*Coaxial*

# Voltage Controlled Oscillator

# ZX95-4424+

## 5V Tuning for PLL IC's 4420 to 4430 MHz

### Features

- linear tuning characteristics
- low phase noise
- low pushing
- protected by US patent 6,790,049

### Applications

- r & d
- lab
- instrumentation
- wireless communications
- test equipment

CASE STYLE: GB956

| Connectors | Model |
|---|---|
| **SMA** | ZX95-4424-S+ |

***+RoHS Compliant***

*The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications*

### Electrical Specifications

| MODEL NO. | FREQ. (MHz) | | POWER OUTPUT (dBm) | PHASE NOISE dBc/Hz SSB at offset frequencies,kHz Typ. | | | | TUNING | | | | | NON HARMONIC SPURIOUS (dBc) | HARMONICS (dBc) | | PULLING pk-pk @12 dBr (MHz) | PUSHING (MHz/V) | DC OPERATING POWER | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | VOLTAGE RANGE (V) | | SENSI-TIVITY (MHz/V) | PORT CAP (pF) | 3 dB MODULATION BANDWIDTH (MHz) | | | | | | Vcc (volts) | Current (mA) |
| | Min. | Max. | Typ. | 1 | 10 | 100 | 1000 | Min. | Max. | Typ. | Typ. | Typ. | Typ. | Typ. | Max. | Typ. | Typ. | | Max. |
| ZX95-4424+ | 4420 | 4430 | +7.5 | -76 | -99 | -119 | -139 | 0.5 | 5 | 21 | 20 | 100 | -90 | -27 | -17 | 6 | 1.4 | 5 | 51 |

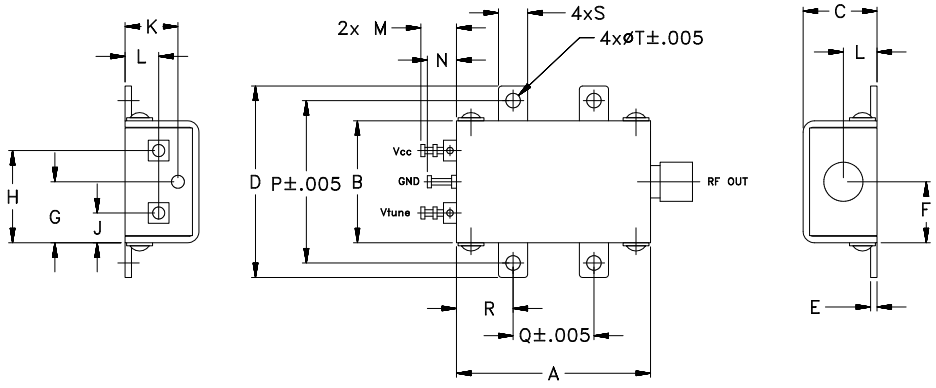
### Maximum Ratings

| | |
|---|---|
| Operating Temperature | -55°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| Absolute Max. Supply Voltage (Vcc) | 7V |
| Absolute Max. Tuning Voltage (Vtune) | 7V |
| All specifications | 50 ohm system |

Permanent damage may occur if any of these limits are exceeded.

*NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminals. See Application Note AN-40-10 .*

### Outline Drawing




### Outline Dimensions (inch / mm)

| A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | S | T | wt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.20** | **.75** | **.46** | **1.18** | **.04** | **.38** | **.38** | **.57** | **.18** | **.33** | **.21** | **.22** | **.18** | **1.00** | **.50** | **.35** | **.18** | **.106** | grams |
| 30.48 | 19.05 | 11.68 | 29.97 | 1.02 | 9.65 | 9.65 | 14.48 | 4.57 | 8.38 | 5.33 | 5.59 | 4.57 | 25.40 | 12.70 | 8.89 | 4.57 | 2.69 | 35.0 |

**Notes**

**A.** Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
**B.** Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
**C.** The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

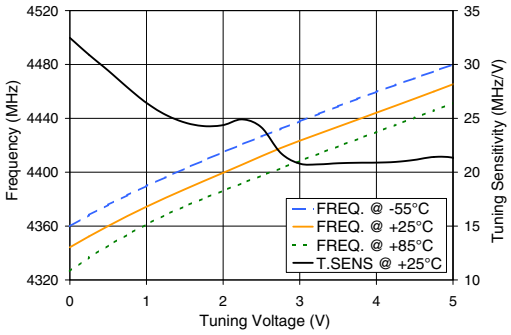
# Performance Data & Curves*

# ZX95-4424+

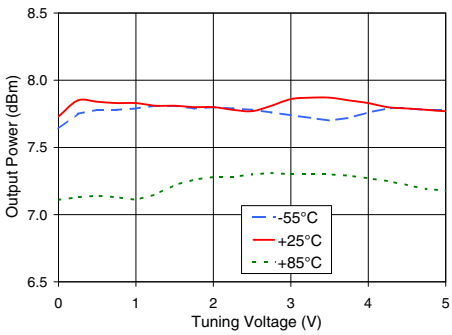
| V TUNE | TUNE SENS (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | | Icc (mA) | HARMONICS (dBc) | | | FREQ. PUSH (MHz/V) | FREQ. PULL (MHz) | PHASE NOISE (dBc/Hz) at offsets | | | | FREQ OFFSET (KHz) | PHASE NOISE at 4425 MHz (dBc/Hz) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -55°C | +25°C | +85°C | -55°C | +25°C | +85°C | | F2 | F3 | F4 | | | 1kHz | 10kHz | 100kHz | 1MHz | | |
| 0.00 | 32.47 | 4359.8 | 4344.2 | 4326.5 | 7.64 | 7.73 | 7.11 | 44.64 | -29.4 | -42.7 | -63.1 | 1.17 | 5.31 | -73.1 | -99.3 | -120.1 | -140.7 | 1.0 | -75.60 |
| 0.50 | 29.44 | 4375.8 | 4360.1 | 4345.6 | 7.78 | 7.84 | 7.14 | 44.72 | -28.7 | -43.0 | -61.0 | 1.33 | 5.70 | -75.6 | -100.4 | -120.0 | -140.4 | 2.0 | -82.81 |
| 0.75 | 27.88 | 4382.9 | 4367.4 | 4353.6 | 7.78 | 7.83 | 7.13 | 44.71 | -28.7 | -43.4 | -57.8 | 1.37 | 6.18 | -77.8 | -99.2 | -119.7 | -139.5 | 3.5 | -88.96 |
| 1.00 | 26.44 | 4389.8 | 4374.4 | 4361.2 | 7.79 | 7.83 | 7.11 | 44.70 | -28.7 | -43.3 | -56.7 | 1.38 | 4.52 | -77.2 | -99.1 | -119.6 | -139.6 | 6.0 | -94.49 |
| 1.25 | 25.33 | 4396.4 | 4381.0 | 4368.4 | 7.81 | 7.81 | 7.15 | 44.68 | -28.8 | -43.2 | -54.8 | 1.38 | 3.36 | -75.7 | -99.3 | -119.8 | -140.0 | 8.5 | -96.97 |
| 1.50 | 24.61 | 4402.7 | 4387.3 | 4374.7 | 7.81 | 7.81 | 7.22 | 44.66 | -28.8 | -43.2 | -54.0 | 1.37 | 4.39 | -75.2 | -99.6 | -119.7 | -139.7 | 10.0 | -99.05 |
| 1.75 | 24.28 | 4408.8 | 4393.5 | 4380.6 | 7.79 | 7.80 | 7.26 | 44.64 | -28.7 | -43.3 | -53.0 | 1.39 | 5.46 | -77.2 | -99.7 | -119.5 | -139.7 | 20.8 | -105.80 |
| 2.00 | 24.38 | 4414.8 | 4399.6 | 4386.3 | 7.80 | 7.80 | 7.28 | 44.61 | -28.5 | -43.2 | -52.3 | 1.41 | 5.59 | -76.9 | -99.0 | -119.3 | -139.3 | 35.5 | -111.00 |
| 2.25 | 24.91 | 4420.7 | 4405.6 | 4391.8 | 7.79 | 7.78 | 7.28 | 44.58 | -28.5 | -43.2 | -51.0 | 1.47 | 4.60 | -75.1 | -99.1 | -119.3 | -139.1 | 60.7 | -115.24 |
| 2.50 | 24.16 | 4426.5 | 4411.9 | 4397.4 | 7.78 | 7.77 | 7.30 | 44.56 | -28.6 | -43.0 | -51.4 | 1.52 | 2.54 | -74.8 | -98.5 | -119.3 | -138.7 | 86.7 | -118.46 |
| 2.75 | 21.80 | 4432.1 | 4417.9 | 4402.9 | 7.76 | 7.81 | 7.31 | 44.59 | -28.9 | -42.8 | -51.1 | 1.43 | 4.38 | -76.6 | -99.6 | -119.6 | -139.2 | 100.0 | -119.80 |
| 3.00 | 20.80 | 4437.8 | 4423.4 | 4408.4 | 7.74 | 7.86 | 7.30 | 44.62 | -29.3 | -43.1 | -50.9 | 1.33 | 6.27 | -75.9 | -99.2 | -120.2 | -140.0 | 148.1 | -122.99 |
| 3.25 | 20.73 | 4443.3 | 4428.6 | 4413.8 | 7.72 | 7.87 | 7.30 | 44.62 | -29.6 | -43.0 | -51.2 | 1.33 | 6.62 | -75.5 | -99.3 | -120.2 | -141.0 | 177.0 | -124.73 |
| 3.50 | 20.83 | 4448.9 | 4433.7 | 4419.2 | 7.70 | 7.87 | 7.30 | 44.62 | -29.8 | -42.9 | -51.2 | 1.35 | 5.41 | -77.5 | -99.4 | -119.8 | -140.2 | 211.6 | -125.91 |
| 3.75 | 20.88 | 4454.4 | 4439.0 | 4424.5 | 7.72 | 7.85 | 7.29 | 44.60 | -29.9 | -42.7 | -50.7 | 1.37 | 5.07 | -77.6 | -99.0 | -120.1 | -139.6 | 302.4 | -128.84 |
| 4.00 | 20.89 | 4459.7 | 4444.2 | 4429.8 | 7.76 | 7.83 | 7.27 | 44.58 | -29.8 | -42.5 | -50.5 | 1.38 | 5.50 | -74.0 | -99.5 | -119.3 | -139.3 | 361.5 | -130.14 |
| 4.25 | 20.96 | 4464.8 | 4449.4 | 4435.2 | 7.79 | 7.80 | 7.25 | 44.56 | -29.7 | -42.3 | -51.1 | 1.40 | 4.80 | -76.5 | -98.9 | -119.8 | -139.3 | 507.5 | -133.53 |
| 4.50 | 21.14 | 4469.8 | 4454.6 | 4440.5 | 7.79 | 7.79 | 7.22 | 44.54 | -29.5 | -42.1 | -50.6 | 1.41 | 5.57 | -77.6 | -99.6 | -120.3 | -140.3 | 606.7 | -135.45 |
| 4.75 | 21.41 | 4474.9 | 4459.9 | 4445.8 | 7.78 | 7.78 | 7.19 | 44.52 | -29.3 | -41.9 | -50.1 | 1.45 | 6.09 | -76.0 | -99.5 | -119.8 | -140.0 | 851.6 | -137.93 |
| 5.00 | 21.35 | 4480.0 | 4465.3 | 4451.2 | 7.78 | 7.77 | 7.18 | 44.50 | -29.5 | -41.9 | -50.1 | 1.46 | 6.63 | -73.7 | -99.5 | -120.1 | -139.3 | 1000.0 | -139.15 |

*at 25°C unless mentioned otherwise

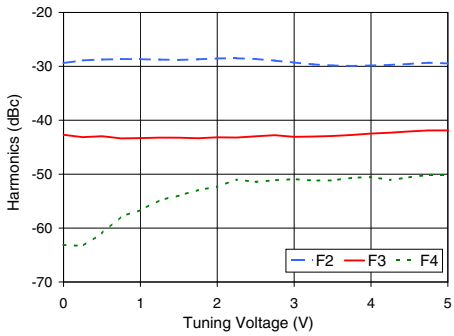
ZX95-4424+
Frequency and Tuning Sensitivity



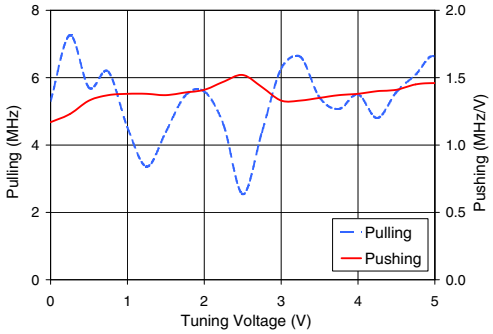

ZX95-4424+
Power Output



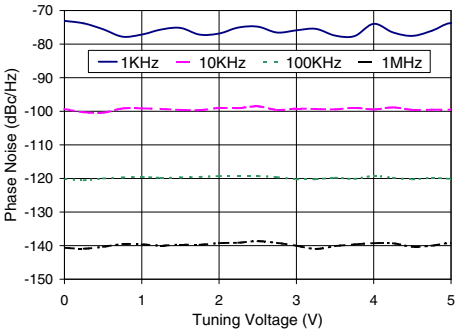

ZX95-4424+
Harmonics Level



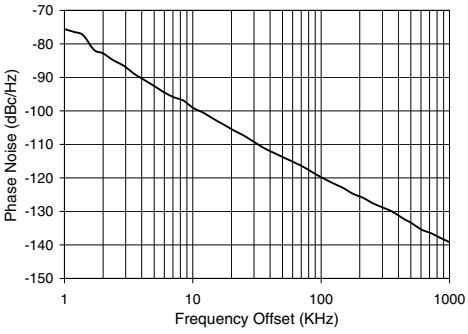

ZX95-4424+
Frequency Pulling & Pushing (Vcc ± 5%)




ZX95-4424+
Phase Noise Vs. Tuning Voltage




ZX95-4424+
Phase Noise

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# Voltage Controlled Oscillator ZX95-4424+

## *Typical Performance Data*

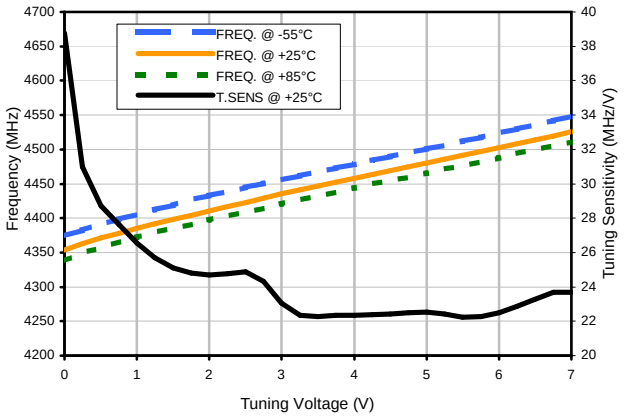
| V TUNE | TUNE SENS (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | | HARMONICS (dBc) | | | FREQ. PUSH (MHz/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -55ºC | +25ºC | +85ºC | -55ºC | +25ºC | +85ºC | F2 | F3 | F4 | |
| 0.0 | 38.79 | 4373.9 | 4353.5 | 4338.1 | 7.12 | 6.61 | 5.08 | -28.5 | -42.8 | -52.6 | 1.47 |
| 0.3 | 30.98 | 4382.7 | 4363.2 | 4348.6 | 7.11 | 6.70 | 5.19 | -28.5 | -43.1 | -51.6 | 1.37 |
| 0.5 | 28.72 | 4390.7 | 4370.9 | 4357.8 | 7.12 | 6.77 | 5.25 | -28.2 | -42.9 | -51.0 | 1.31 |
| 0.8 | 27.63 | 4398.2 | 4378.1 | 4365.8 | 7.15 | 6.77 | 5.33 | -27.8 | -43.0 | -50.6 | 1.35 |
| 1.0 | 26.57 | 4405.3 | 4385.0 | 4372.6 | 7.20 | 6.76 | 5.41 | -27.4 | -43.0 | -50.3 | 1.38 |
| 1.3 | 25.70 | 4412.3 | 4391.6 | 4379.0 | 7.26 | 6.76 | 5.43 | -27.2 | -43.0 | -50.0 | 1.38 |
| 1.5 | 25.12 | 4419.2 | 4398.1 | 4385.2 | 7.32 | 6.79 | 5.44 | -27.2 | -43.2 | -50.0 | 1.39 |
| 1.8 | 24.80 | 4426.0 | 4404.3 | 4391.2 | 7.39 | 6.82 | 5.46 | -27.2 | -43.3 | -50.5 | 1.41 |
| 2.0 | 24.69 | 4432.5 | 4410.5 | 4397.2 | 7.48 | 6.87 | 5.48 | -27.3 | -43.5 | -50.0 | 1.43 |
| 2.3 | 24.78 | 4438.6 | 4416.7 | 4403.0 | 7.57 | 6.92 | 5.52 | -27.3 | -43.5 | -49.8 | 1.46 |
| 2.5 | 24.87 | 4444.4 | 4422.9 | 4408.8 | 7.61 | 6.97 | 5.55 | -27.2 | -43.6 | -50.2 | 1.49 |
| 2.8 | 24.33 | 4450.2 | 4429.1 | 4414.5 | 7.62 | 7.04 | 5.60 | -26.9 | -43.5 | -49.9 | 1.53 |
| 3.0 | 23.07 | 4456.0 | 4435.2 | 4420.3 | 7.63 | 7.11 | 5.64 | -26.6 | -43.1 | -49.9 | 1.50 |
| 3.3 | 22.34 | 4461.7 | 4441.0 | 4426.1 | 7.62 | 7.17 | 5.68 | -26.2 | -42.4 | -50.4 | 1.45 |
| 3.5 | 22.29 | 4467.5 | 4446.6 | 4432.1 | 7.61 | 7.19 | 5.74 | -26.0 | -41.9 | -50.8 | 1.45 |
| 3.8 | 22.33 | 4473.1 | 4452.1 | 4438.0 | 7.58 | 7.21 | 5.80 | -25.8 | -41.7 | -51.4 | 1.48 |
| 4.0 | 22.34 | 4478.8 | 4457.7 | 4443.7 | 7.57 | 7.21 | 5.85 | -25.8 | -41.7 | -53.7 | 1.51 |
| 4.3 | 22.37 | 4484.4 | 4463.3 | 4449.2 | 7.56 | 7.20 | 5.88 | -25.8 | -41.4 | -58.4 | 1.54 |
| 4.5 | 22.42 | 4490.0 | 4468.9 | 4454.7 | 7.55 | 7.18 | 5.91 | -25.9 | -41.3 | -55.1 | 1.57 |
| 4.8 | 22.50 | 4495.6 | 4474.5 | 4460.2 | 7.54 | 7.16 | 5.92 | -26.1 | -41.3 | -50.9 | 1.60 |
| 5.0 | 22.53 | 4501.1 | 4480.1 | 4465.7 | 7.54 | 7.15 | 5.91 | -26.2 | -41.4 | -50.3 | 1.61 |
| 5.3 | 22.42 | 4506.7 | 4485.8 | 4471.3 | 7.55 | 7.15 | 5.89 | -26.2 | -41.6 | -49.5 | 1.63 |
| 5.5 | 22.24 | 4512.3 | 4491.4 | 4476.9 | 7.55 | 7.14 | 5.87 | -26.2 | -41.7 | -49.6 | 1.62 |
| 5.8 | 22.27 | 4518.0 | 4496.9 | 4482.5 | 7.55 | 7.14 | 5.87 | -26.1 | -41.6 | -49.6 | 1.61 |
| 6.0 | 22.51 | 4523.7 | 4502.5 | 4488.1 | 7.56 | 7.14 | 5.86 | -26.0 | -41.8 | -50.0 | 1.62 |
| 6.3 | 22.88 | 4529.7 | 4508.1 | 4493.8 | 7.55 | 7.14 | 5.84 | -25.9 | -41.9 | -50.6 | 1.64 |
| 6.5 | 23.26 | 4535.7 | 4513.8 | 4499.5 | 7.56 | 7.15 | 5.83 | -25.9 | -42.3 | -50.9 | 1.65 |
| 6.8 | 23.70 | 4541.9 | 4519.7 | 4505.2 | 7.57 | 7.16 | 5.83 | -26.0 | -42.8 | -51.3 | 1.67 |
| 7.0 | 23.70 | 4548.1 | 4525.6 | 4511.0 | 7.60 | 7.17 | 5.85 | -26.1 | -42.8 | -52.0 | 1.69 |

| FREQ OFFSET (KHz) | PHASE NOISE (dBc/Hz) |
|---|---|
| 1 | -75 |
| 10 | -99 |
| 100 | -119 |
| 1000 | -138 |

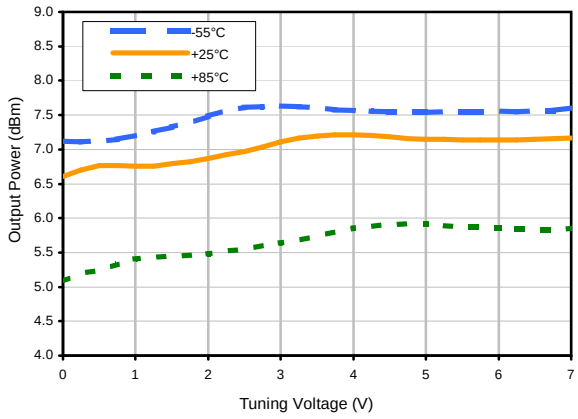
# Voltage Controlled Oscillator ZX95-4424+

## *Typical Performance Data*

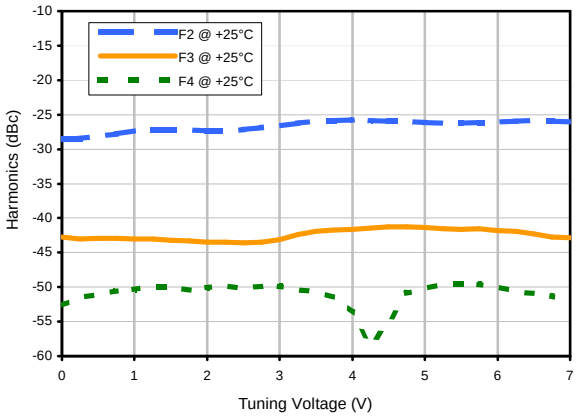
**Frequency and Tuning Sensitivity**



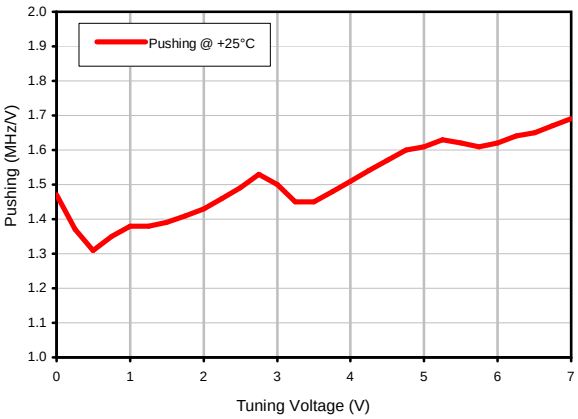

**Power Output**



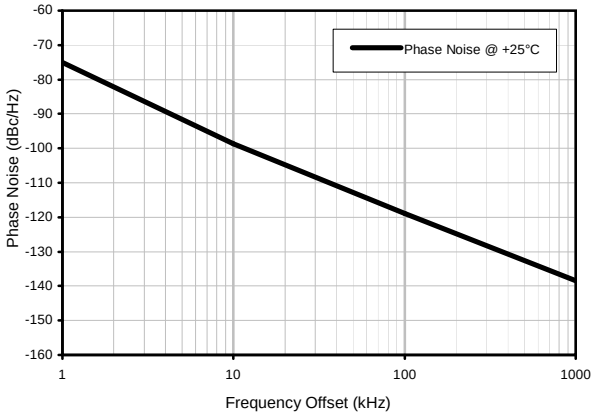

**Harmonics Level**




**Frequency Pushing**



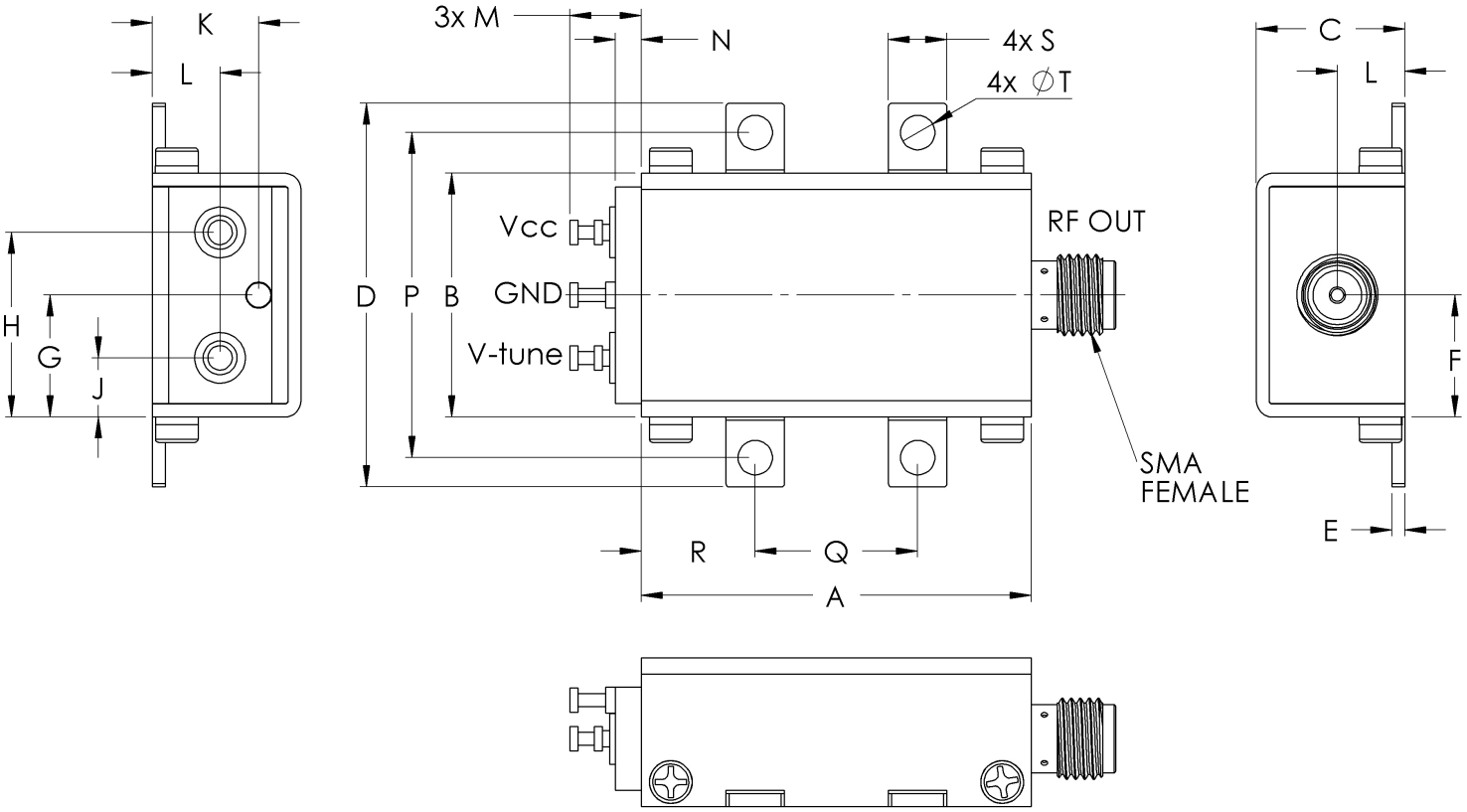

**Phase Noise**



# Case Style GB

## Outline Dimensions

**GB956**




| CASE #. | A | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GB956 | 1.20 (30.48) | .75 (19.15) | .46 (11.61) | 1.18 (30.07) | .04 (1.02) | .38 (9.53) | .38 (9.53) | .57 (14.43) | .18 (4.62) | .33 (8.31) | .21 (5.28) | .22 (5.59) | .08 (2.03) |

| CASE #. | P | Q | R | S | T | WT GRAMS |
|---|---|---|---|---|---|---|
| GB956 | 1.00 (25.4) | .50 (12.7) | .35 (8.89) | .18 (4.57) | .106 (2.69) | 35 |

**Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015**
**Tolerance on hole size and interaxes dimensions to be ± .005.**

**Note:**

1. Case material: Brass
2. Case finish: Nickel plate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**Environmental Specifications** **ENV28T8**

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification | Test/Inspection Condition | Reference/Spec |
|---|---|---|
| Operating Temperature | -55° to 85°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103 |
| Thermal Shock | -65° to 125°C, 5 cycles | MIL-STD-202, Method 107, Condition B |
| Vibration (High Frequency) | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36) | MIL-STD-202, Method 204, Condition D |
| Mechanical Shock | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18) | MIL-STD-202, Method 213, Condition I |


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