

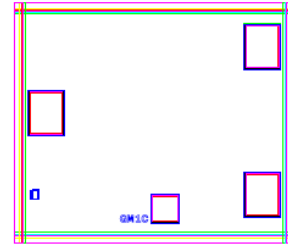
# Low Noise, Wideband, Low Current Monolithic Amplifier Die

## PMA2-183LN-D+

50Ω 4 to 18 GHz

### The Big Deal

- Ultra wideband, 4 to 18 GHz
- Excellent noise figure, 2.5 dB at 15 GHz
- Low Current, 48mA typ.
- Usable to 20 GHz



### Product Overview

The PMA2-183LN-D+ is a E-PHEMT based wideband, low noise MMIC amplifier die with a unique combination of low noise, high IP3, and low current 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 18 GHz <ul style="list-style-type: none"><li>• 2.7 dB typ. at 4 GHz</li><li>• 2.5 dB typ. at 18 GHz</li></ul>	Enables lower system noise figure performance.
High IP3 <ul style="list-style-type: none"><li>• +31 dBm at 4 GHz</li><li>• +29.2 dBm at 20 GHz</li></ul>	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 & 48mA	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

## PMA2-183LN-D+

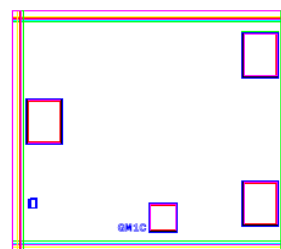
50Ω 4 to 18 GHz

### Product Features

- Ultra wideband, 4 to 18 GHz
- Excellent Noise figure, 2.5 dB at 15 GHz
- Low current, 48mA typ.
- Usable to 20 GHz

### Typical Applications

- WiFi
- WLAN
- LTE
- WiMAX
- C-band Satcom



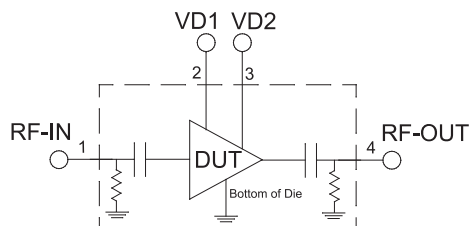
**+RoHS Compliant**  
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

*Ordering Information: Refer to Last Page*

### General Description

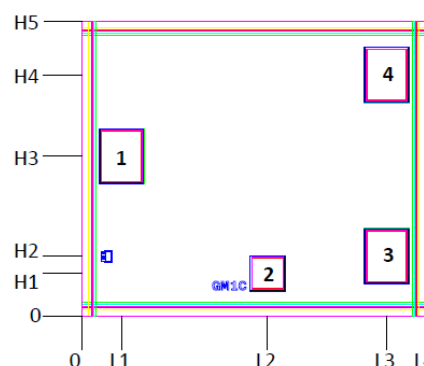
The PMA2-183LN-D+ is a E-PHEMT based wideband, low noise MMIC amplifier die with a unique combination of low noise, high IP3, and low current making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V supply, is well matched for 50Ω.

### Simplified Schematic and Pad description



Pad#	Function
1	RF-IN
2	VD1, Connect to VDD
3	VD2, Connect to VDD
4	RF-OUT

### Bonding Pad Position



Dimensions in μm, Typical

L1	L2	L3	L4	H1	H2	H3	H4	H5	Thickness	Die size	Pad size 1,3&4	Pad size 2
89	420	689	778	97	136	362	547	668	100	778 x 668	89 x 114	69 x 69

**Electrical Specifications<sup>1</sup> at 25°C, Zo=50Ω unless noted**

Parameter	Condition (GHz)	V <sub>DD</sub> =5.0V			Units
		Min.	Typ.	Max.	
Frequency Range		4		18	GHz
Gain	4		13.2		dB
	10		11.8		
	12		10.4		
	15		10.9		
	18		10.2		
	20		9.3		
Input Return Loss	4		10		dB
	10		11		
	12		11		
	15		15		
	18		12		
	20		11		
Output Return Loss	4		12		dB
	10		15		
	12		15		
	15		20		
	18		13		
	20		11		
Output Power at 1dB Compression	4		16		dBm
	10		14.4		
	12		14.2		
	15		15.8		
	18		14.6		
	20		12.8		
Output IP3	4		31		dBm
	10		26.3		
	12		25.6		
	15		28.1		
	18		27.7		
	20		29.2		
Noise Figure	4		2.7		
	10		2.5		
	12		2.5		
	15		2.5		
	18		2.5		
	20		2.9		
Device Operating Voltage (V <sub>DD</sub> )		4.75	5	5.25	V
Device Operating Current (I <sub>DD</sub> )		—	48.2	58	mA
Device Current Variation vs. Temperature <sup>2</sup>			2.31		μA/°C
Device Current Variation vs. Voltage <sup>3</sup>			0.01		mA/mV
Thermal Resistance, junction-to-ground lead			71.9		°C/W

1. Measured on Mini-Circuits Characterization Test Board TB-PMA2-183LN+. Die is packaged in 2X2 mm, 8-lead MCL package and soldered on TB-PMA2-183LN+.

See Characterization Test Circuit (Fig. 1)

2. Device Current Variation vs. Temperature= (Current at 85°C - Current at -45°C)/130

3. Device Current Variation vs. Voltage = (Current at 5.25V - Current at 4.75V) / ((5.25V-4.75V)\*1000 mV/V)

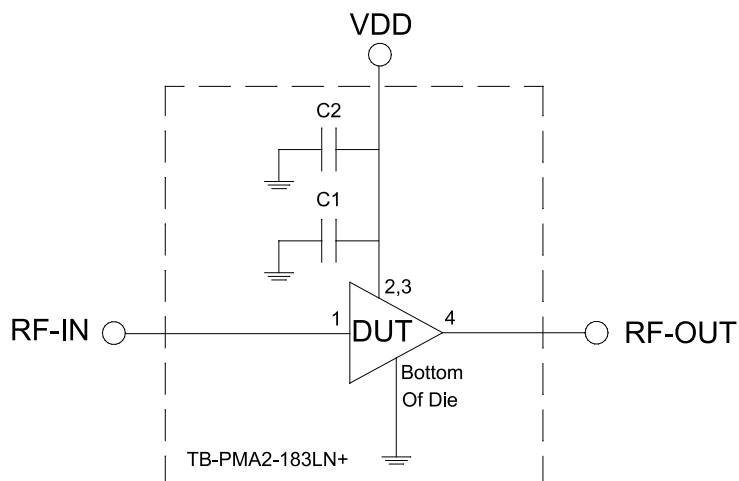
**Absolute Maximum Ratings<sup>4</sup>**

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Junction Temperature	141°C
Total Power Dissipation	0.95W
Input Power (CW), V <sub>DD</sub> =5V	+24 dBm (5 minutes max.) +12 dBm (continuous)
DC Voltage	7V

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	Part Number	Manufacturer
C1	0402	100pF	GRM1555C1H101JA01J	Murata
C2	0402	0.1uF	GRM155R71C104KA88D	Murata

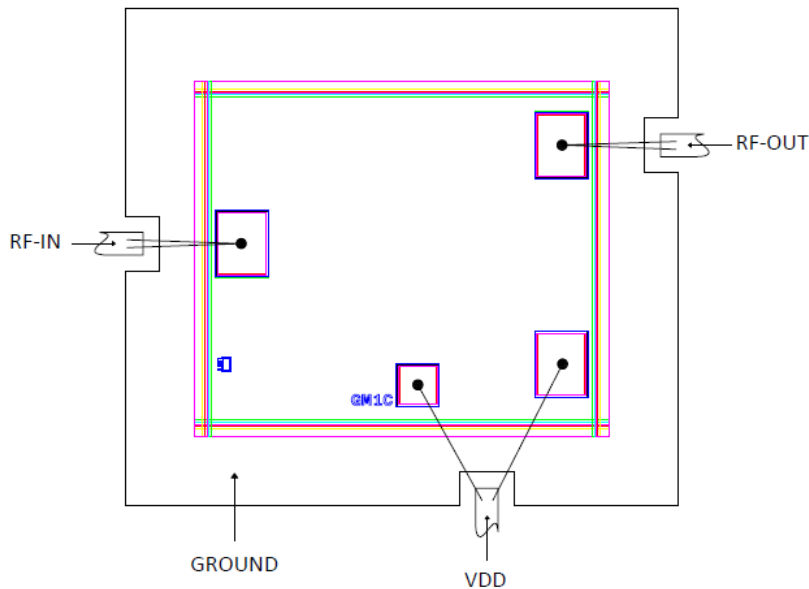
Fig 1. Application and Characterization Circuit

Note: This block diagram is used for characterization. (Die is packaged in 2X2 mm, 8-lead MCL package and soldered on TB-PMA2-183LN+. ) 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 E-PHEMT amplifier dice are susceptible to electrostatic and mechanical damage. Dice are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static workstation. 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.

<b>Additional Detailed Technical Information</b> <i>additional information is available on our dash board.</i>	
<b>Performance Data</b>	Data Table
	Swept Graphs
	S-Parameter (S2P Files) Data Set with and without port extension(.zip file)
<b>Case Style</b>	Die
<b>Die Ordering and packaging information</b>	Quantity, Package <span style="float: right;">Model No.</span>
	Small, Gel - Pak: 5,10,50,100 KGD* <span style="float: right;">PMA2-183LN-DG+</span> Medium†, Partial wafer: KGD*<2112 <span style="float: right;">PMA2-183LN-DP+</span> Large†, Full Wafer <span style="float: right;">PMA2-183LN-DF+</span>
	†Available upon request contact sales representative
	Refer to <a href="#">AN-60-067</a>
<b>Environmental Ratings</b>	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.
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