



Defense  
and Aerospace

**KEMET**  
CHARGED.™

## Ceramic High Voltage, High Temperature Capacitors

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## GENERAL SPECIFICATIONS

### Working Voltage:

C0G	50, 100, 200, 500, 1k, 2k, 3k, 4k, 5k, 7.5k, 10k, 15k, 20k
X7R	50, 100, 200, 500, 1k, 2k, 3k, 4k, 5k, 7.5k, 10k, 15k, 20k, 30k, 40k, 50k
X5U	3k, 4k, 5k, 7.5k, 10k, 15k, 20k

### Temperature Characteristics:

C0G	0 + 30 PPM / °C from - 55°C to + 125°C (1)
X7R	+ 15% from - 55°C to + 125°C
X5U	+ 22%, -56% from -55°C to + 85°C

### Capacitance Tolerance:

C0G	+0.5pF, +1%, +2%, +5%, +10%
X7R	+10%, +20%, +80% / -20%, +100% / -0%
X5U	+10%, +20%, +80% / -20%, +100% / -0%

### Construction:

Epoxy encapsulated - meets flame test requirements of UL Standard 94V-0.  
High-temperature solder - meets EIA RS-198, Method 302, Condition B (260°C for 10 seconds)

### Termination Material:

Check individual Series: Part Number and Ordering Information for Termination Materials offered in each series.

### Solderability:

MIL-STD 202, Method 208  
(Test Method: ANSI/J-STD-002)  
Test A for through-hole mount and surface mount leaded.  
Test B for surface mount leadless components.

### Terminal Strength:

MIL-STD 202, Method 208, Condition A (2.3kg or 5 lbs)

### Resistance to Solvents:

MIL-STD 202, Method 215

### Resistance to Soldering Heat:

MIL-STD 202, Method 210, Test Condition C

## ELECTRICAL

### Capacitance @ 25°C:

Within specified tolerance and following test conditions per MIL-STD 202, Method 305.  
C0G, X7R & X5U  
> 100pF with 1.0 vrms @ 1 kHz with 1.0 vrms  
< 100pF with 1.0 vrms @ 1 MHz with 1.0 vrms

### Dissipation Factor @ 25°C:

Same test conditions as capacitance.  
C0G - 0.15% maximum  
X7R - 2.5% maximum  
X5U - 2.5% maximum

### Insulation Resistance @25°C:

MIL-STD 202, Method 302  
C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.  
X5U:  
10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Dielectric Withstanding Voltage:

MIL-STD 202, Method 301  
<200V test @ 250% of rated voltage  
500V to 1250V test @ 150% of rated voltage  
>1251V test @ 120% of rated voltage

## ENVIRONMENTAL

### Vibration:

MIL-STD 202, Method 204, Condition D (20g)

### Shock:

MIL-STD 202, Method 213, Condition I (100g)

### Life Test:

MIL-STD 202, Method 108

### <200V

C0G - 200% rated voltage @ +125°C  
X7R - 200% rated voltage @ +125°C

### >500V

C0G - rated voltage @ +125°C  
X7R - rated voltage @ +125°C  
X5U - rated voltage @ +85°C

### Post Test Limits @ 25°C are:

#### Capacitance Change:

C0G (< 200V) - +3% or 0.25pF, whichever is greater.  
C0G (> 500V) - +3% or 0.50pF, whichever is greater.  
X7R - + 20% of initial value (2)

#### Dissipation Factor:

C0G - 0.25% maximum  
X7R & X5U - 3.0% maximum

#### Insulation Resistance:

C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

#### X5U:

10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Moisture Resistance:

MIL-STD 202, Method 106  
Post Test Limits @ 25°C are:

#### Capacitance Change:

C0G (< 200V) - +3% or 0.25pF, whichever is greater.  
C0G (> 500V) - +3% or 0.50pF, whichever is greater.  
X7R - + 20% of initial value (2)

#### Dissipation Factor:

C0G - 0.25% maximum  
X7R & X5U - 3.0% maximum

#### Insulation Resistance:

C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

#### X5U:

10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Thermal Shock:

MIL-STD 202, Method 107, Condition A  
C0G & X7R: -55°C to 125°C  
X5U: -55°C to 85°C

- (1) +53 PPM -30 PPM/ °C from +25°C to -55°C, + 60 PPM below 10pF.
- (2) X7R & X5U dielectrics exhibit aging characteristics; therefore, it is highly recommended that capacitors be deaged for 2 hours at 150°C and stabilized at room temperature for 48 hours before capacitance measurements are made.

	HIGH TEMPERATURE	HIGH VOLTAGE
<b>MILITARY &amp; AEROSPACE</b>		
Avionics	X	X
Radar Systems	X	X
Telemetry, Data Tx/Rx		X
Control Systems	X	
<b>MEDICAL</b>		
.5 to 1.5 Tesla MR1 &		X
NM1 Tuning Coils		X
1 to 3 Tesla MR1 Gradient		X
Coils & Magnetic Rings		X
CT-Scanner		X
Medical MRI		X
X-Ray Generator	X	X
<b>SEMICONDUCTOR</b>		
RF Tuning Networks		X
RF Power Supplies		X
Semiconductor Manufacturing	X	
<b>SECURITY</b>		
Handheld Scanners		X
Intruder Detection Systems		X
Luggage Scanners		X
Metal/Explosive Detector		X
<b>OTHER</b>		
LCD Backlight Inverter		X
Electric Ballast for CFL	X	X
Electric Ballast for Fluorescent Lamp	X	X
Measurement Equipment	X	X
Microwave/Convection Ovens	X	X
<b>POWER SUPPLY</b>		
HV Power Supply	X	X
Power Station Equipment		X
Power Supply for Air Conditioner, Washing Machine		X
Inverter Power Supply-AC	X	
<b>TELECOM</b>		
Base Station Power amps		X
Broadcasting Equipment		X
<b>MODEM</b>		
DAA Modem		X
xDSL Modem		X
LAN, Router, HUB, Switches		X
RF Power Amplifiers		X
<b>INDUSTRIAL</b>		
Oil Rigging, Down Hole, Mining	X	X

	ELECTRICAL			ENVIRONMENTAL	MECHANICAL
	Voltage Range	Capacitance Range	Dissipation Factor	Operating Temperature Range	Configuration
<b>HIGH VOLTAGE</b>					
Radial Conformally Coated					
Std	C0G/X7R: 500 to 10k VDC	C0G:12 pF - .330μF X7R: 220 pF - 5.6 μF	C0G: 0.15% max X7R: 2.5% max	C0G: -55°C to + 125°C X7R: -55°C to + 125°C	Radial
Mil-PRF-49467 Equivalent	C0G/X7R: 600 to 5k VDC	C0G: 12 pF - .68 μF X7R: 27 pF - .47 μF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Radial
Space Quality	C0G/X7R: 500 to 10k VDC	C0G/X7R: 560 pF - 2.20μF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Radial
Ceramic Surface Mount Chip					
Military	C0G/X7R: 500 to 5k VDC	C0G: 12 pF- .10 μF X7R: 270 pF -2.50 μF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Chip
Leaded Chips J or L lead	C0G/X7R: 500 to 10k VDC	C0G: 12 pF-.330 μF X7R: 220 pF-5.6 μF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Leaded Chip J or L Lead
Disc	C0G/X5U: 3k to 20k VDC, X7R:3k to 50k VDC	C0G: 1.2 pF-236 pF X7R: 10 p -7400 pF X5U: 80 pF-17300 pF	C0G: 0.15% max X7R: 2.5% max X5U: 2.5% max	C0G/X7R: -55°C to + 125°C X5U: -55°C to + 85°C	Disc
Disc Stack	C0G/X7R/X5U: 5k to 20k VDC	C0G: 1.2 pF-141 pF X7R: 37 pF-4400 pF X5U: 80 pF-10400 pF	C0G: 0.15% max X7R: 2.5% max X5U: 2.5% max	C0G/X7R: -55°C to + 125°C X5U: -55°C to + 85°C	Disc Stack

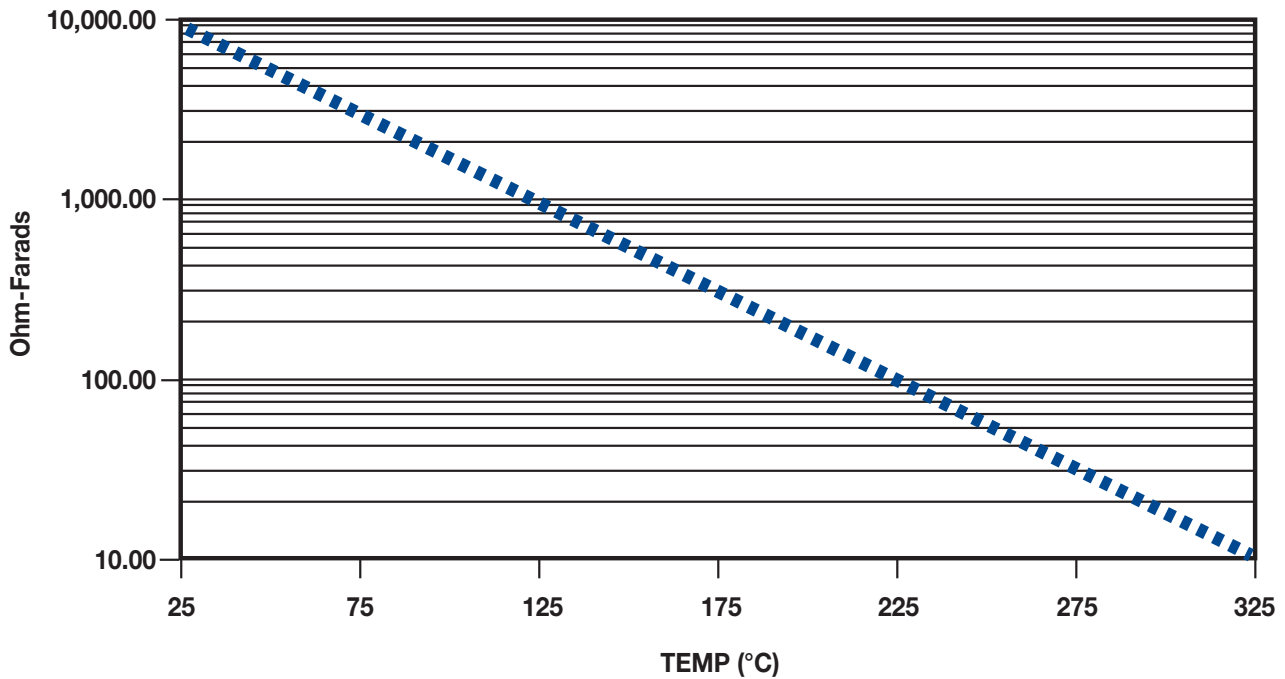
## HIGH TEMPERATURE

Hi Temp (HT/HP)	100 to 200 VDC	C0G: 22 pF-.100 μF X7R:1000 pF-1.0μF	C0G 0.15% X7R Type 2.0% X7R 2.50%	-55°C to + 200°C	Axial/Radial
Hi Temp Hi Volt (HV)	500 to 4000 VDC	C0G: 390 pF-.015 μF X7R:1400 pF- .270 μF	C0G 0.15% X7R Type 2.0% X7R 2.50%	-55°C to + 200°C	Radial
Ceramic Cased Capacitor					
Std 125°C (SCR/SRR/SCA/SRA)	50 to 200 VDC	C0G: 1.0 pF- .12 μF X7R:100 pF- 6.8 μF	C0G 0.15% X7R 2.50%	-55°C to + 125°C	Axial/Radial
200°C (ACR/ARR/ACA/ARA)	50 to 100 VDC	C0G: 1.0 pF- .12 μF X7R:100 pF- 3.3 μF	C0G 0.15% X7R 2.50%	-55°C to + 200°C	Axial/Radial
260°C (TCR/TRR/TCA/TRA)	50 to 100 VDC	C0G: 1.0 pF- .12 μF X7R:100 pF- 3.3 μF	C0G 0.15% X7R 2.50%	-55°C to + 260°C	Axial/Radial
Hi Temp Hi Volt (VCR/VRR)	500 to 5000 VDC	C0G: 10 pF-.056 μF X7R:330 pF-1.2μF	C0G 0.15% X7R 2.50%	-55°C to + 200°C	Radial

**DIELECTRIC COMPARISONS**

Features	Ultra Stable	Semi-Stable High Voltage	Semi-Stable Hi-Temp	Temp/Volt Dependent
Dielectric Type	C0G (NPO)	X7R	X7R type	X5U
Temperature Coefficient	0 ±30ppm/°C	±15%	+15/-40%	+22-56%
Operating Temp. Range	-55 to +200°C	-55 to +125°C	-55 to +200°C	-55 to +125°C
Dissipation Factor	0.1% max.	2.5% max.	2.0% max.	2.5% max.
Aging Rate	None	-2.0% max/dec. hour	-2.0% max/dec. hour	-2.0% max/dec. hour
Voltage Range	25 to 20k VDC	50 to 50k VDC	25 to 4k VDC	Up to 20K VDC
Standard Tolerance	J, K, M	K, M, P, Z	K, M, P, Z	M, P, Z
Coefficient of Thermal Expansion @ 25°C	9 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C

**TYPICAL INSULATION RESISTANCE VS. TEMP (C°)  
FOR C0G, NPO & X7R DIELECTRICS**



## FEATURES

The HT/HP Series is used in robust applications

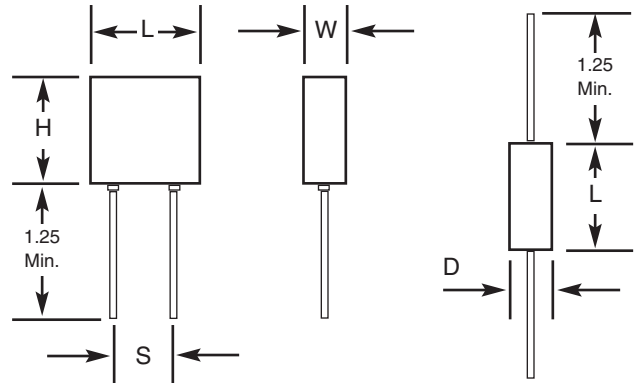
- Down Hole
- Industrial
- Harsh Environments

**Where a Radial/Axial coated capacitor can withstand high temperatures (200°C).**

**NOTE:**

Other tolerances, higher capacitance values, voltages, or special package configurations are available upon request.

## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

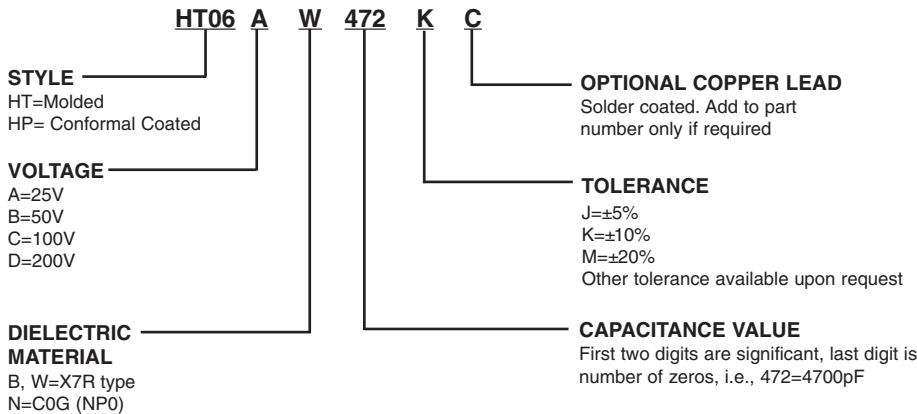
Molded (HT) and Conformal Coated (HP), Radial Lead Types

Style	Sizes in Inches (mm) max			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
HT05	.200 (5.08)	.200 (5.08)	.100 (2.54)	.100 (2.54)
HT55	.200 (5.08)	.200 (5.08)	.100 (2.54)	.200 (5.08)
HT06	.300 (7.62)	.300 (7.62)	.150 (3.81)	.200 (5.08)
HT08	.500 (12.70)	.500 (12.70)	.250 (6.35)	.400 (10.16)
HT09	.700 (17.78)	.400 (10.16)	.200 (5.08)	.500 (12.70)

Tubular Case, Axial Lead Types

Style	Sizes in Inches (mm) max	
	Length (L)	Diameter (D)
HT11	.170 (4.32)	.100 (2.54)
HT13	.260 (6.60)	.135 (3.43)
HT14	.400 (10.16)	.155 (3.94)
HT15	.500 (12.70)	.200 (5.08)
HT16	.750 (19.05)	.375 (9.52)

## PART NUMBER AND ORDERING INFORMATION



**MARKING**  
(HT05, HT55, HT11)  
472K  
KEC  
  
(All other sizes)  
HT06AW472K  
KEC  
Date Code

For CONFORMAL COATED types, change style number to HPXX. HP dimensions will be reduced slightly.

## COG & X7R DIELECTRIC

Radial COG							Radial X7R									
Series		HT/HP05	HT/HP55	HT/HP06	HT/HP08	HT/HP09	Series		HT/HP05	HT/HP55	HT/HP06	HT/HP08	HT/HP09			
Cap	W max	.200 (5.08)	.200 (5.08)	.300 (7.62)	.500 (12.70)	.700 (17.78)	Cap	W max	.200 (5.08)	.200 (5.08)	.300 (7.62)	.500 (12.70)	.700 (17.78)			
	H max	.200 (5.08)	.200 (5.08)	.300 (7.62)	.500 (12.70)	.400 (10.16)		H max	.200 (5.08)	.200 (5.08)	.300 (7.62)	.500 (12.70)	.400 (10.16)			
	T max	.100 (2.54)	.100 (2.54)	.150 (3.81)	.250 (6.35)	.200 (5.08)		T max	.100 (2.54)	.100 (2.54)	.150 (3.81)	.250 (6.35)	.200 (5.08)			
	S ±.030	.100 (2.54)	.200 (5.08)	.200 (5.08)	.400 (10.16)	.500 (12.70)		S ±.030	.100 (2.54)	.200 (5.08)	.200 (5.08)	.400 (10.16)	.500 (12.70)			
	Lead Dia.	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)		Lead Dia.	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)		
Cap Code	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC		
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
1.0pF	109						100pF	101								
1.2	129						120	121								
1.5	159						150	151								
1.8	189						180	181								
2.2	229						220	221								
2.7	279						270	271								
3.3	339						330	331								
3.9	399						390	391								
4.7	479						470	471								
5.6	569						560	561								
6.8	689						680	681								
8.2	829						820	821								
10	100						1000	102								
12	120						1200	122								
15	150						1500	152								
18	180						1800	182								
22	220						2200	222								
27	270						2700	272								
33	330						3300	332								
39	390						3900	392								
47	470						4700	472								
56	560						5600	562								
68	680						6800	682								
82	820						8200	822								
100	101						.010uF	103								
120	121						.012	123								
150	151						.015	153								
180	181						.018	183								
220	221						.022	223								
270	271						.027	273								
330	331						.033	333								
390	391						.039	393								
470	471						.047	473								
560	561						.056	563								
680	681						.068	683								
820	821						.082	823								
1000	102						.10	104								
1200	122						.12	124								
1500	152						.15	154								
1800	182						.18	184								
2200	222						.22	224								
2700	272						.27	274								
3300	332						.33	334								
3900	392						.39	394								
4700	472						.47	474								
5600	562						.56	564								
6800	682						.68	684								
8200	822						.82	824								
.010uF	103						1.0	105								
.012	123						1.2	125								
.015	153						1.5	155								
.018	183						1.8	185								
.022	223						2.2	225								
.027	273						2.7	275								
.033	333						3.3	335								
.039	393						3.9	395								
.047	473						4.7	475								
.056	563															
.068	683															
.082	823															
.10	104															
.12	124															
.15	154															





## FEATURES

The HV series not only withstands high temperatures (200°C), but also offers high voltage (500-4000 VDC)

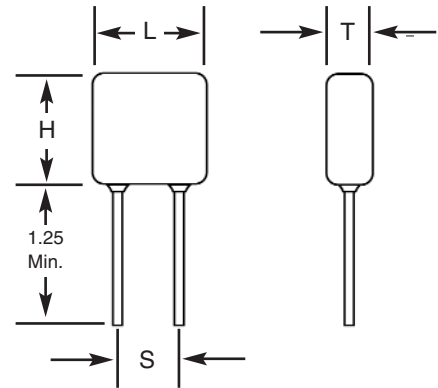
To be used in robust applications

- Down Hole
- Industrial
- Harsh Environments

**NOTE:**

Other tolerances, higher capacitance values, voltages, or special package configurations are available upon request.

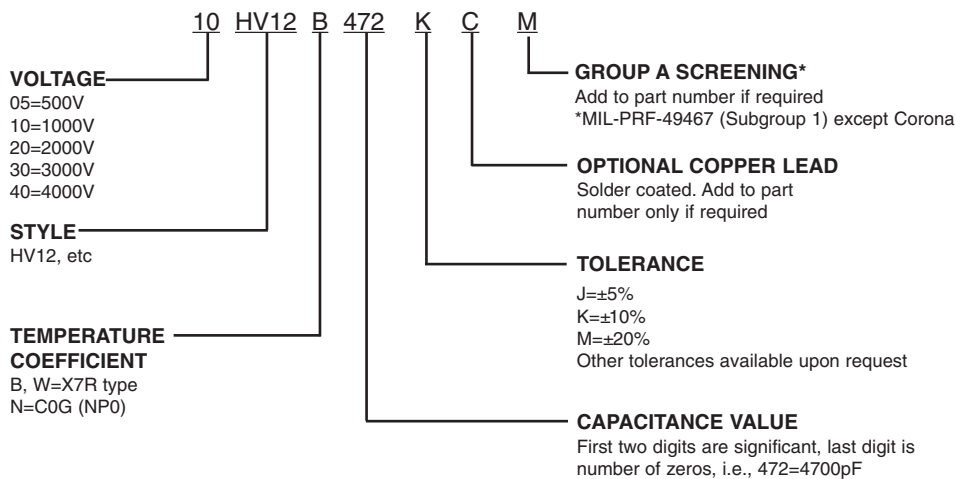
## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (T)	
<b>HV10</b>	.250 (6.35)	.220 (5.59)	.150 (3.81)	.170 (4.32)
<b>HV11</b>	.320 (8.13)	.300 (7.62)	.250 (6.35)	.200 (5.08)
<b>HV12</b>	.420 (10.67)	.400 (10.16)	.250 (6.35)	.300 (7.62)
<b>HV13</b>	.520 (13.21)	.500 (12.70)	.300 (7.62)	.400 (10.16)
<b>HV14</b>	.620 (15.75)	.500 (12.70)	.300 (7.62)	.500 (12.70)
<b>HV15</b>	.720 (18.29)	.700 (17.78)	.300 (7.62)	.600 (15.24)
<b>HV16</b>	.820 (20.83)	.700 (17.78)	.350 (8.89)	.700 (17.78)

## PART NUMBER AND ORDERING INFORMATION



**MARKING**

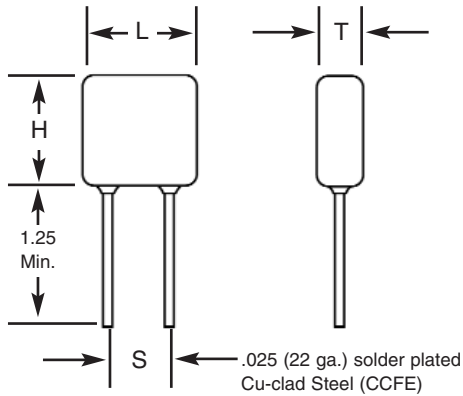
(HV10, HV11)  
472M  
KEC  
Date Code

(All other sizes)  
HV12B472M  
1kV  
KEC  
Date Code

## COG DIELECTRIC

STYLE COG		HV10			HV11			HV12			HV13			HV14			HV15			HV16											
Cap	L max	.250 (6.35)			.320 (8.13)			.420 (10.67)			.520 (13.21)			.620 (15.75)			.720 (18.29)			.820 (20.83)											
	H max	.220 (5.59)			.300 (7.62)			.400 (10.16)			.500 (12.70)			.500 (12.70)			.700 (17.78)			.700 (17.78)											
	W max	.150 (3.81)			.250 (6.35)			.250 (6.35)			.300 (7.62)			.300 (7.62)			.300 (7.62)			.350 (8.89)											
	S ± .030	.170 (4.32)			.200 (5.08)			.300 (7.62)			.400 (10.16)			.500 (12.70)			.600 (15.24)			.700 (17.78)											
	Lead Dia. +.004/-.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)											
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC											
pF		500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	500	1k	2k	3k	4k
12pF	120																														
15	150																														
18	180																														
22	220																														
27	270																														
33	330																														
39	390																														
47	470																														
56	560																														
68	680																														
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.015	153																														

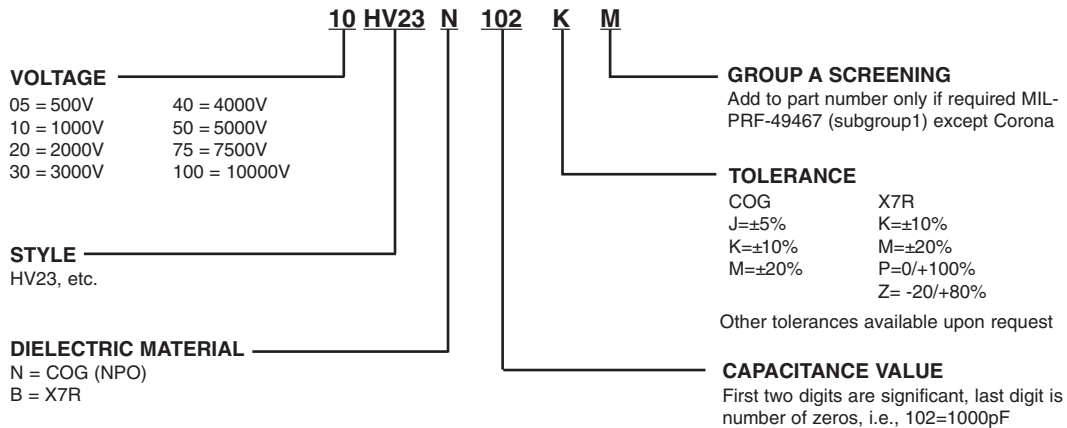
**CAPACITOR OUTLINE DRAWING**



**DIMENSIONS**

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (T)	
HV20	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HV21	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HV22	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HV23	.470 (11.94)	.400 (10.16)	.270 (6.89)	.375 (9.52)
HV24	.570 (14.48)	.500 (12.70)	.270 (6.89)	.475 (12.06)
HV25	.670 (17.02)	.600 (15.24)	.270 (6.89)	.575 (14.60)
HV26	.770 (19.56)	.720 (18.29)	.270 (6.89)	.675 (17.14)
HV30	.450 (11.43)	.220 (5.59)	.200 (5.08)	.300 (7.62)
HV31	.550 (13.97)	.280 (7.11)	.250 (6.35)	.400 (10.16)
HV33	.850 (21.59)	.400 (10.16)	.270 (6.89)	.700 (17.78)
HV34	1.050 (26.67)	.500 (12.70)	.270 (6.89)	.975 (24.76)
HV35	1.250 (31.75)	.600 (15.24)	.270 (6.89)	1.175 (29.84)
HV36	1.450 (36.83)	.720 (18.29)	.270 (6.89)	1.375 (34.92)

**PART NUMBER AND ORDERING INFORMATION**



**MARKING**

(HV20, HV21)	(All Other Sizes)
103K	HV24A103K
1 kV	1 kV
KEC	KEC
Date Code	Date Code



## COG DIELECTRIC

STYLE	COG	HV30				HV31				HV33				HV34				HV35				HV36														
	W max	.450 (11.43)				.550 (13.97)				.850 (21.59)				1.050 (26.67)				1.250 (31.75)				1.450 (36.83)														
	L max	.220 (5.59)				.280 (7.11)				.400 (10.16)				.500 (12.70)				.600 (15.24)				.720 (18.29)														
	T max	.200 (5.08)				.250 (6.35)				.270 (6.89)				.270 (6.89)				.270 (6.89)				.270 (6.89)														
	S ±.030	.300 (7.62)				.400 (10.16)				.700 (17.78)				.975 (24.76)				1.175 (29.84)				1.375 (34.92)														
	Lead Dia. +.004/-0.002	.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)														
	Cap Code	WVDC				WVDC				WVDC				WVDC				WVDC				WVDC														
Cap	pF	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	7k	10k	500	1k	2k	3k	4k	5k	7k	10k	500	1k	2k	3k	4k	5k	7k	10k
10pF	100																																			
12	120																																			
15	150																																			
18	180																																			
22	220																																			
27	270																																			
33	330																																			
39	390																																			
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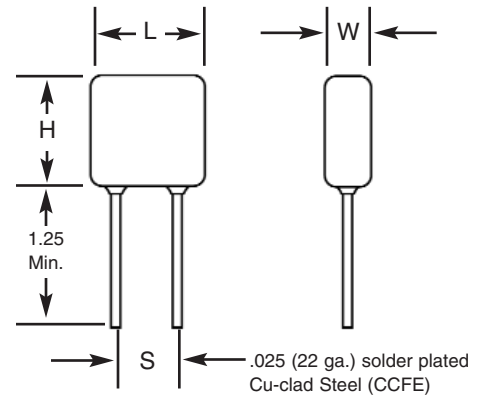




## FEATURES

1. Electrical characteristics and environmental information on these parts may be obtained by referring to MIL-PRF-49467.
2. All parts are conformal coated multilayer ceramic.
3. Designed to provide excellent long-term reliability.
4. Parts are Group A screened per MIL-PRF-49467 which includes 100% Corona testing and meet all other specification requirements.
5. Designed for surface, sea and airborne military and commercial high-reliability applications.
6. No IR degradation over life.
7. BR (X7R) V/TC is -40% at rated voltage and BZ (X7R) V/TC is -40% at 60% rated voltage.
8. BX characteristic (-25%) on BR parts is approximately 52% rated voltage.
9. 100% Non-destructive test by means of CSAM inspection available. SLAM available by special order.

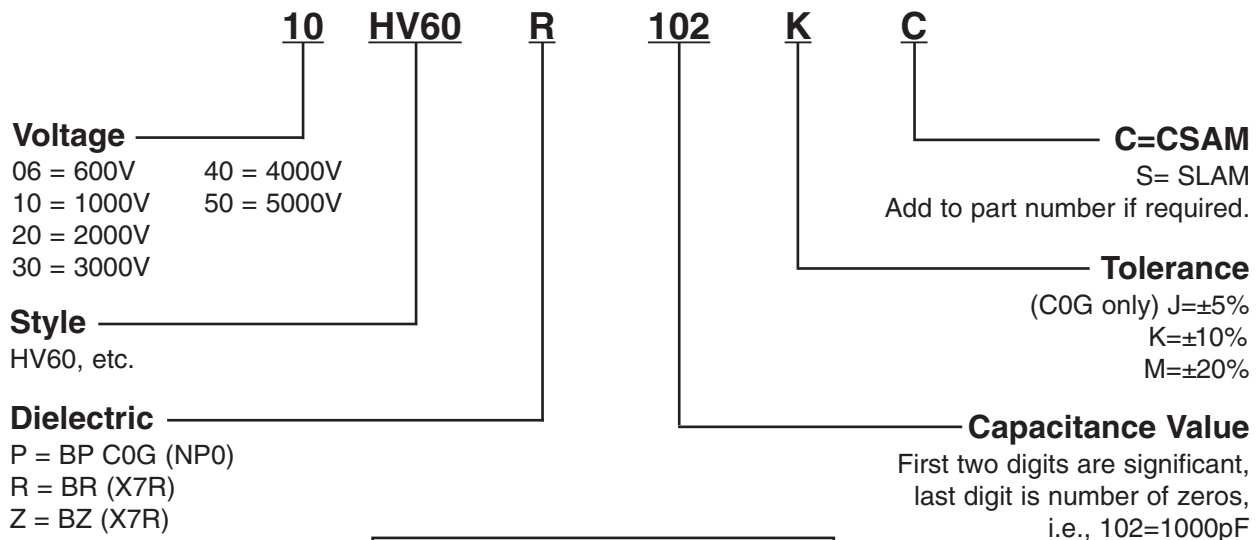
## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
HV60	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HV61	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HV62	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HV63	.470 (11.94)	.400 (10.16)	.270 (6.86)	.375 (9.52)
HV64	.570 (14.48)	.500 (12.70)	.270 (6.86)	.475 (12.06)
HV65	.670 (17.02)	.600 (15.24)	.270 (6.86)	.575 (14.60)
HV66	.770 (19.56)	.720 (18.29)	.270 (6.86)	.675 (17.14)
HV68	1.300 (33.02)	.600 (15.24)	.270 (6.86)	1.175 (29.84)
HV69	1.500 (38.10)	.720 (18.29)	.270 (6.86)	1.375 (34.92)

## PART NUMBER AND ORDERING INFORMATION



## MARKING

(HV60, HV61)	(All Other Sizes)
102K	HV63R102K
1 kV	1 kV
KEC	KEC
Date Code	Date Code

## COG DIELECTRIC

STYLE COG		HV60			HV61			HV62				HV63					HV64					HV65					HV66						
	W max	.250 (6.35)			.320 (8.13)			.370(9.40)				.470 (11.94)					.570 (14.48)					.670 (17.02)					.770 (19.56)						
	L max	.220 (5.59)			.280 (7.11)			.300 (7.62)				.400 (10.16)					.500 (12.70)					.600 (15.24)					.720 (18.29)						
	T max	.200 (5.08)			.250 (6.35)			.250 (6.35)				.270 (6.86)					.270 (6.86)					.270 (6.86)					.270 (6.86)						
	S ±.030	.170 (4.32)			.220 (5.59)			.275 (6.98)				.375 (9.52)					.475 (12.06)					.575 (14.60)					.675 (17.14)						
	Lead Dia. +.004/-0.02	.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)					.025 (.635)						
Cap	Cap Code	WVDC			WVDC			WVDC				WVDC					WVDC					WVDC					WVDC						
	pF	600	1k	2k	600	1k	2k	3k	600	1k	2k	3k	600	1k	2k	3k	4k	600	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k
12pF	120																																
15	150																																
18	180																																
22	220																																
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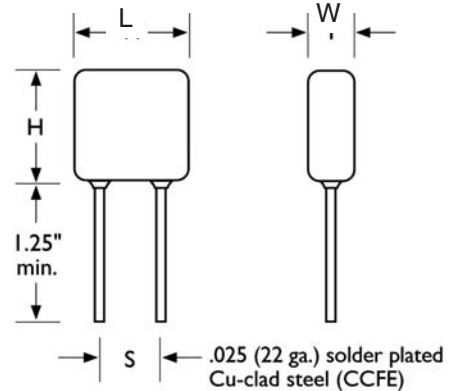
## X7R DIELECTRIC

STYLE X7R	HV60			HV61			HV62			HV63				HV64					HV65					HV66					HV68			HV69								
	W max	L max	T max	S ± .030	Lead Dia. ±.004/-0.002	Cap Code	600	1k	2k	3k	600	1k	2k	3k	600	1k	2k	3k	4k	600	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	3k	4k	5k		
Cap	270pF	330	390	470	560	680	820	1000	1200	1500	1800	2200	2700	3300	3900	4700	5600	6800	8200	.010uF	.012	.015	.018	.022	.027	.033	.039	.047	.056	.068	.082	.10	.12	.15	.18	.22	.27	.33	.39	.47
	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474

**FEATURES**

1. Similar to NASA Spec. SSQ 21113 (1, 2 & 5kV).
2. Conforms to MIL-PRF-49467. (Group A Screening, Subgroup 1)
3. 100% Corona tested.
4. No IR degradation over life.
5. High density, low DF ceramic.
6. Conservative and proven design is recommended for non-repairable applications such as spacecraft.
7. CSAM inspections are available and is recommended for space applications. SLAM available by special order.
8. Burn-in in a non-contaminating inert fluid available.

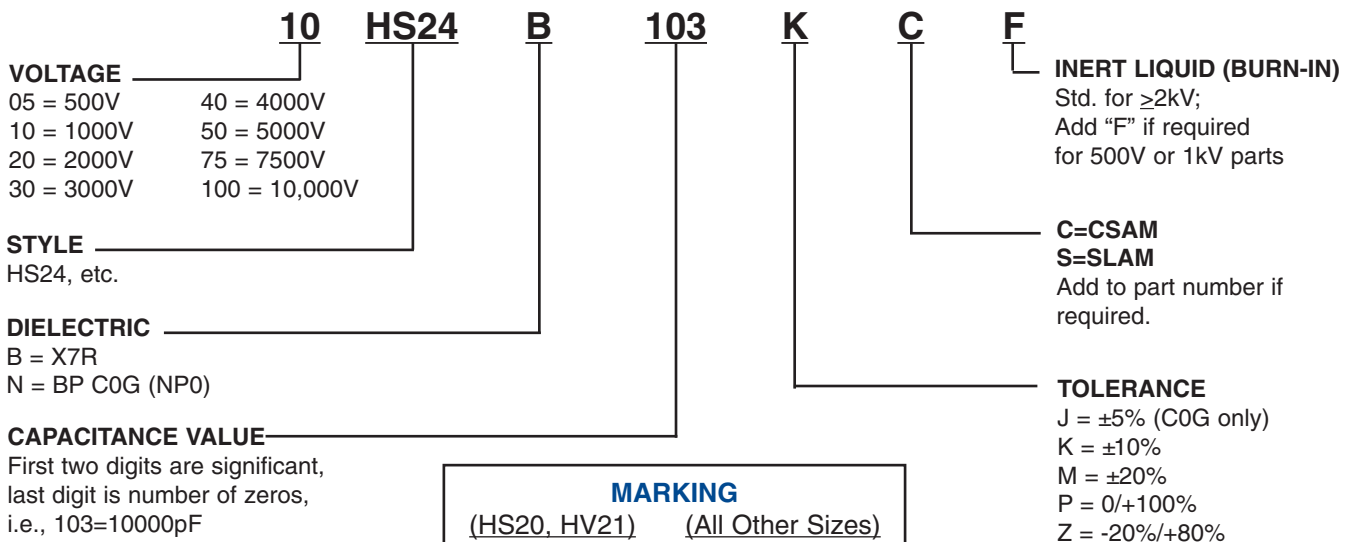
**CAPACITOR OUTLINE DRAWING**



**DIMENSIONS**

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
HS20	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HS21	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HS22	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HS30	.450 (11.43)	.220 (5.59)	.200 (5.08)	.300 (7.62)
HS23	.470 (11.94)	.400 (10.16)	.270 (6.89)	.375 (9.52)
HS31	.550 (13.97)	.280 (7.11)	.250 (6.35)	.400 (10.16)
HS24	.570 (14.48)	.500 (12.70)	.270 (6.89)	.475 (12.06)
HS25	.670 (17.02)	.600 (15.24)	.270 (6.89)	.575 (14.60)
HS26	.770 (19.56)	.720 (18.29)	.270 (6.89)	.675 (17.14)
HS33	.850 (21.59)	.400 (10.16)	.270 (6.89)	.700 (17.78)
HS34	1.050 (26.67)	.500 (12.70)	.270 (6.89)	.975 (24.76)
HS35	1.250 (31.75)	.600 (15.24)	.270 (6.89)	1.175 (29.84)
HS36	1.450 (36.83)	.720 (18.29)	.270 (6.89)	1.375 (34.92)

**PART NUMBER AND ORDERING INFORMATION**



## COG DIELECTRIC

STYLE COG		HS20			HS21			HS22			HS23				HS24					HS25					HS26							
Cap	W max	.250 (6.35)			.320 (8.13)			.370(9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)					.770 (19.56)							
	L max	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.720 (18.29)							
	T max	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)					.270 (6.86)					.270 (6.86)							
	S ± .030	.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)					.575 (14.60)					.675 (17.14)							
	Lead Dia. +.004/-0.02	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)							
Cap Code		WVDC			WVDC			WVDC			WVDC				WVDC					WVDC					WVDC							
pF		500	1k	2k	500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
10pF	100																															
12	120																															
15	150																															
18	180																															
22	220																															
27	270																															
33	330																															
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**X7R DIELECTRIC**

STYLE X7R		HS20			HS21			HS22			HS23				HS24					HS25					HS26						
Cap	W max	.250 (6.35)			.320 (8.13)			.370(9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)					.770 (19.56)						
	L max	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.720 (18.29)						
	T max	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)					.270 (6.86)					.270 (6.86)						
	S ±.030	.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)					.575 (14.60)					.675 (17.14)						
	Lead Dia, ±.004/-.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)						
	Cap Code	WVDC			WVDC			WVDC			WVDC				WVDC					WVDC					WVDC						
	pF	500	1k	2k	500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
270pF	271																														
330	331																														
390	391																														
470	471																														
560	561																														
680	681																														
820	821																														
1000	102																														
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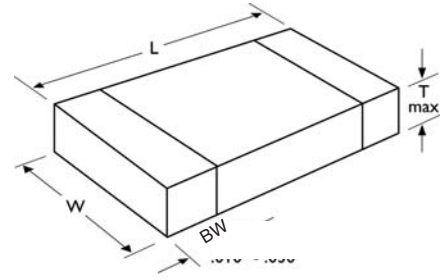




## FEATURES

1. The ceramic chip capacitors described in this section are the types used in our other high voltage ceramic multilayer product lines.
2. Types BP, BR and BZ available as described in MIL-PRF-49467.
3. Group A and B screening per MIL-PRF-49467 available.
4. Ceramic chip capacitors are extremely sensitive to thermal shock damage during installation. Wherever possible, processes involving infrared or vapor phase soldering systems should be utilized.
5. Higher voltages available upon request
6. Where nickel barrier termination is required, end band length dimensions may exceed the standard dimension listed.

## CERAMIC CHIP OUTLINE DRAWING

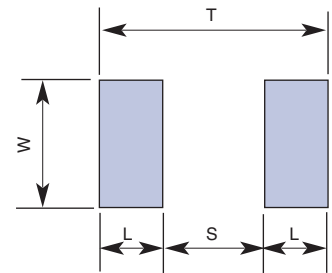


## DIMENSIONS

Style	Length (L) Inches (mm)	Width (W) Inches (mm)	Thickness (T) max Inches (mm)	Bandwidth (BW) Inches
1515	.150 ±.015 (3.81 ±.38)	.150 ±.015 (3.81 ±.38)	.140 (3.55)	.010 - .030"
1812	.180 ±.020 (4.57 ±.51)	.120 ±.015 (3.05 ±.38)	.100 (2.54)	.010 - .040"
1825	.180 ±.020 (4.57 ±.51)	.250 ±.020 (6.35 ±.51)	.160 (4.07)	.010 - .040"
2020	.200 ±.020 (5.08 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (3.55)	.010 - .040"
2225	.220 ±.020 (5.59 ±.51)	.250 ±.020 (6.35 ±.51)	.200 (5.08)	.010 - .040"
2520	.250 ±.020 (6.35 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (4.57)	.030 - .060"
3333	.330 ±.030 (8.38 ±.76)	.330 ±.030 (8.38 ±.76)	.220 (5.59)	.030 - .060"
3530	.350 ±.030 (8.89 ±.76)	.300 ±.030 (7.62 ±.76)	.220 (5.59)	.030 - .060"
4040	.400 ±.030 (10.2 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
4540	.450 ±.030 (11.43 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
5440	.540 ±.030 (13.7 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
5550	.550 ±.030 (14.0 ±.76)	.500 ±.030 (12.7 ±.76)	.220 (5.59)	.030 - .060"
6560	.650 ±.030 (16.5 ±.76)	.600 ±.030 (15.2 ±.76)	.220 (5.59)	.030 - .060"

## RECOMMENDED SOLDER PAD PATTERN DIMENSIONS

Chip Size	T (Total Length)		S (Separation)		W (Pad Width)		L (Pad Length)	
	mm	in.	mm	in.	mm	in.	mm	in.
1515	5.20	0.205	1.90	0.075	4.34	0.171	1.65	0.065
1812	5.90	0.232	2.30	0.091	3.70	0.146	1.80	0.071
1825	5.90	0.232	2.30	0.091	6.90	0.272	1.80	0.071
2020	6.50	0.256	2.80	0.110	5.62	0.221	1.85	0.073
2225	7.00	0.276	3.30	0.130	6.80	0.268	1.85	0.073
2520	8.68	0.342	4.98	0.196	5.62	0.221	1.85	0.073
3333	10.91	0.430	7.11	0.280	9.27	0.365	1.90	0.075
3530	11.51	0.453	7.61	0.300	8.51	0.335	1.95	0.077
4040	12.88	0.507	8.88	0.350	11.05	0.435	2.00	0.079
4540	14.21	0.559	10.15	0.400	11.05	0.435	2.03	0.080
5440	16.51	0.650	10.41	0.410	11.05	0.435	3.05	0.120
5550	18.92	0.745	12.82	0.505	13.59	0.535	3.05	0.120
6560	19.80	0.780	13.20	0.520	16.13	0.635	3.30	0.130



## PART NUMBER AND ORDERING INFORMATION

**4540 B 472 M 202 P M**

**Style**  
1515, 2020, etc.

**Dielectric**  
B or R = X7R  
N = C0G (NP0)

**Capacitance Value**  
First two digits are significant,  
last digit is number of zeros,  
i.e., 472=4700pF

**Tolerance**  
J = ±5% COG (NP0)  
K = ±10%  
M = ±20%  
P = 0/+100%  
Z = -20%/+80%

**Group A Screening\***  
Add to part number if required  
\*MIL-PRF-49467  
(subgroup 1)  
except Corona

**Terminal Material**  
P = PdAg  
S = Ag  
E = Ag/Ni/Sn/Pb Plate  
C = Ag/Ni/Sn Plate

**Voltage**  
First two digits are significant,  
last digit is number of zeros,  
i.e., 202=2000V

**MARKING**  
Not applicable  
As required by customer only.



**COG DIELECTRIC**

STYLE	COG	4040					4540					5440					5550					6560						
		L					L					L					L					L						
	W	.400 ±.030(10,20±.76)					.450 ±.030(11,43±.76)					.540 ±.030(13,70±.76)					.550 ±.030(14,00±.76)					.650 ±.030(16,50±.76)						
	T max	.220 (5,59)					.220 (5,59)					.220 (5,59)					.220 (5,59)					.220 (5,59)						
	Band Width	.030 - .060"					.030 - .060"					.030 - .060"					.030 - .060"					.030 - .060"						
Cap	Cap Code	WVDC					WVDC					WVDC					WVDC					WVDC						
		500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k
10pF	100																											
12	120																											
15	150																											
18	180																											
22	220																											
27	270																											
33	330																											
39	390																											
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.068	683																											
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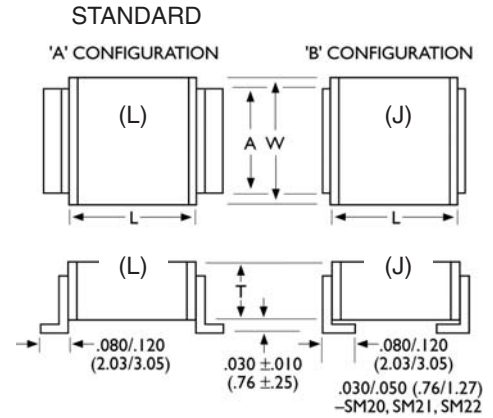
**X7R DIELECTRIC**

STYLE X7R		4040					4540					5440					5550					6560						
Cap	L	.400 ±.030(10,20±.76)					.450 ±.030(11,43±.76)					.540 ±.030(13,70±.76)					.550 ±.030(14,00±.76)					.650 ±.030(16,50±.76)						
	W	.400 ±.030(10,20±.76)					.400 ±.030(10,20±.76)					.400 ±.030(10,20±.76)					.500 ±.030(10,20±.76)					.600 ±.030(15,20±.76)						
	T max	.220 (5,59)					.220 (5,59)					.220 (5,59)					.220 (5,59)					.220 (5,59)						
	Band Width	.030 - .060*					.030 - .060*					.030 - .060*					.030 - .060*					.030 - .060*						
Cap Code	WVDC					WVDC					WVDC					WVDC					WVDC							
pF	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
220pF	221																											
270	271																											
330	331																											
390	391																											
470	471																											
560	561																											
680	681																											
820	821																											
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1.5	155																											
1.8	185																											
2.2	225																											

## FEATURES

1. Silver plated copper alloy terminal for easy soldering.
2. Mounting tabs are designed to minimize the effect of thermal stress introduced by the differences in coefficient of thermal expansion between the capacitor and the mounting surface.
3. Low ESR.
4. High current discharge capability.
5. Group A and B screening per MIL-PRF-49467 available .
6. Standard lead configuration is 'B'.(J) If lead configuration is left out of part number the lead style is assumed to be 'B'.

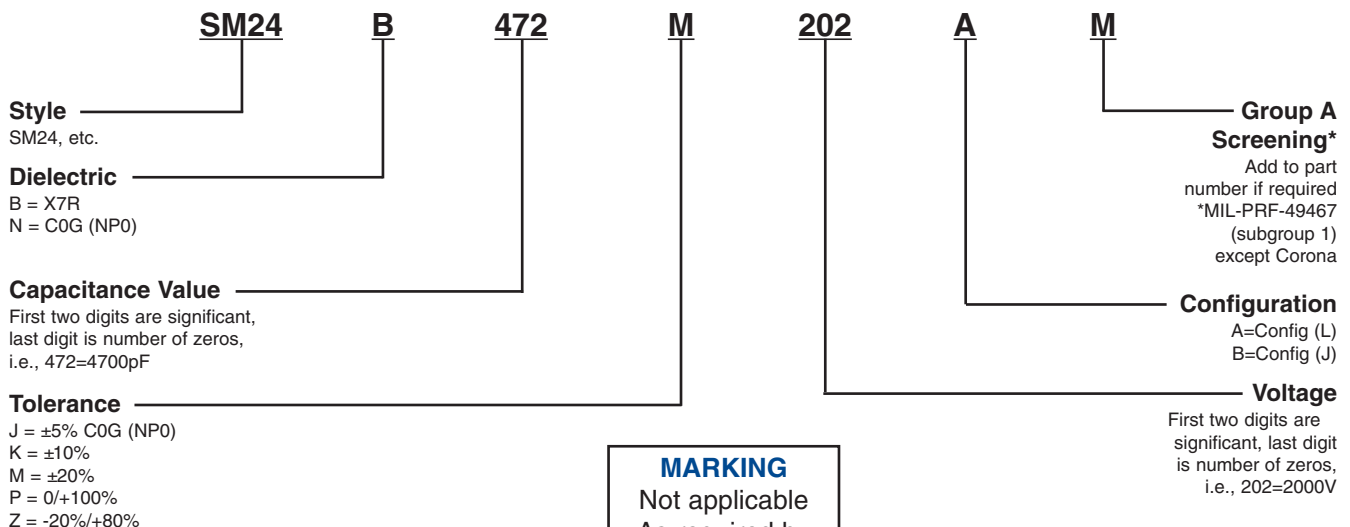
## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

Style	Length (L) Inches (mm)	Width (W) Inches (mm)	Thickness (T) max Inches (mm)	Tab (A) max Inches (mm)
SM20	.150 $\pm$ .015 (3.81 $\pm$ .38)	.150 $\pm$ .015 (3.81 $\pm$ .38)	.130 (3.30)	.100 (2.54)
SM21	.200 $\pm$ .020 (5.08 $\pm$ .51)	.200 $\pm$ .020 (5.08 $\pm$ .51)	.180 (4.57)	.100 (2.54)
SM22	.250 $\pm$ .020 (6.35 $\pm$ .51)	.200 $\pm$ .020 (5.08 $\pm$ .51)	.180 (4.57)	.100 (2.54)
SM23	.350 $\pm$ .030 (8.89 $\pm$ .76)	.300 $\pm$ .030 (7.62 $\pm$ .76)	.220 (5.59)	.200 (5.08)
SM24	.450 $\pm$ .030 (11.43 $\pm$ .76)	.400 $\pm$ .030 (10.20 $\pm$ .76)	.220 (5.59)	.300 (7.62)
SM25	.550 $\pm$ .030 (14.00 $\pm$ .76)	.500 $\pm$ .030 (12.70 $\pm$ .76)	.220 (5.59)	.400 (10.2)
SM26	.650 $\pm$ .030 (16.50 $\pm$ .76)	.600 $\pm$ .030 (15.20 $\pm$ .76)	.220 (5.59)	.500 (12.7)
SM30	.300 $\pm$ .030 (7.62 $\pm$ .76)	.150 $\pm$ .015 (3.81 $\pm$ .38)	.140 (3.55)	.100 (2.54)
SM31	.400 $\pm$ .030 (10.20 $\pm$ .76)	.200 $\pm$ .020 (5.08 $\pm$ .51)	.130 (3.30)	.100 (2.54)
SM33	.700 $\pm$ .030 (17.08 $\pm$ .76)	.300 $\pm$ .030 (7.62 $\pm$ .76)	.180 (4.57)	.200 (5.08)
SM34	.900 $\pm$ .030 (22.90 $\pm$ .76)	.400 $\pm$ .030 (10.20 $\pm$ .76)	.220 (5.59)	.300 (7.62)
SM35	1.100 $\pm$ .030 (27.90 $\pm$ .76)	.500 $\pm$ .030 (12.70 $\pm$ .76)	.220 (5.59)	.400 (10.2)
SM36	1.350 $\pm$ .030 (33.00 $\pm$ .76)	.600 $\pm$ .030 (15.20 $\pm$ .76)	.220 (5.59)	.500 (12.7)

## PART NUMBER AND ORDERING INFORMATION



**MARKING**  
Not applicable  
As required by customer only.

**COG DIELECTRIC**

STYLE	COG	SM20				SM21				SM22				SM23				SM24					SM25					SM26								
		L	W			T max	Tab A max	Cap Code	pF			pF			pF			pF			pF		pF			pF		pF			pF					
Cap	pF	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
		12pF	120																																	
15	150																																			
18	180																																			
22	220																																			
27	270																																			
33	330																																			
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.082	823																																			
.10	104																																			

COG DIELECTRIC

STYLE	COG	SM30	SM31	SM33	SM34	SM35	SM36
	L	.300 ±.030 (7.62±.76)	.400 ±.030(10.20 ±.76)	.700 ±.030 (17.08 ±.76)	.900 ±.030 (22.90 ±.76)	1.100 ±.030 (27.90 ±.76)	1.350 ±.030 (33.00 ±.76)
	W	.150 ±.015 (3.31 ±.38)	.200 ±.020(5.08 ±.51)	.300 ±.030(7.62 ±.76)	.400 ±.030(10.20 ±.76)	.500 ±.030(12.70 ±.76)	.600 ±.030(15.20 ±.76)
	T max	.140 (3.55)	.130 (3.30)	.180 (4.57)	.220 (5.59)	.220 (5.59)	.220 (5.59)
	Tab A max	.100 (2.54)	.100 (2.54)	.200 (5.08)	.300 (7.62)	.400 (10.20)	.500 (12.70)
	Cap Code	WVDC	WVDC	WVDC	WVDC	WVDC	WVDC
Cap	PF	500 1k 2k 3k 4k	50 1k 2k 3k 4k 5k	500 1k 2k 3k 4k 5k 7k	500 1k 2k 3k 4k 5k 7k 10k	500 1k 2k 3k 4k 5k 7k 10k	50 1k 2k 3k 4k 5k 7k 10k
10pF	100						
12	120						
15	150						
18	180						
22	220						
27	270						
33	330						
39	390						
47	470						
56	560						
68	680						
82	820						
100	101						
120	121						
150	151						
180	181						
220	221						
270	271						
330	331						
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470	471						
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3900	392						
4700	472						
5600	562						
6800	682						
8200	822						
.010uF	103						
.012	123						
.015	153						
.018	183						
.022	223						
.027	273						
.033	333						
.039	393						
.047	473						
.056	563						
.068	683						
.082	823						
.10	104						
.12	124						
.15	154						
.18	184						
.22	224						
.27	274						
.33	334						



**X7R DIELECTRIC**

STYLE	X7R	SM20			SM21			SM22			SM23			SM24			SM25			SM26																				
Cap	L	.150±.015 (3.81±.38)			.200±.020(5.08 ±.51)			.250 ±.020 (6.35 ±.51)			.350 ±.030 (8.89 ±.76)			.450 ±.030 (11.43 ±.76)			.550 ±.030 (14.00 ±.76)			.650 ±.030 (16.50 ±.76)																				
	W	.150±.015 (3.81±.38)			.200±.020(5.08 ±.51)			.200 ±.020(5.08 ±.51)			.300 ±.030 (7.62 ±.76)			.400 ±.030 (10.20 ±.76)			.500 ±.030 (12.70 ±.76)			.600 ±.030 (15.20 ±.76)																				
	T max	.130 (3.30)			.180 (4.57)			.180 (4.57)			.220 (5.59)			.220 (5.59)			.220 (5.59)			.220 (5.59)																				
	Tab A max	.100 (2.54)			.100 (2.54)			.100 (2.54)			.200 (5.08)			.300 (7.62)			.400 (10.20)			.500 (12.70)																				
Cap Code		WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC																				
	pF	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k					
270pF	271																																							
330	331																																							
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1.8	185																																							
2.2	225																																							
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Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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).



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