

## Miniature SMD Crystal for Pierce Oscillators 10kHz to 600kHz

### FEATURES

- Frequency Range 10kHz to 600kHz
- High shock resistance
- Low ageing
- Designed for low power applications
- Full MIL testing available

### DESCRIPTION

CX1VSM crystals consist of a high quality tuning fork resonator in a rugged, hermetically sealed ceramic package. CX1VSM is intended for use in Pierce (single inverter) oscillator circuits.

### SPECIFICATION

Specifications stated are typical at 25°C unless otherwise indicated. Specifications may change without notice.

Frequency Range:	10.0kHz to 600.0kHz
Standard Calibration Tolerance*:	see table
Motional Resistance (R <sub>1</sub> ):	Figure 1 Max = 10~169.9kHz, 2x typical 170~600kHz, 2.5x typical
Motional Capacitance (C <sub>1</sub> ):	Figure 2
Quality Factor (Q):	Figure 3 Min. is 0.25x typical
Shunt Capacitance (C <sub>0</sub> ):	2.0pF max.
Drive Level	
10~24.9kHz:	0.5μW max.
25~600.0kHz:	1.0μW max.
Turning Point (T <sub>0</sub> )**:	Figure 4
Temperature Coefficient (k):	-0.035ppm/°C <sup>2</sup>
Ageing, first year:	5ppm max.
Shock, survival***:	1,000g, 1ms, ½ sine
Vibration, survival***:	20g rms, 10~2000Hz
Operating Temperature Range	
Commercial:	-10° to +70°C
Industrial:	-40° to +85°C
Military:	-55 to +125°C
Storage Temperature Range:	-55° to +125°C
Maximum Process Temperature:	+260°C for 20 seconds

- \* Tighter frequency calibration is available.  
 \*\* Other turning point is available  
 \*\*\* Higher shock and vibration survival is available

### PACKAGING OPTIONS

CX1VSM crystals are available either tray packed (<250pcs) or tape and reel (>250 pieces).  
 16mm tape, 178mm or 330mm reels (EIA 418).

### HOW TO ORDER CX1VSM CRYSTALS

**CX1V - S - C - SM1 - 32.768K 30 / I**

'S' if special, custom design. Otherwise leave blank

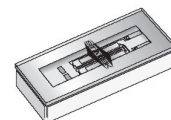
Blank = glass lid  
 C = ceramic lid

Terminations  
 SM1 = Gold plated \*  
 SM2 = Solder plated  
 SM3 = Solder dipped  
 SM4 = Solder plated \*  
 SM5 = Solder dipped \*  
 \* = Lead free

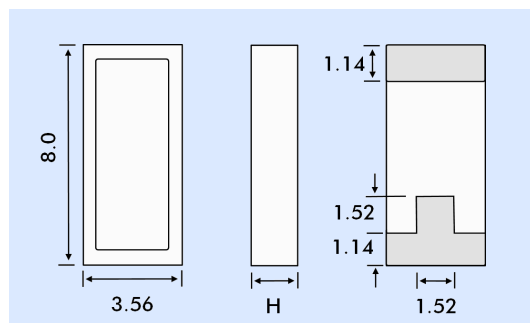
Frequency  
 K = kHz

Calibration Tolerance  
 @25°C  
 (in ppm)

Temp. Range  
 C = -10° ~ +70°C  
 I = -40° ~ +85°C  
 M = -55° ~ +125°C  
 S = Customer specified



### OUTLINE & DIMENSIONS



### DIMENSION 'H'

Terminations	Glass Lid	Ceramic Lid
SM1	1.65	1.78
SM2/SM4	1.70	1.83
SM3/SM5	1.78	1.90

### STANDARD CALIBRATION TOLERANCE

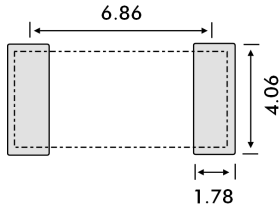
Frequency Range (kHz)			
16~74.9	75~169.9	170~249	250~600
±30ppm (0.003%)	±50ppm (0.005%)	±100ppm (0.01%)	±200ppm (0.02%)
±100ppm (0.01%)	±100ppm (0.01%)	±200ppm (0.02%)	±500ppm (0.05%)
±1000ppm (0.1%)	±1000ppm (0.1%)	±2000ppm (0.2%)	±5000ppm (0.5%)

### LOAD CAPACITANCE (CL)\*

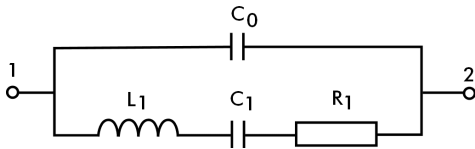
Frequency Range (kHz)	Load Capacitance	Frequency Range (kHz)	Load Capacitance
10~15.9	11pF	55~99.9	8pF
16~24.9	10pF	100~179.9	5pF
25~54.9	9pF	180~600	4pF

\* The load capacitance we use to calibrate CX2VSM. (Other CL is available.)

**SUGGESTED SOLDERING PATTERN**

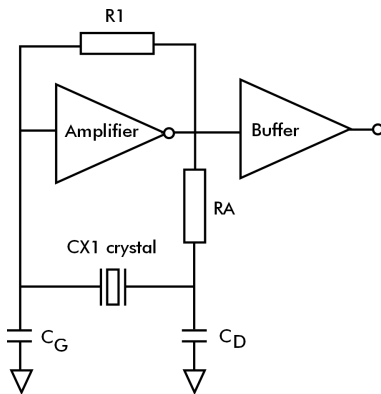


**CRYSTAL EQUIVALENT CIRCUIT**



R1 Motional Resistance      L1 Motional Inductance  
C1 Motional Capacitance      C0 Shunt Capacitance

**CONVENTIONAL CMOS PIERCE OSCILLATOR CIRCUIT**



**TERMINATIONS - PLATING**

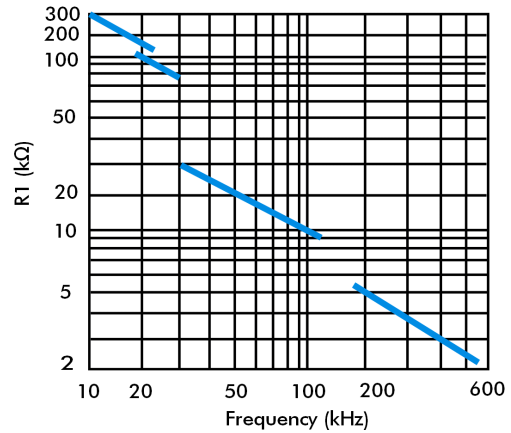
Designation	Termination
SM1	Gold Plated (Lead Free)
SM2	Solder Plated
SM3	Solder Dipped
SM4	Solder Plated (Lead Free)
SM5	Solder Dipped (Lead Free)

**Turning Point Temperature**

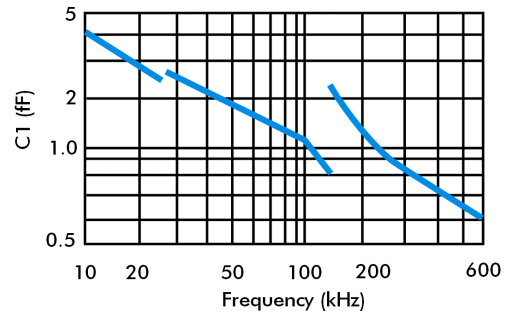
Note: Frequency f at temperature T is related to frequency F0 at turning point temperature To by:

$$\frac{f \cdot f_0}{f_0} = k(T - T_0)^2$$

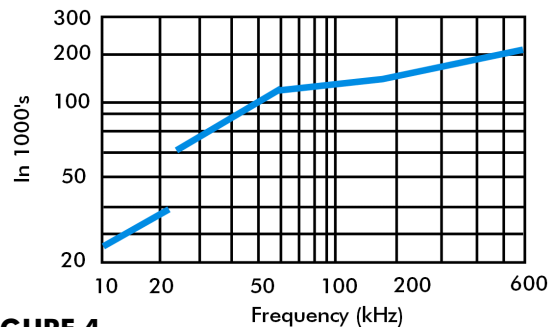
**FIGURE 1**  
**CX1V Typical Motional Resistance R1**



**FIGURE 2**  
**CX1V Typical Motional Capacitance C1**



**FIGURE 3**  
**CX1V Typical Quality Factor (Q)**



**FIGURE 4**  
**CX1V Typical Turning Point Temperature (To)**

