

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

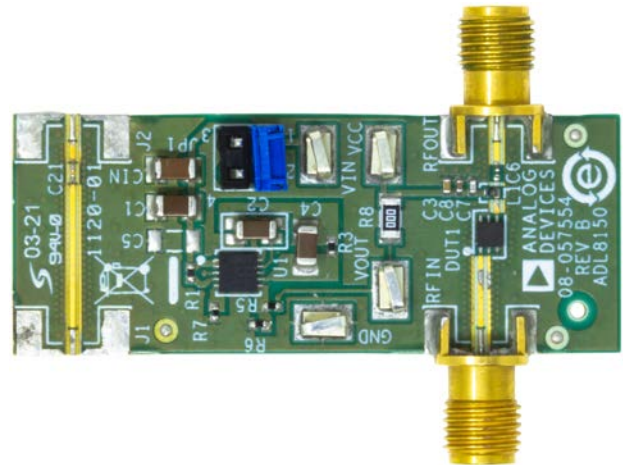


Figure 1. ADL8150-EVALZ Primary Side

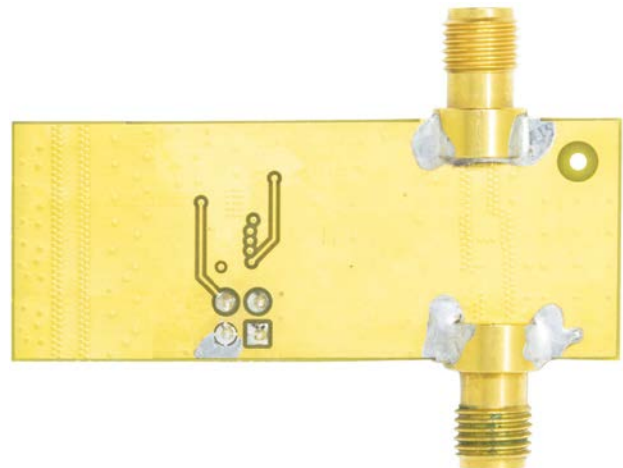


Figure 2. ADL8150-EVALZ Secondary Side

TABLE OF CONTENTS

Features	1	Power Up	3
Evaluation Kit Contents.....	1	Power Down.....	3
Equipment Needed.....	1	Evaluation Board Schematic and Artwork.....	4
General Description	1	Ordering Information.....	5
Evaluation Board Photographs	1	Bill of Materials.....	5
Revision History	2		
Operating the ADL8150-EVALZ.....	3		

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.

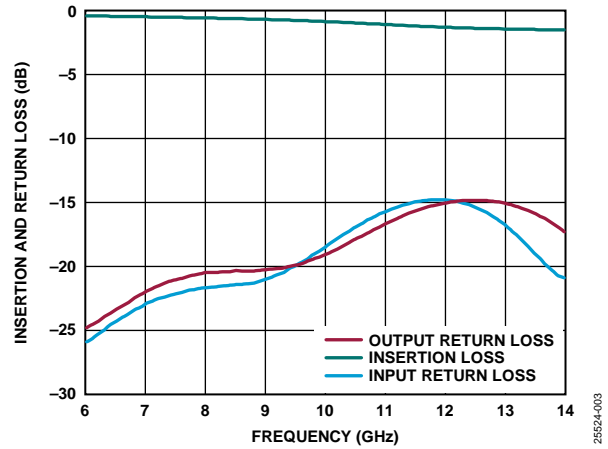


Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

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

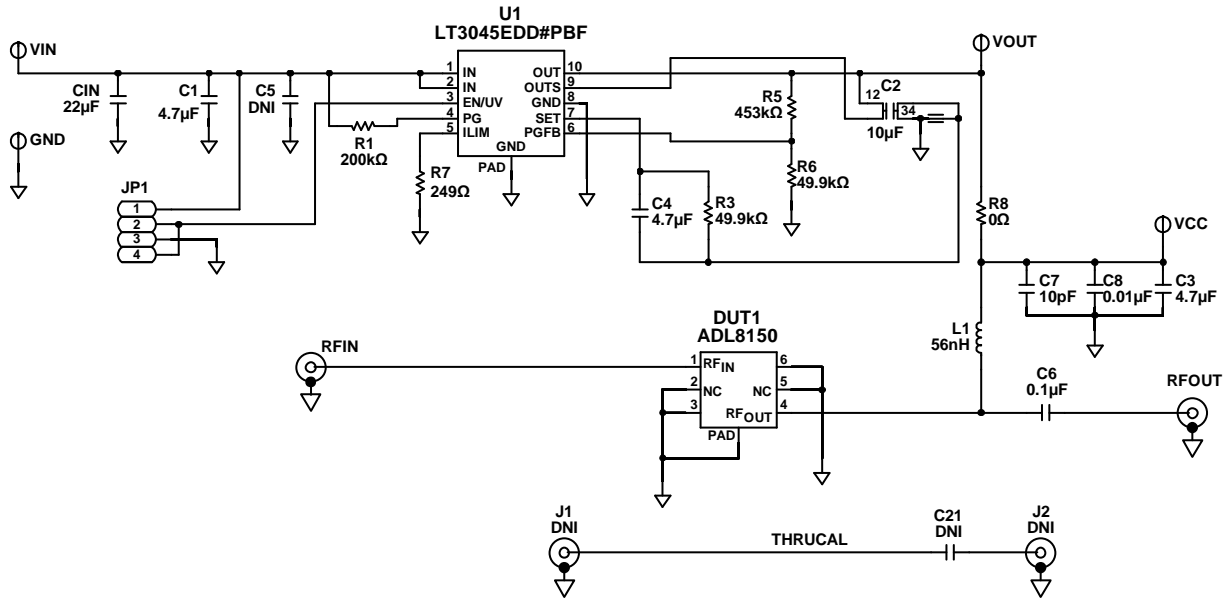


Figure 4. ADL8150-EVALZ Schematic

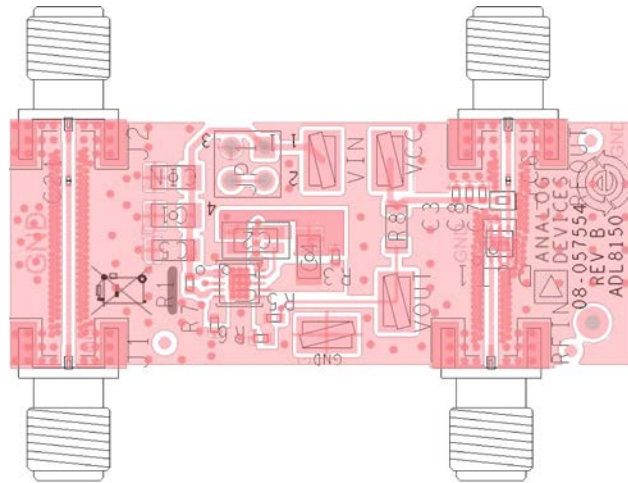


Figure 5. ADL8150-EVALZ Assembly Drawing (J1 and J2 are Not Installed)

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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.