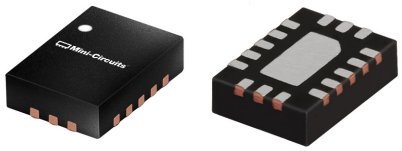
MMIC SURFACE MOUNT

Low Noise Amplifier PMA-163PLN+

50Ω 4 to 16 GHz Wideband Amplifier

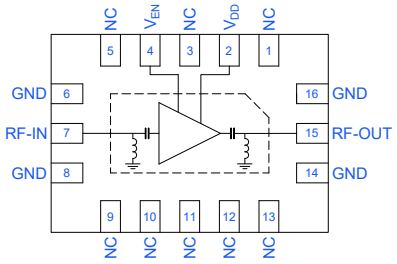
THE BIG DEAL

- Low Noise Figure, Typ. 0.9 dB
- High Gain, Typ. 26.2 dB
- Gain Flatness < ± 0.5 dB
- High OIP3, Typ. +26.5 dBm
- P1dB, Typ. +13.3 dBm
- Single Supply Voltage, 79 mA at +2.6 V
- 3.5 × 2.5 mm 16-Lead QFN-style Package



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM (TOP VIEW)



APPLICATIONS

- Test & Measurement Equipment
- Backhaul Radio Systems
- Satellite Communication
- Radar, EW, and ECM Defense Systems

PRODUCT OVERVIEW

The PMA-163PLN+ is a GaAs pHEMT-based wideband MMIC amplifier delivering low noise, high gain, and excellent gain flatness and linearity for wideband receiver applications. The device is optimized for power-constrained systems drawing only 79 mA at +2.6 V. Operating from 4 to 16 GHz, this amplifier features typical 0.9 dB noise figure, 26.2 dB gain, +13.3 dBm P1dB, and +26.5 dBm OIP3 making it ideal for using as the input stage amplifier in receiver applications. The device is internally DC blocked, and a DC path to ground is present at the RF input and output ports for ESD protection. The PMA-163PLN+ is well-matched to 50Ω and comes in a small, low profile 3.5×2.5 mm QFN-style package for easy integration into dense circuit board layouts.

KEY FEATURES

Feature	Advantages
Low Noise Figure, Typ. 0.9 dB	Enables low system noise figure and maintains receiver sensitivity.
High Dynamic Range • Gain, Typ. 26.2 dB • OIP3, Typ. +26.5 dBm • P1dB, Typ. +13.3 dBm	The MMIC amplifier's unique combination of low noise figure, flat and broadband high gain, and high OIP3 makes it ideal for use as the first stage amplifier in receiver applications. This broadband amplifier is particularly well-suited for applications requiring high performance across multiple frequency bands in a single device, significantly reducing system complexity, size, and power consumption.
Excellent Return Loss, > 15 dB High Isolation, > 55 dB	High isolation, excellent return loss, and robust linearity performance make this amplifier suitable for radar, EW, SATCOM, test equipment, and broadband communication systems operating across C-band through Ku-band frequencies.
Low Voltage and Minimal Power Consumption, 79 mA at +2.6 V	The MMIC amplifier is an excellent choice in applications where low noise, high dynamic range, and exceptional IM3 performance are all critical, while maintaining minimal DC power draw – a key advantage in power-constrained systems such as portable, airborne, or battery-powered equipment.
3.5 × 2.5 mm 16-Lead QFN-Style Package	Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. Industry standard packaging allows for ease of assembly in high volume manufacturing processes.

REV. OR
ECO-029647
PMA-163PLN+
MCL NY
260519

Low Noise Amplifier PMA-163PLN+

50Ω 4 to 16 GHz Wideband Amplifier

ELECTRICAL SPECIFICATIONS[1] AT +25 °C, V_{DD}[2] = +2.6 V AND Zo = 50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	V_{DD}[2] = +2.6 V			V_{DD}[2] = +3 V	Units
		Min.	Typ.	Max.	Typ.	
Frequency Range		4		16		GHz
Gain	4	23.5	26.4		27.3	dB
	8	23.1	26.4		27.4	
	10	23.2	26.2		27.3	
	12	23.2	26.3		27.4	
	16	24.3	27.2		28.2	
Input Return Loss	4		14		14	dB
	8		20		18	
	10		18		17	
	12		20		20	
	16		20		19	
Output Return Loss	4		14		14	dB
	8		18		18	
	10		20		20	
	12		20		20	
	16		20		20	
Isolation	4–16		60.1		59.9	dB
Output Power at 1 dB Compression (P1dB)	4		+11.7		+13.0	dBm
	8		+13.4		+14.8	
	10		+13.3		+14.8	
	12		+12.7		+14.4	
	16		+13.1		+14.5	
Output Power at Saturation (P_{SAT})[3]	4		+12.0		+13.0	dBm
	8		+13.8		+15.0	
	10		+14.4		+15.7	
	12		+14.4		+15.7	
	16		+14.3		+15.6	
Output Third-Order Intercept Point (P_{OUT} = 0 dBm/Tone)	4		+23.6		+25.1	dBm
	8		+28.3		+25.6	
	10		+26.5		+28.9	
	12		+25.2		+28.6	
	16		+24.6		+25.3	
Noise Figure	4		1.1		1.1	dB
	8		0.8		0.8	
	10		0.9		0.8	
	12		0.9		0.9	
	16		0.9		0.9	
Device Operating Voltage (V_{DD})[2]		+2	+2.6	+3	+3	V
Device Operating Current (I_{DD})[4]			79		94	mA
Device Current Variation Vs. Temperature[5]			6.25		-	µA/°C
Device Current Variation Vs. Voltage[6]			47.6		47.6	µA/mV

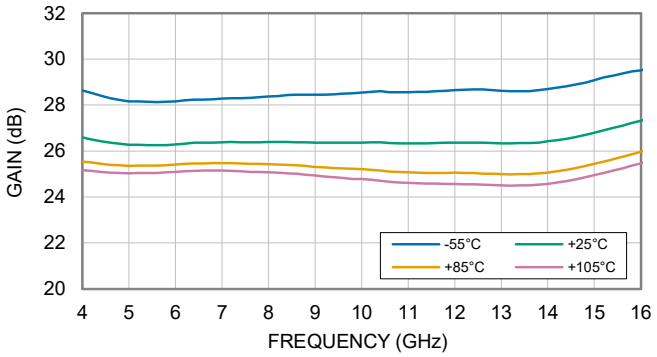
1. Tested on Mini-Circuits Characterization Test Board TB-PMA-163PLNC+. See Figure 2. Board loss de-embedded to the device.
2. $V_{DD} = V_{EN}$. See Figure 2 for recommended schematic.
3. P_{SAT} defined as when the Output Power changes 0.1 dB per 1 dB change in Input Power.
4. Current at P_{IN} = -25 dBm. Increases to 90 mA at P1dB when $V_{DD} = V_{EN}$ = +2.6 V.
5. (Current at +105 °C - Current at -55 °C) / (+105 °C - -55 °C)
6. (Current at +3 V - Current at +2 V) / (+3 V - +2 V)

Low Noise Amplifier PMA-163PLN+

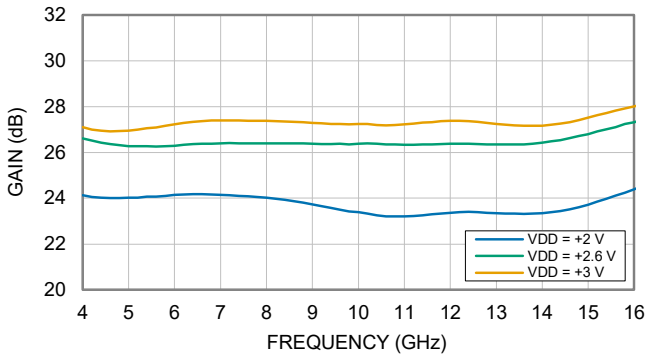
50Ω 4 to 16 GHz Wideband Amplifier

TYPICAL PERFORMANCE GRAPHS

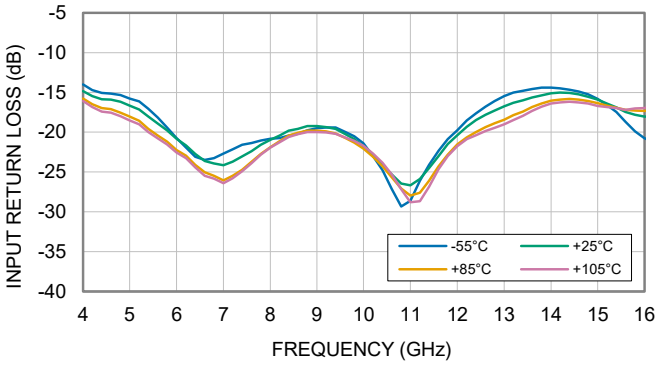
GAIN vs. TEMPERATURE
P_{IN} = -25 dBm, V_{DD} = V_{EN} = +2.6 V



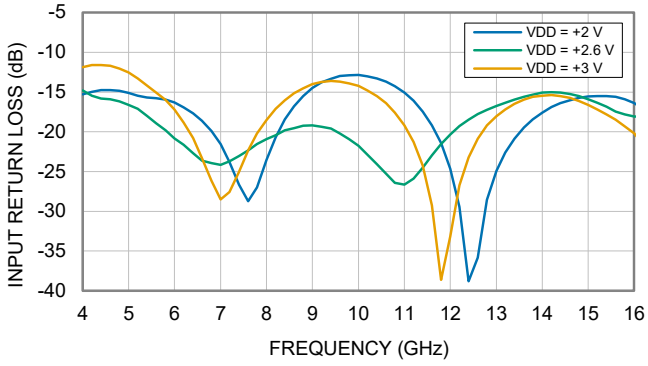
GAIN vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}



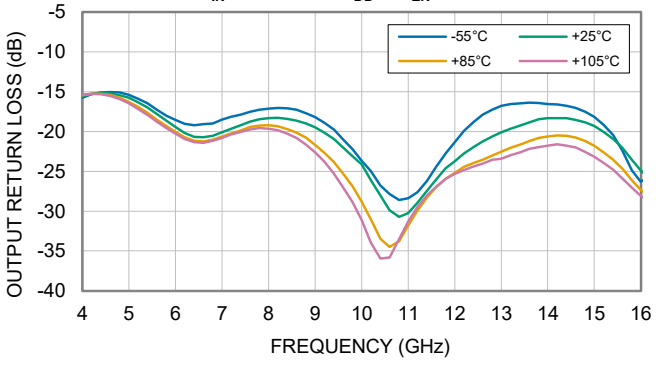
INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25 dBm, V_{DD} = V_{EN} = +2.6 V



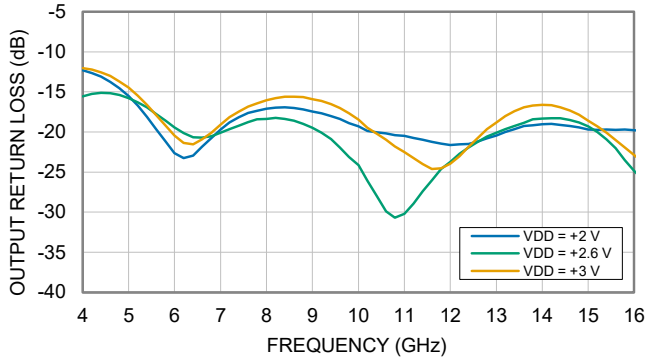
INPUT RETURN LOSS vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}



OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25 dBm, V_{DD} = V_{EN} = +2.6 V



OUTPUT RETURN LOSS vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}

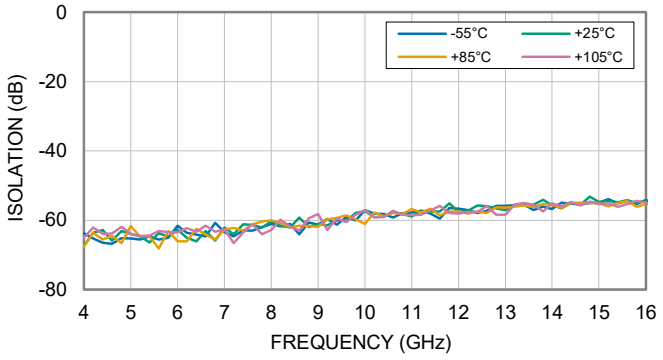


Low Noise Amplifier PMA-163PLN+

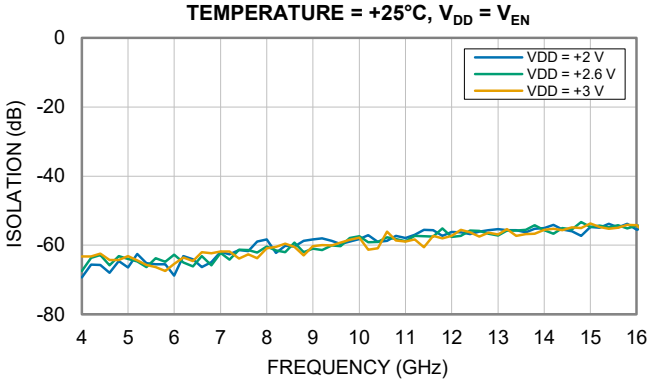
50Ω 4 to 16 GHz Wideband Amplifier

TYPICAL PERFORMANCE GRAPHS

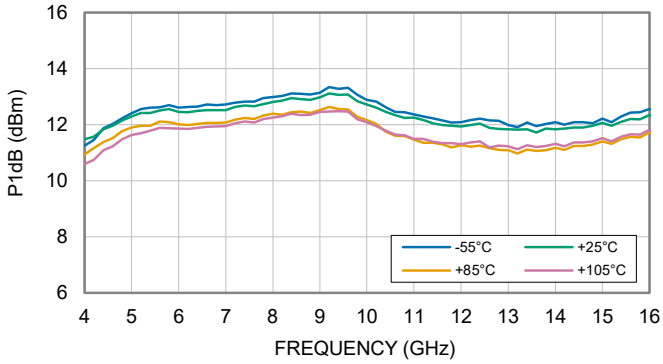
ISOLATION vs. TEMPERATURE
P_{IN} = -25 dBm, V_{DD} = V_{EN} = +2.6 V



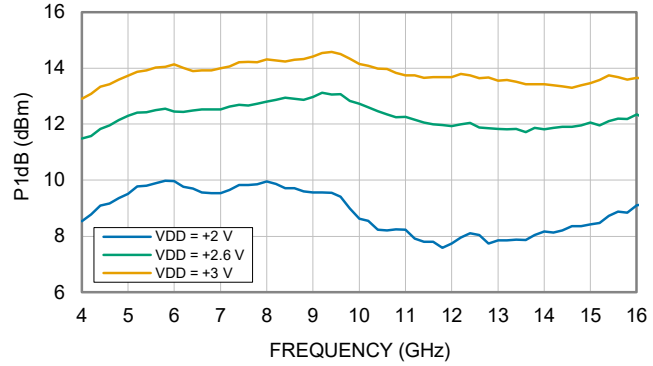
ISOLATION vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}



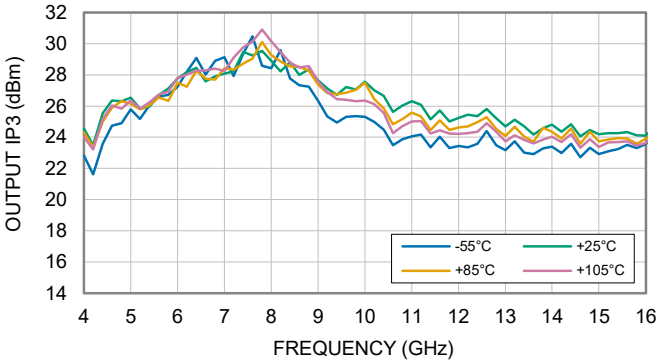
P1dB vs. TEMPERATURE
V_{DD} = V_{EN} = +2.6 V



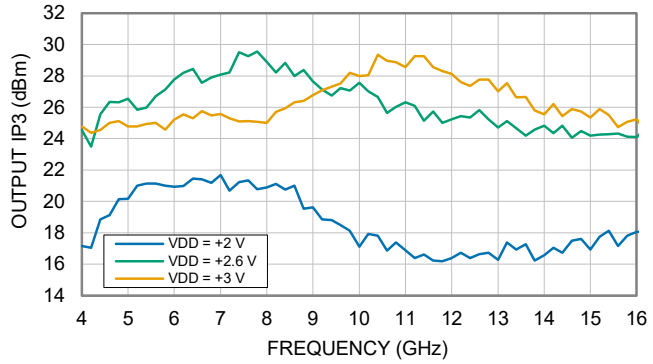
P1dB vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}



OUTPUT IP3 vs. TEMPERATURE
P_{OUT} = 0 dBm/TONE, V_{DD} = V_{EN} = +2.6 V
TONE SPACING = 1 MHz



OUTPUT IP3 vs. DEVICE VOLTAGE
P_{OUT} = 0 dBm/TONE, TEMPERATURE = +25°C
V_{DD} = V_{EN}, TONE SPACING = 1 MHz

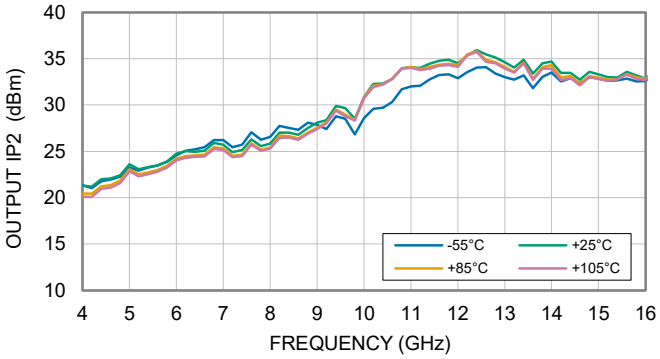


Low Noise Amplifier PMA-163PLN+

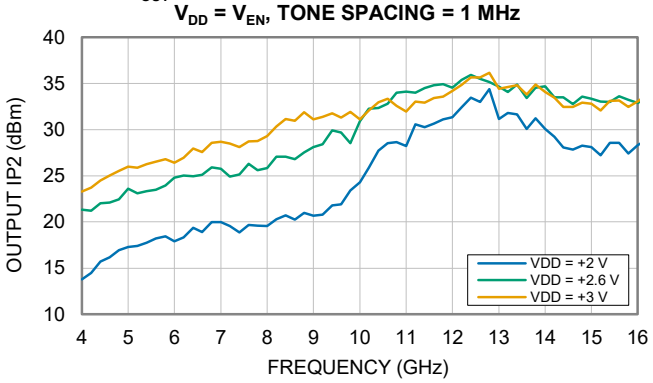
50Ω 4 to 16 GHz Wideband Amplifier

TYPICAL PERFORMANCE GRAPHS

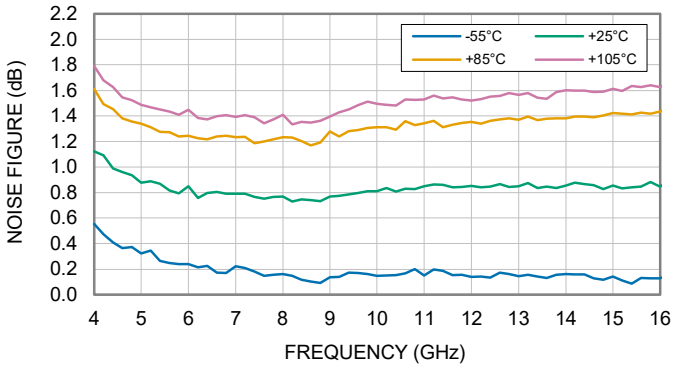
OUTPUT IP2 vs. TEMPERATURE
P_{OUT} = 0 dBm/TONE, V_{DD} = V_{EN} = +2.6 V
TONE SPACING = 1 MHz



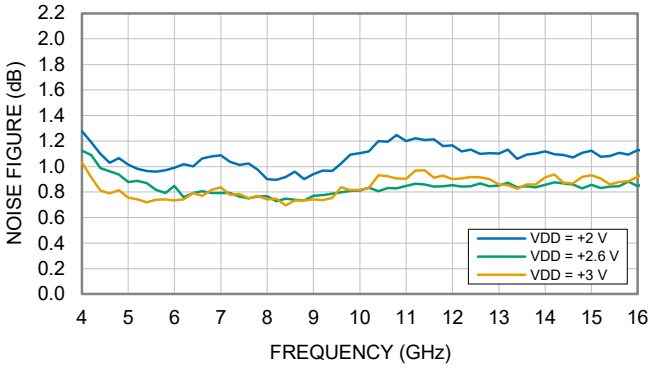
OUTPUT IP2 vs. DEVICE VOLTAGE
P_{OUT} = 0 dBm/TONE, TEMPERATURE = +25°C
V_{DD} = V_{EN}, TONE SPACING = 1 MHz



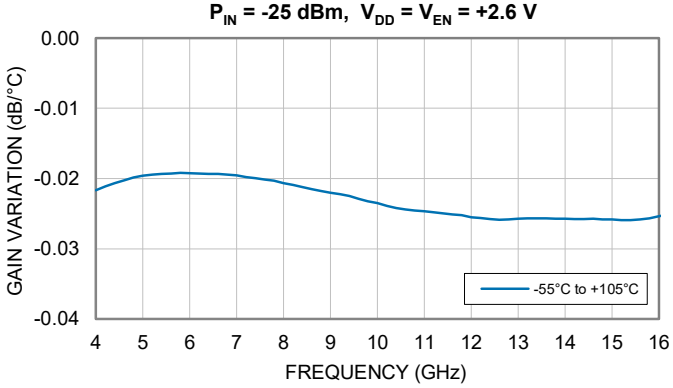
NOISE FIGURE vs. TEMPERATURE
V_{DD} = V_{EN} = +2.6 V



NOISE FIGURE vs. DEVICE VOLTAGE
TEMPERATURE = +25°C, V_{DD} = V_{EN}



GAIN VARIATION vs. TEMPERATURE
P_{IN} = -25 dBm, V_{DD} = V_{EN} = +2.6 V

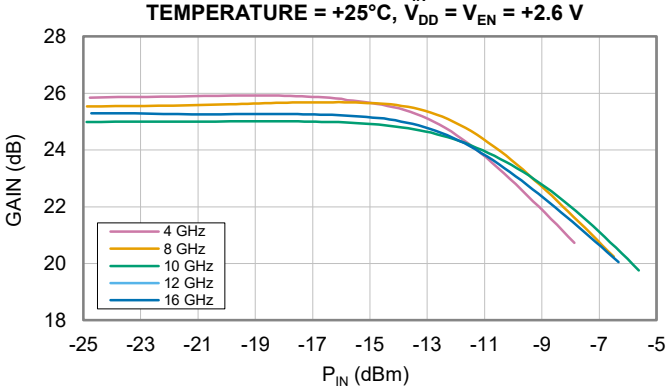


Low Noise Amplifier PMA-163PLN+

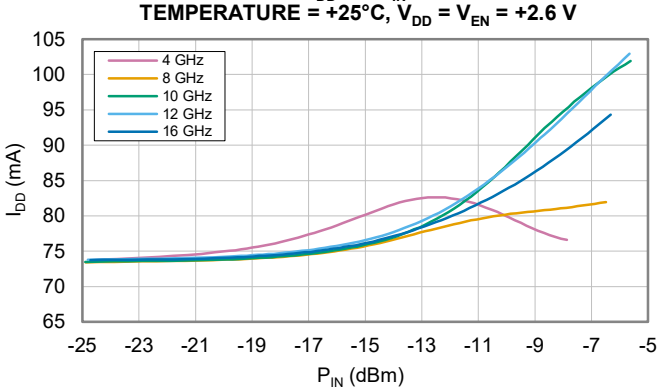
50Ω 4 to 16 GHz Wideband Amplifier

TYPICAL PERFORMANCE GRAPHS

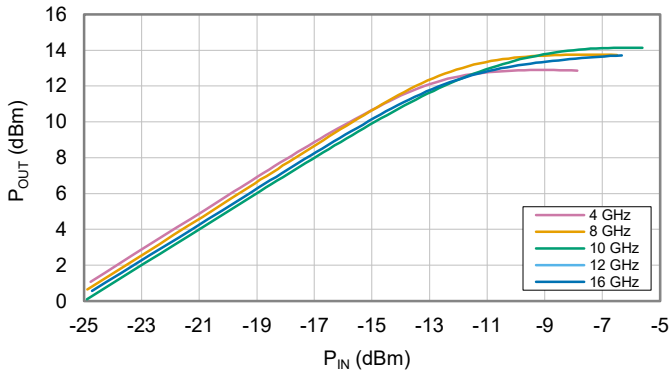
GAIN vs. P_{IN}
TEMPERATURE = +25°C, V_{DD} = V_{EN} = +2.6 V



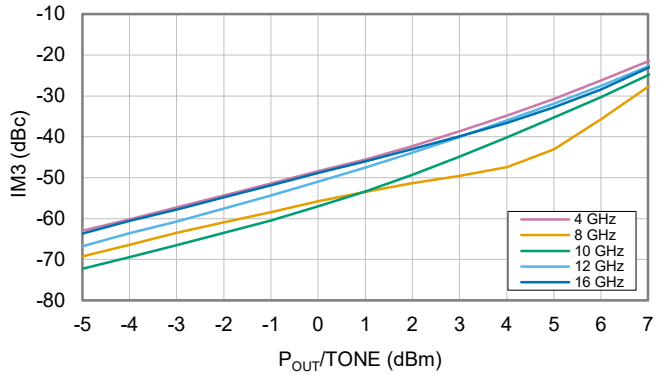
I_{DD} vs. P_{IN}
TEMPERATURE = +25°C, V_{DD} = V_{EN} = +2.6 V



P_{OUT} vs. P_{IN}
TEMPERATURE = +25°C, V_{DD} = V_{EN} = +2.6 V



IM3 vs. P_{OUT}/TONE
TEMPERATURE = +25°C, V_{DD} = V_{EN} = +2.6 V
TONE SPACING = 1 MHz



ABSOLUTE MAXIMUM RATINGS[7]

Parameter	Ratings
Operating Temperature	-55 °C to +105 °C
Storage Temperature	-65 °C to +150 °C
Junction Temperature[8]	+150 °C
Total Power Dissipation	0.99 W
Input Power (CW), V_{DD} = V_{EN} = +2.6 V	+25 dBm
DC Voltage on V_{DD}	+5 V
DC Current I_{DD}	120 mA

7. Permanent damage may occur if any of these limits are exceeded. Maximum ratings are not intended for continuous normal operation.
8. Peak temperature on top of Die.

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{JC})[9]	45.4 °C/W

9. Θ_{JC}= (Hot Spot Temperature on Die - Temperature at Ground Lead)/Dissipated Power

ESD RATING

	Class	Voltage Range	Reference Standard
HBM	1B	500 V to < 1000 V	ANSI/ESDA/JEDEC JS-001-2023
CDM	C3	≥ 1000 V	ANSI/ESDA/JEDEC JS-002-2025

ESD HANDLING PRECAUTION: This device is designed to be Class 1B for HBM. Static charges may easily produce potentials higher than this with improper handling and can discharge into DUT and damage it. As a preventive measure Industry standard ESD handling precautions should be used at all times to protect the device from ESD damage.

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020E/JEDEC J-STD-033C

Low Noise Amplifier PMA-163PLN+

50Ω 4 to 16 GHz Wideband Amplifier

FUNCTIONAL DIAGRAM (TOP VIEW)

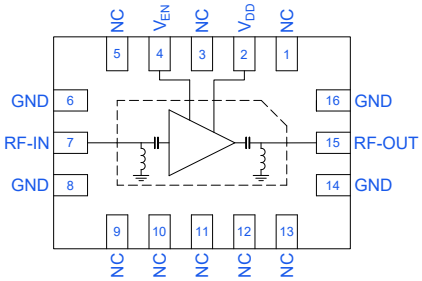


Figure 1. PMA-163PLN+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description (See Figure 2)
RF-IN	7	RF-IN Pad connects to RF-Input port.
RF-OUT	15	RF-OUT Pad connects to RF-Output port.
V_{DD}	2	DC Input Pad connects to voltage input port, V_{DD}.
V_{EN}	4	Enable Voltage Pad connects to V_{DD} via R2.
NC	1, 3, 5, 9-13	Not used internally. Connected to ground on test board.
GND	6, 8, 14, 16 & Paddle	Connects to ground.

CHARACTERIZATION TEST BOARD

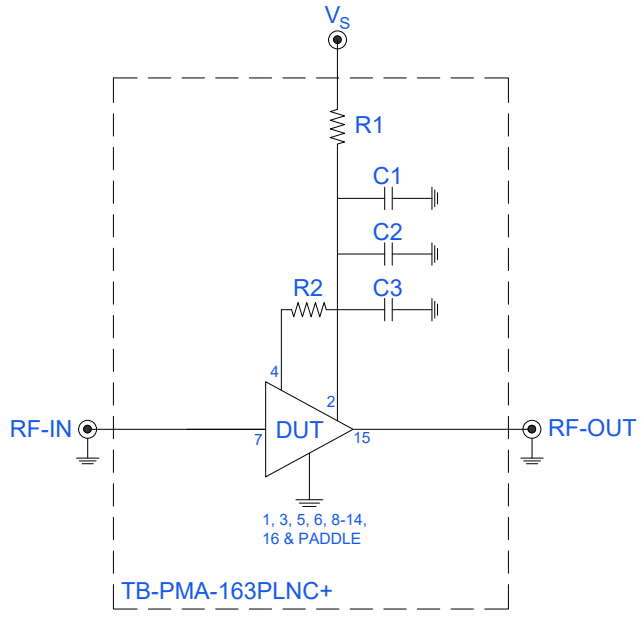


Figure 2. PMA-163PLN+ Characterization and Application Circuit

Electrical Parameters and Conditions
Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3), and Noise Figure measured using N5242A PNA-X microwave network analyzer.

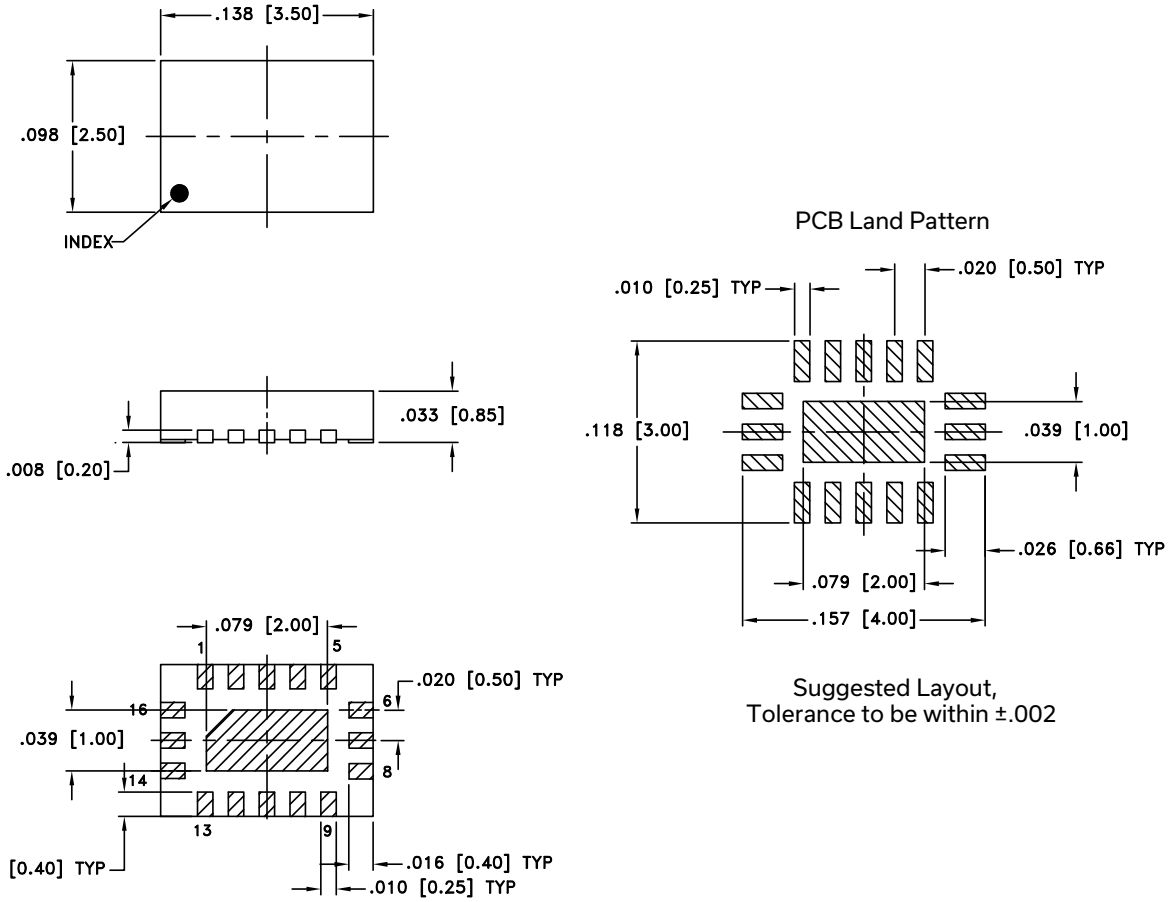
Conditions:
1. Gain and Return Loss: P_{IN} = -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/Tone at output.
3. V_S = +2.6 V

Component	Value	Size	Part Number	Manufacturer
C1	0.33 µF	0805	TAJR334K035RNJ	AVX
C2	1000 pF	0603	GCM1885C1H102JA16D	Murata
C3	100 pF	0402	GRM1555C1H101JA01D	Murata
R1	0 Ohm	0805	PMR10EZPJ000	ROHM Semiconductor
R2	0 Ohm	0402	RK73H1ETTP	KOA Speer

Low Noise Amplifier PMA-163PLN+

50Ω 4 to 16 GHz Wideband Amplifier

CASE STYLE DRAWING



Weight: .03 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005 Inch

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Low Noise Amplifier PMA-163PLN+

50Ω 4 to 16 GHz Wideband Amplifier

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD CLICK HERE

Performance Data	Data Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	JV2579 Plastic package, exposed paddle, lead finish: matte-tin
RoHS Status	Compliant
Tape & Reel **Standard quantities available on reel**	F104 7" reels with 20, 50, 100, 200, 500, 1000 or 2000 devices
Suggested Layout for PCB Design	PL-870
Evaluation Board	TB-PMA-163PLNC+ Gerber File
Environmental Ratings	ENV08T1

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-Circuits' 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