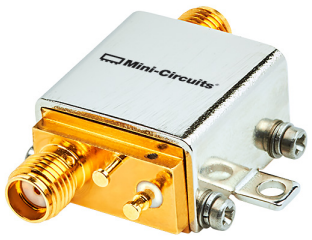
COAXIAL

Low Phase Noise Amplifier ZX60-223LPN+

50Ω 0.01 to 22 GHz SMA Female

KEY FEATURES

- Ultra Broadband Performance
- Gain, 16 dB typ.
- Output P1dB, +18 dBm typ.
- Output OIP3, +27 dBm typ.
- Voltage Regulated Internally and Reverse Voltage Protected
- Ultra-Low Additive Phase Noise, Typ. -172 dBc/Hz @10 kHz Offset

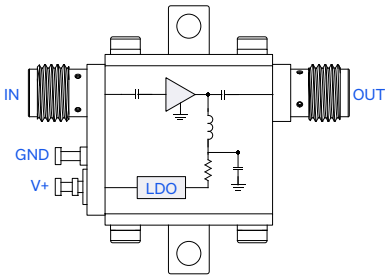


Generic photo used for illustration purposes only

APPLICATIONS

- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems
- 5G MIMO and Back Haul Radio Systems
- Signal Distribution Networks

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' ZX60-223LPN+ is an ultra-wideband amplifier utilizing a GaAs HBT (Mini-Circuits LVA-273-PN+) that provides extremely low additive phase noise and offers excellent gain over a broad frequency range. 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

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		.01		22	GHz
Gain	.01-10	15	17	—	dB
	10-22	12	15	—	
Output Power at 1 dB Compression (P1dB)	.01-10	+15	+18	—	dBm
	10-22	+12	+16	—	
Output Third Order Intercept Point (OIP3)	2-22	—	+27	—	dBm
Input Return Loss	.01-10	—	15	—	dB
	10-22	—	12	—	
Output Return Loss	.01-10	—	15	—	dB
	10-22	—	10	—	
Noise Figure	2-22	—	5.5	—	dB
Additive Phase Noise @10 kHz Offset	—	—	-174	—	dBc/Hz
DC Supply Voltage (Vs)	—	+5.9	+6	+9	V
DC Current[1]	—	—	110	150	mA

1. DC Current increases at P1dB/Psat as applicable.

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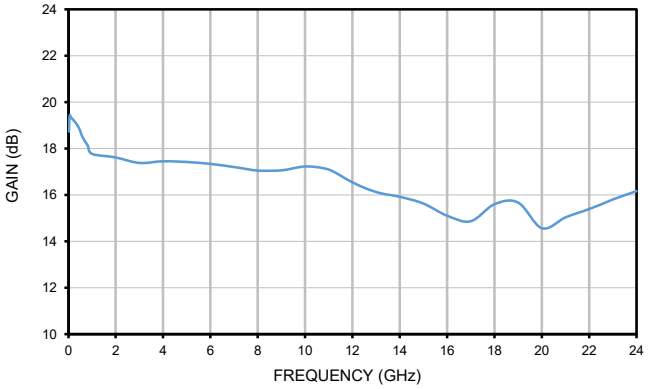
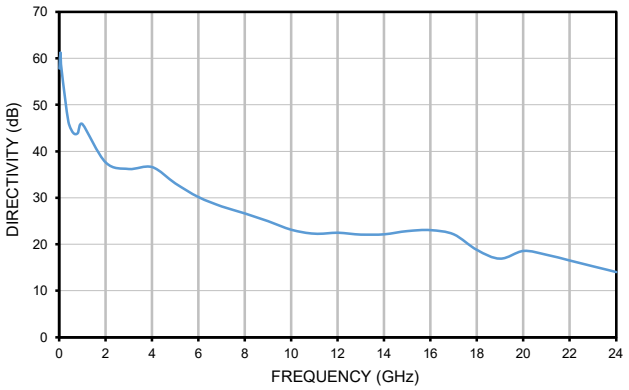
TYPICAL PERFORMANCE GRAPHS

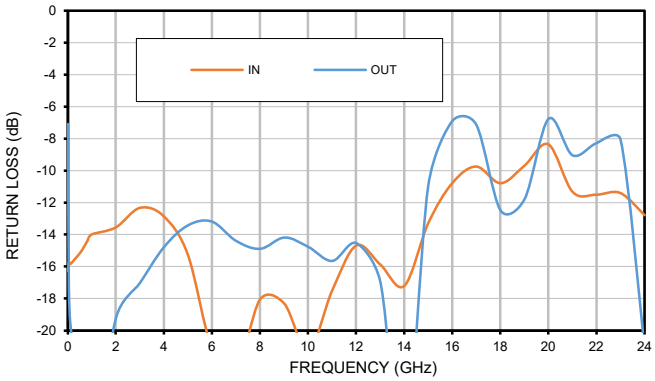
GAIN



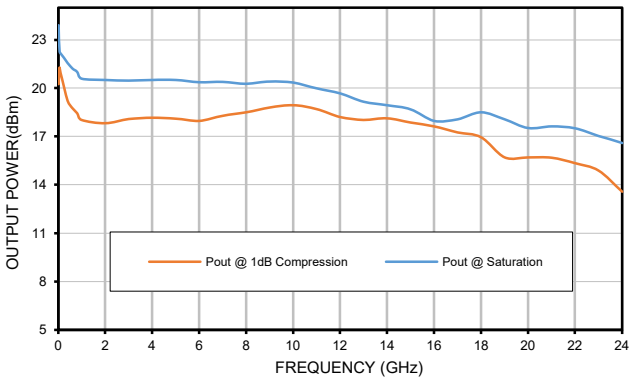
DIRECTIVITY



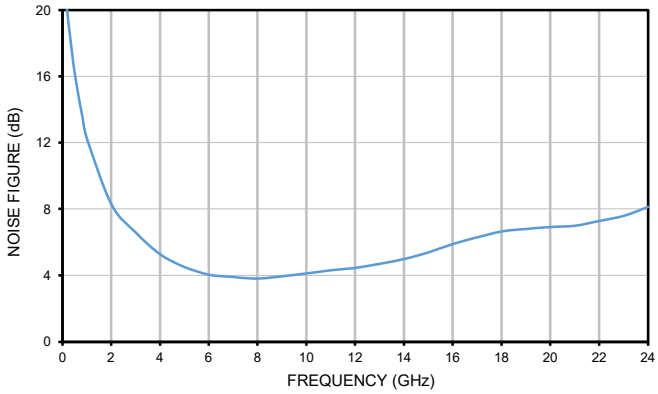
RETURN LOSS



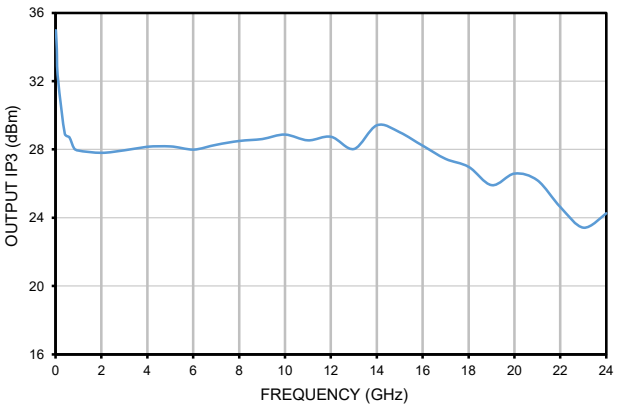
OUTPUT POWER



NOISE FIGURE



OUTPUT IP3



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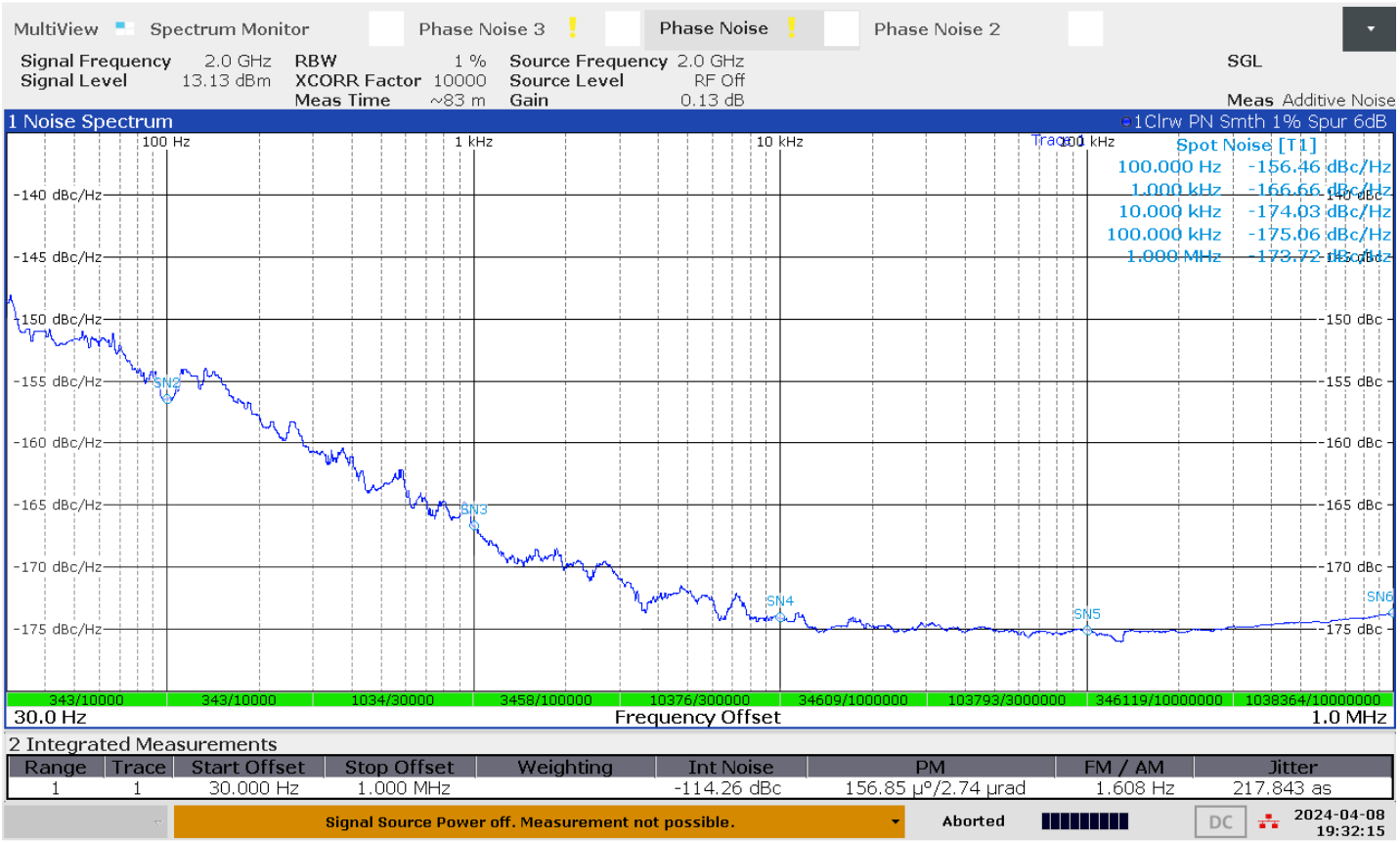
ADDITIVE PHASE NOISE VS. OFFSET FREQUENCY



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ABSOLUTE MAXIMUM RATINGS[2]

Parameter	Ratings
Operating Temperature (Baseplate)	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Total Power Dissipation	1.3 W
RF Input Power (CW)[3]	+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

$$\textit{MAXIMUM THERMAL RESISTANCE} = \frac{\textit{MAXIMUM OPERATING CASE TEMP} - \textit{MAXIMUM USER AMBIENT TEMP}}{\textit{POWER DISSIPATION}}$$

Example:	MAXIMUM OPERATING CASE TEMP = +50 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED) POWER DISSIPATION = 10 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 2 °C/W

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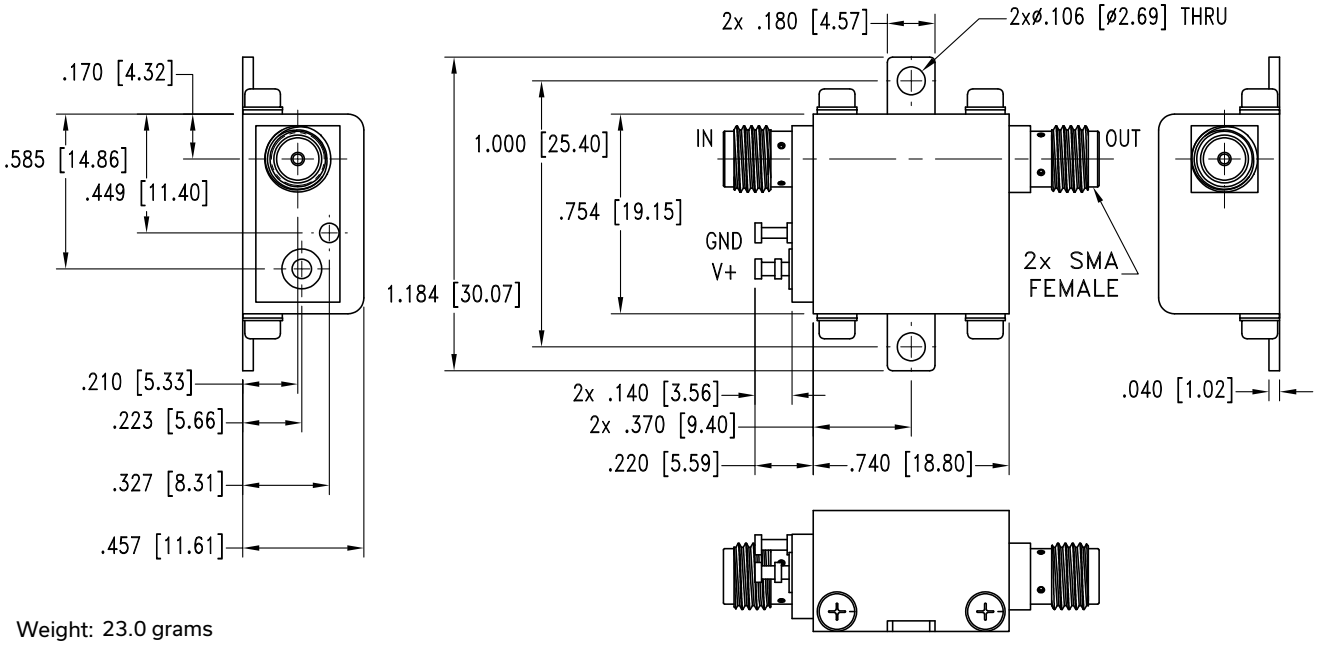
CASE STYLE DRAWING



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

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	ZX60-223LPN+
Case Style	GC957-2
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

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

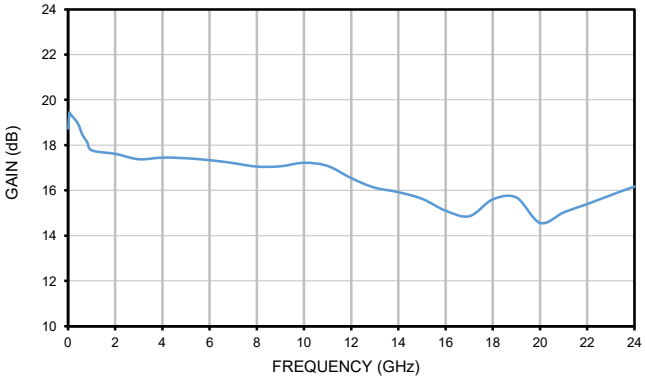
TEST CONDITIONS: Vd = 6V, Id = 110mA @ Temperature = +25°C

FREQUENCY	GAIN	DIRECTIVITY	RETURN LOSS (dB)		STABILITY		Pout @ 1 dB COMPRESSION	P_{SAT}	NOISE FIGURE	OIP3
(GHz)	(dB)	(dB)	IN	OUT	K	Measure	(dBm)	(dBm)	(dB)	(dBm)
0.01	18.7	58	16.3	7.1	306	0.82	20.3	23.9	22.8	35.0
0.05	19.4	61	15.7	17.3	552	1.01	21.3	22.3	21.5	33.9
0.10	19.4	57	15.8	19.4	354	1.01	20.9	22.2	21.2	32.1
0.40	19.0	46	15.3	23.1	100	1.02	19.2	21.6	17.2	28.9
0.60	18.5	44	14.9	22.5	76	1.03	18.8	21.2	15.3	28.7
0.80	18.2	44	14.4	23.6	76	1.03	18.5	21.0	13.7	28.1
1.00	17.8	46	14.0	28.0	94	1.04	18.0	20.6	12.3	27.9
2.00	17.6	38	13.5	19.2	36	1.03	17.8	20.5	8.3	27.8
3.00	17.4	36	12.3	17.0	30	1.04	18.1	20.5	6.6	28.0
4.00	17.5	37	12.9	14.8	31	1.02	18.2	20.5	5.3	28.2
5.00	17.4	33	15.3	13.4	21	0.98	18.1	20.5	4.5	28.2
6.00	17.3	30	21.1	13.2	15	0.96	18.0	20.4	4.1	28.0
7.00	17.2	28	22.6	14.4	12	0.97	18.3	20.4	3.9	28.3
8.00	17.1	27	18.1	14.9	10	0.98	18.5	20.3	3.8	28.5
9.00	17.1	25	18.3	14.2	8	0.98	18.8	20.4	3.9	28.6
10.00	17.2	23	21.3	14.8	7	0.97	19.0	20.4	4.1	28.9
11.00	17.1	22	17.5	15.6	6	0.99	18.7	20.0	4.3	28.5
12.00	16.5	22	14.7	14.5	6	0.99	18.2	19.7	4.5	28.8
13.00	16.1	22	15.9	16.9	6	1.00	18.0	19.2	4.7	28.0
14.00	15.9	22	17.2	27.8	6	1.01	18.1	19.0	5.0	29.4
15.00	15.6	23	13.3	10.9	6	0.97	17.9	18.7	5.4	29.0
16.00	15.1	23	10.8	6.9	5	0.86	17.6	18.0	5.9	28.2
17.00	14.9	22	9.7	7.1	5	0.86	17.3	18.1	6.3	27.5
18.00	15.6	19	10.8	12.5	4	1.01	17.0	18.5	6.7	27.0
19.00	15.7	17	9.7	11.8	3	0.99	15.7	18.1	6.8	25.9
20.00	14.6	19	8.4	6.8	3	0.87	15.7	17.5	6.9	26.6
21.00	15.0	18	11.3	9.0	3	0.94	15.7	17.6	7.0	26.2
22.00	15.4	17	11.5	8.3	3	0.87	15.3	17.5	7.3	24.6
23.00	15.8	15	11.4	8.1	2	0.84	14.9	17.0	7.6	23.4
24.00	16.2	14	12.8	21.1	2	1.01	13.6	16.6	8.1	24.3

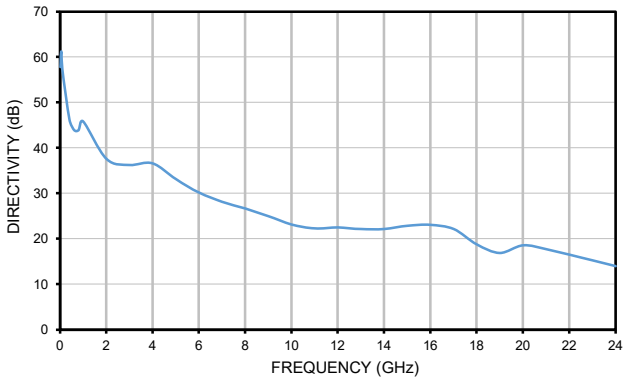
Coaxial Amplifier ZX60-223LPN+

Typical Performance Curves

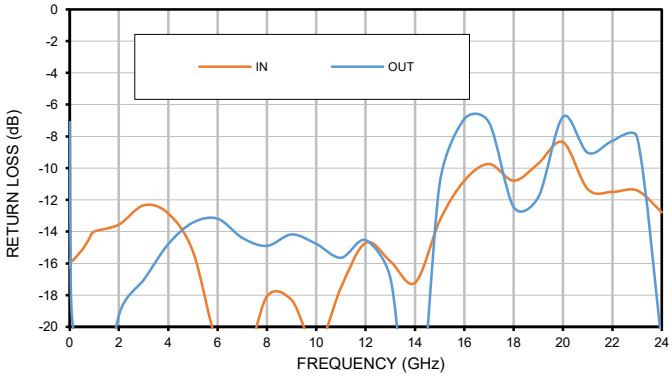
GAIN



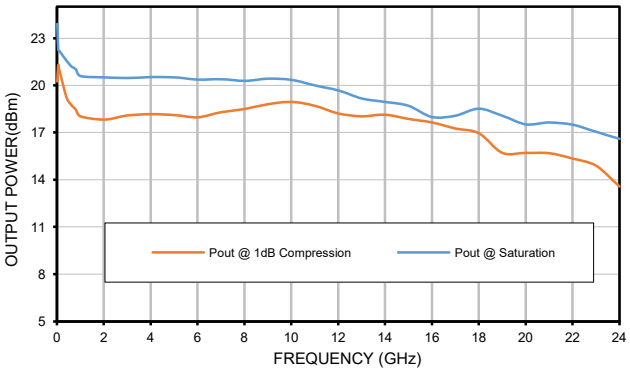
DIRECTIVITY



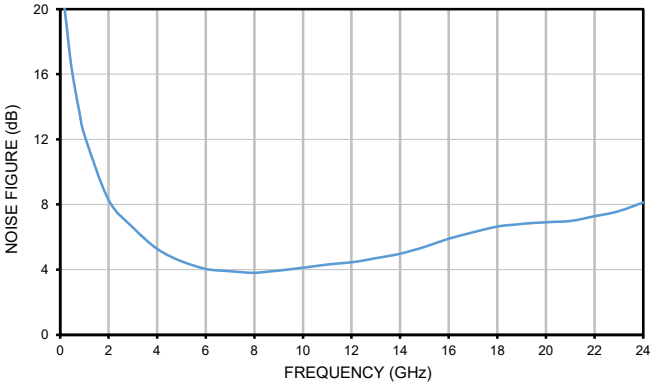
RETURN LOSS



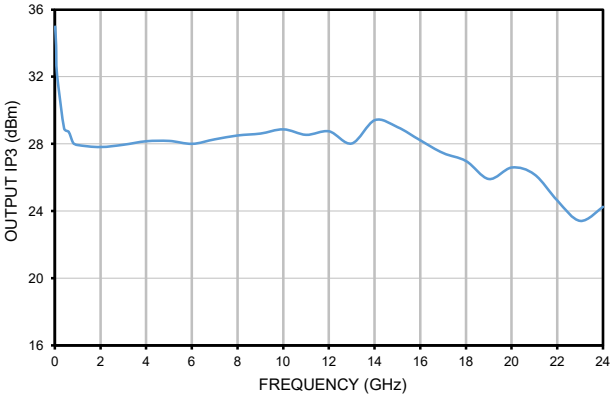
OUTPUT POWER



NOISE FIGURE



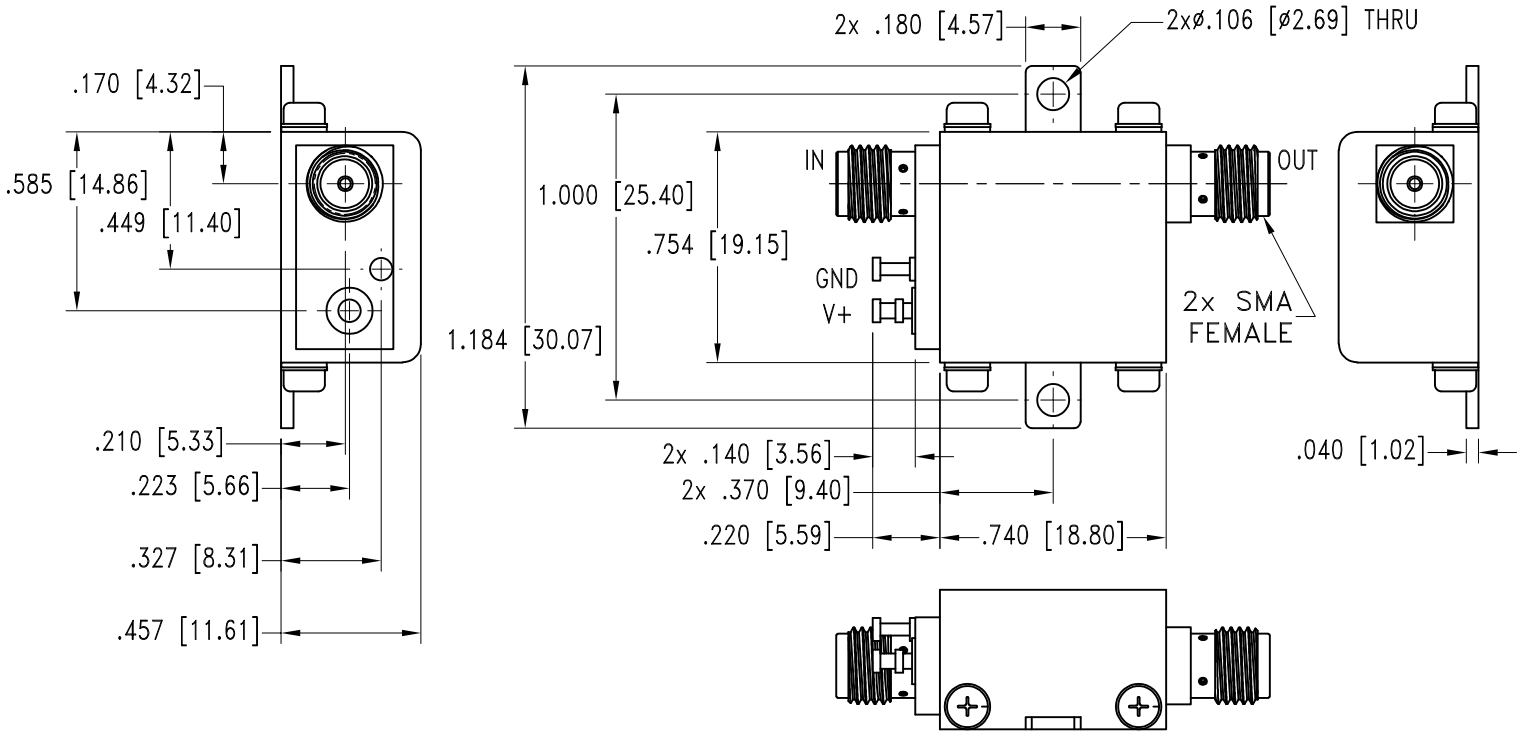
OUTPUT IP3



Case Style GC

Outline Dimensions

GC957-2



Weight: 23.0 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015 Inches

Notes:

Case material:	Brass.
Case Finish:	Nickel plate.

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