

Evaluating the ADL5308 Fast Response 188 dB Range (10 pA to 25 mA) Logarithmic Converter

FEATURES

- ▶ Full-featured evaluation board for the [ADL5308](#)
- ▶ Supports external electrical input or on-board photodiode (PD) for optical input
- ▶ On-chip or external PD bias (PDB)
- ▶ Comparator reference and output connectors with adjustable hysteresis

EVALUATION KIT CONTENTS

- ▶ ADL5308-EVALZ evaluation board

EQUIPMENT NEEDED

- ▶ 5 V DC power supply (minimum 50 mA output current)
- ▶ Precision source measurement unit (for example, Keithley 236)
- ▶ Triax cable
- ▶ Triax-to-BNC adapter (Triax center to BNC center, Triax shield to BNC shield, Triax inner guard may be connected to BNC shield or left floating.)
- ▶ BNC-to-SMA adapter
- ▶ Two digital multimeters
- ▶ Oscilloscope
- ▶ [DC2026C \(Linduino® One\)](#) board (Required only for adjusting the ADL5308's internal registers. Not needed for the evaluation of ADL5308 in factory default settings.)

DOCUMENTS NEEDED

- ▶ ADL5308 data sheet

GENERAL DESCRIPTION

The ADL5308-EVALZ evaluation board allows evaluation of the ADL5308 logarithmic converter IC.

The ADL5308 is a monolithic logarithmic transimpedance amplifier, optimized for measurement of low frequency, and wide dynamic range signal power in fiber optic systems. It produces an output voltage proportional to the logarithm of the ratio between the input current at pin INP, and an internal reference current. The reference current can also be supplied externally through the IREF interface.

The logarithmic slope and intercept are both factory-trimmed to a nominal value of 200 mV/dec and 10 pA respectively. Both can be adjusted through the I²C interface.

Full specifications on the ADL5308 are available in the ADL5308 data sheet available from Analog Devices, Inc., and must be consulted with this user guide when using the ADL5308-EVALZ evaluation board.

ADL5308-EVALZ EVALUATION BOARD PHOTOGRAPH

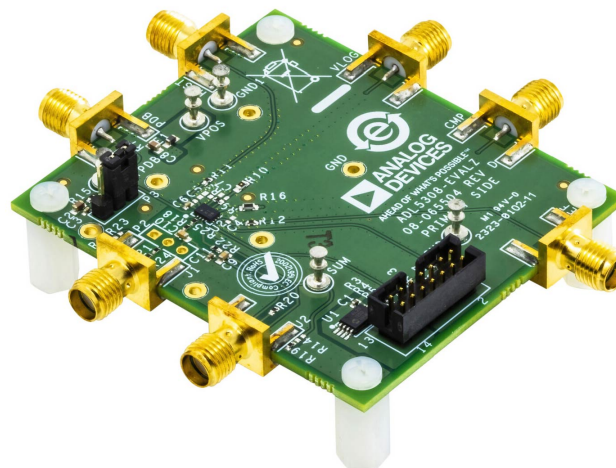


Figure 1. ADL5308-EVALZ Evaluation Board Photograph

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REVISION HISTORY

8/2023—Revision 0: Initial Version

QUICK TEST PROCEDURE

To identify each component and connection, see [Figure 2](#), and to prepare the ADL5308-EVALZ evaluation board for testing, do the following steps (If adjustments to the ADL5308's internal registers are not required, skip all the steps related to the ACE software and the DC2026C (Linduino One) board.):

1. Verify that the ACE software is installed.
2. In the main ACE window, click **Tools > Manage Plug-ins > Available Plug-ins**, and then in the search bar, search for **Board.ADL5308**. Highlight the search result and click **Install Selected**.
3. With the 5 V DC power supply's output turned off, connect its positive output to the VPOS turret on ADL5308-EVALZ evaluation board and its negative output to the GND turret.
4. With the SMU's output turned off, connect its current source output to the evaluation board's INP input SMA connector (J1) using a Triax cable with a Triax-to-BNC adapter and a BNC-to-SMA adapter. The Triax-to-BNC adapter's internal connection should be: Triax center to BNC center, Triax shield to BNC shield, Triax inner guard may be connected to BNC shield or floating.
5. Connect the evaluation board's VLOG and PDB outputs to the digital multimeters.
6. Verify DC2026C (Linduino One) board is set to 3.3 V with a jumper.
7. Connect the Linduino One board to the ADL5308-EVALZ evaluation board via the included 14-pin ribbon cable.
8. Turn on the 5 V DC power supply. Verify that the current consumption is approximately 32 mA.
9. Connect Linduino One board to PC using the included USB cable. When LEDs stop blinking, the hardware connections are complete.
10. Launch the ACE software on the PC.
11. The ACE software shows that the ADL5308 plug-in is available on the **Attached Hardware**. Double-click the plug-in to add to the system. A successfully connected system with a properly loaded plug-in is shown in [Figure 3](#).
12. Click **Reset Board**, verify that the **Firmware Loaded** light indicator turns green.
13. Double-click the **ADL5308** icon. The ADL5308 GUI window opens, which shows the register settings that can be changed as shown in [Figure 4](#). For more information, refer to the Register Summary section of the [ADL5308](#) data sheet.
14. Apply input current from the SMU and measure the VLOG and VPDB voltages. For some expected test results for the default register setting, see [Table 1](#).

Table 1. Quick Test Expected Results

I_{INP}	V_{VLOG}	V_{PDB}
1 nA	$0.406\text{ V} \pm 0.01\text{ V}$	$1.5\text{ V} \pm 0.2\text{ V}$
1 μA	$1.0\text{ V} \pm 0.01\text{ V}$	$1.5\text{ V} \pm 0.2\text{ V}$
10 mA	$1.805\text{ V} \pm 0.01\text{ V}$	$4.4\text{ V} \pm 0.2\text{ V}$

DRIVING THE INPUT USING AN ACTUAL PHOTODIODE

With some minimal modifications to the ADL5308-EVALZ evaluation board, an actual PD may be used to evaluate the performance of the ADL5308.

Do the following procedures for the necessary component changes and for more information, see the [Evaluation Board Schematics and Artwork](#) section:

1. Remove resistors R18, R24 and R25, and capacitor C10.
2. Install 0 Ω jumpers at location R18 and R25.
3. Install PD at location P2.
4. If an external PD cathode voltage is required, EXTPDB can be used with the P3 jumper in pin 1-2 position.

Input capacitive load negatively affect the bandwidth and noise level of logarithmic TIAs. For best bandwidth and noise performance, do not install 0 Ω jumper at locations R18 and R25. Instead, solder the PD's anode directly to the R25 pad close to the ADL5308's INP pin (pin 2).

For more information, refer to the Photodiode Bias (PDB) section of the ADL5308 data sheet.

GRAPHICAL USER INTERFACE

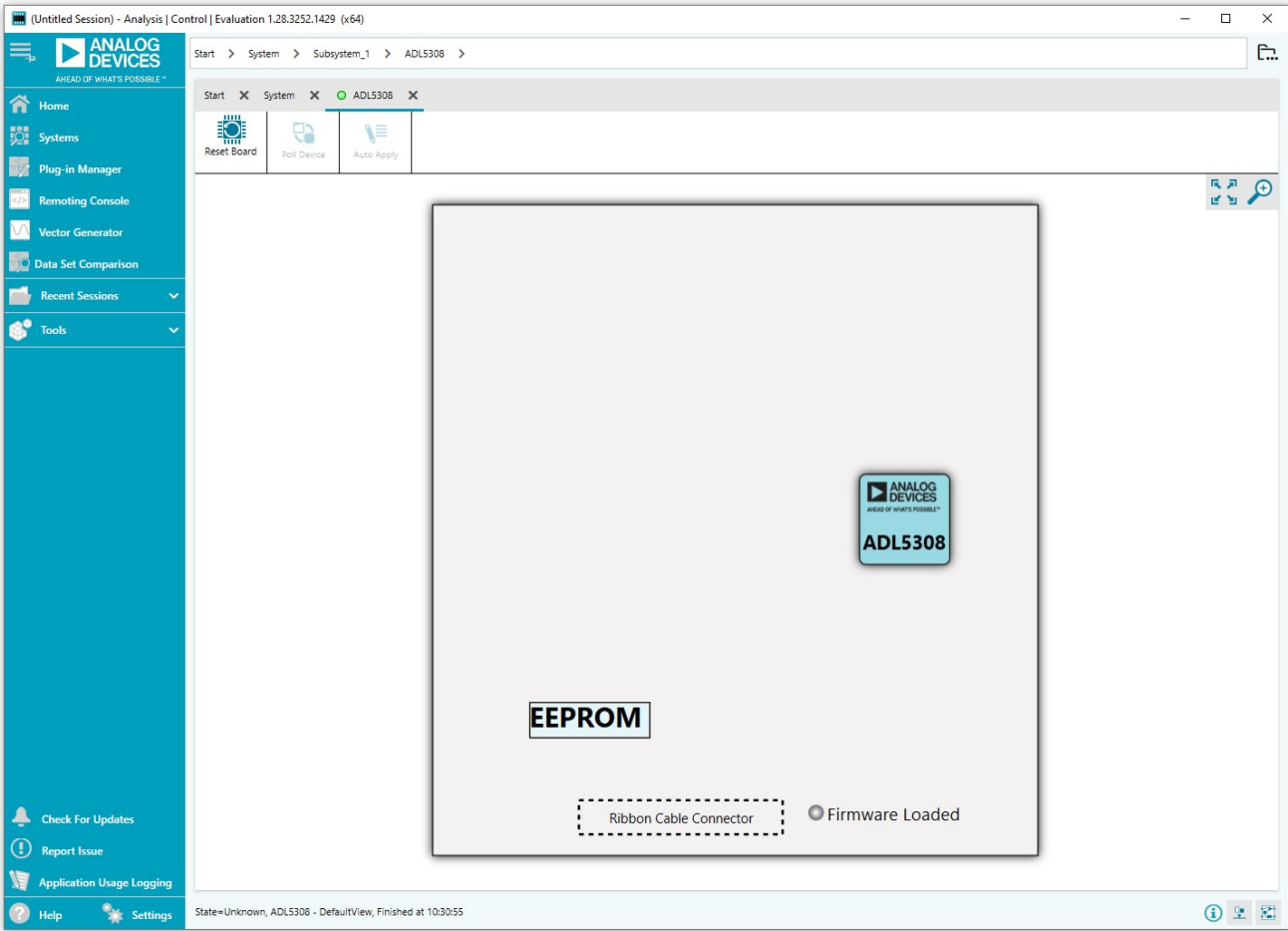


Figure 3. Plug-in View with the Evaluation Board Connected to the ACE System

GRAPHICAL USER INTERFACE

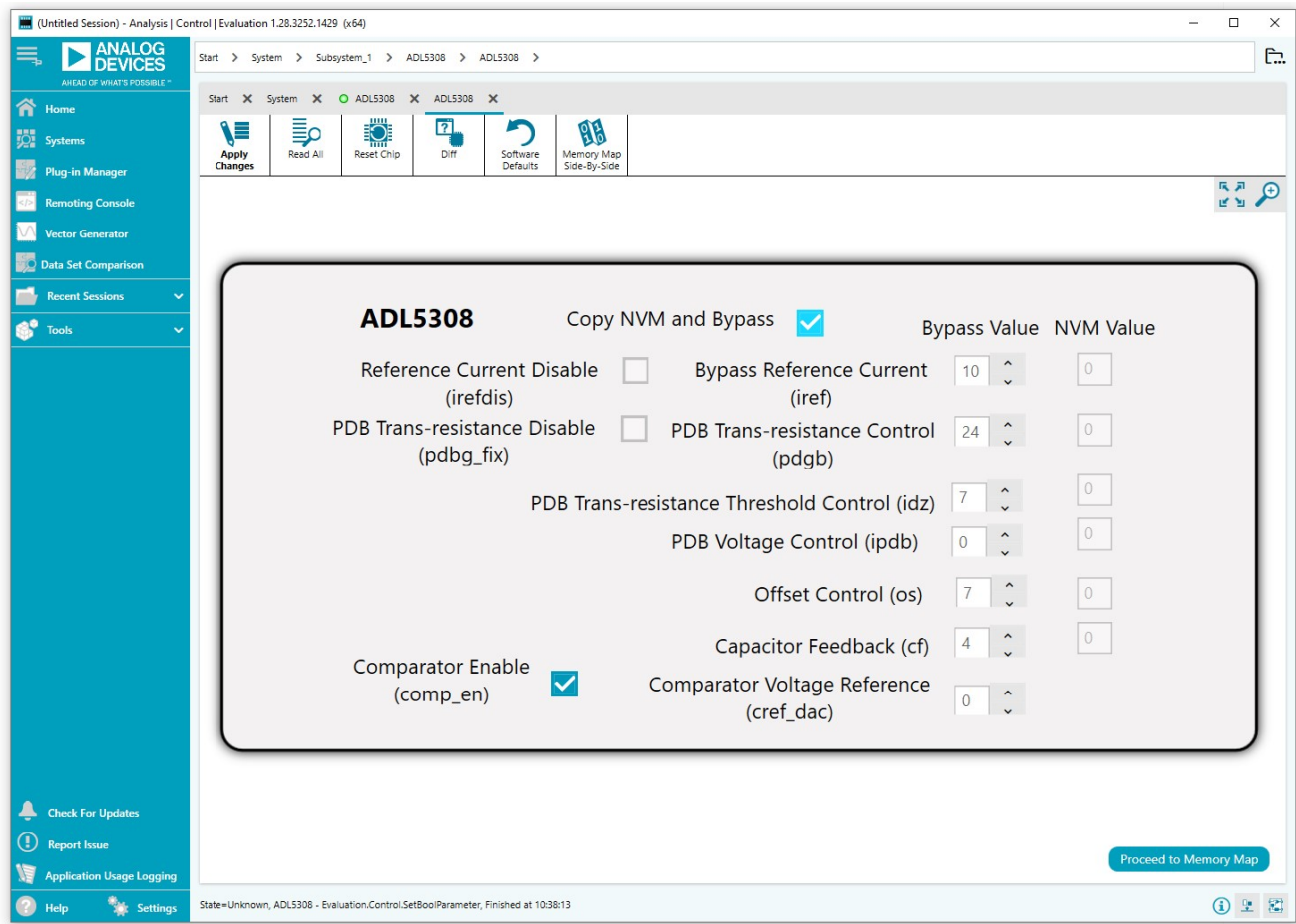


Figure 4. Register Control GUI

EVALUATION BOARD SCHEMATICS AND ARTWORK

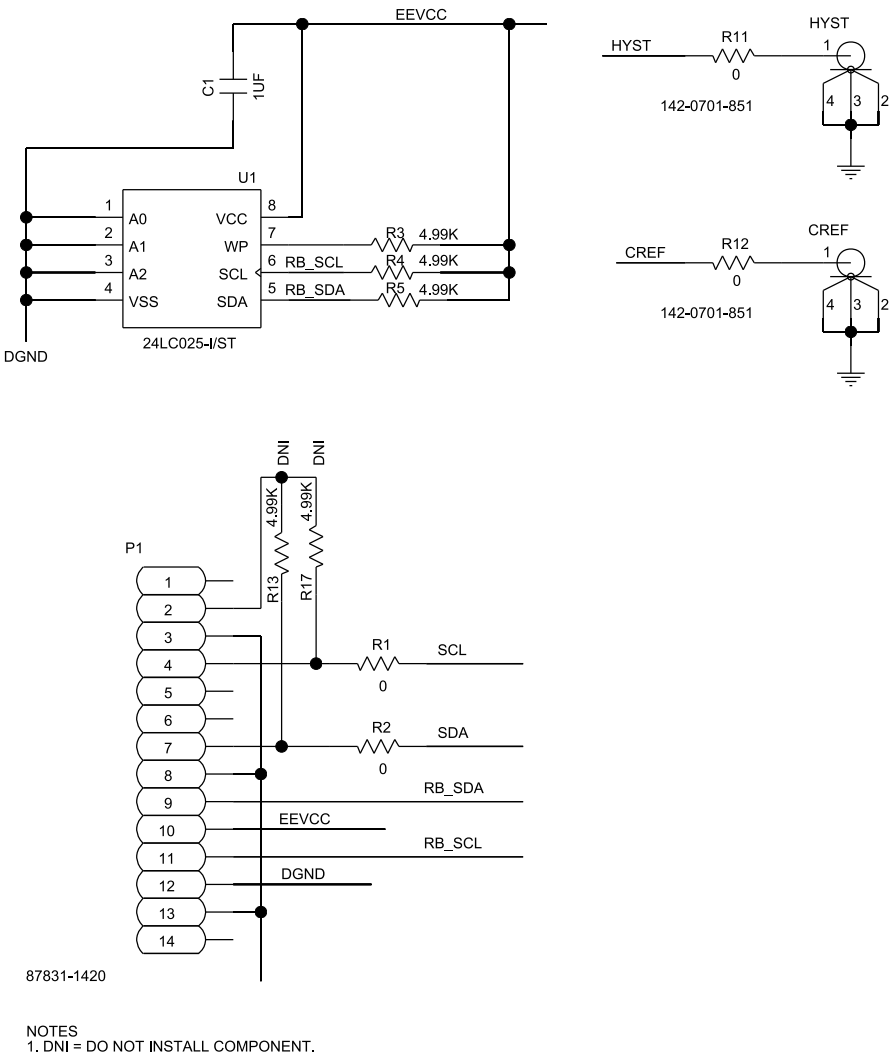


Figure 6. ADL5308-EVALZ Schematic Part 2

EVALUATION BOARD SCHEMATICS AND ARTWORK

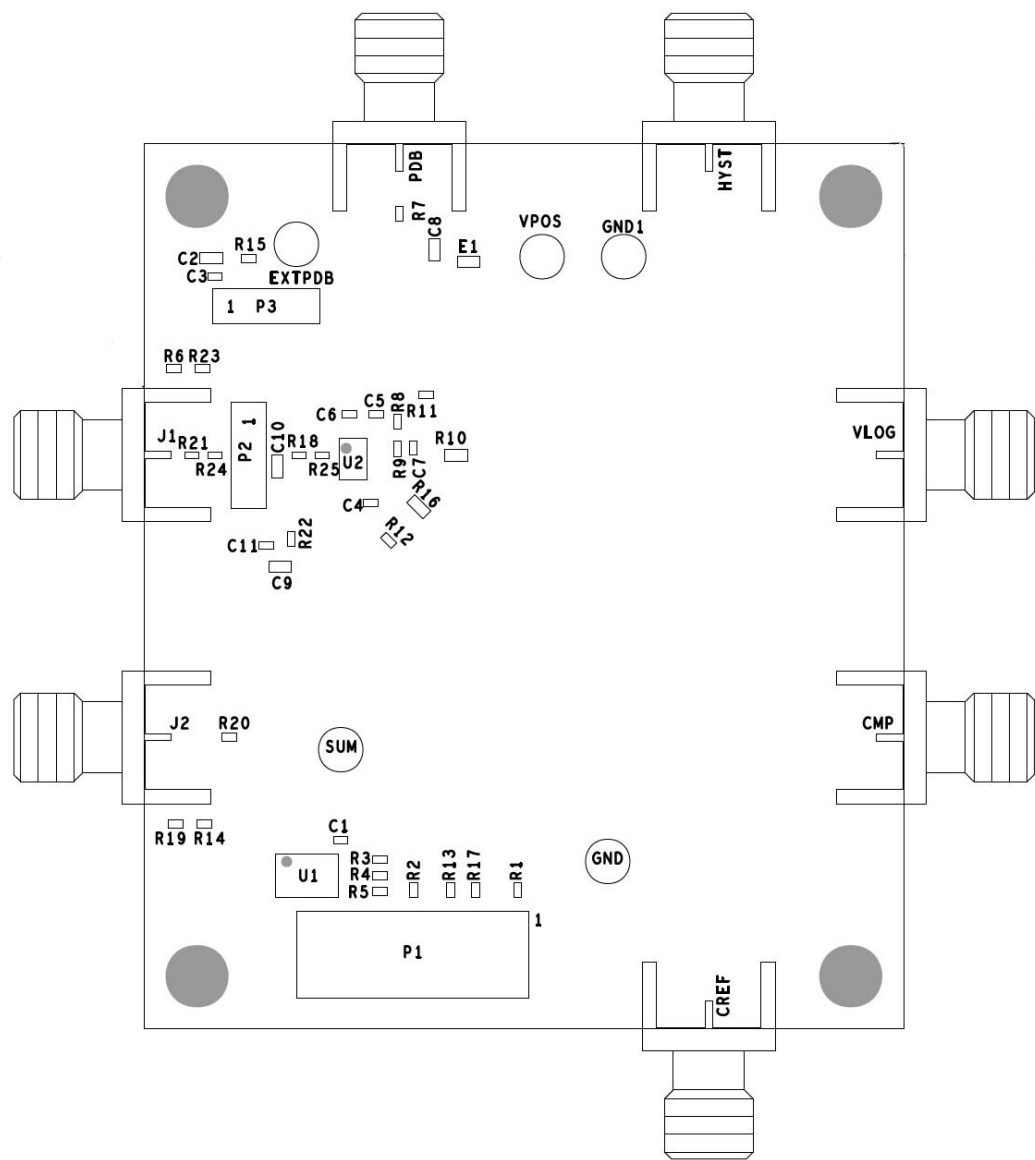


Figure 7. ADL5308-EVALZ Assembly Drawing

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EVALUATION BOARD SCHEMATICS AND ARTWORK

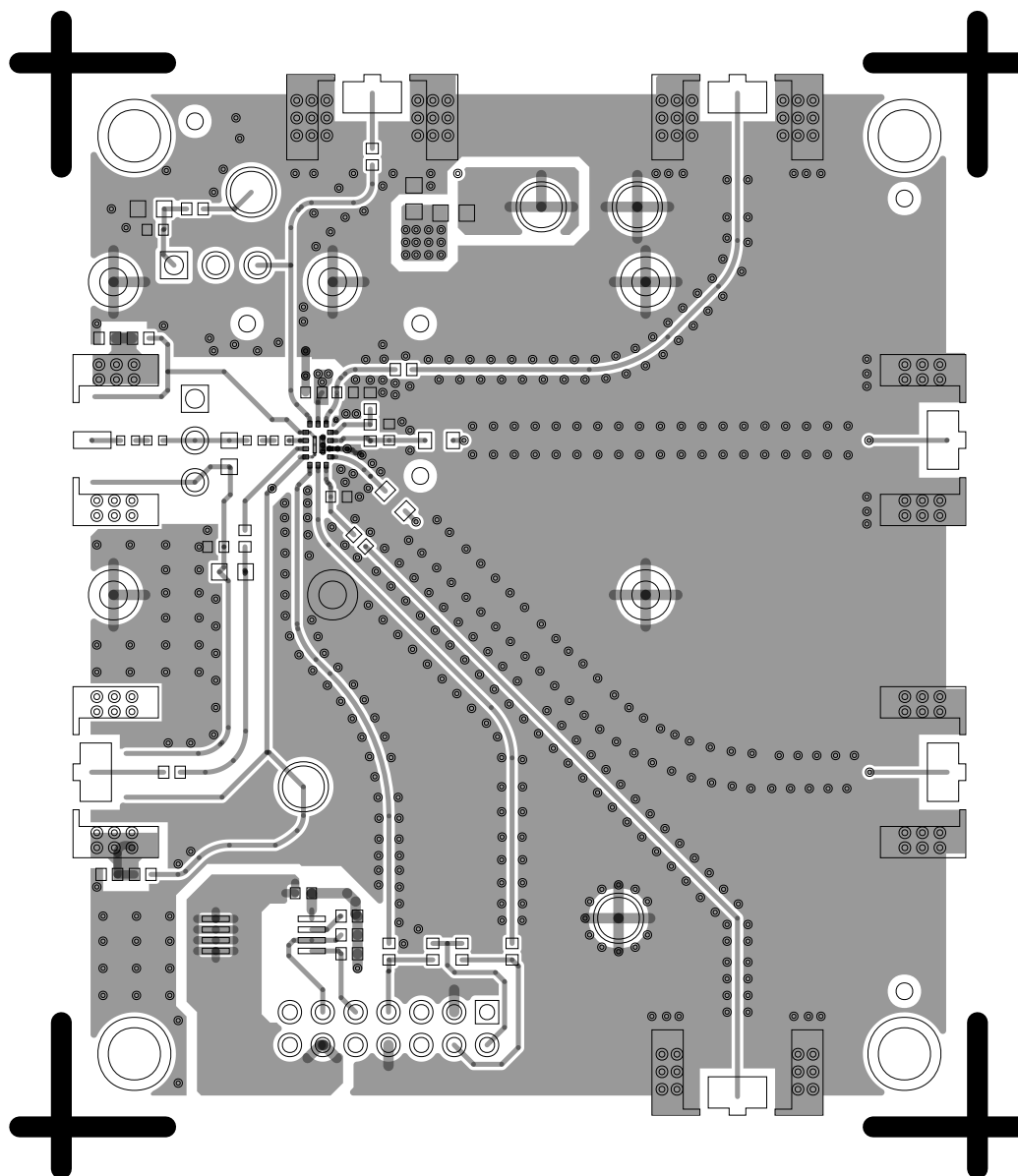


Figure 8. ADL5308-EVALZ Layer 1 (Primary Side)

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EVALUATION BOARD SCHEMATICS AND ARTWORK

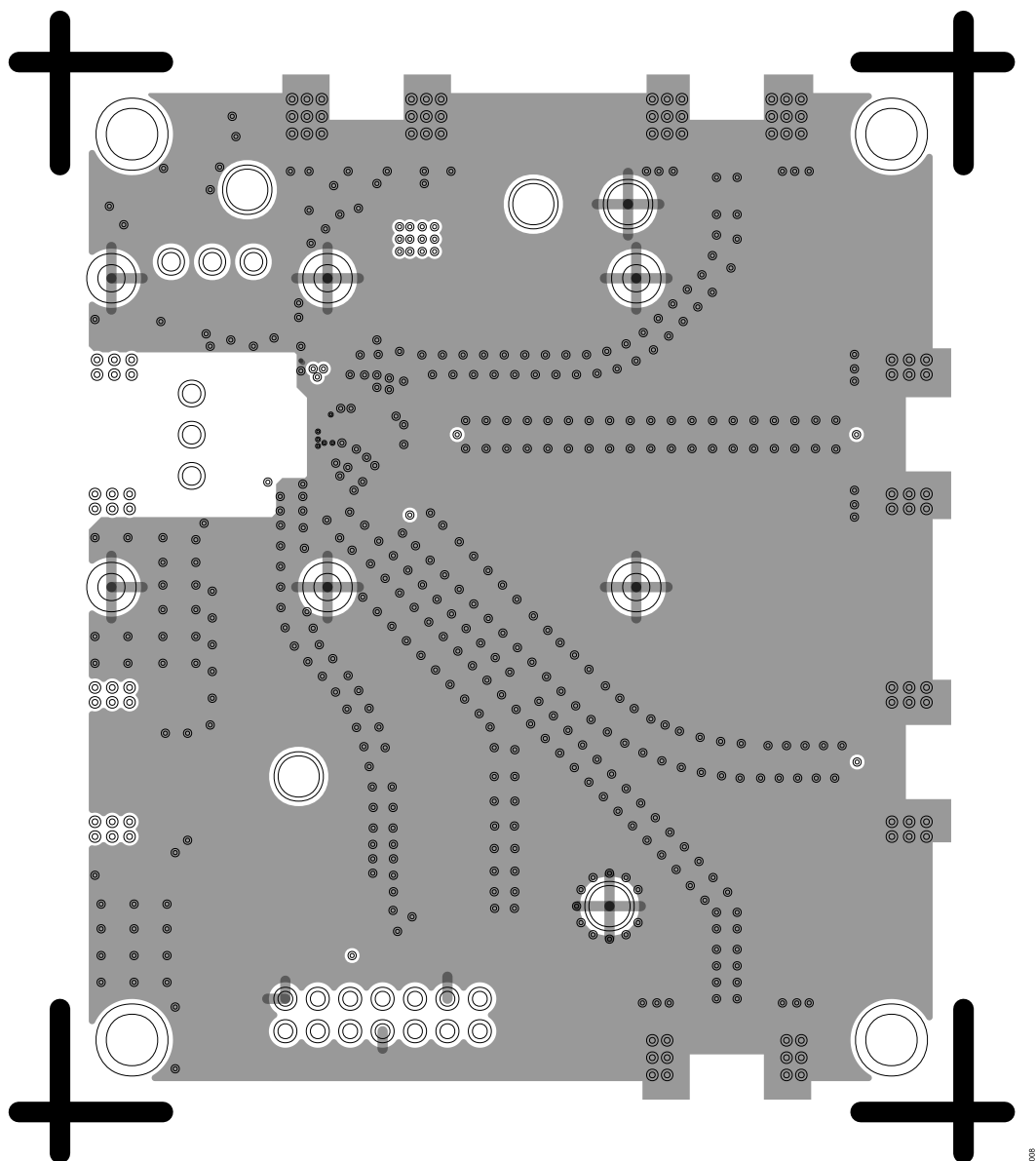


Figure 9. ADL5308-EVALZ Layer 2 (Internal Ground Plane)

EVALUATION BOARD SCHEMATICS AND ARTWORK

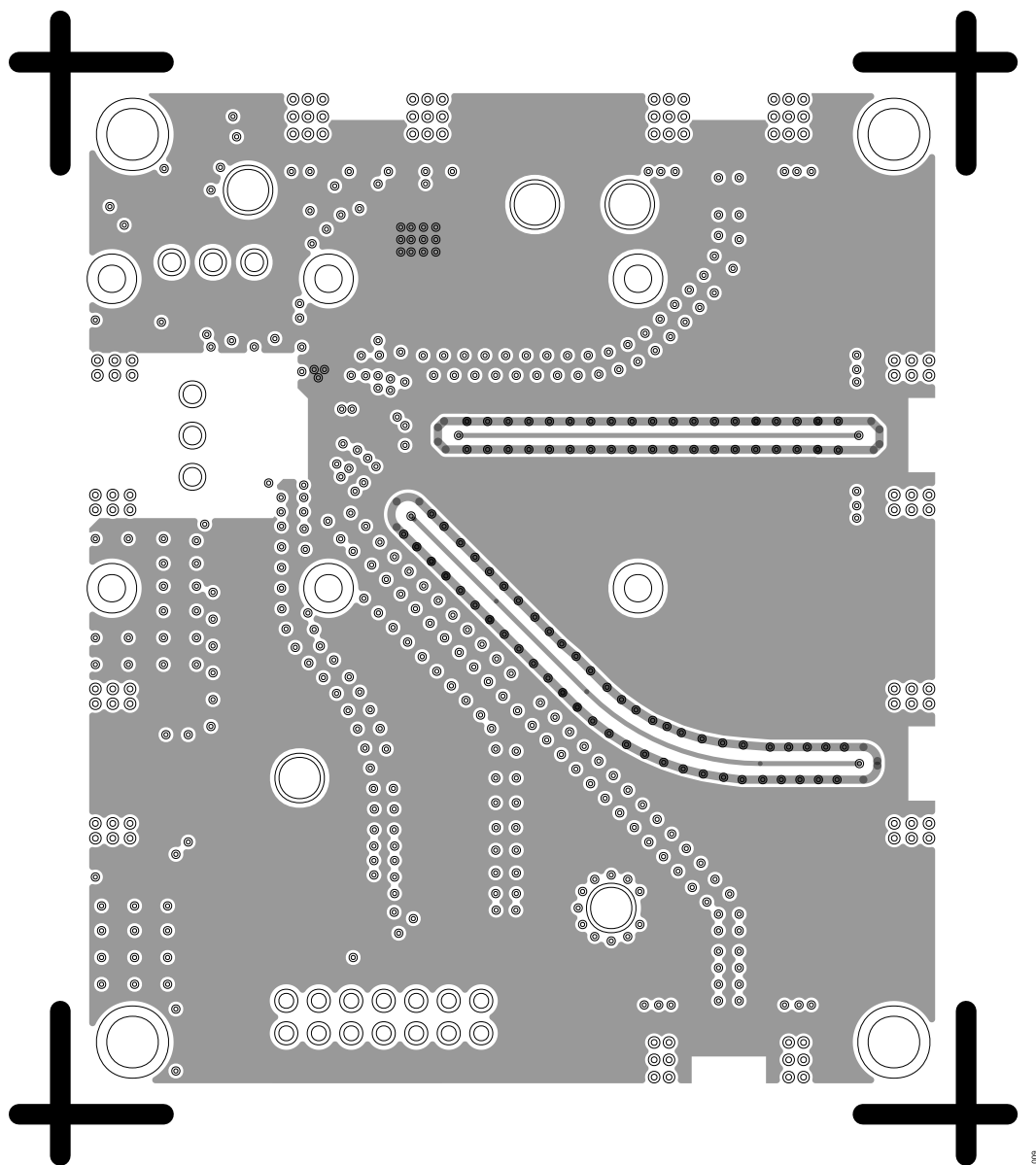


Figure 10. ADL5308-EVALZ Layer 3 (Internal Power Plane)

EVALUATION BOARD SCHEMATICS AND ARTWORK

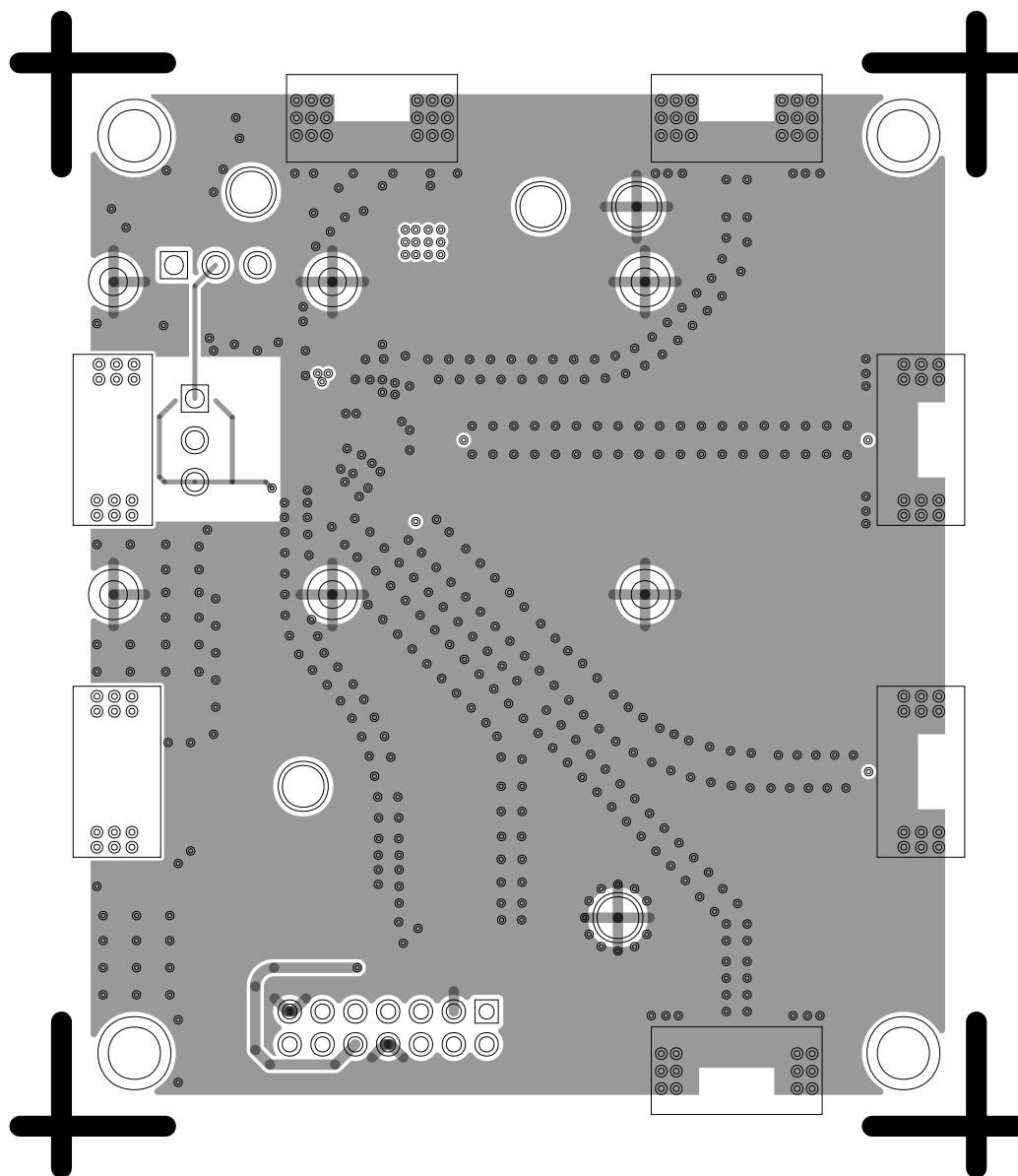


Figure 11. ADL5308-EVALZ Layer 4 (Secondary Side)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. ADL5308-EVALZ Bill of Materials

Reference Designator	Description	Manufacturer	Part Number
C1	Ceramic capacitor, 1 μ F, 10%, 0402	TDK	C1005X6S1C105K050BC
C9, C10	Ceramic capacitors, 1 nF, 10%, X7R, 0603	AVX	06031C102KAT2A
C11	Ceramic capacitor, 0.1 μ F, 10%, X5R, 0402	Yageo	CC0402KRX5R8BB104
C2, C8	Ceramic capacitors, 4.7 μ F, 10%, X6S, 0603	Murata	GRM188C81C475KE11D
C3, C6	Ceramic capacitors, 100 pF, 10%, X7R, 0402	Yageo	CC0402KRX7R7BB102
CMP, CREF, HYST, J1, J2, PDB, VLOG	PCB connectors, coaxial, SMA end launch	Cinch	142-0701-851
E1	Ferrite bead, 120 Ω , 0603	Würth Elektronik	74279262
EXTPDB, GND, GND1, SUM, VPOS	Test points	Mill-max	2501-2-00-80-00-00-07-0
P1	PCB connector, shrouded, HDR, solder termination, male pin, number of positions 14	Molex	87831-1420
P3	PCB connector, HDR, solder termination, male pin, number of positions 3	Harwin	M20-9990345
R1, R2, R6, R9, R11, R12, R15, R19	Thick-film resistors, 0 Ω , 5%, SMD, 0402, 1/10 W	Panasonic	ERJ-2GE0R00X
R10	Thick-film resistor, 220 Ω , 5%, SMD, 0603, 1/4 W	Rohm	ESR03EZPJ221
R16	Thick-film resistor, 49.9 Ω , 1%, SMD, 0603, 1/5 W	Panasonic	ERJP03F49R9V
R18, R21, R24, R25	Thick-film resistors, 499 Ω , 1%, SMD, 0402, 1/16 W	Vishay	CRCW0402499RFKED
R20, R22	Thin-film resistors, 1 k Ω , 1%, SMD, 0402, 1/16 W	Yageo	RT0402FRE071KL
R3, R4, R5	Thick-film resistors, 4.99 k Ω , 1%, SMD, 0402, 1/10 W	Panasonic	ERJ-2RKF4991X
R7	Thick-film resistor, 49.9 Ω , 1%, SMD, 0402, 1/10 W	Panasonic	ERJ-2RKF49R9X
U1	I ² C serial EEPROM, clock compatibility 400 kHz	Microchip Technology	24LC025-I/ST
U2	ADL5308 IC	Analog Device Inc.	ADL5308ACCZ
C4, C5 ¹	Ceramic capacitors, 1 μ F, 10%, 0402	TDK	C1005X6S1C105K050BC
C7 ¹	Ceramic capacitor, 100 pF, 50 V, 1%, COG, 0402	Murata	GCM1555C1H101FA16D
P2 ¹	Photodiode	N/A ²	N/A ²
R13, R17 ¹	Thick-film resistors, 4.99 k Ω , 1%, SMD, 0402, 1/10 W	Panasonic	ERJ-2RKF4991X
R14, R23 ¹	Thick-film resistors, 0 Ω , 5%, SMD, 0402, 1/10 W	Panasonic	ERJ-2GE0R00X
R8 ¹	Thick-film resistor, 10 k Ω , 1%, SMD, 0402, 1/5 W	Vishay	CRCW040210K0FKEDHP

¹ Not populated on standard evaluation board.² N/A means not applicable.

NOTES

**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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