



## COAXIAL

# Low Phase Noise Amplifier **ZX60-123LPN+**

50Ω 0.05 to 10 GHz SMA Female

### THE BIG DEAL

- Ultra Broadband Performance
- Gain, 16 dB typ.
- Excellent Gain Flatness,  $\pm 0.9$  dB, 0.05 to 6 GHz
- Excellent Return Loss, 20 dB typ., 2 GHz
- Low additive phase noise, typically -168 dBc/Hz @10 kHz
- Protected by US patent 6,790,049

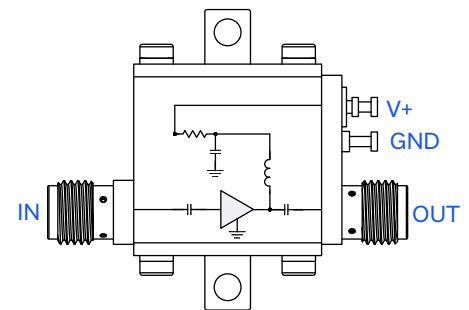


Generic photo used for illustration purposes only

### APPLICATIONS

- Low phase noise applications
- Base Station Infrastructure
- Test Instruments
- MMDS & Wireless LAN
- Satellite Communication
- Avionic

### FUNCTIONAL DIAGRAM



### PRODUCT OVERVIEW

Mini-Circuits' ZX60-123LPN+ is an advanced ultra-wideband amplifier fabricated using GaAs HBT technology that provides extremely low additive phase noise and offers excellent gain flatness over a broad frequency range. In addition, the ZX60-123LPN+ has good input and output return loss over this frequency range without the need for external matching components. Housed in a rugged, cost effective unibody chassis, this amplifier supports a wide variety of applications requiring moderate power output, low distortion and 50 ohm matched input/output ports.

### KEY FEATURES

Feature	Advantages
Ultra Broad Band, 0.05 to 10 GHz	Broadband covering primary wireless communications bands: Cellular, PCS, LTE, WiMAX in a single amplifier.
Ultra Flat Gain, $\pm 0.9$ dB typ: 0.05 to 6 GHz	Ultra Flat Gain, eliminates need for compensation networks to achieve published results
Low Additive Phase Noise	Extremely low additive phase noise of -168 dBc/Hz typ. at 10 kHz offset from 2 GHz carrier, with +1 dBm of input power
Excellent Input and Output Return Loss	ZX60-123LPN+ provides good Input and Output Return Loss of 12-28 dB over 0.05 to 6 GHz without the need for any external matching components
Unconditionally Stable	Capable to operate to a wide range of source and load impedances.
Very Small Size, 0.75" x 0.75"	The unique unibody size and construction enable the ZX60-123LPN+ to be used in extremely compact connectorized applications.
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	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.05		10	GHz
Gain	0.05	–	16.2	–	dB
	2.0	15.2	16.5	–	
	6.0	–	15.5	–	
	8.0	–	14.5	–	
	10.0	–	11.5	–	
Input Return Loss	0.05	–	13.0	–	dB
	2.0	15.0	20.2	–	
	6.0	–	18.4	–	
	8.0	–	10.5	–	
	10.0	–	7.2	–	
Output Return Loss	0.05	–	15.0	–	dB
	2.0	–	17.6	–	
	6.0	–	20.5	–	
	8.0	–	6.50	–	
	10.0	–	10.5	–	
Output Power at 1 dB Compression (P1dB)	0.05	–	+16.9	–	dBm
	2.0	–	+16.2	–	
	6.0	–	+13.5	–	
	8.0	–	+9.6	–	
	10.0	–	+6.7	–	
Output Third Order Intercept Point (OIP3)	0.05	–	+19.2	–	dBm
	2.0	–	+29.9	–	
	6.0	–	+23.3	–	
	8.0	–	+21.0	–	
	10.0	–	+16.8	–	
Directivity (Isolation-Gain)	0.05	–	4.7	–	dB
	6.0	–	6.2	–	
	10.0	–	11.9	–	
Noise Figure	0.05	–	5.8	–	dB
	2.0	–	3.9	–	
	6.0	–	4.3	–	
	8.0	–	4.5	–	
	10.0	–	5.4	–	
Additive Phase Noise <sup>1</sup>	2.0	–	-168.0	–	dBc/Hz
DC Supply Voltage	–	+4.8	+5.0	+5.2	V
DC Current	–	–	48	65	mA

1. Input power +1dBm, 2GHz, 10KHz offset



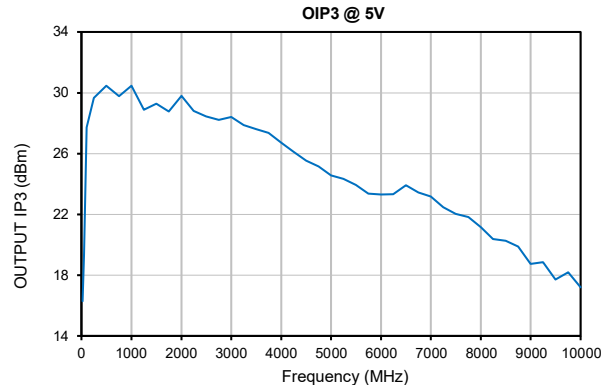
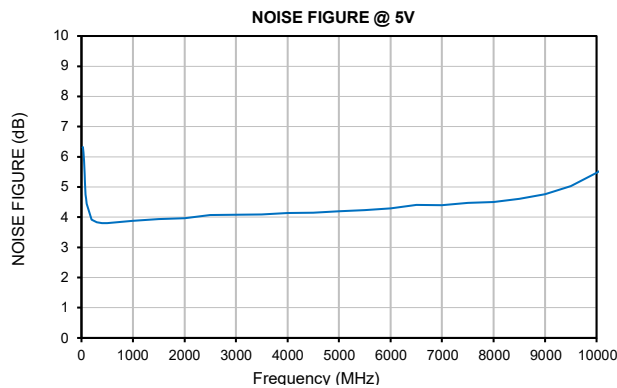
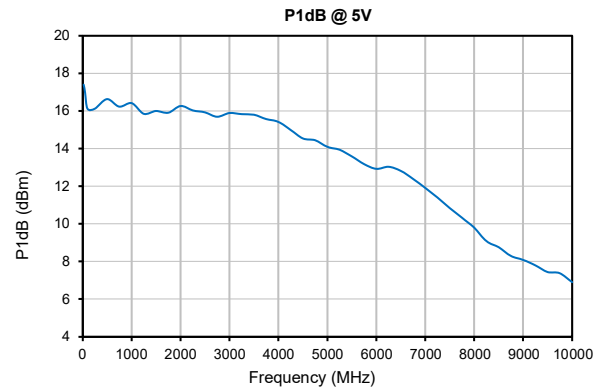
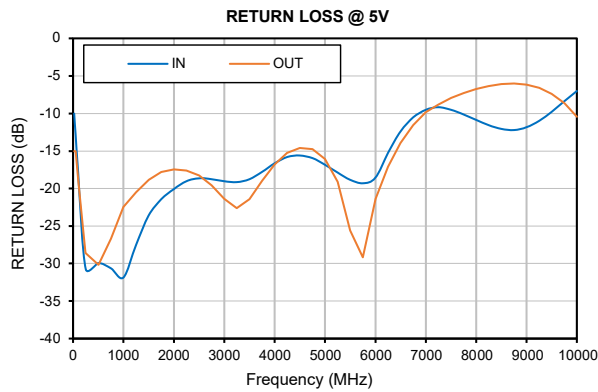
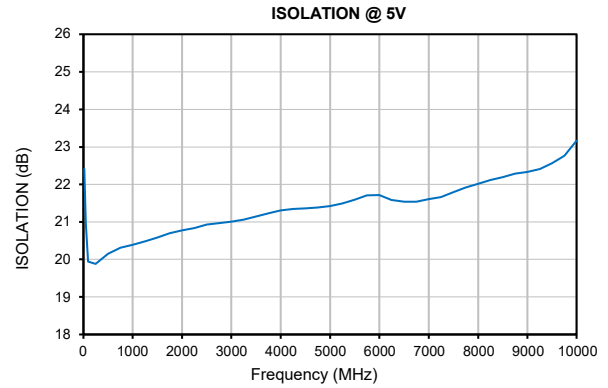
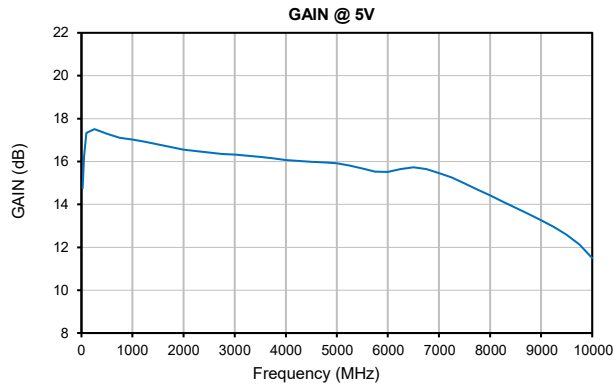
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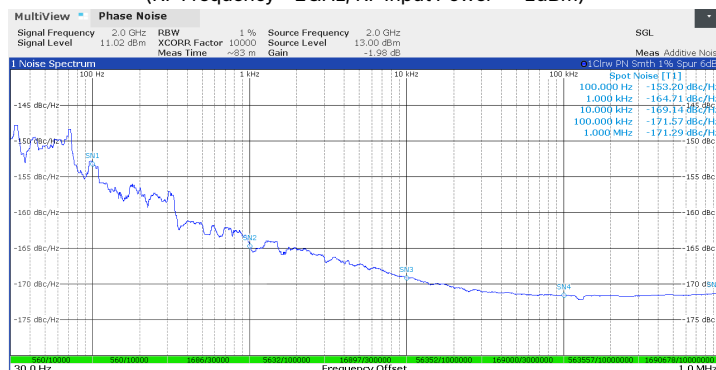
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## TYPICAL PERFORMANCE GRAPHS



## ADDITIVE PHASE NOISE vs. OFFSET FREQUENCY (RF Frequency = 2GHz, RF Input Power = +1dBm)





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## ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	0.34 W
RF Input Power (CW)	+28 dBm (5 minutes max.) +11 dBm (continuous)
DC Voltage	+6V <sup>1</sup>
Operating Current at	+5.2V (V+) 65 mA

Permanent damage may occur if any of these limits are exceeded.  
1. No protection against application of reverse voltage.

## DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

$\text{MAXIMUM THERMAL RESISTANCE} = \frac{\text{MAXIMUM OPERATING CASE TEMP} - \text{MAXIMUM USER AMBIENT TEMP}}{\text{POWER DISSIPATION}}$	
<b>Example:</b>	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



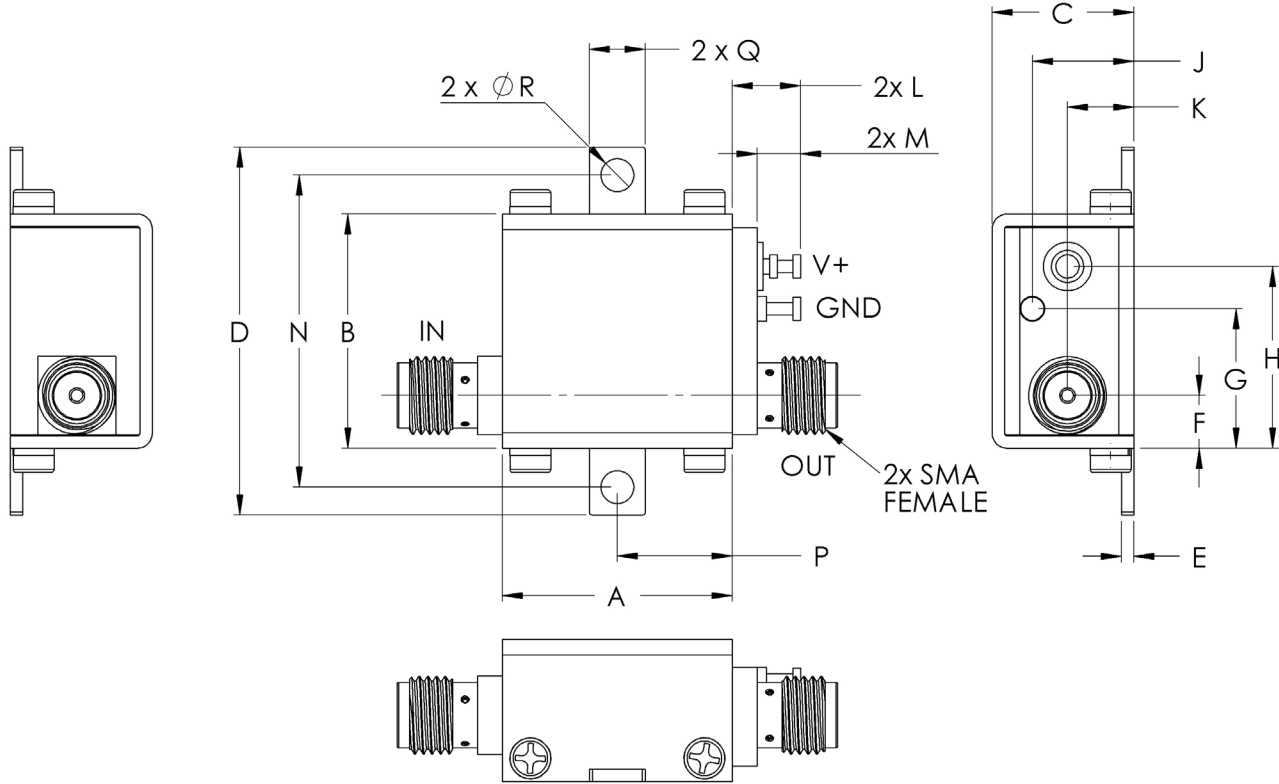
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## OUTLINE DRAWING



**⚠** 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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## 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. Links	<a href="#">ZX60-123LPN+</a>
Case Style	GC957
Connector	IN SMA/Female / OUT SMA/Female

