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Evaluation Board for the [AD7124-4](#) 4-Channel, Low Noise, Low Power, 24-Bit, Sigma-Delta ADC with In-Amp and Reference

FEATURES

Full featured evaluation board for the [AD7124-4](#)
PC control in conjunction with the Analog Devices, Inc.,
System Demonstration Platform ([EVAL-SDP-CB1Z](#))
PC software for control and data analysis (time domain)
Standalone capability

EVALUATION KIT CONTENTS

[EVAL-AD7124-4SDZ](#) evaluation board
Evaluation software CD for the [AD7124-4](#)

ONLINE RESOURCES

Documents Needed

[AD7124-4](#) data sheet
[EVAL-AD7124-4SDZ](#) user guide

Required Software

[AD7124-4 EVAL+ Software](#)

EQUIPMENT NEEDED

[EVAL-AD7124-4SDZ](#) evaluation board
[EVAL-SDP-CB1Z](#) System Demonstration Platform
DC signal source
USB cable
PC running Windows with USB 2.0 port

GENERAL DESCRIPTION

The [EVAL-AD7124-4SDZ](#) evaluation kit features the [AD7124-4](#) 24-bit, low power, low noise analog-to-digital converter (ADC).

A 7 V to 9 V external supply is regulated to 3.3 V to supply the [AD7124-4](#) and to support all necessary components. The [EVAL-AD7124-4SDZ](#) board connects to the USB port of the PC via the connection to the [EVAL-SDP-CB1Z](#) motherboard.

The [AD7124-4 EVAL+ Software](#) fully configures the [AD7124-4](#) device register functionality and provides dc time domain analysis in the form of waveform graphs, histograms, and associated noise analysis for ADC performance evaluation.

The [EVAL-AD7124-4SDZ](#) is an evaluation board that allows the user to evaluate the features of the ADC. The user PC software executable controls the [AD7124-4](#) over the USB through the [EVAL-SDP-CB1Z](#) System Demonstration Platform (SDP) board.

Full specifications on the [AD7124-4](#) are available in the product data sheet, which should be consulted in conjunction with this user guide when working with the evaluation board.

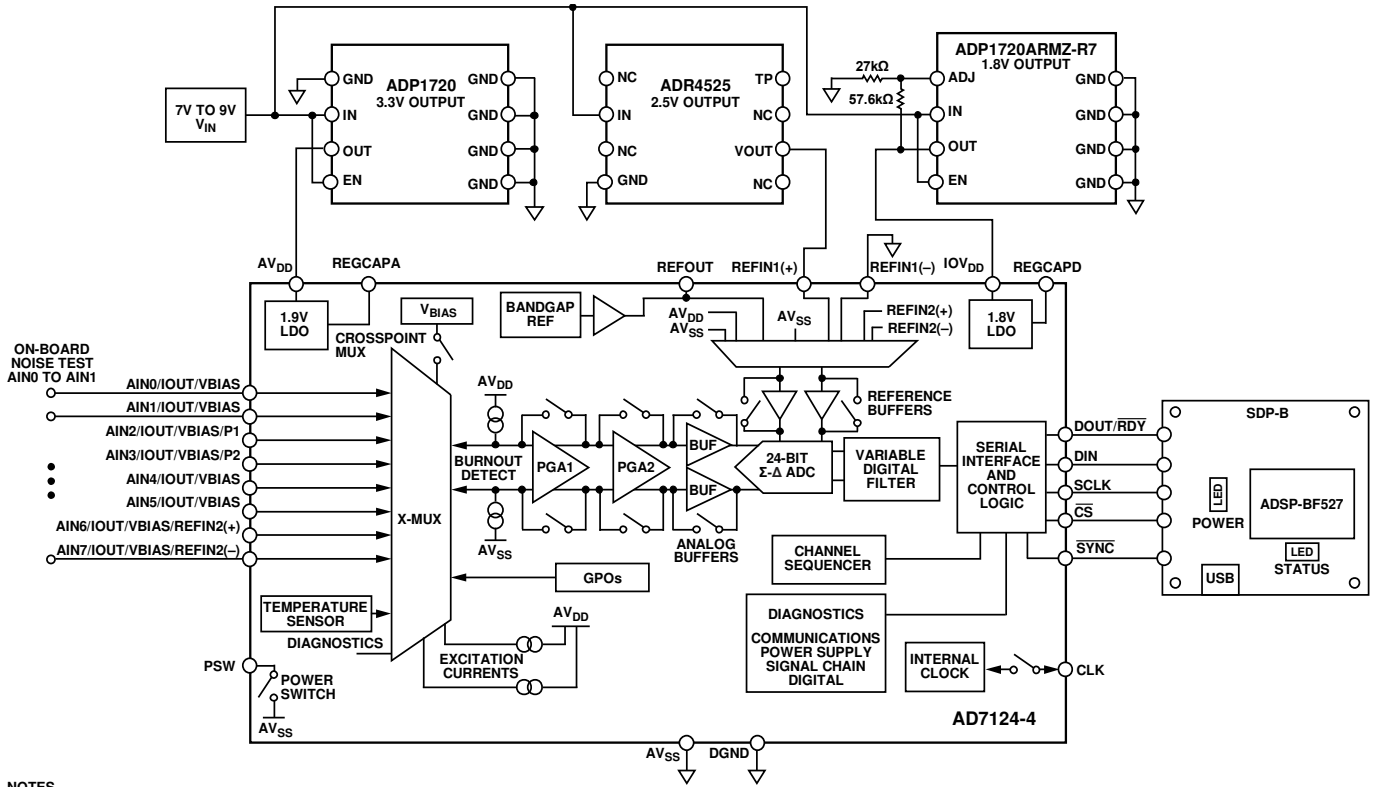
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REVISION HISTORY

7/15—Revision 0: Initial Version

EVAL-AD7124-4SDZ BLOCK DIAGRAM



NOTES
1. FOR SIMPLICITY, DECOUPLING NOT SHOWN.

Figure 1.

13304-001

EVAL-AD7124-4SDZ QUICK START GUIDE

To begin using the evaluation board, do the following:

1. With the [EVAL-SDP-CB1Z](#) board disconnected from the USB port of the PC, install the [AD7124-4 EVAL+ Software](#) (the software is included on the CD in the evaluation kit, or it can be downloaded from the Analog Devices website). The PC must be restarted after the software installation is complete. (For complete software installation instructions, see the Software Installation Procedures section.)
2. Connect the [EVAL-SDP-CB1Z](#) board to the [EVAL-AD7124-4SDZ](#) board.
3. Screw the two boards together using the plastic screw and washer set included in the evaluation board kit to ensure that the boards are connected firmly together.
4. Apply an external voltage in the range of 7 V to 9 V to the J3 or J5 connector of the [EVAL-AD7124-4SDZ](#) board. This provides the power supply for the board.
5. Connect the [EVAL-SDP-CB1Z](#) board to the PC using the supplied USB cable. If you are using Windows® XP, you may need to search for the [EVAL-SDP-CB1Z](#) drivers. Choose to automatically search for the drivers for the [EVAL-SDP-CB1Z](#) board if prompted by the operating system.
6. From the **Programs** menu, go to the **Analog Devices** subfolder, and click **AD7124 Eval+** to launch the [AD7124-4 EVAL+ Software](#) (see the Launching the Software section for further details).



Figure 2. Hardware Configuration, Setting Up the [EVAL-AD7124-4SDZ](#) Evaluation Board

13304-002

EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The [AD7124-4](#) is a low power, low noise, complete analog front end for high precision measurement applications. It contains a low noise, 24-bit, Σ - Δ ADC. It can be configured to have four differential inputs or seven single-ended or pseudo differential inputs. The on-chip low noise instrumentation amplifier means that signals of small amplitude can be interfaced directly to the ADC. Other on-chip features include a low drift 2.5 V reference, excitation currents, reference buffers, multiple filter options, and many diagnostic features.

Complete specifications for the [AD7124-4](#) are provided in the product data sheet, which should be consulted in conjunction with this user guide when using the evaluation board. Full details about the [EVAL-SDP-CB1Z](#) are available on the Analog Devices website.

HARDWARE LINK OPTIONS

Table 1 lists the default link options. By default, the board is configured to operate from a wall wart (dc plug) power supply via Connector J5. The supply required for the [AD7124-4](#) comes from the on-board [ADP1720](#) low dropout regulators (LDOs), which generate their voltage from J5.

Table 1. Default Link and Solder Link Options

Link No.	Default Option	Description
LK1	A	Connects the AV_{DD} voltage to the power supply sequencer, ADM1185 . When AV_{DD} equals 3.3 V, LK1 must be in Position A. When AV_{DD} equals 1.8 V, LK1 must be in Position B.
LK2	B	Selects the connector for the external 7 V to 9 V power supply. In Position A, this link selects the external 7 V to 9 V power supply to come from Connector J3. In Position B, this link selects the external 7 V to 9 V power supply to come from Connector J5.
LK3	Inserted	Inserting this link connects $REFIN(-)$ to AV_{SS} .
LK4	2.5 V	Selects the reference source for the ADC. In Position 2.5 V, $REFIN1(+)$ is connected to the external 2.5 V reference (ADR4525). In Position INT REF, $REFIN1(+)$ is connected to the $REFOUT$ pin of the AD7124-4 . The internal reference of the AD7124-4 can be enabled and applied to the AD7124-4 external to the ADC.
LK5	Inserted	This link shorts $AIN0$ to $AIN1$. This is useful for performing noise tests on the AD7124-4 . The internal bias can be enabled on $AIN0$ or $AIN1$ so that $AIN0$ and $AIN1$ are at an appropriate voltage for the noise test.
LK6	Inserted	LK6 can be used to connect the $AIN4$ and $AIN5$ channels to external components such as an external amplifier. The jumpers in Position A and Position B at LK6 must be opened to include the external component on the front end. Jumper A and Jumper B of this link can be used to connect the $AIN4$ and $AIN5$ channels to external components such as an external amplifier. For this, the jumpers must be open. Having Jumper A and Jumper B in place connects $AIN4$ and $AIN5$ to on-board thermistor used for cold junction measurements.
SL2	A	Sets the voltage applied to the AV_{DD} pin. In Position A, this link sets the voltage applied to the AV_{DD} pin to be a 3.3 V supply from the ADP1720-3.3 (U7) regulator or a 2.5 V supply from the ADP1720 (U4) regulator. In Position B, this link sets the voltage applied to the AV_{DD} pin to be supplied from an external voltage source via Connector J9.
SL3, SL7	A, A	With SL3 and SL7 in Position A, AV_{DD} is supplied with 3.3 V from the ADP1720-3.3 (U7) regulator. With SL3 and SL7 in Position B, AV_{DD} is supplied with 1.8 V from the ADP1720 (U4) regulator.
SL5	B	With this link in Position A, the IOV_{DD} supply is provided from an external source via Connector J9. With this link in Position B, the 3.3 V supply is generated by the ADP1720-3.3 (U10) regulator. The evaluation system operates with 3.3 V logic.
AV_{SS} to AGND		When these links are inserted, AV_{SS} is tied to AGND. When AV_{SS} is set to -1.8 V, these links must be removed.

On-Board Connectors

Table 2 provides information about the external connectors on the [EVAL-AD7124-4SDZ](#).

Table 2. On-Board Connectors

Connector	Function
J1	A 120-pin connector that mates with the EVAL-SDP-CB1Z (controller board).
J2	Straight PCB mount SMB/SMA jack for master clock (not inserted). The EVAL-AD7124-4SDZ has the footprint to include an SMA/SMB connector, if an external clock source is being used to provide the master clock to the ADC.
J3	Bench top power supply voltage input. Apply 7 V to 9 V and GND (0 V) to this connector to power the evaluation board.
J5	Wall wart (dc plug) power supply voltage input. Apply 7 V to 9 V and GND (0 V) to this connector to power the evaluation board.
J6	Analog input connector. Connections to AIN0 to AIN5 are available along with REFIN1(±) connections. This connector can be used to connect an RTD to the AD7124-4 .
J9	Optional external connector, allowing external bench top or alternative supply for AV _{DD} and IOV _{DD} . When split supplies are used, AV _{SS} is supplied externally via J9.
J11	Analog input connector. Connections to AIN6 to AIN7 are available along with REFIN1(±) and analog power supply connections. This connector can be used to connect a load cell to the AD7124-4 .
J12	6-pin connector. Provides an I ² C interface to allow the SDP to interface to a digital temperature sensor. This is required if a thermocouple is interfaced to the AD7124-4 using Connector A2.
J13	7-pin connector that can be used to connect an external amplifier to Channel AIN4/Channel AIN5.
J14	7-pin connector that allows connection to the AIN4 and AIN5 pins.
A0	Straight PCB mount SMB/SMA jack. The footprint for an SMA/SMB connector is included on the evaluation board to provide the signal to the AIN4 analog input.
A1	Straight PCB mount SMB/SMA jack. The footprint for an SMA/SMB connector is included on the evaluation board to provide the signal to the AIN5 analog input.
A2	Thermocouple connector. This connector is required if a thermocouple is being interfaced to the evaluation board.
A5	Straight PCB mount SMB/SMA jack. The footprint for an SMA/SMB connector is included on the evaluation board to provide the REFIN1(+) signal.
A6	Straight PCB mount SMB/SMA jack. The footprint for an SMA/SMB connector is included on the evaluation board to provide the REFIN1(-) signal.

POWER SUPPLIES

The evaluation board requires that an external power supply—either a bench top supply or a wall wart (dc plug) supply—be applied to J3 or J5 (see Table 3 for more information). Linear regulators generate the required power supply levels from the applied V_{IN} rail. The regulators used are the [ADP1720-3.3](#) (U7) and the [ADP1720](#) (U4), which supply 3.3 V and 1.8 V, respectively, to AV_{DD} of the ADC. The 3.3 V [ADP1720](#) (U10) delivers 3.3 V to the IOV_{DD} pin of the [AD7124-4](#).

When a split power supply is used, the AV_{SS} voltage must be applied from an external source via Connector J9. AV_{DD} and IOV_{DD} can also be provided via Connector J9. However, the 7 V to 9 V supply is still required because the on-board reference ([ADR4525](#)) is supplied from this power supply.

Each supply is decoupled at the point where it enters the board and again at the point where it connects to each device (see the schematics shown in Figure 26 to Figure 29 to identify decoupling points).

SERIAL INTERFACE

The [EVAL-AD7124-4SDZ](#) evaluation board connects via the serial peripheral interface (SPI) to the Blackfin® [ADSP-BF527](#) on the [EVAL-SDP-CB1Z](#). There are four primary signals: CS, SCLK, DIN, and $DOUT/\overline{RDY}$ (all are inputs, except for $DOUT/\overline{RDY}$, which is an output).

To operate the [EVAL-AD7124-4SDZ](#) in standalone mode, the [AD7124-4](#) serial interface lines can be disconnected from the 120-pin header by removing the 0 Ω links, R9 through R13. The test points can then be used to fly-wire the signals to an alternative digital capture setup.

ANALOG INPUTS

The [EVAL-AD7124-4SDZ](#) primary analog inputs can be applied in two ways:

- Using J6 and J11, the green screw in terminal connectors
- Using the A0 and A1 SMB/SMA footprints on the evaluation board, which connect to the AIN4 and AIN5 analog inputs.

The [AD7124-4 EVAL+ Software](#) is set up to analyze dc inputs to the ADC.

Table 3. Required External Power Supply¹

Power Supply (V_{IN}) Applied To	Voltage Range	Function
J3	7 V to 9 V	Bench top supply to the evaluation board. Supplies LDOs that create the 3.3 V and 1.8 V rails. It also supplies the ADR4525 external reference. Ensure that LK2 is set to Position A when the external power supply is applied to this connector.
J5	7 V to 9 V	Wall wart (dc plug) supply to the evaluation board. Supplies LDOs that create the 3.3 V and 1.8 V rails. It also supplies the ADR4525 external reference. Ensure that LK2 is set to Position B when the external power supply is applied to this connector.

¹ Only a single supply is required, either J3 or J5. This supply can be selected using LK2.

REFERENCE OPTIONS

The EVAL-AD7124-4SDZ includes an external 2.5 V reference (the ADR4525) and an internal 2.5 V reference. The default operation is to use the external reference input, which is set to accept the 2.5 V ADR4525 on the evaluation board.

The reference used for a conversion is selected by choosing the reference in the configuration registers associated with Setup 0 to Setup 7. Switch between using the internal reference and external reference by accessing the AD7124-4 registers through the pop-up windows (discussed in more detail in the following sections) via the evaluation software. Figure 3 shows how to select the reference source for Setup 0 to Setup 7. Figure 4 shows the ADC_CONTROL register setting that enables the internal reference.

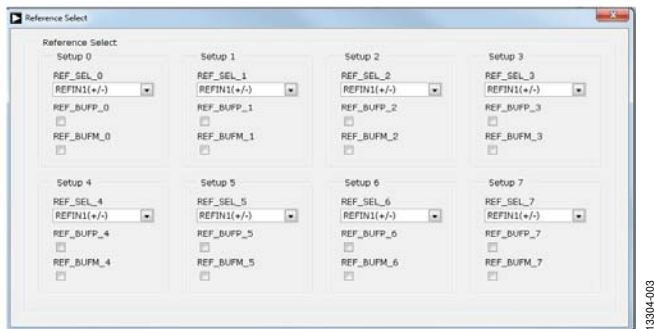


Figure 3. Selecting the Reference Source

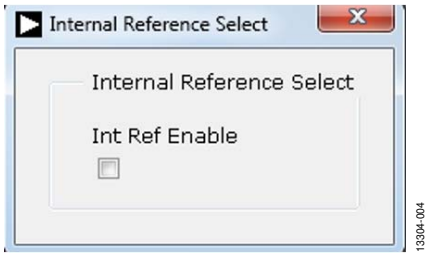


Figure 4. Enabling the Internal 2.5 V Reference

EVALUATION BOARD SETUP PROCEDURES

After following the instructions in the Software Installation Procedures section, set up the evaluation and SDP boards as detailed in this section.

Warning

The evaluation software and drivers must be installed before connecting the evaluation board and EVAL-SDP-CB1Z board to the USB port of the PC to ensure that the evaluation system is correctly recognized when it is connected to the PC.

Configuring the Evaluation and SDP Boards

1. Connect the EVAL-SDP-CB1Z board to Connector A or Connector B on the EVAL-AD7124-4SDZ board. Screw the two boards together using the plastic screw and washer set included in the evaluation board kit to ensure that the boards are connected firmly together.
2. Connect the power supplies to the EVAL-AD7124-4SDZ board. The EVAL-AD7124-4SDZ board, by default, uses the wall wart (dc plug) supply that accompanies the evaluation kit. Connect this supply to J5 on the EVAL-AD7124-4SDZ board. (For more information about the required connections and available options, see the Power Supplies section.)
3. Connect the EVAL-SDP-CB1Z board to the PC using the supplied USB cable.

EVALUATION BOARD SOFTWARE SOFTWARE INSTALLATION PROCEDURES

The EVAL-AD7124-4SDZ evaluation kit includes a CD containing software to be installed on the PC before using the evaluation board.

There are two procedures in the installation:

- AD7124-4 EVAL+ Software installation
- EVAL-SDP-CB1Z SDP board drivers installation

Warning

The evaluation software and drivers must be installed before connecting the evaluation board and EVAL-SDP-CB1Z board to the USB port of the PC to ensure that the evaluation system is correctly recognized when it is connected to the PC.

Installing the AD7124-4 EVAL+ Software

To install the AD7124-4 EVAL+ Software, do the following:

1. With the EVAL-SDP-CB1Z board disconnected from the USB port of the PC, insert the installation CD into the CD-ROM drive.
2. Double-click the **setup.exe** file to begin the evaluation board software installation. The software installs to the following default location: **C:\Program Files\Analog Devices\AD7124 EVAL+**.
3. A dialog box appears asking for permission to allow the program to make changes to your PC. Click **Yes**.

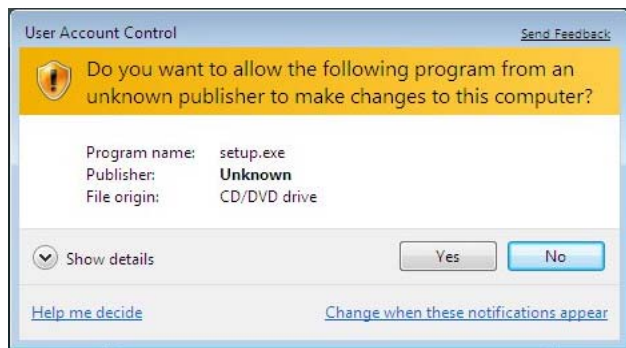


Figure 5. AD7124-4 EVAL+ Software Installation: Granting Permission for the Program to Make Changes to Your PC

4. Select the location to install the software, and then click **Next**. (Figure 6 shows the default locations, which are displayed when the window opens; you can select another location by clicking **Browse**.)

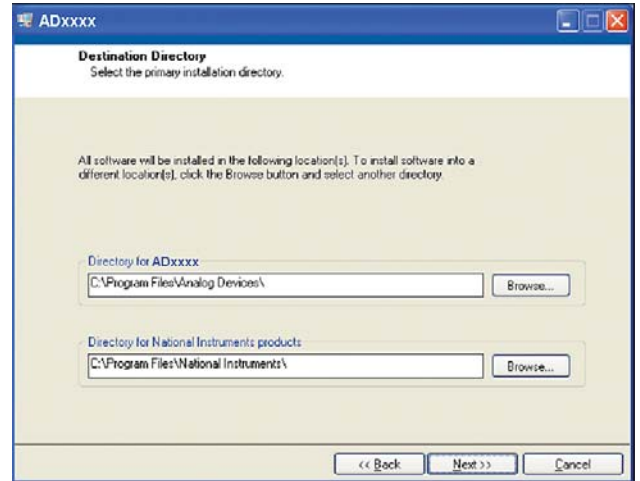


Figure 6. AD7124-4 EVAL+ Software Installation: Selecting the Location for Software Installation

5. A license agreement appears. Read the agreement, select **I accept the License Agreement**, and click **Next**.

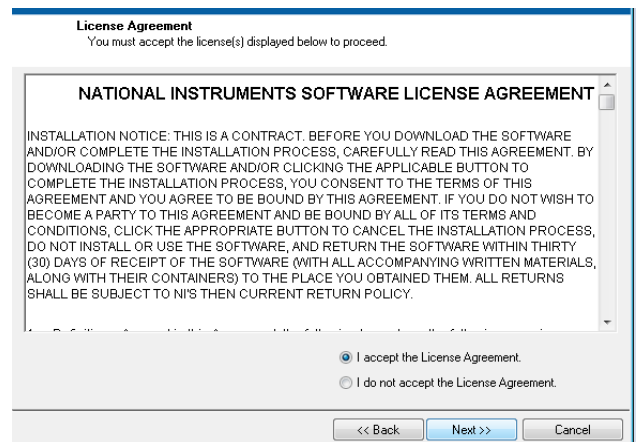


Figure 7. AD7124-4 EVAL+ Software Installation: Accepting the License Agreement

6. A summary of the installation displays. Click **Next** to continue.

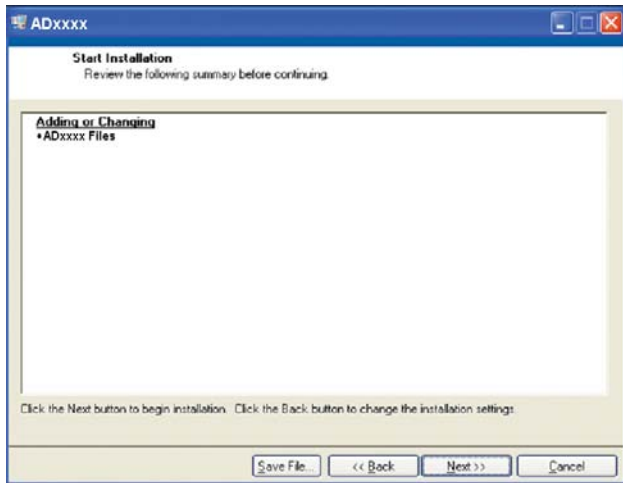


Figure 8. AD7124-4 EVAL+ Software Installation: Reviewing a Summary of the Installation

7. The message in Figure 9 appears when the installation is complete. Click **Next**.

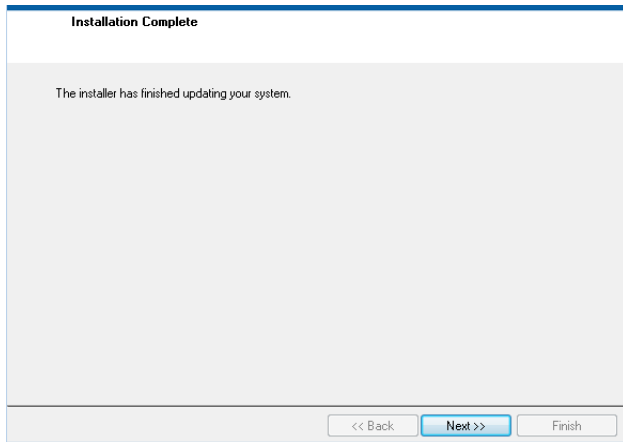


Figure 9. AD7124-4 EVAL+ Software Installation: Indicating When the Installation Is Complete

Installing the EVAL-SDP-CB1Z System Demonstration Platform Board Drivers

After the installation of the evaluation software is complete, a welcome window displays for the installation of the SDP board drivers.

1. With the EVAL-SDP-CB1Z board still disconnected from the USB port of the PC, make sure that all other applications are closed, and then click **Next**.

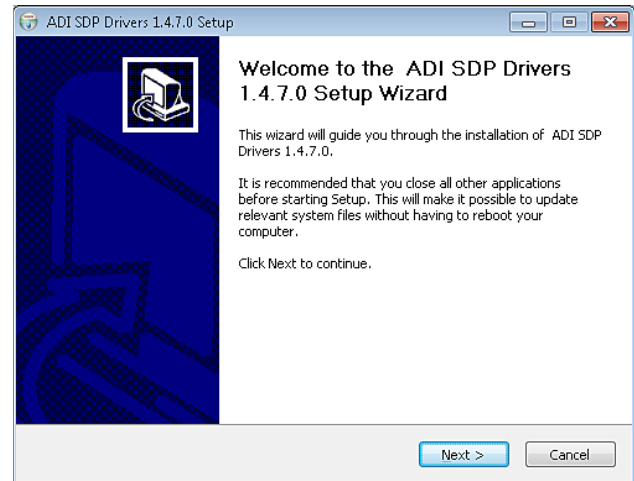


Figure 10. EVAL-SDP-CB1Z Drivers Setup: Beginning the Drivers Installation

2. Select the location to install the drivers, and then click **Next**.

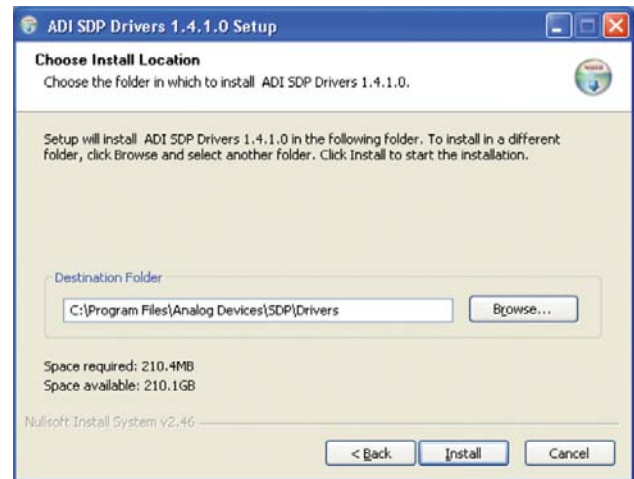


Figure 11. EVAL-SDP-CB1Z Drivers Setup: Selecting the Location for Drivers Installation

3. Click **Install** to confirm that you want to install the drivers.

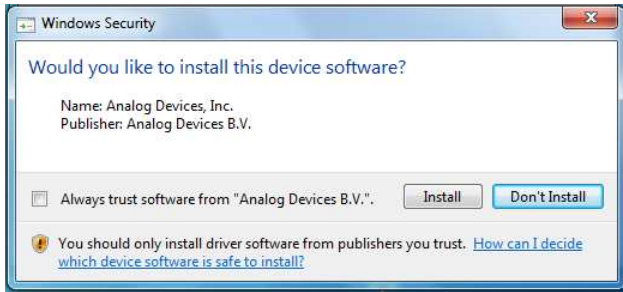


Figure 12. EVAL-SDP-CB1Z Drivers Setup: Granting Permission to Install Drivers

4. To complete the drivers installation, click **Finish**, which closes the setup wizard.



Figure 13. EVAL-SDP-CB1Z Drivers Setup: Completing the Drivers Setup Wizard

5. Before using the evaluation board, you must restart the PC.

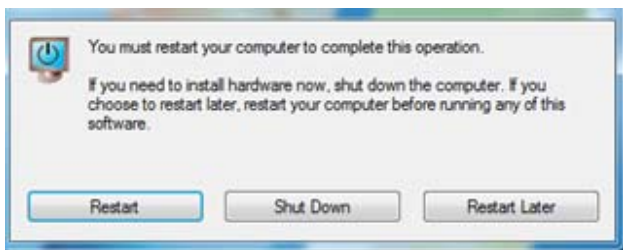


Figure 14. EVAL-SDP-CB1Z Drivers Setup: Restarting the PC

Setting Up the System for Data Capture

After completing the steps in the Software Installation Procedures and Evaluation Board Hardware sections, set up the system for data capture as follows:

1. Allow the **Found New Hardware Wizard** to run after the **EVAL-SDP-CB1Z** board is plugged into your PC. (If you are using Windows XP, you may need to search for the **EVAL-SDP-CB1Z** drivers. Choose to automatically search for the drivers for the **EVAL-SDP-CB1Z** board if prompted by the operating system.)
2. Check that the board is connecting to the PC correctly using the **Device Manager** of the PC.
3. Access the **Device Manager** as follows:
 - a. Right-click **My Computer** and then click **Manage**.
 - b. A dialog box appears asking for permission to allow the program to make changes to your PC. Click **Yes**.
 - c. The **Computer Management** window appears. From the list of **System Tools**, click **Device Manager** (see Figure 15).
 - d. The **EVAL-SDP-CB1Z** board should appear under **ADI Development Tools**, which indicates that the driver software is installed and that the board is connecting to the PC correctly.

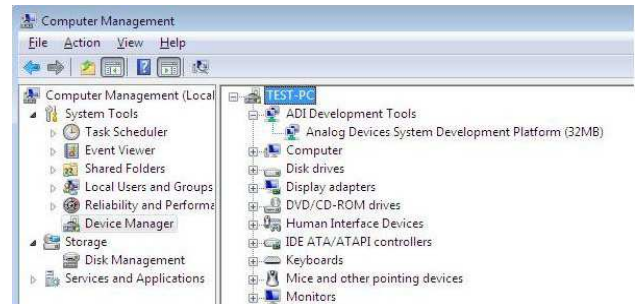


Figure 15. Device Manager: Checking that the Board Is Connected to the PC Correctly

Launching the Software

After completing the steps in the Setting Up the System for Data Capture section, launch the [AD7124-4 EVAL+ Software](#) as follows:

1. From the **Start** menu, click **Programs > Analog Devices > AD7124 Eval+ > AD7124 Eval+**. The dialog box in Figure 19 appears; select **EVAL-AD7124-4SDZ**, and the main window of the software then displays as shown in Figure 20.
2. If the [AD7124-4](#) evaluation system is not connected to the USB port via the [EVAL-SDP-CB1Z](#) when the software is launched, a connectivity error displays (see Figure 16). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and then follow the on-screen instructions.

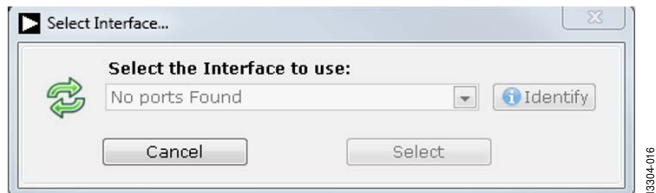


Figure 16. Connectivity Error Alert

When the software starts running, it searches for hardware connected to the PC. A dialog box indicates when the generic SDP attached to the PC is detected, and then the main window appears (see Figure 20). Press the RESET button on the SDP board, as shown in Figure 17.



Figure 17. SDP Connectivity Board—RESET Button

Pressing the RESET button causes the software to rescan for a connected SDP board. If found, the message shown in Figure 18 displays.



Figure 18. Connectivity when SDP and Evaluation Boards are Found

SOFTWARE OPERATION

Overview of the Main Window

The evaluation software supports both the [AD7124-4](#) and the [AD7124-8](#) devices. On running the software, the user selects the evaluation board that is connected to the PC. For the [AD7124-4](#), select **EVAL-AD7124-4SDZ** from the drop-down list, as shown in Figure 19.

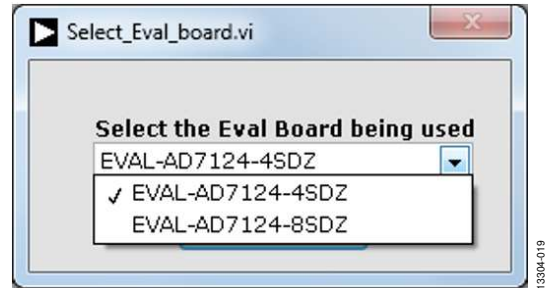


Figure 19. EVAL-AD7124-4SDZ Evaluation Board Selection

After selecting the [EVAL-AD7124-4SDZ](#) evaluation board, the main window of the evaluation software displays, as shown in Figure 20. Figure 20 shows the significant control buttons and analysis indicators of the [AD7124-4 EVAL+ Software](#). The main window of the [AD7124-4 EVAL+ Software](#) contains four tabs:

- Configuration
- Waveform
- Histogram
- Register Map

CONFIGURATION TAB

The **Configuration** tab shows a block diagram of the [AD7124-4](#). It allows the user to set up the ADC, reset the ADC, read the diagnostics to see errors present, as well as configure the device for different demo modes. Figure 20 shows the **Configuration** tab in more detail, and the following sections discuss the different elements on the **Configuration** tab of the software window.

ADC Reset

Click **ADC RESET** (Label 2) to perform a software reset of the [AD7124-4](#). There is no hardware reset pin on the [AD7124-4](#). A hard reset can be performed by removing power to the board. The software reset has the same effect as a hard reset.

Selecting External Reference

There are a number of different options that can be used when selecting the reference to the [AD7124-4](#). Two options are **AV_{DD}** and **Refin1(+/-)** (Label 3). The **Refin1(+/-)** field sets the external reference voltage that is connected between **REFIN1(+)** and **REFIN1(-)**. Using the [EVAL-AD7124-4SDZ](#) evaluation board, the **AV_{DD}** voltage is 3.3 V. Either of these can be used in calculating the results on the **Waveform** and **Histogram** tabs. The evaluation board has an external 2.5 V [ADR4525](#) reference, which can be bypassed; if bypassing the [ADR4525](#) on board, be sure to change the external reference voltage value in **Refin1(+/-)** to ensure correct calculation of results in the **Waveform** and **Histogram** tabs.

Tutorial Button

Clicking TUTORIAL (Label 4) opens a tutorial on using the software, which provides additional information on using the AD7124-4 EVAL+ Software.

Functional Block Diagram

The functional block diagram of the ADC (Label 5) shows each of the functional blocks within the ADC. Clicking a configuration button on this graph opens the configuration popup window for that block.

Configuration Pop-Up Button

Each configuration pop-up button (Label 6) opens a different window allowing configuration of the relevant functional block.

CONFIG SUMMARY

Clicking CONFIG SUMMARY (Label 7) displays the channel configuration, information on the individual setups, as well as information on any error present. These tabs can be used to quickly check how the ADC channels are configured, as well as any errors that are present.

Demo Modes

The AD7124-4 EVAL+ Software supports a number of demo modes (Label 8); these demo modes configure the AD7124-4 for each of the modes shown. A help file is available for each demo mode; to access this help file, click the question mark button.

Status Bar

The status bar (Label 9) displays status updates such as Analysis Completed, Reset Completed, and Configuring Demo Mode during software use, as well as the software version and the Busy indicator.

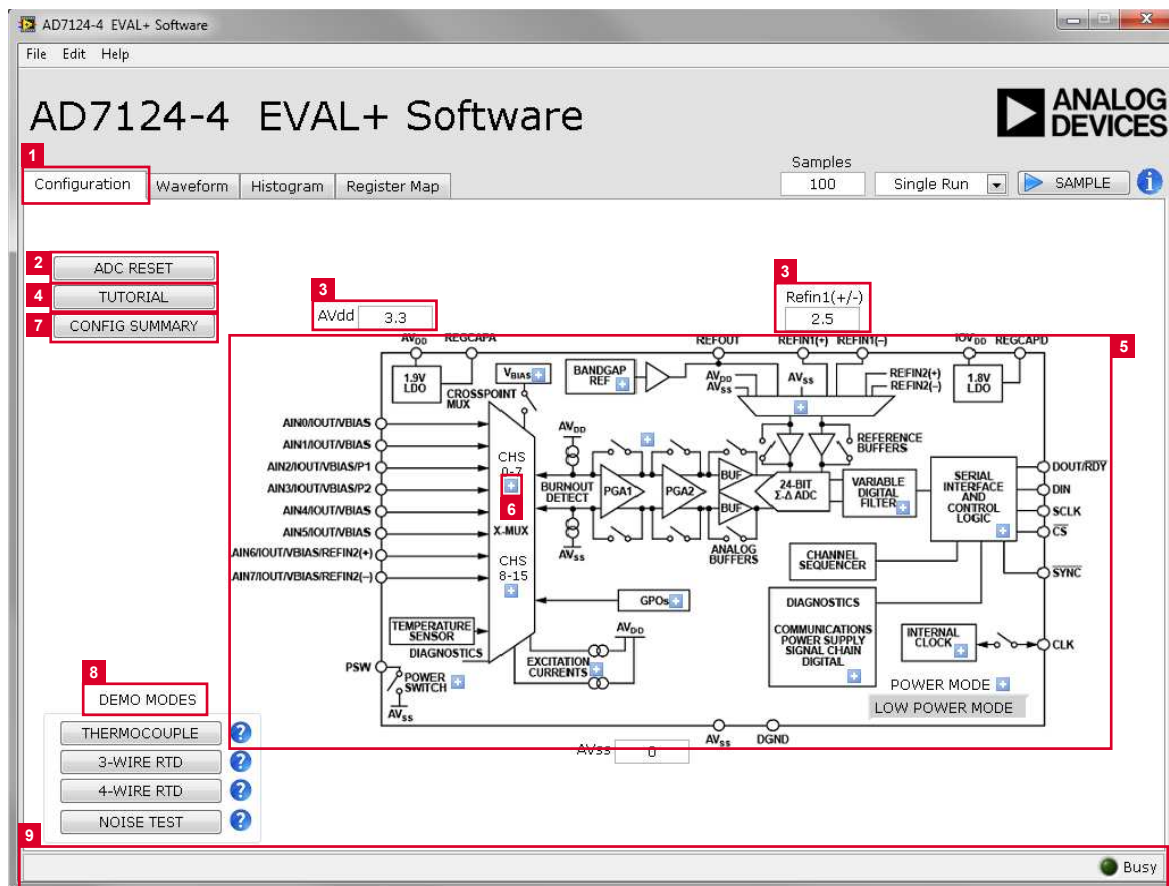


Figure 20. Configuration Tab of the AD7124-4 EVAL+ Software

WAVEFORM TAB

The **Waveform** tab graphs the conversions and processes the data, calculating the p-p noise, rms noise, and resolution (see Figure 21).

Waveform Graph and Controls

The data waveform graph (Label 1) shows each successive sample of the ADC output. Zoom in on the data using the control toolbar (Label 2) in the graph. Change the scales on the graph by typing values into the x-axis and y-axis.

Analysis Channel

The **Noise Analysis** section and histogram graph show the analysis of the channel selected via the **Analysis Channel** control (Label 3).

Samples

The **Samples** numeric control (Label 4) and batch control (Label 5) set the number of samples gathered per batch and whether a single batch or multiple batches of samples are gathered. This control is unrelated to the ADC mode. The user can capture a defined sample set or continuously gather batches of samples. In both cases, the number of samples set in the **Samples** numeric input dictates the number of samples.

Sample

Click **SAMPLE** (Label 6) to start gathering ADC results. Results appear in the waveform graph (Label 1).

Channel Selection

The channel selection control (Label 7) chooses which channels display on the data waveform, and also shows the analog inputs for the channel labeled next to the on and off controls. These controls only affect the display of the channels and have no effect on the channel settings in the ADC register map.

Display Units and Axis Controls

Click the **Display Units** drop-down list (Label 8) to select whether the data graph displays in units of voltages or codes. This control affects both the waveform graph and the histogram graph. The axis controls can be switched between dynamic and fixed. When dynamic is selected, the axis automatically adjusts to show the entire range of the ADC results after each batch of sample. When fixed is selected, the user can program the axis ranges; the axis ranges do not automatically adjust after each batch of sample.

CRC Error and Overall Error

The **CRC Error** LED indicator (Label 9) illuminates when a cyclic redundancy check (CRC) error is detected in the communications between the software and the [AD7124-4](#). The CRC functionality on the [AD7124-4](#) is disabled by default and must be enabled for this indicator to work. The **Error Present** LED indicates if an overall error is present in the diagnostics register. For this indicator to work, the check for the different diagnostic errors must be enabled in the Error_EN register.

Noise Analysis

The **Noise Analysis** section (Label 10) displays the results of the noise analysis for the selected analysis channel, which includes both noise and resolution measurements.

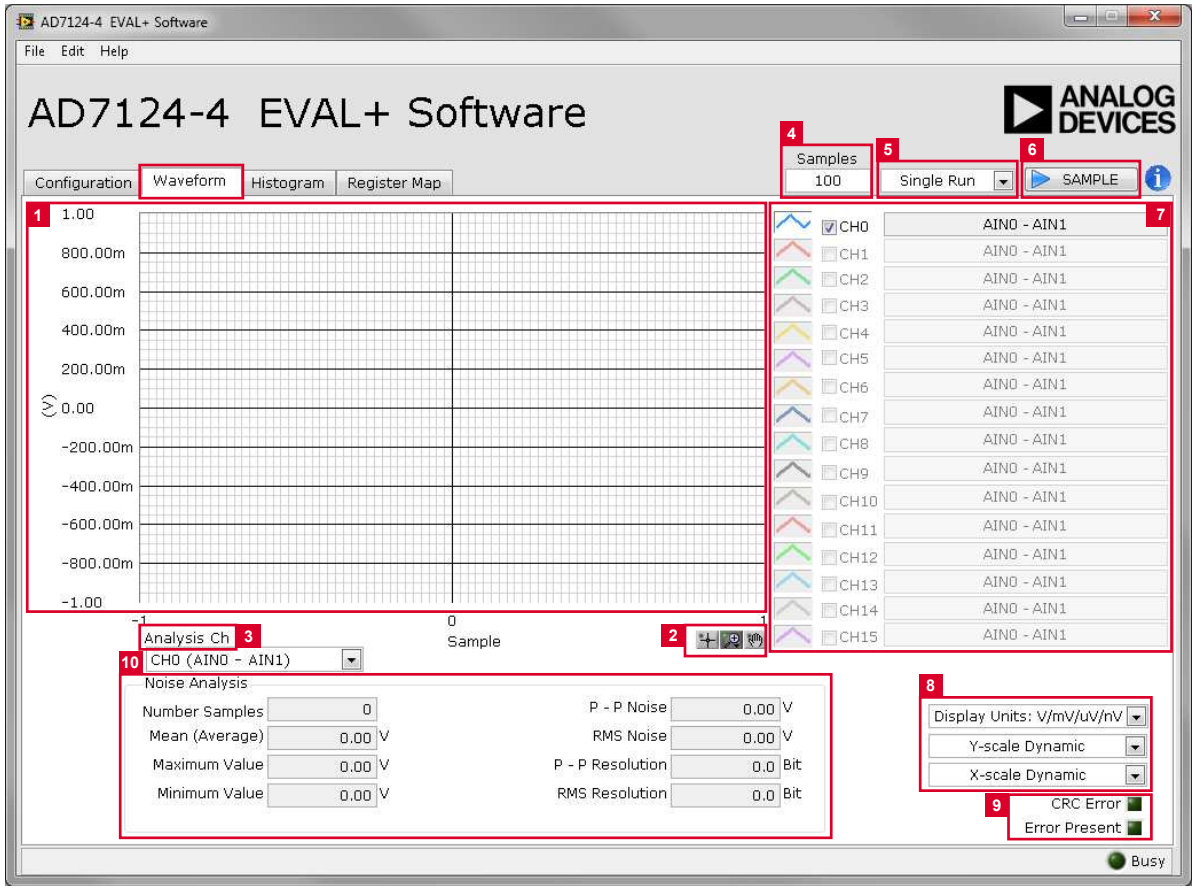


Figure 21. Waveform Tab of the AD7124-4 EVAL+ Software

HISTOGRAM TAB

The **Histogram** tab generates a histogram using the gathered samples and processes the data, calculating the peak-to-peak noise, rms noise, and resolution (see Figure 22).

Histogram Graph and Controls

The data histogram graph (Label 1) shows the number of times each sample of the ADC output occurs. Zoom in on the data using the control toolbar (Label 6) in the graph. Change the scales on the graph by typing values into the x-axis and y-axis.

Analysis Channel

The **Noise Analysis** section and histogram graph show the analysis of the channel selected via the **Analysis Channel** control (Label 2).

Noise Analysis

The **Noise Analysis** section (Label 3) displays the results of the noise analysis for the selected analysis channel, which includes both noise and resolution measurements.

Display Units and Axis Controls

Click the **Display Units** drop-down list (Label 4) to select whether the data graph displays in units of voltages or codes. This control affects both the waveform graph and the histogram graph. The axis controls can be switched between dynamic and fixed. When dynamic is selected, the axis automatically adjusts to show the entire range of the ADC results after each batch of sample. When fixed is selected, the user can program the axis ranges; the axis ranges do not automatically adjust after each batch of sample.

CRC Error and Overall Error

The **CRC Error** LED indicator (Label 5) illuminates when a cyclic redundancy check (CRC) error is detected, in the communications between the software and the AD7124-4. The CRC functionality on the AD7124-4 is disabled by default and must be enabled for this indicator to work. The **Error Present** LED (Label 5) indicates if an overall error is present in the diagnostics register. For this indicator to work, the check for the different diagnostic errors must be enabled in the Error_EN register.

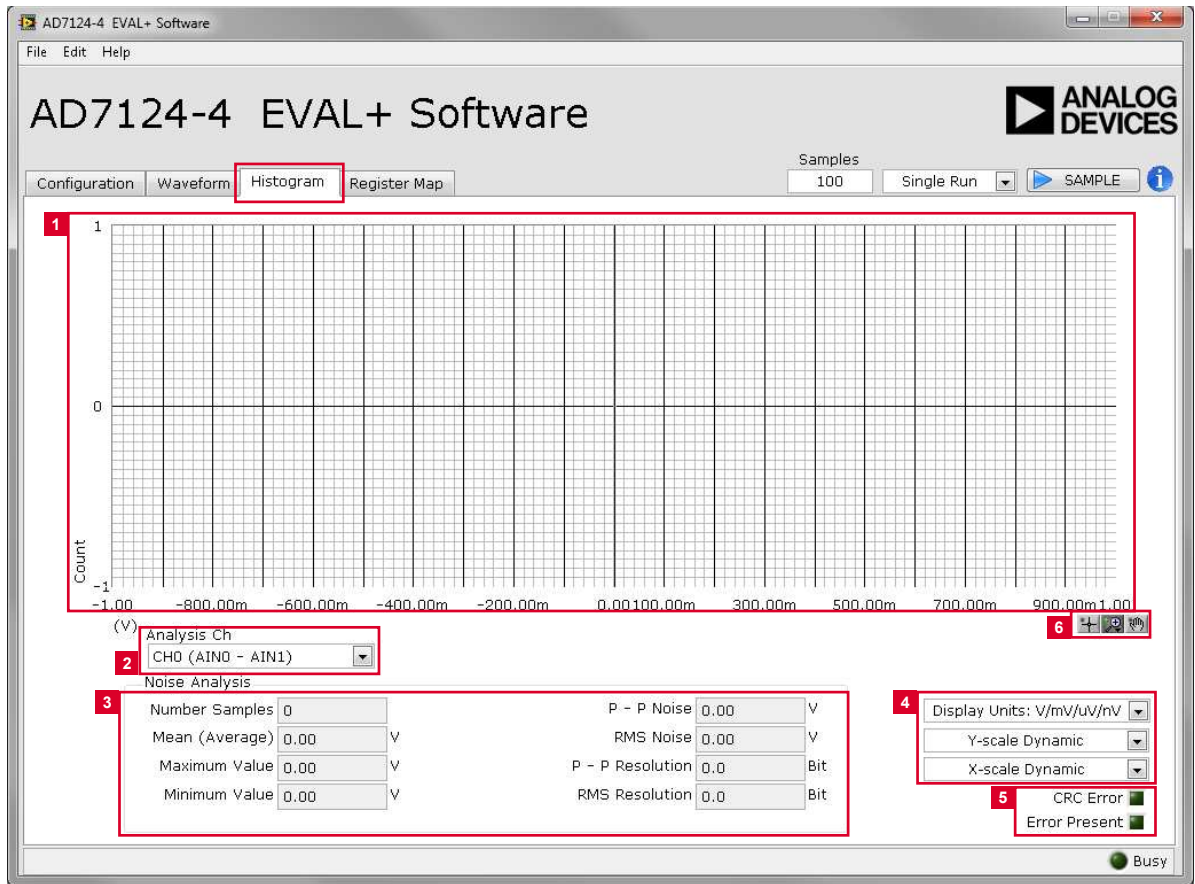


Figure 22. Histogram Tab of the AD7124-4 EVAL+ Software

REGISTER MAP TAB

Use the **Register Map** tab to access the registers of the [AD7124-4](#). Figure 23 shows the view when **Register Map** tab is selected. This tab can be used to quickly change register settings and also to obtain additional information about each of the bits in each of the individual registers.

Register Map

On the left-hand side of Figure 23 are the registers of the [AD7124-4](#). Click any register to read the register value. Each register of the [AD7124-4](#) can be accessed quickly using this register map (Label 1).

Save and Load Buttons

The **Save** and **Load** buttons (Label 2) in the **Register Map** tab allow the user to save and load register settings. Click **Save** to save all the current register settings to a file for use again later. Click **Load** to load a previously saved register map.

Register

The **Register** section (Label 3) shows the value that is currently set in the selected register. The value of the register can be

checked in this section by clicking the bits that are to be changed. Clicking any of the individual bit changes that bit from 1 to 0 or 0 to 1, depending on the initial state of the bit. The register value can also be changed by writing the hex value to the input field on the right-hand side of the individual bits.

Bitfields

The individual bitfields of the selected register are shown in the **Bitfields** section (Label 4). In this section, the register is broken by name into its bitfields, name of the bitfields, a description of each of each bitfield, as well as the access information. The options for the individual bitfields can be viewed by clicking the arrow next to the bitfield. Changing the bitfield value can also be done through this drop-down list. The value of the bitfield can also be changed by writing the appropriate hex value to the associated **Value** input field on the right-hand side of the bitfield.

Documentation

The **Documentation** section (Label 5) shows information relating to the different bit fields when selected from the register map section on the left. This information is the same information that is presented in the [AD7124-4](#) data sheet.

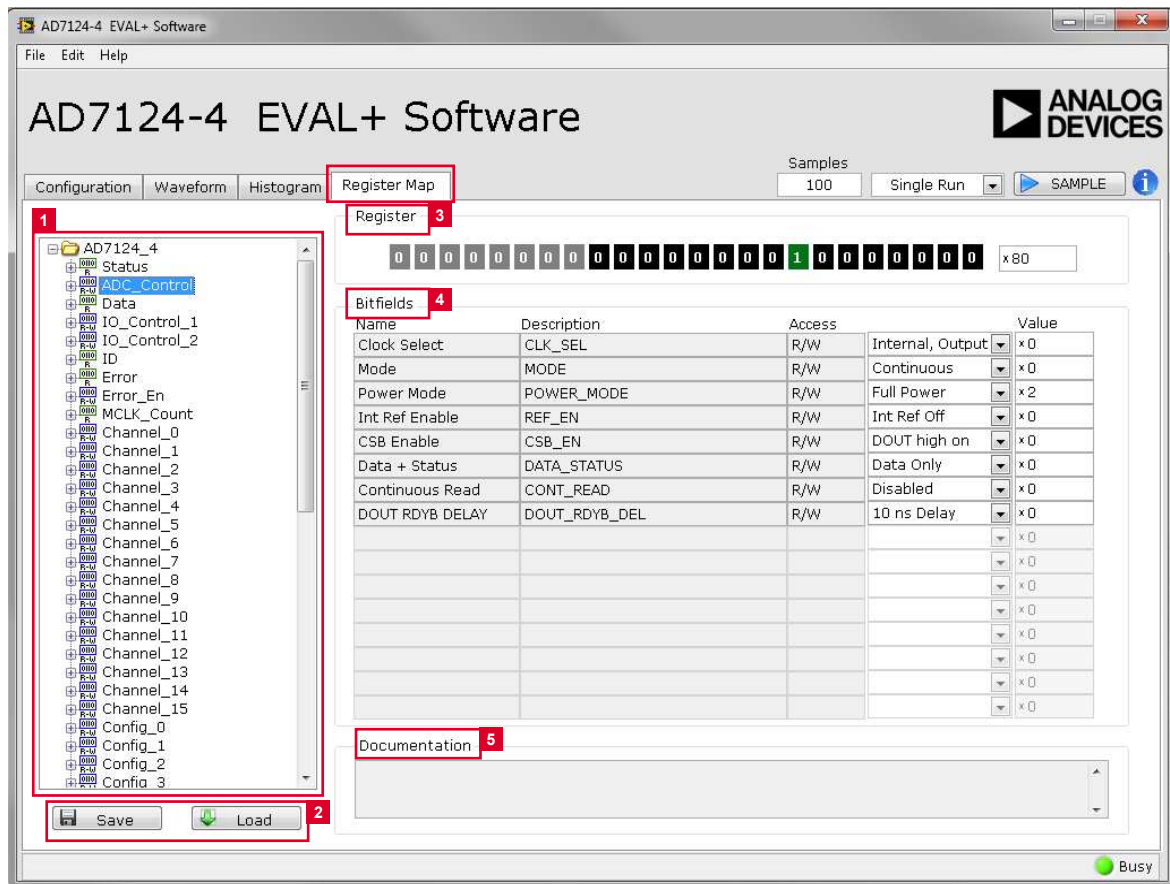


Figure 23. Register Map Tab of the AD7124-4 EVAL+ Software

NOISE TEST—QUICK START DEMONSTRATION

Click the **NOISE TEST** demo button to configure the device for the noise test. The **AD7124-4** is now configured for the noise test demo, where the output data rate is set to 9.38 SPS, with the sinc⁴ digital filter, full power mode of operation, and the REFIN1(±) external reference selected. Gain and offset are the default factory values following a reset.

To gather samples, change the **Samples** field to the number of samples required value, then click **SAMPLE** to acquire the samples from the ADC. Figure 24 shows an example of the main window after running a noise test.

Reading Samples from the ADC

The evaluation board is set up to use the external 2.5 V on-board reference (**ADR4525**). To read samples from the ADC, take the following steps:

1. The value in the **Refin1(+/-)** field on the **Configuration** tab is set to 2.5 V by default to use the external 2.5 V on-board reference (**ADR4525**). If a different reference is used, set the value in the **Refin1(+/-)** field accordingly. The analysis results are based on the value set in this field.
 - a. When **Single Run** is selected from the drop-down list, a batch of samples is read when **SAMPLE** is clicked, with the batch size being set by the value in the **Samples** box.

- b. When the drop-down box is set to **Continuous Run**, the software performs a continuous capture from the ADC when **SAMPLE** is clicked.
 - c. Click **Stop** to stop streaming data.
2. Use the navigation tools within each graph to control the cursor, zooming, and panning.

Waveform

The waveforms resulting from the gathered samples are shown in this tab. The waveform graph shows each successive sample of the ADC output (input referred). The indicators beside this graph show the channels being converted. Navigation tools are provided to allow the user to control the cursor, zooming, and panning. The conversions can be displayed as codes or as volts.

Parameters such as peak-to-peak noise and rms noise are displayed below the graph in the **Analysis** section for the current batch of samples. If several analog input channels are enabled, each enabled channel can be selected and the conversions on that channel analyzed using **Analysis Channel**.

The conversion data can be saved in a text file from the **File** menu. To save the data into an Excel file, right-click the waveform graph and select **Export Data** from the drop-down list that appears. A **Save** dialog box displays, prompting the user to save the data to an appropriate folder location.

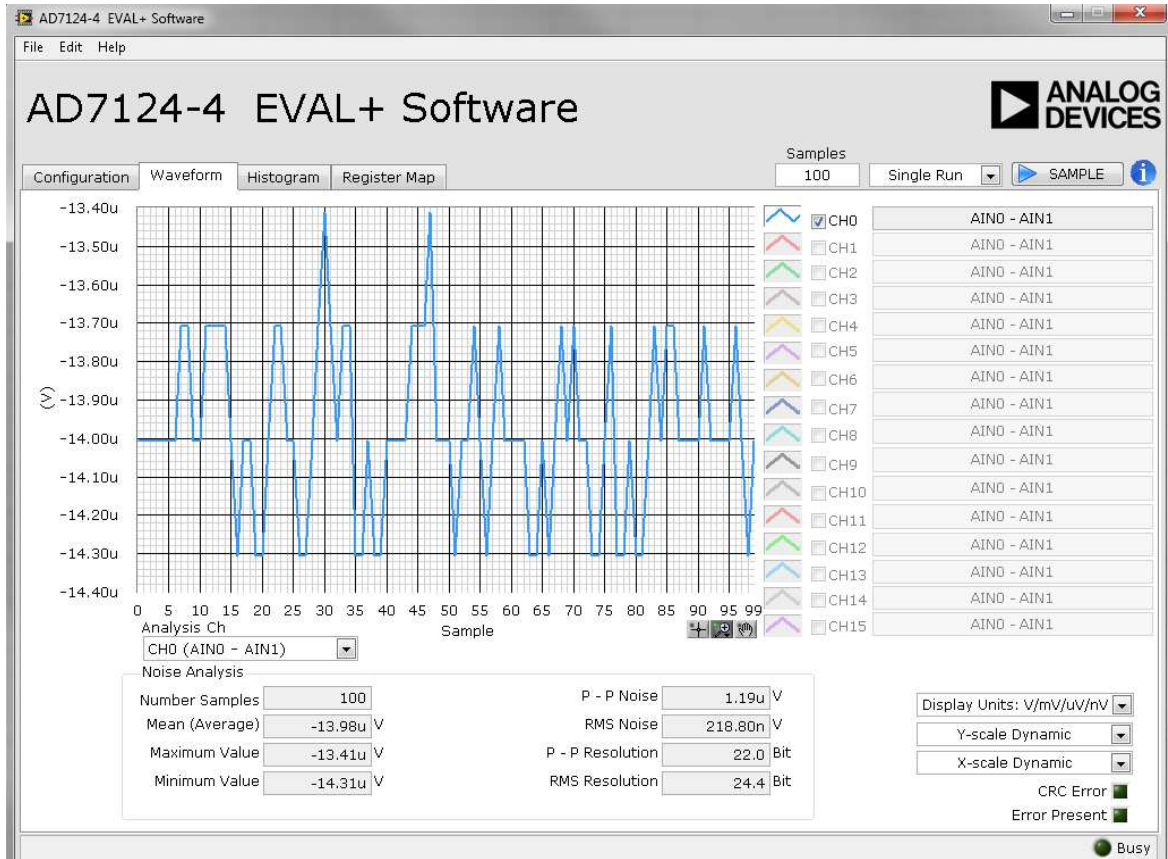


Figure 24. Example of the **Waveform** Tab After Running a Noise Test

Histogram

This tab shows the histogram analysis. The indicators beside this graph show the channels being converted. Navigation tools are provided to allow you to control the cursor, zooming, and panning. The conversions can be displayed as codes or as volts.

Parameters such as peak-to-peak noise and rms noise are displayed in the **Analysis Results** section for the current batch of samples.

The conversion data can be saved in a text file from the **File** at menu. To save the data into an Excel file, right-click the histogram graph and select **Export Data** from the drop-down list that appears. A **Save** dialog box displays, prompting the user to save the data to an appropriate folder location.

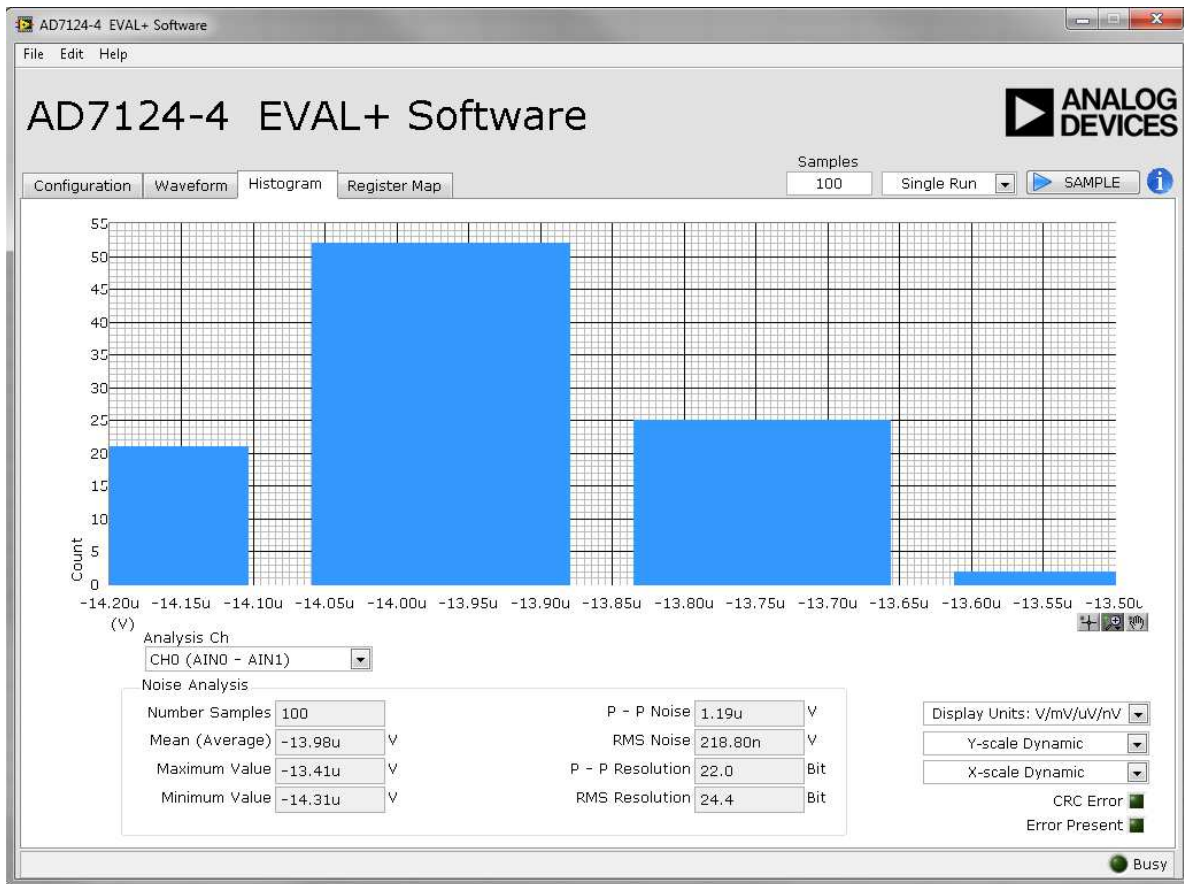


Figure 25. Example of the **Histogram** Tab After Running a Noise Test

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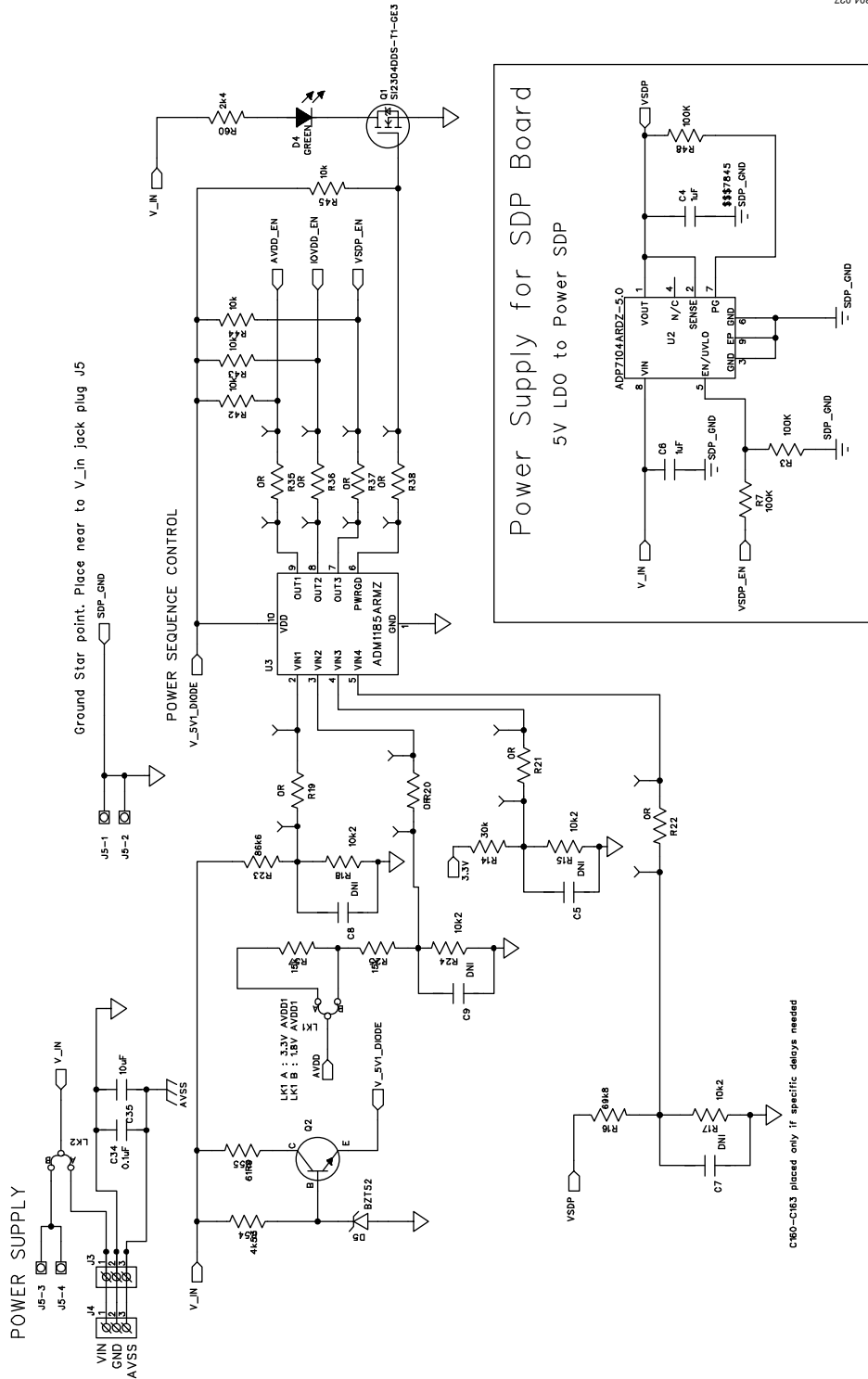


Figure 27. Schematic—Power Supply

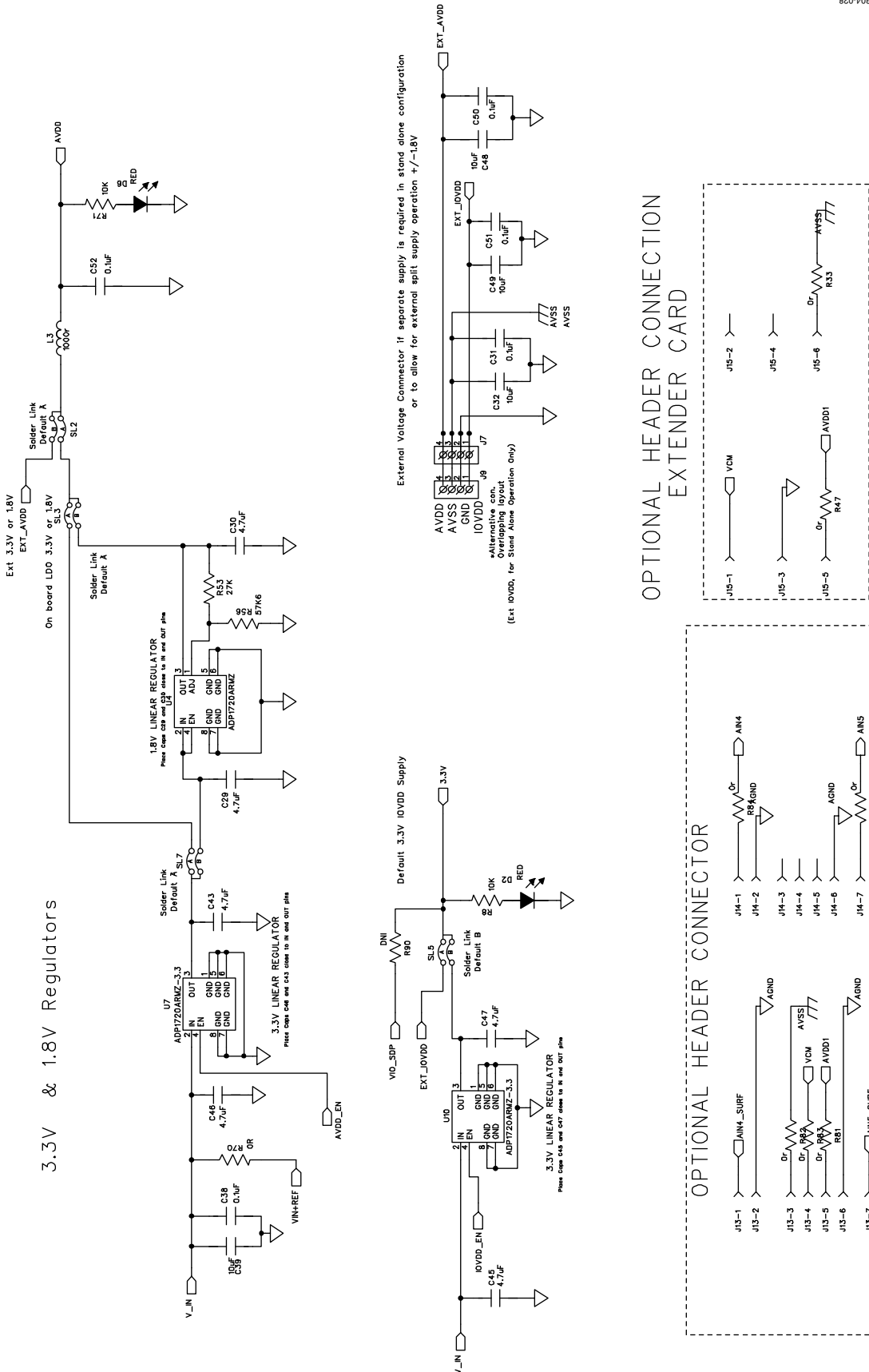


Figure 28. Schematic—Regulators

SDP CONNECTOR EEPROM-SW/USB ID

VIO: USE to set IO voltage max draw 20mA
 VIN: Use this pin to power the SDP requires 4-7V 200mA
 BMODE: Pull up with a 10K resistor to set SDP to boot from a SPI FLASH on the daughter board

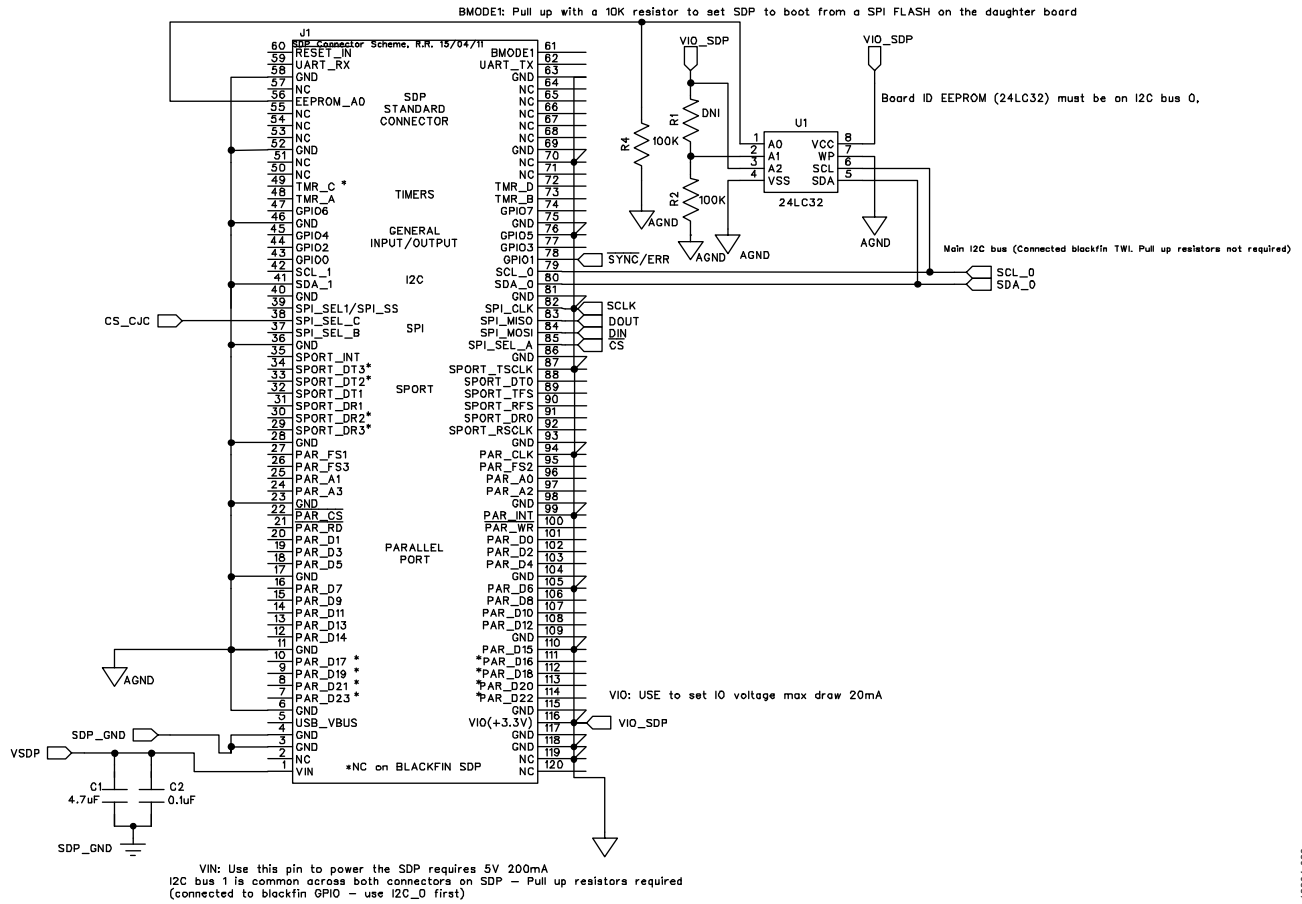


Figure 29. Schematic—SDP

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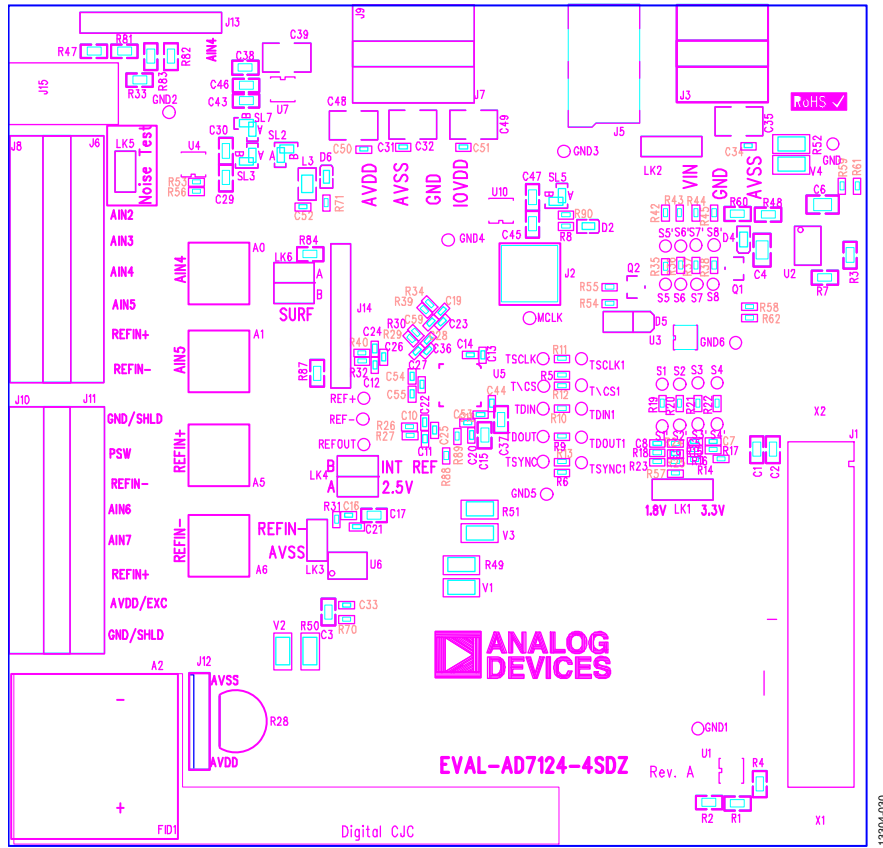


Figure 30. Top Printed Circuit Board (PCB) Silkscreen

13304-030

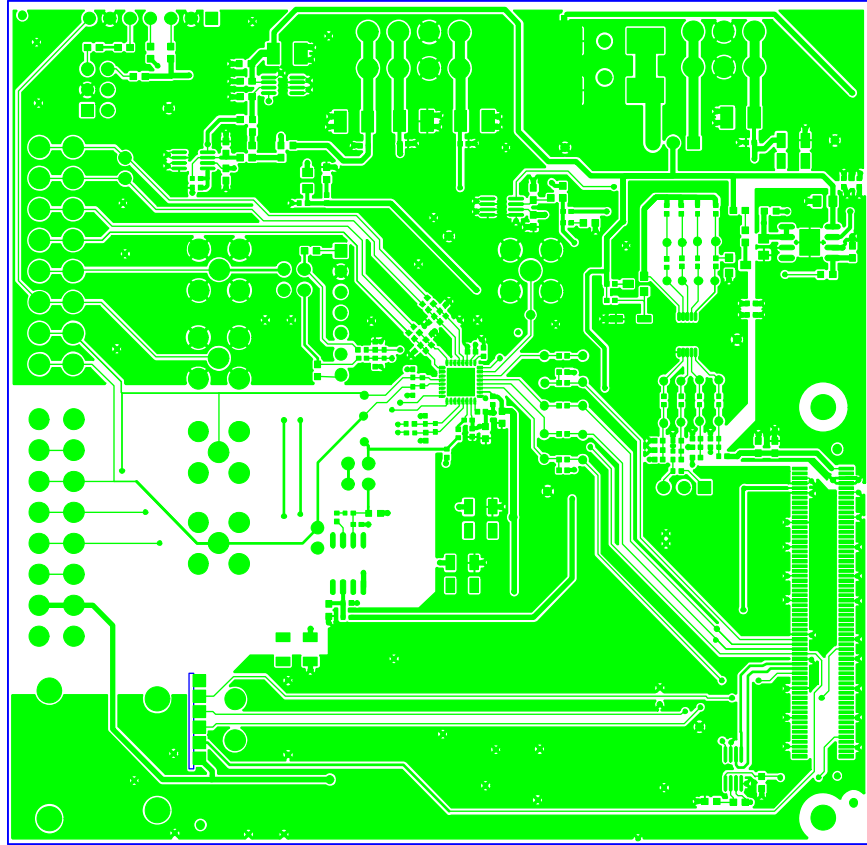


Figure 31. Layer 1—Component Side

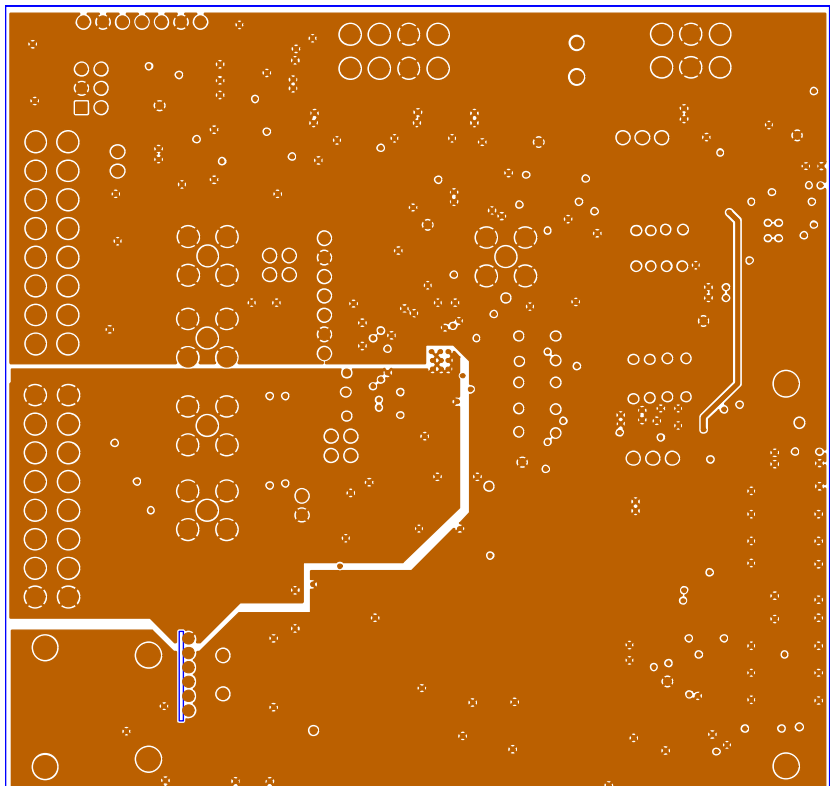


Figure 32. Layer 2—Ground Plane