

Evaluating the ADL8104 Wideband, High Linearity, Low Noise Amplifier, 0.4 GHz to 7.5 GHz

FEATURES

4-layer, Rogers 4350B and Isola 370HR evaluation board
End launch, 3.5 mm RF connectors
Through calibration path (depopulated)

EVALUATION KIT CONTENTS

ADL8104-EVALZ evaluation board

EQUIPMENT NEEDED

RF signal generator
RF spectrum analyzer
RF network analyzer
5 V, 300 mA power supply

GENERAL DESCRIPTION

The ADL8104-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 ADL8104-EVALZ are populated with 3.5 mm, female coaxial connectors, and the corresponding RF traces have a 50 Ω characteristic impedance. The ADL8104-EVALZ is populated with components suitable for use over the entire -40°C to $+85^{\circ}\text{C}$ operating temperature range of the ADL8104. 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 3 for the through calibration path performance.

Access the ADL8104-EVALZ ground path and V_{DD} 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 R_{BIAS} pin (see Figure 5 for the test point locations).

The RF traces on the ADL8104-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 paddle to provide adequate electrical conduction and thermal conduction to the heat sink.

The power supply decoupling capacitors on the ADL8104-EVALZ represent the configuration used to characterize and qualify the device.

For full details on the ADL8104, see the ADL8104 data sheet, which must be consulted in conjunction with this user guide when using the ADL8104-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

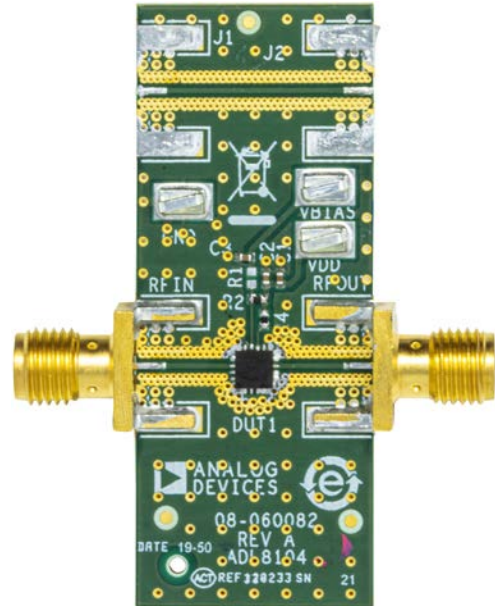


Figure 1. ADL8104-EVALZ Primary Side



Figure 2. ADL8104-EVALZ Secondary Side

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REVISION HISTORY

9/2020—Revision 0: Initial Version

OPERATING THE ADL8104-EVALZ

A 5 V, 300 mA power supply is required to provide the bias to the ADL8104 when using the ADL8104-EVALZ. Connect the 5 V power supply to the SMT test points labeled VDD and VBIAS. Connect the ground reference to the GND test point.

Refer to the ADL8104 data sheet for the recommended resistor values to achieve different supply currents. The default value of the external resistor, R2, connected on the ADL8104-EVALZ is 90.9 Ω , which is the same value used to characterize the ADL8104.

The following bias conditions are recommended to achieve the performance specified in the ADL8104 data sheet: $V_{DD} = 5$ V, supply current (I_{DQ}) = 150 mA, and $R_{BIAS} = 90.9$ Ω .

RECOMMENDED BIAS SEQUENCING

During Power-Up

To power up, follow this bias sequence:

1. Set VDD and VBIAS to 5 V.
2. Apply the RF signal.

During Power-Down

To power down, follow this bias sequence:

1. Turn off the RF signal.
2. Set VDD and VBIAS to 0 V.

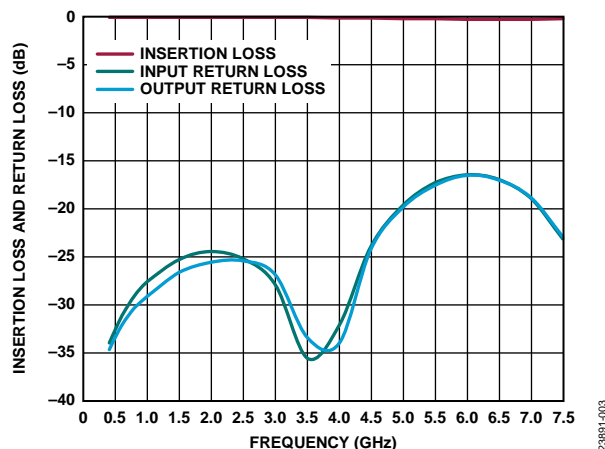


Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
0.4	0.0	-33.8	-34.5
0.6	0.0	-31.0	-32.0
0.8	0.0	-28.9	-30.2
1.0	0.0	-27.5	-29.0
1.5	0.0	-25.2	-26.5
2.0	0.0	-24.4	-25.4
2.5	0.0	-25.1	-25.3
3.0	0.0	-27.8	-26.7
3.5	0.0	-35.4	-33.3
4.0	-0.1	-32.0	-33.8
4.5	-0.1	-23.8	-24.1
5.0	-0.2	-19.6	-19.7
5.5	-0.2	-17.2	-17.5
6.0	-0.2	-16.4	-16.4
6.5	-0.2	-16.8	-16.9
7.0	-0.2	-18.8	-18.7
7.5	-0.2	-23.1	-22.8

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Reference Designator	Description	Manufacturer	Part Number
C1, C3	Ceramic capacitors, 0402, surface-mount device (SMD), multilayer, 1000 pF	TDK Corporation	CGJ2B2X7R1E102K050BA
C2	Ceramic capacitors, 0402, SMD, 1 μ F	AVX Corporation	04026D105KAT2A
RFIN, RFOUT	Connectors, 3.5 mm, jack edge	SRI Connector Gage Co.	21-146-1000-01
VDD, GND, VBIAS	Connectors, SMT test points	Keystone Electronics	5016
J1, J2	Connectors, 3.5 mm, jack edge, do not install (DNI)	SRI Connector Gage Co.	21-146-1000-01
R1	Resistor, 0402, SMD chip, precision, 90.9 Ω , DNI	Panasonic	ERJ-2RKF90R9X
R2	Resistor, 0402, SMD chip, precision, 90.9 Ω	Panasonic	ERJ-2RKF90R9X
R4	Resistor, 0402, SMD chip jumper, 0 Ω	Multicomp Pro	MC00625W040210R
U1	Gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT), monolithic microwave integrated circuit (MMIC), 0.4 GHz to 7.5 GHz, low noise amplifier	Analog Devices, Inc.	ADL8104



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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