COAXIAL

Low Phase Noise Amplifier ZX60-06183LPN+

50Ω 6 to 18 GHz SMA Female

KEY FEATURES

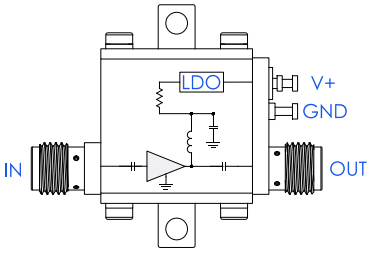
- Wideband Coverage, 6 to 18 GHz
- Ultra-Low Phase Noise, -169 dBc/Hz Typ. at 10 kHz Offset
- High Output P1dB, +18 dBm Typ.
- High Output IP3, +28 dBm Typ.
- Voltage-Regulated Internally and Reverse Voltage-Protected
- Ideal evaluation module for LVA-6183PN+ MMIC

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' ZX60-06183LPN+ is an ultra-low phase noise amplifier utilizing MCL's own GaAs HBT-based amplifier, the LVA-6183PN+, offering industry-leading performance over its full frequency range from 6 to 18 GHz. This design operates on a single +8 V supply @ 146 mA and comes in a rugged, compact unibody case (0.74" x 0.75" x 0.46") with integrated SMA female connectors, making it an excellent candidate for demanding operating conditions and use in crowded system layouts. A compatible heat sink is provided (not installed) for convenient setup and standalone operation.

ELECTRICAL SPECIFICATIONS AT +25°C BASEPLATE AND V_S = +8V , UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range	-	6	-	18	GHz
Gain	6	16.8	18.6	-	dB
	9	17.2	19.0	-	
	12	17.1	19.1	-	
	15	15.9	17.8	-	
	18	13.4	15.6	-	
Input Return Loss	6	-	13	-	dB
	9	-	12	-	
	12	-	13	-	
	15	-	12	-	
	18	-	11		
Output Return Loss	6	-	15	-	dB
	9	-	12	-	
	12	-	12	-	
	15	-	10	-	
	18	-	10	-	

REV. OR
ECO-027533
ZX60-06183LPN+
MCL NY
251126

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ELECTRICAL SPECIFICATIONS AT +25°C BASEPLATE AND V_S = +8V , UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Output Power at 1 dB Compression (P1dB)	6	-	+20.0	-	dBm
	9	-	+20.0	-	
	12	-	+19.0	-	
	15	-	+16.5	-	
	18	-	+14.5	-	
Saturated Output Power (P_{SAT})[1]	6	-	+25	-	dBm
	9	-	+24	-	
	12	-	+22	-	
	15	-	+20	-	
	18	-	+19	-	
Output Third Order Intercept Point (Output Power = +0 dBm/Tone)	6	-	+29.5	-	dBm
	9	-	+29.5	-	
	12	-	+28.5	-	
	15	-	+25.5	-	
	18	-	+23.0	-	
Directivity	6	-	34	-	dB
	9	-	23	-	
	12	-	20	-	
	15	-	18	-	
	18	-	19	-	
Noise Figure	6	-	4.7	-	dB
	9	-	4.8	-	
	12	-	4.6	-	
	15	-	5.5	-	
	18	-	7.1	-	
Additive Phase Noise[2]	-	-	-169	-	dBc/Hz
DC Supply Voltage (V_S)	-	+6.5	+8	+9	V
DC Current[3]	-	-	146	215	mA

1. At P_{SAT}, P_{OUT} changes less than 0.1 dB for a 1 dB change in P_{IN}.
2. Measured at an input power of -1.3 dBm, 6 GHz, and at 10 KHz offset.
3. Typical current measured under small signal conditions. Max DC current measured at P_{SAT}. DC current increases as amplifier is driven into compression.

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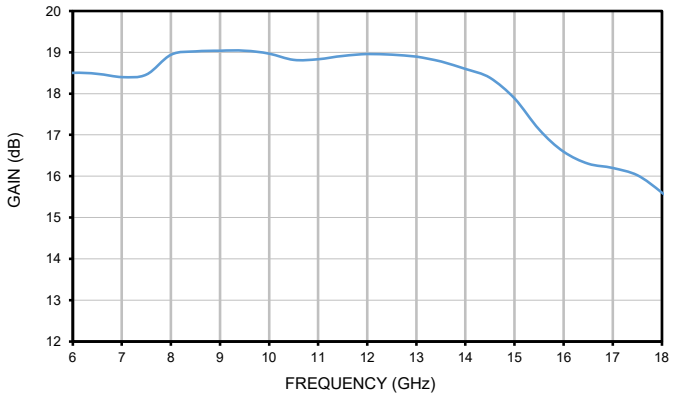
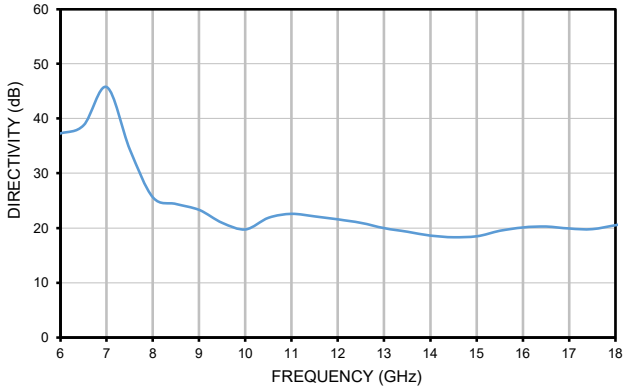
TYPICAL PERFORMANCE GRAPHS

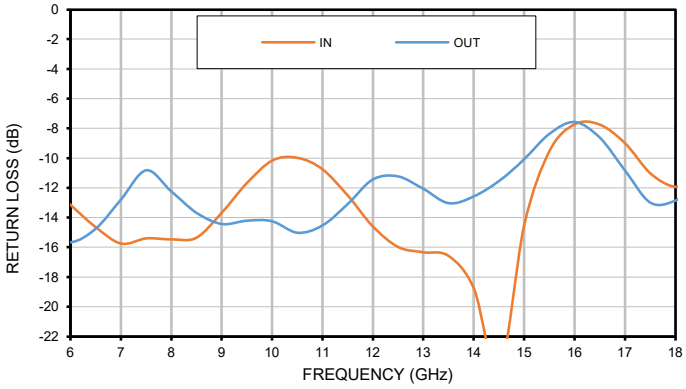
GAIN



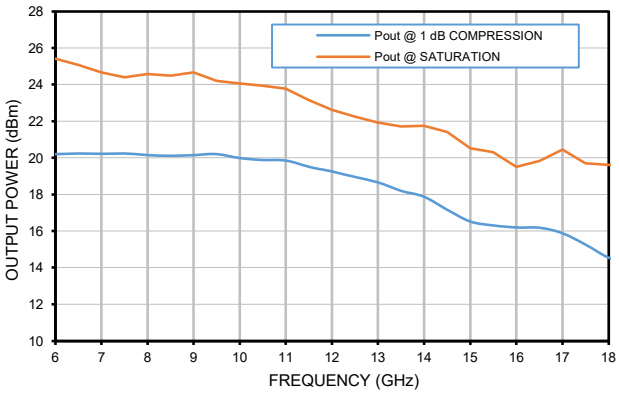
DIRECTIVITY



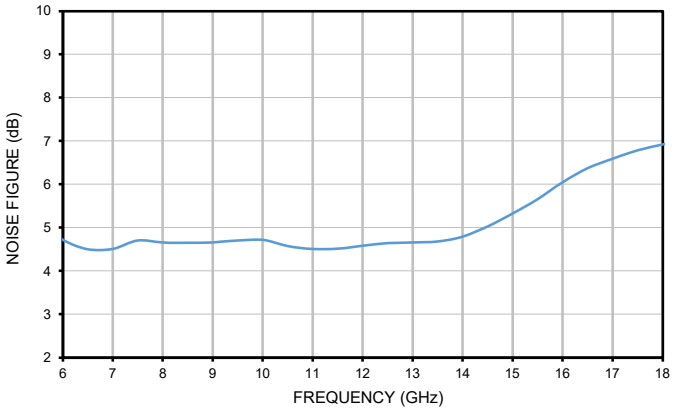
RETURN LOSS



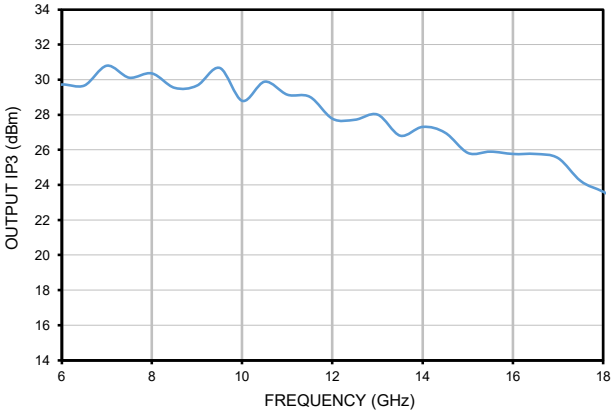
OUTPUT POWER



NOISE FIGURE



OUTPUT IP3



ABSOLUTE MAXIMUM RATINGS[4,5]

Parameter	Ratings
Operating Temperature (Case)	-40°C to +85°C Baseplate -40°C to +65 °C Ambient[6]
Storage Temperature	-55°C to +100°C
Total Power Dissipation[6,7]	1.72 W
RF Input Power (CW)	+15 dBm
DC Operating Voltage	+9.5 V

4. Specified under matched load to 50 ohms.
5. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.
6. Operation is recommended using the supplied heatsink or an alternative heatsink with a thermal resistance ≤ 11.5 °C/W.
7. Total power dissipation determined at V_s =+9.5 V with the amplifier in saturation.

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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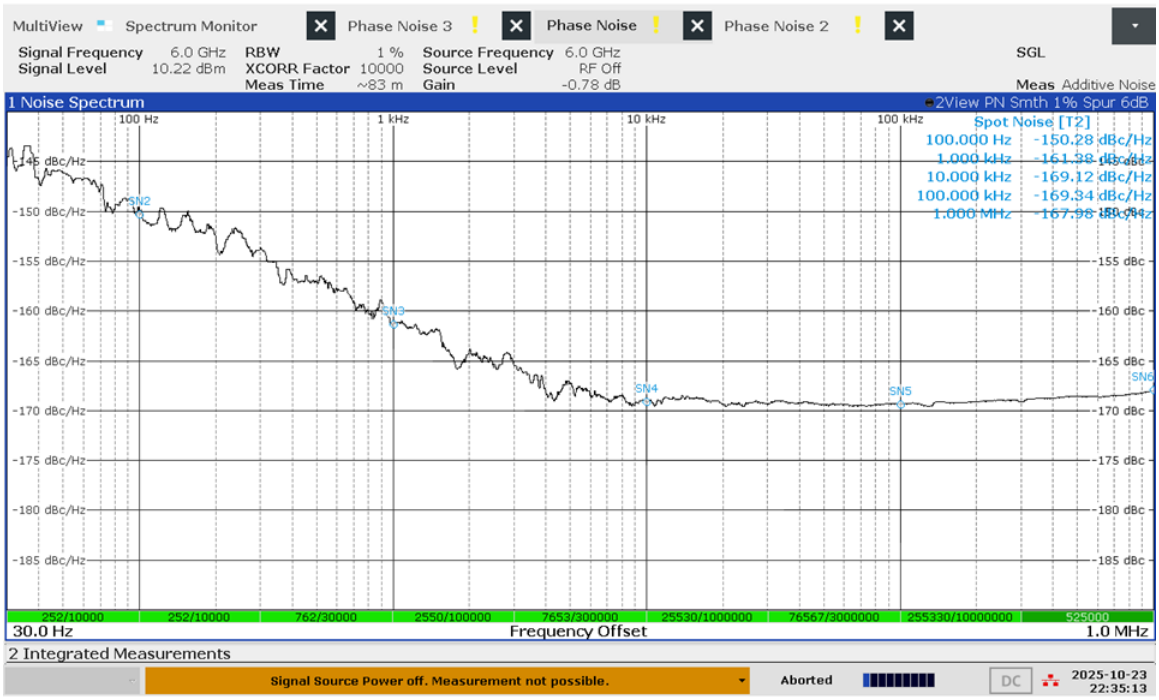
ADDITIVE PHASE NOISE VS. OFFSET FREQUENCY



Measured at 6 GHz with an input power of -1.3 dBm.

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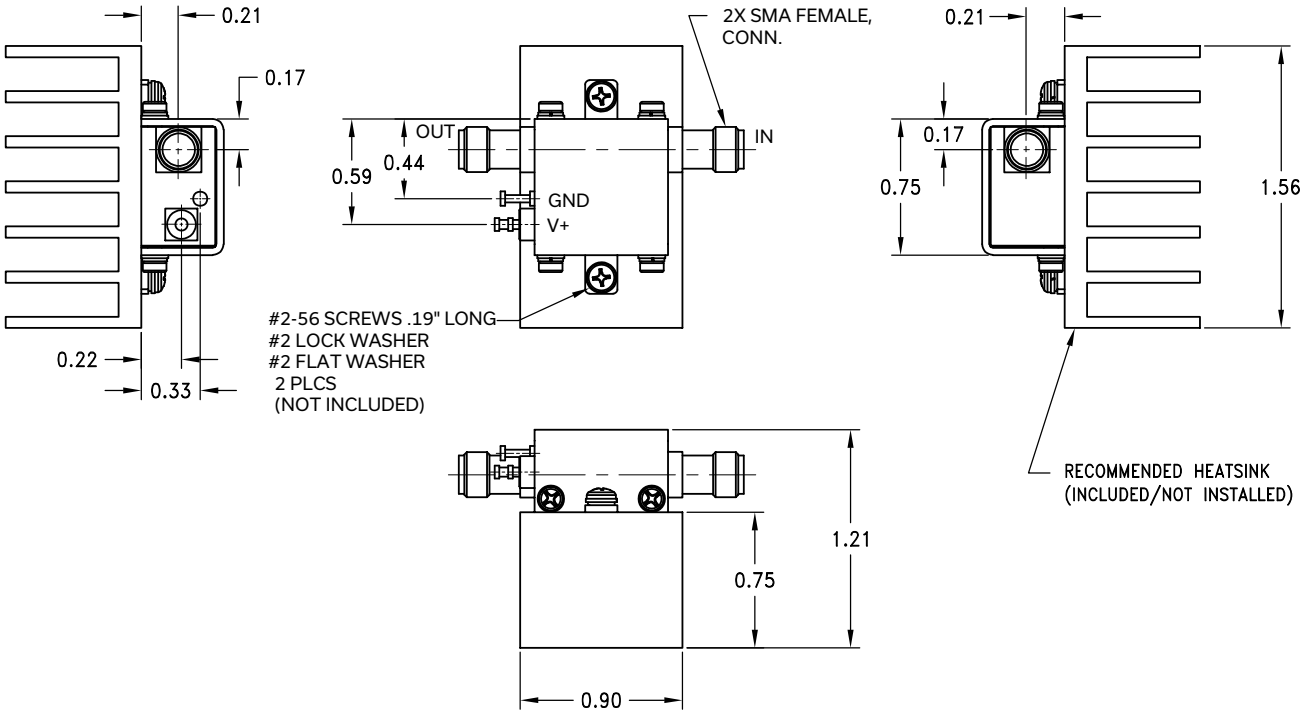
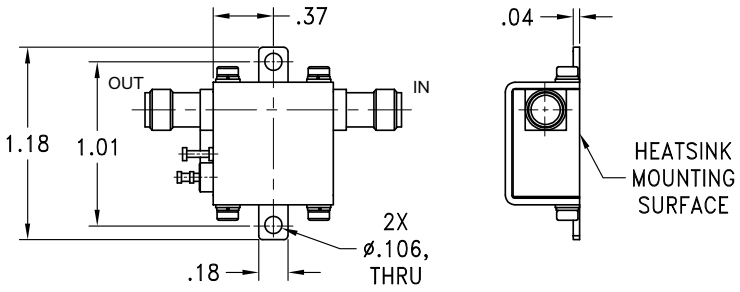
CASE STYLE DRAWING



MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK



Weight: 43 grams; without heatsink 23 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

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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	ZX60-06183LPN+
Case Style	GC957-3
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

Coaxial Amplifier ZX60-06183LPN+

Typical Performance Data

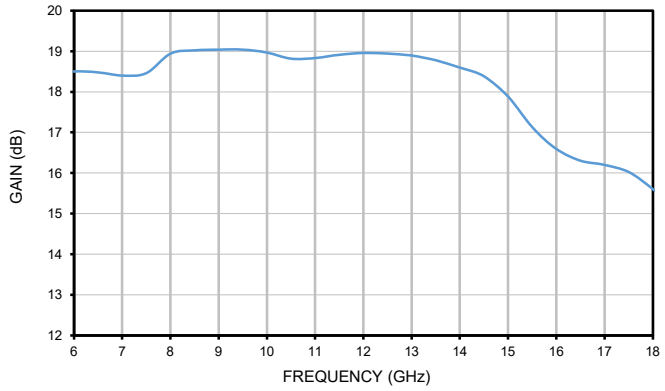
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 8V, Id = 146mA @ Temperature = +25°C

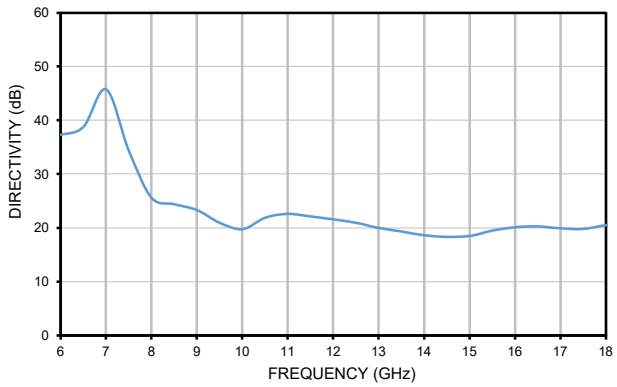
FREQUENCY	GAIN	DIRECTIVITY	RETURN LOSS (dB)		STABILITY		Pout @ 1 dB COMPRESSION	Pout @ SATURATION	NOISE FIGURE	OIP3
(GHz)	(dB)	(dB)	IN	OUT	K	Measure	(dBm)	(dBm)	(dB)	(dBm)
5.0	18.4	35.5	10.0	13.6	25.65	1.05	20.3	25.9	5.7	29.6
5.5	18.5	36.5	11.6	14.9	29.97	1.03	20.2	25.5	5.1	29.5
6.0	18.5	37.3	13.1	15.6	34.04	1.02	20.2	25.4	4.7	29.7
6.5	18.5	38.8	14.6	14.7	40.60	1.00	20.2	25.1	4.5	29.7
7.0	18.4	45.8	15.7	12.8	89.64	0.97	20.2	24.7	4.5	30.8
7.5	18.5	34.4	15.4	10.8	23.31	0.94	20.2	24.4	4.7	30.1
8.0	18.9	25.6	15.5	12.2	8.78	0.96	20.2	24.6	4.7	30.4
8.5	19.0	24.4	15.3	13.7	7.76	0.98	20.1	24.5	4.6	29.5
9.0	19.0	23.3	13.7	14.4	6.76	1.00	20.2	24.7	4.7	29.7
9.5	19.0	21.0	11.7	14.2	5.02	1.03	20.2	24.2	4.7	30.7
10.0	19.0	19.8	10.1	14.2	4.23	1.06	20.0	24.1	4.7	28.8
10.5	18.8	21.9	10.0	15.0	5.40	1.07	19.9	23.9	4.6	29.9
11.0	18.8	22.6	10.7	14.5	5.95	1.05	19.9	23.8	4.5	29.1
11.5	18.9	22.1	12.5	13.1	5.78	1.00	19.5	23.1	4.5	29.0
12.0	19.0	21.6	14.6	11.4	5.47	0.95	19.3	22.6	4.6	27.8
12.5	18.9	21.0	16.0	11.2	5.12	0.93	19.0	22.2	4.6	27.7
13.0	18.9	20.0	16.3	12.1	4.60	0.95	18.7	21.9	4.7	28.0
13.5	18.8	19.4	16.6	13.0	4.34	0.97	18.2	21.7	4.7	26.8
14.0	18.6	18.7	18.8	12.6	4.06	0.94	17.9	21.7	4.8	27.3
14.5	18.4	18.3	24.3	11.5	3.89	0.92	17.2	21.4	5.0	27.0
15.0	17.9	18.5	14.5	10.1	3.73	0.92	16.5	20.5	5.3	25.8
15.5	17.1	19.5	9.5	8.4	3.73	0.92	16.3	20.3	5.7	25.9
16.0	16.6	20.1	7.7	7.6	3.70	0.92	16.2	19.5	6.1	25.8
16.5	16.3	20.3	7.7	8.6	3.89	0.97	16.2	19.8	6.4	25.8
17.0	16.2	19.9	9.0	10.8	4.04	1.02	15.9	20.5	6.6	25.5
17.5	16.0	19.8	11.0	13.0	4.27	1.03	15.3	19.7	6.8	24.2
18.0	15.6	20.5	11.9	12.8	4.76	1.00	14.6	19.6	6.9	23.6
18.5	15.1	21.4	11.5	11.6	5.19	0.98	14.2	19.6	7.1	22.9
19.0	14.4	22.7	11.2	11.7	5.99	0.99	13.5	18.9	7.2	22.2
19.5	13.6	23.8	11.0	10.6	6.61	0.97	12.5	18.3	7.5	21.3
20.0	12.5	25.6	11.2	8.8	7.69	0.93	11.6	16.8	7.8	20.5

Typical Performance Curves

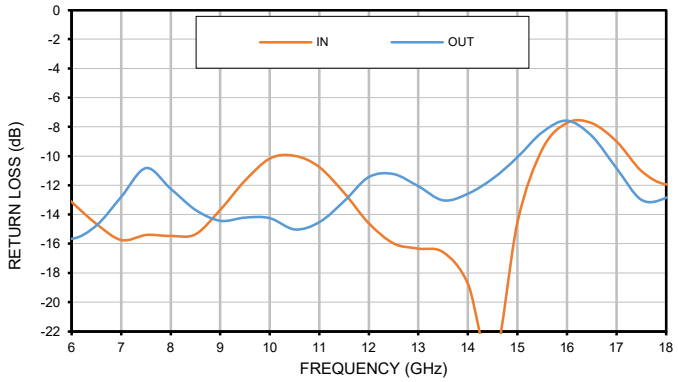
GAIN



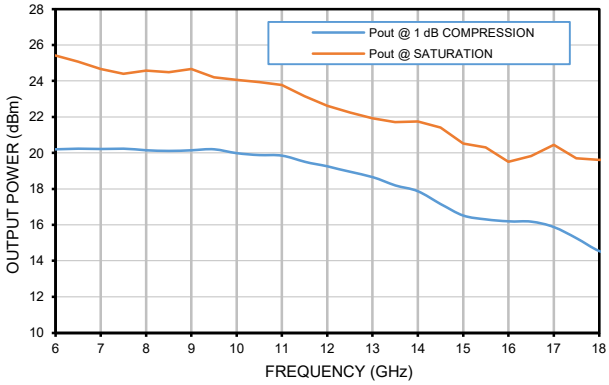
DIRECTIVITY



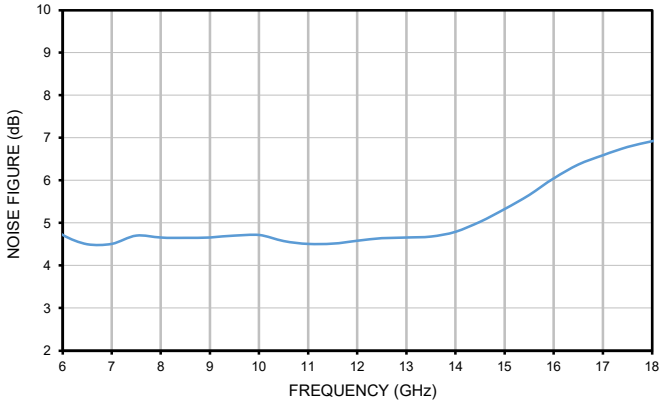
RETURN LOSS



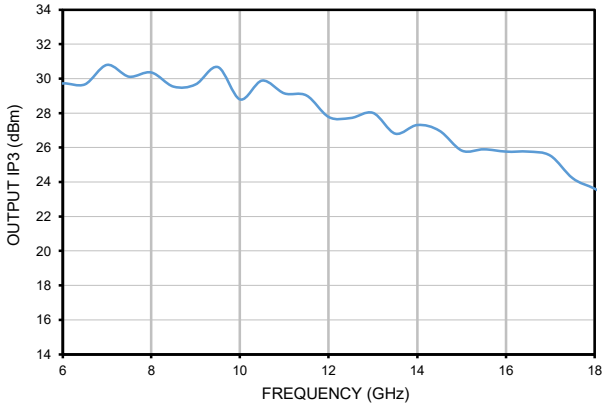
OUTPUT POWER



NOISE FIGURE



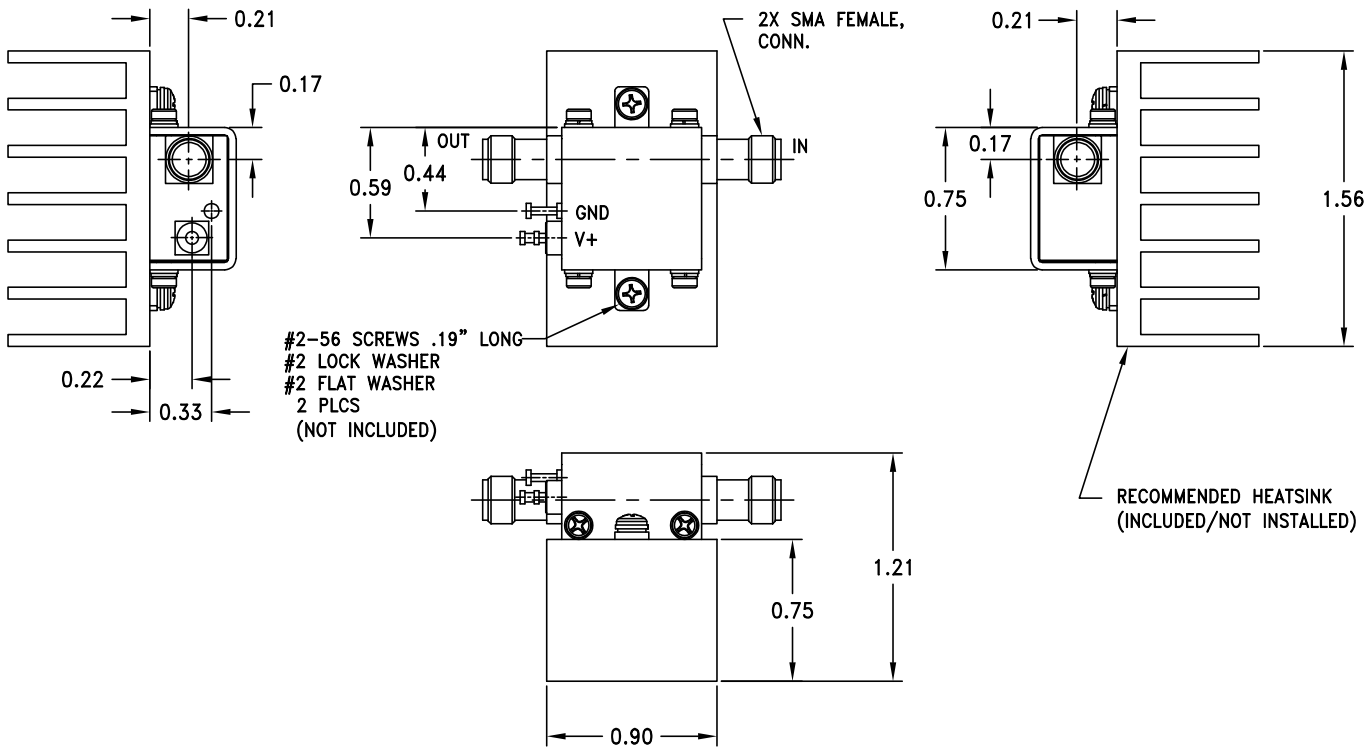
OUTPUT IP3



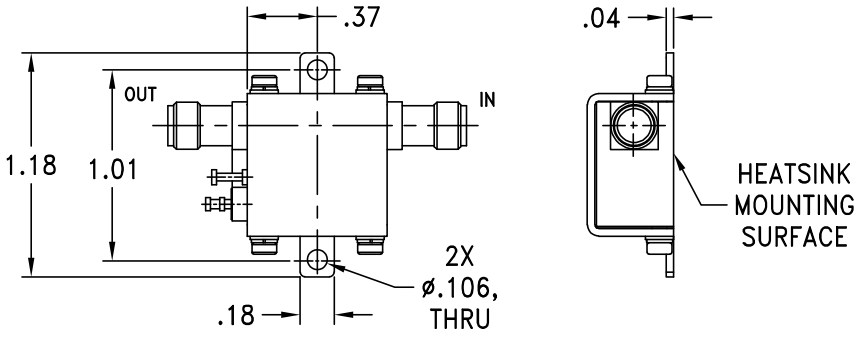
Case Style GC

Outline Dimensions

GC957-3



MOUNTING INFORMATION OF MODEL WITHOUT RECOMMENDED HEATSINK



Weight: 43 grams; without heatsink 23 grams.
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015 inches

Notes:

1. Case Material: Brass.
2. Case Finish: Nickel plate.
3. Heatsink Finish: Black anodize.

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