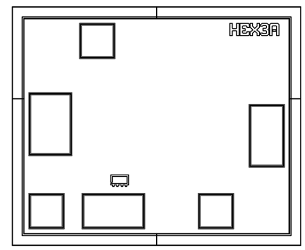
Low Noise, Wideband, Low Current

Monolithic Amplifier Die

PMA2-63LN-D+

50Ω 0.4 to 6 GHz



The Big Deal

- Ultra wideband, 0.4 to 6 GHz
- Excellent noise figure, 0.5 dB at 2 GHz
- Low Current, 44mA at 5V

Product Overview

The PMA2-63LN-D+ is a PHEMT based wideband, low noise MMIC amplifier die with a unique combination of high gain, high IP3 and low noise figure, making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V supply, is well matched for 50Ω.

Key Features

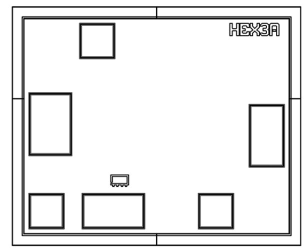
Feature	Advantages
Excellent Noise Figure up to 6 GHz • 0.5 dB typ. at 2 GHz • 0.7 dB typ. at 4 GHz	Enables lower system noise figure performance.
High IP3 • +31.7 dBm at 2 GHz • +31.6 dBm at 4 GHz	Combination of low noise figure and high IP3 makes this MMIC amplifier ideal for use in low noise receiver 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 & 44mA	Low voltage & current consumption is ideal for use in amplifier chain.
Unpackaged die	Enables user to integrate it directly into hybrids.

Low Noise, Wideband, Low Current

Monolithic Amplifier Die

PMA2-63LN-D+

50Ω 0.4 to 6 GHz



+RoHS Compliant

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

Ordering Information: Refer to Last Page

Product Features

- Wideband, 0.4 to 6 GHz
- Excellent Noise figure, 0.5 dB typ. at 2 GHz
- High Gain, 19.5 dB at 2 GHz
- High IP3, 31.7 dBm at 2 GHz.
- Low current, 44mA at 5V

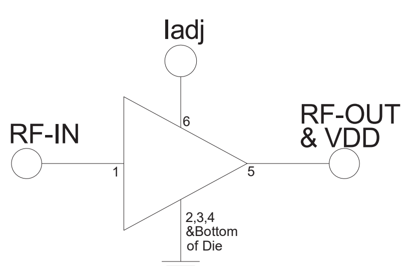
Typical Applications

- 5G
- Fixed-Satellite
- Cellular Infrastructure
- Defense

General Description

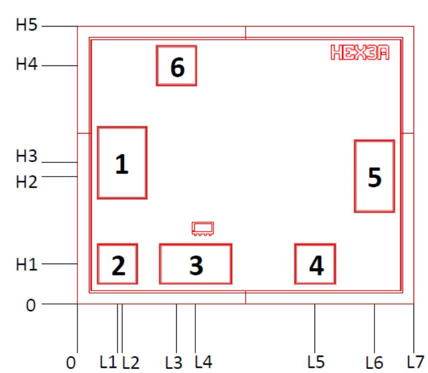
The PMA2-63LN-D+ is a PHEMT based wideband, low noise MMIC amplifier die with a unique combination of high gain, high IP3 and low noise figure, making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V supply, is well matched for 50Ω.

Simplified Schematic and Pad description



Pad#	Function
1	RF-IN
5	RF-OUT & V_{DD}
2,3,4 & Bottom of Die	GROUND
6	Current Adjustment

Bonding Pad Position



Dimensions in µm, Typical

L1	L2	L3	L4	L5	L6	L7	H1	H2	H3	H4	H5
87	97	217	258	521	651	738	87	280	309	522	609

Thickness	Die size	Pad size 1	Pad size 2, 4, & 6	Pad size 3	Pad size 5
100	738 x 609	100 x 150	80 x 80	150 x 80	80 x 150

REV. OR
ECO-007214
PMA2-63LN-D+
GY/RS/CP
210405

Electrical Specifications[1] at 25°C, Zo=50Ω unless noted

Parameter	Condition (GHz)	V_{DD}=5.0V & Vladj=Open			Units
		Min.	Typ.	Max.	
Frequency Range		0.4		6	GHz
Gain	0.4		24.1		dB
	1		22.7		
	2		19.5		
	4		14.7		
	6		11.5		
Input Return Loss	0.4		7.7		dB
	1		9.5		
	2		12.0		
	4		14.2		
	6		12.0		
Output Return Loss	0.4		9.4		dB
	1		9.1		
	2		7.7		
	4		7.1		
	6		6.4		
Output Power at 1dB Compression	0.4		17.2		dBm
	1		17.1		
	2		17.7		
	4		18.4		
	6		17.9		
Output IP3	0.4		31.3		dBm
	1		30.9		
	2		31.7		
	4		31.6		
	6		32.8		
Noise Figure	0.4		0.5		dB
	1		0.5		
	2		0.5		
	4		0.7		
	6		1.0		
Device Operating Voltage (V_{DD})		4.75	5.0	5.25	V
Device Operating Current (I_{DD})		—	44	61	mA
Device Current Variation vs. Temperature[2]			-81		µA/°C
Device Current Variation vs. Voltage[3]			0.014		mA/mV
Thermal Resistance, junction-to-ground lead			65		°C/W

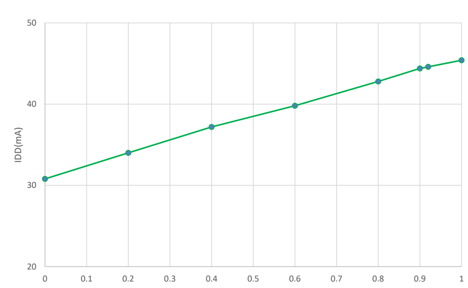
1. Measured on Mini-Circuits Characterization Test Board. Die is packaged in 2x2mm, 8-lead MCL package and soldered on TB-PMA2-63LNE+. See Characterization Test Circuits (Fig.2).
2. Device Current Variation vs. Temperature= (Current in mA at 85°C - Current in mA at -45°C)/130°C
3. Device Current Variation vs. Voltage = (Current in mA at 5.25V – Current in mA at 4.75V) / ((5.25V-4.75V)*1000 mA/mV)

Absolute Maximum Ratings[4]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Junction Temperature	137°C
Total Power Dissipation	0.8W
Input Power (CW), V_{DD}=5V	+22 dBm (5 minutes max.) +13 dBm (continuous)
Current Adjustment Voltage (Vladj)	1.2V
Supply Voltage (VDD)	7V

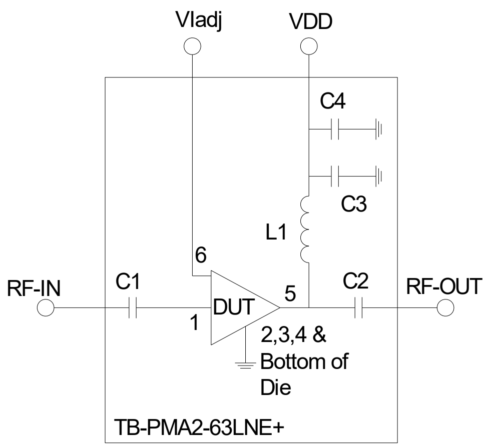
4. Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.

Voltage Level at Current Adjustment Pad (Vladj) vs. Device Current



5.When Iadj connection is open, Vladj =0.92V given a device with IDD=44mA Typ.
For RF performance at different Vladj, please see View Data and Graph

Characterization Test & Application Circuit

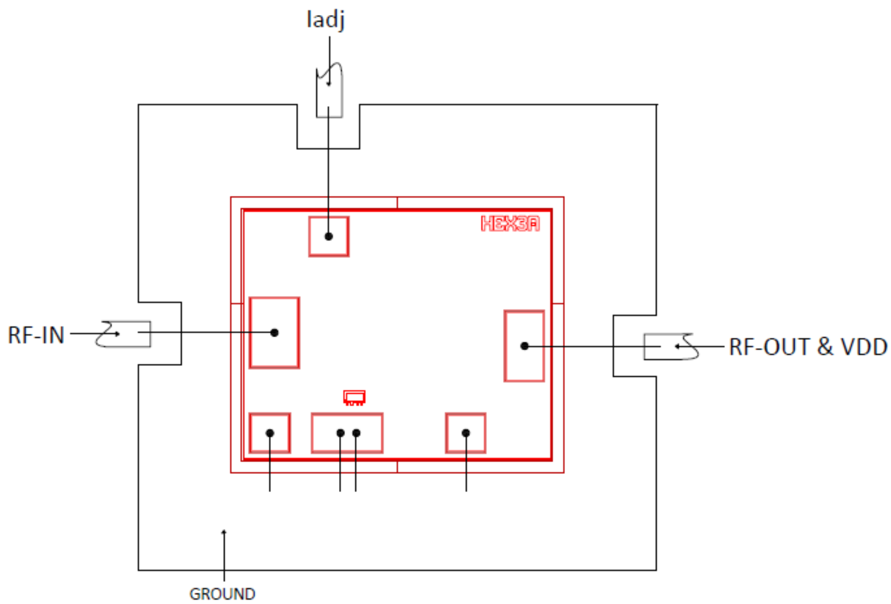


Components	Size	Value	Manufacturer	P/N
C1	0402	150pF	Murata	GRM1555C1H151JA01
C2		150pF		GRM1555C1H151JA01
C3		100pF		GRM1555C1H101JA1D
C4		1uF		GRM155R61E105KA12
L1		56nH	Coilcraft	0402CS-56NXGL

Fig 1. Application and Characterization Circuit
Note: This block diagram is used for characterization. (DUT is packaged in 2x2mm 8-lead MCLP package and soldered on Mini-Circuits Characterization test board TB-PMA2-63LNE+) 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.

Conditions:
1.Gain and Return loss: Pin= -25dBm
2.Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

Assembly Diagram



Assembly and Handling Procedure

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
   MMIC PHEMT amplifer 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.
5. 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.

Additional Detailed Technical Information *additional 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 — Model No. Small, Gel - Pak: 5,10,50,100 KGD* — PMA2-63LN-DG+ Medium†, Partial wafer: KGD*<2346 — PMA2-63LN-DP+ Large†, Full Wafer — PMA2-63LN-DF+ †*Available upon request contact sales representative* Refer to AN-60-067
Environmental Ratings	ENV80

*Known Good Dice ("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 help to provide a higher degree of confidence that dice are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ESD Rating**

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

** Tested in industry standard MCLP 2x2 mm, 8-lead package.

Additional 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/MCLStore/terms.jsp

D. Mini-Circuits does not warrant the accuracy or completeness of the information, text, graphics and other items contained within this document and same are provided as an accommodation and on an "As is" basis, with all faults.

E. Purchasers of this part are solely responsible for proper storing, handling, assembly and processing of Known Good Dice (including, without limitation, proper ESD preventative measures, die preparation, die attach, wire bond ing and related assembly and test activities), and Mini-Circuits assumes no responsibility therefor or for environmental effects on Known Good Dice.

F. Mini-Circuits and the Mini-Circuits logo are registered trademarks of Scientific Components Corporation d/b/a Mini-Circuits. All other third-party trademarks are the property of their respective owners. A reference to any third-party trademark does not constitute or imply any endorsement, affiliation, sponsorship, or recommendation by any such third-party of Mini-Circuits or its products.