MMA042PP4

2 – 26 GHz Distributed Self-Biased LNA

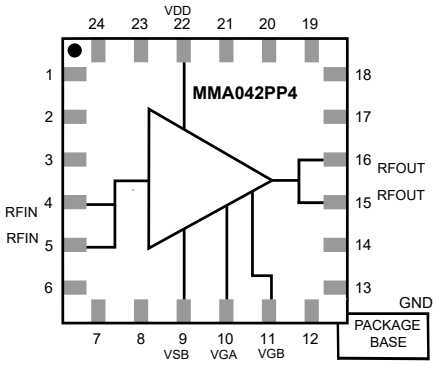
Product Overview

MMA042PP4 is a gallium arsenide (GaAs) monolithic microwave integrated circuit (MMIC) pseudomorphic high-electron mobility transistor (pHEMT) distributed amplifier that operates between 2 GHz and 26 GHz. It is ideal for test instrumentation, defense, and space applications. The amplifier provides a 2 dB positive gain slope with a typical gain of 18 dB, 2.5 dB noise figure, 19 dBm of output power at 1 dB gain compression, and 29 dBm output IP3 at 10 GHz. The MMA042PP4 amplifier features RF I/Os that are internally matched to 50 Ω.

Key Features

- **Frequency range: 2 to 26 GHz**
- **High Gain: 18 dB with +2 dB upslope**
- **Low Noise figure: 2.5 dB**
- **High Output IP3: + 29 dBm**
- **Maximum RF Input Power: + 24 dBm**
- **Single Positive Supply: +6V @ 120 mA (+8V VDD max)**
- **ESD Protection on RF and DC ports**
- **50 Ω matched input/output**

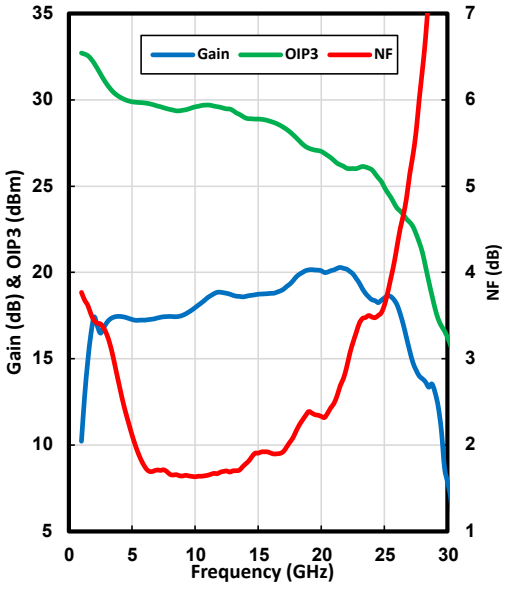
Functional Block Diagram



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

Gain, OIP3& NF Performances



Performance Overview

Parameter	Typ.	Units
Frequency range	2 – 26	GHz
Gain	18	dB
Gain flatness	± 0.75	dB
NF	2.5	dB
Output IP3	+ 29	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 = + 6V, Idd = 120 mA (Unless otherwise mentioned)

Parameter	Frequency Range	Min	Typ.	Max	Units
Frequency range				26	GHz
Gain	2 – 8 GHz		17		dB
	8 – 16 GHz		17		dB
	16 – 22 GHz		18		dB
	22 – 26 GHz		17		dB
Gain flatness	2 – 6 GHz		± 0.75		dB
	6 –12 GHz		± 0.75		dB
	12 – 22 GHz		± 0.75		dB
	22 – 26 GHz		± 1.0		dB
Noise Figure	2 – 6 GHz		3.0		dB
	6 –12 GHz		2.5		dB
	12 – 22 GHz		3.5		dB
	22 – 26 GHz		4		dB
P1dB	2 – 6 GHz		+ 17		dBm
	6 – 12 GHz		+ 16		dBm
	12 – 22 GHz		+ 15		dBm
	22 – 26 GHz		+ 14		dBm
OIP3	2 – 6 GHz		+ 29		dBm
	6 – 12 GHz		+ 28		dBm
	12 – 22 GHz		+ 26		dBm
	22 – 26 GHz		+25		dBm
Input Return Loss	2 – 6 GHz		12		dB
	6 – 12 GHz		13		dB
	12 – 22 GHz		10.5		dB
	22 – 26 GHz		7.5		dB
Output Return Loss	2 – 6 GHz		12		dB
	6 – 12 GHz		9.5		dB
	12 – 22 GHz		13		dB
	22 – 26 GHz		8		dB
VDD (Drain Voltage Supply)			+6		V

.....continued					
Parameter	**Frequency Range**	**Min**	**Typ.**	**Max**	**Units**
Idd (Drain Current)			120		mA

1.2 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MMA042PP4 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 (VDD)	+ 8 V
Gate bias voltage (VG)	– 1 V to + 0.5V
RF input power (Pin)	TBD
Channel Temperature	150 °C
VDD Current (IDD)	200 mA
DC Power Dissipation (T = 85 °C)	1.6 W
Thermal Resistance	17 °C/W
Storage Temperature	– 65 °C to + 150 °C
Operating Temperature	– 55 °C to + 85 °C

ESD Sensitive Device

1.3 Typical Performance Curves

The following graphs show the typical performance curves of the MMA042PP4 device at + 25 °C, + 6V and 120mA unless otherwise indicated.

Figure 1-1. Gain vs. Temperature

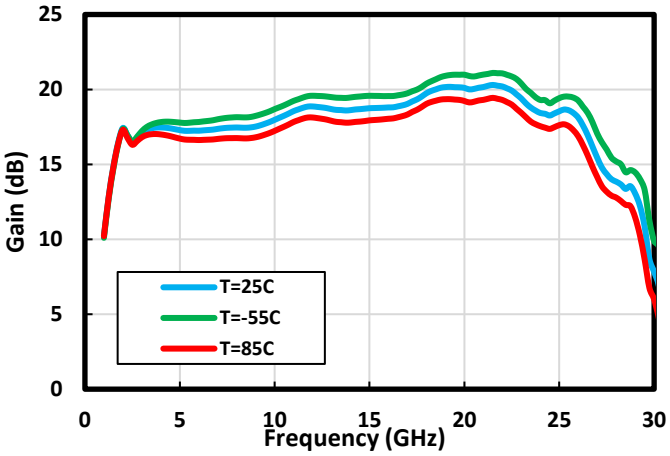


Figure 1-2. NF vs. Temperature

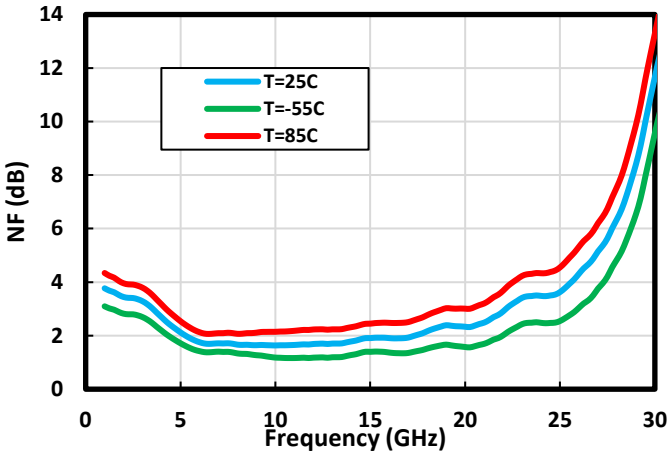


Figure 1-3. S11 vs. Temperature

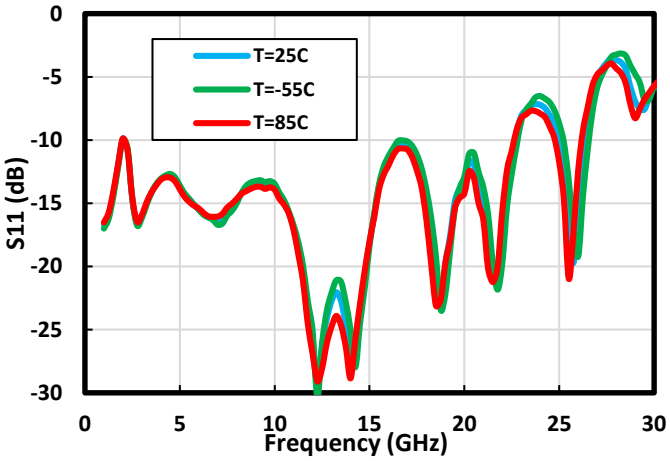


Figure 1-4. S22 vs. Temperature

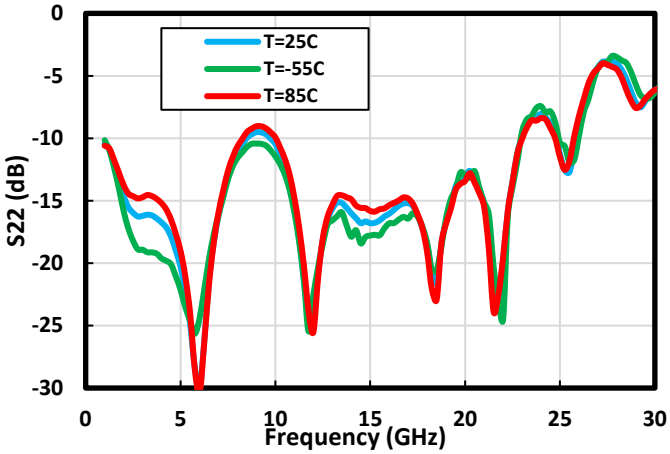


Figure 1-5. P1dB vs. Temperature

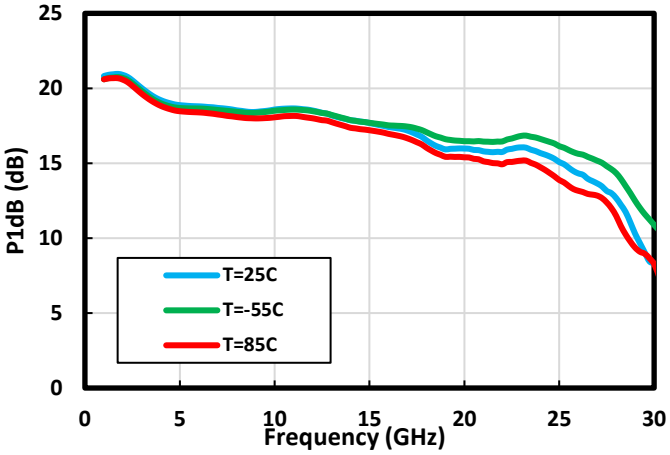


Figure 1-6. P3dB vs. Temperature

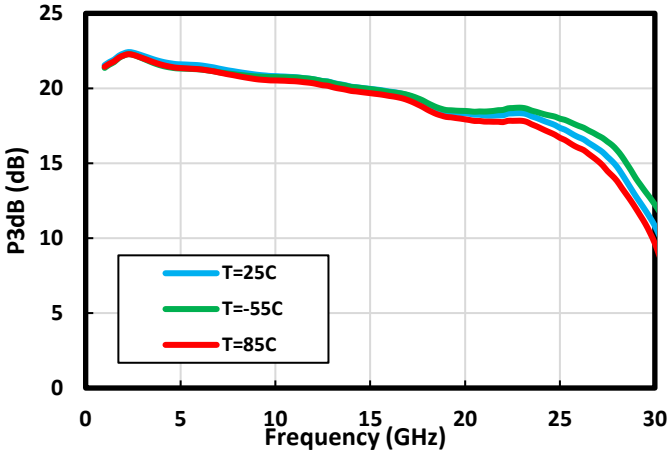


Figure 1-7. OIP3 vs. Temperature

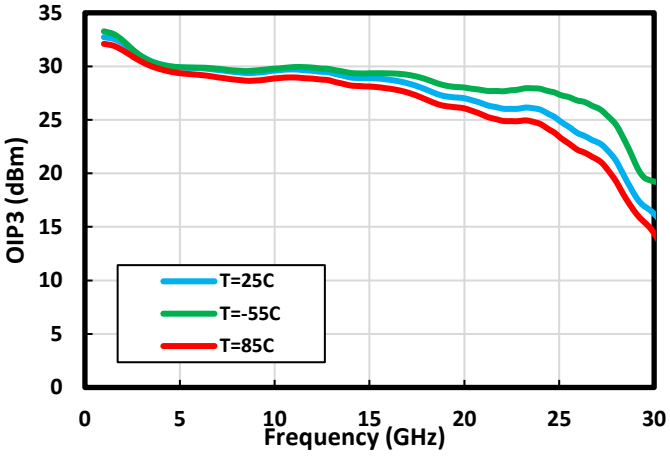


Figure 1-8. Gain vs. Vdd

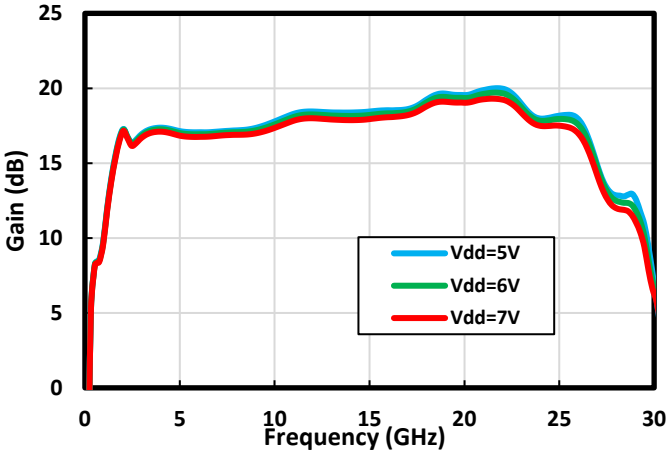


Figure 1-9. NF vs. Vdd

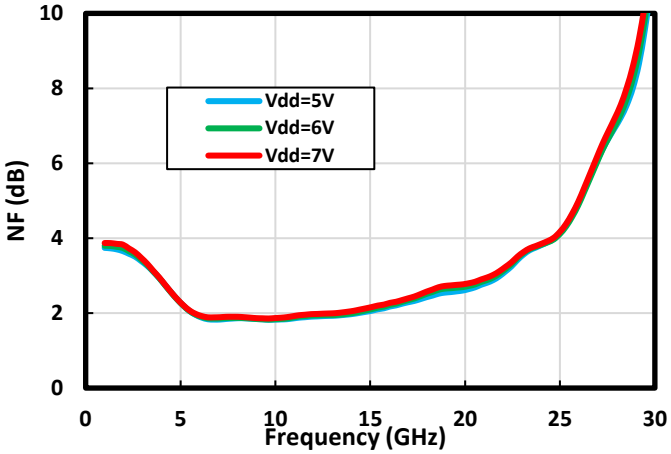


Figure 1-10. P1dB vs. Vdd

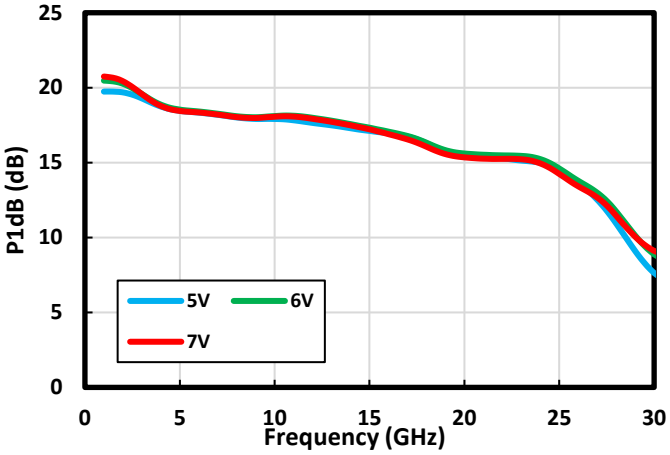


Figure 1-11. OIP3 vs. Vdd

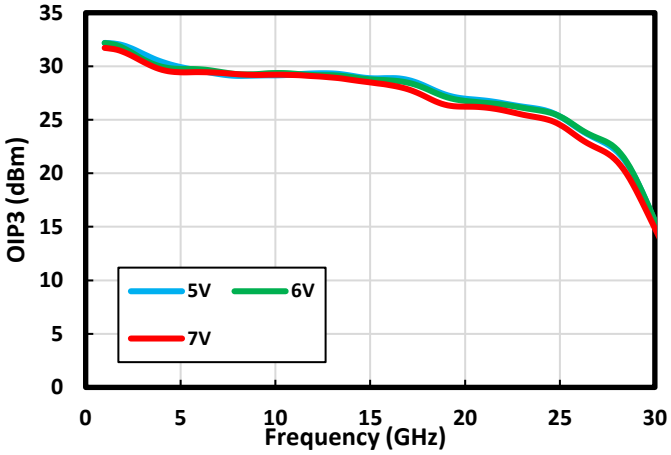


Figure 1-12. Gain vs. Idd @ +6 V

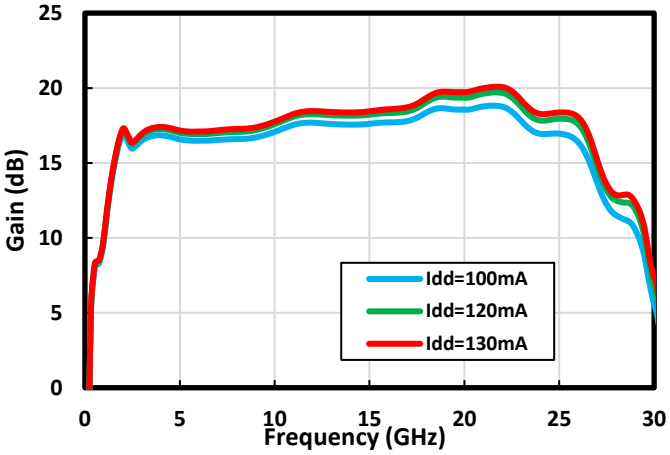


Figure 1-13. NF vs. Idd

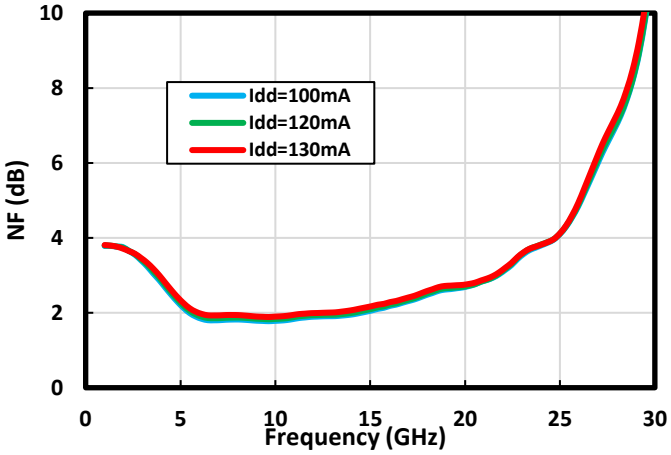
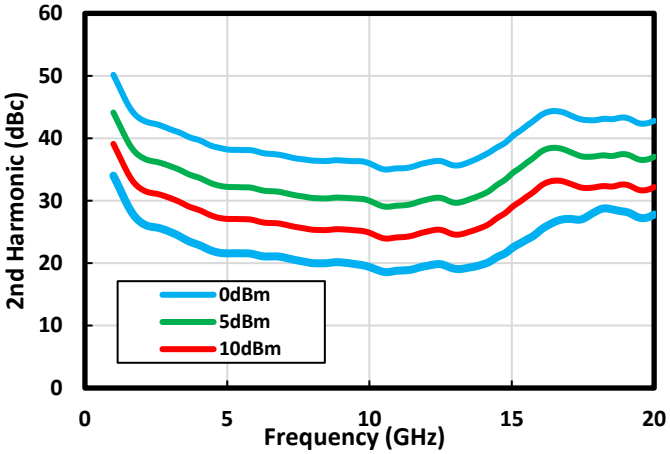


Figure 1-14. 2nd Harmonic vs. Pout



2. Package Specifications

For additional packaging information, contact your Microchip sales representative.

Figure 2-1. Package Outline Drawing (mm)

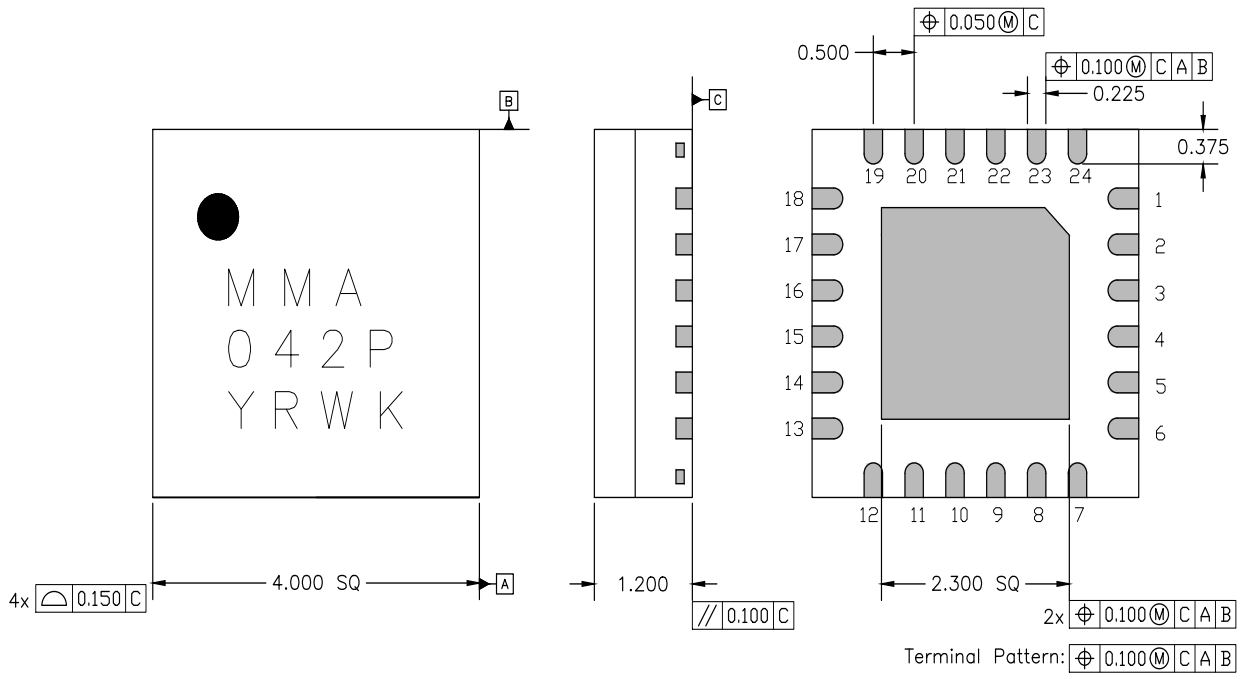


Table 2-1. Package Information

Material	Lead Frame
Plating	Ni: 0.50 um min Pd: 0.02 um min Au: 0.05 um max

Table 2-2. PIN Description

PIN Number	Pad Name	Pad Description
4,5	RFIN	DC-Coupled and Matched to 50Ω.
15,16	RFOUT	Matched to 50Ω.
22	VDD	VDD supply
10	VGA	Connect to RF/DC Ground
11	VGB	Used to change Idd. Refer Table.
9	VSB	Connect to RF/DC Ground
3,6,14,17	GND	RF/DC Ground
1,2,7,8,12,13,18,19,20,21,23,24	N/C	
Backside Paddlle	RF/DC GND	Must be connected to RF/DC Ground

3. Application Ciruits: Eval PCB

Figure 3-1. Eval PCB Schematic

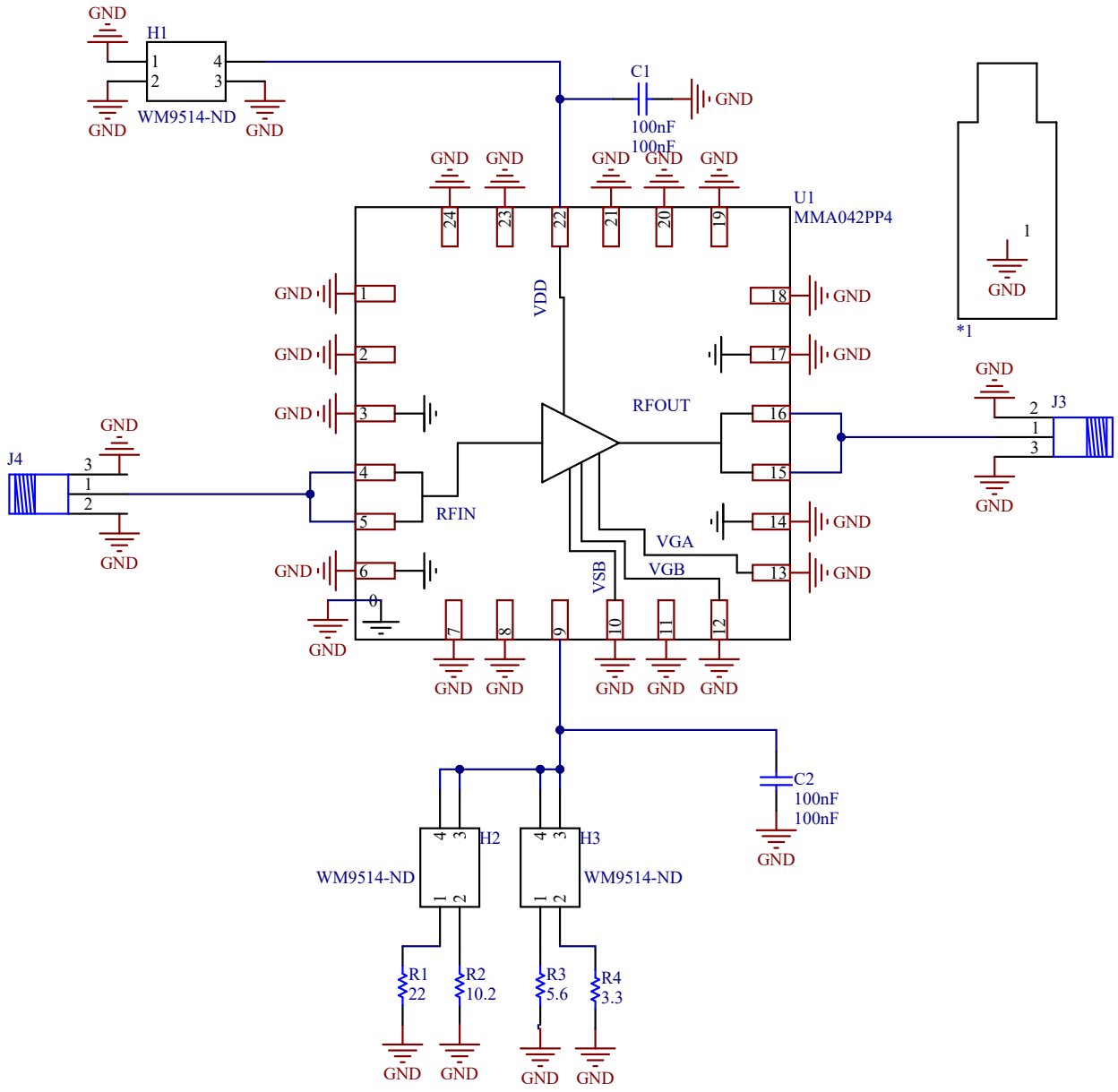


Figure 3-2. Eval PCB

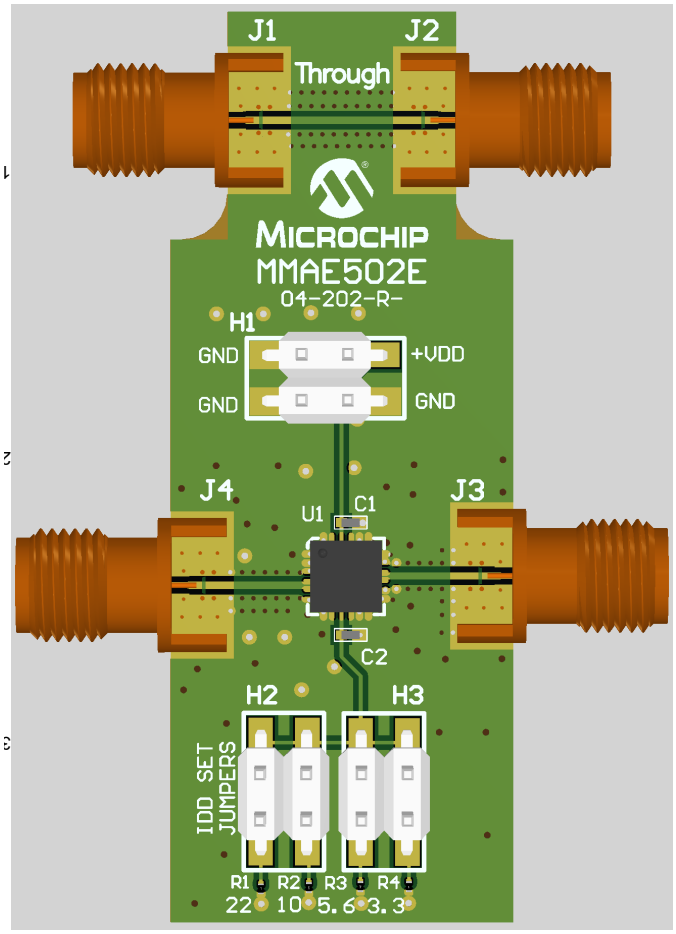


Table 3-1. Bill of Material

Designation	Description	Manufacturer Part Number	Quantity
1	PCB Backplate		1
C1, C2	Cap 100nF 16V +/-10% X7R Au cer 0201	0201X104K160GT	2
H1, H2, H3	Header, 2-Pin, Dual row	15-91-2040	3
J1, J2, J3, J4	CONN 2.9MM FEMALE PCB EDGE MOUNT .012 PIN	25-146-1000-90	4
R1	RES 22 OHM 1/20W 1% 0201 SMD	ERJ-1GEF22R0C	1
R2	RES 10.2 OHM 1/20W 1% 0201 SMD	ERJ-1GEF10R2C	1
R3	Res 5.6-Ohm 1/20W 5% 0201	ERJ-1GEJ5R6C	1
R4	RES 3.3-OHM 1/20W 5% 0201	ERJ-1GEJ3R3C	1
U1	MMA042PP4 4X4 QFN	MMA042PP4	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
MMA042PP4	4 mm X 4 mm, 24L Plastic QFN

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	08/2021	Document created.

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