

**MMA044PP3**

**Datasheet**

**6 GHz–18 GHz GaAs pHEMT MMIC Wideband Low-Noise  
Amplifier**

Released

May 2017



## Contents

---

<b>1</b>	<b>Revision History .....</b>	<b>1</b>
1.1	Revision 1.0 .....	1
<b>2</b>	<b>Product Overview .....</b>	<b>2</b>
2.1	Applications .....	2
2.2	Key Features .....	2
<b>3</b>	<b>Electrical Specifications .....</b>	<b>3</b>
3.1	Absolute Maximum Ratings .....	3
3.2	Specified Electrical Performance .....	4
3.3	Typical Performance Curves .....	4
<b>4</b>	<b>Package Specifications .....</b>	<b>6</b>
4.1	Package Outline Drawing .....	6
4.2	Package Information .....	6
4.3	Pin Descriptions .....	7
4.4	Application Circuit .....	7
<b>5</b>	<b>Handling Recommendations .....</b>	<b>8</b>
<b>6</b>	<b>Evaluation Board Information .....</b>	<b>9</b>
<b>7</b>	<b>Ordering Information .....</b>	<b>10</b>

# 1 Revision History

---

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1 Revision 1.0

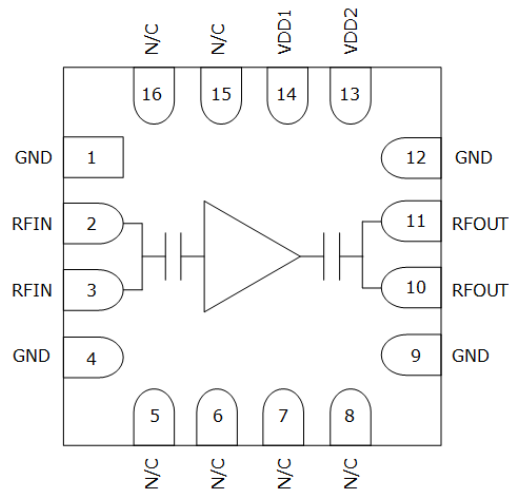
Revision 1.0 was published in May 2017. It was the first publication of this document.

## 2 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 6 GHz and 18 GHz. The MMA044PP3 amplifier provides 17 dB of gain, 2.0 dB noise figure, 14 dBm P1dB, and 28 dBm output IP3. The amplifier draws only 100 mA of current from a 4 V supply. The P1dB power of 14 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.

**Figure 1 • MMA044PP3 Functional Block Diagram**



### 2.1 Applications

The MMA044PP3 device is designed for the following applications:

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

### 2.2 Key Features

The following are key features of the MMA044PP3 device:

- GaAs pHEMT LNA monolithic microwave integrated circuit (MMIC)
- Low-noise figure: 2.0 dB from 6 GHz–12 GHz
- 50 Ω matched input/output
- High gain: 17 dB from 6 GHz–18 GHz
- Broadband performance: 6 GHz–18 GHz
- Excellent P1dB output power: 14 dBm
- High OIP3: 28 dBm
- Single-supply operation: 4 V
- Package: compact 16-lead 3 mm × 3 mm × 0.85 mm QFN package

## 3 Electrical Specifications

---

This section details the electrical specifications of the MMA044PP3 device.

### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MMA044PP3 device.

**Table 1 • Absolute Maximum Ratings**

Parameter	Rating
Storage temperature	–65 °C to 150 °C
Operating temperature	–40 °C to 85 °C
Drain bias voltage ( $V_{D1}$ , $V_{D2}$ )	4.5 V
Channel temperature	150 °C
ESD sensitivity (HBM)	TBD
Thermal impedance (channel-to-die backside)	TBD

### 3.2 Specified Electrical Performance

The following table shows the specified electrical performance of the MMA044PP3 device at 25 °C, where  $V_{D1}$  and  $V_{D2}$  are 4 V,  $I_{D1}$  is 30 mA, and  $I_{D2}$  is 70 mA.

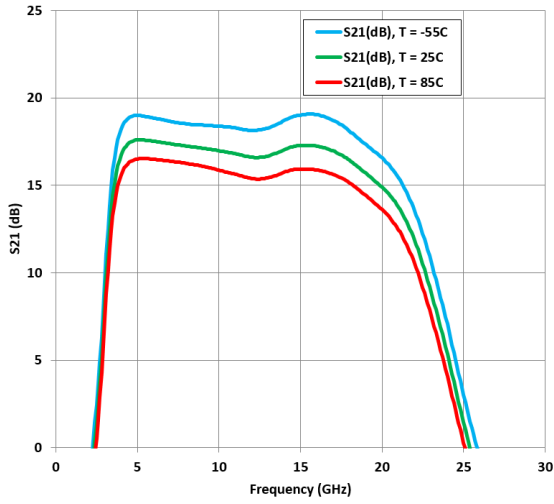
**Table 2 • Specified Electrical Performance**

Parameter	Frequency Range	Min	Typ	Max	Units
Operational frequency range		5		19	GHz
Gain	6 GHz–18 GHz	16	17		dB
Gain flatness	6 GHz–18 GHz		±0.5		dB
Noise figure	6 GHz–12 GHz		2.0	2.5	dB
	12 GHz–18 GHz		2.5	3.5	dB
Input return loss	6 GHz–18 GHz		–12		dB
Output return loss	6 GHz–18 GHz		–12		dB
P1dB	6 GHz–18 GHz		14		dBm
Psat (3 dB compression point)	6 GHz–18 GHz		16		dBm
OIP3	6 GHz–18 GHz		28		dBm
$V_{D1}$ (drain voltage supply)			4		V
$V_{D2}$ (drain voltage supply)			4		V
$I_{D1}$ (drain current nominal)		25	30	35	mA
$I_{D2}$ (drain current nominal)		63	70	78	mA

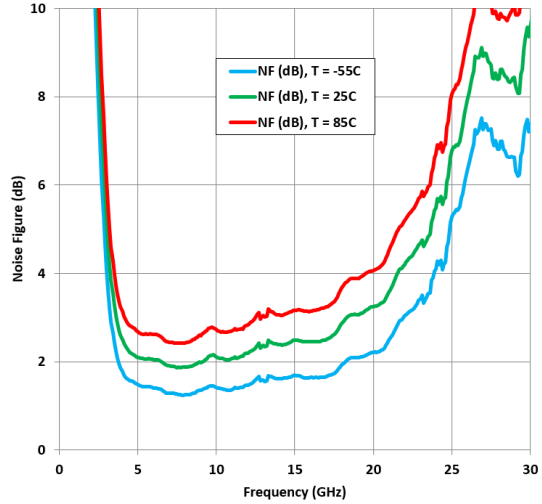
### 3.3 Typical Performance Curves

The following graphs show the typical electrical performance curves of the MMA044PP3 device, where  $V_{DD}$  is 4 V and  $I_{DD}$  is 100 mA, unless otherwise indicated.

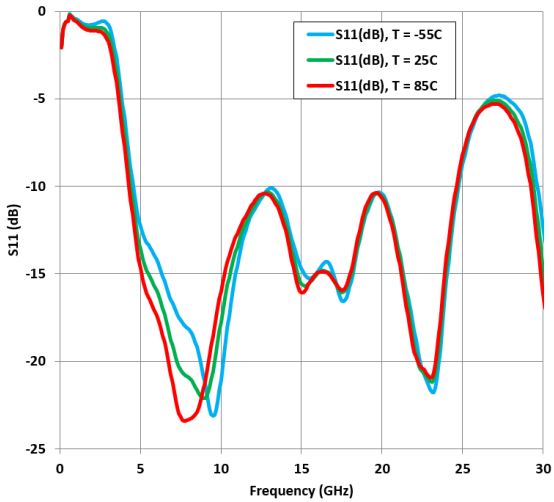
**Figure 2 • Gain vs. Temperature**



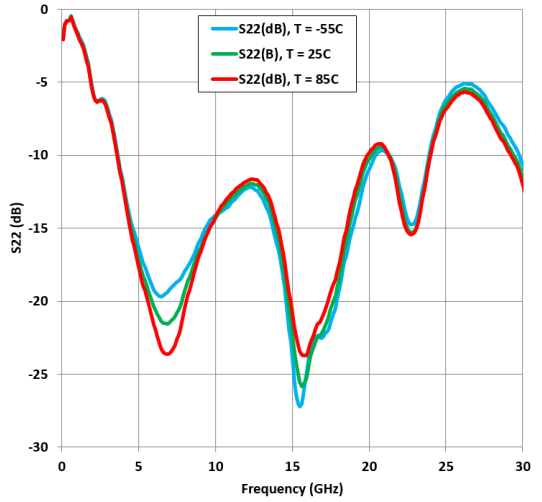
**Figure 3 • Noise Figure vs. Temperature**



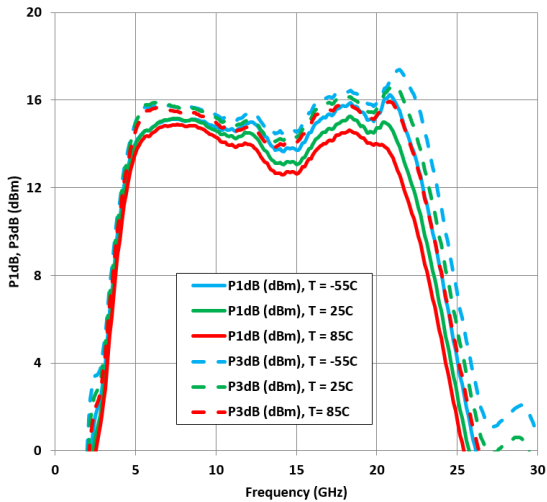
**Figure 4 • Input Return Loss vs. Temperature**



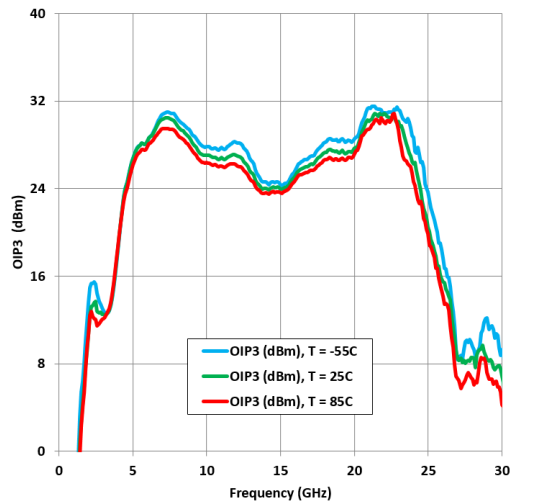
**Figure 5 • Output Return Loss vs. Temperature**



**Figure 6 • P1dB/P3dB Output Power vs. Temperature**



**Figure 7 • Output IP3 vs. Temperature**



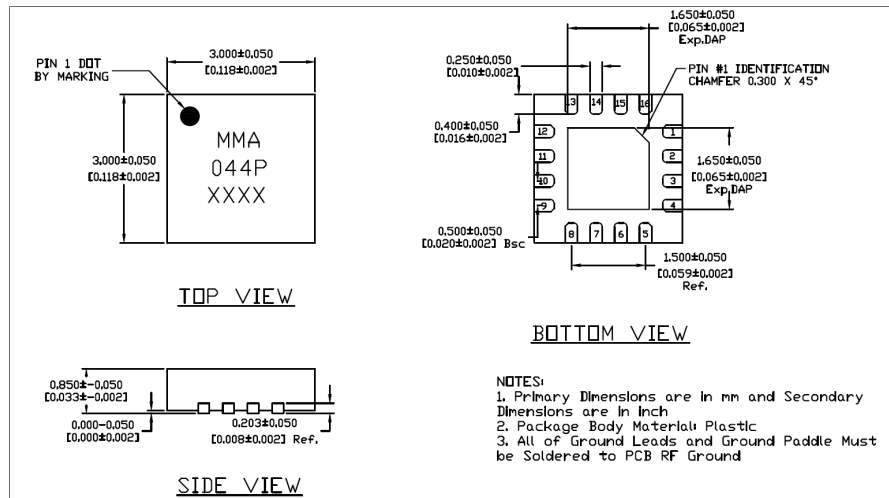
## 4 Package Specifications

This section details the package specifications of the MMA044PP3 device.

### 4.1 Package Outline Drawing

The following illustration shows the package outline of the MMA044PP3 device. Dimensions are in millimeters [inches].

Figure 8 • Package Outline



### 4.2 Package Information

The following table shows the package information of the MMA044PP3 device. For additional packaging information, contact your Microsemi sales representative.

Table 3 • Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking
MMA044PP3	Low-stress injection molded plastic	100% matte Sn	TBD	MMA 044P wwyy



## 4.3 Pin Descriptions

The following table provides descriptions of pins for the MMA044PP3 device.

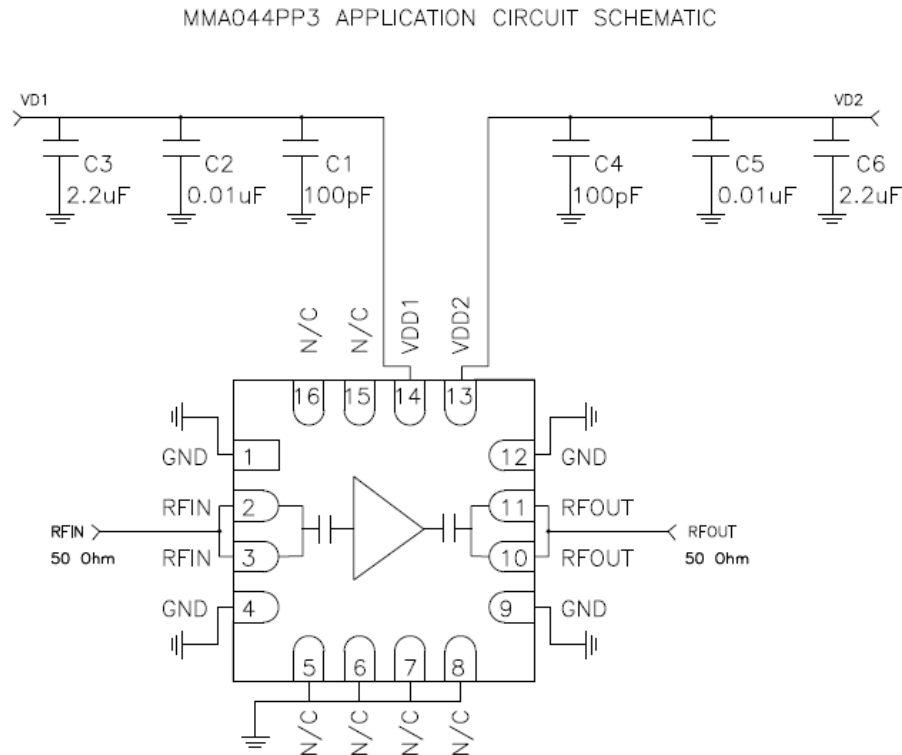
**Table 4 • Pin Descriptions**

Pin Number	Pin Name	Description
1,4,9,12	GND	GND pins and package bottom must be connected to external RF/DC ground on PCB.
2,3	RFIN	This pin is AC-coupled and matched to 50 $\Omega$ .
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.
10,11	RFOUT	This pin is AC-coupled and matched to 50 $\Omega$ .
13,14	VDD2, VDD1	Power supply voltage for the amplifier. See assembly for required external components.
Backside paddle	RF/DC GND	RF/DC ground.

## 4.4 Application Circuit

The following illustration shows the application circuit schematic for the MMA044PP3 device.

**Figure 9 • Application Circuit Schematic**



## 5 Handling Recommendations

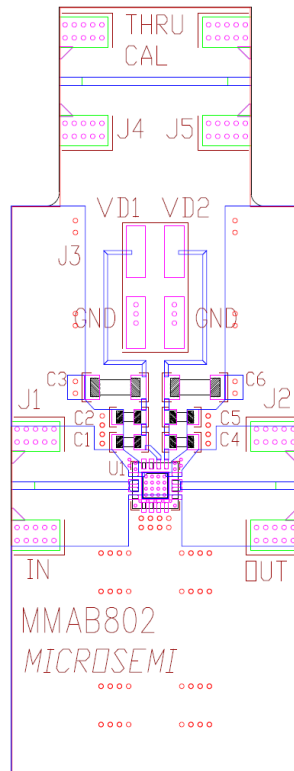
---

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](#).

## 6 Evaluation Board Information

The following image shows the evaluation board of the MMA044PP3 device.

**Figure 10 • Evaluation Board**



The circuit board used in the application should be generated with proper RF circuit design techniques. Signal lines at the RF ports should have 50  $\Omega$  impedance and the package ground leads and backside ground paddle should be connected directly to the ground plane similar to that shown previously.

The following table shows the materials for the evaluation PCB MMA044PP3E.

**Table 5 • Materials for Evaluation PCB MMA044PP3E**

Item	Description
C1, C4	0603, 100 pF, $\pm 5\%$ , 100 V, AVX, NPO
C2, C5	0603, 10000 pF, $\pm 10\%$ , 100 V, AVX, X7R
C3, C6	1206, 2.2 $\mu$ F, $\pm 10\%$ , 50 V, AVX, X7R
J1, J2, J4, J5	SRI RF connector 2.9 mm
J3	4-pin DC header Molex
U1	MMA044PP3 QFN 3X3, 16L
PCB	MMAB802
Base plate	749-MM-0198_Rev 03 (modified)

## 7 Ordering Information

---

The following table shows the ordering information for the MMA044PP3 device.

**Table 6 • Ordering Information**

Part Number	Package
MMA044PP3	3 mm × 3 mm plastic QFN package
MMA044PP3E	Evaluation board for MMA044PP3

**Microsemi Corporate Headquarters**

One Enterprise, Aliso Viejo,  
 CA 92656 USA  
 Within the USA: +1 (800) 713-4113  
 Outside the USA: +1 (949) 380-6100  
 Fax: +1 (949) 215-4996  
 Email: [sales.support@microsemi.com](mailto:sales.support@microsemi.com)  
[www.microsemi.com](http://www.microsemi.com)

© 2017 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at [www.microsemi.com](http://www.microsemi.com).

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [RF Amplifier](#) category:*

*Click to view products by [Microchip](#) manufacturer:*

Other Similar products are found below :

[A82-1](#) [BGA622H6820XTSA1](#) [BGA 728L7 E6327](#) [BGB719N7ESDE6327XTMA1](#) [HMC397-SX](#) [HMC405](#) [HMC561-SX](#) [HMC8120-SX](#)  
[HMC8121-SX](#) [HMC-ALH382-SX](#) [HMC-ALH476-SX](#) [SE2433T-R](#) [SMA3101-TL-E](#) [SMA39](#) [A66-1](#) [A66-3](#) [A67-1](#) [LX5535LQ](#) [LX5540LL](#)  
[MAAM02350](#) [HMC3653LP3BETR](#) [HMC549MS8GETR](#) [HMC-ALH435-SX](#) [SMA101](#) [SMA32](#) [SMA411](#) [SMA531](#) [SST12LP17E-XX8E](#)  
[SST12LP19E-QX6E](#) [WPM0510A](#) [HMC5929LS6TR](#) [HMC5879LS7TR](#) [HMC1126](#) [HMC1087F10](#) [HMC1086](#) [HMC1016](#) [SMA1212](#)  
[MAX2689EWS+T](#) [MAAMSS0041TR](#) [MAAM37000-A1G](#) [LTC6430AIUF-15#PBF](#) [CHA5115-QDG](#) [SMA70-2](#) [SMA4011](#) [A231](#) [HMC-](#)  
[AUH232](#) [LX5511LQ](#) [LX5511LQ-TR](#) [HMC7441-SX](#) [HMC-ALH310](#)