



Mini-Circuits

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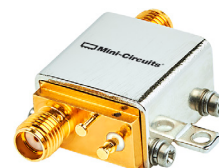
Low Noise Amplifier

ZX60-05113LN+

50Ω 5 to 11 GHz SMA Female

THE BIG DEAL

- Ultra low noise figure, 1.7 dB typ @ 8.5 GHz
- Low current consumption, 36 mA typ.
- High gain broadband performance
- Voltage regulated internally and reverse voltage protected
- Excellent Gain flatness, ± 0.7 dB over 5 to 11 GHz
- Protected by US patent 6,790,049



Generic photo used for illustration purposes only

Model No.	ZX60-05113LN+
Case Style	GC957
Connectors	SMA

+RoHS Compliant

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

APPLICATIONS

- Microwave radios
- C-band application
- X-band application
- Instrumentation and lab use

PRODUCT OVERVIEW

Mini-Circuits' ZX60-05113LN+ 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 5 V 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
Ultra-wideband with excellent gain flatness, ± 0.7 dB typ. for 5 - 11 GHz	Enables a single amplifier to be used in a wide range of applications including microwave radios and C and X-band applications, instrumentation and more.
Low noise over the whole band	Enables lower system noise figure performance.
High gain, 22 dB typ.	Reduces the number of gain stages, lowering component count and overall system cost.
Low operating voltage, +5V	The amplifier features low operating voltage and low current consumption.
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. C
ECO-015740
ZX60-05113LN+
AG/CP/AM
221108





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ELECTRICAL SPECIFICATIONS AT 25°C AND +5V, UNLESS NOTED

Parameter	Condition (GHz)	V _{DD} =5.0			Units
		Min.	Typ.	Max.	
Frequency Range		5		11.0	GHz
Noise Figure	5 - 7		2.0		dB
	7 - 9		1.7		
	9 - 11		1.6		
Gain	5 - 7	17.5	22	—	dB
	7 - 9		22		
	9 - 11		22		
Input Return Loss	5 - 7		7		dB
	7 - 9		13		
	9 - 11		9		
Output Return Loss	5 - 7		13		dB
	7 - 9		17		
	9 - 11		11.5		
Output Power at 1dB Compression ¹	5 - 7		10		dBm
	7 - 9		10		
	9 - 11		10.5		
Output IP3	5 - 7		21		dBm
	7 - 9		21		
	9 - 11		21.5		
Device Operating Voltage (V _{DD})	—	4.9	5.0	9.0	V
Device Operating Current (I _{DD})	—	—	36	53	mA

1. Current increases at P1dB

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

ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Total Power Dissipation	0.6 W
Input Power (CW), V _d =5V	17 dBm
DC Voltage	9V

4. 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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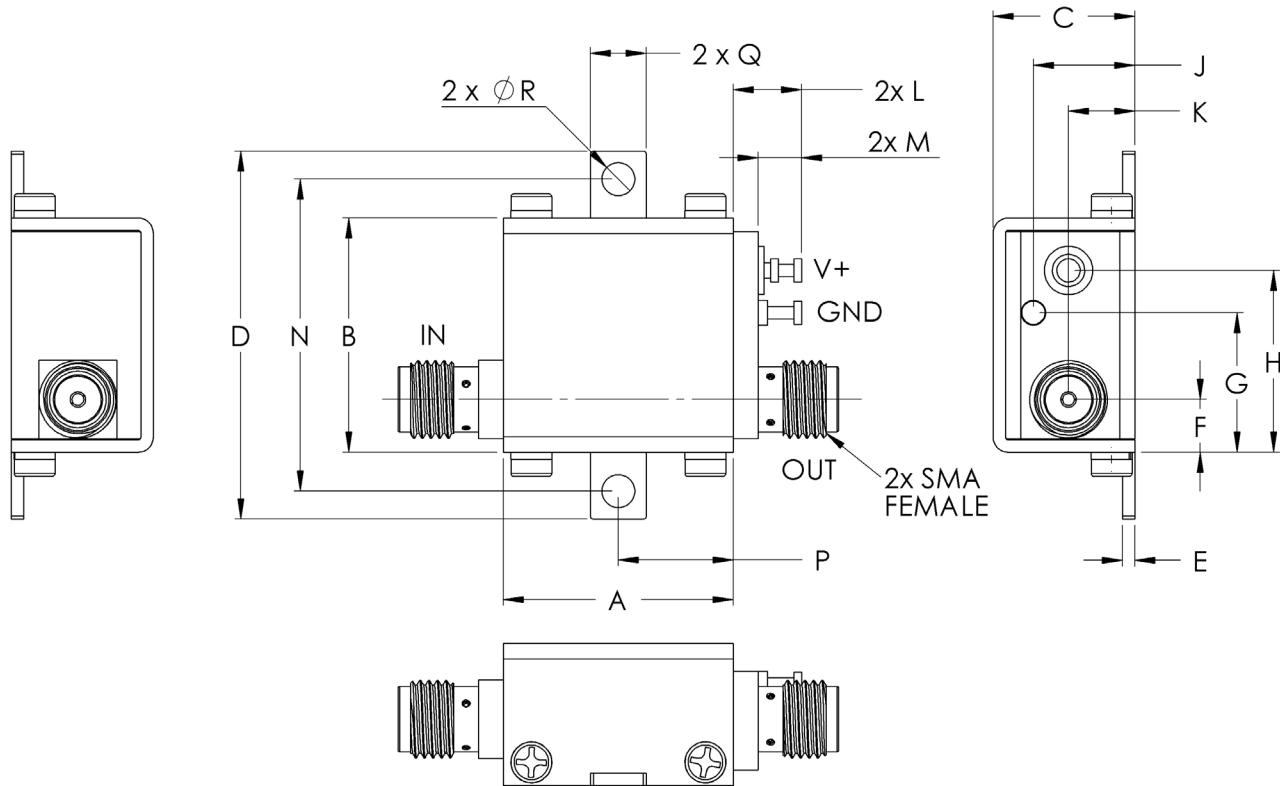
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OUTLINE DRAWING

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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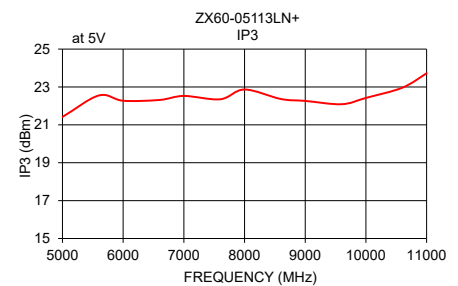
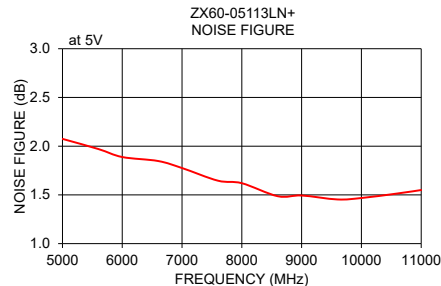
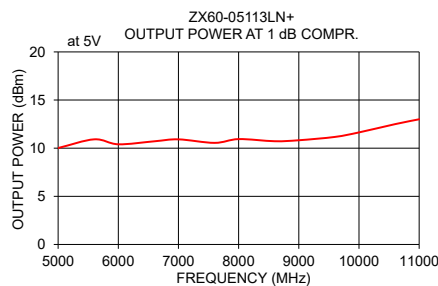
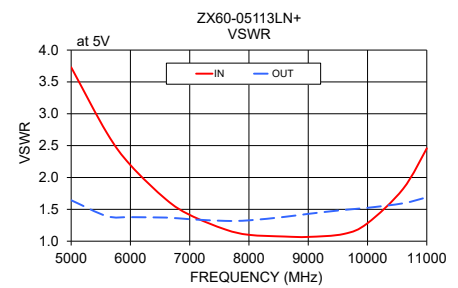
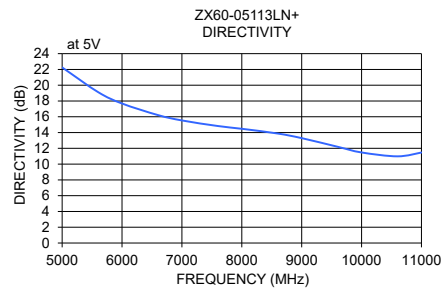
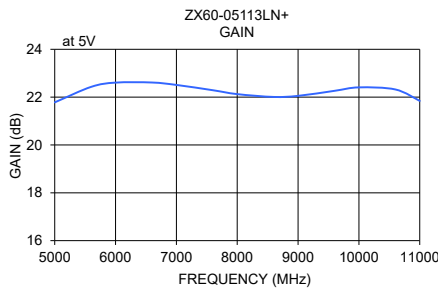
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50Ω 5 to 11 GHz SMA Female

TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1) 5V		Power Out @ 1 dB COMPR. (dBm)	Noise Figure (dB)	IP3 (dBm)
	5V	5V	IN	OUT	5V	5V	5V
5000	21.78	22.25	3.73	1.64	10.02	2.07	21.42
5600	22.43	19.13	2.70	1.39	10.92	1.97	22.55
6000	22.61	17.68	2.19	1.38	10.40	1.89	22.27
6600	22.61	16.21	1.66	1.37	10.72	1.85	22.31
7000	22.51	15.53	1.41	1.34	10.92	1.78	22.53
7600	22.29	14.83	1.18	1.32	10.55	1.65	22.35
8000	22.13	14.48	1.10	1.33	10.94	1.62	22.87
8600	22.01	13.88	1.07	1.38	10.72	1.49	22.36
9000	22.05	13.29	1.07	1.43	10.82	1.49	22.26
9600	22.26	12.20	1.11	1.49	11.17	1.45	22.09
10000	22.41	11.48	1.28	1.52	11.64	1.47	22.42
10600	22.32	10.99	1.82	1.59	12.50	1.51	22.96
11000	21.84	11.47	2.46	1.69	13.00	1.55	23.72



- 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



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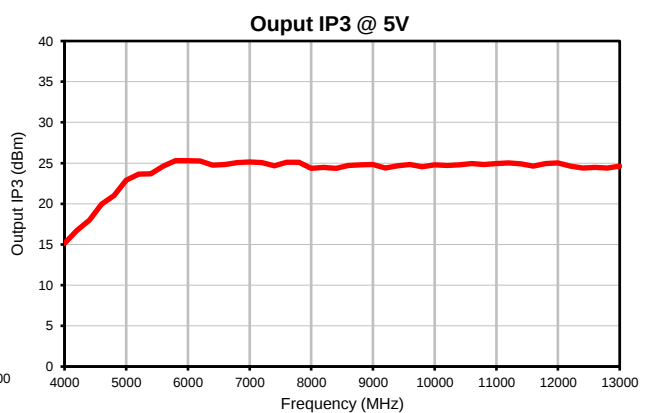
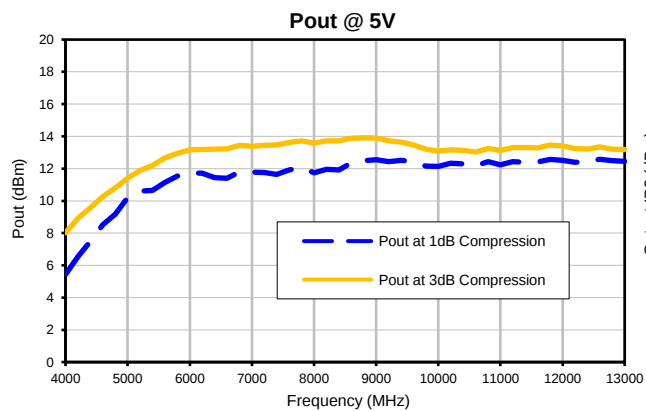
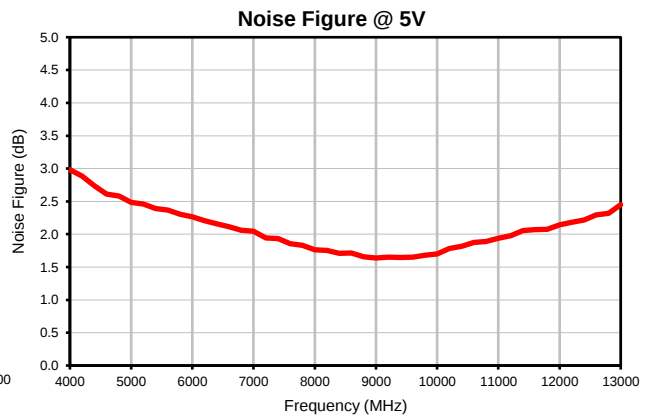
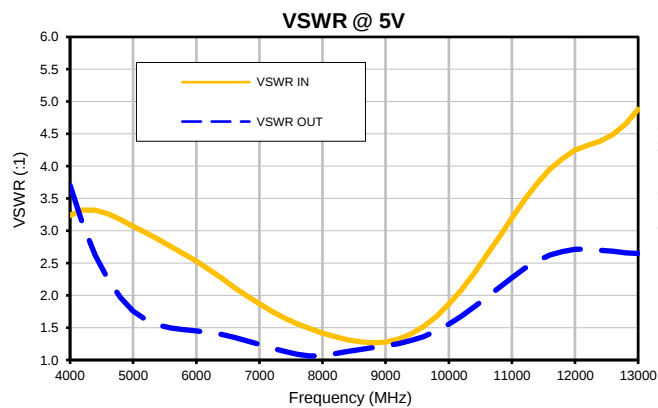
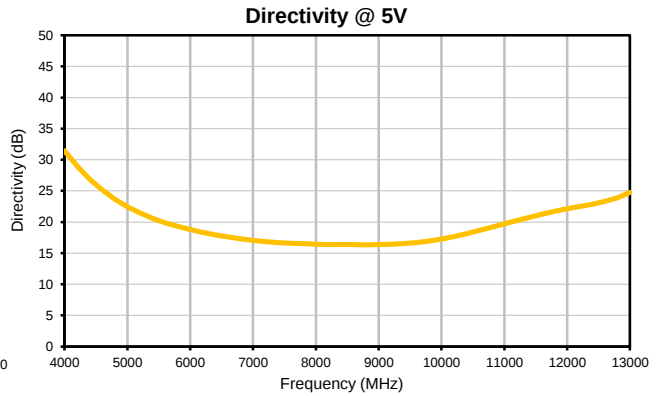
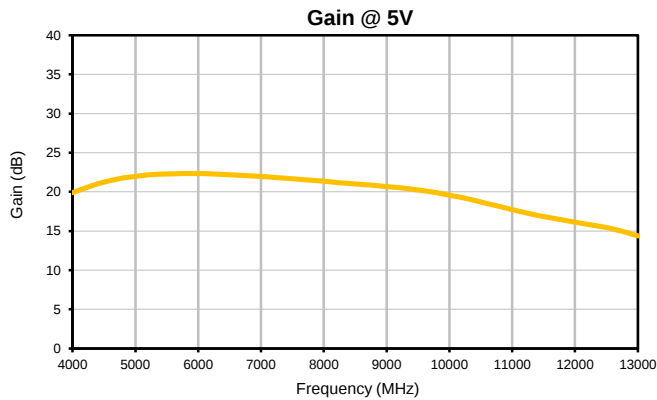
Typical Performance Data

FREQUENCY	GAIN	DIRECTIVITY	VSWR (:1)		NOISE FIGURE	POUT @ 1 dB COMPRESSION	POUT @ 3 dB COMPRESSION	OUTPUT IP3
(MHz)	(dB) 5V	(dB) 5V	IN 5V	OUT 5V	(dB) 5V	(dBm) 5V	(dBm) 5V	(dBm) 5V
4000	19.89	31.43	3.24	3.71	2.98	5.43	8.02	15.14
4200	20.51	28.96	3.32	3.10	2.89	6.54	8.92	16.72
4400	21.02	26.88	3.32	2.62	2.74	7.48	9.58	17.98
4600	21.44	25.15	3.26	2.25	2.61	8.52	10.27	19.97
4800	21.76	23.69	3.17	1.96	2.58	9.18	10.81	21.02
5000	21.99	22.45	3.07	1.76	2.49	10.19	11.40	22.91
5200	22.16	21.45	2.97	1.62	2.46	10.60	11.87	23.64
5400	22.26	20.60	2.87	1.54	2.39	10.65	12.19	23.70
5600	22.31	19.90	2.75	1.50	2.37	11.14	12.67	24.64
5800	22.33	19.31	2.64	1.47	2.30	11.53	12.94	25.30
6000	22.32	18.79	2.53	1.45	2.27	11.71	13.16	25.30
6200	22.29	18.35	2.40	1.43	2.21	11.72	13.18	25.26
6400	22.23	17.94	2.27	1.39	2.16	11.45	13.21	24.73
6600	22.15	17.60	2.13	1.35	2.11	11.39	13.22	24.84
6800	22.06	17.31	1.99	1.30	2.06	11.80	13.44	25.07
7000	21.97	17.06	1.87	1.24	2.05	11.77	13.39	25.14
7200	21.86	16.86	1.75	1.19	1.94	11.76	13.43	25.07
7400	21.74	16.70	1.65	1.13	1.93	11.65	13.46	24.67
7600	21.62	16.60	1.56	1.09	1.86	11.91	13.62	25.11
7800	21.49	16.51	1.48	1.06	1.83	12.08	13.72	25.11
8000	21.35	16.44	1.42	1.07	1.76	11.74	13.58	24.37
8200	21.22	16.41	1.36	1.10	1.75	11.95	13.72	24.49
8400	21.08	16.37	1.31	1.13	1.71	11.91	13.71	24.36
8600	20.95	16.36	1.28	1.16	1.71	12.36	13.88	24.73
8800	20.82	16.36	1.27	1.19	1.66	12.49	13.91	24.79
9000	20.68	16.38	1.28	1.22	1.64	12.55	13.89	24.81
9200	20.53	16.43	1.32	1.25	1.65	12.44	13.73	24.39
9400	20.34	16.54	1.40	1.30	1.65	12.52	13.64	24.67
9600	20.13	16.70	1.52	1.36	1.65	12.43	13.46	24.84
9800	19.88	16.94	1.67	1.45	1.68	12.16	13.20	24.54
10000	19.58	17.27	1.86	1.55	1.70	12.13	13.08	24.80
10200	19.26	17.66	2.09	1.68	1.78	12.32	13.16	24.72
10400	18.89	18.13	2.34	1.82	1.82	12.30	13.12	24.81
10600	18.51	18.64	2.63	1.97	1.88	12.18	13.03	24.93
10800	18.11	19.18	2.91	2.13	1.89	12.42	13.25	24.84
11000	17.72	19.71	3.20	2.27	1.94	12.24	13.13	24.95
11200	17.34	20.25	3.48	2.41	1.98	12.43	13.31	25.01
11400	16.99	20.76	3.73	2.53	2.05	12.40	13.31	24.90
11600	16.68	21.25	3.95	2.62	2.07	12.42	13.28	24.62
11800	16.40	21.72	4.11	2.68	2.08	12.56	13.47	24.95
12000	16.13	22.14	4.25	2.72	2.15	12.51	13.41	25.04
12200	15.86	22.52	4.32	2.72	2.18	12.40	13.25	24.63
12400	15.59	22.87	4.39	2.70	2.22	12.40	13.20	24.39
12600	15.26	23.31	4.49	2.68	2.29	12.58	13.34	24.48
12800	14.87	23.91	4.65	2.66	2.32	12.48	13.20	24.39
13000	14.36	24.78	4.88	2.65	2.45	12.44	13.18	24.62

Low Noise Amplifier

Typical Performance Curves

ZX60-05113LN+

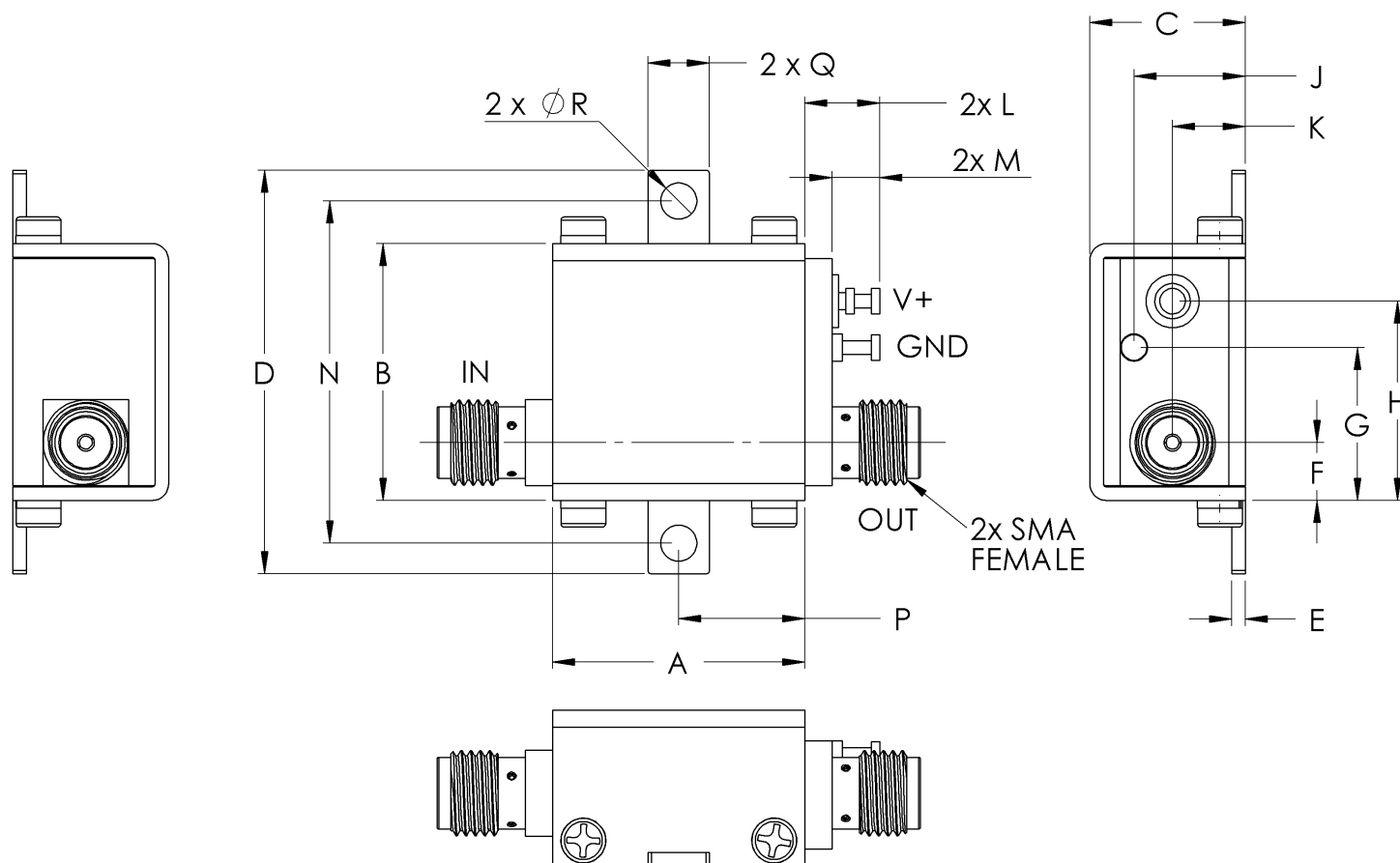


Case Style

Outline Dimensions

GC

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®

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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