ADS1282EVM and ADS1282EVM-PDK User's Guide

ADS1282EVM (Left) and ADS1282EVM-PDK (Right)

This user's guide describes the characteristics, operation, and use of the ADS1282EVM, both by itself and as part of the ADS1282EVM-PDK. This evaluation model (EVM) is an evaluation board for the ADS1282, a high-performance, 32-bit multi-channel, delta-sigma analog-to-digital converter (ADC). The EVM allows evaluation of all aspects of the ADS1282. Complete circuit descriptions, schematic diagrams, and bills of material are included in this document.

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

EVM-Compatible Device Data Sheets

Device	Literature Number	Device	Literature Number
ADS1282	SBAS418E	SN74LVC2G157	SCES207K
REF5025	SBOS410C	SN74LVC1G07	SCES296W
REF5050	SBOS410C	SN74AHCT1G04	SCLS319N
OPA2350	SBOS099C	TPS79225	SLVS337B
OPA1632	SBOS286A	TPS72325	SLVS346B
PCA9535	SCPS129H		

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1 EVM Overview

1.1 Features

ADS1282EVM:

- Contains all support circuitry needed for the ADS1282
- Voltage reference options: external or onboard
- Clock options: External clock source or 4.096MHz onboard crystal oscillator
- Compatible with the TI Modular EVM System

ADS1282EVM-PDK/ADS1282EVM-PDK Features:

- Easy-to-use evaluation software for Microsoft® Windows® XP
- Data collection to text files
- Built-in analysis tools including scope, FFT, and histogram displays
- Complete control of board settings
- Easily expandable with new analysis plug-in tools from Texas Instruments

For use with a computer, the ADS1282EVM-PDK is available. This kit combines the ADS1282EVM board with the DSP-based MMB0 motherboard, and includes ADCPro™ software for evaluation.

The MMB0 motherboard allows the ADS1282EVM to be connected to the computer via an available USB port. This manual shows how to use the MMB0 as part of the ADS1282EVM-PDK, but does not provide technical details about the MMB0 itself.

ADCPro is a program for collecting, recording, and analyzing data from ADC evaluation boards. It is based on a number of plug-in programs, so it can be expanded easily with new test and data collection plug-ins. The ADS1282EVM-PDK is controlled by a plug-in that runs in ADCPro. For more information about ADCPro, see the ADCPro™ Analog-to-Digital Converter Evalutation Software User's Guide (literature number SBAU128), available for download from the TI web site.

This manual covers the operation of both the ADS1282EVM and the ADS1282EVM-PDK. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS1282EVM.

1.2 Introduction

The ADS1282EVM is an evaluation module built to the TI Modular EVM System specification. It can be connected to any modular EVM system interface card.

The ADS1282EVM is available as a stand-alone printed circuit board (PCB) or as part of the ADS1282EVM-PDK, which includes an MMB0 motherboard and software. As a stand-alone PCB, the ADS1282EVM is useful for prototyping designs and firmware.

Note that the ADS1282EVM has no microprocessor and cannot run software. To connect it to a computer, some type of interface is required.

2 Analog Interface

For maximum flexibility, the ADS1282EVM is designed for easy interfacing to multiple analog sources. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row, header/socket combination at J6. This header/socket provides access to the analog input pins of the ADS1282. Consult Samtec at http://www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options.

The input pins on the ADS1282EVM are directly connected to the part, with no filtering or protection. It is important that appropriate caution is taken when handling the pins. Table 1 summarizes the pinouts for analog interface J6.

Table 1. J6: Analog Interface Pinout

Pin Number	Signal	Description
J6.1	A1N	AINN1, ADS1282
J6.2	A1P	AINP1, ADS1282
J6.3	A2N	AINN2, ADS1282
J6.4	A2P	AINP2, ADS1282
J6.9-13 (odd)	AGND	Analog ground connections
J6.15	VCOM	
J6.17-19 (odd	AGND	Analog ground connections
J6.18	REFN	External reference source input (– side of differential input)
J6.20	REFP	External reference source input (+ side of differential input)
J6.5-8	Unused	
J6.10-16 (even)	Unused	

3 Digital Interface

3.1 Serial Data Interface

The ADS1282EVM is designed to easily interface with multiple control platforms. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row, header/socket combination at J5. This header/socket provides access to the digital control and serial data pins of the ADC. Consult Samtec at http://www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options.

All logic levels on J5 are 3.3V CMOS, except for the I^2C™ pins. These pins conform to 3.3V I^2C rules. Table 2 describes the J5 serial interface pins.

Table 2. J5: Serial Interface Pins

Pin No.	Pin Name	Signal Name	I/O Type	Pullup	Function
J5.1	CNTL	Unused			
J5.2	GPIO0	M0	In/Out	Low	Data rate select input / Modulator data output
J5.3	CLKX	SCLK	In	None	ADS1282 SPI™ clock
J5.4	DGND	DGND	In/Out	None	Digital ground
J5.5	CLKR	Unused			
J5.6	GPIO1	M1	In/Out	High	Data rate select input / Modulator data output
J5.7	FSX	Unused			
J5.8	GPIO2	MCLK	Out	Low	Modulator clock output
J5.9	FSR	$\overline{\text{DRDY}}$	Out	None	Data ready signal
J5.10	DGND	DGND	In/Out	None	Digital ground
J5.11	DX	MOD/DIN	In	None	ADS1282 SPI data in
J5.12	GPIO3	SUPSOR	In	High	Power-supply regulator Hi = ±2.5V Lo = +5V
J5.13	DR	DOUT	Out	None	ADS1282 data out
J5.14	GPIO4	PDWN	In	High	Power-down input
J5.15	INT	$\overline{\text{DRDY}}$	Out	None	Data ready signal
J5.16	SCL	SCL	I^2C	n/a	I^2C clock

Table 2. J5: Serial Interface Pins (continued)

Pin No.	Pin Name	Signal Name	I/O Type	Pullup	Function
J5.17	TOUT	CLK	In	None	Can be used to provide a clock from a processor
J5.18	DGND	DGND	In/Out	None	Digital ground
J5.19	GPIO5	EXTCLK	In	None	External clock input
J5.20	SDA	SDA	I^2C	n/a	I^2C data

Many pins on J5 have weak pull-up/-down resistors. These resistors provide default settings for many of the control pins. Many pins on J5 correspond directly to ADS1282 pins. See the ADS1282 product data sheet for complete details on these pins.

4 Power Supplies

J8 is the power-supply input connector. Table 3 lists the configuration details for J8. Analog inputs to the ADC can be applied directly to the device (see Section 8.1, *Analog Input*). An additional bipolar supply is needed to power the bipolar amplifiers. For optimum noise performance, the external supplies (+VA and –VA) should be used.

Table 3. J3 Configuration: Power-Supply Input

Pin No.	Pin Name	Function	Required
J8.1	+VA	+10V to +15V	Yes
J8.2	–VA	–10V to –15V	Yes
J8.3	+5VA	+5V analog supply	Always
J8.4	–5VA	–5V analog supply	No; only for bipolar mode
J8.5	DGND	Digital ground input	Yes
J8.6	AGND	Analog ground input	Yes
J8.7	+1.8VD	1.8V digital supply	No
J8.8	VD1	Not used	No
J8.9	+3.3VD	3.3V digital supply	Always
J8.10	+5VD	+5V	No

4.1 Bipolar Power Options

The voltage used to power the operational amplifiers is +10V and –10V pins J8.1 and J8.2. If using bipolar mode ±5V supplies must be connected to pins J8.3 and J8.4. The ±5V is regulated down to ±2.5V with U10 and U13 in bipolar mode. Jumpers must be properly placed across J7.1 and J7.2 as well as J7.3 and J7.4 to properly power the ADS1282 (shown in Figure 1).

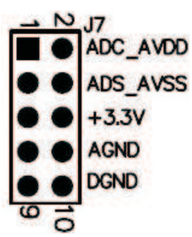


Figure 1. Connectors for J7

5 Voltage Reference

The ADS1282EVM has many options for supplying a reference voltage to the ADS1282. Jumper J1 can select the voltage from the REF5050 (U1) or use ground. The REF5050 supplies 5.0V to the reference for unipolar mode. If ground is selected, then the voltage reference becomes 2.5V in bipolar mode. This comes from the voltage difference across the VREFP and VREFN pins on the ADS1282. The voltage is filtered and buffered by U3 before it is used as a reference for the ADS1282.

The ADS1282 can also be referenced by an external reference voltage using pins J6.18 (REF–) and J6.20 (REF+). Switch S1 chooses either the onboard reference or the external reference voltage that is connected to the pins of J6. Figure 2 shows switch S1 as it appears on the EVM.

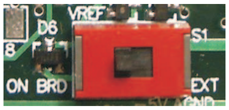


Figure 2. Switch S1

6 Power-Down, Mode and Format Control

The power-down functionality of the ADS1282 is controlled by GPIO4 (J5.14) on the EVM. The ADS1282EVM-PDK uses the I^2C port expander on the EVM to allow the software to control this pin.

7 Clock Source

The ADS1282 clock can come from one of two sources: the onboard 4.096MHz crystal oscillator, or a clock supplied by a processor on the TOUT pin (J5.17).

7.1 Usage in PDK

If using the ADS1282EVM as part of the ADS1282EVM-PDK, the J3 jumper should be set to the DVDD position. Using the onboard 4.096MHz crystal oscillator allows the the ADS1282EVM-PDK software to recognize the EVM using the software provided.

7.2 Usage as a Stand-Alone EVM

If using the EVM in your own system and not with the PDK hardware and software, the J3 jumper can be used to select the clock. The jumper can be used to always select the 4.096MHz crystal (DVDD position) or allow the onboard clock to be controlled by GPIO5 (J5.19), as shown in Figure 3. The P05 (U7.6) pin allows the I^2C interface to program a clock to GPIO5.

Figure 3. Jumper J3

8 EVM Operation

This section provides information on the analog input, digital control, and general operating conditions of the ADS1282EVM.

8.1 Analog Input

The two differential input sources can be applied directly to J6 (top or bottom side) or through signal-conditioning modules available for the modular EVM system. Each input is connected directly through an OPA1632 buffer before reaching the ADS1282. The Common-Mode Voltage (V_{COM}) for the input buffer operational amplifiers is 2.5V supplied from the REF5025.

8.2 Digital Control

The digital control signals can be applied directly to J5 (top or bottom side). The modular ADS1282EVM can also be connected directly to a DSP or microcontroller interface board, such as the 5-6K Interface EVM or HPA-MCU Interface boards available from Texas Instruments, or the MMB0 if purchased as part of the ADS1282EVM-PDK. For a list of compatible interface and/or accessory boards for the EVM or the ADS1282, see the relevant product folder on the TI web site. Some of the digital signals are controlled directly with pins on J5. Other signals, such as SYNC, MFLAG, PMODE, and RESET controls, can only be controlled by U7. These signals are configured and read using the I^2C signals on pins 16 and 20 of J5. The Format and Mode pins can be controlled by both methods (GPIO pins on J5, and the I^2C control from U7).

8.3 Default Jumper Settings and Switch Positions

Figure 4 shows the jumpers found on the EVM and the respective factory default conditions for each.

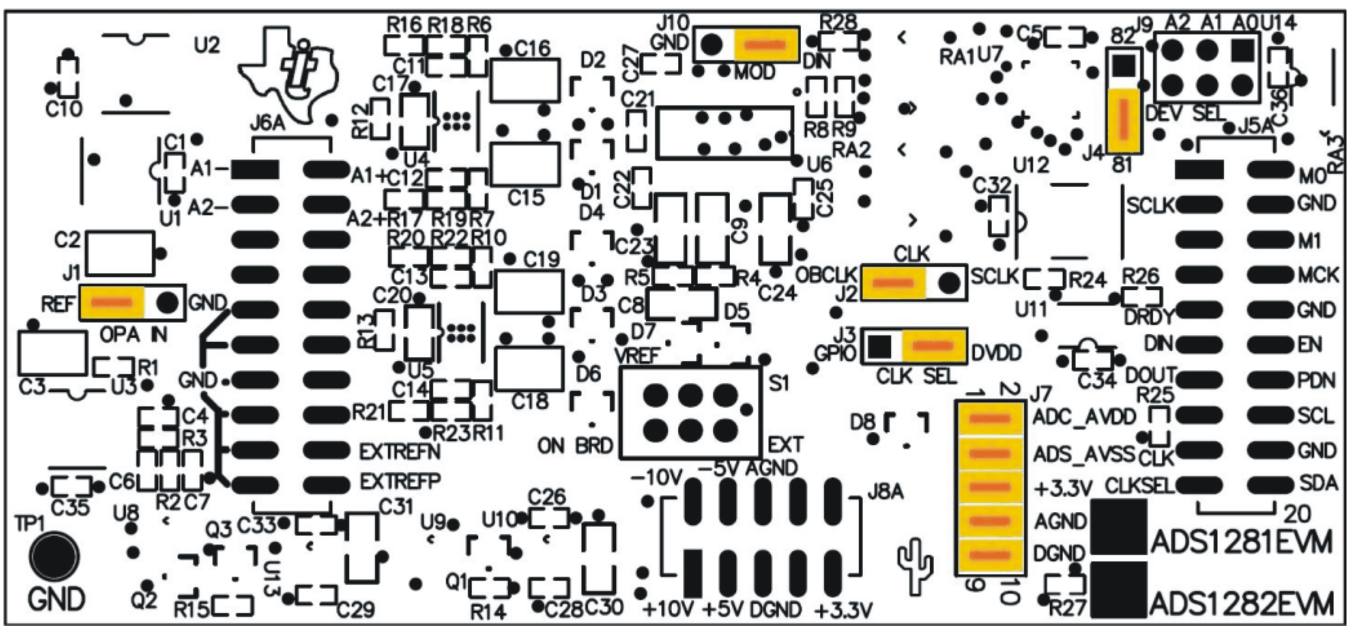


Figure 4. ADS1282EVM Default Jumper Locations

There is only one switch, S1, located on the ADS1282EVM; it is used to set the reference voltage (V_{REF}). The default position is to the left, indicating that the EVM is to use the onboard reference voltage.

9 ADS1282EVM-PDK Kit Operation

This section provides information on using the ADS1282EVM-PDK, including setup, program installation, and program usage.

To prepare to evaluate the ADS1282 with the ADS1282EVM-PDK, complete the following steps:

Step 1. Install the ADCPro software (if not already installed) on a PC.

Step 2. Install the ADS1282EVM-PDK EVM plug-in software.

Step 3. Set up the ADS1282EVM-PDK.

Step 4. Connect a proper power supply or use the included ac adapter.

Step 5. Complete the NI-VISA™ USB driver installation process.

Step 6. Run the ADCPro software.

Step 7. Complete the Microsoft Windows USB driver installation process.

Each task is described in the subsequent sections of this document.

9.1 Installing the ADCPro Software

CAUTION

Do not connect the ADS1282EVM-PDK before installing the software on a suitable PC. Failure to observe this caution may cause Microsoft Windows to not recognize the ADS1282EVM-PDK as an connected device.

The latest software is available from the TI website at http://www.ti.com/. The CD-ROM shipped with the ADS1282EVM may not contain the latest software. The updated ADCPro software can be downloaded directly from the TI web site (http://www.ti.com/adcpro) or the update check command can be used. Refer to the ADCPro User Guide for instructions on installing and using ADCPro.

To install the ADS1282EVM-PDK plug-in, run the file: **ads1282evm-pdk-plugin-1.0.0.exe** (*1.0.0* is the version number, and increments with software version releases; you may have a different version on the CD). Double-click the file to run it; then follow the instructions shown. You can also use the ADCPro *Update Check* feature to check for newer versions of the ADS1282EVM-PDK plug-in, once you have installed one version of it.

The software should now be installed, but the USB drivers may not yet have been loaded by the PC operating system. This step will complete when the ADCPro software is executed; see Section 10, *Running the Software and Completing Driver Installation*.

9.2 Setting Up the ADS1282EVM-PDK

The ADS1282EVM-PDK contains both the ADS1282EVM and the MMB0 motherboard; however, the devices are shipped unconnected. Follow these steps to set up the ADS1282EVM-PDK.

Step 1. Unpack the ADS1282EVM-PDK kit.

Step 2. Set the jumpers and switches on the MMB0 as shown in Figure 5.

- Set the Boot Mode switch to USB.
- Set jumper J4 low to indicate that the EVM board is an ADS1282EVM.

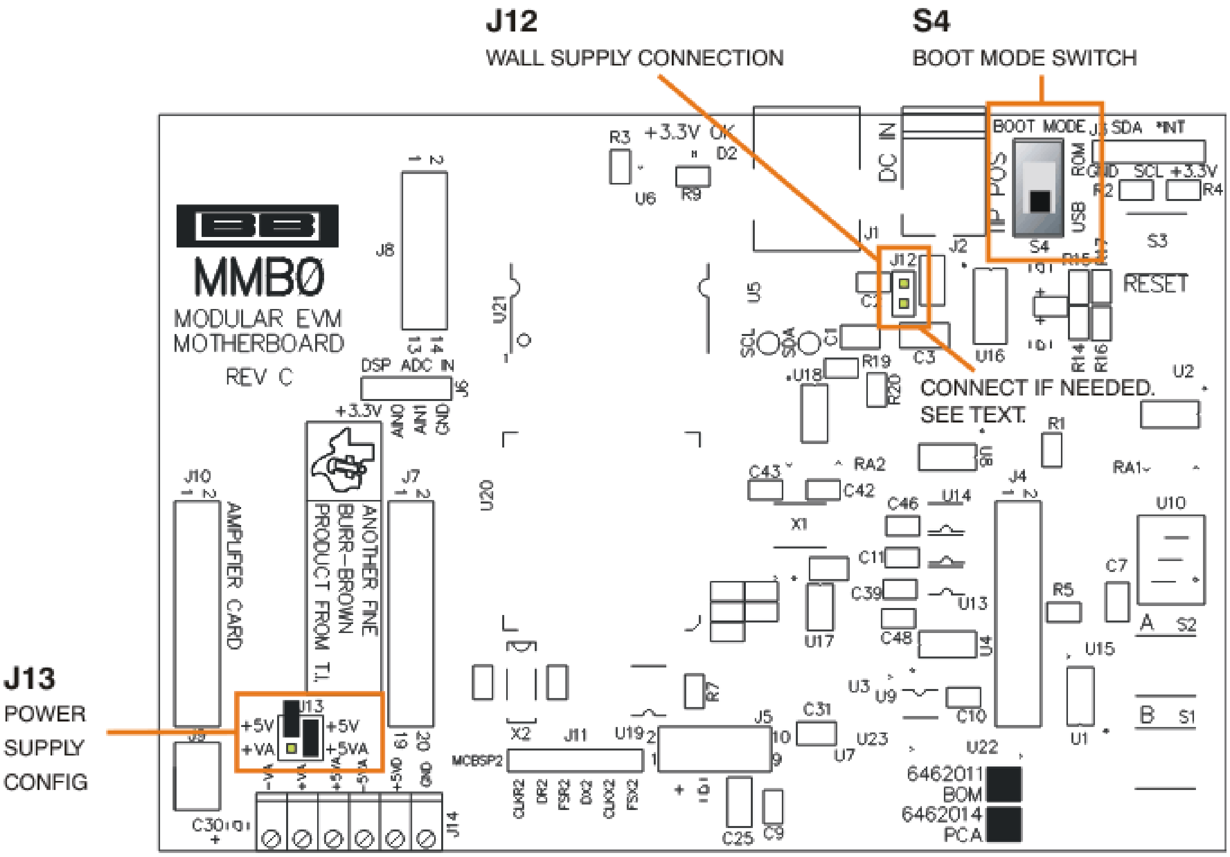


Figure 5. MMB0 Initial Setup

3. Plug the ADS1282EVM into the MMB0 as Figure 6 illustrates.

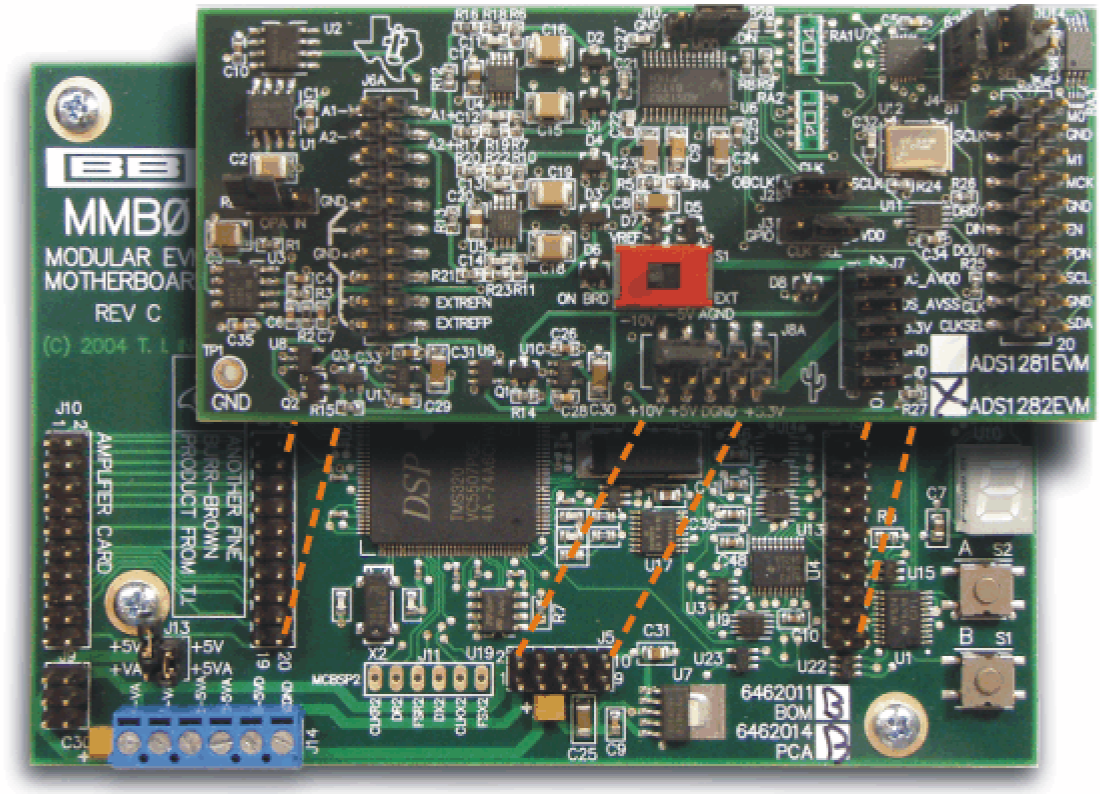


Figure 6. Connecting ADS1282EVM to MMB0

> **CAUTION**
>
> Do not misalign the pins when plugging the ADS1282EVM into the MMB0. Check the pin alignment carefully before applying power to the PDK.

9.2.1 About the MMB0

The MMB0 is a Modular EVM System motherboard. It is designed around the TMS320VC5507, a DSP with an onboard USB interface from Texas Instruments. The MMB0 also has 16MB of SDRAM installed.

The MMB0 is not sold as a DSP development board, and it is not available separately. TI cannot offer support for the MMB0 except as part of an EVM kit. For schematics or other information about the MMB0, contact Texas Instruments.

9.3 Connecting the Power Supply

The ADS1282EVM-PDK requires both a +5V supply and a external supply (±10V to ±15V) to operate. The +5V supply can be provided by either the +6V wall supply (included with the EVM-PDK) or an additional external supply.

When the MMB0 DSP is powered properly, LED D2 glows green. The green light indicates that the 3.3V supply for the MMB0 is operating properly. (It does **not** indicate that the EVM power supplies are operating properly.)

9.3.1 Using the +6V Wall Supply for +5V

An ac wall supply can be connected to barrel jack J2 on the MMB0 to supply the +5V required for operation. J2 is located next to the USB connector. The wall supply must output 6V to 7V dc. The connector must be sleeve-negative, tip-positive. It should have a current rating of at least 2A. The wall supply included in the EVM-PDK will provide the necessary voltage and current to the EVM.

Jumper J12 on the MMB0 connects a wall-mounted power supply to the board. To use the wall-mount supply, J12 must be shorted. Figure 7 illustrates how to connect an ac adapter to the MMB0.

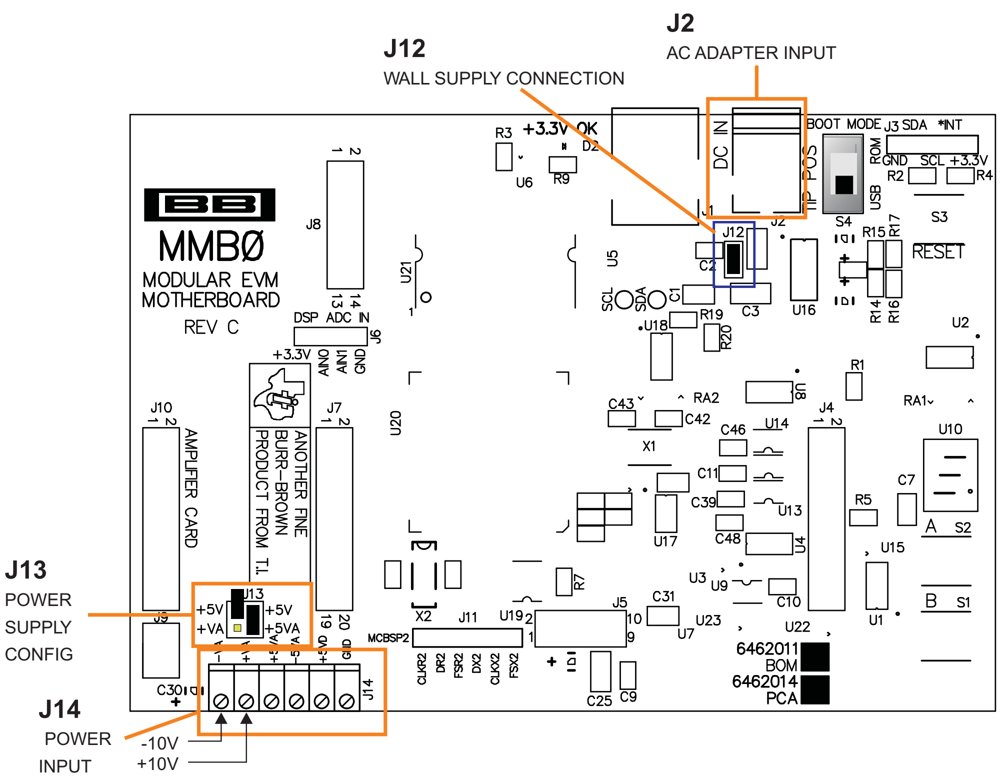


Figure 7. Using the +6V Wall Supply for +5V

9.3.2 Using a External Supply For +5V

A laboratory power supply can be connected through terminal block J14 on the MMB0, as shown in Figure 8, to provide the +5V required for operation.

To use a lab power supply for +5V:

- Disconnect J12 on the MMB0. This disconnect the barrel jack, J2, from powering the +5V supply.
- Connect a +5V dc supply to the +5VA and GND terminals on J14.
- Make sure that the external supply can source 2A of current to the board.

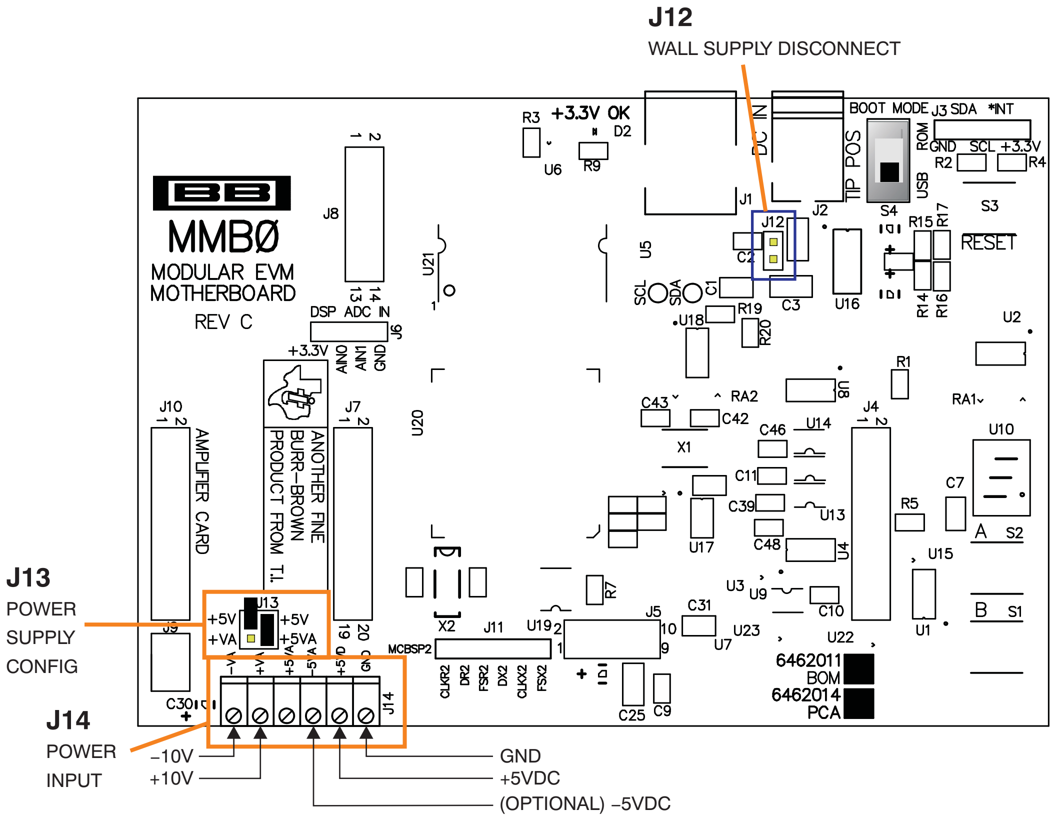


Figure 8. Using a External Supply For +5V

9.3.3 Connecting the External Bipolar Supplies

A external supply of ±10V is required for proper operation of the EVM. These supplies can be connected to the terminal block J14 on the MMB0.

Connect the –10V dc supply to –VA, and +10V dc to +VA terminals on J14.

9.3.4 Power For Bipolar Mode versus Unipolar Mode

The ADS1252EVM allows for operation of the device in either unipolar or bipolar mode. Depending on the mode, the power supply requirements can differ.

For operation in unipolar mode, no additional supplies are required other than those specified in Section 9.3.1 to Section 9.3.3.

For operation in bipolar mode, an additional -5V supply is required. Connect at –5V supply to – 5VA terminal of J14. It is not necessary to connect a +5V dc supply voltage to the +5VA terminal on J14 if the +5V/+5VA position on J13 is shorted.

10 Running the Software and Completing Driver Installation

Note: The software is continually under development. These instructions and screen images are current at the time of this writing, but may not exactly match future releases.

The program for evaluating the ADS1282EVM-PDK is called *ADCPro*. This program uses plug-ins to communicate with the EVM. The ADS1282EVM-PDK plug-in is included in the ADS1282EVM-PDK package.

The program currently runs only on Microsoft Windows platforms of Windows XP; Windows Vista is **NOT** supported.

If this is the first time to install ADCPro and the plug-ins, follow these procedures to run ADCPro and complete the necessary driver installation. Make sure the ADCPro software and device plug-in software are installed from the CD-ROM as described in Section 9.1, *Installing the ADCPro Software*.

10.1 NI-VISA USB Device Driver Installation

1. After the ADCPro software is installed, apply power to the PDK and connect the board to an available PC USB port.
2. The computer should recognize new hardware and begin installing the drivers for the hardware. Figure 9 through Figure 12 are provided for reference to show the installation steps.
   - For the first screen, Figure 9, it is not necessary to search for the software; it has already been installed to your PC.
   - For the remaining steps, accept the default settings.

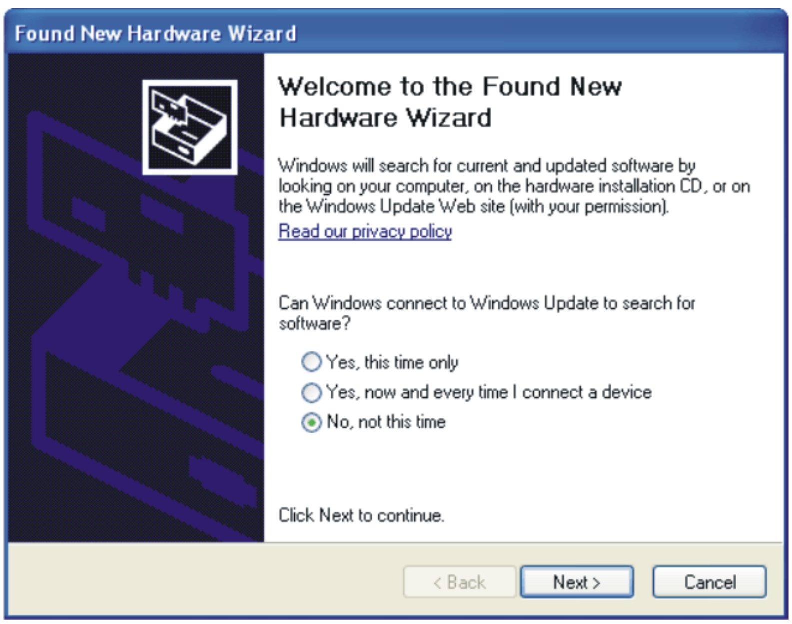


Figure 9. NI-VISA Driver Installation

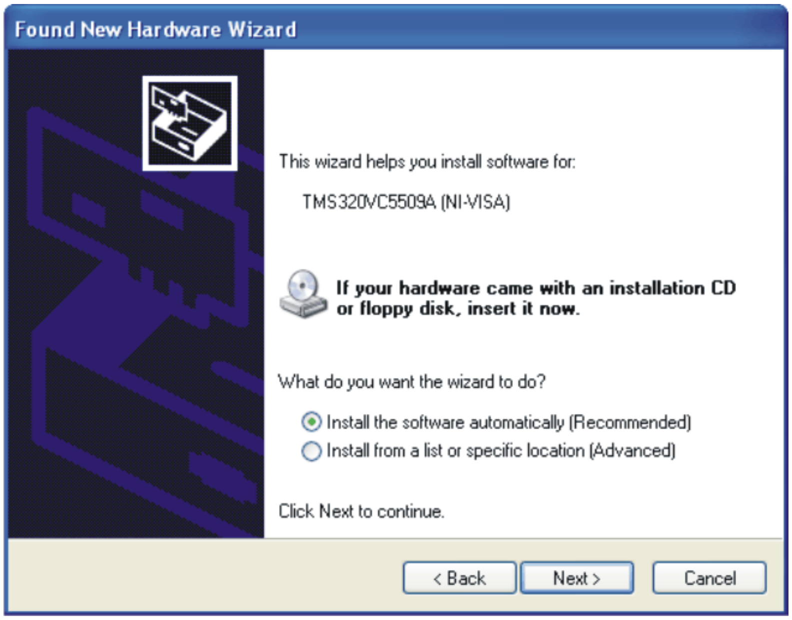


Figure 10. NI-VISA Driver Installation Prompt

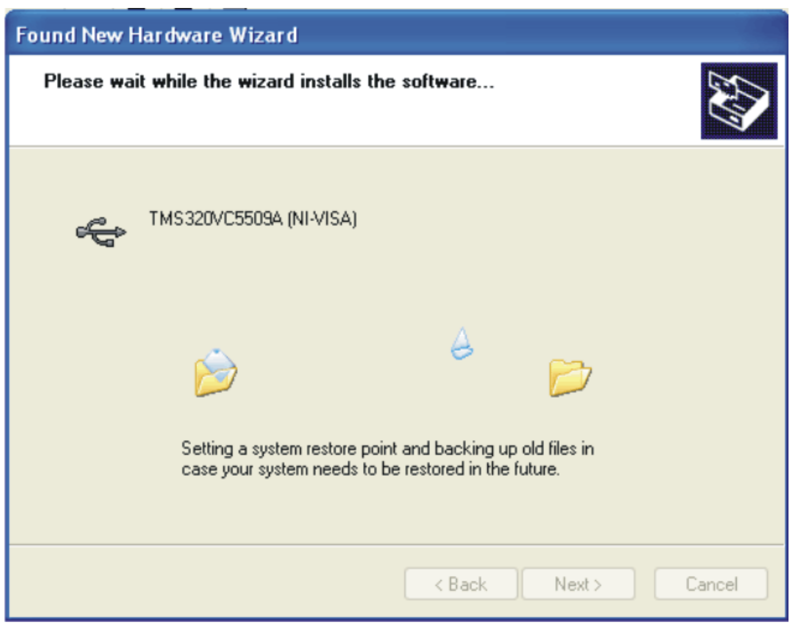


Figure 11. NI-VISA Driver Installing

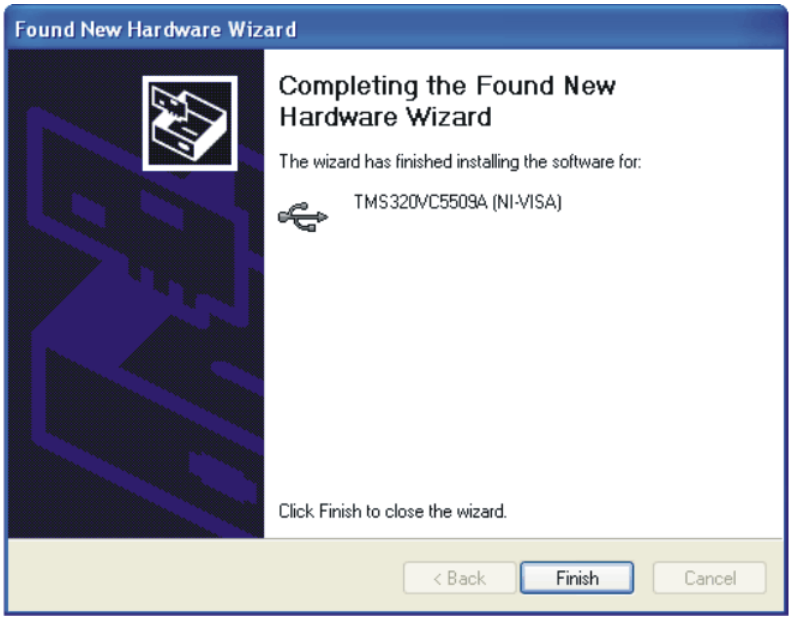


Figure 12. NI-VISA Driver Complete Installation

This process should complete the installation of the NI-VISA drivers. You can verify proper installation by opening the Device Manager and locating the hardware as shown in Figure 13.

Figure 13. NI-VISA Driver Verification Using Device Manager

10.2 USBStyx Driver Installation

Step 1. Start the software by selecting *ADCPro* from the Windows Start menu. The screen in Figure 14 appears.

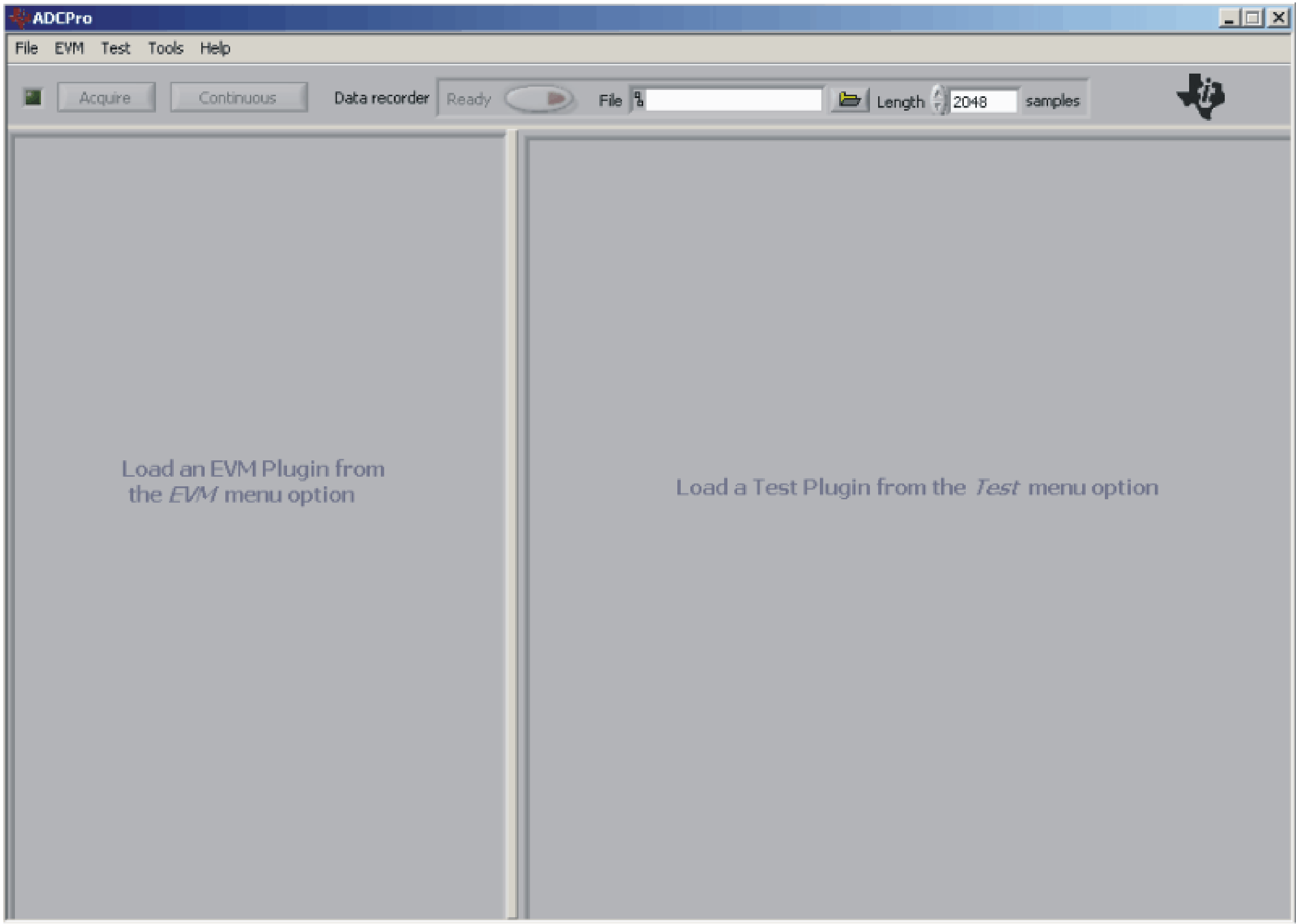


Figure 14. ADCPro Software Start-up Display Window

2. Select *ADS1282EVM* from the EVM drop-down menu. The ADS1282EVM-PDK plug-in appears in the left pane, as shown in Figure 15.

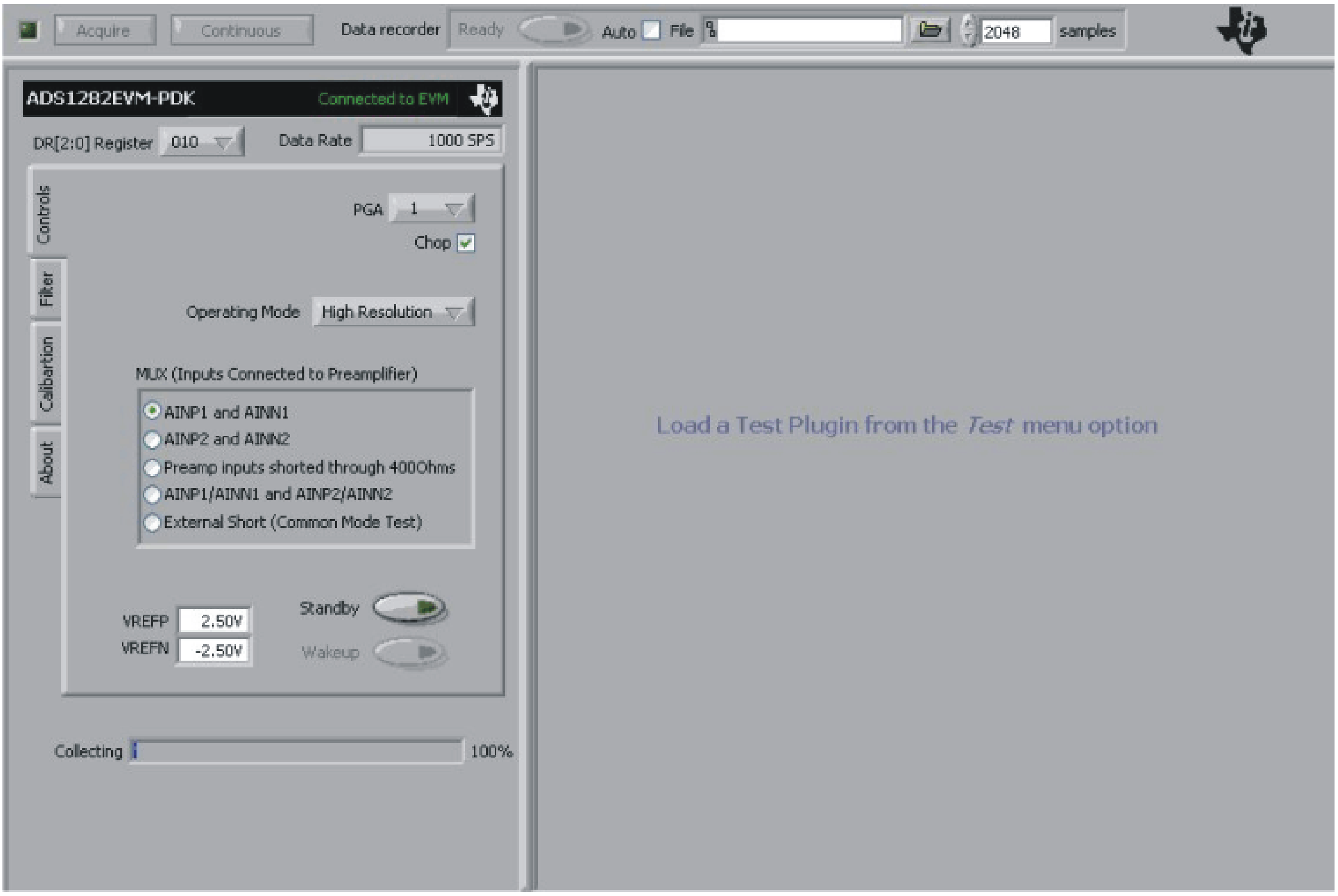


Figure 15. ADS1282EVM-PDK Plug-In Display Window

Step 2. The ADS1282EVM-PDK plug-in window has a status area at the top of the screen. When the plug-in is first loaded, the plug-in searches for the board. You will see a series of messages in the status area indicating this action.

Step 3. If you have not yet loaded the operating system drivers, Windows will display the *Windows Install New Driver Wizard* sequence (illustrated in Figure 16 through Figure 20). Accept the default settings.

NOTE: During the driver installation, a message may appear indicating the firmware load has timed out. Click OK and continue driver installation. The plug-in will attempt to download the firmware again once the driver installation completes.

Figure 16. Install New Driver Wizard, Screen 1

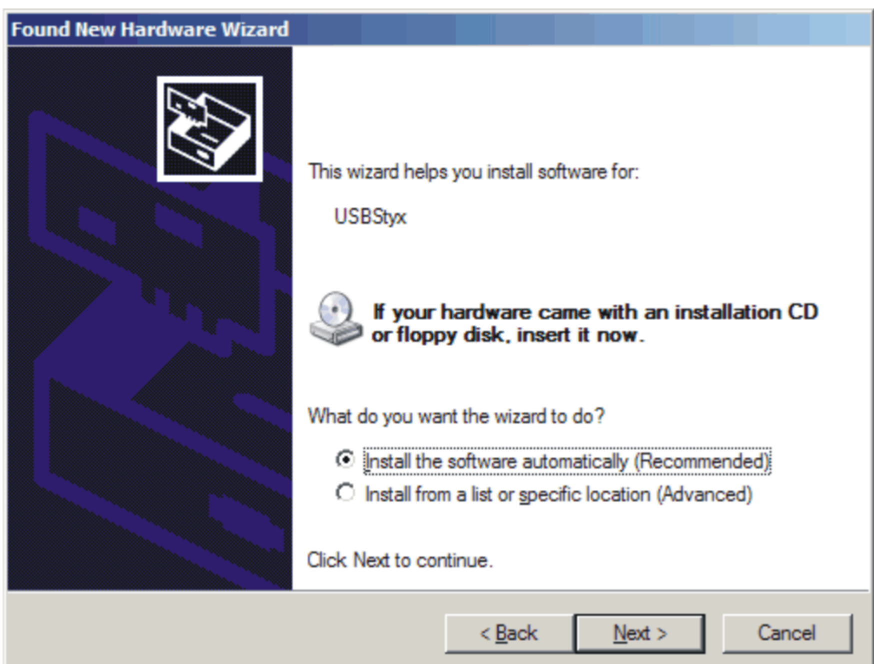


Figure 17. Install New Driver Wizard, Screen 2

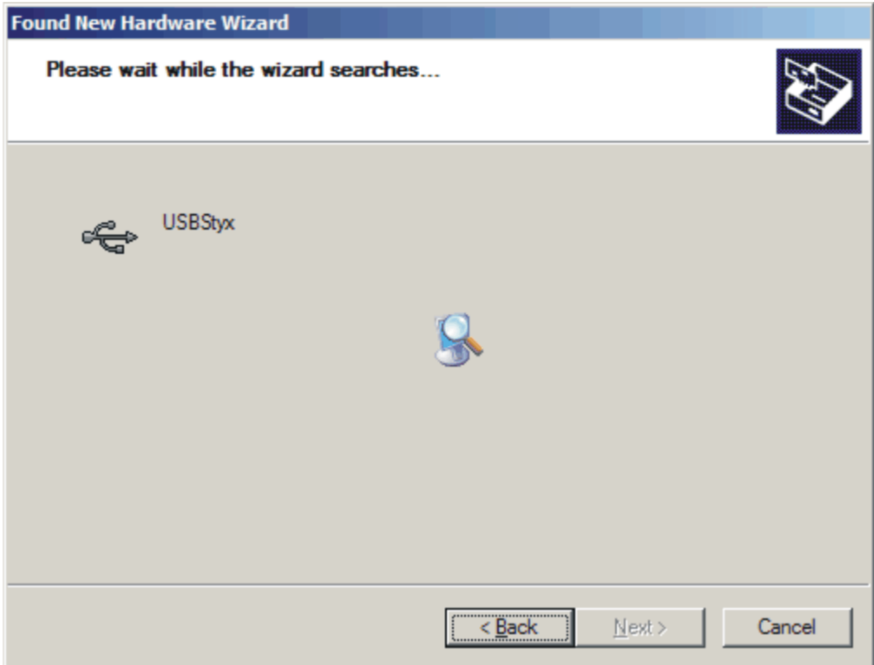


Figure 18. Install New Driver Wizard, Screen 3

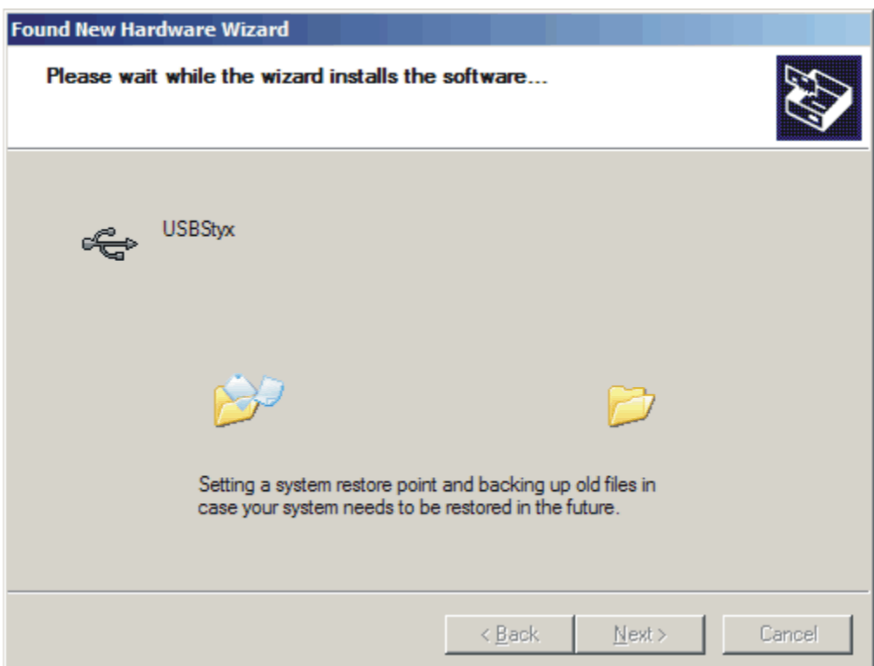


Figure 19. Install New Driver Wizard, Screen 4

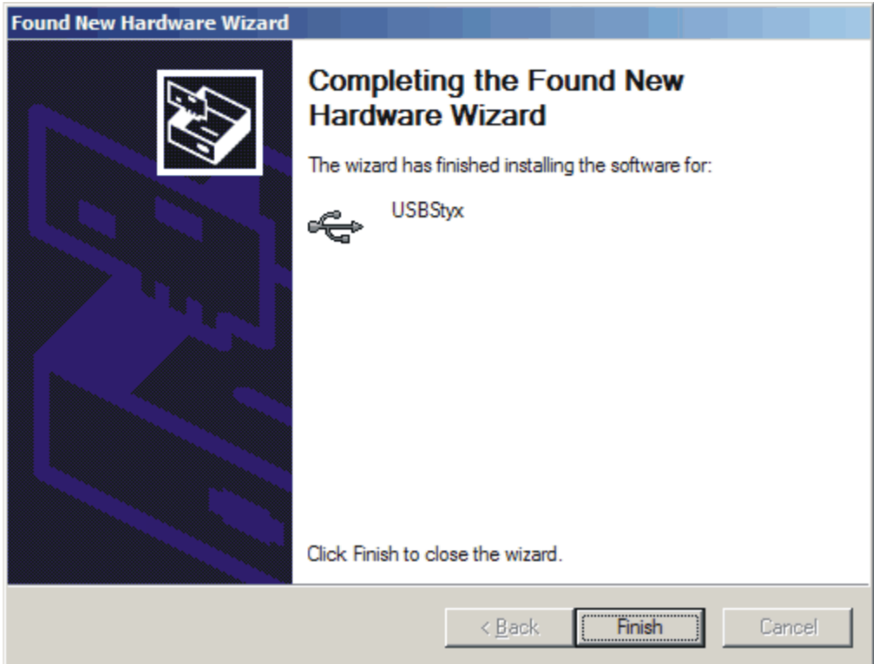


Figure 20. Install New Driver Wizard, Screen 5

Step 4. Once Windows finishes installing the software driver, the plug-in downloads the firmware to the MMB0. The status area will display *Connected to EVM* when the device is connected and ready to use. If the firmware does not load properly, you can try resetting the MMB0 by pressing Reset and then reloading the plug-in.

Step 5. You can verify the proper installation of the USBStyx driver using the Device Manager. Note that the first driver item, **NI-VISA USB Devices**, will disappear and a new item, **LibUSB-Win32 Devices** will appear, as Figure 21 shows.

Figure 21. USBStyx Driver Verification Using Device Manager

The driver installation wizard sequence should not appear again, unless you connect the board to a different USB port.

11 Evaluating Performance with the ADCPro Software

The evaluation software is based on ADCPro, a program that operates using a variety of plug-ins. (The ADS1282EVM plug-in is installed as described in the installation section, Section 10.)

To use ADCPro, load an EVM plug-in and a test plug-in. To load an EVM plug-in, select it from the *EVM* menu. To load a test plug-in, select it from the *Test* menu. To unload a plug-in, select the *Unload* option from the corresponding menu.

Only one of each kind of plug-in can be loaded at a time. If you select a different plug-in, the previous plug-in is unloaded.

11.1 Using the ADS1282EVM-PDK Plug-in

The ADS1282EVM-PDK plug-in for ADCPro provides complete control over all settings of the ADS1282. It consists of a tabbed interface (see Figure 15), with different functions available on different tabs. These controls are described in this section.

You can adjust the ADS1282EVM settings when you are not acquiring data. During acquisition, all controls are disabled and settings may not be changed.

When you change a setting on the ADS1282EVM plug-in, the setting immediately updates on the board.

Settings on the ADS1282EVM correspond to settings described in the ADS1282 product data sheet; see the ADS1282 data sheet (available for download at the TI web site) for details.

11.1.1 Controls Tab

ADCPro can receive data from the ADS1282 at five different data rates. The data rate is controlled by the **DR[2:0] Register** control (shown in Figure 22). The data rate choices are determined by the digital filter that is used. The setting of the register selects the data rate and displays it to the right of the screen.

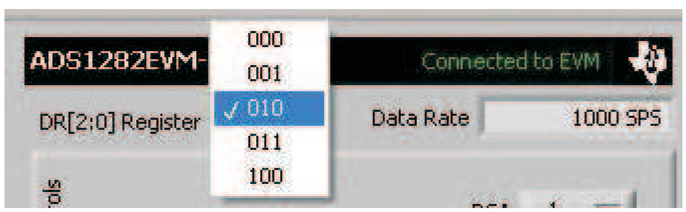


Figure 22. Data Rate Select

The PGA found on the ADS1282 can be set through ADCPro. The **Gain** control is used to set binary gains by setting the register bits accordingly (as shown in Figure 23).

Figure 23. PGA Gain Select

ADCPro can access to the **Chop** control. **Chop** will take two readings, a normal reading and one with the input pins switched. It then averages the two readings for a final output result. Doing this averaging removes the offset, offset drift, and reduces the noise reading. See the ADS1282 product data sheet for more information on **Chop**.

The **Operating Mode** control allows optimization of noise and power. Either *Low Power* or *High Resolution* can be selected.

The **Mux** control determines which input channel is sent through the converter. The five options, shown in Figure 24, are explained in the product data sheet.

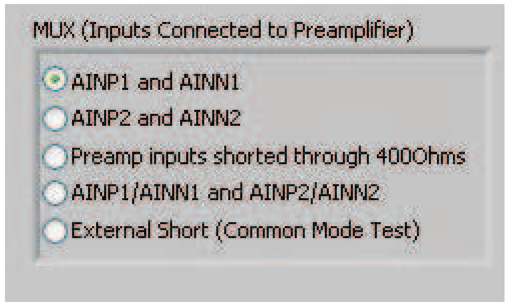


Figure 24. Mux Select

When switch S1 is switched to external VREF, **VREFP** and **VREFN** control the bounds for the reference voltage.

The **Standby** and **Wakeup** controls send the corresponding commands to the ADS1282 (as illustrated in Figure 25). Data cannot be collected while the device is in Standby mode.

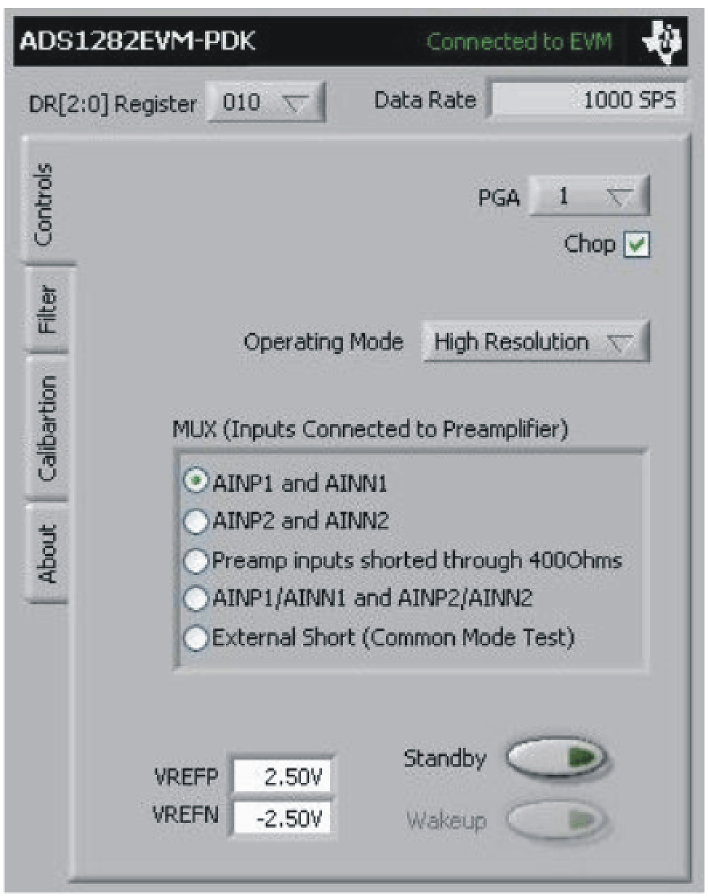


Figure 25. Controls Tab

11.1.2 Filter Tab

There are three different digital filter options in ADCPro. A *Sinc Filter + LPF Filter Block* is the default filter. The Low-Pass Filter (LPF) can be removed or a High-Pass Filter (HPF) can be added (as shown in Figure 26).

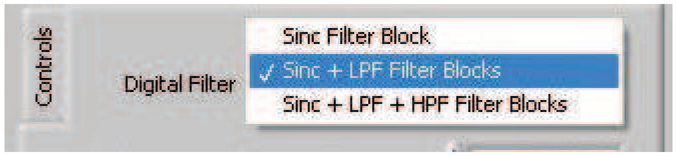


Figure 26. Digital Filter

The **LPF Phase Response** control can be set to either *Linear phase* or *Maximum phase*. The **Digital Filter**, **LPF Phase Response** and the **High-pass Filter Corner Frequency** are controlled in the Filter Tab (as Figure 27 shows).

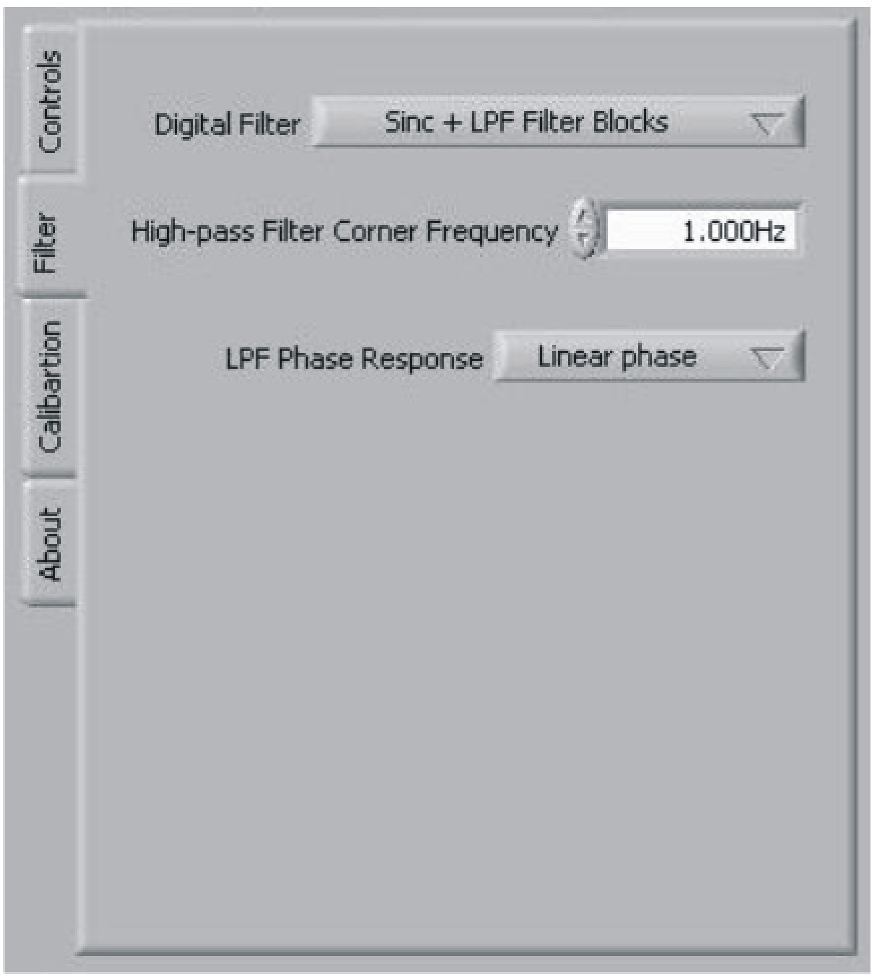


Figure 27. Filter Tab

11.1.3 Calibration Tab

A calibration feature is integrated into the ADS1282 to correct for offset and gain errors. The ADS1282EVM-PDK software is designed to allow the user to use either the built-in system calibration commands or manually calibrate the device by directly entering the values for the offset and gain registers of the ADS1282.

11.1.3.1 System Calibration

The **Start Calibration** button is used for system calibration by sending the Offset and Gain Calibration commands to the ADS1282. Which command is sent is determined by the radio buttons in the **Calibration Type** groupbox (see Figure 28). The calibrations should be performed separately before testing. See the ADS1282 product data sheet for more information on calibration.

A zero input signal must be applied before performing offset calibration. The *Offset* radio button should be selected. When **Start Calibration** is pushed, the offset calibration is performed and the resulting value is reflected in the **OFC** register display (in hex).

A full-scale dc input should be applied for gain calibration. The *Gain* radio button should be selected. When **Start Calibration** is pushed, the gain calibration is performed and the resulting value is reflected in the **FSC** register display (in hex).

11.1.3.2 Manual Calibration

The values of the offset (**OFC**) and full-scale (**FSC**) calibration registers can be directly written to if there are different offset and gain values desired to be used. The **OFC** or **FSC** registers are written to the ADS1282 when the value in these controls changes and the user deselects the text box. For ease of entry, the gain or offset values are entered only in the **OFC** or **FSC** controls; the actual values placed in each of the three corresponding registers on the ADS1282 are displayed on this tab.

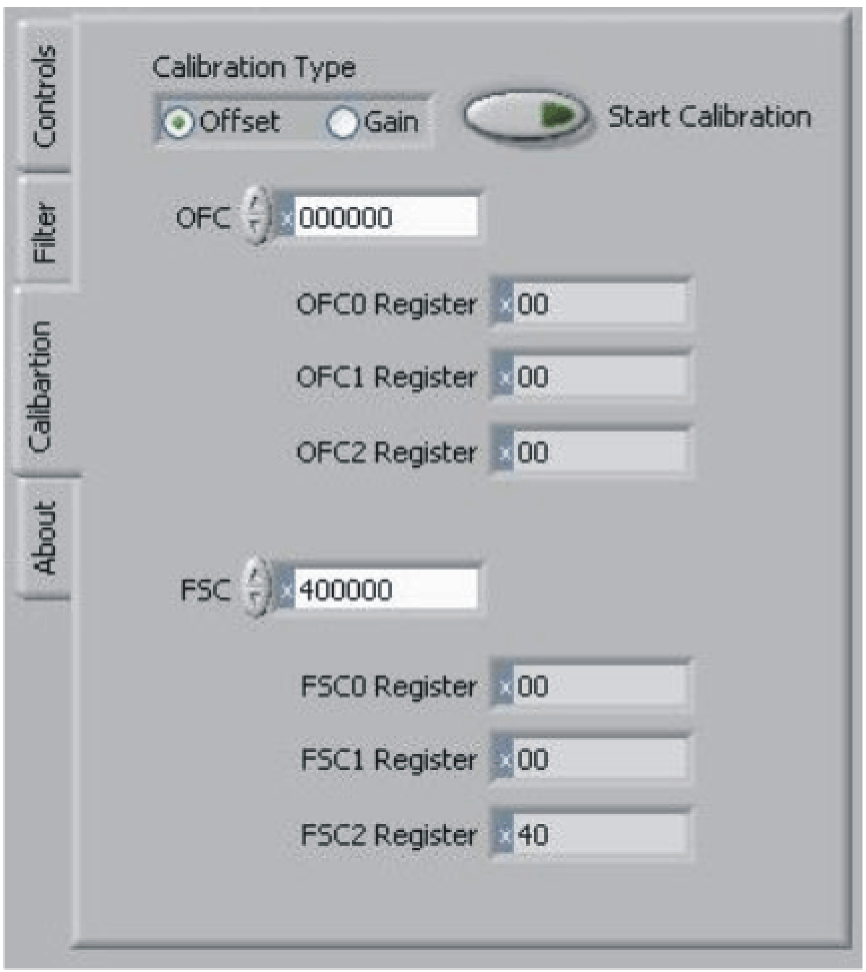


Figure 28. Calibration

11.1.4 Collecting Data

Once you have configured the ADS1282 for your test scenario, press the ADCPro **Acquire** button to start the collection of the number of datapoints specified in the Test plug-in *Block Size* control. The ADS1282EVM-PDK plug-in disables all the front panel controls while acquiring, and displays a progress bar as shown in Figure 29.

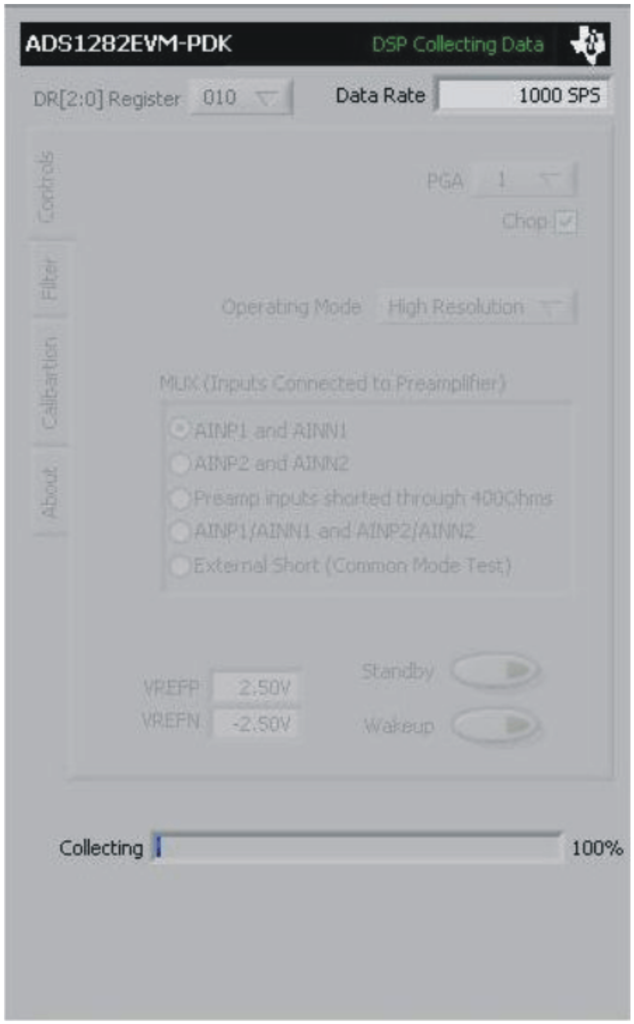


Figure 29. Progress Bar While Collecting Data

For more information on testing analog-to-digital converters in general and using ADCPro and Test plug-ins, refer to the ADCPro User Guide.

11.2 Troubleshooting

If ADCPro stops responding while the ADS1282EVM-PDK is connected, try unplugging the power supply from the PDK. Unload and reload the plug-in before reapplying power to the PDK.

12 Schematics and Layout

Schematics for the ADS1282EVM are appended to this user's guide. The bill of materials is provided in Table 4.

12.1 Bill of Materials

NOTE: All components should 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. (For more information about TI's position on RoHS compliance, see the Quality and Eco-Info information on the TI web site.)

Table 4. ADS1282EVM Bill of Materials

Item No.	Qty	Value	Ref Des	Description	Vendor	Part Number
1	2	0	R4, R5	Resistor, Thick Film Chip, 0Ω, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEY0R00V
2	7	47	R3, R6-R11	Resistor, Thick Film Chip, 47Ω, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ470V
3	8	1k	R16-R23	Resistor, Thick Film Chip, 1kΩ, 1%, 1/16W, Size = 0603	Panasonic	ERJ-3EKF1001V
4	1	2k	R2	Resistor, Thick Film Chip, 2kΩ, 1%, 1/16W, Size = 0603	Panasonic	ERJ-3EKF2001V
5	1	10k	R1	Resistor, Thick Film Chip, 10kΩ, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ103V
6	1	47k	R24	Resistor, Thick Film Chip, 47kΩ, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ473V
7	5	100k	R12-R15, R27	Resistor, Thick Film Chip, 100kΩ, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ104V
Not Installed	1	100k	R28	Resistor, Thick Film Chip, 100kΩ, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ104V
8	2	470k	R25, R26	Resistor, Thick Film Chip, 470kΩ, 5%, 1/10W, Size = 0603	Panasonic	ERJ-3GEYJ474V
9	2	100k	RA1, RA2	Resistor, 8 Thick Film Chip Array, 100kΩ, 5%, 63mW	CTS	745C101104JPTR
Not Installed	1	100k	RA3	Resistor, Chip Array 4 Independent Bus, 100kΩ, 5%, 1/16W, SMD	CTS	741C083104JP
10	6	1nF	C11-C14, C21, C22	Capacitor, C0G Ceramic 1nF ±5%, 50WV, Size = 0603	TDK	C1608C0G1H102JT
11	2	10nF	C27, C32	Capacitor, C0G Ceramic 10nF ±5%, 25WV, Size = 0603	TDK	C1608C0G1E103JT
12	7	0.1µF	C4, C5, C7, C28, C29, C35, C36	Capacitor, X7R Ceramic 0.1µF ±10%, 25WV, Size = 0603	TDK	C1608X7R1E104KT
13	1	0.15µF	C6	Capacitor, X7R Ceramic 0.15µF ±10%, 25WV, Size = 0603	TDK	C1608X7R1E154KT
14	6	1µF	C1, C10, C25, C26, C33, C34	Capacitor, X7R Ceramic 1µF ±10%, 16WV, Size = 0603	TDK	C1608X7R1C105KT
15	2	1µF	C8, C9	Capacitor, X7R Ceramic 1µF ±10%, 50WV, Size = 1206	TDK	C3216X7R1H105KT
16	2	10µF	C17, C20	Capacitor, X5R Ceramic 10µF ±20%, 6.3WV, Size = 0805	TDK	C2012X5R0J106MT
17	4	10µF	C23, C24, C30, C31	Capacitor, X7R Ceramic 10µF ±20%, 16WV, Size = 1206	TDK	C3216X7R1C106MT
18	4	10µF	C15, C16, C18, C19	Capacitor, X7R Ceramic 10µF ±20%, 25WV, Size = 1210	DK	C3225X7R1E106MT
19	2	22µF	C2, C3	Capacitor, X5R Ceramic 22µF ±20%, 16WV, Size = 1210	TDK	C3225X5R1C226MT
20	1		U6	Precision Delta-Sigma ADC, 2 Differential Input, 24-bit	Texas Instruments	ADS1282IPW
21	1		U3	Precision Operational Amplifier	Texas Instruments	OPA227U

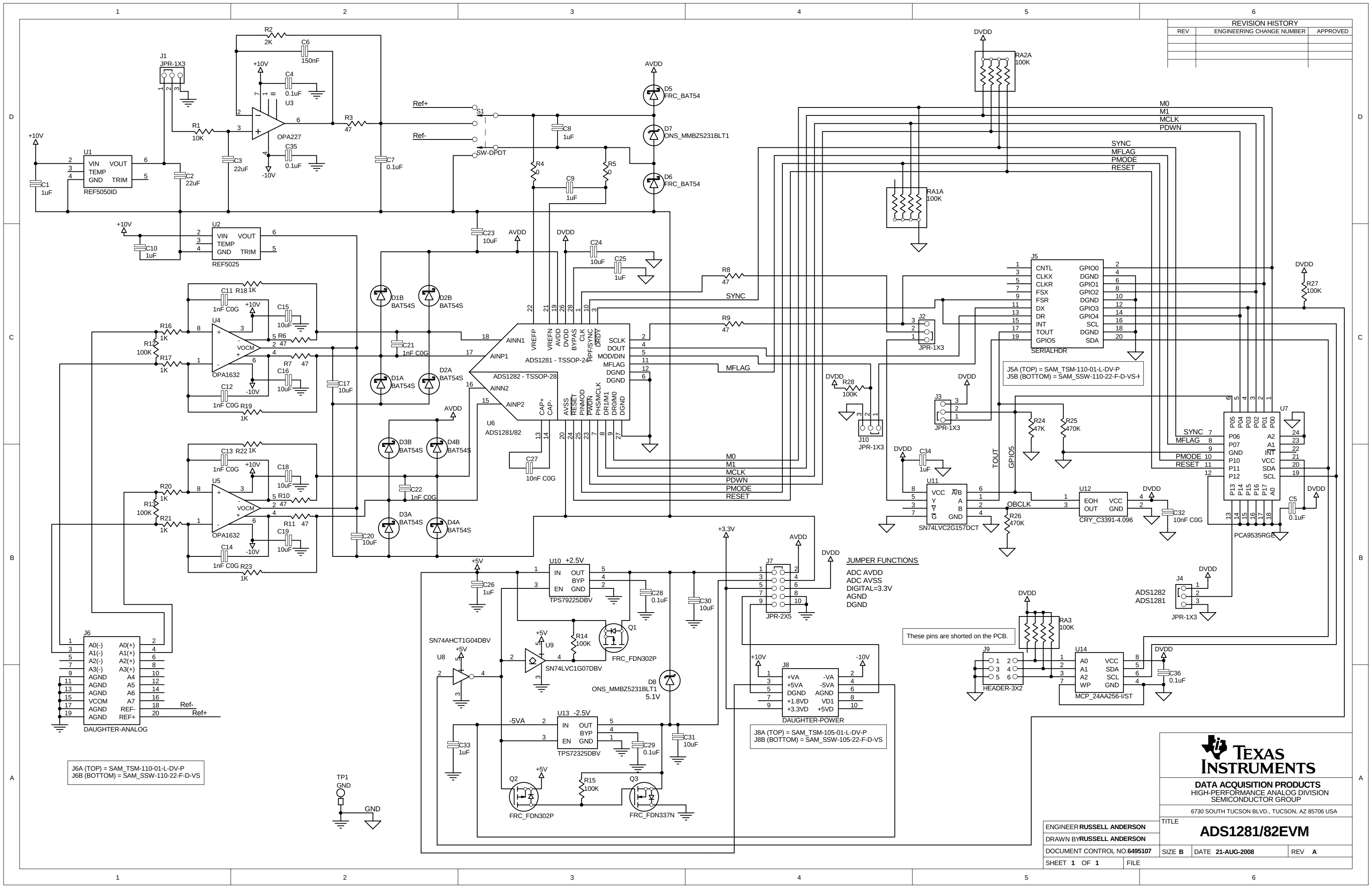
Table 4. ADS1282EVM Bill of Materials (continued)

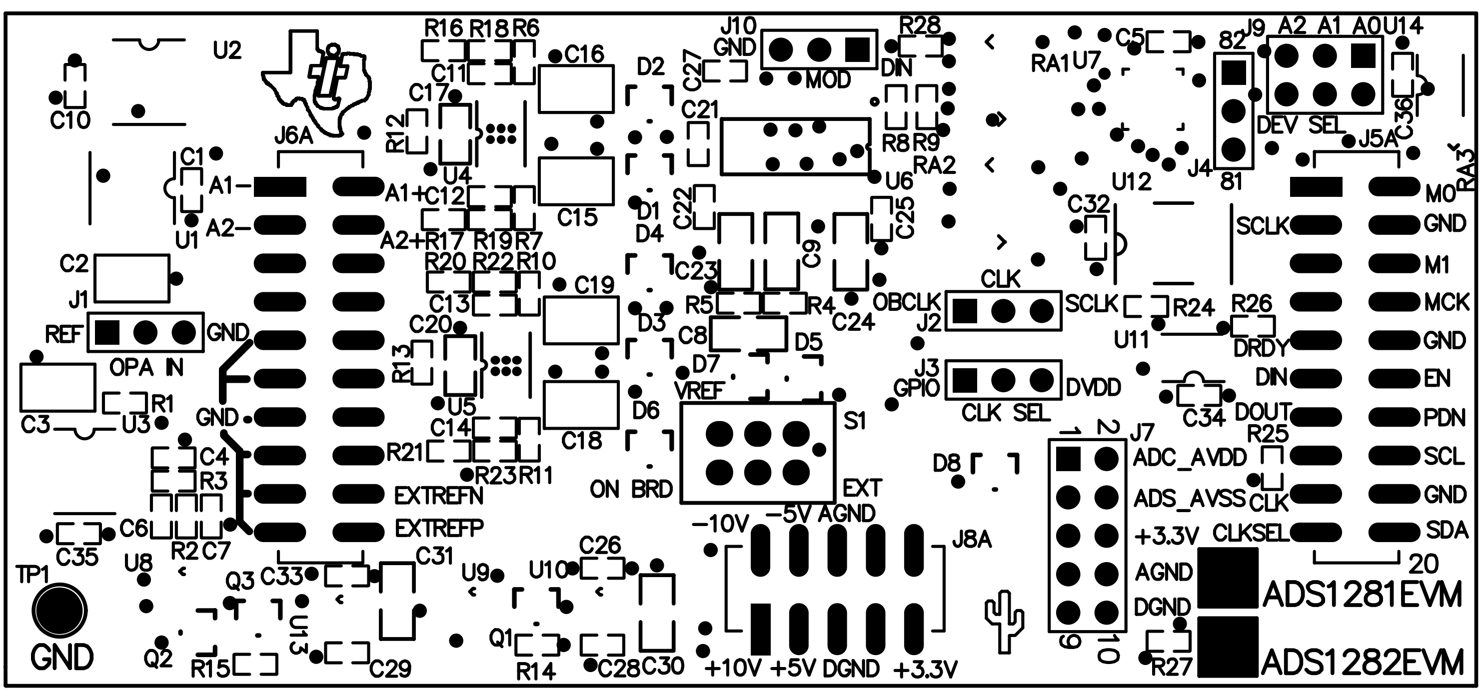
Item No.	Qty	Value	Ref Des	Description	Vendor	Part Number
22	2		U4	U5,Fully-Differential Amplifier	Texas Instruments	OPA1632DGN
23	1		U2	Precision Voltage Reference, 2.5V	Texas Instruments	REF5025ID
24	1		U1	Precision Voltage Reference, 5V	Texas Instruments	REF5050ID
25	1		U8	Inverter, Single Gate	Texas Instruments	SN74AHCT1G04DBVT
26	1		U9	Buffer, Open Drain, Single Gate	Texas Instruments	SN74LVC1G07DBVT
27	1		U11	Single, 2-Line to 1 Data Selector/Multiplexer	Texas Instruments	SN74LVC2G157DCTR
28	1		U13	LDO Voltage Regulator, 2.5V, 200mA	Texas Instruments	TPS72325DBVT
29	1		U10	LDO Voltage Regulator, 2.5V, 100mA	Texas Instruments	TPS79225DBVT
30	1		U7	16-Bit I^2C I/O Expander	Texas Instruments	PCA9535RGE
31	1	4.096MHz	U12	3.3 V Oscillator	Crystek	C3391-4.096
32	1		U14	EEPROM, 1.8V, 256k	Microchip	24AA256-I/ST
33	2		Q1, Q2	MOSFET, P-Channel, 2.5V	Fairchild Semiconductor	FDN302P
34	1		Q3	Enhancement Mode FET, N-Channel	Fairchild Semiconductor	FDN337N
35	2		J5A, J6A	20 Pin SMT Plug	Samtec	TSM-110-01-L-DV-P
36	2		J5B, J6B	20 pin SMT Socket	Samtec	SSW-110-22-F-D-VS-K
37	1		J8A	10 Pin SMT Plug	Samtec	TSM-105-01-L-DV-P
38	1		J8B	10 pin SMT Socket	Samtec	SSW-105-22-F-D-VS-K
39	5		J1-J4, J10	Header Strip, 3-pin ( )	Samtec	TSW-103-07-L-S
Not Installed	1		J9	Header Strip, 6-pin ( )	Samtec	TSW-103-07-L-D
40	1		J7	Header Strip, 10-pin ( )	Samtec	TSW-105-07-L-D
41	1		N/A	ADS1282_82 EVM PCB	Texas Instruments	6495106
42	2		D5, D6	Schottky Diode	Fairchild	BAT54
43	4		D1-D4	Schottky Diode, Stacked	Fairchild	BAT54S
44	2		D7, D8	5.1V, Zener Diode	On Semiconductor	MMBZ5231BLT1G
45	1		S1	Switch, Mini Slide, DPDT	NKK	SS22SDP2
46	1		TP1	PCB Test Point, Large Loop, Through-Hole	Keystone Electronics	5011
47	9		N/A	Shorting Blocks	Samtec	SNT-100-BK-G-H

Revision History

Changes from B Revision (May, 2009) to C Revision **Page**

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


REVISION HISTORY
REV
ENGINEERING CHANGE NUMBER
APPROVED
ADS1281 - TSSOP-24
ADS1282 - TSSOP-28
U6
ADS1281/82
REF5050ID
REF5025
OPA227
OPA1632
DAUGHTER-ANALOG
J6A (TOP) = SAM_TSM-110-01-L-DV-P
J6B (BOTTOM) = SAM_SSW-110-22-F-D-VS
SERIALHDR
J5A (TOP) = SAM_TSM-110-01-L-DV-P
J5B (BOTTOM) = SAM_SSW-110-22-F-D-VS
JUMPER FUNCTIONS
ADC AVDD
ADC AVSS
DIGITAL=3.3V
AGND
DGND
These pins are shorted on the PCB.
DAUGHTER-POWER
J8A (TOP) = SAM_TSM-105-01-L-DV-P
J8B (BOTTOM) = SAM_SSW-105-22-F-D-VS
TPS79225DBV
TPS72325DBV
SN74AHCT1G04DBV
SN74LVC1G07DBV
SN74LVC2G157DCT
CRY_C3391-4.096
PCA9535RGE
MCP_24AA256-I/ST
HEADER-3X2
ADS1282
ADS1281
TEXAS INSTRUMENTS
DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP
6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA
ENGINEER RUSSELL ANDERSON
DRAWN BY RUSSELL ANDERSON
DOCUMENT CONTROL NO. 6495107
TITLE
ADS1281/82EVM
SIZE B
DATE 21-AUG-2008
REV A
SHEET 1 OF 1
FILE



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J6A
C1
A1−
A2−
U1
C2
J1
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OPA IN
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GND
C4
R3
C6
R2
C7
C35
TP1
GND
U8
Q3
C33
U13
Q2
R15
C29
R16 R18 R6
C11
C16
C17
R12
U4
A1+
C12
C15
A2+
R17 R19 R7
R20 R22 R10
C13
C19
C20
R13
U5
C14
C18
R21
R23 R11
EXTREFN
EXTREFP
C31
U9
U10
C26
Q1
R14
C28
C30
D2
D1
D4
D3
D6
D7
D5
D8
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VREF
S1
EXT
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−5V
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+10V
+5V
DGND
+3.3V
J10
GND
MOD
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C21
C22
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RA2
U6
OBCLK
CLK
J2
SCLK
J3
GPIO
DVDD
CLK SEL
RA1
U7
C5
82
J9
A2 A1 A0
U14
J4
81
DEV SEL
C36
J5A
RA3
U12
C32
R24
U11
R26
DRDY
C34
R25
CLK
J7
1 2
9 10
ADC_AVDD
ADS_AVSS
+3.3V
AGND
DGND
CLKSEL
R27
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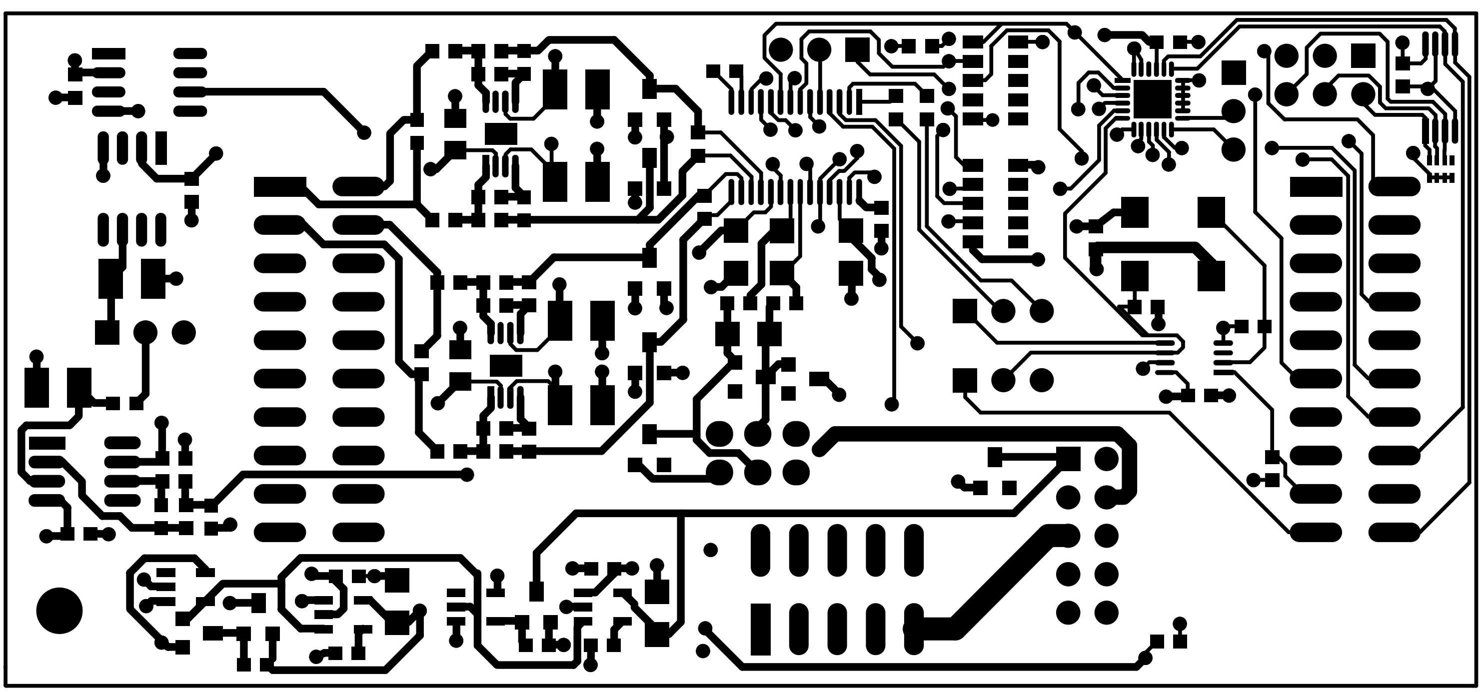
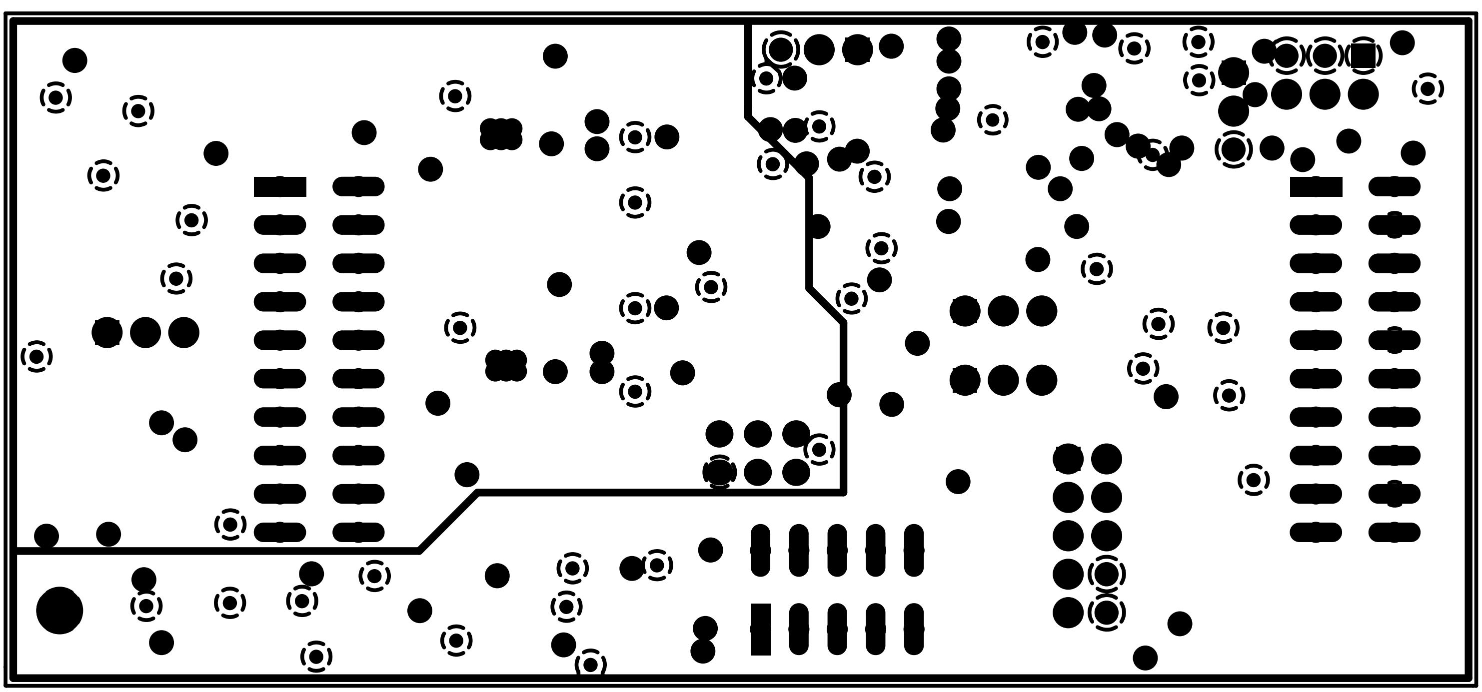
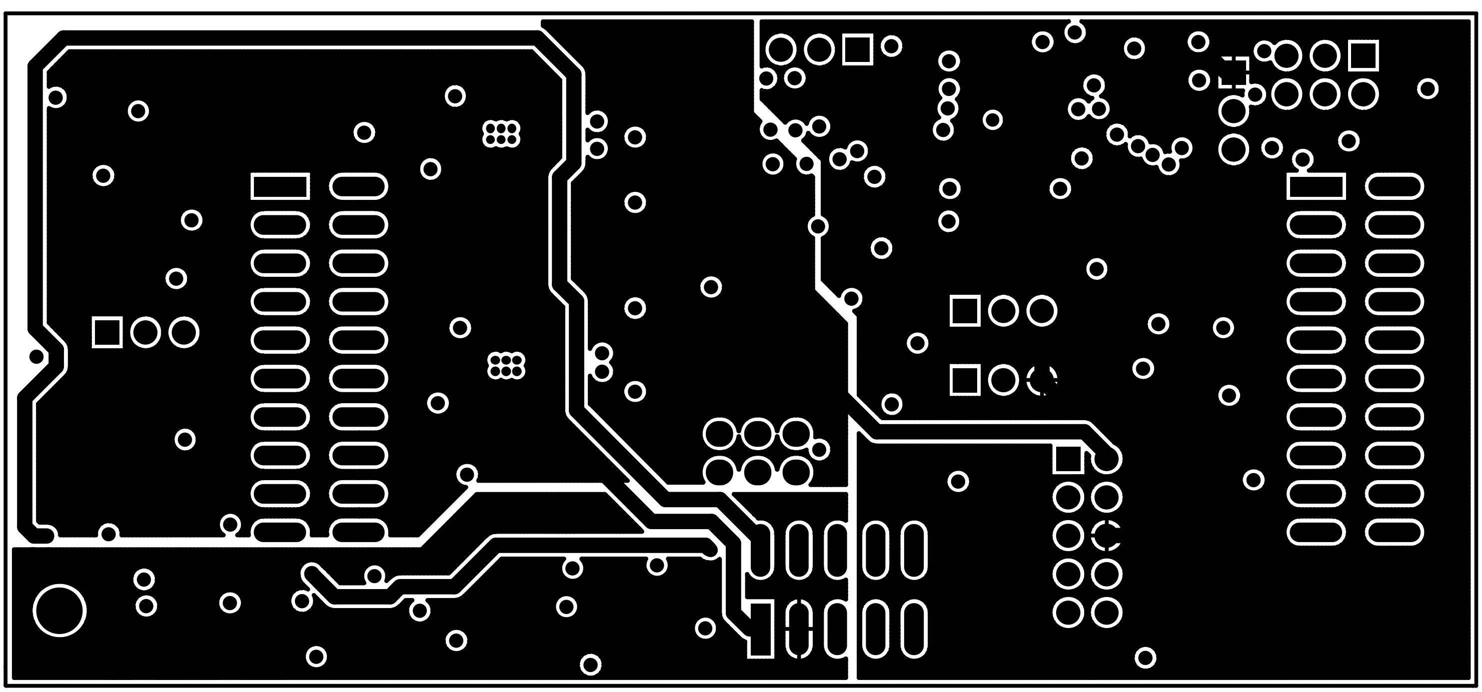
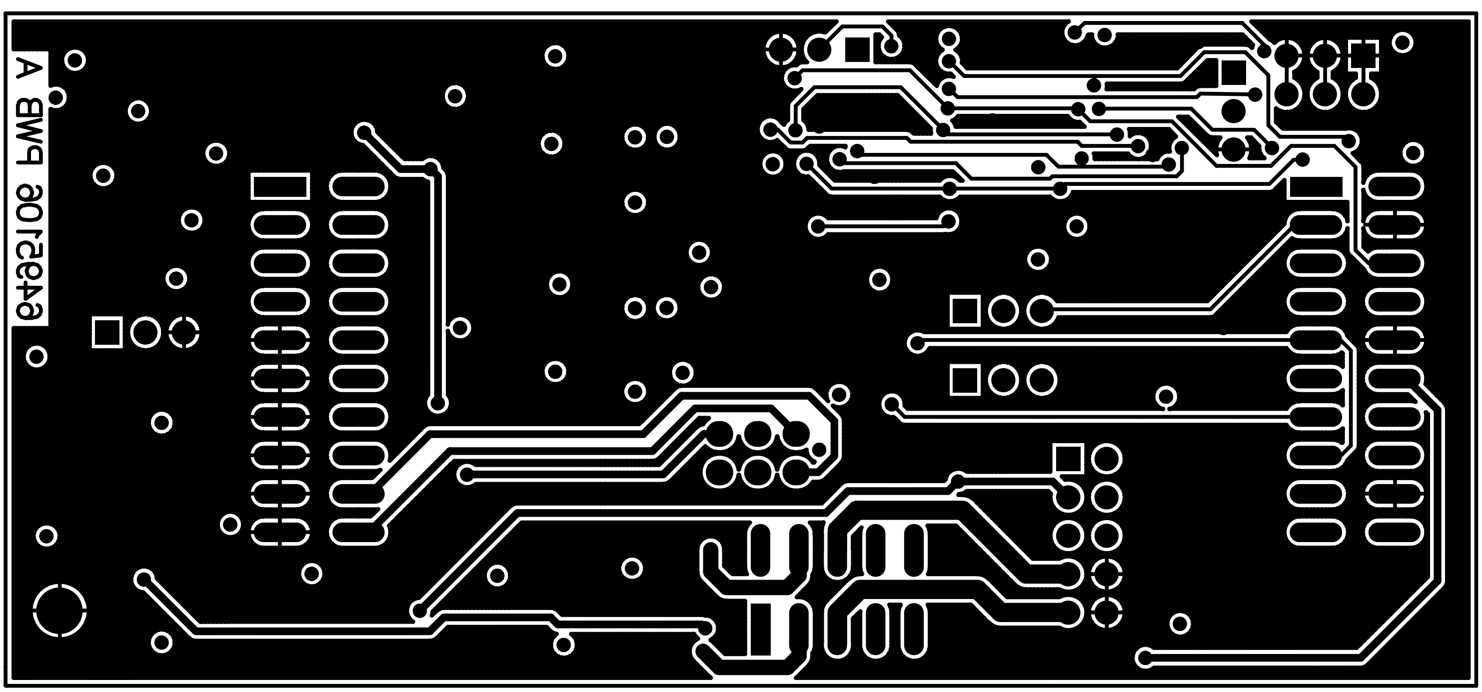
ADS1282EVM





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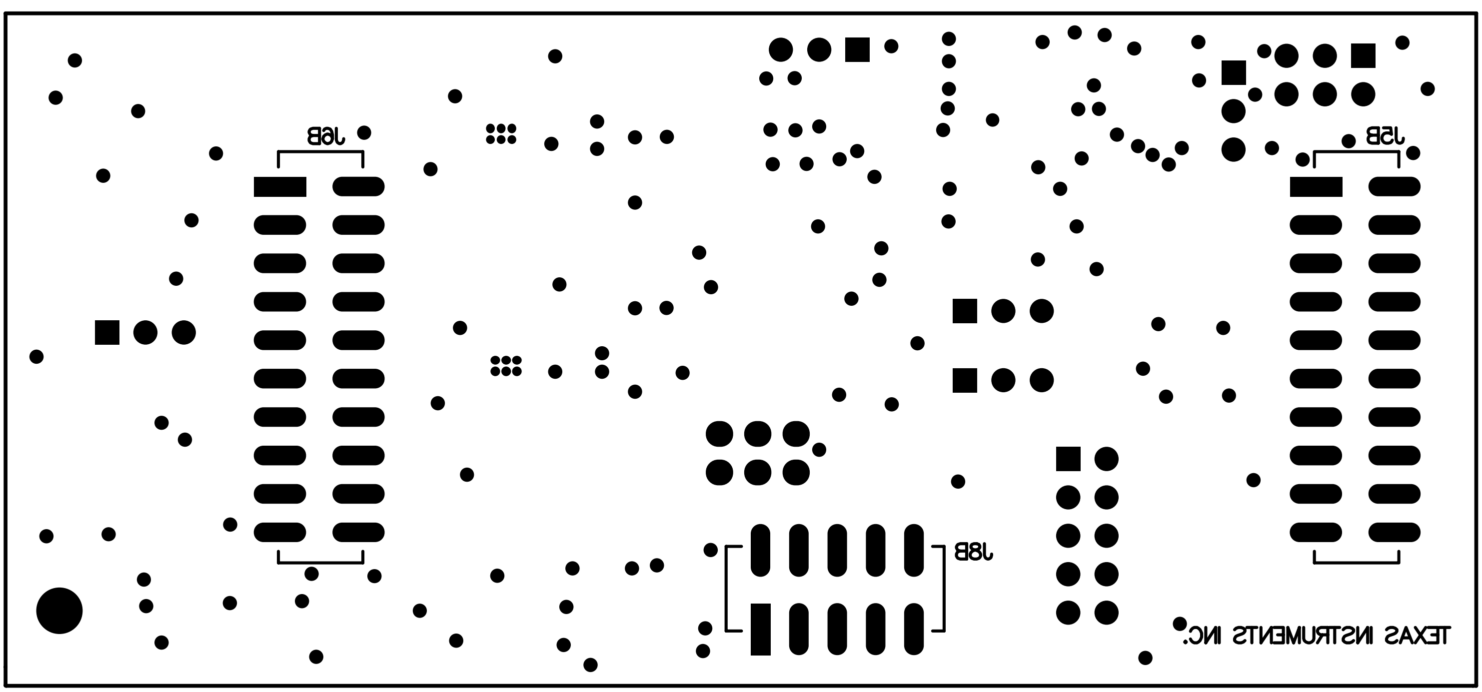
J6B
J5B
J8B
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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of +3.3V to +5V and the output voltage range of 0V to 5V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than +30°C. The EVM is designed to operate properly with certain components above +85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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