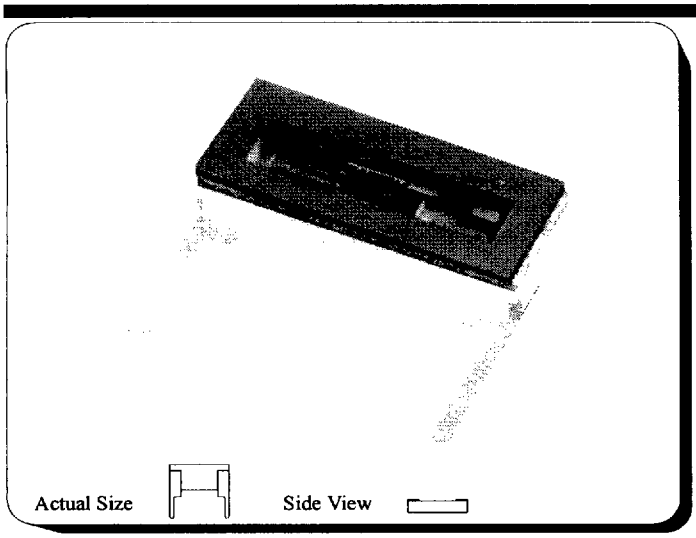


CX-1 CRYSTAL
530 kHz to 2.1 MHz

LOW PROFILE QUARTZ CRYSTAL

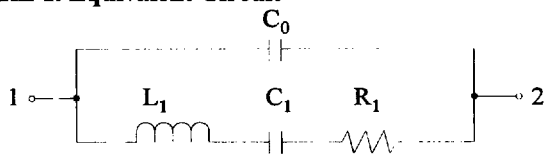
DESCRIPTION

The CX-1 quartz crystal is a high quality extentional mode quartz resonator. The CX-1 is hermetically sealed in a rugged, miniature ceramic package, one-fourth the size of an eight-pin mini-DIP. The CX-1 crystal is manufactured using the Statek-developed photolithographic process, and was designed utilizing the experience acquired by producing millions of crystals for industrial, commercial and military applications.

FEATURES

- **Extensional mode**
- **Ideal for use with microprocessors**
- **Designed for low power applications**
- **Compatible with hybrid or PC board**
- **Low aging**
- **Full military testing available**
- **Ideal for battery operated applications**
- **Designed and manufactured in the USA**

FIGURE 1. Equivalent Circuit

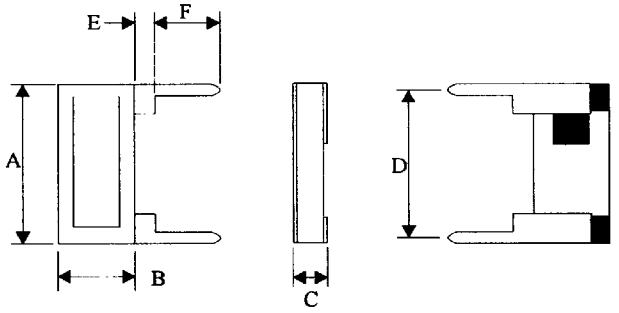


R_1 Motional Resistance L_1 Motional Inductance
C_1 Motional Capacitance C_0 Shunt Capacitance

PACKAGING

CX-1 -Bulk Pack (Standard)
-Tray Pack (Optional)

PACKAGE DIMENSIONS



DIM	TYP. INCHES	TYP. mm	MAX. INCHES	MAX. mm
A	.315	8.00	.330	8.38
B	.140	3.56	.155	3.94
C	.070	1.78	.080	2.03
D	.300	7.62	.310	7.87
E	.020	0.51	.040	1.02
F	.150	3.81		

Leads 0.010" x 0.018" (0.25 x 0.46 mm) nominal.

PACKAGE HANDLING

The CX crystal is hermetically sealed in a ceramic package. Normal handling and soldering precautions for small, low thermal mass parts are adequate when installing or testing CX crystals. CX crystals may be wave soldered, with proper precaution taken to avoid desoldering the leads. A slow machine rate or too high a pre-heat temperature or solder bath temperature can damage the crystals. ***Lead to package solder interface temperature should not exceed 175°C, glass lid to package seal rim temperature should not exceed 210°C.*** If the seal rim reaches temperatures above the maximum specified, the package may lose its hermeticity. Loss of hermeticity results in a frequency decrease and motional resistance increase. Mishandling of CX crystals can cause cracking of the glass lid and loss of hermeticity.

STATEK CORPORATION 512 North Main Street, Orange, California 92868 (714) 639-7810 FAX (714) 997-1256

SPECIFICATIONS

Specifications are typical at 25°C unless otherwise noted. Specifications are subject to change without notice.

	530 kHz - 2.1 MHz
Functional Mode	Extensional
Calibration Tolerance*	A ±0.05% (±500 ppm) B ±0.1% C ±1.0%
Load Capacitance	7 pF
Motional Resistance (R_1)	5 kΩ MAX.
Motional Capacitance (C_1)	1.2 fF
Quality Factor (Q)	150 k
Shunt Capacitance (C_0)	1.0 pF
Drive Level	3 µW MAX.
Turning Point (T_0) **	35°C
Temperature Coefficient (k)	-0.035 ppm/°C^2
Note: Frequency (f) deviation from (f_0) frequency @ turning point temperature (T_0);	$\frac{f-f_0}{f_0} = k(T-T_0)^2$
Aging, first year	5ppm MAX.
Shock	750 g peak, 0.3 msec., 1/2 sine
Vibration, survival	10 g rms, 20-1000 Hz random
Operating Temperature	-10°C to +70°C Commercial -40°C to +85°C Industrial -55°C to +125°C Military
Storage Temperature	-55°C to +125°C

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

HOW TO ORDER CX-1 CRYSTALS

CX-1____ ____ -03 1.0 MHz (__A__/__I__)

- "S" if special or custom design. Blank if Std.
- Blank=Glass Lid, C=Ceramic Lid
- Frequency
- *Calibration Tolerance @25°C (A) (B) (C)
- Temp. Range: C = Commercial, I = Industrial, M = Military

*Other calibration fill in ppm

Typical Application For A Pierce Oscillator

The low profile CX-1 miniature surface mount crystal is ideal for small, high density, battery operated portable products. The CX-1 crystal designed in a Pierce oscillator (single inverter) circuit provides very low current consumption and high stability. A conventional CMOS Pierce oscillator circuit is shown in Figure 2. The crystal is effectively inductive and in a PI-network circuit with C_D and C_G provides the additional phase shift necessary to sustain oscillation. The oscillation frequency (f_0) is 15 to 150 ppm above the crystal's series resonant frequency (f_S). Typical component values for a Pierce oscillator using a 1 MHz CX-1 crystal with a CMOS amplifier are shown in Figure 2.

Drive Level

In Figure 2, 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 amplifiers output resistance (R_0). R_A should be increased for higher voltage operation.

Load Capacitance

The CX-1 crystal calibration tolerance is influenced by the effective circuit capacitances, specified as the load capacitance (C_L). In Figure 2, C_L is approximately equal to:

$$C_L = \frac{C_D \times C_G}{C_D + C_G} + C_S \qquad (1)$$

NOTE: C_D and C_G include stray layout 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_0) is approximately equal to:

$$f_0 = f_S \left[1 + \frac{C_1}{2(C_0+C_L)}\right] \qquad (2)$$

Where f_S = Series resonant frequency of the crystal
C_1 = Motional capacitance
C_0 = Shunt capacitance

FIGURE 2. Conventional CMOS Pierce Oscillator