RO3023

433.97 MHz SAW Resonator

- ***Ideal for European 433.92 MHz Transmitters***
- ***Low Series Resistance***
- ***Quartz Stability***
- ***Rugged, Hermetic, Low-Profile TO39 Case***

The RO3023 is a true one-port, surface-acoustic-wave (SAW) resonator in a low-profile TO39 case. It provides reliable, fundamental-mode, quartz frequency stabilization of fixed-frequency transmitters operating at 433.92 MHz. The RO3023 is designed specifically for remote-control and wireless security devices 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
Soldering Temperature (10 seconds / 5 cycles max.)	260	°C

Electrical Characteristics

Characteristic		Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency at +25 °C	Absolute Frequency	f_C	2, 3, 4, 5	433.895		434.045	MHz
	Tolerance from 433.970 MHz	Δf_C				±75	kHz
Insertion Loss		IL	2, 5, 6		2.5	4.8	dB
Quality Factor	Unloaded Q	Q_U	5, 6, 7		8,500		
	50 W Loaded Q	Q_L			2200		
Temperature Stability	Turnover Temperature	T_O	6, 7, 8	10	25	40	°C
	Turnover Frequency	f_O			f_c + 2.3		kHz
	Frequency Temperature Coefficient	FTC			0.037		ppm/°C^2
Frequency Aging	Absolute Value during the First Year	|fA|	1		≤10		ppm/yr
DC Insulation Resistance between Any Two Pins			5	1.0			MΩ
RF Equivalent RLC Model	Motional Resistance	R_M	5, 7, 9		34.5		Ω
	Motional Inductance	L_M			107		µH
	Motional Capacitance	C_M			1.3		fF
	Pin 1 to Pin 2 Static Capacitance	C_O	5, 6, 9		2.1		pF
	Transducer Static Capacitance	C_P	5, 6, 7, 9		1.8		pF
Test Fixture Shunt Inductance		L_{TEST}	2, 7		68.2		nH
Lid Symbolization		RFM RO3023 Datecode					

CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.

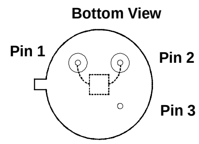
Notes:

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.
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 20°C 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 static (nonmotional) capacitance between Pin1 and Pin 2 measured at low frequency (10 MHz) with a capacitance meter. The measurement includes case parasitic capacitance with a floating case. For usual grounded case applications (with grund connected to either Pin 1 or Pin 2 and to the case), add approximately 0.25 pF to C_O.

Electrical Connections

This one-port, two-terminal SAW resonator is bidirectional. The terminals are interchangeable with the exception of circuit board layout.

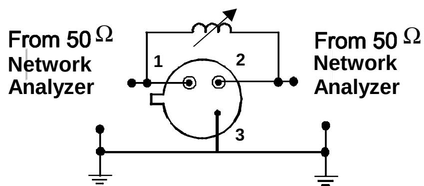
Pin	Connection
1	Terminal 1
2	Terminal 2
3	Case Ground



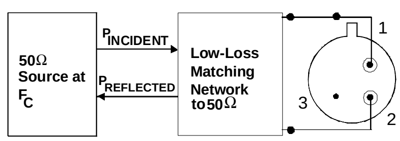
Typical Test Circuit

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

Electrical Test:



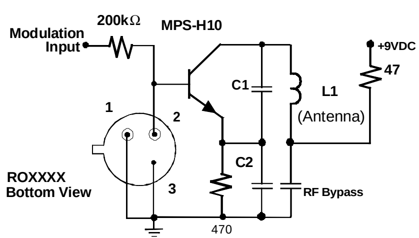
Power Test:



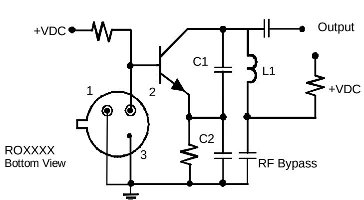
CW RF Power Dissipation = $P_{INCIDENT} - P_{REFLECTED}$

Typical Application Circuits

Typical Low-Power Transmitter Application:

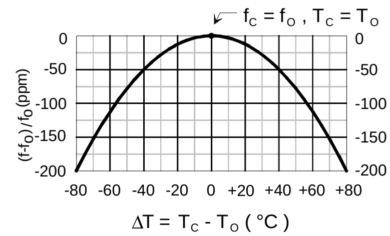


Typical Local Oscillator Application:



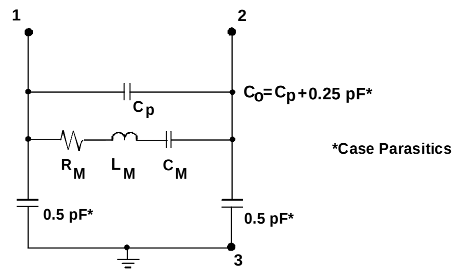
Temperature Characteristics

The curve shown on the right accounts for resonator contribution only and does not include oscillator temperature characteristics.

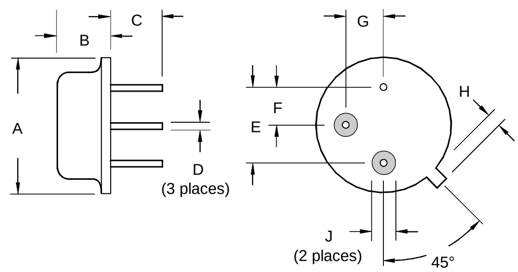


Equivalent LC Model

The following equivalent LC model is valid near resonance:



Case Design



Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A		9.30		0.366
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	