COAXIAL

# Low Phase Noise Amplifier ZX60-43LPN+

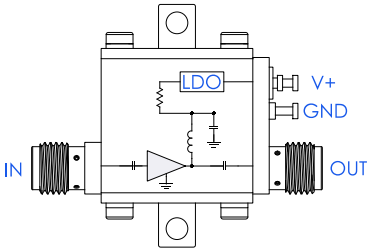
50Ω 0.5 to 4000 MHz SMA Female

## KEY FEATURES

- Wide Bandwidth, 0.5 to 4000 MHz
- Output Power, +21 dBm Typ.
- Voltage Regulated Internally and Reverse Voltage Protected
- Low Additive Phase Noise, Typ. -167 dBc/Hz @10 KHz Offset
- Protected by US Patent 6,790,049 & 6,943,629


*Generic photo used for illustration purposes only*

## FUNCTIONAL DIAGRAM




## APPLICATIONS

- Microwave Point to Point Radios
- Military EW and Radar
- Satellite Systems

## PRODUCT OVERVIEW

Mini-Circuits' ZX60-43LPN+ utilizes an advanced wideband amplifier fabricated using InGaP HBT technology that provides low additive phase noise and offers excellent gain over a broad frequency range. In addition, the ZX60-43LPN+ has medium output power and high linearity to support a wide range of applications where high performance is needed. Housed in a rugged, compact unibody case (0.74 x 0.75 x 0.46") with SMA connectors, making it an excellent candidate for tough operating conditions and crowded system layouts.

## ELECTRICAL SPECIFICATIONS AT +25°C BASEPLATE

| Parameter | Condition (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | 0.5 | | 4000 | MHz |
| Gain | 0.5 - 1000 | — | 23 | — | dB |
| | 1000 - 2000 | — | 21 | — | |
| | 2000 - 4000 | — | 18 | — | |
| Output Power at 1 dB Compression (P1dB) | 100 - 4000 | — | +21 | — | dBm |
| Output Third Order Intercept Point (OIP3) | 0.5 - 4000 | — | +34 | — | dBm |
| Input Return Loss | 0.5 - 4000 | — | 18 | — | dB |
| Output Return Loss | 0.5 - 4000 | — | 9.5 | — | dB |
| Directivity | | — | 7-9 | — | dB |
| Additive Phase Noise @10 kHz Offset | | — | -167 | — | dBc/Hz |
| DC Supply Voltage (Vs) | | +5.9 | +6 | +9 | V |
| DC Current[1] | | — | 120 | 150 | mA |

1. DC Current at P1dB/Psat as applicable.

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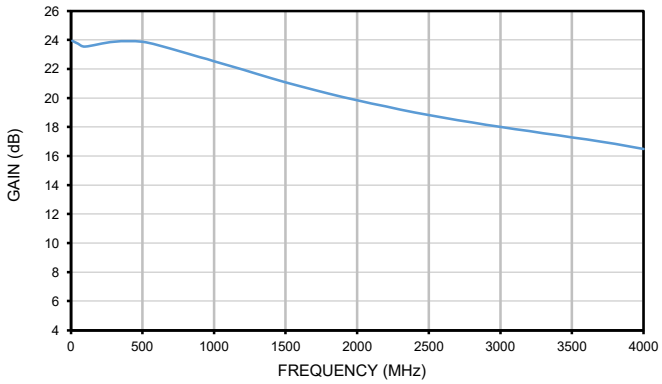
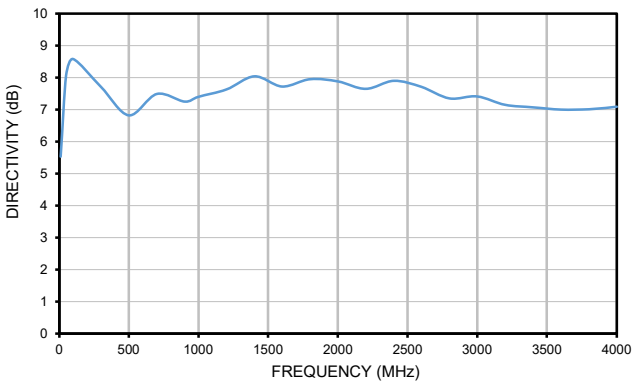
## TYPICAL PERFORMANCE GRAPHS

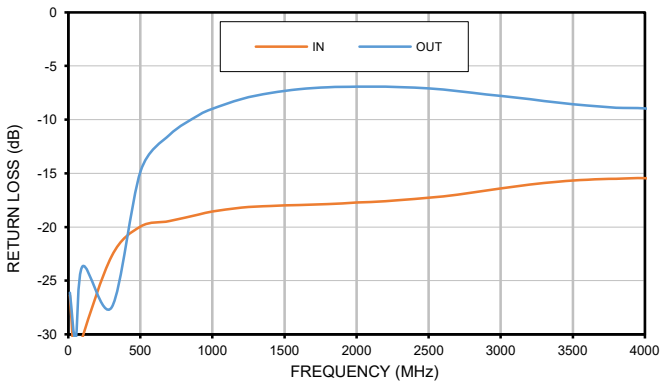
### GAIN



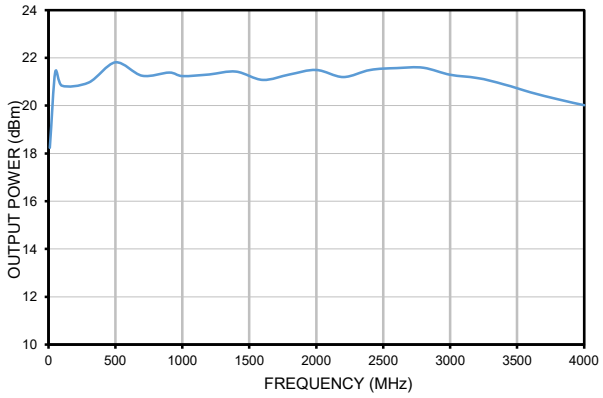

### DIRECTIVITY



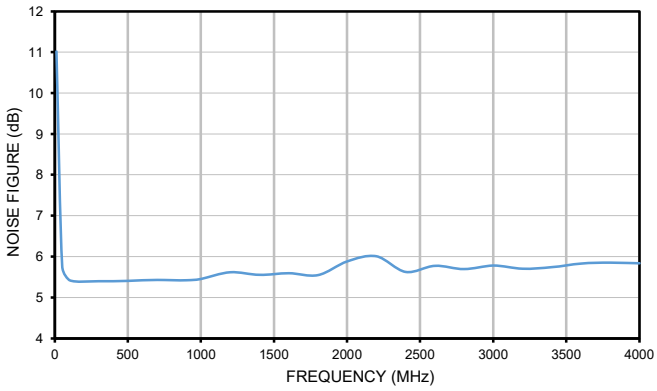

### RETURN LOSS



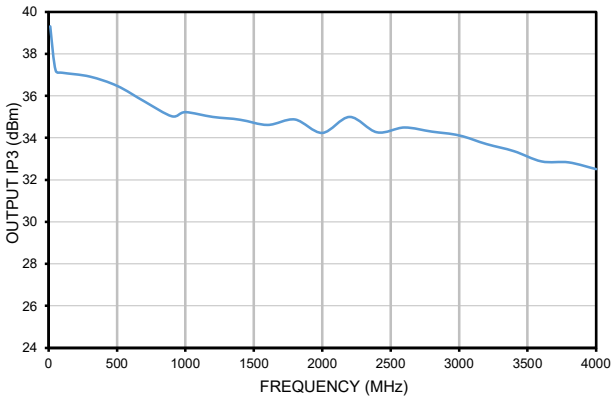

### OUTPUT POWER AT 1dB COMPRESSION




### NOISE FIGURE




### OUTPUT IP3



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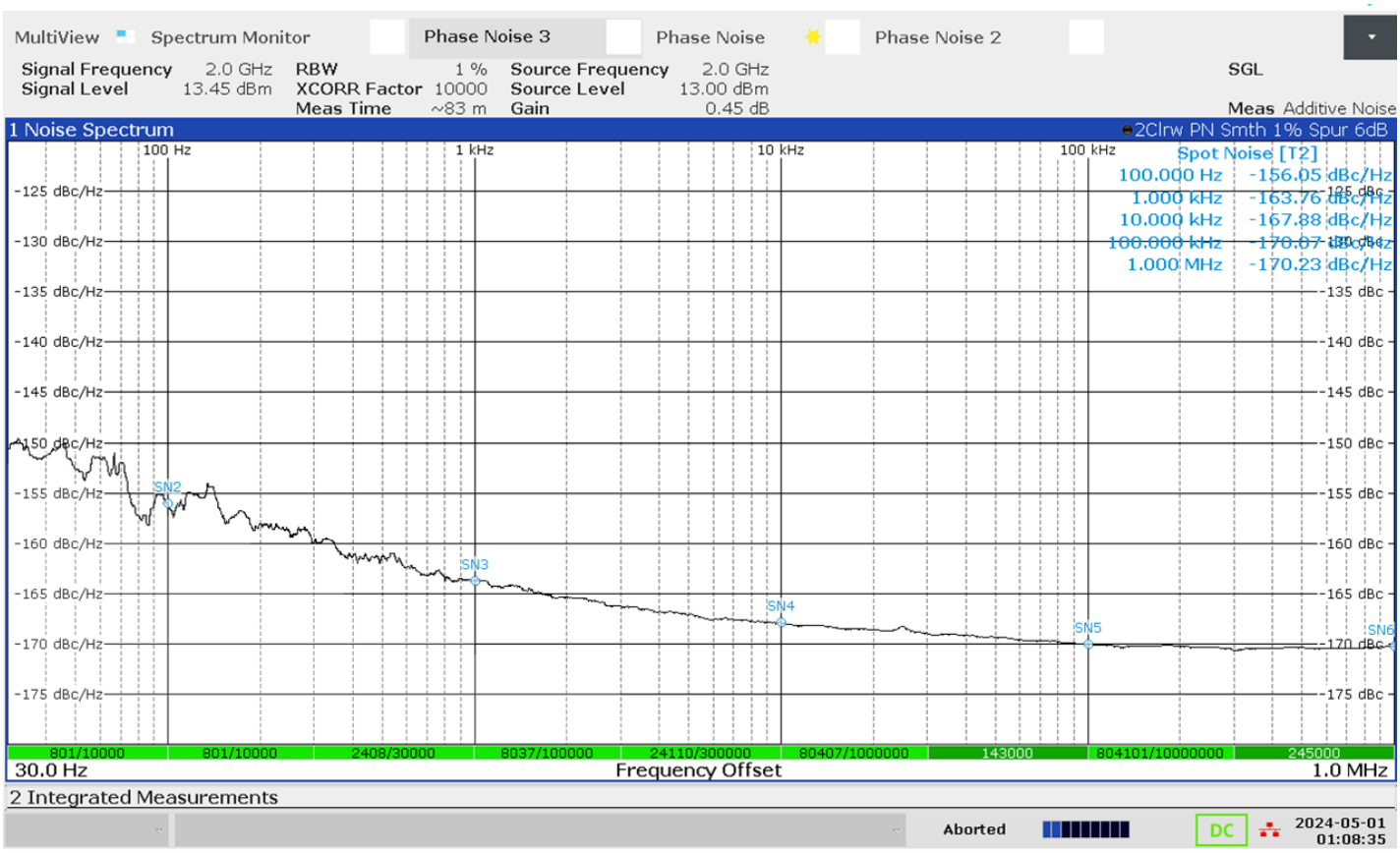
## ADDITIVE PHASE NOISE VS. OFFSET FREQUENCY

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## ABSOLUTE MAXIMUM RATINGS[2]

| Parameter | Ratings |
|---|---|
| Operating Temperature (Baseplate) | -40°C to +85°C |
| Storage Temperature | -55°C to +100°C |
| Total Power Dissipation | 1.4 W |
| RF Input Power (CW)[3] | +10 dBm |
| DC Operating Voltage (Vs) | +9.5 V |

2. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.
3. Specified under matched load to 50 ohms.

## DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

$$\textit{MAXIMUM THERMAL RESISTANCE} = \frac{\textit{MAXIMUM OPERATING CASE TEMP} - \textit{MAXIMUM USER AMBIENT TEMP}}{\textit{POWER DISSIPATION}}$$

| | |
|---|---|
| **Example:** | MAXIMUM OPERATING CASE TEMP = +50 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED)<br>POWER DISSIPATION = 10 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 2 °C/W |

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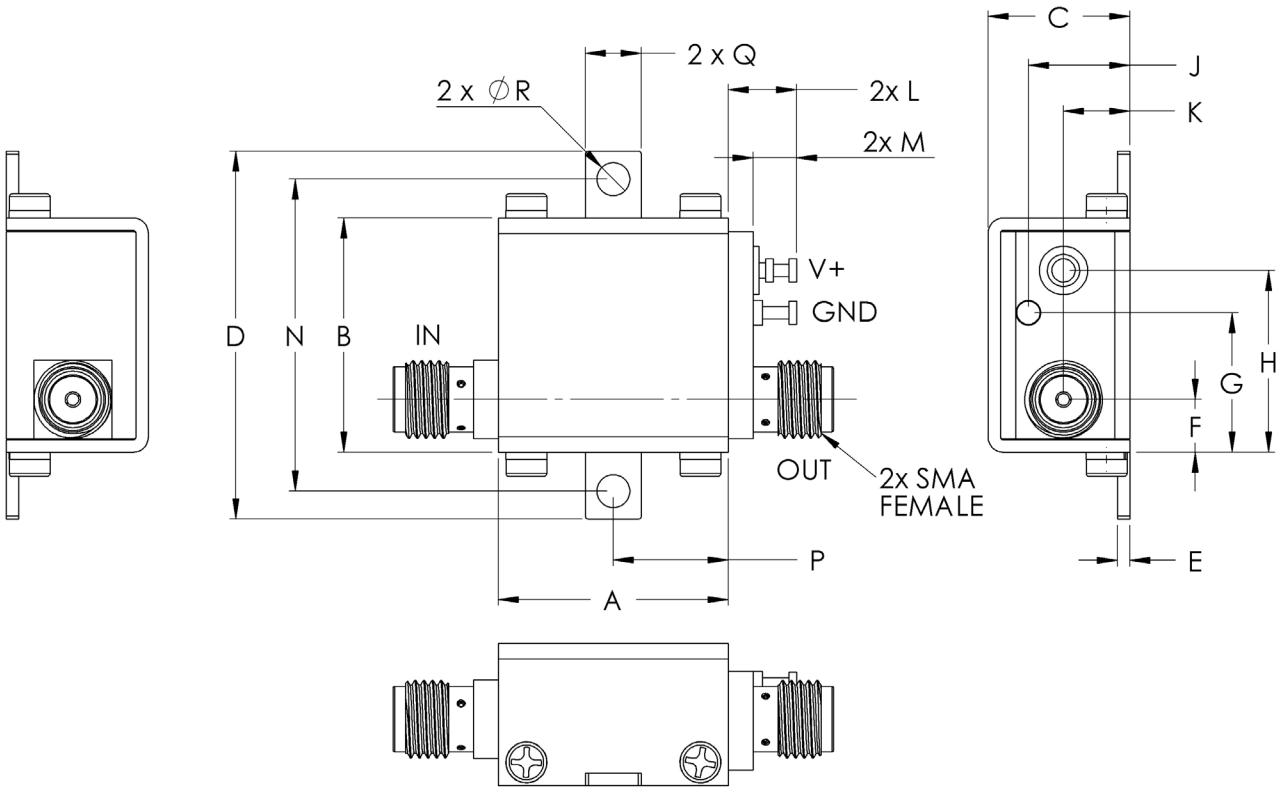
## CASE STYLE DRAWING




Weight: 23.0 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015 Inches

⚠ NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminal. See Application Note AN-40-010

## OUTLINE DIMENSIONS (Inches / mm)

| A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .74 | .75 | .46 | 1.18 | .04 | .17 | .45 | .59 | .33 | .21 | .22 | .14 | 1.00 | .37 | .18 | .106 | grams |
| 18.80 | 19.1 | 11.68 | 30.0 | 1.02 | 4.32 | 11.4 | 14.99 | 8.38 | 5.33 | 5.59 | 3.56 | 25.40 | 9.40 | 4.57 | 2.69 | 23.0 |

## ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

| | |
|---|---|
| **Performance Data & Graphs** | Data<br>Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| **RoHS Status** | Compliant |
| **Environmental Ratings** | ENV23T10 |
| **Export Information** | ECCN# EAR99 |

## ORDERING INFORMATION

| | |
|---|---|
| **Model No. Link** | ZX60-43LPN+ |
| **Case Style** | GC957 |
| **Connector** | IN SMA/Female / OUT SMA/Female |

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-Circuits' 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/terms/viewterm.html

# Coaxial Amplifier ZX60-43LPN+

## *Typical Performance Data*

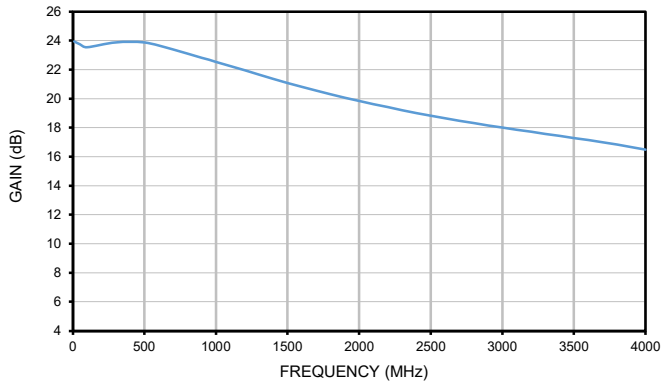
**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 6V, Id = 120mA @ Temperature = +25°C

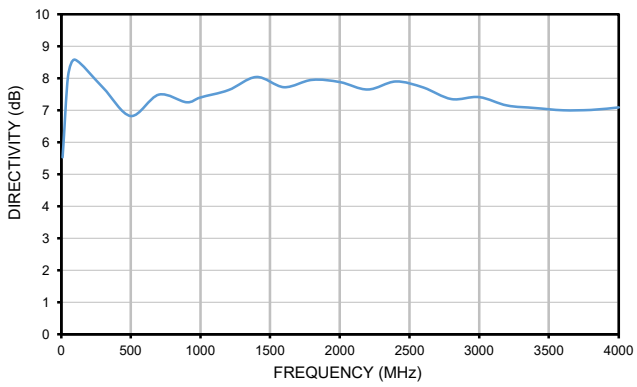
| FREQUENCY | GAIN | DIRECTIVITY | RETURN LOSS (dB) | | STABILITY | | Pout @ 1 dB COMPRESSION | NOISE FIGURE | OIP3 |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | IN | OUT | K | Measure | (dBm) | (dB) | (dBm) |
| 10 | 24.0 | 5.5 | 26.3 | 26.1 | 1.21 | 0.72 | 18.2 | 11.0 | 39.3 |
| 50 | 23.7 | 8.1 | 33.4 | 30.4 | 1.46 | 0.84 | 21.4 | 5.8 | 37.2 |
| 100 | 23.6 | 8.6 | 30.2 | 23.6 | 1.52 | 0.86 | 20.8 | 5.4 | 37.1 |
| 300 | 23.9 | 7.7 | 22.7 | 27.5 | 1.41 | 0.84 | 21.0 | 5.4 | 36.9 |
| 500 | 23.9 | 6.8 | 19.9 | 14.8 | 1.26 | 0.78 | 21.8 | 5.4 | 36.5 |
| 700 | 23.4 | 7.5 | 19.4 | 11.4 | 1.28 | 0.78 | 21.3 | 5.4 | 35.7 |
| 900 | 22.8 | 7.3 | 18.8 | 9.6 | 1.20 | 0.74 | 21.4 | 5.4 | 35.0 |
| 1000 | 22.5 | 7.4 | 18.6 | 9.0 | 1.19 | 0.73 | 21.2 | 5.5 | 35.2 |
| 1200 | 22.0 | 7.6 | 18.2 | 8.1 | 1.17 | 0.71 | 21.3 | 5.6 | 35.0 |
| 1400 | 21.4 | 8.0 | 18.0 | 7.5 | 1.18 | 0.71 | 21.4 | 5.6 | 34.9 |
| 1600 | 20.8 | 7.7 | 18.0 | 7.1 | 1.13 | 0.68 | 21.1 | 5.6 | 34.6 |
| 1800 | 20.3 | 8.0 | 17.9 | 7.0 | 1.14 | 0.69 | 21.3 | 5.5 | 34.9 |
| 2000 | 19.8 | 7.9 | 17.7 | 6.9 | 1.12 | 0.69 | 21.5 | 5.9 | 34.2 |
| 2200 | 19.4 | 7.6 | 17.6 | 6.9 | 1.10 | 0.68 | 21.2 | 6.0 | 35.0 |
| 2400 | 19.0 | 7.9 | 17.4 | 7.0 | 1.13 | 0.70 | 21.5 | 5.6 | 34.3 |
| 2600 | 18.6 | 7.7 | 17.1 | 7.2 | 1.11 | 0.70 | 21.6 | 5.8 | 34.5 |
| 2800 | 18.3 | 7.3 | 16.8 | 7.5 | 1.10 | 0.70 | 21.6 | 5.7 | 34.3 |
| 3000 | 18.0 | 7.4 | 16.4 | 7.8 | 1.11 | 0.72 | 21.3 | 5.8 | 34.1 |
| 3200 | 17.7 | 7.1 | 16.0 | 8.1 | 1.10 | 0.72 | 21.2 | 5.7 | 33.7 |
| 3400 | 17.4 | 7.1 | 15.8 | 8.4 | 1.11 | 0.73 | 20.9 | 5.7 | 33.4 |
| 3600 | 17.2 | 7.0 | 15.6 | 8.7 | 1.11 | 0.74 | 20.6 | 5.8 | 32.9 |
| 3800 | 16.8 | 7.0 | 15.5 | 8.9 | 1.12 | 0.74 | 20.3 | 5.9 | 32.8 |
| 4000 | 16.5 | 7.1 | 15.5 | 9.0 | 1.14 | 0.74 | 20.0 | 5.8 | 32.5 |

## *Typical Performance Curves*

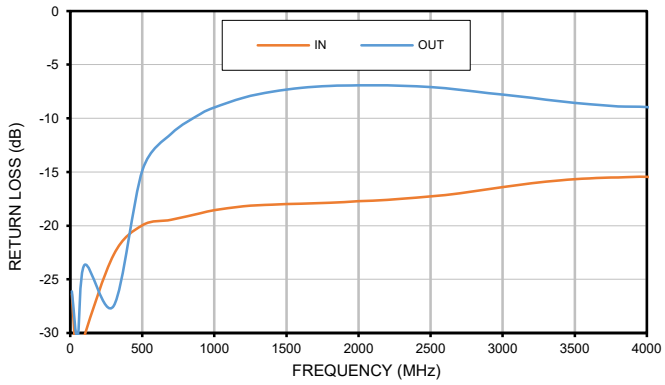
### GAIN



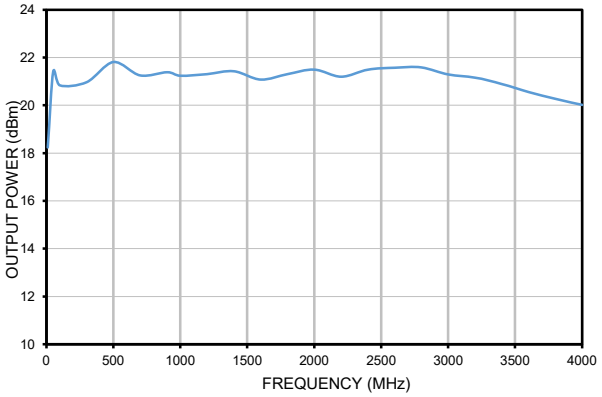

### DIRECTIVITY



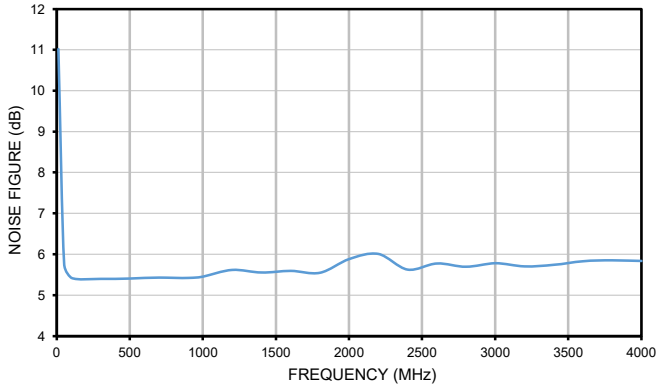

### RETURN LOSS



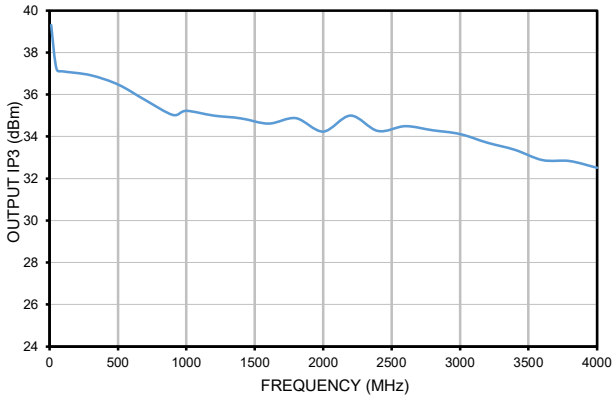

### OUTPUT POWER AT 1dB COMPRESSION




### NOISE FIGURE



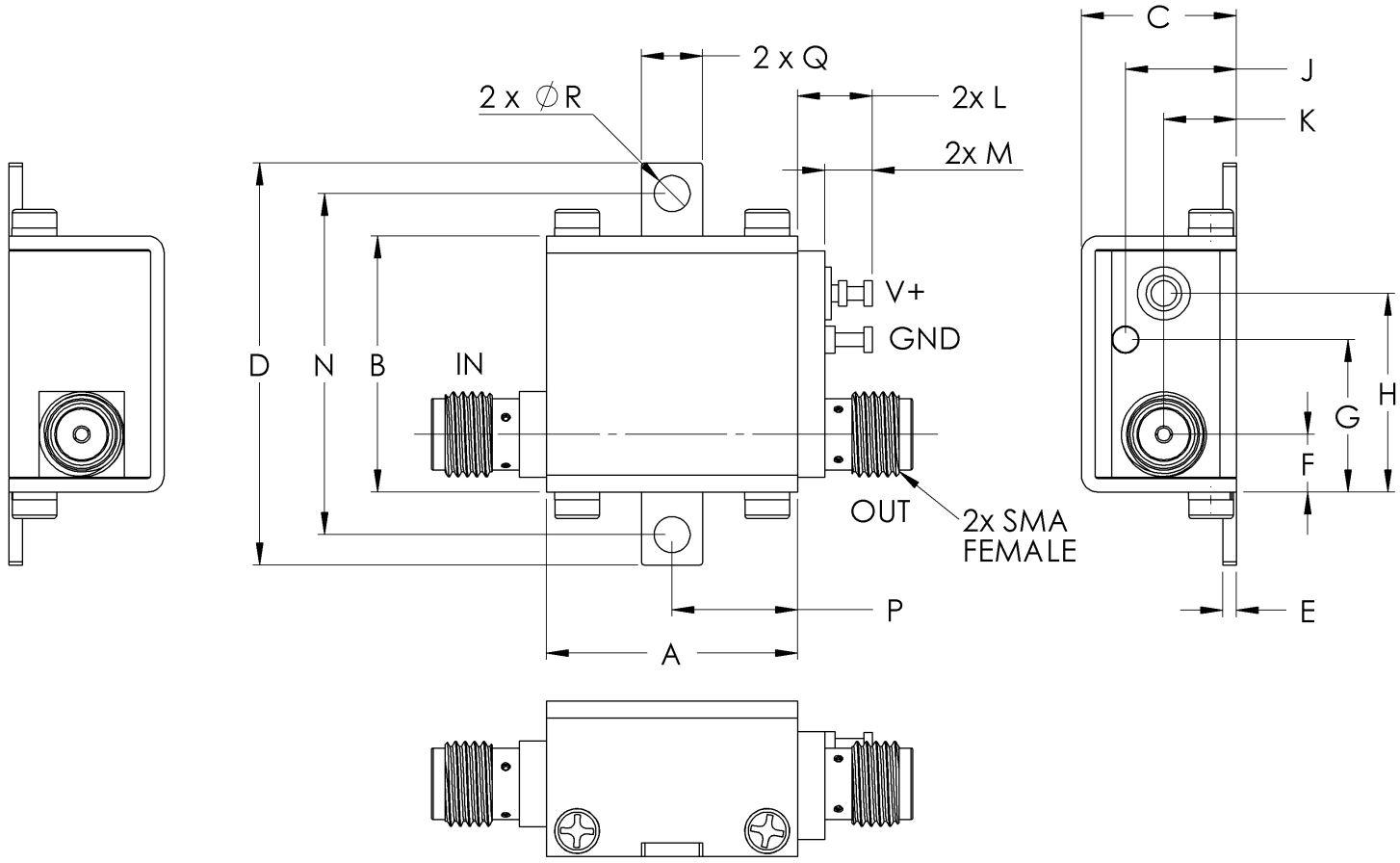

### OUTPUT IP3



# Case Style GC

## Outline Dimensions

GC957




| CASE #. | A | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GC957 | .74 (18.80) | .75 (19.15) | .46 (11.61) | 1.18 (30.07) | .04 (1.02) | .17 (4.32) | .45 (11.40) | .59 (14.86) | .33 (8.31) | .21 (5.44) | .22 (5.59) | .14 (3.56) | 1.00 (25.4) |

| CASE #. | P | Q | R | WT GRAMS |
|---|---|---|---|---|
| GC957 | .37 (9.40) | .18 (4.57) | .106 (2.69) | 23.0 |

**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


Mini-Circuits®
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Mini-Circuits

# Environmental Specifications ENV23T10

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 | -40° to 85° C<br>Case Temperature | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Stabilization Bake | (non-operating)<br>125°C, 24 hours | - - - |
| Burn-in at Elevated Temp. | (DC on)<br>160 hours at 85° C | MIL-STD-202, Method 108 |
| Thermal Shock | -55° to 100°C, 5 cycles | MIL-STD-202, Method 107, Condition A, except 100°C |