

### FEATURES

- Plastic Molded Metal Cylinder Crystal Package
- Stable Frequency Over Temperature and Drive Level
- Fundamental and 3<sup>rd</sup> Overtone Crystals
- Frequency Range 3.5 – 40 MHz
- Frequency Tolerance,  $\pm 50$  ppm Standard
- Frequency Stability,  $\pm 50$  ppm Standard
- Operating Temperature,  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Tape & Reel Packaging Available

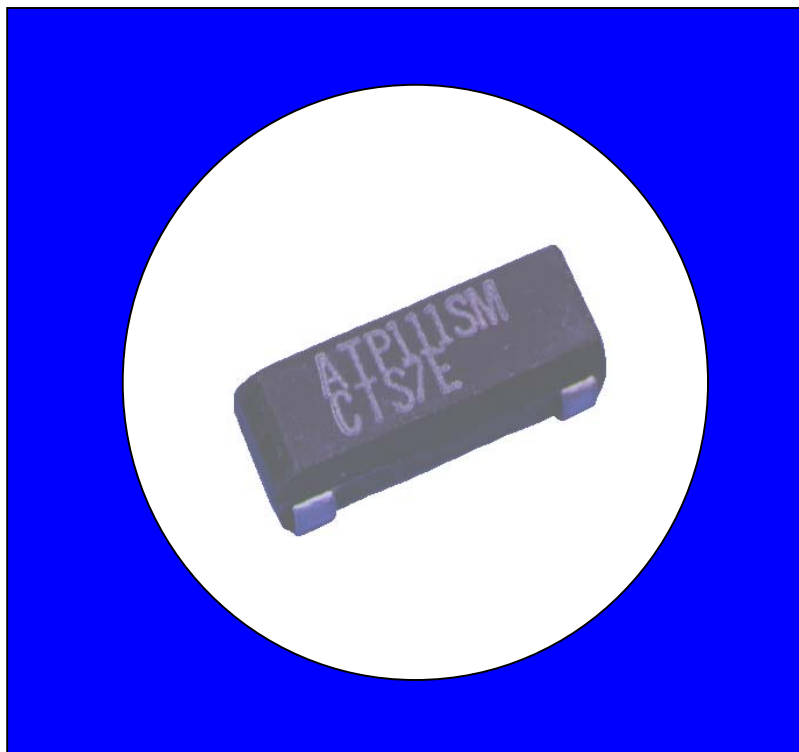
#### • RoHS Compliant

#### • RoHS Exemption

Per EU Directive 2002/95/EC Annex, Section 7: Lead in high temperature solders (+85% lead).

### DESCRIPTION

The ATP-SM crystal series offers excellent long-term stability and reliability in a proven plastic molded package. The excellent shock performance makes it suitable for today's microprocessor, communication, consumer electronic and networking applications.



### STANDARD PART NUMBERS AVAILABLE @ CTS DISTRIBUTORS

ATP-SM

| PART NUMBER | FREQUENCY (MHz) | LOAD CAPACITANCE | OPERATING MODE |
|-------------|-----------------|------------------|----------------|
| ATP036SM    | 3.579545        | 18 pF            | Fundamental    |
| ATP037SM    | 3.686400        | 20 pF            | Fundamental    |
| ATP040SM    | 4.000000        | 20 pF            | Fundamental    |
| ATP042SM    | 4.915200        | 20 pF            | Fundamental    |
| ATP060SM    | 6.000000        | 20 pF            | Fundamental    |
| ATP10ASM    | 10.000000       | 20 pF            | Fundamental    |
| ATP111SM    | 11.059200       | 20 pF            | Fundamental    |

ATP-SM

| PART NUMBER | FREQUENCY (MHz) | LOAD CAPACITANCE | OPERATING MODE |
|-------------|-----------------|------------------|----------------|
| ATP122SM    | 12.288000       | 20 pF            | Fundamental    |
| ATP143SM    | 14.318180       | Series           | Fundamental    |
| ATP160SM    | 16.000000       | Series           | Fundamental    |
| ATP16ASM    | 16.000000       | 20 pF            | Fundamental    |
| ATP200SM    | 20.000000       | Series           | Fundamental    |
| ATP204SM    | 20.480000       | 20 pF            | Fundamental    |
| ATP245SM    | 24.576000       | Series           | Fundamental    |

Contact your authorized CTS distributor for availability.



## ADDITIONAL PART NUMBERS AVAILABLE FROM CTS

ATP-SM

| PART NUMBER | FREQUENCY (MHz) | LOAD CAPACITANCE | OPERATING MODE |
|-------------|-----------------|------------------|----------------|
| ATP04ASM    | 4.000000        | Series           | Fundamental    |
| ATP044SM    | 4.433619        | 20 pF            | Fundamental    |
| ATP050SM    | 5.068800        | 20 pF            | Fundamental    |
| ATP061SM    | 6.144000        | 20 pF            | Fundamental    |
| ATP073SM    | 7.372800        | 20 pF            | Fundamental    |
| ATP080SM    | 8.000000        | Series           | Fundamental    |
| ATP08ASM    | 8.000000        | 20 pF            | Fundamental    |
| ATP08BSM    | 8.192000        | 30 pF            | Fundamental    |
| ATP098SM    | 9.830400        | 20 pF            | Fundamental    |
| ATP099SM    | 9.830400        | Series           | Fundamental    |
| ATP100SM    | 10.000000       | Series           | Fundamental    |
| ATP115SM    | 11.520000       | 20 pF            | Fundamental    |
| ATP120SM    | 12.000000       | Series           | Fundamental    |
| ATP12ASM    | 12.000000       | 20 pF            | Fundamental    |
| ATP125SM    | 12.288000       | Series           | Fundamental    |
| ATP123SM    | 12.296000       | 20 pF            | Fundamental    |
| ATP124SM    | 12.296000       | Series           | Fundamental    |
| ATP126SM    | 12.352000       | Series           | Fundamental    |
| ATP127SM    | 12.352000       | 20 pF            | Fundamental    |
| ATP135SM    | 13.500000       | 20 pF            | Fundamental    |

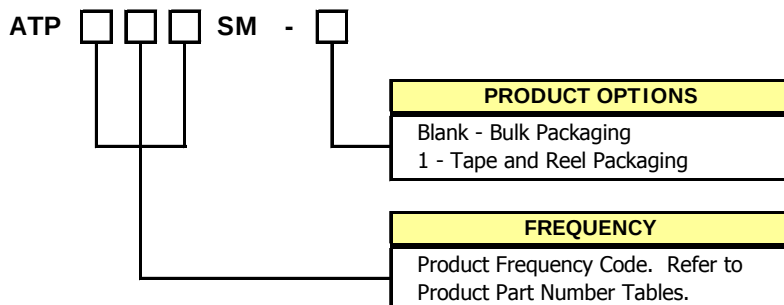
ATP-SM

| PART NUMBER | FREQUENCY (MHz) | LOAD CAPACITANCE | OPERATING MODE           |
|-------------|-----------------|------------------|--------------------------|
| ATP14ASM    | 14.318180       | 20 pF            | Fundamental              |
| ATP153SM    | 15.360000       | 20 pF            | Fundamental              |
| ATP169SM    | 16.934400       | 20 pF            | Fundamental              |
| ATP184SM    | 18.432000       | Series           | Fundamental              |
| ATP18ASM    | 18.432000       | 20 pF            | Fundamental              |
| ATP196SM    | 19.660800       | Series           | Fundamental              |
| ATP19ASM    | 19.660800       | 20 pF            | Fundamental              |
| ATP20ASM    | 20.000000       | 20 pF            | Fundamental              |
| ATP20BSM    | 20.000000       | 50 pF            | Fundamental              |
| ATP220SM    | 22.118400       | Series           | Fundamental              |
| ATP22ASM    | 22.118400       | 20 pF            | Fundamental              |
| ATP240SM    | 24.000000       | Series           | Fundamental              |
| ATP24ASM    | 24.000000       | 20 pF            | Fundamental              |
| ATP24BSM    | 24.576000       | 20 pF            | Fundamental              |
| ATP250SM    | 25.000000       | Series           | Fundamental              |
| ATP25ASM    | 25.000000       | 20 pF            | Fundamental              |
| ATP320SM    | 32.000000       | Series           | 3 <sup>RD</sup> Overtone |
| ATP32ASM    | 32.000000       | 20 pF            | 3 <sup>RD</sup> Overtone |
| ATP400SM    | 40.000000       | Series           | 3 <sup>RD</sup> Overtone |
| ATP40ASM    | 40.000000       | 20 pF            | 3 <sup>RD</sup> Overtone |

Contact your local CTS Representative or CTS Customer Service for availability.

## ADDITIONAL ORDERING INFORMATION

### Available Standard Product Options



### NON-Standard Ordering Options

Custom performance characteristics are available upon request. Use form C052 to detail non-standard parameters. Contact your local CTS Representative or CTS Customer Service for assistance.

## ELECTRICAL CHARACTERISTICS

|                       | PARAMETER                                                                                  | VALUE                                   |
|-----------------------|--------------------------------------------------------------------------------------------|-----------------------------------------|
| Electrical Parameters | Operating Mode                                                                             | Fundamental or 3 <sup>rd</sup> Overtone |
|                       | Crystal Cut                                                                                | AT-Cut Characteristics                  |
|                       | Frequency Range                                                                            | 3.5 MHz to 40.0 MHz                     |
|                       | Frequency Tolerance @ 25°C                                                                 | ± 50 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 *                        |
|                       | Storage Temperature Range                                                                  | -55°C to +125°C                         |
|                       | Equivalent Series Resistance                                                               | See ESR Table                           |
|                       | Load Capacitance or Resonance Mode                                                         | See Standard Part Number Tables *       |
|                       | Shunt Capacitance (C <sub>0</sub> )                                                        | 7.0 pF Maximum                          |
|                       | Drive Level                                                                                | 10 µW Typical, 100 µW Maximum           |
|                       | Reflow Condition, per JEDEC J-STD-020                                                      | +255°C ± 5°C, 10 Seconds Maximum        |

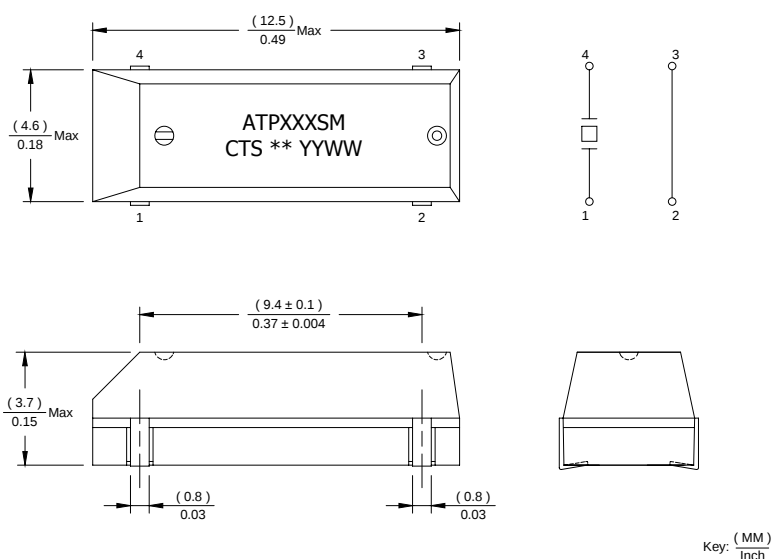
\* Custom requirements are available upon request. Use form C052 to communicate crystal parameters.  
Contact your local CTS Representative or CTS Customer Service for assistance.

## EQUIVALENT SERIES RESISTANCE TABLE

| FREQUENCY RANGE         | MODE of OSCILLATION      | ESR Maximum |
|-------------------------|--------------------------|-------------|
| 3.50 MHz - < 4.00 MHz   | Fundamental              | 200 Ohms    |
| 4.00 MHz - < 6.00 MHz   | Fundamental              | 150 Ohms    |
| 6.00 MHz - < 10.00 MHz  | Fundamental              | 100 Ohms    |
| 10.0 MHz - < 27.00 MHz  | Fundamental              | 50 Ohms     |
| 27.00 MHz - < 36.00 MHz | Fundamental              | 50 Ohms     |
| 27.00 MHz - < 36.00 MHz | 3 <sup>RD</sup> Overtone | 100 Ohms    |
| 36.00 MHz - 40.00 MHz   | 3 <sup>RD</sup> Overtone | 80 Ohms     |

## MECHANICAL SPECIFICATIONS

### ATS-SM PACKAGE DRAWING



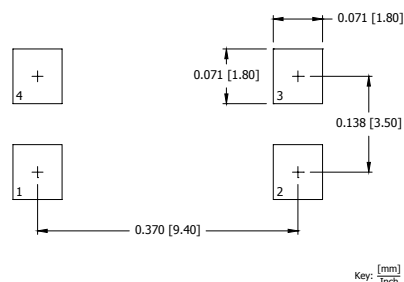
### MARKING INFORMATION

1. CTS Part Number.
2. \*\* - Manufacturing Site Code.
3. YYWW – Date Code, YY – year, WW – week.
4. CTS part number, frequency value and date code information must appear on reel and box labels.

### NOTES

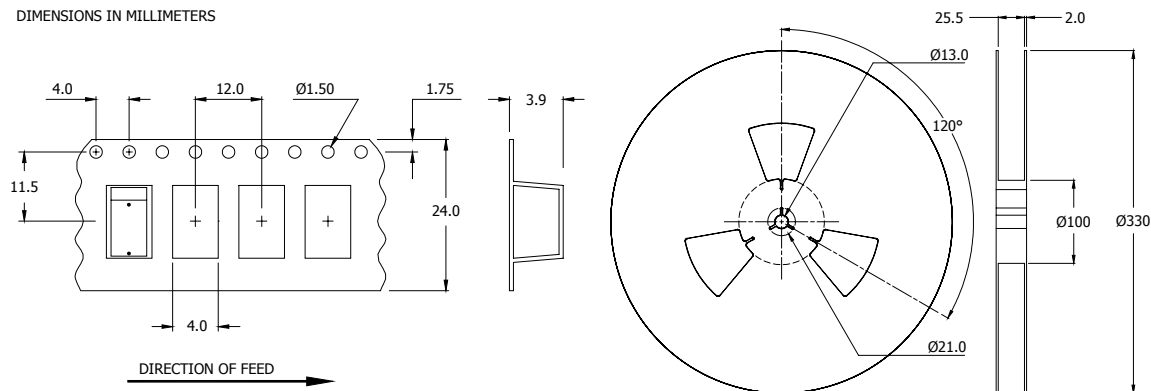
1. Lead finish (e5), SnZnCu.

### SUGGESTED SOLDER PAD GEOMETRY



## PACKAGING INFORMATION

DIMENSIONS IN MILLIMETERS



Device quantity is 1,000 pieces per reel.

## ENVIRONMENTAL SPECIFICATIONS

|                                  |                                                                                                                                        |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Cycle:               | 400 cycles from -55°C to +125°C, 10 minute dwell at each temperature, 1 minute transfer time between temperatures.                     |
| Mechanical Shock:                | 1,500g's, 0.5mS duration, 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°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 +260°C peak, 10 seconds maximum.                                                                     |
| High Temperature Operating Bias: | 2,000 hours at +125°C, disregarding frequency shift.                                                                                   |
| Frequency Aging:                 | 1,000 hours at +85°C, maximum $\pm 5$ ppm shift.                                                                                       |
| Insulation Resistance:           | 500M Ohms @ $100V_{DC} \pm 15V_{DC}$ .                                                                                                 |
| Moisture Sensitivity Level:      | Level 1 per JEDEC J-STD-020.                                                                                                           |

## QUALITY AND RELIABILITY

Quality systems meet or exceed the requirements of ISO 9000:2000 standards.