

Evaluating the ADL8150 GaAs, HBT, MMIC, Low Phase Noise Amplifier, 6 GHz to 14 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

- ADL8150-EVALZ evaluation board

EQUIPMENT NEEDED

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

GENERAL DESCRIPTION

The ADL8150-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 ADL8150-EVALZ are populated with 2.9 mm, female coaxial connectors, and the corresponding RFIN and RFOUT traces have a 50 Ω characteristic impedance. The ADL8150-EVALZ is populated with components suitable for use over the entire -40°C to $+85^{\circ}\text{C}$ operating temperature range of the ADL8150. 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 2 and Figure 3 for the through calibration path performance.

Incorporated on the ADL8150-EVALZ is an ultralow noise, ultrahigh power supply rejection ratio (PSRR), linear regulator. This low noise regulator provides a clean power source to bias the ADL8150.

The RFIN and RFOUT traces on the ADL8150-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 pad to provide adequate electrical conduction and thermal conduction.

The power supply decoupling capacitors on the ADL8150-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the ADL8150, see the ADL8150 data sheet, which must be consulted in conjunction with this user guide when using the ADL8150-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

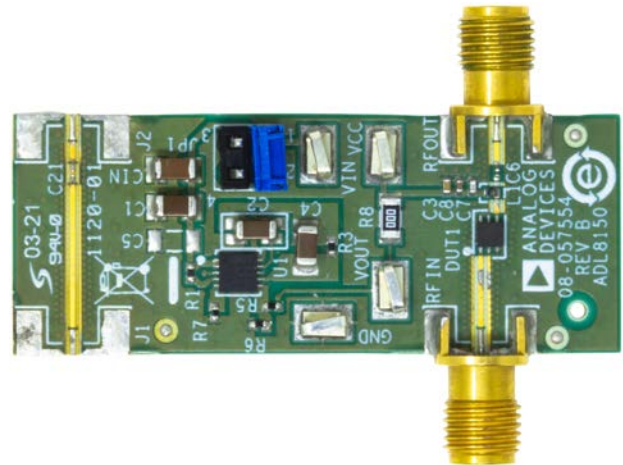


Figure 1. ADL8150-EVALZ Primary Side

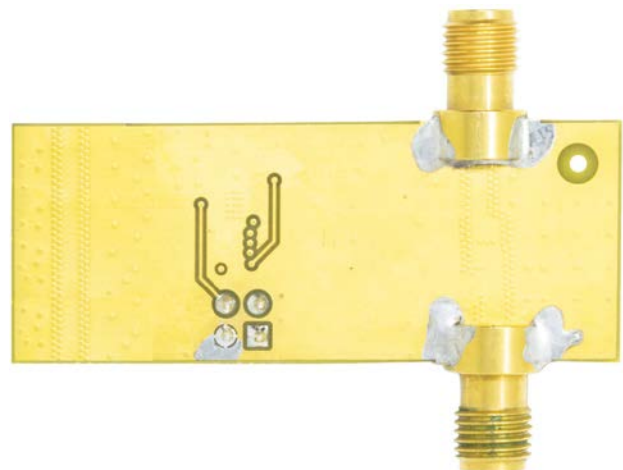


Figure 2. ADL8150-EVALZ Secondary Side

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REVISION HISTORY

10/2020—Revision 0: Initial Version

OPERATING THE ADL8150-EVALZ

The ADL8150-EVALZ is equipped with an ultralow noise regulator. By default, the ADL8150-EVALZ is configured to use the regulator to power the ADL8150. The regulator is configured to provide 5 V to the ADL8150. To adjust the output voltage (V_{OUT}), change the R3 resistor value (see Table 1). When using the regulator, connect a 5.5 V, 200 mA power supply between the surface-mount technology (SMT) pins, VIN and GND.

Table 1. R3 Resistor Values vs. Regulator V_{OUT}

R3 (k Ω)	V_{OUT} (V)
45	4.5
49.9	5
55	5.5

To connect a different supply, bypass the regulator by removing R8 and directly power the ADL8150 from an external power supply by connecting a 5 V power supply between the SMT terminals, VCC and GND.

POWER UP

The recommended bias sequence during power-up follows:

1. Connect a 5.5 V, 200 mA power supply to the SMT test point, VIN. Connect the ground reference to the GND test point.
2. Apply RF.

POWER DOWN

The recommended bias sequence during power-down follows:

1. Turn off the RF.
2. Set the power supply to 0 V.

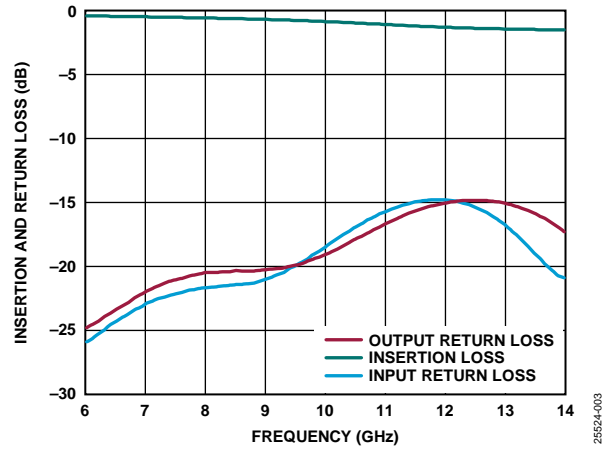


Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

Table 2. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
6	-0.4
6.5	-0.4
7	-0.5
7.5	-0.5
8	-0.6
8.5	-0.6
9	-0.7
9.5	-0.7
10	-0.8
10.5	-0.9
11	-1.1
11.5	-1.2
12	-1.3
12.5	-1.3
13	-1.4
13.5	-1.4
14	-1.5

EVALUATION BOARD SCHEMATIC AND ARTWORK

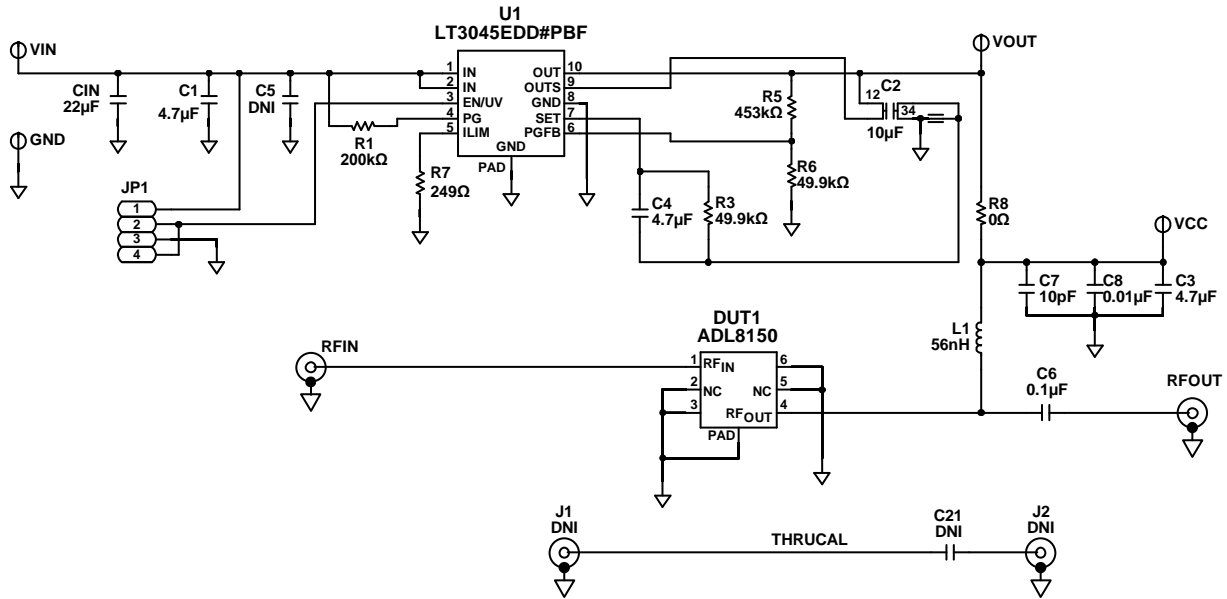


Figure 4. ADL8150-EVALZ Schematic

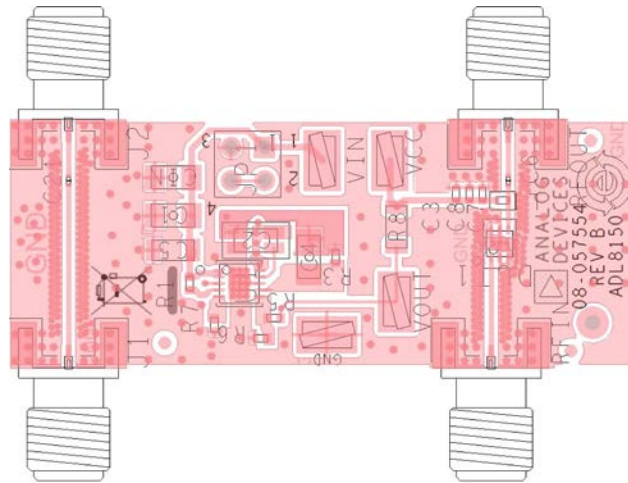


Figure 5. ADL8150-EVALZ Assembly Drawing (J1 and J2 are Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Reference Designator	Description	Manufacturer	Part Number
C1, C4	Capacitors, ceramic, 4.7 μ F, 25 V, 10% tolerance	KEMET	C1206C475K3RACTU
C2	Capacitor, ceramic, 10 μ F, 25 V, 10% tolerance	YAGEO	CC1206KKX5R8BB106
C3	Capacitor, ceramic, 4.7 μ F, 6.3 V, 20% tolerance	Murata	GRM155R60J475ME87D
C6	Capacitor, ceramic, 0.1 μ F, 16 V, 10% tolerance	American Technical Ceramics	531Z104KTR16T
C7	Capacitor, ceramic, 10 pF, 50 V, 5% tolerance	YAGEO	CC0402JRNPO9BN100
C8	Capacitor, ceramic, 0.01 μ F, 25 V, 10% tolerance	TDK	CGA2B2X8R1E103K050BE
C1N	Capacitor, ceramic, 22 μ F, 35 V, 20% tolerance	TDK	C3216X5R1V226M160AC
GND, VIN, VDD, VOUT	Surface-mount test points	Keystone Electronics	5016
RFIN, RFOUT	Connectors, 2.9 mm, jack, PCB mount receptacle	SRI Connector Gage Co.	25-146-1000-92
JP1	4-position male header	Samtec Inc.	TSW-102-07-T-D
Socket	Mini jumper	BERG	65474-001
L1	Chip inductor, 56 nH, 5%, 0.061 Ω DCR, 1.2 A	Coilcraft Inc.	0402DF-560XJR
R1	Surface-mount resistor, 200 k Ω , 1% 1/10 W	Panasonic	ERJ-2RKF2003X
R3, R6	Surface-mount resistors, 49.9 k Ω , 1% 1/10 W	Panasonic	ERJ-2RKF4992X
R5	Surface-mount resistor, 453 k Ω , 1% 1/10 W	Panasonic	ERJ-2RKF4533X
R7	Surface-mount resistor, 249 Ω , 1% 1/10 W	VENKEL	CR0402-16W-2490FT
U1	Linear regulator, ultralow noise, ultrahigh PSRR	Analog Devices, Inc.	LT3045EDD#PBF
DUT1	Low phase noise amplifier	Analog Devices, Inc.	ADL8150ACPZN
J1, J2	Connectors, 2.9 mm, jack, PCB mount receptacle, do not install (DNI)	SRI Connector Gage Co.	25-146-1000-92
C21	Capacitor, ceramic, 0.1 μ F, 16 V, 10% tolerance, DNI	American Technical Ceramics	531Z104KTR16T
C5	Ceramic capacitor, DNI	Not applicable	Not applicable

**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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