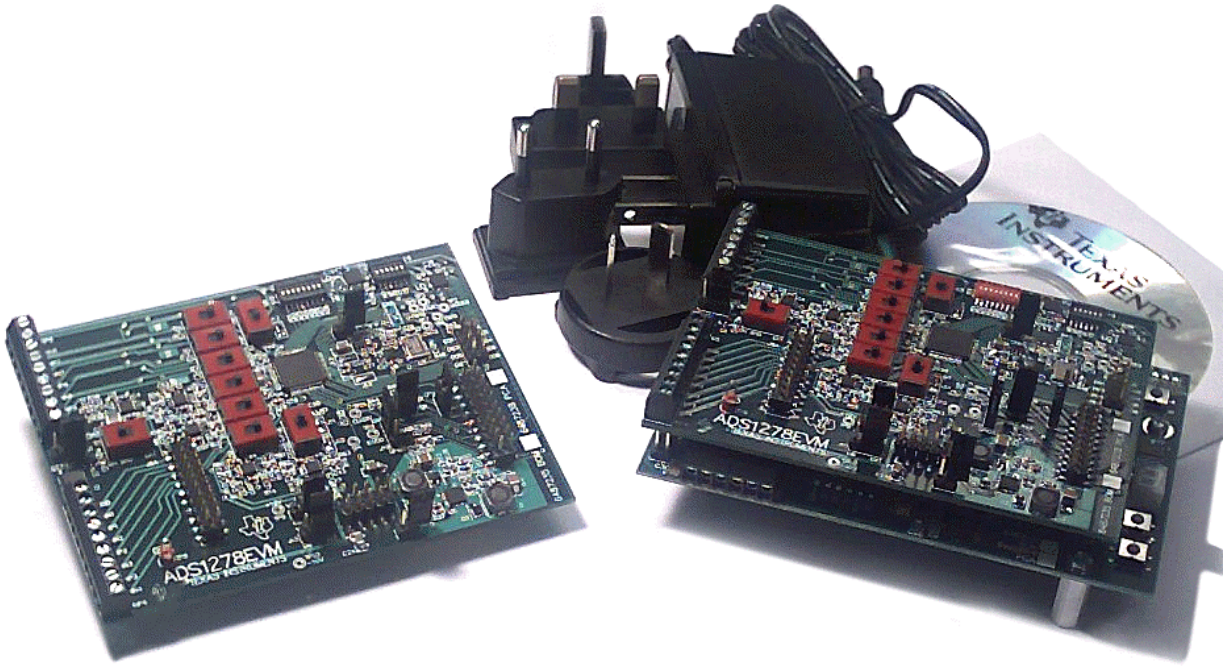
ADS1278EVM and ADS1278EVM-PDK User's Guide



ADS1278EVM (Left) and ADS1278EVM-PDK (Right)

This user's guide describes the characteristics, operation, and use of the ADS1278EVM, both by itself and as part of the ADS1278EVM-PDK. This evaluation module (EVM) is an evaluation board for the ADS1278, a multi-channel, delta-sigma analog-to-digital converter (ADC). The EVM allows evaluation of all aspects of the ADS1278 device. A complete circuit description, schematic diagram, and bill of materials is 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
ADS1278	SBAS367A	SN74LVC2G157	SCES207K
REF1004	SBVS002	TPS73018	SBVS054H
REF3125	SBVS046C	TPS65131	SLVS493B
OPA2350	SBOS099C	PCA9535	SCPS129H
OPA1632	SBOS286A		

Contents

1 EVM Overview 3
2 Analog Interface 3
3 Digital Interface 4
4 Power Supplies 6
5 Voltage Reference 7
6 Clock Source 7
7 EVM Operation 8
8 ADS1278EVM-PDK Kit Operation 10
9 Evaluating Performance with the ADCPro Software 20
10 Schematics and Layout 24

List of Figures

1 Connector J2 5
2 Connectors J15, J16 7
3 Connector J1 7
4 Switch S1 7
5 Connector J5 7
6 Amplifier Selection Switches 8
7 ADS1278EVM Default Jumper Locations 9
8 MMB0 Initial Setup 11
9 Connecting ADS1278EVM to MMB0 12
10 Connecting an AC Adapter 13
11 Laboratory Power Supply Connection 14
12 ADCPro Software Start-up Display Window 15
13 ADS1278EVM-PDK Plug-In Display Window 16
14 Install New Driver Wizard Screen 1 17
15 Install New Driver Wizard Screen 2 18
16 Install New Driver Wizard Screen 3 18
17 Install New Driver Wizard Screen 4 19
18 Install New Driver Wizard Screen 5 19
19 Channel Enable 21
20 Manual Channel Control 21
21 Clock Settings and Mode 22
22 Operating Mode 22
23 Output Data Format 23
24 Progress Bar While Collecting Data 23

List of Tables

1 J9/J7: Analog Interface Pinout 4
2 J8: Supplemental Analog Interface Pinout 4
3 J6: Serial Interface Pins 5
4 J3 Configuration: Power-Supply Input 6
5 J15 +10V Selection 6
6 J16 –10V Selection 6
7 List of Switches 10
8 Operating Modes: Clock Frequency 22
9 ADS1278EVM Bill of Materials 24

1 EVM Overview

1.1 Features

ADS1278EVM Features:

- Contains all support circuitry needed for the ADS1278
- +10V and –10V generated from the +5V supply or supplied externally
- Voltage reference options: external, or onboard
- Clock options: Adjustable frequency, or 32 crystal oscillator
- GPIO access
- Compatible with the TI Modular EVM System

ADS1278EVM-PDK Features:

- Easy-to-use evaluation software for Microsoft Windows® XP or later
- 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 ADS1278EVM-PDK is available. This kit combines the ADS1278EVM board with the DSP-based MMB0 motherboard, and includes ADCPro™ software for evaluation.

The MMB0 motherboard allows the ADS1278EVM to be connected to the computer via an available USB port. This manual shows how to use the MMB0 as part of the ADS1278EVM-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 ADS1278EVM-PDK is controlled by a plug-in running in ADCPro. For more information about ADCPro, see the *ADCPro™ Analog-to-Digital Converter Evaluation Software User's Guide* (SBAU128), available for download from the TI web site.

This manual covers the operation of both the ADS1278EVM and the ADS1278EVM-PDK. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS1278EVM.

1.2 Introduction

The ADS1278EVM is an evaluation module built to the TI Modular EVM System specification. It can be connected to any modular EVM system interface card.

The ADS1278EVM is available as a stand-alone printed circuit board (PCB) or as part of the ADS1278EVM-PDK, which includes an MMB0 motherboard and software. As a stand-alone PCB, the ADS1278EVM is useful for prototyping designs and firmware.

Note that the ADS1278EVM 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 ADS1278EVM 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 J9. This header/socket provides access to the analog input pins of the ADS1278. Consult Samtec at http://www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options. These signals can also be connected to terminal block J7.

In addition to J9 (and J7), terminal block J8 also provides analog inputs to accommodate the large number of input channels available on the ADS1278.

Most of the pins on J7, J8, and J9 are directly connected, with no filtering or protection. Use appropriate caution when handling these pins. Table 1 and Table 2 summarize the pinouts for analog interfaces J9/J7 and J8, respectively.

Table 1. J9/J7: Analog Interface Pinout

Pin Number	Signal	Description
J9.1, J7-3	A1P	AINP1, ADS1278
J9.2, J7-2	A1N	AINN1, ADS1278
J9.3, J7-5	A2P	AINP2, ADS1278
J9.4, J7-4	A2N	AINN2, ADS1278
J9.5, J7-7	A3P	AINP3, ADS1278
J9.6, J7-6	A3N	AINN3, ADS1278
J9.7, J7-9	A4P	AINP4, ADS1278
J9.8, J7-8	A4N	AINN4, ADS1278
J9.18	EXTREFN	External Reference source input (- side of differential input)
J9.20	EXTREFP	External Reference source input (+ side of differential input)
J9.10-16 (even)	Unused	—
J9.15	Unused	—
J9.9-19 (odd), J7-1	AGND	Analog ground connections (except J1.15)

Table 2. J8: Supplemental Analog Interface Pinout

Pin Number	Signal	Description
J8.1	GND	Analog Ground
J8.2	A5N	AIN5N, ADS1278
J8.3	A5P	AIN5P, ADS1278
J8.4	A6N	AIN6N, ADS1278
J8.5	A6P	AIN6P, ADS1278
J8.6	A7N	AIN7N, ADS1278
J8.7	A7P	AIN7P, ADS1278
J8.8	A8N	AIN8N, ADS1278
J8.9	A8N	AIN8P, ADS1278

3 Digital Interface

3.1 Serial Data Interface

The ADS1278EVM 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.

All logic levels on J5 are 3.3V CMOS, except for the I²C™ pins. These pins conform to 3.3V I²C rules. Table 3 describes the J6 serial interface pins.

Table 3. J6: Serial Interface Pins

Pin No.	Pin Name	Signal Name	I/O Type	Pullup	Function
J5.1	CNTL	SYNC	In	High	
J5.2	GPIO0	MODE0	In	High	
J5.3	CLKX	SCLK	In	None	ADS1278 SPI clock
J5.4	DGND	DGND	In/Out	None	Digital Ground
J5.5	CLKR	CLKR	Out	None	
J5.6	GPIO1	MODE1	In	High	
J5.7	FSX	/DRDY/FSYNC	In	Low	
J5.8	GPIO2	FORMAT0	In	High	
J5.9	FSR	/DRDY/FSYNC	Out	None	
J5.10	DGND	DGND	In/Out	None	Digital Ground
J5.11	DX	DIN	In	None	ADS1278 SPI data in
J5.12	GPIO3	FORMAT1	In	High	
J5.13	DR	DOUT1	Out	None	ADS1278 SPI/FSYNC data out
J5.14	GPIO4	FORMAT2	In	None	Unused
J5.15	/INT	/DRDY/FSYNC	Out	None	
J5.16	SCL	SCL	I²C	n/a	I²C clock
J5.17	TOUT	CLK	In	None	External clock input
J5.18	DGND	DGND	In/Out	None	Digital Ground
J5.19	GPIO5	CLK Select		None	
J5.20	SDA	SDA	I²C	n/a	I²C data

Many pins on J5 have weak pull-up/pull-down resistors. These resistors provide default settings for many of the control pins. Many pins on J5 correspond directly to ADS1278 pins. See the ADS1278 data sheet for complete details on these pins.

3.2 Data Output

Most data communications are directed through DOUT1. The data from all eight channels can be observed on the DOUT1 pin using the TDM mode. That is the signal that is used by the ADS1278EVM-PDK to read back and display all the channels. All the data output signals (DOUT1 to DOUT8) can be monitored on J2. Figure 1 illustrates the pinout for J2.

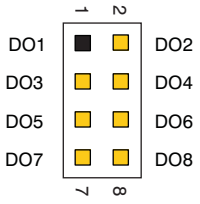


Figure 1. Connector J2

4 Power Supplies

J3 is the power-supply input connector. Table 4 lists the configuration details for J3. A bipolar supply is needed for the amplifiers on each channel. The EVM includes a switching power supply to generate a +10V and –10V supply. For optimum noise performance, the external supplies (+VA and –VA) should be used.

Table 4. J3 Configuration: Power-Supply Input

Pin No.	Pin Name	Function	Required
J5.1	+VA	+10V to +15V	Yes, unless onboard +10V is used.
J5.2	-VA	–10V to –15V	Yes, unless onboard –10V is used.
J5.3	+5VA	+5V analog supply	Always
J5.4	–5VA	–5V analog supply	No
J5.5	DGND	Digital ground input	Yes
J5.6	AGND	Analog ground input	Yes
J5.7	+1.8VD	1.8V digital supply	No
J5.8	+3.3VD	3.3V digital supply	Always
J5.9	VD1	Not used	No
J5.10	+5VD	+5V	Used to generate +10V/–10V

The 1.8V for DV_{DD} comes from the voltage regulator U16 using 3.3V as the source voltage input.

All of the power supplies AVDD(+5V), DVDD(1.8V), IOVDD(3.3V) have corresponding jumpers J10,J11(AVDD), J13(DVDD) and J14(IOVDD) that can be replaced with a current meter to measure the respective supply currents.

4.1 Bipolar Power Options

J15 and J16 require a jumper to select the voltage used by the onboard amplifiers. The external voltages can range from 10V to 15V. The onboard voltage is always 10V. Table 5 and Table 6 list the options for J15 and J16, respectively. Figure 2 shows the pinout for connectors J15 and J16.

Table 5. J15 +10V Selection

Jumper	Name	Function
1-2	+10V	Select the +10V that is generated on the EVM
2-3	+VA	Select the external +VA voltage

Table 6. J16 –10V Selection

Jumper	Name	Function
1-2	–10V	Select the –10V that is generated on the EVM
2-3	–VA	Select the external –VA voltage

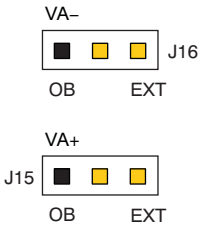


Figure 2. Connectors J15, J16

5 Voltage Reference

The ADS1278EVM has three sources for the reference voltage. Jumper J1 can select the voltage from either the REF3125 (U1) or REF1004 (U2). The reference from either source is filtered and buffered by U3A. Switch S1 chooses either the onboard reference or the external reference voltage that is connected to the reference pins of J9. Figure 3 illustrates the pinout for connector J1. Figure 4 shows switch S1 as it appears on the EVM.

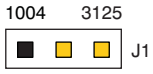


Figure 3. Connector J1

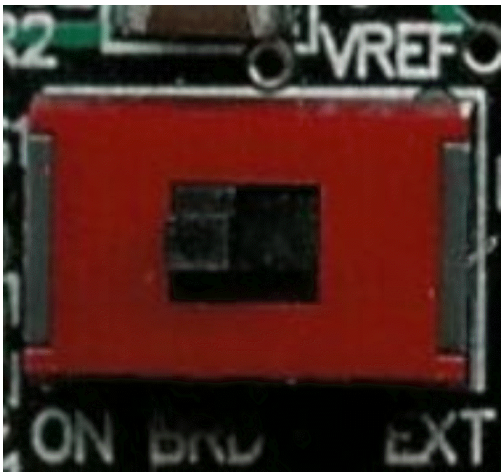


Figure 4. Switch S1

6 Clock Source

The ADS1278 can select either the onboard 32 crystal oscillator of a clock supplied on the TOUT pin of connector J5 (pin 17).

Jumper J19 can be used to always select the 32 crystal (IOVDD position) or allow the clock selection to be controlled by GPIO5 (pin 19) on connector J5, as shown in Figure 5.

Figure 5. Connector J5

7 EVM Operation

The following section provides information on the analog input, digital control, and general operating conditions of the ADS1278EVM.

7.1 Analog Input

Four of the analog input sources (channels 1–4) can be applied directly to J9 (top or bottom side) or through signal-conditioning modules available for the the modular EVM system. Terminal block J7 is connected in parallel with the analog signal connections to J9. The additional four channel sources (5–8) can be applied to the terminal block J8.

Each input signal can be selected to connect to directly to the analog inputs of the ADS1278 or they can use the OPA1632 buffers that are provided. Switches S2-9 can be switched away from the ADS1278 to select the Terminal Block (TBK) or towards the ADS1278 to select the Amplifier (AMP) for the analog inputs 1 through 8 as shown in Figure 6.

Figure 6. Amplifier Selection Switches

7.2 Digital Control

The digital control signals can be applied directly to J5 (top or bottom side). The modular ADS1278EVM can also be connected directly to a DSP or microcontroller interface board, such as the 5-6KINTERFACE or HPA-MCUINTERFACE boards available from Texas Instruments, or the MMB0 if purchased as part of the ADS1278EVM-PDK. For a list of compatible interface and/or accessory boards for the EVM or the ADS1278, 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 the Power Down control can only be controlled with slide switches of the U17 and U18 that are set up and read using the I^2C signals on pins 16 and 18 of J5. The Format and Mode pins can be controlled by all three methods (slide switches, GPIO pins on J5, and the I^2C control from U17.

7.3 ADS1278EVM-PDK Power Supply

The ADS1278EVM can either be powered by an ac adapter or by applying the 5V, +10V and –10V to the connectors on the MMB0 board. The MMB0 board will provide the 5V and 3.3V to the ADS1278EVM along with the +10V and –10V signals. Because the circuitry is provided on the ADS1278EVM to generate +10V and –10V, the complete system can be powered from the supplied ac adapter that supplies +6V and 3A.

7.4 Default Jumper Settings and Switch Positions

Figure 7 shows the jumpers found on the EVM and the respective factory default conditions for each.

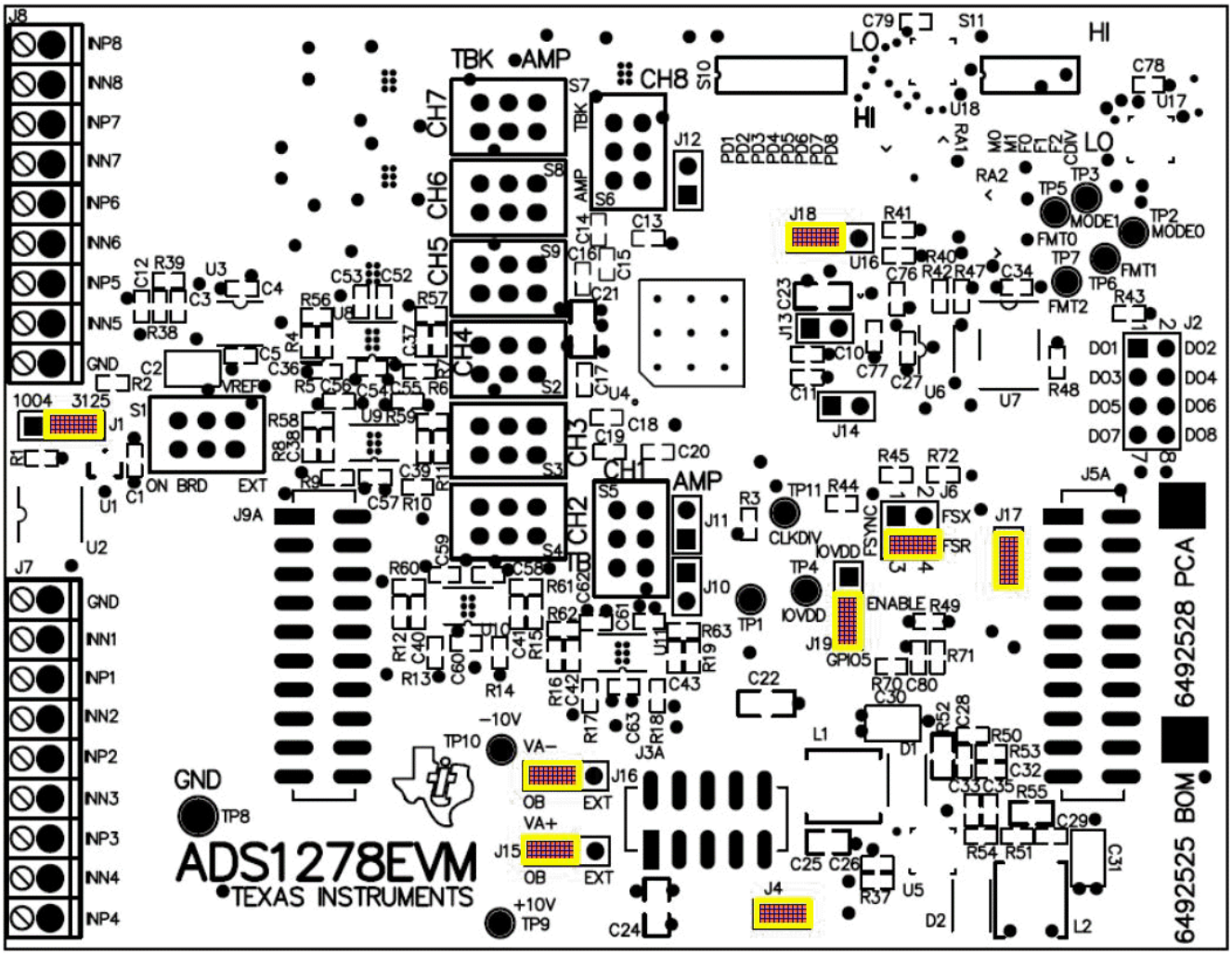


Figure 7. ADS1278EVM Default Jumper Locations

Table 7 lists the switches found on the EVM and the respective factory default conditions for each.

Table 7. List of Switches

Switch	Default Position	Switch Description
S1	Left	Onboard Reference
S2-S4	Right	Ain1-3 Amplifier
S5	Up	Ain4 Amplifier
S6	Down	Ain5 Amplifier
S7-S9	Right	Ain6-8 Amplifier

8 ADS1278EVM-PDK Kit Operation

This section provides information on using the ADS1278EVM-PDK, including setup, program installation, and program usage.

To prepare to evaluate the ADS1278 with the ADS1278EVM-PDK, complete the following steps:

Step 1. Install the ADCPro software (if not already installed) on a PC.
Step 2. Install the ADS1278EVM-PDK EVM plug-in software.
Step 3. Set up the ADS1278EVM-PDK.
Step 4. Connect a proper power supply or use the included ac adapter.
Step 5. Run the ADCPro software.
Step 6. Complete the Microsoft Windows USB driver installation process.

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

8.1 Installing the ADCPro Software

CAUTION

Do not connect the ADS1278EVM-PDK before installing the software on a suitable PC. Failure to observe this caution may cause Microsoft Windows to not recognize the ADS1278EVM-PDK.

The latest software is available from the TI web site at http://www.ti.com/. The CD-ROM shipped with the ADS1278EVM may not contain the latest software, but the ADCPro installer will check for updates when executed (if connected to the Internet), and then give you the option of downloading and installing the latest version. Refer to the ADCPro User's Guide for instructions on installing and using the ADCPro software.

To install the ADS1278EVM-PDK plug-in, run the file: **ads1278evm-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 your CD). Double-click the file to run it; then follow the instructions shown. You can also utilize the ADCPro *Update Check* feature to check for newer versions of the ADS1278EVM-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 8.4.

8.2 Setting Up the ADS1278EVM-PDK

The ADS1278EVM-PDK contains both the ADS1278EVM and the MMB0 motherboard; however, the devices are shipped unconnected. Follow these steps to set up the ADS1278EVM-PDK.

Step 1. Unpack the ADS1278EVM-PDK kit.

Step 2. Set the jumpers and switches on the MMB0 as shown in Figure 8.

- Set the Boot Mode switch to USB.
- Connect +5V and +5VA on jumper block J13 (if +5V is supplied from J14 +5VA).
- Leave +5V and +VA disconnected on jumper block J13.
- If the PDK will be powered from an ac adapter, connect J12. If the PDK will be powered through the terminal block, disconnect J12. (See Section 8.3 for details on connecting the power supply.)

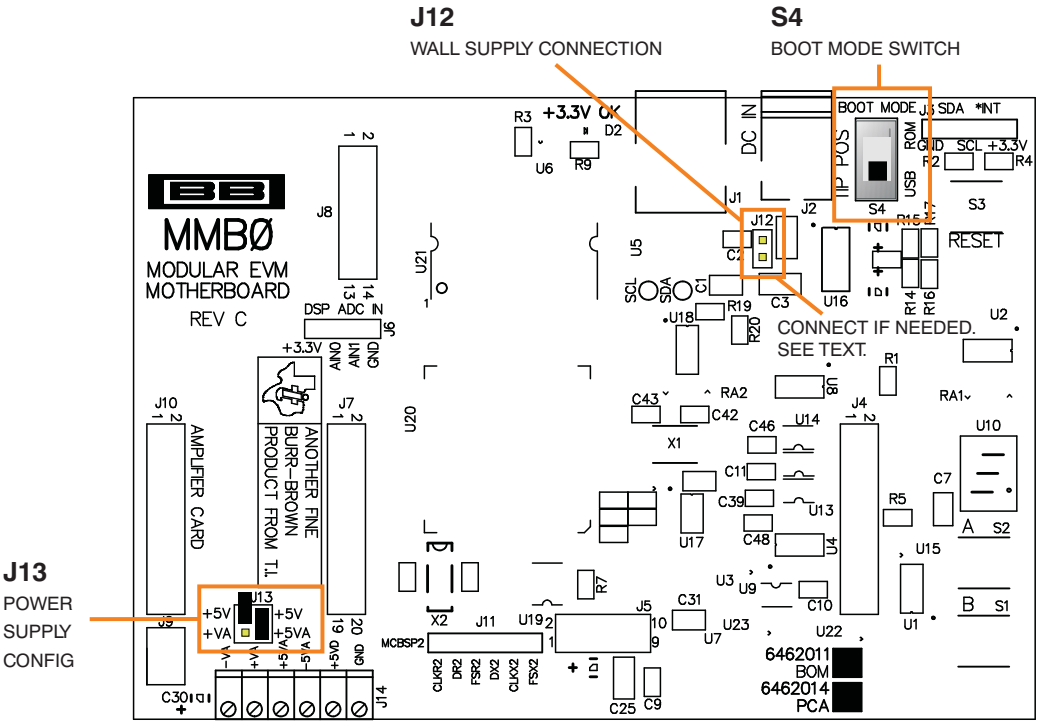


Figure 8. MMB0 Initial Setup

Step 3. Plug the ADS1278EVM into the MMB0, as Figure 9 illustrates.

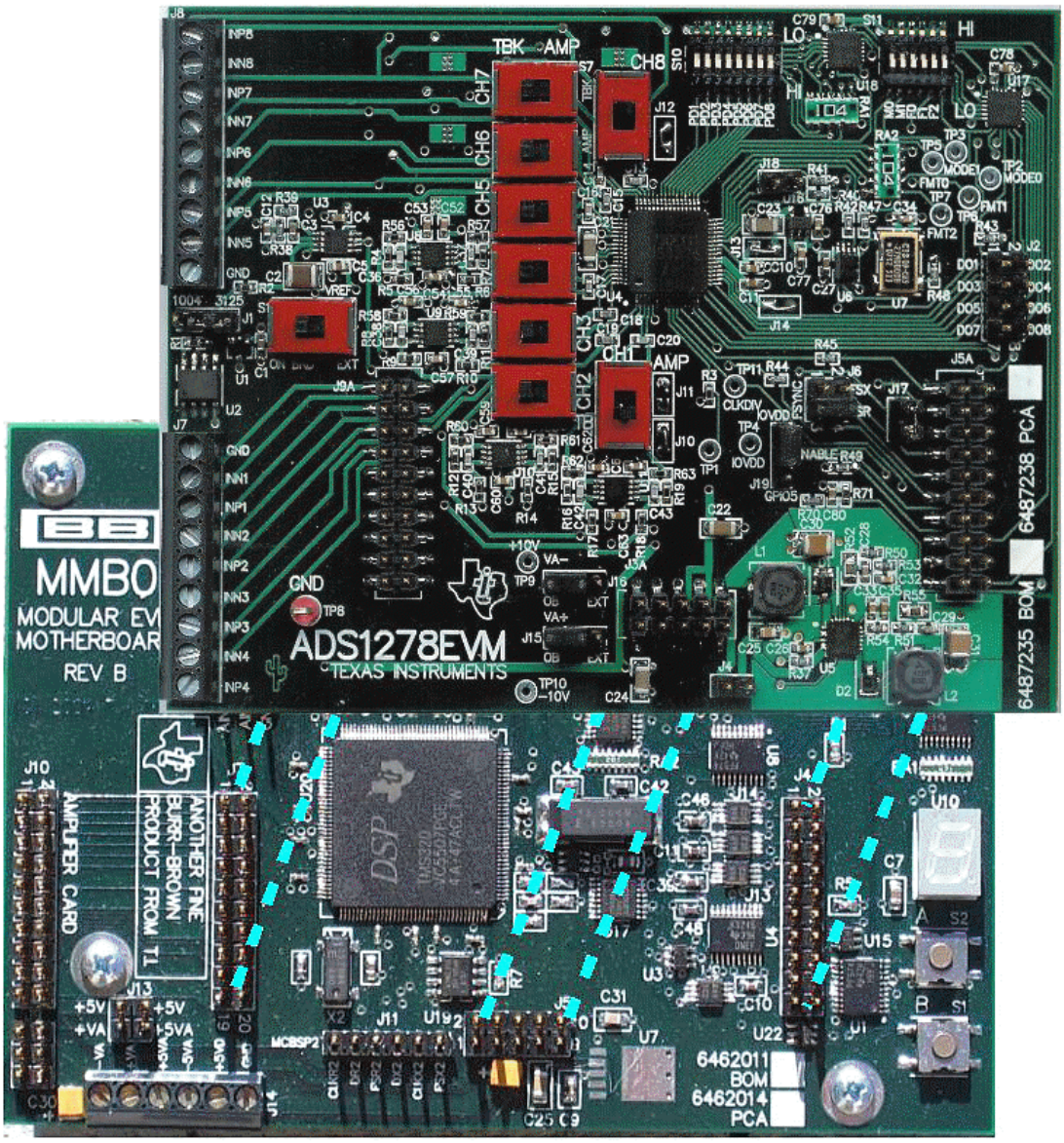


Figure 9. Connecting ADS1278EVM to MMB0

CAUTION

Do not misalign the pins when plugging the ADS1278EVM into the MMB0. Check the pin alignment carefully before applying power to the PDK.

Step 4. Set the jumpers and switches on the ADS1278EVM as shown in Figure 7 (note that these settings are the factory-configured settings for the EVM). If not using the onboard 10V power supplies, change J15 and J16 to the EXT connection.

8.2.1 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.

8.3 Connecting the Power Supply

The ADS1278EVM-PDK can be operated with a unipolar +5V supply or a combination of +5V and bipolar ±(10V to 15V) 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.)

8.3.1 Connecting an AC Adapter

An ac adapter can be connected to barrel jack J2 on the MMB0. J2 is located next to the USB connector. The adapter must output 6V–7V dc. The connector must be sleeve-negative, tip-positive. It should have a current rating of at least 2A.

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 10 illustrates how to connect an ac adapter to the MMB0.

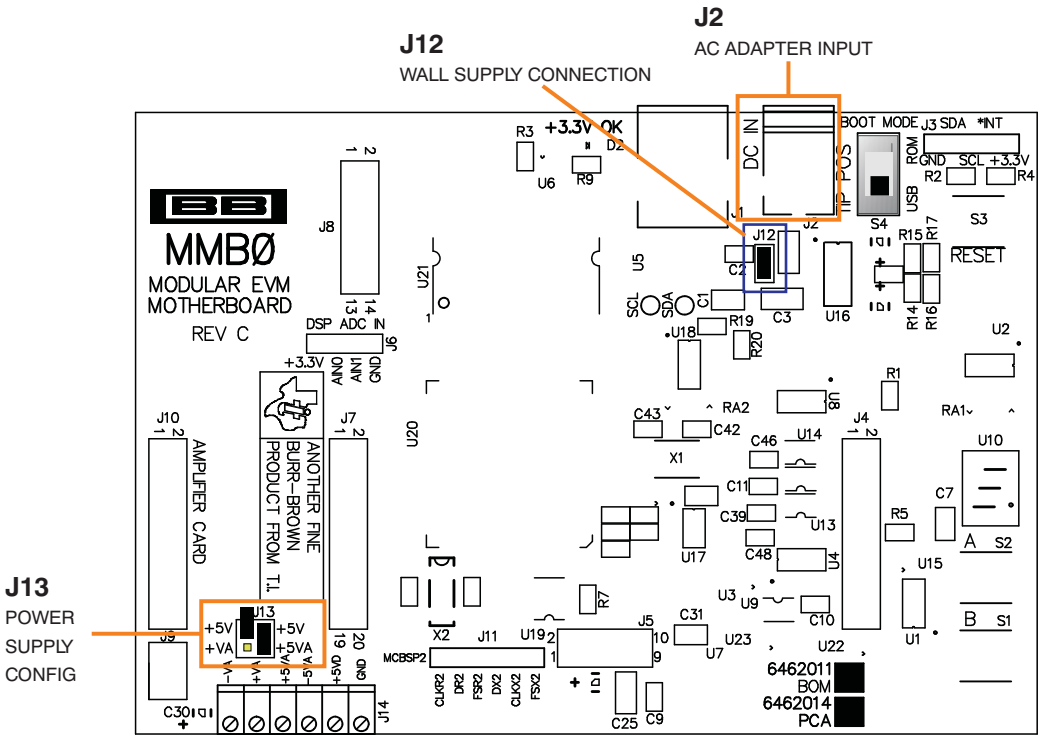


Figure 10. Connecting an AC Adapter

8.3.2 Connecting a Laboratory Power Supply

A laboratory power supply can be connected through terminal block J14 on the MMB0, as shown in Figure 11. Both unipolar and bipolar configurations are supported.

To use a unipolar lab power supply configuration:

- Disconnect J12 on the MMB0.
- Connect a +5V dc supply to the +5VD terminal on J14.
- Connect ground of the dc supply to the GND terminal on J14.

For bipolar mode, also connect a -10V dc supply to the –VA, and +10V on the +VA terminals on 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.

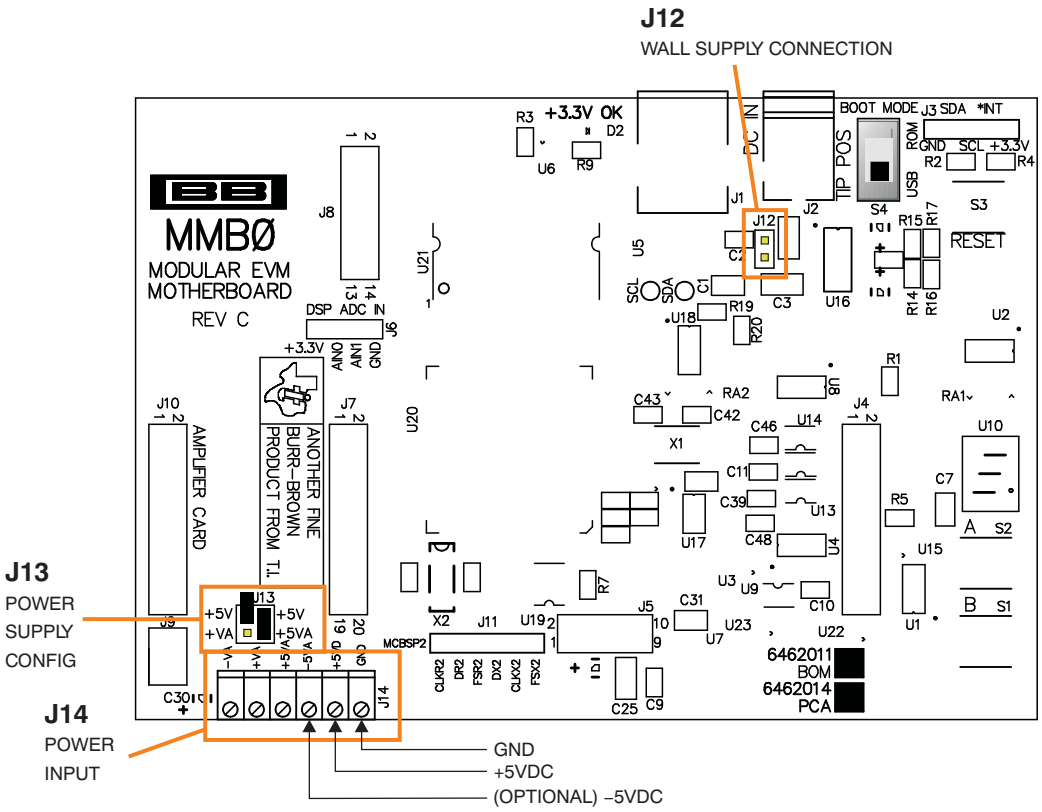


Figure 11. Laboratory Power Supply Connection

8.4 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 ADS1278EVM-PDK is called ADCPro. This program uses plug-ins to communicate with the EVM. The ADS1278EVM-PDK plug-in is included in the ADS1278EVM-PDK package.

The program currently runs only on Microsoft Windows platforms of Windows XP or higher.

Follow these procedures to run ADCPro and complete the necessary driver installation:

1. Start the software by selecting *ADCPro* from the Windows Start menu. The screen in Figure 12 appears.

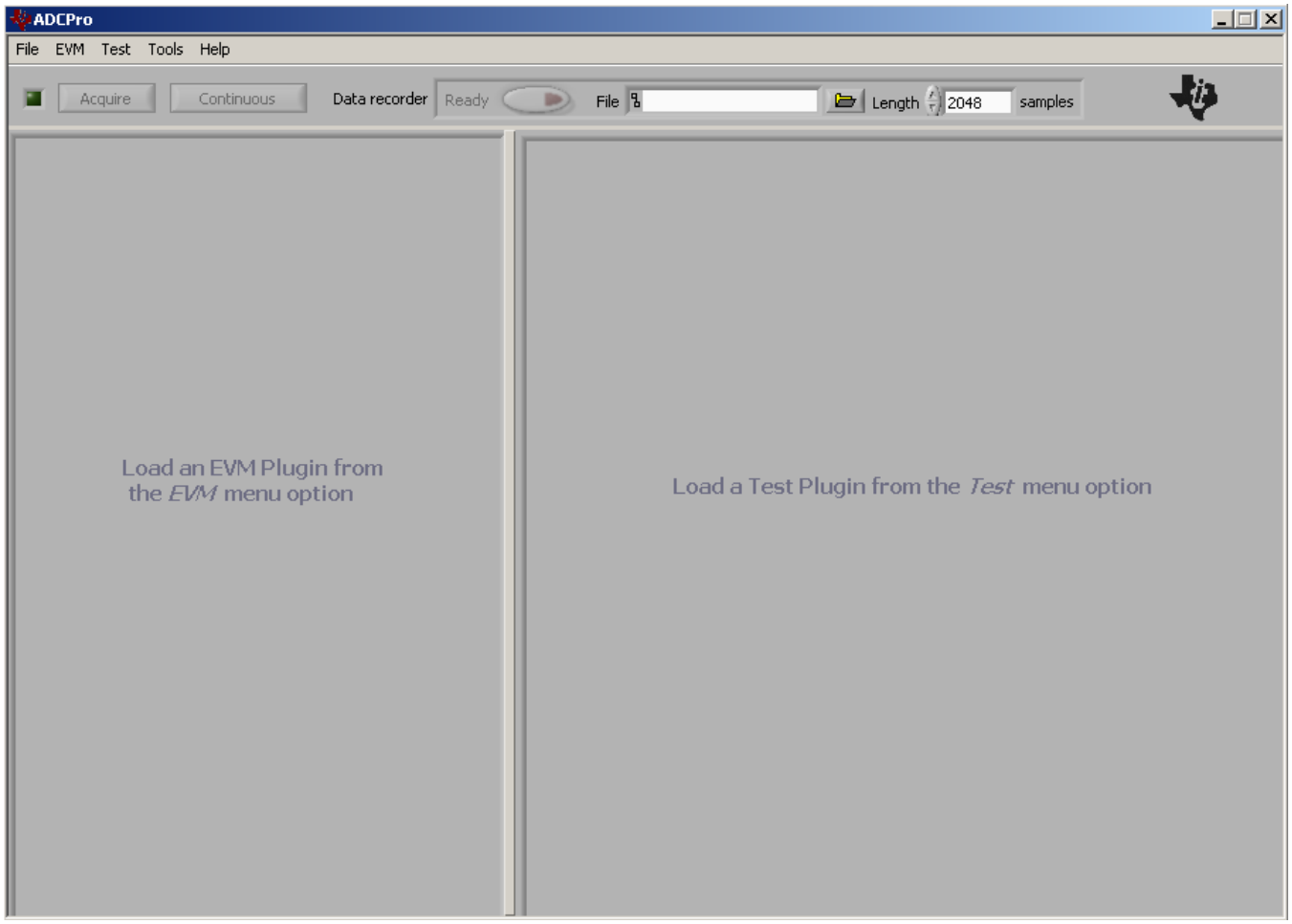


Figure 12. ADCPro Software Start-up Display Window

2. Select *ADS1278EVM* from the EVM drop-down menu. The ADS1278EVM-PDK plug-in appears in the left pane, as shown in Figure 13.

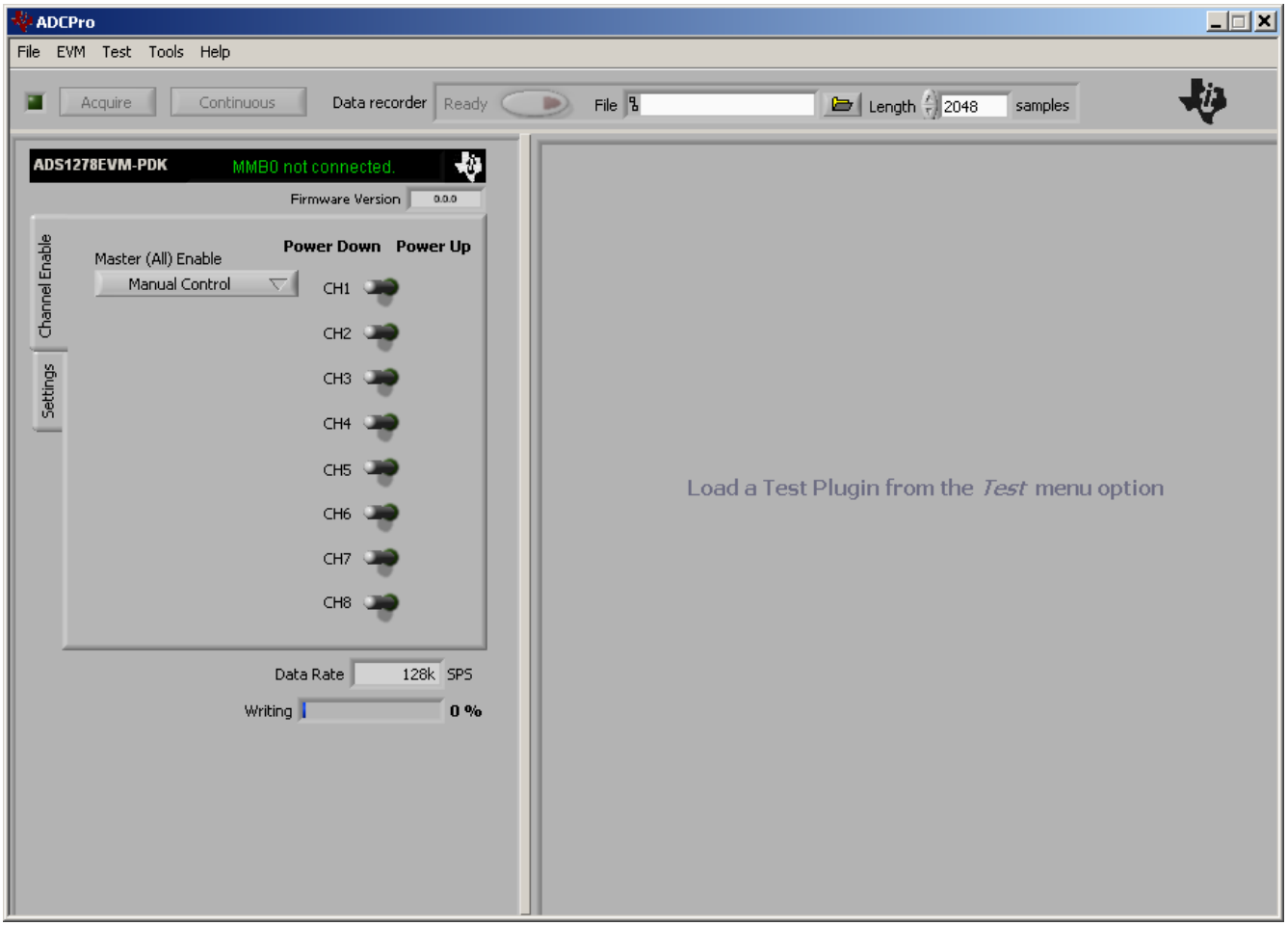


Figure 13. ADS1278EVM-PDK Plug-In Display Window

3. The ADS1278EVM-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.
4. Apply power to the PDK and connect the board to an available PC USB port.

5. If you have not yet loaded the operating system drivers, Windows will display the Windows Install New Driver Wizard sequence (illustrated in Figure 14 through Figure 18). Accept the default settings.

Figure 14. Install New Driver Wizard Screen 1

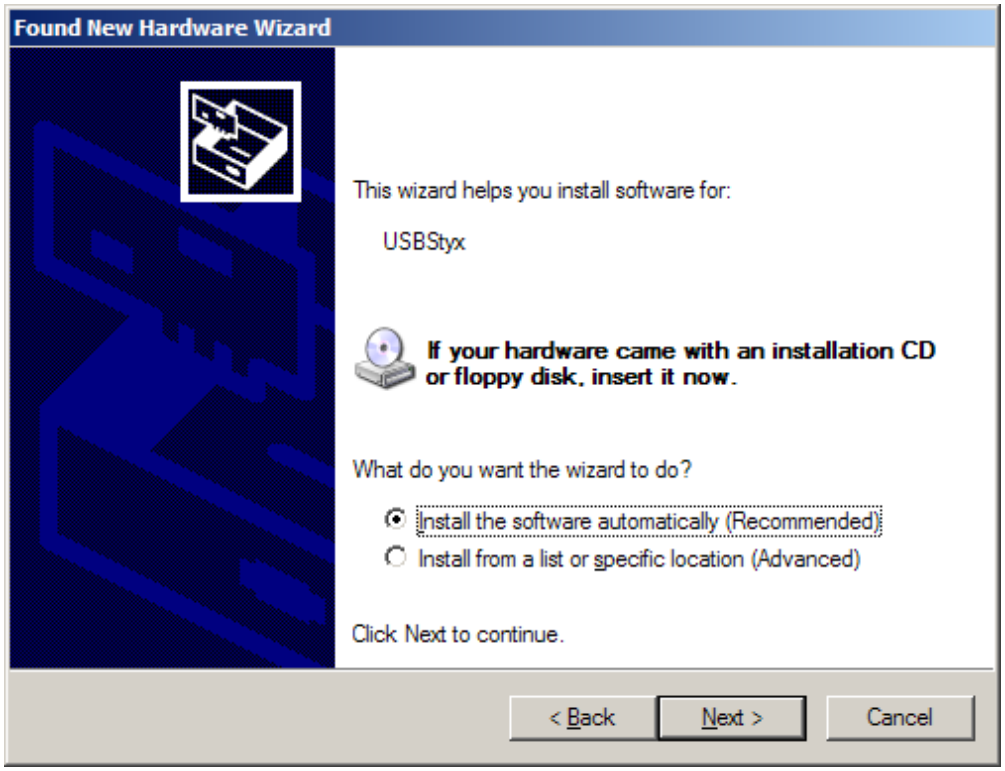


Figure 15. Install New Driver Wizard Screen 2

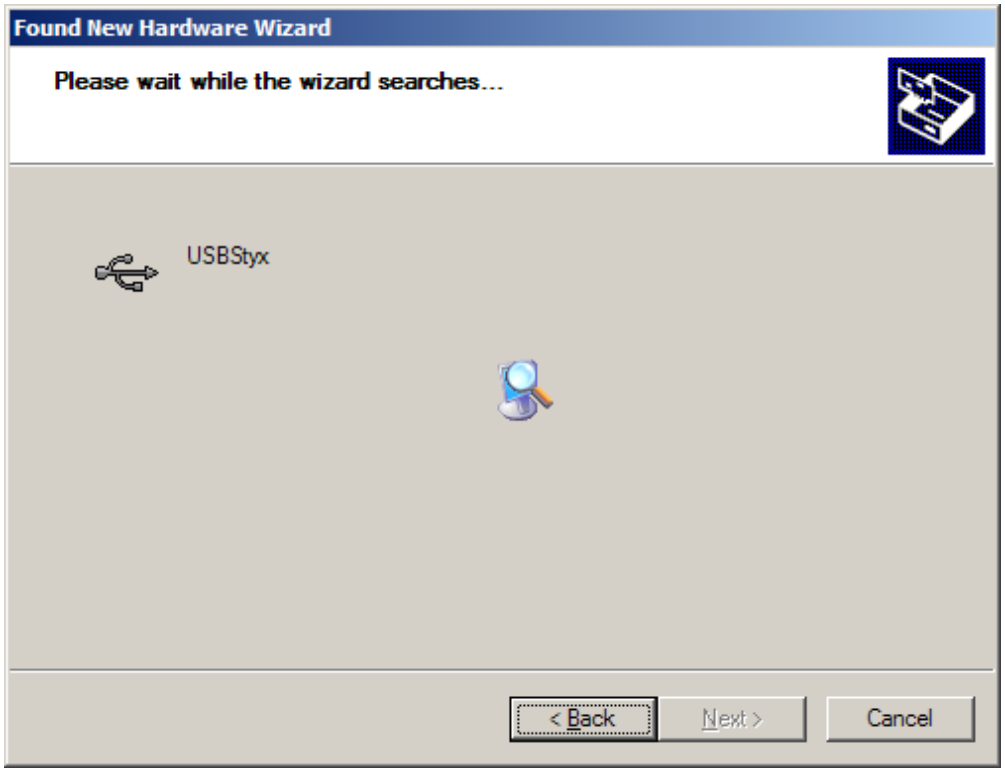


Figure 16. Install New Driver Wizard Screen 3

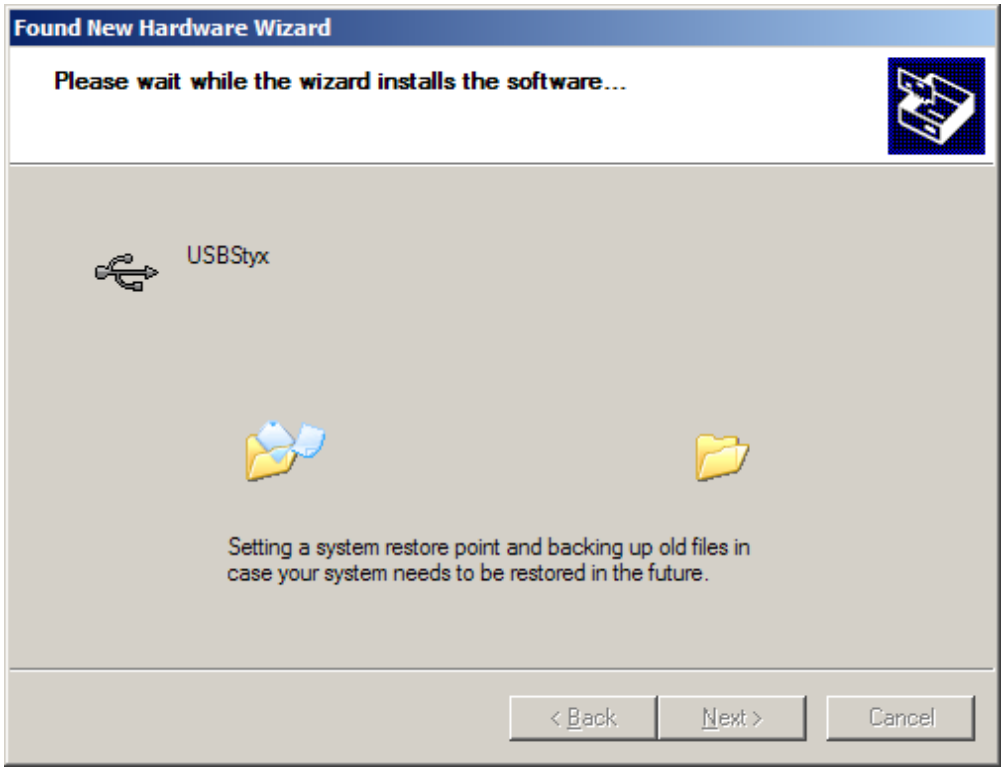


Figure 17. Install New Driver Wizard Screen 4

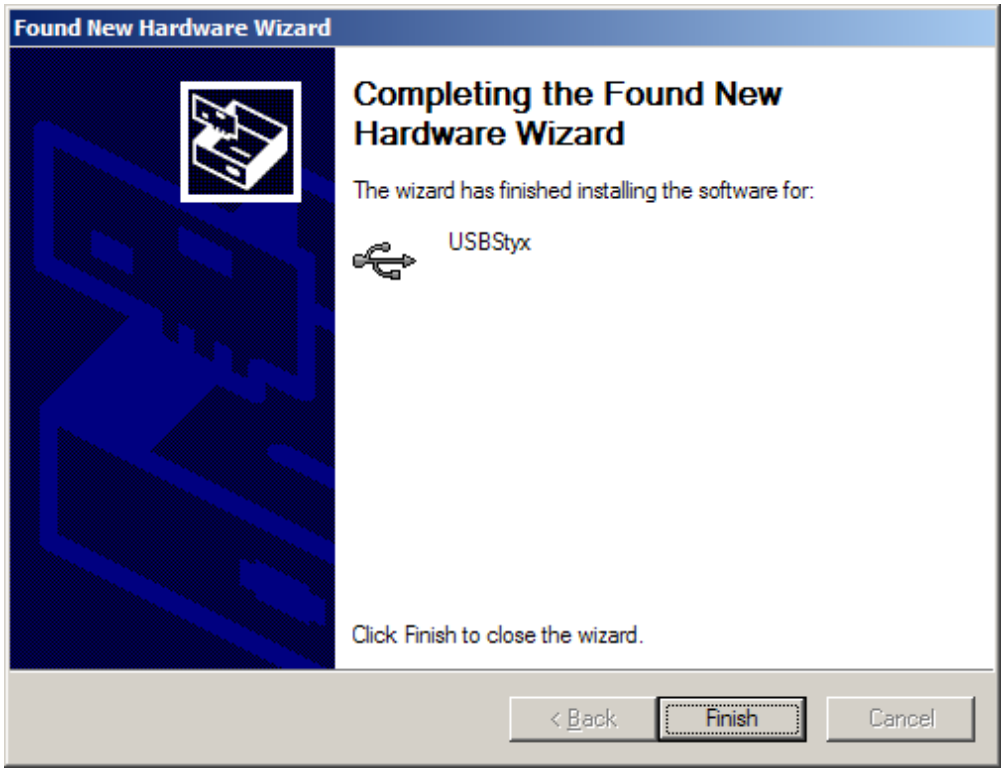


Figure 18. Install New Driver Wizard Screen 5

6. When Windows installs the software driver, the plug-in downloads the firmware to the MMB0.

7. Windows displays the installation wizard a second time. Again, accept the default settings.
8. The status area displays a Connected message. The software is now ready to use.

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

9 Evaluating Performance with the ADCPro Software

The evaluation software is based on ADCPro, a program that operates using a variety of plug-ins. (The ADS1278EVM plug-in is installed as described in the installation Section 8.4.)

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.

9.1 Using the ADS1278EVM-PDK Plug-in

The ADS1278EVM-PDK plug-in for ADCPro provides complete control over all settings of the ADS1278. It consists of a tabbed interface (see Figure 13), with different functions available on different tabs. These controls are described in this section.

You can adjust the ADS1278EVM 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 ADS1278EVM plug-in, the setting immediately updates on the board.

Settings on the ADS1278EVM correspond to settings described in the ADS1278 data sheet; see the ADS1278 data sheet (available for download at www.ti.com) for details.

Because the effective data rate of the ADS1278 depends upon settings of the Clock Freq and Operating Mode, the **Data Rate** indicator in the lower right corner of the plug-in interface is always visible and updates whenever a setting changes that affects the data rate.

9.1.1 Channel Enable Tab

The ADS1278 can acquire from one to eight channels simultaneously. The *ChannelEnable* tab (as shown in Figure 19) provides the control to turn each channel on or off.

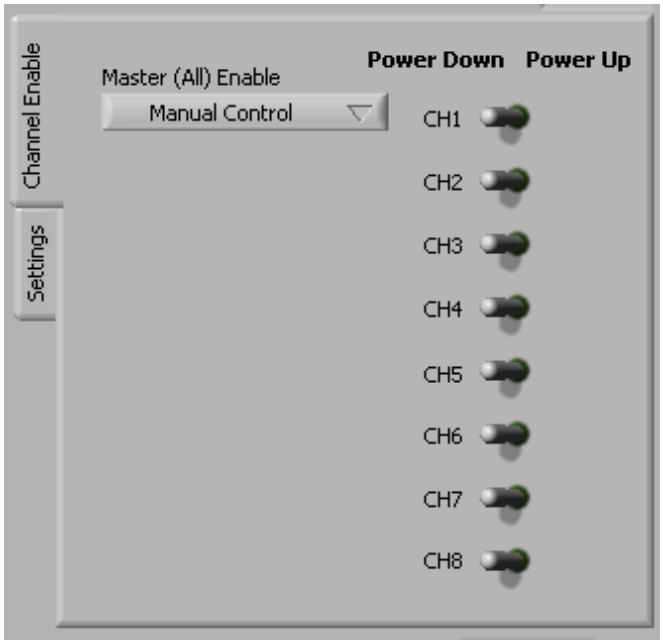


Figure 19. Channel Enable

In addition, the Manual Control button (shown in Figure 20) can be used to enable or disable all the channels.

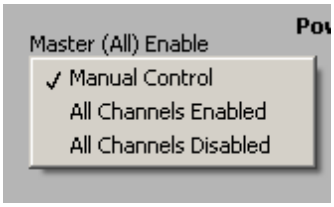


Figure 20. Manual Channel Control

9.1.2 Settings Tab

The ADS1278 requires a clock to operate. The frequency is chosen for the different operating modes, as shown in Table 8.

Table 8. Operating Modes: Clock Frequency

Operating Mode	CLKDIV	Frequency
High-Speed	—	32.4 MHz
High-Resolution	—	27 MHz
Low-Power	1	27 MHz
Low-Power	0	13.5 MHz
Low-Speed	1	27 MHz
Low-Speed	0	5.4 MHz

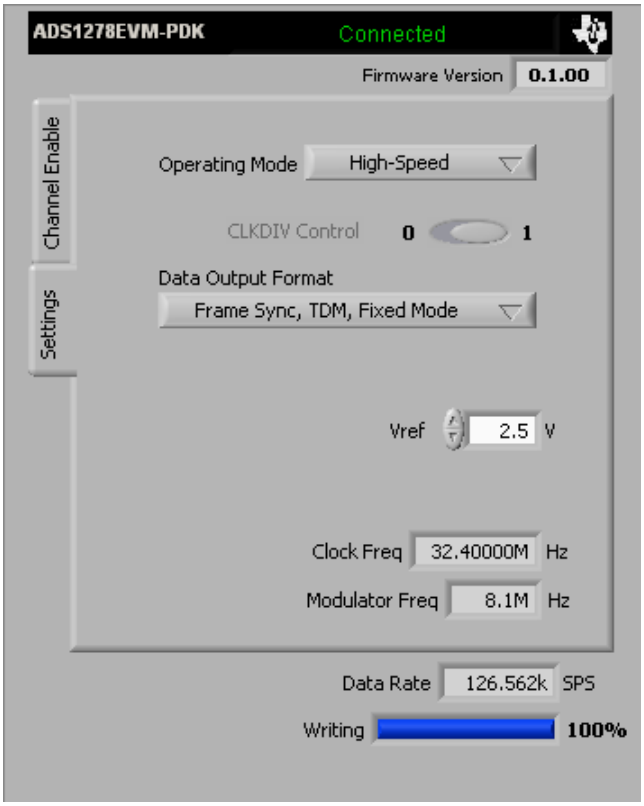


Figure 21. Clock Settings and Mode

The Operating Mode control (illustrated in Figure 22) can select from High-Speed, High-Resolution, Low-Power, or Low-Speed.

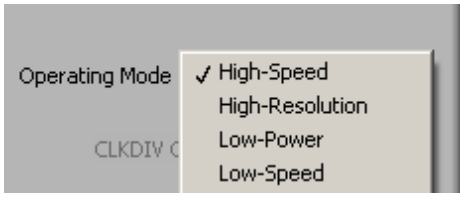


Figure 22. Operating Mode

The CLKDIV control can be selected to be **0** or **1**. The Data Output Formats are limited to the Frame Sync, TDM Format, but both Dynamic and Fixed Mode can be selected. Figure 23 shows the output data format options.

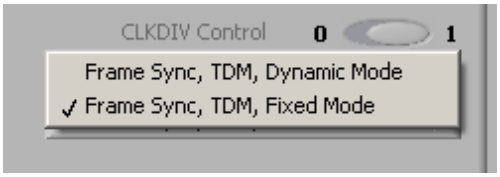


Figure 23. Output Data Format

9.1.3 Collecting Data

Once you have configured the ADS1278 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 ADS1278EVM-PDK plug-in disables all the front panel controls while acquiring, and displays a progress bar as shown in Figure 24.

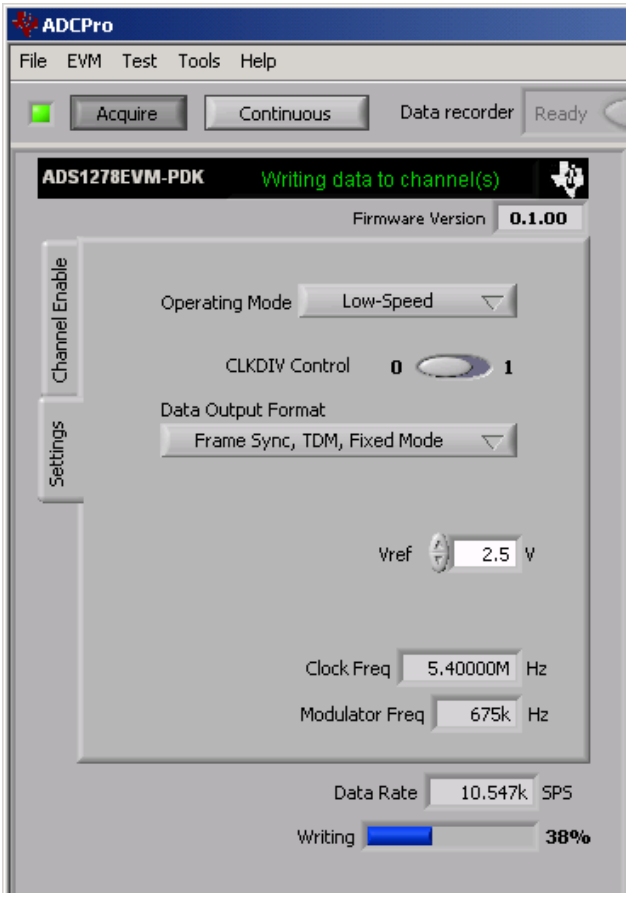


Figure 24. Progress Bar While Collecting Data

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

9.2 Troubleshooting

If ADCPro stops responding while the ADS1278EVM-PDK is connected, try unplugging the power supply from the PDK. Unload and reload the plug-in before reapplying power to the PDK.

10 Schematics and Layout

Schematics for the ADS1278EVM are appended to this user's guide. The bill of materials is provided in Table 9.

10.1 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 TI web site.)

Table 9. ADS1278EVM Bill of Materials

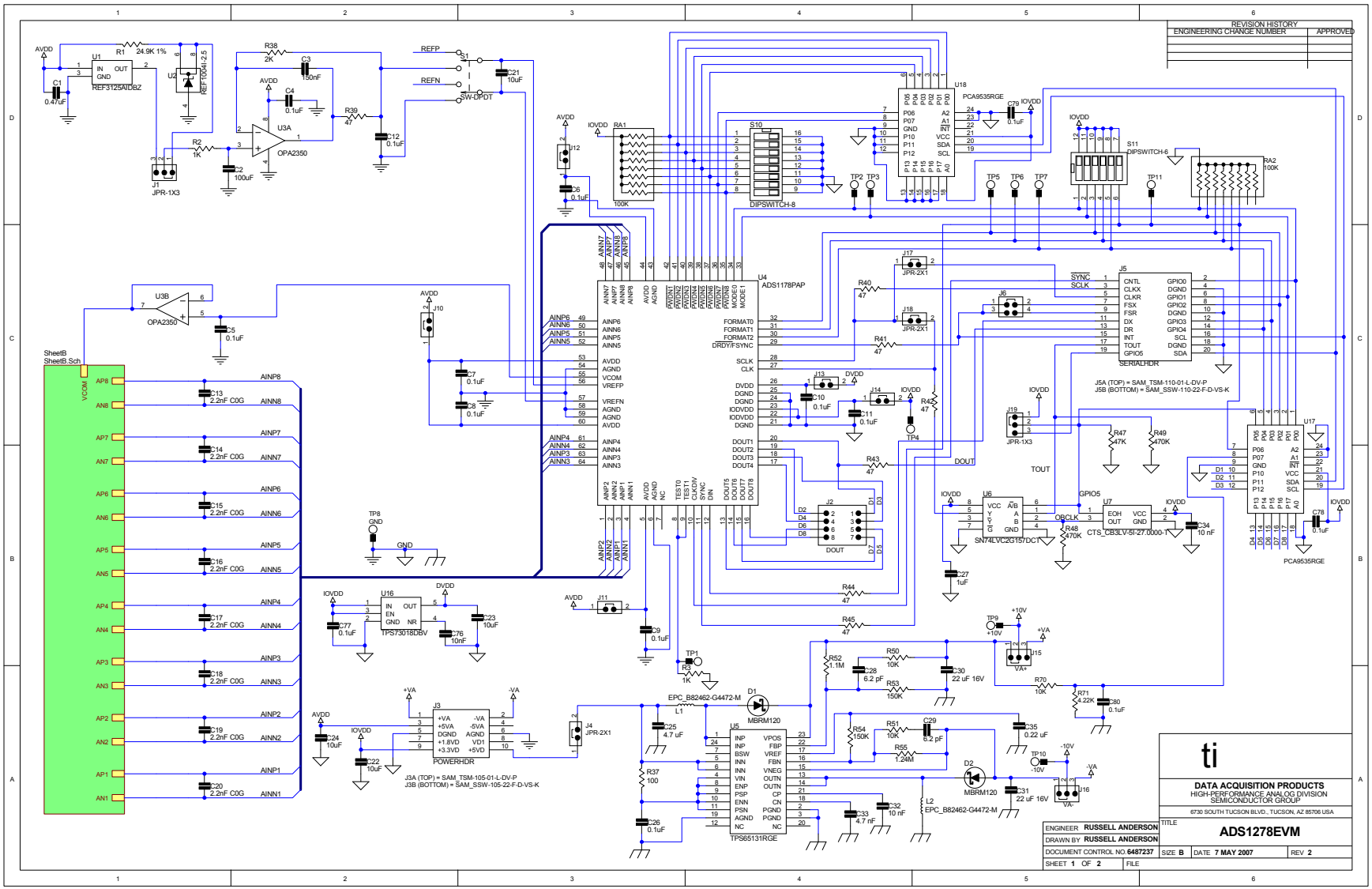
Item No.	RefDes	Count	Value	Description	Part Number	MFR
1	R39-R45	7	47	Resistor, Thick Film Chip 47Ω, 5%, 1/10W, Size = 0603	ERJ-3GEYJ470V	Panasonic
2	R36, R46, R56-R69	16	49.9	Resistor, Thick Film Chip 49.9Ω, 1%, 1/16W, Size = 0603	ERJ-3EKF49R9V	Panasonic
3	R37	1	100	Resistor, Thick Film Chip 100Ω, 5%, 1/10W, Size = 0603	ERJ-3GEYJ101V	Panasonic
4	R2-R35	34	1k	Resistor, Thick Film Chip 1kΩ, 1%, 1/16W, Size = 0603	ERJ-3EKF1001V	Panasonic
5	R38	1	2k	Resistor, Thick Film Chip 2kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ202V	Panasonic
6	R71	1	4.22k	Resistor, Thick Film Chip 4.22kΩ, 1%, 1/16W, Size = 0603	ERJ-3EKF4221V	Panasonic
7	R50, R51, R70	3	10k	Resistor, Thick Film Chip 10kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ103V	Panasonic
8	R1	1	24.9k	Resistor, Thick Film Chip 24.9kΩ, 1%, 1/16W, Size = 0603	ERJ-3EKF2492V	Panasonic
9	R47	1	47k	Resistor, Thick Film Chip 47kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ473V	Panasonic
10	R72	1	100k	Resistor, Thick Film Chip 100kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ104V	Panasonic
11	R53, R54	2	150k	Resistor, Thick Film Chip 150kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ154V	Panasonic
12	R48, R49	2	470k	Resistor, Thick Film Chip 470kΩ, 5%, 1/10W, Size = 0603	ERJ-3GEYJ474V	Panasonic
13	R52	1	1.1M	Resistor, Thick Film Chip 1.1MΩ, 5%, 1/8W, Size = 0805	MCR10EZHF1104	Rohm
14	R55	1	1.24M	Resistor, Thick Film Chip 1.24MΩ, 5%, 1/8W, Size = 0805	MCR10EZHF1244	Rohm
15	RA1, RA2	2	100k	Resistor, Chip Array 10 Terminal Bus 100kΩ, 5%, 1/16W, SMD	745C101104JPTR	CTS
16	C28, C29	2	6.2pF	Capacitor, C0G Ceramic 6.2pF ±0.5pF, 50WV, Size = 0603	GRM1885C1H6R2DZ01D	Murata
17	C36-C51	16	1.5nF	Capacitor, C0G Ceramic 1500pF ±5%, 50WV, Size = 0603	C1608C0G1H152JT	TDK
18	C13-C20	8	2.2nF	Capacitor, C0G Ceramic 2200pF ±5%, 50WV, Size = 0603	C1608C0G1H222JT	TDK
19	C33	1	4.7nF	Capacitor, X7R Ceramic 4700pF ±10%, 50WV, Size = 0603	C1608X7R1H472KT	TDK

Table 9. ADS1278EVM Bill of Materials (continued)

Item No.	RefDes	Count	Value	Description	Part Number	MFR
20	C32, C34, C76	3	10nF	Capacitor, X7R Ceramic 0.01µF ±5%, 50WV, Size = 0603	C1608X7R1H103KT	TDK
21	C4-C12, C26, C52-C75, C77-C80	38	0.1µF	Capacitor, X7R Ceramic 0.1µF ±10%, 50WV, Size = 0603	C1608X7R1H104KT	TDK
22	C3	1	0.15µF	Capacitor, X7R Ceramic 0.15µF ±10%, 25WV, Size = 0603	C1608X7R1E154KT	TDK
23	C35	1	0.22µF	Capacitor, X7R Ceramic 0.22µF ±10%, 16WV, Size = 0603	C1608X7R1C224KT	TDK
24	C1	1	0.47µF	Capacitor, X5R Ceramic 0.47µF ±10%, 10WV, Size = 0603	C1608X5R1A474KT	TDK
25	C27	1	1µF	Capacitor, X7R Ceramic 1µF ±10%, 16WV, Size = 0603	C1608X7R1C105KT	TDK
26	C25	1	4.7µF	Capacitor, X7R Ceramic 4.7µF ±10%, 6.3WV, Size = 0805	GRM21BR61C475KA88L	Murata
27	C21-C24	4	10µF	Capacitor, X5R Ceramic 10µF ±20%, 16WV, Size = 1206	C3216X5R1C106MT	TDK
28	C30, C31	2	22µF	Capacitor, X5R Ceramic 22µF ±20%, 16WV, Size = 1210	C3225X5R1C226MT	TDK
29	C2	1	100µF	Capacitor, X5R Ceramic 100µF ±20%, 6.3WV, Size = 1210	C3225X5R0J107MT	TDK
30	U4	1		Precision Delta-Sigma ADC, 8 Differential Input, 24-bit	ADS1278IPAP	Texas Instruments
31	U2	1		Precision Voltage Reference, 2.5V	REF1004I-2.5	Texas Instruments
32	U3	1		Operational Amplifier, Dual	OPA2350EA	Texas Instruments
33	U1	1		Precision Voltage Reference	REF3125AIDBZ	Texas Instruments
34	U8-U15	8		Fully-Differential Amplifier	OPA1632DGN	Texas Instruments
35	U6	1		Single, 2-Line to 1 Data Selector/Multiplexer	SN74LVC2G157DCT	Texas Instruments
36	U16	1		LDO Voltage Regulator, 1.8V, 200mA	TPS73018DBV	Texas Instruments
37	U5	1		Dual Output 800mA DC/DC Switchboost Converter	TPS65131RGET	Texas Instruments
38	U17, U18	2		16-Bit I^2C I/O Expander	PCA9535RGE	Texas Instruments
39	U7	1	32MHz	3.3 V Oscillator	CB3LV-3I-32M0000	CTS
40	J5A, J9A	2		20 Pin SMT Plug	TSM-110-01-L-DV-P	Samtec
41	J5B, J9B	2		20 pin SMT Socket	SSW-110-22-F-D-VS-K	Samtec
42	J3A	1		10 Pin SMT Plug	TSM-105-01-L-DV-P	Samtec
43	J3B	1		10 pin SMT Socket	SSW-105-22-F-D-VS-K	Samtec
44	J2	1		Header Strip, 8 pin ()	TSW-104-07-L-D	Samtec
45	J6	1		Header Strip, 4-pin ()	TSW-102-07-L-D	Samtec
46	J4, J17	2		Header Strip, 2-pin ()	TSW-102-07-L-S	Samtec
47	J1, J15, J16, J18, J19	5		Header Strip, 4-pin ()	TSW-103-07-L-S	Samtec
48	J7, J8	2		Terminal Block 3.5mm 9 Position PCB	ED555/9DS	On Shore Technology

Table 9. ADS1278EVM Bill of Materials (continued)

Item No.	RefDes	Count	Value	Description	Part Number	MFR
49	N/A	1		ADS1278EVM PWB	6492526	Texas Instruments
50	D1, D2	2		Schottky diode, 20V, 1A	MBRM120LT1G	ON Semiconductor
51	J10-J14	5		Bus wire (18-22 Gauge)		
52	L1, L2	2		Inductor, 4.7µH, 1.8A, 6x6mm, SMD	B82462G4472M	EPCOS
53	S1-S9	9		Switch, Mini Slide, DPDT	SS22SDP2	NKK
54	S10	1		DIP Switch, Half-Pitch, 8-Position	TDA08H0SB1	C&K
55	S11	1		DIP Switch, Half-Pitch, 6-Position	TDA06H0SB1	C&K
56	TP8	1		PCB Test Point, Large Loop, Through-Hole	5011	Keystone Electronics
57	N/A	8		Shorting Blocks	SNT-100-BK-G-H	Samtec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DIPSWITCH-6
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SERIALHDR
POWERHDR
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TPS65131RGE
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MBRM120
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SheetB.Sch
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J5B (BOTTOM) = SAM_SSW-110-22-F-D-VS-K
J3A (TOP) = SAM_TSM-105-01-L-DV-P
J3B (BOTTOM) = SAM_SSW-105-22-F-D-VS-K
DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP
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ENGINEER RUSSELL ANDERSON
DRAWN BY RUSSELL ANDERSON
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DATE 7 MAY 2007
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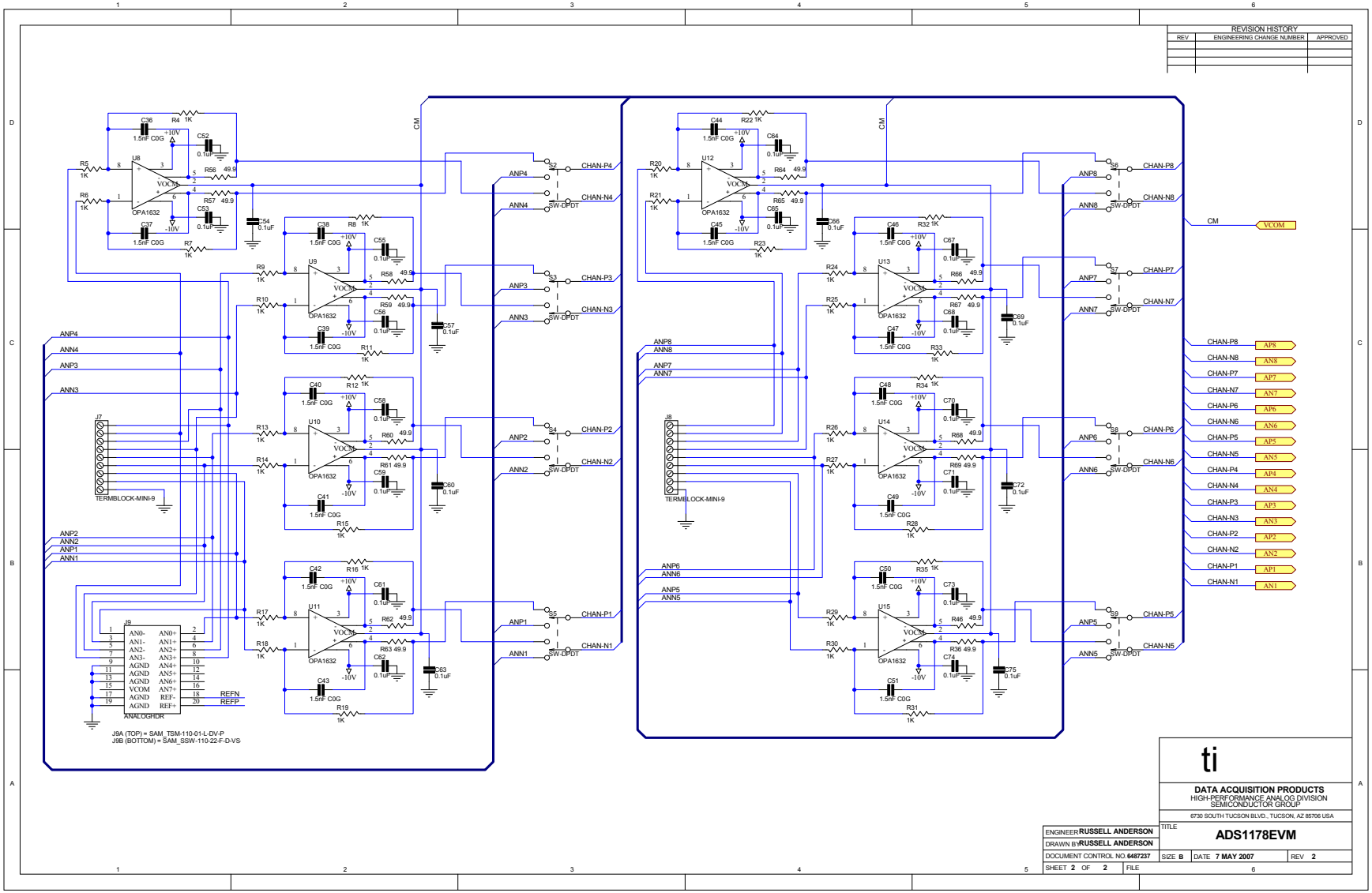
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J9B (BOTTOM) = SAM_SSW-110-22-F-D-VS
SW-DPDT
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DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP
6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA
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DATE 7 MAY 2007
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FILE

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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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