



WIDEBAND

# Low Noise Amplifier

## ZX60-53LN+

Mini-Circuits

50Ω 0.5 to 5 GHz SMA Female

### THE BIG DEAL

- Very wideband, 500 MHz – 5 GHz
- Ultra-flat gain, ±0.7 dB from 500 to 2000 MHz
- Low NF over entire frequency band
- Protected by US patent 6,790,049



Generic photo used for illustration purposes only

### APPLICATIONS

- Wireless Base Station Systems
- Test and Measurement Systems
- Multi-Band Receivers

Model No.	ZX60-53LN+
Case Style	GC957
Connectors	SMA Female

#### +RoHS Compliant

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

### PRODUCT OVERVIEW

Mini-Circuits ZX60-53LN+ is a low-noise amplifier offering industry-leading performance over its full frequency range from 500 MHz to 5 GHz. The internal MMIC amplifier ZX60-53LN+ utilizes E-PHEMT technology to achieve excellent noise figure performance in a unique cascade configuration enabling the combination of very wide band performance and flat gain. This design operates on a single 5V supply and comes in a rugged, compact unobody 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
Ultra-wideband: 500 MHz – 5 GHz	Ideal for a wide range of receiver applications including military, commercial wireless, and instrumentation.
Very flat gain	Ideal for broadband or multi-band applications. Just one, cost-efficient model required for multiple frequency usage.
High IP3, +32 dBm typ.	Provides enhanced linearity over broad frequency range.
High gain, 25 dB typ.	Reduces the number of gain stages, lowering components count and overall system cost.
Low operating voltage, +5V	The amplifier features low operating voltage.
Rugged unobody construction	Mini-Circuits unobody construction integrates the RF connector into the case body, providing high reliability and excellent survivability in critical applications.

REV. B  
ECO-015740  
ZX60-53LN+  
ED-15070802  
AG/CP/AM  
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### ELECTRICAL SPECIFICATIONS AT 25°C, Z<sub>o</sub>=50Ω AND 5V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	V <sub>DD</sub> =5V			Units
		Min.	Typ.	Max.	
Frequency Range		0.5		5	GHz
Noise Figure	0.5		1.20		dB
	1.0		1.25		
	2.0		1.45		
	3.0		1.50		
	4.0		1.60		
	5.0		1.90		
Gain	0.5		22.0		dB
	1.0		22.0		
	2.0	19.5	21.0	23.9	
	3.0		20.0		
	4.0		19.0		
	5.0		18.0		
Gain Flatness	0.5-2.0		±0.7		dB
Input Return Loss	0.5		16.0		dB
	1.0		16.5		
	2.0		15.0		
	3.0		13.0		
	4.0		17.0		
	5.0		14.0		
Output Return Loss	0.5		13.0		dB
	1.0		15.0		
	2.0		20.0		
	3.0		15.0		
	4.0		15.0		
	5.0		12.0		
Output Power at 1dB Compression <sup>1</sup>	0.5		19.2		dBm
	1.0		19.1		
	2.0		18.9		
	3.0		19.1		
	4.0		19.5		
	5.0		18.2		
Output IP3	0.5		32.8		dBm
	1.0		35.0		
	2.0		31.5		
	3.0		31.0		
	4.0		32.0		
	5.0		30.9		
Active Directivity (Isolation-Gain)	—	—	4.5		dB
Device Operating Voltage (V <sub>DD</sub> )	—	4.9	5.0	7.0	V
Device Operating Current (I <sub>D</sub> )	—	—	80	105	mA

1. Current increases at P1dB.



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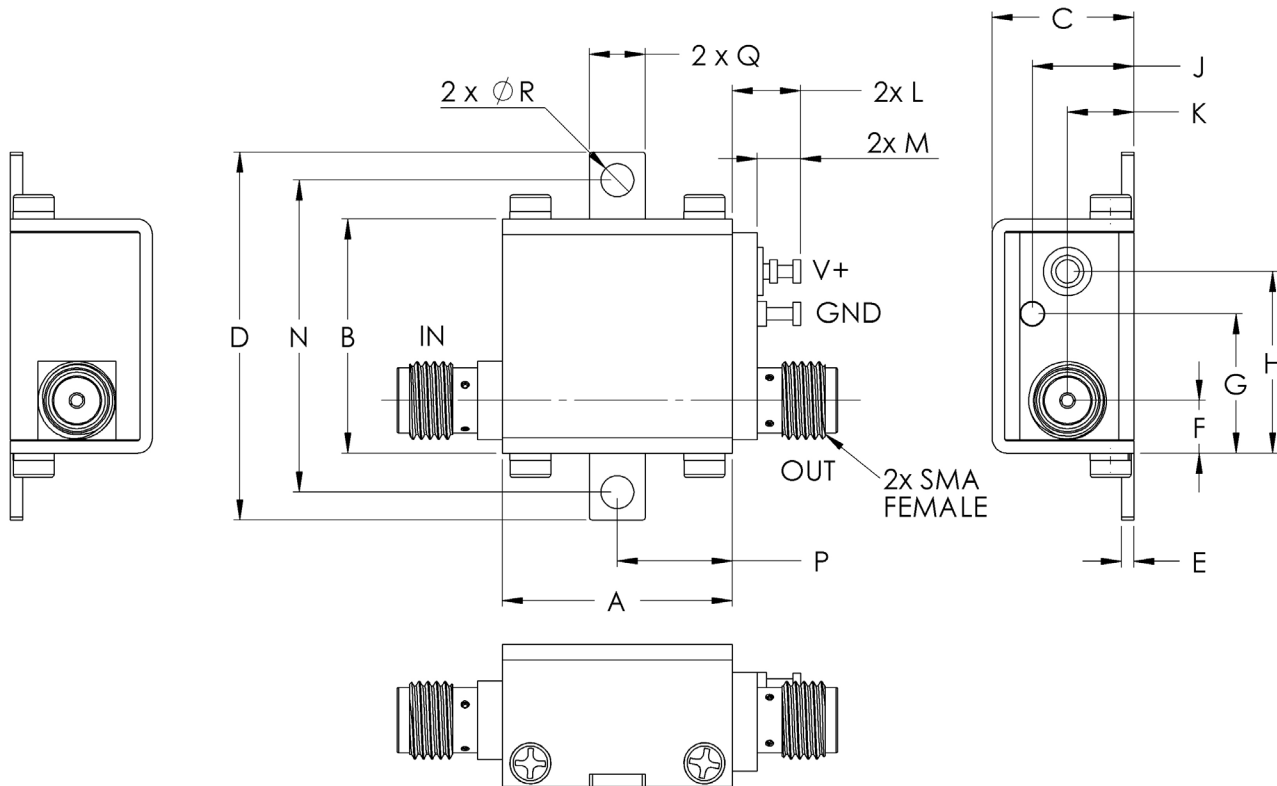
50Ω 0.5 to 5 GHz SMA Female

### 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	0.7 W
Input Power	+19 dBm (5 minutes max.) +8 dBm (continuous)
DC Voltage Vdd	+7V

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

### 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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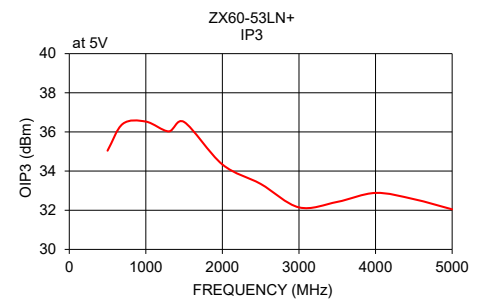
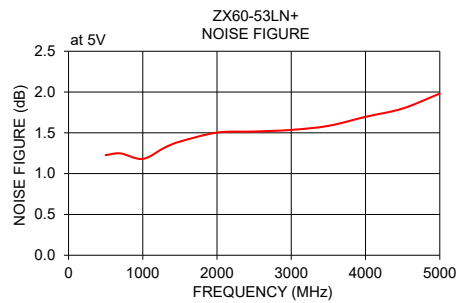
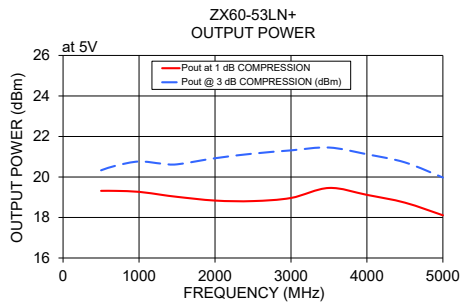
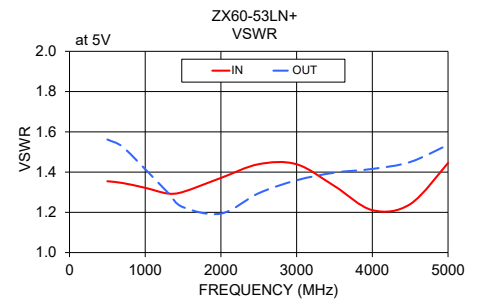
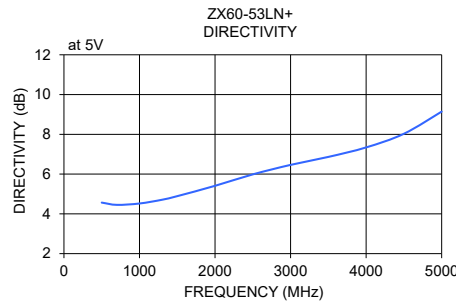
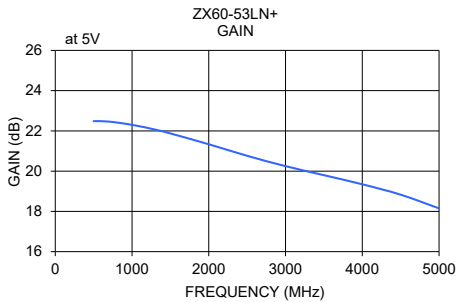
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### TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1)		Power Out @1 dB COMPR. (dBm)	Noise Figure (dB)	IP3 (dBm)
			IN	OUT			
500	22.49	4.57	1.35	1.56	19.32	1.23	35.04
700	22.46	4.45	1.35	1.53	19.31	1.25	36.42
1000	22.30	4.52	1.32	1.41	19.27	1.18	36.53
1300	22.06	4.71	1.29	1.30	19.12	1.32	36.03
1500	21.87	4.89	1.30	1.23	19.02	1.39	36.51
2000	21.34	5.41	1.37	1.19	18.84	1.50	34.34
2500	20.76	5.99	1.44	1.30	18.81	1.52	33.34
3000	20.25	6.46	1.44	1.36	18.96	1.54	32.15
3500	19.80	6.86	1.33	1.40	19.46	1.59	32.43
4000	19.35	7.34	1.21	1.42	19.12	1.70	32.88
4500	18.83	8.03	1.24	1.45	18.73	1.80	32.57
5000	18.15	9.14	1.45	1.54	18.11	1.98	32.05



- 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



## Typical Performance Data

FREQUENCY (MHz)	GAIN (dB) 5V	DIRECTIVITY (dB) 5V	VSWR (:1)		NOISE FIGURE (dB) 5V	POUT @ 1 dB COMPRESSION (dBm) 5V	POUT @ 3 dB COMPRESSION (dBm) 5V	OUTPUT IP3 (dBm) 5V
			IN 5V	OUT 5V				
300	22.11	5.53	1.54	1.64	1.37	18.83	19.13	35.19
400	22.40	4.83	1.39	1.58	1.27	19.22	19.97	34.80
500	22.49	4.57	1.35	1.56	1.23	19.32	20.33	35.04
600	22.49	4.48	1.35	1.55	1.28	19.27	20.34	37.92
700	22.46	4.45	1.35	1.53	1.25	19.31	20.56	36.42
800	22.38	4.52	1.34	1.50	1.27	19.30	20.71	35.49
900	22.35	4.51	1.34	1.46	1.28	19.29	20.64	37.33
1000	22.30	4.52	1.32	1.41	1.18	19.27	20.77	36.53
1100	22.23	4.56	1.30	1.37	1.30	19.14	20.56	38.42
1200	22.15	4.63	1.30	1.34	1.34	19.23	20.64	37.62
1300	22.06	4.71	1.29	1.30	1.32	19.12	20.66	36.03
1400	21.97	4.80	1.30	1.26	1.33	18.86	20.56	35.35
1500	21.87	4.89	1.30	1.23	1.39	19.02	20.62	36.51
1600	21.77	4.98	1.31	1.20	1.39	19.08	20.92	34.83
1700	21.67	5.08	1.31	1.19	1.36	19.01	20.92	34.82
1800	21.56	5.19	1.33	1.19	1.45	18.96	20.98	34.60
1900	21.44	5.32	1.35	1.19	1.46	18.83	20.68	34.71
2000	21.34	5.41	1.37	1.19	1.50	18.84	20.93	34.34
2100	21.22	5.53	1.38	1.21	1.53	18.99	21.22	34.04
2200	21.11	5.64	1.39	1.24	1.49	18.86	21.14	33.48
2300	20.99	5.75	1.40	1.26	1.52	18.67	20.82	34.43
2400	20.88	5.86	1.42	1.28	1.52	18.79	20.99	33.56
2500	20.76	5.99	1.44	1.30	1.52	18.81	21.15	33.34
2600	20.65	6.10	1.45	1.32	1.54	18.56	20.89	33.10
2700	20.55	6.19	1.46	1.34	1.43	18.56	20.57	33.13
2800	20.45	6.28	1.45	1.35	1.61	18.48	20.46	33.27
2900	20.35	6.37	1.44	1.36	1.53	18.92	20.96	33.19
3000	20.25	6.46	1.44	1.36	1.54	18.96	21.31	32.15
3100	20.16	6.54	1.44	1.37	1.56	18.36	20.48	32.64
3200	20.06	6.62	1.41	1.38	1.61	18.73	20.58	33.31
3300	19.98	6.70	1.38	1.39	1.60	18.96	20.81	33.27
3400	19.89	6.77	1.35	1.40	1.59	19.37	21.39	32.42
3500	19.80	6.86	1.33	1.40	1.59	19.46	21.45	32.43
3600	19.71	6.95	1.32	1.39	1.62	19.20	21.09	33.21
3700	19.62	7.03	1.30	1.39	1.65	19.27	20.94	33.69
3800	19.54	7.12	1.27	1.39	1.64	19.48	21.21	33.52
3900	19.45	7.22	1.23	1.40	1.68	19.37	21.31	32.89
4000	19.35	7.34	1.21	1.42	1.70	19.12	21.12	32.88
4100	19.24	7.47	1.21	1.43	1.66	19.19	21.06	34.03
4200	19.14	7.60	1.22	1.43	1.68	19.35	21.17	33.60
4300	19.05	7.72	1.23	1.43	1.74	18.79	20.85	32.67
4400	18.95	7.86	1.22	1.43	1.77	18.67	20.71	32.19
4500	18.83	8.03	1.24	1.45	1.80	18.73	20.72	32.57
4600	18.69	8.24	1.28	1.48	1.84	18.96	20.80	33.05
4700	18.55	8.48	1.33	1.50	1.87	18.88	20.74	33.17
4800	18.42	8.69	1.36	1.52	1.88	18.42	20.49	32.52
4900	18.29	8.90	1.39	1.53	1.91	17.95	19.97	32.14
5000	18.15	9.14	1.45	1.54	1.98	18.11	19.97	32.05
5100	17.98	9.45	1.53	1.55	2.04	17.98	19.91	30.91
5200	17.78	9.82	1.61	1.59	2.11	18.10	19.62	31.36
5300	17.57	10.20	1.66	1.65	2.19	17.81	19.32	30.95
5400	17.37	10.59	1.70	1.71	2.23	17.71	19.16	30.81
5500	17.12	11.05	1.77	1.76	2.30	17.26	18.68	30.67



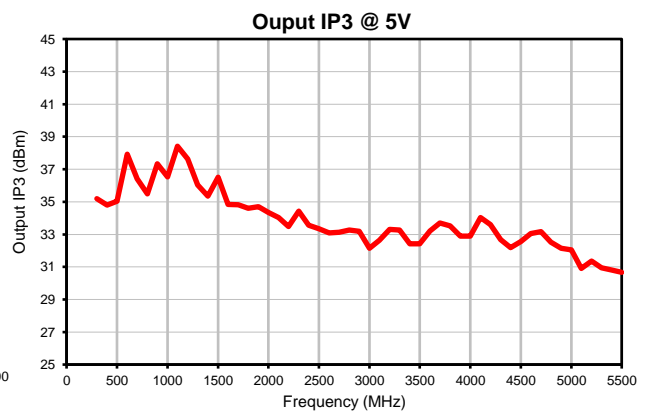
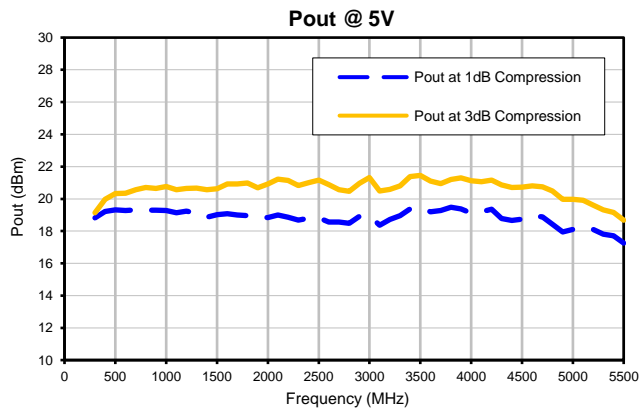
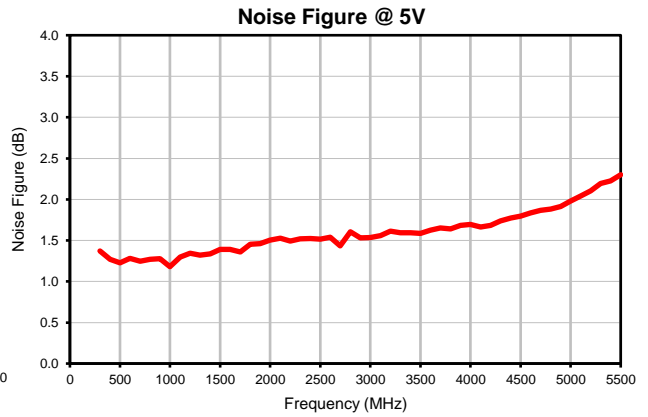
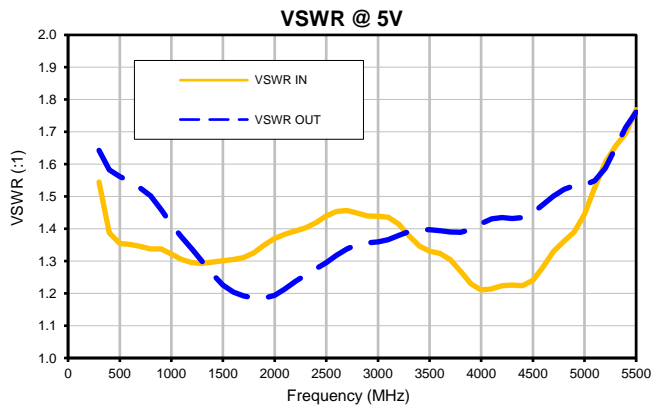
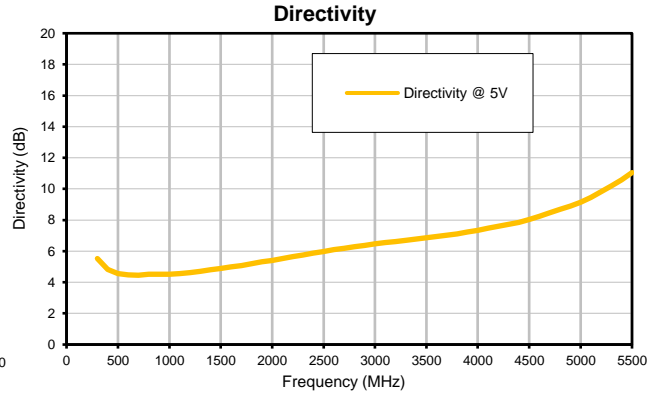
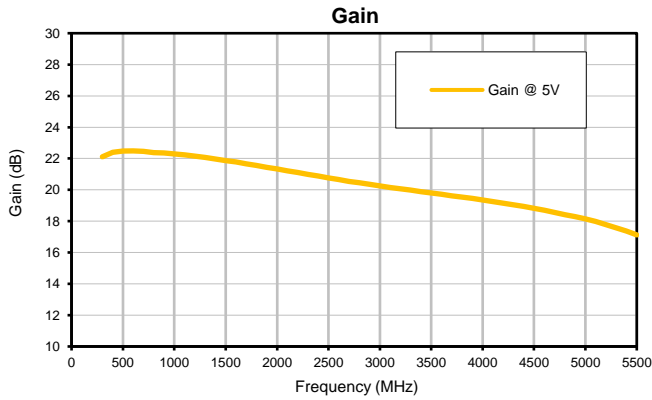
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 The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



IF/RF MICROWAVE COMPONENTS

REV. OR  
 ZX60-53LN+  
 9/30/2019  
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## Typical Performance Curves

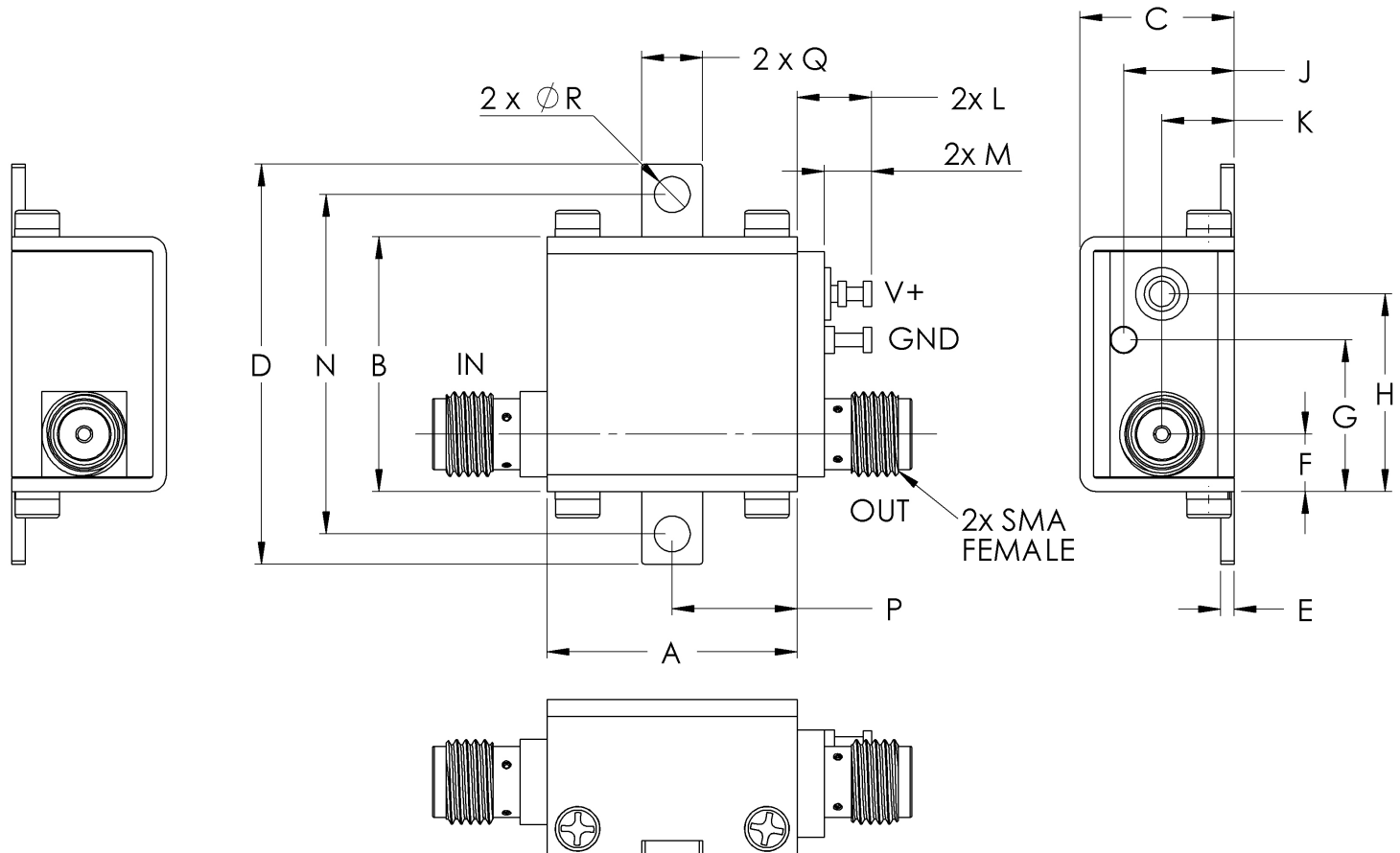


# Case Style

# 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