



MMIC SURFACE MOUNT

Low Noise Amplifier **PMA4-8243LN+**

Mini-Circuits

50Ω 8 to 24 GHz Wideband Amplifier

THE BIG DEAL

- Gain, Typ. 23.0 dB
- OIP3, Typ. +23.9 dBm
- Noise Figure, Typ. 2.0 dB
- Self-Biased from +5 V Supply at 72 mA
- Low Power Consumption, 360 mW
- 4x4 mm 24-Lead QFN-Style Package

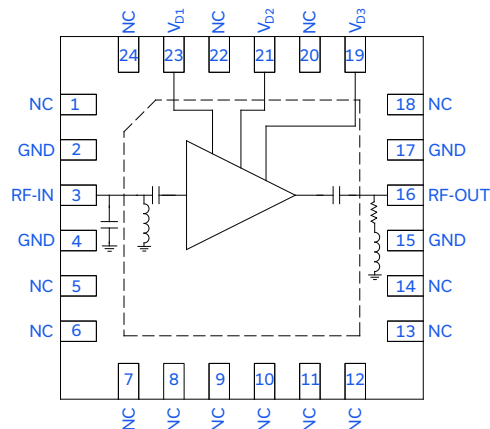


Generic photo used for illustration purposes only

APPLICATIONS

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

FUNCTIONAL DIAGRAM (TOP VIEW)



PRODUCT OVERVIEW

Mini-Circuits' PMA4-8243LN+ is a pHEMT-based low-noise MMIC amplifier with high gain and low power consumption. Operating from 8 to 24 GHz, this amplifier features typical 2.0 dB noise figure, 23.0 dB gain, +12.1 dBm P1dB, and +23.9 dBm OIP3. This device is self-biased, requiring a +5 V supply voltage, is well-matched to 50Ω, and comes in a small 4x4 mm 24-Lead QFN style package for easy integration into dense circuit board layouts.

KEY FEATURES

Feature	Advantages
Noise Figure, Typ. 2.0 dB	A 50Ω matched low noise MMIC device enables low system noise figure performance without the need for complicated discrete-based solutions.
Power Consumption, Typ. +5 V at 72 mA	At only 72 mA, this amplifier is ideal for applications with limited available power or densely packed applications where thermal and power management are critical. Additionally, this model only requires a +5 V supply voltage, eliminating the need for complicated sequencing schemes to accommodate multiple voltages.
4x4 mm 24-Lead QFN-Style Package	Small footprint saves space in dense PCB layouts while providing low inductance, repeatable transitions, and excellent thermal contact with the PCB. Industry standard packaging allows for easy assembly in high volume manufacturing processes.





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ELECTRICAL SPECIFICATIONS¹ AT +25°C, $V_D = +5\text{ V}$, $Z_0 = 50\Omega$ UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		8		24	GHz
Gain	8	22.1	23.6		dB
	10	21.2	22.7		
	15	20.9	23.0		
	20	22.3	24.0		
	24	22.6	24.2		
Input Return Loss	8		16		dB
	10		11		
	15		12		
	20		13		
	24		13		
Output Return Loss	8		10		dB
	10		12		
	15		16		
	20		25		
	24		15		
Isolation	8-24		66		dB
Output Power at 1 dB Compression (P_{1dB})	8		+11.1		dBm
	10		+11.4		
	15		+12.1		
	20		+12.3		
	24		+11.0		
Output Power at Saturation (P_{SAT}) ²	8		+12.0		dBm
	10		+13.7		
	15		+15.2		
	20		+15.1		
	24		+15.1		
Output Third-Order Intercept ($P_{OUT} = -5\text{ dBm/Tone}$)	8		+21.4		dBm
	10		+23.5		
	15		+23.9		
	20		+23.9		
	24		+23.4		
Noise Figure	8		2.0		dB
	10		2.0		
	15		2.0		
	20		2.2		
	24		2.3		
Device Operating Voltage (V_D) ³		+4.0	+5.0		V
Device Operating Current (I_{D1}) ⁴			15.0		mA
Device Operating Current (I_{D2}) ⁴			20.5		mA
Device Operating Current (I_{D3}) ⁴			36.4		mA
DC Current Variation vs. Temperature ⁵			-19.38		$\mu\text{A}/^\circ\text{C}$
DC Current Variation vs. Voltage ⁶			0.019		mA/mV

1. Tested on Mini-Circuits Characterization Test Board TB-PMA48243LNC+. See Figure 2. Board loss de-embedded to the device.

2. Defined as Output Power at which change is 0.1 dB per 1 dB change in input power.

3. $V_D = V_{D1} = V_{D2} = V_{D3}$ 4. Current at $P_{IN} = -25\text{ dBm}$. Total current ($I_{D1} + I_{D2} + I_{D3}$) increases to 77 mA at P1dB when $V_D = +5\text{ V}$

5. (Current at +105°C - Current at -55°C) / (+105°C - -55°C)

6. (Total Current at +5.0 V - Total Current at +4.0 V) / (+5.0 V - +4.0 V)





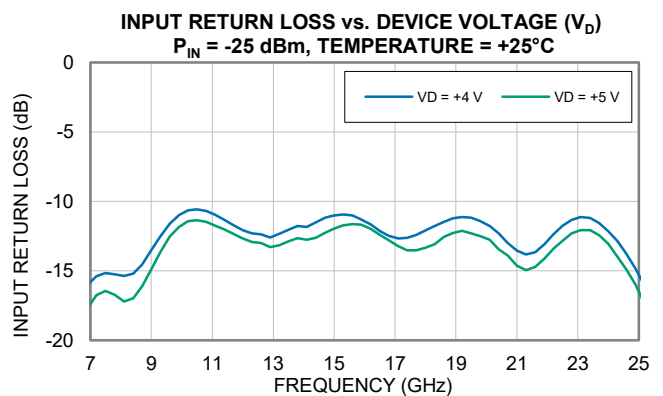
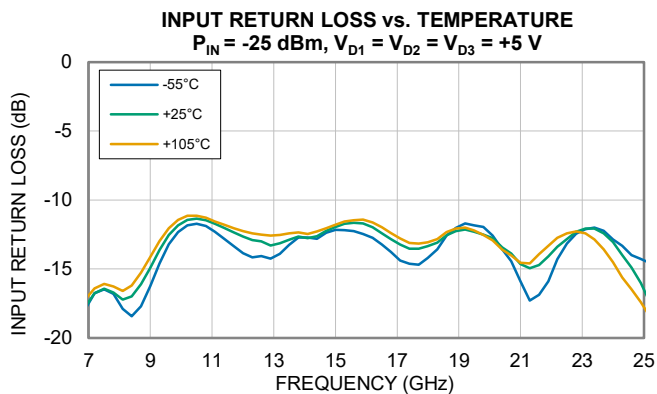
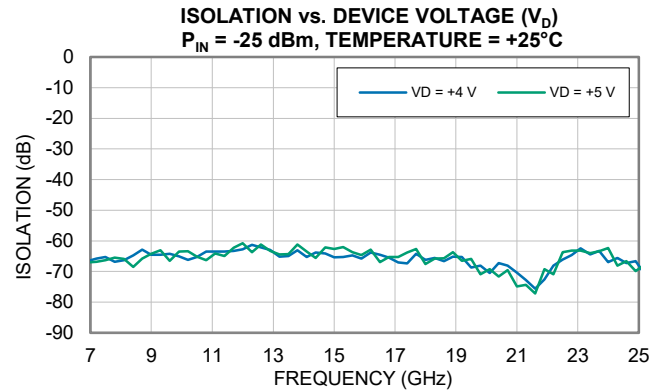
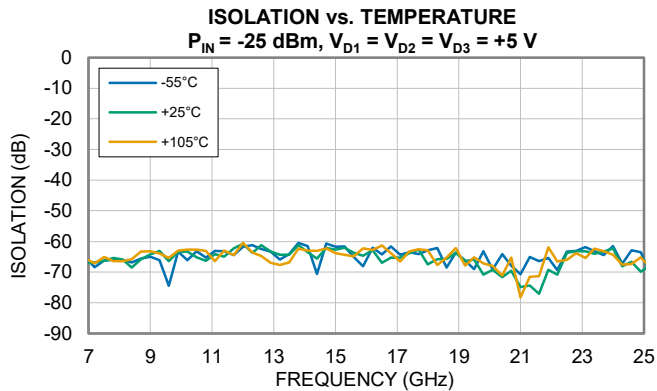
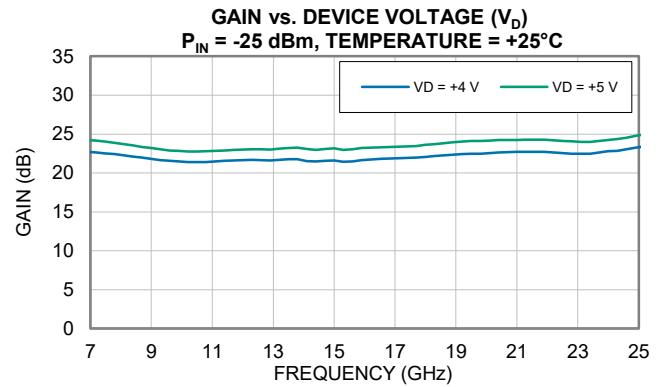
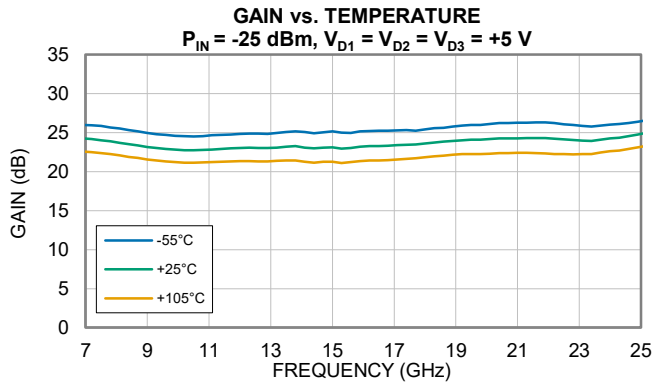
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TYPICAL PERFORMANCE GRAPHS





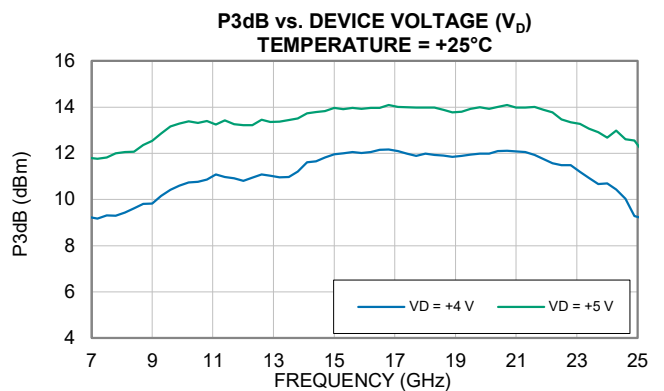
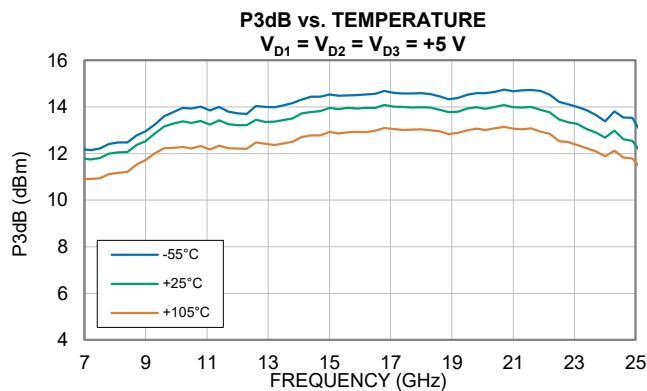
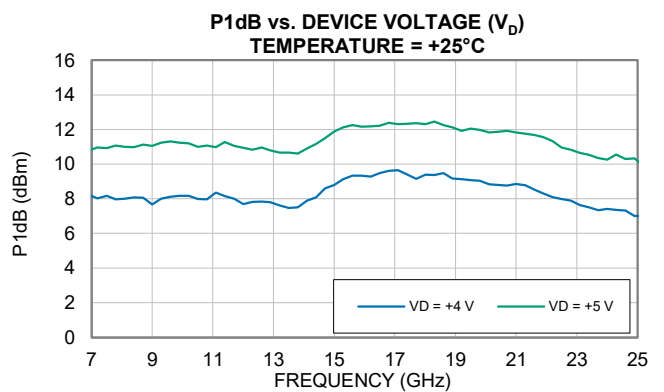
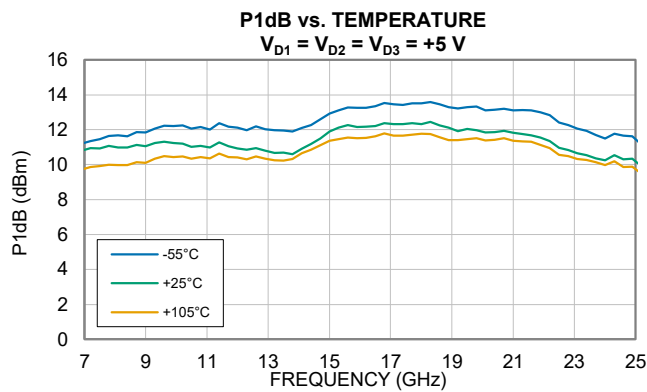
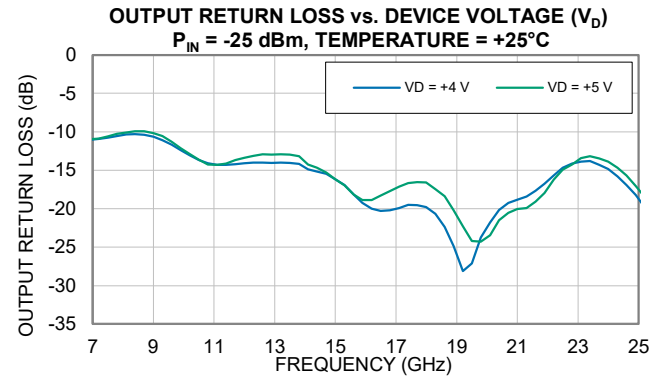
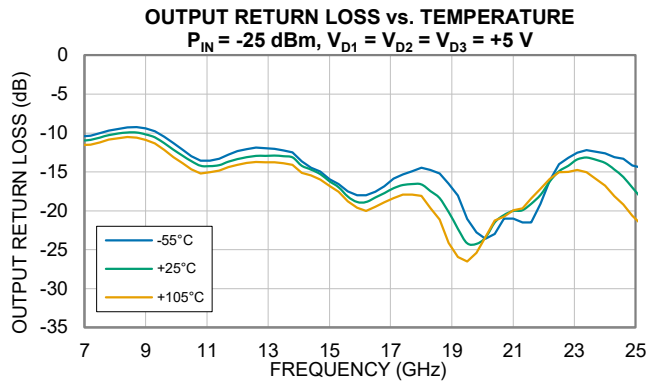
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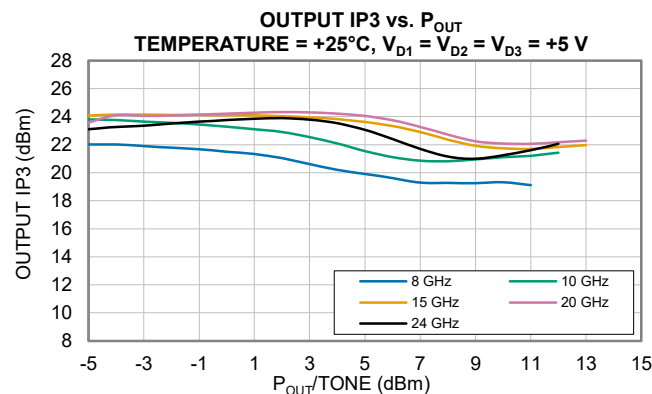
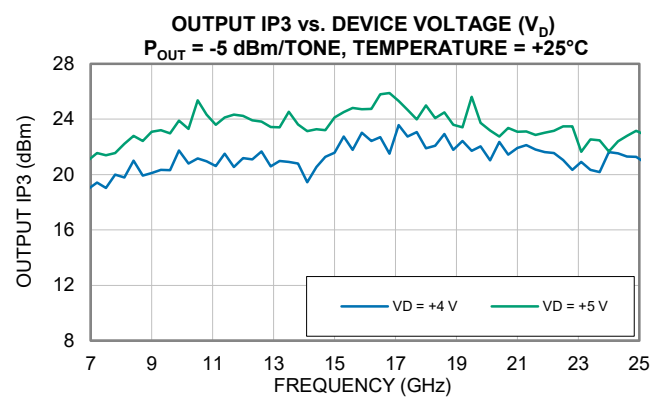
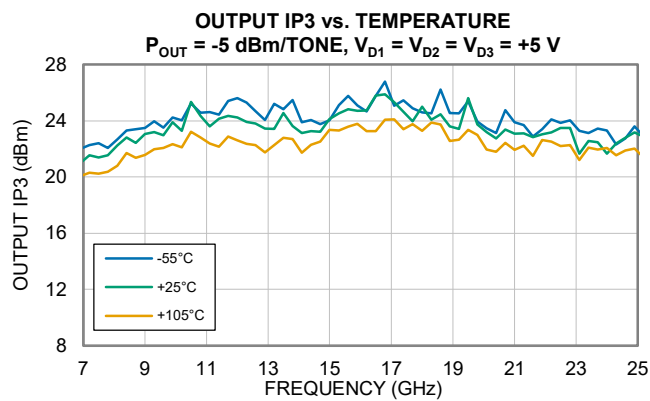
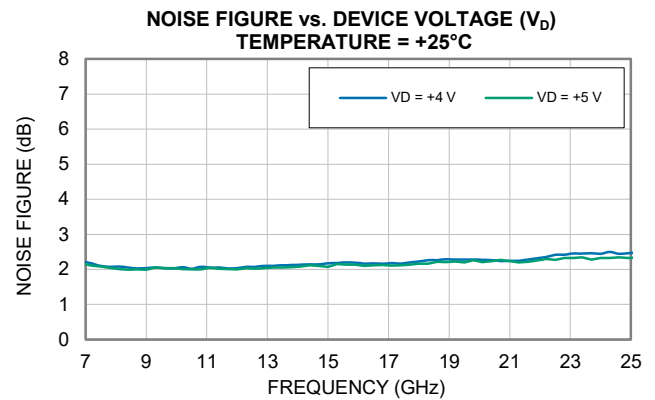
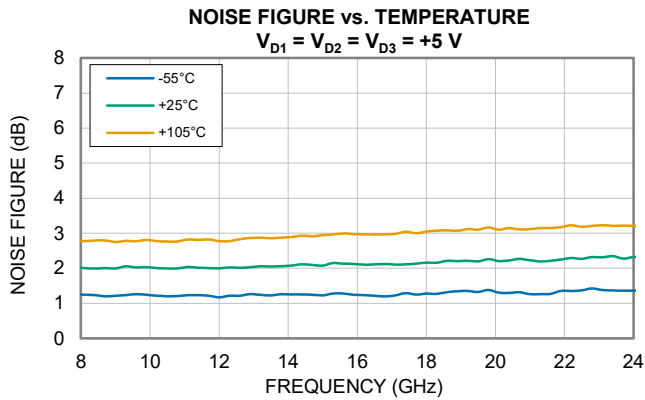
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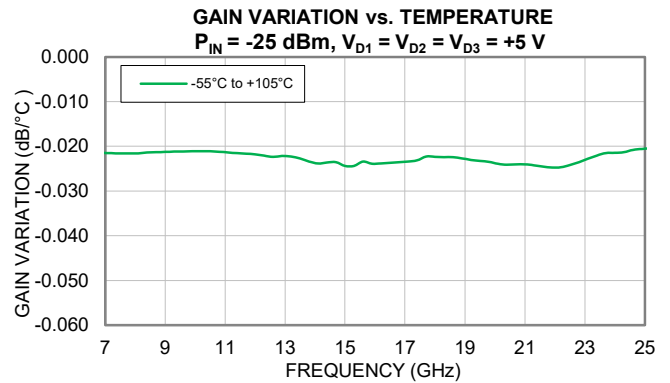
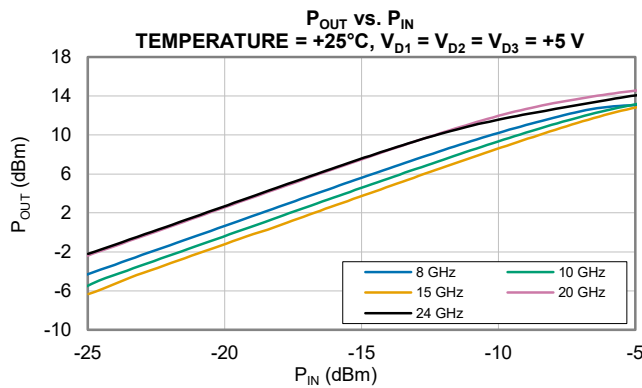
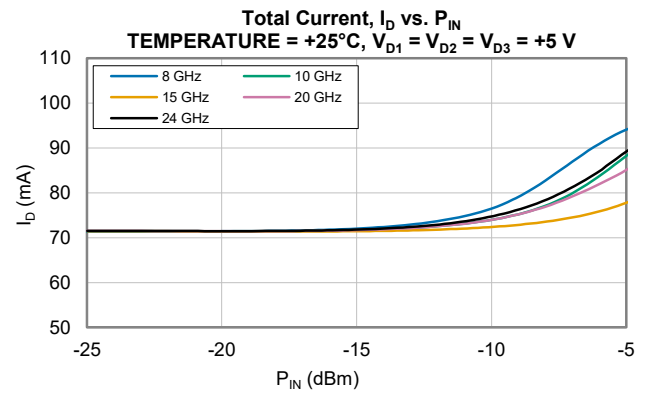
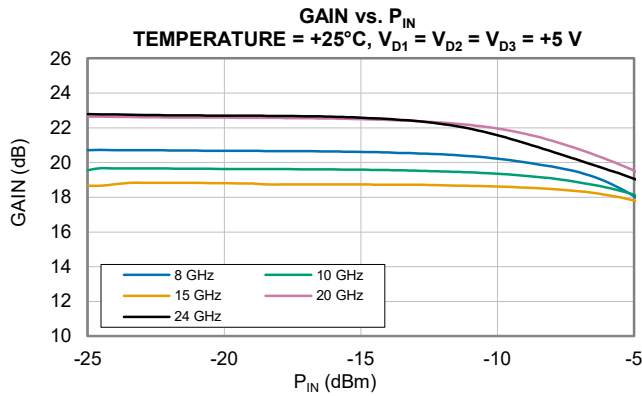
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ABSOLUTE MAXIMUM RATINGS⁷

Parameter	Ratings
Operating Temperature	-55°C to +105°C
Storage Temperature	-65°C to +150°C
Junction Temperature ⁸	+175°C
Total Power Dissipation	0.66 W
Input Power (CW), $V_D = +5$ V	+24 dBm
DC Voltage on RF-OUT	+7.3 V
DC Voltage on RF-IN	+2.4 V
DC Drain Voltage on V_{D1} ⁹	+13.8 V
DC Drain Current on I_{D1}	106 mA
DC Drain Current on I_{D2}	102 mA
DC Drain Current on I_{D3}	97 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.

9. $V_D = V_{D1} = V_{D2} = V_{D3}$

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{JC}) ¹⁰	67.7°C/W

10. 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 < 750 V	ANSI/ESDA/JEDEC JS-001-2023
CDM	C2	750 V to < 1000 V	ANSI/ESDA/JEDEC JS-002-2022



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: MSL3 in accordance with IPC/JEDEC J-STD-020D /JEDEC J-STD-033C





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FUNCTIONAL DIAGRAM (TOP VIEW)

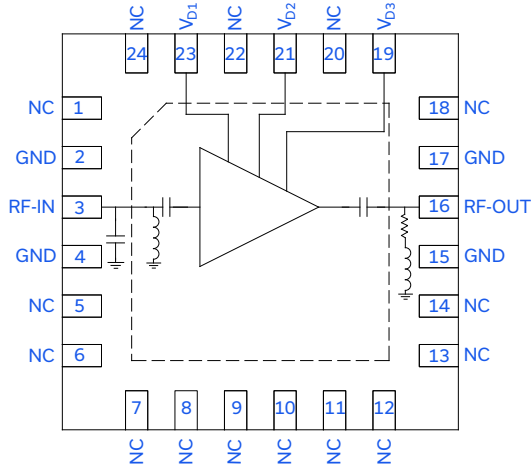


Figure 1. PMA4-8243LN+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description (Refer to Figure 2)
RF-IN	3	RF-IN pad connects to RF-Input port.
RF-OUT	16	RF-OUT pad connects to RF-Output port.
V_{D1}	23	DC Input pad connects to voltage input port, V_{D1} .
V_{D2}	21	DC Input pad connects to voltage input port, V_{D2} .
V_{D3}	19	DC Input pad connects to voltage input port, V_{D3} .
GND	2, 4, 15, 17, & Paddle	Connects to ground.
NC	1, 5-14, 18, 20, 22, & 24	Not used internally. Connected to ground on test board.

CHARACTERIZATION TEST BOARD

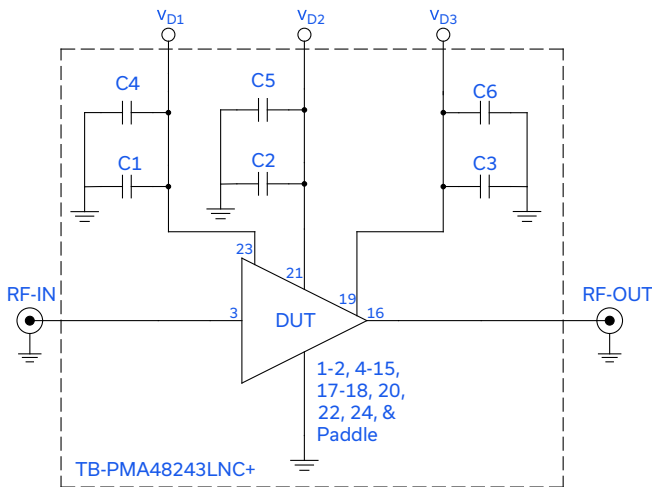


Figure 2. PMA4-8243LN+ Characterization and Application Circuit

Electrical Parameters and Conditions

Gain, Return Loss, Output Power at 1 dB Compression (P_{1dB}), Output IP3 ($OIP3$), and Noise Figure measured using N5247B PNA-X Microwave Network Analyzer.

Conditions:

- Gain and Return Loss: $P_{IN} = -25$ dBm
- Output IP3 ($OIP3$): Two tones, spaced 1 MHz apart, -5 dBm/Tone at output.

Power ON/Power OFF Sequence:

PMA4-8243LN+ is not sensitive to power ON/OFF sequence. V_{D1} , V_{D2} , and V_{D3} can be applied in any order. All three voltage lines may be tied together and applied simultaneously.

Component	Value	Size	Part Number	Manufacturer
C1, C2, C3	100 pF	0402	GRM1555C1H101JA01D	Murata
C4, C5, C6	0.1 μ F	0603	GCM188R71E104JA57D	Murata



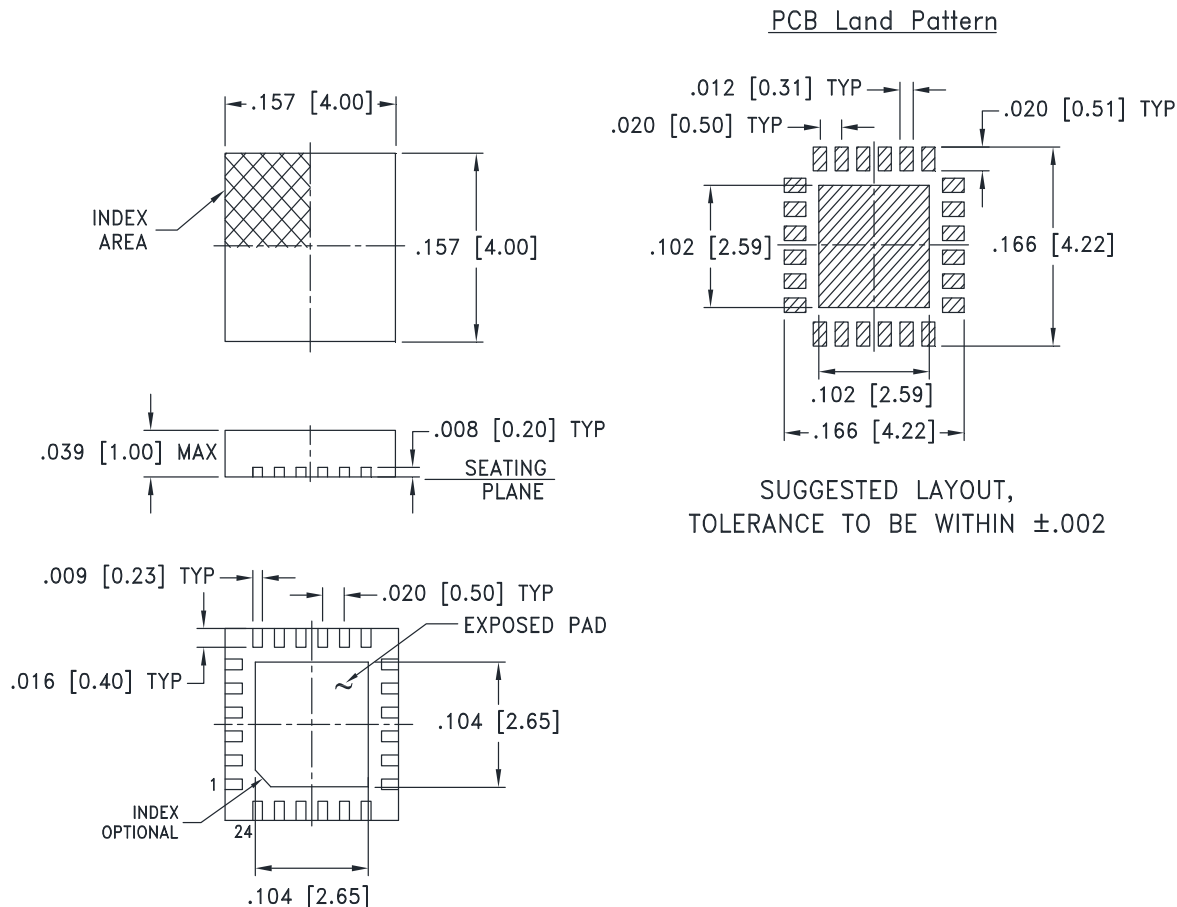
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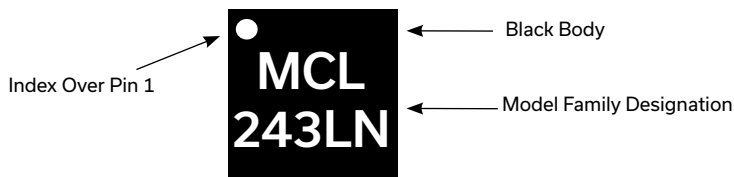
CASE STYLE DRAWING



Weight: .04 Grams

Dimensions are in inches [mm]. Tolerances in inches: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$ inches

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD

[CLICK HERE](#)

Performance Data & Graphs	Data
	Graphs
	S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DG1847 Plastic package, exposed paddle, Lead Finish: Matte-Tin
RoHS Status	Compliant
Tape & Reel	F68
Standard Quantities Available on Reel	7" Reels with 20, 50, 100, 200, 500, or 1000 devices 13" Reels with 2000, 3000, or 4000 devices
Suggested Layout for PCB Design	PL-832
Evaluation Board	TB-PMA48243LNC+
	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-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

