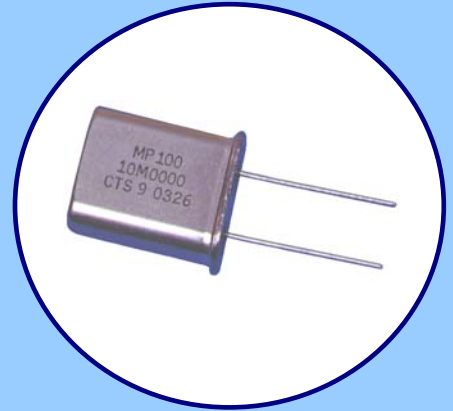




**FEATURES**

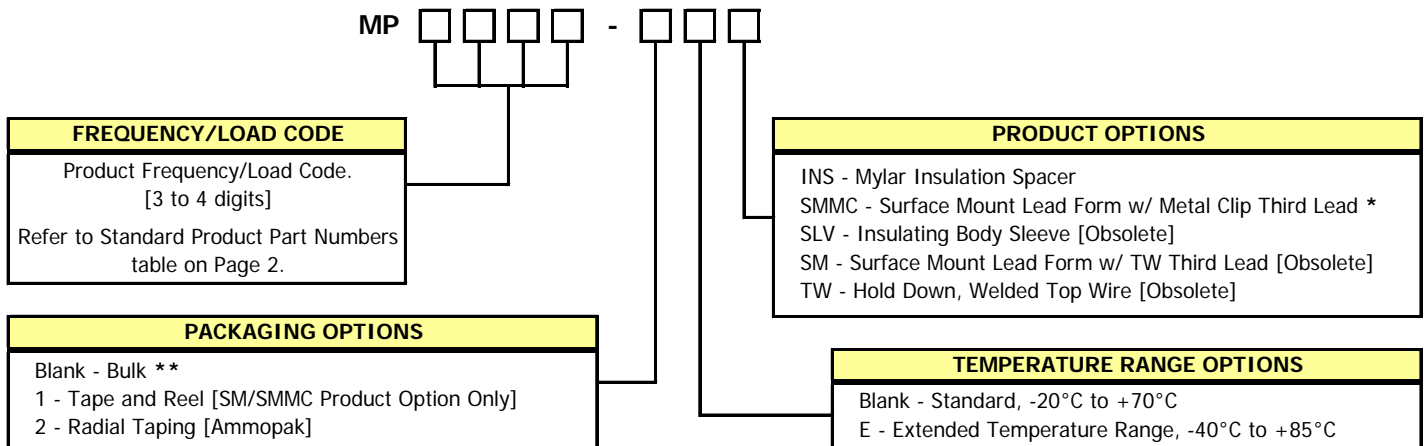
- Standard HC-49/U Package, HC-49/U SMMC Package Option Available
- Stable Frequency Over Temperature and Drive Level
- **Fundamental and 3<sup>rd</sup> Overtone Crystals**
- Frequency Range 1.8432 – 64 MHz
- Frequency Tolerance, ±30 ppm Standard
- Frequency Stability, ±50 ppm Standard
- Operating Temperature, -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**



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

\* Consult factory for Option availability.

**Non-Standard Ordering Options**

- Contact your local CTS Representative or CTS Inside Sales Representative 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 [M Hz] | PART NUMBER [-20/70°C] | PART NUMBER [-40/85°C] | LOAD CAPACITANCE | OPERATING MODE | FREQUENCY [M Hz] | PART NUMBER [-20/70°C] | PART NUMBER [-40/85°C] | LOAD CAPACITANCE | OPERATING MODE |
|------------------|------------------------|------------------------|------------------|----------------|------------------|------------------------|------------------------|------------------|----------------|
| 1.843200         | MP018A                 | MP018A-E               | Series           | Fundamental    | 10.738635        | <b>MP107</b>           | MP107-E                | 32 pF            | Fundamental    |
| 1.843200         | MP018B                 | MP018B-E               | 18 pF            | Fundamental    | 11.000000        | MP110B                 | MP110B-E               | Series           | Fundamental    |
| 1.843200         | <b>MP018S</b>          | MP018S-E               | 13 pF            | Fundamental    | 11.000000        | MP110A                 | MP110A-E               | 20 pF            | Fundamental    |
| 2.000000         | MP020A                 | MP020A-E               | Series           | Fundamental    | 11.000000        | <b>MP110</b>           | MP110-E                | 18 pF            | Fundamental    |
| 2.000000         | <b>MP020S</b>          | MP020S-E               | 20 pF            | Fundamental    | 11.059200        | <b>MP111</b>           | MP111-E                | Series           | Fundamental    |
| 2.000000         | <b>MP020B</b>          | <b>MP020B-E</b>        | 18 pF            | Fundamental    | 11.059200        | MP111A                 | MP111A-E               | 20 pF            | Fundamental    |
| 2.457600         | <b>MP024S</b>          | 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         | <b>MP036S</b>          | MP036S-E               | 18 pF            | Fundamental    | 12.000000        | <b>MP120</b>           | MP120-E                | Series           | Fundamental    |
| 3.686400         | MP037A                 | MP037A-E               | Series           | Fundamental    | 12.000000        | MP120A                 | MP120A-E               | 20 pF            | Fundamental    |
| 3.686400         | <b>MP037</b>           | MP037-E                | 20 pF            | Fundamental    | 12.000000        | MP120B                 | MP120B-E               | 18 pF            | Fundamental    |
| 3.686400         | <b>MP037B</b>          | <b>MP037B-E</b>        | 18 pF            | Fundamental    | 12.000000        | MP120C                 | MP120C-E               | 32 pF            | Fundamental    |
| 4.000000         | <b>MP04A</b>           | MP04A-E                | Series           | Fundamental    | 12.288000        | MP122C                 | MP122C-E               | Series           | Fundamental    |
| 4.000000         | <b>MP040</b>           | MP040-E                | 20 pF            | Fundamental    | 12.288000        | MP122A                 | MP122A-E               | 20 pF            | Fundamental    |
| 4.000000         | <b>MP040B</b>          | <b>MP040B-E</b>        | 18 pF            | Fundamental    | 12.288000        | MP122B                 | MP122B-E               | 18 pF            | Fundamental    |
| 4.032000         | MP043A                 | MP043A-E               | Series           | Fundamental    | 12.288000        | <b>MP122</b>           | MP122-E                | 32 pF            | Fundamental    |
| 4.032000         | MP043                  | MP043-E                | 20 pF            | Fundamental    | 14.318180        | <b>MP143</b>           | MP143-E                | Series           | Fundamental    |
| 4.096000         | MP042A                 | MP042A-E               | 20 pF            | Fundamental    | 14.318180        | <b>MP143B</b>          | <b>MP143B-E</b>        | 18 pF            | Fundamental    |
| 4.194304         | <b>MP041</b>           | MP041-E                | 12 pF            | Fundamental    | 14.745600        | <b>MP147</b>           | MP147-E                | Series           | Fundamental    |
| 4.915200         | MP049A                 | MP049A-E               | Series           | Fundamental    | 14.745600        | MP147A                 | MP147A-E               | 20 pF            | Fundamental    |
| 4.915200         | <b>MP042</b>           | MP042-E                | 20 pF            | Fundamental    | 14.745600        | MP147B                 | MP147B-E               | 18 pF            | Fundamental    |
| 4.915200         | <b>MP049B</b>          | <b>MP049B-E</b>        | 18 pF            | Fundamental    | 15.000000        | <b>MP150</b>           | MP150-E                | Series           | Fundamental    |
| 5.000000         | <b>MP05B</b>           | MP05B-E                | Series           | Fundamental    | 16.000000        | <b>MP160</b>           | MP160-E                | Series           | Fundamental    |
| 5.000000         | <b>MP05A</b>           | MP05A-E                | 20 pF            | Fundamental    | 16.000000        | MP160A                 | MP160A-E               | 20 pF            | Fundamental    |
| 5.000000         | <b>MP050C</b>          | <b>MP050C-E</b>        | 18 pF            | Fundamental    | 16.000000        | MP160B                 | MP160B-E               | 18 pF            | Fundamental    |
| 5.068000         | <b>MP050</b>           | MP050-E                | Series           | Fundamental    | 18.000000        | MP180                  | MP180-E                | Series           | Fundamental    |
| 5.068000         | MP051A                 | MP051A-E               | 20 pF            | Fundamental    | 18.432000        | <b>MP184</b>           | 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        | <b>MP196</b>           | 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        | <b>MP200</b>           | MP200-E                | Series           | Fundamental    |
| 6.000000         | <b>MP060</b>           | MP060-E                | 20 pF            | Fundamental    | 20.000000        | MP200A                 | MP200A-E               | 20 pF            | Fundamental    |
| 6.000000         | <b>MP060B</b>          | <b>MP060B-E</b>        | 18 pF            | Fundamental    | 20.000000        | MP200B                 | MP200B-E               | 18 pF            | Fundamental    |
| 6.000000         | MP060C                 | MP060C-E               | 32 pF            | Fundamental    | 22.118400        | <b>MP221A</b>          | MP221A-E               | Series           | Fundamental    |
| 6.144000         | <b>MP061</b>           | MP061-E                | 20 pF            | Fundamental    | 22.118400        | <b>MP221</b>           | MP221-E                | 20 pF            | Fundamental    |
| 6.144000         | MP061C                 | MP061C-E               | 32 pF            | Fundamental    | 22.118400        | MP221B                 | MP221B-E               | 18 pF            | Fundamental    |
| 6.250000         | MP062                  | MP062-E                | 30 pF            | Fundamental    | 24.000000        | <b>MP240</b>           | MP240-E                | Series           | Fundamental    |
| 6.400000         | MP064                  | MP064-E                | 20 pF            | Fundamental    | 24.000000        | MP240A                 | MP240A-E               | 20 pF            | Fundamental    |
| 6.553600         | MP065                  | MP065-E                | 20 pF            | Fundamental    | 24.000000        | MP240B                 | MP240B-E               | 18 pF            | Fundamental    |
| 6.553600         | MP065C                 | MP065C-E               | 12 pF            | Fundamental    | 24.576000        | <b>MP245</b>           | MP245-E                | Series           | Fundamental    |
| 7.372800         | <b>MP073</b>           | MP073-E                | Series           | Fundamental    | 24.576000        | MP245B                 | MP245B-E               | 18 pF            | Fundamental    |
| 7.372800         | MP073A                 | MP073A-E               | 20 pF            | Fundamental    | 25.000000        | <b>MP250</b>           | MP250-E                | Series           | Fundamental    |
| 7.372800         | MP073B                 | MP073B-E               | 18 pF            | Fundamental    | 25.000000        | MP250A                 | MP250A-E               | 20 pF            | Fundamental    |
| 8.000000         | <b>MP080</b>           | MP080-E                | Series           | Fundamental    | 25.000000        | MP250B                 | MP250B-E               | 18 pF            | Fundamental    |
| 8.000000         | <b>MP080A</b>          | MP080A-E               | 20 pF            | Fundamental    | 27.000000        | MP270                  | MP270-E                | Series           | 3rd Overtone   |
| 8.000000         | <b>MP080B</b>          | <b>MP080B-E</b>        | 18 pF            | Fundamental    | 27.000000        | MP270B                 | MP270B-E               | 18 pF            | 3rd Overtone   |
| 8.000000         | MP080C                 | MP080C-E               | 32 pF            | Fundamental    | 32.000000        | MP320A                 | MP320A-E               | 20 pF            | 3rd Overtone   |
| 8.192000         | MP081B                 | MP081B-E               | 18 pF            | Fundamental    | 32.000000        | MP320B                 | MP320B-E               | 18 pF            | 3rd Overtone   |
| 9.216000         | MP092B                 | MP092B-E               | 18 pF            | Fundamental    | 32.768000        | MP327B                 | MP327B-E               | 18 pF            | 3rd Overtone   |
| 9.830400         | MP098A                 | MP098A-E               | Series           | Fundamental    | 36.000000        | MP360                  | MP360-E                | Series           | 3rd Overtone   |
| 9.830400         | <b>MP098</b>           | MP098-E                | 20 pF            | Fundamental    | 40.000000        | MP400                  | MP400-E                | 20 pF            | 3rd Overtone   |
| 9.830400         | <b>MP098B</b>          | <b>MP098B-E</b>        | 18 pF            | Fundamental    | 48.000000        | MP480                  | MP480-E                | Series           | 3rd Overtone   |
| 10.000000        | <b>MP100</b>           | MP100-E                | Series           | Fundamental    | 48.000000        | MP480A                 | MP480A-E               | 20 pF            | 3rd Overtone   |
| 10.000000        | MP100A                 | MP100A-E               | 20 pF            | Fundamental    | 48.000000        | MP480B                 | MP480B-E               | 18 pF            | 3rd Overtone   |
| 10.000000        | MP100B                 | MP100B-E               | 18 pF            | Fundamental    | 50.000000        | <b>MP500B</b>          | <b>MP500B-E</b>        | 18 pF            | 3rd Overtone   |
| 10.000000        | <b>MP101</b>           | MP101-E                | 30 pF            | Fundamental    | 64.000000        | MP640B                 | MP640B-E               | 18 pF            | 3rd Overtone   |

**ELECTRICAL CHARACTERISTICS**

|                              | <b>PARAMETER</b>   | <b>VALUE</b>   |
|------------------------------|--|--|
| <b>ELECTRICAL PARAMETERS</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                                   |
|                              | Insulation Resistance  | 500 Ohms @ DC 100V   |
|                              | Storage Temperature Range  | -40°C to +85°C   |
|                              | Reflow Condition, per JEDEC J-STD-020  | +250°C Maximum, 10 Seconds Maximum                                     |

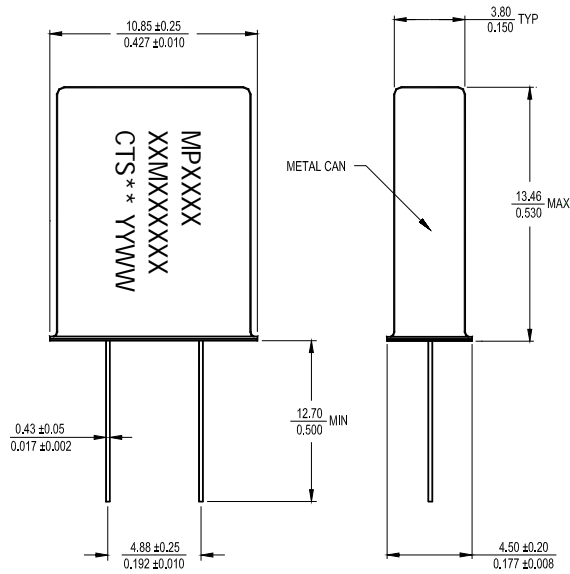
\* Custom requirements may be available upon request.

**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:  $\frac{MM}{INCH}$

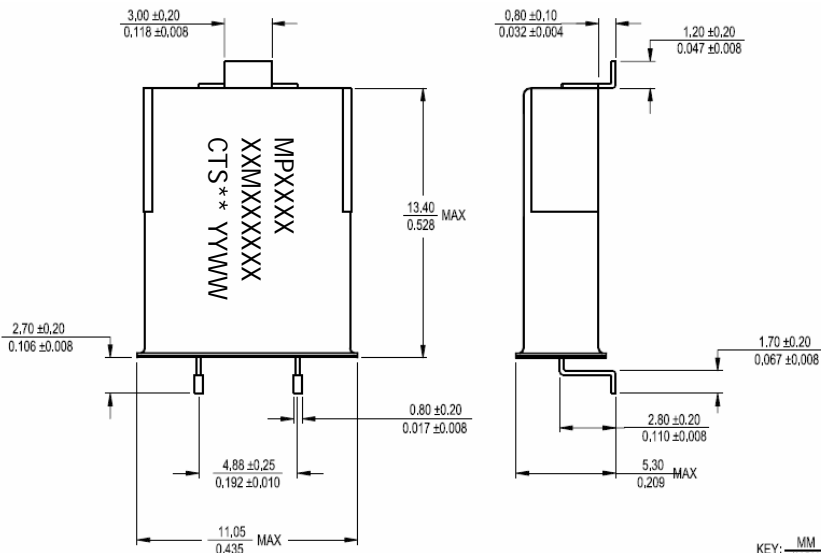
**MARKING INFORMATION**

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**

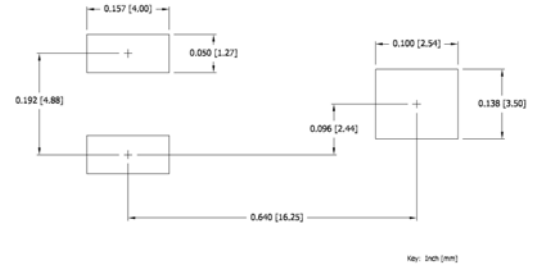
1. Lead finish [e1], SnAgCu.
2. MSL = 1.

**MP-SMMC OPTION w/ METAL CLIP THIRD LEAD**



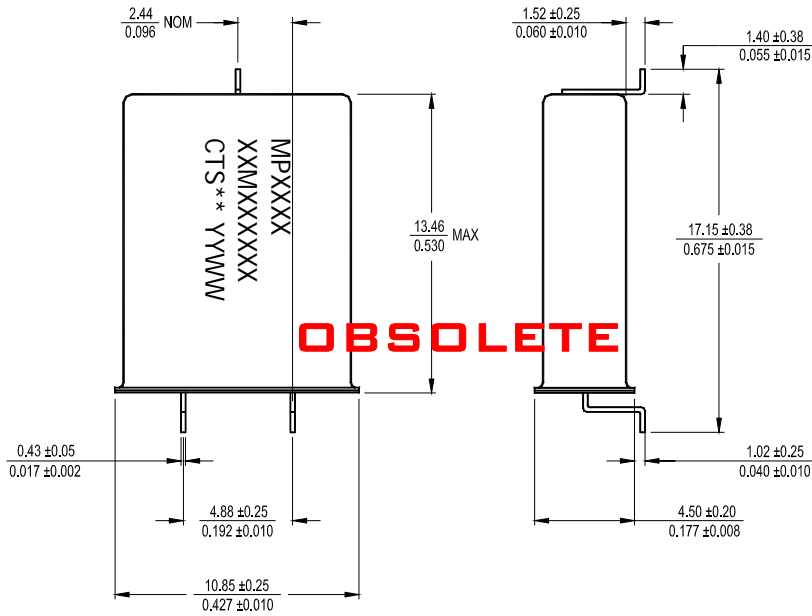
KEY:  $\frac{MM}{INCH}$

**SUGGESTED SOLDER PAD GEOMETRY**



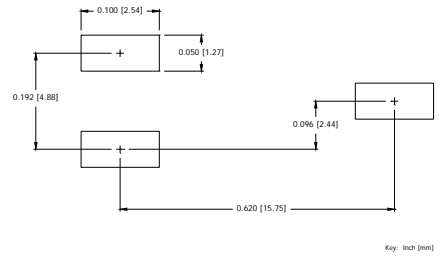
**MECHANICAL SPECIFICATIONS**

**MP-SM OPTION w/ WELDED TOP WIRE THIRD LEAD**

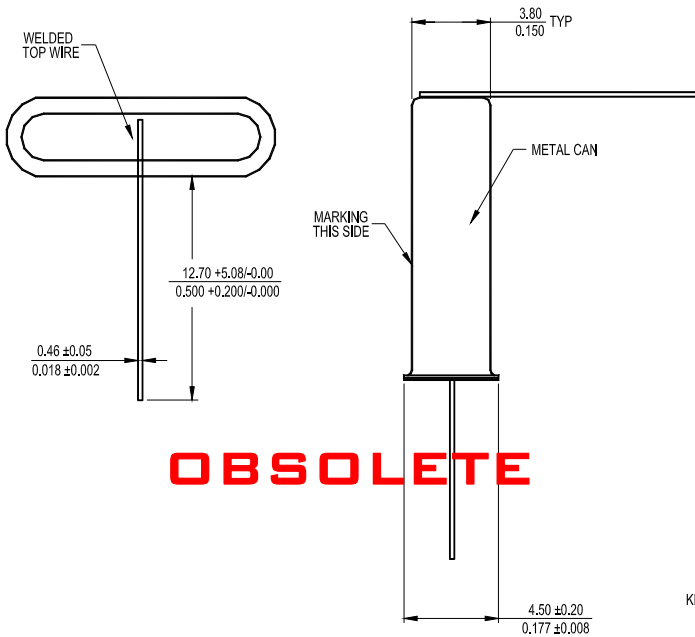


KEY:  $\frac{\text{MM}}{\text{INCH}}$

**SUGGESTED SOLDER PAD GEOMETRY**



**MP PACKAGE w/ WELDED TOP WIRE [TW] OPTION**

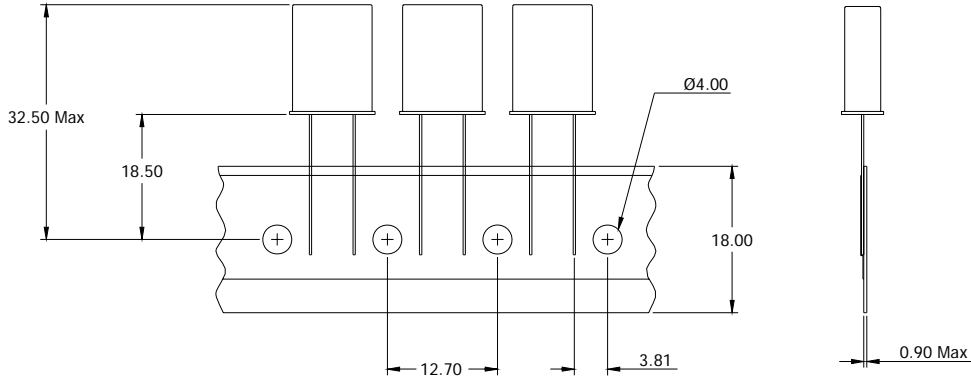


KEY:  $\frac{\text{MM}}{\text{INCH}}$

**PACKAGING INFORMATION [Reference Only]**

**MP Radial Taping [Ammopak]**

DIMENSIONS IN MILLIMETERS



**MP-SMMC Tape and Reel**

DIMENSIONS IN MILLIMETERS

