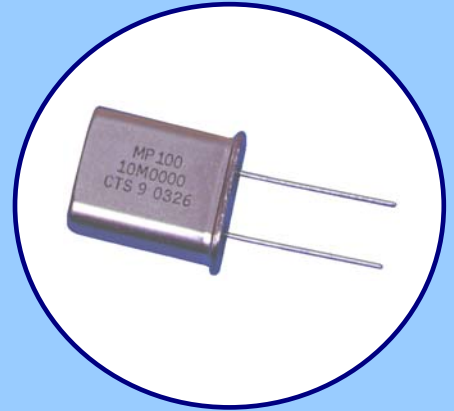




**FEATURES**

- 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**

- 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 (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       | <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>MP221</b>         | MP221-E              | 20 pF            | Fundamental    |
| 6.144000        | <b>MP061</b>         | MP061-E              | 20 pF            | Fundamental    | 22.118400       | MP221B               | MP221B-E             | 18 pF            | Fundamental    |
| 6.144000        | MP061C               | MP061C-E             | 32 pF            | Fundamental    | 24.000000       | <b>MP240</b>         | MP240-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       | <b>MP245</b>         | MP245-E              | Series           | Fundamental    |
| 6.553600        | MP065C               | MP065C-E             | 12 pF            | Fundamental    | 24.576000       | MP245B               | MP245B-E             | 18 pF            | Fundamental    |
| 7.372800        | <b>MP073</b>         | MP073-E              | Series           | Fundamental    | 25.000000       | <b>MP250</b>         | MP250-E              | Series           | Fundamental    |
| 7.372800        | MP073A               | MP073A-E             | 20 pF            | Fundamental    | 25.000000       | MP250A               | MP250A-E             | 20 pF            | Fundamental    |
| 7.372800        | <b>MP073B</b>        | MP073B-E             | 18 pF            | Fundamental    | 25.000000       | MP250B               | MP250B-E             | 18 pF            | Fundamental    |
| 8.000000        | <b>MP080</b>         | MP080-E              | Series           | Fundamental    | 27.000000       | MP270                | MP270-E              | Series           | 3rd Overtone   |
| 8.000000        | <b>MP080A</b>        | MP080A-E             | 20 pF            | Fundamental    | 27.000000       | MP270B               | MP270B-E             | 18 pF            | 3rd Overtone   |
| 8.000000        | <b>MP080B</b>        | <b>MP080B-E</b>      | 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       | MP360                | MP360-E              | Series           | 3rd Overtone   |
| 9.830400        | MP098A               | MP098A-E             | Series           | Fundamental    | 40.000000       | <b>MP400</b>         | MP400-E              | 20 pF            | 3rd Overtone   |
| 9.830400        | <b>MP098</b>         | MP098-E              | 20 pF            | Fundamental    | 48.000000       | MP480                | MP480-E              | Series           | 3rd Overtone   |
| 9.830400        | <b>MP098B</b>        | <b>MP098B-E</b>      | 18 pF            | Fundamental    | 48.000000       | MP480A               | MP480A-E             | 20 pF            | 3rd Overtone   |
| 10.000000       | <b>MP100</b>         | MP100-E              | Series           | Fundamental    | 48.000000       | MP480B               | MP480B-E             | 18 pF            | 3rd Overtone   |
| 10.000000       | MP100A               | MP100A-E             | 20 pF            | Fundamental    | 50.000000       | <b>MP500B</b>        | <b>MP500B-E</b>      | 18 pF            | 3rd Overtone   |
| 10.000000       | MP100B               | MP100B-E             | 18 pF            | Fundamental    | 64.000000       | MP640B               | MP640B-E             | 18 pF            | 3rd Overtone   |
| 10.000000       | <b>MP101</b>         | MP101-E              | 30 pF            | Fundamental    |                 |                      |                      |                  |                |

**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                                   |
|                              | 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  
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**

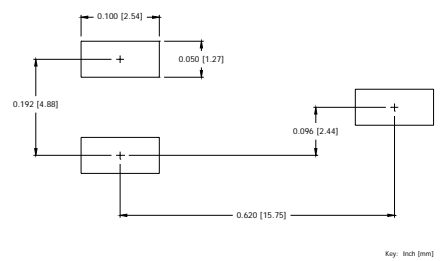


**MP-SM OPTION W/ WELDED TOP WIRE THIRD LEAD**



**OBSELETE**

**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 «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.