



ULTRA HIGH IP3

# Wideband Amplifier

## ZX60-H242+

Mini-Circuits

50Ω 700 to 2400 MHz Coaxial SMA Female

### THE BIG DEAL

- Industry Leading High IP3, +46 dBm Typ.
- Output Power at 1 dB Compression, +23 dBm Typ.
- Wideband, 700 to 2400 MHz
- Protected by US Patent 6,790,049



Generic photo used for illustration purposes only

### APPLICATIONS

- LTE
- Buffer Amplifier
- PCS
- Test Equipment
- High Dynamic Range Lab Driver Amps

Model No.	ZX60-H242+
Case Style	GC957
Connectors	SMA female

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

### PRODUCT OVERVIEW

The ZX60-H242+ (RoHS compliant) uses Mini-Circuits' high dynamic MMIC technology and optimization circuits to provide industry leading linearity over a focused frequency range. 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
Extremely High IP3 vs. Current: +47.7 dBm Typ. at 1500 MHz vs. DC Power Consumption of 145 mA	The ZX60-H242+ offers industry leading IP3 performance relative to power consumption. The combination of the design and E-pHEMT provides enhanced linearity as evidence in the IP3. This feature makes this amplifier ideal for use in: <ul style="list-style-type: none"> <li>• Driver amplifiers for complex waveform upconverter paths</li> <li>• Drivers in linearized transmit systems</li> <li>• Secondary amplifiers in Ultra High Dynamic Range receivers</li> </ul>
Optimized Frequency Range	Covering primary wireless communication bands: cellular and LTE.
Low Noise Figure, 3.0 dB Typ.	A unique feature of the ZX60-H242+ is the combination of low noise figure performance with the high dynamic range, differentiating this amplifier from the competition.
Unconditionally Stable	Capable to operate to a wide range of source and load impedances.
Very Small Size, 0.75x0.75"	The unique unibody size and construction enable the ZX60-H242+ to be used in extremely compact connectorized applications.





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### ELECTRICAL SPECIFICATIONS AT +25 °C AND +5.5 V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.7		2.4	GHz
Gain	0.7	12.5	15.6	15.3	dB
	0.9		15.4		
	1.2		15.0		
	1.5		14.5		
	1.8		14.0		
	2.1		13.4		
	2.4		12.9		
Input Return Loss	0.7		18.3		dB
	0.9		18.3		
	1.2		17.8		
	1.5		16.1		
	1.8		13.9		
	2.1		11.5		
	2.4		9.4		
Output Return Loss	0.7		14.6		dB
	0.9		14.4		
	1.2		13.9		
	1.5		13.9		
	1.8		14.2		
	2.1		14.7		
	2.4		15.0		
Output IP3	0.7	+42	+42.7		dBm
	0.9		+43.1		
	1.2		+44.4		
	1.5		+47.7		
	1.8		+46.8		
	2.1		+45.0		
	2.4		+42.6		
Output Power at 1 dB Compression	0.7		+22.5		dBm
	0.9		+22.5		
	1.2		+22.8		
	1.5		+23.1		
	1.8		+23.2		
	2.1		+23.2		
	2.4		+23.2		
Noise Figure	0.7		2.4		dB
	0.9		2.4		
	1.2		2.5		
	1.5		2.7		
	1.8		2.8		
	2.1		2.9		
	2.4		3.0		
Directivity (Isolation - Gain)	0.7-2.4		5.0		dB
DC Voltage		+5.5		+7.0	V
DC Current		110	145	180	mA





ULTRA HIGH IP3

# Wideband Amplifier

## ZX60-H242+

Mini-Circuits

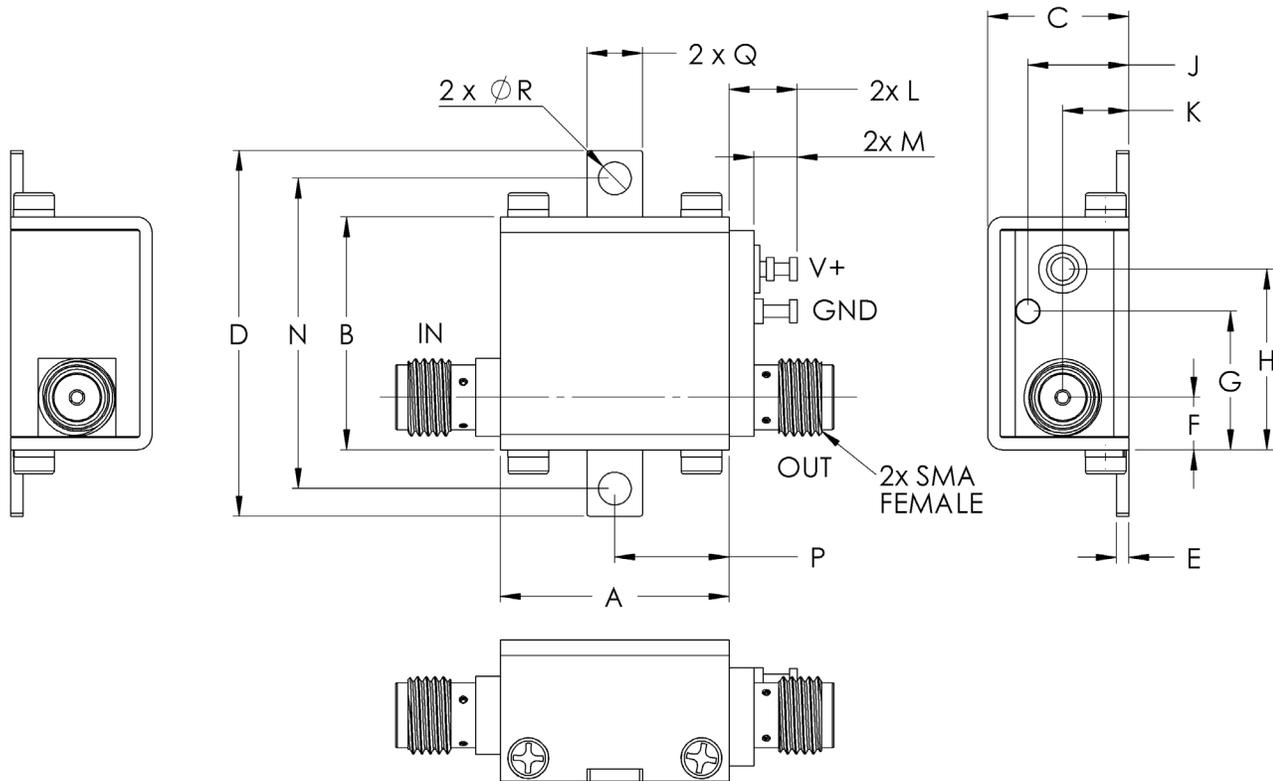
50Ω 700 to 2400 MHz Coaxial SMA Female

### ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40 °C to +85 °C Case
Storage Temperature	-55 °C to +100 °C
DC Voltage	+7 V
Input RF Power (No Damage)	+24 dBm
Power Consumption	1.25 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





ULTRA HIGH IP3

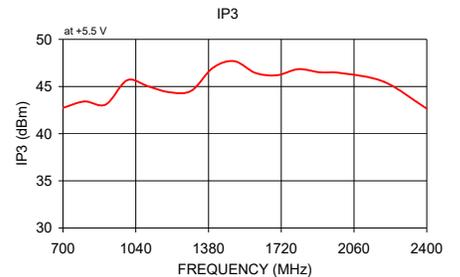
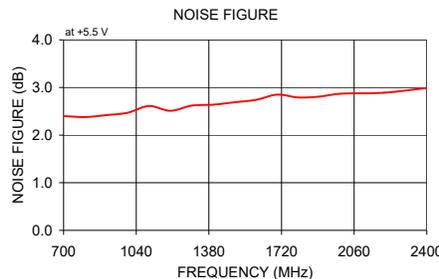
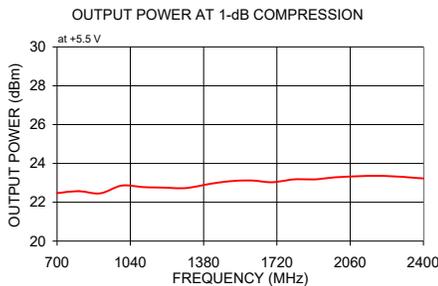
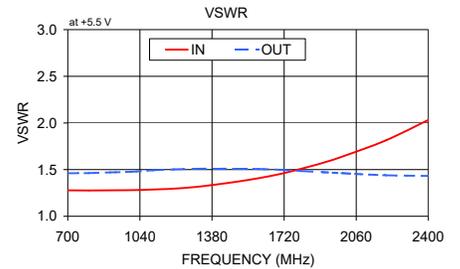
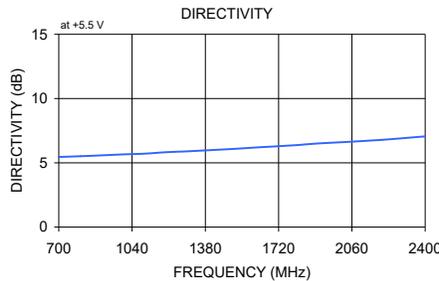
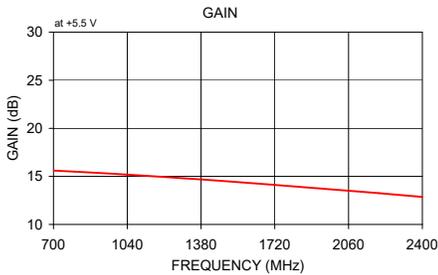
# Wideband Amplifier

## ZX60-H242+

50Ω 700 to 2400 MHz Coaxial SMA Female

### TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1)		Power Out at 1 dB COMPR. (dBm)	Noise Figure (dB)	Output IP3 (dBm)
	+5.5 V	+5.5 V	+5.5 V		+5.5 V	+5.5 V	+5.5 V
			IN	OUT			
700	15.60	5.46	1.28	1.46	22.5	2.4	42.7
800	15.49	5.51	1.28	1.46	22.6	2.4	43.4
900	15.37	5.58	1.28	1.47	22.5	2.4	43.1
1000	15.24	5.66	1.28	1.48	22.9	2.5	45.7
1100	15.10	5.72	1.29	1.49	22.8	2.6	45.0
1200	14.95	5.82	1.30	1.50	22.8	2.5	44.4
1300	14.80	5.89	1.31	1.51	22.7	2.6	44.6
1400	14.65	5.99	1.34	1.51	22.9	2.6	47.0
1500	14.49	6.07	1.37	1.51	23.1	2.7	47.7
1600	14.32	6.18	1.41	1.51	23.1	2.7	46.4
1700	14.15	6.27	1.45	1.50	23.0	2.9	46.2
1800	13.97	6.38	1.51	1.49	23.2	2.8	46.8
1900	13.79	6.50	1.57	1.47	23.2	2.8	46.5
2000	13.61	6.59	1.64	1.46	23.3	2.9	46.4
2200	13.25	6.79	1.81	1.44	23.4	2.9	45.5
2400	12.86	7.06	2.03	1.43	23.2	3.0	42.6



- 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](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 = 5.50V, Id = 136.54mA @ 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)
500.0	15.81	21.20	18.42	15.05	1.14	0.71	42.24	22.29	2.19
600.0	15.73	21.14	18.28	15.18	1.15	0.71	41.87	22.32	2.32
700.0	15.64	21.09	18.26	14.97	1.15	0.71	43.16	22.47	2.24
800.0	15.52	21.03	18.32	14.72	1.15	0.71	44.00	22.57	2.25
900.0	15.39	20.98	18.26	14.49	1.15	0.72	43.15	22.46	2.27
1000.0	15.26	20.89	18.22	14.31	1.15	0.72	44.46	22.86	2.41
1050.0	15.19	20.89	18.15	14.20	1.16	0.72	46.76	22.63	2.42
1100.0	15.12	20.83	18.05	14.08	1.15	0.72	44.94	22.78	2.46
1150.0	15.04	20.82	17.96	14.01	1.16	0.73	44.48	22.79	2.45
1200.0	14.97	20.78	17.80	13.94	1.16	0.73	44.82	22.75	2.36
1250.0	14.89	20.76	17.60	13.89	1.16	0.74	44.90	22.78	2.42
1300.0	14.81	20.74	17.37	13.86	1.16	0.74	43.53	22.73	2.51
1350.0	14.73	20.68	17.10	13.83	1.16	0.75	44.98	22.85	2.50
1400.0	14.65	20.66	16.75	13.84	1.16	0.75	46.26	22.93	2.50
1450.0	14.57	20.65	16.43	13.84	1.17	0.76	44.40	23.15	2.56
1500.0	14.49	20.56	16.10	13.87	1.16	0.76	46.60	23.08	2.59
1550.0	14.40	20.57	15.80	13.87	1.17	0.77	46.34	22.86	2.50
1600.0	14.32	20.54	15.42	13.88	1.17	0.78	47.36	23.12	2.66
1650.0	14.23	20.50	15.09	13.92	1.17	0.78	47.45	23.12	2.74
1700.0	14.15	20.42	14.68	14.00	1.17	0.79	47.91	23.03	2.77
1750.0	14.06	20.41	14.29	14.04	1.17	0.79	45.84	23.07	2.67
1800.0	13.98	20.38	13.86	14.19	1.17	0.80	45.63	23.18	2.72
1850.0	13.88	20.34	13.49	14.28	1.17	0.81	47.03	23.16	2.67
1900.0	13.80	20.33	13.07	14.37	1.18	0.82	44.39	23.18	2.72
1950.0	13.71	20.30	12.66	14.46	1.18	0.83	43.75	23.26	2.75
2000.0	13.63	20.22	12.26	14.55	1.17	0.83	46.62	23.29	2.78
2050.0	13.54	20.23	11.89	14.61	1.18	0.84	46.22	23.09	2.72
2100.0	13.45	20.19	11.53	14.72	1.17	0.85	44.82	23.21	2.59
2150.0	13.36	20.21	11.17	14.74	1.18	0.86	43.48	23.31	2.75
2200.0	13.27	20.10	10.78	14.89	1.17	0.87	44.68	23.36	2.77
2250.0	13.18	20.13	10.43	14.91	1.18	0.88	44.56	23.34	2.87
2300.0	13.09	20.07	10.05	15.04	1.18	0.88	45.91	23.28	2.91
2350.0	12.99	20.06	9.72	15.02	1.18	0.89	43.73	23.28	2.76
2400.0	12.90	20.07	9.36	15.08	1.18	0.90	45.21	23.23	2.90
2500.0	12.70	19.97	8.74	14.91	1.18	0.92	45.66	23.24	2.98
2600.0	12.50	19.98	8.14	14.60	1.18	0.93	44.29	23.33	3.18
2700.0	12.30	19.95	7.57	14.17	1.18	0.94	45.09	23.26	3.10
2800.0	12.09	19.90	7.02	13.60	1.18	0.95	43.68	23.19	3.21
2900.0	11.87	19.91	6.49	12.94	1.18	0.96	45.20	23.16	3.23
3000.0	11.65	19.92	5.98	12.19	1.18	0.97	44.95	23.07	3.25

## 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 = 5.50V, Id = 138.24mA @ 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)
500.0	15.25	20.60	25.28	14.52	1.15	0.69	37.73	22.35	1.86
600.0	15.19	20.56	24.81	15.01	1.16	0.69	37.81	22.45	1.86
700.0	15.14	20.53	24.39	15.27	1.16	0.69	38.54	22.53	1.88
800.0	15.05	20.48	24.38	15.36	1.16	0.70	39.06	22.60	1.93
900.0	14.95	20.44	24.38	15.27	1.17	0.70	38.58	22.51	1.95
1000.0	14.85	20.44	24.17	15.24	1.17	0.71	40.36	22.83	1.99
1050.0	14.80	20.37	23.81	15.22	1.17	0.71	39.43	22.65	2.05
1100.0	14.75	20.34	23.41	15.19	1.17	0.71	40.97	22.76	2.10
1150.0	14.69	20.32	22.96	15.27	1.17	0.71	40.74	22.77	2.07
1200.0	14.63	20.31	22.61	15.24	1.17	0.72	40.26	22.76	2.00
1250.0	14.57	20.28	22.16	15.30	1.18	0.72	41.27	22.77	2.05
1300.0	14.51	20.25	21.65	15.27	1.18	0.72	40.03	22.72	2.11
1350.0	14.45	20.25	21.20	15.26	1.18	0.73	41.07	22.81	2.11
1400.0	14.38	20.22	20.56	15.26	1.18	0.73	41.42	22.90	2.12
1450.0	14.32	20.15	20.04	15.29	1.18	0.74	42.78	23.07	2.14
1500.0	14.25	20.16	19.42	15.34	1.18	0.74	41.50	23.03	2.18
1550.0	14.18	20.12	18.90	15.42	1.18	0.75	40.64	22.87	2.09
1600.0	14.12	20.11	18.26	15.56	1.19	0.76	42.64	23.09	2.25
1650.0	14.05	20.08	17.71	15.67	1.19	0.76	42.05	23.08	2.30
1700.0	13.98	20.04	17.15	15.84	1.19	0.77	40.93	23.01	2.33
1750.0	13.90	20.02	16.59	15.97	1.19	0.77	41.04	23.05	2.24
1800.0	13.83	19.99	16.02	16.19	1.19	0.78	42.62	23.12	2.31
1850.0	13.76	19.97	15.52	16.24	1.19	0.79	42.28	23.13	2.24
1900.0	13.68	19.95	15.01	16.42	1.19	0.80	42.55	23.11	2.31
1950.0	13.61	19.92	14.44	16.40	1.19	0.80	42.63	23.20	2.29
2000.0	13.54	19.87	13.98	16.52	1.19	0.81	43.60	23.23	2.34
2050.0	13.47	19.85	13.51	16.47	1.19	0.82	42.48	23.07	2.31
2100.0	13.39	19.82	13.05	16.67	1.19	0.82	44.28	23.17	2.32
2150.0	13.31	19.81	12.62	16.57	1.19	0.83	43.59	23.23	2.30
2200.0	13.24	19.80	12.12	16.78	1.19	0.84	43.38	23.29	2.34
2250.0	13.15	19.78	11.69	16.66	1.19	0.85	45.05	23.25	2.44
2300.0	13.07	19.72	11.20	16.79	1.19	0.85	46.37	23.20	2.43
2350.0	12.98	19.77	10.79	16.62	1.19	0.86	47.05	23.19	2.29
2400.0	12.90	19.72	10.35	16.57	1.19	0.87	46.47	23.18	2.43
2500.0	12.73	19.69	9.61	16.02	1.19	0.88	44.24	23.21	2.51
2600.0	12.56	19.68	8.91	15.30	1.19	0.89	46.61	23.24	2.61
2700.0	12.36	19.70	8.24	14.48	1.19	0.91	49.06	23.22	2.62
2800.0	12.15	19.68	7.59	13.58	1.19	0.91	46.93	23.18	2.78
2900.0	11.94	19.71	7.00	12.67	1.19	0.92	46.83	23.18	2.73
3000.0	11.73	19.75	6.50	11.78	1.19	0.92	45.39	23.17	2.71

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

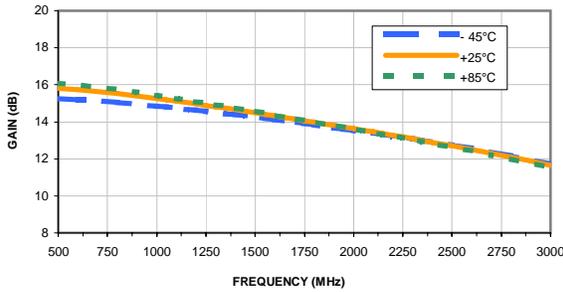
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.50V, Id = 139.26mA @ Temperature = 85degC

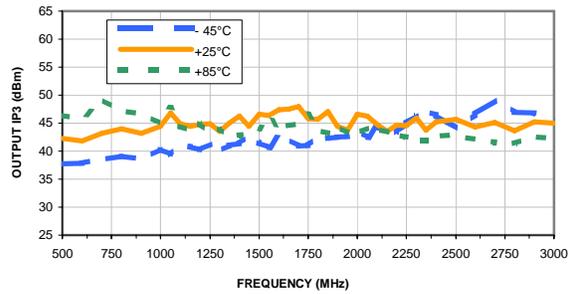
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	16.09	21.57	15.66	14.80	1.14	0.72	46.35	22.13	2.51
600.0	16.00	21.52	15.53	14.69	1.14	0.72	45.79	22.15	2.55
700.0	15.88	21.46	15.62	14.29	1.14	0.72	49.28	22.33	2.61
800.0	15.74	21.39	15.63	13.92	1.14	0.73	47.21	22.43	2.57
900.0	15.59	21.30	15.54	13.57	1.14	0.73	46.63	22.32	2.60
1000.0	15.43	21.23	15.49	13.36	1.14	0.73	44.96	22.76	2.70
1050.0	15.35	21.23	15.47	13.24	1.15	0.74	47.60	22.51	2.76
1100.0	15.27	21.16	15.46	13.14	1.15	0.74	44.38	22.66	2.77
1150.0	15.18	21.11	15.40	13.05	1.15	0.74	43.68	22.70	2.78
1200.0	15.10	21.08	15.36	12.93	1.15	0.75	44.99	22.64	2.72
1250.0	15.01	21.02	15.25	12.88	1.15	0.75	43.41	22.69	2.81
1300.0	14.92	20.98	15.10	12.82	1.15	0.75	43.93	22.63	2.84
1350.0	14.83	20.98	14.95	12.77	1.15	0.76	42.88	22.76	2.85
1400.0	14.74	20.93	14.69	12.76	1.15	0.77	42.89	22.83	2.88
1450.0	14.65	20.90	14.51	12.77	1.15	0.77	43.14	23.05	2.93
1500.0	14.56	20.87	14.28	12.78	1.16	0.78	44.11	22.99	2.94
1550.0	14.46	20.79	14.07	12.77	1.15	0.78	46.39	22.74	2.89
1600.0	14.37	20.79	13.81	12.79	1.16	0.79	43.83	23.00	3.01
1650.0	14.27	20.69	13.54	12.78	1.15	0.79	44.50	23.01	3.07
1700.0	14.18	20.67	13.25	12.84	1.16	0.80	44.84	22.91	3.14
1750.0	14.08	20.65	12.93	12.86	1.16	0.81	46.52	22.96	3.02
1800.0	13.98	20.59	12.58	13.01	1.16	0.82	43.75	23.05	3.13
1850.0	13.89	20.56	12.26	13.03	1.16	0.82	43.18	23.04	3.06
1900.0	13.80	20.51	11.94	13.21	1.16	0.83	44.31	23.02	3.12
1950.0	13.70	20.46	11.56	13.25	1.16	0.84	43.33	23.12	3.11
2000.0	13.60	20.44	11.26	13.40	1.16	0.85	43.32	23.12	3.19
2050.0	13.51	20.45	10.95	13.41	1.17	0.86	44.06	22.94	3.15
2100.0	13.41	20.37	10.64	13.59	1.16	0.87	43.84	23.05	3.18
2150.0	13.31	20.37	10.35	13.53	1.17	0.88	43.37	23.13	3.18
2200.0	13.22	20.29	10.01	13.73	1.16	0.88	42.95	23.15	3.21
2250.0	13.12	20.29	9.71	13.75	1.17	0.89	42.51	23.12	3.29
2300.0	13.03	20.24	9.39	13.97	1.17	0.90	41.83	23.07	3.28
2350.0	12.92	20.24	9.12	13.98	1.17	0.91	41.81	23.05	3.19
2400.0	12.82	20.19	8.83	14.16	1.17	0.92	42.68	22.99	3.34
2500.0	12.62	20.14	8.27	14.18	1.17	0.94	42.81	23.02	3.41
2600.0	12.42	20.11	7.73	14.13	1.17	0.95	42.07	23.11	3.57
2700.0	12.21	20.06	7.21	13.93	1.17	0.97	41.60	23.03	3.58
2800.0	11.99	20.00	6.72	13.57	1.17	0.98	41.31	22.96	3.74
2900.0	11.78	19.98	6.24	13.18	1.17	0.99	42.47	22.92	3.76
3000.0	11.55	19.97	5.77	12.59	1.17	1.00	42.38	22.83	3.77

## Typical Performance Curves

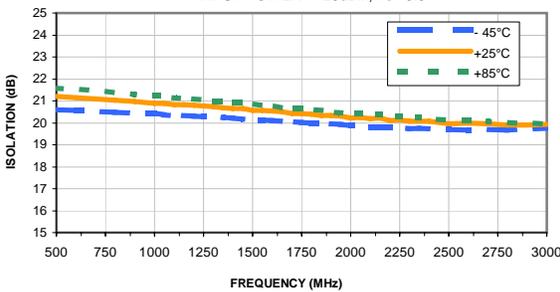
**GAIN vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5.5V



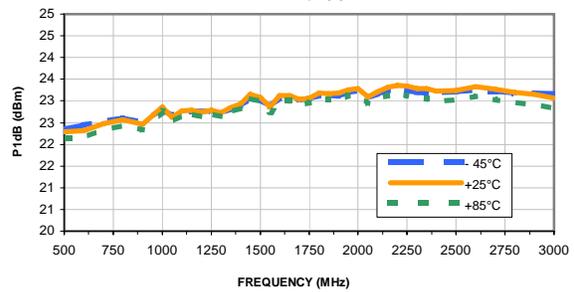
**OUTPUT IP3 vs. FREQUENCY & TEMPERATURE**  
OUTPUT POWER = 5 dBm/1tone, Vd = 5.5V



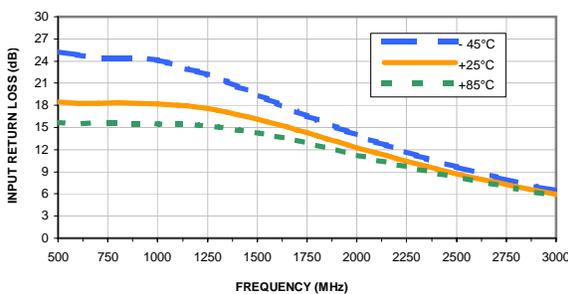
**ISOLATION vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5.5V



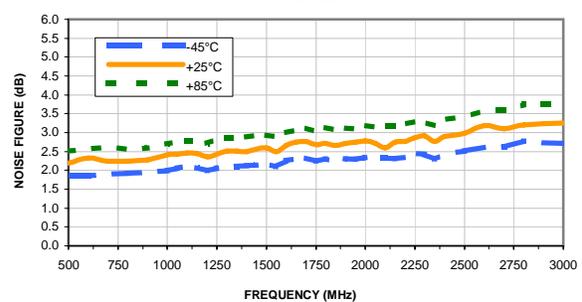
**P1dB vs. FREQUENCY & TEMPERATURE**  
Vd = 5.5V



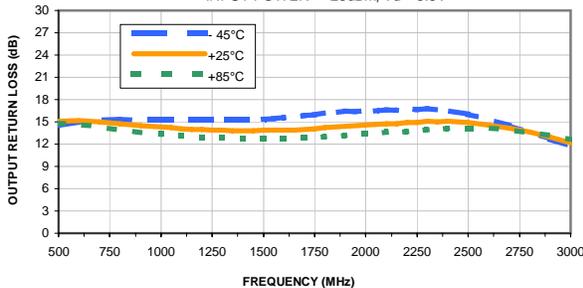
**INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5.5V



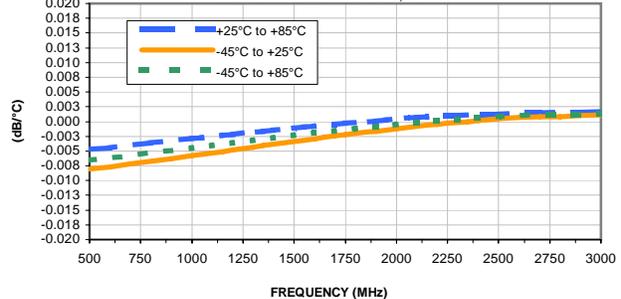
**NOISE FIGURE vs. FREQUENCY & TEMPERATURE**  
Vd = 5.5V



**OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5.5V



**GAIN VARIATION vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5.5V

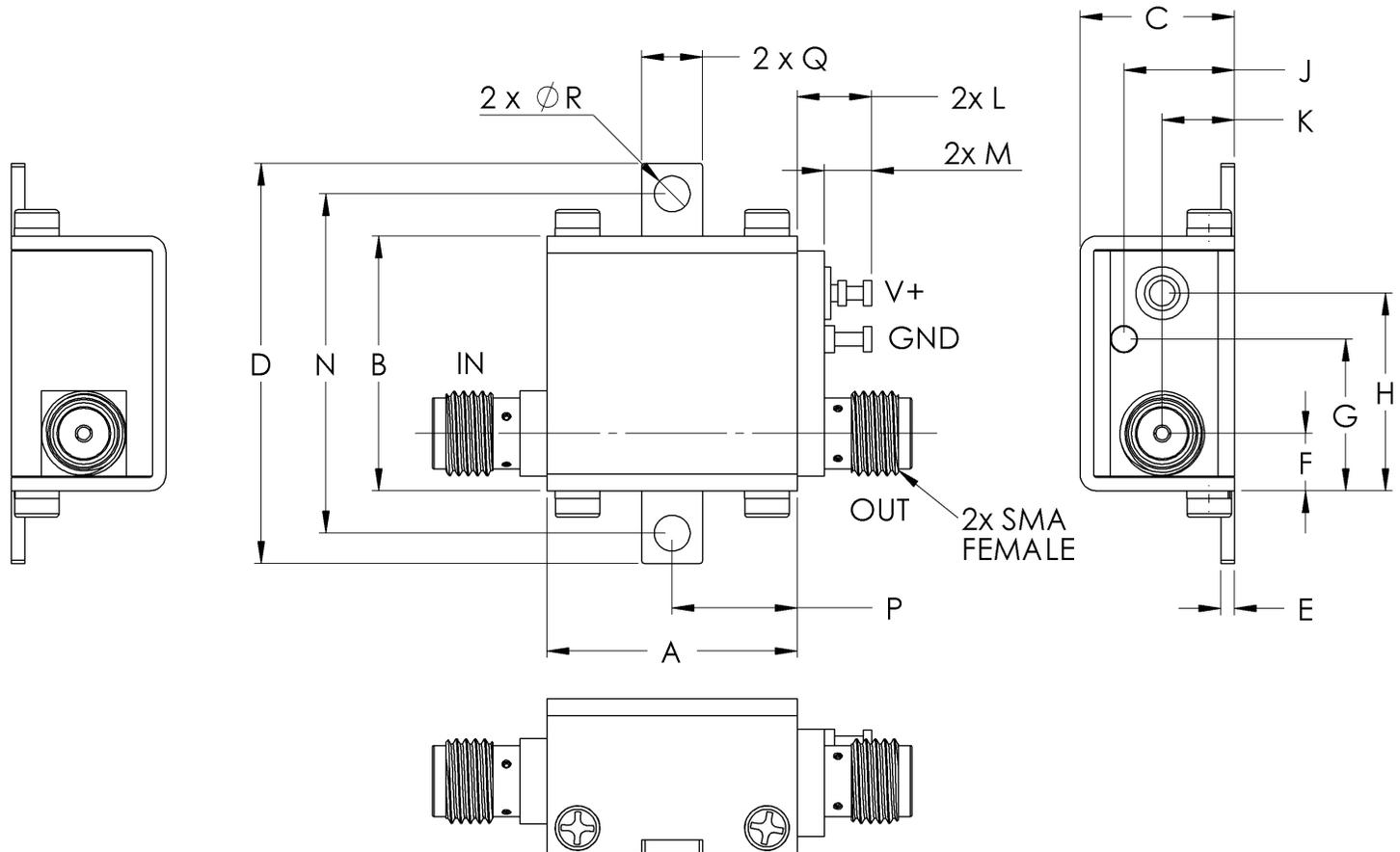


# Case Style

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

### Note:

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

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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