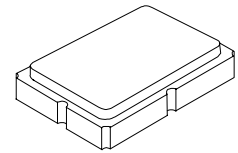




**RO3164A  
RO3164A-1  
RO3164A-2**

**868.35 MHz  
SAW  
Resonator**



**SM5035-4**

- **Ideal for European 868.35 MHz Transmitters**
- **Very Low Series Resistance**
- **Quartz Stability**
- **Surface-mount Ceramic Case**
- **Complies with Directive 2002/95/EC (RoHS)**

The RO3164A 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 EN 300 220.

**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, 10 seconds / 5 cycles maximum	260	°C

**Electrical Characteristics**

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units	
Frequency, +25 °C RO3164A RO3164A-1 RO3164A-2	$f_C$	2,3,4,5	868.150		868.550	MHz	
			868.200		868.500		
			868.250		868.450		
Tolerance from 868.35 MHz RO3164A RO3164A-1 RO3164A-2	$\Delta f_C$				±200	kHz	
					±150		
					±100		
Insertion Loss	IL	2,5,6		1.3	2.0	dB	
Quality Factor	Unloaded Q $Q_U$ 50 $\Omega$ Loaded Q $Q_L$	5,6,7		6600			
					800		
Temperature Stability	Turnover Temperature $T_O$ Turnover Frequency $f_O$ Frequency Temperature Coefficient FTC	6,7,8	10	25	40	°C	
				$f_C$			kHz
				0.032	FTC		ppm/°C <sup>2</sup>
Frequency Aging	Absolute Value during the First Year $ f_A $	1		<±10		ppm/yr	
DC Insulation Resistance between Any Two Terminals		5	1.0			M $\Omega$	
RF Equivalent RLC Model	Motional Resistance $R_M$ Motional Inductance $L_M$ Motional Capacitance $C_M$ Shunt Static Capacitance $C_O$	5, 6, 7, 9		13.8		$\Omega$	
					16.8		$\mu$ H
					2.0		fF
					1.8		pF
Test Fixture Shunt Inductance	$L_{TEST}$	2, 7		18.3		nH	
Lid Symbolization (in addition to Lot and/or Date Codes)	RO3164A: 660, RO3164A-1: 780, RO3164A-2: 868 // YWWS						



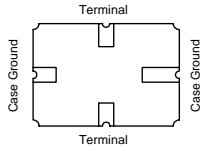
**CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.**

**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 in subsequent years.
- The center frequency,  $f_C$ , is measured at the minimum insertion loss point,  $IL_{MIN}$ , with the resonator in the 50  $\Omega$  test system (VSWR  $\leq$  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  $f_C$ .
- One or more of the following United States patents apply: 4,454,488 and 4,616,197.
- Typically, equipment utilizing this device requires emissions testing and government approval, which is the responsibility of the equipment manufacturer. Unless noted otherwise, case temperature  $T_C = +25 \pm 2$  °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,  $f_C$ . 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*  $T_O$ .
- 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 be calculated as:  $C_P = C_O - 0.05$  pF.

## Electrical Connections

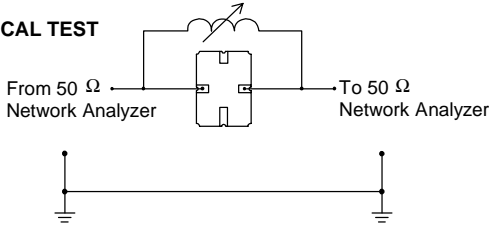
The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help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



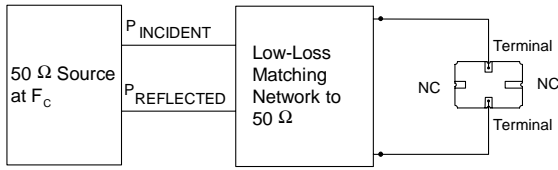
## Typical Test Circuit

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

### ELECTRICAL TEST



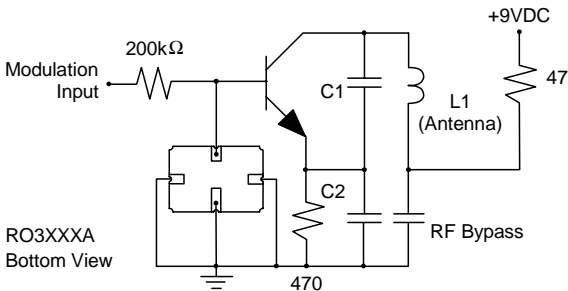
### POWER TEST



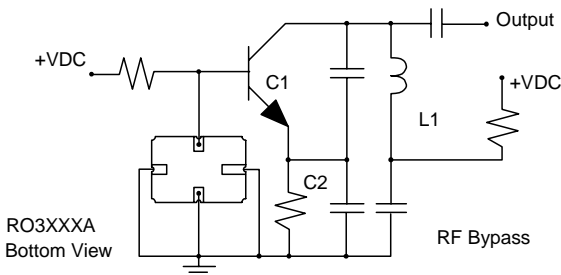
$$CW \text{ RF Power Dissipation} = P_{INCIDENT} - P_{REFLECTED}$$

## Typical Application Circuits

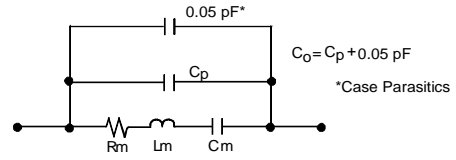
### Typical Low-Power Transmitter Application



### Typical Local Oscillator Applications

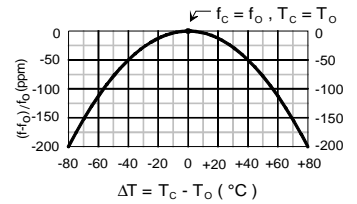


## Equivalent Model

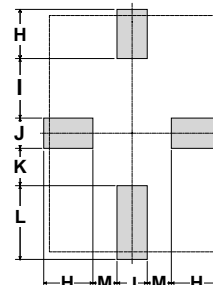
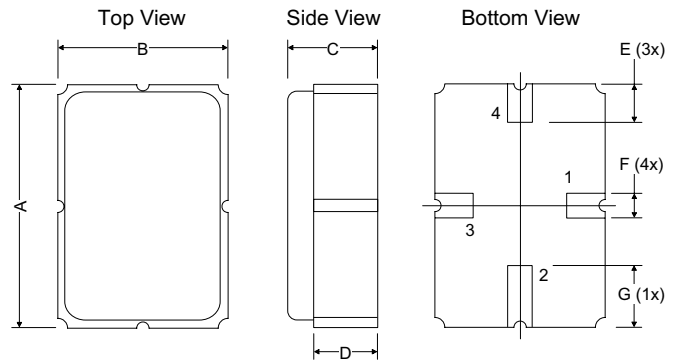


## Temperature Characteristics

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



## Case



PCB Land Pattern Top View

Dimensions	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.87	5.00	5.13	0.191	0.196	0.201
B	3.37	3.50	3.63	0.132	0.137	0.142
C	1.45	1.53	1.60	0.057	0.060	0.062
D	1.35	1.43	1.50	0.040	0.057	0.059
E	0.67	0.80	0.93	0.026	0.031	0.036
F	0.37	0.50	0.63	0.014	0.019	0.024
G	1.07	1.20	1.33	0.042	0.047	0.052
H	-	1.04	-	-	0.041	-
I	-	1.46	-	-	0.058	-
J	-	0.50	-	-	0.019	-
K	-	1.05	-	-	0.041	-
L	-	1.44	-	-	0.057	-
M	-	0.71	-	-	0.028	-