

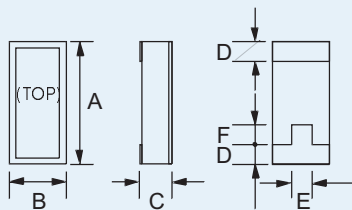
## CX-4V-SM 30kHz to 200kHz ULTRA-MINIATURE SMD CRYSTAL

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## General Description

The ultra-miniature CX-4V-SM quartz crystals are hermetically sealed in a very small surface-mount package measuring 5.0mm x 1.83mm. The high quality tuning-fork resonator is intended for use in Pierce oscillators. (Single inverter.)



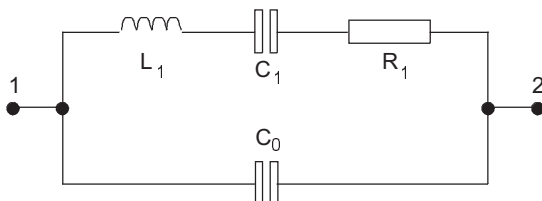
Outline

### CX-4V-SM Package Dimensions

Dimension	Typical (mm)	Maximum (mm)
A	5.00	5.33
B	1.83	2.16
C	-	see below
D	0.97	1.22
E	0.51	0.76
F	0.64	0.89

Dimension "C"	Glass Lid (mm max.)	Ceramic Lid (mm max.)
SM1	1.14	1.27
SM2	1.17	1.30
SM3	1.22	1.35

### Equivalent Circuit



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

- Surface-mount - infrared, vapour phase, wave solder or epoxy mount techniques
- Low profile, hermetically sealed package
- Available with glass or ceramic lid
- High shock and vibration resistance
- Custom designs available
- Full military environmental testing available

## Specification

<b>Frequency Range:</b>	30kHz to 200kHz
<b>Calibration Tolerance:</b>	see table below
<b>Motional Resistance (<math>R_1</math>):</b>	see table below
<b>Motional Capacitance (<math>C_1</math>):</b>	see table below
<b>Quality Factor (Q):</b>	see table below
<b>Shunt Capacitance (<math>C_0</math>):</b>	see table below
<b>Load Capacitance*:</b>	see table below
<b>Turning Point**:</b>	see table below
<b>Calibration Tolerance***:</b>	see table below
<b>Drive Level:</b>	0.5µW max.
<b>Temperature Coefficient (k):</b>	-0.035ppm/°C <sup>2</sup>
Note: Frequency (f) deviation from frequency (f0) @ turning point temperature (t0) =	
	$\frac{f-f_0}{f_0} = k(T-T_0)^2$
<b>Ageing, first year:</b>	±5ppm max.
<b>Shock, survival:</b>	5000g 0.3ms, 1/2 sine
<b>Vibration, survival:</b>	20g rms 10-2,000Hz random
<b>Operating Temperature:</b>	-10°~+70°C (commercial) -40°~+85°C (industrial) -55°~+125°C (military)
<b>Storage Temperature:</b>	-55°C~+125°C
<b>Process Temperature:</b>	260°C for 20 seconds

Specifications are typical at 25°C unless otherwise indicated.

- \* Other load capacitance values available
- \*\* Other turning point temperature available
- \*\*\* Tighter tolerances available

### CX-4V-SM Motional Params., Q, $C_0$ , $C_L$ and Turning Point

Frequency	32.768kHz	100kHz	200kHz
<b>Motional Resistance <math>R_1</math> (<math>\Omega</math>)</b>	50	48	2.7
<b>Motional Capacitance <math>C_1</math> (ff)</b>	2.3	1.07	2.1
<b>Quality Factor (Q) '000s</b>	40	85	140
<b>Shunt Capacitance <math>C_0</math> (pF)</b>	1.1	0.7	1.1
<b>Load Capacitance <math>C_L</math> (pF)</b>	9	8	5
<b>Turning Point (°C)</b>	25	10	9

### CX-4V-SM Calibration Tolerance @ 32.768kHz

Calibration	Glass Lid	Ceramic Lid
A	±0.003%	±0.01%
B	±0.01%	±0.1%
C	±0.1%	±1.0%

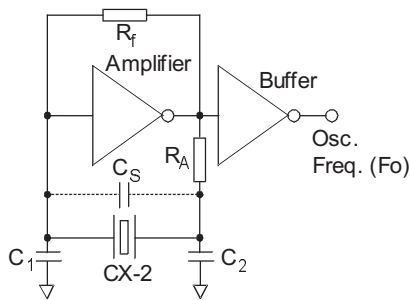
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**30kHz to 200kHz**  
 ULTRA-MINIATURE  
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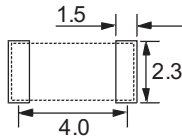
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## Circuit Design

### Conventional HCMOS Pierce Oscillator Circuit



## Solder Pad Layout



## Terminations

Designation	Termination
SM1	Gold Plated
SM2	Nickel, Solder Plated
SM3	Nickel, Solder Plated and Solder Dipped

## Packaging

- CX-3H-SM- Bulk Pack (Standard)
- 16mm tape, 178mm or 330mm reels (Optional) per EIA 481
  - Tray Pack (Optional)

## Order Code

**CX-4V** ——— **C = Ceramic Lid**  
 Blank = Glass Lid

**-SM1** ——— **SM1**  
 SM2  
 SM3

**32.768kHz** ——— **Frequency**

**( A / I )** ——— **Calibration Tolerance\***  
 @ 25°C  
 A, B, C

**( I )** ——— **Temperature Range:**  
**C = Commercial**  
**I = Industrial**  
**M = Military**  
**S = Specify**

\*For other calibration tolerances enter figure in ppm