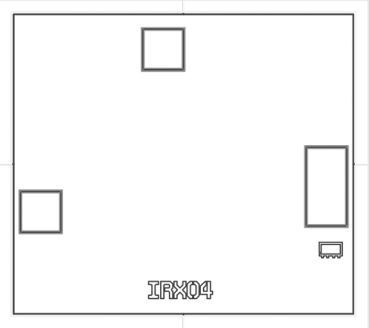
MEDIUM POWER, WIDEBAND, HIGH IP3

Monolithic Amplifier PMA3-83MP-D+

50Ω 0.4 to 8 GHz 0.5W

THE BIG DEAL

- High Pout, 0.5W to 2GHz
- High IP3, 37.9 dBm Typ.
- Low Noise Figure, 3.1dB Typ
- Patent Pending



SEE ORDERING INFORMATION ON THE LAST PAGE

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

TYPICAL APPLICATIONS

- WiFi
- WLAN
- LTE/WCDMA/EDGE
- L, S and C-band Radar
- C-band Satcom

PRODUCT OVERVIEW

The PMA3-83MP-D+ is a GaAs PHEMT based wide-band, low noise MMIC amplifier die with a unique combination of low noise, high IP3, and high output power, over a wide-band making it ideal for sensitive, high-dynamic range receiver applications. This design operates on a single supply of 8V, is well matched for 50Ω.

KEY FEATURES

Feature	Advantages
Low noise, 3dB Typical up to 8GHz	Enables lower system noise figure performance.
High IP3 • +39.5 dBm at 0.4 GHz • +37.9 dBm at 2 GHz • +39.0 dBm at 4 GHz • +38.6 dBm at 8 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.
VDD Operates over 5V to 8V	Allows the designer to tailor Pout and OIP3 via DC input for easier integration.
Unpackaged die	Enables users to integrates it directly into hybrids.
Wide bandwidth with flat gain • ±1.5 dB over 4 to 7 GHz • ±2.0 dB over 0.4 to 8 GHz	Enables a single amplifier to be used in many wideband applications including defense, instrumentation and more.

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ELECTRICAL SPECIFICATIONS[1] AT 25°C, 50Ω, UNLESS NOTED

Parameter	Condition (MHz)	VDD=8V & Vladj= 1.7V			Units
		Min.	Typ.	Max.	
Frequency range		400		8000	MHz
Gain	400 2000 4000 5000 8000		21.7 21.0 18.9 18.6 17.3		dB
Input Return loss	400 2000 4000 5000 8000		13.1 14.8 8.3 8.4 10.4		dB
Output Return loss	400 2000 4000 5000 8000		9.8 17.3 13.8 11.8 23.6		dB
P1dB	400 2000 4000 5000 8000		27.2 27.8 25.9 25.1 25.3		dBm
OIP3 (Pout= 18dBm/Tone)	400 2000 4000 5000 8000		39.5 37.9 39.0 35.2 38.6		dBm
Noise Figure	400 2000 4000 6000 8000		3.5 3.2 3.2 3.0 3.3		dB
Device operating voltage (VDD)		7.6	8.0	8.4	V
Device operating current (IDD)			144	175	mA
Device current variation vs. temperature[2]			-50		µA/°C
Device current variation vs voltage[3]			0.02		mA/mV
Thermal resistance, junction-to-ground Lead			46.3		°C/W

1. Die is soldered in 3x3mm 12L MCLP and measured on Mini-Circuits Characterization Test Board TB-PMA3-83MP+. See Characterization Test & Application Circuit (Fig. 1)
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 8.4V – Current in mA at 7.6V) / ((8.4V-7.6V)*1000 mA/mV)

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating temperature (ground lead)	-40°C to 85°C
Storage temperature	-65°C to 150°C
Junction Temperature	150°C
Total power dissipation	1.4W
Input power (CW)	+22 dBm (5 minutes max.) +17 dBm (continuous)
DC voltage at Vladj	1.8V
DC voltage at VDD	9V

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

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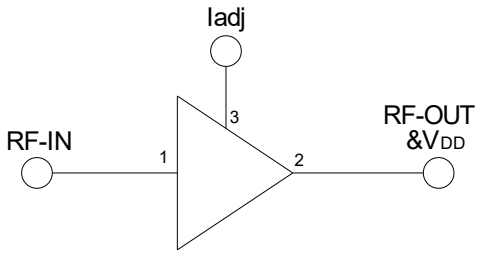
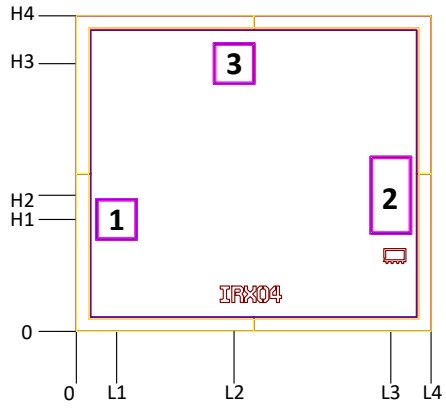
SIMPLIFIED SCHEMATIC



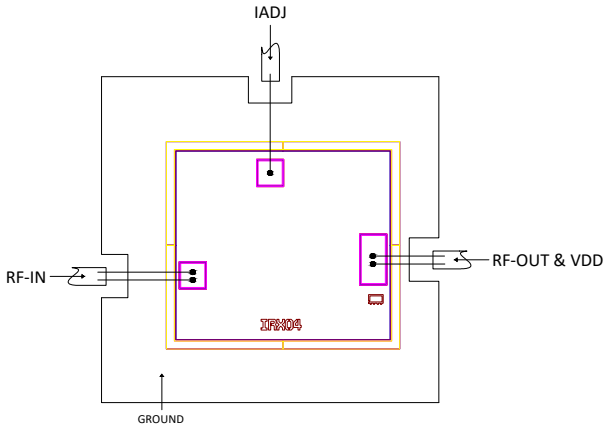
PAD DESCRIPTION

Function	Pad Number	Description (Fig 1)
RF-IN	1	Connects to RF input via C1
RF-OUT & VDD	2	Connects to RF output via C2 and connects to VDD via L1
Iadj	3	Current Adjustment Pad. Connects to Vladj

BONDING PAD POSITION



ASSEMBLY DIAGRAM



DIE DIMENSIONS IN µM

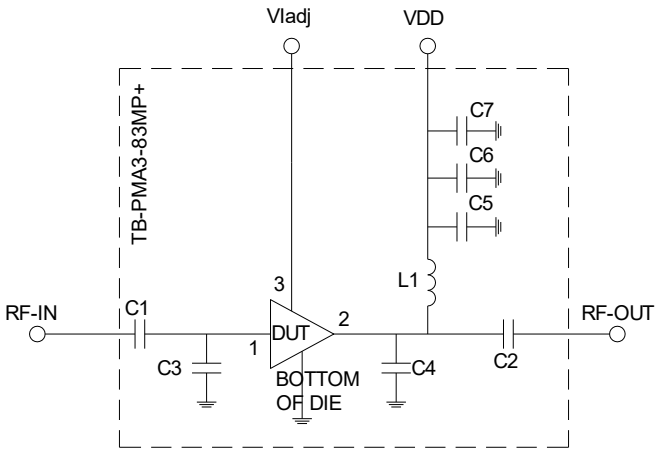
L1	L2	L3	L4	H1	H2	H3	H4
83.0	324	646	728	230	280	550	648

Thickness	Die Size	Pad Size 1 & 3	Pad Size 2
100	728 x 648	75 x 75	75 x 150

Recommended Wire Length and Loop Height, Typical

Wire	Wire Length (mils)	Wire Loop Height (mils)
RF-IN	45	7
RF-OUT & VDD	28	7
IADJ	Not Critical	

CHARACTERIZATION TEST & APPLICATION CIRCUIT



Component	Size	Value	Part Number	Manufacturer
C1	0402	100pF	GRM1555C1H101JA01D	Murata
C2	0402	100pF	GRM1555C1H101JA01D	Murata
C3	0402	0.3pF	GQM1555C2DR30WB01D	Murata
C4	0402	0.3pF	GQM1555C2DR30WB01D	Murata
C5	0402	10pF	GRM1555C1H100JA01D	Murata
C6	0402	1uF	GRM155C71A105KE11D	Murata
C7	0603	10uF	GRM188D71A106MA73J	Murata
L1	0603	33nH	0603CS-33NXJEU	Coilcraft

Fig 1. Application and Characterization Circuit
Note: This block diagram is used for characterization. (DUT is packaged in 3x3 12L MCLP and soldered on Mini-Circuits Characterization test board TB-PMA3-83MP+)

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. VDD=8V, Vladj = 1.7V
2. Gain and Return loss: Pin= -25dBm
3. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 18 dBm/tone at output.

ASSEMBLY 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 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. It is recommended to use anti-static 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. 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.

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ADDITIONAL DETAILED TECHNICAL 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 — PMA3-83MP-DG+ KGD* Medium, Partial wafer: KGD*<2254 — PMA3-83MP-DP+ Full Wafer — PMA3-83MP-DF+ †Available upon request contact sales representative Refer to AN-60-067
Environmental Ratings	ENV80

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

ESD RATING

Human Body Model (HBM): Class 1A (250V) in accordance with ANSI/ESD STM 5.1 - 2001
(Tested in 3x3 12L MCLP package)

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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