Evaluating the ADL8124 1GHz to 20GHz, Low Noise Amplifier with Integrated Temperature Sensor and Enable Function

FEATURES

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

EVALUATION KIT CONTENTS

- ADL8124-EVALZ evaluation board

EQUIPMENT NEEDED

- RF signal generator
- RF spectrum analyzer
- RF network analyzer
- 3.3V, 200mA power supply

GENERAL DESCRIPTION

The ADL8124-EVALZ is a 4-layer printed circuit board (PCB) fabricated from 10mil thick, Rogers 4350B and Isola 370HR, copper clad, forming a nominal thickness of 62mils. The RFIN and RFOUT ports on the ADL8124-EVALZ are populated with 2.92mm, female coaxial connectors, and the corresponding RF traces have a 50Ω characteristic impedance. The ADL8124-EVALZ is populated with components suitable for use over the entire −55°C to +125°C operating temperature range of the ADL8124. 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 Figure 6 and Table 1 for the through calibration path performance.

Access the ADL8124-EVALZ ground path and the VDD and VENBL pins through the surface-mount technology (SMT) test point connectors (GND, VDD, and VENBL). A supplementary test point for VRBIAS is included for simple access on the RBIAS pin (see Figure 8 for the test point locations).

The RF traces on the ADL8124-EVALZ are 50Ω 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.

The power-supply decoupling capacitors on the ADL8124-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the ADL8124, see the ADL8124 data sheet, which must be consulted in conjunction with this user guide when using the ADL8124-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

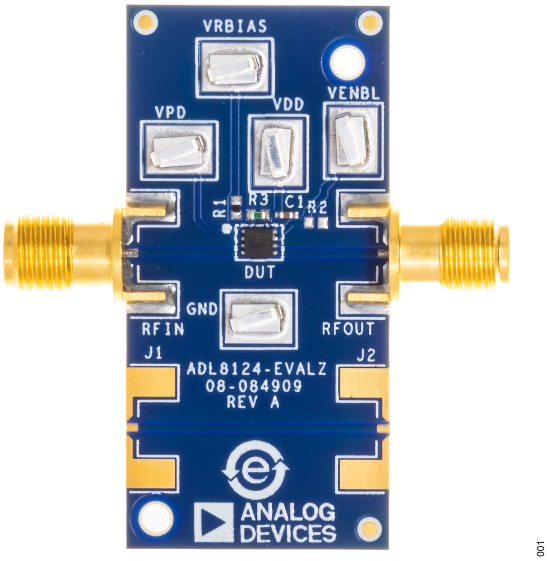

Figure 1. ADL8124-EVALZ Primary Side

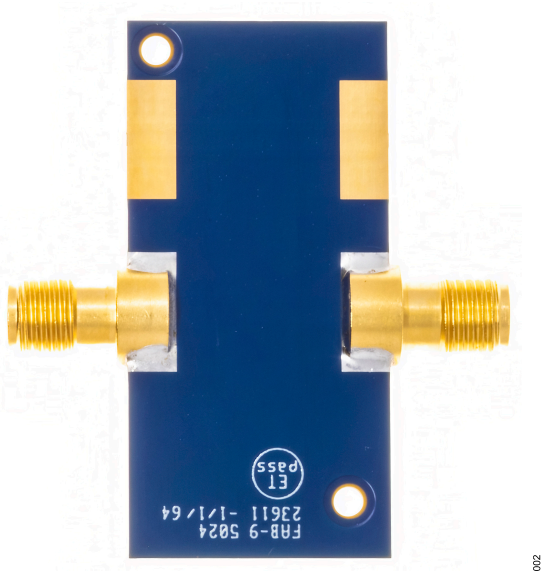

Figure 2. ADL8124-EVALZ Secondary Side

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REVISION HISTORY

9/2025—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OPERATING THE ADL8124-EVALZ

Two 3.3V, 200mA power supplies are required to provide the bias to the ADL8124 when using the ADL8124-EVALZ. Connect the 3.3V power supplies to the SMT test points, VDD and VENBL. Connect the ground references to the GND test point. To measure the output voltage of the integrated temperature sensor, connect a digital voltage meter to the VTEMP SMT test point. To enable the ADL8124 using the VENBL pin of the ADL8124-EVALZ, increase the voltage on the VENBL pin to at least 1.5V.

Refer to the ADL8124 data sheet for the recommended resistor values to achieve different supply currents. The default value of the external resistor, R3, connected on the ADL8124-EVALZ is 1540Ω, which is the same value used to characterize the ADL8124.

The following bias conditions are recommended to achieve the performance specified in the ADL8124 data sheet: V_{DD} = 3.3V, nominal operating current (I_{DQ}) = 55mA, and bias resistance (R_{BIAS}) = 1540Ω.

RECOMMENDED BIAS SEQUENCE

During Power-Up

To power up the ADL8124-EVALZ, take the following bias sequencing steps:

1. Connect the power supply to VDD test point.
2. Connect the power supply to VENBL test point.
3. Set the VDD to 3.3V.
4. Set the VENBL to 3.3V.
5. Apply the RF input signal.

During Power-Down

To power down the ADL8124-EVALZ, take the following bias sequencing steps:

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

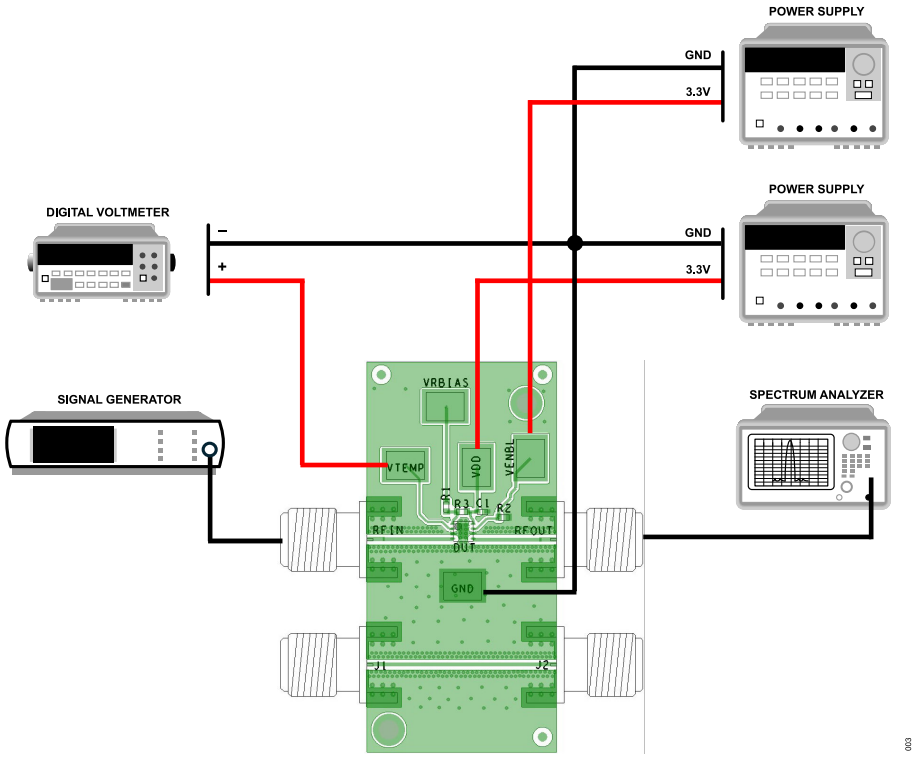

Figure 3. ADL8124-EVALZ Operating Block Diagram

EVALUATION BOARD HARDWARE

EXPECTED PERFORMANCE

Figure 4 and Figure 5 show the broadband gain, input return loss (S11), and output return loss (S22). Gain curves are presented with the evaluation board through loss de-embedded.

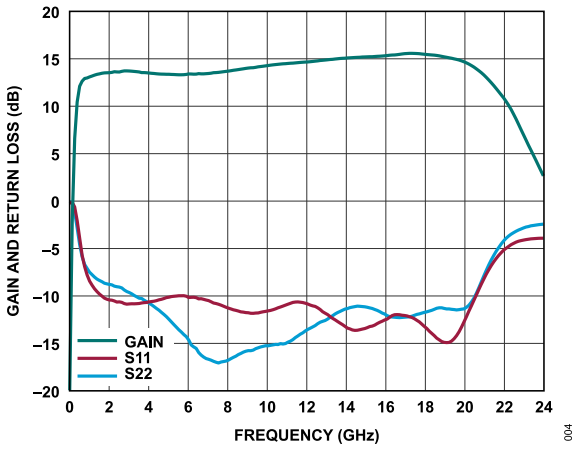

Figure 4. Broadband Gain and Return Loss vs. Frequency, 10MHz to 24GHz, V_{DD} = 3.3V, I_{DQ} = 55mA

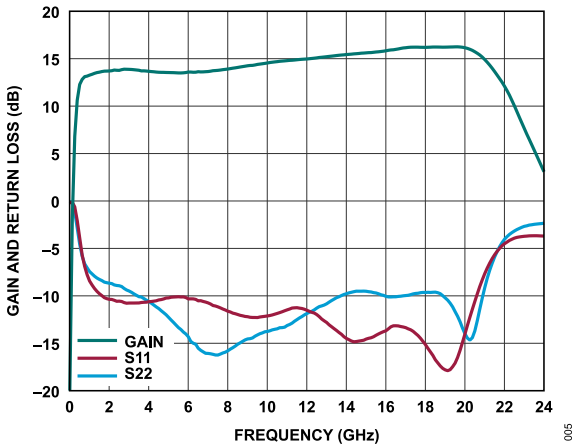

Figure 5. Broadband Gain and Return Loss vs. Frequency, 10MHz to 24GHz, V_{DD} = 5V, I_{DQ} = 85mA

Through Calibration Path

The ADL8124-EVALZ includes a calibration path (Figure 6 and Table 1). The calibration path SMA connectors, J1 and J2, must be populated with RF connectors to use the through calibration path.

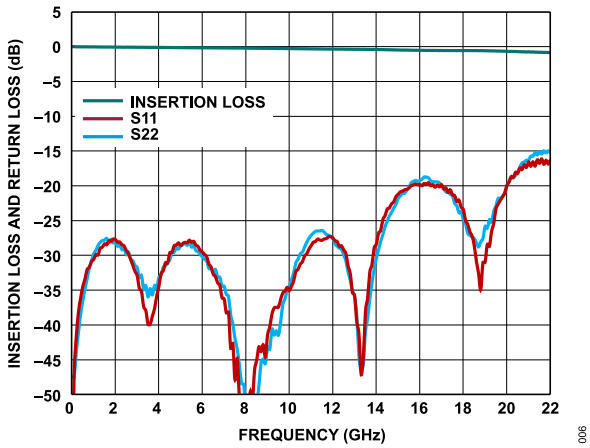

Figure 6. Insertion Loss and Return Loss (Input and Output) of the Through Calibration Path

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
1	–0.05
2	–0.07
4	–0.12
6	–0.17
8	–0.22
10	–0.28
12	–0.36
14	–0.42
16	–0.54
18	–0.57
20	–0.69
22	–0.86

EVALUATION BOARD SCHEMATIC AND ARTWORK

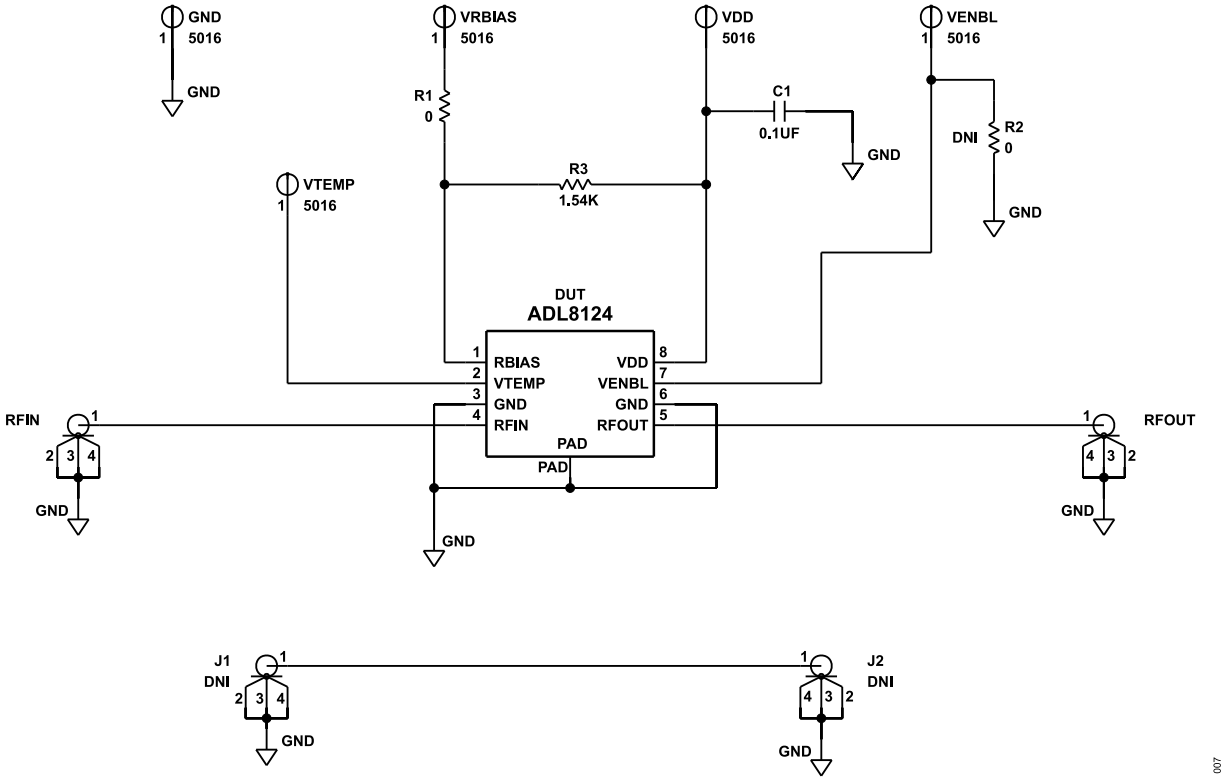

Figure 7. ADL8124-EVALZ Schematic

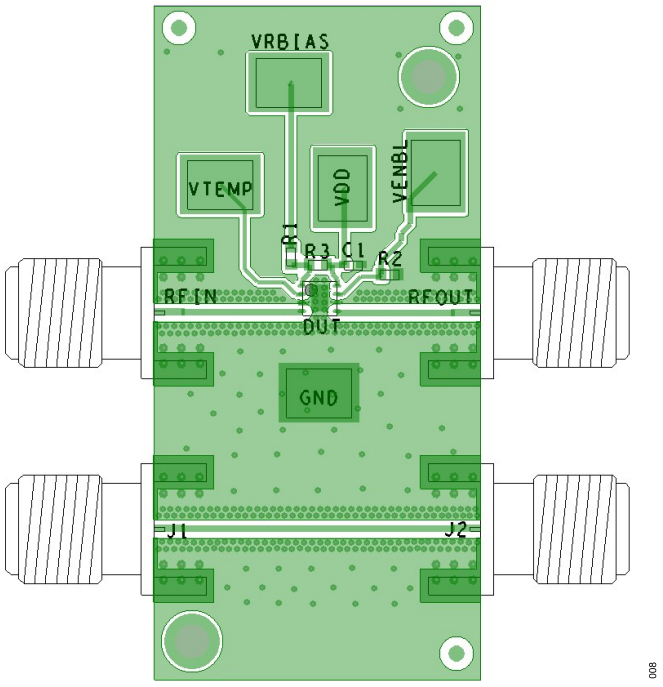

Figure 8. ADL8124-EVALZ Assembly Drawing (J1 and J2 Are Not Installed)

ORDERING INFORMATION

EVALUATION BOARDS

Table 2. Evaluation Boards

Model[1]	Description
ADL8124-EVALZ	Evaluation Board

[1] Z = RoHS-Compliant Part.

BILL OF MATERIALS

Table 3. Bill of Materials

Reference Designator	Description	Manufacturer	Part Number
C1	Capacitor, ceramic, 0.1µF, 50V, 10%, X7R, 0402	TDK	C1005X7R1H104K050BE
RFIN, RFOUT	Connectors, 2.92mm, jack edge	SRI Connector Gage Co.	25-146-1000-92
VDD, GND, VRBIAS, VTEMP, VENBL	Connectors, SMT test points	Keystone Electronics	5016
J1, J2	Connectors, 2.92mm, jack edge, do not install (DNI)	SRI Connector Gage Co.	25-146-1000-92
R1	Resistor, 0402, SMD chip, precision, 0Ω	Yageo	RC0402JR-070RL
R3	Resistor, 0402, SMD chip, precision, 1.54kΩ	Vishay	TNPW04021K54BEED
R2	Resistor, 0402, SMD chip, precision, 0Ω, DNI	Yageo	RC0402JR-070RL
DUT	1GHz to 20GHz, low noise amplifier with integrated temperature sensor and enable function	Analog Devices, Inc.	ADL8124ACPZN

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.