User's Guide
SLAU609A–November 2014–Revised September 2016

AMC7836 Evaluation Module

This user's guide describes the characteristics, operation, and use of the AMC7836 evaluation boards (EVMs). This user's guide also discusses the proper setup and configuration of software and hardware, and reviews various aspects of program operation. A complete circuit description, schematic diagram, and bill of materials (BOM) are also included.

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1 Overview

This EVM features the AMC7836 device, a highly integrated, low-power, complete analog monitoring and control solution that includes a 21-channel (12-bit) ADC, 16-channel (12-bit) DAC, eight general-purpose I/Os (GPIO), and a local temperature sensor. The DACs include a flexible output range that allows the device to be fully compatible with a large array of biasing technologies, such as LDMOS, GaAs, and GaN. The devices also feature programmable out-of-range alarms, an internal reference, and a low power SPI-compatible serial interface.

1.1 AMC7836EVM Kit Contents

Table 1 details the contents of the EVM kit. Contact the TI Product Information Center nearest you if any component is missing. TI highly recommends verifying you have the latest versions of the related software at the TI website, www.ti.com.

Table 1. Contents of AMC7836EVM Kit(1)

Item	Quantity
AMC7836EVM PCB Evaluation Board	1
SDM-USB-DIG Platform PCB	1
USB Extender Cable	1

(1) The 24-V wall adapter is not included with the evaluation module (EVM). Optionally, a 24-V (750-mA) center-positive wall adapter can be separately purchased to interface to the onboard 2.1 × 5.5-mm DC jack. In the case that a wall adapter is not available, external terminal blocks are included, which can interface with external supplies.

1.2 Related Documentation from TI

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the AMC7836EVM. This user's guide is available from the TI web site under literature number SLAU609. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site at http://www.ti.com/, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number

Table 2. Related Documentation

Document	Literature Number
AMC7836 Product Data Sheet	SLAS986
SDM-USB-DIG Platform User's Guide	SBOU136

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2 AMC7836EVM Hardware Setup

This section provides the overall system setup for the EVM. A personal computer (PC) runs software that communicates with the SDM-USB-DIG platform, which generates the power and digital signals used to communicate with the EVM board. The EVM includes a +24-V wall supply that provides power to on-board power regulators (LDOs), which regulate the analog and digital supplies. Connectors are also included on the EVM board for optional, external power supplies. Figure 1 displays the system setup for the AMC7836EVM.

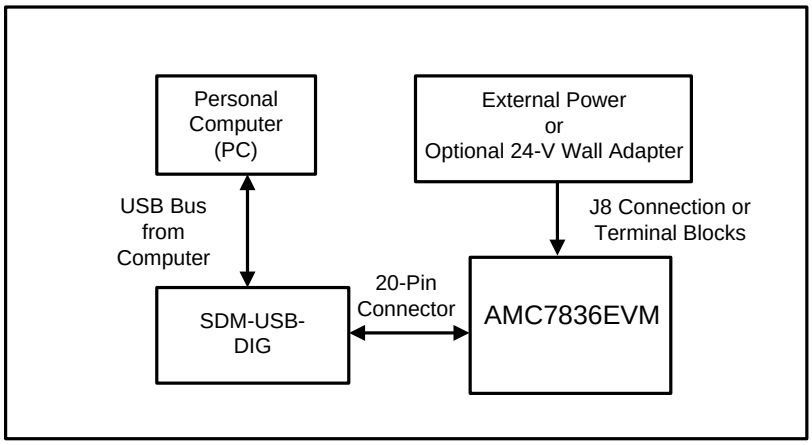


Figure 1. AMC7836EVM Hardware Setup

2.1 Theory of Operation for AMC7836 Hardware

A block diagram of the AMC7836EVM test board is displayed in Figure 2. The EVM board provides test points and connections for the supplies, internal reference, ground connections, SPI inputs, ADC inputs, and analog outputs of the DAC.

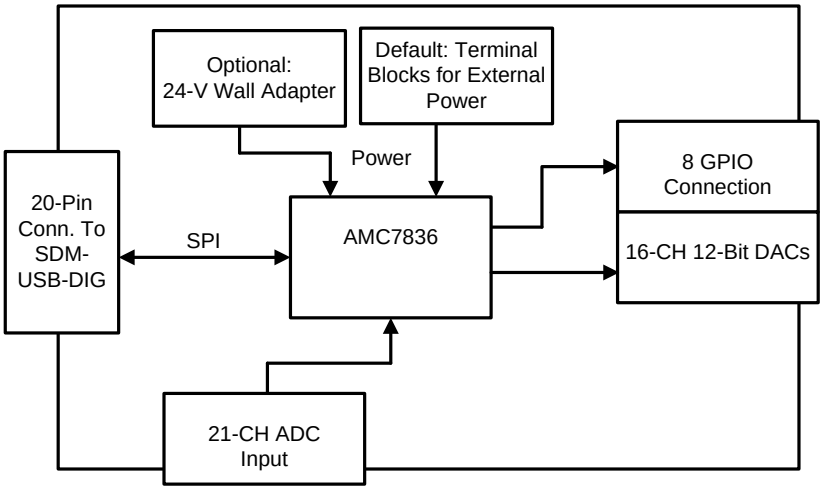


Figure 2. AMC7836 Test Board Block Diagram

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2.2 Signal Definitions of J7 (20-Pin Male Connector Socket)

The AMC7836EVM includes a 20-pin connector socket used to communicate between the EVM and the SDM-USB-DIG platform. The pin out of the J7 connector is shown in Table 3.

Table 3. J7 Signal Definition

Pin on J7	Signal	Description
1	SCL	I^2C clock signal (SCL)
2	DIG_GPIO2	GPIO – control output or measure input
3	DIG_GPIO0	GPIO – control output or measure input
4	DIG_GPIO3	GPIO – control output or measure input
5	SDA	I^2C data signal (SDA)
6	DIG_GPIO4	GPIO – control output or measure input
7	DIG_GPIO1	GPIO – Control Output or Measure Input
8	DIG_GPIO5	GPIO – control output or measure input
9	MOSI	SPI data output (MOSI)
10	DIG_GPIO6	GPIO – control output or measure input
11	VDUT	Switchable DUT power supply: +3.3 V, +5 V, Hi-Z (disconnected). **Note:** When VDUT is Hi-Z all digital I/O are Hi-Z as well.
12	DIG_GPIO7	GPIO – control output or measure input
13	SCLK	SPI clock signal (SCLK)
14	DIG_GPIO8	GPIO – control output or measure input
15	GND	Power return (GND)
16	DIG_GPIO9	GPIO – control output or measure input
17	CS	SPI chip select signal ($\overline{CS}$)
18	DIG_GPIO10	GPIO – control output or measure input
19	MISO	SPI data input (MISO)
20	DIG_GPIO11	GPIO – control output or measure input

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2.3 Theory of Operation for SDM-USB-DIG Platform

The SDM-USB-DIG platform is a general-purpose data acquisition system that is used on select TI EVMs.

The core component of the platform is the MSP430F5528, an ultra-low power 16-bit MCU. The microcontroller receives information from the host PC and translates it into I^2C, SPI, or other digital I/O patterns. The connected device (in this case, the AMC7836 device) connects to the I/O interface of the platform. During digital I/O transactions, the platform obtains information from the AMC7836 device and sends to the host PC for interpretation. A block diagram of the platform is shown in Figure 3.

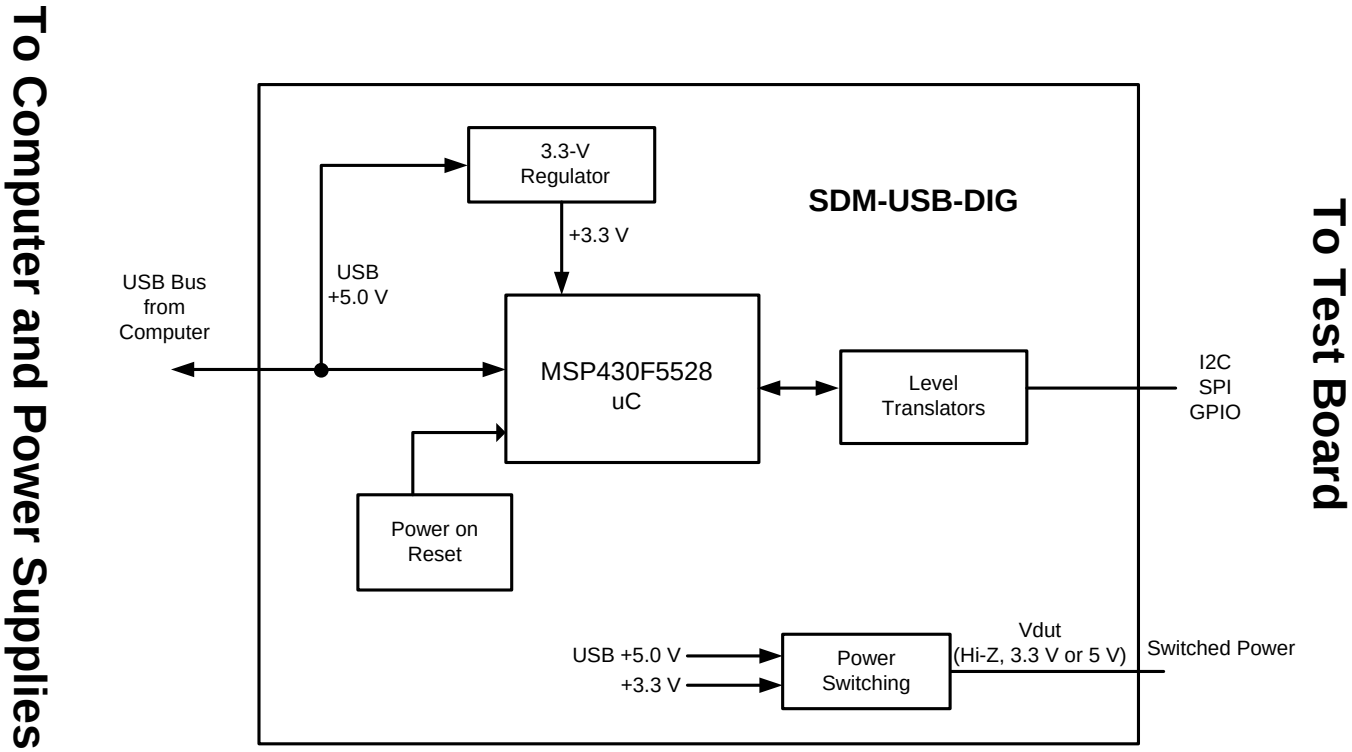


Figure 3. SDM-USB-DIG Platform Block Diagram

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3 AMC7836EVM Software Setup

This section provides the procedure for EVM software installation.

3.1 Operating Systems for AMC7836EVM Software

The EVM software was tested on the Microsoft® Windows® XP and Windows 7 operating systems with the United States and European regional settings. The software should also be compatible with other Windows operating systems.

3.2 AMC7836EVM Software Installation

The software is available through the EVM product folder on the TI website. After the software is downloaded on the PC, navigate to the AMC7836EVM_Installer folder, and run the setup.exe file, as shown in Figure 4. When the software is launched, an installation dialog opens and prompts the user to select an installation directory. If left unchanged, the software location defaults to C:\Program Files (x86)\AMC7836EVM. The software installation automatically copies the required drivers for the SDM-USB-DIG and AMC7836EVM to the PC. After the software is installed, connecting the SDM-USB-DIG to a USB port may launch a driver installation dialog. Choose the *'Install this driver software anyway'* option to continue with installation. (Note: On Windows XP machines, choose to have the system automatically find the driver or software.)

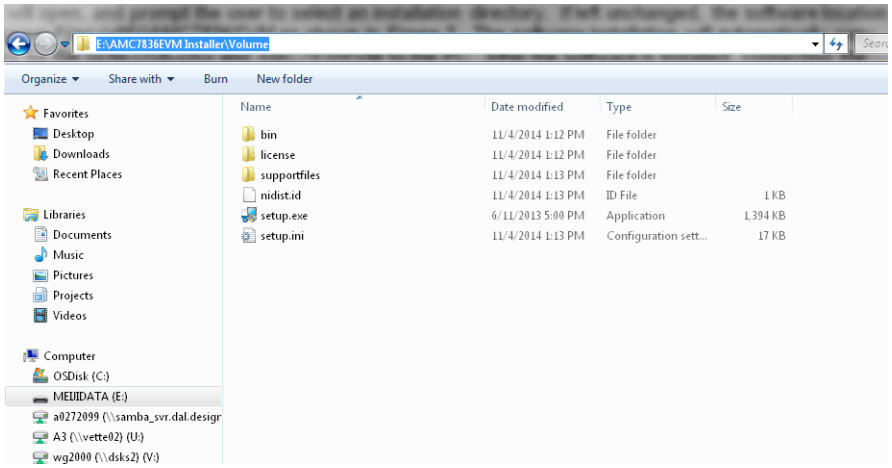


Figure 4. AMC7836EVM Installer Directory

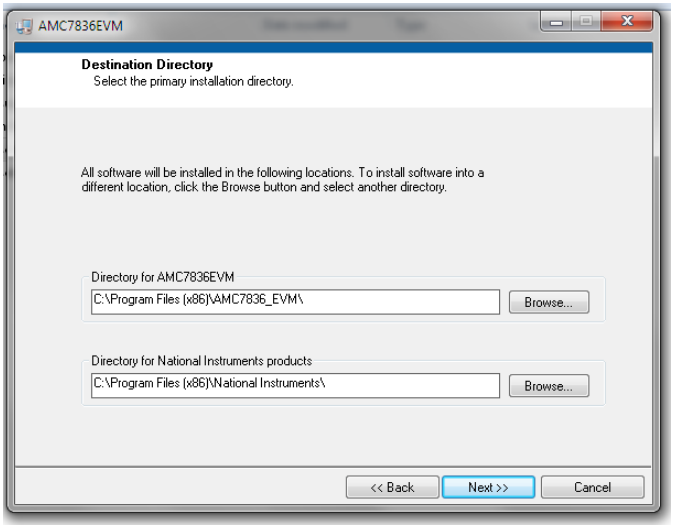


Figure 5. AMC7836EVM Install Path

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4 AMC7836EVM Hardware Overview

The subsequent sections provide detailed information on the EVM hardware, and jumper configuration settings. To use the +24V wall supply and onboard supplies, connect the jumpers to their default configurations, which are located in Table 4. Connect the USB extender cable from the SDM-USB-DIG to the PC, and the +24-V wall adapter to the J8 terminal.

Table 4. Default Jumper Settings

Jumper	Position	Description
JP1	1-2	Shunting JP1 to this position connects the AVCC supply for the AMC7836 to the +12V supply provided on board.
	2-3	Shunting JP1 to this position connects the AVCC supply for the AMC7836 to the +5V supply provided on board.
JP2	1-2	Shunting JP2 to this position connects the AVEE/AVSSA supply for the AMC7836 to the-12V supply provided on board.
	2-3	Shunting JP2 to this position connects the AVEE/AVSSA supply for the AMC7836 to GND provided on board.
JP3	1-2	Shunting JP3 to this position connects the AVSSB pin to AVEE/AVSSA supply.
	2-3	Shunting JP3 to this position connects the AVSSB pin to GND.
JP4	1-2	Shunting JP4 to this position connects the AVSSC pin to AVEE/AVSSA supply.
	2-3	Shunting JP4 to this position connects the AVSSC pin to GND.
JP5	1-2	Shunting JP5 to this position connects the AVSSD pin to AVEE/AVSSA supply.
	2-3	Shunting JP5 to this position connects the AVSSD pin to GND.
JP6	1-2	Shunting JP6 to this position connects the AVDD and DVDD supplies for the AMC7836 to the external connector J10.
	2-3	Shunting JP6 to this position connects the AVDD and DVDD supplies for the AMC7836 to the 5V supply provided on board.
JP7	1-2	Shunting JP7 to this position connects the IOVDD supply for the AMC7836 to the +3.3V supply provided by the SDM-USB-DIG.
	2-3	Shunting JP7 to this position connects the IOVDD supply for the AMC7836 to the external connector J9.

4.1 Electrostatic Discharge Warning

Many of the components on the AMC7836EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

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4.2 Connecting the Hardware

To connect the SDM-USB-DIG to the EVM board, align and firmly connect the female and male ends of the 20-pin connectors (see Figure 6). Verify the connection is snug, as loose connections may cause intermittent operation.

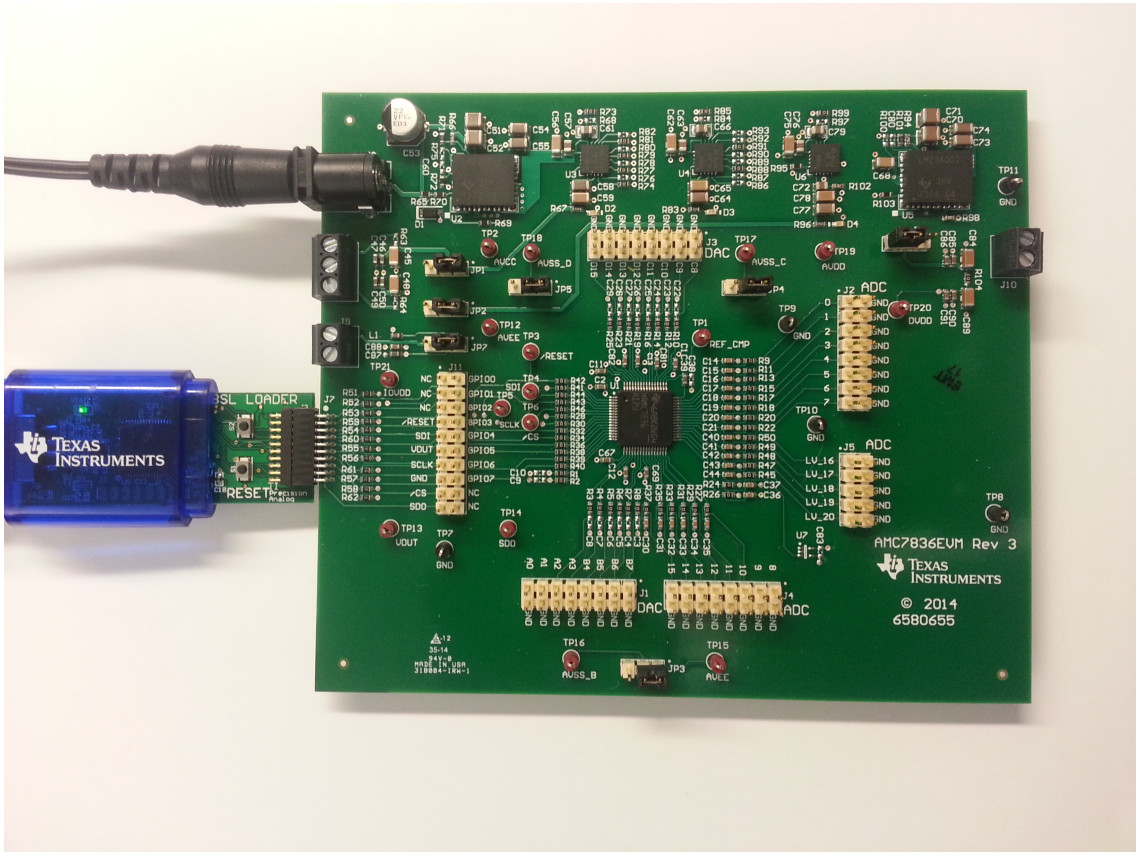


Figure 6. Typical Hardware Connections on the AMC7836EVM

4.3 Connecting the USB Cable to the SDM-DIG

Figure 7 shows the typical response when connecting the SDM-USB-DIG platform to a USB port of a personal computer (PC) for the first time. The PC usually responds with a Found New Hardware, USB Device pop-up dialog window. The pop-up window then changes to *Found New Hardware*, *Virtual COM Port (CDC)*. This pop-up indicates that the device is ready for use. The CDC driver is used for communication between the SDM-USB-DIG and PC.

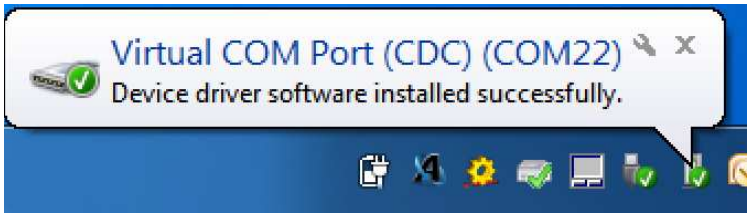


Figure 7. Confirmation of SDM-USB-DIG Platform Driver Installation

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4.4 AMC7836EVM Power Configurations

This section describes the various power configurations that can be used by the EVM.

The AMC7836EVM provides terminal blocks for external supplies as well as (optional) onboard power conditioning to convert a 24-V supply into a +12-V, –12-V, and +5-V supply. Jumpers JP1, JP2, JP6, and JP7 allow the AVCC, AVEE, AVDD, and IOVDD pins to be configured to use these onboard supplies, or external supplies through the J6, J9, and J10 terminal blocks. These connection schemes are displayed in Table 5.

Table 5. AMC7836EVM Jumper Settings

Jumper	Position	Description
JP1	1-2	Shunting JP1 to this position connects the AVCC supply for the AMC7836 to the +12-V supply provided on board.
	2-3	Shunting JP1 to this position connects the AVCC supply for the AMC7836 to the +5-V supply provided on board.
JP2	1-2	Shunting JP2 to this position connects the AVEE/AVSSA supply for the AMC7836 to the -12-V supply provided on board.
	2-3	Shunting JP2 to this position connects the AVEE/AVSSA supply for the AMC7836 to GND provided on board.
JP6	1-2	Shunting JP6 to this position connects the AVDD and DVDD supplies for the AMC7836 to the external connector J10.
	2-3	Shunting JP6 to this position connects the AVDD and DVDD supplies for the AMC7836 to the 5-V supply provided on board.
JP7	1-2	Shunting JP7 to this position connects the IOVDD supply for the AMC7836 to the +3.3-V supply provided by the SDM-USB-DIG.
	2-3	Shunting JP7 to this position connects the IOVDD supply for the AMC7836 to the external connector J9.

4.5 ADC Signal Pins

The AMC7836 device contains 21 ADC single-ended channels, sixteen of which have bipolar inputs (ADC0–ADC15) and have an input range of *–10 V to 10 V*. The unipolar inputs, (ADC16–ADC20), have a range of *0 V to 5 V*. These signal pins are connected to the J2, J4, and J5 connectors, which are described in Table 6.

Table 6. AMC7836EVM ADC Signal Connections

Name	Connector	Description
ADC0	J2-1	ADC channel 0 input
ADC1	J2-3	ADC channel 1 input
ADC2	J2-5	ADC channel 2 input
ADC3	J2-7	ADC channel 3 input
ADC4	J2-9	ADC channel 4 input
ADC5	J2-11	ADC channel 5 input
ADC6	J2-13	ADC channel 6 input
ADC7	J2-15	ADC channel 7 input
ADC8	J4-1	ADC channel 8 input
ADC9	J4-3	ADC channel 9 input
ADC10	J4-5	ADC channel 10 input
ADC11	J4-7	ADC channel 11 input
ADC12	J4-9	ADC channel 12 input
ADC13	J4-11	ADC channel 13 input
ADC14	J4-13	ADC channel 14 input
ADC15	J4-15	ADC channel 15 input
LV ADC16	J5-1	ADC channel 16 input
LV ADC17	J5-3	ADC channel 17 input

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Table 6. AMC7836EVM ADC Signal Connections (continued)

Name	Connector	Description
LV ADC18	J5-5	ADC channel 18 input
LV ADC19	J5-7	ADC channel 19 input
LV ADC20	J5-9	ADC channel 20 input

4.6 DAC Signal Pins

The sixteen DAC voltage outputs of the AMC7836 device are accessible through the J1, and J3 connectors, as shown in Table 7. The DAC voltage ranges are configurable through software and hardware. Table 8 describes the selectable voltage ranges and jumper configurations for JP3, JP4, and JP5.

Table 7. AMC7836EVM DAC Signal Connections

Name	Connector	Description
DAC A0	J1-15	DAC-A0 output
DAC A1	J1-13	DAC-A1 output
DAC A2	J1-11	DAC-A2 output
DAC A3	J1-9	DAC-A3 output
DAC B4	J1-7	DAC-B4 output
DAC B5	J1-5	DAC-B5 output
DAC B6	J1-3	DAC-B6 output
DAC B7	J1-1	DAC-B7 output
DAC C8	J3-2	DAC-C8 output
DAC C9	J3-4	DAC-C9 output
DAC C10	J3-6	DAC-C10 output
DAC C11	J3-8	DAC-C11 output
DAC D12	J3-10	DAC-D12 output
DAC D13	J3-12	DAC-D13 output
DAC D14	J3-14	DAC-D14 output
DAC D15	J3-16	DAC-D15 output

Table 8. AMC7836EVM DAC Range Connections

Jumper	Position	Description
JP3	1-2	Shunting *JP3* to this position connects the AVSSB pin to AVEE/AVSSA supply.
	2-3	Shunting *JP3* to this position connects the AVSSB pin to GND.
JP4	1-2	Shunting *JP4* to this position connects the AVSSC pin to AVEE/AVSSA supply.
	2-3	Shunting *JP4* to this position connects the AVSSC pin to GND.
JP5	1-2	Shunting *JP5* to this position connects the AVSSD pin to AVEE/AVSSA supply.
	2-3	Shunting *JP5* to this position connects the AVSSD pin to GND.

The full-scale output range for each DAC group is limited by the power supplies AVCC and its corresponding AVSS. The DAC outputs cannot exceed AVCC or be lower than AVSS.

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It is important to note that DAC group A shares a dual functionality, both as the AVEE pin and output range for DAC group A. AVEE is also the lowest potential of the device, therefore, the other AVSS pins should not go below the voltage set on the AVEE pin. A complete description of the different DAC Group configurations is listed in Table 9.

Table 9. AMC7836 DAC Group Configuration

DAC Group	DACs	Auto-Range and Clamp Voltage Selection	AVEE = GND		AVEE = -12 V	
			Valid Output Range	Valid Clamp Voltage Connection	Valid Output Range	Valid Clamp Voltage Connection
A	DAC_A0 DAC_A1 DAC_A2 DAC_A3	AVEE			-5-V or -10-V	-12-V
			+5-V or +10-V	GND		
B	DAC_B4 DAC_B5 DAC_B6 DAC_B7	AVSSB			-5-V or -10-V	-12-V
			+5-V or +10-V	GND	+5-V or +10-V	GND
C	DAC_C8 DAC_C9 DAC_C10 DAC_C11	AVSSC			-5-V or -10-V	-12-V
			+5-V or +10-V	GND	+5-V or +10-V	GND
D	DAC_D12 DAC_D13 DAC_D14 DAC_D15	AVSSD			-5-V or -10-V	-12-V
			+5-V or +10-V	GND	+5-V or +10-V	GND

4.7 GPIO Signal Pins

The eight GPIO signals on the EVM can be measured on the J11 header. A signal description of the J11 header is provided in Table 10.

Table 10. AMC7836EVM GPIO Signal Definition

Name	Connector	Description
GPIO0	J11-2	General-purpose I/O (GPIO0)
GPIO1	J11-4	General-purpose I/O (GPIO1)
GPIO2	J11-6	General-purpose I/O (GPIO2)
GPIO3	J11-8	General-purpose I/O (GPIO3)
GPIO4	J11-10	General-purpose I/O (GPIO4)
GPIO5	J11-12	General-purpose I/O (GPIO5)
GPIO6	J11-14	General-purpose I/O (GPIO6)
GPIO7	J11-16	General-purpose I/O (GPIO7)

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5 AMC7836EVM Software Overview

This section discusses how to use the AMC7836EVM software.

5.1 Starting the AMC7836EVM Software

Once the hardware connections are established and jumper settings configured, launch the software located in the AMC7836EVM folder of the Start *All Programs* menu, and select the *AMC7836EVM* icon.

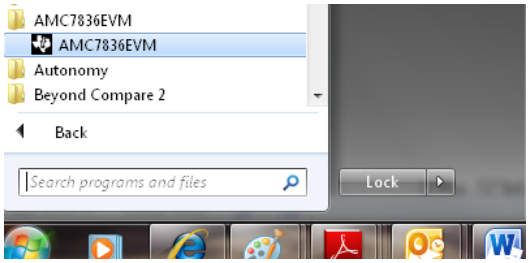


Figure 8. AMC7836EVM GUI Location

If the SDM-USB-DIG is properly connected to the AMC7836EVM, the GUI should automatically power on the system and display *CONNECTED: Power On* in the upper right of the GUI, as seen in Figure 9.

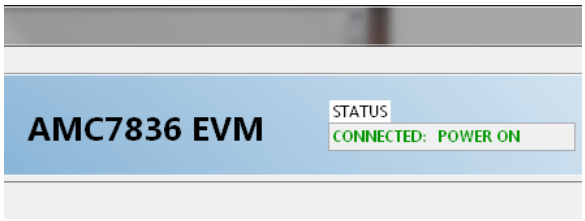


Figure 9. AMC7836EVM GUI – Power On

If the SDM-USB-DIG has a faulty connection, or is not connected at all, the GUI will launch in simulation mode. In simulation mode, *NOT CONNECTED: Simulating* will be displayed in the top right of the GUI. If this text appears while the SDM-USB-DIG device is connected, then unplug the SDM-USB-DIG and close the GUI. Reconnect the SDM-USB-DIG, and ensure that the connectors are correctly aligned. After this, verify the USB extender cable is properly connected to both the SDM-USB-DIG and PC, and re-launch the GUI. This issue can also occur if the CDC driver is installed incorrectly, and so the AMC7836EVM software may need to be reinstalled.

5.2 AMC7836EVM Software Features

The following subsections describe the functionality of each page of the AMC7836EVM GUI.

5.2.1 Software Reset

The AMC7836 *Software Reset* button, shown in Figure 10, resets the AMC7836 device and resets all registers to their default setting.

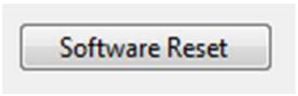


Figure 10. Software Reset

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5.2.2 AMC7836EVM Low Level Configuration Page

The AMC7836EVM features a *Register Map* page that allows access to low-level communication by directly writing to and reading from the AMC7836's registers. Selecting a register on the Register Map list will present a description of the values in that register, and also display information such as the register's address, default value, size, and current value. The register values can be modified through the Hex *Write Register* field, or set through Boolean check boxes under the *Register Data* column, as displayed in Figure 11.

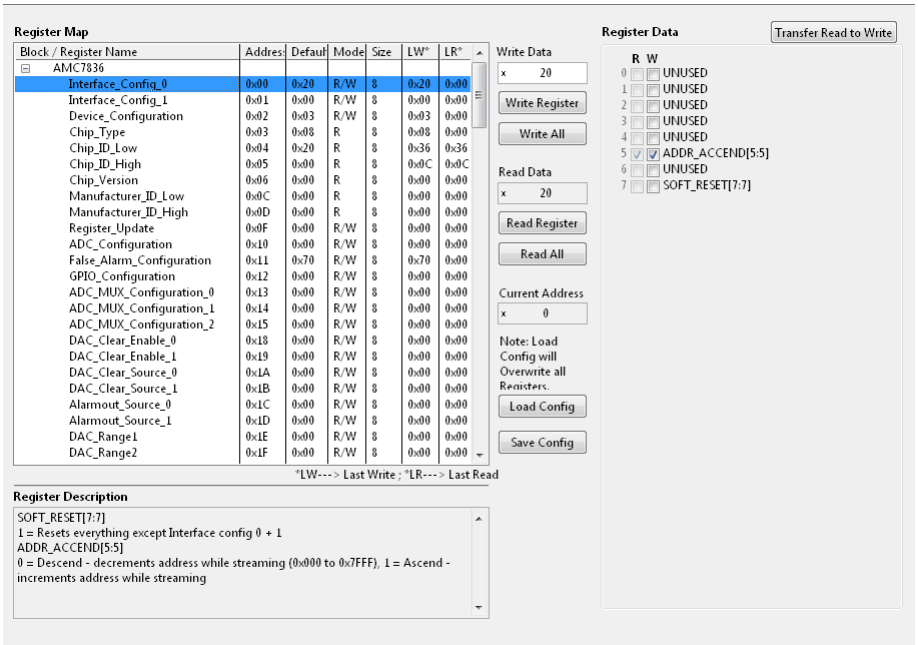


Figure 11. Low Level Configuration Page

This page also provides the option of saving the Register Map settings as a configuration file, which is done by pressing the *Save Config* button. Additionally, the configuration files can be accessed through the *Load Config* button.

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5.2.3 AMC7836EVM ADC Page

This page provides insight into the functionality of the AMC7836's (21) channel 12-bit ADC. The ADC block includes sixteen bipolar ADC channels featuring a –10- to 10-V input range, and five low voltage unipolar analog channels that accept a 0- to 5-V range. The channels with the twenty volt range are labeled as (*ADC0–ADC15*), while channels with five volt ranges are printed as (*LV_ADC16–LV_ADC20*). Figure 12 displays the ADC Page.

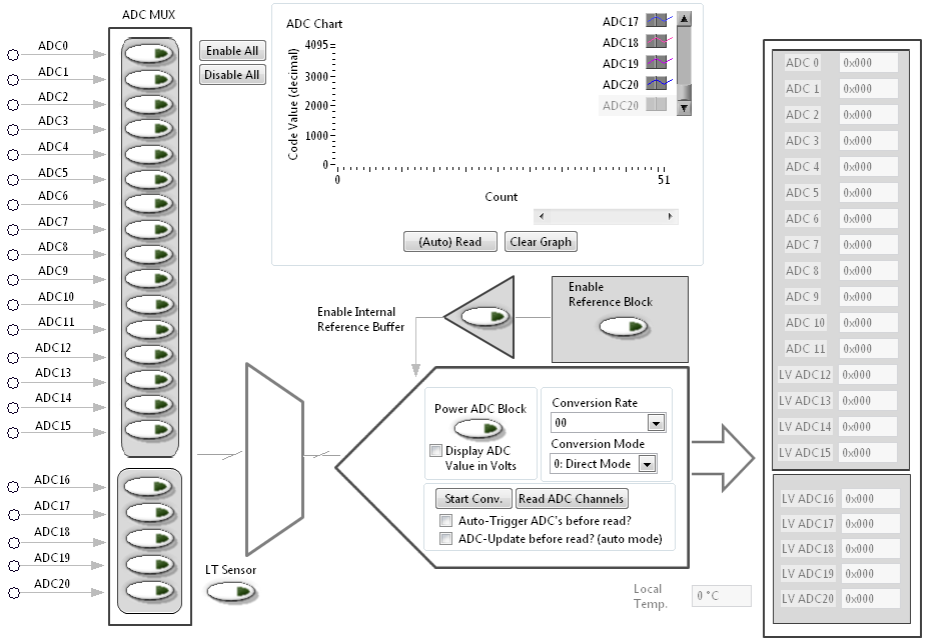


Figure 12. ADC Page

To completely activate the ADC block, the *Enable Reference Block* must be enabled, along with the *Enable Internal Reference Buffer* and *Power ADC Block*. This sequence is shown in Figure 13.

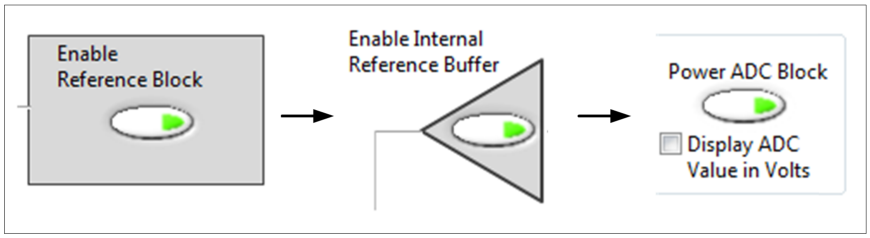


Figure 13. ADC Block Activation Sequence

Once the device is configured, individual channels can be enabled by selecting their respective *ADC MUX* button, as shown in Figure 14.



Figure 14. ADC Channel MUX

The conversion mode can be set to either *Auto* or *Direct* mode.

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If choosing *Direct* Mode, a *Start Conv* is required to update every new read. In Direct Mode, the analog inputs enabled in the ADC MUX register are converted sequentially one time. Conversions are triggered by pressing the *Start Conv* button or can be automatically triggered before every read by enabling the *Auto-Trigger ADC's before read?* check box. The ADC data registers, displayed on the right side of the GUI, are updated with the converted results when the *Read* button is pressed. These controls are located in Figure 15.

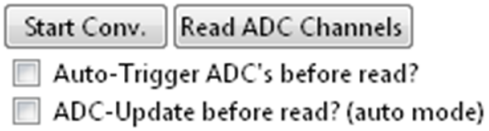


Figure 15. ADC Channel MUX

If choosing *Auto* Mode, ensure that the *ADC-Update before read? (auto mode)* boolean field is checked and a *Start Conv* is issued to start the auto conversion process. The analog inputs that are enabled in the ADC MUX register are converted sequentially and repeatedly. When one set of conversion is complete, the ADC multiplexer returns to the first channel and repeats the process. The auto conversion process can be stopped by pressing the *Start Conv* button again.

Most of the controls listed within the ADC image are used to set up the ADC configuration register. These include the *Conversion Rate* and *Conversion Mode* parameters, which are selectable through their respective drop-down list. The selectable conversion rates are listed in Table 11.

Table 11. Conversion Rates

Conversion Rate	Throughput (ADC0–ADC11) (Single-Channel Auto Mode)	Throughput (LVADC12–LVADC16) (Single-Channel Auto Mode)
00	29 kSPS	87 kSPS
01	29 kSPS	43.5 kSPS
10	29 kSPS	29 kSPS
11	14.5 kSPS	14.5 kSPS

An ADC Chart is included in the ADC Page to keep a history of the contents of the data registers. This is displayed in Figure 16. Pressing the *(Auto) Read* button starts the ADC Chart to periodically read the ADC data registers. If in *Direct* Mode, the chart automatically issues a software conversion before every read. In *Auto* mode, the user must ensure that all input channels are enabled in the ADC MUX block and *Start Conv* button pressed before starting the *(Auto) Read*. The contents of the chart can be copied into Microsoft® Excel® by right clicking on the chart and selecting *Export Data to Excel*.

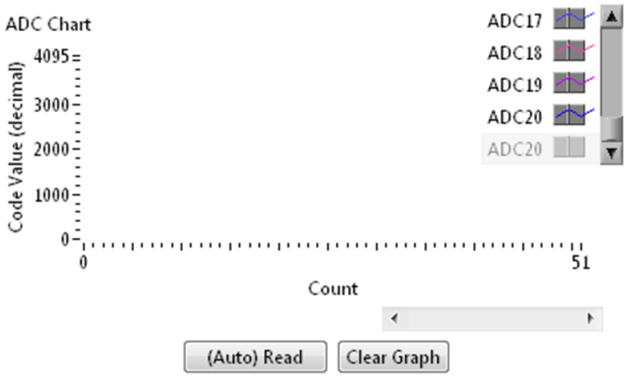


Figure 16. ADC Chart

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5.2.4 AMC7836EVM DAC Page

The DAC page gives the users an interface to observe and control the different data registers, modes, and configurations available for each individual DAC channel.

To fully activate the DAC block, the *Enable Reference Block* should be set. The DAC channels can be individually set by selecting their respective check box under the *Power DACs* column, as displayed in Figure 17.

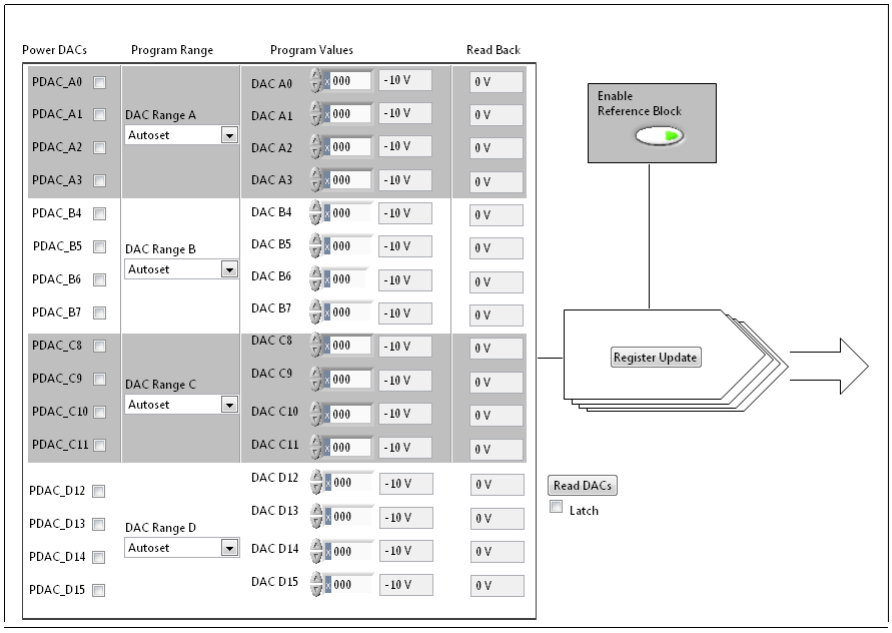


Figure 17. DAC Page

The sixteen DAC channels are broken up into different DAC banks, where each channel within a bank shares a common programmable voltage range, which is selectable through the Program Range column. The default *'Autoset'* range is automatically set at startup by the auto range detection circuit within the AMC7836 device. If the AVSS pin is connected to ground, the Autoset range will automatically configure the DAC for the 0- to 5-V range, while an AVSS value of –12 V would program the range for –10 V to 0 V. The different DAC ranges can be by set by configuring the appropriate jumpers and supplies listed in Table 8 and Table 9.

NOTE: Please ensure that the AMC7836EVM board is powered off before selecting different jumper positions.

The DAC Page includes one hexadecimal input field under the *Program Values* column, which is shown in Figure 18.

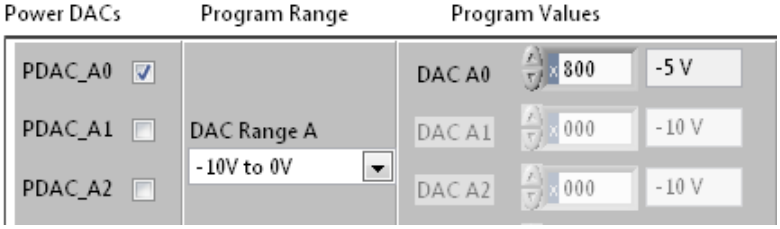


Figure 18. Program DAC Registers

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This window can be programmed with the desired DAC output voltage by writing the corresponding hexadecimal value. Once the hexadecimal value is entered, it is instantly written to the internal DAC *buffer* register, and the neighboring output voltage window will update. Pressing the *Register Update* button shifts the contents of the DAC *buffer* stage to the DAC *latch* stage, which then updates the DAC output voltage.

The *Read Back* column allows the user to read back the register contents of either the Latch or Buffer stage, which is selectable through the Boolean check box under the *Read DACs* button, as shown in Figure 19. The results are read back once the *Read DACs* button is pressed.

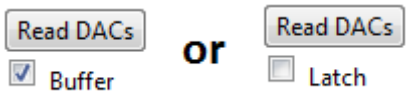


Figure 19. DAC Read

The AMC7836 ALARMS page gives the user access to the programmable out-of-range alarms for the internal temperature sensor and low-voltage ADC channels (ADC16–ADC20). Figure 20 displays the *ALARMS Page* of the AMC7836EVM. The page displays the name of each Alarm, shown under the Alarm Name column, and provides information such as the value, *High Limit*, *Low Limit*, and *Alarm Status*, along with other additional options.

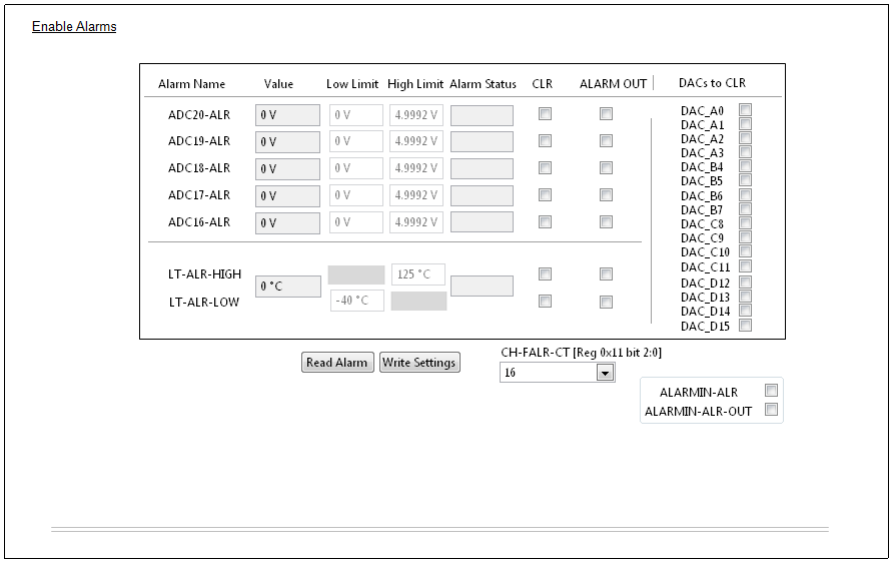


Figure 20. ALARMS Page

5.2.5 AMC7836EVM ALARMS Page

To use the page, the ADC channel or Temperature Sensor should be enabled in the ADCs page of the GUI. This is achieved by enabling the appropriate channel's mux. Once the channels are active, the *Low Limit* and *High Limit* fields will be available for edit (see Figure 21).

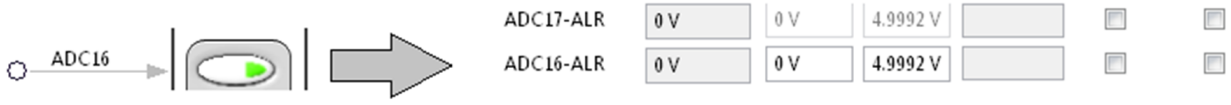


Figure 21. Enable Alarm for Configuration

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The *Write Settings* button is used to write the values from the *Low Limit* and *High Limit* fields into the device. The *Read Alarm* button is used to read the state of the active channels. When an alarm is triggered, the Alarm Status will display the text *Tripped* in red. If the channel values are within the range of the alarm thresholds, the status will display *No Alarm* in black text.

Figure 22 displays the False Alarm protection, CH-FALR-CT, drop-down list, which contains integer values that are related to the consecutive number of samples required for the alarm to activate. The lists defaults to 16 consecutive samples, and therefore requires 16 conversions with an over range value before the alarm is triggered.

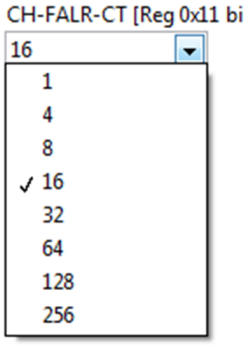


Figure 22. CH-FALR-CT Menu

The *CLR*, *ALARM OUT*, and *DACs to CLR* column, as shown in Figure 23, allow the user to tie DAC output behavior to alarm events. By selecting the *CLR* checkbox, the alarm events are able to force the DACs into a clear state, regardless of which DAC operation mode is active, auto or manual. The DAC channels to clear are selectable under the *DACs to CLR* column.

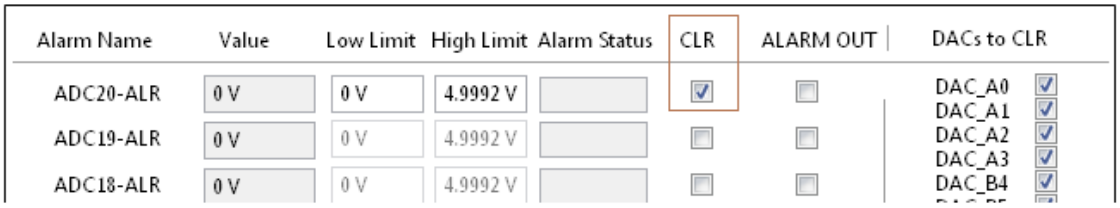


Figure 23. Clear DAC Options

The *ALARM OUT* checkbox allows the device to create an external signal on GPIO1 that goes low (active) when an alarm event is detected. The general-purpose I/O, more specifically GPIO1 must be configured for *ALARMOUT* for this function to take effect.

The *ALARMIN-ALR* checkbox gives the user the ability to clear the DACs with an active low input signal through GPIO0. Just as with GPIO1, GPIO0 must be configured for *ALARMIN* for this function to take effect.

The *ALARMIN-ALR-OUT* checkbox enables the propagation of alarm signals by allowing the user to input an active-low signal to the ALARMIN pin, which then creates an active low signal on the ALARMOUT pin. These functions need to be set in the GPIO configuration register, which is available for configuration in the GPIO page of the AMC7836EVM GUI.

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5.3 AMC7836EVM GPIO Page

The AMC7836 GPIO Page features the first four (*GPIO0–GPIO3*) general-purpose I/O of the AMC7836 device. These four GPIOs are also configurable for other specific functions, including the ability to externally trigger conversions, enable alarms, and provide an output indicating conversion completion. The GPIO page also provides a detailed description text box that gives more information about the different GPIO pins as the user hovers over the pull-down list under the *GPIO Block* column (see Figure 24).

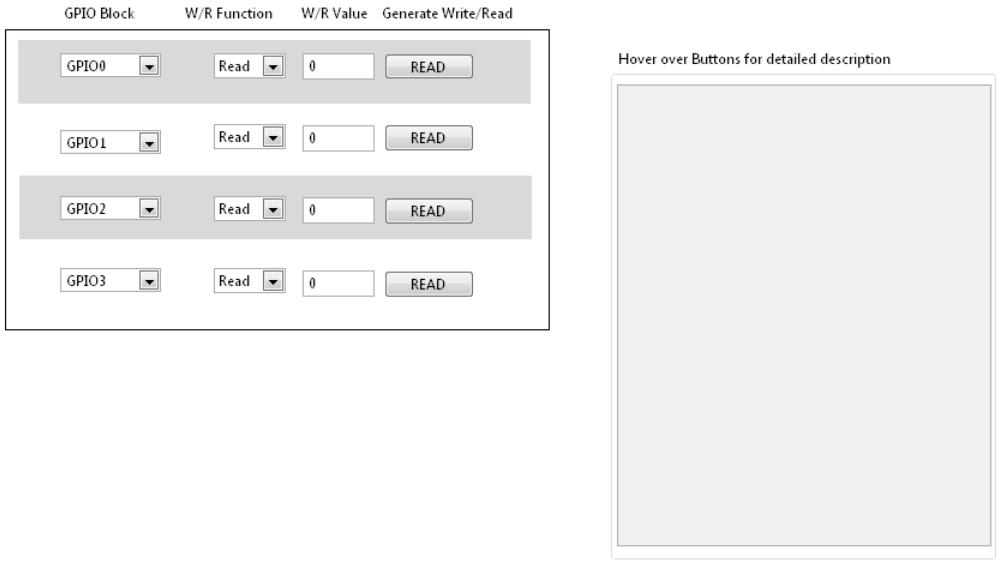


Figure 24. GPIO Page

Use the *GPIO Block* section of the GPIO tab, as shown in Figure 25, to set the various GPIO functions. The drop-down menu defaults to general-purpose I/O. To perform a write or read, set the *W/R Function* pull-down to either Write or Read. The *W/R value* enables the user to input or observe the Boolean value of the GPIO register. Press the *Generate Write/Read* button to write to or read from the GPIO pin.

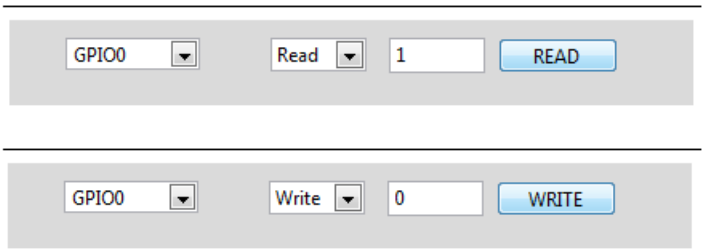


Figure 25. GPIO Write/Read

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6 AMC7836EVM Documentation

This section contains the schematic diagrams and complete BOM for the AMC7836EVM. Documentation information for the SDM-USB-DIG platform can be found in the *SDM-USB-DIG Platform User's Guide* (SBOU136), available at the TI website at www.ti.com.

6.1 AMC7836EVM Board Schematic

Figure 26 and Figure 27 illustrate the EVM schematic.

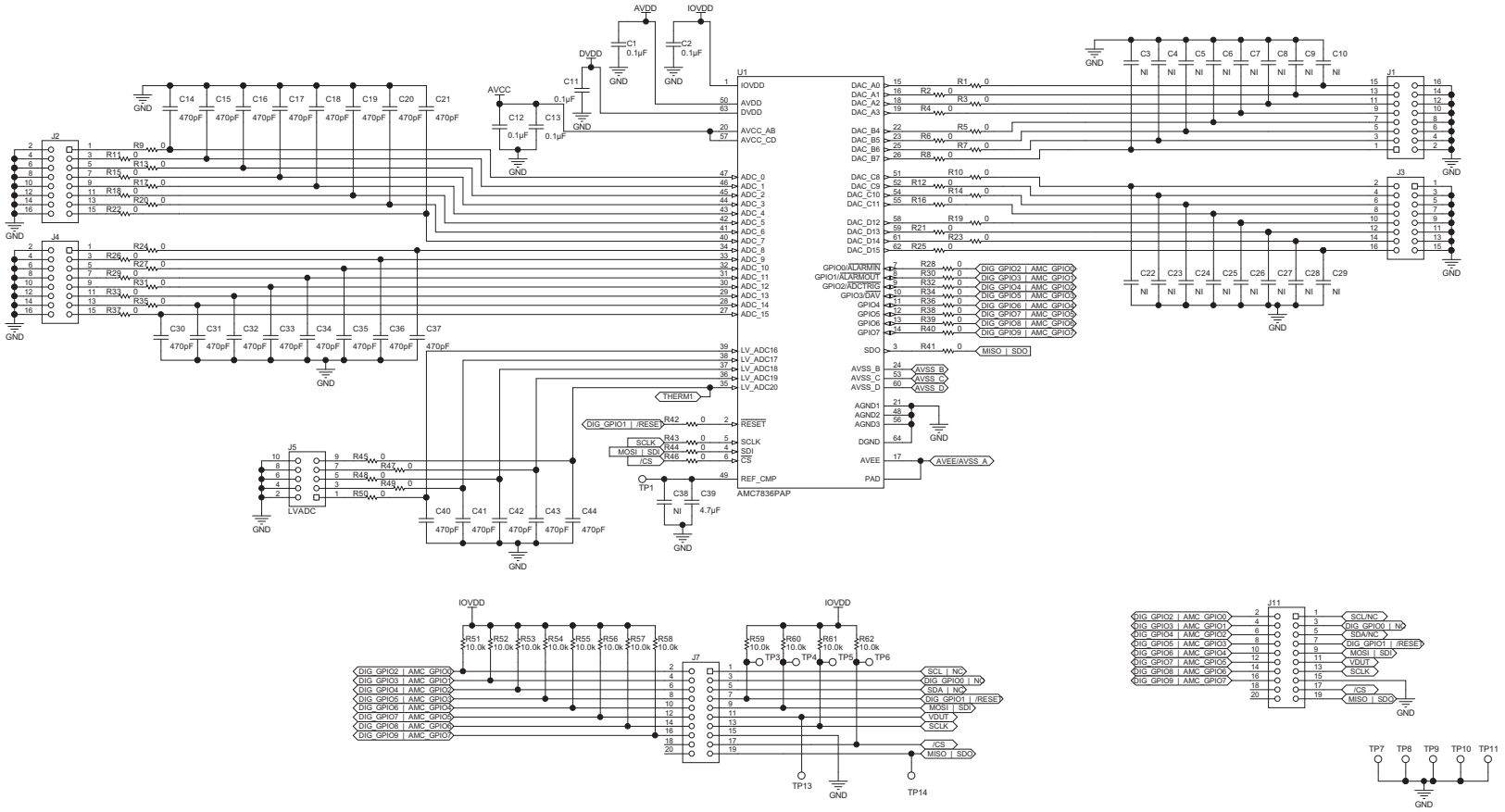


Figure 26. AMC7836EVM Schematic (1 of 2)

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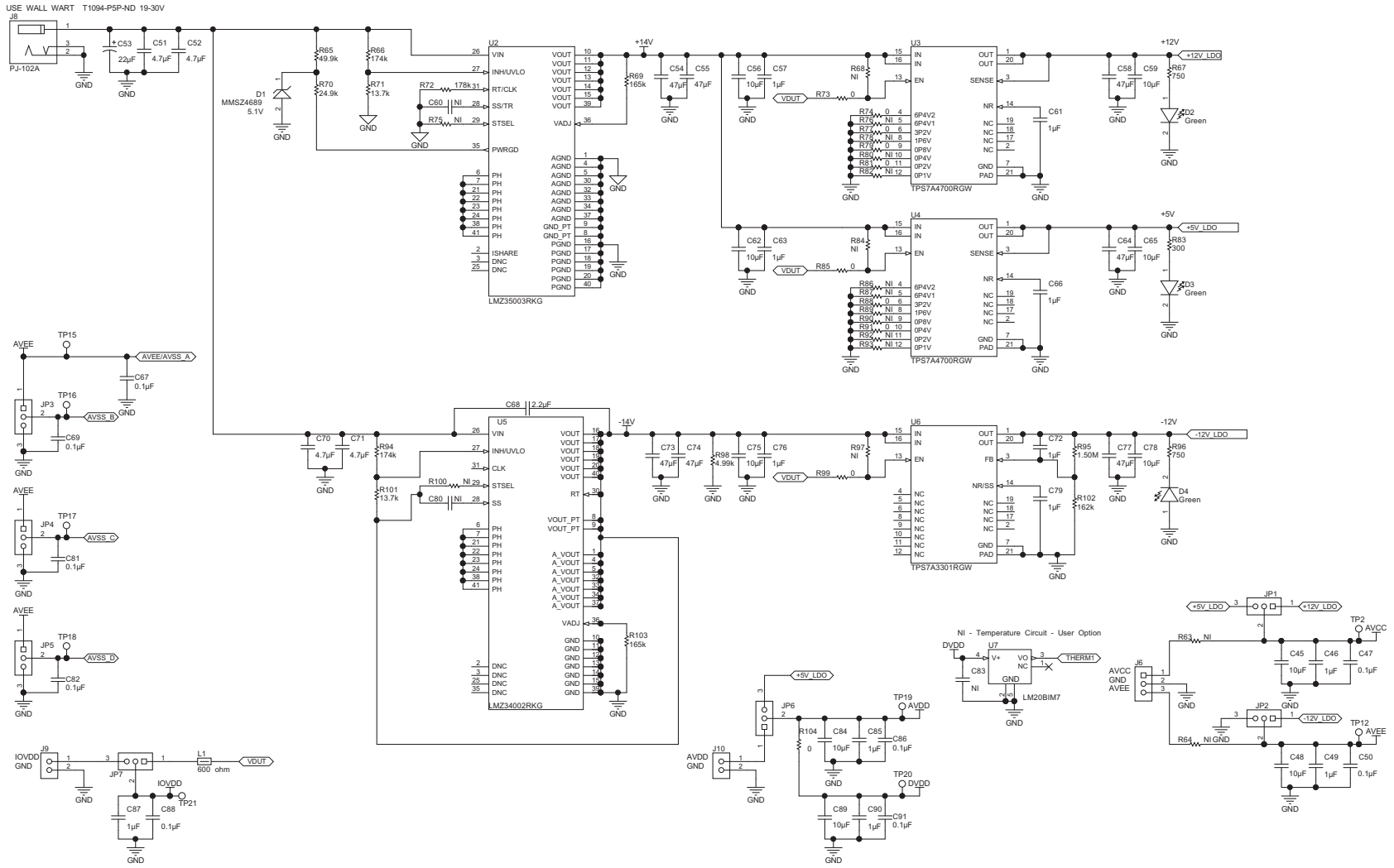


Figure 27. AMC7836EVM Schematic (2 of 2)

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6.2 AMC7836EVM PCB Components Layout

Figure 28 shows the layout of the components for the AMC7836EVM board.

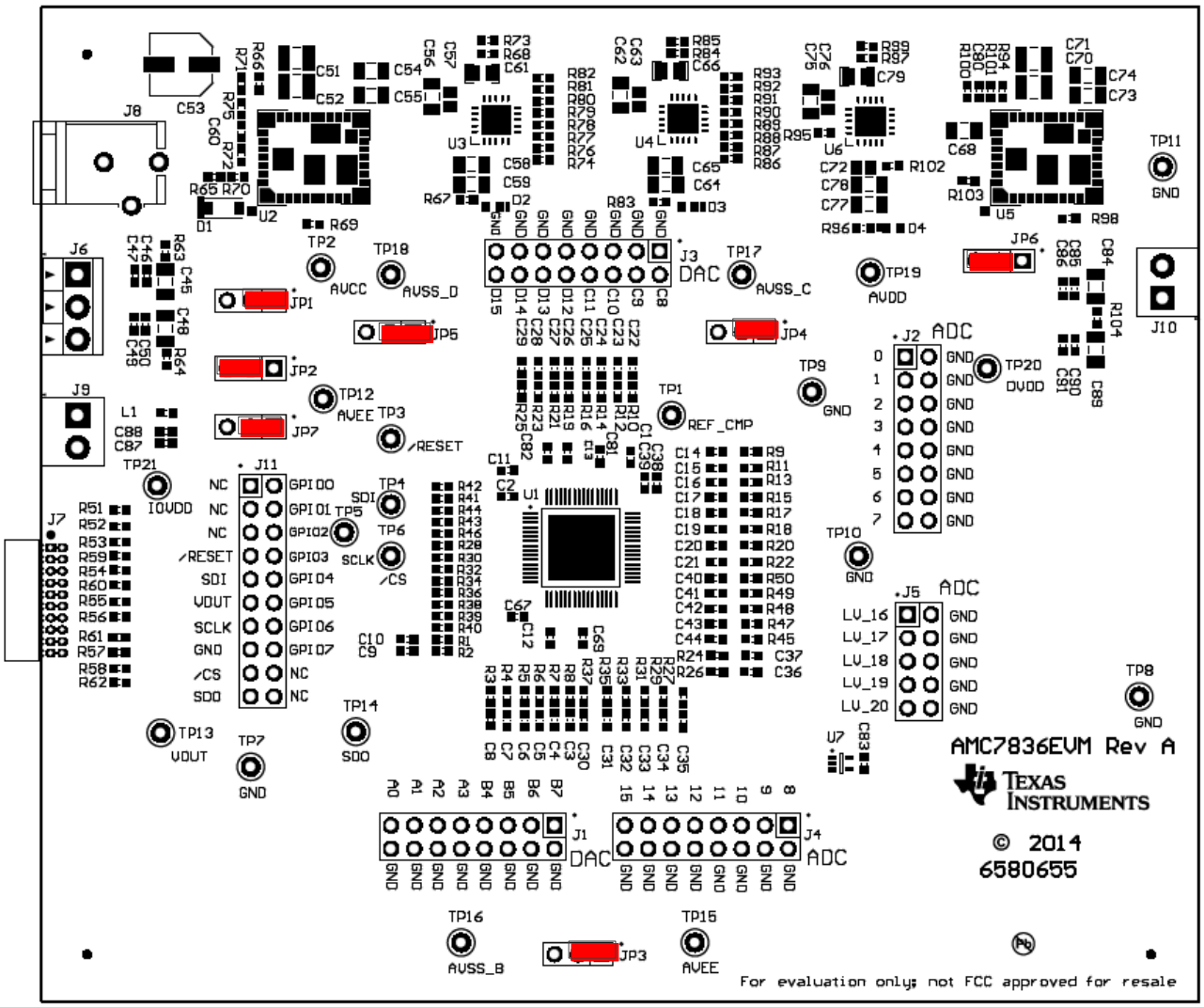


Figure 28. AMC7836EVM PCB Components Layout

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6.3 AMC7836 Test Board Bill of Materials

Table 12 lists the BOM for this EVM.

Table 12. AMC7836EVM Bill of Materials

Item	Quantity	Designator	Description	Manufacturer	Part Number
1	1		Printed Circuit Board	Any	6579845
2	14	C1, C2, C11, C12, C13, C47, C50, C67, C69, C81, C82, C86, C88, C91	CAP, CERM, 0.1uF, 50V, +/-10%, X7R, 0603	MuRata	GCM188R71H104KA57D
3	0	C3, C4, C5, C6, C7, C8, C9, C10, C22, C23, C24, C25, C26, C27, C28, C29, C38, C60, C80, C83	NI		
4	21	C14 - C21, C30 - C37, C40 - C44	CAP, CERM, 470pF, 50V, +/-10%, X7R, 0603	Kemet	C0603C471K5RACTU
5	1	C39	CAP, CERM, 4.7uF, 10V, +/-10%, X5R, 0603	Kemet	C0603C475K8PACTU
6	10	C45, C48, C56, C59, C62, C65, C75, C78, C84, C89	CAP, CERM, 10uF, 25V, +/-10%, X7R, 1206	MuRata	GRM31CR71E106KA12L
7	5	C46, C49, C85, C87, C90	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0603	MuRata	GRM188R61E105KA12D
8	4	C51, C52, C70, C71	CAP, CERM, 4.7uF, 50V, +/-10%, X7R, 1210	MuRata	GRM32ER71H475KA88L
9	1	C53	CAP, AL, 22uF, 35V, +/-20%, 1 ohm, SMD	Panasonic	EEE-FC1V220P
10	7	C54, C55, C58, C64, C73, C74, C77	CAP, CERM, 47uF, 25V, +/-20%, X5R, 1206	TDK	C3216X5R1E476M160AC
11	7	C57, C61, C63, C66, C72, C76, C79	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0805	TDK	C2012X5R1E105K
12	1	C68	CAP, CERM, 2.2uF, 25V, +/-10%, X5R, 1206	AVX	12063D225KAT2A
13	1	D1	Diode, Zener, 5.1V, 500mW, SOD-123	Fairchild	MMSZ4689
14	3	D2, D3, D4	LED, Green, SMD	Lumex	SML-LX0603GW-TR
15	4	J1, J2, J3, J4	Header, TH, 100mil, 8x2, Gold plated, 230 mil above insulator	Samtec	TSW-108-07-G-D
16	1	J5	Header, TH, 100mil, 5x2, Gold plated, 230 mil above insulator	Samtec	TSW-105-07-G-D
17	1	J6	Terminal Block, 6A, 3.5mm Pitch, 3-Pos, TH	On-Shore Technology	ED555/3DS
18	1	J7	Receptacle, 50mil 10x2, R/A, TH	Mill-Max	853-43-020-20-001000
19	1	J8	Connector, DC Jack 2.1X5.5 mm, TH	CUI Inc.	PJ-102A
20	2	J9, J10	Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	On-Shore Technology	ED555/2DS
21	1	J11	Header, TH, 100mil, 10x2, Gold plated, 230 mil above insulator	Samtec	TSW-110-07-G-D
22	7	JP1, JP2, JP3, JP4, JP5, JP6, JP7	Header, TH, 100mil, 3x1, Gold plated, 230 mil above insulator	Samtec	TSW-103-07-G-S
23	1	L1	0.2A Ferrite Bead, 600 ohm @ 100MHz, SMD	MuRata	BLM18HG601SN1D
24	60	R1 - R50, R73, R74, R77, R79, R81, R85, R88, R91, R99, R104	RES, 0 ohm, 5%, 0.1W, 0603	Yageo America	RC0603JR-070RL
25	12	R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62	RES, 10.0k ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW060310K0FKEA
26	1	R65	RES, 49.9k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0749K9L
27	0	R63, R64, R68, R75, R76, R78, R80, R82, R84, R86, R87, R89, R90, R92, R93, R97, R100	NI		
28	2	R66, R94	RES, 174k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07174KL
29	2	R67, R96	RES, 750 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07750RL
30	2	R69, R103	RES, 165k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07165KL
31	1	R70	RES, 24.9k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0724K9L
32	2	R71, R101	RES, 13.7k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0713K7L
33	1	R72	RES, 178k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07178KL
34	1	R83	RES, 300 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07300RL
35	1	R95	RES, 1.50Meg ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-071M5L
36	1	R98	RES, 4.99k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-074K99L
37	1	R102	RES, 162k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07162KL
38	16	TP1, TP2, TP3, TP4, TP5, TP6, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21	Test Point, Miniature, RedTH	Keystone	5000
39	5	TP7, TP8, TP9, TP10, TP11	Test Point, TH, Miniature, Black	Keystone	5001
40	0	U1	12-Bit ANALOG MONITOR AND CONTROL (AMC) SOLUTION with Multichannel ADC, Bipolar DACs and Temperature Sensors, PAP0064G	Texas Instruments	AMC7836PAP
41	1	U2	7-V to 50-V Input, 2.5-A Step-Down, Integrated Power Solution, RKG0041A	Texas Instruments	LMZ35003RKG

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Item	Quantity	Designator	Description	Manufacturer	Part Number
42	2	U3, U4	36-V, 1-A, 4.17-µVRMS, RF LDO Voltage Regulator, RGW0020A	Texas Instruments	TPS7A4700RGW
43	1	U5	4.5-V to 40-V Input, 15-W, Negative Output, Integrated Power Solution, RKG0041A	Texas Instruments	LMZ34002RKG
44	1	U6	–36-V, –1-A, Ultralow-Noise Negative Voltage Regulator, Adjustable, RGW0020A	Texas Instruments	TPS7A3301RGW
45	0	U7	NI		

Revision History

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

Changes from Original (November, 2014) to A Revision **Page**

- Added note and removed last row in the *Contents of AMC7836EVM Kit* table. 3
- Modified the *AMC7836EVM Hardware Setup* image. 4
- Changed "Default" and "Optional" blocks in *AMC7836 Test Board Block Diagram* image. 4
- Changed the text in the *AMC7836EVM Power Configurations* section. 10

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STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

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   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

   3.1 *United States*

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

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

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

      CAUTION

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

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

      FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 *Canada*

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

Concerning EVMs Including Radio Transmitters:

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

Concernant les EVMs avec appareils radio:

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

Concerning EVMs Including Detachable Antennas:

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

Concernant les EVMs avec antennes détachables

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

3.3 *Japan*

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

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

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

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

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