ADRF5300-EVALZ Evaluation Board User Guide

UG-1886

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Evaluating the ADRF5300, Silicon, SPDT Switch, Reflective, 24 GHz to 32 GHz

FEATURES

Contains ADRF5300 device and external components
RF connectors
Simple connection to test equipment
On-board through line for calibration

EQUIPMENT NEEDED

DC power supply
Network and spectrum analyzer
Signal generator

GENERAL DESCRIPTION

The ADRF5300-EVALZ is designed to evaluate the features and performance of the ADRF5300 silicon, SPDT, reflective switch, which has a frequency range of 24 GHz to 32 GHz. The ADRF5300-EVALZ (see Figure 1) is populated with a 2.4 mm Hirose connector.

For full details on the ADRF5300, see the ADRF5300 data sheet, which must be consulted in conjunction with this user guide when using the ADRF5300-EVALZ.

EVALUATION BOARD PHOTOGRAPH

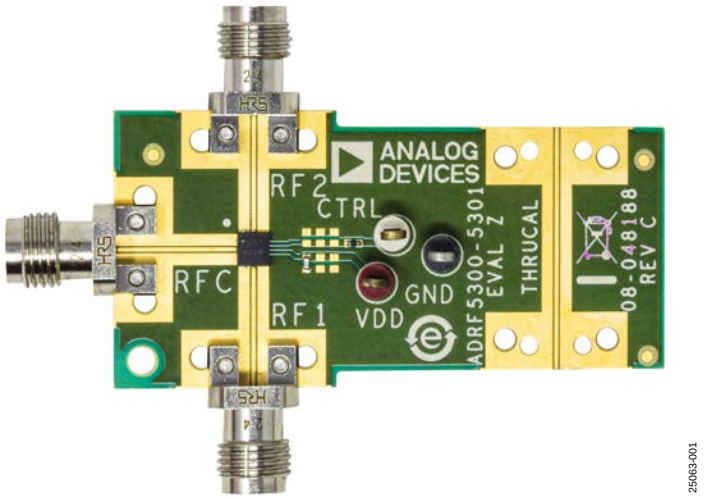

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

9/2020—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OVERVIEW

The ADRF5300-EVALZ is a connectorized evaluation board assembled with the ADRF5300 device and application circuity. All components are located on the primary side of the ADRF5300-EVALZ. Figure 5 shows the ADRF5300-EVALZ schematic, and Figure 6 shows the assembly drawing. Table 2 shows the bill of materials for the ADRF5300-EVALZ components.

BOARD LAYOUT

Figure 2 shows the topside ADRF5300-EVALZ layout and component placement locations.

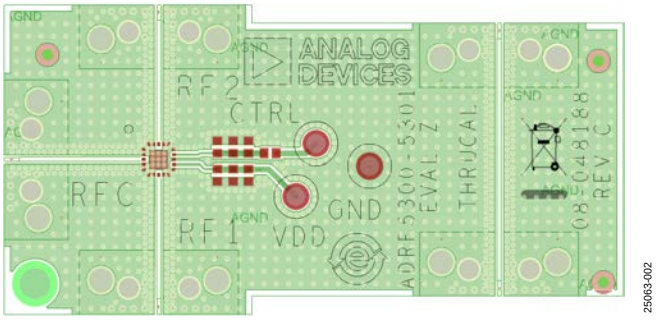

Figure 2. ADRF5300-EVALZ Layout, Top View

RF INPUTS AND OUTPUTS

The RF input and output ports (RFC, RF1, and RF2) are connected through 50 Ω transmission lines to the 2.4 mm RF connectors. These high frequency RF connectors are installed onto the ADRF5300-EVALZ by contact and are not soldered onto the board.

A through line (THRUCAL) is provided for calibration and connects the unpopulated RF connectors. This transmission line is the trace loss from the ADRF5300-EVALZ and is used to determine the device performance at the pins of the IC.

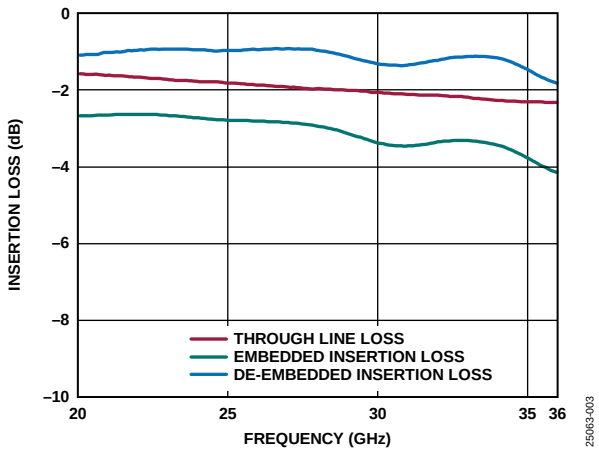

Figure 3. Insertion Loss vs. Frequency

Although the ADRF5300-EVALZ is assembled with the Hirose 2.4 mm connectors, the evaluation board printed circuit board (PCB) is designed to match Southwest 2.4 mm connectors.

POWER SUPPLY AND CONTROL INPUTS

Because the ADRF5300 incorporates a negative voltage generator (NVG) to operate with a single positive supply of 3.3 V applied to the VDD pin, only one power supply is needed to power up the ADRF5300-EVALZ. The control input is connected to the CTRL test point, and the ground reference is connected to the GND test point.

On the supply trace, a 100 pF bypass capacitor filters the high frequency noise. Additionally, unpopulated component positions are available for applying extra bypass capacitors.

On the control trace, there are provisions for an RC filter to eliminate dc-coupled noise, if required by the application.

TEST PROCEDURE

The ADRF5300-EVALZ is shipped assembled and tested. Figure 4 shows a basic setup diagram to measure the scattering parameter response of the ADRF5300. To complete the test setup and verify the operation of the ADRF5300-EVALZ, perform the following steps:

1. Connect the GND test point to the ground terminal of the two 3.3 V dc power supplies.
2. Connect the VDD test point to the voltage output terminal of the 3.3 V dc power supply.
3. Connect the CTRL test point to the voltage output terminal or ground terminal of the other 3.3 V dc power supply.
4. Connect the RFC, RF1, and RF2 ports to a calibrated network analyzer.
5. Turn on the 3.3 V dc power supply connected to the VDD test point.
6. Turn on the 3.3 V dc power supply connected to the CTRL test point.
7. Measure the scattering parameters.

Table 1. Power Supply and Control Inputs

Test Points	Description	Nominal Voltage (V)	Nominal Current (µA)
VDD	Supply voltage	3.3	450
CTRL	Control voltage	0 or 3.3	<1 or 11
GND	Ground	Ground	Not applicable

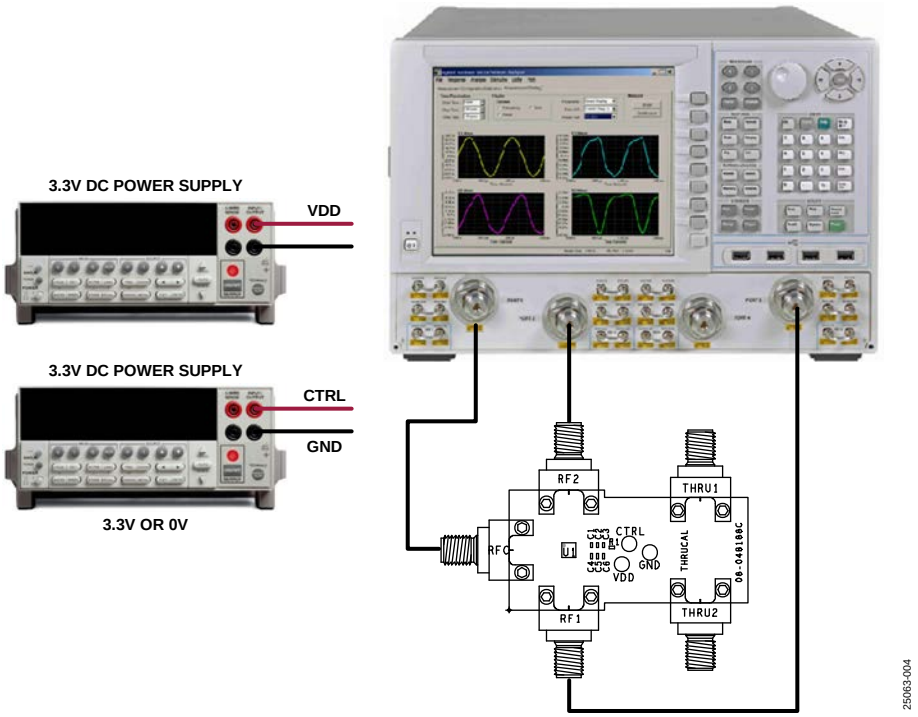

Figure 4. Scattering Parameter Test Setup Diagram for the ADRF5300-EVALZ

EVALUATION BOARD SCHEMATIC AND ARTWORK

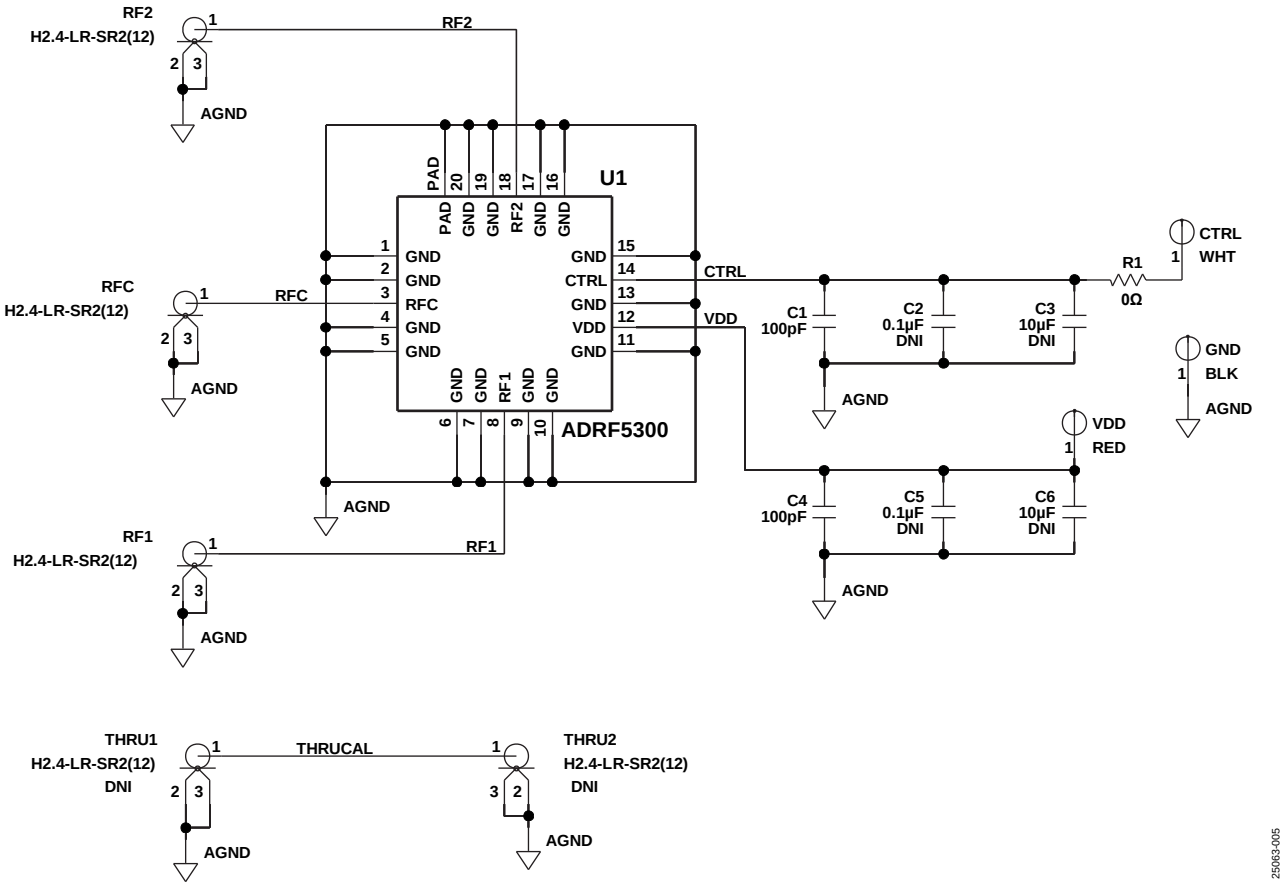

Figure 5. ADRF5300-EVALZ Schematic

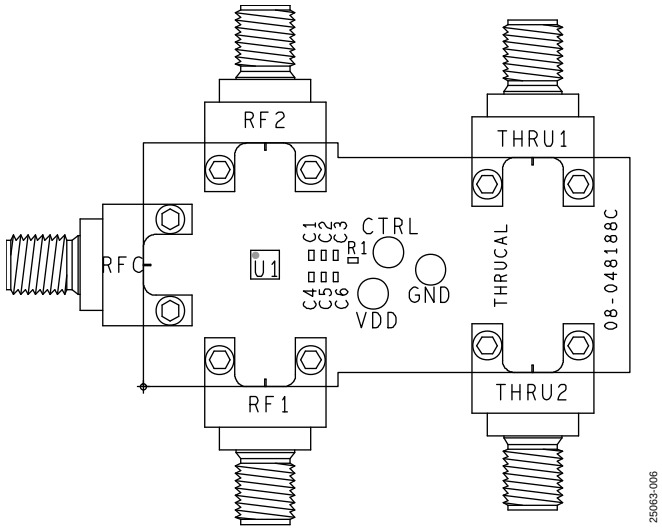

Figure 6. ADRF5300-EVALZ Assembly Diagram

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. Evaluation Board Components

Qty	Reference Designator	Description	Manufacturer	Part Number
2	C1, C4	Capacitors, 100 pF, 50 V, C0402 package	TDK	C1005NP01H101J050BA
2	C2, C5	Capacitors, 0.1 µF, 10 V, C0402 package, do not install (DNI)	TDK	545L104KT10C
2	C3, C6	Capacitors, 10 µF, 4 V, C0402 package, DNI	TDK	GRM155R60G106ME44D
3	RFC, RF1, RF2	2.4 mm coaxial for frequency test measurements, 50 Ω, 50 GHz	Hirose Electric	H2.4-LR-SR2(12)
2	THRU1, THRU2	2.4 mm coaxial for frequency test measurements, 50 Ω, 50 GHz, DNI	Hirose Electric	H2.4-LR-SR2(12)
1	R1	Resistor, 0 Ω, 0402 package	Panasonic	ERJ-2GE0R00X
3	VDD, CTRL, GND	Through hole mount test points	Components Corp.	TP-104-01-XX
1	U1	Silicon, SPDT switch, reflective, 24 GHz to 32 GHz	Analog Devices, Inc.	ADRF5300
1	PCB	Evaluation PCB	Analog Devices	BR-048188

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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