



FEATURES

- Standard 7.0x5.0mm Surface Mount Footprint
- Stable Frequency Over Temperature and Drive Level
- Frequency Range 8 – 100 MHz
- Frequency Tolerance, ± 30 ppm Standard (± 10 ppm and ± 20 ppm available)
- Frequency Stability, ± 50 ppm Standard ($\pm 10, \pm 20, \pm 30$ and ± 40 ppm available)
- Operating Temperature to -40°C to $+85^{\circ}\text{C}$
- Tape & Reel Packaging, EIA-481-2 Compliant
- **RoHS/Green Compliant**

DESCRIPTION

The Model 407 is a ceramic packaged Crystal offering reduced size, ideal for high-density circuit board applications. The Model 407 offers reliable precision and excellent shock performance in wireless telecommunication devices.



ORDERING INFORMATION

407 □ □ □ □ □ □ □ M □ □ □ □

| MODE OF OSCILLATION * |
|------------------------------|
| F = Fundamental |
| T = 3 RD Overtone |

| FREQUENCY TOLERANCE @ 25°C |
|-----------------------------|
| 1 = ± 10 ppm |
| 2 = ± 20 ppm |
| 3 = ± 30 ppm (standard) |

| STABILITY TOLERANCE/TEMPERATURE RANGE |
|---|
| Over Operating Temperature Range (Referenced to 25°C Reading) |
| 1 = ± 10 ppm, -20°C to $+70^{\circ}\text{C}$ |
| 2 = ± 20 ppm, -20°C to $+70^{\circ}\text{C}$ |
| 3 = ± 30 ppm, -20°C to $+70^{\circ}\text{C}$ |
| 4 = ± 40 ppm, -20°C to $+70^{\circ}\text{C}$ |
| 5 = ± 50 ppm, -20°C to $+70^{\circ}\text{C}$ (standard) |
| 6 = ± 20 ppm, -40°C to $+85^{\circ}\text{C}$ |
| 7 = ± 30 ppm, -40°C to $+85^{\circ}\text{C}$ |
| 8 = ± 40 ppm, -40°C to $+85^{\circ}\text{C}$ |
| 9 = ± 50 ppm, -40°C to $+85^{\circ}\text{C}$ |

| FREQUENCY IN MHz |
|--|
| M - indicates MHz and decimal point. Frequency is recorded with minimum 4 significant digits to the right of the "M". |

| LOAD CAPACITANCE | |
|------------------|------------|
| A = 10 pF | G = 30 pF |
| B = 13 pF | H = 32 pF |
| C = 16 pF | J = 9 pF |
| D = 18 pF | K = 8 pF |
| E = 20 pF | L = 12 pF |
| F = 24 pF | S = Series |

Example Part Numbers:
407F35A014M3181 ($F_0 = 14.31818$ MHz)
407T39A050M0000

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.

* Prior to 11/7/06 the part number format did not contain this designator. These "Old Format" numbers (008-0261-0 Rev. E) are still valid with frequencies less than or equal to 48.0000 MHz as Fundamental Mode designs. Frequencies above 48.0000 MHz will be Third Overtone designs. Refer to PCM-1211 for more details.

ELECTRICAL CHARACTERISTICS

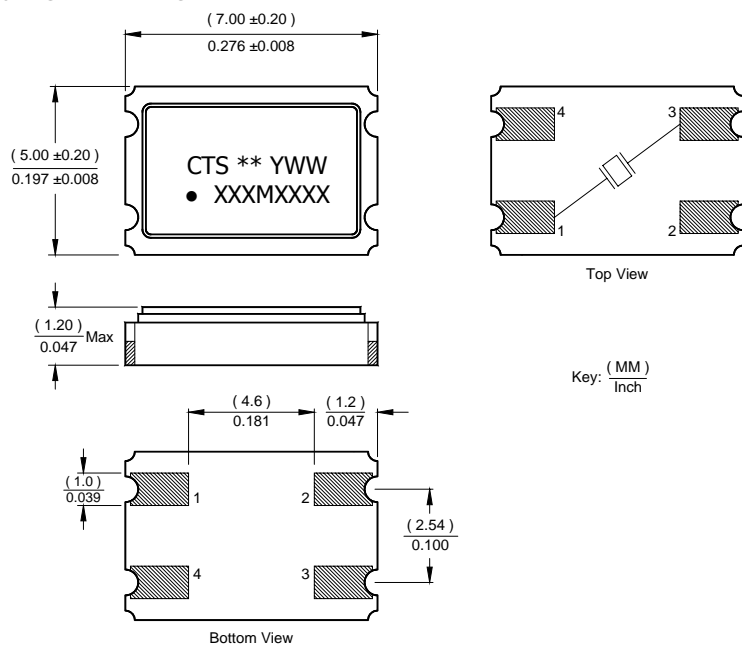
| | PARAMETER | VALUE |
|-----------------------|--|--|
| Electrical Parameters | Operating Mode (Note 1) | Fundamental or 3 RD Overtone |
| | Crystal Cut | AT-Cut |
| | Frequency Range | 8.0 MHz to 100.0 MHz |
| | Frequency Tolerance @ 25°C | ± 30 ppm Standard (± 10 ppm and ± 20 ppm Available) |
| | Frequency Stability Tolerance (Operating Temperature Range, Referenced to 25°C Reading) | ± 50 ppm Standard (± 10 ppm, ± 20 ppm, ± 30 ppm and ± 40 ppm Available) |
| | Operating Temperature Range | -20°C to +70°C Standard (-40°C to +85°C Available) |
| | Storage Temperature Range | -55°C to +125°C |
| | Equivalent Series Resistance | See ESR Table |
| | Load Capacitance or Resonance Mode | See Ordering Information |
| | Shunt Capacitance (C ₀) | 4.0 pF Maximum (2.5 pF ± 0.5 pF Typical) |
| | Drive Level | 25 μW Typical, 100 μW Maximum |
| | Reflow Condition, per JEDEC J-STD-020 | +255°C ± 5°C, 10 Seconds Maximum |

EQUIVALENT SERIES RESISTANCE TABLE

| FREQUENCY RANGE | MODE of OSCILLATION | ESR Maximum |
|--------------------------|--------------------------|-------------|
| 8.000 MHz - 15.999 MHz | Fundamental | 60 Ohms |
| 16.000 MHz - 50.000 MHz | Fundamental | 40 Ohms |
| 30.001 MHz - 60.000 MHz | 3 RD Overtone | 100 Ohms |
| 60.001 MHz - 100.000 MHz | 3 RD Overtone | 80 Ohms |

MECHANICAL SPECIFICATIONS

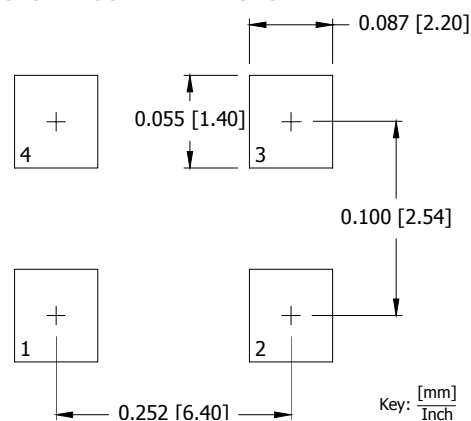
PACKAGE DRAWING



MARKING INFORMATION

- ** - Manufacturing Site Code.
- YWW – Date Code, Y – Last Digit of Year, WW – Week.
- XXXMXXXX – Frequency marked with 4 significant digits after the 'M'.
- Complete CTS part number, frequency value and date code information must appear on reel and box labels.

SUGGESTED SOLDER PAD GEOMETRY



Notes:

- Termination pads (e4), barrier-plating is nickel (Ni) with gold (Au) flash plate.
- Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground.

TAPE AND REEL INFORMATION



Device quantity is 1,000 pieces per 180mm 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 $+260^{\circ}\text{C}$ peak, 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 @ $100\text{V}_{\text{DC}} \pm 15\text{V}_{\text{DC}}$. |
| 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.