

# RP1236

## 312.0 MHz SAW Resonator



- Designed for 312 MHz Low-Power Superhet Transmitters
- Nominal Insertion Phase Shift of 180° at Resonance
- Quartz Stability
- Rugged, Hermetic, Low-Profile TO39 Case

The RP1236 is a two-port, 180° 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 312 MHz. Typical applications include wireless security and remote-control receivers operating in the USA under FCC Part 15 and in Canada under DoC RSS-210.



### Electrical Characteristics

Characteristic		Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency (+25°C)	Absolute Frequency	$f_C$	2, 3, 4, 5,	311.750		312.250	MHz
	Tolerance from 312.000 MHz	$\Delta f_C$					
Insertion Loss		IL	2, 5, 6		8.1	13.0	dB
Quality Factor	Unloaded Q	$Q_U$	5, 6, 7		14,000		
	50 $\Omega$ Loaded Q	$Q_L$			8,500		
Temperature Stability	Turnover Temperature	$T_O$	6, 7, 8	24	39	54	°C
	Turnover Frequency	$f_O$			$f_C + 2.3$		kHz
	Frequency Temp. Coefficient	FTC			0.037		ppm/°C <sup>2</sup>
Frequency Aging	Absolute Value during First Year	$ f_A $	6		$\leq 10$		ppm/yr
DC Insulation Resistance between Any Two Pins			5	1.0			M $\Omega$
RF Equivalent RLC Model	Motional Resistance	$R_M$	5, 7, 9		154	347	$\Omega$
	Motional Inductance	$L_M$			1.09824		$\mu$ H
	Motional Capacitance	$C_M$			0.236938		fF
	Shunt Static Capacitance	$C_O$			1.3	1.6	1.9
Lid Symbolization (in addition to Lot and/or Date Codes)		RFM P1236					



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

#### Notes:

1. 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 in subsequent years.
2. The frequency  $f_C$  is the frequency of minimum IL with the resonator in the specified test fixture in a 50  $\Omega$  test system with VSWR  $\leq 1.2:1$ . Typically,  $f_{OSCILLATOR}$  or  $f_{TRANSMITTER}$  is less than the resonator  $f_C$ .
3. One or more of the following United States patents apply: 4,454,488; 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  $T_C = +25^\circ\text{C} \pm 2^\circ\text{C}$
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:  $f = f_O [1 - FTC (T_O - T_C)^2]$ . Typically, *oscillator*  $T_O$  is 20° less than the specified *resonator*  $T_O$ .
9. This equivalent RLC model approximates resonator performance near the resonant frequency and is provided for reference only. The capacitance  $C_O$  is the measured static (nonmotional) capacitance between either pin 1 and ground or pin 2 and ground. The measurement includes case parasitic capacitance.

# 312.0 MHz SAW Resonator

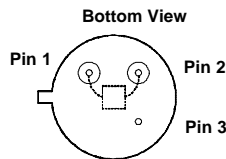
## Absolute Maximum Ratings

Rating	Value	Units
CW RF Power Dissipation (See: Typical Test Circuit)	+0	dBm
DC Voltage Between Any Two Pins (Observe ESD Precautions)	±30	VDC
Case Temperature	-40 to +85	°C

## Electrical Connections

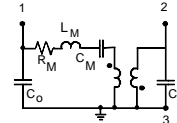
This two-port, three-terminal SAW resonator is bidirectional. However, impedances and circuit board parasitics may not be symmetrical, requiring slightly different oscillator component-matching values.

Pin	Connection
1	Input or Output
2	Output or Input
3	Case Ground



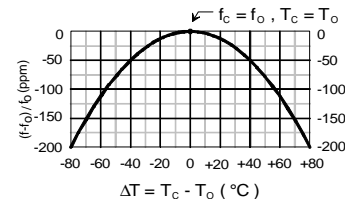
## Equivalent LC Model

The following equivalent LC model is valid near resonance:

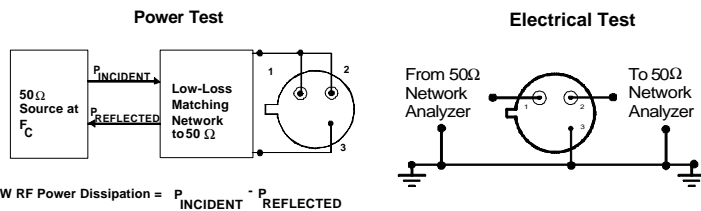


## Temperature Characteristics

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



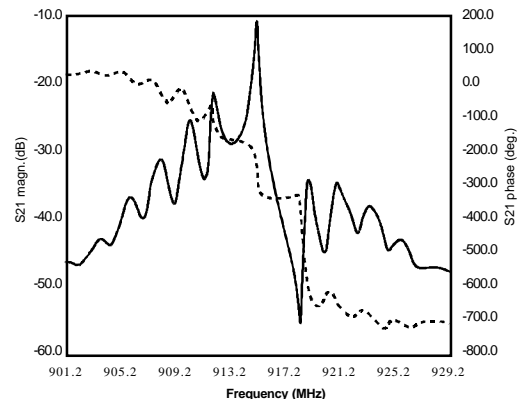
## Typical Test Circuit



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

## Typical Frequency Response

The plot shown below is a typical frequency response for the RP series of two-port resonators. The plot is for RP1094.

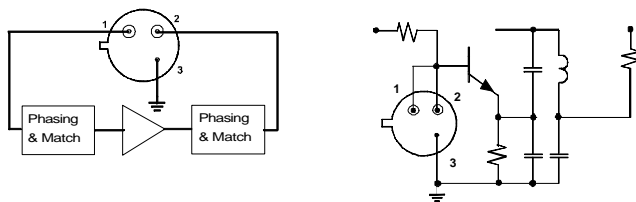


## Typical Application Circuits

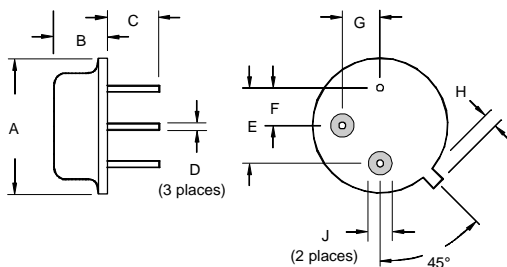
This SAW resonator can be used in oscillator or transmitter designs that require 180° phase shift at resonance in a two-port configuration. One-port resonators can be simulated, as shown, by connecting pins 1 and 2 together. However, for most low-cost consumer products, this is only recommended for retrofit applications and not for new designs.

Conventional Two-Port Design:

Simulated One-Port Design:



## 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	