EUROQUARTZ

CX2SM CRYSTAL

Low Profile Miniature SMD Crystal — 760kHz to 1.35MHz

FEATURES

- **Extensional mode resonator, 760kHz to 1.35MHz**
- **Designed for low power applications**
- **Ideal microprocessor clock crystal**
- **Low ageing**
- **Full military testing available**

DESCRIPTION

CX2SM crystals consist of a high quality extensional mode resonator in a rugged, hermetically sealed ceramic package.

SPECIFICATION

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

Frequency Range:	760.0kHz to 1.35MHz
Standard Calibration Tolerance*:	±500ppm (0.05%) ±1000ppm (0.1%) ±10000ppm (1.0%)
Load Capacitance:	7pF
Motional Resistance (R1):	5kΩ maximum
Motional Capacitance (C1):	1.2fF
Quality Factor (Q):	150k
Shunt Capacitance (C0):	1.0pF
Drive Level:	3μW maximum
Turning Point (T0**):	35°C
Temperature Coefficient (k):	-0.035ppm/°C[2]
Ageing First Year:	±5ppm maximum
Shock, Survival:	1000g, 0.3ms, ½ sine
Vibration, Survival:	10g rms, 20~1000Hz random
Operating Temperature Range:	-10°C to +70°C (Commercial) -40°C to +85°C (Industrial) -55°C to +125°C (Military)
Storage Temperature Range:	-55° to +125°C
Maximum Process Temperature:	+260°C for 20 seconds

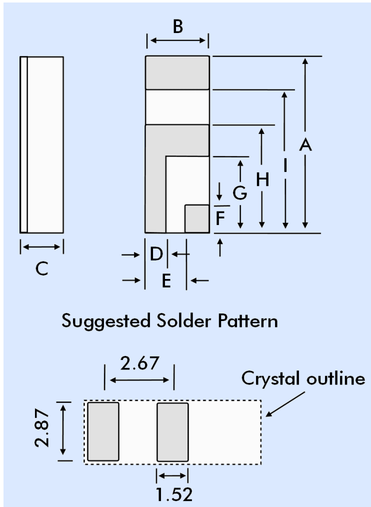
* *Tighter frequency calibration is available.*
** *Other turning point is available.*

Turning Point Temperature

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

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

OUTLINE & DIMENSIONS



Dim.	Typ.	Max.
A	6.60	6.99
B	2.39	2.74
C	see below	
D	0.89	1.14
E	1.50	1.75
F	1.27	1.52
G	2.67	2.92
H	3.94	4.19
I	5.33	5.59

Dim. C	Glass Lid	Ceramic Lid
SM1	1.65	1.91
SM2	1.70	1.96
SM3	1.78	2.03
SM4	1.70	1.96
SM5	1.78	2.03

PACKAGING OPTIONS

CX2SM crystals are available either tray packed (<250pcs) or tape and reel (>250 pieces).
16mm tape, 178mm or 330mm reels (EIA 418).

HOW TO ORDER CX2SM CRYSTALS

CX2 - S - C - SM1 - 1.0M , 500 / I

S	C	SM1	1.0M	500	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 M = MHz	Calibration Tolerance @25°C (in ppm)	Temp. Range C = -10° ~ +70°C I = -40° ~ +85°C M = -55° ~ +125°C S = Customer specified

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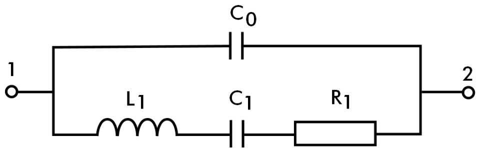
CRYSTAL EQUIVALENT CIRCUIT



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

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)

TYPICAL APPLICATION FOR A PIERCE OSCILLATOR

The low profile CX miniature crystal is ideal for use in small, high density, battery operated portable products. The CX crystal designed in a Pierce oscillator (single inverter) circuit provides very low current consumption and high stability. A conventional Pierce oscillator is shown above. The crystal is effectively inductive and in a Pi network circuit with C_D and C_G provides the additional phase shift to sustain oscillation. The oscillation frequency (f_O) is 15 to 250ppm above the crystal's 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_D. R_A also stabilizes the oscillator against changes in the amplifier's 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:

$$C_L = \frac{C_D \times C_G}{C_D + C_G} + C_S$$

Note: C_D and C_G include stray layout-induced capacitance to ground and C_S is the stray shunt capacitance between the crystal terminal. In practice, the effective value of C_L will be less than that calculated from C_D, C_G and C_S values because of the effect of the amplifier output resistance. C_S should be minimized.

The oscillation frequency (f_O) is approximately equal to:

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

Where

F_S = Series resonant frequency of the crystal
C_1 = Motional Capacitance
C_O = Shunt Capacitance

Turning Point Temperature

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

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

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