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

FEATURES

- Full featured evaluation boards for the ADA4510-2, a dual-channel, low input bias current amplifier available in an 8-lead, standard small outline package (SOIC_N) and in a mini small outline package (MSOP)
- 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

EVALUATION KIT CONTENTS

- EVAL-ADA4510-2ARZ evaluation board
- EVAL-ADA4510-2ARMZ evaluation board

EQUIPMENT NEEDED

- DC power supplies (capable of +18 V and −18 V)
- Signal source
- Oscilloscope

DOCUMENTS NEEDED

- ADA4510-2 data sheet

GENERAL DESCRIPTION

This user guide is designed to aid in the evaluation of the ADA4510-2. The EVAL-ADA4510-2ARZ and EVAL-ADA4510-2ARMZ are evaluation boards 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) and in a mini small outline package (MSOP). The EVAL-ADA4510-2ARZ and the EVAL-ADA4510-2ARMZ are hereafter referred to as the ADA4510-2 evaluation board in this user guide. 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 ADA4510-2 evaluation board uses surface-mount components (SMT) in case size 0603, except for bypass capacitors and termination resistors. The ADA4510-2 evaluation board 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 ADA4510-2 evaluation board.

TABLE OF CONTENTS

REVISION HISTORY

7/2024—Rev. 0 to Rev. A

Changed EVAL-ADA4510-2ARZ to ADA4510-2 (Throughout).....1
Changes to Features Section.....1
Added Evaluation Kit Contents Section, Equipment Needed Section, and Documents Needed Section.....1
Changes to General Description Section.....1
Added Figure 2; Renumbered Sequentially.....3
Changes to Figure 5 to Figure 7.....6
Changes to Table 2.....8

7/2023—Revision 0: Initial Version

EVALUATION BOARD PHOTOGRAPH

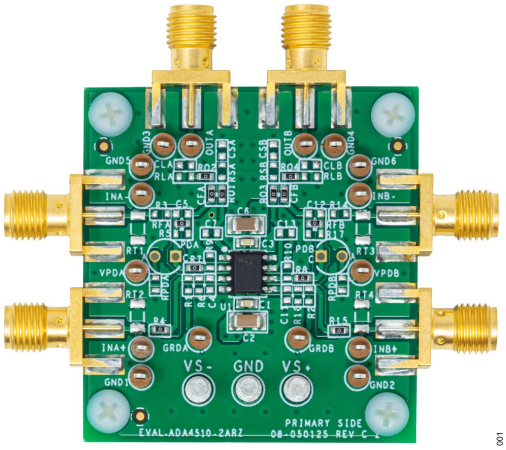

Figure 1. EVAL-ADA4510-2ARZ Evaluation Board Photograph

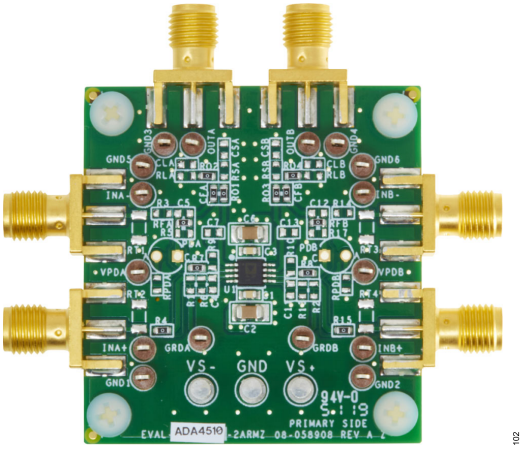

Figure 2. EVAL-ADA4510-2ARMZ Evaluation Board Photograph

EVALUATION BOARD QUICK START OPERATION

OVERVIEW

This section outlines the basic configuration of the ADA4510-2 evaluation 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 ADA4510-2 evaluation board 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 ADA4510-2 evaluation board are configured in a noninverting configuration with a gain of +1 by default. Preinstalled resistors accommodate this configuration. Figure 3 shows the default connections on the board.

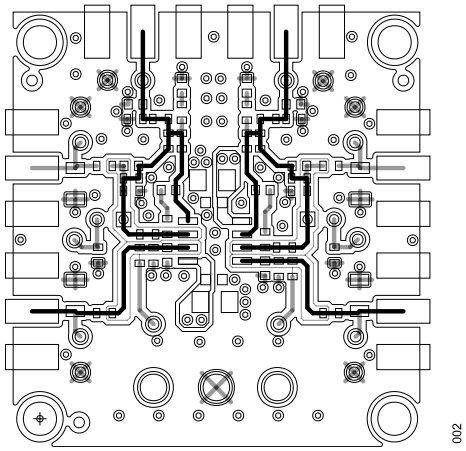

Figure 3. Default Connection

POWER-UP PROCEDURE

To begin using the ADA4510-2 evaluation 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.

TRANSIMPEDANCE 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 5 and Figure 6. 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 1. Configuration Table

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

EVALUATION BOARD QUICK START OPERATION

BOARD CONFIGURATION

Figure 4 shows the locations of board components described in Table 1.

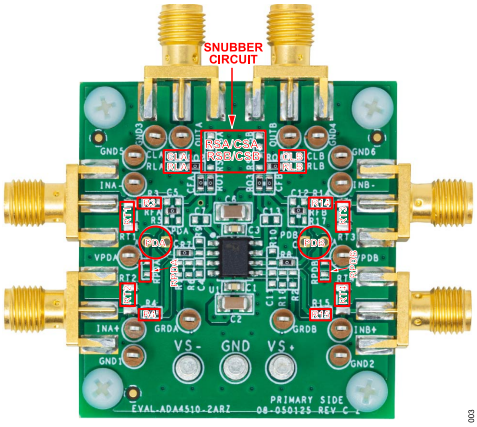

Figure 4. Board Configuration

EVALUATION BOARD SCHEMATICS AND ARTWORK

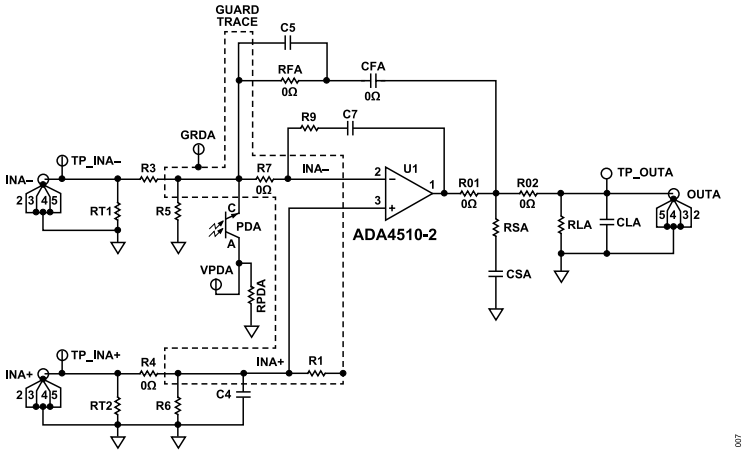

Figure 5. Channel A Circuit Connections

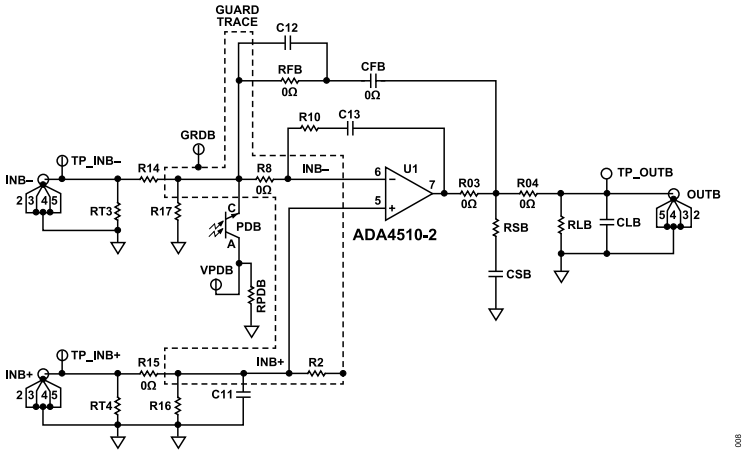

Figure 6. Channel B Circuit Connections

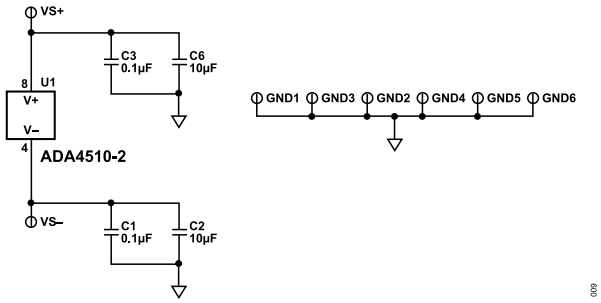

Figure 7. Power and Ground Connections

EVALUATION BOARD SCHEMATICS AND ARTWORK

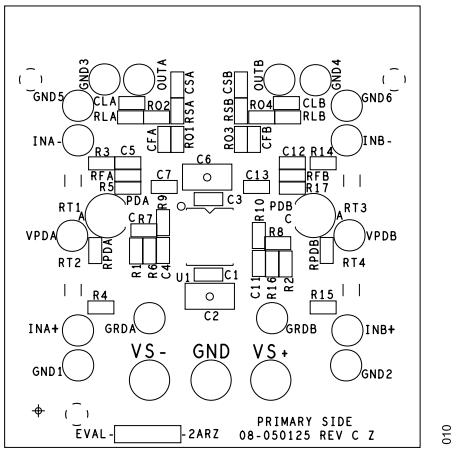

Figure 8. Assembly Drawing, Primary Side

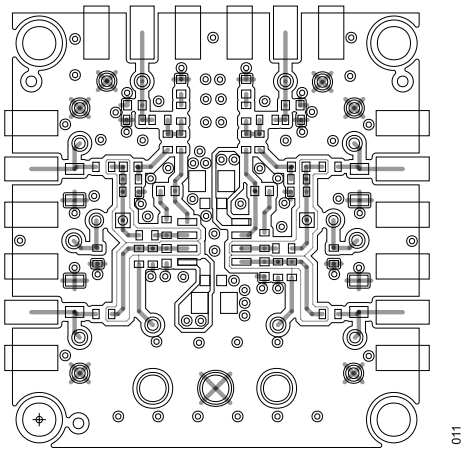

Figure 9. Layout Pattern, Primary Side

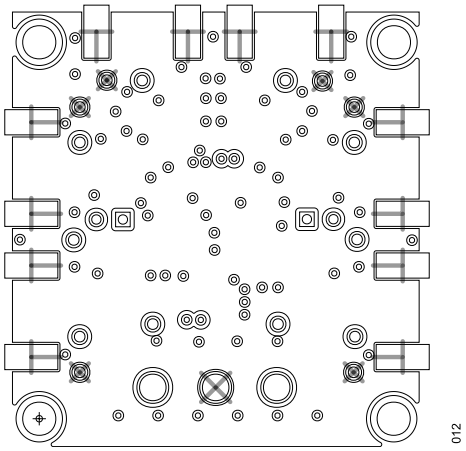

Figure 10. Layout Pattern, Secondary Side

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. Bill of Materials

Quantity	Reference Designator	Description	Supplier	Part Number
1	U1	IC, dual-channel, 40 V, high precision operational amplifier	Analog Devices, Inc.	ADA4510-2ARZ/ ADA4510-2ARMZ
2	C1, C3	Ceramic capacitors, X7R, 0603, 0.1 µF, 50 V	Vishay	VJ0603Y104KXAAC31X
2	C2, C6	Ceramic capacitors, X5R, 0603, 10 µF, 50 V	TDK	C3216X5R1H106K160AB
10	C4, C5, C7, C11, C12, C13, CLA, CLB, CSA, CSB	User defined capacitors, 0603	Not applicable	Not applicable
12	CFA, CFB, R4, R7, R8, R15, RFA, RFB, RO1, RO2, RO3, RO4	0 Ω resistors, 0603	Panasonic	ERJ-3GEY0R00V
16	R1, R2, RPDA, RPDB, R3, R5, R6, R9, R10, R14, R16, R17, RLA, RLB, RSA, RSB	User defined resistors, 0603	Not applicable	Not applicable
4	RT1, RT2, RT3, RT4	User defined resistors, 1206	Not applicable	Not applicable
3	GND, VS+, VS−	Connectors, solder terminal turrets	Mill-Max	2501-2-00-80-00-00-07-0
2	GND1, GND2	Test points, black	Components Corporation	TP-104-01-00
2	PDA, PDB	User defined photodiodes	Not applicable	Not applicable
6	INA+, INA−, INB+, INB−, OUTA, OUTB	Coaxial SMA end launches	Cinch Connectivity Solutions	142-0701-801
16	GND1, GND2, GND3, GND4, GND5, GND6, GRDA, GRDB, TP_INA+, TP_INA−, TP_INB+, TP_INB−, TP_OUTA, TP_OUTB, VPDA, VPDB	Connectors, PCB test points	Keystone Electronics	5115

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.