CX MINIATURE CRYSTALS

CX-6V-SM

800kHz to 1.35MHz

ULTRA-LOW PROFILE
MINIATURE SMD CRYSTAL

EUROQUARTZ

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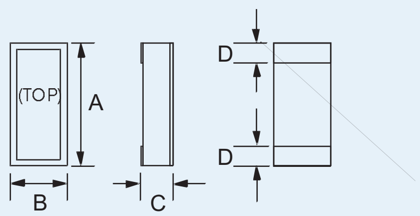
- Ultra-low profile (1mm)
- Extensional mode
- Ideal for use with microprocessors
- Designed for low power applications
- Compatible with hybrid or PCB packaging
- Low ageing
- Full military environmental testing available
- Ideal for battery operated applications

General Description

The CX-6-SM quartz crystals are leadless devices designed for surface mounting on printed circuit boards or hybrid substrates. The crystals are intended for use in Pierce oscillators. Hermetically sealed in a miniature ceramic package, the crystals are produced utilizing a photo-lithographic process ensuring consistent high quality production units.



Outline

CX-6-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

Dimension "C"	Glass Lid (mm max.)	Ceramic Lid (mm max.)
SM1	0.99	1.35
SM2	1.04	1.40
SM3	1.12	1.47

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

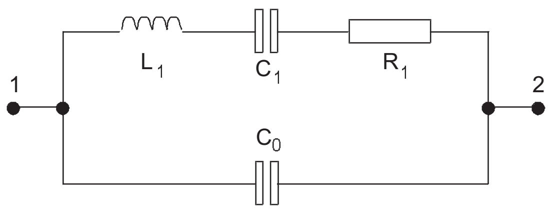
Note: frequency (f) deviation from frequency (f0) at turning point temperature = $\frac{f-fo}{fo} = k(T-To)^2$

Ageing, first year:	±5ppm max.
Shock, survival:	1000g 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
Process Temperature:	260°C for 20 sec.

Specifications are typical at 25°C unless otherwise indicated.

* Closer calibration available
** Other Turning Point available

Equivalent Circuit



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

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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 approximately equal to:

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

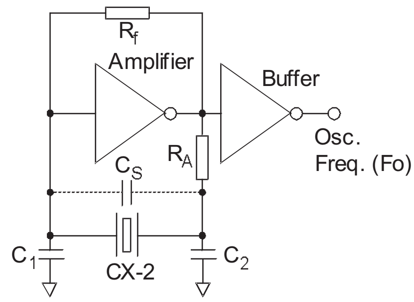
NOTE: C_1 and C_2 include stray layout capacitance to ground. C_s is the stray shunt capacitance between the crystal terminals. In practice, the effective valus of C_L will be less than that calculated from C_1, C_2, and CS values due to the effect of the amplifier output resistance. C_s should be minimized.

The oscillation frequency (f_0) is approximately equal to:

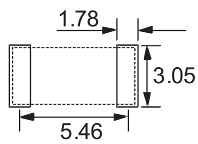
$$f_0 = f_S\left[1+\frac{C_1}{2(C_0 + C_L)}\right]$$

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



Terminations

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

Packaging

CX-6V-SM- Tray Pack (Standard)
- 16mm tape, 178mm or 330mm reels (Optional) per EIA 481

Order Code

CX-6 ____ ____ -SM1 1.0MHz (A / I)

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

*For other calibration tolerances enter figure in ppm