Low Noise, High Gain

Monolithic Amplifier Die PMA3-63GLN-D+

50Ω 1.8 to 6.0 GHz

The Big Deal

- Flat gain over wideband
- Low noise figure, 0.6 dB typ.
- High Gain, up to 29.7 dB typ.

Product Overview

The PMA3-63GLN-D+ is a PHEMT based wideband, low noise MMIC amplifier die with a unique combination of low noise, high gain and IP3 over wideband making it ideal for sensitive, high-dynamic-range S-band receiver applications. This design operates on a single 5V supply, is well matched for 50Ω.

Key Features

Feature	Advantages
Low noise, 0.6 dB at 2.5 GHz	Enables lower system noise figure performance.
Wide bandwidth with flat gain • ±1.6 dB over 2.5 to 5 GHz	Enables a single amplifier to be used in many wideband applications including defense, instrumentation and more.
High Gain, 29.7 dB at 2.5 GHz	Enables signal amplification without the need for multiple gain stage. Thus minimize effect of subsequent stages on noise figure.
High IP3 • +28.6 dBm at 2.5 GHz • +14.8 dBm at 2.5 GHz	Combination of low noise 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.
Unpackaged die	Enables user to integrate it directly into hybrids.

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50Ω 1.8 to 6.0 GHz

Product Features
- Low Noise figure, 0.6 dB typ.
- High IP3, 28.6 dBm typ.
- Excellent Gain flatness, ±1.6 dB over 2.5 to 5 GHz
- High Gain, 29.7 dB typ.

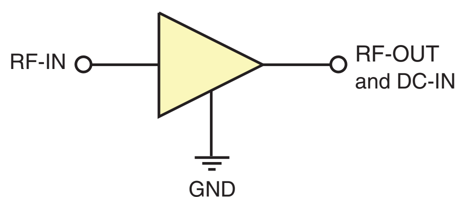
+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Ordering Information: Refer to Last Page

Typical Applications
- 5G
- WiFi
- WLAN
- UMTS
- LTE
- WiMAX
- S-band Radar
- C-band Satcom

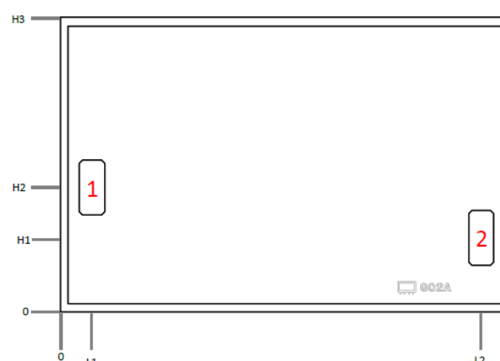
General Description
The PMA3-63GLN-D+ is a PHEMT based wideband, low noise MMIC amplifier die with a unique combination of low noise, high gain & IP3 over wideband making it ideal for sensitive, high-dynamic-range S-band receiver applications. This design operates on a single 5V supply, is well matched for 50Ω.

Simplified Schematic and Pad description



Pad#	Function
1	RF-IN
2	RF-OUT and DC-IN
Bottom of Die	GND

Bonding Pad Position



Dimensions in μm, Typical

L1	L2	L3	H1	H2	H3
81.5	1074	1150	187	315.5	750
Bond pad size		Thickness		Die size	
65.0 x 140.0		100		1150.0 X 750.0	

Electrical Specifications[1] at 25°C and 5V, unless noted otherwise

Parameter	Condition (GHz)	V_{DD}=5.0V			Units
		Min.	Typ.	Max.	
Frequency Range		1.8		6.0	GHz
Noise Figure	1.8		0.8		dB
	2.5		0.6		
	3.5		0.7		
	5		0.9		
	6		1.1		
Gain	1.8		31.7		dB
	2.5		29.7		
	3.5		27.9		
	5		26.5		
	6		24.9		
Input Return Loss	1.8		7		dB
	2.5		10		
	3.5		11		
	5		10		
	6		12		
Output Return Loss	1.8		10		dB
	2.5		10		
	3.5		10		
	5		16		
	6		22		
Output Power at 1dB Compression	1.8		15.2		dBm
	2.5		14.8		
	3.5		14.1		
	5		11.5		
	6		10.7		
Output IP3[3]	1.8		28.8		dBm
	2.5		28.6		
	3.5		26.6		
	5		23.4		
	6		22.3		
Device Operating Voltage (V_{DD})			5.0		V
Device Operating Current (I_{DD})		—	69	80	mA
Device Current Variation vs. Temperature[2]			-26.9		µA/°C
Device Current Variation vs. Voltage			0.006		mA/mV
Thermal Resistance, junction-to-ground lead			57.3		°C/W

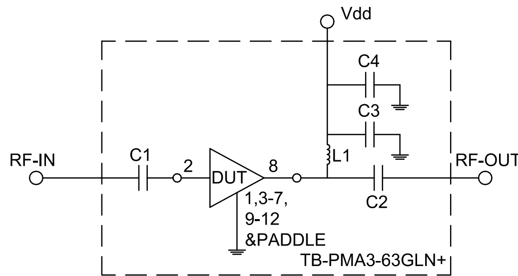
1. Measured on Mini-Circuits Characterization test board with tested board loss being deducted. Die is packaged in 3x3 mm, 12-lead MCL package and soldered on TB-PMA3-63GLN+. See Characterization Test Circuit (Fig. 1)
2. (Current at 85°C - Current at -45°C)/130
3. Tested at Pout=0 dBm/tone

Absolute Maximum Ratings[4]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Junction Temperature	150°C
Total Power Dissipation	1.0W
Input Power (CW), Vd=5V	+29 dBm (5 minutes max.) +10 dBm (continuous)
DC Voltage	8.5V

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

Characterization Test Circuit

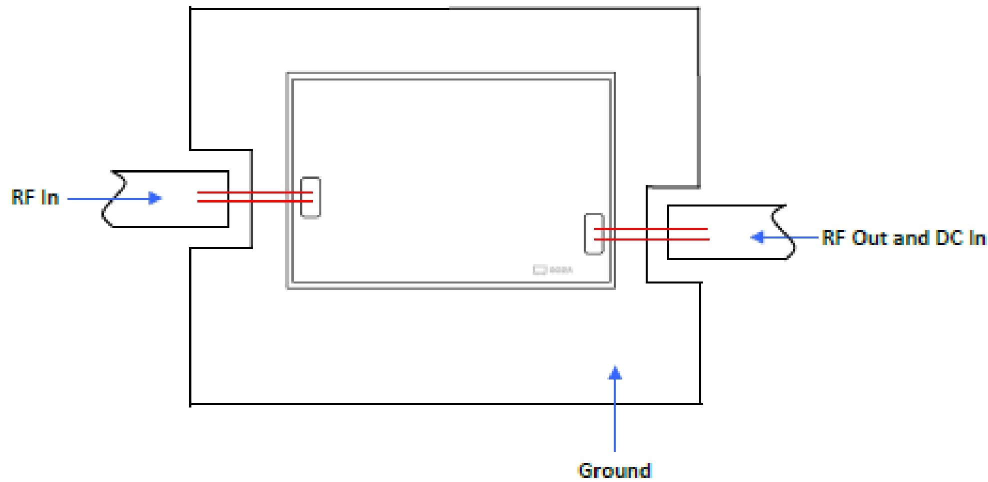


Component	Size	Value	P/N	Manufacturer
C1	0402	22pF	GRM1555C1H220JA01	Murata
C2	0402	22pF	GRM1555C1H220JA01	Murata
C3	0402	100pF	GRM1555C1H101JA01	Murata
C4	1206	22uF	GRM31CR61H106KA12	Murata
L1	0402	10nH	LQG15HSIONJD2	Murata

Fig 1. Application and Characterization Circuit
Note: This block diagram is used for characterization. (Die is packaged in 3x3mm, 12-lead MCLP package and soldered on Mini-Circuits Characterization test board TB-PMA3-63GLN+) Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: Pin= -35dBm
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 amplifier dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static worksta tion. Devices need careful handling using correctly designed collets, vacuum pickup tips or sharp antistatic tweezers to deter ESD damage to dice.
3. Die Attach
   The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are DieMat DM6030HK-PT/H579 or Ablestik 84-1LMISR4. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total die periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. It is recommended to use antistatic 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. Thermosonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1 mil diameter. Bonds must be made from the bond pads on the die to the package 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* — PMA3-63GLN-DG+ Medium[†], Partial wafer: KGD*<1575 — PMA3-63GLN-DP+ Large[†], Full Wafer — PMA3-63GLN-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 1C (pass <2000V) in accordance with ANSI/ESD STM 5.1 - 2001

** Tested in industry standard MCLP 3 x 3 mm, 12-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.

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