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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

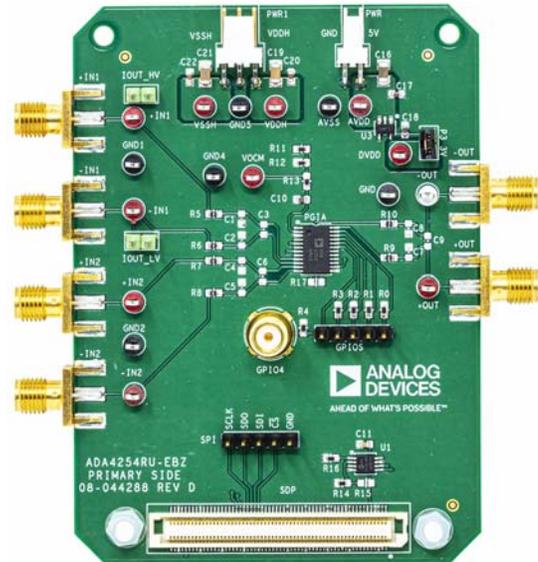ADA4254 Evaluation Software

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.

EVALUATION BOARD PHOTOGRAPHS

Figure 1. ADA4254RU-EBZ Front Side

Figure 2. ADA4254RU-EBZ Back Side

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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.
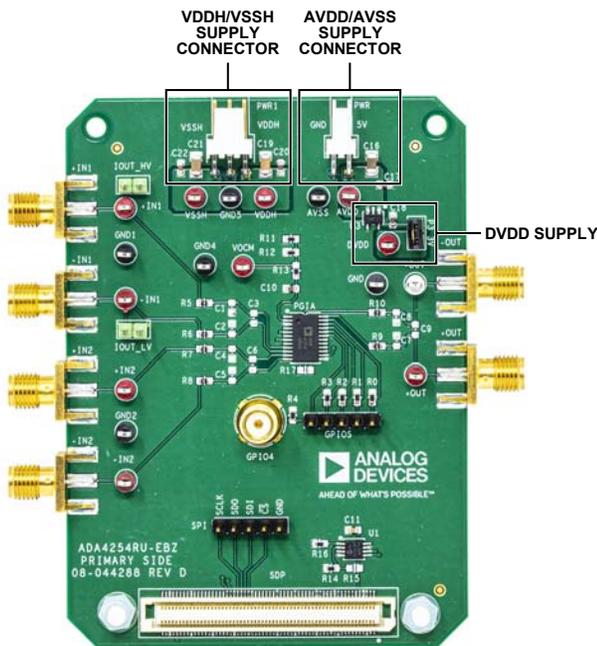

Figure 3. Power Supply Connections

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.
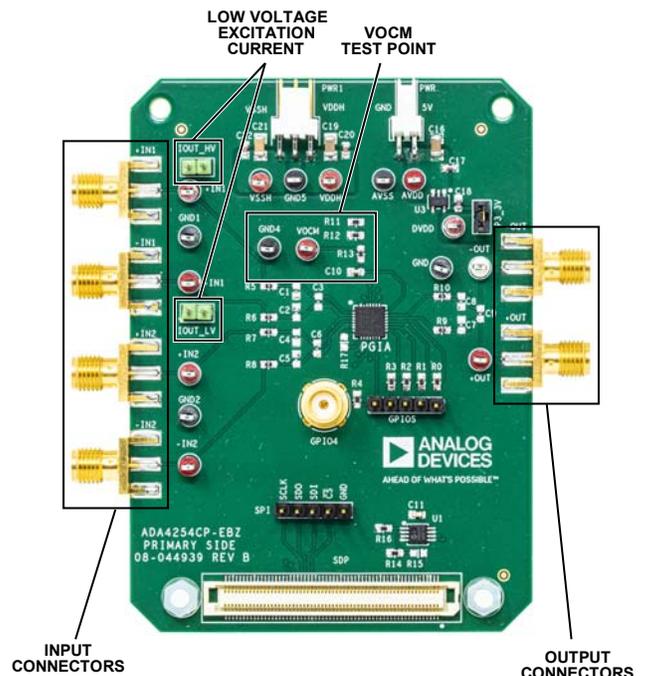

Figure 4. Inputs and Outputs SMA Connections

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.
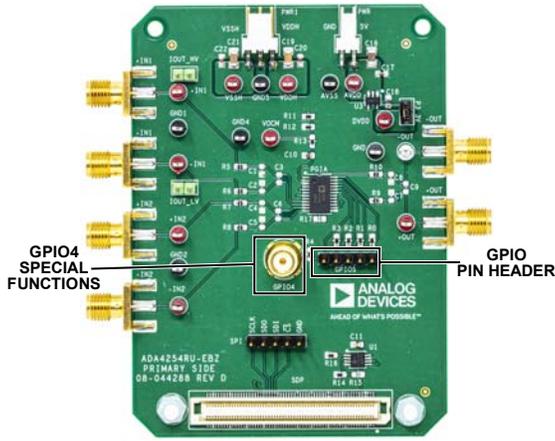

Figure 5. GPIO Connections

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**.
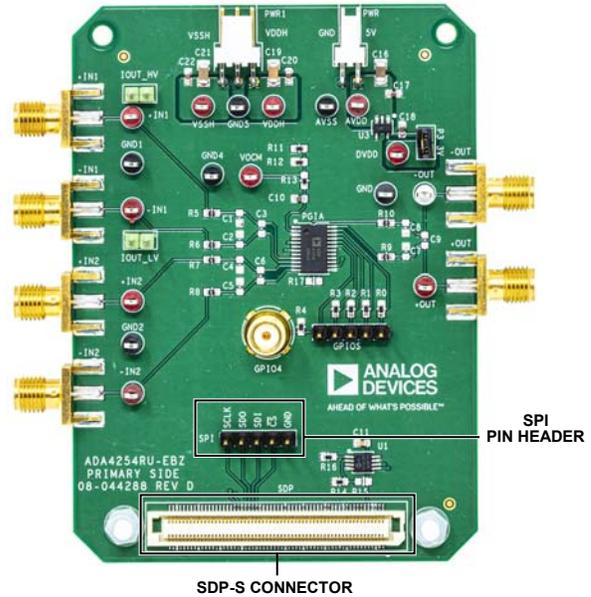

Figure 6. SDP-S Connector and SPI Pin Header Connector

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.
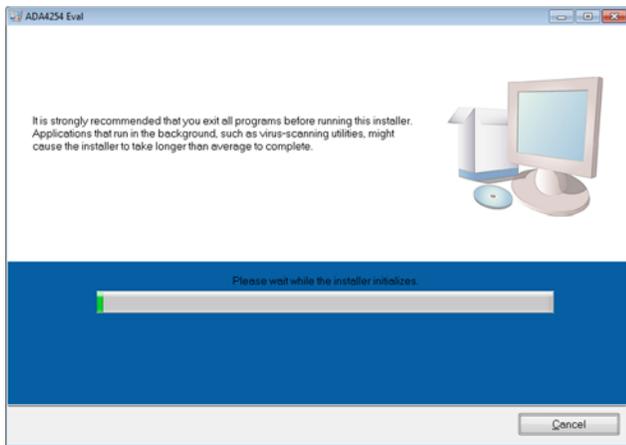

Figure 7. Software Installation Window

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**.
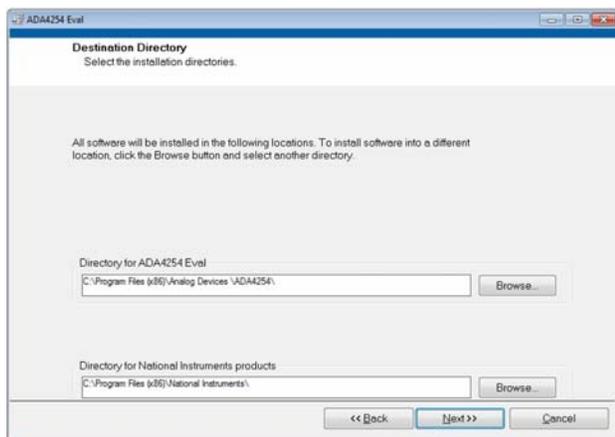

*Figure 8. **Destination Directory** Window*

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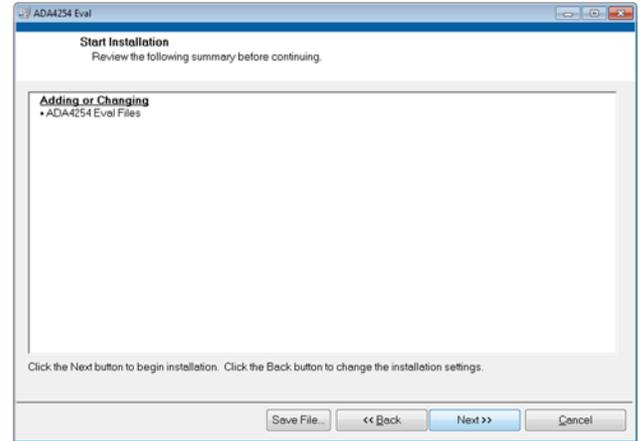

*Figure 9. **Start Installation** Window*

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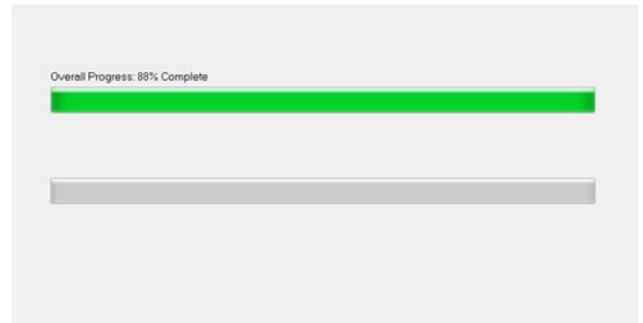

Figure 10. Software Installation Progress Window

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.
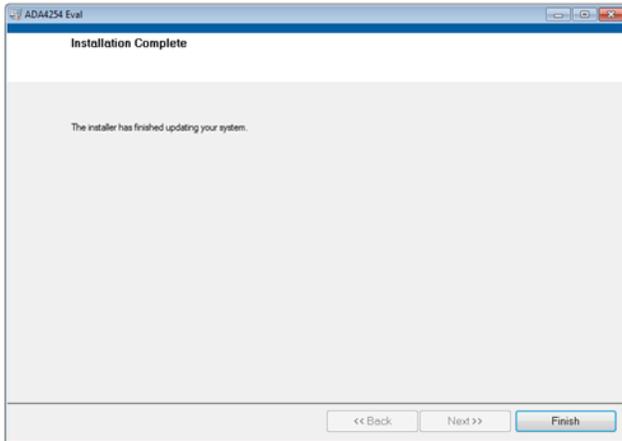

*Figure 11. **Installation Complete** Window*

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.
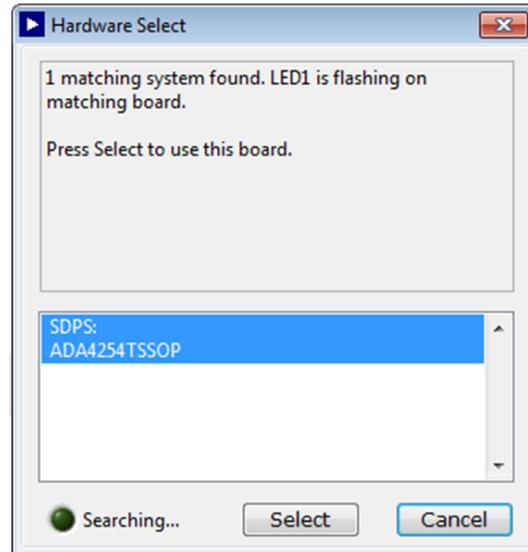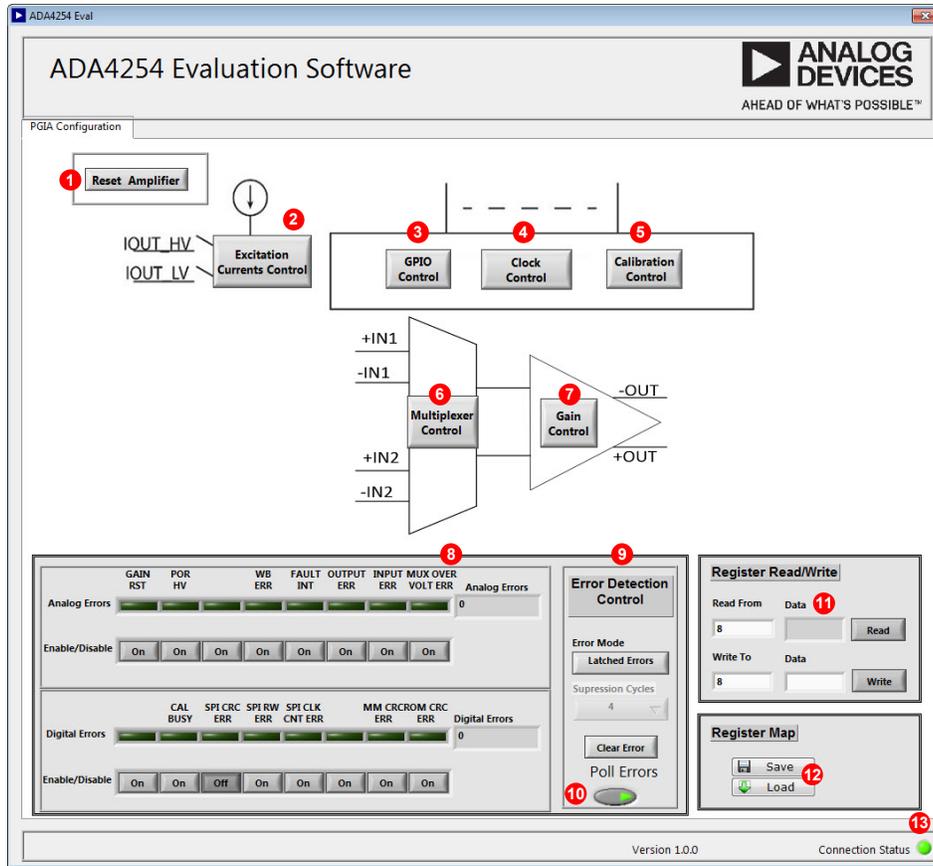

*Figure 12. Evaluation Board **Hardware Select** Window*

*Figure 13. **ADA4254 Evaluation Software** Main Display*

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.

*Figure 14. **Excitation Current** Settings Window*

- 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.

*Figure 15. **GPIO Settings** Window*

- 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.
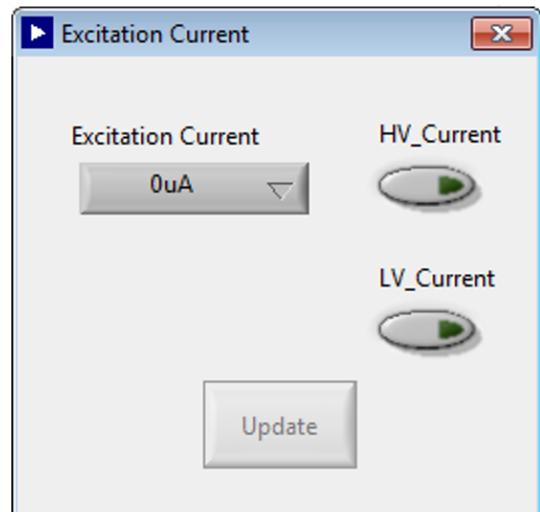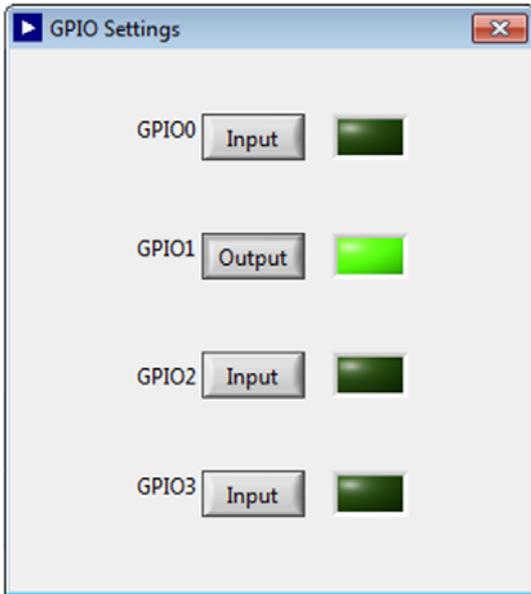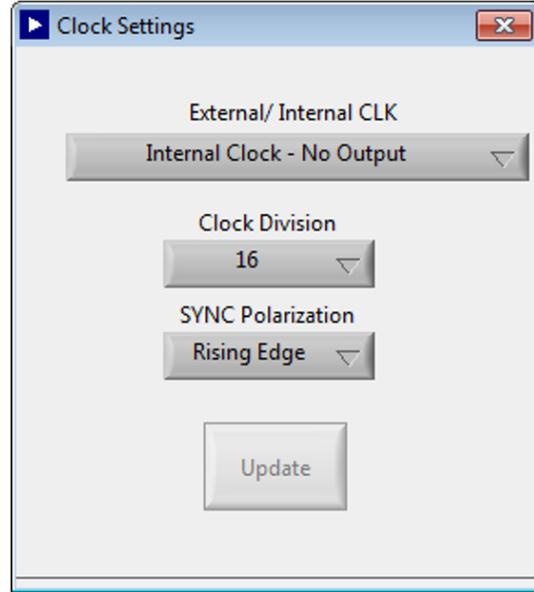

Figure 16. Clock Synchronization Settings Window

- 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.
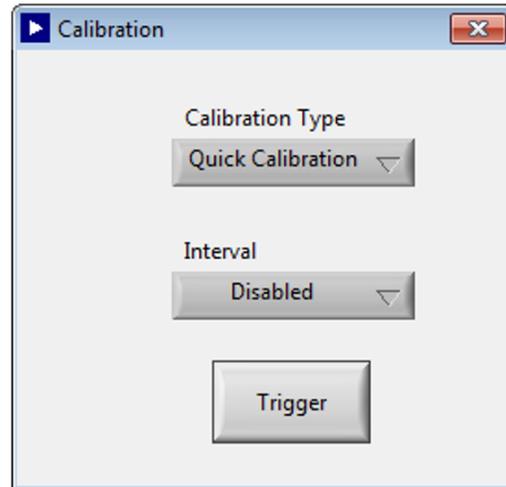

*Figure 17. **Calibration** Settings Window*

- 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.
- **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**.

- **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.
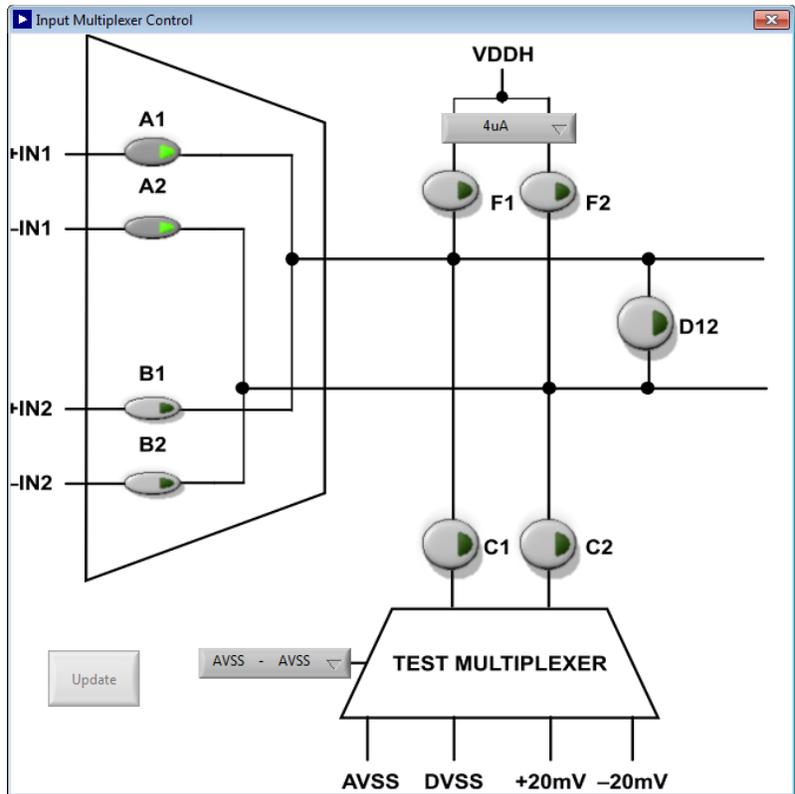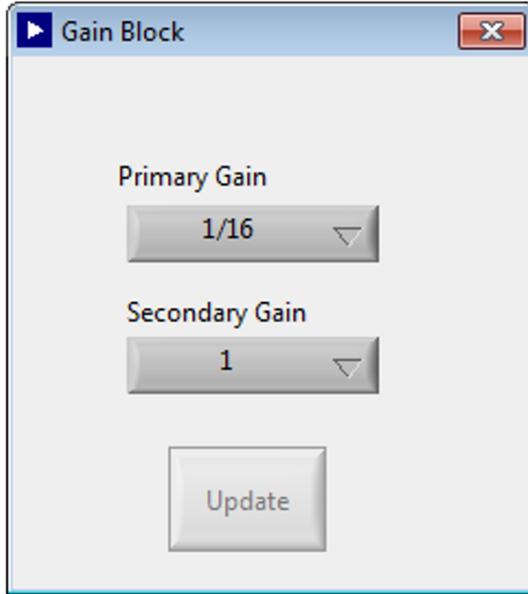

Figure 18. *Input Mux* Settings Window

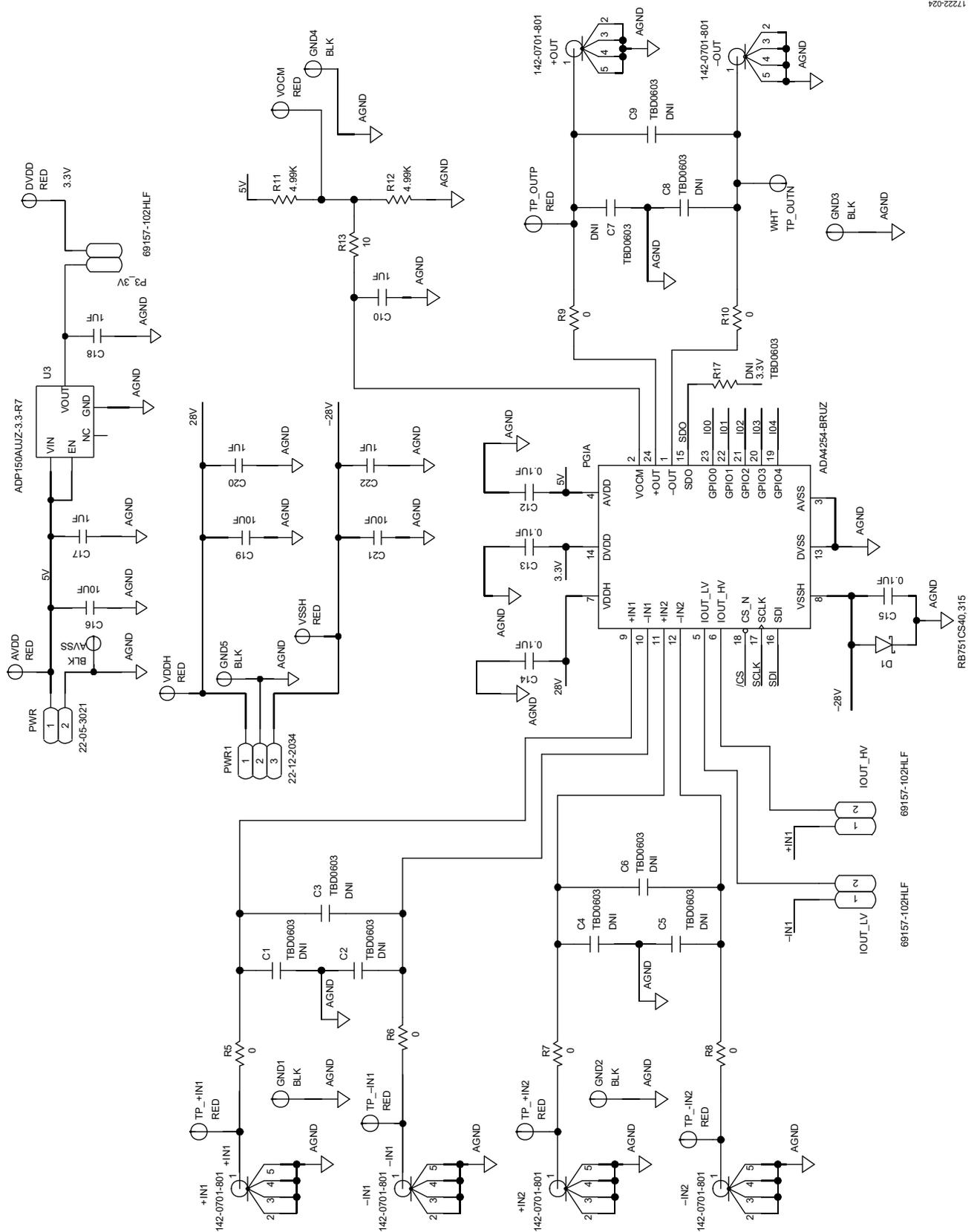*Figure 19. **Gain Block** Settings Window*

EVALUATION BOARD SCHEMATICS
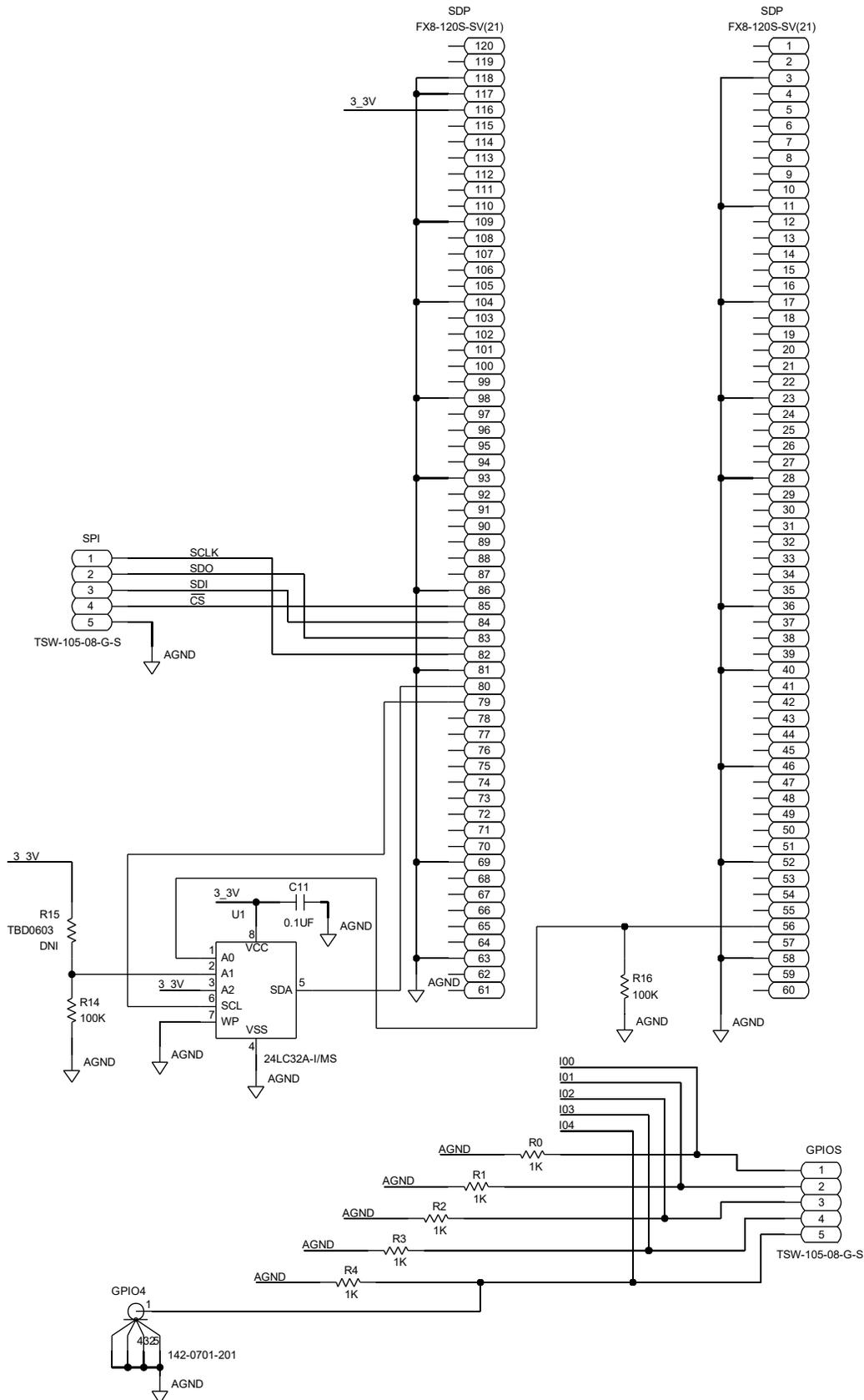

Figure 20. ADA4254RU-EBZ Evaluation Board Schematic

Figure 21. ADA4254RU-EBZ Evaluation Board Schematic

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. ADA4254RU-EBZ Bill of Materials

Qty	Value[1]	Reference Designator	Description	Manufacturer	Part Number
1	N/A	PGIA	Zero drift, high voltage, low power, programmable gain instrumentation amplifier	Analog Devices	ADA4254-BRUZ
6	N/A	+IN1 ,+IN2, +OUT, −IN1, −IN2, −OUT	SMA connectors	Cinch	142-0701-801
10	N/A	AVDD, DVDD, TP_+IN1, TP_+IN2, TP_−IN1, TP_−IN2, TP_OUTP, VDDH, VOCM, VSSH, AVSS, GND1, GND2, GND3, GND4, GND5, TP_OUTN	Test points	Keystone	5005
3	1 µF	C10, C17, C18	0603, capacitors, 10 V, X7R	Kemet	C0603C105K8RACTU
3	0.1 µF	C11 to C13	0603, capacitors, 16 V, X7R	Kemet	C0603C104K4RAC
2	0.1 µF	C14, C15	0603, capacitors, 50 V, X7R	AVX	06035C104KAT2A
1	10 µF	C16	1206, capacitor, 50 V, X7R	TDK	C3216X7R1C106M160AC
2	10 µF	C19, C21	1206, capacitors, 50 V, X7R	Samsung	CL31B106KBHNNNE
2	1 µF	C20, C22	0603, capacitors, 50 V, X7R	Taiyo Yuden	UMK107AB7105KA-T
1	N/A	D1	Schottky diode	NXP	RB751CS40,315
1	N/A	GPIO4	SMA connector	Cinch	142-0701-201
2	N/A	GPIOs, SPD 120-pin connector	5-pin header connectors	Samtec	TSW-105-08-G-S
3	N/A	IOUT_HV, IOUT_LV, P3_3V	2-pin header connectors	Amphenol	69157-102HLF
1	N/A	PWR	2-pin power connector	Molex	22-05-3021
1	N/A	PWR1	3-pin power connector	Molex	22-12-2034
5	1 kΩ	R0 to R4	0603, resistors, 0.1 W, 1%	Panasonic	ERJ-3EKF1001V
6	0 Ω	R5 to R10	0603, resistors, 0.1 W, 1%	Vishay	CRCW06030000Z0EA
2	4.99 kΩ	R11, R12	0603, resistors, 0.1 W, 1%	Panasonic	ERJ-3EKF4991V
1	10 Ω	R13	0603, resistor, 0.1 W, 1%	Panasonic	ERJ-3EKF10R0V
2	100 kΩ	R14, R16	0603, resistors, 0.1 W, 1%	Panasonic	ERJ-3EKF1003V
1	N/A	SDP	120-pin board to board connector	Hirose	FX8-120S-SV(21)

[1] N/A means not applicable.

NOTES

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ANALOG DEVICES

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