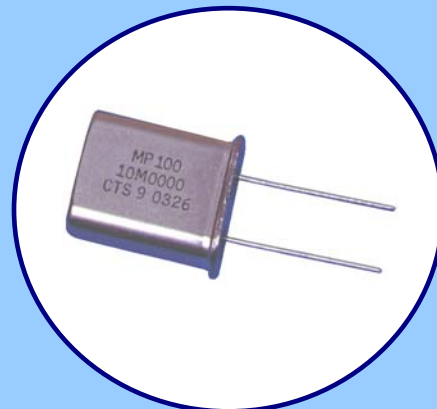


## FEATURES

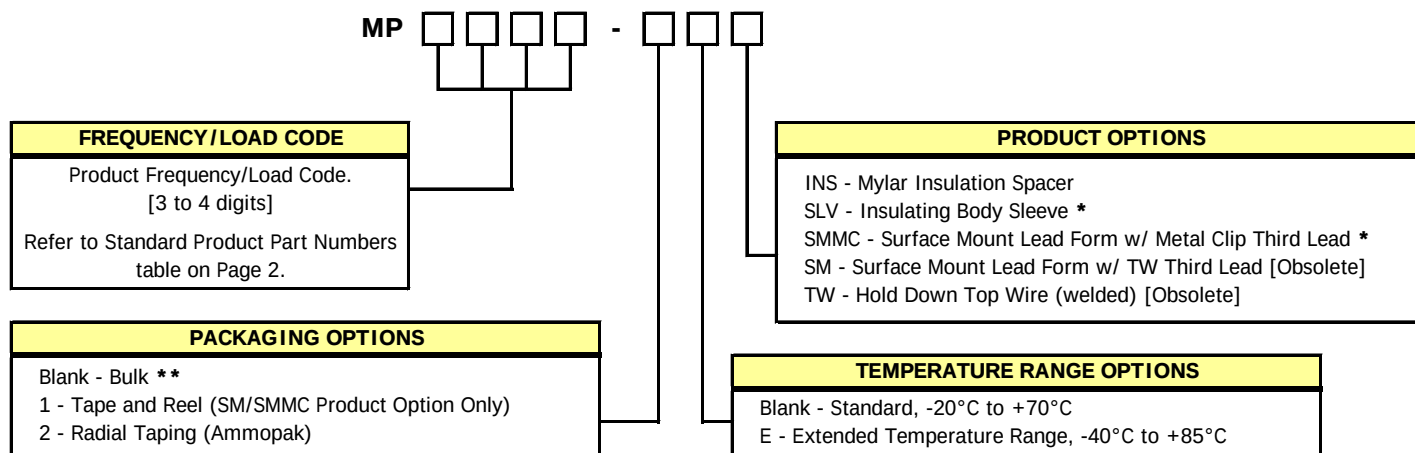
- Standard HC-49/U Package, HC-49/U SMMC Package Option Available
- Stable Frequency Over Temperature and Drive Level
- **Fundamental and 3<sup>rd</sup> Overtone Crystals**
- Frequency Range 1.8432 – 64 MHz
- Frequency Tolerance,  $\pm 30$  ppm Standard
- Frequency Stability,  $\pm 50$  ppm Standard
- Operating Temperature,  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  Standard,  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Available
- Tape & Reel Packaging Available
- **RoHS/Green Compliant (6/6)**



## APPLICATIONS

The MP crystal series offers excellent long-term stability and reliability in a proven resistance-weld metal package. The excellent shock performance makes it suitable for microprocessor, telecommunication, industrial, consumer electronics and networking applications.

## ORDERING INFORMATION



\*\* Standard packaging is bulk in a bag.

\* Consult factory for Option availability.

## Non-Standard Ordering Options

- Custom requirements may be available upon request. Use form C052 to detail non-standard parameters.  
([http://www.ctscorp.com/components/CTS\\_Crystal\\_Specifying\\_Form.xls](http://www.ctscorp.com/components/CTS_Crystal_Specifying_Form.xls))
- Contact your local CTS Representative or CTS Customer Service for assistance.

### STANDARD PRODUCT PART NUMBERS

Part numbers in **BOLD** are common stock items through CTS authorized distributors. Non-bold part numbers may be stocked or are available for order.

Contact your CTS Distributor or local CTS Representative for availability.

| FREQUENCY<br>(MHz) | PART<br>NUMBER<br>-20/70°C | PART<br>NUMBER<br>-40/85°C | LOAD<br>CAPACITANCE | OPERATING<br>MODE |
|--------------------|----------------------------|----------------------------|---------------------|-------------------|
| 1.843200           | MP018A                     | MP018A-E                   | Series              | Fundamental       |
| 1.843200           | MP018B                     | MP018B-E                   | 18 pF               | Fundamental       |
| 1.843200           | <b>MP018S</b>              | MP018S-E                   | 13 pF               | Fundamental       |
| 2.000000           | MP020A                     | MP020A-E                   | Series              | Fundamental       |
| 2.000000           | <b>MP020S</b>              | MP020S-E                   | 20 pF               | Fundamental       |
| 2.000000           | <b>MP020B</b>              | <b>MP020B-E</b>            | 18 pF               | Fundamental       |
| 2.457600           | <b>MP024S</b>              | MP024S-E                   | 32 pF               | Fundamental       |
| 3.579545           | MP036                      | MP036-E                    | Series              | Fundamental       |
| 3.579545           | <b>MP036S</b>              | MP036S-E                   | 18 pF               | Fundamental       |
| 3.686400           | MP037A                     | MP037A-E                   | Series              | Fundamental       |
| 3.686400           | <b>MP037</b>               | MP037-E                    | 20 pF               | Fundamental       |
| 3.686400           | <b>MP037B</b>              | <b>MP037B-E</b>            | 18 pF               | Fundamental       |
| 4.000000           | <b>MP04A</b>               | MP04A-E                    | Series              | Fundamental       |
| 4.000000           | <b>MP040</b>               | MP040-E                    | 20 pF               | Fundamental       |
| 4.000000           | <b>MP040B</b>              | <b>MP040B-E</b>            | 18 pF               | Fundamental       |
| 4.032000           | MP043A                     | MP043A-E                   | Series              | Fundamental       |
| 4.032000           | MP043                      | MP043-E                    | 20 pF               | Fundamental       |
| 4.096000           | MP042A                     | MP042A-E                   | 20 pF               | Fundamental       |
| 4.194304           | <b>MP041</b>               | MP041-E                    | 12 pF               | Fundamental       |
| 4.915200           | MP049A                     | MP049A-E                   | Series              | Fundamental       |
| 4.915200           | <b>MP042</b>               | MP042-E                    | 20 pF               | Fundamental       |
| 4.915200           | <b>MP049B</b>              | <b>MP049B-E</b>            | 18 pF               | Fundamental       |
| 5.000000           | <b>MP05B</b>               | MP05B-E                    | Series              | Fundamental       |
| 5.000000           | <b>MP05A</b>               | MP05A-E                    | 20 pF               | Fundamental       |
| 5.000000           | <b>MP050C</b>              | <b>MP050C-E</b>            | 18 pF               | Fundamental       |
| 5.068000           | <b>MP050</b>               | MP050-E                    | Series              | Fundamental       |
| 5.068000           | MP051A                     | MP051A-E                   | 20 pF               | Fundamental       |
| 5.185000           | MP052                      | MP052-E                    | Series              | Fundamental       |
| 5.185000           | MP051                      | MP051-E                    | 20 pF               | Fundamental       |
| 5.185000           | MP052C                     | MP052C-E                   | 32 pF               | Fundamental       |
| 5.714300           | MP057                      | MP057-E                    | Series              | Fundamental       |
| 5.714300           | MP057A                     | MP057A-E                   | 20 pF               | Fundamental       |
| 6.000000           | MP060A                     | MP060A-E                   | Series              | Fundamental       |
| 6.000000           | <b>MP060</b>               | MP060-E                    | 20 pF               | Fundamental       |
| 6.000000           | <b>MP060B</b>              | <b>MP060B-E</b>            | 18 pF               | Fundamental       |
| 6.000000           | MP060C                     | MP060C-E                   | 32 pF               | Fundamental       |
| 6.144000           | <b>MP061</b>               | MP061-E                    | 20 pF               | Fundamental       |
| 6.144000           | MP061C                     | MP061C-E                   | 32 pF               | Fundamental       |
| 6.250000           | MP062                      | MP062-E                    | 30 pF               | Fundamental       |
| 6.400000           | MP064                      | MP064-E                    | 20 pF               | Fundamental       |
| 6.553600           | MP065                      | MP065-E                    | 20 pF               | Fundamental       |
| 6.553600           | MP065C                     | MP065C-E                   | 12 pF               | Fundamental       |
| 7.372800           | <b>MP073</b>               | MP073-E                    | Series              | Fundamental       |
| 7.372800           | MP073A                     | MP073A-E                   | 20 pF               | Fundamental       |
| 7.372800           | <b>MP073B</b>              | MP073B-E                   | 18 pF               | Fundamental       |
| 8.000000           | <b>MP080</b>               | MP080-E                    | Series              | Fundamental       |
| 8.000000           | <b>MP080A</b>              | MP080A-E                   | 20 pF               | Fundamental       |
| 8.000000           | <b>MP080B</b>              | <b>MP080B-E</b>            | 18 pF               | Fundamental       |
| 8.000000           | MP080C                     | MP080C-E                   | 32 pF               | Fundamental       |
| 8.192000           | MP081B                     | MP081B-E                   | 18 pF               | Fundamental       |
| 9.216000           | MP092B                     | MP092B-E                   | 18 pF               | Fundamental       |
| 9.830400           | MP098A                     | MP098A-E                   | Series              | Fundamental       |
| 9.830400           | <b>MP098</b>               | MP098-E                    | 20 pF               | Fundamental       |
| 9.830400           | <b>MP098B</b>              | <b>MP098B-E</b>            | 18 pF               | Fundamental       |
| 10.000000          | <b>MP100</b>               | MP100-E                    | Series              | Fundamental       |
| 10.000000          | MP100A                     | MP100A-E                   | 20 pF               | Fundamental       |
| 10.000000          | MP100B                     | MP100B-E                   | 18 pF               | Fundamental       |
| 10.000000          | <b>MP101</b>               | MP101-E                    | 30 pF               | Fundamental       |

| FREQUENCY<br>(MHz) | PART<br>NUMBER<br>-20/70°C | PART<br>NUMBER<br>-40/85°C | LOAD<br>CAPACITANCE | OPERATING<br>MODE |
|--------------------|----------------------------|----------------------------|---------------------|-------------------|
| 10.738635          | <b>MP107</b>               | MP107-E                    | 32 pF               | Fundamental       |
| 11.000000          | MP110B                     | MP110B-E                   | Series              | Fundamental       |
| 11.000000          | MP110A                     | MP110A-E                   | 20 pF               | Fundamental       |
| 11.000000          | <b>MP110</b>               | MP110-E                    | 18 pF               | Fundamental       |
| 11.059200          | <b>MP111</b>               | MP111-E                    | Series              | Fundamental       |
| 11.059200          | MP111A                     | MP111A-E                   | 20 pF               | Fundamental       |
| 11.059200          | MP111B                     | MP111B-E                   | 18 pF               | Fundamental       |
| 11.059200          | MP111C                     | MP111C-E                   | 32 pF               | Fundamental       |
| 12.000000          | <b>MP120</b>               | MP120-E                    | Series              | Fundamental       |
| 12.000000          | MP120A                     | MP120A-E                   | 20 pF               | Fundamental       |
| 12.000000          | MP120B                     | MP120B-E                   | 18 pF               | Fundamental       |
| 12.000000          | MP120C                     | MP120C-E                   | 32 pF               | Fundamental       |
| 12.288000          | MP122C                     | MP122C-E                   | Series              | Fundamental       |
| 12.288000          | MP122A                     | MP122A-E                   | 20 pF               | Fundamental       |
| 12.288000          | MP122B                     | MP122B-E                   | 18 pF               | Fundamental       |
| 12.288000          | <b>MP122</b>               | MP122-E                    | 32 pF               | Fundamental       |
| 14.318180          | <b>MP143</b>               | MP143-E                    | Series              | Fundamental       |
| 14.318180          | <b>MP143B</b>              | <b>MP143B-E</b>            | 18 pF               | Fundamental       |
| 14.745600          | <b>MP147</b>               | MP147-E                    | Series              | Fundamental       |
| 14.745600          | MP147A                     | MP147A-E                   | 20 pF               | Fundamental       |
| 14.745600          | MP147B                     | MP147B-E                   | 18 pF               | Fundamental       |
| 15.000000          | <b>MP150</b>               | MP150-E                    | Series              | Fundamental       |
| 16.000000          | <b>MP160</b>               | MP160-E                    | Series              | Fundamental       |
| 16.000000          | MP160A                     | MP160A-E                   | 20 pF               | Fundamental       |
| 16.000000          | MP160B                     | MP160B-E                   | 18 pF               | Fundamental       |
| 18.000000          | MP180                      | MP180-E                    | Series              | Fundamental       |
| 18.432000          | <b>MP184</b>               | MP184-E                    | Series              | Fundamental       |
| 18.432000          | MP184A                     | MP184A-E                   | 20 pF               | Fundamental       |
| 18.432000          | MP184B                     | MP184B-E                   | 18 pF               | Fundamental       |
| 19.660800          | <b>MP196</b>               | MP196-E                    | Series              | Fundamental       |
| 19.660800          | MP196A                     | MP196A-E                   | 20 pF               | Fundamental       |
| 19.660800          | MP196B                     | MP196B-E                   | 18 pF               | Fundamental       |
| 20.000000          | <b>MP200</b>               | MP200-E                    | Series              | Fundamental       |
| 20.000000          | MP200A                     | MP200A-E                   | 20 pF               | Fundamental       |
| 20.000000          | MP200B                     | MP200B-E                   | 18 pF               | Fundamental       |
| 22.118400          | <b>MP221</b>               | MP221-E                    | 20 pF               | Fundamental       |
| 22.118400          | MP221B                     | MP221B-E                   | 18 pF               | Fundamental       |
| 24.000000          | <b>MP240</b>               | MP240-E                    | Series              | Fundamental       |
| 24.000000          | MP240A                     | MP240A-E                   | 20 pF               | Fundamental       |
| 24.000000          | MP240B                     | MP240B-E                   | 18 pF               | Fundamental       |
| 24.576000          | <b>MP245</b>               | MP245-E                    | Series              | Fundamental       |
| 24.576000          | MP245B                     | MP245B-E                   | 18 pF               | Fundamental       |
| 25.000000          | <b>MP250</b>               | MP250-E                    | Series              | Fundamental       |
| 25.000000          | MP250A                     | MP250A-E                   | 20 pF               | Fundamental       |
| 25.000000          | MP250B                     | MP250B-E                   | 18 pF               | Fundamental       |
| 27.000000          | MP270                      | MP270-E                    | Series              | 3rd Overtone      |
| 27.000000          | MP270B                     | MP270B-E                   | 18 pF               | 3rd Overtone      |
| 32.000000          | MP320A                     | MP320A-E                   | 20 pF               | 3rd Overtone      |
| 32.000000          | MP320B                     | MP320B-E                   | 18 pF               | 3rd Overtone      |
| 32.768000          | MP327B                     | MP327B-E                   | 18 pF               | 3rd Overtone      |
| 36.000000          | MP360                      | MP360-E                    | Series              | 3rd Overtone      |
| 40.000000          | MP400                      | MP400-E                    | 20 pF               | 3rd Overtone      |
| 48.000000          | MP480                      | MP480-E                    | Series              | 3rd Overtone      |
| 48.000000          | MP480A                     | MP480A-E                   | 20 pF               | 3rd Overtone      |
| 48.000000          | MP480B                     | MP480B-E                   | 18 pF               | 3rd Overtone      |
| 50.000000          | MP500B                     | MP500B-E                   | 18 pF               | 3rd Overtone      |
| 64.000000          | MP640B                     | MP640B-E                   | 18 pF               | 3rd Overtone      |

**ELECTRICAL CHARACTERISTICS**

| <b>ELECTRICAL PARAMETERS</b> | <b>PARAMETER</b>                                                                           | <b>VALUE</b>                                                           |
|------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|                              | Frequency Range                                                                            | 1.8432 MHz to 64.0 MHz                                                 |
|                              | Operating Mode                                                                             | Fundamental or 3rd Overtone                                            |
|                              | Crystal Cut                                                                                | AT-Cut                                                                 |
|                              | Frequency Tolerance @ +25°C                                                                | ± 30 ppm Standard *                                                    |
|                              | Frequency Stability Tolerance<br>(Operating Temperature Range, Referenced to 25°C Reading) | ± 50 ppm Standard *                                                    |
|                              | Operating Temperature Range                                                                | -20°C to +70°C *<br>-40°C to +85°C Available, See Ordering Information |
|                              | Equivalent Series Resistance                                                               | See ESR Table                                                          |
|                              | Load Capacitance or Resonance Mode                                                         | See Standard Part Numbers tables *                                     |
|                              | Shunt Capacitance (C <sub>0</sub> )                                                        | 7.0 pF Maximum                                                         |
|                              | Drive Level                                                                                | 100 µW Typical, 1,000 µW Maximum                                       |
|                              | Aging @ +25°C                                                                              | ±3 ppm/yr Typical, ±5 ppm/yr Maximum                                   |
|                              | Storage Temperature Range                                                                  | -40°C to +85°C                                                         |
|                              | Reflow Condition, per JEDEC J-STD-020                                                      | +250°C Maximum, 10 Seconds Maximum                                     |

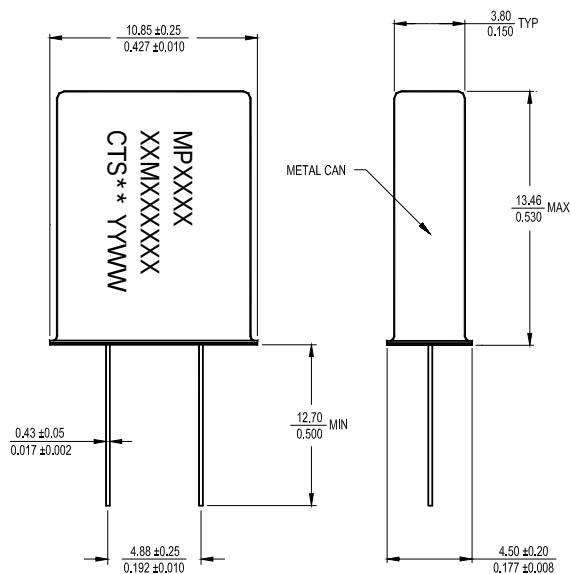
\* Custom requirements may be available upon request. Use form C052 to detail non-standard parameters.

**EQUIVALENT SERIES RESISTANCE TABLE**

| <b>FREQUENCY RANGE</b>  | <b>OSCILLATION MODE</b> | <b>ESR MAXIMUM</b> |
|-------------------------|-------------------------|--------------------|
| 1.80 MHz - < 2.00 MHz   | Fundamental             | 600 Ohms           |
| 2.00 MHz - < 2.40 MHz   | Fundamental             | 500 Ohms           |
| 2.40 MHz - < 3.00 MHz   | Fundamental             | 300 Ohms           |
| 3.00 MHz - < 3.70 MHz   | Fundamental             | 200 Ohms           |
| 3.70 MHz - < 4.20 MHz   | Fundamental             | 100 Ohms           |
| 4.20 MHz - < 4.90 MHz   | Fundamental             | 70 Ohms            |
| 4.90 MHz - < 6.00 MHz   | Fundamental             | 50 Ohms            |
| 6.00 MHz - < 8.00 MHz   | Fundamental             | 40 Ohms            |
| 8.00 MHz - < 10.00 MHz  | Fundamental             | 35 Ohms            |
| 10.00 MHz - < 12.50 MHz | Fundamental             | 30 Ohms            |
| 12.50 MHz - < 40.00 MHz | Fundamental             | 25 Ohms            |
| 24.00 MHz - < 64.00 MHz | 3rd Overtone            | 55 Ohms            |

## MECHANICAL SPECIFICATIONS

### MP PACKAGE DRAWING



KEY:  $\frac{\text{MM}}{\text{INCH}}$

### MARKING INFORMATION

1. MPXXXX - CTS Part Number.  
[Per Ordering Information Format]
2. XXMXXXXXX - Frequency is marked with only leading significant digits before the 'M' and 4 - 6 digits after the 'M' (including zeros).  
Ex. XMXXXXXX - 3M579545  
XXMXXXXXX - 14M31818  
XXMXXXXXX - 20M0000
2. \*\* - Manufacturing Site Code.
3. YYWW - Date Code, YY - year, WW - week.
4. Complete CTS part number, frequency value and date code information must appear on bag and box labels.

### NOTES

1. Lead finish (e1), SnAgCu.

### MP PACKAGE W/ WELDED TOP WIRE (TW) OPTION

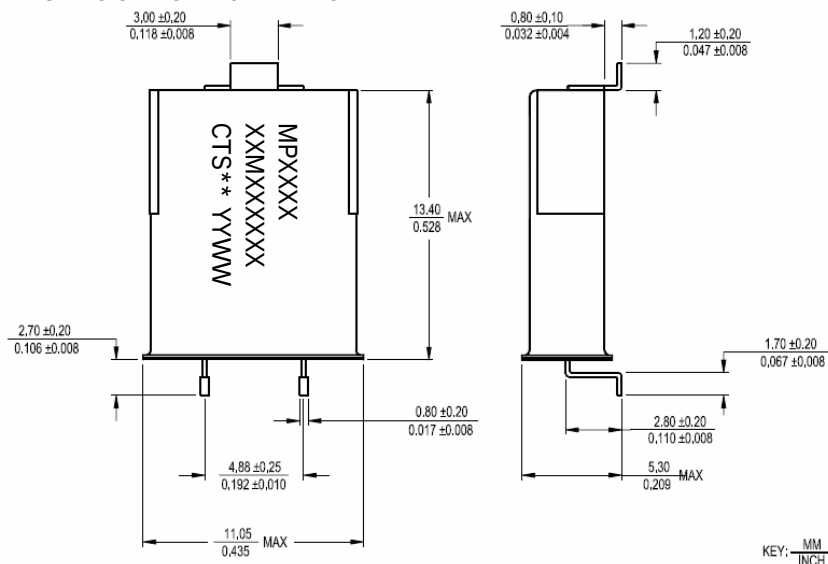


KEY:  $\frac{\text{MM}}{\text{INCH}}$

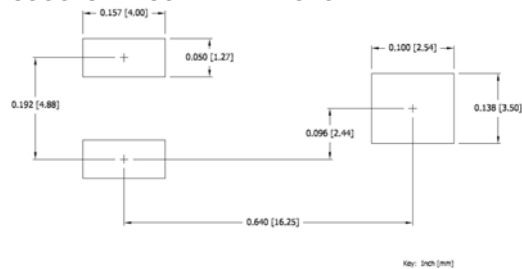
**OBsolete**

## MECHANICAL SPECIFICATIONS

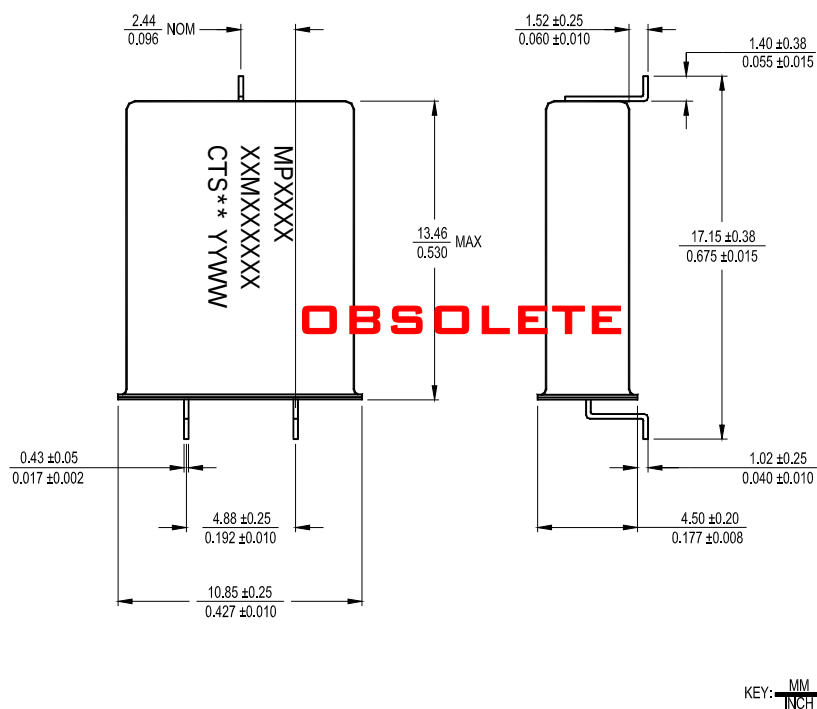
### MP-SMMC OPTION W/ METAL CLIP THIRD LEAD



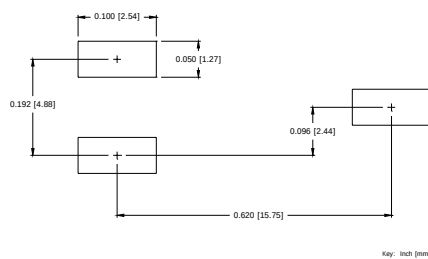
### SUGGESTED SOLDER PAD GEOMETRY



### MP-SM OPTION W/ WELDED TOP WIRE THIRD LEAD

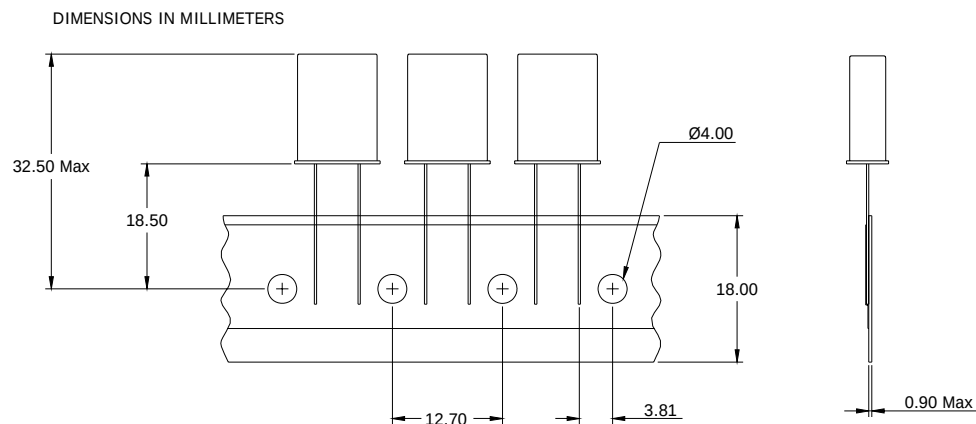


### SUGGESTED SOLDER PAD GEOMETRY

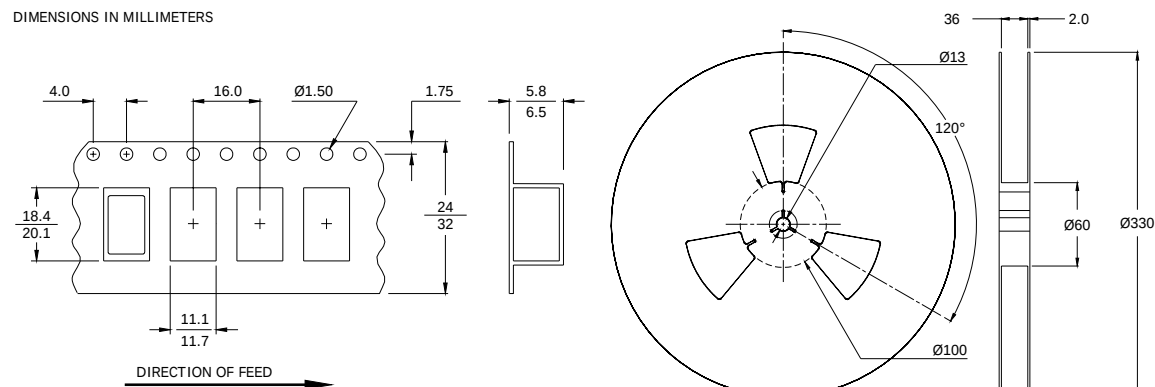


## PACKAGING INFORMATION [Reference Only]

### MP Radial Taping (Ammopak)



### MP-SMMC Tape and Reel



## ENVIRONMENTAL SPECIFICATIONS

|                                  |                                                                                                                                                     |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Cycle:               | 400 cycles from $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ , 10 minute dwell at each temperature, 1 minute transfer time between temperatures. |
| Mechanical Shock:                | 1,500g's, 0.5mS duration, $\frac{1}{2}$ sinewave, 3 shocks each direction along 3 mutually perpendicular planes (18 total shocks).                  |
| Sinusoidal Vibration:            | 0.06 inches double amplitude, 10 to 55 Hz and 20g's, 55 to 2,000 Hz, 3 cycles each in 3 mutually perpendicular planes (9 times total).              |
| Gross Leak:                      | No leak shall appear while immersed in an FC40 or equivalent liquid at $+125^{\circ}\text{C}$ for 20 seconds.                                       |
| Fine Leak:                       | Mass spectrometer leak rates less than $2 \times 10^{-8}$ ATM cc/sec air equivalent.                                                                |
| Resistance to Solder Heat:       | Product must survive 3 reflows of $+250^{\circ}\text{C}$ maximum, 10 seconds maximum.                                                               |
| High Temperature Operating Bias: | 2,000 hours at $+125^{\circ}\text{C}$ , disregarding frequency shift.                                                                               |
| Frequency Aging:                 | 1,000 hours at $+85^{\circ}\text{C}$ , maximum $\pm 5$ ppm shift.                                                                                   |
| Insulation Resistance:           | 500M Ohms @ $100V_{\text{DC}} \pm 15V_{\text{DC}}$ .                                                                                                |
| Moisture Sensitivity Level:      | Level 1 per JEDEC J-STD-020.                                                                                                                        |

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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