EVAL-AD7903SDZ User Guide

UG-609

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Evaluating the AD7903 Dual Differential, 16-Bit, 1 MSPS PulSAR ADC

FEATURES

Full featured evaluation board for the AD7903
Versatile analog signal conditioning circuitry
On-board reference, reference buffers, and ADC drivers
System demonstration board compatible (EVAL-SDP-CB1Z)
PC software for control and data analysis of time and frequency domain

EVALUATION KIT CONTENTS

EVAL-AD7903SDZ evaluation board
Wall power supply 9 V dc adapter
Daughter card power connector

ADDITIONAL EQUIPMENT/SOFTWARE NEEDED

System demonstration platform (EVAL-SDP-CB1Z)
Precision analog signal source
Power supply, +7 V/−2.5 V (optional)
USB cable
SMA cable
PC running Windows XP SP2, Windows Vista, Windows 7, or higher with USB 2.0 port
Evaluation software for the AD7903 (download from AD7903 product page)

ONLINE RESOURCES

Documents Needed
AD7903 data sheet
EVAL-AD7903SDZ user guide
Required Software
EVAL-AD7903SDZ evaluation software
FAQs and Troubleshooting

TYPICAL SETUP

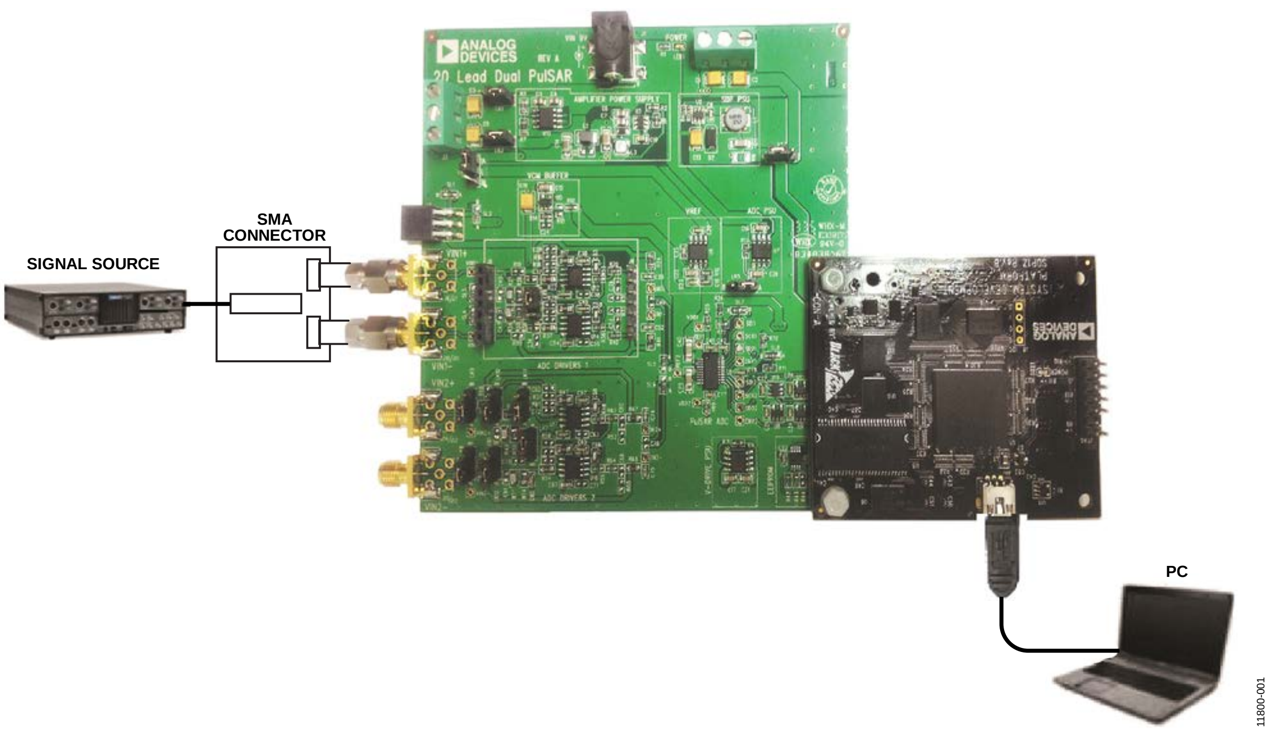

Figure 1. Typical Setup for the EVAL-AD7903SDZ (EVAL-AD7903SDZ on Left and EVAL-SDP-CB1Z on Right)

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REVISION HISTORY

1/14—Revision 0: Initial Version

GENERAL DESCRIPTION

The EVAL-AD7903SDZ is an evaluation board designed to demonstrate the low power AD7903 performance and to provide an easy to understand interface for a variety of system applications. The AD7903 is a dual differential 16-bit, 1 MSPS PulSAR® ADC. A full description of the AD7903 is available in the AD7903 data sheet and should be consulted when using this evaluation board.

The evaluation board is ideal for use with the Analog Devices, Inc., system demonstration platform (SDP) board, EVAL-SDP-CB1Z. The evaluation board interfaces to the SDP board via a 120-pin connector. SMA Connectors J6, J7, J10, and J15 are provided to connect a low noise analog signal source.

The user PC software executable controls the evaluation board over the USB through the SDP board, EVAL-SDP-CB1Z.

On-board components include the following:

- ADR435: high precision, buffered band gap 5.0 V reference
- AD8031: reference buffer
- ADA4841-1: signal conditioning circuit with op amps
- ADP7104 and ADP2301: regulators to derive necessary voltage levels on board

GETTING STARTED

SOFTWARE INSTALLATION PROCEDURES

The evaluation board software can be downloaded from the AD7903 product page on the Analog Devices website, at www.analog.com.

There are two parts to the installation:

- AD7903 evaluation board software installation
- EVAL-SDP-CB1Z system demonstration platform board drivers installation

Warning

The evaluation board 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 AD7903 Evaluation Board Software

To install the AD7903 evaluation board software,

1. Start the Windows operating system and download the software from the AD7903 product page on the Analog Devices website, at www.analog.com.
2. Unzip the downloaded file.
3. Double-click the **setup.exe** file to begin the evaluation board software installation (see Figure 2).

11800-002

Figure 2. AD7903 Evaluation Board Software Installation: Installation Begins

4. Select the location to install the software, and then click **Next**. (The default location is **C:\Program Files (x86)\Analog Devices\AD7902_03 Evaluation Software**. This location also contains the executable software and example files.)

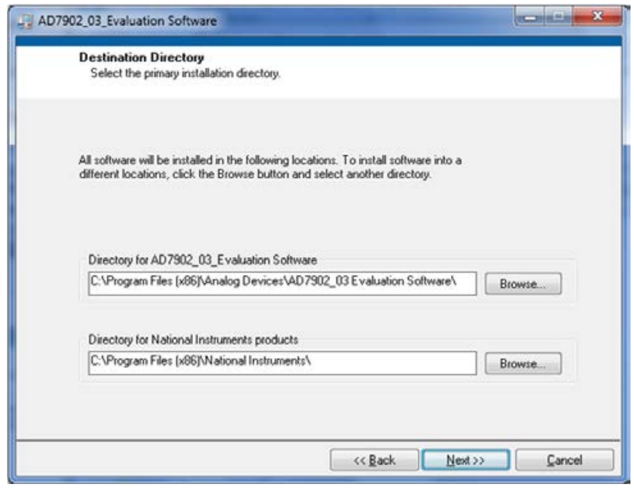

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Figure 3. AD7903 Evaluation Board Software Installation: Selecting the Location for Software Installation (the Default Location Is Shown)

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

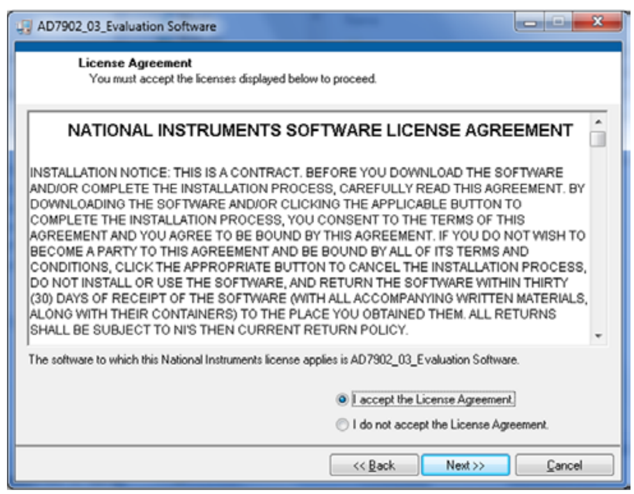

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Figure 4. AD7903 Evaluation Board Software Installation: Accepting the License Agreement

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

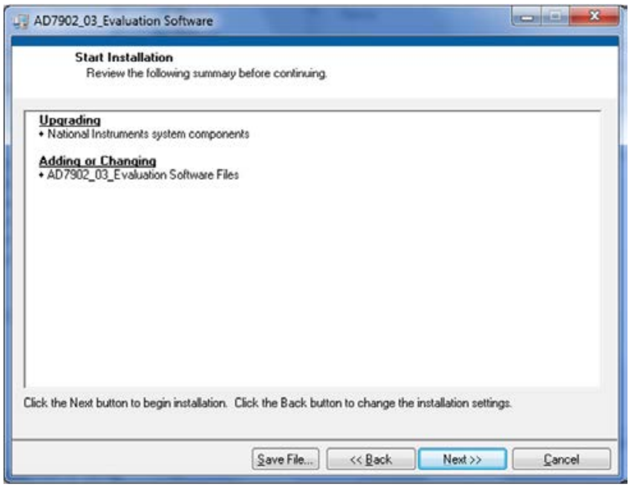

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Figure 5. AD7903 Evaluation Board Software Installation: Reviewing a Summary of the Installation

7. A dialog box shows the installation progress.

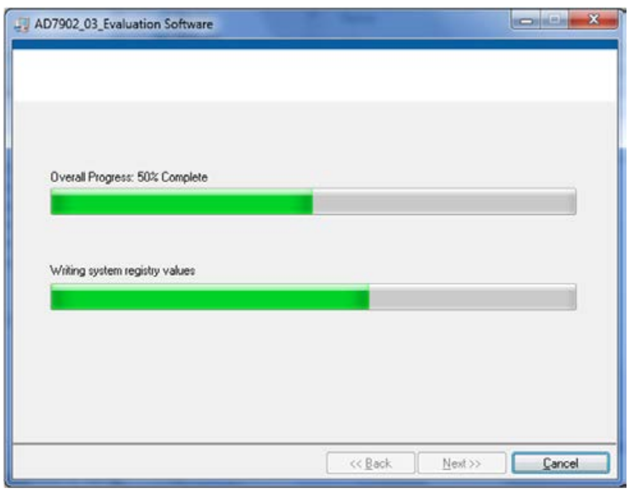

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Figure 6. AD7903 Evaluation Board Software Installation: Displaying Installation Progress

8. The dialog box informs you when the installation is complete. Click **Next**.

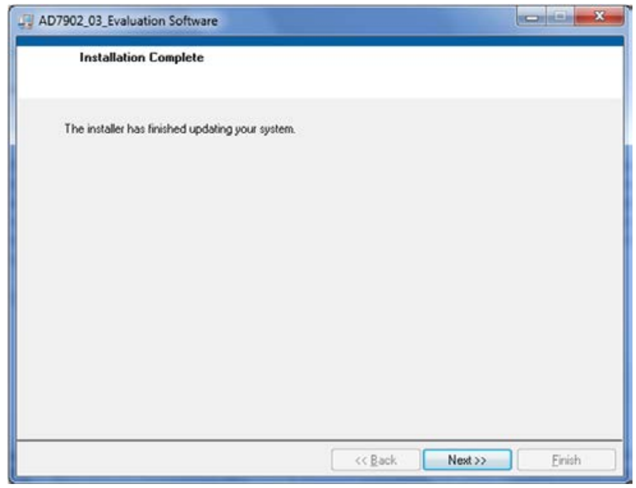

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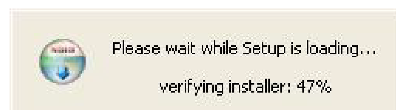
Figure 7. AD7903 Evaluation Board Software Installation: Indicating When the Installation Is Complete

9. The setup for the installation of the EVAL-SDP-CB1Z system demonstration platform board drivers automatically begins to load.



11800-008

Figure 8. Loading the Setup for SDP Drivers Installation

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

After the installation of the evaluation board software is complete, a welcome window is displayed for the installation of the EVAL-SDP-CB1Z system demonstration platform board drivers.

1. Make sure that all other applications are closed, and then click **Next**.

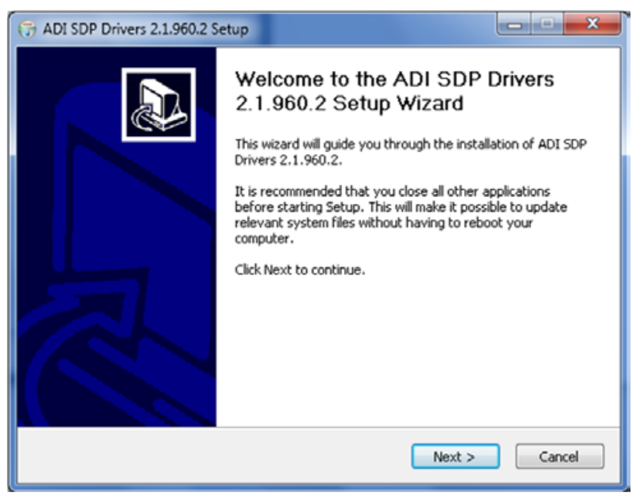


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Figure 9. EVAL-SDP-CB1Z Drivers Setup: Beginning the Drivers Installation

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

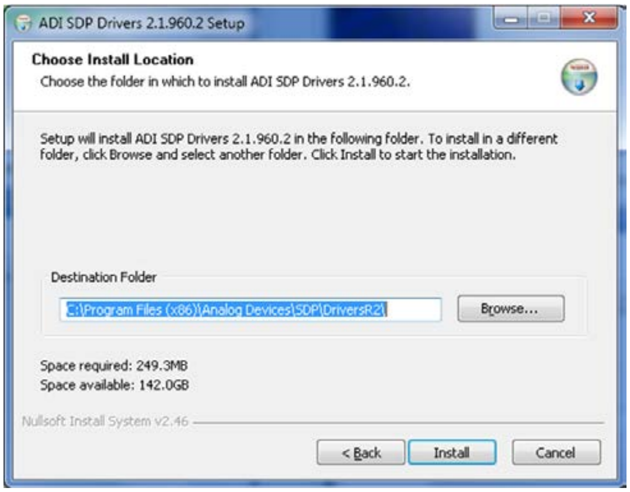

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Figure 10. EVAL-SDP-CB1Z Drivers Setup: Selecting the Location for Drivers Installation

3. Installation of the SDP drivers begins.

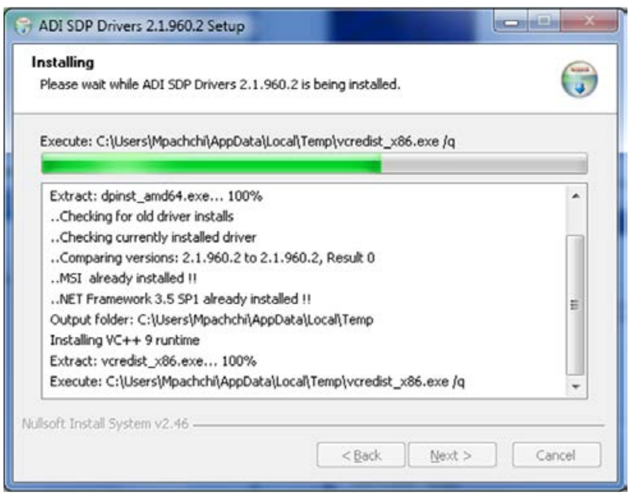

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Figure 11. EVAL-SDP-CB1Z Drivers Setup: Beginning the Installation

4. A dialog box appears asking whether you would like to install this device software. Click **Install** to confirm that you would like to install the drivers.

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

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

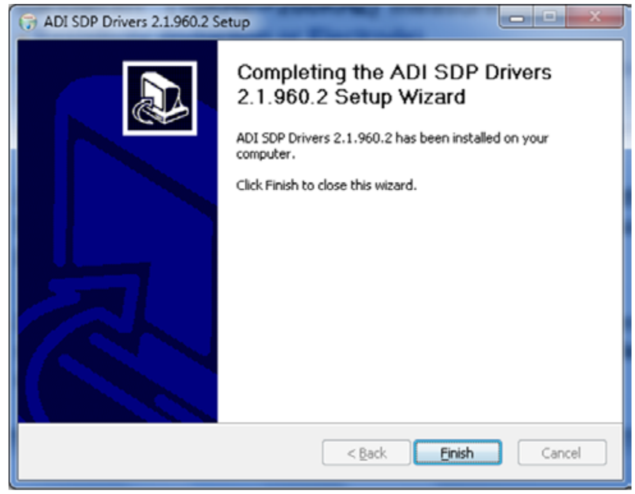

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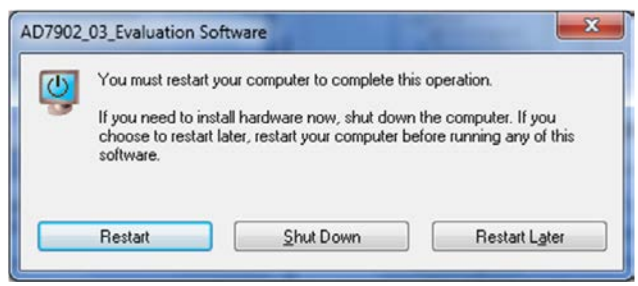
Figure 13. EVAL-SDP-CB1Z Drivers Setup: Completing the Drivers Setup Wizard

6. Before using the evaluation board, you must restart your computer. A dialog box opens, giving you the following options: **Restart**, **Shut Down**, **Restart Later**. Click the appropriate button.



11800-014

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

EVALUATION BOARD SETUP PROCEDURES

The AD7903 evaluation board connects to the (EVAL-SDP-CB1Z) system demonstration board. The EVAL-SDP-CB1Z board is the controller board, which is the communication link between the PC and the main evaluation board.

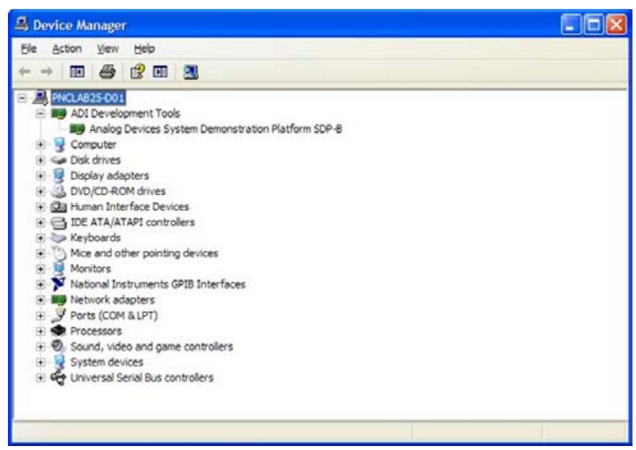
Figure 1 shows a photograph of the connections made between the EVAL-AD7903SDZ daughter board and the EVAL-SDP-CB1Z motherboard.

Connecting the Evaluation and SDP Boards to a PC

1. Install the AD7903 software. Ensure that the EVAL-SDP-CB1Z board is disconnected from the USB port of the PC while installing the software. The PC must be restarted after the installation is complete.
2. Before connecting power, connect the 120-pin connector, J5, of the EVAL-AD7903SDZ board to Connector J4 on the EVAL-SDP-CB1Z board. Nylon screws are included in the EVAL-AD7903SDZ evaluation kit and can be used to ensure that the EVAL-AD7903SDZ and EVAL-SDP-CB1Z boards are connected firmly together.
3. Connect the 9 V power supply adapter included in the kit to the EVAL-SDP-CB1Z.
4. Connect the EVAL-SDP-CB1Z board to the PC via the 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.)

Verifying the Board Connection

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 connected to the PC correctly using the **Device Manager** of the PC.
   a. Access the **Device Manager** as follows:
      i. Right-click **My Computer** and then click **Manage**.
      ii. A dialog box appears asking for permission to allow the program to make changes to your computer. Click **Yes**.
      iii. The **Computer Management** box appears. From the list of **System Tools**, click **Device Manager**.
   b. Under **ADI Development Tools**, **Analog Devices System Development Platform SDP-B** should appear (see Figure 15), indicating that the EVAL-SDP-CB1Z driver software is installed and that the board is connected to the PC correctly.



11800-015

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

EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The AD7903 is a 16-bit, 1 MSPS, precision, power efficient, dual differential PulSAR ADC that uses SAR-based architecture and does not exhibit any pipeline delay or latency. The AD7903 is specified for use with a single supply of 2.5 V (VDD1, VDD2). The interface from the digital host to the AD7903 uses 1.8 V/ 2.5 V/3.3 V/5.5 V logic. The AD7903 is compatible with the SPI/QSPI/MICROWIRE/DSP serial interface to transfer data conversions. Complete AD7903 specifications are provided in the AD7903 data sheet and should be consulted in conjunction with this user guide when using the evaluation board. Full details on the EVAL-SDP-CB1Z are available on the Analog Devices website, at www.analog.com.

Figure 26 to Figure 31 show the evaluation board schematics. The board consists of an AD7903 ADC (U1) with a reference (U6—ADR435), and several ADC drivers (U12, U14, U16, and U17—ADA4841-1YRZ). The evaluation board is a flexible design that enables you to adjust compensation components and operate the evaluation board from an adjustable bench top power supply.

POWER SUPPLIES

The evaluation board can be powered from a wall adapter or from a bench top power supply. By default, the board is set up to operate from a 9 V wall adapter using the on-board power supplies described in Table 1.

Table 1. Power Supplies Provided on the Board

Power Supply (V)	Function	Components Used
+5	SDP power	ADP2301
+7.5	Positive rail	ADP7104
−2.5	Negative rail	ADP2301
+2.5	ADC V_{DD} rail	ADP7104
+3.3	V_{DRIVE} (digital power)	ADP7104

Each on-board power supply is decoupled where it enters the board as well as where it connects to each device. A single ground plane is used on this board to minimize the effect of high frequency noise interference.

Alternatively, the board can be powered from a bench top power supply by using the J2 and J3 screw terminals and changing the SL1 to SL4 and LK3 to LK5 solder link settings to Position B (see Table 2). When bench top power is used, use of the wall adapter and the on-board power supplies are no longer required.

Table 2. Solder Links—Settings for Bench Top Power Supply[1]

Link	Setting	Function
SL1	B	$+V_S$
SL2	B	$-V_S$
SL3	B	$-V_S$
SL4	B	$+V_S$
LK3	B	V_SDP
LK4	B	V_{REF}
LK5	B	V_{DD} for ADC

[1] All other solder link settings are as described in Table 3.

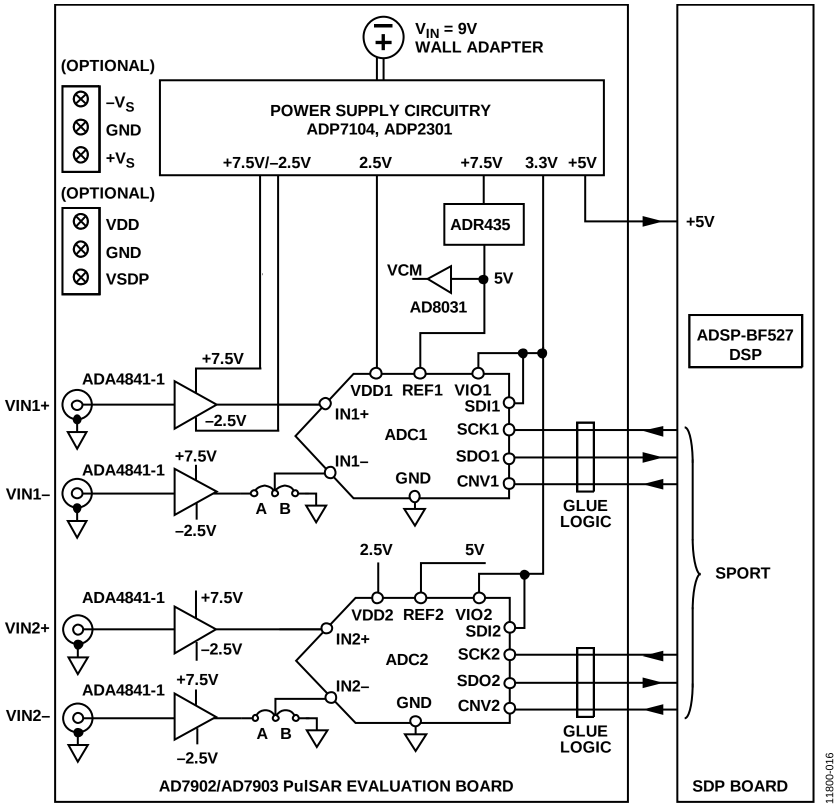


Figure 16. Simplified Evaluation Board Functional Block Diagram

LINK CONFIGURATION OPTIONS

Care should be taken before applying power and signals to the evaluation board to ensure that all link positions are as required by the operating mode. There are two modes in which to operate the evaluation board. The evaluation board can be operated in SDP controlled mode to be used with the SDP board, or the evaluation board can be used in standalone mode.

When operating in SDP controlled mode, ensure that VIO is 3.3 V. Operating with a VIO greater than 3.3 V in SDP controlled mode may damage the SDP board.

The Default Position column of Table 3 shows the default positions in which the links are set when the evaluation board is packaged. When the board is shipped, it is assumed that you are going to operate the evaluation board with the SDP board (SDP controlled mode).

Table 3. Solder Links—Factory Default Settings

Link	Setting	Function	Comment
SL1	A	$+V_S$	Change to B if using bench supplies.
SL2	A	$−V_S$	Change to B if using bench supplies.
SL3	A	$−V_S$	Change to B if using bench supplies.
SL4	A	$+V_S$	Change to B if using bench supplies.
SL5	A	Analog input	Do not alter.
SL6	A	Analog input	Do not alter.
LK3	A	V_SDP	Change to B if using bench supplies.
LK4	A	V_{REF}	Change to B if using bench supplies.
LK5	A	V_{DD} for ADC	Change to B if using bench supplies.
LK6	A	U12 output connects to U14 input	Change to B if U14 inverting input needs to be connected to ground.
LK7	A	U17 output connects to U16 input	Change to B if U16 inverting input needs to be connected to ground.
LK8	A	ADC2 input	Change to B if using ADC1 input.
LK9	A	ADC2 input	Change to B if using ADC1 input.
LK10	A	U17 input	Change to B if U17 needs to be bypassed.
LK11	A	U17 input	Change to B if U17 needs to be bypassed.
LK12	A	U16 input	Change to B if U16 needs to be bypassed.

EVALUATION BOARD CIRCUITRY

ANALOG INPUTS

The analog inputs to the evaluation board are SMA Connectors J6, J7, J10, and J15. These inputs are buffered with dedicated amplifier circuitry (U12, U14, U16, and U17), as shown in Figure 26 and Figure 27. The circuit not only allows different configurations, input range scaling, and filtering but also allows adding a dc component and using different op amps and supplies. The analog input amplifiers are set as unity-gain buffers by factory default. The amplifier positive rail is driven from 7.5 V (from U13—ADP7104). The negative amplifier rail is driven from $-V_S$ (generated by U3—ADP2301).

The default configuration sets all op amps (U12, U14, U16, and U17) at midscale, generated from a buffered reference voltage divider (VCM).

The evaluation board is configured by factory default for providing a differential analog input path to ADC1 and ADC2 (see Figure 16).

For dynamic performance, an FFT test can be done by applying a very low distortion ac source.

For low frequency testing, the audio precision source can be used directly because its outputs are isolated. Set the outputs for a balanced and floating ground. Different sources can be used; however, most are single-ended sources that use a fixed output resistance.

By default, the evaluation board uses the amplifiers as unity-gain buffers. The noninverting input has a common-mode adjustment that involves a 49.9 kΩ shunt resistor. This resistor creates a voltage divider with the source, which must be accounted for when using the board.

REFERENCE

An external 5 V reference (U6—ADR435) is used to supply the ADCs directly.

SERIAL INTERFACE

The evaluation board uses the SPORT interface from the ADSP-BF527 DSP.

Multiple AND gates (U9, U10, and U11) are used to clock and gate the SPORT transfer to the ADC device.

MODES OF OPERATION

SDP CONTROLLED MODE

The AD7903 uses a high speed serial interface that allows sampling rates of up to 1 MSPS. For more information about the operation of the serial interface, refer to the AD7903 data sheet.

The AD7903 uses the serial interface to transfer data to the EVAL-SDP-CB1Z.

The EVAL-AD7903SDZ communicates with the EVAL-SDP-CB1Z board using level shifters. The EVAL-SDP-CB1Z operates at a 3.3 V logic level, which allows logic voltages that exceed 3.3 V to be used without damaging the SDP interface.

STANDALONE MODE

The EVAL-AD7903SDZ can also be used without the EVAL-SDP-CB1Z controller board. In this case, the EVAL-AD7903SDZ is connected to the serial interface using the J5 connector or the test points. For more information about the operation of the serial interface, refer to the AD7903 data sheet.

HOW TO USE THE SOFTWARE

SETTING UP THE SYSTEM FOR DATA CAPTURE: BOARD OPERATION/CONNECTION SEQUENCE

With the evaluation software installed, the following board operation/connection sequence can be used:

1. Connect the SDP controller board to the evaluation board with the J5 connector (screw into place as required). The software is configured to find the evaluation board on either the J4 or J5 connector of the SDP board.
2. Power the board with the appropriate supply, as described in the Power Supplies section.
3. Connect the EVAL-SDP-CB1Z board to a PC using the USB cable.
4. Start the evaluation software. Click **Start** >**All Programs** > **AD7903_03_Evaluation** > **AD7903_03_Evaluation_ Software**.
5. Apply a signal source and capture data.

STARTING THE SOFTWARE

When the software starts running, it searches for hardware connected to the PC. The software automatically detects the generic attached to the PC, or you can choose to run the software in standalone mode without any hardware connected.

With Hardware Connected

To run the program with hardware connected,

1. Click **Start** > **All Programs** > **AD7903_03_Evaluation** > **AD7903_03_Evaluation_Software**. (To uninstall the program, click **Start** > **Control Panel** > **Add or Remove Programs** > **AD7903_03_Evaluation**.)
2. If the SDP board is not connected to the USB port when the software is launched, a connectivity error displays (see Figure 17). If a connectivity error is displayed, connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

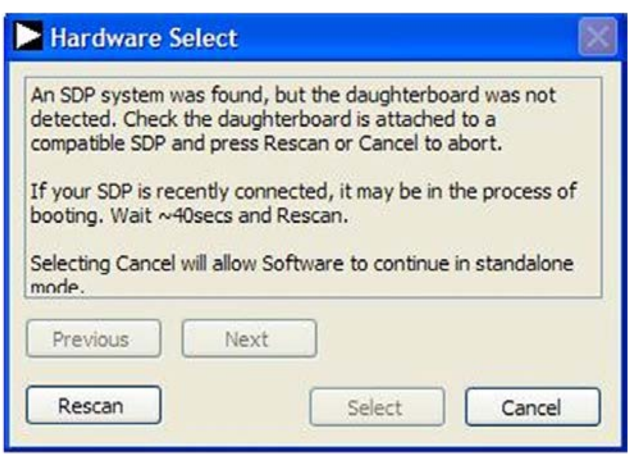


Figure 17. SDP Board Not Connected to the USB Port Pop-Up Window Error

3. After finding the evaluation board, the software connects to the board and displays the dialog box shown in Figure 18.

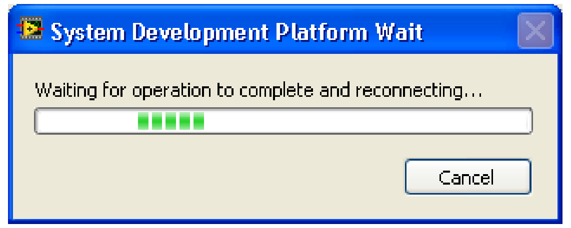


Figure 18. Software Connects to SDP Board

4. After the board is correctly detected, the main window of the software appears (see Figure 21), showing that the EVAL-AD7903SDZ board is connected.

Without Hardware Connected

The software can run in standalone mode when no evaluation board hardware is connected to the USB port.

1. Click **Start** > **All Programs** > **AD7903_03_Evaluation** > **AD7903_03_Evaluation_Software**.
2. The software automatically seeks to find the hardware connected; therefore, when no hardware is connected, a connectivity error is displayed (see Figure 19). If you wish to continue without hardware in standalone mode, click **Cancel**.

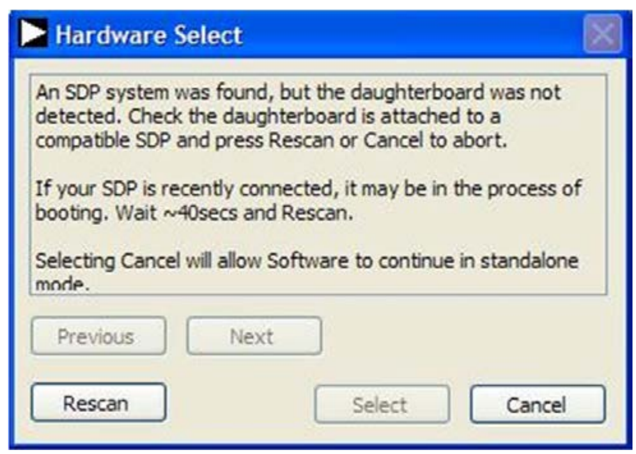


Figure 19. No Hardware Connected Pop-Up Window Error

3. The software alerts the user that no hardware is connected and that the software is going to continue in standalone mode.

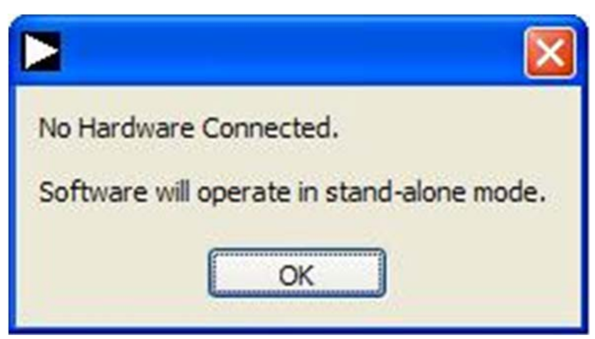


Figure 20. Software Indicates Operating in Standalone Mode

4. You can then load example files or previously saved files and analyze data. The main window of the software appears (see Figure 21), showing the evaluation board connected as the part number from the saved data file.
5. If you decide to connect hardware at this point, you must close the software and relaunch it to allow it to search for the board again.

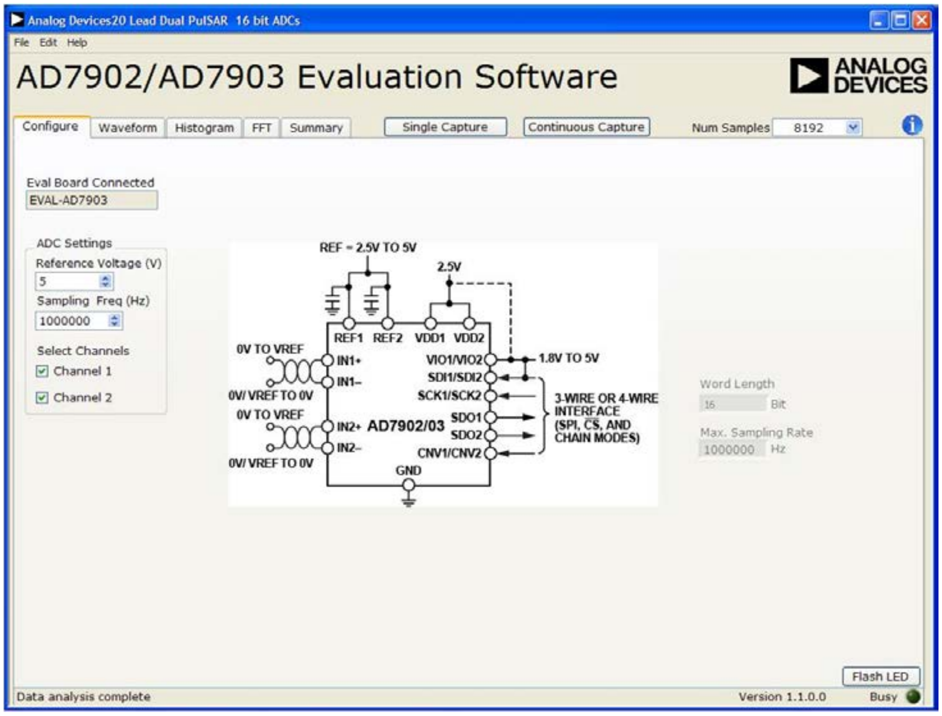


Figure 21. Main Window

OVERVIEW OF THE MAIN WINDOW

The main window of the software is shown in Figure 21 and has the features described in this section.

File Menu

The **File** menu offers the choice to

- **Load data**: load previously captured data.
- **Save Data as .tsv**: save captured data in .tsv format for future analysis.
- **Save Picture**: save the current screen capture.
- **Print**: print the main window to the default printer.
- **Exit**: close the application.

Eval Board Connected Box

The **Eval Board Connected** box displays the evaluation board connected to the USB port—either EVAL-AD7902SDZ or EVAL-AD7903SDZ.

When an evaluation board is not connected to the USB port, the software can be operated in standalone mode for data analysis, and the part information notes the part number from the saved data file.

ADC Settings Area

The **ADC Settings** section allows changing the sampling frequency and the reference voltage value, as well as selecting Channel 1 or Channel 2.

Reference Voltage (V) Box

By default, the external reference voltage is 5 V (ADR435 on-board reference). The minimum/maximum voltage calculations are based on this reference voltage. If you change the reference voltage, you must change this input accordingly.

Sampling Freq (Hz) Box

The default sampling frequency (10000000 Hz) in the **Sampling Freq (Hz)** box matches the maximum sample rate of the ADC connected to the board. Although you can adjust the sampling frequency, there are limitations in terms of the sample frequencies that can be entered related to the SCLK frequency applied. The sample frequency must be an integer divider of the SCLK frequency. If an unusable sample frequency is input, the software automatically adjusts the sample frequency accordingly. Units can be entered as, for example, 10k for 10,000 Hz. The software automatically adjusts the sample frequency according to the ability of the ADC connected to the board. For example, if you enter a value that is beyond the ability of the device, the software indicates this and reverts to the maximum sample frequency.

Select Channels Checkboxes

Select either **Channel 1** or **Channel 2** or both to read the data from a single ADC or both ADCs simultaneously.

Tabs Area

There are five tabs available in the tabs area of the main window: **Configure**, **Waveform**, **Histogram**, **FFT**, and **Summary**. These tabs display the data in different formats. Navigation tools are provided within each tab to allow you to control the cursor, zooming, and panning (see Figure 22) within the graphs displayed.

Each tab is described in more detail in the Generating a Waveform Analysis Report; Generating a Histogram of the ADC Code Distribution; Generating a Fast Fourier Transform of AC Characteristics; and Generating a Summary of the Waveform, Histogram, and Fast Fourier Transform sections.

Single Capture Button

Clicking **Single Capture** performs a single capture from the ADC.

Continuous Capture Button

Clicking **Continuous Capture** performs a continuous capture from the ADC.

Num Samples Box

The **Num Samples** box allows you to select the number of samples to analyze.

Exit Button

Clicking the **Exit** button (in the upper right corner of the window) closes the software. Alternatively, you can select **Exit** from the **File** menu.

GENERATING A WAVEFORM ANALYSIS REPORT

Figure 22 illustrates the **Waveform** tab for a 10 kHz sine wave input signal when the on-board 5 V external reference is used.

The **Waveform Analysis** area (located toward the bottom of the window) reports the amplitudes recorded from the captured signal and the frequency of the signal tone. Select the **Channel 1** tab or **Channel 2** tab in the **Waveform Analysis** area to view the corresponding waveform.

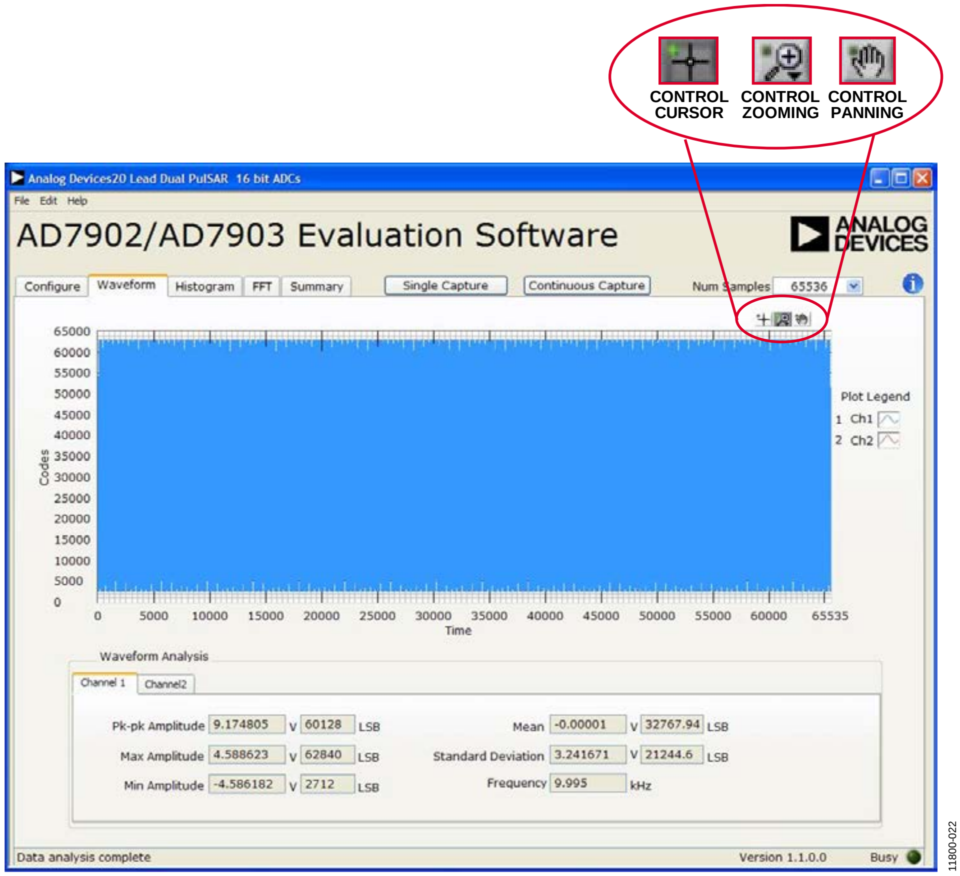


Figure 22. Waveform Tab

GENERATING A HISTOGRAM OF THE ADC CODE DISTRIBUTION

The **Histogram** tab can be used to perform ac testing or, more commonly, dc testing. This tab shows the ADC code distribution of the input and computes the mean and standard deviation, which are displayed as **DC Offset/Mean** and **Transition Noise**, respectively, in the **Histogram Analysis** area (located toward the bottom of the window).

Figure 23 shows the histogram with ac input for a 1 kHz sine wave applied to the ADC input and the resulting calculations.

AC Input

To perform a histogram test of ac input,

1. Apply a differential sinusoidal signal with low distortion (better than 100 dB) to the evaluation board at the J6/J7 or J10/J15 input SMA connector pair.
2. Click the **Histogram** tab from the main window.
3. Click **Single Capture** or **Continuous Capture**.

Raw data is then captured and passed to the PC for statistical computations, and various measured values are displayed in the **Histogram Analysis** area.

DC Input

A histogram test of dc input can be performed with or without an external source because the evaluation board has a buffered $V_{REF}/2$ source at the ADC input.

To perform a histogram test of dc input,

1. If an external source is being used, apply a differential sinusoidal signal with low distortion (better than 100 dB) to the evaluation board at the J6/J7 or J10/J15 input SMA connector pair. It may be required to filter the signal to ensure that the dc source is noise-compatible with the ADC.
2. Click the **Histogram** tab from the main window.
3. Click **Single Capture** or **Continuous Capture**.

Raw data is then captured and passed to the PC for statistical computations, and various measured values are displayed in the **Histogram Analysis** area.

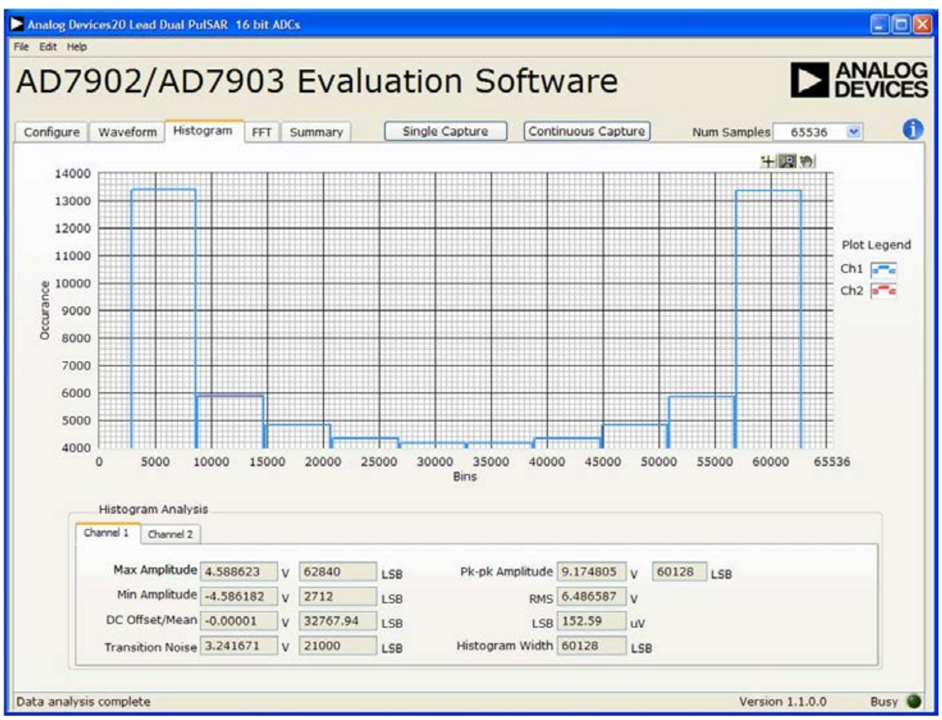


Figure 23. Histogram Tab

GENERATING A FAST FOURIER TRANSFORM OF AC CHARACTERISTICS

Figure 24 shows the **FFT** tab. This feature tests the traditional ac characteristics of the converter and displays a fast Fourier transform (FFT) of the results.

To perform an ac FFT test,

1. Apply a differential sinusoidal signal with low distortion (better than 100 dB) to the evaluation board at the J6/J7 or J10/J15 input SMA connector pair. To attain the requisite low distortion, which is necessary to allow true evaluation of the part, one option is to
   a. Filter the input signal from the ac source. A band-pass filter can be used; its center frequency must match the test frequency of interest.
   b. If a low frequency band-pass filter is used when the full-scale input range is more than a few volts peak-to-peak, use the on-board amplifiers to amplify the signal, thus preventing the filter from distorting the input signal.
2. Click the **FFT** tab from the main window.
3. Click **Sample**.

As in the histogram test, raw data is then captured and passed to the PC, which performs the FFT and displays the resulting SNR, SINAD, THD, and SFDR.

The **FFT Analysis** area displays the results of the captured data.

- The area labeled 1 in Figure 24 shows the spectrum information.
- The area labeled 2 in Figure 24 displays the fundamental frequency and amplitude. You can also click **Show Harmonic Content** to view information about the second to fifth harmonics.
- The area labeled 3 in Figure 24 displays the performance data, including the SNR, dynamic range, THD, SINAD, and noise performance.

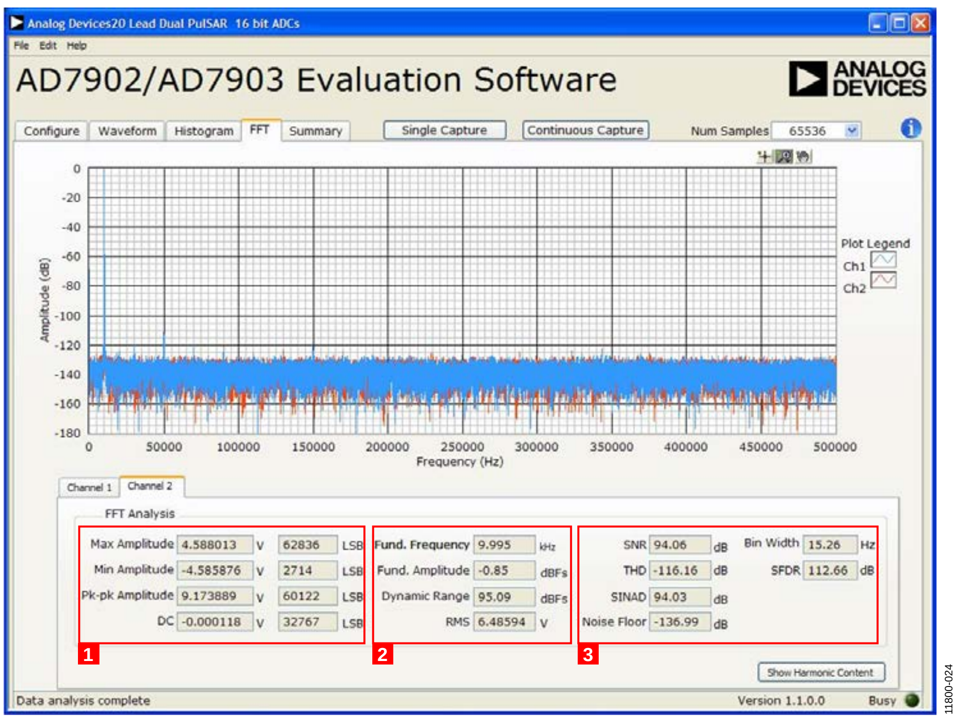
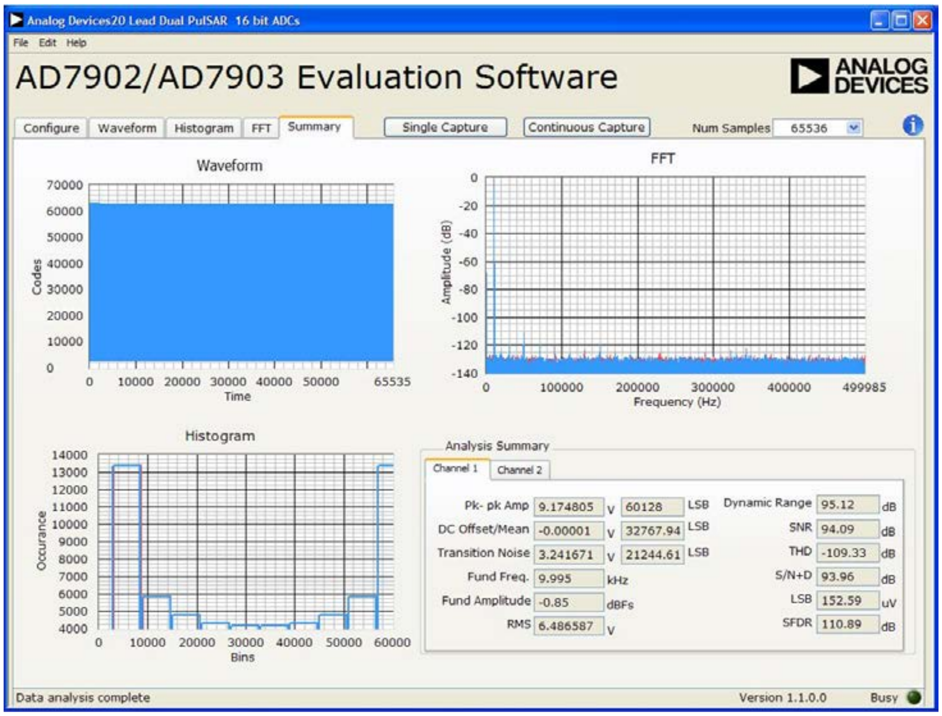


Figure 24. FFT Tab

GENERATING A SUMMARY OF THE WAVEFORM, HISTOGRAM, AND FAST FOURIER TRANSFORM

Figure 25 shows the **Summary** tab. The **Summary** tab captures all the display information and provides it in one panel with a synopsis of the information, including key performance parameters such as SNR and THD.



11800-025

Figure 25. Summary Tab

EVALUATION BOARD SCHEMATICS AND ARTWORK

EVAL-AD7903SDZ SCHEMATICS

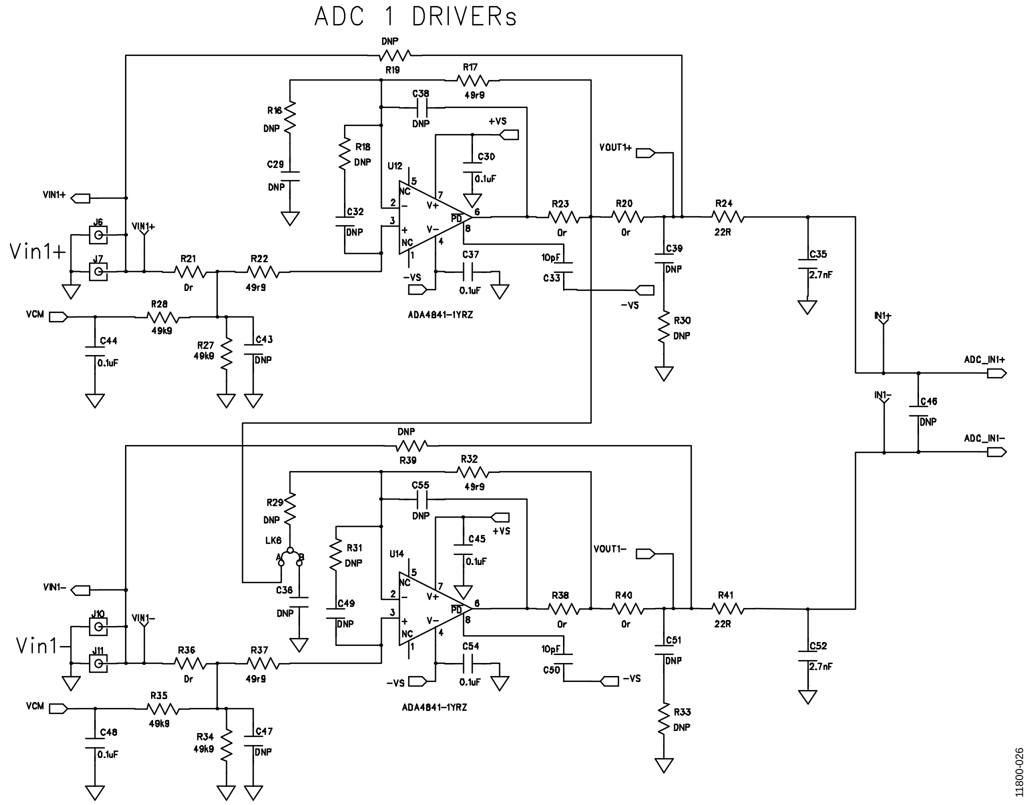


Figure 26. Schematic, Page 1

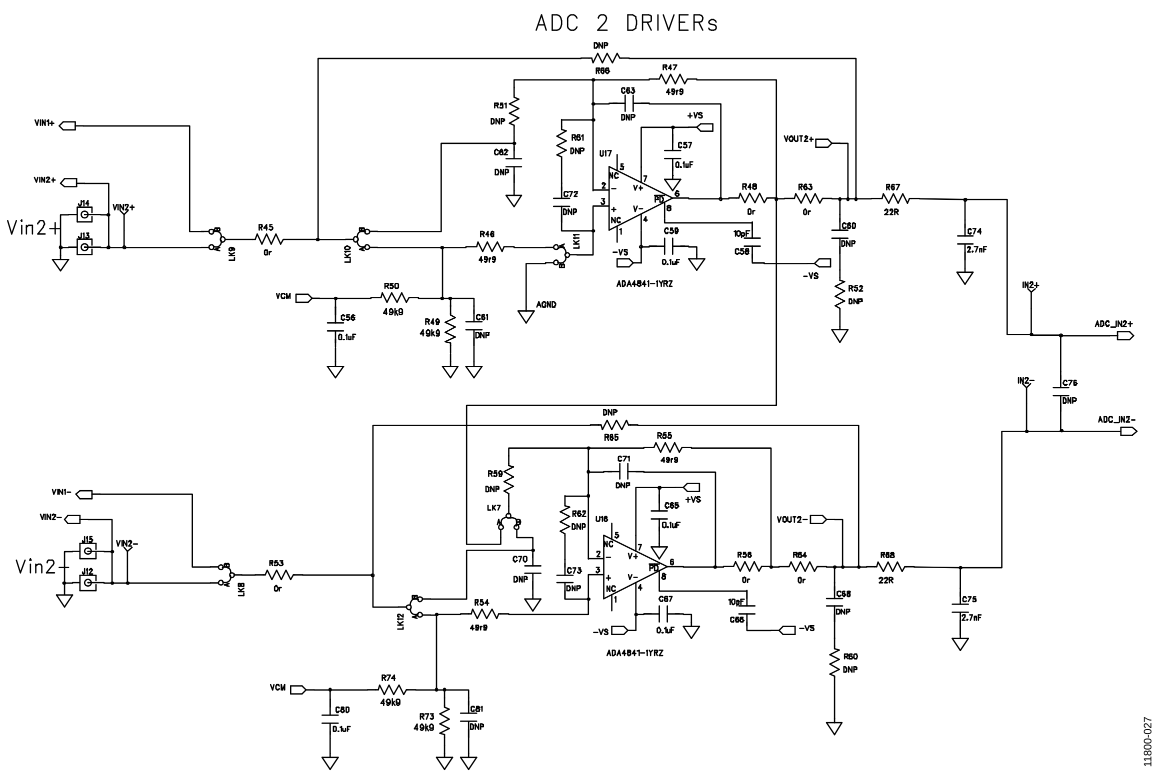


Figure 27. Schematic, Page 2

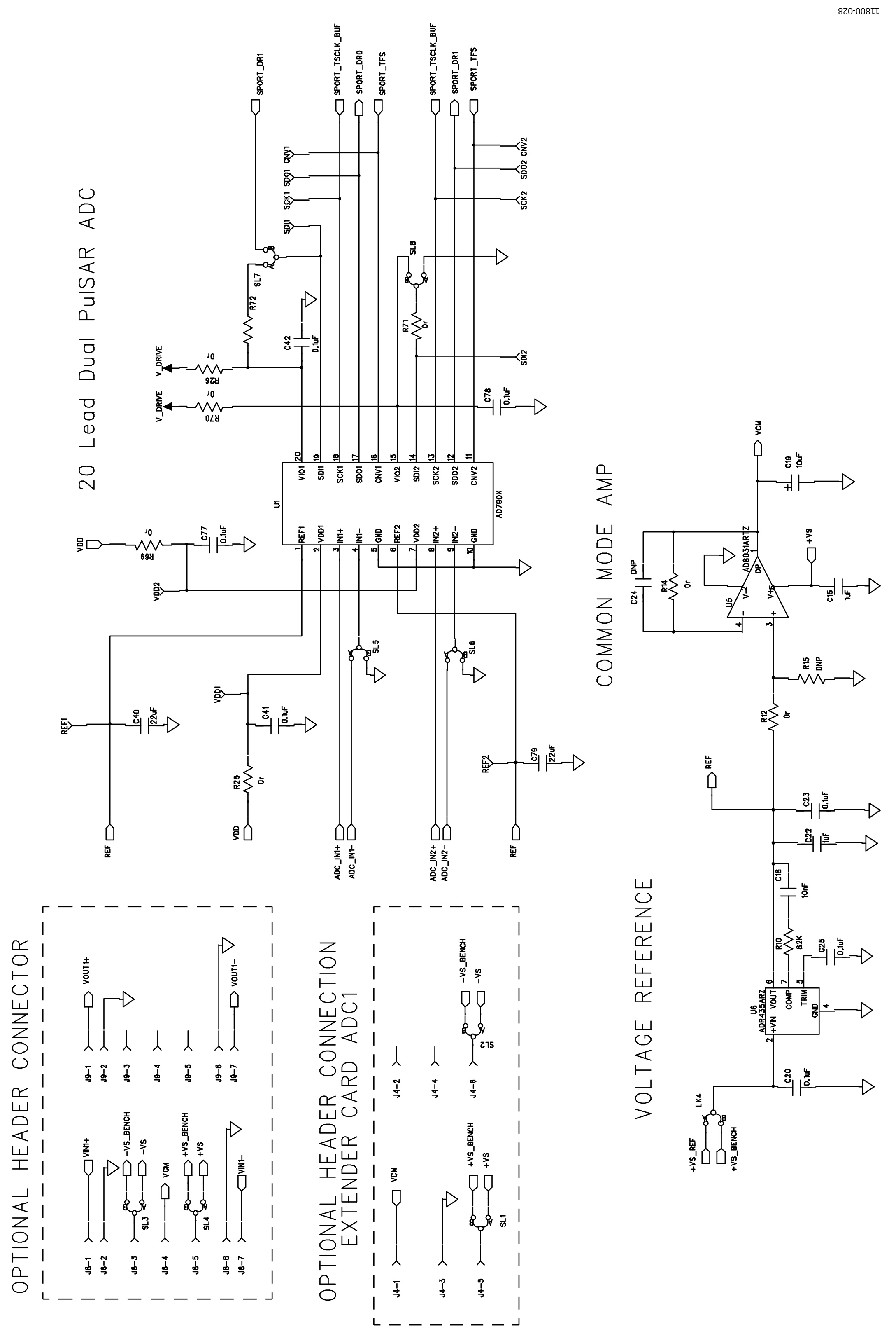


Figure 28. Schematic, Page 3

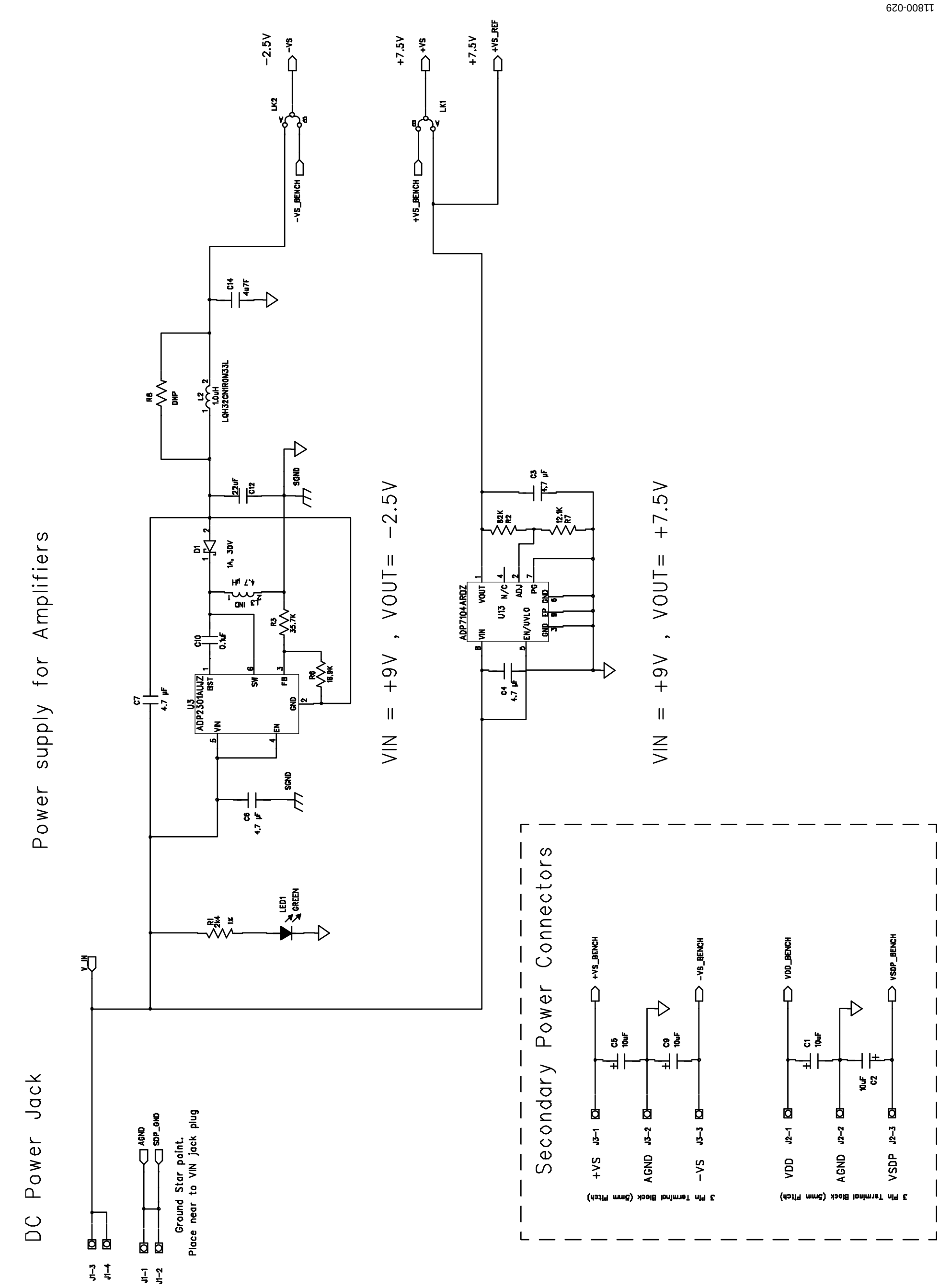


Figure 29. Schematic, Page 4

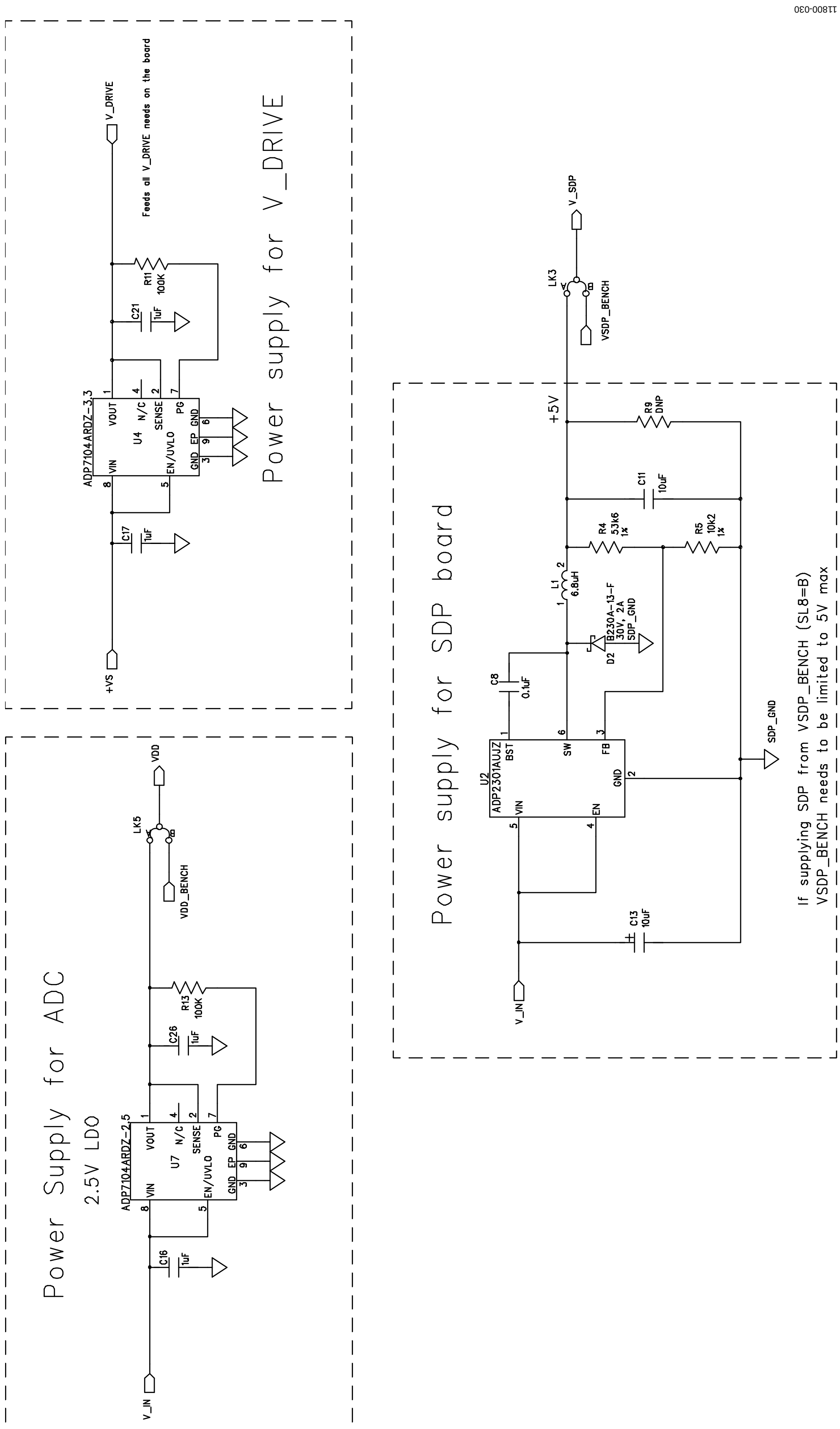


Figure 30. Schematic, Page 5

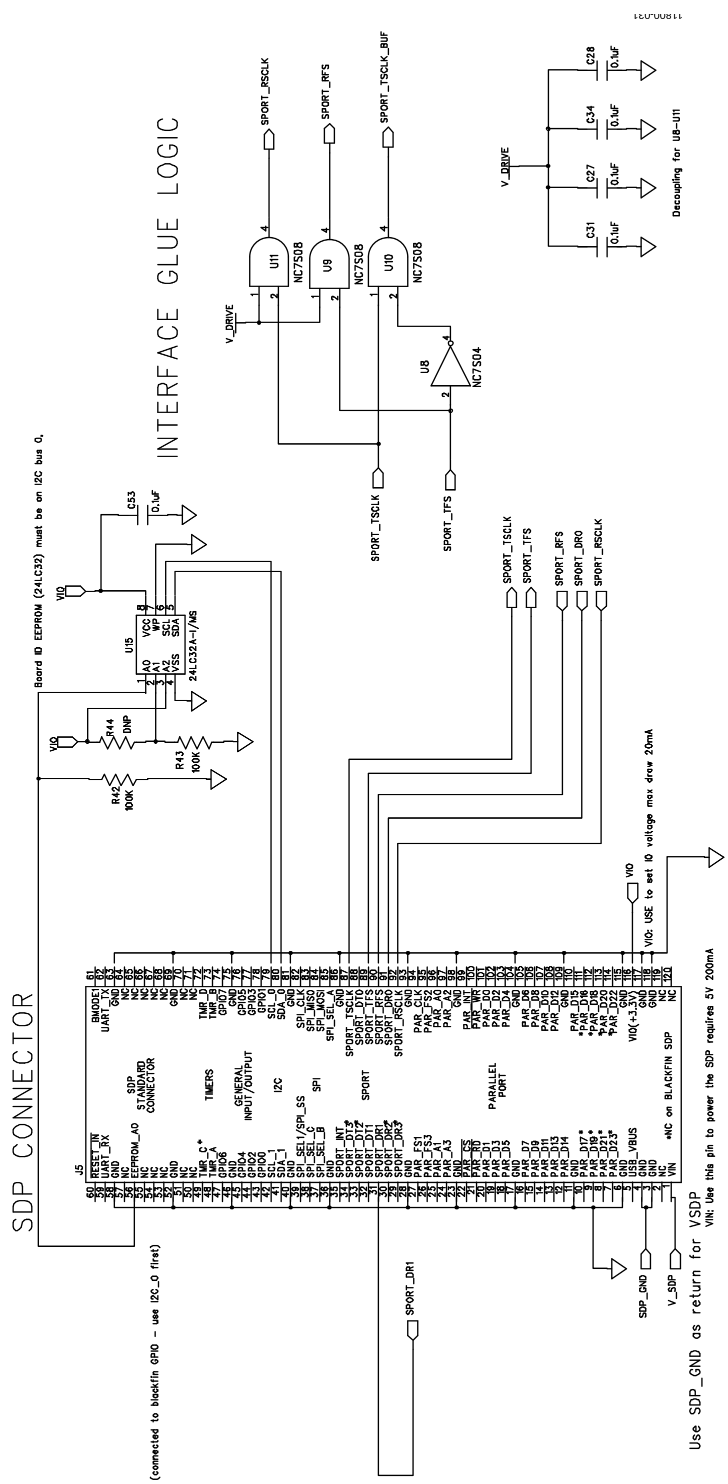


Figure 31. Schematic, Page 6

EVAL-AD7903SDZ LAYOUT

Layout Considerations

When laying out the printed circuit board (PCB) for the AD7903, follow the recommended guidelines described in this section to obtain the maximum performance from the converter. Figure 33 through Figure 36 show the recommended layout for the AD7903 evaluation board.

- Decouple all the power supply pins (VDD1, VDD2, and VIO) and the REF pin with low ESR and low ESL ceramic capacitors, typically 10 µF and 100 nF, placed close to the DUT (U1) and connected using short, wide traces to provide low impedance paths and to reduce the effect of glitches on the power supply lines.
- Separate analog and digital sections and keep power supply circuitry away from the AD7903.
- Avoid running digital lines under the device and crossover of digital and analog signals because these couple noise into the AD7903.

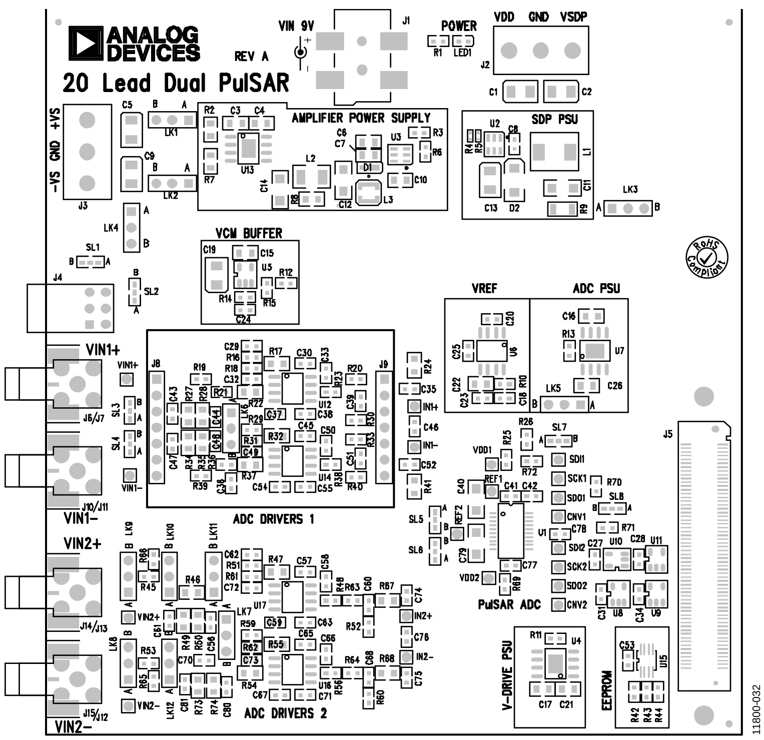


Figure 32. EVAL-AD7903SDZ Evaluation Board Silkscreen—Top Assembly

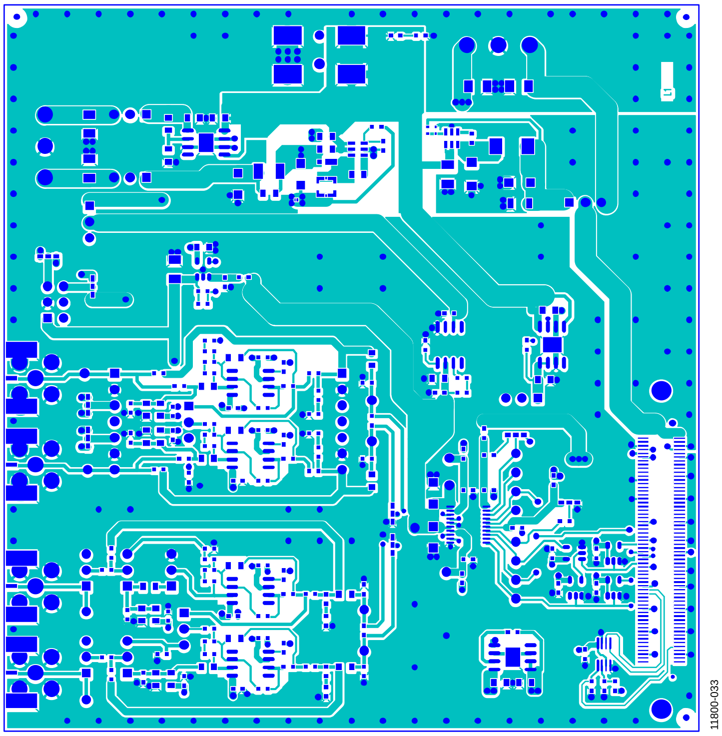


Figure 33. EVAL-AD7903SDZ Evaluation Board—Top Layer

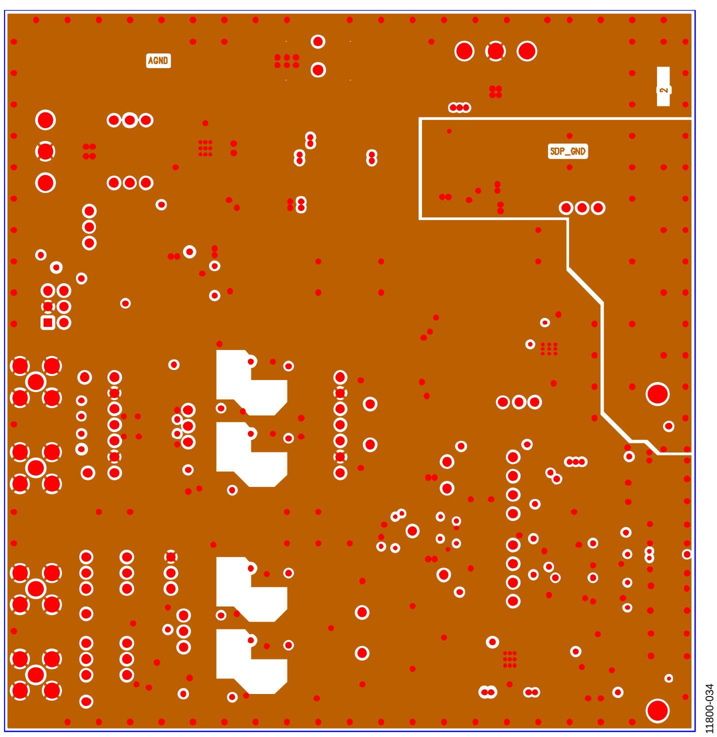


Figure 34. EVAL-AD7903SDZ Evaluation Board Layer 2—Ground

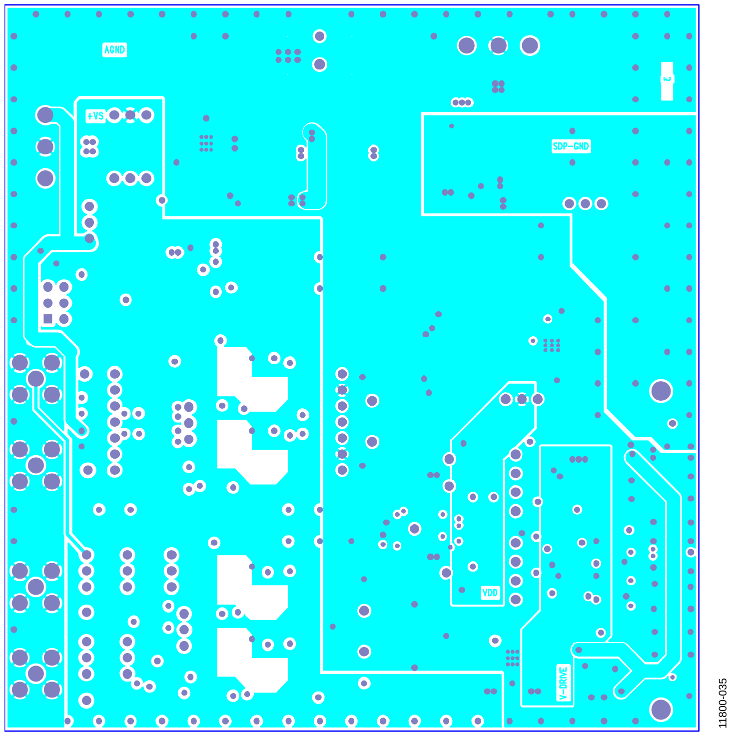


Figure 35. EVAL-AD7903SDZ Evaluation Board Layer 3—Power

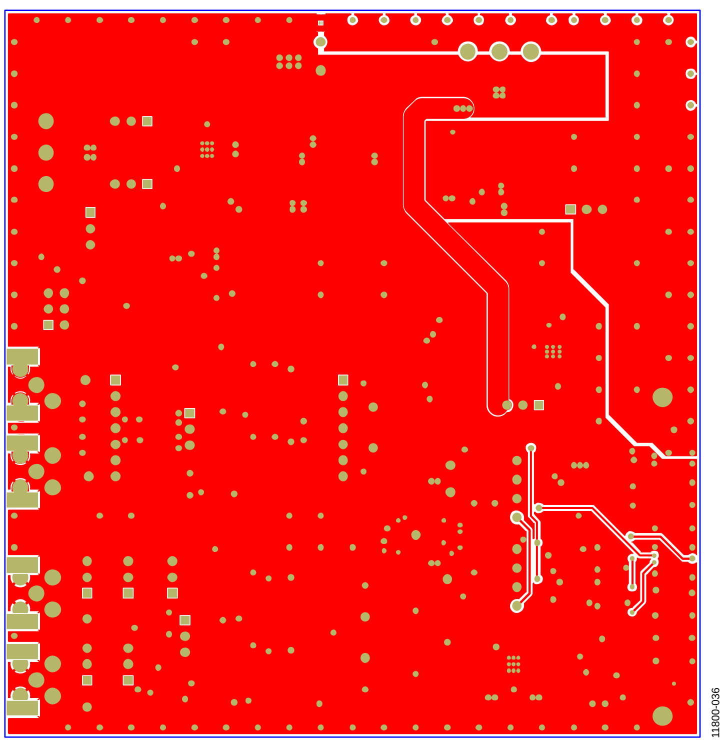


Figure 36. EVAL-AD7903SDZ Evaluation Board Bottom Layer

BILL OF MATERIALS

Table 4. EVAL-AD7903SDZ Bill of Materials

Reference Designator	Part Description	Manufacturer	Part Number	Stock Code
U1	Dual differential 16-bit, 1 MSPS PulSAR® ADC	Analog Devices	AD7903	AD7903
U2	1.2 A, 20 V, 1.4 MHz nonsynchronous step-down switching regulator	Analog Devices	ADP2301AUJZ	ADP2301AUJZ-R7
U3	1.2 A, 20 V, 1.4 MHz nonsynchronous step-down switching regulator	Analog Devices	ADP2301AUJZ	ADP2301AUJZ-R7
U4	Linear regulator, 3.3 V, 20 V, 500 mA, ultralow noise, CMOS	Analog Devices	ADP7104ARDZ-3.3	ADP7104ARDZ-3.3-R7
U5	2.7 V, 800 µA, 80 MHz rail-to-rail I/O single amplifier SOT23-5	Analog Devices	AD8031ARTZ	AD8031ARTZ-R2
U6	Ultralow noise XFET voltage references	Analog Devices	ADR435BRZ	ADR435BRZ
U7	Linear regulator, 2.5 V, 20 V, 500 mA, ultralow noise, CMOS	Analog Devices	ADP7104ARDZ-2.5	ADP7104ARDZ-2.5-R7
U8	Single INV	Fairchild	NC7SZ04M5	Farnell 1013809
U9	Single AND gate	Fairchild	NC7SZ085M5	Farnell 1013807
U10	Single AND gate	Fairchild	NC7SZ085M5	Farnell 1013807
U11	Single AND gate	Fairchild	NC7SZ085M5	Farnell 1013807
U12	Low noise, high speed amplifier for 16-bit systems	Analog Devices	ADA4841-1YRZ	ADA4841-1YRZ-R7
U13	20 V, 500 mA, low noise, CMOS adjustable LDO	Analog Devices	ADP7104ARDZ	ADP7104ARDZ-R7
U14	Low noise, high speed amplifier for 16-bit systems	Analog Devices	ADA4841-1YRZ	ADA4841-1YRZ-R7
U15	32k I²C serial EEPROM, 8-lead MSOP	Microchip	24LC32A-I/MS	Farnell 1331330
U16	Low noise, high speed amplifier for 16-bit systems	Analog Devices	ADA4841-1YRZ	ADA4841-1YRZ-R7
U17	Low noise, high speed amplifier for 16-bit systems	Analog Devices	ADA4841-1YRZ	ADA4841-1YRZ-R7
C1, C2, C5, C9, C11, C13, C19	Capacitor tantalum, 20 V	AVX	TAJB106K020RNJ	Farnell 197427
C3, C4, C6, C7	Capacitor ceramic, 4.7 µF, 16 V, X7R, 0805	Taiyo Yuden	EMK212B7475KG-T	Farnell 1853520
C8, C20, C23, C25, C27, C28, C30, C31, C34, C37, C41, C42, C44, C45, C48, C53, C54, C56, C57, C59, C65, C67, C77, C78, C80	Capacitor ceramic, 50 V, X7R	Murata	GRM188R71H104KA93D	Farnell 8820023
C9	Capacitor ceramic, 50 V, X7R, 0805	Murata	C0805C104K5RACTU	Farnell 1414664
C12, C40, C79	Capacitor ceramic, 22 µF, 10 V, X7R, 1206	AVX	LMK316AB7226ML-TR	Farnell 1894515
C14	Capacitor ceramic, 4.7 µF, 16 V, X5R, 1206	Taiyo Yuden	EMK316BJ475KL-T	Farnell 6578937
C15, C16, C17, C21, C22, C26	Capacitor, 0805, 1 µF, 50 V, X7R	Murata	GRM21BR71H105KA12L	Farnell 1735541
C18	Capacitor ceramic, 50 V, X7R	Murata	GRM188R71H103KA01D	Farnell 1118178
C33, C50, C58, C66	Capacitor ceramic ,10 pF, 100 V, C0G, 0603	AVX	06031A100JAT2A	Farnell 1273324
C35, C52, C74, C75	Capacitor ceramic, 2700 pF, 50 V, C0G/NP0, 0603	TDK	C1608C0G1H272J	Farnell 1844178

Reference Designator	Part Description	Manufacturer	Part Number	Stock Code
C24, C29, C32, C36, C38, C39, C43, C46, C47, C49, C55, C60, C61, C62, C63, C68, C69, C70, C71, C72, C73, C76, C81	Capacitor ceramic, 50 V, C0G/NP0, 0603	TDK	C1608C0G1H272J	Do not place
R1	Resistor, thick film, 2.4 kΩ, 0603, 100 mW, 1%	Yageo	RC0603FR-072K4L	Farnell 1799329
R2	SMD resistor	Multicomp	MC 0.1W 0805 1% 62K	Farnell 9333436
R3	Resistor, 0603, 35.7 kΩ	Multicomp	MC 0.063W 0603 1% 35K7	Farnell 1170942
R4	SMD resistor	Multicomp	MC 0.0625W 0402 1% 53K6	Farnell 1803723
R5	SMD resistor	Multicomp	MC 0.0625W 0402 1% 10K2	Farnell 1803137
R6	Resistor, 0603, 16.9 kΩ	Multicomp	MC 0.063W 0603 1% 16K9	Farnell 1170908
R7	Resistor, 0805, 12.1 kΩ, 1%	Vishay Draloric	CRCW080512K1FKEA	Farnell 1469866
R10	Resistor, 0603, 82 kΩ, 0.063 W, 1%	Multicomp	MC 0.063W 0603 1% 82K	Farnell 9331573
R11, R13, R42, R44	SMD resistor	Multicomp	MC 0.063W 0603 1% 100K	Farnell 9330402
R12, R14, R20, R21, R23, R25, R26, R36, R38, R40, R45, R48, R53, R56, R63, R64, R69, R70, R71, R72	SMD resistor	Multicomp	MC 0.063W 0603 0R	Farnell 9331662
R17, R22, R32, R37, R46, R47, R54, R55	Resistor, 0805, 49.9 Ω, 0.1%, 0.125 W	Panasonic	ERA6AEB49R9V	Farnell 1810805
R27, R28, R34, R35, R49, R50, R73, R74	Resistor, 0805, 49.9 kΩ, 1%, 0.125 W	Panasonic	ERJ-6ENF4992V	Digi-Key P49.9KCCT-ND
R24, R41, R67, R68	Resistor, 22 Ω, 1% 0805	Vishay Draloric	CRCW080522ROFKEAHP	Farnell 1738936
R8, R9, R15, R16, R18, R19, R29, R30, R31, R33, R39, R44, R59, R60, R61, R62, R65, R66	Not applicable	Not applicable	Not applicable	Do not place

RELATED LINKS

Resource	Description
AD7903	Product Page: Dual Differential 16-Bit, 1 MSPS PulSAR ADC
ADA4841-1	Product Page: Unity Gain Stable, Low Noise and Distortion, Rail-to-Rail Output Amplifier
AD8031	Product Page: 2.7 V, 800 µA, 80 MHz Rail-to-Rail I/O Amplifiers
ADP7104	Product Page : 20 V, 300 mA/500 mA, Low Noise, CMOS LDO
ADP2301	Product Page: 1.2 A, 20 V, 1.4 MHz, Nonsynchronous Step-Down Regulator
ADR435	Product Page: Ultralow Noise, High Accuracy Voltage References

NOTES

NOTES

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.

UG11800-0-1/14(0)

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