

# Preliminary



**RO2044**

**318.00 MHz  
SAW  
Resonator**

- **Designed for 318 MHz Transmitter Applications**
- **Low Series Resistance**
- **Quartz Stability**
- **Rugged, Hermetic, Low-Profile TO39 Case**
- **Complies with Directive 2002/95/EC (RoHS)**



The RO2044 is a true one-port, surface-acoustic-wave (SAW) resonator in a low-profile TO39 case. It provides reliable, fundamental-mode quartz frequency stabilization of fixed-frequency transmitters operating at or near 318 MHz. The RO2044 is designed specifically for remote-control and wireless security AM transmitters operating in the USA under FCC Part 15, in Canada under Doc RSS-210, and in Australia.

### Absolute Maximum Ratings

Rating	Value	Units
CW RF Power Dissipation	+0	dBm
DC Voltage Between Terminals (Observe ESD Precautions)	±30	VDC
Case Temperature	-40 to +85	°C



**TO39-3 Case**

### Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units	
Frequency (+25 °C) Nominal Frequency	$f_C$	2, 3, 4, 5	317.900		318.100	MHz	
	Tolerance from 318.000 MHz						$\Delta f_C$
Insertion Loss	IL	2, 5, 6		2.4	5.0	dB	
Quality Factor	Unloaded Q	5, 6, 7		10400			
	50 Ω Loaded Q						$Q_L$
Temperature Stability	Turnover Temperature	$T_O$	29	44	59	°C	
	Turnover Frequency	$f_O$	6, 7, 8	$f_C+4.2$		kHz	
	Frequency Temperature Coefficient	FTC		0.037		ppm/°C <sup>2</sup>	
Frequency Aging	Absolute Value during the First Year	fA	1, 6	10		ppm/yr	
DC Insulation Resistance between Any Two Pins		5	1.0			MΩ	
RF Equivalent RLC Model	Motional Resistance	$R_M$		32	78	Ω	
	Motional Inductance	$L_M$	5, 6, 7, 9	160.269		μH	
	Motional Capacitance	$C_M$		1.56292		fF	
	Pin 1 to Pin 2 Static Capacitance	$C_O$	5, 6, 9	2.9	3.2	3.6	pF
	Transducer Static Capacitance	$C_P$	5, 6, 7, 9		3.0		pF
Test Fixture Shunt Inductance	$L_{TEST}$	2, 7		78		nH	
Lid Symbolization (in addition to Lot and/or Date Codes)	RFM // RO2044 // YVWS##						

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

#### Notes:

- Frequency aging is the change in  $f_C$  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 significantly in subsequent years.
- 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  $f_C$ . Typically,  $f_{OSCILLATOR}$  or  $f_{TRANSMITTER}$  is less than the resonator  $f_C$ .
- One or more of the following United States patents apply: 4,454,488 and 4,616,197 and others pending.
- Typically, equipment designs utilizing this device require emissions testing and government approval, which is the responsibility of the equipment manufacturer. Unless noted otherwise, case temperature  $T_C = +25°C \pm 2°C$ .
- 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:  $f_C$ , IL, 3 dB bandwidth,  $f_C$  versus  $T_C$ , and  $C_O$ .
- 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:  $f = f_O [1 - FTC (T_O - T_C)^2]$ . Typically, oscillator  $T_O$  is 20°C less than the specified resonator  $T_O$ .
- 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 pin1 and pin 2 measured at low frequency (10 MHz) with a capacitance meter. The measurement includes case parasitic capacitance with a floating case. For usual grounded case applications (with ground connected to either pin 1 or pin 2 and to the case), add approximately 0.25 pF to  $C_O$ .

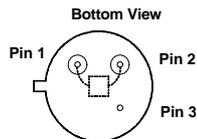
# 318.000 MHz

# SAW Resonator

## Electrical Connections

This one-port, two-terminal SAW resonator is bidirectional. The terminals are interchangeable with the exception of circuit board layout.

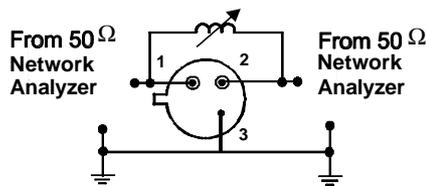
Pin	Connection
1	Terminal 1
2	Terminal 2
3	Case Ground



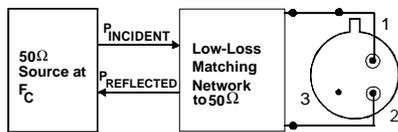
## Typical Test Circuit

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

### Electrical Test:



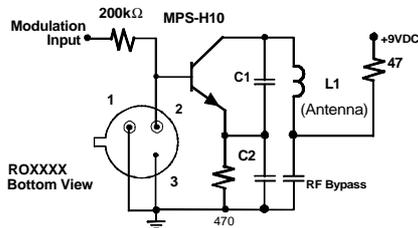
### Power Test:



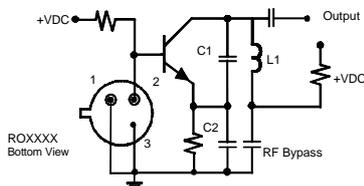
$$CW \text{ RF Power Dissipation} = P_{INCIDENT} - P_{REFLECTED}$$

## Typical Application Circuits

### Typical Low-Power Transmitter Application:

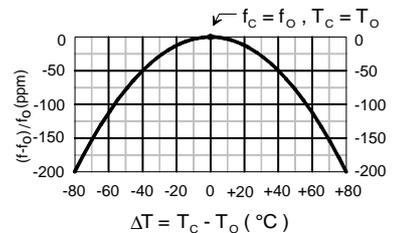


### Typical Local Oscillator Application:



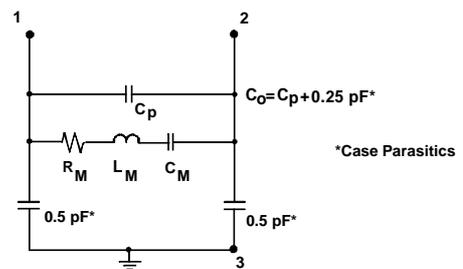
## Temperature Characteristics

The curve shown on the right accounts for resonator contribution only and does not include oscillator temperature characteristics.

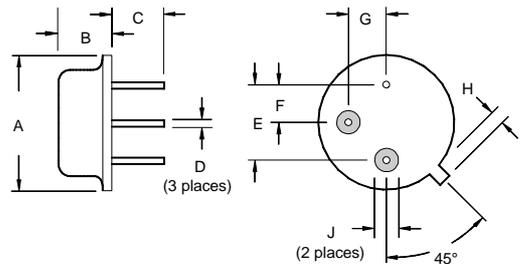


## Equivalent LC Model

The following equivalent LC model is valid near resonance:



## Case Design



Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A		9.30		0.366
B		3.18		0.125
C	2.50	3.50	0.098	0.138
D	0.46 Nominal		0.018 Nominal	
E	5.08 Nominal		0.200 Nominal	
F	2.54 Nominal		0.100 Nominal	
G	2.54 Nominal		0.100 Nominal	
H		1.02		0.040
J	1.40		0.055	