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



Generic photo used for illustration purposes only

APPLICATIONS

- Base Station Infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- LTE
- SATCOM
- Radar

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 50Ω 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, 0.75x0.75"	The unique unibody construction enables the ZX60-V63+ to be used in compact designs.

REV. C
ECO-016369
ZX60-V63+
MCL NY
260202

Wideband Amplifier

ZX60-V63+

50Ω 0.05 to 6 GHz SMA Female

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

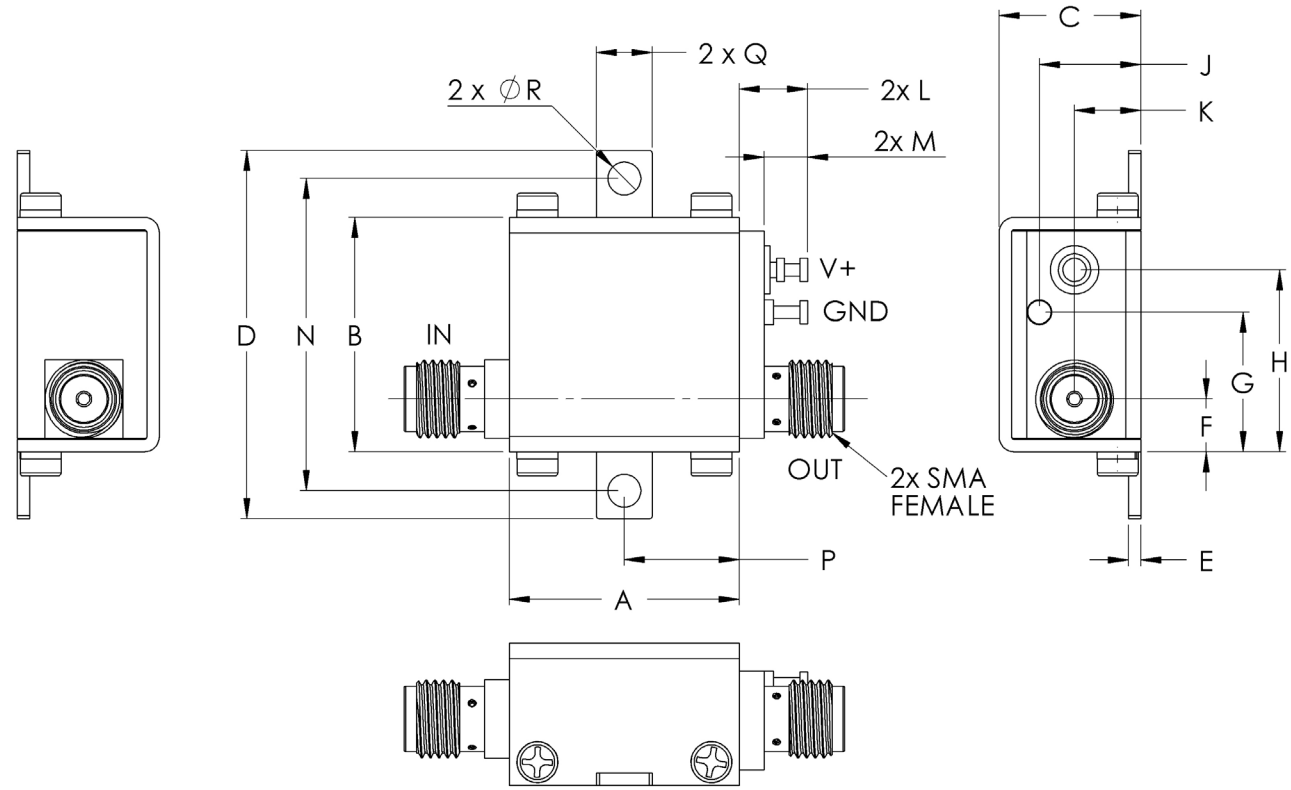
Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.05		6	GHz
Gain	0.05 0.8 2.0 3.0 4.0 6.0	19.0	21.9 21.1 20.3 19.2 18.0 15.4		dB
Gain Flatness	0.05-3.0 0.7-2.6		±1.7 ±1.3		dB
Input Return Loss	0.05 0.8 2.0 3.0 4.0 6.0	14.0	14.8 23.6 16.7 10.8 10.8 13.4		dB
Output Return Loss	0.05 0.8 2.0 3.0 4.0 6.0	12.0	15.7 15.5 13.6 15.9 24.1 11.8		dB
Output IP3	0.05 0.8 2.0 3.0 4.0 6.0		+34.2 +33.3 +31.2 +28.8 +27.7 +23.9		dBm
Output Power at 1 dB Compression	0.05 0.8 2.0 3.0 4.0 6.0	+17.0	+18.4 +18.5 +17.8 +16.1 +15.0 +12.1		dBm
Noise Figure	0.05 0.8 2.0 3.0 4.0 6.0		3.6 3.7 3.7 3.8 3.8 4.3		dB
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

ABSOLUTE MAXIMUM RATINGS

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

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

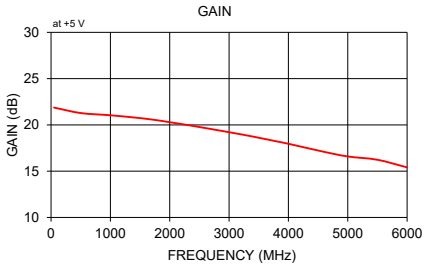
Wideband Amplifier

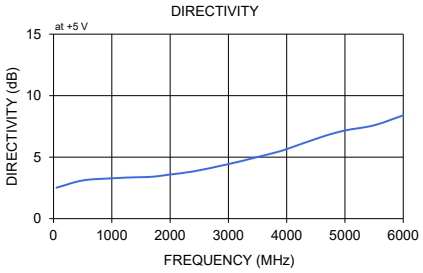
ZX60-V63+

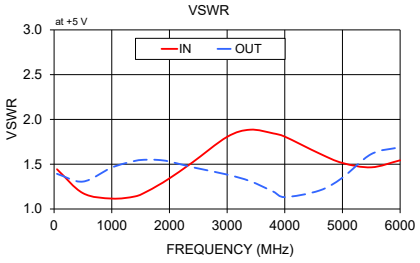
50Ω 0.05 to 6 GHz SMA Female

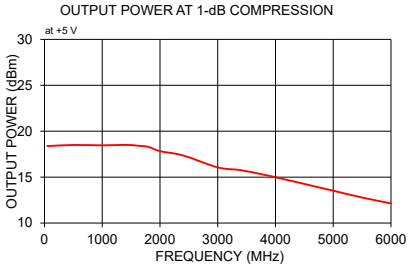
TYPICAL PERFORMANCE DATA/CURVES

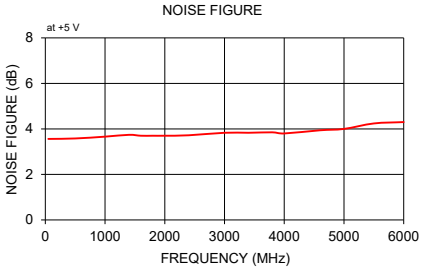
Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1) +5 V		Power Out at 1 dB COMPR. (dBm)	Noise Figure (dB)	Output IP3 (dBm)
	+5 V	+5 V	IN	OUT	+5 V	+5 V	+5 V
50	21.87	2.52	1.44	1.39	18.4	3.6	34.2
500	21.28	3.10	1.18	1.31	18.5	3.6	33.7
1000	21.04	3.28	1.12	1.46	18.5	3.7	32.3
1400	20.80	3.36	1.14	1.54	18.5	3.7	32.2
1600	20.66	3.38	1.19	1.55	18.4	3.7	31.8
1800	20.49	3.46	1.26	1.55	18.3	3.7	31.8
2000	20.29	3.59	1.34	1.53	17.8	3.7	31.2
2400	19.88	3.84	1.52	1.47	17.4	3.7	30.5
3000	19.21	4.43	1.81	1.38	16.1	3.8	28.8
3400	18.74	4.89	1.89	1.31	15.8	3.8	28.8
3800	18.22	5.37	1.84	1.19	15.3	3.9	28.0
4000	17.96	5.65	1.81	1.13	15.0	3.8	27.7
4600	17.09	6.64	1.62	1.21	14.1	3.9	26.4
5000	16.59	7.17	1.51	1.35	13.5	4.0	25.7
5500	16.23	7.59	1.47	1.61	12.8	4.2	24.8
6000	15.41	8.40	1.54	1.69	12.1	4.3	23.9

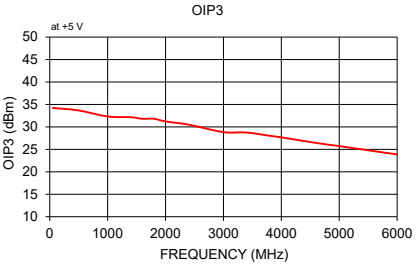












NOTES

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

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
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(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
(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

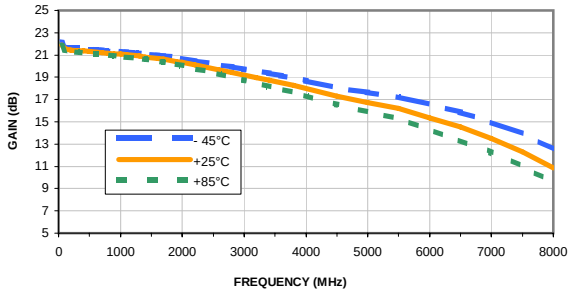
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

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

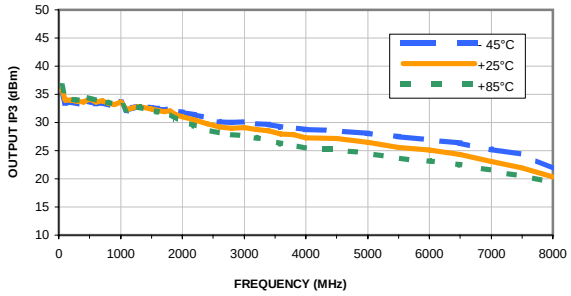
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
50.0	21.77	24.47	15.56	15.76	0.99	0.50	36.49	18.37	3.70
100.0	21.41	24.35	19.92	18.76	1.03	0.50	34.39	18.71	4.17
200.0	21.30	24.28	21.90	19.92	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

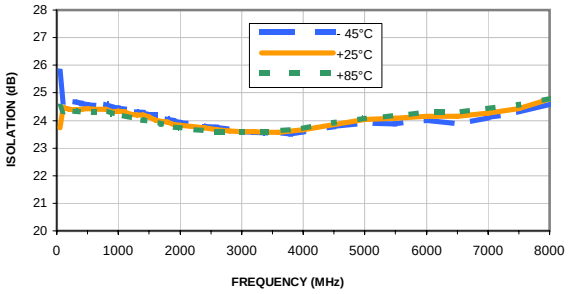
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd =5V



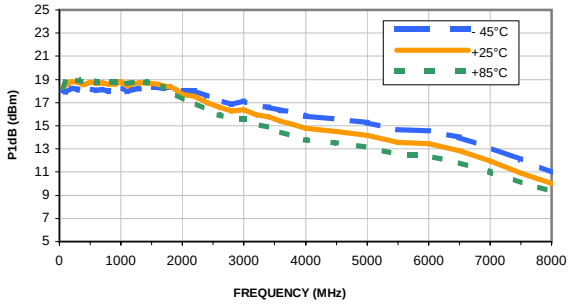
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
OUTPUT POWER = 5 dBm/tone, Vd = 5V



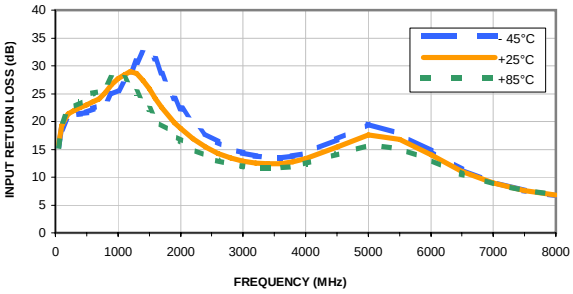
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd =5V



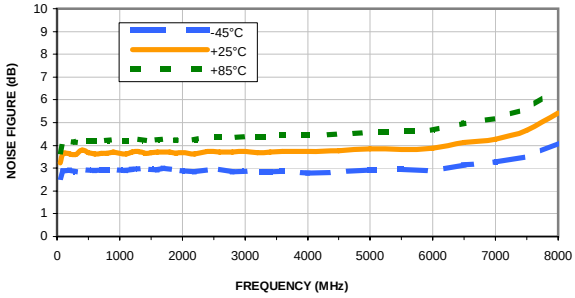
P1dB vs. FREQUENCY & TEMPERATURE
Vd =5V



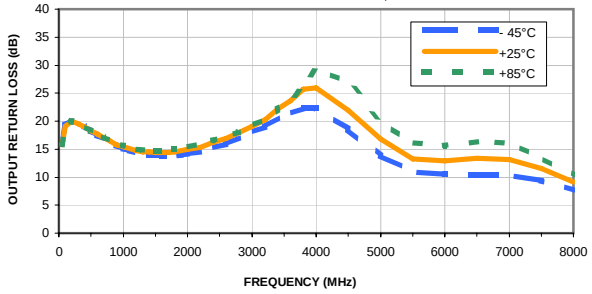
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



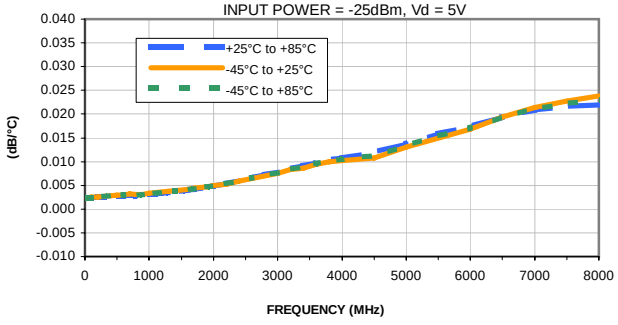
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
Vd = 5V



OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



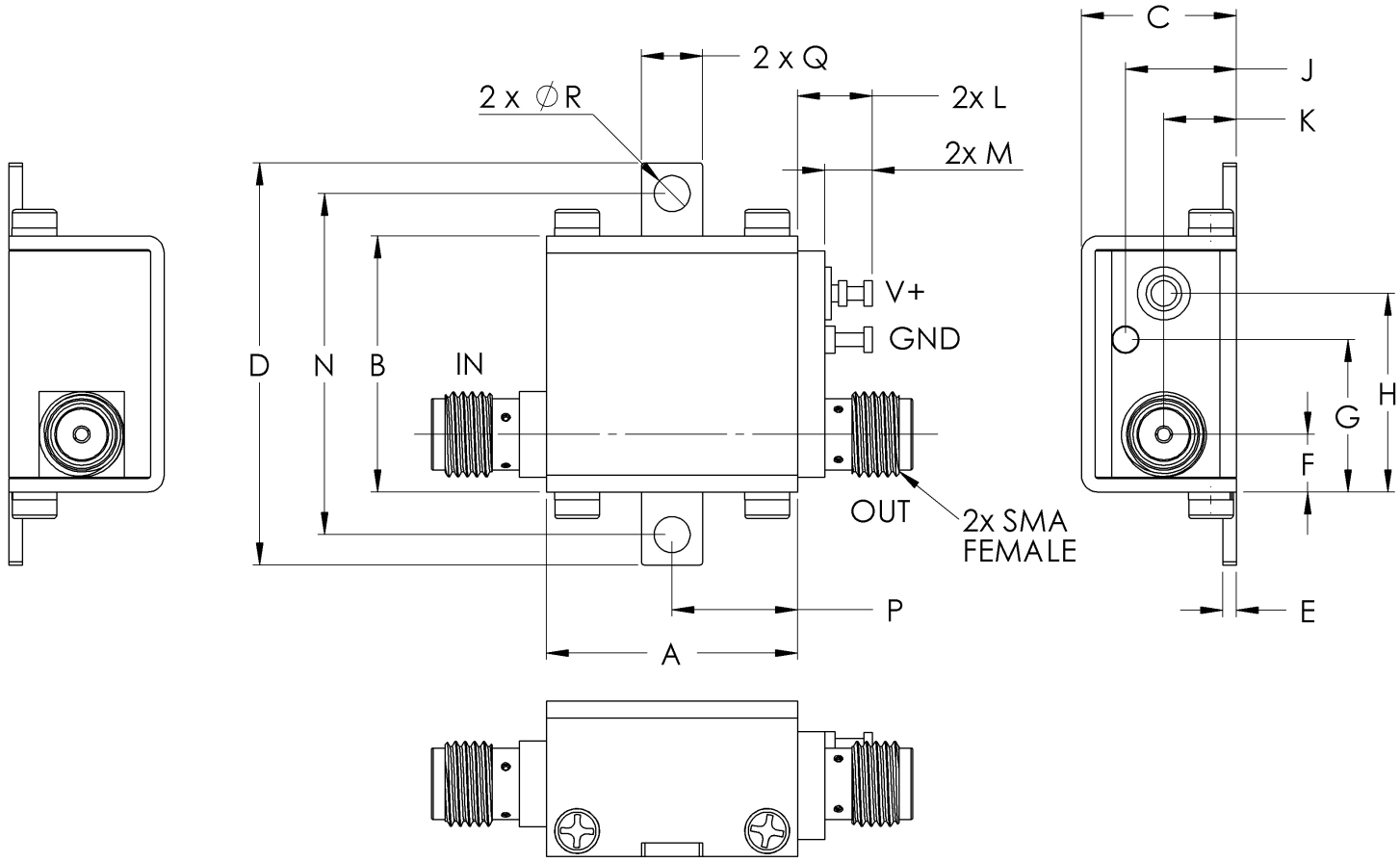
GAIN VARIATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



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

This document and its contents are the property of Mini-Circuits.

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

This document and its contents are the property of Mini-Circuits.