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## Evaluating the HMC1126ACEZ GaAs, pHEMT, Low Noise Amplifier, 400 MHz to 52 GHz

### FEATURES

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

### EVALUATION KIT CONTENTS

**HMC1126-EVALZ evaluation board**

### EQUIPMENT NEEDED

**RF signal generator**
**RF spectrum analyzer**
**RF network analyzer**
**5 V, 200 mA power supply**
**0 V to −2 V, ±1 mA power supply**
**1 V, 1 mA power supply**

### GENERAL DESCRIPTION

The HMC1126-EVALZ is a 4-layer printed circuit board (PCB). The substrate between the top layer and the first internal layer is 12 mils thick and is made from Rogers 4003C. The internal and bottom side layers are all ground planes.

The RFIN and RFOUT ports on the HMC1126-EVALZ are populated with 1.85 mm, female coaxial connectors, and the respective RF traces have a 50 Ω characteristic impedance. The HMC1126-EVALZ is populated with components suitable for use over the entire −40°C to +85°C operating temperature range of the HMC1126ACEZ.

To calibrate out board trace losses, a through calibration path, CAL, is provided between the CAL1 and CAL2 connectors. CAL1 and CAL2 must be populated with 1.85 mm, female coaxial connectors (see Table 2 for the part number). The power and bias voltages are the applied surface-mount technology (SMT) test points VDD, VGG1, and VGG2. Because there is no ground pin on the HMC1126-EVALZ, connect the ground cable by attaching a clip lead to one of the RF connector edges or to one of the available holes in the PCB.

The RF traces are 50 Ω, grounded, coplanar waveguide. The package ground leads and the exposed pad connect directly to the ground plane. Multiple vias connect the ground planes with particular focus on the area directly beneath the ground pad.

For full details on the HMC1126ACEZ, see the HMC1126ACEZ data sheet, which must be consulted in conjunction with this user guide when using the HMC1126-EVALZ.

### EVALUATION BOARD PHOTOGRAPHS

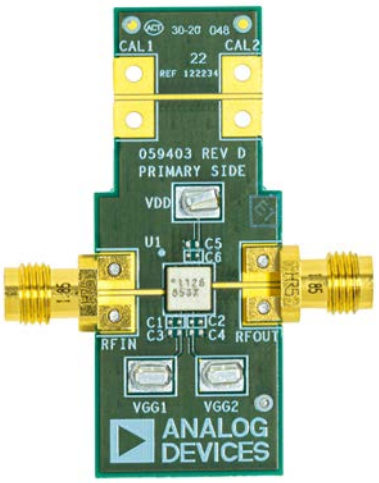


*Figure 1. HMC1126-EVALZ Top Side*

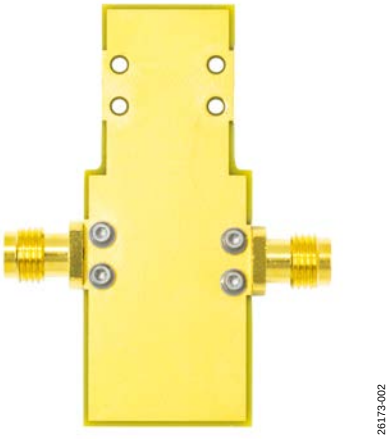


*Figure 2. HMC1126-EVALZ Bottom Side*

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## REVISION HISTORY

**11/2021—Revision 0: Initial Version**

# EVALUATION BOARD HARDWARE

## OPERATING THE HMC1126-EVALZ

A 5 V power supply that can source up to 200 mA is required to provide the main bias to the HMC1126-EVALZ (see Figure 4). Connect the 5 V power supply to the VDD SMT test point. In addition, a 0 V to −2 V power supply that can source ±1 mA and a 1 V power supply that can source 1 mA are required to provide bias control. Connect the 0 V to −2 V power supply to the VGG1 SMT test point, and connect the 1 V power supply to the VGG2 SMT test point. Because there is no ground pin on the HMC1126-EVALZ, connect the ground cable by attaching a clip lead to one of the RF connector edges or to one of the available holes in the PCB.

## 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 voltages, and the drain bias voltage.

See the HMC1126ACEZ data sheet for the bias sequencing information.

## THROUGH CALIBRATION PATH

The HMC1126-EVALZ includes a calibration path (see the evaluation board schematic and assembly drawing in Figure 5 and Figure 6, respectively). CAL1 and CAL2 must be populated with RF connectors to use the through calibration path. Figure 3 shows the insertion loss, input return loss, and output return loss of the through calibration path. Table 1 details the insertion loss of the through calibration path.

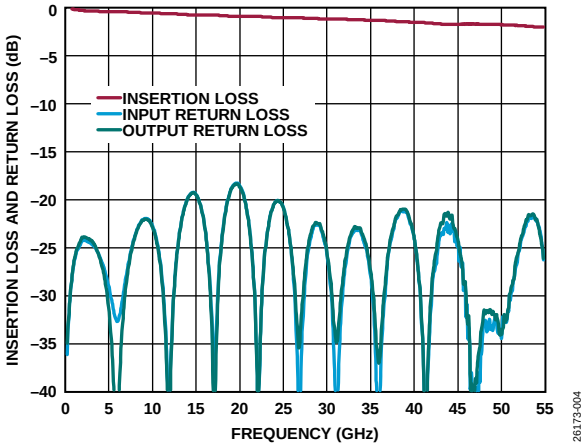


*Figure 3. Insertion Loss and Return Loss (Input and Output) of the Through Calibration Path*

**Table 1. Insertion Loss of the Through Calibration Path**

| Frequency (GHz) | Insertion Loss (dB) |
|---|---|
| 0.4 | −0.11 |
| 1 | −0.16 |
| 5 | −0.41 |
| 10 | −0.58 |
| 15 | −0.77 |
| 20 | −0.93 |
| 25 | −1.0 |
| 30 | −1.1 |
| 35 | −1.3 |
| 40 | −1.5 |
| 45 | −1.7 |
| 50 | −1.7 |
| 52 | −1.9 |
| 55 | −2.0 |

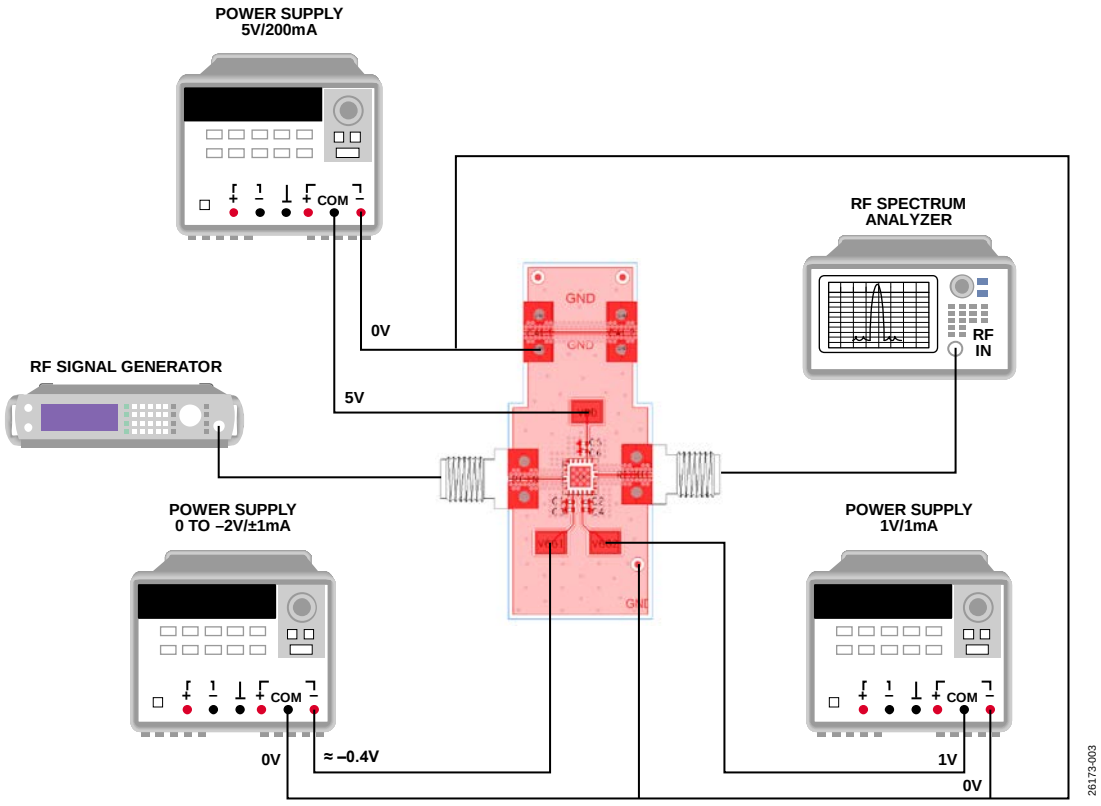


*Figure 4. Operating the HMC1126-EVALZ*

# EVALUATION BOARD SCHEMATIC AND ARTWORK

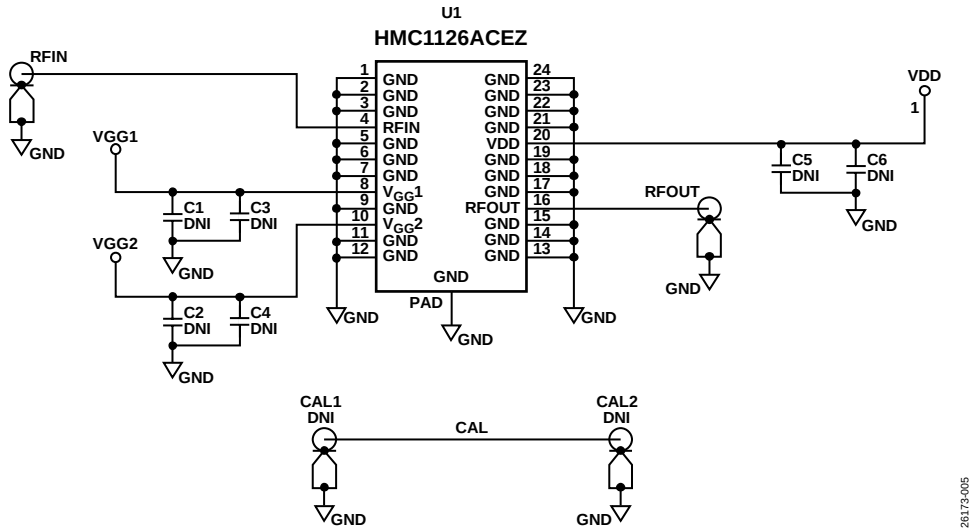


*Figure 5. HMC1126-EVALZ Schematic*

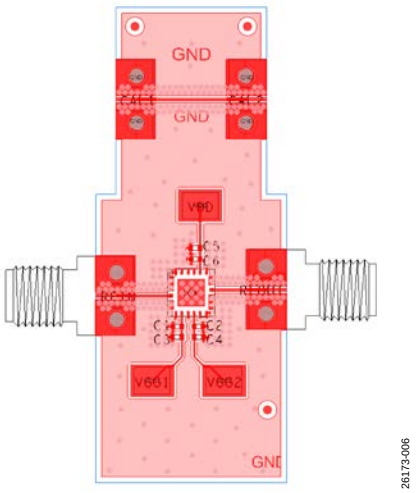


*Figure 6. HMC1126-EVALZ Assembly Drawing (CAL1 and CAL2 Not Installed)*

# ORDERING INFORMATION

## BILL OF MATERIALS

**Table 2.**

| Reference Designator | Description | Manufacturer | Part Number |
|---|---|---|---|
| C1, C2, C6 | Ceramic capacitors, 100 pF, 0402, do not install (DNI) | Kemet | C0402C101J5GACTU |
| C3, C4, C5 | Ceramic capacitors, 0.1 µF, 0402, DNI | TDK Corporation | C1005X7R1H104K050BE |
| RFIN, RFOUT | Coaxial connectors, PCB header, 1.85 mm, 50 Ω, 67 GHz | Hirose Electric Co. | HV-LR-SR2(12) |
| VDD, VGG1, VGG2 | Connectors, SMT test points | Keystone Electronics | 5016 |
| CAL1, CAL2 | Coaxial connectors, PCB header, 1.85 mm, 50 Ω, 67 GHz, DNI | Hirose Electric Co. | HV-LR-SR2(12) |
| U1 | Gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT), low noise amplifier, 400 MHz to 52 GHz | Analog Devices, Inc. | HMC1126ACEZ |

**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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