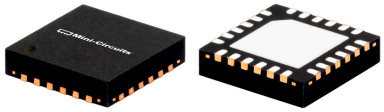
MMIC SURFACE MOUNT

Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

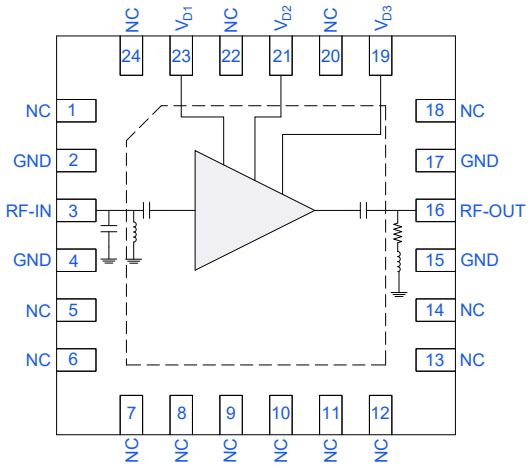
THE BIG DEAL

- High Gain, Typ. 24.6 dB
- High OIP3, Typ. +22.8 dBm
- Low Noise Figure, Typ. 2.5 dB
- Self-Biased with Low Power Consumption, +4 V @ 52.5 mA
- 4x4 mm 24-Lead QFN-Style Package



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- Back Haul Radio Systems
- Satellite Communications
- Test & Measurement Equipment
- Radar, EW, and ECM Defense Systems

PRODUCT OVERVIEW

Mini-Circuits' PMA4-6263LN+ is a pHEMT-based low-noise MMIC amplifier with high gain and low power consumption. Operating from 6 to 26.5 GHz, this amplifier features typical 2.5 dB noise figure, 24.6 dB gain, +9.9 dBm P1dB, and +22.8 dBm OIP3. This device is self-biased, requiring only a single +4 V supply voltage, and is well-matched to 50Ω coming in a small 4x4 mm 24-Lead QFN style package for easy integration into dense circuit board layouts.

KEY FEATURES

Features	Advantages
Low Noise Figure, Typ. 2.5 dB at High Frequency	This low noise MMIC device enables low system noise figure performance without the need for complicated discrete-based solutions.
Low Power Consumption, Typ. +4 V @ 52.5 mA	At only 52.5 mA, this amplifier is ideal for applications with limited available power or densely packed applications where thermal and power management is critical. Additionally, this model only requires a +4 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 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.

Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

ELECTRICAL SPECIFICATIONS[1] AT +25°C, V_{DD} = +4 V, Zo = 50Ω UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		6		26.5	GHz
Gain	6	18.9	21.2		dB
	10	21.1	23.6		
	15	19.6	22.7		
	20	21.2	24.6		
	26.5	21.9	26.2		
Input Return Loss	6		10		dB
	10		12		
	15		11		
	20		11		
	26.5		19		
Output Return Loss	6		12		dB
	10		12		
	15		12		
	20		14		
	26.5		13		
Isolation	6 - 26.5		66.7		dB
Output Power at 1 dB Compression (P1dB)	6		+9.9		dBm
	10		+9.1		
	15		+10.3		
	20		+9.9		
	26.5		+6.7		
Output Power at Saturation (P_{SAT})[2]	6		+11.9		dBm
	10		+14.4		
	15		+14.1		
	20		+14.0		
	26.5		+12.9		
Output Third-Order Intercept (OIP3) (P_{OUT} = -5 dBm/Tone)	6		+18.9		dBm
	10		+21.7		
	15		+22.3		
	20		+22.8		
	26.5		+20.5		
Noise Figure	6		2.7		dB
	10		2.2		
	15		2.4		
	20		2.5		
	26.5		2.6		
Device Operating Voltage (V_{DD})[3]		+3.5	+4.0	+5.0	V
Device Operating Current (I_{D1})[4]			9.5		mA
Device Operating Current (I_{D2})[4]			12.6		mA
Device Operating Current (I_{D3})[4]			30.4		mA
Device Current Variation Vs. Temperature[5]			-45.28		µA/°C
Device Current Variation Vs. Voltage[6]			18.0		µA/mV

1. Tested in Mini-Circuits Characterization Test/Evaluation Board TB-PMA46263LNC+. See Figure 2. De-embedded to the device reference plane.
2. Defined as Output Power at which change is 0.1 dB per 1 dB change in input power.
3. $V_{DD} = V_{D1} = V_{D2} = V_{D3}$
4. Current at P_{IN} = -25 dBm. Total current ($I_{D1} + I_{D2} + I_{D3}$) increases to 65 mA at P1dB when V_{DD} = +4 V.
5. ((Current at +105°C) – (Current at -45°C))/(+150°C)
6. ((Current at +5 V) - (Current at +3.5 V))/(+5 V - +3.5 V)

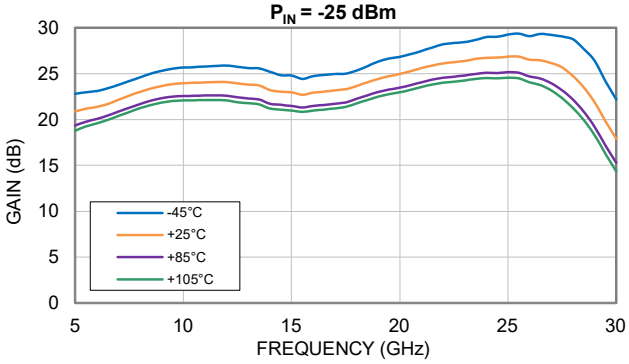
Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

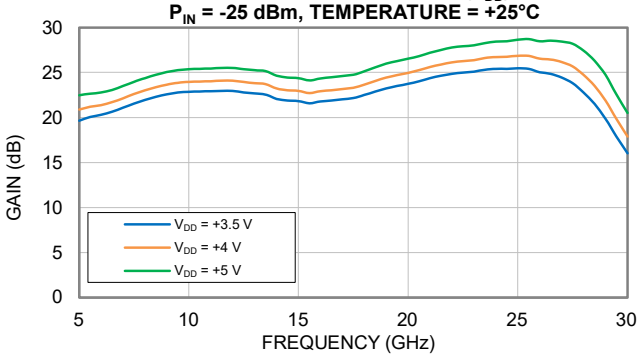
TYPICAL PERFORMANCE GRAPHS

Note: All data taken at nominal condition V_{DD} = +4 V unless noted otherwise.

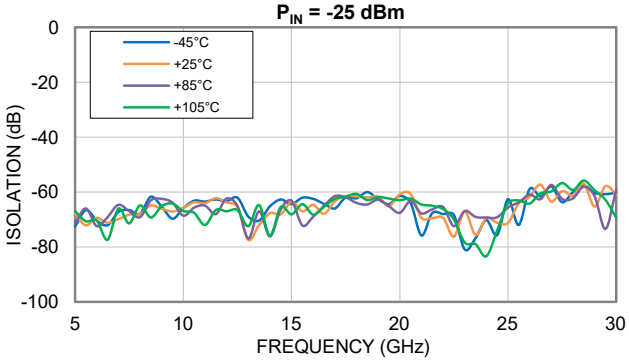
GAIN vs. TEMPERATURE
P_{IN} = -25 dBm



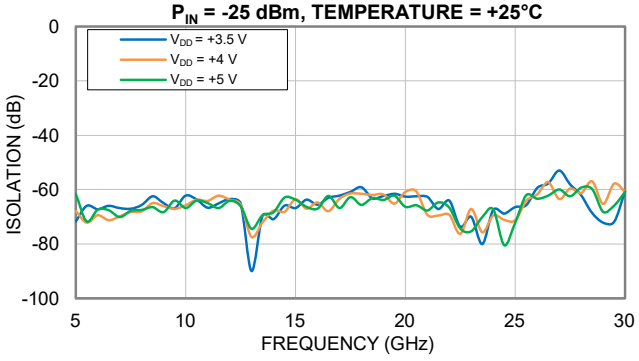
GAIN vs. DEVICE VOLTAGE (V_{DD})
P_{IN} = -25 dBm, TEMPERATURE = +25°C



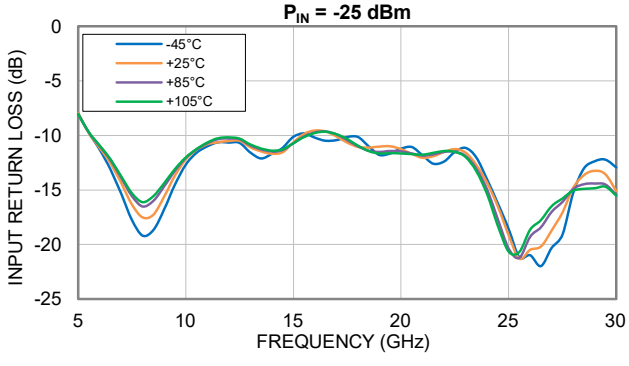
ISOLATION vs. TEMPERATURE
P_{IN} = -25 dBm



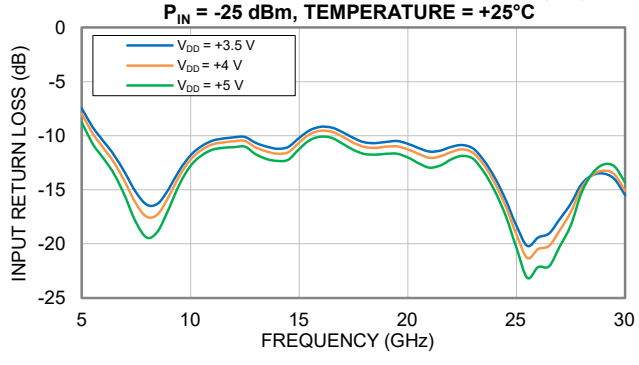
ISOLATION vs. DEVICE VOLTAGE (V_{DD})
P_{IN} = -25 dBm, TEMPERATURE = +25°C



INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25 dBm



INPUT RETURN LOSS vs. DEVICE VOLTAGE (V_{DD})
P_{IN} = -25 dBm, TEMPERATURE = +25°C



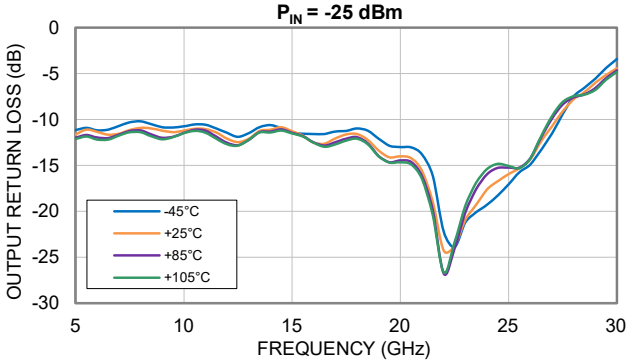
Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

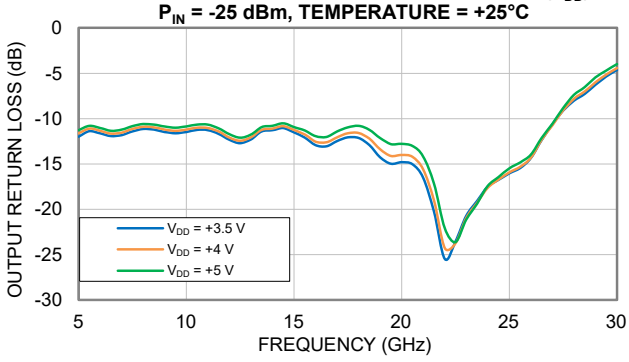
TYPICAL PERFORMANCE GRAPHS

Note: All data taken at nominal condition V_{DD} = +4 V unless noted otherwise.

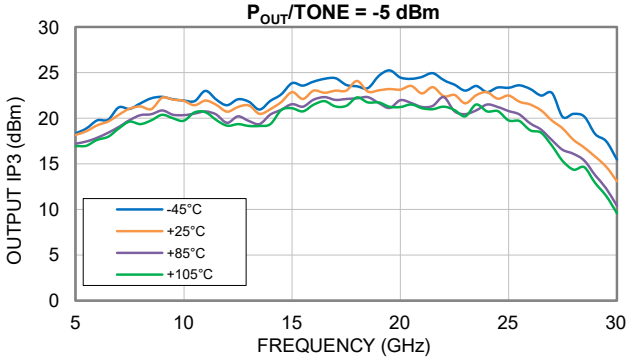
OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25 dBm



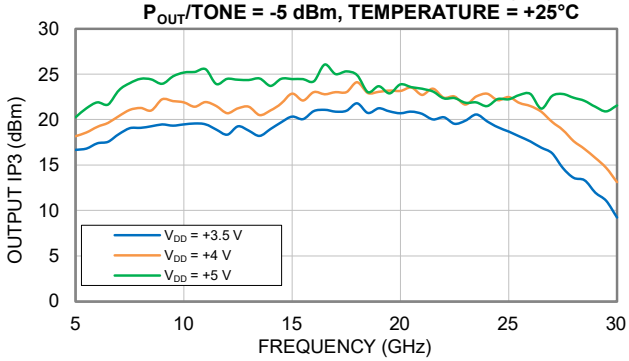
OUTPUT RETURN LOSS vs. DEVICE VOLTAGE (V_{DD})
P_{IN} = -25 dBm, TEMPERATURE = +25°C



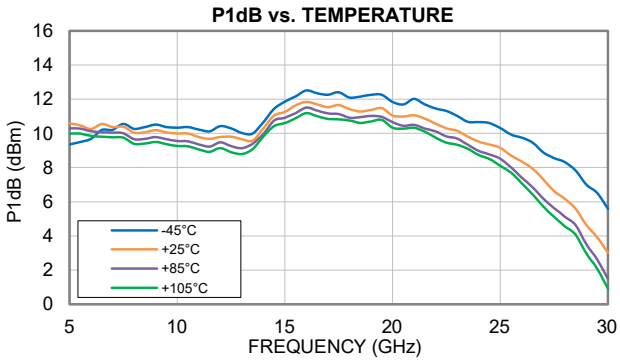
OUTPUT IP3 vs. TEMPERATURE
P_{OUT}/TONE = -5 dBm



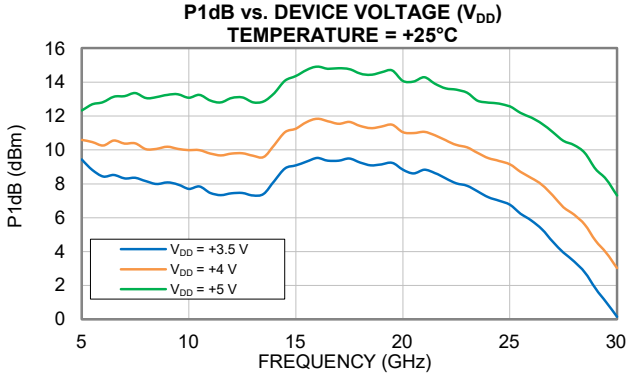
OUTPUT IP3 vs. DEVICE VOLTAGE (V_{DD})
P_{OUT}/TONE = -5 dBm, TEMPERATURE = +25°C



P1dB vs. TEMPERATURE



P1dB vs. DEVICE VOLTAGE (V_{DD})
TEMPERATURE = +25°C



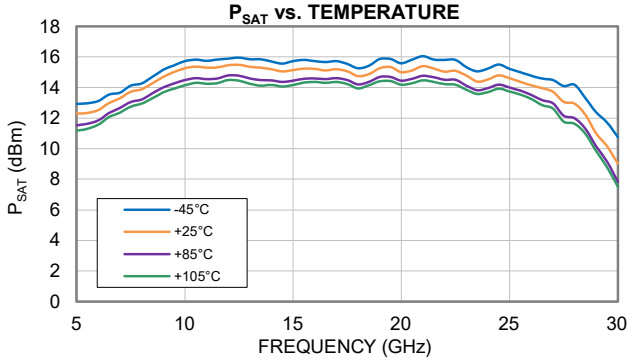
Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

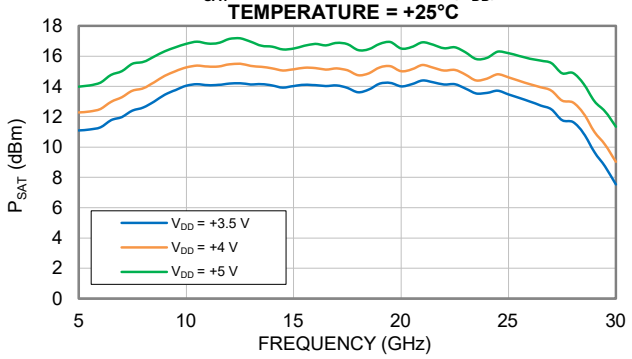
TYPICAL PERFORMANCE GRAPHS

Note: All data taken at nominal condition V_{DD} = +4 V unless noted otherwise.

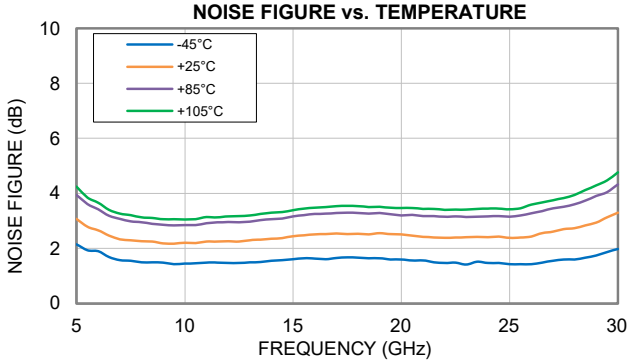
P_{SAT} vs. TEMPERATURE



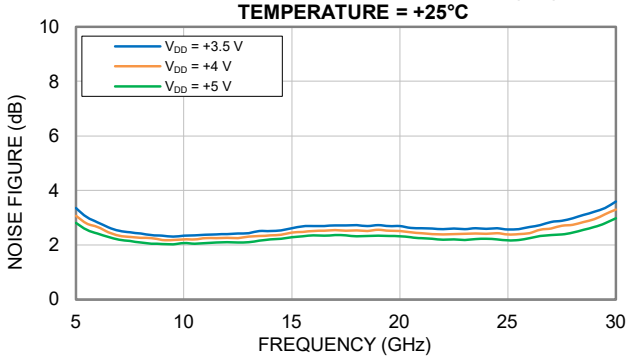
P_{SAT} vs. DEVICE VOLTAGE (V_{DD}) TEMPERATURE = +25°C



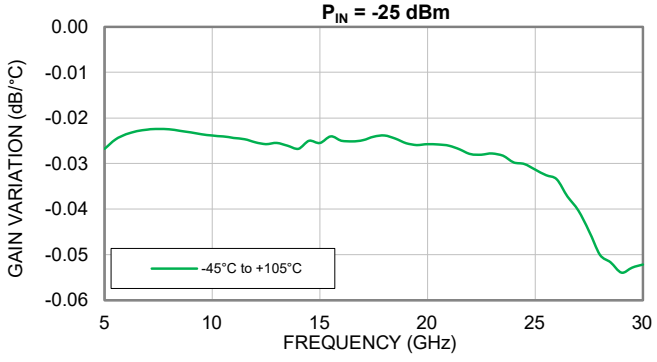
NOISE FIGURE vs. TEMPERATURE



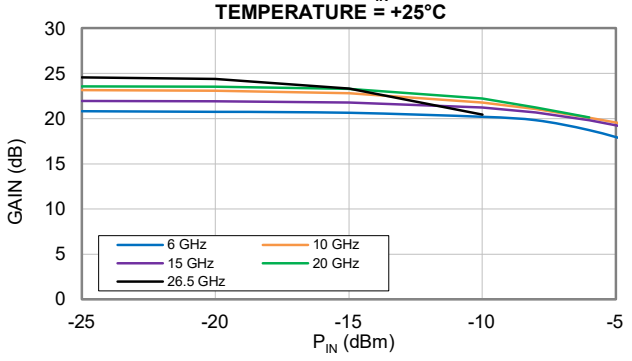
NOISE FIGURE vs. DEVICE VOLTAGE (V_{DD}) TEMPERATURE = +25°C



GAIN VARIATION vs. TEMPERATURE P_{IN} = -25 dBm

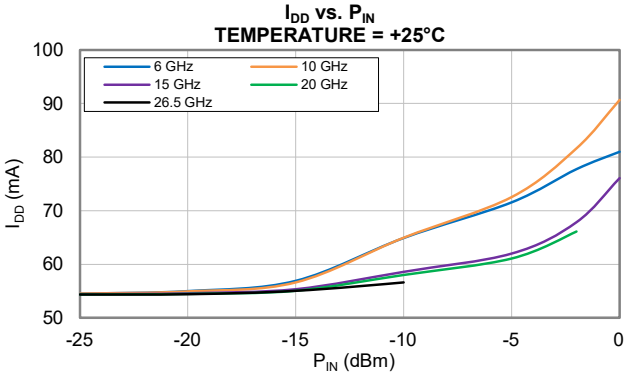


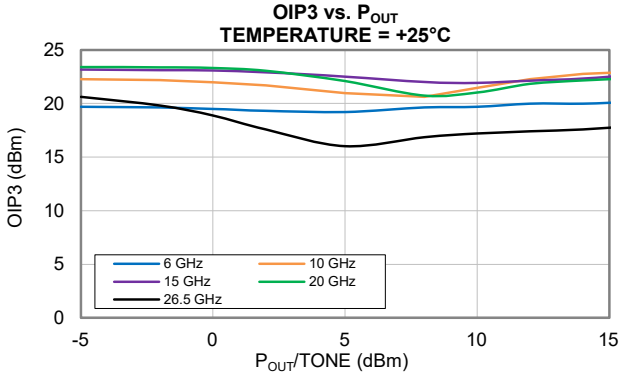
GAIN vs. P_{IN} TEMPERATURE = +25°C



TYPICAL PERFORMANCE GRAPHS

Note: All data taken at nominal condition V_{DD} = +4 V unless noted otherwise.





ABSOLUTE MAXIMUM RATINGS[7]

Parameter	Ratings
Operating Temperature	-45°C to +105°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	0.86 W
Junction Temperature[8]	+175°C
Input Power (CW), V_{DD}[9] = +4 V	+19 dBm
DC Voltage on RF-OUT	+11 V
DC Voltage on RF-IN	+2.6 V
DC Drain Voltage on V_{DD}[9]	+9 V
DC Drain Current I_{D1}	100 mA
DC Drain Current I_{D2}	100 mA
DC Drain Current I_{D3}	90 mA

7. Permanent damage may occur if any of these limits are exceeded. Maximum ratings are not intended for continuous operation.
8. Peak temperature on top of Die.
9. $V_{DD} = V_{D1} = V_{D2} = V_{D3}$

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{JC})[10]	52.2°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 to < 1000 V	ANSI/ESDA/JEDEC JS-001-2023
CDM	C2A	500 to < 750 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: MSL1 in accordance with IPC/JEDEC J-STD-020E/JEDEC J-STD-033C

Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

FUNCTIONAL DIAGRAM

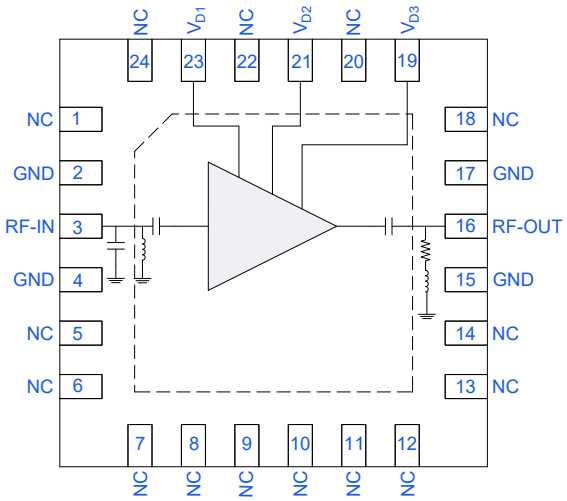


Figure 1. PMA4-6263LN+ Functional Diagram

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.

EVALUATION BOARD

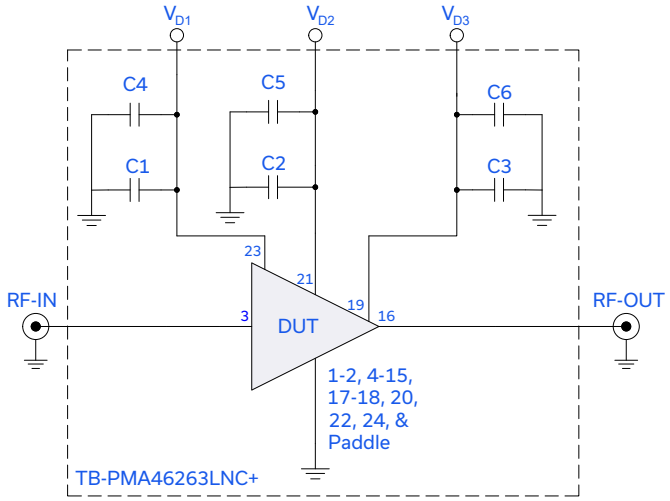


Figure 2. PMA4-6263LN+ Evaluation and Application Circuit

Electrical Parameters and Conditions
Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3), Saturated Output Power (P_{SAT}), and Noise Figure measured using N5247B 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, -5 dBm/Tone at output.

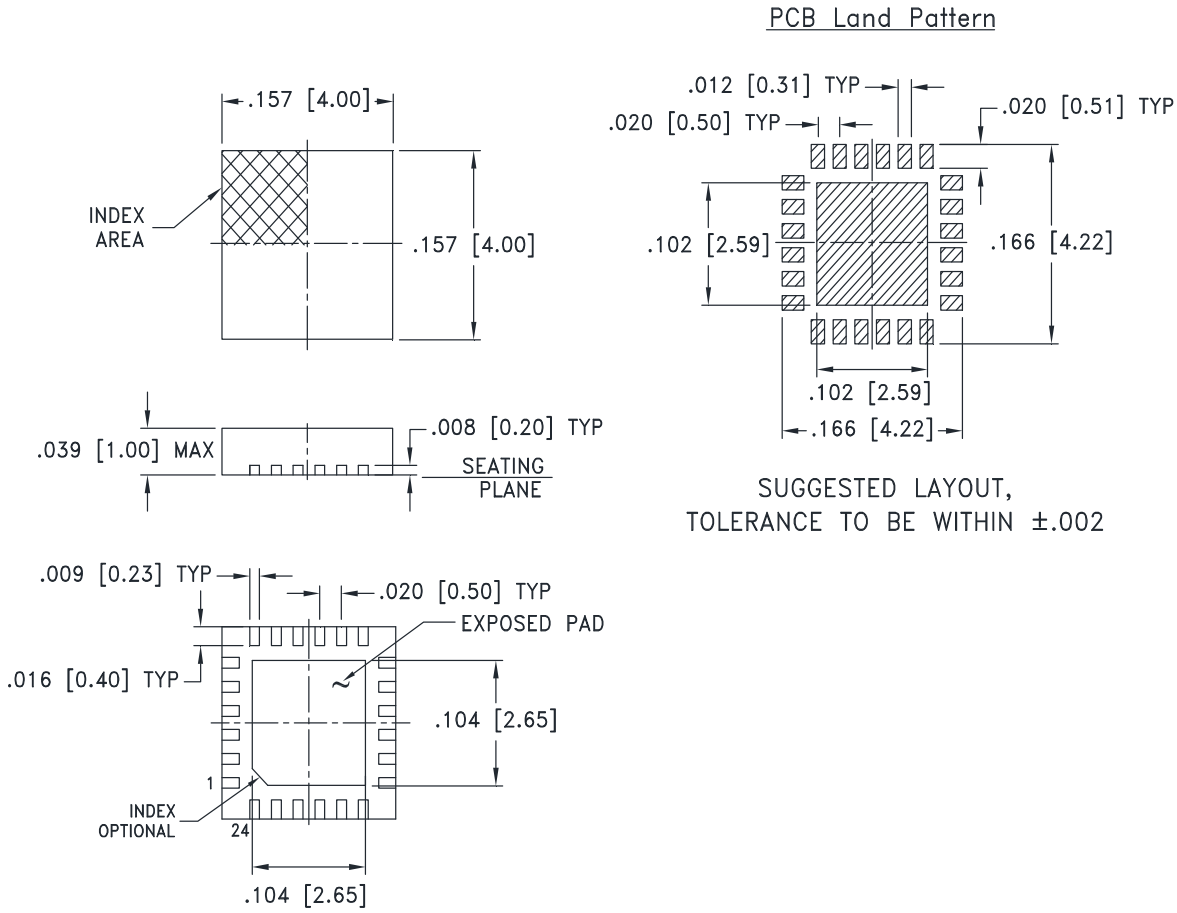
Power ON/Power OFF Sequence:
PMA4-6263LN+ is not sensitive to power ON/OFF sequence. V_{D1}, V_{D2}, and V_{D3} can be applied in any order. All three voltage lines may be tied together and applied simultaneously.

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

Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

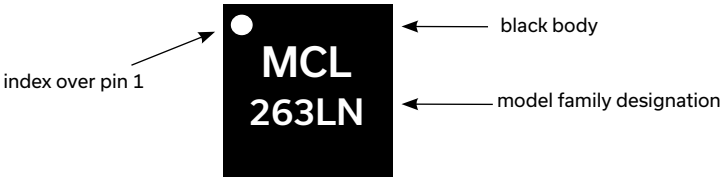
CASE STYLE DRAWING



Weight: .04 Grams

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

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Low Noise Amplifier PMA4-6263LN+

50Ω 6 to 26.5 GHz Wideband Amplifier

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 **Standard quantities available on reel**	F68 7" reels with 20, 50, 100, 200, 500, or 1000 devices
Suggested Layout for PCB Design	PL-799
Evaluation Board	TB-PMA46263LNC+ 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