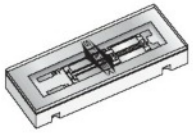
EUROQUARTZ — CX4VSM CRYSTAL

Ultra-Miniature SMD Crystal — 30kHz to 250kHz



FEATURES

- **Frequency Range 30kHz to 250kHz**
- **High shock resistance**
- **Low ageing**
- **Designed for low power applications**
- **Full MIL testing available**

DESCRIPTION

CX3VSM crystals are leadless devices designed for surface mounting on PCBs or hybrid substrates. The crystals are intended for use in Pierce (single inverter) oscillator circuits. Designed and manufactured by Statek Inc.

SPECIFICATION

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

Parameters	Fundamental		Overtone
Frequency (Hz):	32.768	100	200
Motional Resistance R1 (kΩ):	50	18	2.4
Motional Capacitance C1 (fF):	*2.3*	1.07	2.2
QualityFactor Q (k):	40	85	140
Load Capacitance (pF)[1]:	9	8	5
Turning Point (°C)[1]:	25	10	29

Standard Calibration Tolerance for 32.768kHz (2)			
Glass Lid:	±30ppm (0.003%)	±100ppm (0.01%)	±1000ppm (0.1%)
Ceramic Lid:	±100ppm (0.01%)	±1000ppm (0.1%)	±10000ppm (1.0%)

Drive Level:	0.5μW max.
Temperature Coefficient (k):	-0.035ppm/°C[2]
Ageing, first year:	5ppm max.

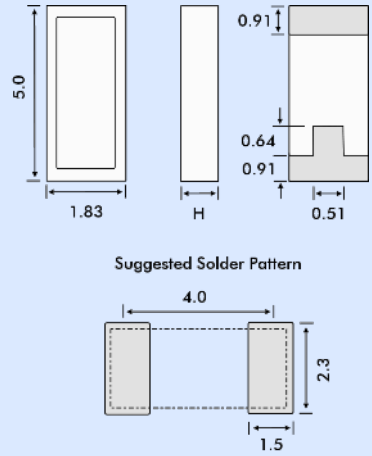
Note: Frequency f at temperature T is related to frequency Fo at turning point temperature To by:

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

Shock, survival:	5000g, 0.3ms, ½ sine
Vibration, survival:	20g rms, 20~2000Hz 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. *Other values available*
2. *Tighter tolerances available*

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

PACKAGING OPTIONS

CX4VSM crystals are available either tray packed (<250pcs) or tape and reel (>250 pieces).
16mm tape, 178mm or 330mm reels (EIA 418).

HOW TO ORDER CX4VSM CRYSTALS

CX4V - S - C - SM1 - 32.768K, 100 / I

- **S**: 'S' if special, custom design. Otherwise leave blank
- **C**: Blank = glass lid; C = ceramic lid
- **SM1**: Terminations — SM1 = Gold plated *; SM2 = Solder plated; SM3 = Solder dipped; SM4 = Solder plated *; SM5 = Solder dipped *; * = Lead free
- **32.768K**: Frequency K = kHz
- **100**: Calibration Tolerance @25°C (in ppm)
- **I**: Temp. Range — C = -10° ~ +70°C; I = -40° ~ +85°C; M = -55° ~ +125°C; S = Customer specified

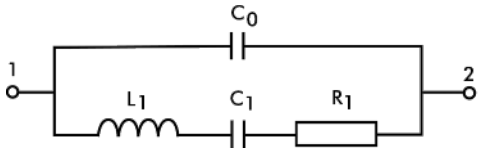
EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk

EUROQUARTZ

CX4VSM CRYSTAL

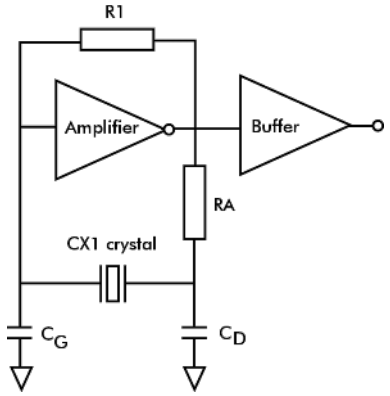
Ultra-Miniature SMD Crystal — 30kHz to 250kHz

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

EUROQUARTZ LIMITED Blacknell Lane CREWKERNE Somerset UK TA18 7HE
Tel: +44 (0)1460 230000 Fax: +44 (0)1460 230001 info@euroquartz.co.uk www.euroquartz.co.uk