COAXIAL

Low Noise Amplifier ZX60-123LN-S+

50Ω 0.5 to 12 GHz SMA Female

THE BIG DEAL

- Ultra-wideband, 0.5 to 12 GHz
- Flat gain, 17 ±2.4 dB over full band
- Low noise figure, 2.4 dB
- High IP3, +28 dBm
- Protected by US patent 6,790,049

Generic photo used for illustration purposes only

Model No.	ZX60-123LN-S+
Case Style	GC957
Connectors	SMA Female

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

APPLICATIONS

- WiFi
- WLAN
- UMTS
- LTE
- WiMAX
- S-band Radar
- C-band Satcom

PRODUCT OVERVIEW

Mini-Circuits' ZX60-123LN-S+ is an ultra-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 12V 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, ±2.4 dB	Enables a single amplifier to be used in a wide range of applications including WiFi, LTE, S-Band radar, C-band and X-band SatCom, defense, instrumentation and more.
Low noise over the whole band, 2.4 dB typ.	Enables lower system noise figure performance.
High gain, 17 dB typ.	Reduces the number of gain stages, lowering component count and overall system cost.
High IP3, +28 dBm typ.	The combination of low noise and high IP3 makes the ZX60-123LN-S+ 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.
Rugged, unibody construction	The amplifier features low operating 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.

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ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Condition GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.5		12	GHz
Noise Figure	0.5		2.6		dB
	2.0		2.1		
	8.0		2.4		
	10.0		2.7		
	12.0		3.1		
Gain	0.5		18.4		dB
	2.0		18.9		
	8.0	15.1	16.2	18.4	
	10.0		15.4		
	12.0		14.4		
Input VSWR	0.5		2.5		:1
	2.0		1.7		
	8.0		1.9		
	10.0		1.7		
	12.0		2.3		
Output VSWR	0.5		1.5		:1
	2.0		1.5		
	8.0		1.4		
	10.0		1.5		
	12.0		1.6		
Output Power at 1dB Compression[1]	0.5		15.8		dBm
	2.0		16.5		
	8.0		16.0		
	10.0		14.8		
	12.0		13.4		
Output IP3	0.5		29.4		dBm
	2.0		31.2		
	8.0		28.3		
	10.0		27		
	12.0		25.1		
Device Operating Voltage (Vdd)	—	—	12	—	V
Device Operating Current (Id)	—	—	82	94	mA
Device Current Variation vs. Temperature[2]			-11.7		µA/°C
Device Current Variation vs. Voltage			0.0187		mA/mV

1. Current increases at P1dB.
2. (Current at 85°C - Current at -45°C)/130

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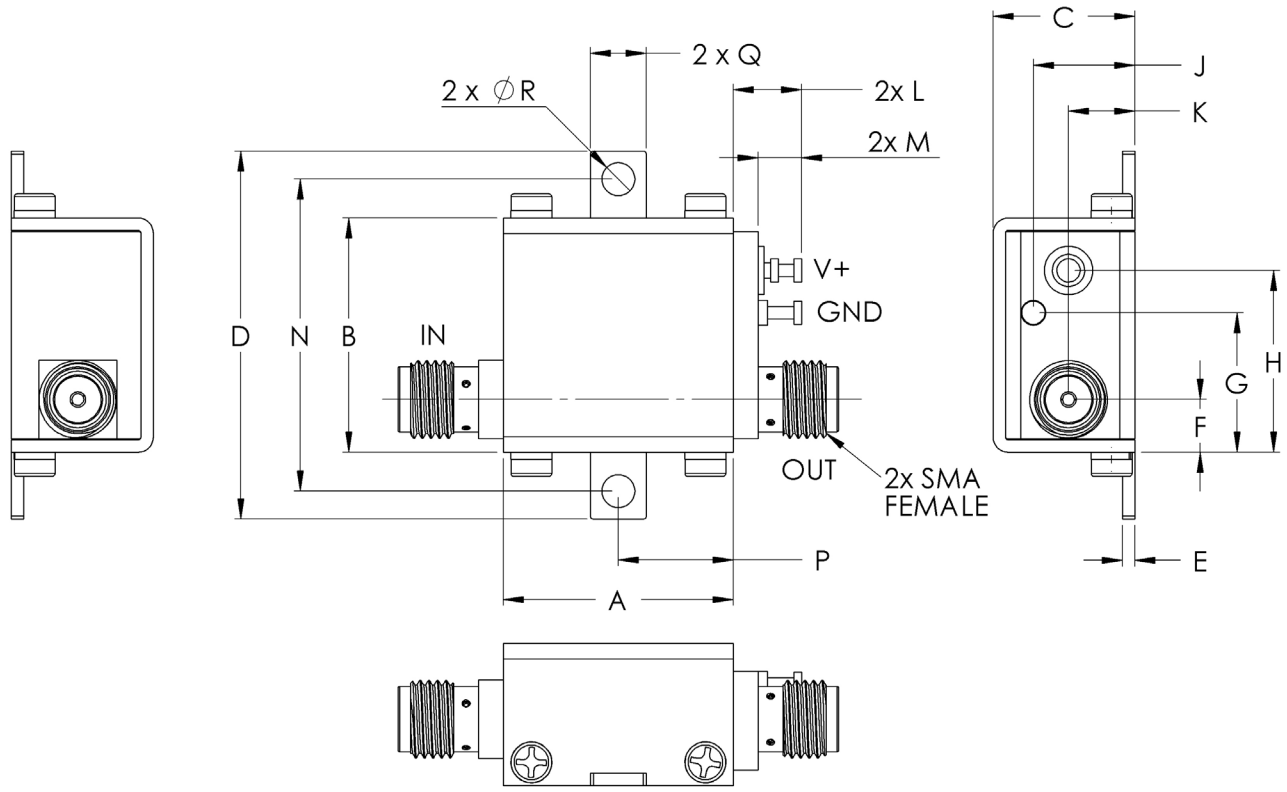
ABSOLUTE MAXIMUM RATINGS[3]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Total Power Dissipation	1.2 W
Input Power (CW), Vd=12	+23 dBm (5 minutes max.) +8 dBm (continuous)
DC Voltage	+13V

3. 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)

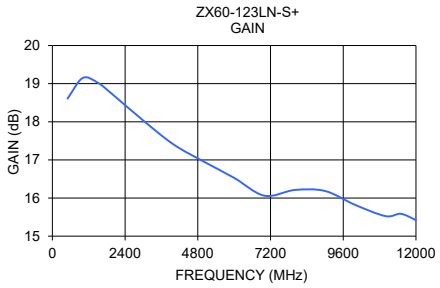
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
.74	.75	.46	1.18	.04	.17	.45	.59	.33	.21	.22	.14	1.00	.37	.18	.106	grams
18.80	19.1	11.68	30.0	1.02	4.32	11.4	14.99	8.38	5.33	5.59	3.56	25.40	9.40	4.57	2.69	23.0

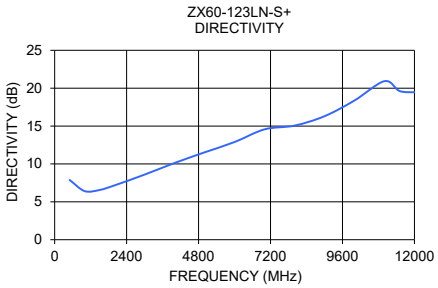
Low Noise Amplifier ZX60-123LN-S+

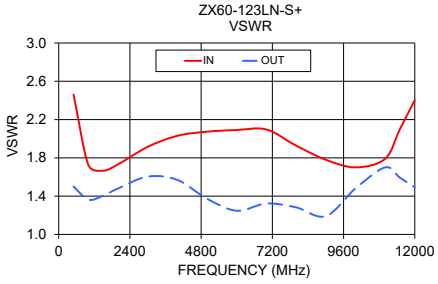
50Ω 0.5 to 12 GHz SMA Female

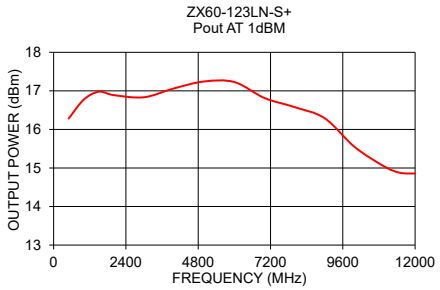
TYPICAL PERFORMANCE DATA/CURVES

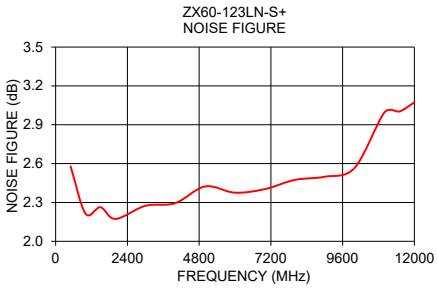
Frequency (MHz)	Gain (dB)	Directivity (dB)	VSVR (:1)		Power Out @1 dB COMPR. (dBm)	Noise Figure (dB)	IP3 (dBm)
			IN	OUT			
500	18.61	7.88	2.46	1.50	16.28	2.58	30.97
1000	19.15	6.42	1.73	1.36	16.77	2.21	31.21
1500	19.02	6.56	1.67	1.40	16.98	2.26	32.66
2000	18.71	7.17	1.73	1.48	16.89	2.17	32.75
3000	18.03	8.59	1.91	1.60	16.83	2.27	31.79
4000	17.41	10.13	2.03	1.57	17.06	2.29	31.80
5000	16.95	11.53	2.07	1.37	17.24	2.42	31.14
6000	16.53	12.89	2.09	1.25	17.23	2.38	30.32
7000	16.06	14.57	2.10	1.32	16.81	2.40	29.67
8000	16.21	15.06	1.93	1.28	16.58	2.47	28.97
9000	16.18	16.30	1.78	1.19	16.29	2.50	27.76
10000	15.82	18.37	1.70	1.48	15.54	2.57	27.39
11000	15.52	20.92	1.79	1.70	15.03	3.00	27.08
11500	15.59	19.63	2.10	1.59	14.87	3.00	26.89
12000	15.42	19.46	2.40	1.49	14.86	3.07	27.16

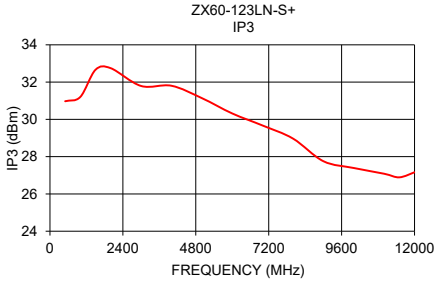












NOTES

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

Low Noise Bypass Amplifier ZX60-123LN-S+

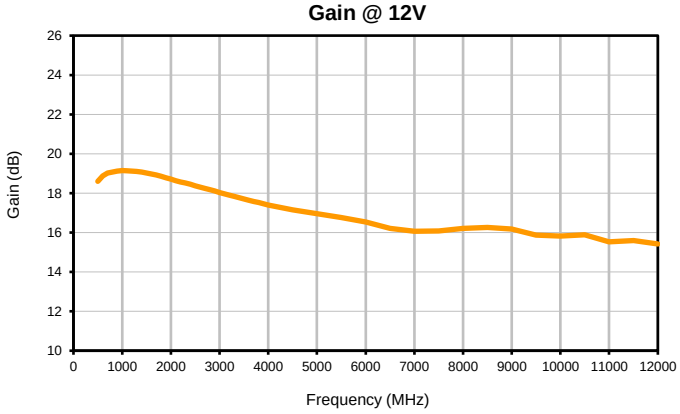
Typical Performance Data

FREQUENCY (MHz)	Gain (dB) 12V	Directivity (dB) 12V	VSWR IN (:1) 12V	VSWR OUT (:1) 12V	Noise Figure (dB) 12V	Pout @ 1dB Compression (dBm) 12V	Output IP3 (dBm) 12V
500	18.61	7.88	2.46	1.50	2.58	16.28	30.97
600	18.87	7.25	2.16	1.44	2.47	16.47	31.76
700	19.01	6.91	1.97	1.40	2.39	16.58	31.54
800	19.07	6.67	1.85	1.38	2.37	16.66	31.84
900	19.13	6.55	1.78	1.37	2.28	16.76	32.36
1000	19.15	6.42	1.73	1.36	2.21	16.77	31.21
1100	19.14	6.41	1.69	1.37	2.30	16.85	32.03
1200	19.12	6.41	1.67	1.37	2.23	16.88	32.12
1300	19.10	6.47	1.66	1.38	2.30	16.93	32.65
1400	19.06	6.50	1.66	1.39	2.24	16.94	32.80
1500	19.02	6.56	1.67	1.40	2.26	16.98	32.66
1600	18.98	6.64	1.67	1.42	2.25	16.89	32.27
1700	18.92	6.73	1.69	1.44	2.29	16.97	33.07
1800	18.86	6.87	1.70	1.45	2.23	16.90	32.90
1900	18.79	7.02	1.72	1.47	2.20	16.87	32.71
2000	18.71	7.17	1.73	1.48	2.17	16.89	32.75
2100	18.63	7.30	1.75	1.49	2.22	16.74	32.01
2200	18.57	7.40	1.76	1.50	2.27	16.80	32.08
2300	18.51	7.56	1.78	1.52	2.21	16.92	33.10
2400	18.45	7.66	1.80	1.53	2.21	17.00	33.06
2500	18.38	7.80	1.82	1.55	2.26	16.96	33.15
2600	18.31	7.99	1.84	1.56	2.27	16.93	33.07
2700	18.24	8.12	1.86	1.58	2.32	16.93	32.79
2800	18.17	8.27	1.88	1.59	2.34	16.94	32.67
2900	18.11	8.42	1.90	1.60	2.34	16.98	32.54
3000	18.03	8.59	1.91	1.60	2.27	16.83	31.79
3100	17.97	8.73	1.93	1.61	2.33	16.91	32.16
3200	17.90	8.90	1.95	1.62	2.33	16.98	32.56
3300	17.83	9.07	1.96	1.62	2.29	16.89	31.98
3400	17.77	9.24	1.97	1.62	2.29	17.11	32.88
3500	17.71	9.39	1.99	1.61	2.28	17.17	32.98
3600	17.64	9.49	2.00	1.61	2.31	17.03	32.25
3700	17.58	9.69	2.01	1.60	2.25	17.09	32.24
3800	17.52	9.85	2.02	1.59	2.29	17.08	32.04
3900	17.46	9.98	2.03	1.58	2.27	17.03	31.64
4000	17.41	10.13	2.03	1.57	2.29	17.06	31.80
4500	17.15	10.81	2.05	1.48	2.34	17.23	31.89
5000	16.95	11.53	2.07	1.37	2.42	17.24	31.14
5500	16.76	12.17	2.09	1.29	2.37	17.27	30.51
6000	16.53	12.89	2.09	1.25	2.38	17.23	30.32
6500	16.22	13.88	2.08	1.27	2.43	16.98	30.08
7000	16.06	14.57	2.10	1.32	2.40	16.81	29.67
7500	16.09	14.75	2.05	1.32	2.42	16.72	29.41
8000	16.21	15.06	1.93	1.28	2.47	16.58	28.97
8500	16.27	15.72	1.85	1.19	2.42	16.52	28.76
9000	16.18	16.30	1.78	1.19	2.50	16.29	27.76
9500	15.88	17.36	1.71	1.34	2.52	15.80	27.58
10000	15.82	18.37	1.70	1.48	2.57	15.54	27.39
10500	15.89	19.29	1.74	1.60	2.73	15.28	27.28
11000	15.52	20.92	1.79	1.70	3.00	15.03	27.08
11500	15.59	19.63	2.10	1.59	3.00	14.87	26.89
12000	15.42	19.46	2.40	1.49	3.07	14.86	27.16

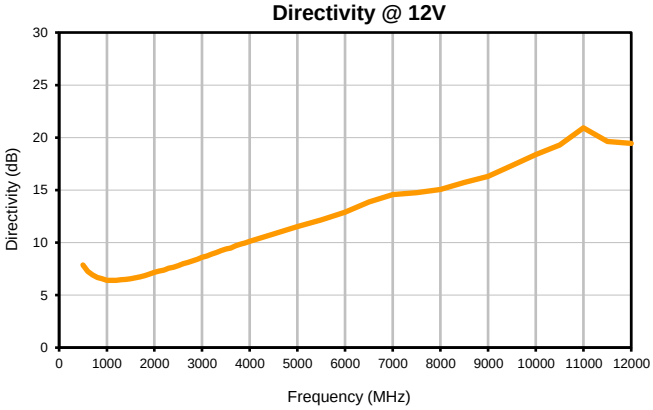
Low Noise Bypass Amplifier ZX60-123LN-S+

Typical Performance Curves

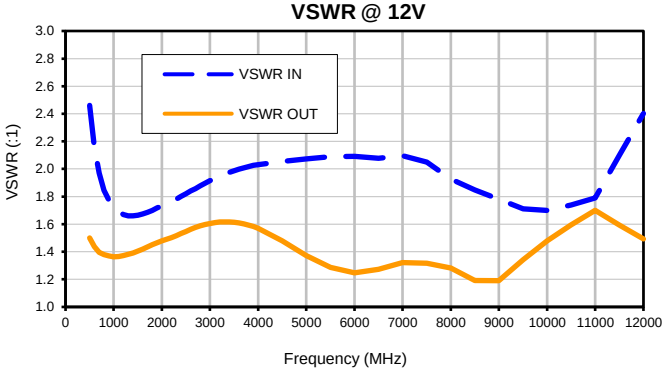
Gain @ 12V



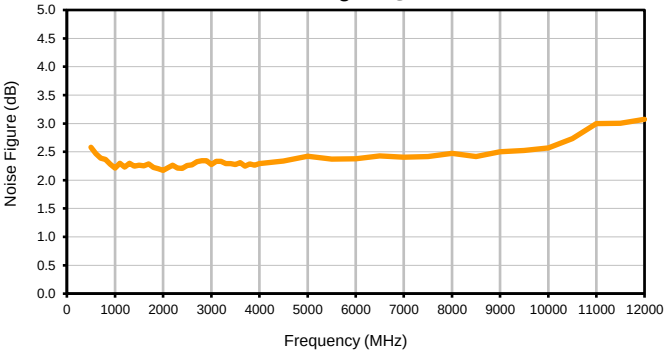
Directivity @ 12V



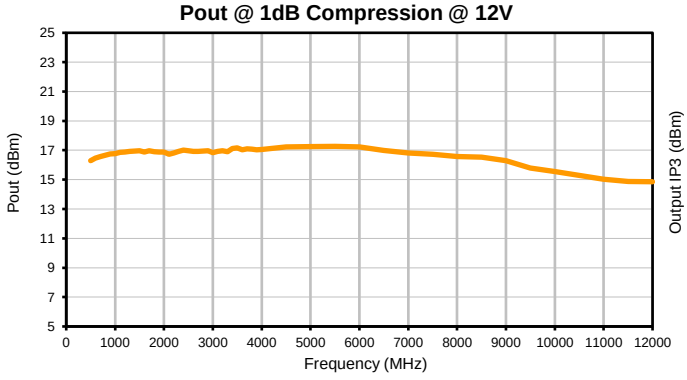
VSWR @ 12V



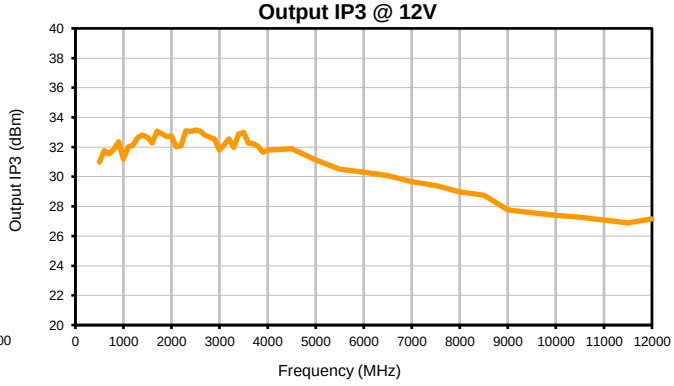
Noise Figure @ 12V



Pout @ 1dB Compression @ 12V



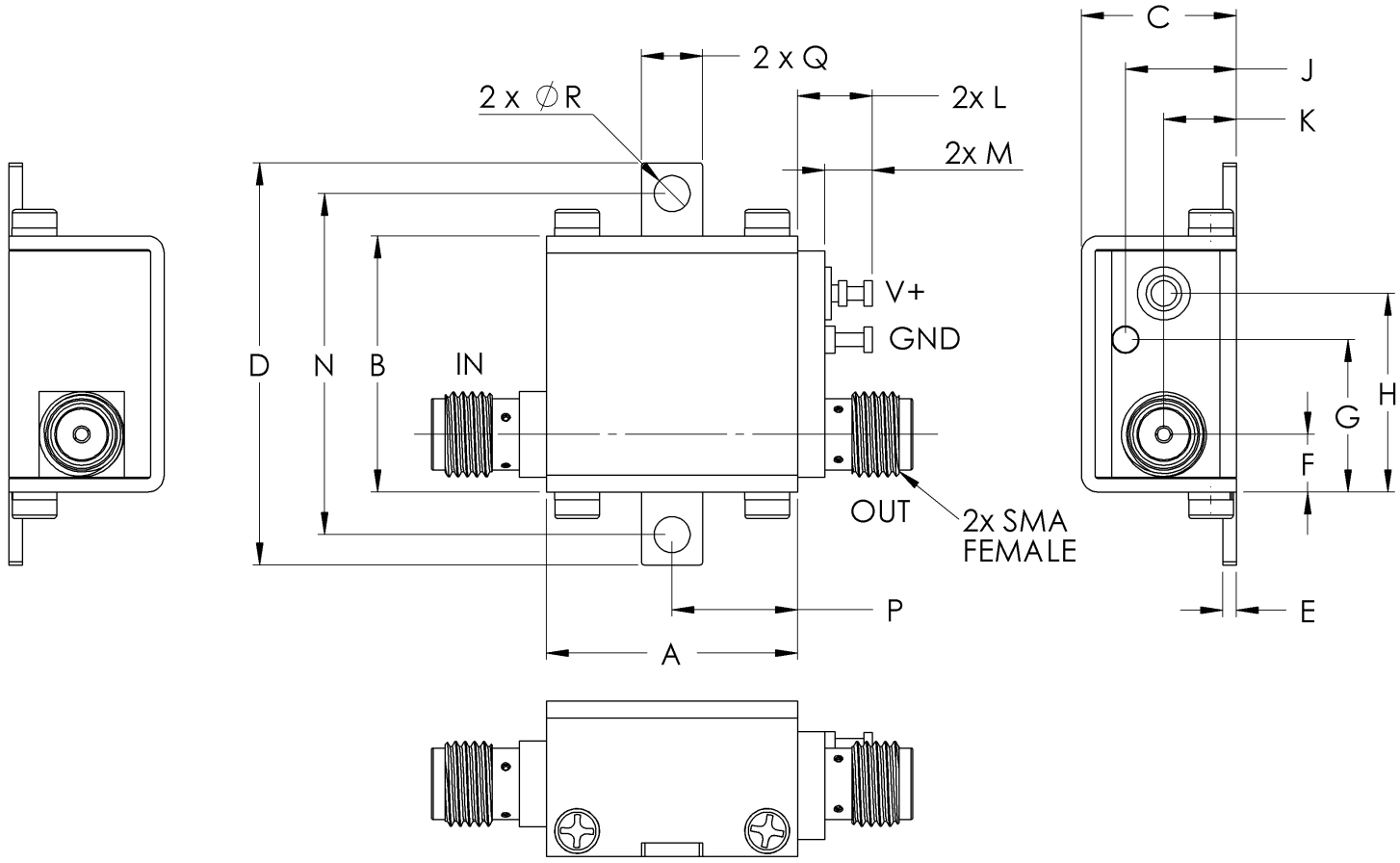
Output IP3 @ 12V



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 ISO 9001 & ISO 14001 Certified

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 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