WIDEBAND, LOW NOISE, POSITIVE GAIN SLOPE

Monolithic Amplifier Die PMA-183PLN-D+

50Ω 6 to 18GHz

THE BIG DEAL

- Wideband, 6 to 18 GHz
- Excellent Noise Figure, 1.3 dB at 15 GHz
- Positive Gain Slope
- High Directivity, 33dB typ.

Generic photo used for illustration purposes only

+RoHS Compliant

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

SEE ORDERING INFORMATION ON THE LAST PAGE

APPLICATIONS

- Instrumentation
- Cellular Infrastructure
- Defense

PRODUCT OVERVIEW

PMA-183PLN-D+ is a PHEMT based wideband MMIC Amplifier die with an unique combination of high gain with positive gain slope, high directivity and low noise figure, making it ideal for receiver applications. This design operates on a single 2.6V voltage supply, and it is well matched for 50Ω.

KEY FEATURES

Feature	Advantages
High Directivity	With active directivity of 33 dB, PMA-183PLN-D+ is an excellent choice for buffering broadband circuits, eliminating the need for an expensive isolator in most cases.
Positive Gain Slope Vs. Frequency • +0.13 dB/GHz (6-15 GHz) • +0.73 dB/GHz (15-18 GHz)	Useful for compensating negative gain slope of most wideband microwave components and eliminating the need for equalization.
Excellent Noise Figure up to 18 GHz • 1.3 dB Typ. at 18 GHz	Enables lower system noise figure performance
Unpackaged Die	Enables user to integrate it directly into hybrids. Allows for high layout density of circuit boards, while minimizing effects of parasitics.

REV. OR
ECO-009250
PMA-183PLN-D+
GY/CP/PS
210812

Monolithic Amplifier Die PMA-183PLN-D+

ELECTRICAL SPECIFICATIONS AT 25°C

Parameter[1]	Condition (MHz)	Vs=2.6V Min.	Typ.	Max.	Units
Frequency range		6		18	GHz
Gain	6000		26.3		dB
	10000		26.3		
	15000		27.5		
	18000		29.7		
Input Return loss	6000		10.2		dB
	10000		14.8		
	15000		12.7		
	18000		9.1		
Output Return loss	6000		11.4		dB
	10000		15.3		
	15000		16.9		
	18000		25.0		
Directivity	6000 - 18000		33		dB
Output Power at 1dB Compression	6000		9.8		dBm
	10000		8.6		
	15000		9.6		
	18000		10.2		
Output IP3	6000		25.0		dBm
	10000		22.0		
	15000		22.4		
	18000		21.9		
Noise Figure	6000		1.4		dB
	10000		1.3		
	15000		1.2		
	18000		1.3		
Device Operating Voltage (V_s)		2.3	2.6	2.9	V
Device Operating Current (I_s)			57.2	72	mA
Device Current Variation vs. Temperature[2]			7.69		µA/°C
Device Current Variation vs. Voltage[3]			0.04		mA/mV
Thermal Resistance, junction-to-ground lead			49.5		°C/W

1. Die is packaged in 3.5x2.5mm 16L MCLP and soldered on Mini-Circuits Characterization Test Board TB-PMA-183PLN+. See Characterization Test & Application Circuit (Fig. 1)
2. Device Current Variation vs. Temperature= (Current in mA at 85°C - Current in mA at -45°C)/130°C
3. Device Current Variation vs. Voltage = (Current in mA at 2.9V – Current in mA at 2.3V)/(2.9V- 2.3V)*1000 mA/mV)

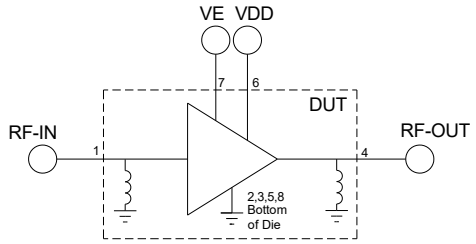
MAXIMUM RATINGS

Parameter	Ratings
Operating temperature (ground lead)	-40°C to 85°C
Junction Temperature	131°C
Total power dissipation	0.9W
Input power (CW)	+24 dBm (5 minute Max) +13 dBm (Continuous)
DC voltage at Vs	4V
DC voltage at RF-Ports(RF-IN &RF-OUT)	4V

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

Monolithic Amplifier Die PMA-183PLN-D+

SIMPLIFIED SCHEMATIC



PAD DESCRIPTION

Function	Pad Number	Description (See Figure 1)
RF-IN	1	RF Input Pad
RF-OUT	4	RF Output Pad
VDD	6	Supply Voltage Pad, Connects to Vs via R1
VE	7	Enable Voltage Pad, Connects to VDD via R2
GROUND	2, 3, 5, 8 & Bottom of Die	Connects to Ground

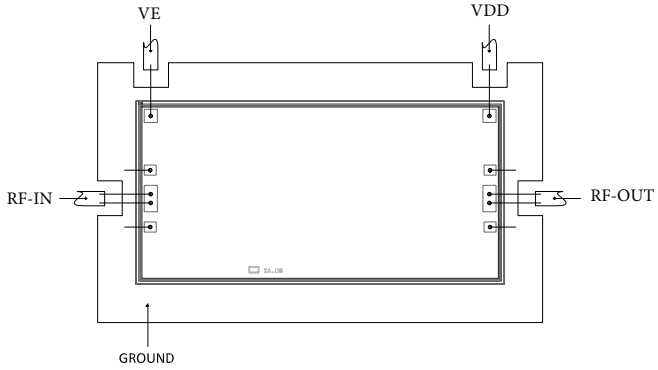
BONDING PAD POSITION

Dimension in µm

L1	L2	L3	H1	H2	H3	H4	H5
75.0	1867.0	1942.0	301.0	451.0	601.0	887.0	965.0

Thickness	Die size	Pad size 1 & 4	Pad size 2, 3, 5 & 8	Pad size 6 & 7
100	1942 x 965	69 x 139	63 x 54	69 x 69

ASSEMBLY DRAWING



CHARACTERIZATION, APPLICATION CIRCUIT

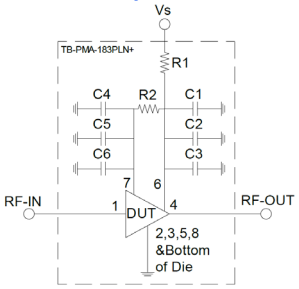


Fig 1. Characterization, Application Circuit & Assembly Drawing

Note: This block diagram is used for characterization. (DUT was packaged in 3.5x2.5mm, 16L MCLP and soldered on Mini-Circuits Characterization Test Board TB-PMA-183PLN+). Gain, Return loss, Output power at 1dB compression (P1dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Condition:

1. Gain and Return Loss: Pin = -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -10 dBm/tone at output.

Component	Size	Value	Part Number	Manufacturer
C1, C4	0805	0.33uF	TAJR334K035RNJ	AVX
C2, C5	0603	1000pF	GCM1885C1H102JA16D	Murata
C3, C6	0402	100pF	GRM1555C1H101JA01D	Murata
R1	0603	10Ohm	ESR03EZPF10R0	Rohm Semiconductor
R2	0402	180 Ohm	RK73H1ETTP1800F	Koa Speer

ASSEMBLY PROCEDURE

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
   MMIC PHEMT amplifier dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
3. Die Handling and Attachment
   Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom design collet. The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1 LMISR4 or equivalents. Apply sufficent epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. It is recommended to use anti-static die pick up tools only.
4. Wire Bonding
   Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.

Monolithic Amplifier Die PMA-183PLN-D+

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set with and without port extension(.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* Medium†, Partial wafer: KGD*<936 Full Wafer †Available upon request contact sales representative Refer to AN-60-067	Model No. PMA-183PLN-DG+ PMA-183PLN-DP+ PMA-183PLN-DF+
Environmental Ratings	ENV80	

*Known Good Die ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ESD RATING**

Human Body Model (HBM): Class 1C (1000 to <2000V) in accordance with ANSI/ESD STM 5.1 - 2001

**Tested in industry standard MCLP 3.5 x 2.5 mm, 16 lead package

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.

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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 = 2.3V, Id = 48mA @ 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)
6000	25.01	64.83	10.16	10.82	43.60	1.01	22.88	8.90	1.45
6200	24.91	63.72	10.26	11.18	39.32	1.01	24.28	8.84	1.45
6400	24.83	62.65	10.41	11.58	35.55	1.02	23.70	8.88	1.48
6600	24.78	61.11	10.76	11.94	30.46	1.02	23.93	8.84	1.41
6800	24.72	62.21	11.21	12.38	35.51	1.01	22.62	8.78	1.44
7000	24.67	60.35	11.85	12.82	29.44	1.01	22.89	8.75	1.43
7200	24.62	60.79	12.42	13.26	31.75	1.01	22.79	8.63	1.39
7400	24.58	59.72	13.11	13.61	28.68	1.00	22.74	8.51	1.42
7600	24.52	58.84	13.80	13.98	26.50	1.00	23.89	8.47	1.42
7800	24.45	58.45	14.42	14.27	25.91	1.00	24.08	8.43	1.40
8000	24.37	58.32	14.96	14.47	26.04	1.00	23.37	8.43	1.38
8200	24.27	58.37	15.31	14.58	26.67	0.99	22.63	8.08	1.44
8400	24.19	57.81	15.64	14.63	25.43	0.99	23.19	7.99	1.34
8600	24.08	57.72	15.72	14.62	25.57	0.99	23.13	7.74	1.41
8800	23.99	57.98	15.80	14.60	26.75	0.99	24.31	7.50	1.41
9000	23.90	57.48	15.68	14.72	25.60	0.99	26.37	7.28	1.44
9200	23.79	57.90	15.26	14.78	27.19	0.99	26.88	7.11	1.49
9400	23.71	57.18	15.08	15.00	25.34	1.00	25.73	6.81	1.50
9600	23.64	57.58	14.55	15.34	26.79	1.00	23.81	6.73	1.45
9800	23.59	57.32	14.14	15.89	26.22	1.01	22.36	6.56	1.52
10000	23.55	57.59	13.71	16.50	27.24	1.02	22.10	6.64	1.52
10200	23.52	57.25	13.24	17.34	26.32	1.03	22.95	6.68	1.55
10400	23.50	57.18	12.90	18.37	26.25	1.04	24.49	6.70	1.49
10600	23.50	57.23	12.63	19.67	26.48	1.04	23.74	6.83	1.53
10800	23.53	56.96	12.60	20.94	25.76	1.05	24.17	6.95	1.46
11000	23.56	57.43	12.52	22.43	27.23	1.05	23.58	6.99	1.45
11200	23.60	56.89	12.45	23.90	25.55	1.05	24.49	6.98	1.41
11400	23.65	57.80	12.83	24.91	28.43	1.05	24.41	7.02	1.39
11600	23.72	57.57	12.98	25.61	27.62	1.05	23.40	7.03	1.33
11800	23.79	57.47	13.40	25.90	27.31	1.04	24.33	7.10	1.34
12000	23.88	57.74	13.83	26.32	28.12	1.04	25.17	7.37	1.34
12200	23.96	58.03	14.25	26.92	28.98	1.04	24.91	7.40	1.29
12400	24.05	58.78	14.48	27.50	31.44	1.03	24.32	7.56	1.39
12600	24.14	58.35	14.62	28.15	29.72	1.03	24.50	7.68	1.26
12800	24.22	58.53	14.36	28.31	30.04	1.04	25.32	7.81	1.28
13000	24.30	58.99	14.00	27.42	31.36	1.04	26.12	7.86	1.34
13200	24.38	58.69	13.50	25.53	29.89	1.04	25.77	7.83	1.33
13400	24.46	59.34	12.99	23.70	31.76	1.05	24.71	7.90	1.32
13600	24.53	59.36	12.30	21.86	31.28	1.05	24.84	7.91	1.32
13800	24.61	59.68	11.87	20.44	31.92	1.06	23.16	7.99	1.32
14000	24.67	60.43	11.29	19.15	34.17	1.06	22.81	7.87	1.28
14200	24.76	59.97	11.14	18.12	31.94	1.06	24.24	8.01	1.31
14400	24.87	60.21	10.95	17.39	32.26	1.06	24.70	8.00	1.34
14600	25.01	59.69	10.92	16.91	29.93	1.06	24.82	8.32	1.39
14800	25.15	59.24	11.01	16.62	28.03	1.06	25.39	8.24	1.39
15000	25.31	59.48	11.12	16.50	28.40	1.05	24.23	8.44	1.35
15200	25.50	58.41	11.50	16.62	24.83	1.05	23.55	8.51	1.35
15400	25.69	58.21	11.80	16.94	23.95	1.04	23.05	8.76	1.37
15600	25.88	57.07	12.42	17.51	20.85	1.04	23.86	8.80	1.42
15800	26.09	57.31	13.17	18.10	21.20	1.03	25.34	8.77	1.38
16000	26.31	57.60	13.69	18.97	21.59	1.03	25.75	8.81	1.41
16200	26.54	57.69	14.54	19.80	21.50	1.02	23.85	8.94	1.46
16400	26.79	57.11	15.22	20.69	19.72	1.02	23.10	8.86	1.44
16600	27.06	57.14	15.96	21.54	19.36	1.02	21.94	9.05	1.38
16800	27.35	57.08	16.28	22.44	18.68	1.02	22.90	9.24	1.44
17000	27.64	57.65	15.96	23.90	19.33	1.02	22.42	9.02	1.44
17200	27.91	58.11	14.71	25.94	19.68	1.03	24.14	9.45	1.41
17400	28.14	58.29	13.13	27.49	19.37	1.05	25.17	9.60	1.45
17600	28.30	57.55	11.58	29.81	17.16	1.07	24.41	9.32	1.41
17800	28.37	58.04	9.92	26.77	17.44	1.10	25.11	9.41	1.47
18000	28.32	57.97	8.29	22.62	16.52	1.14	23.69	9.35	1.44

Note: Test data of Die packaged in industry standard 3.5x2.5mm 16L MCLP package

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 = 2.6V, Id = 60mA @ 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)
6000	26.03	65.57	11.13	10.84	43.17	0.99	25.19	9.90	1.39
6200	25.96	64.45	11.13	11.23	38.67	1.00	24.73	9.89	1.35
6400	25.91	63.33	11.20	11.65	34.59	1.00	26.35	9.89	1.35
6600	25.90	62.45	11.47	12.02	31.79	1.01	26.05	9.98	1.38
6800	25.87	62.05	11.87	12.47	30.93	1.01	26.85	9.96	1.34
7000	25.86	61.57	12.48	12.93	29.89	1.00	27.65	9.98	1.33
7200	25.85	61.40	13.01	13.38	29.83	1.00	26.71	9.92	1.34
7400	25.85	60.73	13.70	13.74	28.03	1.00	26.63	9.91	1.31
7600	25.84	59.70	14.38	14.09	25.32	1.00	25.13	9.95	1.26
7800	25.81	59.04	15.02	14.37	23.82	0.99	25.31	9.86	1.30
8000	25.77	58.78	15.60	14.56	23.46	0.99	25.28	9.91	1.33
8200	25.72	58.40	15.99	14.65	22.76	0.99	24.16	9.71	1.29
8400	25.68	57.90	16.36	14.68	21.74	0.99	23.35	9.66	1.28
8600	25.61	58.19	16.46	14.65	22.75	0.99	23.12	9.45	1.31
8800	25.55	57.92	16.56	14.61	22.28	0.99	23.49	9.24	1.26
9000	25.49	57.97	16.43	14.72	22.64	0.99	23.59	9.05	1.37
9200	25.42	57.92	15.94	14.77	22.72	0.99	23.09	8.78	1.33
9400	25.36	57.85	15.70	14.98	22.72	0.99	22.80	8.52	1.36
9600	25.31	57.76	15.04	15.31	22.64	1.00	22.70	8.45	1.35
9800	25.27	57.04	14.50	15.86	20.98	1.01	25.08	8.40	1.40
10000	25.25	57.13	13.94	16.51	21.28	1.02	24.17	8.38	1.44
10200	25.23	56.97	13.32	17.40	20.97	1.03	24.53	8.44	1.42
10400	25.23	57.38	12.85	18.52	22.02	1.04	21.77	8.45	1.40
10600	25.23	57.33	12.48	19.97	21.93	1.05	23.93	8.59	1.39
10800	25.26	57.38	12.35	21.47	22.09	1.05	23.90	8.59	1.38
11000	25.30	57.34	12.18	23.28	21.96	1.06	24.57	8.62	1.32
11200	25.34	57.30	12.04	25.12	21.79	1.06	24.06	8.63	1.27
11400	25.40	57.70	12.32	26.31	22.84	1.06	25.77	8.67	1.31
11600	25.47	57.67	12.41	26.86	22.71	1.06	24.26	8.67	1.25
11800	25.55	57.63	12.76	26.76	22.54	1.05	22.62	8.72	1.24
12000	25.64	58.07	13.12	26.80	23.65	1.05	21.85	8.89	1.25
12200	25.73	57.67	13.50	27.04	22.51	1.04	22.22	8.93	1.23
12400	25.82	58.25	13.72	27.43	23.92	1.04	23.30	9.08	1.15
12600	25.92	57.90	13.85	28.06	22.81	1.04	23.65	9.19	1.22
12800	26.01	58.39	13.61	28.61	23.90	1.04	23.89	9.33	1.22
13000	26.10	57.90	13.31	28.05	22.35	1.04	22.52	9.38	1.19
13200	26.18	59.80	12.84	26.27	27.41	1.05	22.68	9.25	1.25
13400	26.26	58.41	12.37	24.41	23.00	1.05	21.60	9.44	1.22
13600	26.34	59.40	11.72	22.42	25.32	1.06	21.64	9.45	1.20
13800	26.42	58.94	11.31	20.88	23.60	1.07	21.32	9.41	1.23
14000	26.48	59.98	10.78	19.49	26.08	1.07	22.66	9.40	1.21
14200	26.57	60.45	10.63	18.31	27.13	1.07	22.14	9.43	1.20
14400	26.67	60.32	10.46	17.50	26.27	1.07	21.84	9.54	1.25
14600	26.81	60.23	10.44	16.94	25.61	1.07	22.29	9.71	1.29
14800	26.95	60.36	10.55	16.58	25.67	1.06	23.97	9.66	1.22
15000	27.11	59.19	10.68	16.40	22.10	1.06	24.79	9.82	1.30
15200	27.29	58.42	11.07	16.47	20.05	1.05	24.32	9.92	1.26
15400	27.46	58.08	11.38	16.75	19.07	1.05	22.27	10.10	1.22
15600	27.64	57.89	12.01	17.28	18.57	1.04	22.20	10.25	1.25
15800	27.84	58.00	12.75	17.85	18.65	1.04	21.85	10.08	1.30
16000	28.04	57.69	13.28	18.71	17.79	1.03	22.23	9.98	1.27
16200	28.24	58.15	14.09	19.51	18.54	1.03	22.99	10.22	1.36
16400	28.48	57.80	14.64	20.37	17.49	1.02	22.68	10.09	1.34
16600	28.72	57.74	15.18	21.15	17.02	1.02	21.22	10.18	1.30
16800	28.98	57.96	15.17	21.97	17.01	1.02	22.86	10.43	1.36
17000	29.22	58.32	14.59	23.25	17.21	1.03	23.50	10.23	1.37
17200	29.44	58.55	13.29	24.85	17.12	1.04	23.90	10.57	1.36
17400	29.59	59.36	11.76	25.65	18.16	1.06	23.54	10.84	1.38
17600	29.67	59.24	10.37	26.79	17.40	1.09	23.63	10.47	1.37
17800	29.63	59.86	8.93	24.72	18.05	1.12	22.58	10.57	1.40
18000	29.46	60.02	7.50	21.54	17.69	1.17	21.95	10.53	1.37

Note: Test data of Die packaged in industry standard 3.5x2.5mm 16L MCLP package

Typical Performance Data

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

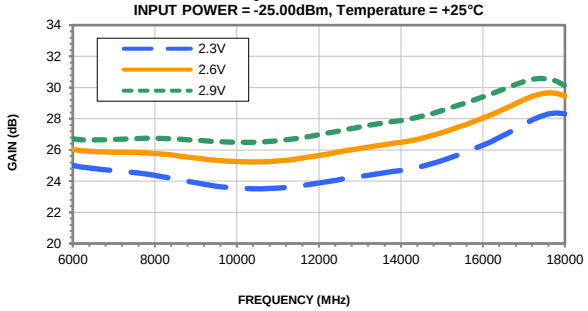
TEST CONDITIONS: Vd = 2.9V, Icc = 73mA @ Temperature = +25°C

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)
6000	26.70	66.84	12.23	10.87	47.15	0.97	24.53	10.57	1.31
6200	26.66	65.35	12.13	11.26	40.30	0.98	25.67	10.60	1.30
6400	26.63	64.53	12.10	11.69	37.13	0.99	25.41	10.70	1.26
6600	26.64	62.92	12.30	12.08	31.25	0.99	26.78	10.76	1.37
6800	26.64	61.63	12.63	12.54	27.32	1.00	26.15	10.76	1.32
7000	26.66	61.74	13.21	13.02	28.09	1.00	26.38	10.80	1.32
7200	26.68	60.63	13.70	13.47	25.01	1.00	25.53	10.79	1.29
7400	26.72	60.47	14.39	13.83	24.81	0.99	25.21	10.80	1.27
7600	26.74	60.02	15.07	14.18	23.83	0.99	23.87	10.89	1.21
7800	26.75	59.59	15.72	14.45	22.91	0.99	23.28	10.81	1.22
8000	26.75	59.45	16.34	14.64	22.78	0.99	23.83	10.89	1.24
8200	26.73	58.59	16.74	14.70	20.80	0.99	23.79	10.75	1.21
8400	26.72	58.15	17.15	14.73	19.95	0.99	23.36	10.62	1.25
8600	26.68	58.15	17.27	14.69	20.08	0.98	22.77	10.53	1.21
8800	26.66	57.98	17.41	14.64	19.83	0.98	23.18	10.25	1.26
9000	26.62	57.69	17.29	14.72	19.32	0.98	22.80	10.06	1.33
9200	26.58	57.91	16.74	14.76	19.94	0.99	22.23	9.81	1.34
9400	26.55	57.66	16.44	14.95	19.49	0.99	22.83	9.69	1.38
9600	26.52	57.42	15.68	15.28	19.04	0.99	23.48	9.55	1.34
9800	26.50	57.67	15.00	15.84	19.67	1.00	24.19	9.52	1.34
10000	26.49	57.62	14.32	16.48	19.59	1.01	22.78	9.50	1.36
10200	26.49	56.87	13.56	17.40	17.98	1.02	22.61	9.58	1.34
10400	26.49	57.04	12.97	18.56	18.33	1.03	23.26	9.60	1.35
10600	26.51	57.22	12.50	20.10	18.70	1.04	23.66	9.75	1.35
10800	26.55	57.17	12.29	21.78	18.59	1.05	23.38	9.73	1.33
11000	26.59	57.46	12.04	23.85	19.16	1.06	22.01	9.76	1.32
11200	26.64	57.70	11.85	26.00	19.61	1.06	22.71	9.79	1.25
11400	26.71	57.49	12.07	27.39	19.14	1.06	23.10	9.83	1.28
11600	26.79	57.73	12.11	27.77	19.58	1.06	23.07	9.72	1.23
11800	26.87	57.89	12.41	27.25	19.87	1.06	21.36	9.78	1.17
12000	26.97	57.46	12.74	26.97	18.85	1.05	22.76	9.94	1.19
12200	27.07	58.01	13.10	26.90	19.98	1.05	22.50	10.00	1.19
12400	27.17	58.11	13.32	27.13	20.08	1.04	24.24	10.13	1.22
12600	27.28	58.16	13.45	27.70	20.03	1.04	23.55	10.24	1.18
12800	27.38	58.50	13.24	28.36	20.60	1.05	24.17	10.30	1.20
13000	27.47	58.70	12.96	28.10	20.82	1.05	24.25	10.35	1.15
13200	27.56	59.01	12.51	26.56	21.25	1.05	23.28	10.22	1.14
13400	27.65	59.37	12.06	24.73	21.79	1.06	22.17	10.42	1.16
13600	27.73	59.52	11.42	22.71	21.74	1.07	21.32	10.44	1.19
13800	27.82	60.02	11.03	21.09	22.62	1.07	20.54	10.39	1.14
14000	27.89	59.61	10.53	19.61	21.15	1.08	23.60	10.47	1.20
14200	27.98	60.18	10.40	18.38	22.25	1.08	25.10	10.49	1.18
14400	28.08	59.78	10.24	17.50	20.89	1.08	26.33	10.54	1.26
14600	28.22	59.68	10.24	16.88	20.31	1.07	25.08	10.68	1.22
14800	28.36	59.89	10.37	16.48	20.57	1.07	23.40	10.74	1.17
15000	28.52	59.27	10.53	16.27	18.90	1.06	23.65	10.78	1.24
15200	28.69	58.96	10.96	16.31	18.10	1.06	24.75	10.99	1.23
15400	28.87	58.38	11.30	16.58	16.75	1.05	25.87	10.96	1.19
15600	29.03	58.06	11.95	17.10	16.11	1.04	24.21	11.22	1.32
15800	29.21	58.18	12.72	17.67	16.24	1.04	24.35	10.92	1.28
16000	29.39	58.18	13.24	18.51	16.08	1.03	25.71	10.85	1.38
16200	29.58	57.94	14.00	19.31	15.51	1.03	25.32	11.12	1.23
16400	29.78	58.22	14.32	20.14	15.75	1.03	25.22	10.94	1.27
16600	29.99	58.25	14.53	20.90	15.51	1.03	23.67	11.09	1.29
16800	30.20	59.02	14.05	21.65	16.52	1.03	23.43	11.32	1.33
17000	30.39	59.09	13.15	22.82	16.21	1.04	23.53	11.13	1.38
17200	30.53	58.63	11.78	24.10	14.93	1.06	22.52	11.39	1.37
17400	30.59	59.81	10.32	24.53	16.57	1.09	22.71	11.68	1.38
17600	30.55	60.52	9.11	25.06	17.55	1.12	22.52	11.31	1.36
17800	30.40	62.33	7.88	23.33	21.05	1.16	21.73	11.39	1.38
18000	30.12	60.57	6.70	20.69	16.69	1.20	20.99	11.36	1.38

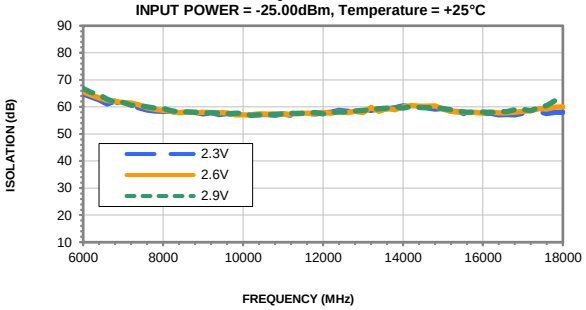
Note: Test data of Die packaged in industry standard 3.5x2.5mm 16L MCLP package

Typical Performance Curves

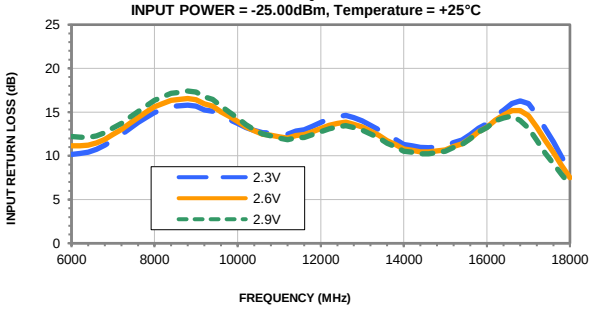
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



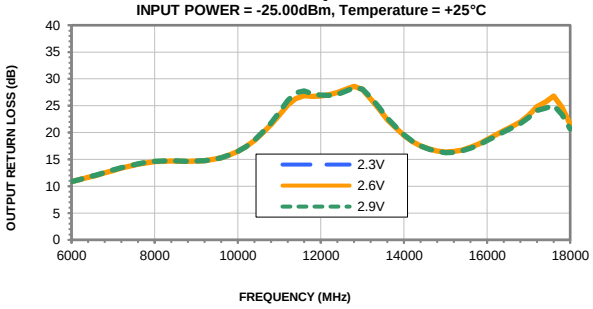
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



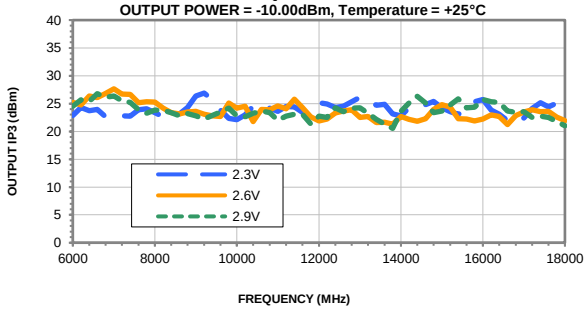
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



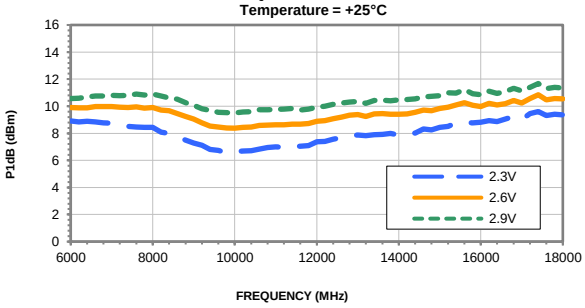
OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



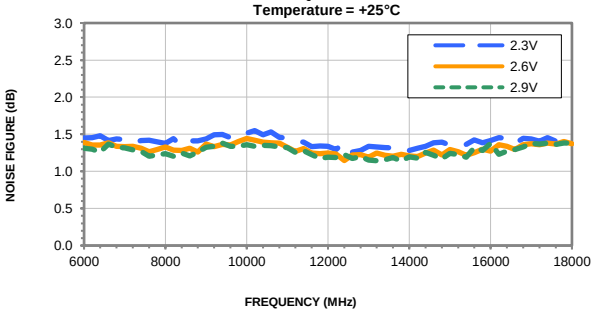
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
OUTPUT POWER = -10.00dBm, Temperature = +25°C



P1dB vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



Note: Test data of Die packaged in industry standard 3.5x2.5mm 16L MCLP package

Mini-Circuits

Environmental Specifications ENV80

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 -40° to 105° C or -55° to 105° C or -45° to 105° C Ambient Environment	Refer to Individual Model Data Sheet
Storage Environment (Die)	-65° to 150°C	Individual Model Data Sheet
Storage Environment(Packaging)	-40° to 70°C and 40 to 60% humidity (In Factory Shipped Package)	