CX MINIATURE CRYSTALS

EURO QUARTZ

CX-2

760kHz to 1.35MHz

MINIATURE QUARTZ CRYSTAL

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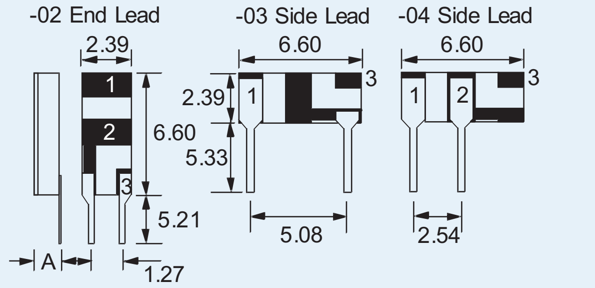
- Extensional mode
- Ideal for use with microprocessors
- Designed for low-power applications
- Compatible with hybrid or PCB
- Low ageing
- Ideal for battery powered applications
- Full military environmental testing available

General Description

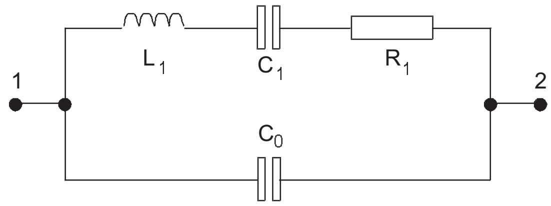
The CX-2 quartz crystal is a high quality extensional mode resonator. The CX-2 is hermetically sealed in a rugged, miniature ceramic package, a quarter the size of an eight pin dual-in-line package. The crystal is manufactured utilizing a photo-lithographic process, ensuring consistency and repeatability of electrical characteristics.



Outline and Dimensions

Notes:
1. Terminal 1 is electrically connected to terminal 3.
2. Lead Dimensions: width 0.33mm typical, thickness 0.18mm.
3. A = Glass Lid - 2.03mm max.
   Ceramic Lid - 2.41mm max.

Equivalent Circuit



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

Specification

Frequency Range:	760kHz to 1.35MHz
Functional Mode:	Extensional
Calibration Tolerance*:	A ±0.05% (±50ppm) B ±0.1% C ±1.0%
Motional Resistance (R_1):	5kΩ max.
Motional Capacitance (C_1):	1.2fF
Quality Factor (Q):	150k
Shunt Capacitance (C_0):	1.0pF max.
Drive Level:	3µW max.
Turning Point (T_0):**	35°C
Temperature Coefficient (k):	-0.035ppm/°C²

Note: frequency (f) deviation from frequency (fo) @ turning point temperature (To):

$$\frac{f-fo}{fo} = k(T-To)^2$$

Ageing, first year:	±5ppm max.
Shock, survival:	1,000g 0.3ms, ½ sine
Vibration, survival:	10g rms 20 - 1,000Hz
Operating Temperature:	-10°~+70°C (commercial) -40°~+85°C (industrial) -55°~+125°C (military)
Storage Temperature:	-55°C~+125°C
Process Temperature:	Lead to Package temp. not to exceed 175°C Glass lid to package seal rim temp. not to exceed 210°C

Specifications are typical at 25°C unless otherwise indicated.
* Closer calibration available
** Other turning point available

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Typical Application

Typical application for Pierce oscillator

The low-profile CX miniature leaded crystal is ideal for small, high density, battery operated portable products. A CX crystal incorporated into a Pierce oscillator (single inverter) circuit provides a high stability with low current consumption. A conventional HCMOS Pierce oscillator circuit is shown below. The crystal is effectively inductive and in a Pi-network circuit with C_1 and C_2 providing the additional phase shift necessary to sustain oscillation. The oscillation frequency (f_0) is 15 to 150ppm above the crystals 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 amplifier's 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:

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

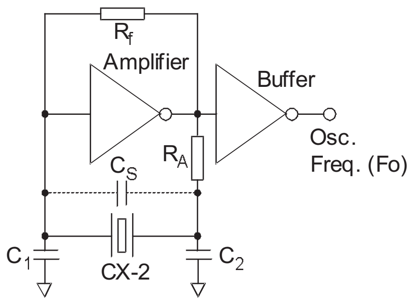
NOTE: C_1 and C_2 include stray layout capacitance to ground. C_S is the stray shunt capacitance between the crystal terminals. In practice, the effective valus of C_L will be less than that calculated from C_1, C_2, and CS values due to the effect of the amplifier output resistance. C_S should be minimized.

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



Packaging

CX-2-Leaded - Tray Pack (Standard)

Order Code

CX-2 ____ -03 1.0MHz (A / I)

- Frequency: 1.0MHz
- "S" if special or custom design; Blank if standard
- Leads: -02, -03, -04
- Calibration Tolerance* @ 25°C: (A), (B), (C)
- *For other calibrations insert value in ppm
- Temperature Range: C = Commercial, I = Industrial, M = Military, S = Specify