Evaluating the ADL8106 GaAs, pHEMT, Low Noise Amplifier, 18 GHz to 54 GHz

FEATURES

- 4-layer, Rogers 4003C evaluation board
- End launch, 1.85 mm RF connectors
- Through calibration path (depopulated)

EVALUATION KIT CONTENTS

- ADL8106-EVALZ evaluation board

EQUIPMENT NEEDED

- RF signal generator
- RF spectrum analyzer
- RF network analyzer
- 3 V, 300 mA power supply
- 0 V to −2 V, ±1 mA power supply

GENERAL DESCRIPTION

The ADL8106-EVALZ is a 4-layer printed circuit board (PCB). The substrate between the top layer and the first internal layer is made from Rogers 4003C. The internal and bottom side layers are all ground.

The RFIN and RFOUT ports on the ADL8106-EVALZ are populated with 1.85 mm, female coaxial connectors, and the respective RF traces have a 50 Ω characteristic impedance. The ADL8106-EVALZ is populated with components suitable for use over the entire −40°C to +85°C operating temperature range of the ADL8106.

To calibrate out board trace losses, a through calibration path is provided between the CAL1 and CAL2 connectors. CAL1 and CAL2 must be populated with 1.85 mm, female coaxial connectors (for part number see Table 2). The power and bias voltages are applied to the surface-mounted technology (SMT) test points, VDD1, VDD2, and VGG.

The RF traces are 50 Ω, grounded, coplanar waveguide. The package ground leads and the exposed pad directly connect to the ground plane. Multiple vias are used to connect the ground planes with particular focus on the area directly beneath the ground pad. For full details on the ADL8106, see the ADL8106 data sheet, which must be consulted in conjunction with this user guide when using the ADL8106-EVALZ.

EVALUATION BOARD PHOTOGRAPHS

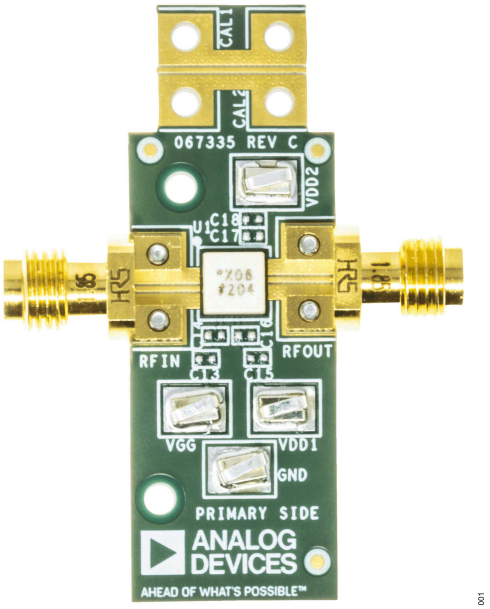

Figure 1. ADL8106-EVALZ Top Side

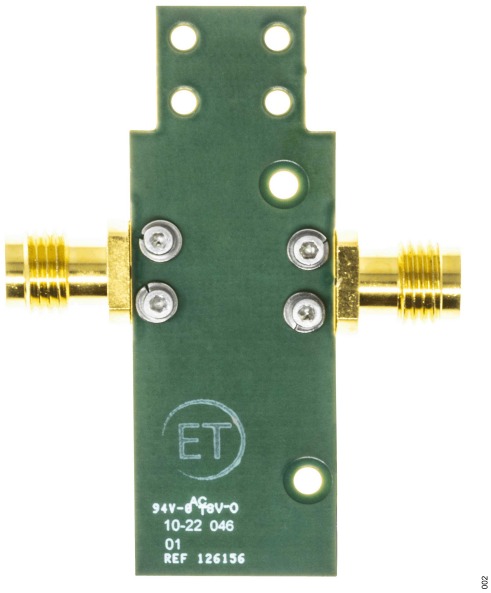

Figure 2. ADL8106-EVALZ Bottom Side

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REVISION HISTORY

8/2022—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OPERATING THE ADL8106-EVALZ

A 3 V power supply that can source up to 300 mA is required to provide the main bias to the ADL8106-EVALZ. Connect the 3 V power supply to the VDD1 and VDD2 SMT test points. In addition, a 0 V to −2 V power supply that can source or sink up to 1 mA is required to provide bias control. Connect the −2 V power supply to the VGG SMT test point.

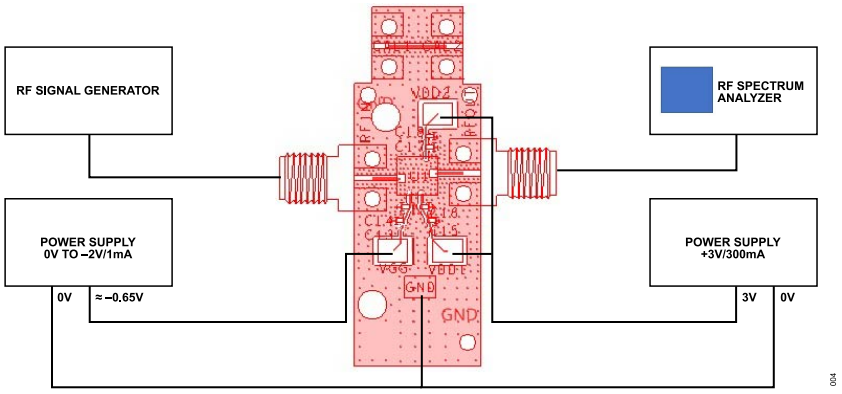

Figure 3. Operating the ADL8106-EVALZ

EVALUATION BOARD HARDWARE

POWER-UP AND POWER-DOWN SEQUENCING

To avoid damaging the device, careful attention must be paid to the sequencing of the RF input, the gate bias voltage, and the drain bias voltage. See the following sections for the recommended power-up sequence and power-down sequence.

Power-Up Sequence

Use the following biasing sequence during power-up:

1. Ensure that all power supplies and the signal generator are off.
2. Connect GND to RF and dc ground.
3. Set VGG to –2 V.
4. Set VDD1 and VDD2 to 3 V.
5. Increase VGG until the total current into VDD1 and VDD2 is 120 mA (this current is achieved with VGG approximately equal to −0.65 V).
6. Turn on the RF input signal.

If the target VGG voltage is know in advance, VGG can be set to that level directly in Step 3, and Step 5 can be skipped.

Power-Down Sequence

Use the following biasing sequence during power-down:

1. Turn off the RF input signal.
2. Decrease VGG to −2 V.
3. Decrease VDD1 and VDD2 to 0 V.
4. Increase VGG to 0 V.

THROUGH CALIBRATION PATH

The ADL8106-EVALZ includes a calibration path (see Figure 5). CAL1 and CAL2 must be populated with RF connectors to use the through calibration path. Figure 4 shows the insertion loss, input return loss, and output return loss of the through calibration path. Table 1 lists the insertion loss of the through calibration path.

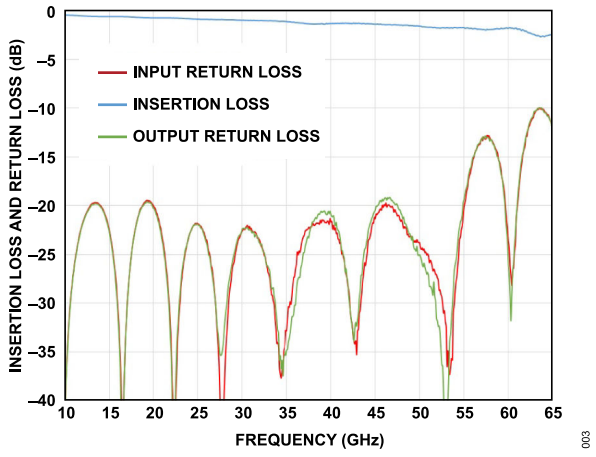

Figure 4. Insertion Loss and Return Loss (Input and Output) of the Through Calibration Path

Table 1. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
10	−0.46
15	−0.61
20	−0.74
25	−0.88
30	−0.99
35	−1.11
40	−1.30
45	−1.39
50	−1.57
55	−1.72
60	−1.78
65	−2.4

EVALUATION BOARD SCHEMATIC AND ARTWORK

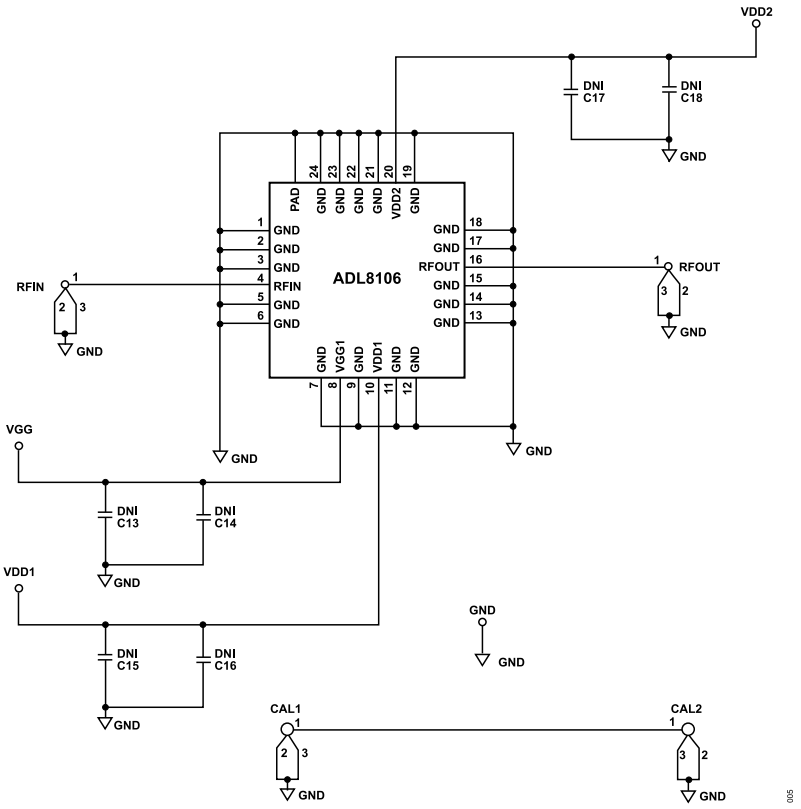

Figure 5. ADL8106-EVALZ Schematic

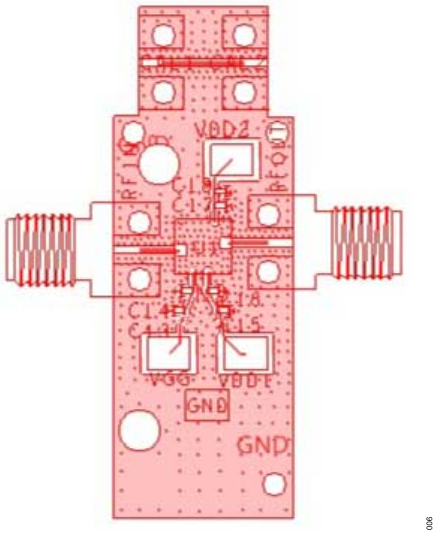

Figure 6. ADL8106-EVALZ Assembly Drawing (CAL1 and CAL2 Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Reference Designator	Description	Manufacturer	Part Number
C13, C15, C18	Capacitors, 0402 (do not install (DNI))	Not applicable	Not applicable
C14, C16, C17	Capacitors, 0402 (DNI)	Not applicable	Not applicable
RFIN, RFOUT	Coaxial connectors, PCB header, 1.85 mm, 50 Ω, 67 GHz	Hirose Electric Co.	HV-LR-SR2(12)
VDD1, VDD2, VGG, GND	Connectors, SMT test points	Keystone Electronics	5016
CAL1, CAL2	Coaxial connectors, PCB header, 1.85 mm, 50 Ω, 67 GHz (not installed)	Hirose Electric Co.	HV-LR-SR2(12)
U1	GaAs, pHEMT, low noise amplifier, 18 GHz to 54 GHz	Analog Devices, Inc.	ADL8106ACEZ

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.