RFM ®

RP1308

433.92 MHz SAW Resonator

- *Ideal for 433.92 MHz Low-Power Transmitters*
- *Nominal Insertion Phase Shift of 180° at Resonance*
- *Quartz Stability*
- *Rugged, Hermetic, Low-Profile TO39 Case*
- *Complies with Directive 2002/95/EC (RoHS)* Pb

The RP1308 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 AM, FSK, or PSK transmitters operating at 433.92 MHz. The RP1308 was designed specifically for remote-control and wireless security transmitters operating in Europe under ETSI I-ETS 300 220 and in Germany under FTZ 17 TR 2100.

TO39-3 Case

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 Characteristics

Characteristic		Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency	Absolute Frequency	f_C	2, 3, 4, 5,	433.845		433.995	MHz
	Tolerance from 433.920 MHz	Δf_C				±75	kHz
Insertion Loss		IL	2, 5, 6		6.3	8.0	dB
Quality Factor	Unloaded Q	Q_U	5, 6, 7		12,000		
	50 Ω Loaded Q	Q_L			6,300		
Temperature Stability	Turnover Temperature	T_O	6, 7, 8	36	51	66	°C
	Turnover Frequency	f_O			f_C+11		kHz
	Frequency Temp. Coefficient	FTC			0.037		ppm/°C^2
Frequency Aging	Absolute Value during First Year	$|f_A|$	6		≤ 10		ppm/yr
DC Insulation Resistance between Any Two Pins			5	1.0			MΩ
RF Equivalent RLC	Motional Resistance	R_M	5, 7, 9		107	152	Ω
	Motional Inductance	L_M			481.378		µH
	Motional Capacitance	C_M			0.279470		fF
	Shunt Static Capacitance	C_O	5, 6, 9	1.4	1.7	2.0	pF
Lid Symbolization (in addition to Lot and/or Date Codes)		RFM P1308					

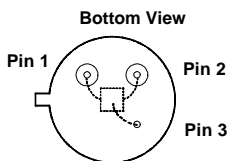**CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.**

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 significantly 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 Ω test system with VSWR ≤ 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°C± 5°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.

433.92 MHz   SAW Resonator
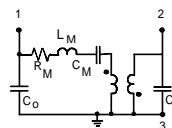
Electrical Connections

This two-port, three-terminal SAW resonator is bidirectional. However, im-
pedances 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

Bottom View

Pin 1   Pin 2

Pin 3

Typical Test Circuit

Power Test

50Ω Source at F_C

$P_{INCIDENT}$

$P_{REFLECTED}$

Low-Loss Matching Network to 50Ω

Electrical Test

From 50Ω Network Analyzer

To 50Ω Network Analyzer

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

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:

Phasing & Match   Phasing & Match

Case Design

B C

A

D
(3 places)

G

F

E

H

J
(2 places)

45°

Equivalent LC Model

The following equivalent LC model is valid near resonance:

1   L_M 2
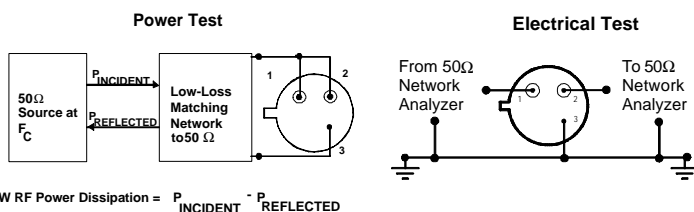
R_M C_M

C_O C_O

3

Temperature Characteristics

The curve shown on the right
accounts for resonator con-
tribution only and does not
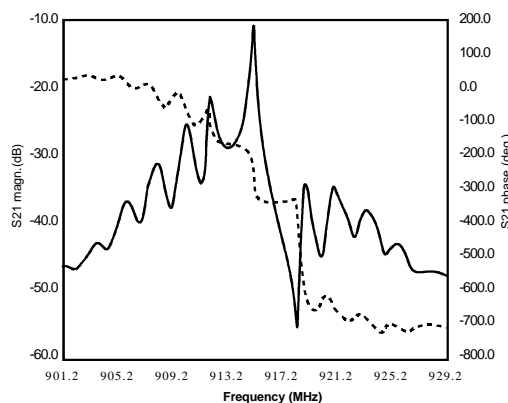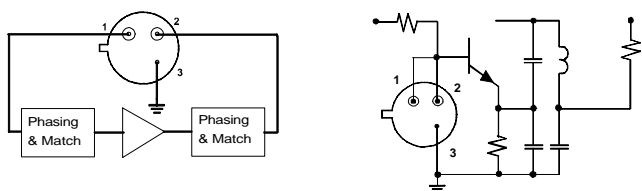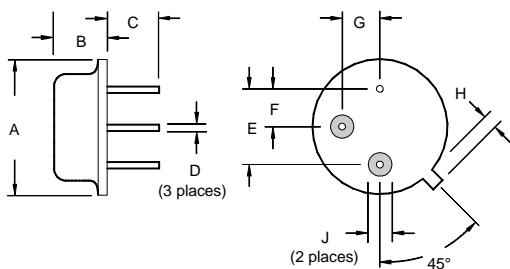include LC component tem-
perature contributions.

$f_C = f_O$, $T_C = T_O$

$(f-f_O)/f_O$ (ppm)

0
-50
-100
-150
-200

0
-50
-100
-150
-200

-80 -60 -40 -20   0   +20 +40 +60 +80

$\Delta T = T_C - T_O$ (°C)
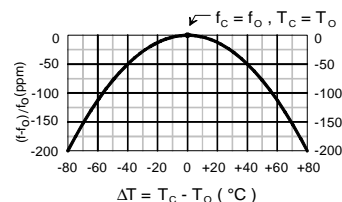
Typical Frequency Response

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

S21 magn.(dB)

-10.0
-20.0
-30.0
-40.0
-50.0
-60.0

S21 phase (deg.)

200.0
100.0
0.0
-100.0
-200.0
-300.0
-400.0
-500.0
-600.0
-700.0
-800.0

901.2 905.2 909.2 913.2 917.2 921.2 925.2 929.2

Frequency (MHz)

Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A		9.40		0.370
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	