



COAXIAL

# Low Phase Noise Amplifier

## ZX60-43LPN+

Mini-Circuits

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

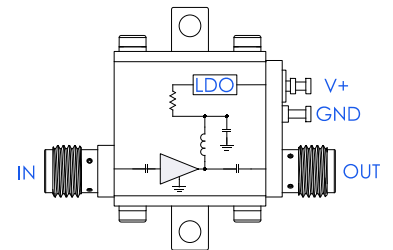


Generic photo used for illustration purposes only

### APPLICATIONS

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

### FUNCTIONAL DIAGRAM



### 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 <sup>1</sup>		-	120	150	mA

1. DC Current at P1dB/Psat as applicable.





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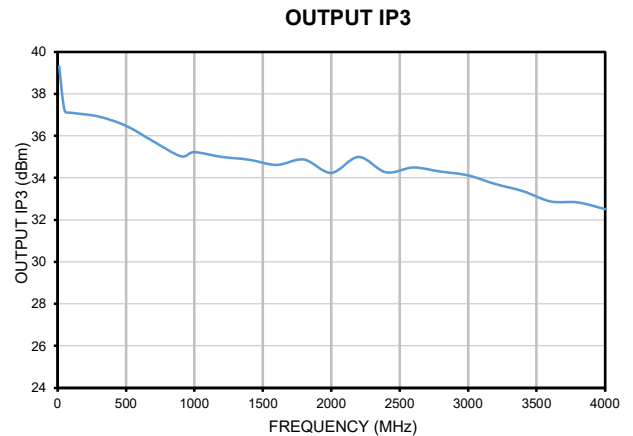
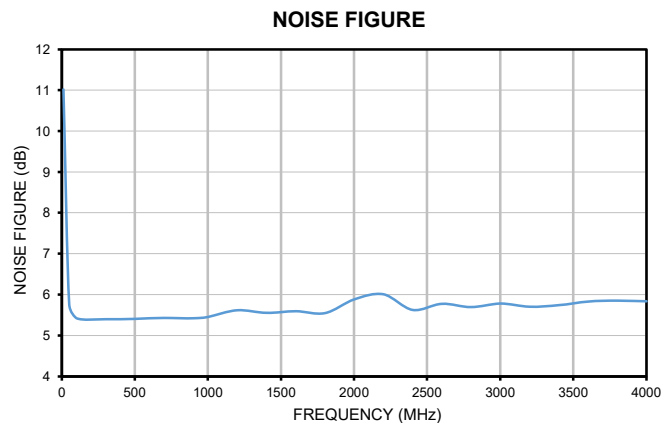
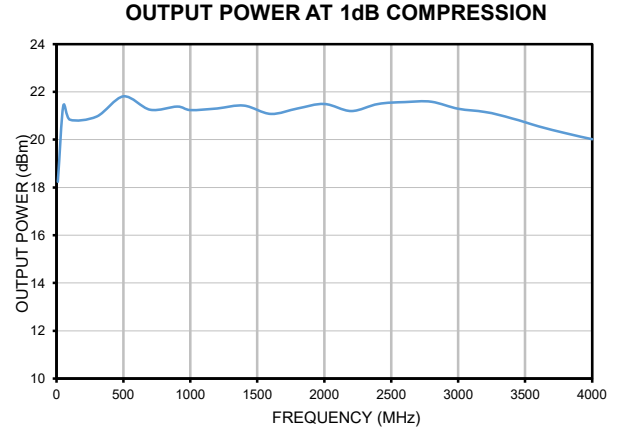
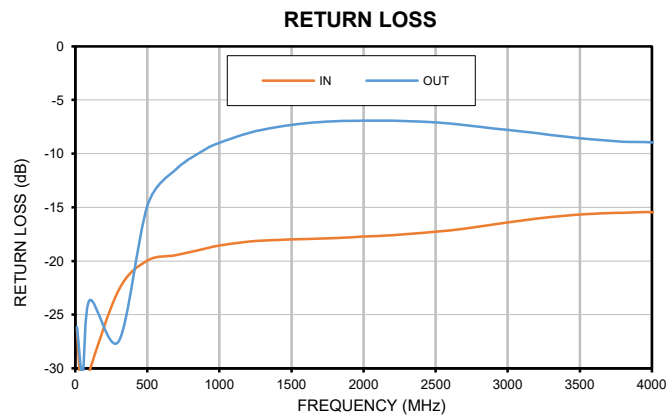
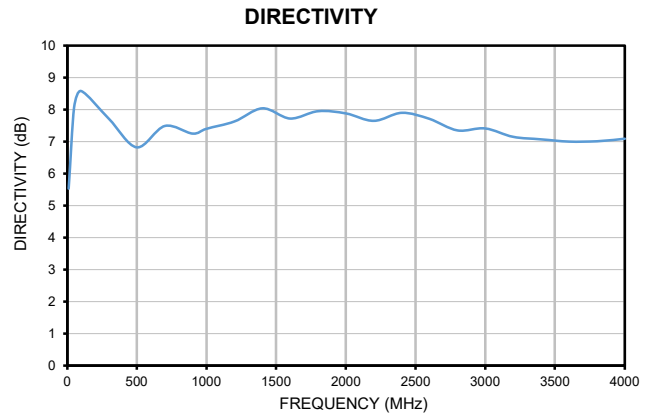
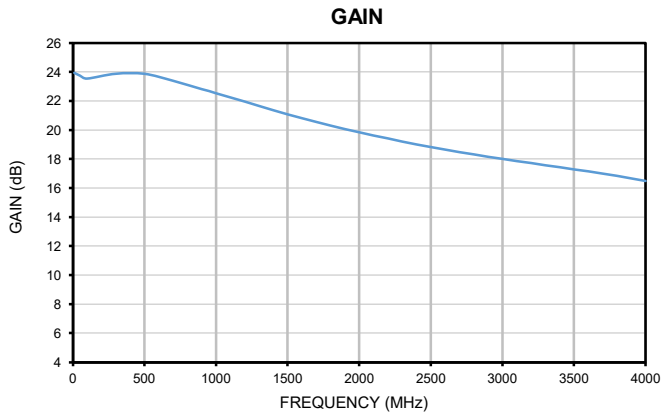
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## TYPICAL PERFORMANCE GRAPHS





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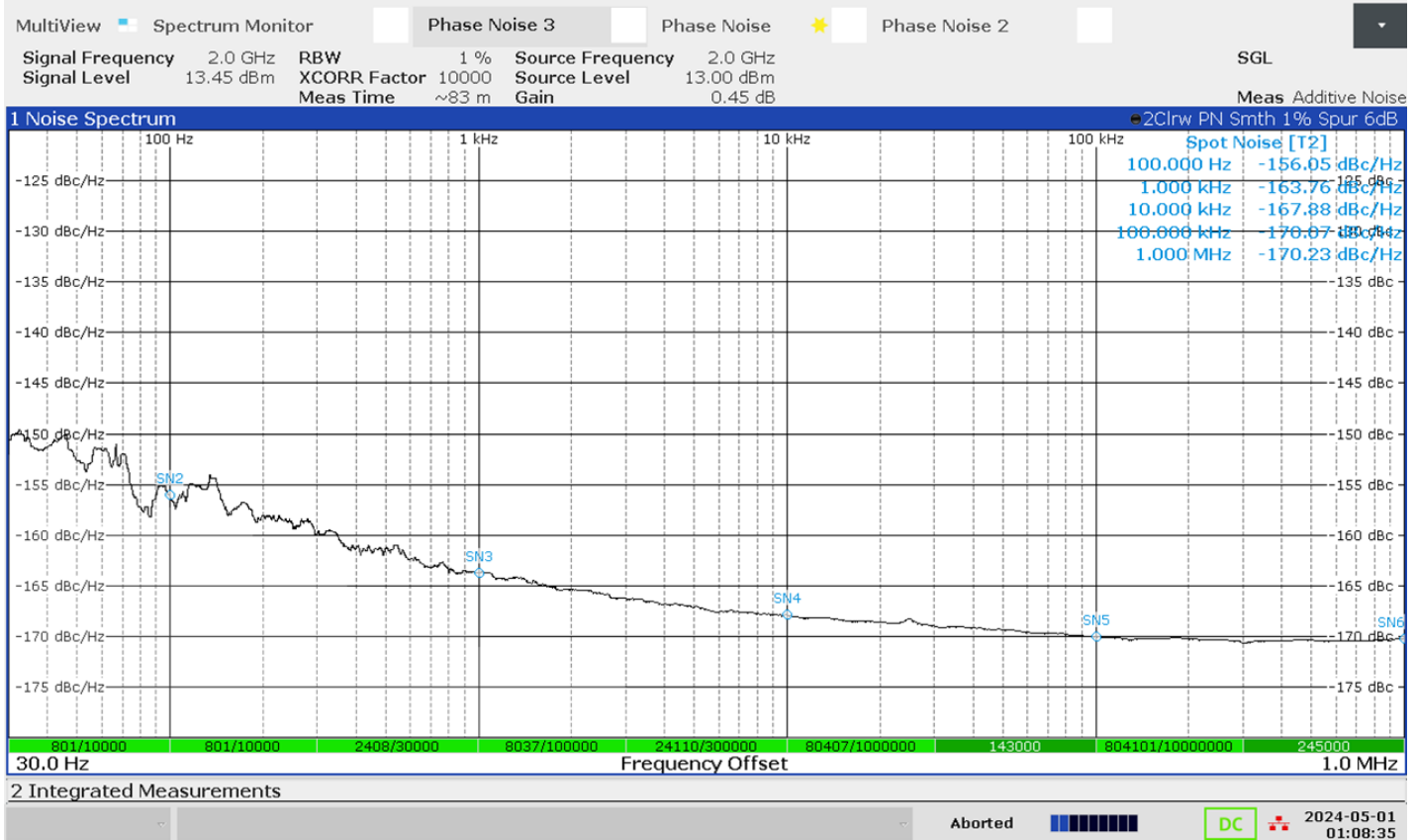
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## ZX60-43LPN+



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### ADDITIVE PHASE NOISE VS. OFFSET FREQUENCY



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### ABSOLUTE MAXIMUM RATINGS<sup>2</sup>

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) <sup>3</sup>	+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

<i>MAXIMUM THERMAL RESISTANCE</i>	= $\frac{\text{MAXIMUM OPERATING CASE TEMP} - \text{MAXIMUM USER AMBIENT TEMP}}{\text{POWER DISSIPATION}}$
<b>Example:</b>	<p>MAXIMUM OPERATING CASE TEMP = +50 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)</p> <p>MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED)</p> <p>POWER DISSIPATION = 10 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)</p> <p>THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 2 °C/W</p>



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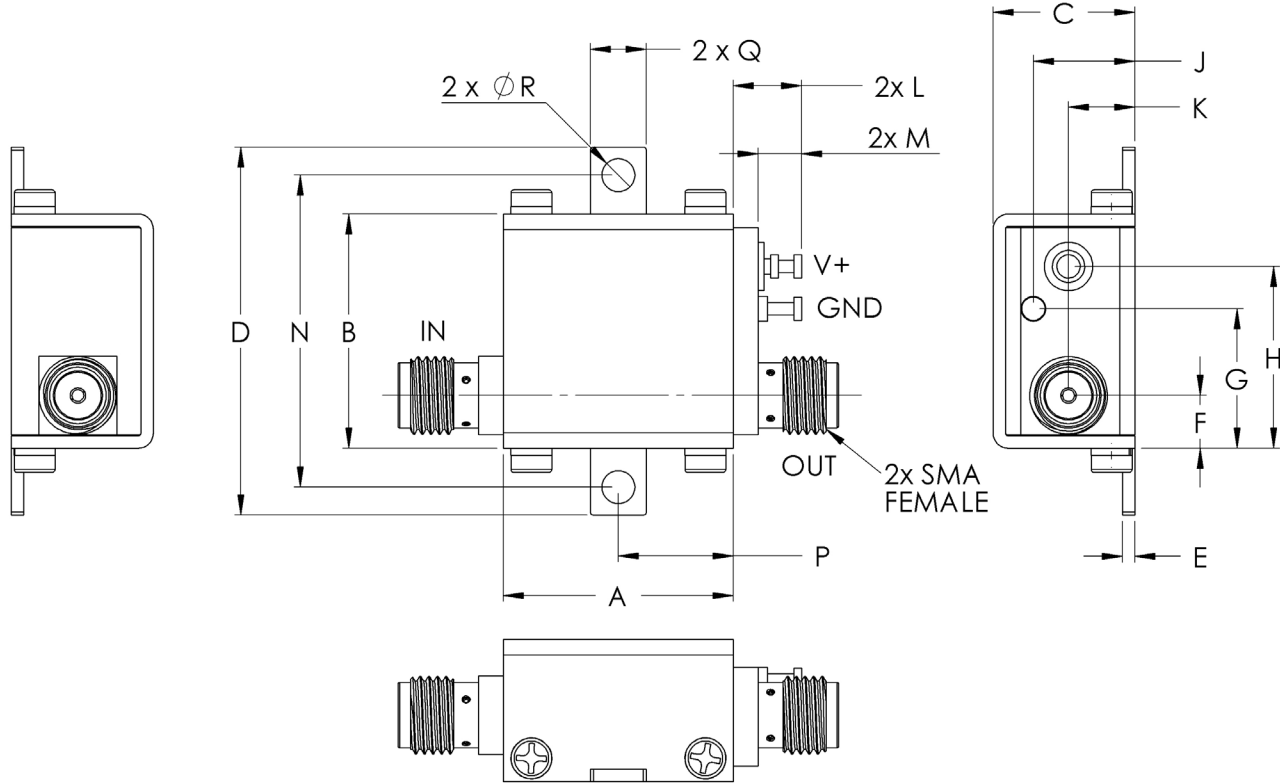
# Low Phase Noise Amplifier

## ZX60-43LPN+

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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)

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 Phase Noise Amplifier

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### ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

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

### ORDERING INFORMATION

Model No. Link	<a href="#">ZX60-43LPN+</a>
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](http://www.minicircuits.com/terms/viewterm.html)



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# ZX60-43LPN+

## Typical Performance Data

**Definitions:**

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

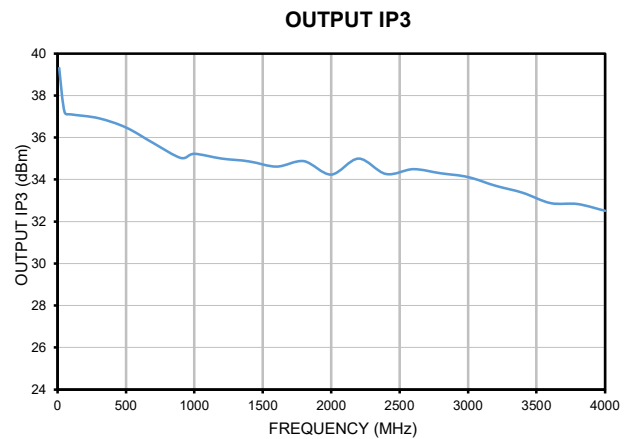
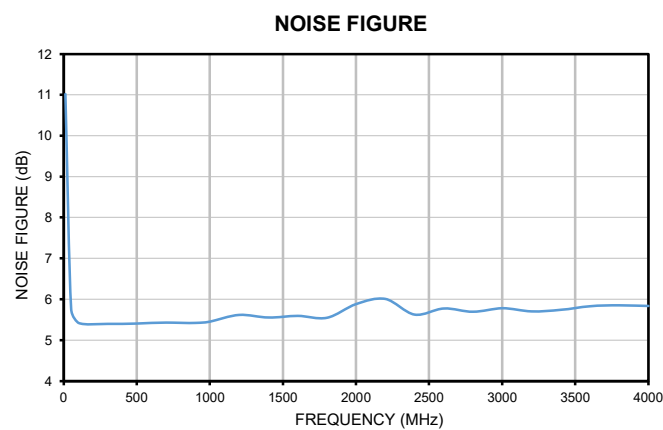
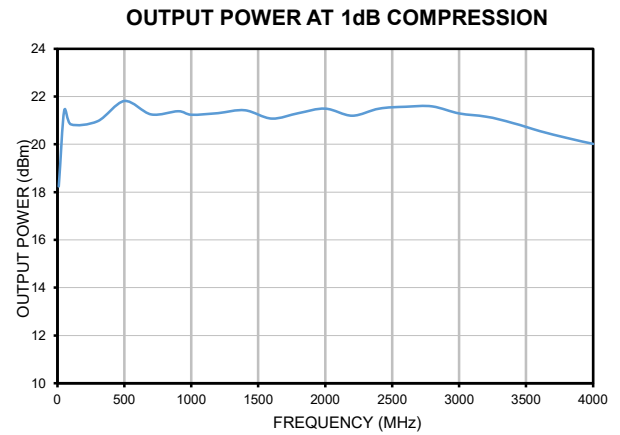
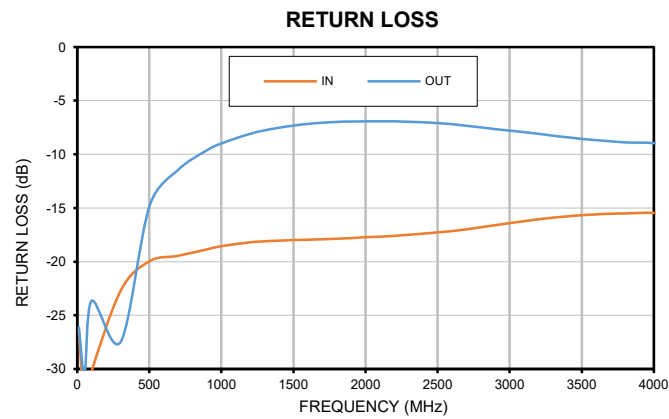
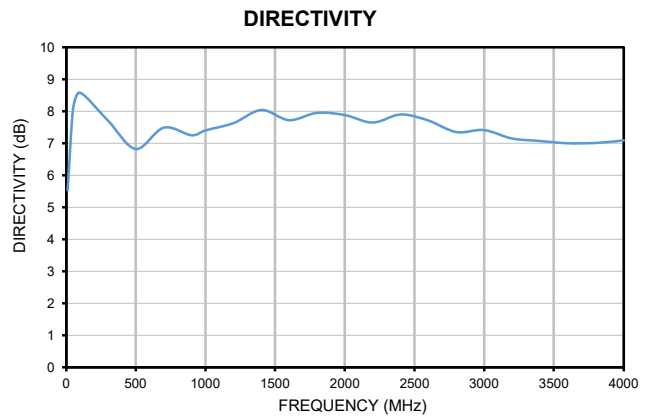
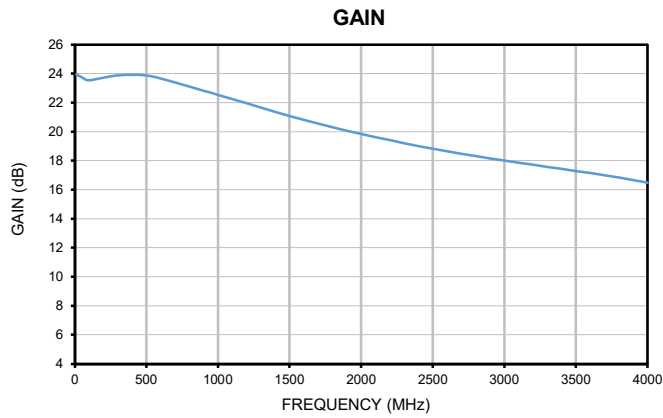
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

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

FREQUENCY (MHz)	GAIN (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		STABILITY		Pout @ 1 dB COMPRESSION (dBm)	NOISE FIGURE (dB)	OIP3 (dBm)
			IN	OUT	K	Measure			
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



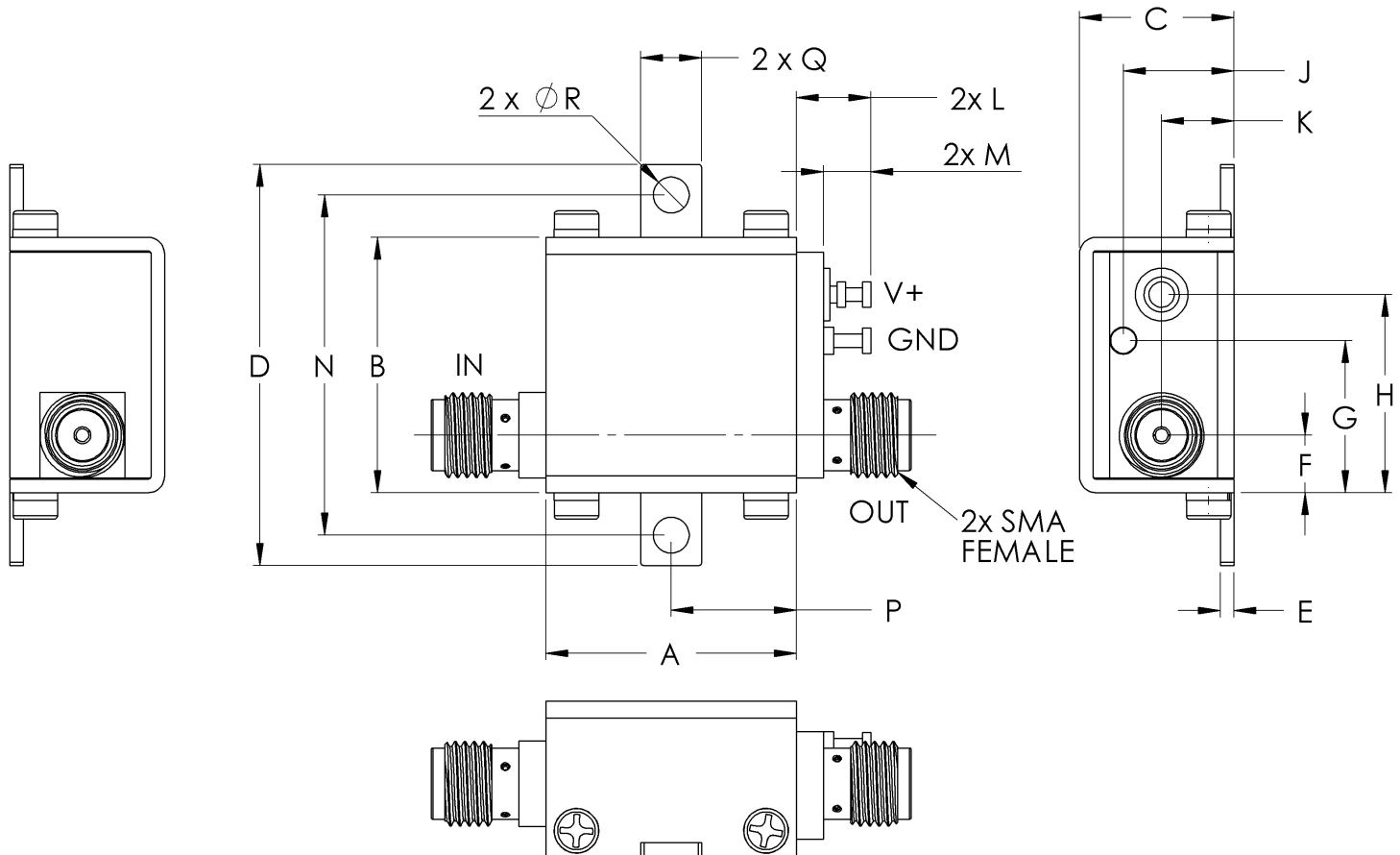


# Case Style

# 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.  $\pm .03$ ; 3Pl.  $\pm .015$   
Tolerance on hole size and interaxes dimensions to be  $\pm .005$ .

### Note:

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

**Mini-Circuits**<sup>®</sup>

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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	-40° to 85° C Case Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Stabilization Bake	(non-operating) 125°C, 24 hours	- - -
Burn-in at Elevated Temp.	(DC on) 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