



### FEATURES

- Standard 5.0x3.2mm Surface Mount Footprint
- Stable Frequency Over Temperature and Drive Level
- Frequency Range 12 – 50 MHz
- Frequency Tolerance,  $\pm 30$  ppm Standard ( $\pm 10$  ppm and  $\pm 20$  ppm available)
- Frequency Stability,  $\pm 50$  ppm Standard ( $\pm 10, \pm 20, \pm 30$  and  $\pm 40$  ppm available)
- Operating Temperature to  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Tape & Reel Packaging, EIA-481-2 Compliant
- **RoHS/Green Compliant**

### DESCRIPTION

The Model 405 is a ceramic packaged Crystal offering reduced size, ideal for high-density circuit board applications. The Model 405 offers reliable precision and excellent shock performance in wireless telecommunication devices.



### ORDERING INFORMATION



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                                                                |
|                       | Crystal Cut                                                                                | AT-Cut                                                                     |
|                       | Frequency Range                                                                            | 12.0 MHz to 50.0 MHz                                                       |
|                       | Frequency Tolerance @ 25°C                                                                 | ± 30 ppm Standard<br>(± 10 ppm and ± 20 ppm Available)                     |
|                       | Frequency Stability Tolerance<br>(Operating Temperature Range, Referenced to 25°C Reading) | ± 50 ppm Standard<br>(± 10 ppm, ± 20 ppm, ± 30 ppm and ± 40 ppm Available) |
|                       | Operating Temperature Range                                                                | -20°C to +70°C Standard<br>(-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 <sub>0</sub> )                                                        | 7.0 pF Maximum<br>(3.0 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 |
|-----------------------|---------------------|-------------|
| 12.00 MHz - 50.00 MHz | Fundamental         | 50 Ohms     |

## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### 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.

### MARKING INFORMATION

- XX.XXX – Frequency marked with 3 significant digits after the decimal.
- C – CTS and Pin 1 identifier.
- \*\* - Manufacturing Site Code.
- YWW – Date Code, Y – Last Digit of Year, WW – Week.
- Complete CTS part number, frequency value and date code information must appear on reel and box labels.

### SUGGESTED SOLDER PAD GEOMETRY



## TAPE AND REEL INFORMATION



Device quantity is 1,000 pieces per 180mm 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 $+260^\circ\text{C}$ 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 $\pm 5$ ppm shift.                                                                                 |
| Insulation Resistance:           | 500M Ohms @ $100V_{\text{DC}} \pm 15V_{\text{DC}}$ .                                                                                            |
| Moisture Sensitivity Level:      | Level 1 per JEDEC J-STD-020.                                                                                                                    |

## QUALITY AND RELIABILITY

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