



## 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  
(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.  
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

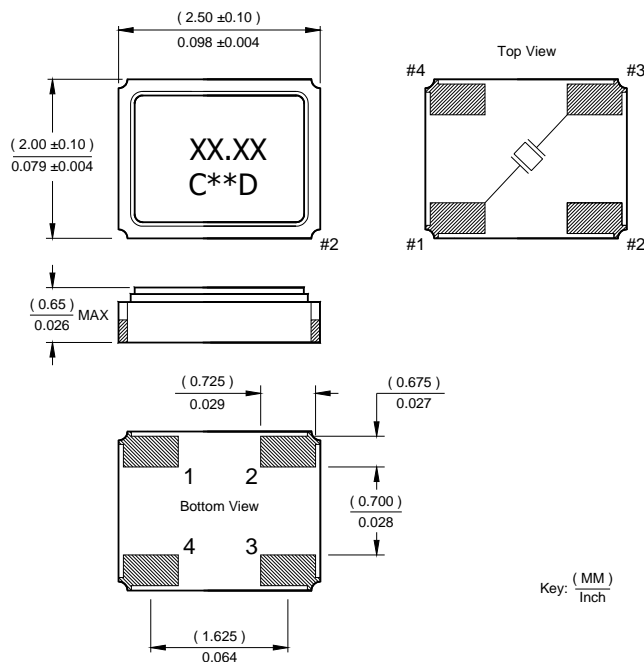
	PARAMETER	VALUE
Electrical Parameters	Operating Mode	Fundamental
	Crystal Cut	AT-Cut
	Frequency Range	16.0 MHz to 54.0 MHz
	Frequency Tolerance @ 25°C	± 30 ppm Standard (± 10 ppm, ±15 ppm and ± 20 ppm Available)
	Frequency Stability Tolerance (Operating Temperature Range, Referenced to 25°C Reading)	± 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	-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.