

## 4 – 18 GHz MMIC Wideband LNA

### Product Overview

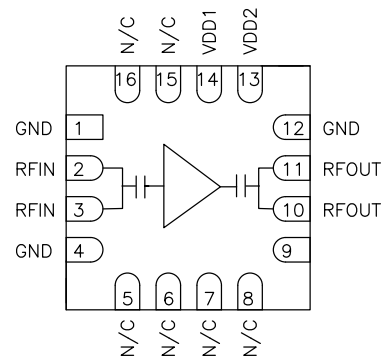
The MMA044PP3 is a gallium arsenide (GaAs) pseudomorphic high-electron-mobility transistor (pHEMT) low-noise wideband amplifier in a plastic leadless 3 mm × 3 mm surface-mount package that operates between 4 GHz and 18 GHz. The MMA044PP3 amplifier provides 17 dB of gain, 2.5 dB noise figure, 15 dBm P1dB, 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

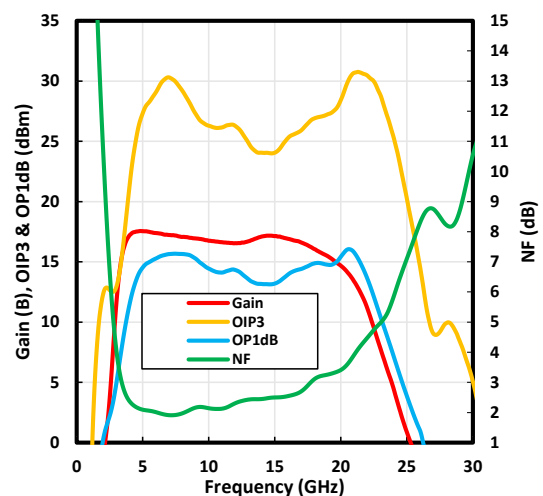
- Test and measurement instrumentation
- Electronic warfare (EW), electronic countermeasures (ECM), and electronic counter-countermeasures (ECCM)
- Military and space
- Telecom infrastructure
- Wideband microwave radios
- Microwave and millimeter-wave communication systems

#### Performance Overview

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

**Export Classification: EAR99**

**Figure 2. Gain, NF, OIP3 & OP1dB Performances**



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## 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

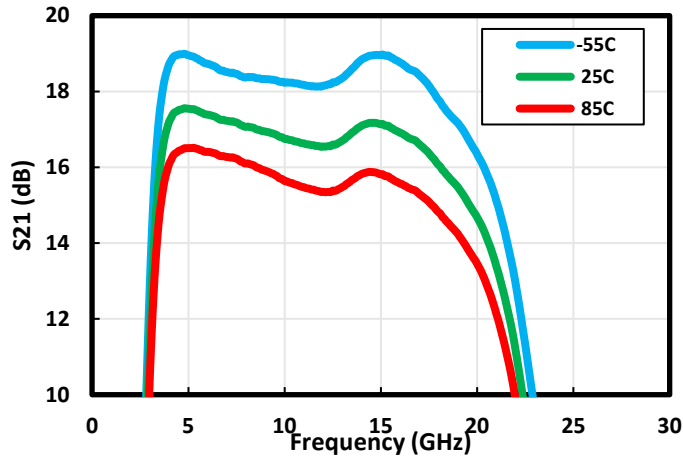


Figure 1-2. NF vs. Temperature

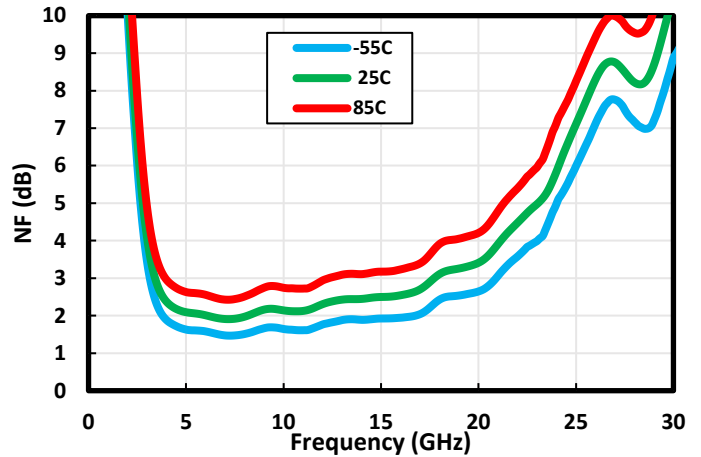


Figure 1-3. S11 vs. Temperature

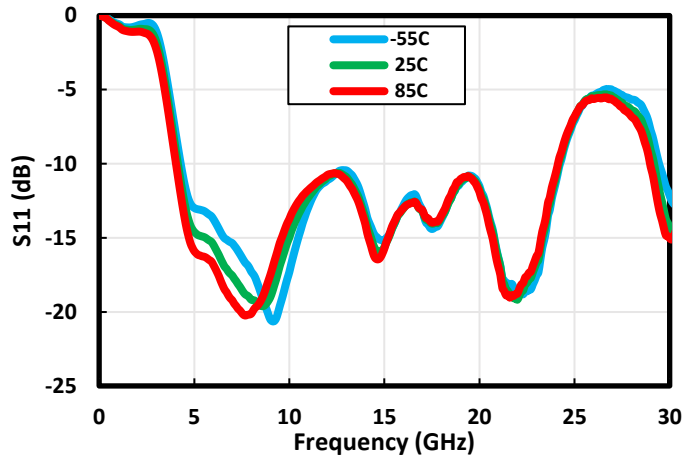


Figure 1-4. S22 vs. Temperature

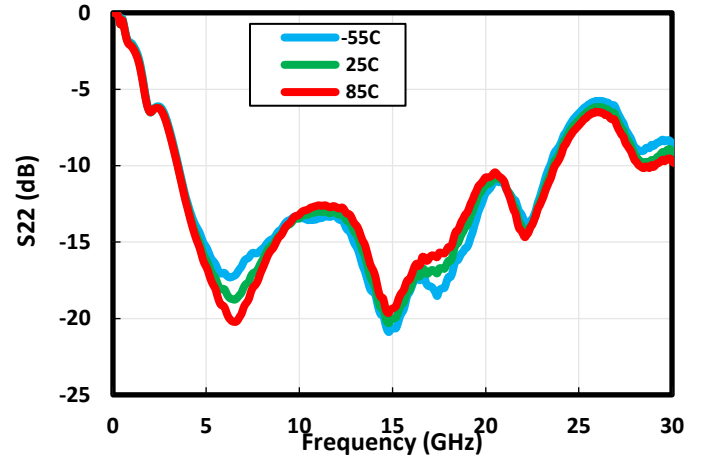


Figure 1-5. Output IP3 vs. Temperature

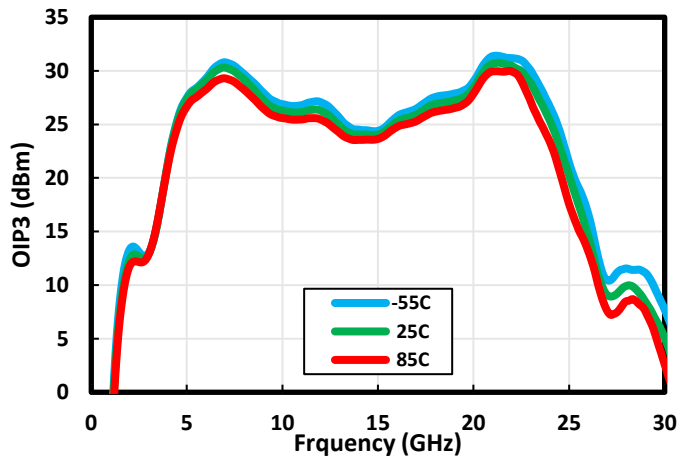


Figure 1-6. Output P1dB vs. Temperature

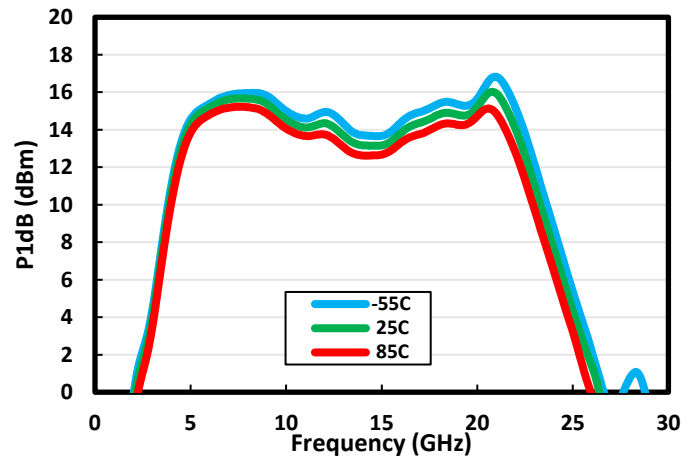


Figure 1-7. Output P3dB vs. Temperature

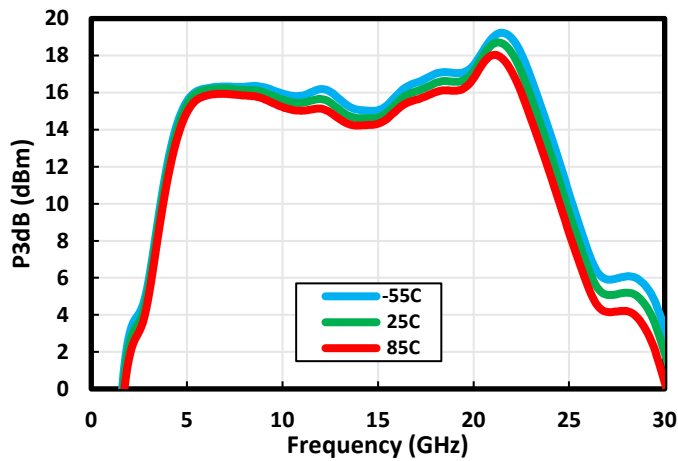
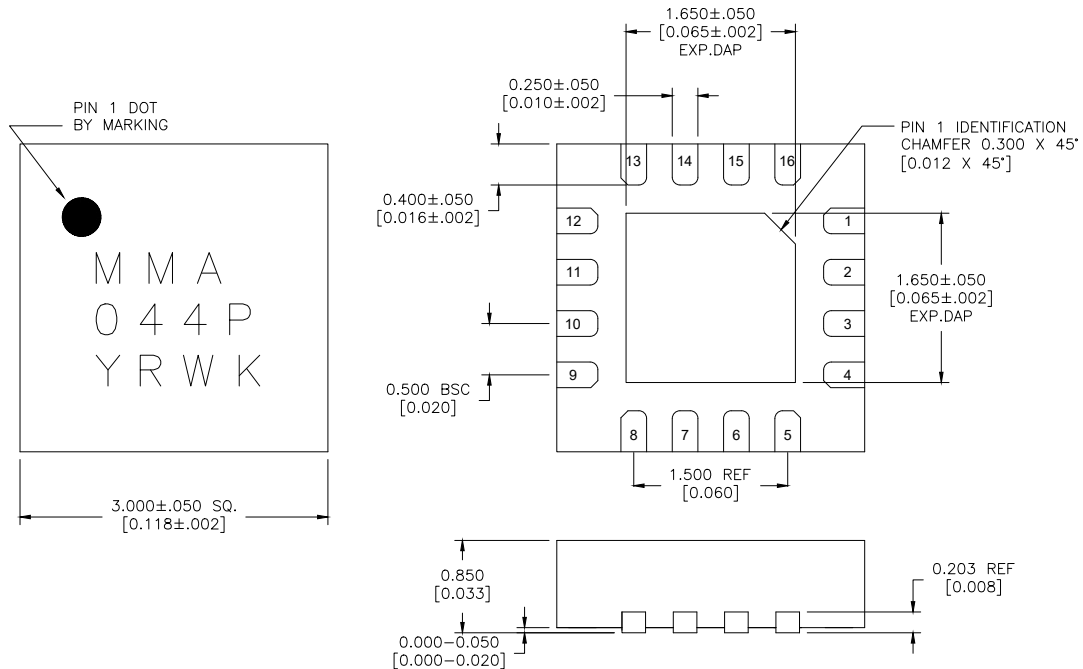


Figure 1-8. P3dB vs. Temperature @ 10V/370mA

## 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

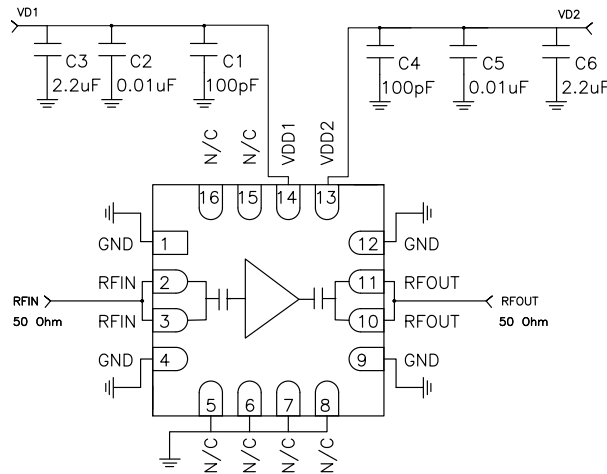


Figure 3-2. Eval PCB

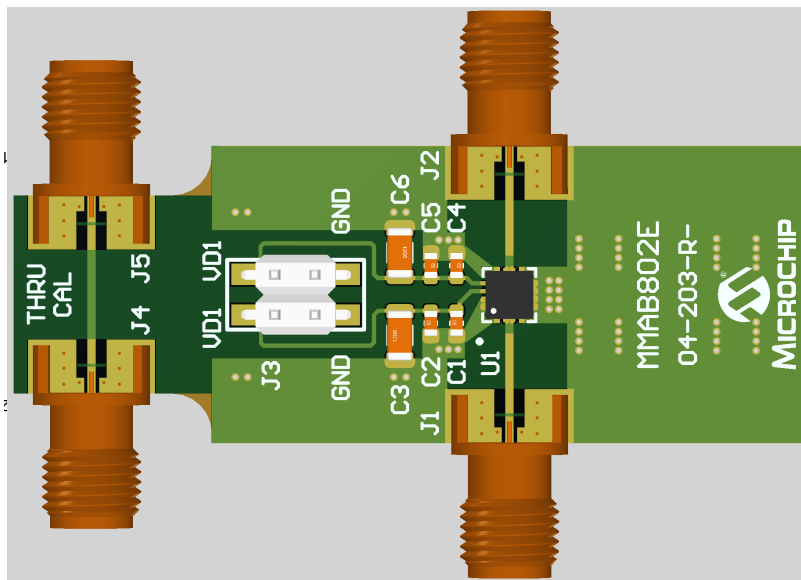


Table 3-1. Bill of Material

| 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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