Evaluating the ADA4510-2 Precision, 40 V, ±70 nV/°C, Rail-to-Rail Input and Output Op Amp with DigiTrim

FEATURES

► Full featured evaluation board for the ADA4510-2, a dual-channel, low input bias current amplifier available in an 8-lead narrow-body SOIC
► Enables quick prototyping
► User defined circuit configuration
► Edge mounted SMA connectors
► Connects easily to test equipment and other circuits
► Available provisions for photodiode sensors for quick evaluation
► Connections available for photodiode bias
► Guard traces to minimize leakage

GENERAL DESCRIPTION

The EVAL-ADA4510-2ARZ is an evaluation board used to test the ADA4510-2, a dual-channel, low input bias current amplifier that comes in an 8-lead, standard small outline package (SOIC_N). The design of this evaluation board emphasizes simplicity and ease of use. Provisions are available on the board to interface easily to test equipment.

The EVAL-ADA4510-2ARZ uses surface-mount components (SMT) in case size 0603, except for bypass capacitors and termination resistors. The EVAL-ADA4510-2ARZ features a variety of unpopulated resistor and capacitor footprints that provide the user with multiple choices and extensive flexibility for different application circuits.

The evaluation board has provisions for photodiode sensors that allow for easy configuration of a transimpedance amplifier (TIA). The layout is optimized with provisions for guarding to ensure low leakage and low parasitic capacitance for TIA applications.

Additionally, the evaluation board has provisions to build different types of filters. For selecting specific component values and designing filters, refer to https://tools.analog.com/en/filterwizard/.

Full details about the part are available in the ADA4510-2 data sheet, which must be consulted when using the EVAL-ADA4510-2ARZ.

EVALUATION BOARD PHOTOGRAPH

![Figure 1. EVAL-ADA4510-2ARZ Evaluation Board Photograph](image-url)
TABLE OF CONTENTS

Features................................................................ 1
General Description...............................................1
Evaluation Board Photograph................................1
Evaluation Board Quick Start Operation.................3
  Overview............................................................ 3
  Power Supply..................................................... 3
  Amplifier Configuration.................................. 3
  Power-Up Procedure........................................ 3

Transimpedance Amplifier (TIA)
  Configuration....................................................3
  Configuration Table..........................................3
  Board Configuration.........................................4
Evaluation Board Schematics and Artwork.............5
Ordering Information..........................................7
Bill of Materials................................................7

REVISION HISTORY

7/2023—Revision 0: Initial Version
EVALUATION BOARD QUICK START OPERATION

OVERVIEW

This section outlines the basic configuration of the EVAL-ADA4510-2ARZ board to test basic functionality of the device. Provisions are included on the board so that it is highly configurable for any application. The connectors available on the board provide an easy interface to various bench equipment.

POWER SUPPLY

The EVAL-ADA4510-2ARZ uses turret connectors for the power supply connections. The board comes installed with 0.1 µF and 10 µF decoupling capacitors on both supplies. Apply the positive supply to the VS+ connector and the negative supply to the VS− connector.

AMPLIFIER CONFIGURATION

Both channels on the EVAL-ADA4510-2ARZ board are configured in a noninverting configuration with a gain of +1 by default. Preinstalled resistors accommodate this configuration. Figure 2 shows the default connections on the board.

Figure 2. Default Connection

POWER-UP PROCEDURE

To begin using the EVAL-ADA4510-2ARZ board, use the following procedure:

1. Connect the power supply wires to the VS+, VS−, and GND turrets, respectively.
2. Connect an oscilloscope to the OUTA and OUTB Subminiature Version A (SMA) connectors.
3. Connect an input signal source to INA+ and INB+.
4. Set the signal source to the preferred amplitude and frequency while keeping the peak-to-peak input signal within the input voltage range of the device to ensure proper operation.
5. Set the power supplies to 18 V and −18 V.
6. Turn on the power supplies.
7. Turn on the input signal source.

The oscilloscope reads the same amplitude and frequency as the input signal.

TRANSIMPEDEANCE AMPLIFIER (TIA) CONFIGURATION

The low input bias current and low input capacitance of the ADA4510-2 amplifier makes the op amp a good choice for transimpedance configurations as shown in Figure 4 and Figure 5. The evaluation board has an on-board provision for a photodiode (radial package) on both channels of the amplifier and is fabricated with a guard trace around the inverting pins (−INA, −INB) to ensure minimal leakage when evaluating in a transimpedance configuration. The R1 connection for Channel A and the R2 connection for Channel B provide quick connections of the guard trace to the noninverting pins (+INA, +INB) of the amplifier.

When operating in a TIA configuration, a bias voltage can be applied to the VPDA pin or to the VPDB pin to bias the anode of the photodiode. If no bias voltage needs to be applied, install a 0 Ω resistor at the RPDA footprint or the RPDB footprint to connect the anode of the photodiode to ground. For this TIA configuration, install the photodiode at either the PDA footprint or the PDB footprint and connect a feedback resistor at the RFA footprint for Channel A or the RFB footprint for Channel B. A feedback capacitor at the C5 footprint or the C12 footprint can be added for stability of the circuit.

CONFIGURATION TABLE

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3, R14</td>
<td>INA− or INB− can be used by installing a resistor on the R3 slot or the R14 slot</td>
</tr>
<tr>
<td>R4, R15</td>
<td>INA+ or INB+ can be used by installing a resistor on the R4 or the R15 slot</td>
</tr>
<tr>
<td>RT1, RT2, RT3, RT4</td>
<td>Termination resistors</td>
</tr>
<tr>
<td>RSA, CSA and RSB, CSB</td>
<td>Snubber circuit</td>
</tr>
<tr>
<td>RLA, RLB</td>
<td>Load resistor</td>
</tr>
<tr>
<td>CLA, CLB</td>
<td>Load capacitor</td>
</tr>
<tr>
<td>PDA, CLB</td>
<td>Photodiode slot</td>
</tr>
<tr>
<td>RPDA, PDB</td>
<td>Set the PDA slot and the PDB slot to photovoltaic mode</td>
</tr>
</tbody>
</table>
BOARD CONFIGURATION

Figure 3 shows the locations of board components described in Table 1.

![Figure 3. Board Configuration](image-url)
Figure 4. Channel A Circuit Connections

Figure 5. Channel B Circuit Connections

Figure 6. Power and Ground Connections
Figure 7. Assembly Drawing, Primary Side

Figure 8. Layout Pattern, Primary Side

Figure 9. Layout Pattern, Secondary Side
ORDERING INFORMATION

BILL OF MATERIALS

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Reference Designator</th>
<th>Description</th>
<th>Supplier</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U1</td>
<td>8-lead SOIC</td>
<td>Analog Devices, Inc.</td>
<td>ADA4510-2</td>
</tr>
<tr>
<td>2</td>
<td>C1, C3</td>
<td>Ceramic capacitors, X7R, 0.1 µF, 50 V</td>
<td>Vishay</td>
<td>JV0603Y104KXXAC31X</td>
</tr>
<tr>
<td>2</td>
<td>C2, C6</td>
<td>Ceramic capacitors, X5R, 10 µF, 50 V</td>
<td>TDK</td>
<td>C3216X5R1106K160AB</td>
</tr>
<tr>
<td>10</td>
<td>C4, C5, C7, C11, C12, C13, CLA, CLB, CSA, CSB, CFA, CFB, R4, R7, R8, R15, RFA, RFB, R01, R02, R03, R04</td>
<td>User defined capacitors, 0603</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>12</td>
<td>R1, R2, RPDA, RPDB, R3, R5, R6, R9, R10, R14, R16, R17, RLA, RLB, RSA, RSB</td>
<td>0 Ω resistors, 0603</td>
<td>Panasonic</td>
<td>Not applicable</td>
</tr>
<tr>
<td>4</td>
<td>RT1, RT2, RT3, RT4</td>
<td>User defined resistors, 1206</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>3</td>
<td>GND, VS+, VS−</td>
<td>Connectors, solder terminal turrets</td>
<td>Mill-Max</td>
<td>2501-2-00-80-00-00-07-0</td>
</tr>
<tr>
<td>2</td>
<td>GND1, GND2</td>
<td>Test points, black</td>
<td>Components Corporation</td>
<td>TP-104-01-00</td>
</tr>
<tr>
<td>2</td>
<td>PDA, PDB</td>
<td>User defined photodiodes</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>6</td>
<td>INA+, INA−, INB+, INB−, OUTA, OUTB</td>
<td>Coaxial SMA end launches</td>
<td>Cinch Connectivity Solutions</td>
<td>142-0701-801</td>
</tr>
<tr>
<td>16</td>
<td>GND1, GND2, GND3, GND4, GND5, GND6, GRD, GRDB, TP_INA+, TP_INA−, TP_INB+, TP_INB-, TP_OUTA, TP_OUTB, VPDA, VPDB</td>
<td>Connectors, PCB test points</td>
<td>Keystone Electronics</td>
<td>5115</td>
</tr>
</tbody>
</table>

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 or 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 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.

©2023 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.