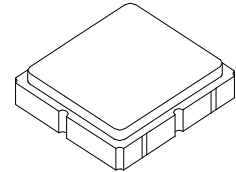


## RO3156E/E-1/E-2

## 868.950 MHz SAW Resonator



**SM3030-6 3 x 3 mm Case**

- **Designed for European 868.95 MHz SRD Transmitters**
- **Very Low Series Resistance**
- **Quartz Stability**
- **Complies with Directive 2002/95/EC (RoHS)**

The RO3156E 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 868.95 MHz. This SAW is designed specifically for SRD remote control and wireless security transmitters operating under ETSI EN 300 220.

### Absolute Maximum Ratings

Rating	Value	Units
Input Power Level	0	dBm
DC Voltage	12	VDC
Storage Temperature	-40 to +125	°C
Operating Temperature Range	-40 to +125	°C
Soldering Temperature, 10 seconds / 5 cycles maximum	+260	°C

### Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units	
Frequency, +25 °C	RO3156E RO3156E-1 RO3156E-2	$f_C$	2,3,4,5	868.750		869.150	MHz
				868.800		869.100	
				868.850		869.050	
Tolerance from 868.95 MHz	RO3156E RO3156E-1 RO3156E-2	$\Delta f_C$			±200	kHz	
					±150		
					±100		
Insertion Loss	IL	2,5,6		1.2	2.0	dB	
Quality Factor	Unloaded Q	$Q_U$	5,6,7		6700		
	50 $\Omega$ Loaded Q	$Q_L$			800		
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 <sup>2</sup>
Frequency Aging	Absolute Value during the First Year	fA	1	<±10		ppm/yr	
DC Insulation Resistance between Any Two Terminals			5	1.0		M $\Omega$	
RF Equivalent RLC Model	Motional Resistance	$R_M$	5, 6, 7, 9		14.1	$\Omega$	
	Motional Inductance	$L_M$			17.2	$\mu$ H	
	Motional Capacitance	$C_M$			2.0	fF	
	Shunt Static Capacitance	$C_O$		5, 6, 9	2.3	pF	
Test Fixture Shunt Inductance		$L_{TEST}$	2, 7		14.6	nH	
Lid Symbolization (in addition to Lot and/or Date Codes)				RO3156E: 707, RO3156E-1: 708, RO3156E-2: 926 // YWWS			
Standard Reel Quantity	Reel Size 7 Inch		10	500 Pieces / Reel			
	Reel Size 13 Inch			3000 Pieces / Reel			



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

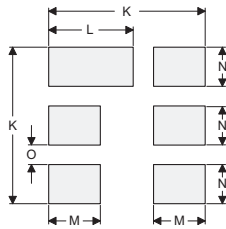
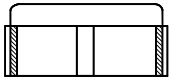
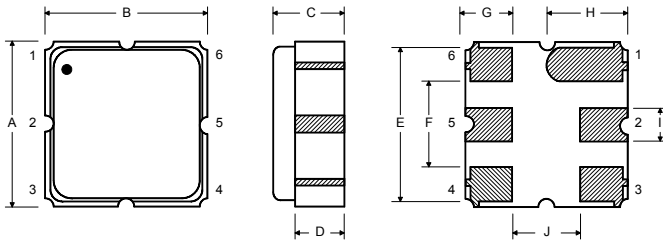
**NOTES:**

- Frequency aging is the change in  $f_C$  with time and is specified at  $+65^\circ\text{C}$  or less. Aging may exceed the specification for prolonged temperatures above  $+65^\circ\text{C}$ . 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,  $IL_{\text{MIN}}$ , with the resonator in the  $50\ \Omega$  test system (VSWR  $\leq 1.2:1$ ). The shunt inductance,  $L_{\text{TEST}}$ , is tuned for parallel resonance with  $C_0$  at  $f_C$ . Typically,  $f_{\text{OSCILLATOR}}$  or  $f_{\text{TRANSMITTER}}$  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  $T_C = +25 \pm 2^\circ\text{C}$ .
- 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  $C_0$ .
- Turnover temperature,  $T_0$ , is the temperature of maximum (or turnover) frequency,  $f_0$ . The nominal frequency at any case temperature,  $T_C$ , may be calculated from:  $f = f_0 [1 - \text{FTC} (T_0 - T_C)^2]$ . Typically *oscillator*  $T_0$  is approximately equal to the specified *resonator*  $T_0$ .
- This equivalent RLC model approximates resonator performance near the resonant frequency and is provided for reference only. The capacitance  $C_0$  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:  $C_P \approx C_0 - 0.05\ \text{pF}$ .
- Tape and Reel Standard for ANSI / EIA 481.

**Electrical Connections**

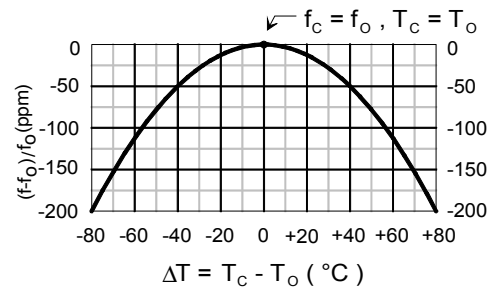
The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help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

Pin	Connection
1	NC
2	Terminal
3	NC
4	NC
5	Terminal



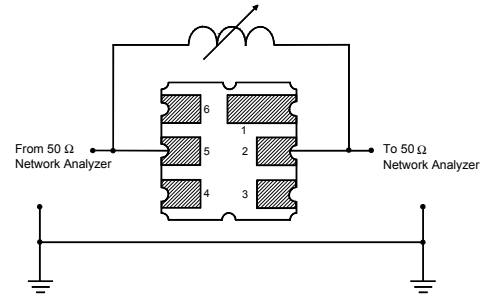
**Temperature Characteristics**

The curve shown accounts for resonator

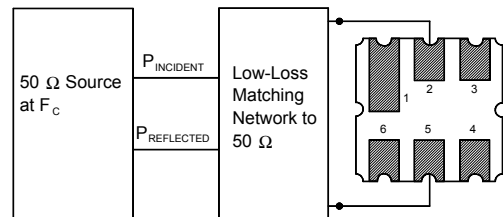


**Characterization Test Circuit**

Inductor  $L_{\text{TEST}}$  is tuned to resonate with the static capacitance,  $C_0$ , at  $F_C$ .



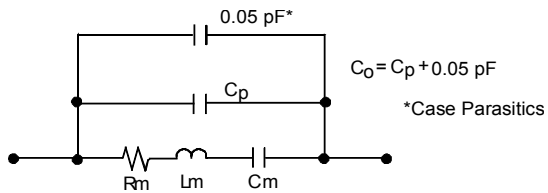
**Power Dissipation Test**



## Case and Typical PCB Land Dimensions

Ref	mm			Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.87	3.00	3.13	0.113	0.118	0.123
B	2.87	3.00	3.13	0.113	0.118	0.123
C	1.12	1.25	1.38	0.044	0.049	0.054
D	0.77	0.90	1.03	0.030	0.035	0.040
E	2.67	2.80	2.93	0.105	0.110	0.115
F	1.47	1.60	1.73	0.058	0.063	0.068
G	0.72	0.85	0.98	0.028	0.033	0.038
H	1.37	1.50	1.63	0.054	0.059	0.064
I	0.47	0.60	0.73	0.019	0.024	0.029
J	1.17	1.30	1.43	0.046	0.051	0.056
K		3.20			0.126	
L		1.70			0.067	
M		1.05			0.041	
N		0.81			0.032	
O		0.38			0.015	

## Equivalent RLC Model



## Example Application Circuits

