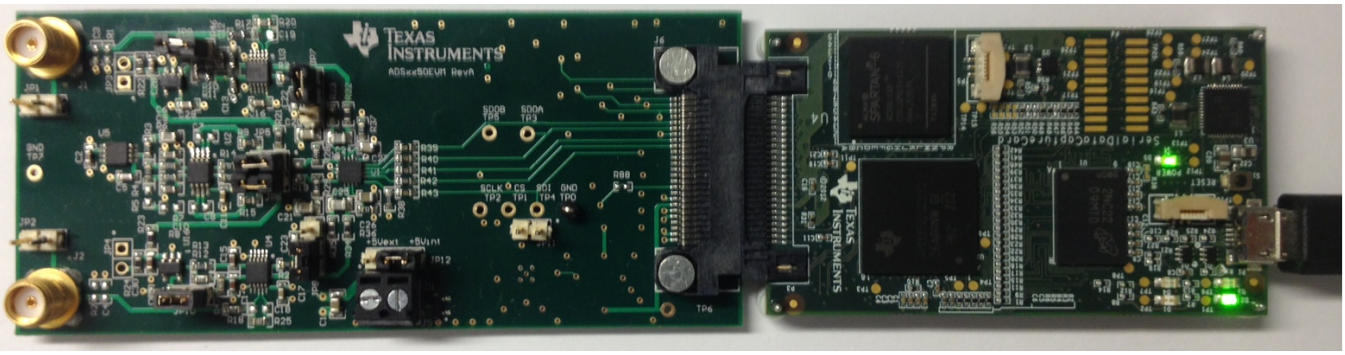
ADS8350EVM-PDK



ADS8350EVM-PDK

This user's guide describes the characteristics, operation and use of the ADS8350EVM performance demonstration kit (PDK). This kit is an evaluation platform for the ADS8350, dual-channel, 16-bit, simultaneous sampling, successive approximation register (SAR) analog-to-digital converter (ADC) that supports pseudo-differential analog inputs. This EVM eases the evaluation of the ADS8350 device with hardware and software for computer connectivity through a universal serial bus (USB). This user's guide includes complete circuit descriptions, a schematic diagram, and a bill of materials.

Throughout this document, the terms demonstration kit, evaluation board, evaluation module are synonymous with the ADS8350EVM-PDK.

The following related documents are available through the Texas Instruments web site at http://www.ti.com.

Related Documentation

Device	Literature Number
ADS8350	SBAS580
REF5025	SBOS410
OPA2350	SBOS099
OPA376	SBOS432
OPA2836	SLOS712
TPS3836E18	SLVS292
TPS7A4700	SBVS204
REG71055	SBAS221

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1 Overview

The ADS8350EVM-PDK is a platform for evaluation of the ADS8350 analog-to-digital converter (ADC). The evaluation kit combines the ADS8350EVM board with a simple capture card controller board. The simple capture card controller board consists of a TI Sitara embedded microcontroller (AM3352) and a field programmable gate array (FPGA). The simple capture card controller board provides an interface from the EVM to the computer through a universal serial bus (USB) port. The included software communicates with the simple capture card controller board platform, and the simple capture card board provides the power and digital signals used to communicate with the ADS8350EVM board. These demonstration kits include the ADS8350EVM board, the simple capture card controller board, a microSD memory card, and an A-to-micro-B USB cable.

1.1 ADS8350EVM Features

- Contains support circuitry as a design example to match ADC performance
- 3.3-V slave serial peripheral interface (SPI™)
- Onboard 5-V analog supply
- Onboard REF5025 (2.5-V) reference
- Voltage reference buffering with OPA2350
- Onboard OPA2836 (205-MHz BW, 1-mA quiescent current) ADC operational amplifier input drivers

1.2 ADS8350EVM-PDK Features

- USB port for computer interfacing
- Easy-to-use evaluation software for Windows XP®, Windows 7®, Windows 8® operating systems
- Data collection to text files
- Built-in analysis tools including scope, FFT, and histogram displays
- Complete control of board settings

2 EVM Analog Interface

The ADS8350 is a dual-channel, simultaneous-sampling ADC that supports pseudo-differential analog inputs. Each channel of the ADS8350 uses a OPA2836 dual operational amplifier to drive the inputs of the ADC; see Figure 1. The positive input terminals of each ADC are driven by the OPA836 operational amplifier configured in the inverting configuration. The negative input terminals of each ADC are driven by the OPA836 in the buffer configuration and biased at the 2.5-V, onboard reference voltage ($+V_{ref}$). The ADS8350EVM is designed for easy interfacing to multiple analog sources. SMA connectors allow the EVM to have input signals connected through coaxial cables. In addition, header connectors JP1 and JP2 provide a convenient way to connect input signals.

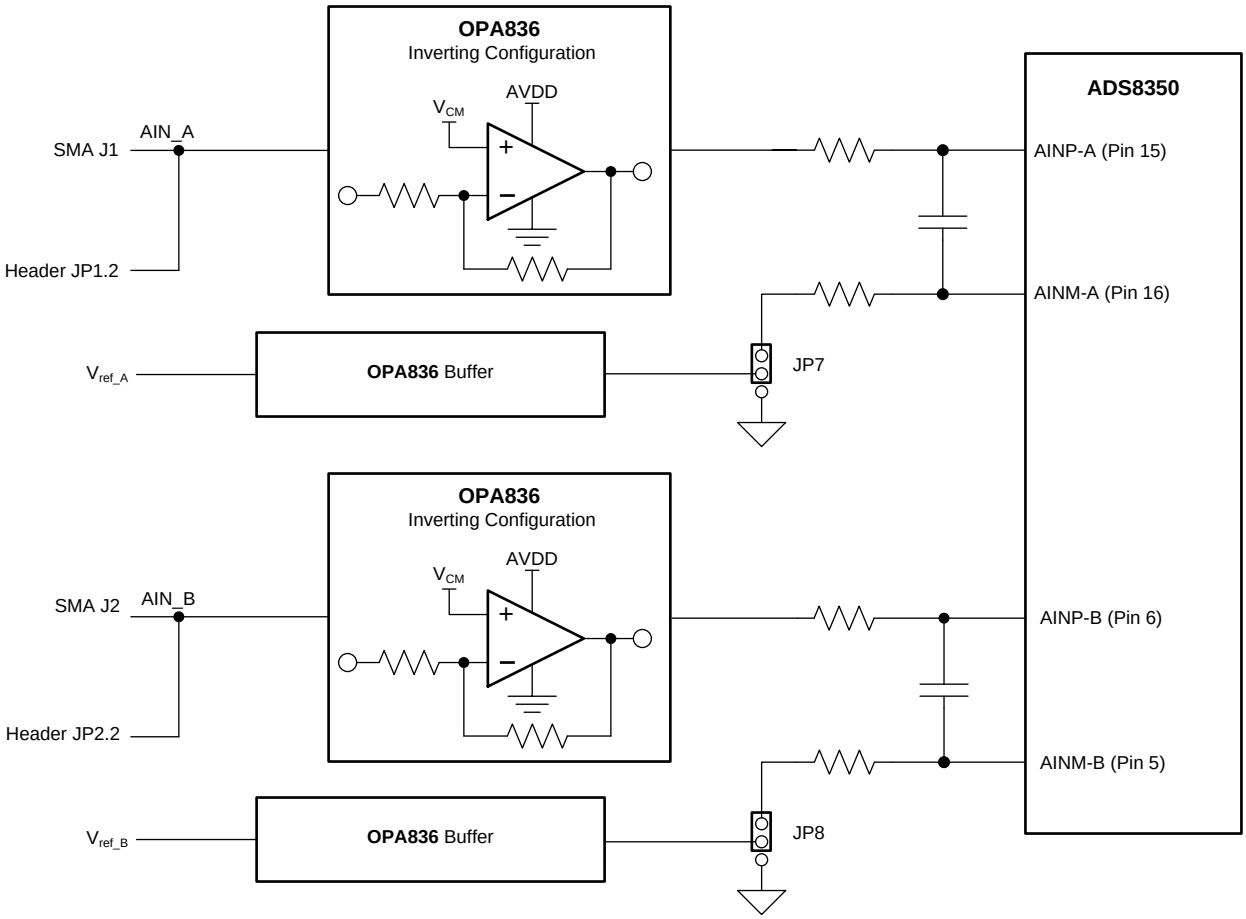


Figure 1. ADS8350EVM Analog Interface Input Connections

Table 1 summarizes the JP1 and JP2 analog interface connectors.

Table 1. JP1 and JP2: Analog Interface Connections

Terminal Number	Signal	Description
JP1.2	AIN_A	Channel A inverted input. The signal is routed through an OPA836 in the inverting configuration.
JP2.2	AIN_B	Channel B inverted input. The signal is routed through an OPA836 in the inverting configuration.

Table 2 lists the SMA analog inputs.

Table 2. SMA Analog Interface Connections

Terminal Number	Signal	Description
J1	AIN_A	Channel A inverted input. The signal is routed through an OPA836 in the inverting configuration.
J2	AIN_B	Channel B inverted input. The signal is routed through an OPA836 in the inverting configuration.

2.1 Bipolar Input Signal Configuration

When jumpers JP9 and JP10 are closed, the inverting amplifier positive input is biased with +1.25 V. This bias voltage is created by dividing the ADS8350EVM 2.5-V onboard reference by two. The bias voltage at the input results in a 2.5-V offset at the amplifier output. In this configuration, apply a bipolar input signal with 0-V common-mode voltage.

To keep the OPA836 distortion as low as possible, the input signal swing is limited from –2.3 V to +2.3 V, as shown in Figure 2.

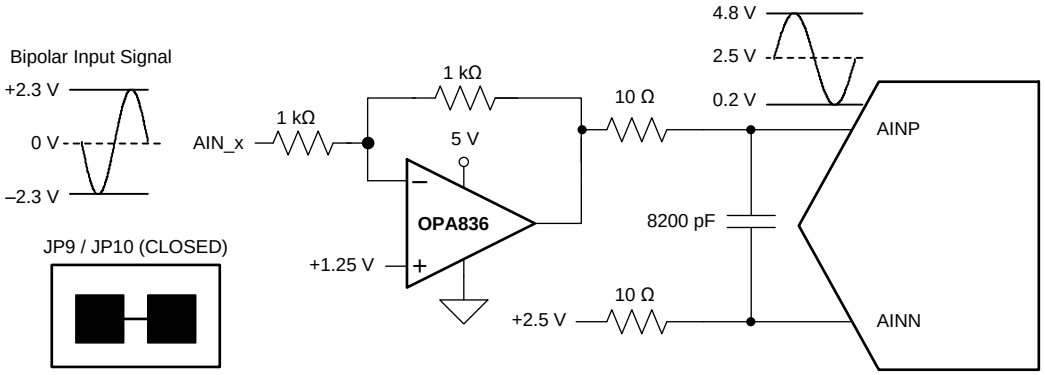


Figure 2. Bipolar Input Signal Configuration

2.2 Unipolar Input Signal Configuration

When jumpers JP9 and JP10 are open, the inverting amplifier positive input is biased with +2.5 V. This bias voltage is created using the ADS8350EVM 2.5-V onboard reference. In this configuration, apply a unipolar input signal with 2.5-V common-mode voltage. To keep the OPA836 distortion as low as possible, the input signal swing is limited from +0.2 V to +4.8 V, as shown in Figure 3.

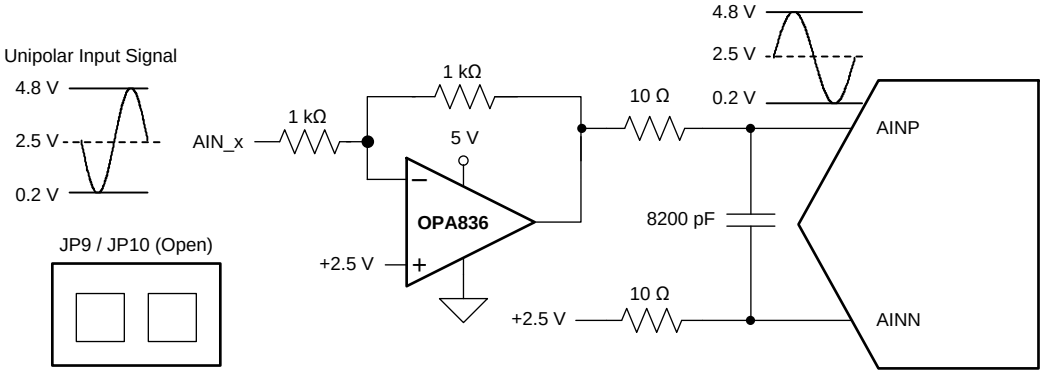


Figure 3. Unipolar Input Signal Configuration

2.3 ADS8350EVM Onboard Reference

The ADS8350 dual, simultaneous ADC operates with reference voltages V_{ref_A} and V_{ref_B} present on pins REFIN_A and REFIN_B, respectively. The ADS8350EVM provides an onboard 2.5-V reference source, REF5025 (U5), buffered with a dual OPA2350 amplifier and routed through jumpers JP5 and JP6. By default, the EVM is set up with jumpers JP5 and JP6 installed, as shown in Figure 4.

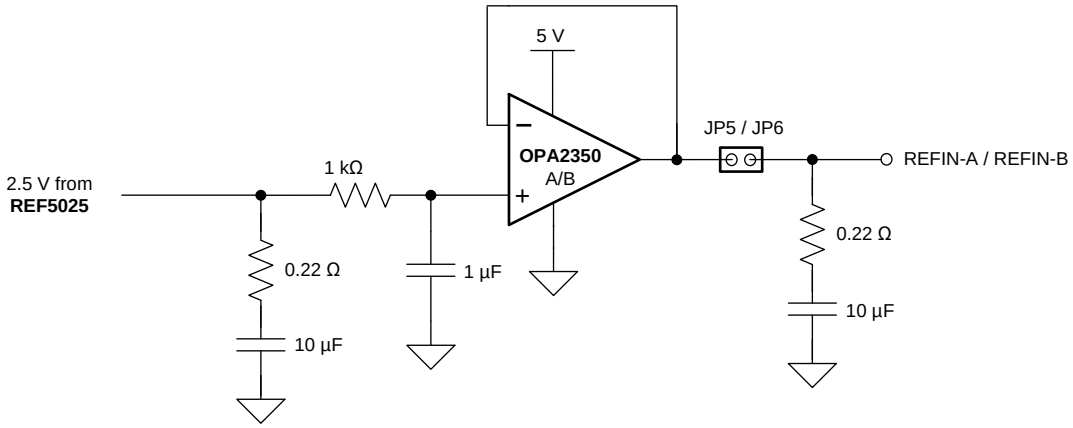


Figure 4. REFIN_A and REFIN_B Reference Connections

3 Digital Interface

Socket strip connector J6 provides the digital I/O connections between the ADS8350EVM board and the simple capture card board.

Table 3 summarizes the pinout for connector J6.

Table 3. Connector J6 Pinout

Terminal Number	Signal	Description
J6.2, J6.10, J6.15, J6.16, J6.18	GND	Ground connections
J6.4	$\overline{\text{EVM PRESENT}}$	EVM present, active low
J6.11, J6.12	I^2C™ bus	I^2C bus; used only used to program the U7 EEPROM on the EVM board
J6.13	DVDD	3.3-V digital supply from simple capture card controller board
J6.34	$\overline{\text{CS}}$	Chip select, active low
J6.36	SCLK	Serial interface clock
J6.40	SDO_A	Serial data output for channel A
J6.42	SDO_B	Serial data output for channel B

3.1 Serial Peripheral Interface (SPI)

The ADS8350 digital output is available in SPI-compatible format, which makes interfacing with microprocessors, digital signal processors (DSPs), and FPGAs easy. The ADS8350EVM offers 47-Ω resistors between the SPI signals and connector J6 to aid with signal integrity. Typically, in high-speed SPI communication, fast signal edges can cause overshoot; these 47-Ω resistors slow down the signal edges in order to minimize signal overshoot.

3.2 I^2C Bus for Onboard EEPROM

The ADS8350EVM has an I^2C bus to communicate with the onboard EEPROM that records the board name and assembly date. It is not used in any form by the ADS8350 converter.

4 Power Supplies

The analog portion of the ADS8350EVM-PDK requires a 5-V supply. The ADS8350EVM-PDK is configured at the factory using the onboard regulated analog 5-V supply (+VA); and an onboard 3.3-V digital supply. Alternatively, set the AVDD analog supply voltage by connecting an external power source through two-terminal connector J5. Table 4 lists the configuration details for P3.

Table 4. Power-Supply Jumpers

Terminal Number	Position	Function
JP12	Shunt 2-3 (default)	Onboard 5-V AVDD analog supply selected
	Shunt 1-2	External 5-V AVDD connected through two-terminal block J5
JP11	Open (default)	Open sets onboard AVDD supply to 5 V
	Closed	Closed sets onboard AVDD supply to 5.2 V

CAUTION

The external AVDD supply applied to external two-terminal connector J5 must not exceed 5.5 V or device damage may occur. The external AVDD supply must be in the range of 5.0 V to 5.5 V for proper ADS8350EVM operation.

5 ADS8350EVM-PDK Initial Setup

This section presents the steps required to set up the ADS8350EVM-PDK kit before operation.

5.1 Default Jumper Settings

A silkscreen plot detailing the default jumper settings is shown in Figure 5. Table 5 explains the configuration for these jumpers.

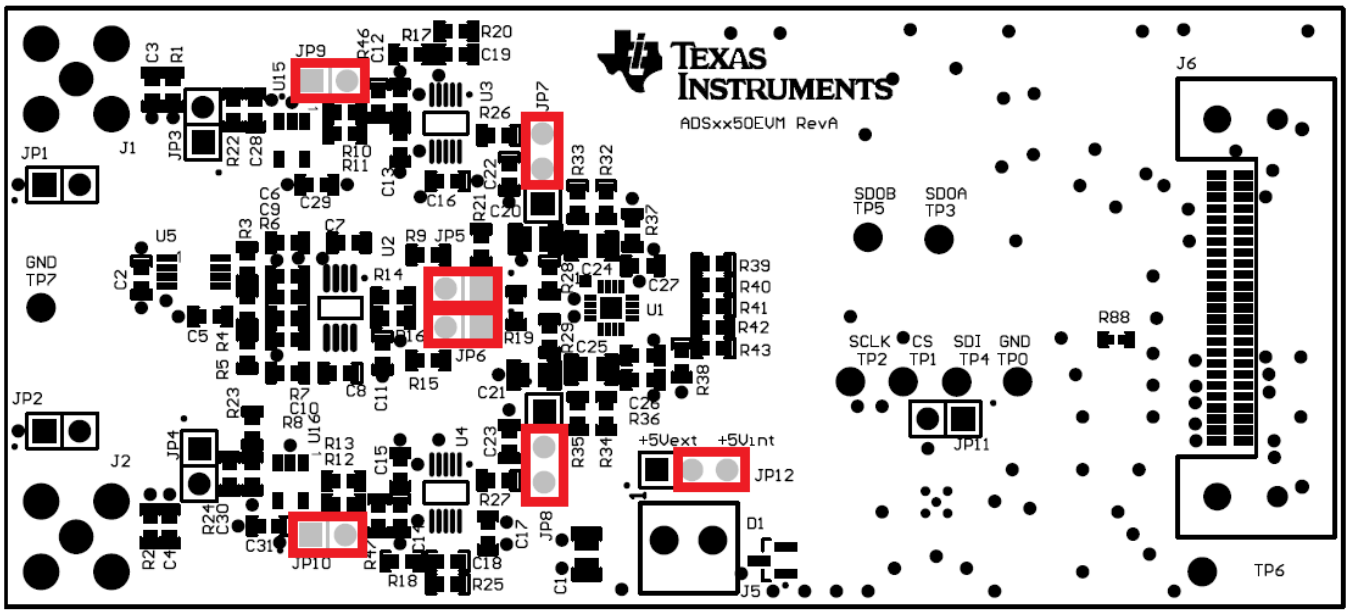


Figure 5. ADS8350EVM Default Jumper Settings

Table 5. Default Jumper Configuration

Terminal Number	Default Position	Switch Description
JP1	Open	JP1.2 header connector to inverted channel A input
JP2	Open	JP1.2 header connector to inverted channel B input
JP3	N/A	JP3 not installed on PCB board
JP4	N/A	JP4 not installed on PCB board
JP5	Closed	Closed to connect onboard 2.5-V reference to REFIN_A
JP6	Closed	Closed to connect onboard 2.5-V reference to REFIN_B
JP7	Short 2-3	Short 2-3 connects AINM_A(-) to 2.5-V
JP8	Short 2-3	Short 2-3 connects AINM_B(-) to 2.5-V
JP9	Closed	Open for channel A unipolar input signals at SMA connector; closed for channel A bipolar input signals at SMA connector.
JP10	Closed	Open for channel B unipolar input signals at SMA connector; closed for channel B bipolar input signals at SMA connector.
JP11	Open	Open sets onboard AVDD to 5 V; closed sets onboard AVDD to 5.2 V.
JP12	Short 2-3	Short 2-3 selects onboard regulated AVDD supply; short 1-2 selects external AVDD through J5.

5.2 Software Installation

This section presents the steps required to the install the software. Section 6 explains how to operate the software to acquire data.

NOTE: The ADS8350EVM-PDK with ADS8350 PWB Board revision A includes (1) microSD card. Ensure the microSD memory card included in the kit is installed in the microSD socket on the back of the simple capture card board before connecting the EVM to the PC. Otherwise, as a result of improper boot up, Windows cannot recognize the ADS8350EVM-PDK as a connected device.

The ADS8350EVM-PDK with ADS8350 PWB Board revision B includes (2) microSD cards. Ensure both microSD memory cards that contain the software are installed in the microSD sockets on the back of the simple capture card board and on the back of ADS8350EVM board respectively. Otherwise, as a result of improper boot up, Windows cannot recognize the ADS8350EVM-PDK as a connected device.

Complete the following steps to install the software:

Step 1. Verify the microSD memory card(s) are installed:
- ADS8350EVM PWB revision A: This PDK kit version includes (1) microSD Card. Verify the microSD memory card is installed on the simple capture card controller board
- ADS8350EVM PWB revision B: This PDK kit version includes (2) microSD Cards. Ensure both microSD memory cards are installed in the microSD sockets on the back of the simple capture card board and ADS8350EVM board respectively

Step 2. Verify jumpers are in the factory-default position and connect the hardware.

Step 3. Install the ADS8350EVM-PDK software.

Step 4. Complete the simple capture card device driver installation.

Each task is described in the following subsections.

5.2.1 Verify the microSD Memory Card is Installed on the Simple Capture Card Controller Board

The ADS8350EVM-PDK includes the microSD card(s) that contain the EVM software and simple capture card controller board firmware required for the EVM operation.

NOTE: Ensure the microSD memory card that contains the software is installed in the microSD socket (P6) on the back of the simple capture card board.

Figure 6 illustrates the bottom view of the simple capture card controller board with the microSD card installed.

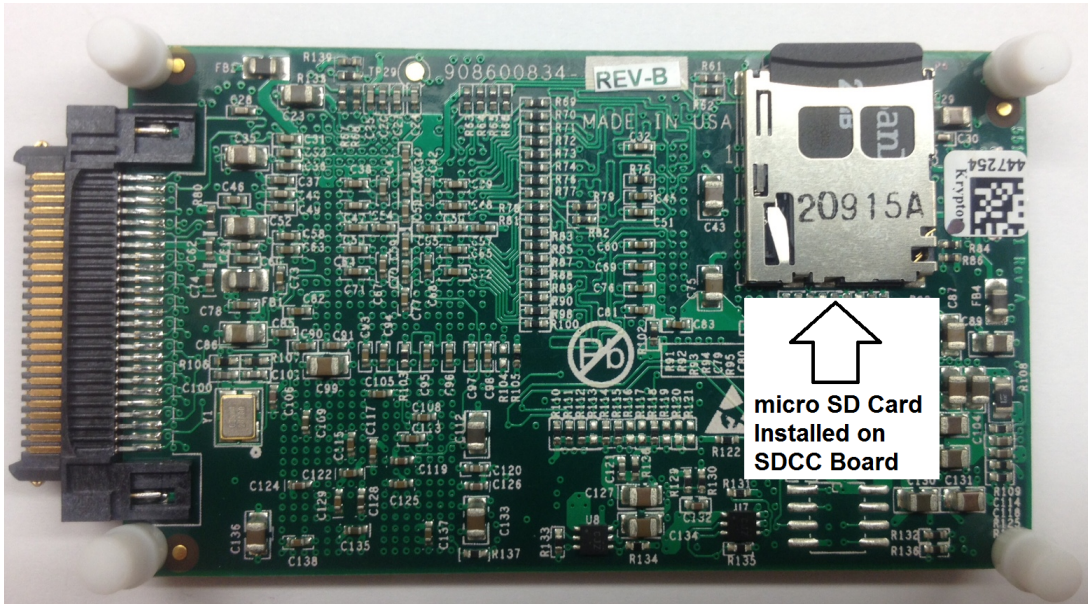


Figure 6. Bottom View of Simple Capture Card Board with microSD Memory Card Installed

NOTE: ADS8350EVM-PDK with ADS8350EVM PWB Board revision B (only):
This ADS8350EVM PWB version includes two (2) microSD cards. Ensure both microSD memory cards are installed in the microSD sockets on the back of the simple capture card board and on the back of the ADS8350EVM, as shown in Figure 6 and Figure 7 respectively.

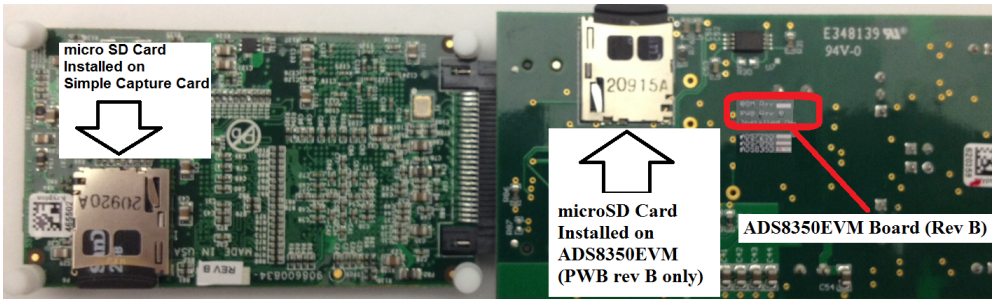


Figure 7. Bottom View of ADS8350EVM Rev B with microSD Card Installed

The microSD cards are formatted from the factory with the necessary firmware files for the simple capture card controller board to boot properly. In addition to the simple capture card firmware files (*app* and *MLO* files), the microSD cards contain the ADS8350EVM-PDK software installation files inside the *ADS8350 EVM V#.#.#* folder. *<V#.#.#>* refers to the installation software version number, and increments with software installer releases.

5.2.2 Verify Jumpers are in the Factory-Default Position and Connect the Hardware

The ADS8350EVM-PDK includes both the ADS8350EVM and the simple capture card controller board; however, the devices are shipped unconnected. Follow these steps to verify that ADS8350EVM-PDK kit is configured and connected properly.

Step 1. Verify the microSD card is installed on the back of the simple capture card board; see Figure 6.

Step 2. Verify the ADS8350EVM jumpers are configured; see Figure 5.

Step 3. Connect the ADS8350EVM board to the simple capture card controller board as Figure 8 shows.

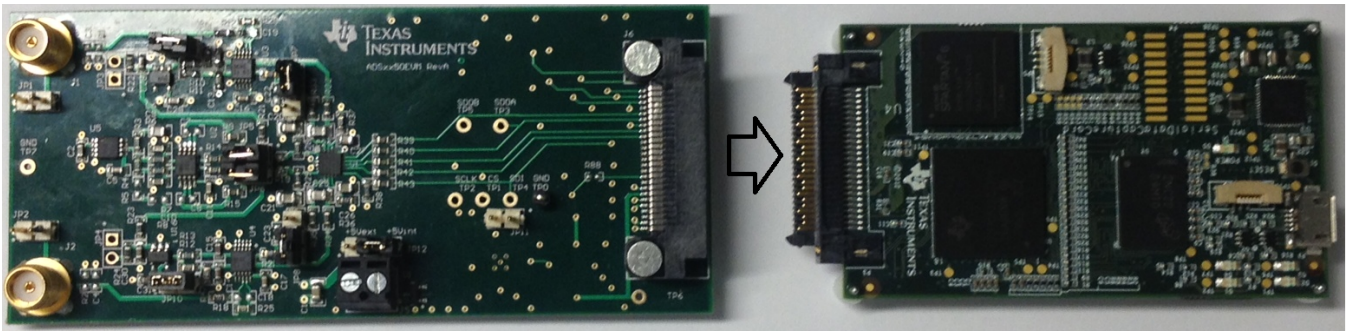


Figure 8. Connecting ADS8350EVM Board to Simple Capture Card Controller Board

Step 4. Connect the simple capture card controller board to the PC through the micro USB cable.

Step 5. Verify that the LED D5 *Power Good* indicator is illuminated. Wait approximately ten seconds and verify that diode D2 blinks, indicating that USB communication with the host PC is functioning properly. Figure 9 shows the location of the LED indicators in the simple capture card controller board.

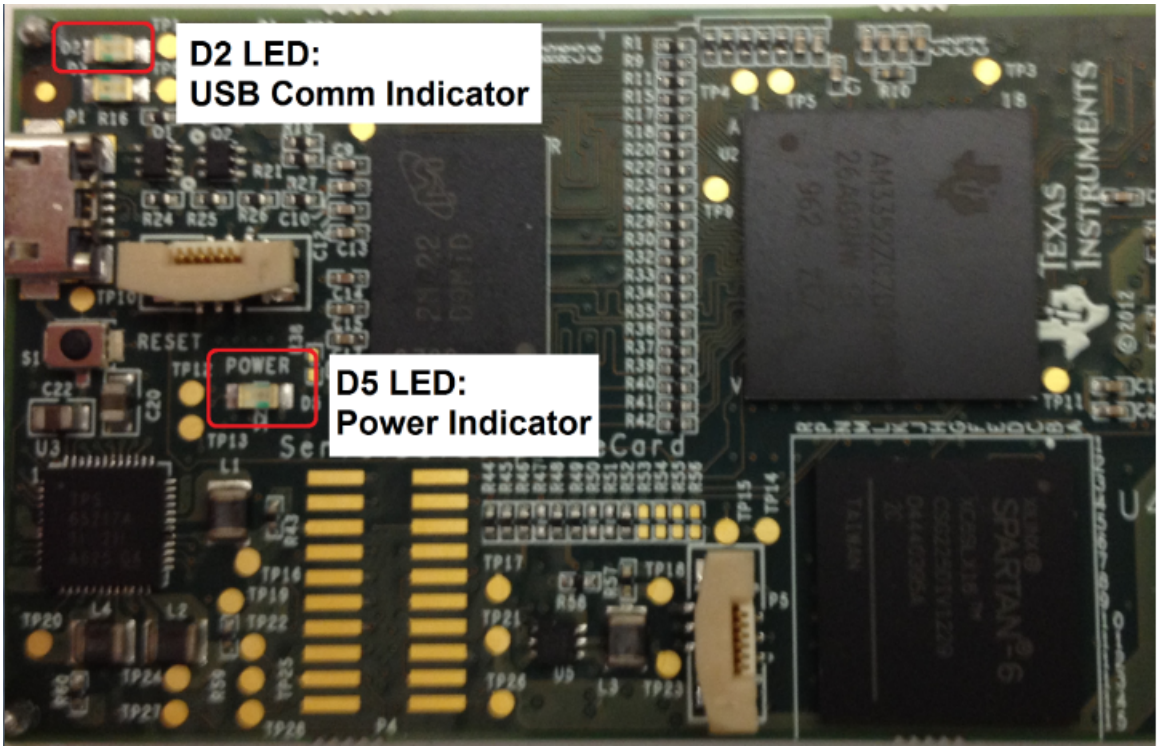


Figure 9. LED Indicators on the Simple Capture Card Board

5.2.3 Install the ADS8350EVM-PDK Software

The *ADS8350 EVM V#.#.#* software must be installed on the PC. This software supports the ADS8350EVM-PDK. The user must have administrator privileges to install the EVM software. The following steps list the directions to install the software.

1. Open Windows explorer and find the microSD memory card in the browser as a storage device.
2. Navigate to the *...\ADS8350 EVM Vx.x.x\Volume* folder.
3. Run the installer by right-clicking the *setup.exe* and selecting *Run as Administrator*. This action installs the EVM GUI software and the required simple capture card device driver components.
4. After the installer begins, a welcome screen displays. Click *Next* to continue.
5. A prompt appears with the destination directory; select the default directory under: *...\Program Files(x86)\Texas Instruments\ADS8350evm*, as shown in Figure 10.

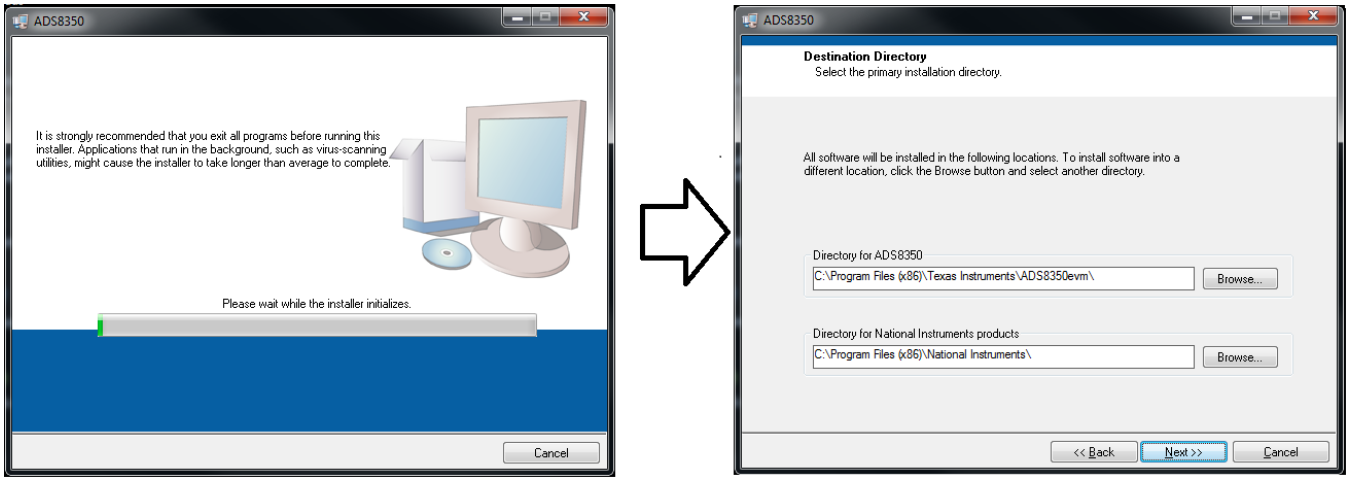


Figure 10. Welcome Screen and Destination Directory Screens

6. One or more software license agreements appear. Select *I Accept the License Agreement* and click *Next*.
7. The *Start Installation* screen appears, as shown in Figure 11. Click *Next*.

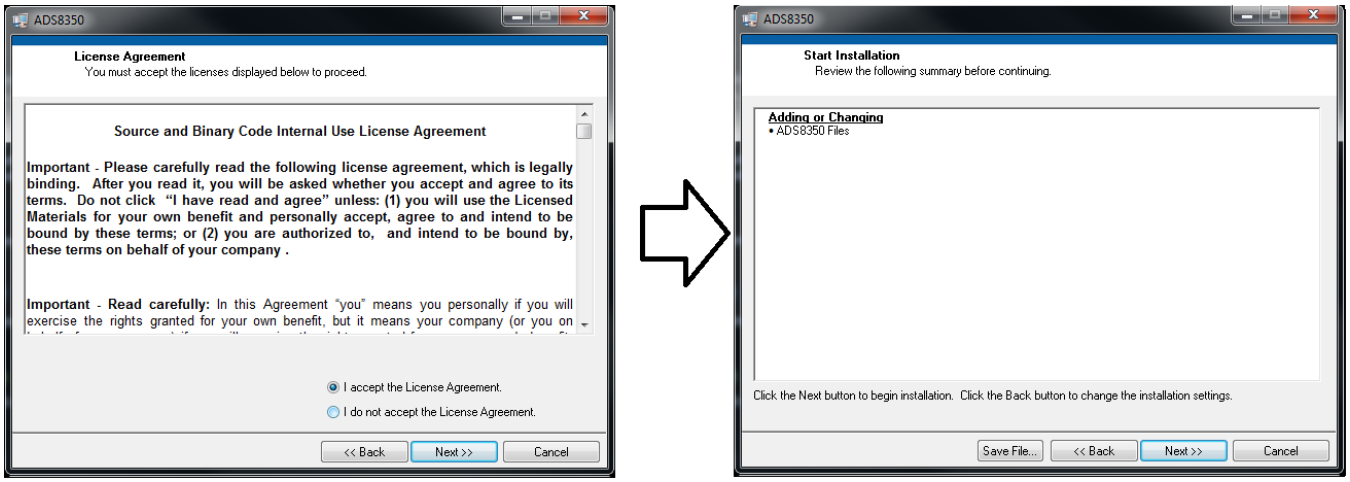


Figure 11. License Agreement and Start Installation Screens

8. A progress bar appears; this step takes a few minutes.
9. The progress bar is followed by an installation complete notice, as shown in Figure 12.

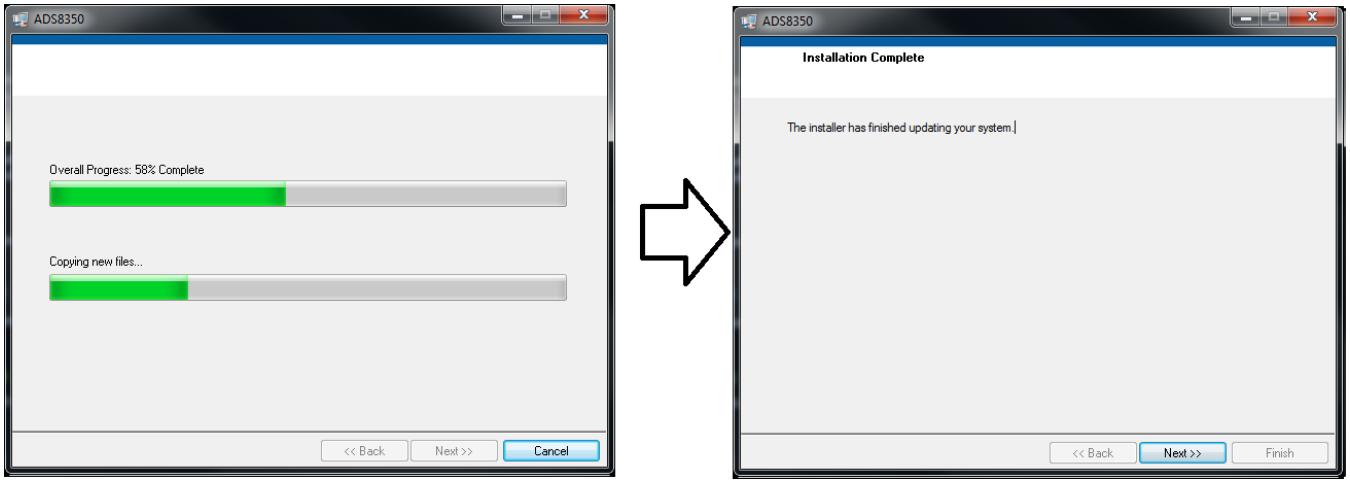


Figure 12. Progress Bar and Installation Complete Screens

5.2.4 Complete the Simple Capture Card Device Driver Installation

During installation of the simple capture card device driver, a prompt may appear with the Windows security message shown in Figure 13. Select *Install this driver software anyway* to install the driver required for proper operation of the software. The drivers contained within the installers are safe for installation to your system.

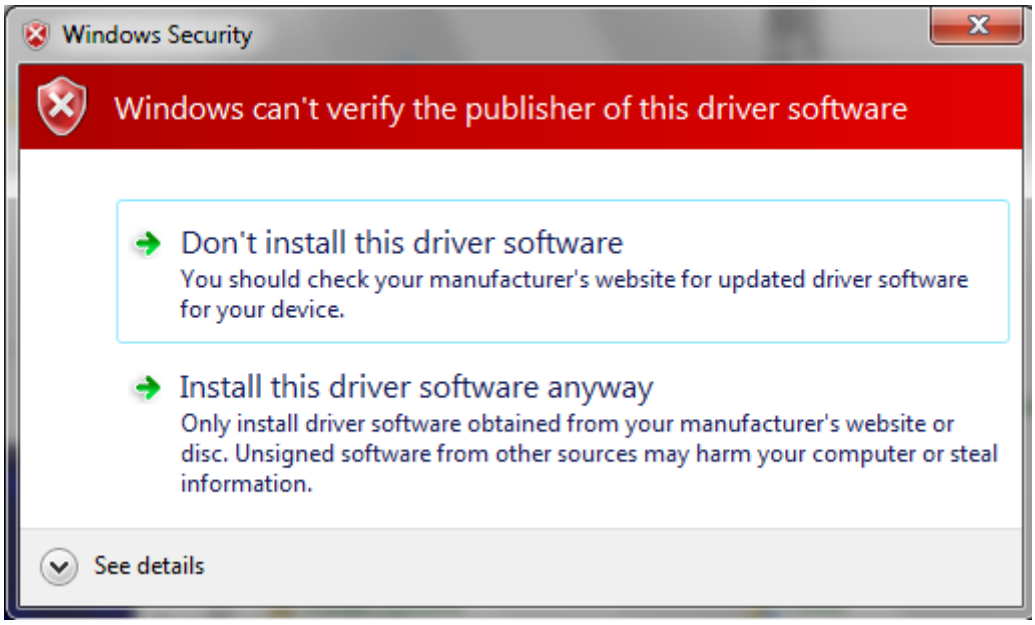


Figure 13. Windows 7 Driver Installation Warning

NOTE: Driver installation prompts do not appear if the simple capture card device driver is installed on your system previously.

The following steps describe how to install the simple capture card device driver.

Step 1. Immediately after the ADS8350 EVM software installation is complete, prompts appear to install the simple capture card device driver, as shown in Figure 14 and Figure 15

Step 2. A computer restart may be required to finish the software installation. If prompted, restart the PC to complete the installation.

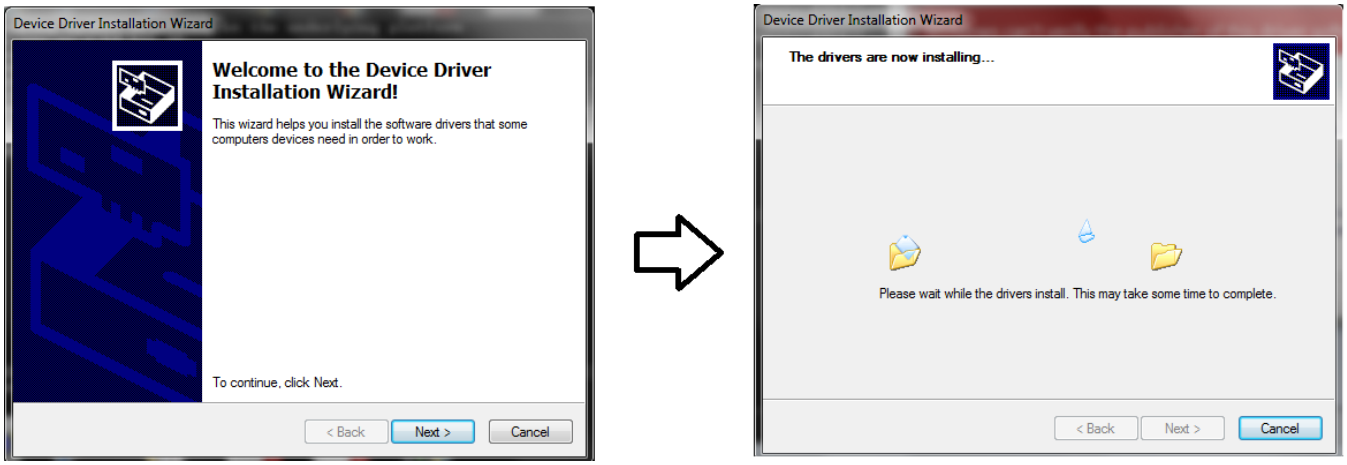


Figure 14. Simple Capture Card Device Driver Installation

Figure 15. Simple Capture Card Device Driver Completion

6 ADS8350EVM-PDK Kit Operation

This section describes how to use ADS8350EVM-PDK and the ADS8350EVM software to configure the EVM and acquire data.

6.1 About the Simple Capture Card Controller Board

The simple capture card controller board provides the USB interface between the PC and the ADS8350EVM. The controller board is designed around the AM335x processor, a USB 2.0 high-speed capability, 32-bit ARM core. The simple capture card controller board incorporates an onboard FPGA subsystem and 256MB of onboard DDR SRAM memory.

The simple capture card controller board is not sold as a development board, and it is not available separately. TI cannot offer support for the simple capture card controller` board except as part of this EVM kit.

6.2 Loading the ADS8350EVM-PDK Software

The ADS8350 EVM software provides control over the settings of the ADS8350. Adjust the ADS8350EVM settings when the EVM is not acquiring data. During acquisition, all controls are disabled and settings cannot be changed.

Settings on the ADS8350EVM correspond to settings described in the ADS8350 product data sheet (available for download at http://www.ti.com); see the product data sheet for details.

To load the *ADS8350 EVM* software, follow these steps:

Step 1. Make sure the EVM kit is configured and powered up as explained in Section 5.

Step 2. Start the ADS8350 EVM software. Go to *Start → All Programs →Texas Instruments → ADS8350 EVM* and run the software by right-clicking *ADS8350 EVM* and selecting *Run as Administrator*.

Step 3. Verify that the software detects the ADS8350EVM. The GUI identifies the EVM hardware that is connected to the controller board and displays *Loading the ADS8350evm Settings*. After the settings are loaded, *ADS8350EVM GUI* displays at the top of the GUI screen, as shown in Figure 16.

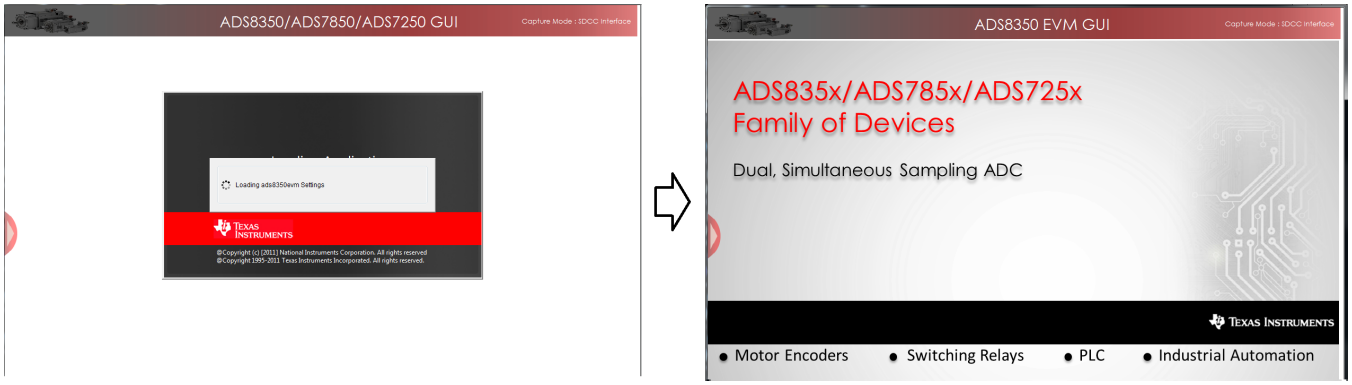


Figure 16. GUI Display Prompt

6.3 ADS8350EVM Settings

Configure the ADS8350EVM for evaluation. The *ADS8350EVM Settings* page explains in detail the analog input connections available on the evaluation board. In order to configure the EVM analog input connections, follow these steps:

1. Load the *ADS8350EVM Settings* page in the GUI. Hover the cursor over the red arrow at the left-center side of the GUI screen; a menu with different GUI pages appears. Click on *ADS8350 EVM Settings*, as shown in Figure 17.

Figure 17. Open the *ADS8350EVM Settings* Page

2. The ADS8350 dual, simultaneous ADC requires reference voltages V_{ref_A} and V_{ref_B} present on pins REFIN-A and REFIN_B, respectively. The ADS8350EVM provides an onboard 2.5-V reference source, REF5025 (U5), buffered with a dual OPA2350 amplifier and routed through jumpers JP5 and JP6. Therefore, jumpers JP5 and JP6 must be installed. Figure 18 shows the reference connections as described on the *ADS8350EVM Settings* page of the GUI.

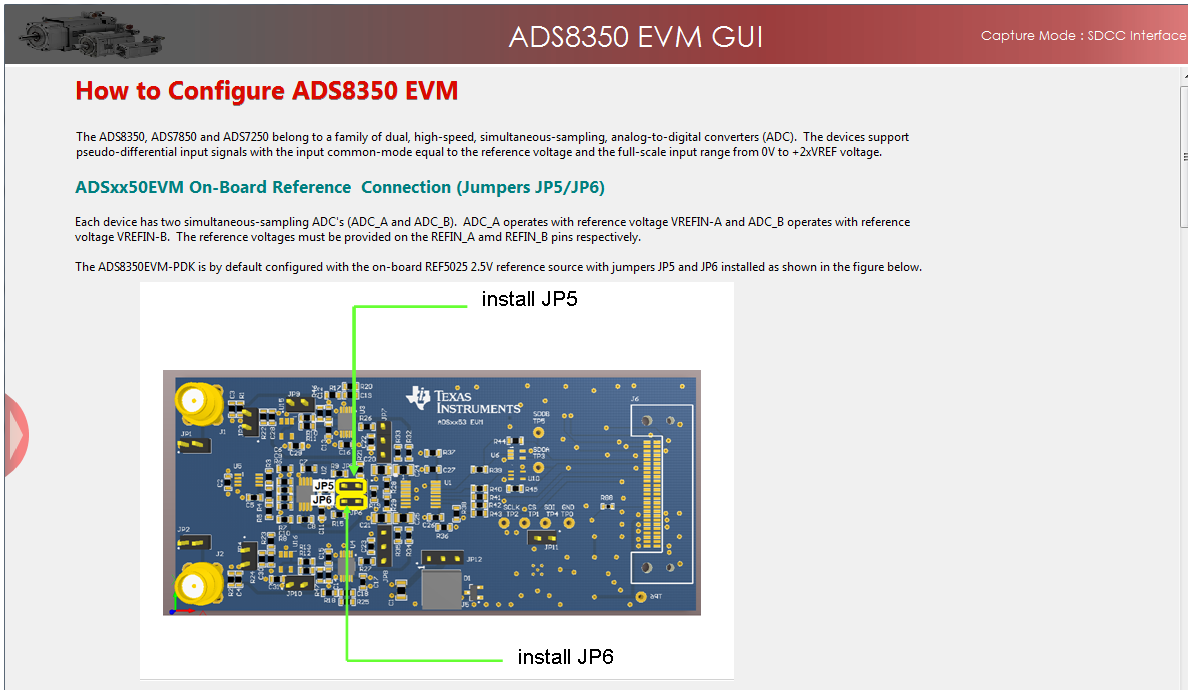


Figure 18. *ADS8350EVM Settings* Page

3. Scroll down in the *ADS8350EVM Settings* page and find the *ADS8350 Analog Inputs* connections descriptions on the GUI. The ADS8350EVM can be driven with a signal generator producing a bipolar source signal centered on GND or a unipolar signal centered at $+V_{ref}$ / 2. Jumpers JP9 and JP10 are installed when supporting a bipolar signal centered at GND. Jumpers JP9 and JP10 must be removed when supporting a unipolar signal source signal centered at 2.5-V. Figure 19 shows jumpers JP9 and JP10 on the *ADS8350EVM Settings* page of the GUI.

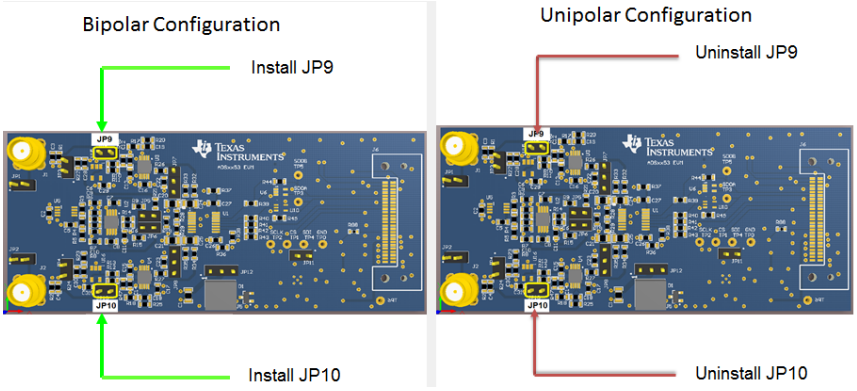


Figure 19. Bipolar or Unipolar Signal Jumper Settings Description on the GUI

6.4 Capturing Data with the ADS8350EVM-PDK

Access the *Data Monitor* page in the GUI to monitor data acquired by the ADS8350. This GUI page displays the acquired data versus time. To access the *Data Monitor* page, hover the cursor over the red arrow at the left center side of the GUI screen; a menu with different GUI pages appear. Click on the *Data Monitor* option in the menu, as shown in Figure 20.

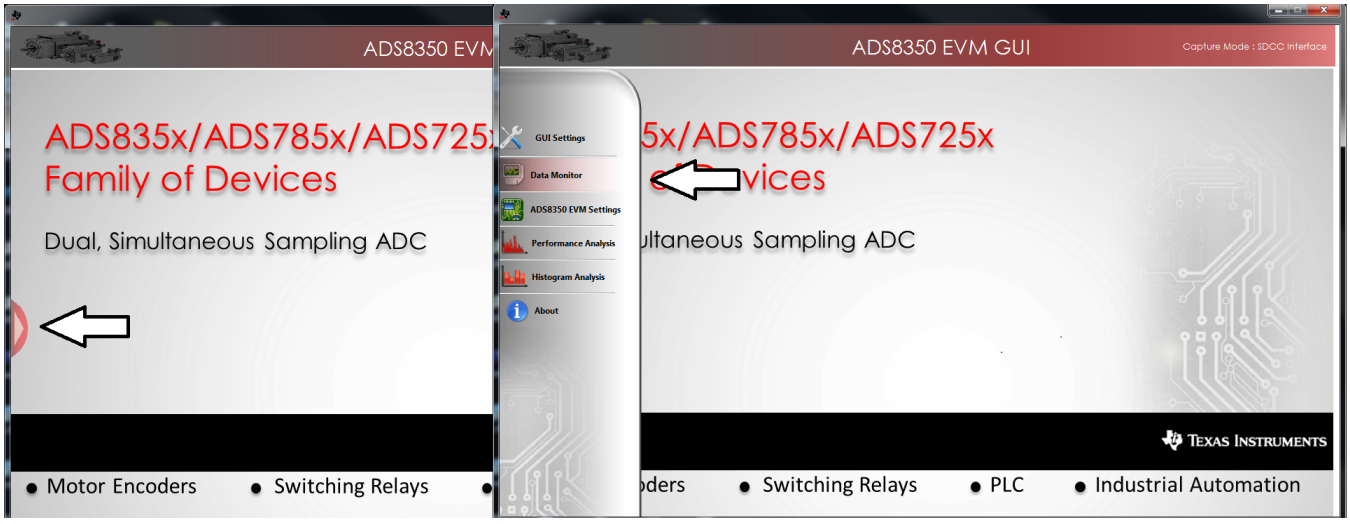


Figure 20. Open the *Data Monitor* page on the GUI

Figure 21 shows the *Data Monitor* page of the EVM GUI. Configure the device sampling rate and capture settings by using the *Capture Settings* portion of the *Data Monitor* page. The change in configuration settings are executed immediately after pressing the *Configure Device* button. The following list describes the different options available on the *Data Monitor* page.

No. of Samples— This option is used to select the number of samples captured in a block.

The number of samples captured in a block are contiguous. The drop-down menu is used to select a data block in the range of 1024 samples to 1,048,576 samples per channel. This control provides a drop-down list for values restricted to 2^n, where *n* is an integer.

SCLK— This control sets the clock frequency used by the SPI interface to capture data.

By configuring the SCLK frequency, the data rate of the ADS8350 is configured. The ADS8351EVM-PDK software supports SCLK frequencies of 24 MHz, 20 MHz, and 16.2 MHz. These SCLK frequencies correspond to data rates of 750 kSPS, 625 kSPS, and 506.2 kSPS respectively.

Device Status— This panel shows the current clock frequency and data rate of the ADS8350.

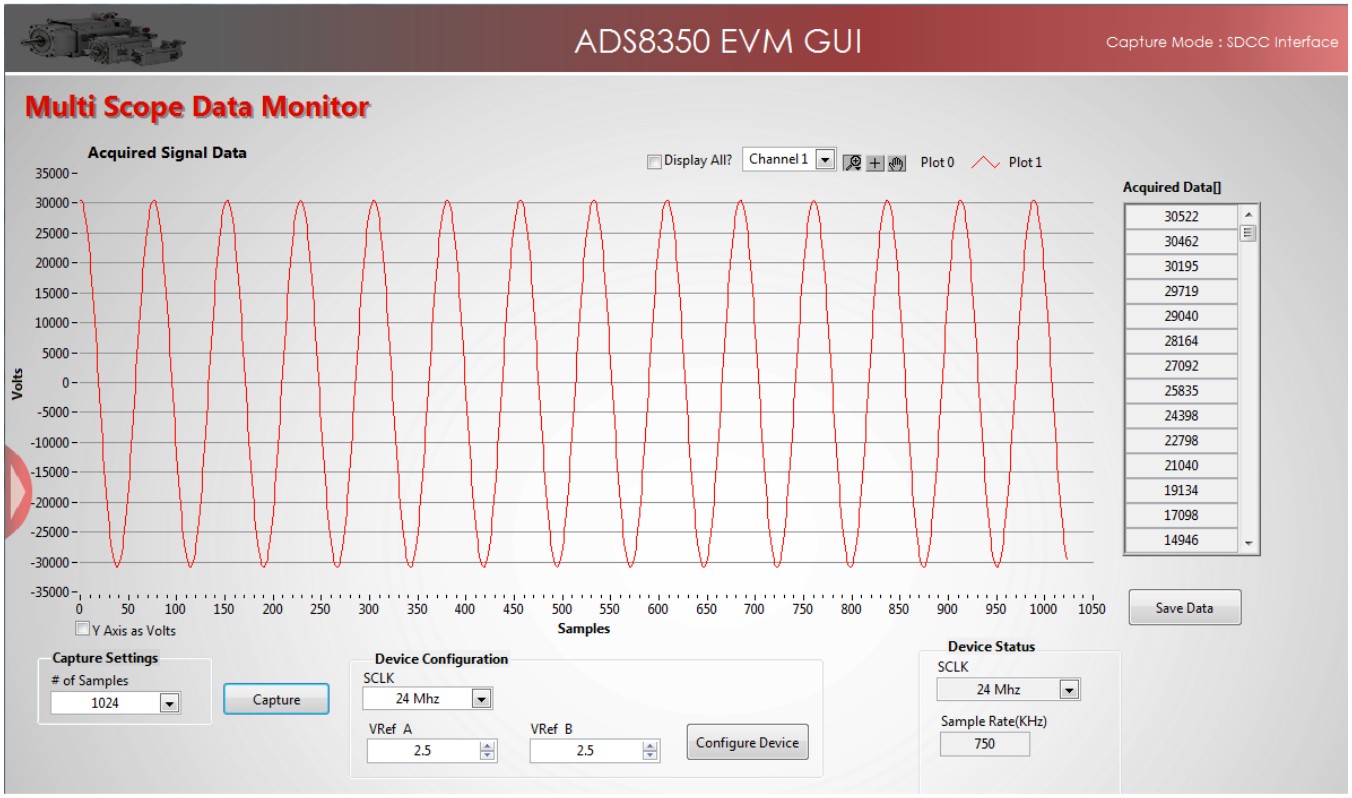


Figure 21. Data Monitor Page

6.4.1 Data Collection to Text Files

The *Data Monitor* page of the GUI allows data to be saved in a tab-delimited text file format that can be imported into Excel®, or other spreadsheet software tools. The text file contains the raw ADC data of both channel A and channel B in decimal data format. Information such as the device name, date and time, the sampling frequency, and number of samples of the data record are also stored. In order to save any data captured by the EVM, click on the *Save Data* button and specify the file path and file name of the data file, as shown in Figure 22.

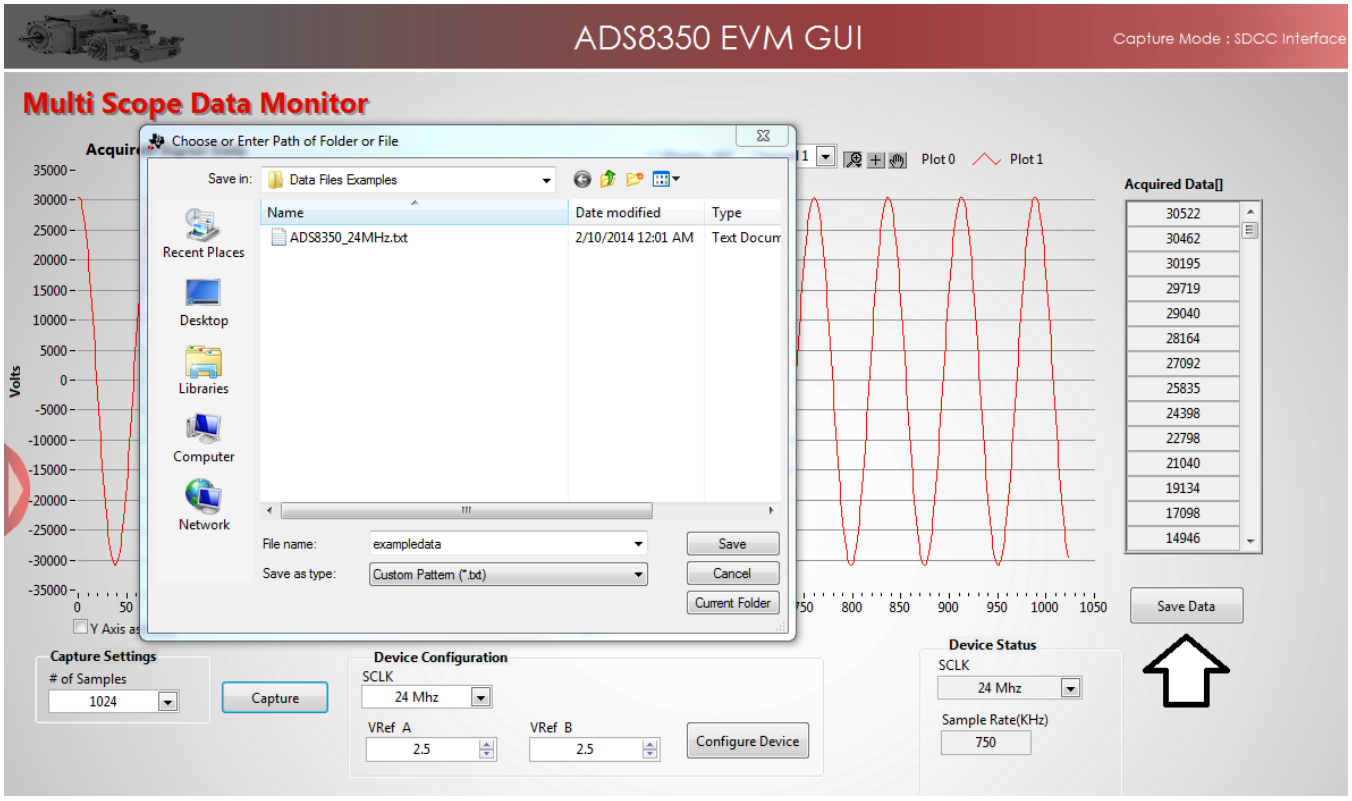


Figure 22. Saving Data to a Text File

6.5 FFT Analysis

The *Performance Analysis* page in the GUI performs the fast fourier transform (FFT) of the captured data, and displays the resulting frequency domain plots of channel A and channel B of the ADS8350. This page also calculates key ADC dynamic performance parameters, such as signal-to-noise ratio (SNR), total harmonic distortion (THD), signal-to-noise and distortion ratio (SINAD), and spurious-free dynamic range (SFDR). Figure 23 shows the FFT performance analysis display. The FFT calculated parameters are shown on the right side of the display.

Figure 23. FFT Performance Analysis Page

6.5.1 FFT Analysis Settings and Controls

Sample Rate (kHz)— This field indicates the sampling frequency of the ADC data (kHz).

Samples (No.)— The FFT requires a time domain record with a number of samples that is a power of 2. The Samples (#) drop-down menu provides a list of values that satisfy this requirement.

Fi Calculated— This field displays the frequency of the largest amplitude input signal computed from the FFT data, typically the fundamental frequency.

Window— The window function is a mathematical function that reduces the signal to zero at the end points of the data block.

In applications where coherent sampling cannot be achieved, a window-weighting function can be applied to the data to minimize spectral leakage. The following opions are available:

- None (no window weighting function applied; use for coherent data)
- Hanning
- Hamming
- Blackman-Harris
- Exact Blackman
- Blackman
- Flat Top
- 4-Term Blackman-Harris
- 7-Term Blackman-Harris
- Low Sidelobe

For a more thorough discussion of windowing, refer to IEEE1241-2000.

Harmonics— This field sets the number of harmonics that are included in the FFT performance calculations.

Leakage Bins— These fields provide for the removal of the unwanted frequency bins that may be the result of noncoherent data sampling.

Set the *Fundamental Leakage Bins* and *Harmonic Leakage Bins* fields to the number of adjacent bins on either side of the fundamental or harmonic frequencies to include the main frequency power. The *DC Leakage Bins* field allows the number of frequency bins that are a result of the dc portion of the measurement to be excluded from the calculations.

6.6 Histogram Analysis

Histogram testing is commonly used when characterizing ADCs. A histogram is merely a count of the number of times a code has occurred in a particular data set. The *Histogram Analysis* page of the GUI creates a histogram of the data of the acquired data set and displays it. Figure 24 shows the *Histogram Analysis* page of the GUI.

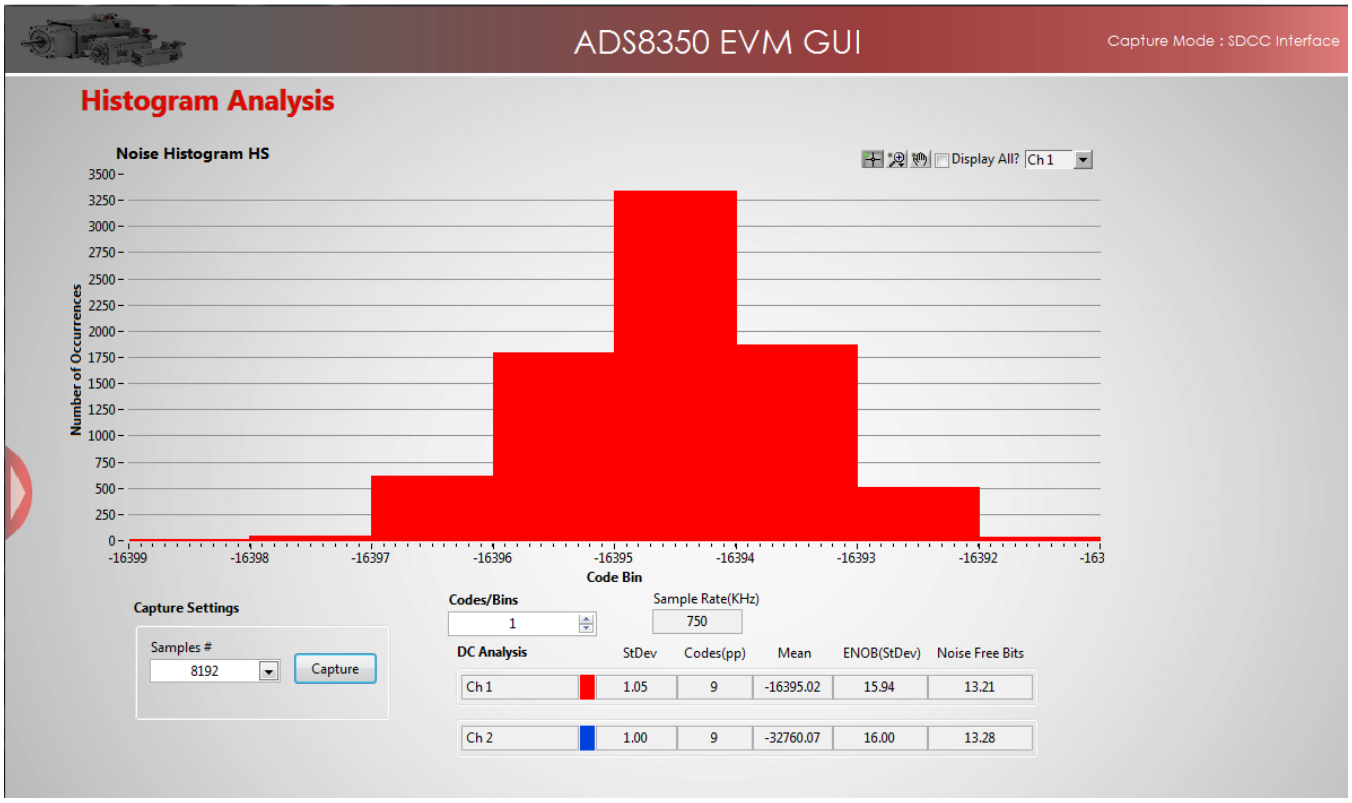


Figure 24. Histogram Analysis Page

The *DC Analysis* table shown in Figure 24 displays several parameters of the captured data set:

- The *StDev* column displays the standard deviation of the data set. This value is equivalent to the RMS noise of the signal when analyzing a dc data set.
- The *Codes(pp)* column shows the peak-to-peak spread of the codes in the data set; for a dc data set, this range would be the peak-to-peak noise.
- The *Mean* column displays the average value of the data set.
- The *ENOB(StDev)* column displays the effective number of bits of the converter, as calculated from the standard deviation or RMS noise.
- The *Noise Free Bits* column displays the effective bits of the converter when calculated using the peak-to-peak noise.

6.7 Troubleshooting

If the ADS8350EVM software stops responding while the ADS8350EVM-PDK is connected, unplug the USB cable from the EVM, unload the ADS8350EVM-PDK software, reconnect the ADS8350EVM-PDK to the PC, and reload the ADS8350EVM software.

When initially setting up the ADS8350 GUI, the software detects the EVM hardware, and loads the appropriate hardware settings. If the EVM hardware is not detected, the GUI defaults to the *Capture Mode: Software Debug* mode of operation using a preloaded captured data file for demonstration purposes.

While using the EVM-PDK hardware for data acquisition, keep the GUI in the *Capture Mode: SDCC interface* mode of operation. The GUI indicates the selected mode of operation on the top-right corner of the GUI display. In order to select the simple capture card interface mode of operation, navigate to the *GUI Settings* page and select the *SDCC Interface* option on the *Capture Mode* drop-down menu, as shown in Figure 25 and Figure 26.

Figure 25. Open the *GUI Settings* page

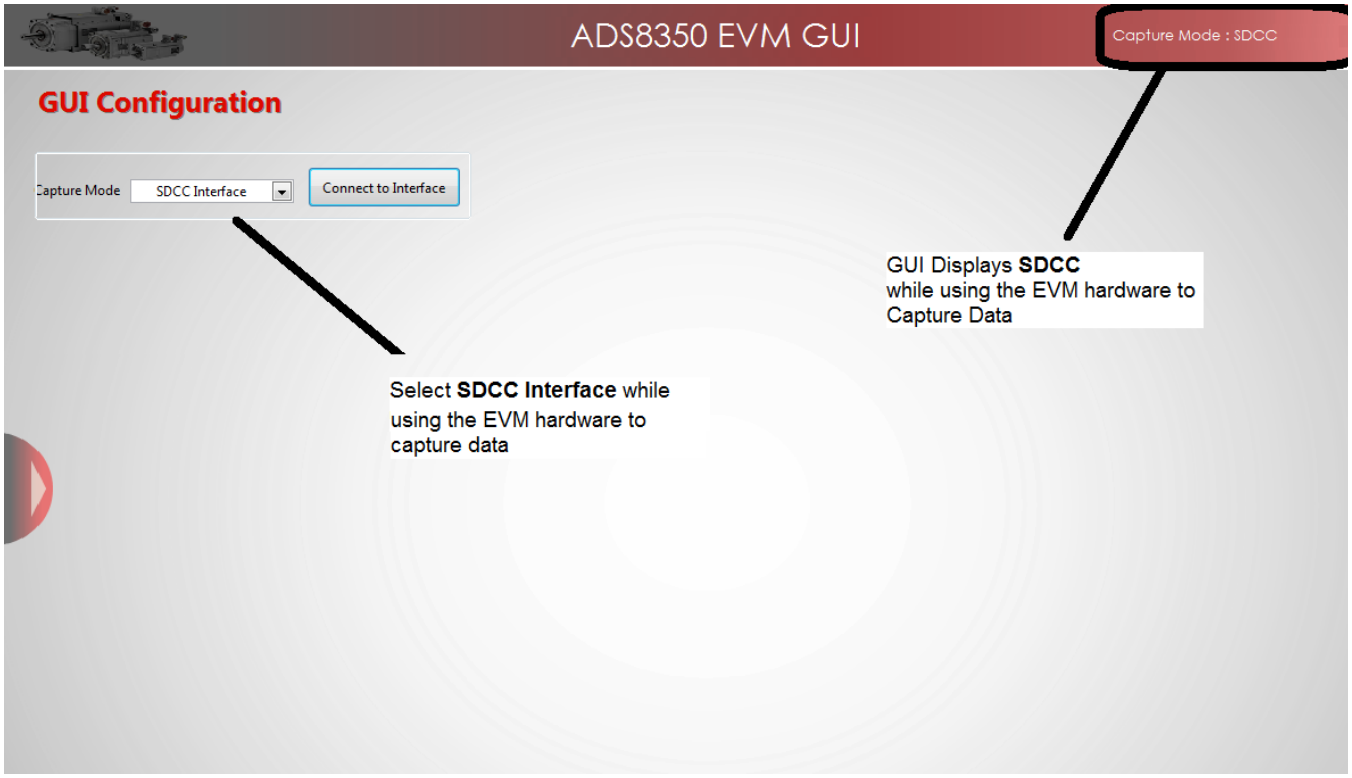


Figure 26. Set Capture Mode to *SDCC Interface* While Using the EVM Hardware

7 Bill of Materials, PCB Layout, and Schematics

Table 6 lists the bill of materials. Section 7.2 provides the PCB layout for the ADS8350EVM. The schematics for the ADS8350EVM are appended to the end of this user's guide.

7.1 Bill of Materials

NOTE: All components must be compliant with the European Union Restriction on Use of Hazardous Substances (RoHS) Directive. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS-compliant.

Table 6. ADS8350EVM Bill of Materials

Item No.	Qty	Ref Des	Description	Vendor	Part Number
1	11	C1, C20, C21, C39, C41, C42, C43, C44, C45, C46, C54	CAP, CERM, 10uF, 16V, +/-10%, X5R, 0805	Murata	GRM21BR61C106KE15L
2	11	C2, C5, C9, C10, C12, C13, C14, C15, C28, C30, C40	CAP, CERM, 1uF, 6.3V, +/-10%, X7R, 0603	Murata	GRM188R70J105KA01D
3	0	C3, C4, C7, C8, C18, C19, C22, C23	Not Install	Not Install	Not Install
4	4	C6, C26, C27, C51	CAP, CERM, 10uF, 6.3V, +/-20%, X5R, 0603	TDK	C1608X5R0J106M
5	8	C11, C16, C17, C29, C31, C48, C52, C53	CAP, CERM, 0.1uF, 16V, +/-5%, X7R, 0603	AVX	0603YC104JAT2A6
6	2	C24, C25	CAP CER 8200PF 50V 5% NP0 0805	TDK	C2012C0G1H822J060AA
7	2	C47, C50	CAP, CERM, 2.2uF, 16V, +/-10%, X5R, 0603	Murata	GRM188R61C225KE15D
8	1	C49	CAP, CERM, 0.22uF, 16V, +/-10%, X5R, 0603	TDK	GRM188R61C224KA88D
9	1	D1	DIODE ZENER 5.9V 250MW SOT23	NXP Semiconductors	PLVA659A.215
10	2	J1, J2	Connector, TH, SMA	TE Connectivity	142-0701-201
11	1	J5	2 Terminal Block 3.5MM 2POS PCB	On Shore Technology Inc	ED555/2DS
12	1	J6	SAMTEC, dual-row, right-angle, female, latching	SAMTEC	ERF8-025-01-L-D-RA-L-TR
13	1	J7	Note: Connector Not Installed on PWB RevA. MOLEX connector for microSD card	Molex Inc	Note: Connector Not Installed on PWB Rev. A MOLEX 502570-0893
14	0	JP3, JP4	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	SAMTEC	TSW-102-07-G-S
15	7	JP1, JP2, JP5, JP6, JP9, JP10, JP11	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulato	SAMTEC	TSW-102-07-G-S
16	3	JP7, JP8, JP12	Header, TH, 100mil, 3x1, Gold plated, 230 mil above insulator	SAMTEC	TSW-103-07-G-S
17	1	R3	RES, 0.22 ohm, 1%, 0.1W, 0603	Panasonic Electronic Components	ERJ-3RQFR22V
18	7	R4, R14, R16, R36, R37, R89, R90	RES, 0 ohm, 5%, 0.1W, 0603	Vishay Dale	CRCW06030000Z0EA
19	2	R6, R7	RES, 100 ohm, 1%, 0.1W, 0603	Vishay Dale	CRCW0603100RFKEA
20	8	R9, R15, R31, R39, R40, R41, R42, R43	RES, 47.0 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0747RL
21	8	R10, R12, R17, R18, R20, R25, R46, R47	RES, 1.00k ohm, 0.1%, 0.1W, 0603	Susumu	RG1608P-102-B-T5
22	2	R11, R13	RES, 1.00k ohm, 1%, 0.1W, 0603	Vishay Dale	CRCW06031K00FKEA
23	4	R21, R22, R23, R24	RES, 20.0k ohm, 1%, 0.1W, 0603	Vishay Dale	CRCW060320K0FKEA
24	2	R26, R27	RES, 1.00 ohm, 1%, 0.1W, 0603	Vishay Dale	CRCW06031R00FKEA

Table 6. ADS8350EVM Bill of Materials (continued)

Item No.	Qty	Ref Des	Description	Vendor	Part Number
25	2	R28, R29	RES, 0.1 ohm, 1%, 0.1W, 0603	Panasonic Electronic Components	ERJ-3RSFR10V
26	4	R32, R33, R34, R35	RES, 10.0 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0710RL
27	2	R38, R86	RES, 100k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW0603100KJNEA
28	6	R70, R71, R72, R73, R74, R75	RES, 10k ohm, 5%, 0.063W, 0402	Vishay Dale	CRCW040210K0JNED
29	1	R76	RES, 10.0k ohm, 1%, 0.1W, 0603	Vishay Dale	CRCW060310K0FKEA
30	2	R80, R84	RES, 0 ohm, 5%, 0.125W, 0805	Vishay Dale	CRCW08050000Z0EA
31	0	R1, R2, R5, R8, R19, R30	Not Install		Not Install
32	0	R83, R87, R88, R91	Not Install		Not Install
33	1	U1	Dual, 750kSPS, 16 BIT Simultaneous Sampling ADC	Texas Instruments	ADS8350IRTE
34	1	U2	High-Speed, Single-Supply, Rail-to-Rail OPA	Texas Instruments	OPA2350EA
35	2	U3, U4	Very Low-Power, Rail-to-Rail Out, Negative Rail In, VFB Op Amp 205MHz	Texas Instruments	OPA2836IDGS
36	1	U5	Low Noise, Low Drift, Precision Voltage Reference	Texas Instruments	REF5025IDGK
37	1	U7	Atmel I2C Compatible (2-Wire) Serial EEPROM	Atmel	AT24C02C-XHM
38	1	U8	36-vA, 1-A, 4.17uVRMS RF LDO Voltage Regulator	Texas Instruments	TPS7A4700RGW
39	1	U9	60mA, 5.5V, Buck/Boost Charge Pump	Texas Instruments	REG71055DDC
40	1	U14	NanoPower Supervisory Circuit	Texas Instruments	TPS3836E18DBVT
41	2	U15, U16	Low Noise, Low Quiescent Current, Precision OPA	Texas Instruments	OPA376AIDBVT
42	7	N/A	Conn Shunt, Pitch 0.100"; Height 0.240" , Gold Plated	SAMTEC	SNT-100-BK-G
43	5	TP0, TP7, TP8, TP9, TP10	TEST POINT PC MINI .040"D BLACK	Keystone Elerctronics	5001
44	0	TP1, TP2, TP3, TP4, TP5, TP6	Not Install	Keystone Elerctronics	Not Install
45	2	N/A	BUMPON CYLINDRICAL .375X.135 BLK	3M	SJ61A8

7.2 PCB Layout

Figure 27 through Figure 30 show the PCB layouts for the ADS8350EVM.

NOTE: Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing ADS8350EVM PCBs.

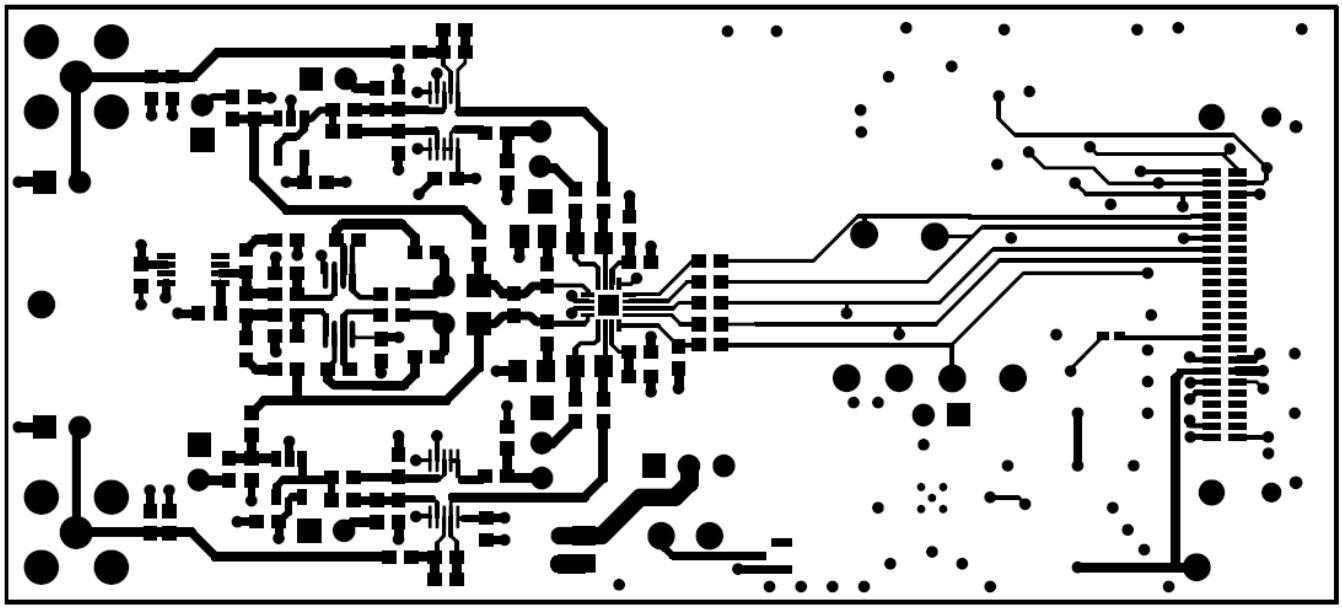


Figure 27. ADS8350EVM PCB: Top Layer

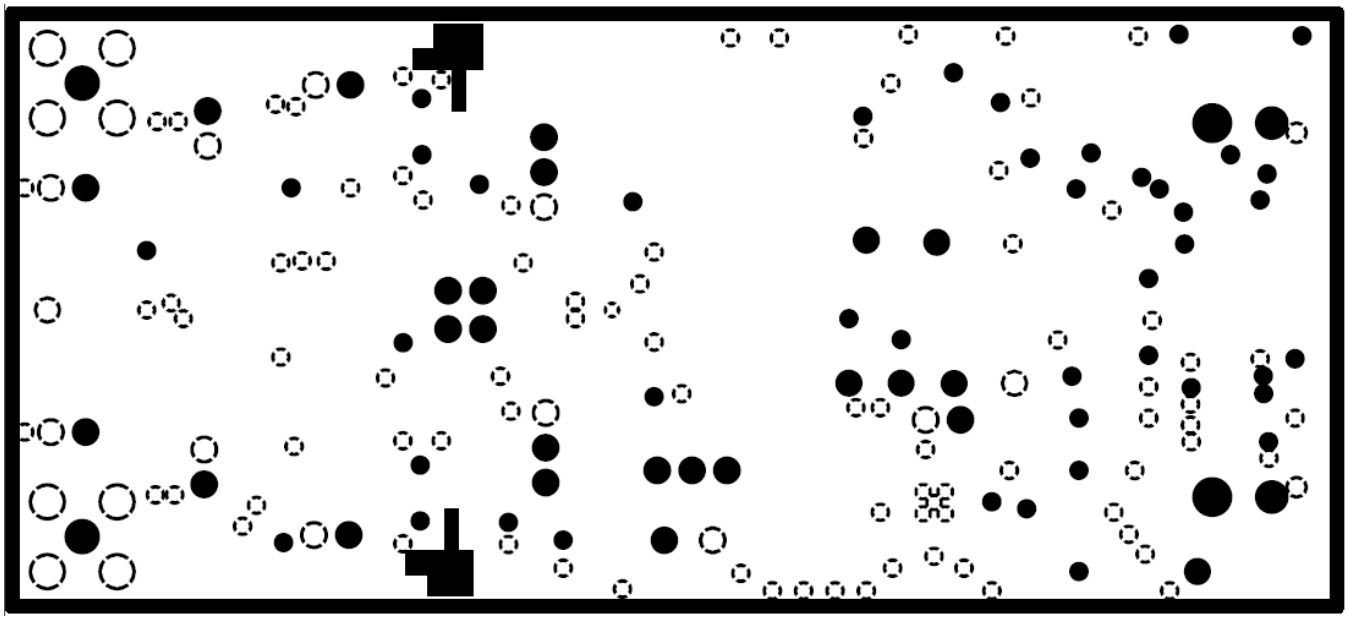


Figure 28. ADS8350EVM PCB: Ground Layer

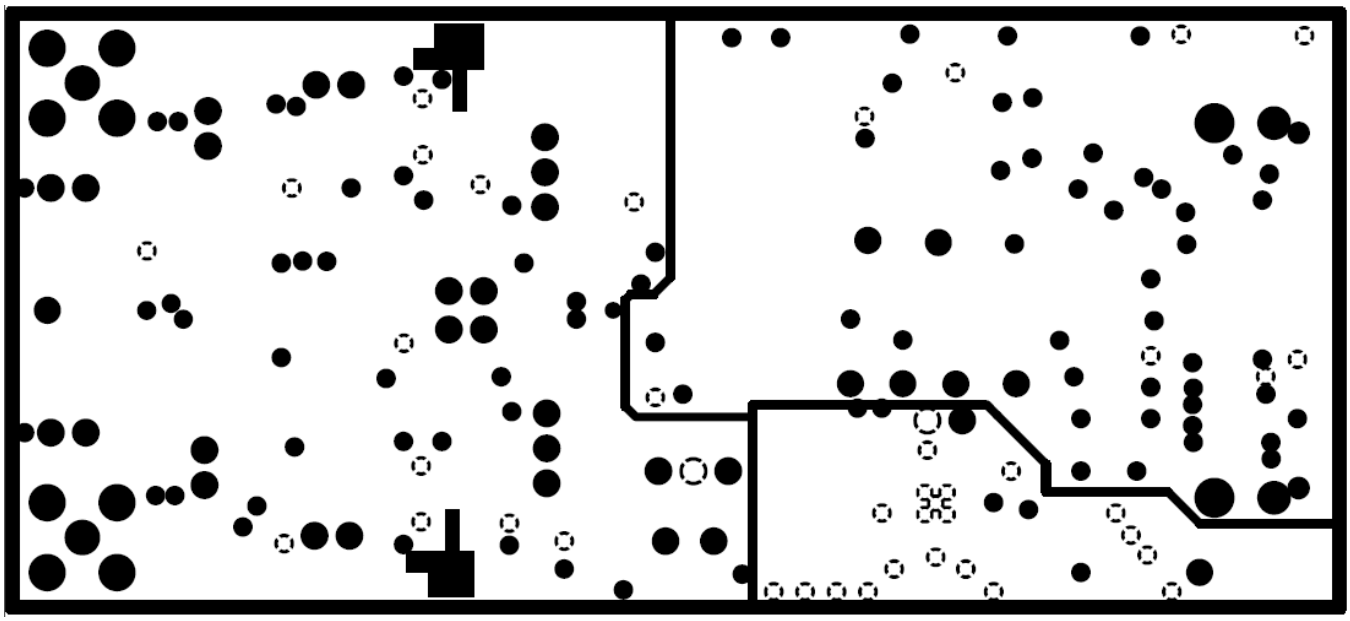


Figure 29. ADS8350EVM PCB: Power Layer

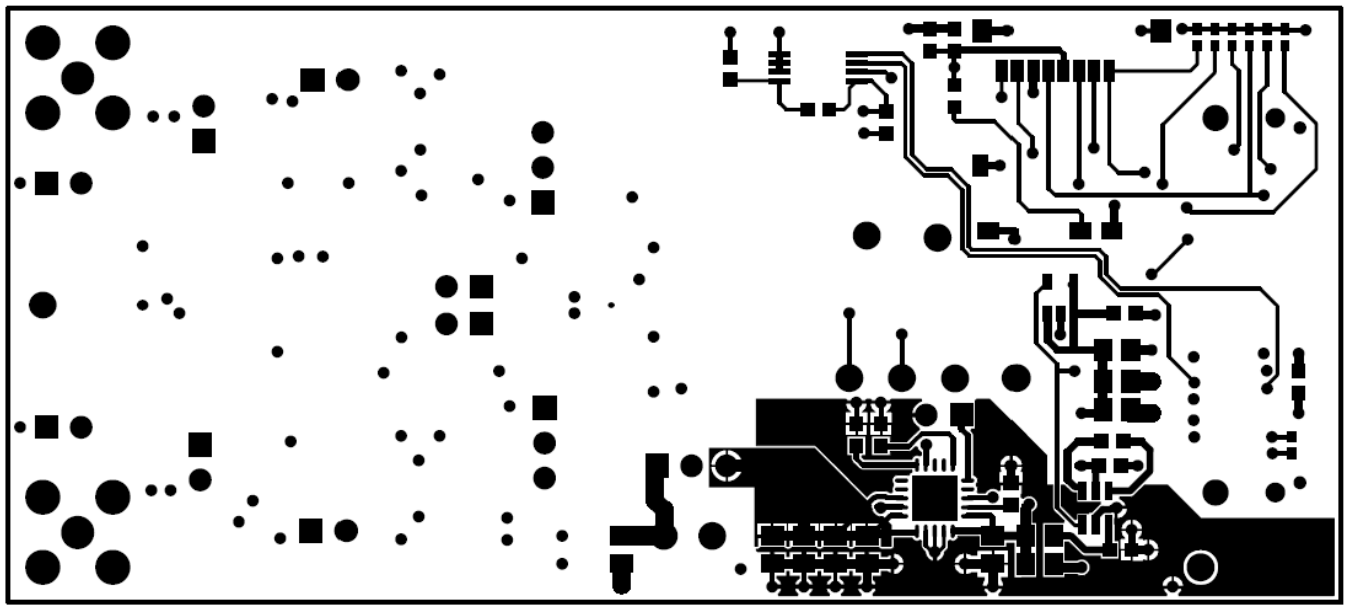


Figure 30. ADS8350EVM PCB: Bottom Layer

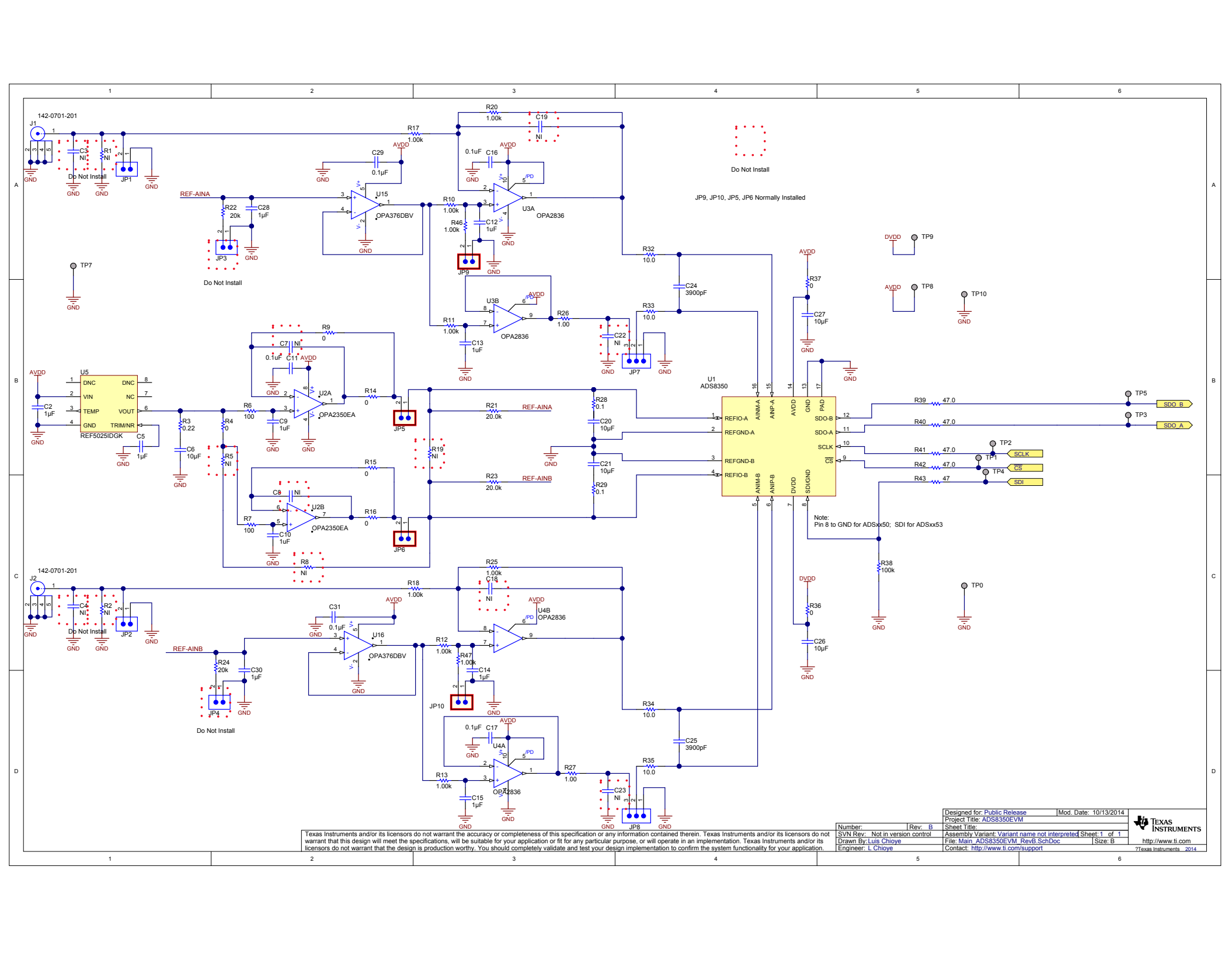
7.3 Schematics

The schematics for the ADS8350EVM are appended to the end of this user's guide.

Revision History

Changes from Original (April 2014) to A Revision	Page
• Changed SDCC controller to Simple Capture Card controller where applicable throughout document	1
• Deleted J6.38 (SDI) row from Table 3	7
• Changed Section 5.2: changed ADS8350EVM rev B requirement to two microSD cards, added Figure 7	10
• Added Figure 7	11
• Changed Table 6: J7 is installed for ADS8350EVM rev B, added TP7, TP8, TP9, TP10 for ADS8350EVM rev B	25

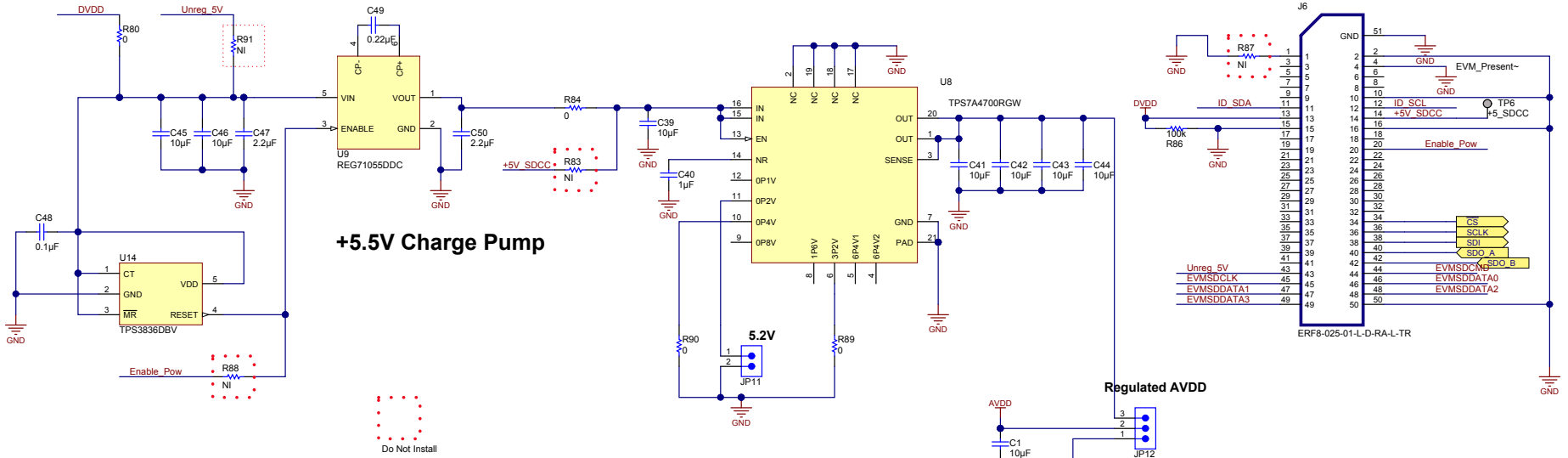
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.



Number:	Rev: B	Designed for: Public Release	Mod. Date: 10/13/2014
SVN Rev: Not in version control		Project Title: ADS8350EVM	
Drawn By: Luis Chioye		Sheet Title:	
Engineer: L Chioye		Assembly Variant: Variant name not interpreted	Sheet: 1 of 1
		File: Main_ADS8350EVM_RevB.SchDoc	Size: B
		Contact: http://www.ti.com/support	

Texas Instruments
http://www.ti.com

+3.3V SDCC Digital Supply



Number:	Rev: B	Designed for: Public Release	Mod. Date: 9/11/2014
SVN Rev: Not in version control		Project Title: ADS8350EVM	
Drawn By:		Sheet Title:	
Engineer: L Chioye		Assembly Variant: Variant name not interpreted	Sheet: 1 of 1
		File: Connector_ADS8350EVM_RevB.SchDoc	Size: B
		Contact: http://www.ti.com/support	

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   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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