

Approved by:
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Issued by:



Surface-Acoustic-Wave Resonator

SPECIFICATION

LR1 315.00

Ideal for 315.00MHz Transmitters
Low Series Resistance
Quartz Stability
Rugged, Hermetic, Low-profile TO-39 Case

315.00 MHz
 SAW
 Resonator

The LR1 315.00 is a true one-port, surface-acoustic-wave (SAW) resonator in low-profile TO-39 case. It provides reliable, fundamental-mode, quartz frequency stabilization of fixed-frequency transmitters operating at 315 MHz. The LR1 315.00 is designed specifically for wireless remote controls and security transmitters. Typically for automotive-keyless-entry, operating in the USA under FCC Part15, in Canada under DoC RSS-210, and in Italy.



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

Electrical Characteristics

Characteristics	Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency (+25°C) Absolute Frequency	f_c		314.925		315.075	MHz
	Δf_c	2,3,4,5			±75	KHz
Tolerance from 315.000MHz						
Insertion Loss	IL	2,5,6		1.5	2.2	dB
Quality Factor Unloaded Q	Q_U			13.300		
	Q_L	5,6,7		2.000		
Temperature Stability Turnover Temperature	T_O		10	25	40	°C
	f_O	5,7,8		f_c		KHz
	Frequency Temperature Coefficient	FTC		0.037		ppm/°C ²
Frequency Aging Absolute Value during the First Year	$ f_{A} $	1		≤10		ppm/y τ
DC Insulation Resistance between Any Two Pins		5	1.0			MΩ
RF Equivalent RLC Model Motional Resistance	R_M			19	29	Ω
	L_M	5,7,9		127.677		μH
	C_M			1.99943		pF
	Pin 1 to Pin 2 Static Capacitance	C_O	5,6,9	2.3	2.6	2.9
Transducer Static Capacitance	C_P	5,6,7,9		2.3		pF
Test Fixture Shunt Inductance	L_{TEST}	2,7		100		nH
Lid Symbolization (in Addition to Lot and/or Date Code)	LR1 315.00					

CAUTION: electrostatic Sensitive Device, Observe precautions for handling.

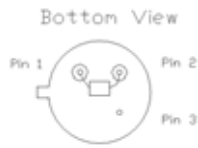
Notes:

- 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 significantly in subsequent years.
- The center frequency, f_c , is measured at the minimum insertion loss point, $I_{L_{MIN}}$ with the resonator in the 50Ω test system (VSWR ≤ 1.2:1). The shunt inductance, L_{TEST} , is turned for parallel resonator with C_O at f_c . Typically, $f_{OSCILLATOR}$ OR $f_{TRANSMITTER}$ is less than the resonator f_c .
- One or more of following United States patents apply: 4,454,488 and 4,616,197 and others pending.
- Typically, equipment designs utilizing this device require emissions testing and government approval, which is the responsibility of the equipment manufacturer.
- Unless noted otherwise, case temperature $T_c = 25°C ± 2°C$.
- 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 parameter: f_c , IL, 3dB bandwidth, f_c versus T_c , and C_O .
- 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 .
- This equivalent RLC model approximates resonators performance near the resonant frequency and is provided for reference only. The capacitance C_O is the static (non-motional) capacitance between pin 1 and pin 2 measured at low frequency (10MHz) with a capacitance meter. The measurement includes case parasitic capacitance with a floating case. For usual grounded case applications (with ground connected to either pin 1 or pin 2 and to the case), add approximately 0.25pF to C_O .

Electrical Connections

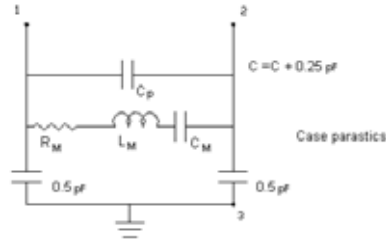
This one-port, two-terminal SAW resonator is bi-directional. The terminals are interchangeable with the exception of circuit board layout.

Pin	Connection
1	Terminal 1
2	Terminal 2
3	Case Ground



Equivalent LC Model

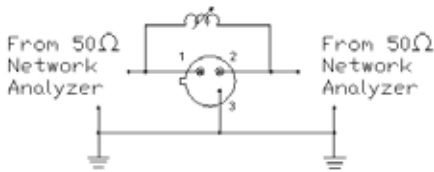
The following equivalent LC model is valid near resonance:



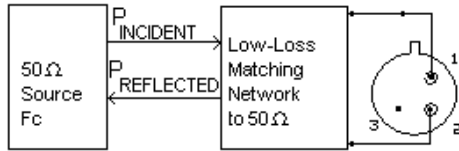
Typical Test Circuit

The test circuit inductor, L_{TEST} , is turned to resonate with the static capacitance, C_0 at F_c .

Electrical Test:

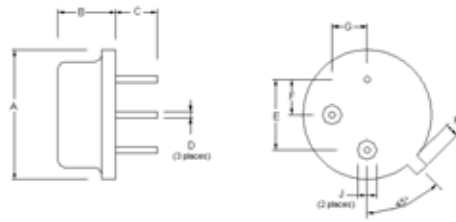


Power Test:



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

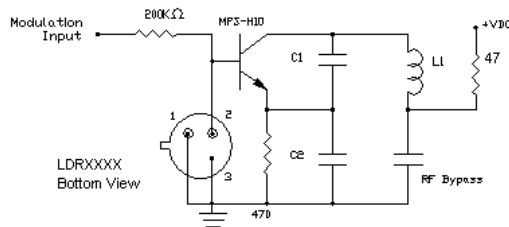
Case Design



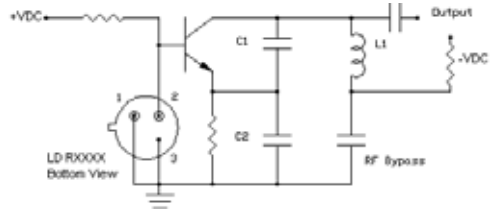
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A		9.30		0.366
B		3.50		0.138
C	2.50	3.50	0.098	0.138
D		0.50 Nominal		0.020 Nominal
E		5.08 Nominal		0.200 Nominal
F		2.54 Nominal		0.100 Nominal
G		2.54 Nominal		0.100 Nominal
H		1.02		0.040
J	1.75		0.069	

Typical Application Circuits

Typical Low-Power Transmitter Application:

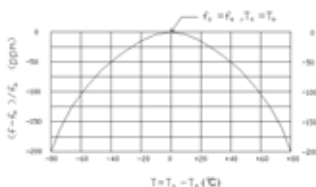


Typical Local Oscillator Application:

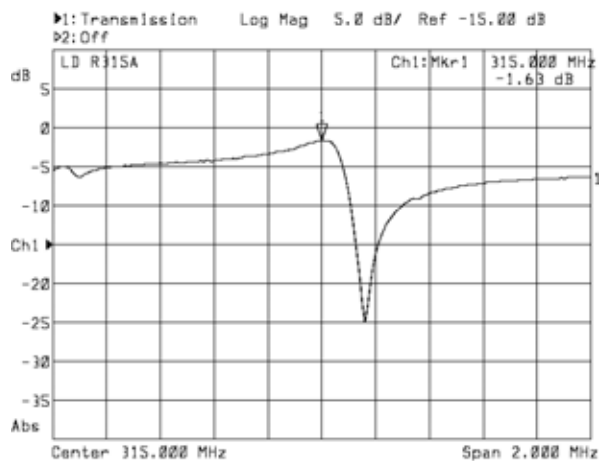


Temperature Characteristics

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



Frequency Response



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