

# Coaxial Low Noise Amplifier

## ZX60-06203LN+

50Ω    6 to 20 GHz

### The Big Deal

- Low noise figure, 2.8 dB typ, 6 to 18 GHz
- Excellent gain flatness
- High gain broadband performance
- Voltage regulated internally and reverse voltage protected
- Excellent directivity, 20 dB typ



CASE STYLE: GC957

### Product Overview

Mini-Circuits' ZX60-06203LN+ is a 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 5 V 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, $\pm 1.6$ dB for 8 - 18 GHz	Enables a single amplifier to be used in a wide range of applications including EW and communication systems instrumentation and more.
Low noise over the whole band	Enables lower system noise figure performance.
High gain, 18 dB typ.	Reduces the number of gain stages, lowering component count and overall system cost.
High IP3 +26 dBm typ over 6 to 12 GHz +29 dBm typ over 12 to 20 GHz	The combination of low noise and high IP3 makes the ZX60-06203LN+ 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.
Excellent Directivity (Isolation-Gain), 20 dB typ.	Buffer amplifier reduces need for adjacent circuits
Low operating voltage, 5V	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.

#### 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# Coaxial Low Noise Amplifier

## ZX60-06203LN+

50Ω 6 to 20 GHz

### Features

- Low noise figure, 2.8 dB typ, over 6 to 18 GHz
- Excellent Gain flatness, ±1.6 dB over 8 to 18 GHz
- High gain 18 dB typ. 8-18 GHz
- Medium power with good linearity, 15.5 dBm typ P1dB, 27 dBm typ OIP3
- Excellent directivity, 20 typ

### Applications

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



Generic photo used for illustration purposes only

CASE STYLE: GC957

Connectors	Model
SMA	ZX60-06203LN+

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

### Electrical Specifications at 25°C and 5V, unless noted

Parameter	Condition (GHz)	V <sub>DD</sub> =5.0			Units
		Min.	Typ.	Max.	
Frequency Range		6.0		20.0	GHz
Noise Figure	6.0-8.0		2.5		dB
	8.0-12.0		2.6		
	12.0-16.0		2.9		
	16.0-18.0		2.8		
	18.0-20.0		3.4		
Gain	6.0-8.0		16.9		dB
	8.0-12.0		18.3		
	12.0-16.0	13.0	18.6		
	16.0-18.0	15.0	18.4		
	18.0-20.0		15.3		
Input Return Loss	6.0-8.0		14.0		dB
	8.0-12.0		13.0		
	12.0-16.0		7.5		
	16.0-18.0		10.0		
	18.0-20.0		7.5		
Output Return Loss	6.0-8.0		14.0		dB
	8.0-12.0		10.5		
	12.0-16.0		12.2		
	16.0-18.0		12.0		
	18.0-20.0		10.0		
Output Power at 1dB Compression <sup>(1)</sup>	6.0-8.0		15.4		dBm
	8.0-12.0		16.0		
	12.0-16.0		16.0		
	16.0-18.0		15.0		
	18.0-20.0		14.7		
Output IP3 <sup>2</sup>	6.0-8.0		26.3		dBm
	8.0-12.0		26.2		
	12.0-16.0		27.4		
	16.0-18.0		29.3		
	18.0-20.0		29.7		
Device Operating Voltage (V <sub>DD</sub> )	—	4.9	5.0	6.0	V
Device Operating Current (I <sub>DD</sub> )			128	150	mA

1. Current increases at P1dB
2. OIP3 measured with 0 dBm tones and 1 MHz spacing.

### 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

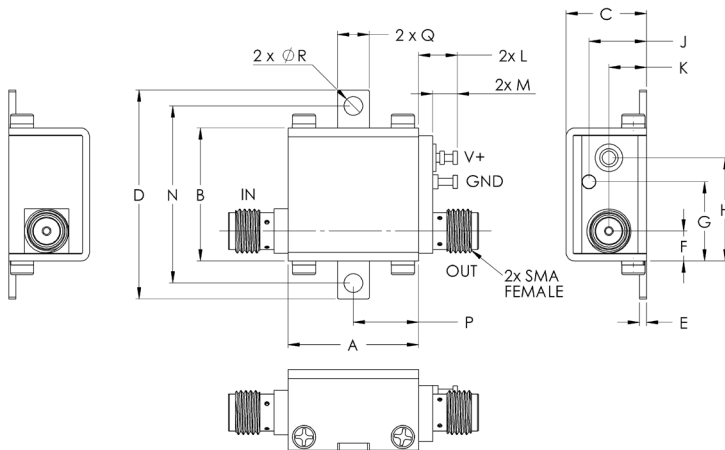


## Absolute Maximum Ratings<sup>3</sup>

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Total Power Dissipation	0.7 W
Input Power (CW), Vd=5V	17 dBm
DC Voltage	6V

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 (inch/mm)

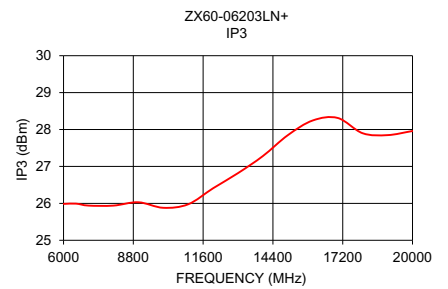
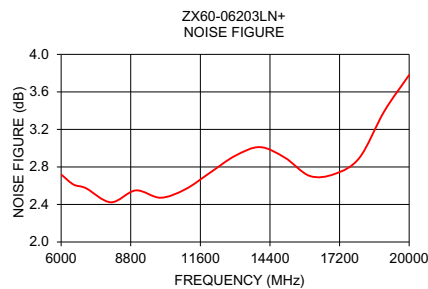
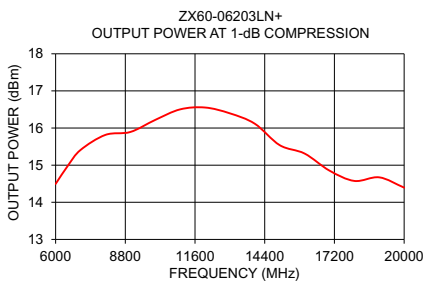
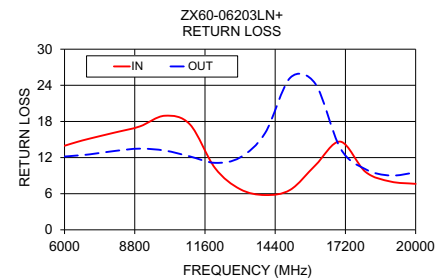
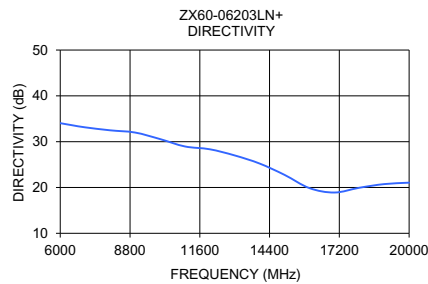
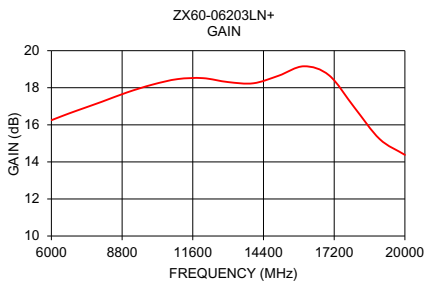
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
.74	.75	.46	1.18	.04	.17	.45	.59	.33	.21	.22	.14	1.00	.37	.18	.106	grams
18.80	19.1	11.68	30.0	1.02	4.32	11.4	14.99	8.38	5.33	5.59	3.56	25.40	9.40	4.57	2.69	23.0

### 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



FREQUENCY (MHz)	GAIN (dB)	DIRECTIVITY (dB)	RETURN LOSS 5V		POWER OUT @1 dB COMPR. (dBm)	NF (dB)	IP3 (dBm)
	5V	5V	IN	OUT	5V	5V	5V
6000	16.25	34.04	13.96	12.17	14.50	2.72	25.99
6500	16.51	33.56	14.59	12.34	14.99	2.61	25.99
7000	16.76	33.13	15.15	12.53	15.41	2.57	25.94
8000	17.24	32.48	16.15	13.10	15.82	2.42	25.94
9000	17.75	32.00	17.17	13.48	15.89	2.55	26.03
10000	18.17	30.58	18.95	13.16	16.22	2.47	25.88
11000	18.47	28.96	17.51	12.19	16.50	2.56	25.98
12000	18.52	28.34	10.26	11.12	16.55	2.74	26.41
13000	18.31	27.00	6.75	12.02	16.40	2.92	26.82
14000	18.24	25.23	5.78	16.09	16.12	3.01	27.28
15000	18.65	22.75	6.64	25.26	15.54	2.90	27.85
16000	19.16	19.86	10.71	24.26	15.31	2.70	28.25
17000	18.67	18.90	14.65	13.53	14.85	2.73	28.31
18000	16.94	19.94	9.62	10.07	14.58	2.90	27.90
19000	15.23	20.74	8.02	9.02	14.67	3.39	27.85
20000	14.38	21.05	7.63	9.53	14.40	3.78	27.96



**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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



## Typical Performance Data

**NOTE: Use PDF Bookmarks to view DATA at required conditions**

**Definitions:**

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Id = 128.89mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
4000	14.62	54.42	30.09	8.98	42.65	0.87	24.01	10.54	4.11
4500	15.36	52.37	14.82	10.30	31.03	0.94	25.65	11.81	3.45
5000	15.70	51.36	13.11	11.28	26.68	0.97	26.11	12.89	3.06
5500	15.98	50.69	13.29	11.90	24.21	0.98	26.00	13.86	2.87
6000	16.25	50.29	13.96	12.17	22.67	0.98	25.99	14.50	2.72
6500	16.51	50.08	14.59	12.34	21.64	0.98	25.99	14.99	2.61
7000	16.76	49.89	15.15	12.53	20.72	0.97	25.94	15.41	2.57
7500	17.01	49.84	15.64	12.78	20.17	0.97	25.90	15.72	2.50
8000	17.24	49.72	16.15	13.10	19.50	0.98	25.94	15.82	2.42
8500	17.51	49.82	16.60	13.32	19.22	0.98	26.08	15.76	2.49
9000	17.75	49.75	17.17	13.48	18.62	0.97	26.03	15.89	2.55
9500	17.97	49.32	17.89	13.46	17.35	0.97	25.86	16.13	2.48
10000	18.17	48.74	18.95	13.16	15.87	0.96	25.88	16.22	2.47
10500	18.34	48.07	19.62	12.68	14.35	0.96	25.87	16.38	2.48
11000	18.47	47.43	17.51	12.19	12.99	0.95	25.98	16.50	2.56
12000	18.52	46.86	10.26	11.12	11.01	1.00	26.41	16.55	2.74
13000	18.31	45.30	6.75	12.02	8.32	1.13	26.82	16.40	2.92
14000	18.24	43.47	5.78	16.09	6.52	1.24	27.28	16.12	3.01
15000	18.65	41.40	6.64	25.26	5.38	1.21	27.85	15.54	2.90
16000	19.16	39.02	10.71	24.26	4.55	1.07	28.25	15.31	2.70
16500	19.12	38.11	14.53	17.65	4.28	1.00	28.14	15.03	2.67
17000	18.67	37.57	14.65	13.53	4.14	0.97	28.31	14.85	2.73
17500	17.85	37.32	11.53	11.29	4.15	0.97	28.08	14.67	2.77
18000	16.94	36.87	9.62	10.07	4.08	0.98	27.90	14.58	2.90
18500	16.03	36.34	8.64	9.35	4.00	1.00	27.94	14.62	3.06
19000	15.23	35.97	8.02	9.02	3.99	1.02	27.85	14.67	3.39
19500	14.67	35.66	7.64	8.99	3.98	1.04	28.09	14.50	3.53
20000	14.38	35.43	7.63	9.53	4.06	1.06	27.96	14.40	3.78
20500	14.25	35.15	7.93	10.07	4.12	1.06	27.37	14.37	4.07
21000	14.26	34.80	8.04	10.19	4.02	1.05	26.10	14.43	4.19
21500	14.06	34.65	7.33	9.58	3.92	1.05	26.09	14.86	4.38
22000	13.49	34.68	6.04	8.60	3.86	1.05	25.87	14.75	4.59
22500	12.63	34.87	4.90	7.85	3.90	1.07	25.73	14.94	4.77
23000	11.71	35.12	4.07	7.53	4.00	1.11	25.59	15.11	4.86
23500	10.87	35.22	3.60	7.74	4.15	1.16	25.63	15.02	5.04
24000	10.24	35.19	3.46	8.78	4.40	1.24	25.66	15.08	4.96

## 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 = 5.00V, Id = 128.08mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
4000	15.96	54.17	27.66	8.80	35.24	0.87	24.15	10.34	3.17
4500	16.64	52.10	14.20	10.21	25.75	0.94	26.82	11.63	2.62
5000	16.95	50.94	12.71	11.18	21.85	0.97	28.21	12.63	2.29
5500	17.17	50.27	12.58	11.61	19.83	0.98	28.82	13.49	2.16
6000	17.41	49.85	13.11	11.73	18.55	0.98	28.74	14.08	2.00
6500	17.63	49.63	13.19	11.58	17.60	0.98	28.01	14.47	1.90
7000	17.89	49.52	13.68	11.72	16.99	0.97	27.82	14.84	1.89
7500	18.13	49.52	14.08	11.73	16.60	0.97	27.75	15.15	1.79
8000	18.38	49.59	14.56	11.97	16.40	0.97	27.73	15.32	1.75
8500	18.66	49.69	14.75	12.19	16.14	0.97	27.81	15.41	1.75
9000	18.93	49.84	15.20	12.67	16.07	0.98	27.75	15.48	1.84
9500	19.19	49.48	16.00	12.86	15.10	0.97	27.59	15.74	1.77
10000	19.41	49.00	17.09	12.78	13.99	0.97	27.68	15.85	1.72
10500	19.60	48.34	19.16	12.01	12.65	0.95	27.65	15.96	1.76
11000	19.75	47.70	20.21	11.19	11.46	0.93	27.84	16.10	1.77
12000	19.82	47.03	11.26	9.50	9.52	0.94	28.20	16.23	2.00
13000	19.59	45.48	6.60	10.19	7.03	1.10	28.39	16.34	2.21
14000	19.56	43.58	5.31	15.45	5.41	1.26	28.95	16.09	2.28
15000	20.11	41.35	6.09	38.12	4.39	1.24	29.39	15.87	2.09
16000	20.80	38.80	10.19	20.07	3.63	1.07	30.66	15.57	1.85
16500	20.74	37.95	12.35	15.04	3.39	1.00	31.31	15.26	1.89
17000	20.32	37.44	11.73	12.88	3.27	0.99	32.48	15.13	1.92
17500	19.59	37.03	10.19	11.13	3.21	0.98	31.81	14.90	1.94
18000	18.84	36.33	9.38	10.10	3.09	0.98	31.88	14.82	1.95
18500	17.99	35.63	8.84	9.21	2.99	0.97	31.16	14.81	2.07
19000	17.05	35.21	8.14	8.57	2.98	0.99	31.61	14.90	2.37
19500	16.28	35.01	7.42	8.23	2.99	1.01	31.92	14.72	2.49
20000	15.82	34.97	6.76	8.77	3.03	1.07	30.93	14.65	2.76
20500	15.65	34.82	6.77	9.40	3.08	1.09	29.78	14.50	3.15
21000	15.76	34.25	7.22	10.13	3.01	1.09	29.01	14.64	3.35
21500	15.78	33.99	7.22	9.67	2.96	1.06	28.07	14.99	3.56
22000	15.45	33.87	6.19	8.80	2.89	1.04	27.83	14.93	3.63
22500	14.74	33.89	5.01	7.97	2.85	1.05	27.37	15.11	3.70
23000	13.71	34.15	4.06	6.99	2.88	1.05	27.16	14.95	3.77
23500	12.76	34.40	3.48	6.56	2.95	1.07	27.29	15.03	3.87
24000	11.83	34.90	3.05	6.86	3.14	1.15	27.18	15.18	3.89

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

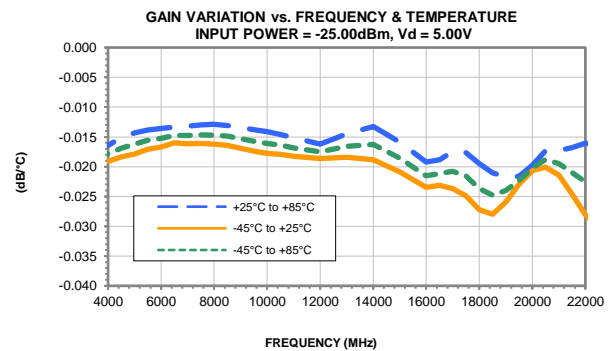
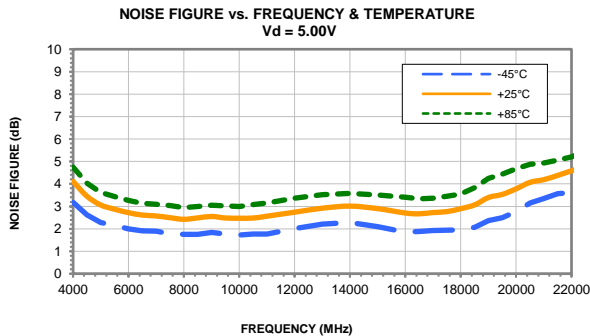
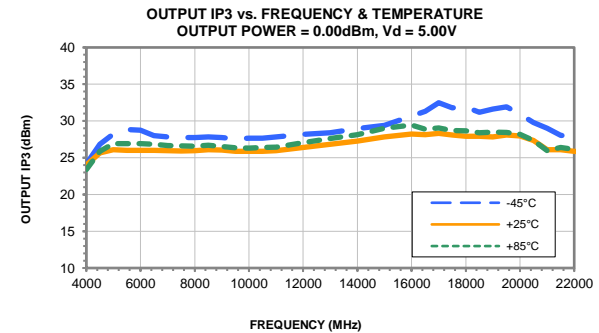
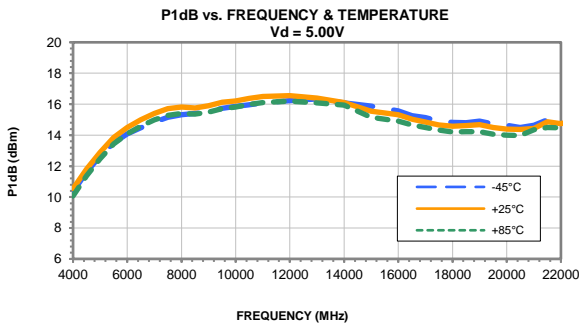
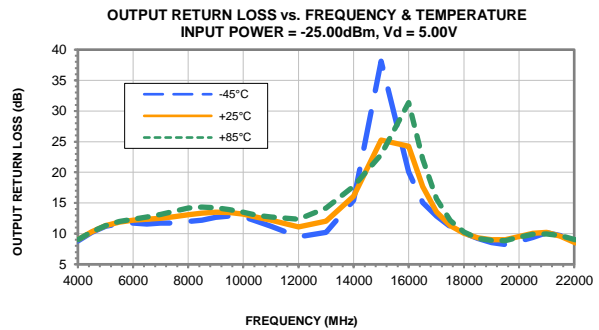
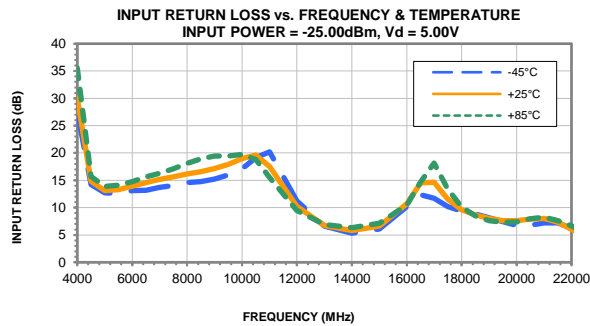
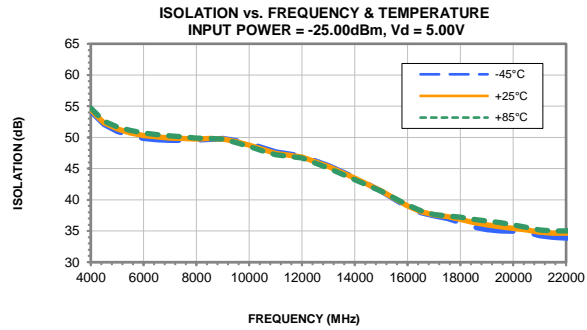
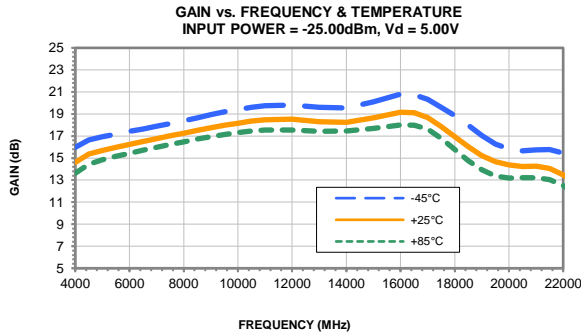
TEST CONDITIONS: Vd = 5.00V, Id = 130.07mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
4000	13.64	54.71	35.55	9.03	49.45	0.88	23.38	10.07	4.74
4500	14.45	52.61	15.70	10.31	35.67	0.93	25.89	11.36	4.04
5000	14.84	51.67	13.86	11.32	30.80	0.97	26.94	12.47	3.62
5500	15.15	51.10	14.12	11.99	28.22	0.97	26.92	13.44	3.43
6000	15.43	50.69	14.77	12.37	26.36	0.97	26.91	14.08	3.26
6500	15.71	50.44	15.63	12.71	25.07	0.97	26.82	14.58	3.13
7000	15.97	50.23	16.30	13.11	23.96	0.97	26.67	14.98	3.09
7500	16.23	50.09	17.10	13.66	23.11	0.98	26.63	15.28	3.03
8000	16.47	49.88	18.09	14.19	22.16	0.98	26.57	15.40	2.94
8500	16.72	49.81	18.92	14.33	21.43	0.98	26.72	15.36	2.99
9000	16.94	49.74	19.45	14.21	20.74	0.97	26.54	15.49	3.05
9500	17.14	49.17	19.44	13.90	18.93	0.97	26.35	15.71	3.02
10000	17.32	48.53	19.74	13.48	17.17	0.97	26.33	15.81	3.00
10500	17.47	47.82	18.77	13.00	15.44	0.96	26.40	15.98	3.08
11000	17.56	47.21	15.52	12.69	14.02	0.97	26.46	16.10	3.15
12000	17.55	46.69	9.46	12.36	12.04	1.04	27.03	16.20	3.36
13000	17.44	45.06	6.90	14.15	9.22	1.16	27.64	16.09	3.52
14000	17.45	43.20	6.31	17.75	7.27	1.22	28.12	15.95	3.58
15000	17.70	41.35	7.13	22.91	6.11	1.19	29.02	15.15	3.51
16000	18.00	39.18	10.48	31.37	5.26	1.08	29.45	14.91	3.41
16500	17.99	38.24	14.70	22.14	5.00	1.02	28.88	14.67	3.33
17000	17.62	37.62	18.18	15.71	4.85	0.98	29.05	14.49	3.36
17500	16.79	37.41	13.33	12.13	4.89	0.97	28.68	14.32	3.45
18000	15.76	37.20	10.10	10.25	4.91	0.98	28.66	14.21	3.55
18500	14.76	36.84	8.48	9.24	4.84	1.00	28.39	14.22	3.84
19000	13.93	36.61	7.63	8.90	4.86	1.03	28.47	14.22	4.25
19500	13.37	36.34	7.34	8.88	4.89	1.05	28.45	14.07	4.44
20000	13.19	35.98	7.40	9.43	4.88	1.06	28.18	14.00	4.67
20500	13.21	35.55	7.97	9.89	4.88	1.05	27.34	13.97	4.87
21000	13.22	35.18	8.24	9.97	4.79	1.03	25.96	14.35	4.94
21500	13.05	35.01	7.63	9.71	4.70	1.03	26.38	14.49	5.07
22000	12.53	35.02	6.66	9.04	4.72	1.04	26.12	14.46	5.20
22500	11.63	35.30	5.39	8.29	4.83	1.07	25.95	14.60	5.45
23000	10.58	35.63	4.43	7.69	5.02	1.10	26.09	14.82	5.68
23500	9.66	35.66	3.89	8.02	5.22	1.16	26.01	14.53	5.88
24000	8.98	35.64	3.60	9.06	5.45	1.24	25.93	14.52	5.94

# Low Noise Amplifier

# ZX60-06203LN+

## Typical Performance Curves



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



IF/RF MICROWAVE COMPONENTS

REV. OR  
ZX60-06203LN+  
6/24/2019  
Page 1 of 1

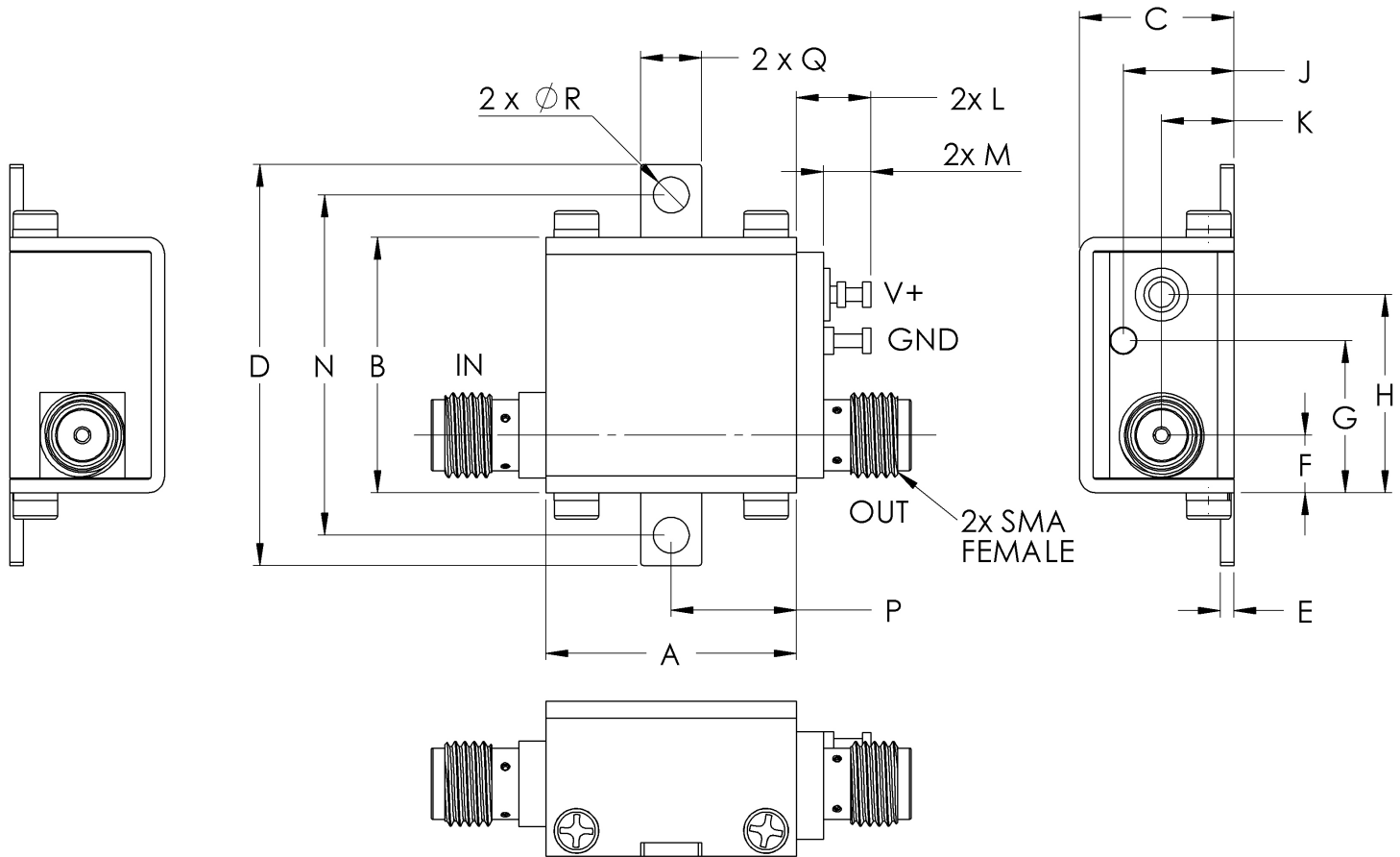


# Case Style

# 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**®

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified



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