

Evaluating the ADL8143 GaAs, pHEMT, MMIC, Low Noise Amplifier, 8 GHz to 14 GHz

FEATURES

- ▶ 4-layer, Rogers 4003C and Isola Group 370HR evaluation board
- ▶ End launch, 2.92 mm RF connectors
- ▶ Through calibration path (depopulated connectors)

EVALUATION KIT CONTENTS

- ▶ ADL8143-EVALZ evaluation board

EQUIPMENT NEEDED

- ▶ RF signal generator
- ▶ RF spectrum analyzer
- ▶ RF network analyzer
- ▶ 1.5 V, 100 mA power supply

GENERAL DESCRIPTION

The ADL8143-EVALZ is a 4-layer printed circuit board (PCB) fabricated from 0.203 mm (8 mil) thick, Rogers 4003C and Isola 370HR, copper clad, forming a nominal thickness of 1.63 mm (64 mils). The RFIN and RFOUT ports on the ADL8143-EVALZ are populated with 2.92 mm, female coaxial connectors. The ADL8143-EVALZ is populated with components suitable for use over the entire -55°C to $+125^{\circ}\text{C}$ operating temperature range.

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 4](#) for the through calibration path performance.

Access the ADL8143-EVALZ ground path and drain voltage 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 6](#) for the test point assembly).

The RF traces on the ADL8143-EVALZ are 50 Ω , grounded, and 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 ADL8143-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the [ADL8143](#), see the ADL8143 data sheet, which must be consulted in conjunction with this user guide when using the ADL8143-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

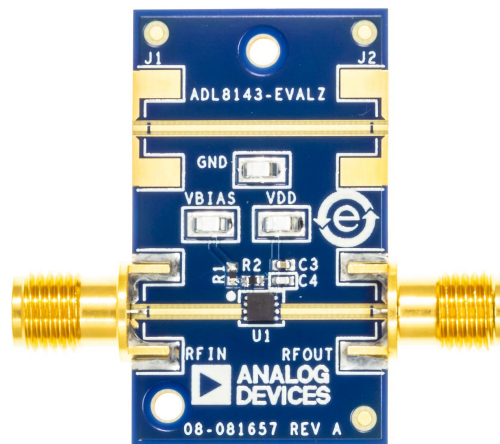


Figure 1. ADL8143-EVALZ Primary Side

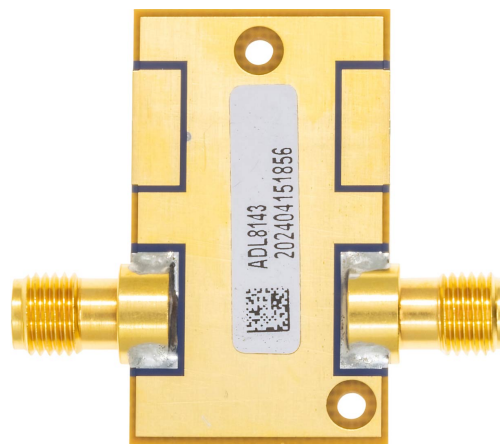


Figure 2. ADL8143-EVALZ Secondary Side

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REVISION HISTORY

7/2024—Revision 0: Initial Version

OPERATING THE ADL8143-EVALZ

A 1.5 V, 100 mA power supply is required to provide the bias to the ADL8143. Connect the 1.5 V power supply to the SMT test point, VDD. Connect the ground reference to the GND test point.

Refer to the ADL8143 data sheet for the recommended resistor values to achieve different supply currents. The following bias

conditions are recommended to achieve optimal performance: drain supply voltage (V_{DD}) = 1.5 V and quiescent current (I_{DQ}) = 35 mA. The I_{DQ} is typically achieved using a 487 Ω value for the bias resistance (R_{BIAS}).

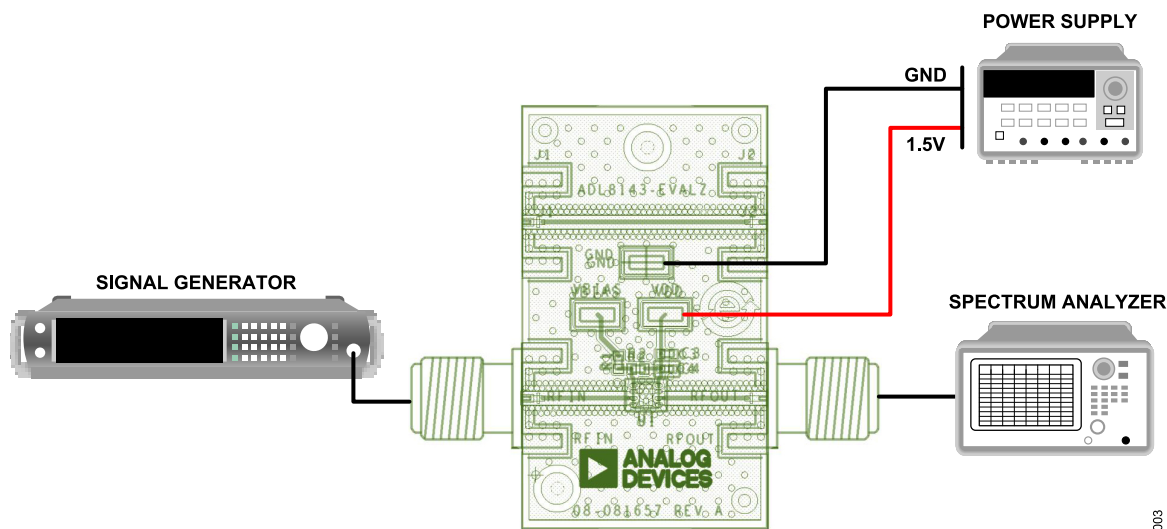


Figure 3. ADL8143-EVALZ Operating Block Diagram

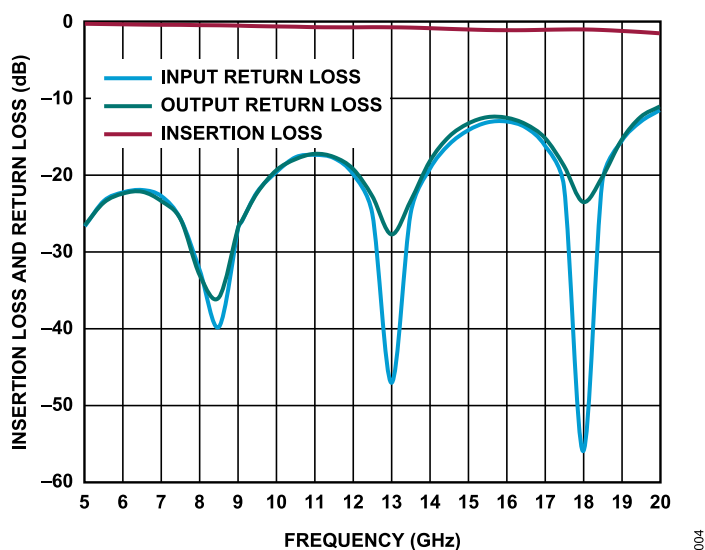


Figure 4. Insertion Loss (S_{21}) and Return Loss (Input and Output) of the Through Calibration Path

OPERATING THE ADL8143-EVALZ

Table 1. Insertion Loss and Return Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
5	-0.29	-26.7	-26.6
6	-0.36	-22.3	-22.4
7	-0.42	-22.8	-23.4
8	-0.47	-32.5	-33.1
8.5	-0.48	-39.8	-36.0
9	-0.52	-26.9	-26.8
11	-0.73	-17.4	-17.3
12.5	-0.73	-25.1	-22.8
13	-0.74	-47.1	-27.8
13.5	-0.78	-25.0	-23.4
15	-1.03	-14.2	-13.3
15.5	-1.10	-13.1	-12.4
16	-1.12	-13.0	-12.5
17.5	-1.03	-21.5	-18.8
18	-1.02	-56.1	-23.5
18.5	-1.09	-20.9	-20.3
20	-1.52	-11.5	-11.1

RECOMMENDED BIAS SEQUENCING

During Power-Up

To power up the ADL8143-EVALZ, take the following steps:

1. Connect the VDD power supply.
2. Set the VDD supply to 1.5 V.
3. Apply the RF input signal.

During Power-Down

To power down the ADL8143-EVALZ, take the following steps:

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

EVALUATION BOARD SCHEMATIC AND ARTWORK

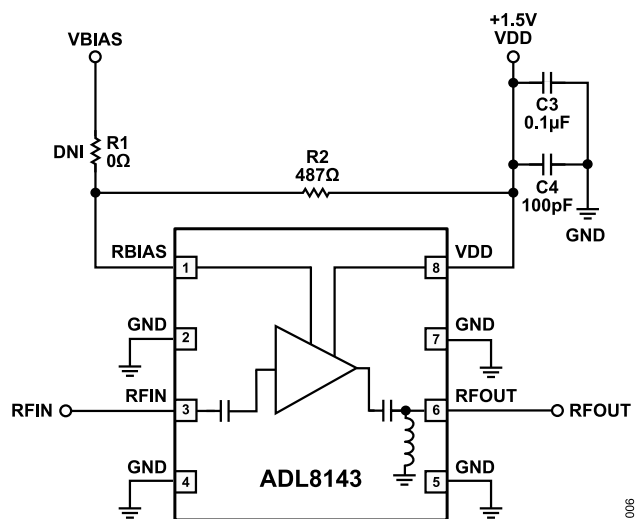


Figure 5. ADL8143-EVALZ Schematic

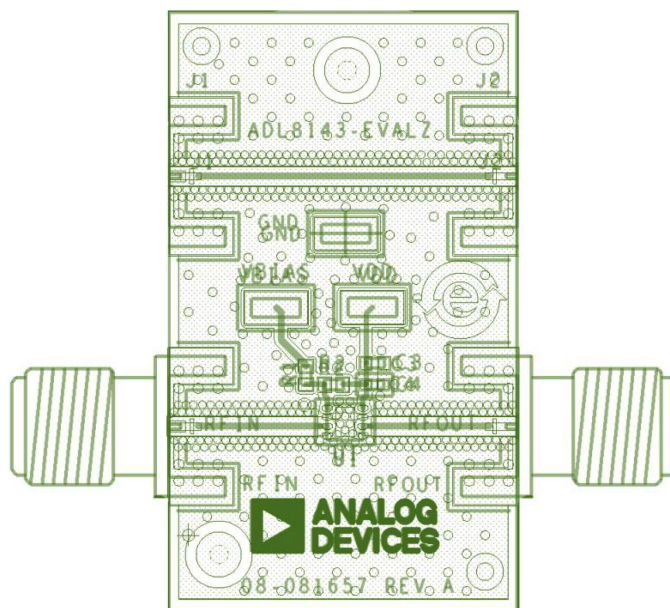



Figure 6. ADL8143-EVALZ Assembly Drawing (J1 and J2 Not Installed)

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	CL05B104KO5NUNC
C4	Capacitor, ceramic, 100 pF, 50 V, 5%, COG, 0402, extreme low, effective series resistance (ESR)	KEMET	C0402C101J5GACTU
R1	Resistor SMD, 0 Ω jumper, 1/10 W, 0402 (do not install, DNI)	Panasonic	ERJ-2GE0R00X
R2	Resistor SMD, 487 Ω, 1/16 W, 1%, 0402	Bourns	CR0402-FX-4870GLF
GND, VBIAS, VDD	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
RFIN, RFOUT	Connectors, 2.92 mm, jack edge	SRI Connector Gage Co.	25-146-1000-92
U1	GaAs, pHEMT, MMIC, low noise amplifier, 8 GHz to 14 GHz	Analog Devices, Inc.	ADL8143



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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