COAXIAL

Low Noise Amplifier ZX60-P162LN+

50Ω 0.7 to 1.6 GHz SMA Female

THE BIG DEAL

- Ultra Low Noise Figure, 0.5 dB Typ.
- High Dynamic Range
- Protected by US Patent 6,790,049



Generic photo used for illustration purposes only

APPLICATIONS

- Base Station Infrastructure
- Portable Wireless
- GPS
- GSM
- Airborne Radar

Model No.	ZX60-P162LN+
Case Style	GC957-2
Connectors	SMA female

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

PRODUCT OVERVIEW

The ZX60-P162LN+ (RoHS compliant) uses Mini-Circuits' E-pHEMT technology to offer ultra low noise figure 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
Ultra Low Noise Figure, 0.5 dB at 1 GHz	Outstanding world class noise figure performance.
High IP3 vs. DC Power Consumption +29.9 dBm Typical at 1 GHz	Combining Low Noise and High IP3 makes this model ideal for use in Low Noise Receiver Front End (RFE).
Max. Input Power, +25 dBm	Ruggedized design operates to high input powers often seen at receiver inputs.
Very Small Size, 0.75x0.75"	The unique unibody size and construction enable the ZX60-P162LN+ to be used in extremely compact connectorized applications.

REV. E
ECO-017292
ZX60-P162LN+
MCL NY
260202

Low Noise Amplifier ZX60-P162LN+

50Ω 0.7 to 1.6 GHz SMA Female

ELECTRICAL SPECIFICATIONS AT +25 °C AND +4.0 V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.7		1.6	GHz
Noise Figure	0.7		0.65		
	0.8		0.47		
	1.0		0.52	0.95	dB
	1.3		0.56		
	1.6		0.74		
Gain	0.7		24.1		
	0.8		23.8		
	1.0	20.9	22.5	24.5	dB
	1.3		20.5		
	1.6		18.5		
Output Power at 1 dB Compression	0.7		+19.2		
	0.8		+19.9		
	1.0	+17.5	+19.9		dBm
	1.3		+19.7		
	1.6		+19.5		
Output IP3	0.7		+29.0		
	0.8		+29.8		
	1.0	+28.0	+29.9		dBm
	1.3		+30.2		
	1.6		+29.6		
Input VSWR	0.7		2.18		
	0.8		1.63		
	1.0		1.19		:1
	1.3		1.23		
	1.6		1.39		
Output VSWR	0.7		1.57		
	0.8		1.42		
	1.0		1.38		:1
	1.3		1.65		
	1.6		2.11		
Active Directivity (Isolation-Gain)	0.7-1.6		8.0		dB
DC Supply Voltage		+3.8	+4.0	+4.2	V
Supply Current		44	52	60	mA

ABSOLUTE MAXIMUM RATINGS

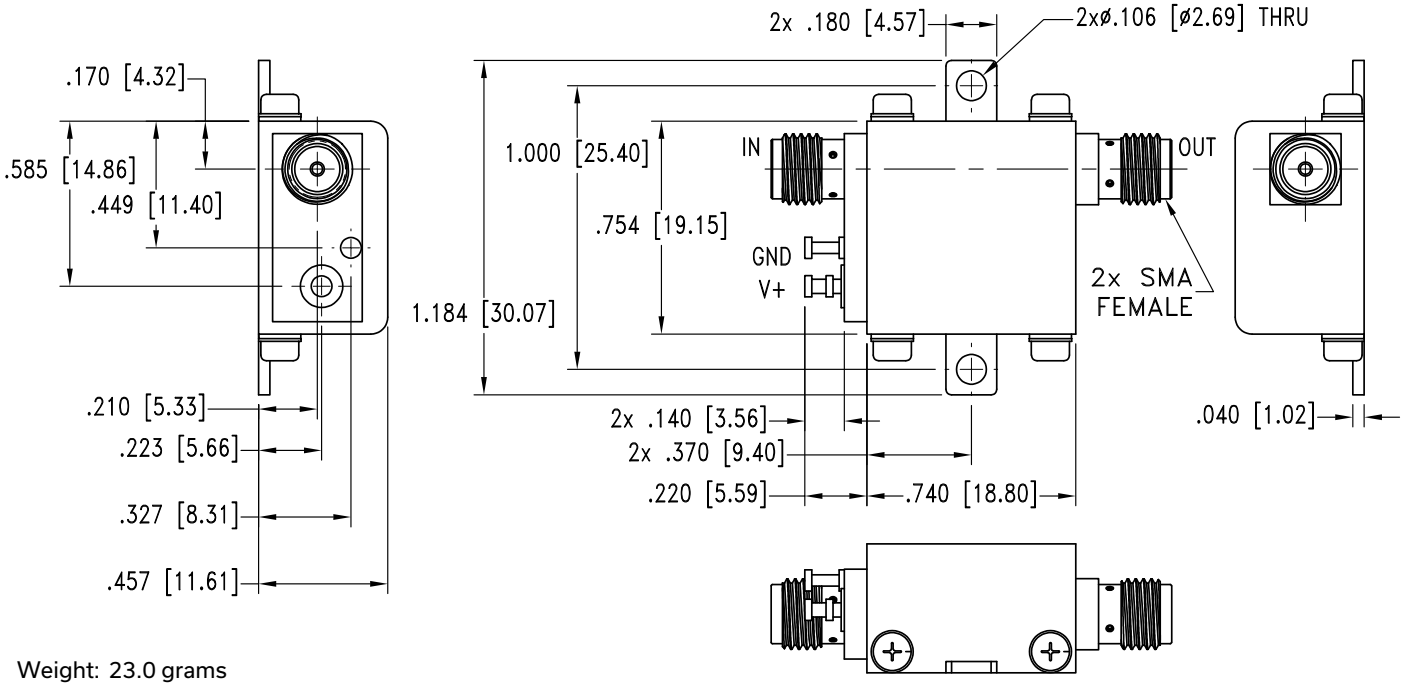
Parameter	Ratings
Operating Temperature	-40 °C to +85 °C Case
Storage Temperature	-55 °C to +100 °C
DC Voltage	+5.5 V
Input RF Power (No Damage) V_D = +4 V	+25 dBm
Power Consumption	0.55 W

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

Low Noise Amplifier ZX60-P162LN+

50Ω 0.7 to 1.6 GHz SMA Female

OUTLINE DRAWING



Weight: 23.0 grams

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

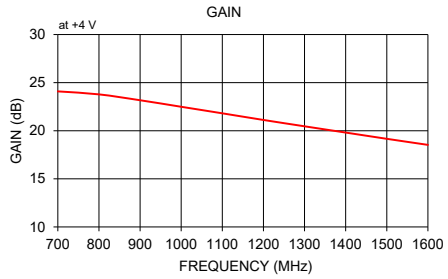
⚠ NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminal. See Application Note. AN-40-010.

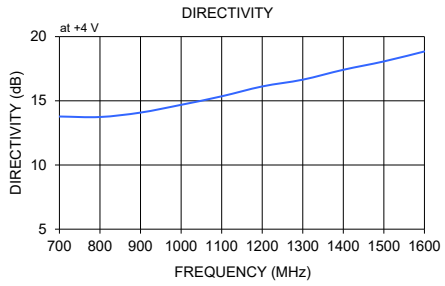
Low Noise Amplifier ZX60-P162LN+

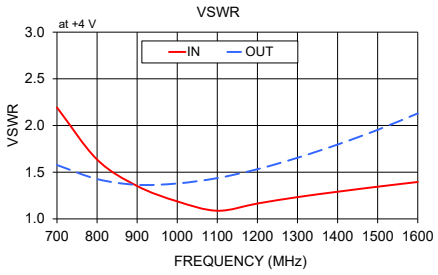
50Ω 0.7 to 1.6 GHz SMA Female

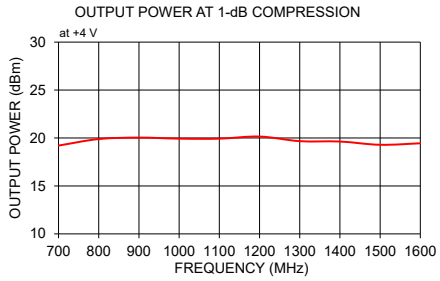
TYPICAL PERFORMANCE DATA/CURVES

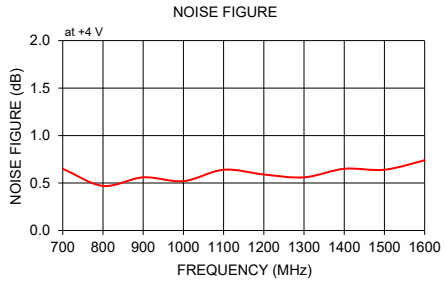
Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1) +4 V		Power Out at 1 dB COMPR. (dBm)	Noise Figure (dB)	Output IP3 (dBm)
	+4 V	+4 V	IN	OUT	+4 V	+4 V	+4 V
700	24.09	13.78	2.19	1.58	19.2	0.7	29.0
800	23.78	13.74	1.64	1.43	19.9	0.5	29.8
900	23.17	14.08	1.35	1.37	20.0	0.6	30.2
1000	22.49	14.69	1.19	1.38	19.9	0.5	29.9
1100	21.81	15.35	1.09	1.44	19.9	0.6	30.3
1200	21.12	16.12	1.16	1.53	20.2	0.6	30.4
1300	20.46	16.65	1.23	1.65	19.7	0.6	30.2
1400	19.81	17.42	1.29	1.80	19.6	0.7	29.8
1500	19.16	18.07	1.34	1.95	19.3	0.6	29.8
1600	18.53	18.84	1.40	2.13	19.5	0.7	29.6

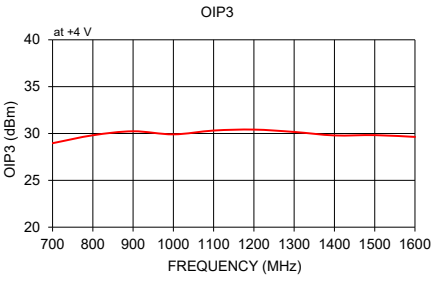












NOTES

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 = 4.0V, Id = 50.99mA @ 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)
700.0	24.18	38.09	9.54	13.00	2.24	1.00	29.47	19.21	0.65
800.0	23.85	37.74	14.51	15.10	2.43	0.95	30.53	19.89	0.47
900.0	23.27	37.50	20.87	16.24	2.60	0.94	31.34	20.04	0.56
1000.0	22.62	37.57	31.45	16.38	2.82	0.94	31.47	19.93	0.52
1100.0	21.96	37.59	29.58	15.69	3.02	0.95	31.97	19.93	0.50
1200.0	21.29	37.66	23.25	14.44	3.22	0.95	32.44	20.15	0.59
1300.0	20.64	37.55	20.08	13.07	3.35	0.95	32.76	19.67	0.56
1400.0	20.00	37.97	18.21	11.74	3.67	0.94	32.79	19.63	0.65
1500.0	19.37	38.02	16.77	10.55	3.84	0.93	32.91	19.29	0.64
1600.0	18.73	37.92	15.69	9.51	3.94	0.91	32.65	19.45	0.74
1700.0	18.11	38.12	14.79	8.56	4.15	0.89	32.97	19.24	0.75
1800.0	17.46	38.52	13.96	7.70	4.46	0.87	33.20	18.67	0.84
1900.0	16.73	38.88	13.23	6.88	4.79	0.84	32.20	18.62	0.87
2000.0	16.30	38.41	12.69	6.60	4.64	0.83	33.04	17.81	0.90
2100.0	15.76	38.57	12.17	5.94	4.75	0.80	32.53	17.34	0.88
2200.0	15.18	39.01	11.65	5.38	5.03	0.77	31.08	17.03	0.97
2300.0	14.60	39.09	11.18	4.92	5.12	0.74	29.67	16.49	1.01
2400.0	14.02	39.21	10.73	4.52	5.24	0.72	29.87	16.33	1.12
2500.0	13.45	39.36	10.29	4.19	5.38	0.69	28.74	15.39	1.14
2600.0	12.89	39.78	9.89	3.88	5.68	0.67	28.68	15.15	1.31
2700.0	12.31	39.82	9.48	3.63	5.77	0.65	27.95	14.99	1.42
2800.0	11.75	39.50	9.11	3.40	5.60	0.63	27.86	14.38	1.51
2900.0	11.22	39.31	8.80	3.23	5.55	0.61	27.82	13.73	1.48
3000.0	10.72	39.11	8.49	3.05	5.45	0.59	26.40	13.20	1.50
3100.0	10.21	38.96	8.15	2.89	5.38	0.58	25.70	13.04	1.44
3200.0	9.71	38.52	7.85	2.71	5.09	0.56	25.21	12.71	1.65
3300.0	9.25	38.11	7.59	2.54	4.79	0.54	26.09	12.18	1.72
3400.0	8.80	37.57	7.36	2.41	4.48	0.52	24.60	11.95	1.95
3500.0	8.36	36.86	7.11	2.28	4.09	0.51	24.50	11.50	1.77
3600.0	7.92	36.40	6.87	2.17	3.84	0.50	23.52	11.57	1.91
3700.0	7.47	35.76	6.65	2.07	3.55	0.49	24.14	11.12	2.03
3800.0	7.04	35.19	6.49	2.00	3.32	0.48	23.60	10.46	2.04
3900.0	6.66	34.41	6.35	1.93	3.02	0.47	22.34	10.29	2.42
4000.0	6.24	33.62	6.19	1.88	2.79	0.47	21.77	9.83	2.22

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 = 4.0V, Id = 51.96mA @ 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)
700.0	24.57	38.61	8.51	12.36	2.19	1.01	29.86	19.28	0.42
800.0	24.29	38.12	12.58	14.32	2.36	0.96	31.05	19.94	0.28
900.0	23.76	37.82	17.08	15.60	2.52	0.95	31.60	20.08	0.35
1000.0	23.15	37.96	22.70	15.99	2.77	0.94	31.58	19.97	0.28
1100.0	22.52	37.82	31.95	15.54	2.92	0.94	32.02	19.98	0.26
1200.0	21.89	37.88	32.87	14.51	3.12	0.94	32.17	20.20	0.34
1300.0	21.26	37.74	26.12	13.32	3.24	0.94	32.21	19.75	0.34
1400.0	20.65	38.13	22.77	12.06	3.54	0.93	31.92	19.68	0.39
1500.0	20.03	37.86	20.33	10.87	3.58	0.92	31.64	19.36	0.39
1600.0	19.42	38.01	18.54	9.78	3.77	0.90	31.32	19.46	0.49
1700.0	18.82	38.18	17.26	8.81	3.97	0.88	31.59	19.38	0.46
1800.0	18.19	38.51	16.23	7.93	4.24	0.86	31.39	18.70	0.54
1900.0	17.47	38.67	15.24	7.06	4.44	0.83	30.40	18.61	0.58
2000.0	17.04	38.21	14.46	6.84	4.33	0.83	30.45	17.85	0.59
2100.0	16.53	38.95	13.76	6.11	4.71	0.80	29.88	17.29	0.56
2200.0	15.96	38.93	13.05	5.50	4.72	0.77	28.89	17.13	0.61
2300.0	15.39	38.83	12.43	5.02	4.70	0.74	28.12	16.58	0.66
2400.0	14.83	39.80	11.85	4.61	5.29	0.71	28.46	16.45	0.70
2500.0	14.26	39.94	11.30	4.23	5.40	0.68	27.37	15.36	0.72
2600.0	13.71	40.03	10.80	3.90	5.46	0.66	27.25	15.39	0.88
2700.0	13.14	40.01	10.36	3.64	5.50	0.64	26.75	15.18	0.98
2800.0	12.59	40.22	9.90	3.43	5.71	0.62	26.78	14.67	1.05
2900.0	12.04	39.85	9.44	3.24	5.51	0.60	26.80	14.07	0.98
3000.0	11.53	40.02	8.99	3.07	5.66	0.59	25.32	13.53	1.06
3100.0	11.03	39.76	8.61	2.92	5.52	0.58	24.85	13.47	0.92
3200.0	10.55	39.63	8.30	2.76	5.44	0.56	24.60	13.10	1.18
3300.0	10.09	39.12	8.00	2.56	5.03	0.54	25.22	12.61	1.17
3400.0	9.65	38.67	7.69	2.38	4.66	0.51	23.97	12.46	1.30
3500.0	9.23	38.18	7.38	2.24	4.32	0.50	23.90	11.95	1.27
3600.0	8.81	37.23	7.09	2.13	3.80	0.49	23.25	12.13	1.30
3700.0	8.36	36.64	6.85	2.02	3.50	0.47	23.99	11.76	1.29
3800.0	7.93	36.08	6.62	1.91	3.24	0.46	23.35	11.07	1.39
3900.0	7.55	35.22	6.39	1.83	2.87	0.45	22.26	11.05	1.72
4000.0	7.16	34.54	6.20	1.79	2.65	0.45	21.96	10.63	1.50

Typical Performance Data

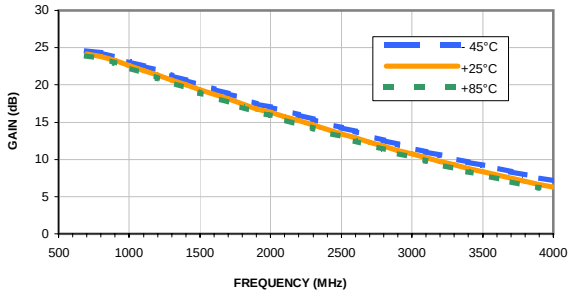
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.0V, Id = 52.33mA @ Temperature = 85degC

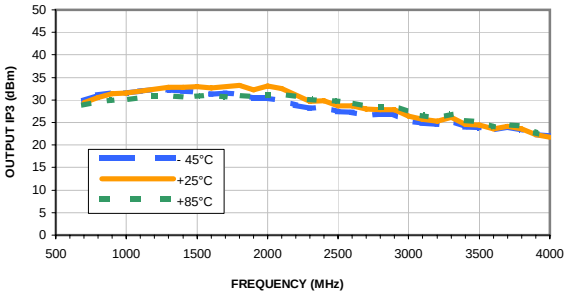
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
700.0	23.88	37.98	9.95	13.09	2.31	0.99	28.81	18.76	0.85
800.0	23.55	37.66	15.48	15.19	2.51	0.95	29.65	19.44	0.65
900.0	22.95	37.52	23.18	16.16	2.70	0.94	30.04	19.57	0.69
1000.0	22.28	37.65	31.03	16.11	2.95	0.95	30.01	19.48	0.67
1100.0	21.60	37.73	24.61	15.43	3.17	0.95	30.59	19.52	0.66
1200.0	20.92	37.84	20.46	14.16	3.40	0.95	30.89	19.70	0.71
1300.0	20.25	37.86	18.06	12.77	3.58	0.95	30.79	19.28	0.73
1400.0	19.59	37.98	16.48	11.47	3.79	0.94	30.71	19.23	0.84
1500.0	18.95	38.16	15.37	10.38	4.03	0.93	30.88	18.92	0.84
1600.0	18.32	38.39	14.51	9.39	4.29	0.92	30.91	19.01	0.92
1700.0	17.68	38.29	13.72	8.46	4.37	0.90	30.74	18.84	0.97
1800.0	17.02	38.80	12.96	7.61	4.76	0.88	30.97	18.30	1.03
1900.0	16.28	39.30	12.30	6.86	5.21	0.85	30.75	18.18	1.10
2000.0	15.87	38.71	11.89	6.58	4.98	0.84	31.15	17.52	1.18
2100.0	15.32	39.01	11.48	5.96	5.20	0.81	31.18	17.07	1.16
2200.0	14.74	39.48	11.03	5.41	5.54	0.78	30.77	16.72	1.21
2300.0	14.15	39.69	10.64	4.96	5.74	0.75	30.07	16.18	1.29
2400.0	13.59	39.50	10.26	4.58	5.68	0.73	29.98	16.11	1.38
2500.0	13.03	39.39	9.90	4.27	5.67	0.71	29.63	15.17	1.47
2600.0	12.46	39.51	9.52	3.98	5.82	0.68	29.37	15.04	1.63
2700.0	11.87	39.38	9.13	3.72	5.80	0.66	28.60	14.90	1.74
2800.0	11.32	39.53	8.80	3.48	5.95	0.64	28.54	14.42	1.90
2900.0	10.80	39.49	8.57	3.30	6.00	0.62	28.70	13.73	1.91
3000.0	10.30	38.88	8.32	3.15	5.67	0.61	27.43	13.21	1.90
3100.0	9.77	38.83	8.01	2.99	5.70	0.59	26.56	13.15	1.90
3200.0	9.26	38.06	7.72	2.80	5.18	0.57	25.82	12.83	2.09
3300.0	8.79	37.70	7.50	2.63	4.94	0.55	26.89	12.29	2.17
3400.0	8.36	37.24	7.31	2.52	4.70	0.54	25.37	12.13	2.40
3500.0	7.90	36.45	7.12	2.43	4.34	0.53	25.27	11.58	2.34
3600.0	7.43	35.98	6.88	2.31	4.10	0.52	24.08	11.54	2.56
3700.0	6.97	35.11	6.66	2.19	3.67	0.51	24.58	11.14	2.52
3800.0	6.55	34.53	6.57	2.13	3.47	0.50	24.17	10.51	2.56
3900.0	6.16	34.02	6.48	2.09	3.34	0.49	22.68	10.31	3.01
4000.0	5.72	33.40	6.37	2.05	3.18	0.49	21.95	9.85	2.83

Typical Performance Curves

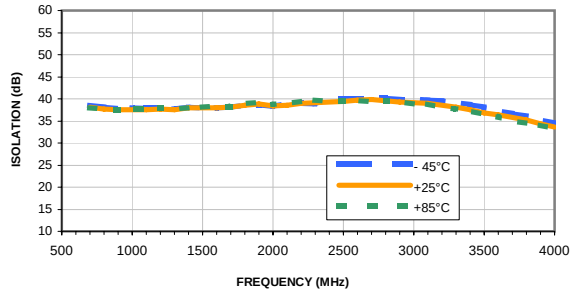
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd =4.0V



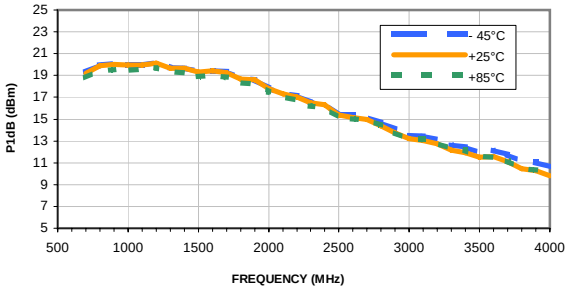
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
OUTPUT POWER = 5 dBm/tone, Vd = 4.0V



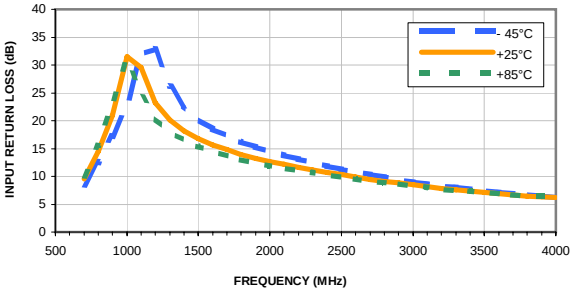
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd =4.0V



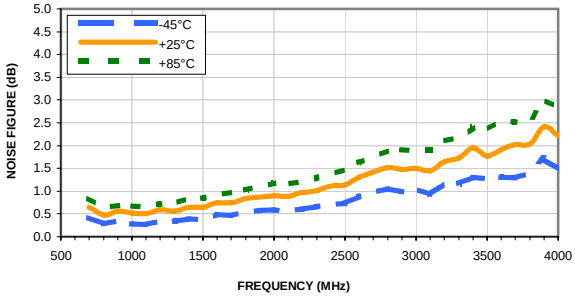
P1dB vs. FREQUENCY & TEMPERATURE
Vd =4.0V



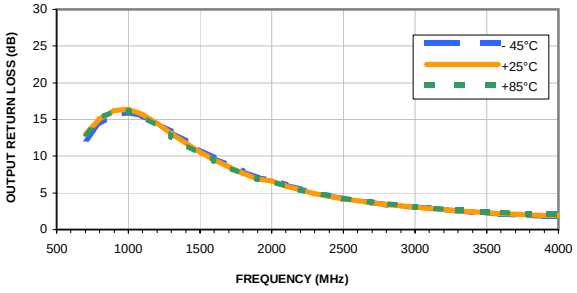
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 4.0V



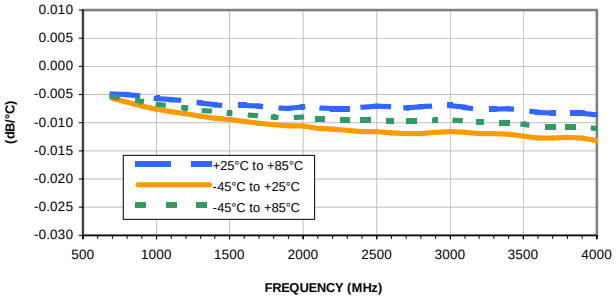
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
Vd = 4.0V



OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 4.0V



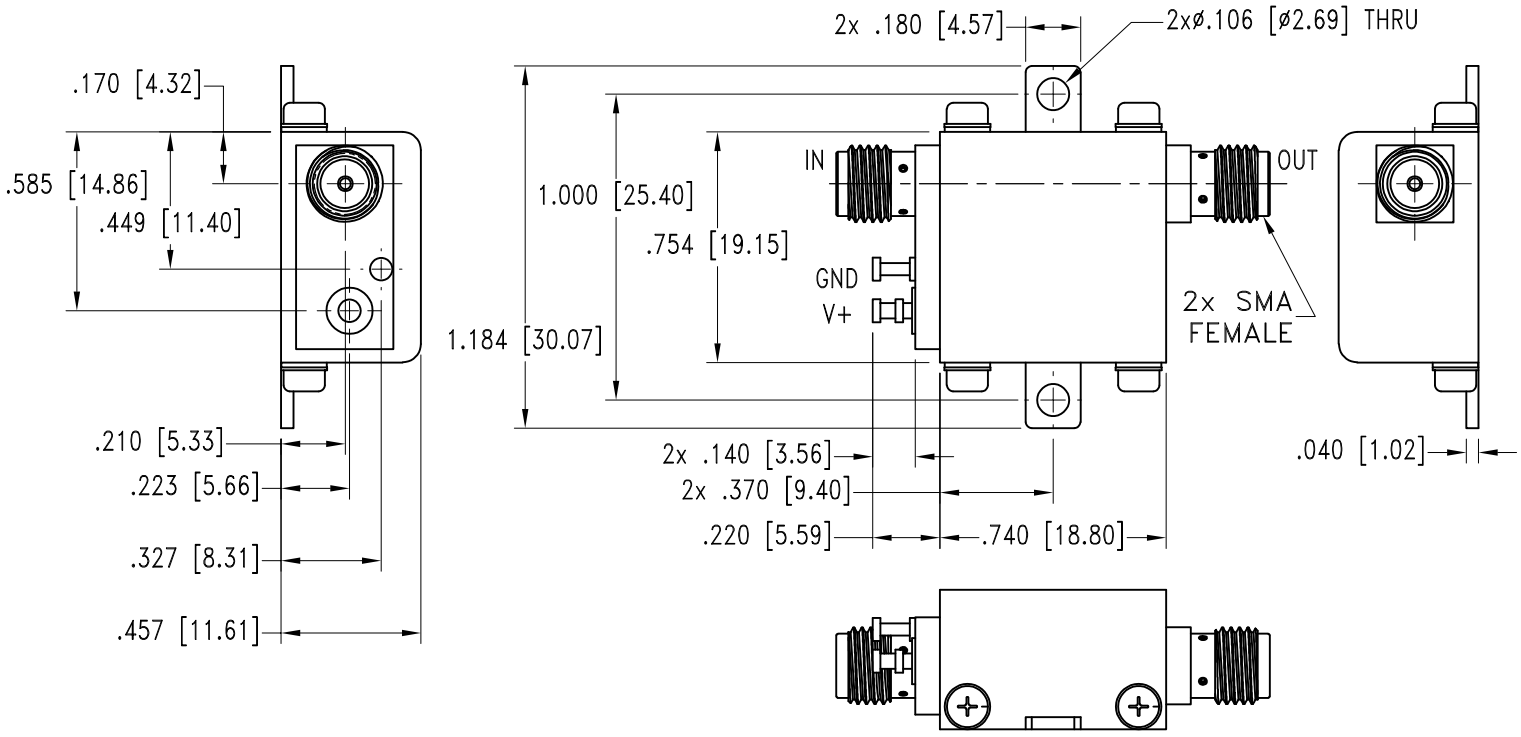
GAIN VARIATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 4.0V



Case Style GC

Outline Dimensions

GC957-2



Weight: 23.0 grams

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

Notes:

Case material:	Brass.
Case Finish:	Nickel plate.

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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

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