CX-3-SM

800kHz to 1.35MHz

LOW-PROFILE MINIATURE SMD CRYSTAL

EUROQUARTZ

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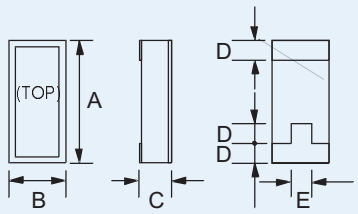
- Extensional mode
- Ideal for use with microprocessors
- Designed for low power applications
- Compatible with hybrid or PCB mounting
- Low ageing
- Full military environmental testing available
- Ideal for battery operated applications

General Description

CX-3-SM quartz crystals are leadless devices designed for surface-mounting on printed circuit boards or hybrid circuits. Hermetically sealed in a rugged, ceramic package, the crystals are produced utilizing a photo-lithographic process giving excellent repeatability and consistent high quality.



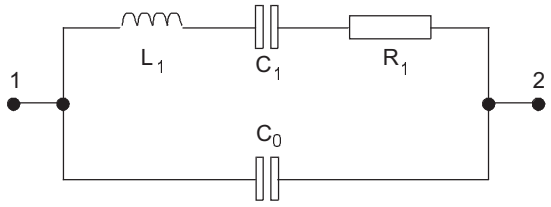
Outline

CX-3-SM Package Dimensions

Dimension	Typical (mm)	Maximum (mm)
A	6.73	7.11
B	2.62	2.90
C	-	see below
D	1.27	1.52
E	1.32	1.57

Dimension "C"	Glass Lid (mm max.)	Ceramic Lid (mm max.)
SM1	1.47	1.75
SM2	1.52	1.80
SM3	1.60	1.88

Equivalent Circuit



R_1 Motional Resistance L_1 Motional Inductance
C_1 Motional Capacitance C_0 Shunt Capacitance

Specification

Frequency Range:	800kHz to 1.35MHz
Functional Mode:	Extensional
Calibration Tolerance*:	A: ±0.05% (±500ppm) B: ±0.1% C: ±1.0%
Load Capacitance:	7pF
Motional Resistance (R_1):	5kΩ max.
Motional Capacitance (C_1):	1.2fF
Quality Factor (Q):	150k
Shunt Capacitance (C_0):	1.0pF
Drive Level:	3μW max.
Turning Point (T_0):**	35°C
Temperature Coefficient (k):	-0.035ppm/°C^2
Note: Frequency (f) deviation from frequency (f0) @ turning point temperature (t0) =	$\frac{f-fo}{fo} = k(T-To)^2$
Ageing, first year:	±5ppm max.
Shock:	1,000g peak, 0.3ms, ½ sine
Vibration, survival:	10g rms 20-1,000Hz random
Operating Temperature:	-10°~+70°C (commercial) -40°~+85°C (industrial) -55°~+125°C (military)
Storage Temperature:	-55°C~+125°C
Max. Process Temperature:	260°C for 20 seconds

Specifications are typical at 25°C unless otherwise indicated.

* Closer frequency calibration available
** Other turning point available

Terminations

Designation	Termination
SM1	Gold Plated
SM2	Nickel, Silver Plated
SM3	Nickel, Solder Plated and Solder Dipped

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Circuit Design

Typical Pierce Oscillator Application

The low profile CX miniature surface-mount crystal is ideal for small, battery operated portable products. The CX crystal designed in a Pierce oscillator (single inverter) circuit has a very low current consumption with high stability. A conventional HCMOS Pierce oscillator circuit is shown below. The crystal is effectively inductive and in a Pi network with C_1 and C_2 which provides the additional phase-shift necessary to sustain oscillation. The oscillation frequency (f_0) is 15ppm to 150ppm above the crystal's series resonant frequency (F_s).

Drive Level

R_A is used to limit the crystal's drive level by forming a voltage divider between R_A and C_1. R_A also stabilizes the oscillator against changes in the amplifiers output resistance (R_0). R_A should be increased for higher voltage operation.

Load Capacitance

The CX crystal calibration tolerance is influenced by the effective circuit capacitances, specified as the load capacitance (C_L.) C_L is

$$C_L = \frac{C_1 \times C_2}{C_1 + C_2} + C_S$$

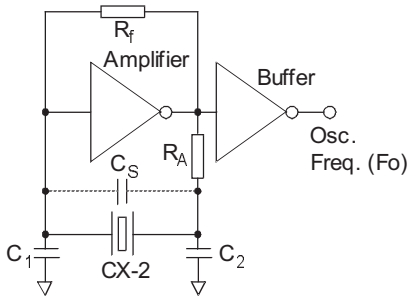
NOTE: C_1 and C_2 include stray layout capacitance to ground. C_s is the stray shunt capacitance between the crystal terminals. In practice, the effective valus of C_L will be less than that calculated from C_1, C_2, and CS values due to the effect of the amplifier output resistance. C_s should be minimized.

The oscillation frequency (f_0) is approximately equal to:

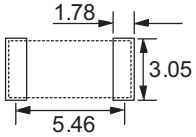
$$f_0 = f_S \left[1 + \frac{C_1}{2(C_0 + C_L)}\right]$$

Where F_s = Series resonant frequency of the crystal
C_1 = Motional Capacitance
C_0 = Shunt Capacitance

Conventional HCMOS Pierce Oscillator Circuit



Solder Pad Layout



Packaging

CX-3H-SM- Bulk Pack (Standard)
- 16mm tape, 178mm or 330mm reels (Optional) per EIA 481
- Tray Pack (Optional)

Order Code

CX-3 [ ] [ ] **-SM1** **1.0MHz** **(A / I)**

- [ ]: "S" if special or custom design, Blank if standard
- [ ]: C = Ceramic Lid, Blank = Glass Lid
- -SM1: SM1, SM2, SM3
- 1.0MHz: Frequency
- A: Calibration Tolerance* @ 25°C, A, B, C
- I: Temperature Range: C = Commercial, I = Industrial, M = Military, S = Specify

*For other calibration tolerances enter figure in ppm