



HIGH GAIN, HIGH IP3

# Wideband Amplifier

## ZX60-V63+

50Ω 0.05 to 6 GHz SMA Female

### THE BIG DEAL

- High Gain
- Broadband High Dynamic Range
- Wideband, 0.05 to 6 GHz
- Protected by US patent 6,790,049

### APPLICATIONS

- Base station infrastructure
- Portable wireless
- CATV & DBS
- MMDS & Wireless LAN
- LTE
- SATCOM
- Radar



Generic photo used for illustration purposes only

Model No.	ZX60-V63+
Case Style	GC957
Connectors	SMA Female

**+RoHS Compliant**  
 The +Suffix identifies RoHS Compliance.  
 See our website for methodologies and qualifications

### PRODUCT OVERVIEW

The ZX60-V63+ (RoHS compliant) uses Mini-Circuits' HBT technology to offer high gain over a broad frequency range and high IP3. 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
High Gain 21.9 dB typ. at 0.05 GHz 15.4 dB typ. at 6 GHz	High gain reduces number of gain stages, at lower real estate, component count and cost. ±1.7 dB gain flatness from 50 MHz to 3 GHz
Broadband: 0.05 to 6 GHz	Broadband covering primary wireless communications bands: Cellular, PCS, LTE, WiMAX, UHF, VHF, L band, Satcom, radar, etc.
High IP3 vs. DC power consumption 34.2 dBm typical at 0.05 GHz 33.3 dBm typical at 0.8 GHz	This model matches good IP3 performance relative to power consumption. The HBT structure provides good linearity over a broad frequency range as shown in the IP3 being typically 16 dB above the P1dB point to 0.8 GHz. This feature makes this amplifier ideal for use in: • driver amplifiers for complex waveform upconverter paths • drivers in linearized transmit systems
Very Small Size, 0.75" x 0.75"	The unique unibody construction enables the ZX60-V63+ to be used in compact designs.



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### ELECTRICAL SPECIFICATIONS AT 25°C AND +5.0V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.05		6	GHz
Gain	0.05	19.0	21.9		dB
	0.8		21.1		
	2.0		20.3		
	3.0		19.2		
	4.0		18.0		
	6.0		15.4		
Gain Flatness	0.05 - 3.0		±1.7		dB
	0.7 - 2.6		±1.3		
Input Return Loss	0.05	14.0	14.8		dB
	0.8		23.6		
	2.0		16.7		
	3.0		10.8		
	4.0		10.8		
	6.0		13.4		
Output Return Loss	0.05	12.0	15.7		dB
	0.8		15.5		
	2.0		13.6		
	3.0		15.9		
	4.0		24.1		
	6.0		11.8		
Output IP3	0.05		34.2		dBm
	0.8		33.3		
	2.0		31.2		
	3.0		28.8		
	4.0		27.7		
	6.0		23.9		
Output Power @ 1 dB compression	0.05	17.0	18.4		dBm
	0.8		18.5		
	2.0		17.8		
	3.0		16.1		
	4.0		15.0		
	6.0		12.1		
Noise Figure	0.05		3.6		dB
	0.8		3.7		
	2.0		3.7		
	3.0		3.8		
	4.0		3.8		
	6.0		4.3		
Active Directivity (Isolation-Gain)	0.05 - 6		4.0		dB
DC Supply Voltage		4.8	5.0	5.2	V
Supply Current		58	69	78	mA





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# Wideband Amplifier

## ZX60-V63+

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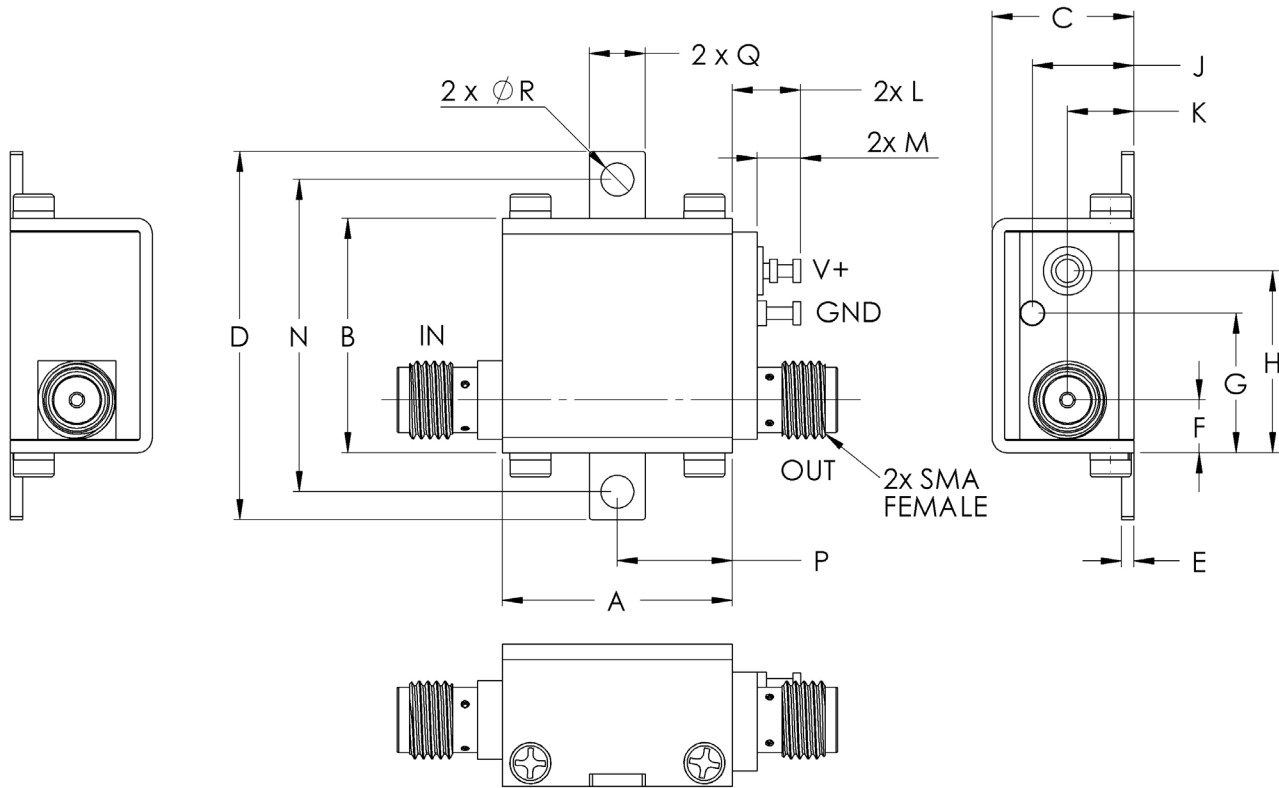
50Ω 0.05 to 6 GHz SMA Female

### ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to 85°C Case
Storage Temperature	-55°C to 100°C
DC Voltage	+5.7V
Input RF Power (no damage)	+13dBm
Power Consumption	0.5W

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

### 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





HIGH GAIN, HIGH IP3

# Wideband Amplifier

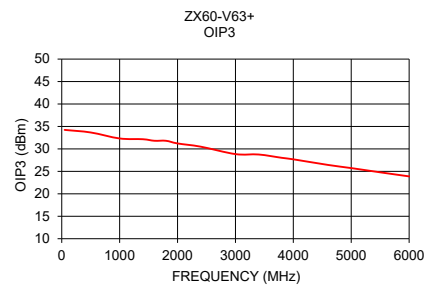
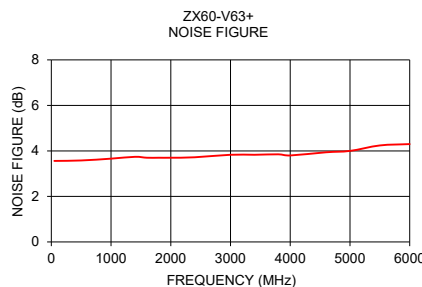
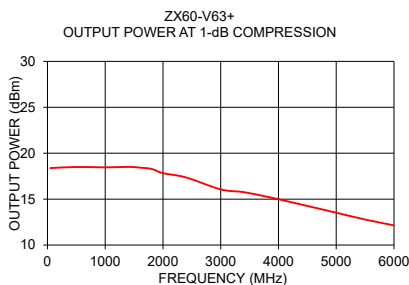
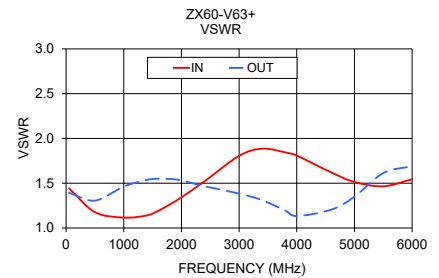
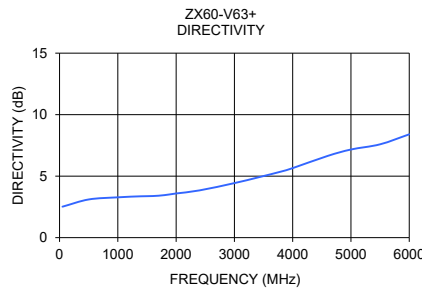
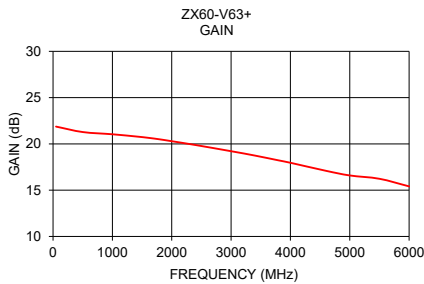
## ZX60-V63+

Mini-Circuits

50Ω 0.05 to 6 GHz SMA Female

### TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1)		Power Out @ 1 dB COMPR. (dBm)	Noise Figure (dB)	Output IP3 (dBm)
			IN	OUT			
50.00	21.87	2.52	1.44	1.39	18.4	3.6	34.2
500.00	21.28	3.10	1.18	1.31	18.5	3.6	33.7
1000.00	21.04	3.28	1.12	1.46	18.5	3.7	32.3
1400.00	20.80	3.36	1.14	1.54	18.5	3.7	32.2
1600.00	20.66	3.38	1.19	1.55	18.4	3.7	31.8
1800.00	20.49	3.46	1.26	1.55	18.3	3.7	31.8
2000.00	20.29	3.59	1.34	1.53	17.8	3.7	31.2
2400.00	19.88	3.84	1.52	1.47	17.4	3.7	30.5
3000.00	19.21	4.43	1.81	1.38	16.1	3.8	28.8
3400.00	18.74	4.89	1.89	1.31	15.8	3.8	28.8
3800.00	18.22	5.37	1.84	1.19	15.3	3.9	28.0
4000.00	17.96	5.65	1.81	1.13	15.0	3.8	27.7
4600.00	17.09	6.64	1.62	1.21	14.1	3.9	26.4
5000.00	16.59	7.17	1.51	1.35	13.5	4.0	25.7
5500.00	16.23	7.59	1.47	1.61	12.8	4.2	24.8
6000.00	15.41	8.40	1.54	1.69	12.1	4.3	23.9



- 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



## 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 = 5V, Id = 68.41mA @ Temperature = 25degC

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)			(dBm)	(dBm)	(dB)
50.0	21.90	23.74	15.86	15.79	0.97	0.38	35.79	18.29	3.22
100.0	21.56	24.47	19.36	19.04	1.03	0.50	34.00	18.51	3.65
200.0	21.45	24.40	21.37	19.96	1.04	0.50	33.98	18.79	3.62
300.0	21.39	24.39	22.00	19.49	1.04	0.50	33.72	18.75	3.60
400.0	21.36	24.40	22.53	18.98	1.04	0.50	33.61	18.56	3.78
500.0	21.31	24.44	22.99	18.29	1.05	0.51	34.19	18.78	3.67
600.0	21.27	24.40	23.54	17.68	1.05	0.50	33.64	18.63	3.61
700.0	21.22	24.40	24.05	17.01	1.05	0.50	33.81	18.71	3.64
800.0	21.14	24.41	25.14	16.44	1.06	0.51	33.43	18.57	3.65
900.0	21.12	24.30	26.70	15.82	1.05	0.49	33.20	18.59	3.70
1000.0	21.09	24.33	27.67	15.41	1.05	0.49	33.66	18.79	3.64
1100.0	21.03	24.32	28.42	15.05	1.05	0.49	32.25	18.45	3.62
1200.0	20.97	24.23	28.96	14.74	1.05	0.49	32.64	18.64	3.72
1300.0	20.91	24.19	28.64	14.54	1.05	0.49	32.88	18.69	3.75
1400.0	20.83	24.19	27.37	14.48	1.05	0.50	32.63	18.73	3.64
1500.0	20.77	24.12	25.83	14.43	1.05	0.50	32.36	18.67	3.67
1600.0	20.69	24.02	24.14	14.38	1.05	0.50	32.17	18.59	3.72
1700.0	20.61	23.97	22.50	14.40	1.05	0.50	31.89	18.44	3.71
1800.0	20.53	23.95	21.10	14.56	1.05	0.51	32.00	18.38	3.72
1900.0	20.42	23.85	19.80	14.75	1.05	0.52	31.33	18.09	3.65
2000.0	20.32	23.82	18.79	14.93	1.05	0.53	31.00	17.73	3.67
2200.0	20.11	23.78	16.92	15.35	1.05	0.56	30.47	17.55	3.63
2400.0	19.89	23.73	15.40	16.18	1.06	0.59	29.82	16.98	3.74
2600.0	19.68	23.67	14.29	16.96	1.06	0.62	29.23	16.60	3.71
2800.0	19.44	23.61	13.45	17.99	1.07	0.64	29.02	16.26	3.70
3000.0	19.21	23.59	12.91	19.09	1.08	0.67	29.11	16.37	3.75
3200.0	18.97	23.59	12.51	20.28	1.09	0.70	28.73	15.93	3.68
3400.0	18.73	23.57	12.42	22.13	1.10	0.72	28.52	15.75	3.71
3600.0	18.50	23.58	12.46	23.69	1.12	0.74	28.00	15.38	3.74
3800.0	18.25	23.62	12.75	25.73	1.14	0.77	27.83	15.14	3.75
4000.0	17.99	23.66	13.30	25.94	1.17	0.78	27.30	14.77	3.73
4500.0	17.30	23.85	15.40	21.95	1.25	0.81	27.11	14.51	3.76
5000.0	16.70	24.04	17.53	16.79	1.32	0.83	26.45	14.15	3.86
5500.0	16.22	24.09	16.73	13.28	1.34	0.82	25.61	13.58	3.82
6000.0	15.37	24.16	14.02	12.91	1.42	0.86	25.07	13.43	3.87
6500.0	14.51	24.15	11.03	13.40	1.49	0.93	24.30	12.83	4.14
7000.0	13.52	24.27	8.96	13.12	1.58	0.99	23.09	11.97	4.28
7500.0	12.31	24.44	7.57	11.53	1.70	1.02	21.89	10.91	4.67
8000.0	10.86	24.79	6.73	9.17	1.86	1.01	20.31	10.02	5.42

## 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 = 63.11mA @ Temperature = -45degC

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)
50.0	22.08	25.77	15.68	16.26	1.03	0.61	34.93	18.09	2.57
100.0	21.73	24.65	18.77	19.34	1.03	0.51	33.45	17.87	2.87
200.0	21.63	24.56	20.70	20.07	1.04	0.50	33.63	18.27	2.93
300.0	21.58	24.68	21.21	19.63	1.04	0.52	33.32	18.16	2.85
400.0	21.55	24.61	21.41	19.10	1.04	0.51	33.15	17.94	2.89
500.0	21.52	24.56	21.63	18.25	1.04	0.50	33.77	18.21	2.93
600.0	21.48	24.54	22.29	17.52	1.04	0.50	33.29	18.05	2.90
700.0	21.44	24.53	22.86	16.82	1.05	0.49	33.52	18.15	2.92
800.0	21.35	24.59	23.50	16.31	1.05	0.50	33.11	17.99	2.93
900.0	21.34	24.48	24.88	15.61	1.05	0.49	32.92	18.04	2.95
1000.0	21.32	24.46	25.67	15.14	1.05	0.48	33.54	18.29	2.92
1100.0	21.27	24.41	26.89	14.72	1.04	0.48	32.17	17.92	2.88
1200.0	21.22	24.36	28.76	14.34	1.04	0.47	32.56	18.15	2.95
1300.0	21.17	24.31	30.69	14.08	1.04	0.47	32.92	18.19	2.97
1400.0	21.10	24.29	32.14	13.96	1.04	0.47	32.84	18.33	2.92
1500.0	21.05	24.19	32.88	13.92	1.04	0.47	32.63	18.33	2.94
1600.0	20.99	24.19	31.26	13.84	1.04	0.48	32.48	18.29	2.92
1700.0	20.92	24.08	28.62	13.79	1.04	0.48	32.15	18.21	3.01
1800.0	20.85	24.05	26.28	13.84	1.04	0.48	32.49	18.39	2.94
1900.0	20.76	23.98	24.01	13.97	1.04	0.49	32.09	18.28	2.85
2000.0	20.66	23.93	22.30	14.14	1.04	0.50	31.87	18.06	2.90
2200.0	20.48	23.89	20.07	14.48	1.04	0.53	31.41	18.04	2.84
2400.0	20.30	23.78	17.87	15.17	1.04	0.55	30.85	17.53	2.92
2600.0	20.13	23.76	16.30	15.85	1.04	0.57	30.16	17.21	2.95
2800.0	19.93	23.66	15.11	17.02	1.05	0.60	29.98	16.84	2.84
3000.0	19.74	23.60	14.31	18.00	1.05	0.62	30.12	17.13	2.85
3200.0	19.55	23.56	13.83	19.02	1.06	0.64	29.75	16.77	2.83
3400.0	19.34	23.54	13.55	20.55	1.07	0.67	29.63	16.61	2.84
3600.0	19.16	23.56	13.50	21.40	1.08	0.69	29.24	16.34	2.85
3800.0	18.95	23.51	13.83	22.26	1.09	0.70	29.13	16.19	2.84
4000.0	18.71	23.60	14.23	22.24	1.11	0.72	28.79	15.80	2.79
4500.0	18.05	23.77	16.81	18.64	1.18	0.76	28.58	15.61	2.85
5000.0	17.62	23.89	19.54	13.77	1.20	0.75	28.09	15.25	2.91
5500.0	17.27	23.87	17.78	10.92	1.19	0.72	27.44	14.69	2.94
6000.0	16.54	24.01	14.69	10.47	1.25	0.76	26.96	14.56	2.90
6500.0	15.87	23.88	11.35	10.40	1.26	0.81	26.36	14.01	3.15
7000.0	15.01	24.10	9.03	10.36	1.32	0.89	25.25	13.11	3.26
7500.0	13.90	24.29	7.54	9.32	1.39	0.92	24.36	12.06	3.52
8000.0	12.53	24.60	6.63	7.69	1.49	0.92	21.85	10.96	4.11

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

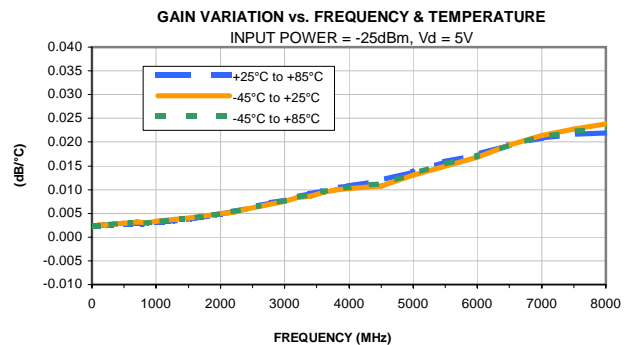
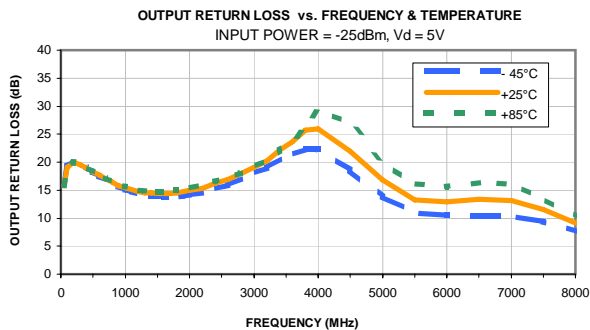
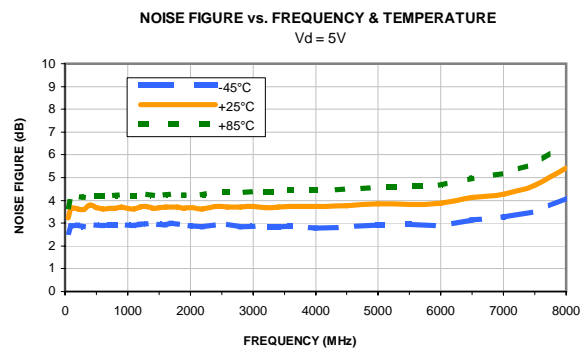
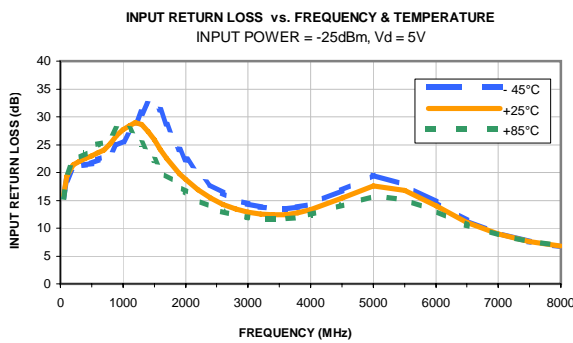
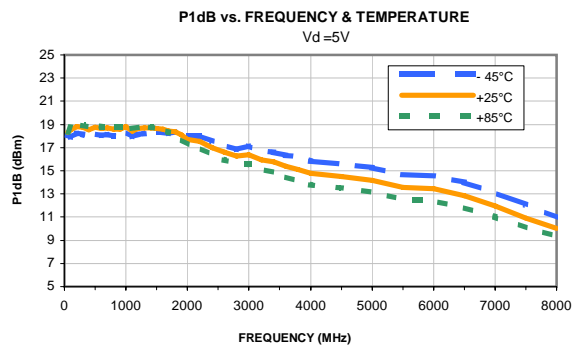
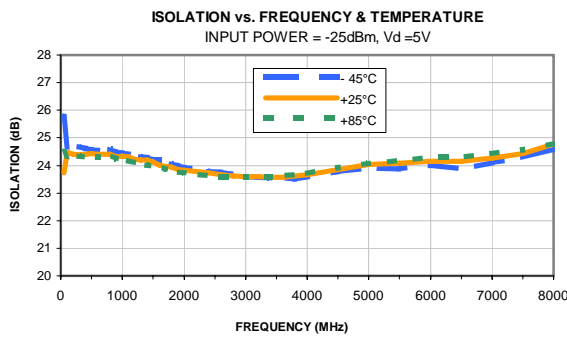
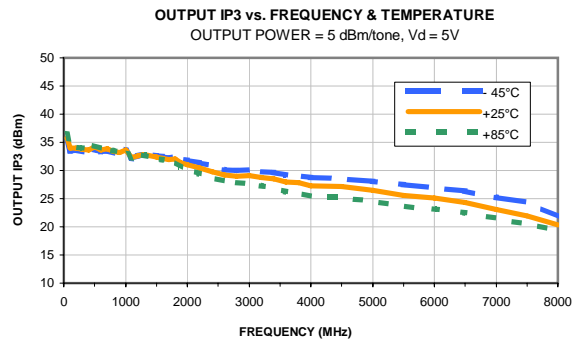
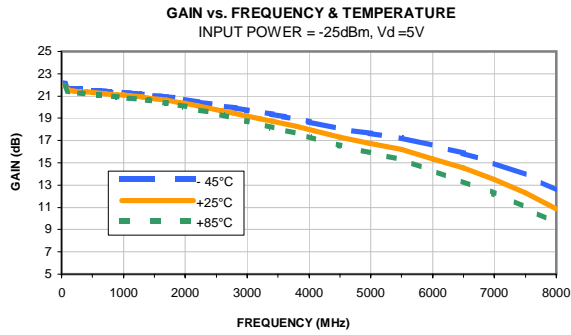
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id = 70.53mA @ Temperature = 85degC

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)
50.0	21.77	24.47	15.56	15.76	0.99	0.50	36.49	18.37	3.70
100.0	21.41	24.35	19.92	18.76	1.03	0.50	34.39	18.71	4.17
200.0	21.30	24.28	21.90	19.92	1.04	0.50	34.20	18.90	4.19
300.0	21.24	24.34	22.55	19.53	1.05	0.51	33.99	18.92	4.12
400.0	21.19	24.31	23.50	18.96	1.05	0.51	33.95	18.77	4.29
500.0	21.15	24.33	24.35	18.24	1.05	0.51	34.47	18.93	4.19
600.0	21.10	24.28	25.06	17.68	1.05	0.51	33.82	18.81	4.19
700.0	21.04	24.26	25.42	17.16	1.05	0.51	34.00	18.87	4.23
800.0	20.97	24.36	26.37	16.62	1.06	0.52	33.54	18.75	4.22
900.0	20.94	24.23	27.65	15.99	1.06	0.50	33.28	18.76	4.25
1000.0	20.89	24.26	28.09	15.61	1.06	0.51	33.68	18.94	4.20
1100.0	20.83	24.17	27.71	15.27	1.06	0.50	32.20	18.62	4.19
1200.0	20.76	24.10	26.61	15.03	1.06	0.50	32.56	18.77	4.25
1300.0	20.70	24.08	25.16	14.86	1.06	0.50	32.75	18.78	4.29
1400.0	20.62	24.00	23.66	14.81	1.06	0.50	32.34	18.77	4.20
1500.0	20.54	23.96	22.20	14.76	1.06	0.51	32.09	18.68	4.24
1600.0	20.45	23.95	20.77	14.75	1.06	0.52	31.88	18.52	4.24
1700.0	20.36	23.87	19.51	14.86	1.06	0.52	31.60	18.32	4.28
1800.0	20.26	23.79	18.46	15.00	1.06	0.53	31.45	18.14	4.29
1900.0	20.15	23.76	17.47	15.19	1.06	0.54	30.60	17.70	4.21
2000.0	20.03	23.73	16.56	15.42	1.06	0.56	30.12	17.25	4.26
2200.0	19.79	23.69	15.04	15.89	1.07	0.59	29.47	17.00	4.24
2400.0	19.53	23.63	13.81	16.57	1.07	0.62	28.78	16.40	4.34
2600.0	19.28	23.59	12.96	17.29	1.08	0.65	28.12	15.94	4.35
2800.0	19.01	23.61	12.32	18.10	1.09	0.68	27.84	15.61	4.36
3000.0	18.75	23.56	11.94	19.16	1.10	0.71	27.75	15.59	4.38
3200.0	18.46	23.60	11.65	20.20	1.12	0.74	27.27	15.09	4.38
3400.0	18.18	23.60	11.64	22.21	1.14	0.77	26.89	14.83	4.39
3600.0	17.92	23.62	11.69	23.67	1.16	0.79	26.23	14.43	4.47
3800.0	17.63	23.66	11.97	26.25	1.19	0.81	25.95	14.14	4.43
4000.0	17.34	23.70	12.45	29.22	1.22	0.83	25.43	13.76	4.44
4500.0	16.58	23.92	14.14	26.97	1.32	0.86	25.12	13.49	4.51
5000.0	15.88	24.08	15.69	20.01	1.42	0.88	24.51	13.11	4.59
5500.0	15.27	24.17	15.13	16.07	1.48	0.89	23.62	12.52	4.63
6000.0	14.32	24.29	13.09	15.70	1.60	0.93	23.22	12.41	4.65
6500.0	13.35	24.29	10.57	16.31	1.70	0.99	22.55	11.83	4.97
7000.0	12.27	24.43	8.73	16.17	1.84	1.04	21.49	11.03	5.16
7500.0	11.00	24.58	7.61	13.46	2.01	1.07	20.45	10.07	5.62
8000.0	9.54	24.80	6.85	10.40	2.22	1.05	19.49	9.36	6.48

## Typical Performance Curves



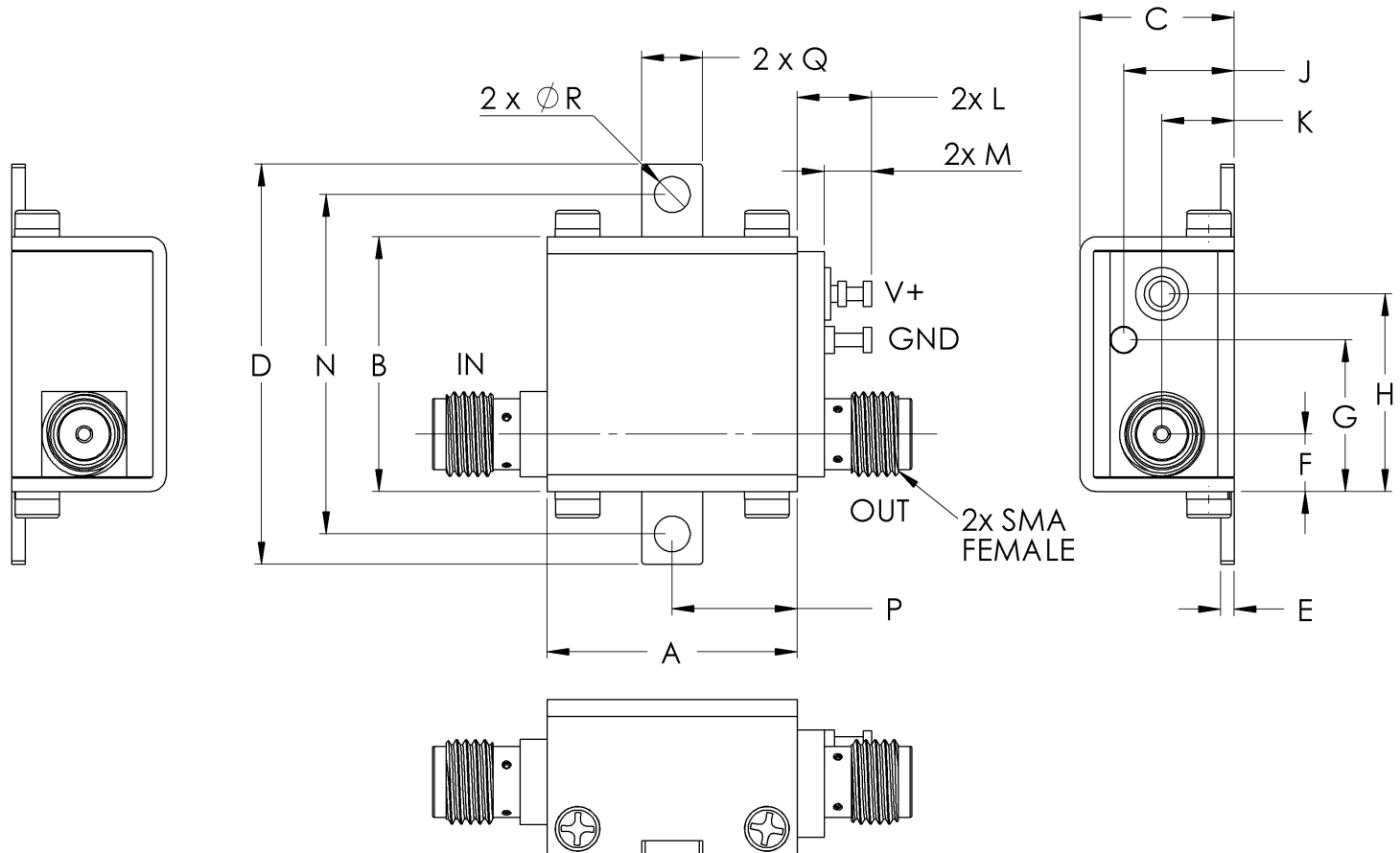


# Case Style

# 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.  $\pm .03$ ; 3Pl.  $\pm .015$   
Tolerance on hole size and interaxes dimensions to be  $\pm .005$ .

### Note:

1. Case material: Brass
2. Case finish: Nickel plate

**Mini-Circuits**<sup>®</sup>

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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