EUROQUARTZ

CX4 CRYSTAL

Ultra-miniature Low Profile SMD

FEATURES

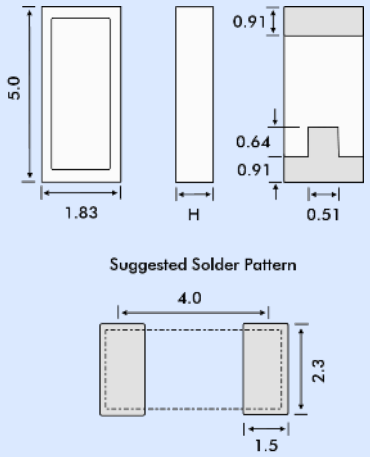
- **Designed for low power applications**
- **Smallest available package in this frequency range**
- **Hermetically sealed, ceramic package**
- **Excellent ageing characteristics**
- **Full Military testing available**

Fundamental Mode: 600kHz to 1.4MHz
Overtone: 1.8432MHz to 2.5MHz

DESCRIPTION

CX4 crystals are leadless devices designed for surface mounting on PCBs or hybrid substrates. The crystal has been designed for low power applications.Designed and manufactured by Statek Inc.

OUTLINE & DIMENSIONS



Dim. H	Glass Lid	Ceramic Lid
SM1	1.14	1.27
SM2	1.17	1.30
SM3	1.22	1.35
SM4	1.17	1.30
SM5	1.22	1.35

SPECIFICATION

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

Parameters	Fundamental			Overtone	
Frequency (Hz):	600K	1.0M	1.4M	1.8432M	2.4576M
Motional Resistance R1 (kΩ):	300	400	600	500	1000
Motional Resistance R1 Max. (kΩ):	3kΩ				
Motional Capacitance C1 (Ff):	3.5	2.0	1.3	3.5	1.5
Quality Factor Q (k):	250	200	150	80	45
Shunt Capacitance C0 (pF):	1.0	0.8	0.7	1.0	0.8

Standard Calibration Tolerance[1]:	±500ppm (±0.5%) ±1000ppm (±0.1%) ±10000ppm (±1.0%)
Drive Level:	3μW maximum
Load Capacitance CL[2]:	7pF
Turning Point[2]:	35°C
Temperature Coefficient (k):	-0.035ppm/°C[2]

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

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

Functional mode:	Extensional
Ageing, First year:	±5pppm maximum
Shock, survival:	1500g, 0.3ms, ½ sine
Vibration, survival:	20g rms, 10~2000Hz random
Operating Temperature Range	
Commercial:	-10° to +70°C
Industrial:	-40° to +85°C
Military:	-55 to +125°C
Storage Temperature Range:	-55° to +125°C
Maximum Process Temperature:	+260°C for 20 seconds

1. *Tighter tolerance available*
2. *Other values available*

PACKAGING OPTIONS

CX4 crystals are available either tray packed (<250pcs) or tape and reel (>250 pieces).
16mm tape, 178mm or 330mm reels (EIA 418).

HOW TO ORDER CX4 CRYSTALS

CX4 - S - C - SM1 - 1.8432M, 500 / I

S	C	SM1	1.8432M,	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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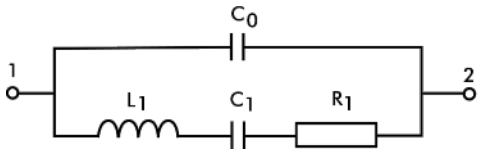
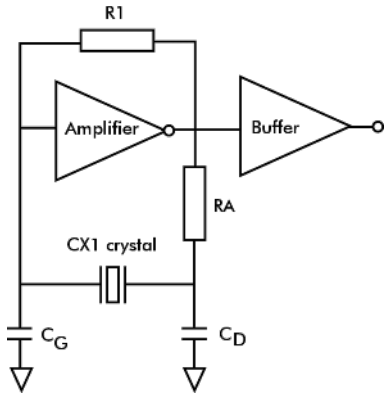
CRYSTAL EQUIVALENT CIRCUIT



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

CONVENTIONAL CMOS PIERCE OSCILLATOR CIRCUIT



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

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