Evaluating the ADL8105 Wideband, High Linearity, Low Noise Amplifier, 5 GHz to 20 GHz

FEATURES

- 4-layer Rogers 4350B and Isola 370HR evaluation board
- End launch, 2.9 mm RF connectors
- Through calibration path (depopulated)

EVALUATION KIT CONTENTS

- ADL8105-EVALZ evaluation board

EQUIPMENT NEEDED

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

GENERAL DESCRIPTION

The ADL8105-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 ADL8105-EVALZ are populated with 2.9 mm, female coaxial connectors, and the corresponding RF traces have a 50 Ω characteristic impedance. The ADL8105-EVALZ is populated with components suitable for use over the entire −40°C to +85°C operating temperature range of the ADL8105. 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 ADL8105-EVALZ ground path and the 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 ADL8105-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 ADL8105-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the ADL8105, see the ADL8105 data sheet, which must be consulted in conjunction with this user guide when using the ADL8105-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

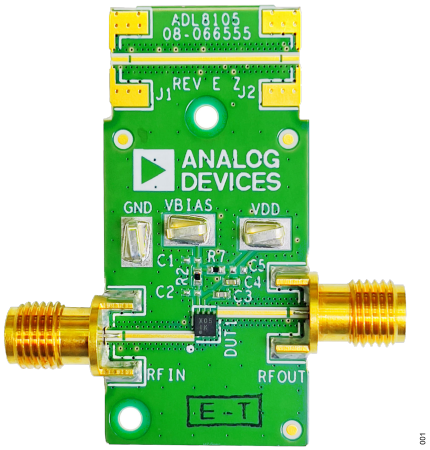

Figure 1. ADL8105-EVALZ Primary Side

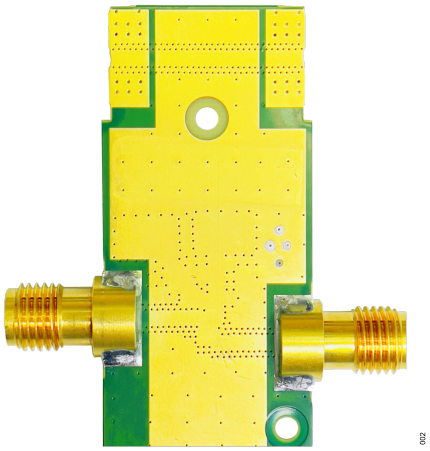

Figure 2. ADL8105-EVALZ Secondary Side

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REVISION HISTORY

7/2022—Revision 0: Initial Version

OPERATING THE ADL8105-EVALZ

A 5 V, 300 mA power supply is required to provide the bias to the ADL8105 when using the ADL8105-EVALZ. Connect the 5 V power supply to the SMT test points, VDD and VBIAS. Connect the ground reference to the GND test point.

Refer to the ADL8105 data sheet for the recommended resistor values to achieve different supply currents. The default value of the external resistor, R2, connected on the ADL8105-EVALZ is 392 Ω, which is the same value used to characterize the ADL8105.

The following bias conditions are recommended to achieve the performance specified in the ADL8105 data sheet: supply voltage (V_{DD}) = 5 V, quiescent current (I_{DQ}) = 90 mA, and bias resistance (R_{BIAS}) = 392 Ω.

RECOMMENDED BIAS SEQUENCING

During Power-Up

To power up the ADL8105-EVALZ, follow this bias sequence:

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 ADL8105-EVALZ, follow this bias sequence:

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

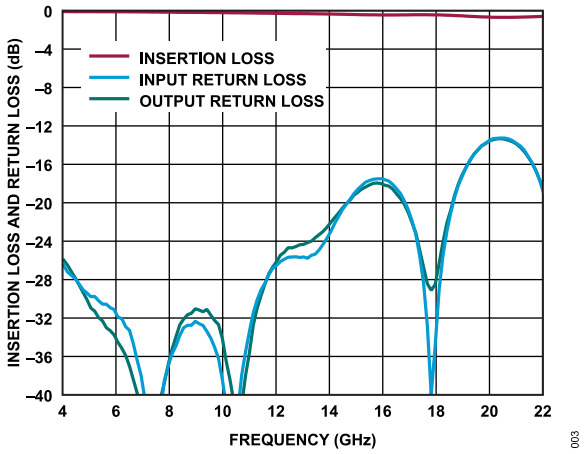

Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
4	−0.1	−26.5	−25.9
5	−0.1	−29.8	−30.9
6	−0.1	−31.9	−34.5
7	−0.1	−40.4	−44.6
8	−0.1	−35.7	−35.2
9	−0.1	−32.3	−31.0
10	−0.2	−38.4	−34.1
11	−0.2	−33.3	−35.6
12	−0.2	−26.5	−26.1
13	−0.3	−25.6	−24.3
14	−0.3	−23.0	−22.0
15	−0.4	−18.6	−18.9
16	−0.4	−17.6	−18.1
17	−0.4	−21.8	−22.0
18	−0.4	−29.8	−26.4
19	−0.5	−16.3	−16.3
20	−0.6	−13.3	−13.4
21	−0.6	−13.8	−13.9
22	−0.6	−18.9	−18.7

EVALUATION BOARD SCHEMATIC AND ARTWORK

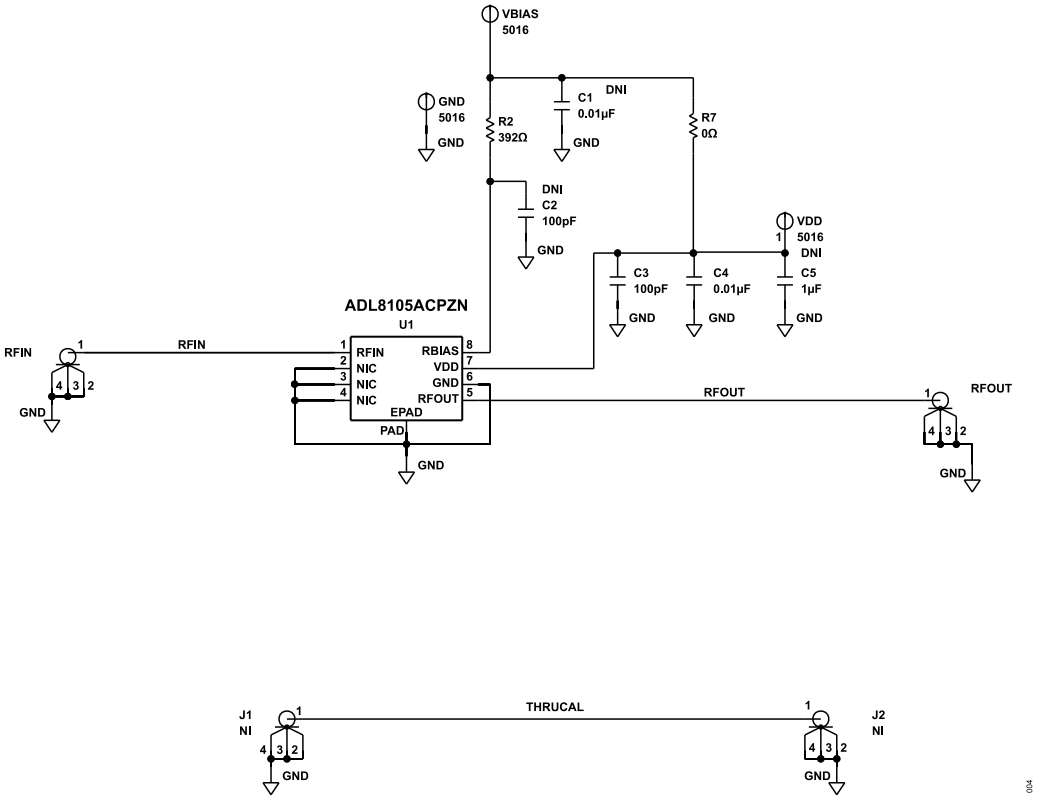

Figure 4. ADL8105-EVALZ Schematic

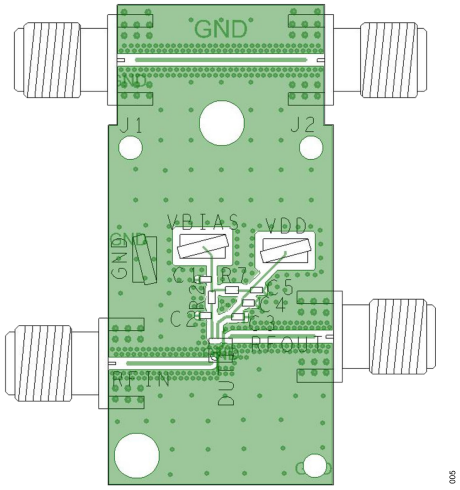

Figure 5. ADL8105-EVALZ Assembly Drawing (J1 and J2 Are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Reference Designator	Description	Manufacturer	Part Number
C1	0.01 µF capacitor, 0402, do not install (DNI)	Not applicable	Not applicable
C2	100 pF capacitor, 0402 (DNI)	Not applicable	Not applicable
C3	100 pF ceramic capacitor, 50 V, 5%, C0G, 0402	TDK Corporation	C1005NP01H101J050BA
C4	0.01 µF ceramic capacitor, 25 V, 10%, X8R, 0402	TDK Corporation	C1005X8R1E103K
C5	1 µF capacitor, 0402 (DNI)	Not applicable	Not applicable
RFIN, RFOUT	Connectors, 2.9 mm, jack edge	SRI Connector Gage Co.	25-146-1000-92
VDD, GND, VBIAS	Connectors, SMT test points	Keystone Electronics	5016
J1, J2	Connectors, 2.9 mm, jack edge, not installed (NI)	SRI Connector Gage Co.	25-146-1000-92
R2	392 Ω resistor, surface-mount device (SMD), 1%, 1/10 W, 0402	Panasonic	ERJ-2RKF3920X
U1	Gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT), monolithic microwave integrated circuit (MMIC), 5 GHz to 20 GHz	Analog Devices, Inc.	ADL8105

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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Analog Devices Inc.:

ADL8105-EVALZ