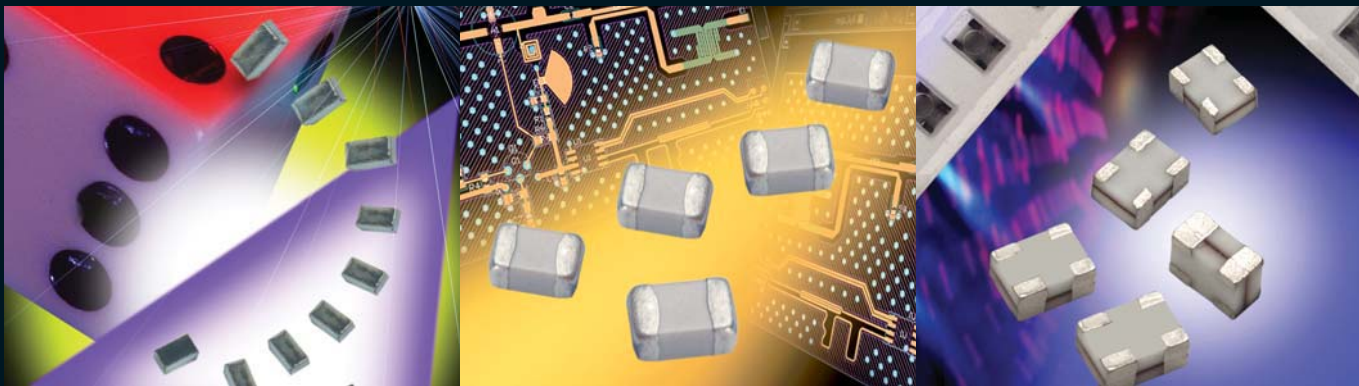


# AVX RF Microwave Products



Version 16.4

**AVX**  
A KYOCERA GROUP COMPANY

## *AVX Microwave Ask The World Of Us*

As one of the world's broadest line multilayer ceramic chip capacitor suppliers, and a major Thin Film RF/Microwave capacitor, inductor, directional coupler and low pass filter and microwave ceramic capacitor manufacturer, it is our mission to provide **First In Class** Technology, Quality and Service, by establishing progressive design, manufacturing and continuous improvement programs driving toward a single goal:

**TOTAL CUSTOMER SATISFACTION**

QV2000

## Table of Contents

|                              |          |
|------------------------------|----------|
| <b>Company Profile .....</b> | <b>4</b> |
|------------------------------|----------|

### Thin-Film RF/Microwave Capacitor Technology

#### Accu-P®

|                                                        |       |
|--------------------------------------------------------|-------|
| Thin-Film Technology.....                              | 6     |
| Thin-Film Chip Capacitors.....                         | 7-9   |
| 0201 Typical Electrical Tables – Accu-P®.....          | 10-11 |
| 0402 Typical Electrical Tables – Accu-P®.....          | 12-13 |
| 0603 Typical Electrical Tables – Accu-P®.....          | 14-15 |
| 0805 Typical Electrical Tables – Accu-P®.....          | 16-17 |
| 1210 Typical Electrical Tables – Accu-P®.....          | 18-19 |
| High Frequency Characteristics .....                   | 20-25 |
| Environmental / Mechanical Characteristics .....       | 26    |
| Performance Characteristics RF Power Applications..... | 27    |
| Application Notes.....                                 | 28-29 |
| Automatic Insertion Packaging .....                    | 30    |

### Thin-Film RF/Microwave Inductor Technology

#### Accu-L®

|                                                        |       |
|--------------------------------------------------------|-------|
| L0201 Tight Tolerance RF Inductor .....                | 32-33 |
| L0402 Tight Tolerance RF Inductor .....                | 34-35 |
| L0603 AND L0805 SMD High-Q RF Inductor – Accu-L® ..... | 36-38 |
| Environmental Characteristics.....                     | 39    |
| Application Notes .....                                | 40    |

### Thin-Film RF/Microwave Directional Couplers

#### CP0302/CP0402/CP0603/CP0805 and DB0603N/DB0805 3dB 90°

|                                                            |       |
|------------------------------------------------------------|-------|
| CP0402W2700FNTR Wide Band High Directivity .....           | 42-43 |
| CP0402W2700FNTR Test Jigs .....                            | 44    |
| CP0302A5425ENTR / CP0402Q5425ENTR / CP0603Q5425ENTR .....  | 45-46 |
| High Directivity Directional Couplers For WiFi Bands ..... | 47-48 |
| CP0402P High Directivity, Tight Coupling Tolerance .....   | 49-52 |
| CP0402 High Directivity LGA Termination.....               | 53-58 |
| CP0603 High Directivity LGA Termination.....               | 59    |
| CP0402 / CP0603 High Directivity Couplers Test Jigs.....   | 60-62 |
| CP0603 SMD Type – Thin-Film Directional Couplers.....      | 63    |
| CP0603 SMD Type – High Directivity .....                   | 64-68 |
| CP0805 SMD Type – Thin-Film Directional Couplers.....      | 69    |
| CP0805 and CP0603 Test Jigs .....                          | 70-86 |
| DB0603N 3dB 90° Couplers .....                             | 87-98 |
| DB0805 3dB 90° Couplers .....                              | 99    |

### Thin-Film RF/Microwave Harmonic Low Pass Filter

#### LP0402/LP0603/LP0805

|                                               |         |
|-----------------------------------------------|---------|
| LP0402N Series Harmonic Low Pass Filter ..... | 101-103 |
| Lead-Free LGA Termination.....                | 104     |
| LP0402N Series Harmonic Low Pass Filter ..... | 105-108 |
| Lead-Free LGA Termination Test Jigs.....      | 109     |
| LP0603 Test Jigs .....                        | 110-111 |
| LP0805 Type Harmonic.....                     | 112     |

### 1206 High Performance

|                                               |         |
|-----------------------------------------------|---------|
| LP1206A0512BNTR Harmonic Low Pass Filter..... | 113-114 |
| LP1206A0700ANTR Low Pass Filter.....          | 115-116 |

### Thin-Film RF/Microwave Products – Designer Kits .... 117-119

### Multilayer Organic (MLO™) Technology

#### MLO™ Capacitors ..... 121-124

#### MLO™ Diplexers

|                                                |         |
|------------------------------------------------|---------|
| 0603 WLAN/BT .....                             | 125-130 |
| 0805 CDMA.....                                 | 131-132 |
| 0805 WCDMA .....                               | 133-134 |
| 0805 WLAN .....                                | 135-136 |
| 0805 WLAN/BT .....                             | 137-138 |
| Automated SMT Assembly/SMT Reflow Profile..... | 139     |

#### MLO™ Inductors

|                                                |         |
|------------------------------------------------|---------|
| Tight Tolerance .....                          | 140-141 |
| High Current.....                              | 142-143 |
| Hi-Q.....                                      | 144-145 |
| Performance Characteristics.....               | 146     |
| Automated SMT Assembly/SMT Reflow Profile..... | 147     |

#### MLO™ SMT Crossovers

|                                                |         |
|------------------------------------------------|---------|
| RF-DC.....                                     | 148-150 |
| RF-RF .....                                    | 151-153 |
| Automated SMT Assembly/SMT Reflow Profile..... | 154     |

### RF Inductors

|                                              |         |
|----------------------------------------------|---------|
| AL Series – Air Core Inductors.....          | 156-162 |
| AS Series – Square Air Core Inductors.....   | 163-167 |
| LCWC Series – Wire Wound Chip Inductor ..... | 168-177 |

### RF/Microwave Capacitors

#### RF/Microwave Multilayer Capacitors (MLC)

|                                                                             |         |
|-----------------------------------------------------------------------------|---------|
| UQ Series High Q Ultra Low ESR MLC .....                                    | 179-191 |
| SQ Series Ultra Low ESR MLC .....                                           | 192-204 |
| MK Series Ultra Low ESR, COG (NP0) Capacitors .....                         | 205-207 |
| AQ Series.....                                                              | 208-211 |
| MIL-PRF-55681 “BG” Voltage Temperature .....                                | 212-214 |
| Limits (+90±20ppm/°C).....                                                  |         |
| • CDR11BG; CDR12BG (0.055" x 0.055") - Failure Rate Level: M, P, R, S ..... |         |
| • CDR13BG; CDR14BG (0.110" x 0.110") - Failure Rate Level: M, P, R, S ..... |         |
| Performance Curves .....                                                    | 215-219 |
| Automatic Insertion Packaging.....                                          | 220     |
| HQ® Series, High RF Power Capacitors .....                                  | 221-227 |

#### RF/Microwave COG (NP0) Capacitors

|                                                              |         |
|--------------------------------------------------------------|---------|
| Ultra Low ESR “CU” Series, COG (NP0) Capacitors (RoHS) ..... | 228-229 |
| Ultra Low ESR “U” Series, COG (NP0) Capacitors (RoHS).....   | 230-232 |
| Ultra Low ESR “U” Series, COG (NP0) Capacitors (RoHS) .....  | 233-235 |
| Automotive, AEC Q200 Qualified.....                          |         |
| Ultra Low ESR “U” Series, COG (NP0) Capacitors (Sn/Pb).....  | 236-238 |

#### RF/Microwave “U” Series Designer Kits ..... 239

## Table of Contents

---

|                                                        |                     |
|--------------------------------------------------------|---------------------|
| Company Profile .....                                  | 4                   |
| Thin-Film RF/Microwave Capacitor Technology .....      | 5-30                |
| Accu-P                                                 |                     |
| Thin-Film RF/Microwave Inductor Technology .....       | 31-40               |
| Accu-L®                                                |                     |
| Thin-Film RF/Microwave Directional Couplers .....      | 41-99               |
| CP0302/CP0402/CP0603/CP0805 and DB0603N/DB0805 3dB 90° |                     |
| Thin-Film RF/Microwave Harmonic Low Pass Filter .....  | 100-116             |
| LP0402/LP0603/LP0805                                   |                     |
| LP1206 High Performance                                |                     |
| Thin-Film RF/Microwave Products – Designer Kits .....  | 117-119             |
| Multilayer Organic (MLO™) Technology .....             | 120-154             |
| MLO™ Capacitors                                        | MLO™ Inductors      |
| MLO™ Diplexers                                         | MLO™ SMT Crossovers |
| RF Inductors .....                                     | 155-177             |
| Air Core Inductors                                     |                     |
| Square Air Core Inductors                              |                     |
| Wire Wound Chip Inductors                              |                     |
| RF/Microwave Capacitors .....                          | 178-239             |
| RF/Microwave Multilayer Capacitors (MLC)               |                     |
| RF/Microwave COG (NP0) Capacitors                      |                     |
| RF/Microwave “U” Series Designer Kits                  |                     |

AVX Corporation is a leading manufacturer of multilayer ceramic, thin film and tantalum, as well as other passive electronic components. These products are used in virtually every electronic system today, including data processing, telecommunications, consumer electronics, automotive electronics, military and aerospace systems, and instrumentation and process controls.

We continually strive to be the leader in all component segments we supply. RF/Microwave capacitors is a thrust business for us. AVX offers a broad line of RF/Microwave Chip Capacitors in a wide range of sizes, styles, and ratings.

The Thin-Film Products range illustrated in this catalog represents the state-of-the-art in RF Capacitors, Inductors, Directional Couplers and Low Pass Filters. The thin-film technology provides components that exhibit excellent batch-to-batch repeatability of electrical parameters at RF frequencies.

The Accu-P® series of capacitors are available in ultra-tight tolerances ( $\pm 0.01\text{pF}$ ) as well as non-standard capacitance values.

The Accu-L® series of inductors are ideally suited for applications requiring an extremely high Q and high current capability.

The CP0302/CP0402/CP0603/CP0805 series of Directional Couplers cover the frequency range of 800 MHz to 6 GHz. They feature low insertion loss, high directivity and highly accurate coupling factors.

The LP0402/0603/0805 series of Low Pass Filters provide a rugged component in a small size package with excellent high frequency performance.

The Multilayer Organic (MLO™) series of components are based on AVX's patented multilayer organic technology (US patent 6,987,307). They are low profile with frequencies well above 1GHz.

Another major series of microwave capacitors consists of both multilayer porcelain and ceramic capacitors for frequencies from 10 MHz to 4.2 GHz (UQ and SQ Series). Six sizes of specially designed ultra-low ESR C0G (NP0) capacitors are covered for RF applications (CU and U Series).

The air core and wire wound ceramic chip inductors offer high current ratings (up to 4.4A) and quality factor ( $>100$ ).

**Ask the world of us. Call (864) 967-2150.**

**Or visit our website <http://www.avx.com>**



# Thin-Film RF/Microwave Capacitor Technology

Accu-P®

## Thin-Film Technology

### THE IDEAL CAPACITOR

The non-ideal characteristics of a real capacitor can be ignored at low frequencies. Physical size imparts inductance to the capacitor and dielectric and metal electrodes result in resistive losses, but these often are of negligible effect on the circuit. At the very high frequencies of radio communication (>100MHz) and satellite systems (>1GHz), these effects become important. Recognizing that a real capacitor will exhibit inductive and resistive impedances in addition to capacitance, the ideal capacitor for these high frequencies is an ultra low loss component which can be fully characterized in all parameters with total repeatability from unit to unit.

Until recently, most high frequency/microwave capacitors were based on fired-ceramic (porcelain) technology. Layers of ceramic dielectric material and metal alloy electrode paste are interleaved and then sintered in a high temperature oven. This technology exhibits component variability in dielectric quality (losses, dielectric constant and insulation resistance), variability in electrode conductivity and variability in physical size (affecting inductance). An alternate thin-film technology has been developed which virtually eliminates these variances. It is this technology which has been fully incorporated into Accu-P® and Accu-P® to provide high frequency capacitors exhibiting truly ideal characteristics.

The main features of Accu-P® may be summarized as follows:

- High purity of electrodes for very low and repeatable ESR.
- Highly pure, low-K dielectric for high breakdown field, high insulation resistance and low losses to frequencies above 40GHz.
- Very tight dimensional control for uniform inductance, unit to unit.
- Very tight capacitance tolerances for high frequency signal applications.

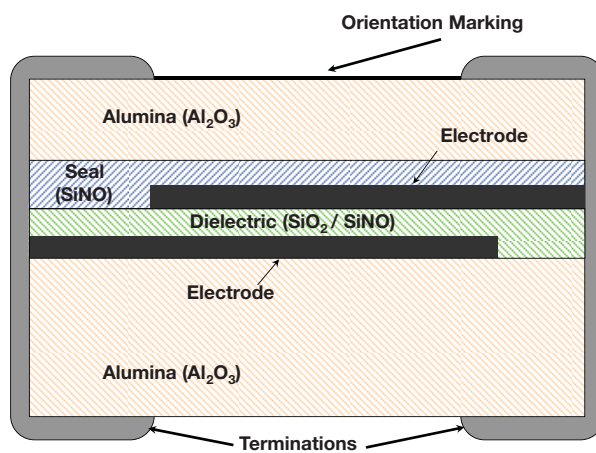
This accuracy sets apart these Thin-Film capacitors from ceramic capacitors so that the term Accu has been employed as the designation for this series of devices, an abbreviation for “accurate.”

### THIN-FILM TECHNOLOGY

Thin-film technology is commonly used in producing semiconductor devices. In the last two decades, this technology has developed tremendously, both in performance and in process control. Today's techniques enable line definitions of below 1µm, and the controlling of thickness of layers at 100Å (10<sup>-2</sup>µm). Applying this technology to the manufacture of capacitors has enabled the development of components where both electrical and physical properties can be tightly controlled.

The thin-film production facilities at AVX consist of:

- Class 1000 clean rooms, with working areas under laminar-flow hoods of class 100, (below 100 particles per cubic foot larger than 0.5µm).
- High vacuum metal deposition systems for high-purity electrode construction.
- Photolithography equipment for line definition down to 2.0µm accuracy.
- Plasma-enhanced CVD for various dielectric depositions (CVD=Chemical Vapor Deposition).
- High accuracy, microprocessor-controlled dicing saws for chip separation.
- High speed, high accuracy sorting to ensure strict tolerance adherence.



ACCU-P® CAPACITOR STRUCTURE

## Thin-Film Chip Capacitors

### ACCU-P® TECHNOLOGY

The use of very low-loss dielectric materials, silicon dioxide and silicon oxynitride, in conjunction with highly conductive electrode metals results in low ESR and high Q. These high-frequency characteristics change at a slower rate with increasing frequency than for ceramic microwave capacitors.

Because of the thin-film technology, the above-mentioned frequency characteristics are obtained without significant compromise of properties required for surface mounting.

The main Accu-P® properties are:

- Internationally agreed sizes with excellent dimensional control.
- Ultra small size chip capacitors (01005) are available.
- Ultra tight capacitance tolerances.
- Low ESR at VHF, UHF and microwave frequencies.
- Enhanced RF power handling capability.
- High stability with respect to time, temperature, frequency and voltage variation.
- Nickel/solder-coated terminations to provide excellent solderability and leach resistance.

### ACCU-P® FEATURES

Accu-P® meets the fast-growing demand for low-loss (high-Q) capacitors for use in surface mount technology especially for the mobile communications market, such as cellular radio of 450 and 900 MHz, UHF walkie-talkies, UHF cordless telephones to 2.3 GHz, low noise blocks at 11-12.5 GHz and for other VHF, UHF and microwave applications.

Accu-P® is currently unique in its ability to offer very low capacitance values (0.05pF) and very tight capacitance tolerances ( $\pm 0.01\text{pF}$ ).

- The RF power handling capability of the Accu-P® allows for its usage in both small signal and RF power applications.
- Thin Film Technology guarantees minimal batch to batch variability of parameters at high frequency.
- Inspection test and quality control procedures in accordance with ISO 9001, CECC, IECQ and USA MIL Standards yield products of the highest quality.
- Hand soldering Accu-P®: Due to their construction utilizing relatively high thermal conductivity materials, Accu-P's have become the preferred device in R & D labs and production environments where hand soldering is used.

### APPLICATIONS

Cellular Communications  
CT2/PCN (Cordless Telephone/Personal Comm. Networks)  
Satellite TV  
Cable TV  
GPS (Global Positioning Systems)  
Vehicle Location Systems  
Vehicle Alarm Systems  
Paging  
Military Communications

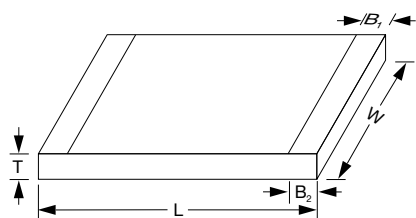
Radar Systems  
Video Switching  
Test & Measurements  
Filters  
VCO's  
Matching Networks  
RF Amplifiers

### APPROVALS

ISO 9001

# Accu-P®

## Thin-Film Chip Capacitors for RF Signal and Power Applications



### ACCUP® (Signal and Power Type Capacitors)

|                | 01005*                                                                               | 0201*                         | 0402*                                                                                | 0603*                      | 0805*                     | 1210                      |
|----------------|--------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------|----------------------------|---------------------------|---------------------------|
| L              | 0.405±0.020<br>(0.016±0.001)                                                         | 0.60±0.05<br>(0.023±0.002)    | 1.00±0.1<br>(0.039±0.004)                                                            | 1.60±0.1<br>(0.063±0.004)  | 2.01±0.1<br>(0.079±0.004) | 3.02±0.1<br>(0.119±0.004) |
| W              | 0.215 ± 0.020<br>(0.0085 ± 0.001)                                                    | 0.325±0.050<br>(0.0128±0.002) | 0.55±0.07<br>(0.022±0.003)                                                           | 0.81±0.1<br>(0.032±0.004)  | 1.27±0.1<br>(0.050±0.004) | 2.5±0.1<br>(0.100±0.004)  |
| T              | 0.145 ± 0.020<br>(0.006 ± 0.001)                                                     | 0.225±0.050<br>(0.009±0.002)  | 0.40±0.1<br>(0.016±0.004)                                                            | 0.63±0.1<br>(0.025±0.004)  | 0.93±0.2<br>(0.036±0.008) | 0.93±0.2<br>(0.036±0.008) |
| B <sub>1</sub> | 0.00 <sup>+0.1</sup> <sub>-0.0</sub><br>(0.000 <sup>+0.004</sup> <sub>-0.000</sub> ) | 0.10±0.10<br>(0.004±0.004)    | 0.00 <sup>+0.1</sup> <sub>-0.0</sub><br>(0.000 <sup>+0.004</sup> <sub>-0.000</sub> ) | 0.35±0.15<br>(0.014±0.006) | 0.30±0.1<br>(0.012±0.004) | 0.43±0.1<br>(0.017±0.004) |
| B <sub>2</sub> | 0.10 ± 0.03<br>(0.004 ± 0.001)                                                       | 0.15±0.05<br>(0.006±0.002)    | 0.20±0.1<br>(0.008±0.004)                                                            | 0.35±0.15<br>(0.014±0.006) | 0.30±0.1<br>(0.012±0.004) | 0.43±0.1<br>(0.017±0.004) |

\*Mount Black Side Up

DIMENSIONS: millimeters (inches)

## HOW TO ORDER

**0402**  
T

**Size**  
C005  
0201  
0402  
0603  
0805  
1210\*

**3**  
T

**Voltage**  
2 = 200V  
1 = 100V  
5 = 50V  
3 = 25V  
Y = 16V  
Z = 10V

**J**  
T

**Temperature Coefficient (1)**  
J = 0±30ppm/°C  
(-55°C to +125°C)  
K = 0±60ppm/°C  
(-55°C to +125°C)

**4R7**  
T

**Capacitance**  
Capacitance expressed in pF.  
(2 significant digits + number of zeros)  
**for values <10pF**, letter R denotes decimal point.  
Example:  
68pF = 680  
8.2pF = 8R2

**A**  
T

**Tolerance for C≤2.0pF\***  
Z = ±0.01pF  
P = ±0.02pF  
Q = ±0.03pF  
A = ±0.05pF  
B = ±0.1pF  
C = ±0.25pF

**for C≤3.0pF**  
Q = ±0.03pF  
A = ±0.05pF  
B = ±0.1pF  
C = ±0.25pF

**for C≤5.6pF**  
A = ±0.05pF  
B = ±0.1pF  
C = ±0.25pF

**for 5.6pF<C<10pF**  
B = ±0.1pF  
C = ±0.25pF  
D = ±0.5pF

**for C≥10pF**  
F = ±1%  
G = ±2%  
J = ±5%

**B**  
T

**Specification Code**  
B = Accu-P® technology

**S**  
T

**Termination Code**

W = Nickel/Solder Coated  
**Accu-P® 0402** Sn90, Pb10\*\*\*  
T = Nickel/High Temperature Solder Coated  
**Accu-P® 0805\*\*, 1210\*\*** Sn96, Ag4  
Nickel/Solder Coated  
**Accu-P® 0603\*\*\*** Sn63, Pb37  
\*\*S = Nickel/Lead Free Solder Coated  
**Accu-P® 01005, 0201, 0402, 0603** Sn100

\*\*RoHS compliant

\*\*\* Not RoHS Compliant

**TR**  
T

**Packaging Code**

TR = Tape & Reel

(1) TC's shown are per EIA/IEC Specifications.

**Engineering Kits Available**  
see pages 118-119

\*Tolerances as tight as ±0.01pF are available. Please consult the factory.



For RoHS compliant products,  
please select correct termination style.

## ELECTRICAL SPECIFICATIONS

|                                         |                                                                        |
|-----------------------------------------|------------------------------------------------------------------------|
| Operating and Storage Temperature Range | -55°C to +125°C                                                        |
| Temperature Coefficients <sup>(1)</sup> | 0 ± 30ppm/°C dielectric code "J" / 0 ± 60ppm/°C dielectric code "K"    |
| Capacitance Measurement                 | 1 MHz, 1 Vrms                                                          |
| Insulation Resistance (IR)              | ≥10 <sup>11</sup> Ohms (≥10 <sup>10</sup> Ohms for 0201 and 0402 size) |
| Proof Voltage                           | 2.5 U <sub>R</sub> for 5 secs.                                         |
| Aging Characteristic                    | Zero                                                                   |
| Dielectric Absorption                   | 0.01%                                                                  |

## Signal and Power Type Capacitors

### Accu-P® Capacitance Ranges (pF)

#### TEMP. COEFFICIENT CODE

“J” = 0±30ppm/°C (-55°C to +125°C)<sup>(2)</sup> “K” = 0±60ppm/°C (-55°C to +125°C)<sup>(2)</sup>

| Size                        |   |             | C005 |     |    |    |    | 0201 |     |     |    |    | 0402 |    |     |     |    | 0603 |     |    |    | 0805 |    |  | 1210 |  |
|-----------------------------|---|-------------|------|-----|----|----|----|------|-----|-----|----|----|------|----|-----|-----|----|------|-----|----|----|------|----|--|------|--|
| Size Code                   |   |             | 16   | 100 | 50 | 25 | 16 | 10   | 200 | 100 | 50 | 25 | 16   | 10 | 200 | 100 | 50 | 25   | 100 | 50 | 25 | 100  | 50 |  |      |  |
| Voltage                     |   |             | 16   | 100 | 50 | 25 | 16 | 10   | 200 | 100 | 50 | 25 | 16   | 10 | 200 | 100 | 50 | 25   | 100 | 50 | 25 | 100  | 50 |  |      |  |
| Cap in<br>pF <sup>(1)</sup> | — | Cap<br>code |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.1                         | — | 0R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.2                         | — | 0R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.3                         | — | 0R3         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.4                         | — | 0R4         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.5                         | — | 0R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.6                         | — | 0R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.7                         | — | 0R7         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.8                         | — | 0R8         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 0.9                         | — | 0R9         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.0                         | — | 1R0         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.1                         | — | 1R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.2                         | — | 1R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.3                         | — | 1R3         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.4                         | — | 1R4         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.5                         | — | 1R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.6                         | — | 1R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.7                         | — | 1R7         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.8                         | — | 1R8         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 1.9                         | — | 1R9         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.0                         | — | 2R0         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.1                         | — | 2R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.2                         | — | 2R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.3                         | — | 2R3         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.4                         | — | 2R4         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.5                         | — | 2R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.6                         | — | 2R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.7                         | — | 2R7         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.8                         | — | 2R8         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 2.9                         | — | 2R9         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.0                         | — | 3R0         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.1                         | — | 3R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.2                         | — | 3R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.3                         | — | 3R3         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.4                         | — | 3R4         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.5                         | — | 3R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.6                         | — | 3R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.7                         | — | 3R7         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.8                         | — | 3R8         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 3.9                         | — | 3R9         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.0                         | — | 4R0         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.1                         | — | 4R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.2                         | — | 4R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.3                         | — | 4R3         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.4                         | — | 4R4         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.5                         | — | 4R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.6                         | — | 4R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 4.7                         | — | 4R7         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 5.1                         | — | 5R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 5.6                         | — | 5R6         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 6.2                         | — | 6R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 6.8                         | — | 6R8         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 7.5                         | — | 7R5         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 8.2                         | — | 8R2         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 9.1                         | — | 9R1         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 10.0                        | — | 100         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 11.0                        | — | 110         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 12.0                        | — | 120         |      |     |    |    |    |      |     |     |    |    |      |    |     |     |    |      |     |    |    |      |    |  |      |  |
| 13.0                        | — | 130         |      |     |    |    |    |      |     |     |    |    |      | </ |     |     |    |      |     |    |    |      |    |  |      |  |

<sup>(1)</sup> For capacitance values higher than listed in table, please consult factory.

<sup>(2)</sup> TC shown is per EIA/IEC Specifications.

These values are produced with “K” temperature coefficient code only.

Intermediate values are available within the indicated range.

## 0201 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 0.05                                   | ±0.02 | 20.9                                            | 599                        | 402  | 0.055               | 650       | 3220               | 0.056                | 265       | 4010               | 0.057                | 195       | 4450               |
| 0.1                                    | ±0.02 | 19.4                                            | 574                        | 316  | 0.110               | 614       | 2682               | 0.112                | 246       | 3036               | 0.113                | 188       | 3113               |
| 0.15                                   | ±0.02 | 17.9                                            | 510                        | 280  | 0.163               | 550       | 2087               | 0.166                | 220       | 2404               | 0.168                | 170       | 2441               |
| 0.2                                    | ±0.02 | 16.4                                            | 445                        | 245  | 0.216               | 520       | 1693               | 0.220                | 210       | 1971               | 0.223                | 160       | 1970               |
| 0.25                                   | ±0.02 | 15.5                                            | 436                        | 240  | 0.262               | 510       | 1371               | 0.268                | 204       | 1604               | 0.272                | 153       | 1646               |
| 0.3                                    | ±0.02 | 14.6                                            | 427                        | 235  | 0.309               | 500       | 1149               | 0.316                | 199       | 1337               | 0.320                | 146       | 1421               |
| 0.35                                   | ±0.02 | 14.1                                            | 423                        | 232  | 0.360               | 494       | 1001               | 0.369                | 196       | 1177               | 0.374                | 144       | 1265               |
| 0.4                                    | ±0.02 | 12.5                                            | 418                        | 230  | 0.411               | 489       | 874                | 0.421                | 193       | 1038               | 0.427                | 142       | 1129               |
| 0.45                                   | ±0.02 | 11.9                                            | 413                        | 227  | 0.461               | 484       | 819                | 0.473                | 191       | 972                | 0.481                | 140       | 1066               |
| 0.5                                    | ±0.02 | 11.3                                            | 408                        | 224  | 0.512               | 478       | 765                | 0.526                | 188       | 906                | 0.535                | 138       | 1003               |
| 0.55                                   | ±0.02 | 10.9                                            | 403                        | 222  | 0.563               | 473       | 710                | 0.578                | 186       | 840                | 0.588                | 137       | 940                |
| 0.6                                    | ±0.02 | 10.4                                            | 398                        | 219  | 0.614               | 468       | 667                | 0.631                | 183       | 791                | 0.642                | 135       | 882                |
| 0.65                                   | ±0.02 | 10.0                                            | 394                        | 217  | 0.664               | 462       | 624                | 0.683                | 181       | 742                | 0.695                | 133       | 825                |
| 0.7                                    | ±0.02 | 9.5                                             | 389                        | 214  | 0.715               | 457       | 580                | 0.735                | 178       | 693                | 0.749                | 131       | 767                |
| 0.75                                   | ±0.02 | 9.3                                             | 384                        | 211  | 0.766               | 452       | 557                | 0.788                | 176       | 664                | 0.802                | 129       | 729                |
| 0.8                                    | ±0.02 | 9.1                                             | 379                        | 209  | 0.817               | 446       | 534                | 0.840                | 173       | 635                | 0.856                | 127       | 692                |
| 0.85                                   | ±0.02 | 8.9                                             | 374                        | 206  | 0.868               | 441       | 511                | 0.893                | 171       | 606                | 0.909                | 126       | 654                |
| 0.9                                    | ±0.02 | 8.8                                             | 370                        | 203  | 0.918               | 436       | 487                | 0.945                | 168       | 577                | 0.963                | 124       | 616                |
| 0.95                                   | ±0.02 | 8.6                                             | 365                        | 201  | 0.969               | 430       | 464                | 0.998                | 166       | 548                | 1.016                | 122       | 579                |
| 1                                      | ±0.02 | 8.4                                             | 360                        | 198  | 1.020               | 425       | 441                | 1.050                | 163       | 519                | 1.070                | 120       | 541                |
| 1.05                                   | ±0.02 | 8.2                                             | 358                        | 197  | 1.078               | 421       | 426                | 1.112                | 161       | 502                | 1.134                | 119       | 523                |
| 1.1                                    | ±0.02 | 8.0                                             | 355                        | 195  | 1.135               | 418       | 410                | 1.173                | 159       | 486                | 1.199                | 117       | 505                |
| 1.15                                   | ±0.02 | 7.8                                             | 353                        | 194  | 1.193               | 414       | 395                | 1.235                | 157       | 469                | 1.263                | 116       | 488                |
| 1.2                                    | ±0.02 | 7.6                                             | 350                        | 193  | 1.251               | 411       | 379                | 1.296                | 155       | 452                | 1.327                | 115       | 470                |
| 1.25                                   | ±0.02 | 7.5                                             | 348                        | 191  | 1.308               | 407       | 364                | 1.358                | 153       | 436                | 1.392                | 114       | 452                |
| 1.3                                    | ±0.02 | 7.4                                             | 345                        | 190  | 1.366               | 403       | 348                | 1.419                | 151       | 419                | 1.456                | 112       | 434                |
| 1.35                                   | ±0.02 | 7.3                                             | 343                        | 189  | 1.424               | 400       | 333                | 1.481                | 149       | 402                | 1.520                | 111       | 416                |
| 1.4                                    | ±0.02 | 7.2                                             | 340                        | 187  | 1.481               | 396       | 317                | 1.542                | 147       | 386                | 1.585                | 110       | 398                |
| 1.45                                   | ±0.02 | 7.1                                             | 338                        | 186  | 1.539               | 393       | 302                | 1.604                | 145       | 369                | 1.649                | 109       | 381                |
| 1.5                                    | ±0.02 | 7.0                                             | 335                        | 184  | 1.597               | 389       | 287                | 1.665                | 144       | 353                | 1.713                | 107       | 363                |
| 1.55                                   | ±0.02 | 6.8                                             | 332                        | 183  | 1.642               | 386       | 282                | 1.714                | 142       | 347                | 1.764                | 106       | 358                |
| 1.6                                    | ±0.02 | 6.7                                             | 330                        | 181  | 1.687               | 382       | 277                | 1.762                | 141       | 342                | 1.815                | 105       | 352                |
| 1.65                                   | ±0.02 | 6.6                                             | 327                        | 180  | 1.732               | 378       | 272                | 1.810                | 140       | 337                | 1.866                | 104       | 347                |
| 1.7                                    | ±0.02 | 6.5                                             | 324                        | 178  | 1.777               | 375       | 267                | 1.859                | 138       | 331                | 1.917                | 103       | 342                |
| 1.75                                   | ±0.02 | 6.4                                             | 321                        | 176  | 1.822               | 371       | 262                | 1.907                | 137       | 326                | 1.968                | 102       | 337                |
| 1.8                                    | ±0.02 | 6.3                                             | 318                        | 175  | 1.866               | 367       | 257                | 1.955                | 136       | 321                | 2.018                | 101       | 331                |
| 1.85                                   | ±0.02 | 6.2                                             | 315                        | 173  | 1.911               | 364       | 252                | 2.003                | 134       | 316                | 2.069                | 100       | 326                |
| 1.9                                    | ±0.02 | 6.2                                             | 312                        | 172  | 1.956               | 360       | 247                | 2.052                | 133       | 310                | 2.120                | 99        | 321                |
| 1.95                                   | ±0.02 | 6.1                                             | 309                        | 170  | 2.001               | 357       | 242                | 2.100                | 132       | 305                | 2.171                | 98        | 316                |
| 2                                      | ±0.03 | 6.0                                             | 306                        | 168  | 2.046               | 353       | 237                | 2.148                | 131       | 300                | 2.222                | 97        | 310                |
| 2.1                                    | ±0.03 | 5.9                                             | 301                        | 166  | 2.150               | 348       | 232                | 2.263                | 128       | 293                | 2.344                | 95        | 303                |
| 2.2                                    | ±0.03 | 5.7                                             | 296                        | 163  | 2.254               | 343       | 227                | 2.377                | 125       | 287                | 2.467                | 93        | 296                |
| 2.3                                    | ±0.03 | 5.6                                             | 292                        | 160  | 2.358               | 337       | 222                | 2.491                | 122       | 281                | 2.590                | 91        | 289                |
| 2.4                                    | ±0.03 | 5.5                                             | 287                        | 158  | 2.462               | 332       | 217                | 2.606                | 120       | 274                | 2.712                | 89        | 282                |
| 2.5                                    | ±0.03 | 5.4                                             | 282                        | 155  | 2.566               | 327       | 212                | 2.720                | 117       | 268                | 2.835                | 87        | 275                |
| 2.6                                    | ±0.03 | 5.3                                             | 277                        | 152  | 2.670               | 322       | 207                | 2.834                | 114       | 262                | 2.958                | 85        | 268                |
| 2.7                                    | ±0.03 | 5.2                                             | 272                        | 150  | 2.773               | 317       | 202                | 2.949                | 112       | 255                | 3.080                | 83        | 261                |
| 2.8                                    | ±0.03 | 5.1                                             | 269                        | 148  | 2.878               | 312       | 199                | 3.066                | 110       | 252                | 3.209                | 81        | 258                |
| 2.9                                    | ±0.03 | 5.0                                             | 265                        | 146  | 2.983               | 308       | 196                | 3.184                | 108       | 248                | 3.337                | 80        | 254                |
| 3                                      | ±0.03 | 4.9                                             | 261                        | 144  | 3.088               | 304       | 193                | 3.301                | 106       | 245                | 3.465                | 78        | 251                |
| 3.1                                    | ±0.05 | 4.8                                             | 257                        | 141  | 3.192               | 299       | 190                | 3.419                | 105       | 241                | 3.593                | 77        | 247                |
| 3.2                                    | ±0.05 | 4.7                                             | 253                        | 139  | 3.297               | 295       | 187                | 3.536                | 103       | 238                | 3.722                | 76        | 244                |
| 3.3                                    | ±0.05 | 4.6                                             | 250                        | 137  | 3.402               | 291       | 185                | 3.654                | 101       | 234                | 3.850                | 74        | 240                |
| 3.4                                    | ±0.05 | 4.6                                             | 246                        | 135  | 3.506               | 286       | 182                | 3.771                | 99        | 231                | 3.978                | 73        | 237                |
| 3.5                                    | ±0.05 | 4.5                                             | 242                        | 133  | 3.611               | 282       | 179                | 3.889                | 98        | 227                | 4.107                | 71        | 233                |
| 3.6                                    | ±0.05 | 4.5                                             | 238                        | 131  | 3.716               | 278       | 176                | 4.006                | 96        | 224                | 4.235                | 70        | 230                |
| 3.7                                    | ±0.05 | 4.4                                             | 234                        | 129  | 3.820               | 273       | 173                | 4.124                | 94        | 220                | 4.363                | 69        | 226                |
| 3.8                                    | ±0.05 | 4.4                                             | 230                        | 127  | 3.925               | 269       | 170                | 4.241                | 92        | 217                | 4.492                | 67        | 223                |
| 3.9                                    | ±0.05 | 4.3                                             | 227                        | 125  | 4.030               | 265       | 167                | 4.359                | 91        | 213                | 4.620                | 66        | 219                |

## 0201 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Tesonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 4                                      | ±0.05 | 4.3                                             | 224                        | 123  | 4.138               | 262       | 165                | 4.484                | 89        | 210                | 4.760                | 65        | 216                |
| 4.1                                    | ±0.05 | 4.2                                             | 222                        | 122  | 4.247               | 259       | 162                | 4.610                | 88        | 207                | 4.901                | 64        | 213                |
| 4.2                                    | ±0.05 | 4.2                                             | 220                        | 121  | 4.356               | 257       | 159                | 4.735                | 87        | 204                | 5.041                | 63        | 210                |
| 4.3                                    | ±0.05 | 4.1                                             | 218                        | 120  | 4.464               | 254       | 157                | 4.860                | 86        | 201                | 5.181                | 62        | 207                |
| 4.4                                    | ±0.05 | 4.1                                             | 216                        | 119  | 4.573               | 252       | 154                | 4.986                | 85        | 198                | 5.322                | 61        | 204                |
| 4.5                                    | ±0.05 | 4.0                                             | 214                        | 118  | 4.682               | 249       | 152                | 5.111                | 83        | 195                | 5.462                | 60        | 201                |
| 4.6                                    | ±0.05 | 4.0                                             | 212                        | 116  | 4.790               | 246       | 149                | 5.237                | 82        | 192                | 5.602                | 59        | 198                |
| 4.7                                    | ±0.05 | 3.9                                             | 209                        | 115  | 4.899               | 244       | 147                | 5.362                | 81        | 189                | 5.743                | 58        | 195                |
| 5.1                                    | ±0.05 | 3.8                                             | 201                        | 110  | 5.334               | 233       | 136                | 5.863                | 76        | 178                | 6.304                | 54        | 183                |
| 5.6                                    | ±0.05 | 3.6                                             | 190                        | 105  | 5.877               | 220       | 124                | 6.490                | 70        | 163                | 7.006                | 49        | 168                |
| 6.2                                    | ±0.1  | 3.5                                             | 177                        | 97   | 6.488               | 208       | 126                | 7.290                | 65        | 167                | 7.993                | 45        | 174                |
| 6.8                                    | ±0.1  | 3.3                                             | 164                        | 90   | 7.100               | 195       | 128                | 8.090                | 60        | 171                | 8.980                | 41        | 179                |
| 7.5                                    | ±0.1  | 3.2                                             | 153                        | 84   | 7.901               | 182       | 125                | 9.129                | 56        | 166                | 10.27                | 38        | 173                |
| 8.2                                    | ±0.1  | 3.0                                             | 142                        | 78   | 8.701               | 168       | 121                | 10.17                | 52        | 160                | 11.56                | 34        | 167                |
| 9.1                                    | ±0.1  | 2.9                                             | 135                        | 74   | 9.676               | 159       | 118                | 11.57                | 49        | 154                | 13.49                | 32        | 161                |
| 10                                     | ±1%   | 2.8                                             | 128                        | 70   | 10.65               | 151       | 114                | 12.96                | 45        | 148                | 15.41                | 29        | 155                |
| 11                                     | ±1%   | 2.7                                             | 120                        | 66   | 11.73               | 141       | 110                | 14.52                | 42        | 142                | 17.55                | 27        | 148                |
| 12                                     | ±1%   | 2.5                                             | 112                        | 62   | 12.82               | 132       | 105                | 16.07                | 39        | 135                | 19.68                | 24        | 141                |
| 13                                     | ±1%   | 2.4                                             | 105                        | 58   | 13.92               | 124       | 104                | 17.82                | 36        | 135                | 22.38                | 22        | 142                |
| 14                                     | ±1%   | 2.4                                             | 98                         | 54   | 15.02               | 116       | 103                | 19.57                | 32        | 135                | 25.08                | 19        | 142                |
| 15                                     | ±1%   | 2.3                                             | 91                         | 50   | 16.12               | 108       | 102                | 21.32                | 29        | 135                | 27.78                | 17        | 143                |
| 16                                     | ±1%   | 2.2                                             | 86                         | 47   | 17.37               | 102       | 103                | 24.04                | 27        | 135                | NA                   | NA        | NA                 |
| 17                                     | ±1%   | 2.2                                             | 81                         | 44   | 18.63               | 96        | 105                | 26.76                | 25        | 136                | NA                   | NA        | NA                 |
| 18                                     | ±1%   | 2.1                                             | 76                         | 42   | 19.88               | 90        | 106                | 29.48                | 23        | 136                | NA                   | NA        | NA                 |
| 19                                     | ±1%   | 2.1                                             | 71                         | 39   | 21.14               | 83        | 108                | 32.20                | 21        | 136                | NA                   | NA        | NA                 |
| 20                                     | ±1%   | 2.1                                             | 65                         | 36   | 22.39               | 77        | 109                | 34.92                | 19        | 136                | NA                   | NA        | NA                 |
| 22                                     | ±1%   | 2.0                                             | 55                         | 30   | 24.90               | 65        | 112                | 40.36                | 15        | 137                | NA                   | NA        | NA                 |

## 0402 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 0.05                                   | ±0.02 | 20.9                                            | 856                        | 471  | 0.06                | 881       | 1411               | 0.06                 | 562       | 1216               | 0.06                 | 498       | 983                |
| 0.1                                    | ±0.02 | 19.4                                            | 848                        | 466  | 0.11                | 873       | 1316               | 0.11                 | 554       | 1115               | 0.11                 | 490       | 914                |
| 0.15                                   | ±0.02 | 17.9                                            | 840                        | 462  | 0.16                | 866       | 1222               | 0.16                 | 547       | 1013               | 0.16                 | 482       | 845                |
| 0.2                                    | ±0.02 | 16.4                                            | 832                        | 457  | 0.21                | 858       | 1128               | 0.21                 | 539       | 912                | 0.22                 | 474       | 776                |
| 0.25                                   | ±0.02 | 15.5                                            | 823                        | 453  | 0.26                | 850       | 1033               | 0.27                 | 532       | 810                | 0.27                 | 465       | 707                |
| 0.3                                    | ±0.02 | 14.6                                            | 815                        | 448  | 0.31                | 842       | 939                | 0.32                 | 525       | 708                | 0.32                 | 457       | 638                |
| 0.35                                   | ±0.02 | 14.1                                            | 807                        | 444  | 0.36                | 834       | 844                | 0.37                 | 517       | 607                | 0.37                 | 449       | 569                |
| 0.4                                    | ±0.02 | 12.5                                            | 799                        | 439  | 0.41                | 827       | 750                | 0.42                 | 510       | 505                | 0.42                 | 441       | 500                |
| 0.45                                   | ±0.02 | 11.9                                            | 791                        | 435  | 0.46                | 819       | 667                | 0.47                 | 502       | 458                | 0.48                 | 432       | 453                |
| 0.5                                    | ±0.02 | 11.3                                            | 783                        | 430  | 0.51                | 811       | 583                | 0.52                 | 495       | 410                | 0.53                 | 424       | 407                |
| 0.55                                   | ±0.02 | 10.9                                            | 774                        | 426  | 0.57                | 803       | 500                | 0.57                 | 487       | 363                | 0.58                 | 416       | 360                |
| 0.6                                    | ±0.02 | 10.4                                            | 766                        | 421  | 0.62                | 796       | 465                | 0.62                 | 480       | 343                | 0.63                 | 408       | 339                |
| 0.65                                   | ±0.02 | 10.0                                            | 758                        | 417  | 0.67                | 788       | 431                | 0.67                 | 472       | 322                | 0.68                 | 399       | 317                |
| 0.7                                    | ±0.02 | 9.5                                             | 750                        | 413  | 0.72                | 780       | 396                | 0.72                 | 465       | 302                | 0.73                 | 391       | 296                |
| 0.75                                   | ±0.02 | 9.3                                             | 746                        | 410  | 0.77                | 776       | 375                | 0.78                 | 456       | 290                | 0.79                 | 381       | 285                |
| 0.8                                    | ±0.02 | 9.1                                             | 743                        | 408  | 0.82                | 772       | 354                | 0.83                 | 447       | 277                | 0.84                 | 370       | 273                |
| 0.85                                   | ±0.02 | 9.0                                             | 739                        | 406  | 0.87                | 768       | 334                | 0.88                 | 438       | 265                | 0.89                 | 360       | 262                |
| 0.9                                    | ±0.02 | 8.8                                             | 735                        | 404  | 0.92                | 764       | 313                | 0.93                 | 429       | 253                | 0.95                 | 350       | 250                |
| 0.95                                   | ±0.02 | 8.4                                             | 732                        | 402  | 0.97                | 760       | 292                | 0.98                 | 420       | 240                | 1.00                 | 339       | 239                |
| 1                                      | ±0.02 | 8.0                                             | 728                        | 400  | 1.02                | 756       | 271                | 1.04                 | 411       | 228                | 1.05                 | 329       | 227                |
| 1.05                                   | ±0.02 | 7.9                                             | 725                        | 398  | 1.07                | 752       | 258                | 1.09                 | 406       | 221                | 1.11                 | 323       | 221                |
| 1.1                                    | ±0.02 | 7.8                                             | 721                        | 397  | 1.12                | 749       | 245                | 1.14                 | 401       | 214                | 1.16                 | 318       | 214                |
| 1.15                                   | ±0.02 | 7.6                                             | 718                        | 395  | 1.17                | 745       | 232                | 1.20                 | 396       | 207                | 1.22                 | 312       | 208                |
| 1.2                                    | ±0.02 | 7.4                                             | 714                        | 393  | 1.22                | 742       | 218                | 1.25                 | 391       | 200                | 1.27                 | 306       | 202                |
| 1.25                                   | ±0.02 | 7.2                                             | 711                        | 391  | 1.27                | 738       | 205                | 1.31                 | 386       | 193                | 1.32                 | 301       | 195                |
| 1.3                                    | ±0.02 | 7.0                                             | 707                        | 389  | 1.32                | 734       | 192                | 1.36                 | 381       | 185                | 1.38                 | 295       | 189                |
| 1.35                                   | ±0.02 | 6.9                                             | 704                        | 387  | 1.37                | 731       | 179                | 1.41                 | 376       | 178                | 1.43                 | 289       | 183                |
| 1.4                                    | ±0.02 | 6.8                                             | 700                        | 385  | 1.42                | 727       | 165                | 1.47                 | 371       | 171                | 1.49                 | 283       | 177                |
| 1.45                                   | ±0.02 | 6.7                                             | 697                        | 383  | 1.47                | 724       | 152                | 1.52                 | 366       | 164                | 1.54                 | 278       | 170                |
| 1.5                                    | ±0.02 | 6.5                                             | 693                        | 381  | 1.52                | 720       | 139                | 1.58                 | 361       | 157                | 1.60                 | 272       | 164                |
| 1.55                                   | ±0.02 | 6.5                                             | 690                        | 379  | 1.56                | 716       | 135                | 1.62                 | 358       | 153                | 1.65                 | 269       | 159                |
| 1.6                                    | ±0.02 | 6.5                                             | 686                        | 377  | 1.61                | 713       | 130                | 1.67                 | 355       | 148                | 1.70                 | 267       | 155                |
| 1.65                                   | ±0.02 | 6.5                                             | 683                        | 375  | 1.66                | 709       | 126                | 1.72                 | 352       | 143                | 1.76                 | 264       | 150                |
| 1.7                                    | ±0.02 | 6.4                                             | 679                        | 373  | 1.71                | 705       | 122                | 1.77                 | 349       | 139                | 1.81                 | 261       | 146                |
| 1.75                                   | ±0.02 | 6.3                                             | 676                        | 372  | 1.75                | 702       | 118                | 1.82                 | 347       | 134                | 1.86                 | 259       | 141                |
| 1.8                                    | ±0.02 | 6.2                                             | 672                        | 370  | 1.80                | 698       | 113                | 1.87                 | 344       | 130                | 1.92                 | 256       | 137                |
| 1.85                                   | ±0.02 | 6.1                                             | 669                        | 368  | 1.85                | 694       | 109                | 1.92                 | 341       | 125                | 1.97                 | 253       | 132                |
| 1.9                                    | ±0.02 | 6.0                                             | 665                        | 366  | 1.90                | 690       | 105                | 1.97                 | 338       | 121                | 2.02                 | 251       | 128                |
| 1.95                                   | ±0.02 | 5.9                                             | 662                        | 364  | 1.94                | 687       | 101                | 2.01                 | 335       | 116                | 2.08                 | 248       | 123                |
| 2                                      | ±0.03 | 5.7                                             | 658                        | 362  | 1.99                | 683       | 96                 | 2.06                 | 332       | 112                | 2.13                 | 245       | 119                |
| 2.1                                    | ±0.03 | 5.4                                             | 651                        | 358  | 2.10                | 676       | 93                 | 2.18                 | 326       | 108                | 2.26                 | 241       | 115                |
| 2.2                                    | ±0.03 | 5.1                                             | 643                        | 354  | 2.21                | 669       | 89                 | 2.30                 | 321       | 104                | 2.38                 | 236       | 112                |
| 2.3                                    | ±0.03 | 5.0                                             | 636                        | 350  | 2.31                | 662       | 85                 | 2.42                 | 315       | 101                | 2.51                 | 231       | 109                |
| 2.4                                    | ±0.03 | 4.9                                             | 629                        | 346  | 2.42                | 656       | 81                 | 2.54                 | 309       | 97                 | 2.64                 | 226       | 106                |
| 2.5                                    | ±0.03 | 4.7                                             | 622                        | 342  | 2.53                | 649       | 77                 | 2.65                 | 303       | 94                 | 2.76                 | 221       | 102                |
| 2.6                                    | ±0.03 | 4.6                                             | 614                        | 338  | 2.64                | 642       | 74                 | 2.77                 | 298       | 90                 | 2.89                 | 216       | 99                 |
| 2.7                                    | ±0.03 | 4.5                                             | 607                        | 334  | 2.75                | 635       | 70                 | 2.89                 | 292       | 86                 | 3.02                 | 211       | 96                 |
| 2.8                                    | ±0.03 | 4.5                                             | 600                        | 330  | 2.85                | 628       | 68                 | 3.01                 | 288       | 83                 | 3.15                 | 207       | 92                 |
| 2.9                                    | ±0.03 | 4.4                                             | 592                        | 326  | 2.95                | 621       | 66                 | 3.13                 | 283       | 80                 | 3.28                 | 203       | 88                 |
| 3                                      | ±0.03 | 4.4                                             | 585                        | 322  | 3.06                | 614       | 64                 | 3.24                 | 279       | 76                 | 3.41                 | 200       | 84                 |
| 3.1                                    | ±0.05 | 4.4                                             | 578                        | 318  | 3.16                | 607       | 62                 | 3.36                 | 274       | 73                 | 3.54                 | 196       | 80                 |
| 3.2                                    | ±0.05 | 4.3                                             | 570                        | 314  | 3.27                | 600       | 60                 | 3.48                 | 270       | 70                 | 3.67                 | 192       | 76                 |
| 3.3                                    | ±0.05 | 4.3                                             | 563                        | 310  | 3.37                | 593       | 58                 | 3.60                 | 265       | 67                 | 3.80                 | 188       | 72                 |
| 3.4                                    | ±0.05 | 4.3                                             | 556                        | 306  | 3.47                | 586       | 57                 | 3.71                 | 261       | 63                 | 3.93                 | 184       | 68                 |
| 3.5                                    | ±0.05 | 4.2                                             | 548                        | 302  | 3.58                | 579       | 55                 | 3.83                 | 256       | 60                 | 4.06                 | 180       | 64                 |
| 3.6                                    | ±0.05 | 4.2                                             | 541                        | 298  | 3.68                | 572       | 53                 | 3.95                 | 252       | 57                 | 4.19                 | 177       | 60                 |
| 3.7                                    | ±0.05 | 4.1                                             | 534                        | 294  | 3.78                | 565       | 51                 | 4.06                 | 247       | 54                 | 4.32                 | 173       | 56                 |
| 3.8                                    | ±0.05 | 4.0                                             | 526                        | 289  | 3.89                | 558       | 49                 | 4.18                 | 243       | 50                 | 4.45                 | 169       | 52                 |
| 3.9                                    | ±0.05 | 3.9                                             | 519                        | 285  | 3.99                | 551       | 47                 | 4.30                 | 238       | 47                 | 4.58                 | 165       | 48                 |

## 0402 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 4                                      | ±0.05 | 3.9                                             | 513                        | 282  | 4.10                | 545       | 47                 | 4.42                 | 235       | 47                 | 4.73                 | 162       | 48                 |
| 4.1                                    | ±0.05 | 3.8                                             | 507                        | 279  | 4.20                | 539       | 47                 | 4.55                 | 232       | 46                 | 4.87                 | 160       | 48                 |
| 4.2                                    | ±0.05 | 3.8                                             | 501                        | 275  | 4.30                | 534       | 46                 | 4.67                 | 228       | 46                 | 5.01                 | 157       | 48                 |
| 4.3                                    | ±0.05 | 3.7                                             | 495                        | 272  | 4.41                | 528       | 46                 | 4.79                 | 225       | 46                 | 5.16                 | 154       | 48                 |
| 4.4                                    | ±0.05 | 3.7                                             | 489                        | 269  | 4.51                | 522       | 46                 | 4.92                 | 222       | 46                 | 5.30                 | 151       | 47                 |
| 4.5                                    | ±0.05 | 3.6                                             | 483                        | 265  | 4.61                | 516       | 46                 | 5.04                 | 219       | 45                 | 5.44                 | 149       | 47                 |
| 4.6                                    | ±0.05 | 3.6                                             | 477                        | 262  | 4.72                | 511       | 45                 | 5.16                 | 216       | 45                 | 5.59                 | 146       | 47                 |
| 4.7                                    | ±0.05 | 3.5                                             | 471                        | 259  | 4.82                | 505       | 45                 | 5.29                 | 213       | 45                 | 5.73                 | 143       | 47                 |
| 5.1                                    | ±0.05 | 3.4                                             | 446                        | 245  | 5.23                | 482       | 44                 | 5.78                 | 200       | 43                 | 6.30                 | 133       | 47                 |
| 5.6                                    | ±0.05 | 3.3                                             | 416                        | 229  | 5.75                | 453       | 43                 | 6.40                 | 184       | 42                 | 7.02                 | 119       | 46                 |
| 6.2                                    | ±0.1  | 3.0                                             | 388                        | 213  | 6.41                | 427       | 44                 | 7.26                 | 167       | 44                 | 8.11                 | 107       | 47                 |
| 6.8                                    | ±0.1  | 2.8                                             | 360                        | 198  | 7.07                | 400       | 44                 | 8.12                 | 150       | 45                 | 9.19                 | 95        | 48                 |
| 7.5                                    | ±0.1  | 2.7                                             | 338                        | 186  | 7.85                | 378       | 45                 | 9.17                 | 139       | 47                 | 10.57                | 86        | 49                 |
| 8.2                                    | ±0.1  | 2.6                                             | 315                        | 173  | 8.62                | 356       | 45                 | 10.22                | 128       | 48                 | 11.95                | 77        | 50                 |
| 9.1                                    | ±0.1  | 2.5                                             | 292                        | 160  | 9.63                | 333       | 45                 | 11.75                | 115       | 47                 | 14.23                | 69        | 50                 |
| 10                                     | ±1%   | 2.4                                             | 268                        | 148  | 10.65               | 310       | 45                 | 13.28                | 103       | 47                 | 16.50                | 61        | 49                 |
| 11                                     | ±1%   | 2.3                                             | 242                        | 133  | 11.77               | 285       | 44                 | 14.98                | 89        | 46                 | 19.04                | 51        | 49                 |
| 12                                     | ±1%   | 2.2                                             | 217                        | 119  | 12.90               | 259       | 44                 | 16.68                | 75        | 45                 | 21.57                | 42        | 48                 |
| 13                                     | ±1%   | 2.2                                             | 202                        | 111  | 14.03               | 241       | 44                 | 18.83                | 68        | 47                 | 25.73                | 38        | 49                 |
| 14                                     | ±1%   | 2.1                                             | 187                        | 103  | 15.17               | 223       | 44                 | 20.97                | 62        | 49                 | 29.89                | 33        | 49                 |
| 15                                     | ±1%   | 2.1                                             | 172                        | 94   | 16.30               | 204       | 45                 | 23.12                | 56        | 51                 | 34.05                | 29        | 50                 |
| 16                                     | ±1%   | 2.0                                             | 157                        | 87   | 17.53               | 187       | 44                 | 25.91                | 50        | 49                 | 41.44                | 25        | 49                 |
| 17                                     | ±1%   | 1.9                                             | 143                        | 79   | 18.75               | 169       | 43                 | 28.70                | 45        | 46                 | 48.82                | 21        | 47                 |
| 18                                     | ±1%   | 1.8                                             | 129                        | 71   | 19.98               | 152       | 42                 | 31.49                | 39        | 44                 | 56.21                | 17        | 46                 |
| 19                                     | ±1%   | 1.8                                             | 121                        | 67   | 21.11               | 143       | 42                 | 33.51                | 36        | 44                 | 60.92                | 15        | 47                 |
| 20                                     | ±1%   | 1.8                                             | 110                        | 61   | 22.25               | 131       | 41                 | 35.53                | 33        | 43                 | 65.63                | 14        | 48                 |
| 22                                     | ±1%   | 1.8                                             | 98                         | 54   | 24.51               | 116       | 41                 | 39.57                | 26        | 42                 | 75.05                | 10        | 51                 |
| 24                                     | ±1%   | 1.8                                             | 87                         | 48   | 27.51               | 104       | 37                 | 54.94                | 21        | 35                 | NA                   | NA        | NA                 |
| 27                                     | ±1%   | 1.7                                             | 70                         | 39   | 32.01               | 85        | 32                 | 77.98                | 13        | 23                 | NA                   | NA        | NA                 |
| 30                                     | ±1%   | 1.7                                             | 65                         | 36   | 35.89               | 78        | 28                 | 106.50               | 10        | 12                 | NA                   | NA        | NA                 |
| 33                                     | ±1%   | 1.7                                             | 60                         | 33   | 40.05               | 74        | 27                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 36                                     | ±1%   | 1.7                                             | 58                         | 32   | 45.13               | 71        | 28                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 39                                     | ±1%   | 1.7                                             | 56                         | 31   | 50.21               | 69        | 28                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 43                                     | ±1%   | 1.6                                             | 53                         | 29   | 56.98               | 66        | 29                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 47                                     | ±1%   | 1.6                                             | 50                         | 28   | 63.75               | 63        | 30                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 51                                     | ±1%   | 1.6                                             | 48                         | 26   | 70.53               | 60        | 31                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 56                                     | ±1%   | 1.6                                             | 44                         | 24   | 78.99               | 56        | 33                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 58                                     | ±1%   | 1.6                                             | 42                         | 23   | 83.54               | 54        | 34                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |
| 68                                     | ±1%   | 1.6                                             | 32                         | 18   | 106.28              | 42        | 40                 | NA                   | NA        | NA                 | NA                   | NA        | NA                 |

## 0603 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 0.05                                   | ±0.02 | 25.6                                            | 1200                       | 660  | 0.06                | 1333      | 945                | 0.06                 | 556       | 832                | 0.06                 | 397       | 880                |
| 0.1                                    | ±0.02 | 18.1                                            | 1156                       | 636  | 0.11                | 1284      | 675                | 0.11                 | 535       | 628                | 0.11                 | 382       | 667                |
| 0.15                                   | ±0.02 | 14.8                                            | 1111                       | 611  | 0.16                | 1235      | 555                | 0.16                 | 514       | 533                | 0.16                 | 367       | 567                |
| 0.2                                    | ±0.02 | 12.8                                            | 1067                       | 587  | 0.21                | 1185      | 483                | 0.21                 | 494       | 474                | 0.22                 | 353       | 505                |
| 0.25                                   | ±0.02 | 11.4                                            | 1022                       | 562  | 0.26                | 1136      | 433                | 0.27                 | 473       | 433                | 0.27                 | 338       | 462                |
| 0.3                                    | ±0.02 | 10.4                                            | 978                        | 538  | 0.31                | 1086      | 397                | 0.32                 | 453       | 402                | 0.32                 | 323       | 430                |
| 0.35                                   | ±0.02 | 9.7                                             | 933                        | 513  | 0.36                | 1037      | 368                | 0.37                 | 432       | 378                | 0.37                 | 309       | 404                |
| 0.4                                    | ±0.02 | 9.0                                             | 889                        | 489  | 0.41                | 988       | 345                | 0.42                 | 412       | 358                | 0.42                 | 294       | 383                |
| 0.45                                   | ±0.02 | 8.5                                             | 844                        | 464  | 0.46                | 938       | 326                | 0.47                 | 391       | 341                | 0.48                 | 279       | 365                |
| 0.5                                    | ±0.02 | 8.1                                             | 800                        | 440  | 0.51                | 889       | 310                | 0.52                 | 370       | 327                | 0.53                 | 265       | 350                |
| 0.55                                   | ±0.02 | 7.7                                             | 788                        | 434  | 0.57                | 875       | 296                | 0.57                 | 363       | 315                | 0.58                 | 261       | 337                |
| 0.6                                    | ±0.02 | 7.4                                             | 777                        | 427  | 0.62                | 860       | 283                | 0.62                 | 356       | 304                | 0.63                 | 258       | 326                |
| 0.65                                   | ±0.02 | 7.1                                             | 765                        | 421  | 0.67                | 846       | 273                | 0.67                 | 348       | 294                | 0.68                 | 255       | 315                |
| 0.7                                    | ±0.02 | 6.8                                             | 754                        | 414  | 0.72                | 832       | 263                | 0.72                 | 341       | 285                | 0.73                 | 252       | 306                |
| 0.75                                   | ±0.02 | 6.6                                             | 742                        | 408  | 0.77                | 817       | 254                | 0.78                 | 334       | 277                | 0.79                 | 248       | 298                |
| 0.8                                    | ±0.02 | 6.4                                             | 730                        | 402  | 0.82                | 803       | 247                | 0.83                 | 326       | 270                | 0.84                 | 245       | 290                |
| 0.85                                   | ±0.02 | 6.2                                             | 719                        | 395  | 0.87                | 789       | 239                | 0.88                 | 319       | 264                | 0.89                 | 242       | 283                |
| 0.9                                    | ±0.02 | 6.0                                             | 707                        | 389  | 0.92                | 775       | 233                | 0.93                 | 312       | 258                | 0.95                 | 239       | 277                |
| 0.95                                   | ±0.02 | 5.9                                             | 696                        | 383  | 0.97                | 760       | 227                | 0.98                 | 304       | 252                | 1.00                 | 235       | 271                |
| 1                                      | ±0.02 | 5.7                                             | 684                        | 376  | 1.019               | 746       | 216                | 1.061                | 297       | 242                | 1.101                | 232       | 260                |
| 1.05                                   | ±0.02 | 5.6                                             | 667                        | 367  | 1.076               | 731       | 213                | 1.126                | 290       | 239                | 1.171                | 226       | 256                |
| 1.1                                    | ±0.02 | 5.4                                             | 649                        | 357  | 1.134               | 717       | 210                | 1.190                | 282       | 236                | 1.241                | 220       | 253                |
| 1.15                                   | ±0.02 | 5.3                                             | 632                        | 347  | 1.192               | 702       | 206                | 1.254                | 275       | 233                | 1.311                | 214       | 250                |
| 1.2                                    | ±0.02 | 5.2                                             | 614                        | 338  | 1.250               | 687       | 203                | 1.318                | 267       | 230                | 1.381                | 209       | 247                |
| 1.25                                   | ±0.02 | 5.1                                             | 605                        | 333  | 1.307               | 677       | 200                | 1.382                | 262       | 227                | 1.451                | 203       | 244                |
| 1.3                                    | ±0.02 | 5.0                                             | 596                        | 328  | 1.365               | 667       | 197                | 1.446                | 257       | 224                | 1.521                | 197       | 241                |
| 1.35                                   | ±0.02 | 4.9                                             | 587                        | 323  | 1.423               | 658       | 194                | 1.511                | 252       | 221                | 1.591                | 191       | 238                |
| 1.4                                    | ±0.02 | 4.8                                             | 578                        | 318  | 1.481               | 648       | 190                | 1.575                | 247       | 218                | 1.661                | 185       | 235                |
| 1.45                                   | ±0.02 | 4.8                                             | 569                        | 313  | 1.538               | 638       | 187                | 1.639                | 242       | 215                | 1.731                | 179       | 232                |
| 1.5                                    | ±0.02 | 4.7                                             | 560                        | 308  | 1.596               | 628       | 184                | 1.703                | 237       | 212                | 1.801                | 173       | 229                |
| 1.55                                   | ±0.02 | 4.6                                             | 551                        | 303  | 1.645               | 620       | 181                | 1.760                | 233       | 209                | 1.866                | 170       | 226                |
| 1.6                                    | ±0.02 | 4.5                                             | 542                        | 298  | 1.694               | 611       | 178                | 1.817                | 228       | 206                | 1.930                | 166       | 222                |
| 1.65                                   | ±0.02 | 4.5                                             | 534                        | 293  | 1.743               | 603       | 175                | 1.874                | 224       | 203                | 1.995                | 163       | 219                |
| 1.7                                    | ±0.02 | 4.4                                             | 525                        | 289  | 1.792               | 595       | 172                | 1.931                | 219       | 200                | 2.060                | 159       | 216                |
| 1.75                                   | ±0.02 | 4.3                                             | 516                        | 284  | 1.841               | 587       | 169                | 1.988                | 215       | 197                | 2.124                | 156       | 213                |
| 1.8                                    | ±0.02 | 4.2                                             | 507                        | 279  | 1.890               | 578       | 166                | 2.045                | 211       | 194                | 2.189                | 153       | 209                |
| 1.85                                   | ±0.02 | 4.2                                             | 498                        | 274  | 1.939               | 570       | 163                | 2.102                | 206       | 191                | 2.253                | 149       | 206                |
| 1.9                                    | ±0.02 | 4.1                                             | 490                        | 269  | 1.988               | 562       | 160                | 2.158                | 202       | 188                | 2.318                | 146       | 203                |
| 1.95                                   | ±0.02 | 4.1                                             | 481                        | 264  | 2.037               | 553       | 157                | 2.215                | 197       | 185                | 2.383                | 142       | 199                |
| 2                                      | ±0.03 | 4.0                                             | 472                        | 260  | 2.086               | 545       | 154                | 2.272                | 193       | 182                | 2.447                | 139       | 196                |
| 2.1                                    | ±0.03 | 3.9                                             | 462                        | 254  | 2.190               | 535       | 151                | 2.402                | 187       | 180                | 2.604                | 134       | 193                |
| 2.2                                    | ±0.03 | 3.8                                             | 452                        | 249  | 2.295               | 524       | 148                | 2.532                | 181       | 177                | 2.761                | 129       | 191                |
| 2.3                                    | ±0.03 | 3.8                                             | 442                        | 243  | 2.400               | 514       | 145                | 2.662                | 175       | 175                | 2.917                | 124       | 188                |
| 2.4                                    | ±0.03 | 3.7                                             | 433                        | 238  | 2.504               | 503       | 143                | 2.793                | 168       | 172                | 3.074                | 118       | 186                |
| 2.5                                    | ±0.03 | 3.6                                             | 423                        | 232  | 2.609               | 493       | 140                | 2.923                | 162       | 170                | 3.230                | 113       | 183                |
| 2.6                                    | ±0.03 | 3.6                                             | 413                        | 227  | 2.714               | 482       | 137                | 3.053                | 156       | 167                | 3.387                | 108       | 181                |
| 2.7                                    | ±0.03 | 3.5                                             | 403                        | 222  | 2.818               | 472       | 134                | 3.183                | 150       | 165                | 3.543                | 103       | 178                |
| 2.8                                    | ±0.03 | 3.4                                             | 395                        | 217  | 2.933               | 463       | 133                | 3.336                | 147       | 164                | 3.742                | 100       | 177                |
| 2.9                                    | ±0.03 | 3.4                                             | 388                        | 213  | 3.047               | 453       | 131                | 3.489                | 144       | 162                | 3.940                | 97        | 175                |
| 3                                      | ±0.03 | 3.3                                             | 380                        | 209  | 3.162               | 444       | 130                | 3.642                | 140       | 161                | 4.139                | 95        | 174                |
| 3.1                                    | ±0.05 | 3.2                                             | 372                        | 205  | 3.276               | 435       | 129                | 3.795                | 137       | 160                | 4.337                | 92        | 172                |
| 3.2                                    | ±0.05 | 3.2                                             | 365                        | 201  | 3.391               | 425       | 127                | 3.947                | 134       | 159                | 4.536                | 89        | 171                |
| 3.3                                    | ±0.05 | 3.1                                             | 357                        | 196  | 3.506               | 416       | 126                | 4.100                | 131       | 157                | 4.734                | 86        | 169                |
| 3.4                                    | ±0.05 | 3.1                                             | 349                        | 192  | 3.620               | 407       | 125                | 4.253                | 128       | 156                | 4.933                | 84        | 168                |
| 3.5                                    | ±0.05 | 3.1                                             | 342                        | 188  | 3.735               | 397       | 123                | 4.406                | 125       | 155                | 5.131                | 81        | 166                |
| 3.6                                    | ±0.05 | 3.0                                             | 334                        | 184  | 3.849               | 388       | 122                | 4.559                | 121       | 154                | 5.330                | 78        | 165                |
| 3.7                                    | ±0.05 | 3.0                                             | 326                        | 179  | 3.964               | 379       | 121                | 4.712                | 118       | 152                | 5.528                | 75        | 164                |
| 3.8                                    | ±0.05 | 3.0                                             | 318                        | 175  | 4.078               | 369       | 119                | 4.865                | 115       | 151                | 5.727                | 73        | 162                |
| 3.9                                    | ±0.05 | 2.9                                             | 311                        | 171  | 4.193               | 360       | 118                | 5.018                | 112       | 150                | 5.925                | 70        | 161                |

## 0603 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 4                                      | ±0.05 | 2.9                                             | 307                        | 169  | 4.301               | 355       | 117                | 5.188                | 110       | 149                | 6.188                | 68        | 160                |
| 4.1                                    | ±0.05 | 2.8                                             | 303                        | 167  | 4.410               | 351       | 116                | 5.358                | 108       | 148                | 6.450                | 67        | 159                |
| 4.2                                    | ±0.05 | 2.8                                             | 299                        | 164  | 4.518               | 347       | 116                | 5.528                | 106       | 148                | 6.713                | 65        | 158                |
| 4.3                                    | ±0.05 | 2.7                                             | 295                        | 162  | 4.627               | 342       | 115                | 5.698                | 104       | 147                | 6.975                | 64        | 157                |
| 4.4                                    | ±0.05 | 2.7                                             | 291                        | 160  | 4.735               | 338       | 114                | 5.867                | 102       | 146                | 7.238                | 62        | 157                |
| 4.5                                    | ±0.05 | 2.7                                             | 287                        | 158  | 4.843               | 333       | 113                | 6.037                | 100       | 146                | 7.500                | 61        | 156                |
| 4.6                                    | ±0.05 | 2.6                                             | 283                        | 156  | 4.952               | 329       | 112                | 6.207                | 98        | 145                | 7.763                | 59        | 155                |
| 4.7                                    | ±0.05 | 2.6                                             | 279                        | 154  | 5.060               | 324       | 112                | 6.377                | 96        | 144                | 8.025                | 58        | 154                |
| 5.1                                    | ±0.05 | 2.5                                             | 263                        | 145  | 5.494               | 307       | 109                | 7.057                | 88        | 142                | 9.075                | 52        | 151                |
| 5.6                                    | ±0.05 | 2.4                                             | 244                        | 134  | 6.035               | 285       | 105                | 7.906                | 78        | 138                | 10.39                | 44        | 147                |
| 6.2                                    | ±0.1  | 2.3                                             | 228                        | 126  | 6.865               | 267       | 102                | 9.517                | 72        | 133                | 13.66                | 40        | 141                |
| 6.8                                    | ±0.1  | 2.2                                             | 213                        | 117  | 7.694               | 250       | 100                | 11.13                | 66        | 128                | 16.93                | 35        | 135                |
| 7.5                                    | ±0.1  | 2.1                                             | 195                        | 107  | 8.367               | 227       | 98                 | 12.63                | 57        | 125                | 20.91                | 28        | 132                |
| 8.2                                    | ±0.1  | 2.0                                             | 176                        | 97   | 9.041               | 205       | 96                 | 14.14                | 49        | 123                | 24.88                | 21        | 129                |
| 9.1                                    | ±0.1  | 1.9                                             | 161                        | 89   | 10.20               | 188       | 96                 | 18.09                | 42        | 122                | 40.00                | 16        | 128                |
| 10                                     | ±1%   | 1.8                                             | 146                        | 80   | 11.37               | 171       | 95                 | 22.05                | 36        | 121                | 70.00                | 12        | 127                |
| 11                                     | ±1%   | 1.7                                             | 129                        | 71   | 12.66               | 153       | 95                 | 26.44                | 29        | 120                | 140.0                | 6         | 126                |
| 12                                     | ±1%   | 1.6                                             | 112                        | 62   | 13.95               | 134       | 94                 | 30.83                | 22        | 119                | 231.3                | 1         | 125                |
| 13                                     | ±1%   | 1.6                                             | 102                        | 56   | 15.31               | 122       | 93                 | 40.37                | 18        | 118                | n/a                  | n/a       | n/a                |
| 14                                     | ±1%   | 1.5                                             | 92                         | 51   | 16.67               | 111       | 92                 | 49.91                | 15        | 118                | n/a                  | n/a       | n/a                |
| 15                                     | ±1%   | 1.5                                             | 82                         | 45   | 18.03               | 99        | 90                 | 59.44                | 11        | 117                | n/a                  | n/a       | n/a                |
| 16                                     | ±1%   | 1.4                                             | 79                         | 43   | 19.61               | 96        | 90                 | 80.00                | 8         | 117                | n/a                  | n/a       | n/a                |
| 17                                     | ±1%   | 1.4                                             | 76                         | 42   | 21.18               | 92        | 90                 | 120.0                | 6         | 116                | n/a                  | n/a       | n/a                |
| 18                                     | ±1%   | 1.3                                             | 73                         | 40   | 22.76               | 89        | 90                 | 190.0                | 4         | 116                | n/a                  | n/a       | n/a                |
| 19                                     | ±1%   | 1.3                                             | 69                         | 38   | 24.37               | 84        | 89                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 20                                     | ±1%   | 1.2                                             | 65                         | 36   | 25.98               | 80        | 89                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 22                                     | ±1%   | 1.2                                             | 57                         | 31   | 29.21               | 72        | 87                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 24                                     | ±1%   | 1.2                                             | 48                         | 26   | 34.44               | 62        | 87                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 27                                     | ±1%   | 1.1                                             | 43                         | 24   | 41.87               | 56        | 86                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 30                                     | ±1%   | 1.0                                             | 37                         | 21   | 49.29               | 49        | 85                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 33                                     | ±1%   | 1.0                                             | 32                         | 18   | 56.72               | 43        | 84                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 36                                     | ±1%   | 1.0                                             | 27                         | 15   | 64.15               | 37        | 83                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 39                                     | ±1%   | 1.0                                             | 21                         | 12   | 71.57               | 30        | 82                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |

## 0805 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 0.1                                    | ±0.02 | 17.2                                            | 880                        | 484  | 0.125               | 890       | 3296               | 0.125                | 545       | 2417               | 0.126                | 447       | 2265               |
| 0.15                                   | ±0.02 | 14.1                                            | 872                        | 480  | 0.176               | 885       | 2073               | 0.178                | 530       | 1626               | 0.181                | 434       | 1546               |
| 0.2                                    | ±0.02 | 12.3                                            | 864                        | 475  | 0.228               | 880       | 1492               | 0.231                | 516       | 1227               | 0.235                | 420       | 1178               |
| 0.25                                   | ±0.02 | 11.0                                            | 857                        | 471  | 0.279               | 874       | 1156               | 0.284                | 501       | 986                | 0.290                | 407       | 955                |
| 0.3                                    | ±0.02 | 10.1                                            | 849                        | 467  | 0.331               | 869       | 938                | 0.337                | 487       | 825                | 0.344                | 394       | 804                |
| 0.35                                   | ±0.02 | 9.4                                             | 841                        | 462  | 0.382               | 864       | 787                | 0.390                | 472       | 710                | 0.399                | 380       | 695                |
| 0.4                                    | ±0.02 | 8.8                                             | 833                        | 458  | 0.433               | 859       | 675                | 0.443                | 458       | 623                | 0.453                | 367       | 613                |
| 0.45                                   | ±0.02 | 8.3                                             | 825                        | 454  | 0.485               | 853       | 590                | 0.496                | 443       | 555                | 0.508                | 353       | 549                |
| 0.5                                    | ±0.02 | 7.9                                             | 817                        | 450  | 0.536               | 848       | 523                | 0.549                | 429       | 501                | 0.562                | 340       | 497                |
| 0.55                                   | ±0.02 | 7.5                                             | 811                        | 446  | 0.584               | 843       | 469                | 0.600                | 420       | 456                | 0.616                | 331       | 454                |
| 0.6                                    | ±0.02 | 7.2                                             | 805                        | 443  | 0.631               | 838       | 425                | 0.651                | 411       | 419                | 0.670                | 322       | 418                |
| 0.65                                   | ±0.02 | 6.9                                             | 798                        | 439  | 0.679               | 834       | 387                | 0.702                | 402       | 387                | 0.724                | 313       | 388                |
| 0.7                                    | ±0.02 | 6.7                                             | 792                        | 436  | 0.726               | 829       | 356                | 0.753                | 393       | 360                | 0.778                | 304       | 362                |
| 0.75                                   | ±0.02 | 6.5                                             | 786                        | 432  | 0.774               | 824       | 329                | 0.804                | 384       | 337                | 0.832                | 295       | 339                |
| 0.8                                    | ±0.02 | 6.3                                             | 779                        | 429  | 0.822               | 819       | 306                | 0.855                | 375       | 316                | 0.886                | 286       | 319                |
| 0.85                                   | ±0.02 | 6.1                                             | 773                        | 425  | 0.869               | 814       | 285                | 0.906                | 366       | 298                | 0.940                | 277       | 301                |
| 0.9                                    | ±0.02 | 5.9                                             | 767                        | 422  | 0.917               | 810       | 267                | 0.957                | 357       | 282                | 0.994                | 268       | 285                |
| 0.95                                   | ±0.02 | 5.8                                             | 760                        | 418  | 0.964               | 805       | 251                | 1.008                | 348       | 267                | 1.049                | 260       | 271                |
| 1                                      | ±0.02 | 5.6                                             | 754                        | 415  | 1.012               | 800       | 231                | 1.059                | 339       | 235                | 1.103                | 251       | 242                |
| 1.05                                   | ±0.02 | 5.5                                             | 747                        | 411  | 1.065               | 794       | 223                | 1.120                | 335       | 228                | 1.170                | 247       | 235                |
| 1.1                                    | ±0.02 | 5.4                                             | 740                        | 407  | 1.119               | 788       | 215                | 1.181                | 330       | 221                | 1.237                | 244       | 228                |
| 1.15                                   | ±0.02 | 5.3                                             | 732                        | 403  | 1.172               | 782       | 208                | 1.242                | 326       | 214                | 1.304                | 240       | 220                |
| 1.2                                    | ±0.02 | 5.1                                             | 725                        | 399  | 1.225               | 776       | 200                | 1.304                | 322       | 207                | 1.371                | 237       | 213                |
| 1.25                                   | ±0.02 | 5.0                                             | 718                        | 395  | 1.279               | 770       | 192                | 1.365                | 318       | 200                | 1.438                | 233       | 206                |
| 1.3                                    | ±0.02 | 4.9                                             | 711                        | 391  | 1.332               | 764       | 184                | 1.426                | 313       | 193                | 1.505                | 230       | 199                |
| 1.35                                   | ±0.02 | 4.9                                             | 704                        | 387  | 1.386               | 758       | 176                | 1.487                | 309       | 186                | 1.573                | 226       | 192                |
| 1.4                                    | ±0.02 | 4.8                                             | 696                        | 383  | 1.439               | 752       | 169                | 1.548                | 305       | 179                | 1.640                | 223       | 184                |
| 1.45                                   | ±0.02 | 4.7                                             | 689                        | 379  | 1.492               | 746       | 161                | 1.609                | 300       | 172                | 1.707                | 219       | 177                |
| 1.5                                    | ±0.02 | 4.6                                             | 682                        | 375  | 1.546               | 740       | 153                | 1.670                | 296       | 165                | 1.774                | 216       | 170                |
| 1.55                                   | ±0.02 | 4.6                                             | 675                        | 371  | 1.600               | 733       | 151                | 1.734                | 292       | 163                | 1.850                | 212       | 168                |
| 1.6                                    | ±0.02 | 4.5                                             | 668                        | 367  | 1.654               | 726       | 148                | 1.799                | 287       | 161                | 1.927                | 208       | 165                |
| 1.65                                   | ±0.02 | 4.4                                             | 660                        | 363  | 1.708               | 719       | 146                | 1.864                | 283       | 159                | 2.003                | 204       | 163                |
| 1.7                                    | ±0.02 | 4.3                                             | 653                        | 359  | 1.762               | 712       | 143                | 1.928                | 278       | 157                | 2.079                | 200       | 160                |
| 1.75                                   | ±0.02 | 4.3                                             | 646                        | 355  | 1.816               | 705       | 141                | 1.993                | 274       | 155                | 2.156                | 197       | 158                |
| 1.8                                    | ±0.02 | 4.2                                             | 639                        | 351  | 1.870               | 698       | 139                | 2.058                | 269       | 152                | 2.232                | 193       | 155                |
| 1.85                                   | ±0.02 | 4.2                                             | 632                        | 347  | 1.924               | 691       | 136                | 2.122                | 265       | 150                | 2.308                | 189       | 153                |
| 1.9                                    | ±0.02 | 4.1                                             | 624                        | 343  | 1.978               | 684       | 134                | 2.187                | 260       | 148                | 2.385                | 185       | 150                |
| 1.95                                   | ±0.02 | 4.1                                             | 617                        | 339  | 2.033               | 677       | 131                | 2.252                | 256       | 146                | 2.461                | 181       | 148                |
| 2                                      | ±0.03 | 4.0                                             | 610                        | 336  | 2.087               | 670       | 129                | 2.316                | 251       | 144                | 2.537                | 177       | 145                |
| 2.1                                    | ±0.03 | 3.9                                             | 597                        | 328  | 2.183               | 658       | 127                | 2.440                | 245       | 142                | 2.690                | 171       | 143                |
| 2.2                                    | ±0.03 | 3.8                                             | 584                        | 321  | 2.280               | 646       | 124                | 2.563                | 239       | 139                | 2.843                | 165       | 141                |
| 2.3                                    | ±0.03 | 3.8                                             | 571                        | 314  | 2.377               | 634       | 122                | 2.687                | 233       | 137                | 2.996                | 159       | 139                |
| 2.4                                    | ±0.03 | 3.6                                             | 557                        | 307  | 2.474               | 623       | 119                | 2.810                | 227       | 135                | 3.149                | 154       | 136                |
| 2.5                                    | ±0.03 | 3.6                                             | 544                        | 299  | 2.571               | 611       | 117                | 2.934                | 221       | 133                | 3.301                | 148       | 134                |
| 2.6                                    | ±0.03 | 3.6                                             | 531                        | 292  | 2.668               | 599       | 114                | 3.057                | 215       | 130                | 3.454                | 142       | 132                |
| 2.7                                    | ±0.03 | 3.4                                             | 518                        | 285  | 2.764               | 587       | 112                | 3.181                | 209       | 128                | 3.607                | 136       | 130                |
| 2.8                                    | ±0.03 | 3.4                                             | 507                        | 279  | 2.875               | 575       | 111                | 3.348                | 204       | 127                | 3.850                | 132       | 129                |
| 2.9                                    | ±0.03 | 3.4                                             | 497                        | 273  | 2.987               | 564       | 110                | 3.514                | 199       | 125                | 4.093                | 129       | 127                |
| 3                                      | ±0.03 | 3.3                                             | 486                        | 267  | 3.098               | 552       | 109                | 3.681                | 194       | 124                | 4.335                | 125       | 126                |
| 3.1                                    | ±0.05 | 3.3                                             | 475                        | 261  | 3.209               | 540       | 108                | 3.848                | 189       | 123                | 4.578                | 121       | 125                |
| 3.2                                    | ±0.05 | 3.2                                             | 465                        | 256  | 3.320               | 528       | 107                | 4.014                | 183       | 122                | 4.821                | 118       | 123                |
| 3.3                                    | ±0.05 | 3.1                                             | 454                        | 250  | 3.431               | 517       | 106                | 4.181                | 178       | 120                | 5.064                | 114       | 122                |
| 3.4                                    | ±0.05 | 3.1                                             | 443                        | 244  | 3.542               | 505       | 105                | 4.348                | 173       | 119                | 5.307                | 110       | 121                |
| 3.5                                    | ±0.05 | 3.1                                             | 433                        | 238  | 3.653               | 493       | 104                | 4.515                | 168       | 118                | 5.549                | 107       | 119                |
| 3.6                                    | ±0.05 | 3.0                                             | 422                        | 232  | 3.764               | 481       | 103                | 4.681                | 163       | 116                | 5.792                | 103       | 118                |
| 3.7                                    | ±0.05 | 3.0                                             | 412                        | 226  | 3.875               | 470       | 102                | 4.848                | 158       | 115                | 6.035                | 99        | 116                |
| 3.8                                    | ±0.05 | 3.0                                             | 401                        | 220  | 3.986               | 458       | 101                | 5.015                | 153       | 114                | 6.278                | 96        | 115                |
| 3.9                                    | ±0.05 | 2.9                                             | 390                        | 215  | 4.097               | 446       | 100                | 5.182                | 148       | 113                | 6.521                | 92        | 114                |

## 0805 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 4                                      | ±0.05 | 2.9                                             | 384                        | 211  | 4.214               | 440       | 99                 | 5.378                | 144       | 112                | 6.861                | 89        | 113                |
| 4.1                                    | ±0.05 | 2.9                                             | 378                        | 208  | 4.331               | 434       | 98                 | 5.574                | 141       | 112                | 7.201                | 86        | 113                |
| 4.2                                    | ±0.05 | 2.8                                             | 372                        | 205  | 4.448               | 428       | 98                 | 5.769                | 138       | 111                | 7.541                | 84        | 112                |
| 4.3                                    | ±0.05 | 2.7                                             | 366                        | 202  | 4.564               | 422       | 97                 | 5.965                | 134       | 111                | 7.881                | 81        | 111                |
| 4.4                                    | ±0.05 | 2.7                                             | 360                        | 198  | 4.681               | 415       | 96                 | 6.161                | 131       | 110                | 8.222                | 78        | 111                |
| 4.5                                    | ±0.05 | 2.7                                             | 355                        | 195  | 4.798               | 409       | 96                 | 6.357                | 128       | 110                | 8.562                | 75        | 110                |
| 4.6                                    | ±0.05 | 2.7                                             | 349                        | 192  | 4.915               | 403       | 95                 | 6.553                | 124       | 109                | 8.902                | 72        | 110                |
| 4.7                                    | ±0.05 | 2.6                                             | 343                        | 188  | 5.032               | 397       | 94                 | 6.749                | 121       | 109                | 9.242                | 69        | 109                |
| 5.1                                    | ±0.05 | 2.5                                             | 319                        | 175  | 5.499               | 373       | 91                 | 7.533                | 108       | 107                | 10.60                | 58        | 107                |
| 5.6                                    | ±0.05 | 2.4                                             | 289                        | 159  | 6.083               | 342       | 88                 | 8.513                | 91        | 104                | 12.30                | 44        | 104                |
| 6.2                                    | ±0.1  | 2.3                                             | 264                        | 145  | 6.842               | 313       | 86                 | 10.43                | 79        | 102                | 18.03                | 36        | 103                |
| 6.8                                    | ±0.1  | 2.2                                             | 239                        | 131  | 7.601               | 283       | 84                 | 12.35                | 68        | 101                | 23.76                | 28        | 102                |
| 7.5                                    | ±0.1  | 2.1                                             | 218                        | 120  | 8.468               | 259       | 83                 | 14.84                | 61        | 100                | 37.25                | 21        | 101                |
| 8.2                                    | ±0.1  | 2.0                                             | 198                        | 109  | 9.334               | 234       | 82                 | 17.32                | 55        | 100                | 50.74                | 15        | 100                |
| 9.1                                    | ±0.1  | 1.9                                             | 179                        | 99   | 10.57               | 213       | 82                 | 24.90                | 46        | 100                | n/a                  | n/a       | n/a                |
| 10                                     | ±1%   | 1.8                                             | 160                        | 88   | 11.80               | 191       | 81                 | 32.48                | 37        | 100                | n/a                  | n/a       | n/a                |
| 11                                     | ±1%   | 1.7                                             | 139                        | 77   | 13.17               | 167       | 81                 | 40.90                | 26        | 101                | n/a                  | n/a       | n/a                |
| 12                                     | ±1%   | 1.6                                             | 119                        | 65   | 14.54               | 143       | 80                 | 49.32                | 16        | 101                | n/a                  | n/a       | n/a                |
| 13                                     | ±1%   | 1.6                                             | 110                        | 60   | 16.17               | 134       | 80                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 14                                     | ±1%   | 1.5                                             | 101                        | 55   | 17.79               | 125       | 80                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 15                                     | ±1%   | 1.5                                             | 92                         | 51   | 19.42               | 116       | 80                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 16                                     | ±1%   | 1.4                                             | 87                         | 48   | 21.13               | 110       | 79                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 17                                     | ±1%   | 1.4                                             | 83                         | 46   | 22.85               | 104       | 78                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 18                                     | ±1%   | 1.3                                             | 78                         | 43   | 24.57               | 99        | 77                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 19                                     | ±1%   | 1.3                                             | 73                         | 40   | 26.41               | 92        | 77                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 20                                     | ±1%   | 1.3                                             | 67                         | 37   | 28.26               | 85        | 76                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 22                                     | ±1%   | 1.2                                             | 57                         | 31   | 31.95               | 72        | 76                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 24                                     | ±1%   | 1.2                                             | 46                         | 25   | 35.64               | 59        | 75                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 27                                     | ±1%   | 1.1                                             | 41                         | 22   | 44.94               | 54        | 74                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 30                                     | ±1%   | 1.0                                             | 36                         | 20   | 54.24               | 48        | 73                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 33                                     | ±1%   | 1.0                                             | 30                         | 17   | 63.54               | 42        | 72                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 36                                     | ±1%   | 0.9                                             | 25                         | 14   | 72.84               | 37        | 71                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 39                                     | ±1%   | 0.9                                             | 20                         | 11   | 82.14               | 31        | 70                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 43                                     | ±1%   | 0.9                                             | 16                         | 9    | 102.9               | 27        | 66                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 47                                     | ±1%   | 0.8                                             | 12                         | 7    | 123.7               | 23        | 63                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |

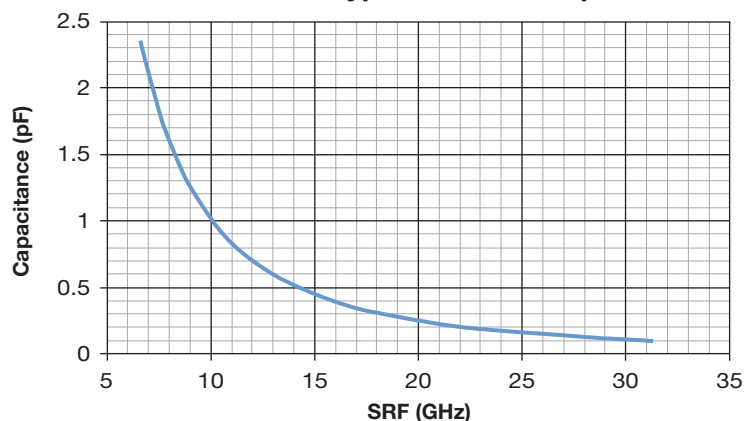
## 1210 Typical Electrical Tables

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 0.1                                    | ±0.02 | 15.6                                            | 1190                       | 654  | 0.136               | 1176      | 3633               | 0.136                | 606       | 2149               | 0.136                | 450       | 2068               |
| 0.15                                   | ±0.03 | 12.7                                            | 1179                       | 648  | 0.190               | 1166      | 2129               | 0.190                | 597       | 1407               | 0.191                | 444       | 1370               |
| 0.2                                    | ±0.02 | 11.0                                            | 1168                       | 642  | 0.244               | 1156      | 1457               | 0.244                | 589       | 1042               | 0.246                | 438       | 1023               |
| 0.25                                   | ±0.02 | 9.8                                             | 1156                       | 636  | 0.297               | 1145      | 1086               | 0.299                | 581       | 826                | 0.301                | 432       | 816                |
| 0.3                                    | ±0.02 | 8.9                                             | 1145                       | 630  | 0.351               | 1135      | 854                | 0.353                | 573       | 683                | 0.356                | 426       | 678                |
| 0.35                                   | ±0.02 | 8.3                                             | 1134                       | 624  | 0.405               | 1125      | 697                | 0.408                | 565       | 581                | 0.411                | 421       | 580                |
| 0.4                                    | ±0.02 | 7.7                                             | 1123                       | 618  | 0.459               | 1115      | 584                | 0.462                | 557       | 505                | 0.466                | 415       | 506                |
| 0.45                                   | ±0.02 | 7.3                                             | 1112                       | 612  | 0.513               | 1105      | 500                | 0.516                | 549       | 447                | 0.521                | 409       | 449                |
| 0.5                                    | ±0.02 | 6.9                                             | 1101                       | 606  | 0.567               | 1095      | 435                | 0.571                | 541       | 400                | 0.576                | 403       | 404                |
| 0.55                                   | ±0.02 | 6.6                                             | 1090                       | 599  | 0.617               | 1084      | 384                | 0.621                | 532       | 362                | 0.627                | 397       | 366                |
| 0.6                                    | ±0.02 | 6.3                                             | 1079                       | 593  | 0.666               | 1074      | 342                | 0.672                | 524       | 331                | 0.679                | 391       | 335                |
| 0.65                                   | ±0.02 | 6.0                                             | 1068                       | 587  | 0.716               | 1064      | 308                | 0.723                | 516       | 304                | 0.731                | 385       | 309                |
| 0.7                                    | ±0.02 | 5.8                                             | 1057                       | 581  | 0.765               | 1054      | 279                | 0.774                | 508       | 282                | 0.783                | 379       | 287                |
| 0.75                                   | ±0.02 | 5.6                                             | 1046                       | 575  | 0.815               | 1044      | 255                | 0.824                | 500       | 262                | 0.834                | 374       | 267                |
| 0.8                                    | ±0.02 | 5.4                                             | 1035                       | 569  | 0.864               | 1034      | 234                | 0.875                | 492       | 245                | 0.886                | 368       | 250                |
| 0.85                                   | ±0.02 | 5.3                                             | 1023                       | 563  | 0.914               | 1024      | 216                | 0.926                | 484       | 230                | 0.938                | 362       | 236                |
| 0.9                                    | ±0.02 | 5.1                                             | 1012                       | 557  | 0.963               | 1013      | 201                | 0.976                | 476       | 217                | 0.989                | 356       | 222                |
| 0.95                                   | ±0.02 | 5.0                                             | 1001                       | 551  | 1.013               | 1003      | 187                | 1.027                | 467       | 205                | 1.041                | 350       | 210                |
| 1                                      | ±0.02 | 5.0                                             | 992                        | 546  | 1.062               | 983       | 167                | 1.078                | 459       | 170                | 1.093                | 344       | 177                |
| 1.05                                   | ±0.02 | 4.9                                             | 981                        | 539  | 1.107               | 975       | 163                | 1.124                | 451       | 167                | 1.141                | 338       | 174                |
| 1.1                                    | ±0.02 | 4.8                                             | 969                        | 533  | 1.152               | 966       | 158                | 1.170                | 443       | 165                | 1.189                | 331       | 172                |
| 1.15                                   | ±0.02 | 4.7                                             | 958                        | 527  | 1.196               | 958       | 154                | 1.217                | 435       | 162                | 1.236                | 325       | 169                |
| 1.2                                    | ±0.02 | 4.6                                             | 946                        | 521  | 1.241               | 950       | 150                | 1.263                | 427       | 160                | 1.284                | 318       | 167                |
| 1.25                                   | ±0.02 | 4.5                                             | 935                        | 514  | 1.285               | 942       | 146                | 1.309                | 419       | 157                | 1.332                | 312       | 164                |
| 1.3                                    | ±0.02 | 4.4                                             | 923                        | 508  | 1.330               | 933       | 142                | 1.355                | 410       | 155                | 1.380                | 305       | 162                |
| 1.35                                   | ±0.02 | 4.3                                             | 912                        | 502  | 1.375               | 925       | 138                | 1.402                | 402       | 152                | 1.428                | 299       | 159                |
| 1.4                                    | ±0.02 | 4.2                                             | 900                        | 495  | 1.419               | 917       | 134                | 1.448                | 394       | 150                | 1.476                | 293       | 156                |
| 1.45                                   | ±0.02 | 4.1                                             | 889                        | 489  | 1.464               | 908       | 129                | 1.494                | 386       | 147                | 1.524                | 286       | 154                |
| 1.5                                    | ±0.02 | 4.1                                             | 877                        | 483  | 1.508               | 900       | 125                | 1.541                | 378       | 144                | 1.572                | 280       | 151                |
| 1.55                                   | ±0.02 | 4.0                                             | 862                        | 474  | 1.567               | 890       | 123                | 1.618                | 371       | 143                | 1.638                | 274       | 150                |
| 1.6                                    | ±0.02 | 3.9                                             | 846                        | 465  | 1.626               | 881       | 122                | 1.694                | 363       | 142                | 1.704                | 268       | 149                |
| 1.65                                   | ±0.02 | 3.9                                             | 831                        | 457  | 1.685               | 871       | 120                | 1.771                | 356       | 140                | 1.770                | 262       | 148                |
| 1.7                                    | ±0.02 | 3.8                                             | 815                        | 448  | 1.743               | 862       | 118                | 1.848                | 349       | 139                | 1.836                | 256       | 147                |
| 1.75                                   | ±0.02 | 3.7                                             | 800                        | 440  | 1.802               | 852       | 116                | 1.925                | 342       | 138                | 1.902                | 250       | 145                |
| 1.8                                    | ±0.02 | 3.7                                             | 784                        | 431  | 1.861               | 843       | 114                | 2.002                | 334       | 136                | 1.968                | 244       | 144                |
| 1.85                                   | ±0.02 | 3.6                                             | 769                        | 423  | 1.920               | 833       | 112                | 2.079                | 327       | 135                | 2.034                | 239       | 143                |
| 1.9                                    | ±0.02 | 3.5                                             | 753                        | 414  | 1.978               | 824       | 110                | 2.156                | 320       | 134                | 2.100                | 233       | 142                |
| 1.95                                   | ±0.02 | 3.4                                             | 737                        | 406  | 2.037               | 814       | 108                | 2.233                | 313       | 132                | 2.167                | 227       | 141                |
| 2                                      | ±0.03 | 3.3                                             | 722                        | 397  | 2.096               | 805       | 107                | 2.310                | 305       | 131                | 2.233                | 221       | 139                |
| 2.1                                    | ±0.03 | 3.2                                             | 691                        | 380  | 2.213               | 786       | 103                | 2.464                | 291       | 128                | 2.365                | 209       | 137                |
| 2.2                                    | ±0.03 | 3.0                                             | 660                        | 363  | 2.331               | 767       | 99                 | 2.618                | 276       | 126                | 2.497                | 198       | 135                |
| 2.3                                    | ±0.03 | 2.9                                             | 644                        | 354  | 2.420               | 747       | 97                 | 2.681                | 268       | 123                | 2.613                | 191       | 132                |
| 2.4                                    | ±0.03 | 2.9                                             | 629                        | 346  | 2.508               | 728       | 96                 | 2.744                | 259       | 121                | 2.729                | 185       | 130                |
| 2.5                                    | ±0.03 | 2.8                                             | 614                        | 338  | 2.597               | 709       | 94                 | 2.807                | 251       | 118                | 2.845                | 179       | 128                |
| 2.6                                    | ±0.03 | 2.8                                             | 598                        | 329  | 2.686               | 689       | 93                 | 2.870                | 242       | 116                | 2.961                | 173       | 126                |
| 2.7                                    | ±0.03 | 2.7                                             | 583                        | 321  | 2.775               | 670       | 91                 | 2.933                | 234       | 114                | 3.077                | 167       | 123                |
| 2.8                                    | ±0.03 | 2.7                                             | 574                        | 316  | 2.875               | 659       | 90                 | 3.047                | 230       | 113                | 3.205                | 164       | 122                |
| 2.9                                    | ±0.03 | 2.7                                             | 566                        | 311  | 2.975               | 647       | 89                 | 3.162                | 227       | 112                | 3.334                | 161       | 121                |
| 3                                      | ±0.03 | 2.7                                             | 557                        | 306  | 3.075               | 636       | 88                 | 3.276                | 223       | 111                | 3.462                | 157       | 121                |
| 3.1                                    | ±0.05 | 2.7                                             | 548                        | 302  | 3.174               | 625       | 87                 | 3.390                | 220       | 110                | 3.590                | 154       | 120                |
| 3.2                                    | ±0.05 | 2.6                                             | 540                        | 297  | 3.274               | 613       | 87                 | 3.504                | 216       | 109                | 3.718                | 151       | 119                |
| 3.3                                    | ±0.05 | 2.6                                             | 531                        | 292  | 3.374               | 602       | 86                 | 3.619                | 213       | 108                | 3.847                | 148       | 118                |
| 3.4                                    | ±0.05 | 2.6                                             | 522                        | 287  | 3.474               | 591       | 85                 | 3.733                | 209       | 107                | 3.975                | 145       | 117                |
| 3.5                                    | ±0.05 | 2.6                                             | 514                        | 283  | 3.574               | 579       | 84                 | 3.847                | 206       | 106                | 4.103                | 141       | 116                |
| 3.6                                    | ±0.05 | 2.5                                             | 505                        | 278  | 3.674               | 568       | 83                 | 3.961                | 202       | 105                | 4.231                | 138       | 115                |
| 3.7                                    | ±0.05 | 2.5                                             | 496                        | 273  | 3.773               | 556       | 82                 | 4.076                | 198       | 104                | 4.359                | 135       | 114                |
| 3.8                                    | ±0.05 | 2.5                                             | 488                        | 268  | 3.873               | 545       | 81                 | 4.190                | 195       | 103                | 4.488                | 132       | 113                |
| 3.9                                    | ±0.05 | 2.4                                             | 479                        | 264  | 3.973               | 534       | 80                 | 4.304                | 191       | 102                | 4.616                | 129       | 112                |

| Capacitance<br>@ 1MHz<br>and Tolerance |       | Self<br>Resonance<br>Frequency<br>(GHz)<br>Typ. | Q Standard Value<br>@ 1GHz |      | Frequency<br>900MHz |           |                    | Frequency<br>1900MHz |           |                    | Frequency<br>2400MHz |           |                    |
|----------------------------------------|-------|-------------------------------------------------|----------------------------|------|---------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------|--------------------|
| C (pF)                                 | Tol.  |                                                 | Typ.                       | Min. | C(eff)<br>(pF) Typ. | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. | C(eff)<br>(pF) Typ.  | Q<br>Typ. | ESR<br>(mOhm) Typ. |
| 4                                      | ±0.05 | 2.4                                             | 473                        | 260  | 4.083               | 528       | 79                 | 4.435                | 189       | 101                | 4.768                | 127       | 112                |
| 4.1                                    | ±0.05 | 2.4                                             | 467                        | 257  | 4.192               | 522       | 78                 | 4.565                | 186       | 100                | 4.919                | 125       | 111                |
| 4.2                                    | ±0.05 | 2.4                                             | 462                        | 254  | 4.302               | 516       | 78                 | 4.695                | 183       | 100                | 5.071                | 123       | 110                |
| 4.3                                    | ±0.05 | 2.3                                             | 456                        | 251  | 4.411               | 511       | 77                 | 4.825                | 180       | 99                 | 5.223                | 121       | 110                |
| 4.4                                    | ±0.05 | 2.3                                             | 450                        | 247  | 4.521               | 505       | 76                 | 4.956                | 178       | 98                 | 5.375                | 119       | 109                |
| 4.5                                    | ±0.05 | 2.3                                             | 444                        | 244  | 4.630               | 499       | 75                 | 5.086                | 175       | 98                 | 5.526                | 117       | 108                |
| 4.6                                    | ±0.05 | 2.3                                             | 438                        | 241  | 4.740               | 493       | 75                 | 5.216                | 172       | 97                 | 5.678                | 115       | 108                |
| 4.7                                    | ±0.05 | 2.2                                             | 432                        | 238  | 4.849               | 487       | 74                 | 5.347                | 170       | 96                 | 5.830                | 113       | 107                |
| 5.1                                    | ±0.05 | 2.1                                             | 408                        | 225  | 5.288               | 464       | 71                 | 5.868                | 159       | 93                 | 6.437                | 106       | 105                |
| 5.6                                    | ±0.05 | 2.0                                             | 379                        | 208  | 5.835               | 435       | 67                 | 6.519                | 145       | 90                 | 7.195                | 96        | 102                |
| 6.2                                    | ±0.1  | 1.9                                             | 355                        | 195  | 6.440               | 408       | 65                 | 7.176                | 137       | 86                 | 7.897                | 91        | 96                 |
| 6.8                                    | ±0.1  | 1.8                                             | 330                        | 182  | 7.044               | 380       | 62                 | 7.832                | 129       | 83                 | 8.599                | 85        | 91                 |
| 7.5                                    | ±0.1  | 1.7                                             | 308                        | 169  | 7.823               | 351       | 61                 | 8.927                | 115       | 81                 | 10.08                | 74        | 89                 |
| 8.2                                    | ±0.1  | 1.7                                             | 285                        | 157  | 8.601               | 322       | 60                 | 10.02                | 100       | 78                 | 11.55                | 63        | 87                 |
| 9.1                                    | ±0.1  | 1.6                                             | 266                        | 146  | 9.600               | 304       | 58                 | 11.55                | 93        | 77                 | 13.93                | 57        | 85                 |
| 10                                     | ±1%   | 1.5                                             | 247                        | 136  | 10.60               | 285       | 57                 | 13.09                | 85        | 76                 | 16.30                | 50        | 84                 |
| 11                                     | ±1%   | 1.5                                             | 225                        | 124  | 11.71               | 265       | 56                 | 14.79                | 76        | 74                 | 18.94                | 43        | 82                 |
| 12                                     | ±1%   | 1.4                                             | 204                        | 112  | 12.82               | 244       | 54                 | 16.49                | 68        | 73                 | 21.57                | 36        | 81                 |
| 13                                     | ±1%   | 1.3                                             | 193                        | 106  | 13.97               | 230       | 53                 | 18.64                | 61        | 72                 | 26.09                | 32        | 80                 |
| 14                                     | ±1%   | 1.3                                             | 181                        | 99   | 15.13               | 215       | 53                 | 20.80                | 55        | 71                 | 30.61                | 28        | 79                 |
| 15                                     | ±1%   | 1.2                                             | 169                        | 93   | 16.28               | 200       | 52                 | 22.95                | 48        | 70                 | 35.13                | 24        | 78                 |
| 16                                     | ±1%   | 1.2                                             | 164                        | 90   | 17.51               | 195       | 51                 | 26.01                | 46        | 69                 | 46.51                | 22        | 76                 |
| 17                                     | ±1%   | 1.2                                             | 159                        | 88   | 18.75               | 189       | 50                 | 29.07                | 43        | 67                 | 57.90                | 19        | 75                 |
| 18                                     | ±1%   | 1.1                                             | 154                        | 85   | 19.98               | 183       | 49                 | 32.14                | 41        | 66                 | 69.29                | 17        | 73                 |
| 19                                     | ±1%   | 1.1                                             | 150                        | 82   | 21.21               | 178       | 49                 | 36.34                | 39        | 66                 | n/a                  | n/a       | n/a                |
| 20                                     | ±1%   | 1.1                                             | 145                        | 80   | 22.43               | 172       | 49                 | 40.55                | 38        | 65                 | n/a                  | n/a       | n/a                |
| 22                                     | ±1%   | 1.0                                             | 136                        | 75   | 24.88               | 162       | 49                 | 48.96                | 34        | 64                 | n/a                  | n/a       | n/a                |
| 24                                     | ±1%   | 1.0                                             | 126                        | 70   | 27.34               | 151       | 48                 | 57.38                | 31        | 63                 | n/a                  | n/a       | n/a                |
| 27                                     | ±1%   | 0.9                                             | 112                        | 62   | 31.02               | 135       | 48                 | 70.00                | 26        | 62                 | n/a                  | n/a       | n/a                |
| 30                                     | ±1%   | 0.9                                             | 101                        | 56   | 36.14               | 121       | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 33                                     | ±1%   | 0.8                                             | 90                         | 50   | 41.27               | 108       | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 36                                     | ±1%   | 0.8                                             | 79                         | 44   | 46.39               | 95        | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 39                                     | ±1%   | 0.8                                             | 68                         | 38   | 51.52               | 82        | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 43                                     | ±1%   | 0.7                                             | 54                         | 30   | 58.35               | 64        | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 47                                     | ±1%   | 0.7                                             | 39                         | 21   | 65.18               | 46        | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |
| 82                                     | ±1%   | 0.7                                             | 17                         | 10   | 148.400             | 24        | 48                 | n/a                  | n/a       | n/a                | n/a                  | n/a       | n/a                |

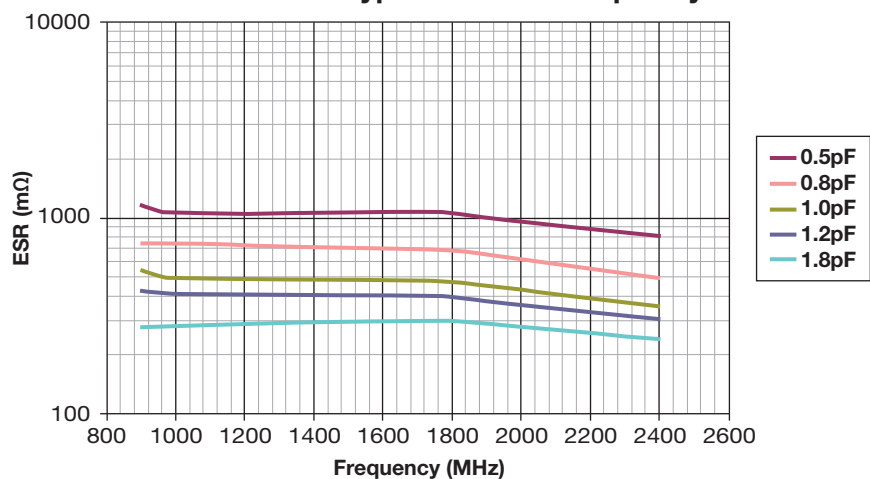
1

**Accu-P® 01005 Typical SRF vs Capacitance**



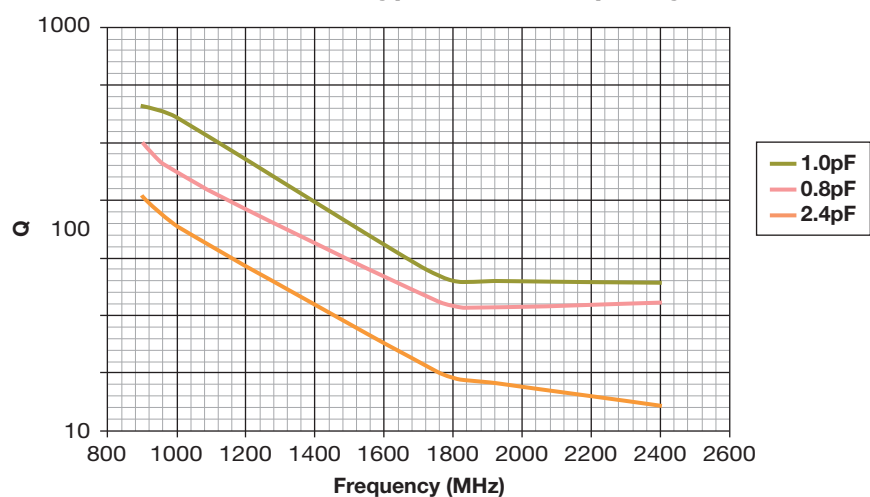
Measured on HP8720ES

**Accu-P® 01005 Typical ESR vs Frequency**



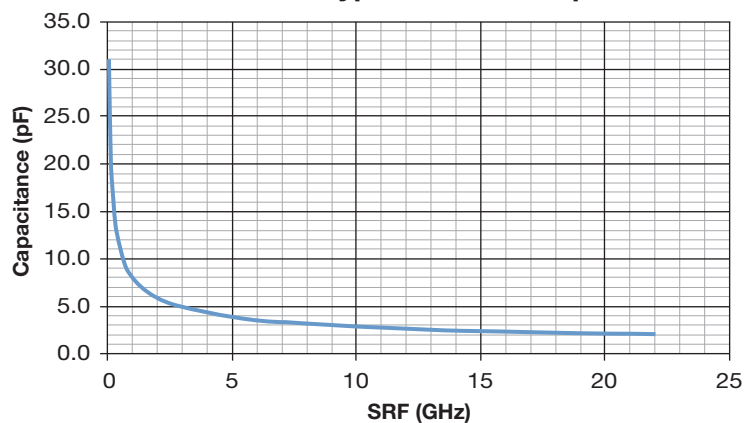
Measured on Agilent 4278A/4991A

**Accu-P® 01005 Typical Q vs Frequency**

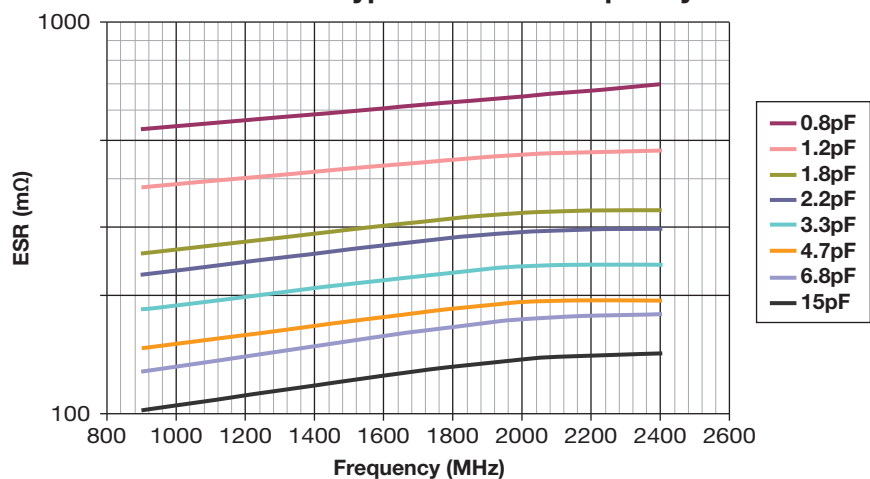


Measured on Agilent 4278A/4991A

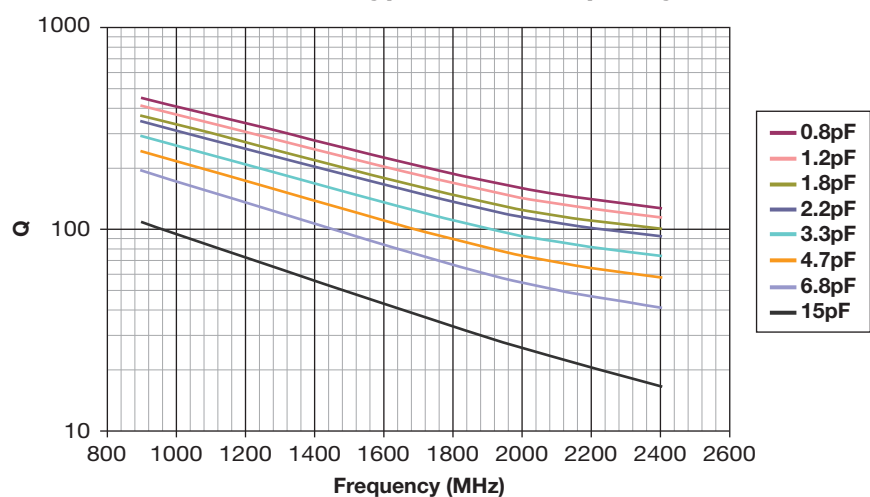
**Accu-P® 0201 Typical SRF vs Capacitance**



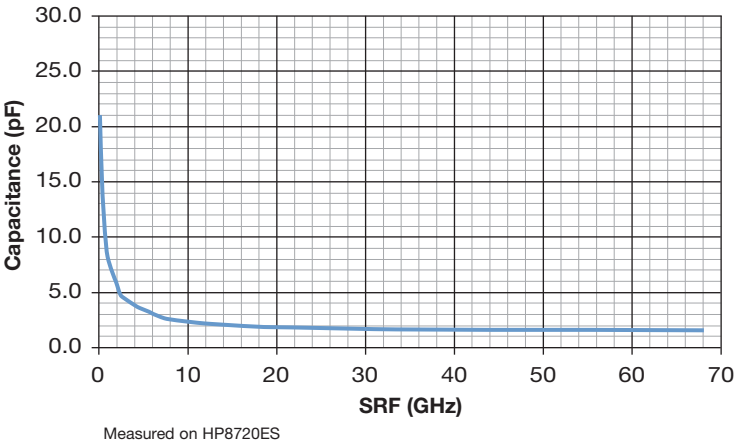
**Accu-P® 0201 Typical ESR vs Frequency**



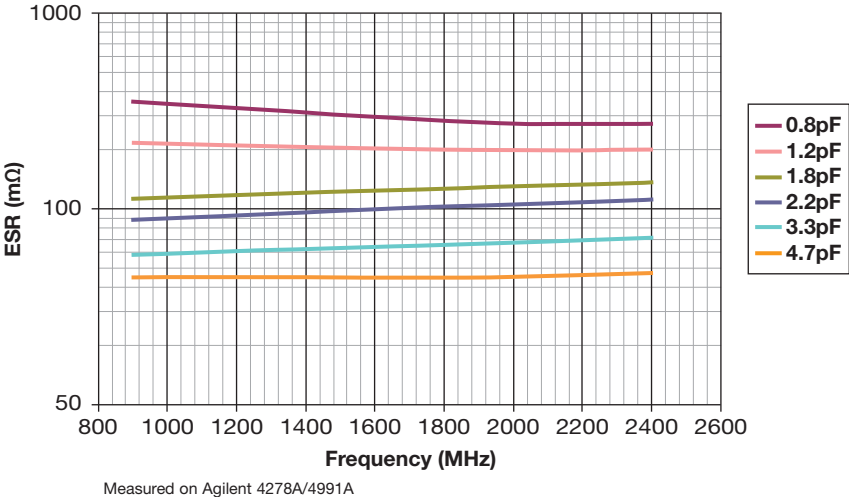
**Accu-P® 0201 Typical Q vs Frequency**



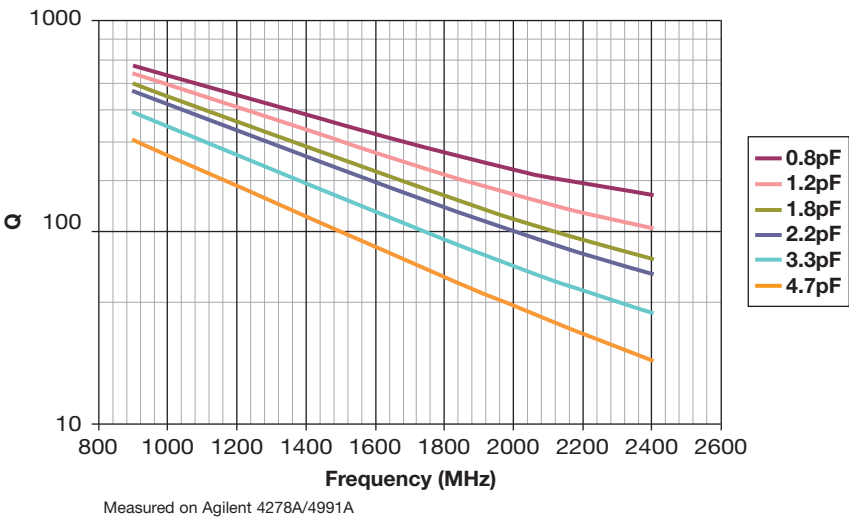
Accu-P<sup>®</sup> 0402 Typical SRF vs Capacitance



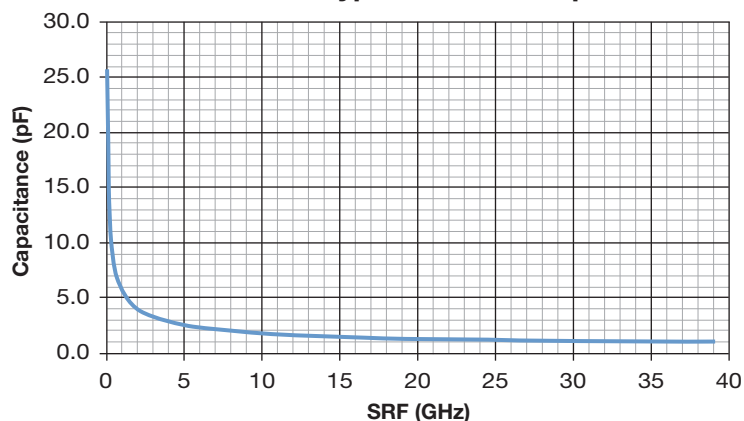
Accu-P<sup>®</sup> 0402 Typical ESR vs Frequency



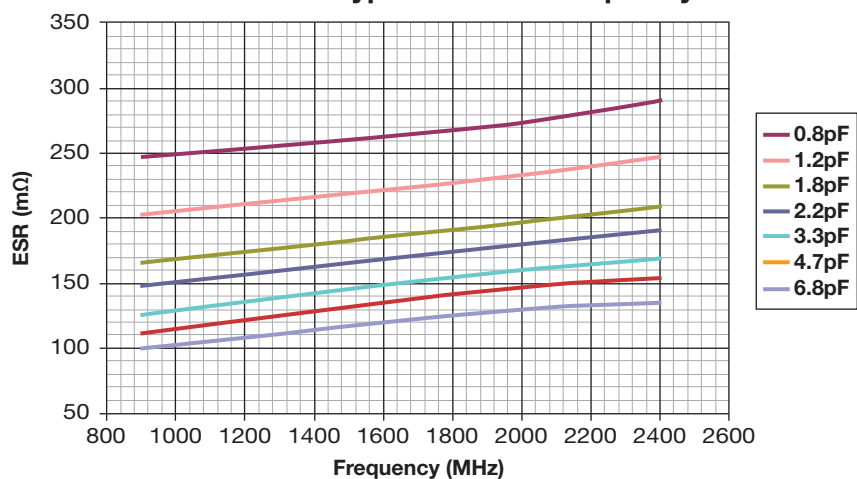
Accu-P<sup>®</sup> 0402 Typical Q vs Frequency



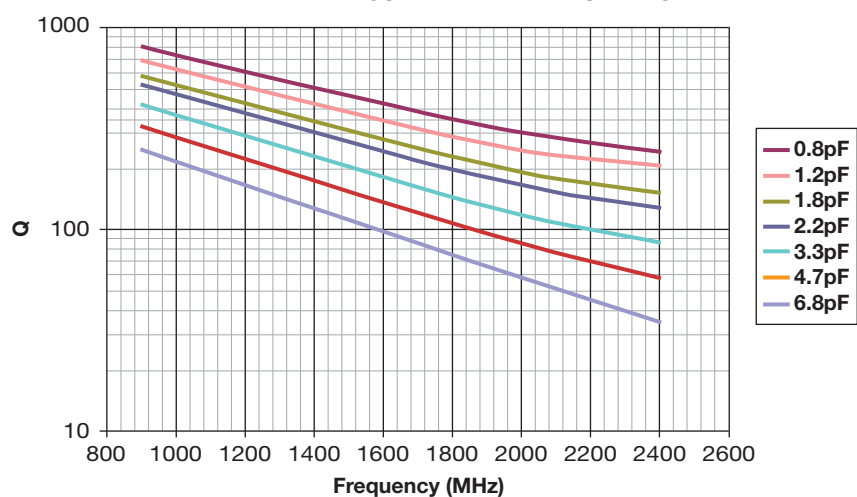
**Accu-P® 0603 Typical SRF vs Capacitance**



**Accu-P® 0603 Typical ESR vs Frequency**

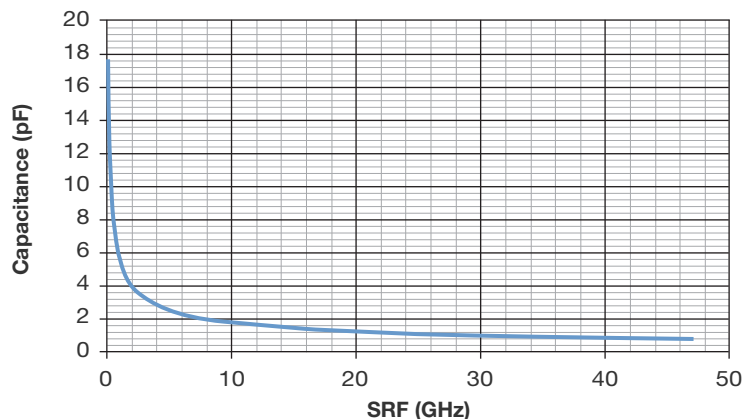


**Accu-P® 0603 Typical Q vs Frequency**



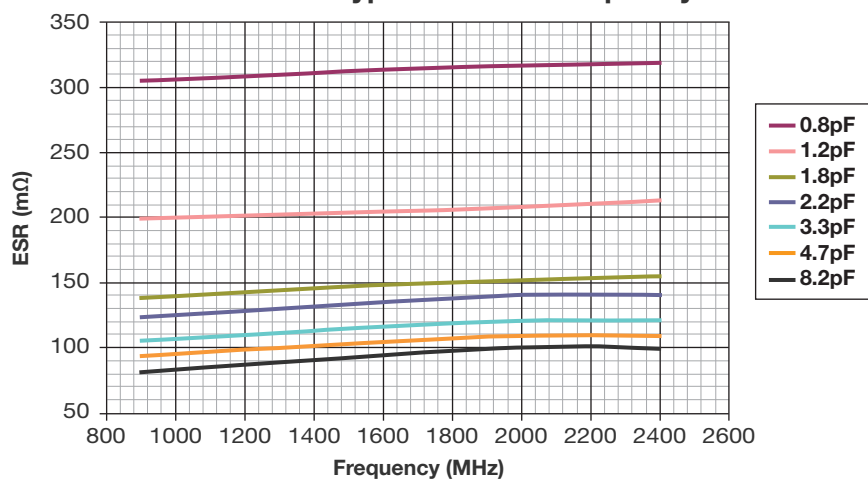
1

**Accu-P® 0805 Typical SRF vs Capacitance**



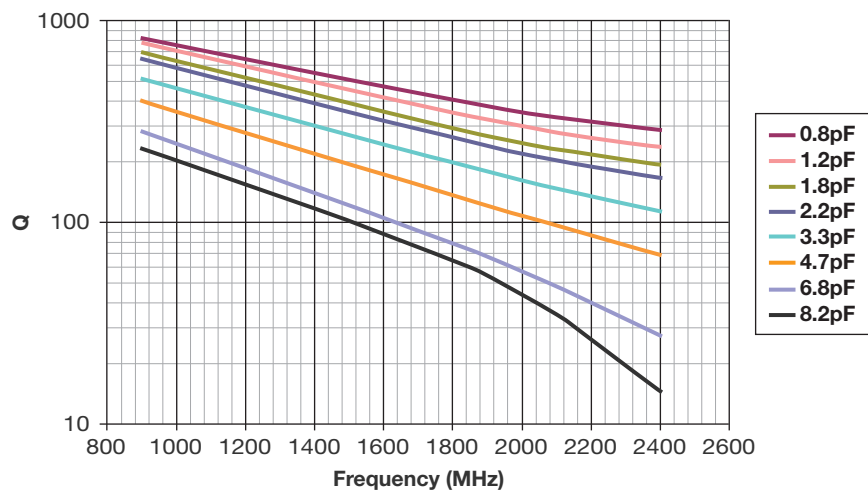
Measured on HP8720ES

**Accu-P® 0805 Typical ESR vs Frequency**



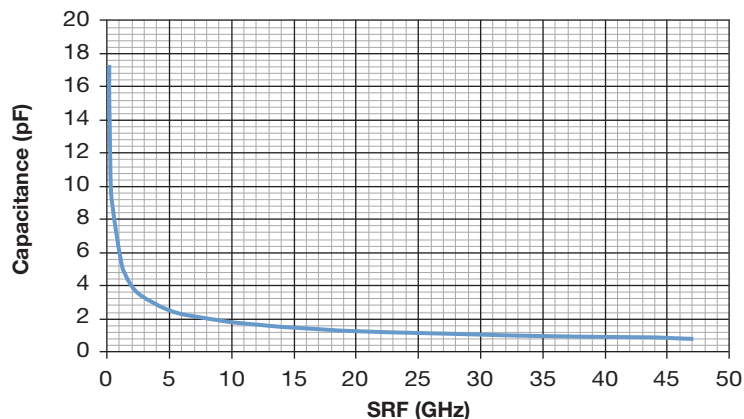
Measured on Agilent 4278A/4991A

**Accu-P® 0805 Typical Q vs Frequency**



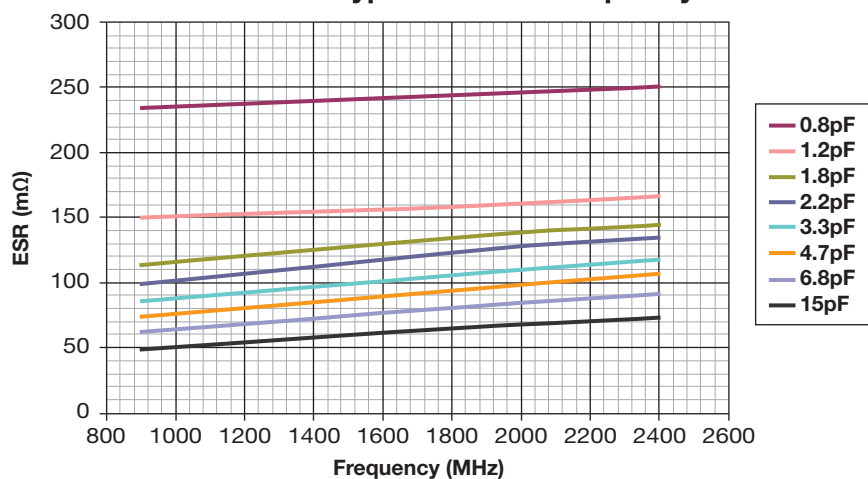
Measured on Agilent 4278A/4991A

**Accu-P® 1210 Typical SRF vs Capacitance**



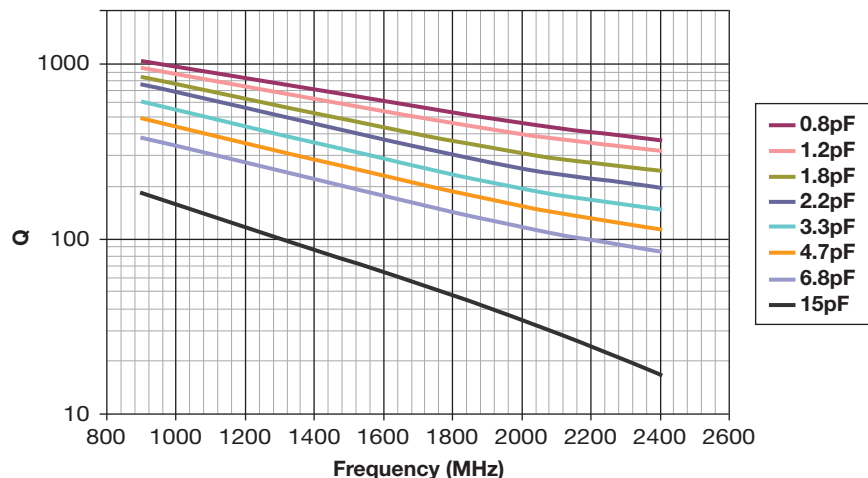
Measured on HP8720ES

**Accu-P® 1210 Typical ESR vs Frequency**



Measured on Agilent 4278A/4991A

**Accu-P® 1210 Typical Q vs Frequency**



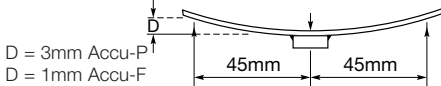
Measured on Agilent 4278A/4991A

## Environmental / Mechanical Characteristics

### ENVIRONMENTAL CHARACTERISTICS

| TEST                                                                                 | CONDITIONS                                | REQUIREMENT                                                                                                              |
|--------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Life (Endurance)</b><br>MIL-STD-202F Method 108A                                  | 125°C, 2U <sub>R</sub> , 1000 hours       | No visible damage<br>$\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Accelerated Damp Heat Steady State</b><br>MIL-STD-202F Method 103B                | 85°C, 85% RH, U <sub>R</sub> , 1000 hours | No visible damage<br>$\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Temperature Cycling</b><br>MIL-STD-202F Method 107E<br>MIL-STD-883D Method 1010.7 | -55°C to +125°C, 15 cycles – Accu-P®      | No visible damage<br>$\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Resistance to Solder Heat</b><br>IEC-68-2-58                                      | 260°C $\pm$ 5°C for 10 secs               | C remains within initial limits                                                                                          |

### MECHANICAL CHARACTERISTICS

| TEST                                                                             | CONDITIONS                                                                                                                                           | REQUIREMENT                                                                                                              |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Solderability</b><br>IEC-68-2-58                                              | Components completely immersed in a solder bath at 235°C for 2 secs.                                                                                 | Terminations to be well tinned, minimum 95% coverage                                                                     |
| <b>Leach Resistance</b><br>IEC-68-2-58                                           | Components completely immersed in a solder bath at 260 $\pm$ 5°C for 60 secs.                                                                        | Dissolution of termination faces $\leq 15\%$ of area<br>Dissolution of termination edges $\leq 25\%$ of length           |
| <b>Adhesion</b><br>MIL-STD-202F Method 211A                                      | A force of 5N applied for 10 secs.                                                                                                                   | No visible damage                                                                                                        |
| <b>Termination Bond Strength</b><br>IEC-68-2-21 Amend. 2                         | Tested as shown in diagram<br><br>D = 3mm Accu-P<br>D = 1mm Accu-F | No visible damage<br>$\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Robustness of Termination</b><br>IEC-68-2-21 Amend. 2                         | A force of 5N applied for 10 secs.                                                                                                                   | No visible damage                                                                                                        |
| <b>High Frequency Vibration</b><br>MIL-STD-202F Method 201A, 204D (Accu-P® only) | 55Hz to 2000Hz, 20G                                                                                                                                  | No visible damage                                                                                                        |
| <b>Storage</b>                                                                   | 12 months minimum with components stored in "as received" packaging                                                                                  | Good solderability                                                                                                       |

### QUALITY & RELIABILITY

Accu-P® is based on well established thin-film technology and materials.

#### • ON-LINE PROCESS CONTROL

This program forms an integral part of the production cycle and acts as a feedback system to regulate and control production processes. The test procedures, which are integrated into the production process, were developed after long research work and are based on the highly developed semiconductor industry test procedures and equipment. These measures help AVX to produce a consistent and high yield line of products.

#### • FINAL QUALITY INSPECTION

Finished parts are tested for standard electrical parameters and visual/mechanical characteristics. Each production lot is 100% evaluated for: capacitance and proof voltage at 2.5 U<sub>R</sub>. In addition, production is periodically evaluated for:

Average capacitance with histogram printout for capacitance distribution;  
IR and Breakdown Voltage distribution;  
Temperature Coefficient;  
Solderability;  
Dimensional, mechanical and temperature stability.

### QUALITY ASSURANCE

The reliability of these thin-film chip capacitors has been studied intensively for several years. Various measures have been taken to obtain the high reliability required today by the industry. Quality assurance policy is based on well established international industry standards. The reliability of the capacitors is determined by accelerated testing under the following conditions:

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| Life (Endurance)                   | 125°C, 2U <sub>R</sub> , 1000 hours        |
| Accelerated Damp Heat Steady State | 85°C, 85% RH, U <sub>R</sub> , 1000 hours. |

## Performance Characteristics RF Power Applications

### RF POWER APPLICATIONS

In RF power applications capacitor losses generate heat. Two factors of particular importance to designers are:

- Minimizing the generation of heat.
- Dissipating heat as efficiently as possible.

### CAPACITOR HEATING

- The major source of heat generation in a capacitor in RF power applications is a function of RF current (I) and ESR, from the relationship:

$$\text{Power dissipation} = I_{\text{RMS}}^2 \times \text{ESR}$$

- Accu-P® capacitors are specially designed to minimize

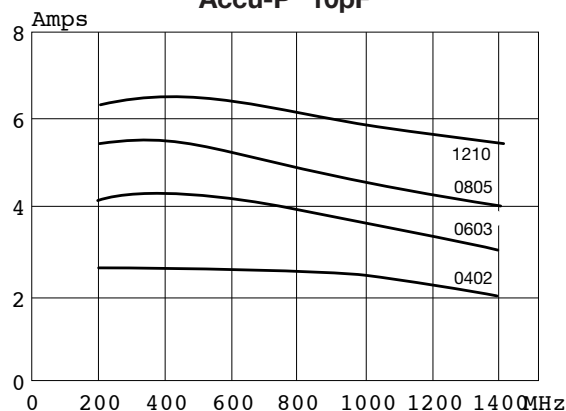
ESR and therefore RF heating. Values of ESR for Accu-P® capacitors are significantly less than those of ceramic MLC components currently available.

### HEAT DISSIPATION

- Heat is dissipated from a capacitor through a variety of paths, but the key factor in the removal of heat is the thermal conductivity of the capacitor material.
- The higher the thermal conductivity of the capacitor, the more rapidly heat will be dissipated.
- The table below illustrates the importance of thermal conductivity to the performance of Accu-P® in power applications.

| PRODUCT       | MATERIAL           | THERMAL CONDUCTIVITY W/mK |
|---------------|--------------------|---------------------------|
| Accu-P®       | Alumina            | 18.9                      |
| Microwave MLC | Magnesium Titanate | 6.0                       |

**Power Handling  
Accu-P® 10pF**



Data used in calculating the graph:

Thermal impedance of capacitors:

|      |         |
|------|---------|
| 0402 | 17°C/W  |
| 0603 | 12°C/W  |
| 0805 | 6.5°C/W |
| 1210 | 5°C/W   |

Thermal impedance measured using RF generator, amplifier and strip-line transformer.

ESR of capacitors measured on Boonton 34A

### THERMAL IMPEDANCE

Thermal impedance of Accu-P® chips is shown below compared with the thermal impedance of Microwave MLC's.

| CAPACITOR TYPE | CHIP SIZE | THERMAL IMPEDANCE (°C/W) |
|----------------|-----------|--------------------------|
| Accu-P®        | 0805      | 6.5                      |
|                | 1210      | 5                        |
| Microwave MLC  | 0505      | 12                       |
|                | 1210      | 7.5                      |

The thermal impedance expresses the temperature difference in °C between chip center and termination caused by a power dissipation of 1 watt in the chip. It is expressed in °C/W.

### ADVANTAGES OF ACCU-P® IN RF POWER CIRCUITS

The optimized design of Accu-P® offers the designer of RF power circuits the following advantages:

- Reduced power losses due to the inherently low ESR of Accu-P®.
- Increased power dissipation due to the high thermal conductivity of Accu-P®.

• THE ONLY TRUE TEST OF A CAPACITOR IN ANY PARTICULAR APPLICATION IS ITS PERFORMANCE UNDER OPERATING CONDITIONS IN THE ACTUAL CIRCUIT.

### PRACTICAL APPLICATION IN RF POWER CIRCUITS

- There is a wide variety of different experimental methods for measuring the power handling performance of a capacitor in RF power circuits. Each method has its own problems and few of them exactly reproduce the conditions present in "real" circuit applications.
- Similarly, there is a very wide range of different circuit applications, all with their unique characteristics and operating conditions which cannot possibly be covered by such "theoretical" testing.

## Application Notes

### GENERAL

Accu-P® SMD capacitors are designed for soldering to printed circuit boards or other substrates. The construction of the components is such that they will withstand the time/temperature profiles used in both wave and reflow soldering methods.

### HANDLING

SMD capacitors should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of plastic tipped tweezers or vacuum pick-ups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized. For automatic equipment, taped and reeled product gives the ideal medium for direct presentation to the placement machine.

### CIRCUIT BOARD TYPE

The circuit board types which may be used with Accu-P® are as follows:

All flexible types of circuit boards  
(eg. FR-4, G-10) and also alumina.

For other circuit board materials, please consult factory.

### COMPONENT PAD DESIGN

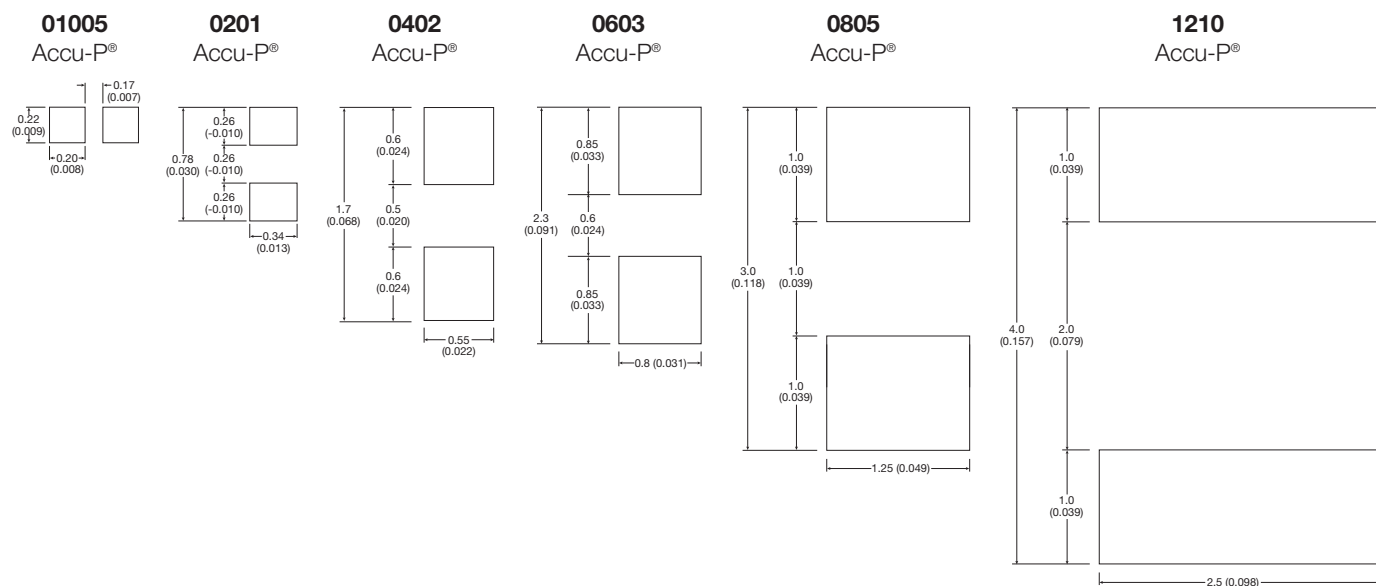
Component pads must be designed to achieve good joints and minimize component movement during reflow soldering. Pad designs are given below for both wave and reflow soldering.

The basis of these designs is:

- Pad width equal to component width. It is permissible to decrease this to as low as 85% of component width but it is not advisable to go below this.
- Pad overlap 0.5mm beneath large components. Pad overlap about 0.3mm beneath small components.
- Pad extension of 0.5mm for reflow of large components and pad extension about 0.3mm for reflow of small components. Pad extension about 1.0mm for wave soldering.

### REFLOW SOLDERING

#### PAD DIMENSIONS: millimeters (inches)



## Application Notes

### PREHEAT & SOLDERING

The rate of preheat in production should not exceed 4°C/second and a recommended maximum is about 2°C/second. Temperature differential from preheat to soldering should not exceed 100°C.

For further specific application or process advice, please consult AVX.

### COOLING

After soldering, the assembly should preferably be allowed to cool naturally. In the event of assisted cooling, similar conditions to those recommended for preheating should be used.

### HAND SOLDERING & REWORK

Hand soldering is permissible. Preheat of the PCB to 150°C is required. The most preferable technique is to use hot air soldering tools. Where a soldering iron is used, a temperature controlled model not exceeding 30 watts should be used and set to not more than 260°C.

### CLEANING RECOMMENDATIONS

Care should be taken to ensure that the devices are thoroughly cleaned of flux residues, especially the space beneath the device. Such residues may otherwise become conductive and effectively offer a lossy bypass to the device. Various recommended cleaning conditions (which must be optimized for the flux system being used) are as follows:

Cleaning liquids. . . . . i-propanol, ethanol, acetylacetone, water and other standard PCB cleaning liquids.

Ultrasonic conditions . . power-20w/liter max.  
frequency-20kHz to 45kHz.

Temperature . . . . . 80°C maximum (if not otherwise limited by chosen solvent system).

Time . . . . . 5 minutes max.

### STORAGE CONDITIONS

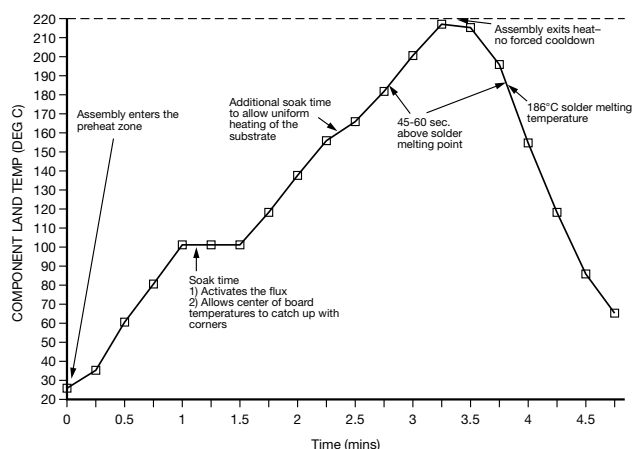
Recommended storage conditions for Accu-P® prior to use are as follows:

Temperature . . . . . 15°C to 35°C

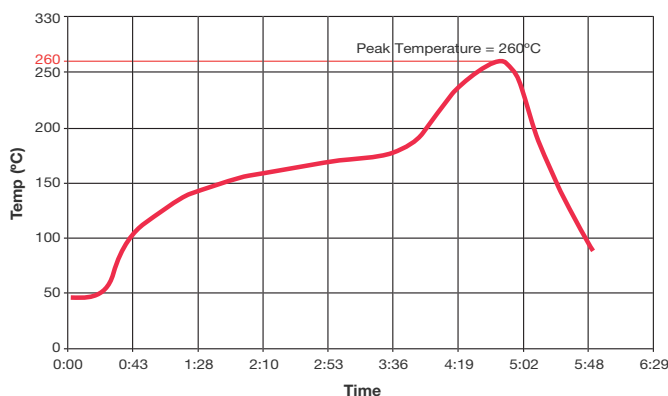
Humidity . . . . . ≤65%

Air Pressure . . . . . 860mbar to 1060mbar

### RECOMMENDED REFLOW SOLDERING PROFILE COMPONENTS WITH SnPb TERMINATIONS



### RECOMMENDED REFLOW SOLDERING PROFILE LEAD FREE COMPONENTS WITH Sn100 TERMINATIONS



Automatic Insertion Packaging

TAPE & REEL

All tape and reel specifications are in compliance with EIA 481-1-A.  
(equivalent to IEC 286 part 3).

- 8mm carrier
- Reeled quantities: Reels of 3,000 per 7" reel or 10,000 pieces per 13" reel  
01005, 0201 and 0402 = 5,000 pieces per 7" reel and 20,000 pieces per 13" reel

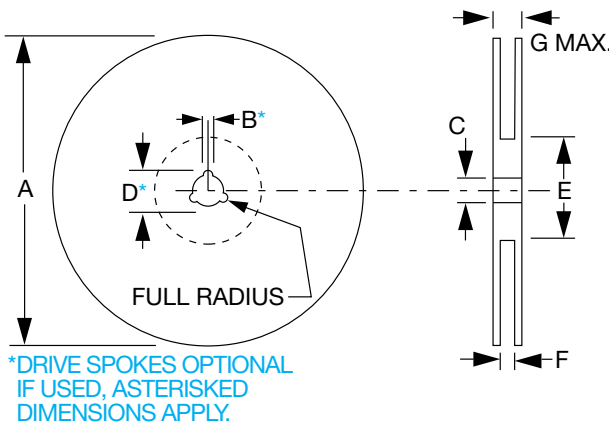
REEL

DIMENSIONS: millimeters (inches)

| A <sup>(1)</sup>         | B                        | C                         | D                         | E                       | F                          | G                         |
|--------------------------|--------------------------|---------------------------|---------------------------|-------------------------|----------------------------|---------------------------|
| 180±1.0<br>(7.087±0.039) | 1.5 min.<br>(0.059 min.) | 13±0.2<br>(0.512 ± 0.008) | 20.2 min.<br>(0.795 min.) | 50 min.<br>(1.969 min.) | 9.6±1.5<br>(0.370 ± 0.050) | 14.4 max.<br>(0.567 max.) |

Metric dimensions will govern.  
Inch measurements rounded and for reference only.

(1) 330mm (13 inch) reels are available.

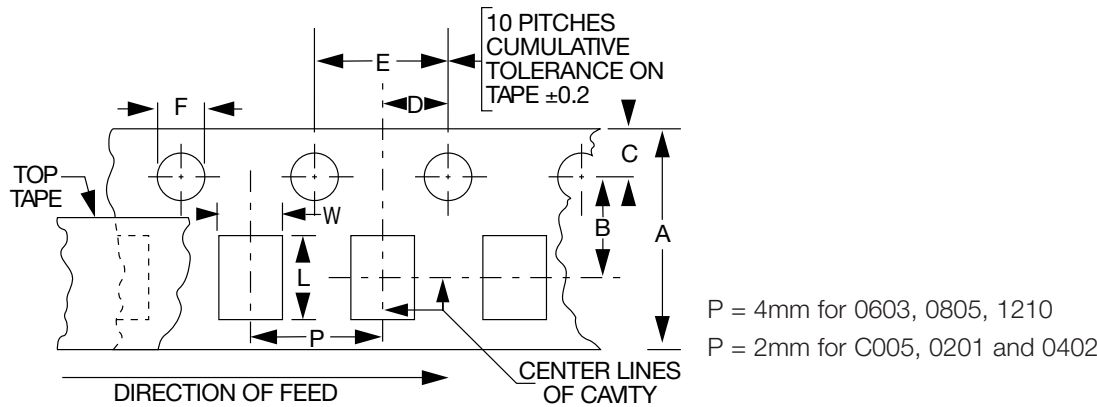


CARRIER

DIMENSIONS: millimeters (inches)

| A                            | B                             | C                           | D                             | E                            | F                                                                                   |
|------------------------------|-------------------------------|-----------------------------|-------------------------------|------------------------------|-------------------------------------------------------------------------------------|
| 8.0 ± 0.3<br>(0.315 ± 0.012) | 3.5 ± 0.05<br>(0.138 ± 0.002) | 1.75±0.1<br>(0.069 ± 0.004) | 2.0 ± 0.05<br>(0.079 ± 0.002) | 4.0 ± 0.1<br>(0.157 ± 0.004) | 1.5 <sup>+0.1</sup> <sub>-0.0</sub><br>(0.059 <sup>+0.004</sup> <sub>-0.000</sub> ) |

The nominal dimensions of the component compartment (W,L) are derived from the component size.



AVX reserves the right to change the information published herein without notice.



# Thin-Film RF/Microwave Inductor Technology

Accu-L<sup>®</sup>

# Accu-L® 0201 Tight Tolerance

## SMD RF Thin Film Tuning Inductor



2



### ACCU-L® TECHNOLOGY

The L0201 SMD Tuning Inductor is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

### APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's
- Filters
- Matching Networks

### HOW TO ORDER

**L0201**

**XXX**

**X**

**H**

**S**

**TR**

Inductance  
(nH)

Tolerance

Series

Lead Free  
Termination

Taped &  
Reeled



P/N Example: **L02013R3BHSTR**

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

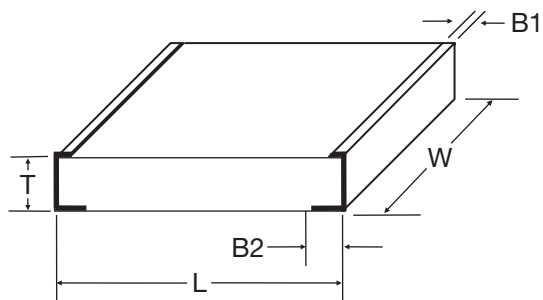
- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

### TERMINATION

Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### DIMENSIONS: (TOP View)

millimeters (inches)

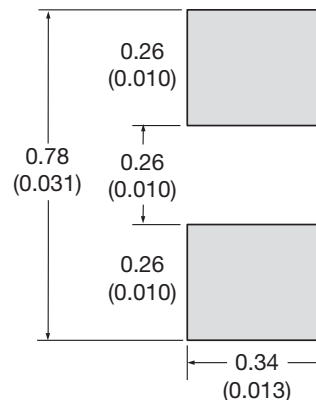


|          |                              |
|----------|------------------------------|
| <b>L</b> | 0.600±0.050<br>(0.024±0.002) |
| <b>W</b> | 0.325±0.050<br>(0.013±0.002) |
| <b>T</b> | 0.225±0.050<br>(0.009±0.002) |

|           |                              |
|-----------|------------------------------|
| <b>B1</b> | 0.100±0.100<br>(0.004±0.004) |
| <b>B2</b> | 0.150±0.050<br>(0.006±0.002) |

### Recommended Pad Layout Dimensions

mm (inches)



# Accu-L<sup>®</sup> 0201 Tight Tolerance

## SMD RF Thin Film Tuning Inductor



### ELECTRICAL SPECIFICATIONS

| L(nH) | 450MHz                                                  | Q<br>(min) | 900MHz     | 1900MHz    | 2400MHz    | SRF<br>min.<br>(GHz) | R <sub>DC</sub><br>max.<br>(Ω) | I <sub>DC</sub><br>max.<br>(mA) |
|-------|---------------------------------------------------------|------------|------------|------------|------------|----------------------|--------------------------------|---------------------------------|
|       | Tolerance<br>A=±0.05nH, B=±0.1nH,<br>C=±0.2nH, D=±0.5nH |            | Q<br>(Typ) | Q<br>(Typ) | Q<br>(Typ) |                      |                                |                                 |
| 0.33  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 13         | 24         | 36         | 39         | 35                   | 0.1                            | 550                             |
| 0.39  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 11         | 23         | 34         | 38         | 33                   | 0.1                            | 550                             |
| 0.47  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 10         | 18         | 26         | 30         | 32                   | 0.1                            | 550                             |
| 0.56  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 9          | 16         | 24         | 27         | 31                   | 0.1                            | 500                             |
| 0.68  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 8          | 19         | 28         | 32         | 30                   | 0.2                            | 500                             |
| 0.82  | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 8          | 19         | 28         | 32         | 28                   | 0.2                            | 400                             |
| 1.0   | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 7          | 16         | 26         | 30         | 26                   | 0.2                            | 400                             |
| 1.2   | ±0.05nH, ± 0.1nH, ± 0.2nH                               | 7          | 16         | 26         | 30         | 24                   | 0.3                            | 300                             |
| 1.5   | ± 0.1nH, ± 0.2nH, ± 0.5nH                               | 7          | 16         | 26         | 30         | 23                   | 0.5                            | 250                             |
| 1.8   | ± 0.1nH, ± 0.2nH, ± 0.5nH                               | 7          | 15         | 25         | 29         | 20                   | 0.5                            | 250                             |
| 2.2   | ± 0.1nH, ± 0.2nH, ± 0.5nH                               | 7          | 15         | 22         | 24         | 18                   | 0.6                            | 200                             |
| 2.7   | ± 0.1nH, ± 0.2nH, ± 0.5nH                               | 7          | 15         | 22         | 24         | 14                   | 0.7                            | 180                             |
| 3.3   | ± 0.1nH, ± 0.2nH, ± 0.5nH                               | 7          | 15         | 22         | 24         | 13                   | 1.0                            | 150                             |

All intermediate Inductance values within the indicated range are available.

# L0402 Tight Tolerance

## RF Inductor



### GENERAL DESCRIPTION ITF TECHNOLOGY

The L0402 LGA Inductor is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

### APPLICATIONS

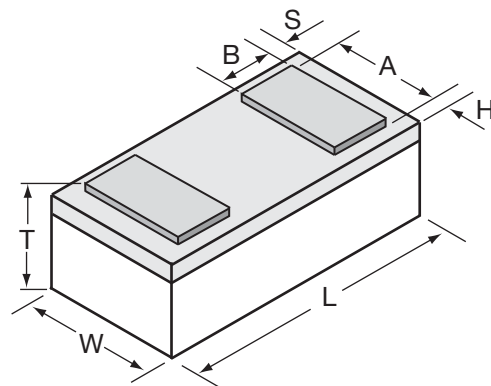
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's
- Filters
- Matching Networks

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

### DIMENSIONS: (Bottom View)

millimeters (inches)



|   |                            |
|---|----------------------------|
| L | 1.00±0.10<br>(0.039±0.004) |
| W | 0.58±0.07<br>(0.023±0.003) |
| T | 0.35±0.10<br>(0.014±0.004) |

|      |                             |
|------|-----------------------------|
| A    | 0.48±0.05<br>(0.019±0.002)  |
| B    | 0.17±0.05<br>(0.007±0.002)  |
| S, H | 0.064±0.05<br>(0.003±0.002) |

### HOW TO ORDER

|              |                    |           |          |                             |                   |
|--------------|--------------------|-----------|----------|-----------------------------|-------------------|
| <b>L0402</b> | <b>XXX</b>         | <b>X</b>  | <b>H</b> | <b>N</b>                    | <b>TR</b>         |
|              | Inductance<br>(nH) | Tolerance | Series   | LGA<br>Termination<br>Sn100 | Taped &<br>Reeled |

P/N Example: **L04023R3BHNT**

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

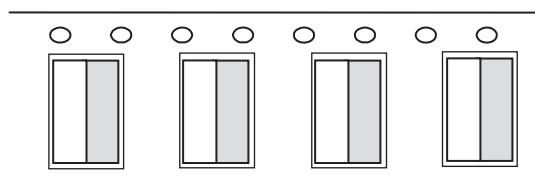
### TERMINATION

Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

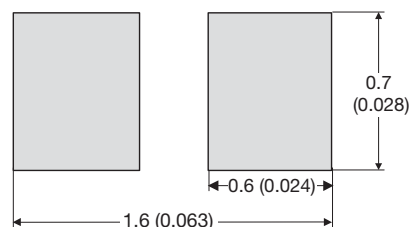


### MAKING AND ORIENTATION IN TAPE

(Top View)



### Recommended Pad Layout Dimensions mm (inches)



# L0402 Tight Tolerance

## RF Inductor

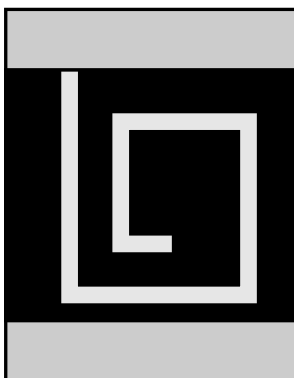


### ELECTRICAL SPECIFICATIONS

| 450MHz |                                                          |            |            | 900MHz     | 1900MHz    | 2400MHz    | SRF<br>min.<br>(MHz) | R <sub>dc</sub><br>max.<br>(Ω) | I <sub>dc</sub><br>max.<br>(mA) |
|--------|----------------------------------------------------------|------------|------------|------------|------------|------------|----------------------|--------------------------------|---------------------------------|
| L(nH)  | Tolerance<br>A=±0.05nH , B=±0.1nH,<br>C=±0.2nH, D=±0.5nH | Q<br>(min) | Q<br>(Typ) | Q<br>(Typ) | Q<br>(Typ) | Q<br>(Typ) |                      |                                |                                 |
| 0.56   | ± 0.05nH, ± 0.1nH                                        | 35         | 45         | 55         | 65         | 75         | 20000                | 0.02                           | 1000                            |
| 0.68   | ± 0.05nH, ± 0.1nH                                        | 30         | 40         | 50         | 60         | 70         | 20000                | 0.04                           | 750                             |
| 0.82   | ± 0.05nH, ± 0.1nH                                        | 25         | 40         | 50         | 60         | 70         | 20000                | 0.06                           | 500                             |
| 1.0    | ± 0.05nH, ± 0.1nH                                        | 20         | 30         | 35         | 40         | 50         | 20000                | 0.15                           | 500                             |
| 1.2    | ± 0.05nH, ± 0.1nH, ± 0.2nH                               | 20         | 30         | 30         | 40         | 45         | 20000                | 0.20                           | 400                             |
| 1.5    | ± 0.05nH, ± 0.1nH, ± 0.2nH                               | 20         | 25         | 30         | 40         | 40         | 18000                | 0.20                           | 400                             |
| 1.8    | ± 0.05nH, ± 0.1nH, ± 0.2nH                               | 18         | 20         | 30         | 35         | 40         | 16000                | 0.20                           | 400                             |
| 2.2    | ± 0.05nH, ± 0.1nH, ± 0.2nH                               | 15         | 20         | 25         | 35         | 40         | 15000                | 0.20                           | 400                             |
| 2.7    | ± 0.05nH, ± 0.1nH, ± 0.2nH                               | 15         | 20         | 25         | 35         | 40         | 9500                 | 0.25                           | 250                             |
| 3.3    | ± 0.1nH, ± 0.2nH, ± 0.5nH                                | 15         | 20         | 25         | 35         | 40         | 8500                 | 0.40                           | 250                             |
| 3.9    | ± 0.1nH, ± 0.2nH, ± 0.5nH                                | 13         | 20         | 20         | 30         | 30         | 8000                 | 0.45                           | 250                             |
| 4.7    | ± 0.1nH, ± 0.2nH, ± 0.5nH                                | 13         | 20         | 20         | 30         | 30         | 7500                 | 0.45                           | 250                             |
| 5.6    | ± 0.1nH, ± 0.2nH, ± 0.5nH                                | 13         | 20         | 20         | 30         | 30         | 7000                 | 0.65                           | 200                             |
| 6.8    | ± 0.1nH, ± 0.2nH, ± 0.5nH                                | 12         | 15         | 20         | 25         | 30         | 6500                 | 0.90                           | 200                             |

Please contact factory for intermediate inductance values within the indicated range.

2



10 nH Inductor (Top View)

## ACCU-L<sup>®</sup> TECHNOLOGY

The Accu-L<sup>®</sup> SMD Inductor is based on thin-film multilayer technology. This technology provides a level of control on the electrical and physical characteristics of the component which gives consistent characteristics within a lot and lot-to-lot.

The original design provides small size, excellent high-frequency performance and rugged construction for reliable automatic assembly.

The Accu-L<sup>®</sup> inductor is particularly suited for the telecommunications industry where there is a continuing trend towards miniaturization and increasing frequencies. The Accu-L<sup>®</sup> inductor meets both the performance and tolerance requirements of present cellular frequencies 450MHz and 900MHz and of future frequencies, such as 1700MHz, 1900MHz and 2400MHz.

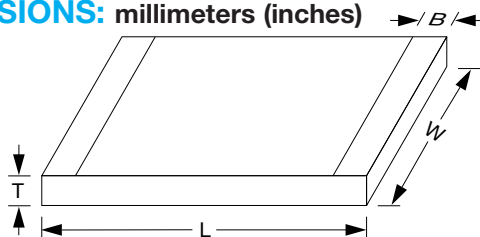
## FEATURES

- High Q
- RF Power Capability
- High SRF
- Low DC Resistance
- Ultra-Tight Tolerance on Inductance
- Standard 0603 and 0805 Chip Size
- Low Profile
- Rugged Construction
- Taped and Reeled

## APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Locations Systems
- Filters
- Matching Networks

## DIMENSIONS: millimeters (inches)



|   | 0603                                                                    | 0805                       |
|---|-------------------------------------------------------------------------|----------------------------|
| L | 1.6±0.10<br>(0.063±0.004)                                               | 2.11±0.10<br>(0.083±0.004) |
| W | 0.81±0.10<br>(0.032±0.004)                                              | 1.5±0.10<br>(0.059±0.004)  |
| T | 0.61±0.10<br>(0.024±0.004)                                              | 0.91±0.13<br>(0.036±0.005) |
| B | top: 0.0 +0.3/-0.0<br>(0.0+0.012)<br>bottom: 0.35±0.20<br>(0.014±0.008) | 0.25±0.15<br>(0.010±0.006) |

Operating/Storage  
Temp. Range:  
-55°C to +125°C

# Accu-L® 0603 and 0805

## SMD High-Q RF Inductor



### HOW TO ORDER

| L<br>T                     | 0805<br>T                   | 4R7<br>T                                                                                                                                                                                                    | D<br>T                                                                                                                                                                                                        | E<br>T                                                                                                  | S<br>T                                                                                                                                                  | TR<br>T                                                               |
|----------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Product</b><br>Inductor | <b>Size</b><br>0603<br>0805 | <b>Inductance</b><br>Expressed in nH<br>(2 significant digits +<br>number of zeros)<br><b>for</b><br><b>values &lt;10nH,</b><br>letter R denotes<br>decimal point.<br>Example:<br>22nH = 220<br>4.7nH = 4R7 | <b>Tolerance</b><br><b>for</b><br><b>L ≤ 4.7nH,</b><br>B = ±0.1nH<br>C = ±0.2nH<br>D = ±0.5nH<br><br><b>4.7nH &lt; L &lt; 10nH,</b><br>C = ±0.2nH<br>D = ±0.5nH<br><br><b>L ≥ 10nH,</b><br>G = ±2%<br>J = ±5% | <b>Specification</b><br><b>Code</b><br>E = Accu-L® 0805<br>technology<br>G = Accu-L® 0603<br>technology | <b>Termination</b><br><b>Code</b><br>W = Nickel/<br>solder coated<br>(Sn 63, Pb 37)<br><b>**S = Nickel/<br/>Lead Free<br/>Solder coated<br/>(Sn100)</b> | <b>Packaging</b><br><b>Code</b><br>TR = Tape and Reel<br>(3,000/reel) |

**Not RoHS Compliant**



For RoHS compliant products,  
please select correct termination style.

**\*\*RoHS compliant**

**Engineering Kits Available  
see pages 118-119**

2

### ELECTRICAL SPECIFICATIONS TABLE FOR ACCU-L® 0603

| 450 MHz<br>Test Frequency |                                   |              | 900 MHz<br>Test Frequency |              | 1900 MHz<br>Test Frequency |              | 2400 MHz<br>Test Frequency |              | SRF min<br>(MHz) | R <sub>DC</sub> max<br>(Ω) | I <sub>DC</sub> max<br>(mA) |
|---------------------------|-----------------------------------|--------------|---------------------------|--------------|----------------------------|--------------|----------------------------|--------------|------------------|----------------------------|-----------------------------|
| Inductance<br>L (nH)      | Available<br>Inductance Tolerance | Q<br>Typical | L (nH)                    | Q<br>Typical | L (nH)                     | Q<br>Typical | L (nH)                     | Q<br>Typical |                  |                            |                             |
| 1.2                       | ±0.1, ±0.2nH                      | 49           | 1.2                       | 70           | 1.2                        | 134          | 1.2                        | 170          | 10000            | 0.04                       | 1000                        |
| 1.5                       | ±0.1, ±0.2nH                      | 26           | 1.54                      | 39           | 1.52                       | 63           | 1.52                       | 76           | 10000            | 0.06                       | 1000                        |
| 1.8                       | ±0.1, ±0.2nH                      | 20           | 1.74                      | 30           | 1.73                       | 50           | 1.72                       | 59           | 10000            | 0.07                       | 1000                        |
| 2.2                       | ±0.1, ±0.2nH                      | 20           | 2.2                       | 30           | 2.24                       | 49           | 2.24                       | 56           | 10000            | 0.08                       | 1000                        |
| 2.7                       | ±0.1, ±0.2nH                      | 21           | 2.7                       | 30           | 2.75                       | 48           | 2.79                       | 54           | 9000             | 0.08                       | 750                         |
| 3.3                       | ±0.1, ±0.2, ±0.5nH                | 24           | 3.33                      | 35           | 3.39                       | 56           | 3.47                       | 64           | 8400             | 0.08                       | 750                         |
| 3.9                       | ±0.1, ±0.2, ±0.5nH                | 25           | 3.9                       | 57           | 4.06                       | 60           | 4.21                       | 69           | 6500             | 0.12                       | 500                         |
| 4.7                       | ±0.1, ±0.2, ±0.5nH                | 23           | 4.68                      | 32           | 4.92                       | 46           | 5.2                        | 49           | 5500             | 0.15                       | 500                         |
| 5.6                       | ±0.2, ±0.5nH                      | 26           | 5.65                      | 36           | 5.94                       | 54           | 6.23                       | 60           | 5000             | 0.25                       | 300                         |
| 6.8                       | ±0.2, ±0.5nH                      | 23           | 6.9                       | 33           | 7.3                        | 47           | 8.1                        | 39           | 4500             | 0.30                       | 300                         |
| 8.2                       | ±0.2, ±0.5nH                      | 23           | 8.4                       | 31           | 10                         | 35           | 12.1                       | 31           | 3800             | 0.35                       | 300                         |
| 10.0                      | ±2%, ±5%                          | 28           | 10                        | 39           | 11.8                       | 47           | 14.1                       | 41           | 3500             | 0.45                       | 300                         |
| 12.0                      | ±2%, ±5%                          | 28           | 13.2                      | 38           | 14.1                       | 30           | 17.2                       | 20           | 3000             | 0.50                       | 300                         |
| 15.0                      | ±2%, ±5%                          | 28           | 16.2                      | 38           | 25.9                       | 30           | 49.8                       | 15           | 2500             | 0.60                       | 300                         |

(1) I<sub>DC</sub> measured for 15°C rise at 25°C ambient temperature when soldered to FR-4 board.

Inductance and Q measured on Agilent 4291B / 4287 using the 16196A test fixture.

### ELECTRICAL SPECIFICATIONS TABLE FOR ACCU-L® 0805

| 450 MHz<br>Test Frequency |                                   |              | 900 MHz<br>Test Frequency |              | 1700 MHz<br>Test Frequency |              | 2400 MHz<br>Test Frequency |              | SRF min<br>(MHz) | R <sub>DC</sub> max<br>(Ω) | I <sub>DC</sub> max<br>(mA) |                  |
|---------------------------|-----------------------------------|--------------|---------------------------|--------------|----------------------------|--------------|----------------------------|--------------|------------------|----------------------------|-----------------------------|------------------|
| Inductance<br>L (nH)      | Available<br>Inductance Tolerance | Q<br>Typical | L (nH)                    | Q<br>Typical | L (nH)                     | Q<br>Typical | L (nH)                     | Q<br>Typical |                  |                            | ΔT = 15°C<br>(1)            | ΔT = 70°C<br>(2) |
| 1.2                       | ±0.1nH, ±0.2nH, ±0.5nH            | 60           | 1.2                       | 92           | 1.2                        | 122          | 1.2                        | 92           | 10000            | 0.05                       | 1000                        | 2000             |
| 1.5                       | ±0.1nH, ±0.2nH, ±0.5nH            | 50           | 1.5                       | 74           | 1.5                        | 102          | 1.5                        | 84           | 10000            | 0.05                       | 1000                        | 2000             |
| 1.8                       | ±0.1nH, ±0.2nH, ±0.5nH            | 50           | 1.8                       | 72           | 1.8                        | 88           | 1.9                        | 73           | 10000            | 0.06                       | 1000                        | 2000             |
| 2.2                       | ±0.1nH, ±0.2nH, ±0.5nH            | 42           | 2.2                       | 62           | 2.2                        | 82           | 2.3                        | 72           | 10000            | 0.07                       | 1000                        | 2000             |
| 2.7                       | ±0.1nH, ±0.2nH, ±0.5nH            | 42           | 2.7                       | 62           | 2.8                        | 80           | 2.9                        | 70           | 10000            | 0.08                       | 1000                        | 2000             |
| 3.3                       | ±0.1nH, ±0.2nH, ±0.5nH            | 38           | 3.3                       | 46           | 3.4                        | 48           | 3.5                        | 57           | 10000            | 0.11                       | 750                         | 1500             |
| 3.9                       | ±0.1nH, ±0.2nH, ±0.5nH            | 27           | 3.9                       | 36           | 4.0                        | 38           | 4.1                        | 42           | 10000            | 0.20                       | 750                         | 1500             |
| 4.7                       | ±0.1nH, ±0.2nH, ±0.5nH            | 43           | 4.8                       | 62           | 5.3                        | 76           | 5.8                        | 60           | 5500             | 0.10                       | 750                         | 1500             |
| 5.6                       | ±0.5nH                            | 50           | 5.7                       | 68           | 6.3                        | 73           | 7.6                        | 62           | 4600             | 0.10                       | 750                         | 1500             |
| 6.8                       | ±0.5nH                            | 43           | 7.0                       | 62           | 7.7                        | 71           | 9.4                        | 50           | 4500             | 0.11                       | 750                         | 1500             |
| 8.2                       | ±0.5nH                            | 43           | 8.5                       | 56           | 10.0                       | 55           | 15.2                       | 32           | 3500             | 0.12                       | 750                         | 1500             |
| 10                        | ±2%, ±5%                          | 46           | 10.6                      | 60           | 13.4                       | 52           | —                          | —            | 2500             | 0.13                       | 750                         | 1500             |
| 12                        | ±2%, ±5%                          | 40           | 12.9                      | 50           | 17.3                       | 40           | —                          | —            | 2400             | 0.20                       | 750                         | 1500             |
| 15                        | ±2%, ±5%                          | 36           | 16.7                      | 46           | 27                         | 23           | —                          | —            | 2200             | 0.20                       | 750                         | 1000             |
| 18                        | ±2%, ±5%                          | 30           | 21.9                      | 27           | —                          | —            | —                          | —            | 1700             | 0.35                       | 500                         | 1000             |
| 22                        | ±2%, ±5%                          | 36           | 27.5                      | 33           | —                          | —            | —                          | —            | 1400             | 0.40                       | 500                         | 1000             |

(1) I<sub>DC</sub> measured for 15°C rise at 25°C ambient temperature

(2) I<sub>DC</sub> measured for 70°C rise at 25°C ambient temperature

L, Q, SRF measured on HP 4291A, Boonton 34A and Wiltcon 360  
Vector Analyzer, R<sub>DC</sub> measured on Keithley 580 micro-ohmmeter.



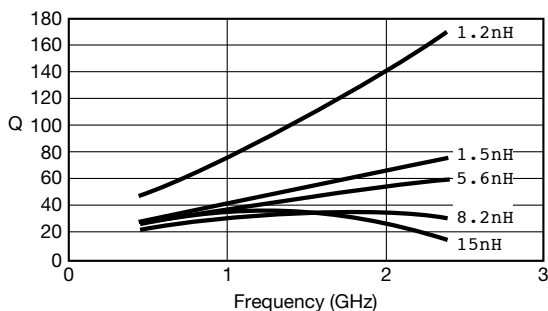
# Accu-L® 0603 and 0805

## SMD High-Q RF Inductor



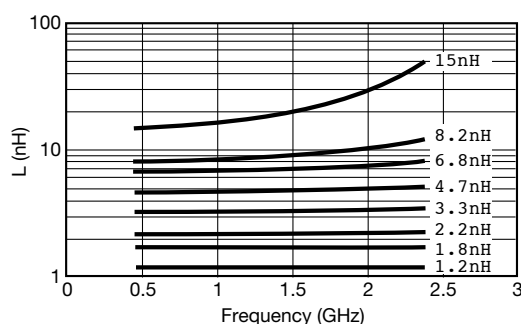
### L0603

Typical Q vs. Frequency  
L0603



Measured on AGILENT 4291B/4287  
using the 16196A test fixture

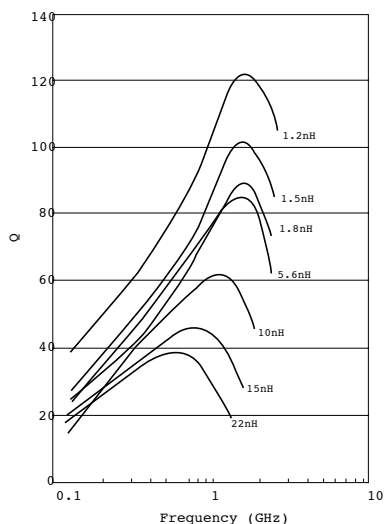
Typical Inductance vs. Frequency  
L0603



Measured on AGILENT 4291B/4287  
using the 16196A test fixture

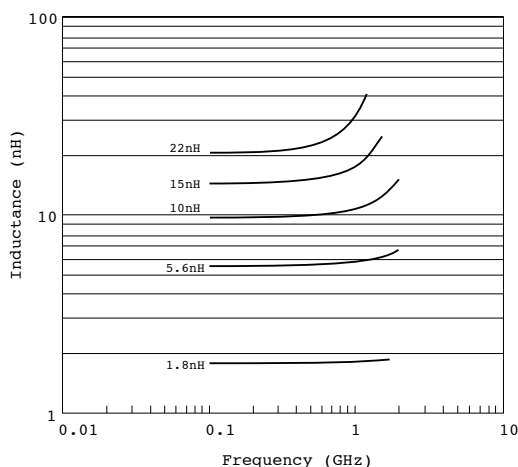
### L0805

Typical Q vs. Frequency  
L0805



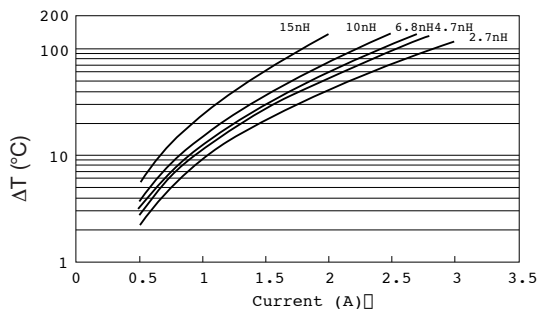
Measured on HP4291A and  
Boonton 34A Coaxial Line

Typical Inductance vs. Frequency  
L0805



Measured on HP4291A and  
Wiltron 360 Vector Analyzer

Maximum Temperature Rise  
at 25°C ambient temperature (on FR-4)  
L0805



Temperature rise will typically be no higher than shown by the graph



# Accu-L<sup>®</sup> 0603 and 0805

## SMD High-Q RF Inductor



### FINAL QUALITY INSPECTION

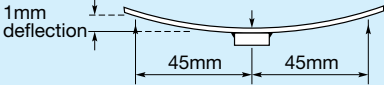
Finished parts are tested for electrical parameters and visual/mechanical characteristics.

Parts are 100% tested for inductance at 450MHz. Parts are 100% tested for R<sub>DC</sub>. Each production lot is evaluated on a sample basis for:

- Q at test frequency
- Static Humidity Resistance: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I<sub>R</sub>, 4 hours

2

### ENVIRONMENTAL CHARACTERISTICS

| TEST                                        | CONDITIONS                                                                                                                                    | REQUIREMENT                                                                                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Solderability                               | Components completely immersed in a solder bath at 235 ± 5°C for 2 secs.                                                                      | Terminations to be well tinned. No visible damage.                                                           |
| Leach Resistance                            | Components completely immersed in a solder bath at 260 ±5°C for 60 secs.                                                                      | Dissolution of termination faces ≤ 15% of area.<br>Dissolution of termination edges ≤ 25% of length.         |
| Storage                                     | 12 months minimum with components stored in “as received” packaging.                                                                          | Good solderability                                                                                           |
| Shear                                       | Components mounted to a substrate. A force of 5N applied normal to the line joining the terminations and in a line parallel to the substrate. | No visible damage                                                                                            |
| Rapid Change of Temperature                 | Components mounted to a substrate. 5 cycles -55°C to +125°C.                                                                                  | No visible damage                                                                                            |
| Bend Strength                               | Tested as shown in diagram<br>                             | No visible damage                                                                                            |
| Temperature Coefficient of Inductance (TCL) | Component placed in environmental chamber -55°C to +125°C.                                                                                    | +0 to +125 ppm/°C (typical)<br>$TCL = \frac{L_2 - L_1}{L_1 (T_2 - T_1)} \cdot 10^6$<br>T <sub>1</sub> = 25°C |

## Application Notes

### HANDLING

SMD chips should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of plastic tipped tweezers or vacuum pick-ups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized. For automatic equipment, taped and reeled product is the ideal medium for direct presentation to the placement machine.

### CIRCUIT BOARD TYPE

All flexible types of circuit boards may be used (e.g. FR-4, G-10) and also alumina.

For other circuit board materials, please consult factory.

### COMPONENT PAD DESIGN

Component pads must be designed to achieve good joints and minimize component movement during soldering.

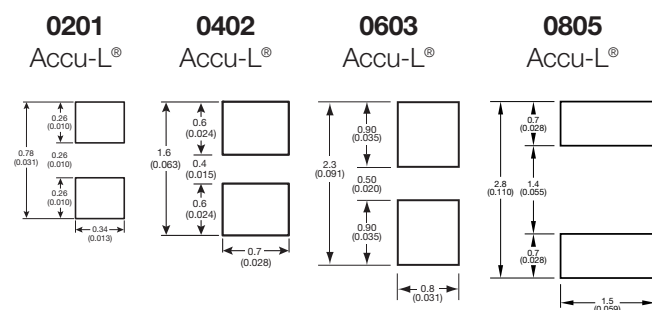
Pad designs are given below for both wave and reflow soldering.

The basis of these designs is:

- Pad width equal to component width. It is permissible to decrease this to as low as 85% of component width but it is not advisable to go below this.
- Pad overlap about 0.3mm.
- Pad extension about 0.3mm for reflow.  
Pad extension about 0.8mm for wave soldering.

### REFLOW SOLDERING

#### DIMENSIONS: millimeters (inches)



### PREHEAT & SOLDERING

The rate of preheat in production should not exceed 4°C/second. It is recommended not to exceed 2°C/second. Temperature differential from preheat to soldering should not exceed 150°C.

For further specific application or process advice, please consult AVX.

### HAND SOLDERING & REWORK

Hand soldering is permissible. Preheat of the PCB to 100°C is required. The most preferable technique is to use hot air soldering tools. Where a soldering iron is used, a temperature controlled model not exceeding 30 watts should be used and set to not more than 260°C. Maximum allowed time at temperature is 1 minute. When hand soldering, the base side (white side) must be soldered to the board.

### COOLING

After soldering, the assembly should preferably be allowed to cool naturally. In the event of assisted cooling, similar conditions to those recommended for preheating should be used.

### CLEANING RECOMMENDATIONS

Care should be taken to ensure that the devices are thoroughly cleaned of flux residues, especially the space beneath the device. Such residues may otherwise become conductive and effectively offer a lossy bypass to the device. Various recommended cleaning conditions (which must be optimized for the flux system being used) are as follows:

- Cleaning liquids . . . . . i-propanol, ethanol, acetylacetone, water, and other standard PCB cleaning liquids.
- Ultrasonic conditions . . power – 20w/liter max.  
frequency – 20kHz to 45kHz.
- Temperature . . . . . 80°C maximum (if not otherwise limited by chosen solvent system).
- Time . . . . . 5 minutes max.

### STORAGE CONDITIONS

Recommended storage conditions for Accu-L® prior to use are as follows:

- Temperature . . . . . 15°C to 35°C
- Humidity . . . . . ≤65%
- Air Pressure . . . . . 860mbar to 1060mbar

### RECOMMENDED SOLDERING PROFILE

For recommended soldering profile see page 29



## Thin-Film RF/Microwave Directional Couplers

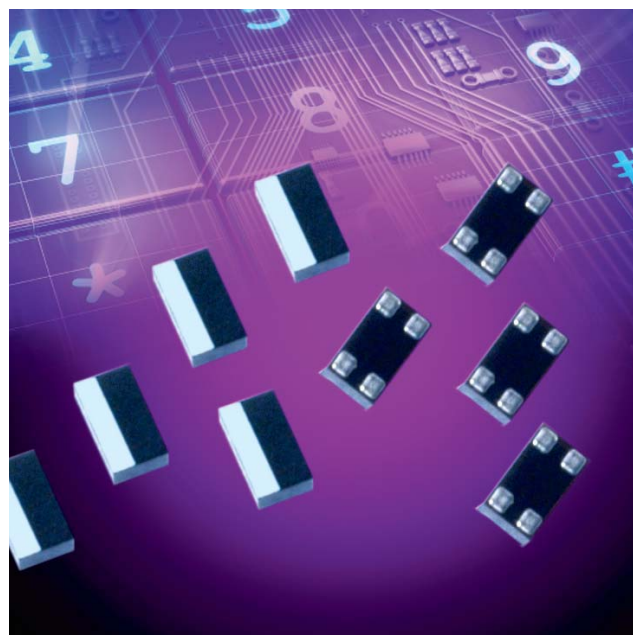
CP0302/CP0402/CP0603/CP0805  
and DB0603N/DB0805 3dB 90°

# Thin Film Directional Couplers

## Wide Band High Directivity



CP0402W2700FNTR



### ITF TECHNOLOGY

The ITF High Directivity Wide Band LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The Wide Band High Directivity Coupler displays a stable coupling factor over a wide frequency band.

### APPLICATIONS

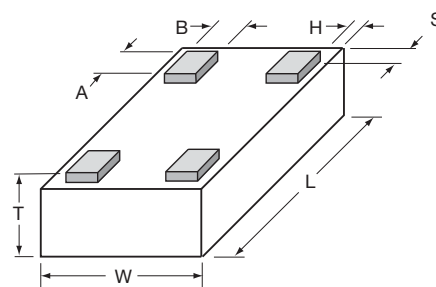
- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LAN's

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

### DIMENSIONS (Bottom View)

mm (inches)



|      |                            |
|------|----------------------------|
| L    | 1.00±0.05<br>(0.040±0.002) |
| W    | 0.58±0.04<br>(0.023±0.002) |
| T    | 0.35±0.05<br>(0.014±0.002) |
| A    | 0.20±0.05<br>(0.008±0.002) |
| B    | 0.18±0.05<br>(0.007±0.002) |
| S, H | 0.05±0.05<br>(0.002±0.002) |

### HOW TO ORDER

CP 0402 W XXXX X N TR

Type Wide Band Frequency (MHz) Sub-Type LGA Termination Sn100 Taped & Reeled

RoHS COMPLIANT

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I<sub>B</sub>, 4 hours

### TERMINATION

Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

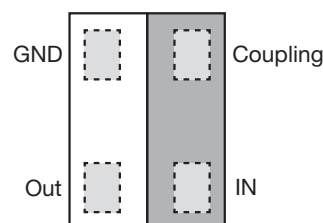
### OPERATING TEMPERATURE

-40°C to +85°C

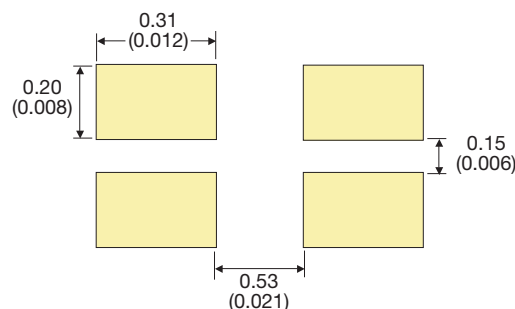
### POWER RATING

3W RF Continuous

### TERMINALS (Top View)



### Recommended Pad Layout Dimensions mm (inches)



# Thin Film Directional Couplers

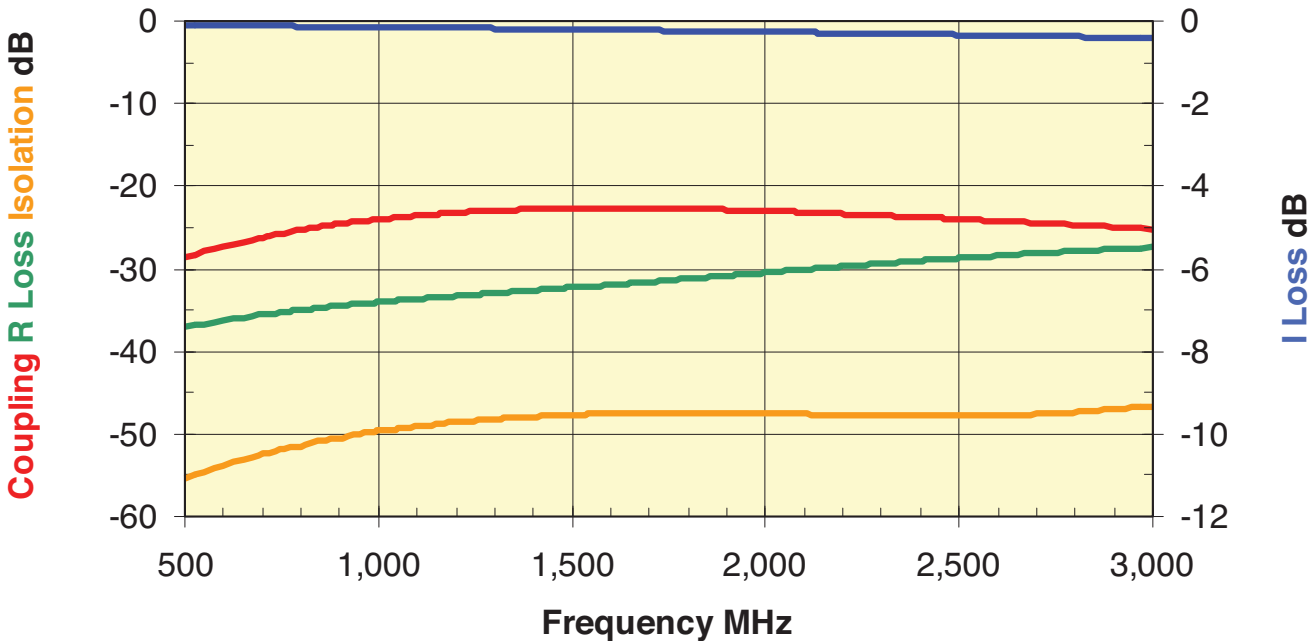
## Wide Band High Directivity



CP0402W2700FNTR

Directional Coupler Type CP0402W2700FNTR

| P/N             | Frequency [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|-----------------|-----------------|---------------|-------------------|------------------|------------------|
| CP0402W2700FNTR | 700-2,700       | 24±2          | 0.3               | 18               | 20               |



3

# Thin Film Directional Couplers

## Wide Band High Directivity

### CP0402W2700FNTR Test Jigs

#### GENERAL DESCRIPTION

These jigs are designed for testing the CP0402W2700FNTR High Directivity Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm (0.010") from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

#### MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig

terminal connected to port 2. Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-Port calibration in the required bandwidths.

##### Place the coupler on the [measurement jig](#) as follows:

|                    |                     |               |                     |
|--------------------|---------------------|---------------|---------------------|
| GND (Coupler)      | → Connector 1 (Jig) | IN (Coupler)  | → Connector 3 (Jig) |
| Coupling (Coupler) | → Connector 2 (Jig) | Out (Coupler) | → Connector 4 (Jig) |

##### To measure I. Loss connect:

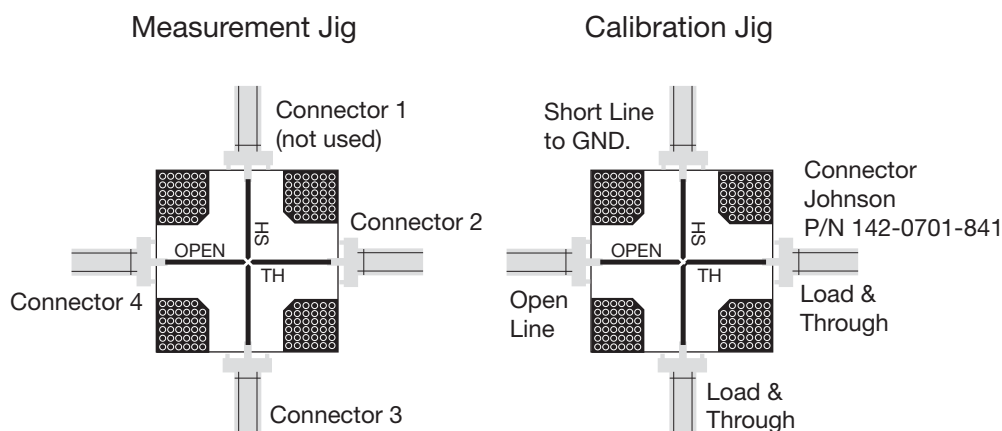
|                   |                |                   |       |
|-------------------|----------------|-------------------|-------|
| Connector 3 (Jig) | → Port 1 (VNA) | Connector 2 (Jig) | → 50Ω |
| Connector 4 (Jig) | → Port 2 (VNA) |                   |       |

##### To measure R. Loss and Coupling connect:

|                   |                |                   |       |
|-------------------|----------------|-------------------|-------|
| Connector 3 (Jig) | → Port 1 (VNA) | Connector 4 (Jig) | → 50Ω |
| Connector 2 (Jig) | → Port 2 (VNA) |                   |       |

##### To measure Isolation connect:

|                   |                |                   |                |
|-------------------|----------------|-------------------|----------------|
| Connector 4 (Jig) | → Port 1 (VNA) | Connector 2 (Jig) | → Port 2 (VNA) |
| Connector 3 (Jig) | → 50Ω          |                   |                |



# Thin Film Directional Couplers

## WiFi Band High Directivity

**CP0302P5425ENTR / CP0302A5425ENTR / CP0402Q5425ENTR / CP0603Q5425ENTR**  
**HIGH DIRECTIVITY DIRECTIONAL COUPLERS FOR WIFI BANDS**

### TECHNOLOGY

These High Directivity LGA Couplers are based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The WiFi Bands Couplers are offered in 0302, 0402 and 0603 standard sizes having identical electrical performance.



### APPLICATIONS:

- WiFi

### PART NUMBERS

CP0302P5425ENTR  
 CP0302A5425ENTR  
 CP0402Q5425ENTR  
 CP0603Q5425ENTR

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance : 125°C, IR, 4 hours

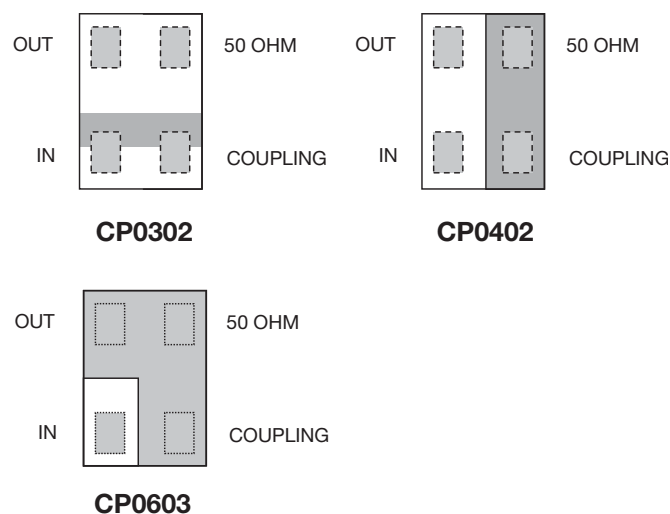
### TERMINATION

Nickel/Lead-Free Solder coating (Sn100) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

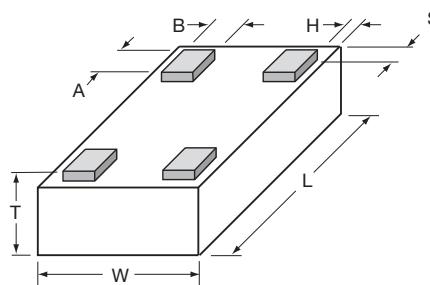
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINALS (Top View)



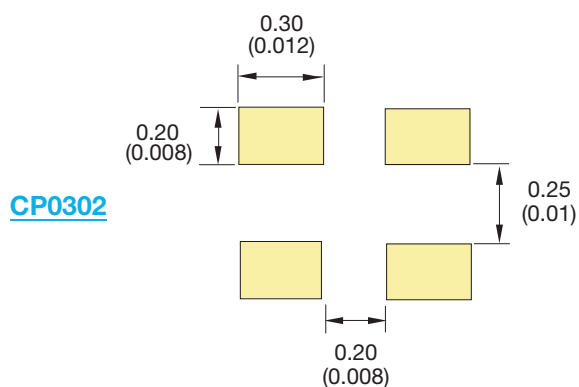
### DIMENSIONS (Bottom View) mm (inches)



|             | CP0302                       | CP0402                     | CP0603                     |
|-------------|------------------------------|----------------------------|----------------------------|
| <b>L</b>    | 0.65±0.04<br>(0.026±0.002)   | 1.0±0.05<br>(0.040±0.002)  | 1.6±0.1<br>(0.063±0.004)   |
| <b>W</b>    | 0.50±0.04<br>(0.02±0.002)    | 0.58±0.04<br>(0.023±0.002) | 0.84±0.1<br>(0.033±0.004)  |
| <b>T</b>    | 0.25±0.05<br>(0.01±0.002)    | 0.35±0.05<br>(0.014±0.002) | 0.60±0.1<br>(0.024±0.004)  |
| <b>A</b>    | 0.20±0.05<br>(0.008±0.002)   | 0.20±0.05<br>(0.008±0.002) | 0.25±0.05<br>(0.01±0.002)  |
| <b>B</b>    | 0.10±0.04<br>(0.004±0.002)   | 0.18±0.05<br>(0.007±0.002) | 0.20±0.05<br>(0.008±0.002) |
| <b>S, H</b> | 0.025±0.025<br>(0.001±0.001) | 0.05±0.05<br>(0.002±0.002) | 0.05±0.05<br>(0.002±0.002) |

### RECOMMENDED PAD LAYOUT DIMENSIONS

mm (inches)



**CP0402 / CP0603:** see pages 49 / 53

# Thin Film Directional Couplers

## WiFi Band High Directivity

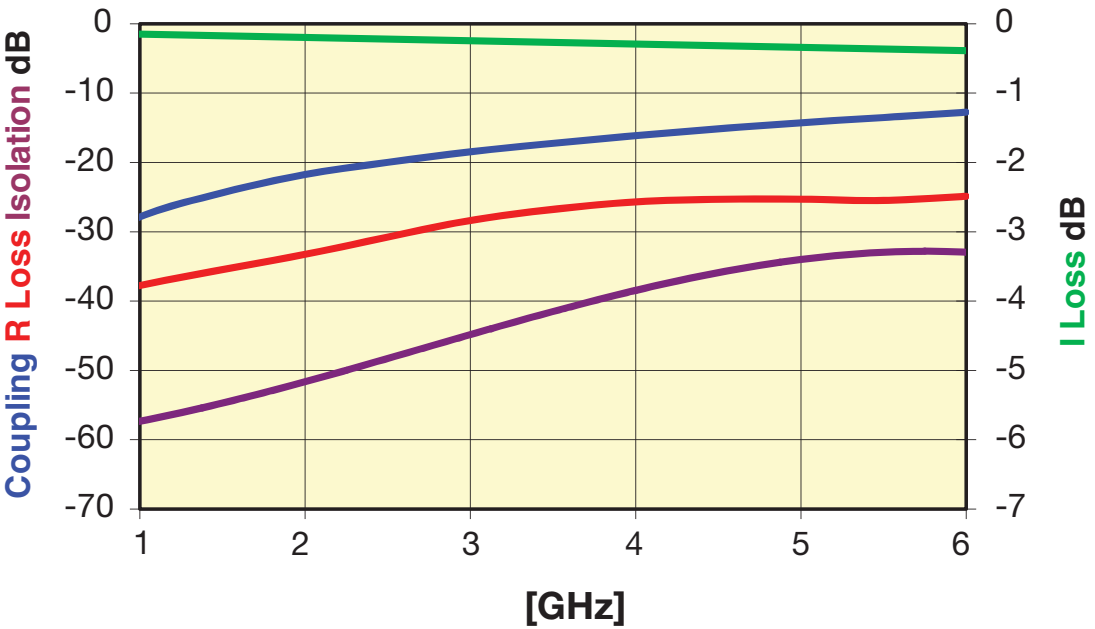


### ELECTRICAL CHARACTERISTICS

| P/N             | Frequency [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|-----------------|-----------------|---------------|-------------------|------------------|------------------|
| CP0302P5425ENTR | 2,400-2,496     | -20±0.5       | -0.2              | -30              | 20               |
|                 | 4,900-5,950     | -13±0.5       | -0.4              | -25              | 20               |

| P/N             | Frequency [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|-----------------|-----------------|---------------|-------------------|------------------|------------------|
| CP0302A5425ENTR | 2,400-2,496     | -20±1         | -0.2              | -30              | 20               |
|                 | 4,900-5,950     | -13±1         | -0.4              | -25              | 20               |

| P/N                                | Frequency [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|------------------------------------|-----------------|---------------|-------------------|------------------|------------------|
| CP0402Q5425ENTR<br>CP0603Q5425ENTR | 2,400-2,496     | -20±1         | -0.3              | -30              | 20               |
|                                    | 4,900-5,950     | -13±1         | -0.4              | -25              | 20               |



# Thin Film Directional Coupler



## CP0402P High Directivity, Tight Coupling Tolerance

### GENERAL DESCRIPTION

#### ITF (Integrated Thin-Film) TECHNOLOGY

The CP0402P Series High Directivity, Tight Coupling Tolerance LGA Coupler is based on the proprietary RFAP Thin-Film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### APPLICATIONS

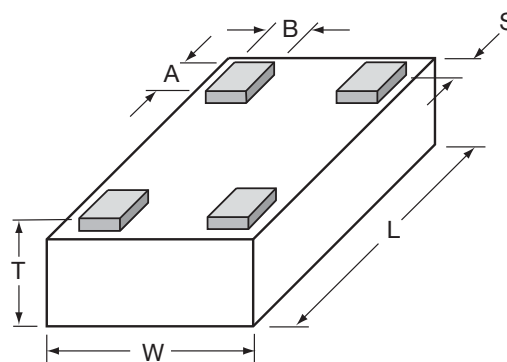
- Wireless communications
- Wireless LAN's
- GPS
- WiMAX

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Power Rating 3W RF Continuous

### DIMENSIONS: (Bottom View)

millimeters (inches)



|   |                            |
|---|----------------------------|
| L | 1.00±0.05<br>(0.040±0.002) |
| W | 0.58±0.04<br>(0.023±0.002) |
| T | 0.35±0.05<br>(0.014±0.002) |

|   |                            |
|---|----------------------------|
| A | 0.20±0.05<br>(0.008±0.002) |
| B | 0.18±0.05<br>(0.007±0.002) |
| S | 0.05±0.05<br>(0.002±0.002) |

### HOW TO ORDER

**CP**  
T  
Style

**0402**  
T  
Size  
0402

**P**  
T  
Type  
±0.5dB  
Tight Tolerance

**XXXX**  
T  
Frequency  
MHz

**X**  
T  
Sub-Type

**N**  
T  
Termination  
LGA  
Lead-Free

**TR**  
T  
Taped & Reeled

### QUALITY INSPECTION

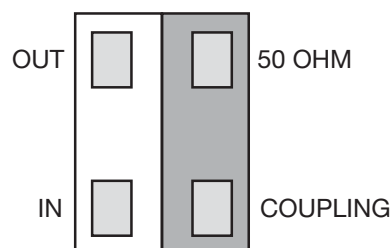
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

### TERMINATION

Nickel/Lead-Free Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### TERMINALS (Top View)



LEAD-FREE  
LEAD-FREE COMPATIBLE  
COMPONENT

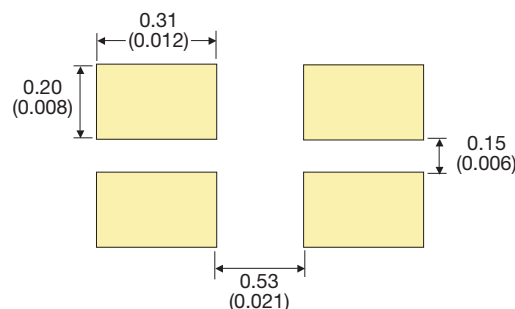


### OPERATING TEMPERATURE:

-40°C to +85°C

### Recommended Pad Layout Dimensions

mm (inches)



# Thin Film Directional Coupler

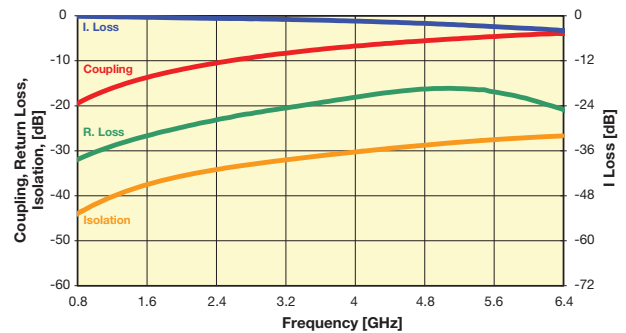


## CP0402P High Directivity, Tight Coupling Tolerance

Coupler P/N CP0402PxxxxAN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402P0836AN | 824 - 849            | 19.10±0.5     | 0.25              | 32               | 21               |
|              | CP0402P0881AN | 869 - 894            | 18.60±0.5     | 0.25              | 31               |                  |
| GSM          | CP0402P0902AN | 890 - 915            | 18.50±0.5     | 0.25              | 31               |                  |
|              | CP0402P0947AN | 935 - 960            | 18.00±0.5     | 0.25              | 31               |                  |
| E-GSM        | CP0402P0897AN | 880 - 915            | 18.50±0.5     | 0.25              | 31               |                  |
|              | CP0402P0942AN | 925 - 960            | 18.00±0.5     | 0.25              | 31               |                  |
| PDC          | CP0402P1441AN | 1429 - 1453          | 14.50±0.5     | 0.40              | 28               |                  |
| PCN          | CP0402P1747AN | 1710 - 1785          | 13.00±0.5     | 0.50              | 26               |                  |
|              | CP0402P1842AN | 1805 - 1880          | 12.50±0.5     | 0.50              | 26               |                  |
| PCS          | CP0402P1880AN | 1850 - 1910          | 12.30±0.5     | 0.50              | 25               |                  |
|              | CP0402P1960AN | 1930 - 1990          | 12.00±0.5     | 0.50              | 25               |                  |
| PHP          | CP0402P1907AN | 1895 - 1920          | 12.30±0.5     | 0.50              | 25               |                  |
| DECT         | CP0402P1890AN | 1880 - 1900          | 12.30±0.5     | 0.50              | 25               |                  |
| Wireless LAN | CP0402P2442AN | 2400 - 2484          | 10.30±0.5     | 0.70              | 23               |                  |
| WiFi         | CP0402P3500AN | 3450 - 3550          | 7.60±0.5      | 1.30              | 15               | 14               |
|              | CP0402P5000AN | 4950 - 5050          | 5.00±0.5      | 1.50              | 15               | 13               |
|              | CP0402P5500AN | 5450 - 5550          | 4.60±0.5      | 1.50              | 14               | 13               |
|              | CP0402P6000AN | 5950 - 6050          | 4.00±0.5      | 1.50              | 14               | 13               |

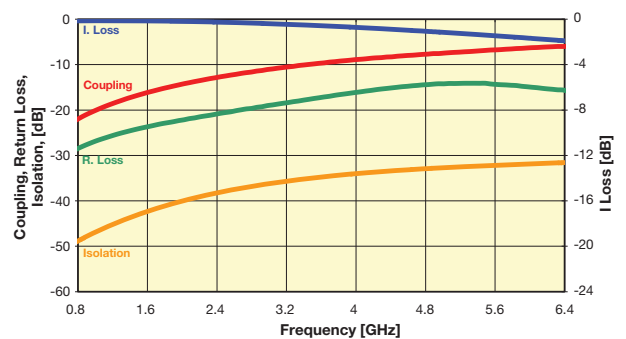
CP0402PxxxxANTR



Coupler P/N CP0402PxxxxBN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402P0836BN | 824 - 849            | 22.00±0.5     | 0.20              | 28               | 27               |
|              | CP0402P0881BN | 869 - 894            | 21.70±0.5     | 0.20              | 28               |                  |
| GSM          | CP0402P0902BN | 890 - 915            | 21.50±0.5     | 0.20              | 28               |                  |
|              | CP0402P0947BN | 935 - 960            | 21.00±0.5     | 0.25              | 27               |                  |
| E-GSM        | CP0402P0897BN | 880 - 915            | 21.50±0.5     | 0.20              | 28               |                  |
|              | CP0402P0942BN | 925 - 960            | 21.00±0.5     | 0.25              | 27               |                  |
| PDC          | CP0402P1441BN | 1429 - 1453          | 17.50±0.5     | 0.25              | 24               |                  |
| PCN          | CP0402P1747BN | 1710 - 1785          | 16.00±0.5     | 0.30              | 23               |                  |
|              | CP0402P1842BN | 1805 - 1880          | 15.50±0.5     | 0.35              | 23               |                  |
| PCS          | CP0402P1880BN | 1850 - 1910          | 15.50±0.5     | 0.35              | 23               |                  |
|              | CP0402P1960BN | 1930 - 1990          | 15.00±0.5     | 0.35              | 22               |                  |
| PHP          | CP0402P1907BN | 1895 - 1920          | 15.50±0.5     | 0.35              | 23               |                  |
| DECT         | CP0402P1890BN | 1880 - 1900          | 15.50±0.5     | 0.35              | 23               |                  |
| Wireless LAN | CP0402P2442BN | 2400 - 2484          | 13.30±0.5     | 0.40              | 21               |                  |
| WiFi         | CP0402P3500BN | 3450 - 3550          | 9.40±0.5      | 0.80              | 18               | 14               |
|              | CP0402P5000BN | 4950 - 5050          | 7.40±0.5      | 1.20              | 14               | 13               |
|              | CP0402P5500BN | 5450 - 5550          | 6.70±0.5      | 1.60              | 14               | 13               |
|              | CP0402P6000BN | 5950 - 6050          | 6.10±0.5      | 2.00              | 14               | 13               |

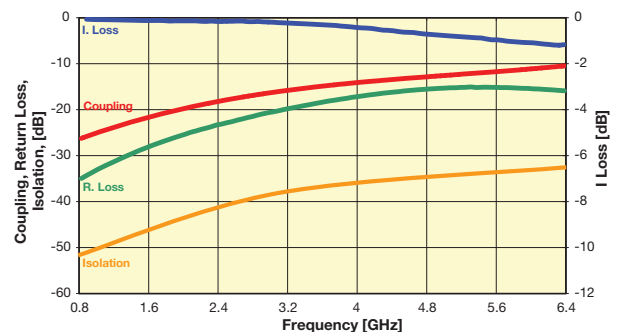
CP0402PxxxxBNTR



Coupler P/N CP0402PxxxxEN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402P0836EN | 824 - 849            | 27.20±0.5     | 0.20              | 35               | 25               |
|              | CP0402P0881EN | 869 - 894            | 26.80±0.5     | 0.20              | 34               |                  |
| GSM          | CP0402P0902EN | 890 - 915            | 26.50±0.5     | 0.20              | 34               |                  |
|              | CP0402P0947EN | 935 - 960            | 26.00±0.5     | 0.20              | 34               |                  |
| E-GSM        | CP0402P0897EN | 880 - 915            | 26.50±0.5     | 0.20              | 34               | 23               |
|              | CP0402P0942EN | 925 - 960            | 26.00±0.5     | 0.20              | 34               |                  |
| PDC          | CP0402P1441EN | 1429 - 1453          | 22.30±0.5     | 0.25              | 29               |                  |
| PCN          | CP0402P1747EN | 1710 - 1785          | 20.50±0.5     | 0.25              | 27               |                  |
|              | CP0402P1842EN | 1805 - 1880          | 20.30±0.5     | 0.25              | 26               |                  |
| PCS          | CP0402P1880EN | 1850 - 1910          | 20.00±0.5     | 0.25              | 26               |                  |
|              | CP0402P1960EN | 1930 - 1990          | 20.00±0.5     | 0.25              | 26               |                  |
| PHP          | CP0402P1907EN | 1895 - 1920          | 20.00±0.5     | 0.25              | 26               |                  |
| DECT         | CP0402P1890EN | 1880 - 1900          | 20.00±0.5     | 0.25              | 26               |                  |
| Wireless LAN | CP0402P2442EN | 2400 - 2484          | 18.00±0.5     | 0.35              | 23               |                  |
| WiFi         | CP0402P3500EN | 3450 - 3550          | 15.00±0.5     | 0.37              | 20               | 16               |
|              | CP0402P5000EN | 4950 - 5050          | 12.50±0.5     | 0.50              | 18               | 13               |
|              | CP0402P5500EN | 5450 - 5550          | 11.50±0.5     | 0.65              | 16               | 13               |
|              | CP0402P6000EN | 5950 - 6050          | 11.10±0.5     | 0.70              | 15               | 13               |

CP0402PxxxxENTR



# Thin-Film Directional Couplers



## CP0402 High Directivity LGA Termination

### GENERAL DESCRIPTION

#### ITF (Integrated Thin-Film) TECHNOLOGY

The ITF High Directivity LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### APPLICATIONS

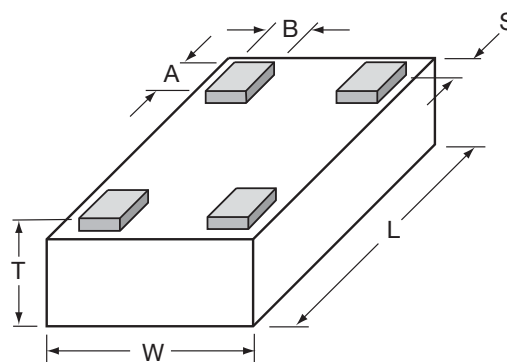
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

### FEATURES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Operating/Storage Temp  
-40°C to +85°C
- Power Rating 3W RF Cont

### DIMENSIONS: (Bottom View)

millimeters (inches)



|   |                            |
|---|----------------------------|
| L | 1.00±0.05<br>(0.040±0.002) |
| W | 0.58±0.04<br>(0.023±0.002) |
| T | 0.35±0.05<br>(0.014±0.002) |

|   |                            |
|---|----------------------------|
| A | 0.20±0.05<br>(0.008±0.002) |
| B | 0.18±0.05<br>(0.007±0.002) |
| S | 0.05±0.05<br>(0.002±0.002) |

### HOW TO ORDER

|                                                       |                                         |                              |                                               |                                  |                                                                                                             |                                                               |
|-------------------------------------------------------|-----------------------------------------|------------------------------|-----------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>CP</b><br>T<br><b>Style</b><br>Directional Coupler | <b>0402</b><br>T<br><b>Size</b><br>0402 | <b>X</b><br>T<br><b>Type</b> | <b>****</b><br>T<br><b>Frequency</b><br>(MHz) | <b>X</b><br>T<br><b>Sub Type</b> | <b>N</b><br>T<br><b>LGA Termination</b><br>L = LGA Sn90, Pb10<br>**N = LGA Sn100<br><b>**RoHS compliant</b> | <b>TR</b><br>T<br><b>Packaging Code</b><br>TR = Tape and Reel |
|-------------------------------------------------------|-----------------------------------------|------------------------------|-----------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|

### QUALITY INSPECTION

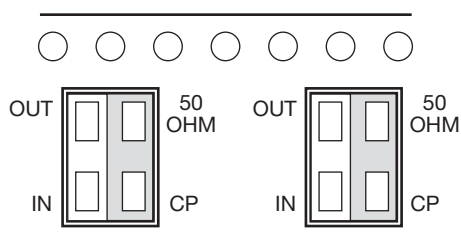
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I<sub>R</sub>, 4 hours

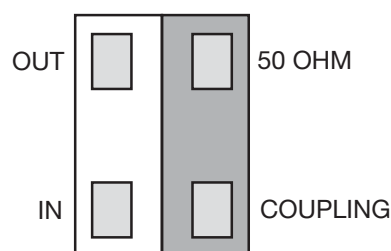
### TERMINATION

Sn90Pb10 or Lead-Free Sn100 Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### ORIENTATION IN TAPE



### TERMINALS (Top View)



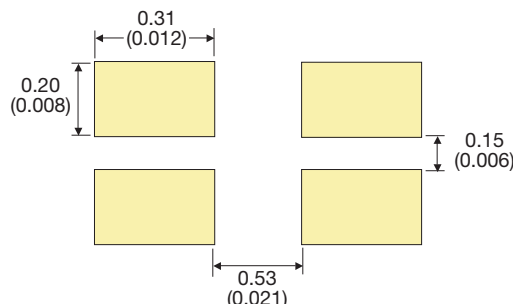
**Not RoHS Compliant**



For RoHS compliant products,  
please select correct termination style.

### Recommended Pad Layout Dimensions

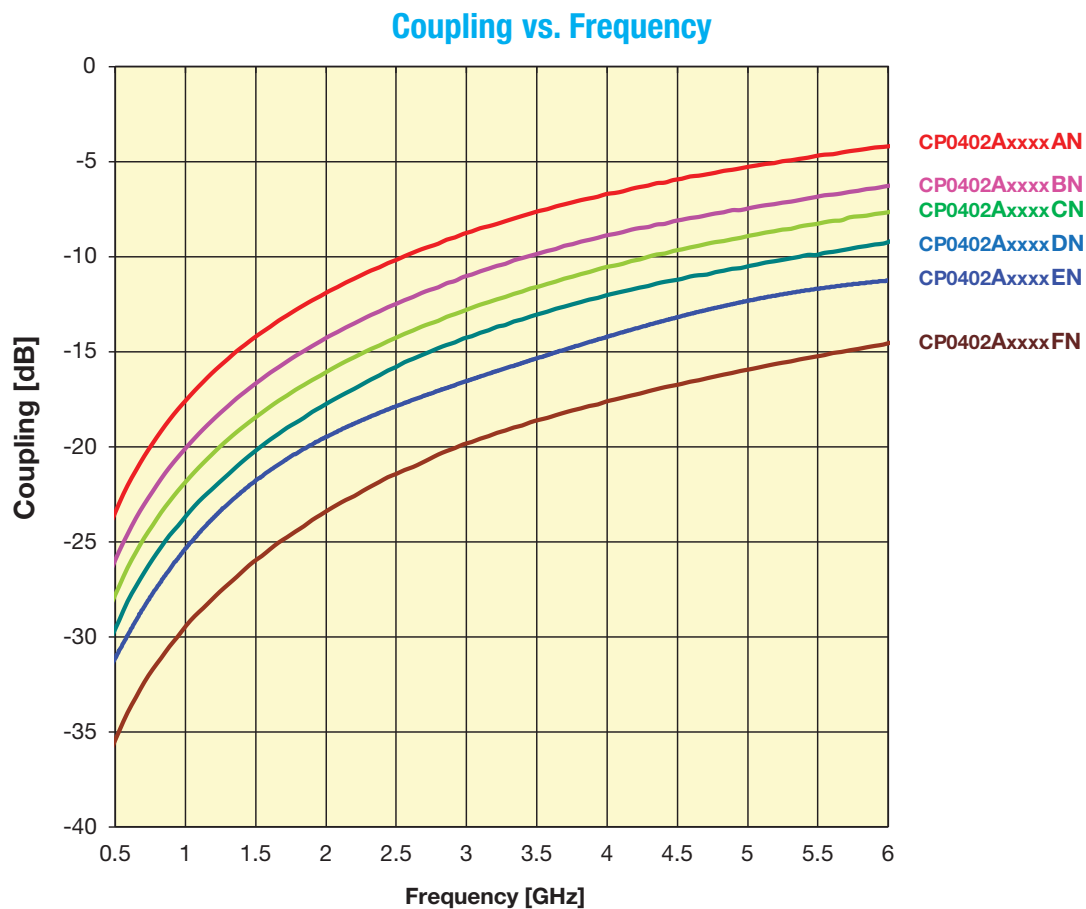
mm (inches)



\*The recommended distance to the PCB Ground Plane is 0.254mm (0.010")



### CP0402 - TYPE SELECTION CHART



Intermediate coupling factors are readily available.  
Please contact factory.

# Thin-Film Directional Couplers

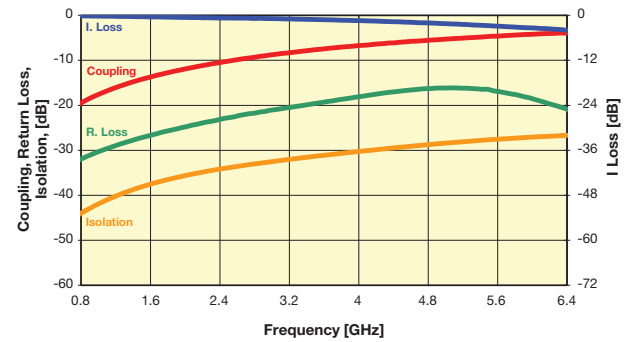


## CP0402 High Directivity LGA Termination

Coupler P/N CP0402AxxxxAN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836AN | 824 - 849            | 19.10         | 0.25              | 32               | 21               |
|              | CP0402A0881AN | 869 - 894            | 18.60         | 0.25              | 31               |                  |
| GSM          | CP0402A0902AN | 890 - 915            | 18.50         | 0.25              | 31               |                  |
|              | CP0402A0947AN | 935 - 960            | 18.00         | 0.25              | 31               |                  |
| E-GSM        | CP0402A0897AN | 880 ÷ 915            | 18.50         | 0.25              | 31               |                  |
|              | CP0402A0942AN | 925 ÷ 960            | 18.00         | 0.25              | 31               |                  |
| PDC          | CP0402A1441AN | 1429 - 1453          | 14.50         | 0.40              | 28               |                  |
| PCN          | CP0402A1747AN | 1710 - 1785          | 13.00         | 0.50              | 26               |                  |
|              | CP0402A1842AN | 1805 - 1880          | 12.50         | 0.50              | 26               |                  |
| PCS          | CP0402A1880AN | 1850 - 1910          | 12.30         | 0.50              | 25               |                  |
|              | CP0402A1960AN | 1930 - 1990          | 12.00         | 0.50              | 25               |                  |
| PHP          | CP0402A1907AN | 1895 - 1920          | 12.30         | 0.50              | 25               |                  |
| DECT         | CP0402A1890AN | 1880 - 1900          | 12.30         | 0.50              | 25               |                  |
| Wireless LAN | CP0402A2442AN | 2400 - 2484          | 10.30         | 0.70              | 23               |                  |
| WiFi         | CP0402A3500AN | 3450 - 3550          | 7.60          | 1.30              | 15               | 14               |
|              | CP0402A5000AN | 4950 - 5050          | 5.00          | 1.50              | 15               | 13               |
|              | CP0402A5500AN | 5450 - 5550          | 4.60          | 1.50              | 14               | 13               |
|              | CP0402A6000AN | 5950 - 6050          | 4.00          | 1.50              | 14               | 13               |

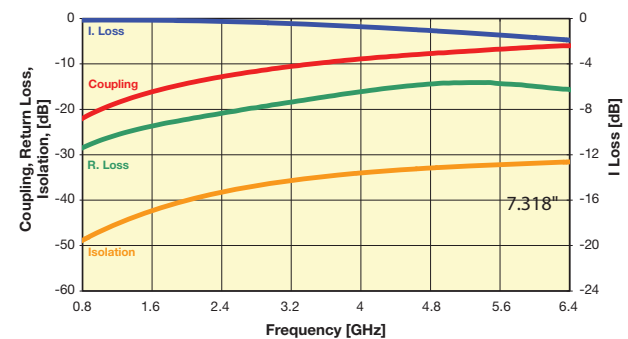
CP0402AxxxxANTR



Coupler P/N CP0402AxxxxBN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836BN | 824 - 849            | 22.00         | 0.20              | 28               | 27               |
|              | CP0402A0881BN | 869 - 894            | 21.70         | 0.20              | 28               |                  |
| GSM          | CP0402A0902BN | 890 - 915            | 21.50         | 0.20              | 28               |                  |
|              | CP0402A0947BN | 935 - 960            | 21.00         | 0.25              | 27               |                  |
| E-GSM        | CP0402A0897BN | 880 ÷ 915            | 21.50         | 0.20              | 28               |                  |
|              | CP0402A0942BN | 925 ÷ 960            | 21.00         | 0.25              | 27               |                  |
| PDC          | CP0402A1441BN | 1429 - 1453          | 17.50         | 0.25              | 24               |                  |
| PCN          | CP0402A1747BN | 1710 - 1785          | 16.00         | 0.30              | 23               |                  |
|              | CP0402A1842BN | 1805 - 1880          | 15.50         | 0.35              | 23               |                  |
| PCS          | CP0402A1880BN | 1850 - 1910          | 15.50         | 0.35              | 23               |                  |
|              | CP0402A1960BN | 1930 - 1990          | 15.00         | 0.35              | 22               |                  |
| PHP          | CP0402A1907BN | 1895 - 1920          | 15.50         | 0.35              | 23               |                  |
| DECT         | CP0402A1890BN | 1880 - 1900          | 15.50         | 0.35              | 23               |                  |
| Wireless LAN | CP0402A2442BN | 2400 - 2484          | 13.30         | 0.40              | 21               |                  |
| WiFi         | CP0402A3500BN | 3450 - 3550          | 9.40          | 0.80              | 18               | 14               |
|              | CP0402A5000BN | 4950 - 5050          | 7.40          | 1.20              | 14               | 13               |
|              | CP0402A5500BN | 5450 - 5550          | 6.70          | 1.60              | 14               | 13               |
|              | CP0402A6000BN | 5950 - 6050          | 6.10          | 2.00              | 14               | 13               |

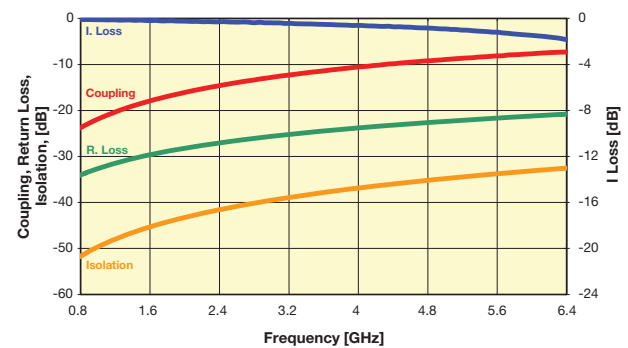
CP0402AxxxxBNTR



Coupler P/N CP0402AxxxxCN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836CN | 824 - 849            | 23.60         | 0.20              | 33               | 22               |
|              | CP0402A0881CN | 869 - 894            | 23.00         | 0.20              | 33               |                  |
| GSM          | CP0402A0902CN | 890 - 915            | 23.00         | 0.20              | 26               |                  |
|              | CP0402A0947CN | 935 - 960            | 22.50         | 0.20              | 33               |                  |
| E-GSM        | CP0402A0897CN | 880 ÷ 915            | 23.00         | 0.20              | 25               | 19               |
|              | CP0402A0942CN | 925 ÷ 960            | 22.50         | 0.20              | 32               |                  |
| PDC          | CP0402A1441CN | 1429 - 1453          | 19.00         | 0.25              | 31               |                  |
| PCN          | CP0402A1747CN | 1710 - 1785          | 17.20         | 0.25              | 30               |                  |
|              | CP0402A1842CN | 1805 - 1880          | 17.00         | 0.25              | 30               |                  |
| PCS          | CP0402A1880CN | 1850 - 1910          | 16.80         | 0.25              | 30               |                  |
|              | CP0402A1960CN | 1930 - 1990          | 16.50         | 0.25              | 29               |                  |
| PHP          | CP0402A1907CN | 1895 - 1920          | 16.80         | 0.25              | 29               |                  |
| DECT         | CP0402A1890CN | 1880 - 1900          | 16.80         | 0.25              | 30               |                  |
| Wireless LAN | CP0402A2442CN | 2400 - 2484          | 14.70         | 0.45              | 28               |                  |
| WiFi         | CP0402A3500CN | 3450 - 3550          | 10.97         | 0.67              | 23               | 17               |
|              | CP0402A5000CN | 4950 - 5050          | 8.00          | 1.00              | 21               | 16               |
|              | CP0402A5500CN | 5450 - 5550          | 7.50          | 1.10              | 21               | 15               |
|              | CP0402A6000CN | 5950 - 6050          | 7.10          | 1.30              | 23               | 15               |

CP0402AxxxxCNTR



Important: Couplers can be used at any frequency within the indicated range.



# Thin-Film Directional Couplers

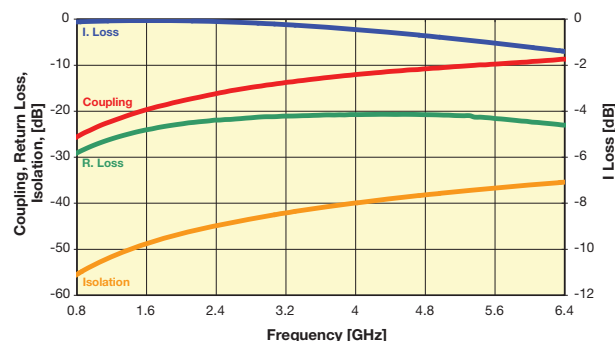


## CP0402 High Directivity LGA Termination

Coupler P/N CP0402AxxxxDN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836DN | 824 - 849            | 25.20         | 0.20              | 29               | 20               |
|              | CP0402A0881DN | 869 - 894            | 24.80         | 0.20              | 28               |                  |
| GSM          | CP0402A0902DN | 890 - 915            | 24.70         | 0.20              | 28               |                  |
|              | CP0402A0947DN | 935 - 960            | 24.10         | 0.20              | 28               |                  |
| E-GSM        | CP0402A0897DN | 880 ÷ 915            | 24.70         | 0.20              | 28               | 18               |
|              | CP0402A0942DN | 925 ÷ 960            | 24.10         | 0.20              | 28               |                  |
| PDC          | CP0402A1441DN | 1429 - 1453          | 20.50         | 0.20              | 25               |                  |
|              | CP0402A1747DN | 1710 - 1785          | 19.00         | 0.20              | 24               |                  |
| PCN          | CP0402A1842DN | 1805 - 1880          | 18.50         | 0.25              | 23               | 17               |
| PCS          | CP0402A1880DN | 1850 - 1910          | 18.20         | 0.25              | 23               |                  |
|              | CP0402A1960DN | 1930 - 1990          | 18.00         | 0.25              | 23               |                  |
| PHP          | CP0402A1907DN | 1895 - 1920          | 18.10         | 0.25              | 23               |                  |
| DECT         | CP0402A1890DN | 1880 - 1900          | 18.20         | 0.25              | 23               | 16               |
| Wireless LAN | CP0402A2442DN | 2400 - 2484          | 16.00         | 0.35              | 22               |                  |
|              | CP0402A3500DN | 3450 - 3550          | 12.50         | 0.46              | 21               |                  |
|              | CP0402A5000DN | 4950 - 5050          | 10.00         | 0.65              | 21               |                  |
| WiFi         | CP0402A5500DN | 5450 - 5550          | 9.60          | 0.76              | 20               | 15               |
|              | CP0402A6000DN | 5950 - 6050          | 9.10          | 0.84              | 20               | 15               |

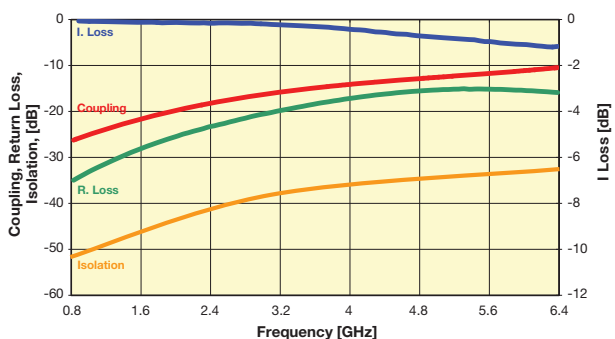
CP0402AxxxxDNTR



Coupler P/N CP0402AxxxxEN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836EN | 824 - 849            | 27.20         | 0.20              | 35               | 25               |
|              | CP0402A0881EN | 869 - 894            | 26.80         | 0.20              | 34               |                  |
| GSM          | CP0402A0902EN | 890 - 915            | 26.50         | 0.20              | 34               |                  |
|              | CP0402A0947EN | 935 - 960            | 26.00         | 0.20              | 34               |                  |
| E-GSM        | CP0402A0897EN | 880 ÷ 915            | 26.50         | 0.20              | 34               | 23               |
|              | CP0402A0942EN | 925 ÷ 960            | 26.00         | 0.20              | 34               |                  |
| PDC          | CP0402A1441EN | 1429 - 1453          | 22.30         | 0.25              | 29               |                  |
|              | CP0402A1747EN | 1710 - 1785          | 20.50         | 0.25              | 27               |                  |
| PCN          | CP0402A1842EN | 1805 - 1880          | 20.30         | 0.25              | 26               | 16               |
| PCS          | CP0402A1880EN | 1850 - 1910          | 20.00         | 0.25              | 26               |                  |
|              | CP0402A1960EN | 1930 - 1990          | 20.00         | 0.25              | 26               |                  |
| PHP          | CP0402A1907EN | 1895 - 1920          | 20.00         | 0.25              | 26               |                  |
| DECT         | CP0402A1890EN | 1880 - 1900          | 20.00         | 0.25              | 26               | 13               |
| Wireless LAN | CP0402A2442EN | 2400 - 2484          | 18.00         | 0.35              | 23               |                  |
|              | CP0402A3500EN | 3450 - 3550          | 15.00         | 0.37              | 20               |                  |
|              | CP0402A5000EN | 4950 - 5050          | 12.50         | 0.50              | 18               |                  |
| WiFi         | CP0402A5500EN | 5450 - 5550          | 11.50         | 0.65              | 16               | 13               |
|              | CP0402A6000EN | 5950 - 6050          | 11.10         | 0.70              | 15               | 13               |

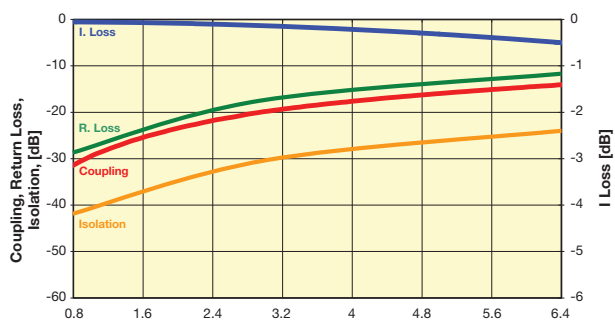
CP0402AxxxxENTR



Coupler P/N CP0402AxxxxFN

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0402A0836FN | 824 - 849            | 31.00         | 0.20              | 29.10            | 11               |
|              | CP0402A0881FN | 869 - 894            | 30.70         | 0.20              | 28.60            |                  |
| GSM          | CP0402A0902FN | 890 - 915            | 30.60         | 0.20              | 28.50            |                  |
|              | CP0402A0947FN | 935 - 960            | 30.00         | 0.20              | 28.10            |                  |
| E-GSM        | CP0402A0897FN | 880 ÷ 915            | 30.60         | 0.20              | 28.50            | 9                |
|              | CP0402A0942FN | 925 ÷ 960            | 30.00         | 0.20              | 28.10            |                  |
| PDC          | CP0402A1441FN | 1429 - 1453          | 26.50         | 0.20              | 25.00            |                  |
|              | CP0402A1747FN | 1710 - 1785          | 25.00         | 0.20              | 23.80            |                  |
| PCN          | CP0402A1842FN | 1805 - 1880          | 24.50         | 0.20              | 23.60            | 8                |
| PCS          | CP0402A1880FN | 1850 - 1910          | 24.20         | 0.20              | 23.50            |                  |
|              | CP0402A1960FN | 1930 - 1990          | 24.00         | 0.20              | 23.30            |                  |
| PHP          | CP0402A1907FN | 1895 - 1920          | 24.20         | 0.20              | 23.40            |                  |
| DECT         | CP0402A1890FN | 1880 - 1900          | 24.20         | 0.20              | 23.50            | 7.5              |
| Wireless LAN | CP0402A2442FN | 2400 - 2484          | 22.00         | 0.25              | 22.60            |                  |
|              | CP0402A3500FN | 3450 - 3550          | 18.00         | 0.27              | 22.00            |                  |
|              | CP0402A5000FN | 4950 - 5050          | 15.70         | 0.30              | 23.01            |                  |
| WiFi         | CP0402A5500FN | 5450 - 5550          | 15.20         | 0.30              | 20.36            | 7.5              |
|              | CP0402A6000FN | 5950 - 6050          | 14.50         | 0.30              | 18.94            | 7.5              |

CP0402AxxxxFNTR



Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers



## CP0603 High Directivity LGA Termination

### GENERAL DESCRIPTION

#### ITF (Integrated Thin-Film) TECHNOLOGY

The ITF LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### APPLICATIONS

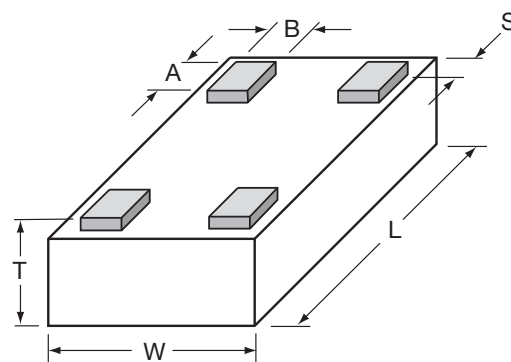
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

### FEATURES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Operating/Storage Temp -40°C to +85°C
- Power Rating 3W RF Cont

### DIMENSIONS: (Bottom View)

millimeters (inches)



|   |                            |
|---|----------------------------|
| L | 1.60±0.10<br>(0.063±0.004) |
| W | 0.84±0.10<br>(0.033±0.004) |
| T | 0.60±0.10<br>(0.024±0.004) |

|   |                            |
|---|----------------------------|
| A | 0.25±0.05<br>(0.010±0.002) |
| B | 0.20±0.05<br>(0.008±0.002) |
| S | 0.05±0.05<br>(0.002±0.002) |

### HOW TO ORDER

|                                                       |                                         |                              |                                               |                                  |                                                                                   |                                                               |
|-------------------------------------------------------|-----------------------------------------|------------------------------|-----------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>CP</b><br>T<br><b>Style</b><br>Directional Coupler | <b>0603</b><br>T<br><b>Size</b><br>0603 | <b>X</b><br>T<br><b>Type</b> | <b>****</b><br>T<br><b>Frequency</b><br>(MHz) | <b>X</b><br>T<br><b>Sub Type</b> | <b>N</b><br>T<br><b>Termination Code</b><br>L = LGA Sn90, Pb10<br>**N = LGA Sn100 | <b>TR</b><br>T<br><b>Packaging Code</b><br>TR = Tape and Reel |
|-------------------------------------------------------|-----------------------------------------|------------------------------|-----------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------|

\*\*RoHS compliant

### QUALITY INSPECTION

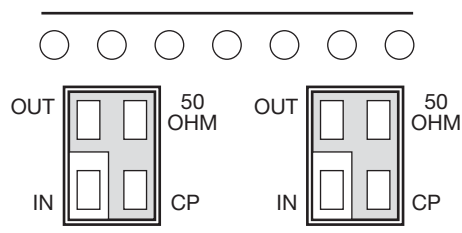
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I<sub>R</sub>, 4 hours

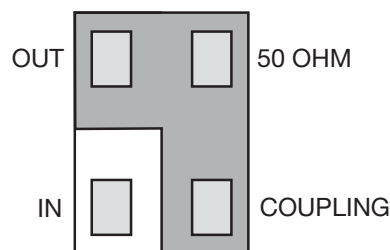
### TERMINATION

Sn90Pb10 or Lead-Free Sn100 Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### ORIENTATION IN TAPE



### TERMINALS (Top View)



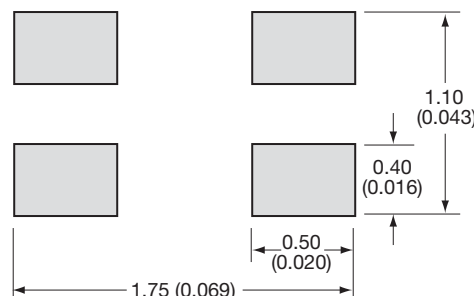
Not RoHS Compliant



For RoHS compliant products, please select correct termination style.

### Recommended Pad Layout Dimensions

mm (inches)

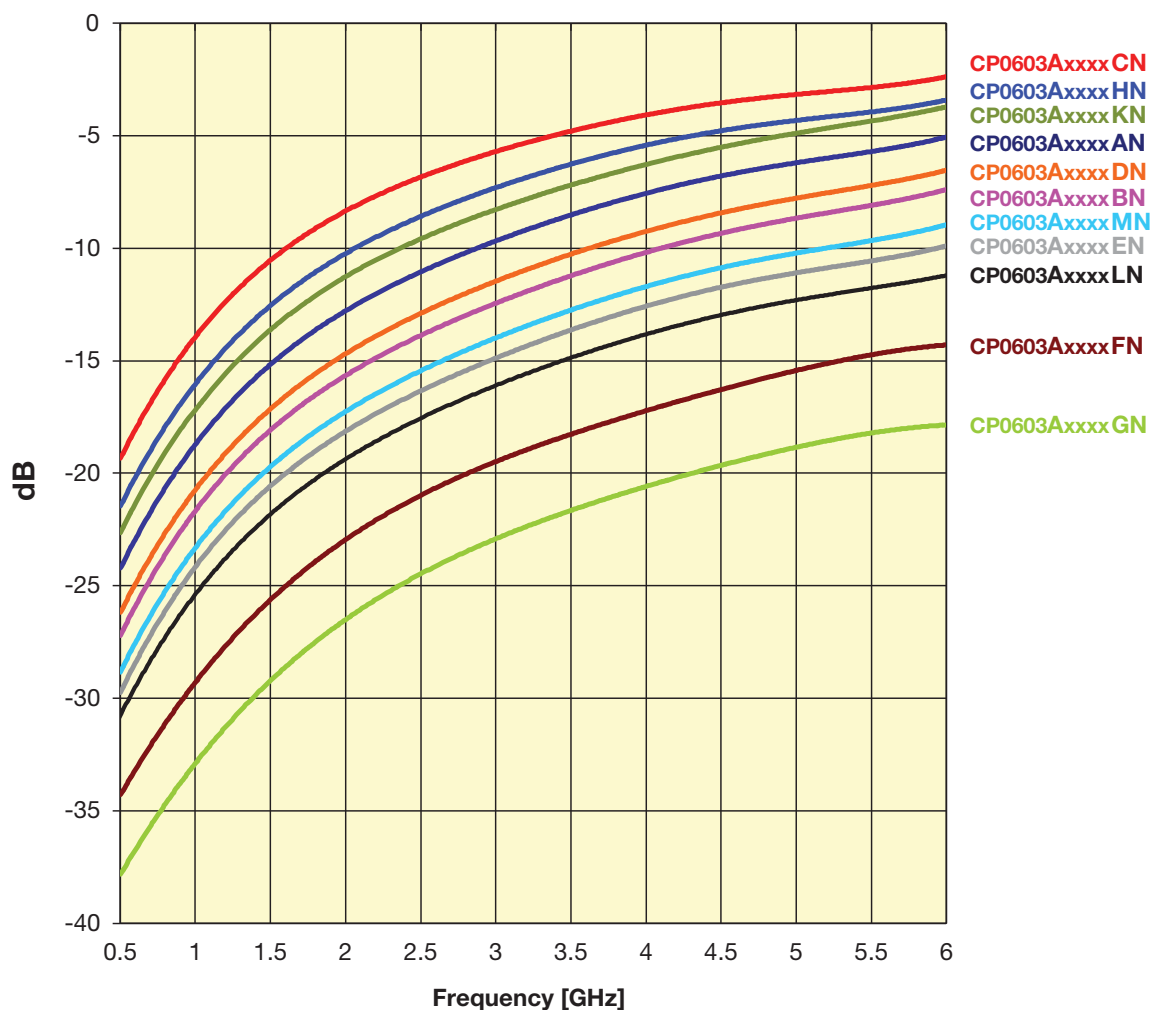


\*The recommended distance to the PCB Ground Plane is 0.254mm (0.010")



### CP0603 - TYPE SELECTION CHART

Coupling vs. Frequency



Intermediate coupling factors are readily available.  
Please contact factory.

# Thin-Film Directional Couplers

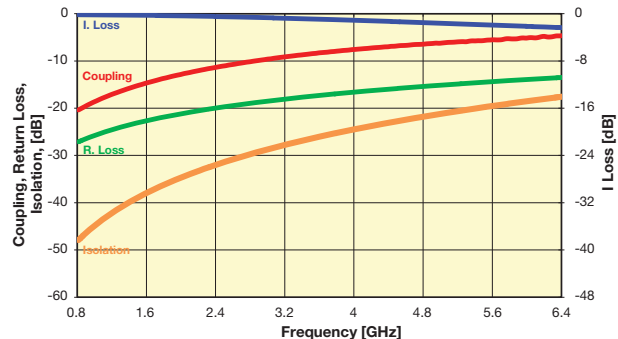


## CP0603 High Directivity LGA Type

Coupler P/N CP0603AxxxxAN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836AN | 824 - 849            | 20.0          | 0.25              | 28               | 22               |
| GSM          | CP0603A0881AN | 869 - 894            | 19.7          | 0.25              | 28               |                  |
|              | CP0603A0902AN | 890 - 915            | 19.4          | 0.25              | 27               |                  |
| E-GSM        | CP0603A0947AN | 935 - 960            | 19.0          | 0.25              | 27               |                  |
|              | CP0603A0897AN | 880 - 915            | 19.4          | 0.25              | 28               |                  |
| PDC          | CP0603A0942AN | 925 - 960            | 19.0          | 0.25              | 27               |                  |
|              | CP0603A1441AN | 1429 - 1453          | 15.5          | 0.40              | 24               |                  |
| PCN          | CP0603A1747AN | 1710 - 1785          | 14.0          | 0.50              | 22               |                  |
|              | CP0603A1842AN | 1805 - 1880          | 13.5          | 0.50              | 22               |                  |
| PCS          | CP0603A1880AN | 1850 - 1910          | 13.2          | 0.50              | 22               |                  |
|              | CP0603A1960AN | 1930 - 1990          | 13.0          | 0.55              | 21               |                  |
| PHP          | CP0603A1907AN | 1895 - 1920          | 13.2          | 0.50              | 22               |                  |
| DECT         | CP0603A1890AN | 1880 - 1900          | 13.2          | 0.50              | 22               |                  |
| Wireless LAN | CP0603A2442AN | 2400 - 2484          | 11.5          | 0.75              | 20               |                  |
| WiFi         | CP0603A3500AN | 3450 - 3550          | 8.6           | 1.3               | 17               | 20               |
|              | CP0603A5000AN | 4950 - 5050          | 6.1           | 2.2               | 13               | 14               |
|              | CP0603A5500AN | 5450 - 5550          | 5.5           | 2.5               | 15               | 13               |
|              | CP0603A6000AN | 5950 - 6050          | 5             | 3                 | 11.6             | 13               |

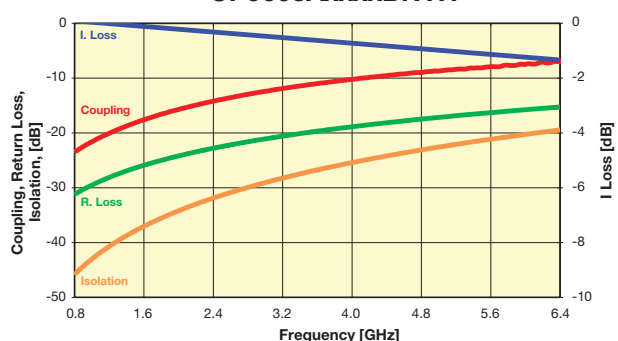
CP0603AxxxxANTR



Coupler P/N CP0603AxxxxBN

| Application | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|-------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS        | CP0603A0836BN | 824 - 849            | 23.0          | 0.20              | 31               | 24               |
| GSM         | CP0603A0881BN | 869 - 894            | 22.7          | 0.20              | 31               |                  |
|             | CP0603A0902BN | 890 - 915            | 22.5          | 0.20              | 31               |                  |
|             | CP0603A0947BN | 935 - 960            | 22.0          | 0.20              | 30               |                  |
| E-GSM       | CP0603A0897BN | 880 - 915            | 22.5          | 0.20              | 31               | 21               |
|             | CP0603A0942BN | 925 - 960            | 22.0          | 0.20              | 30               |                  |
| PDC         | CP0603A1441BN | 1429 - 1453          | 18.5          | 0.25              | 27               |                  |
|             | CP0603A1747BN | 1710 - 1785          | 17.0          | 0.25              | 25               |                  |
| PCN         | CP0603A1842BN | 1805 - 1880          | 16.4          | 0.25              | 25               |                  |
|             | CP0603A1880BN | 1850 - 1910          | 16.2          | 0.25              | 25               |                  |
| PCS         | CP0603A1960BN | 1930 - 1990          | 16.0          | 0.25              | 24               |                  |
|             | CP0603A1907BN | 1895 - 1920          | 16.1          | 0.25              | 25               |                  |
| DECT        | CP0603A1890BN | 1880 - 1900          | 16.2          | 0.25              | 25               |                  |
|             | CP0603A2442BN | 2400 - 2484          | 14.2          | 0.35              | 23               |                  |
| WiFi        | CP0603A3500BN | 3450 - 3550          | 11.2          | 0.6               | 20               | 20               |
|             | CP0603A5000BN | 4950 - 5050          | 8.4           | 1.1               | 16.7             | 17               |
|             | CP0603A5500BN | 5450 - 5550          | 7.8           | 1.4               | 15.7             | 16               |
|             | CP0603A6000BN | 5950 - 6050          | 7.2           | 1.6               | 15               | 15               |

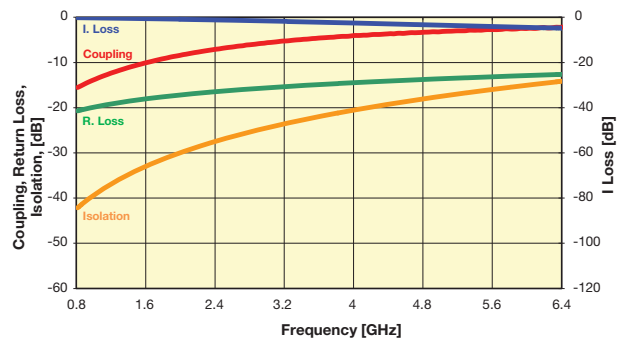
CP0603AxxxxBNTR



Coupler P/N CP0603AxxxxCN

| Application | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|-------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS        | CP0603A0836CN | 824 - 849            | 15.2          | 0.35              | 23               | 23               |
| GSM         | CP0603A0881CN | 869 - 894            | 15.0          | 0.35              | 23               |                  |
|             | CP0603A0902CN | 890 - 915            | 14.7          | 0.35              | 23               |                  |
|             | CP0603A0947CN | 935 - 960            | 14.3          | 0.40              | 22               |                  |
| E-GSM       | CP0603A0897CN | 880 - 915            | 14.7          | 0.35              | 23               | 21               |
|             | CP0603A0942CN | 925 - 960            | 14.3          | 0.40              | 22               |                  |
| PDC         | CP0603A1441CN | 1429 - 1453          | 11.0          | 0.70              | 19               |                  |
|             | CP0603A1747CN | 1710 - 1785          | 9.5           | 0.80              | 18               |                  |
| PCN         | CP0603A1842CN | 1805 - 1880          | 9.0           | 0.90              | 17               |                  |
|             | CP0603A1880CN | 1850 - 1910          | 8.8           | 0.90              | 17               |                  |
| PCS         | CP0603A1960CN | 1930 - 1990          | 8.5           | 1.00              | 17               |                  |
|             | CP0603A1907CN | 1895 - 1920          | 8.8           | 0.90              | 17               |                  |
| DECT        | CP0603A1890CN | 1880 - 1900          | 8.8           | 0.90              | 17               |                  |
|             | CP0603A2442CN | 2400 - 2484          | 7.0           | 1.40              | 15               |                  |
| WiFi        | CP0603A3500CN | 3450 - 3550          | 4.8           | 2.0               | 23               | 20               |
|             | CP0603A5000CN | 4950 - 5050          | 3.0           | 3.6               | 21               | 17               |
|             | CP0603A5500CN | 5450 - 5550          | 3.0           | 4.0               | 20.6             | 16               |
|             | CP0603A6000CN | 5950 - 6050          | 2.5           | 4.5               | 20.5             | 16               |

CP0603AxxxxCNTR



Important: Couplers can be used at any frequency within the indicated range.



# Thin-Film Directional Couplers

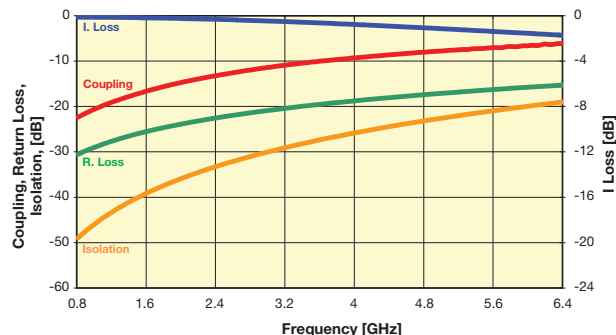


## CP0603 High Directivity LGA Type

Coupler P/N CP0603AxxxxDN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836DN | 824 - 849            | 22.0          | 0.25              | 31               | 30               |
|              | CP0603A0881DN | 869 - 894            | 21.8          | 0.25              | 30               |                  |
| GSM          | CP0603A0902DN | 890 - 915            | 21.3          | 0.25              | 30               |                  |
|              | CP0603A0947DN | 935 - 960            | 21.0          | 0.30              | 30               |                  |
| E-GSM        | CP0603A0897DN | 880 - 915            | 21.3          | 0.25              | 30               | 25               |
|              | CP0603A0942DN | 925 - 960            | 21.0          | 0.30              | 30               |                  |
| PDC          | CP0603A1441DN | 1429 - 1453          | 17.7          | 0.40              | 27               |                  |
|              | CP0603A1747DN | 1710 - 1785          | 16.0          | 0.40              | 25               |                  |
| PCN          | CP0603A1842DN | 1805 - 1880          | 15.4          | 0.40              | 25               |                  |
| PCS          | CP0603A1880DN | 1850 - 1910          | 15.2          | 0.40              | 24               |                  |
|              | CP0603A1960DN | 1930 - 1990          | 15.0          | 0.40              | 24               |                  |
| PHP          | CP0603A1907DN | 1895 - 1920          | 15.2          | 0.40              | 24               |                  |
| DECT         | CP0603A1890DN | 1880 - 1900          | 15.2          | 0.40              | 24               | 20               |
| Wireless LAN | CP0603A2442DN | 2400 - 2484          | 13.3          | 0.55              | 22               |                  |
|              | CP0603A3500DN | 3450 - 3550          | 10.1          | 0.66              | 25.3             |                  |
|              | CP0603A5000DN | 4950 - 5050          | 7.8           | 1.17              | 21.1             |                  |
| WiFi         | CP0603A5500DN | 5450 - 5550          | 6.8           | 1.39              | 19.9             | 18               |
|              | CP0603A6000DN | 5950 - 6050          | 6.3           | 1.64              | 18.8             | 17               |

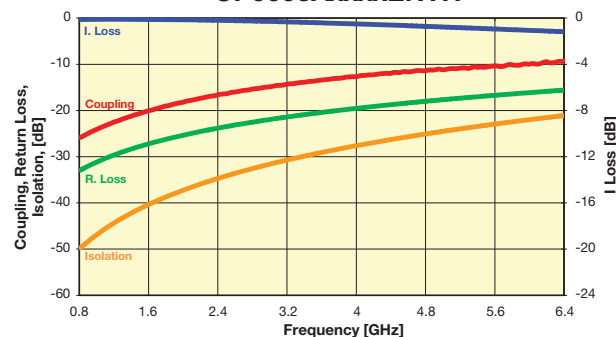
CP0603AxxxxDNTR



Coupler P/N CP603AxxxxEN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836EN | 824 - 849            | 25.8          | 0.20              | 32               | 21               |
|              | CP0603A0881EN | 869 - 894            | 25.3          | 0.20              | 32               |                  |
| GSM          | CP0603A0902EN | 890 - 915            | 25.0          | 0.20              | 32               |                  |
|              | CP0603A0947EN | 935 - 960            | 24.7          | 0.20              | 31               |                  |
| E-GSM        | CP0603A0897EN | 880 - 915            | 26.0          | 0.20              | 32               |                  |
|              | CP0603A0942EN | 925 - 960            | 24.7          | 0.20              | 31               |                  |
| PDC          | CP0603A1441EN | 1429 - 1453          | 22.0          | 0.25              | 28               |                  |
|              | CP0603A1747EN | 1710 - 1785          | 19.5          | 0.30              | 26               |                  |
| PCN          | CP0603A1842EN | 1805 - 1880          | 19.0          | 0.30              | 26               | 20               |
| PCS          | CP0603A1880EN | 1850 - 1910          | 18.8          | 0.30              | 26               |                  |
|              | CP0603A1960EN | 1930 - 1990          | 18.5          | 0.30              | 26               |                  |
| PHP          | CP0603A1907EN | 1895 - 1920          | 18.7          | 0.30              | 26               |                  |
| DECT         | CP0603A1890EN | 1880 - 1900          | 18.8          | 0.30              | 26               |                  |
| Wireless LAN | CP0603A2442EN | 2400 - 2484          | 17.0          | 0.40              | 24               |                  |
|              | CP0603A3500EN | 3450 - 3550          | 13.2          | 0.5               | 18               |                  |
|              | CP0603A5000EN | 4950 - 5050          | 10.7          | 0.9               | 13               |                  |
| WiFi         | CP0603A5500EN | 5450 - 5550          | 10.2          | 1.2               | 12               | 15               |
|              | CP0603A6000EN | 5950 - 6050          | 9.7           | 1.4               | 12               | 14               |

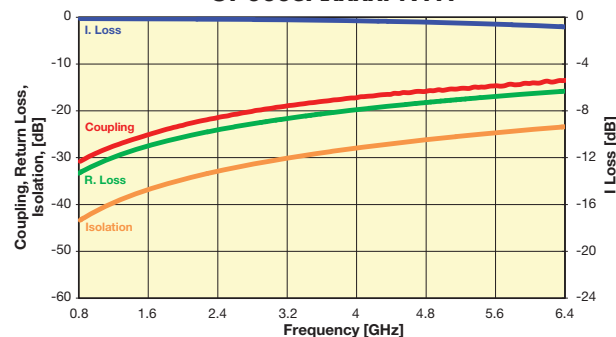
CP0603AxxxxENTR



Coupler P/N CP603AxxxxFN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836FN | 824 - 849            | 31.2          | 0.20              | 32               | 12               |
|              | CP0603A0881FN | 869 - 894            | 30.8          | 0.20              | 32               |                  |
| GSM          | CP0603A0902FN | 890 - 915            | 30.5          | 0.20              | 30               |                  |
|              | CP0603A0947FN | 935 - 960            | 30.2          | 0.20              | 30               |                  |
| E-GSM        | CP0603A0897FN | 880 - 915            | 30.5          | 0.20              | 30               |                  |
|              | CP0603A0942FN | 925 - 960            | 30.2          | 0.20              | 30               |                  |
| PDC          | CP0603A1441FN | 1429 - 1453          | 27.0          | 0.25              | 28               |                  |
|              | CP0603A1747FN | 1710 - 1785          | 25.0          | 0.25              | 27               |                  |
| PCN          | CP0603A1842FN | 1805 - 1880          | 26.5          | 0.25              | 27               | 13               |
| PCS          | CP0603A1880FN | 1850 - 1910          | 24.3          | 0.25              | 27               |                  |
|              | CP0603A1960FN | 1930 - 1990          | 24.0          | 0.25              | 28               |                  |
| PHP          | CP0603A1907FN | 1895 - 1920          | 24.2          | 0.25              | 27               |                  |
| DECT         | CP0603A1890FN | 1880 - 1900          | 24.2          | 0.25              | 27               |                  |
| Wireless LAN | CP0603A2442FN | 2400 - 2484          | 21.5          | 0.25              | 25               |                  |
|              | CP0603A3500FN | 3450 - 3550          | 17.8          | 0.33              | 20.0             |                  |
|              | CP0603A5000FN | 4950 - 5050          | 15.4          | 0.62              | 14.86            |                  |
| WiFi         | CP0603A5500FN | 5450 - 5550          | 14.8          | 0.86              | 13.58            | 12               |
|              | CP0603A6000FN | 5950 - 6050          | 14.3          | 1.02              | 12.58            | 11               |

CP0603AxxxxFNTR



Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers

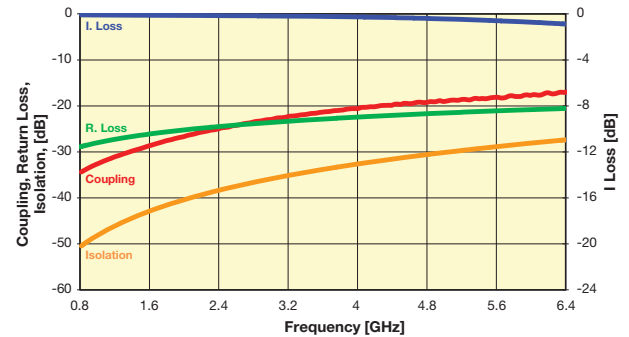


## CP0603 High Directivity LGA Type

Coupler P/N CP603AxxxxGN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836GN | 824 - 849            | 34.2          | 0.20              | 30               | 13               |
|              | CP0603A0881GN | 869 - 894            | 33.8          | 0.20              | 30               |                  |
| GSM          | CP0603A0902GN | 890 - 915            | 33.6          | 0.20              | 30               |                  |
|              | CP0603A0947GN | 935 - 960            | 33.2          | 0.20              | 29               |                  |
| E-GSM        | CP0603A0897GN | 880 - 915            | 33.6          | 0.20              | 30               |                  |
|              | CP0603A0942GN | 925 - 960            | 33.2          | 0.20              | 29               |                  |
| PDC          | CP0603A1441GN | 1429 - 1453          | 30.0          | 0.25              | 25               |                  |
|              | CP0603A1747GN | 1710 - 1785          | 28.5          | 0.25              | 24               |                  |
| PCN          | CP0603A1842GN | 1805 - 1880          | 28.0          | 0.25              | 24               |                  |
|              | CP0603A1880GN | 1850 - 1910          | 27.7          | 0.25              | 24               |                  |
| PCS          | CP0603A1960GN | 1930 - 1990          | 27.5          | 0.25              | 23               |                  |
| PHP          | CP0603A1907GN | 1895 - 1920          | 27.6          | 0.25              | 24               |                  |
| DECT         | CP0603A1890GN | 1880 - 1900          | 27.7          | 0.25              | 24               |                  |
| Wireless LAN | CP0603A2442GN | 2400 - 2484          | 25.5          | 0.25              | 22               |                  |
|              | CP0603A3500GN | 3450 - 3550          | 21.6          | 0.31              | 20               | 13               |
| Wifi         | CP0603A5000GN | 4950 - 5050          | 19            | 0.39              | 16               | 12               |
|              | CP0603A5500GN | 5450 - 5550          | 18.5          | 0.57              | 15               | 12               |
|              | CP0603A6000GN | 5950 - 6050          | 18.0          | 0.74              | 14               | 11               |

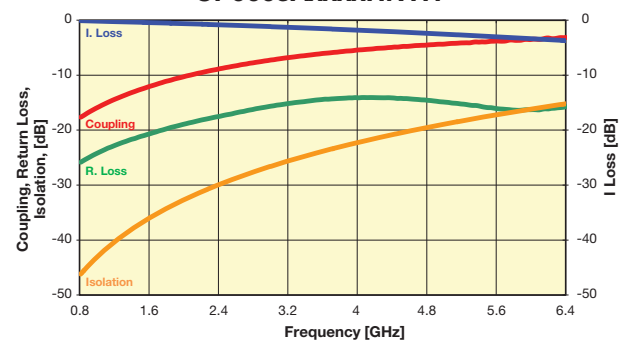
CP0603AxxxxGNTR



Coupler P/N CP603AxxxxHN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836HN | 824 - 849            | 17.3          | 0.30              | 26               | 26               |
|              | CP0603A0881HN | 869 - 894            | 17.0          | 0.30              | 25               |                  |
| GSM          | CP0603A0902HN | 890 - 915            | 16.7          | 0.30              | 25               |                  |
|              | CP0603A0947HN | 935 - 960            | 16.3          | 0.35              | 25               | 24               |
| E-GSM        | CP0603A0897HN | 880 - 915            | 17.0          | 0.35              | 25               |                  |
|              | CP0603A0942HN | 925 - 960            | 16.3          | 0.35              | 25               |                  |
| PDC          | CP0603A1441HN | 1429 - 1453          | 13.0          | 0.55              | 22               |                  |
|              | CP0603A1747HN | 1710 - 1785          | 11.4          | 0.75              | 20               |                  |
| PCN          | CP0603A1842HN | 1805 - 1880          | 11.0          | 0.75              | 20               |                  |
|              | CP0603A1880HN | 1850 - 1910          | 10.8          | 0.75              | 19               |                  |
| PCS          | CP0603A1960HN | 1930 - 1990          | 10.5          | 0.75              | 19               |                  |
| PHP          | CP0603A1907HN | 1895 - 1920          | 10.7          | 0.75              | 19               |                  |
| DECT         | CP0603A1890HN | 1880 - 1900          | 10.8          | 0.75              | 19               |                  |
| Wireless LAN | CP0603A2442HN | 2400 - 2484          | 8.8           | 1.00              | 17               |                  |
|              | CP0603A3500HN | 3450 - 3550          | 5.9           | 1.48              | 25               | 21               |
| Wifi         | CP0603A5000HN | 4950 - 5050          | 4.4           | 2.59              | 22               | 18               |
|              | CP0603A5500HN | 5450 - 5550          | 4             | 2.95              | 22               | 17               |
|              | CP0603A6000HN | 5950 - 6050          | 3.5           | 3.37              | 21               | 17               |

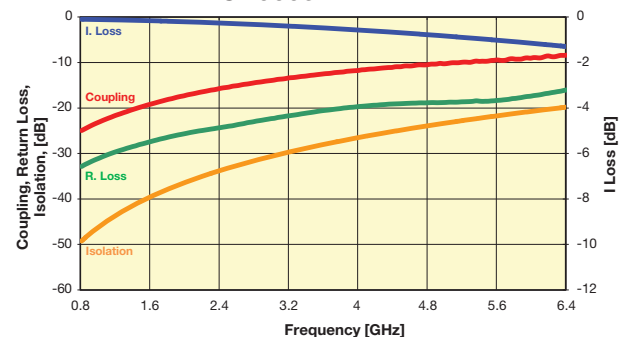
CP0603AxxxxHNTR



Coupler P/N CP603AxxxxMN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836MN | 824 - 849            | 24.2          | 0.20              | 33               | 23               |
|              | CP0603A0881MN | 869 - 894            | 23.8          | 0.20              | 32               |                  |
| GSM          | CP0603A0902MN | 890 - 915            | 23.4          | 0.20              | 32               |                  |
|              | CP0603A0947MN | 935 - 960            | 23.2          | 0.20              | 32               | 20               |
| E-GSM        | CP0603A0897MN | 880 - 915            | 23.4          | 0.20              | 32               |                  |
|              | CP0603A0942MN | 925 - 960            | 23.2          | 0.20              | 32               |                  |
| PDC          | CP0603A1441MN | 1429 - 1453          | 20.0          | 0.25              | 28               |                  |
|              | CP0603A1747MN | 1710 - 1785          | 18.4          | 0.25              | 27               |                  |
| PCN          | CP0603A1842MN | 1805 - 1880          | 18.0          | 0.25              | 26               |                  |
|              | CP0603A1880MN | 1850 - 1910          | 17.8          | 0.25              | 26               |                  |
| PCS          | CP0603A1960MN | 1930 - 1990          | 17.5          | 0.25              | 26               |                  |
| PHP          | CP0603A1907MN | 1895 - 1920          | 17.7          | 0.25              | 26               |                  |
| DECT         | CP0603A1890MN | 1880 - 1900          | 17.8          | 0.25              | 26               |                  |
| Wireless LAN | CP0603A2442MN | 2400 - 2484          | 15.6          | 0.35              | 24               |                  |
|              | CP0603A3500MN | 3450 - 3550          | 12.8          | 0.58              | 18               | 20               |
| Wifi         | CP0603A5000MN | 4950 - 5050          | 10.2          | 1.0               | 15               | 16               |
|              | CP0603A5500MN | 5450 - 5550          | 9.7           | 1.2               | 15               | 14               |
|              | CP0603A6000MN | 5950 - 6050          | 8.9           | 1.5               | 13.5             | 9                |

CP0603AxxxxMNTR



Important: Couplers can be used at any frequency within the indicated range.



# Thin-Film Directional Couplers

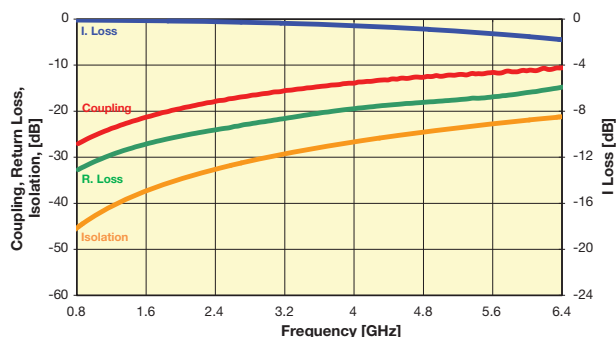


## CP0603 High Directivity LGA Type

Coupler P/N CP603AxxxxLN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836LN | 824 - 849            | 26.89         | 0.08              | 32.5             | 18               |
|              | CP0603A0881LN | 869 - 894            | 26.55         | 0.08              | 32.2             |                  |
|              | CP0603A0902LN | 890 - 915            | 26.2          | 0.09              | 31.9             |                  |
| GSM          | CP0603A0947LN | 935 - 960            | 25.87         | 0.09              | 31.5             | 18               |
|              | CP0603A0897LN | 880 - 915            | 26.2          | 0.09              | 31.9             |                  |
|              | CP0603A0942LN | 925 - 960            | 25.87         | 0.09              | 31.5             |                  |
| E-GSM        | CP0603A1441LN | 1429 - 1453          | 22.31         | 0.12              | 28.1             | 17.5             |
|              | CP0603A1747LN | 1710 - 1785          | 20.51         | 0.15              | 26.4             |                  |
|              | CP0603A1842LN | 1805 - 1880          | 20.03         | 0.15              | 26               |                  |
| PDC          | CP0603A1880LN | 1850 - 1910          | 19.87         | 0.16              | 26               | 16.5             |
| PCN          | CP0603A1960LN | 1930 - 1990          | 19.57         | 0.17              | 25.5             |                  |
|              | CP0603A1907LN | 1895 - 1920          | 19.77         | 0.16              | 25.7             |                  |
| PCS          | CP0603A1890LN | 1880 - 1900          | 19.87         | 0.16              | 25.8             | 16               |
| PHP          | CP0603A2442LN | 2400 - 2484          | 17.7          | 0.22              | 23.9             |                  |
| DECT         | CP0603A3500LN | 3450 - 3550          | 14.85         | 0.56              | 20.6             |                  |
| Wireless LAN | CP0603A5000LN | 4950 - 5050          | 12.4          | 0.95              | 17.8             | 11               |
|              | CP0603A5500LN | 5450 - 5550          | 11.83         | 1.2               | 17.1             |                  |
|              | CP0603A6000LN | 5950 - 6050          | 11.08         | 1.33              | 15.9             |                  |
| WiFi         |               |                      |               |                   |                  | 9                |

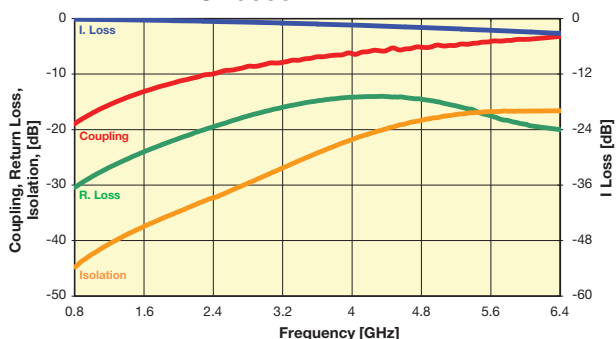
CP0603AxxxxLNTR



Coupler P/N CP603AxxxxKN

| Application  | P/N Examples* | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603A0836KN | 824 - 849            | 18.5          | 0.14              | 30               | 26               |
|              | CP0603A0881KN | 869 - 894            | 18.1          | 0.14              | 29               |                  |
|              | CP0603A0902KN | 890 - 915            | 17.6          | 0.15              | 29               |                  |
| GSM          | CP0603A0947KN | 935 - 960            | 17.3          | 0.15              | 29               | 25               |
|              | CP0603A0897KN | 880 - 915            | 17.9          | 0.147             | 29               |                  |
|              | CP0603A0942KN | 925 - 960            | 17.6          | 0.15              | 29               |                  |
| E-GSM        | CP0603A1441KN | 1429 - 1453          | 14            | 0.27              | 25               | 24               |
| PDC          | CP0603A1747KN | 1710 - 1785          | 12.4          | 0.36              | 23               |                  |
|              | CP0603A1842KN | 1805 - 1880          | 12            | 0.39              | 22.5             |                  |
| PCS          | CP0603A1880KN | 1850 - 1910          | 11.8          | 0.4               | 22               | 24               |
| PCN          | CP0603A1960KN | 1930 - 1990          | 11.4          | 0.44              | 22               |                  |
|              | CP0603A1907KN | 1895 - 1920          | 11.5          | 0.43              | 22               |                  |
| PHP          | CP0603A1890KN | 1880 - 1900          | 11.7          | 0.41              | 22               | 23               |
| DECT         | CP0603A2442KN | 2400 - 2484          | 9.7           | 0.6               | 19               |                  |
| Wireless LAN | CP0603A3500KN | 3450 - 3550          | 7.2           | 1.15              | 15               |                  |
|              | CP0603A5000KN | 4950 - 5050          | 4.7           | 2.15              | 15               | 13               |
|              | CP0603A5500KN | 5450 - 5550          | 4.2           | 2.5               | 17               |                  |
|              | CP0603A6000KN | 5950 - 6050          | 3.7           | 2.8               | 19               |                  |
| WiFi         |               |                      |               |                   |                  | 13               |

CP0603AxxxxKNTR



Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers

## CP0402 / CP0603 High Directivity Couplers Test Jigs

### GENERAL DESCRIPTION

These jigs are designed for testing the CP0402 and CP0603 High Directivity Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm (0.010") from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

### MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig

terminal connected to port 2. Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-Port calibration in the required bandwidths.

#### Place the coupler on the [measurement jig](#) as follows:

Input (Coupler) → Connector 1 (Jig)      Termination (Coupler) → Connector 3 (Jig)  
Output (Coupler) → Connector 2 (Jig)      Coupling (Coupler) → Connector 4 (Jig)

#### To measure I. Loss connect:

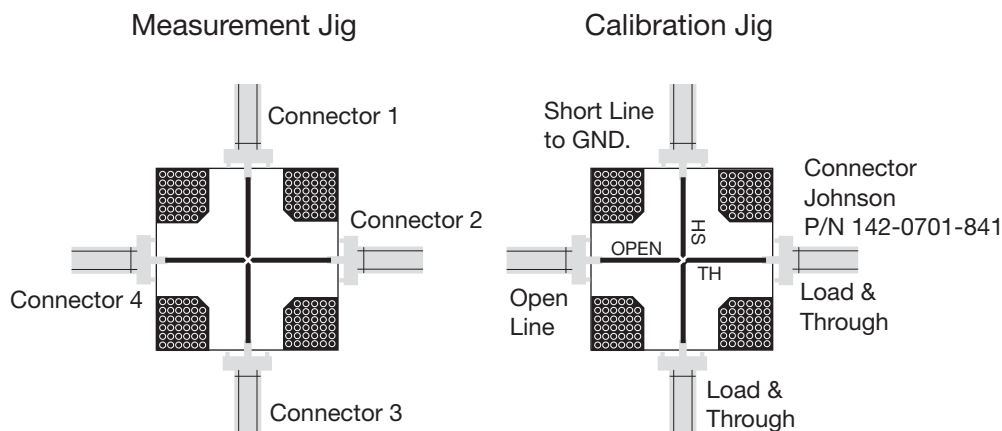
Connector 1 (Jig) → Port 1 (VNA)      Connector 3 (Jig) → 50Ω  
Connector 2 (Jig) → Port 2 (VNA)      Connector 4 (Jig) → 50Ω

#### To measure R. Loss and Coupling connect:

Connector 1 (Jig) → Port 1 (VNA)      Connector 3 (Jig) → 50Ω  
Connector 2 (Jig) → 50Ω      Connector 4 (Jig) → Port 2 (VNA)

#### To measure Isolation connect:

Connector 1 (Jig) → 50Ω      Connector 3 (Jig) → 50Ω  
Connector 2 (Jig) → Port 1 (VNA)      Connector 4 (Jig) → Port 2 (VNA)



# Thin-Film Directional Couplers



## CP0603 SMD Type

### GENERAL DESCRIPTION ITF (Integrated Thin-Film) TECHNOLOGY

The ITF SMD Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

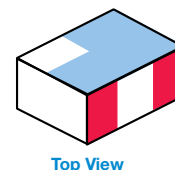
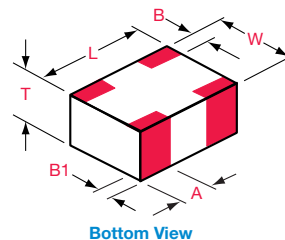
### APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's
- Miniature Size: 0603
- Frequency Range: 800MHz - 3GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

### FEATURES

### DIMENSIONS:

millimeters (inches)



Bottom View

|    | 0603                                |
|----|-------------------------------------|
| L  | 1.6±0.1<br>(0.063±0.004)            |
| W  | 0.84±0.1<br>(0.033±0.004)           |
| T  | 0.60±0.1<br>(0.028±0.004)           |
| A  | 0.35±0.15<br>(0.014±0.006)          |
| B  | 0.175±0.1<br>(0.007±0.004)          |
| B1 | 0.00±0.1/0-0.0<br>(0.00±0.004/-0.0) |

### HOW TO ORDER

|                                                       |                                         |                              |                                             |                                  |                                                                           |                                                               |
|-------------------------------------------------------|-----------------------------------------|------------------------------|---------------------------------------------|----------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>CP</b><br>T<br><b>Style</b><br>Directional Coupler | <b>0603</b><br>T<br><b>Size</b><br>0603 | <b>X</b><br>T<br><b>Type</b> | <b>****</b><br>T<br><b>Frequency</b><br>MHz | <b>X</b><br>T<br><b>Sub Type</b> | <b>S</b><br>T<br><b>Termination Code</b><br>W = Sn90, Pb10<br>**S = Sn100 | <b>TR</b><br>T<br><b>Packaging Code</b><br>TR = Tape and Reel |
|-------------------------------------------------------|-----------------------------------------|------------------------------|---------------------------------------------|----------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------|

\*\*RoHS compliant

### QUALITY INSPECTION

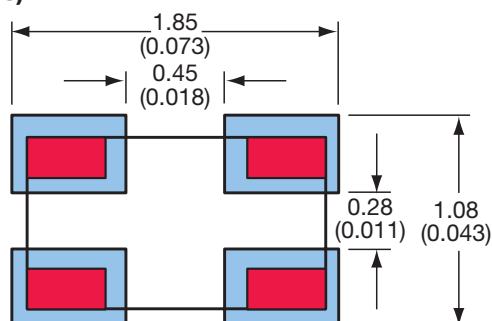
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I<sub>R</sub>, 4 hours

### TERMINATION

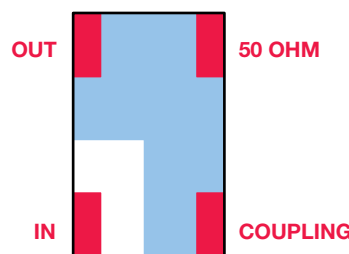
Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### Recommended Pad Layout Dimensions mm (inches)

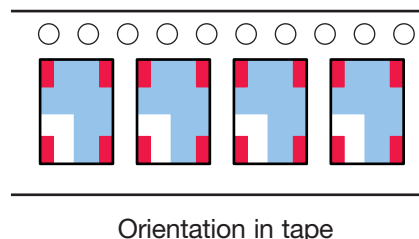


### TERMINALS (Top View)

Not RoHS Compliant



For RoHS compliant products, please select correct termination style.



# Thin-Film Directional Couplers

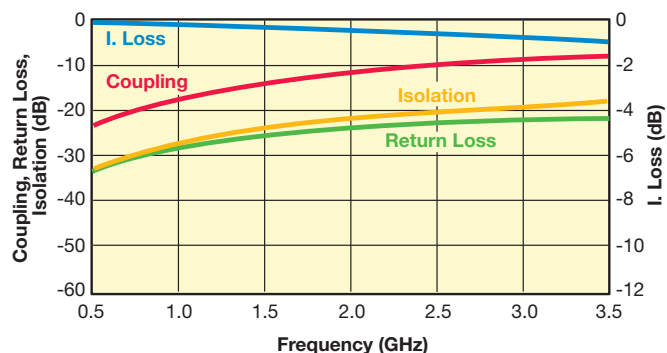


## CP0603 SMD Type

Coupler P/N CP0603A\*\*\*\*AS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0603A0836AS | 824 - 849            | 18.5±1        | 0.25        | 1.2      |
|              | CP0603A0881AS | 869 - 894            | 18.5±1        |             |          |
| GSM          | CP0603A0902AS | 890 - 915            | 18±1          | 0.25        |          |
|              | CP0603A0947AS | 935 - 960            | 17.5±1        |             |          |
| E-GSM        | CP0603A0897AS | 880 - 915            | 18±1          | 0.25        |          |
|              | CP0603A0942AS | 925 - 960            | 17.5±1        |             |          |
| PDC          | CP0603A1441AS | 1429 - 1453          | 14±1          | 0.4         |          |
| PCN          | CP0603A1747AS | 1710 - 1785          | 12.5±1        | 0.6         |          |
|              | CP0603A1842AS | 1805 - 1880          | 12±1          |             |          |
| PCS          | CP0603A1880AS | 1850 - 1910          | 12±1          | 0.65        |          |
|              | CP0603A1960AS | 1930 - 1990          | 11.5±1        |             |          |
| PHP          | CP0603A1907AS | 1895 - 1920          | 12±1          | 0.6         |          |
| DECT         | CP0603A1890AS | 1880 - 1900          | 12±1          | 0.6         |          |
| Wireless LAN | CP0603A2442AS | 2400 - 2484          | 10±1          | 0.85        |          |

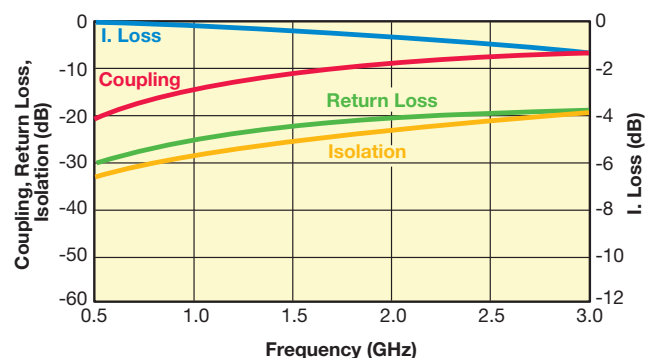
CP0603A\*\*\*\*AS



Coupler P/N CP0603A\*\*\*\*BS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |      |     |
|--------------|---------------|----------------------|---------------|-------------|----------|------|-----|
| AMPS         | CP0603A0836BS | 824 - 849            | 16±1          | 0.25        | 1.2      |      |     |
|              | CP0603A0881BS | 869 - 894            | 15.5±1        |             |          |      |     |
| GSM          | CP0603A0902BS | 890 - 915            | 15.5±1        |             |          | 0.55 | 1.3 |
|              | CP0603A0947BS | 935 - 960            | 15±1          |             |          |      |     |
| E-GSM        | CP0603A0897BS | 880 - 915            | 15.5±1        | 0.8         | 1.4      |      |     |
|              | CP0603A0942BS | 925 - 960            | 15±1          |             |          |      |     |
| PDC          | CP0603A1441BS | 1429 - 1453          | 11.5±1        |             |          | 1.1  | 1.3 |
| PCN          | CP0603A1747BS | 1710 - 1785          | 10±1          |             |          |      |     |
|              | CP0603A1842BS | 1805 - 1880          | 9.5±1         |             |          |      |     |
| PCS          | CP0603A1880BS | 1850 - 1910          | 9±1           | 1.1         | 1.4      |      |     |
|              | CP0603A1960BS | 1930 - 1990          | 9±1           |             |          |      |     |
| PHP          | CP0603A1907BS | 1895 - 1920          | 9±1           |             |          | 1.1  | 1.4 |
| DECT         | CP0603A1890BS | 1880 - 1900          | 9±1           |             |          |      |     |
| Wireless LAN | CP0603A2442BS | 2400 - 2484          | 7.5±1         |             |          |      |     |

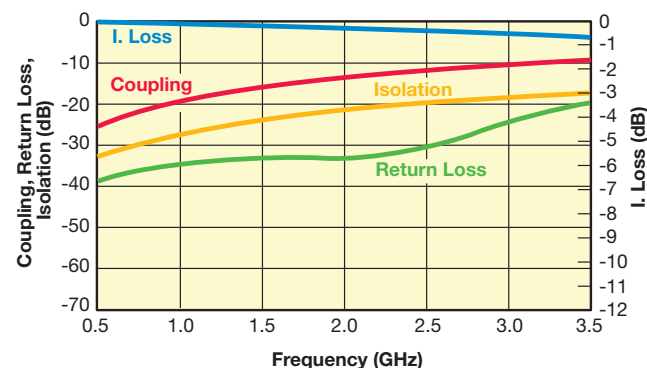
CP0603A\*\*\*\*BS



Coupler P/N CP0603A\*\*\*\*CS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0603A0836CS | 824 - 849            | 21±1          | 0.25        | 1.2      |
|              | CP0603A0881CS | 869 - 894            | 20.5±1        |             |          |
| GSM          | CP0603A0902CS | 890 - 915            | 20.5±1        | 0.25        |          |
|              | CP0603A0947CS | 935 - 960            | 20±1          |             |          |
| E-GSM        | CP0603A0897CS | 880 - 915            | 20.5±1        | 0.25        |          |
|              | CP0603A0942CS | 925 - 960            | 20±1          |             |          |
| PDC          | CP0603A1441CS | 1429 - 1453          | 16.5±1        | 0.40        |          |
| PCN          | CP0603A1747CS | 1710 - 1785          | 15±1          | 0.5         |          |
|              | CP0603A1842CS | 1805 - 1880          | 14.5±1        |             |          |
| PCS          | CP0603A1880CS | 1850 - 1910          | 14.5±1        | 0.5         |          |
|              | CP0603A1960CS | 1930 - 1990          | 14±1          |             |          |
| PHP          | CP0603A1907CS | 1895 - 1920          | 14.5±1        | 0.5         |          |
| DECT         | CP0603A1890CS | 1880 - 1900          | 14.5±1        |             |          |
| Wireless LAN | CP0603A2442CS | 2400 - 2484          | 12.5±1        | 0.65        |          |

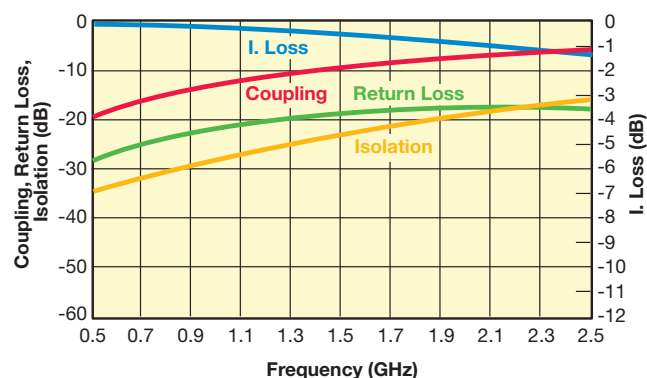
CP0603A\*\*\*\*CS



Coupler P/N CP0603A\*\*\*\*DS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |  |  |
|--------------|---------------|----------------------|---------------|-------------|----------|--|--|
| AMPS         | CP0603A0836DS | 824 - 849            | 15.0±1        | 0.40        | 1.2      |  |  |
|              | CP0603A0881DS | 869 - 894            | 14.5±1        |             |          |  |  |
| GSM          | CP0603A0902DS | 890 - 915            | 14.5±1        |             |          |  |  |
|              | CP0603A0947DS | 935 - 960            | 14±1          |             |          |  |  |
| E-GSM        | CP0603A0897DS | 880 - 915            | 14.5±1        |             |          |  |  |
|              | CP0603A0942DS | 925 - 960            | 14±1          |             |          |  |  |
| PDC          | CP0603A1441DS | 1429 - 1453          | 10.5±1        | 0.7         | 1.3      |  |  |
| PCN          | CP0603A1747DS | 1710 - 1785          | 9±1           | 0.9         | 1.5      |  |  |
|              | CP0603A1842DS | 1805 - 1880          | 8.5±1         |             |          |  |  |
| PCS          | CP0603A1880DS | 1850 - 1910          | 8.5±1         | 1.0         |          |  |  |
|              | CP0603A1960DS | 1930 - 1990          | 8±1           |             |          |  |  |
| PHP          | CP0603A1907DS | 1895 - 1920          | 8.5±1         |             |          |  |  |
| DECT         | CP0603A1890DS | 1880 - 1900          | 8.5±1         |             |          |  |  |
| Wireless LAN | CP0603A2442DS | 2400 - 2484          | 6.5±1         | 1.5         |          |  |  |

CP0603A\*\*\*\*DS



Important: Couplers can be used at any frequency within the indicated range.



# Thin-Film Directional Couplers

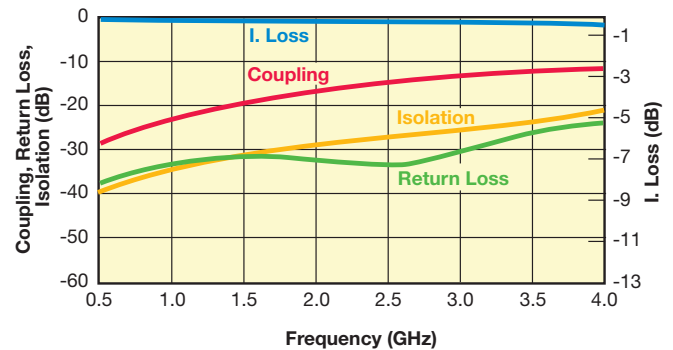


## CP0603 SMD Type

Coupler P/N CP0603B\*\*\*\*AS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0603B0836AS | 824 - 849            | 24.5±1        | 0.2         | 1.2      |
|              | CP0603B0881AS | 869 - 894            | 24±1          |             |          |
| GSM          | CP0603B0902AS | 890 - 915            | 24±1          |             |          |
|              | CP0603B0947AS | 935 - 960            | 23.5±1        |             |          |
| E-GSM        | CP0603B0897AS | 880 - 915            | 24±1          |             |          |
|              | CP0603B0942AS | 925 - 960            | 23.5±1        |             |          |
| PDC          | CP0603B1441AS | 1429 - 1453          | 20±1          | 0.25        |          |
| PCN          | CP0603B1747AS | 1710 - 1785          | 18±1          |             |          |
|              | CP0603B1842AS | 1805 - 1880          | 17.5±1        | 0.3         |          |
| PCS          | CP0603B1880AS | 1850 - 1910          | 17.5±1        |             |          |
|              | CP0603B1960AS | 1930 - 1990          | 17.5±1        |             |          |
| PHP          | CP0603B1907AS | 1895 - 1920          | 17.5±1        |             |          |
| DECT         | CP0603B1890AS | 1880 - 1900          | 17.5±1        |             |          |
| Wireless LAN | CP0603B2442AS | 2400 - 2484          | 15.5±1        |             |          |

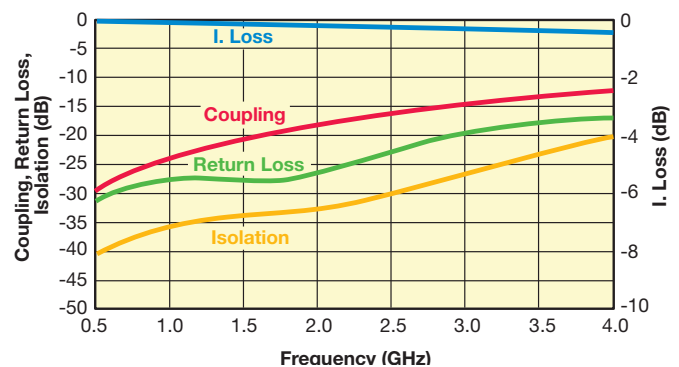
CP0603B\*\*\*\*AS



Coupler P/N CP0603B\*\*\*\*BS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0603B0836BS | 824 - 849            | 25.5±1        | 0.2         | 1.2      |
|              | CP0603B0881BS | 869 - 894            | 25±1          |             |          |
| GSM          | CP0603B0902BS | 890 - 915            | 25±1          |             |          |
|              | CP0603B0947BS | 935 - 960            | 24.5±1        |             |          |
| E-GSM        | CP0603B0897BS | 880 - 915            | 25±1          | 0.25        |          |
|              | CP0603B0942BS | 925 - 960            | 24.5±1        |             |          |
| PDC          | CP0603B1441BS | 1429 - 1453          | 21±1          | 0.25        |          |
| PCN          | CP0603B1747BS | 1710 - 1785          | 19±1          |             |          |
|              | CP0603B1842BS | 1805 - 1880          | 19±1          |             |          |
| PCS          | CP0603B1880BS | 1850 - 1910          | 18.5±1        |             |          |
|              | CP0603B1960BS | 1930 - 1990          | 18.5±1        |             |          |
| PHP          | CP0603B1907BS | 1895 - 1920          | 18.5±1        |             |          |
| DECT         | CP0603B1890BS | 1880 - 1900          | 18.5±1        |             |          |
| Wireless LAN | CP0603B2442BS | 2400 - 2484          | 16.5±1        | 0.35        |          |

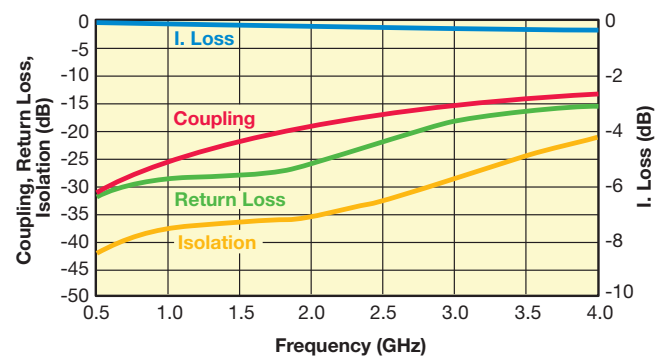
CP0603B\*\*\*\*BS



Coupler P/N CP0603B\*\*\*\*CS

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0603B0836CS | 824 - 849            | 26.5±1        | 0.2         | 1.2      |
|              | CP0603B0881CS | 869 - 894            | 26±1          |             |          |
| GSM          | CP0603B0902CS | 890 - 915            | 26±1          |             |          |
|              | CP0603B0947CS | 935 - 960            | 25.5±1        |             |          |
| E-GSM        | CP0603B0897CS | 880 - 915            | 26±1          | 0.25        |          |
|              | CP0603B0942CS | 925 - 960            | 25.5±1        |             |          |
| PDC          | CP0603B1441CS | 1429 - 1453          | 22±1          |             |          |
| PCN          | CP0603B1747CS | 1710 - 1785          | 20.5±1        |             |          |
|              | CP0603B1842CS | 1805 - 1880          | 20±1          |             |          |
| PCS          | CP0603B1880CS | 1850 - 1910          | 20±1          |             |          |
|              | CP0603B1960CS | 1930 - 1990          | 19.5±1        |             |          |
| PHP          | CP0603B1907CS | 1895 - 1920          | 20±1          |             |          |
| DECT         | CP0603B1890CS | 1880 - 1900          | 20±1          |             |          |
| Wireless LAN | CP0603B2442CS | 2400 - 2484          | 18±1          |             | 0.35     |

CP0603B\*\*\*\*CS



Important: Couplers can be used at any frequency within the indicated range.

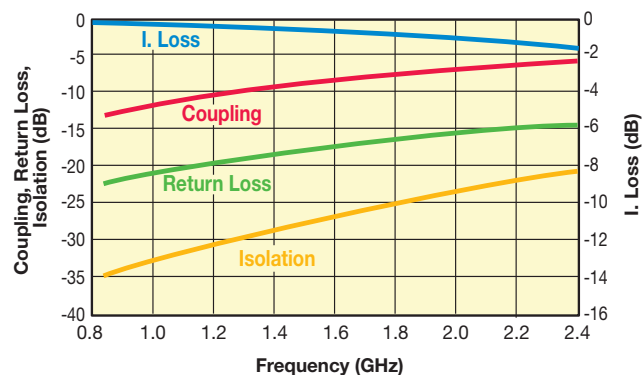
# Thin-Film Directional Couplers

## CP0603 SMD Type – High Directivity

**Coupler P/N CP0603D\*\*\*\*AS**

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603D0836AS | 824 - 849            | 13.50         | 0.50              | 23               | 21               |
|              | CP0603D0881AS | 869 - 894            | 13.00         |                   |                  |                  |
| GSM          | CP0603D0902AS | 890 - 915            |               |                   | 22               |                  |
|              | CP0603D0947AS | 935 - 960            | 12.50         |                   |                  |                  |
| E-GSM        | CP0603D0897AS | 880 - 915            | 13.00         |                   |                  |                  |
|              | CP0603D0942AS | 925 - 960            | 12.50         |                   |                  |                  |
| PDC          | CP0603D1441AS | 1429 - 1453          | 9.00          | 1.00              | 18               | 19               |
| PCN          | CP0603D1747AS | 1710 - 1785          | 8.00          | 1.40              | 17               | 18               |
|              | CP0603D1842AS | 1805 - 1880          |               |                   |                  | 17               |
| PCS          | CP0603D1880AS | 1850 - 1910          | 7.50          |                   |                  |                  |
|              | CP0603D1960AS | 1930 - 1990          |               |                   | 16               |                  |
| PHP          | CP0603D1907AS | 1895 - 1920          | 7.00          |                   |                  |                  |
| DECT         | CP0603D1890AS | 1880 - 1900          |               |                   |                  |                  |
| Wireless LAN | CP0603D2442AS | 2400 - 2484          | 5.50          | 2.00              | 15               | 15               |

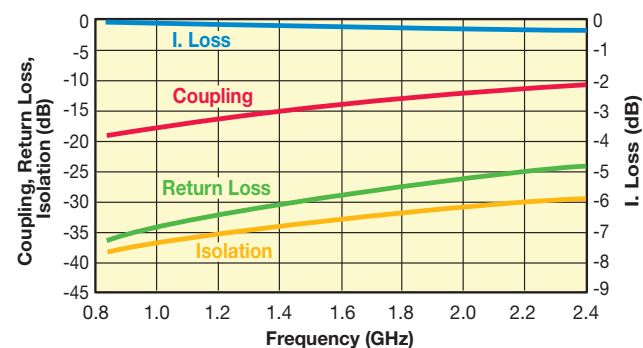
**CP0603D\*\*\*\*AS**



**Coupler P/N CP0603D\*\*\*\*BS**

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max. [dB] | Return Loss [dB] | Directivity [dB] |
|--------------|---------------|----------------------|---------------|-------------------|------------------|------------------|
| AMPS         | CP0603D0836BS | 824 - 849            | 20.00         | 0.25              | 36               | 19               |
|              | CP0603D0881BS | 869 - 894            | 19.50         |                   |                  |                  |
| GSM          | CP0603D0902BS | 890 - 915            |               |                   | 35               |                  |
|              | CP0603D0947BS | 935 - 960            | 19.00         |                   |                  |                  |
| E-GSM        | CP0603D0897BS | 880 - 915            | 19.50         |                   | 36               |                  |
|              | CP0603D0942BS | 925 - 960            | 19.00         |                   | 35               |                  |
| PDC          | CP0603D1441BS | 1429 - 1453          | 15.50         | 0.40              | 30               |                  |
| PCN          | CP0603D1747BS | 1710 - 1785          | 14.00         | 0.50              | 28               |                  |
|              | CP0603D1842BS | 1805 - 1880          |               | 0.55              |                  | 27               |
| PCS          | CP0603D1880BS | 1850 - 1910          | 13.50         |                   |                  |                  |
|              | CP0603D1960BS | 1930 - 1990          |               |                   |                  |                  |
| PHP          | CP0603D1907BS | 1895 - 1920          | 13.00         |                   |                  |                  |
| DECT         | CP0603D1890BS | 1880 - 1900          |               |                   |                  |                  |
| Wireless LAN | CP0603D2442BS | 2400 - 2484          | 11.00         | 0.70              | 24               |                  |

**CP0603D\*\*\*\*BS**



Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers



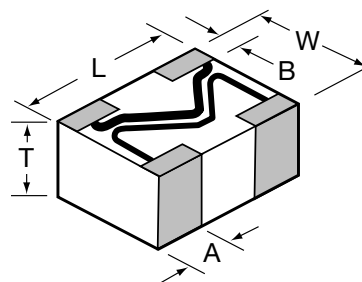
## CP0805 SMD Type

### GENERAL DESCRIPTION ITF (Integrated Thin-Film) TECHNOLOGY

The ITF SMD Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### DIMENSIONS: (Top View)



|   | 0805                    |
|---|-------------------------|
| L | 2.03±0.1 (0.080±0.004)  |
| W | 1.55±0.1 (0.061±0.004)  |
| T | 0.98±0.1 (0.039±0.004)  |
| A | 0.56±0.25 (0.022±0.010) |
| B | 0.35±0.15 (0.014±0.006) |

### FEATURES

- Small Size: 0805
- Frequency Range: 800MHz - 3GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

### APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

### HOW TO ORDER

|                                     |                     |                                          |                         |                                           |                                                                                                 |                                             |
|-------------------------------------|---------------------|------------------------------------------|-------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>CP</b><br>T                      | <b>0805</b><br>T    | <b>A</b><br>T                            | <b>0902</b><br>T        | <b>A</b><br>T                             | <b>S</b><br>T                                                                                   | <b>TR</b><br>T                              |
| <b>Style</b><br>Directional Coupler | <b>Size</b><br>0805 | <b>Layout Type</b><br>(see layout types) | <b>Frequency</b><br>MHz | <b>Sub Type</b><br>(see layout sub-types) | <b>Termination Code</b><br>W = Nickel/Solder (Sn/Pb)<br>**S = Nickel / Lead Free Solder (Sn100) | <b>Packaging Code</b><br>TR = Tape and Reel |

**Not RoHS Compliant**



For RoHS compliant products,  
please select correct termination style.

**\*\*RoHS compliant**

### QUALITY INSPECTION

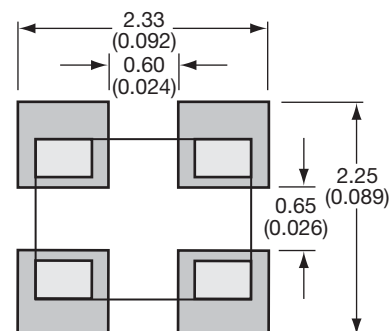
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

### TERMINATION

Nickel/Solder coating (Sn, Pb) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### Recommended Pad Layout Dimensions mm (inches)

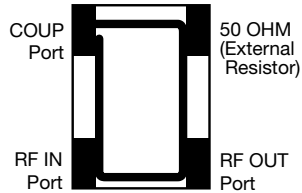


NOTE: Components must be mounted on the board with the white (Alumina) side DOWN.

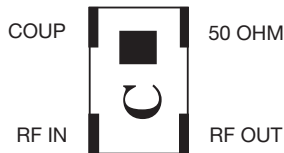
# Thin-Film Directional Couplers

## CP0805 Layout Types

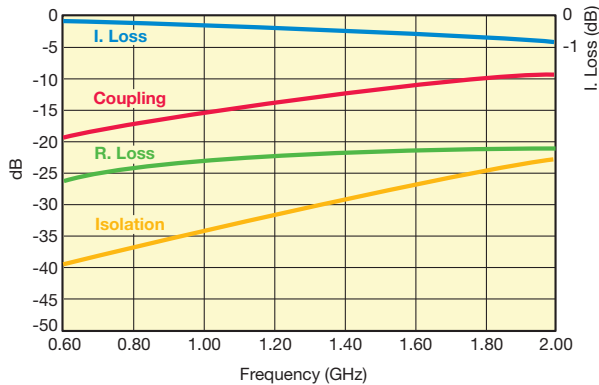
### LAYOUT



### Sn100 LAYOUT

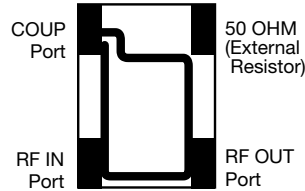


Type: A  
Sub-Type: A



| Application | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |  |
|-------------|---------------|----------------------|---------------|-------------|----------|--|
| AMPS        | CP0805A0836AW | 824 - 849            | 16.5±1        | 0.25        | 1.2      |  |
|             | CP0805A0881AW | 869 - 894            | 16±1          |             |          |  |
| GSM         | CP0805A0902AW | 890 - 915            | 16±1          | 0.25        |          |  |
|             | CP0805A0947AW | 935 - 960            | 15.5±1        |             |          |  |
| E-GSM       | CP0805A0897AW | 880 - 915            | 16±1          | 0.25        |          |  |
|             | CP0805A0942AW | 925 - 960            | 15.5±1        |             |          |  |
| PDC         | CP0805A1441AW | 1429 - 1453          | 12±1          | 0.5         | 1.3      |  |
| PCN         | CP0805A1747AW | 1710 - 1785          | 10.5±1        | 0.7         | 1.4      |  |
|             | CP0805A1842AW | 1805 - 1880          | 10±1          | 0.8         |          |  |
| PCS         | CP0805A1880AW | 1850 - 1910          | 9.5±1         | 0.8         |          |  |
|             | CP0805A1960AW | 1930 - 1990          | 9.5±1         |             |          |  |
| PHP         | CP0805A1907AW | 1895 - 1920          | 9.5±1         | 0.8         |          |  |
| DECT        | CP0805A1890AW | 1880 - 1900          | 9.5±1         | 0.8         |          |  |

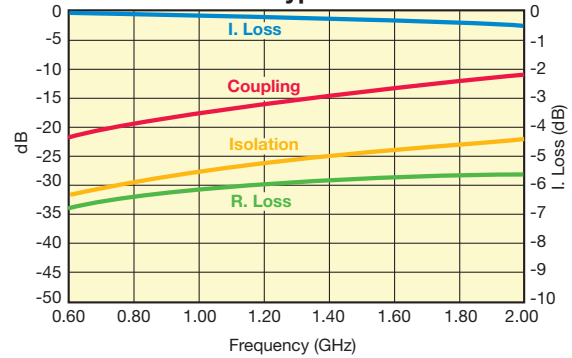
### LAYOUT



### Sn100 LAYOUT

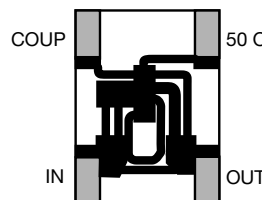


Type: A  
Sub-Type: B

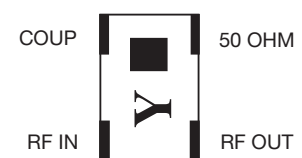


| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805A0836BW | 824 - 849            | 19±1          | 0.25        | 1.2      |
|              | CP0805A0881BW | 869 - 894            | 18.5±1        |             |          |
| GSM          | CP0805A0902BW | 890 - 915            | 18±1          | 0.25        | 1.2      |
|              | CP0805A0947BW | 935 - 960            | 18±1          |             |          |
| E-GSM        | CP0805A0897BW | 880 - 915            | 18.5±1        | 0.25        | 1.2      |
|              | CP0805A0942BW | 925 - 960            | 18±1          |             |          |
| PDC          | CP0805A1441BW | 1429 - 1453          | 14.5±1        | 0.35        | 1.4      |
| PCN          | CP0805A1747BW | 1710 - 1785          | 12.5±1        | 0.5         |          |
|              | CP0805A1842BW | 1805 - 1880          | 12.5±1        | 0.5         |          |
| PCS          | CP0805A1880BW | 1850 - 1910          | 12±1          | 0.6         |          |
|              | CP0805A1960BW | 1930 - 1990          | 11.5±1        | 0.7         |          |
| PHP          | CP0805A1907BW | 1895 - 1920          | 12±1          | 0.6         |          |
| DECT         | CP0805A1890BW | 1880 - 1900          | 12±1          | 0.6         |          |
| Wireless LAN | CP0805A2442BW | 2400 - 2484          | 10±1          | 0.9         |          |

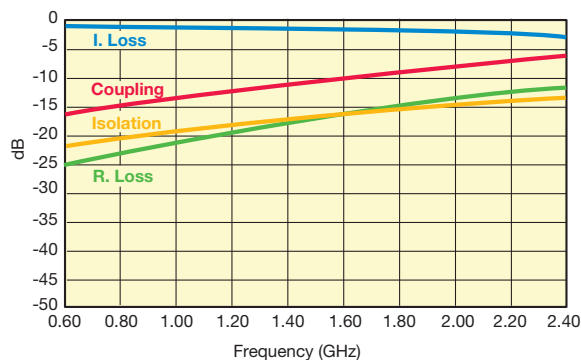
### LAYOUT



### Sn100 LAYOUT



Type: A  
Sub-Type: C



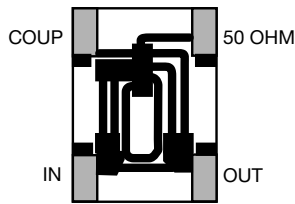
| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805A0836CW | 824 - 849            | 14±1          | 0.5         | 1.4      |
|              | CP0805A0881CW | 869 - 894            | 13.5±1        |             |          |
| GSM          | CP0805A0902CW | 890 - 915            | 13.5±1        | 0.5         | 1.4      |
|              | CP0805A0947CW | 935 - 960            | 13±1          |             |          |
| E-GSM        | CP0805A0897CW | 880 - 915            | 13.5±1        | 0.5         | 1.4      |
|              | CP0805A0942CW | 925 - 960            | 13±1          |             |          |
| PDC          | CP0805A1441CW | 1429 - 1453          | 9.5±1         | 1.15        | 1.8      |
| PCN          | CP0805A1747CW | 1710 - 1785          | 8±1           | 1.6         | 2.2      |
|              | CP0805A1842CW | 1805 - 1880          | 8±1           | 1.6         |          |
| PCS          | CP0805A1880CW | 1850 - 1910          | 7.5±1         | 1.75        |          |
|              | CP0805A1960CW | 1930 - 1990          | 7.5±1         | 1.75        |          |
| PHP          | CP0805A1907CW | 1895 - 1920          | 7.5±1         | 1.75        | 2.2      |
| DECT         | CP0805A1890CW | 1880 - 1900          | 7.5±1         | 1.75        |          |
| Wireless LAN | CP0805A2442CW | 2400 - 2484          | 6±1           | 2.5         | 2.2      |

Important: Couplers can be used at any frequency within the indicated range.

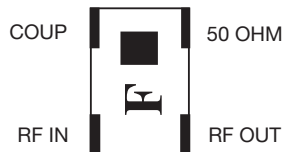
# Thin-Film Directional Couplers

## CP0805 Layout Types

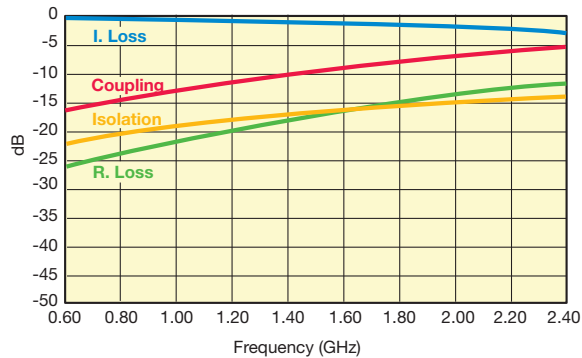
### LAYOUT



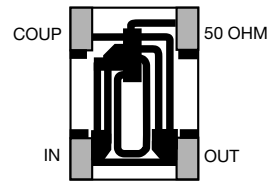
### Sn100 LAYOUT



Type: A  
Sub-Type: D



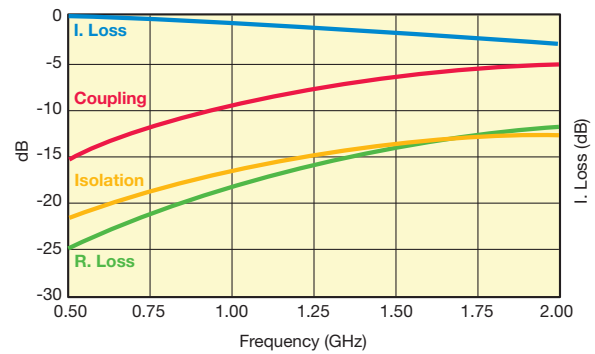
### LAYOUT



### Sn100 LAYOUT



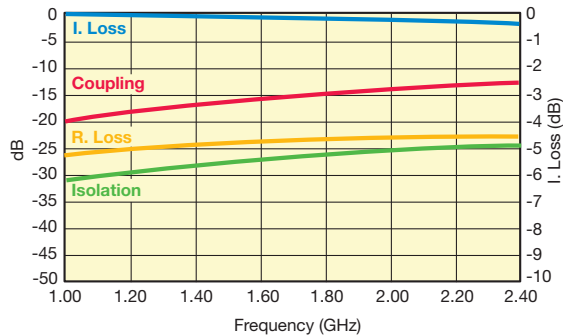
Type: A  
Sub-Type: E



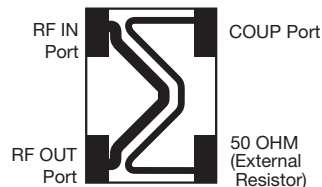
| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805A0836DW | 824 - 849            | 13.0±1        | 0.5         | 1.4      |
|              | CP0805A0881DW | 869 - 894            | 12.5±1        |             |          |
|              | CP0805A0902DW | 890 - 915            | 12.5±1        |             |          |
| GSM          | CP0805A0947DW | 935 - 960            | 12±1          | 1.25        | 1.8      |
| E-GSM        | CP0805A0897DW | 880 - 915            | 12.5±1        |             |          |
|              | CP0805A0942DW | 925 - 960            | 12±1          |             |          |
| PDC          | CP0805A1441DW | 1429 - 1453          | 8.5±1         | 1.85        | 2.1      |
| PCN          | CP0805A1747DW | 1710 - 1785          | 7±1           |             |          |
|              | CP0805A1842DW | 1805 - 1880          | 7±1           |             |          |
| PCS          | CP0805A1880DW | 1850 - 1910          | 7±1           | 2.15        | 2.1      |
|              | CP0805A1960DW | 1930 - 1990          | 6.5±1         |             |          |
|              | CP0805A1907DW | 1895 - 1920          | 6.5±1         |             |          |
| PHP          | CP0805A1890DW | 1880 - 1900          | 7±1           | 1.85        | 1.8      |
| DECT         | CP0805A1890DW | 1880 - 1900          | 7±1           |             |          |
| Wireless LAN | CP0805A2442DW | 2400 - 2484          | 5.5±1         | 2.4         | 2.1      |

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805A0836EW | 824 - 849            | 11±1          | 0.85        | 1.4      |
|              | CP0805A0881EW | 869 - 894            | 10.5±1        |             |          |
|              | CP0805A0902EW | 890 - 915            | 10.5±1        |             |          |
| GSM          | CP0805A0947EW | 935 - 960            | 10±1          | 1.8         | 1.8      |
| E-GSM        | CP0805A0897EW | 880 - 915            | 10.5±1        |             |          |
|              | CP0805A0942EW | 925 - 960            | 10±1          |             |          |
| PDC          | CP0805A1441EW | 1429 - 1453          | 7±1           | 2.7         | 2.2      |
| PCN          | CP0805A1747EW | 1710 - 1785          | 5.5±1         |             |          |
|              | CP0805A1842EW | 1805 - 1880          | 5.5±1         |             |          |
| PCS          | CP0805A1880EW | 1850 - 1910          | 5±1           | 3.15        | 2.4      |
|              | CP0805A1960EW | 1930 - 1990          | 5±1           |             |          |
|              | CP0805A1907EW | 1895 - 1920          | 5±1           |             |          |
| PHP          | CP0805A1890EW | 1880 - 1900          | 5±1           | 4.2         |          |
| DECT         | CP0805A1890EW | 1880 - 1900          | 5±1           |             |          |
| Wireless LAN | CP0805A2442EW | 2400 - 2484          | 4±1           |             |          |

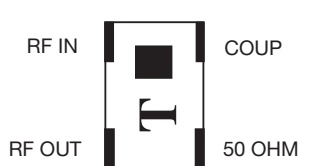
Type: B  
Sub-Type: A



### LAYOUT



### Sn100 LAYOUT



| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805B0836AW | 824 - 849            | 21.5±1        | 0.25        | 1.2      |
|              | CP0805B0881AW | 869 - 894            | 21±1          |             |          |
|              | CP0805B0902AW | 890 - 915            | 21±1          |             |          |
| GSM          | CP0805B0947AW | 935 - 960            | 20.5±1        | 0.3         | 0.3      |
| E-GSM        | CP0805B0897AW | 880 - 915            | 21±1          |             |          |
|              | CP0805B0942AW | 925 - 960            | 20.5±1        |             |          |
| PDC          | CP0805B1441AW | 1429 - 1453          | 17±1          | 0.4         | 0.4      |
| PCN          | CP0805B1747AW | 1710 - 1785          | 15.5±1        |             |          |
|              | CP0805B1842AW | 1805 - 1880          | 15.5±1        |             |          |
| PCS          | CP0805B1880AW | 1850 - 1910          | 15±1          | 15±1        | 15±1     |
|              | CP0805B1960AW | 1930 - 1990          | 14.5±1        |             |          |
|              | CP0805B1907AW | 1895 - 1920          | 15±1          |             |          |
| PHP          | CP0805B1890AW | 1880 - 1900          | 15±1          | 0.4         |          |
| DECT         | CP0805B1890AW | 1880 - 1900          | 15±1          |             |          |
| Wireless LAN | CP0805B2442AW | 2400 - 2484          | 13±1          |             |          |

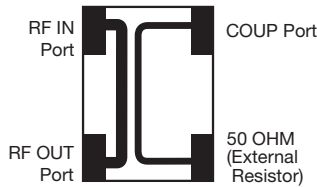
Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers

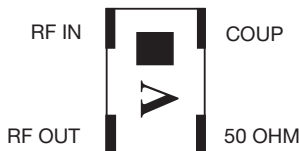


## CP0805 Layout Types

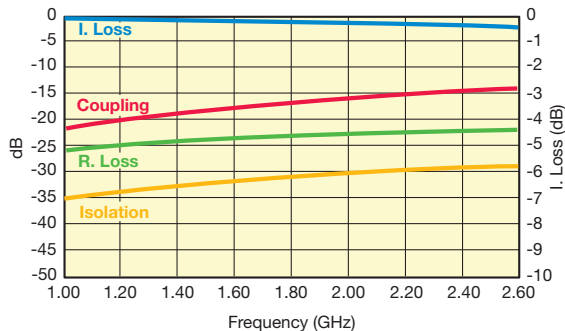
### LAYOUT



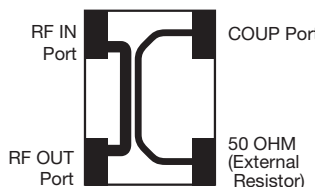
### Sn100 LAYOUT



Type: B  
Sub-Type: B



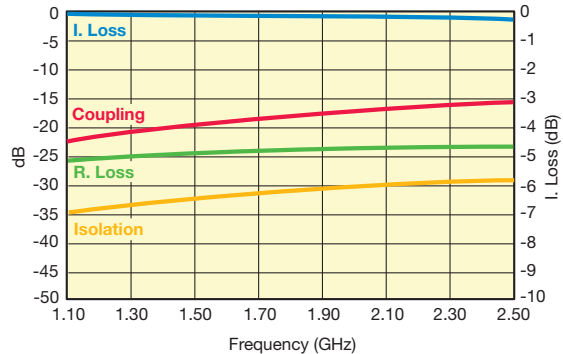
### LAYOUT



### Sn100 LAYOUT



Type: B  
Sub-Type: C



| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805B0836BW | 824 - 849            | 23.5±1        | 0.25        | 1.2      |
|              | CP0805B0881BW | 869 - 894            | 23±1          |             |          |
| GSM          | CP0805B0902BW | 890 - 915            | 22.5±1        |             |          |
|              | CP0805B0947BW | 935 - 960            | 22±1          |             |          |
| E-GSM        | CP0805B0897BW | 880 - 915            | 23±1          |             |          |
|              | CP0805B0942BW | 925 - 960            | 22±1          |             |          |
| PDC          | CP0805B1441BW | 1429 - 1453          | 18.5±1        |             |          |
| PCN          | CP0805B1747BW | 1710 - 1785          | 17±1          |             |          |
|              | CP0805B1842BW | 1805 - 1880          | 16.5±1        |             |          |
| PCS          | CP0805B1880BW | 1850 - 1910          | 16.5±1        |             |          |
|              | CP0805B1960BW | 1930 - 1990          | 16±1          |             |          |
| PHP          | CP0805B1907BW | 1895 - 1920          | 16±1          |             |          |
| DECT         | CP0805B1890BW | 1880 - 1900          | 16±1          |             |          |
| Wireless LAN | CP0805B2442BW | 2400 - 2484          | 14±1          | 0.4         |          |

| Application  | P/N Examples  | Frequency Band [MHz] | Coupling [dB] | I. Loss max | VSWR max |
|--------------|---------------|----------------------|---------------|-------------|----------|
| AMPS         | CP0805B0836CW | 824 - 849            | 25±1          | 0.25        | 1.2      |
|              | CP0805B0881CW | 869 - 894            | 24.5±1        |             |          |
| GSM          | CP0805B0902CW | 890 - 915            | 24±1          |             |          |
|              | CP0805B0947CW | 935 - 960            | 24±1          |             |          |
| E-GSM        | CP0805B0897CW | 880 - 915            | 24.5±1        |             |          |
|              | CP0805B0942CW | 925 - 960            | 24±1          |             |          |
| PDC          | CP0805B1441CW | 1429 - 1453          | 20±1          |             |          |
| PCN          | CP0805B1747CW | 1710 - 1785          | 18.5±1        |             |          |
|              | CP0805B1842CW | 1805 - 1880          | 18.5±1        |             |          |
| PCS          | CP0805B1880CW | 1850 - 1910          | 18±1          |             |          |
|              | CP0805B1960CW | 1930 - 1990          | 17.5±1        |             |          |
| PHP          | CP0805B1907CW | 1895 - 1920          | 18±1          |             |          |
| DECT         | CP0805B1890CW | 1880 - 1900          | 18±1          |             |          |
| Wireless LAN | CP0805B2442CW | 2400 - 2484          | 16±1          | 0.4         |          |

Important: Couplers can be used at any frequency within the indicated range.



# Thin-Film Directional Couplers

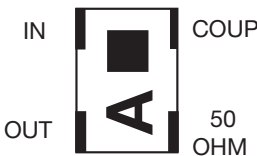


## CP0805 Layout Types

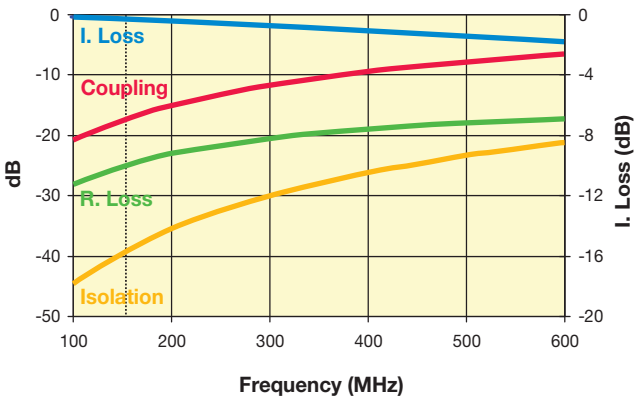
### VHF DIRECTIONAL COUPLER

CP0805L0155ASTR

Sn100 LAYOUT



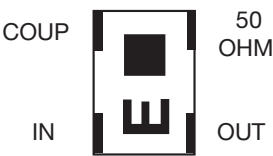
| P/N             | Frequency [MHz] | Coupling [dB] | R. Loss [dB] | I. Loss max [dB] | Directivity [dB] |
|-----------------|-----------------|---------------|--------------|------------------|------------------|
| CP0805L0155ASTR | 155             | 17.1±1        | 24           | 0.35             | 22               |



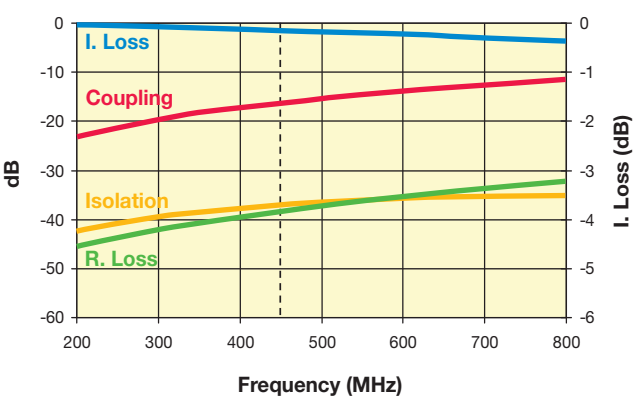
### UHF DIRECTIONAL COUPLER

CP0805L0436BSTR

Sn100 LAYOUT



| P/N             | Frequency [MHz] | Coupling [dB] | R. Loss [dB] | I. Loss max [dB] | Directivity [dB] |
|-----------------|-----------------|---------------|--------------|------------------|------------------|
| CP0805L0436BSTR | 403-470         | 15.85±1       | 35           | 0.25             | 22               |



Important: Couplers can be used at any frequency within the indicated range.

# Thin-Film Directional Couplers



## CP0805 and CP0603 Test Jig

### ITF TEST JIG FOR COUPLER TYPES 0805 AND 0603 SMD

#### GENERAL DESCRIPTION

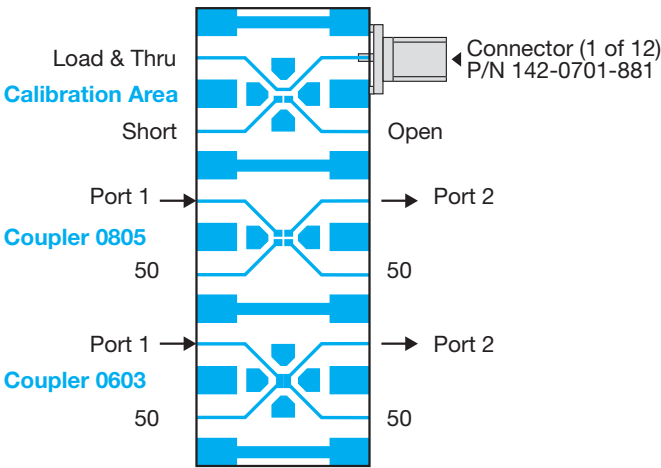
This jig is designed for the testing of CP0805 and CP0603 series Directional Couplers using a vector network analyzer. It consists of a FR4 multi-layer substrate, having 50Ω microstrips as conducting lines and a ground plane in the middle layer, located at a distance of 0.2mm from the microstrips.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-881.

The jig is designed for a full 2-port calibration. LOAD calibration can be done either by a 50Ω SMA termination, or by soldering a 50Ω chip resistor at the 50Ω ports.

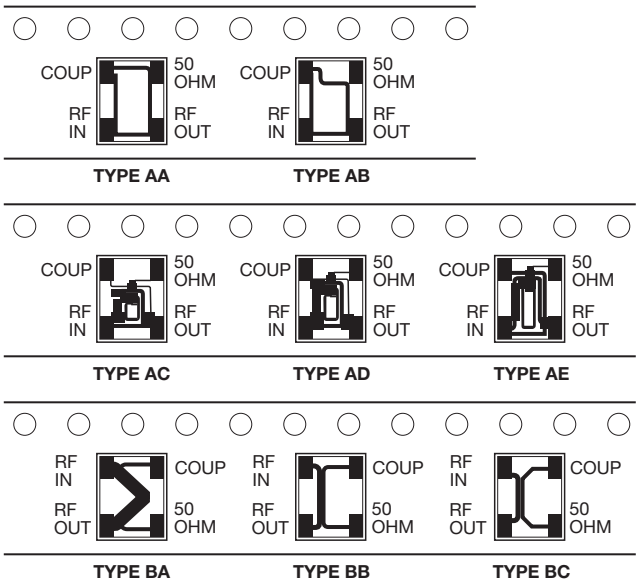
#### MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed by a non-metallic stick until all four ports touch the appropriate pads. To measure the coupling (and the R. Loss) place the component on the Port 1 & Port 2 pads. Use two SMA 50Ω terminations (male) to terminate the ports, which are not connected to the network analyzer, and connect the network analyzer to the two ports. A 90° rotation of the component on its pads allows measuring a second parameter (I. Loss).



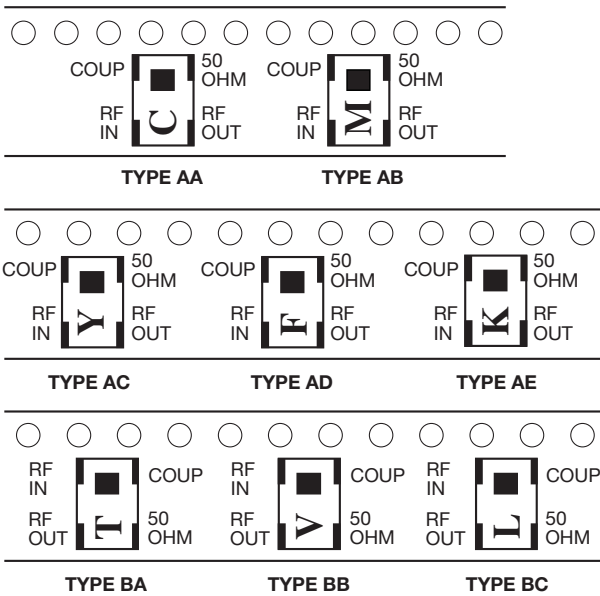
### CP0805 SERIES DIRECTIONAL COUPLERS

#### Orientation and Tape and Reel Packaging Specification (Top View)



The parts should be mounted on the PCB with White (Alumina) side down and the "dark" side up.

#### CP0805xxxxxxSTR (Sn100) (Top View)



The parts should be mounted on the PCB with printed side up.



# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



### GENERAL DESCRIPTION RFAP TECHNOLOGY

The DB0603N 3dB 90° Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The RFAP LGA 3dB 90° Coupler will be offered in a variety of frequency bands compatible with various types of high frequency wireless systems.



### APPLICATIONS

- Balanced Amplifiers and Signal Distribution in Wireless Communications

### FEATURES

- Miniature 0603 size
- Low I. Loss
- High Isolation
- Surface Mountable
- RoHS Compliant
- Supplied on T&R
- Power Rating:  
10W RF  
Continuous

### LAND GRID ARRAY ADVANTAGES:

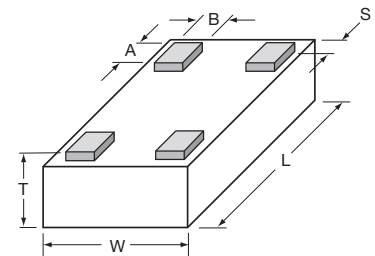
- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

### DIMENSIONS:

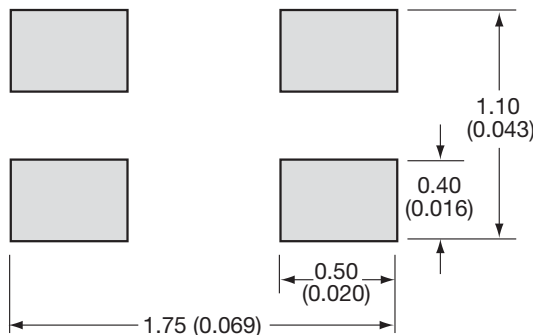
millimeters (inches)

|   |                            |
|---|----------------------------|
| L | 1.60±0.10<br>(0.063±0.004) |
| W | 0.84±0.10<br>(0.033±0.004) |
| T | 0.60±0.10<br>(0.024±0.004) |
| A | 0.25±0.05<br>(0.010±0.002) |
| B | 0.20±0.05<br>(0.008±0.002) |
| S | 0.05±0.05<br>(0.002±0.002) |

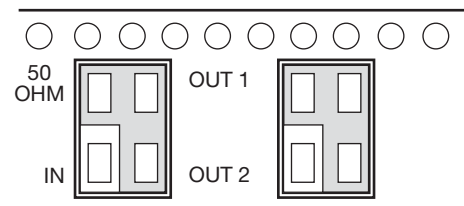
### Bottom View



### Recommended Pad Layout Dimensions mm (inches)



### ORIENTATION IN TAPE



### ELECTRICAL PARAMETERS

| Part Number     | Frequency MHz |      | Port Impedance $\Omega$ | Return Loss [dB] |      | Isolation [dB] |      | Insertion Loss [dB] |      | Amplitude Balance [dB] |      | Phase Balance (Relative to 90°) Deg |      | Power Handling Watts |
|-----------------|---------------|------|-------------------------|------------------|------|----------------|------|---------------------|------|------------------------|------|-------------------------------------|------|----------------------|
|                 | Min.          | Max. |                         | Min.             | Typ. | Min.           | Typ. | Typ.                | Max. | Typ.                   | Max. | Typ.                                | Max. |                      |
| DB0603N2140ANTR | 2040          | 2240 | 50                      | 15               | 26   | 15             | 23   | 0.30                | 0.40 | 0.50                   | 0.80 | 2                                   | 3    | 10                   |
| DB0603N2400ANTR | 2300          | 2500 | 50                      | 12               | 17   | 15             | 23   | 0.25                | 0.35 | 0.30                   | 0.80 | 2                                   | 3    | 10                   |
| DB0603N2600ANTR | 2400          | 2800 | 50                      | 12               | 17   | 15             | 23   | 0.25                | 0.35 | 0.30                   | 0.80 | 2                                   | 3    | 10                   |
| DB0603N3000ANTR | 2850          | 3150 | 50                      | 12               | 15   | 15             | 26   | 0.20                | 0.30 | 0.30                   | 0.80 | 2                                   | 3    | 10                   |
| DB0603N3500ANTR | 3300          | 3700 | 50                      | 12               | 15   | 15             | 26   | 0.20                | 0.30 | 0.30                   | 0.80 | 2                                   | 3    | 10                   |
| DB0603N4600ANTR | 4200          | 5000 | 50                      | 12               | 16   | 12             | 15   | 0.50                | 0.70 | 0.40                   | 1.00 | 1.5                                 | 3    | 10                   |
| DB0603N5500ANTR | 5100          | 5900 | 50                      | 12               | 16   | 10             | 14   | 0.60                | 0.80 | 0.80                   | 1.50 | 1                                   | 3    | 10                   |
| DB0603N5800ANTR | 5600          | 6000 | 50                      | 12               | 16   | 12             | 17   | 0.40                | 0.90 | 0.30                   | 0.90 | 2                                   | 3    | 10                   |

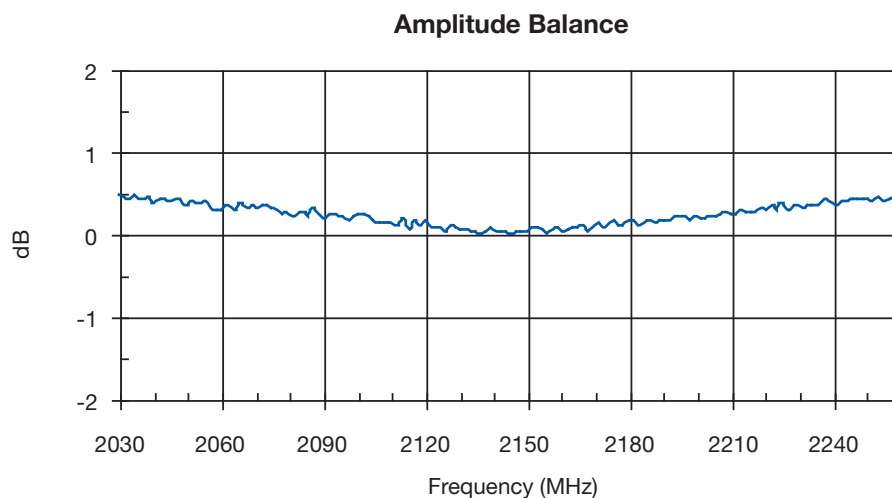
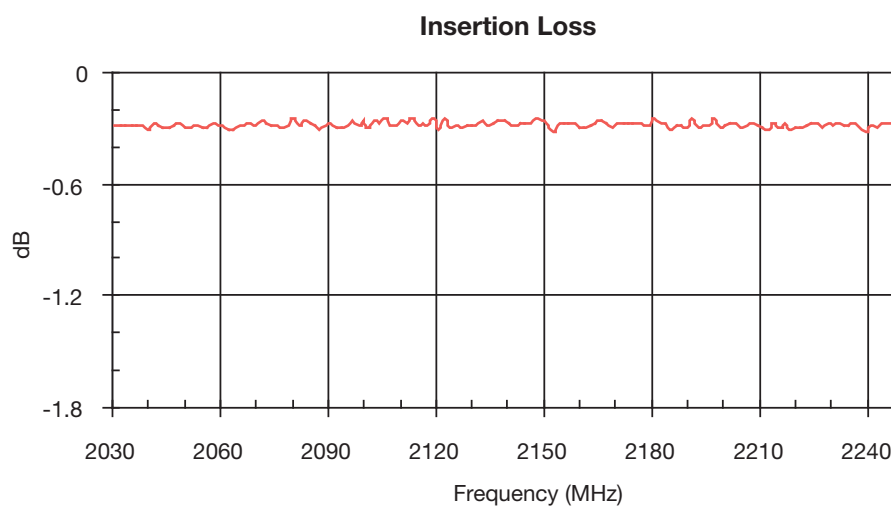
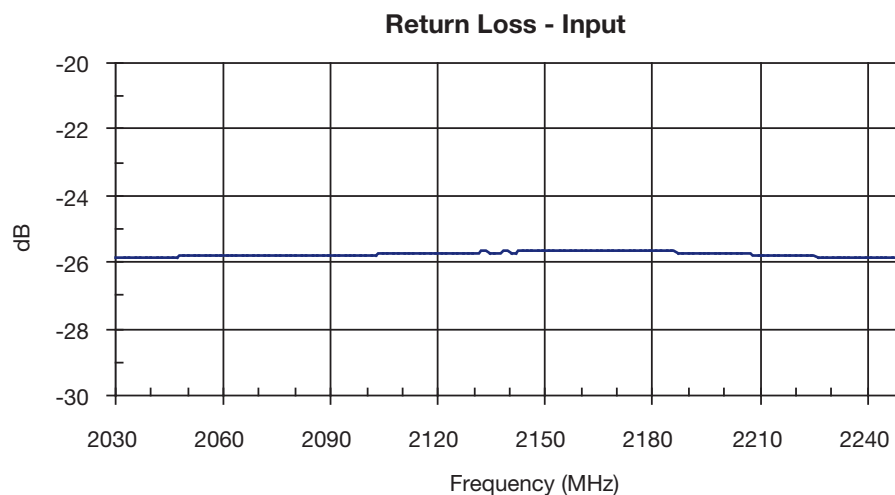
NOTE: Additional Frequencies Available Upon Request

# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



2040MHz to 2240MHz DB0603N2140ANTR



3

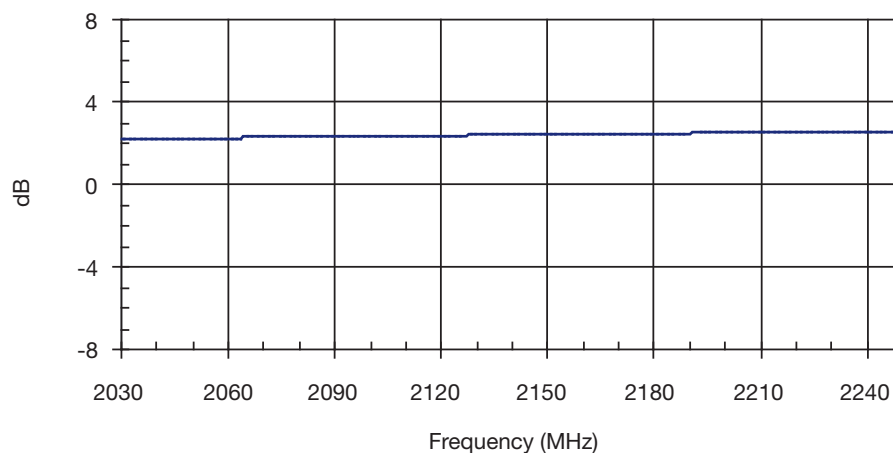
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

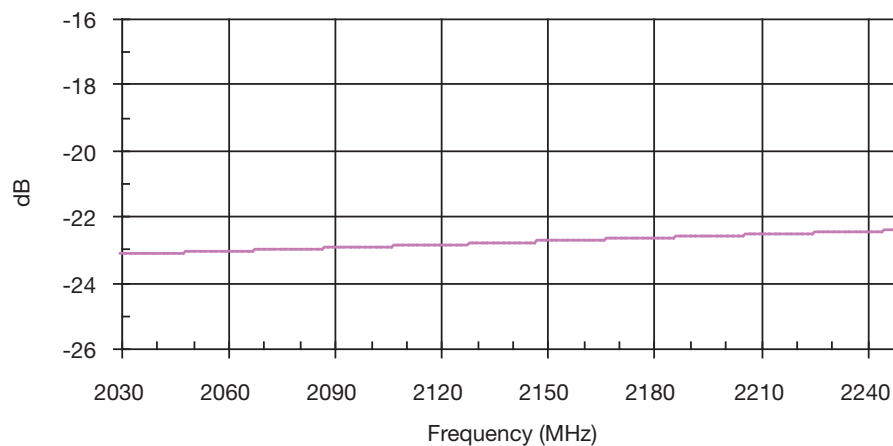


2040MHz to 2240MHz DB0603N2140ANTR

Phase Balance



Isolation



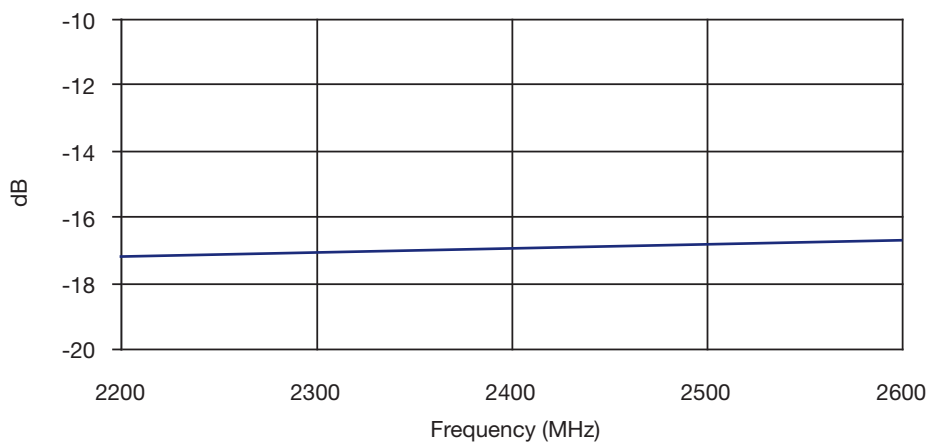
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

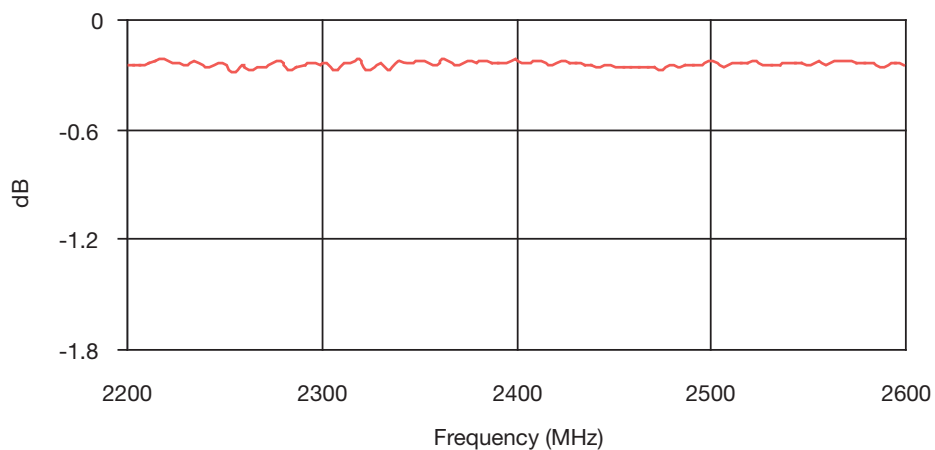


2200MHz to 2600MHz DB0603N2400ANTR

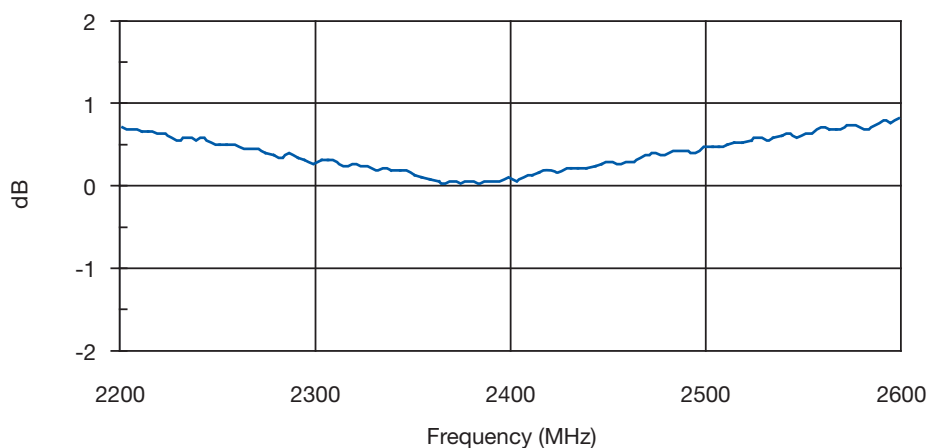
Return Loss - Input



Insertion Loss



Amplitude Balance



3



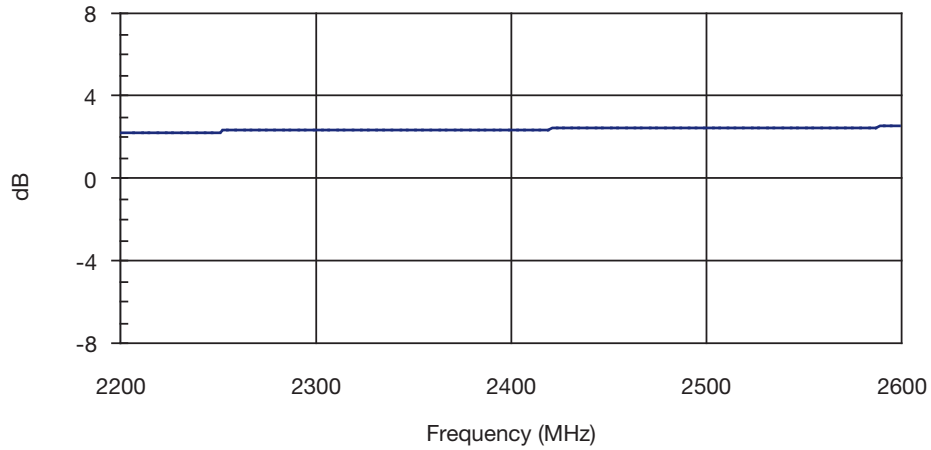
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

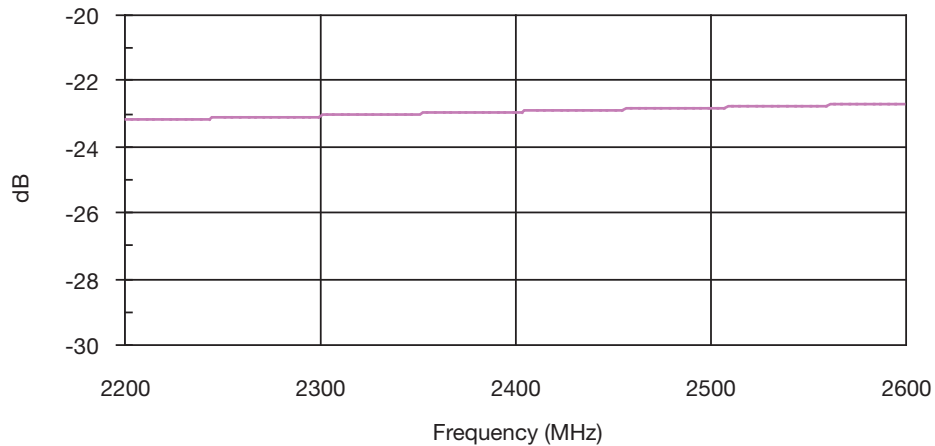


2200MHz to 2600MHz DB0603N2400ANTR

Phase Balance



Isolation

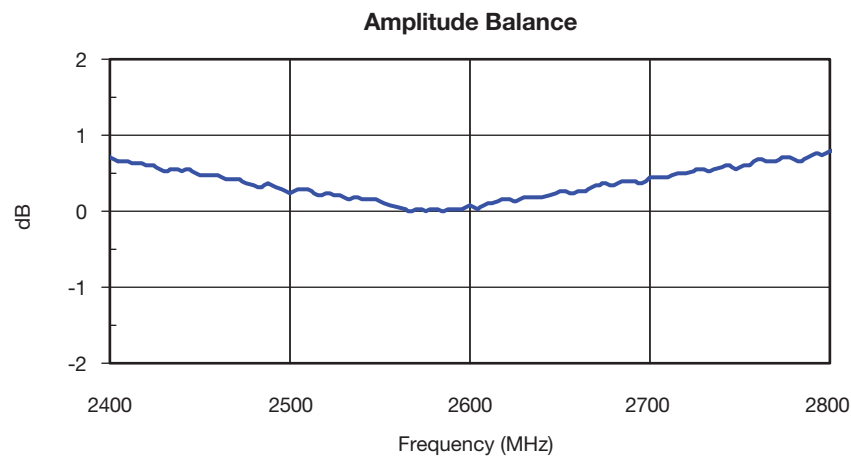
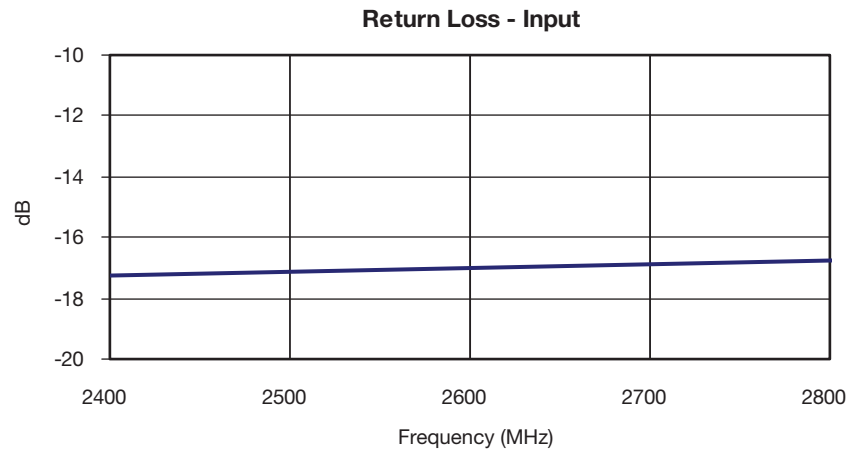


# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



### 2400MHz TO 2800MHz DB0603N2600ANTR



3

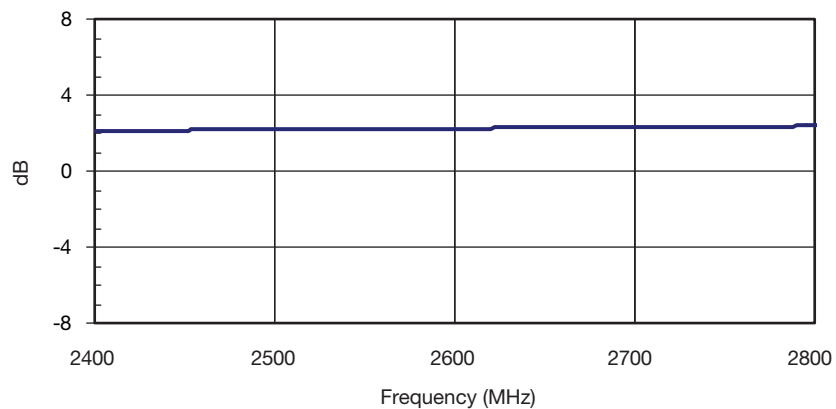
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

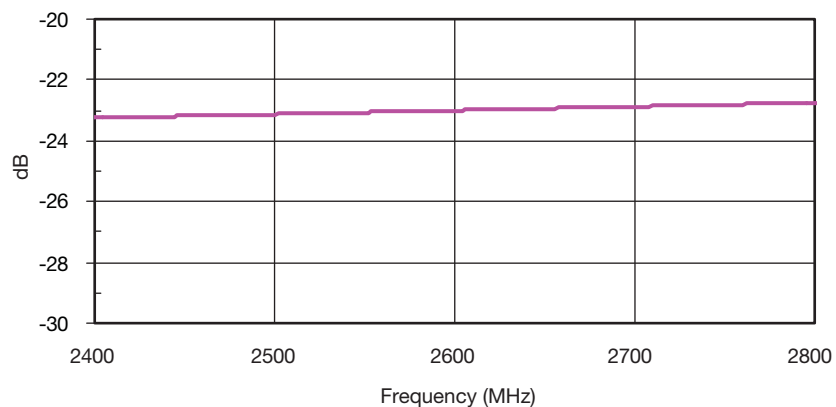


### 2400MHz TO 2800MHz DB0603N2600ANTR

Phase Balance



Isolation



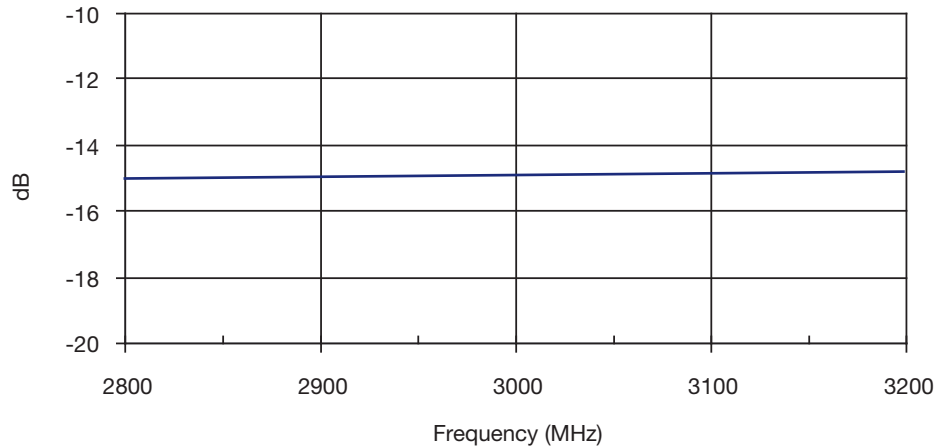
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

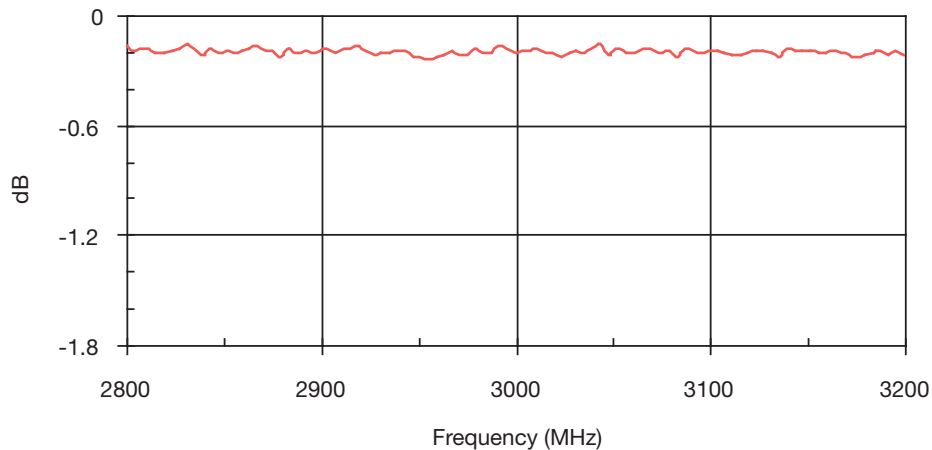


2850MHz to 3150MHz DB0603N3000ANTR

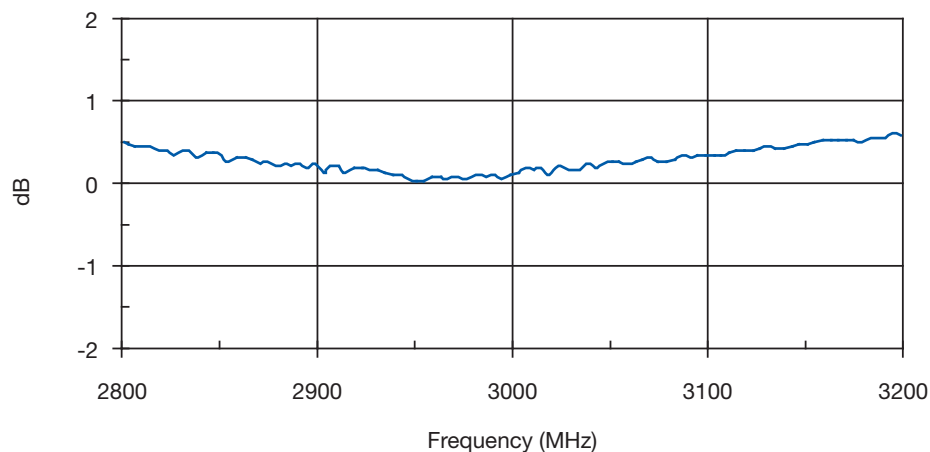
Return Loss - Input



Insertion Loss



Amplitude Balance



3



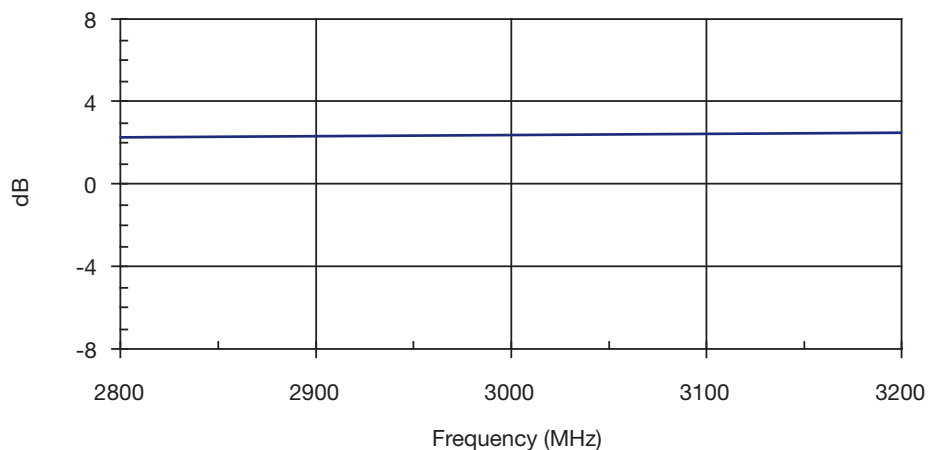
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

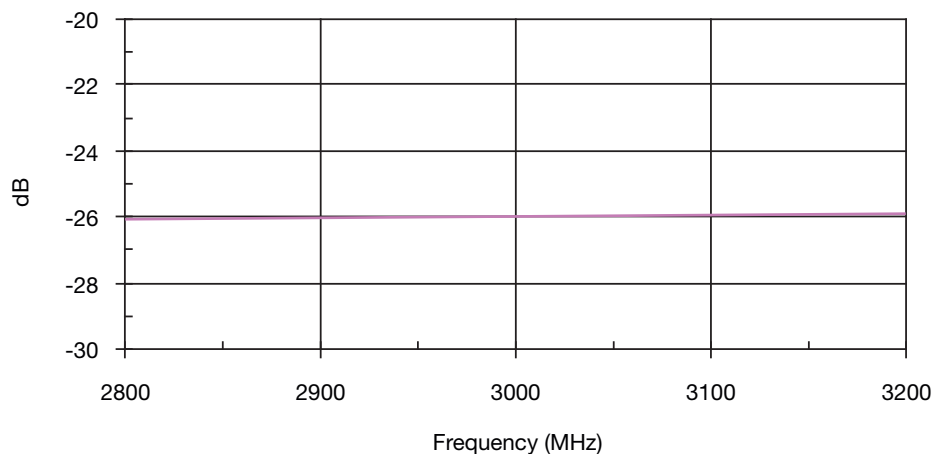


2850MHz to 3150MHz DB0603N3000ANTR

Phase Balance



Isolation



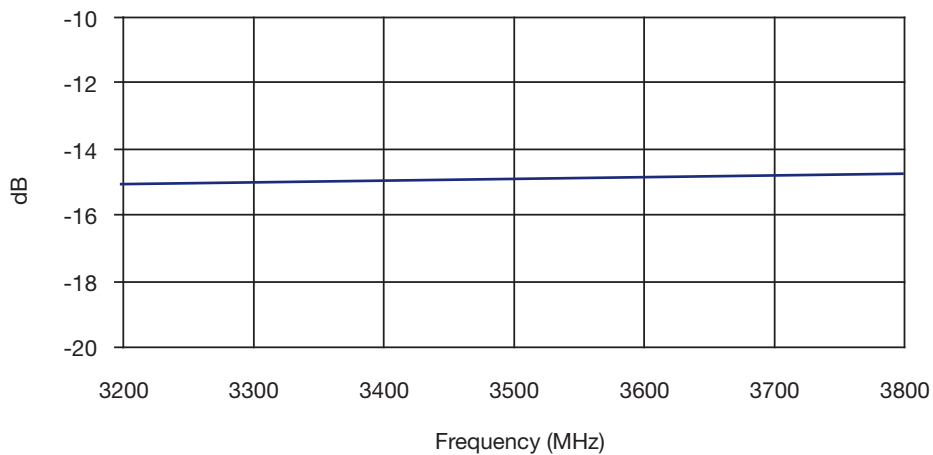
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

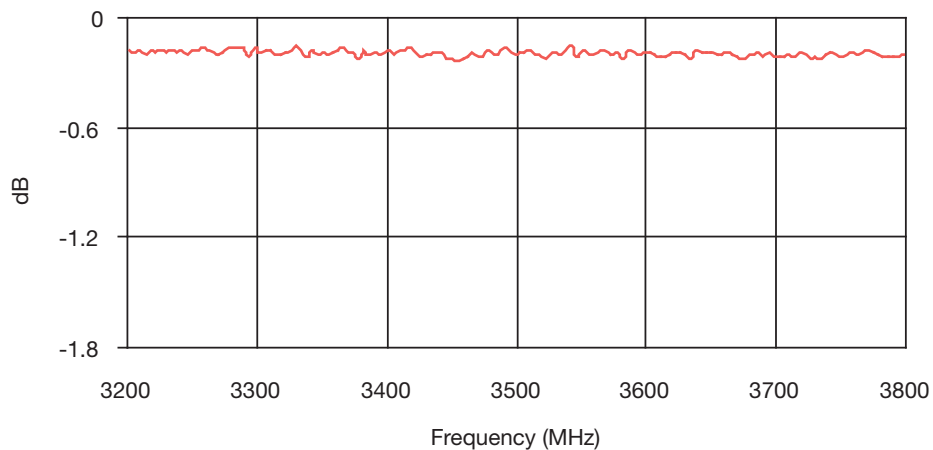


3200MHz to 3800MHz DB0603N3500ANTR

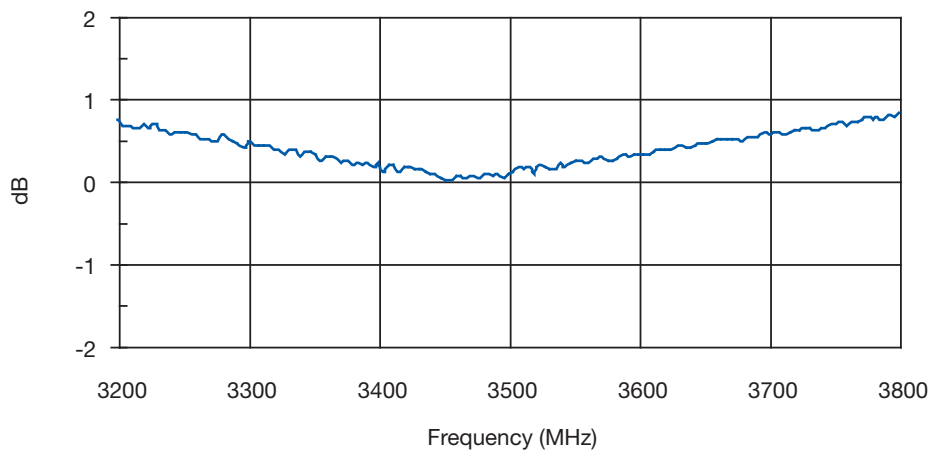
Return Loss - Input



Insertion Loss



Amplitude Balance



3

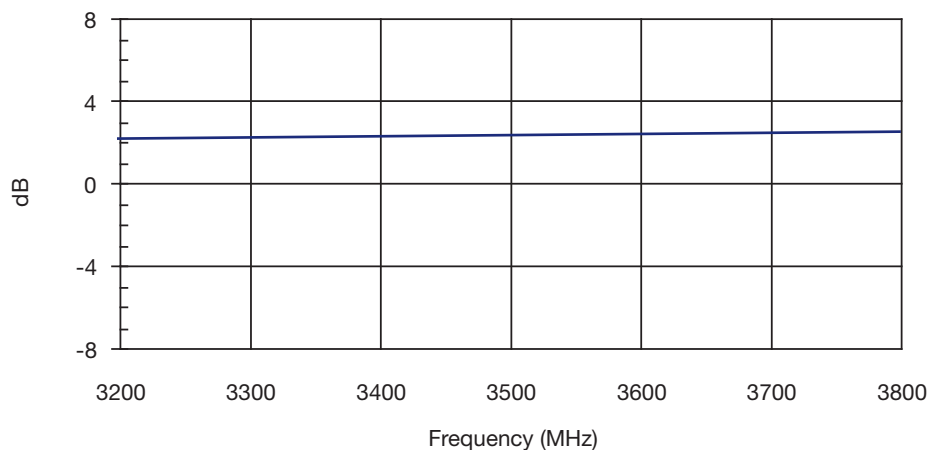
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

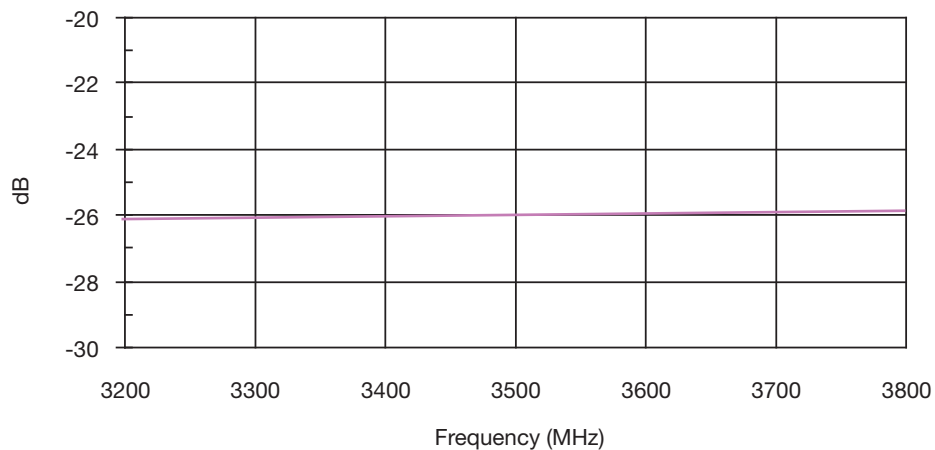


3200MHz to 3800MHz DB0603N3500ANTR

Phase Balance



Isolation

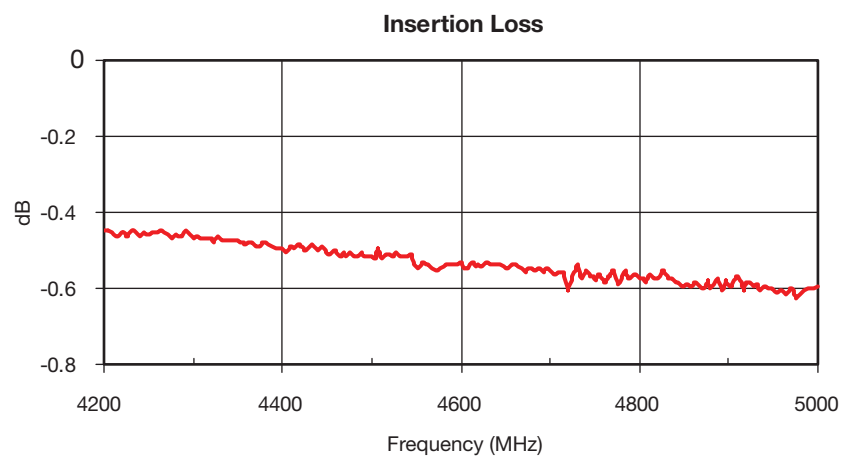
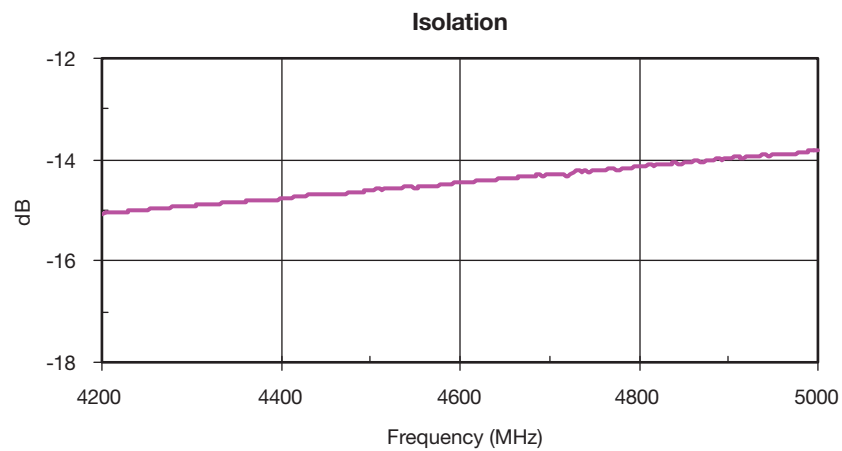
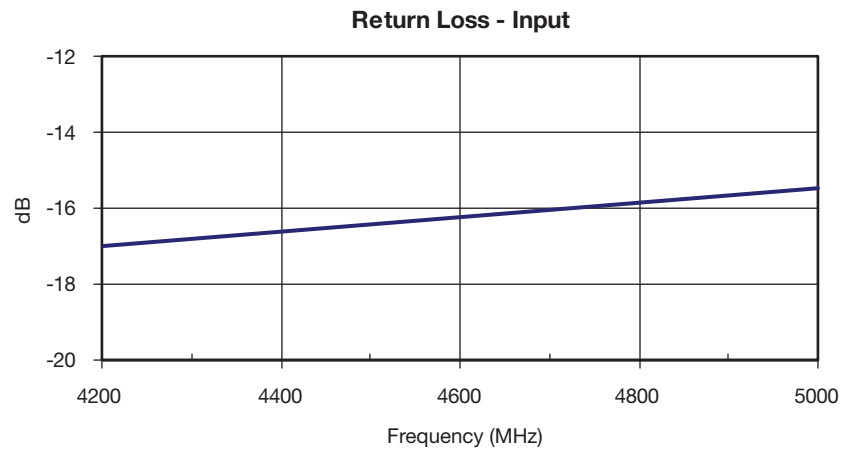


# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



### 4200MHz TO 5000MHz DB0603N4600ANTR



3

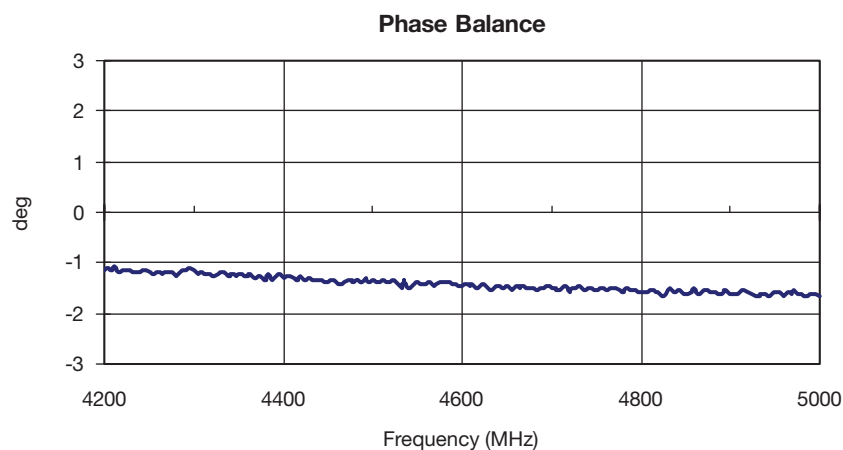
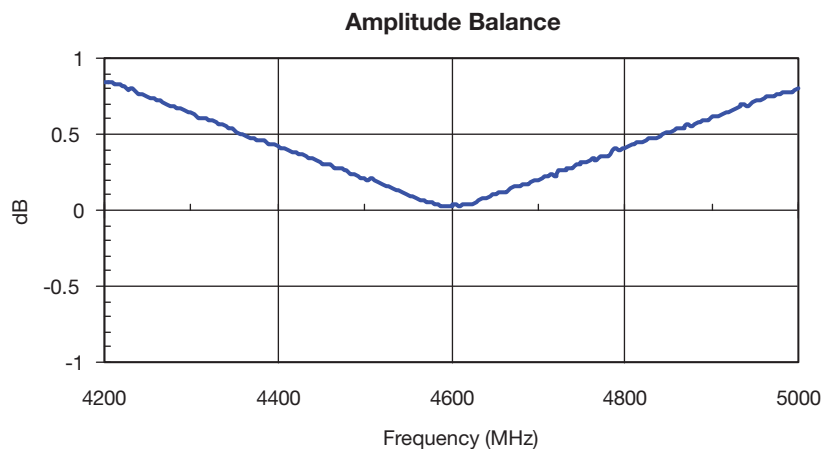


# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



4200MHz TO 5000MHz DB0603N4600ANTR

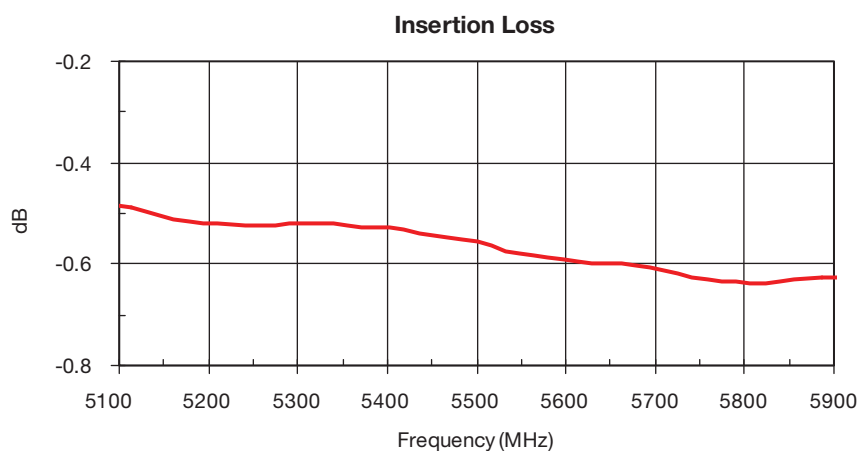
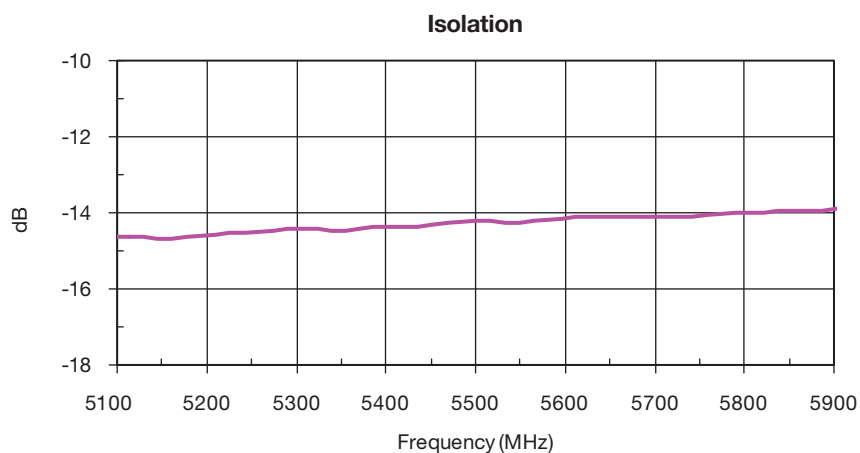
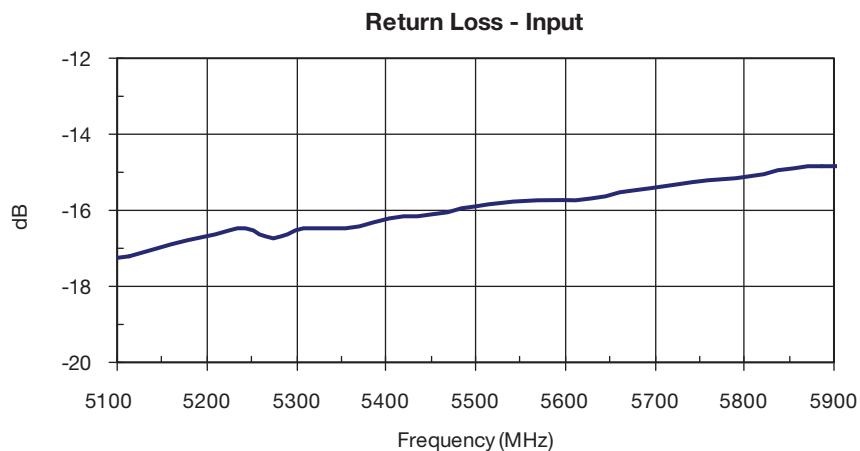


# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



### 5100MHz TO 5900MHz DB0603N5500ANTR



3

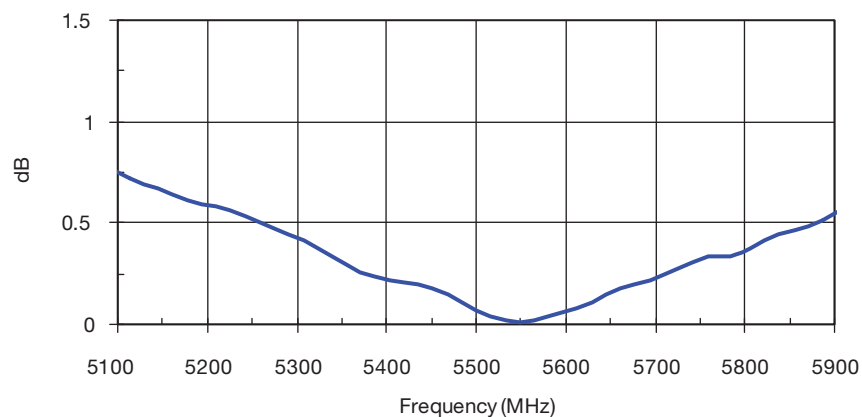
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

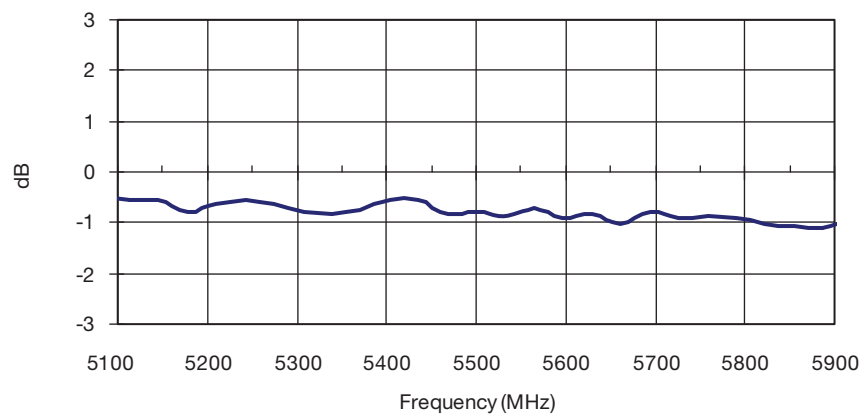


### 5100MHz TO 5900MHz DB0603N5500ANTR

Amplitude Balance



Phase Balance

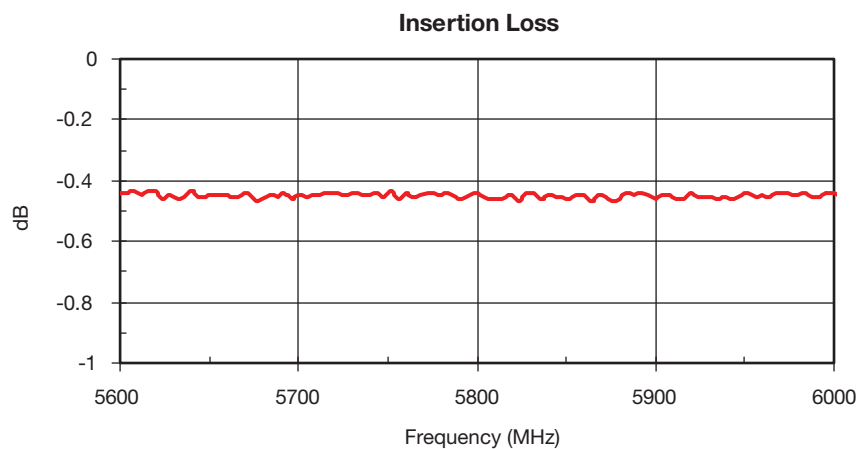
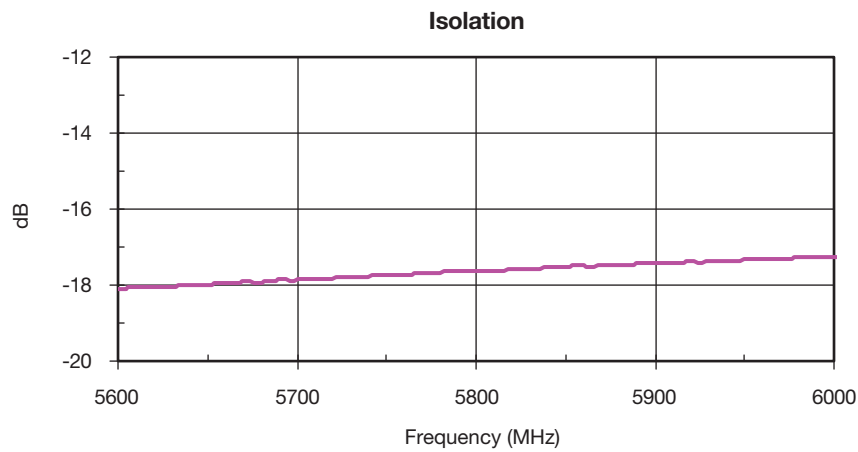
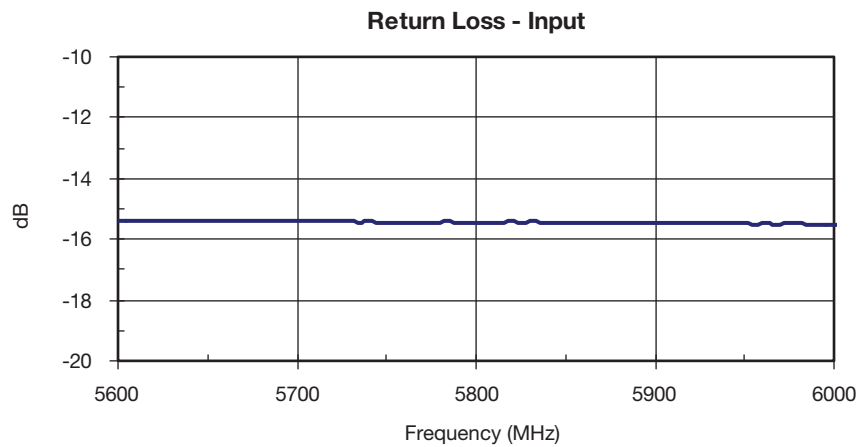


# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers



### 5600MHz TO 6000MHz DB0603N5800ANTR



3

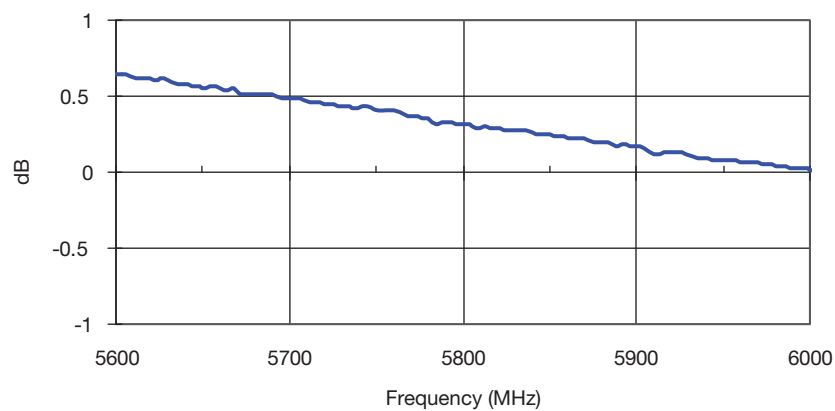
# Thin-Film Directional Couplers

## DB0603N 3dB 90° Couplers

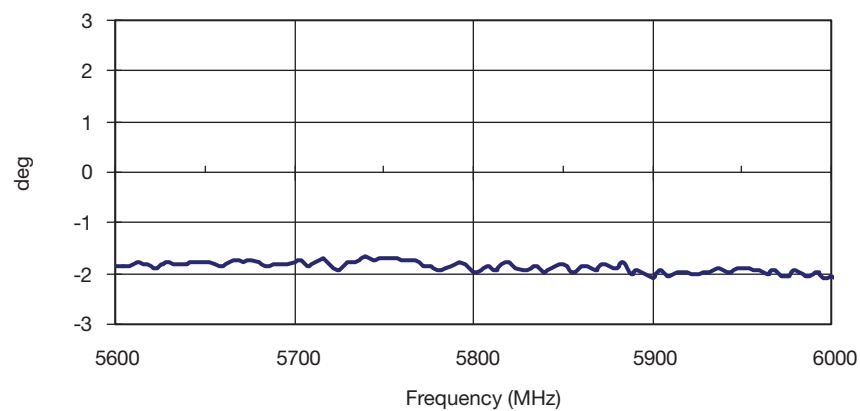


### 5600MHz TO 6000MHz DB0603N5800ANTR

Amplitude Balance



Phase Balance



3

# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



### GENERAL DESCRIPTION ITF TECHNOLOGY

The ITF SMD 3dB 90° Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF 3dB 90° Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

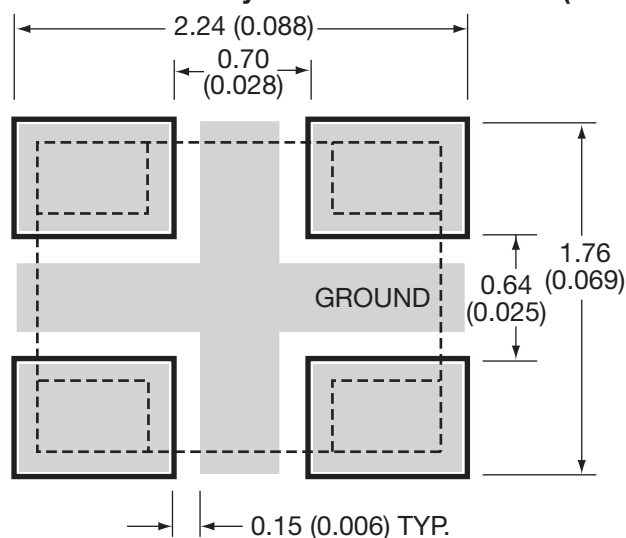
### APPLICATIONS

- Balanced Amplifiers and Signal Distribution in Mobile Communications

### FEATURES

- Miniature 0805 size
- Low I. Loss
- High Isolation
- Power Handling: 10W RF CW
- Surface Mountable
- Supplied on Tape and Reel
- Operating Temperature -40°C to +85°C

### Recommended Pad Layout Dimensions mm (inches)

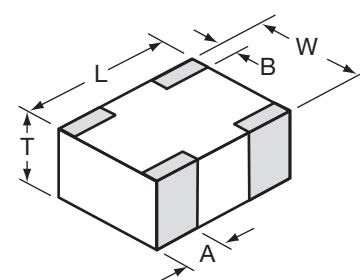


### DIMENSIONS:

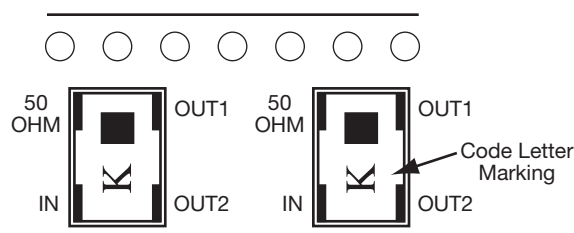
millimeters (inches)

|   |                            |
|---|----------------------------|
| L | 2.03±0.10<br>(0.080±0.004) |
| W | 1.55±0.10<br>(0.061±0.004) |
| T | 0.98±0.15<br>(0.037±0.006) |
| A | 0.56±0.25<br>(0.022±0.010) |
| B | 0.35±0.15<br>(0.014±0.006) |

### Bottom View



### TERMINALS (Top View) Orientation in Tape



### ELECTRICAL PARAMETERS\*

| Part Number**   | Frequency F <sub>0</sub><br>[MHz] | I. Loss @ F <sub>0</sub><br>[dB] | Phase Balance<br>[deg] max. | Code Letter<br>Marking |
|-----------------|-----------------------------------|----------------------------------|-----------------------------|------------------------|
| DB0805A0880ASTR | 880±30                            | 0.35                             | 3                           | Y                      |
| DB0805A0915ASTR | 915±30                            | 0.35                             | 3                           | V                      |
| DB0805A0967ASTR | 967±30                            | 0.35                             | 3                           | V                      |
| DB0805A1350ASTR | 1350±50                           | 0.35                             | 3                           | C                      |
| DB0805A1650ASTR | 1650±50                           | 0.35                             | 3                           | F                      |
| DB0805A1800ASTR | 1800±50                           | 0.30                             | 3                           | F                      |
| DB0805A1850ASTR | 1850±50                           | 0.30                             | 3                           | K                      |
| DB0805A1900ASTR | 1900±50                           | 0.30                             | 3                           | K                      |
| DB0805A1950ASTR | 1950±50                           | 0.25                             | 3                           | K                      |
| DB0805A2140ASTR | 2140±50                           | 0.25                             | 3                           | L                      |
| DB0805A2325ASTR | 2325±50                           | 0.25                             | 3                           | T                      |

\*With Recommended Pad Layout

NOTE: Additional Frequencies Available Upon Request

### \*\*LEAD FREE TERMINATION PART NUMBERS: DB0805AxxxxASTR

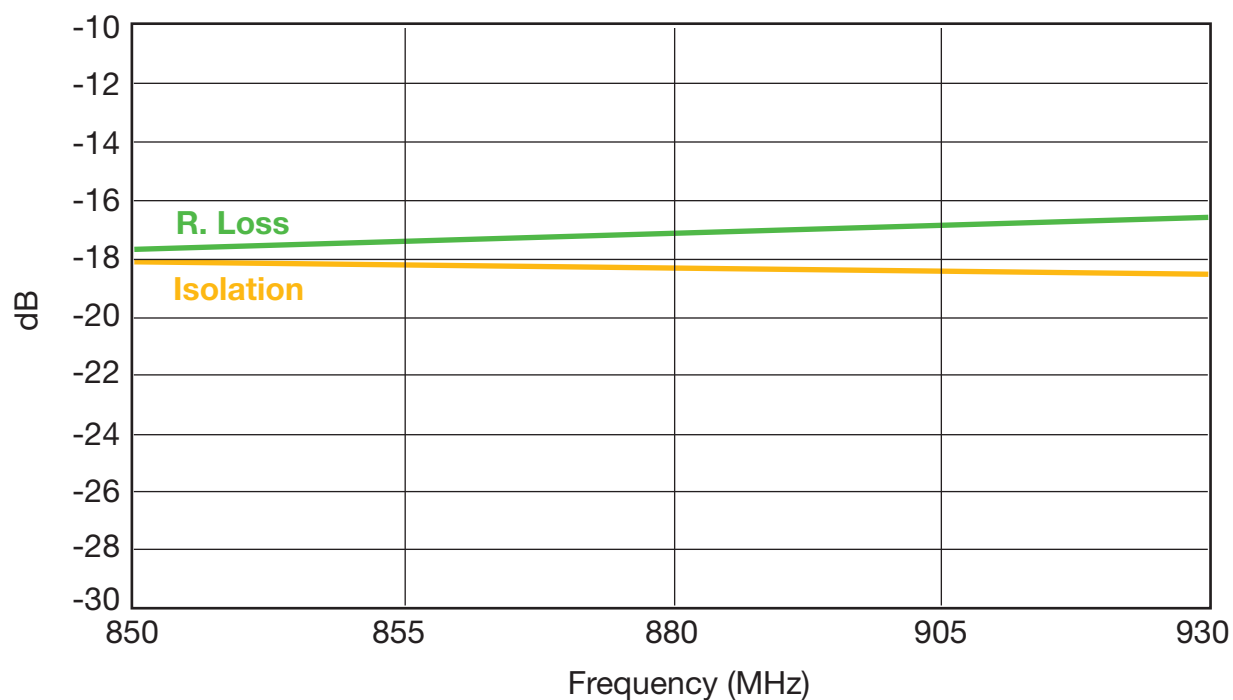
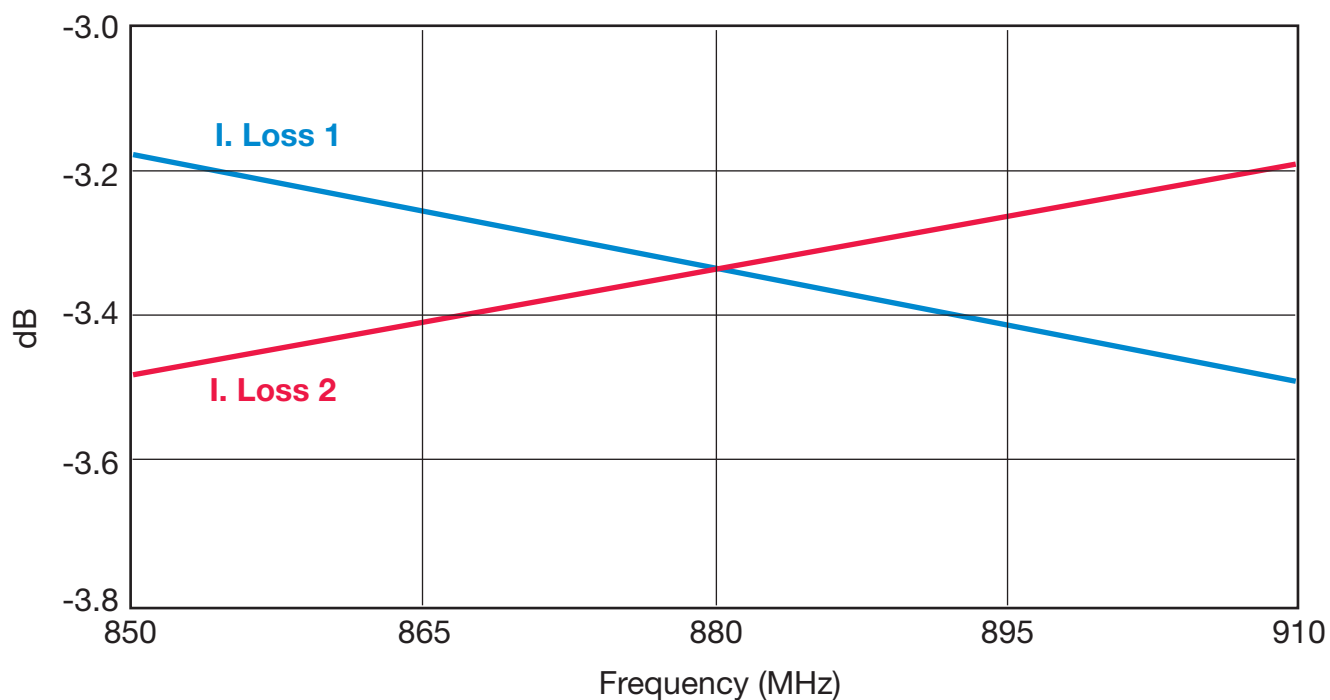


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



880 ± 30MHz DB0805A0880ASTR

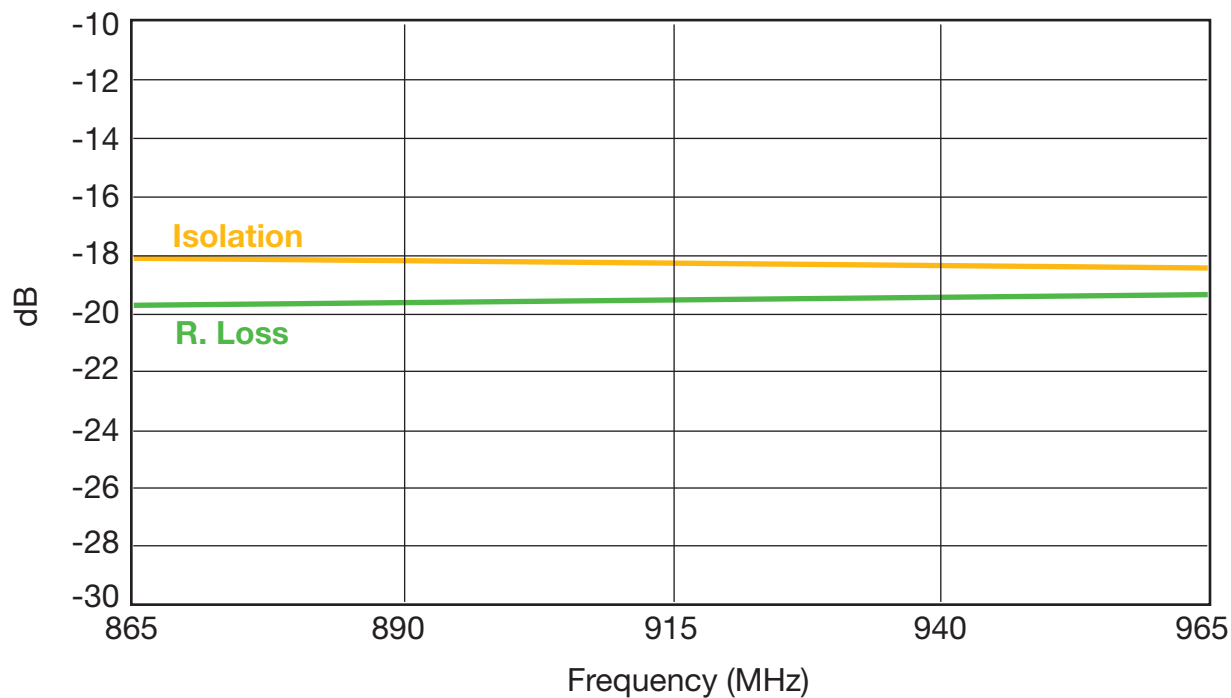
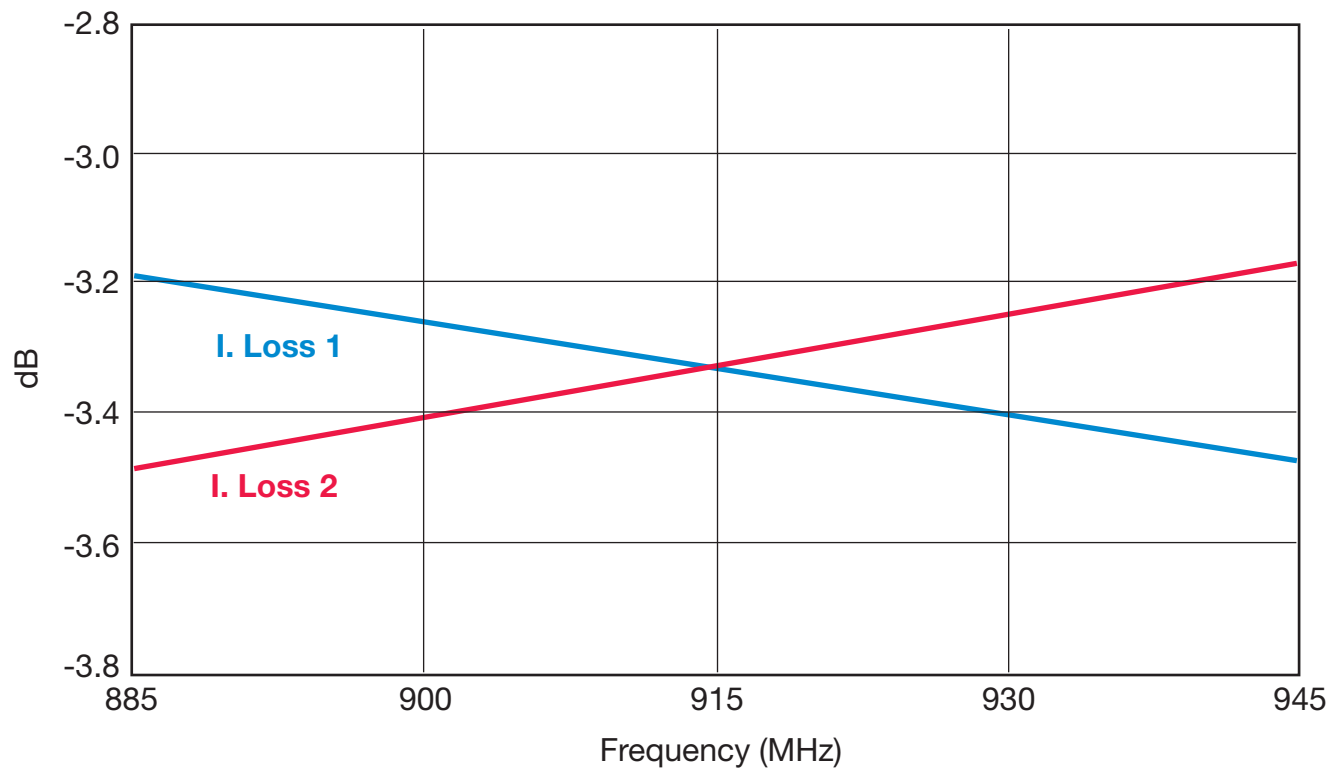


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



915  $\pm$  30MHz DB0805A0915ASTR

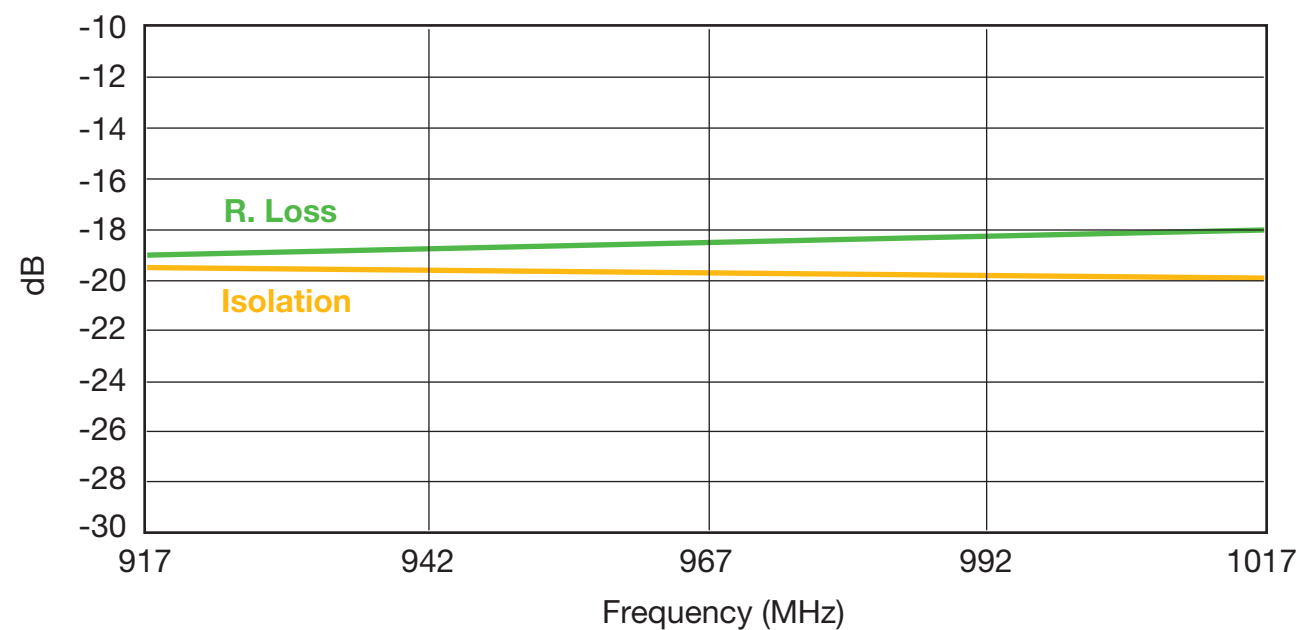
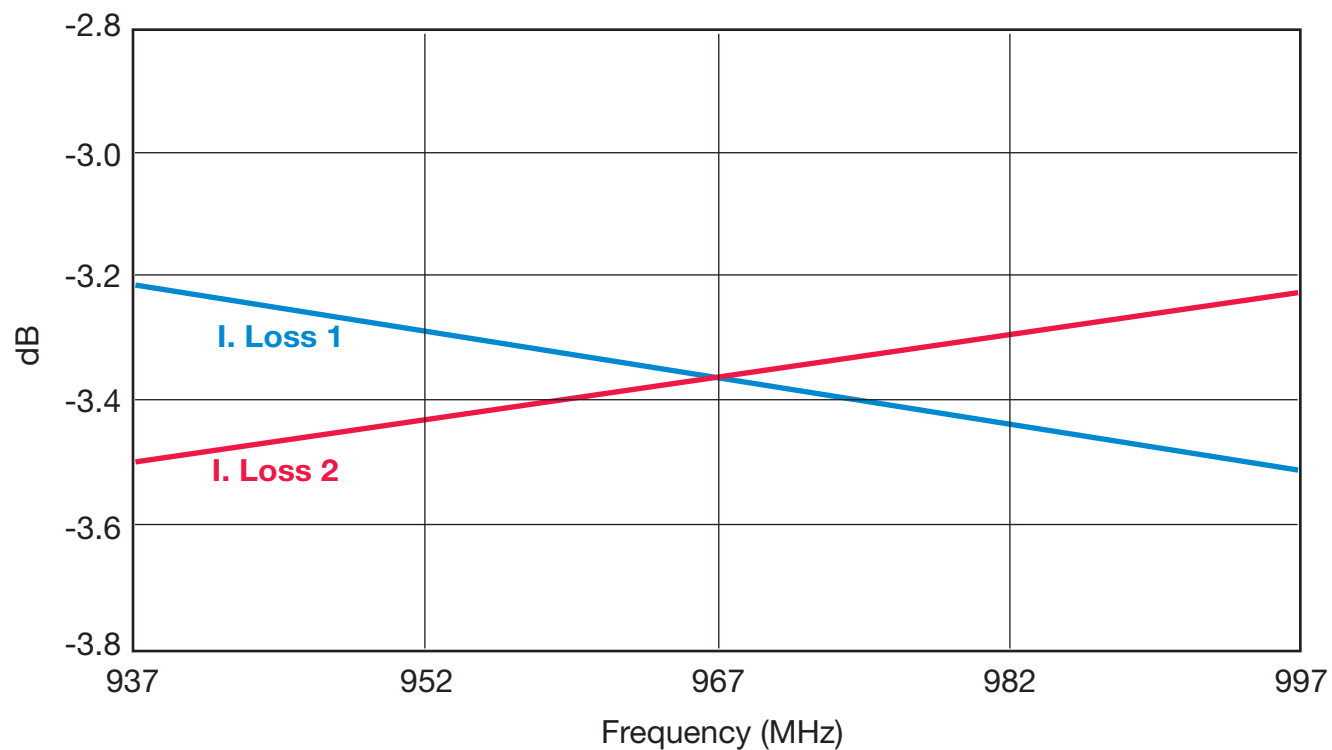


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



967± 30MHz DB0805A0967ASTR

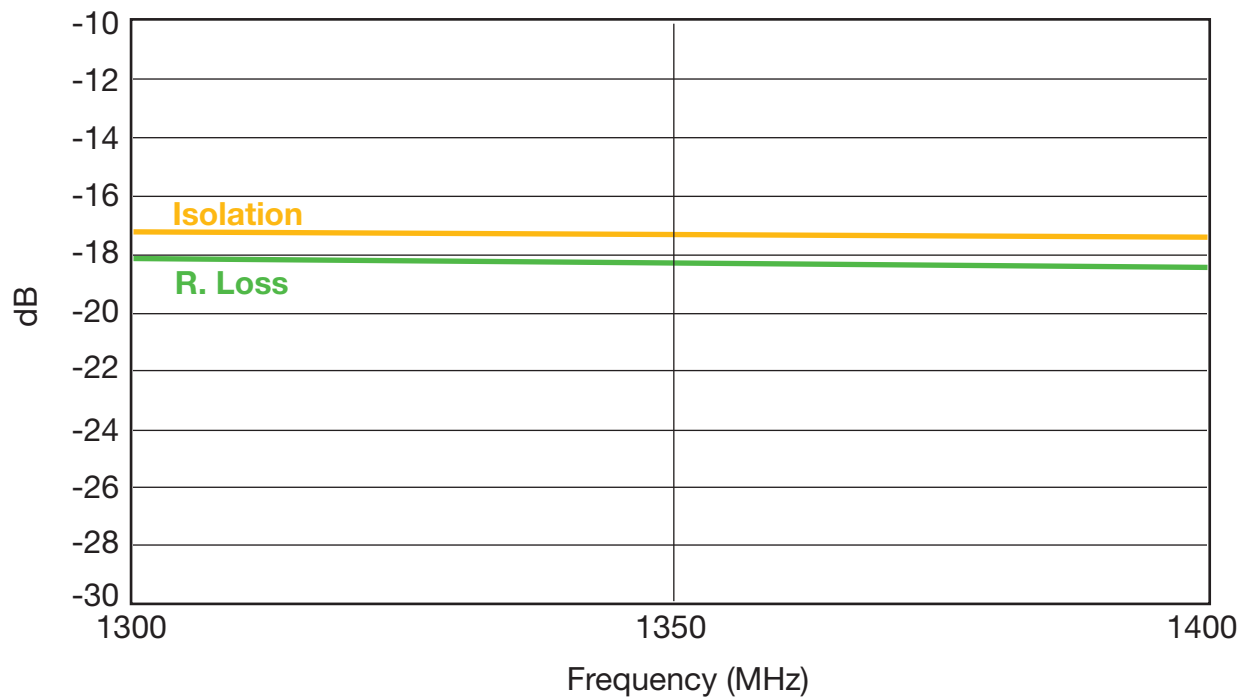
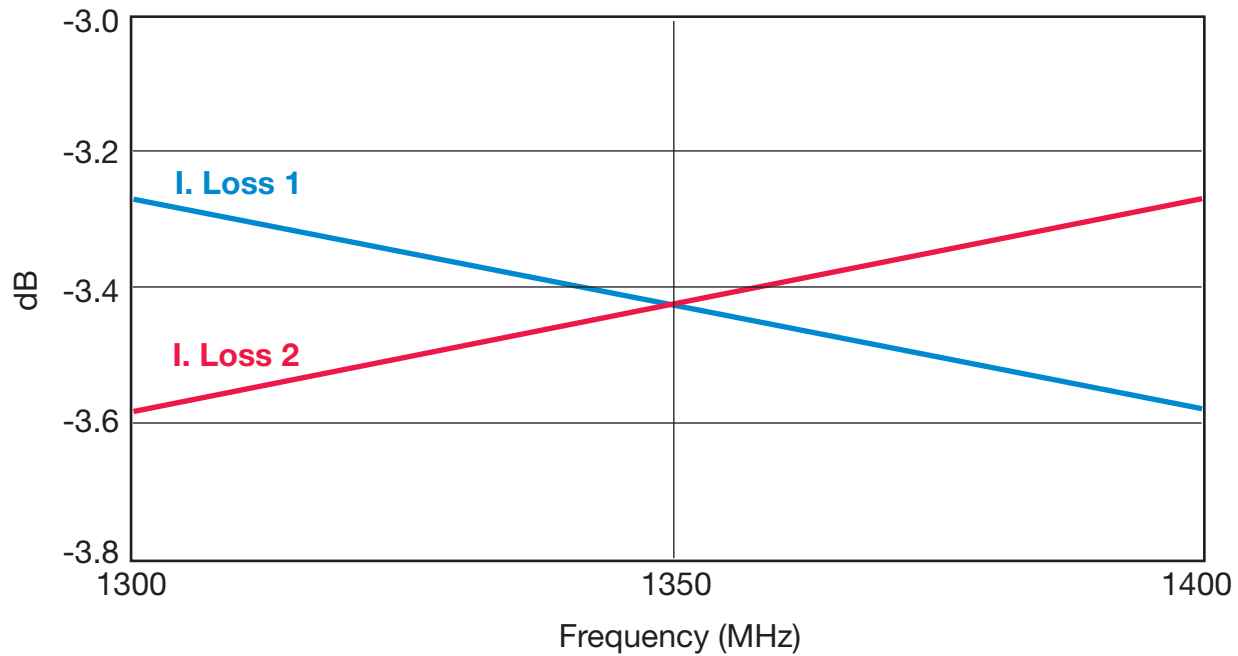


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



1350 ± 50MHz DB0805A1350ASTR



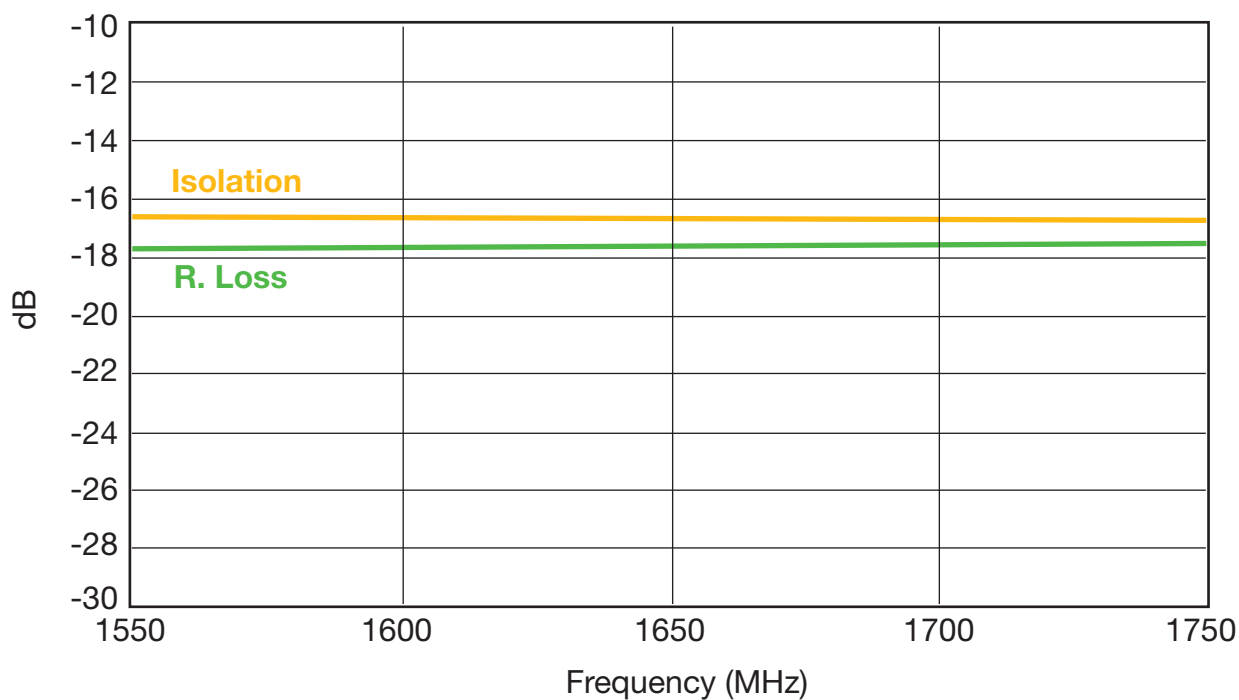
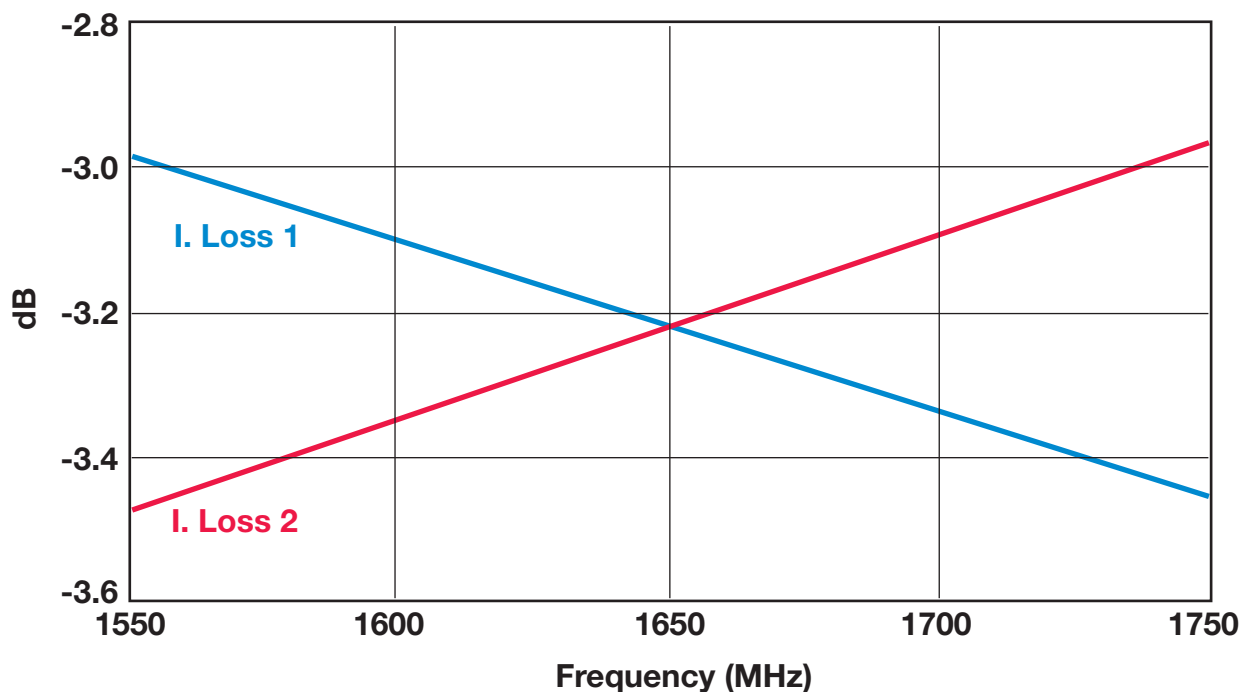
3

# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



1650 ± 50MHz DB0805A1650ASTR

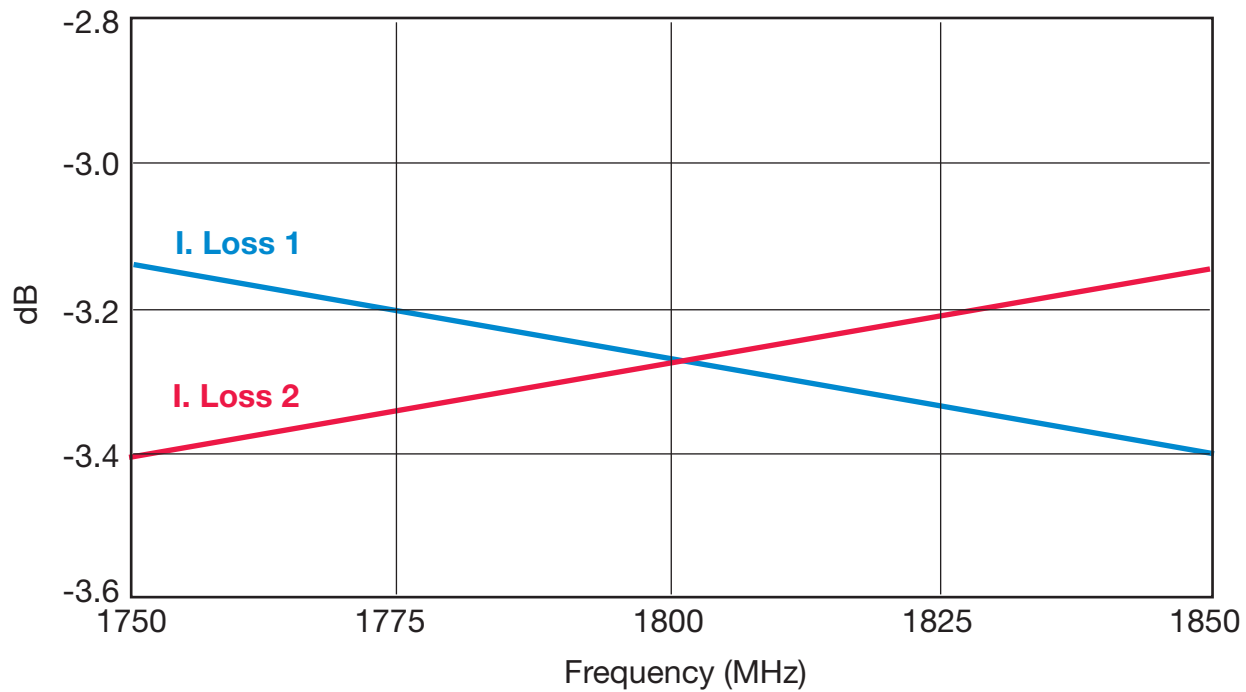


# Thin-Film Directional Couplers

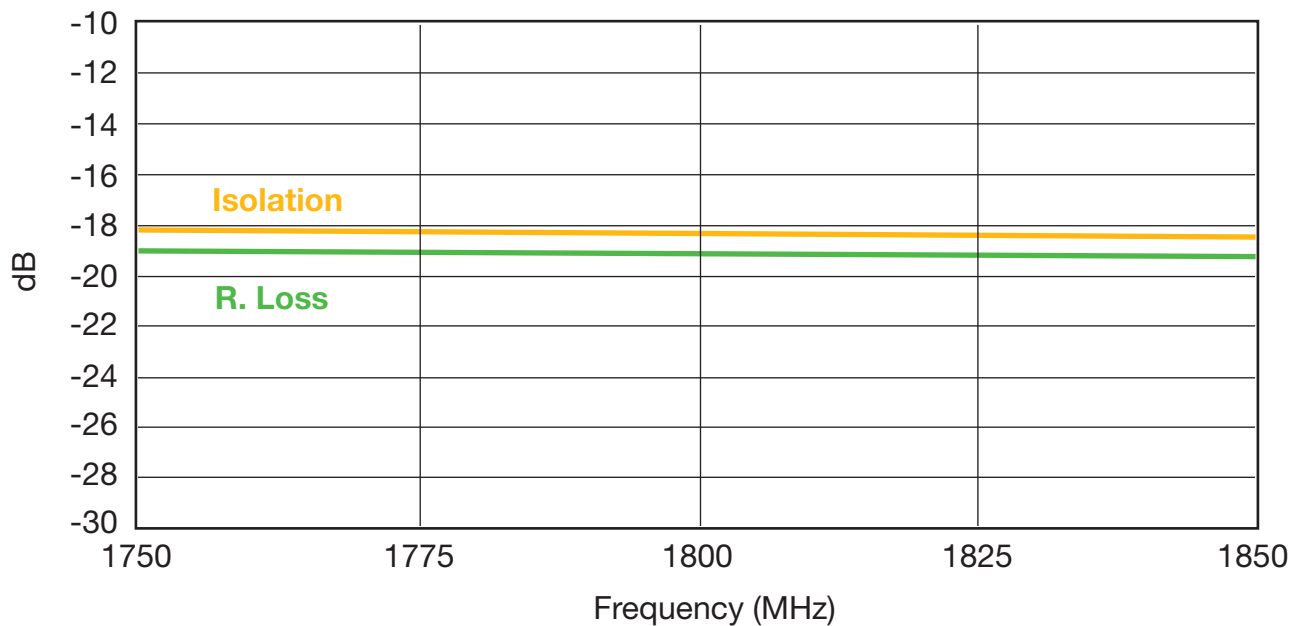
## DB0805 3dB 90° Couplers



1800 ± 50MHz DB0805A1800ASTR



3

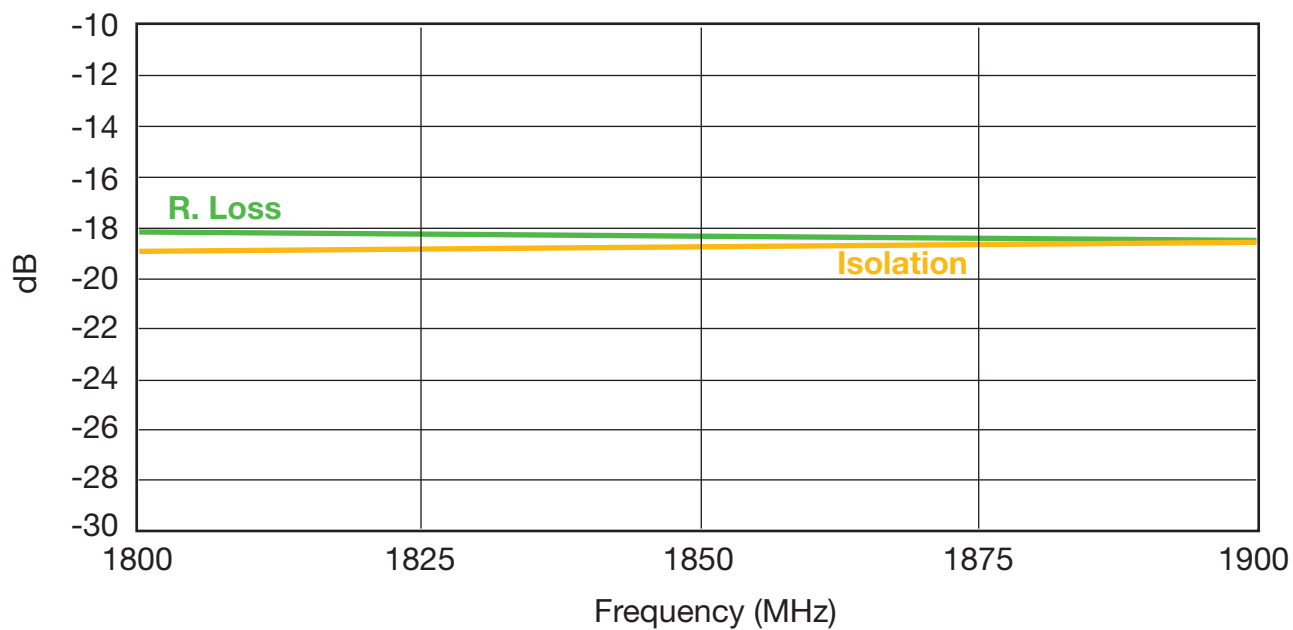
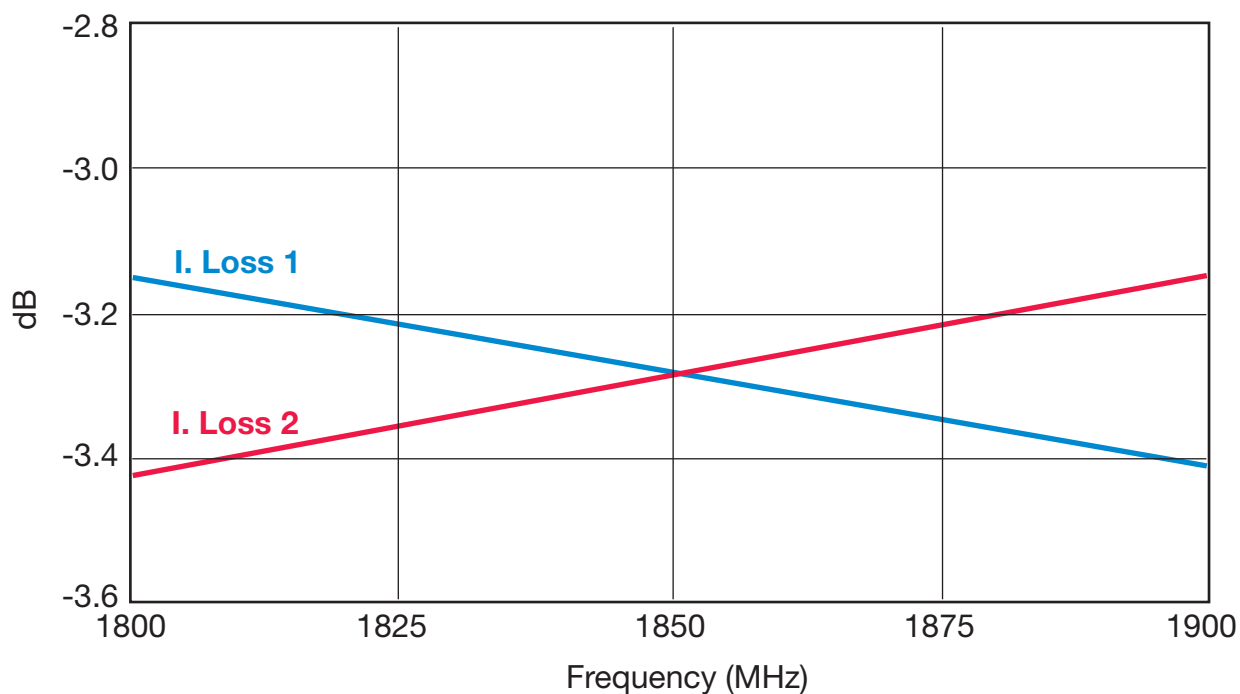


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



1850 ± 50MHz DB0805A1850ASTR

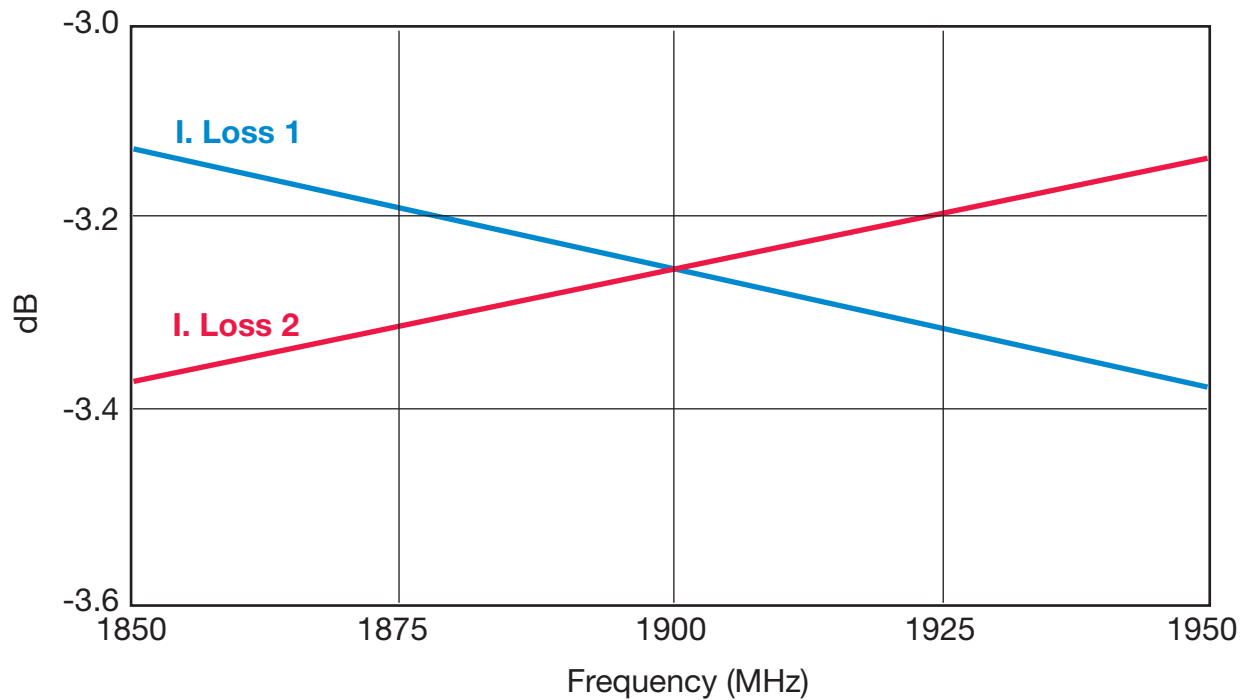


# Thin-Film Directional Couplers

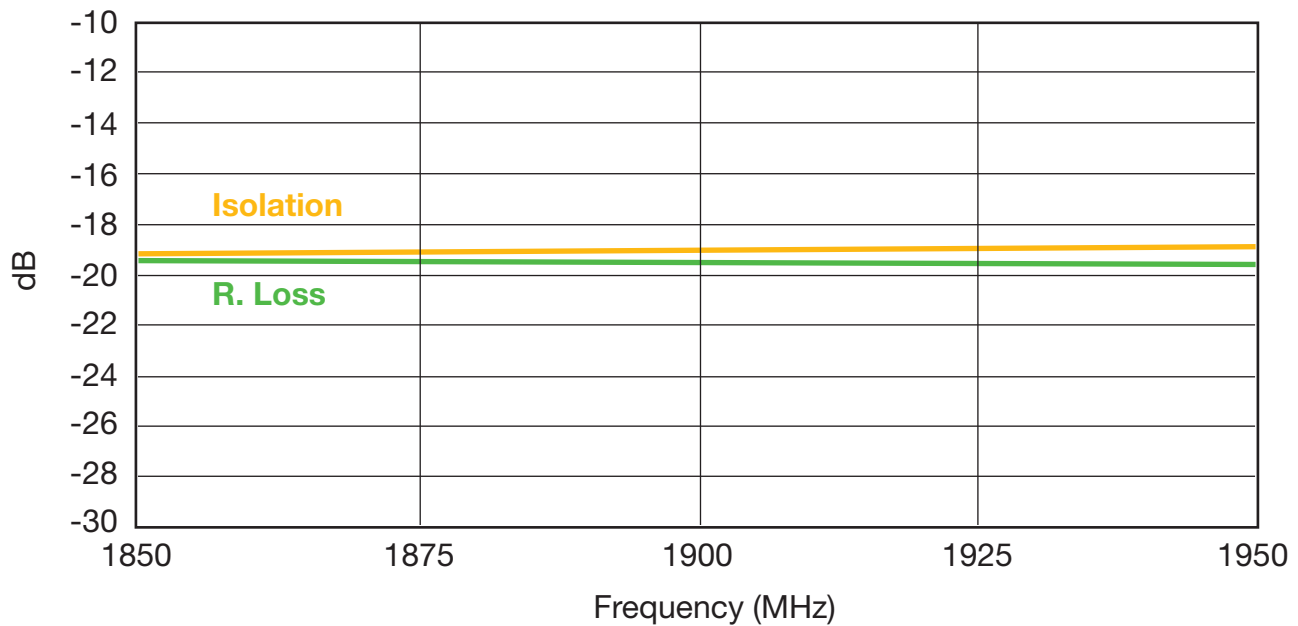
## DB0805 3dB 90° Couplers



1900  $\pm$  50MHz DB0805A1900ASTR



3

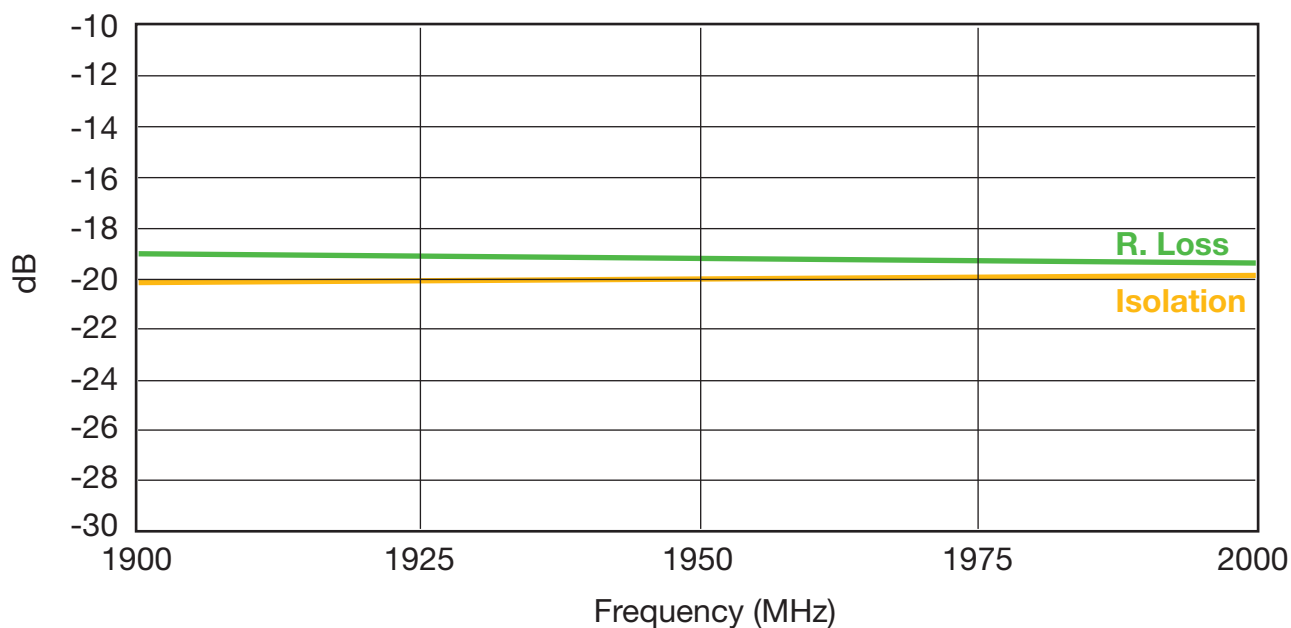
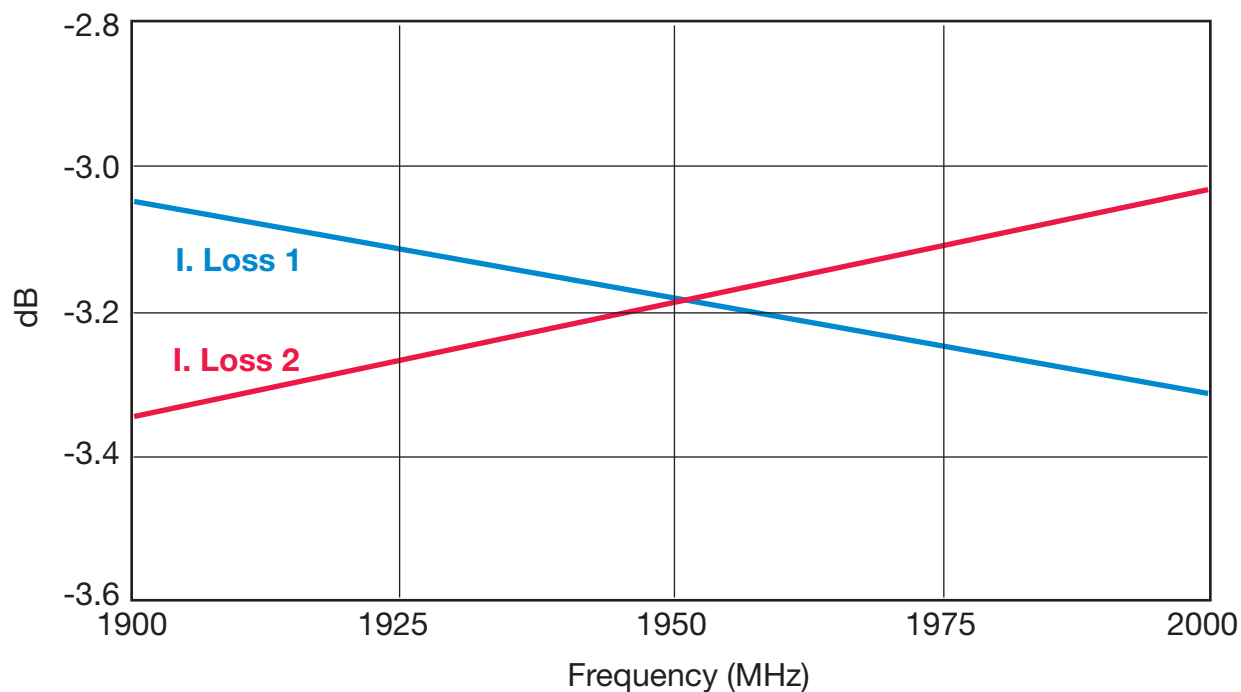


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



1950 ± 50MHz DB0805A1950ASTR

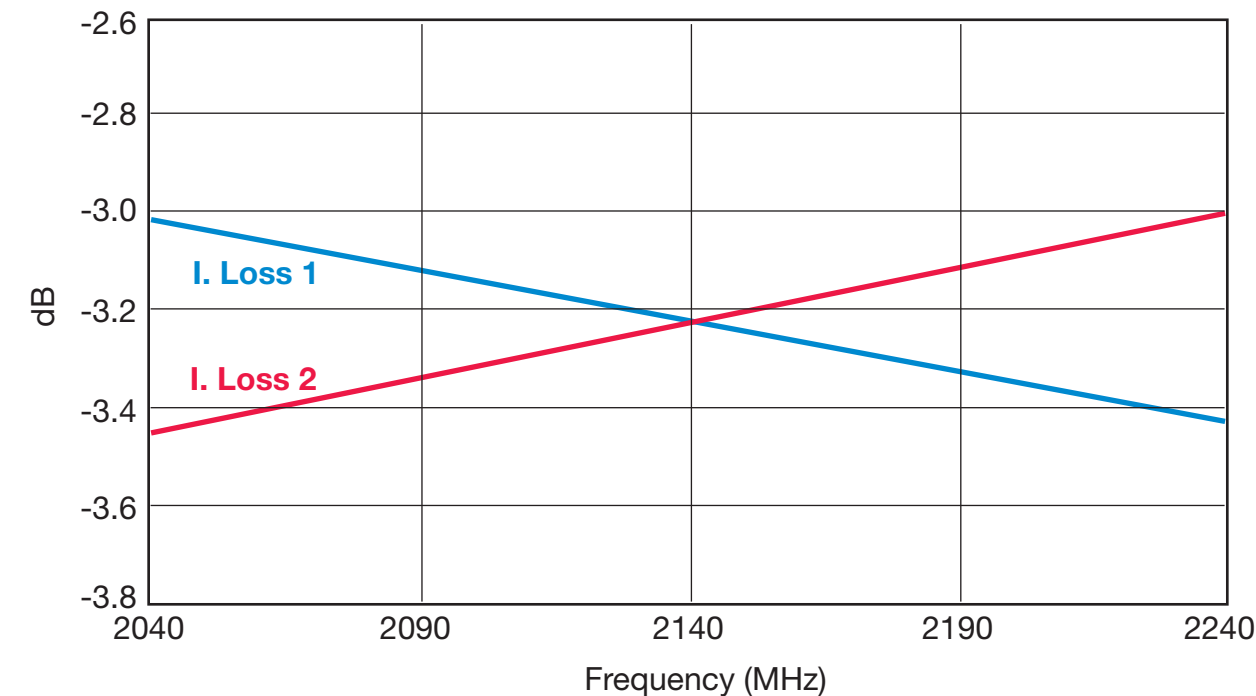


# Thin-Film Directional Couplers

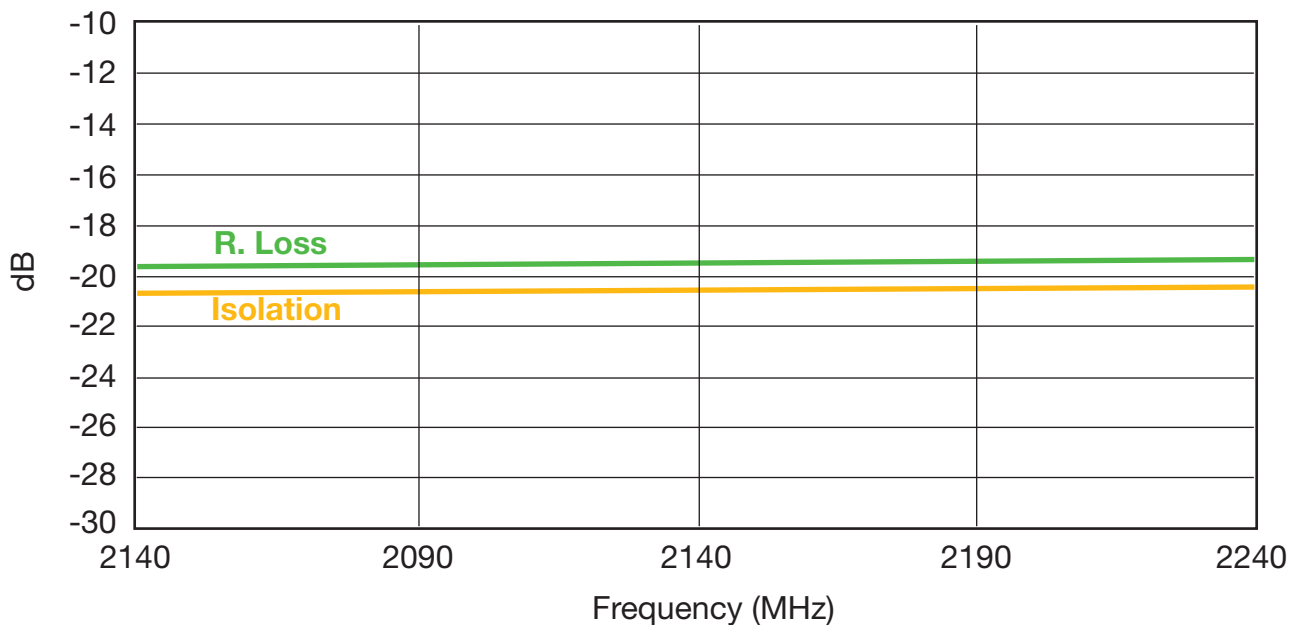
## DB0805 3dB 90° Couplers



2140 ± 50MHz DB0805A2140ASTR



3

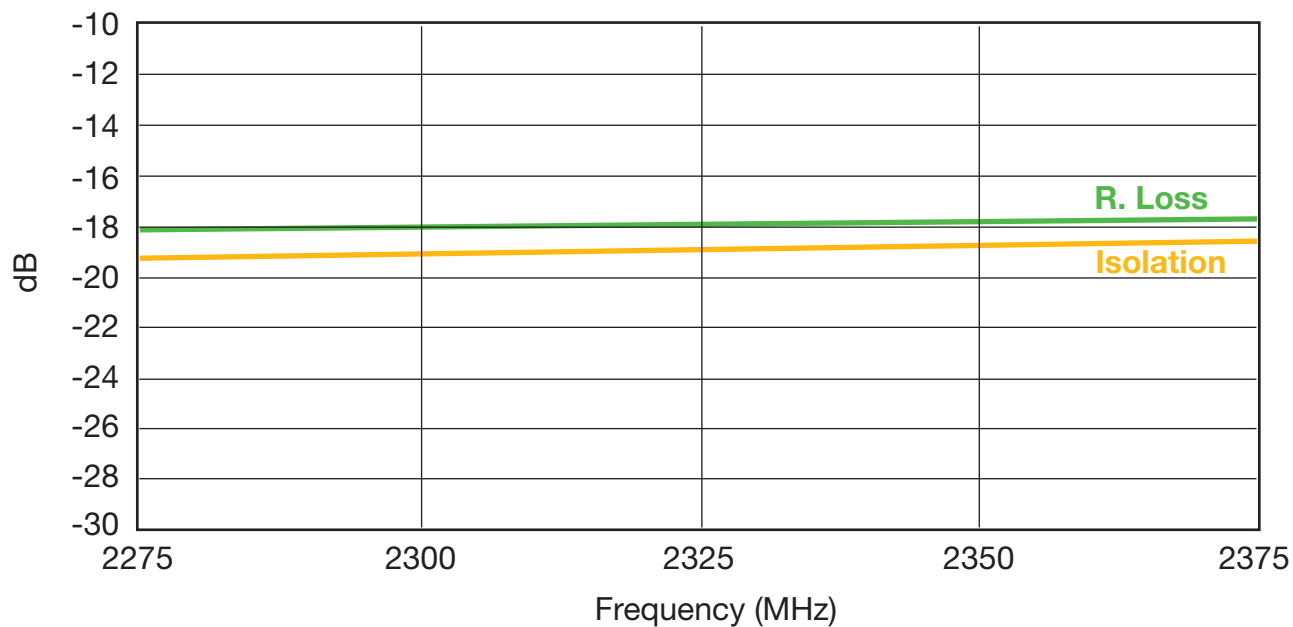
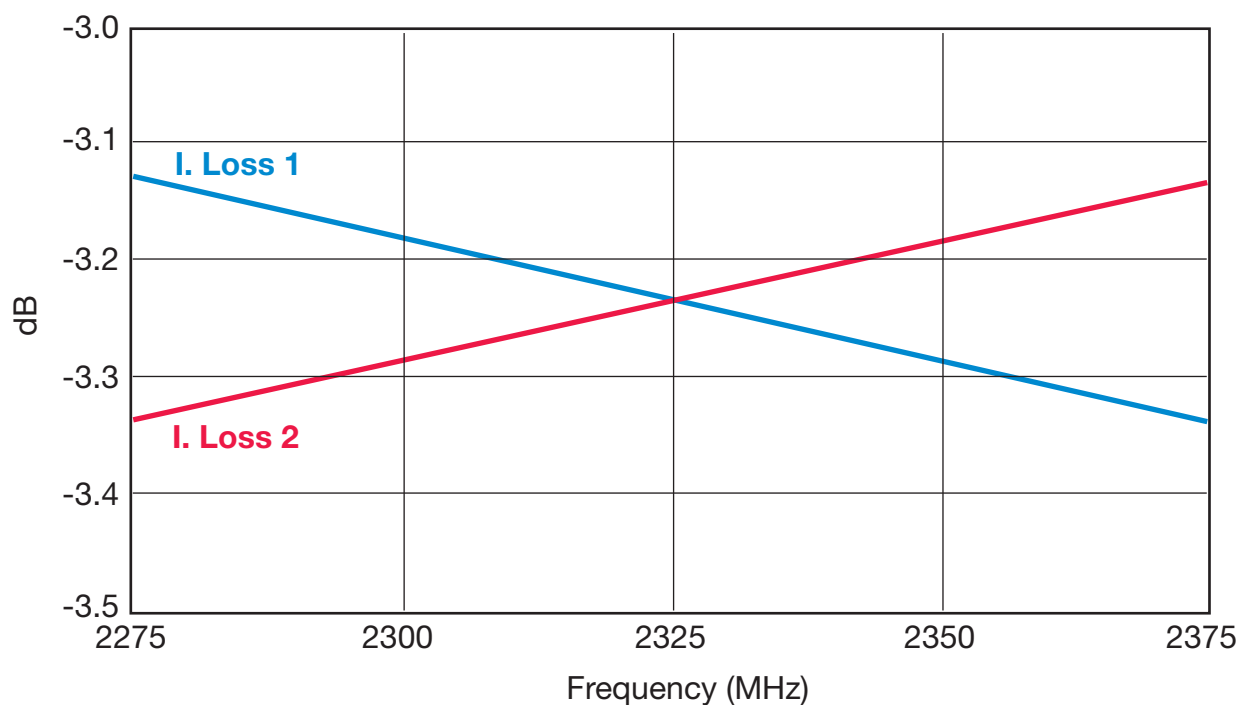


# Thin-Film Directional Couplers

## DB0805 3dB 90° Couplers



2325 ± 50MHz DB0805A2325ASTR



## DB0805 3dB 90° Test Jigs

### GENERAL DESCRIPTION

These jigs are designed for testing the DB0805 3dB 90° Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

### MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig

terminal connected to port 2. Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-port calibration in the required bandwidths.

#### Place the coupler on the [measurement jig](#) as follows:

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| Input (Coupler) → Connector 1 (Jig) | Output 1 (Coupler) → Connector 3 (Jig) |
| 50Ω (Coupler) → Connector 2 (Jig)   | Output 2 (Coupler) → Connector 4 (Jig) |

#### To measure [R. Loss](#) and [I. Loss 1](#) connect:

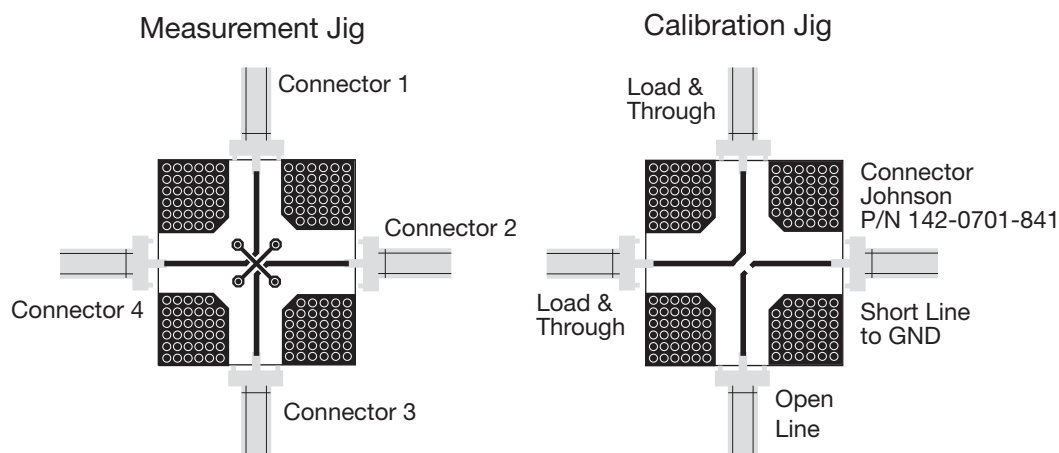
|                                  |                                  |
|----------------------------------|----------------------------------|
| Connector 1 (Jig) → Port 1 (VNA) | Connector 3 (Jig) → Port 2 (VNA) |
| Connector 2 (Jig) → 50Ω          | Connector 4 (Jig) → 50Ω          |

#### To measure [R. Loss](#) and [I. Loss 2](#) connect:

|                                  |                                  |
|----------------------------------|----------------------------------|
| Connector 1 (Jig) → Port 1 (VNA) | Connector 3 (Jig) → 50Ω          |
| Connector 2 (Jig) → 50Ω          | Connector 4 (Jig) → Port 2 (VNA) |

#### To measure [Isolation](#) connect:

|                         |                                  |
|-------------------------|----------------------------------|
| Connector 1 (Jig) → 50Ω | Connector 3 (Jig) → Port 1 (VNA) |
| Connector 2 (Jig) → 50Ω | Connector 4 (Jig) → Port 2 (VNA) |





# Thin-Film RF/Microwave Harmonic Low Pass Filter

LP0402/LP0603/LP0805

# Thin-Film Low Pass Filter



## LP0402N Series Harmonic Lead-Free LGA Termination

### RFAP TECHNOLOGY

The LP0402N Series Harmonic Low Pass Filter is based on the proprietary RFAP Thin-Film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The RFAP Harmonic Low Pass Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### APPLICATIONS

- Wireless communications
- Wireless LAN's
- GPS
- WiMAX

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

### HOW TO ORDER

LP  
T  
Style

0402  
T  
Size

N  
T  
Type

XXXX  
T  
Frequency  
MHz

X  
T  
Sub-Type

N  
T  
Termination  
LGA  
Lead Free

TR  
T  
Taped & Reeled

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, IR, 4 hours

### TERMINATION

Nickel/Lead-Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

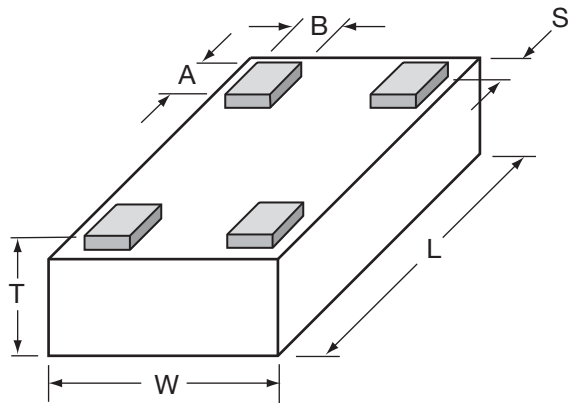


# Thin-Film Low Pass Filter



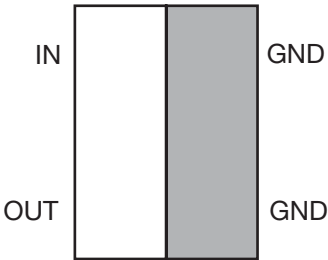
## LP0402N Series Harmonic Lead-Free LGA Termination

### DIMENSIONS: millimeters (inches) (Bottom View)

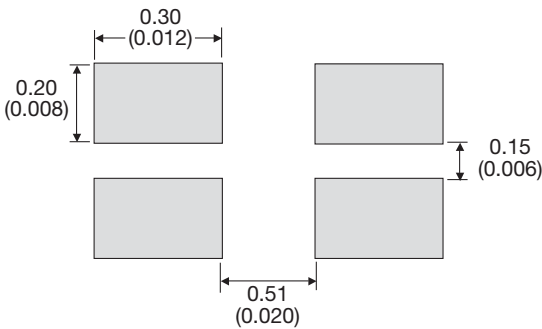


|   |                            |   |                            |
|---|----------------------------|---|----------------------------|
| L | 1.0±0.05<br>(0.040±0.002)  | A | 0.20±0.06<br>(0.008±0.002) |
| W | 0.58±0.04<br>(0.023±0.002) | B | 0.18±0.05<br>(0.007±0.002) |
| T | 0.35±0.5<br>(0.014±0.002)  | S | 0.05±0.05<br>(0.002±0.002) |

### TERMINALS (Top View)



### RECOMMENDED PAD LAYOUT (mm)



### ELECTRICAL CHARACTERISTICS

(Guaranteed over -40°C to +85°C Operating Temperature Range)

| P/N             | Frequency Band [MHz] | I. Loss [dB]        | R. Loss [dB] | Attenuation @ 2xF <sub>0</sub> [dB] | Attenuation @ 3xF <sub>0</sub> [dB] |
|-----------------|----------------------|---------------------|--------------|-------------------------------------|-------------------------------------|
| LP0402N2442ANTR | 2400-2484            | 0.35 typ<br>0.5 max | 20           | 30                                  | 17                                  |
| LP0402N2690ANTR | 2640-2740            | 0.35 typ<br>0.5 max | 20           | 30                                  | 20                                  |
| LP0402N3500ANTR | 3400-3600            | 0.3 typ<br>0.5 max  | 19           | 30                                  | 20                                  |
| LP0402N5200ANTR | 5500-5350            | 0.2 typ<br>0.5 max  | 19           | 30                                  | 20                                  |
| LP0402N5500ANTR | 5350-5650            | 0.2 typ<br>0.5 max  | 15           | 30                                  | –                                   |
| LP0402N5800ANTR | 5600-6000            | 0.2 typ<br>0.5 max  | 16           | 25                                  | –                                   |

NOTE: Additional Frequencies Available Upon Request

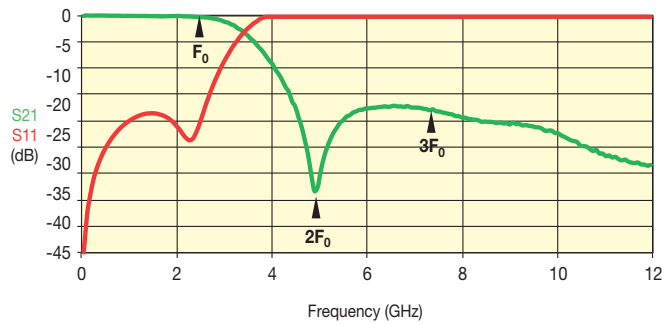


# Thin-Film Low Pass Filter

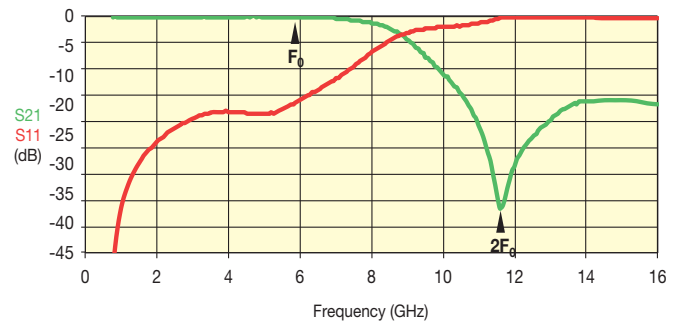


## LP0402N Series Harmonic Lead-Free LGA Termination

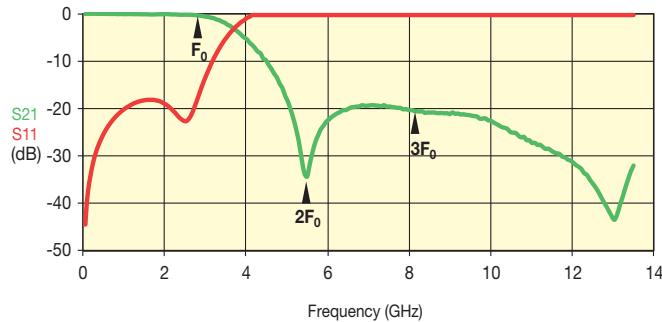
LP0402N2442ANTR



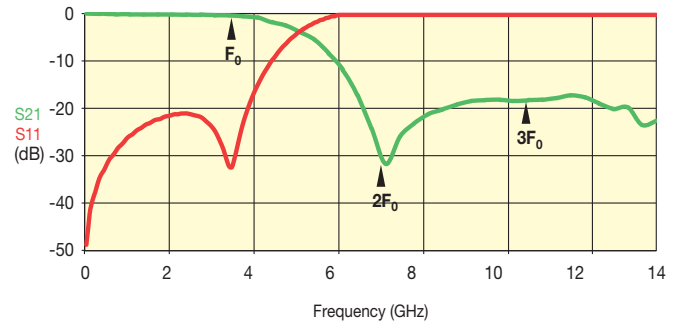
LP0402N5800ANTR



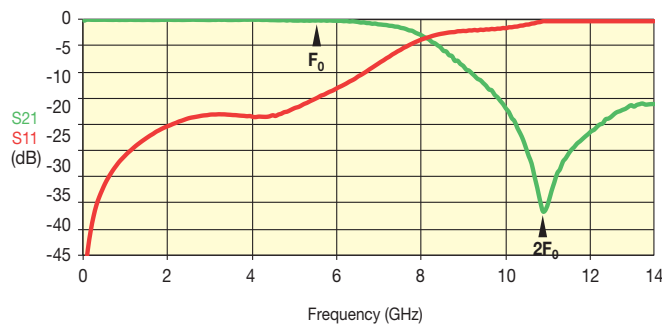
LP0402N2690ANTR



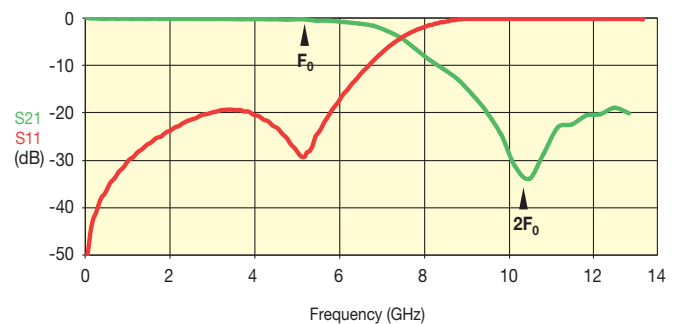
LP0402N3500ANTR



LP0402N5500ANTR



LP0402N5200ANTR



# Thin-Film Low Pass Filter

## LP0402N Series Harmonic Lead-Free LGA Termination Test Jig

### TEST JIG FOR LP0402 LOW PASS FILTER

#### GENERAL DESCRIPTION

These jigs are designed for testing the LP0603 LGA Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50 $\Omega$  microstrips as conducting lines and a bottom ground plane located at a distance of 0.127mm from the microstrips.

The substrate used is Neltec's NH9338ST0127C1BC (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841 (or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50 $\Omega$  SMA termination.

#### MEASUREMENT PROCEDURE

Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-Port calibration in the required bandwidths.

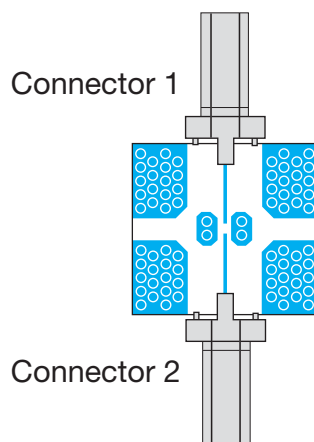
Solder the filter to the [measurement jig](#) as follows:

Input (Filter) ➡ Connector 1 (Jig)      GND (Filter) ➡ GND (Jig)

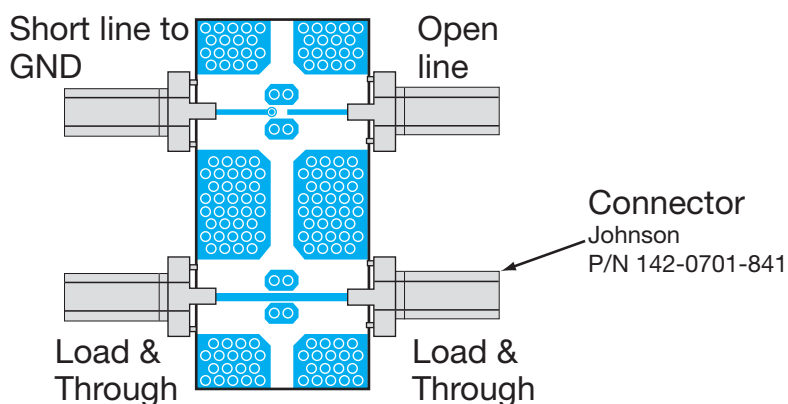
Output (Filter) ➡ Connector 2 (Jig)      GND (Filter) ➡ GND (Jig)

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).

Measurement



Calibration Jig



# Thin-Film Low Pass Filter



## LP0603 Lead-Free LGA Type

### GENERAL DESCRIPTION

The LP0603 ITF (Integrated Thin Film) Lead-Free LGA Low Pass Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Low Pass Filters are offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

### FEATURES

- Miniature Size: 0603
- Frequency Range: 900MHz-5.5GHz
- Characteristic Impedance: 50 Ohm
- Operating/Storage Temperature: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Lead Free
- Taped and Reeled

### APPLICATIONS

- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LANs
- RFID

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

### HOW TO ORDER

**LP**  
T  
Style

**0603**  
T  
Size  
0603

**A**  
T  
Type  
A or N

**XXXX**  
T  
Frequency  
MHz

**A**  
T  
Sub-Type

**N**  
T  
Termination  
LGA  
\*\*Ni/Lead Free Solder

**TR**  
T  
Taped & Reeled

**\*\*RoHS compliant**

### FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, IR, 4 hours

### TERMINATION

Nickel/Lead-Free Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

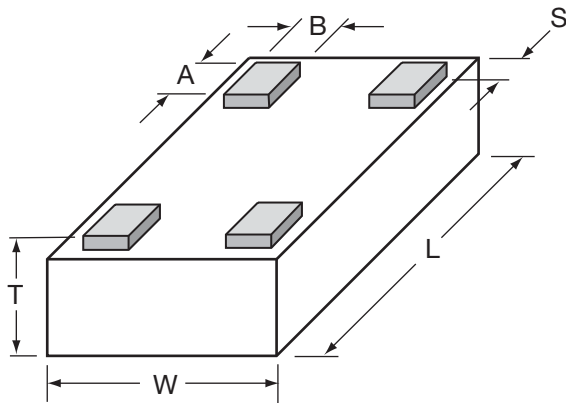


# Thin-Film Low Pass Filter

## LP0603 Lead-Free LGA Type

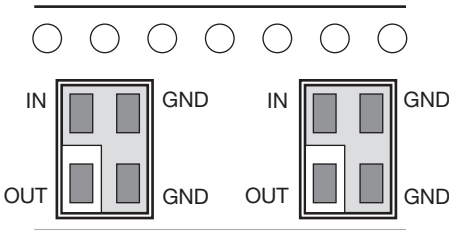


### DIMENSIONS: millimeters (inches) (Bottom View)

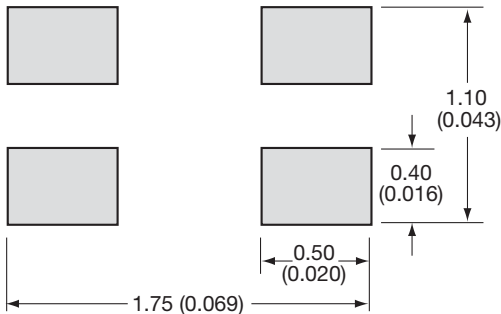


|   |                           |   |                            |
|---|---------------------------|---|----------------------------|
| L | 1.6±0.1<br>(0.063±0.004)  | A | 0.25±0.05<br>(0.010±0.002) |
| W | 0.84±0.1<br>(0.033±0.004) | B | 0.20±0.05<br>(0.008±0.002) |
| T | 0.60±0.1<br>(0.024±0.004) | S | 0.05±0.05<br>(0.002±0.002) |

### TERMINALS AND ORIENTATION IN TAPE (Top View)



### RECOMMENDED PAD LAYOUT (mm)



### ELECTRICAL CHARACTERISTICS

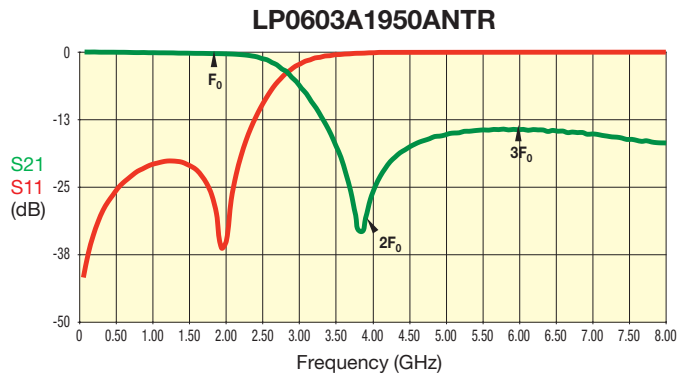
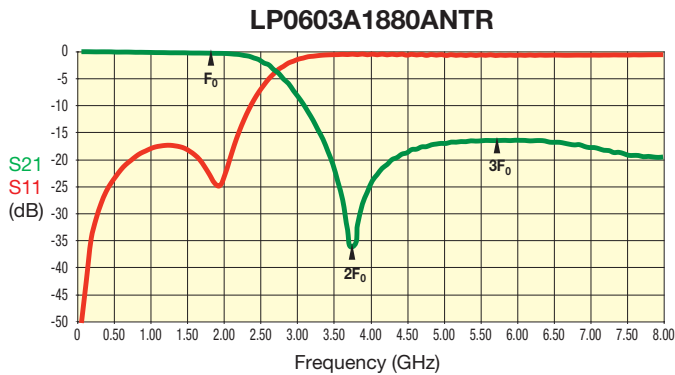
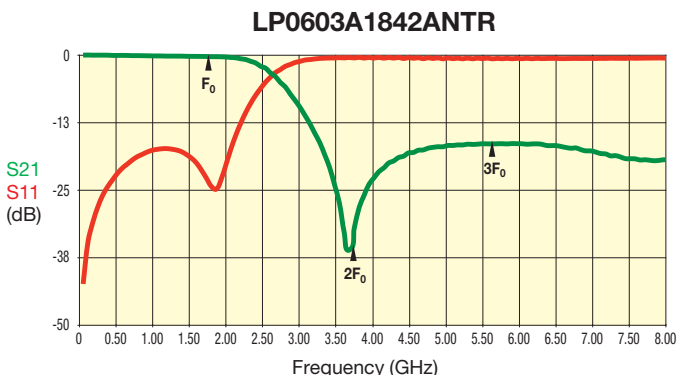
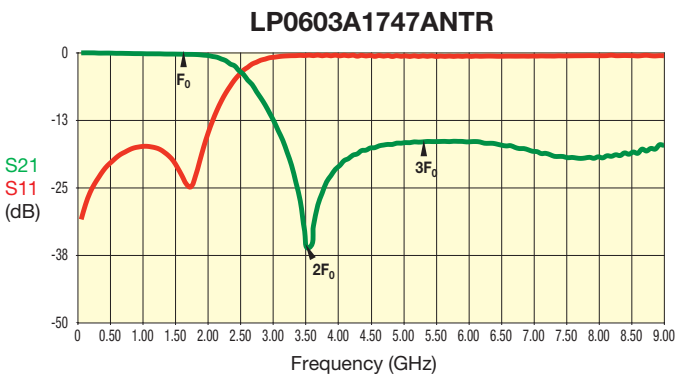
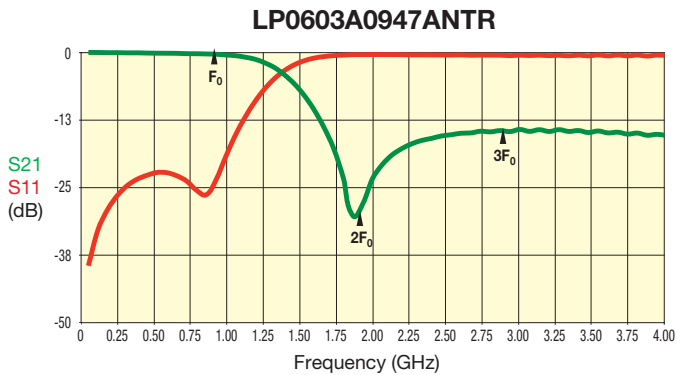
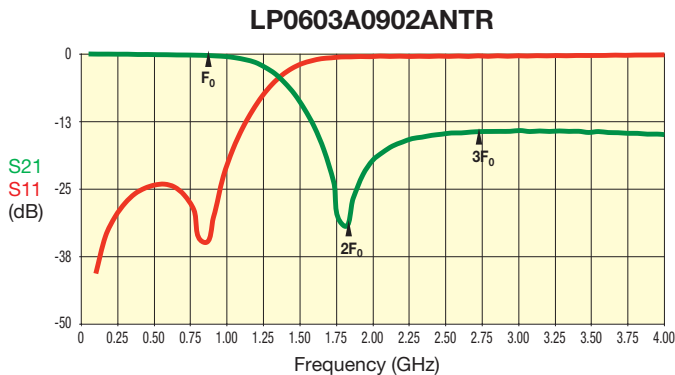
(Guaranteed over -40°C to +85°C Operating Temperature Range)

| P/N             | Frequency Band [MHz] | I. Loss [dB]           | VSWR max [dB] | Attenuation typ. [dB]                          |
|-----------------|----------------------|------------------------|---------------|------------------------------------------------|
| LP0603A0902ANTR | 890-915              | 0.35 typ<br>(0.5 max)  | 1.4           | 25 @ 2xF <sub>0</sub><br>14 @ 3xF <sub>0</sub> |
| LP0603A0947ANTR | 935-960              | 0.35 typ<br>(0.5 max)  | 1.4           | 25 @ 2xF <sub>0</sub><br>17 @ 3xF <sub>0</sub> |
| LP0603A1747ANTR | 1710-1785            | 0.3 typ<br>(0.5 max)   | 1.4           | 25 @ 2xF <sub>0</sub><br>17 @ 3xF <sub>0</sub> |
| LP0603A1842ANTR | 1805-1880            | 0.3 typ<br>(0.5 max)   | 1.4           | 27 @ 2xF <sub>0</sub><br>15 @ 3xF <sub>0</sub> |
| LP0603A1880ANTR | 1840-1920            | 0.3 typ<br>(0.5 max)   | 1.4           | 25 @ 2xF <sub>0</sub><br>17 @ 3xF <sub>0</sub> |
| LP0603A1950ANTR | 1920-1980            | 0.3 typ<br>(0.5 max)   | 1.4           | 27 @ 2xF <sub>0</sub><br>15 @ 3xF <sub>0</sub> |
| LP0603A2140ANTR | 2110-2170            | 0.3 typ<br>(0.5 max)   | 1.4           | 27 @ 2xF <sub>0</sub><br>17 @ 3xF <sub>0</sub> |
| LP0603A2442ANTR | 2412-2472            | 0.3 typ<br>(0.5 max)   | 1.4           | 25 @ 2xF <sub>0</sub><br>17 @ 3xF <sub>0</sub> |
| LP0603N3500ANTR | 3400-3600            | -0.3 typ.<br>-0.5 max. | 1.4           | 30 @ 2xF <sub>0</sub><br>20 @ 3xF <sub>0</sub> |
| LP0603N5200ANTR | 5050-5350            | -0.2 typ.<br>-0.5 max. | 1.4           | 30 @ 2xF <sub>0</sub><br>20 @ 3xF <sub>0</sub> |
| LP0603N5500ANTR | 5350-5650            | -0.2 typ.<br>-0.5 max. | 1.4           | 30 @ 2xF <sub>0</sub><br>20 @ 3xF <sub>0</sub> |

NOTE: Additional Frequencies Available Upon Request

# Thin-Film Low Pass Filter

## LP0603 Lead-Free LGA Type



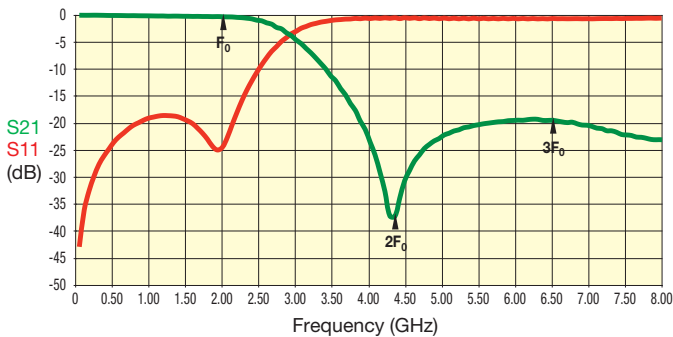
4

# Thin-Film Low Pass Filter

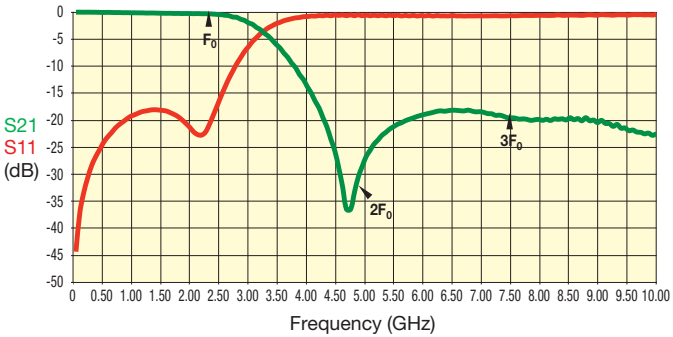
LP0603 Lead-Free LGA Type



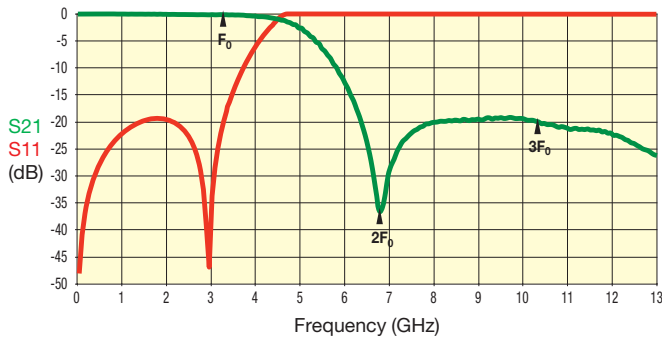
LP0603A2140ANTR



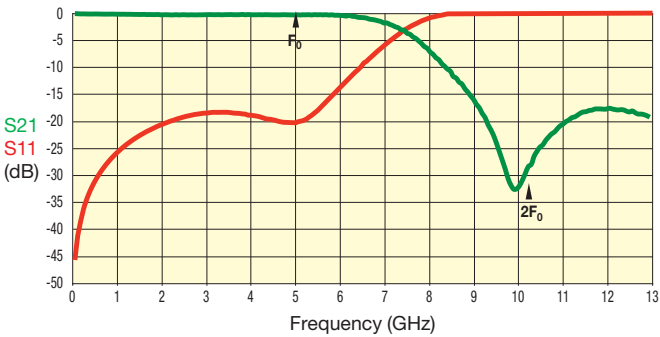
LP0603A2442ANTR



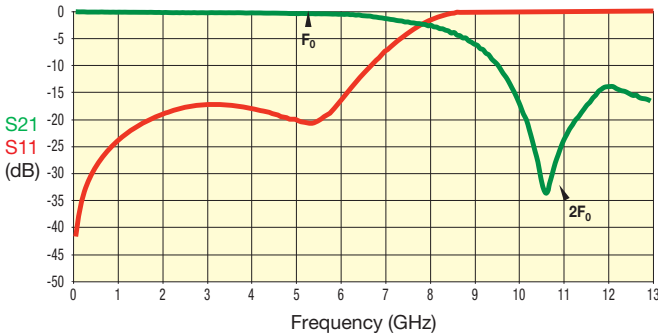
LP0603N3500ANTR



LP0603N5200ANTR



LP0603N5500ANTR



# Thin-Film Low Pass Filter

## LP0603 Lead-Free LGA Type Test Jig

### TEST JIG FOR LP0603 LEAD-FREE LGA LOW PASS FILTER

#### GENERAL DESCRIPTION

These jigs are designed for testing the LP0603 LGA Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.127mm from the microstrips.

The substrate used is Neltec's NH9338ST0127C1BC (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841 (or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

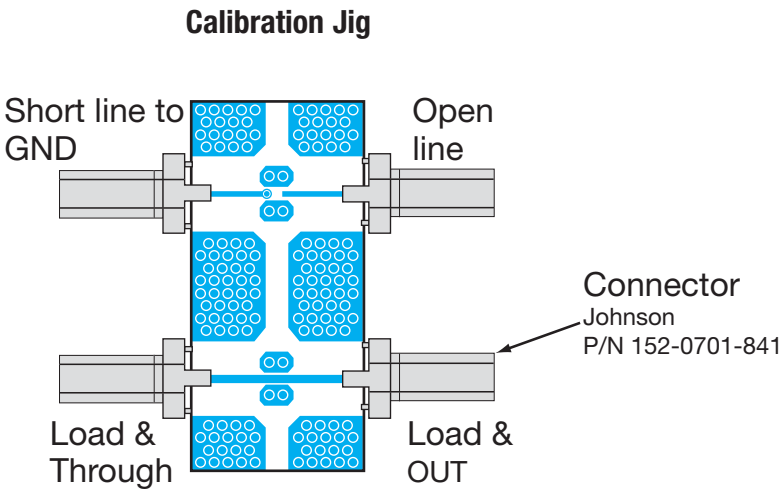
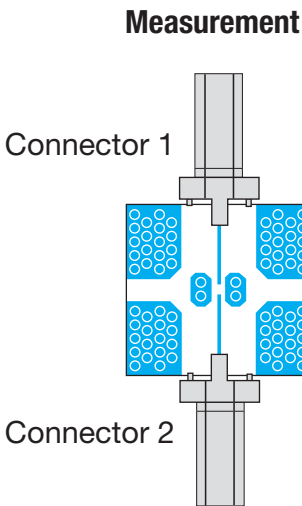
#### MEASUREMENT PROCEDURE

Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-Port calibration in the required bandwidths.

Solder the filter to the [measurement jig](#) as follows:

|                                     |                          |
|-------------------------------------|--------------------------|
| Input (Filter) ➡ Connector 1 (Jig)  | GND (Filter) ➡ GND (Jig) |
| Output (Filter) ➡ Connector 2 (Jig) | GND (Filter) ➡ GND (Jig) |

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).



# Thin-Film Low Pass Filter



## LP0805 Type Harmonic

### GENERAL DESCRIPTION

The ITF (Integrated Thin-Film) SMD Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

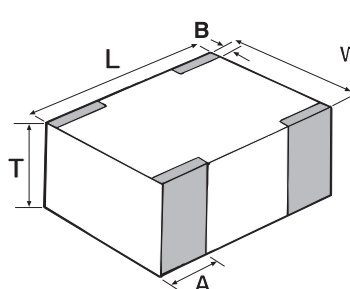
### FEATURES

- Small Size: 0805
- Frequency Range: 800MHz - 3.5GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

### APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

### DIMENSIONS: millimeters (inches)



|   |                            |
|---|----------------------------|
| L | 2.03±0.1<br>(0.080±0.004)  |
| W | 1.55±0.1<br>(0.061±0.004)  |
| T | 1.02±0.1<br>(0.040±0.004)  |
| A | 0.56±0.25<br>(0.022±0.010) |
| B | 0.35±0.15<br>(0.014±0.006) |

### PAD LAYOUT

See CP0805 pad layout on page 64.

### FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual/mechanical characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$  4 hours

### TERMINATION

Nickel/Solder coating (Sn, Pb) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

### HOW TO ORDER

**LP**  
T  
**Style**  
Low Pass

**0805A**  
T  
**Size**  
0805

**0902**  
T  
**Frequency**  
MHz

**AW**  
T  
**Termination**  
AW= Nickel/Solder (SnPb)  
\*\*AS = Nickel/ Lead Free  
Solder (Sn100)

**TR**  
T  
**Packaging Code**  
TR = Tape and Reel

\*\*RoHS compliant

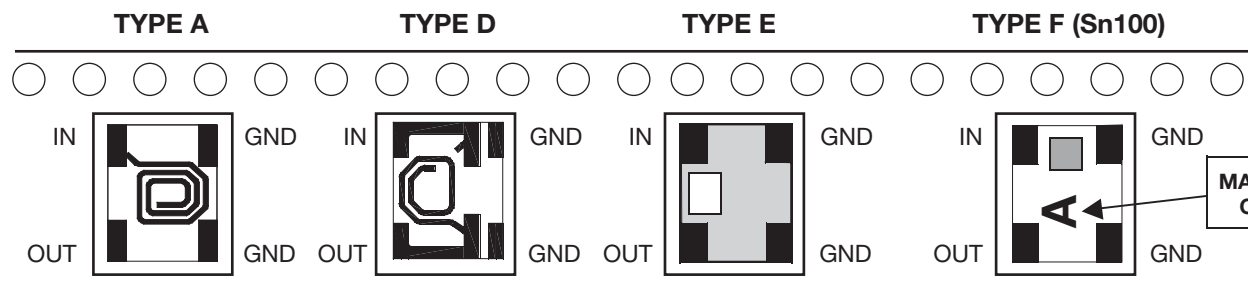
Not RoHS Compliant



For RoHS compliant products,  
please select correct termination style.

### TERMINALS AND LAYOUT (Top View)

#### Orientation in Tape



# Thin-Film Low Pass Filter

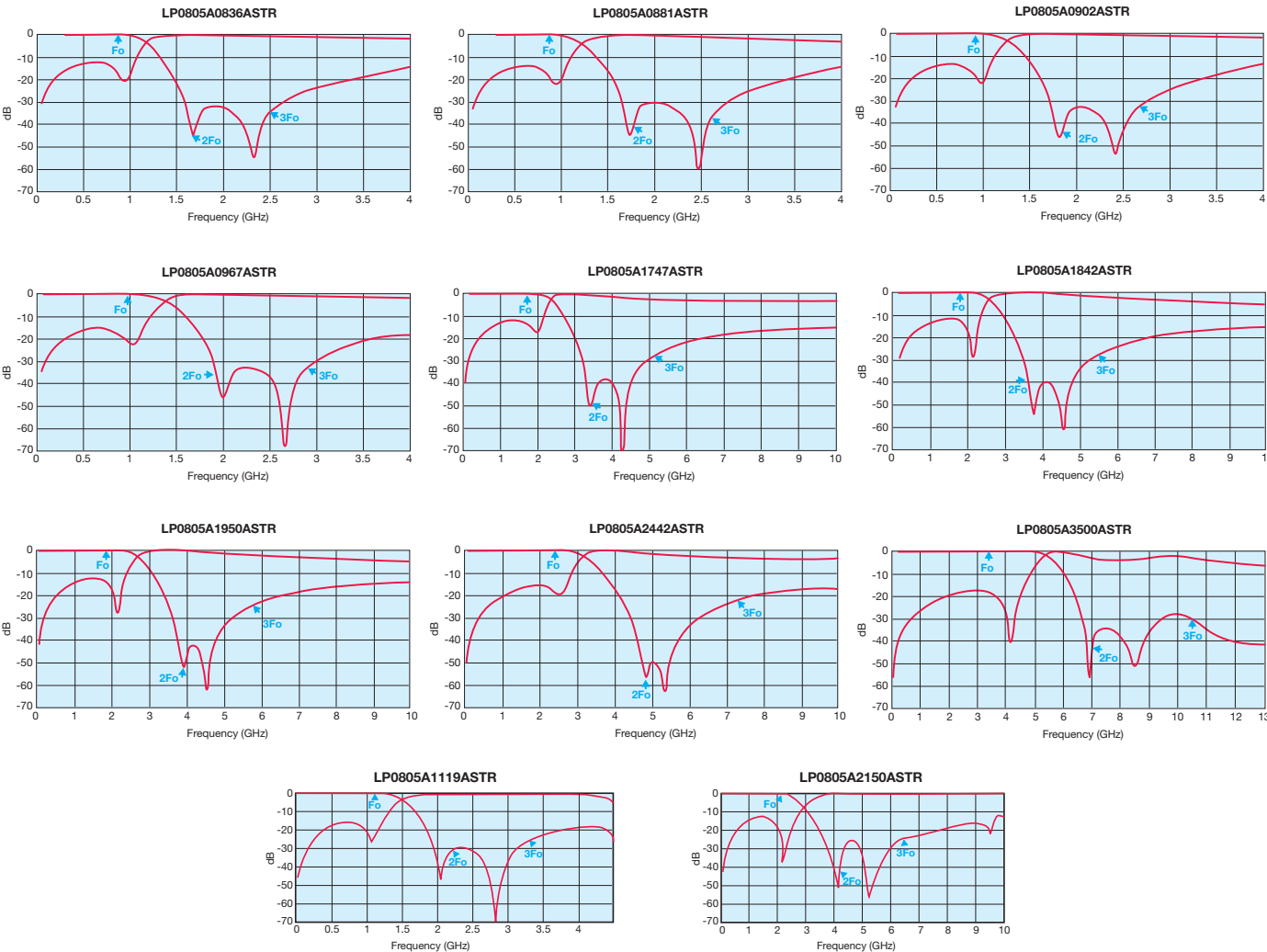
## LP0805 Type Harmonic



### ELECTRICAL CHARACTERISTICS

| Application  | Part Number   | Frequency Band (MHz) | I. Loss max          | VSWR max | Attenuation (dB) Typical                       | Layout Type (SnPb) | Layout Type F Marking Code |
|--------------|---------------|----------------------|----------------------|----------|------------------------------------------------|--------------------|----------------------------|
| E-GSM        | LP0805A0897AS | 880 - 915            | 0.4dB<br>(0.3dB typ) | 1.7      | 30 @ 2X <sub>Fo</sub><br>20 @ 3X <sub>Fo</sub> | A                  | E                          |
|              | LP0805A0942AS | 925 - 960            |                      |          |                                                | A                  | F                          |
| GSM          | LP0805A0902AS | 890 - 915            |                      |          |                                                | A                  | E                          |
|              | LP0805A0947AS | 935 - 960            |                      |          |                                                | A                  | F                          |
|              | LP0805A1119AS | 1101 - 1137          |                      |          |                                                | A                  | H                          |
| AMPS         | LP0805A0836AS | 824 - 849            |                      |          |                                                | A                  | A                          |
|              | LP0805A0881AS | 869 - 894            |                      |          |                                                | A                  | C                          |
| PCN          | LP0805A1747AS | 1710 - 1785          |                      |          |                                                | D                  | I                          |
|              | LP0805A1842AS | 1805 - 1880          |                      |          |                                                | D                  | J                          |
| PCS          | LP0805A1880AS | 1850 - 1910          |                      |          |                                                | D                  | K                          |
|              | LP0805A1960AS | 1930 - 1990          |                      |          |                                                | D                  | M                          |
| PHP          | LP0805A1907AS | 1895 - 1920          |                      |          |                                                | D                  | L                          |
| DECT         | LP0805A1890AS | 1880 - 1900          |                      |          |                                                | D                  | K                          |
| 3G           | LP0805A2150AS | 1905 - 2180          |                      |          |                                                | D                  | N                          |
| Wireless LAN | LP0805A2442AS | 2400 - 2484          |                      |          |                                                | D                  | S                          |
| WLL          | LP0805A3500AS | 3400 ~ 3600          |                      |          |                                                | E                  | X                          |

### Typical Electrical Performance



### ITF TEST JIG FOR LOW PASS FILTER 0805

#### GENERAL DESCRIPTION

These jigs are designed for testing the LPF0805 Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50W microstrips as conducting lines and a bottom ground plane located at a distance of 0.254 mm from the microstrips.

The substrate used is RF-35-0100-C1B107 (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841 (or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50W SMA termination.

#### MEASUREMENT PROCEDURE

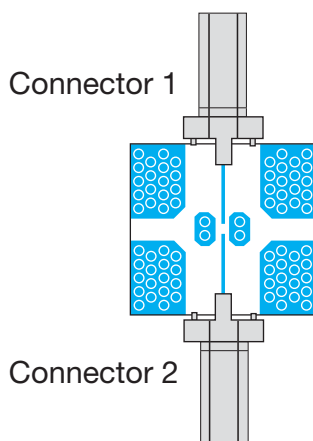
Follow the VNA's instruction manual and use the [calibration jig](#) to perform a full 2-Port calibration in the required bandwidths.

Solder the filter to the [measurement jig](#) as follows:

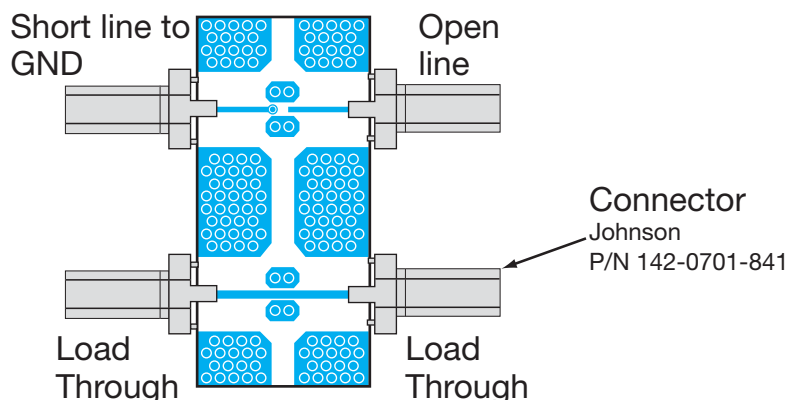
|                                     |                          |
|-------------------------------------|--------------------------|
| Input (Filter) ➡ Connector 1 (Jig)  | GND (Filter) ➡ GND (Jig) |
| Output (Filter) ➡ Connector 2 (Jig) | GND (Filter) ➡ GND (Jig) |

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).

**Measurement**



**Calibration Jig**



# High Performance Harmonic Low Pass Filter



LP1206A0512BNTR



## HOW TO ORDER

LP 1206 **A** **XXXX** **B** **N** **TR**  
 Type Frequency (MHz) Sub-Type Termination Taped & Reeled

## FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual/mechanical characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

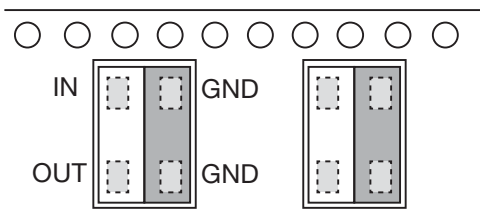
## TERMINATION

Nickel/ Lead free Solder coating (Sn100) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

## POWER RATING

3W RF Continuous

## ORIENTATION IN TAPE



## ITF TECHNOLOGY

The ITF LGA Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The ITF Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

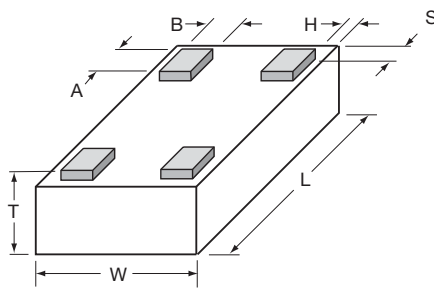
## FEATURES

- Small size: 1206
- Frequency: 512MHz
- Characteristic impedance: 50Ω
- Operating/Storage temp: -40°C to +85°C
- Low profile
- Rugged construction
- Taped and reeled
- RoHS compliant

## APPLICATIONS

- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LAN's

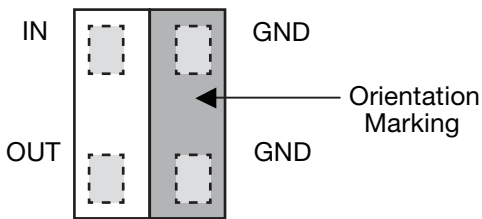
## DIMENSIONS (Bottom View)



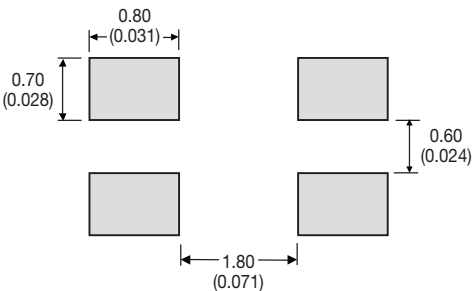
mm (inches)

|      |                            |
|------|----------------------------|
| L    | 3.10±0.10<br>(0.122±0.004) |
| W    | 1.60±0.10<br>(0.063±0.004) |
| T    | 0.60±0.30<br>(0.024±0.012) |
| A    | 0.39±0.10<br>0.015±0.004   |
| B    | 0.33±0.10<br>0.013±0.004   |
| H, S | 0.05±0.05<br>(0.002±0.002) |

## TERMINALS (Top View)



## Recommended Pad Layout Dimensions mm (inches)



# High Performance Harmonic Low Pass Filter

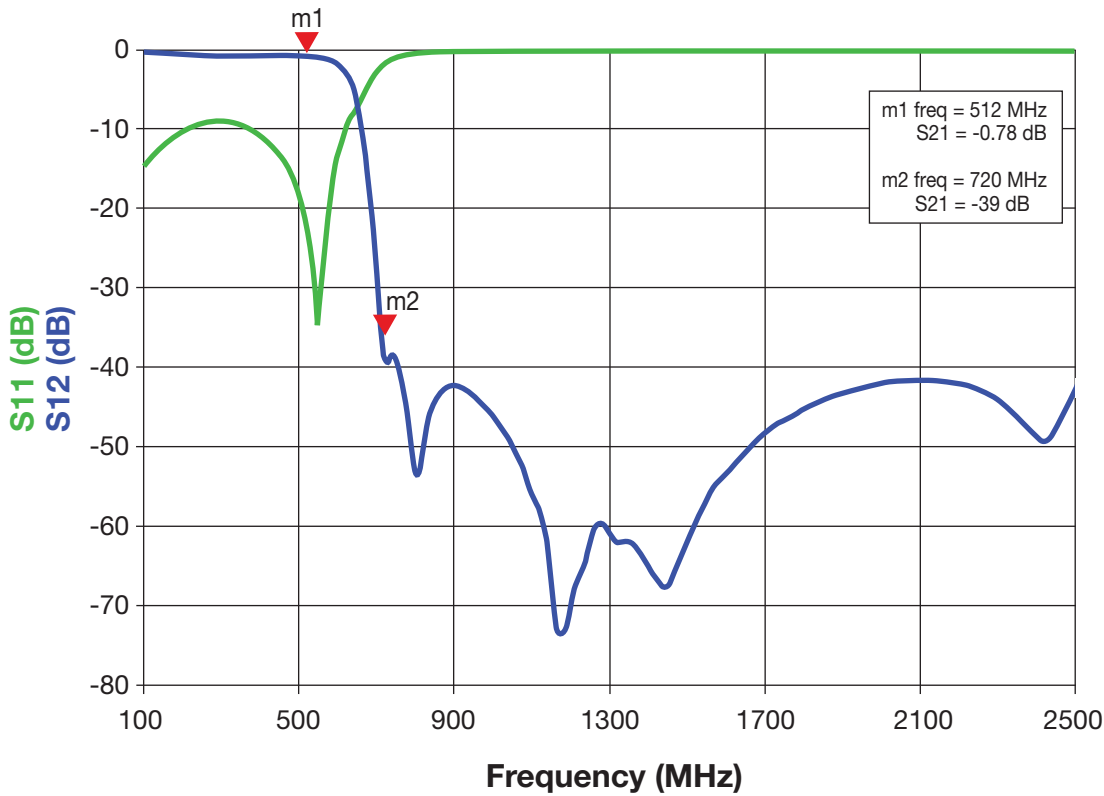


LP1206A0512BNTR

## TERMINALS (Top View)

| Parameter          | Value      | Unit | Notes                 |
|--------------------|------------|------|-----------------------|
| Fc                 | 512        | MHz  |                       |
| Rejection @ 900MHz | -35        | dB   | Min. (720MHz to 2GHz) |
| Insertion Loss     | 0.8        | dB   | Max.                  |
| VSWR               | 2.3: 1     |      | Max. (all ports)      |
| Power Handling     | 3          | W    | Continuous            |
| Impedance          | 50         | Ohm  |                       |
| Operating Temp.    | -40 to +85 | °C   |                       |
| Size               | 1206       |      |                       |

## TYPICAL ELECTRICAL PERFORMANCE



# High Performance Low Pass Filter **AVX RF**

LP1206A0700ANTR



## HOW TO ORDER

LP 1206 **A** **XXXX** **A** **N** **TR**  
 Type Frequency (MHz) Sub-Type Termination Taped & Reeled

## FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual/mechanical characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C,  $I_R$ , 4 hours

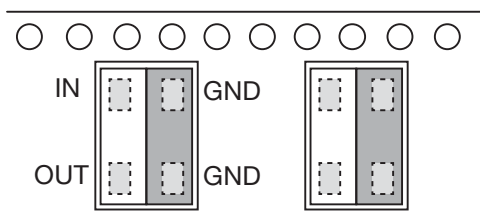
## TERMINATION

Nickel/ Lead free Solder coating (Sn100) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

## POWER RATING

3W RF Continuous

## ORIENTATION IN TAPE



## ITF TECHNOLOGY

The ITF LGA Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The ITF Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

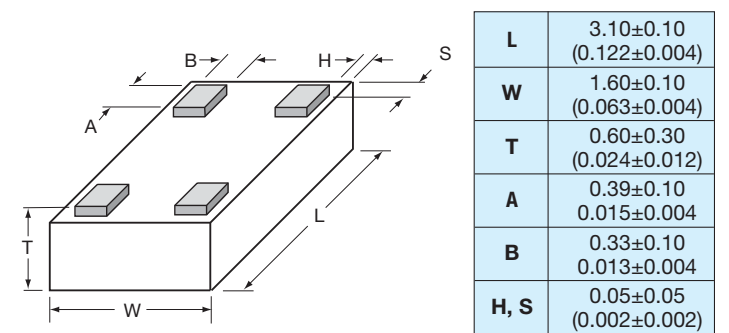
## FEATURES

- Small size: 1206
- Frequency: 700MHz
- Characteristic impedance: 50Ω
- Operating/Storage temp: -40°C to +85°C
- Low profile
- Rugged construction
- Taped and reeled
- RoHS compliant

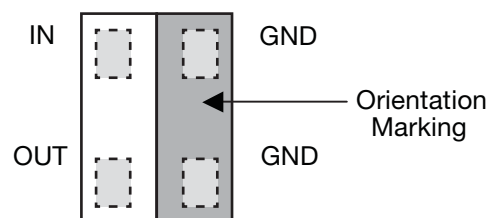
## APPLICATIONS

- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LAN's

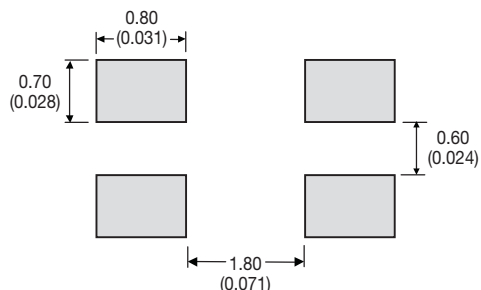
## DIMENSIONS (Bottom View)



## TERMINALS (Top View)



## Recommended Pad Layout Dimensions mm (inches)



High Performance Low Pass Filter

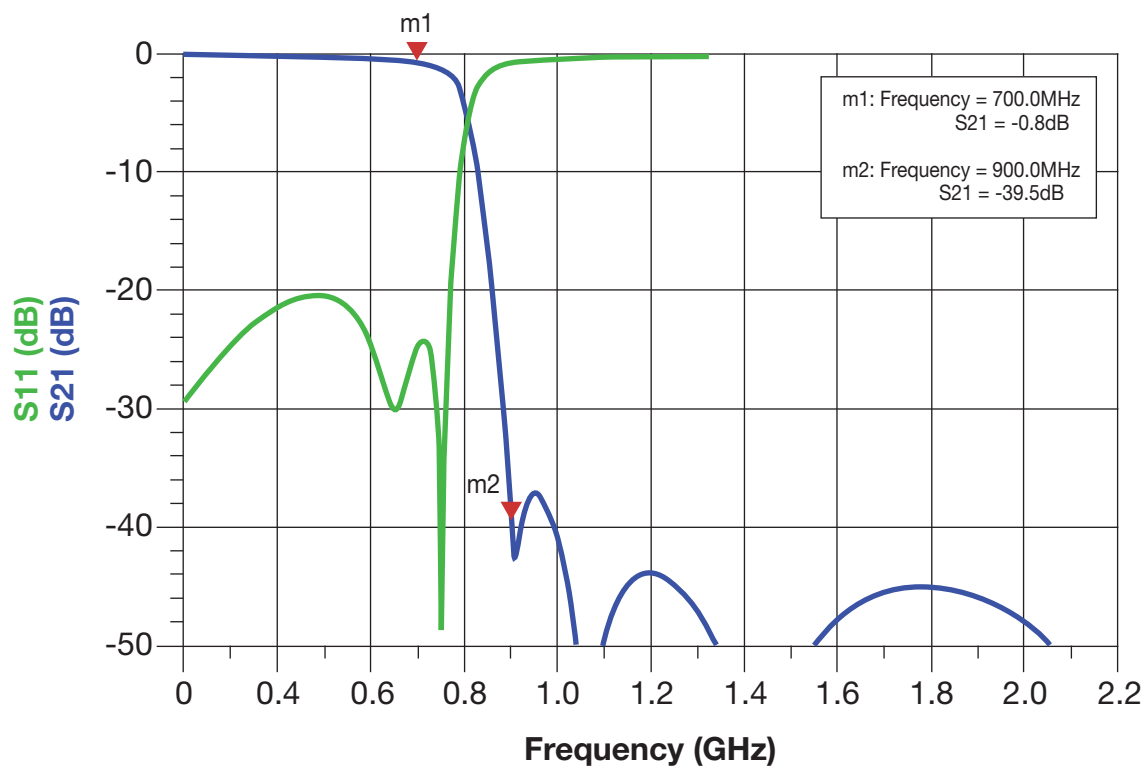
AVXX RF

LP1206A0700ANTR

TERMINALS (Top View)

| Parameter          | Value      | Unit | Notes                 |
|--------------------|------------|------|-----------------------|
| Fc                 | 700        | MHz  |                       |
| Rejection @ 900MHz | -35        | dB   | Min. (900MHz to 2GHz) |
| Insertion Loss     | 0.9        | dB   | Max.                  |
| VSWR               | 2.3: 1     |      | Max. (all ports)      |
| Power Handling     | 3          | W    | Continuous            |
| Impedance          | 50         | Ohm  |                       |
| Operating Temp.    | -40 to +85 | °C   |                       |
| Size               | 1206       |      |                       |

TYPICAL ELECTRICAL PERFORMANCE





# Thin-Film RF/Microwave Products Designer Kits

Accu-P<sup>®</sup>/Accu-L<sup>®</sup> Kits

**Accu-P®**  
Designer Kit Type 1700LF  
Order Number: Accu-P® 0201KITL2

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.1                   | P         |
|       | 0.2                   | P         |
|       | 0.3                   | P         |
|       | 0.4                   | P         |
|       | 0.5                   | P         |
| 50    | 0.6                   | P         |
|       | 0.7                   | P         |
|       | 0.8                   | P         |
|       | 0.9                   | P         |
|       | 1.0                   | P         |
|       | 1.1                   | A         |
|       | 1.2                   | A         |
|       | 1.3                   | A         |
| 25    | 1.5                   | A         |
|       | 1.8                   | A         |
|       | 2.0                   | B         |
|       | 2.2                   | B         |
|       | 2.4                   | B         |
|       | 2.7                   | B         |
|       | 3.0                   | B         |
|       | 3.3                   | B         |
|       | 3.6                   | B         |
|       | 3.9                   | B         |
|       | 4.7                   | B         |
|       | 5.6                   | B         |
| 16    | 6.8                   | B         |
|       | 7.5                   | B         |
|       | 8.2                   | B         |
|       | 10.0                  | G         |
|       | 12.0                  | G         |

600 Capacitors, 20 each of 30 values  
**Tolerance** P = ± 0.02pF A = ± 0.05pF  
 B = ± 0.1pF G = ± 2%

**Accu-P®**  
Designer Kit Type 1800LF  
Order Number: Accu-P® 0201KITL3

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 50    | 1.0                   | A         |
|       | 1.1                   | A         |
|       | 1.2                   | A         |
|       | 1.3                   | A         |
|       | 1.4                   | A         |
|       | 1.5                   | A         |
|       | 1.6                   | A         |
|       | 1.7                   | A         |
| 25    | 1.8                   | A         |
|       | 1.9                   | A         |
|       | 2.0                   | A         |
|       | 2.1                   | B         |
|       | 2.2                   | B         |
|       | 2.3                   | B         |
|       | 2.4                   | B         |
|       | 2.5                   | B         |
|       | 2.6                   | B         |
|       | 2.7                   | B         |
|       | 2.8                   | B         |
|       | 2.9                   | B         |
|       | 3.0                   | B         |
|       | 3.1                   | B         |
|       | 3.3                   | B         |
|       | 3.4                   | B         |
|       | 3.6                   | B         |
|       | 3.9                   | B         |
|       | 4.1                   | B         |
|       | 4.3                   | B         |
|       | 4.5                   | B         |
|       | 4.7                   | B         |

600 Capacitors, 20 each of 30 values  
**Tolerance** A = ± 0.05pF  
 B = ± 0.1pF

**Accu-P®**  
Designer Kit Type 1300LF  
Order Number: Accu-P® 0402KITL1

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.1                   | P         |
|       | 0.2                   | P         |
|       | 0.3                   | P         |
|       | 0.4                   | P         |
|       | 0.5                   | P         |
|       | 0.6                   | P         |
|       | 0.7                   | P         |
|       | 0.8                   | P         |
|       | 0.9                   | P         |
|       | 1.0                   | P         |
| 50    | 1.1                   | A         |
|       | 1.2                   | A         |
|       | 1.5                   | A         |
|       | 1.8                   | A         |
|       | 2.0                   | A         |
|       | 2.2                   | B         |
|       | 2.4                   | B         |
|       | 2.7                   | B         |
|       | 3.0                   | B         |
|       | 3.3                   | B         |
| 25    | 3.9                   | B         |
|       | 4.7                   | B         |
|       | 5.6                   | B         |
|       | 6.8                   | B         |
|       | 8.2                   | B         |
|       | 10.0                  | G         |
|       | 12.0                  | G         |
|       | 15.0                  | G         |
|       | 18.0                  | G         |
|       | 22.0                  | G         |
| 16    |                       | G         |

600 Capacitors, 20 each of 30 values  
**Tolerance** P = ± 0.02pF A = ± 0.05pF  
 B = ± 0.1pF G = ± 2%

**Accu-P®**  
Designer Kit Type 1400LF  
Order Number: Accu-P® 0402KITL2

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 1.0                   | A         |
|       | 1.1                   | A         |
|       | 1.2                   | A         |
|       | 1.3                   | A         |
|       | 1.4                   | A         |
|       | 1.5                   | A         |
|       | 1.6                   | A         |
|       | 1.7                   | A         |
| 50    | 1.8                   | A         |
|       | 1.9                   | A         |
|       | 2.0                   | A         |
|       | 2.1                   | B         |
|       | 2.2                   | B         |
|       | 2.3                   | B         |
|       | 2.4                   | B         |
|       | 2.5                   | B         |
|       | 2.6                   | B         |
|       | 2.7                   | B         |
|       | 2.8                   | B         |
|       | 2.9                   | B         |
|       | 3.0                   | B         |
|       | 3.1                   | B         |
|       | 3.3                   | B         |
|       | 3.4                   | B         |
|       | 3.6                   | B         |
|       | 3.9                   | B         |
|       | 4.1                   | B         |
|       | 4.3                   | B         |
|       | 4.5                   | B         |
|       | 4.7                   | B         |

600 Capacitors, 20 each of 30 values  
**Tolerance** A = ± 0.05pF  
 B = ± 0.1pF

**Accu-P®**  
Designer Kit Type 900LF  
Order Number: Accu-P® 0603KITL1

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.1                   | A         |
|       | 0.2                   | A         |
|       | 0.3                   | A         |
|       | 0.4                   | B         |
|       | 0.5                   | B         |
|       | 0.6                   | B         |
|       | 0.7                   | B         |
|       | 0.8                   | B         |
|       | 0.9                   | B         |
|       | 1.0                   | B         |
|       | 1.1                   | B         |
|       | 1.2                   | B         |
|       | 1.5                   | B         |
|       | 1.8                   | B         |
|       | 2.0                   | B         |
|       | 2.2                   | B         |
|       | 2.4                   | B         |
|       | 2.7                   | B         |
| 50    | 3.0                   | B         |
|       | 3.3                   | B         |
|       | 3.9                   | B         |
|       | 4.7                   | B         |
|       | 5.6                   | B         |
|       | 6.8                   | B         |
|       | 8.2                   | B         |
|       | 10.0                  | G         |
|       | 12.0                  | G         |
|       | 15.0                  | G         |
| 25    | 18.0                  | G         |
|       | 22.0                  | G         |

600 Capacitors, 20 each of 30 values  
**Tolerance** A = ± 0.05pF  
 B = ± 0.1pF  
 G = ± 2%

**Accu-P®**  
Designer Kit Type 800LF  
Order Number: Accu-P® 0805KITL2

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.1                   | A         |
|       | 0.2                   | A         |
|       | 0.3                   | A         |
|       | 0.4                   | A         |
|       | 0.5                   | B         |
|       | 0.7                   | B         |
|       | 0.8                   | B         |
|       | 0.9                   | B         |
|       | 1.0                   | B         |
|       | 1.2                   | B         |
|       | 1.5                   | B         |
|       | 1.8                   | B         |
|       | 2.0                   | B         |
|       | 2.2                   | B         |
|       | 2.7                   | B         |
|       | 3.3                   | B         |
|       | 3.9                   | B         |
|       | 4.7                   | B         |
| 50    | 5.6                   | B         |
|       | 6.8                   | B         |
|       | 8.2                   | B         |
|       | 10.0                  | G         |
|       | 12.0                  | G         |
|       | 15.0                  | G         |
|       | 18.0                  | G         |
|       | 22.0                  | G         |
|       | 27.0                  | J         |
|       | 33.0                  | J         |
|       | 39.0                  | J         |
|       | 47.0                  | J         |

300 Capacitors, 10 each of 30 values  
**Tolerance** A = ± 0.05pF G = ± 2%  
 B = ± 0.1pF J = ± 5%

**Accu-P®**  
Designer Kit Type 2800LF  
Order Number: Accu-P® 0201KITL5

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.05                  | Z         |
|       | 0.10                  | Z         |
|       | 0.15                  | Z         |
|       | 0.20                  | Z         |
|       | 0.25                  | Z         |
|       | 0.30                  | Z         |
|       | 0.35                  | Z         |
|       | 0.40                  | Z         |
|       | 0.45                  | Z         |
|       | 0.50                  | Z         |
| 50    | 0.55                  | P         |
|       | 0.60                  | P         |
|       | 0.65                  | P         |
|       | 0.70                  | P         |
|       | 0.75                  | P         |
|       | 0.80                  | P         |
|       | 0.85                  | P         |
|       | 0.90                  | P         |
|       | 0.95                  | P         |
|       | 1.0                   | P         |
|       | 1.1                   | P         |
|       | 1.2                   | P         |
|       | 1.3                   | P         |
|       | 1.4                   | P         |
|       | 1.5                   | P         |
|       | 1.6                   | P         |
|       | 1.7                   | P         |
| 25    | 1.8                   | P         |
|       | 1.9                   | P         |
|       | 2.0                   | P         |

600 Capacitors, 20 each of 30 values  
**Tolerance** Z = ± 0.01pF  
 P = ± 0.02pF

**Accu-P®**  
Designer Kit Type 2700LF  
Order Number: Accu-P® 0402KITL4

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.05                  | Z         |
|       | 0.10                  | Z         |
|       | 0.15                  | Z         |
|       | 0.20                  | Z         |
|       | 0.25                  | Z         |
|       | 0.30                  | Z         |
|       | 0.35                  | Z         |
|       | 0.40                  | Z         |
|       | 0.45                  | Z         |
|       | 0.50                  | Z         |
|       | 0.55                  | P         |
|       | 0.60                  | P         |
|       | 0.65                  | P         |
|       | 0.70                  | P         |
|       | 0.75                  | P         |
|       | 0.80                  | P         |
|       | 0.85                  | P         |
|       | 0.90                  | P         |
| 50    | 0.95                  | P         |
|       | 1.0                   | P         |
|       | 1.1                   | P         |
|       | 1.2                   | P         |
|       | 1.3                   | P         |
|       | 1.4                   | P         |
|       | 1.5                   | P         |
|       | 1.6                   | P         |
|       | 1.7                   | P         |
|       | 1.8                   | P         |
|       | 1.9                   | P         |
|       | 2.0                   | P         |

600 Capacitors, 20 each of 30 values  
**Tolerance** Z = ± 0.01pF  
 P = ± 0.02pF

**Accu-P®**  
Designer Kit Type 2200LF  
Order Number: Accu-P® 0603KITL2

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 0.05                  | P         |
|       | 0.10                  | P         |
|       | 0.15                  | P         |
|       | 0.20                  | P         |
|       | 0.25                  | P         |
|       | 0.30                  | P         |
|       | 0.35                  | P         |
|       | 0.40                  | P         |
|       | 0.45                  | P         |
|       | 0.50                  | P         |
|       | 0.55                  | P         |
|       | 0.60                  | P         |
|       | 0.65                  | P         |
|       | 0.70                  | P         |
|       | 0.75                  | P         |

300 Capacitors, 20 each of 15 values  
Tolerance P =  $\pm 0.02\text{pF}$

**Accu-P®**  
Designer Kit Type 700  
Order Number: Accu-P® 1210KIT02

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 100   | 1.0                   | B         |
|       | 1.5                   | B         |
|       | 1.8                   | B         |
|       | 2.2                   | B         |
|       | 2.7                   | B         |
|       | 3.3                   | B         |
|       | 4.7                   | B         |
|       | 5.6                   | B         |
|       | 6.8                   | B         |
|       | 10.0                  | G         |
|       | 12.0                  | G         |
|       | 18.0                  | G         |
|       | 22.0                  | G         |
|       | 27.0                  | G         |
|       | 33.0                  | G         |

150 Capacitors, 10 each of 15 values  
Tolerance B =  $\pm 0.1\text{pF}$   
G =  $\pm 2\%$

**Accu-P® 01005**  
Designer Kit Type 3100LF  
Order Number: Accu-P® C005KITL1

| Volts | Capacitors Value (pF) | Tolerance |
|-------|-----------------------|-----------|
| 16    | 0.05                  | P         |
|       | 0.1                   | P         |
|       | 0.2                   | P         |
|       | 0.3                   | P         |
|       | 0.4                   | P         |
|       | 0.5                   | P         |
|       | 0.6                   | P         |
|       | 0.7                   | P         |
|       | 0.8                   | P         |
|       | 0.9                   | P         |
|       | 1.0                   | Q         |
|       | 1.2                   | Q         |
|       | 1.5                   | Q         |
|       | 1.8                   | Q         |
|       | 2.2                   | Q         |

7500 Capacitors, 500 each of 15 values  
Tolerance P =  $\pm 0.02\text{pF}$   
Q =  $\pm 0.03\text{pF}$

**Accu-L® 0201**  
Designer Kit Type 3200  
Order Number: Accu-L® 0201KIT1

| Inductance Value (nH) | Tolerance |
|-----------------------|-----------|
| 0.33                  | A         |
| 0.39                  | A         |
| 0.47                  | A         |
| 0.56                  | A         |
| 0.68                  | A         |
| 0.82                  | A         |
| 1.0                   | A         |
| 1.2                   | A         |
| 1.5                   | B         |
| 1.8                   | B         |
| 2.2                   | B         |
| 2.7                   | B         |
| 3.3                   | B         |

260 Inductors, 20 each of 13 values  
Tolerance A =  $\pm 0.05\text{nH}$   
B =  $\pm 0.1\text{nH}$

**Accu-L®**  
Designer Kit Type 2500  
Order Number: Accu-L® L0402KIT01

| Inductance Value (nH) | Tolerance |
|-----------------------|-----------|
| 0.82                  | A         |
| 1.0                   | A         |
| 1.2                   | A         |
| 1.5                   | A         |
| 1.8                   | A         |
| 2.2                   | A         |
| 2.7                   | A         |
| 3.3                   | B         |
| 3.9                   | B         |
| 4.7                   | B         |
| 5.6                   | B         |
| 6.8                   | B         |

240 Inductors, 20 each of 12 values  
Tolerance A =  $\pm 0.05\text{nH}$   
B =  $\pm 0.1\text{nH}$

**Accu-L®**  
Designer Kit Type 1600LF  
Order Number: Accu-L® 0603KITL2

| Inductance Value (nH) | Tolerance |
|-----------------------|-----------|
| 1.2                   | C         |
| 1.5                   | C         |
| 1.8                   | C         |
| 2.2                   | C         |
| 2.7                   | C         |
| 3.3                   | C         |
| 3.9                   | C         |
| 4.7                   | C         |
| 5.6                   | C         |
| 6.8                   | C         |
| 8.2                   | C         |
| 10                    | G         |
| 12                    | G         |
| 15                    | G         |

280 Inductors, 20 each of 14 values  
Tolerance C =  $\pm 0.2\text{nH}$   
G =  $\pm 2\%$

**Accu-L®**  
Designer Kit Type 1100LF  
Order Number: Accu-L® 0805KITL2

| Inductance Value (nH) | Tolerance |
|-----------------------|-----------|
| 1.8                   | C         |
| 2.2                   | C         |
| 2.7                   | C         |
| 3.3                   | C         |
| 3.9                   | C         |
| 4.7                   | C         |
| 5.6                   | C         |
| 6.8                   | D         |
| 8.2                   | D         |
| 10.0                  | J         |
| 12.0                  | J         |
| 15.0                  | J         |
| 18.0                  | J         |
| 22.0                  | J         |

280 Inductors, 20 each of 14 values  
Tolerance C =  $\pm 0.2\text{nH}$   
D =  $\pm 0.5\text{nH}$   
J =  $\pm 5\%$



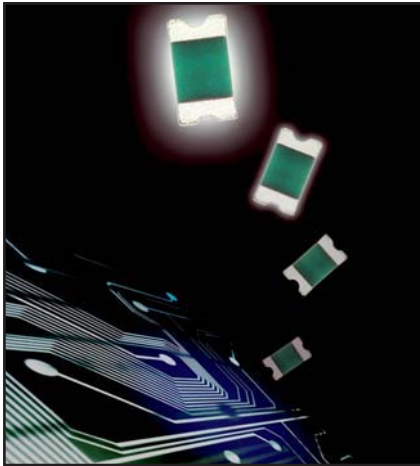
# Multilayer Organic (MLO™) Technology

MLO™ Capacitors

MLO™ Diplexers

MLO™ Inductors

MLO™ SMT Crossovers



Based on its patented multilayer low loss organic (MLO™) technology. These new capacitors represent a paradigm shift from traditional ceramic and thin film passive SMD components. Multilayer Organic Capacitors (MLOC) are polymer based capacitors that use high conductivity copper interconnects in a multilayer fashion. The ability to fabricate these components on large area substrates and state of the art laser direct imaging allow for improved cost benefits and tolerance control. The end result is a state of the art low ESR and high SRF low profile RF capacitor that can support frequencies well above one GHz. Additionally MLOCs are expansion matched to printed circuit boards to allow for improved reliability.

## FEATURES

- Low ESR
- Hi-Q®
- High Self Resonance
- Tight Tolerance
- Low Dielectric Absorption (0.0015%)

## APPLICATIONS

- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- Instrumentation

## HOW TO ORDER

|                                   |                                            |                                                                    |                                                                |                                                                                                                                                                                                        |                                                                                                                                                                   |                                                            |                                                         |                                                             |
|-----------------------------------|--------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|
| <b>ML</b><br><br><b>AVX Style</b> | <b>03</b><br><b>Case Size</b><br>03 = 0603 | <b>7</b><br><b>Voltage Code</b><br>5 = 50V<br>V = 250V<br>7 = 500V | <b>1</b><br><b>Temperature Coefficient Code</b><br>1 = 0±30ppm | <b>1R8</b><br><b>Capacitance</b><br>EIA Capacitance Code in pF.<br>First two digits = significant figures or "R" for decimal place.<br>Third digit = number of zeros or after "R" significant figures. | <b>P</b><br><b>Capacitance Tolerance Code</b><br>P = ± 0.02 pF<br>A = ± .05 pF<br>B = ± .10 pF<br>C = ± .25 pF<br>D = ± .5 pF<br>F = ± 1%<br>G = ± 2%<br>J = ± 5% | <b>A</b><br><b>Failure Rate Code</b><br>A = Not Applicable | <b>T</b><br><b>Termination Style Code</b><br>T = Ni, Sn | <b>2A</b><br><b>Packaging Code</b><br>2A = 7" Reel Unmarked |
|-----------------------------------|--------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|

## MECHANICAL DIMENSIONS: inches (millimeters)

| Case | Length (L)                       | Width (W)                        | Thickness (T)                    | Band Width (B)                   | Castellation Radius (R)          |
|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 0603 | 0.063 ± 0.004<br>(1.600 ± 0.102) | 0.033 ± 0.004<br>(0.838 ± 0.102) | 0.025 ± 0.004<br>(0.635 ± 0.102) | 0.015 ± 0.005<br>(0.381 ± 0.127) | 0.008 ± 0.002<br>(0.203 ± 0.051) |

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

- 8mm carrier
- 7" reel, 3,000 pcs per reel

## ENVIRONMENTAL CHARACTERISTICS

| TEST                                                                           | CONDITIONS                                | REQUIREMENT                                                                                                             |
|--------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Life (Endurance) MIL-STD-202F Method 108A</b>                               | 125°C, 2U <sub>R</sub> , 1000 hours       | No visible damage $\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C/C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Accelerated Damp Heat Steady State MIL-STD-202F Method 103B</b>             | 85°C, 85% RH, U <sub>R</sub> , 1000 hours | No visible damage $\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C/C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Temperature Cycling MIL-STD-202F Method 107E MIL-STD-883D Method 1010.7</b> | -55°C to +125°C, 15 cycles – MLO™         | No visible damage $\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C/C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Resistance to Solder Heat IEC-68-2-58</b>                                   | 260°C $\pm$ 5°C for 10 secs.              | C remains within initial limits                                                                                         |

## MECHANICAL SPECIFICATIONS

| TEST                                                  | CONDITIONS                                                                    | REQUIREMENT                                                                                                             |
|-------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Solderability IEC-68-2-58</b>                      | Components completely immersed in a solder bath at 235°C for 2 secs.          | Terminations to be well tinned, minimum 95% coverage                                                                    |
| <b>Leach Resistance IEC-68-2-58</b>                   | Components completely immersed in a solder bath at 260 $\pm$ 5°C for 60 secs. | Dissolution of termination faces $\leq 15\%$ of area<br>Dissolution of termination edges $\leq 25\%$ of length          |
| <b>Adhesion MIL-STD-202F Method 211A</b>              | A force of 5N applied for 10 secs.                                            | No visible damage                                                                                                       |
| <b>Termination Bond Strength IEC-68-2-21 Amend. 2</b> | Tested as shown in diagram                                                    | No visible damage $\Delta C/C \leq 2\%$ for $C \geq 5\text{pF}$<br>$\Delta C/C \leq 0.25\text{pF}$ for $C < 5\text{pF}$ |
| <b>Robustness of Termination IEC-68-2-21 Amend. 2</b> | A force of 5N applied for 10 secs.                                            | No visible damage                                                                                                       |
| <b>Storage</b>                                        | 12 months minimum with components stored in “as received” packaging           | Good solderability                                                                                                      |

## QUALITY & RELIABILITY

MLO™ capacitors utilize high density interconnect wiring technology on well established low loss organic materials.

- Solderability;
- Dimensional, mechanical and temperature stability.

## FINAL QUALITY INSPECTION

Finished parts are tested for standard electrical parameters and visual/mechanical characteristics. Each production lot is 100% evaluated for: capacitance and proof voltage at 2.5 U<sub>R</sub>. In addition, production is periodically evaluated for:

- Average capacitance with histogram printout for capacitance distribution;
- IR and Breakdown Voltage distribution;
- Temperature Coefficient;

## QUALITY ASSURANCE

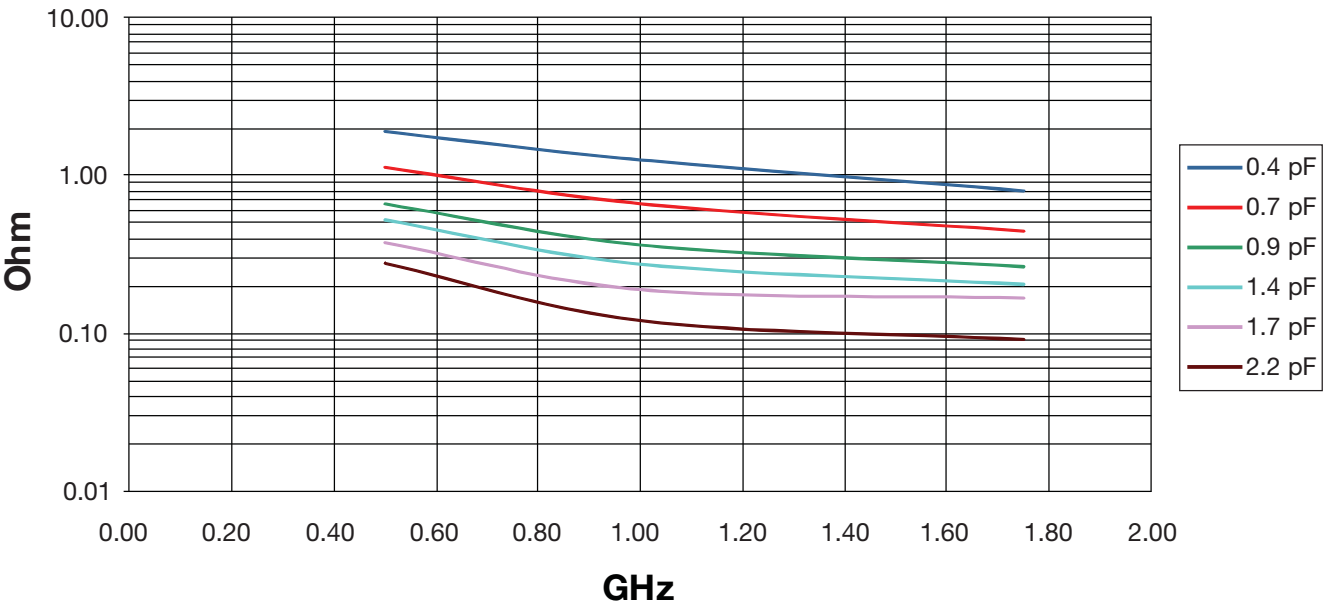
The reliability of these multilayer organic capacitors has been extensively studied. Various methods and standards have been used to ensure a high quality component including JEDEC, Mil Spec and IPC testing. AVX's quality assurance policy is based on well established international industry standards. The reliability of the capacitors is determined by accelerated testing under the following conditions:

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| Life (Endurance)                   | 125°C, 2U <sub>R</sub> , 1000 hours        |
| Accelerated Damp Heat Steady State | 85°C, 85% RH, U <sub>R</sub> , 1000 hours. |

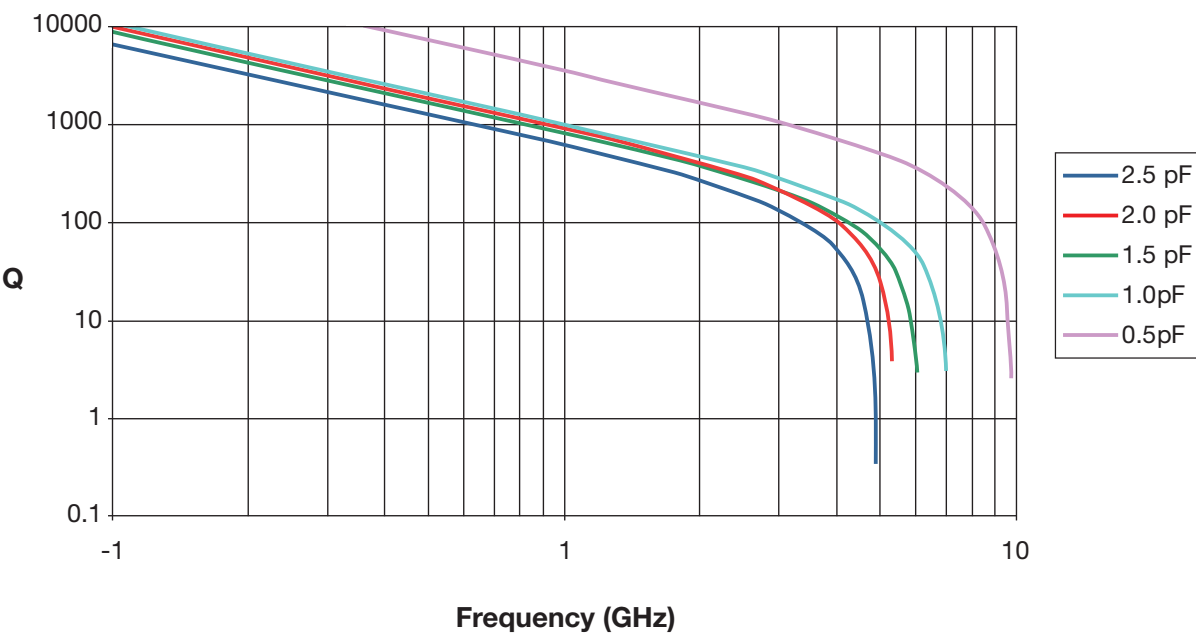
**TABLE I: CASE SIZE ML03**

| Cap. pF | Cap. Tol.  | WVDC         | Cap. pF | Cap. Tol.  | WVDC         | Cap. pF | Cap. Tol.  | WVDC    |
|---------|------------|--------------|---------|------------|--------------|---------|------------|---------|
| 0.1     | P, A, B    | 50, 250, 500 | 1.3     | P, A, B, C | 50, 250, 500 | 3.0     | P, A, B, C | 50, 250 |
| 0.2     | P, A, B    | 50, 250, 500 | 1.4     | P, A, B, C | 50, 250, 500 | 3.3     | P, A, B, C | 50, 250 |
| 0.3     | P, A, B    | 50, 250, 500 | 1.5     | P, A, B, C | 50, 250, 500 | 3.6     | P, A, B, C | 50, 250 |
| 0.4     | P, A, B    | 50, 250, 500 | 1.6     | P, A, B, C | 50, 250, 500 | 3.9     | P, A, B, C | 50, 250 |
| 0.5     | P, A, B, C | 50, 250, 500 | 1.7     | P, A, B, C | 50, 250, 500 |         |            |         |
| 0.6     | P, A, B, C | 50, 250, 500 | 1.8     | P, A, B, C | 50, 250, 500 |         |            |         |
| 0.7     | P, A, B, C | 50, 250, 500 | 1.9     | P, A, B, C | 50, 250, 500 |         |            |         |
| 0.8     | P, A, B, C | 50, 250, 500 | 2.0     | P, A, B, C | 50, 250, 500 |         |            |         |
| 0.9     | P, A, B, C | 50, 250, 500 | 2.2     | P, A, B, C | 50, 250, 500 |         |            |         |
| 1.0     | P, A, B, C | 50, 250, 500 | 2.4     | P, A, B, C | 50, 250, 500 |         |            |         |
| 1.1     | P, A, B, C | 50, 250, 500 | 2.5     | P, A, B, C | 50, 250, 500 |         |            |         |
| 1.2     | P, A, B, C | 50, 250, 500 | 2.7     | P, A, B, C | 50, 250      |         |            |         |

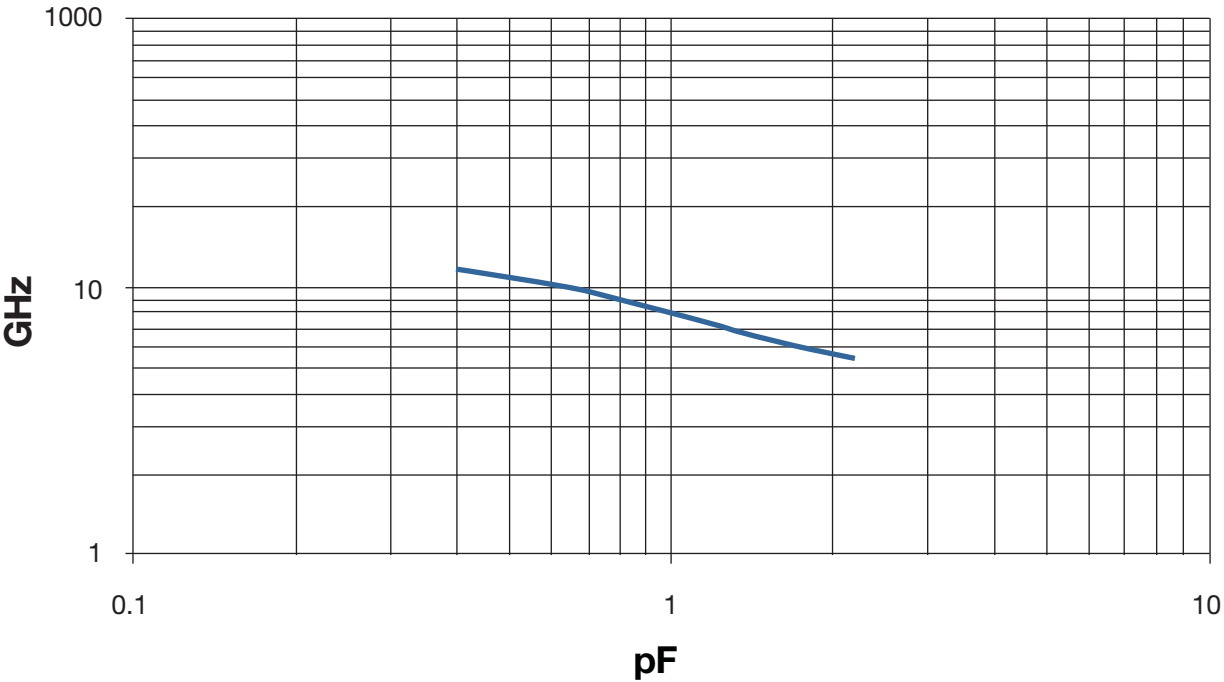
Typical ESR vs. Frequency  
MLO™ 0603



Typical Q vs. Frequency  
MLO™ 0603



Typical Self Resonant Frequency vs. Capacitance  
MLO™ 0603



# Multilayer Organic (MLO™)



## 0603 WLAN/BT Diplexer



### MLO™ TECHNOLOGY

The 0603 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors, and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN, GSM, and BT. These diplexers are less than 0.5mm in height and are ideally suited for band switching for dual band systems. All diplexers are expansion matched to printed circuit boards thereby resulting in improved reliability vs. ceramic and Si components.

### APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- High Heat Dissipation

### HOW TO ORDER

**DP** **03** **B** **5425** **7** **TR**  
Type Size Design Frequency (MHz) Finish Packaging  
Tape & Reel  
7 = Au  
T = NiSn



### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

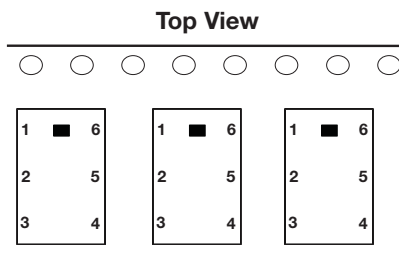
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni Au, Ni Sn and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

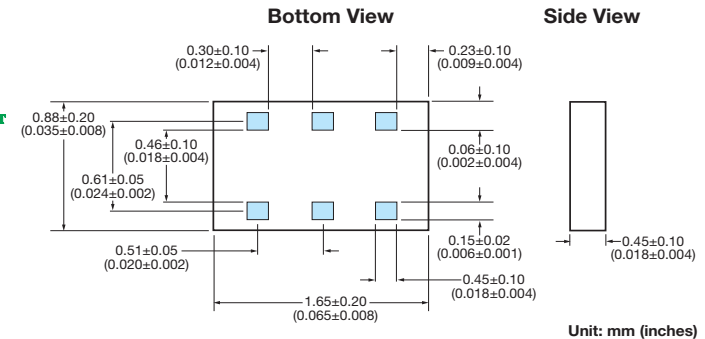
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | GND                 |
| 2            | Common              |
| 3            | GND                 |
| 4            | Low Frequency Port  |
| 5            | GND                 |
| 6            | High Frequency Port |

PART NUMBER: DP03B54257TR

### Electrical Characteristics @ 25°C

| No. | Parameter   | Freq. (MHz) | Port     | Specification | Typ. value | Unit |
|-----|-------------|-------------|----------|---------------|------------|------|
| 1   | Insertion   | 2400-2496   | Low      | 0.55 max      | 0.40       | dB   |
| 2   | Loss        | 4900-5950   | High     | 1.2 max       | 0.80       | dB   |
| 3   | Attenuation | 500-2700    | High     | 28 min        | 35         | dB   |
| 4   |             | 9800-11900  | High     | 10 min        | 14         | dB   |
| 6   | Attenuation | 4800-4992   | Low      | 20 min        | 25         | dB   |
| 7   |             | 4900-5950   | Low      | 23 min        | 27         | dB   |
| 8   |             | 7200-7500   | Low      | 26 min        | 30         | dB   |
| 9   | Isolation   | 500-2700    | Low-High | 28 min        | 35         | dB   |
| 10  |             | 4900-5950   | Low-High | 22 min        | 25         | dB   |
| 11  | VSWR        | 2400-2500   | Ant      | 2.0 max       | 1.5        | -    |
| 12  | VSWR        | 4900-5950   | Ant      | 2.0 max       | 1.3        | -    |
| 13  | VSWR        | 2400-2500   | Low      | 2.0 max       | 1.5        | -    |
| 14  | VSWR        | 4900-5950   | High     | 2.0 max       | 1.3        | -    |

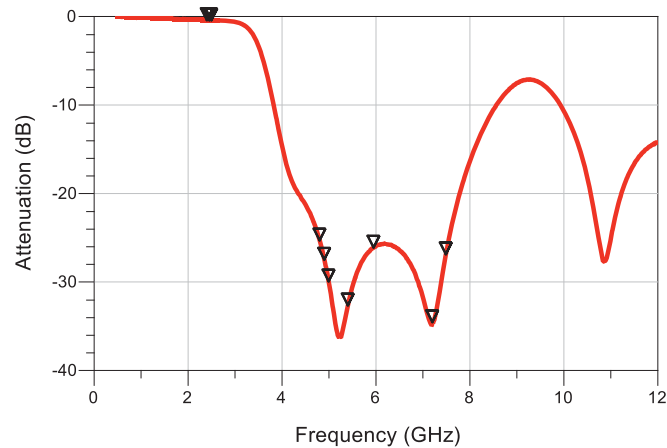
### Mechanical Characteristics @ 25°C

|                     |                             |
|---------------------|-----------------------------|
| Size [mm(inches)]   | 1.65 x 0.88 (0.065 x 0.035) |
| Height [mm(inches)] | 0.42 (0.017)                |
| Volume (mm^3)       | 0.77                        |



S PARAMETER MEASUREMENTS

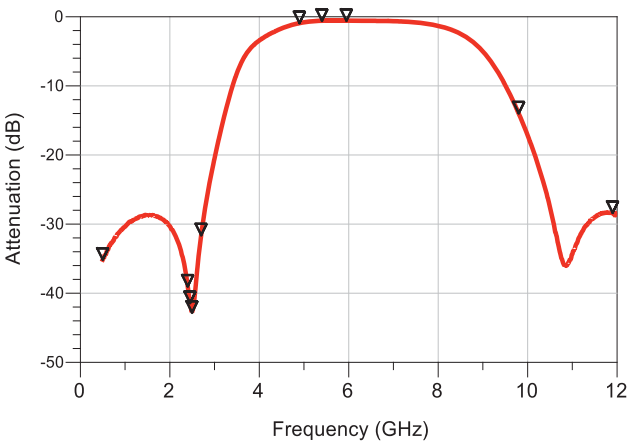
LOW BAND PORT ATTENUATION



Low Band Attenuation

| Frequency | Attenuation |
|-----------|-------------|
| 4.800 GHz | 25.302      |
| 4.992 GHz | 29.935      |
| 4.900 GHz | 27.471      |
| 5.400 GHz | 32.647      |
| 5.590 GHz | 26.099      |
| 7.200 GHz | 34.531      |
| 7.488 GHz | 26.860      |

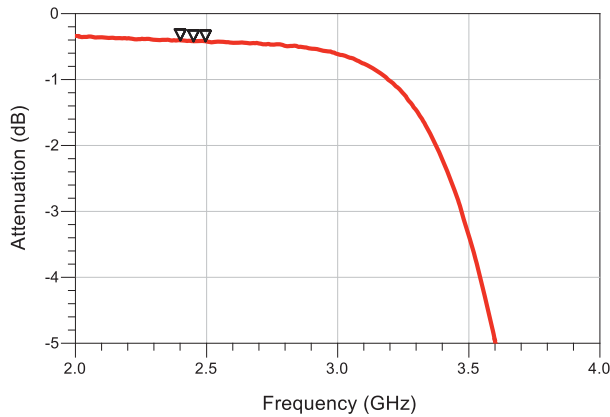
HIGH BAND PORT ATTENUATION



High Band Attenuation

| Frequency | Attenuation |
|-----------|-------------|
| 0.500 GHz | 35.133      |
| 2.400 GHz | 39.019      |
| 2.450 GHz | 41.406      |
| 2.496 GHz | 42.793      |
| 2.700 GHz | 31.607      |
| 9.800 GHz | 13.967      |
| 11.90 GHz | 28.352      |

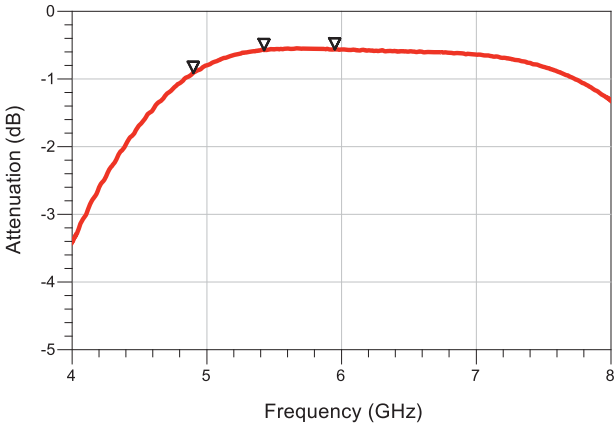
LOW BAND INSERTION LOSS



Low Band Insertion Loss

| Frequency | Insertion Loss |
|-----------|----------------|
| 2.400 GHz | 0.404          |
| 2.450 GHz | 0.418          |
| 2.496 GHz | 0.420          |

HIGH BAND INSERTION LOSS

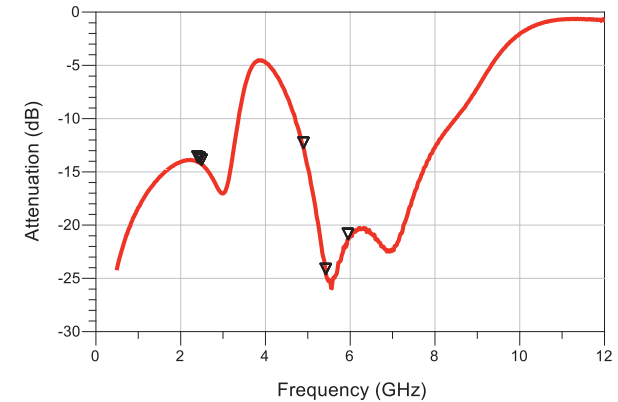


High Band Insertion Loss

| Frequency | Insertion Loss |
|-----------|----------------|
| 4.900 GHz | 0.909          |
| 5.400 GHz | 0.577          |
| 5.950 GHz | 0.562          |

S PARAMETER MEASUREMENTS

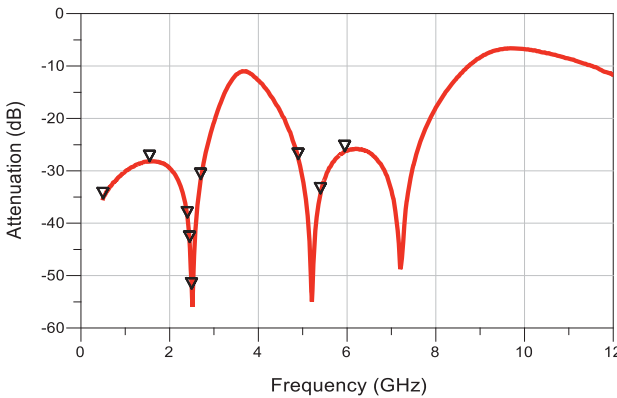
COMMON PORT RETURN LOSS



Common Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 2.400 GHz | 14.066      | 1.494 |
| 2.450 GHz | 14.162      | 1.487 |
| 2.496 GHz | 14.325      | 1.476 |
| 4.900 GHz | 12.750      | 1.599 |
| 5.400 GHz | 24.603      | 1.125 |
| 5.950 GHz | 21.310      | 1.188 |

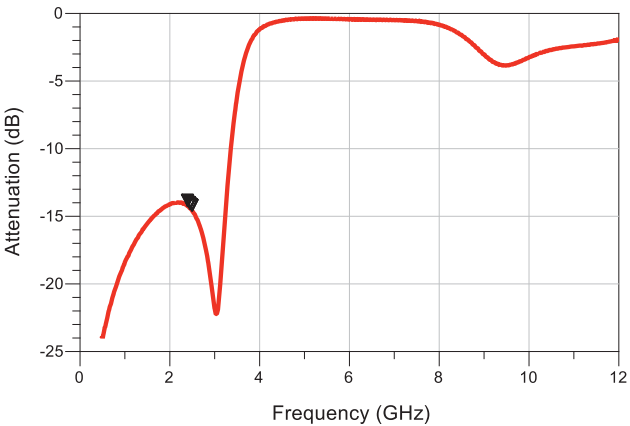
ISOLATION



Isolation

| Frequency | Attenuation |
|-----------|-------------|
| 0.500 GHz | 32.253      |
| 1.550 GHz | 28.144      |
| 2.400 GHz | 28.913      |
| 2.450 GHz | 43.562      |
| 2.496 GHz | 52.470      |
| 2.700 GHz | 31.566      |
| 4.900 GHz | 27.731      |
| 5.400 GHz | 34.304      |
| 5.950 GHz | 26.249      |

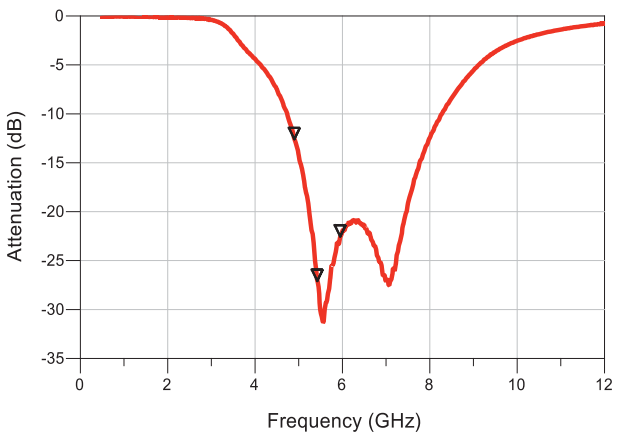
LOW BAND RETURN LOSS



Low Band Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 2.400 GHz | 14.232      | 1.482 |
| 2.450 GHz | 14.429      | 1.469 |
| 2.496 GHz | 14.572      | 1.459 |

HIGH BAND RETURN LOSS



High Band Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 4.900 GHz | 12.587      |       |
| 5.400 GHz | 27.577      | 1.087 |
| 5.950 GHz | 22.533      | 1.161 |

# Multilayer Organic (MLO™)



## 0603 WLAN/BT Diplexer



### MLO™ TECHNOLOGY

The 0603 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors, and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN, GSM, and BT. These diplexers are less than 0.5mm in height and are ideally suited for band switching for dual band systems. All diplexers are expansion matched to printed circuit boards thereby resulting in improved reliability vs. ceramic and Si components.

### APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- High Heat Dissipation

### HOW TO ORDER

| DP   | 03   | A      | 5425            | 7                            | TR                       |                |
|------|------|--------|-----------------|------------------------------|--------------------------|----------------|
| Type | Size | Design | Frequency (MHz) | Finish<br>7 = Au<br>T = NiSn | Packaging<br>Tape & Reel | RoHS COMPLIANT |

### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

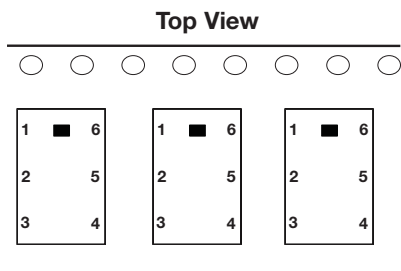
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni Au, Ni Sn and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

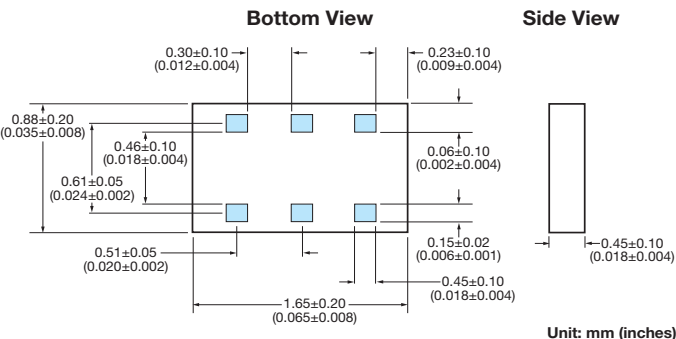
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | Low Frequency Port  |
| 2            | GND                 |
| 3            | High Frequency Port |
| 4            | GND                 |
| 5            | Common              |
| 6            | GND                 |

PART NUMBER: DP03A54257TR

#### Electrical Characteristics @ 25°C

| No. | Parameter      | Freq. (MHz) | Port     | Specification | Typ. value | Unit |
|-----|----------------|-------------|----------|---------------|------------|------|
| 1   | Insertion Loss | 2400-2496   | Low      | 0.55 max      | 0.40       | dB   |
| 2   |                | 4900-5950   | High     | 1.2 max       | 0.80       | dB   |
| 3   | Attenuation    | 500-2700    | High     | 28 min        | 35         | dB   |
| 4   |                | 9800-11900  | High     | 10 min        | 14         | dB   |
| 6   | Attenuation    | 4800-4992   | Low      | 20 min        | 25         | dB   |
| 7   |                | 4900-5950   | Low      | 23 min        | 27         | dB   |
| 8   |                | 7200-7500   | Low      | 26 min        | 30         | dB   |
| 9   | Isolation      | 500-2700    | Low-High | 28 min        | 35         | dB   |
| 10  |                | 4900-5950   | Low-High | 22 min        | 25         | dB   |
| 11  | VSWR           | 2400-2500   | Ant      | 2.0 max       | 1.5        | -    |
| 12  | VSWR           | 4900-5950   | Ant      | 2.0 max       | 1.3        | -    |
| 13  | VSWR           | 2400-2500   | Low      | 2.0 max       | 1.5        | -    |
| 14  | VSWR           | 4900-5950   | High     | 2.0 max       | 1.3        | -    |

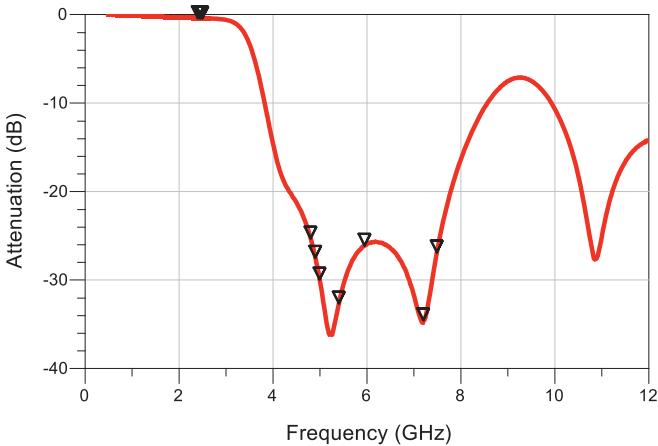
#### Mechanical Characteristics @ 25°C

|                     |                             |
|---------------------|-----------------------------|
| Size [mm(inches)]   | 1.65 x 0.88 (0.065 x 0.035) |
| Height [mm(inches)] | 0.42 (0.017)                |
| Volume (mm^3)       | 0.77                        |



S PARAMETER MEASUREMENTS

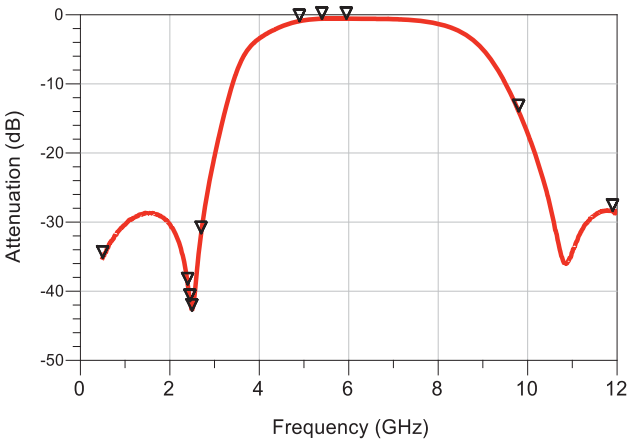
LOW BAND PORT ATTENUATION



Low Band Attenuation

| Frequency | Attenuation |
|-----------|-------------|
| 4.800 GHz | 25.302      |
| 4.992 GHz | 29.935      |
| 4.900 GHz | 27.471      |
| 5.400 GHz | 32.647      |
| 5.590 GHz | 26.099      |
| 7.200 GHz | 34.531      |
| 7.488 GHz | 26.860      |

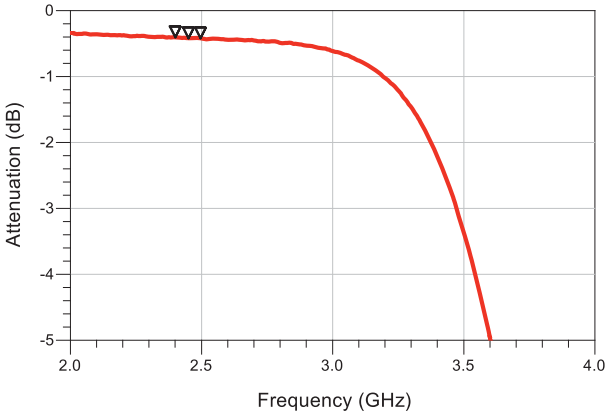
HIGH BAND PORT ATTENUATION



High Band Attenuation

| Frequency | Attenuation |
|-----------|-------------|
| 0.500 GHz | 35.133      |
| 2.400 GHz | 39.019      |
| 2.450 GHz | 41.406      |
| 2.496 GHz | 42.793      |
| 2.700 GHz | 31.607      |
| 9.800 GHz | 13.967      |
| 11.90 GHz | 28.352      |

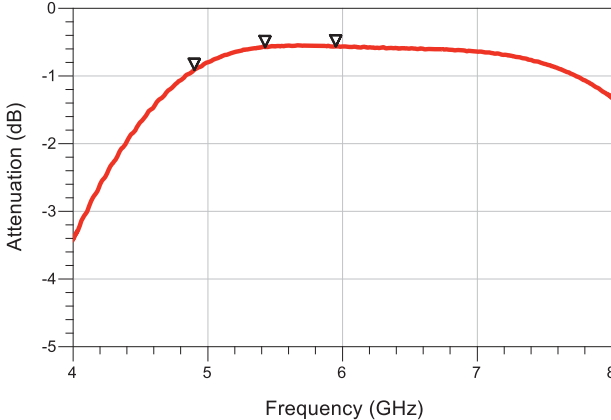
LOW BAND INSERTION LOSS



Low Band Insertion Loss

| Frequency | Insertion Loss |
|-----------|----------------|
| 2.400 GHz | 0.404          |
| 2.450 GHz | 0.418          |
| 2.496 GHz | 0.420          |

HIGH BAND INSERTION LOSS

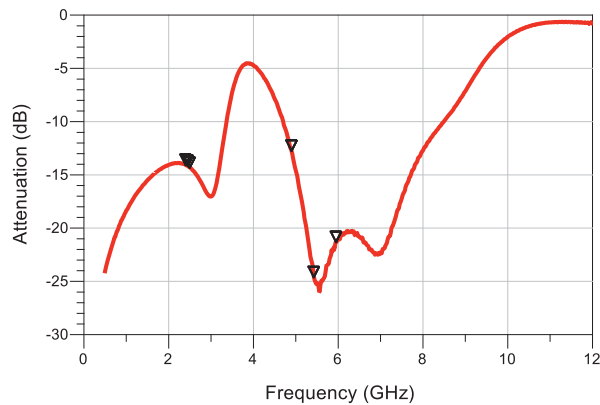


High Band Insertion Loss

| Frequency | Insertion Loss |
|-----------|----------------|
| 4.900 GHz | 0.909          |
| 5.400 GHz | 0.577          |
| 5.950 GHz | 0.562          |

S PARAMETER MEASUREMENTS

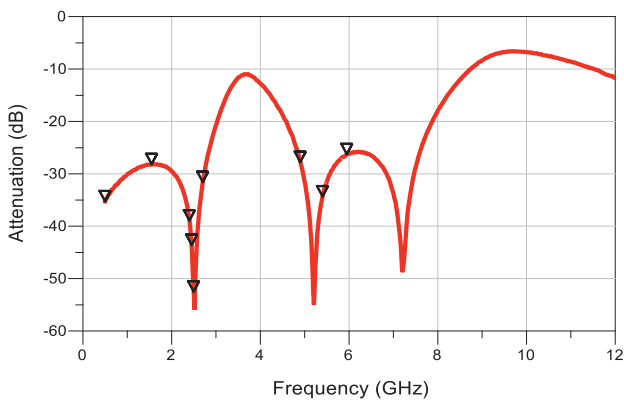
COMMON PORT RETURN LOSS



Common Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 2.400 GHz | 14.066      | 1.494 |
| 2.450 GHz | 14.162      | 1.487 |
| 2.496 GHz | 14.325      | 1.476 |
| 4.900 GHz | 12.750      | 1.599 |
| 5.400 GHz | 24.603      | 1.125 |
| 5.950 GHz | 21.310      | 1.188 |

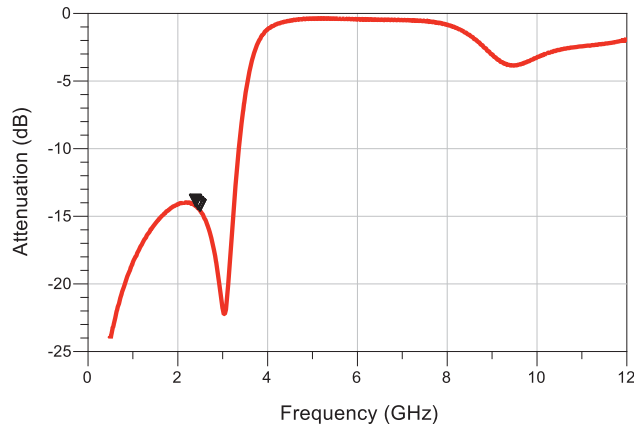
ISOLATION



Isolation

| Frequency | Attenuation |
|-----------|-------------|
| 0.500 GHz | 32.253      |
| 1.550 GHz | 28.144      |
| 2.400 GHz | 28.913      |
| 2.450 GHz | 43.562      |
| 2.496 GHz | 52.470      |
| 2.700 GHz | 31.566      |
| 4.900 GHz | 27.731      |
| 5.400 GHz | 34.304      |
| 5.950 GHz | 26.249      |

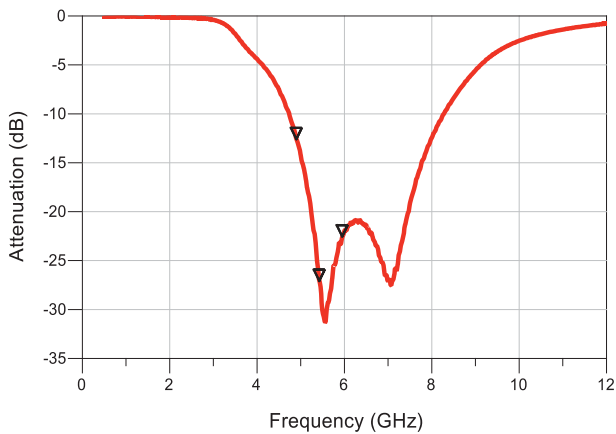
LOW BAND RETURN LOSS



Low Band Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 2.400 GHz | 14.232      | 1.482 |
| 2.450 GHz | 14.429      | 1.469 |
| 2.496 GHz | 14.572      | 1.459 |

HIGH BAND RETURN LOSS



High Band Return Loss

| Frequency | Return Loss | VSWR  |
|-----------|-------------|-------|
| 4.900 GHz | 12.587      |       |
| 5.400 GHz | 27.577      | 1.087 |
| 5.950 GHz | 22.533      | 1.161 |

# Multilayer Organic (MLO™)

**AVX RF**

## 0805 CDMA Diplexer



### MLO™ TECHNOLOGY

The 0805 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed passive elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN, and GSM and are less than 0.6mm in thickness. These components are ideally suited for band switching for dual band systems. All diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

### APPLICATIONS

Multiband applications including WCDMA, WLAN, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

### HOW TO ORDER

**DP** **05** **A** **1920** **7** **TR**  
Type Size Design Frequency (MHz) Finish  
7 = Au  
T = NiSn  
Packaging  
Tape & Reel  
TR = 3 Kpcs  
TR/500 = 500 pcs



### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

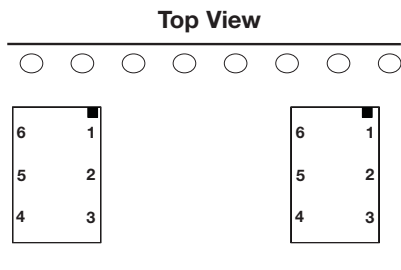
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

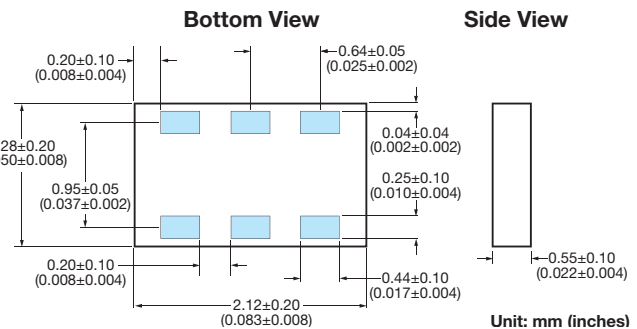
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



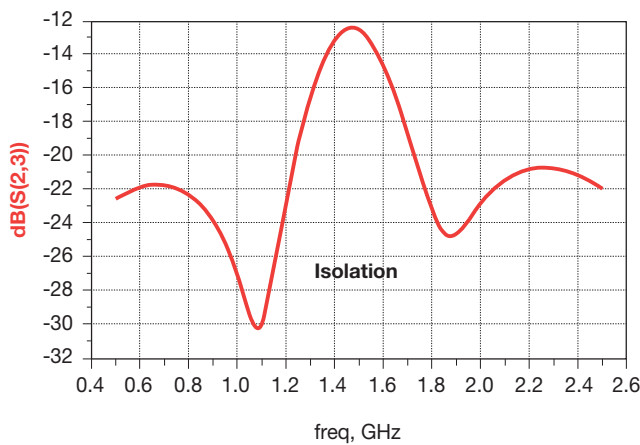
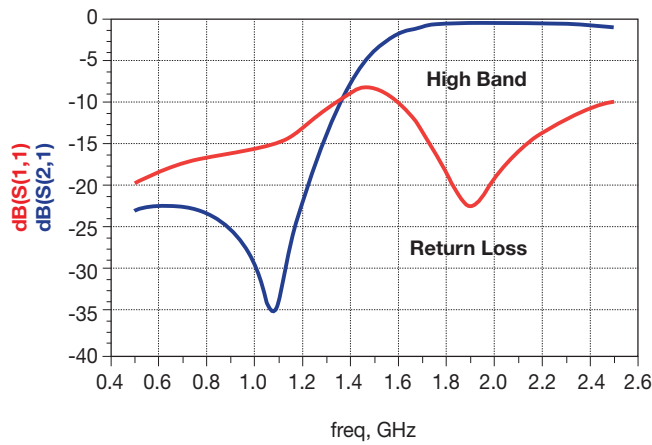
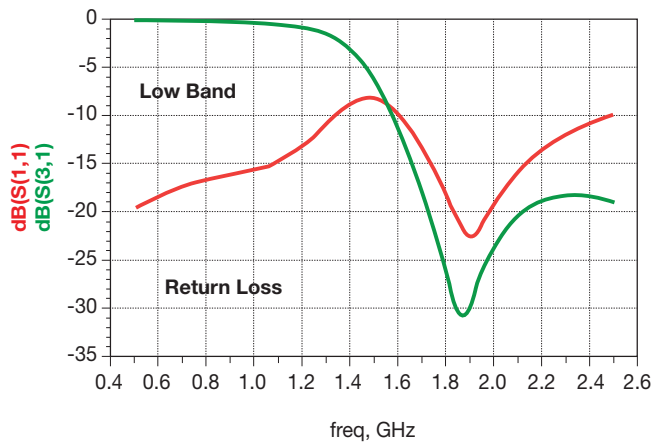
| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | High Frequency Port |
| 2            | GND                 |
| 3            | Low Frequency Port  |
| 4            | GND                 |
| 5            | Common Port         |
| 6            | GND                 |

PART NUMBER: DP05A19207TR

| Specification @ 25°C            |                             |
|---------------------------------|-----------------------------|
| Size [mm(inches)]               | 2.12 x 1.28 (0.083 x 0.050) |
| Height [mm(inches)]             | 0.55 (0.021)                |
| Volume (mm^3)                   | 1.5                         |
| Frequency Range (F1) (MHz)      | 859±35                      |
| Frequency Range (F2) (MHz)      | 1920±70                     |
| Insertion Loss (F1, at Fc) (dB) | -0.4                        |
| Insertion Loss (F2, at Fc) (dB) | -0.6                        |
| Attenuation (F1) at (F2) (dB)   | -23                         |
| Attenuation (F2) at (F1) (dB)   | -23                         |
| VSWR (Input @ F1)               | 1.4                         |
| VSWR (Input @ F2)               | 1.3                         |
| VSWR (Lowband @ F1)             | 1.4                         |
| VSWR (Highband @ F2)            | 1.4                         |

**AVX**

S PARAMETER MEASUREMENTS



**Note:** Measurements were taken using an Anritsu 4 port VNA; Diplexer was mounted on a custom evaluation board. To reduce systematic errors from the VNA, the coaxial measurement cables, and evaluation board, a Short-Open-Load-Thru (SOLT) calibration was performed, using a custom fabricated calibration substrate. This is the most common coaxial calibration methods.

# Multilayer Organic (MLO™)



## 0805 WCDMA Diplexer



### MLO™ TECHNOLOGY

The 0805 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed passive elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN, and GSM and are less than 0.6mm in thickness. These components are ideally suited for band switching for dual band systems. All diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

### APPLICATIONS

Multiband applications including WCDMA, WLAN, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

### HOW TO ORDER

**DP** **05** **A** **1940** **7** **TR**  
Type Size Design Frequency (MHz) Finish Packaging  
7 = Au TR = 3 Kpcs  
T = NiSn TR/500 = 500 pcs



### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

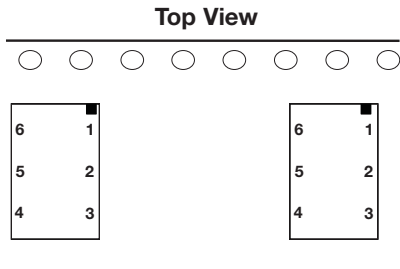
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

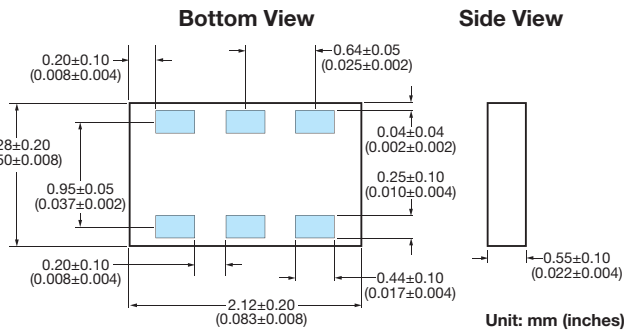
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



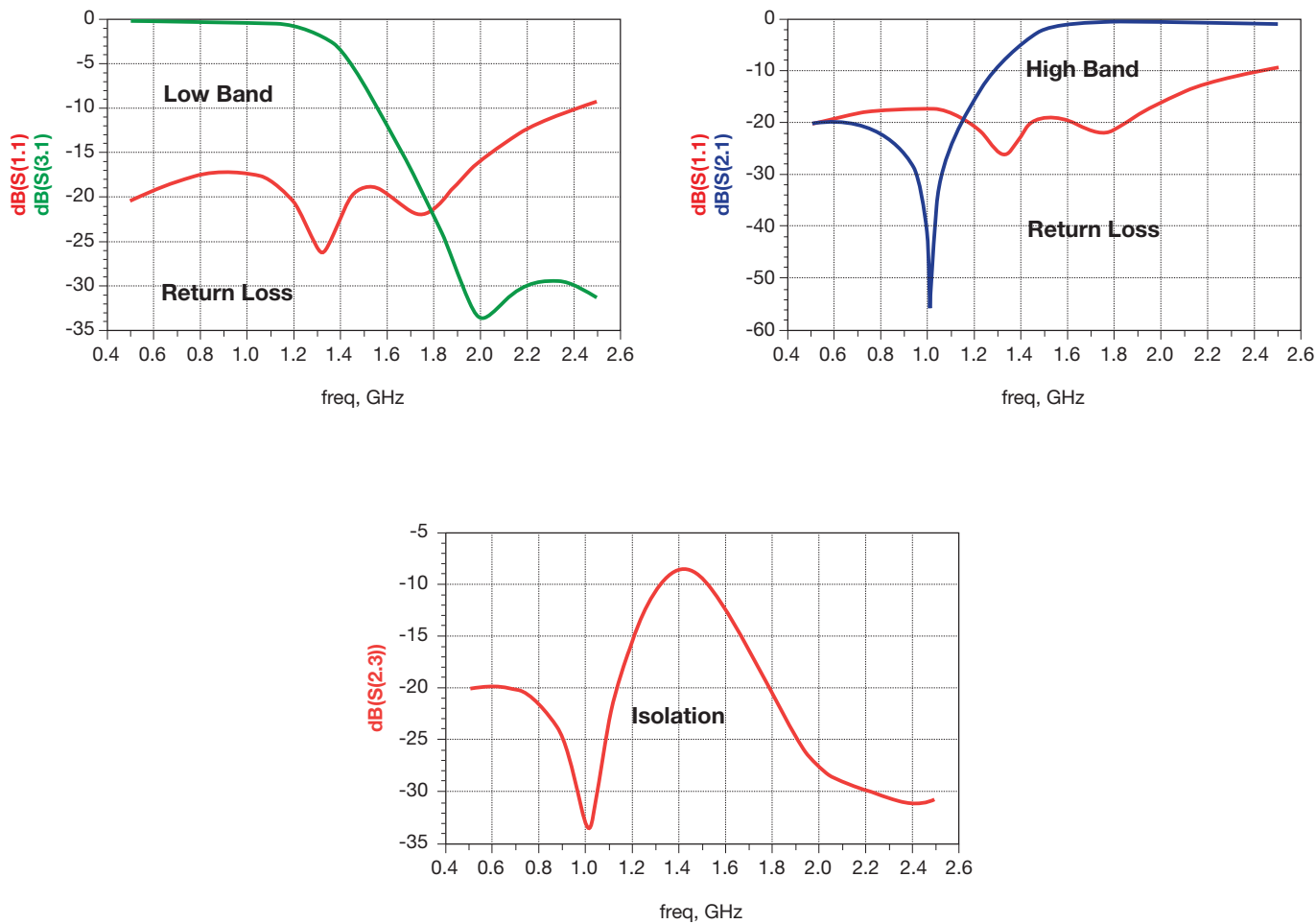
| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | High Frequency Port |
| 2            | GND                 |
| 3            | Low Frequency Port  |
| 4            | GND                 |
| 5            | Common Port         |
| 6            | GND                 |

PART NUMBER: DP05A19407TR

| Specification @ 25°C            |                             |
|---------------------------------|-----------------------------|
| Size [mm(inches)]               | 2.12 x 1.28 (0.083 x 0.050) |
| Height [mm(inches)]             | 0.55 (0.021)                |
| Volume (mm^3)                   | 1.5                         |
| Frequency Range (F1) (MHz)      | 892±68                      |
| Frequency Range (F2) (MHz)      | 1940±230                    |
| Insertion Loss (F1, at Fc) (dB) | -0.4                        |
| Insertion Loss (F2, at Fc) (dB) | -0.65                       |
| Attenuation (F1) at (F2) (dB)   | -23                         |
| Attenuation (F2) at (F1) (dB)   | -20                         |
| VSWR (Input @ F1)               | 1.3                         |
| VSWR (Input @ F2)               | 1.4                         |
| VSWR (Lowband @ F1)             | 1.4                         |
| VSWR (Highband @ F2)            | 1.2                         |



S PARAMETER MEASUREMENTS



**Note:** Measurements were taken using an Anritsu 4 port VNA; Diplexer was mounted on a custom evaluation board. To reduce systematic errors from the VNA, the coaxial measurement cables, and evaluation board, a Short-Open-Load-Thru (SOLT) calibration was performed, using a custom fabricated calibration substrate. This is the most common coaxial calibration methods.

# Multilayer Organic (MLO™)

**AVX RF**

## 0805 WLAN Diplexer



### MLO™ TECHNOLOGY

The 0805 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN and GSM. These components which are less than 0.6mm in thickness are ideally suited for band switching for dual band systems. All diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

### APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

### HOW TO ORDER

**DP** **05** **A** **5250** **7** **TR**  
Type Size Design Frequency (MHz) Finish  
7 = Au  
T = NiSn  
Packaging  
Tape & Reel  
TR = 3 Kpcs  
TR/500 = 500 pcs



### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

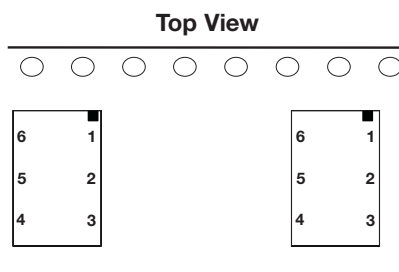
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

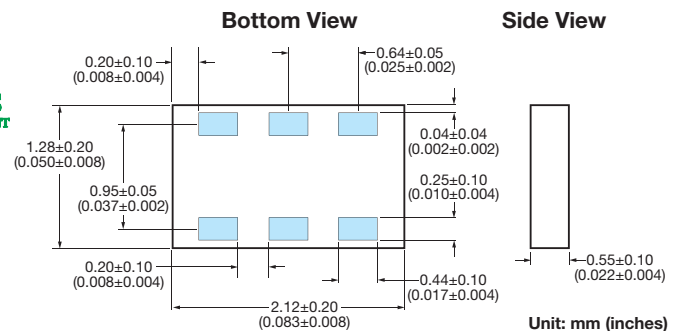
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



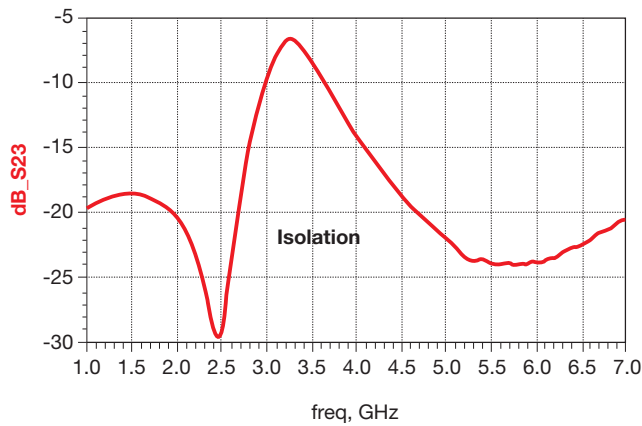
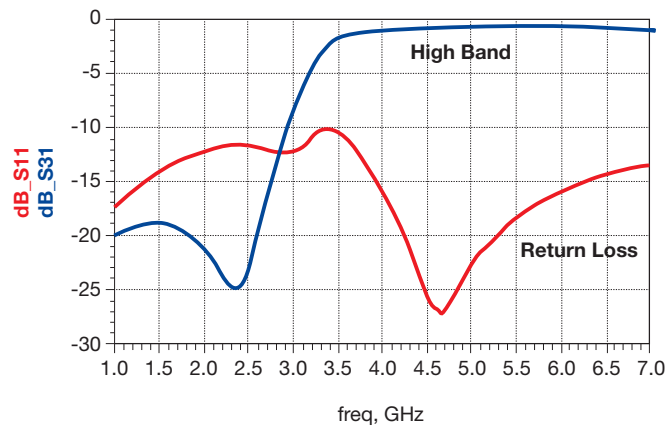
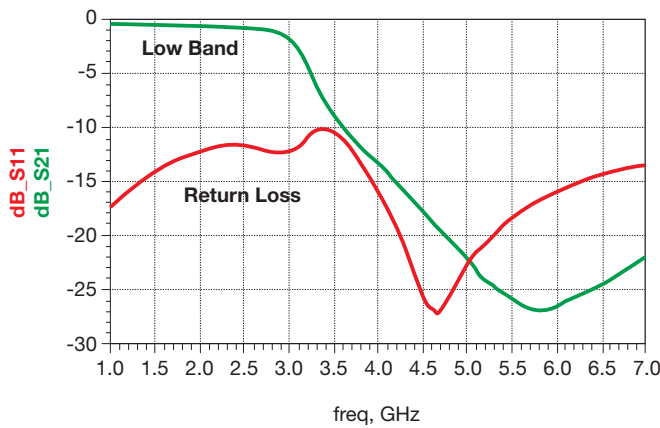
| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | High Frequency Port |
| 2            | GND                 |
| 3            | Low Frequency Port  |
| 4            | GND                 |
| 5            | Common Port         |
| 6            | GND                 |

PART NUMBER: DP05A52507TR

| Specification @ 25°C             |                             |
|----------------------------------|-----------------------------|
| Size [mm(inches)]                | 2.12 x 1.28 (0.083 x 0.050) |
| Height [mm(inches)]              | 0.55 (0.021)                |
| Volume (mm^3)                    | 1.5                         |
| Frequency Range (F1) (MHz)       | 2450±50                     |
| Frequency Range (F2) (MHz)       | 5250±100                    |
| Insertion Loss (F1) (dB)         | -0.5                        |
| Insertion Loss (F2) (dB)         | -0.5                        |
| Attenuation (F1) at (F2) (dB)    | -20                         |
| Attenuation (F2) at (F1) (dB)    | -20                         |
| Return Loss (Lowband @ F1) (dB)  | -12                         |
| Return Loss (Highband @ F2) (dB) | -12                         |
| Isolation (Lowband @ F1) (dB)    | -25                         |
| Isolation (Highband @ F2) (dB)   | -21                         |

**AVX**

S PARAMETER MEASUREMENTS



# Multilayer Organic (MLO™)



## 0805 WLAN/BT Diplexer



### MLO™ TECHNOLOGY

The 0805 MLO™ diplexer is best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN and GSM. These components which are less than 0.5mm in thickness are ideally suited for band switching for dual band systems. All MLO™ diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

### APPLICATIONS

Multiband applications including WiFi, BT, WiMax, GPS, and cellular bands

### LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Matched CTE to PCB

### HOW TO ORDER

**DP** **05** **B** **5425** **7** **TR**  
Type Size Design Frequency (MHz) Finish  
7 = Au  
T = NiSn  
Packaging  
Tape & Reel  
TR = 3 Kpcs  
TR/500 = 500 pcs



### QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

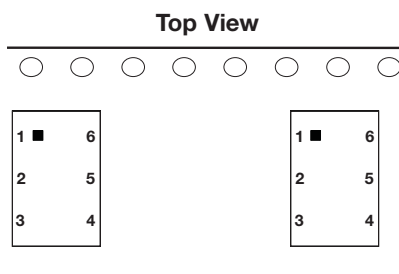
### OPERATING TEMPERATURE

-40°C to +85°C

### TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

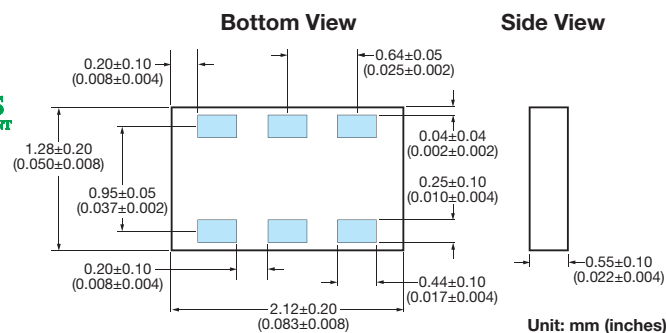
### ORIENTATION IN TAPE



### POWER CAPACITY

4.5W Maximum

### COMPONENT DIMENSIONS AND FUNCTIONS



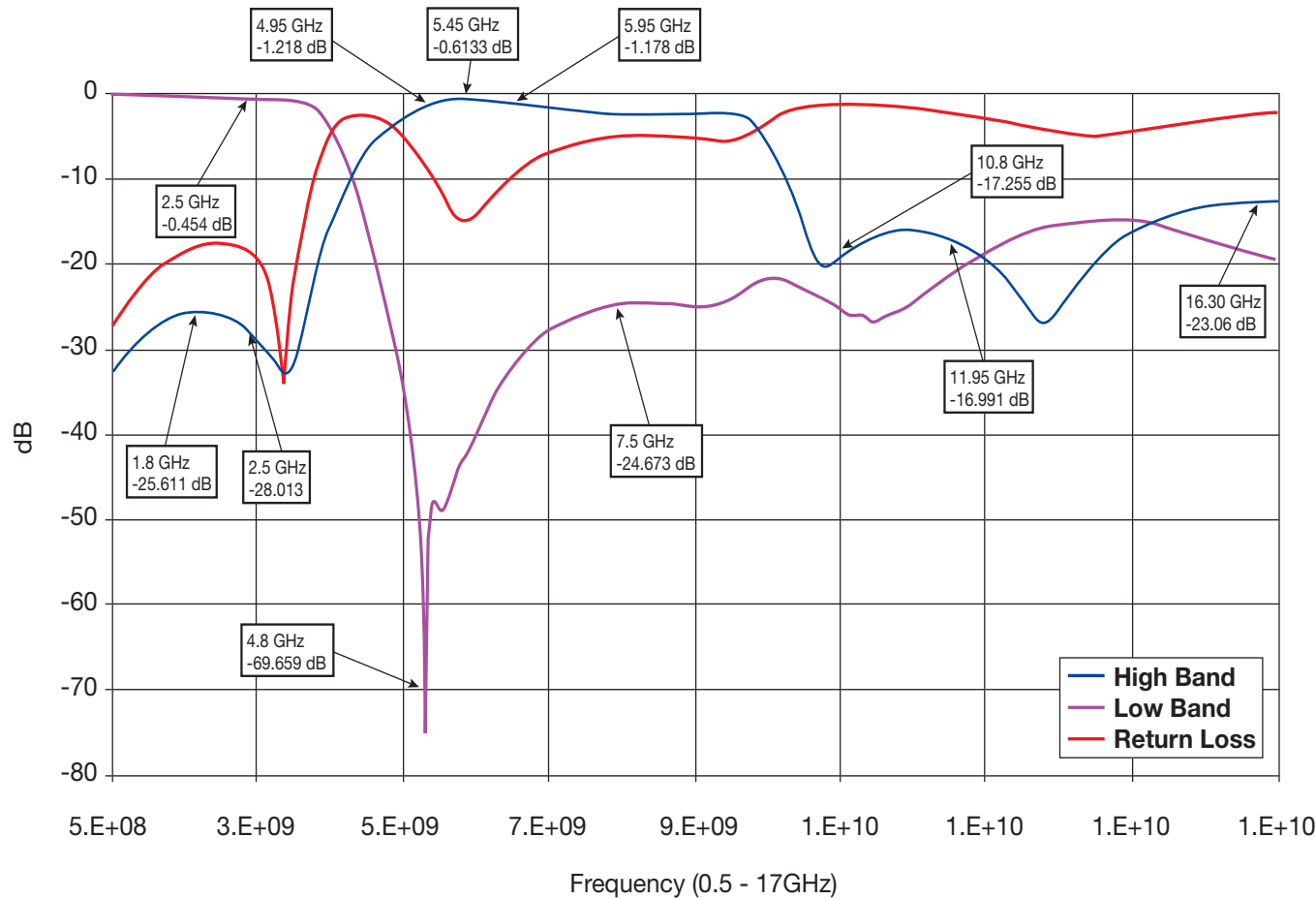
| Terminal No. | Terminal Name       |
|--------------|---------------------|
| 1            | Low Frequency Port  |
| 2            | GND                 |
| 3            | High Frequency Port |
| 4            | GND                 |
| 5            | Common Port         |
| 6            | GND                 |

PART NUMBER: DP05B54257TR

| Specification @ 25°C                       |                             |
|--------------------------------------------|-----------------------------|
| Size [mm(inches)]                          | 2.12 x 1.28 (0.083 x 0.050) |
| Height [mm(inches)]                        | 0.55 (0.021)                |
| Volume (mm^3)                              | 1.5                         |
| Pass Band Range (F1) (MHz)                 | 2450 +/-50MHz               |
| Pass Band Range (F2) (MHz)                 | 5425 +/-525MHz              |
| Insertion Loss (F1) (dB)                   | -0.5                        |
| Insertion Loss (F2) (dB)                   | -1.0                        |
| Attenuation (F1)<br>4800MHz - 6000MHz (dB) | -36                         |
| Attenuation 3 x (F1) (dB)                  | -31                         |
| Attenuation (F2)<br>1800MHz - 2500MHz (dB) | -26                         |
| Attenuation 2 x (F2) (dB)                  | -13                         |
| Attenuation 3 x (F2) (dB)                  | -15                         |
| VSWR (Input @ F1)                          | 1.2                         |
| VSWR (Input @ F2)                          | 1.7                         |
| VSWR (Lowband @ F1)                        | 1.2                         |
| VSWR (Highband @ F2)                       | 1.7                         |



S PARAMETER MEASUREMENTS



AUTOMATED SMT ASSEMBLY

The following section describes the guidelines for automated SMT assembly of MLO™ RF devices which are typically Land Grid Array (LGA) packages or side termination SMT packages. Control of solder and solder paste volume is critical for surface mount assembly of MLO™ RF devices onto the PCB.

Stencil thickness and aperture openings should be adjusted according to the optimal solder volume. The following are general recommendations for SMT mounting of MLO™ devices onto the PCB.

SMT REFLOW PROFILE

Common IR or convection reflow SMT processes shall be used for the assembly. Standard SMT reflow profiles, for eutectic and Pb free solders, can be used to surface mount the MLO™ devices onto the PCB. In all cases, a temperature gradient of 3°C/sec, or less, should be maintained to prevent warpage of the package and to ensure that all joints reflow properly. Additional soak time and slower preheating time

may be required to improve the out-gassing of solder paste. In addition, the reflow profile depends on the PCB density and the type of solder paste used. Standard no-clean solder paste is generally recommended. If another type of flux is used, complete removal of flux residual may be necessary. Example of a typical lead free reflow profile is shown below.

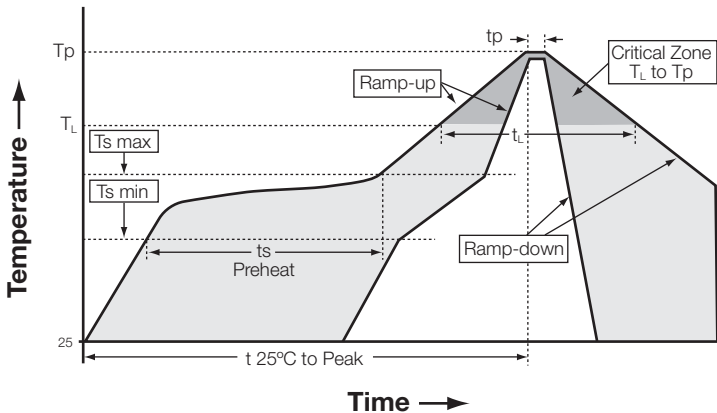


Figure A. Typical Lead Free Profile and Parameters

| Profile Parameter                        | Pb free, Convection, IR/Convection |
|------------------------------------------|------------------------------------|
| Ramp-up rate (Tsmax to Tp)               | 3°C/second max.                    |
| Preheat temperature (Ts min to Ts max)   | 150°C to 200°C                     |
| Preheat time (ts)                        | 60 – 180 seconds                   |
| Time above TL, 217°C (tL)                | 60 – 120 seconds                   |
| Peak temperature (Tp)                    | 260°C                              |
| Time within 5°C of peak temperature (tp) | 10 – 20 seconds                    |
| Ramp-down rate                           | 4°C/second max.                    |
| Time 25°C to peak temperature            | 6 minutes max.                     |

# MLO™ Tight Tolerance Inductors **AVX RF**



The Multilayer Organic Tight Tolerance Inductor is a low profile organic based inductor that can support mobile communications, satellite applications, GPS, matching networks, and collision avoidance. The MLO™ Tight Tolerance Inductor series of components are based on AVX's patented multilayer organic technology (US patent 6,987,307). MLO™ Tight Tolerance Inductors incorporate very low loss organic materials which allow for high Q and high stability over frequency. MLO™ Tight Tolerance Inductors are surface mountable and are expansion matched to FR4 printed wiring boards. MLO™ Tight Tolerance Inductors utilize fine line high density interconnect technology thereby allowing for tight tolerance control and high repeatability. Reliability testing is performed to JEDEC and mil standards. Finishes are available in RoHS compliant Sn.

## APPLICATIONS

- Mobile communications
- Satellite Applications
- GPS
- Collision Avoidance
- Wireless LAN's

## FEATURES

- Tight Tolerance
- High Frequency
- High Withstanding Voltage
- Low DC Resistance
- Surface Mountable
- 0402 Case Size
- RoHS Compliant Finishes
- Available in Tape and Reel

## SURFACE MOUNT ADVANTAGES

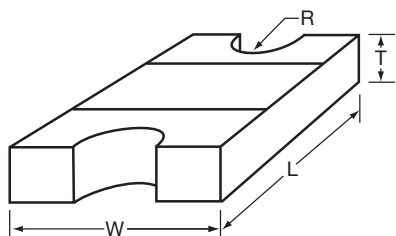
- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Expansion Matched to PCB

## HOW TO ORDER

| HL                          | 02                | XXX                                                                                                                                                                                  | X                                                                               | T                    | TR                          |
|-----------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------|-----------------------------|
| Style<br>Tight<br>Tolerance | Size<br>02 = 0402 | Inductance<br>Expressed in nH<br>(2 significant digits + number of zeros)<br><b>for values &lt;10nH,</b><br>letter R denotes decimal point.<br>Example:<br>22nH = 220<br>4.7nH = 4R7 | Tolerance<br>A = $\pm 0.05\text{nH}$<br>B = $\pm 0.1\text{nH}$<br>G = $\pm 2\%$ | Termination<br>Sn100 | Packaging<br>5000pcs<br>T&R |



## DIMENSIONS



mm (inches)

| L                                      | W                                       | T                                      | R                                        |
|----------------------------------------|-----------------------------------------|----------------------------------------|------------------------------------------|
| 1.00 $\pm$ 0.10<br>(0.040 $\pm$ 0.004) | 0.58 $\pm$ 0.075<br>(0.023 $\pm$ 0.003) | 0.35 $\pm$ 0.10<br>(0.014 $\pm$ 0.004) | 0.125 $\pm$ 0.050<br>(0.005 $\pm$ 0.002) |

## QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

## TERMINATION

RoHS compliant Sn finish.

## OPERATING TEMPERATURE

-55°C to +125°C



## 0402 ELECTRICAL SPECIFICATIONS

| L (nH)<br>450MHz | Available<br>Inductance Tolerance<br>A = $\pm 0.05\text{nH}$ , B = $\pm 0.1\text{nH}$<br>G = $\pm 2\%$ | Q<br>450MHz | Idc max<br>(mA) | Rdc max<br>(m $\Omega$ ) | SRF min<br>(GHz) |
|------------------|--------------------------------------------------------------------------------------------------------|-------------|-----------------|--------------------------|------------------|
| 0.8              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 450             | 100                      | 7                |
| 0.9              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 450             | 100                      | 7                |
| 1                | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 420             | 100                      | 7                |
| 1.1              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 410             | 100                      | 7                |
| 1.2              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 410             | 110                      | 7                |
| 1.3              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 295             | 13                       | 7                |
| 1.5              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 295             | 150                      | 7                |
| 1.6              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 230             | 150                      | 7                |
| 1.8              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 295             | 160                      | 7                |
| 2                | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 230             | 18                       | 7                |
| 2.2              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 230             | 200                      | 7                |
| 2.4              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 230             | 200                      | 7                |
| 2.7              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 230             | 250                      | 7                |
| 3                | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 200             | 300                      | 7                |
| 3.3              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 200             | 340                      | 7                |
| 3.6              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 180             | 350                      | 7                |
| 3.9              | $\pm 0.05\text{nH}$ , $\pm 0.1\text{nH}$                                                               | 15          | 180             | 400                      | 7                |
| 4.7              | $\pm 0.1\text{nH}$                                                                                     | 15          | 170             | 480                      | 7                |
| 5.6              | $\pm 0.1\text{nH}$                                                                                     | 15          | 150             | 500                      | 7                |
| 6.8              | $\pm 0.1\text{nH}$                                                                                     | 15          | 140             | 600                      | 7                |
| 8.2              | $\pm 0.1\text{nH}$                                                                                     | 15          | 115             | 800                      | 6                |
| 10               | $\pm 2\%$                                                                                              | 15          | 105             | 1000                     | 5                |
| 12               | $\pm 2\%$                                                                                              | 15          | 95              | 1100                     | 4                |
| 15               | $\pm 2\%$                                                                                              | 15          | 95              | 1200                     | 4                |
| 18               | $\pm 2\%$                                                                                              | 15          | 85              | 1500                     | 3                |
| 22               | $\pm 2\%$                                                                                              | 15          | 75              | 1900                     | 3                |
| 27               | $\pm 2\%$                                                                                              | 15          | 75              | 2100                     | 3                |
| 30               | $\pm 2\%$                                                                                              | 15          | 65              | 2200                     | 2                |
| 32               | $\pm 2\%$                                                                                              | 15          | 65              | 2200                     | 2                |

Specifications based on performance of component assembled properly on printed circuit board with 50 $\Omega$  nominal impedance.



The Multilayer Organic High Current Inductor is a low profile organic based inductor that can support mobile communications, satellite applications, GPS, matching networks, and collision avoidance. Based on AVX's patented multilayer organic technology (US patent 6,987,307), the 0402 size Multilayer Organic High Current Inductor allows for much higher current handling over similar multilayer ceramic chip inductors, a 50% average increase in current handling over comparable thin film products with similar Q, and current handling approaching that of wire wound ceramic chip inductors. MLO™ High Current Inductors incorporate very low loss organic materials which allow for high Q and high stability over frequency. They are surface mountable and are expansion matched to FR4 printed wiring boards. MLO™ High Current Inductors utilize fine line high density interconnect technology thereby allowing for tight tolerance control and high repeatability. Reliability testing is performed to JEDEC and mil standards. Finishes are available in RoHS compliant Sn.

## APPLICATIONS

- Mobile communications
- Satellite Applications
- GPS
- Collision Avoidance
- Wireless LAN's

## FEATURES

- High Q
- High SRF
- High Frequency
- High Current Handling
- Low DC Resistance
- Surface Mountable
- 0402 Case Size
- RoHS Compliant Finishes
- Available in Tape and Reel

## SURFACE MOUNT ADVANTAGES

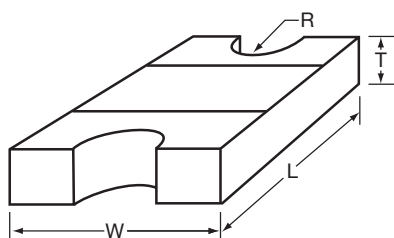
- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Expansion Matched to PCB

## HOW TO ORDER

| HLC                | 02        | XXX                                                                                                                                                                    | X                                                                                                           | T           | TR          |  |
|--------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------|-------------|--|
| Type               | Size      | Inductance                                                                                                                                                             | Tolerance                                                                                                   | Termination | Packaging   |  |
| HLC = High Current | 02 = 0402 | Expressed in nH<br>(2 significant digits + number of zeros)<br><b>for values &lt;10nH,</b><br>letter R denotes decimal point.<br>Example:<br>22nH = 220<br>4.7nH = 4R7 | B = $\pm 0.1$ nH<br>C = $\pm 0.2$ nH<br>D = $\pm 0.5$ nH<br>G = $\pm 2\%$<br>H = $\pm 3\%$<br>J = $\pm 5\%$ | Sn100       | 5000pcs T&R |  |



## DIMENSIONS



mm (inches)

| L                                      | W                                       | T                                      | R                                        |
|----------------------------------------|-----------------------------------------|----------------------------------------|------------------------------------------|
| 1.00 $\pm$ 0.10<br>(0.040 $\pm$ 0.004) | 0.58 $\pm$ 0.075<br>(0.023 $\pm$ 0.003) | 0.35 $\pm$ 0.10<br>(0.014 $\pm$ 0.004) | 0.125 $\pm$ 0.050<br>(0.005 $\pm$ 0.002) |

## QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

## TERMINATION

RoHS compliant Sn finish.

## OPERATING TEMPERATURE

-55°C to +125°C

## 0402 ELECTRICAL SPECIFICATIONS

| 450 MHz<br>Test Frequency |                                                                                                        |              | 900 MHz<br>Test Frequency |              | 1900 MHz<br>Test Frequency |               | 2400 MHz<br>Test Frequency |               | SRF Min<br>(GHz) | Rdc Max<br>(mΩ) | Idc Max<br>(mA) |
|---------------------------|--------------------------------------------------------------------------------------------------------|--------------|---------------------------|--------------|----------------------------|---------------|----------------------------|---------------|------------------|-----------------|-----------------|
| L (nH)<br>450 MHz         | Available<br>Inductance Tolerance<br>B = ±0.1nH, C = ±0.2nH<br>D = ±0.5nH, G = ±2%<br>H = ±3%, J = ±5% | Q<br>450 MHz | L (nH)<br>900 MHz         | Q<br>900 MHz | L (nH)<br>1900 MHz         | Q<br>1900 MHz | L (nH)<br>2400 MHz         | Q<br>2400 MHz |                  |                 |                 |
| 0.8                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 30           | 0.8                       | 42           | 0.8                        | 55            | 0.8                        | 61            | >20              | 100             | 875             |
| 0.9                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 26           | 0.9                       | 36           | 0.9                        | 47            | 0.9                        | 52            | >20              | 100             | 835             |
| 1                         | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 25           | 1.0                       | 34           | 1.0                        | 45            | 1.0                        | 50            | >20              | 100             | 800             |
| 1.1                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 24           | 1.1                       | 33           | 1.1                        | 43            | 1.1                        | 48            | 20               | 100             | 782             |
| 1.2                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 24           | 1.2                       | 33           | 1.2                        | 44            | 1.2                        | 48            | 20               | 110             | 751             |
| 1.3                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 25           | 1.3                       | 34           | 1.3                        | 44            | 1.3                        | 49            | 19               | 130             | 725             |
| 1.5                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 25           | 1.5                       | 35           | 1.5                        | 45            | 1.5                        | 50            | 19               | 150             | 679             |
| 1.6                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 25           | 1.6                       | 35           | 1.6                        | 45            | 1.6                        | 49            | 18               | 150             | 660             |
| 1.8                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 25           | 1.8                       | 35           | 1.8                        | 45            | 1.8                        | 49            | 18               | 160             | 626             |
| 2                         | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 26           | 2.0                       | 35           | 2.0                        | 45            | 2.1                        | 49            | 17               | 180             | 596             |
| 2.2                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 2.2                       | 36           | 2.2                        | 46            | 2.2                        | 50            | 16               | 200             | 571             |
| 2.4                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 2.4                       | 37           | 2.4                        | 47            | 2.4                        | 50            | 15               | 200             | 549             |
| 2.7                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 2.7                       | 36           | 2.7                        | 46            | 2.7                        | 48            | 14               | 250             | 521             |
| 3                         | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 3.0                       | 36           | 3.0                        | 44            | 3.1                        | 46            | 12               | 300             | 497             |
| 3.3                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 3.3                       | 36           | 3.3                        | 44            | 3.4                        | 46            | 11               | 340             | 476             |
| 3.6                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 27           | 3.6                       | 37           | 3.7                        | 45            | 3.8                        | 46            | 10               | 350             | 457             |
| 3.9                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 28           | 3.9                       | 38           | 4.0                        | 46            | 4.1                        | 47            | 10               | 400             | 441             |
| 4.7                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 29           | 4.7                       | 39           | 4.9                        | 45            | 5.1                        | 44            | 9                | 480             | 405             |
| 5.6                       | ±0.1nH, ±0.2nH, ±0.5nH                                                                                 | 30           | 5.7                       | 40           | 6.0                        | 44            | 6.3                        | 42            | 8                | 500             | 375             |
| 6.8                       | ±2%, ±3%, ±5%                                                                                          | 30           | 6.9                       | 39           | 7.5                        | 41            | 8.0                        | 37            | 7                | 600             | 343             |
| 8.2                       | ±2%, ±3%, ±5%                                                                                          | 29           | 8.4                       | 37           | 9.4                        | 37            | 10.4                       | 31            | 6                | 800             | 315             |
| 10                        | ±2%, ±3%, ±5%                                                                                          | 30           | 10.3                      | 38           | 12.0                       | 35            | 13.9                       | 27            | 5                | 1000            | 290             |
| 12                        | ±2%, ±3%, ±5%                                                                                          | 32           | 12.5                      | 40           | 15.7                       | 31            | 19.8                       | 19            | 4                | 1100            | 265             |
| 15                        | ±2%, ±3%, ±5%                                                                                          | 32           | 15.9                      | 38           | 22.3                       | 24            | 33.0                       | 9             | 4                | 1200            | 240             |
| 18                        | ±2%, ±3%, ±5%                                                                                          | 28           | 19.4                      | 32           | 31.1                       | 15            | 60.0                       | 0.3           | 3                | 1500            | 210             |
| 22                        | ±2%, ±3%, ±5%                                                                                          | 30           | 24.0                      | 34           | 44.7                       | 11            | n/a                        | n/a           | 3                | 1900            | 202             |
| 27                        | ±2%, ±3%, ±5%                                                                                          | 29           | 30.5                      | 30           | n/a                        | n/a           | n/a                        | n/a           | 3                | 2100            | 184             |
| 30                        | ±2%, ±3%, ±5%                                                                                          | 28           | 34.0                      | 27           | n/a                        | n/a           | n/a                        | n/a           | 2                | 2200            | 180             |
| 32                        | ±2%, ±3%, ±5%                                                                                          | 28           | 37.7                      | 27           | n/a                        | n/a           | n/a                        | n/a           | 2                | 2200            | 175             |

Specifications based on performance of component assembled properly on printed circuit board with 50Ω nominal impedance.

Idc max: Maximum 15°C rise in component temperature over ambient.



The Multilayer Organic Hi-Q Inductor is a low profile organic based inductor that can support mobile communications, satellite applications, GPS, matching networks, and collision avoidance. The MLO™ Hi-Q Inductor series of components are based on AVX's patented multilayer organic technology (US patent 6,987,307 and 7,439,840). MLO™ Hi-Q Inductors incorporate very low loss organic materials and low profile copper which allow for high Q and high stability over frequency. MLO™ Hi-Q Inductors are surface mountable and are expansion matched to FR4 printed wiring boards. MLO™ Hi-Q Inductors utilize fine line high density interconnect technology thereby allowing for tight tolerance control and high repeatability. Reliability testing is performed to JEDEC and mil standards. Finishes are available in RoHS compliant Sn.

APPLICATIONS

- Mobile communications
- Satellite Applications
- GPS
- Collision Avoidance
- Wireless LAN's

FEATURES

- High Q
- High SRF
- High Frequency
- Low DC Resistance
- Surface Mountable
- 0402 Case Size
- RoHS Compliant Finishes
- Available in Tape and Reel

SURFACE MOUNT ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Expansion Matched to PCB

HOW TO ORDER

**HLQ**  
Type  
HLQ = High Q

**02**  
Size  
02 = 0402

**XXX**  
Inductance  
Expressed in nH  
(2 significant digits + number of zeros)  
**for values <10nH,**  
letter R denotes decimal point.  
Example:  
22nH = 220  
4.7nH = 4R7

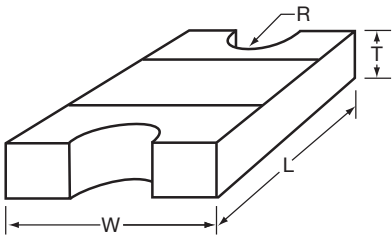
**X**  
Tolerance  
B = ±0.1nH  
C = ±0.2nH  
H = ±3%

**T**  
Termination  
Sn100

**TR**  
Packaging  
5000pcs T&R

  
RoHS  
COMPLIANT

DIMENSIONS



| mm (inches)                |                             |                            |                              |
|----------------------------|-----------------------------|----------------------------|------------------------------|
| L                          | W                           | T                          | R                            |
| 1.00±0.10<br>(0.040±0.004) | 0.58±0.075<br>(0.023±0.003) | 0.35±0.10<br>(0.014±0.004) | 0.125±0.050<br>(0.005±0.002) |

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

TERMINATION

RoHS compliant Sn finish.

OPERATING TEMPERATURE

-55°C to +125°C

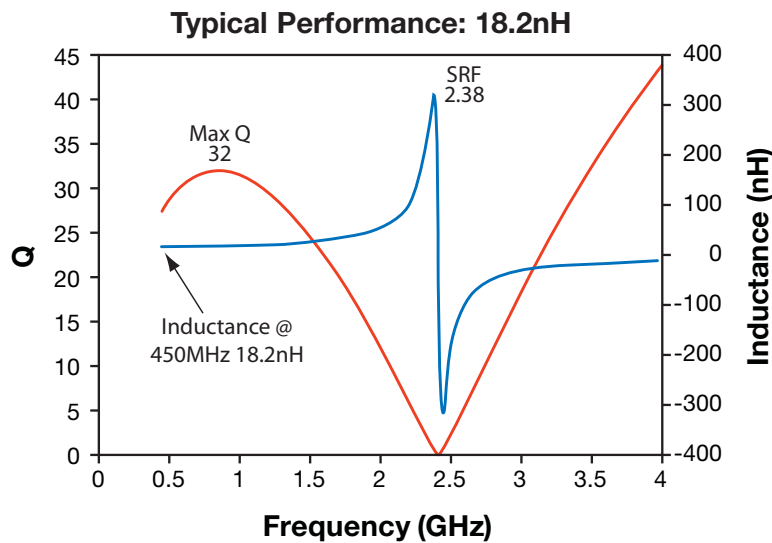
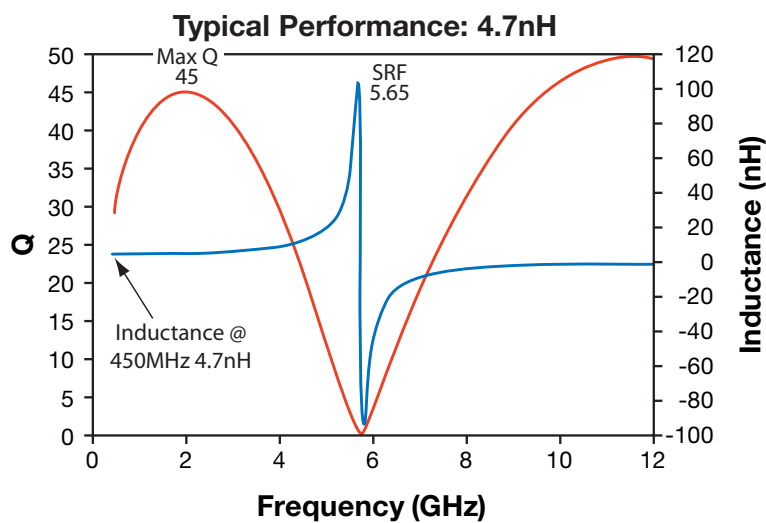
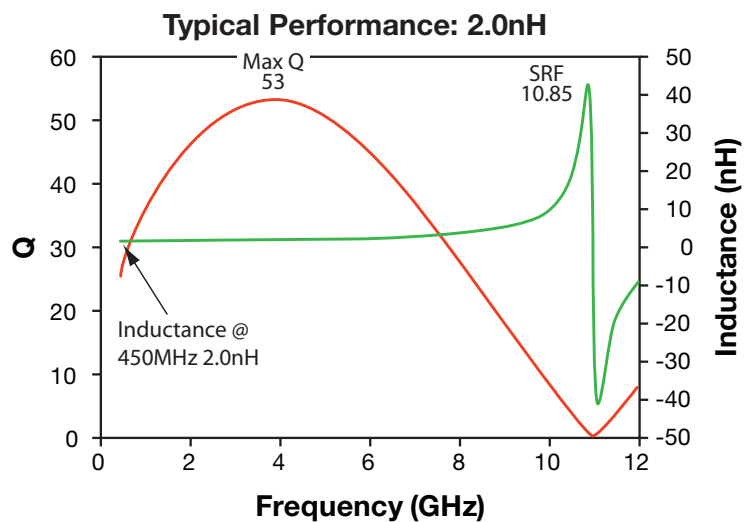
## 0402 ELECTRICAL SPECIFICATIONS

| L (nH)<br>450MHz | Available<br>Inductance Tolerance<br>B = $\pm 0.1\text{nH}$ , C = $\pm 0.2\text{nH}$<br>H = $\pm 3\%$ | Q min<br>450MHz | SRF min<br>(GHz) | Rdc max<br>(m $\Omega$ ) | Idc max<br>(mA) |
|------------------|-------------------------------------------------------------------------------------------------------|-----------------|------------------|--------------------------|-----------------|
| 0.8              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 100                      | 350             |
| 0.9              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 100                      | 350             |
| 1                | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 100                      | 330             |
| 1.1              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 100                      | 330             |
| 1.2              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 110                      | 330             |
| 1.3              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 130                      | 330             |
| 1.5              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 150                      | 330             |
| 1.6              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 150                      | 300             |
| 1.8              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 160                      | 300             |
| 2                | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 180                      | 245             |
| 2.2              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 200                      | 245             |
| 2.4              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 200                      | 245             |
| 2.7              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 250                      | 245             |
| 3                | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 300                      | 225             |
| 3.3              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 340                      | 225             |
| 3.6              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 350                      | 200             |
| 3.9              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 400                      | 200             |
| 4.7              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 480                      | 195             |
| 5.6              | $\pm 0.1\text{nH}$ , $\pm 0.2\text{nH}$                                                               | 17              | 7                | 500                      | 170             |
| 6.8              | $\pm 3\%$                                                                                             | 17              | 7                | 600                      | 160             |
| 8.2              | $\pm 3\%$                                                                                             | 17              | 6                | 800                      | 130             |
| 10               | $\pm 3\%$                                                                                             | 17              | 5                | 1000                     | 120             |
| 12               | $\pm 3\%$                                                                                             | 17              | 4                | 1100                     | 110             |
| 15               | $\pm 3\%$                                                                                             | 17              | 4                | 1200                     | 110             |
| 18               | $\pm 3\%$                                                                                             | 17              | 3                | 1500                     | 110             |
| 22               | $\pm 3\%$                                                                                             | 17              | 3                | 1900                     | 95              |
| 27               | $\pm 3\%$                                                                                             | 17              | 3                | 2100                     | 95              |
| 30               | $\pm 3\%$                                                                                             | 17              | 2                | 2200                     | 85              |
| 32               | $\pm 3\%$                                                                                             | 17              | 2                | 2200                     | 85              |

Specifications based on performance of component assembled properly on printed circuit board with 50 $\Omega$  nominal impedance.

Idc max: Maximum 15°C rise in component temperature over ambient.

MLO™ INDUCTOR PERFORMANCE CHARACTERISTICS



AUTOMATED SMT ASSEMBLY

The following section describes the guidelines for automated SMT assembly of MLO™ RF devices which are typically Land Grid Array (LGA) packages or side termination SMT packages. Control of solder and solder paste volume is critical for surface mount assembly of MLO™ RF devices onto the PCB.

Stencil thickness and aperture openings should be adjusted according to the optimal solder volume. The following are general recommendations for SMT mounting of MLO™ devices onto the PCB.

SMT REFLOW PROFILE

Common IR or convection reflow SMT processes shall be used for the assembly. Standard SMT reflow profiles, for eutectic and Pb free solders, can be used to surface mount the MLO™ devices onto the PCB. In all cases, a temperature gradient of 3°C/sec, or less, should be maintained to prevent warpage of the package and to ensure that all joints reflow properly. Additional soak time and slower preheating time

may be required to improve the out-gassing of solder paste. In addition, the reflow profile depends on the PCB density and the type of solder paste used. Standard no-clean solder paste is generally recommended. If another type of flux is used, complete removal of flux residual may be necessary. Example of a typical lead free reflow profile is shown below.

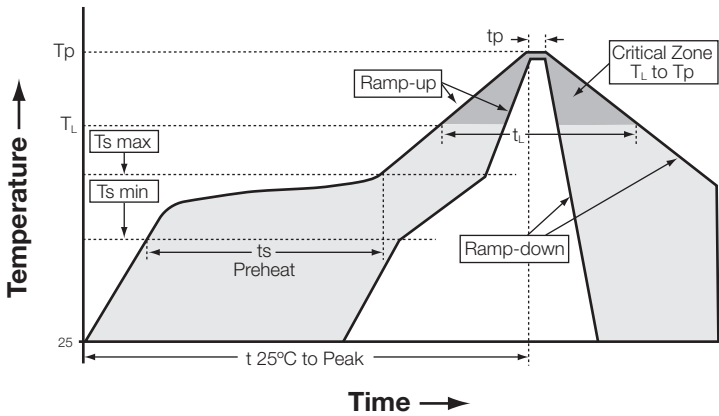
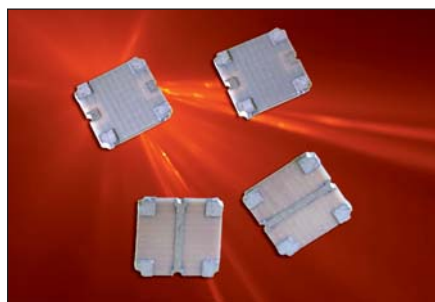


Figure A. Typical Lead Free Profile and Parameters

| Profile Parameter                        | Pb free, Convection, IR/Convection |
|------------------------------------------|------------------------------------|
| Ramp-up rate (Tsmax to Tp)               | 3°C/second max.                    |
| Preheat temperature (Ts min to Ts max)   | 150°C to 200°C                     |
| Preheat time (ts)                        | 60 – 180 seconds                   |
| Time above TL, 217°C (tL)                | 60 – 120 seconds                   |
| Peak temperature (Tp)                    | 260°C                              |
| Time within 5°C of peak temperature (tp) | 10 – 20 seconds                    |
| Ramp-down rate                           | 4°C/second max.                    |
| Time 25°C to peak temperature            | 6 minutes max.                     |



## GENERAL DESCRIPTION

The MLO™ SMT RF-DC Crossover is a very low profile crossover that intersects an RF and DC circuit trace in an SMT package. The RF-DC Crossover is a low cost solution for applications where a critical RF circuit trace intersects a DC circuit precluding the need for an expensive multilayer printed circuit board. The SMT package can support frequencies up to 6 GHz. MLO™ crossovers have been subjected to JEDEC reliability standards and 100% electrically tested. The RF-DC crossovers are available in NiSn.

## FEATURES

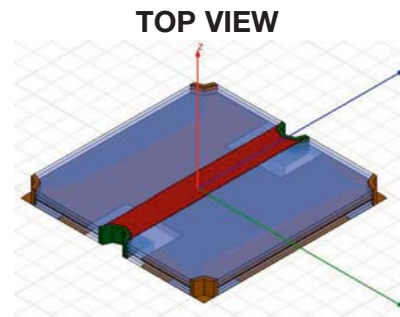
- DC – 6.0 GHz
- RF – DC Crossover
- Low Loss
- DC Isolation
- Surface Mountable
- Tape and Reel
- 100% Tested

## APPLICATIONS

- Mobile communications
- GPS
- Vehicle location systems
- Wireless LAN's

## LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation



## HOW TO ORDER

**X2A**

Series

**2020**

Size

**RFDC**

Type

**T**

Packaging

T = 1000pcs T&R  
T/250 = 250pcs T&R  
B = Bulk



| Frequency (GHz) | Port Impedance (ohms) | Ins. Loss (dB max) | Return Loss (dB min) | Power (Watts) | θJC (°C /Watts) | Operating Temperature (°C) |
|-----------------|-----------------------|--------------------|----------------------|---------------|-----------------|----------------------------|
| DC -2.5         | 50                    | 0.05               | 20                   | 30            | 140             | -55 to +85                 |
| 2.5 – 4.0       | 50                    | 0.10               | 20                   | 19            | 140             | -55 to +85                 |
| 4.0 – 6.0       | 50                    | 0.15               | 15                   | 9             | 140             | -55 to +85                 |

\* Specification based on performance of component assembled properly on printed circuit board with 50Ω nominal impedance.

## QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

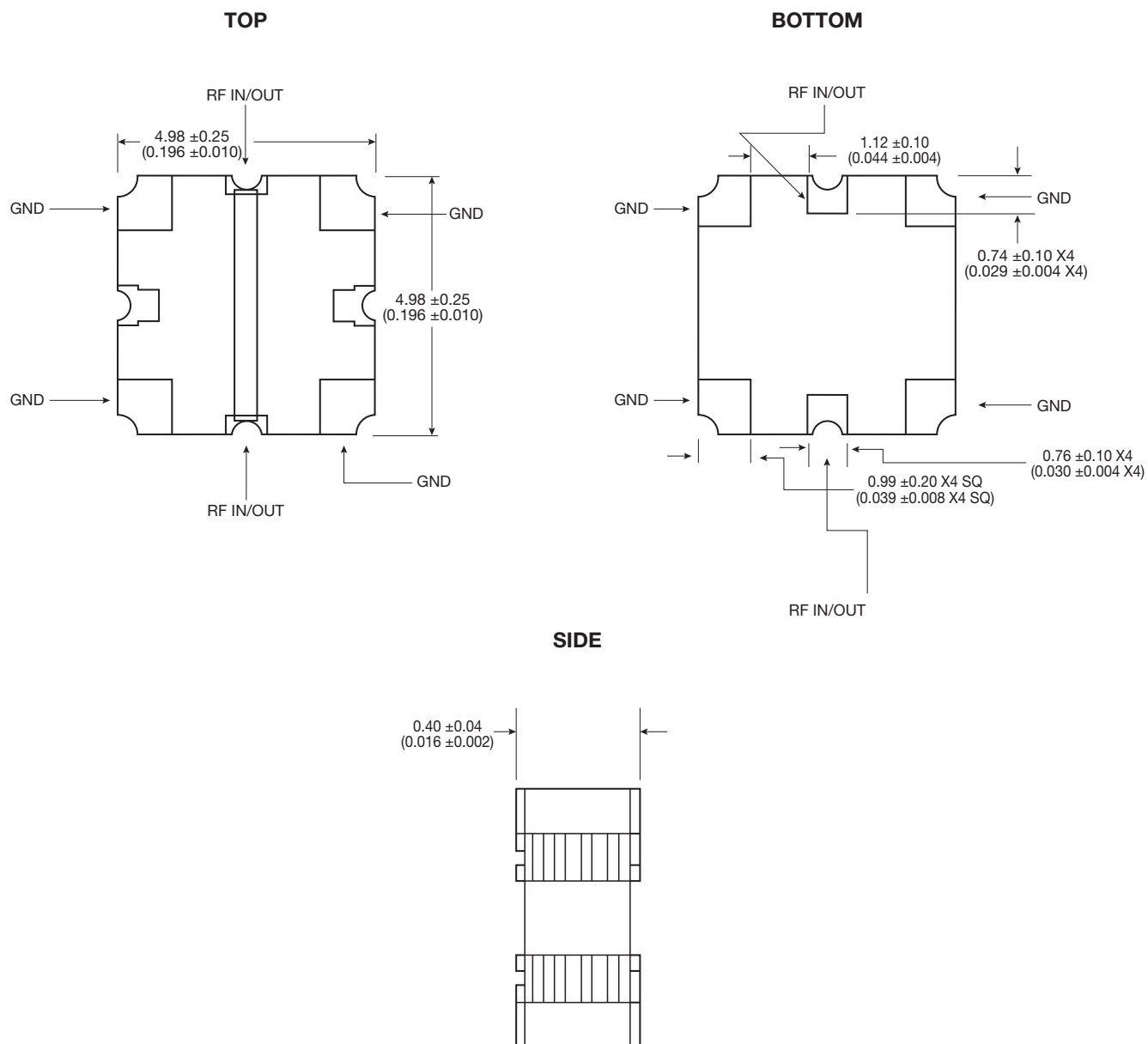
## TERMINATION

NiSn compatible with automatic soldering technologies: Pb free reflow, wave soldering, vapor phase and manual.

## OPERATING TEMPERATURE

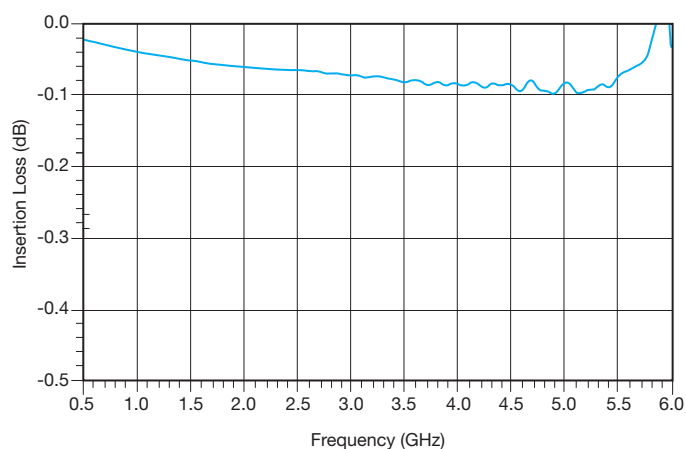
- 55°C to +85°C

## MECHANICAL OUTLINE

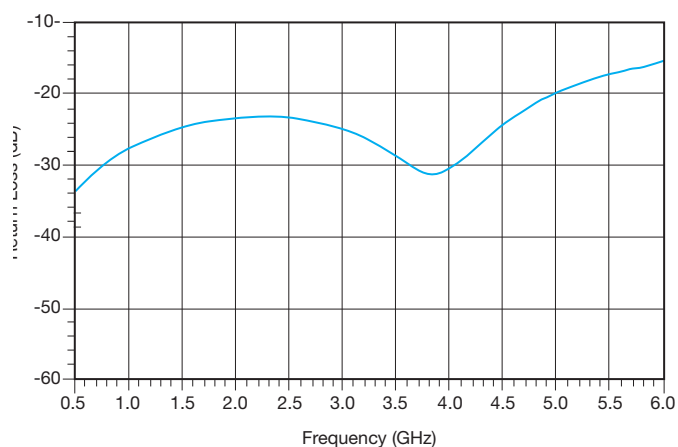


## RF-DC SMT CROSSOVER PERFORMANCE: 0.3 GHz TO 6 GHz

### RF/DC Crossover – Insertion Loss



### RF/DC Crossover – Return Loss

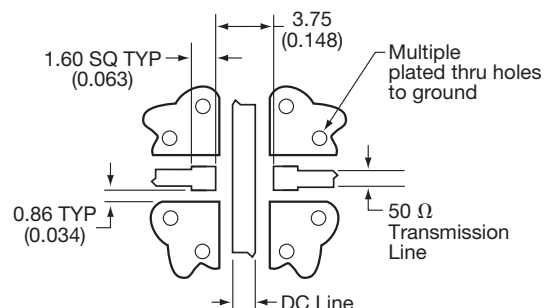
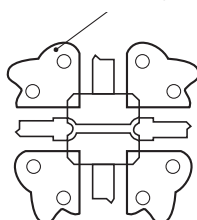


## MOUNTING PROCEDURE

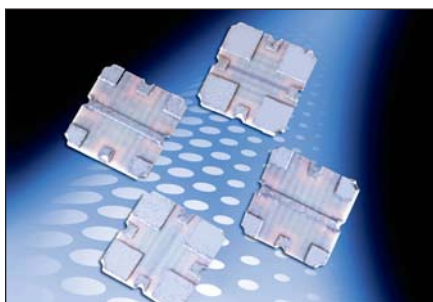
MLO™ SMT crossovers require 50Ω transmission lines leading to and from all of the RF ports. Proper grounding is required in order to ensure optimal device performance. If these conditions are not met then performance parameters including insertion loss, return loss and any isolation may not meet published values. All of the MLO™ components utilize castellated interconnects which allow for high yield assembly, expansion matched and halogen free dielectric. When mounting the user must be mindful of the following: a) ensure the RF pads of the device are in contact with the circuit trace of the printed circuit board and b) the ground plane of neither the component nor the PCB is in contact with the RF signal. Parts are specifically oriented in the tape and reel.

## MOUNTING FOOTPRINT

To ensure proper electrical and thermal performance there must be a ground plane with 100% solder connection underneath the part.



Dimensions are in mm (inches)



## GENERAL DESCRIPTION

The MLO™ SMT RF-RF Crossover is a very low profile crossover that intersects an RF and RF circuit trace in an SMT package. The RF-RF Crossover is a low cost solution for applications where a critical RF circuit trace intersects a RF circuit precluding the need for an expensive multilayer printed circuit board. The SMT package can support frequencies up to 6 GHz. MLO™ crossovers have been subjected to JEDEC reliability standards and 100% electrically tested. The RF-RF crossovers are available in NiSn.

## FEATURES

- DC – 6.0 GHz
- RF – RF Crossover
- Low Loss
- High Isolation
- Surface Mountable
- Tape and Reel
- 100% Tested

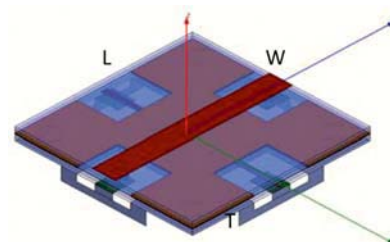
## APPLICATIONS

- Mobile communications
- GPS
- Vehicle location systems
- Wireless LAN's

## LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

## TOP VIEW



## HOW TO ORDER

**X2B**

Series

**2020**

Size

**RFRF**

Type

**T**

Packaging

T = 1000pcs T&R  
T/250 = 250pcs T&R  
B = Bulk



| Frequency (GHz) | Port Impedance (ohms) | Ins. Loss (dB max) | Return Loss (dB min) | Isolation (dB min) | Power (Watts) | θJC (°C /Watts) | Operating Temperature (°C) |
|-----------------|-----------------------|--------------------|----------------------|--------------------|---------------|-----------------|----------------------------|
| DC -2.5         | 50                    | 0.05               | 20                   | 50                 | 30            | 150             | -55 to +85                 |
| 2.5 – 4.0       | 50                    | 0.10               | 18                   | 30                 | 19            | 150             | -55 to +85                 |
| 4.0 – 6.0       | 50                    | 0.15               | 10                   | 20                 | 9             | 150             | -55 to +85                 |

\* Specification based on performance of component assembled properly on printed circuit board with 50Ω nominal impedance.

## QUALITY INSPECTION

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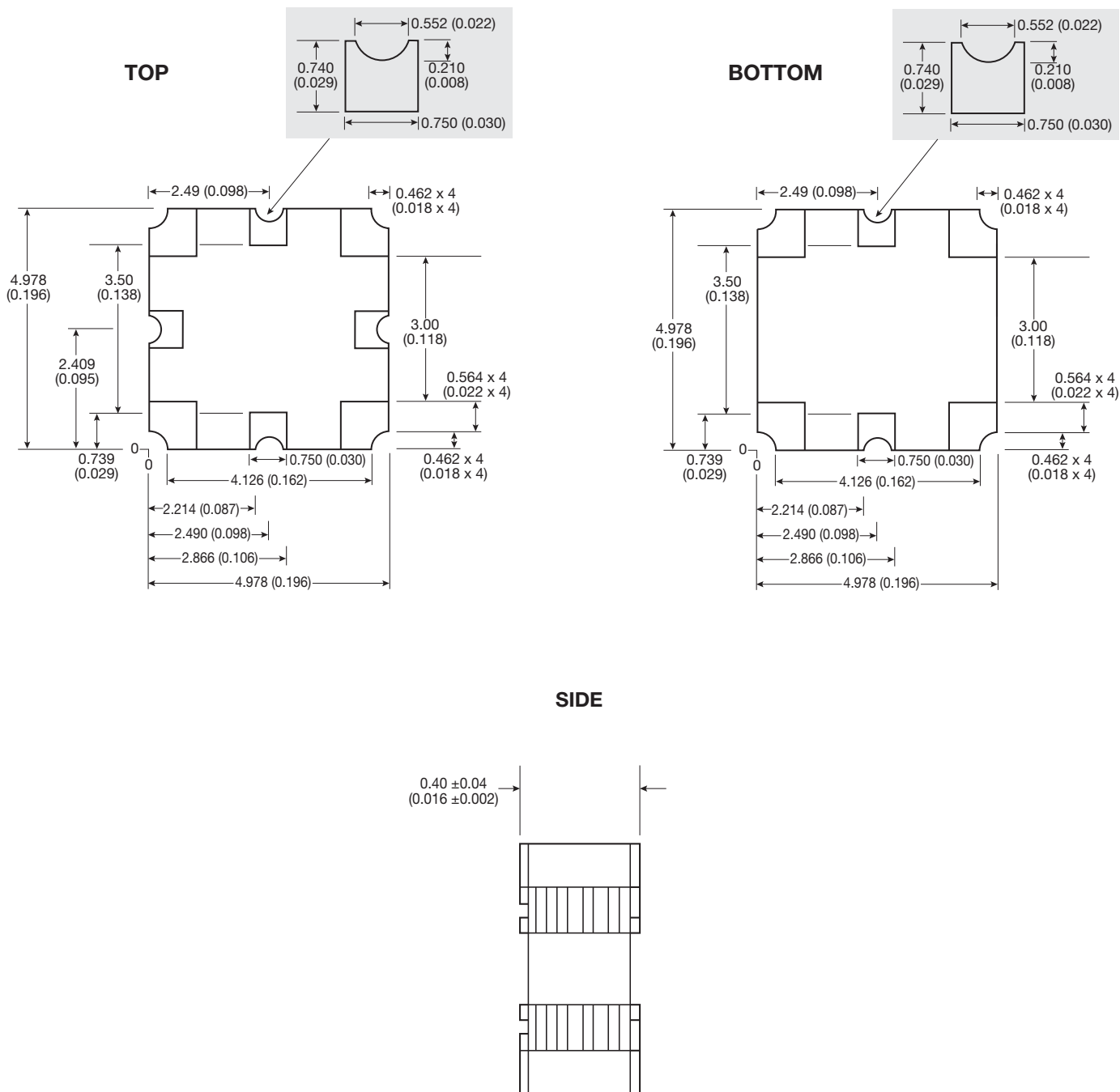
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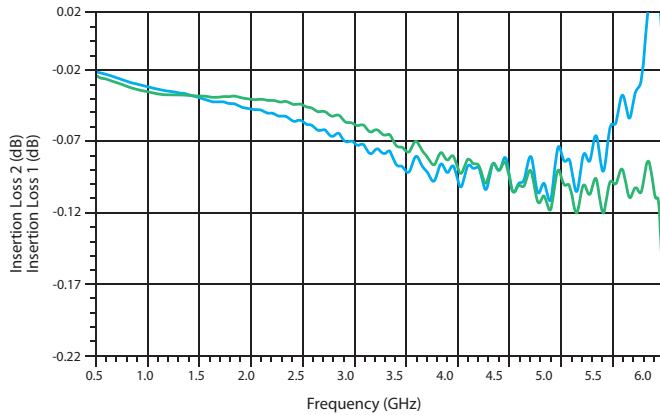
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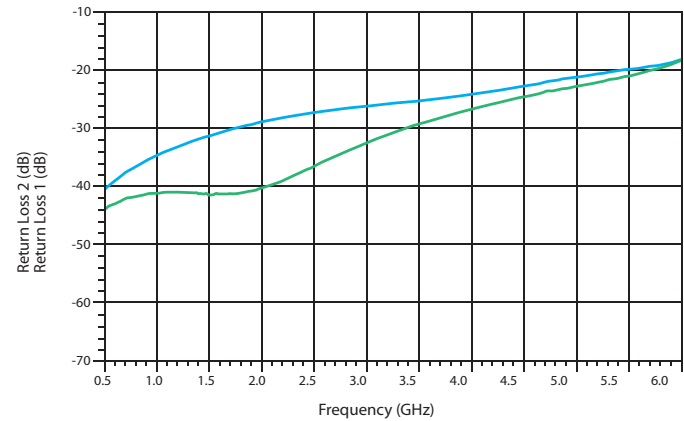


## RF-RF SMT CROSSOVER PERFORMANCE: 0.3 GHZ TO 6 GHZ

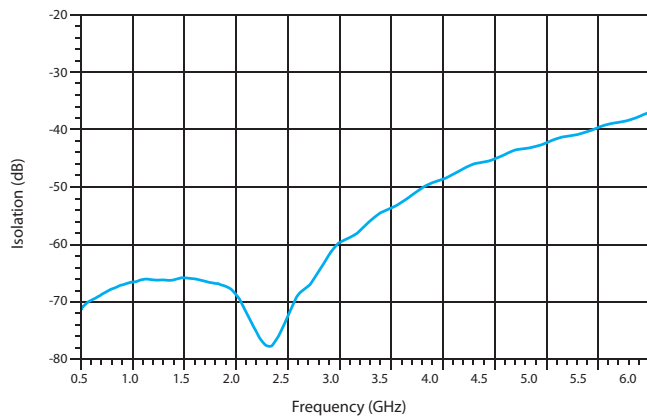
### RF/RF Crossover – Insertion Loss



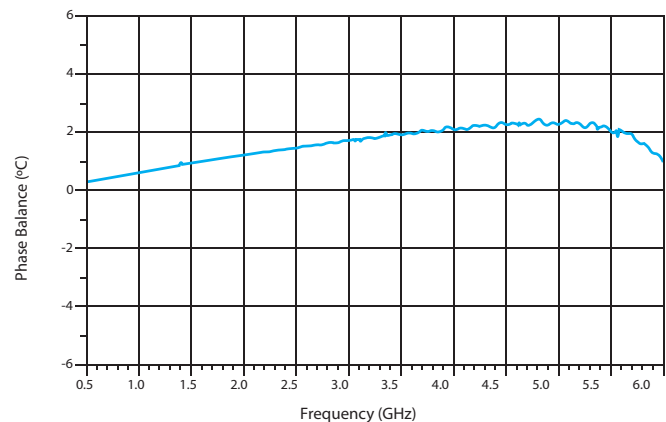
### RF/RF Crossover – Return Loss



### RF/RF Crossover – Isolation



### RF/RF Crossover – Phase Balance

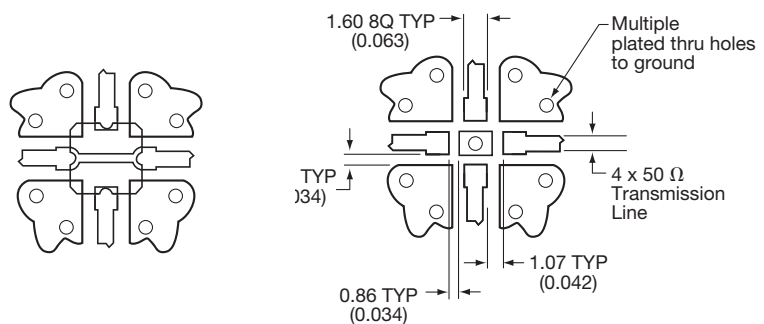


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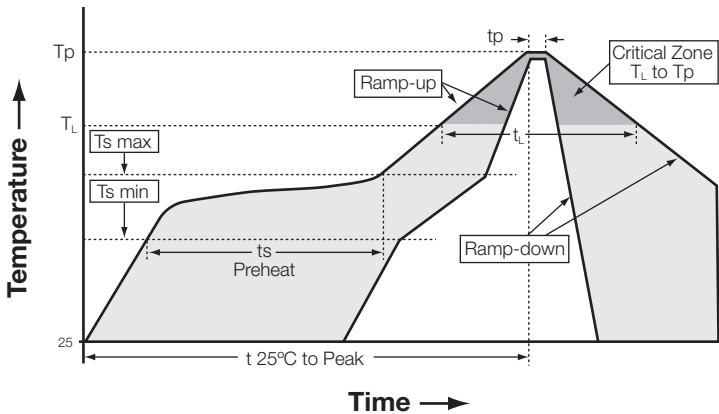
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| Profile Parameter                                   | Pb free, Convection, IR/Convection |
|-----------------------------------------------------|------------------------------------|
| Ramp-up rate (Tsmax to Tp)                          | 3°C/second max.                    |
| Preheat temperature (Ts min to Ts max)              | 150°C to 200°C                     |
| Preheat time (ts)                                   | 60 – 180 seconds                   |
| Time above T <sub>L</sub> , 217°C (t <sub>L</sub> ) | 60 – 120 seconds                   |
| Peak temperature (Tp)                               | 260°C                              |
| Time within 5°C of peak temperature (tp)            | 10 – 20 seconds                    |
| Ramp-down rate                                      | 4°C/second max.                    |
| Time 25°C to peak temperature                       | 6 minutes max.                     |



## RF Inductors

AL Series - Air Core Inductors

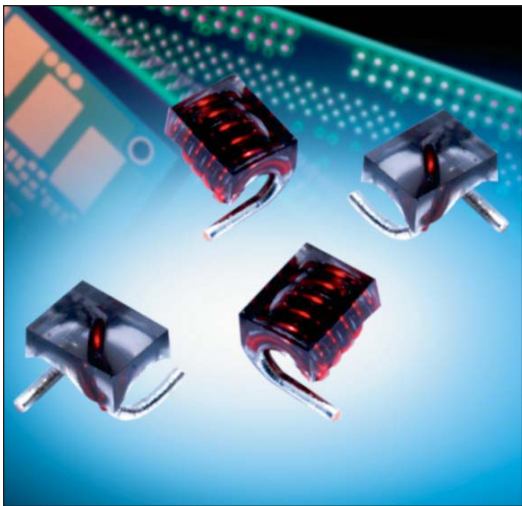
AS Series - Square Air Core Inductors

LCWC - Wire Wound Chip Inductors

# Air Core RF Inductors



## AL Series



### GENERAL DESCRIPTION

AVX Air Core RF Inductors, part of the wound air core inductor family, are ideal for RF circuits, broadband I/O filtering, frequency selection, or impedance matching. The air core inductor provides better performance over solid core inductors with higher Q, and better current handling capabilities.

### FEATURES

- Air Core Construction
- High Q
- High Current
- Excellent SRF
- Many inductance values ranging from 1.65nH to 538nH

### APPLICATIONS

- RF Applications
- RF Circuits
- Broadband I/O Filtering
- Impedance Matching/Tuning
- Decoupling/Bypassing

### HOW TO ORDER

| AL                | 05A        | 02N5          | G         | T                 | R                   |
|-------------------|------------|---------------|-----------|-------------------|---------------------|
|                   |            |               |           |                   |                     |
| Air Core Inductor | Size       | Inductance    | Tolerance | Termination       | Packaging           |
|                   | 05A = 0605 | 02N5 = 2.5nH  | G = 2%    | T = Sn/Ag over Cu | R = 7" reel         |
|                   | 05B = 0605 | 12N5 = 12.5nH | J = 5%    | (96.5% Sn, 3% Ag, | S = 13" reel*       |
|                   | 12A = 1212 | 130N = 130nH  | K = 10%   | 0.5% Cu)          |                     |
|                   | 12B = 1212 |               |           |                   | *AL016 & AL023 Only |
|                   | 016 = 1516 |               |           |                   |                     |
|                   | 023 = 2523 |               |           |                   |                     |



### ELECTRICAL SPECIFICATIONS

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| Technical Data        | All technical data related to an ambient temperature of +25°C |
| Inductance Range      | 1.65nH to 538nH                                               |
| Inductance Tolerance  | 2%, 5%, 10%                                                   |
| Rated Current         | 1.5A to 4.0A                                                  |
| Operating Temperature | -40°C to +125°C                                               |
| Termination           | 96.5% Tin/3% Silver over 0.5% Copper                          |

# Air Core RF Inductors



## AL Series

### ELECTRICAL SPECIFICATIONS

| AVX P/N      | Turns | Inductance (nH) | Tolerance (%) | Q min. | Q typ. | Test Freq. (MHz) | DCR max (mΩ) | SRF GHz (min.) | Ir max Amps |
|--------------|-------|-----------------|---------------|--------|--------|------------------|--------------|----------------|-------------|
| AL05A1N65KTR | 2     | 1.65            | K             | 100    | -      | 800              | 4            | 10             | 1.60        |
| AL05A2N55*TR | 3     | 2.55            | J, K          | 100    | -      | 800              | 5            | 8.2            | 1.60        |
| AL05A3N85*TR | 4     | 3.85            | G, J, K       | 100    | -      | 800              | 6            | 7.5            | 1.60        |
| AL05A5N45*TR | 5     | 5.45            | G, J          | 100    | -      | 800              | 8            | 7              | 1.60        |
| AL05B05N6*TR | 6     | 5.6             | G, J          | 100    | -      | 800              | 9            | 6.5            | 1.60        |
| AL05B7N15*TR | 7     | 7.15            | G, J          | 100    | -      | 800              | 10           | 6              | 1.60        |
| AL05B08N8*TR | 8     | 8.8             | G, J          | 100    | -      | 800              | 12           | 6              | 1.60        |
| AL05B9N85*TR | 9     | 9.85            | G, J          | 100    | -      | 800              | 13           | 5.2            | 1.60        |
| AL05B12N5*TR | 10    | 12.55           | G, J          | 100    | -      | 800              | 14           | 4.6            | 1.60        |
| AL12A02N5KTR | 1     | 2.5             | K             | 145    | -      | 150              | 1.1          | 12.5           | 4.00        |
| AL12A05N0*TR | 2     | 5               | J, K          | 140    | -      | 150              | 1.8          | 6.5            | 4.00        |
| AL12A08N0*TR | 3     | 8               | G, J          | 140    | -      | 150              | 2.6          | 5              | 4.00        |
| AL12A12N5*TR | 4     | 12.5            | G, J          | 137    | -      | 150              | 3.4          | 3.3            | 4.00        |
| AL12A18N5*TR | 5     | 18.5            | G, J          | 132    | -      | 150              | 3.9          | 2.5            | 4.00        |
| AL12B17N5*TR | 6     | 17.5            | G, J          | 100    | -      | 150              | 4.5          | 2.2            | 4.00        |
| AL12B22N0*TR | 7     | 22              | G, J          | 102    | -      | 150              | 5.2          | 2.1            | 4.00        |
| AL12B28N0*TR | 8     | 28              | G, J          | 105    | -      | 150              | 6            | 1.8            | 4.00        |
| AL12B35N5*TR | 9     | 35.5            | G, J          | 112    | -      | 150              | 6.8          | 1.5            | 4.00        |
| AL12B43N0*TR | 10    | 43              | G, J          | 106    | -      | 150              | 7.9          | 1.2            | 4.00        |
| AL01622N0*TS | 4     | 22              | G, J          | 100    | 135    | 150              | 4.2          | 3.2            | 3.00        |
| AL01627N0*TS | 5     | 27              | G, J          | 100    | 135    | 150              | 4            | 2.7            | 3.50        |
| AL01633N0*TS | 5     | 33              | G, J          | 100    | 130    | 150              | 4.8          | 2.5            | 3.00        |
| AL01639N0*TS | 6     | 39              | G, J          | 100    | 135    | 150              | 4.4          | 2.1            | 3.00        |
| AL01647N0*TS | 6     | 47              | G, J          | 100    | 135    | 150              | 5.6          | 2.1            | 3.00        |
| AL01656N0*TS | 7     | 56              | G, J          | 100    | 125    | 150              | 6.2          | 1.5            | 3.00        |
| AL01668N0*TS | 7     | 68              | G, J          | 100    | 120    | 150              | 8.2          | 1.5            | 2.50        |
| AL01682N0*TS | 8     | 82              | G, J          | 100    | 120    | 150              | 9.4          | 1.3            | 2.50        |
| AL016100N*TS | 9     | 100             | G, J          | 100    | 115    | 150              | 12.3         | 1.2            | 1.70        |
| AL016120N*TS | 9     | 120             | G, J          | 100    | 125    | 150              | 17.3         | 1.1            | 1.50        |
| AL02390N0*TS | 9     | 90              | G, J          | 95     | 114    | 50               | 15           | 1.140          | 3.50        |
| AL023111N*TS | 10    | 111             | G, J          | 87     | 104    | 50               | 15           | 1.020          | 3.50        |
| AL023130N*TS | 11    | 130             | G, J          | 87     | 104    | 50               | 20           | 0.900          | 3.00        |
| AL023169N*TS | 12    | 169             | G, J          | 95     | 114    | 50               | 25           | 0.875          | 3.00        |
| AL023206N*TS | 13    | 206             | G, J          | 95     | 114    | 50               | 30           | 0.800          | 3.00        |
| AL023222N*TS | 14    | 222             | G, J          | 92     | 110    | 50               | 35           | 0.730          | 3.00        |
| AL023246N*TS | 15    | 246             | G, J          | 95     | 114    | 50               | 35           | 0.685          | 3.00        |
| AL023307N*TS | 16    | 307             | G, J          | 95     | 114    | 50               | 35           | 0.660          | 3.00        |
| AL023380N*TS | 17    | 380             | G, J          | 95     | 114    | 50               | 50           | 0.590          | 2.50        |
| AL023422N*TS | 18    | 422             | G, J          | 95     | 114    | 50               | 60           | 0.540          | 2.50        |
| AL023491N*TS | 19    | 491             | G, J          | 95     | 114    | 50               | 65           | 0.535          | 2.00        |
| AL023538N*TS | 20    | 538             | G, J          | 87     | 104    | 50               | 90           | 0.490          | 2.00        |

\*Tolerance: G= ± 2%, J: ± 5%, K: ± 10%

a. Test Equipment:

L/Q: HP-4291B With HP16193A test fixture or equivalent.

SRF: HP8753E /HP8720D or equivalent.

RDC: Chroma 16502 or equivalent.

b. Operating temperature range: -40°C to +125°C.

c. For Temperature Rise: 15°C

d. Storage Temp.: -40°C to +85°C.

f. MSL: Level 1

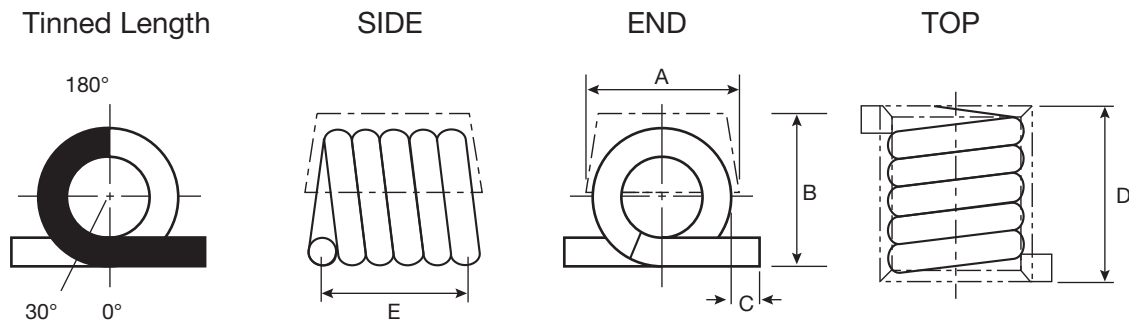
# Air Core RF Inductors



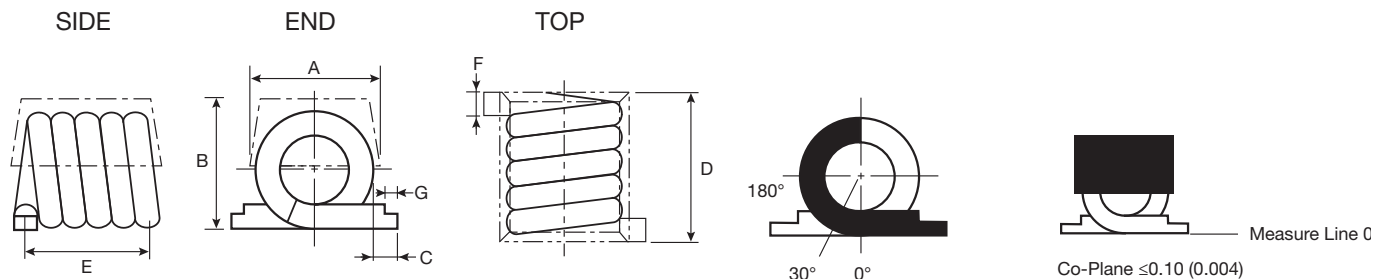
## AL Series

### PHYSICAL DIMENSIONS

#### AL12A, AL12B, AL016, AL023



#### AL05A, AL05B



TINNED LENGTH BETWEEN 30° AND 180°

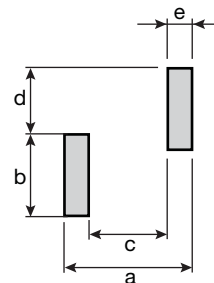
mm (inches)

| Part Number | A                              | B                              | C                              | D                              | E                              | F                         | G                         |
|-------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------|---------------------------|
| AL05A       | 1.42 ± 0.13<br>(0.056 ± 0.005) | 1.37 ± 0.15<br>(0.056 ± 0.005) | 0.89 ± 0.25<br>(0.035 ± 0.010) | 2.21 ± 0.25<br>(0.087 ± 0.010) | 1.83 ± 0.25<br>(0.072 ± 0.010) | 0.51 max.<br>(0.200 max.) | 0.35 min.<br>(0.014 min.) |
| AL05B       | 1.42 ± 0.13<br>(0.056 ± 0.005) | 1.37 ± 0.15<br>(0.056 ± 0.005) | 0.89 ± 0.25<br>(0.035 ± 0.010) | 4.04 ± 0.30<br>(0.159 ± 0.012) | 3.66 ± 0.30<br>(0.144 ± 0.012) | 0.51 max.<br>0.200 max.   | 0.35 min.<br>0.014 min.   |
| AL12A       | 3.05 max.<br>(0.120 max.)      | 3.18 max.<br>(0.125 max.)      | 0.58 ± 0.38<br>(0.023 ± 0.015) | 3.68 max.<br>(0.145 max.)      | 2.92 ± 0.25<br>(0.115 ± 0.010) | —                         | —                         |
| AL12B       | 3.05 max.<br>(0.120 max.)      | 3.18 max.<br>(0.125 max.)      | 0.58 ± 0.38<br>(0.023 ± 0.015) | 6.86 max.<br>(0.270 max.)      | 5.84 ± 0.25<br>(0.230 ± 0.010) | —                         | —                         |
| AL016       | 3.81<br>(0.150)                | 4.20 max.<br>(0.165 max.)      | 1.53 ± 0.39<br>(0.060 ± 0.015) | 4.83 max.<br>(0.190 max.)      | 4.32 ± 0.39<br>(0.170 ± 0.015) | —                         | —                         |
| AL023       | 6.35 max.<br>(0.250 max.)      | 5.90 max.<br>(0.232 max.)      | 1.02 ± 0.39<br>(0.040 ± 0.015) | 10.55 max.<br>(0.415 max.)     | 7.98 ± 0.51<br>(0.314 ± 0.020) | —                         | —                         |

### RECOMMENDED LAND PATTERNS

mm (inches)

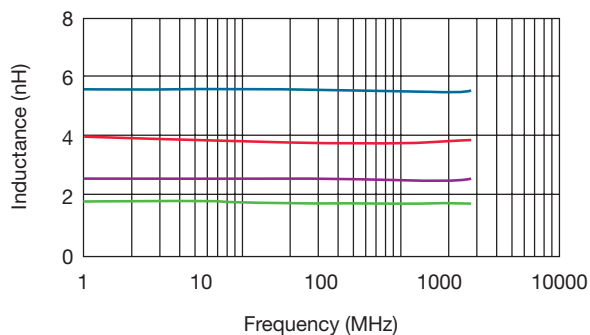
| Part Number | A               | B               | C               | D               | E               |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| AL05A       | 2.62<br>(0.103) | 2.46<br>(0.097) | 1.04<br>(0.041) | 1.02<br>(0.040) | 0.79<br>(0.031) |
| AL05B       | 4.45<br>(0.175) | 2.46<br>(0.097) | 2.87<br>(0.113) | 1.02<br>(0.040) | 0.79<br>(0.031) |
| AL12A       | 4.19<br>(0.165) | 3.30<br>(0.130) | 1.65<br>(0.065) | 2.79<br>(0.110) | 1.27<br>(0.050) |
| AL12B       | 7.24<br>(0.285) | 3.30<br>(0.130) | 4.70<br>(0.185) | 2.79<br>(0.110) | 1.27<br>(0.050) |
| AL016       | 5.80<br>(0.228) | 5.16<br>(0.203) | 2.85<br>(0.112) | 2.62<br>(0.103) | 1.48<br>(0.058) |
| AL023       | 10.0<br>(0.394) | 4.70<br>(0.185) | 5.95<br>(0.234) | 2.42<br>(0.095) | 2.04<br>(0.080) |



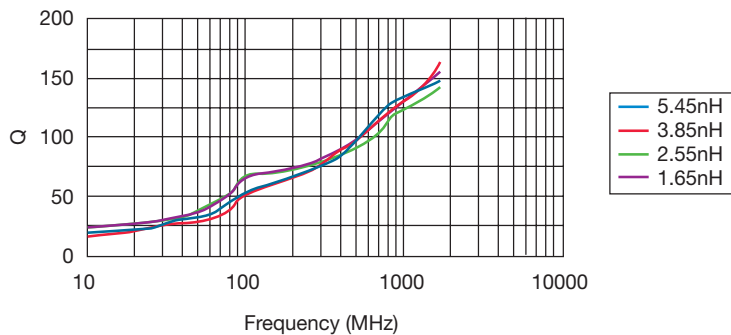
### PERFORMANCE SPECIFICATIONS

#### AL05A

Inductance vs. Frequency

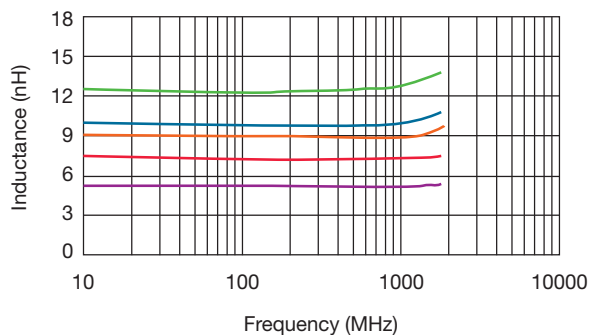


Typical Q vs. Frequency

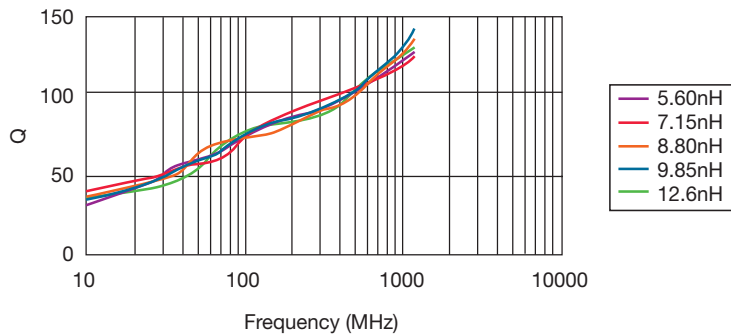


#### AL05B

Inductance vs. Frequency

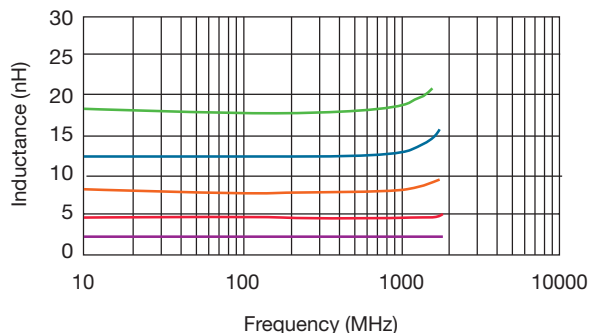


Typical Q vs. Frequency

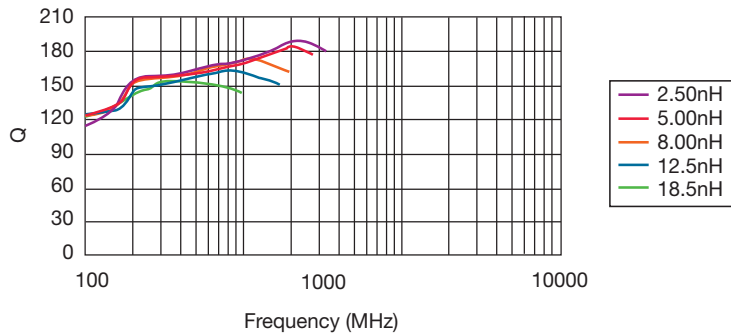


#### AL12A

Inductance vs. Frequency



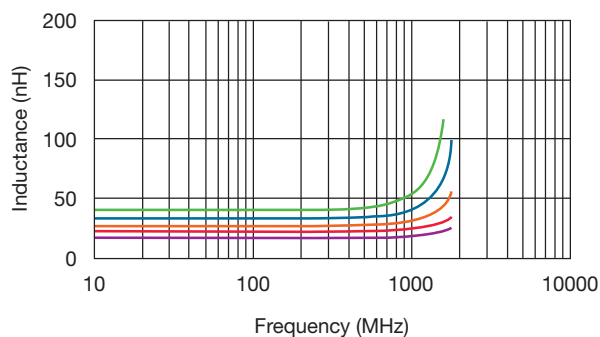
Typical Q vs. Frequency



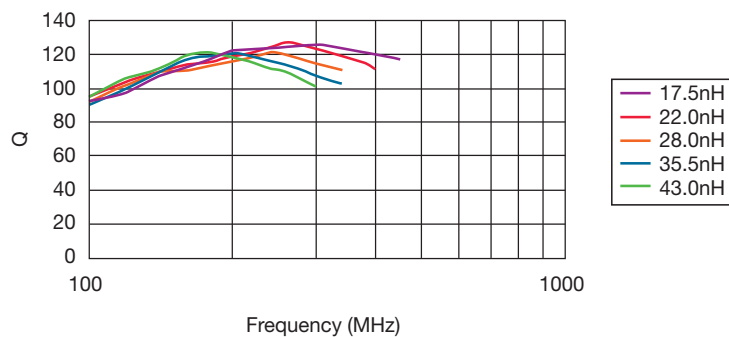
### PERFORMANCE SPECIFICATIONS

#### AL12B

Inductance vs. Frequency

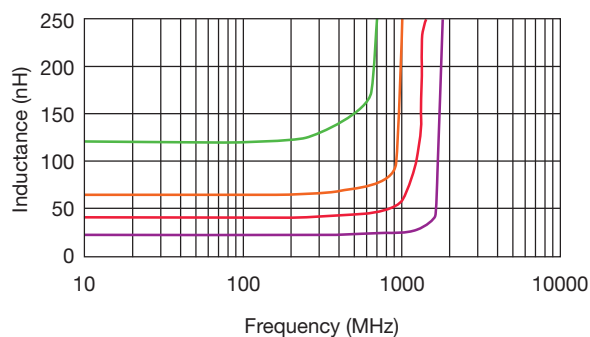


Typical Q vs. Frequency

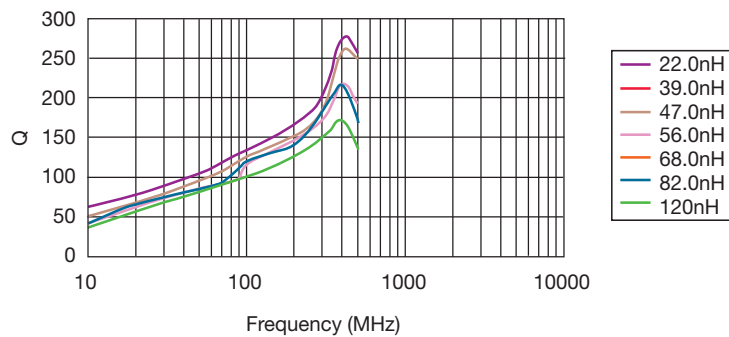


#### AL016

Inductance vs. Frequency

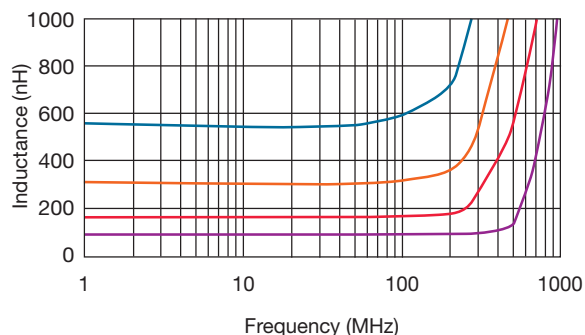


Typical Q vs. Frequency

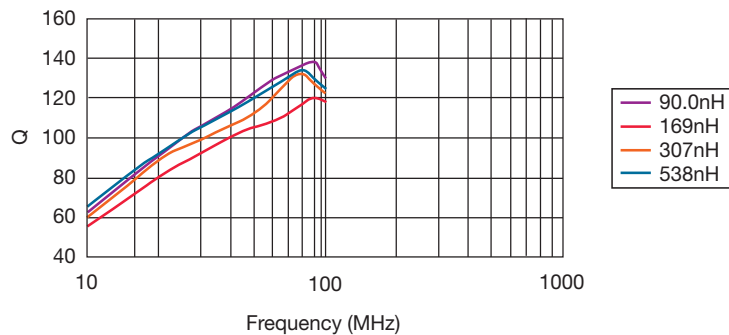


#### AL023

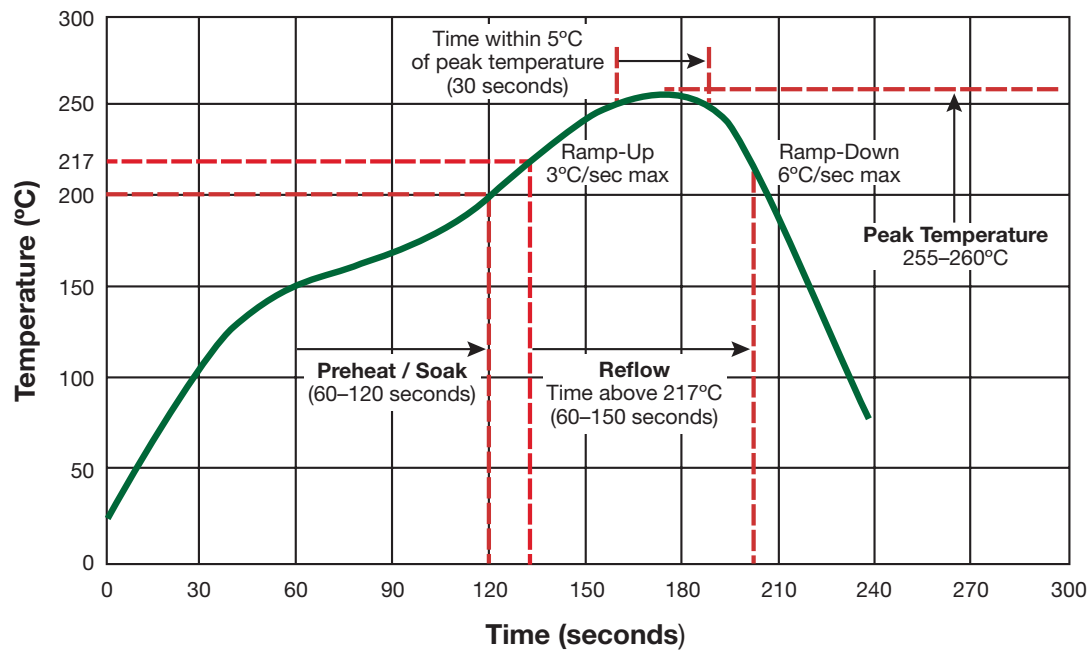
Inductance vs. Frequency



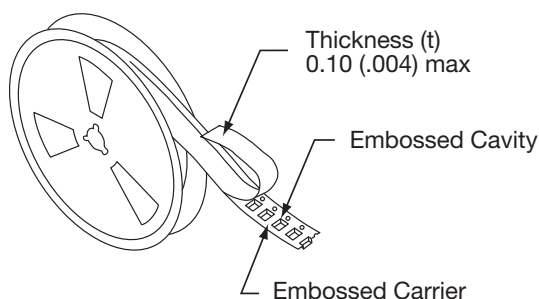
Typical Q vs. Frequency



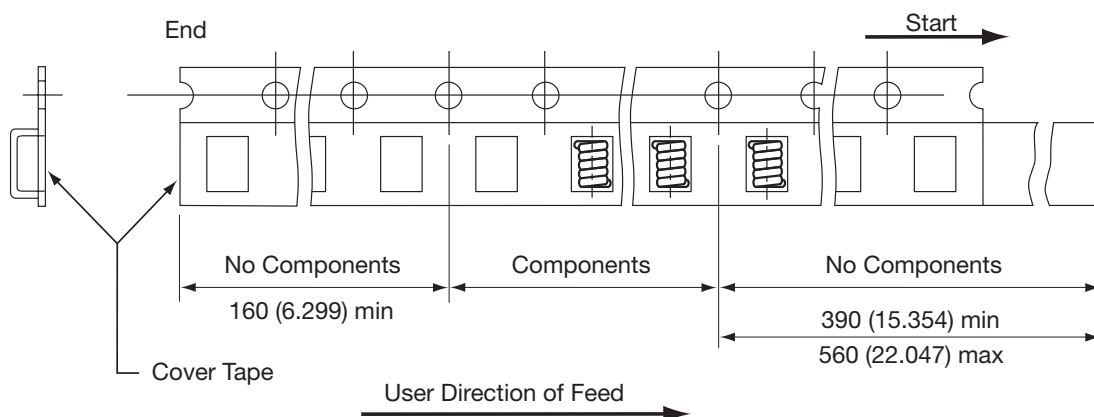
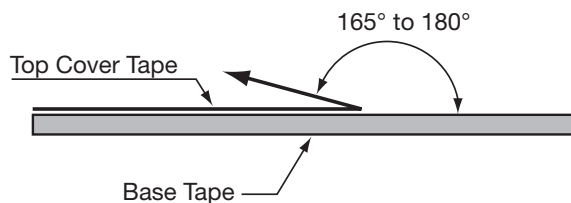
## TYPICAL RoHS REFLOW PROFILE



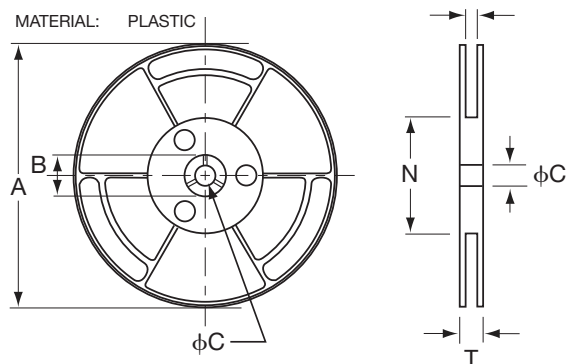
### PACKAGING SPECIFICATIONS



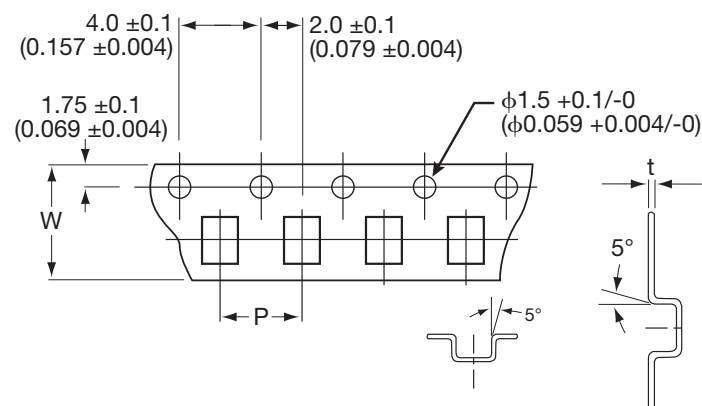
- The force for tearing off cover tape is 10 to 130 grams in the arrow direction



### CARRIER TAPE REELS



### DIMENSIONS OF CARRIER TAPE

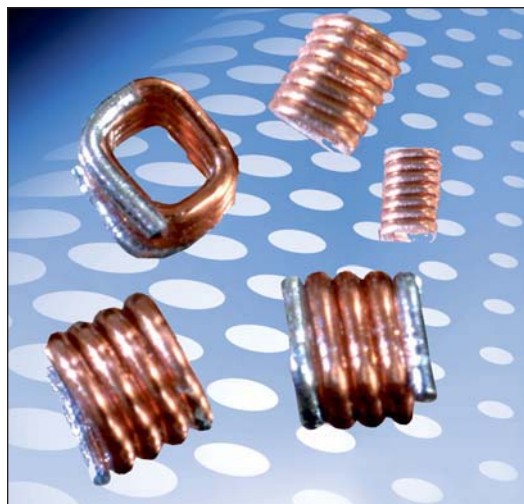


mm (inches)

| Series | ITEM | A         | B         | C         | N         | G         | T         | W          | P          | t          |
|--------|------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| AL05A  | DIM. | 178       | 21        | 13        | 75        | 8.4       | 12.5      | 8          | 4          | 0.30       |
|        | TOL. | $\pm 2.0$ | $\pm 0.8$ | $\pm 0.8$ | $\pm 2.0$ | +1.5      | +1.5      | $\pm 0.3$  | $\pm 0.1$  | $\pm 0.05$ |
| AL05B  | DIM. | 180       | 21        | 13        | 50        | 12.4      | 18.4      | 12         | 4          | 0.35       |
|        | TOL. | MAX       | $\pm 0.8$ | +0.5/-0.2 | MIN       | +2.0      | MAX       | $\pm 0.30$ | $\pm 0.10$ | $\pm 0.05$ |
| AL12A  | DIM. | 178       | 25        | 15        | 75        | 12.5      | 16.4      | 12         | 8          | 0.25       |
|        | TOL. | $\pm 2.0$ | $\pm 1.0$ | $\pm 0.5$ | $\pm 2.0$ | +1.5      | +1.5      | $\pm 0.2$  | $\pm 0.1$  | $\pm 0.05$ |
| AL12B  | DIM. | 178       | 50        | 15        | 75        | 16.5      | 20.4      | 16         | 8          | 0.25       |
|        | TOL. | $\pm 2.0$ | $\pm 1.0$ | $\pm 0.5$ | $\pm 2.0$ | +1.5      | +1.5      | $\pm 0.2$  | $\pm 0.1$  | $\pm 0.05$ |
| AL016  | DIM. | 340       | 20.2      | 13        | 100       | 16.5      | 25.5      | 16         | 12         | 0.30       |
|        | TOL. | MAX       | MIN       | $\pm 0.5$ | REF       | $\pm 0.5$ | $\pm 0.5$ | $\pm 0.30$ | $\pm 0.10$ | $\pm 0.05$ |
| AL023  | DIM. | 340       | 20.2      | 13        | 100       | 24.5      | 30.4      | 24.0       | 12.0       | 0.35       |
|        | TOL. | MAX       | MIN       | $\pm 0.5$ | REF       | $\pm 0.5$ | $\pm 0.5$ | $\pm 0.30$ | $\pm 0.10$ | $\pm 0.05$ |

# Square Air Core RF Inductors

## AS Series



### GENERAL DESCRIPTION

AVX Square Air Core RF Inductors, part of the wound air core inductor family, are ideal for RF circuits, broadband I/O filtering, frequency selection, or impedance matching. The unique square cross section of the air core inductor provides better performance, and offers manufacturing advantages over toroidal coils.

### FEATURES

- Square cross section construction
- Available in 0806, 0807, and 0908 sizes
- 20 Inductance values ranging from 5.5nH to 27.3nH
- High Q
- High Current
- Excellent SRF

### APPLICATIONS

- RF Applications
- RF Circuits
- Broadband I/O Filtering
- Impedance Matching

### HOW TO ORDER

| AS                                                 | 06                                                 | 05N5                                                               | J                                               | T                                                                     | R                                                             |
|----------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------|
| <b>Air Core Inductor</b><br>(Square Cross Section) | <b>Size</b><br>06 = 0806<br>07 = 0807<br>08 = 0908 | <b>Inductance</b><br>05N5 = 5.5nH<br>06N0 = 6.0nH<br>12N3 = 12.3nH | <b>Tolerance</b><br>G = 2%<br>J = 5%<br>K = 10% | <b>Termination</b><br>T = Sn/Ag over Cu<br>(96.5% Sn, 3% Ag, 0.5% Cu) | <b>Packaging</b><br>R = 7 inch reel<br>(2000 pieces per reel) |



### ELECTRICAL SPECIFICATIONS

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| Technical Data        | All technical data related to an ambient temperature of +25°C |
| Inductance Range      | 5.5nH to 27.3nH                                               |
| Inductance Tolerance  | 2%, 5%, 10%                                                   |
| Rated Current         | 2.7A, 2.9A, 4.4A                                              |
| Operating Temperature | -40°C to +125°C                                               |
| Termination           | 96.5% Tin/3% Silver over 0.5% Copper                          |

### ELECTRICAL SPECIFICATIONS

| AVX P/N     | Turns | Inductance (nH) | Tolerance (%) | Q min. | Test Freq. (MHz) | DCR max (mΩ) | SRF (GHz) | I <sub>r</sub> max (A) |
|-------------|-------|-----------------|---------------|--------|------------------|--------------|-----------|------------------------|
| AS0605N5*TR | 3     | 5.5             | G, J, K       | 60     | 400              | 3.4          | 4.9       | 2.9                    |
| AS0606N0*TR | 3     | 6               | G, J, K       | 64     | 400              | 6            | 5.2       | 2.9                    |
| AS0608N9*TR | 4     | 8.9             | G, J, K       | 90     | 400              | 7            | 4.3       | 2.9                    |
| AS0612N3*TR | 5     | 12.3            | G, J, K       | 90     | 400              | 8            | 4.8       | 2.9                    |
| AS0615N7*TR | 6     | 15.7            | G, J, K       | 90     | 400              | 9            | 4.4       | 2.9                    |
| AS0619N4*TR | 7     | 19.4            | G, J, K       | 90     | 400              | 10           | 4         | 2.9                    |
| AS0706N9*TR | 3     | 6.9             | G, J, K       | 100    | 400              | 6            | 4.6       | 2.7                    |
| AS0710N2*TR | 4     | 10.2            | G, J, K       | 100    | 400              | 7            | 4         | 2.7                    |
| AS0711N2*TR | 4     | 11.2            | G, J, K       | 90     | 400              | 6.3          | 3.6       | 2.7                    |
| AS0713N7*TR | 5     | 13.7            | G, J, K       | 100    | 400              | 8            | 4.3       | 2.7                    |
| AS0717N0*TR | 6     | 17              | G, J, K       | 100    | 400              | 9            | 4         | 2.7                    |
| AS0722N0*TR | 7     | 22              | G, J, K       | 100    | 400              | 10           | 3.5       | 2.7                    |
| AS0808N1*TR | 3     | 8.1             | G, J, K       | 130    | 400              | 6            | 5.2       | 4.4                    |
| AS0812N1*TR | 4     | 12.1            | G, J, K       | 130    | 400              | 7            | 4.3       | 4.4                    |
| AS0814N7*TR | 4     | 14.7            | G, J, K       | 90     | 400              | 7.2          | 3         | 4.4                    |
| AS0816N6*TR | 5     | 16.6            | G, J, K       | 130    | 400              | 8            | 3.4       | 4.4                    |
| AS0821N5*TR | 6     | 21.5            | G, J, K       | 130    | 400              | 9            | 3.7       | 4.4                    |
| AS0823N0*TR | 6     | 23              | G, J, K       | 130    | 400              | 10           | 2.6       | 4.4                    |
| AS0825N0*TR | 7     | 25              | G, J, K       | 130    | 400              | 10           | 2.5       | 4.4                    |
| AS0827N3*TR | 7     | 27.3            | G, J, K       | 130    | 400              | 10           | 3.2       | 4.4                    |

Note: 1. \*Tolerance: G=±2%, J=±5%, K=±10%  
2. Inductance & Q measured on the HP4291B. With HP16193A test fixture.  
3. SRF measured using the HP8753E

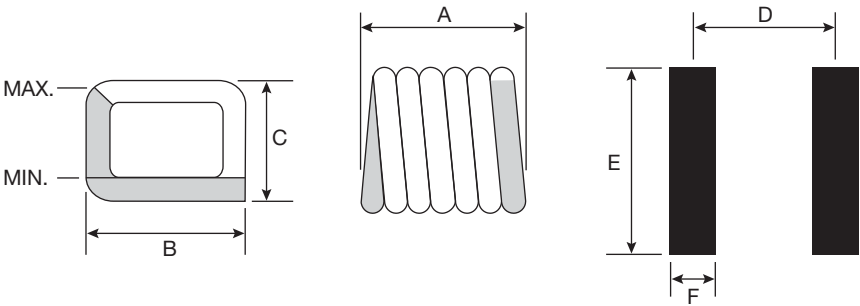
4. Operating Temperature range: -40°C to +125°C  
5. Electrical Specifications at 25°C  
6. MSL: Level 1

# Square Air Core RF Inductors

## AS Series



### PHYSICAL DIMENSIONS



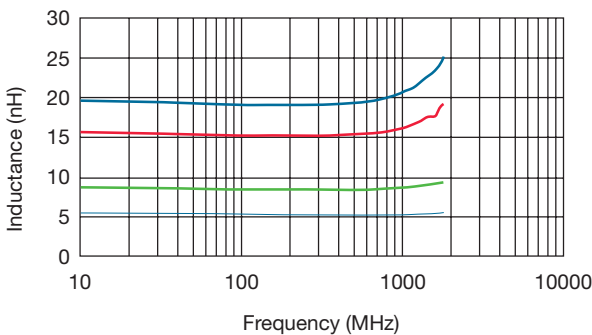
mm (inches)

| Part Number | A                            | B                            | C                            | D                | E               | F               |
|-------------|------------------------------|------------------------------|------------------------------|------------------|-----------------|-----------------|
| AS0605N5*TR | 1.346±0.102<br>(0.053±0.004) | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 0.962<br>(0.038) | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0606N0*TR | 1.295±0.102<br>(0.051±0.004) | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 0.99<br>(0.390)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0608N9*TR | 1.626±0.152<br>(0.640±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 1.27<br>(0.050)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0612N3*TR | 1.930±0.152<br>(0.076±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 1.63<br>(0.064)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0615N7*TR | 2.286±0.152<br>(0.09±0.006)  | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 1.96<br>(0.070)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0619N4*TR | 2.591±0.152<br>(0.102±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.397±0.102<br>(0.055±0.004) | 2.29<br>(0.090)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0706N9*TR | 1.295±0.102<br>(0.051±0.004) | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 1.02<br>(0.040)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0710N2*TR | 1.626±0.152<br>(0.064±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 1.32<br>(0.052)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0711N2*TR | 1.549±0.152<br>(0.061±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 1.24<br>(0.049)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0713N7*TR | 1.930±0.152<br>(0.076±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 1.57<br>(0.062)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0717N0*TR | 2.286±0.152<br>(0.09±0.006)  | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 1.93<br>(0.076)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0722N0*TR | 2.591±0.152<br>(0.102±0.006) | 1.829±0.254<br>(0.072±0.01)  | 1.524±0.254<br>(0.060±0.010) | 2.29<br>(0.090)  | 2.60<br>(0.102) | 0.51<br>(0.020) |
| AS0808N1*TR | 1.473±0.152<br>(0.058±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 1.12<br>(0.044)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0812N0*TR | 1.854±0.152<br>(0.073±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 1.45<br>(0.570)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0814N7*TR | 1.549±0.152<br>(0.061±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 1.24<br>(0.049)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0816N6*TR | 2.210±0.152<br>(0.087±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 1.83<br>(0.072)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0821N5*TR | 2.565±0.152<br>(0.101±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 2.18<br>(0.086)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0823N0*TR | 2.235±0.152<br>(0.088±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 1.90<br>(0.075)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0825N0*TR | 2.972±0.152<br>(0.117±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 2.57<br>(0.101)  | 2.80<br>(0.110) | 0.64<br>(0.025) |
| AS0827N3*TR | 2.972±0.152<br>(0.117±0.006) | 2.134±0.152<br>(0.084±0.006) | 1.829±0.152<br>(0.072±0.006) | 2.57<br>(0.101)  | 2.80<br>(0.110) | 0.64<br>(0.025) |

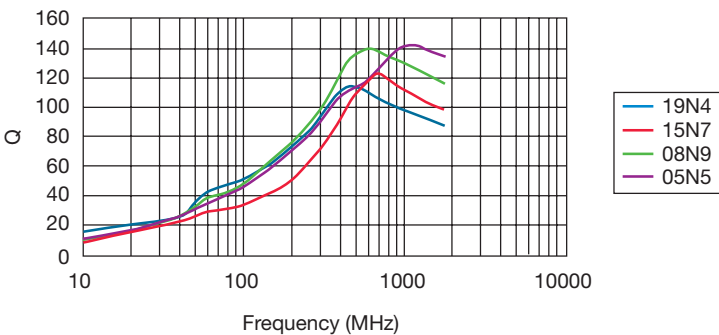
### PERFORMANCE SPECIFICATIONS

#### AS06

Inductance vs. Frequency

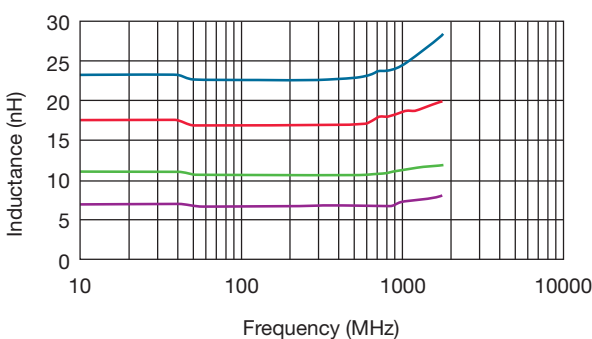


Typical Q vs. Frequency

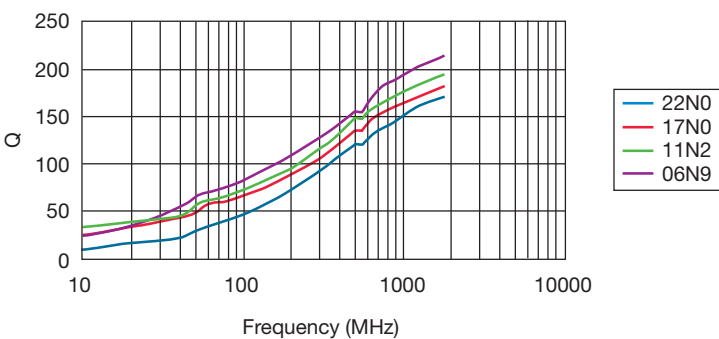


#### AS07

Inductance vs. Frequency

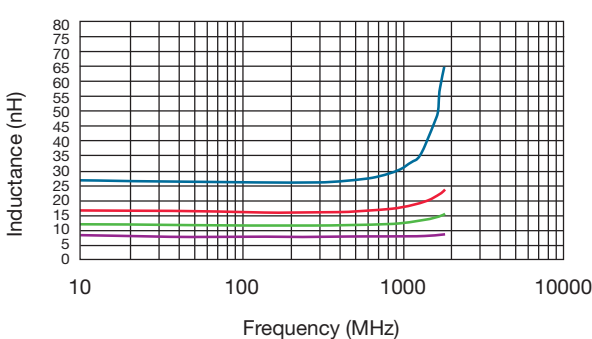


Typical Q vs. Frequency

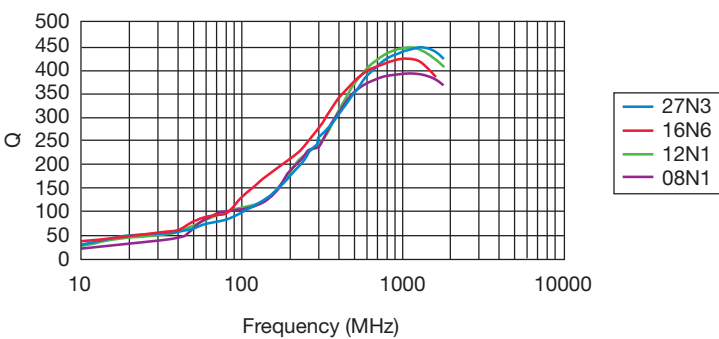


#### AS08

Inductance vs. Frequency



Typical Q vs. Frequency

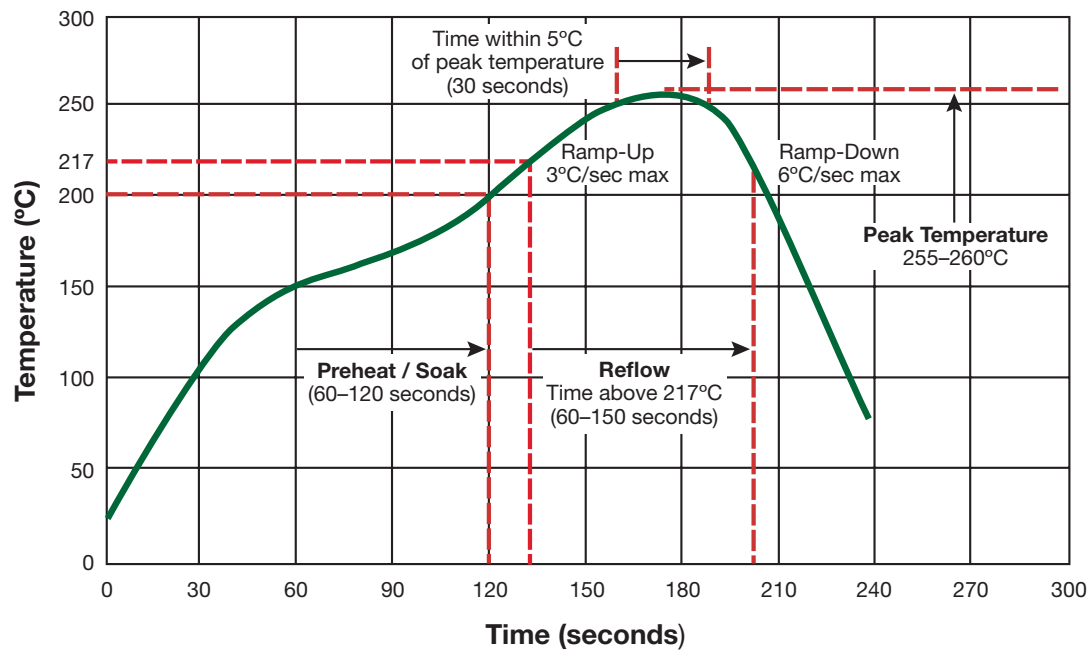


# Square Air Core RF Inductors

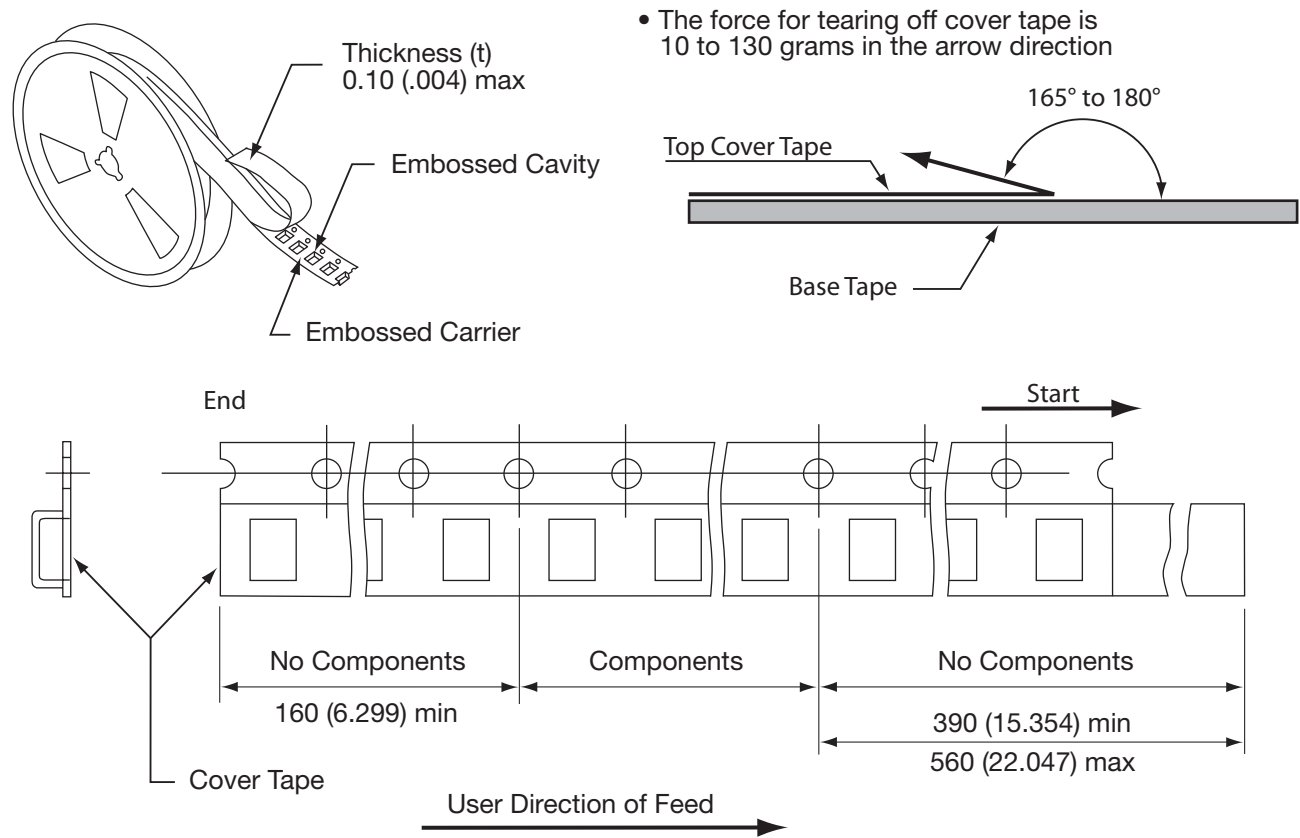
## AS Series



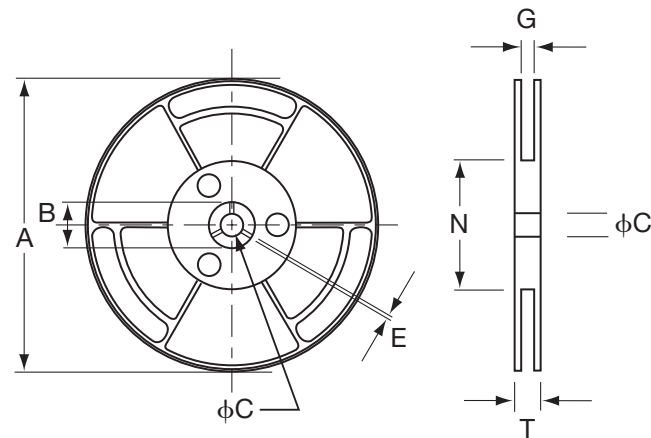
### TYPICAL RoHS REFLOW PROFILE



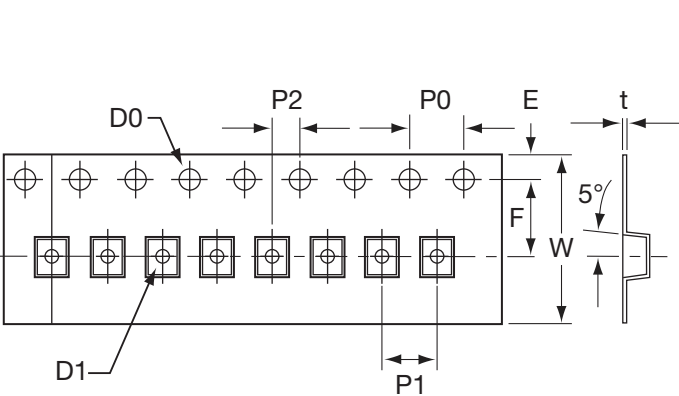
PACKAGING SPECIFICATIONS



CARRIER TAPE REELS



DIMENSIONS OF CARRIER TAPE



| mm (inches) |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                  |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| ITEM        | A               | B               | C               | G               | N               | T               | W               | E               | F               | P1              | P2              | P0              | D0              | D1              | t                |
| DIM.        | 178<br>(7.008)  | 25<br>(0.984)   | 15<br>(0.591)   | 12.5<br>(0.492) | 75<br>(2.953)   | 16.4<br>(0.646) | 12.0<br>(0.472) | 1.75<br>(0.069) | 5.50<br>(0.217) | 4.00<br>(0.157) | 2.0<br>(0.079)  | 4.0<br>(0.157)  | 1.5<br>(0.059)  | 1.0<br>(0.039)  | 0.23<br>(0.009)  |
| TOL.        | ±2.0<br>(0.079) | ±1.0<br>(0.039) | ±0.5<br>(0.020) | ±1.5<br>(0.059) | ±2.0<br>(0.079) | ±1.5<br>(0.059) | ±0.2<br>(0.008) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.1<br>(0.004) | ±0.05<br>(0.020) |

# Wire Wound Chip Inductor

## LCWC Series



### FEATURES

- Ceramic base provide high SRF
- Ultra-compact inductors provide high Q factors
- Low profile, high current are available
- Miniature SMD chip inductor for fully automated assembly
- Outstanding endurance from Pull-up force, mechanical shock and pressure
- Tighter tolerance down to  $\pm 2\%$
- Smaller size of 0402 (1005)

### APPLICATIONS

#### RF Products:

- Cellular Phone (CDMA/GSM/PHS)
- Cordless Phone (DECT/CT1CT2)
- Remote Control, Security System
- Wireless PDA
- Smart Phone
- WLL, Wireless LAN / Mouse / Keyboard / Earphone
- VCO, RF Module & Other Wireless Products

- Base Station, Repeater

- GPS Receiver

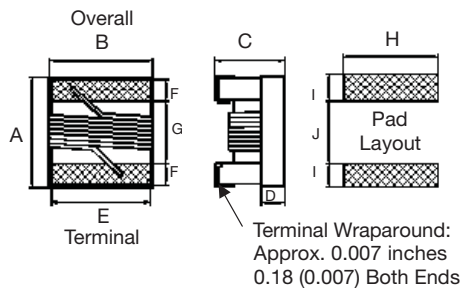
#### Broad Band Applications:

- CATV Filter, Tuner
- Cable Modem/ XDSL Tuner
- Set Top Box

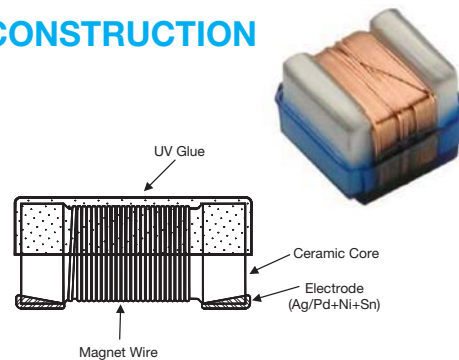
#### IT Applications:

- USB 2.0
- IEEE 1394

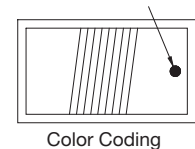
### DIMENSIONS



### CONSTRUCTION



### COLOR CODING



### STANDARD

mm (inches)

| Type | Size (inch) | A Max.          | B Max.          | C Max.          | D Ref.          | E               | F               | G               | H               | I               | J               | Weight (g) (1000pcs) |
|------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|
| 0402 | 0402        | 1.27<br>(0.050) | 0.76<br>(0.030) | 0.61<br>(0.024) | 0.15<br>(0.006) | 0.51<br>(0.020) | 0.23<br>(0.009) | 0.56<br>(0.022) | 0.66<br>(0.026) | 0.50<br>(0.020) | 0.46<br>(0.018) | 0.8                  |
| 0603 | 0603        | 1.80<br>(0.071) | 1.12<br>(0.044) | 1.02<br>(0.040) | 0.38<br>(0.015) | 0.76<br>(0.030) | 0.33<br>(0.013) | 0.86<br>(0.034) | 1.02<br>(0.040) | 0.64<br>(0.025) | 0.64<br>(0.025) | 3.46                 |
| 0805 | 0805        | 2.29<br>(0.090) | 1.73<br>(0.068) | 1.52<br>(0.060) | 0.51<br>(0.020) | 1.27<br>(0.050) | 0.44<br>(0.017) | 1.02<br>(0.040) | 1.78<br>(0.070) | 1.02<br>(0.040) | 0.76<br>(0.030) | 12.13                |
| 1008 | 1008        | 2.92<br>(0.115) | 2.79<br>(0.110) | 2.13<br>(0.084) | 0.65<br>(0.026) | 2.03<br>(0.080) | 0.51<br>(0.020) | 1.52<br>(0.060) | 2.54<br>(0.100) | 1.02<br>(0.040) | 1.27<br>(0.050) | 30.73                |
| 1206 | 1206        | 3.45<br>(0.136) | 1.90<br>(0.075) | 1.40<br>(0.055) | 0.50<br>(0.020) | 1.60<br>(0.063) | 0.50<br>(0.020) | 2.20<br>(0.087) | 1.93<br>(0.076) | 1.02<br>(0.040) | 1.78<br>(0.070) | 40                   |

### LOW PROFILE

mm (inches)

| Type | Size (inch) | A Max.          | B Max.          | C Max.          | D Ref.          | E               | F               | G               | H               | I               | J               |
|------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0805 | 0805        | 2.29<br>(0.090) | 1.73<br>(0.068) | 1.03<br>(0.041) | 0.51<br>(0.020) | 1.27<br>(0.050) | 0.44<br>(0.017) | 1.02<br>(0.040) | 1.78<br>(0.070) | 1.02<br>(0.040) | 0.76<br>(0.030) |
| 1008 | 1008        | 2.92<br>(0.115) | 2.79<br>(0.110) | 1.40<br>(0.055) | 0.65<br>(0.026) | 2.03<br>(0.080) | 0.51<br>(0.020) | 1.52<br>(0.060) | 2.54<br>(0.100) | 1.02<br>(0.040) | 1.27<br>(0.050) |

### HIGH CURRENT/HIGH Q

mm (inches)

| Type | Size (inch) | A Max.          | B Max.          | C Max.          | D Ref.          | E               | F               | G               | H               | I               | J               |
|------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0603 | 0603        | 1.80<br>(0.071) | 1.12<br>(0.044) | 1.02<br>(0.040) | 0.38<br>(0.015) | 0.76<br>(0.030) | 0.33<br>(0.013) | 0.86<br>(0.034) | 1.02<br>(0.040) | 0.64<br>(0.025) | 0.64<br>(0.025) |
| 0805 | 0805        | 2.29<br>(0.090) | 1.73<br>(0.068) | 1.52<br>(0.060) | 0.51<br>(0.020) | 1.27<br>(0.050) | 0.44<br>(0.017) | 1.02<br>(0.040) | 1.78<br>(0.070) | 1.02<br>(0.040) | 0.76<br>(0.030) |
| 1008 | 1008        | 2.92<br>(0.115) | 2.79<br>(0.110) | 2.03<br>(0.080) | 0.65<br>(0.026) | 2.03<br>(0.080) | 0.51<br>(0.020) | 1.52<br>(0.060) | 2.54<br>(0.100) | 1.02<br>(0.040) | 1.27<br>(0.050) |



# Wire Wound Chip Inductor



## LCWC Series

### HOW TO ORDER

| LC                 | WC              | 0402                                 | K                           | 101                                                                       | G                                                         | T                  | A              | R                |
|--------------------|-----------------|--------------------------------------|-----------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|--------------------|----------------|------------------|
| <b>Family</b>      | <b>Series</b>   | <b>Size</b>                          | <b>Tolerance</b>            | <b>Inductance</b>                                                         | <b>Style</b>                                              | <b>Termination</b> | <b>Special</b> | <b>Packaging</b> |
| LC = Chip Inductor | WC = WW Ceramic | 0402<br>0603<br>0805<br>1008<br>1206 | G = 2%<br>J = 5%<br>K = 10% | 3N9 = 3.9nH<br>39N = 39nH<br>R39 = 390nH<br>3R9 = 3900nH<br>153 = 15000nH | G = Standard<br>Q = High Q/<br>Current<br>R = Low Profile | T = Sn Plate       | A = Standard   | R = 7" Reel      |



### STANDARD ELECTRICAL SPECIFICATIONS

| 0402               |              |                  |                        |               |                 |                  |        |    |        |     |
|--------------------|--------------|------------------|------------------------|---------------|-----------------|------------------|--------|----|--------|-----|
| Inductance<br>(nH) | Tolerance    | L Freq.<br>(MHz) | Quality Factor<br>Min. | SRF<br>Factor | DCR<br>(Ω) max. | IDC<br>(mA) max. | 900MHz |    | 1.7GHz |     |
|                    |              |                  |                        |               |                 |                  | L      | Q  | L      | Q   |
| 1.0                | ±10%         | 250              | 16                     | 12.70         | 0.045           | 1360             | 1.02   | 77 | 1.02   | 69  |
| 1.9                | ±10%         | 250              | 16                     | 11.30         | 0.070           | 1040             | 1.72   | 68 | 1.74   | 82  |
| 2.0                | ±10%         | 250              | 16                     | 11.10         | 0.070           | 1040             | 1.93   | 54 | 1.93   | 75  |
| 2.2                | ±10%         | 250              | 19                     | 10.80         | 0.070           | 960              | 2.19   | 59 | 2.23   | 100 |
| 2.4                | ±10%         | 250              | 15                     | 10.50         | 0.070           | 790              | 2.24   | 51 | 2.27   | 68  |
| 2.7                | ±10%         | 250              | 16                     | 10.40         | 0.120           | 640              | 2.23   | 42 | 2.25   | 61  |
| 3.3                | ±10%         | 250              | 19                     | 7.00          | 0.066           | 840              | 3.10   | 65 | 3.12   | 87  |
| 3.6                | ±5, ±10%     | 250              | 19                     | 6.80          | 0.066           | 840              | 3.56   | 45 | 3.62   | 71  |
| 3.9                | ±5, ±10%     | 250              | 19                     | 5.80          | 0.066           | 840              | 3.89   | 50 | 4.00   | 75  |
| 4.3                | ±5, ±10%     | 250              | 18                     | 6.00          | 0.091           | 700              | 4.19   | 47 | 4.30   | 71  |
| 4.7                | ±5, ±10%     | 250              | 18                     | 4.70          | 0.130           | 640              | 4.55   | 48 | 4.68   | 68  |
| 5.1                | ±5, ±10%     | 250              | 20                     | 4.80          | 0.083           | 800              | 5.15   | 56 | 5.25   | 82  |
| 5.6                | ±5, ±10%     | 250              | 20                     | 4.80          | 0.083           | 760              | 5.16   | 54 | 5.28   | 81  |
| 6.2                | ±5, ±10%     | 250              | 20                     | 4.80          | 0.083           | 760              | 6.16   | 52 | 6.37   | 76  |
| 6.8                | ±5, ±10%     | 250              | 20                     | 4.80          | 0.083           | 680              | 6.56   | 63 | 6.93   | 78  |
| 7.5                | ±5, ±10%     | 250              | 22                     | 4.80          | 0.104           | 680              | 7.91   | 60 | 8.22   | 88  |
| 8.2                | ±5, ±10%     | 250              | 22                     | 4.40          | 0.104           | 680              | 8.50   | 57 | 8.85   | 84  |
| 8.7                | ±5, ±10%     | 250              | 18                     | 4.10          | 0.200           | 480              | 8.78   | 54 | 9.21   | 73  |
| 9.0                | ±5, ±10%     | 250              | 22                     | 4.16          | 0.104           | 680              | 9.07   | 62 | 9.53   | 78  |
| 9.5                | ±5, ±10%     | 250              | 18                     | 4.00          | 0.200           | 480              | 9.42   | 54 | 9.98   | 69  |
| 10                 | ±2, ±5, ±10% | 250              | 21                     | 3.90          | 0.195           | 480              | 9.80   | 50 | 10.10  | 67  |
| 11                 | ±2, ±5, ±10% | 250              | 24                     | 3.68          | 0.120           | 640              | 10.70  | 52 | 11.20  | 78  |
| 12                 | ±2, ±5, ±10% | 250              | 24                     | 3.60          | 0.120           | 640              | 11.90  | 53 | 12.70  | 71  |
| 13                 | ±2, ±5, ±10% | 250              | 24                     | 3.45          | 0.210           | 440              | 13.40  | 51 | 14.60  | 57  |
| 15                 | ±2, ±5, ±10% | 250              | 24                     | 3.28          | 0.172           | 560              | 14.60  | 55 | 15.50  | 77  |
| 16                 | ±2, ±5, ±10% | 250              | 24                     | 3.10          | 0.220           | 560              | 16.60  | 46 | 18.80  | 47  |
| 18                 | ±2, ±5, ±10% | 250              | 25                     | 3.10          | 0.230           | 420              | 18.30  | 57 | 20.30  | 62  |
| 19                 | ±2, ±5, ±10% | 250              | 24                     | 3.04          | 0.202           | 480              | 19.10  | 50 | 21.10  | 67  |
| 20                 | ±2, ±5, ±10% | 250              | 25                     | 3.00          | 0.250           | 420              | 20.70  | 52 | 23.70  | 53  |
| 22                 | ±2, ±5, ±10% | 250              | 25                     | 2.80          | 0.300           | 400              | 23.20  | 53 | 26.80  | 53  |
| 23                 | ±2, ±5, ±10% | 250              | 24                     | 2.72          | 0.300           | 400              | 23.80  | 49 | 26.90  | 64  |
| 24                 | ±2, ±5, ±10% | 250              | 25                     | 2.70          | 0.300           | 400              | 25.10  | 51 | 29.50  | 50  |
| 27                 | ±2, ±5, ±10% | 250              | 24                     | 2.48          | 0.300           | 400              | 28.70  | 49 | 33.50  | 63  |
| 30                 | ±2, ±5, ±10% | 250              | 25                     | 2.35          | 0.350           | 400              | 31.10  | 46 | 38.50  | 39  |
| 33                 | ±2, ±5, ±10% | 250              | 24                     | 2.35          | 0.350           | 400              | 34.90  | 31 | 41.70  | 32  |
| 36                 | ±2, ±5, ±10% | 250              | 24                     | 2.32          | 0.440           | 320              | 39.50  | 44 | 48.40  | 53  |
| 39                 | ±2, ±5, ±10% | 250              | 25                     | 2.10          | 0.550           | 200              | 41.70  | 47 | 50.20  | 45  |
| 40                 | ±2, ±5, ±10% | 250              | 24                     | 2.24          | 0.500           | 320              | 39.00  | 44 | 47.40  | 33  |
| 43                 | ±2, ±5, ±10% | 250              | 25                     | 2.03          | 0.810           | 100              | 45.80  | 46 | 61.60  | 34  |
| 47                 | ±2, ±5, ±10% | 250              | 25                     | 2.10          | 0.830           | 150              | 50.00  | 38 | 55.80  | 37  |
| 51                 | ±2, ±5, ±10% | 250              | 25                     | 1.75          | 0.820           | 100              | 50.40  | 47 | 59.40  | 37  |
| 56                 | ±2, ±5, ±10% | 250              | 25                     | 1.76          | 0.970           | 100              | 57.40  | 49 | 72.40  | 40  |
| 68                 | ±2, ±5, ±10% | 250              | 22                     | 1.62          | 1.120           | 100              | 69.60  | 45 | 83.40  | 38  |

# Wire Wound Chip Inductor

## LCWC Series



### 0603

| Inductance<br>(nH) | Tolerance                | L Freq.<br>(MHz) | Quality Factor<br>Min. | SRF<br>Factor | DCR<br>( $\Omega$ ) max. | IDC<br>(mA) max. | 900MHz |    | 1.7GHz |    | Color<br>Code |
|--------------------|--------------------------|------------------|------------------------|---------------|--------------------------|------------------|--------|----|--------|----|---------------|
|                    |                          |                  |                        |               |                          |                  | L      | Q  | L      | Q  |               |
| 1.6                | $\pm 5, \pm 10\%$        | 250              | 24                     | 12.5          | 0.030                    | 700              | 1.53   | 35 | 1.58   | 55 | Blue          |
| 1.8                | $\pm 5, \pm 10\%$        | 250              | 16                     | 12.5          | 0.045                    | 700              | 1.63   | 35 | 1.66   | 50 | Black         |
| 2.2                | $\pm 5, \pm 10\%$        | 250              | 15                     | 6.00          | 0.100                    | 700              | 2.18   | 41 | 2.20   | 64 | White         |
| 2.3                | $\pm 5, \pm 10\%$        | 250              | 16                     | >4.00         | 0.140                    | 700              | 2.32   | 32 | 2.35   | 40 | Yellow        |
| 3.3                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 22                     | >6.00         | 0.080                    | 700              | 3.35   | 47 | 3.40   | 65 | Red           |
| 3.6                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 22                     | 5.80          | 0.063                    | 700              | 3.53   | 49 | 3.58   | 65 | Violet        |
| 3.9                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 22                     | >6.00         | 0.080                    | 700              | 3.95   | 49 | 3.96   | 67 | Brown         |
| 4.3                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 22                     | 5.80          | 0.063                    | 700              | 4.32   | 49 | 4.43   | 67 | Orange        |
| 4.5                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 20                     | 5.80          | 0.120                    | 700              | 4.74   | 55 | 4.87   | 92 | Gray          |
| 4.7                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 25                     | 5.80          | 0.120                    | 700              | 4.65   | 53 | 4.80   | 67 | Violet        |
| 5.1                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 20                     | 5.80          | 0.160                    | 700              | 5.13   | 47 | 5.36   | 56 | Green         |
| 5.6                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 20                     | 5.80          | 0.170                    | 700              | 5.53   | 56 | 5.86   | 77 | Yellow        |
| 6.2                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 25                     | 5.80          | 0.110                    | 700              | 6.28   | 60 | 6.40   | 85 | Black         |
| 6.3                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 25                     | 5.80          | 0.110                    | 700              | 6.67   | 41 | 6.86   | 61 | Black         |
| 6.8                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 27                     | 5.80          | 0.110                    | 700              | 6.75   | 60 | 7.10   | 81 | Red           |
| 7.5                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 28                     | 4.80          | 0.106                    | 700              | 7.70   | 60 | 7.82   | 65 | Brown         |
| 8.2                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 27                     | 4.80          | 0.110                    | 700              | 8.25   | 64 | 8.40   | 81 | Green         |
| 8.7                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 28                     | 4.80          | 0.109                    | 700              | 8.86   | 62 | 9.32   | 58 | Yellow        |
| 9.1                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 4.80          | 0.130                    | 700              | 9.20   | 70 | 9.70   | 80 | Black         |
| 9.5                | $\pm 2, \pm 5, \pm 10\%$ | 250              | 28                     | 5.40          | 0.135                    | 700              | 9.70   | 59 | 9.92   | 61 | Blue          |
| 10                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 31                     | 4.80          | 0.130                    | 700              | 10.0   | 66 | 10.6   | 83 | Orange        |
| 11                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 31                     | 4.00          | 0.086                    | 700              | 11.3   | 53 | 12.1   | 56 | Gray          |
| 12                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 4.00          | 0.130                    | 700              | 12.3   | 72 | 13.5   | 83 | Yellow        |
| 15                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 4.00          | 0.170                    | 700              | 15.4   | 64 | 16.8   | 89 | Green         |
| 16                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 3.30          | 0.110                    | 700              | 16.5   | 55 | 18.0   | 52 | White         |
| 17                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 3.20          | 0.170                    | 700              | 17.6   | 56 | 19.4   | 44 | Red           |
| 18                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 35                     | 3.10          | 0.170                    | 700              | 18.7   | 70 | 21.4   | 69 | Blue          |
| 20                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 40                     | 3.00          | 0.190                    | 700              | 20.7   | 80 | 23.5   | 30 | Green         |
| 22                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 38                     | 3.00          | 0.190                    | 700              | 22.8   | 73 | 26.1   | 71 | Violet        |
| 23                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 38                     | 2.85          | 0.190                    | 700              | 24.1   | 71 | 28.0   | 71 | Orange        |
| 24                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 38                     | 2.80          | 0.130                    | 700              | 25.7   | 45 | 30.9   | 40 | Black         |
| 27                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 40                     | 2.80          | 0.220                    | 600              | 29.2   | 74 | 34.6   | 65 | Gray          |
| 30                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 40                     | 2.80          | 0.150                    | 600              | 31.4   | 47 | 39.8   | 28 | Brown         |
| 33                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 40                     | 2.30          | 0.220                    | 600              | 36.0   | 67 | 49.5   | 42 | White         |
| 36                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 37                     | 2.30          | 0.250                    | 600              | 39.1   | 47 | 48.9   | 24 | Red           |
| 39                 | $\pm 2, \pm 5, \pm 10\%$ | 250              | 40                     | 2.20          | 0.250                    | 600              | 42.7   | 60 | 60.2   | 40 | Black         |
| 43                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 38                     | 2.00          | 0.280                    | 600              | 46.9   | 44 | 60.3   | 21 | Orange        |
| 47                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 38                     | 2.00          | 0.280                    | 600              | 52.2   | 62 | 77.2   | 35 | Brown         |
| 51                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 38                     | 1.90          | 0.280                    | 600              | 55.5   | 69 | 82.2   | 34 | Blue          |
| 56                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 38                     | 1.90          | 0.310                    | 600              | 62.5   | 56 | 97.0   | 26 | Red           |
| 62                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 37                     | 1.80          | 0.340                    | 600              | 68.0   | 40 | 110    | 10 | Gray          |
| 68                 | $\pm 2, \pm 5, \pm 10\%$ | 200              | 37                     | 1.70          | 0.340                    | 600              | 80.5   | 54 | 168    | 21 | Orange        |
| 72                 | $\pm 2, \pm 5, \pm 10\%$ | 150              | 34                     | 1.70          | 0.490                    | 600              | 82.0   | 53 | 135    | 20 | Yellow        |
| 82                 | $\pm 2, \pm 5, \pm 10\%$ | 150              | 34                     | 1.70          | 0.540                    | 400              | 96.2   | 54 | 177    | 21 | Green         |
| 91                 | $\pm 2, \pm 5, \pm 10\%$ | 150              | 30                     | 1.70          | 0.500                    | 400              | 110.0  | 50 | 416.4  | 6  | Brown         |
| 100                | $\pm 2, \pm 5, \pm 10\%$ | 150              | 34                     | 1.40          | 0.580                    | 400              | 124.0  | 49 | 319.5  | 13 | Blue          |
| 110                | $\pm 2, \pm 5, \pm 10\%$ | 150              | 32                     | 1.35          | 0.610                    | 300              | 138.0  | 43 | 342.7  | 15 | Violet        |
| 120                | $\pm 2, \pm 5, \pm 10\%$ | 150              | 32                     | 1.30          | 0.650                    | 300              | 166.0  | 39 | 529.3  | 8  | Gray          |
| 130                | $\pm 2, \pm 5, \pm 10\%$ | 150              | 30                     | 1.40          | 0.720                    | 300              | 185.0  | 60 | -      | -  | White         |
| 140                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 28                     | 1.30          | 0.870                    | 280              | 190.0  | 80 | -      | -  | Blue          |
| 150                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 28                     | 1.30          | 0.950                    | 280              | 230.0  | 25 | -      | -  | White         |
| 160                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 1.30          | 1.400                    | 280              | 215.0  | 20 | -      | -  | Yellow        |
| 180                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 1.25          | 1.400                    | 250              | 305.0  | 22 | -      | -  | Black         |
| 220                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 1.20          | 1.600                    | 250              | 377.0  | 21 | -      | -  | Brown         |
| 260                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 1.00          | 2.000                    | 200              | 469.0  | 21 | -      | -  | Violet        |
| 270                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 0.90          | 2.100                    | 200              | 523.0  | 19 | -      | -  | Red           |
| 280                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 1.00          | 2.400                    | 100              | 524.0  | 18 | -      | -  | Green         |
| 300                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 0.75          | 2.500                    | 150              | 539.7  | 21 | -      | -  | Orange        |
| 330                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 0.90          | 3.800                    | 100              | 680.4  | 20 | -      | -  | Blue          |
| 390                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 25                     | 0.90          | 4.350                    | 100              | 734.5  | 29 | -      | -  | Yellow        |
| 470                | $\pm 2, \pm 5, \pm 10\%$ | 100              | 23                     | 0.60          | 3.600                    | 80               | -      | -  | -      | -  | White         |



# Wire Wound Chip Inductor

## LCWC Series



### 0805

| Inductance (nH) | Tolerance    | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR (Ω) max. | IDC (mA) max. | Color Code |
|-----------------|--------------|---------------|---------------------|----------------|--------------|---------------|------------|
| 2.7             | ±5, ±10%     | 250           | 80 @ 1500MHz        | 7.900          | 0.06         | 800           | Brown      |
| 2.8             | ±5, ±10%     | 250           | 80 @ 1500MHz        | 7.900          | 0.06         | 800           | Gray       |
| 3.0             | ±5, ±10%     | 250           | 65 @ 1500MHz        | 7.900          | 0.06         | 800           | White      |
| 3.3             | ±5, ±10%     | 250           | 50 @ 1500MHz        | 6.000          | 0.08         | 600           | Black      |
| 5.6             | ±5, ±10%     | 250           | 65 @ 1000MHz        | 5.500          | 0.08         | 600           | Orange     |
| 6.2             | ±5, ±10%     | 250           | 50 @ 1000MHz        | 5.500          | 0.11         | 600           | Green      |
| 6.8             | ±5, ±10%     | 250           | 50 @ 1000MHz        | 5.500          | 0.11         | 600           | Brown      |
| 7.5             | ±5, ±10%     | 250           | 50 @ 1000MHz        | 4.500          | 0.14         | 600           | Green      |
| 8.2             | ±5, ±10%     | 250           | 50 @ 1000MHz        | 4.700          | 0.12         | 600           | Red        |
| 8.7             | ±5, ±10%     | 250           | 50 @ 1000MHz        | 4.000          | 0.21         | 400           | White      |
| 10              | ±2, ±5, ±10% | 250           | 60 @ 500MHz         | 4.200          | 0.10         | 600           | Blue       |
| 12              | ±2, ±5, ±10% | 250           | 50 @ 500MHz         | 4.000          | 0.15         | 600           | Orange     |
| 15              | ±2, ±5, ±10% | 250           | 50 @ 500MHz         | 3.400          | 0.17         | 600           | Yellow     |
| 18              | ±2, ±5, ±10% | 250           | 50 @ 500MHz         | 3.300          | 0.20         | 600           | Green      |
| 22              | ±2, ±5, ±10% | 250           | 55 @ 500MHz         | 2.600          | 0.22         | 500           | Blue       |
| 24              | ±2, ±5, ±10% | 250           | 50 @ 500MHz         | 2.000          | 0.22         | 500           | Gray       |
| 27              | ±2, ±5, ±10% | 250           | 55 @ 500MHz         | 2.500          | 0.25         | 500           | Violet     |
| 33              | ±2, ±5, ±10% | 250           | 60 @ 500MHz         | 2.050          | 0.27         | 500           | Gray       |
| 36              | ±2, ±5, ±10% | 250           | 55 @ 500MHz         | 1.700          | 0.27         | 500           | Orange     |
| 39              | ±2, ±5, ±10% | 250           | 60 @ 500MHz         | 2.000          | 0.29         | 500           | White      |
| 43              | ±2, ±5, ±10% | 200           | 60 @ 500MHz         | 1.650          | 0.34         | 500           | Yellow     |
| 47              | ±2, ±5, ±10% | 200           | 60 @ 500MHz         | 1.650          | 0.31         | 500           | Black      |
| 56              | ±2, ±5, ±10% | 200           | 60 @ 500MHz         | 1.550          | 0.34         | 500           | Brown      |
| 68              | ±2, ±5, ±10% | 200           | 60 @ 500MHz         | 1.450          | 0.38         | 500           | Red        |
| 72              | ±2, ±5, ±10% | 150           | 65 @ 500MHz         | 1.400          | 0.40         | 500           | Green      |
| 82              | ±2, ±5, ±10% | 150           | 65 @ 500MHz         | 1.300          | 0.42         | 400           | Orange     |
| 91              | ±2, ±5, ±10% | 150           | 65 @ 500MHz         | 1.200          | 0.48         | 400           | Black      |
| 100             | ±2, ±5, ±10% | 150           | 65 @ 500MHz         | 1.200          | 0.46         | 400           | Yellow     |
| 110             | ±2, ±5, ±10% | 150           | 50 @ 250MHz         | 1.000          | 0.48         | 400           | Brown      |
| 120             | ±2, ±5, ±10% | 150           | 50 @ 250MHz         | 1.100          | 0.51         | 400           | Green      |
| 150             | ±2, ±5, ±10% | 100           | 50 @ 250MHz         | 0.920          | 0.56         | 400           | Blue       |
| 180             | ±2, ±5, ±10% | 100           | 50 @ 250MHz         | 0.870          | 0.64         | 400           | Violet     |
| 200             | ±2, ±5, ±10% | 100           | 50 @ 250MHz         | 0.860          | 0.66         | 400           | Orange     |
| 220             | ±2, ±5, ±10% | 100           | 50 @ 250MHz         | 0.850          | 0.70         | 400           | Gray       |
| 240             | ±2, ±5, ±10% | 100           | 44 @ 250MHz         | 0.690          | 1.00         | 350           | Red        |
| 250             | ±2, ±5, ±10% | 100           | 50 @ 250MHz         | 0.680          | 1.00         | 350           | Green      |
| 270             | ±2, ±5, ±10% | 100           | 48 @ 250MHz         | 0.650          | 1.00         | 350           | White      |
| 300             | ±2, ±5, ±10% | 100           | 48 @ 250MHz         | 0.620          | 1.20         | 330           | Yellow     |
| 330             | ±2, ±5, ±10% | 100           | 48 @ 250MHz         | 0.600          | 1.40         | 310           | Black      |
| 360             | ±2, ±5, ±10% | 100           | 48 @ 250MHz         | 0.580          | 1.45         | 300           | Green      |
| 390             | ±2, ±5, ±10% | 100           | 48 @ 250MHz         | 0.560          | 1.50         | 290           | Brown      |
| 430             | ±2, ±5, ±10% | 50            | 33 @ 100MHz         | 0.430          | 1.70         | 230           | Blue       |
| 470             | ±2, ±5, ±10% | 50            | 33 @ 100MHz         | 0.375          | 1.70         | 250           | Red        |
| 560             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.340          | 1.90         | 230           | Orange     |
| 600             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.260          | 1.60         | 450           | White      |
| 620             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.220          | 2.20         | 210           | Yellow     |
| 680             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.200          | 2.20         | 190           | Green      |
| 750             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.200          | 2.30         | 180           | Blue       |
| 820             | ±2, ±5, ±10% | 25            | 23 @ 50MHz          | 0.200          | 2.35         | 180           | Violet     |
| 1000            | ±2, ±5, ±10% | 25            | 20 @ 50MHz          | 0.100          | 2.50         | 170           | Gray       |
| 1200            | ±2, ±5, ±10% | 7.9           | 18 @ 25MHz          | 0.100          | 2.50         | 170           | White      |
| 1500            | ±2, ±5, ±10% | 7.9           | 16 @ 25MHz          | 0.100          | 2.50         | 170           | Black      |
| 1800            | ±2, ±5, ±10% | 7.9           | 16 @ 7.9MHz         | 0.080          | 2.50         | 170           | Brown      |
| 2200            | ±2, ±5, ±10% | 7.9           | 16 @ 7.9MHz         | 0.060          | 2.70         | 160           | Red        |
| 2700            | ±2, ±5, ±10% | 7.9           | 16 @ 7.9MHz         | 0.050          | 3.10         | 150           | Orange     |
| 3300            | ±2, ±5, ±10% | 7.9           | 15 @ 7.9MHz         | 0.040          | 4.40         | 90            | Blue       |
| 4700            | ±2, ±5, ±10% | 7.9           | 15 @ 7.9MHz         | 0.040          | 6.40         | 90            | Green      |

# Wire Wound Chip Inductor

## LCWC Series



### 1008

| Inductance (nH) | Tolerance    | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR (Ω) max. | IDC (mA) max. | Color Code |
|-----------------|--------------|---------------|---------------------|----------------|--------------|---------------|------------|
| *5.6            | ±5, ±10%     | 50            | 50 @ 1500MHz        | 4.000          | 0.15         | 1000          | Black      |
| *10             | ±2, ±5, ±10% | 50            | 50 @ 500MHz         | 4.100          | 0.08         | 1000          | Brown      |
| *12             | ±2, ±5, ±10% | 50            | 50 @ 500MHz         | 3.300          | 0.09         | 1000          | Red        |
| *15             | ±2, ±5, ±10% | 50            | 50 @ 500MHz         | 2.500          | 0.11         | 1000          | Orange     |
| *18             | ±2, ±5, ±10% | 50            | 50 @ 350MHz         | 2.400          | 0.12         | 1000          | Yellow     |
| *22             | ±2, ±5, ±10% | 50            | 55 @ 350MHz         | 2.400          | 0.12         | 1000          | Green      |
| 24              | ±2, ±5, ±10% | 50            | 55 @ 350MHz         | 1.900          | 0.13         | 1000          | Blue       |
| *27             | ±2, ±5, ±10% | 50            | 55 @ 350MHz         | 1.600          | 0.13         | 1000          | Violet     |
| *33             | ±2, ±5, ±10% | 50            | 60 @ 350MHz         | 1.600          | 0.14         | 1000          | Gray       |
| 36              | ±2, ±5, ±10% | 50            | 60 @ 350MHz         | 1.600          | 0.15         | 1000          | Orange     |
| *39             | ±2, ±5, ±10% | 50            | 60 @ 350MHz         | 1.500          | 0.15         | 1000          | White      |
| *47             | ±2, ±5, ±10% | 50            | 65 @ 350MHz         | 1.500          | 0.16         | 1000          | Black      |
| *56             | ±2, ±5, ±10% | 50            | 65 @ 350MHz         | 1.300          | 0.18         | 1000          | Brown      |
| *62             | ±2, ±5, ±10% | 50            | 65 @ 350MHz         | 1.250          | 0.20         | 1000          | Blue       |
| *68             | ±2, ±5, ±10% | 50            | 65 @ 350MHz         | 1.300          | 0.20         | 1000          | Red        |
| 75              | ±2, ±5, ±10% | 50            | 60 @ 350MHz         | 1.100          | 0.21         | 1000          | White      |
| *82             | ±2, ±5, ±10% | 50            | 60 @ 350MHz         | 1.000          | 0.22         | 1000          | Orange     |
| 91              | ±2, ±5, ±10% | 50            | 50 @ 350MHz         | 1.000          | 0.45         | 1000          | White      |
| *100            | ±2, ±5, ±10% | 25            | 60 @ 350MHz         | 1.000          | 0.56         | 650           | Yellow     |
| *120            | ±2, ±5, ±10% | 25            | 60 @ 350MHz         | 0.950          | 0.63         | 650           | Green      |
| *150            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.850          | 0.70         | 800           | Blue       |
| *180            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.750          | 0.77         | 620           | Violet     |
| *220            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.700          | 0.84         | 500           | Gray       |
| *240            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.650          | 0.88         | 500           | White      |
| *270            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.600          | 0.91         | 690           | Black      |
| *300            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.585          | 1.00         | 450           | Brown      |
| *330            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.570          | 1.05         | 450           | Red        |
| *360            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.530          | 1.10         | 470           | Orange     |
| *390            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.500          | 1.12         | 630           | Yellow     |
| *430            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.480          | 1.15         | 470           | Green      |
| *470            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.450          | 1.19         | 470           | Blue       |
| *560            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.415          | 1.33         | 580           | Violet     |
| *620            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.375          | 1.40         | 300           | Gray       |
| *680            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.375          | 1.47         | 540           | White      |
| *750            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.360          | 1.54         | 360           | Black      |
| *820            | ±2, ±5, ±10% | 25            | 45 @ 100MHz         | 0.350          | 1.61         | 400           | Brown      |
| *910            | ±2, ±5, ±10% | 25            | 35 @ 50MHz          | 0.320          | 1.68         | 380           | Red        |
| *1000           | ±2, ±5, ±10% | 25            | 35 @ 50MHz          | 0.290          | 1.75         | 370           | Orange     |
| *1200           | ±2, ±5, ±10% | 7.9           | 35 @ 50MHz          | 0.250          | 2.00         | 310           | Yellow     |
| *1500           | ±2, ±5, ±10% | 7.9           | 28 @ 50MHz          | 0.200          | 2.30         | 330           | Green      |
| *1800           | ±2, ±5, ±10% | 7.9           | 28 @ 50MHz          | 0.160          | 2.60         | 300           | Blue       |
| *2200           | ±2, ±5, ±10% | 7.9           | 28 @ 50MHz          | 0.160          | 2.80         | 280           | Violet     |
| *2700           | ±2, ±5, ±10% | 7.9           | 22 @ 25MHz          | 0.140          | 3.20         | 290           | Gray       |
| *3300           | ±2, ±5, ±10% | 7.9           | 22 @ 25MHz          | 0.110          | 3.40         | 290           | White      |
| *3900           | ±2, ±5, ±10% | 7.9           | 18 @ 25MHz          | 0.100          | 3.60         | 260           | Black      |
| *4700           | ±2, ±5, ±10% | 7.9           | 18 @ 25MHz          | 0.090          | 4.00         | 260           | Brown      |
| 5600            | ±2, ±5, ±10% | 7.9           | 16 @ 7.96MHz        | 0.020          | 4.00         | 240           | Red        |
| 6800            | ±2, ±5, ±10% | 7.9           | 15 @ 7.96MHz        | 0.040          | 4.90         | 200           | Orange     |
| 8200            | ±2, ±5, ±10% | 7.9           | 15 @ 7.96MHz        | 0.025          | 6.00         | 170           | Yellow     |
| 10000           | ±2, ±5, ±10% | 2.52          | 15 @ 7.96MHz        | 0.020          | 9.00         | 150           | Green      |
| 12000           | ±2, ±5, ±10% | 2.52          | 15 @ 7.96MHz        | 0.018          | 10.5         | 130           | Blue       |
| 15000           | ±2, ±5, ±10% | 2.52          | 15 @ 7.96MHz        | 0.015          | 11.5         | 120           | Violet     |

\*Test Methods | Instrument: Network | Spectrum Analyzer

# Wire Wound Chip Inductor

## LCWC Series



### 1206

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 6.8             | $\pm 5, \pm 10\%$        | 100           | 30 @ 300MHz         | 5.50           | 0.07                  | 1000          | Brown      |
| 10              | $\pm 5, \pm 10\%$        | 100           | 40 @ 300MHz         | 4.00           | 0.08                  | 1000          | Red        |
| 12              | $\pm 5, \pm 10\%$        | 100           | 40 @ 300MHz         | 3.20           | 0.08                  | 1000          | Orange     |
| 15              | $\pm 5, \pm 10\%$        | 100           | 40 @ 300MHz         | 3.20           | 0.10                  | 1000          | Yellow     |
| 18              | $\pm 5, \pm 10\%$        | 100           | 50 @ 300MHz         | 2.80           | 0.10                  | 1000          | Green      |
| 22              | $\pm 5, \pm 10\%$        | 100           | 50 @ 300MHz         | 2.20           | 0.10                  | 1000          | Blue       |
| 24              | $\pm 5, \pm 10\%$        | 100           | 50 @ 300MHz         | 2.00           | 0.10                  | 1000          | Red        |
| 27              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 50 @ 300MHz         | 1.80           | 0.11                  | 1000          | Violet     |
| 33              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.80           | 0.11                  | 1000          | Gray       |
| 39              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.80           | 0.12                  | 1000          | White      |
| 47              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.50           | 0.13                  | 1000          | Black      |
| 56              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.45           | 0.14                  | 1000          | Brown      |
| 62              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.20           | 0.20                  | 1000          | Violet     |
| 68              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.20           | 0.26                  | 950           | Red        |
| 82              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.20           | 0.21                  | 920           | Orange     |
| 91              | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.10           | 0.24                  | 900           | White      |
| 100             | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 1.10           | 0.26                  | 850           | Yellow     |
| 120             | $\pm 2, \pm 5, \pm 10\%$ | 100           | 55 @ 300MHz         | 0.75           | 0.26                  | 800           | Green      |
| 150             | $\pm 2, \pm 5, \pm 10\%$ | 100           | 60 @ 300MHz         | 0.95           | 0.31                  | 750           | Blue       |
| 180             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 55 @ 300MHz         | 0.90           | 0.43                  | 700           | Violet     |
| 220             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 55 @ 300MHz         | 0.76           | 0.50                  | 670           | Gray       |
| 270             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 55 @ 300MHz         | 0.74           | 0.56                  | 630           | White      |
| 300             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 50 @ 150MHz         | 0.68           | 0.60                  | 600           | Green      |
| 330             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 45 @ 150MHz         | 0.65           | 0.62                  | 590           | Black      |
| 360             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 45 @ 150MHz         | 0.60           | 0.65                  | 550           | Blue       |
| 390             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 45 @ 150MHz         | 0.60           | 0.75                  | 530           | Brown      |
| 470             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 45 @ 150MHz         | 0.55           | 1.30                  | 490           | Red        |
| 560             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.47           | 1.34                  | 460           | Orange     |
| 620             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.47           | 1.58                  | 460           | Gray       |
| 680             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.45           | 1.58                  | 430           | Yellow     |
| 750             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.44           | 2.25                  | 320           | White      |
| 820             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.42           | 1.82                  | 400           | Green      |
| 910             | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.41           | 2.95                  | 310           | Green      |
| 1000            | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.40           | 2.80                  | 320           | Blue       |
| 1200            | $\pm 2, \pm 5, \pm 10\%$ | 35            | 45 @ 150MHz         | 0.38           | 3.20                  | 300           | Violet     |

# Wire Wound Chip Inductor

## LCWC Series



### LOW PROFILE ELECTRICAL SPECIFICATIONS

#### 0805

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 1.8             | $\pm 5\%$                | 250           | 55 @ 1500MHz        | 9.40           | 0.03                  | 800           | Black      |
| 3.9             | $\pm 5, \pm 10\%$        | 250           | 60 @ 1000MHz        | 6.10           | 0.06                  | 800           | Brown      |
| 4.7             | $\pm 5, \pm 10\%$        | 250           | 50 @ 1000MHz        | 5.50           | 0.06                  | 800           | Red        |
| 6.8             | $\pm 5, \pm 10\%$        | 250           | 50 @ 1000MHz        | 5.50           | 0.08                  | 800           | Orange     |
| 8.2             | $\pm 5, \pm 10\%$        | 250           | 50 @ 1000MHz        | 4.80           | 0.08                  | 800           | Yellow     |
| 10              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 55 @ 750MHz         | 3.30           | 0.08                  | 800           | Green      |
| 12              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 55 @ 750MHz         | 3.80           | 0.10                  | 800           | Blue       |
| 15              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 2.95           | 0.10                  | 800           | Violet     |
| 18              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 3.10           | 0.13                  | 800           | Gray       |
| 22              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 2.90           | 0.15                  | 800           | Whit       |
| 27              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 2.45           | 0.23                  | 600           | Black      |
| 33              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 2.35           | 0.28                  | 600           | Brown      |
| 39              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 50 @ 500MHz         | 2.20           | 0.33                  | 600           | Red        |
| 47              | $\pm 2, \pm 5, \pm 10\%$ | 200           | 50 @ 500MHz         | 2.00           | 0.39                  | 600           | Orange     |
| 56              | $\pm 2, \pm 5, \pm 10\%$ | 200           | 50 @ 500MHz         | 1.85           | 0.39                  | 500           | Yellow     |
| 68              | $\pm 2, \pm 5, \pm 10\%$ | 200           | 50 @ 500MHz         | 1.50           | 0.40                  | 500           | Green      |
| 82              | $\pm 2, \pm 5, \pm 10\%$ | 150           | 50 @ 500MHz         | 1.50           | 0.44                  | 500           | Blue       |
| 100             | $\pm 2, \pm 5, \pm 10\%$ | 150           | 50 @ 500MHz         | 1.20           | 0.64                  | 400           | Violet     |
| 120             | $\pm 2, \pm 5, \pm 10\%$ | 150           | 40 @ 250MHz         | 1.15           | 0.68                  | 300           | Gray       |
| 150             | $\pm 2, \pm 5, \pm 10\%$ | 150           | 40 @ 250MHz         | 1.05           | 0.80                  | 300           | Whit       |
| 1000            | $\pm 2, \pm 5, \pm 10\%$ | 25            | 16 @ 50MHz          | 0.08           | 3.50                  | 170           | Black      |

#### 1008

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 3.3             | $\pm 5, \pm 10\%$        | 50            | 42 @ 1500MHz        | 6.00           | 0.03                  | 1000          | White      |
| 4.2             | $\pm 5, \pm 10\%$        | 50            | 42 @ 1500MHz        | 6.00           | 0.15                  | 1000          | Black      |
| 6.8             | $\pm 5, \pm 10\%$        | 50            | 50 @ 1500MHz        | 5.40           | 0.17                  | 1000          | Brown      |
| 8.2             | $\pm 5, \pm 10\%$        | 50            | 50 @ 1500MHz        | 5.00           | 0.22                  | 1000          | Red        |
| 15              | $\pm 5, \pm 10\%$        | 50            | 57 @ 500MHz         | 3.00           | 0.22                  | 1000          | Orange     |
| 18              | $\pm 5, \pm 10\%$        | 50            | 50 @ 350MHz         | 2.40           | 0.12                  | 1000          | Gray       |
| 20              | $\pm 5, \pm 10\%$        | 50            | 72 @ 500MHz         | 2.40           | 0.33                  | 1000          | Yellow     |
| 27              | $\pm 5, \pm 10\%$        | 50            | 50 @ 350MHz         | 1.60           | 0.13                  | 850           | Green      |
| 30              | $\pm 5, \pm 10\%$        | 50            | 69 @ 500MHz         | 2.40           | 0.38                  | 600           | Blue       |
| 40              | $\pm 5, \pm 10\%$        | 50            | 67 @ 500MHz         | 2.00           | 0.43                  | 600           | Violet     |
| 50              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 72 @ 500MHz         | 1.90           | 0.48                  | 600           | Gray       |
| 60              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 500MHz         | 1.80           | 0.52                  | 600           | White      |
| 70              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 68 @ 500MHz         | 1.70           | 0.55                  | 510           | Black      |
| 80              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 500MHz         | 1.40           | 0.56                  | 510           | Brown      |
| 180             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 50 @ 350MHz         | 0.90           | 0.40                  | 450           | Blue       |
| 560             | $\pm 2, \pm 5, \pm 10\%$ | 25            | 40 @ 100MHz         | 0.415          | 1.33                  | 400           | Red        |

# Wire Wound Chip Inductor

## LCWC Series



### HIGH CURRENT ELECTRICAL SPECIFICATIONS

#### 0603

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 1.6             | $\pm 5, \pm 10\%$        | 250           | 24                  | 12.50          | 0.030                 | 2400          | Black      |
| 3.6             | $\pm 5, \pm 10\%$        | 250           | 24                  | 5.90           | 0.048                 | 2300          | Brown      |
| 3.9             | $\pm 5, \pm 10\%$        | 250           | 25                  | 5.90           | 0.054                 | 2200          | Red        |
| 6.8             | $\pm 5, \pm 10\%$        | 250           | 35                  | 5.80           | 0.054                 | 2100          | Orange     |
| 7.5             | $\pm 5, \pm 10\%$        | 250           | 38                  | 3.70           | 0.059                 | 2100          | Yellow     |
| 8.2             | $\pm 5, \pm 10\%$        | 250           | 38                  | 3.70           | 0.060                 | 2000          | White      |
| 10              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 38                  | 3.70           | 0.071                 | 2000          | Green      |
| 12              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 38                  | 3.00           | 0.075                 | 2000          | Blue       |
| 15              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 38                  | 2.80           | 0.080                 | 1900          | Violet     |
| 18              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 40                  | 2.80           | 0.099                 | 1900          | Gray       |
| 22              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 42                  | 2.40           | 0.099                 | 1800          | White      |
| 24              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 42                  | 2.40           | 0.105                 | 1800          | Black      |

### HIGH Q ELECTRICAL SPECIFICATIONS

#### 0805

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 2.5             | $\pm 5, \pm 10\%$        | 250           | 80 @ 1500MHz        | 6.00           | 0.020                 | 1600          | Black      |
| 5.6             | $\pm 5, \pm 10\%$        | 250           | 98 @ 1500MHz        | 6.00           | 0.035                 | 1600          | Brown      |
| 6.2             | $\pm 5, \pm 10\%$        | 250           | 88 @ 1000MHz        | 4.75           | 0.035                 | 1600          | Red        |
| 6.8             | $\pm 5, \pm 10\%$        | 250           | 80 @ 1000MHz        | 4.40           | 0.035                 | 1600          | White      |
| 8.2             | $\pm 5, \pm 10\%$        | 250           | 75 @ 1000MHz        | 3.00           | 0.075                 | 1000          | Gray       |
| 10              | $\pm 5, \pm 10\%$        | 250           | 80 @ 1000MHz        | 3.00           | 0.060                 | 1600          | Black      |
| 12              | $\pm 5, \pm 10\%$        | 250           | 80 @ 1000MHz        | 3.00           | 0.045                 | 1600          | Orange     |
| 15              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 80 @ 1000MHz        | 2.80           | 0.100                 | 1200          | Black      |
| 16              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 72 @ 500MHz         | 2.95           | 0.060                 | 1500          | Yellow     |
| 18              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 75 @ 500MHz         | 2.55           | 0.060                 | 1400          | Green      |
| 20              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 70 @ 500MHz         | 2.05           | 0.055                 | 1400          | Blue       |
| 22              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 80 @ 500MHz         | 2.00           | 0.100                 | 1200          | Black      |
| 27              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 75 @ 500MHz         | 2.00           | 0.070                 | 1300          | Violet     |
| 30              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 65 @ 500MHz         | 1.95           | 0.095                 | 1200          | Gray       |
| 39              | $\pm 2, \pm 5, \pm 10\%$ | 250           | 65 @ 500MHz         | 1.60           | 0.110                 | 1100          | White      |
| 48              | $\pm 2, \pm 5, \pm 10\%$ | 200           | 65 @ 500MHz         | 1.40           | 0.095                 | 1200          | Black      |
| 51              | $\pm 2, \pm 5, \pm 10\%$ | 200           | 65 @ 500MHz         | 1.40           | 0.120                 | 1000          | Brown      |

#### 1008

| Inductance (nH) | Tolerance                | L Freq. (MHz) | Quality Factor min. | SRF (GHz) min. | DCR ( $\Omega$ ) max. | IDC (mA) max. | Color Code |
|-----------------|--------------------------|---------------|---------------------|----------------|-----------------------|---------------|------------|
| 3.0             | $\pm 5, \pm 10\%$        | 50            | 70 @ 1500MHz        | 6.00           | 0.04                  | 1600          | Black      |
| 3.9             | $\pm 5, \pm 10\%$        | 50            | 75 @ 1500MHz        | 6.00           | 0.05                  | 1600          | White      |
| 4.1             | $\pm 5, \pm 10\%$        | 50            | 75 @ 1500MHz        | 6.00           | 0.05                  | 1600          | Brown      |
| 7.8             | $\pm 5, \pm 10\%$        | 50            | 75 @ 500MHz         | 3.80           | 0.05                  | 1600          | Red        |
| 10              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 60 @ 500MHz         | 3.60           | 0.06                  | 1600          | Orange     |
| 12              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 70 @ 500MHz         | 2.80           | 0.06                  | 1500          | Yellow     |
| 18              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 62 @ 350MHz         | 2.70           | 0.07                  | 1400          | Green      |
| 22              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 62 @ 350MHz         | 2.05           | 0.07                  | 1400          | Blue       |
| 33              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 350MHz         | 1.70           | 0.09                  | 1300          | Violet     |
| 39              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 350MHz         | 1.30           | 0.09                  | 1300          | Gray       |
| 47              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 350MHz         | 1.45           | 0.12                  | 1200          | White      |
| 56              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 75 @ 350MHz         | 1.23           | 0.12                  | 1200          | Black      |
| 68              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 80 @ 350MHz         | 1.15           | 0.13                  | 1100          | Brown      |
| 82              | $\pm 2, \pm 5, \pm 10\%$ | 50            | 80 @ 350MHz         | 1.06           | 0.16                  | 1100          | Red        |
| 100             | $\pm 2, \pm 5, \pm 10\%$ | 50            | 50 @ 350MHz         | 0.82           | 0.16                  | 1000          | Orange     |

# Wire Wound Chip Inductor

## LCWC Series



### ENVIRONMENTAL CHARACTERISTICS

#### MECHANICAL PERFORMANCE TEST

| Items                 | Requirement                                                          | Test Methods                                                                                 |
|-----------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Inductance            | Refer to standard electrical characteristic spec.                    | HP4286                                                                                       |
| Q                     |                                                                      | HP4286                                                                                       |
| SRF                   |                                                                      | HP4287                                                                                       |
| DC Resistance RDC     |                                                                      | Micro-Ohm meter (Gom-801G)                                                                   |
| Rated Current IDC     |                                                                      | Applied the current to coils, The inductance change should be less than 10% to initial value |
| Over Load             | Inductors shall have no evidence of electrical and mechanical damage | Applied 2 times of rated allowed DC current to inductor for a period of 5 minutes            |
| Withstanding Voltage  | Inductors shall be no evidence of electrical and mechanical damage.  | AC voltage of 500 VAC applied between inductors terminal and case for 1 min.                 |
| Insulation Resistance | 1000M ohm min.                                                       | 100 VDC applied between inductor terminal and case and case                                  |

#### MECHANICAL PERFORMANCE TEST

| Items                          | Requirement                                                                        | Test Methods                                                                                                                                                                                                                                                               |
|--------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vibration                      | Appearance: No damage<br>L change: within $\pm 5\%$<br>Q change: within $\pm 10\%$ | Test device shall be soldered on the substrate<br>Oscillation Frequency: 10 to 55 to 10Hz for 1 min.<br>Amplitude: 1.5 mm<br>Time: 2 hrs for each axis (X, Y & Z), total 6 hrs                                                                                             |
| Resistance to Soldering Heat   |                                                                                    | Solder Temperature: $260 \pm 50^\circ\text{C}$<br>Immersion Time: $10 \pm 2$ seconds                                                                                                                                                                                       |
| Component Adhesion (Push Test) | 1 lbs. For 0402<br>2 lbs. For 0603<br>3 lbs. For the rest                          | The device should be soldered ( $260 \pm 5$ for 10 seconds) to a tinned copper subs rate. A dynamiter force gauge should be applied to the side of the component. The device must with stand a minimum force of 2 or 4 pounds without a failure of adhesion on termination |
| Drop                           | No damage                                                                          | Dropping chip by each side and each corner.<br>Drop 10 times in total<br>Drop height: 100 cm Drop weight: 125 g                                                                                                                                                            |
| Solderability                  | 90% covered with solder                                                            | Inductor shall be dipped in a melted solder bath at $245 \pm 5$ for 3 seconds                                                                                                                                                                                              |
| Resistance to Solvent          | No damage on appearance and marking                                                | MIL-STD202F, Method 215D                                                                                                                                                                                                                                                   |

#### CLIMATIC TEST

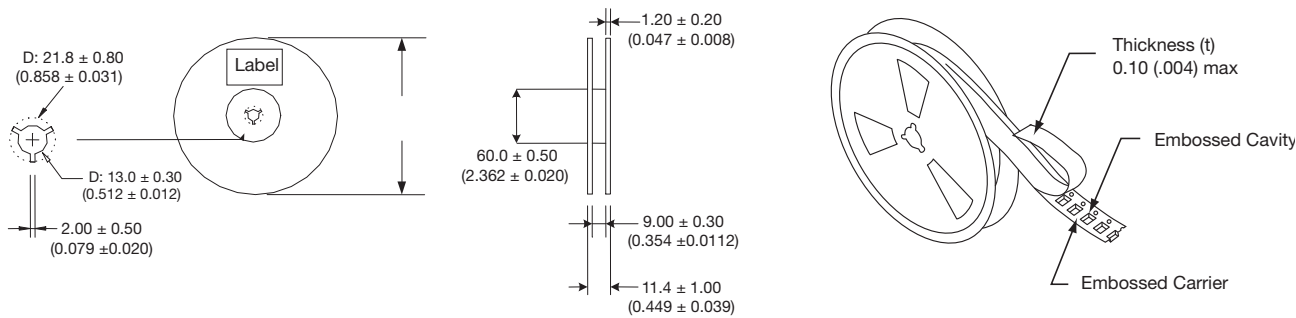
| Items                      | Requirement                                                                                     | Test Methods                                                                                                                                                                                                                                                                                |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
|----------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|-------------|---|-------|----|---|------|----|---|-------|----|---|------|----|
| Temperature Characteristic | Appearance: No damage<br>L change: within ±10%<br>Q change: within ±20%                         | -40 ~ +125°C                                                                                                                                                                                                                                                                                |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| Humidity                   |                                                                                                 | Temperature: 40±2°C<br>Relative Humidity: 90 ~ 95% Time: 96±2 hrs<br>Measured after exposure in the room condition for 2 hrs                                                                                                                                                                |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| Low Temperature Storage    |                                                                                                 | Temperature: -40±2°C<br>Time: 96±2 hrs<br>Inductors are tested after 1 hour at room temperature                                                                                                                                                                                             |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| Thermal Shock              |                                                                                                 | One cycle: <table><tr><td>Step</td><td>Temperature (°C)</td><td>Time (min.)</td></tr><tr><td>1</td><td>-25±3</td><td>30</td></tr><tr><td>2</td><td>25±2</td><td>15</td></tr><tr><td>3</td><td>125±3</td><td>30</td></tr><tr><td>4</td><td>25±2</td><td>15</td></tr></table> Total: 5 cycles | Step        | Temperature (°C) | Time (min.) | 1 | -25±3 | 30 | 2 | 25±2 | 15 | 3 | 125±3 | 30 | 4 | 25±2 | 15 |
| Step                       |                                                                                                 | Temperature (°C)                                                                                                                                                                                                                                                                            | Time (min.) |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| 1                          | -25±3                                                                                           | 30                                                                                                                                                                                                                                                                                          |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| 2                          | 25±2                                                                                            | 15                                                                                                                                                                                                                                                                                          |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| 3                          | 125±3                                                                                           | 30                                                                                                                                                                                                                                                                                          |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| 4                          | 25±2                                                                                            | 15                                                                                                                                                                                                                                                                                          |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| High Temperature Storage   | Temperature: 125±2°C Time: 96±2 hrs<br>Measured after exposure in the room condition for 1 hour |                                                                                                                                                                                                                                                                                             |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| High Temperature Load Life | There should be no evidence of short of open circuit.                                           | Temperature: 85±2°C Time: 1000±12 hrs<br>Load: Allowed DC current                                                                                                                                                                                                                           |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |
| Damp Heat with Load        |                                                                                                 | Temperature: 40±2°C Relative Humidity: 90 ~ 95%<br>Time: 1000±12 hrs Load: Allowed DC current                                                                                                                                                                                               |             |                  |             |   |       |    |   |      |    |   |       |    |   |      |    |

# Wire Wound Chip Inductor

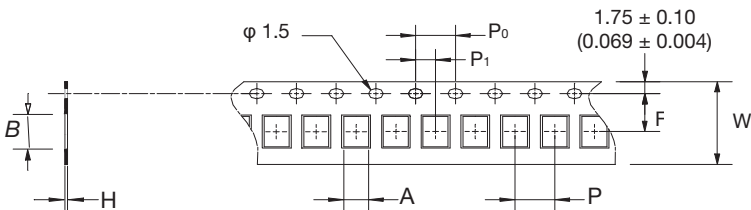
## LCWC Series



### REEL DIMENSIONS AND PACKAGING QUANTITY



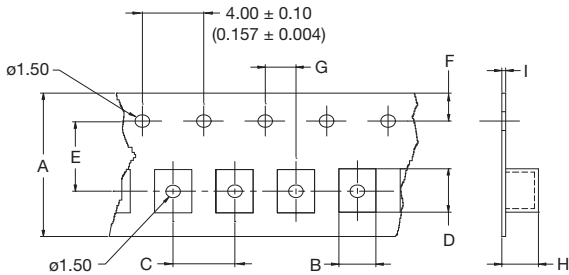
### PAPER TAPE SPECIFICATION AND PACKAGING QUANTITY



mm (inches)

| Type     | A               | B               | H               | F               | P               | P <sub>0</sub>  | P <sub>1</sub>  | W               | Reel (EA) |
|----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|
| LCWC0402 | 0.72<br>(0.028) | 1.19<br>(0.047) | 0.60<br>(0.024) | 3.50<br>(0.138) | 4.00<br>(0.157) | 4.00<br>(0.147) | 2.00<br>(0.079) | 8.00<br>(0.315) | 4,000     |
| LCWC0603 | 1.35<br>(0.053) | 1.95<br>(0.077) | 0.95<br>(0.037) | 3.50<br>(0.138) | 4.00<br>(0.157) | 4.00<br>(0.147) | 2.00<br>(0.079) | 8.00<br>(0.315) | 4,000     |

### EMBOSSED PLASTIC PAPER TAPE SPECIFICATION AND PACKAGING QUANTITY



mm (inches)

| Type         | A                              | B                              | C                              | D                              | E                              | F                              | G                              | H                              | I                              | Reel (EA) |
|--------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-----------|
| LCWC0805     | 8.00 ± 0.20<br>(0.315 ± 0.008) | 1.85 ± 0.10<br>(0.073 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.30 ± 0.10<br>(0.091 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 1.45 ± 0.05<br>(0.057 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC0805 (R) | 8.00 ± 0.20<br>(0.315 ± 0.008) | 1.80 ± 0.10<br>(0.071 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.30 ± 0.10<br>(0.091 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 0.90 ± 0.05<br>(0.035 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC0805 (Q) | 8.00 ± 0.20<br>(0.315 ± 0.008) | 1.85 ± 0.10<br>(0.073 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.30 ± 0.10<br>(0.091 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 1.45 ± 0.05<br>(0.057 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC1206     | 8.00 ± 0.20<br>(0.315 ± 0.008) | 1.95 ± 0.10<br>(0.077 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 3.50 ± 0.10<br>(0.138 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 1.50 ± 0.05<br>(0.059 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC1008     | 8.00 ± 0.20<br>(0.315 ± 0.008) | 2.70 ± 0.10<br>(0.106 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.80 ± 0.10<br>(0.110 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC1008 (R) | 8.00 ± 0.20<br>(0.315 ± 0.008) | 2.70 ± 0.10<br>(0.106 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.80 ± 0.10<br>(0.110 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 1.50 ± 0.05<br>(0.059 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |
| LCWC1008 (Q) | 8.00 ± 0.20<br>(0.315 ± 0.008) | 2.70 ± 0.10<br>(0.106 ± 0.073) | 4.00 ± 0.10<br>(0.157 ± 0.073) | 2.80 ± 0.10<br>(0.110 ± 0.073) | 3.50 ± 0.05<br>(0.138 ± 0.002) | 1.75 ± 0.10<br>(0.069 ± 0.073) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 2.00 ± 0.05<br>(0.079 ± 0.002) | 0.23 ± 0.05<br>(0.009 ± 0.002) | 2,000     |



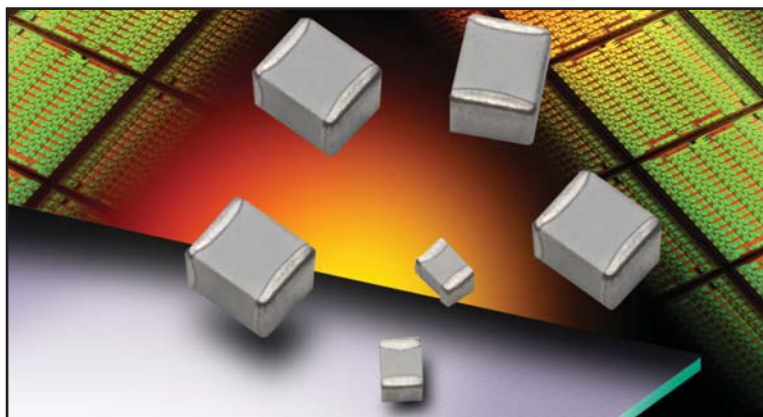


## RF/Microwave Capacitors

RF/Microwave Multilayer Capacitors (MLC)  
RF/Microwave C0G (NP0) Capacitors  
RF/Microwave “U” Series Designer Kits

# Microwave MLCs

## UQ Series High Q Ultra Low ESR MLC



### FEATURES:

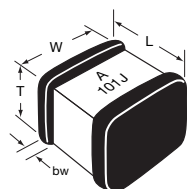
- Ultra Low ESR
- High Q
- High Self Resonance
- Capacitance Range 0.1 pF to 1000 pF

### APPLICATIONS:

- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- MRI Systems

### HOW TO ORDER

|                  |                                                                                                                                       |                                                                                                        |                                                                                    |                                                                                                                                                                                          |                                                                                                                                                                                                                                            |                                                |                                                                                                                                                  |                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UQ</b>        | <b>CB</b>                                                                                                                             | <b>7</b>                                                                                               | <b>A</b>                                                                           | <b>100</b>                                                                                                                                                                               | <b>J</b>                                                                                                                                                                                                                                   | <b>A</b>                                       | <b>T</b>                                                                                                                                         | <b>ME</b>                                                                                                                                           |
| <b>AVX Style</b> | <b>Case Size</b><br>CA = 0605<br>CB = 1210<br>CR = 0709<br>CL = 0402<br>CS = 0603<br>CF = 0805<br><br>See mechanical dimensions below | <b>Voltage Code</b><br>5 = 50V<br>1 = 100V<br>E = 150V<br>2 = 200V<br>V = 250V<br>9 = 300V<br>7 = 500V | <b>Temperature Coefficient Code</b><br>A = $0 \pm 30 \text{ ppm}/^{\circ}\text{C}$ | <b>Capacitance</b><br>EIA Capacitance Code in pF.<br>First two digits = significant figures or "R" for decimal place.<br>Third digit = number of zeros or after "R" significant figures. | <b>Capacitance Tolerance Code</b><br>A = $\pm 0.05 \text{ pF}$<br>B = $\pm 0.1 \text{ pF}$<br>C = $\pm 0.25 \text{ pF}$<br>D = $\pm 0.5 \text{ pF}$<br>F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$<br>K = $\pm 10\%$<br>M = $\pm 20\%$ | <b>Failure Rate Code</b><br>A = Not Applicable | <b>Termination Style Code</b><br>J = Nickel Barrier<br>Sn/Pb (60/40)<br>**T = 100% Tin<br>**C = Non-Magnetic Barrier/Tin<br><br>**RoHS compliant | <b>Packaging Code</b><br>ME = 7" Reel Marked (0605, 1210 & 0709 only)<br>2A = 7" Unmarked (0402, 0603, & 0805 only)<br><br>* Vertical T&R available |



### MECHANICAL DIMENSIONS: inches (millimeters)

| Case | Length (L)                                 | Width (W)                    | Thickness (T)    | Band Width (bw)                            |
|------|--------------------------------------------|------------------------------|------------------|--------------------------------------------|
| UQCA | .055 + .015 - .010<br>(1.40+ .381 - .254)  | .055 ± .015<br>(1.40 ± .381) | .057 (1.45) max. | .010 + .010 - .005<br>(.254 + .254 - .127) |
| UQCB | .110 + .020 - .010<br>(2.79 + .508 - .254) | .110 ± .015<br>(2.79 ± .381) | .102 (2.59) max. | .015 ± .010<br>(.381 ± .254)               |
| UQCR | .070 ± .015<br>(1.78 ± .381)               | .090 ± .010<br>(2.29 ± .254) | .115 (2.92) max. | .010 + .010 - .005<br>(.254 + .254 - .127) |
| UQCL | .040 ± .004<br>(1.02 ± .100)               | .020 ± .004<br>(0.51 ± .100) | .024 (.600) max. | .010 ± .006<br>(0.25 ± 0.15)               |
| UQCS | .063 ± .006<br>(1.60 ± 0.15)               | .032 ± .006<br>(0.81 ± 0.15) | .035 (.890) max. | .014 ± .006<br>(0.36 ± 0.15)               |
| UQCF | .079 ± .008<br>(2.01 ± 0.20)               | .049 ± .008<br>(1.24 ± 0.20) | .051 (1.30) max. | .020 ± 0.01<br>(0.51 ± 0.25)               |

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

—8mm carrier  
—7" reel: UQCA = 500 or 4000 pc T&R  
UQCB = 500 or 1000 pc T&R  
UQCR = 500 or 1000 pc T&R

UQCL = 500, 4000 or 10,000 pc T&R  
UQCS = 500 or 4000 pc T&R  
UQCF = 500 or 4000 pc T&R



For RoHS compliant products, please select correct termination style.

Also available in:  
**Not RoHS Compliant**



### ELECTRICAL SPECIFICATIONS

|                                       | Temperature Characteristic Code A                                                                                            |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient (TCC)         | (A) $0 \pm 30$ PPM/°C                                                                                                        |
| Capacitance Range                     | (A) 0.1 pF to 1000 pF                                                                                                        |
| Operating Temperature                 | 0.1 pF to 1000 pF: from -55°C to +125°C                                                                                      |
| Quality Factor (Q)                    | Greater than 2,000 at 1 MHz                                                                                                  |
| Insulation Resistance (IR)            | 0.1 pF to 1000 pF<br>10 <sup>5</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>4</sup> Megohms min. @ 125°C at rated WVDC |
| Working Voltage (WVDC)                | See Capacitance Values table                                                                                                 |
| Dielectric Withstanding Voltage (DWV) | 250% of rated WVDC for 5 secs                                                                                                |
| Aging Effects                         | None                                                                                                                         |
| Piezoelectric Effects                 | None                                                                                                                         |
| Capacitance Drift                     | $\pm$ (0.02% or 0.02 pF), whichever is greater                                                                               |

### ENVIRONMENTAL CHARACTERISTICS

AVX UQ will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

|                           |                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Thermal Shock             | Mil-STD-202, Method 107, Condition A                                                                                                          |
| Moisture Resistance       | Mil-STD-202, Method 106                                                                                                                       |
| Low Voltage Humidity      | Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours |
| Life Test                 | Mil-STD-202, Method 108, for 2000 hours at 125°C 200% WVDC                                                                                    |
| Shock                     | Mil-STD-202, Method 213, Condition J                                                                                                          |
| Vibration                 | Mil-STD-202, Method 204, Condition B                                                                                                          |
| Immersion                 | Mil-STD-202, Method 104, Condition B                                                                                                          |
| Salt Spray                | Mil-STD-202, Method 101, Condition B                                                                                                          |
| Solderability             | Mil-STD-202, Method 208                                                                                                                       |
| Terminal Strength         | Mil-STD-202, Method 211                                                                                                                       |
| Temperature Cycling       | Mil-STD-202, Method 102, Condition C                                                                                                          |
| Barometric Pressure       | Mil-STD-202, Method 105, Condition B                                                                                                          |
| Resistance to Solder Heat | Mil-STD-202, Method 210, Condition C                                                                                                          |

### Case Size A

**TABLE I: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
|---------|-----------|------|---------|-----------|------|---------|---------------|------|---------|---------------|------|
| 0.1     | B         | 250  | 1.6     | B, C, D   | 250  | 5.6     | B, C, D       | 250  | 24      | F, G, J, K, M | 250  |
| 0.2     | B         | 250  | 1.7     | B, C, D   | 250  | 6.2     | B, C, D       | 250  | 27      | F, G, J, K, M | 250  |
| 0.3     | B,C       | 250  | 1.8     | B, C, D   | 250  | 6.8     | B, C, J, K    | 250  | 30      | F, G, J, K, M | 250  |
| 0.4     | B,C       | 250  | 1.9     | B, C, D   | 250  | 7.5     | B, C, J, K    | 250  | 33      | F, G, J, K, M | 250  |
| 0.5     | B, C, D   | 250  | 2.0     | B, C, D   | 250  | 8.2     | B, C, J, K    | 250  | 36      | F, G, J, K, M | 250  |
| 0.6     | B, C, D   | 250  | 2.2     | B, C, D   | 250  | 9.1     | B, C, J, K    | 250  | 39      | F, G, J, K, M | 250  |
| 0.7     | B, C, D   | 250  | 2.4     | B, C, D   | 250  | 10      | F, G, J, K, M | 250  | 43      | F, G, J, K, M | 250  |
| 0.8     | B, C, D   | 250  | 2.7     | B, C, D   | 250  | 11      | F, G, J, K, M | 250  | 47      | F, G, J, K, M | 250  |
| 0.9     | B, C, D   | 250  | 3.0     | B, C, D   | 250  | 12      | F, G, J, K, M | 250  | 51      | F, G, J, K, M | 250  |
| 1.0     | B, C, D   | 250  | 3.3     | B, C, D   | 250  | 13      | F, G, J, K, M | 250  | 56      | F, G, J, K, M | 250  |
| 1.1     | B, C, D   | 250  | 3.6     | B, C, D   | 250  | 15      | F, G, J, K, M | 250  | 62      | F, G, J, K, M | 250  |
| 1.2     | B, C, D   | 250  | 3.9     | B, C, D   | 250  | 16      | F, G, J, K, M | 250  | 68      | F, G, J, K, M | 250  |
| 1.3     | B, C, D   | 250  | 4.3     | B, C, D   | 250  | 18      | F, G, J, K, M | 250  | 75      | F, G, J, K, M | 250  |
| 1.4     | B, C, D   | 250  | 4.7     | B, C, D   | 250  | 20      | F, G, J, K, M | 250  | 82      | F, G, J, K, M | 250  |
| 1.5     | B, C, D   | 250  | 5.1     | B, C, D   | 250  | 22      | F, G, J, K, M | 250  | 91      | F, G, J, K, M | 250  |
|         |           |      |         |           |      |         |               |      | 100     | F, G, J, K, M | 250  |

### Case Size B

**TABLE II: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
|---------|-----------|------|---------|---------------|------|---------|---------------|------|---------|---------------|------|
| 0.1     | B         | 500  | 3.6     | B, C, D       | 500  | 39      | F, G, J, K, M | 500  | 430     | F, G, J, K, M | 200  |
| 0.2     | B         | 500  | 3.9     | B, C, D       | 500  | 43      | F, G, J, K, M | 500  | 470     | F, G, J, K, M | 200  |
| 0.3     | B,C       | 500  | 4.3     | B, C, D       | 500  | 47      | F, G, J, K, M | 500  | 510     | F, G, J, K, M | 100  |
| 0.4     | B,C       | 500  | 4.7     | B, C, D       | 500  | 51      | F, G, J, K, M | 500  | 560     | F, G, J, K, M | 100  |
| 0.5     | B, C, D   | 500  | 5.1     | B, C, D       | 500  | 56      | F, G, J, K, M | 500  | 620     | F, G, J, K, M | 100  |
| 0.6     | B, C, D   | 500  | 5.6     | B, C, D       | 500  | 62      | F, G, J, K, M | 500  | 680     | F, G, J, K, M | 50   |
| 0.7     | B, C, D   | 500  | 6.2     | B, C, D       | 500  | 68      | F, G, J, K, M | 500  | 750     | F, G, J, K, M | 50   |
| 0.8     | B, C, D   | 500  | 6.8     | B, C, J, K    | 500  | 75      | F, G, J, K, M | 500  | 820     | F, G, J, K, M | 50   |
| 0.9     | B, C, D   | 500  | 7.5     | B, C, J, K    | 500  | 82      | F, G, J, K, M | 500  | 910     | F, G, J, K, M | 50   |
| 1.0     | B, C, D   | 500  | 8.2     | B, C, J, K    | 500  | 91      | F, G, J, K, M | 500  | 1000    | F, G, J, K, M | 50   |
| 1.1     | B, C, D   | 500  | 9.1     | B, C, J, K    | 500  | 100     | F, G, J, K, M | 500  |         |               |      |
| 1.2     | B, C, D   | 500  | 10      | F, G, J, K, M | 500  | 110     | F, G, J, K, M | 300  |         |               |      |
| 1.3     | B, C, D   | 500  | 11      | F, G, J, K, M | 500  | 120     | F, G, J, K, M | 300  |         |               |      |
| 1.4     | B, C, D   | 500  | 12      | F, G, J, K, M | 500  | 130     | F, G, J, K, M | 300  |         |               |      |
| 1.5     | B, C, D   | 500  | 13      | F, G, J, K, M | 500  | 150     | F, G, J, K, M | 300  |         |               |      |
| 1.6     | B, C, D   | 500  | 15      | F, G, J, K, M | 500  | 160     | F, G, J, K, M | 300  |         |               |      |
| 1.7     | B, C, D   | 500  | 16      | F, G, J, K, M | 500  | 180     | F, G, J, K, M | 300  |         |               |      |
| 1.8     | B, C, D   | 500  | 18      | F, G, J, K, M | 500  | 200     | F, G, J, K, M | 300  |         |               |      |
| 1.9     | B, C, D   | 500  | 20      | F, G, J, K, M | 500  | 220     | F, G, J, K, M | 200  |         |               |      |
| 2.0     | B, C, D   | 500  | 22      | F, G, J, K, M | 500  | 240     | F, G, J, K, M | 200  |         |               |      |
| 2.2     | B, C, D   | 500  | 24      | F, G, J, K, M | 500  | 270     | F, G, J, K, M | 200  |         |               |      |
| 2.4     | B, C, D   | 500  | 27      | F, G, J, K, M | 500  | 300     | F, G, J, K, M | 200  |         |               |      |
| 2.7     | B, C, D   | 500  | 30      | F, G, J, K, M | 500  | 330     | F, G, J, K, M | 200  |         |               |      |
| 3.0     | B, C, D   | 500  | 33      | F, G, J, K, M | 500  | 360     | F, G, J, K, M | 200  |         |               |      |
| 3.3     | B, C, D   | 500  | 36      | F, G, J, K, M | 500  | 390     | F, G, J, K, M | 200  |         |               |      |

### Case Size R

**TABLE III: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC |
|---------|-----------|------|---------|------------|------|---------|------------|------|---------|------------|------|
| 1.0     | B, C, D   | 500  | 3.0     | B, C, D    | 500  | 12      | G, J, K, M | 500  | 51      | G, J, K, M | 500  |
| 1.1     | B, C, D   | 500  | 3.3     | B, C, D    | 500  | 13      | G, J, K, M | 500  | 56      | G, J, K, M | 500  |
| 1.2     | B, C, D   | 500  | 3.6     | B, C, D    | 500  | 15      | G, J, K, M | 500  | 62      | G, J, K, M | 500  |
| 1.3     | B, C, D   | 500  | 3.9     | B, C, D    | 500  | 16      | G, J, K, M | 500  | 68      | G, J, K, M | 500  |
| 1.4     | B, C, D   | 500  | 4.3     | B, C, D    | 500  | 18      | G, J, K, M | 500  | 75      | G, J, K, M | 500  |
| 1.5     | B, C, D   | 500  | 4.7     | B, C, D    | 500  | 20      | G, J, K, M | 500  | 82      | G, J, K, M | 500  |
| 1.6     | B, C, D   | 500  | 5.1     | B, C, D    | 500  | 22      | G, J, K, M | 500  | 91      | G, J, K, M | 500  |
| 1.7     | B, C, D   | 500  | 5.6     | G, J, K, M | 500  | 24      | G, J, K, M | 500  | 100     | G, J, K, M | 500  |
| 1.8     | B, C, D   | 500  | 6.2     | G, J, K, M | 500  | 27      | G, J, K, M | 500  |         |            |      |
| 1.9     | B, C, D   | 500  | 6.8     | G, J, K, M | 500  | 30      | G, J, K, M | 500  |         |            |      |
| 2.0     | B, C, D   | 500  | 7.5     | G, J, K, M | 500  | 33      | G, J, K, M | 500  |         |            |      |
| 2.1     | B, C, D   | 500  | 8.2     | G, J, K, M | 500  | 36      | G, J, K, M | 500  |         |            |      |
| 2.2     | B, C, D   | 500  | 9.1     | G, J, K, M | 500  | 39      | G, J, K, M | 500  |         |            |      |
| 2.4     | B, C, D   | 500  | 10      | G, J, K, M | 500  | 43      | G, J, K, M | 500  |         |            |      |
| 2.7     | B, C, D   | 500  | 11      | G, J, K, M | 500  | 47      | G, J, K, M | 500  |         |            |      |

### Case Size L

**TABLE IV: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.     | WVDC |
|---------|------------|------|---------|------------|------|---------|---------------|------|
| 0.1     | A, B       | 200  | 1.6     | A, B, C, D | 200  | 6.2     | A, B, C, D    | 200  |
| 0.2     | A, B       | 200  | 1.8     | A, B, C, D | 200  | 6.8     | B, C, J, K    | 200  |
| 0.3     | A, B, C    | 200  | 2.0     | A, B, C, D | 200  | 7.5     | B, C, J, K    | 200  |
| 0.4     | A, B, C    | 200  | 2.2     | A, B, C, D | 200  | 8.2     | B, C, J, K    | 200  |
| 0.5     | A, B, C    | 200  | 2.4     | A, B, C, D | 200  | 9.1     | B, C, J, K    | 200  |
| 0.6     | A, B, C    | 200  | 2.7     | A, B, C, D | 200  | 10      | F, G, J, K, M | 200  |
| 0.7     | A, B, C    | 200  | 3.0     | A, B, C, D | 200  | 11      | F, G, J, K, M | 200  |
| 0.8     | A, B, C    | 200  | 3.3     | A, B, C, D | 200  | 12      | F, G, J, K, M | 200  |
| 0.9     | A, B, C    | 200  | 3.6     | A, B, C, D | 200  | 15      | F, G, J, K, M | 200  |
| 1.0     | A, B, C, D | 200  | 3.9     | A, B, C, D | 200  | 18      | F, G, J, K, M | 200  |
| 1.1     | A, B, C, D | 200  | 4.3     | A, B, C, D | 200  | 20      | F, G, J, K, M | 200  |
| 1.2     | A, B, C, D | 200  | 4.7     | A, B, C, D | 200  | 22      | F, G, J, K, M | 200  |
| 1.3     | A, B, C, D | 200  | 5.1     | A, B, C, D | 200  | 24      | F, G, J, K, M | 200  |
| 1.5     | A, B, C, D | 200  | 5.6     | A, B, C, D | 200  | 27      | F, G, J, K, M | 200  |

### Case Size S

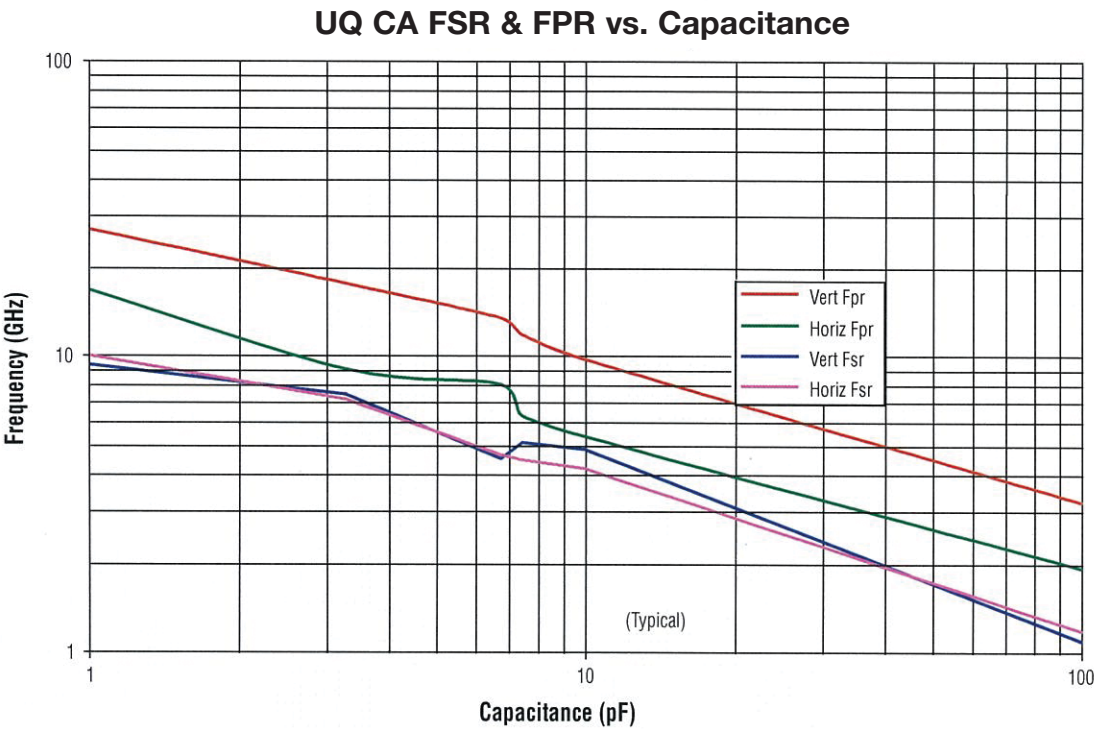
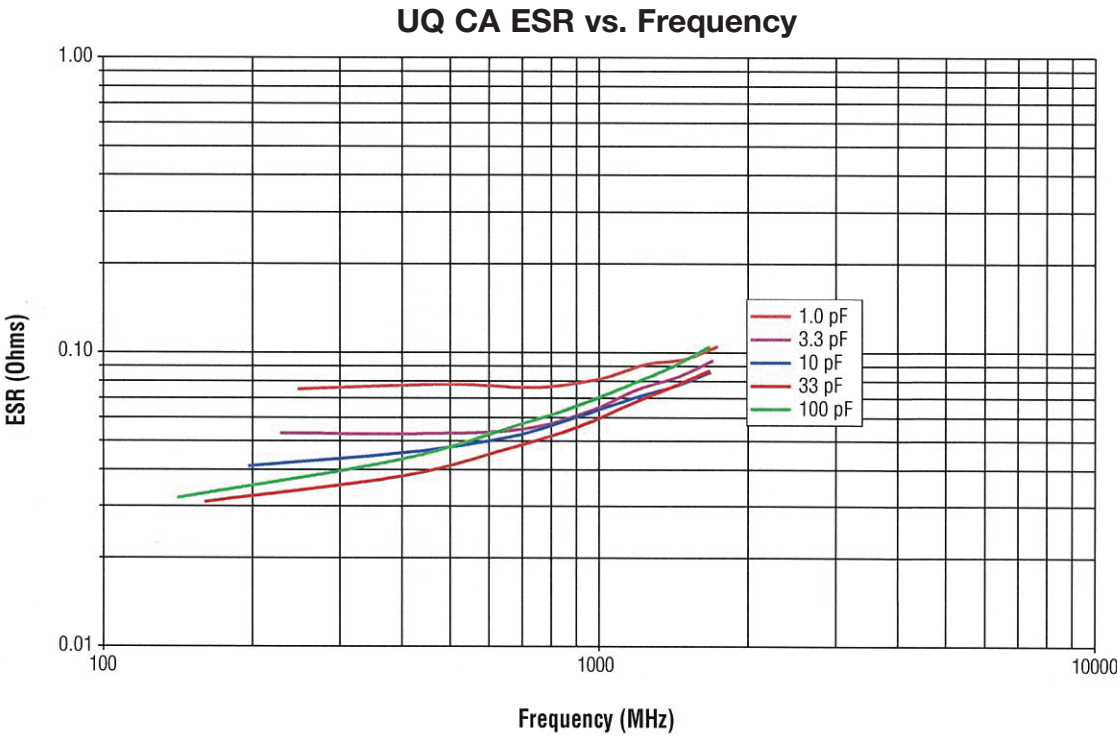
**TABLE V:**

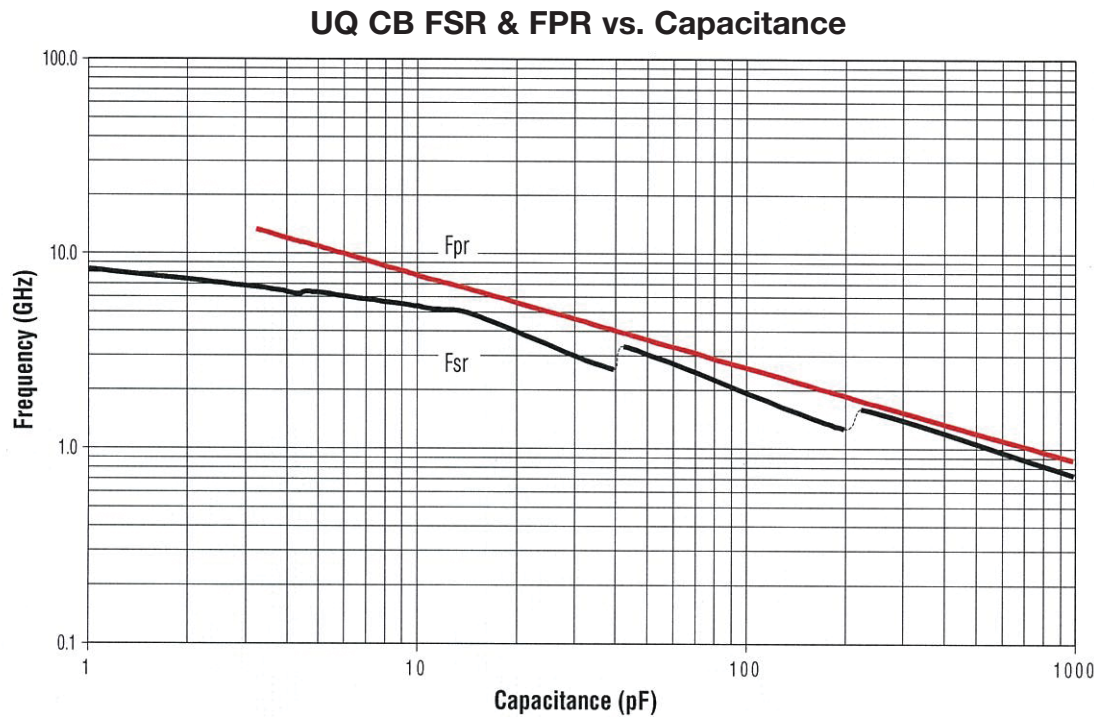
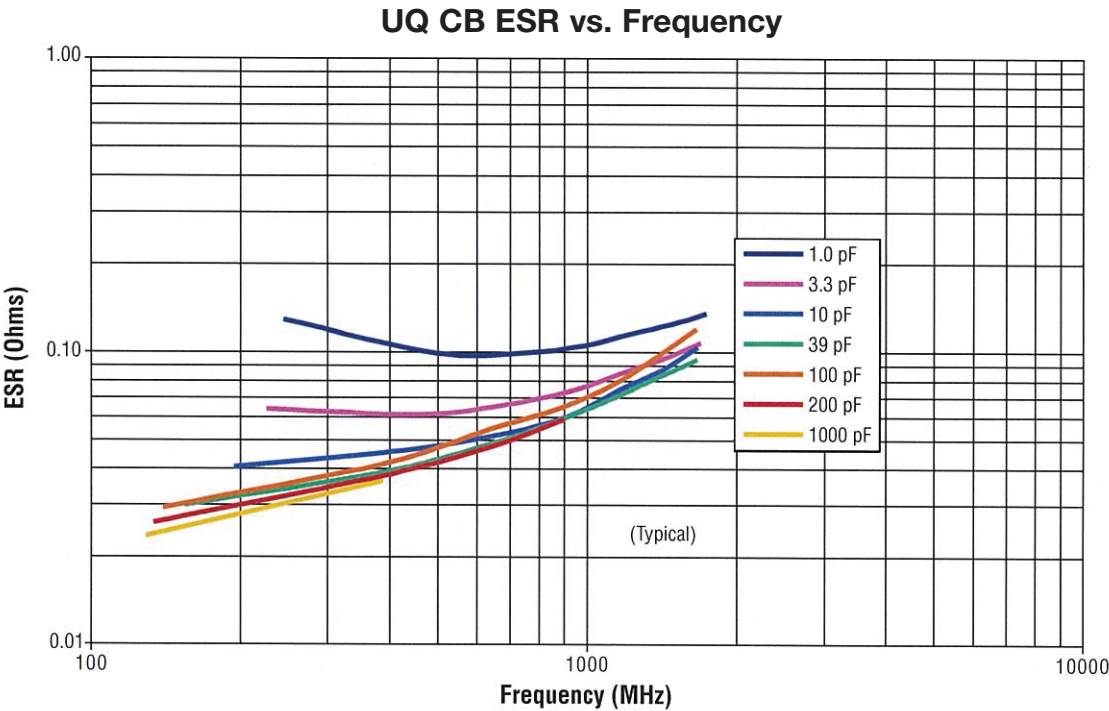
| Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
|---------|------------|------|---------|---------------|------|---------|---------------|------|
| 0.1     | A, B       | 250  | 2.7     | A, B, C, D    | 250  | 20      | F, G, J, K, M | 250  |
| 0.2     | A, B       | 250  | 3.0     | A, B, C, D    | 250  | 22      | F, G, J, K, M | 250  |
| 0.3     | A, B, C    | 250  | 3.3     | A, B, C, D    | 250  | 24      | F, G, J, K, M | 250  |
| 0.4     | A, B, C    | 250  | 3.6     | A, B, C, D    | 250  | 27      | F, G, J, K, M | 250  |
| 0.5     | A, B, C    | 250  | 3.9     | A, B, C, D    | 250  | 30      | F, G, J, K, M | 250  |
| 0.6     | A, B, C    | 250  | 4.3     | A, B, C, D    | 250  | 33      | F, G, J, K, M | 250  |
| 0.7     | A, B, C    | 250  | 4.7     | A, B, C, D    | 250  | 36      | F, G, J, K, M | 250  |
| 0.8     | A, B, C    | 250  | 5.1     | A, B, C, D    | 250  | 39      | F, G, J, K, M | 250  |
| 0.9     | A, B, C    | 250  | 5.6     | A, B, C, D    | 250  | 43      | F, G, J, K, M | 250  |
| 1.0     | A, B, C, D | 250  | 6.2     | A, B, C, D    | 250  | 47      | F, G, J, K, M | 250  |
| 1.1     | A, B, C, D | 250  | 6.8     | B, C, J, K    | 250  | 51      | F, G, J, K, M | 250  |
| 1.2     | A, B, C, D | 250  | 7.5     | B, C, J, K    | 250  | 56      | F, G, J, K, M | 250  |
| 1.3     | A, B, C, D | 250  | 8.2     | B, C, J, K    | 250  | 62      | F, G, J, K, M | 250  |
| 1.5     | A, B, C, D | 250  | 9.1     | B, C, J, K    | 250  | 68      | F, G, J, K, M | 250  |
| 1.6     | A, B, C, D | 250  | 10      | F, G, J, K, M | 250  | 75      | F, G, J, K, M | 250  |
| 1.8     | A, B, C, D | 250  | 11      | F, G, J, K, M | 250  | 82      | F, G, J, K, M | 250  |
| 2.0     | A, B, C, D | 250  | 12      | F, G, J, K, M | 250  | 91      | F, G, J, K, M | 250  |
| 2.2     | A, B, C, D | 250  | 15      | F, G, J, K, M | 250  | 100     | F, G, J, K, M | 250  |
| 2.4     | A, B, C, D | 250  | 18      | F, G, J, K, M | 250  |         |               |      |

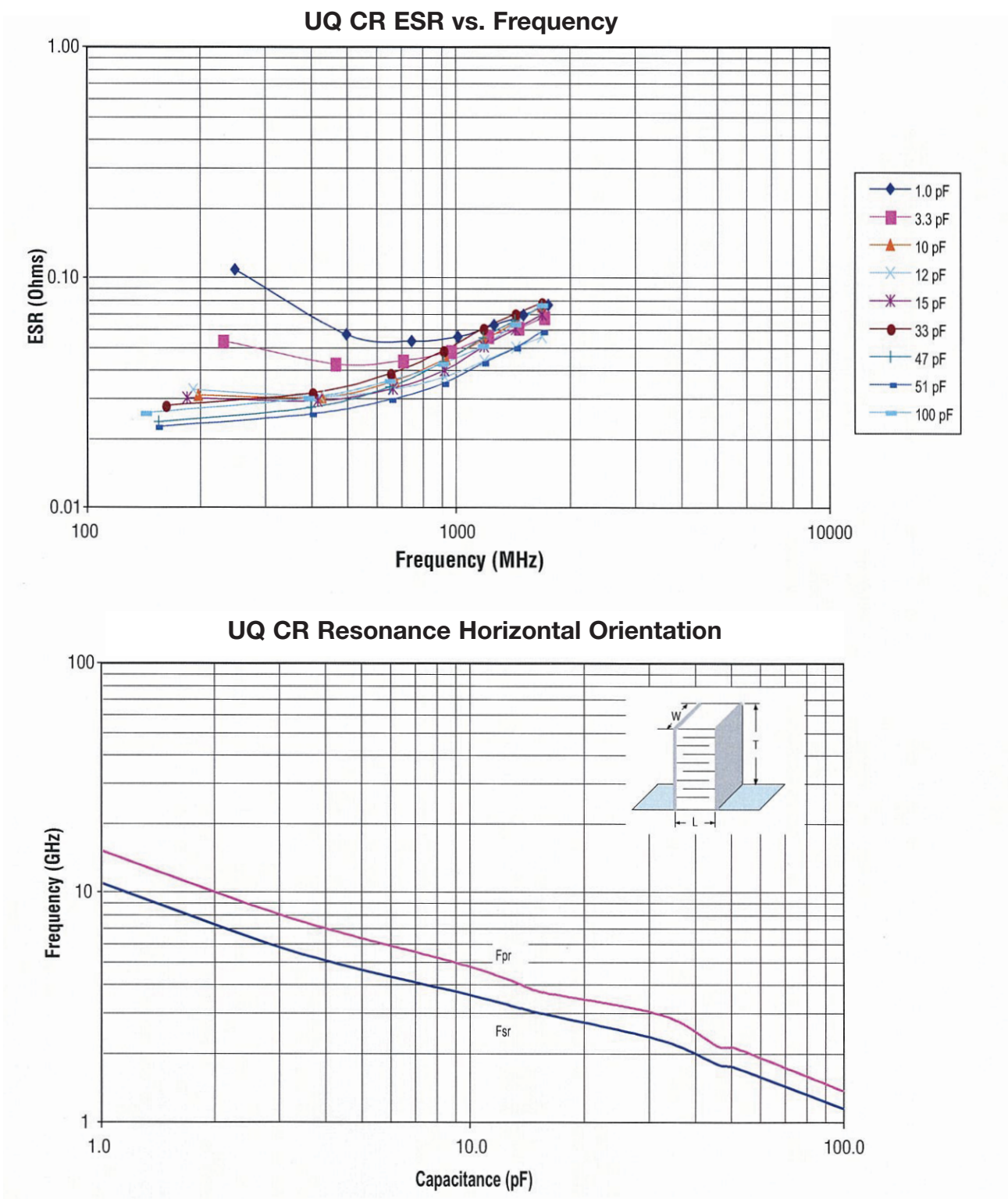
### Case Size F

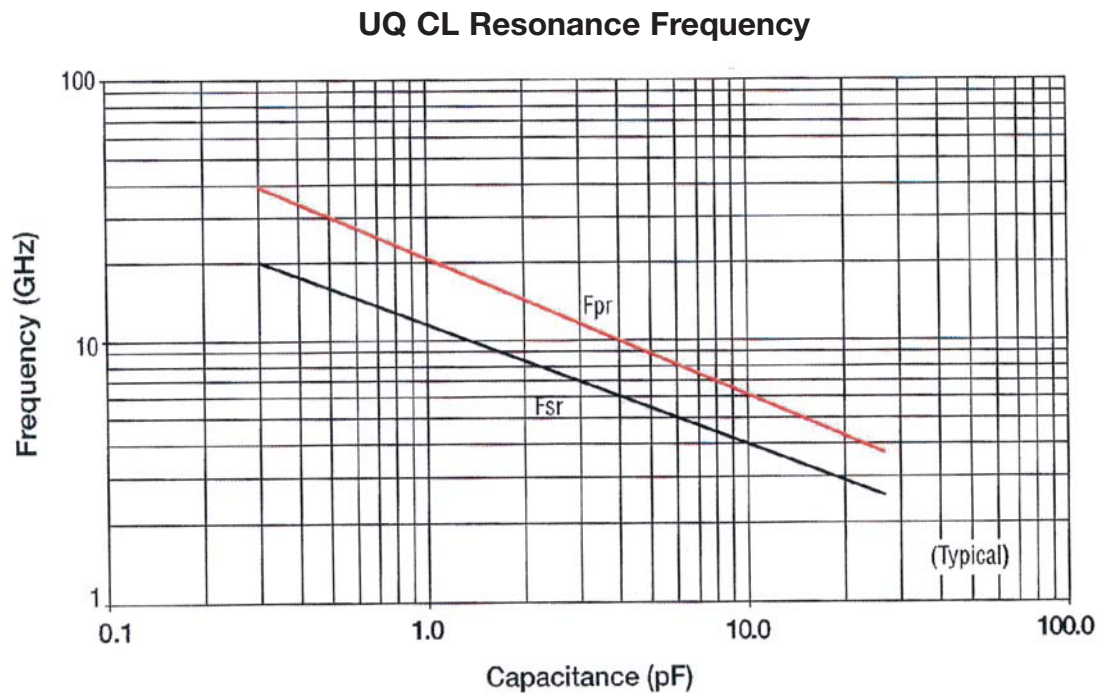
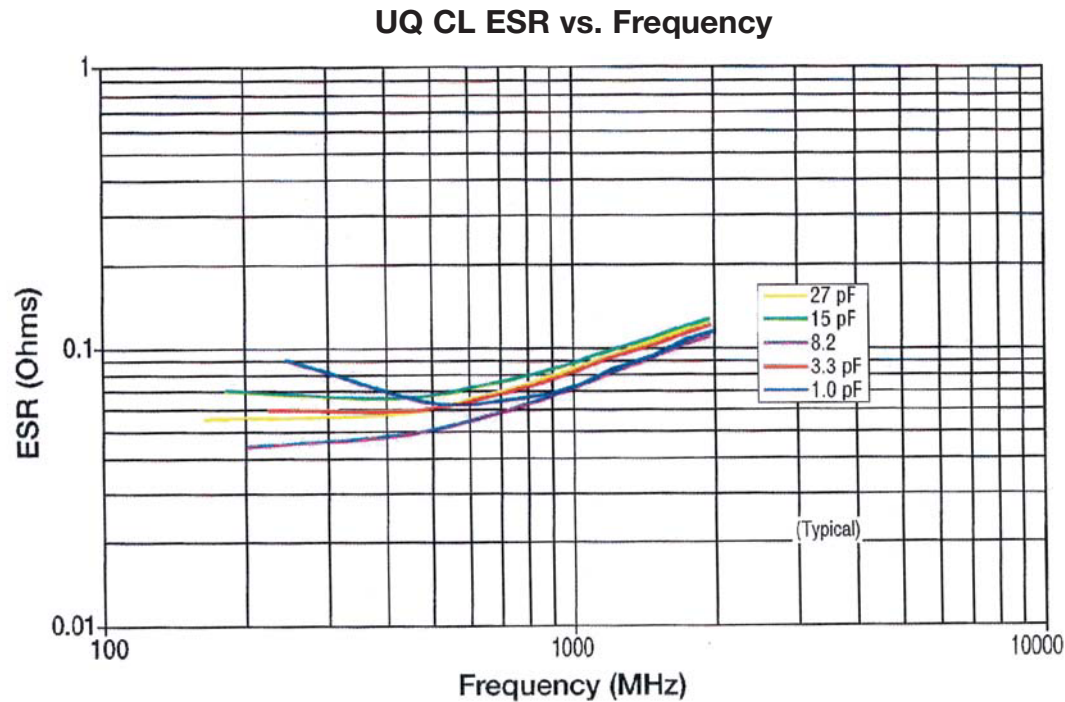
**TABLE VI:**

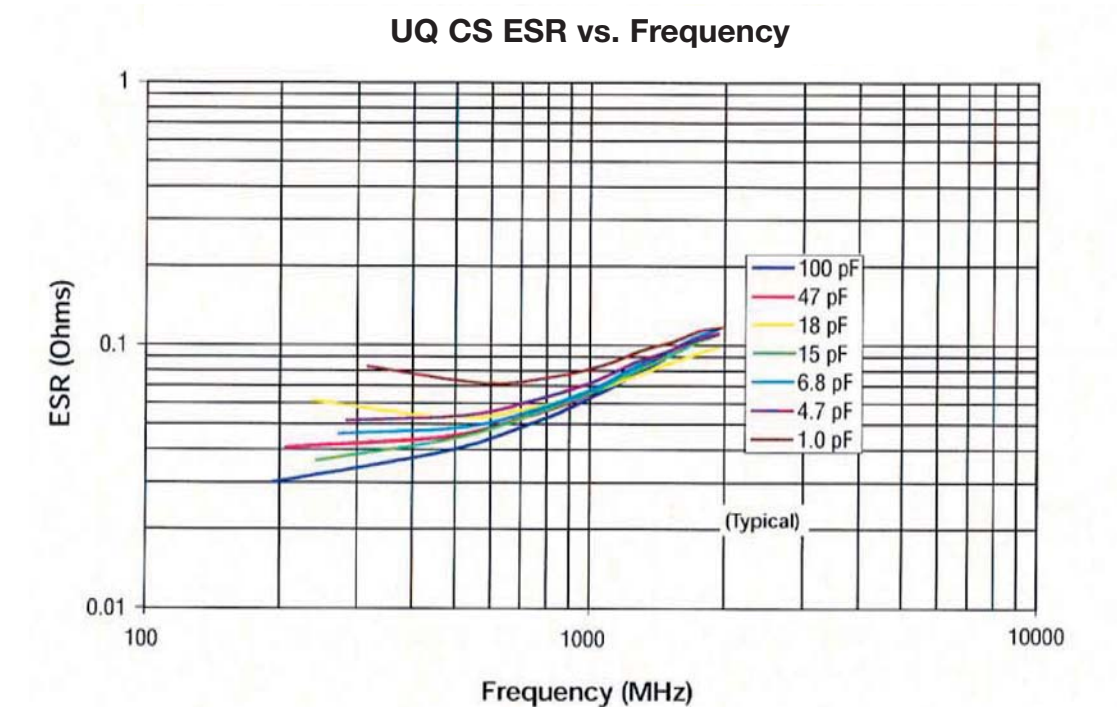
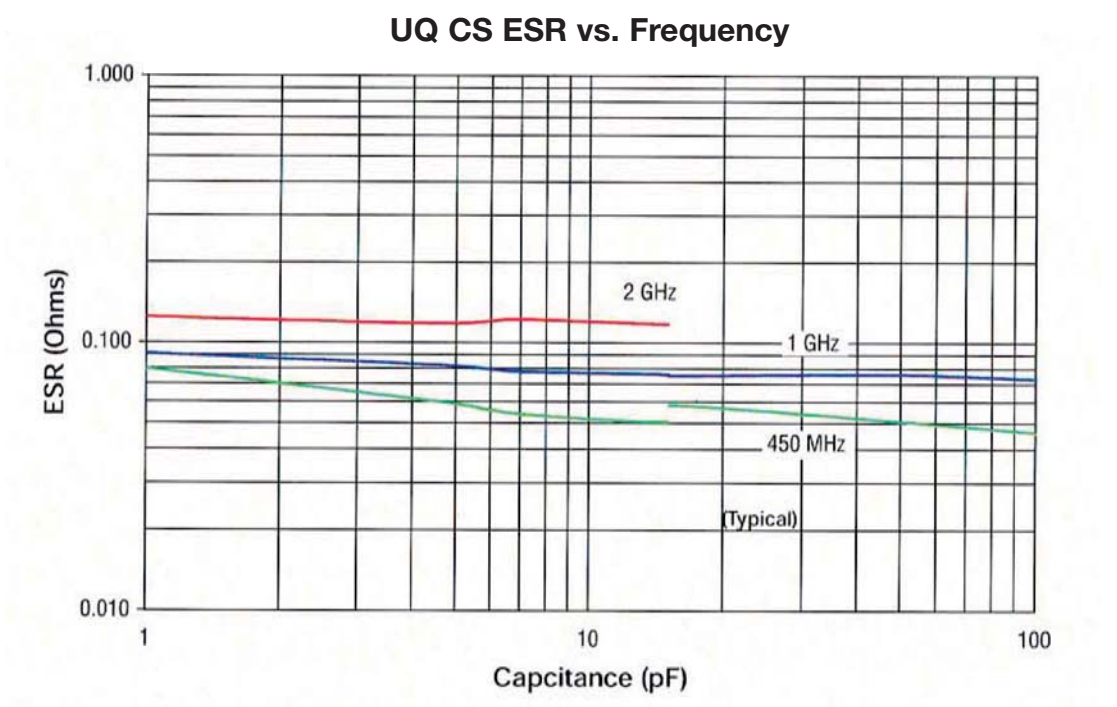
| Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
|---------|------------|------|---------|---------------|------|---------|---------------|------|
| 0.1     | A, B       | 250  | 3.3     | A, B, C, D    | 250  | 30      | F, G, J, K, M | 250  |
| 0.2     | A, B       | 250  | 3.6     | A, B, C, D    | 250  | 33      | F, G, J, K, M | 250  |
| 0.3     | A, B, C    | 250  | 3.9     | A, B, C, D    | 250  | 36      | F, G, J, K, M | 250  |
| 0.4     | A, B, C    | 250  | 4.3     | A, B, C, D    | 250  | 39      | F, G, J, K, M | 250  |
| 0.5     | A, B, C    | 250  | 4.7     | A, B, C, D    | 250  | 43      | F, G, J, K, M | 250  |
| 0.6     | A, B, C    | 250  | 5.1     | A, B, C, D    | 250  | 47      | F, G, J, K, M | 250  |
| 0.7     | A, B, C    | 250  | 5.6     | A, B, C, D    | 250  | 51      | F, G, J, K, M | 250  |
| 0.8     | A, B, C    | 250  | 6.2     | A, B, C, D    | 250  | 56      | F, G, J, K, M | 250  |
| 0.9     | A, B, C    | 250  | 6.8     | B, C, J, K    | 250  | 62      | F, G, J, K, M | 250  |
| 1.0     | A, B, C, D | 250  | 7.5     | B, C, J, K    | 250  | 68      | F, G, J, K, M | 250  |
| 1.1     | A, B, C, D | 250  | 8.2     | B, C, J, K    | 250  | 75      | F, G, J, K, M | 250  |
| 1.2     | A, B, C, D | 250  | 9.1     | B, C, J, K    | 250  | 82      | F, G, J, K, M | 250  |
| 1.3     | A, B, C, D | 250  | 10      | F, G, J, K, M | 250  | 91      | F, G, J, K, M | 250  |
| 1.5     | A, B, C, D | 250  | 11      | F, G, J, K, M | 250  | 100     | F, G, J, K, M | 250  |
| 1.6     | A, B, C, D | 250  | 12      | F, G, J, K, M | 250  | 110     | F, G, J, K, M | 250  |
| 1.8     | A, B, C, D | 250  | 15      | F, G, J, K, M | 250  | 120     | F, G, J, K, M | 250  |
| 2.0     | A, B, C, D | 250  | 18      | F, G, J, K, M | 250  | 150     | F, G, J, K, M | 250  |
| 2.2     | A, B, C, D | 250  | 20      | F, G, J, K, M | 250  | 180     | F, G, J, K, M | 250  |
| 2.4     | A, B, C, D | 250  | 22      | F, G, J, K, M | 250  | 200     | F, G, J, K, M | 250  |
| 2.7     | A, B, C, D | 250  | 24      | F, G, J, K, M | 250  | 220     | F, G, J, K, M | 250  |
| 3.0     | A, B, C, D | 250  | 27      | F, G, J, K, M | 250  | 240     | F, G, J, K, M | 250  |



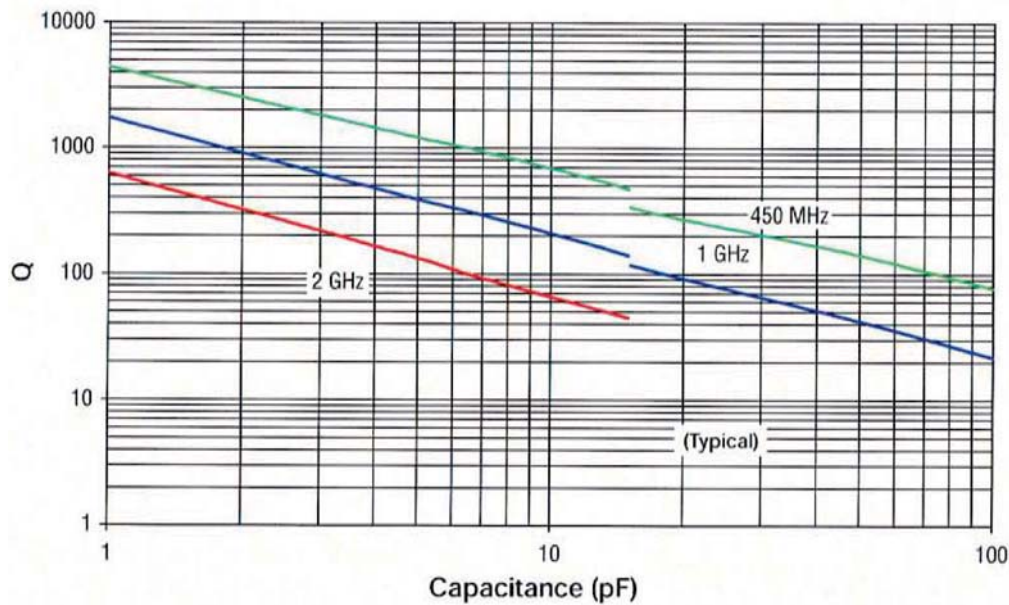




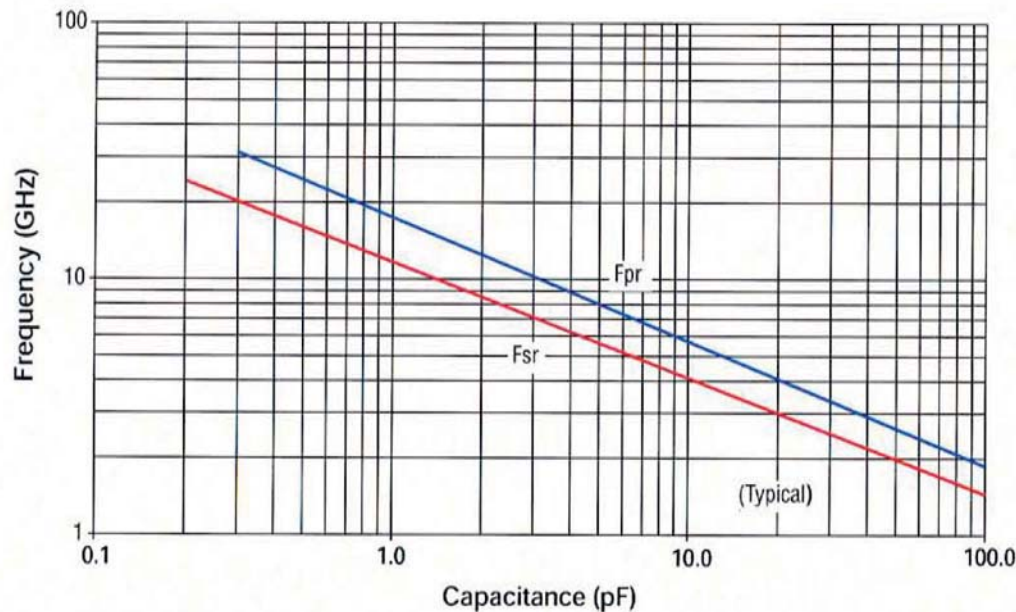


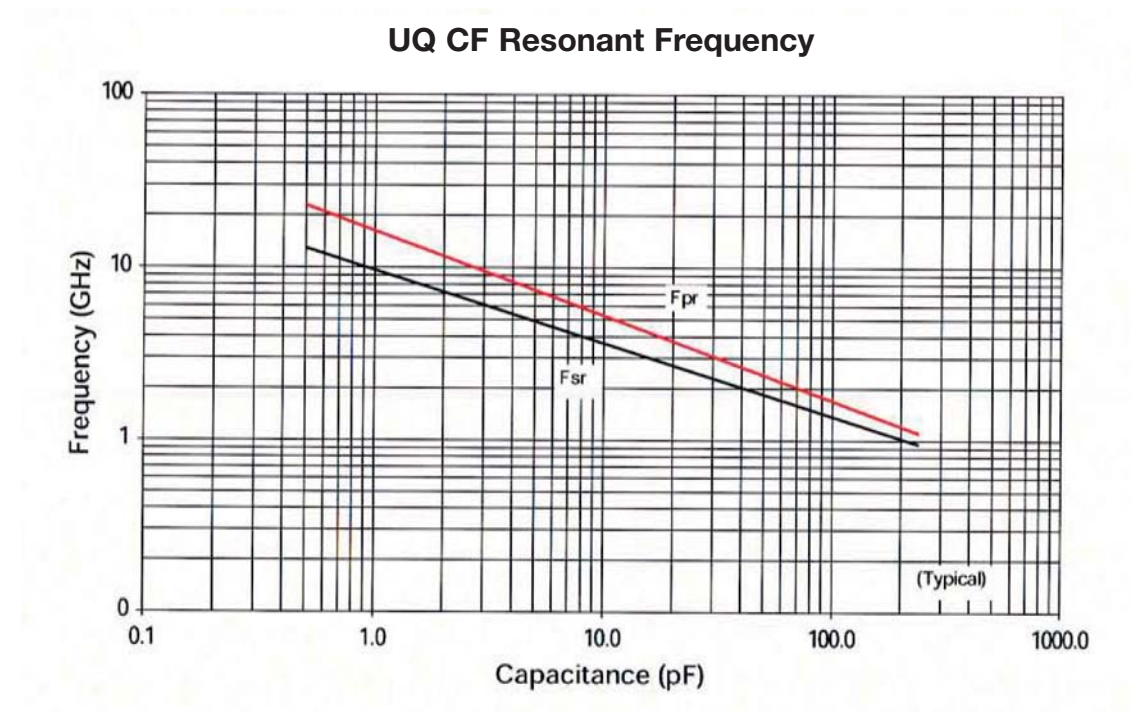
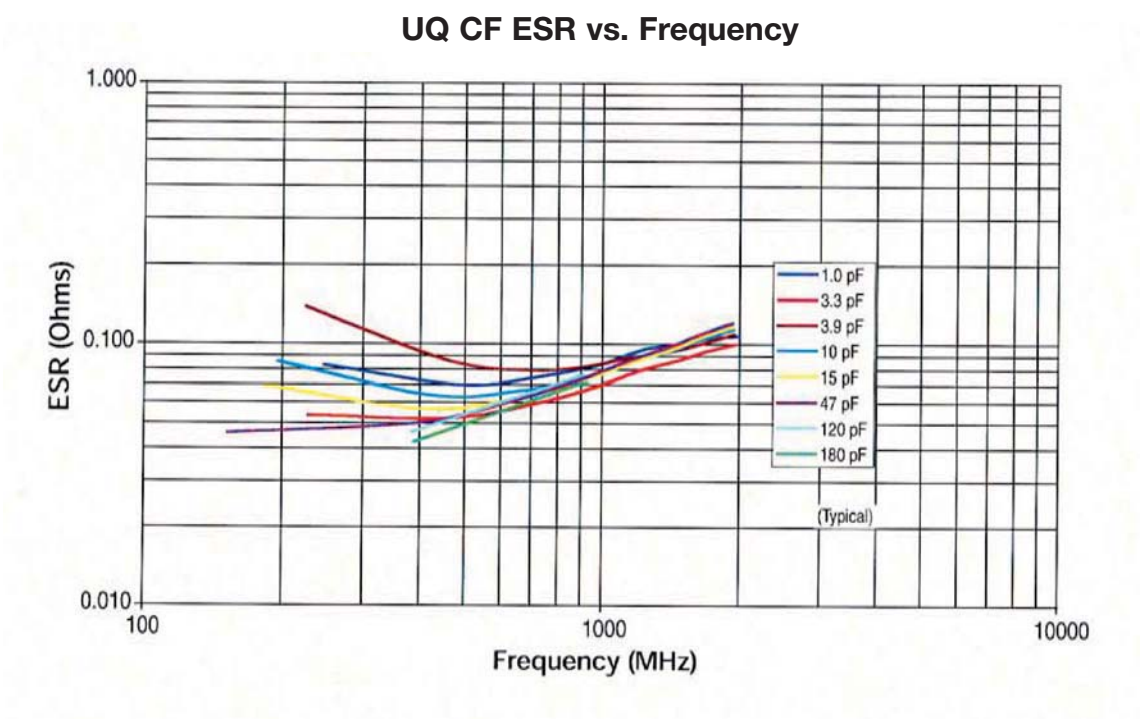


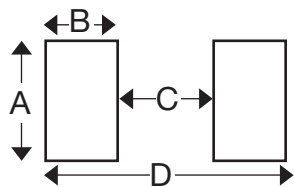
UQ CS Q vs. Capacitance



UQ CS Resonant Frequency







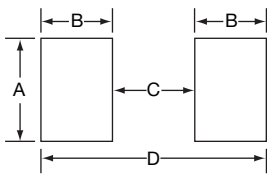
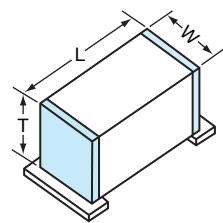
MOUNTING PAD DIMENSIONS CASE CA: inches (millimeters)

|                  | Pad Size     | A min         | B min         | C min         | D min         |
|------------------|--------------|---------------|---------------|---------------|---------------|
| Vertical Mount   | Normal       | 0.070 (1.778) | 0.050 (1.270) | 0.030 (0.762) | 0.130 (3.302) |
|                  | High Density | 0.050 (1.270) | 0.030 (0.762) | 0.030 (0.762) | 0.090 (2.286) |
| Horizontal Mount | Normal       | 0.080 (2.032) | 0.050 (1.270) | 0.030 (0.762) | 0.130 (3.302) |
|                  | High Density | 0.060 (1.524) | 0.030 (0.762) | 0.030 (0.762) | 0.090 (2.286) |

MOUNTING PAD DIMENSIONS CASE CB: inches (millimeters)

|                  | Cap Value     | Pad Size     | A min         | B min         | C min         | D min         |
|------------------|---------------|--------------|---------------|---------------|---------------|---------------|
| Vertical Mount   | 0.1 pF        | Normal       | 0.065 (1.651) | 0.050 (1.270) | 0.075 (1.905) | 0.175 (4.445) |
|                  |               | High Density | 0.045 (1.143) | 0.030 (0.762) | 0.075 (1.905) | 0.135 (3.429) |
|                  | 0.2 pF        | Normal       | 0.090 (2.286) | 0.050 (1.270) | 0.075 (1.905) | 0.175 (4.445) |
|                  |               | High Density | 0.070 (1.778) | 0.030 (0.762) | 0.075 (1.905) | 0.135 (3.429) |
|                  | 0.3 to 510 pF | Normal       | 0.110 (2.794) | 0.050 (1.270) | 0.075 (1.905) | 0.175 (4.445) |
|                  |               | High Density | 0.090 (2.286) | 0.030 (0.762) | 0.075 (1.905) | 0.135 (3.429) |
| Horizontal Mount | All Values    | Normal       | 0.120 (3.048) | 0.050 (1.270) | 0.075 (1.905) | 0.175 (4.445) |
|                  |               | High Density | 0.100 (2.540) | 0.030 (0.762) | 0.075 (1.905) | 0.135 (3.429) |
|                  |               | Normal       | 0.130 (3.302) | 0.050 (1.270) | 0.075 (1.905) | 0.175 (4.445) |
|                  |               | High Density | 0.110 (2.794) | 0.030 (0.762) | 0.075 (1.905) | 0.135 (3.429) |

MOUNTING PAD DIMENSIONS CASE CL, CS & CF: inches (millimeters)



| Case        | A min.       | B min.       | C min.        | D min.       |
|-------------|--------------|--------------|---------------|--------------|
| 0402 (1005) | .0275 (0.70) | .0354 (0.90) | .0157 (0.40)  | .0866 (2.20) |
| 0603 (1608) | .0393 (1.00) | .0433 (1.10) | .03236 (0.60) | .110 (2.80)  |
| 0805 (2012) | .0590 (1.50) | .0512 (1.30) | .0236 (0.60)  | .1259 (3.20) |

# Microwave MLCs



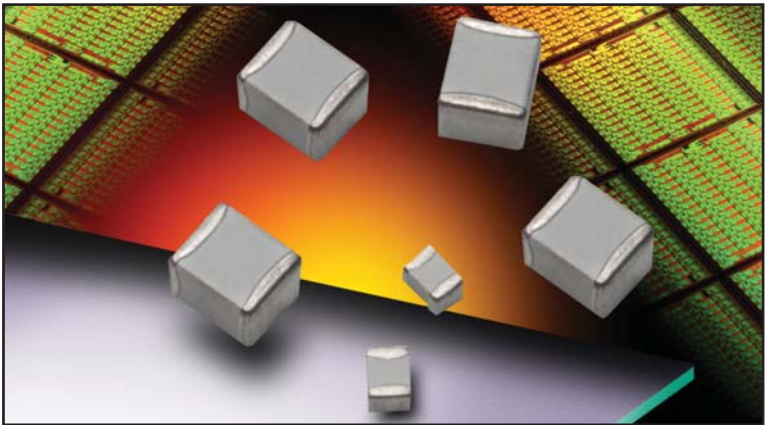
## UQ Series High Q Ultra Low ESR MLC

### DESIGN KITS

| Kit #      | Compliance | Description                                                                                              | Cap Value      | Cap. Values (pF)                                                | Tol. (pF) |
|------------|------------|----------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------|-----------|
| KITUQ800LF |            | UQCA 0605 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 0.1 to 2.0     | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5 | ±0.1      |
|            |            |                                                                                                          |                | 1.6, 1.8, 2.0                                                   | ±0.25     |
| KITUQ810LF |            | UQCA 0605 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 1.0 to 10 pF   | 1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3                | ±0.1      |
|            |            |                                                                                                          |                | 3.9, 4.7, 5.6, 6.8, 8.0                                         | ±0.25     |
|            |            |                                                                                                          |                | 10                                                              | ±5%       |
| KITUQ820LF |            | UQCA 0605 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 10 to 100 pF   | 10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100 | ±5%       |
| KITUQ830LF |            | UQCB 1210 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 1.0 to 10 pF   | 1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3                | ±0.1      |
|            |            |                                                                                                          |                | 3.9, 4.7, 5.6, 6.8, 8.0                                         | ±0.25     |
|            |            |                                                                                                          |                | 10                                                              | ±5%       |
| KITUQ840LF |            | UQCB 1210 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 10 to 100 pF   | 10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100 | ±5%       |
| KITUQ850LF |            | UQCB 1210 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 100 to 1000 pF | 100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470      | ±5%       |
|            |            |                                                                                                          |                | 560, 680, 820, 1000                                             | ±10%      |
| KITUQ360LF |            | UQCL 0402 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 0.1 to 2.0     | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5 | ±0.1      |
|            |            |                                                                                                          |                | 1.6, 1.8, 2.0                                                   | ±0.25     |
| KITUQ370LF |            | UQCL 0402 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 1.0 to 10      | 1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3                | ±0.1      |
|            |            |                                                                                                          |                | 3.9, 4.7, 5.6, 6.8, 8.2                                         | ±0.25     |
|            |            |                                                                                                          |                | 10                                                              | ±5%       |
| KITUQ380LF |            | UQCL 0402 Series Ultra-Low ESR High Q Microwave Capacitors<br>8 different values, 15 pcs min. per value  | 10 to 27       | 10, 12, 15, 18, 20, 22, 24, 27                                  | ±5%       |
| KITUQ250LF |            | UQCS 0603 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 0.1 to 2.0     | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5 | ±0.1      |
|            |            |                                                                                                          |                | 1.6, 1.8, 2.0                                                   | ±0.25     |
| KITUQ260LF |            | UQCS 0603 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 1.0 to 10      | 1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3                | ±0.1      |
|            |            |                                                                                                          |                | 3.9, 4.7, 5.6, 6.8, 8.2                                         | ±0.25     |
|            |            |                                                                                                          |                | 10                                                              | ±5%       |
| KITUQ270LF |            | UQCS 0603 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 10 to 100      | 10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100 | ±5%       |
| KITUQ320LF |            | UQCF 0805 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 0.1 to 2.0     | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5 | ±0.1      |
|            |            |                                                                                                          |                | 1.6, 1.8, 2.0                                                   | ±0.25     |
| KITUQ330LF |            | UQCF 0805 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 1.0 to 10      | 1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3                | ±0.1      |
|            |            |                                                                                                          |                | 3.9, 4.7, 5.6, 6.8, 8.2                                         | ±0.25     |
|            |            |                                                                                                          |                | 10                                                              | ±5%       |
| KITUQ340LF |            | UQCF 0805 Series Ultra-Low ESR High Q Microwave Capacitors<br>16 different values, 15 pcs min. per value | 10 to 100      | 10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100 | ±5%       |
| KITUQ350LF |            | UQCF 0805 Series Ultra-Low ESR High Q Microwave Capacitors<br>7 different values, 15 pcs min. per value  | 100 to 240     | 100, 120, 150, 180, 200, 220, 250                               | ±5%       |

# Microwave MLC's

## SQ Series Ultra Low ESR MLC



### FEATURES:

- Low ESR
- High Q
- High Self Resonance
- Capacitance Range 0.1 pF to 5100 pF
- 175°C Capability SQCB

### APPLICATIONS:

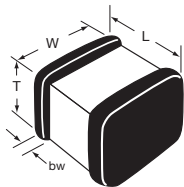
- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- MRI Systems

### HOW TO ORDER

|                                   |                                                                                                             |                                                                                                                                      |                                                                                                                                       |                                                                                                                                                                                                                      |                                                                                                                                                                                   |                                                                        |                                                                                                                                                                              |                                                                                                                                                                                               |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>SQ</b></p> <p>AVX Style</p> | <p><b>CA</b></p> <p><b>Case Size</b><br/>CA = 0605<br/>CB = 1210</p> <p>See mechanical dimensions below</p> | <p><b>7</b></p> <p><b>Voltage Code</b><br/>5 = 50V<br/>1 = 100V<br/>E = 150V<br/>2 = 200V<br/>V = 250V<br/>9 = 300V<br/>7 = 500V</p> | <p><b>M</b></p> <p><b>Temperature Coefficient Code</b><br/>M = +90±20ppm/°C<br/>A = 0±30ppm/°C<br/>C = 15% ("J" Termination only)</p> | <p><b>100</b></p> <p><b>Capacitance</b><br/>EIA Capacitance Code in pF.<br/>First two digits = significant figures or "R" for decimal place.<br/>Third digit = number of zeros or after "R" significant figures.</p> | <p><b>J</b></p> <p><b>Capacitance Tolerance Code</b><br/>B = ±.1 pF<br/>C = ±.25 pF<br/>D = ±.5 pF<br/>F = ±1%<br/>G = ±2%<br/>J = ±5%<br/>K = ±10%<br/>M = ±20%<br/>N = ±30%</p> | <p><b>A</b></p> <p><b>Failure Rate Code</b><br/>A = Not Applicable</p> | <p><b>T</b></p> <p><b>Termination Style Code</b><br/>**1 = Pd/Ag<br/>**7 = Ag/Ni/Au<br/>J = Nickel Barrier Sn/Pb (60/40)<br/>**T = 100% Tin<br/>H = Cu/Sn (Non-Magnetic)</p> | <p><b>1A</b></p> <p><b>Packaging Code</b><br/>1A = 7" Reel Unmarked<br/>6A = Waffle Pack Unmarked<br/>ME = 7" Reel Marked<br/>WE = Waffle Pack Marked</p> <p>* Vertical T&amp;R available</p> |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

\*\*RoHS compliant

### MECHANICAL DIMENSIONS: inches (millimeters)



| Case  | Length (L)                                 | Width (W)                | Thickness (T)            | Band Width (bw)                            |
|-------|--------------------------------------------|--------------------------|--------------------------|--------------------------------------------|
| SQCA* | .055 + .015 - .010<br>(1.40+ .381 - .254)  | .055±.015<br>(1.40±.381) | .020/.057<br>(.508/1.45) | .010 + .010 - .005<br>(.254 + .254 - .127) |
| SQCB* | .110 + .020 - .010<br>(2.79 + .508 - .254) | .110±.010<br>(2.79±.254) | .030/.102<br>(.762/2.59) | .015±.010<br>(.381±.254)                   |

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

- 8mm carrier
- 7" reel: SQCA/SQCB = 1000 pcs

### WAFFLE PACK

SQCA 100 pcs  
SQCB 100 pcs

Not RoHS Compliant



For RoHS compliant products,  
please select correct termination style.

# Microwave MLC's

## SQ Series Ultra Low ESR MLC



### ELECTRICAL SPECIFICATIONS

|                                       |                         | M & A                                                                                                                                                                                                                                                       | C                                                                                                       |
|---------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Temperature Coefficient (TCC)         |                         | (M) $+90 \pm 20$ PPM/°C ( -55°C to +125°C)<br>(M) $+90 \pm 30$ PPM/°C ( +125°C to +175°C)*<br>(A) $0 \pm 30$ PPM/°C                                                                                                                                         | $\pm 15\%$ (-55°C to 125°C)                                                                             |
| Capacitance Range                     |                         | (M) 0.1 pF to 1000 pF<br>(A) 0.1 pF to 5100 pF                                                                                                                                                                                                              | 0.001μF to 0.1μF                                                                                        |
| Operating Temperature                 |                         | 0.1 pF to 330 pF: from -55°C to +175°C*<br>360 pF to 5100 pF: from -55°C to +125°C                                                                                                                                                                          | -55°C to +125°C                                                                                         |
| Quality Factor (Q)                    | M Dielectric A & B Case | Greater than 10,000 at 1 MHz                                                                                                                                                                                                                                | 2.5% @ 1kHz                                                                                             |
|                                       | A Dielectric B Case     | Greater than 10,000 at 1 MHz<br>Greater than 2,000 at 1 MHz<br>Greater than 2,000 at 1 KHz                                                                                                                                                                  | 0.1 - 200 pF<br>220 - 1000 pF<br>1100 - 5100 pF                                                         |
|                                       | A Dielectric A Case     | Greater than 10,000 at 1 MHz<br>Greater than 2,000 at 1 MHz                                                                                                                                                                                                 | 0.1 - 100 pF<br>110 - 1000 pF                                                                           |
| Insulation Resistance (IR)            |                         | 0.2 pF to 470 pF<br>10 <sup>9</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>9</sup> Megohms min. @ 125°C at rated WVDC<br>510 pF to 5100 pF<br>10 <sup>9</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>9</sup> Megohms min. @ 125°C at rated WVDC | 10 <sup>4</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>3</sup> Megohms min. @ 125°C at rated WVDC |
| Working Voltage (WVDC)                |                         | See Capacitance Values table                                                                                                                                                                                                                                | See Capacitance Values table                                                                            |
| Dielectric Withstanding Voltage (DWV) |                         | 250% of rated WVDC for 5 secs<br>(for 500V rated 150% of rated voltage)                                                                                                                                                                                     | 250% of rated WVDC for 5 secs                                                                           |
| Aging Effects                         |                         | None                                                                                                                                                                                                                                                        | <3% per decade hour                                                                                     |
| Piezoelectric Effects                 |                         | None                                                                                                                                                                                                                                                        | None                                                                                                    |
| Capacitance Drift                     |                         | $\pm$ (0.02% or 0.02 pF), whichever is greater                                                                                                                                                                                                              | Not Applicable                                                                                          |

\* 175 SQCB & SQLB only

### ENVIRONMENTAL CHARACTERISTICS

AVX SQ will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

|                           |                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Thermal Shock             | Mil-STD-202, Method 107, Condition A                                                                                                          |
| Moisture Resistance       | Mil-STD-202, Method 106                                                                                                                       |
| Low Voltage Humidity      | Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours |
| Life Test                 | Mil-STD-202, Method 108, for 2000 hours at 125°C                                                                                              |
| Shock                     | Mil-STD-202, Method 213, Condition J                                                                                                          |
| Vibration                 | Mil-STD-202, Method 204, Condition B                                                                                                          |
| Immersion                 | Mil-STD-202, Method 104, Condition B                                                                                                          |
| Salt Spray                | Mil-STD-202, Method 101, Condition B                                                                                                          |
| Solderability             | Mil-STD-202, Method 208                                                                                                                       |
| Terminal Strength         | Mil-STD-202, Method 211                                                                                                                       |
| Temperature Cycling       | Mil-STD-202, Method 102, Condition C                                                                                                          |
| Barometric Pressure       | Mil-STD-202, Method 105, Condition B                                                                                                          |
| Resistance to Solder Heat | Mil-STD-202, Method 210, Condition C                                                                                                          |

### Case Size A

**TABLE I: TC: M (+90±20PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC     | Cap. pF | Cap. Tol. | WVDC     | Cap. pF | Cap. Tol.  | WVDC     | Cap. pF | Cap. Tol.  | WVDC     |
|---------|-----------|----------|---------|-----------|----------|---------|------------|----------|---------|------------|----------|
| 0.1     | B         | 150, 250 | 1.7     | B, C, D   | 150, 250 | 6.2     | B, C, D    | 150, 250 | 27      | F, G, J, K | 150, 250 |
| 0.2     | B         | 150, 250 | 1.8     | B, C, D   | 150, 250 | 6.8     | B, C, J, K | 150, 250 | 30      | F, G, J, K | 150, 250 |
| 0.3     | B, C      | 150, 250 | 1.9     | B, C, D   | 150, 250 | 7.5     | B, C, J, K | 150, 250 | 33      | F, G, J, K | 150, 250 |
| 0.4     | B, C      | 150, 250 | 2.0     | B, C, D   | 150, 250 | 8.2     | B, C, J, K | 150, 250 | 36      | F, G, J, K | 150, 250 |
| 0.5     | B, C, D   | 150, 250 | 2.2     | B, C, D   | 150, 250 | 9.1     | B, C, J, K | 150, 250 | 39      | F, G, J, K | 150, 250 |
| 0.6     | B, C, D   | 150, 250 | 2.4     | B, C, D   | 150, 250 | 10      | F, G, J, K | 150, 250 | 43      | F, G, J, K | 150, 250 |
| 0.7     | B, C, D   | 150, 250 | 2.7     | B, C, D   | 150, 250 | 11      | F, G, J, K | 150, 250 | 47      | F, G, J, K | 150, 250 |
| 0.8     | B, C, D   | 150, 250 | 3.0     | B, C, D   | 150, 250 | 12      | F, G, J, K | 150, 250 | 51      | F, G, J, K | 150, 250 |
| 0.9     | B, C, D   | 150, 250 | 3.3     | B, C, D   | 150, 250 | 13      | F, G, J, K | 150, 250 | 56      | F, G, J, K | 150, 250 |
| 1.0     | B, C, D   | 150, 250 | 3.6     | B, C, D   | 150, 250 | 15      | F, G, J, K | 150, 250 | 62      | F, G, J, K | 150, 250 |
| 1.1     | B, C, D   | 150, 250 | 3.9     | B, C, D   | 150, 250 | 16      | F, G, J, K | 150, 250 | 68      | F, G, J, K | 150, 250 |
| 1.2     | B, C, D   | 150, 250 | 4.3     | B, C, D   | 150, 250 | 18      | F, G, J, K | 150, 250 | 75      | F, G, J, K | 150, 250 |
| 1.3     | B, C, D   | 150, 250 | 4.7     | B, C, D   | 150, 250 | 20      | F, G, J, K | 150, 250 | 82      | F, G, J, K | 150, 250 |
| 1.4     | B, C, D   | 150, 250 | 5.1     | B, C, D   | 150, 250 | 22      | F, G, J, K | 150, 250 | 91      | F, G, J, K | 150, 250 |
| 1.5     | B, C, D   | 150, 250 | 5.6     | B, C, D   | 150, 250 | 24      | F, G, J, K | 150, 250 | 100     | F, G, J, K | 150, 250 |
| 1.6     | B, C, D   | 150, 250 |         |           |          |         |            |          |         |            |          |

**TABLE II: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC     | Cap. pF | Cap. Tol.  | WVDC     | Cap. pF | Cap. Tol.  | WVDC     | Cap. pF | Cap. Tol.  | WVDC |
|---------|-----------|----------|---------|------------|----------|---------|------------|----------|---------|------------|------|
| 0.1     | B         | 150, 250 | 2.7     | B, C, D    | 150, 250 | 20      | F, G, J, K | 150, 250 | 150     | F, G, J, K | 150  |
| 0.2     | B         | 150, 250 | 3.0     | B, C, D    | 150, 250 | 22      | F, G, J, K | 150, 250 | 160     | F, G, J, K | 150  |
| 0.3     | B, C      | 150, 250 | 3.3     | B, C, D    | 150, 250 | 24      | F, G, J, K | 150, 250 | 180     | F, G, J, K | 150  |
| 0.4     | B, C      | 150, 250 | 3.6     | B, C, D    | 150, 250 | 27      | F, G, J, K | 150, 250 | 200     | F, G, J, K | 150  |
| 0.5     | B, C, D   | 150, 250 | 3.9     | B, C, D    | 150, 250 | 30      | F, G, J, K | 150, 250 | 220     | F, G, J, K | 150  |
| 0.6     | B, C, D   | 150, 250 | 4.3     | B, C, D    | 150, 250 | 33      | F, G, J, K | 150, 250 | 240     | F, G, J, K | 150  |
| 0.7     | B, C, D   | 150, 250 | 4.7     | B, C, D    | 150, 250 | 36      | F, G, J, K | 150, 250 | 270     | F, G, J, K | 150  |
| 0.8     | B, C, D   | 150, 250 | 5.1     | B, C, D    | 150, 250 | 39      | F, G, J, K | 150, 250 | 300     | F, G, J, K | 150  |
| 0.9     | B, C, D   | 150, 250 | 5.6     | B, C, D    | 150, 250 | 43      | F, G, J, K | 150, 250 | 330     | F, G, J, K | 150  |
| 1.0     | B, C, D   | 150, 250 | 6.2     | B, C, D    | 150, 250 | 47      | F, G, J, K | 150, 250 | 360     | F, G, J, K | 150  |
| 1.1     | B, C, D   | 150, 250 | 6.8     | B, C, J, K | 150, 250 | 51      | F, G, J, K | 150, 250 | 390     | F, G, J, K | 150  |
| 1.2     | B, C, D   | 150, 250 | 7.5     | B, C, J, K | 150, 250 | 56      | F, G, J, K | 150, 250 | 430     | F, G, J, K | 150  |
| 1.3     | B, C, D   | 150, 250 | 8.2     | B, C, J, K | 150, 250 | 62      | F, G, J, K | 150, 200 | 470     | F, G, J, K | 150  |
| 1.4     | B, C, D   | 150, 250 | 9.1     | B, C, J, K | 150, 250 | 68      | F, G, J, K | 150, 200 | 510     | F, G, J, K | 150  |
| 1.5     | B, C, D   | 150, 250 | 10      | F, G, J, K | 150, 250 | 75      | F, G, J, K | 150, 200 | 560     | F, G, J, K | 150  |
| 1.6     | B, C, D   | 150, 250 | 11      | F, G, J, K | 150, 250 | 82      | F, G, J, K | 150, 200 | 620     | F, G, J, K | 150  |
| 1.7     | B, C, D   | 150, 250 | 12      | F, G, J, K | 150, 250 | 91      | F, G, J, K | 150, 200 | 680     | F, G, J, K | 50   |
| 1.8     | B, C, D   | 150, 250 | 13      | F, G, J, K | 150, 250 | 100     | F, G, J, K | 150      | 750     | F, G, J, K | 50   |
| 1.9     | B, C, D   | 150, 250 | 15      | F, G, J, K | 150, 250 | 110     | F, G, J, K | 150      | 820     | F, G, J, K | 50   |
| 2.0     | B, C, D   | 150, 250 | 16      | F, G, J, K | 150, 250 | 120     | F, G, J, K | 150      | 910     | F, G, J, K | 50   |
| 2.2     | B, C, D   | 150, 250 | 18      | F, G, J, K | 150, 250 | 130     | F, G, J, K | 150      | 1000    | F, G, J, K | 50   |
| 2.4     | B, C, D   | 150, 250 |         |            |          |         |            |          |         |            |      |

**TABLE III: TC: C (±15%)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC |
|---------|-----------|------|---------|-----------|------|---------|-----------|------|
| 1000    | K, M, N   | 50   | 2200    | K, M, N   | 50   | 5100    | K, M, N   | 50   |
| 1200    | K, M, N   | 50   | 2700    | K, M, N   | 50   | 5600    | K, M, N   | 50   |
| 1500    | K, M, N   | 50   | 3300    | K, M, N   | 50   | 6800    | K, M, N   | 50   |
| 1800    | K, M, N   | 50   | 3900    | K, M, N   | 50   | 8200    | K, M, N   | 50   |
| 2000    | K, M, N   | 50   | 4700    | K, M, N   | 50   | 10000   | K, M, N   | 50   |

### Case Size B

**TABLE IV: TC: M (+90±20PPM/°C)**

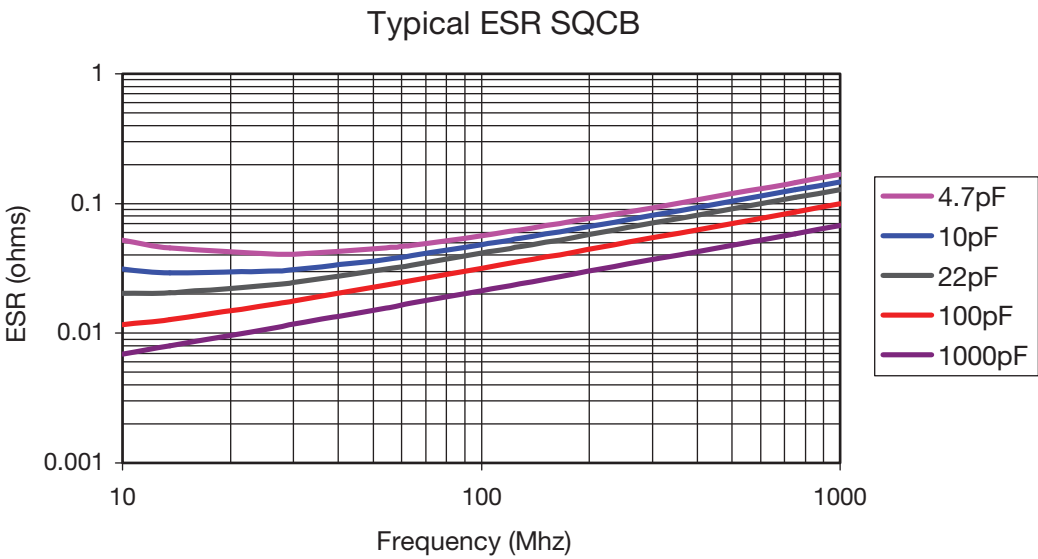
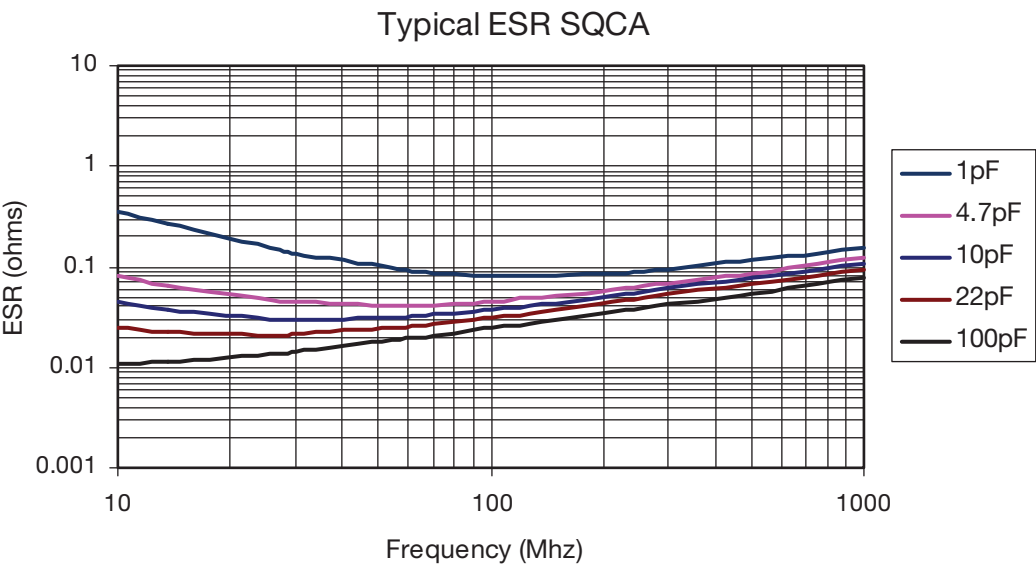
| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC |
|---------|-----------|------|---------|------------|------|---------|------------|------|---------|------------|------|
| 0.1     | B         | 500  | 2.7     | B, C, D    | 500  | 20      | F, G, J, K | 500  | 150     | F, G, J, K | 300  |
| 0.2     | B         | 500  | 3.0     | B, C, D    | 500  | 22      | F, G, J, K | 500  | 160     | F, G, J, K | 300  |
| 0.3     | B, C      | 500  | 3.3     | B, C, D    | 500  | 24      | F, G, J, K | 500  | 180     | F, G, J, K | 300  |
| 0.4     | B, C      | 500  | 3.6     | B, C, D    | 500  | 27      | F, G, J, K | 500  | 200     | F, G, J, K | 300  |
| 0.5     | B, C, D   | 500  | 3.9     | B, C, D    | 500  | 30      | F, G, J, K | 500  | 220     | F, G, J, K | 200  |
| 0.6     | B, C, D   | 500  | 4.3     | B, C, D    | 500  | 33      | F, G, J, K | 500  | 240     | F, G, J, K | 200  |
| 0.7     | B, C, D   | 500  | 4.7     | B, C, D    | 500  | 36      | F, G, J, K | 500  | 270     | F, G, J, K | 200  |
| 0.8     | B, C, D   | 500  | 5.1     | B, C, D    | 500  | 39      | F, G, J, K | 500  | 300     | F, G, J, K | 200  |
| 0.9     | B, C, D   | 500  | 5.6     | B, C, D    | 500  | 43      | F, G, J, K | 500  | 330     | F, G, J, K | 200  |
| 1.0     | B, C, D   | 500  | 6.2     | B, C, D    | 500  | 47      | F, G, J, K | 500  | 360     | F, G, J, K | 200  |
| 1.1     | B, C, D   | 500  | 6.8     | B, C, J, K | 500  | 51      | F, G, J, K | 500  | 390     | F, G, J, K | 200  |
| 1.2     | B, C, D   | 500  | 7.5     | B, C, J, K | 500  | 56      | F, G, J, K | 500  | 430     | F, G, J, K | 200  |
| 1.3     | B, C, D   | 500  | 8.2     | B, C, J, K | 500  | 62      | F, G, J, K | 500  | 470     | F, G, J, K | 200  |
| 1.4     | B, C, D   | 500  | 9.1     | B, C, J, K | 500  | 68      | F, G, J, K | 500  | 510     | F, G, J, K | 150  |
| 1.5     | B, C, D   | 500  | 10      | F, G, J, K | 500  | 75      | F, G, J, K | 500  | 560     | F, G, J, K | 150  |
| 1.6     | B, C, D   | 500  | 11      | F, G, J, K | 500  | 82      | F, G, J, K | 500  | 620     | F, G, J, K | 150  |
| 1.7     | B, C, D   | 500  | 12      | F, G, J, K | 500  | 91      | F, G, J, K | 500  | 680     | F, G, J, K | 150  |
| 1.8     | B, C, D   | 500  | 13      | F, G, J, K | 500  | 100     | F, G, J, K | 500  | 750     | F, G, J, K | 150  |
| 1.9     | B, C, D   | 500  | 15      | F, G, J, K | 500  | 110     | F, G, J, K | 300  | 820     | F, G, J, K | 150  |
| 2.0     | B, C, D   | 500  | 16      | F, G, J, K | 500  | 120     | F, G, J, K | 300  | 910     | F, G, J, K | 150  |
| 2.2     | B, C, D   | 500  | 18      | F, G, J, K | 500  | 130     | F, G, J, K | 300  | 1000    | F, G, J, K | 150  |
| 2.4     | B, C, D   | 500  |         |            |      |         |            |      |         |            |      |

**TABLE V: TC: A (0±30PPM/°C)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC | Cap. pF | Cap. Tol.  | WVDC |
|---------|-----------|------|---------|------------|------|---------|------------|------|---------|------------|------|
| 0.1     | B         | 500  | 3.9     | B, C, D    | 500  | 47      | F, G, J, K | 500  | 560     | F, G, J, K | 150  |
| 0.2     | B         | 500  | 4.3     | B, C, D    | 500  | 51      | F, G, J, K | 500  | 620     | F, G, J, K | 150  |
| 0.3     | B, C      | 500  | 4.7     | B, C, D    | 500  | 56      | F, G, J, K | 500  | 680     | F, G, J, K | 150  |
| 0.4     | B, C      | 500  | 5.1     | B, C, D    | 500  | 62      | F, G, J, K | 500  | 750     | F, G, J, K | 150  |
| 0.5     | B, C, D   | 500  | 5.6     | B, C, D    | 500  | 68      | F, G, J, K | 500  | 820     | F, G, J, K | 150  |
| 0.6     | B, C, D   | 500  | 6.2     | B, C, D    | 500  | 75      | F, G, J, K | 500  | 910     | F, G, J, K | 150  |
| 0.7     | B, C, D   | 500  | 6.8     | B, C, J, K | 500  | 82      | F, G, J, K | 500  | 1000    | F, G, J, K | 150  |
| 0.8     | B, C, D   | 500  | 7.5     | B, C, J, K | 500  | 91      | F, G, J, K | 500  | 1100    | F, G, J, K | 50   |
| 0.9     | B, C, D   | 500  | 8.2     | B, C, J, K | 500  | 100     | F, G, J, K | 500  | 1200    | F, G, J, K | 50   |
| 1.0     | B, C, D   | 500  | 9.1     | B, C, J, K | 500  | 110     | F, G, J, K | 300  | 1300    | F, G, J, K | 50   |
| 1.1     | B, C, D   | 500  | 10      | F, G, J, K | 500  | 120     | F, G, J, K | 300  | 1500    | F, G, J, K | 50   |
| 1.2     | B, C, D   | 500  | 11      | F, G, J, K | 500  | 130     | F, G, J, K | 300  | 1600    | F, G, J, K | 50   |
| 1.3     | B, C, D   | 500  | 12      | F, G, J, K | 500  | 150     | F, G, J, K | 300  | 1800    | F, G, J, K | 50   |
| 1.4     | B, C, D   | 500  | 13      | F, G, J, K | 500  | 160     | F, G, J, K | 300  | 2000    | F, G, J, K | 50   |
| 1.5     | B, C, D   | 500  | 15      | F, G, J, K | 500  | 180     | F, G, J, K | 300  | 2200    | F, G, J, K | 50   |
| 1.6     | B, C, D   | 500  | 16      | F, G, J, K | 500  | 200     | F, G, J, K | 300  | 2400    | F, G, J, K | 50   |
| 1.7     | B, C, D   | 500  | 18      | F, G, J, K | 500  | 220     | F, G, J, K | 200  | 2700    | F, G, J, K | 50   |
| 1.8     | B, C, D   | 500  | 20      | F, G, J, K | 500  | 240     | F, G, J, K | 200  | 3000    | F, G, J, K | 50   |
| 1.9     | B, C, D   | 500  | 22      | F, G, J, K | 500  | 270     | F, G, J, K | 200  | 3300    | F, G, J, K | 50   |
| 2.0     | B, C, D   | 500  | 24      | F, G, J, K | 500  | 300     | F, G, J, K | 200  | 3600    | F, G, J, K | 50   |
| 2.2     | B, C, D   | 500  | 27      | F, G, J, K | 500  | 330     | F, G, J, K | 200  | 3900    | F, G, J, K | 50   |
| 2.4     | B, C, D   | 500  | 30      | F, G, J, K | 500  | 360     | F, G, J, K | 200  | 4300    | F, G, J, K | 50   |
| 2.7     | B, C, D   | 500  | 33      | F, G, J, K | 500  | 390     | F, G, J, K | 200  | 4700    | F, G, J, K | 50   |
| 3.0     | B, C, D   | 500  | 36      | F, G, J, K | 500  | 430     | F, G, J, K | 200  | 5000    | F, G, J, K | 50   |
| 3.3     | B, C, D   | 500  | 39      | F, G, J, K | 500  | 470     | F, G, J, K | 200  | 5100    | F, G, J, K | 50   |
| 3.6     | B, C, D   | 500  | 43      | F, G, J, K | 500  | 510     | F, G, J, K | 150  |         |            |      |

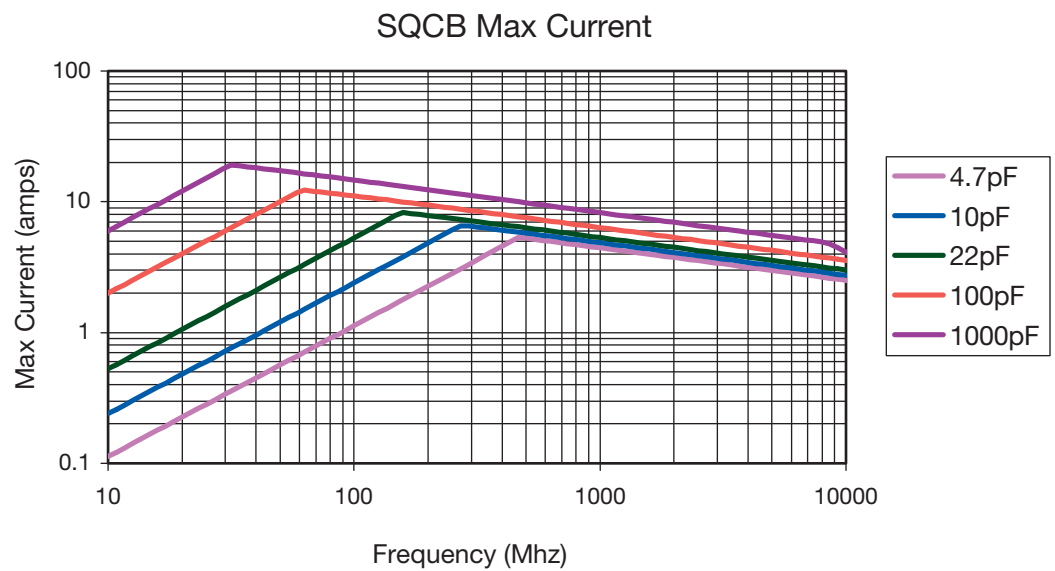
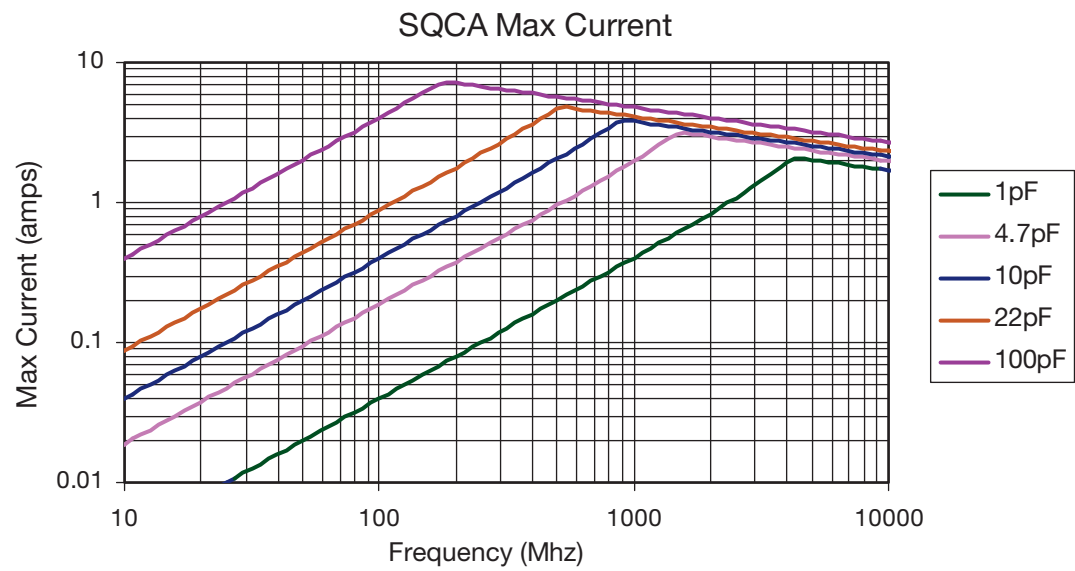
**TABLE VI: TC: C (±15%)**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC |
|---------|-----------|------|---------|-----------|------|---------|-----------|------|
| 5000    | K, M, N   | 50   | 15000   | K, M, N   | 50   | 47000   | K, M, N   | 50   |
| 6800    | K, M, N   | 50   | 18000   | K, M, N   | 50   | 68000   | K, M, N   | 50   |
| 8200    | K, M, N   | 50   | 27000   | K, M, N   | 50   | 82000   | K, M, N   | 50   |
| 10000   | K, M, N   | 50   | 33000   | K, M, N   | 50   | 100000  | K, M, N   | 50   |
| 12000   | K, M, N   | 50   | 39000   | K, M, N   | 50   |         |           |      |



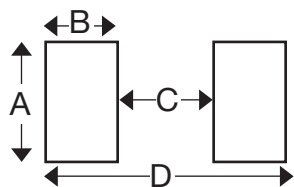
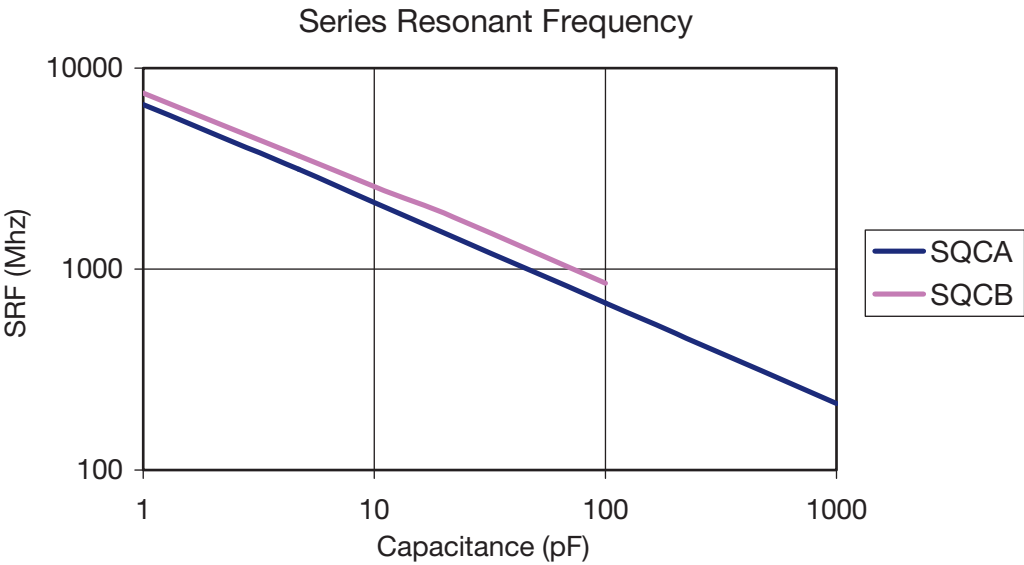
# Microwave MLC's

## SQ Series Ultra Low ESR MLC



# Microwave MLC's

## SQ Series Ultra Low ESR MLC



**MOUNTING PAD DIMENSIONS:** inches (millimeters)

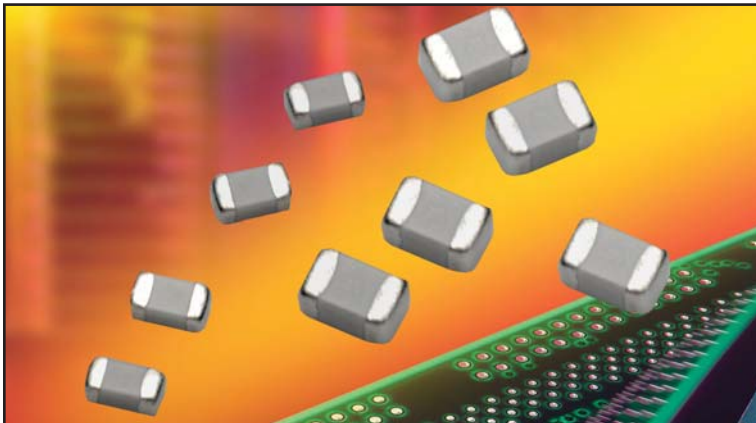
| Case | A min         | B min         | C min         | D min         |
|------|---------------|---------------|---------------|---------------|
| SQCA | 0.082 (2.083) | 0.051 (1.295) | 0.032 (0.813) | 0.130 (3.302) |
| SQCB | 0.131 (3.327) | 0.051 (1.295) | 0.074 (1.880) | 0.177 (4.496) |
| SQCS | 0.038 (0.965) | 0.043 (1.092) | 0.025 (0.635) | 0.112 (2.845) |
| SQCF | 0.059 (1.499) | 0.051 (1.295) | 0.024 (0.610) | 0.125 (3.175) |

### SQCA & SQCB DESIGN KITS

| PN          | Series | Diel | Term             | Range           | Different Values | # per value |
|-------------|--------|------|------------------|-----------------|------------------|-------------|
| KITSQ100LF  | SQCA   | P90  | 100% Tin<br>RoHS | .1 to 2pF       | 16               | 15          |
| KITSQ400LF  |        | C0G  |                  |                 |                  |             |
| KITSQ200LF  | SQCA   | P90  | 100% Tin<br>RoHS | 1 to 10pF       | 16               | 15          |
| KITSQ500LF  |        | C0G  |                  |                 |                  |             |
| KITSQ300LF  | SQCA   | P90  | 100% Tin<br>RoHS | 10 to 100pF     | 16               | 15          |
| KITSQ600LF  |        | C0G  |                  |                 |                  |             |
| KITSQ700LF  | SQCA   | C0G  | 100% Tin<br>RoHS | 100 to 1000pF   | 16               | 15          |
| KITSQ800LF  | SQCB   | P90  | 100% Tin<br>RoHS | 1 to 10pF       | 16               | 15          |
| KITSQ1100LF |        | C0G  |                  |                 |                  |             |
| KITSQ900LF  | SQCB   | P90  | 100% Tin<br>RoHS | 10 to 100pF     | 16               | 15          |
| KITSQ1200LF |        | C0G  |                  |                 |                  |             |
| KITSQ1000LF | SQCB   | P90  | 100% Tin<br>RoHS | 100 to 1000pF   | 16               | 15          |
| KITSQ1300LF |        | C0G  |                  |                 |                  |             |
| KITSQ1400LF | SQCB   | C0G  | 100% Tin<br>RoHS | 1000 to 5100 pF | 11               | 15          |

# Microwave MLC's

SQCS (0603) SQCF (0805) Ultra Low ESR MLC



## FEATURES:

- Low ESR
- High Q
- High Self Resonance
- Capacitance Range 0.1 pF to 240 pF
- EIA Size

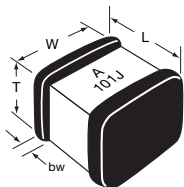
## APPLICATIONS:

- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- Point to Point Radios

## HOW TO ORDER

|                                   |                                                               |                                                  |                                                                        |                                                                                                                                                                                                               |                                                                                                                                                     |                                                                 |                                                                                                                                                     |                                                                                                                                                                |
|-----------------------------------|---------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>SQ</b></p> <p>AVX Style</p> | <p><b>CS</b></p> <p>Case Size<br/>CS = 0603<br/>CF = 0805</p> | <p><b>V</b></p> <p>Voltage Code<br/>V = 250V</p> | <p><b>A</b></p> <p>Temperature Coefficient Code<br/>A = 0±30ppm/°C</p> | <p><b>100</b></p> <p>Capacitance<br/>EIA Capacitance Code in pF.<br/>First two digits = significant figures or "R" for decimal place.<br/>Third digit = number of zeros or after "R" significant figures.</p> | <p><b>J</b></p> <p>Capacitance Tolerance Code<br/>A = ±.05 pF<br/>B = ±.1 pF<br/>C = ±.25 pF<br/>D = ±.5 pF<br/>F = ±1%<br/>G = ±2%<br/>J = ±5%</p> | <p><b>A</b></p> <p>Failure Rate Code<br/>A = Not Applicable</p> | <p><b>T</b></p> <p>Termination Style Code<br/>**1 = Pd/Ag<br/>**7 = Ag/Ni/Au<br/>J = Nickel Barrier Sn/Pb (60/40)<br/>**T = 100% Tin (Standard)</p> | <p><b>1A</b></p> <p>Packaging Code<br/>1A = 7" Reel Unmarked<br/>ME = 7" Reel Marked<br/><br/>* Vertical T&amp;R available<br/>* 500 piece reels available</p> |
|-----------------------------------|---------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|

\*\*RoHS compliant



## MECHANICAL DIMENSIONS: inches (millimeters)

| Case | Length (L)               | Width (W)                | Thickness (T)       | Band Width (bw)          |
|------|--------------------------|--------------------------|---------------------|--------------------------|
| SQCS | .063±.006<br>(1.60±.152) | .032±.006<br>(.813±.152) | .030 Max.<br>(.762) | .014±.006<br>(.357±.152) |
| SQCF | .079±.008<br>(2.01±.200) | .049±.008<br>(1.24±.200) | .045 Max.<br>(1.14) | .014±.006<br>(.357±.152) |

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

- 8mm carrier
- 7" reel = 4000 pcs (500 piece options)

**Not RoHS Compliant**



For RoHS compliant products, please select correct termination style.



# Microwave MLC's

## Low ESR MLC Capacitors



### ELECTRICAL SPECIFICATIONS

|                                       |                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient (TCC)         | (A) 0 ± 30 PPM/°C                                                                                                           |
| Operating Temperature                 | -55°C to +125°C                                                                                                             |
| Quality Factor (Q)                    | Greater than 10,000 at 1 MHz                                                                                                |
| Insulation Resistance (IR)            | 0.1 pF to 240 pF<br>10 <sup>5</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>4</sup> Megohms min. @ 125°C at rated WVDC |
| Working Voltage (WVDC)                | See Capacitance Values table                                                                                                |
| Dielectric Withstanding Voltage (DWW) | 250% of rated WVDC for 5 secs                                                                                               |
| Aging Effects                         | None                                                                                                                        |
| Piezoelectric Effects                 | None                                                                                                                        |
| Capacitance Drift                     | ± (0.02% or 0.02 pF), whichever is greater                                                                                  |

### ENVIRONMENTAL CHARACTERISTICS

AVX SQ will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

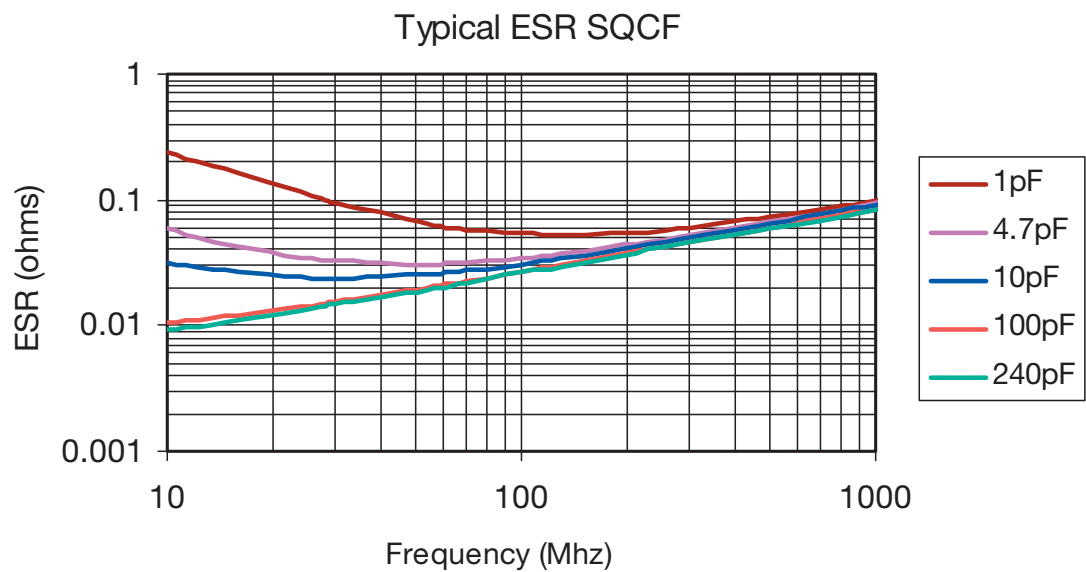
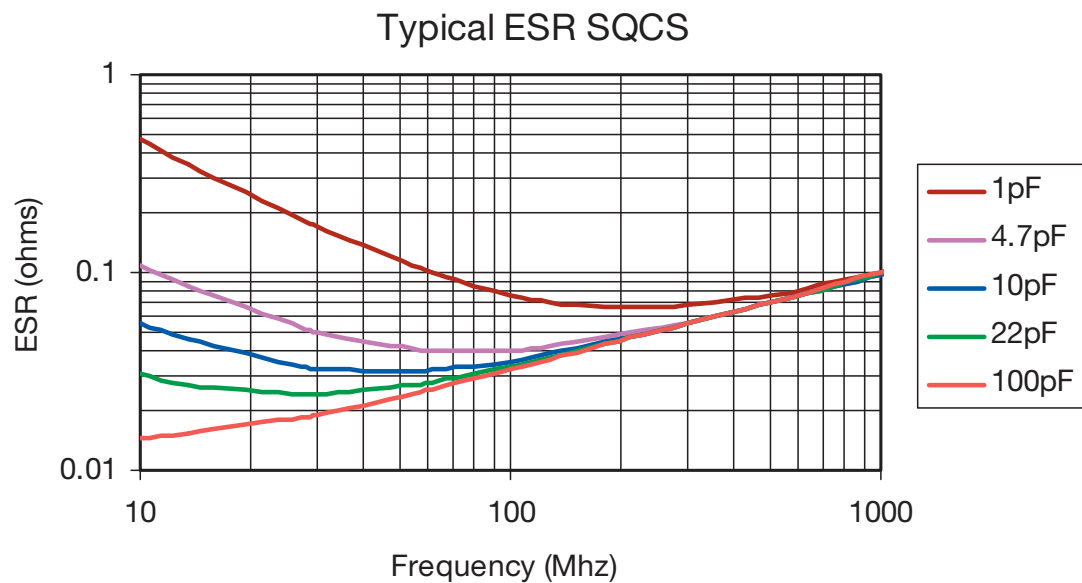
|                           |                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Thermal Shock             | Mil-STD-202, Method 107, Condition A                                                                                                          |
| Moisture Resistance       | Mil-STD-202, Method 106                                                                                                                       |
| Low Voltage Humidity      | Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours |
| Life Test                 | Mil-STD-202, Method 108, for 2000 hours at 125°C                                                                                              |
| Shock                     | Mil-STD-202, Method 213, Condition J                                                                                                          |
| Vibration                 | Mil-STD-202, Method 204, Condition B                                                                                                          |
| Immersion                 | Mil-STD-202, Method 104, Condition B                                                                                                          |
| Salt Spray                | Mil-STD-202, Method 101, Condition B                                                                                                          |
| Solderability             | Mil-STD-202, Method 208                                                                                                                       |
| Terminal Strength         | Mil-STD-202, Method 211                                                                                                                       |
| Temperature Cycling       | Mil-STD-202, Method 102, Condition C                                                                                                          |
| Barometric Pressure       | Mil-STD-202, Method 105, Condition B                                                                                                          |
| Resistance to Solder Heat | Mil-STD-202, Method 210, Condition C                                                                                                          |

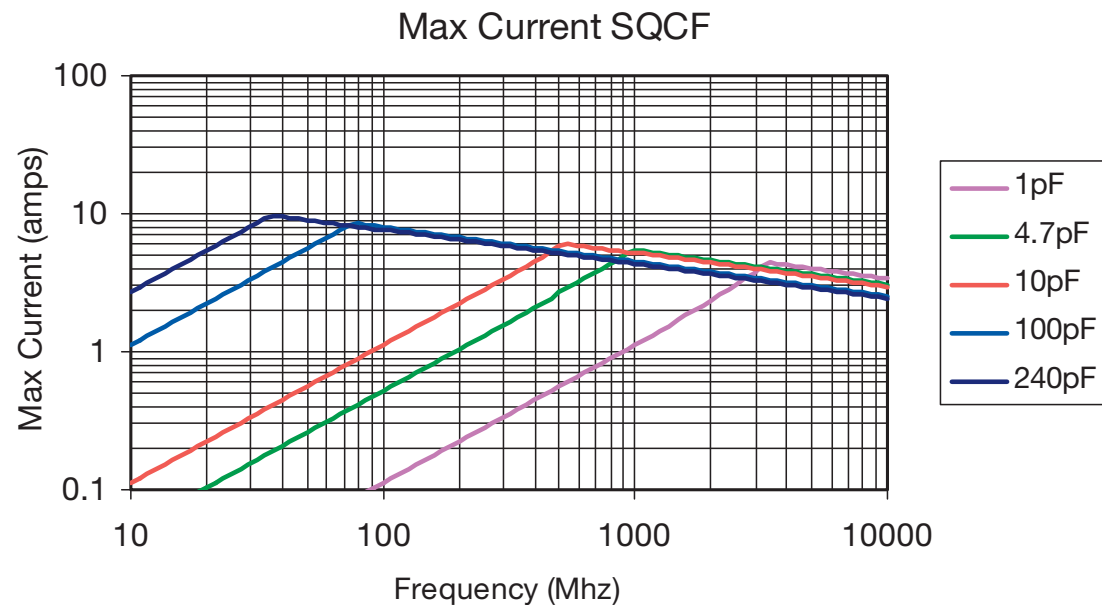
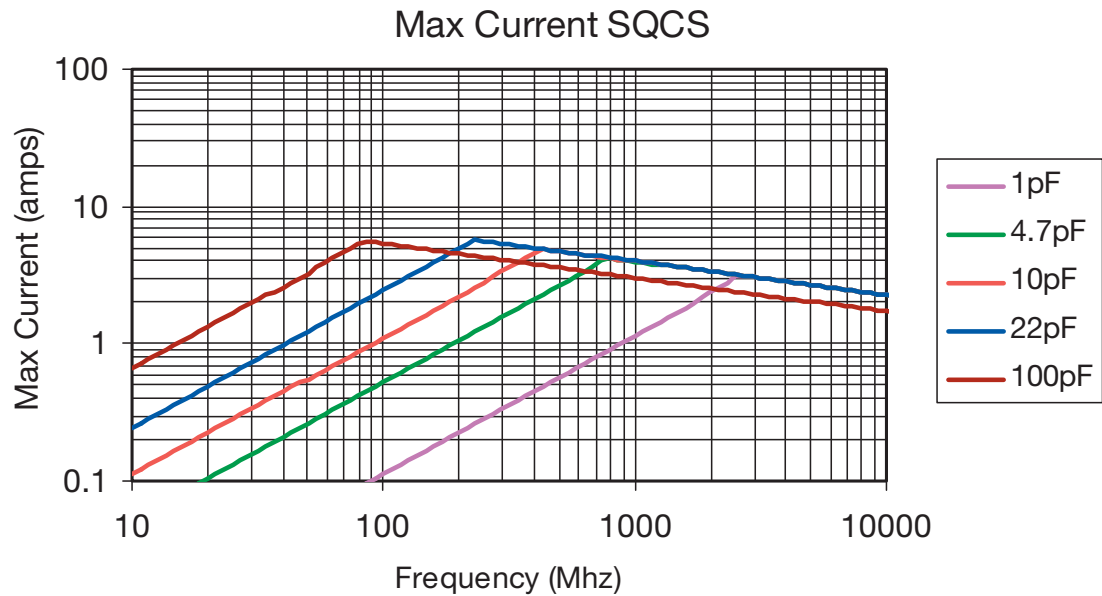
**TABLE I: TC: A (0±30PPM/°C) CASE SIZE S**

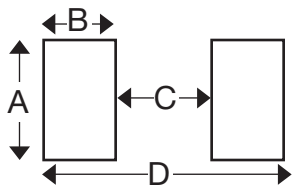
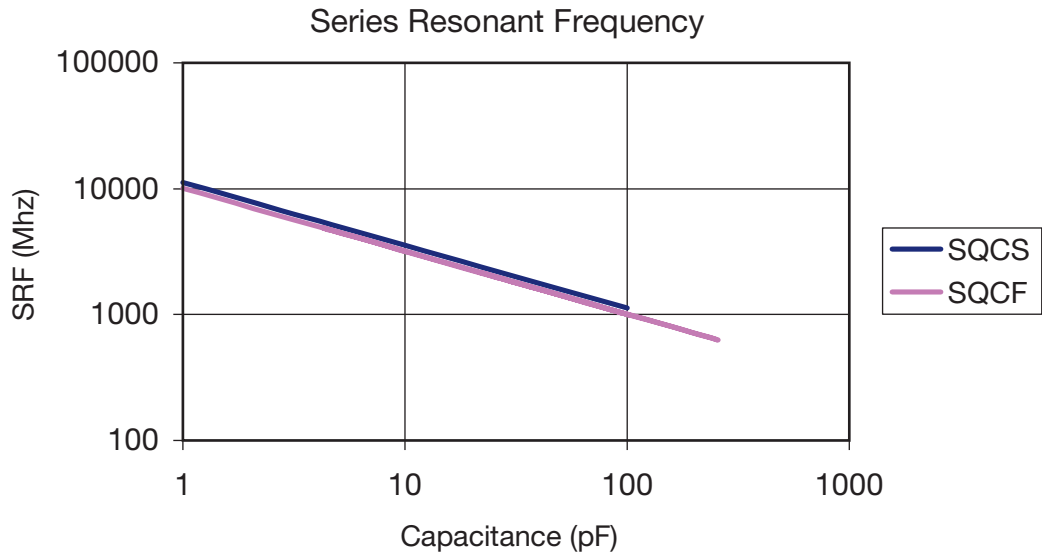
| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC |
|---------|-----------|------|---------|-----------|------|---------|-----------|------|
| 0.1     | A, B      | 250  | 2.4     | A, B, C   | 250  | 18      | F, G, J   | 250  |
| 0.2     | A, B      | 250  | 2.7     | A, B, C   | 250  | 20      | F, G, J   | 250  |
| 0.3     | A, B      | 250  | 3.0     | A, B, C   | 250  | 22      | F, G, J   | 250  |
| 0.4     | A, B      | 250  | 3.3     | A, B, C   | 250  | 24      | F, G, J   | 250  |
| 0.5     | A, B, C   | 250  | 3.6     | A, B, C   | 250  | 27      | F, G, J   | 250  |
| 0.6     | A, B, C   | 250  | 3.9     | A, B, C   | 250  | 30      | F, G, J   | 250  |
| 0.7     | A, B, C   | 250  | 4.3     | A, B, C   | 250  | 33      | F, G, J   | 250  |
| 0.8     | A, B, C   | 250  | 4.7     | A, B, C   | 250  | 36      | F, G, J   | 250  |
| 0.9     | A, B, C   | 250  | 5.1     | A, B, C   | 250  | 39      | F, G, J   | 250  |
| 1.0     | A, B, C   | 250  | 5.6     | A, B, C   | 250  | 43      | F, G, J   | 250  |
| 1.1     | A, B, C   | 250  | 6.2     | A, B, C   | 250  | 47      | F, G, J   | 250  |
| 1.2     | A, B, C   | 250  | 6.8     | B, C, D   | 250  | 51      | F, G, J   | 250  |
| 1.3     | A, B, C   | 250  | 7.5     | B, C, D   | 250  | 56      | F, G, J   | 250  |
| 1.4     | A, B, C   | 250  | 8.2     | B, C, D   | 250  | 62      | F, G, J   | 250  |
| 1.5     | A, B, C   | 250  | 9.1     | B, C, D   | 250  | 68      | F, G, J   | 250  |
| 1.6     | A, B, C   | 250  | 10      | F, G, J   | 250  | 75      | F, G, J   | 250  |
| 1.7     | A, B, C   | 250  | 11      | F, G, J   | 250  | 82      | F, G, J   | 250  |
| 1.8     | A, B, C   | 250  | 12      | F, G, J   | 250  | 91      | F, G, J   | 250  |
| 1.9     | A, B, C   | 250  | 13      | F, G, J   | 250  | 100     | F, G, J   | 250  |
| 2.0     | A, B, C   | 250  | 15      | F, G, J   | 250  |         |           |      |
| 2.2     | A, B, C   | 250  | 16      | F, G, J   | 250  |         |           |      |

**TABLE II: TC: A (0±30PPM/°C) CASE SIZE F**

| Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC |
|---------|-----------|------|---------|-----------|------|---------|-----------|------|---------|-----------|------|
| 0.1     | A, B      | 250  | 2.4     | A, B, C   | 250  | 18      | F, G, J   | 250  | 150     | F, G, J   | 250  |
| 0.2     | A, B      | 250  | 2.7     | A, B, C   | 250  | 20      | F, G, J   | 250  | 180     | F, G, J   | 250  |
| 0.3     | A, B      | 250  | 3.0     | A, B, C   | 250  | 22      | F, G, J   | 250  | 200     | F, G, J   | 250  |
| 0.4     | A, B      | 250  | 3.3     | A, B, C   | 250  | 24      | F, G, J   | 250  | 220     | F, G, J   | 250  |
| 0.5     | A, B, C   | 250  | 3.6     | A, B, C   | 250  | 27      | F, G, J   | 250  | 240     | F, G, J   | 250  |
| 0.6     | A, B, C   | 250  | 3.9     | A, B, C   | 250  | 30      | F, G, J   | 250  |         |           |      |
| 0.7     | A, B, C   | 250  | 4.3     | A, B, C   | 250  | 33      | F, G, J   | 250  |         |           |      |
| 0.8     | A, B, C   | 250  | 4.7     | A, B, C   | 250  | 36      | F, G, J   | 250  |         |           |      |
| 0.9     | A, B, C   | 250  | 5.1     | A, B, C   | 250  | 39      | F, G, J   | 250  |         |           |      |
| 1.0     | A, B, C   | 250  | 5.6     | A, B, C   | 250  | 43      | F, G, J   | 250  |         |           |      |
| 1.1     | A, B, C   | 250  | 6.2     | A, B, C   | 250  | 47      | F, G, J   | 250  |         |           |      |
| 1.2     | A, B, C   | 250  | 6.8     | B, C, D   | 250  | 51      | F, G, J   | 250  |         |           |      |
| 1.3     | A, B, C   | 250  | 7.5     | B, C, D   | 250  | 56      | F, G, J   | 250  |         |           |      |
| 1.4     | A, B, C   | 250  | 8.2     | B, C, D   | 250  | 62      | F, G, J   | 250  |         |           |      |
| 1.5     | A, B, C   | 250  | 9.1     | B, C, D   | 250  | 68      | F, G, J   | 250  |         |           |      |
| 1.6     | A, B, C   | 250  | 10      | F, G, J   | 250  | 75      | F, G, J   | 250  |         |           |      |
| 1.7     | A, B, C   | 250  | 11      | F, G, J   | 250  | 82      | F, G, J   | 250  |         |           |      |
| 1.8     | A, B, C   | 250  | 12      | F, G, J   | 250  | 91      | F, G, J   | 250  |         |           |      |
| 1.9     | A, B, C   | 250  | 13      | F, G, J   | 250  | 100     | F, G, J   | 250  |         |           |      |
| 2.0     | A, B, C   | 250  | 15      | F, G, J   | 250  | 110     | F, G, J   | 250  |         |           |      |
| 2.2     | A, B, C   | 250  | 16      | F, G, J   | 250  | 120     | F, G, J   | 250  |         |           |      |







MOUNTING PAD DIMENSIONS: inches (millimeters)

| Case | A min         | B min         | C min         | D min         |
|------|---------------|---------------|---------------|---------------|
| SQCA | 0.082 (2.083) | 0.051 (1.295) | 0.032 (0.813) | 0.130 (3.302) |
| SQCB | 0.131 (3.327) | 0.051 (1.295) | 0.074 (1.880) | 0.177 (4.496) |
| SQCS | 0.038 (0.965) | 0.043 (1.092) | 0.025 (0.635) | 0.112 (2.845) |
| SQCF | 0.059 (1.499) | 0.051 (1.295) | 0.024 (0.610) | 0.125 (3.175) |

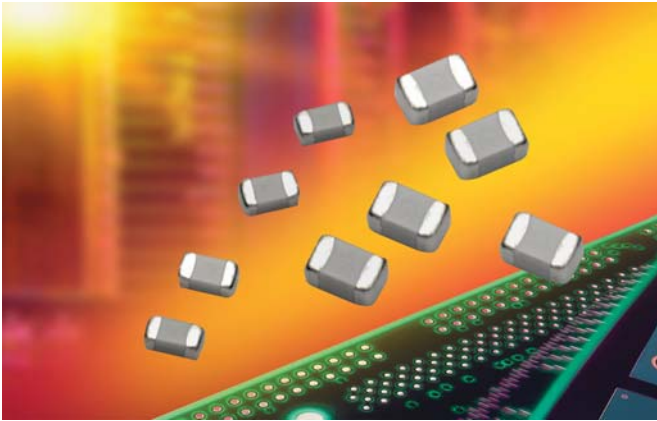
SQCS & SQCF ENGINEERING KITS

| PN           | Series | Diel | Term     | Range       | Different Values | # per value |
|--------------|--------|------|----------|-------------|------------------|-------------|
| Kit SQ1800LF | SQCF   | C0G  | 100% Tin | .1 to 10pF  | 27               | 15          |
| Kit SQ1900LF |        |      | RoHS     | 10 to 240pF | 22               |             |
| Kit SQ1500LF | SQCS   | C0G  | 100%Tin  | .1 to 10pF  | 27               | 15          |
| Kit SQ1600LF |        |      | RoHS     | 10 to 100pF | 16               |             |

| Tolerance per PF: |                  |
|-------------------|------------------|
| B from .1 to 3.3  | J from 10 to 240 |
| C from 3.9 to 8.2 |                  |

# MK Series Capacitors

## Ultra Low ESR, C0G (NP0) Chip Capacitors

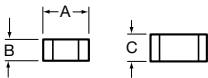


### GENERAL INFORMATION

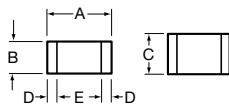
Capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0402, 0603, 0805, and 1210.

### DIMENSIONS: inches (millimeters)

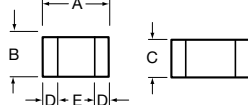
0402



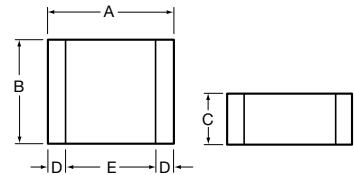
0603



0805



1210



inches (mm)

| Size | A                       | B                       | C                        | D                         | E                |
|------|-------------------------|-------------------------|--------------------------|---------------------------|------------------|
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max          | N/A                       | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max         | 0.010±0.005 (0.25±0.13)   | 0.030 (0.76) min |
| 0805 | 0.079±0.008 (2.01±0.2)  | 0.049±0.008 (1.25±0.2)  | 0.040±0.005 (1.02±0.127) | 0.020±0.010 (0.51±0.254)  | 0.020 (0.51) min |
| 1210 | 0.126±0.008 (3.2±0.2)   | 0.098±0.008 (2.49±0.2)  | 0.050±0.005 (1.27±0.127) | 0.025±0.015 (0.635±0.381) | 0.040 (1.02) min |

### HOW TO ORDER

**MK05**

**Case Size**  
MK02 = 0402  
MK03 = 0603  
MK05 = 0805  
MK10 = 1210

**V**

**Voltage Code**  
3 = 25V  
5 = 50V  
1 = 100V  
2 = 200V  
V = 250V  
7 = 500V

**7**

**Dielectric = Ultra Low ESR**

**100**

**Capacitance**

EIA Capacitance Code in pF.  
First two digits = significant figures or "R" for decimal place.  
Third digit = number of zeros or after "R" significant figures.

**J**

**Capacitance Tolerance Code**

B = ±0.1pF  
C = ±0.25pF  
D = ±0.5pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

**A**

**Failure Rate Code**  
A = Not Applicable

**T**

**Termination**  
T = 100% Tin

**2**

**Packaging Code**  
2 = 7" Reel  
4 = 13" Reel  
9 = Bulk

**A**

**Special Code**  
A = Standard



LEAD-FREE  
LEAD-FREE COMPATIBLE  
COMPONENT



RoHS  
COMPLIANT

# MK Series Capacitors



## Ultra Low ESR, C0G (NP0) Chip Capacitors

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size MK02 - 0.2 pF to 30 pF @ 1 MHz  
Size MK03 - 0.2 pF to 120 pF @ 1 MHz  
Size MK05 - 1.0 pF to 160 pF @ 1 MHz  
Size MK10 - 1.0 pF to 1000 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
MK02 - 50, 25 WVDC  
MK03 - 250, 200, 100, 50 WVDC  
MK05 - 250 WVDC  
MK10 - 500, 200, 100 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

MK02 - See Performance Curve, page 207  
MK03 - See Performance Curve, page 207  
MK05 - See Performance Curve, page 207  
MK10 - See Performance Curve, page 207

#### MILITARY SPECIFICATIONS

Meets or exceeds the requirements  
of MIL-C-55681

### CAPACITANCE RANGE

| Cap (pF) | Available | Size |      |      |      |
|----------|-----------|------|------|------|------|
|          | Tolerance | MK02 | MK03 | MK05 | MK10 |
| 0.2      | B,C       | 50V  | 250V | N/A  | N/A  |
| 0.3      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 0.4      | B,C       | ↓    | ↓    | ↓    | ↓    |
| 0.5      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 0.6      | B,C,D     | ↓    | ↓    | ↓    | ↓    |
| 0.7      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 0.8      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 0.9      | B,C,D     | ↓    | ↓    | ↓    | ↓    |

| Cap (pF) | Available | Size |      |      |      |
|----------|-----------|------|------|------|------|
|          | Tolerance | MK02 | MK03 | MK05 | MK10 |
| 1.0      | B,C,D     | 50V  | 250V | 250V | 500V |
| 1.1      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.2      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.3      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.4      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.5      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.6      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.7      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.8      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1.9      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 2.0      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 2.1      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 2.2      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 2.4      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 2.7      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 3.0      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 3.3      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 3.6      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 3.9      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 4.3      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 4.7      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 5.1      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 5.6      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 6.2      | B,C,D     | ↓    | ↓    | ↓    | ↓    |
| 6.8      | B,C,J,K,M | ↓    | ↓    | ↓    | ↓    |

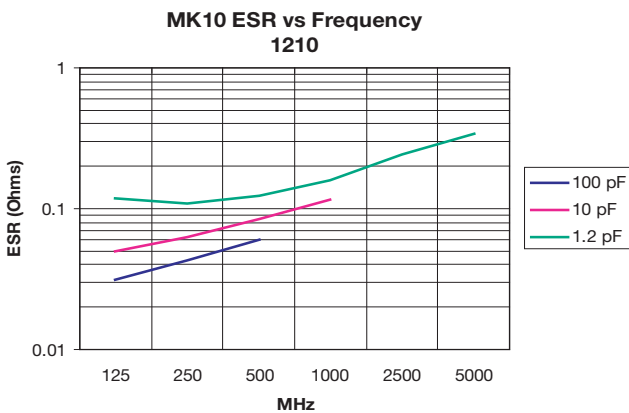
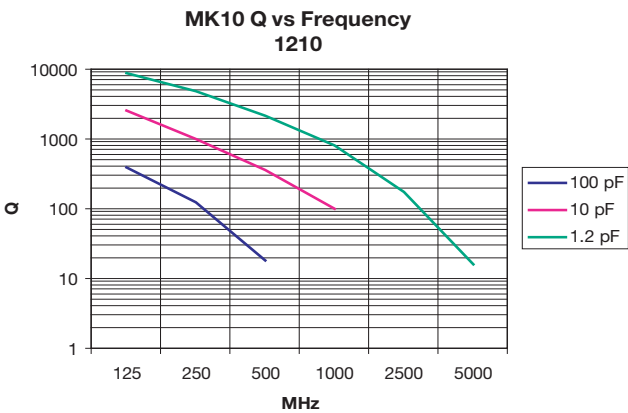
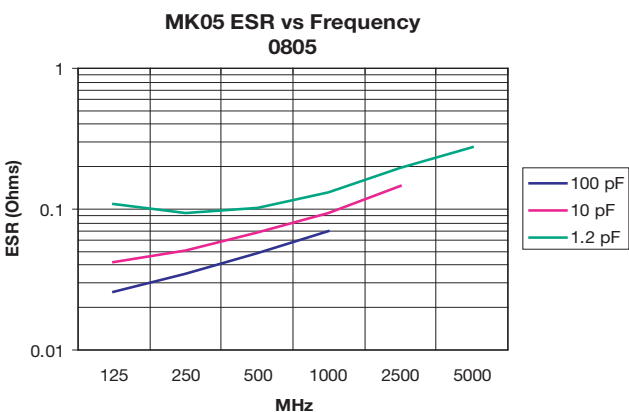
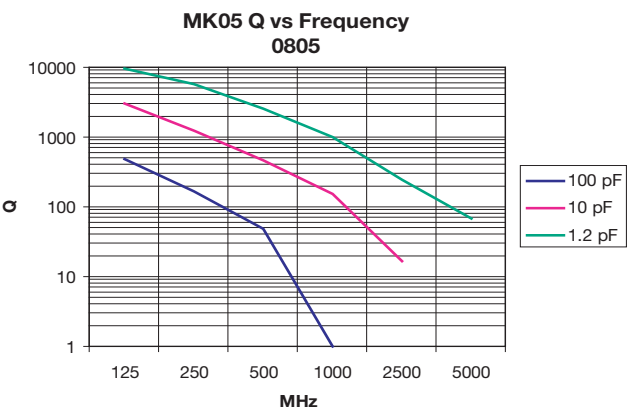
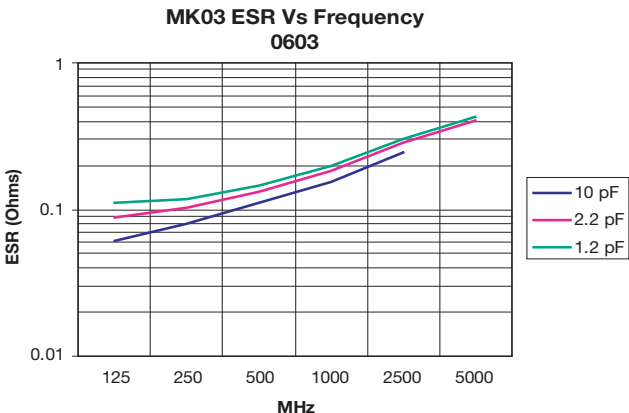
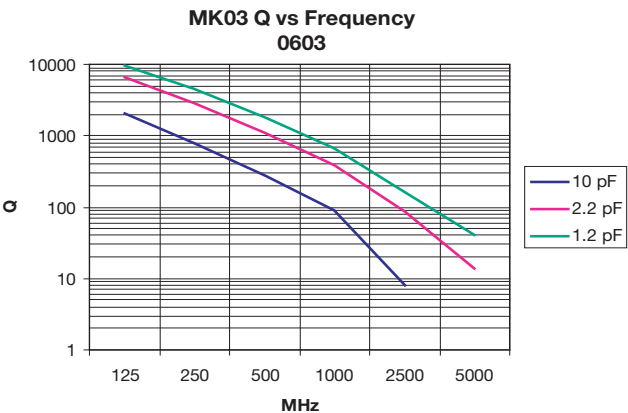
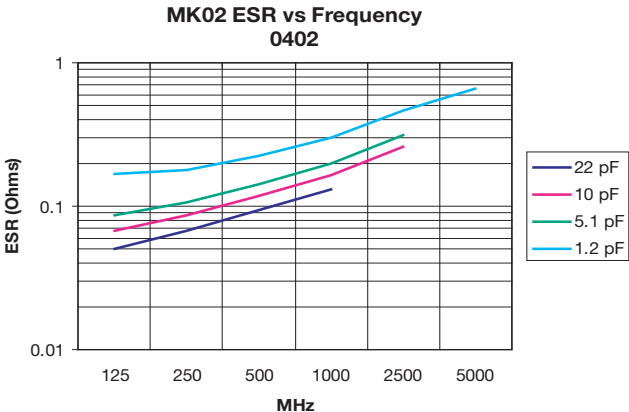
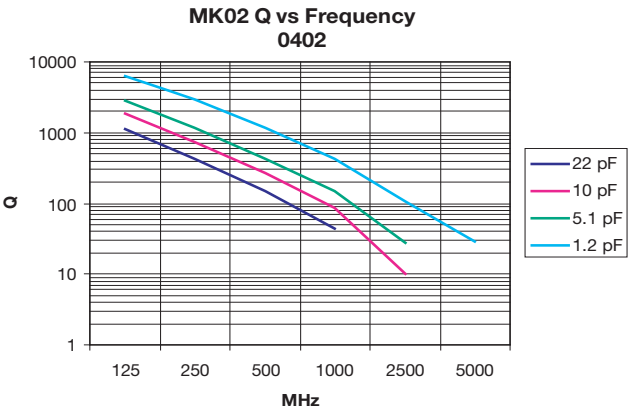
| Cap (pF) | Available | Size |      |      |      |
|----------|-----------|------|------|------|------|
|          | Tolerance | MK02 | MK03 | MK05 | MK10 |
| 7.5      | B,C,J,K,M | 50V  | 250V | 250V | 500V |
| 8.2      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 9.1      | B,C,J,K,M | ↓    | ↓    | ↓    | ↓    |
| 10       | F,G,J,K,M | ↓    | ↓    | ↓    | ↓    |
| 11       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 12       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 13       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 15       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 18       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 20       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 22       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 24       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 27       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 30       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 33       | ↓         | N/A  | ↓    | ↓    | ↓    |
| 36       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 39       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 43       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 47       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 51       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 56       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 68       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 75       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 82       | ↓         | ↓    | ↓    | ↓    | ↓    |
| 91       | ↓         | ↓    | ↓    | ↓    | ↓    |

| Cap (pF) | Available | Size |      |      |      |
|----------|-----------|------|------|------|------|
|          | Tolerance | MK02 | MK03 | MK05 | MK10 |
| 100      | F,G,J,K,M | N/A  | 100V | 250V | 500V |
| 110      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 120      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 130      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 140      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 150      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 160      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 180      | ↓         | ↓    | ↓    | N/A  | ↓    |
| 200      | ↓         | ↓    | ↓    | ↓    | 200  |
| 220      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 270      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 300      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 330      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 360      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 390      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 430      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 470      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 510      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 560      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 620      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 680      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 750      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 820      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 910      | ↓         | ↓    | ↓    | ↓    | ↓    |
| 1000     | F,G,J,K,M | ↓    | ↓    | ↓    | ↓    |



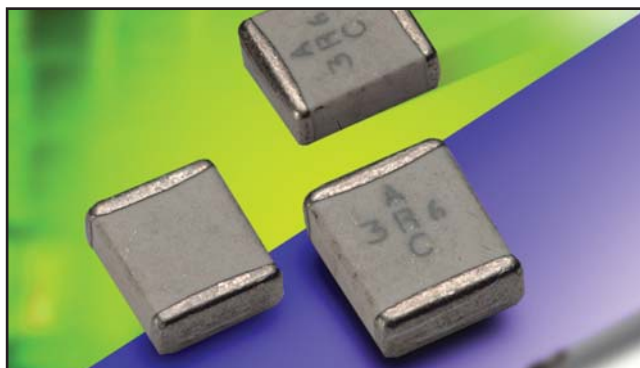
# MK Series Capacitors

Ultra Low ESR, C0G (NP0) Chip Capacitors



# Microwave MLC's

## AQ Series

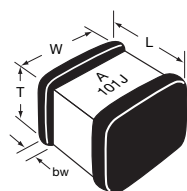


These porcelain and ceramic dielectric multilayer capacitor (MLC) chips are best suited for RF/ Microwave applications typically ranging from 10 MHz to 4.2 GHz. Characteristic is a fine grained, high density, high purity dielectric material impervious to moisture with heavy internal palladium electrodes.

These characteristics lend well to applications requiring:

- 1) high current carrying capabilities;
- 2) high quality factors;
- 3) very low equivalent series resistance;
- 4) very high series resonance;
- 5) excellent stability under stresses of changing voltage, frequency, time and temperature.

### MECHANICAL DIMENSIONS: inches (millimeters)



| Case | Length (L)                                | Width (W)                | Thickness (T)            | Band Width (bw)                         |
|------|-------------------------------------------|--------------------------|--------------------------|-----------------------------------------|
| AQ11 | .055±.015<br>(1.40±.381)                  | .055±.015<br>(1.40±.381) | .020/.057<br>(.508/1.45) | .010 + .010 -.005<br>(.254 +.254 -.127) |
| AQ12 | .055 + .015 - .010<br>(1.40+ .381 - .254) | .055±.015<br>(1.40±.381) | .020/.057<br>(.508/1.45) | .010 + .010 -.005<br>(.254 +.254 -.127) |
| AQ13 | .110±.020<br>(2.79±.508)                  | .110±.020<br>(2.79±.508) | .030/.102<br>(.762/2.59) | .015±.010<br>(.381±.254)                |
| AQ14 | .110 + .020 - .010<br>(2.79 +.889 -.254)  | .110±.010<br>(2.79±.508) | .030/.102<br>(.762/2.59) | .015±.010<br>(.381±.254)                |

### HOW TO ORDER

|                                                     |                                       |                                                                                                 |                                                                                                                                                            |                                                                                                                                                                                                 |                                                                                                                                                        |                                                     |                                                                                                                                                                                   |                                                                                                                                                      |
|-----------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AQ</b><br>AVX Style<br>AQ11, AQ12,<br>AQ13, AQ14 | <b>11</b><br>Case Size<br>(See Chart) | <b>E</b><br>Voltage Code<br>5 = 50V<br>1 = 100V<br>E = 150V<br>2 = 200V<br>9 = 300V<br>7 = 500V | <b>M</b><br>Temperature Coefficient Code<br>M = +90±20ppm/°C (AQ11/12/13/14)<br>A = 0±30ppm/°C (AQ11/12/13/14)<br>C = 15% ("J" Termination only) (AQ12/14) | <b>100</b><br>Capacitance<br>EIA Capacitance Code in pF.<br>First two digits = significant figures or "R" for decimal place.<br>Third digit = number of zeros or after "R" significant figures. | <b>J</b><br>Capacitance Tolerance Code<br>B = ±.1 pF<br>C = ±.25 pF<br>D = ±.5 pF<br>F = ±1%<br>G = ±2%<br>J = ±5%<br>K = ±10%<br>M = ±20%<br>N = ±30% | <b>A</b><br>Failure Rate Code<br>A = Not Applicable | <b>1</b><br>Termination Style Code<br>1 = Pd/Ag (AQ11/13 only)<br>7 = Ag/Ni/Au (AQ11/13 only)<br>J = Nickel Barrier Sn/Pb (60/40) - (AQ12/14 only)<br>T = 100% Tin (AQ12/14 only) | <b>ME</b><br>Packaging* Code<br>3A = 13" Reel Unmarked<br>ME = 7" Reel Marked<br>RE = 13" Reel Marked<br>WE = Waffle Pack Marked<br>BE = Bulk Marked |
|-----------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|

### PACKAGING

Standard Packaging = Waffle Pack (maximum quantity is 80)

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

Sizes SQCA through SQCB, CDR11/12 through 13/14.

- 8mm carrier
- 7" reel: ≤0.040" thickness = 2000 pcs  
≤0.075" thickness = 2000 pcs
- 13" reel: ≤0.075" thickness = 10,000 pcs

**Not RoHS Compliant**



For RoHS compliant products, please select correct termination style.



### ELECTRICAL SPECIFICATIONS

| AQ11, AQ12, AQ13, AQ14                |                                                                                                                                                                                                                                                             |                                                                                                         |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|                                       | M & A                                                                                                                                                                                                                                                       | C                                                                                                       |
| Temperature Coefficient (TCC)         | (M) $+90 \pm 20$ PPM/°C ( -55°C to +125°C)<br>(M) $+90 \pm 30$ PPM/°C ( +125°C to +175°C)<br>(A) $0 \pm 30$ PPM/°C                                                                                                                                          | $\pm 15\%$ (-55°C to 125°C)                                                                             |
| Capacitance Range                     | (M) 0.1 pF to 1000 pF<br>(A) 0.1 pF to 5100 pF                                                                                                                                                                                                              | 0.001 $\mu$ F to 0.1 $\mu$ F                                                                            |
| Operating Temperature                 | 0.1 pF to 330 pF: from -55°C to +175°C<br>360 pF to 5100 pF: from -55°C to +125°C                                                                                                                                                                           | -55°C to +125°C                                                                                         |
| Quality Factor (Q)                    | M Dielectric A & B Case                                                                                                                                                                                                                                     | Greater than 10,000 at 1 MHz                                                                            |
|                                       | A Dielectric B Case                                                                                                                                                                                                                                         | Greater than 10,000 at 1 MHz<br>Greater than 2,000 at 1 MHz<br>Greater than 2,000 at 1 KHz              |
|                                       | A Dielectric A Case                                                                                                                                                                                                                                         | Greater than 10,000 at 1 MHz<br>Greater than 2,000 at 1 MHz                                             |
| Insulation Resistance (IR)            | 0.1 pF to 470 pF<br>10 <sup>6</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>5</sup> Megohms min. @ 125°C at rated WVDC<br>510 pF to 5100 pF<br>10 <sup>5</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>4</sup> Megohms min. @ 125°C at rated WVDC | 10 <sup>4</sup> Megohms min. @ 25°C at rated WVDC<br>10 <sup>3</sup> Megohms min. @ 125°C at rated WVDC |
| Working Voltage (WVDC)                | See Capacitance Values table                                                                                                                                                                                                                                | See Capacitance Values table                                                                            |
| Dielectric Withstanding Voltage (DWW) | 250% of rated WVDC for 5 secs<br>(for 500V rated 150% of rated voltage)                                                                                                                                                                                     | 250% of rated WVDC for 5 secs                                                                           |
| Aging Effects                         | None                                                                                                                                                                                                                                                        | <3% per decade hour                                                                                     |
| Piezoelectric Effects                 | None                                                                                                                                                                                                                                                        | None                                                                                                    |
| Capacitance Drift                     | $\pm$ (0.02% or 0.02 pF), whichever is greater                                                                                                                                                                                                              | Not Applicable                                                                                          |

### ENVIRONMENTAL CHARACTERISTICS

AVX SQLB will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

|                           |                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Thermal Shock             | Mil-STD-202, Method 107, Condition A                                                                                                          |
| Moisture Resistance       | Mil-STD-202, Method 106                                                                                                                       |
| Low Voltage Humidity      | Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours |
| Life Test                 | Mil-STD-202, Method 108, for 2000 hours at 125°C                                                                                              |
| Shock                     | Mil-STD-202, Method 213, Condition J                                                                                                          |
| Vibration                 | Mil-STD-202, Method 204, Condition B                                                                                                          |
| Immersion                 | Mil-STD-202, Method 104, Condition B                                                                                                          |
| Salt Spray                | Mil-STD-202, Method 101, Condition B                                                                                                          |
| Solderability             | Mil-STD-202, Method 208                                                                                                                       |
| Terminal Strength         | Mil-STD-202, Method 211                                                                                                                       |
| Temperature Cycling       | Mil-STD-202, Method 102, Condition C                                                                                                          |
| Barometric Pressure       | Mil-STD-202, Method 105, Condition B                                                                                                          |
| Resistance to Solder Heat | Mil-STD-202, Method 210, Condition C                                                                                                          |

**TABLE I: TC: M (+90±20PPM/°C)**  
**CASE SIZE 11, 12, 13 & 14**

**DIMENSIONS:** inches (millimeters)

| Case | Length                                | Width                 | Thickness             | Band Width                          | Avail. Term. |
|------|---------------------------------------|-----------------------|-----------------------|-------------------------------------|--------------|
| 11   | .055±.015 (1.40±.381)                 | .055±.015 (1.40±.381) | .020/.057 (.508/1.45) | .010 +.010 -.005 (.254 +.254 -.127) | 1 & 7        |
| 12   | .055±.025 (1.40±.635)                 | .055±.015 (1.40±.381) | .020/.057 (.508/1.45) | .010 +.010 -.005 (.254 +.254 -.127) | J            |
| 13   | .110±.020 (2.79±.508)                 | .110±.020 (2.79±.508) | .030/.102 (.762/2.59) | .015±.010 (.381±.254)               | 1 & 7        |
| 14   | .110 +0.035 -0.020 (2.79 +.889 -.508) | .110±.020 (2.79±.508) | .030/.102 (.762/2.59) | .015±.010 (.381±.254)               | J            |

| Case: AQ11, AQ12 |               |      | Case: AQ13, AQ14 |               |      |
|------------------|---------------|------|------------------|---------------|------|
| Cap. pF          | Cap. Tol.     | WVDC | Cap. pF          | Cap. Tol.     | WVDC |
| 0.1              | B             | 150  | 0.1              | B             | 500  |
| 0.2              | B             | 150  | 0.2              | B             | 500  |
| 0.3              | B,C           | 150  | 0.3              | B,C           | 500  |
| 0.4              | B,C           | 150  | 0.4              | B,C           | 500  |
| 0.5              | B, C, D       | 150  | 0.5              | B, C, D       | 500  |
| 0.6              | B, C, D       | 150  | 0.6              | B, C, D       | 500  |
| 0.7              | B, C, D       | 150  | 0.7              | B, C, D       | 500  |
| 0.8              | B, C, D       | 150  | 0.8              | B, C, D       | 500  |
| 0.9              | B, C, D       | 150  | 0.9              | B, C, D       | 500  |
| 1.0              | B, C, D       | 150  | 1.0              | B, C, D       | 500  |
| 1.1              | B, C, D       | 150  | 1.1              | B, C, D       | 500  |
| 1.2              | B, C, D       | 150  | 1.2              | B, C, D       | 500  |
| 1.3              | B, C, D       | 150  | 1.3              | B, C, D       | 500  |
| 1.4              | B, C, D       | 150  | 1.4              | B, C, D       | 500  |
| 1.5              | B, C, D       | 150  | 1.5              | B, C, D       | 500  |
| 1.6              | B, C, D       | 150  | 1.6              | B, C, D       | 500  |
| 1.7              | B, C, D       | 150  | 1.7              | B, C, D       | 500  |
| 1.8              | B, C, D       | 150  | 1.8              | B, C, D       | 500  |
| 1.9              | B, C, D       | 150  | 1.9              | B, C, D       | 500  |
| 2.0              | B, C, D       | 150  | 2.0              | B, C, D       | 500  |
| 2.2              | B, C, D       | 150  | 2.2              | B, C, D       | 500  |
| 2.4              | B, C, D       | 150  | 2.4              | B, C, D       | 500  |
| 2.7              | B, C, D       | 150  | 2.7              | B, C, D       | 500  |
| 3.0              | B, C, D       | 150  | 3.0              | B, C, D       | 500  |
| 3.3              | B, C, D       | 150  | 3.3              | B, C, D       | 500  |
| 3.6              | B, C, D       | 150  | 3.6              | B, C, D       | 500  |
| 3.9              | B, C, D       | 150  | 3.9              | B, C, D       | 500  |
| 4.3              | B, C, D       | 150  | 4.3              | B, C, D       | 500  |
| 4.7              | B, C, D       | 150  | 4.7              | B, C, D       | 500  |
| 5.1              | B, C, D       | 150  | 5.1              | B, C, D       | 500  |
| 5.6              | B, C, D       | 150  | 5.6              | B, C, D       | 500  |
| 6.2              | B, C, D       | 150  | 6.2              | B, C, D       | 500  |
| 6.8              | B, C, J, K, M | 150  | 6.8              | B, C, J, K, M | 500  |
| 7.5              | B, C, J, K, M | 150  | 7.5              | B, C, J, K, M | 500  |
| 8.2              | B, C, J, K, M | 150  | 8.2              | B, C, J, K, M | 500  |
| 9.1              | B, C, J, K, M | 150  | 9.1              | B, C, J, K, M | 500  |
| 10               | F, G, J, K, M | 150  | 10               | F, G, J, K, M | 500  |
| 11               | F, G, J, K, M | 150  | 11               | F, G, J, K, M | 500  |
| 12               | F, G, J, K, M | 150  | 12               | F, G, J, K, M | 500  |
| 13               | F, G, J, K, M | 150  | 13               | F, G, J, K, M | 500  |
| 15               | F, G, J, K, M | 150  | 15               | F, G, J, K, M | 500  |
| 16               | F, G, J, K, M | 150  | 16               | F, G, J, K, M | 500  |
| 18               | F, G, J, K, M | 150  | 18               | F, G, J, K, M | 500  |
| 20               | F, G, J, K, M | 150  | 20               | F, G, J, K, M | 500  |
| 22               | F, G, J, K, M | 150  | 22               | F, G, J, K, M | 500  |
| 24               | F, G, J, K, M | 150  | 24               | F, G, J, K, M | 500  |
| 27               | F, G, J, K, M | 150  | 27               | F, G, J, K, M | 500  |
| 30               | F, G, J, K, M | 150  | 30               | F, G, J, K, M | 500  |
| 33               | F, G, J, K, M | 150  | 33               | F, G, J, K, M | 500  |
| 36               | F, G, J, K, M | 150  | 36               | F, G, J, K, M | 500  |
| 39               | F, G, J, K, M | 150  | 39               | F, G, J, K, M | 500  |
| 43               | F, G, J, K, M | 150  | 43               | F, G, J, K, M | 500  |
| 47               | F, G, J, K, M | 150  | 47               | F, G, J, K, M | 500  |
| 51               | F, G, J, K, M | 150  | 51               | F, G, J, K, M | 500  |
| 56               | F, G, J, K, M | 150  | 56               | F, G, J, K, M | 500  |
| 62               | F, G, J, K, M | 150  | 62               | F, G, J, K, M | 500  |
| 68               | F, G, J, K, M | 150  | 68               | F, G, J, K, M | 500  |
| 75               | F, G, J, K, M | 150  | 75               | F, G, J, K, M | 500  |
| 82               | F, G, J, K, M | 150  | 82               | F, G, J, K, M | 500  |
| 91               | F, G, J, K, M | 150  | 91               | F, G, J, K, M | 500  |
| 100              | F, G, J, K, M | 150  |                  |               |      |

**TABLE II: TC: A ( $0 \pm 30 \text{PPM}/^\circ\text{C}$ )  
CASE SIZE 11, 12, 13 & 14**

**DIMENSIONS:** inches (millimeters)

| Case | Length                                | Width                 | Thickness             | Band Width                          | Avail. Term. |
|------|---------------------------------------|-----------------------|-----------------------|-------------------------------------|--------------|
| 11   | .055±.015 (1.40±.381)                 | .055±.015 (1.40±.381) | .020/.057 (.508/1.45) | .010 +.010 -.005 (.254 +.254 -.127) | 1 & 7        |
| 12   | .055±.025 (1.40±.635)                 | .055±.015 (1.40±.381) | .020/.057 (.508/1.45) | .010 +.010 -.005 (.254 +.254 -.127) | J            |
| 13   | .110±.020 (2.79±.508)                 | .110±.020 (2.79±.508) | .030/.102 (.762/2.59) | .015±.010 (.381±.254)               | 1 & 7        |
| 14   | .110 +0.035 -0.020 (2.79 +.889 -.508) | .110±.020 (2.79±.508) | .030/.102 (.762/2.59) | .015±.010 (.381±.254)               | J            |

| Case: AQ11, AQ12 |               |      |         |               |      |
|------------------|---------------|------|---------|---------------|------|
| Cap. pF          | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
| 0.1              | B             | 150  | 24      | F, G, J, K, M | 150  |
| 0.2              | B             | 150  | 27      | F, G, J, K, M | 150  |
| 0.3              | B,C           | 150  | 30      | F, G, J, K, M | 150  |
| 0.4              | B,C           | 150  | 33      | F, G, J, K, M | 150  |
| 0.5              | B, C, D       | 150  | 36      | F, G, J, K, M | 150  |
| 0.6              | B, C, D       | 150  | 39      | F, G, J, K, M | 150  |
| 0.7              | B, C, D       | 150  | 43      | F, G, J, K, M | 150  |
| 0.8              | B, C, D       | 150  | 47      | F, G, J, K, M | 150  |
| 0.9              | B, C, D       | 150  | 51      | F, G, J, K, M | 150  |
| 1.0              | B, C, D       | 150  | 56      | F, G, J, K, M | 150  |
| 1.1              | B, C, D       | 150  | 62      | F, G, J, K, M | 150  |
| 1.2              | B, C, D       | 150  | 68      | F, G, J, K, M | 150  |
| 1.3              | B, C, D       | 150  | 75      | F, G, J, K, M | 150  |
| 1.4              | B, C, D       | 150  | 82      | F, G, J, K, M | 150  |
| 1.5              | B, C, D       | 150  | 91      | F, G, J, K, M | 150  |
| 1.6              | B, C, D       | 150  | 100     | F, G, J, K, M | 150  |
| 1.7              | B, C, D       | 150  | 110     | F, G, J, K, M | 50   |
| 1.8              | B, C, D       | 150  | 120     | F, G, J, K, M | 50   |
| 1.9              | B, C, D       | 150  | 130     | F, G, J, K, M | 50   |
| 2.0              | B, C, D       | 150  | 150     | F, G, J, K, M | 50   |
| 2.2              | B, C, D       | 150  | 160     | F, G, J, K, M | 50   |
| 2.4              | B, C, D       | 150  | 180     | F, G, J, K, M | 50   |
| 2.7              | B, C, D       | 150  | 200     | F, G, J, K, M | 50   |
| 3.0              | B, C, D       | 150  | 220     | F, G, J, K, M | 50   |
| 3.3              | B, C, D       | 150  | 240     | F, G, J, K, M | 50   |
| 3.6              | B, C, D       | 150  | 270     | F, G, J, K, M | 50   |
| 3.9              | B, C, D       | 150  | 300     | F, G, J, K, M | 50   |
| 4.3              | B, C, D       | 150  | 330     | F, G, J, K, M | 50   |
| 4.7              | B, C, D       | 150  | 360     | F, G, J, K, M | 50   |
| 5.1              | B, C, D       | 150  | 390     | F, G, J, K, M | 50   |
| 5.6              | B, C, D       | 150  | 430     | F, G, J, K, M | 50   |
| 6.2              | B, C, D       | 150  | 470     | F, G, J, K, M | 50   |
| 6.8              | B, C, J, K, M | 150  | 510     | F, G, J, K, M | 50   |
| 7.5              | B, C, J, K, M | 150  | 560     | F, G, J, K, M | 50   |
| 8.2              | B, C, J, K, M | 150  | 620     | F, G, J, K, M | 50   |
| 9.1              | B, C, J, K, M | 150  | 680     | F, G, J, K, M | 50   |
| 10               | F, G, J, K, M | 150  | 750     | F, G, J, K, M | 50   |
| 11               | F, G, J, K, M | 150  | 820     | F, G, J, K, M | 50   |
| 12               | F, G, J, K, M | 150  | 910     | F, G, J, K, M | 50   |
| 13               | F, G, J, K, M | 150  | 1000    | F, G, J, K, M | 50   |
| 15               | F, G, J, K, M | 150  |         |               |      |
| 16               | F, G, J, K, M | 150  |         |               |      |
| 18               | F, G, J, K, M | 150  |         |               |      |
| 20               | F, G, J, K, M | 150  |         |               |      |
| 22               | F, G, J, K, M | 150  |         |               |      |

| Case: AQ13, AQ14 |               |      |         |               |      |
|------------------|---------------|------|---------|---------------|------|
| Cap. pF          | Cap. Tol.     | WVDC | Cap. pF | Cap. Tol.     | WVDC |
| 0.1              | B             | 500  | 51      | F, G, J, K, M | 500  |
| 0.2              | B             | 500  | 56      | F, G, J, K, M | 500  |
| 0.3              | B,C           | 500  | 62      | F, G, J, K, M | 500  |
| 0.4              | B,C           | 500  | 68      | F, G, J, K, M | 500  |
| 0.5              | B, C, D       | 500  | 75      | F, G, J, K, M | 500  |
| 0.6              | B, C, D       | 500  | 82      | F, G, J, K, M | 500  |
| 0.7              | B, C, D       | 500  | 91      | F, G, J, K, M | 500  |
| 0.8              | B, C, D       | 500  | 100     | F, G, J, K, M | 500  |
| 0.9              | B, C, D       | 500  | 110     | F, G, J, K, M | 300  |
| 1.0              | B, C, D       | 500  | 120     | F, G, J, K, M | 300  |
| 1.1              | B, C, D       | 500  | 130     | F, G, J, K, M | 300  |
| 1.2              | B, C, D       | 500  | 150     | F, G, J, K, M | 300  |
| 1.3              | B, C, D       | 500  | 160     | F, G, J, K, M | 300  |
| 1.4              | B, C, D       | 500  | 180     | F, G, J, K, M | 300  |
| 1.5              | B, C, D       | 500  | 200     | F, G, J, K, M | 300  |
| 1.6              | B, C, D       | 500  | 220     | F, G, J, K, M | 200  |
| 1.7              | B, C, D       | 500  | 240     | F, G, J, K, M | 200  |
| 1.8              | B, C, D       | 500  | 270     | F, G, J, K, M | 200  |
| 1.9              | B, C, D       | 500  | 300     | F, G, J, K, M | 200  |
| 2.0              | B, C, D       | 500  | 330     | F, G, J, K, M | 200  |
| 2.2              | B, C, D       | 500  | 360     | F, G, J, K, M | 200  |
| 2.4              | B, C, D       | 500  | 390     | F, G, J, K, M | 200  |
| 2.7              | B, C, D       | 500  | 430     | F, G, J, K, M | 200  |
| 3.0              | B, C, D       | 500  | 470     | F, G, J, K, M | 200  |
| 3.3              | B, C, D       | 500  | 510     | F, G, J, K, M | 150  |
| 3.6              | B, C, D       | 500  | 560     | F, G, J, K, M | 150  |
| 3.9              | B, C, D       | 500  | 620     | F, G, J, K, M | 150  |
| 4.3              | B, C, D       | 500  | 680     | F, G, J, K, M | 150  |
| 4.7              | B, C, D       | 500  | 750     | F, G, J, K, M | 150  |
| 5.1              | B, C, D       | 500  | 820     | F, G, J, K, M | 150  |
| 5.6              | B, C, D       | 500  | 910     | F, G, J, K, M | 150  |
| 6.2              | B, C, D       | 500  | 1000    | F, G, J, K, M | 150  |
| 6.8              | B, C, J, K, M | 500  | 1100    | F, G, J, K, M | 50   |
| 7.5              | B, C, J, K, M | 500  | 1200    | F, G, J, K, M | 50   |
| 8.2              | B, C, J, K, M | 500  | 1300    | F, G, J, K, M | 50   |
| 9.1              | B, C, J, K, M | 500  | 1500    | F, G, J, K, M | 50   |
| 10               | F, G, J, K, M | 500  | 1600    | F, G, J, K, M | 50   |
| 11               | F, G, J, K, M | 500  | 1800    | F, G, J, K, M | 50   |
| 12               | F, G, J, K, M | 500  | 2000    | F, G, J, K, M | 50   |
| 13               | F, G, J, K, M | 500  | 2200    | F, G, J, K, M | 50   |
| 15               | F, G, J, K, M | 500  | 2400    | F, G, J, K, M | 50   |
| 16               | F, G, J, K, M | 500  | 2700    | F, G, J, K, M | 50   |
| 18               | F, G, J, K, M | 500  | 3000    | F, G, J, K, M | 50   |
| 20               | F, G, J, K, M | 500  | 3300    | F, G, J, K, M | 50   |
| 22               | F, G, J, K, M | 500  | 3600    | F, G, J, K, M | 50   |
| 24               | F, G, J, K, M | 500  | 3900    | F, G, J, K, M | 50   |
| 27               | F, G, J, K, M | 500  | 4300    | F, G, J, K, M | 50   |
| 30               | F, G, J, K, M | 500  | 4700    | F, G, J, K, M | 50   |
| 33               | F, G, J, K, M | 500  | 5000    | F, G, J, K, M | 50   |
| 36               | F, G, J, K, M | 500  | 5100    | F, G, J, K, M | 50   |
| 39               | F, G, J, K, M | 500  |         |               |      |
| 43               | F, G, J, K, M | 500  |         |               |      |
| 47               | F, G, J, K, M | 500  |         |               |      |

**TABLE III: TC: C ( $\pm 15\%$ ) CASE SIZE 12 & 14**

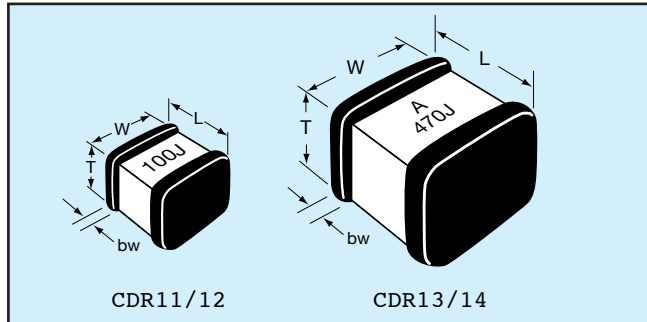
| Case: AQ12 |           |      |         |           |      |         |           |      | Case: AQ14 |           |      |         |           |      |         |           |      |
|------------|-----------|------|---------|-----------|------|---------|-----------|------|------------|-----------|------|---------|-----------|------|---------|-----------|------|
| Cap. pF    | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF    | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC | Cap. pF | Cap. Tol. | WVDC |
| 1000       | K, M, N   | 50   | 2200    | K, M, N   | 50   | 5100    | K, M, N   | 50   | 5000       | K, M, N   | 50   | 15000   | K, M, N   | 50   | 47000   | K, M, N   | 50   |
| 1200       | K, M, N   | 50   | 2700    | K, M, N   | 50   | 5600    | K, M, N   | 50   | 6800       | K, M, N   | 50   | 18000   | K, M, N   | 50   | 68000   | K, M, N   | 50   |
| 1500       | K, M, N   | 50   | 3300    | K, M, N   | 50   | 6800    | K, M, N   | 50   | 8200       | K, M, N   | 50   | 27000   | K, M, N   | 50   | 82000   | K, M, N   | 50   |
| 1800       | K, M, N   | 50   | 3900    | K, M, N   | 50   | 8200    | K, M, N   | 50   | 10000      | K, M, N   | 50   | 33000   | K, M, N   | 50   | 100000  | K, M, N   | 50   |
| 2000       | K, M, N   | 50   | 4700    | K, M, N   | 50   | 10000   | K, M, N   | 50   | 12000      | K, M, N   | 50   | 39000   | K, M, N   | 50   |         |           |      |

# Microwave MLC's



## CDR Series — MIL-PRF-55681 (RF/Microwave Chips)

### MILITARY DESIGNATION PER MIL-PRF-55681



### CROSS REFERENCE: AVX/MIL-PRF-55681

| Per MIL-C-55681 | AVX Style | Length (L)                              | Width (W)                | Thickness (T)  |                | Termination Band (bw) |                |
|-----------------|-----------|-----------------------------------------|--------------------------|----------------|----------------|-----------------------|----------------|
|                 |           |                                         |                          | Max            | Min            | Max                   | Min            |
| CDR11           | AQ11      | .055±.015<br>(1.40±.381)                | .055±.015<br>(1.40±.381) | .057<br>(1.45) | .020<br>(.508) | .020<br>(.508)        | .005<br>(.127) |
| CDR12           | AQ12      | .055±.025<br>(1.40±.635)                | .055±.015<br>(1.40±.381) | .057<br>(1.45) | .020<br>(.508) | .020<br>(.508)        | .005<br>(.127) |
| CDR13           | AQ13      | .110±.020<br>(2.79±.508)                | .110±.020<br>(2.79±.508) | .102<br>(2.59) | .030<br>(.762) | .025<br>(.635)        | .005<br>(.127) |
| CDR14           | AQ14      | .110 +.035 -0.020<br>(2.79 +.889 -.508) | .110±.020<br>(2.79±.508) | .102<br>(2.59) | .030<br>(.762) | .025<br>(.635)        | .005<br>(.127) |

### HOW TO ORDER

**CDR12**

**MIL Style**  
CDR11, CDR12,  
CDR13, CDR14

**BG**

**Voltage  
Temperature  
Limits**

BG = +90±20 ppm/°C with and without  
rated voltage from -55°C to +125°C  
BP = 0±30ppm/°C with and without  
rated voltage from -55°C to +125°C

**101**

**Capacitance**

EIA Capacitance Code in pF.  
First two digits = significant figures  
or "R" for decimal place.  
Third digit = number of zeros or  
after "R" significant figures.

**A**

**Rated Voltage  
Code**

A = 50V  
B = 100V  
C = 200V  
D = 300V  
E = 500V

**K**

**Capacitance  
Tolerance  
Code**

B = ±.1 pF  
C = ±.25 pF  
D = ±.5 pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

**U**

**Termination  
Finish (Military  
Designations)  
Code**

M = Palladium silver  
N = Silver-nickel-gold  
S = Solder coated final with a minimum of  
4 percent lead  
T = Silver  
U = Base metallization-barrier metal-solder coated  
(tin/lead alloy, with a minimum of 4 percent lead)  
W = Base metallization-barrier metal-tinned (tin or  
tin/lead alloy)  
Y = Base metallization-barrier metal-tin (100 per-  
cent)  
Z = Base metallization-barrier metal-tinned  
(tin/lead alloy, with a minimum of 4 percent lead)  
\*See MIL-PRF-55681 Specification for more details

**S**

**Failure Rate  
Level**

M = 1.0%  
P = .1%  
R = .01%  
S = .001%

### PACKAGING

Standard Packaging Quantity

CDR11-12 = 100 pcs per waffle pack

CDR13-14 = 80 pcs per waffle pack

**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481  
(equivalent to IEC 286 part 3).

Sizes SQCA through SQCB, CDR11/12 through 13/14.

- 8mm carrier
- 7" reel: ≤0.040" thickness = 2000 pcs  
≤0.075" thickness = 2000 pcs
- 13" reel: ≤0.075" thickness = 10,000 pcs

**Not RoHS Compliant**



For RoHS compliant products,  
please select correct termination style.



**TABLE I: STYLES CDR11 AND CDR12 CAPACITOR CHARACTERISTICS**

| Type<br>Designation<br>1/ | Capacitance<br>in pF | Capacitance<br>tolerance | Rated temperature<br>and<br>V/Temperature | WVDC | Type<br>Designation<br>1/ | Capacitance<br>in pF | Capacitance<br>tolerance | Rated temperature<br>and<br>V/Temperature | WVDC |
|---------------------------|----------------------|--------------------------|-------------------------------------------|------|---------------------------|----------------------|--------------------------|-------------------------------------------|------|
| CDR1 -B-0R1AB--           | 0.1                  | B                        | BG, BP                                    | 50   | CDR1 -B-300A--            | 30                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R2AB--           | 0.2                  | B                        | BG, BP                                    | 50   | CDR1 -B-330A--            | 33                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R3A--            | 0.3                  | B, C                     | BG, BP                                    | 50   | CDR1 -B-360A--            | 36                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R4A--            | 0.4                  | B, C                     | BG, BP                                    | 50   | CDR1 -B-390A--            | 39                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R5A--            | 0.5                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-430A--            | 43                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R6A--            | 0.6                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-470A--            | 47                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R7A--            | 0.7                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-510A--            | 51                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R8A--            | 0.8                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-560A--            | 56                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-0R9A--            | 0.9                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-620A--            | 62                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R0A--            | 1.0                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-680A--            | 68                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R1A--            | 1.1                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-750A--            | 75                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R2A--            | 1.2                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-820A--            | 82                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R3A--            | 1.3                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-910A--            | 91                   | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R4A--            | 1.4                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-101A--            | 100                  | F, G, J, K, M            | BG, BP                                    | 50   |
| CDR1 -B-1R5A--            | 1.5                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-111A--            | 110                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-1R6A--            | 1.6                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-121A--            | 120                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-1R7A--            | 1.7                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-131A--            | 130                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-1R8A--            | 1.8                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-151A--            | 150                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-1R9A--            | 1.9                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-161A--            | 160                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-2R0A--            | 2.0                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-181A--            | 180                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-2R1A--            | 2.1                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-201A--            | 200                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-2R2A--            | 2.2                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-221A--            | 220                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-2R4A--            | 2.4                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-241A--            | 240                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-2R7A--            | 2.7                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-271A--            | 270                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-3R0A--            | 3.0                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-301A--            | 300                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-3R3A--            | 3.3                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-331A--            | 330                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-3R6A--            | 3.6                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-361A--            | 360                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-3R9A--            | 3.9                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-391A--            | 390                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-4R3A--            | 4.3                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-431A--            | 430                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-4R7A--            | 4.7                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-471A--            | 470                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-5R1A--            | 5.1                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-511A--            | 510                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-5R6A--            | 5.6                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-561A--            | 560                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-6R2A--            | 6.2                  | B, C, D                  | BG, BP                                    | 50   | CDR1 -B-621A--            | 620                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-6R8A--            | 6.8                  | B, C, J, K, M            | BG, BP                                    | 50   | CDR1 -B-681A--            | 680                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-7R5A--            | 7.5                  | B, C, J, K, M            | BG, BP                                    | 50   | CDR1 -B-751A--            | 750                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-8R2A--            | 8.2                  | B, C, J, K, M            | BG, BP                                    | 50   | CDR1 -B-821A--            | 820                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-9R1A--            | 9.1                  | B, C, J, K, M            | BG, BP                                    | 50   | CDR1 -B-911A--            | 910                  | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-100A--            | 10                   | F, G, J, K, M            | BG, BP                                    | 50   | CDR1 -B-102A--            | 1000                 | F, G, J, K, M            | BP                                        | 50   |
| CDR1 -B-110A--            | 11                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-120A--            | 12                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-130A--            | 13                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-150A--            | 15                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-160A--            | 16                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-180A--            | 18                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-200A--            | 20                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-220A--            | 22                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-240A--            | 24                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |
| CDR1 -B-270A--            | 27                   | F, G, J, K, M            | BG, BP                                    | 50   |                           |                      |                          |                                           |      |

1/Complete type designation will include additional symbols to indicate style, voltage-temperature limits, capacitance tolerance (where applicable), termination finish ("M" or "N" for style CDR11, and "S", "U", "W", "Y" or "Z" for style CDR12) and failure rate level.

# Microwave MLC's



## CDR Series — MIL-PRF-55681 (RF/Microwave Chips)

**TABLE II: STYLES CDR13 AND CDR14 CAPACITOR CHARACTERISTICS**

| Type Designation 1/ | Capacitance in pF | Capacitance tolerance | Rated temperature and V/Temperature | WVDC    | Type Designation 1/ | Capacitance in pF | Capacitance tolerance | Rated temperature and V/Temperature | WVDC    |
|---------------------|-------------------|-----------------------|-------------------------------------|---------|---------------------|-------------------|-----------------------|-------------------------------------|---------|
| CDR1 -B-0R1*B--     | 0.1               | B                     | BG, BP                              | 200/500 | CDR1 -B-560*---     | 56                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R2*B--     | 0.2               | B                     | BG, BP                              | 200/500 | CDR1 -B-620*---     | 62                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R3*---     | 0.3               | B, C                  | BG, BP                              | 200/500 | CDR1 -B-680*---     | 68                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R4*---     | 0.4               | B, C                  | BG, BP                              | 200/500 | CDR1 -B-750*---     | 75                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R5*---     | 0.5               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-820*---     | 82                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R6*---     | 0.6               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-910*---     | 91                | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R7*---     | 0.7               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-101*---     | 100               | F, G, J, K, M         | BG, BP                              | 200/500 |
| CDR1 -B-0R8*---     | 0.8               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-111*---     | 110               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-0R9*---     | 0.9               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-121*---     | 120               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R0*---     | 1.0               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-131*---     | 130               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R1*---     | 1.1               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-151*---     | 150               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R2*---     | 1.2               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-161*---     | 160               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R3*---     | 1.3               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-181*---     | 180               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R4*---     | 1.4               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-201*---     | 200               | F, G, J, K, M         | BG, BP                              | 200/300 |
| CDR1 -B-1R5*---     | 1.5               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-221C---     | 220               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-1R6*---     | 1.6               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-241C---     | 240               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-1R7*---     | 1.7               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-271C---     | 270               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-1R8*---     | 1.8               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-301C---     | 300               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-1R9*---     | 1.9               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-331C---     | 330               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-2R0*---     | 2.0               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-361C---     | 360               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-2R1*---     | 2.1               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-391C---     | 390               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-2R2*---     | 2.2               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-431C---     | 430               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-2R4*---     | 2.4               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-471C---     | 470               | F, G, J, K, M         | BG, BP                              | 200     |
| CDR1 -B-2R7*---     | 2.7               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-511B---     | 510               | F, G, J, K, M         | BG, BP                              | 100     |
| CDR1 -B-3R0*---     | 3.0               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-561B---     | 560               | F, G, J, K, M         | BG, BP                              | 100     |
| CDR1 -B-3R3*---     | 3.3               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-621B---     | 620               | F, G, J, K, M         | BG, BP                              | 100     |
| CDR1 -B-3R6*---     | 3.6               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-681A---     | 680               | F, G, J, K, M         | BG, BP                              | 50      |
| CDR1 -B-3R9*---     | 3.9               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-751A---     | 750               | F, G, J, K, M         | BG, BP                              | 50      |
| CDR1 -B-4R3*---     | 4.3               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-821A---     | 820               | F, G, J, K, M         | BG, BP                              | 50      |
| CDR1 -B-4R7*---     | 4.7               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-911A---     | 910               | F, G, J, K, M         | BG, BP                              | 50      |
| CDR1 -B-5R1*---     | 5.1               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-102A---     | 1000              | F, G, J, K, M         | BG, BP                              | 50      |
| CDR1 -B-5R6*---     | 5.6               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-112A---     | 1100              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-6R2*---     | 6.2               | B, C, D               | BG, BP                              | 200/500 | CDR1 -B-122A---     | 1200              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-6R8*---     | 6.8               | B, C, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-132A---     | 1300              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-7R5*---     | 7.5               | B, C, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-152A---     | 1500              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-8R2*---     | 8.2               | B, C, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-162A---     | 1600              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-9R1*---     | 9.1               | B, C, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-182A---     | 1800              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-100*---     | 10                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-202A---     | 2000              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-110*---     | 11                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-222A---     | 2200              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-120*---     | 12                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-242A---     | 2400              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-130*---     | 13                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-272A---     | 2700              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-150*---     | 15                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-302A---     | 3000              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-160*---     | 16                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-332A---     | 3300              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-180*---     | 18                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-362A---     | 3600              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-200*---     | 20                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-392A---     | 3900              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-220*---     | 22                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-432A---     | 4300              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-240*---     | 24                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-472A---     | 4700              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-270*---     | 27                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-502A---     | 5000              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-300*---     | 30                | F, G, J, K, M         | BG, BP                              | 200/500 | CDR1 -B-512A---     | 5100              | F, G, J, K, M         | BP                                  | 50      |
| CDR1 -B-330*---     | 33                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |
| CDR1 -B-360*---     | 36                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |
| CDR1 -B-390*---     | 39                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |
| CDR1 -B-430*---     | 43                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |
| CDR1 -B-470*---     | 47                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |
| CDR1 -B-510*---     | 51                | F, G, J, K, M         | BG, BP                              | 200/500 |                     |                   |                       |                                     |         |

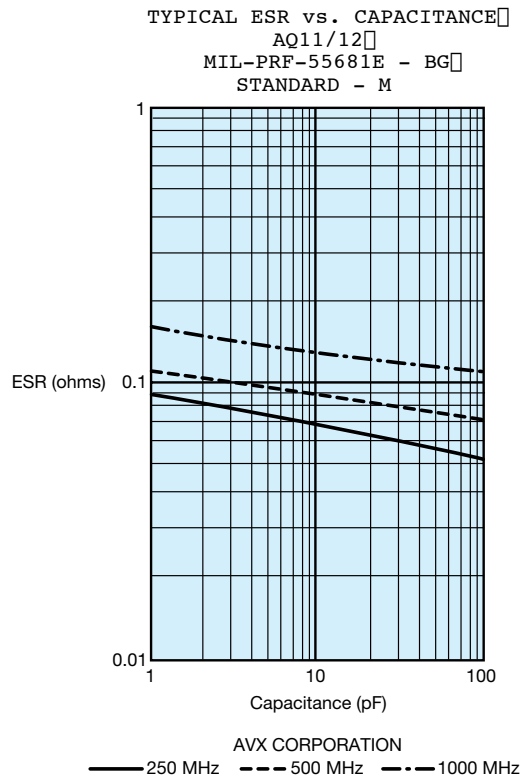
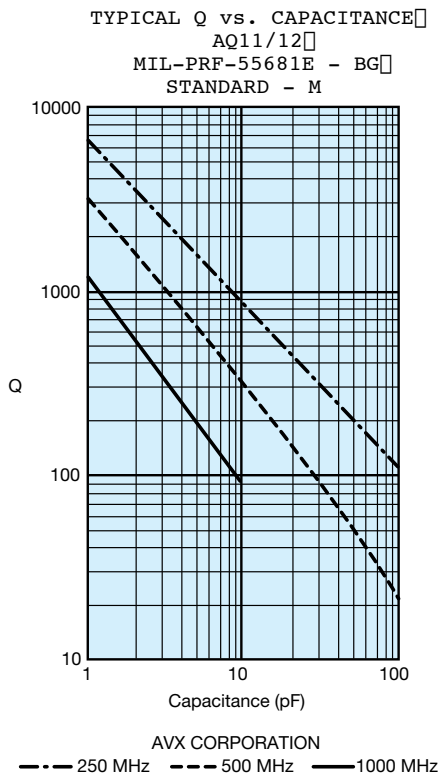
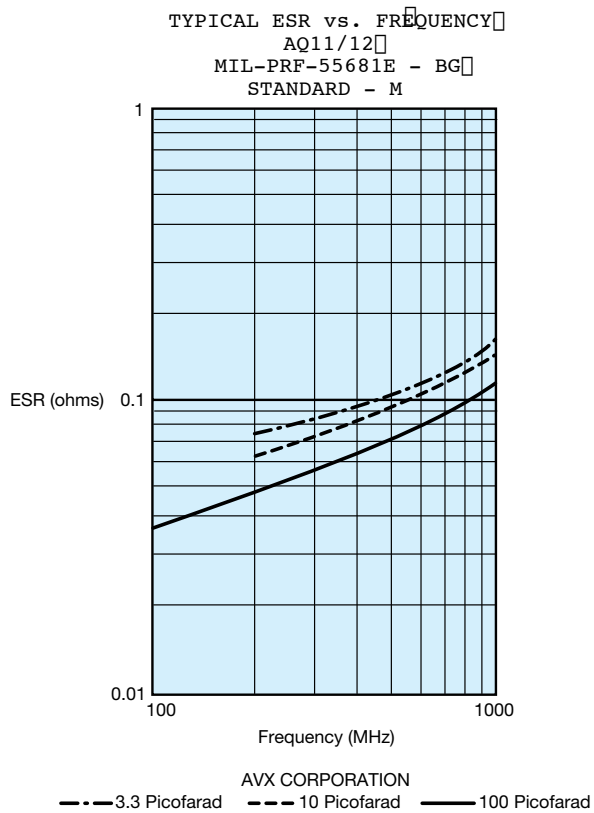
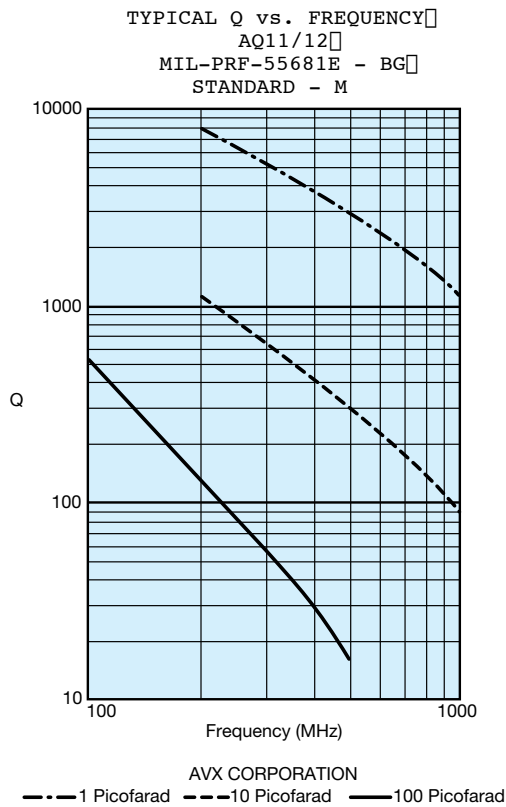
1/Complete type designation will include additional symbols to indicate style, voltage-temperature limits, capacitance tolerance (where applicable), termination finish ("M" or "N" for style CDR13, and "S", "U", "W", "Y" or "Z" for style CDR14) and failure rate level.

\*C=200V; E=500V.

‡C=200V; D=300V.

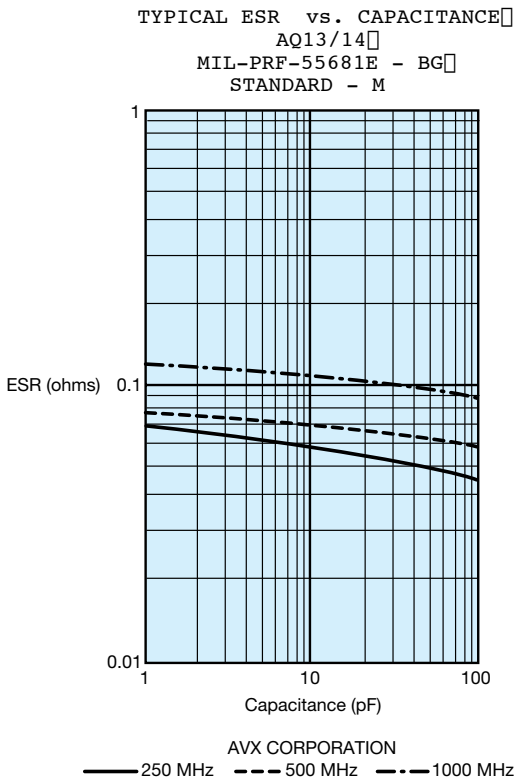
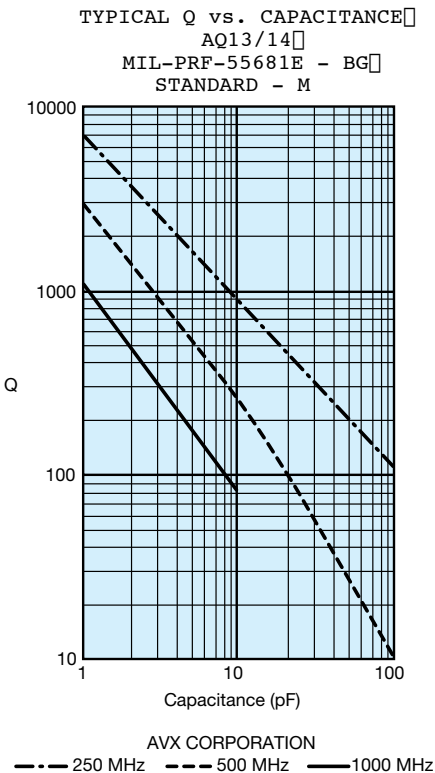
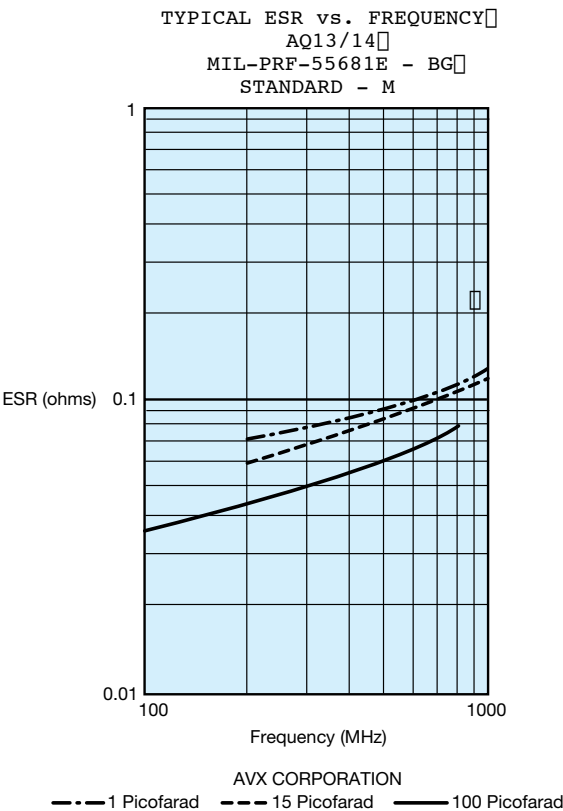
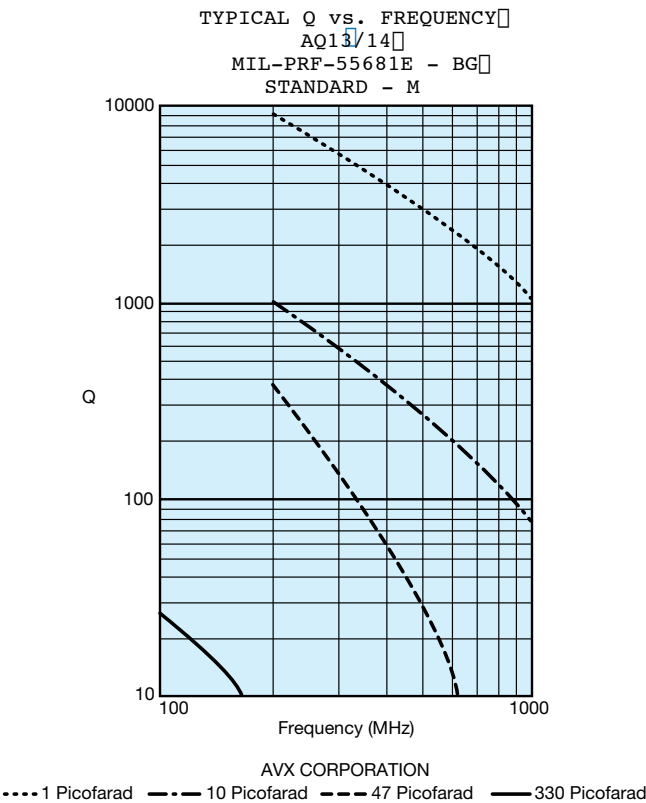
# Microwave MLC's

## Performance Curves



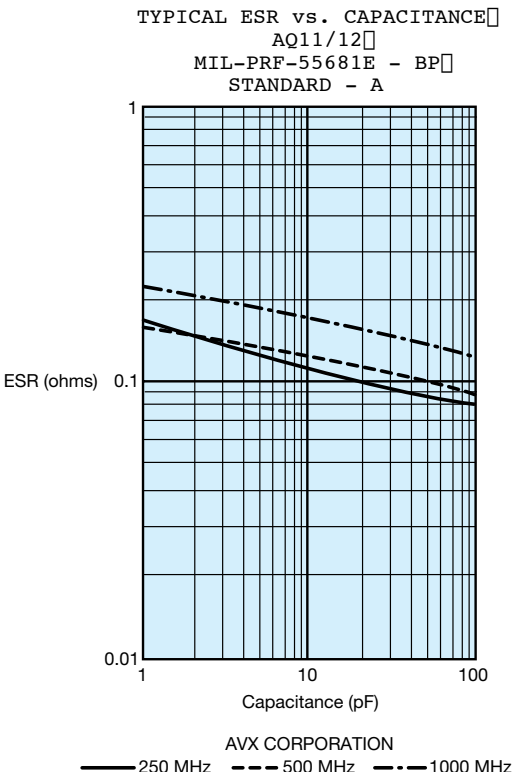
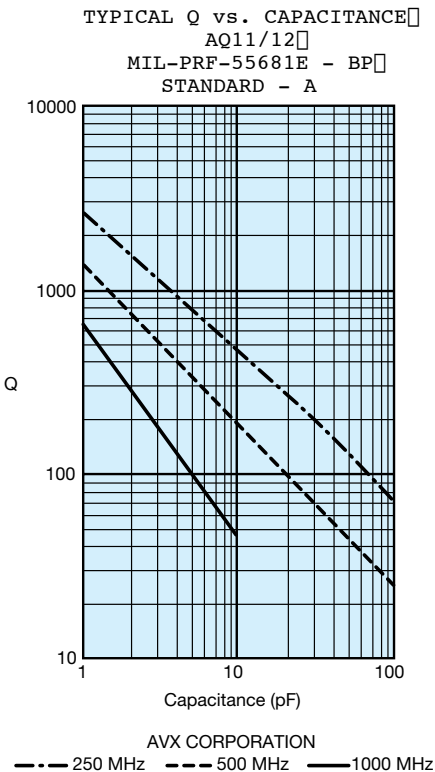
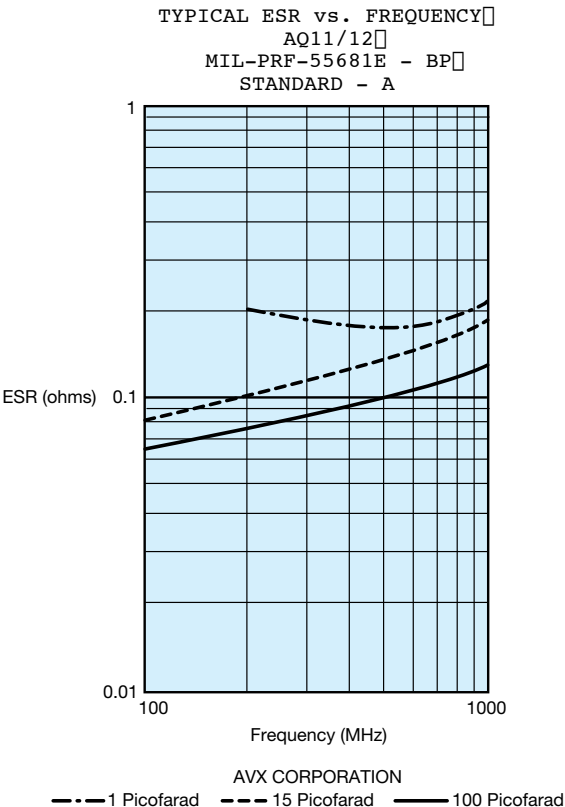
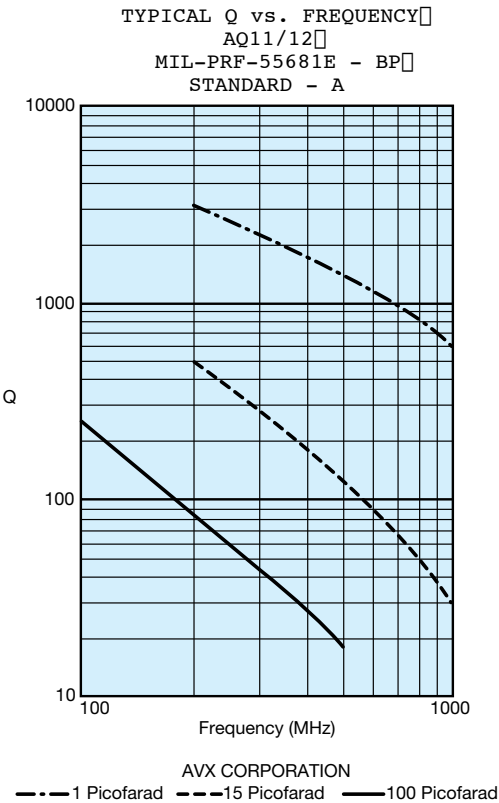
# Microwave MLC's

## Performance Curves



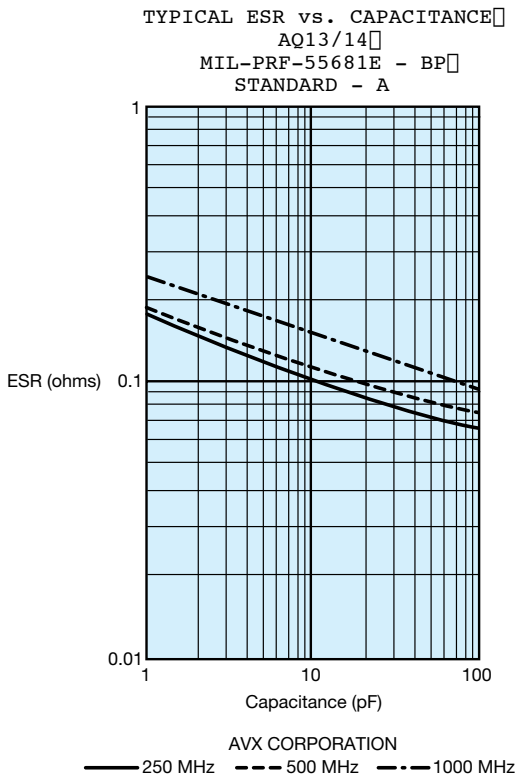
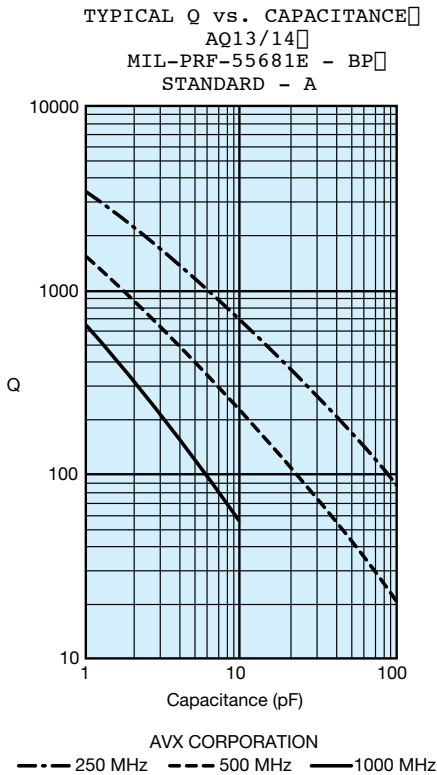
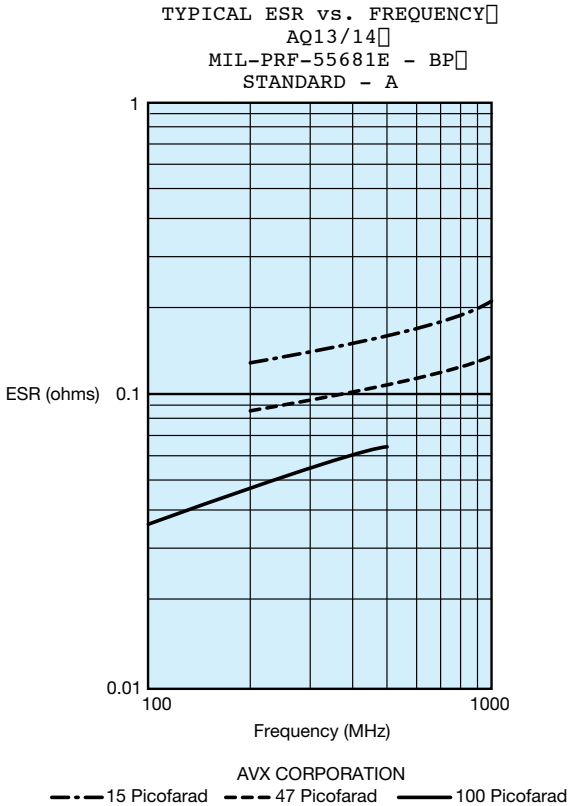
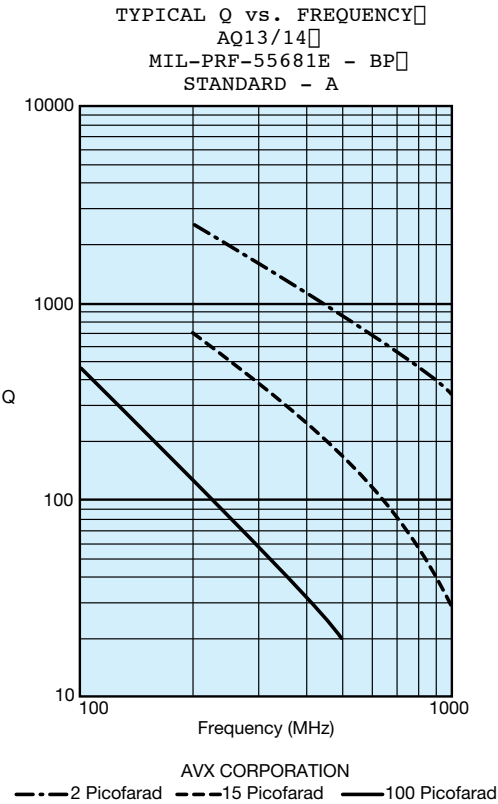
# Microwave MLC's

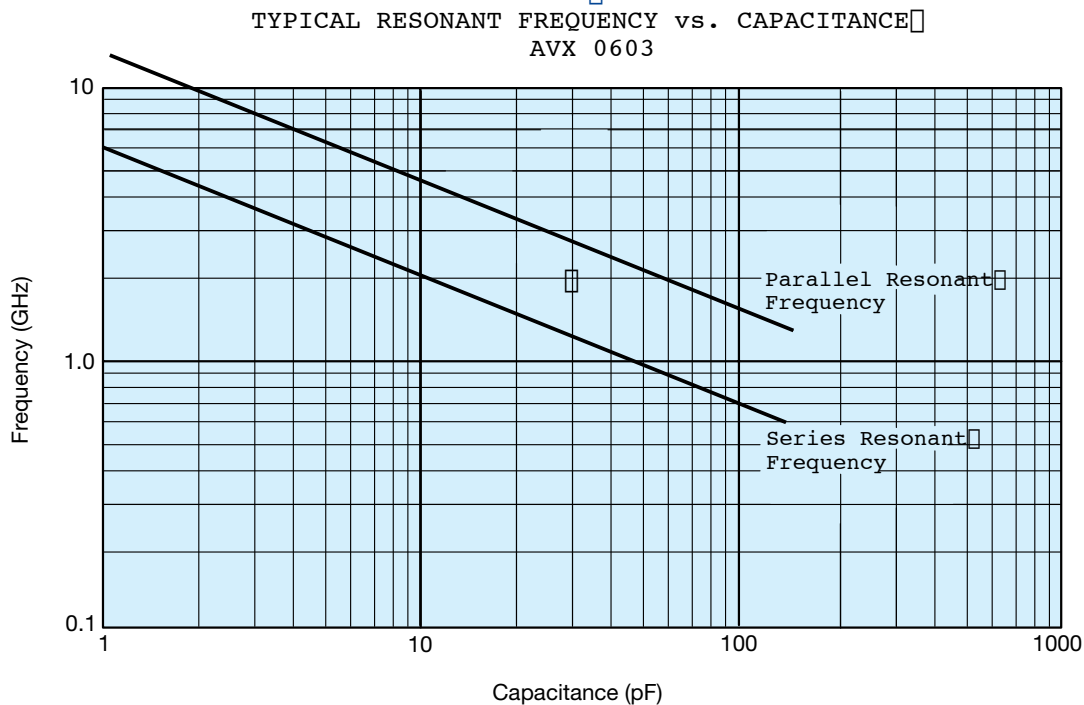
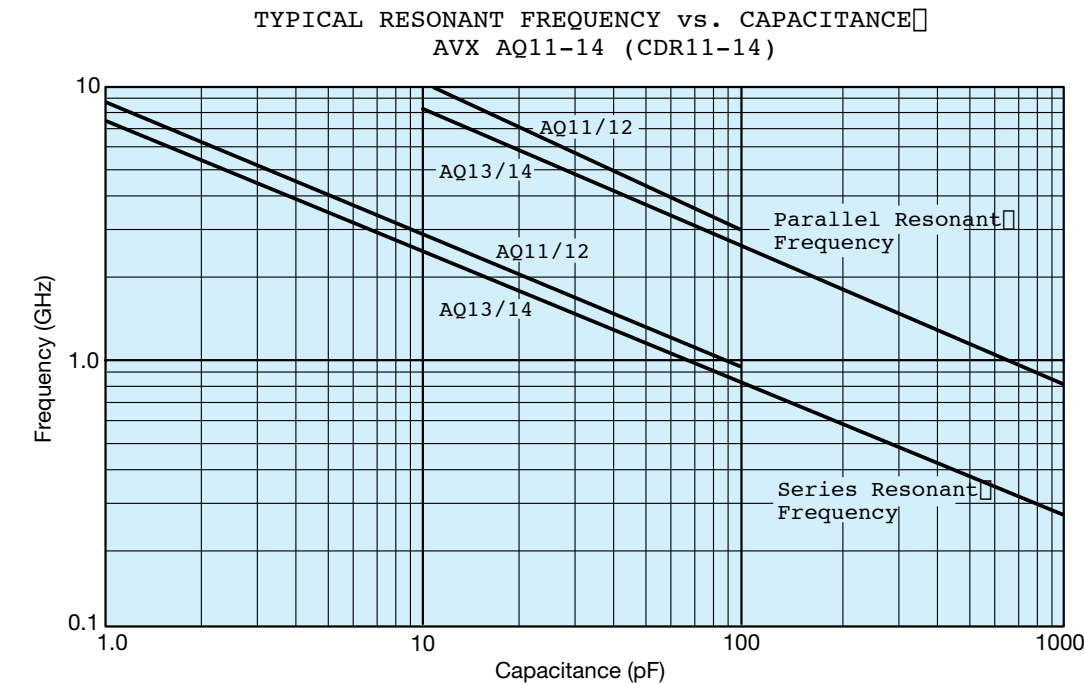
## Performance Curves



# Microwave MLC's

## Performance Curves





# Microwave MLC's

## Automatic Insertion Packaging



**TAPE & REEL:** All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

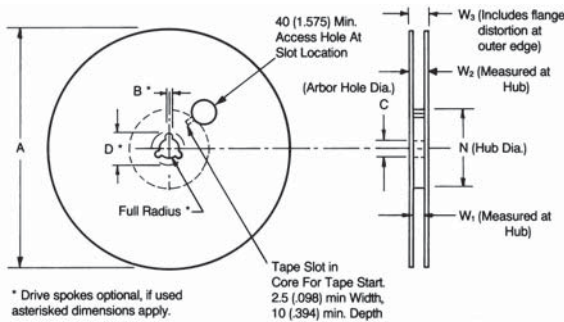
Sizes SQCA through SQCB, CDR11/12 through 13/14.

- 8mm carrier
- 7" reel:  $\leq 0.040$ " thickness = 2000 pcs  
 $\leq 0.075$ " thickness = 2000 pcs
- 13" reel:  $\leq 0.075$ " thickness = 10,000 pcs

"U" Series - 402/0603/0805/1210 Size Chips

- 8mm carrier
- 7" reel: 0402 = 10,000 pcs  
0603 & 0805  $\leq 0.40$ " thickness = 4000 pcs  
0805 . 0.040" thickness & 1210 = 2000 pcs
- 13" reel:  $\leq 0.075$ " thickness = 10,000 pcs

### REEL DIMENSIONS: millimeters (inches)



| Tape Size <sup>(1)</sup> | A Max.          | B* Min.       | C                                    | D* Min.        | N Min.        | W <sub>1</sub>                                                                    | W <sub>2</sub> Max. | W <sub>3</sub>                             |
|--------------------------|-----------------|---------------|--------------------------------------|----------------|---------------|-----------------------------------------------------------------------------------|---------------------|--------------------------------------------|
| 8mm                      | 330<br>(12.992) | 1.5<br>(.059) | 13.0 $\pm$ 0.20<br>(.512 $\pm$ .008) | 20.2<br>(.795) | 50<br>(1.969) | 8.4 <sup>+1.0</sup> <sub>-0.0</sub><br>(.331 <sup>+0.003</sup> <sub>-0.0</sub> )  | 14.4<br>(.567)      | 7.9 Min.<br>(.311)<br>10.9 Max.<br>(.429)  |
| 12mm                     |                 |               |                                      |                |               | 12.4 <sup>+2.0</sup> <sub>-0.0</sub><br>(.488 <sup>+0.076</sup> <sub>-0.0</sub> ) | 18.4<br>(.724)      | 11.9 Min.<br>(.469)<br>15.4 Max.<br>(.607) |

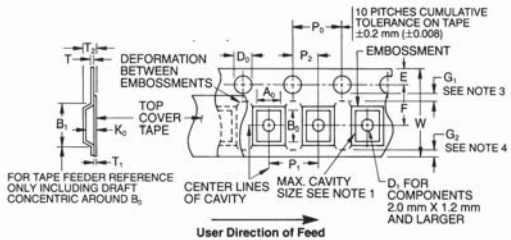
Metric dimensions will govern.  
English measurements rounded and for reference only.  
(1) For tape sizes 16mm and 24mm (used with chip size 3640) consult EIA RS-481 latest revision.

## EMBOSSED CARRIER CONFIGURATION

### 8 & 12 MM TAPE ONLY

### CONSTANT DIMENSIONS

| Tape Size    | D <sub>0</sub>                                                                    | E                                    | P <sub>0</sub>                      | P <sub>2</sub>                      | T Max.          | T <sub>1</sub>         | G <sub>1</sub>                    | G <sub>2</sub>                    |
|--------------|-----------------------------------------------------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|-----------------|------------------------|-----------------------------------|-----------------------------------|
| 8mm and 12mm | 8.4 <sup>+0.10</sup> <sub>-0.0</sub><br>(.059 <sup>+0.004</sup> <sub>-0.0</sub> ) | 1.75 $\pm$ 0.10<br>(.069 $\pm$ .004) | 4.0 $\pm$ 0.10<br>(.157 $\pm$ .004) | 2.0 $\pm$ 0.05<br>(.079 $\pm$ .002) | 0.600<br>(.024) | 0.10<br>(.004)<br>Max. | 0.75<br>(.030)<br>Min. See Note 3 | 0.75<br>(.030)<br>Min. See Note 4 |

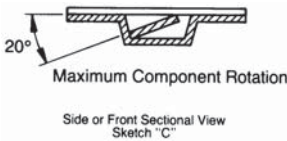
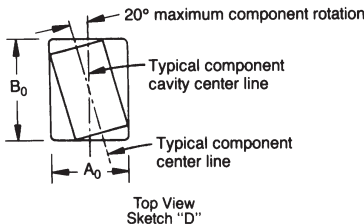


### VARIABLE DIMENSIONS

| Tape Size | B <sub>1</sub> Max.<br>See Note 6 | D <sub>1</sub> Min.<br>See Note 5 | F                                   | P <sub>1</sub>                      | R Min.<br>See Note 2 | T <sub>2</sub>    | W                                                                                  | A <sub>0</sub> B <sub>0</sub> K <sub>0</sub> |
|-----------|-----------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|----------------------|-------------------|------------------------------------------------------------------------------------|----------------------------------------------|
| 8mm       | 4.55<br>(.179)                    | 1.0<br>(.039)                     | 3.5 $\pm$ 0.05<br>(.138 $\pm$ .002) | 4.0 $\pm$ 0.10<br>(.157 $\pm$ .004) | 25<br>(.984)         | 2.5 Max<br>(.098) | 8.0 <sup>+0.3</sup> <sub>-0.1</sub><br>(.315 <sup>+0.012</sup> <sub>-0.004</sub> ) | See Note 1                                   |
| 12mm      | 8.2<br>(.323)                     | 1.5<br>(.059)                     | 5.5 $\pm$ 0.05<br>(.217 $\pm$ .002) | 4.0 $\pm$ 0.10<br>(.157 $\pm$ .004) | 30<br>(1.181)        | 6.5 Max<br>(.256) | 12.0 $\pm$ .30<br>(.472 $\pm$ .012)                                                | See Note 1                                   |

### NOTES:

- A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> are determined by the max. dimensions to the ends of the terminals extending from the component body and/or the body dimensions of the component. The clearance between the end of the terminals or body of the component to the sides and depth of the cavity (A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub>) must be within 0.05 mm (.002) min. and 0.50 mm (.020) max. The clearance allowed must also prevent rotation of the component within the cavity of not more than 20 degrees (see sketches C & D).
- Tape with components shall pass around radius "R" without damage. The minimum trailer length (Note 2 Fig. 3) may require additional length to provide R min. for 12mm embossed tape for reels with hub diameters approaching N min. (Table 4).
- G<sub>1</sub> dimension is the flat area from the edge of the sprocket hole to either the outward deformation of the carrier tape between the embossed cavities or to the edge of the cavity whichever is less.
- G<sub>2</sub> dimension is the flat area from the edge of the carrier tape opposite the sprocket holes to either the outward deformation of the carrier tape between the embossed cavity or to the edge of the cavity whichever is less.
- The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.
- B<sub>1</sub> dimension is a reference dimension for tape feeder clearance only.



# Hi-Q® High RF Power MLC Surface Mount Capacitors

## For 600V to 7200V Applications



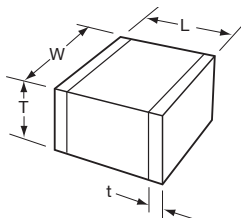
### PRODUCT OFFERING

Hi-Q®, high RF power, surface mount MLC capacitors from AVX Corporation are characterized with ultra-low ESR and dissipation factor at high frequencies. They are designed to handle high power and high voltage levels for applications in RF power amplifiers, inductive heating, high magnetic field environments (MRI coils), medical and industrial electronics.

### HOW TO ORDER

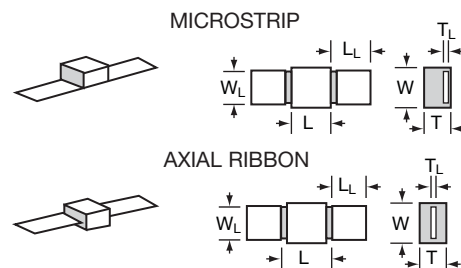
| AVX Style | Voltage   | Temperature Coefficient | Capacitance Code                      | Capacitance Tolerance | Test Level   | Termination*                          | Packaging         |
|-----------|-----------|-------------------------|---------------------------------------|-----------------------|--------------|---------------------------------------|-------------------|
| HQCC      | 300V = 9  | C0G = A                 | (2 significant digits + no. of zeros) | B = 0.1pF (<8.2pF)    | A = Standard | T = Plated Ni and Sn (RoHS Compliant) | 1A = 7" Reel*     |
| HQCE      | 500V = 7  | P90 = M                 | Examples:                             | C = ±0.25pF (<8.2pF)  |              | J = 5% Min Pb                         | 6A = Waffle Pack  |
| HQLC      | 800V = U  |                         | 4.7 pF = 4R7                          | D = ±0.50pF (<8.2pF)  |              | 7 = Plated Ni and Au                  | *HQCC & HQCE only |
| HQLE      | 1000V = A |                         | 10 pF = 100                           | F = ±1% (≥10pF)       |              | A = Axial Ribbon                      |                   |
|           | 1500V = S |                         | 100 pF = 101                          | G = ±2%               |              | M = Microstrip                        |                   |
|           | 2500V = W |                         | 1,000 pF = 102                        | J = ±5%               |              | H = Cu/Sn (Non-Magnetic)              |                   |
|           | 3000V = H |                         |                                       | K = ±10%              |              | 4 = Axial Ribbon (Non-Magnetic)       |                   |
|           | 3600V = J |                         |                                       | M = ±20%              |              | 5 = Microstrip (Non-Magnetic)         |                   |
|           | 5000V = K |                         |                                       |                       |              |                                       |                   |
|           | 7200V = M |                         |                                       |                       |              |                                       |                   |

### DIMENSIONS



mm (inches)

| STYLE              | HQCC                                                                                                       | HQCE                                      |
|--------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| (L) Length         | 5.84 +0.51 -0.25<br>(0.230 +0.020 -0.010)                                                                  | 9.65 +0.38 -0.25<br>(0.380 +0.015 -0.010) |
| (W) Width          | 6.35 ± 0.38<br>(0.250 ± 0.015)                                                                             | 9.65 ± 0.25<br>(0.380 ± 0.010)            |
| (T) Thickness Max. | 3.68 (0.145) max. for<br>capacitance values ≤ 680pF<br>4.19 (0.165) max. for<br>capacitance values > 680pF | 4.32 (0.170) max.                         |
| (t) Overlap        | 1.02 (0.040) max.                                                                                          | 1.02 (0.040) max.                         |



mm (inches)

| STYLE                            | HQLC                                                                                                       | HQLE                                                                           |
|----------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| (L) Length                       | 6.22 ± 0.64<br>(0.245 ± 0.025)                                                                             | 9.65 +0.89 -0.25<br>(0.380 +0.035 -0.010)                                      |
| (W) Width                        | 6.35 ± 0.38<br>(0.250 ± 0.015)                                                                             | 9.65 ± 0.25<br>(0.380 ± 0.010)                                                 |
| (T) Thickness Max.               | 3.68 (0.145) max. for<br>capacitance values ≤ 680pF<br>4.19 (0.165) max. for<br>capacitance values ≤ 680pF | 4.32 (0.170) max.                                                              |
| (L <sub>L</sub> ) Lead Length    | 12.7 min.<br>(0.500)                                                                                       | 19.05<br>(0.750)                                                               |
| (W <sub>L</sub> ) Lead Width     | 6.10 ± 0.127<br>(0.240 ± 0.005)                                                                            | 8.89 ± 0.25<br>(0.350 ± 0.010)                                                 |
| (T <sub>L</sub> ) Lead Thickness | 0.102 ± 0.025<br>(0.004 ± 0.001)                                                                           | 0.25 ± 0.13<br>(0.010 ± 0.005)                                                 |
| Lead Material                    | High Purity Silver Leads<br>Leads are attached with<br>High Temperature Solder                             | High Purity Silver Leads<br>Leads are attached with<br>High Temperature Solder |

**Not RoHS Compliant**



For RoHS compliant products,  
please select correct termination style.



# Hi-Q® High RF Power MLC Surface Mount Capacitors

For 600V to 7200V Applications



## DIELECTRIC PERFORMANCE CHARACTERISTICS

|                                    |                                                                                                                                                                                                                                       |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Capacitance Range</b>           | 1.0pF to 2,700pF<br>(25°C, 1.0 ±0.2 Vrms at 1kHz, for ≤ 1000 pF use 1MHz)                                                                                                                                                             |
| <b>Capacitance Tolerances</b>      | ±0.10pF, ±0.25pF, ±0.50pF, ±1%, ±2%, ±5%, ±10%, ±20%                                                                                                                                                                                  |
| <b>Dissipation Factor 25°C</b>     | 0.1% Max (+25°C, 1.0 ±0.2 Vrms at 1kHz, for ≤ 1000 pF use 1MHz)                                                                                                                                                                       |
| <b>Operating Temperature Range</b> | -55°C to +125°C                                                                                                                                                                                                                       |
| <b>Temperature Characteristic</b>  | C0G: 0 ± 30 ppm/°C (-55°C to +125°C), P90: 90 ± 30 ppm/°C (-55°C to +125°C)                                                                                                                                                           |
| <b>Insulation Resistance</b>       | 100K MΩ min. @ +25°C and 500VDC<br>10K MΩ min. @ +125°C and 500VDC                                                                                                                                                                    |
| <b>Dielectric Strength</b>         | 250% of WVDC for capacitors rated at 500 volts DC or less for 5 seconds.<br>150% of WVDC for capacitors rated at 1250 volts DC or less for 5 seconds.<br>120% of WVDC for capacitors rated above 1250 volts DC or less for 5 seconds. |

## HQCC CAPACITANCE VALUES (A DIELECTRIC)

| Cap Code | Cap (pF) | Tol.    | Rated WVDC | Cap Code | Cap (pF) | Tol.    | Rated WVDC | Cap Code | Cap (pF) | Tol.            | Rated WVDC | Cap Code | Cap (pF) | Tol.            | Rated WVDC |
|----------|----------|---------|------------|----------|----------|---------|------------|----------|----------|-----------------|------------|----------|----------|-----------------|------------|
| 1R0      | 1.0      | B, C, D | 2500       | 8R2      | 8.2      | B, C, D | 2500       | 680      | 68       | F, G, J<br>K, M | 2500       | 471      | 470      | F, G, J<br>K, M | 1500       |
| 1R2      | 1.2      |         |            | 100      | 10       | 820     |            | 82       | 561      |                 |            | 560      | 1000     |                 |            |
| 1R5      | 1.5      |         |            | 120      | 12       | 101     |            | 100      | 681      |                 |            | 680      |          |                 |            |
| 1R8      | 1.8      |         |            | 150      | 15       | 121     |            | 120      | 821      |                 |            | 820      |          |                 |            |
| 2R2      | 2.2      |         |            | 180      | 18       | 151     |            | 150      | 102      |                 |            | 1000     |          |                 |            |
| 2R7      | 2.7      |         |            | 220      | 22       | 181     |            | 180      | 122      |                 |            | 1200     |          |                 |            |
| 3R3      | 3.3      |         |            | 270      | 27       | 221     |            | 220      | 152      |                 |            | 1500     | 500      |                 |            |
| 3R9      | 3.9      |         |            | 330      | 33       | 271     |            | 270      | 182      |                 |            | 1800     | 300      |                 |            |
| 4R7      | 4.7      |         |            | 390      | 39       | 331     |            | 330      | 222      |                 | 2200       |          |          |                 |            |
| 5R6      | 5.6      | 470     | 47         | 391      | 390      | 272     | 2700       |          |          |                 |            |          |          |                 |            |
| 6R8      | 6.8      |         |            | 560      | 56       |         |            |          |          |                 |            |          |          |                 |            |

## HQCC CAPACITANCE VALUES (M DIELECTRIC)

| Cap Code | Cap (pF) | Tol.    | Rated WVDC |          | Cap Code | Cap (pF) | Tol.            | Rated WVDC |          | Cap Code | Cap (pF) | Tol.            | Rated WVDC |          |
|----------|----------|---------|------------|----------|----------|----------|-----------------|------------|----------|----------|----------|-----------------|------------|----------|
|          |          |         | Standard   | Extended |          |          |                 | Standard   | Extended |          |          |                 | Standard   | Extended |
| 1R0      | 1.0      | B, C, D | 2500       | 3600     | 100      | 10       | F, G, J<br>K, M | 2500       | 3600     | 161      | 160      | F, G, J<br>K, M | 2500       | 3000     |
| 1R1      | 1.1      |         |            |          | 110      | 11       |                 |            |          | 181      | 180      |                 |            |          |
| 1R2      | 1.2      |         |            |          | 120      | 12       |                 |            |          | 201      | 200      |                 |            |          |
| 1R3      | 1.3      |         |            |          | 130      | 13       |                 |            |          | 221      | 220      |                 |            |          |
| 1R4      | 1.4      |         |            |          | 150      | 15       |                 |            |          | 241      | 240      |                 |            |          |
| 1R5      | 1.5      |         |            |          | 160      | 16       |                 |            |          | 271      | 270      |                 |            |          |
| 1R6      | 1.6      |         |            |          | 180      | 18       |                 |            |          | 301      | 300      |                 | 1500       | 2000     |
| 1R7      | 1.7      |         |            |          | 200      | 20       |                 |            |          | 331      | 330      |                 |            |          |
| 1R8      | 1.8      |         |            |          | 220      | 22       |                 |            |          | 331      | 330      |                 |            |          |
| 1R9      | 1.9      |         |            |          | 240      | 24       |                 |            |          | 361      | 360      |                 |            |          |
| 2R0      | 2.0      |         |            |          | 270      | 27       |                 |            |          | 391      | 390      |                 |            |          |
| 2R1      | 2.1      |         |            |          | 300      | 30       |                 |            |          | 431      | 430      |                 |            |          |
| 2R2      | 2.2      |         |            |          | 330      | 33       |                 |            |          | 471      | 470      |                 |            |          |
| 2R4      | 2.4      |         |            |          | 360      | 36       |                 |            |          | 511      | 510      |                 | 1000       | 1500     |
| 2R5      | 2.5      |         |            |          | 390      | 39       |                 |            |          | 561      | 560      |                 |            |          |
| 3R0      | 3.0      |         |            |          | 430      | 43       |                 |            |          | 621      | 620      |                 |            |          |
| 3R3      | 3.3      |         |            |          | 470      | 47       |                 |            |          | 681      | 680      |                 |            |          |
| 3R6      | 3.6      |         |            |          | 510      | 51       |                 |            |          | 751      | 750      |                 |            |          |
| 3R9      | 3.9      |         |            |          | 560      | 56       |                 |            |          | 821      | 820      |                 |            |          |
| 4R3      | 4.3      |         |            |          | 620      | 62       |                 |            |          | 911      | 910      |                 |            |          |
| 4R7      | 4.7      |         |            |          | 680      | 68       |                 |            |          | 102      | 1000     |                 | 500        | 800      |
| 5R1      | 5.1      |         |            |          | 750      | 75       |                 |            |          | 112      | 1100     |                 |            |          |
| 5R6      | 5.6      |         |            |          | 820      | 82       |                 |            |          | 122      | 1200     |                 |            |          |
| 6R2      | 6.2      |         |            |          | 910      | 91       |                 |            |          | 152      | 1500     |                 | 300        | 500      |
| 6R8      | 6.8      |         |            |          | 101      | 100      |                 |            |          | 182      | 1800     |                 |            |          |
| 7R5      | 7.5      |         |            |          | 111      | 110      |                 |            |          | 222      | 2200     |                 |            |          |
| 8R2      | 8.2      |         |            |          | 121      | 120      |                 | 3000       |          | 242      | 2400     |                 |            |          |
| 9R1      | 9.1      |         |            |          | 131      | 130      |                 |            |          | 272      | 2700     |                 |            |          |
|          |          |         |            |          | 151      | 150      |                 |            |          |          |          |                 |            |          |

# Hi-Q® High RF Power MLC Surface Mount Capacitors

For 600V to 7200V Applications



## HQCE CAPACITANCE VALUES (A DIELECTRIC)

| Cap Code | Cap (pF) | Tol.       | Rated WVDC |          | Cap Code | Cap (pF) | Tol.       | Rated WVDC |          | Cap Code | Cap (pF) | Tol.       | Rated WVDC |          |
|----------|----------|------------|------------|----------|----------|----------|------------|------------|----------|----------|----------|------------|------------|----------|
|          |          |            | Standard   | Extended |          |          |            | Standard   | Extended |          |          |            | Standard   | Extended |
| 1R0      | 1.0      | C, D       | 3600       | 7200     | 150      | 15       | G, J, K, M | 3600       | 7200     | 221      | 220      | G, J, K, M | 3600       | NA       |
| 1R2      | 1.2      |            |            |          | 180      | 18       |            |            |          | 271      | 270      |            |            |          |
| 1R5      | 1.5      |            |            |          | 220      | 22       |            |            |          | 331      | 330      |            |            |          |
| 1R8      | 1.8      |            |            |          | 270      | 27       |            |            |          | 391      | 390      |            |            |          |
| 2R2      | 2.2      |            |            |          | 330      | 33       |            |            |          | 471      | 470      |            | 2500       |          |
| 2R7      | 2.7      |            |            |          | 390      | 39       |            |            |          | 561      | 560      |            |            |          |
| 3R3      | 3.3      |            |            |          | 470      | 47       |            |            |          | 681      | 680      |            |            |          |
| 3R9      | 3.9      |            |            |          | 560      | 56       |            |            |          | 821      | 820      |            | 1000       |          |
| 4R7      | 4.7      |            |            |          | 680      | 68       |            |            | 102      | 1000     |          |            |            |          |
| 5R6      | 5.6      | 820        | 82         | 122      | 1200     |          |            |            |          |          |          |            |            |          |
| 6R8      | 6.8      | 101        | 100        | 152      | 1500     |          |            |            |          |          |          |            |            |          |
| 8R2      | 8.2      | 121        | 120        | 182      | 1800     |          |            |            |          |          |          |            |            |          |
| 100      | 10       | G, J, K, M |            |          | 151      | 150      |            | 5000       | 222      | 2200     |          |            |            |          |
| 120      | 12       |            |            |          | 181      | 180      |            |            |          |          |          |            |            |          |

## HQCE CAPACITANCE VALUES (M DIELECTRIC)

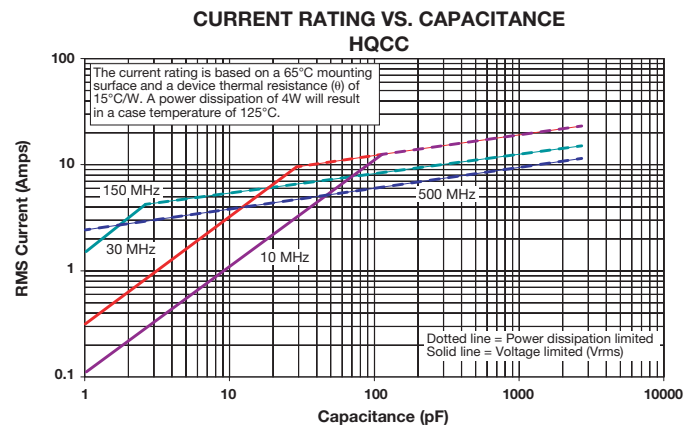
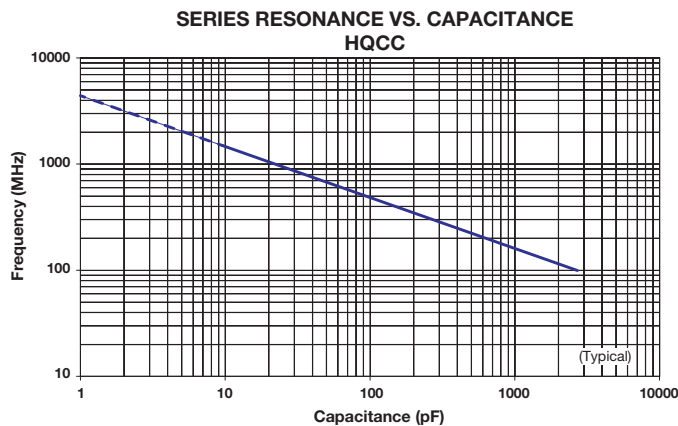
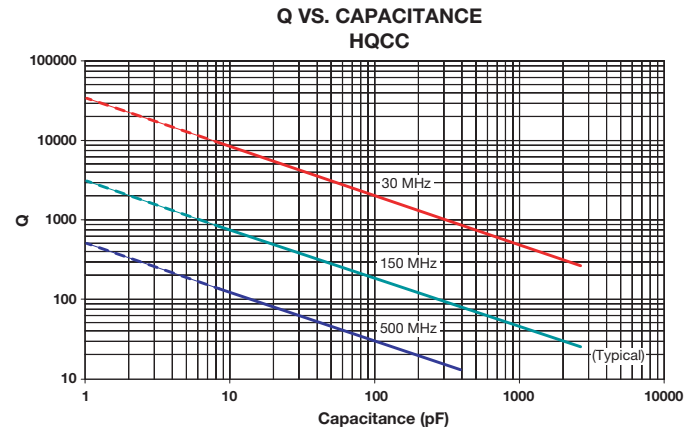
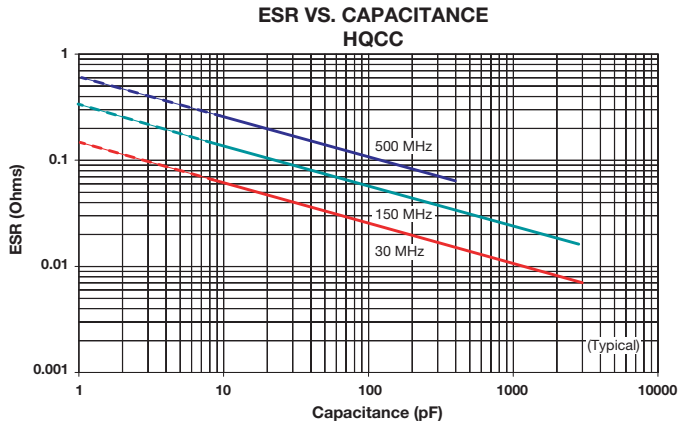
| Cap Code | Cap (pF) | Tol.          | Rated WVDC |          | Cap Code | Cap (pF) | Tol.          | Rated WVDC |          | Cap Code | Cap (pF) | Tol.          | Rated WVDC |          |
|----------|----------|---------------|------------|----------|----------|----------|---------------|------------|----------|----------|----------|---------------|------------|----------|
|          |          |               | Standard   | Extended |          |          |               | Standard   | Extended |          |          |               | Standard   | Extended |
| 1R0      | 1.0      | B, C, D       | 3600       | 7200     | 180      | 18       | F, G, J, K, M | 3600       | 7200     | 331      | 330      | F, G, J, K, M | 3600       | NA       |
| 1R2      | 1.2      |               |            |          | 220      | 22       |               |            |          | 391      | 390      |               |            |          |
| 1R5      | 1.5      |               |            |          | 270      | 27       |               |            |          | 471      | 470      |               |            |          |
| 1R8      | 1.8      |               |            |          | 330      | 33       |               |            |          | 561      | 560      |               | 2500       |          |
| 2R2      | 2.2      |               |            |          | 390      | 39       |               |            |          | 681      | 680      |               |            |          |
| 2R7      | 2.7      |               |            |          | 470      | 47       |               |            |          | 821      | 820      |               | 1000       |          |
| 3R3      | 3.3      |               |            |          | 560      | 56       |               |            |          | 102      | 1000     |               |            |          |
| 3R9      | 3.9      |               |            |          | 680      | 68       |               |            |          | 122      | 1200     |               |            |          |
| 4R7      | 4.7      |               |            |          | 820      | 82       |               |            |          | 152      | 1500     |               |            |          |
| 5R6      | 5.6      |               |            |          | 101      | 100      |               |            |          | 182      | 1800     |               |            |          |
| 6R8      | 6.8      | 121           | 120        | 222      | 2200     | 500      |               |            |          |          |          |               |            |          |
| 8R2      | 8.2      | 151           | 150        | 272      | 2700     |          |               |            |          |          |          |               |            |          |
| 100      | 10       | 181           | 180        | 332      | 3300     |          |               |            |          |          |          |               |            |          |
| 120      | 12       | F, G, J, K, M |            |          | 221      | 220      | G, J K, M     |            |          |          |          |               |            |          |
| 150      | 15       |               |            |          | 271      | 270      |               |            |          | 472      | 4700     |               |            |          |
|          |          |               |            |          |          |          |               |            |          | 512      | 5100     |               |            |          |

# Hi-Q® High RF Power MLC Surface Mount Capacitors

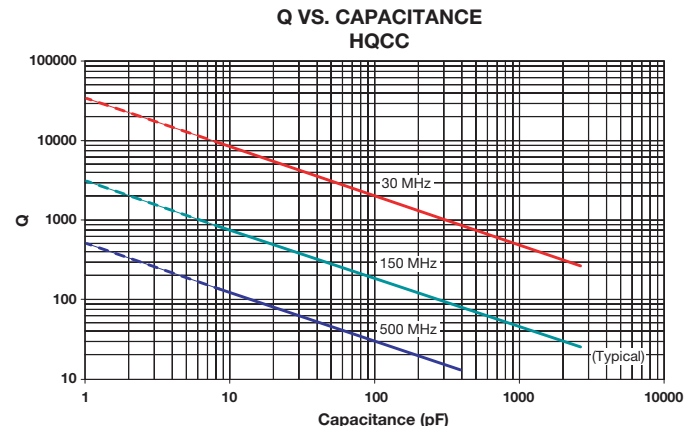
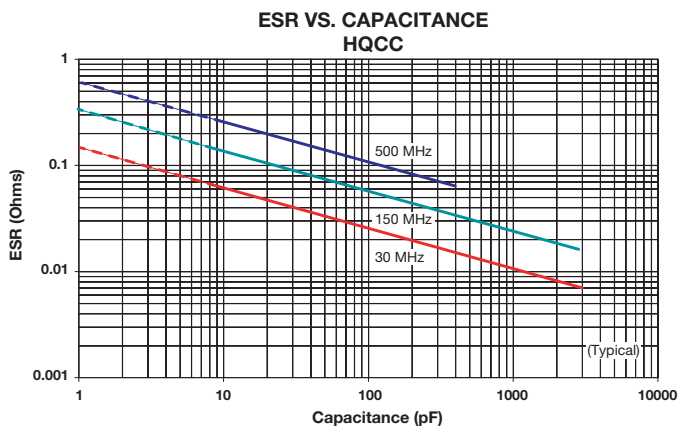
For 600V to 7200V Applications



## HQCC PERFORMANCE CHARACTERISTICS (A DIELECTRIC)

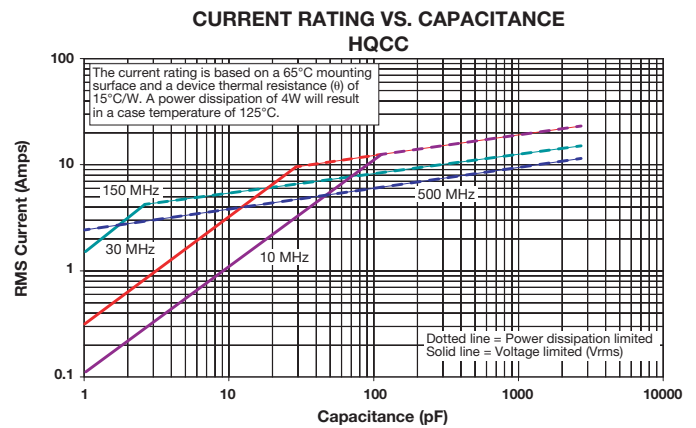
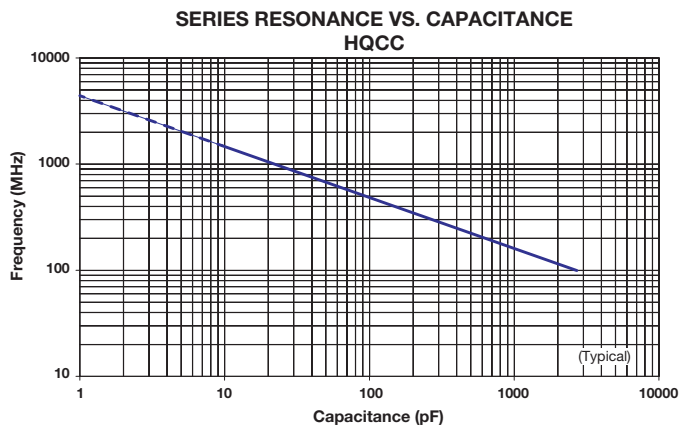


## HQCC PERFORMANCE CHARACTERISTICS (M DIELECTRIC)

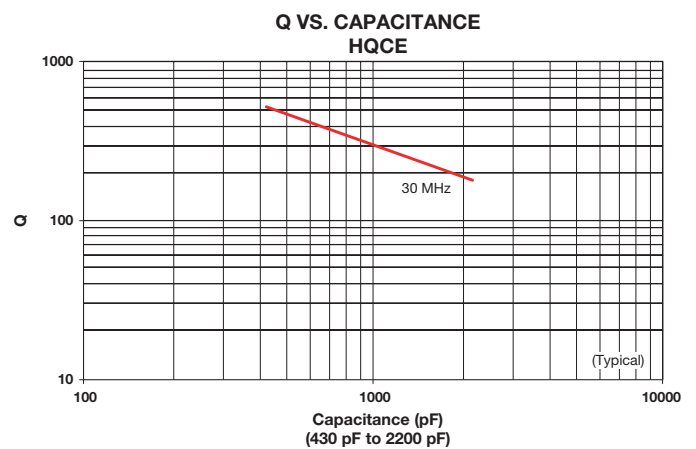
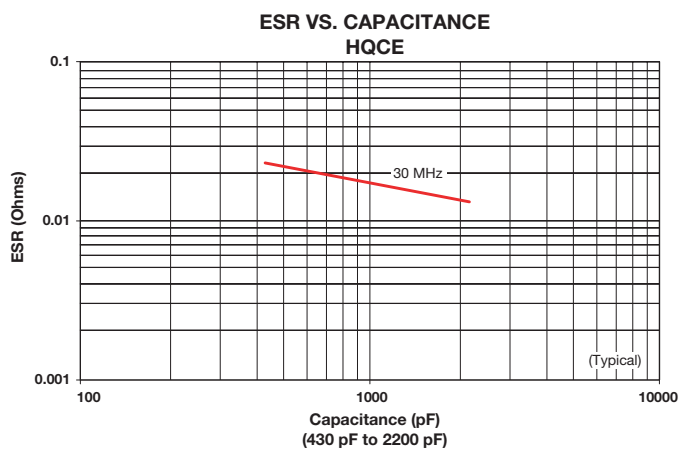
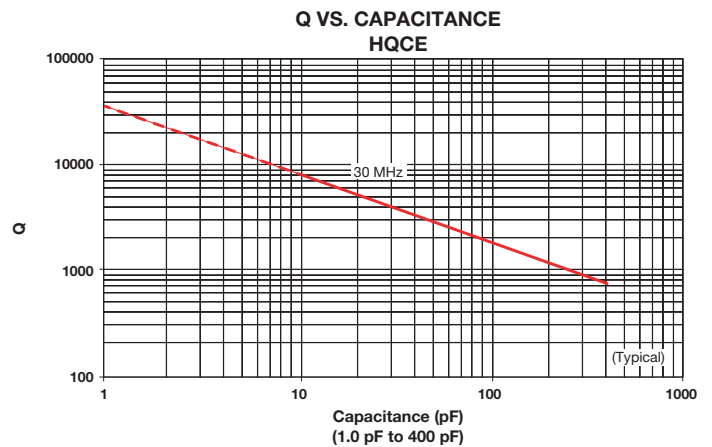
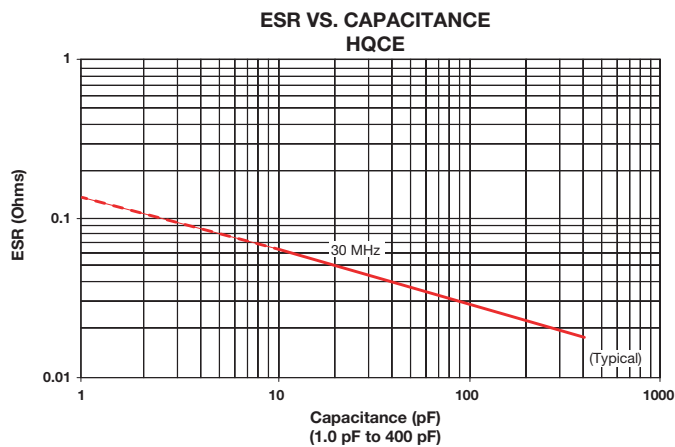


# Hi-Q® High RF Power MLC Surface Mount Capacitors

For 600V to 7200V Applications

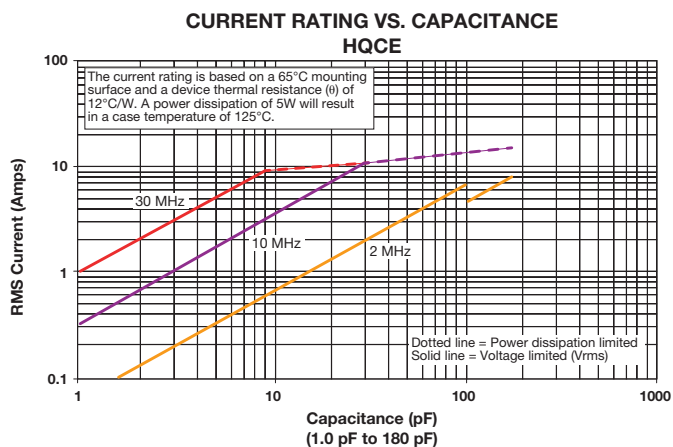
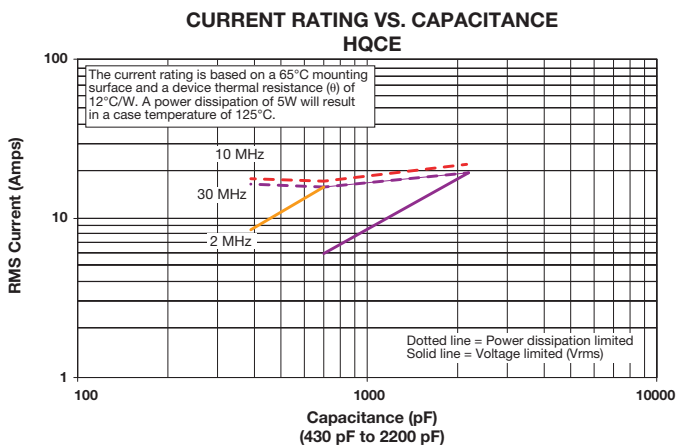
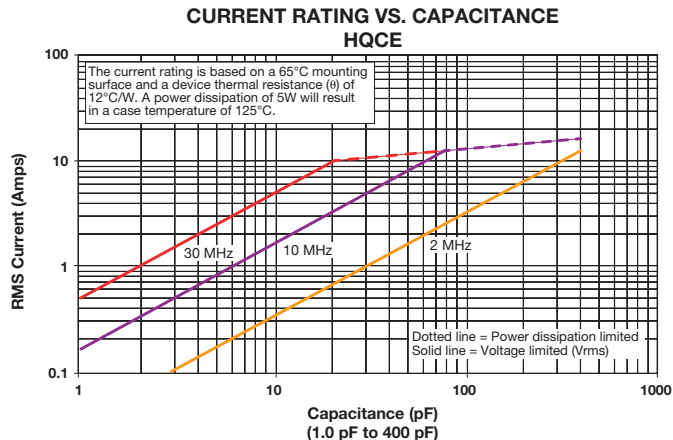
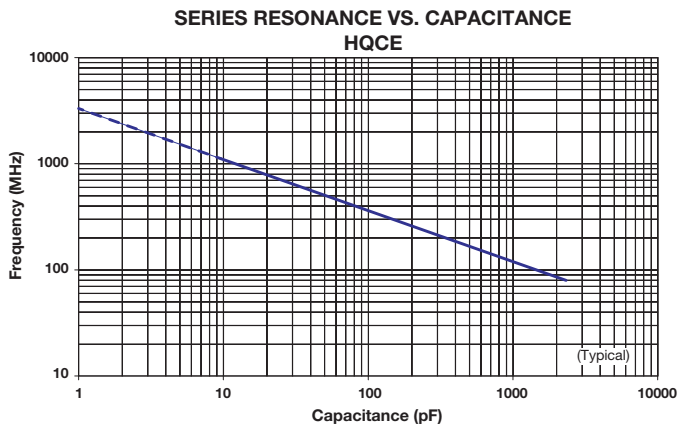


## HQCE PERFORMANCE CHARACTERISTICS (A DIELECTRIC)

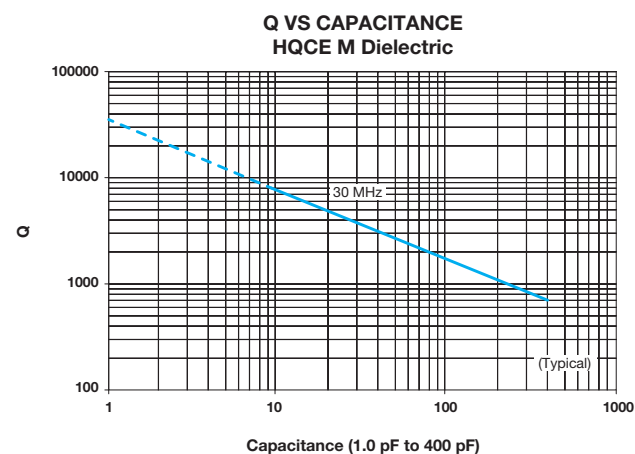
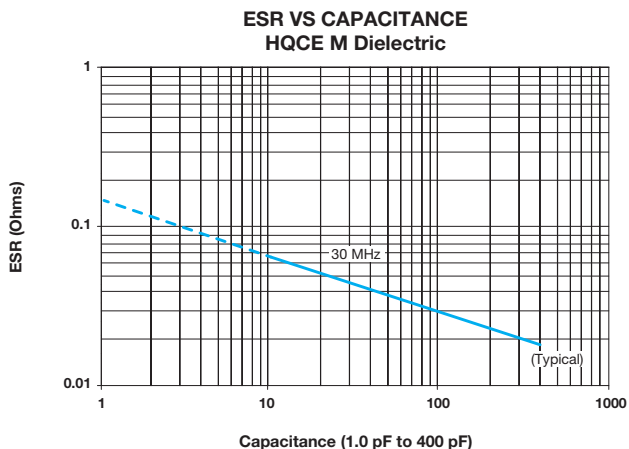


# Hi-Q® High RF Power MLC Surface Mount Capacitors

For 600V to 7200V Applications



## HQCE PERFORMANCE CHARACTERISTICS (M DIELECTRIC)

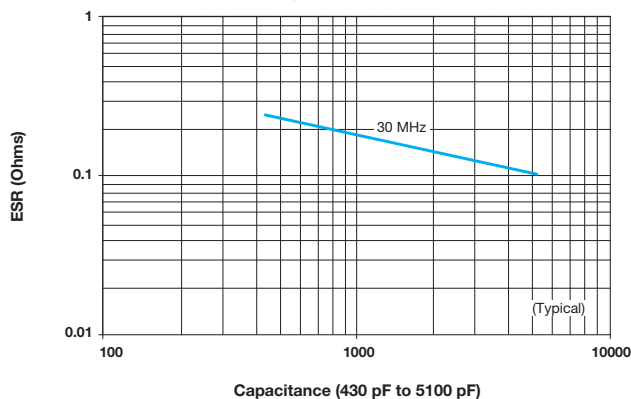


# Hi-Q® High RF Power MLC Surface Mount Capacitors

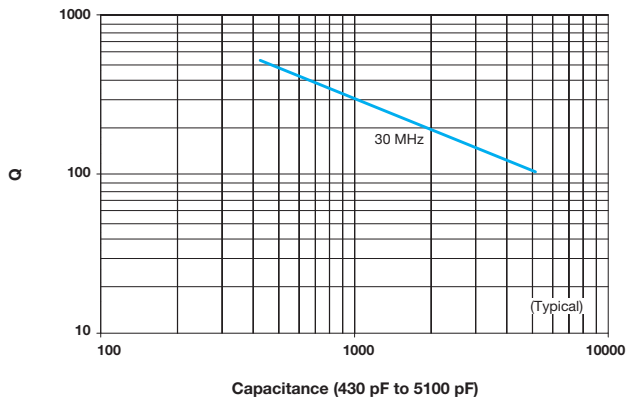
For 600V to 7200V Applications



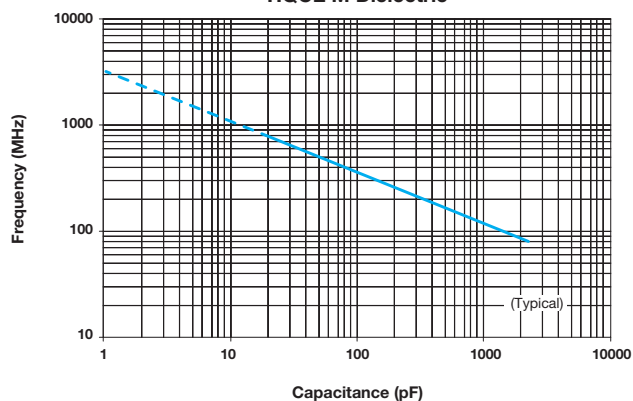
**ESR VS CAPACITANCE**  
HQCE M Dielectric



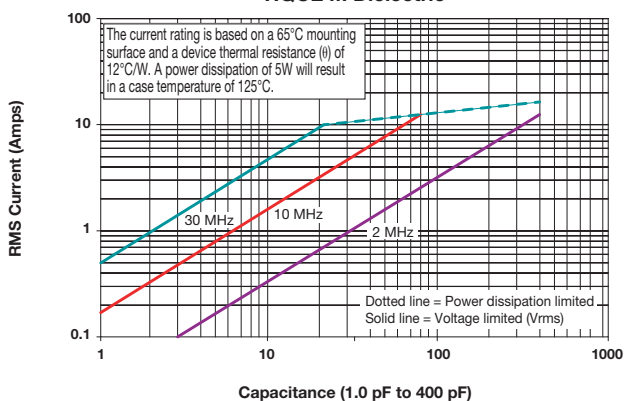
**Q VS CAPACITANCE**  
HQCE M Dielectric



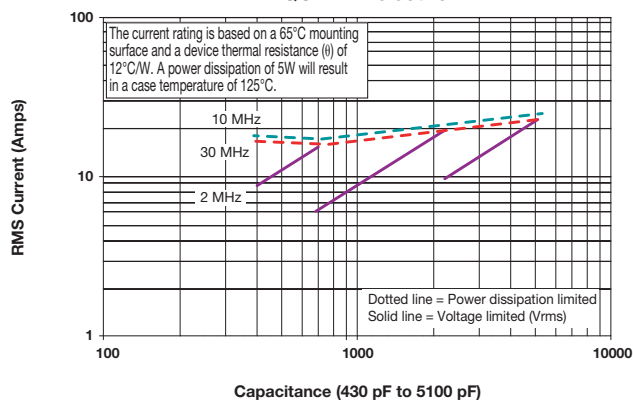
**SERIES RESONANCE VS CAPACITANCE**  
HQCE M Dielectric



**CURRENT RATING VS CAPACITANCE**  
HQCE M Dielectric



**CURRENT RATING VS CAPACITANCE**  
HQCE M Dielectric



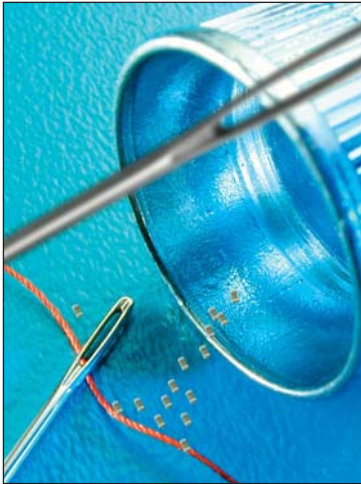
# RF/Microwave C0G (NP0) Capacitors (RoHS)



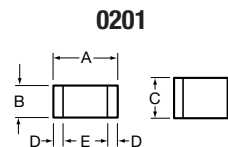
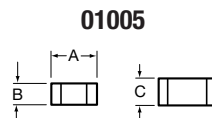
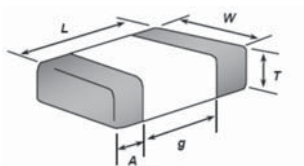
## Ultra Low ESR, "CU" Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

"CU" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Sizes available are EIA chip sizes 01005 and 0201.



### DIMENSIONS:



mm (inches)

| Size            | L<br>(Length)               | W<br>(Width)                | T<br>(Max. Thickness) | g<br>(min.)     | A<br>(Termination Min./Max.) |
|-----------------|-----------------------------|-----------------------------|-----------------------|-----------------|------------------------------|
| 0402<br>(01005) | 0.40±0.02<br>(0.016±0.0008) | 0.20±0.02<br>(0.008±0.0008) | 0.22<br>(0.009)       | 0.13<br>(0.005) | 0.70/0.14<br>(0.003/0.006)   |
| 0603<br>(0201)  | 0.60±0.03<br>(0.024±0.001)  | 0.30±0.03<br>(0.012±0.001)  | 0.33<br>(0.013)       | 0.15<br>(0.006) | 0.10/0.20<br>(0.004/0.008)   |

### HOW TO ORDER

|                                                 |                                           |                                               |                                                                                                                                                                                                  |                                                                                                        |                                                |                                            |                                                                                       |                                |
|-------------------------------------------------|-------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------|
| <b>CU01</b>                                     | <b>3</b>                                  | <b>1</b>                                      | <b>100</b>                                                                                                                                                                                       | <b>J</b>                                                                                               | <b>A</b>                                       | <b>T</b>                                   | <b>2</b>                                                                              | <b>A</b>                       |
| <b>Case Size</b><br>CU10 = 01005<br>CU01 = 0201 | <b>Voltage Code</b><br>3 = 25V<br>Y = 16V | <b>Dielectric</b><br>1 = 0±30ppm<br>C0G (NP0) | <b>Capacitance</b><br>EIA Capacitance Code in pF.<br><br>First two digits = significant figures or "R" for decimal place.<br><br>Third digit = number of zeros or after "R" significant figures. | <b>Capacitance Tolerance Code</b><br><br>B = ±0.1pF<br>C = ±0.25pF<br>D = ±0.5pF<br>G = ±2%<br>J = ±5% | <b>Failure Rate Code</b><br>A = Not Applicable | <b>Termination</b><br>T = Plated Ni and Sn | <b>Packaging Code</b><br>2 = 7" Reel<br>4 = 13" Reel<br>U = 7" Reel<br>4mm TR (01005) | <b>Special</b><br>A = Standard |



### ELECTRICAL CHARACTERISTICS

#### Capacitance Value Range:

Size 01005 0.5 to 22pF  
Size 0201 0.5 to 22pF

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
01005 - 16 WVDC  
0201 - 25 WVDC



# RF/Microwave C0G (NP0) Capacitors (RoHS)

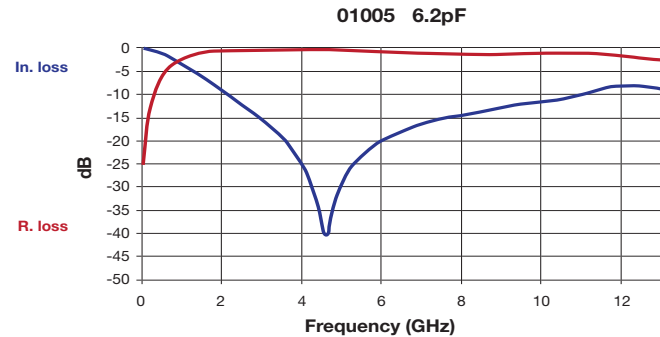


## Ultra Low ESR, “CU” Series, C0G (NP0) Chip Capacitors

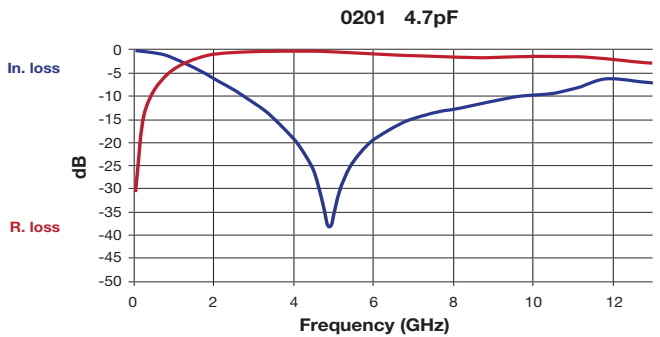
### CAPACITANCE RANGE

| Cap (pF) | Available Tolerance |       |
|----------|---------------------|-------|
|          | 01005               | 0201  |
| 0.5      | B,C,D               | B,C,D |
| 0.75     |                     |       |
| 1.0      |                     |       |
| 1.2      |                     |       |
| 1.5      |                     |       |
| 1.8      |                     |       |
| 2.2      |                     |       |
| 2.7      |                     |       |
| 3.3      |                     |       |
| 3.9      |                     |       |
| 4.7      |                     | B,C,D |
| 5.6      |                     | C,D   |
| 6.2      |                     | C,D   |
| 6.8      |                     | D     |
| 8.2      |                     | D     |
| 10.0     | G,J,K               | J,K   |
| 12.0     |                     |       |
| 15.0     |                     |       |
| 18.0     |                     |       |
| 22.0     |                     | J,K   |

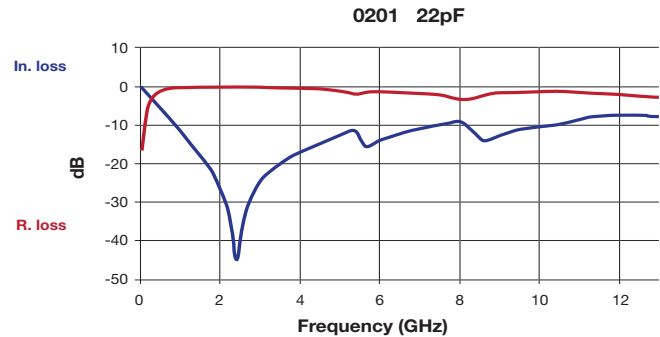
### ULTRA LOW ESR, “CU” SERIES



|    | F (GHz) | IL     | R. loss |
|----|---------|--------|---------|
| F1 | 0.31    | -0.40  | -9.68   |
| F2 | 1.28    | -5.03  | -1.44   |
| F3 | 2.408   | -11.58 | -0.27   |
| F4 | 4.635   | -40.55 | -0.39   |
| F5 | 4.897   | -31.82 | -0.47   |



|    | F (GHz) | IL     | R. loss |
|----|---------|--------|---------|
| F1 | 0.31    | -0.13  | -12.90  |
| F2 | 1.28    | -2.89  | -2.84   |
| F3 | 2.408   | -8.09  | -0.60   |
| F4 | 4.635   | -29.45 | -0.37   |
| F5 | 4.897   | -38.55 | -0.45   |



|    | F (GHz) | IL     | R. loss |
|----|---------|--------|---------|
| F1 | 0.31    | -2.90  | -2.85   |
| F2 | 1.28    | -15.26 | -0.10   |
| F3 | 2.408   | -45.65 | -0.10   |
| F4 | 4.635   | -14.90 | -0.87   |
| F5 | 4.897   | -12.89 | -1.08   |

# RF/Microwave C0G (NP0) Capacitors (RoHS)



## Ultra Low ESR, "U" Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

"U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance

are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0603, 0805, and 1210.

### DIMENSIONS: inches (millimeters)

|      | 0402                    | 0603                    | 0805                     | 1210                      |                  |
|------|-------------------------|-------------------------|--------------------------|---------------------------|------------------|
|      |                         |                         |                          |                           |                  |
|      |                         |                         |                          |                           | inches (mm)      |
| Size | A                       | B                       | C                        | D                         | E                |
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max          | N/A                       | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max         | 0.010±0.005 (0.25±0.13)   | 0.030 (0.76) min |
| 0805 | 0.079±0.008 (2.01±0.2)  | 0.049±0.008 (1.25±0.2)  | 0.040±0.005 (1.02±0.127) | 0.020±0.010 (0.51±0.254)  | 0.020 (0.51) min |
| 1210 | 0.126±0.008 (3.2±0.2)   | 0.098±0.008 (2.49±0.2)  | 0.050±0.005 (1.27±0.127) | 0.025±0.015 (0.635±0.381) | 0.040 (1.02) min |

### HOW TO ORDER

|                                                  |                                                                   |                                   |                                                                                                                                                                                             |                                                                                                                                       |                                                |                                            |                                                                  |                                     |
|--------------------------------------------------|-------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------|------------------------------------------------------------------|-------------------------------------|
| <b>0805</b>                                      | <b>1</b>                                                          | <b>U</b>                          | <b>100</b>                                                                                                                                                                                  | <b>J</b>                                                                                                                              | <b>A</b>                                       | <b>T</b>                                   | <b>2</b>                                                         | <b>A</b>                            |
| <b>Case Size</b><br>0402<br>0603<br>0805<br>1210 | <b>Voltage Code</b><br>3 = 25V<br>5 = 50V<br>1 = 100V<br>2 = 200V | <b>Dielectric = Ultra Low ESR</b> | <b>Capacitance</b><br>EIA Capacitance Code in pF.<br>First two digits = significant figures<br>or "R" for decimal place.<br>Third digit = number of zeros or after "R" significant figures. | <b>Capacitance Tolerance Code</b><br>B = ±0.1pF<br>C = ±0.25pF<br>D = ±0.5pF<br>F = ±1%<br>G = ±2%<br>J = ±5%<br>K = ±10%<br>M = ±20% | <b>Failure Rate Code</b><br>A = Not Applicable | <b>Termination</b><br>T = Plated Ni and Sn | <b>Packaging Code</b><br>2 = 7" Reel<br>4 = 13" Reel<br>9 = Bulk | <b>Special Code</b><br>A = Standard |

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz  
Size 0603 - 1.0 pF to 100 pF @ 1 MHz  
Size 0805 - 1.6 pF to 160 pF @ 1 MHz  
Size 1210 - 2.4 pF to 1000 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
0402 - 50, 25 WVDC  
0603 - 200, 100, 50 WVDC  
0805 - 200, 100 WVDC  
1210 - 200, 100 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

0402 - See Performance Curve, page 231  
0603 - See Performance Curve, page 231  
0805 - See Performance Curve, page 231  
1210 - See Performance Curve, page 231

**Marking:** Laser marking EIA J marking standard (except 0603) (capacitance code and tolerance upon request).

#### MILITARY SPECIFICATIONS

Meets or exceeds the requirements of MIL-C-55681



# RF/Microwave C0G (NP0) Capacitors (RoHS)



## Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors

### CAPACITANCE RANGE

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | 0402 | 0603 | 0805 | 1210 |
| 0.2      | B,C                 | 50V  | N/A  | N/A  | N/A  |
| 0.3      | B,C                 | 50V  | N/A  | N/A  | N/A  |
| 0.4      | B,C                 | 50V  | N/A  | N/A  | N/A  |
| 0.5      | B,C                 | 50V  | N/A  | N/A  | N/A  |
| 0.6      | B,C,D               | 50V  | N/A  | N/A  | N/A  |
| 0.7      | B,C,D               | 50V  | N/A  | N/A  | N/A  |
| 0.8      | B,C,D               | 50V  | N/A  | N/A  | N/A  |
| 0.9      | B,C,D               | 50V  | N/A  | N/A  | N/A  |

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | 0402 | 0603 | 0805 | 1210 |
| 1.0      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.1      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.2      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.3      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.4      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.5      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.6      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.7      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.8      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.9      | B,C,D               | 50V  | 200V | 200V | 200V |
| 2.0      | B,C,D               | 50V  | 200V | 200V | 200V |
| 2.1      | B,C,D               | 50V  | 200V | 200V | 200V |
| 2.2      | B,C,D               | 50V  | 200V | 200V | 200V |
| 2.4      | B,C,D               | 50V  | 200V | 200V | 200V |
| 2.7      | B,C,D               | 50V  | 200V | 200V | 200V |
| 3.0      | B,C,D               | 50V  | 200V | 200V | 200V |
| 3.3      | B,C,D               | 50V  | 200V | 200V | 200V |
| 3.6      | B,C,D               | 50V  | 200V | 200V | 200V |
| 3.9      | B,C,D               | 50V  | 200V | 200V | 200V |
| 4.3      | B,C,D               | 50V  | 200V | 200V | 200V |
| 4.7      | B,C,D               | 50V  | 200V | 200V | 200V |
| 5.1      | B,C,D               | 50V  | 200V | 200V | 200V |
| 5.6      | B,C,D               | 50V  | 200V | 200V | 200V |
| 6.2      | B,C,D               | 50V  | 200V | 200V | 200V |
| 6.8      | B,C,D               | 50V  | 200V | 200V | 200V |

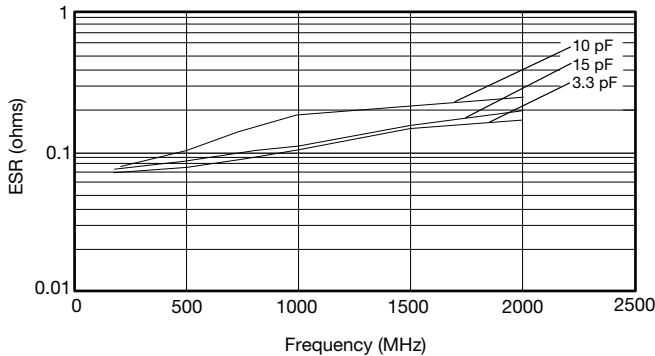
| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | 0402 | 0603 | 0805 | 1210 |
| 7.5      | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 8.2      | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 9.1      | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 10       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 11       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 12       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 13       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 15       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 18       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 20       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 22       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 24       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 27       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 30       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 33       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 36       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 39       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 43       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 47       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 51       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 56       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 68       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 75       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 82       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 91       | B,C,J,K,M           | 50V  | 200V | 200V | 200V |

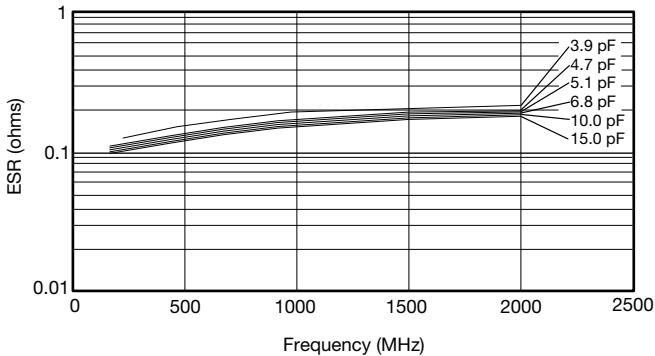
| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | 0402 | 0603 | 0805 | 1210 |
| 100      | F,G,J,K,M           | N/A  | 100V | 200V | 200V |
| 110      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 120      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 130      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 140      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 150      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 160      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 180      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 200      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 220      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 270      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 300      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 330      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 360      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 390      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 430      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 470      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 510      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 560      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 620      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 680      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 750      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 820      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 910      | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |
| 1000     | F,G,J,K,M           | N/A  | 50V  | 200V | 200V |

### ULTRA LOW ESR, “U” SERIES

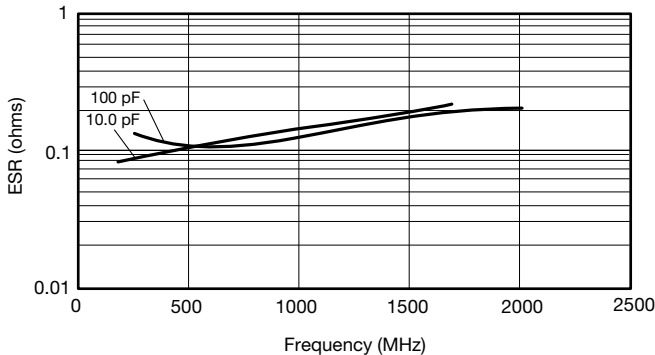
TYPICAL ESR vs. FREQUENCY  
0402 “U” SERIES



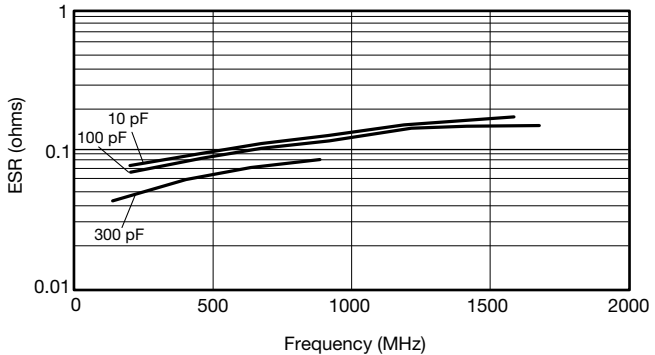
TYPICAL ESR vs. FREQUENCY  
0603 “U” SERIES



TYPICAL ESR vs. FREQUENCY  
0805 “U” SERIES



TYPICAL ESR vs. FREQUENCY  
1210 “U” SERIES

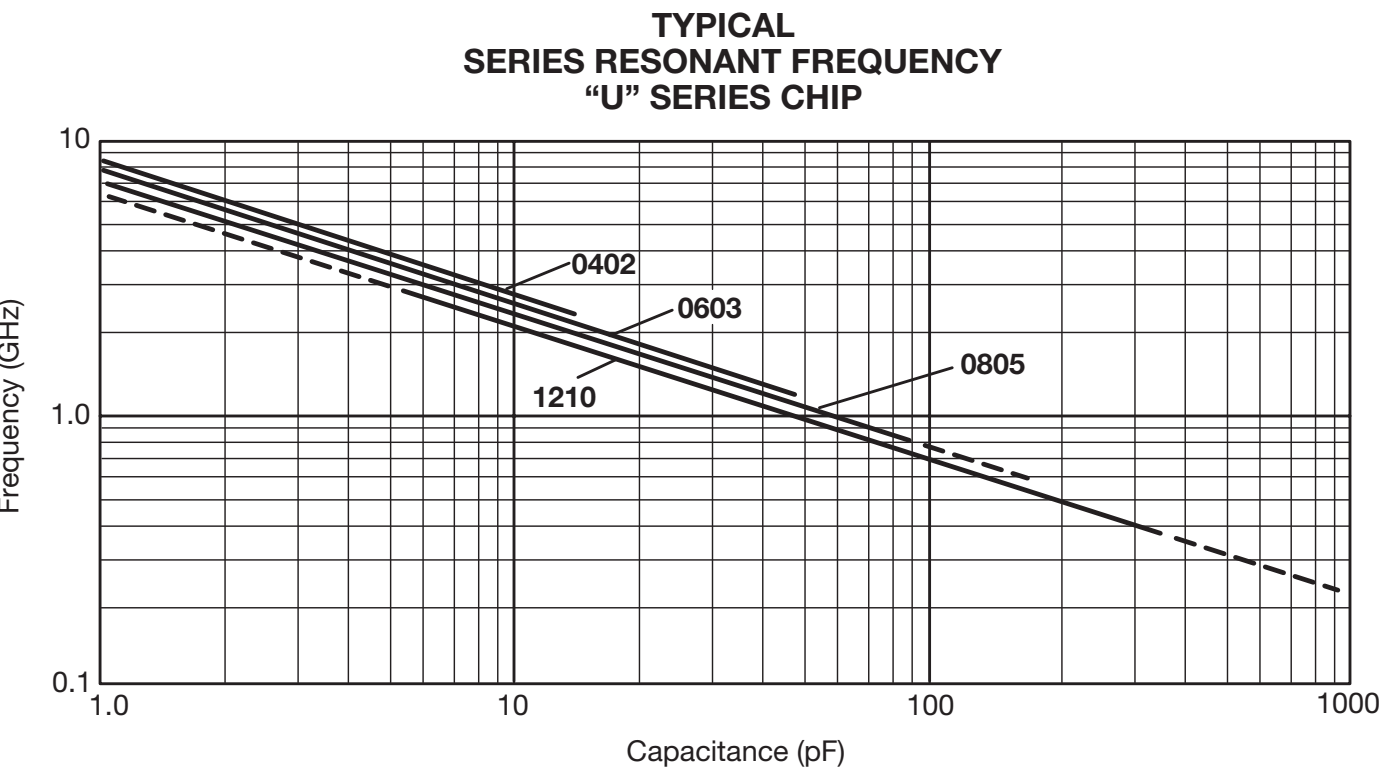


ESR Measured on the Boonton 34A

# RF/Microwave C0G (NP0) Capacitors (RoHS)



Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors



# RF/Microwave Automotive C0G (NP0) Capacitors (RoHS), AEC Q200 Qualified



## Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

Automotive “U” Series capacitors are C0G (NP0) chip capacitors specially designed for “Ultra” low ESR for applications in the automotive market. Max ESR and effective capacitance

are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0402 and 0603.

### DIMENSIONS: inches (millimeters)

0402

0603



| Size | inches (mm)             |                         |                  |                         |                  |
|------|-------------------------|-------------------------|------------------|-------------------------|------------------|
|      | A                       | B                       | C                | D                       | E                |
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max  | N/A                     | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max | 0.010±0.005 (0.25±0.13) | 0.030 (0.76) min |

### HOW TO ORDER

**0402**

Case Size  
0402  
0603

**1**

Voltage Code  
5 = 50V  
1 = 100V  
2 = 200V

**U**

Dielectric =  
Ultra Low  
ESR

**100**

Capacitance  
EIA Capacitance Code in pF.  
First two digits = significant figures  
or “R” for decimal place.  
Third digit = number of zeros or  
after “R” significant figures.

**J**

Capacitance  
Tolerance  
Code  
B = ±0.1pF  
C = ±0.25pF  
D = ±0.5pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

**4**

Failure Rate  
Code  
4 = Automotive

**T**

Termination  
T = Plated Ni and Sn

**2**

Packaging  
Code  
2 = 7" Reel  
4 = 13" Reel  
9 = Bulk

**A**

Special Code  
A = Standard

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz  
Size 0603 - 1.0 pF to 100 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
0402 - 50, 25 WVDC  
0603 - 200, 100, 50 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

0402 - See Performance Curve, page 234  
0603 - See Performance Curve, page 234

#### Automotive Specifications

Meets or exceeds the requirements of AEC Q200



# RF/Microwave Automotive C0G (NP0) Capacitors (RoHS), AEC Q200 Qualified



## Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors

### CAPACITANCE RANGE

| Cap (pF) | Available Tolerance | Size |      |
|----------|---------------------|------|------|
|          |                     | 0402 | 0603 |
| 0.2      | B,C                 | 50V  | N/A  |
| 0.3      |                     |      |      |
| 0.4      |                     |      |      |
| 0.5      | B,C                 |      |      |
| 0.6      | B,C,D               |      |      |
| 0.7      |                     |      |      |
| 0.8      |                     |      |      |
| 0.9      | B,C,D               |      |      |

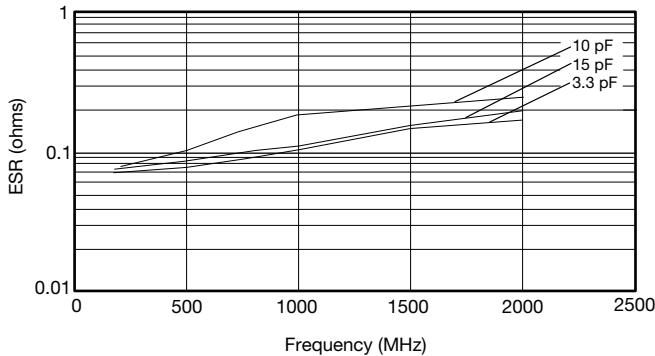
| Cap (pF) | Available Tolerance | Size |      |
|----------|---------------------|------|------|
|          |                     | 0402 | 0603 |
| 1.0      | B,C,D               | 50V  | 200V |
| 1.1      |                     |      |      |
| 1.2      |                     |      |      |
| 1.3      |                     |      |      |
| 1.4      |                     |      |      |
| 1.5      |                     |      |      |
| 1.6      |                     |      |      |
| 1.7      |                     |      |      |
| 1.8      |                     |      |      |
| 1.9      |                     |      |      |
| 2.0      |                     |      |      |
| 2.1      |                     |      |      |
| 2.2      |                     |      |      |
| 2.4      |                     |      |      |
| 2.7      |                     |      |      |
| 3.0      |                     |      |      |
| 3.3      |                     |      |      |
| 3.6      |                     |      |      |
| 3.9      |                     |      |      |
| 4.3      |                     |      |      |
| 4.7      |                     |      |      |
| 5.1      |                     |      |      |
| 5.6      |                     |      |      |
| 6.2      | B,C,D               |      |      |
| 6.8      | B,C,J,K,M           |      |      |

| Cap (pF) | Available Tolerance | Size |      |
|----------|---------------------|------|------|
|          |                     | 0402 | 0603 |
| 7.5      | B,C,J,K,M           | 50V  | 200V |
| 8.2      |                     |      |      |
| 9.1      | B,C,J,K,M           |      |      |
| 10       | F,G,J,K,M           |      |      |
| 11       |                     |      |      |
| 12       |                     |      |      |
| 13       |                     |      |      |
| 15       |                     |      |      |
| 18       |                     |      |      |
| 20       |                     |      |      |
| 22       |                     |      |      |
| 24       |                     |      |      |
| 27       |                     |      |      |
| 30       |                     |      |      |
| 33       |                     |      |      |
| 36       |                     |      |      |
| 39       |                     |      |      |
| 43       |                     |      |      |
| 47       |                     |      |      |
| 51       |                     |      |      |
| 56       |                     |      |      |
| 68       |                     |      |      |
| 75       |                     |      |      |
| 82       |                     |      |      |
| 91       |                     |      |      |

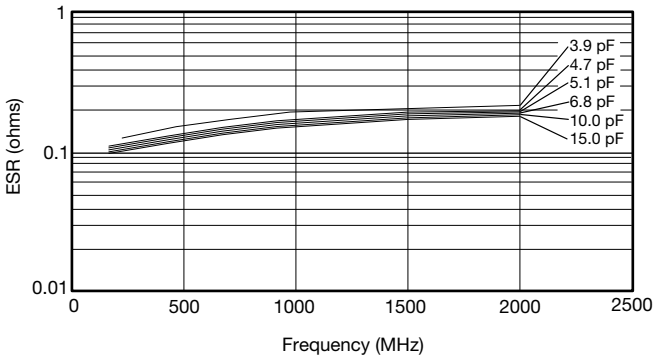
| Cap (pF) | Available Tolerance | Size |      |
|----------|---------------------|------|------|
|          |                     | 0402 | 0603 |
| 100      | F,G,J,K,M           | N/A  | 100V |
| 110      |                     |      | 50V  |
| 120      |                     |      | 50V  |
| 130      |                     |      | N/A  |
| 140      |                     |      |      |
| 150      |                     |      |      |
| 160      |                     |      |      |
| 180      |                     |      |      |
| 200      |                     |      |      |
| 220      |                     |      |      |
| 270      |                     |      |      |
| 300      |                     |      |      |
| 330      |                     |      |      |
| 360      |                     |      |      |
| 390      |                     |      |      |
| 430      |                     |      |      |
| 470      |                     |      |      |
| 510      |                     |      |      |
| 560      |                     |      |      |
| 620      |                     |      |      |
| 680      |                     |      |      |
| 750      |                     |      |      |
| 820      |                     |      |      |
| 910      |                     |      |      |
| 1000     | F,G,J,K,M           |      |      |

### ULTRA LOW ESR, “U” SERIES

TYPICAL ESR vs. FREQUENCY  
0402 “U” SERIES



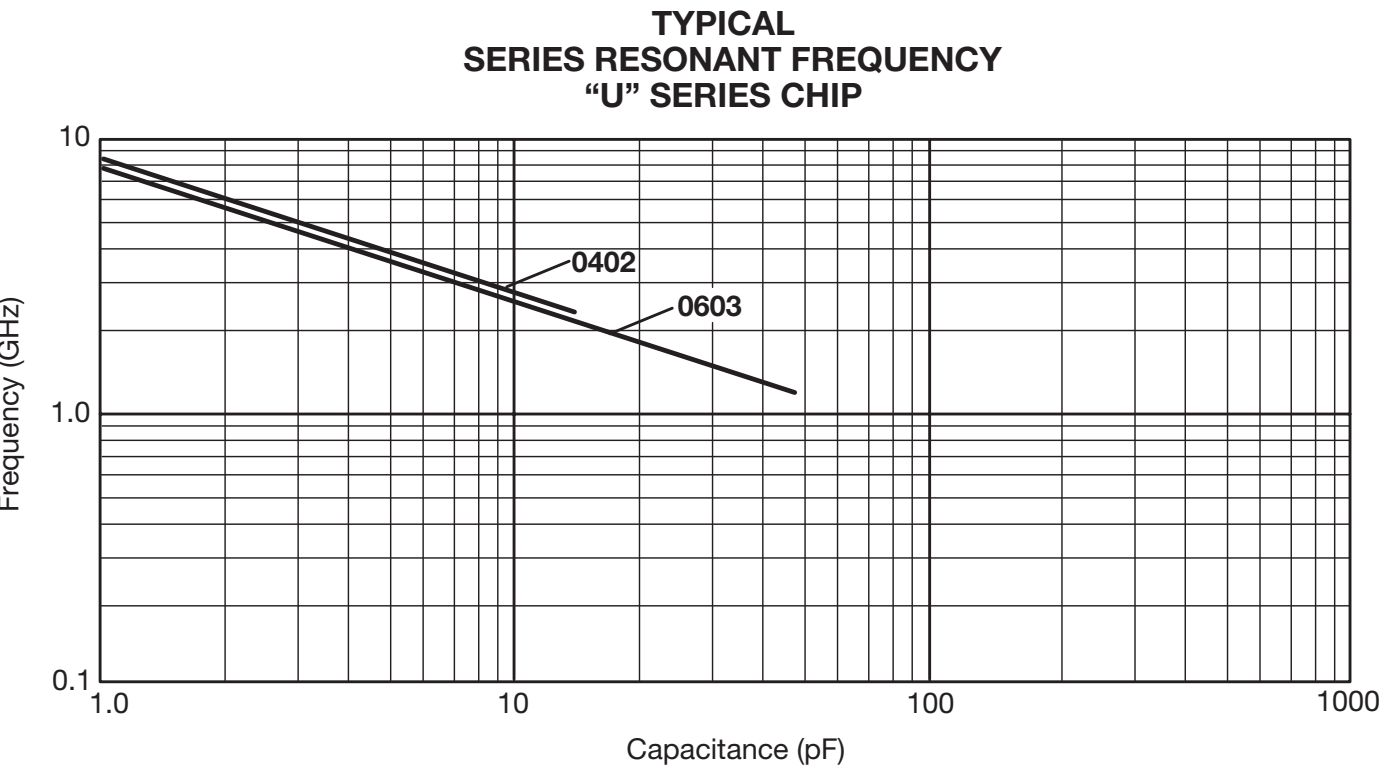
TYPICAL ESR vs. FREQUENCY  
0603 “U” SERIES



RF/Microwave Automotive C0G (NP0)  
Capacitors (RoHS), AEC Q200 Qualified



Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors



# RF/Microwave C0G (NP0) Capacitors (Sn/Pb)



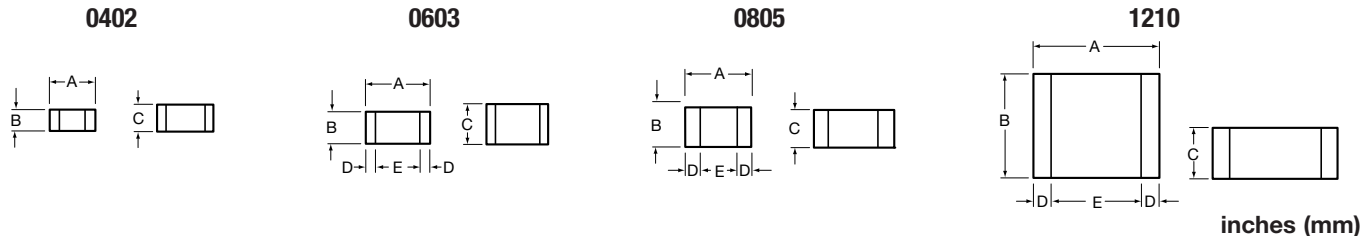
## Ultra Low ESR, "U" Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

"U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance

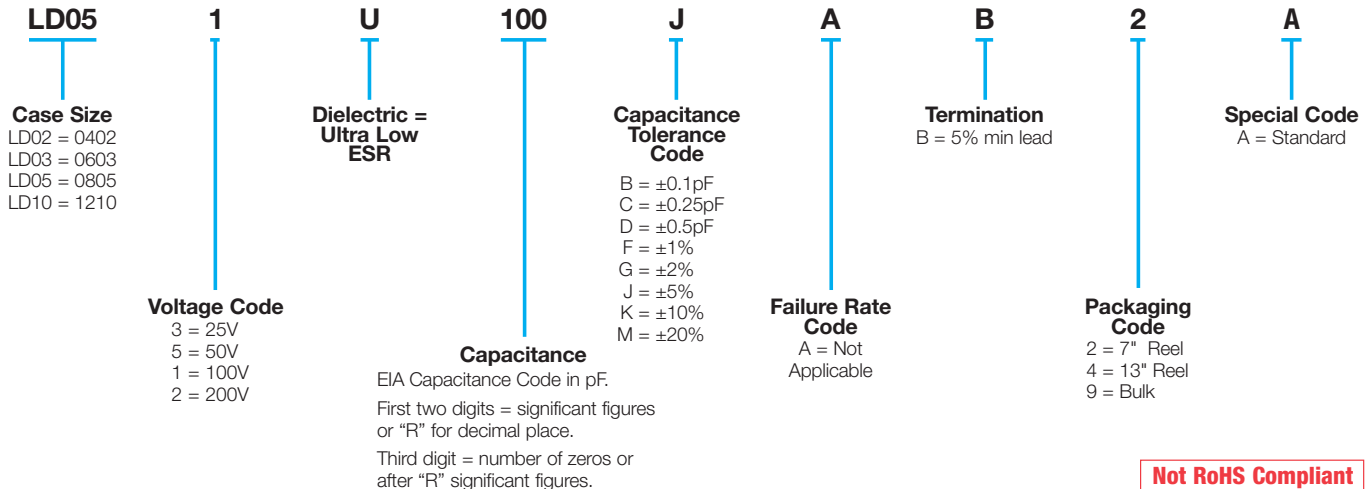
are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0603, 0805, and 1210.

### DIMENSIONS: inches (millimeters)



| Size | A                       | B                       | C                        | D                         | E                |
|------|-------------------------|-------------------------|--------------------------|---------------------------|------------------|
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max          | N/A                       | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max         | 0.010±0.005 (0.25±0.13)   | 0.030 (0.76) min |
| 0805 | 0.079±0.008 (2.01±0.2)  | 0.049±0.008 (1.25±0.2)  | 0.040±0.005 (1.02±0.127) | 0.020±0.010 (0.51±0.254)  | 0.020 (0.51) min |
| 1210 | 0.126±0.008 (3.2±0.2)   | 0.098±0.008 (2.49±0.2)  | 0.050±0.005 (1.27±0.127) | 0.025±0.015 (0.635±0.381) | 0.040 (1.02) min |

### HOW TO ORDER



Not RoHS Compliant

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz  
Size 0603 - 1.0 pF to 100 pF @ 1 MHz  
Size 0805 - 1.6 pF to 160 pF @ 1 MHz  
Size 1210 - 2.4 pF to 1000 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
0402 - 50, 25 WVDC  
0603 - 200, 100, 50 WVDC  
0805 - 200, 100 WVDC  
1210 - 200, 100 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

0402 - See Performance Curve, page 237  
0603 - See Performance Curve, page 237  
0805 - See Performance Curve, page 237  
1210 - See Performance Curve, page 237

**Marking:** Laser marking EIA J marking standard  
(except 0603) (capacitance code and  
tolerance upon request).

#### MILITARY SPECIFICATIONS

Meets or exceeds the requirements of MIL-C-55681



## CAPACITANCE RANGE

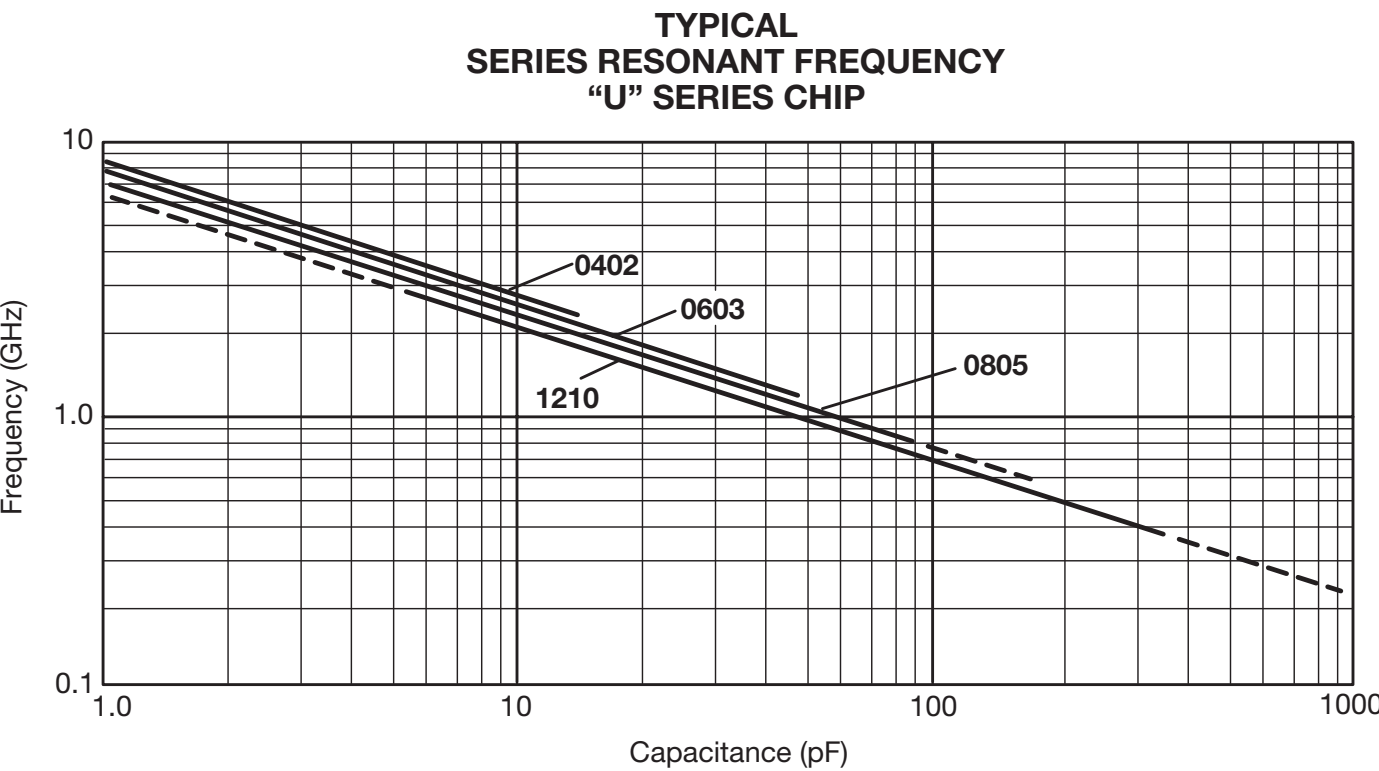
| Cap (pF) | Available<br>Tolerance                 | Size |      |      |      |
|----------|----------------------------------------|------|------|------|------|
|          |                                        | LD02 | LD03 | LD05 | LD10 |
| 0.2      | B,C<br>↓<br>B,C<br>B,C,D<br>↓<br>B,C,D | 50V  | N/A  | N/A  | N/A  |
| 0.3      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.4      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.5      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.6      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.7      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.8      |                                        | ↓    | ↓    | ↓    | ↓    |
| 0.9      |                                        | ↓    | ↓    | ↓    | ↓    |
|          |                                        |      | ↓    | ↓    | ↓    |

| Cap (pF) | Available<br>Tolerance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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|      |      |      |      |

# RF/Microwave C0G (NP0) Capacitors (Sn/Pb)



Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors



### 0402

| Kit 5000 UZ      |                   |                  |                   |
|------------------|-------------------|------------------|-------------------|
| Cap. Value<br>pF | Tolerance         | Cap. Value<br>pF | Tolerance         |
| 0.5              | B ( $\pm 0.1$ pF) | 4.7              | B ( $\pm 0.1$ pF) |
| 1.0              |                   | 5.6              |                   |
| 1.5              |                   | 6.8              |                   |
| 1.8              |                   | 8.2              |                   |
| 2.2              |                   | 10.0             |                   |
| 2.4              |                   | 12.0             | J ( $\pm 5\%$ )   |
| 3.0              |                   | 15.0             |                   |
| 3.6              |                   |                  |                   |

\*\*\*25 each of 15 values

### 0603

| Kit 4000 UZ      |                   |                  |                   |
|------------------|-------------------|------------------|-------------------|
| Cap. Value<br>pF | Tolerance         | Cap. Value<br>pF | Tolerance         |
| 1.0              | B ( $\pm 0.1$ pF) | 6.8              | B ( $\pm 0.1$ pF) |
| 1.2              |                   | 7.5              |                   |
| 1.5              |                   | 8.2              |                   |
| 1.8              |                   | 10.0             | J ( $\pm 5\%$ )   |
| 2.0              |                   | 12.0             |                   |
| 2.4              |                   | 15.0             |                   |
| 2.7              |                   | 18.0             |                   |
| 3.0              |                   | 22.0             |                   |
| 3.3              |                   | 27.0             |                   |
| 3.9              |                   | 33.0             |                   |
| 4.7              |                   | 39.0             |                   |
| 5.6              |                   | 47.0             |                   |

\*\*\*25 each of 24 values

### 0805

| Kit 3000 UZ      |                   |                  |                 |
|------------------|-------------------|------------------|-----------------|
| Cap. Value<br>pF | Tolerance         | Cap. Value<br>pF | Tolerance       |
| 1.0              | B ( $\pm 0.1$ pF) | 15.0             | J ( $\pm 5\%$ ) |
| 1.5              |                   | 18.0             |                 |
| 2.2              |                   | 22.0             |                 |
| 2.4              |                   | 24.0             |                 |
| 2.7              |                   | 27.0             |                 |
| 3.0              |                   | 33.0             |                 |
| 3.3              |                   | 36.0             |                 |
| 3.9              |                   | 39.0             |                 |
| 4.7              |                   | 47.0             |                 |
| 5.6              |                   | 56.0             |                 |
| 7.5              |                   | 68.0             |                 |
| 8.2              |                   | 82.0             |                 |
| 9.1              |                   | 100.0            |                 |
| 10.0             | J ( $\pm 5\%$ )   | 130.0            |                 |
| 12.0             |                   | 160.0            |                 |

\*\*\*25 each of 30 values

### 1210

| Kit 3500 UZ      |                   |                  |                 |
|------------------|-------------------|------------------|-----------------|
| Cap. Value<br>pF | Tolerance         | Cap. Value<br>pF | Tolerance       |
| 2.2              | B ( $\pm 0.1$ pF) | 36.0             | J ( $\pm 5\%$ ) |
| 2.7              |                   | 39.0             |                 |
| 4.7              |                   | 47.0             |                 |
| 5.1              |                   | 51.0             |                 |
| 6.8              |                   | 56.0             |                 |
| 8.2              |                   | 68.0             |                 |
| 9.1              |                   | 82.0             |                 |
| 10.0             | J ( $\pm 5\%$ )   | 100.0            |                 |
| 13.0             |                   | 120.0            |                 |
| 15.0             |                   | 130.0            |                 |
| 18.0             |                   | 240.0            |                 |
| 20.0             |                   | 300.0            |                 |
| 24.0             |                   | 390.0            |                 |
| 27.0             |                   | 470.0            |                 |
| 30.0             |                   | 680.0            |                 |

\*\*\*25 each of 30 values

## SOLUTIONS ACROSS THE BOARD

### Capacitors

Advanced Power Film  
Ceramic  
Disc  
Film  
Glass  
High Voltage  
Leaded / Through Hole  
Low ESR  
Low Inductance  
Military / Aerospace  
MLCC Array  
MOS / MIS  
Niobium Oxide\* (OxiCap®)  
RF / Microwave  
(Power, Hi Q, Thin-Film)  
Single Layer (SLC)  
SMPS (Power Supply)  
Stacked Ceramic  
Supercapacitor (BestCap™)  
Tantalum  
Tantalum Polymer  
Trimmer

### Circuit Protection

Fuses (Thin-Film)  
MLV (TransGuard™)  
MLV Array (MultiGuard™)  
NTC Thermistors  
Transient Voltage Suppressors  
Zinc Oxide Varistors

### Filters

EMI (Bolt-In and SMD)  
EMI / TVS Filter  
Feedthrough  
High Current Feedthrough  
Low Pass (Thin-Film)  
SAW

### RF / Microwave

Capacitors  
Couplers  
Inductors  
PMC Custom Filters  
Modules  
Timing Devices  
Passive Micro Components (PMC)  
Diplexers  
Crossovers

### Integrated Passives

IDC (Low Inductance Array)  
Passive Thick Film Array  
Passive Micro Components (PMC)

### Module Devices

Antenna Switch  
Bluetooth  
LTCC  
GPS  
RX Module  
WLAN Module

### Piezo

Acoustic Devices  
Actuators

### Timing Devices

Ceramic Resonator  
Clock Oscillator  
Crystal Applied Product  
MHz Crystal  
SAW Resonator  
TCXO

### Connectors

2mm Hard Metric  
Automotive – Custom  
Battery  
Board to Board  
1 piece Compression  
2 piece Microleaf  
Card Edge  
DIN41612  
FFC / FPC  
IDC  
Memory Connectors  
PCMCIA Kits  
Compact Flash  
SO-DIMM  
SIMM / RUM  
SDIO / SD  
Military  
PCI Express  
Varicon Rack and Panel

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## AMERICAS

**AVX Greenville, SC**  
Tel: 864-967-2150

## EUROPE

**AVX Limited, England**  
Tel: +44-1276-697000

**AVX S.A.S., France**  
Tel: +33-1-69-18-46-00

**AVX GmbH, Germany**  
Tel: +49-0811-95949-0

**AVX SRL, Italy**  
Tel: +39-02-614-571

**AVX Czech Republic**  
Tel: +420-57-57-57-521

**AVX/ELCO UK**  
Tel: +44-1638-675000

**ELCO Europe GmbH**  
Tel: +49-2741-299-0

**AVX S.A., Spain**  
Tel: +34-91-63-97-197

**AVX Benelux**  
Tel: +31-187-489-337

## ASIA-PACIFIC

**AVX/Kyocera (S) Pte Ltd.,  
Singapore**  
Tel: +65-6286-7555

**AVX/Kyocera, Asia, Ltd.,  
Hong Kong**  
Tel: +852-2363-3303

**AVX/Kyocera Yuhan Hoesa,  
South Korea**  
Tel: +82-2785-6504

**AVX/Kyocera HK Ltd.,  
Taiwan**  
Tel: +886-2-2656-0258

**AVX/Kyocera (M) Sdn Bhd,  
Malaysia**  
Tel: +60-4228-1190

**AVX/Kyocera International  
Trading Co. Ltd.,  
Shanghai**  
Tel: +86-21-3255 1933

**AVX/Kyocera Asia Ltd.,  
Shenzen**  
Tel: +86-755-3336-0615

**AVX/Kyocera International  
Trading Co. Ltd.,  
Beijing**  
Tel: +86-10-6588-3528

**AVX/Kyocera India  
Liaison Office**  
Tel: +91-80-6450-0715

## ASIA-KED

(KYOCERA Electronic Devices)

**KED Hong Kong Ltd.**  
Tel: +852-2305-1080/1223

**KED Hong Kong Ltd.  
Shenzen**  
Tel: +86-755-3398-9600

**KED Company Ltd.  
Shanghai**  
Tel: +86-21-3255-1833

**KED Hong Kong Ltd.  
Beijing**  
Tel: +86-10-5869-4655

**KED Taiwan Ltd.**  
Tel: +886-2-2950-0268

**KED Korea Yuhan Hoesa,  
South Korea**  
Tel: +82-2-783-3604/6126

**KED (S) Pte Ltd.  
Singapore**  
Tel: +65-6509-0328

**Kyocera Corporation  
Japan**  
Tel: +81-75-604-3449

**Contact:**



<http://www.avx.com>

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А