# CX1VSM CRYSTAL

10 kHz to 600 kHz

Miniature Surface Mount
Quartz Crystal for Pierce Oscillators

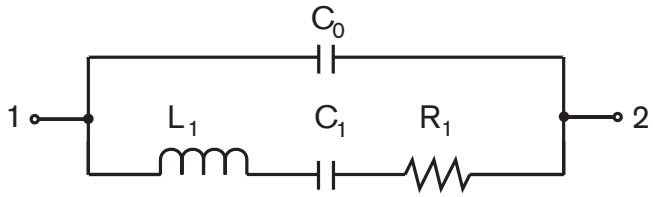
## DESCRIPTION

The CX1VSM quartz crystal is a high quality tuning fork resonator for use in Pierce (single inverter) oscillators. The CX1VSM is hermetically sealed in a rugged, miniature ceramic package. The CX1VSM crystal is manufactured using the STATEK-developed photolithographic process, and was designed utilizing the experience acquired by producing millions of crystals for industrial, commercial, military and medical applications. Maximum process temperature should not exceed 260°C.

## FEATURES

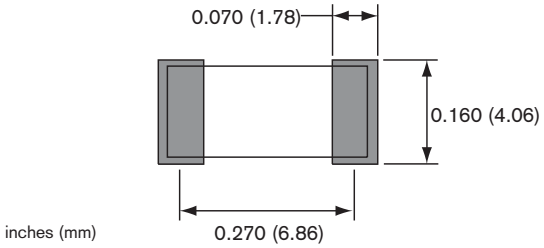
- Miniature tuning fork design
- High shock resistance
- Designed for low power applications
- Compatible with hybrid or PC board packaging
- Low aging
- Full military testing available
- Ideal for battery operated applications
- Designed and manufactured in the USA

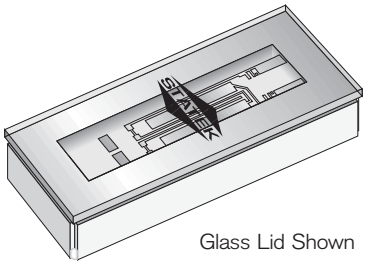
## EQUIVALENT CIRCUIT




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

## SUGGESTED LAND PATTERN



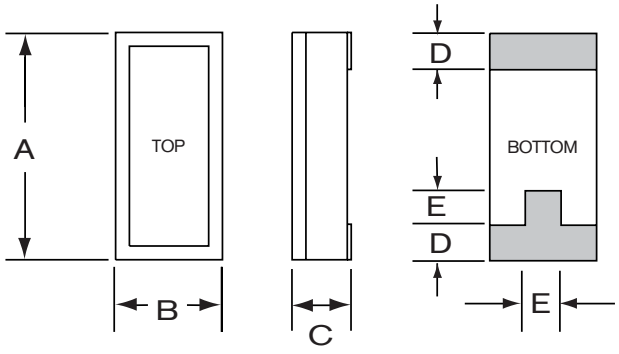



Glass Lid Shown

actual size

side view

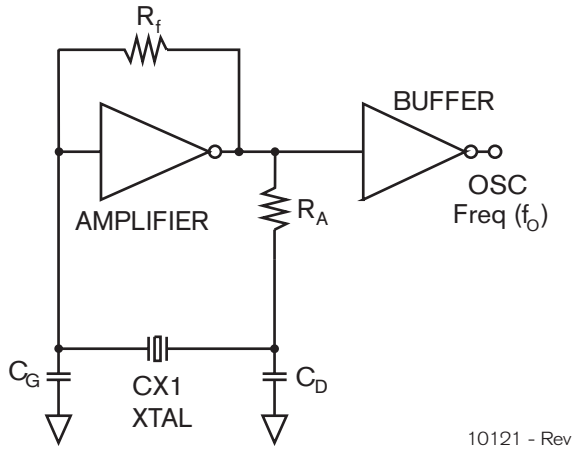
## PACKAGE DIMENSIONS




| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.315 | 8.00 | 0.330 | 8.38 |
| B | 0.140 | 3.56 | 0.155 | 3.94 |
| C | - | - | see below | |
| D | 0.045 | 1.14 | 0.055 | 1.40 |
| E | 0.060 | 1.52 | 0.070 | 1.78 |

| DIM "C" | GLASS LID | | CERAMIC LID | |
|---|---|---|---|---|
| MAX | inches | mm | inches | mm |
| SM1 | 0.065 | 1.65 | 0.070 | 1.78 |
| SM2 | 0.067 | 1.70 | 0.072 | 1.83 |
| SM3 | 0.070 | 1.78 | 0.075 | 1.90 |

## CONVENTIONAL CMOS PIERCE OSCILLATOR CIRCUIT




10121 - Rev B

## SPECIFICATIONS

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

| | |
|---|---|
| Frequency Range | 10 kHz to 600 kHz |
| Standard Calibration Tolerance* (see table below) | |
| Motional Resistance ($R_1$) | Figure 1<br>MAX: 10-169.9 kHz, 2x Typ.<br>170-600 kHz, 2.5x Typ. |
| Motional Capacitance ($C_1$) | Figure 2 |
| Quality Factor (Q) | Figure 3<br>Min. is 0.25x Typ. |
| Shunt Capacitance ($C_0$) | 2.0 pF MAX. |
| Drive Level | 10-24.9 kHz 0.5 µW MAX.<br>25-600 kHz 1.0 µW MAX. |
| Turning Point ($T_0$)** | Figure 4 |
| Temperature Coefficient (k) | -0.035 ppm/°C² |
| Aging, first year | 5 ppm MAX. |
| Shock, survival*** | 1,000 g, 1ms, ½ sine |
| Vibration, survival*** | 20 g RMS, 10-2,000 Hz |
| Operating Temp. Range | -10°C to +70°C (Commercial)<br>-40°C to +85°C (Industrial)<br>-55°C to +125°C (Military) |
| Storage Temp. Range | -55°C to +125°C |
| Max Process Temperature | 260°C for 20 sec. |

* Tighter frequency calibration available.
** Other turning point available.
*** Higher shock and vibration available.

### CX1VSM Standard Calibration Tolerance at 25°C

| Frequency Range (kHz) | | | |
|---|---|---|---|
| 10-74.9 | 75-169.9 | 170-249.9 | 250-600 |
| ± 30 ppm (0.003%) | ± 50 ppm (0.005%) | ± 100 ppm (0.01%) | ±200 ppm (0.02%) |
| ± 100 ppm (0.01%) | ± 100 ppm (0.01%) | ± 200 ppm (0.02%) | ±500 ppm (0.05%) |
| ± 1000 ppm (0.1%) | ± 1000 ppm (0.1%) | ± 2000 ppm (0.2%) | ±5000 ppm (0.5%) |

### Load Capacitance ($C_L$), Used to Calibrate CX1VSM (other $C_L$ available)

| Frequency Range (kHz) | Load Capacitance (pF) | Frequency Range (kHz) | Load Capacitance (pF) |
|---|---|---|---|
| 10-15.9 | 11 | 55-99.9 | 8 |
| 16-24.9 | 10 | 100-179.9 | 5 |
| 25-54.9 | 9 | 180-600 | 4 |

## HOW TO ORDER CX1VSM CRYSTALS

CX1V S C SM1 – 32.768K , 30 / M

- S: "S" if special or custom design. Blank if Std.
- C: Blank = Glass Lid; C = Ceramic Lid
- SM1: SM1 = Gold Plated; SM2 = Solder Plated; SM3 = Solder Dipped
- 32.768K: Frequency K = kHz
- 30: Calibration Tolerance @ 25°C (in ppm)
- M: Operating Temp. Range: C = -10°C to +70°C; I = -40°C to +85°C; M = -55°C to +125°C; S = Customer Specified

**FIGURE 1**
**CX1V TYPICAL MOTIONAL RESISTANCE ($R_1$)**

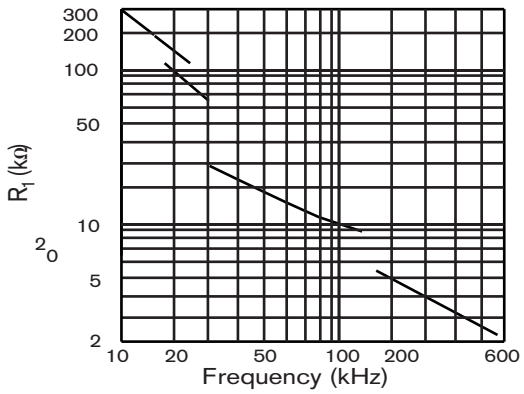



**FIGURE 2**
**CX1V TYPICAL MOTIONAL CAPACITANCE ($C_1$)**

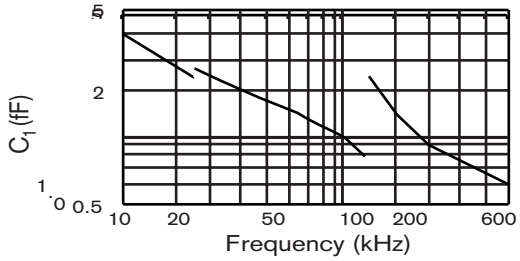



**FIGURE 3**
**CX1V TYPICAL QUALITY FACTOR (Q)**

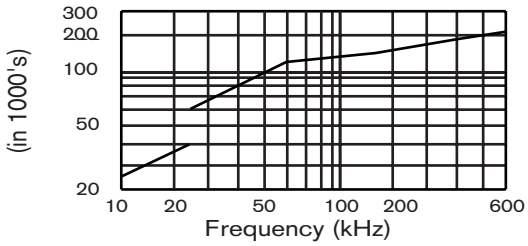
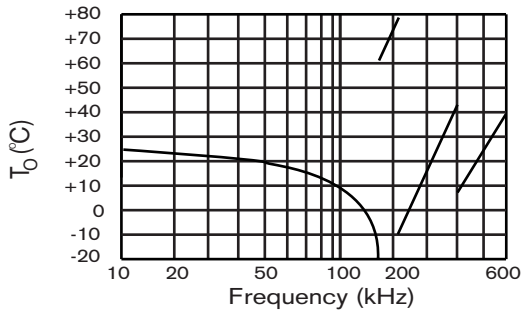



**FIGURE 4**
**CX1V TYPICAL TURNING POINT TEMP. ($T_o$)**




Note: Frequency f at temperature T is related to frequency $f_0$ at turning point temperature $T_0$ by: $\frac{f-f_0}{f_0} = k(T-T_0)^2$

## TERMINATIONS

| Designation | Termination |
|---|---|
| SM1 | Gold Plated |
| SM2 | Solder Plated |
| SM3 | Solder Dipped |

## PACKAGING OPTIONS

CX1VSM - Tray Pack
- 16mm tape, 7" or 13" reels
(Reference tape and reel data sheet 10109)