



ULTRA HIGH DYNAMIC RANGE

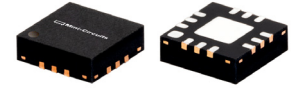
# Monolithic Amplifier

## LHA-13HLN+

50Ω 1 MHz to 1 GHz

### THE BIG DEAL

- Ultra-High IP3, +43.3 dBm typ.
- Medium power, +28 dBm typ.
- Gain, 22.7 dB typ. at 0.5 GHz
- Excellent Noise Figure, 1.2 dB typ.



Generic photo used for illustration purposes only

CASE STYLE: DQ1225

### +RoHS Compliant

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

### APPLICATIONS

- Base station infrastructure
- CATV
- Cellular

### PRODUCT OVERVIEW

LHA-13HLN+ (RoHS compliant) is an advanced wideband amplifier fabricated using E-PHEMT technology and offers extremely high dynamic range over a broad frequency range and with low noise figure. In addition, the LHA-13HLN+ has good input and output return loss over a broad frequency range. LHA-13HLN+ is enclosed in a 3mm x 3mm, 12-lead MCLP package and has very good thermal performance.

### KEY FEATURES

Feature	Advantages
Broad Band: 1 MHz to 1 GHz	Broadband covering primary wireless communications bands: VHF, UHF, Cellular
Extremely High IP3 +38.1 dBm typical at 1 MHz +43.3 dBm typical at 0.5 GHz	The LHA-13HLN+ matches industry leading IP3 performance relative to device size and power consumption. The combination of the design and E-PHEMT Structure provides enhanced linearity over a broad frequency range as evidence in the IP3 being approximately 12-16 dB above the P1dB point. This feature makes this amplifier ideal for use in: <ul style="list-style-type: none"> <li>• Driver amplifiers for complex waveform up converter paths</li> <li>• Drivers in linearized transmit systems</li> <li>• Secondary amplifiers in ultra-High Dynamic range receivers</li> </ul>
Low Noise Figure 1.2 dB at 0.5 GHz	Enables lower system noise figure performance and along with High OIP3 provides high dynamic range
High P1dB, +28 dBm at 0.5 GHz	High P1dB, High OIP3, Low NF results in a very dynamic range preventing amplifier saturation under strong interfering signals.

REV. A  
ECO-011665  
LHA-13HLN+  
MCL NY  
240725





ULTRA HIGH DYNAMIC RANGE

# Monolithic Amplifier

## LHA-13HLN+

50Ω 1 MHz to 1 GHz

### ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C, 50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (MHz)	Vd=+8V <sup>1</sup>			Units
		Min.	Typ.	Max.	
Frequency Range		1		1000	MHz
Gain	1	22.4	24.9	27.4	dB
	20	—	24.2	—	
	250	—	23.0	—	
	500	20.4	22.7	25.0	
Input Return Loss	1		12		dB
	20		16		
	250		17		
	500		18		
Output Return Loss	1		12		dB
	20		18		
	250		18		
	500		30		
Reverse Isolation	500		26		dB
Output Power @ 1 dB compression	1		+25.7		dBm
	20		+26.3		
	250		+28.1		
	500		+28.0		
Output IP3 <sup>2</sup>	1	—	+38.1		dBm
	20	—	+41.5		
	250	—	+43.6		
	500	+40	+43.3		
Noise Figure	1		3.0		dB
	20		1.4		
	250		1.1		
	500		1.2		
Device Operating Voltage			+8		V
Device Operating Current			239	251	mA
Device Current Variation vs. Temperature <sup>3</sup>			-251		μA/°C
Device Current Variation vs Voltage			0.0281		mA/mV
Thermal Resistance, junction-to-ground lead Junction-to-ground lead at 85°C stage temperature			23.3		°C/W

1. Measured on Mini-Circuits Characterization test board TB-1063-13HLN+. See Characterization Test Circuit (Fig. 1)

2. Tested at Pout= 0 dBm / tone.

3. (Current at 95°C – Current at -45°C)/140

### ABSOLUTE MAXIMUM RATINGS<sup>4</sup>

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +95°C
Storage Temperature	-65°C to +150°C
Power Dissipation	3.3 W <sup>5</sup>
Input Power (CW)	+21 dBm (5 minutes max) <sup>6</sup> +10 dBm (continuous) for 1-10 MHz +11 dBm (continuous) for 10-1000 MHz
DC Voltage on Pad <sup>7</sup>	+10 V

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

Electrical maximum ratings are not intended for continuous normal operation.

5. up to 85°C, derate linearly to 2.5 W at 95°C.

6. up to 85°C, derate linearly to 18 dBm at 95°C.





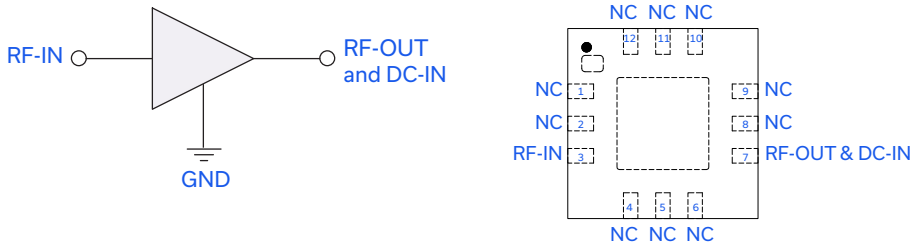
ULTRA HIGH DYNAMIC RANGE

# Monolithic Amplifier

# LHA-13HLN+

50Ω 1 MHz to 1 GHz

## SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	3	RF Input
RF-OUT and DC-IN	7	RF Output and DC Bias
GND	Paddle	Connections to ground.
NC	1-2, 4-6, 8-12	No connection, grounded externally

## CHARACTERIZATION TEST / RECOMMENDED APPLICATION CIRCUIT

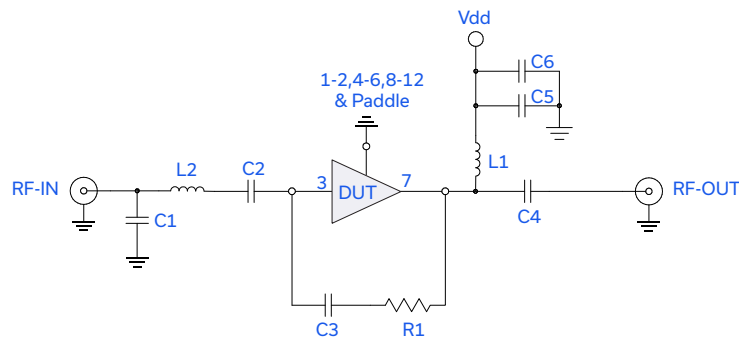


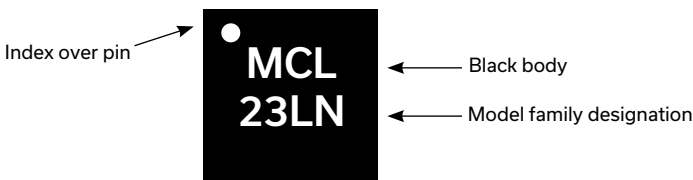
Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-1063-13HLN+)  
Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

- Gain and Return loss:  $P_{IN} = -25\text{dBm}$
- Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/ tone at output.

Components	Size	Value	Manufacturer	P/N
C1	0402	1.5 pF	Murata	GRM1555C1H1R5CZ01
C2	0603	2.2 uF		GRM188R61C225KE15
C3	0402	0.1uF		GRM155R71C104KA88
C4	0603	2.2 uF		GRM188R61C225KE15
C5	0402	1000 pF		GRM1555C1H102JA01
C6	0805	10 uF		GRM21BR61C106KE15
L1	1210	15 uH	Coilcraft	LQH32DN150K53L
L2	0603	5.1 nH		0603CS-5N1XJL
R1	0402	1500 Ω		Koa

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control





# Monolithic Amplifier

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. [CLICK HERE](#)

Performance Data	Data Table Swept Graphs
Case Style	DQ1225 Plastic package, exposed paddle lead finish: Matte-Tin
Tape & Reel Standard quantities available on reel	F66 7" reels with 20, 50, 100, 200, 500, 1K, 2K or 3K devices
Suggested Layout for PCB Design	PL-594
Evaluation Board	TB-1063-13HLN+
Environmental Ratings	ENV08T9

### ESD RATING

Human Body Model (HBM): Class 1B (Pass 500 V) in accordance with ANSI/ESD STM 5.1 - 2001

### MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

### 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 = 8.00V, Id = 242.2mA @ 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)			(dBm)	(dBm)	(dB)
1	25.00	29.30	11.60	11.50	1.08	0.54	39.13	26.01	2.87
3	25.30	28.80	15.30	23.60	1.07	0.57	42.04	26.27	1.84
5	25.20	28.60	15.90	40.50	1.06	0.57	42.51	26.33	1.49
7	25.10	28.40	16.00	32.10	1.05	0.56	42.12	26.26	1.52
9	25.00	28.20	16.00	26.10	1.04	0.55	42.56	26.38	1.35
10	25.00	28.00	15.90	24.50	1.03	0.54	42.37	26.48	1.29
20	24.30	27.10	15.60	18.30	1.01	0.50	42.43	26.38	1.33
30	23.90	26.60	15.40	16.60	1.01	0.47	42.53	26.26	1.30
40	23.60	26.30	15.30	15.90	1.02	0.45	43.20	28.15	1.22
50	23.50	26.20	15.20	15.60	1.02	0.45	42.31	27.54	1.22
60	23.40	26.10	15.20	15.40	1.03	0.44	43.77	27.53	1.16
70	23.30	26.00	15.30	15.40	1.03	0.44	45.96	27.15	1.12
80	23.20	26.00	15.20	15.30	1.03	0.44	44.54	28.25	1.13
90	23.20	26.00	15.20	15.30	1.03	0.44	43.47	27.82	1.16
100	23.20	26.00	15.30	15.30	1.04	0.44	44.36	27.65	1.12
150	23.10	25.90	15.30	15.50	1.04	0.44	44.68	27.85	1.12
200	23.00	26.00	15.40	15.90	1.04	0.46	45.70	27.94	1.08
250	23.00	26.00	15.60	16.40	1.05	0.47	43.58	28.12	1.09
300	23.00	26.00	15.70	17.10	1.05	0.49	45.18	28.06	1.11
350	22.90	26.10	15.90	18.00	1.06	0.50	46.62	28.17	1.22
400	22.90	26.10	16.10	19.30	1.06	0.52	44.36	28.08	1.10
450	22.80	26.20	16.40	21.10	1.07	0.54	43.73	28.28	1.14
500	22.70	26.30	16.60	23.60	1.07	0.56	44.07	28.14	1.18
550	22.70	26.40	16.80	27.20	1.08	0.59	43.59	28.13	1.23
600	22.60	26.50	16.80	33.00	1.09	0.61	42.84	28.11	1.33
650	22.40	26.70	16.70	38.40	1.11	0.65	43.73	28.07	1.15
700	22.30	26.90	16.10	30.90	1.12	0.67	43.17	28.19	0.99
750	22.20	26.90	16.10	24.30	1.12	0.68	42.97	28.29	1.22
800	22.10	27.10	16.00	20.70	1.14	0.70	43.32	28.25	1.19
850	21.90	27.30	15.60	18.10	1.15	0.72	42.80	27.93	1.22
900	21.70	27.60	15.00	16.00	1.18	0.75	43.72	27.96	1.34
950	21.40	27.90	14.20	14.20	1.20	0.78	42.73	27.68	1.33
1000	21.10	28.40	13.30	12.60	1.25	0.81	42.53	27.05	1.38
1050	20.50	29.00	12.00	11.20	1.31	0.85	41.15	26.88	1.45
1100	19.70	29.80	10.60	9.90	1.43	0.90	40.72	26.27	1.44
1150	18.60	31.10	9.00	9.00	1.65	0.97	40.70	25.69	1.53
1200	17.30	32.50	7.50	8.70	2.00	1.04	39.37	24.83	1.66

## 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 = 7.75V, Id = 235.1mA @ 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)
1	25.00	29.30	11.60	11.50	1.08	0.54	39.17	25.73	--
3	25.30	28.80	15.20	23.60	1.07	0.57	42.35	25.99	--
5	25.20	28.60	15.70	40.90	1.06	0.57	42.87	26.06	--
7	25.10	28.40	15.90	32.00	1.05	0.56	42.56	26.00	--
9	25.00	28.20	15.90	26.10	1.04	0.55	42.40	26.10	--
10	25.00	28.00	15.80	24.40	1.03	0.54	42.64	26.05	1.38
20	24.30	27.10	15.60	18.30	1.01	0.50	42.53	26.10	1.31
30	23.90	26.50	15.40	16.60	1.01	0.47	42.75	26.04	1.27
40	23.60	26.30	15.30	15.90	1.02	0.45	42.96	27.89	1.20
50	23.50	26.20	15.30	15.60	1.02	0.44	43.36	27.33	1.21
60	23.40	26.10	15.30	15.40	1.03	0.44	42.57	27.30	1.16
70	23.30	26.00	15.30	15.30	1.03	0.44	45.98	26.95	1.09
80	23.20	26.00	15.30	15.30	1.03	0.44	44.21	27.98	1.12
90	23.20	26.00	15.30	15.30	1.03	0.44	44.19	27.58	1.13
100	23.20	26.00	15.40	15.30	1.04	0.43	44.41	27.44	1.07
150	23.10	25.90	15.40	15.40	1.04	0.44	45.77	27.61	1.06
200	23.10	26.00	15.50	15.90	1.04	0.45	44.23	27.69	1.07
250	23.00	26.00	15.60	16.30	1.05	0.47	45.70	27.88	1.05
300	23.00	26.00	15.80	17.00	1.05	0.48	44.61	27.82	1.14
350	22.90	26.10	15.90	18.00	1.06	0.50	45.58	27.92	1.16
400	22.90	26.10	16.20	19.20	1.06	0.52	46.56	27.83	1.08
450	22.80	26.20	16.40	21.10	1.07	0.54	45.41	28.05	1.17
500	22.80	26.30	16.70	23.50	1.07	0.56	44.35	27.89	1.13
550	22.70	26.40	16.80	27.20	1.08	0.58	43.44	27.87	1.18
600	22.60	26.50	16.90	33.50	1.09	0.61	44.42	27.85	1.33
650	22.40	26.70	16.70	40.40	1.11	0.65	43.35	27.84	1.12
700	22.30	26.80	16.20	31.70	1.12	0.67	43.61	27.98	1.15
750	22.30	26.90	16.20	24.60	1.12	0.68	44.08	28.09	1.33
800	22.10	27.10	16.10	20.90	1.13	0.70	43.29	28.03	1.19
850	22.00	27.30	15.70	18.20	1.15	0.72	44.32	27.72	1.18
900	21.70	27.60	15.10	16.10	1.17	0.75	42.96	27.77	1.28
950	21.50	27.90	14.30	14.30	1.20	0.78	43.38	27.52	1.28
1000	21.10	28.30	13.30	12.70	1.24	0.81	43.09	26.93	1.33
1050	20.50	28.90	12.10	11.20	1.31	0.85	42.28	26.75	1.40
1100	19.70	29.80	10.60	9.90	1.42	0.90	41.72	26.14	1.41
1150	18.60	31.10	9.00	9.00	1.64	0.96	41.49	25.51	1.48
1200	17.30	32.40	7.50	8.70	1.98	1.04	39.94	24.68	1.57

## 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 = 8.25V, Id = 249.0mA @ 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)			(dBm)	(dBm)	(dB)
1	25.00	29.30	11.70	11.50	1.08	0.54	39.44	26.39	--
3	25.30	28.80	15.50	23.60	1.07	0.57	42.23	26.54	--
5	25.20	28.60	16.00	40.00	1.06	0.57	42.28	26.61	--
7	25.10	28.40	16.10	32.20	1.05	0.56	42.26	26.69	--
9	25.00	28.20	16.10	26.20	1.04	0.55	42.29	26.78	--
10	24.90	28.10	16.00	24.60	1.04	0.55	42.11	26.75	1.45
20	24.30	27.10	15.60	18.40	1.01	0.50	41.34	26.64	1.37
30	23.90	26.60	15.40	16.70	1.01	0.47	40.46	26.46	1.32
40	23.60	26.30	15.20	16.00	1.02	0.46	40.79	28.39	1.25
50	23.40	26.20	15.20	15.70	1.03	0.45	41.25	27.74	1.27
60	23.30	26.10	15.20	15.50	1.03	0.44	41.38	27.75	1.23
70	23.30	26.00	15.20	15.40	1.03	0.44	42.36	27.34	1.14
80	23.20	26.00	15.20	15.40	1.03	0.44	44.47	28.50	1.16
90	23.20	26.00	15.20	15.40	1.04	0.44	44.04	28.04	1.20
100	23.20	26.00	15.30	15.40	1.04	0.44	45.12	27.88	1.11
150	23.10	26.00	15.20	15.50	1.04	0.45	43.01	28.08	1.14
200	23.00	26.00	15.30	15.90	1.04	0.46	44.94	28.17	1.14
250	23.00	26.00	15.50	16.40	1.05	0.47	43.79	28.34	1.10
300	22.90	26.10	15.60	17.20	1.05	0.49	45.03	28.29	1.21
350	22.90	26.10	15.80	18.10	1.06	0.51	43.54	28.40	1.22
400	22.90	26.20	16.00	19.40	1.06	0.52	44.44	28.31	1.13
450	22.80	26.20	16.30	21.20	1.07	0.54	43.75	28.50	1.19
500	22.70	26.30	16.50	23.60	1.07	0.57	44.77	28.36	1.18
550	22.70	26.40	16.70	27.10	1.08	0.59	43.87	28.37	1.24
600	22.50	26.50	16.80	32.60	1.09	0.62	42.98	28.34	1.38
650	22.40	26.70	16.60	36.80	1.11	0.65	43.46	28.28	1.19
700	22.30	26.90	16.10	30.20	1.12	0.68	42.77	28.39	1.13
750	22.20	26.90	16.10	23.90	1.13	0.68	43.29	28.46	1.27
800	22.10	27.10	15.90	20.50	1.14	0.70	42.89	28.45	1.23
850	21.90	27.30	15.50	18.00	1.15	0.73	42.68	28.11	1.27
900	21.70	27.60	14.90	15.90	1.18	0.75	42.47	28.13	1.36
950	21.40	27.90	14.20	14.20	1.21	0.78	42.68	27.79	1.33
1000	21.00	28.40	13.20	12.60	1.25	0.82	41.37	27.13	1.39
1050	20.50	29.00	12.00	11.10	1.32	0.85	41.22	26.97	1.48
1100	19.70	29.90	10.50	9.90	1.44	0.90	40.80	26.36	1.46
1150	18.50	31.10	8.90	9.00	1.66	0.97	40.41	25.78	1.57
1200	17.30	32.50	7.50	8.80	2.01	1.04	38.78	24.92	1.64

## 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 = 8.00V, Id = 253.18mA @ 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)
1	25.00	29.20	11.20	11.30	1.07	0.53	40.21	26.18	--
3	25.30	28.70	14.80	23.20	1.06	0.56	40.18	26.28	--
5	25.30	28.50	15.40	38.30	1.05	0.55	39.12	26.35	--
7	25.20	28.30	15.60	32.30	1.04	0.54	38.24	26.28	--
9	25.10	28.10	15.60	26.20	1.03	0.53	38.54	26.53	--
10	25.00	27.90	15.60	24.50	1.03	0.53	38.38	26.52	2.22
20	24.30	27.00	15.60	18.30	1.01	0.48	38.67	26.58	1.40
30	23.90	26.50	15.60	16.70	1.01	0.45	39.61	26.45	1.16
40	23.60	26.20	15.60	16.10	1.01	0.44	40.06	28.72	0.99
50	23.50	26.10	15.70	15.80	1.02	0.43	44.65	28.13	1.00
60	23.40	26.00	15.80	15.70	1.02	0.42	43.93	27.84	0.90
70	23.30	25.90	15.90	15.70	1.03	0.42	44.42	27.38	0.83
80	23.30	25.90	15.90	15.70	1.03	0.42	44.75	28.75	0.83
90	23.30	25.90	16.00	15.80	1.03	0.42	44.63	28.31	0.85
100	23.20	25.80	16.20	15.80	1.03	0.42	47.37	27.92	0.79
150	23.20	25.80	16.30	16.20	1.04	0.42	46.71	28.21	0.81
200	23.10	25.80	16.30	16.40	1.04	0.43	47.26	28.30	0.77
250	23.10	25.90	16.20	16.50	1.04	0.44	46.49	28.57	0.82
300	23.00	25.90	16.20	16.80	1.05	0.46	46.51	28.44	0.89
350	23.00	26.00	16.20	17.40	1.05	0.47	45.95	28.56	1.37
400	22.90	26.00	16.50	18.60	1.05	0.49	45.44	28.45	0.80
450	22.90	26.10	16.80	20.30	1.06	0.51	47.15	28.76	0.88
500	22.90	26.10	17.10	22.70	1.06	0.53	46.24	28.58	0.86
550	22.80	26.20	17.50	26.30	1.07	0.55	44.13	28.50	0.92
600	22.70	26.30	17.90	33.60	1.08	0.58	44.62	28.45	1.33
650	22.60	26.50	18.10	42.50	1.09	0.61	43.56	28.63	0.83
700	22.40	26.70	17.40	35.40	1.11	0.65	43.51	28.83	0.94
750	22.40	26.70	17.60	25.50	1.11	0.64	42.96	29.12	1.35
800	22.30	26.80	17.70	21.50	1.11	0.66	42.74	28.98	0.86
850	22.20	27.00	17.30	18.80	1.13	0.68	42.35	28.77	0.87
900	22.00	27.20	16.80	16.60	1.14	0.70	41.97	28.91	1.02
950	21.80	27.50	15.90	14.80	1.17	0.73	42.11	28.89	0.96
1000	21.40	27.90	14.80	13.10	1.20	0.76	41.29	28.56	1.01
1050	21.00	28.40	13.40	11.60	1.25	0.80	40.91	28.40	1.05
1100	20.30	29.20	11.80	10.10	1.33	0.85	40.19	27.84	1.02
1150	19.20	30.40	9.90	8.80	1.51	0.91	39.82	27.08	1.11
1200	17.60	32.10	8.00	8.10	1.85	0.99	38.29	25.90	1.18



## 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 = 7.75V, Id = 243.9mA @ 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)
1	25.00	29.10	11.10	11.30	1.07	0.53	38.42	25.74	--
3	25.30	28.70	14.70	23.10	1.06	0.56	38.32	25.99	--
5	25.30	28.50	15.30	37.50	1.05	0.55	38.23	26.05	--
7	25.20	28.30	15.50	32.40	1.04	0.54	38.35	25.97	--
9	25.00	28.00	15.60	26.30	1.03	0.53	38.42	26.24	--
10	25.00	27.90	15.60	24.60	1.03	0.53	38.84	26.21	2.14
20	24.30	26.90	15.60	18.40	1.01	0.48	37.46	26.29	1.32
30	23.90	26.40	15.60	16.80	1.01	0.45	40.72	26.24	1.13
40	23.60	26.20	15.70	16.10	1.01	0.44	42.49	28.43	0.97
50	23.50	26.00	15.80	15.90	1.02	0.43	42.76	27.88	0.99
60	23.40	26.00	15.90	15.80	1.02	0.42	43.52	27.59	0.89
70	23.30	25.90	16.00	15.80	1.03	0.42	45.38	27.17	0.81
80	23.30	25.90	16.00	15.80	1.03	0.42	45.69	28.45	0.81
90	23.20	25.80	16.10	15.90	1.03	0.42	44.79	28.04	0.84
100	23.20	25.80	16.30	15.90	1.03	0.42	45.40	27.67	0.79
150	23.20	25.80	16.40	16.30	1.04	0.42	45.60	27.95	0.78
200	23.10	25.80	16.50	16.50	1.04	0.43	46.77	28.04	0.74
250	23.10	25.80	16.30	16.60	1.04	0.44	46.16	28.31	0.77
300	23.00	25.90	16.30	16.90	1.04	0.46	46.51	28.17	0.85
350	23.00	25.90	16.30	17.50	1.05	0.47	46.44	28.29	1.41
400	22.90	26.00	16.60	18.80	1.05	0.49	47.38	28.17	0.78
450	22.90	26.00	16.90	20.50	1.06	0.51	45.84	28.49	0.87
500	22.80	26.10	17.30	22.90	1.06	0.53	45.95	28.30	0.86
550	22.80	26.20	17.70	26.60	1.07	0.55	44.29	28.21	0.89
600	22.70	26.30	18.00	34.40	1.08	0.58	44.21	28.17	1.18
650	22.50	26.50	18.20	41.00	1.09	0.61	43.89	28.35	0.80
700	22.40	26.70	17.50	35.00	1.11	0.64	42.96	28.56	0.93
750	22.40	26.70	17.70	25.40	1.11	0.64	42.52	28.86	1.09
800	22.30	26.80	17.80	21.40	1.11	0.65	43.17	28.71	0.84
850	22.20	27.00	17.40	18.70	1.13	0.68	42.81	28.50	0.85
900	22.00	27.20	16.80	16.60	1.14	0.70	41.85	28.65	0.96
950	21.80	27.50	16.00	14.70	1.16	0.73	41.75	28.66	0.92
1000	21.40	27.90	14.90	13.10	1.20	0.76	41.58	28.40	1.00
1050	21.00	28.40	13.50	11.60	1.24	0.80	41.41	28.23	1.05
1100	20.30	29.20	11.80	10.10	1.33	0.85	41.09	27.68	1.03
1150	19.20	30.40	9.90	8.70	1.50	0.91	39.32	26.89	1.12
1200	17.60	32.10	8.00	8.00	1.85	0.99	38.17	25.73	1.18

## 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 = 8.25V, Id = 262.1mA @ 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)
1	25.00	29.20	11.20	11.30	1.07	0.53	38.32	26.35	--
3	25.30	28.70	14.90	23.20	1.06	0.56	38.22	26.58	--
5	25.30	28.50	15.50	38.80	1.05	0.55	38.18	26.65	--
7	25.20	28.30	15.60	32.20	1.04	0.54	38.36	26.73	--
9	25.10	28.10	15.70	26.10	1.03	0.53	38.52	26.68	--
10	25.00	28.00	15.70	24.50	1.03	0.53	38.72	26.81	2.30
20	24.40	27.00	15.60	18.30	1.01	0.48	40.43	26.85	1.47
30	23.90	26.50	15.60	16.60	1.01	0.45	41.28	26.65	1.22
40	23.70	26.20	15.60	16.00	1.02	0.44	43.08	29.00	1.05
50	23.50	26.10	15.70	15.70	1.02	0.43	41.86	28.36	1.03
60	23.40	26.00	15.70	15.60	1.02	0.42	44.19	28.07	0.92
70	23.40	25.90	15.80	15.60	1.03	0.42	45.35	27.58	0.85
80	23.30	25.90	15.90	15.70	1.03	0.42	47.01	29.11	0.86
90	23.30	25.90	16.00	15.70	1.03	0.42	45.56	28.57	0.89
100	23.30	25.90	16.10	15.80	1.03	0.42	47.92	28.16	0.81
150	23.20	25.80	16.20	16.10	1.04	0.42	47.13	28.46	0.84
200	23.10	25.90	16.30	16.30	1.04	0.43	46.54	28.56	0.78
250	23.10	25.90	16.10	16.40	1.04	0.44	46.00	28.81	0.79
300	23.00	25.90	16.10	16.70	1.05	0.46	46.53	28.70	0.89
350	23.00	26.00	16.10	17.40	1.05	0.47	45.85	28.82	1.35
400	23.00	26.00	16.40	18.60	1.05	0.49	48.47	28.70	0.81
450	22.90	26.10	16.70	20.20	1.06	0.51	45.77	29.01	0.88
500	22.90	26.10	17.00	22.60	1.06	0.53	46.64	28.84	0.86
550	22.80	26.20	17.40	26.10	1.07	0.55	44.74	28.77	0.93
600	22.70	26.30	17.90	33.10	1.08	0.58	44.84	28.73	1.19
650	22.60	26.50	18.10	43.50	1.09	0.61	43.32	28.90	0.84
700	22.40	26.70	17.30	35.60	1.11	0.65	43.53	29.09	1.44
750	22.40	26.70	17.50	25.50	1.11	0.64	43.43	29.35	1.06
800	22.30	26.80	17.60	21.50	1.11	0.66	42.70	29.23	0.89
850	22.20	27.00	17.30	18.80	1.13	0.68	42.33	29.01	0.89
900	22.00	27.30	16.70	16.60	1.14	0.71	42.26	29.14	1.01
950	21.80	27.60	15.90	14.80	1.17	0.73	41.87	29.09	0.97
1000	21.50	27.90	14.80	13.10	1.20	0.77	41.41	28.69	1.01
1050	21.00	28.50	13.40	11.60	1.25	0.80	40.36	28.54	1.09
1100	20.30	29.20	11.80	10.10	1.33	0.85	40.60	27.97	1.06
1150	19.10	30.50	9.90	8.80	1.51	0.91	39.57	27.21	1.14
1200	17.60	32.10	8.00	8.10	1.86	0.99	38.05	26.04	1.23

## 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 = 8.00V, Id = 216.87mA @ Temperature = +95°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)
1	24.50	29.20	12.30	11.60	1.11	0.58	39.34	24.55	--
3	24.80	28.80	15.90	23.00	1.10	0.61	37.56	24.88	--
5	24.70	28.60	16.40	32.10	1.09	0.61	36.92	25.07	--
7	24.60	28.40	16.40	31.90	1.08	0.60	36.77	25.04	--
9	24.50	28.20	16.40	27.40	1.06	0.60	36.84	25.16	--
10	24.50	28.00	16.30	25.80	1.06	0.59	36.87	25.25	1.82
20	23.90	27.10	15.80	19.60	1.03	0.55	36.22	25.80	1.83
30	23.50	26.60	15.40	17.80	1.03	0.52	37.78	25.80	1.80
40	23.20	26.30	15.20	17.10	1.03	0.51	37.57	27.11	1.69
50	23.10	26.20	15.10	16.70	1.04	0.50	38.52	26.63	1.73
60	23.00	26.10	15.00	16.50	1.04	0.49	39.43	26.85	1.70
70	22.90	26.00	15.00	16.30	1.04	0.49	39.11	26.63	1.63
80	22.90	26.00	14.90	16.20	1.05	0.49	39.40	27.31	1.65
90	22.90	26.00	14.80	16.10	1.05	0.49	40.36	27.02	1.69
100	22.80	26.00	14.80	16.00	1.05	0.49	40.10	27.03	1.63
150	22.70	26.00	14.60	15.90	1.05	0.50	39.74	27.17	1.65
200	22.70	26.00	14.70	16.30	1.06	0.51	41.07	27.23	1.64
250	22.60	26.00	14.90	17.10	1.06	0.52	40.13	27.31	1.68
300	22.60	26.10	15.20	18.40	1.07	0.54	39.60	27.33	1.74
350	22.50	26.10	15.50	19.90	1.07	0.56	40.19	27.39	1.89
400	22.50	26.20	15.80	21.90	1.08	0.58	41.18	27.31	1.68
450	22.40	26.20	16.00	24.40	1.08	0.60	40.04	27.32	1.75
500	22.40	26.30	16.10	27.80	1.09	0.62	39.85	27.16	1.72
550	22.30	26.50	16.30	32.30	1.10	0.64	39.40	27.25	1.76
600	22.10	26.60	16.20	33.00	1.12	0.67	39.23	27.19	2.05
650	22.00	26.80	15.90	29.10	1.14	0.70	39.23	26.85	1.74
700	21.90	26.90	15.60	24.40	1.15	0.71	39.36	26.92	1.31
750	21.80	27.10	15.50	20.60	1.15	0.72	38.64	26.78	1.98
800	21.60	27.30	15.20	18.10	1.17	0.74	39.40	26.86	1.80
850	21.40	27.50	14.70	16.20	1.19	0.77	38.61	26.41	1.82
900	21.20	27.80	14.00	14.60	1.22	0.79	38.42	26.31	1.95
950	20.90	28.20	13.30	13.20	1.26	0.82	38.32	25.90	1.92
1000	20.40	28.70	12.40	11.90	1.32	0.85	37.83	25.21	2.02
1050	19.90	29.30	11.20	10.80	1.40	0.89	37.24	25.04	2.10
1100	19.10	30.20	9.90	9.90	1.55	0.94	36.72	24.46	2.10
1150	18.00	31.40	8.60	9.40	1.79	1.00	36.87	24.02	2.24
1200	17.00	32.50	7.30	9.50	2.10	1.07	35.88	23.34	2.35

## 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 = 7.75V, Id = 211.93mA @ Temperature = +95°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)
1	24.50	29.20	12.10	11.60	1.10	0.58	39.18	24.82	--
3	24.80	28.80	15.70	23.10	1.09	0.61	37.53	25.14	--
5	24.80	28.60	16.20	32.90	1.08	0.61	36.98	25.36	--
7	24.70	28.40	16.30	32.30	1.07	0.60	36.89	25.33	--
9	24.60	28.20	16.20	27.40	1.06	0.59	36.98	25.44	--
10	24.50	28.00	16.20	25.80	1.06	0.59	36.91	25.53	1.74
20	23.90	27.10	15.80	19.50	1.03	0.55	36.50	25.60	1.75
30	23.50	26.50	15.40	17.70	1.03	0.52	39.97	25.64	1.68
40	23.30	26.30	15.30	17.00	1.03	0.50	38.95	26.99	1.59
50	23.10	26.10	15.20	16.60	1.04	0.49	38.78	26.52	1.65
60	23.00	26.10	15.10	16.30	1.04	0.49	39.11	26.69	1.59
70	23.00	26.00	15.00	16.20	1.04	0.49	39.48	26.51	1.53
80	22.90	26.00	15.00	16.10	1.04	0.48	40.42	27.15	1.56
90	22.90	26.00	14.90	16.00	1.05	0.48	40.40	26.87	1.58
100	22.90	26.00	14.90	15.90	1.05	0.48	40.36	26.85	1.55
150	22.80	25.90	14.70	15.80	1.05	0.49	40.38	27.00	1.57
200	22.70	26.00	14.80	16.20	1.06	0.50	41.31	27.07	1.57
250	22.70	26.00	15.00	17.00	1.06	0.52	39.99	27.16	1.59
300	22.60	26.00	15.30	18.20	1.07	0.54	40.15	27.17	1.62
350	22.60	26.10	15.60	19.70	1.07	0.55	40.61	27.23	1.88
400	22.50	26.20	15.90	21.70	1.08	0.57	41.01	27.15	1.60
450	22.40	26.20	16.10	24.20	1.08	0.59	40.08	27.21	1.65
500	22.40	26.30	16.20	27.70	1.09	0.61	39.98	27.04	1.66
550	22.30	26.40	16.40	32.70	1.10	0.63	39.79	27.13	1.70
600	22.10	26.60	16.30	34.30	1.12	0.66	39.53	27.07	1.96
650	22.00	26.80	16.00	29.80	1.14	0.70	39.72	26.79	1.64
700	21.90	26.90	15.70	24.80	1.14	0.71	39.34	26.88	2.14
750	21.80	27.00	15.50	20.90	1.15	0.72	39.21	26.77	1.72
800	21.70	27.20	15.20	18.30	1.17	0.74	39.66	26.83	1.72
850	21.50	27.50	14.70	16.30	1.19	0.76	39.06	26.40	1.73
900	21.20	27.80	14.10	14.70	1.22	0.79	38.85	26.33	1.90
950	20.90	28.20	13.30	13.30	1.26	0.82	38.45	25.93	1.83
1000	20.50	28.70	12.40	12.00	1.31	0.85	37.99	25.26	1.91
1050	19.90	29.30	11.30	10.80	1.40	0.89	37.75	25.10	2.03
1100	19.10	30.20	9.90	9.90	1.54	0.94	37.26	24.50	2.01
1150	18.10	31.30	8.60	9.40	1.77	1.00	37.15	24.06	2.15
1200	17.00	32.40	7.40	9.50	2.08	1.07	36.49	23.37	2.25

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

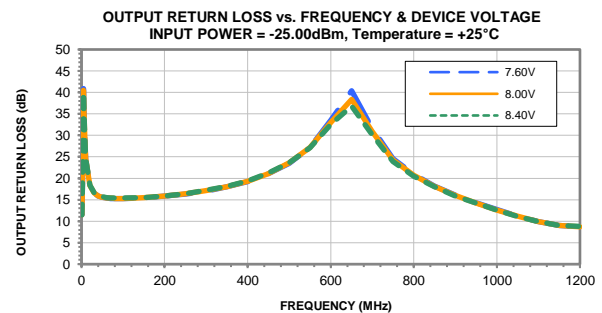
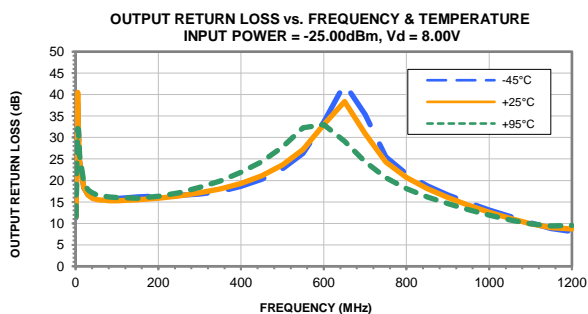
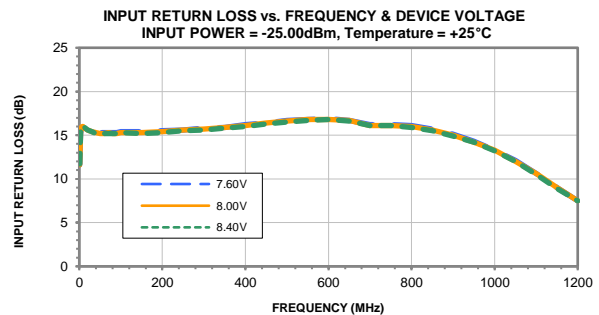
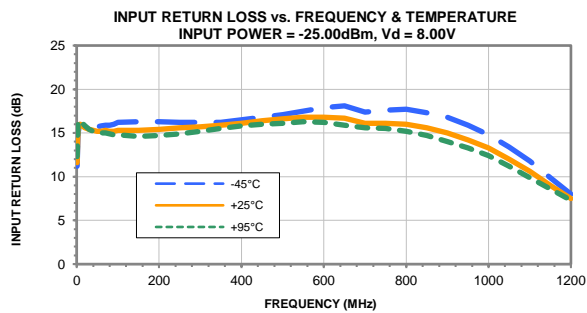
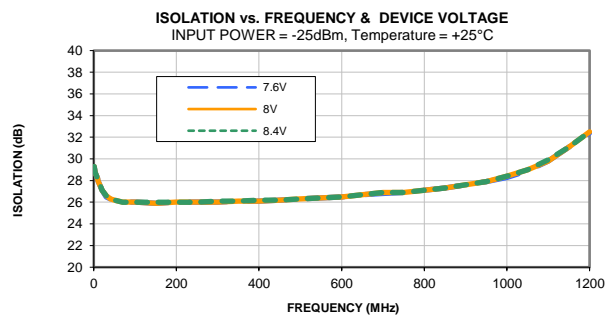
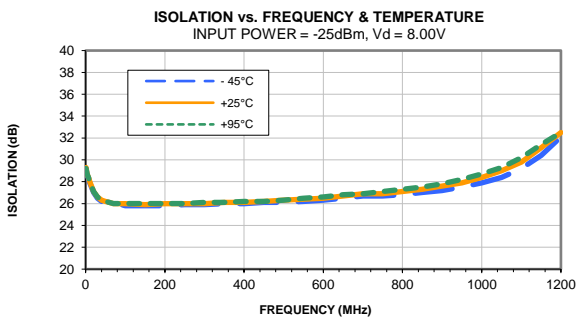
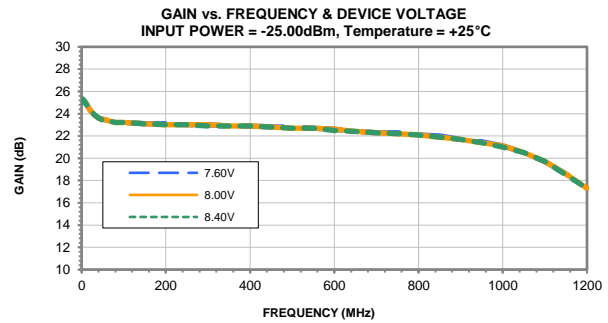
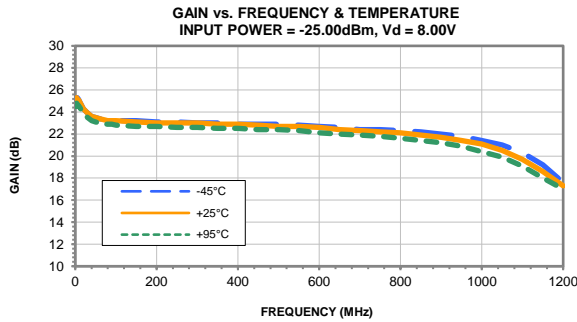
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

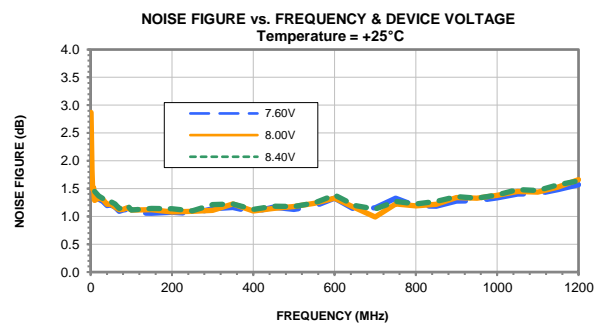
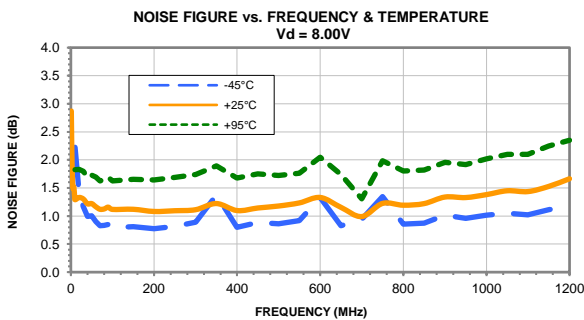
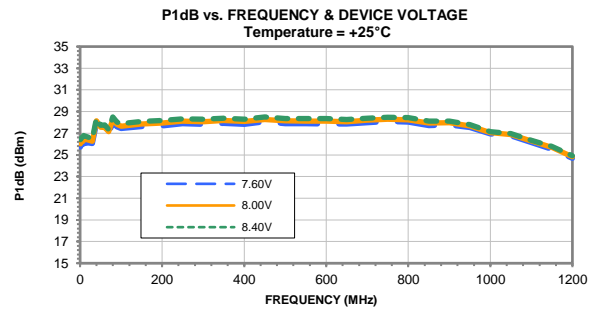
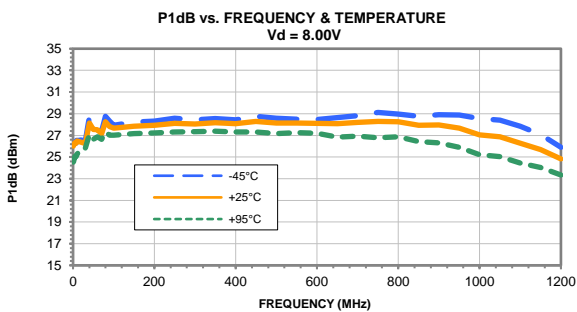
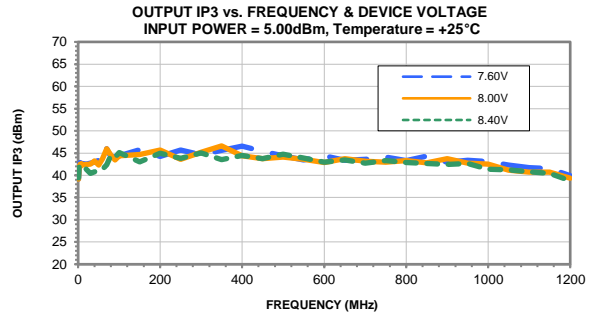
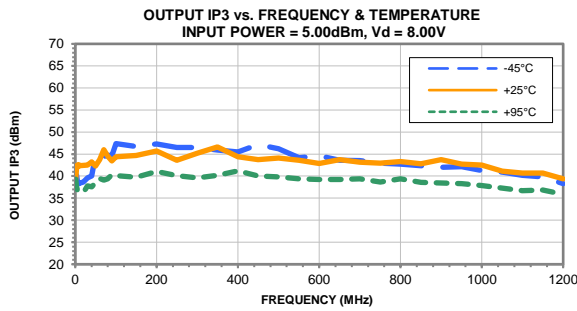
TEST CONDITIONS: Vd = 8.25V, Id = 221.3708mA @ Temperature = +95°C

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)
1	24.50	29.20	12.40	11.60	1.11	0.58	39.09	25.03	--
3	24.70	28.80	16.10	22.80	1.10	0.62	37.39	25.52	--
5	24.70	28.60	16.60	31.30	1.09	0.61	36.77	25.61	--
7	24.60	28.40	16.70	31.50	1.08	0.61	36.70	25.68	--
9	24.50	28.20	16.50	27.40	1.07	0.60	36.66	25.79	--
10	24.40	28.10	16.50	25.90	1.06	0.59	36.65	25.77	1.90
20	23.90	27.10	15.80	19.70	1.03	0.55	36.39	26.04	1.89
30	23.40	26.60	15.40	18.00	1.03	0.53	38.90	25.99	1.81
40	23.20	26.30	15.20	17.20	1.04	0.51	38.72	27.29	1.74
50	23.10	26.20	15.10	16.80	1.04	0.50	38.48	26.80	1.77
60	23.00	26.10	15.00	16.60	1.04	0.50	39.22	27.06	1.71
70	22.90	26.10	14.90	16.50	1.05	0.50	38.99	26.79	1.66
80	22.90	26.00	14.80	16.30	1.05	0.50	39.44	27.53	1.68
90	22.80	26.00	14.80	16.20	1.05	0.50	39.31	27.19	1.71
100	22.80	26.00	14.80	16.20	1.05	0.50	39.86	27.24	1.67
150	22.70	26.00	14.50	16.00	1.06	0.50	40.05	27.38	1.69
200	22.60	26.00	14.60	16.50	1.06	0.52	40.87	27.44	1.66
250	22.60	26.00	14.80	17.30	1.06	0.53	40.02	27.50	1.65
300	22.60	26.10	15.10	18.50	1.07	0.55	39.95	27.53	1.79
350	22.50	26.10	15.40	20.10	1.07	0.56	40.31	27.58	1.95
400	22.50	26.20	15.70	22.10	1.08	0.58	40.47	27.51	1.69
450	22.40	26.30	15.90	24.60	1.09	0.60	39.65	27.49	1.76
500	22.30	26.40	16.10	28.00	1.10	0.62	39.64	27.31	1.76
550	22.20	26.50	16.20	32.00	1.11	0.64	39.60	27.42	1.83
600	22.10	26.60	16.20	31.90	1.12	0.67	39.26	27.35	2.25
650	21.90	26.90	15.80	28.40	1.14	0.70	39.24	26.98	1.78
700	21.90	27.00	15.50	24.00	1.15	0.72	38.90	27.05	2.21
750	21.80	27.10	15.40	20.30	1.16	0.73	38.55	26.88	1.92
800	21.60	27.30	15.10	17.90	1.17	0.75	38.94	26.98	1.84
850	21.40	27.50	14.60	16.00	1.20	0.77	38.52	26.52	1.83
900	21.20	27.80	14.00	14.50	1.22	0.79	38.39	26.40	1.97
950	20.80	28.20	13.20	13.10	1.26	0.82	38.01	25.97	1.94
1000	20.40	28.70	12.30	11.80	1.32	0.85	37.34	25.27	2.01
1050	19.80	29.40	11.20	10.70	1.41	0.89	37.14	25.11	2.13
1100	19.00	30.30	9.90	9.90	1.55	0.94	36.48	24.52	2.14
1150	18.00	31.40	8.50	9.40	1.80	1.00	36.55	24.08	2.26
1200	16.90	32.50	7.30	9.50	2.12	1.07	35.69	23.40	2.38

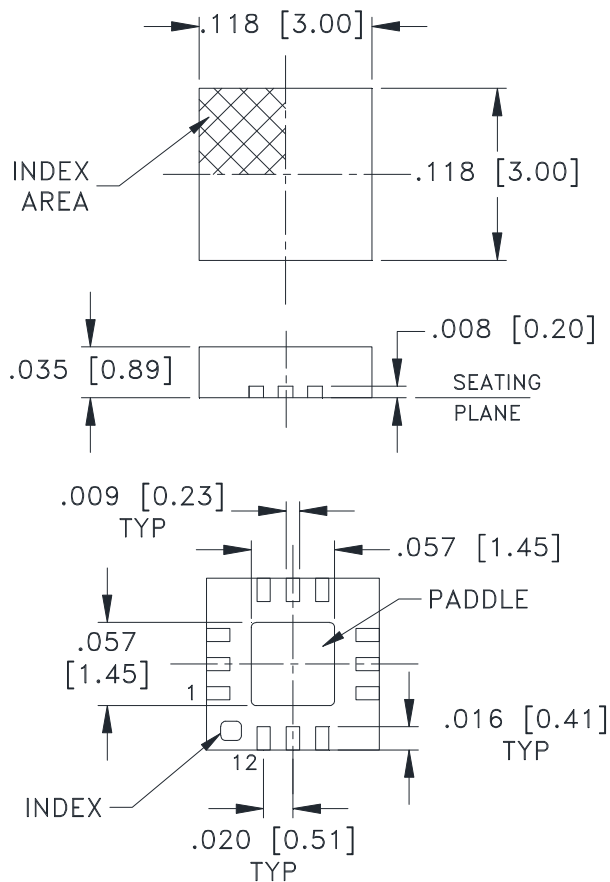
## Typical Performance Curves



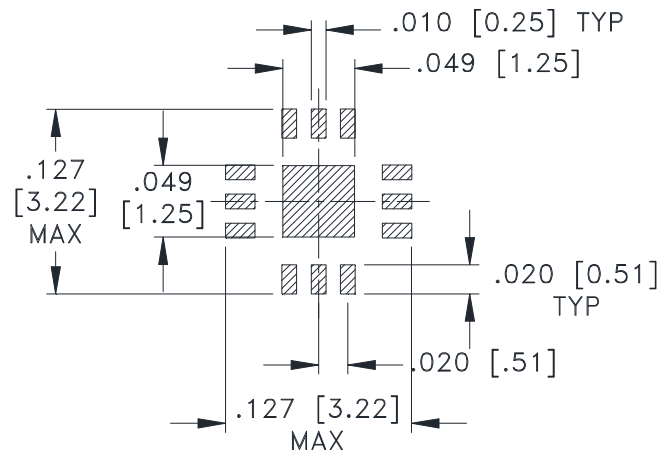
## Typical Performance Curves



### Outline Dimensions



### PCB Land Pattern



SUGGESTED LAYOUT,  
TOLERANCE TO BE WITHIN  $\pm .002$

**Weight: .02 Grams**

**Dimensions are in inches (mm). Tolerances: 2Pl.  $\pm .01$ ; 3 Pl.  $\pm .004$**

### Notes:

1. Case material: Plastic.
2. Termination finish:
  - For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. All models, (+) suffix. See Data sheet.
  - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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# Tape & Reel Packaging TR-F66



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000, 3000

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)

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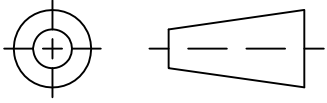
INTERNET <http://www.minicircuits.com>

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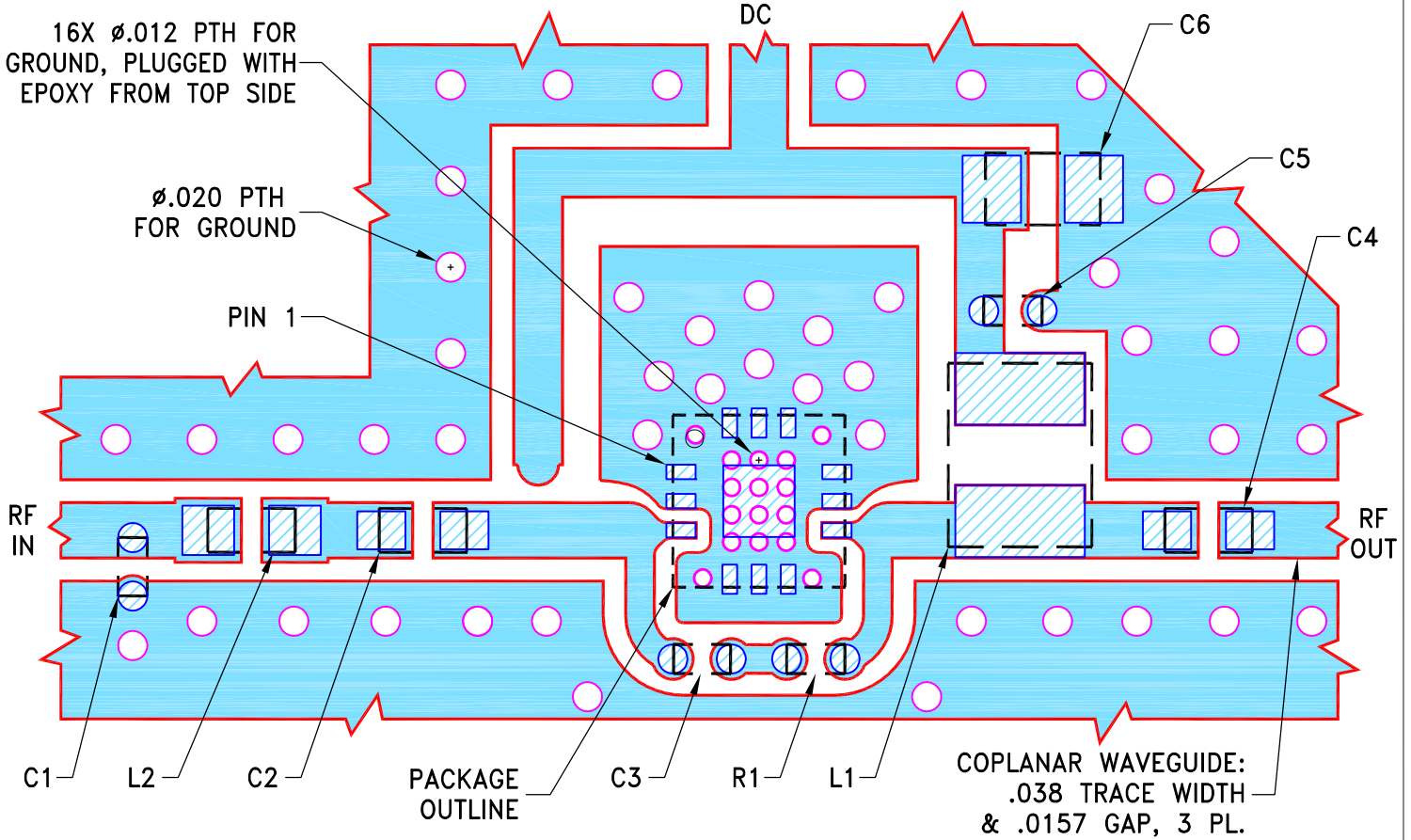
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168912	NEW RELEASE	08/02/18	ITG	RS


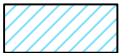
SUGGESTED MOUNTING CONFIGURATION  
FOR DQ1225 CASE STYLE, "12AM03" PIN CODE



COMPONENT	SIZE
R1,C1,C3,C5	0402
L2,C2,C4	0603
L1	1210

NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020"±.0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-1063-13LN+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

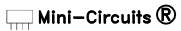
 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).  
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	ITG	07/12/18
TOLERANCES ON:	GF	08/02/18
2 PL DECIMALS ±	RS	08/02/18
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

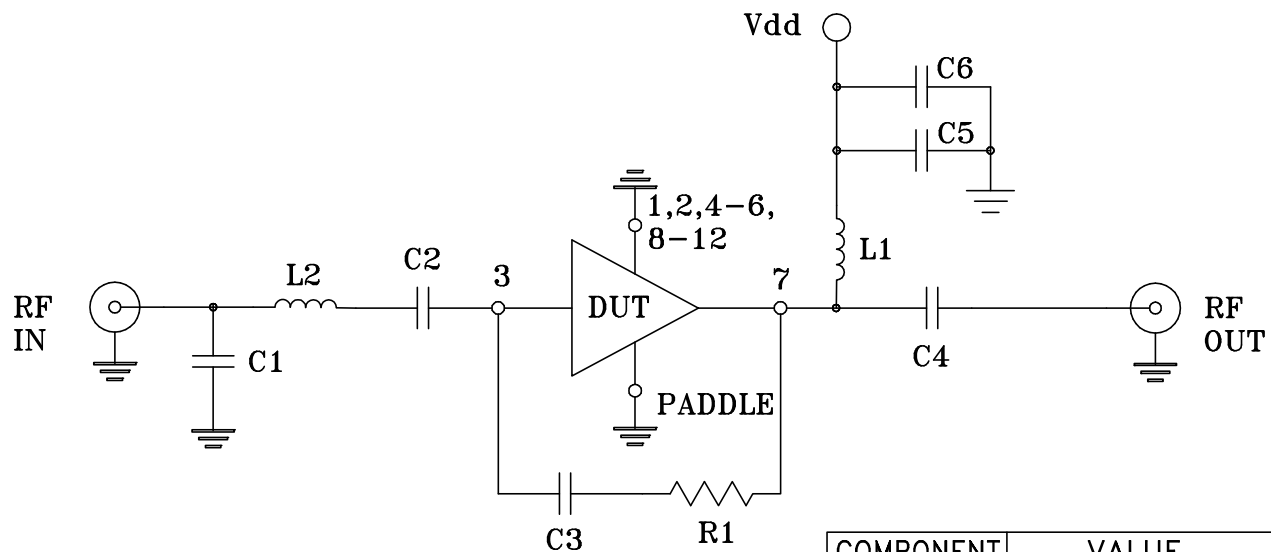
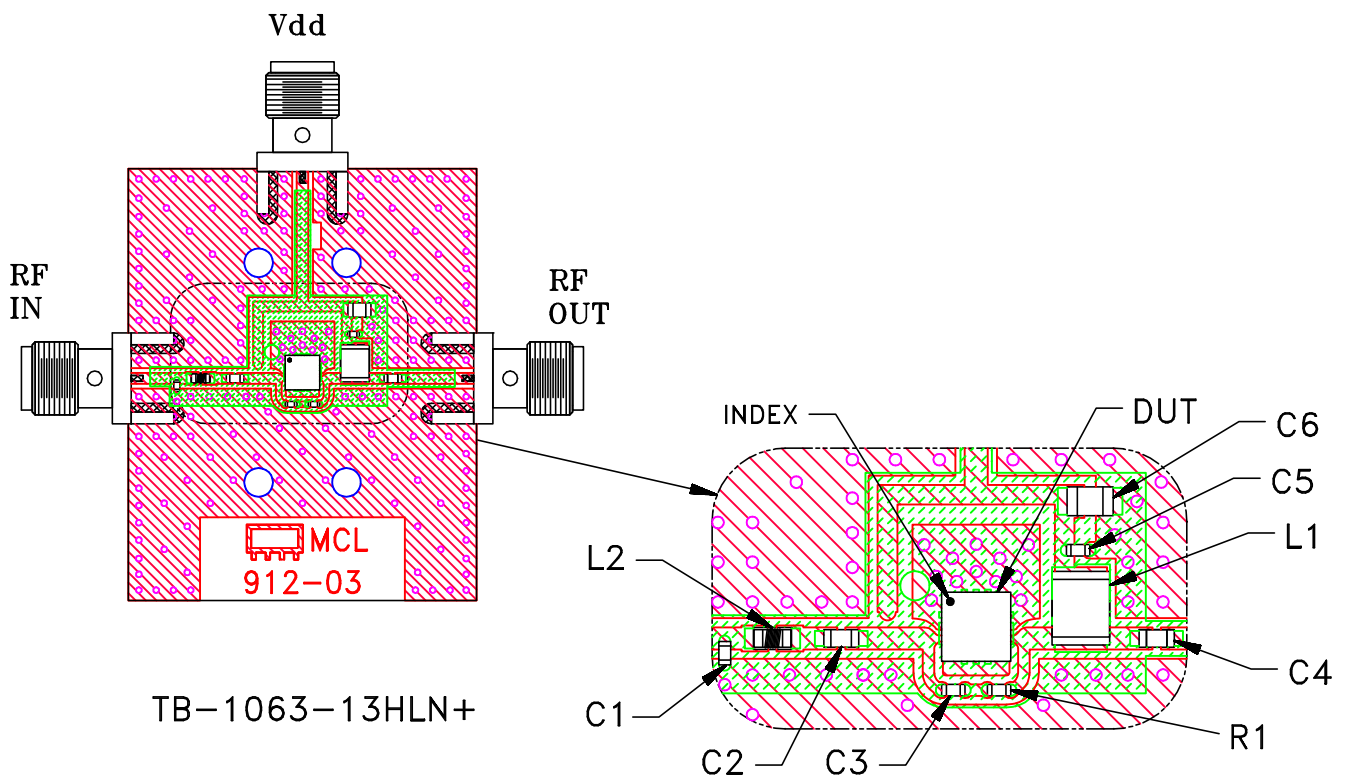
 **Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

PL, 12AM03, DQ1225, TB-1063-13LN+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-594	OR
FILE:	98PL594	SCALE: 8:1	SHEET: 1 OF 1

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 ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit




Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 inch.

COMPONENT	VALUE	SIZE
DUT	LHA-13HLN+	3X3 MM
C1	Capacitor 1.5 pF	0402
C2,C4	Capacitor 2.2 uF	0603
C3	Capacitor 0.1 uF	0402
C5	Capacitor 0.001 uF	
C6	Capacitor 10 uF	0805
R1	Resistor 1.5 KOhm	0402
L1	Inductor 15 uH	1210
L2	Inductor 5.1 nH	0603

 **Mini-Circuits®**



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 95° C / 105° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020C, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours. Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak	J-STD-020
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether +	MIL-STD-202, Method 215



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
	monoethanolamine at 63°C to 70°C	