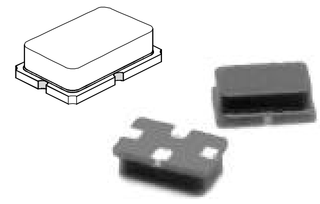
RO2101A-11

433.92 MHz SAW Resonator

- ***Ideal for European 433.92 MHz Transmitters***
- ***Very Low Series Resistance***
- ***Quartz Stability***
- ***Surface-Mount Ceramic Case with 21 mm^2 Footprint***

The RO2101A-11 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 433.92 MHz. This resonator is designed specifically for remote-control and wireless security transmitters operating in Europe under ETSI I-ETS 300 220.



SM-2 Case

Absolute Maximum Ratings

Rating	Value	Units
CW RF Power Dissipation (See: Typical Test Circuit)	+0	dBm
DC voltage Between Terminals (Observe ESD Precautions)	±30	VDC
Case Temperature	-40 to +105	°C
Soldering Temperature	+250	°C

Electrical Characteristics

Characteristic		Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency (+25 °C)	Absolute Frequency	f_C	2,3,4,5	433.820		434.020	MHz
	Tolerance from 433.920 MHz	Δf_C				±100	kHz
Insertion Loss		IL	2,5,6		1.1	2.0	dB
Quality Factor	Unloaded Q	Q_U	5,6,7		14,300		
	50 Ω Loaded Q	Q_L			1,700		
Temperature Stability	Turnover Temperature	T_O	6,7,8	10	25	40	°C
	Turnover Frequency	f_O			f_C		
	Frequency Temperature Coefficient	FTC			0.032		ppm/°C^2
Frequency Aging	Absolute Value during the First Year	$\|f_A\|$	1			±50	ppm/yr
DC Insulation Resistance between Any Two Terminals			5	1.0			MΩ
RF Equivalent RLC Model	Motional Resistance	R_M	5, 7, 9		13	26	Ω
	Motional Inductance	L_M			69.4594		µH
	Motional Capacitance	C_M			1.93682		fF
	Shunt Static Capacitance	C_O	5, 6, 9	1.5	1.8	2.1	pF
Test Fixture Shunt Inductance		L_{TEST}	2, 7		75		nH
Lid Symbolization (in addition to Lot and/or Date Codes)		277					

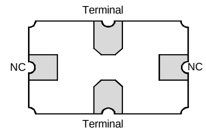
CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.

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.

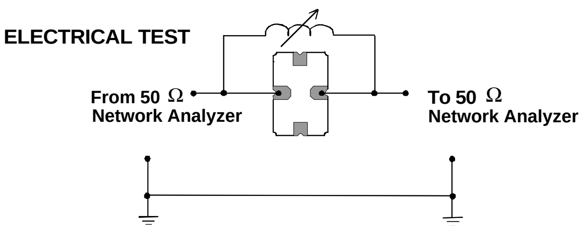
Electrical Connections

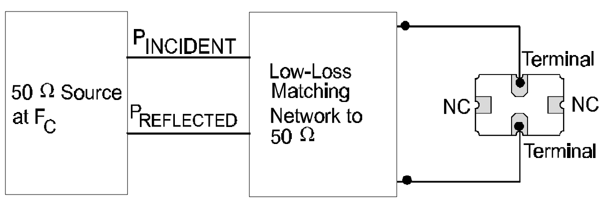
The SAW resonator is bidirectional and may be installed with either orientation. The two terminals are interchangeable and unnumbered. The callout NC indicates no internal connection. The NC pads assist with mechanical positioning and stability. External grounding of the NC pads is recommended to help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



Typical Test Circuit

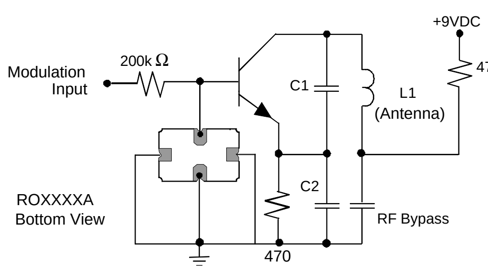
The test circuit inductor, L_{TEST}, is tuned to resonate with the static capacitance, C_O, at F_C.

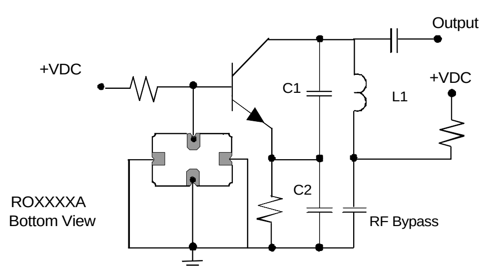




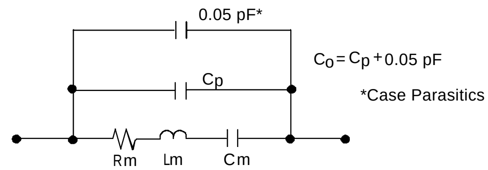
CW RF Power Dissipation = $P_{INCIDENT}$ - $P_{REFLECTED}$

Typical Application Circuits



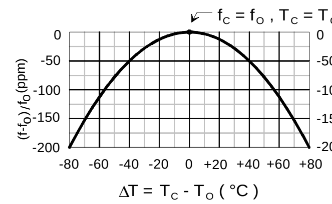


Equivalent LC Model



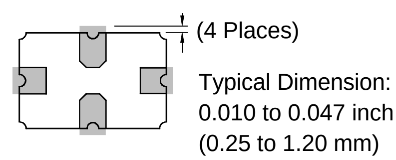
Temperature Characteristics

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



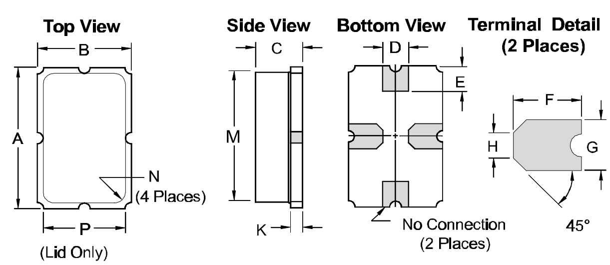
Typical Circuit Board Land Pattern

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.



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

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