

Evaluating the ADL8102 Wideband, Low Noise Amplifier, Single Positive Supply, 1 GHz to 20 GHz

FEATURES

- ▶ 2-layer Rogers 4350B evaluation board
- ▶ End launch, 2.9 mm RF connectors
- ▶ Through calibration path (depopulated)

EVALUATION KIT CONTENTS

- ▶ ADL8102-EVALZ evaluation board

EQUIPMENT NEEDED

- ▶ RF signal generator
- ▶ RF spectrum analyzer
- ▶ RF network analyzer
- ▶ 5 V, 500 mA power supply

DOCUMENTS NEEDED

- ▶ [ADL8102](#) data sheet

GENERAL DESCRIPTION

The ADL8102-EVALZ is a 2-layer printed circuit board (PCB) fabricated from 10 mil thick, Rogers 4350B, and copper clad.

The RFIN and RFOUT ports on the ADL8102-EVALZ are populated with 2.9 mm, female coaxial connectors, and the corresponding RF traces have a 50 Ω characteristic impedance. The ADL8102-EVALZ is populated with components suitable for use over the entire -40°C to $+85^{\circ}\text{C}$ operating temperature range.

To calibrate board trace losses, a through calibration path, THRU-CAL, is provided between the J1 and J2 connectors. J1 and J2 must be populated with RF connectors to use the through calibration path. For the through calibration path performance, see [Table 1](#) and [Figure 3](#).

Access the ADL8102-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 (for the test point locations, see [Figure 5](#)).

The RF traces on the ADL8102-EVALZ are 50 Ω , grounded, coplanar waveguide. The package ground leads and the exposed pads 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.

The power-supply decoupling capacitors on the ADL8102-EVALZ represent the configuration used to characterize and qualify the device.

Full specifications on the ADL8102 are available in the ADL8102 data sheet available from Analog Devices, Inc., and must be consulted with this user guide when using the ADL8102-EVALZ evaluation board.

ADL8102-EVALZ EVALUATION BOARD PHOTOGRAPHS

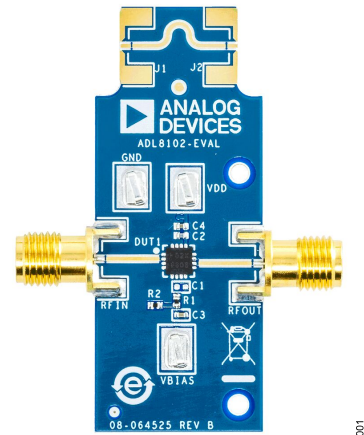


Figure 1. ADL8102-EVALZ Primary Side

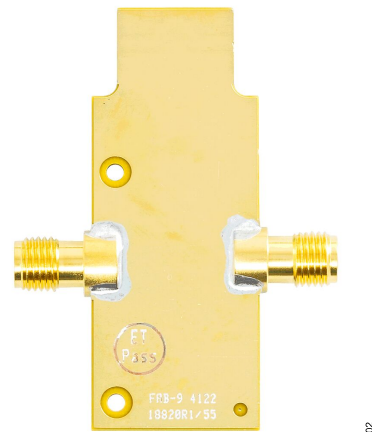


Figure 2. ADL8102-EVALZ Secondary Side

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REVISION HISTORY

7/2023—Revision 0: Initial Version

OPERATING THE ADL8102-EVALZ

A 5 V, 500 mA power supply is required to provide the bias to the ADL8102 when using the ADL8102-EVALZ. Connect the 5 V power supply to the VDD test point. Connect the ground reference to the GND test point.

For the recommended resistor values to achieve different supply currents, refer to the ADL8102 data sheet. The default value of the external resistor, R2, connected on the ADL8102-EVALZ is 1150 Ω, which is the same value used to characterize the ADL8102.

The following bias conditions are recommended to achieve the performance specified in the ADL8102 data sheet: supply voltage (V_{DD}) = 5 V, quiescent current (I_{DQ}) = 110 mA, and bias resistance (R_{BIAS}) = 1150 Ω.

RECOMMENDED BIAS SEQUENCING

During Power-Up

To power up the ADL8102-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 ADL8102-EVALZ, follow this bias sequence:

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

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
1	-0.03	-43.9	-50.70
3	-0.14	-35.6	-41.40
5	-0.26	-32.32	-30.77
7	-0.36	-25.39	-25.08
9	-0.43	-33.40	-31.92
11	-0.53	-22.17	-22.16
13	-0.67	-17.38	-17.26
15	-0.70	-20.14	-20.03
17	-0.74	-28.62	-29.02
19	-1.01	-14.44	-14.75
21	-1.17	-13.91	-14.02
23	-1.11	-22.94	-27.57
25	-1.59	-10.48	-10.65

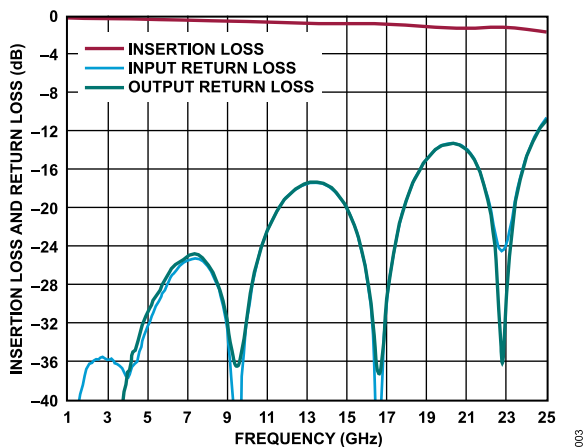


Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

EVALUATION BOARD SCHEMATIC AND ARTWORK

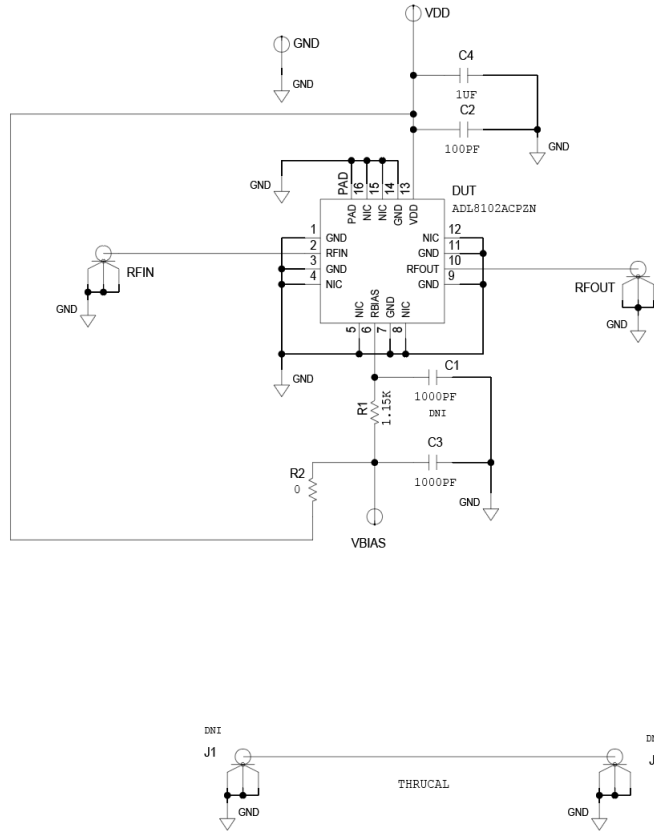


Figure 4. ADL8102-EVALZ Schematic

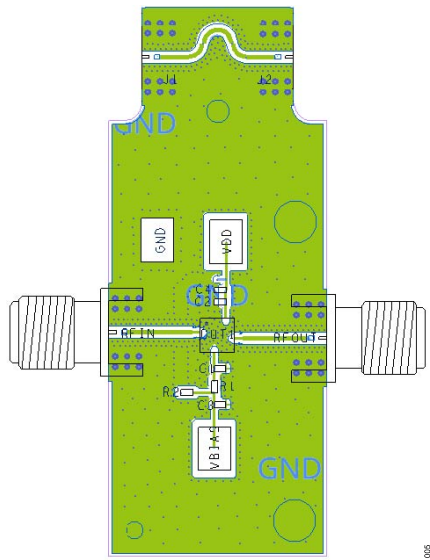


Figure 5. ADL8102-EVALZ Assembly Drawing (J1 and J2 Are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. ADL8102-EVALZ Bill of Materials

Reference Designator	Description	Manufacturer	Part Number
C1	Ceramic capacitor, 1000 pF, 50 V, 10%, X7R, 0402, do not install (DNI)	TDK Corporation	CGA2B2X7R1H102K050BA
C2	Capacitor, 100 pF, 50 V, 5%, 0402	TDK Corporation	C1005NP01H101J050BA
C3	Capacitor, 1000 pF, 50 V, 10%, 0402	TDK Corporation	CGA2B2X7R1H102K050BA
C4	Ceramic capacitor, 1 μ F, 25 V, 10%, X5R, 0402	TDK Corporation	C1005X5R1E105K050BC
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, do not install (DNI)	SRI Connector Gage Co.	25-146-1000-92
R1	Resistor, 1.15 k Ω , surface-mount device (SMD), 0.1%, 1/16 W, 0402	Yageo	RT0402BRD071K15L
R2	Resistor, 0 Ω , SMD, jumper, 1/10 W, 0402	Panasonic	ERJ-2GEOR00X
U1	Gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT), monolithic microwave integrated circuit (MMIC), 1 GHz to 22 GHz	Analog Devices, Inc.	ADL8102

**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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