

Evaluating the **ADRF5019** Silicon SPDT Switch, Nonreflective, 100 MHz to 13 GHz

FEATURES

Contains **ADRF5019** device and external components
RF SMA connectors
Through line for calibration

EQUIPMENT NEEDED

DC power supplies
Network analyzer

GENERAL DESCRIPTION

The ADRF5019-EVALZ (see Figure 1) is designed to evaluate the features and performance of the **ADRF5019** 100 MHz to 13 GHz, single-pole double throw (SPDT) switch manufactured in a silicon process.

For full details on the **ADRF5019**, see the **ADRF5019** data sheet, which must be consulted in conjunction with this user guide when using the ADRF5019-EVALZ.

EVALUATION BOARD PHOTOGRAPH

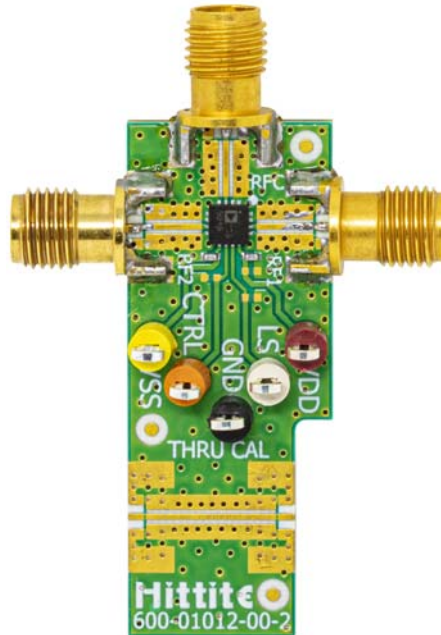


Figure 1.

21248-001

TABLE OF CONTENTS

Features	1	RF Inputs and Outputs	3
Equipment Needed.....	1	Power Supply and Control Inputs	3
General Description	1	Using the ADRF5019-EVALZ.....	4
Evaluation Board Photograph.....	1	Evaluation Board Schematic	5
Revision History	2	Ordering Information.....	6
Evaluation Board Hardware	3	Bill of Materials.....	6
Overview.....	3		
Board Layout.....	3		

REVISION HISTORY

8/2019—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OVERVIEW

The ADRF5019-EVALZ is a connectorized evaluation board assembled with the [ADRF5019](#) device and the [ADRF5019](#) application circuitry. All components are located on the primary side of the ADRF5019-EVALZ (see Figure 2).

BOARD LAYOUT

Figure 2 shows the topside ADRF5019-EVALZ layout and component placement locations.

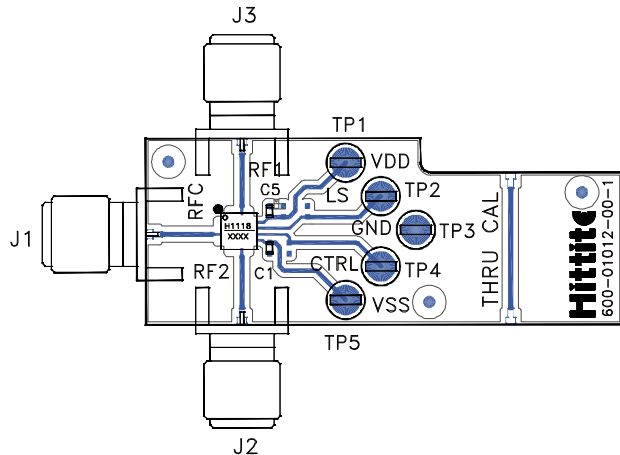


Figure 2. ADRF5019-EVALZ Layout

RF INPUTS AND OUTPUTS

The RF input and output ports (RFC, RF1, and RF2) are connected through 50 Ω transmission lines to the Subminiature Version A (SMA) launchers (J1, J3, and J2, respectively).

The through calibration line, THRU CAL, calibrates out the board loss effects from the ADRF5019-EVALZ measurements to determine the device performance at the pins of the IC. Figure 3 shows the typical board loss for the ADRF5019-EVALZ at room temperature, as well as the embedded and de-embedded insertion loss for the [ADRF5019](#).

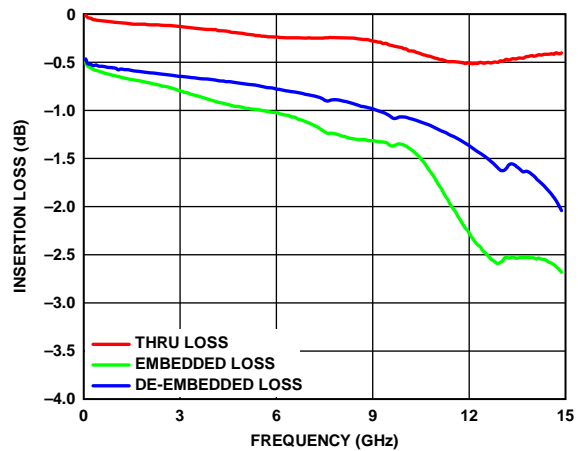


Figure 3. Insertion Loss vs. Frequency

POWER SUPPLY AND CONTROL INPUTS

Two power supply ports are connected to the VDD and VSS test points on the ADRF5019-EVALZ, and the ground reference is connected to the GND test point. On the VDD and VSS supply traces, a 100 pF bypass capacitor filters high frequency noise. Unpopulated component positions are available for applying extra bypass capacitors.

Two control ports are connected to the CTRL and LS test points. There are provisions for the RC filter to eliminate dc-coupled noise, if needed by the application.

USING THE ADRF5019-EVALZ

The ADRF5019-EVALZ is shipped assembled and tested. Figure 4 provides a basic test setup diagram to measure the scattering parameter response of the ADRF5019. To complete the test setup and verify the operation of the ADRF5019-EVALZ, take the following steps:

1. Connect the GND test point to the ground terminal of the power supply.
2. Connect the VDD, VSS, LS, and CTRL test points to the voltage output terminal of the power supplies. See Table 2 for the power supply connections.
3. Connect the RFC, RF1, and RF2 ports to a calibrated network analyzer.
4. Turn on the VDD and VSS power supplies connected to the ADRF5019-EVALZ. See Table 2 for nominal bias conditions.
5. Turn on the LS and CTRL power supplies. Use LS and CTRL to control the state of the switch. See Table 1 for the control voltage truth table.
6. Measure the scattering parameters.

Table 1. Control Voltage Truth Table

Digital Control Inputs		RF Paths	
LS	CTRL	RF1 to RFC	RF2 to RFC
High	Low	Insertion loss (on)	Isolation (off)
High	High	Isolation (off)	Insertion loss (on)
Low	Low	Isolation (off)	Insertion loss (on)
Low	High	Insertion loss (on)	Isolation (off)

Table 2. Power Supply and Control Inputs

Test Points	Description	Nominal Voltage	Nominal Current
TP1	VDD	3.3 V	20 μ A
TP2	LS	0 V or 3.3 V	<1 μ A
TP3	GND	Ground	Not applicable
TP4	CTRL	0 V or 3.3 V	< 1 μ A
TP5	VSS	-2.5 V	0.5 μ A

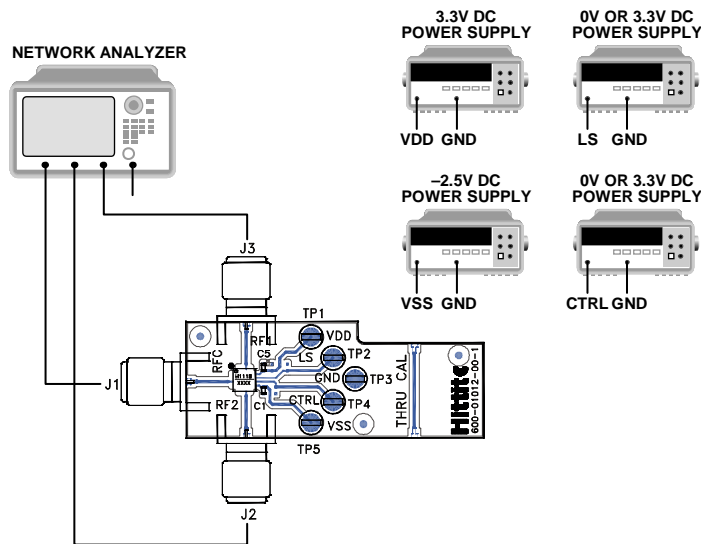


Figure 4. Scattering Parameter Test Setup Diagram

212-48-006

EVALUATION BOARD SCHEMATIC

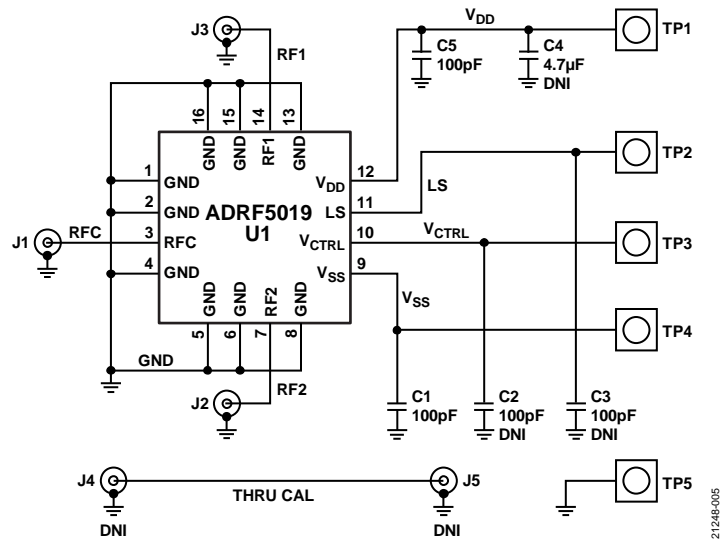


Figure 5. ADRF5019-EVALZ Schematic

ORDERING INFORMATION

BILL OF MATERIALS

Table 3. Bill of Materials for ADRF5019-EVALZ

Qty	Reference Designator	Description	Manufacturer	Part Number
3	J1 to J3	PC mount, SMA, RF connectors	SRI Connector Gage Co.	21-146-1000-01
2	J4, J5	PC mount, SMA, RF connectors (do not insert)	SRI Connector Gage Co.	21-146-1000-01
5	TP1 to TP5	Through hole, hold mount test points	Keystone Electronics	5006
2	C1, C5	Capacitors, 100 pF, 50 V, 0402 package	Kemet	C0402C101J5GACTU
3	C2 to C4	Capacitors, 100 pF, 50 V, 0402 package (do not insert)	Kemet	C0402C101J5GACTU
1	U1	SPDT switch	Analog Devices	ADRF5019
1	PCB	600-01012-00-1 evaluation printed circuit board (PCB)	Analog Devices	600-01012-00-1



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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.