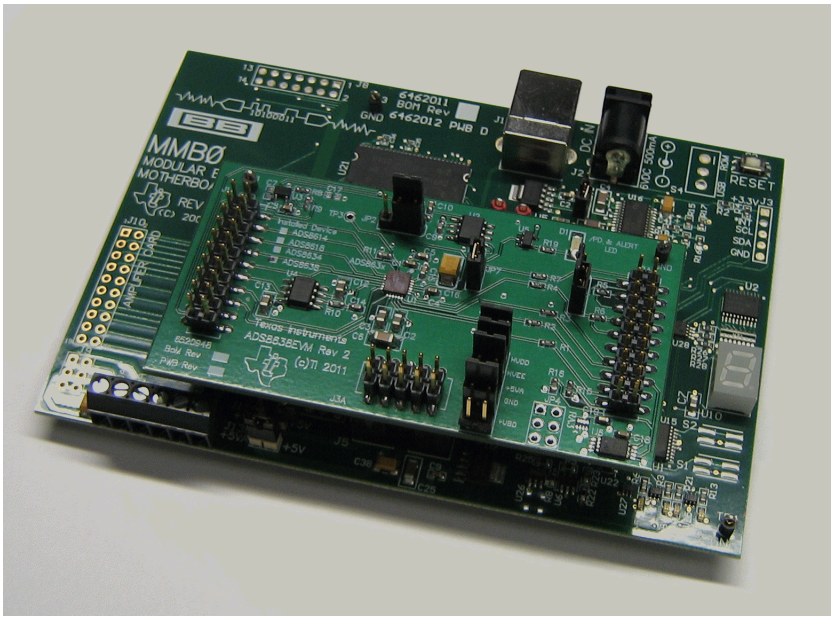
ADS8638EVM-PDK



ADS8638EVM-PDK

This user's guide describes the characteristics, operation, and use of the ADS8638EVM, both by itself and as a part of the ADS8638EVM-PDK. This evaluation module (EVM) is designed to feature the ADS8638 but can also support the ADS8614, ADS8618, or ADS8634 if installed. This family of devices includes either an 8- or 12-bit, 1-MHz, multi-channel, successive approximation register (SAR) analog-to-digital converters (ADCs). The EVM allows evaluation of all aspects of the ADS8638 device. A complete circuit description as well as schematic diagram and bill of materials are included.

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

EVM-Related Device Data Sheets

Device	Literature Number
ADS8638	SBAS541A
OPA140	SBOS498A
OPA379	SBOS347D
REF5025	SBOS410E
SN74LVC1G17D	SCES351R

Microsoft, Windows are registered trademarks of Microsoft Corporation.
SPI is a trademark of Motorola, Inc.
I²C is a trademark of NXP Semiconductors.
All other trademarks are the property of their respective owners.

Copyright © 2011, Texas Instruments Incorporated

Contents

List of Figures

List of Tables

Copyright © 2011, Texas Instruments Incorporated

1 EVM Overview

1.1 Features

ADS8638EVM:

- Full-featured evaluation board for the ADS8638 SAR ADC
- Contains all support circuitry needed for the ADS8638
- Optional onboard external REF5025 reference source
- Compatible with the TI Modular EVM System

ADS8638EVM-PDK:

- Easy-to-use evaluation software for Microsoft® Windows® XP operating system
- 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 ADS8638EVM-PDK is also available. This kit combines the ADS8638 board with the DSP-based MMB0 motherboard, and includes ADCPro software for evaluation.

The MMB0 motherboard allows the ADS8638EVM to be connected to the computer via an available USB port. This manual shows how to use the MMB0 as part of the ADS8638EVMPDK, 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 ADS8638EVM-PDK is controlled by a plug-in running 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 ADS8638EVM and the ADS8638EVM-PDK. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS8638EVM. For clarity of reading, the rest of this manual will refer only to the ADS8638EVM or ADS8638EVM-PDK, but operation of the EVM and kit for the ADS8614, ADS8618, and ADS8634 is identical, unless otherwise noted.

1.2 Introduction

The ADS8638 is a 12-bit, eight-channel, 1-MHz SAR ADC with a serial peripheral interface (SPI™). The ADC uses a capacitor-based switching method to create an adjustable input voltage range option. Additionally, the device features two preset alarms with hysteresis per channel. During normal operation, the ADS8638 dissipates a mere 22.5 mW at 5-V AVDD and ±15-V high voltage supplies.

The ADS8638EVM is an evaluation module built to the TI Modular EVM System specification. It can be connected to any modular EVM system interface card.

The ADS8638EVM is available as a stand-alone printed circuit board (PCB) or as part of the ADS8638EVM-PDK, which includes an MMB0 motherboard and software. As a stand-alone PCB, the ADS8638EVM is useful for evaluating designs and firmware.

Note that the ADS8638EVM has no microprocessor and cannot run software. To connect it to a computer, some type of interface is required.

Copyright © 2011, Texas Instruments Incorporated

2 Analog Interface

For maximum flexibility, the ADS8638EVM 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 J1. This header/socket provides access to the analog input pins of the ADC. Consult Samtec at www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options. Table 1 shows the pinout of the analog input connector, J1.

Table 1. J1: Analog Interface Header

Pin Number	Signal	Description
J1.2	AIN7 / NC	ADC analog input (AIN7: ADS8x38, NC: ADS8x34)
J1.4	AIN6 / NC	ADC analog input (AIN6: ADS8x38, NC: ADS8x34)
J1.6	AIN5 / AIN3	ADC analog input (AIN5: ADS8x38, AIN3: ADS8x34)
J1.8	AIN4 / AIN2	ADC analog input (AIN4: ADS8x38, AIN2: ADS8x34)
J1.10	AIN3 / AIN1	ADC analog input (AIN3: ADS8x38, AIN1: ADS8x34)
J1.12	AIN2 / AIN0	ADC analog input (AIN2: ADS8x38, AIN0: ADS8x34)
J1.14	AIN1 / NC	ADC analog input (AIN1: ADS8x38, NC: ADS8x34)
J1.16	AIN0 / NC	ADC analog input (AIN0: ADS8x38, NC: ADS8x34)
J1.1-19 (odd)	GND	Analog ground connections (except J1.15)
J1.15	V_{REFOUT}	Buffered reference output
J1.18	NC	—
J1.20	Ext V_{REF}	External reference voltage input

The eight ADC analog inputs (four inputs for ADS8x34 devices) are available at the J1 header. All of these inputs, with the exception of one, are routed directly from the J1 header to the ADC. The AIN2/AIN0 channel includes an OPA140 to help drive one of the analog input channels to show the proper way to drive the ADC. The op amp is in unity gain, and includes a RC low-pass filter component before reaching the ADC.

An external reference can be applied to the ADC via an external source using pin J1.20. This signal is routed directly to JP2 where it can be jumped in to the VREFP line.

An OPA379 is located on the EVM to buffer the reference signal and output it on J1.15.

Copyright © 2011, Texas Instruments Incorporated

3 Digital Interface

3.1 Serial Data Interface

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 J2. This header/socket provides access to the digital control pins of the EVM. Consult Samtec at www.samtec.com or 1-800-SAMTEC- 9 for a variety of mating connector options.

Table 2 describes the J2 serial interface pins.

Table 2. J2: Serial Interface Header

Pin Number	Signal	Description
J2.1	$\overline{CS}$	ADC $\overline{CS}$ signal: controlled by jumper JP1
J2.2	GPIO	ADC $\overline{PD}$ / Alert signal
J2.3	SCLK	ADC SCLK signal
J2.4	GND	Digital ground
J2.5	SCLK	ADC SCLK signal
J2.7	$\overline{CS}$	ADC $\overline{CS}$ signal: controlled by jumper JP1
J2.9	$\overline{CS}$	ADC $\overline{CS}$ signal: controlled by jumper JP1
J2.10	GND	Digital ground
J2.11	SDI	ADC SDI signal
J2.13	SDO	ADC SDO signal
J2.16	SCL	I^2C™ clock line for EEPROM
J2.18	GND	Digital ground
J2.20	SDA	I^2C data line for EEPROM

4 Power Supplies

J3 is the power-supply input connector. Table 3 lists the configuration details for J3.

Table 3. J3: Power-Supply Interface Header

Pin Number	Pin Name	Function	Required
J3.1	+VA	High voltage positive analog supply	Yes
J3.2	–VA	High voltage negative analog supply	Yes
J3.3	+5VA	5-V analog supply	Yes
J3.4	–5VA	Unused	No
J3.5	GND	Digital ground input	Yes
J3.6	GND	Analog ground input	Yes
J3.7	+1.8VD	1.8-V digital supply	Yes/Optional
J3.8	VD1	Unused	No
J3.9	+3.3VD	3.3-V digital supply	Yes/Optional
J3.10	+5VD	Unused	Yes/Optional

Copyright © 2011, Texas Instruments Incorporated

4.1 Power Options

JP3 is in place for current measurement in order to regulate the power consumption of the ADS8638. When current measurement is not taking place, jumpers must be applied across many of the jumpers to properly power the ADC. Table 4 lists the power option details for JP3.

Table 4. JP3 Configuration: Power Options

Row	Name	Function
1-2	ADC HVDD	Supply current measurement point for high voltage positive rail. Must be connected for operation.
3-4	ADC HVEE	Supply current measurement point for high voltage negative rail. Must be connected for operation.
5-6	ADC +5 VA	Supply current measurement point for +5-VA voltage rail. Must be connected for operation.
7-8	GND	Ground points for EVM board
9-10	ADC +3.3 VD	Supply current measurement point for 3.3-V digital supply rail. Must be connected for ADC use with DVDD = 3.3 V. Do not connect if +5-VD jumper is installed.
11-12	ADC +1.8 VD	Supply current measurement point for 1.8V digital supply rail. Must be connected for ADC use with DVDD = 1.8 V. Do not connect if +3.3-VD jumper is installed.

The ADS8638EVM has the option to either set +1.8 VD or +3.3 VD as the ADS8638 DVDD supply. Install a jumper across pins 9-10 to set DVDD = 3.3 V, or install a jumper across pins 11-12 to set DVDD = 1.8 V.

CAUTION

Do not install both jumpers. Doing so may cause damage to the board or ADC device itself.

4.2 Reference Voltages

The ADS8638EVM can be configured to use the internal reference voltage found within the chip, an onboard REF5025 reference source, or use the option to input an external reference source. Jumper JP2 is used to route the reference signal to the ADC. When placed in the 1-2 position, the onboard REF5025 is used as the reference signal. When placed in the 2-3 position, an outside external reference can be applied to J1.20 on the analog header to feed the ADC reference. If the ADC internal reference is enabled, the shunt on jumper JP2 must be either in the 2-3 position or left disconnected. This configuration ensures that the REF5025 source is not driving the ADS8638 reference pin when the pin is configured as an output.

5 EVM Operation

This section provides information on the analog input, digital control, and general operating conditions of the ADS8638EVM.

5.1 Analog Input

Each of the analog input sources can be applied directly to J1 (top or bottom side) or through signal-conditioning modules available for the modular EVM system.

Copyright © 2011, Texas Instruments Incorporated

5.2 Digital Control

The digital control signals can be applied directly to J2 (top or bottom side). The modular ADS8638EVM can also be connected directly to a DSP or microcontroller interface board, such as the 5-6K Interface or HPA-MCU Interface boards available from Texas Instruments, or the MMB0 if purchased as part of the ADS8638EVM-PDK. For a list of compatible interface and/or accessory boards for the EVM or the ADS8638, see the relevant device product folder on the TI web site

5.3 Default Jumper Settings and Switch Positions

Figure 1 shows the jumpers found on the EVM and the respective factory default conditions for each.

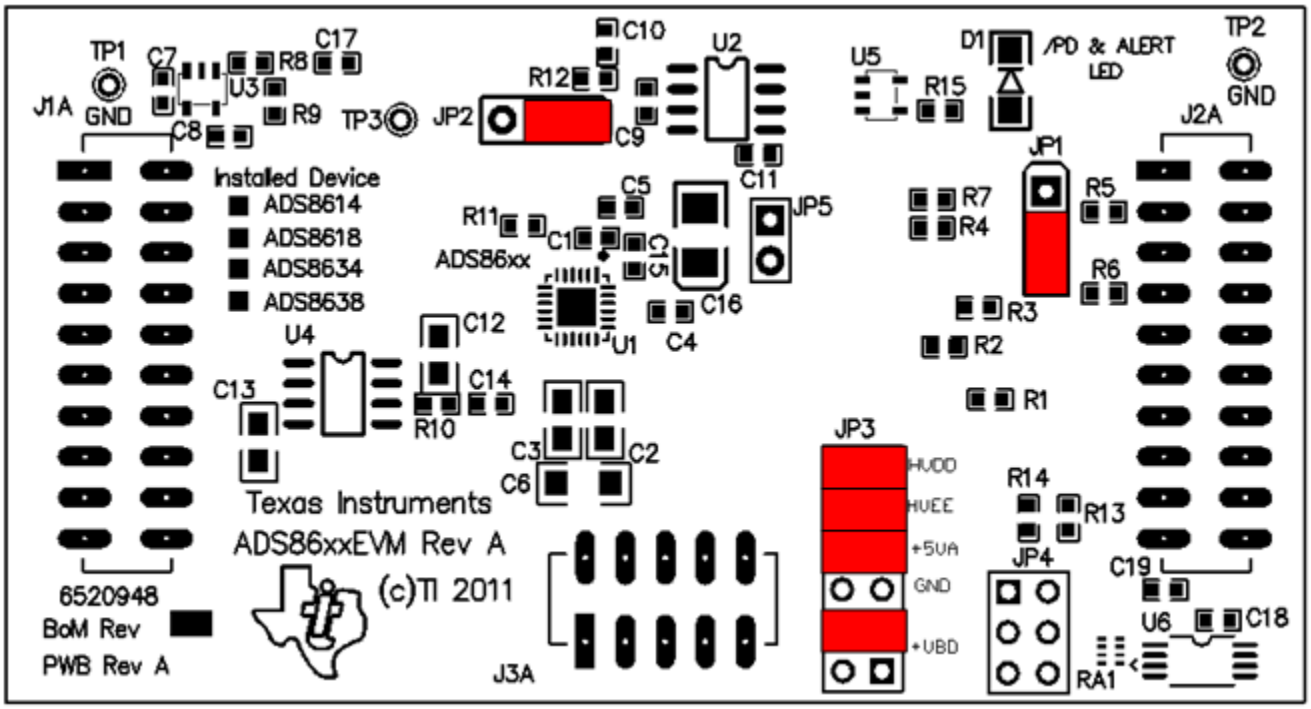


Figure 1. ADS8638EVM Default Jumper Locations

6 ADS8638EVM-PDK Kit Operation

This section provides information on the analog input, digital control, and general operating conditions of the ADS8638EVM.

6.1 Installing ADCPro Software

The latest software is available from the TI website at http://www.ti.com. Any updates to the ADCPro software can also 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 ADS8638EVM-PDK plug-in, run the file: **ads86xx-adcproplugin-1.2.3.exe** (*1.2.3* is the version number, and increments with software version releases). 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 ADS8638EVM-PDK plug-in, once you have installed a version of it.

Copyright © 2011, Texas Instruments Incorporated

Figure 2 and Figure 3 show a set of installation screens to pass through as the ADS86xxEVM-PDK plug-in is installed.

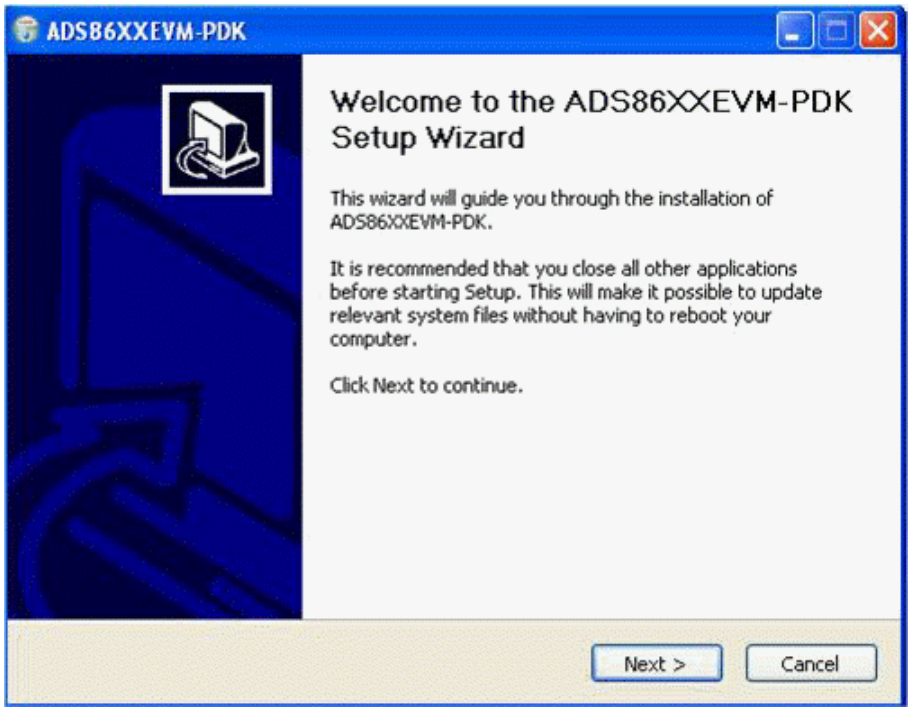


Figure 2. ADS8638EVM-PDK Installer

Continue through the pop-up screens until the plug-in is completely installed.

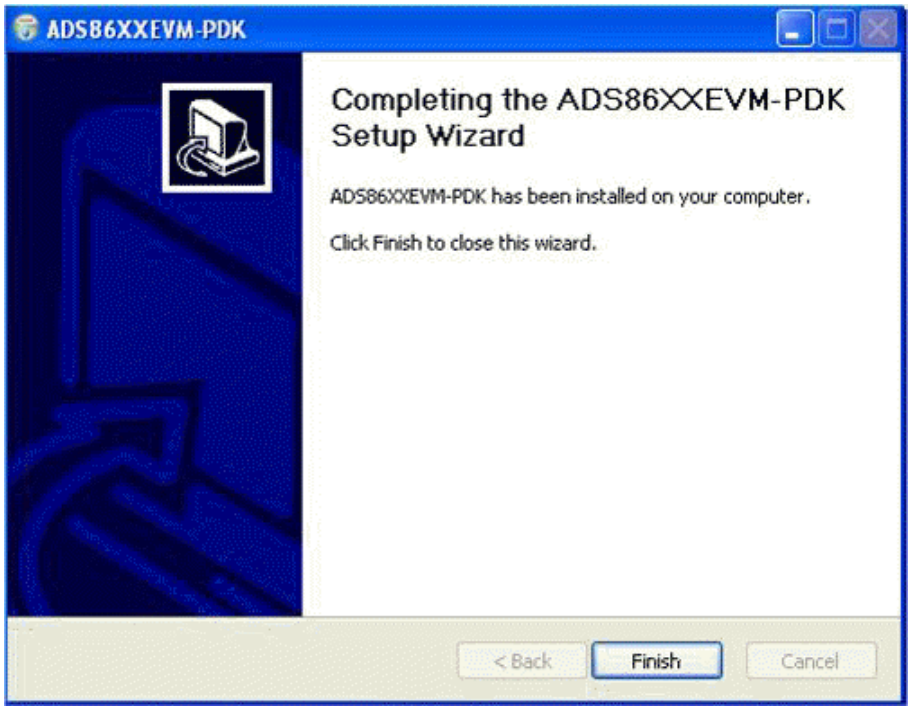


Figure 3. Completed ADS8638EVM-PDK Installer

Copyright © 2011, Texas Instruments Incorporated

6.2 Setting Up the ADS8638EVM-PDK

The ADS8638EVM-PDK contains both the ADS8638EVM and the MMB0 motherboard; however, the devices are shipped unconnected. Follow these steps to set up the ADS8638EVM-PDK.

Step 1. Unpack the ADS8638EVM-PDK kit.

Step 2. Set the jumpers and switches on the MMB0 as shown in Figure 4.

- Set the Boot Mode switch to USB.
- Connect +5 V and +5 VA on jumper block J13B (if +5 V is supplied from J14 +5 VA).
- Leave +5 V and +VA disconnected on jumper block J13A.
- If the PDK is powered from an ac adapter, connect J12. If the PDK is powered through the terminal block, disconnect J12. (See Section 6.3 for details on connecting the power supply.)

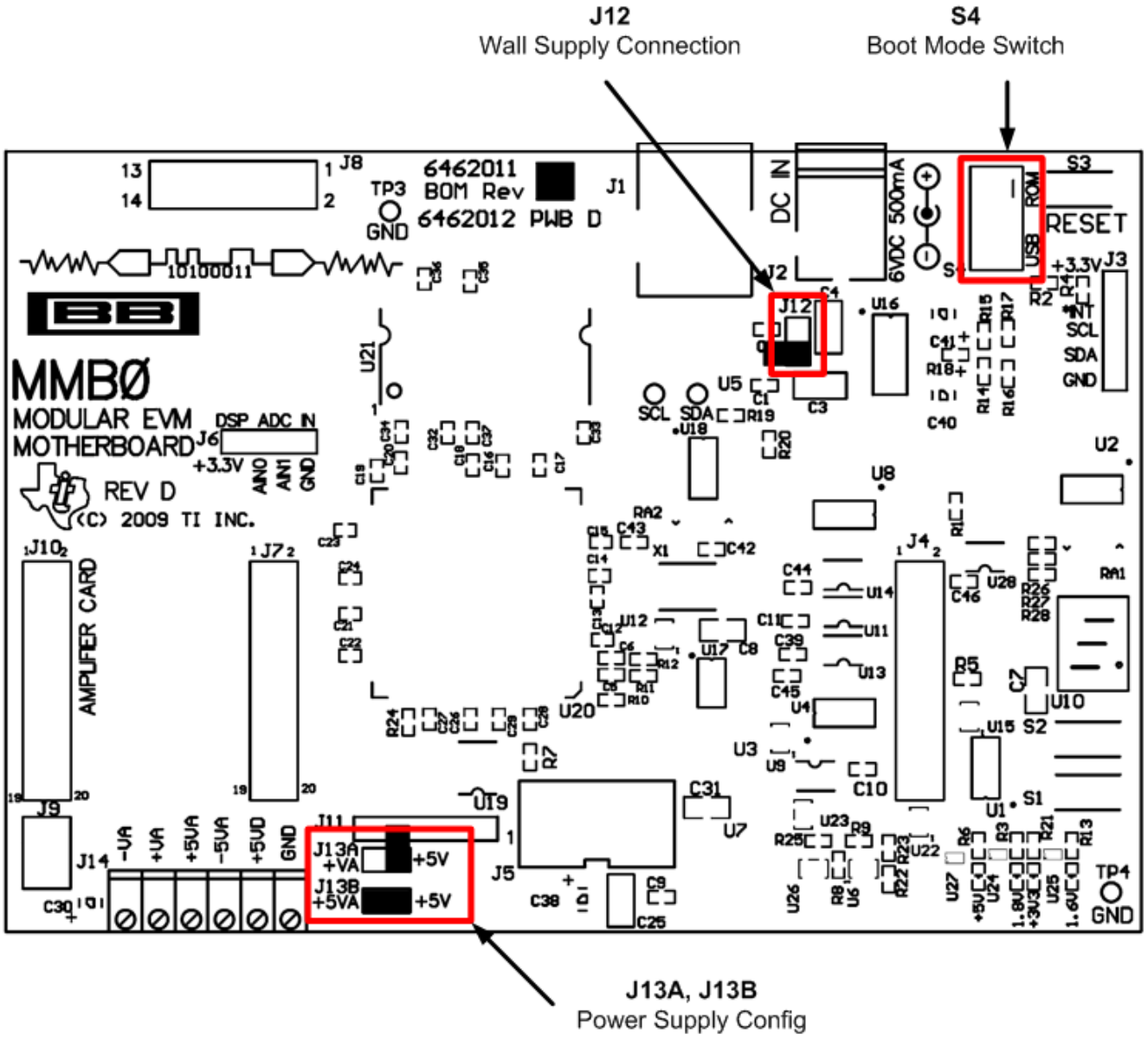


Figure 4. MMB0 Initial Setup

Copyright © 2011, Texas Instruments Incorporated

Step 3. Plug the ADS8638EVM into the MMB0 as Figure 5 illustrates.

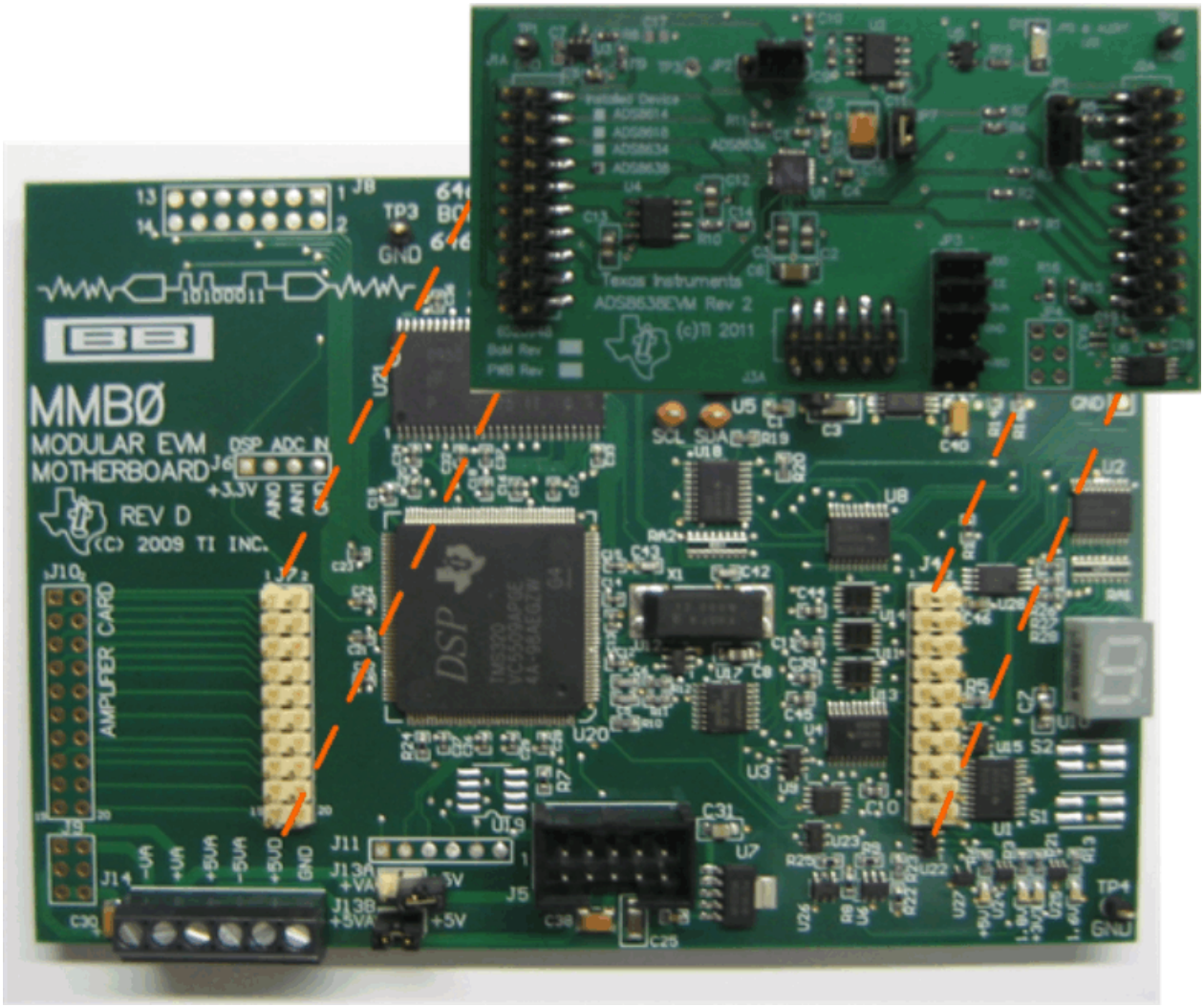


Figure 5. Connecting ADS8638EVM to MMB0

Step 4. Set the jumpers on the ADS8638EVM as shown in Figure 1 (note that these settings are the factory-configured default settings for the EVM).

6.2.1 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 16 MB 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.

Copyright © 2011, Texas Instruments Incorporated

6.3 Connecting the Power Supply

The ADS8638EVM-PDK requires multiple supplies to power the ADC to be used with the MMB0 motherboard. The ADS8638 requires two high-voltage supplies (±10 V to ±15 V), HVDD and HVEE, along with a +5-V supply to power the analog, AVDD, and +3.3 V to +5 V to power the digital circuitry, DVDD.

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

6.3.1 Connecting the Laboratory Power Supply

A laboratory power supply can be connected through terminal block J14 on the MMB0, as shown in Figure 6. To use a unipolar lab power supply configuration, follow these procedures:

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

For bipolar mode, also connect a –10-V dc supply to the –VA, and +10 V on the +VA terminals on J14.

It is not necessary to connect a +5-V dc supply voltage to the +5 VA terminal on J14 if the +5 V/+5 VA position on J13 is shorted.

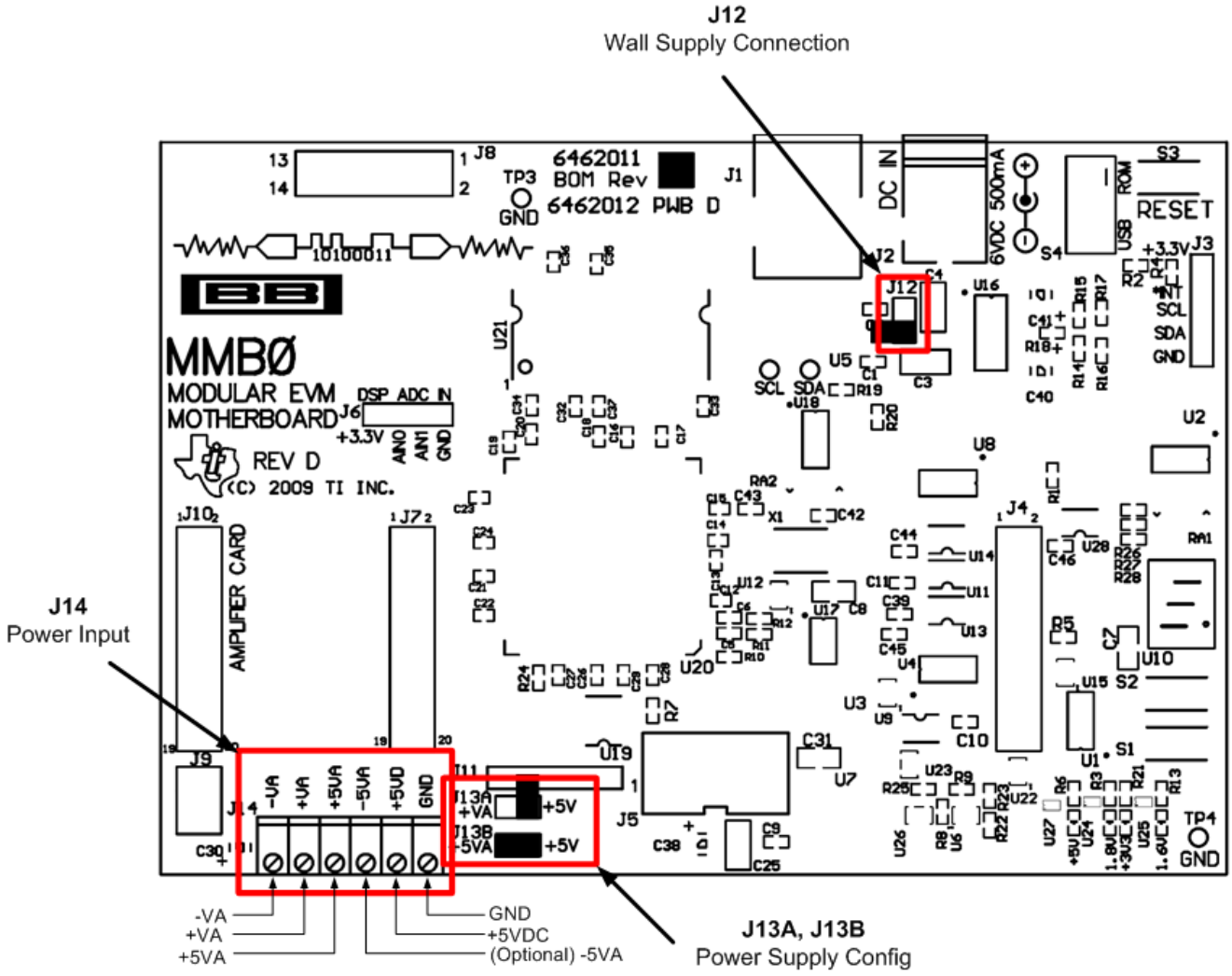


Figure 6. Laboratory Power-Supply Connections

Copyright © 2011, Texas Instruments Incorporated

6.4 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 ADS8638EVM-PDK is called ADCPro. This program uses plug-ins to communicate with the EVM. The ADS8638EVM-PDK plug-in is included in the ADS8638EVM-PDK package.

The program currently runs only on Microsoft Windows platforms of Windows XP; plans are in place to have ADCPro working on Windows 7 in the near future.

If this is the first time installing ADCPro and any related plug-ins, follow these procedures to run the ADCPro software and complete the necessary driver installation. Make sure the ADCPro software and device plug-in software are the latest versions available online at www.ti.com/ADCPro.

6.4.1 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 the new hardware and begin installing the drivers for the hardware. Figure 7 is provided for reference to show the installation steps. To simplify installation, accept the default settings.

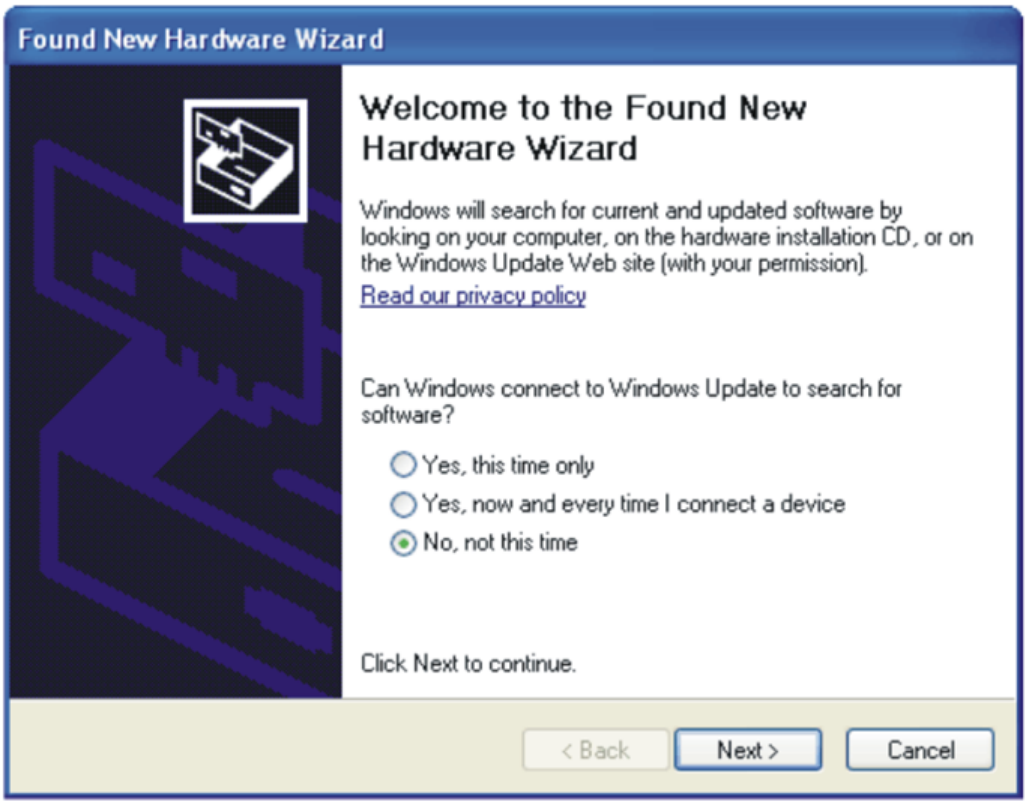


Figure 7. NI-VISA Driver Installation

Copyright © 2011, Texas Instruments Incorporated

6.4.2 USBStyx Driver Installation

1. Start the software by selecting ADCPro from the Windows Start menu.
2. Select *ADS86xxEVM* from the EVM drop-down menu. The ADS86xxEVM-PDK plug-in appears in the left pane. The setup is shown in Figure 8.

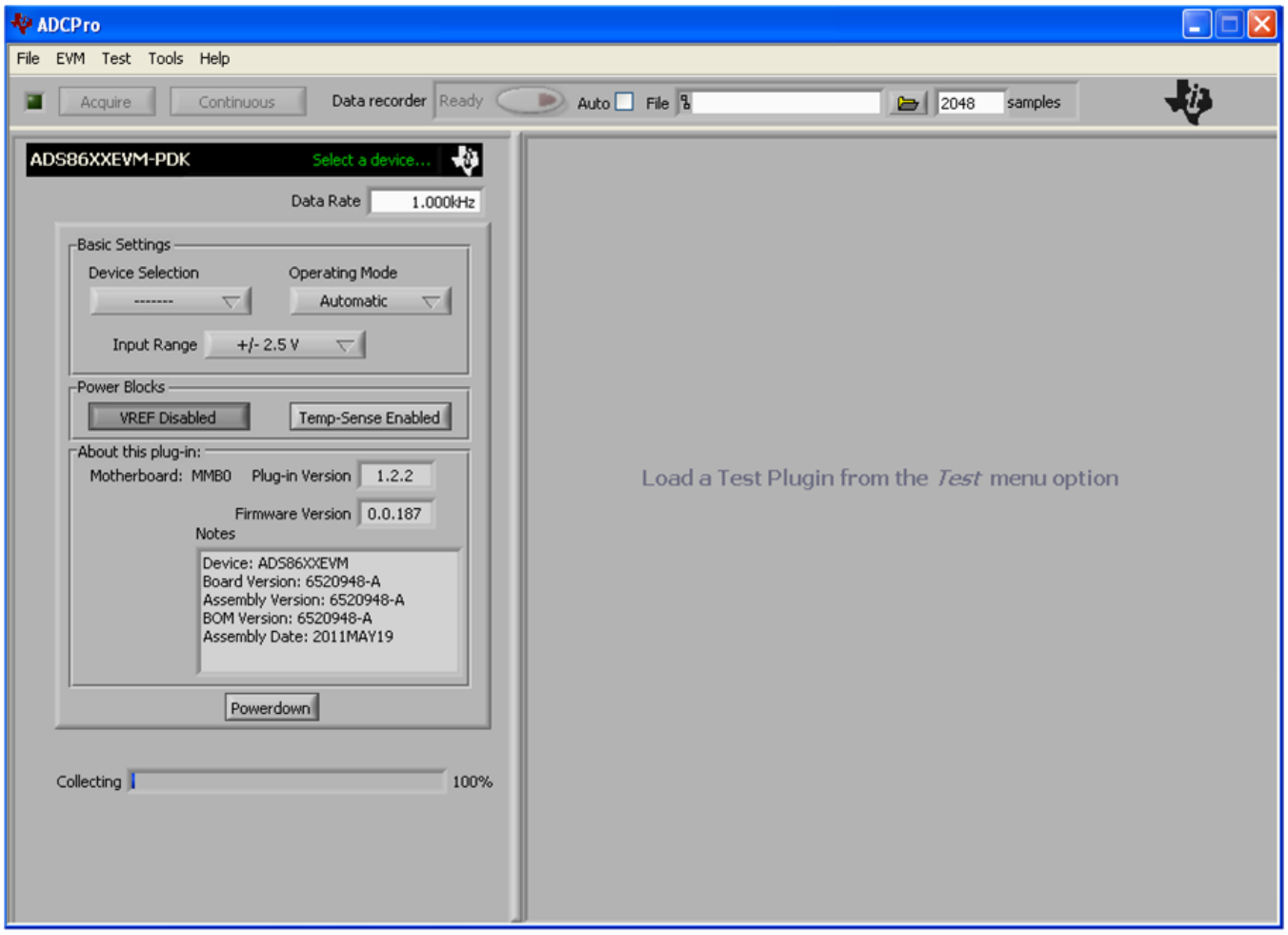


Figure 8. ADS86xxEVM-PDK Plug-in

3. The ADS86xxEVM-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. A series of messages will appear in the status area to indicate this action.
4. If you have not yet loaded the operating system drivers, Windows displays the *Install New Driver Wizard* sequence; accept the default settings.

NOTE: During the driver installation process, a message may appear that indicates 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.

5. Once Windows finishes installing the software driver, the plug-in downloads the firmware to the MMB0. The status area displays *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.

Copyright © 2011, Texas Instruments Incorporated

7 Evaluating Performance with the ADCPro Software

The evaluation software is based on ADCPro, a program that operates using a variety of plug-ins. (The ADS8638EVM plug-in is installed as described in the Installation section).

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.

7.1 Using the ADS8638EVM-PDK Plug-in

The ADS8638EVM-PDK plug-in for ADCPro provides complete control over all settings of the ADS8638. It consists of a tabbed interface, with different functions available on different tabs. These controls are described in this section.

You can adjust the ADS8638EVM 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 ADS8638EVM plug-in, the setting immediately updates on the board. Settings on the ADS8638EVM correspond to settings described in the ADS8638 product data sheet (available for download at www.ti.com).

Copyright © 2011, Texas Instruments Incorporated

7.1.1 Plug-in Setup and The Device Config Tab

When the ADS86xxEVM plug-in is first loaded, you must select the device from the *Device Selection* tab found in the basic settings window. The ADC options are not available on the plug-in until the device is selected. Use Figure 9 for reference.

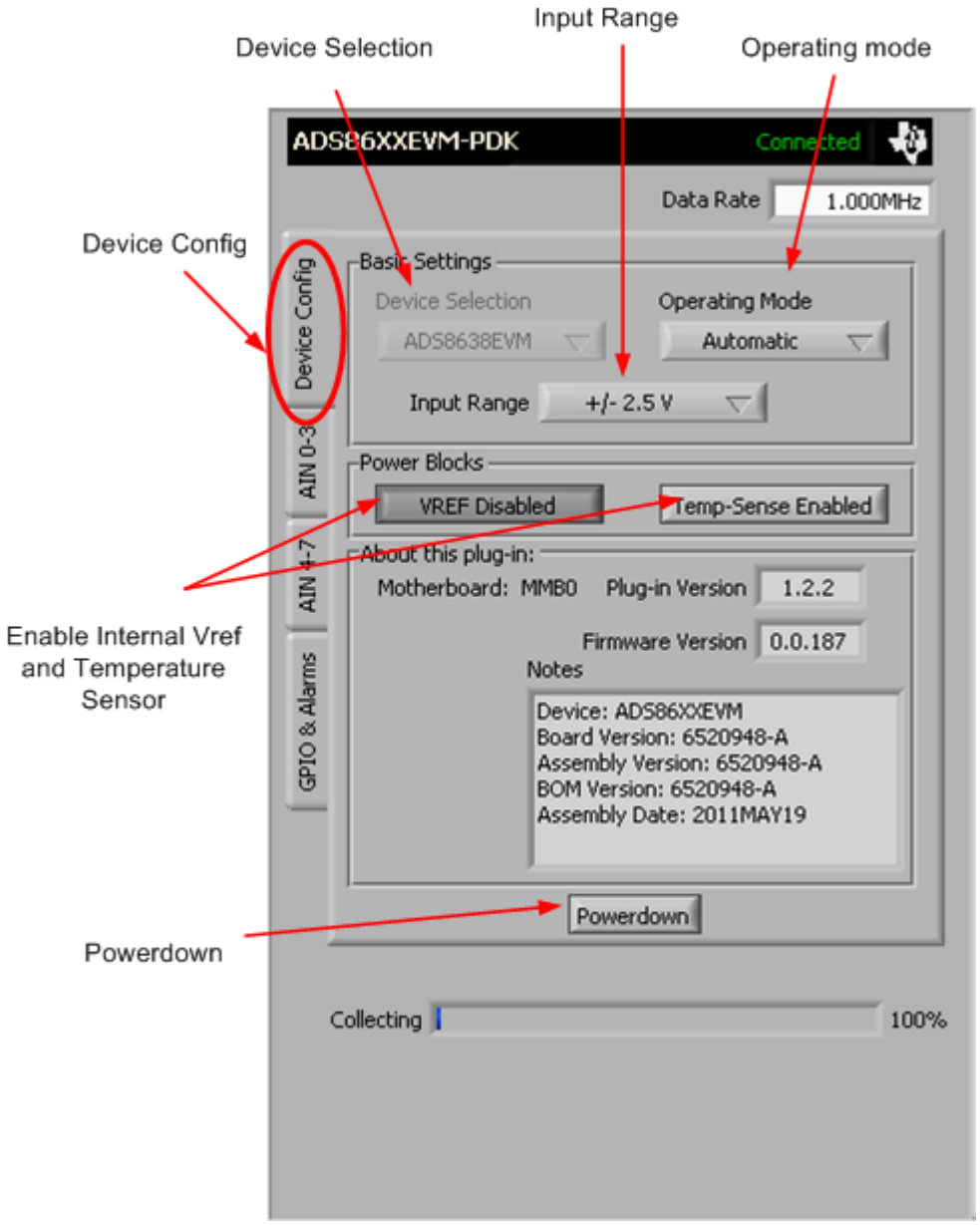


Figure 9. Device Configuration

After the ADC has been selected, the tabs on the left become available, including the plug-in options to configure the ADC. The *Device Config* tab is the default window and includes some of the basic settings to configure that ADC. Basic information, such as the Plug-in version and Firmware version, is shown here along with some simple settings use to set up the ADC according to user preferences.

Copyright © 2011, Texas Instruments Incorporated

The *Data Rate* control on the main plug-in window sets the data rate for the ADS8638. Changing the data rate controls the time between sequential conversions once the acquisition period begins.

In the Basic Settings window, the Operating Mode and Input Range options are available. The plug-in was designed to only use auto-mode channel sequencing, and therefore manual mode is not selectable. The input range option allows the user to select the desired analog input voltage range from +5 V, +10 V, ±2.5 V, ±5 V, or ±10 V. This setting becomes the range for all the channels that are enabled at the time of data acquisition.

The Power Blocks window includes buttons to enable the internal reference voltage and the internal temperature sensor. *By default, these two options are disabled and are enabled once the appropriate button is selected*.

The *About this plug-in* tab has the plug-in version history along with the firmware version. The *Notes* indicator shows manufacturing information about the EVM that is stored in the EVM EEPROM, and may show relevant notes about the plug-in or firmware code, if any.

At the bottom of the Device Config window is the **PowerDown** button. Use this button to direct the processor to write the command that puts the ADC into power-down mode.

7.1.2 Channels 1-4 Tab and 5-8 Tab

These two tabs, as shown in Figure 10, are used to enable/disable the ADC channels as well as configure the alarm states. By default, all of the eight channels are disabled. Before an acquisition can be performed, at least one channel must be enabled. Once a channel is enabled, the alarm high and alarm low thresholds can be set along with the respective hysteresis limits. As the converted result exceeds the alarm threshold, the LED found on the EVM board should turn on to indicate an alarm.

As multiple channels are enabled, the effective data rate decreases. The ADS8638 uses an architecture that relies on an internal cycling mux, requiring the conversions to be completed in a sequential order rather than simultaneously. The data rate displayed in the top right corner of the plugin refers to all enabled channels to be converted.

Copyright © 2011, Texas Instruments Incorporated

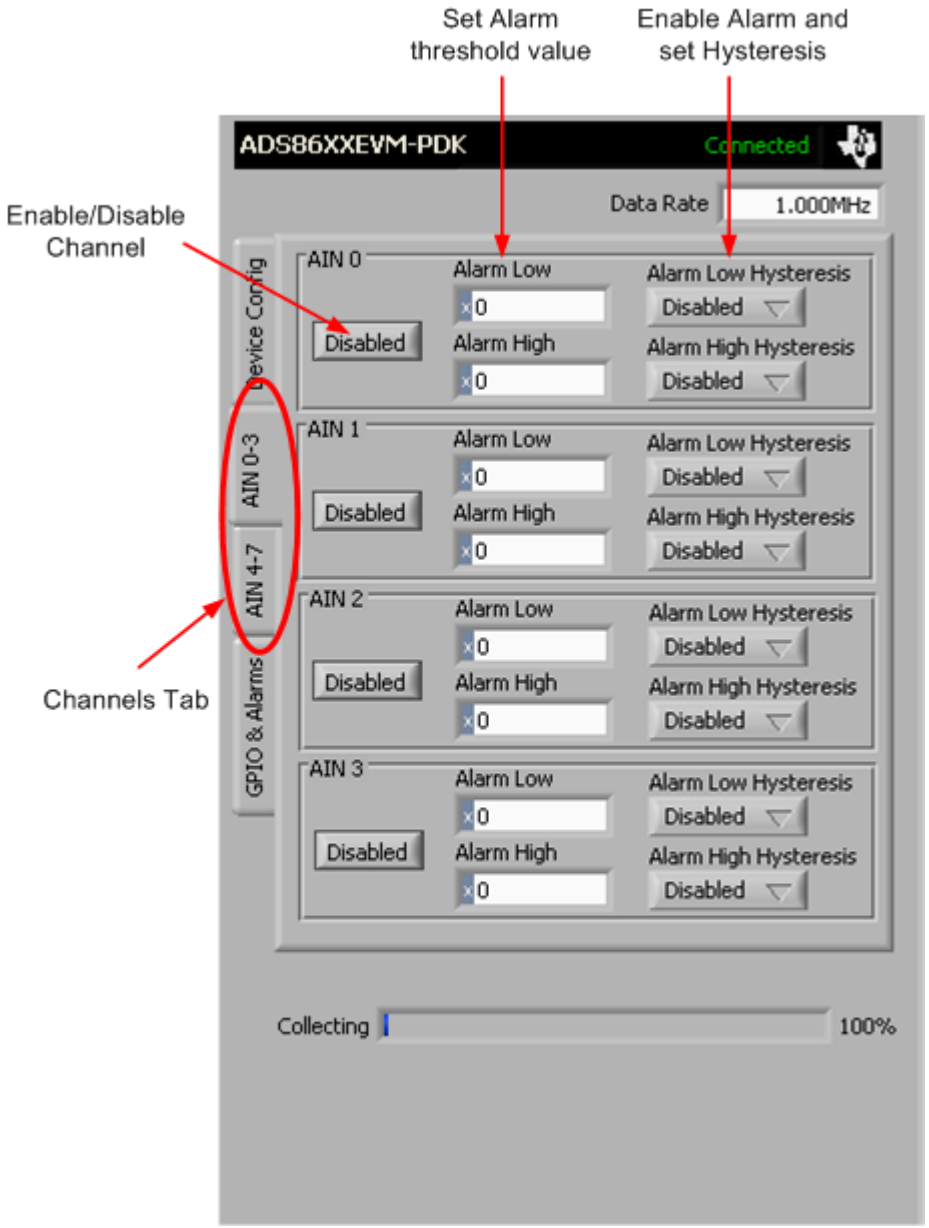


Figure 10. Channels Tabs

Copyright © 2011, Texas Instruments Incorporated

7.1.3 GPIO & Alarms Tab

The *GPIO & Alarms* tab (as shown in Figure 11) includes some of the additional options found within the ADS8638. Here, the software provides access to setting the GPIO as either a power-down input or an alarm state output. This I/O line is routed to the onboard LED on the evaluation board to indicate when the alarm is active.

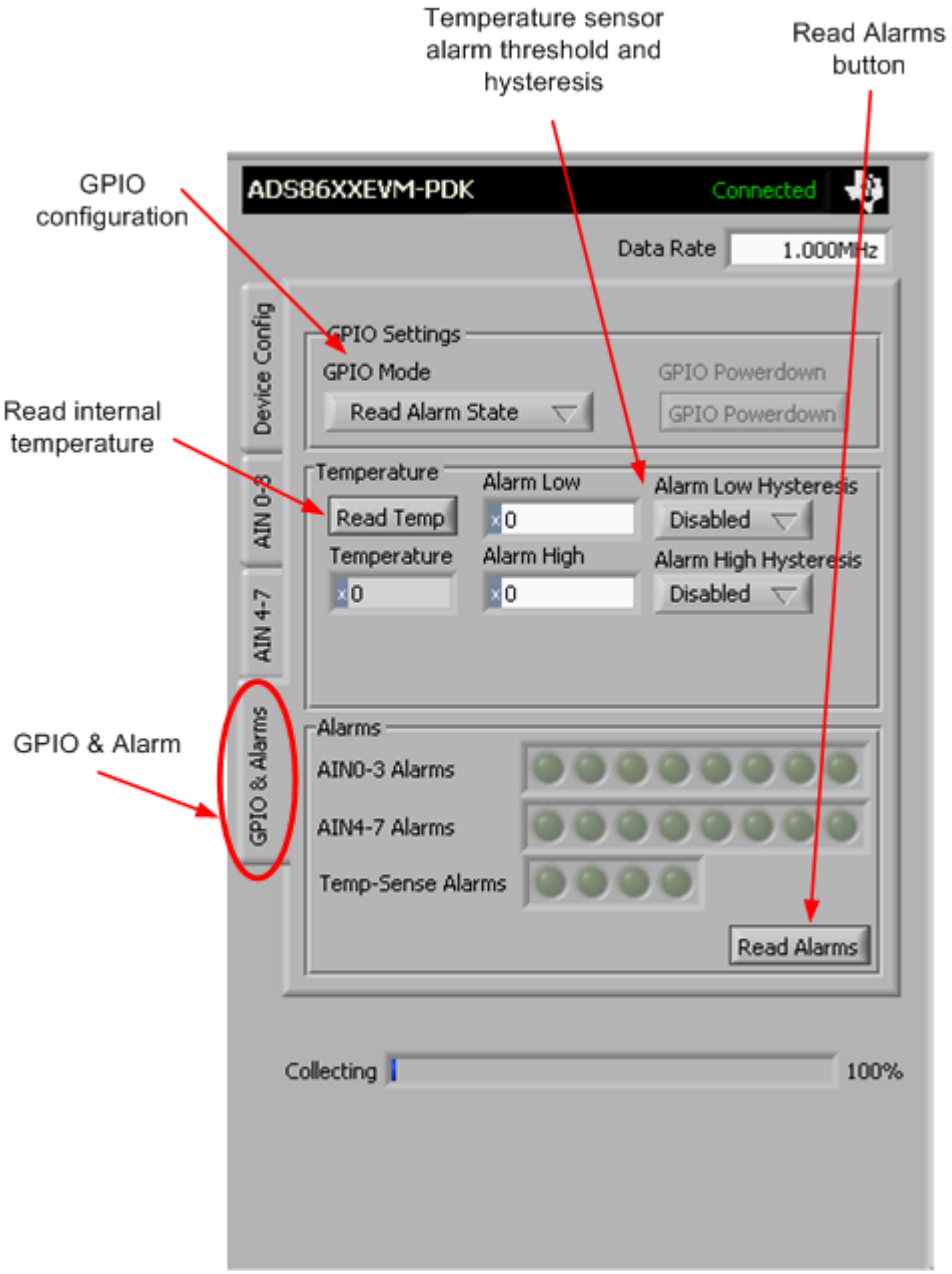


Figure 11. GPIOs & Alarms Tab

The Temperature control is used to read back the temperature control and enable high and low alarms along with hysteresis. When reading back the temperature reading, the result is read back in codes where it must be converted to a temperature using the parameters described in the ADS8638 product data sheet. The high and low alarms, along with hysteresis settings, behave the same way that the analog input channel alarm settings do.

Copyright © 2011, Texas Instruments Incorporated

After an acquisition, the **Read Alarms** button allows the user to read back the specific alarms that reported a fault. When the button is pressed, the firmware uses the sticky register read command; once the alarms are read, they are set back to zero. Each channel has two alarms, a high alarm and a low alarm; both are placed side by side in the alarm list. When the Read Alarms button is pressed, the LED corresponding to the alarm limit that was breached is enabled.

7.1.4 Collecting Data

Once you have configured the ADS8638 for your test scenario, press the **ADCPro Acquire** button to start the collection of the number of data points specified in the Test plug-in Block Size control. The ADS8638EVM-PDK plug-in disables all the front panel controls while acquiring, and displays a progress bar.

7.2 Troubleshooting

If ADCPro stops responding while the ADS8638EVM-PDK is connected, try unplugging the power supply from the PDK. Unload and reload the plug-in before reapplying power to the PDK.

Copyright © 2011, Texas Instruments Incorporated

8 EVM Bill of Materials, Schematic, and Layout

Table 5 contains a complete bill of materials for the modular ADS8638EVM. The schematic diagram is also provided for reference. Figure 12 through Figure 15 show the PCB layouts.

8.1 Parts List

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 5. Bill of Materials

Item	Qty	Ref Des	Description	MFR	Part Number
1	1	N/A	Printed wiring board	n/a	6520948
2	3	C1, C4, C11	Capacitor, ceramic, 1.0 µF 16V 10% X5R 0603	Murata	GRM188R61C105KA93D
3	4	C2, C3, C12, C13	Capacitor, ceramic, 10 µF 16V X5R 0805	Murata	GRM21BR61C106KE15L
4	4	C5, C8, C15, C18	Capacitor, ceramic, 0.1 µF 16V 10% X7R 0603	Murata	GRM188R71C104KA01D
5	1	C6	Capacitor, ceramic, 1 µF 50V X7R 1206	Murata	GRM31CR71H105KA61L
6	3	C9, C10, C19	Capacitor, ceramic, 10 µF 6.3V X5R 0603	Murata	GRM188R60J106ME47D
7	0	C7, C17	Not installed		
8	1	C14	Capacitor, ceramic, 1000 pF 50V 5% C0G 0603	Murata	GRM1885C1H102JA01D
9	1	C16	Capacitor, tantalum, 10 µF 16V 10% SMD	Kemet	T494B106K016AT
10	1	D1	LED 565 nm, green diff 1206 SMD	Lumex Opto	SML-LX1206GW-TR
11	2	J1A, J2A (Top Side)	10-pin, dual row, SM Header (20 Pos.)	Samtec	TSM-110-01-T-DV-P
12	2	J1B, J2B (Bottom Side)	10-pin, dual row, SM Header (20 Pos.)	Samtec	SSW-110-22-F-D-VS-K
13	1	J3A (Top Side)	5-pin, dual row, SM Header (10 Pos.)	Samtec	TSM-105-01-T-DV-P
14	1	J3B (Bottom Side)	5-pin, dual row, SM Header (10 Pos.)	Samtec	SSW-105-22-F-D-VS-K
15	2	JP1, JP2	Header strip, 3-pin (1x3)	Samtec	TSW-103-07-L-S
16	1	JP3	Header ltrip, 12-pin (2x6)	Samtec	TSW-106-07-L-D
17	0	JP4	Not installed		
18	1	JP5	2-position jumper _ .1" spacing	Samtec	TSW-102-07-T-S
19	4	R1, R2, R3, R4, R7	Resistor, 33 Ω 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEYJ330V
20	5	R5, R6, R8, R9, R12	Resistor, 0 Ω 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEY0R00V
21	2	R10, R11	Resistor, 20 Ω 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEYJ200V
22	2	R13, R14	Resistor, 10 kΩ 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEYJ103V
23	1	R15	Resistor, 470 Ω 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEYJ471V
24	0	RA1	Not installed		
25	2	TP1, TP2	Test point: single .025-Pin, Black	Keystone	5001
26	1	TP3	Test point: single .025-Pin, Red	Keystone	5000
27	1	U1	ADS8638, 8-channel 12-bit HV MUX SAR ADC SPI	Texas Instruments	ADS8638SRGER

Copyright © 2011, Texas Instruments Incorporated

Table 5. Bill of Materials (continued)

Item	Qty	Ref Des	Description	MFR	Part Number
28	1	U2	Precision voltage reference 2.5 V, 8SOIC	Texas Instruments	REF5025AID
29	1	U3	IC Op Amp GP R-R 90 kHz SOT23-5	Texas Instruments	OPA379AIDBVT
30	1	U4	IC Op Amp GP R-R 80 MHz SGL 8SOIC	Texas Instruments	OPA140AID
31	1	U5	Logic Single Schmitt-Trigger Buffer	Texas Instruments	SN74LVC1G17DBVR
32	1	U6	IC EEPROM 256Kbit 400 kHz 8TSSOP	Microchip	24AA256-I/ST
33	6	N/A	Shunt Jumper .1" Black gold	3M	969102-0000-DA

8.2 Board Layouts

NOTE: Board layouts are not to scale. These images are intended to show how the board is laid out; they are not intended to be used for manufacturing ADS8638EVM PCBs.

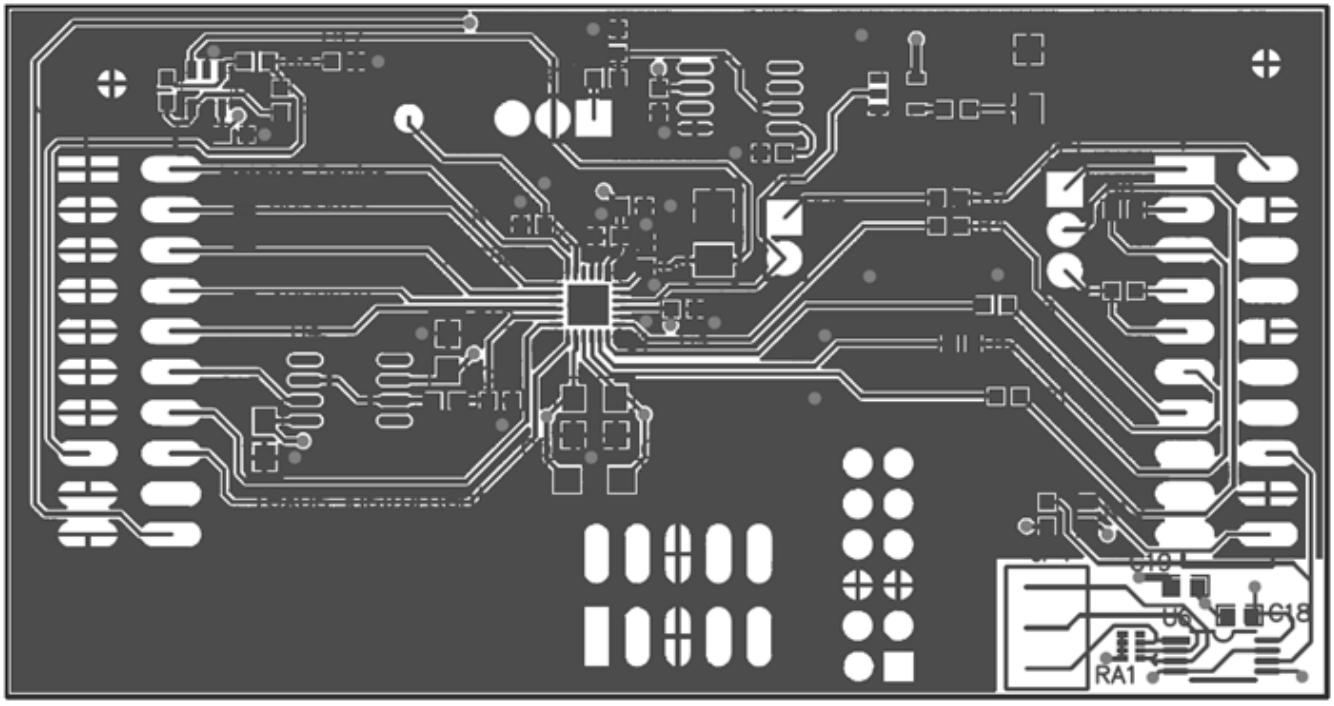


Figure 12. ADS8638EVM PCB: Top Layer

Copyright © 2011, Texas Instruments Incorporated

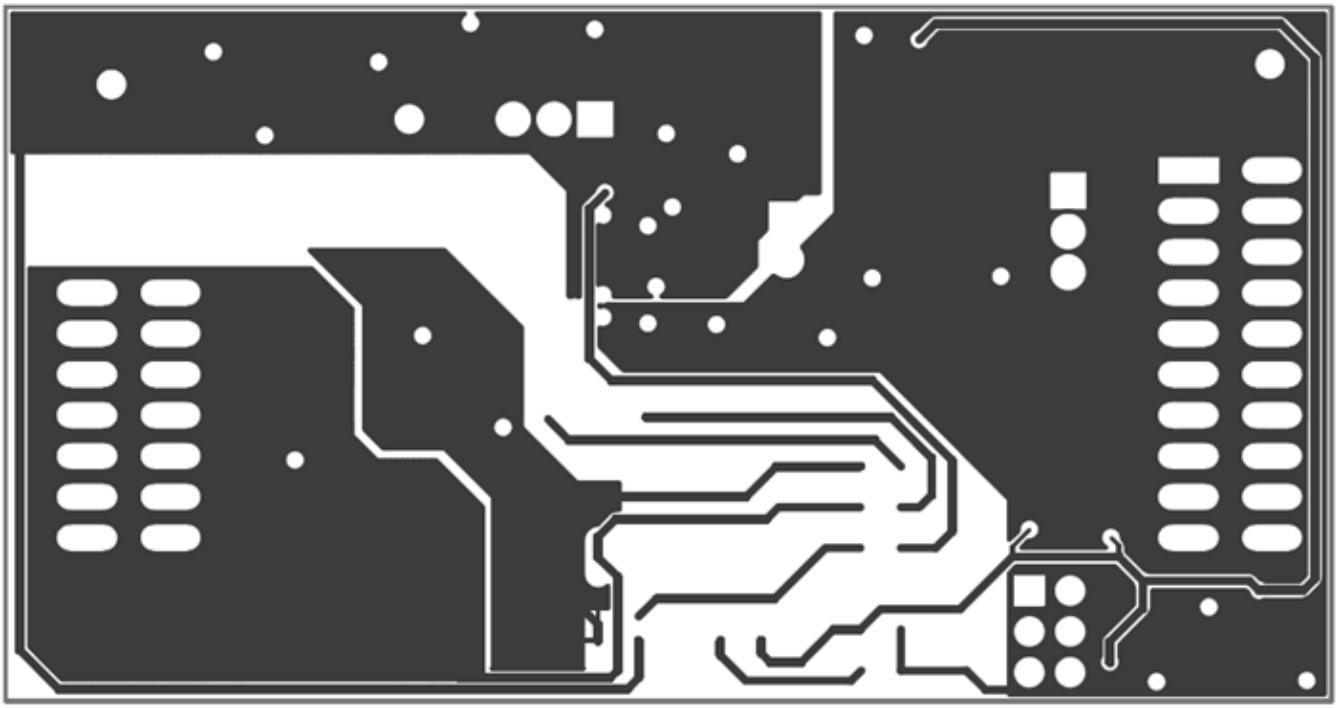


Figure 13. ADS8638EVM PCB: Mid Layer

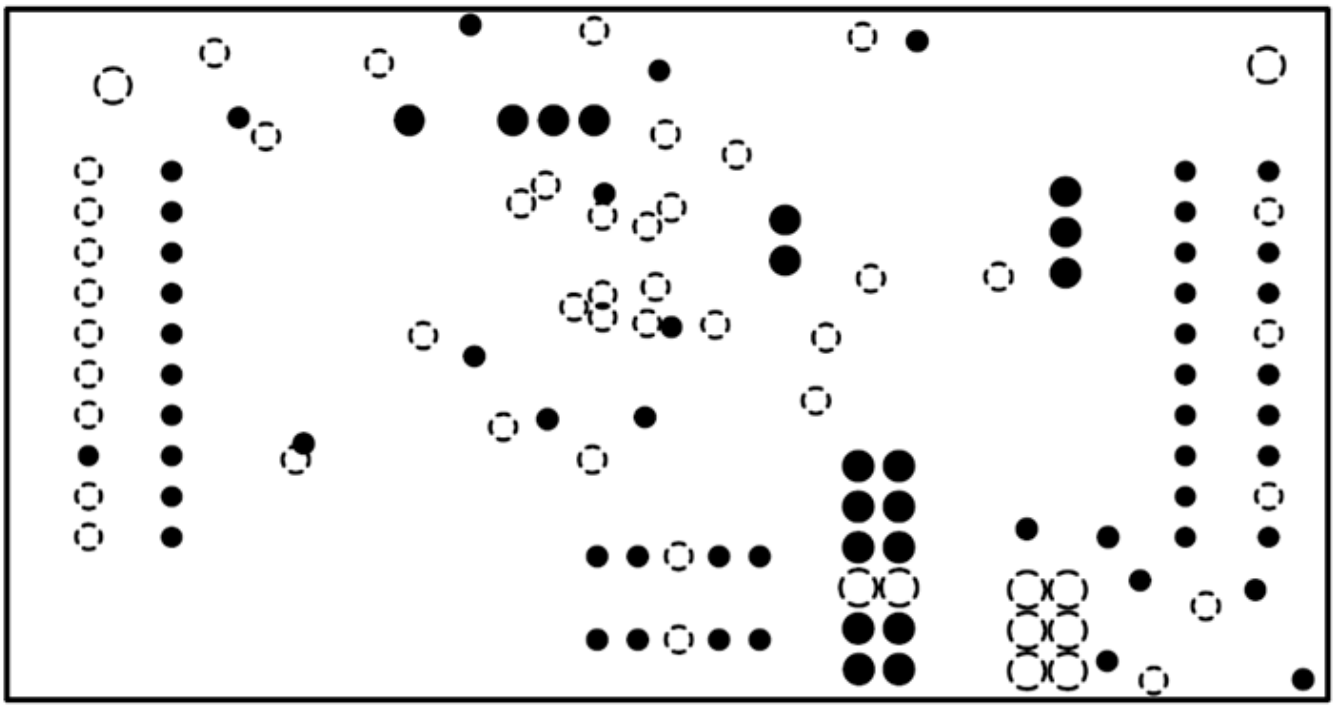


Figure 14. ADS8638EVM PCB: Ground Layer

Copyright © 2011, Texas Instruments Incorporated

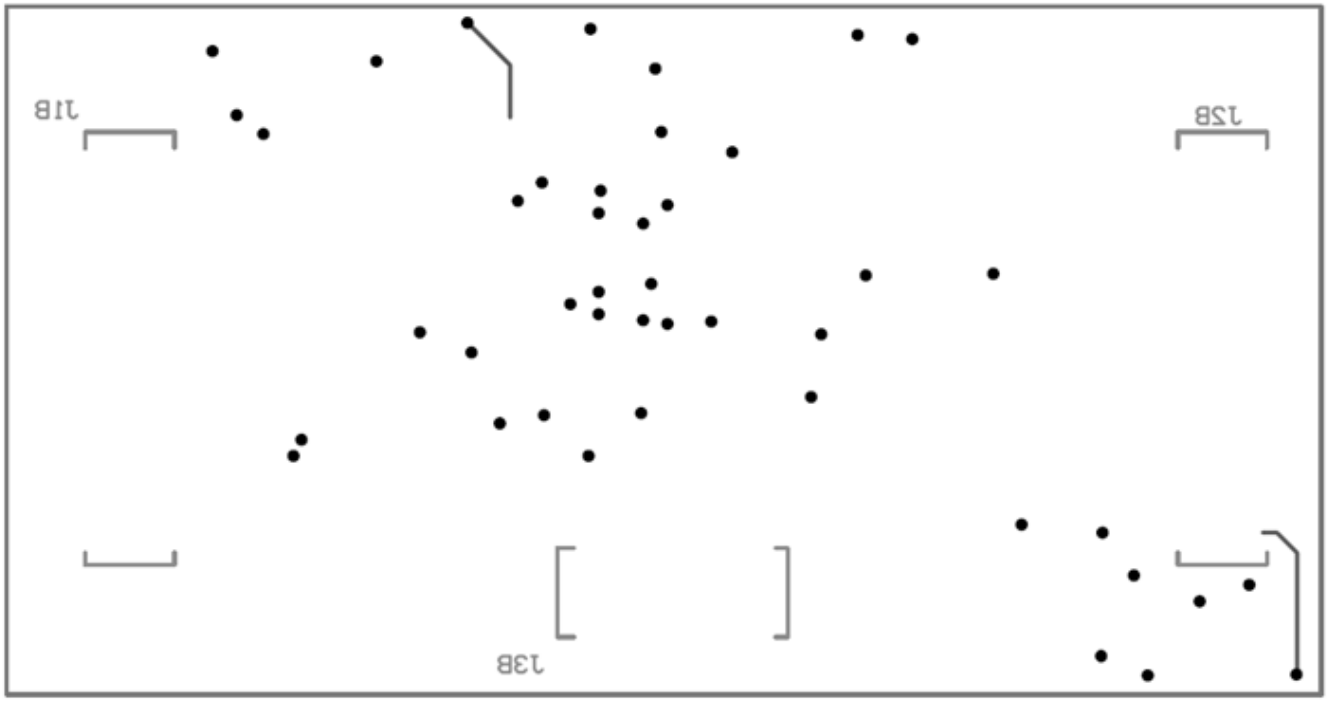
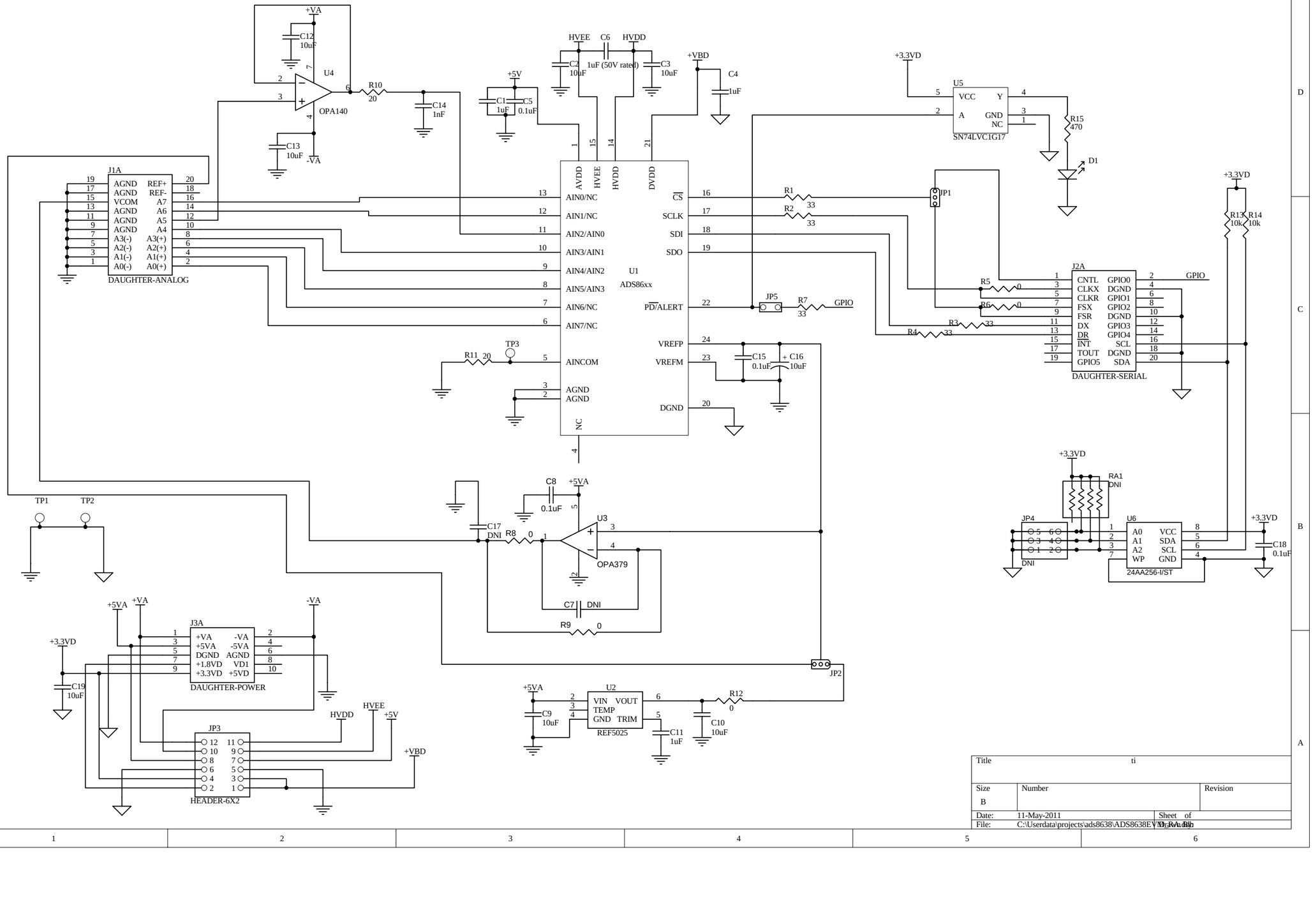


Figure 15. ADS8638EVM PCB: Bottom Layer

Copyright © 2011, Texas Instruments Incorporated


+VA
C12
10uF
U4
OPA140
R10
20
C14
1nF
C13
10uF
-VA
+5V
C1
1uF
C5
0.1uF
HVEE
C6
1uF (50V rated)
HVDD
C2
10uF
C3
10uF
+VBD
C4
1uF
+3.3VD
U5
SN74LVC1G17
R15
470
D1
J1A
DAUGHTER-ANALOG
U1
ADS86xx
AVDD
HVEE
HVDD
DVDD
AIN0/NC
AIN1/NC
AIN2/AIN0
AIN3/AIN1
AIN4/AIN2
AIN5/AIN3
AIN6/NC
AIN7/NC
AINCOM
AGND
NC
CS
SCLK
SDI
SDO
PD/ALERT
VREFP
VREFM
DGND
R1
33
R2
33
JP1
JP5
R7
33
GPIO
R5
0
R6
0
R3
33
R4
33
J2A
DAUGHTER-SERIAL
CNTL
CLKX
CLKR
FSX
FSR
DX
DR
INT
TOUT
GPIO5
GPIO0
GPIO1
GPIO2
DGND
GPIO3
GPIO4
SCL
DGND
SDA
GPIO
TP3
R11
20
C15
0.1uF
C16
10uF
+3.3VD
R13
10k
R14
10k
TP1
TP2
C8
0.1uF
+5VA
C17
DNI
R8
0
U3
OPA379
C7
DNI
R9
0
JP2
+3.3VD
RA1
DNI
JP4
DNI
U6
24AA256-I/ST
A0
A1
A2
WP
VCC
SDA
SCL
GND
C18
0.1uF
+5VA
+VA
-VA
+3.3VD
J3A
DAUGHTER-POWER
+VA
+5VA
DGND
+1.8VD
+3.3VD
-VA
-5VA
AGND
VD1
+5VD
C19
10uF
HVDD
HVEE
+5V
+VBD
JP3
HEADER-6X2
+5VA
U2
REF5025
VIN
TEMP
GND
VOUT
TRIM
C9
10uF
C11
1uF
R12
0
C10
10uF
Title
ti
Size
B
Number
Revision
Date:
11-May-2011
Sheet of
File:
C:\Userdata\projects\ads8638\ADS8638EVM\rev A\adc.sch
Drawn By:

Evaluation Board/Kit Important Notice

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive.**

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of –15 V to +15 V and the output voltage range of 0 V to 5 V.

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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com	Wireless	www.ti.com/wireless-apps
RF/IF and ZigBee® Solutions	www.ti.com/lprf		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated