Evaluating the ADL8107 GaAs, pHEMT, MMIC, Low Noise Amplifier, 6 GHz to 18 GHz

FEATURES

- 4-layer, Rogers 4350B and Isola 370HR evaluation board
- End launch, 2.92 mm RF connectors
- Through calibration path (depopulated)

EVALUATION KIT CONTENTS

- ADL8107-EVALZ evaluation board

EQUIPMENT NEEDED

- RF signal generator
- RF spectrum analyzer
- RF network analyzer
- 5 V, 300 mA power supply

GENERAL DESCRIPTION

The ADL8107-EVALZ consists of a 4-layer printed circuit board (PCB) fabricated from 10 mil thick, Rogers 4350B and Isola 370HR, copper clad, forming a nominal thickness of 62 mils. The RFIN and RFOUT ports on the ADL8107-EVALZ are populated with 2.92 mm, female coaxial connectors, and the corresponding RF traces have a 50 Ω characteristic impedance. The ADL8107-EVALZ is populated with components suitable for use over the entire −40°C to +85°C operating temperature range of the ADL8107. To calibrate board trace losses, a through calibration path is provided between the J1 and J2 connectors. J1 and J2 must be populated with RF connectors to use the through calibration path. Refer to Table 1 and Figure 3 for the through calibration path performance.

Access the ADL8107-EVALZ ground path and VDD pin through the surface-mount technology (SMT) test point connectors, GND and VDD. A supplementary test point for VBIAS is included for simple access on the RBIAS pin (see Figure 5 for the test point locations).

The RF traces on the ADL8107-EVALZ are 50 Ω, grounded, coplanar waveguide. The package ground leads and the exposed pad connect directly to the ground plane. Multiple vias 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 sink.

The power supply decoupling capacitors on the ADL8107-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the ADL8107, see the ADL8107 data sheet, which must be consulted in conjunction with this user guide when using the ADL8107-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

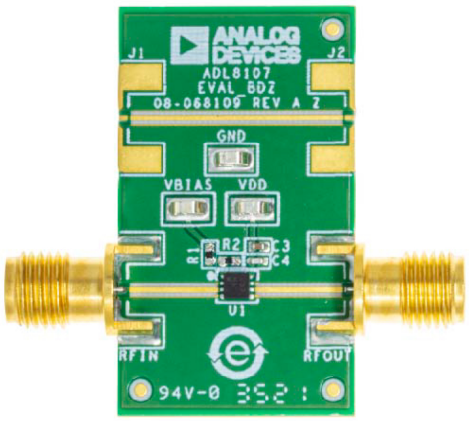

Figure 1. ADL8107-EVALZ Primary Side

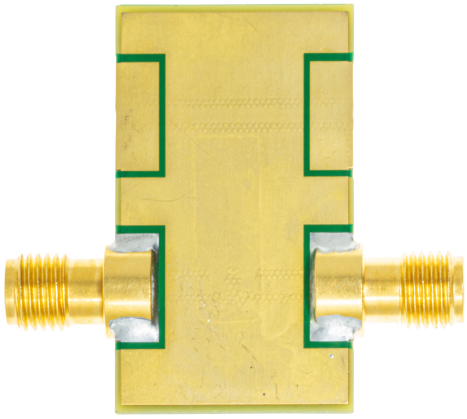

Figure 2. ADL8107-EVALZ Secondary Side

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REVISION HISTORY

2/2025—Rev. A to Rev. B

Changes to Figure 1 and Figure 2 1
Changes to Operating the ADL8107-EVALZ Section 3
Changes to Figure 3 and Table 1 3
Changes to Figure 4 4
Changes to Table 2 5

11/2022—Rev. 0 to Rev. A

Changes to Figure 3 and Table 1 3

1/2022—Revision 0: Initial Version

OPERATING THE ADL8107-EVALZ

A 5 V, 300 mA power supply is required to provide the bias to the ADL8107 when using the ADL8107-EVALZ. Connect the 5 V power supply to the SMT test points, VDD. Connect the ground reference to the GND test point.

Refer to the ADL8107 data sheet for the recommended resistor values to achieve different supply currents. The default value of the external resistor, R2, connected on the ADL8107-EVALZ is 7.15 kΩ, which is the same value used to characterize the ADL8107.

The following bias conditions are recommended to achieve the performance specified in the ADL8107 data sheet: V_{DD} = 5 V, total supply current (I_{DQ}) = 90 mA, and R_{BIAS} = 7.15 kΩ.

RECOMMENDED BIAS SEQUENCING

During Power-Up

To power up the ADL8107-EVALZ, take the following bias sequencing steps:

1. Connect the VDD power supply
2. Set the VDD supply to 5 V.
3. Apply the RF input signal.

During Power-Down

To power down the ADL8107-EVALZ, take the following bias sequencing steps:

1. Turn off the RF input signal.
2. Set the VDD supply to 0 V.

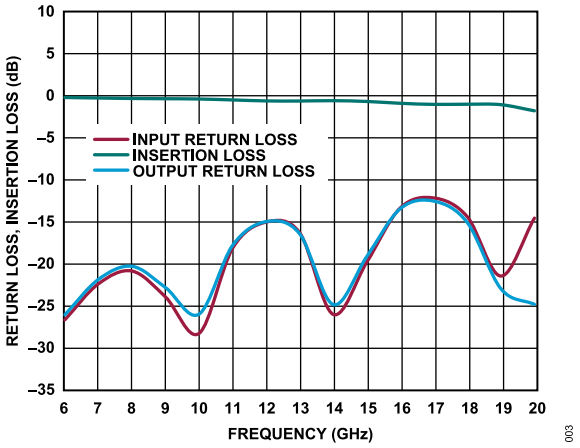

Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
6	−0.26	−26.809	−26.212
7	−0.322	−22.511	−21.984
8	−0.377	−20.981	−20.417
9.0	−0.406	−24.073	−22.958
10.0	−0.44	−28.437	−26.136
11.0	−0.552	−18.268	−17.926
12.0	−0.668	−15.139	−15.085
13.0	−0.68	−16.403	−16.534
14.0	−0.641	−26.156	−24.985
15.0	−0.732	−19.937	−19.263
16.0	−0.951	−13.444	−13.54
17.0	−1.081	−12.248	−12.634
18.0	−1.061	−14.5	−15.201
19.0	−1.116	−21.579	−23.099
20.0	−1.848	−14.654	−24.965

EVALUATION BOARD SCHEMATIC AND ARTWORK

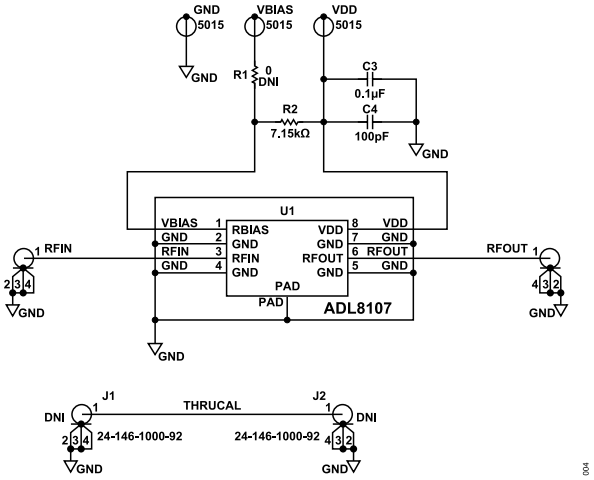

Figure 4. ADL8107-EVALZ Schematic

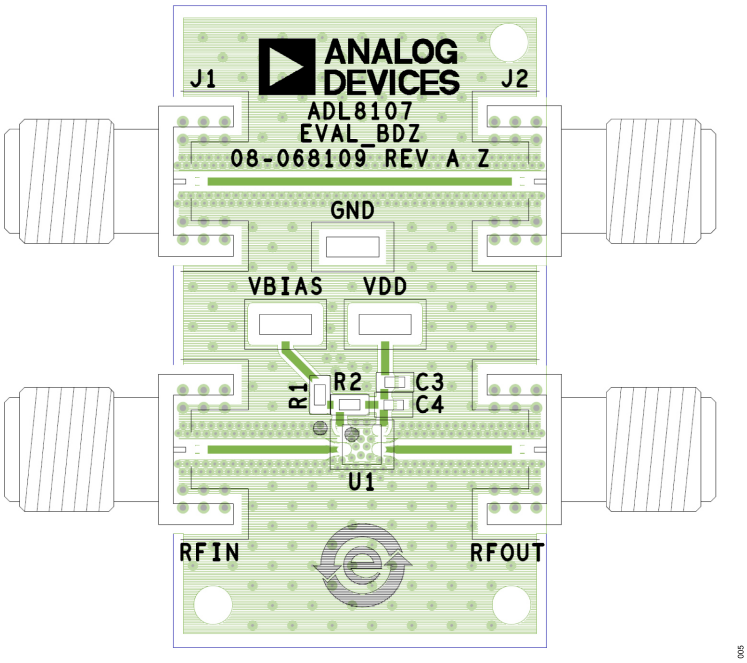

Figure 5. ADL8107-EVALZ Assembly Drawing (J1 and J2 Are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. Bill of Materials

Reference Designator	Description	Manufacturer	Part Number
C3	Capacitor, ceramic, 0.1 µF, 16 V, 10%, X7R, 0402	SAMSUNG	CL05B104KO5NNNC
C4	Capacitor, ceramic, 100 pF, 50 V, 5%, C0G, 0402, extreme low, effective series resistance (ESR)	KEMET	C0402C101J5GACTU
RFIN, RFOUT	Connectors, 2.92 mm, jack edge	SRI Connector Gage Co.	25-146-1000-92
VDD, GND, VBIAS	Connectors, SMT test points	Keystone Electronics	5015
J1, J2	Connectors, 2.92 mm, jack edge, do not install (DNI)	SRI Connector Gage Co.	25-146-1000-92
R1	Resistor, 0402, SMD chip, precision, 0 Ω, DNI	Panasonic	ERJ-2GE0R00X
R2	Resistor, 0402, SMD chip, precision, 7.15 kΩ	Panasonic	ERJ-2RKF7151X
U1	Wideband, high linearity, low noise amplifier, 8 GHz to 16 GHz	Analog Devices, Inc.	ADL8107

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.