MMA044PP3

4 – 18 GHz MMIC Wideband LNA

Product Overview

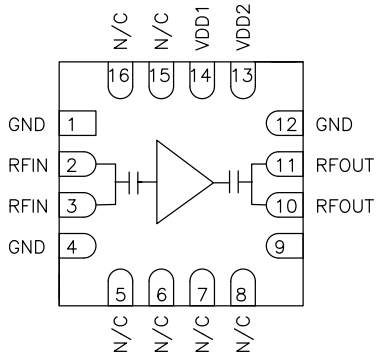
The MMA044PP3 is a gallium arsenide (GaAs) pseudomorphic high-electron-mobility transistor (pHEMT) low-noise wideband amplifier in a plastic leadless 3 mm × 3 mm surface-mount package that operates between 4 GHz and 18 GHz. The MMA044PP3 amplifier provides 17 dB of gain, 2.5 dB noise figure, 15 dBm P1dB, and 28 dBm output IP3. The amplifier draws only 100 mA of current from a 4 V supply. The P1dB power of 15 dBm enables the LNA to function as an LO driver. The RF input and output ports of the amplifier are DC blocked and internally matched to 50 Ω. This product is also available in die format as the MMA044AA.

The following illustration shows the primary functional diagram of the MMA044PP3 device.

Key Features

- **Frequency range: 4 to 18 GHz**
- **High Gain: 17 dB**
- **Low Noise figure: 2.5 dB**
- **High Output IP3: + 28 dBm**
- **High Output P1dB: + 15 dBm**
- **Single Positive Supply: +4V**
- **50 Ω matched input/output**
- **Compact 16-lead 3 mm X 3 mm X 0.85 mm QFN package**

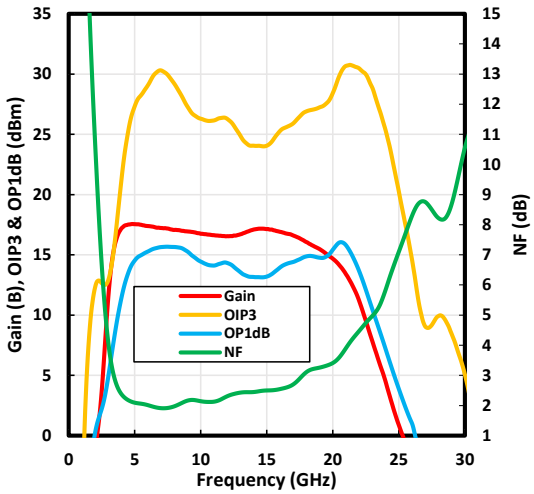
Figure 1. Functional Block Diagram



Applications

- Test and measurement instrumentation
- Electronic warfare (EW), electronic countermeasures (ECM), and electronic counter-countermeasures (ECCM)
- Military and space
- Telecom infrastructure
- Wideband microwave radios
- Microwave and millimeter-wave communication systems

Figure 2. Gain, NF, OIP3 & OP1dB Performances



Performance Overview

Parameter	Typ.	Units
Frequency range	4 – 18	GHz
Gain	17	dB
NF	2.5	dB
Output IP3	+ 28	dBm

Export Classification: EAR99

Table of Contents

1. Electrical Specifications

1.1 Typical Electrical Performance

Table 1-1. Typical Electrical Performance at 25 °C, Vdd = + 4V, Idd = 100 mA (Unless otherwise mentioned)

Parameter	Frequency Range	Min	Typ.	Max	Units
Frequency range		6		18	GHz
Gain	4– 12 GHz		17		dB
	12 – 18 GHz		16.5		dB
Noise Figure	4 – 12 GHz		2.0		dB
	12 –18 GHz		2.8		dB
OIP3	4 – 12 GHz		+ 28		dBm
	12 – 18 GHz		+ 25		dBm
P1dB	4 – 18 GHz		+ 15		dBm
	12 – 18 GHz		+ 14		dBm
Input Return Loss	4 – 12 GHz		– 11		dB
	12 – 18 GHz		– 10		dB
Output Return Loss	4 – 12 GHz		– 12.5		dB
	12 – 18 GHz		– 13		dB
VDD1 & VDD2 (Drain Voltage Supply)			+ 4		V
IDD1 (Drain Current 1)			30		mA
IDD2 (Drain Current 2)			70		mA

1.2 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MMA044PP3 device at 25 °C, unless otherwise specified. Exceeding one or any of the maximum ratings potentially could cause damage or latent defects to the device.

Table 1-2. Absolute Maximum Ratings

Parameter	Rating
Drain bias voltage (VDD1 & VDD2)	+ 4.5V
RF input power (Pin)	TBD dBm
Thermal Resistance	TBD
Operating Temperature	– 40 °C to + 85 °C
Channel Temperature	150 °C
Storage Temperature	– 65 °C to + 150 °C

ESD Sensitive Device

1.3 Typical Performance Curves

The following graphs show the typical performance curves of the MMA044PP3 device at 25 °C, 70 mA at +6V unless otherwise indicated.

Figure 1-1. Gain vs. Temperature

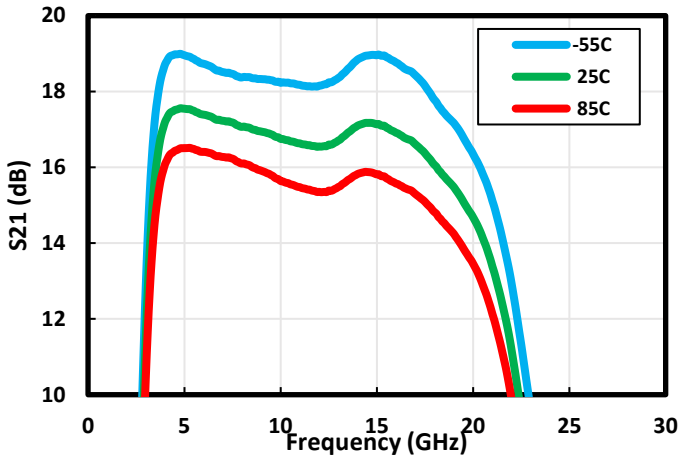


Figure 1-2. NF vs. Temperature

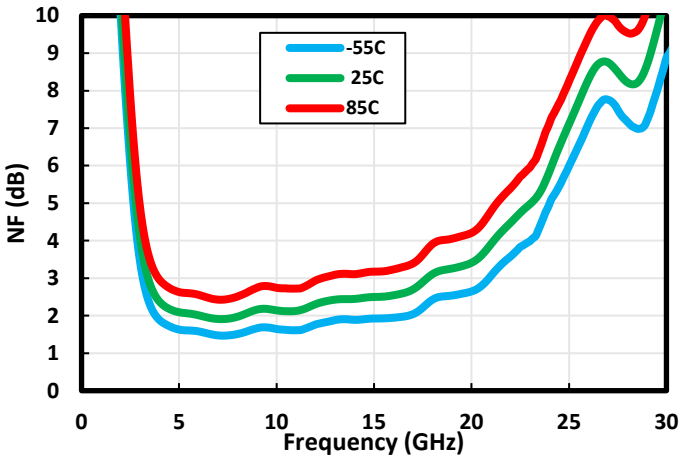


Figure 1-3. S11 vs. Temperature

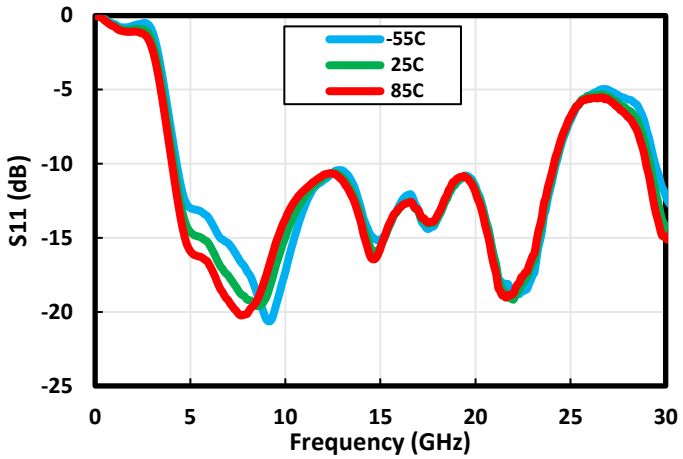


Figure 1-4. S22 vs. Temperature

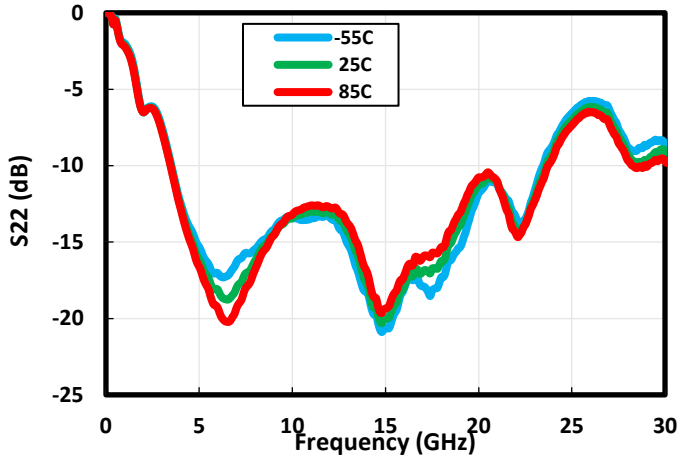


Figure 1-5. Output IP3 vs. Temperature

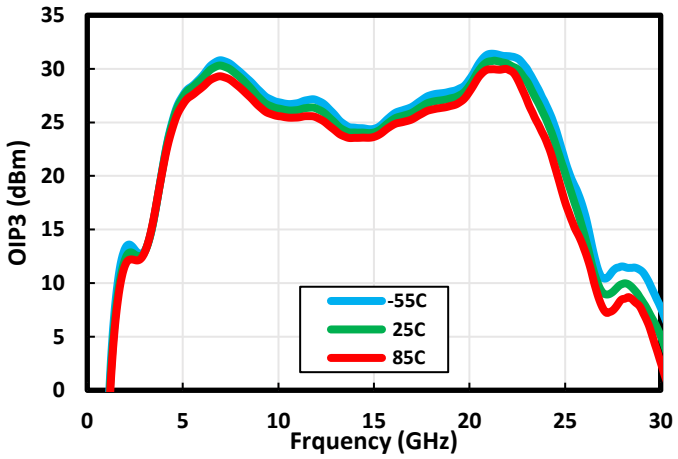


Figure 1-6. Output P1dB vs. Temperature

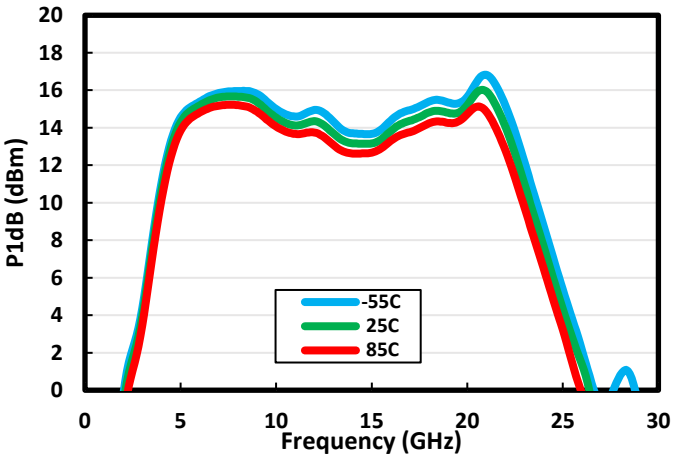


Figure 1-7. Output P3dB vs. Temperature

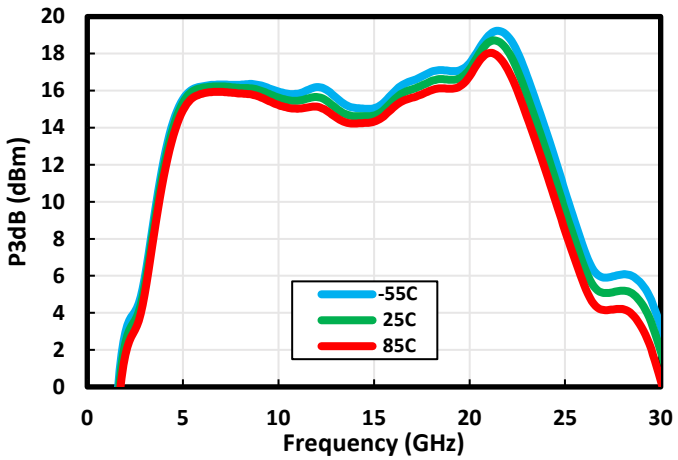


Figure 1-8. P3dB vs. Temperature @ 10V/370mA

2. Package Specifications

For additional packaging information, contact your Microchip sales representative.

Figure 2-1. Package Outline Drawing (mm[Inches])

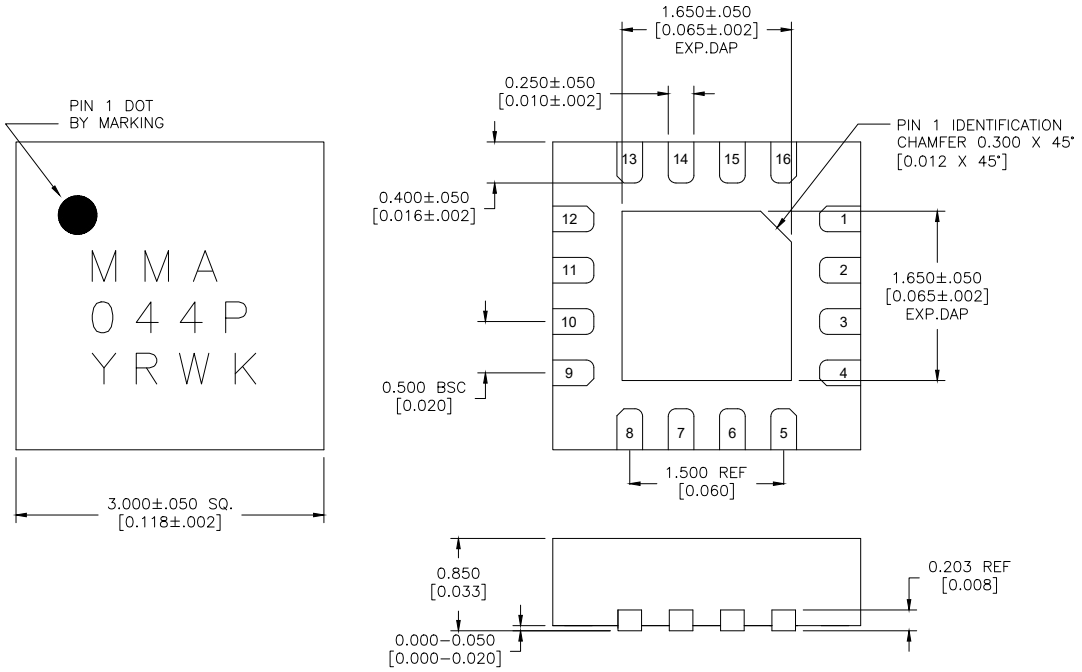


Table 2-1. Package Information

Material	Lead Frame
Plating	100% Matte Tin finish
Package Body Material	Low-stress injection molded plastic

Table 2-2. PIN Description

PIN Number	Pad Name	Pad Description
2, 3	RFIN	AC-Coupled and matched to 50Ω.
10, 11	RFOUT	AC-Coupled and matched to 50Ω.
14, 13	VDD1,VDD2	Power supply voltage for the amplifier. See assembly for required external components.
1,4,9,12	RF/DC GND	RF/DC Ground. Should be connected to PCB RF/DC Ground
5,6,7,8,15,16	N/C	These pins are not connected internally, but they may be connected to external RF/DC Ground on PCB.
Backside Paddle	RF/DC GND	Must be connected to RF/DC Ground

3. Application Ciruits: Eval PCB

Figure 3-1. Eval PCB Schematic

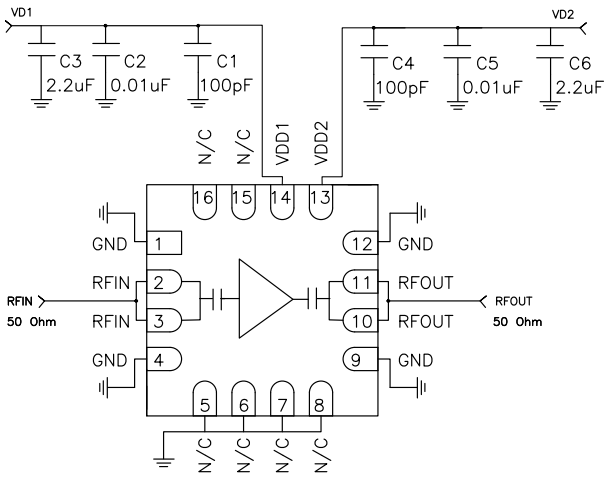


Figure 3-2. Eval PCB

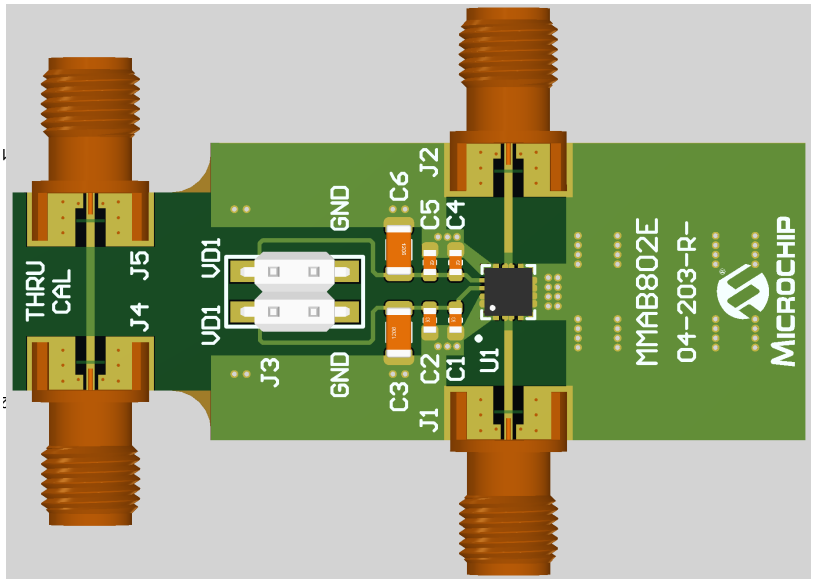


Table 3-1. Bill of Material

Designation	Description	Manufacturer Part Number	Quantity
U1	MMA044PP3 3X3 QFN	MMA044PP3	1
C1, C4	CAP CER 100pF 100V 5% C0G SMD 0603	C0603C101J1GACTU	2
C2, C5	CAP CER 10000pF 100V 10% X7R SMD 0603	C1608X7R2A103K080AA	2
C3, C6	CAP CER 2.2uF 50V 10% X7R SMD 1206 AEC-Q200	GCM31CR71H225KA55K	2
J1, J2, J4, J5	CONN 2.9MM FEMALE PCB EDGE MOUNT .012 PIN	25-146-1000-90	4
J3	CONN HEADER SMD 4POS 2.54MM	15-91-2040	1
1	PCB Backplate	DWGB415 (MM-FD-0010)	1

4. Ordering, Shipping and Handling

4.1 Handling Recommendations

Gallium arsenide integrated circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. It is recommended to follow all procedures and guidelines outlined in the Microsemi application note AN01: GaAs MMIC Handling and Die Attach Recommendations.

4.2 Ordering Information

For additional ordering information, contact your Microchip sales representative.

Part Number	Package
MMA044AA	Bare Die (Refer to MMA044AA Datasheet)
MMA044PP3	3 mm × 3 mm, 24L Plastic QFN
MMA044PP3E	Evaluation board for MMA044PP3

4.3 Packing Information

Standard Format
Tape and Reel

Note: Contact your Microchip sales representative for the minimum quantity order

5. Revision History

Table 5-1. Revision History

Revision	Date	Description
A	10/2021	Document created.

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