

Evaluating the ADPA1116 0.3 GHz to 6 GHz, 39.5 dBm, GaN Power Amplifier

FEATURES

- ▶ 2-layer Rogers 4350B evaluation board with heat spreader
- ▶ End launch, SMA, RF connectors
- ▶ Through calibration path (depopulated)

EVALUATION KIT CONTENTS

- ▶ ADPA1116-EVALZ evaluation board

EQUIPMENT NEEDED

- ▶ RF signal generator
- ▶ RF spectrum analyzer
- ▶ RF network analyzer
- ▶ 28 V, 2 A power supply
- ▶ 0 V to -6 V, 100 mA power supply
- ▶ RF attenuator: ≥ 20 dB, 20 W
- ▶ RF coupler: 30 dB, 20 W
- ▶ RF power meter and power sensor
- ▶ Thermal plate or heatsink

GENERAL DESCRIPTION

The ADPA1116-EVALZ is a 2-layer printed circuit board (PCB) fabricated from a 10 mil thick Rogers 4350B copper clad mounted to an aluminum heat spreader. The heat spreader provides thermal relief to the [ADPA1116](#) and mechanical support to the PCB. Mounting holes on the heat spreader allow it to be attached to larger heatsinks for improved thermal management. The RFIN and RFOUT ports are populated by Subminiature Version A (SMA) female coaxial connectors, and their respective RF traces are of 50 Ω characteristic impedance. The ADPA1116-EVALZ is populated with components suitable for use over the entire operating temperature range of the ADPA1116.

The RF traces are 50 Ω grounded coplanar waveguide, and the package ground leads connect directly to the ground plane. Multiple vias are used to connect the top and bottom ground planes. Multiple vias under the package paddle ensure adequate electrical and thermal conduction.

The power supply decoupling capacitors shown in [Figure 6](#) represent the configuration that was used to characterize the device.

For full details on the ADPA1116, see the ADPA1116 data sheet, which should be consulted in conjunction with this user guide when using the ADPA1116-EVALZ evaluation board.

ADPA1116-EVALZ EVALUATION BOARD PHOTOGRAPHS

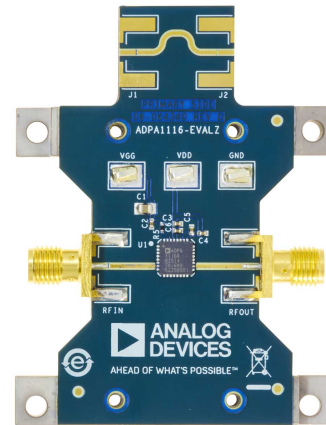


Figure 1. ADPA1116-EVALZ Evaluation Board, Primary Side

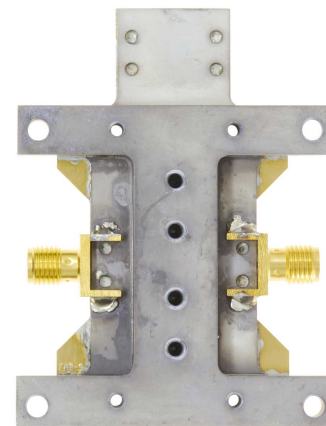


Figure 2. ADPA1116-EVALZ Evaluation Board, Secondary Side

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REVISION HISTORY**4/2024—Revision 0: Initial Version**

OPERATING THE ADPA1116-EVALZ

The DC connections required to operate the ADPA1116-EVALZ are accessed through the VGG1, VDD, and ground surface-mount test points, see [Table 1](#) for the pin descriptions.

Table 1. Header Connections to the ADPA1116

Header Pin No.	Mnemonic
Not Applicable (Surface-Mount Test Point)	VGG1
Not Applicable (Surface-Mount Test Point)	VDD
Not Applicable (Surface-Mount Test Point)	GND

Attach the ADPA1116-EVALZ to a thermal plate or a heatsink and then complete the power-up and power-down sequences that follow to evaluate the performance of the [ADPA1116](#).

POWER-UP SEQUENCE

Take the following steps to power up:

1. Apply -6 V to the VGG1 surface-mount test point.
2. Apply 28 V to the VDD surface-mount test point.
3. Adjust VGG1 between -3 V and -1 V to achieve a quiescent current (I_{DQ}) of 300 mA . The nominal gate voltage is approximately -2 V .
4. Apply the RF signal to the RFIN connector of the [ADPA1116](#).

POWER-DOWN SEQUENCE

Take the following steps to power down:

1. Turn off the RF signal.
2. Set VGG1 to -6 V .
3. Set VDD to 0 V .
4. Set VGG1 to 0 V .

TEST SETUP DIAGRAMS

[Figure 3](#) and [Figure 4](#) show the power and S-parameter test setups, respectively.

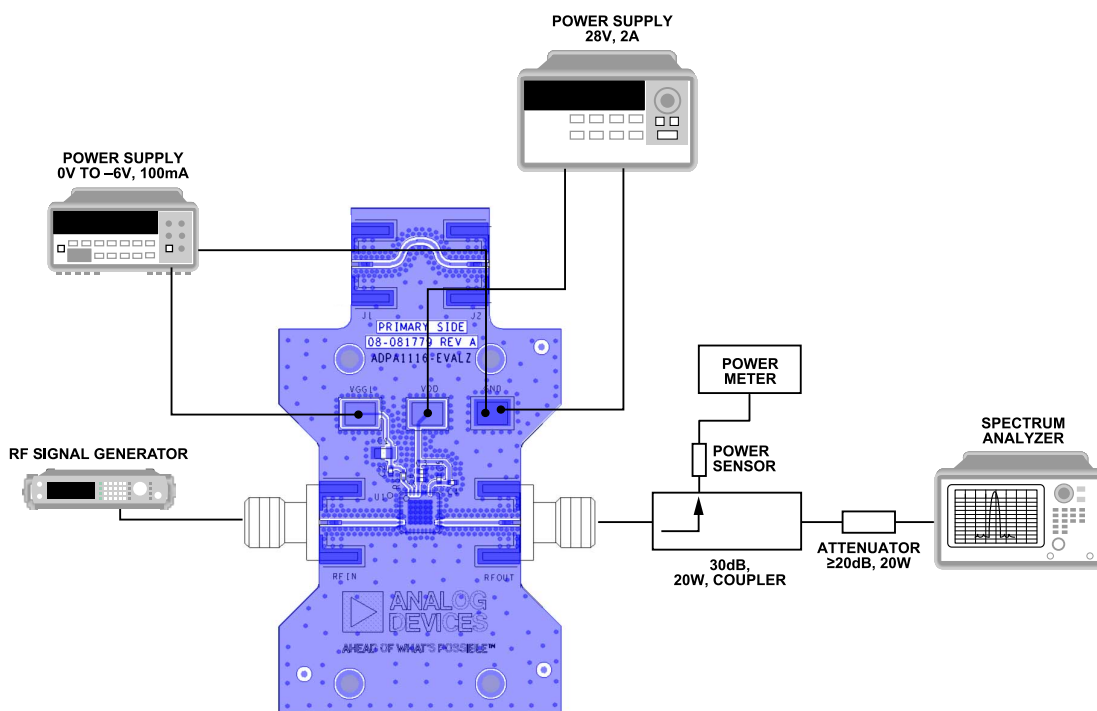


Figure 3. Power Test Setup Diagram

OPERATING THE ADPA1116-EVALZ

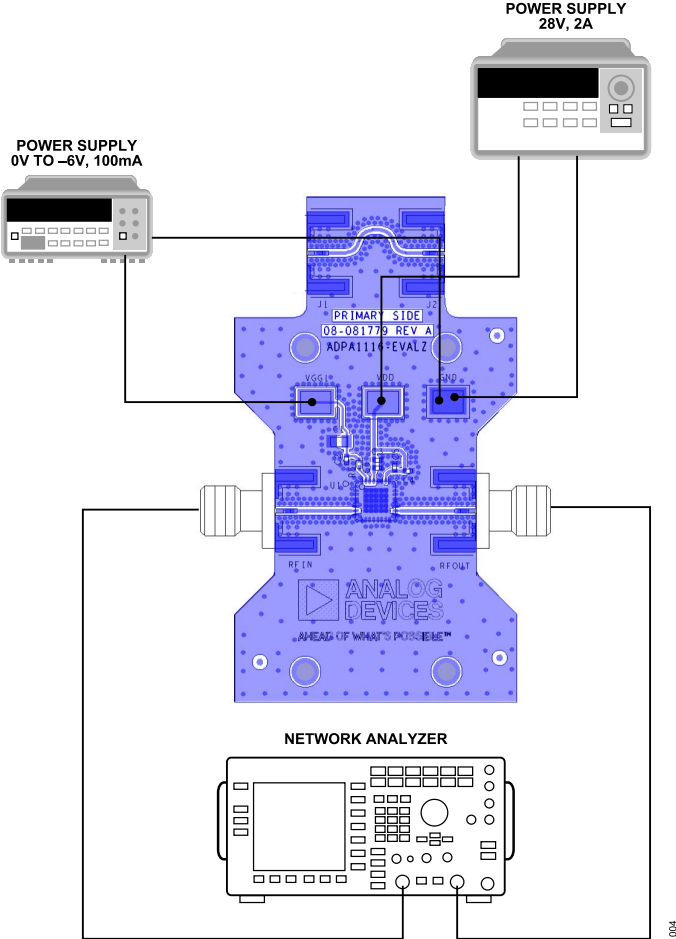


Figure 4. S-Parameter Test Setup Diagram

OPERATING THE ADPA1116-EVALZ

THROUGH CALIBRATION PATH

To calibrate out board trace losses, a through (THRU) calibration path is provided between J1 and J2. Both J1 and J2 must be populated with RF connectors to use the through (THRU) calibration path.

Figure 5 shows the plot of the data in Table 2 of the through (THRU) calibration path (J1 to J2). See Figure 6 for the evaluation board schematic.

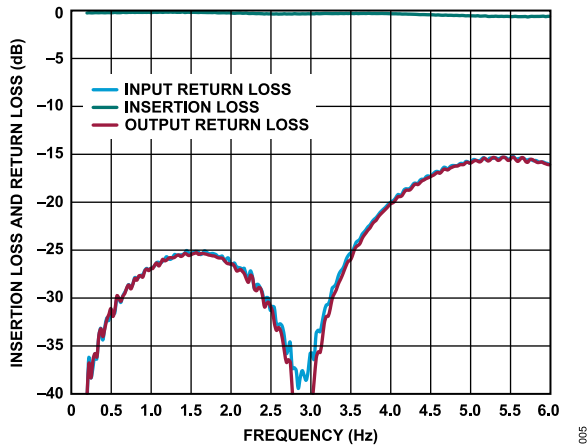


Figure 5. Insertion Loss and Return Loss of Through Calibration Path

Table 2. Insertion Loss of Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
0.3	-0.21
0.6	-0.21
1.0	-0.19
1.5	-0.18
2.0	-0.24
2.5	-0.33
3.0	-0.33
3.5	-0.28
4.0	-0.32
4.5	-0.43
5.0	-0.54
5.5	-0.62
6	-0.59

EVALUATION BOARD SCHEMATIC AND ARTWORK

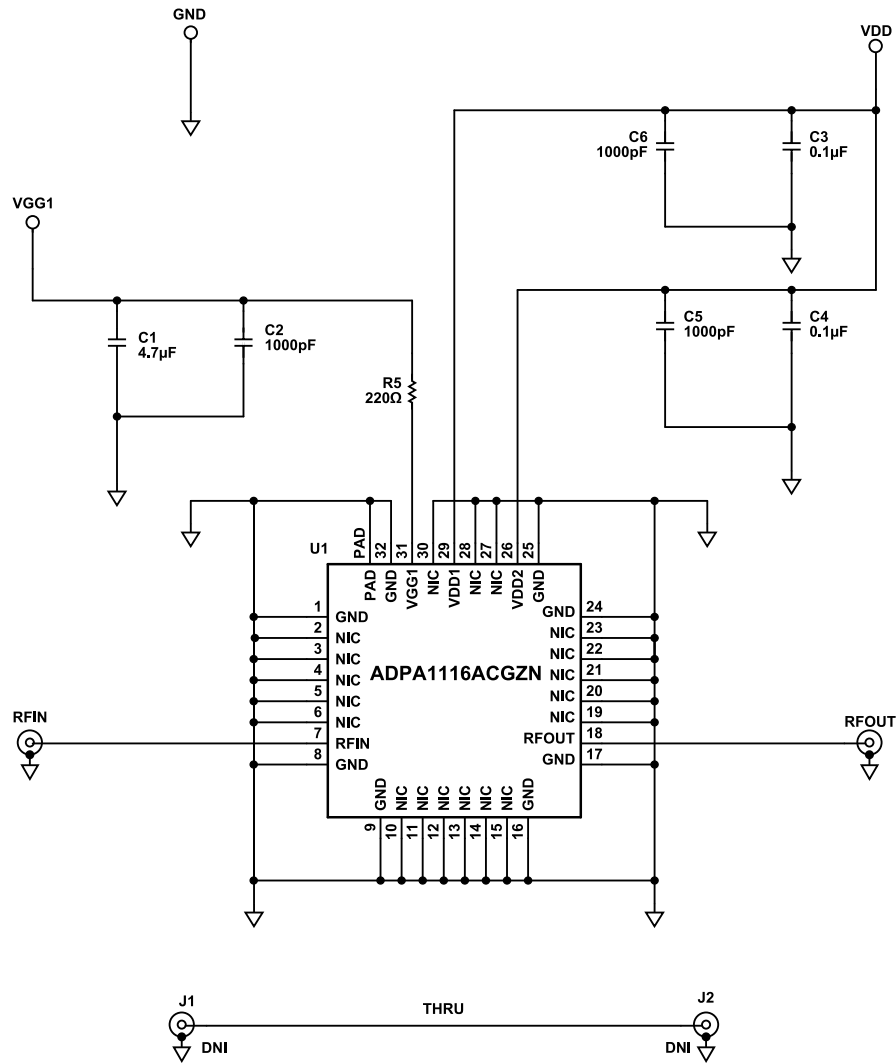


Figure 6. ADPA1116-EVALZ Evaluation Board Schematic

EVALUATION BOARD SCHEMATIC AND ARTWORK

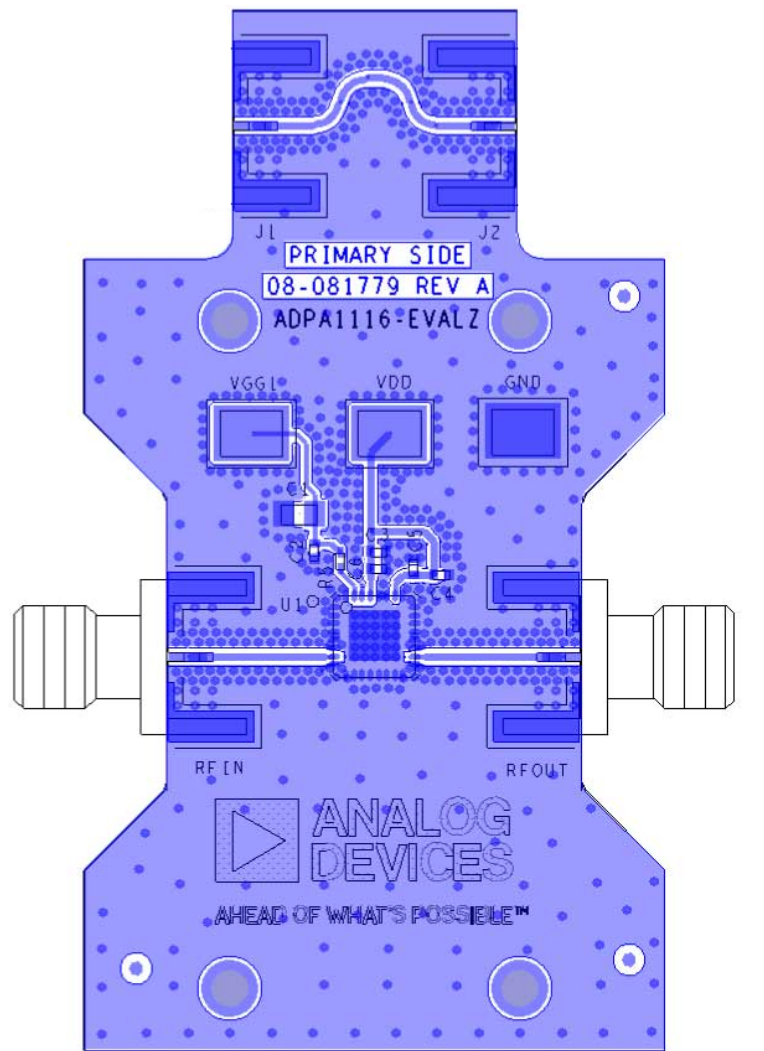


Figure 7. ADPA1116-EVALZ Assembly Drawing (Note That J1 and J2 Are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 3. ADPA1116-EVALZ Bill of Materials

Reference Designator	Description	Manufacturer	Part Number
C1	Ceramic capacitor, 4.7 μ F, X7R, 16 V, 10%, 0805	TDK	C2012X7R1C475K125AB
C2, C5, C6	Ceramic capacitors, 1000 pF, X7R, 100 V, 10%, 0402	Murata	GRM155R72A102KA01D
C3, C4	Ceramic capacitors, 0.1 μ F, X5R, 50 V, 10%, 0402	YAGEO	CC0402KRX5R9BB104
Not Applicable	Heat spreader	Not applicable	Not applicable
VGG1, VDD, GND	Surface-mount test points	Keystone Electronics	5016
R5	Resistor, 220 Ω , 0.1%, 1/16 W, 0402, AEC-Q200, high reliability	Panasonic	ERA-2AEB221X
RFIN, RFOUT	SMA, connectors, jack, EDGE_LAUNCH	Cinch Connectivity Solutions	142-0701-851
J1, J2	SMA, connectors, jack, EDGE_LAUNCH (not installed)	Cinch Connectivity Solutions	142-0701-851
U1	0.3 GHz to 6 GHz, 39.5 dBm, GaN power amplifier	Analog Devices, Inc.	ADPA1116ACGZN

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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