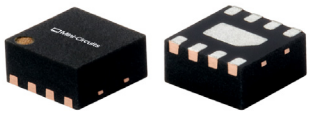
LOW NOISE, WIDEBAND, LOW CURRENT

Monolithic Amplifier PMA2-123LN5+

50Ω 0.5 to 12 GHz

THE BIG DEAL

- Ultra wideband, 0.5 to 12 GHz
- Excellent noise figure, 1.8 dB at 12GHz
- Low Current, 30mA
- Usable up to 18 GHz



Generic photo used for illustration purposes only

CASE STYLE: MC1631-1

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

APPLICATIONS

- WiFi / LTE
- Satellite Communications
- Military and Commercial Radar applications
- Point-to-Point Radio applications

PRODUCT OVERVIEW

The PMA2-123LN5+ is a E-PHEMT based wideband, low noise MMIC amplifier with a unique combination of low noise, high IP3, and low current making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single +5V supply, is well matched for 50Ω and comes in a tiny, low profile package (2 x 2 mm, 8 lead MCLP), accommodating dense circuit board layouts.

KEY FEATURES

Feature	Advantages
Excellent Noise Figure up to 18 GHz • 1.8 dB typ. at 12 GHz • 2.4 dB typ. at 18 GHz	Industry leading combination of low noise and wideband frequency enables lower system noise figure performance.
High IP3 • +24 dBm at 0.5 GHz • +24.1 dBm at 12 GHz	Combination of low noise figure and high IP3 makes this MMIC amplifier ideal for use in low noise receiver front end (RFE) as it gives the user advantages of sensitivity and two-tone IM performance at both ends of the dynamic range.
Low operating voltage & current +5V & 30mA	Low voltage & current consumption is ideal for use in amplifier chain.
2 x 2mm 8-lead MCLP package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

REV. A
ECO-011027
PMA2-123LN5+
GY/RS/CP
240327

Monolithic Amplifier PMA2-123LN5+

50Ω 0.5 to 12 GHz

ELECTRICAL SPECIFICATIONS[1] AT 25°C, V_{DD}= +5V UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.5		12	GHz
Noise Figure	0.5		1.4		dB
	5		1.2		
	10		1.6		
	12		1.8		
	18		2.4		
Gain	0.5	16.0	17.7	19.5	dB
	5	—	15.1	—	
	10	9.7	11.6	13.4	
	12	9.0	10.7	12.5	
	18	—	7.6	—	
Reverse Isolation	10	—	24.4	—	dB
Input Return Loss	0.5		6		dB
	5		10		
	10		10		
	12		10		
	18		7		
Output Return Loss	0.5		12		dB
	5		17		
	10		12		
	12		11		
	18		6		
Output Power at 1dB Compression	0.5		+12.3		dBm
	5		+12.2		
	10		+11.6		
	12		+11.5		
	18		+9.6		
Output IP3	0.5		+24.0		dBm
	5		+23.4		
	10		+23.5		
	12		+24.1		
	18		+21.6		
Device Operating Voltage (V_{DD})			+5		V
Device Operating Current (I_{DD})		—	30	47	mA
Device Current Variation vs. Temperature[2]			7.69		µA/°C
Device Current Variation vs. Voltage			0.008		mA/mV
Thermal Resistance, junction-to-junction			69.8		°C/W

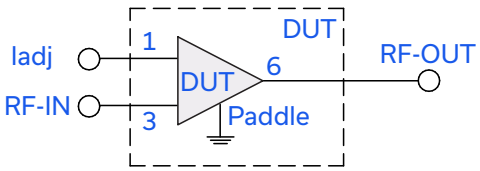
1. Measured on Mini-Circuits Characterization Test Board TB-PMA2-123LN5+. See Characterization Test Circuit (Fig. 1) and de-embedded to the device reference plane.
2. (Current at 85°C - Current at -45°C)/130

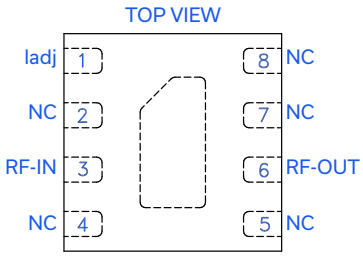
ABSOLUTE MAXIMUM RATINGS[3]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Junction Temperature	150 °C
Total Power Dissipation	0.65 W
Input Power (CW), Vd=+5V	+24 dBm (5 minutes max.) +7 dBm (continuous)
DC Voltage	+7 V

3. Permanent damage may occur if any of these limits are exceeded. Electrical maximum ratings are not intended for continuous normal operation.

SIMPLIFIED SCHEMATIC & PAD DESCRIPTION





Function	Pad Number	Description (See Figure 1)
RF-IN	3	Connects to RF input via a blocking capacitor.
RF-OUT & DC-IN	6	Connects to RF out and V_{DD} via Bias-Tee & 68.1 Ohm resistor
Ground	Paddle	Connects to ground
No Connection	2,4,5,7,8	Not used internally. Connected to ground on Test Board.
Iadj	1	Current adjust pad. Open on test board.

CHARACTERIZATION TEST CIRCUIT

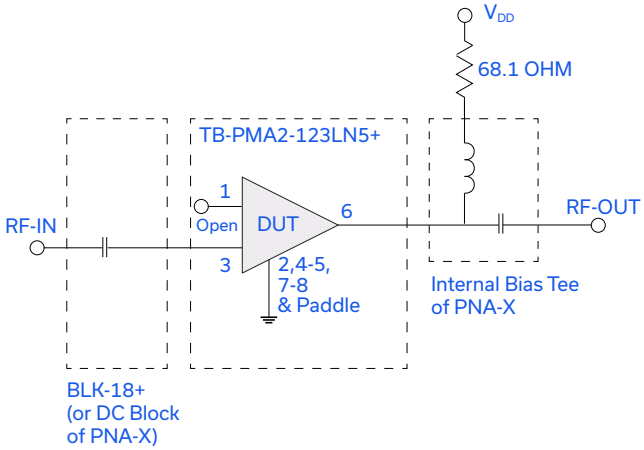
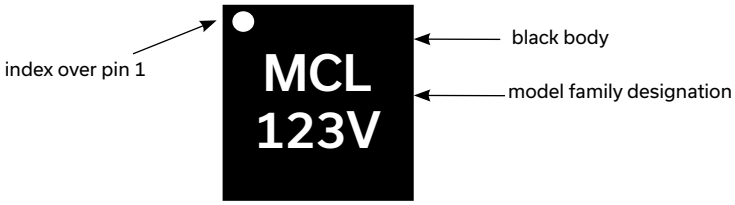


Fig 1. Characterization Circuit
Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-PMA2-123LN5+)
Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5dBm/tone at output.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Monolithic Amplifier PMA2-123LN5+

50Ω 0.5 to 12 GHz

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1631-1 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-626
Evaluation Board	TB-PMA2123LN5E+ (Includes all components for turn-key evaluation across 0.5 to 12 GHz)
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 1A (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

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 = 5.00V, Id = 30mA @ Temperature = +25°C

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)
200	14.83	28.54	2.47	7.48	1.23	1.13	25.97	12.75	2.65
400	17.27	25.37	4.92	10.80	1.13	0.95	25.51	12.56	1.56
600	17.85	24.56	6.49	13.43	1.12	0.88	24.74	12.49	1.37
800	18.00	24.25	7.43	15.42	1.12	0.85	24.52	12.54	1.25
1000	18.01	24.09	8.03	16.92	1.13	0.84	24.17	12.33	1.14
1200	17.95	23.98	8.41	18.00	1.14	0.83	24.28	12.29	1.18
1400	17.84	23.91	8.66	18.76	1.14	0.84	24.52	12.41	1.21
1600	17.72	23.85	8.86	19.30	1.15	0.84	23.84	12.50	1.20
1800	17.58	23.79	8.98	19.63	1.16	0.84	23.92	12.21	1.16
2000	17.43	23.76	9.05	19.81	1.18	0.85	24.76	12.14	1.12
2200	17.26	23.71	9.11	19.84	1.19	0.85	23.49	12.18	1.14
2400	17.10	23.69	9.15	19.75	1.20	0.86	24.42	12.55	1.11
2600	16.94	23.65	9.18	19.61	1.21	0.86	23.53	12.01	1.21
2800	16.78	23.62	9.22	19.32	1.22	0.87	24.49	12.24	1.19
3000	16.62	23.59	9.26	19.02	1.23	0.87	23.99	12.08	1.09
4000	15.88	23.44	9.71	17.87	1.30	0.88	24.11	12.09	1.22
5000	15.16	23.38	10.47	17.60	1.38	0.89	23.96	12.34	1.21
6000	14.40	23.65	10.32	17.41	1.50	0.93	24.34	12.28	1.29
7000	13.62	23.79	9.62	17.62	1.61	0.97	24.50	12.08	1.42
8000	12.88	23.98	9.07	16.65	1.71	1.00	23.91	12.09	1.51
9000	12.24	24.13	9.18	14.46	1.83	1.00	24.84	12.16	1.53
10000	11.69	24.19	9.86	12.98	1.95	0.97	23.64	11.76	1.61
11000	11.12	24.54	10.88	12.10	2.17	0.95	23.46	11.63	1.91
12000	10.86	24.81	9.91	11.10	2.20	0.96	24.33	11.57	1.70
13000	10.36	24.90	9.21	10.59	2.28	0.97	24.24	11.27	1.73
14000	9.85	25.13	8.50	10.51	2.40	0.99	23.79	11.02	1.93
15000	9.34	25.45	7.99	10.27	2.56	1.01	23.82	11.11	2.18
16000	8.74	25.97	7.79	9.00	2.77	0.99	23.18	10.29	2.40
17000	8.19	26.67	8.02	7.25	2.99	0.91	22.05	10.05	2.62
18000	7.72	27.09	7.50	6.18	3.07	0.86	21.99	9.78	2.29
19000	7.22	27.79	7.34	5.62	3.35	0.82	22.89	9.41	2.55
20000	6.56	28.87	6.91	5.24	3.86	0.81	21.25	8.93	3.06

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 = 4.75V, Id = 28mA @ Temperature = +25°C

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)
200	14.72	28.39	2.48	7.63	1.23	1.14	25.22	12.14	2.66
400	17.14	25.24	4.90	10.98	1.13	0.95	24.17	11.94	1.58
600	17.70	24.49	6.44	13.62	1.12	0.89	23.86	11.86	1.35
800	17.85	24.18	7.35	15.60	1.13	0.86	24.08	11.90	1.29
1000	17.85	24.01	7.91	17.09	1.13	0.85	23.62	11.69	1.16
1200	17.79	23.90	8.28	18.16	1.14	0.84	23.40	11.77	1.18
1400	17.69	23.83	8.52	18.91	1.15	0.84	23.64	11.77	1.21
1600	17.56	23.77	8.71	19.43	1.16	0.85	23.11	11.85	1.20
1800	17.42	23.73	8.82	19.74	1.17	0.85	23.17	11.69	1.17
2000	17.27	23.69	8.90	19.90	1.18	0.86	23.85	11.62	1.12
2200	17.11	23.65	8.95	19.90	1.19	0.86	22.75	11.66	1.13
2400	16.94	23.60	8.99	19.79	1.20	0.86	23.65	11.90	1.12
2600	16.78	23.55	9.02	19.63	1.21	0.87	22.57	11.38	1.23
2800	16.62	23.54	9.05	19.32	1.22	0.87	23.59	11.60	1.24
3000	16.46	23.50	9.09	19.02	1.23	0.88	23.09	11.44	1.11
4000	15.73	23.37	9.54	17.91	1.30	0.89	23.59	11.46	1.25
5000	15.02	23.30	10.29	17.74	1.39	0.90	23.19	11.71	1.19
6000	14.27	23.56	10.16	17.62	1.51	0.93	23.72	11.65	1.33
7000	13.48	23.72	9.48	17.83	1.61	0.98	23.71	11.57	1.43
8000	12.74	23.94	8.93	16.75	1.72	1.01	22.91	11.58	1.53
9000	12.10	24.09	9.02	14.50	1.84	1.00	24.45	11.53	1.57
10000	11.55	24.13	9.69	13.01	1.96	0.98	23.13	11.01	1.64
11000	10.98	24.52	10.69	12.11	2.19	0.96	22.80	10.88	1.91
12000	10.72	24.75	9.73	11.11	2.21	0.97	23.87	10.93	1.79
13000	10.22	24.88	9.05	10.60	2.29	0.98	23.07	10.63	1.78
14000	9.71	25.14	8.36	10.52	2.43	1.00	22.92	10.50	1.96
15000	9.20	25.42	7.86	10.27	2.58	1.02	22.81	10.47	2.21
16000	8.60	25.99	7.67	8.99	2.80	0.99	22.30	9.64	2.48
17000	8.05	26.64	7.92	7.24	3.01	0.91	21.11	9.41	2.64
18000	7.59	27.08	7.42	6.18	3.09	0.86	21.08	9.14	2.27
19000	7.09	27.77	7.28	5.62	3.38	0.83	21.91	8.78	2.58
20000	6.43	28.80	6.86	5.23	3.87	0.81	20.40	8.19	3.01

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 = 5.25, Id = 32mA @ Temperature = +25°C

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)
200	14.92	28.63	2.46	7.34	1.23	1.12	27.01	13.33	2.65
400	17.39	25.47	4.93	10.63	1.13	0.94	25.69	13.05	1.57
600	17.98	24.68	6.54	13.26	1.12	0.87	25.33	13.00	1.34
800	18.14	24.33	7.51	15.24	1.12	0.84	25.26	13.05	1.24
1000	18.15	24.17	8.13	16.73	1.13	0.83	25.02	12.84	1.15
1200	18.08	24.05	8.52	17.83	1.13	0.83	24.78	12.79	1.15
1400	17.98	23.97	8.78	18.61	1.14	0.83	25.03	12.91	1.19
1600	17.86	23.91	8.99	19.15	1.15	0.83	24.37	13.00	1.19
1800	17.72	23.89	9.12	19.51	1.16	0.83	24.89	12.71	1.16
2000	17.56	23.84	9.20	19.72	1.17	0.84	25.10	12.64	1.09
2200	17.40	23.79	9.26	19.76	1.18	0.84	24.40	12.68	1.12
2400	17.24	23.75	9.30	19.67	1.20	0.85	25.34	13.05	1.10
2600	17.08	23.73	9.33	19.56	1.21	0.85	24.35	12.51	1.20
2800	16.92	23.72	9.36	19.29	1.22	0.86	25.24	12.62	1.20
3000	16.76	23.68	9.41	18.98	1.23	0.86	24.36	12.58	1.10
4000	16.02	23.54	9.88	17.81	1.30	0.87	25.01	12.59	1.22
5000	15.28	23.45	10.64	17.47	1.38	0.88	24.50	12.83	1.18
6000	14.52	23.70	10.45	17.21	1.50	0.92	25.77	12.77	1.29
7000	13.74	23.84	9.74	17.43	1.60	0.96	25.10	12.56	1.42
8000	13.00	24.04	9.20	16.53	1.71	1.00	24.65	12.58	1.48
9000	12.37	24.16	9.33	14.42	1.82	0.99	26.08	12.65	1.55
10000	11.82	24.22	10.03	12.97	1.94	0.97	24.63	12.13	1.61
11000	11.24	24.56	11.06	12.09	2.15	0.95	24.22	12.00	1.90
12000	10.98	24.80	10.07	11.09	2.18	0.96	25.47	12.06	1.76
13000	10.48	24.94	9.35	10.56	2.27	0.97	24.53	11.88	1.73
14000	9.97	25.14	8.62	10.49	2.38	0.99	24.62	11.63	1.93
15000	9.46	25.46	8.11	10.27	2.54	1.01	24.33	11.61	2.17
16000	8.86	25.99	7.88	9.01	2.75	0.98	23.92	10.79	2.43
17000	8.31	26.65	8.10	7.26	2.96	0.91	22.85	10.55	2.53
18000	7.84	27.11	7.57	6.19	3.05	0.86	22.80	10.28	2.28
19000	7.34	27.81	7.40	5.62	3.33	0.82	23.60	9.91	2.51
20000	6.67	28.89	6.95	5.24	3.83	0.81	22.42	9.42	2.97

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 = 5.00V, Id = 29mA @ Temperature = -45°C

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)
200	15.09	28.86	2.44	7.17	1.23	1.11	26.27	12.78	2.18
400	17.61	25.59	4.92	10.41	1.12	0.92	24.79	12.54	1.25
600	18.21	24.78	6.59	13.02	1.11	0.85	24.39	12.49	1.08
800	18.39	24.47	7.63	15.00	1.12	0.83	24.55	12.54	0.99
1000	18.41	24.26	8.28	16.48	1.12	0.81	24.07	12.34	0.84
1200	18.35	24.15	8.72	17.56	1.13	0.81	24.07	12.31	0.88
1400	18.26	24.07	9.01	18.40	1.13	0.81	24.30	12.32	0.86
1600	18.14	23.99	9.21	18.98	1.14	0.81	23.79	12.40	0.85
1800	18.00	23.96	9.33	19.33	1.15	0.82	23.76	12.22	0.84
2000	17.85	23.93	9.42	19.56	1.16	0.82	24.33	12.03	0.85
2200	17.70	23.88	9.47	19.60	1.17	0.83	23.51	12.08	0.81
2400	17.54	23.85	9.51	19.49	1.18	0.83	23.79	12.46	0.81
2600	17.38	23.82	9.53	19.30	1.20	0.84	23.16	11.92	0.88
2800	17.23	23.78	9.58	19.03	1.21	0.84	23.84	12.15	0.91
3000	17.08	23.73	9.65	18.71	1.22	0.84	23.54	12.00	0.77
4000	16.36	23.59	10.26	17.72	1.28	0.85	23.91	12.04	0.84
5000	15.64	23.50	10.97	17.37	1.36	0.87	23.83	12.29	0.80
6000	14.91	23.71	10.81	16.84	1.46	0.90	24.32	12.22	0.93
7000	14.15	23.84	10.03	17.03	1.55	0.94	24.40	12.06	0.98
8000	13.43	23.99	9.38	16.58	1.65	0.98	23.77	12.07	1.05
9000	12.82	24.11	9.65	14.16	1.75	0.97	24.72	12.00	1.06
10000	12.29	24.13	10.51	12.87	1.86	0.95	23.76	11.54	1.05
11000	11.71	24.42	11.52	12.25	2.04	0.94	23.50	11.53	1.36
12000	11.47	24.68	10.39	11.23	2.07	0.94	24.31	11.44	1.19
13000	11.00	24.82	9.59	10.77	2.15	0.96	23.74	11.18	1.21
14000	10.48	25.04	8.68	10.56	2.25	0.98	23.67	10.95	1.45
15000	9.97	25.34	8.24	10.08	2.39	0.99	23.76	10.99	1.55
16000	9.42	25.77	8.08	9.02	2.56	0.97	22.89	10.21	1.69
17000	8.87	26.47	8.25	7.36	2.77	0.90	22.12	10.02	1.97
18000	8.43	26.91	7.68	6.27	2.84	0.85	22.46	9.78	1.68
19000	7.97	27.52	7.48	5.70	3.05	0.82	22.90	9.37	1.83
20000	7.24	28.69	6.83	5.19	3.49	0.80	21.53	8.82	2.10

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 = 4.75, Id = 27mA @ Temperature = -45°C

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)
200	14.98	28.64	2.44	7.34	1.22	1.12	24.96	12.16	2.14
400	17.47	25.48	4.91	10.61	1.12	0.93	24.49	11.90	1.22
600	18.07	24.67	6.54	13.24	1.11	0.86	23.76	11.83	1.02
800	18.24	24.31	7.55	15.21	1.12	0.83	23.73	11.89	0.93
1000	18.25	24.16	8.18	16.69	1.12	0.82	23.39	11.69	0.90
1200	18.20	24.06	8.58	17.78	1.13	0.82	23.14	11.65	0.86
1400	18.10	23.98	8.86	18.60	1.14	0.82	23.73	11.65	0.90
1600	17.98	23.92	9.06	19.16	1.15	0.82	22.95	11.74	0.90
1800	17.84	23.87	9.17	19.48	1.15	0.82	23.09	11.56	0.85
2000	17.69	23.84	9.25	19.67	1.17	0.83	23.53	11.50	0.83
2200	17.54	23.82	9.31	19.67	1.18	0.84	22.58	11.54	0.80
2400	17.38	23.78	9.34	19.52	1.19	0.84	23.56	11.79	0.83
2600	17.23	23.74	9.36	19.30	1.20	0.84	22.62	11.26	0.86
2800	17.07	23.69	9.41	19.02	1.21	0.85	23.58	11.49	0.84
3000	16.92	23.66	9.47	18.70	1.22	0.85	22.83	11.34	0.76
4000	16.21	23.50	10.07	17.76	1.28	0.86	23.20	11.39	0.87
5000	15.50	23.42	10.77	17.48	1.36	0.87	23.00	11.64	0.80
6000	14.77	23.63	10.64	17.02	1.46	0.91	23.58	11.57	0.96
7000	14.02	23.78	9.88	17.21	1.56	0.95	23.61	11.41	0.96
8000	13.29	23.97	9.24	16.64	1.66	0.99	22.83	11.42	1.07
9000	12.67	24.11	9.47	14.15	1.77	0.98	23.84	11.48	1.06
10000	12.15	24.12	10.31	12.84	1.87	0.95	22.82	10.89	1.09
11000	11.57	24.44	11.29	12.23	2.07	0.94	22.59	10.88	1.38
12000	11.33	24.69	10.20	11.20	2.09	0.95	23.79	10.91	1.20
13000	10.86	24.84	9.42	10.76	2.17	0.96	23.09	10.66	1.28
14000	10.34	25.09	8.53	10.55	2.28	0.99	22.84	10.29	1.38
15000	9.82	25.37	8.10	10.06	2.42	1.00	22.89	10.20	1.68
16000	9.28	25.76	7.96	8.99	2.58	0.97	22.18	9.55	1.76
17000	8.73	26.55	8.16	7.33	2.82	0.90	21.33	9.35	2.07
18000	8.30	26.94	7.61	6.25	2.87	0.85	21.47	9.13	1.66
19000	7.84	27.55	7.43	5.68	3.09	0.82	21.98	8.60	1.86
20000	7.11	28.68	6.80	5.18	3.53	0.80	20.42	8.29	2.34

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 = 5.25V, Id = 31mA @ Temperature = -45°C

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)
200	15.17	28.96	2.42	7.03	1.22	1.10	26.37	13.26	2.18
400	17.72	25.68	4.93	10.23	1.12	0.92	25.08	13.04	1.20
600	18.34	24.86	6.63	12.83	1.11	0.85	25.14	13.00	1.05
800	18.52	24.53	7.70	14.80	1.11	0.82	25.19	13.06	0.93
1000	18.54	24.36	8.38	16.26	1.12	0.81	24.72	12.85	0.88
1200	18.48	24.24	8.83	17.35	1.13	0.80	24.76	12.82	0.89
1400	18.39	24.17	9.13	18.16	1.13	0.80	24.95	12.95	0.91
1600	18.27	24.12	9.34	18.76	1.14	0.81	24.36	13.03	0.88
1800	18.14	24.05	9.47	19.14	1.15	0.81	24.53	12.73	0.88
2000	17.99	23.98	9.56	19.40	1.16	0.81	24.94	12.67	0.82
2200	17.83	23.97	9.62	19.49	1.17	0.82	24.11	12.72	0.87
2400	17.67	23.94	9.65	19.40	1.18	0.83	24.92	13.09	0.79
2600	17.52	23.90	9.67	19.23	1.19	0.83	23.84	12.43	0.85
2800	17.37	23.86	9.73	18.99	1.21	0.83	24.40	12.66	0.84
3000	17.21	23.82	9.80	18.68	1.22	0.84	24.08	12.51	0.79
4000	16.49	23.64	10.42	17.68	1.28	0.85	24.82	12.67	0.86
5000	15.76	23.55	11.12	17.25	1.35	0.86	24.26	12.79	0.78
6000	15.02	23.77	10.95	16.67	1.45	0.89	25.02	12.83	0.87
7000	14.27	23.88	10.14	16.86	1.54	0.94	25.06	12.68	0.99
8000	13.55	24.02	9.51	16.51	1.64	0.97	24.20	12.57	1.06
9000	12.94	24.12	9.80	14.16	1.74	0.96	25.48	12.63	1.04
10000	12.41	24.12	10.69	12.89	1.84	0.94	24.41	12.03	1.07
11000	11.82	24.40	11.71	12.28	2.02	0.93	24.30	12.02	1.34
12000	11.58	24.72	10.56	11.23	2.07	0.94	25.56	12.07	1.19
13000	11.11	24.81	9.74	10.78	2.13	0.95	24.56	11.68	1.20
14000	10.59	25.02	8.80	10.57	2.23	0.98	24.33	11.57	1.39
15000	10.08	25.32	8.35	10.09	2.37	0.99	24.42	11.62	1.51
16000	9.54	25.74	8.18	9.04	2.53	0.97	23.85	10.84	1.84
17000	8.99	26.48	8.34	7.37	2.75	0.90	22.92	10.64	1.83
18000	8.55	26.90	7.74	6.28	2.81	0.85	22.95	10.29	1.59
19000	8.09	27.54	7.53	5.71	3.04	0.82	23.72	9.87	1.75
20000	7.35	28.68	6.85	5.19	3.46	0.80	22.23	9.44	2.10

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 = 5.00V, Id = 30mA @ Temperature = +85°C

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)
200	14.64	28.20	2.50	7.78	1.23	1.15	25.68	12.42	3.06
400	17.02	25.11	4.91	11.14	1.13	0.96	24.63	12.18	1.89
600	17.57	24.36	6.43	13.74	1.12	0.89	24.26	12.08	1.63
800	17.71	24.05	7.32	15.68	1.13	0.86	24.12	12.12	1.57
1000	17.71	23.90	7.87	17.10	1.13	0.85	23.78	11.90	1.43
1200	17.65	23.80	8.23	18.07	1.14	0.85	23.50	11.83	1.45
1400	17.54	23.72	8.46	18.76	1.15	0.85	24.08	11.96	1.48
1600	17.41	23.67	8.64	19.21	1.16	0.85	23.38	12.04	1.46
1800	17.27	23.63	8.76	19.46	1.17	0.85	23.63	11.75	1.43
2000	17.11	23.58	8.84	19.59	1.18	0.86	24.18	11.67	1.36
2200	16.95	23.56	8.90	19.59	1.19	0.86	23.22	11.71	1.40
2400	16.78	23.54	8.93	19.47	1.21	0.87	24.25	12.09	1.39
2600	16.61	23.52	8.94	19.33	1.22	0.88	23.11	11.56	1.47
2800	16.45	23.48	8.98	19.08	1.23	0.88	24.35	11.78	1.54
3000	16.29	23.46	9.00	18.76	1.24	0.88	23.54	11.61	1.41
4000	15.54	23.34	9.39	17.58	1.31	0.90	24.00	11.60	1.51
5000	14.82	23.28	10.18	17.39	1.40	0.90	23.51	11.85	1.50
6000	14.07	23.57	10.04	17.47	1.53	0.94	24.32	11.92	1.62
7000	13.27	23.76	9.37	17.48	1.64	0.98	23.98	11.70	1.77
8000	12.52	24.00	8.88	16.27	1.77	1.01	23.53	11.70	1.85
9000	11.87	24.20	8.94	14.48	1.90	1.01	24.92	11.76	1.98
10000	11.28	24.29	9.47	12.91	2.03	0.99	23.59	11.22	2.00
11000	10.71	24.71	10.37	11.62	2.26	0.96	23.14	11.08	2.31
12000	10.45	24.95	9.63	10.74	2.30	0.96	24.16	11.15	2.16
13000	9.94	25.12	8.96	10.28	2.40	0.98	23.52	10.85	2.25
14000	9.42	25.31	8.36	10.11	2.53	0.99	23.28	10.61	2.40
15000	8.93	25.62	7.96	10.09	2.71	1.01	23.56	10.74	2.67
16000	8.31	26.22	7.66	9.01	2.96	1.00	22.81	10.03	2.99
17000	7.74	26.91	7.76	7.14	3.17	0.92	21.70	9.79	3.20
18000	7.23	27.39	7.36	6.06	3.29	0.86	21.64	9.46	2.92
19000	6.69	28.14	7.27	5.49	3.63	0.82	22.40	8.93	3.13
20000	6.02	29.19	6.91	5.04	4.15	0.80	21.03	8.57	3.58

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 = 4.75V, Id = 29mA @ Temperature = +85°C

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)
200	14.53	28.16	2.50	7.94	1.24	1.16	25.09	11.93	3.06
400	16.89	25.02	4.89	11.31	1.13	0.96	23.99	11.66	1.89
600	17.42	24.26	6.37	13.90	1.12	0.89	23.40	11.57	1.66
800	17.56	23.97	7.22	15.81	1.13	0.87	23.63	11.61	1.57
1000	17.56	23.81	7.76	17.21	1.13	0.86	23.16	11.39	1.47
1200	17.49	23.71	8.09	18.16	1.14	0.85	23.03	11.44	1.47
1400	17.38	23.66	8.32	18.83	1.15	0.86	23.28	11.44	1.46
1600	17.26	23.58	8.50	19.25	1.16	0.86	22.71	11.52	1.46
1800	17.11	23.54	8.61	19.49	1.17	0.86	22.97	11.36	1.46
2000	16.95	23.50	8.69	19.59	1.18	0.87	23.33	11.28	1.40
2200	16.79	23.47	8.74	19.57	1.19	0.87	22.61	11.20	1.43
2400	16.62	23.46	8.77	19.44	1.21	0.88	23.29	11.58	1.39
2600	16.46	23.44	8.79	19.28	1.22	0.88	22.31	11.05	1.50
2800	16.30	23.41	8.82	19.04	1.23	0.89	23.11	11.27	1.55
3000	16.13	23.37	8.84	18.72	1.24	0.89	22.73	11.22	1.42
4000	15.39	23.28	9.22	17.60	1.32	0.90	23.18	11.09	1.50
5000	14.68	23.19	10.00	17.51	1.40	0.91	22.91	11.35	1.51
6000	13.93	23.48	9.90	17.66	1.53	0.95	23.84	11.30	1.66
7000	13.13	23.68	9.24	17.67	1.64	0.99	23.76	11.21	1.76
8000	12.38	23.96	8.74	16.38	1.78	1.02	22.83	11.20	1.87
9000	11.73	24.15	8.79	14.52	1.91	1.02	24.03	11.26	1.94
10000	11.14	24.26	9.31	12.93	2.05	1.00	22.95	10.72	2.03
11000	10.57	24.67	10.20	11.63	2.28	0.96	22.37	10.59	2.35
12000	10.32	24.92	9.45	10.75	2.32	0.97	23.81	10.65	2.20
13000	9.81	25.05	8.82	10.31	2.41	0.98	22.85	10.34	2.25
14000	9.29	25.28	8.24	10.13	2.55	1.00	22.32	10.11	2.47
15000	8.79	25.60	7.84	10.11	2.73	1.02	22.71	10.23	2.56
16000	8.17	26.20	7.55	9.01	2.98	1.00	22.08	9.51	3.07
17000	7.61	26.82	7.67	7.13	3.17	0.92	20.91	9.16	3.22
18000	7.10	27.34	7.28	6.06	3.30	0.86	20.93	8.95	2.91
19000	6.56	28.09	7.21	5.49	3.65	0.82	21.68	8.54	3.15
20000	5.89	29.17	6.87	5.04	4.19	0.80	19.87	7.95	3.73

Typical Performance Data

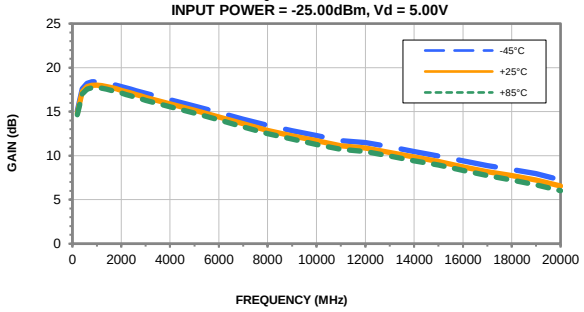
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 32mA @ Temperature = +85°C

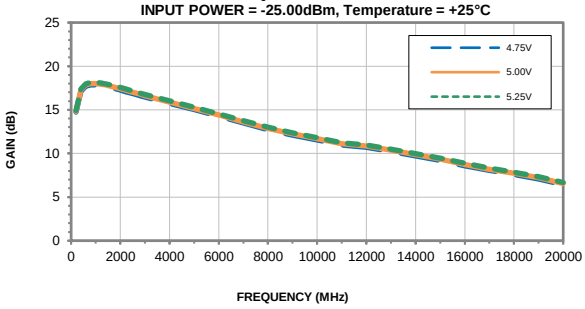
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
200	14.73	28.32	2.49	7.65	1.23	1.14	26.06	12.99	3.05
400	17.14	25.19	4.93	10.99	1.13	0.95	25.29	12.65	1.87
600	17.70	24.42	6.48	13.60	1.12	0.88	24.87	12.56	1.65
800	17.85	24.13	7.40	15.54	1.13	0.85	24.72	12.60	1.55
1000	17.85	23.96	7.98	16.98	1.13	0.84	24.41	12.37	1.41
1200	17.78	23.87	8.34	17.98	1.14	0.84	24.47	12.31	1.47
1400	17.67	23.79	8.59	18.67	1.15	0.84	24.40	12.43	1.45
1600	17.55	23.74	8.78	19.14	1.16	0.84	23.97	12.51	1.45
1800	17.40	23.70	8.89	19.40	1.17	0.84	24.45	12.22	1.44
2000	17.25	23.65	8.98	19.55	1.18	0.85	24.44	12.15	1.37
2200	17.08	23.62	9.04	19.55	1.19	0.86	23.70	12.19	1.40
2400	16.92	23.60	9.07	19.45	1.20	0.86	24.72	12.56	1.36
2600	16.75	23.57	9.09	19.32	1.22	0.87	23.48	11.91	1.43
2800	16.59	23.54	9.12	19.07	1.23	0.87	24.84	12.25	1.49
3000	16.42	23.53	9.14	18.76	1.24	0.88	23.98	12.08	1.40
4000	15.67	23.41	9.53	17.53	1.31	0.89	24.35	12.07	1.47
5000	14.94	23.35	10.33	17.28	1.40	0.90	24.27	12.31	1.50
6000	14.19	23.64	10.17	17.28	1.53	0.94	24.88	12.26	1.65
7000	13.39	23.82	9.48	17.31	1.64	0.98	24.89	12.16	1.73
8000	12.64	24.06	9.00	16.17	1.76	1.01	24.07	12.04	1.87
9000	11.99	24.24	9.07	14.42	1.89	1.00	25.59	12.10	1.92
10000	11.40	24.33	9.61	12.88	2.02	0.98	24.30	11.56	2.03
11000	10.83	24.78	10.53	11.60	2.26	0.96	23.89	11.54	2.33
12000	10.57	24.97	9.76	10.72	2.29	0.96	24.92	11.62	2.23
13000	10.06	25.14	9.09	10.26	2.39	0.97	24.04	11.31	2.21
14000	9.54	25.36	8.48	10.08	2.52	0.99	24.02	11.20	2.41
15000	9.05	25.66	8.07	10.07	2.70	1.01	24.30	11.21	2.72
16000	8.42	26.23	7.76	9.02	2.94	0.99	23.55	10.50	2.99
17000	7.86	26.93	7.84	7.15	3.15	0.91	22.53	10.14	3.12
18000	7.35	27.40	7.43	6.06	3.27	0.86	22.54	9.93	2.89
19000	6.81	28.16	7.33	5.49	3.61	0.82	23.24	9.52	3.10
20000	6.13	29.29	6.96	5.03	4.16	0.79	21.64	9.04	3.60

Typical Performance Curves

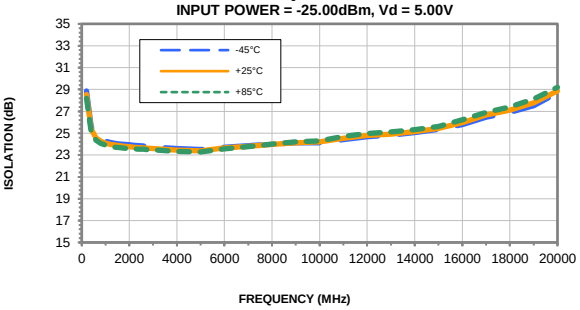
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



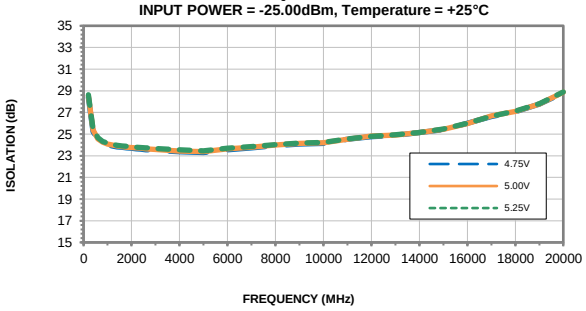
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



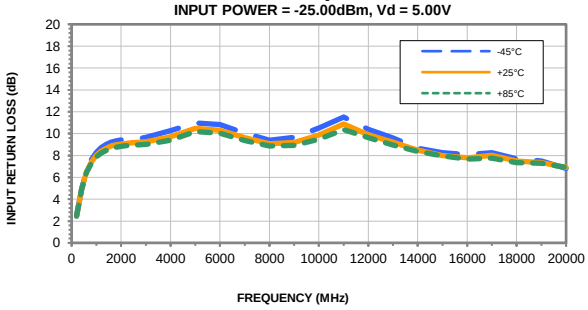
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



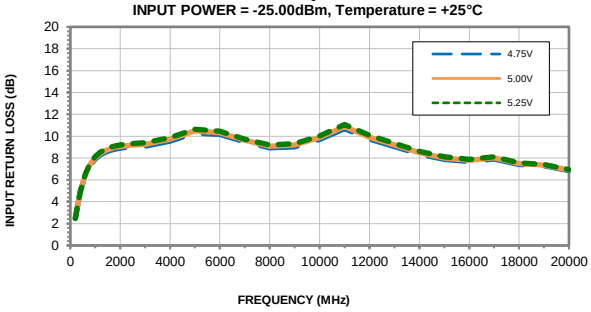
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



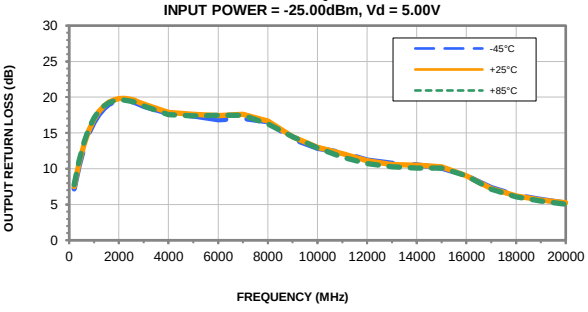
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



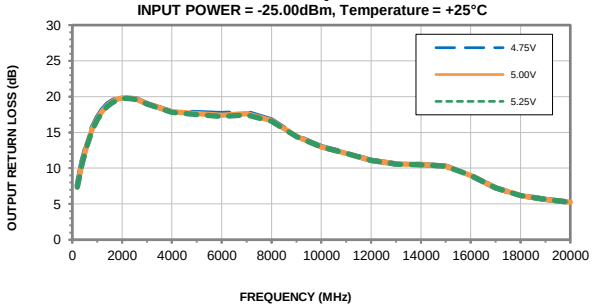
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



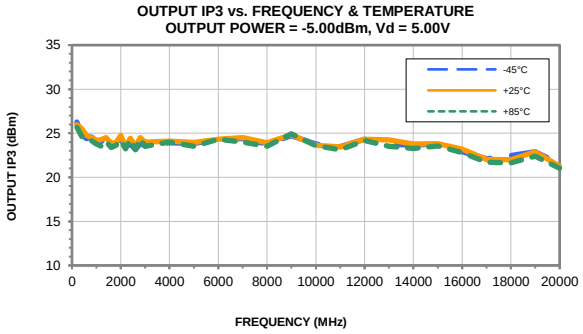
OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V

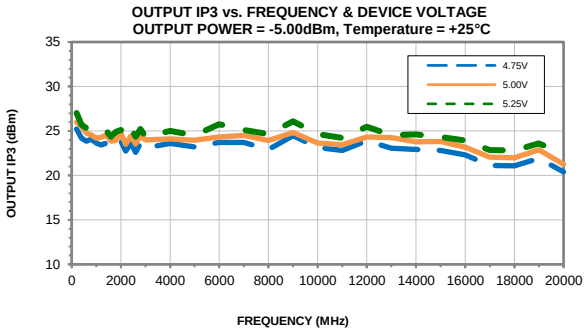


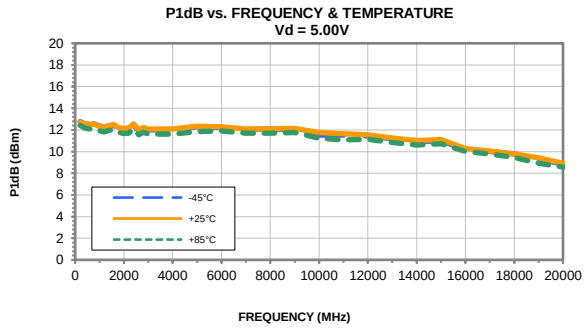
OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C

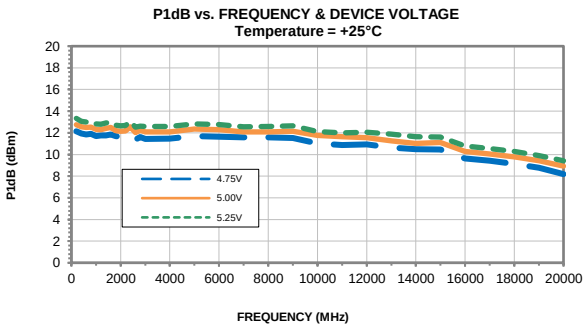


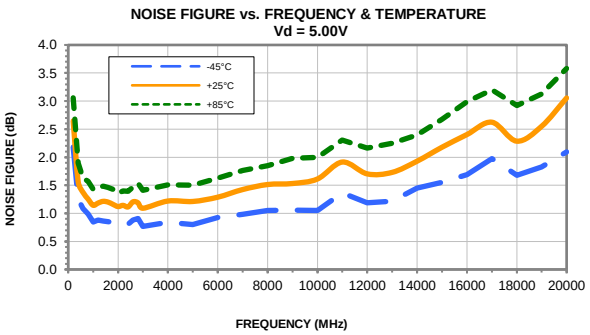
Typical Performance Curves

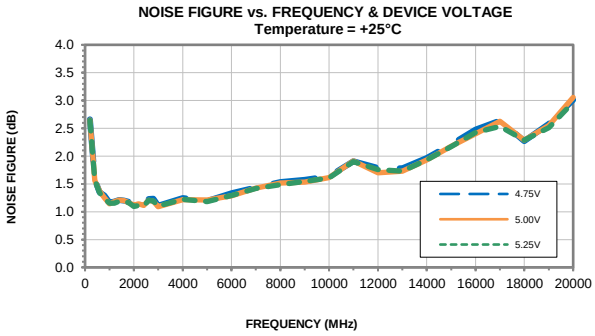


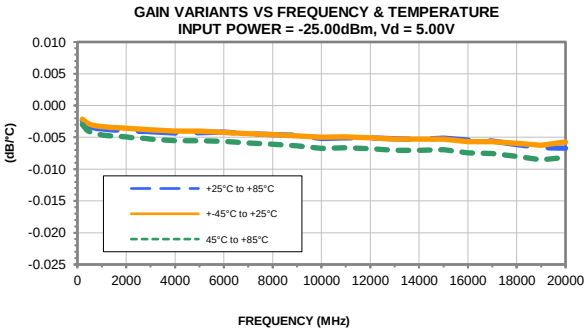










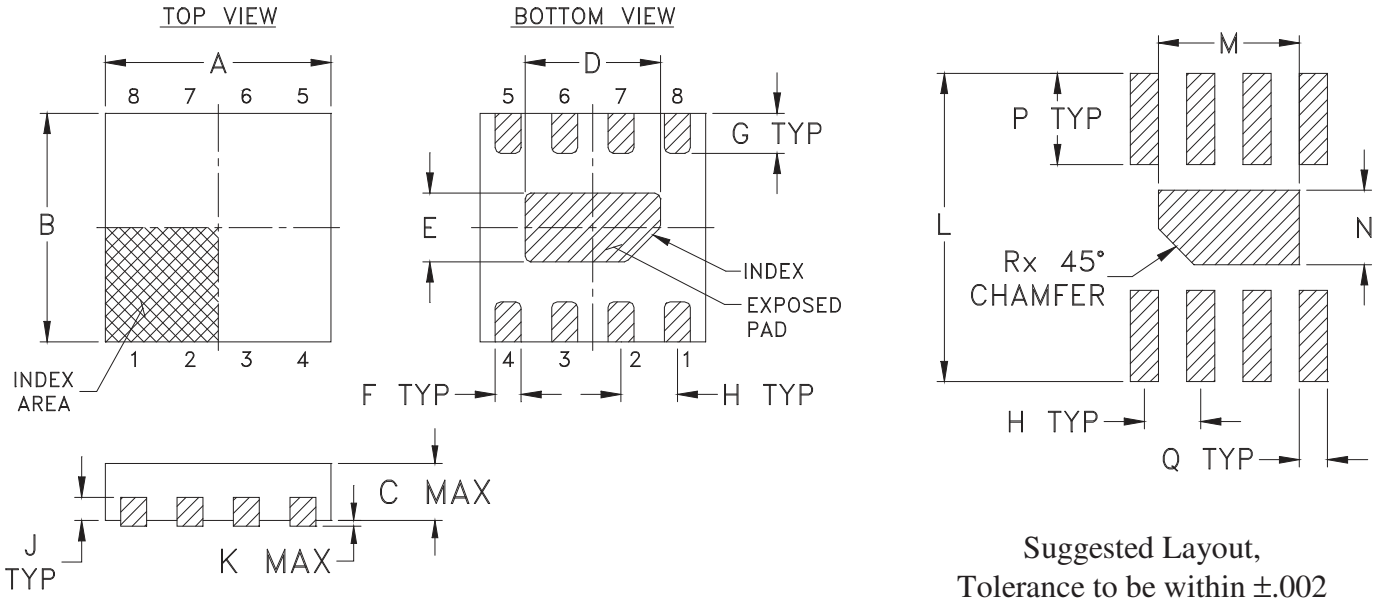


Case Style MC

MC1631-1

Outline Dimensions

PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

SE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MC1631-1	.079 (2.00)	.079 (2.00)	.039 (1.00)	.047 (1.20)	.024 (.60)	.009 (.23)	.014 (.35)	.020 (.50)	.008 (.20)	.002 (.05)	.106 (2.70)	.049 (1.25)	.026 (.65)	.031 (.80)

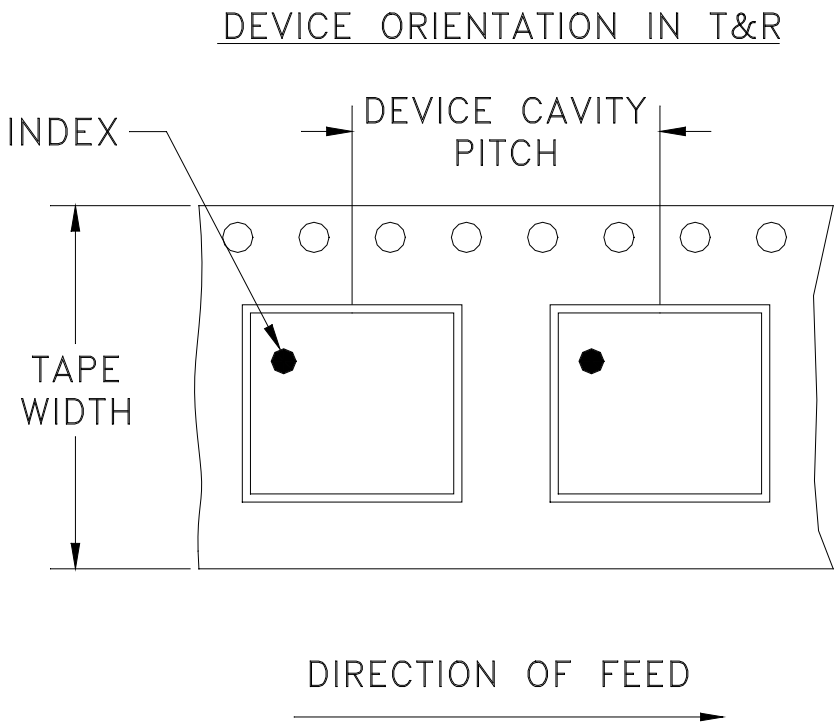
CASE #.	Q	R	WT, GRAM
MC1631-1	.010 (.25)	.012 (.30)	.006

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin Plated (See Data sheet).
   All models, (+) suffix.
3. Lead #1 identifier shall be located in the cross-hatched area shown.
   Identifier may be either a molded or marked feature.

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

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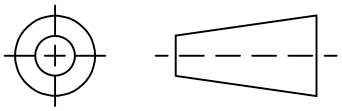
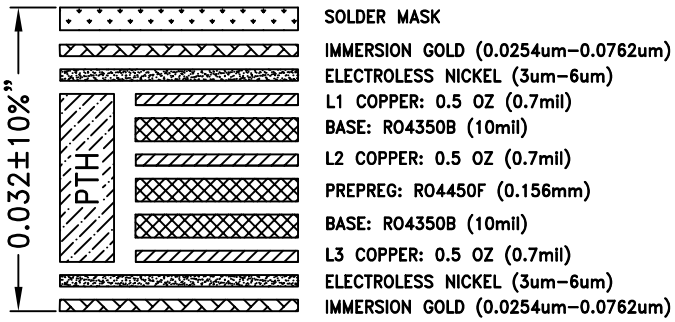
THIRD ANGLE PROJECTION



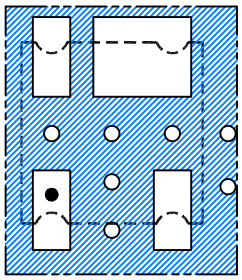
REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-015833	NEW RELEASE	11/23/22	ITG	IL

SUGGESTED MOUNTING CONFIGURATION
FOR MC1631-1 CASE STYLE

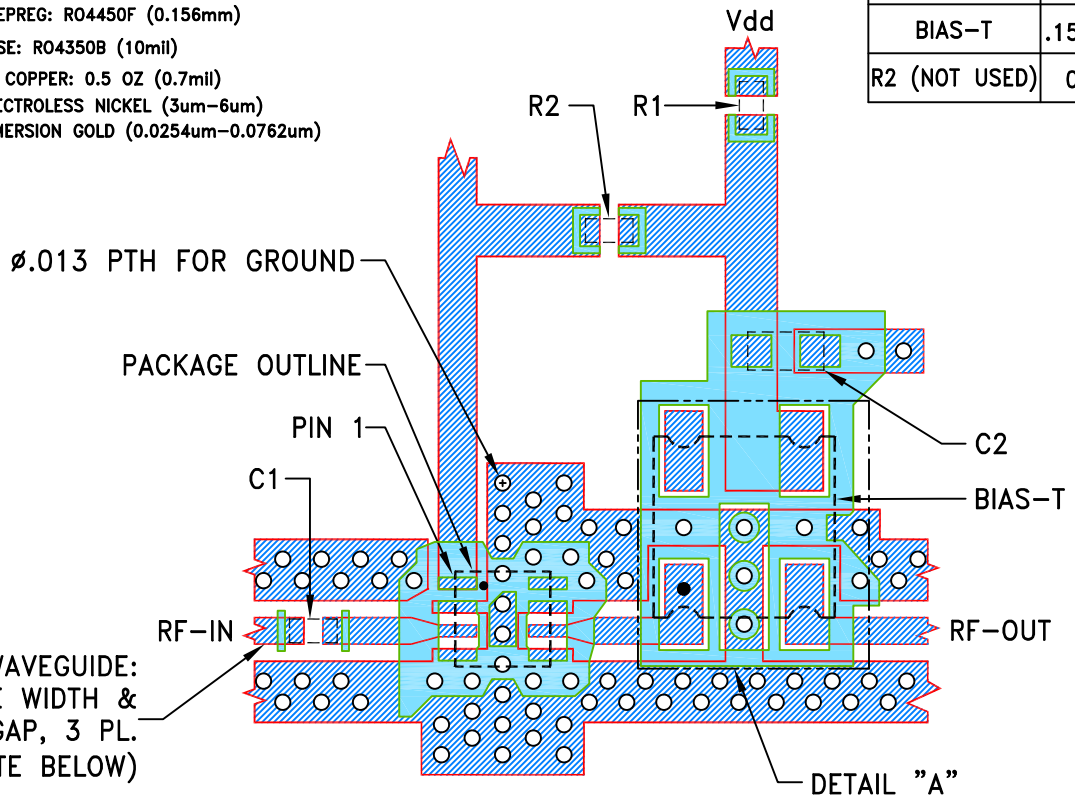
3 LAYER STACK-UP DETAIL



COMPONENT	SIZE
C1	0402
C2	0603
R1	0402
BIAS-T	.15X.15"
R2 (NOT USED)	0402



DETAIL "A"
SCRATCHES IN LAYER 2
UNDER BIAS-T



NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010".
   COPPER: 1/2 OZ. EACH LAYER. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
3. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE, FOR COMPONENT VALUES REFER TO TB-PMA2123LN5E+.
4. LAYER 2 OF PCB IS CONTINUOUS GROUND PLANE EXCEPT SCRATCHES (SEE DETAIL "A").
5. LAYER 3 OF 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	DRAWN	ITG	11/22/22
TOLERANCES ON:	CHECKED	GF	11/22/22
2 PL DECIMALS ±	APPROVED	IL	11/23/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

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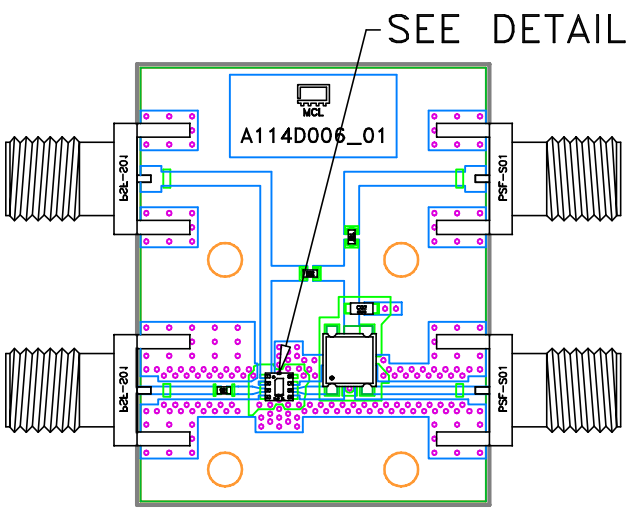
13 Neptune Avenue
Brooklyn NY 11235

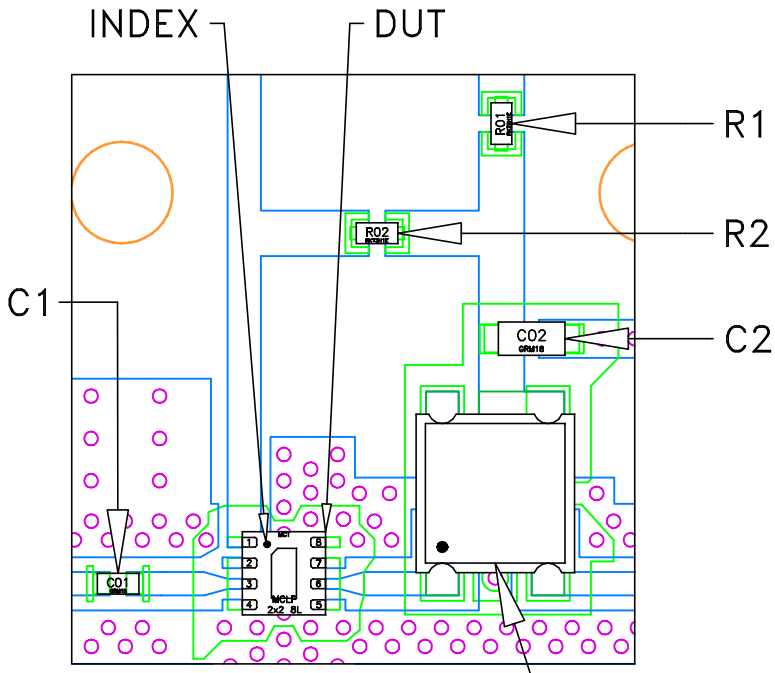
PL, MC1631-1, TB-PMA2123LN5E+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-745	OR

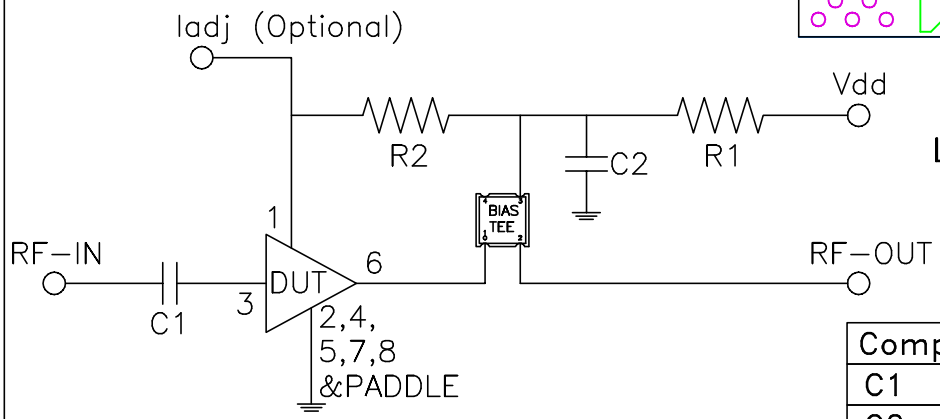
FILE:	SCALE:	SHEET:
98PL745	6:1	1 OF 1

Evaluation Board and Circuit





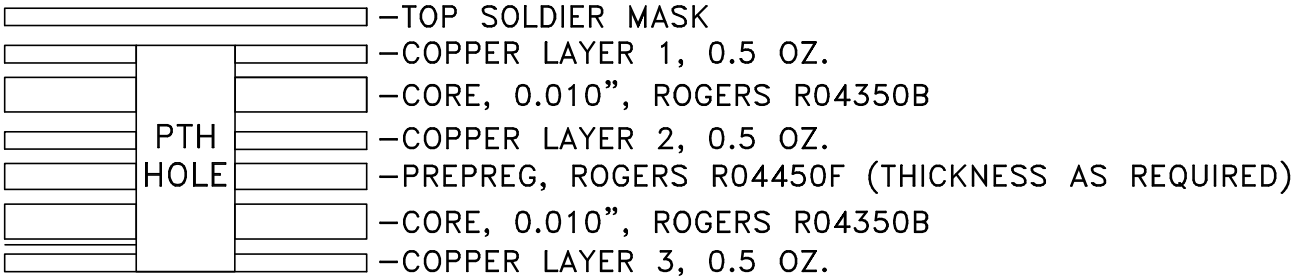
DETAIL "A"
LOCATION OF COMPONENT
ON THE PCB
(SCALE 3:1)



Schematic Diagram

Component	Size	Description
C1	0402	0.1uF
C2	0603	0.01uF
R1	0402	68ohm
BIAS TEE	.15"x.15"	TCBT-123+
R2 (Not used)	0402	For current adjust purpose, refer to datasheet.

STACK-UP DIAGRAM



NOTES:

1. 50 Ohm SMA Female Connectors.
2. PCB Material: Roger R04350B or equivalent, Dielectric constant=3.5, Thickness=0.032 inch

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Environmental Specifications ENV08T1

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 or -45° to 85°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, 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-020, 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	