Approved by:
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®
LADDER

Surface-Acoustic-Wave Resonator

SPECIFICATION

LR1 433.92

TO-39 CASE

www.dqladder.com

Ideal for 433.92MHz Transmitters
Low Series Resistance
Quartz Stability
Rugged, Hermetic, Low-profile TO-39 Case

433.92 MHz
SAW
Resonator


TO-39 Case

The LR1-433.92 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 433.92 MHz. The LR1-433.92 is designed specifically for remote-controls and wireless security transmitters. Operating in the Europe underETS11-ETS 300 220 and in Germany under FTZ 17 TR 2100.

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	℃

Electrical Characteristics

Characteristics		Sym	Notes	Minimum	Typical	Maximum	Units
Center Frequency (+25℃)	Absolute Frequency	f_c	2,3,4,5	433.845		433.995	MHz
	Tolerance from 433.920MHz	Δf_c				±75	KHz
Insertion Loss		IL	2,5,6		1.5	2.0	dB
Quality Factor	Unloaded Q	Q_U	5,6,7		12.800		
	50Ω loaded Q	Q_L			2.000		
Temperature Stability	Turnover Temperature	T_O	5,7,8	24	39	54	℃
	Turnover Frequency	f_O			f_c+2.7		KHz
	Frequency Temperature Coefficient	FTC			0.037		ppm/℃^{2}
Frequency Aging	Absolute Value during the First Year	$\|f_A\|$	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		18	26	Ω
	Motional Inductance	L_M			86.0075		μH
	Motional Capacitance	C_M			1.56417		pF
	Pin 1 to Pin 2 Static Capacitance	C_O	5,6,9	1.7	2.0	2.3	pF
	Transducer Static Capacitance	C_P	5,6,7,9		1.7		pF
Test Fixture Shunt Inductance		L_{TEST}	2,7		78		nH
Lid Symbolization (in Addition to Lot and/or Date Code		LR1 433.92					

CAUTION: electrostatic Sensitive Device, Observe precautions for handling.

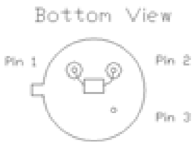
Notes:

1. Frequency aging is the change in f_C with time and is specified at +65℃ or less. Aging may exceed the specification for prolonged temperatures above +65℃. Typically, aging is greatest the first year after manufacture, decreasing significantly in subsequent years.
2. The center frequency, f_C, is measured at the minimum insertion loss point, IL_{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.
3. One or more of following United States patents apply:4,454,488 and 4,616,197 and others pending.
4. Typically, equipment designs utilizing this device require emissions testing and government approval, which is the responsibility of the equipment manufacturer.
5. Unless noted otherwise, case temperature T_c=25℃±2℃.
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 parameter: f_c, IL, 3dB 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℃ less than the specified *resonator* T_o.
9. 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

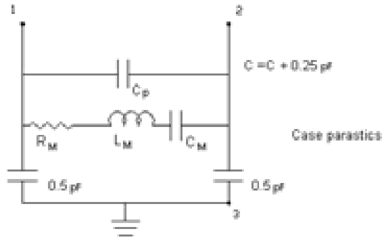
This one-port, two-terminal SAW resonator is bi-directional. The terminals are interchangeable with the exception of circuit board layout.

Pin	Connection
1	Terminal 1
2	Terminal 2
3	Case Ground



Equivalent LC Model

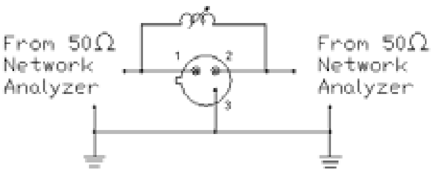
The following equivalent LC model is valid near resonance:



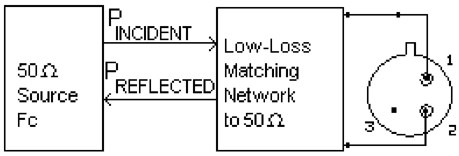
Typical Test Circuit

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

Electrical Test:

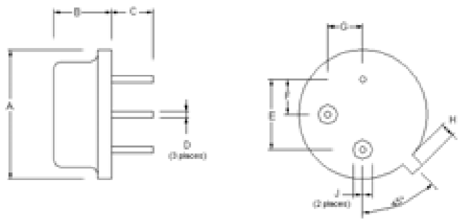


Power Test:



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

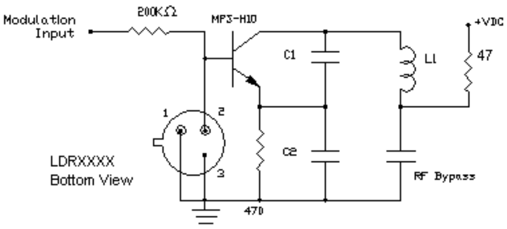
Case Design



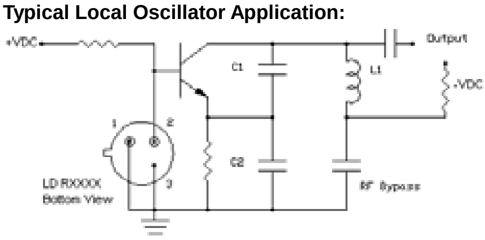
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A		9.30		0.366
B		3.50		0.138
C	2.50	3.50	0.098	0.138
D	0.50 Nominal		0.020 Nominal	
E	5.08 Nominal		0.200 Nominal	
F	2.54Nominal		0.100 Nominal	
G	2.54Nominal		0.100 Nominal	
H		1.02		0.040
J	1.75		0.069	

Typical Application Circuits

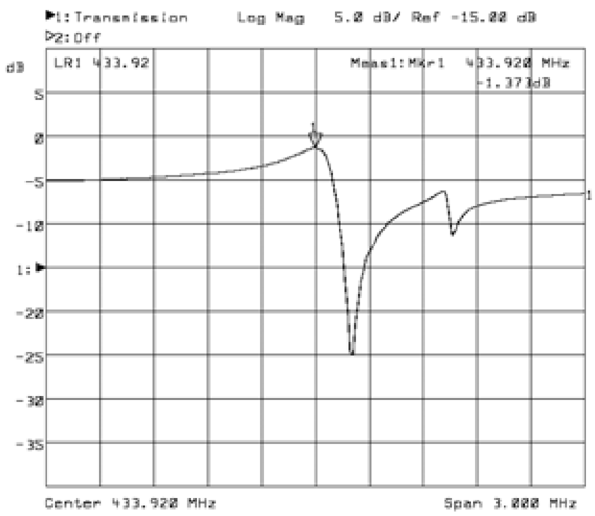
Typical Low-Power Transmitter Application:



Typical Local Oscillator Application:

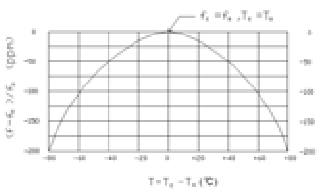


Frequency Response



Temperature Characteristics

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



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