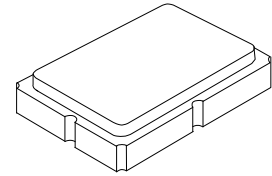


RO3156A/A-1/A-2

868.95 MHz SAW Resonator



SM5035-4

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

The RO3156A is a one-port surface-acoustic-wave (SAW) resonator packaged in a surface-mount ceramic case. It provides reliable, fundamental-mode quartz frequency stabilization of fixed-frequency transmitters operating at 868.95 MHz. The RO3156A is designed specifically for SRD transmitters operating in Europe under ETSI EN 300 220-2.

Absolute Maximum Ratings

| Rating | Value | Units |
|--|------------|-------|
| CW RF Power Dissipation | +5 | dBm |
| DC Voltage Between Terminals | ±30 | VDC |
| Case Temperature | -40 to +85 | °C |
| Soldering Temperature, 10 seconds / 5 cycles maximum | 260 | °C |

Electrical Characteristics

| Characteristic | | Sym | Notes | Minimum | Typical | Maximum | Units | |
|--|--|--------------|------------|---------|---------|---------|------------|---------------------|
| Frequency, +25 °C | RO3156A | f_C | 2,3,4,5 | 868.750 | | 869.150 | MHz | |
| | RO3156A-1 | | | 868.800 | | 869.100 | | |
| | RO3156A-2 | | | 868.850 | | 869.050 | | |
| Tolerance from 868.95 MHz | RO3156A | Δf_C | | | | ±200 | kHz | |
| | RO3156A-1 | | | | | ±150 | | |
| | RO3156A-2 | | | | | ±100 | | |
| Insertion Loss | | IL | 2,5,6 | | 1.2 | 2.0 | dB | |
| Quality Factor | Unloaded Q | Q_U | 5,6,7 | | 6200 | | | |
| | 50 Ω Loaded Q | Q_L | | | 850 | | | |
| 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 ² |
| Frequency Aging | Absolute Value during the First Year | fA | 1 | | <±10 | | ppm/yr | |
| DC Insulation Resistance between Any Two Terminals | | | 5 | 1.0 | | | M Ω | |
| RF Equivalent RLC Model | Motional Resistance | R_M | 5, 6, 7, 9 | | 14.5 | | Ω | |
| | Motional Inductance | L_M | | | 18.0 | | μ H | |
| | Motional Capacitance | C_M | | | | 2.0 | | fF |
| | Shunt Static Capacitance | C_O | | 5, 6, 9 | | 2.1 | | pF |
| Test Fixture Shunt Inductance | | L_{TEST} | 2, 7 | | 15.8 | | nH | |
| Lid Symbolization | RO3156A: 714, RO3156A-1: 923, RO3156A-2 828, //YYWWS | | | | | | | |



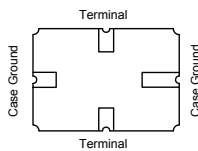
CAUTION: Electrostatic Sensitive Device. Observe precautions for handling.

NOTES:

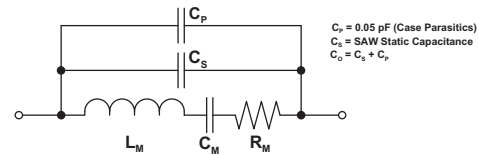
1. Frequency aging is the change in f_c with time and is specified at +65 °C or less. Aging may exceed the specification for prolonged temperatures above +65 °C. Typically, aging is greatest the first year after manufacture, decreasing in subsequent years.
2. The center frequency, f_c , is measured at the minimum insertion loss point, IL_{MIN} , with the resonator in the 50 Ω test system ($VSWR \leq 1.2:1$). 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 $T_C = +25 \pm 2$ °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 be calculated as: $C_P = C_O - 0.05$ 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.



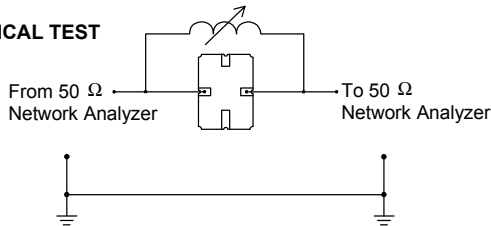
Equivalent RLC Model



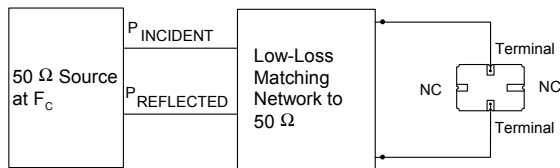
Typical Test Circuit

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

ELECTRICAL TEST



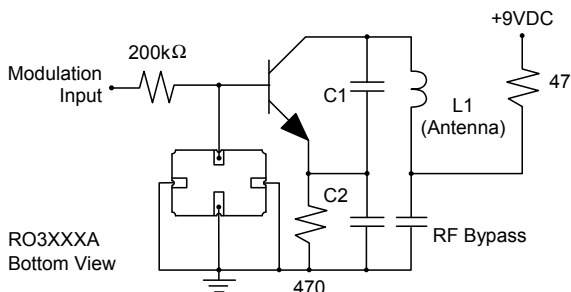
POWER TEST



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

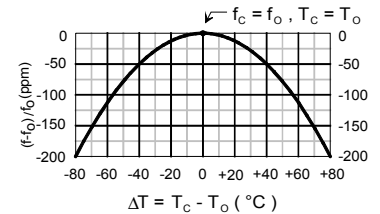
Typical Application Circuits

Typical Low-Power Transmitter Application

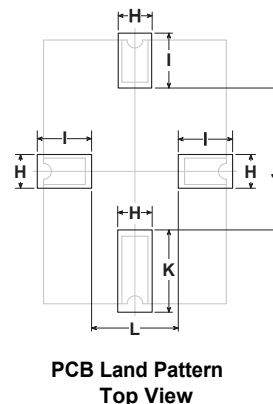
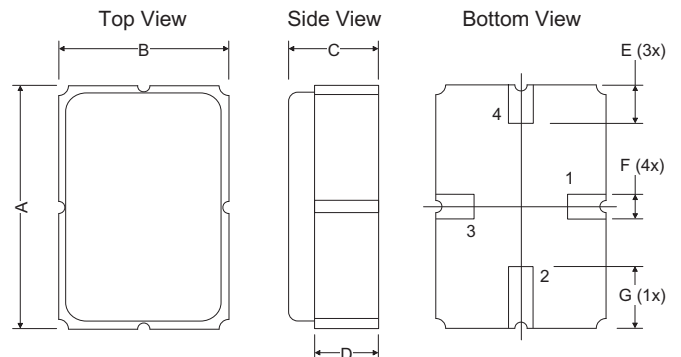


Temperature Characteristics

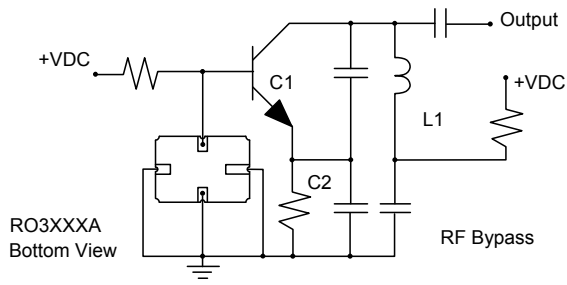
The curve shown on the right accounts for resonator contribution only and does not include LC component temperature contributions.



Case



Typical Local Oscillator Applications



| Dimensions | Millimeters | | | Inches | | |
|------------|-------------|------|------|--------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 4.87 | 5.00 | 5.13 | 0.191 | 0.196 | 0.201 |
| B | 3.37 | 3.50 | 3.63 | 0.132 | 0.137 | 0.142 |
| C | 1.45 | 1.53 | 1.60 | 0.057 | 0.060 | 0.062 |
| D | 1.35 | 1.43 | 1.50 | 0.040 | 0.057 | 0.059 |
| E | 0.67 | 0.80 | 0.93 | 0.026 | 0.031 | 0.036 |
| F | 0.37 | 0.50 | 0.63 | 0.014 | 0.019 | 0.024 |
| G | 1.07 | 1.20 | 1.33 | 0.042 | 0.047 | 0.052 |
| H | - | 1.04 | - | - | 0.041 | - |
| I | - | 1.46 | - | - | 0.058 | - |
| J | - | 3.01 | - | - | 0.119 | - |
| K | - | 1.44 | - | - | 0.057 | - |
| L | - | 1.92 | - | - | 0.076 | - |