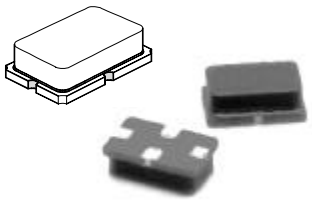
# RO2193A

# 379.3 MHz SAW Resonator

- ***Ideal for 390 MHz Superhet Receiver LO***
- ***Very Low Series Resistance***
- ***Quartz Stability***
- ***Rugged, Hermetic, Surface Mount SM-2 Package***
- ***Complies with Directive 2002/95/EC (RoHS)***

The RO2193A is a true one-port, surface-acoustic-wave (SAW) resonator in a surface-mount ceramic case. It provides reliable, fundamental-mode, quartz frequency stabilization of local oscillators operating at approximately 379.3 MHz. This SAW is designed for 390 MHz superhet receivers with 10.7 MHz IF. Applications include keyless-entry receivers operating in the USA under FCC Part 15, in Canada under DOC RSS-210, and in Italy.



**SM-2 Case**

### Absolute Maximum Ratings

| Rating | Value | Units |
|---|---|---|
| CW RF Power Dissipation | +5 | dBm |
| DC Voltage Between Any Two Pins (Observe ESD Precautions) | ±30 | VDC |
| Case Temperature | -40 to +85 | °C |
| Soldering Temperature (10 seconds / 5 cycles max.) | 260 | °C |

### Electrical Characteristics

| Characteristic | | Sym | Notes | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|---|---|
| Center Frequency at +25 °C | Absolute Frequency | $f_C$ | 2, 3, 4, 5 | 379.2 | 379.3 | 379.4 | MHz |
| | Tolerance from 304.0 MHz | $\Delta f_C$ | | | | ±100 | kHz |
| Insertion Loss | | IL | 2, 5, 6 | | 0.9 | 2.0 | dB |
| Quality Factor | Unloaded Q | $Q_U$ | 5, 6, 7 | | 13,000 | | |
| | 50 Ω Loaded Q | $Q_L$ | | | 2,000 | | |
| Temperature Stability | Turnover Temperature | $T_O$ | 6, 7, 8 | 27 | 42 | 57 | °C |
| | Turnover Frequency | $f_O$ | | | $f_C$-5 | | kHz |
| | Frequency Temperature Coefficient | FTC | | | 0.037 | | ppm/°C$^2$ |
| Frequency Aging | Absolute Value during the First Year | \|fA\| | 1 | | ≤10 | | ppm/yr |
| DC Insulation Resistance between Any Two Terminals | | | 5 | 1.0 | | | MΩ |
| RF Equivalent RLC Model | Motional Resistance | $R_M$ | 5, 7, 9 | | 18 | 25 | Ω |
| | Motional Inductance | $L_M$ | | | 107 | | µH |
| | Motional Capacitance | $C_M$ | | | 1.6 | | fF |
| | Pin 1 to Pin 2 Static Capacitance | $C_O$ | 5, 6, 9 | 3.6 | 3.9 | 4.2 | pF |
| | Transducer Static Capacitance | $C_P$ | 5, 6, 7, 9 | | 2.7 | | pF |
| Test Fixture Shunt Inductance | | $L_{TEST}$ | 2, 7 | | 57 | | nH |
| Lid Symbolization | | TBD | | | | | |

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

**Notes:**

1. Lifetime (10 year) frequency aging.
2. The center frequency, $f_C$, is measured at the minimum insertion loss point, $IL_{MIN}$, with the resonator in the 50 Ω test system (VSWR ≤ 1.2:1). The shunt inductance, $L_{TEST}$, is tuned for parallel resonance with $C_O$ at $f_C$.
3. One or more of the following United States patents apply: 4,454,488 and 4,616,197.
4. Typically, equipment utilizing this device requires emissions testing and government approval, which is the responsibility of the equipment manufacturer.
5. Unless noted otherwise, case temperature $T_C$ = +25°C±2°C.
6. The design, manufacturing process, and specifications of this device are subject to change without notice.
7. Derived mathematically from one or more of the following directly measured parameters: $f_C$, IL, 3 dB bandwidth, $f_C$ versus $T_C$, and $C_O$.
8. Turnover temperature, $T_O$, is the temperature of maximum (or turnover) frequency, $f_O$. The nominal frequency at any case temperature, $T_C$, may be calculated from: $f = f_O [1 - FTC (T_O - T_C)^2]$.
9. This equivalent RLC model approximates resonator performance near the resonant frequency and is provided for reference only. The capacitance $C_O$ 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 a floating case. Case parasitic capacitance is approximately 0.25pF. Transducer parallel capacitance can be calculated as: $C_P \approx C_O$ - 0.25pF.

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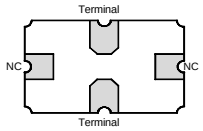
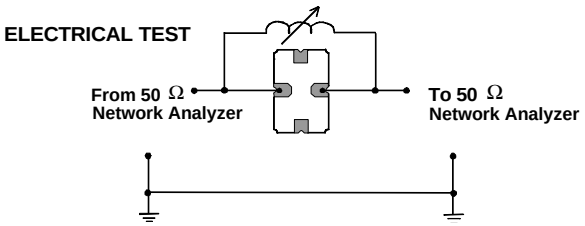
## Electrical Connections

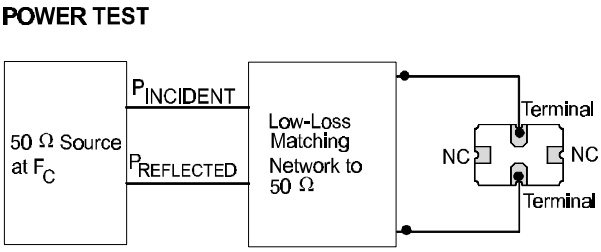
The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help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




## Typical Test Circuit

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

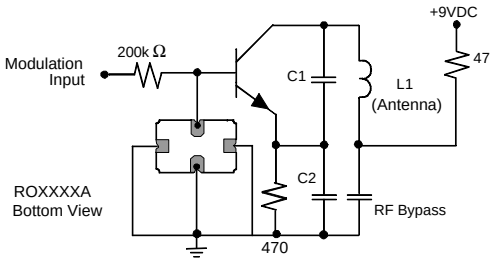


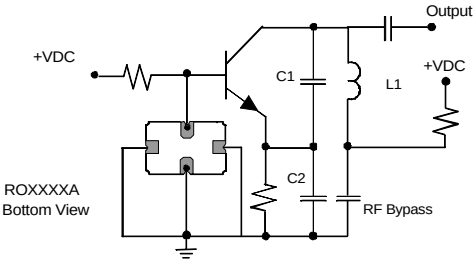

CW RF Power Dissipation = $P_{INCIDENT} - P_{REFLECTED}$

## Typical Application Circuits

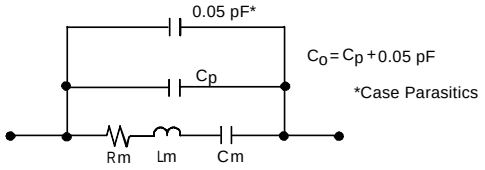
**Typical Low-Power Transmitter Application**




**Typical Local Oscillator Application**

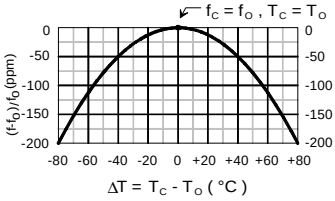



## Equivalent LC Model



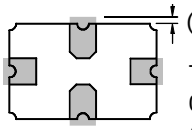

## Temperature Characteristics

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




## Typical Circuit Board Land Pattern

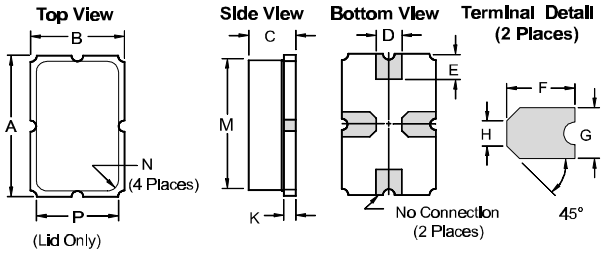
The circuit board land pattern shown below is one possible design. The optimum land pattern is dependent on the circuit board assembly process which varies by manufacturer. The distance between adjacent land edges should be at a maximum to minimize parasitic capacitance. Trace lengths from terminal lands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




Typical Dimension:
0.010 to 0.047 inch
(0.25 to 1.20 mm)

## 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 micorinches electroless nickel.




| Dimensions | Millimeters | | Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | | 5.97 | | 0.235 |
| B | | 3.94 | | 0.155 |
| C | | 2.16 | | 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 | | 5.31 | | 0.209 |
| N | 0.38 | 0.64 | 0.015 | 0.025 |
| P | | 3.28 | | 0.129 |

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