

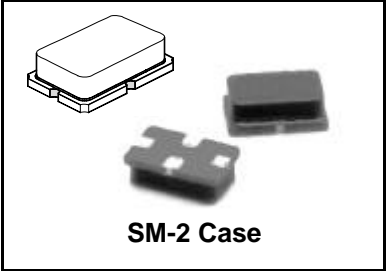


- **Ideal for 980.0 MHz FCC Part 15 Transmitters**
- **Very Low Series Resistance**
- **Quartz Stability**
- **Surface-Mount Ceramic Case with 21 mm<sup>2</sup> Footprint**
- **Complies with Directive 2002/95/EC (RoHS)**

The RO2173A is a true one-port, surface-acoustic-wave (SAW) resonator in a surface-mount ceramic case. It provides reliable, fundamental-mode stabilization of fixed-frequency transmitters operating at 980.0 MHz. This SAW is designed specifically for remote-control and data-link transmitters operating in the USA under FCC Part 15 regulations.

**RO2173A  
RO2173A-1  
RO2173A-2**

**980.0 MHz  
SAW  
Resonator**



**Absolute Maximum Ratings**

Rating	Value	Units
CW RF Power Dissipation (See Typical Test Circuit)	+0	dBm
DC Voltage Between Terminals (Observe ESD Precautions)	±30	VDC
Case Temperature <sup>1</sup>	-40 to +85	°C
Soldering Temperature (10 seconds / 5 cycles max.)	260	°C

**Electrical Characteristics**

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Frequency (+25 °C) Nominal Frequency RO2173A RO2173A-1 RO2173A-2	f <sub>C</sub>	2, 3, 4, 5	979.825		980.175	MHz
			979.650		980.350	
			979.500		980.500	
Tolerance from 980.0 MHz RO2173A RO2173A-1 RO2173A-2	Δf <sub>C</sub>				±175	kHz
					±350	
					±500	
Insertion Loss	IL	2, 5, 6			2.5	dB
Quality Factor Unloaded Q 50 Ω Loaded Q	Q <sub>U</sub>	5, 6, 7		23,509		
	Q <sub>L</sub>			4,000		
Temperature Stability Turnover Temperature Turnover Frequency Frequency Temperature Coefficient	T <sub>O</sub>	6, 7, 8	10	25	40	°C
	f <sub>O</sub>					MHz
	FTC			0.032		ppm/°C <sup>2</sup>
Frequency Aging Absolute Value during the First Year	fA	1			50	ppm
DC Insulation Resistance between Any Two Terminals		5	1.0			MΩ
RF Equivalent RLC Model Motional Resistance Motional Inductance Motional Capacitance Transducer Static Capacitance	R <sub>M</sub>	5, 6, 7, 9		20.5036		Ω
	L <sub>M</sub>			83.704		μH
	C <sub>M</sub>			0.3603		fF
	C <sub>P</sub>	5, 6, 9		2.2		pF
Test Fixture Shunt Inductance	L <sub>TEST</sub>	2, 7		13.7		nH
Lid Symbolization				287		

**CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.**  
Notes:

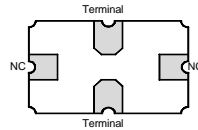
- Frequency aging is the change in f<sub>C</sub> with time and is specified at +65°C or less. Aging may exceed the specification for prolonged temperatures above +65°C. Typically, aging is greatest the first year after manufacture, decreasing in subsequent years.
- The center frequency, f<sub>C</sub>, is measured at the minimum insertion loss point, IL<sub>MIN</sub>, with the resonator in the 50 Ω test system (VSWR ≤ 1.2:1). The shunt inductance, L<sub>TEST</sub>, is tuned for parallel resonance with C<sub>O</sub> at f<sub>C</sub>. Typically, f<sub>OS-CILLATOR</sub> or f<sub>TRANSMITTER</sub> is approximately equal to the resonator f<sub>C</sub>.
- One or more of the following United States patents apply: 4,454,488 and 4,616,197.
- Typically, equipment utilizing this device requires emissions testing and government approval, which is the responsibility of the equipment manufacturer.
- Unless noted otherwise, case temperature T<sub>C</sub> = +25°C±2°C.
- The design, manufacturing process, and specifications of this device are subject to change without notice.
- Derived mathematically from one or more of the following directly measured parameters: f<sub>C</sub>, IL, 3 dB bandwidth, f<sub>C</sub> versus T<sub>C</sub>, and C<sub>O</sub>.
- Turnover temperature, T<sub>O</sub>, is the temperature of maximum (or turnover) frequency, f<sub>O</sub>. The nominal frequency at any case temperature, T<sub>C</sub>, may be calculated from: f = f<sub>O</sub> [1 - FTC (T<sub>O</sub> - T<sub>C</sub>)<sup>2</sup>]. Typically oscillator T<sub>O</sub> is approximately equal to the specified resonator T<sub>O</sub>.
- This equivalent RLC model approximates resonator performance near the resonant frequency and is provided for reference only. The capacitance C<sub>O</sub> is the static (nonmotional) capacitance between the two terminals measured at low frequency (10 MHz) with a capacitance meter. The measurement includes parasitic capacitance with "NC" pads unconnected. Case parasitic capacitance is approximately 0.05 pF. Transducer parallel capacitance can be calculated as: C<sub>P</sub> ≈ C<sub>O</sub> - 0.05 pF.

# 980.00 MHz

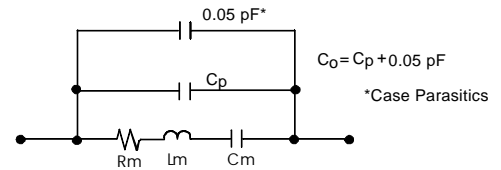
# SAW Resonator

## Electrical Connections

The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help reduce parasitic capacitance in the circuit.



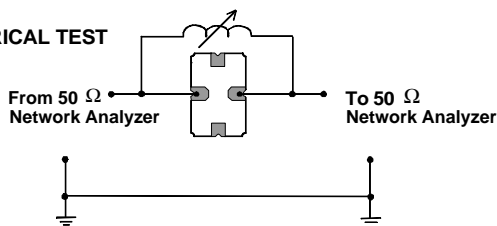
## Equivalent LC Model



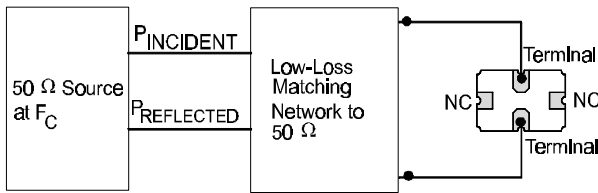
## Typical Test Circuit

The test circuit inductor,  $L_{TEST}$ , is tuned to resonate with the static capacitance,  $C_O$ , at  $F_C$ .

### ELECTRICAL TEST



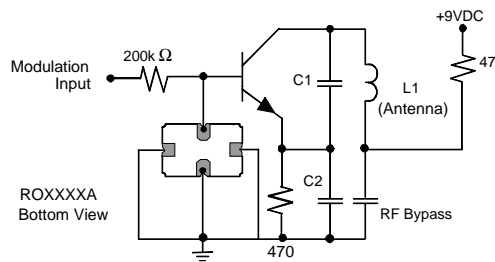
### POWER TEST



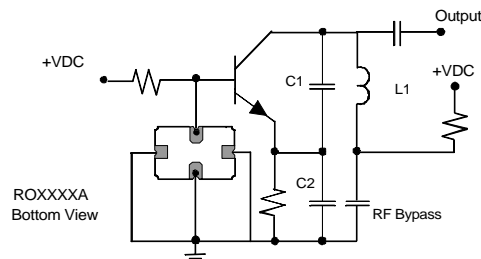
$$CW \text{ RF Power Dissipation} = P_{INCIDENT} - P_{REFLECTED}$$

## Typical Application Circuits

### Typical Low-Power Transmitter Application

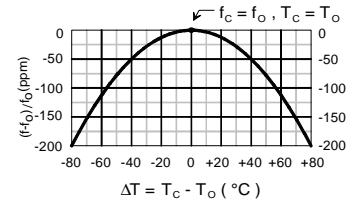


### Typical Local Oscillator Application



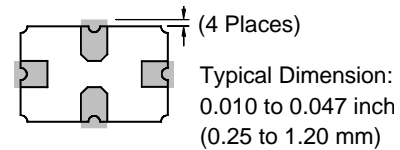
## Temperature Characteristics

The curve shown on the right accounts for resonator contribution only and does not include LC component temperature contributions.



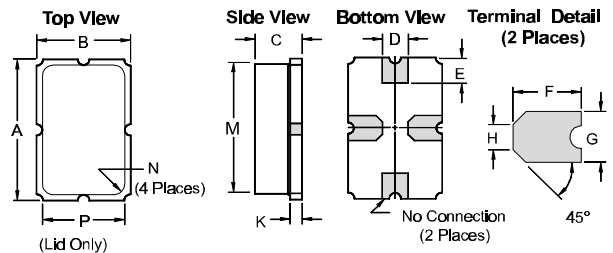
## Typical Circuit Board Land Pattern

The circuit board land pattern shown below is one possible design. The optimum land pattern is dependent on the circuit board assembly process which varies by manufacturer. The distance between adjacent land edges should be at a maximum to minimize parasitic capacitance. Trace lengths from terminal lands to other components should be short and wide to minimize parasitic series inductances.



## Case Design

The case material is black alumina with contrasting symbolization. All pads are nominally centered with respect to the base and consist of 40 to 70 microinches electroless gold on 60-350 microrinches electroless nickel.



Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	5.74	5.99	0.226	0.236
B	3.73	3.99	0.147	0.157
C	1.91	2.16	0.075	0.085
D	0.94	1.10	0.037	0.043
E	0.83	1.20	0.033	0.047
F	1.16	1.53	0.046	0.060
G	0.94	1.10	0.037	0.043
H	0.43	0.59	0.017	0.023
K	0.43	0.59	0.017	0.023
M	5.08	5.33	0.200	0.210
N	0.38	0.64	0.015	0.025
P	3.05	3.30	0.120	0.130