Evaluating the **ADA4254** Zero Drift, High Voltage, Low Power, Programmable Gain Instrumentation Amplifier

**FEATURES**
- Enables quick breadboarding and prototyping
- Edge mounted SMA connector provisions
- Easy connection to test equipment and other circuits

**EQUIPMENT NEEDED**
- **SDP-S board**
- **Cable (SMA input to evaluation board)**
- **Standard USB A that connects to a mini-B USB cable**
- **PC running Windows 7 and up OS**

**DOCUMENTS NEEDED**
- **ADA4254** data sheet

**SOFTWARE NEEDED**
- **ADA4254 Evaluation Software**

**GENERAL DESCRIPTION**

The ADA4254RU-EBZ evaluation board is designed to help users evaluate the **ADA4254**, which is offered in a 24-lead thin shrink small outline package (TSSOP) or a 28-lead lead frame chip scale package (LFCSP). Figure 1 and Figure 2 show the front and back sides of the evaluation boards with the TSSOP package.

The ADA4254RU-EBZ evaluation board is a 4-layer printed circuit board (PCB). The evaluation board accepts Subminiature Version A (SMA) edge mounted connectors on the inputs and outputs to efficiently connect to test equipment or other circuitry.

The ADA4254RU-EBZ evaluation board requires the following three supply domains.

- A high voltage supply domain consisting of the supply pins, VDDH and VSSH, which are typically +28 V and –28 V respectively.
- The analog output supply domain, AVDD, typically 5 V.
- The digital supply domain, DVDD, typically 3.3 V.

[Please see the last page for an important warning and legal terms and conditions.]
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REVISION HISTORY
11/2019—Revision 0: Initial Version
EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The ADA4254 is a zero drift, high voltage, and low power programmable gain instrumentation amplifier (PGIA) designed for process control and industrial applications. The ADA4254 features 12 binary weighted gains ranging from 1/16 V/V to 128 V/V and three scaling options of 1 V/V, 1.25 V/V, and 1.375 V/V, which results in 36 possible gain settings. The power consumption of the ADA4254 is 20 mW, making the device an excellent choice for industrial systems that demand precision, robustness, and low power.

POWER SUPPLIES

The ADA4254RU-EBZ evaluation board requires the following three supplies (see Figure 3):

- The AVDD and AVSS supply for the output amplifier. This supply must be provided externally.
- The VDDH and VSSH supply for the input multiplexer. This supply must be provided externally.
- The DVDD supply for the digital supply. This supply is generated on the evaluation board using the ADP150, a 3.3 V voltage regulator.

ANALOG INPUTS AND OUTPUTS

The ADA4254RU-EBZ evaluation board has four inputs that each correspond to one of the four inputs of the ADA4254 input multiplexer (see Figure 4). The ADA4254RU-EBZ board also has two outputs corresponding to the fully differential output of the ADA4254.

The output common-mode voltage (VOCM) is set to ½ of the output amplifier supply through a voltage divider. However, the user can control VOCM by connecting an external voltage to the VOCM test point (see Figure 4).

The ADA4254RU-EBZ evaluation board allows the user to connect the high voltage excitation current to the +IN1 input through a pin header connector. The user can also connect the low voltage excitation current to the –IN1 input through a pin header connector. See Figure 4 for the connection details.

Figure 3. Power Supply Connections

Figure 4. Inputs and Outputs SMA Connections
GENERAL-PURPOSE INPUTS AND OUTPUTS (GPIOs)

The ADA4254RU-EBZ evaluation board allows the user to interact with the various GPIO functions of the ADA4254. The user can set the GPIOs as outputs and toggle these outputs between high and low. The ADA4254RU-EBZ board also allows the user to connect to the GPIOs through a pin header (see Figure 5).

The GPIO4 can be used to either input an external clock or to output the ADA4254 internal clock with the special function of the GPIO4, see the ADA4254 data sheet for more information, through an easy to connect SMA connector.

EVALUATION BOARD CONTROL

The ADA4254RU-EBZ evaluation board uses the SDP-S board to communicate with the ADA4254 Evaluation Software. Connect the SDP-S board to the ADA4254RU-EBZ 120-pin connector (see Figure 6). The evaluation board also allows the user to use other means of serial peripheral interface (SPI) controls through the pin header marked as SPI.
EVALUATION BOARD SOFTWARE

INSTALLING THE SOFTWARE
Install the software prior to connecting the SDP-S board to the USB port of the PC to ensure that the SDP-S board is recognized when it connects to the PC. To install the software, take the following steps:

1. Start the Windows® operating system and download the software from the EVAL-ADA4254 product page.
2. Unzip the downloaded file and run the setup.exe file. This executable file is in the downloaded folder.
3. Begin installing the ADA4254 Evaluation Software. After installation, the window shown in Figure 7 opens.

4. Choose the installation directory in the Directory for ADA4254 Eval field and click Next >> (see Figure 8). The default installation directory location is C:\Program Files (x86)\Analog Devices\ADA4254\.

5. The window shown in Figure 9 summarizes which files are installing. Click Next >> to install the software listed in the window.

6. After clicking Next >>, the pop up window shown in Figure 10 opens and displays a bar showing the software installation progress.

7. After installing the software, the ADA4254.exe is automatically placed in the location specified in Step 4.
8. The pop up window shown in Figure 11 opens when the software installation is complete. Click Finish to proceed.

![Figure 11. Installation Complete Window](image)

**RUNNING THE EVALUATION SOFTWARE**

After installing the ADA4254 Evaluation Software (see the Installing the Software section), run the software with either of the following methods:

- Navigate to the destination folder of the ADA4254 Evaluation Software, selected during Step 4 in the Installing the Software section, and run the ADA4254.exe file.
- On the PC, click Start > All Programs > Analog Devices > ADA4254 Eval > ADA4254 Eval.

**SOFTWARE OPERATION**

When the software launches, the Hardware Select window shown in Figure 12 opens and the software searches for the SDP-S board connected to the PC. After the software detects the SDP-S and the ADA4254RU-EBZ, the board is listed in the Hardware Select window. Select the evaluation board listed in the Hardware Select window and click Select (see Figure 12).

After the evaluation software connects to the SDP-S board, the main display window shown in Figure 13 is now interactive.

![Figure 12. Evaluation Board Hardware Select Window](image)
DESCRIPTION OF THE SOFTWARE PANEL

The components of the evaluation software user panel shown in Figure 13 include the following:

- The Reset Amplifier button (Label 1 in Figure 13) writes a 0x01 to the Software Reset register of the ADA4254, which sets the ADA4254 back to the default configuration.

- The Excitation Currents Control button (Label 2 in Figure 13) opens the window shown in Figure 14. In this window, users set both the excitation current value and the source of the excitation current from the ADA4254. Use the controls in Figure 14 together with the pin headers mentioned in the Analog Inputs and Outputs section to route the current to one of the inputs. After a change is made to Excitation Current window, the Update button enables. Click the Update button to write the changes to the ADA4254. Note that the Update button disables after the changes are written to the ADA4254.
The GPIO Control button (Label 3 in Figure 13) opens the window shown in Figure 15. This window allows the user to configure the GPIOs into input or output mode by clicking the corresponding buttons. These buttons flip between Input and Output. If in output mode, the user can click the green box to set the GPIO pin high (lit up) or low (dark). If in input mode, the green box is lit up when the voltage on the corresponding GPIO pin is high, and the green box is dark when the voltage on the corresponding GPIO is low.

The Clock Control button (Label 4 in Figure 13) opens the window shown in Figure 16. This window allows the user to either bring out the ADA4254 clock on the GPIO4 or to provide an external clock on the GPIO4. The GPIO4 has an SMA connector for easy use with the external clock for synchronization purposes. The user can set up the division factor depending on the external clock speed as well as the edge on which the clock synchronizes. After a change is made in the window, the Update button enables. Click the Update button to write the change to the ADA4254. Note that the Update button disables after the changes are written to the ADA4254.

The Calibration Control button (Label 5 in Figure 13) opens the window shown in Figure 17. This window allows the user to configure the ADA4254 calibration. Click the Trigger button to trigger a calibration.
- The **Multiplexer Control** button (Label 6 in Figure 13) opens the **Input Multiplexer Control** window shown in Figure 18. This window controls all the switches available in the ADA4254 input multiplexer. The window also sets the wire break detection currents, the wire break switches, and the test multiplexer. After a change is made in the window, the **Update** button enables. Click the **Update** button to write the changes to the ADA4254. Note that the **Update** button disables after the changes are written to the ADA4254.

- The **Gain Control** button (Label 7 in Figure 13) opens the window shown in Figure 19. Users can select the gain of the ADA4254 as well as the scaling gains, 1 V/V, 1.25 V/V, and 1.375 V/V gains. After a change is made in the window, the **Update** button enables. Click the **Update** button to write the changes to the ADA4254. Note that the **Update** button disables after the changes are written to the ADA4254.

- The **Digital Errors and Analog Errors** section (Label 8 in Figure 13). Each ADA4254 error flag is mapped into an indicator that turns on when the corresponding error bit is on. Both digital and analog error register values are updated in the **Analog Errors** and **Digital Errors** fields in hex format. There is an **On** button under each error flag that indicates whether the corresponding error flag is enabled or not. To disable the error flag, click the corresponding **On** button to update the button to read **Off**.

- The **Error Detection Control** section (Label 9 in Figure 13). This window allows the user to set the mode of the error detection to either **Latched Errors** or **Live Errors**. In **Live Errors** mode, the user can select the suppression cycles. Click the **Clear Error** button to clear the error registers.

- The **Poll Errors** button (Label 10 in Figure 13) controls whether the SDP-S board is polling errors from the ADA4254. When disabled, the digital errors and analog errors are not updated.

- The **Register Read/Write** section (Label 11 in Figure 13) allows the user to read from and write to any of the registers. Use hex format in all fields.

- The **Save** button and the **Load** button (Label 12 in Figure 13) allow the user to save and to load the current register map of the ADA4254.

- The **Connection Status** indicator (Label 13 in Figure 13) shows if the software is connected to the ADA4254RU-EBZ evaluation board.

**Figure 18. Input Mux Settings Window**
Figure 19. **Gain Block** Settings Window
Figure 20. ADA4254RU-EBZ Evaluation Board Schematic
Figure 21. ADA4254RU-EBZ Evaluation Board Schematic
## ORDERING INFORMATION

### BILL OF MATERIALS

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1 N/A means not applicable.
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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