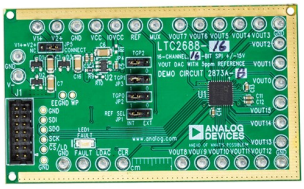

ANALOG DEVICES UG-2054 Wireless Development Boards User Guide

User Guide
EVAL-ADPA7009-2
UG-2054

Evaluating the ADPA7009-2 20 GHz to 54 GHz, GaAs, pHEMT, MMIC, 29 dBm (0.5 W) Power Amplifier

ADPA7009-2-EVALZ EVALUATION BOARD PHOTOGRAPHS

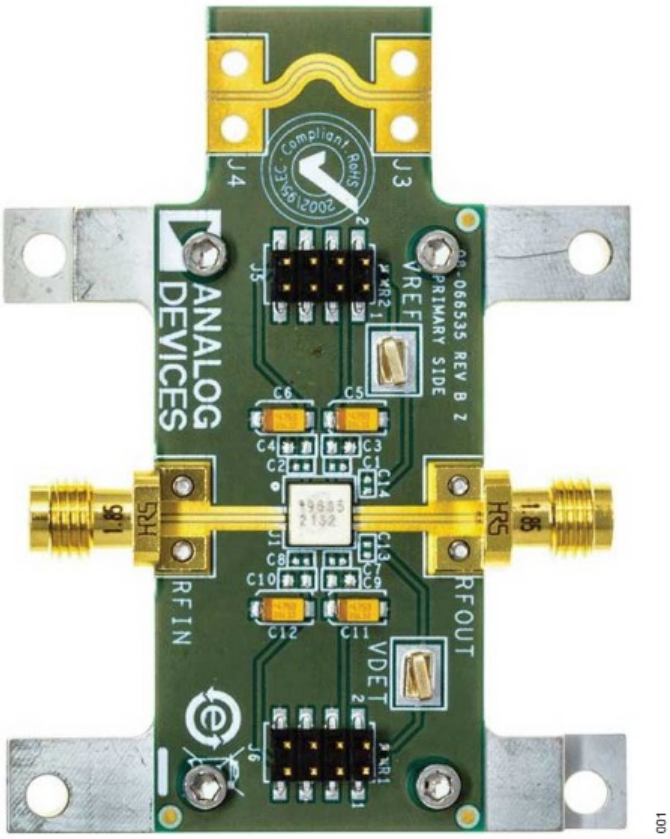

Figure 1. Primary Side

Contents

FEATURES

- 2-layer Rogers 4350B evaluation board with heat spreader
- End launch 1.85 mm RF connectors
- Through calibration path

EVALUATION KIT CONTENTS

- 2-layer Rogers 4350B evaluation board with heat spreader

EQUIPMENT NEEDED

- RF signal generator

- RF spectrum analyzer
- RF network analyzer
- 5 V, 1.5 A power supply
- –1.5 V, 10 mA power supply

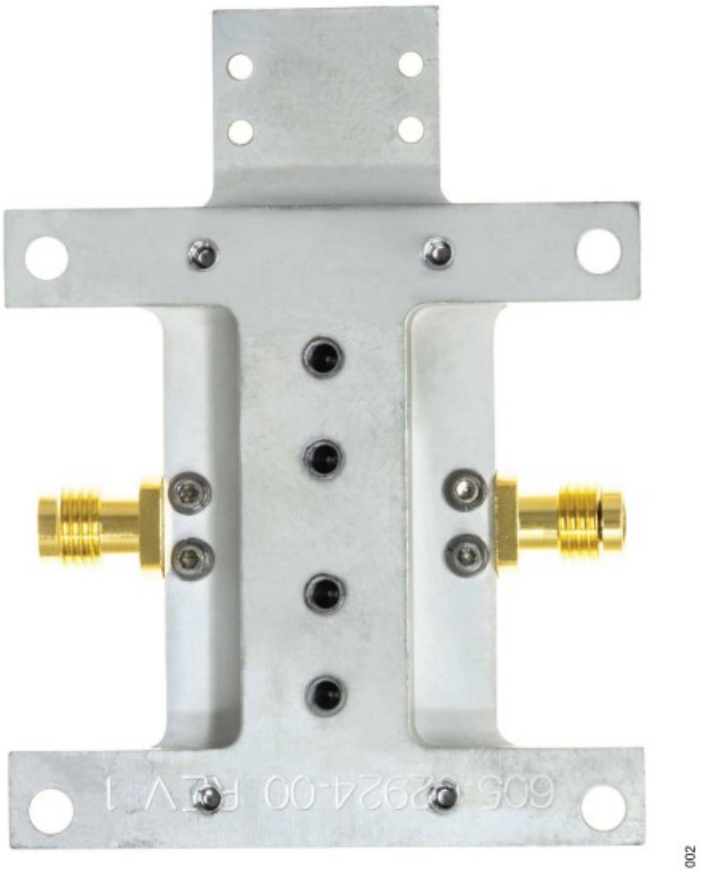

Figure 2. Secondary Side

GENERAL DESCRIPTION

The ADPA7009-2-EVALZ consists of a 2-layer printed circuit board (PCB) fabricated from 10 mil thick Rogers 4350B copper clad mounted to an aluminum heat spreader. The heat spreader assists in providing thermal relief to the ADPA7009-2 as well as mechanical support to the PCB. Mounting holes on the heat spreader allow it to be attached to larger heat sinks for improved thermal management. The RFIN and RFOUT ports are populated by 1.85 mm female coaxial connectors, and their respective RF traces are of 50 Ω characteristic impedance. The ADPA7009-2-EVALZ is populated with components suitable for use over the entire operating temperature range of the ADPA7009.

RF traces are 50 Ω grounded coplanar waveguide. Package ground leads and the exposed pad connect directly to the ground plane. Multiple vias are used to connect the top and bottom ground planes, with particular focus on the area directly beneath the ground paddle to provide adequate electrical conduction and thermal conduction to the heat spreader.

The power supply decoupling capacitors shown in Figure 4 represent the configuration that was used to characterize and qualify the device.

It is possible to reduce the number of capacitors; however, this reduction varies by system. It is instead recommended to first remove
or combine the largest capacitors that are farthest from the device.

Consult the ADPA7009 data sheet in conjunction with this user guide when working with the ADPA7009-2-EVALZ board.

OPERATING THE ADPA7009-2-EVALZ

The ADPA7009-2 operates by externally biasing the gate voltage.
Adjust VGG1 within the −1.5 V to 0 V range through J5 or VGG2 within the −1.5 V to 0 V range through the J6 header to set the target drain current.
See the ADPA7009-2 data sheet for the bias sequencing information.
Ground and gate control voltages are accessed through two 8-pin headers (see Table 1 for the header pinout).

Table 1. J5 and J6 Header Connections to the ADPA7009-2

Header Pin No.	ADPA7009-2 Pin
J5 8 4 2 3, 5, 6, and 7[1]	VGG1 VDD1 VREF GND[1]
J6 7 3 1 4, 5, 6, and 8[1]	VGG2 VDD2 VDET GND[1]

1 These header pins are connected to all GND pins, and the exposed pad of the ADPA7009-2 on the evaluation board.

THROUGH CALIBRATION PATH

To calibrate out board trace losses, a through (thru) calibration path is provided between J3 and J4. J3 and J4 must be populated with RF connectors to use the through calibration path.
Figure 3 shows the plot of the data in Table 2 of the through calibration path (J3 to J4). See Figure 4 for the evaluation board schematic.

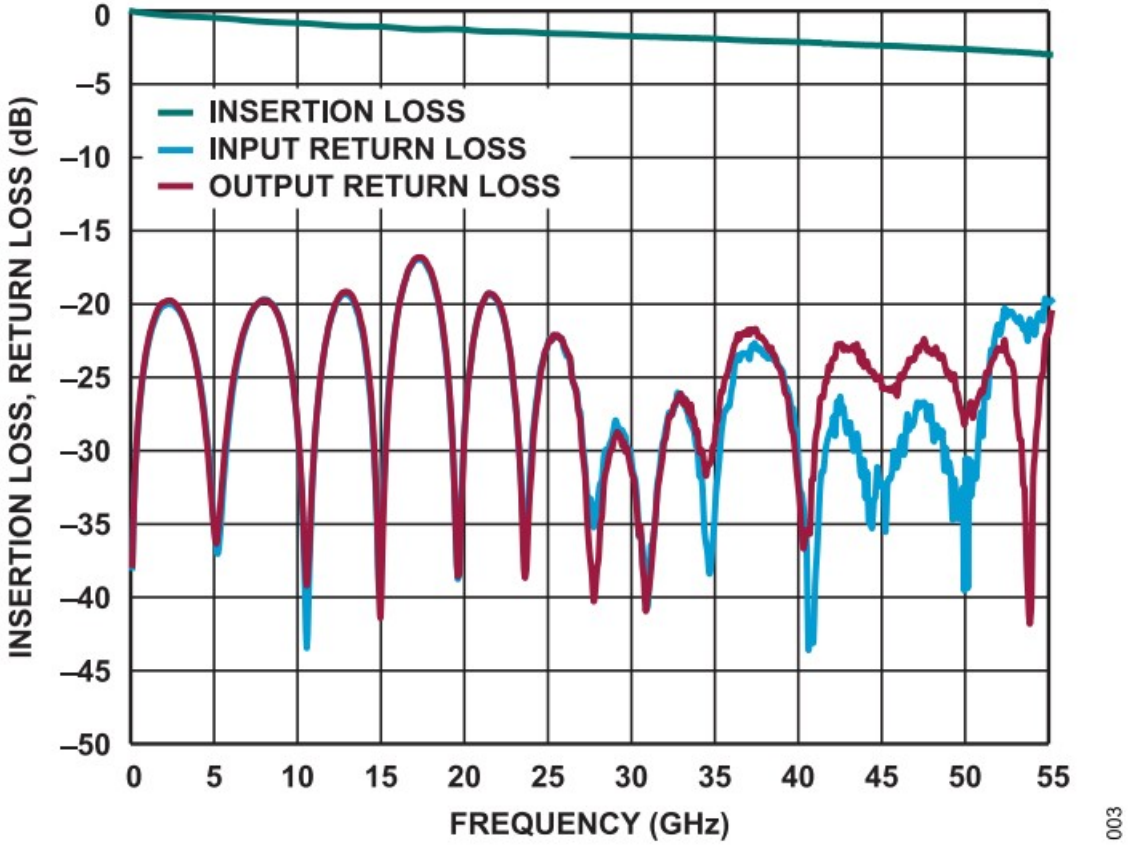

Figure 3. Insertion Loss and Return Loss of Through Calibration Path

Table 2. Insertion Loss and Return Loss of Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
0.1 1 5 10 15 20 25 30 35 40 45 50 55	–0.03 –0.18 –0.49 –0.83 –1.08 –1.30 –1.53 –1.73 –1.92 –2.16 –2.40 –2.63 –3.01

EVALUATION BOARD SCHEMATIC AND ARTWORK

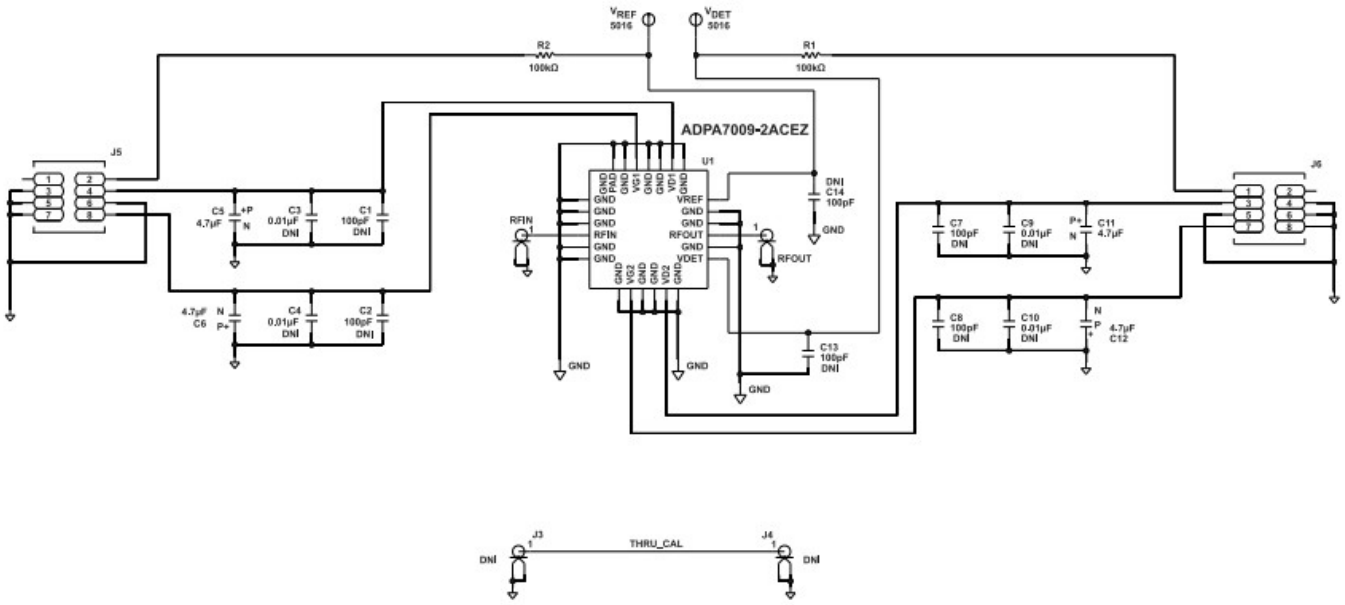

Figure 4. ADPA7009-2-EVALZ Evaluation Board Schematic

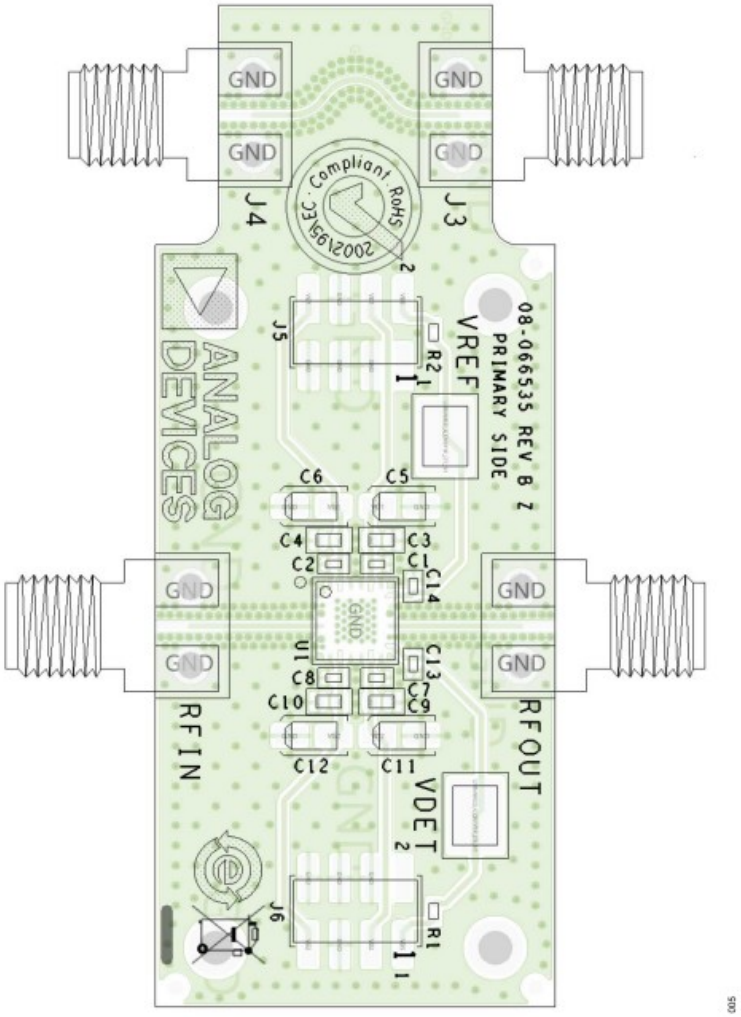

Figure 5. ADPA7009-2-EVALZ Assembly Drawing (Note That J3 and J4 Are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Reference Designator	Description	Manufacturer	Part Number
C1, C2, C7, C8, C13, C14 (do not install, DNI) C3, C4, C9, C10 (DNI) C5, C6, C11, C12 J3, J4 (Not Installed) RFIN, RFOUT J5, J6 R1, R2 U1 Not applicable	100 pF ceramic capacitors, 0402 0.01 µF ceramic capacitors, 0603 Tantalum capacitors, 4.7 µF, 20 V, 10%, 3216-18 CONN-PCB, 1.85 mm, coax, 50 Ω, 67 GHz CONN-PCB, 1.85 m coax, 50 Ω, 67 GHz Connectors, PCB header, vertical, dual row, 8-position, 2 mm pitch 100 kΩ resistors, SMD, 5%, 1/10 W, 0402 20 GHz to 54 GHz, gallium arsenide (GaAs), pseudomorphic high electron mobility transfer (pHEMT), monolithic microwave integrated circuit (MMIC), 29 dBm (0.5 W) power amplifier Aluminum heat spreader, 02.51 in. × 1.9 in.	Not applicable Not applicable AVX HIROSE ELECTRIC CO. HIROSE ELECTRIC CO. Molex Panasonic Analog Devices, Inc. Not applicable	Not applicable Not applicable TAJA475K020RNJ HV-LR-SR2(12) HV-LR-SR2(12) 87759-0814 ERJ-2GEJ104X ADPA7009-2ACEZ Not applicable

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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Documents / Resources

	ANALOG DEVICES UG-2054 Wireless Development Boards [pdf] User Guide UG-2054 Wireless Development Boards, UG-2054, Wireless Development Boards, Development Boards, Boards

References

- User Manual