

CX-1-SM

530kHz to 2.1MHz

MINIATURE SMD CRYSTAL

Page
1 of 2

Telephone: +44(0)1460 230000
 Fax: +44(0)1460 230001
 Email: sales@euroquartz.co.uk
 Web: www.euroquartz.co.uk

General Description

The miniature CX-1-SM crystals in leadless ceramic packages have been designed for surface-mounting on printed circuit boards or hybrid circuits. Hermetically sealed in a rugged, miniature ceramic package, the CX-1-SM crystal is manufactured using a photolithographic process.

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

Specification

Frequency Range: 530kHz to 2.1MHz
Functional Mode: Extensional
Calibration Tolerance*: A ±0.05% (±500ppm)
 B ±0.1%
 C ±1.0%

Load Capacitance: 7pF
Motional Resistance (R₁): 3kΩ max.
Motional Capacitance (C₁): 1.2fF
Quality Factor (Q): 150k
Shunt Capacitance (C₀): 1.0pF
Drive Level: 3μW max.
Turning Point (T₀):** 35°C

Note: Frequency (f) deviation from frequency (f₀) @ turning point temperature (T₀):

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

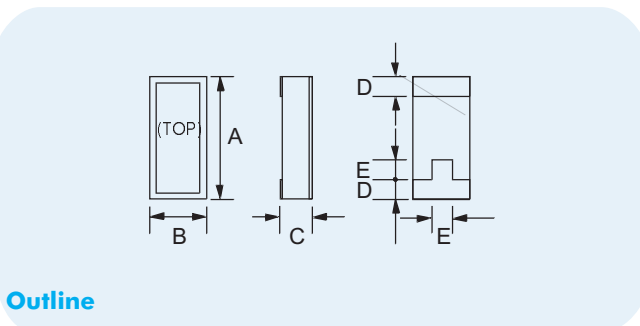
Ageing, first year: ±5ppm max.
Shock, survival: 750g 0.3ms, ½ sine
Vibration, survival: 10g rms, 20-1,000Hz random
Operating Temperature: -10°~+70°C (commercial)
 -40°~+85°C (industrial)
 -55°~+125°C (military)

Storage Temperature: -55°C~+125°C
Process Temperature: 260°C for 20 seconds

Specifications are typical at 25°C unless otherwise indicated.

* Tighter frequency calibration available

** Other turning point available



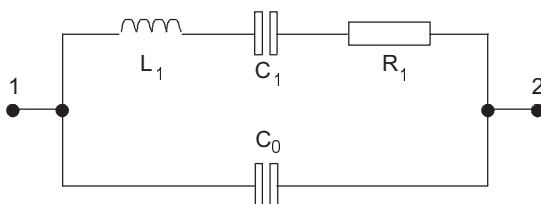
Outline

CX-1-SM Package Dimensions

Dimension	Typical (mm)	Maximum (mm)
A	8.00	8.38
B	3.56	3.94
C	-	see below
D	1.14	1.40
E	1.52	1.78

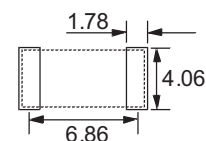
Dimension "C"	Glass Lid (mm max.)	Ceramic Lid (mm max.)
SM1	1.65	1.78
SM2	1.70	1.83
SM3	1.78	1.90

Equivalent Circuit



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

Solder Pad Layout



CX-1-SM

530kHz to 2.1MHz

MINIATURE SMD CRYSTAL

Page
2 of 2

Telephone: +44(0)1460 230000
 Fax: +44(0)1460 230001
 Email: sales@euroquartz.co.uk
 Web: www.euroquartz.co.uk

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 design 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_o). 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:

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

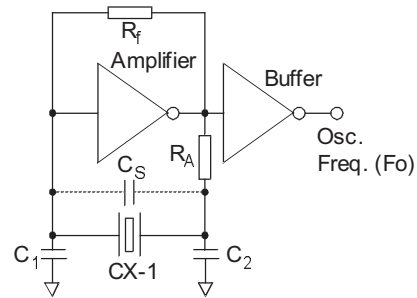
NOTE: C_1 and C_2 include stray layout capacitance to ground. C_S is the stray shunt capacitance between the crystal terminals. In practice, the effective value of C_L will be less than that calculated from C_1 , C_2 , and C_S values due to the effect of the amplifier output resistance. C_S should be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



Terminations

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

Packaging

- CX-1-SM - Tray Pack (Standard)
- 16mm tape, 178mm or 330mm reels (Optional)
- per EIA 481

Order Code

