Evaluating the ADL5507 10 MHz to 12 GHz, 55 dB Logarithmic RF Power Detector

FEATURES

- Full-featured evaluation board for the ADL5507
- −56 dBm to −1 dBm RF power detection range (±1 dB error at 3.6 GHz RF input)
- Positive/negative slope output response controlled by jumper
- 2.7 V to 3.45 V operation

EVALUATION KIT CONTENTS

- ADL5507-EVALZ evaluation board

EQUIPMENT NEEDED

- 3.3 V DC power supply (Keysight E3631A)
- RF signal generator (Keysight E8257D)
- DC voltmeter (Keysight 34401A)
- Low-loss RF coaxial cables
- RF connector adapters
- RF power attenuator (6 dB attenuation or higher)
- DC connection cables

DOCUMENTS NEEDED

- ADL5507 data sheet

GENERAL DESCRIPTION

The ADL5507-EVALZ provides efficient evaluation of the ADL5507 10 MHz to 12 GHz logarithm RF power detector. The ADL5507 has a wide input power dynamic range of 55 dB. Its output DC voltage responds linear-in-dB to the RF signal level applied at its input. The output can be configured to respond to increasing RF input levels positively or negatively. The ADL5507-EVALZ provides easy connections for the DC power supply, RF input signal, and the logarithmic output voltage.

For full details on the ADL5507, refer to ADL5507 data sheet. Consult the ADL5507 data sheet in conjunction with this user guide when using the ADL5507-EVALZ evaluation board.

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REVISION HISTORY

11/2023—Revision 0: Initial Version

EVALUATION BOARD PHOTOGRAPH

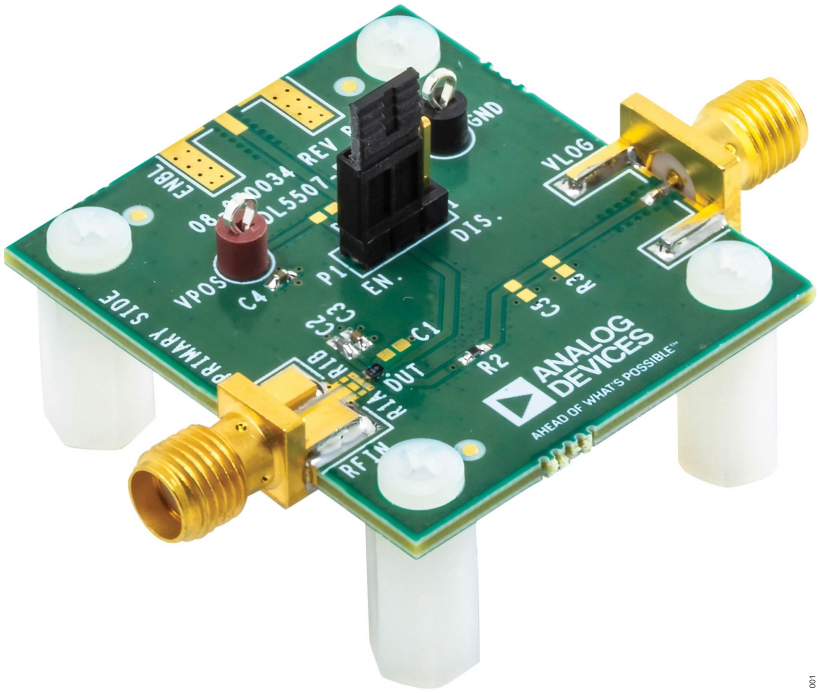

Figure 1. ADL5507-EVALZ Evaluation Board Photograph

TEST EQUIPMENT REQUIREMENTS

DC POWER SUPPLY

The ADL5507-EVALZ evaluation board requires a single 2.7 V to 3.45 V DC power supply. The typical current consumption of the ADL5507-EVALZ is approximately 12 mA. A Keysight E3631A power supply can be used to power the evaluation board.

RF SIGNAL SOURCE

An analog RF signal generator, such as the Keysight E8257D, that is capable of producing a continuous wave (CW) test signal with a minimum of 12 GHz output frequency and −70 dBm to +15 dBm output power is required to fully evaluate the ADL5507-EVALZ evaluation board. The RFIN port on the ADL5507-EVALZ is a female, 26.5 GHz, SMA connector. Appropriate adapter and cable may be required to mate the signal generator's RF output port to the evaluation board's RFIN input port.

RF POWER ATTENUATOR

A 6 dB or larger RF power attenuator placed at the ADL5507-EVAL-ZADL5507-EVALZ evaluation board's RFIN port improves the board input matching. At frequencies below 5 GHz, the evaluation board's input return loss is higher than 10 dB, and the RF attenuator is optional but recommended. However, at frequencies above 5 GHz, the RF attenuator should always be used to ensure good input matching and to minimize signal reflection to the RF signal source. The RF power attenuator should be rated to at least 12 GHz and should be placed immediately after the evaluation board RFIN connector. Be sure to account for the additional attenuation when evaluating the ADL5507.

DC VOLTMETER

The ADL5507-EVALZ evaluation board's VLOG output voltage range is approximately 0 V to 1.2 V. The Keysight 34401A 6½ digit DMM can be used to measure the output voltage of the ADL5507-EVALZ.

EVALUATION BOARD TEST SETUP

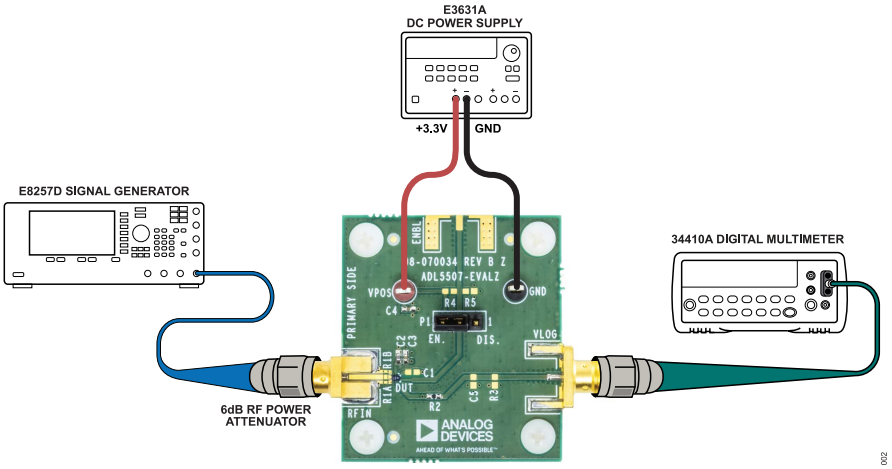

Figure 2. ADL5507-EVALZ Basic Test Setup

QUICK TEST PROCEDURE

The ADL5507-EVALZ evaluation board is designed for quick and easy evaluation of the ADL5507 Logarithmic RF Power detector. To identify each test equipment and connection, see Figure 2.

The ADL5507-EVALZ can be disabled with the three-pin jumper block **P1**. Short the jumper to location **DIS** to disable the ADL5507. Short the jumper to location **EN** to enable the ADL5507 in positive slope mode, i.e., increasing RF power input results in increasing detector VLOG output voltage. **Remove** the jumper entirely to enable the ADL5507 in negative slope, i.e., increasing RF input power results in decreasing output voltage.

To evaluate the ADL5507, take the following steps:

1. With the 3.3 V DC power supply's output turned off, connect its positive output to the VPOS turret on the ADL5507-EVALZ evaluation board and its negative output to the GND turret.
2. With the RF signal generator's output turned off, connect its RF output port to the evaluation board's SMA RFIN port through an RF coaxial cable and power attenuator. The RF power attenuator should be placed immediately at the evaluation board RFIN connector. Carefully mate the connectors. Appropriate connector adapters may be required.
3. Connect the evaluation board's VLOG output to the digital voltmeter.
4. Turn on the 3.3 V power supply.
5. Short the evaluation board jumper **P1** to location **EN** to enable the ADL5507 in positive slope mode, or remove the jumper to enable the ADL5507 in negative slope mode.
6. Turn on the RF signal generator's RF output and apply RF signal at desire frequency and power. Measure the ADL5507's VLOG output voltage on the digital voltmeter.

EVALUATION BOARD SCHEMATICS AND ARTWORK

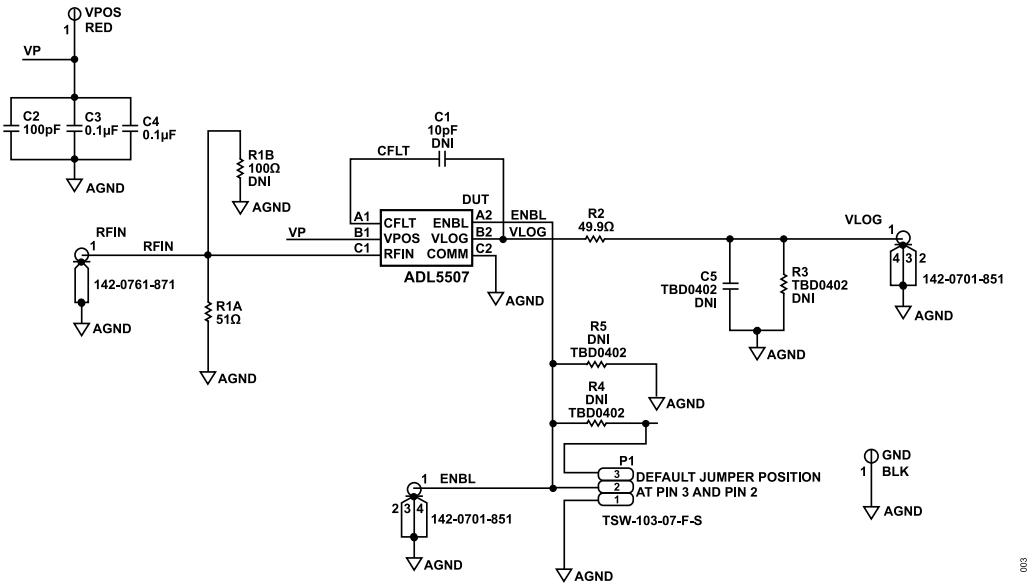

Figure 3. ADL5507-EVALZ, Schematic

EVALUATION BOARD SCHEMATICS AND ARTWORK

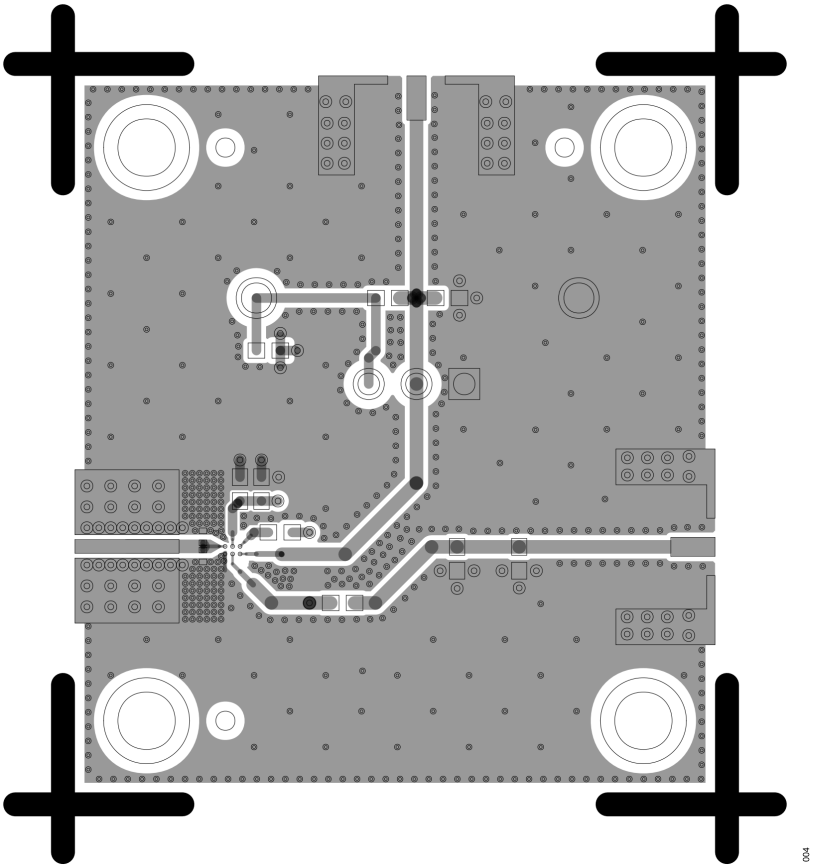

Figure 4. ADL5507-EVALZ, Top Layer

EVALUATION BOARD SCHEMATICS AND ARTWORK

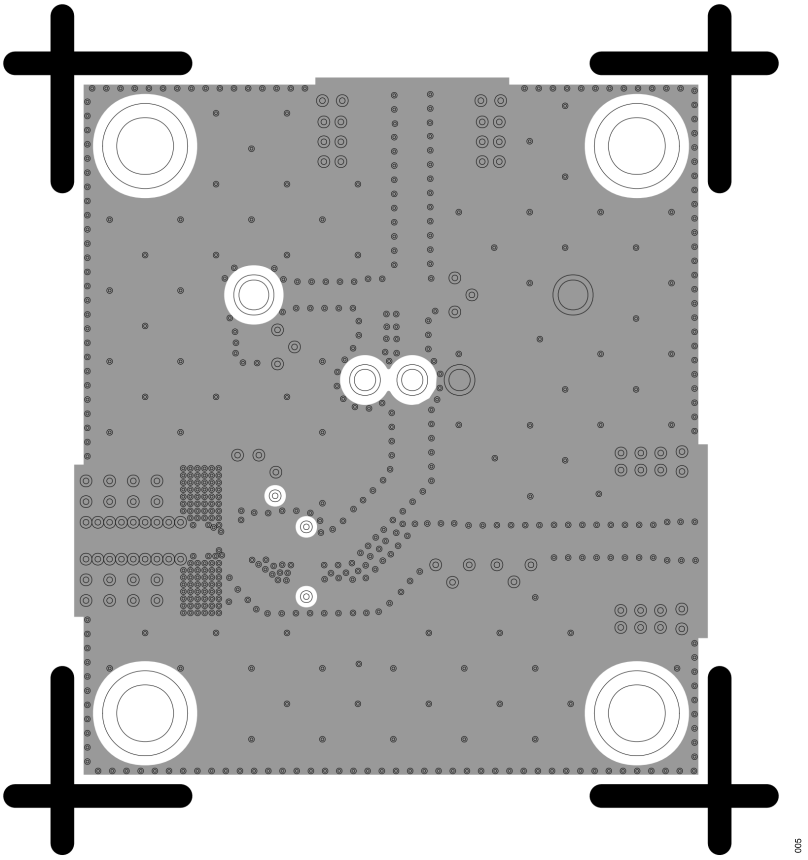

Figure 5. ADL5507-EVALZ, Layer 2, GND

EVALUATION BOARD SCHEMATICS AND ARTWORK

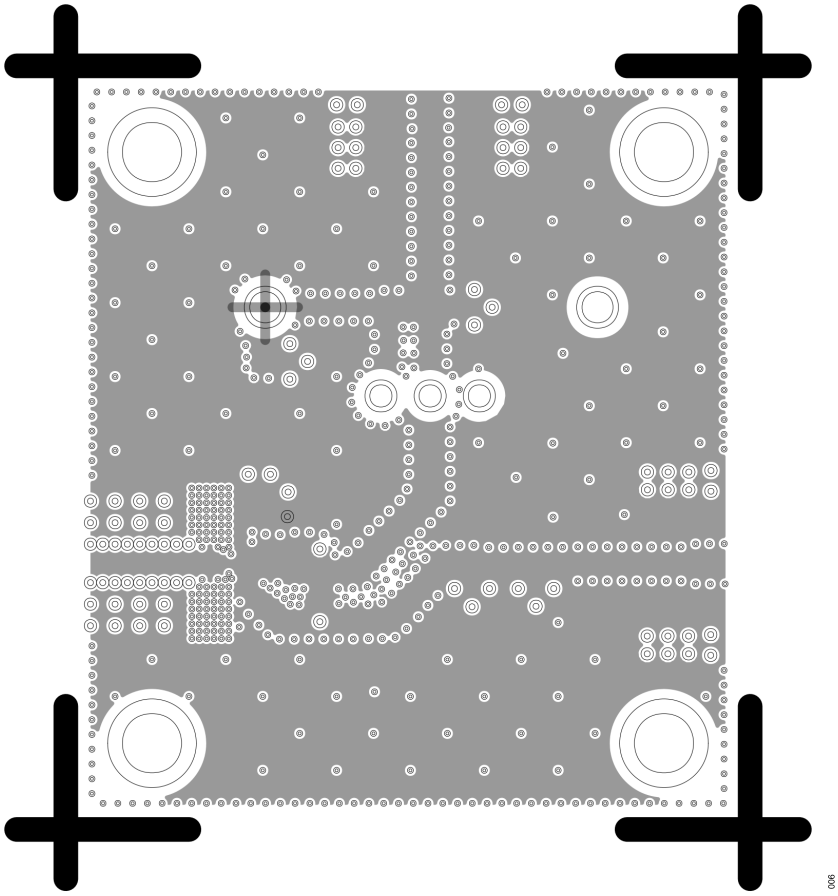

Figure 6. ADL5507-EVALZ, Layer 3, Power

EVALUATION BOARD SCHEMATICS AND ARTWORK

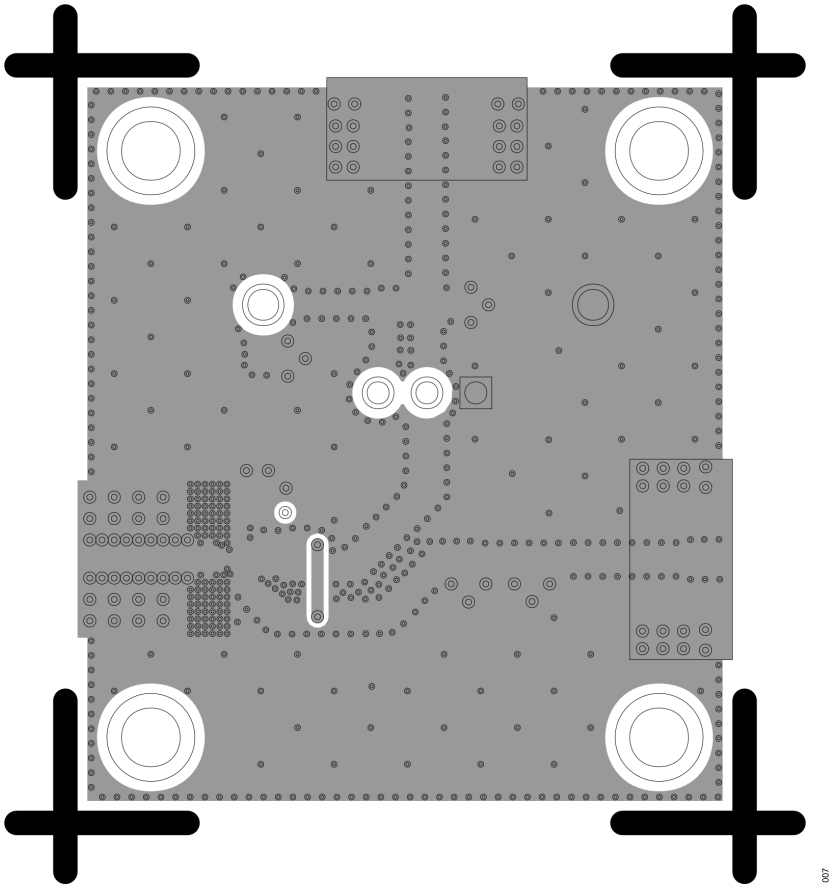

Figure 7. ADL5507-EVALZ, Bottom Layer

EVALUATION BOARD SCHEMATICS AND ARTWORK

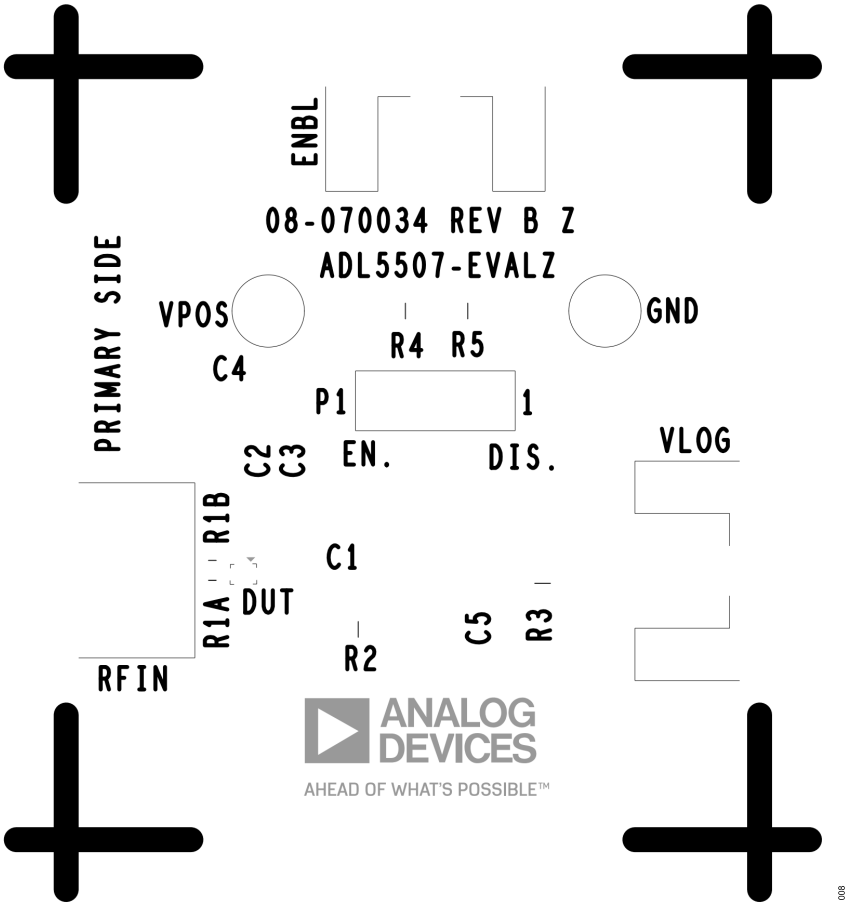

Figure 8. ADL5507-EVALZ, Top Silkscreen

EVALUATION BOARD SCHEMATICS AND ARTWORK

Figure 9. ADL5507-EVALZ, Bottom Silkscreen

EVALUATION BOARD SCHEMATICS AND ARTWORK

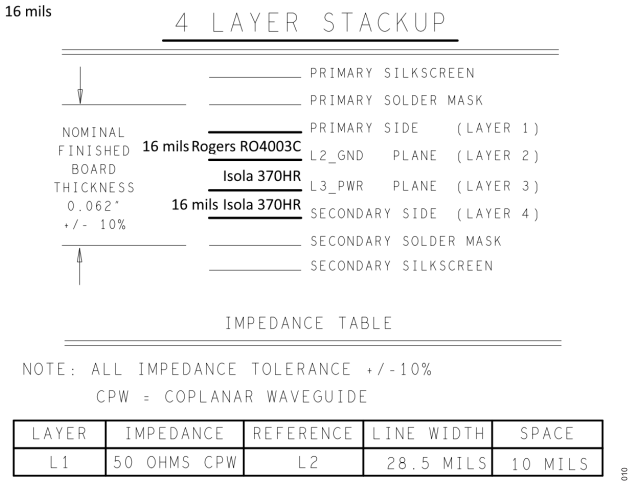

Figure 10. ADL5507-EVALZ, Layer Stack up

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. Bill of Materials for ADL5507-EVALZ

Qty	Reference Designator	Description	Manufacturer	Part Number
0	C1	Capacitor, 0402, optional[1]	N/A[2]	N/A[2]
1	C2	Capacitor, ceramic, 100 pF, 5%, C0G, 50 V, 0402	TDK	C1005NP01H101J050BA
2	C3, C4	Capacitors, ceramic, 0.1 µF, 10%, X7R, 16 V, 0402	American Technical Ceramics	530L104KT16T
0	C5	Capacitor, 0402, optional[1]	N/A[2]	N/A[2]
1	DUT	IC, ADL5507	Analog Devices, Inc	ADL5507ACBZ
0	ENBL	PCB connector, optional[1]	N/A[2]	N/A[2]
1	GND	Test point, black	Keystone	5006
1	P1	PCB connector, unshrouded HDR, single row, 3 positions	Samtec	TSW-103-07-F-S
1	R1A	Resistor, thick-film, 51 Ω, 1%, 1/20 W, 0201	Panasonic	ERJ-1GNF51R0C
0	R1B	Resistor, 0201, optional[1]	N/A[2]	N/A[2]
1	R2	Resistor, thick-film, 49.9 Ω, 1%, 1/10 W, 0402	Panasonic	ERJ-2RKF49R9X
0	R3, R4, R5	Resistors, 0402, optional[1]	N/A[2]	N/A[2]
1	RFIN	PCB connector, coaxial, SMA end launch, edge mount	Cinch	142-0761-871
1	VLOG	PCB connector, coaxial, SMA end launch, edge mount	Cinch	142-0701-851
3	VPOS	Test point, red	Keystone	5005

[1] Optional component. Not populated on standard evaluation board.

[2] N/A means not applicable.