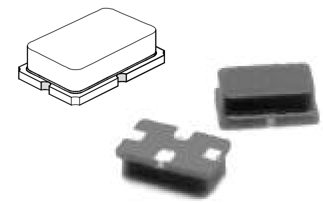
RO2164A
RO2164A-1
RO2164A-2

868.35 MHz SAW Resonator



SM-2 Case

- ***Ideal for European 868.35 MHz Transmitters***
- ***Very Low Series Resistance***
- ***Quartz Stability***
- ***Surface-Mount Ceramic Case with 21 mm^2 Footprint***

The RO2164A 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 fixed-frequency transmitters operating at 868.35 MHz. This SAW is designed specifically for remote-control and wireless security transmitters operating under ETSI-ETS 300 220 in Europe and under FTZ 17 TR 2100 in Germany.

Absolute Maximum Ratings

Rating	Value	Units
CW RF Power Dissipation	+5	dBm
DC Voltage Between Terminals	±30	VDC
Case Temperature	-40 to +85	°C
Soldering Temperature	+250	°C

Electrical Characteristics

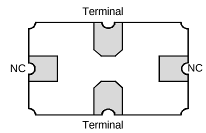
Characteristic		Sym	Notes	Minimum	Typical	Maximum	Units
Frequency (+25 °C) Nominal Frequency	RO2164A	f_C	2,3,4,5	868.275		868.425	MHz
	RO2164A-1			868.200		868.500	
	RO2164A-2			868.250		868.450	
Tolerance from 868.35 MHz	RO2164A	Δf_C				±75	kHz
	RO2164A-1					±150	
	RO2164A-2					±100	
Insertion Loss		IL	2,5,6		1.1	2.0	dB
Quality Factor	Unloaded Q	Q_U	5,6,7		24,737		
	50 Ω Loaded Q	Q_L			4,000		
Temperature Stability	Turnover Temperature	T_O	6,7,8	10	25	40	°C
	Turnover Frequency	f_O			f_C		kHz
	Frequency Temperature Coefficient	FTC			0.032		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, 6, 7, 9		19.2889		Ω
	Motional Inductance	L_M			87.455		µH
	Motional Capacitance	C_M			0.3841		fF
	Shunt Static Capacitance	C_O	5, 6, 9		3.1		pF
Test Fixture Shunt Inductance		L_{TEST}	2, 7		10.8365		nH
Lid Symbolization (in addition to Lot and/or Date Codes)		260					

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 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 approximately equal to the resonator 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: $f = f_O [1 - FTC (T_O - T_C)^2]$. Typically *oscillator* T_O is approximately equal to 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 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 by calculated as: $C_P \approx C_O$ - 0.05 pF.

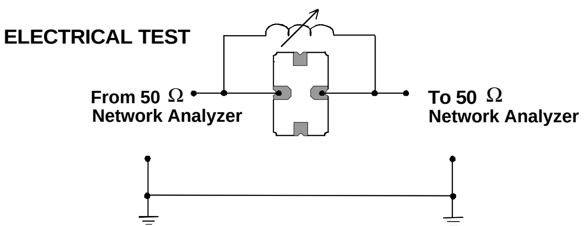
Electrical Connections



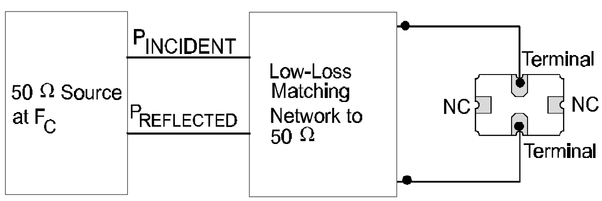
The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help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



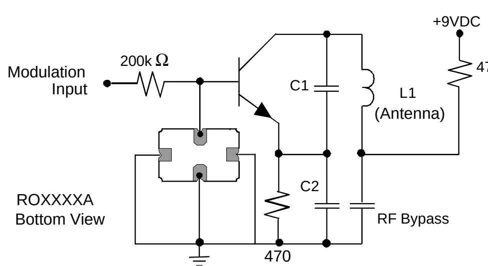
POWER TEST



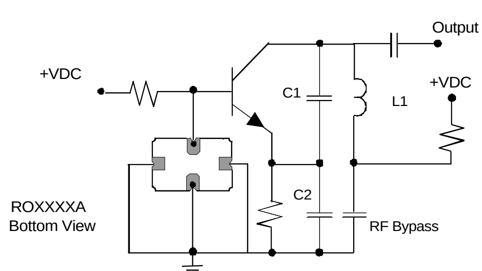
CW RF Power Dissipation = $P_{INCIDENT} - P_{REFLECTED}$

Typical Application Circuits

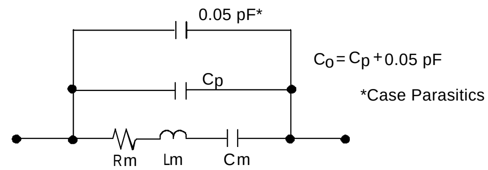
Typical Low-Power Transmitter Application



Typical Local Oscillator Application

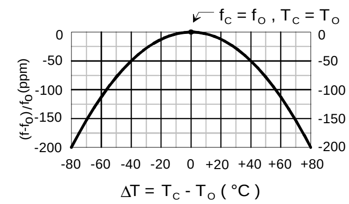


Equivalent LC Model



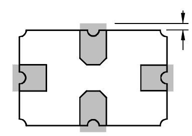
Temperature Characteristics

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.

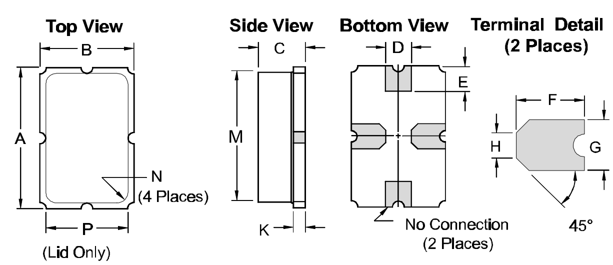


(4 Places)

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 60 to 100 microinches (min) electroless gold on 50 micorinches (min) 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

RF Monolithics, Inc. Phone: (972) 233-2903 Fax: (972) 387-9148 E-mail: info@rfm.com
RFM Europe Phone: 44 1963 251383 Fax: 44 1963 251510 http://www.rfm.com