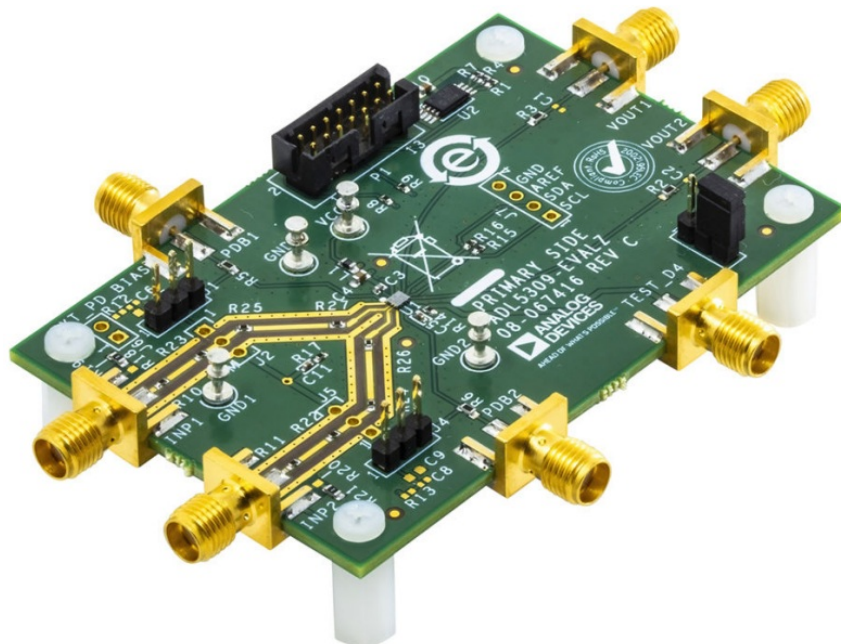


## ANALOG DEVICES UG-2223 ADL5309 Dual Logarithmic Converter User Guide

[Home](#) » [Analog Devices](#) » ANALOG DEVICES UG-2223 ADL5309 Dual Logarithmic Converter User Guide 

ANALOG DEVICES UG-2223 ADL5309 Dual Logarithmic Converter User Guide



## Contents

### 1 Using Instruction

#### 1.1 FEATURES

#### 1.2 EVALUATION KIT CONTENTS

#### 1.3 EQUIPMENT NEEDED

#### 1.4 GENERAL DESCRIPTION

#### 1.5 REVISION HISTORY

#### 1.6 EVALUATION BOARD TEST SETUP

#### 1.7 QUICK TEST PROCEDURE

#### 1.8 GRAPHICAL USER INTERFACE

### 2 Documents / Resources

#### 2.1 References

### 3 Related Posts

## Using Instruction

### FEATURES

- Full featured evaluation board for the ADL5309
- Supports external electrical input or on-board photodiode for optical input
- On-chip or external photodiode bias
- ADC control for VOUT1, VOUT2, and digital thermometer

### EVALUATION KIT CONTENTS

- ADL5309-EVALZ evaluation board

### EQUIPMENT NEEDED

- DC power supply (5 V and 100 mA)
- Two precision source measurement units (for example, Keithley model 236 or Keithley model 238)
- Two triaxial cables
- Two triax-to-BNC adapters (triax center to BNC center, triax shield to BNC shield, or triax inner guard may be connected to BNC shield or left floating)
- Two BNC-to-SMA adapters
- Two digital multimeters
- Oscilloscope
- DC2026C (Linduino One) board (required only for adjusting the internal registers of the ADL5309, and not needed for the evaluation of the ADL5309 in factory default settings)

### DOCUMENTS NEEDED

- ADL5309 data sheet

### GENERAL DESCRIPTION

The ADL5309-EVALZ evaluation board allows for the evaluation of the ADL5309 logarithmic converter IC.

The ADL5309 is comprised of dual monolithic logarithmic transimpedance amplifiers that are optimized for the measurement of low frequency and wide dynamic range signal power in fiber optic systems. The device produces a highly accurate, temperature compensated output voltage proportional to the logarithm of the ratio between the input current at Pin INP and an internally generated reference current.

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

A digital representation of the OUT1 and OUT2 outputs, along with a digital thermometer, is available through the I2C interface. A 14-bit successive approximation register (SAR) analog-to-digital (ADC), controlled through the I2C interface, samples the OUT1 channel output, OUT2 channel output, and the digital thermometer output.

Full specifications on the ADL5309 are available in the ADL5309 data sheet available from Analog Devices, Inc., and must be consulted with this user guide and the ADL5309-EVALZ evaluation board.

**PLEASE SEE THE LAST PAGE FOR AN IMPORTANT WARNING AND LEGAL TERMS AND CONDITIONS.**

## REVISION HISTORY

**6/2024—Revision 0: Initial Version**

## EVALUATION BOARD TEST SETUP

The complete [ADL5309](#) evaluation system includes the ADL5309- EVALZ evaluation board, the [DC2026C](#) (Linduino One) board, and the ADL5309 [Analysis | Control | Evaluation \(ACE\)](#) plug-in. Plug-ins are product-specific applications downloaded and run in the ACE software in a Microsoft Windows environment. For ACE software installation and usage instructions, go to [www.analog.com/ACE](http://www.analog.com/ACE). The ADL5309-EVALZ communicates with ACE through the Linduino One board.

Typically, a Linduino One board is shipped with the ADL5309-KIT- EVALZ board as a kit. For more information, refer to the ordering guide section of the ADL5309 data sheet. A 14-conductor ribbon cable provides I2C and regulated +3.3 V connections between the interface board and the evaluation board.

The ADL5309-EVALZ evaluation board requires a 3 V power supply with at least 100 mA of current. The current input pins, INP1 and INP2, are connected to the source measurement units (SMUs) outputs. The VOUT1 and VOUT2 outputs are connected to digital multimeters (DMM). The PC is connected to the Linduino One board that communicates with the I2C interface of the ADL5309 IC. The PC runs the ADL5309 graphical user interface (GUI) plug-in through the ACE software, which sets the on-chip registers to control various parameters of the ADL5309 and displays the on-chip ADC digital output.

The ADL5309-EVALZ evaluation board requires a 3 V power supply with at least 100 mA of current. The current input pins, INP1 and INP2, are connected to the source measurement units (SMUs) outputs. The VOUT1 and VOUT2 outputs are connected to digital multimeters (DMM). The PC is connected to the Linduino One board that communicates with the I2C interface of the ADL5309 IC.

The PC runs the ADL5309 graphical user interface (GUI) plug-in through the ACE software, which sets the on-chip registers to control various parameters of the ADL5309 and displays the on-chip ADC digital output.

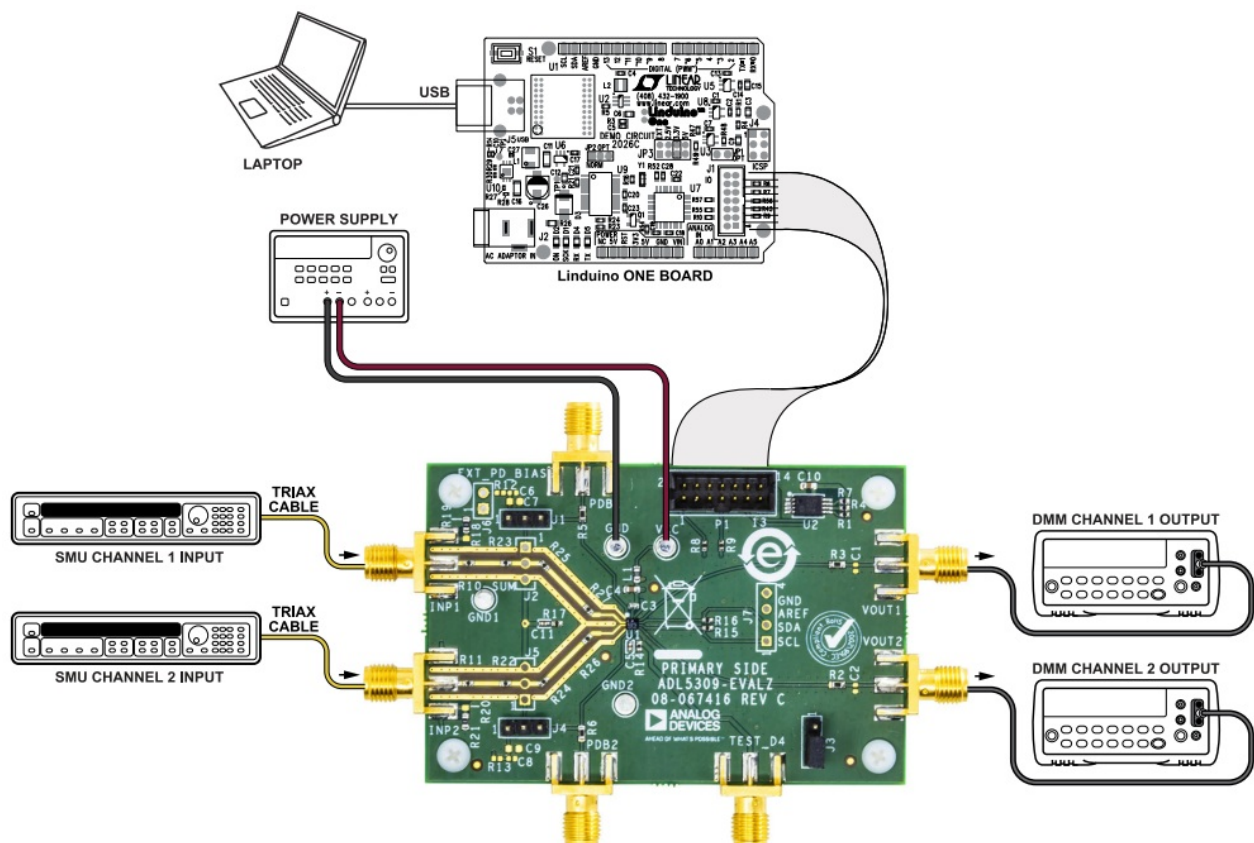


Figure 2. ADL5309-EVALZ Basic Test Setup

## QUICK TEST PROCEDURE

See [Figure 2](#) to identify each component and connection. To prepare the ADL5309-EVALZ evaluation board for testing, complete the following steps. (If no internal register adjustments of the ADL5309 are required, skip all the steps related to the ACE software and the [DC2026C](#) (Linduo One) board):

1. Verify that the ACE software is
2. In the main ACE window, click **Tools > Manage Plug-ins > Available Plug-ins**. Then, in the search bar, search for **Board.ADL5309**. Select the search result and click **Install selected**.
3. With the output of the 3 V DC power supply turned off, connect the positive output of the power supply to the VCC turret on the ADL5309-EVALZ evaluation board and the negative output of the power supply to the GND turret.
4. With the output of each SMU turned off, connect the current source output of the SMU output to the evaluation board's INP1 and INP2 input SMA connectors using triax cables, triax-to-BNC adapters, and/or BNC-to-SMA. The internal connection of the triax-to-BNC adapter should be triax center to BNC center, triax shield to BNC shield, and the triax inner guard may be connected to the BNC shield or left floating.
5. Install a jumper at the 2 to 3 position on the J3 header for regular I2C.
6. Verify DC2026C (Linduo One) board is set to 3.3 V with a
7. Connect the Linduo One board to the ADL5309-EVALZ evaluation board via the included 14-pin ribbon.
8. Turn on the 3 V DC power supply. Verify that the current is approximately 57
9. Connect the Linduo One board to a PC using the included USB cable. When the light-emitting diodes (LEDs) stop blinking, the hardware connections are complete.
10. Launch the ACE software on the
11. The ACE software shows that the ADL5309 plug-in is available in 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** and verify that the **Firmware Loaded** light indicator turns green.
13. Double-click the **ADL5309** The ADL5309 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 ADL5309 data sheet.
14. Apply input currents ( $I_{INP}$ ) from the SMUs and measure the  $V_{OUT1}$ ,  $V_{OUT2}$ ,  $V_{PDB1}$ , and  $V_{PDB2}$  For an example of expected test results for the default register setting, see [Table 1](#).

**Table 1. Quick Test Expected Results**

IINP1	V OUT1	VPDB1	IINP2	VOUT2	VPDB2
1 nA	0.4 V	1.6 V	1 nA	0.4 V	1.6 V
1 $\mu$ A	1.0 V	1.6 V	1 $\mu$ A	1.0 V	1.6 V
10 mA ( $V_{CC} = 5$ V)	1.8 V	4.2 V	10 mA	1.8 V	4.2 V

**DRIVING THE INPUT USING AN ACTUAL PHOTODIODE** With some minimal modifications to the ADL5309-EVALZ evaluation board, two photodiodes may be used to evaluate the performance of the [ADL5309](#). For the lowest input capacitance, install the photodiodes as close to the IC pins as possible. Complete the following procedures for the necessary component changes:

1. Remove Resistor R27 for Input 1 and Resistor R26 for Input
2. Connect the anodes of photodiodes at the R27 location for Input 1 and at R26 for Input 2 on the resistor pads next to the IC
3. Connect the cathodes of the photodiodes to Pin 1 of the J2 header for Input 1 and at Pin 1 of the J5 header for Input
4. Connect the optional photodiode shield and case pins to Pin 3 of the J2 header for Input 1 and Pin 3 of the J5 header for Input
5. For a more mechanically robust photodiode connection with higher input board capacitance make the following changes:
  - Replace R24, R25, R26, and R27 with 0  $\Omega$
  - Remove Resistor R22 and Resistor
  - Install photodiodes with anodes at Pin 2 of the J2 header for Input 1 and Pin 2 of the J5 header for Input
6. If no external photodiode bias is used, set the J1 jumper to the 2-3 position for Input 1 and set the J4 jumper to the 2-3 position for Input
7. Similarly, If an external photodiode cathode bias is required, set the J1 jumper to the 1-2 position for Input 1 and the J4 jumper to the 1-2 position for Input 2. The external photodiode bias (PDB) should be applied to the J6 Pin 2. The J6 Pin 1 is

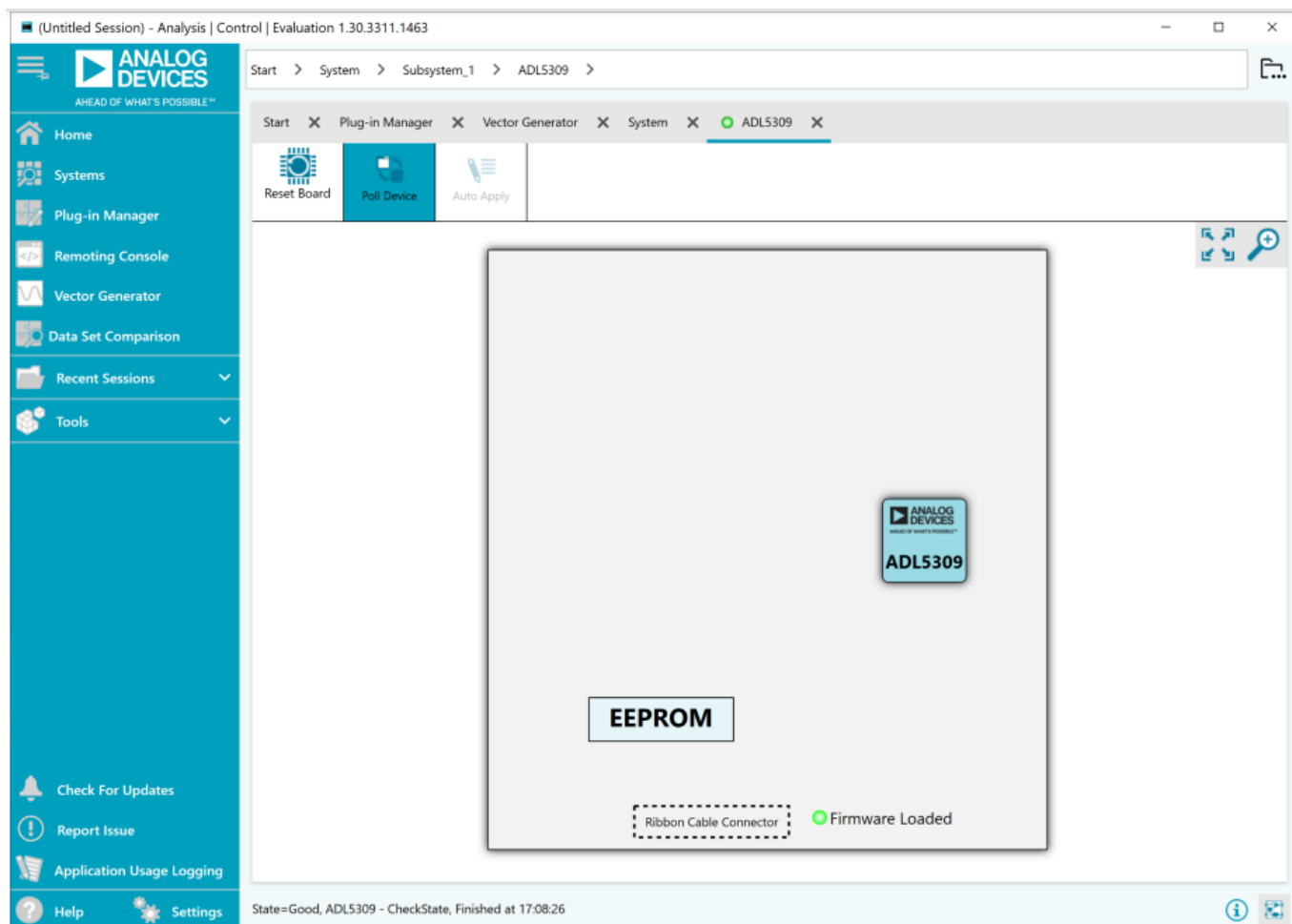
## USING THE ADCREF PIN

The ADCREF pin can be used to achieve improved accuracy while using the internal ADC for input current measurements.

Take the following steps to use the ADCREF interface to improve ADC readout accuracy:

1. Remove the R14
2. Apply a reference voltage (for example, 2.000 V) to the TEST\_D4
3. Follow the instructions in the ADCREF Interface section of the [ADL5309](#) data

## GRAPHICAL USER INTERFACE



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



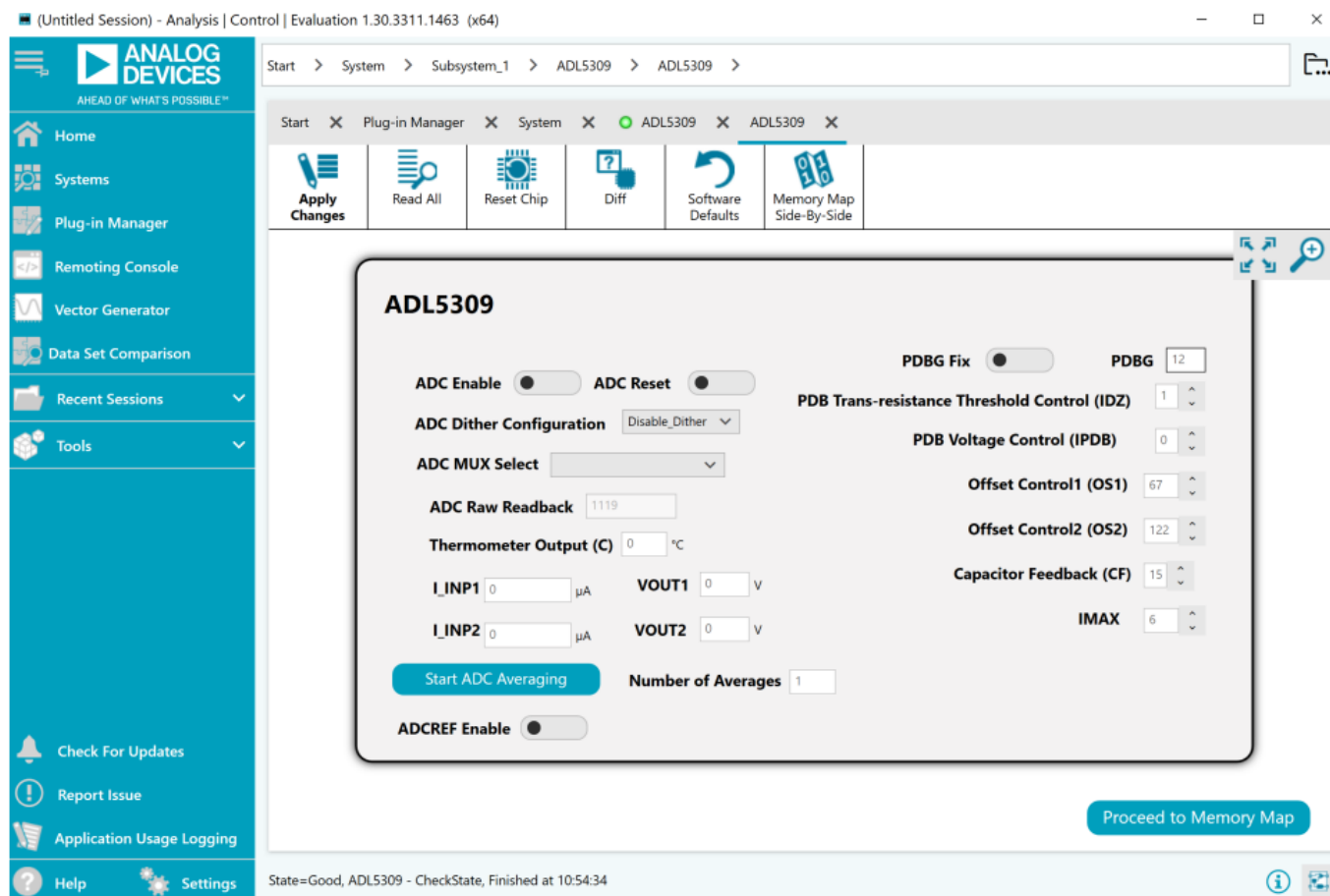


Figure 4. Register Control GUI



#### 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 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 NONINFRINGEMENT 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.

©2024 Analog Devices, Inc. All rights reserved. Trademarks and registered trademarks are the property of their respective owners.  
One Analog Way, Wilmington, MA 01887-2356, U.S.A.



Documents / Resources

	<p><b><a href="#">ANALOG DEVICES UG-2223 ADL5309 Dual Logarithmic Converter</a></b> [pdf] User Guide ADL5309-EVALZ, UG-2223 ADL5309 Dual Logarithmic Converter, UG-2223, ADL5309, UG-2223 Dual Logarithmic Converter, ADL5309 Dual Logarithmic Converter, Dual Logarithmic Converter, Converter, Dual Converter, Logarithmic Converter</p>
---	--

References

- [User Manual](#)

[Manuals+](#), [Privacy Policy](#)

This website is an independent publication and is neither affiliated with nor endorsed by any of the trademark owners. The "Bluetooth®" word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. The "Wi-Fi®" word mark and logos are registered trademarks owned by the Wi-Fi Alliance. Any use of these marks on this website does not imply any affiliation with or endorsement.