



COAXIAL

Low Noise Amplifier

ZX60-10223G+

Mini-Circuits

50Ω 10 to 20 GHz SMA Female

KEY FEATURES

- Wideband, 10 to 20 GHz
- High gain, 26 dB typ.
- Low noise figure, 2.3 dB typ.
- Voltage regulated internally and reverse voltage protected
- Excellent directivity, 22 dB typ.

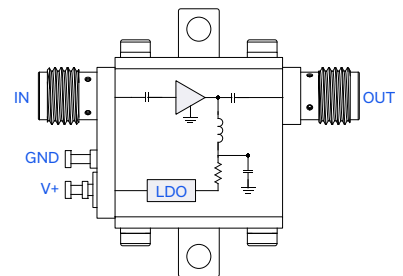


Generic photo used for illustration purposes only

APPLICATIONS

- Microwave point to point radios
- Military EW and radar
- Satellite Systems

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' ZX60-10223G+ is a wideband low noise connectorized amplifier providing a unique combination of low noise figure and high gain over a very wide frequency range, supporting a wide range of applications and many systems where high performance over wideband is needed. This design operates on a single +5V 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.

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range		10		20	GHz
Noise Figure	10-12	—	2.2	—	dB
	12-18	—	2.3	—	
	18-20	—	2.6	—	
Gain	10-12	21	26	—	dB
	12-18	22	26	—	
	18-20	20	24	—	
Input Return Loss	10-12	—	10	—	dB
	12-18	—	8	—	
	18-20	—	10	—	
Output Return Loss	10-12	—	15	—	dB
	12-18	—	9	—	
	18-20	—	6	—	
Output Power at 1 dB Compression (P1dB) ¹	10-12	—	+9	—	dBm
	12-18	—	+10	—	
	18-20	—	+10	—	
Output Third Order Intercept Point (OIP3) ²	10-12	—	+18	—	dBm
	12-18	—	+20	—	
	18-20	—	+20	—	
Device Operating Voltage (V _{DD})	—	+4.75	+5.0	+8.0	V
Device Operating Current (I _{DD})	—	—	75	120	mA

1. Current increases at P1dB

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





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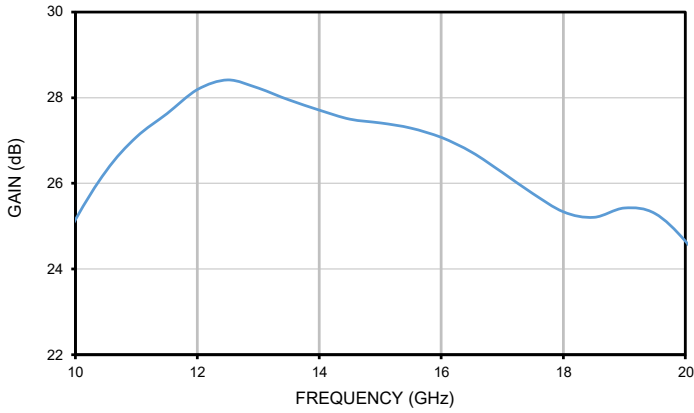
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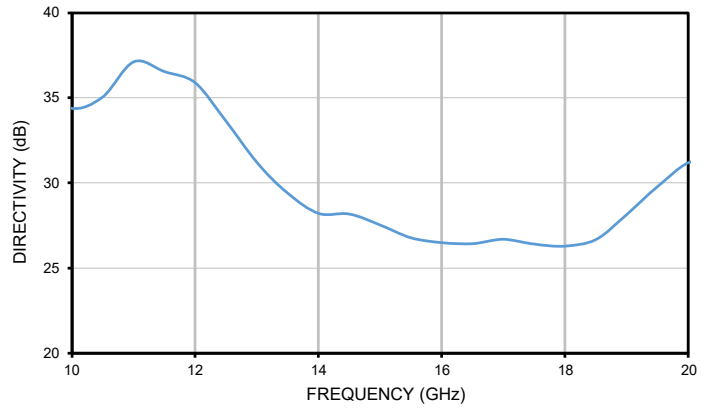
50Ω 10 to 20 GHz SMA Female

TYPICAL PERFORMANCE GRAPHS

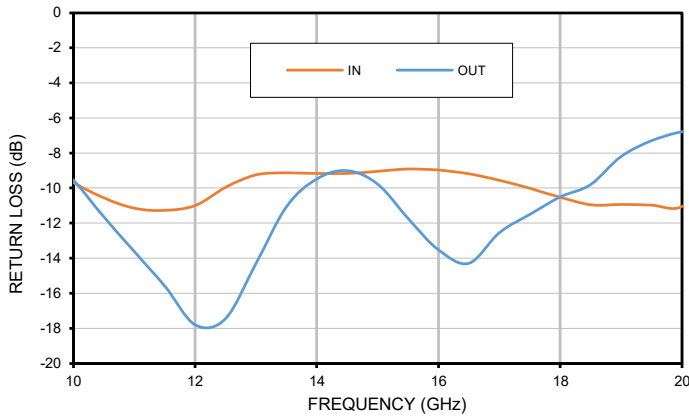
GAIN



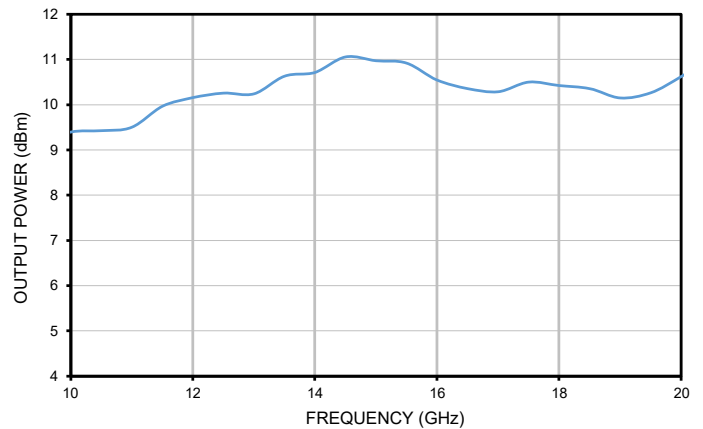
DIRECTIVITY



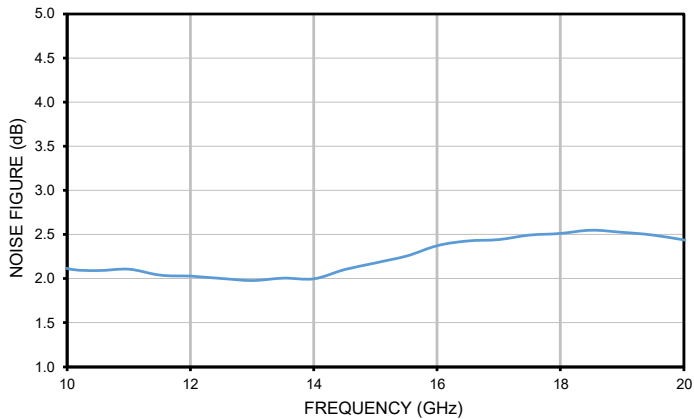
RETURN LOSS



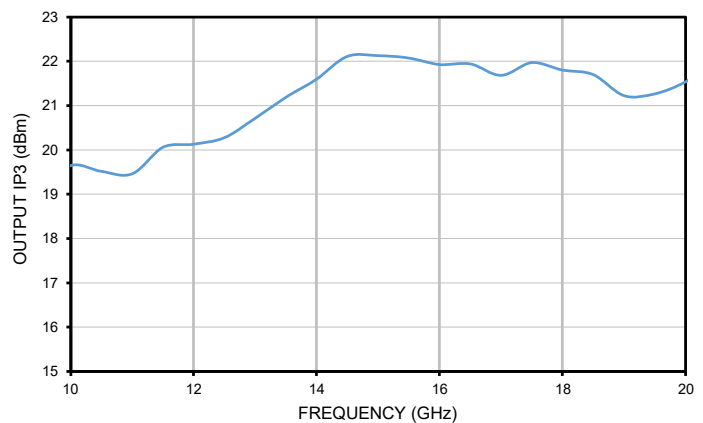
OUTPUT POWER AT 1dB COMPRESSION



NOISE FIGURE



OUTPUT IP3





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ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Total Power Dissipation	1 W
Input Power (CW), Vd=5V	+13 dBm
DC Voltage	+8.5 V

Permanent damage may occur if any of these limits are exceeded.

DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

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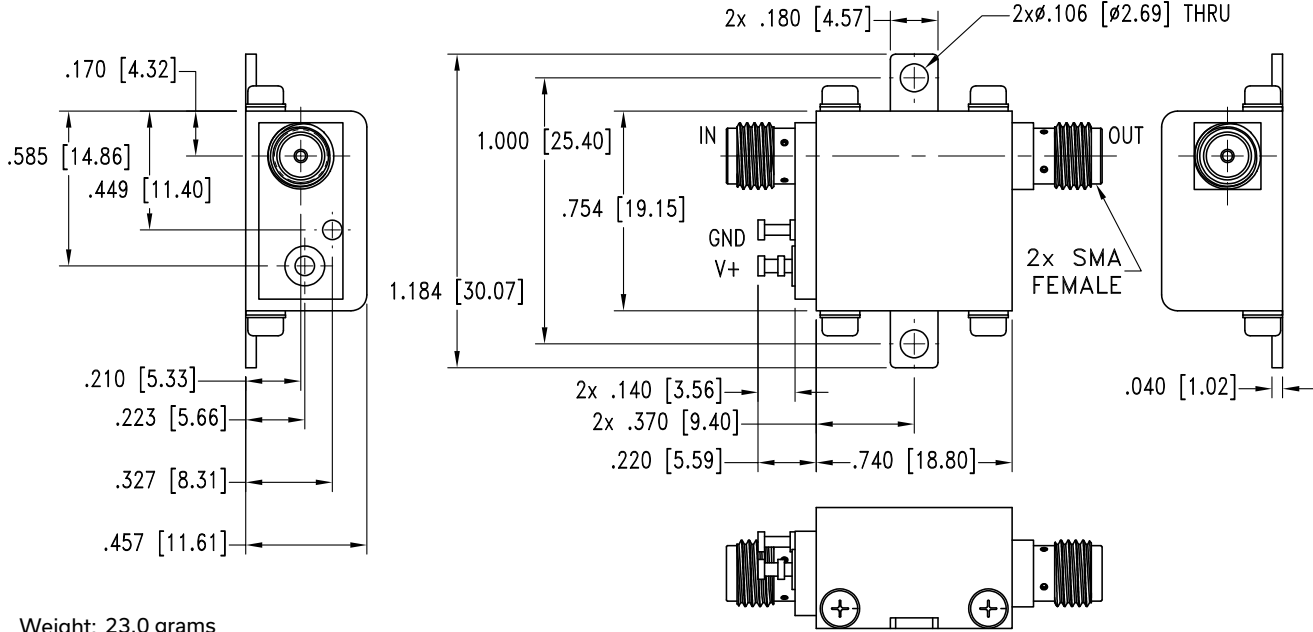
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CASE STYLE DRAWING



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](#)



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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

ORDERING INFORMATION

Model No. Link	ZX60-10223G+
Case Style	GC957-2
Connector	IN SMA/Female / OUT SMA/Female

Coaxial Amplifier

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Typical Performance Data

Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

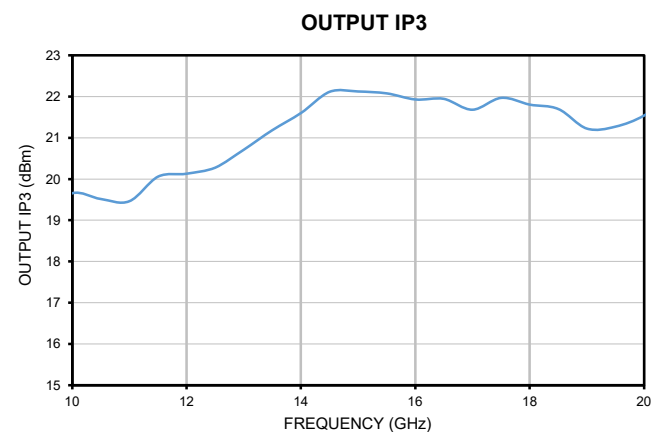
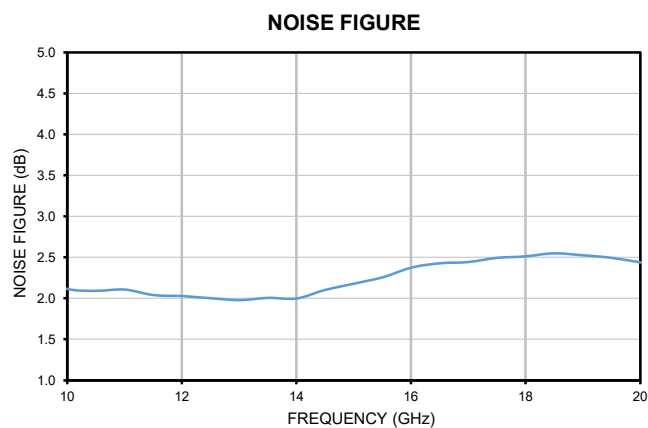
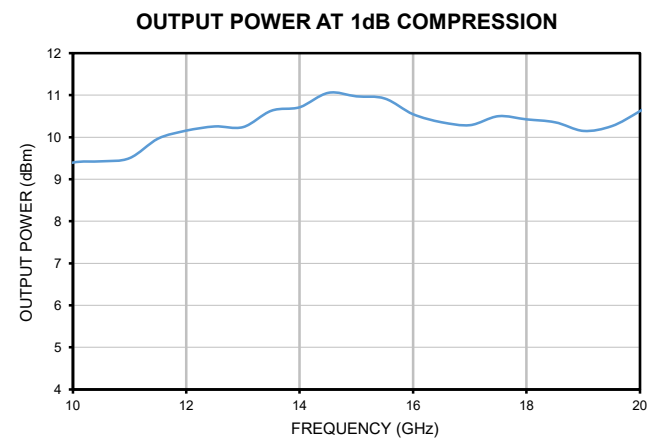
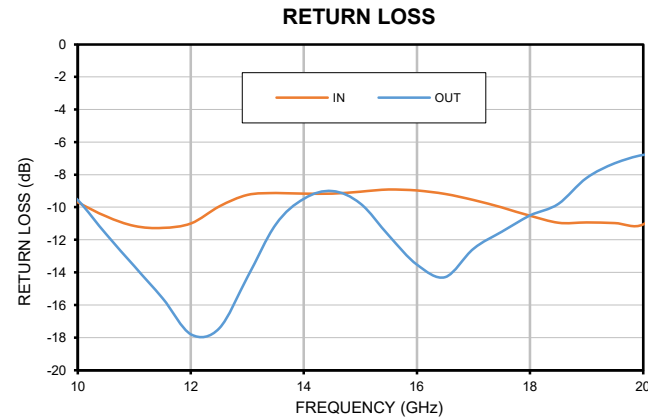
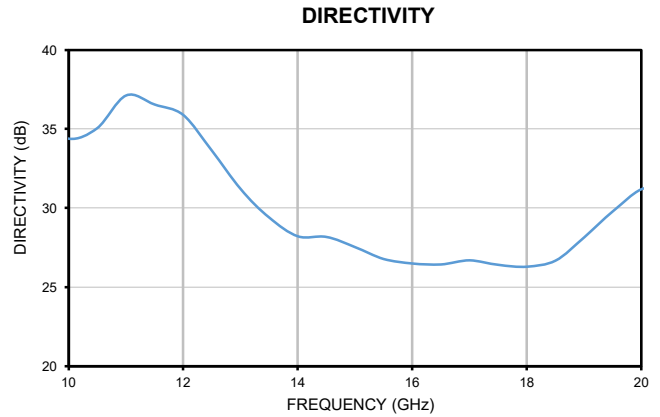
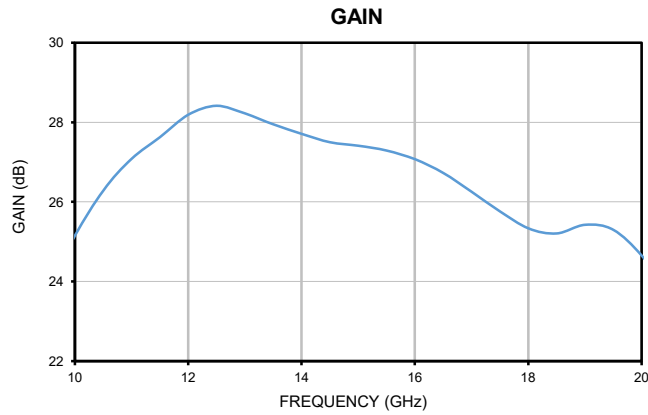
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id = 77mA @ Temperature = +25°C

FREQUENCY (GHz)	GAIN (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		STABILITY		Pout @ 1 dB COMPRESSION (dBm)	NOISE FIGURE (dB)	OIP3 (dBm)
			IN	OUT	K	Measure			
9.0	22.0	39.0	8.6	8.1	32.5	1.0	8.3	2.5	18.1
9.5	23.7	35.6	9.7	9.6	24.1	1.0	9.1	2.2	19.1
10.0	25.2	34.4	10.6	11.7	22.4	1.0	9.4	2.1	19.7
10.5	26.3	35.1	11.1	13.6	25.1	1.0	9.4	2.1	19.5
11.0	27.1	37.1	11.3	15.6	32.4	1.0	9.5	2.1	19.5
11.5	27.6	36.5	11.0	17.8	30.4	1.1	10.0	2.0	20.1
12.0	28.2	35.9	9.9	17.4	27.5	1.1	10.2	2.0	20.1
12.5	28.4	33.6	9.2	14.3	20.3	1.1	10.3	2.0	20.3
13.0	28.2	31.2	9.1	11.0	14.7	1.0	10.2	2.0	20.7
13.5	28.0	29.4	9.2	9.5	11.5	1.0	10.6	2.0	21.2
14.0	27.7	28.2	9.2	9.0	9.9	1.0	10.7	2.0	21.6
14.5	27.5	28.2	9.0	9.8	10.1	1.0	11.1	2.1	22.1
15.0	27.4	27.5	8.9	11.7	9.8	1.0	11.0	2.2	22.1
15.5	27.3	26.8	9.0	13.5	9.2	1.1	10.9	2.3	22.1
16.0	27.1	26.5	9.2	14.3	9.0	1.1	10.5	2.4	21.9
16.5	26.7	26.4	9.5	12.5	8.9	1.0	10.4	2.4	21.9
17.0	26.3	26.7	10.0	11.5	9.1	1.0	10.3	2.4	21.7
17.5	25.8	26.4	10.5	10.5	8.8	1.0	10.5	2.5	22.0
18.0	25.3	26.3	10.9	9.8	8.6	1.0	10.4	2.5	21.8
18.5	25.2	26.7	10.9	8.2	8.4	0.9	10.4	2.5	21.7
19.0	25.4	28.2	11.0	7.3	9.5	0.9	10.2	2.5	21.2
19.5	25.3	29.8	11.0	6.8	11.1	0.9	10.3	2.5	21.3
20.0	24.7	31.2	9.2	6.7	12.6	0.9	10.6	2.4	21.5
20.5	23.7	31.3	6.8	6.2	11.2	0.9	11.0	2.4	22.0
21.0	22.6	31.1	5.3	6.2	9.9	1.0	11.2	2.4	22.1

Typical Performance Curves

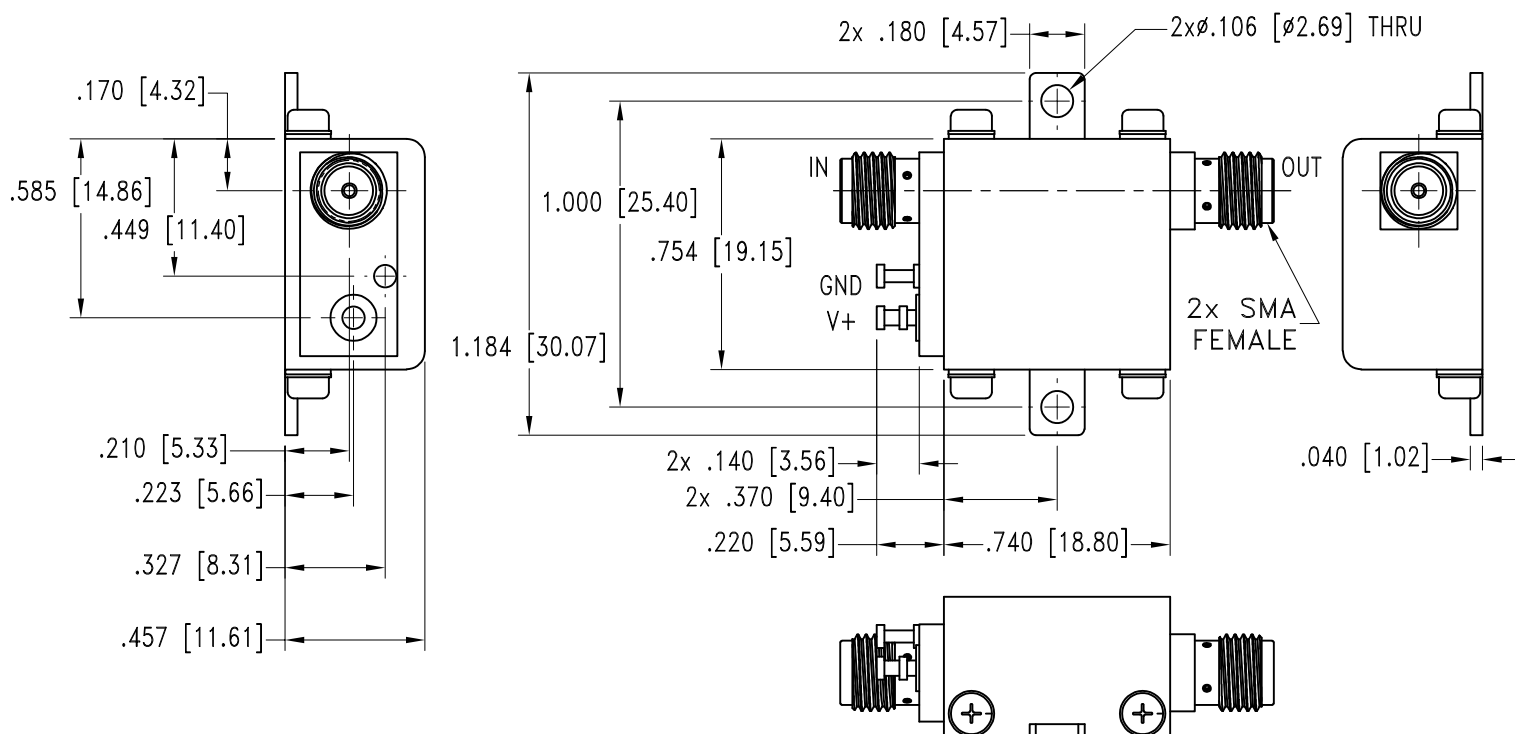


Case Style

GC

Outline Dimensions

GC957-2



Weight: 23.0 grams

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

Notes:

Case material: Brass.
Case Finish: Nickel plate.

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RF/IF MICROWAVE COMPONENTS



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