

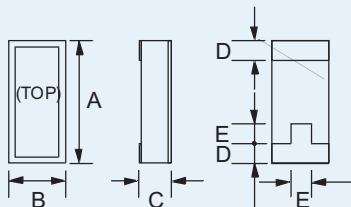
## CX-1H-SM 10kHz to 600kHz MINIATURE SMD CRYSTAL FOR SERIES OSCILLATORS

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## General Description

The miniature CX-1H-SM quartz crystal is a high quality tuning-fork resonator for use in series (two cascaded inverters) oscillators. The CX-1H-SM is hermetically sealed in a rugged, leadless ceramic package. The crystal has been designed for surface-mounting on printed circuit boards or hybrid circuits. The CX-1-SM crystal is manufactured using a photo-lithographic process, yielding consistently high quality production parts.



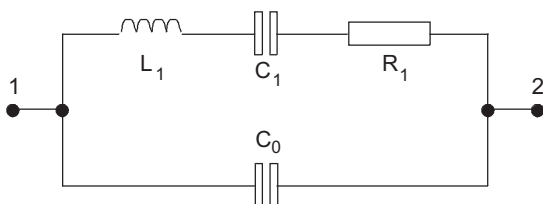
### Outline

### CX-1-SM Package Dimensions

Dimension	Typical (mm)	Maximum (mm)
A	8.00	8.38
B	3.56	3.94
C	-	see below
D	1.14	1.40
E	1.52	1.78

Dimension "C"	Glass Lid (mm max.)	Ceramic Lid (mm max.)
SM1	1.65	1.78
SM2	1.70	1.83
SM3	1.78	1.90

### Equivalent Circuit



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

- Miniature tuning-fork design
- High shock resistance
- Designed for low-power applications
- Compatible with hybrid or PC board packaging
- Low ageing
- Full military environmental testing available
- Ideal for battery operated applications

## Specification

<b>Frequency Range:</b>	10kHz to 600kHz
<b>Calibration Tolerance*:</b>	A, B or C (see table)
<b>Motional Resistance (<math>R_1</math>):</b>	Figure 1 Max.: 10 ~ 169.9kHz, 2x typ. 170~600kHz, 2.5x typ.
<b>Motional Capacitance (<math>C_1</math>):</b>	Figure 2
<b>Quality Factor (Q):</b>	Figure 3 Min. is 0.25x typ.
<b>Shunt Capacitance (<math>C_0</math>):</b>	2.0pF max.
<b>Drive Level:</b>	10~24.98kHz 1.5 $\mu$ W max. 25~600kHz 3.0 $\mu$ W max.
<b>Turning Point (<math>T_0</math>)**:</b>	Figure 4
<b>Temperature Coefficient:</b>	-0.035ppm/ $^{\circ}$ C <sup>2</sup>
<b>Ageing, first year:</b>	$\pm$ 5ppm max.
<b>Shock, survival***:</b>	1000g 1ms, 1/2 sine
<b>Vibration, survival***:</b>	20g rms, 10-2,000Hz random
<b>Operating Temperature:</b>	-10 $^{\circ}$ ~+70 $^{\circ}$ C (commercial) -40 $^{\circ}$ ~+85 $^{\circ}$ C (industrial) -55 $^{\circ}$ ~+125 $^{\circ}$ C (military)
<b>Storage Temperature:</b>	-55 $^{\circ}$ C~+125 $^{\circ}$ C
<b>Process Temperature:</b>	260 $^{\circ}$ C for 20 seconds

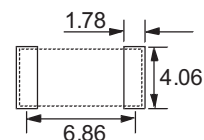
Specifications are typical at 25 $^{\circ}$ C unless otherwise indicated.

- \* Tighter frequency calibration available
- \*\* Other turning point available
- \*\*\* Higher shock and vibration version available

### CX-1H-SM Crystal Calibration Tolerance at 25 $^{\circ}$ C

Calibration	Frequency Range (kHz)			
	10~74.9	75~169.9	170~249.9	250~600
A	$\pm$ 0.003%	$\pm$ 0.005%	$\pm$ 0.01%	$\pm$ 0.02%
B	$\pm$ 0.01%	$\pm$ 0.01%	$\pm$ 0.02%	$\pm$ 0.05%
C	$\pm$ 0.1%	$\pm$ 0.1%	$\pm$ 0.2%	$\pm$ 0.5%

## Solder Pad Layout



## CX-1H-SM 10kHz to 600kHz

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## Circuit Design

### Conventional Series Oscillator Circuit

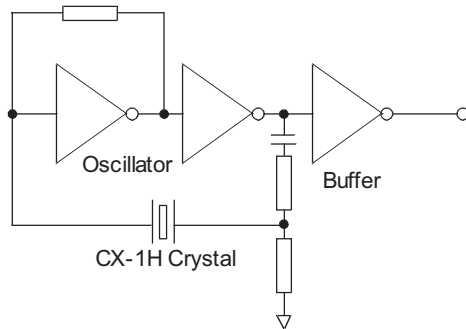


Figure 1 - CX-1H Typical Motional Resistance ( $R_1$ )

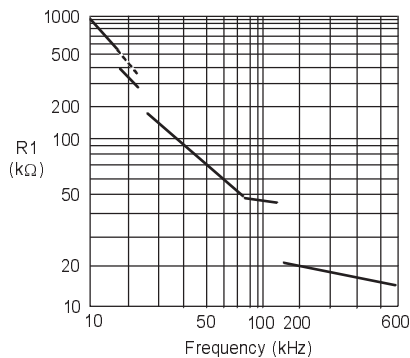


Figure 2 - CX-1H Typical Motional Capacitance ( $C_1$ )

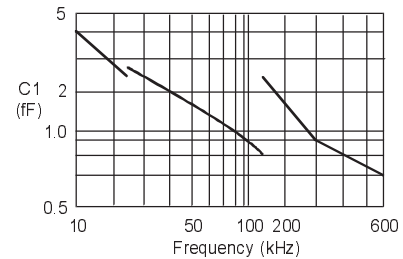


Figure 3 - CX-1H Typical Quality Factor (Q)

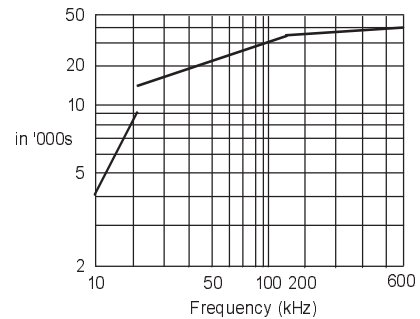
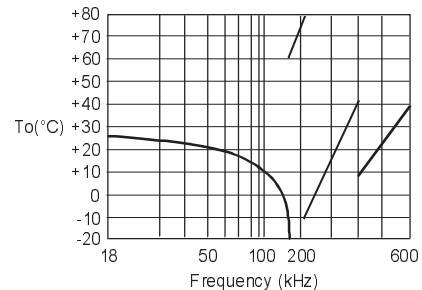


Figure 4 - CX-1H Typical Turning Point Temp. ( $T_0$ )



## Packaging

- CX-1H-SM - Bulk Pack (Standard)
  - 16mm tape, 178mm or 330mm reels (Optional) per EIA 481
  - Tray Pack (Optional)

## Order Code

CX-1H C = Ceramic Lid  
Blank = Glass Lid -SM1 32.768kHz ( A / I )

"S" if special  
or custom design  
Blank if standard

SM1  
SM2  
SM3

Calibration  
Tolerance\*  
@ 25°C  
A, B, C

Temperature  
Range:  
C = Commercial  
I = Industrial  
M = Military  
S = Specify

\*For other calibration  
tolerances enter  
figure in ppm

## Terminations

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