ADS1015EVM, ADS1115EVM, ADS1015EVM-PDK, and ADS1115EVM-PDK

ADS1115EVM (Left) and ADS1115EVM-PDK (Right)

This user's guide describes the characteristics, operation, and use of the ADS1015EVM and ADS1115EVM, both by themselves and as part of the ADS1015EVM-PDK or ADS1115EVM-PDK. These evaluation modules (EVMs) are evaluation boards for the ADS1115, a 16-bit multi-channel, delta-sigma analog-to-digital converter (ADC), and the ADS1015, a 12-bit version of the ADS1115. The EVM allows evaluation of all aspects of the ADS1015 or ADS1115 device. Complete circuit descriptions, schematic diagrams, and bills of material are included in this document.

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

EVM-Compatible Device Data Sheets

Device	Literature Number
ADS1015	SBAS473
ADS1115	SBAS444
SN74LVC2G125	SCES204M
PCA9306	SCPS113I

ADCPro is a trademark of Texas Instruments.
Microsoft, Windows are registered trademarks of Microsoft Corporation.
I^2C is a trademark of NXP Semiconductors.
All other trademarks are the property of their respective owners.

Copyright © 2009–2011, Texas Instruments Incorporated

Contents

1 EVM Overview 3
2 Analog Interface 3
3 Digital Interface 4
4 Power Supplies 5
5 EVM Operation 5
6 ADS1115EVM-PDK Kit Operation 6
7 Evaluating Performance with the ADCPro Software 15
8 Schematics and Layout 21

List of Figures

1 ADS1115EVM Default Jumper Locations 6
2 Virtual COM Port Installer 7
3 Virtual COM Port Setup 7
4 MMB3 Switch Locations 8
5 Connecting ADS1115EVM to MMB3 9
6 MMB3 Block Diagram 10
7 ADCPro Software Start-up Display Window 11
8 ADS1115EVM-PDK Plug-In Display Window 12
9 Connection Timeout 13
10 Firmware Download Message Box 13
11 Firmware Download Progress Indicator 14
12 Firmware Download Complete Message Box 15
13 Device 1 Tab 17
14 About Tab 19
15 Progress Bar While Collecting Data 20

List of Tables

1 J1: Analog Interface Pinout 4
2 J3: Serial Interface Pins 4
3 J2 Configuration: Power-Supply Input 5
4 JMP1 Configuration: Power Options 5
5 List of Switches 6
6 ADS1015EVM/ADS1115EVM Bill of Materials 22

Copyright © 2009–2011, Texas Instruments Incorporated

1 EVM Overview

1.1 Features

ADS1015EVM/ADS1115EVM Features:

- Contains all support circuitry needed for the ADS1015/ADS1115
- Two ADS1015/ADS1115 devices onboard to demonstrate I²C™ bus functionality
- +3.3, +5V, or external power supply options for ADC
- Compatible with the TI Modular EVM System

ADS1015EVM-PDK/ADS1115EVM-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 ADS1015EVM-PDK or ADS1115EVM-PDK is available. This kit combines the ADS1015/ADS1115EVM board with the MSP430-based MMB3 motherboard, and includes ADCPro™ software for evaluation.

The MMB3 motherboard allows the ADS1015/ADS1115EVM to be connected to the computer via an available USB port. This manual shows how to use the MMB3 as part of the ADS1015EVM-PDK/ADS1115EVM-PDK, but does not provide technical details about the MMB3 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 ADS1015EVM-PDK/ADS1115EVM-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 ADS1015/ADS1115EVM and the ADS1015EVM-PDK/ADS1115EVM-PDK. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS1015/ADS1115EVM. For clarity of reading, the rest of this manual will refer only to the ADS1115EVM or ADS1115EVM-PDK, but operation of the EVM and kit for the ADS1015 is identical, unless otherwise noted.

1.2 Introduction

The ADS1115EVM is an evaluation module built to the TI Modular EVM System specification. It can be connected to any modular EVM system interface card.

The ADS1115EVM is available as a stand-alone printed circuit board (PCB) or as part of the ADS1115EVM-PDK, which includes an MMB3 motherboard and software. As a stand-alone PCB, the ADS1115EVM is useful for prototyping designs and firmware.

Note that the ADS1115EVM 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 ADS1115EVM 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 ADS1115. Consult Samtec at http://www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options.

Copyright © 2009–2011, Texas Instruments Incorporated

All of the pins on J1 are connected directly to the ADS1115 device input pins, with no protection. Use appropriate caution when handling these pins. Table 1 summarizes the pinouts for the analog interface J1.

Table 1. J1: Analog Interface Pinout

Pin Number	Signal	Description, ADS1015/ADS1115
J1.2	A0(+)	AIN0, Device 1 (U1)
J1.4	A1(+)	AIN1, Device 1 (U1)
J1.6	A2(+)	AIN2, Device 1 (U1)
J1.8	A3(+)	AIN3, Device 1 (U1)
J1.10	A0(+)	AIN0, Device 2 (U2)
J1.12	A1(+)	AIN1, Device 2 (U2)
J1.14	A2(+)	AIN2, Device 2 (U2)
J1.16	A3(+)	AIN3, Device 2 (U2)
J1.1-7 (odd)	Unused	
J1.15	Unused	
J1.9-19 (odd)	AGND	Analog ground connections (except J1.15)
J1.18, J1.20	Unused	

3 Digital Interface

3.1 Serial Data Interface

The ADS1115EVM 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 J3. 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 J3 are 3.3V CMOS, except for the I^2C pins. These pins conform to 3.3V I^2C rules. Table 2 describes the J3 serial interface pins.

Table 2. J3: Serial Interface Pins

Pin No.	Pin Name	Signal Name	I/O Type	Pullup	Function
J3.1-19 (odd)	—	Unused	—	None	
J3.2	GPIO0	ALERT/RDY (U1)	Out	None	Digital comparator output or conversion ready for Device 1 (U1)
J3.4	DGND	DGND	In/Out	None	Digital ground
J3.6	GPIO1	ALERT/RDY (U2)	Out	None	Digital comparator output or conversion ready for Device 2 (U2)
J3.8	GPIO2	Unused	—	None	
J3.10	DGND	DGND	In/Out	None	Digital ground
J3.12	GPIO3	Unused	—	None	
J3.14	GPIO4	Unused	—	None	
J3.16	SCL	SCL	I^2C	High	I^2C clock
J3.18	DGND	DGND	In/Out	None	Digital ground
J3.20	SDA	SDA	I^2C	High	I^2C data

Copyright © 2009–2011, Texas Instruments Incorporated

4 Power Supplies

J2 is the power-supply input connector. Table 3 lists the configuration details for J2.

Table 3. J2 Configuration: Power-Supply Input

Pin No.	Pin Name	Function	Required
J2.1	+VA	External analog supply	If 3.3 or 5V supplies not used
J2.2	–VA	Unused	No
J2.3	+5VA	Unused	No
J2.4	–5VA	Unused	No
J2.5	DGND	Digital ground input	Yes
J2.6	AGND	Analog ground input	Yes
J2.7	+1.8VD	Unused	No
J2.8	VD1	Unused	No
J2.9	+3.3VD	3.3V digital supply	If 5V or external supplies not used
J2.10	+5VD	+5V digital supply	If 3.3V or external supplies not used

4.1 Power Options

JMP1 is arranged as four rows, each of which can be shorted. Table 4 lists the power option details for JMP1. For normal operation, all jumpers should be installed.

Table 4. JMP1 Configuration: Power Options

Row	Name	Function
1-2	VDD1	Supply current measurement point for Device 1. Must be connected for operation.
3-4	VDD2	Supply current measurement point for Device 2. Must be connected for operation.
5-6	VDD	Supply current measurement point for the other digital devices. Must be connected for operation.
7-8	GND	Connects DGND to AGND.

Switch S1 selects the supply voltage used to feed JMP1 and the respective VDDs shown in Table 4. S1 may be switched to +VA, +5VD, or +3.3VD from power connector J2.

5 EVM Operation

This section provides information on the analog input, digital control, and general operating conditions of the ADS1115EVM.

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 the modular EVM system.

5.2 Digital Control

The digital control signals can be applied directly to J3 (top or bottom side). The modular ADS1115EVM 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 MMB3 if purchased as part of the ADS1115EVM-PDK. For a list of compatible interface and/or accessory boards for the EVM or the ADS1115, see the relevant product folder on the TI web site.

Copyright © 2009–2011, Texas Instruments Incorporated

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.

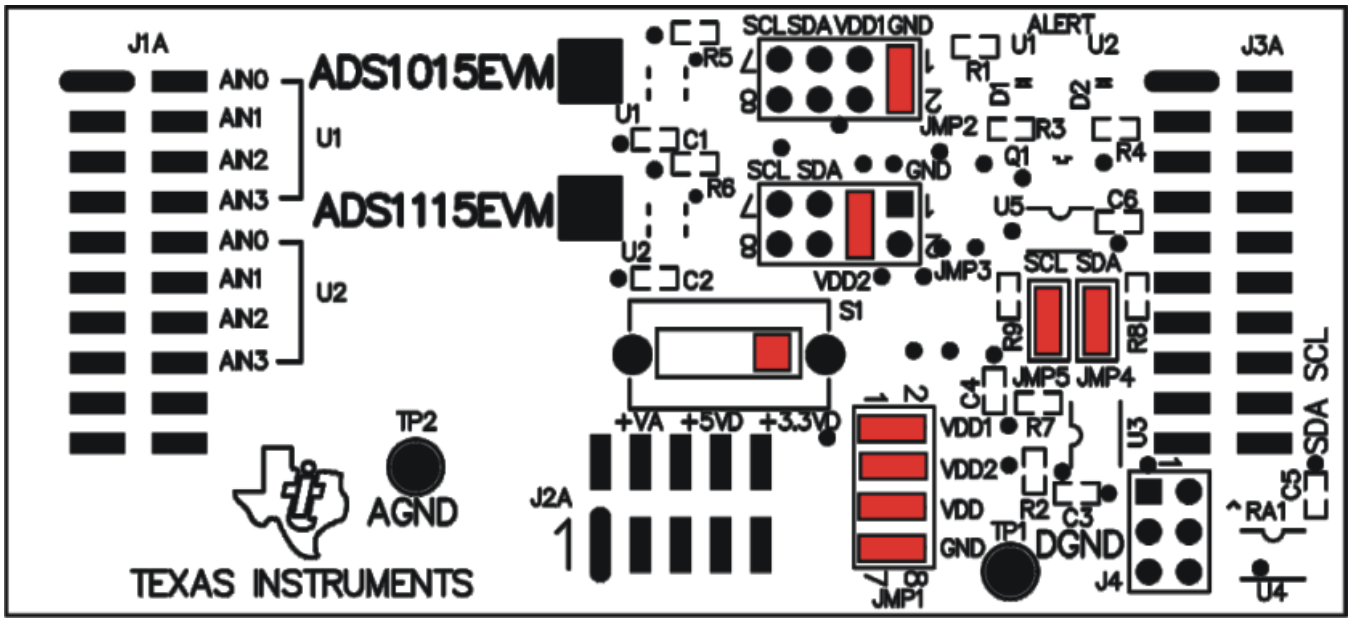


Figure 1. ADS1115EVM Default Jumper Locations

Table 5 lists the switches found on the EVM and the respective factory default conditions for each.

Table 5. List of Switches

Switch	Position	Switch Description
S1	Right (default)	VDD = +3.3VD
	Center	VDD = +5VD
	Left	VDD = +VA

6 ADS1115EVM-PDK Kit Operation

This section provides information on using the ADS1115EVM-PDK, including setup, program installation, and program usage.

To prepare to evaluate the ADS1115 with the ADS1115EVM-PDK, complete the following steps:

Step 1. Install the ADCPro software (if not already installed) on a PC.
Step 2. Install the ADS1115EVM-PDK EVM plug-in software.
Step 3. Complete the USB driver installation process.
Step 4. Set up the ADS1115EVM-PDK.
Step 5. Connect the ADS1115EVM-PDK to the computer with a USB cable.
Step 6. Run the ADCPro software.

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

Copyright © 2009–2011, Texas Instruments Incorporated

6.1 Installing the ADCPro Software

CAUTION

Do not connect the ADS1115EVM-PDK before installing the software on a suitable PC. Failure to observe this caution may cause Microsoft Windows to not recognize the ADS1115EVM-PDK as a connected device.

The latest software is available from the TI website at http://www.ti.com. Refer to the ADCPro User Guide for instructions on installing and using ADCPro.

To install the ADS1115EVM-PDK plug-in, run the file: **ads1115evm-pdk-plug-in-1.0.0.exe** (*1.0.0* 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 ADS1115EVM-PDK plug-in, once you have installed a version of it.

Follow the on-screen prompts. Once the ADCPro plug-in installs, you will be prompted to install the Virtual COM port driver as shown in Figure 2.

Figure 2. Virtual COM Port Installer

Press *OK*, and the screen shown in Figure 3 displays.

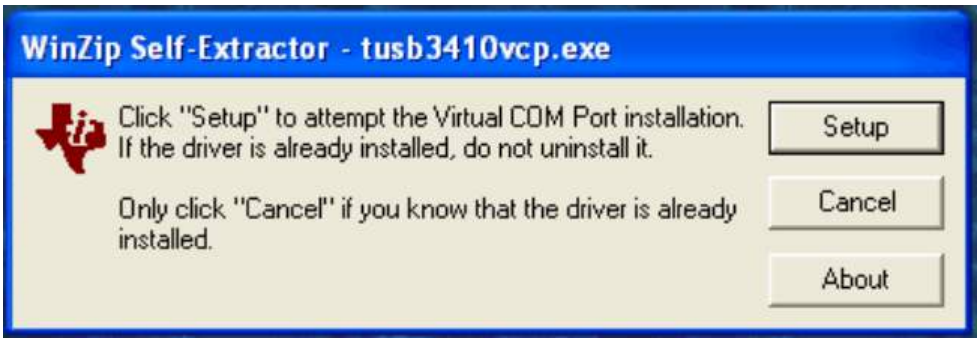


Figure 3. Virtual COM Port Setup

If you already have a TUSB3410 Virtual COM port driver installed on your system, select *Cancel*; otherwise, press *Setup* and follow the on-screen prompts. You may be notified that the driver is not digitally signed. If this occurs, select *Continue Anyway* and proceed.

Copyright © 2009–2011, Texas Instruments Incorporated

6.2 Setting Up the ADS1115EVM-PDK

The ADS1115EVM-PDK contains both the ADS1115EVM and the MMB3 motherboard; however, the devices are shipped unconnected. Follow these steps to set up the ADS1115EVM-PDK.

Step 1. Unpack the ADS1115EVM-PDK kit.

Step 2. Set the switches on the MMB3 as described below, as Figure 4 illustrates.

- Set switch SW4 to the right.
- Set the DAC switch (SW5) to the OUT position (to the right).

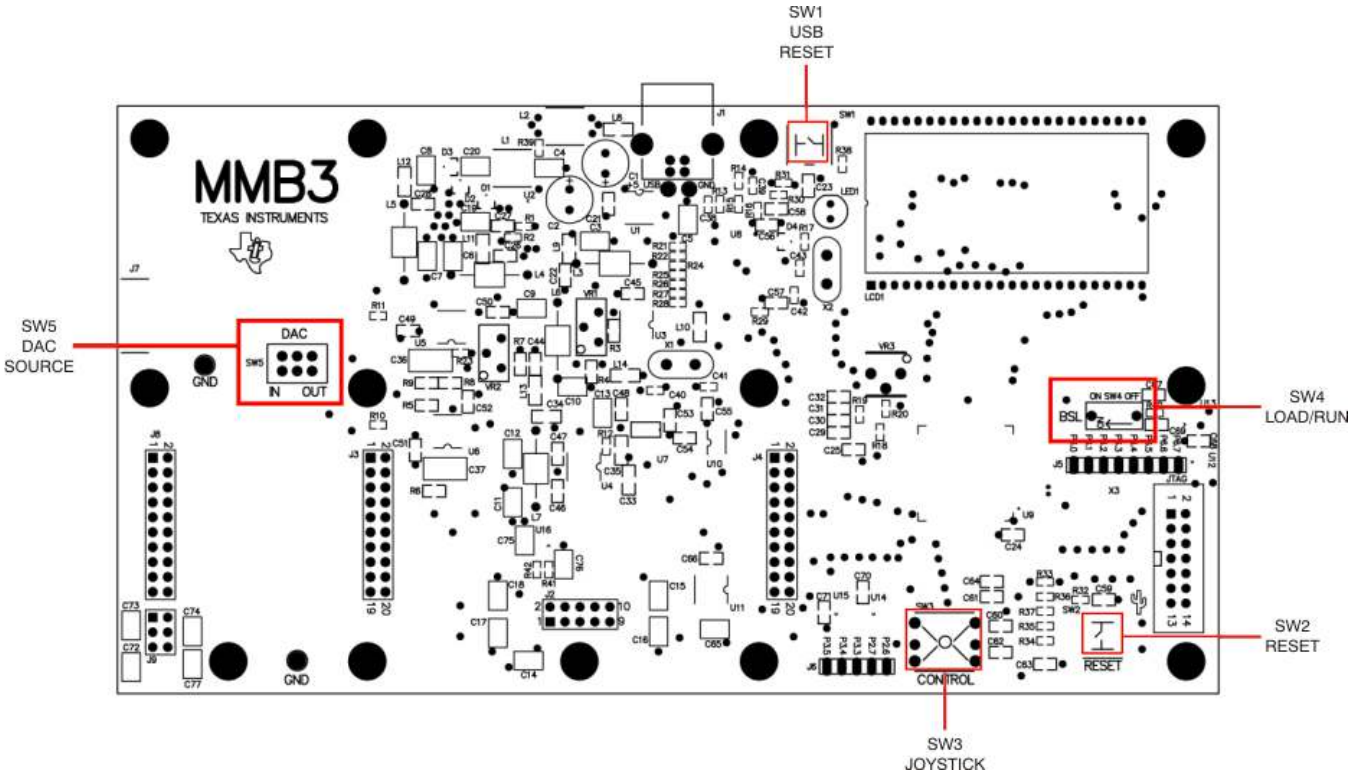


Figure 4. MMB3 Switch Locations

Copyright © 2009–2011, Texas Instruments Incorporated

Step 3. Plug the ADS1115EVM into the MMB3 as Figure 5 illustrates.

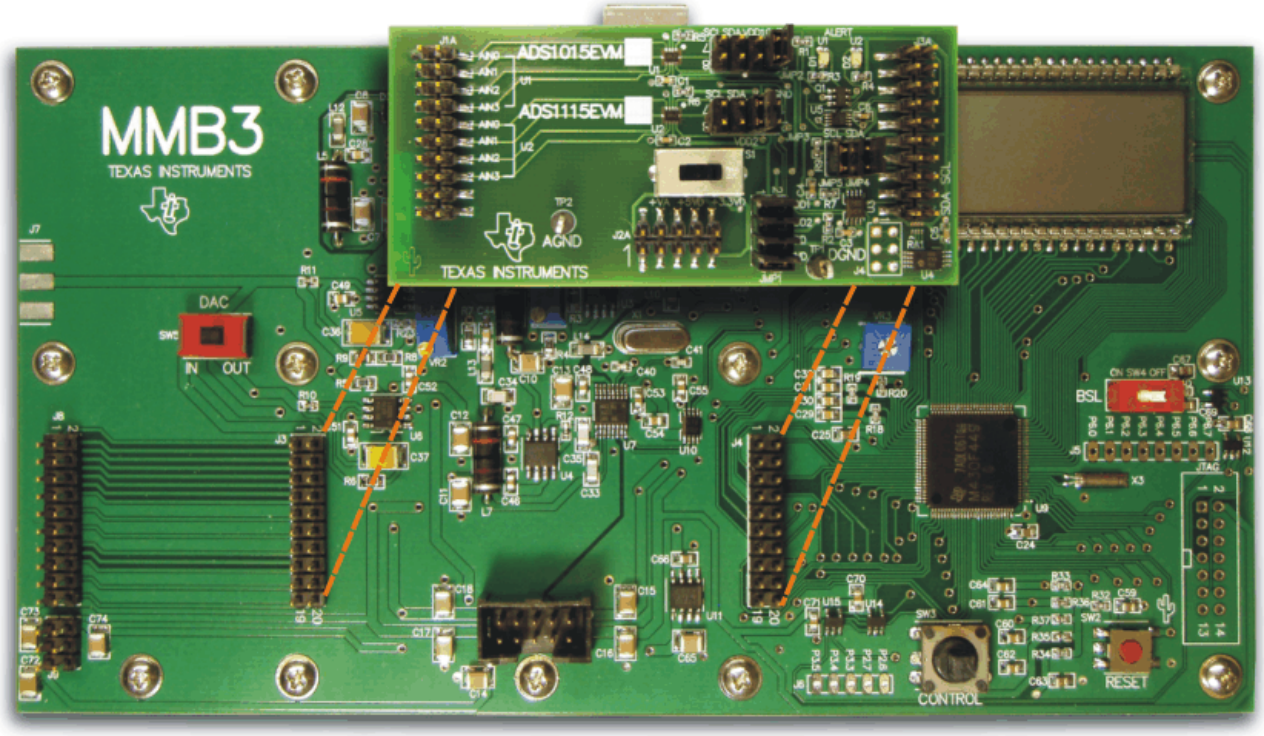


Figure 5. Connecting ADS1115EVM to MMB3

Step 4. Set the jumpers and switches on the ADS1115EVM as shown in Figure 1 (note that these settings are the factory-configured settings for the EVM).

Copyright © 2009–2011, Texas Instruments Incorporated

6.2.1 About the MMB3

The MMB3 is a Modular EVM System motherboard. It is designed around the MSP430F449, a low-power microcontroller from Texas Instruments. Figure 6 shows a block diagram of the MMB3.

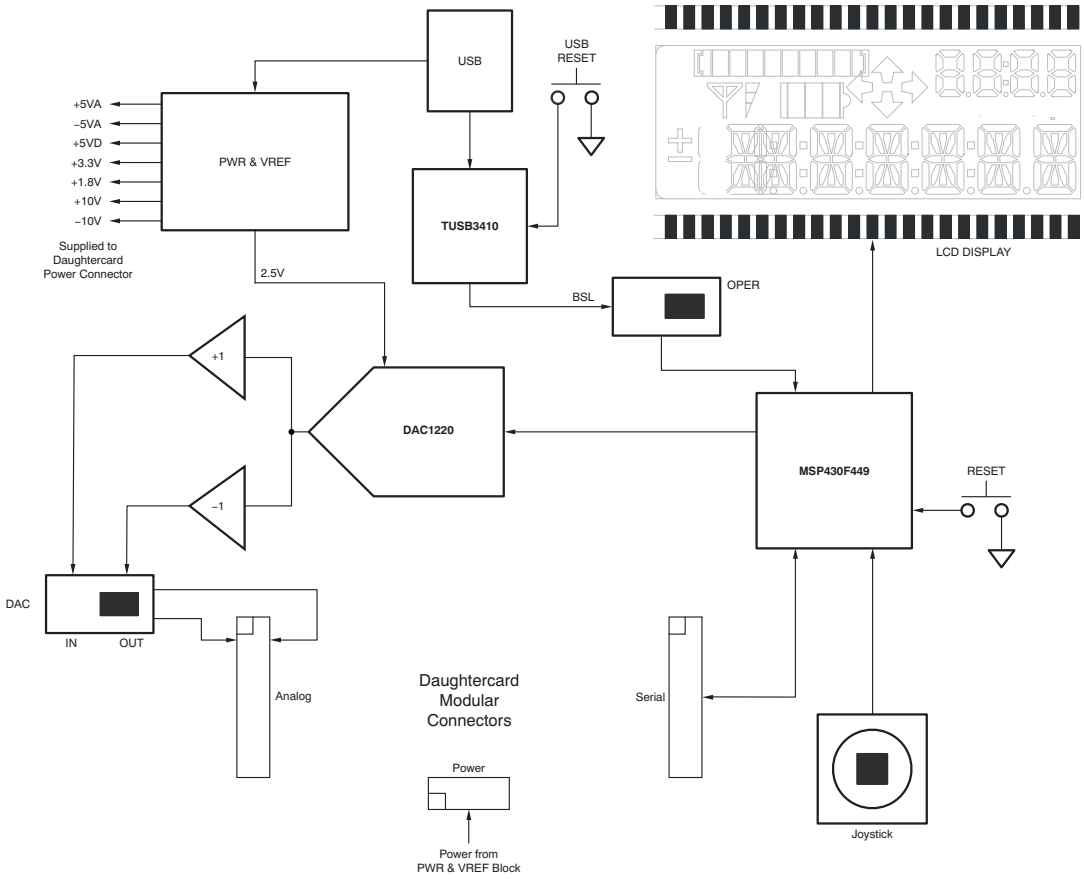


Figure 6. MMB3 Block Diagram

The MMB3 was designed to be used as a stand-alone demonstration platform for low-speed data converters. It features an onboard, 20-bit digital-to-analog converter (DAC) that can be used as a signal source for an ADC under test, and has a joystick for control of functions on the board when it is not controlled by a PC. ***These features are experimental and not supported in the ADS1115EVM-PDK at this time.***

The MMB3 derives power from the USB interface, and generates +5VD, 3.3V, and 1.8V, as well as +5VA and –5VA and ±10V. The ±10V is supplied to the daughtercard power connector as +VA and –VA.

CAUTION

When using the ADS1115EVM connected to the MMB3, do not move switch S1 to the +VA position. This switch position will apply +10V to the devices on the EVM and damage the EVM.

The MMB3 is not sold as a microcontroller development board, and it is not available separately. TI cannot offer support for the MMB3 except as part of an EVM kit. For schematics or other information about the MMB3, contact Texas Instruments.

Copyright © 2009–2011, Texas Instruments Incorporated

6.3 EVM Power Supply

The ADS1115EVM-PDK is powered completely from the USB connection on the MMB3. The MMB3 provides 3.3V and 5V to the ADS1115EVM.

6.4 Running the Software and Download of Firmware to MMB3

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 ADS1115EVM-PDK is called *ADCPro*. This program uses plug-ins to communicate with the EVM. The ADS1115EVM-PDK plug-in is included in the ADS1115EVM-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 installing ADCPro and plug-ins, follow these procedures to run ADCPro and perform any necessary firmware installations. Make sure the ADCPro software and device plug-in software are installed as described in Section 6.1.

Step 1. Start the software by selecting *ADCPro* from the Windows Start menu. The screen in Figure 7 appears.

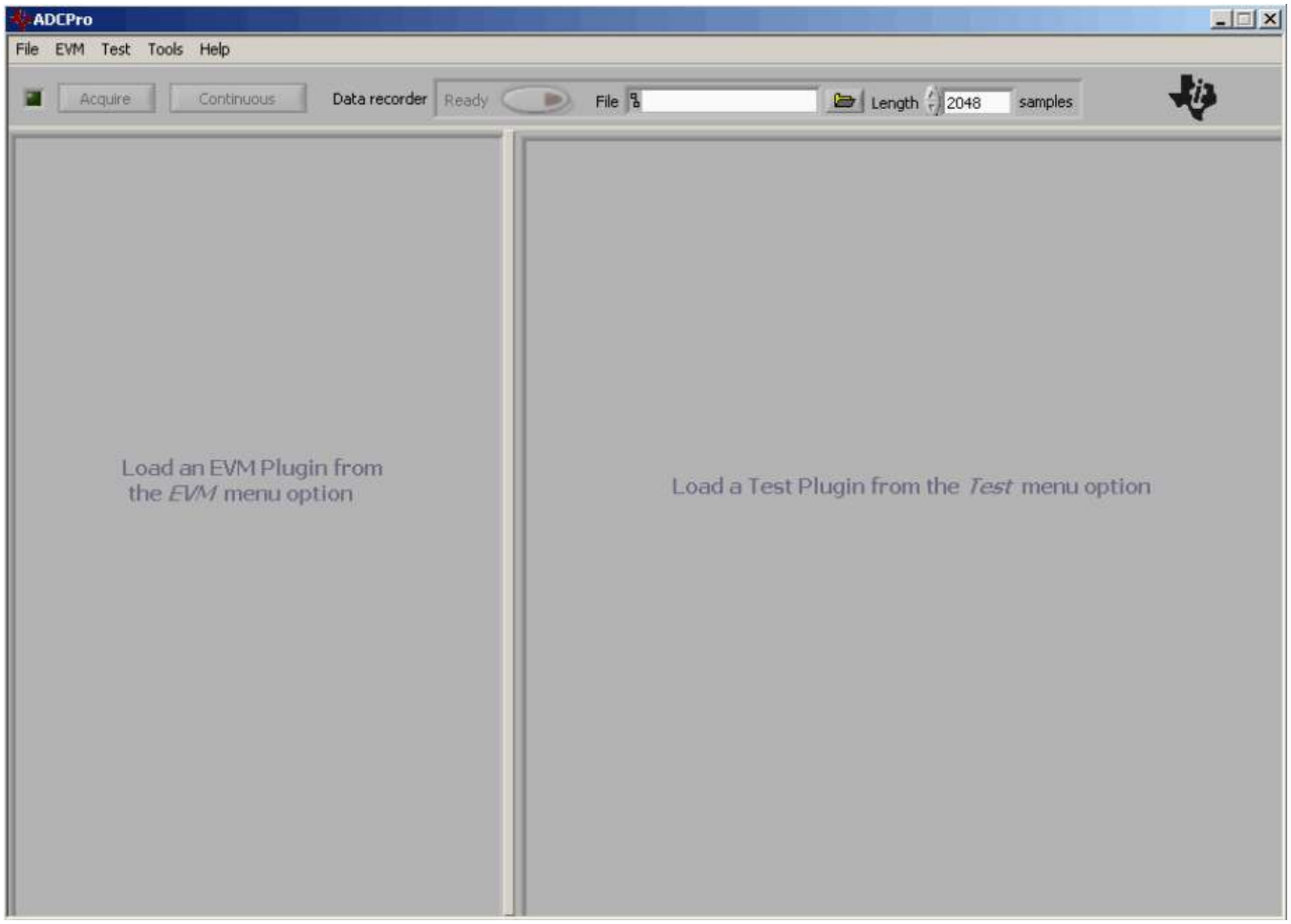


Figure 7. ADCPro Software Start-up Display Window

Copyright © 2009–2011, Texas Instruments Incorporated

Step 2. Select *ADS1115EVM* from the EVM drop-down menu. The ADS1115EVM-PDK plug-in appears in the left pane, as Figure 8 shows.

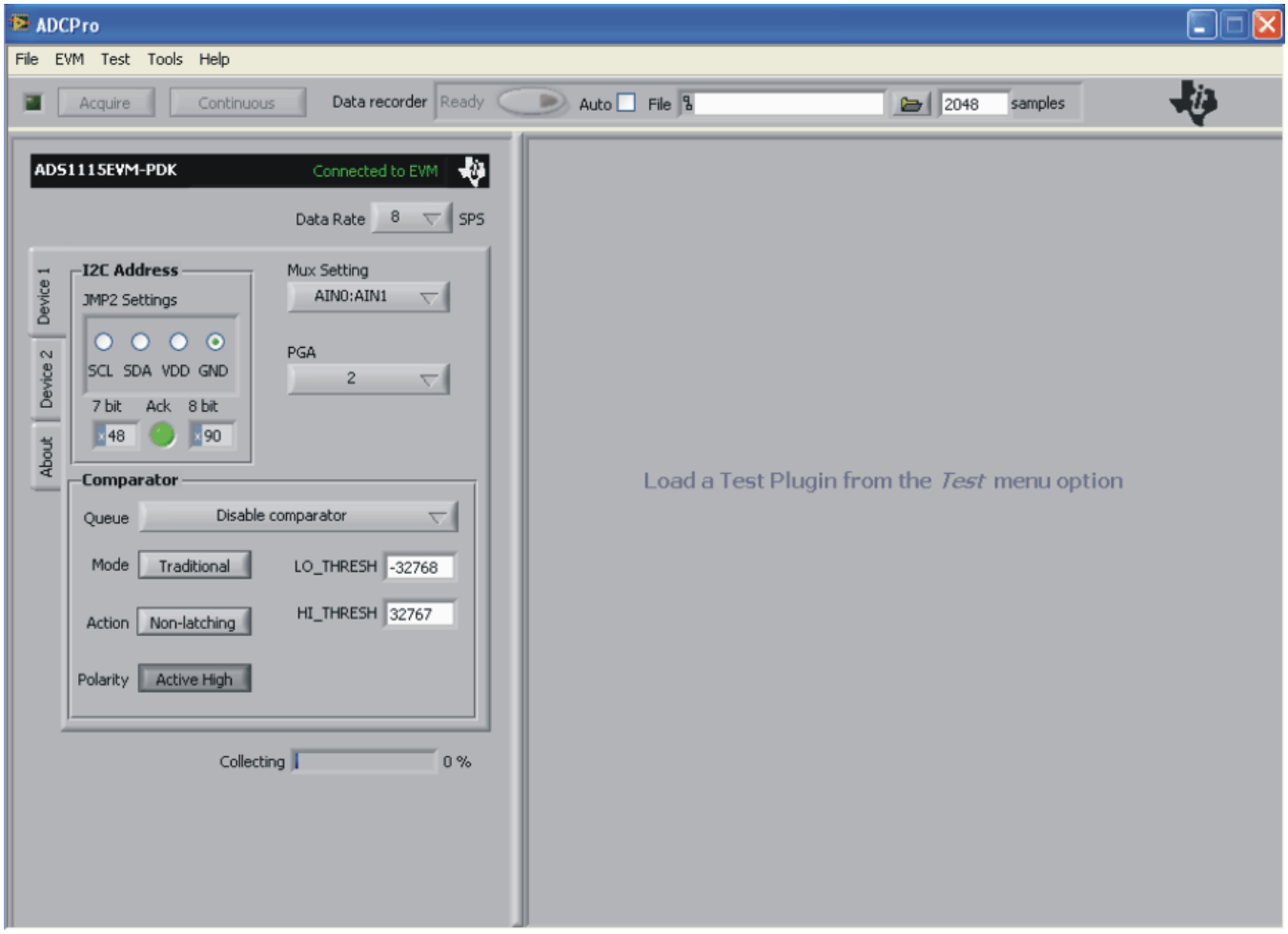


Figure 8. ADS1115EVM-PDK Plug-In Display Window

Step 3. The ADS1115EVM-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.

Copyright © 2009–2011, Texas Instruments Incorporated

Step 4. If the plug-in cannot connect to the EVM, you will see a window as shown in Figure 9. This message may indicate that the firmware is not loaded on the MMB3. You may select *Retry Auto Connect*; if that action fails, select *Retry Manual Connect* and specify the COM port to be used.

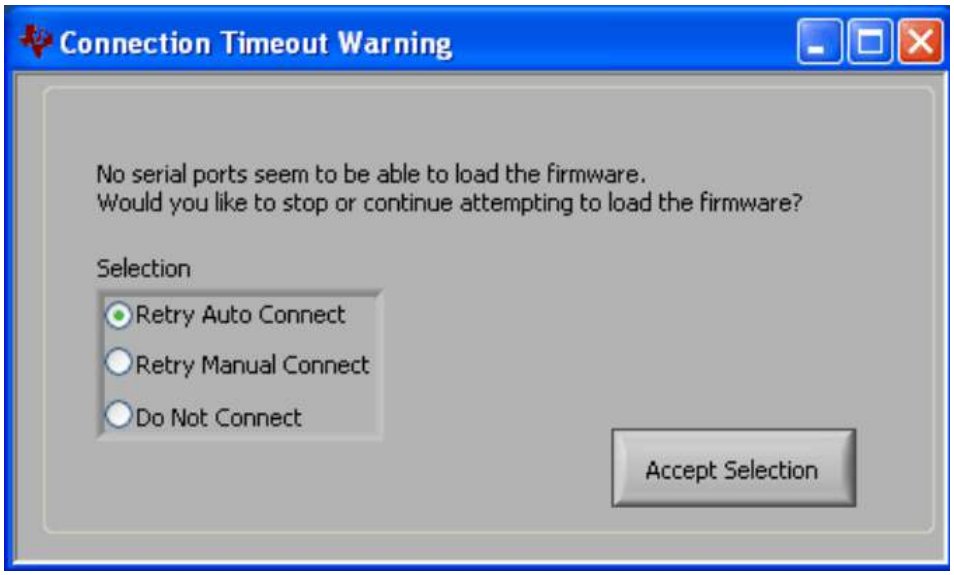


Figure 9. Connection Timeout

Step 5. The plug-in will detect whether or not the board has the correct firmware loaded. The first time you use the ADS1115EVM-PDK, the firmware for the MMB3 may need to be downloaded to the MMB3. If the firmware needs to be loaded, you will see a screen as shown in Figure 10.

Figure 10. Firmware Download Message Box

Copyright © 2009–2011, Texas Instruments Incorporated

Switch the BSL switch (SW4) on the MMB3 to the BSL position (to the left) as instructed, then press **OK**. The plug-in will download the firmware to the MMB3. This operation may take a couple of minutes, so the progress is updated in the message at the top of the ADS1115 plug-in window (as Figure 11 shows). The firmware is saved in flash memory on the MMB3, so this operation should only need to be performed once.

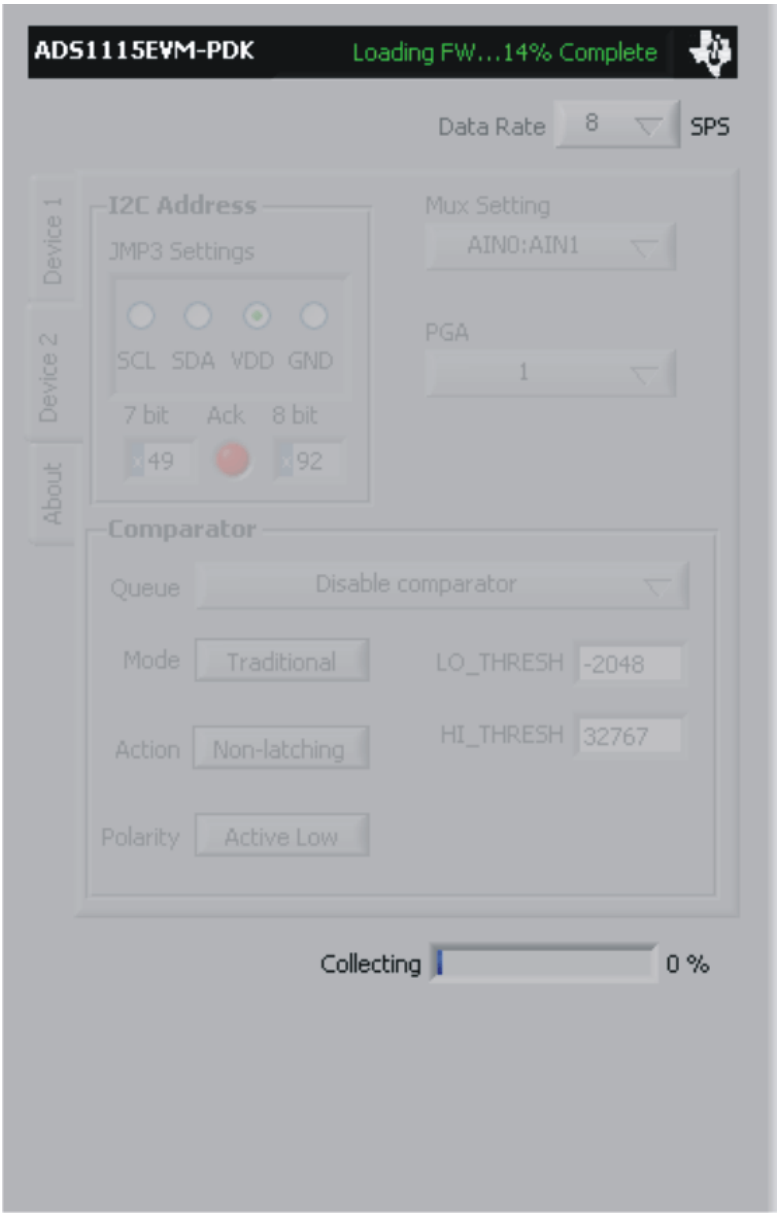


Figure 11. Firmware Download Progress Indicator

Copyright © 2009–2011, Texas Instruments Incorporated

When the firmware download completes, the message box shown in Figure 12 appears. Follow the on-screen instructions and the plug-in should now connect to the EVM.

Figure 12. Firmware Download Complete Message Box

7 Evaluating Performance with the ADCPro Software

The evaluation software is based on ADCPro, a program that operates using a variety of plug-ins. 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 ADS1115EVM-PDK Plug-in

The ADS1115EVM-PDK plug-in for ADCPro provides complete control over all settings of the ADS1115. 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 ADS1115EVM settings when you are not acquiring data. During acquisition, all controls are disabled and settings may not be changed. The ADS1115EVM plug-in always collects data from both ADS1115 devices on the EVM, so you must be sure to have both devices configured as desired in order to collect meaningful data.

When you change a setting on the ADS1115EVM plug-in, the setting immediately updates on the board.

Settings on the ADS1115EVM correspond to settings described in the ADS1115 product data sheet (available for download at www.ti.com) for details.

Copyright © 2009–2011, Texas Instruments Incorporated

7.1.1 Data Rate and Sampling Information

The **Data Rate** control on the main plug-in window sets the data rate for both ADS1115 converters on the EVM. It is a requirement of the ADCPro software that both devices operate at the same data rate. The ADS1115EVM-PDK always operates the device in continuous conversion mode; one-shot power-down mode is not supported.

The ADS1115EVM-PDK allows the **Data Rate** control to set the data rate to 8, 16, 32, 64, 128, 250, 475, or 860 samples per second (SPS). Note that the data rate can go quite low; therefore, if the block size is large, the time it takes to collect a block of data can be quite long. It is advisable to first test collection at the higher data rates. Once a test is known to work properly, drop down to the lower data rate and allow sufficient time to collect the data.

The ADS1015EVM-PDK allows the **Data Rate** control to set the data rate to 128, 256, 500, 920, 1600, 2500, or 3300 SPS. The MMB3 does not have the capability to send every sample at data rates above 920 SPS; when a data rate higher than this is selected, the data points collected will not be continuous. The ADS1015 will operate at the higher data rate, but data will be collected at 920 SPS, skipping some data points.

Note that both the ADS1115 and ADS1015 have internal clocks with a ±10% accuracy. If performing FFT tests, frequencies may appear to be incorrect as a result of this tolerance range. At data rates above 920 SPS, the sample rate reported to test plug-ins will be 920 SPS so that FFT tests should run properly.

The ADS1115EVM-PDK plug-in has a tabbed interface, with two different tabs to control the other functions of the two ADS1115s on the EVM. These tabs are described below.

Copyright © 2009–2011, Texas Instruments Incorporated

7.1.2 Device 1 Tab

This tab, shown in Figure 13, is the primary tab that controls all features of the ADS1115. *Device 1* refers to *U1* on the ADS1115EVM.

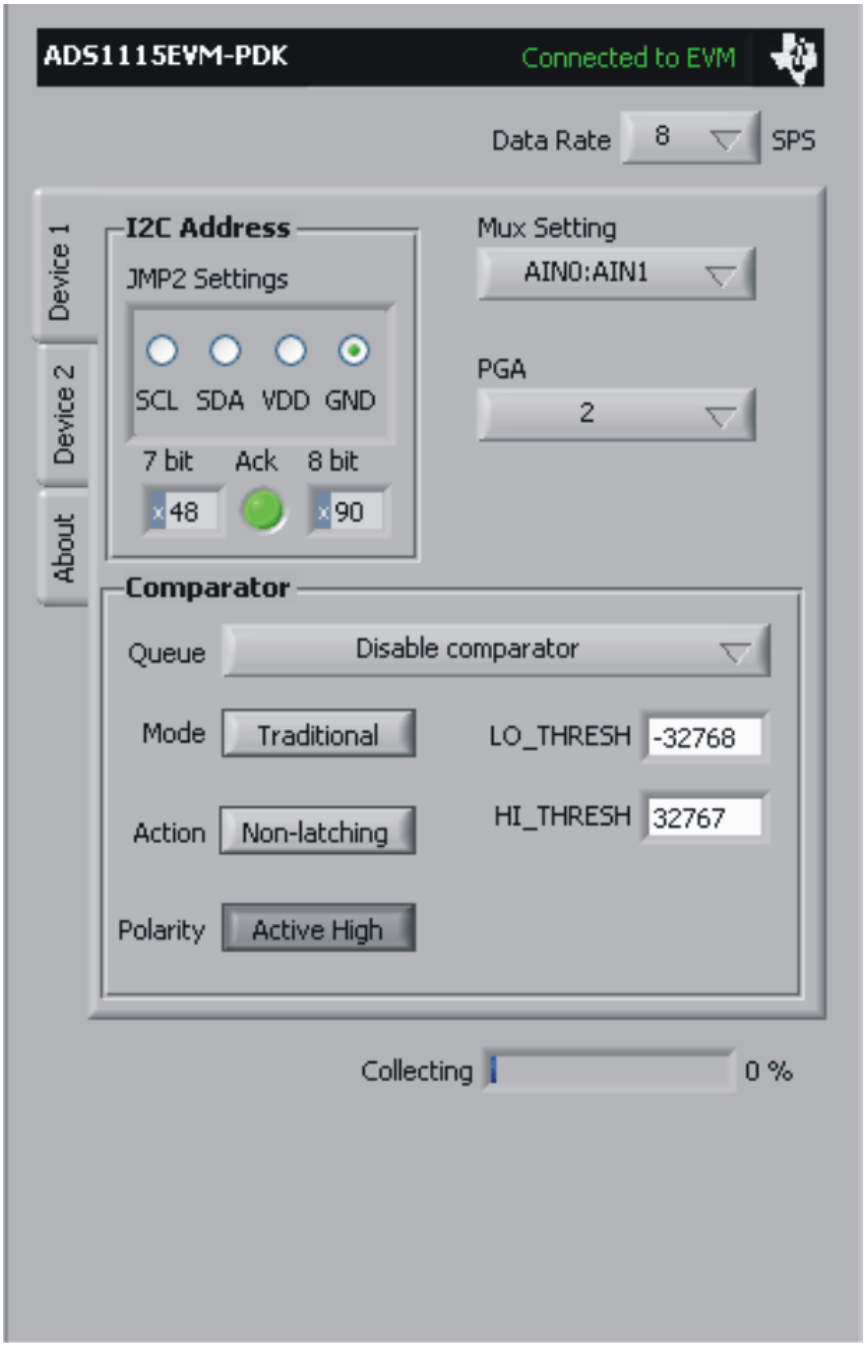


Figure 13. Device 1 Tab

Copyright © 2009–2011, Texas Instruments Incorporated

The **I2C Address** groupbox contains controls related to the setting of the I^2C address of Device 1. The **JMP2 Settings** control is set up to mimic the layout of JMP2 on the EVM. When, for example, a jumper is installed in the rightmost position, connecting the ADS1115 ADDR pin to GND, the *GND* radio button should be selected here.

Whenever the **JMP2 settings** are changed, the I^2C address of the device is changed, and the corresponding address value is shown in the **7 bit** and **8 bit** indicators. The **7 bit** indicator shows the address considering only the seven bits that set the address of the device; the **8 bit** indicator reflects how a byte would actually be viewed if the eighth bit (the R/$\overline{W}$ bit) is set to zero.

The **ACK** light will reflect whether or not the address selected returns an I^2C acknowledgement. If this light is red, then no device was found at that address. This result may indicate that the jumper settings on the EVM do not match the selection in the **JMP2 Settings**. A red light may also indicate that the two devices on the board have been set to the same I^2C address, and this state will be indicated by a message at the top of the plug-in that says ***I2C Address Conflict***. The two devices on the ADS1115EVM must be set for different I^2C addresses in order for the plug-in to operate. When a valid I^2C address is selected, the **ACK** light will turn green, indicating that a valid address has been found on the bus.

The **Mux Setting** control determines which set of inputs is used, displayed as AINP:AINN, where AINP is the input connected to the positive input of the ADC, and AINN is the input connected to the negative input of the ADC. Selections available are *AIN0:AIN1*, *AIN0:AIN3*, *AIN1:AIN3*, *AIN2:AIN3*, *AIN0:GND*, *AIN1:GND*, *AIN2:GND*, or *AIN3:GND*.

The **PGA Gain** control sets the PGA gain. Selections available are *0.66666*, *1*, *2*, *4*, *8*, or *16*.

The **Comparator** groupbox contains controls related to the comparator functions of the ADS1115. The **Queue** control selects whether to *Disable Comparator*, or to enable the comparator and have it *Assert after one conversion*, *Assert after two conversions*, or *Assert after four conversions*. The comparator output status is reflected by the D1 LED on the EVM.

The **Mode** switch allows selection of the comparator mode, either *Traditional* or *Window*. The **Action** switch selects between *Non-latching* or *Latching* operation, and the **Polarity** switch determines if the ALERT output of the device is *Active Low* or *Active High*. More details on these settings can be found in the product data sheet.

The **LO_THRESH** and **HI_THRESH** controls set the numbers that are placed in corresponding low and high threshold registers of the ADS1115. These numbers are displayed and entered in decimal format.

7.1.3 Device 2 Tab

This tab is identical to the Device 1 tab, but controls the settings for Device 2, which is U2 on the ADS1115EVM.

Copyright © 2009–2011, Texas Instruments Incorporated

7.1.4 About Tab

The About tab displays information about the EVM and software, as shown in Figure 14.

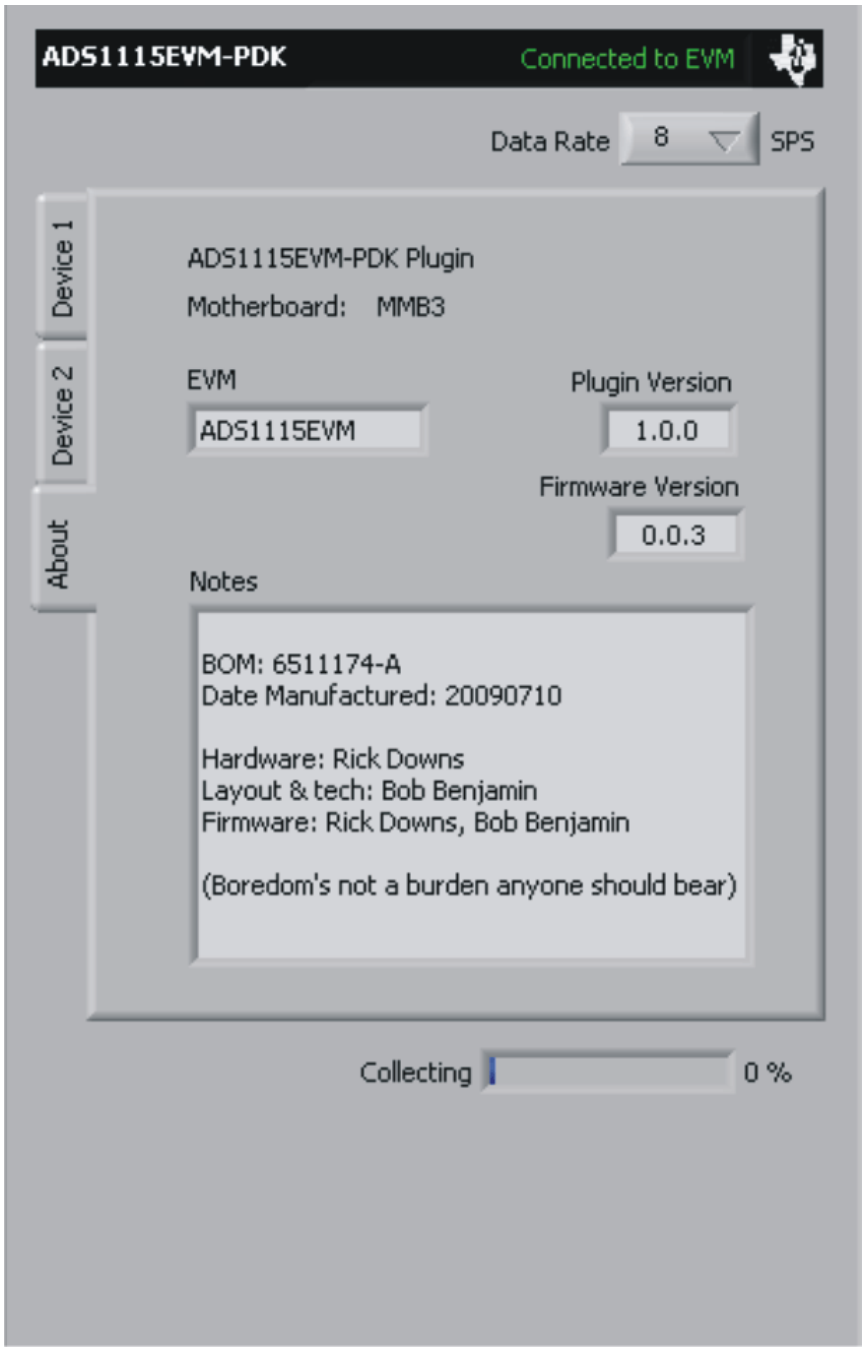


Figure 14. About Tab

The **Plugin Version** and **Firmware Version** indicators show the version numbers of the plug-in and firmware code, respectively.

The **Notes** indicator will show 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 there are any.

Copyright © 2009–2011, Texas Instruments Incorporated

7.1.5 Collecting Data

Once you have configured the ADS1115 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 ADS1115EVM-PDK plug-in disables all the front panel controls while acquiring, and displays a progress bar as shown in Figure 15.

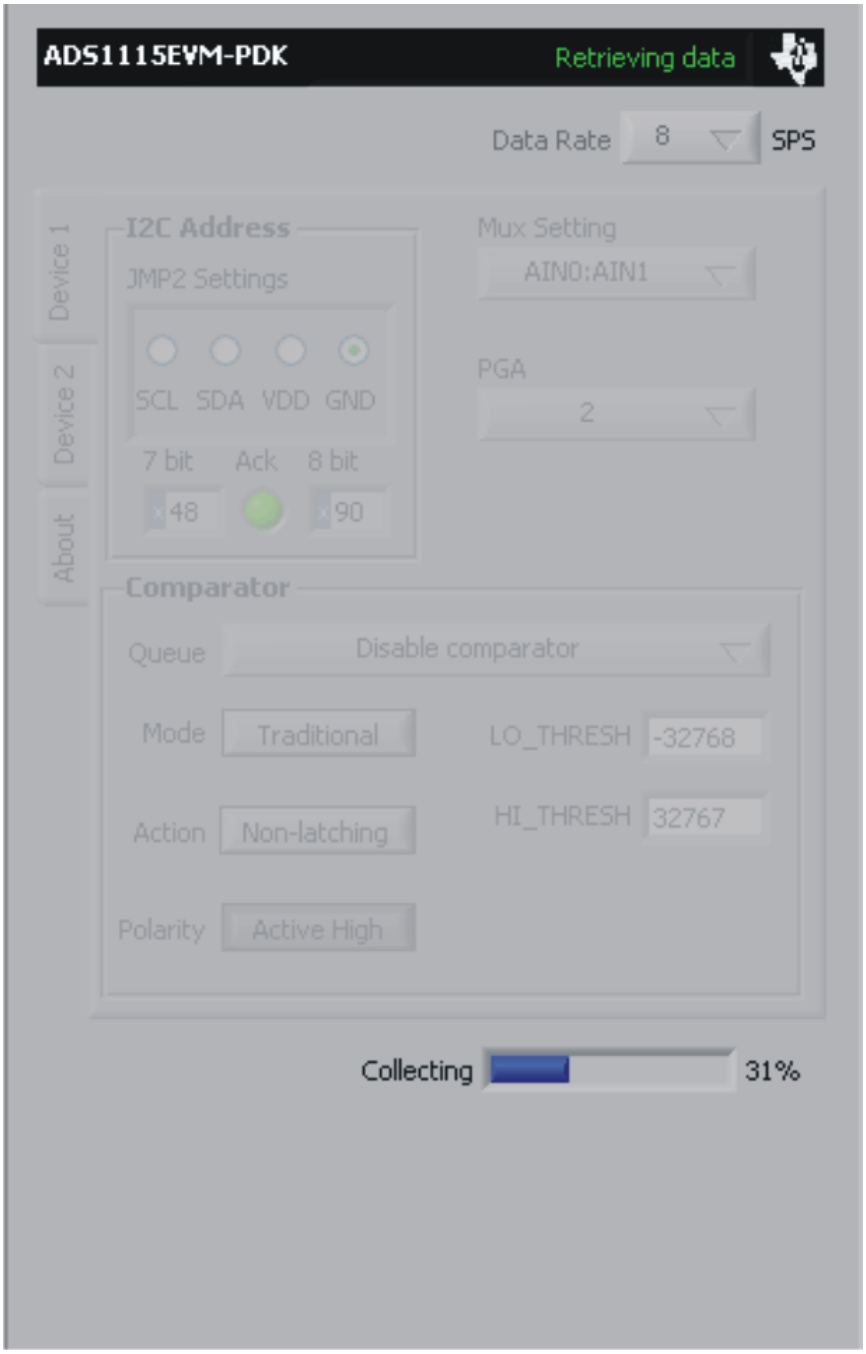


Figure 15. Progress Bar While Collecting Data

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

Copyright © 2009–2011, Texas Instruments Incorporated

7.2 Troubleshooting

- If the ADS1115EVM plug-in cannot find the ADS1115EVM-PDK, press the USB RESET button on the MMB3 (refer to Figure 4) and try again.
- If the MMB3 board is unable to be detected, there may be conflicting settings for the COM port assignments on your PC that requires manual configuration.
  1. Open the **Device Manager** application under Windows. You should observe an item entitled *USB-Serial Port* under the *Ports (COM&LPT)* menu.
  2. If the *USB - Serial Port* is configured to use a COM port already in use, you can either disable the current use for the port OR configure the *USB-Serial Port* as a COM port that is not used. To do this:
     (a) Select the COM port item and right-click to access the **Properties** menu.
     (b) In the properties, select the *Port Settings* tab.
     (c) Select the *Advanced* button.
     (d) Select the desired COM port setting from the *COM Port Number* control. This control will note if the COM port is in use or open.
  3. Press the USB RESET button on the MMB3 to reconnect.
- If ADCPro stops responding while the ADS1115EVM-PDK is connected, try unplugging the USB cable from the PDK. Unload and reload the plug-in before reapplying power to the PDK.

8 Schematics and Layout

Schematics for the ADS1015EVM and ADS1115EVM are appended to this user's guide. The bill of materials is provided in Table 6.

Copyright © 2009–2011, Texas Instruments Incorporated

8.1 Bill of Materials

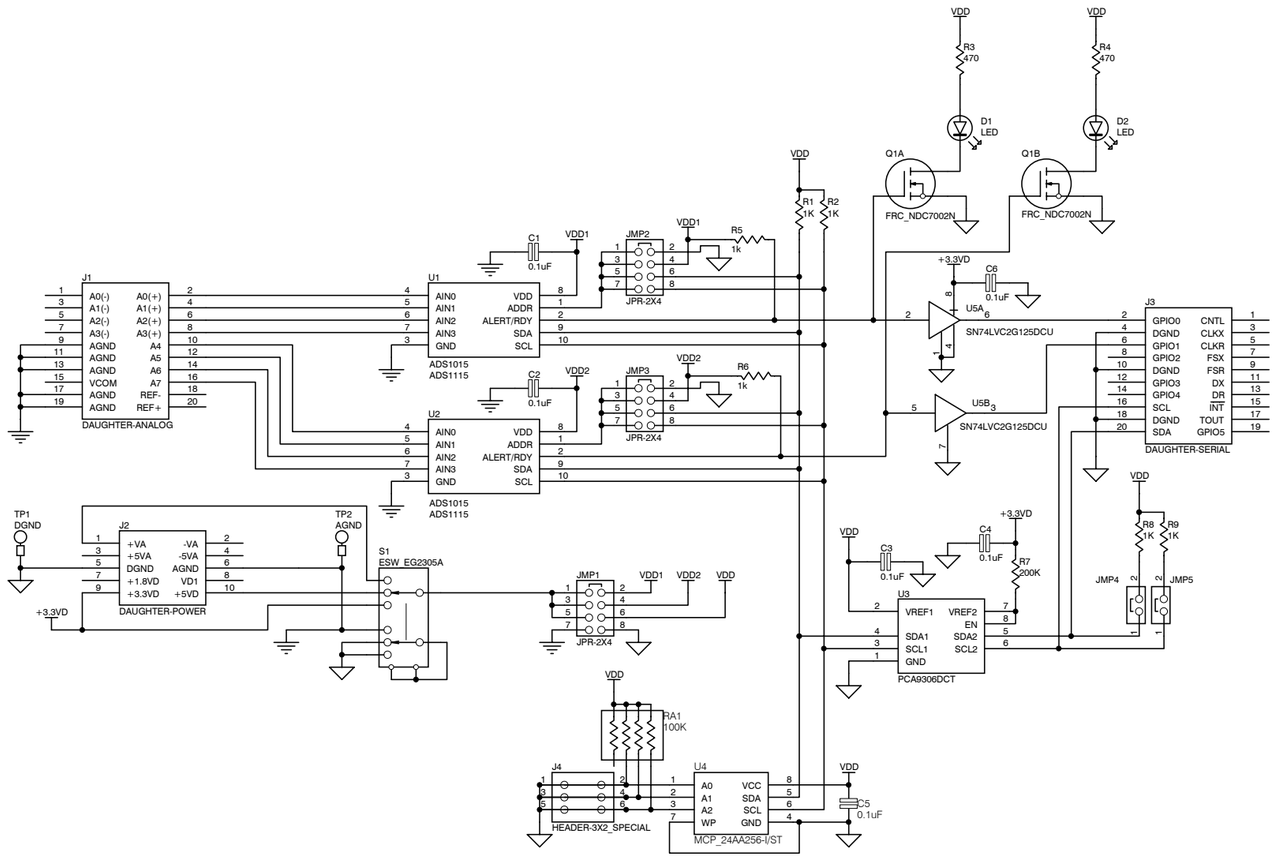
NOTE: All components should be compliant with the European Union Restriction on Use of Hazardous Substances (RoHS) Directive. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS-compliant. (For more information about TI's position on RoHS compliance, see the TI web site.)

Table 6. ADS1015EVM/ADS1115EVM Bill of Materials

Item No.	Qty	Value	Ref Des	Description	Vendor	Part Number
1	1		N/A	ADS1015/1115 EVM PWB	Texas Instruments	6511174
2	6	0.1µF	C1, C2, C3, C4, C5, C6	16V Ceramic Chip Capacitor X7R	Panasonic	ECJ-1VB1C104K
3	2		D1, D2	LED, Red, 0805	Lumex	SML-LXT0805IW-TR
4	2		J1A, J3A	20-pin SMT Plug	Samtec	TSM-110-01-L-DV-P
5	2		J1B, J3B	20-pin SMT Socket	Samtec	SSW-110-22-F-D-VS-K
6	1		J2A	10-pin SMT Plug	Samtec	TSM-105-01-L-DV-P
7	1		J2B	10-pin SMT Socket	Samtec	SSW-105-22-F-D-VS-K
8	0		J4	Header Strip, 6-pin ( )		
9	3		JMP1, JMP2, JMP3	Header Strip, 8-pin ( )	Samtec	TSW-104-07-L-D
10	2		JMP4, JMP5	Header Strip, 2-pin ( )	Samtec	TSW-102-07-L-S
11	1		Q1	N-Channel Enhancement MOSFET	Fairchild	NDC7002N
12	2	470	R3, R4	1/10 W, Chip Resistor, ±5% 0603	Panasonic	ERJ-3GEYJ471V
13	6	1kΩ	R1, R2, R5, R6, R8, R9	1/10 W, Chip Resistor, ±5%, 0603	Panasonic	ERJ-3GEYJ102V
14	1	200kΩ	R7	1/10 W, Chip Resistor, ±5%, 0603	Panasonic	ERJ-3GEYJ204V
15	0		RA1	Resistor, Chip Array Four Independent Bus 100kΩ, 5%, 1/16W, SMD		
16	1		S1	DP3T Slide Switch	E-Switch	EG2305A
17	2		TP1,TP2	PCB Test Point, Large Loop, Through-Hole	Keystone Electronics	5011
18	2		U1,U2	Analog-Digital Converter	Texas Instruments	ADS1115IRUG—ADS1115 EVM ADS1015IRUG—ADS1015 EVM
19	1		U3	I^2C Bus Level Shifter	Texas Instruments	PCA9306DCT
20	1		U4	EEPROM, 1.8V, 256K	Microchip	24AA256-I/ST
21	1		U5	Dual Gate Buffer, 3-state	Texas Instruments	SN74LVC2G125DCU
22	8		N/A	Shorting Blocks	Samtec	SNT-100-BK-G-H

Copyright © 2009–2011, Texas Instruments Incorporated

REVISION HISTORY		
REV	ENGINEERING CHANGE NUMBER	APPROVED



ENGINEER	**RICK DOWNS**
DRAWN BY	**BOB BENJAMIN**
DOCUMENT CONTROL NO.	**6511174**
SHEET	**1** OF **1**
FILE	

TEXAS INSTRUMENTS

PRECISION ANALOG PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP

5411 EAST WILLIAMS BOULEVARD, TUCSON, AZ 85711 USA

TITLE
ADS1015EVM
ADS1115EVM

SIZE	DATE	REV
B	**6-Jul-2009**	**A**

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 2V to +5.5V and the output voltage range of 2V to +5.5V.

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 +40°C. The EVM is designed to operate properly with certain components above +40°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