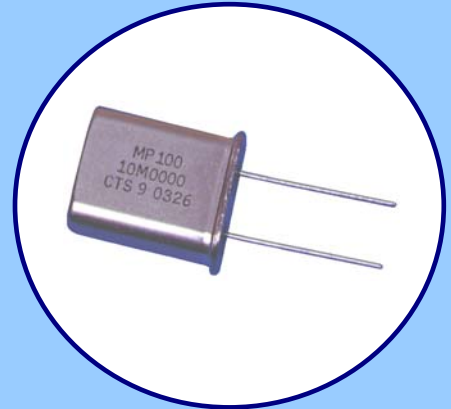




FEATURES

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

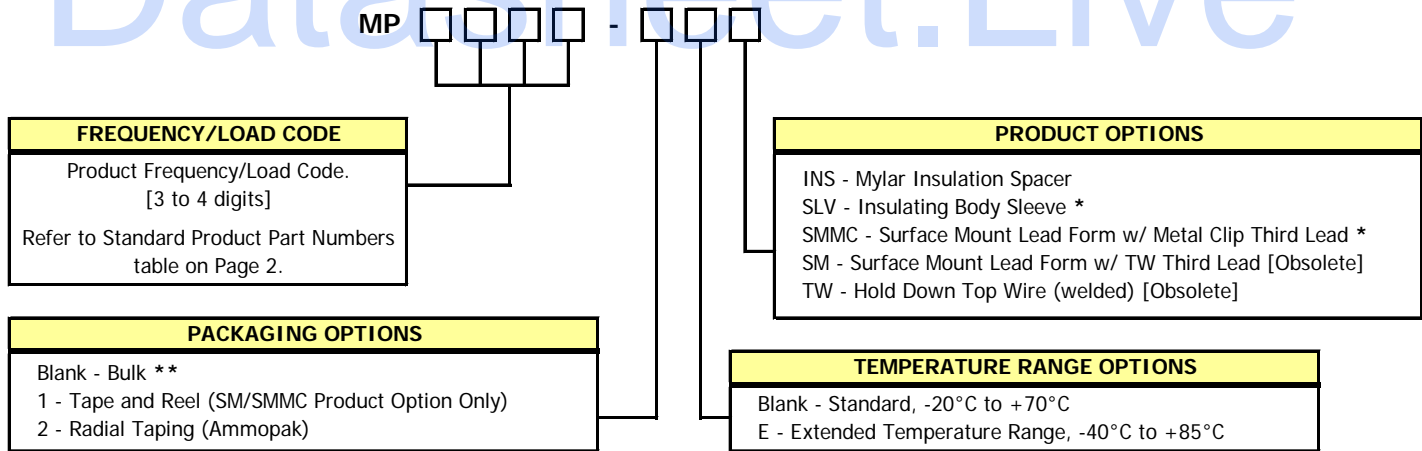


APPLICATIONS

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

Datasheet.Live



** 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)
- 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 (MHz) | PART NUMBER -20/70°C | PART NUMBER -40/85°C | LOAD CAPACITANCE | OPERATING MODE | FREQUENCY (MHz) | PART NUMBER -20/70°C | PART NUMBER -40/85°C | LOAD CAPACITANCE | OPERATING MODE |
|-----------------|----------------------|----------------------|------------------|----------------|-----------------|----------------------|----------------------|------------------|----------------|
| 1.843200 | MP018A | MP018A-E | Series | Fundamental | 10.738635 | MP107 | MP107-E | 32 pF | Fundamental |
| 1.843200 | MP018B | MP018B-E | 18 pF | Fundamental | 11.000000 | MP110B | MP110B-E | Series | Fundamental |
| 1.843200 | MP018S | MP018S-E | 13 pF | Fundamental | 11.000000 | MP110A | MP110A-E | 20 pF | Fundamental |
| 2.000000 | MP020A | MP020A-E | Series | Fundamental | 11.000000 | MP110 | MP110-E | 18 pF | Fundamental |
| 2.000000 | MP020S | MP020S-E | 20 pF | Fundamental | 11.059200 | MP111 | MP111-E | Series | Fundamental |
| 2.000000 | MP020B | MP020B-E | 18 pF | Fundamental | 11.059200 | MP111A | MP111A-E | 20 pF | Fundamental |
| 2.457600 | MP024S | MP024S-E | 32 pF | Fundamental | 11.059200 | MP111B | MP111B-E | 18 pF | Fundamental |
| 3.579545 | MP036 | MP036-E | Series | Fundamental | 11.059200 | MP111C | MP111C-E | 32 pF | Fundamental |
| 3.579545 | MP036S | MP036S-E | 18 pF | Fundamental | 12.000000 | MP120 | MP120-E | Series | Fundamental |
| 3.686400 | MP037A | MP037A-E | Series | Fundamental | 12.000000 | MP120A | MP120A-E | 20 pF | Fundamental |
| 3.686400 | MP037 | MP037-E | 20 pF | Fundamental | 12.000000 | MP120B | MP120B-E | 18 pF | Fundamental |
| 3.686400 | MP037B | MP037B-E | 18 pF | Fundamental | 12.000000 | MP120C | MP120C-E | 32 pF | Fundamental |
| 4.000000 | MP04A | MP04A-E | Series | Fundamental | 12.288000 | MP122C | MP122C-E | Series | Fundamental |
| 4.000000 | MP04O | MP04O-E | 20 pF | Fundamental | 12.288000 | MP122A | MP122A-E | 20 pF | Fundamental |
| 4.000000 | MP04OB | MP04OB-E | 18 pF | Fundamental | 12.288000 | MP122B | MP122B-E | 18 pF | Fundamental |
| 4.032000 | MP043A | MP043A-E | Series | Fundamental | 12.288000 | MP122 | MP122-E | 32 pF | Fundamental |
| 4.032000 | MP043 | MP043-E | 20 pF | Fundamental | 14.318180 | MP143 | MP143-E | Series | Fundamental |
| 4.096000 | MP042A | MP042A-E | 20 pF | Fundamental | 14.318180 | MP143B | MP143B-E | 18 pF | Fundamental |
| 4.194304 | MP041 | MP041-E | 12 pF | Fundamental | 14.745600 | MP147 | MP147-E | Series | Fundamental |
| 4.915200 | MP049A | MP049A-E | Series | Fundamental | 14.745600 | MP147A | MP147A-E | 20 pF | Fundamental |
| 4.915200 | MP042 | MP042-E | 20 pF | Fundamental | 14.745600 | MP147B | MP147B-E | 18 pF | Fundamental |
| 4.915200 | MP049B | MP049B-E | 18 pF | Fundamental | 15.000000 | MP150 | MP150-E | Series | Fundamental |
| 5.000000 | MP05B | MP05B-E | Series | Fundamental | 16.000000 | MP160 | MP160-E | Series | Fundamental |
| 5.000000 | MP05A | MP05A-E | 20 pF | Fundamental | 16.000000 | MP160A | MP160A-E | 20 pF | Fundamental |
| 5.000000 | MP050C | MP050C-E | 18 pF | Fundamental | 16.000000 | MP160B | MP160B-E | 18 pF | Fundamental |
| 5.068000 | MP05O | MP05O-E | Series | Fundamental | 18.000000 | MP180 | MP180-E | Series | Fundamental |
| 5.068000 | MP051A | MP051A-E | 20 pF | Fundamental | 18.432000 | MP184 | MP184-E | Series | Fundamental |
| 5.185000 | MP052 | MP052-E | Series | Fundamental | 18.432000 | MP184A | MP184A-E | 20 pF | Fundamental |
| 5.185000 | MP051 | MP051-E | 20 pF | Fundamental | 18.432000 | MP184B | MP184B-E | 18 pF | Fundamental |
| 5.185000 | MP052C | MP052C-E | 32 pF | Fundamental | 19.660800 | MP196 | MP196-E | Series | Fundamental |
| 5.714300 | MP057 | MP057-E | Series | Fundamental | 19.660800 | MP196A | MP196A-E | 20 pF | Fundamental |
| 5.714300 | MP057A | MP057A-E | 20 pF | Fundamental | 19.660800 | MP196B | MP196B-E | 18 pF | Fundamental |
| 6.000000 | MP060A | MP060A-E | Series | Fundamental | 20.000000 | MP200 | MP200-E | Series | Fundamental |
| 6.000000 | MP06O | MP06O-E | 20 pF | Fundamental | 20.000000 | MP200A | MP200A-E | 20 pF | Fundamental |
| 6.000000 | MP060B | MP060B-E | 18 pF | Fundamental | 20.000000 | MP200B | MP200B-E | 18 pF | Fundamental |
| 6.000000 | MP060C | MP060C-E | 32 pF | Fundamental | 22.118400 | MP221 | MP221-E | 20 pF | Fundamental |
| 6.144000 | MP061 | MP061-E | 20 pF | Fundamental | 22.118400 | MP221B | MP221B-E | 18 pF | Fundamental |
| 6.144000 | MP061C | MP061C-E | 32 pF | Fundamental | 24.000000 | MP24O | MP24O-E | Series | Fundamental |
| 6.250000 | MP062 | MP062-E | 30 pF | Fundamental | 24.000000 | MP240A | MP240A-E | 20 pF | Fundamental |
| 6.400000 | MP064 | MP064-E | 20 pF | Fundamental | 24.000000 | MP240B | MP240B-E | 18 pF | Fundamental |
| 6.553600 | MP065 | MP065-E | 20 pF | Fundamental | 24.576000 | MP245 | MP245-E | Series | Fundamental |
| 6.553600 | MP065C | MP065C-E | 12 pF | Fundamental | 24.576000 | MP245B | MP245B-E | 18 pF | Fundamental |
| 7.372800 | MP073 | MP073-E | Series | Fundamental | 25.000000 | MP25O | MP25O-E | Series | Fundamental |
| 7.372800 | MP073A | MP073A-E | 20 pF | Fundamental | 25.000000 | MP250A | MP250A-E | 20 pF | Fundamental |
| 7.372800 | MP073B | MP073B-E | 18 pF | Fundamental | 25.000000 | MP250B | MP250B-E | 18 pF | Fundamental |
| 8.000000 | MP08O | MP08O-E | Series | Fundamental | 27.000000 | MP27O | MP27O-E | Series | 3rd Overtone |
| 8.000000 | MP080A | MP080A-E | 20 pF | Fundamental | 27.000000 | MP270B | MP270B-E | 18 pF | 3rd Overtone |
| 8.000000 | MP080B | MP080B-E | 18 pF | Fundamental | 32.000000 | MP320A | MP320A-E | 20 pF | 3rd Overtone |
| 8.000000 | MP080C | MP080C-E | 32 pF | Fundamental | 32.000000 | MP320B | MP320B-E | 18 pF | 3rd Overtone |
| 8.192000 | MP081B | MP081B-E | 18 pF | Fundamental | 32.768000 | MP327B | MP327B-E | 18 pF | 3rd Overtone |
| 9.216000 | MP092B | MP092B-E | 18 pF | Fundamental | 36.000000 | MP36O | MP36O-E | Series | 3rd Overtone |
| 9.830400 | MP098A | MP098A-E | Series | Fundamental | 40.000000 | MP40O | MP40O-E | 20 pF | 3rd Overtone |
| 9.830400 | MP098 | MP098-E | 20 pF | Fundamental | 48.000000 | MP48O | MP48O-E | Series | 3rd Overtone |
| 9.830400 | MP098B | MP098B-E | 18 pF | Fundamental | 48.000000 | MP480A | MP480A-E | 20 pF | 3rd Overtone |
| 10.000000 | MP10O | MP10O-E | Series | Fundamental | 48.000000 | MP480B | MP480B-E | 18 pF | 3rd Overtone |
| 10.000000 | MP100A | MP100A-E | 20 pF | Fundamental | 50.000000 | MP500B | MP500B-E | 18 pF | 3rd Overtone |
| 10.000000 | MP100B | MP100B-E | 18 pF | Fundamental | 64.000000 | MP640B | MP640B-E | 18 pF | 3rd Overtone |
| 10.000000 | MP101 | MP101-E | 30 pF | Fundamental | | | | | |

ELECTRICAL CHARACTERISTICS

| | PARAMETER | VALUE |
|------------------------------|--|--|
| ELECTRICAL PARAMETERS | 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 (Operating Temperature Range, Referenced to 25°C Reading) | ± 50 ppm Standard * |
| | Operating Temperature Range | -20°C to +70°C * -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 ₀) | 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 |

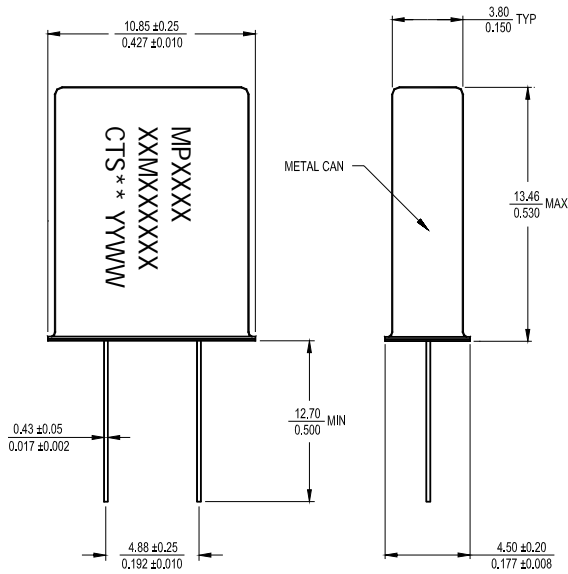
* Custom requirements may be available upon request. Use form C052 to detail non-standard parameters.

EQUIVALENT SERIES RESISTANCE TABLE

| FREQUENCY RANGE | OSCILLATION MODE | ESR MAXIMUM |
|-------------------------|-------------------------|--------------------|
| 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: $\frac{\text{MM}}{\text{INCH}}$

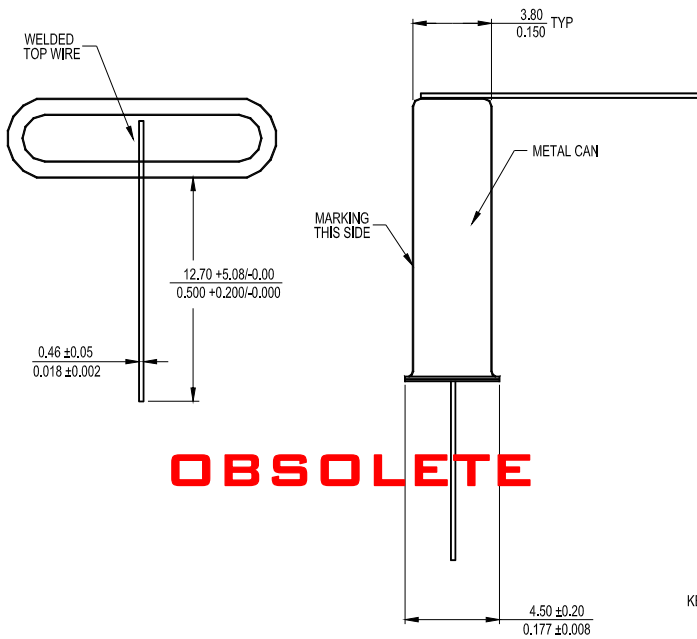
MARKING INFORMATION

1. MPXXXX - CTS Part Number.
[Per Ordering Information Format]
2. XXMXXXXX - Frequency is marked with only leading significant digits before the 'M' and 4 - 6 digits after the 'M' (including zeros).
Ex. XMXXXXXX - 3M579545
XXMXXXXX - 14M31818
XXMXXXXX - 20M0000
3. ** - Manufacturing Site Code.
4. 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

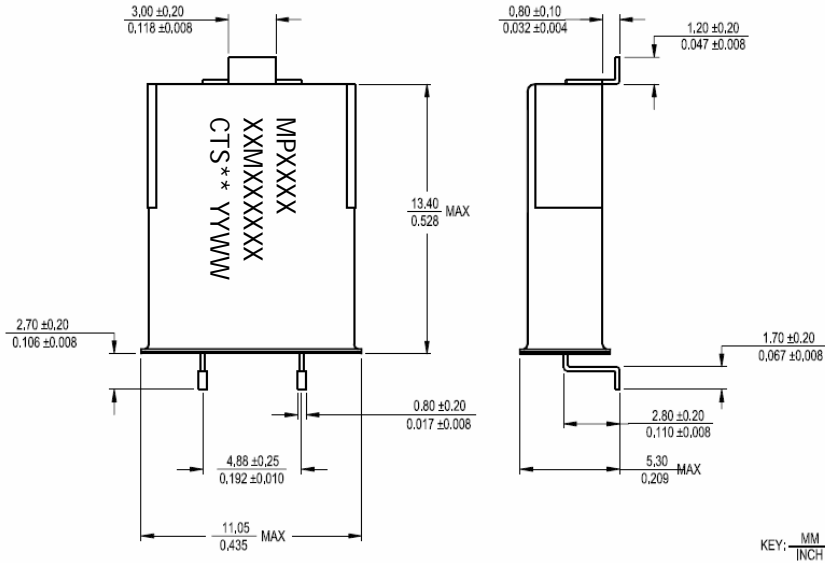


OBSOLETE

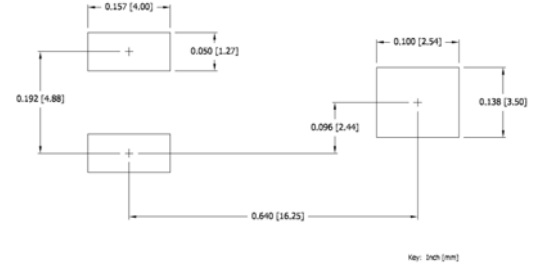
KEY: $\frac{\text{MM}}{\text{INCH}}$

MECHANICAL SPECIFICATIONS

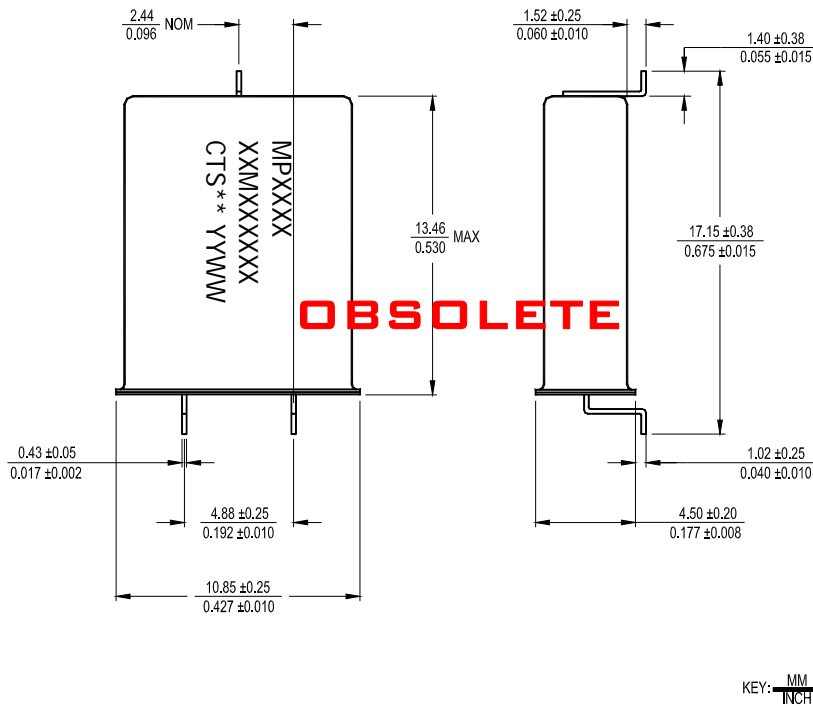
MP-SMMC OPTION W/ METAL CLIP THIRD LEAD



SUGGESTED SOLDER PAD GEOMETRY

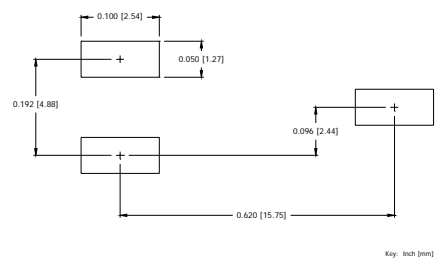


MP-SM OPTION W/ WELDED TOP WIRE THIRD LEAD



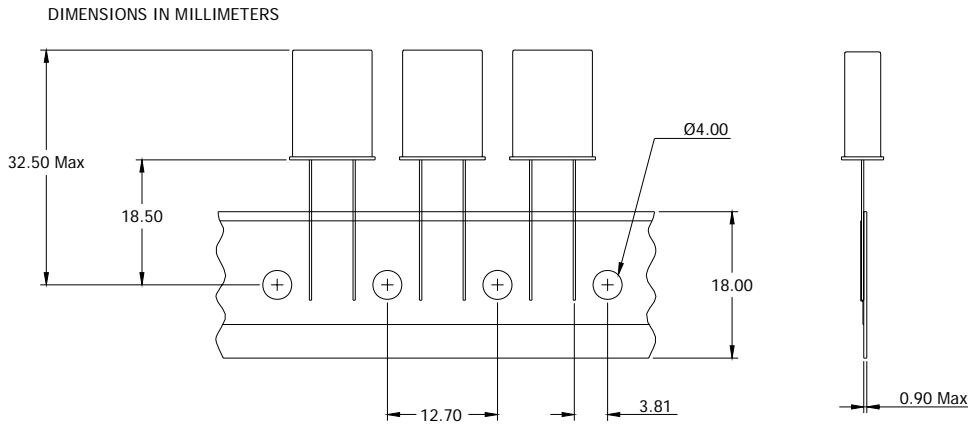
OBSOLETE

SUGGESTED SOLDER PAD GEOMETRY

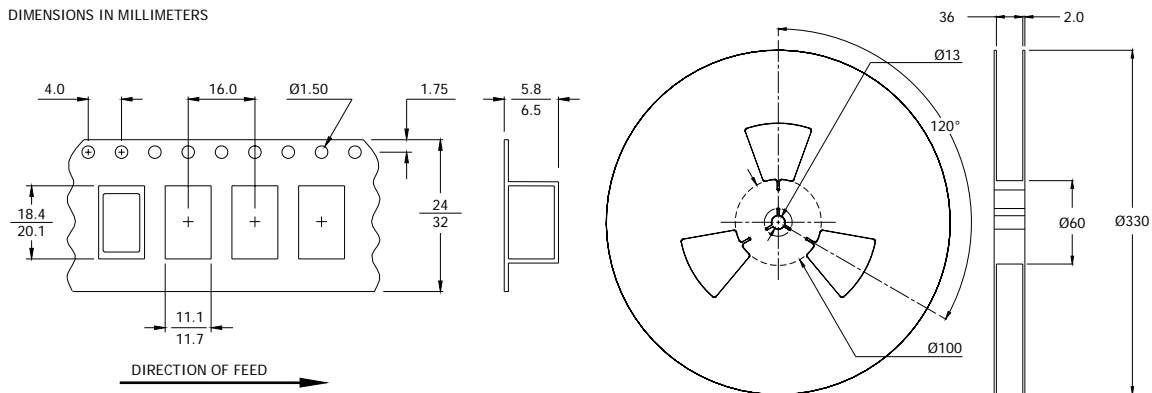


PACKAGING INFORMATION [Reference Only]

MP Radial Taping (Ammopak)



MP-SMMC Tape and Reel



ENVIRONMENTAL SPECIFICATIONS

| | |
|----------------------------------|---|
| Temperature Cycle: | 400 cycles from -55°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 2×10^{-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 ± 5 ppm shift. |
| Insulation Resistance: | 500M Ohms @ $100V_{\text{DC}} \pm 15V_{\text{DC}}$. |
| Moisture Sensitivity Level: | Level 1 per JEDEC J-STD-020. |

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

CTS:

[MP041](#) [MP098](#) [MP120A](#) [MP120B-E](#) [MP147-E](#) [MP250A](#) [MP245B](#) [MP250B](#) [MP320A](#) [MP480B-E](#) [MP060B](#)
[MP480](#) [MP018A](#) [MP052C-E](#) [MP064](#) [MP065C](#) [MP196B-E](#) [MP057A](#) [MP080-E](#) [MP110A-E](#) [MP049B](#) [MP05A-E](#)
[MP200B-E](#) [MP065C-E](#) [MP098B-E](#) [MP120C-E](#) [MP200-E](#) [MP020B-E](#) [MP051A-E](#) [MP057A-E](#) [MP073B-E](#) [MP111-E](#)
[MP327B-E](#) [MP160-E](#) [MP042-E](#) [MP400-E](#) [MP143B](#) [MP04A-E](#) [MP052](#) [MP060C-E](#) [MP052-E](#) [MP073-E](#) [MP08A-E](#)
[MP110B](#) [MP111C](#) [MP221-E](#) [MP240A-E](#) [MP240](#) [MP250](#) [MP018S](#) [MP037](#) [MP036-E](#) [MP036S](#) [MP098A](#) [MP110B-](#)
[E](#) [MP196B](#) [MP020B](#) [MP040B](#) [MP160](#) [MP100A](#) [MP122C](#) [MP018B](#) [MP043](#) [MP043-E](#) [MP061C](#) [MP320B](#) [MP111](#)
[MP200](#) [MP050-E](#) [MP122-E](#) [MP018B-E](#) [MP020S-E](#) [MP020S](#) [MP101](#) [MP018S-E](#) [MP061C-E](#) [MP101-E](#) [MP043A-E](#)
[MP057-E](#) [MP160A-E](#) [MP640B-E](#) [MP04A](#) [MP061](#) [MP180-E](#) [MP184B](#) [MP196-E](#) [MP200A-E](#) [MP020A-E](#) [MP037-E](#)
[MP100B](#) [MP049B-E](#) [MP107-E](#) [MP120A-E](#) [MP160B](#) [MP180](#) [MP196](#) [MP024S](#) [MP042](#) [MP080](#) [MP122](#)