



Mini-Circuits

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# Low Noise Amplifier

**ZX60-63GLN+**

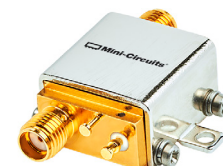
50Ω 1.8 to 6 GHz SMA Female

## THE BIG DEAL

- Low Noise Figure, 0.9 dB typ.
- High Gain, up to 29.6 dB typ.
- Protected by US patent 6,790,049

## APPLICATIONS

- 5G
- WiFi
- WLAN
- UMTS
- LTE
- WiMAX
- S-band radar
- C-band Satcom



Generic photo used for illustration purposes only

|            |             |
|------------|-------------|
| Model No.  | ZX60-63GLN+ |
| Case Style | GC957       |
| Connectors | SMA Female  |

### +RoHS Compliant

The +Suffix identifies RoHS Compliance.  
See our website for methodologies and qualifications

## PRODUCT OVERVIEW

Mini-Circuits' ZX60-G63LN-S+ is a wideband low noise connectorized amplifier providing a unique combination of low noise figure, high IP3 and flat gain over a very wide frequency range, supporting a wide range of sensitive, high-dynamic range receiver applications and many systems where high performance over wideband is needed. This design operates on a single 5V supply and comes 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.

## KEY FEATURES

| Feature                                                     | Advantages                                                                                                                                                                                                                            |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low noise, 0.8 dB typ. at 2.5 GHz                           | Enables lower system noise figure performance.                                                                                                                                                                                        |
| Wideband with flat gain<br>• ±1.6 dB typ. over 2.5 to 5 GHz | Enables a single amplifier to be used in a wide range of applications including WiFi, LTE, S-Band radar, C-band SATCOM, defense, instrumentation and more.                                                                            |
| High gain, 29.8 dB typ. at 2.5 GHz                          | Reduces the number of gain stages, lowering component count and overall system cost.                                                                                                                                                  |
| High IP3 at +27 dBm at 2.5 GHz                              | The combination of low noise and high IP3 makes the ZX60-63GLN+ ideal for use in low noise receiver front end (RFE) as it gives the user the advantages of sensitivity and two-tone IM performance at both ends of the dynamic range. |
| Low operating voltage, +5V                                  | The amplifier achieves high IP3 using low voltage.                                                                                                                                                                                    |
| Rugged, unibody construction                                | Mini-Circuits unibody construction integrates the RF connector into the case body, providing high reliability and excellent survivability in critical applications.                                                                   |

REV. A  
ECO-015740  
ZX60-63GLN+  
AG/CP/AM  
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ZX60-63GLN+

50Ω 1.8 to 6 GHz SMA Female

ELECTRICAL SPECIFICATIONS AT 25°C,  $Z_0=50\Omega$  and +5V, UNLESS NOTED OTHERWISE

| Parameter                                   | Condition (GHz) | $V_{DD}+5V$ |      |      | Units |
|---------------------------------------------|-----------------|-------------|------|------|-------|
|                                             |                 | Min.        | Typ. | Max. |       |
| Frequency Range                             |                 | 1.8         |      | 6.0  | GHz   |
| Noise Figure                                | 1.8             |             | 0.9  |      | dB    |
|                                             | 2.5             |             | 0.8  |      |       |
|                                             | 3.5             |             | 0.8  |      |       |
|                                             | 5.0             |             | 1.2  |      |       |
|                                             | 6.0             |             | 1.5  |      |       |
| Gain                                        | 1.8             | 28          | 31.5 |      | dB    |
|                                             | 2.5             |             | 29.6 |      |       |
|                                             | 3.5             | 24.5        | 27.8 |      |       |
|                                             | 5.0             |             | 26.3 |      |       |
|                                             | 6.0             | 21.5        | 24.5 |      |       |
| Input Return Loss                           | 1.8             |             | 6    |      | dB    |
|                                             | 2.5             |             | 8.5  |      |       |
|                                             | 3.5             |             | 11   |      |       |
|                                             | 5.0             |             | 11.5 |      |       |
|                                             | 6.0             |             | 12.5 |      |       |
| Output Return Loss                          | 1.8             |             | 10   |      | dB    |
|                                             | 2.5             |             | 10   |      |       |
|                                             | 3.5             |             | 10.5 |      |       |
|                                             | 5.0             |             | 16   |      |       |
|                                             | 6.0             |             | 21   |      |       |
| Output Power at 1dB Compression             | 1.8             |             | 15   |      | dBm   |
|                                             | 2.5             |             | 14.6 |      |       |
|                                             | 3.5             | 12.0        | 13.6 |      |       |
|                                             | 5.0             |             | 11.1 |      |       |
|                                             | 6.0             |             | 10.2 |      |       |
| Output IP3 <sup>1</sup>                     | 1.8             |             | 27.8 |      | dBm   |
|                                             | 2.5             |             | 27.7 |      |       |
|                                             | 3.5             |             | 26   |      |       |
|                                             | 5.0             |             | 22.8 |      |       |
|                                             | 6.0             |             | 21.7 |      |       |
| Device Operating Voltage (V <sub>DD</sub> ) | —               | 4.9         | 5.0  | 7.0  | V     |
| Device Operating Current (I <sub>D</sub> )  | —               | —           | 67   | 80   | mA    |

1. OIP3 measured with 0 dBm tones and 1 MHz spacing.

ABSOLUTE MAXIMUM RATINGS<sup>2</sup>

| Parameter                            | Ratings                                          |
|--------------------------------------|--------------------------------------------------|
| Operating Temperature (ground lead)  | -40°C to 85°C                                    |
| Storage Temperature                  | -55°C to 100°C                                   |
| Total Power Dissipation              | 0.56 W                                           |
| Input Power (CW), V <sub>d</sub> =5V | +29 dBm (5 minutes max.)<br>+10 dBm (continuous) |
| DC Voltage                           | +7V                                              |

2. Permanent damage may occur if any of these limits are exceeded.  
Electrical maximum ratings are not intended for continuous normal operation.



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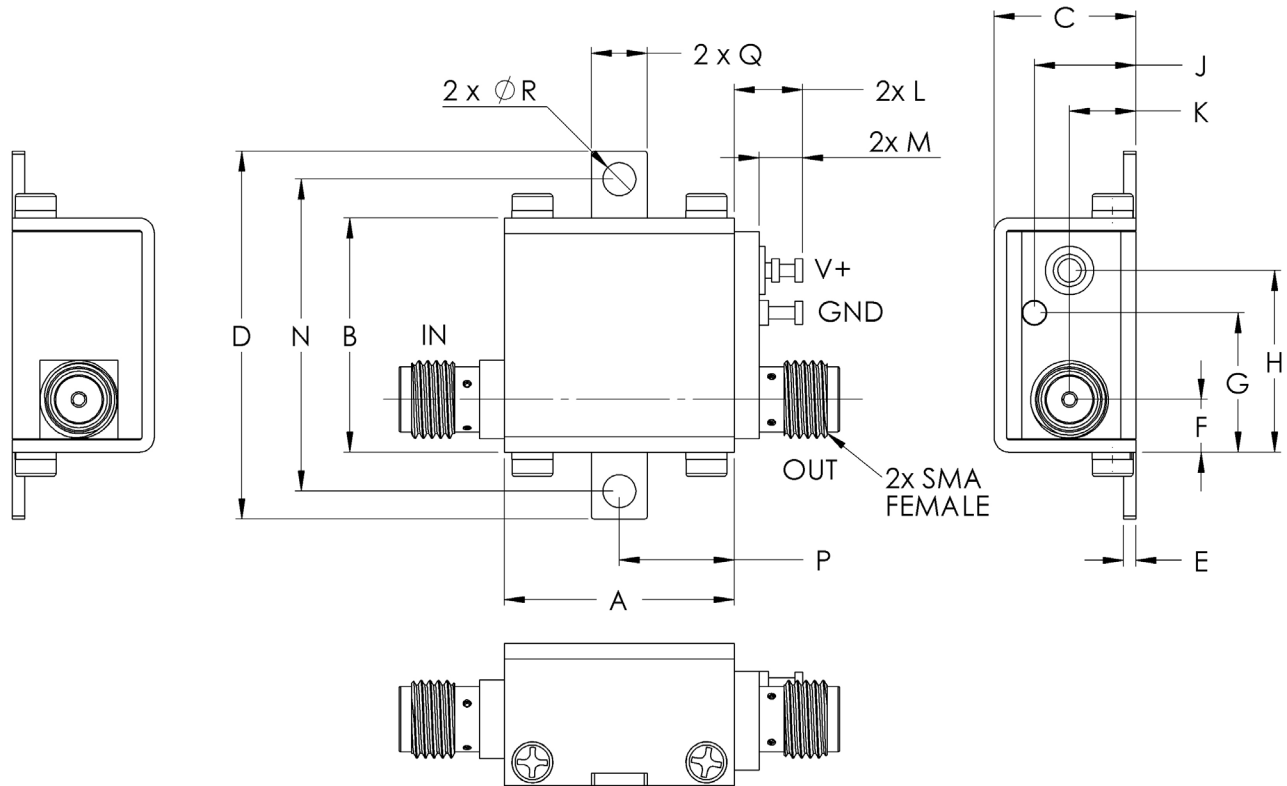
## Low Noise Amplifier

ZX60-63GLN+

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50Ω 1.8 to 6 GHz SMA Female

## OUTLINE DRAWING

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  |





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# Low Noise Amplifier

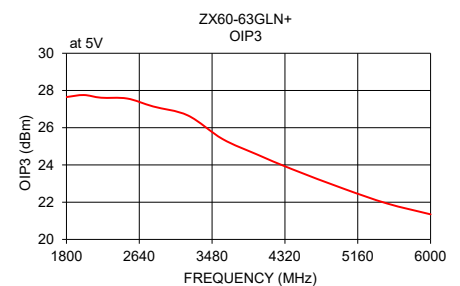
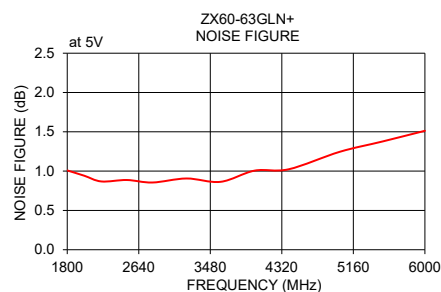
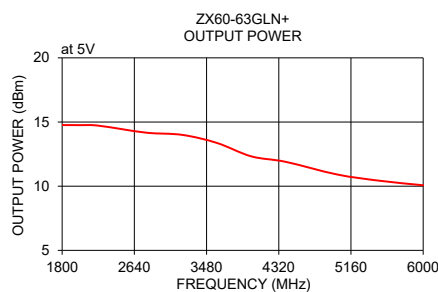
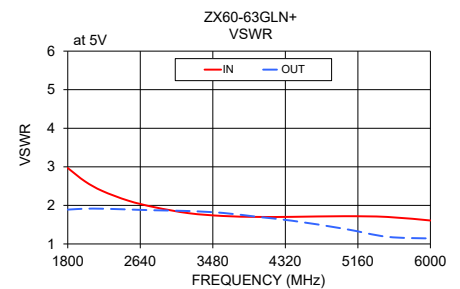
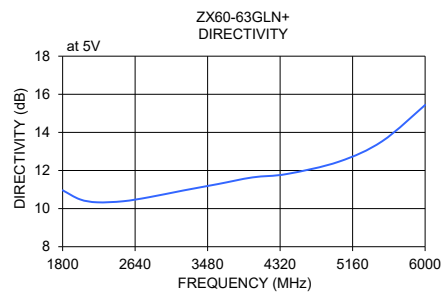
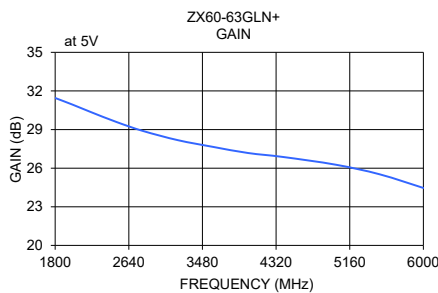
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## TYPICAL PERFORMANCE DATA/CURVES

| Frequency<br>(MHz) | Gain<br>(dB) | Directivity<br>(dB) | VSWR (:1) |      | Power Out<br>@1 dB COMPR.<br>(dBm) | Noise<br>Figure<br>(dB) | IP3<br>(dBm) |
|--------------------|--------------|---------------------|-----------|------|------------------------------------|-------------------------|--------------|
|                    |              |                     | IN        | OUT  |                                    |                         |              |
| 1800               | 31.45        | 10.96               | 2.97      | 1.89 | 14.76                              | 1.01                    | 27.65        |
| 2000               | 30.93        | 10.49               | 2.62      | 1.91 | 14.76                              | 0.94                    | 27.76        |
| 2200               | 30.38        | 10.33               | 2.37      | 1.91 | 14.73                              | 0.87                    | 27.61        |
| 2500               | 29.59        | 10.39               | 2.12      | 1.89 | 14.44                              | 0.89                    | 27.57        |
| 2800               | 28.89        | 10.60               | 1.95      | 1.87 | 14.15                              | 0.86                    | 27.14        |
| 3200               | 28.17        | 10.95               | 1.80      | 1.85 | 13.99                              | 0.91                    | 26.66        |
| 3600               | 27.65        | 11.29               | 1.72      | 1.80 | 13.37                              | 0.86                    | 25.39        |
| 4000               | 27.18        | 11.64               | 1.70      | 1.70 | 12.32                              | 1.01                    | 24.56        |
| 4400               | 26.87        | 11.82               | 1.70      | 1.60 | 11.90                              | 1.02                    | 23.78        |
| 5000               | 26.27        | 12.46               | 1.72      | 1.39 | 10.91                              | 1.25                    | 22.72        |
| 5500               | 25.53        | 13.53               | 1.70      | 1.19 | 10.42                              | 1.38                    | 21.93        |
| 6000               | 24.46        | 15.44               | 1.61      | 1.14 | 10.07                              | 1.51                    | 21.35        |



### NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/terms/viewterm.html)



# Low Noise Amplifier

**ZX60-63GLN+**

## Typical Performance Data

| FREQUENCY<br>(MHz) | GAIN<br>(dB)<br>5V | DIRECTIVITY<br>(dB)<br>5V | VSWR (:1) |           | NOISE FIGURE<br>(dB)<br>5V | POUT @ 1 dB<br>COMPRESSION<br>(dBm)<br>5V | OUTPUT IP3<br>(dBm)<br>5V |
|--------------------|--------------------|---------------------------|-----------|-----------|----------------------------|-------------------------------------------|---------------------------|
|                    |                    |                           | IN<br>5V  | OUT<br>5V |                            |                                           |                           |
| 1500               | 31.86              | 13.08                     | 3.70      | 1.74      | 1.10                       | 14.62                                     | 26.75                     |
| 1600               | 31.81              | 12.10                     | 3.43      | 1.81      | 1.05                       | 14.66                                     | 27.16                     |
| 1700               | 31.66              | 11.42                     | 3.19      | 1.86      | 1.00                       | 14.93                                     | 27.37                     |
| 1800               | 31.45              | 10.96                     | 2.97      | 1.89      | 1.01                       | 14.76                                     | 27.65                     |
| 1900               | 31.20              | 10.68                     | 2.78      | 1.91      | 0.91                       | 14.67                                     | 27.68                     |
| 2000               | 30.93              | 10.49                     | 2.62      | 1.91      | 0.94                       | 14.76                                     | 27.76                     |
| 2100               | 30.66              | 10.38                     | 2.49      | 1.91      | 0.88                       | 14.47                                     | 27.60                     |
| 2200               | 30.38              | 10.33                     | 2.37      | 1.91      | 0.87                       | 14.73                                     | 27.61                     |
| 2300               | 30.11              | 10.33                     | 2.28      | 1.91      | 0.84                       | 14.56                                     | 27.82                     |
| 2400               | 29.85              | 10.34                     | 2.20      | 1.90      | 0.93                       | 14.72                                     | 27.74                     |
| 2500               | 29.59              | 10.39                     | 2.12      | 1.89      | 0.89                       | 14.44                                     | 27.57                     |
| 2600               | 29.34              | 10.44                     | 2.06      | 1.89      | 0.84                       | 14.25                                     | 27.33                     |
| 2700               | 29.11              | 10.51                     | 2.00      | 1.88      | 0.90                       | 14.33                                     | 27.39                     |
| 2800               | 28.89              | 10.60                     | 1.95      | 1.87      | 0.86                       | 14.15                                     | 27.14                     |
| 2900               | 28.68              | 10.68                     | 1.91      | 1.87      | 0.90                       | 14.18                                     | 27.15                     |
| 3000               | 28.49              | 10.79                     | 1.87      | 1.86      | 0.89                       | 13.89                                     | 26.71                     |
| 3200               | 28.17              | 10.95                     | 1.80      | 1.85      | 0.91                       | 13.99                                     | 26.66                     |
| 3400               | 27.92              | 11.10                     | 1.75      | 1.84      | 0.97                       | 13.74                                     | 26.35                     |
| 3600               | 27.65              | 11.29                     | 1.72      | 1.80      | 0.86                       | 13.37                                     | 25.39                     |
| 3800               | 27.39              | 11.49                     | 1.71      | 1.75      | 0.93                       | 12.83                                     | 25.00                     |
| 4000               | 27.18              | 11.64                     | 1.70      | 1.70      | 1.01                       | 12.32                                     | 24.56                     |
| 4200               | 27.03              | 11.71                     | 1.70      | 1.65      | 0.99                       | 12.16                                     | 23.97                     |
| 4400               | 26.87              | 11.82                     | 1.70      | 1.60      | 1.02                       | 11.90                                     | 23.78                     |
| 4600               | 26.70              | 11.98                     | 1.71      | 1.54      | 1.15                       | 11.81                                     | 23.74                     |
| 4800               | 26.50              | 12.18                     | 1.71      | 1.47      | 1.13                       | 11.10                                     | 22.58                     |
| 5000               | 26.27              | 12.46                     | 1.72      | 1.39      | 1.25                       | 10.91                                     | 22.72                     |
| 5100               | 26.15              | 12.63                     | 1.72      | 1.35      | 1.23                       | 10.56                                     | 22.01                     |
| 5200               | 26.01              | 12.82                     | 1.72      | 1.31      | 1.29                       | 10.80                                     | 22.47                     |
| 5300               | 25.86              | 13.03                     | 1.72      | 1.27      | 1.29                       | 10.55                                     | 21.80                     |
| 5400               | 25.70              | 13.26                     | 1.71      | 1.22      | 1.35                       | 10.25                                     | 21.57                     |
| 5500               | 25.53              | 13.53                     | 1.70      | 1.19      | 1.38                       | 10.42                                     | 21.93                     |
| 5600               | 25.34              | 13.83                     | 1.69      | 1.15      | 1.41                       | 10.40                                     | 21.70                     |
| 5700               | 25.14              | 14.19                     | 1.67      | 1.12      | 1.44                       | 10.23                                     | 21.57                     |
| 5800               | 24.93              | 14.55                     | 1.66      | 1.11      | 1.45                       | 10.37                                     | 21.75                     |
| 5900               | 24.70              | 14.96                     | 1.63      | 1.12      | 1.49                       | 10.22                                     | 21.65                     |
| 6000               | 24.46              | 15.44                     | 1.61      | 1.14      | 1.51                       | 10.07                                     | 21.35                     |
| 6100               | 24.22              | 15.95                     | 1.58      | 1.18      | 1.56                       | 9.85                                      | 21.15                     |
| 6200               | 23.96              | 16.51                     | 1.55      | 1.23      | 1.58                       | 9.89                                      | 21.17                     |
| 6300               | 23.69              | 17.12                     | 1.51      | 1.28      | 1.66                       | 10.10                                     | 21.41                     |
| 6400               | 23.42              | 17.82                     | 1.47      | 1.34      | 1.72                       | 9.99                                      | 21.18                     |
| 6500               | 23.15              | 18.59                     | 1.43      | 1.40      | 1.72                       | 10.17                                     | 21.40                     |



ISO 9001 ISO 14001 AS 9100 CERTIFIED



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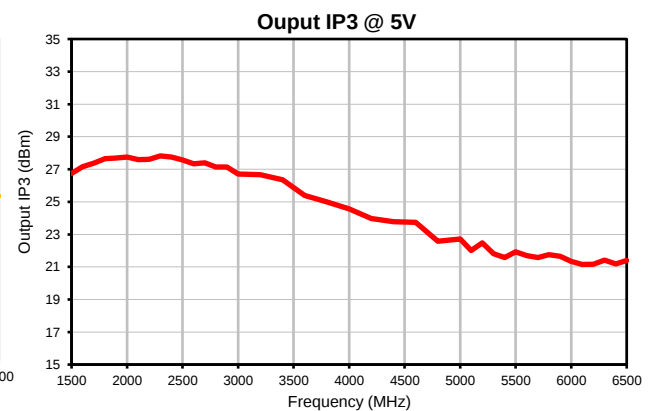
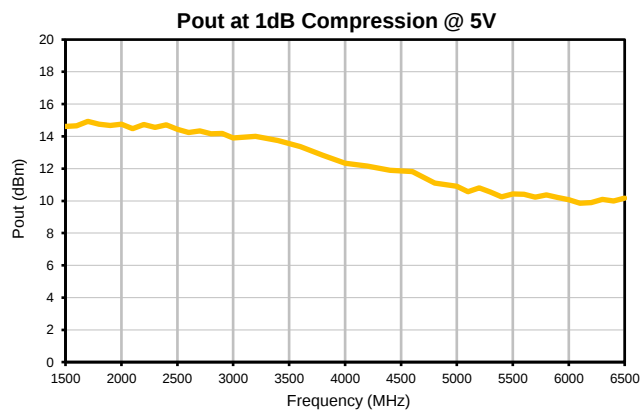
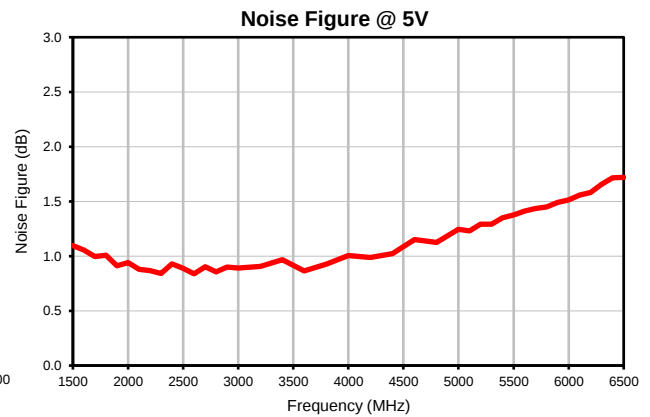
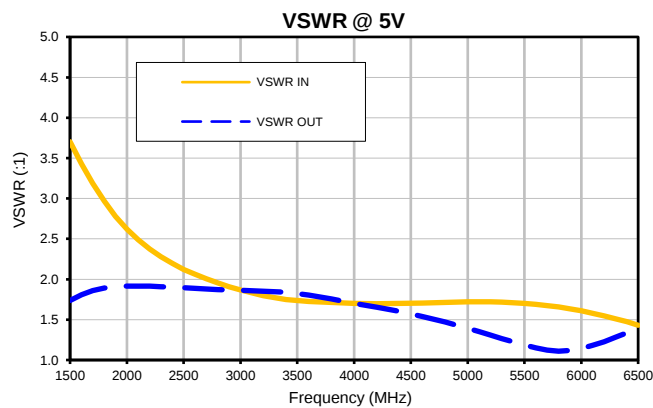
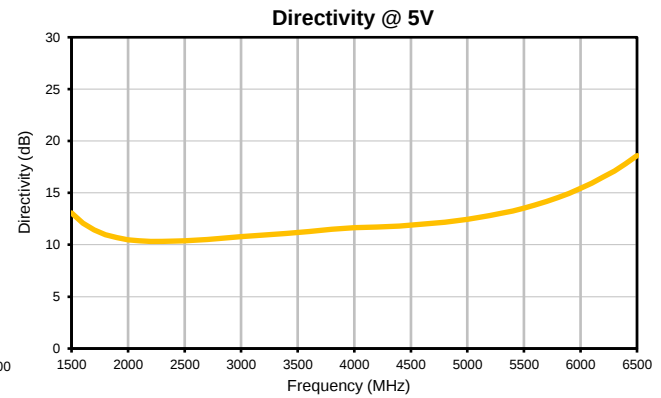
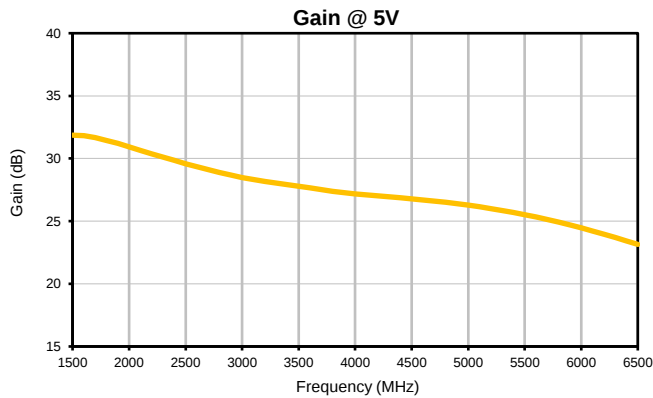
IF/RF MICROWAVE COMPONENTS

REV. OR  
ZX60-63GLN+  
10/15/2019  
Page 1 of 1

# Low Noise Amplifier

## Typical Performance Curves

**ZX60-63GLN+**

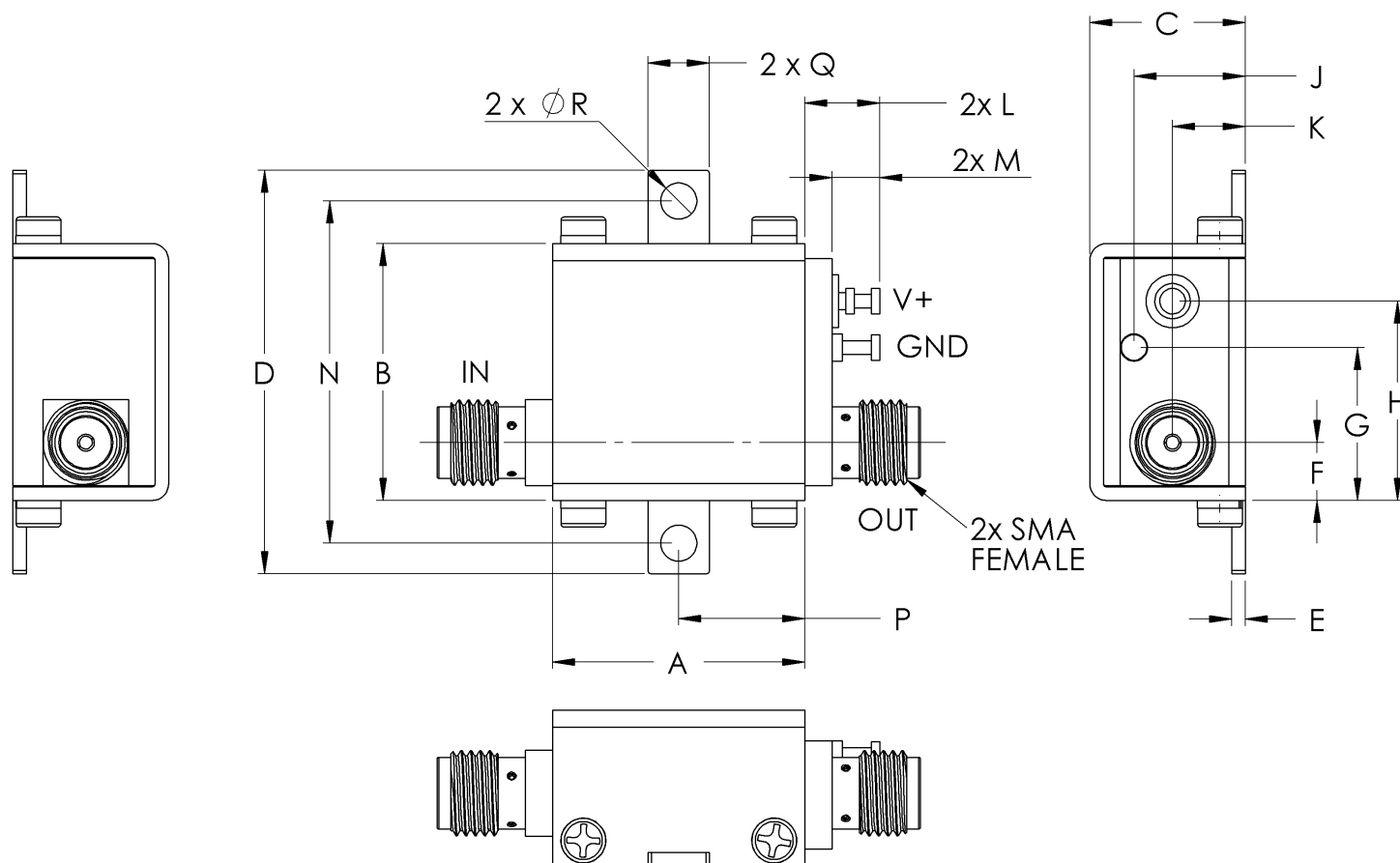


# Case Style

## Outline Dimensions

# GC

## GC957



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

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

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

### Note:

1. Case material: Brass
2. Case finish: Nickel plate

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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 100°C<br>Ambient Environment                                                   | Individual Model Data Sheet          |
| Storage Temperature        | -55° to 125° 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 |