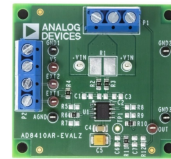


ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board



ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board User Guide

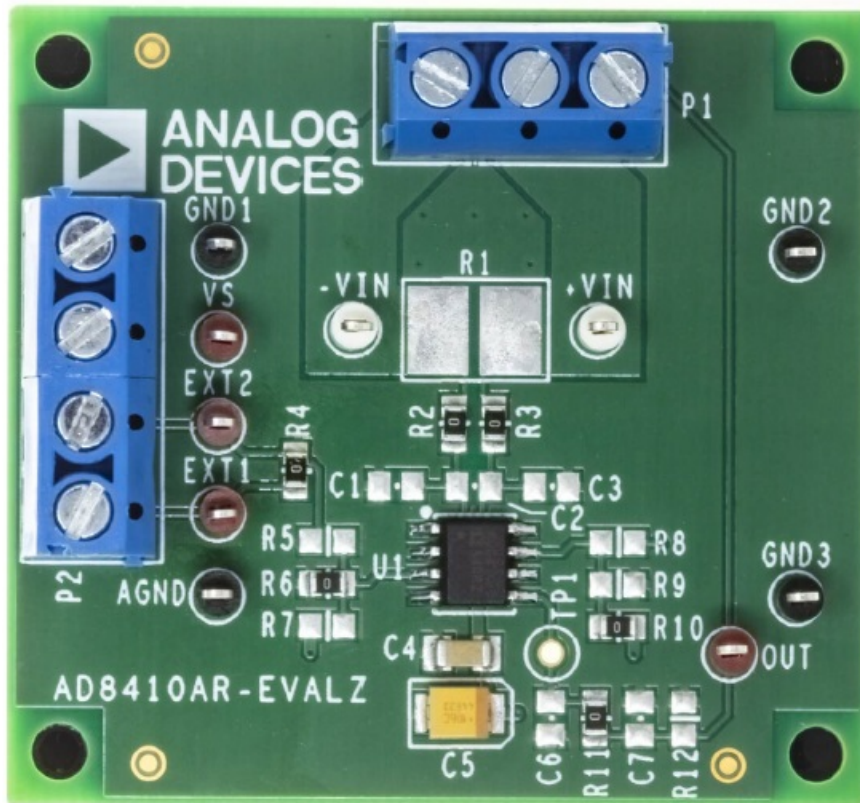
[Home](#) » [Analog Devices](#) » ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board User Guide 

Contents

- 1 [ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board](#)
- 2 [Product Information](#)
- 3 [Product Usage Instructions](#)
- 4 [FEATURES](#)
- 5 [GENERAL DESCRIPTION](#)
- 6 [AD8410A EVALUATION BOARD PHOTOGRAPHS](#)
- 7 [QUICK START](#)
- 8 [POWER SUPPLIES](#)
- 9 [SETTING THE REFERENCE VOLTAGE](#)
- 10 [External Referenced Output](#)
- 11 [INPUT FILTER](#)
- 12 [AD8410A EVALUATION BOARD SCHEMATIC](#)
- 13 [ORDERING INFORMATION](#)
- 14 [Legal Terms and Conditions](#)
- 15 [Documents / Resources](#)
 - 15.1 [References](#)
- 16 [Related Posts](#)



ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board



Product Information

Specifications

- Input Voltage Range: -2V to 70V
- Bandwidth: 2.2 MHz
- Features: PWM Rejection, Current-Sense Amplifier
- Package Type: SOIC_N (AD8410AR-EVALZ), MSOP (AD8410ARM-EVALZ)

Product Usage Instructions

Quick Start

1. Connect the AD8410A evaluation board to power supplies as per the specifications provided.
2. Set the reference voltage according to your requirements.
3. Configure the input and output filters as needed.

Power Supplies

Ensure the power supplies meet the specified voltage range of -2V to 70V for proper operation of the evaluation board.

Components

The evaluation kit includes the AD8410AR-EVALZ and AD8410ARM-EVALZ evaluation boards for testing and prototyping purposes.

Setting the Reference Voltage

Adjust the reference voltage on the evaluation board to match your application requirements using the provided documentation.

Input Filter

Utilize the provisions for an input filter to enhance the performance of the current-sense amplifier as needed.

FAQ

- **Q: What is the maximum size of the shunt resistor that can be soldered to the boards?**

A: The maximum standard size of the shunt resistor that can be soldered is 2818.

- **Q: Where can I find the full specifications of the AD8410A?**

A: The full specifications of the AD8410A are available in the AD8410A datasheet from Analog Devices, Inc.

User Guide | EVAL-AD8410A

UG-2083

Evaluating the AD8410A, –2 V to 70 V Wide Input Voltage Range, 2.2 MHz High Bandwidth, Current-Sense Amplifier with PWM Rejection

FEATURES

- Enables quick breadboarding and prototyping
- Easily configurable for unidirectional or bidirectional operation
- Includes provision for current-sense shunt resistor
- Easy connection to test equipment
- Includes provisions for an input filter and an output filter
- Decoupled supply line

EVALUATION KIT CONTENTS

- AD8410AR-EVALZ evaluation board
- AD8410ARM-EVALZ evaluation board

DOCUMENTS NEEDED

- AD8410A data sheet

GENERAL DESCRIPTION

- This user guide is designed to aid in the evaluation of the AD8410A current-sense amplifier. The AD8410AR-EVALZ and the AD8410ARM-EVALZ are designed for easy configuration of different modes of operation and allow flexibility with loads. A shunt resistor (R1), with a maximum standard size of 2818, can be soldered to both boards.
- The AD8410AR-EVALZ accommodates the AD8410A in a standard small outline package (SOIC_N). The AD8410ARM-EVALZ accommodates the AD8410A in a mini small outline package (MSOP). The AD8410ARM-EVALZ and AD8410AR-EVALZ are hereafter referred to as the AD8410A evaluation board in this user guide.
- Full specifications on the AD8410A are available in the AD8410A data sheet available from Analog Devices, Inc., and must be consulted with this user guide when using the AD8410A evaluation board.

AD8410A EVALUATION BOARD PHOTOGRAPHS



Figure 1. AD8410AR-EVALZ Top View

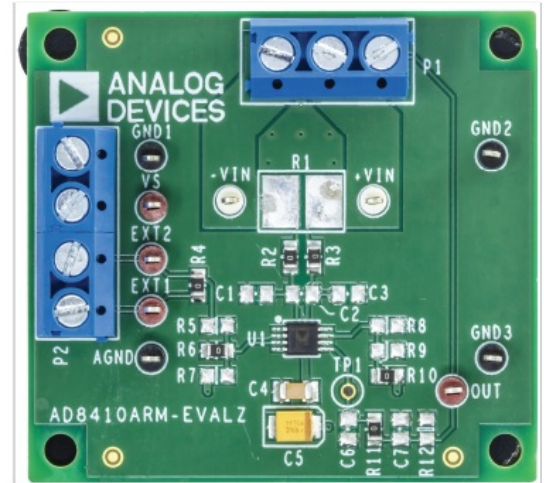


Figure 3. AD8410ARM-EVALZ Top View



Figure 2. AD8410AR-EVALZ Bottom View



Figure 4. AD8410ARM-EVALZ Bottom View

QUICK START

- By default, VREF1 is connected to VS and VREF2 is connected to the GND pin. This split supply configuration sets the output to mid-supply and allows bidirectional current sensing. Connect 5 V to the VS test point on the AD8410A evaluation board, connect the ground of the supply to the AGND test point on the AD8410A evaluation board, and place a 0.1 V differential voltage between the +VIN test point and the -VIN test point on the AD8410A evaluation board. This small 0.1 V differential input voltage represents the voltage drop across the shunt resistor that is used in the application.

$$V_{OUT} = (2.5V + V_{DIFF} \times GAIN) \quad (1)$$

- After the AD8410A evaluation board is powered, the output reads as:

$$4.5V = 2.5V + 0.1V \times 20V/V \quad (2)$$

- Then swap the input differential voltage leads (move the lead on the +VIN test point to the -VIN test point and move the lead that was on the -VIN test point to the +VIN test point). The output then reads as:

$$0.5V = 2.5V - (0.1V \times 20V/V) \quad (3)$$

POWER SUPPLIES

The AD8410A has a power-supply operating range from 2.9 V to 5.5 V. Power is applied to the VS test point. Decoupling capacitors of 10 μ F and 0.1 μ F are preinstalled on the AD8410A evaluation board.

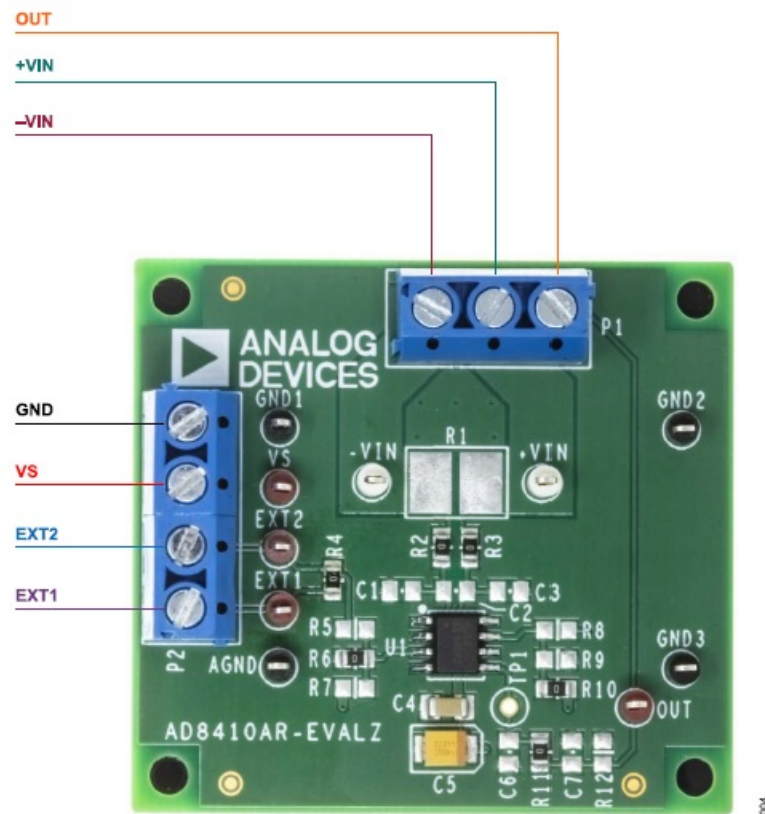


Figure 5. Connections to Terminal Blocks

COMPONENTS

The AD8410A can be used for a variety of current monitoring applications. The AD8410A evaluation board has a provision for a current-sense shunt resistor with a maximum standard size of 2818. There are also provisions with 0805 footprints for a capacitive-load, a resistive load, an input electromagnetic interference (EMI) filter, an output filter, and provisions to set the reference voltage. Terminal blocks (P1 and P2) are provided to allow easy wiring and evaluation.

SETTING THE REFERENCE VOLTAGE

- Three resistor spaces (R8, R9, and R10) are on the right side of the AD8410A on the AD8410A evaluation board. These three resistors are used to set VREF1. Fill only one of these resistor spaces at a time with a 0 Ω , 0805 resistor. See Table 1 for the resistor spaces that must be filled with 0 Ω to set VREF1.
- Three resistor spaces (R5, R6, and R7) are on the left side of the AD8410A on the AD8410A evaluation board. These three resistors are used to set VREF2. Fill only one of these resistor spaces at a time with a 0 Ω , 0805 resistor. See Table 2 for the resistor spaces that must be filled with 0 Ω to set VREF2.

Table 1. V_{REF1} Pin Connections

Pin	R8	R9	R10
V_S	X	X	✓
GND	X	✓	X
EXT1	✓	X	X

Table 2. V_{REF2} Pin Connections

Pin	R5	R6	R7
V_S	X	X	✓
GND	X	✓	X
EXT2	✓	X	X

Unidirectional Operation

- For unidirectional operation, the output can be set at the negative rail (near ground) or at the positive rail (near the supply voltage) when the differential voltage is 0 V. To set the AD8410A evaluation board for a ground referenced output, solder the 0 Ω resistor on the left side of the AD8410A in the R6 space and the 0 Ω resistor on the right side of the AD8410A in the R9 space.
- To set the AD8410A evaluation board for a supply voltage referenced output, solder the 0 Ω resistor on the left side of the AD8410A in the R7 space and the 0 Ω resistor on the right side of the AD8410A in the R10 space.

Bidirectional Operation

- For bidirectional operation, the output is typically set at half scale for equal range in both directions. To configure the output to be at midsupply in the presence of 0 A of current through the shunt resistor on the AD8410A evaluation board, solder the 0 Ω resistor on the left side of the AD8410A in the R6 space and the 0 Ω resistor on the right side of the AD8410A in the R10 space.
- By default, the output of the AD8410A evaluation board is biased at midsupply.
- Table 3 shows which resistor must be filled with 0 Ω resistor to set the AD8410A evaluation board for different operations. In unidirectional operation, it can be ground referenced output and supply

QUICK START

voltage-referenced output whereas in the bidirectional operation, the output can be set to midsupply.

Table 3. Operation Connection

Mode	R6	R7	R9	R10
UNIDIRECTIONAL				
Ground Referenced	✓	X	✓	X
Supply Voltage Referenced	X	✓	X	✓
BIDIRECTIONAL				
Midsupply	✓	X	X	✓

External Referenced Output

- An external supply can also be used to set the reference voltage. To bias the output to a single external supply, solder a 0 Ω , 0805 resistor in the R4 space. Then, solder the 0 Ω resistor on the left side of the AD8410A in the R5 space and solder the 0 Ω resistor on the right side of the AD8410A in the R8 space. The external supply voltage can then be applied to any one of the EXT_x test points on the AD8410A evaluation board, and this configuration biases the output to the external supply.
- The external supply can also be divided by 2 and used as a reference level. For this reference level, solder the 0 Ω resistor on the left side of the AD8410A in the R6 space, desolder the resistor in the R4 space, and solder the 0 Ω resistor on the right side of the AD8410A in the R8 space. Apply the external supply to the EXT1 test point or EXT1 terminal block input, and the output of the AD8410A is referenced to half of the external supply.
- Two separate external supplies can also be used to set the reference for the output. Desolder the 0 Ω resistor from the R4 space. Solder the 0 Ω resistor on the left side of the AD8410A in the R5 space and solder the 0 Ω resistor on the right side of the AD8410A in the R8 space. Apply the first external supply, VEXT1, to the EXT1 test point or EXT1 terminal block input. Apply the second external supply, VEXT2, to the EXT2 test point or EXT2 terminal block input. This configuration references the output to:

$$\text{VEXT1} + \text{VEXT2} / 2$$

INPUT FILTER

- The AD8410A evaluation board includes provisions for the components necessary for an input filter. By default, R2 and R3 are 0 Ω , 0805 resistors and C1, C2, and C3 are left unpopulated. It is required to filter at the input of the device to reduce EMI. The EMI specifications vary depending on the application. Filtering at the input must be preferred if the output cannot be filtered because filtering at the output changes the low output impedance seen by the components attached to the output of the AD8410A. The +IN and –IN inputs of the AD8410A have balanced input bias currents. This means that the input series resistors, R2 and R3, must be the same measured value to not have a large offset voltage added on the output of the device as a result of R2 and R3. It is recommended to keep R2 and R3 below 100 Ω .
- The EMI filter has two different bandwidths, common-mode (BWCM) and differential (BWDIFF). The differential bandwidth defines the frequency response of the filter with a differential input signal applied between the two inputs of the amplifier, which are +IN and –IN. C1 and C3 must be the same value for the following equations.
- The –3 dB differential bandwidth for the filter is:

$$BW_{DIFF} = \frac{1}{2\pi \times R2 \times ((2 \times C2) + C1)}$$

(5)

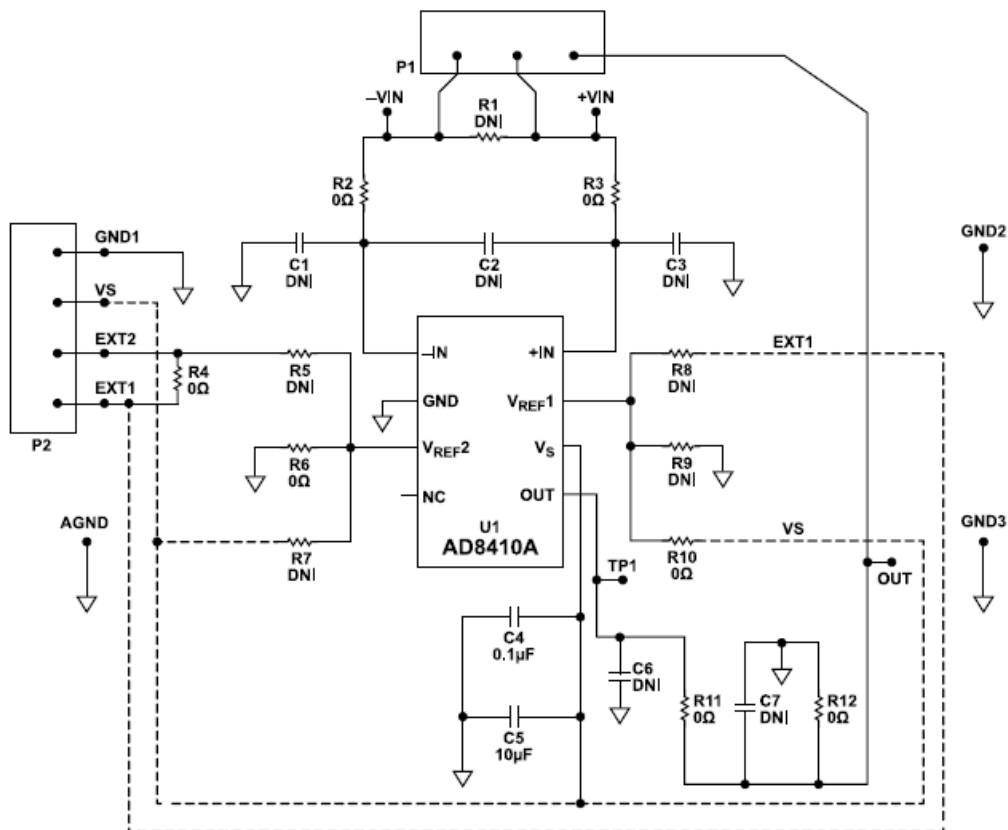
- The common-mode bandwidth defines what a common-mode RF signal experiences between ground and the +IN and –IN inputs of the amplifier tied together.
- The –3 dB common-mode bandwidth for the filter is:

$$BW_{CM} = \frac{1}{2\pi \times R2 \times C1}$$

(6)

- Keep the resistor values to a 1% tolerance and the filter capacitors to a 5% tolerance to assist with reducing AC common-mode rejection (CMR) errors. Choose C2 to be at least 10× larger than C1 or C3 to reduce AC CMR errors, which are caused by component mismatching.
- Figure 1 shows the top view and Figure 2 shows the bottom view of the AD8410AR-EVALZ evaluation board. Figure 3 shows the top view and Figure 4 shows the bottom view of the AD8410ARM-EVALZ evaluation board. Figure 6 shows the default schematic of the AD8410A evaluation board. The dotted lines in Figure 6 are routed under the printed circuit board (PCB).

AD8410A EVALUATION BOARD SCHEMATIC



NOTES

1. DOTTED LINES ARE ROUTED UNDER THE BOARD.

Figure 6. AD8410AR-EVALZ/AD8410ARM-EVALZ Evaluation Board Schematic

ORDERING INFORMATION

BILL OF MATERIALS

Table 4. Bill of Materials

Item	Quantity	Reference Designator	Part Description	Manufacturer, Part Number
1	1	U1	IC, High voltage, high bandwidth, current-sense amplifier	Analog Devices Inc., AD8410AWBRZ/
			, automotive	AD8410AWBMRZ
2	2	+VIN, –VIN	Connectors-PCB, test point white	Keystone Electronics, 5002
3	4	AGND, GND1, GND2,	Connectors-PCB, test point black	Keystone Electronics, 5001
		GND3		
4	1	C4	Capacitor, CER, 0.1 μ F, 50 V, 10% , X7R, 1206	Yageo, CC1206KRX7R9BB104
5	1	C5	Capacitor, TANT, 10 μ F, 16 V, 10% , 3528-20	AVX Corporation, TAJB106K016R NJ
6	4	EXT1, EXT2, OUT, VS	Connectors-PCB, test point red	Keystone Electronics, 5000
7	1	P1	Connector-PCB, terminal block VE RT, 5 mm pitch	On Shore Technology, OSTTC030 162
8	1	P2	Connector-PCB, terminal block, 5 mm pitch, 3.5 mm	On shore Technology, OSTTC040 162
			solder tail	
9	6	R2, R3, R4, R6, R10, R11	Resistors, SMD, 0 Ω , 1/10 W, 0805	Multicomp (SPC), MC 0.1 W 0805 0R
10	4	Standard Grip	Miscellaneous, Bumper cylindrical , size 0.312" Dial	3M, SJ61A6
			(7.92 mm), thickness 0.215" (5.46 mm), black with	
			adhesive	
11	5	C1, C2, C3, C6, C7	Not installed, Capacitors, C0805	Not Applicable
12	1	R1	Not installed, Resistor, 2818	Vishay, WSHM2818R0500FEA
13	5	R5, R7, R8, R9, R12	Not installed, Resistors, R0805	Not Applicable
14	1	TP1	Connector-PCB, test point black	Keystone Electronics, 5001




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.

Documents / Resources

	<p>ANALOG DEVICES AD8410A Current Sense Amplifier Evaluation Board [pdf] User Guide AD8410AR-EVALZ, AD8410ARM-EVALZ, AD8410A Current Sense Amplifier Evaluation Board, AD8410A, Current Sense Amplifier Evaluation Board, Sense Amplifier Evaluation Board, Amplifier Evaluation Board, Evaluation Board, Board</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.