ANALOG DEVICES

ADL9006-EVALZ Evaluation Board User Guide

UG-1659

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Evaluating the ADL9006 2 GHz to 28 GHz, GaAs, pHEMT, MMIC, Low Noise Amplifier

FEATURES

2-layer Rogers 4350 evaluation board with heat sink
End launch, 2.9 mm RF connectors
Through calibration path

EVALUATION KIT CONTENTS

ADL9006-EVALZ evaluation board

EQUIPMENT NEEDED

RF signal generator
RF spectrum analyzer
RF network analyzer
5 V, 200 mA power supply
−2.6 V to +2.6 V, 100 mA power supply

GENERAL DESCRIPTION

The ADL9006-EVALZ consists of a 2-layer printed circuit board (PCB) fabricated from 10 mil thick, Rogers 4350, copper clad, mounted to an aluminum heat sink. The heat sink assists in providing thermal relief to the device as well as mechanical support to the PCB. Mounting holes on the heat sink allow attachment to larger heat sinks for improved thermal management. The RFIN and RFOUT ports on the ADL9006-EVALZ are populated with 2.9 mm, female coaxial connectors, and the respective RF traces have a 50 Ω characteristic impedance. The ADL9006-EVALZ is populated with components suitable for use over the entire −40°C to +85°C operating temperature range of the ADL9006. To calibrate out board trace losses, a through calibration path, THRU CAL, is provided between the J5 and J6 connectors. J5 and J6 must be populated with RF connectors to use the through calibration path. The power voltages, ground voltages, gate control voltages, and detector output voltages are accessed through two 4-pin headers (see Table 1).

The RF traces are 50 Ω, grounded, coplanar waveguide. The package ground leads and the exposed paddle directly connect to the ground plane. Multiple vias are used to 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 ADL9006-EVALZ represent the configuration used to characterize and qualify the device. It is possible to reduce the number of capacitors, but this reduction varies from system to system. It is recommended to first remove or combine the largest capacitors that are farthest from the ADL9006 when reducing the number of capacitors.

EVALUATION BOARD PHOTOGRAPHS

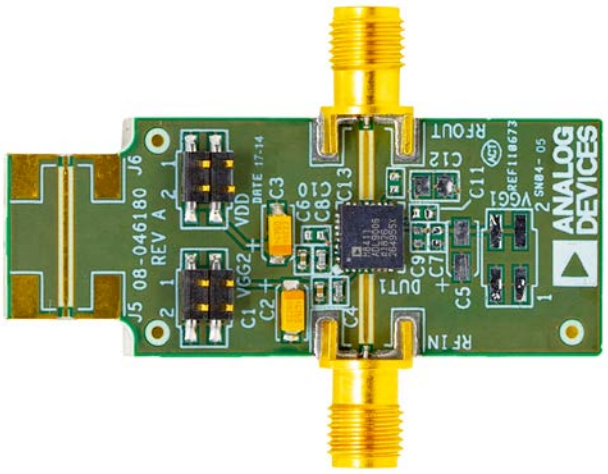

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Figure 1. ADL9006-EVALZ Top Side

21766-002

Figure 2. ADL9006-EVALZ Bottom Side

For full details on the ADL9006, see the ADL9006 data sheet, which must be consulted in conjunction with this user guide when using the ADL9006-EVALZ.

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REVISION HISTORY

8/2020—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OPERATING THE ADL9006-EVALZ

A 5 V, 200 mA power supply is required to provide the main bias to the ADL9006-EVALZ. Connect the 5 V power supply to the VDD line through the VDD header.

To use the optional gain control feature, a −2.0 V to +2.6 V, 100 mA power supply is required to provide the necessary gate control voltage to VGG2. Connect the −2.0 V to +2.6 V power supply to the VGG2 line through the VGG2 header.

See the ADL9006 data sheet for the bias sequencing information.

Table 1. VDD and VGG2 Header Connections to the ADL9006

Connector[1]	Header Pin	ADL9006 Mnemonic
VDD	1, 3	Ground
VDD	2, 4	V_{DD}
VGG2	1, 3	$V_{GG}2$
VGG2	2, 4	Ground
J5 to J6		Through calibration path (THRUCAL)

[1] See Figure 4 for more details.

THROUGH CALIBRATION PATH

Figure 3 shows the plot of the data in Table 2 of the through calibration path (J5 to J6). See Figure 4 for the evaluation board schematic.

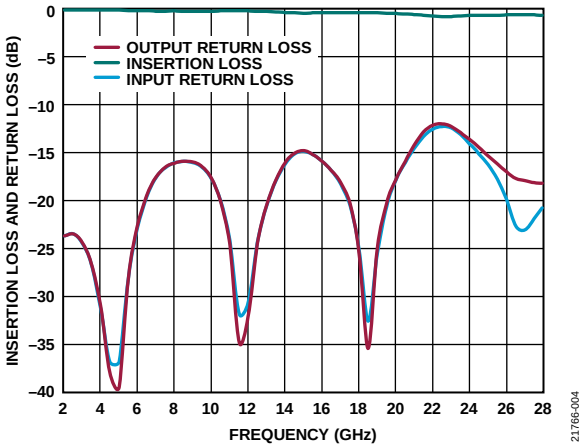

Figure 3. Insertion Loss and Return Loss of the Through Calibration Path

Table 2. Insertion Loss of the Through Calibration Path

Frequency (GHz)	Insertion Loss (dB)
2	−0.1
3	−0.1
4	−0.1
5	−0.1
6	−0.1
7	−0.2
8	−0.3
9	−0.3
10	−0.3
11	−0.3
12	−0.3
13	−0.3
14	−0.4
15	−0.5
16	−0.5
17	−0.5
18	−0.4
19	−0.5
20	−0.6
21	−0.8
22	−0.8
23	−0.8
24	−0.7
25	−0.7
26	−0.7
27	−0.7
28	−0.7

EVALUATION BOARD SCHEMATIC AND ARTWORK

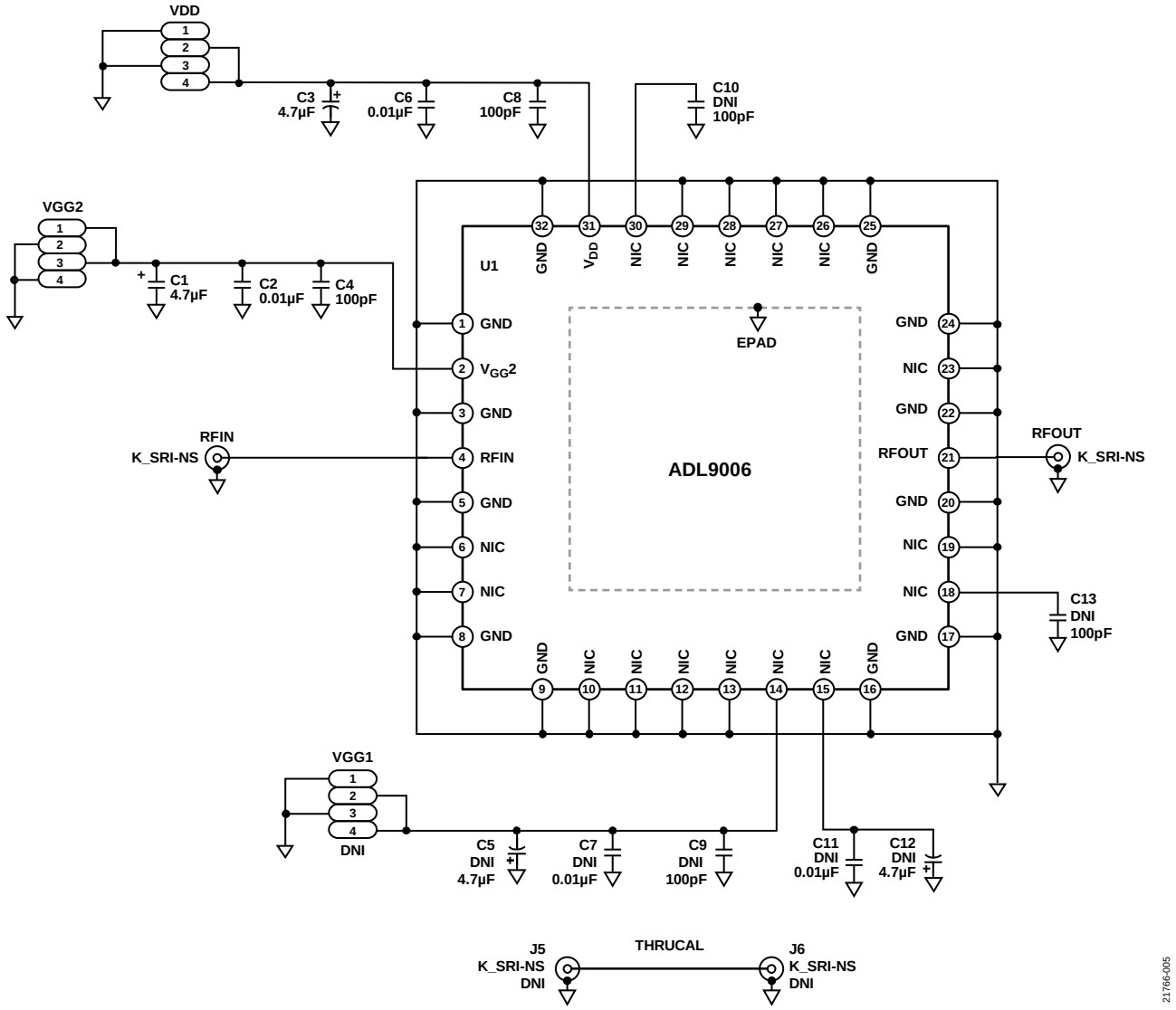

Figure 4. ADL9006-EVALZ Schematic

Figure 5. ADL9006-EVALZ Assembly Drawing (J5 and J6 Not Installed)

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Reference Designator	Description	Manufacturer	Device Number
C1, C3	4.7 µF capacitors, tantalum	AVX	TAJA475K020RNJ
C2, C6	0.01 µF capacitors, multilayer, ceramic, XR7	Kemet	C0402C103J3RACTU
C4, C8	100 pF capacitors, multilayer, ceramic, NPO, high temperature	TDK	C1005NP01H101J050BA
J5, J6	Connectors, K jack edge, do not insert (DNI)	SRI Connector Gage Co.	25-146-1000-92
VDD, VGG2	Connectors, PCB header, unshrouded, dual row, header 4-position, 0.5 mm pitch	Molex	87759-0414
RFIN, RFOUT	Connectors, K jack edge	SRI Connector Gage Co.	25-146-1000-92
U1	Gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT), monolithic microwave integrated circuit (MMIC), 2 GHz to 28 GHz, low noise amplifier	Analog Devices, Inc.	ADL9006
Not Applicable	Aluminum heat sink (see Figure 2), dimensions of heat sink: 1.9 inch × 0.75 inch	Not applicable	Not applicable