



## FEATURES

- Standard 2.5x2.0mm Surface Mount Footprint
- Stable Frequency Over Temperature and Drive Level
- **Fundamental Crystal Design**
- Frequency Range 16 – 54 MHz
- Frequency Tolerance,  $\pm 30$  ppm Standard ( $\pm 10$  ppm,  $\pm 15$  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 (6/6)**

## DESCRIPTION

The Model 425 is a ceramic packaged Crystal offering reduced size, ideal for high-density circuit board applications. The Model 425 offers reliable precision and excellent shock performance in wireless telecommunication devices.



## ORDERING INFORMATION

425 □ □ □ □ □ □ □ M □ □ □ □

| MODE OF OSCILLATION |
|---------------------|
| F = Fundamental     |

| FREQUENCY TOLERANCE @ 25°C  |
|-----------------------------|
| 1 = $\pm 10$ ppm            |
| 2 = $\pm 20$ ppm            |
| 3 = $\pm 30$ ppm (standard) |
| X = $\pm 15$ ppm            |

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

| FREQUENCY IN MHz   |
|--|
| M - indicates MHz and decimal point.<br>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:  
425F35E014M3181  
425FX9A050M0000

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

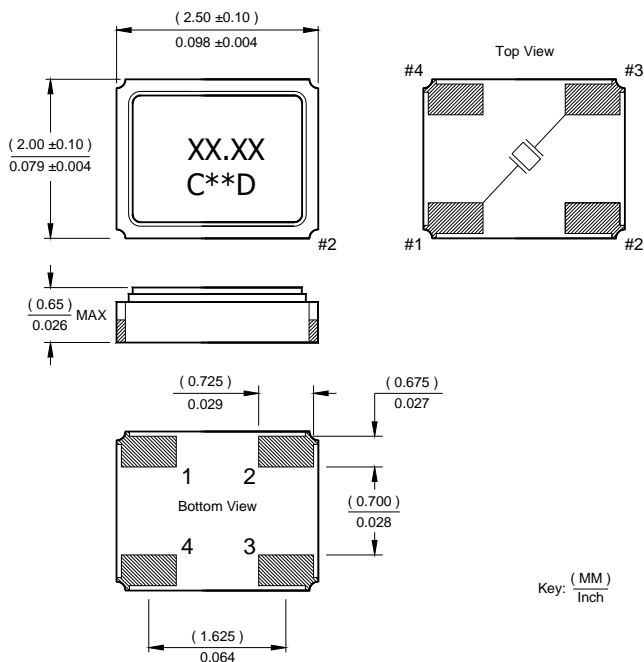
|                       | PARAMETER  | VALUE  |
|-----------------------|--|--|
| Electrical Parameters | Operating Mode   | Fundamental  |
|                       | Crystal Cut  | AT-Cut   |
|                       | Frequency Range  | 16.0 MHz to 54.0 MHz   |
|                       | Frequency Tolerance @ 25°C   | ± 30 ppm Standard<br>(± 10 ppm, ±15 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  | -40°C to +85°C   |
|                       | Equivalent Series Resistance   | See ESR Table  |
|                       | Load Capacitance or Resonance Mode   | See Ordering Information   |
|                       | Shunt Capacitance (C <sub>0</sub> )  | 5.0 pF Maximum   |
|                       | Drive Level  | 10 μW Typical, 100 μW Maximum  |
|                       | Aging @ 25°C   | ± 3 ppm/year 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 |
|------------------------|---------------------|-------------|
| 16.00 MHz - 19.999 MHz | Fundamental         | 120 Ohms    |
| 20.00 MHz - 29.999 MHz | Fundamental         | 100 Ohms    |
| 30.00 MHz - 54.000 MHz | Fundamental         | 60 Ohms     |

## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### MARKING INFORMATION

1. XX.XX – Frequency in MHz.
2. C – CTS and Pin 1 identifier.
3. \*\* – Manufacturing Site Code.
4. D – Manufactured Date Code. See Table I for codes.
5. Complete CTS part number, frequency value and date code information must appear on reel and box labels.

### SUGGESTED SOLDER PAD GEOMETRY



### Notes:

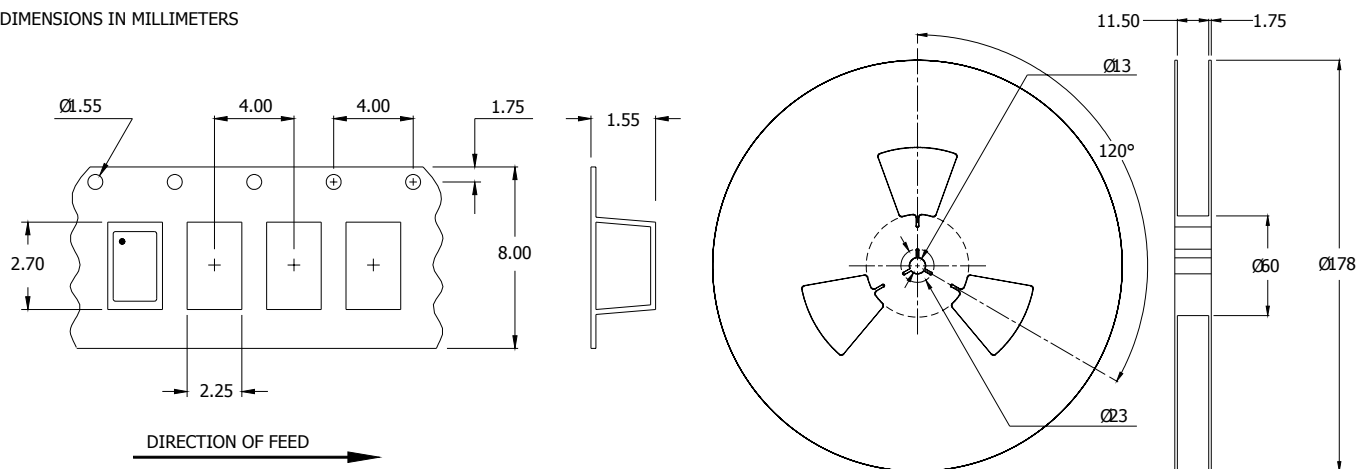
1. Termination pads (e4), barrier-plating is nickel (Ni) with gold (Au) flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground.

TABLE I

| YEAR |      |      |      |      | MONTH |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |      |      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| 2001 | 2005 | 2009 | 2013 | 2017 | A     | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
| 2002 | 2006 | 2010 | 2014 | 2018 | N     | P   | Q   | R   | S   | T   | U   | V   | W   | X   | Y   | Z   |
| 2003 | 2007 | 2011 | 2015 | 2019 | a     | b   | c   | d   | e   | f   | g   | h   | j   | k   | l   | m   |
| 2004 | 2008 | 2012 | 2016 | 2020 | n     | p   | q   | r   | s   | t   | u   | v   | w   | x   | y   | z   |

## TAPE AND REEL INFORMATION

DIMENSIONS IN MILLIMETERS



Device quantity is 3,000 pieces minimum per 178mm 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 @ $100\text{V}_{\text{DC}} \pm 15\text{V}_{\text{DC}}$ .  |
| 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.