AMC7834 Evaluation Module

This user's guide describes the characteristics, operation, and use of the AMC7834 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 AMC7834 device, a highly integrated, low-power, analog monitoring and control solution for power amplifier biasing capable of current, temperature, and voltage supervision. The AMC7834 integrates a multi-channel (12-bit) ADC, 8 (12-bit) DACs, and four high-side current sense amplifiers supporting common mode voltages from +4-V up to +60-V into a single device. 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 device also features 4 GPIO, out-of-range alarms, an internal reference, and a low-power, SPI compatible interface.

1.1 AMC7834EVM 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 AMC7834EVM Kit(1)

Item	Quantity
AMC7834EVM 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 x 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 AMC7834EVM. This user's guide is available from the TI web site under literature number SLAU608. 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
AMC7834 Product Data Sheet	SLAS972
SDM-USB-DIG Platform User's Guide	SBOU136

2 AMC7834EVM 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. An optional +24-V wall supply can provide power through the J7 connector to provide power to on-board power regulators (LDOs) that regulate the analog and digital supplies. By default, on-board connectors are included on the EVM board for external supplies. Figure 1 displays the system setup for the AMC7834EVM.

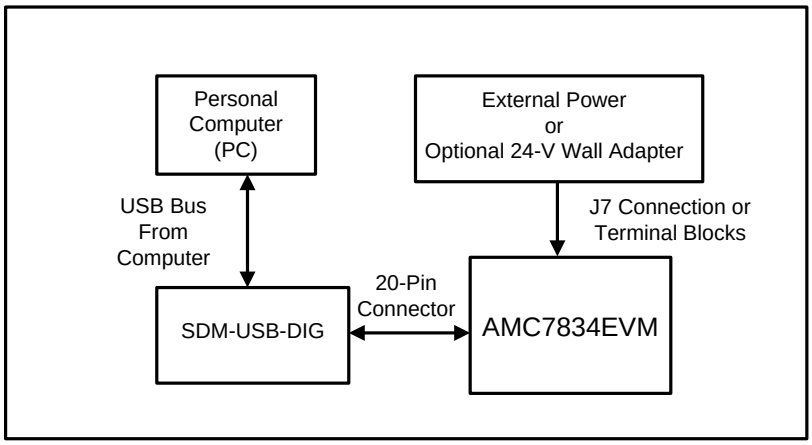

Figure 1. AMC7834EVM Hardware Setup

2.1 Theory of Operation for AMC7834 Hardware

A block diagram of the AMC7834EVM 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, current sense inputs, external temp sensing diodes, and analog outputs of the DAC.

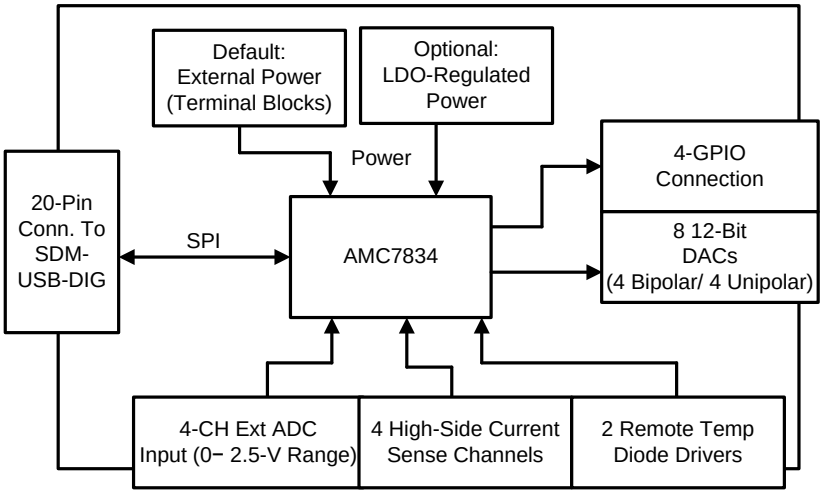

Figure 2. AMC7834 Test Board Block Diagram

2.2 Signal Definitions of J4 (20-Pin Male Connector Socket)

The AMC7834EVM includes a 20-pin connector socket used to communicate between the EVM and the SDM-USB-DIG platform. The pin out of the J4 connector is shown in Table 3.

Table 3. J4 Signal Definition

Pin on J4	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

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 AMC7834 device) connects to the I/O interface of the platform. During digital I/O transactions, the platform obtains information from the AMC7834 device and sends to the host PC for interpretation. A block diagram of the platform is shown in Figure 3.

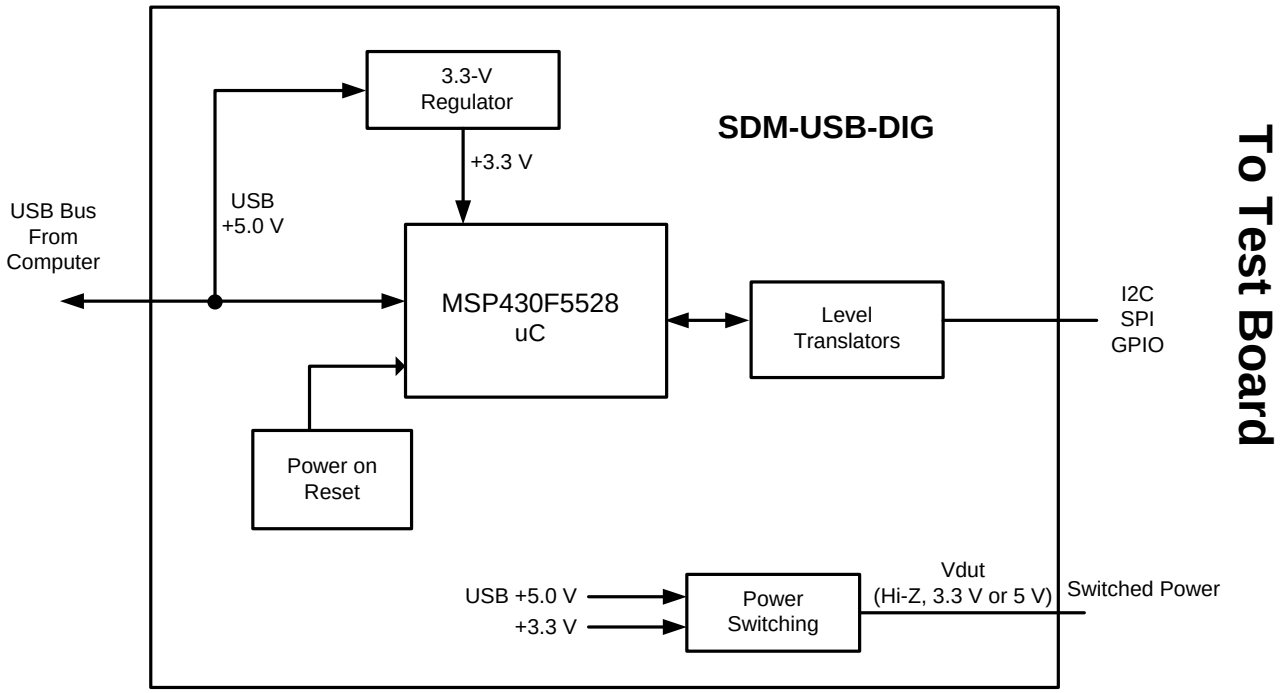

Figure 3. SDM-USB-DIG Platform Block Diagram

3 AMC7834EVM Software Setup

This section provides the procedure for EVM software installation.

3.1 Operating Systems for AMC7834EVM 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 AMC7834EVM 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 AMC7834EVM_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)\AMC7834EVM. The software installation automatically copies the required drivers for the SDM-USB-DIG and AMC7834EVM 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.)

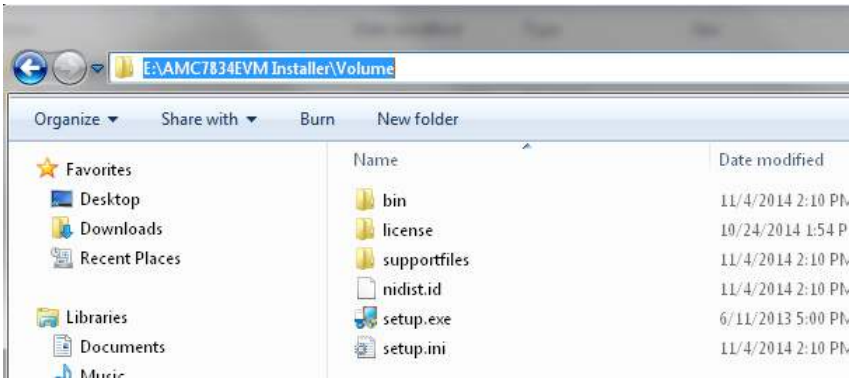

Figure 4. AMC7834EVM Installer Directory

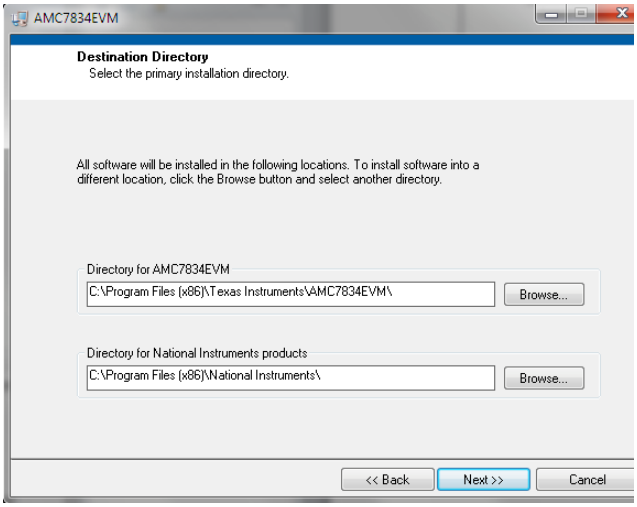

Figure 5. AMC7834EVM Install Path

4 AMC7834EVM Hardware Overview

The subsequent sections provide detailed information on the EVM hardware and jumper configuration settings. To use the +24-V wall supply, set the AV_{DD} and IOV_{DD} jumper connections to the default configuration listed in Table 4. The table also displays the default configurations of all jumper connections on the AMC7834EVM. Connect the USB extender cable from the SDM-USB-DIG to the PC, and the +24-V wall adapter to the J7 terminal.

Table 4. Default Jumper Settings(1)

Jumper	Default Position	Function
JP1	Shunt on 1-2	Q2 Remote Diode Configuration • 1-2: Connects Q2 in diode configuration with base-collector connected • Remove: Q2 in diode configuration with collector floating
JP3/JP5	Shunt on 2-3	Remote Diode Selection • 1-2: Connects D1+ and D1– to terminal block J1 • 2-3: Connects D1+ and D1– to the onboard diode-connected transistor Q2
JP2/JP4	Shunt on 2-3	Remote Diode Selection • 1-2: Connects D2+ and D2– to terminal block J1 • 2-3: Connects D2+ and D2– to the onboard diode-connected transistor Q1
JP6	Installed	Reference Selection • Installed: REF_ADC/CMP connects to onboard +2.5-V supply • Not Installed: External reference signal is applied to REF_ADC/CMP
JP7	Shunt on 1-2	PAV_{DD} Connection (Power Supply for PA_ON Control Signal.) • 1-2: PAVDD_EX: Connects to external supply • 2-3: Connects to V_{DD} supply
JP8	Shunt on 1-2	VCLAMP2 Connection • 1-2: Connects to onboard voltage divider • 2-3: Connects to GND
JP9	Shunt on 1-2	VCLAMP1 Connection • 1-2: Connects to onboard voltage divider • 2-3: Connects to GND
JP10	Shunt on 1-2	REF_IN Selection • 1-2: Connects to onboard 2.5-V REF supply • 2-3: Connects to REF_OUT pin
JP11	Shunt on 1-2	Selecting Internal or External AV_{DD}/DV_{DD} • 1-2: Connects AVDD/DVDD pins to onboard +5-V • 2-3: Connects AVDD/DVDD pins to external connector (J8)
JP12	Shunt on 1-2	Selecting Internal or External V_{CC} • 1-2: Connects VCC pins to onboard +5-V • 2-3: Connects VCC pins to external connector (J9)
JP13	Shunt on 1-2	Selecting Internal or External AVSS • 1-2: Connects AVSS pins to onboard –5-V • 2-3: Connects AVSS pins to external connector (J10)
JP14	Shunt on 1-2	Selecting Internal or External IOV_{DD} • 1-2: Connects IOVDD pins to SDM-USB-DIG supplied +3.3 V • 2-3: Connects IOVDD pins to external connector (J11)

(1) Table 4 lists the default connections for the 24-V wall adapter connection. Refer to Table 5 and Table 7 for external power and reference connections.

4.1 Electrostatic Discharge Warning

Many of the components on the AMC7834EVM 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.

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.

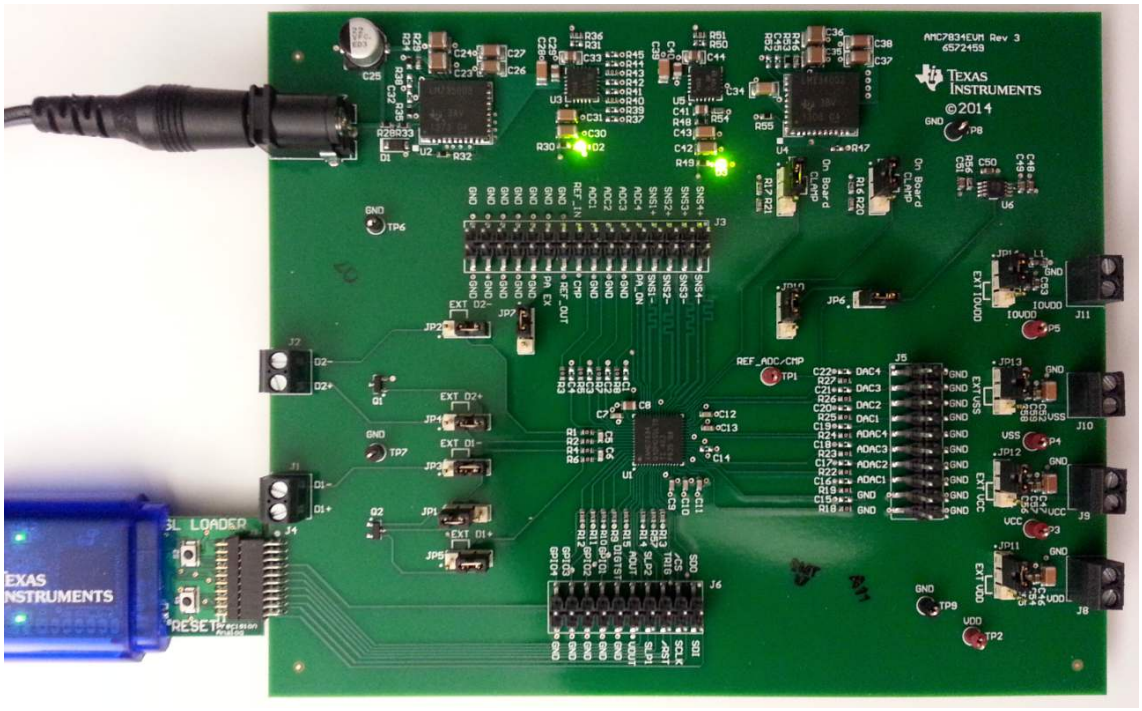

Figure 6. Typical Hardware Connections on the AMC7834EVM

4.3 Connecting the USB Cable to the SDM-USB-DIG

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

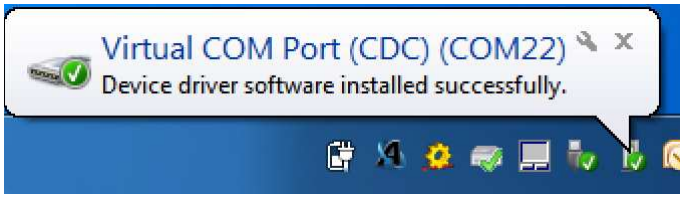

Figure 7. Confirmation of SDM-USB-DIG Platform Driver Installation

4.4 AMC7834EVM Power Configurations

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

The AMC7834EVM provides terminal blocks for external supplies as well as (optional) onboard power conditioning to convert a 24-V supply into a +5-V, –5-V, and +2.5-V supply. Jumpers JP11, JP12, JP13, and JP14 allow the AVDD / DVDD, VCC, AV_{ss}, and IOVDD inputs to be configured to use these onboard supplies, or external supplies through the terminal blocks. The reference can also be connected to the onboard +2.5-V supply or the external REFIN or REF_ADC/CMP pins located on J3-17 and J3-18, respectively

Table 5. AMC7834EVM Power Shunt Jumper Settings

Jumper	Default Position	Function
JP11	Shunt on 1-2	Selecting Internal/External AVDD/DVDD • 1-2: Connects AVDD/DVDD pins to onboard +5-V • 2-3: Connects AVDD/DVDD pins to external connector (J8)
JP12	Shunt on 1-2	Selecting Internal/External VCC • 1-2: Connects VCC pins to onboard +5-V • 2-3: Connects VCC pins to external connector (J9)
JP13	Shunt on 1-2	Selecting Internal/External AVSS • 1-2: Connects AVSS pins to onboard -5-V • 2-3: Connects AVSS pins to external connector (J10)
JP14	Shunt on 1-2	Selecting Internal/External IOVDD • 1-2: Connects IOVDD pins to onboard +3.3-V • 2-3: Connects IOVDD pins to external connector (J11)

4.5 ADC/SENSE Signal Pins

The AMC7834 device contains a multi-channel 12-bit SAR ADC with four external ADC inputs, which range from 0 to +2.5 V. The device also features four high-side current sense amplifiers that have common-mode voltages of 4- to +60-V, and can be programmed for closed-loop (drain current) operation. These signal pins connect to the J3 header, which is described in Table 6.

Table 6. AMC7834EVM ADC/SENSE Signal Connections

Name	Connector	Description
ADC1	J3-15	ADC channel 1 input
ADC2	J3-13	ADC channel 2 input
ADC3	J3-11	ADC channel 3 input
ADC4	J3-9	ADC channel 4 input
SNS1+/–	J3-7,8	SENSE 1 input
SNS2+/–	J3-5,6	SENSE 2 input
SNS3+/–	J3-3,4	SENSE 3 input
SNS4+/–	J3-1,2	SENSE 4 input

4.6 Reference Configuration Options

As described in AMC7834EVM Power Configurations, the reference has multiple configuration schemes that can connect to an internal or external +2.5 V, and can be configured to connect to the ADC or DAC block. The different connection schemes are displayed in Table 7.

Table 7. Reference Configuration Settings

Setting Number	Reference Config	Jumper Position	Description
Setting 1	External ADC/ External DAC Reference (two supplies)	JP6 not installed JP10 is not installed	(Verify that both ADC and DAC Reference buffers are disabled.) Apply external reference voltages to ADC/CMP and REF_IN pins, J3–18 and J3–17 respectively.
Setting 2	Internal ADC/DAC Reference	JP6 not installed JP10 set to 2-3	(Enable ADC and DAC Reference buffers through software.) Use REF_OUT to supply REF_IN pin (J3–17).
Setting 3	External ADC/ External DAC Reference (one supply)	JP6 not installed JP10 is not installed	(Enable ADC and DAC Reference buffers through software.) Use external reference to supply REF_IN pin (J3–17).

Table 8. Optional 2.5-V Reference Generated From Wall Adapter

Configuration	Jumper Position	Function	Description
On board 2.5-V reference	JP6 installed	Connect to 2.5-V onboard reference	(Verify the ADC internal buffer is off.) 2.5 V is supplied to both CMP and REF_IN pins.
	JP10 set to 1-2	Connect to 2.5-V onboard reference	

4.7 DAC Signal Pins

The eight 12-bit DACs of the AMC7834 device are accessible through the J5 connector, as shown in Table 9. The DACs are separated into four bipolar DACs, and four unipolar DACs. The bipolar can be programmed for any of the following ranges: –4- to +1-V, –5- to 0-V, and 0- to 5-V range. The unipolar DACs range can be set from the following two ranges: 0 to 5 V, and 2.5 to 7.5 V.

Table 9. AMC7834EVM DAC Signal Connections

Name	Connector	Description
DAC1	J5–7	DAC1 bipolar DAC output
DAC2	J5–5	DAC2 bipolar DAC output
DAC3	J5–3	DAC3 bipolar DAC output
DAC4	J5–1	DAC4 bipolar DAC output
ADAC1	J5–15	ADAC1 unipolar DAC output
ADAC2	J5–13	ADAC2 unipolar DAC output
ADAC3	J5–11	ADAC3 unipolar DAC output
ADAC4	J5–9	ADAC4 unipolar DAC output

4.8 PA ON Signal

The PA ON signal provides the control voltage to drive an external PMOS switch capable of turning on/off the drain current to a PA transistor. Maximum output voltage is set by PAVDD and limited to +20-V.

Table 10. AMC7834EVM PA ON

Name	Connector	Description
PA_ON	J3-10	PA ON signal

4.9 External Remote Temperature

The AMC7834 device includes two remote temperature sensor diode drivers. These pins can be connected to the onboard diode-connected transistors, or connected externally through the J1 and J2 terminal blocks. This information is presented in Table 11.

Table 11. External Remote Temperature Inputs

Name	Connector	Description
D1+/D1–	J1-1,2	External connection for D1+/D1– pins
D2+/D2–	J2-1,2	External connection for D2+/D2– pins

4.10 Digital Inputs and GPIO Signal Pins

The four GPIO signals on the EVM can be measured on the J6 header. The J6 header also includes most of the digital inputs to the AMC7834 device — these inputs include $\overline{\text{Sleep1}}$, $\overline{\text{Sleep2}}$, ALARMOUT, $\overline{\text{RESET}}$, $\overline{\text{DACTRIG}}$, and $\overline{\text{DIGTEST}}$. A signal description of the J6 header is provided in Table 12.

Table 12. AMC7834EVM GPIO Signal Definition

Name	Connector	Description
GPIO1	J6-13	General Purpose I/O (GPIO1)
GPIO2	J6-15	General Purpose I/O (GPIO2)
GPIO3	J6-17	General Purpose I/O (GPIO3)
GPIO4	J6-19	General Purpose I/O (GPIO4)
$\overline{\text{Sleep1}}$	J6-8	Power down digital input
$\overline{\text{Sleep2}}$	J6-7	Power down digital input
ALARMOUT	J6-9	Global alarm open drain output
$\overline{\text{RESET}}$	J6-6	Reset input
$\overline{\text{DACTRIG}}$	J6-5	DAC trigger control input
$\overline{\text{DIGTEST}}$	J6-11	DAV/ADC_RDY data available indicator

4.11 SPI Communication Signals

The SPI signals are located on the J6 header and are described in Table 13.

Table 13. SPI Signal Definition

Name	Connector	Description
SCLK	J6-4	Serial Interface Clock
SDI	J6-2	Serial interface data input
SDO	J6-1	Serial interface data output
/CS	J6-3	Active low serial data enable

5 AMC7834EVM Software Overview

This section discusses how to use the AMC7834EVM software.

5.1 Starting the AMC7834EVM Software

After the hardware connections are established and jumper settings configured, launch the software located in the AMC7834EVM folder of the Start *All Programs* menu, and select the *AMC7834EVM* icon.

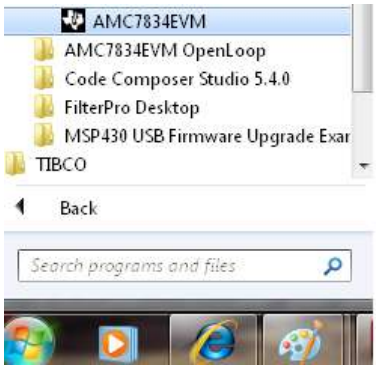

Figure 8. AMC7834EVM GUI Location

If the SDM-USB-DIG is properly connected to the AMC7834EVM, the GUI should automatically power on the system and display *CONNECTED: Power On* in the upper right area of the GUI (see Figure 9).

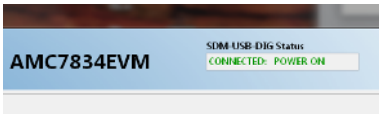

Figure 9. AMC7834EVM GUI – Power On

If the SDM-USB-DIG has a faulty connection, or is not connected at all, the GUI launches in simulation mode. In simulation mode, *NOT CONNECTED: Simulating* is displayed in the top right area 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 doing those steps, verify the USB extender cable is properly connected to both the SDM-USB-DIG and PC, and relaunch the GUI. This issue can also occur if the CDC driver is installed incorrectly. The AMC7834EVM software may need to be reinstalled.

5.2 AMC7834EVM Software Features

The following subsections describe the functionality of each page of the AMC7834EVM GUI.

5.2.1 Software Reset

The AMC7834 *Software Reset* button, shown in Figure 10, resets the AMC7834 device and resets all registers to their default setting.

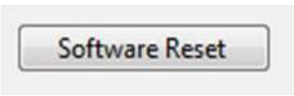

Figure 10. Software Reset Button

5.2.2 AMC7834EVM Low Level Configuration Page

The AMC7834EVM features a register map page that allows access to low-level communication by directly writing to and reading from the AMC7834 device's registers. Selecting a register on the Register Map list presents a description of the values in that register and also displays 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 checkboxes in the *Register Data* column, as displayed in Figure 11.

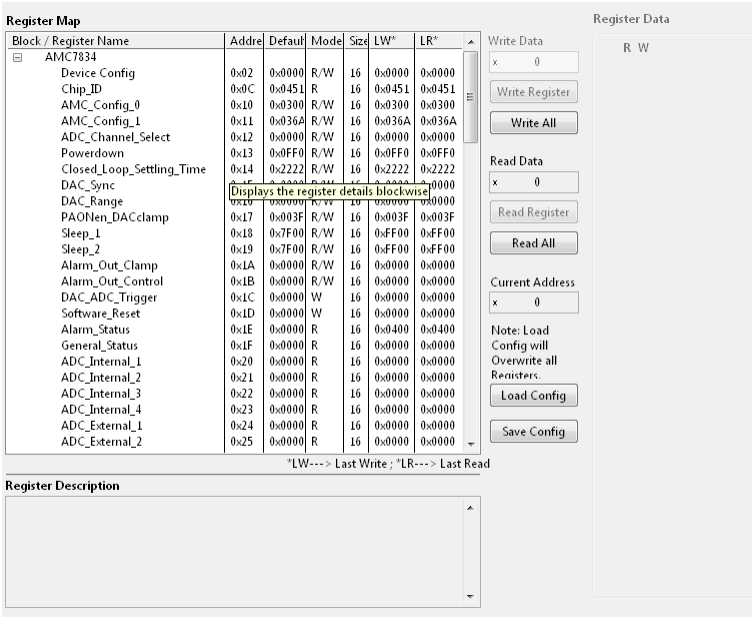

Figure 11. Low Level Configuration Page

This low-level configuration page also provides the option to save 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.

5.2.3 AMC7834EVM ADC Page

This page provides insight into the functionality of the AMC7834 device's 12-bit ADC. The ADC page includes the ability to monitor the four external analog inputs, as well as the four internal inputs for bipolar DAC monitoring, four high-side current sense inputs, the local temperature, and two remote temperature sensing devices. The analog inputs are controlled through the *Enable MUX* button, with the data visible on the right hand side of the page located in their respective indicator boxes (see Figure 12).

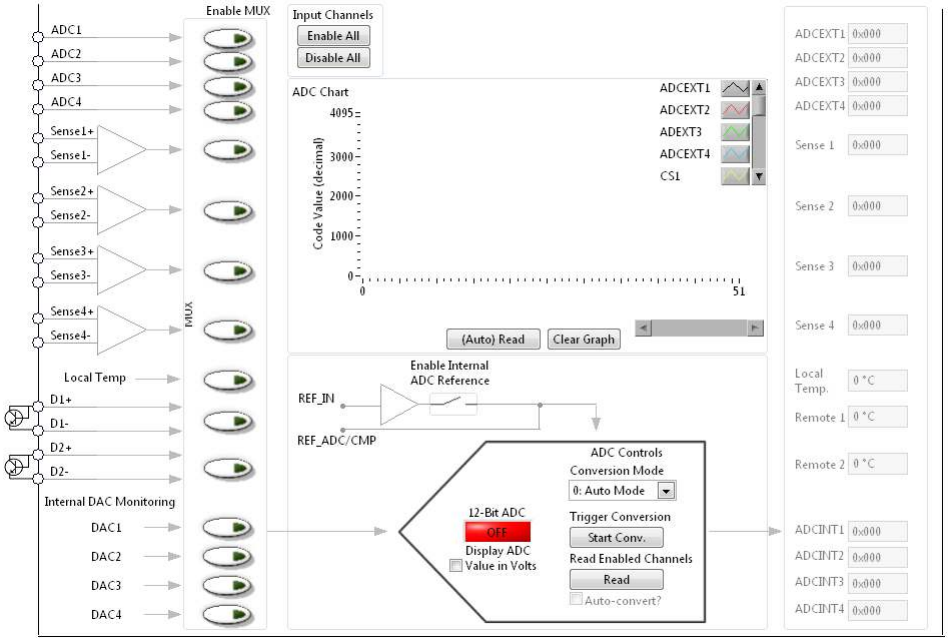

Figure 12. ADC Page

To completely activate the ADC block, the *Powerdown Mode* option must be set for reference configuration. The *Powerdown Mode* option changes the *POWER-MODE* bits of the *Device Configuration Register*, 0x02. The *Powerdown Mode* allows the user to configure the ADC block to use the internal reference of the device or an external reference. The reference selection should adhere to the *Reference Configuration Options*, listed in Table 7. The EVM is currently configured to use the onboard +2.5-V reference. Figure 13 displays the options for internal or external reference operation. These options can be selected in the Powerdown Mode drop-down menu illustrated in Table 14. For default EVM operation, select Power Mode “11” to use the onboard +2.5-V supply.

Table 14. ADC Block Reference Selection

Power Mode	ADC Ref Buffer	Description
0X	OFF	ADC block powered off
10	ON	Configured for internal reference
11	OFF	Configured for external reference

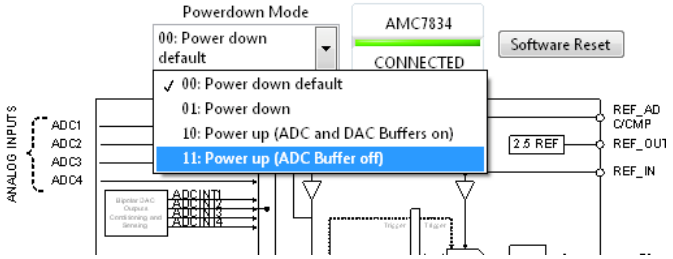

Figure 13. Powerdown Mode Reference Selection

Once the POWER-MODE is configured, individual channels can be enabled by selecting their respective *ADC MUX* button, as shown in Figure 14. Selecting a channel enables the button’s respective indicator field for register readout. To view the contents of the read in volts, select *Display ADC Value in Volts*.

Figure 14. ADC Channel MUX

The *Conversion Mode* is selectable in the ADC Controls ADC Block Diagram.

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. When one set of conversions is complete, the ADC is idle and waits for a new trigger. Conversions are triggered by pressing the *Start Conv* button or can automatically be triggered by enabling the *Auto-convert?* 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 illustrated in Figure 15.

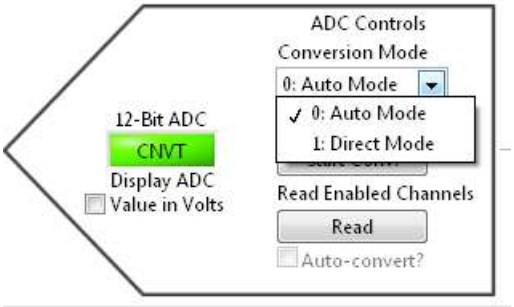

Figure 15. ADC Channel MUX

If choosing *Auto Mode*, the *Start Conv* button must be pressed 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 conversions is complete, the ADC multiplexer returns to the first channel and repeats the process. Stop the auto conversion process by pressing *Start Conv* button again.

In both modes, the state of the *12-Bit ADC* is viewable from the *12-Bit ADC* field displayed in the ADC Controls Block. If the ADC is in the *OFF* state, then ensure that the ADC block is configured in the Powerdown Mode drop-down menu. If the ADC is in the *IDLE* state, press the *Start Conv* button for ADC conversion and register readout. While converting, the *12-Bit ADC* indicator turns yellow and displays the text *CNVT*. These different ADC states are displayed in Figure 16.

Figure 16. ADC Controls Block

An *ADC Chart* is included in the ADC page to keep a history of the contents of the data registers (see Figure 17). 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*, ensure that all input channels are enabled in the ADC MUX block and press the *Start Conv* button 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*.

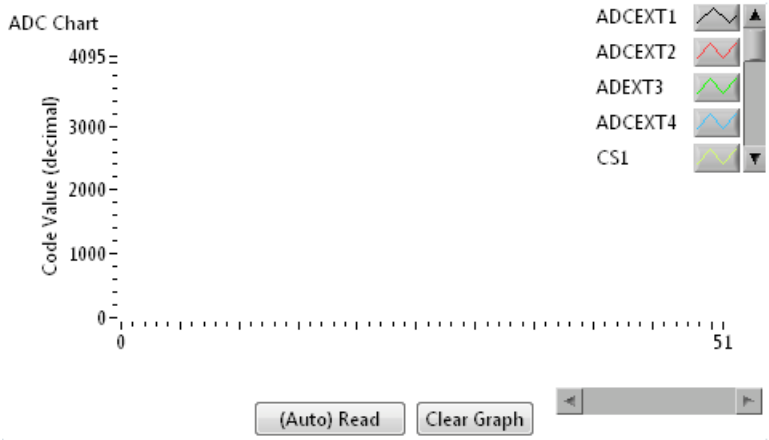

Figure 17. ADC Chart

5.2.4 AMC7834EVM DAC Page

The DAC page provides an interface to observe and control the different data registers, modes, and configurations available for each individual DAC channel (see Figure 18).

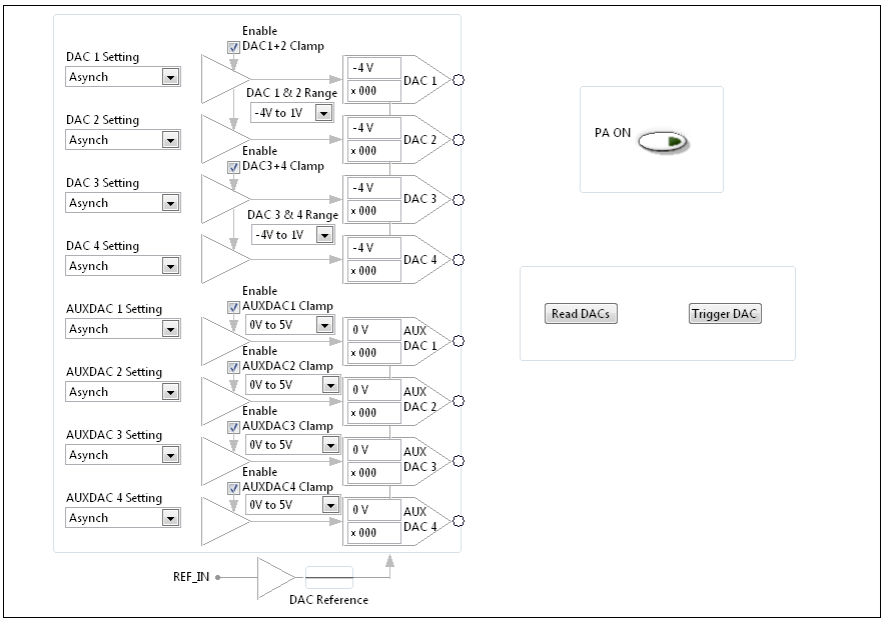

Figure 18. DAC Page

Before setting the DAC channels, ensure that the DAC reference is configured correctly for use. By default, the EVM is configured to use the on board +2.5-V supply. Additional DAC reference configurations are illustrated in Table 7.

After the DAC reference configuration is set, the DACs can be programmed and released from the clamp voltage by unchecking the *Enable DACX Clamp*, see the blue boxes in Figure 19. The eight DACs are separated into 4 bipolar and 4 unipolar DAC outputs. The bipolar DACs include the following ranges, which are selectable in the DAC Range drop-down menu: –4 to +1 V, –5 to 0 V, and 0 to +5 V. The unipolar DACs are programmable with the following ranges: 0 to 5 V, and 2.5 to 7.5 V. The DAC ranges and DAC input fields are respectively highlighted in green and red boxes. Either one of the DAC input fields can be programmed with the desired DAC output voltage or hexadecimal value.

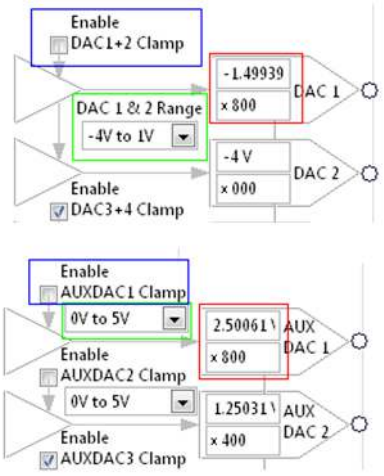

Figure 19. Program DAC Registers

The DACs can be set to output synchronously or asynchronously by selecting the *DAC X Settings*, displayed in Figure 20. Press the *Trigger DAC* button to synchronously load the DACs that have been set in synchronous mode in the DAC Sync register. The *Read DACs* button also reads from the DAC data registers and updates the input fields with the read values. The DAC read buttons are displayed in Figure 21.

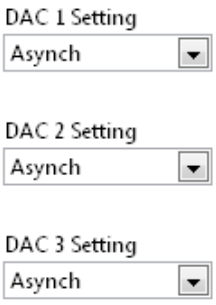

Figure 20. Program DAC Registers

Figure 21. DAC Read

The last item on the DACs page is the PA ON button, which is responsible for direct control of the PA_ON terminal. When cleared to '0', the PA_ON terminal is in the 'off' state, when set to '1', the PA_ON terminal is set to the 'on' state. Figure 22 displays the PA ON button.

Figure 22. PA ON Button

5.2.5 AMC7834EVM ALARMS Page

The AMC7834 ALARMS page provides access to the programmable out-of-range alarms for the internal and external temperature sensors, the DAC internal monitoring channels, and the bipolar DAC outputs. Figure 23 displays the ALARMS Page of the AMC7834EVM. 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*, with additional options.

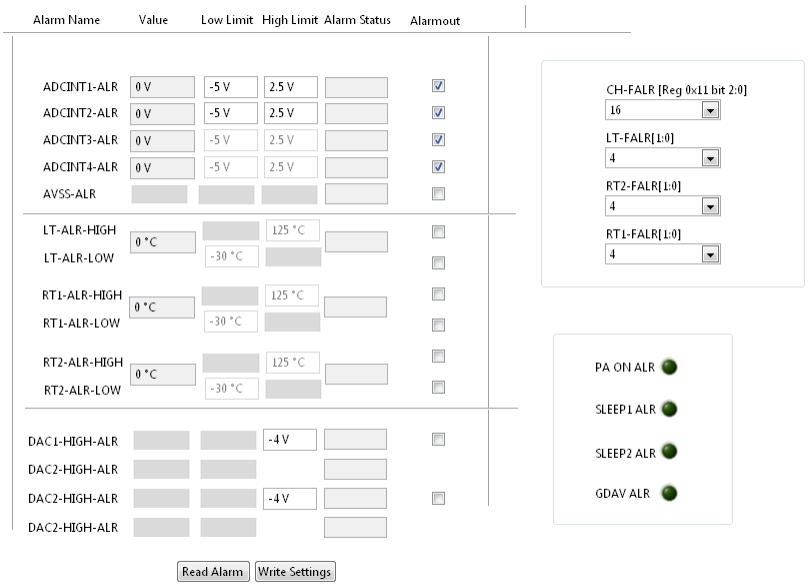

Figure 23. ALARMS Page

To use the page, the ADC channel, Temperature Sensors, or bipolar DACs should be enabled in their respective ADC and DAC 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 are available for edit (see Figure 24).

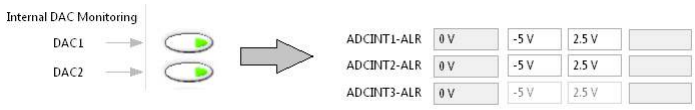

Figure 24. Low Level Configuration Page

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 displays the text *Tripped* in red. If the channel values are within the range of the alarm thresholds, the status displays *No Alarm* in black text.

Figure 25 displays the ADC Channel False Alarm protection, CH-FALR, 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, therefore requiring 16 conversions with an over-range value before the alarm is triggered. The temperature sensing inputs also have their respective False alarm protection. The lists for these inputs default to 4 consecutive samples before the alarms are triggered.

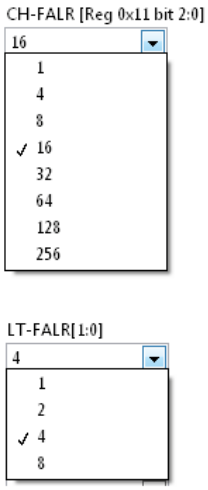

Figure 25. CH-FALR-CT Menu

Figure 26 shows the *Alarmout* column where alarms are activated to enable the ALARMOUT terminal. When the *Alarmout* checkbox is selected, an alarm event associated with the corresponding Alarm Name will trigger the ALARMOUT terminal. By default the ALARMOUT terminal is active low, the polarity of the ALARMOUT terminal can be configured by setting the ALARMOUT-POLARITY bit in the ALARMOUT configuration register.

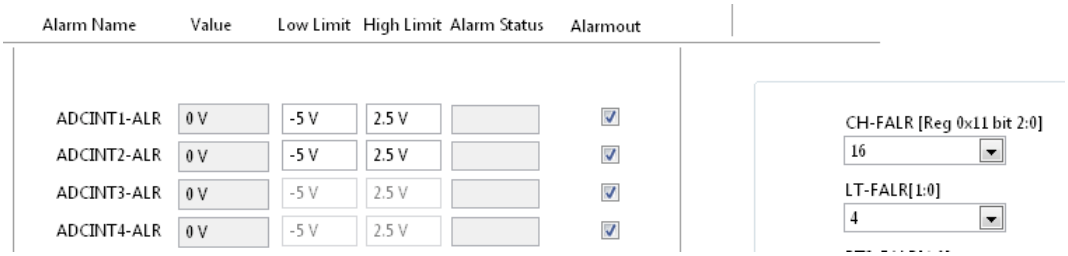

Figure 26. Alarmout

The alarm page also includes the ability to check the status of the following signals: PA ON, SLEEP1, SLEEP2, and GDAV. These flags are located in the *General Status* Register and default to '0'. If any of the signals are in an active state, the LED lights up after the *Read Alarms* button is pressed, Figure 27.

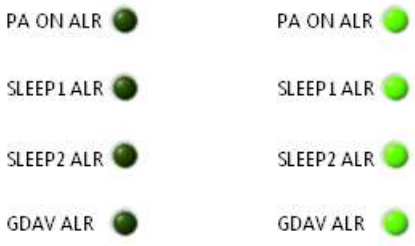

Figure 27. Alarmout

5.2.6 AMC7834EVM GPIO Page

The AMC7834 GPIO Page features the four (*GPIO1–GPIO4*) GPIOs of the AMC7834 device.

Figure 28. GPIO Page

Use the *GPIO Block* section of the GPIO tab, as shown in Figure 29, to set the various GPIO functions. 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 *W/R* button to write to or read from the GPIO pin.

Figure 29. GPIO Write/Read

6 AMC7834EVM Documentation

This section contains the schematic diagrams and complete BOM for the AMC7834EVM. 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 AMC7834EVM Board Schematic

Figure 30 and Figure 31 illustrate the EVM schematic.

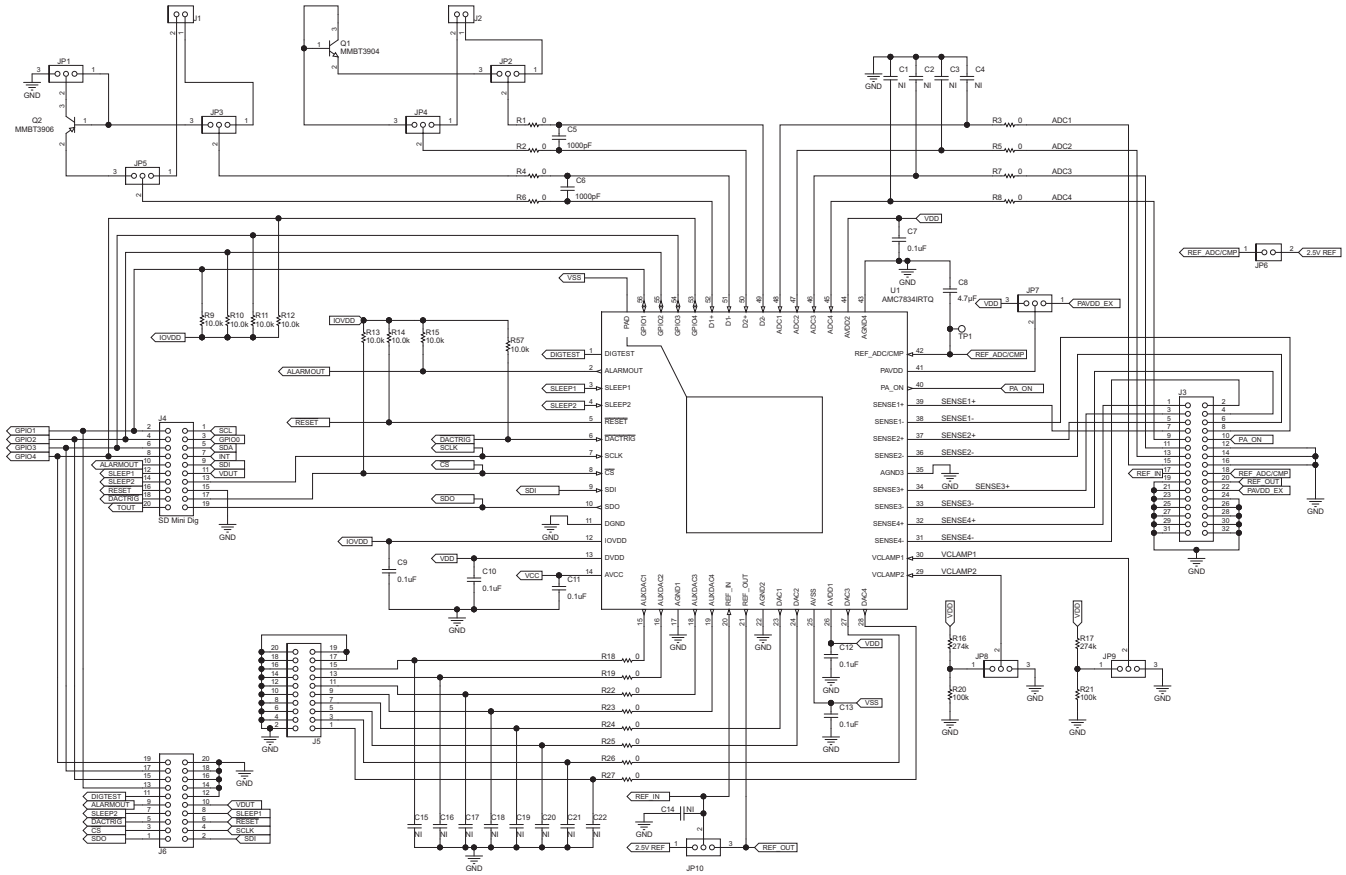

Figure 30. AMC7834EVM Schematic (1 of 2)

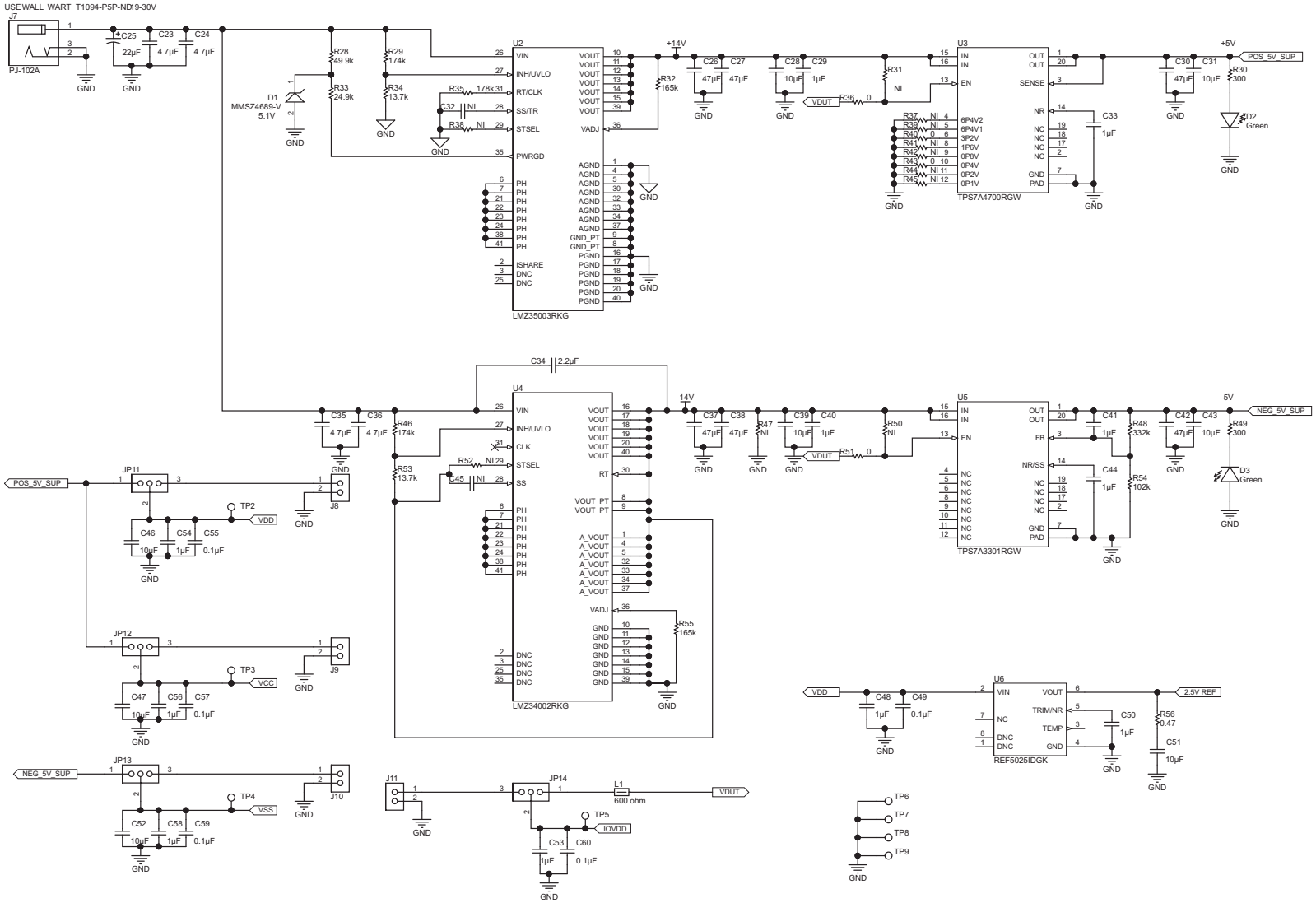

Figure 31. AMC7834EVM Schematic (2 of 2)

6.2 AMC7834EVM PCB Components Layout

Figure 32 shows the layout of the components for the AMC7834EVM board.

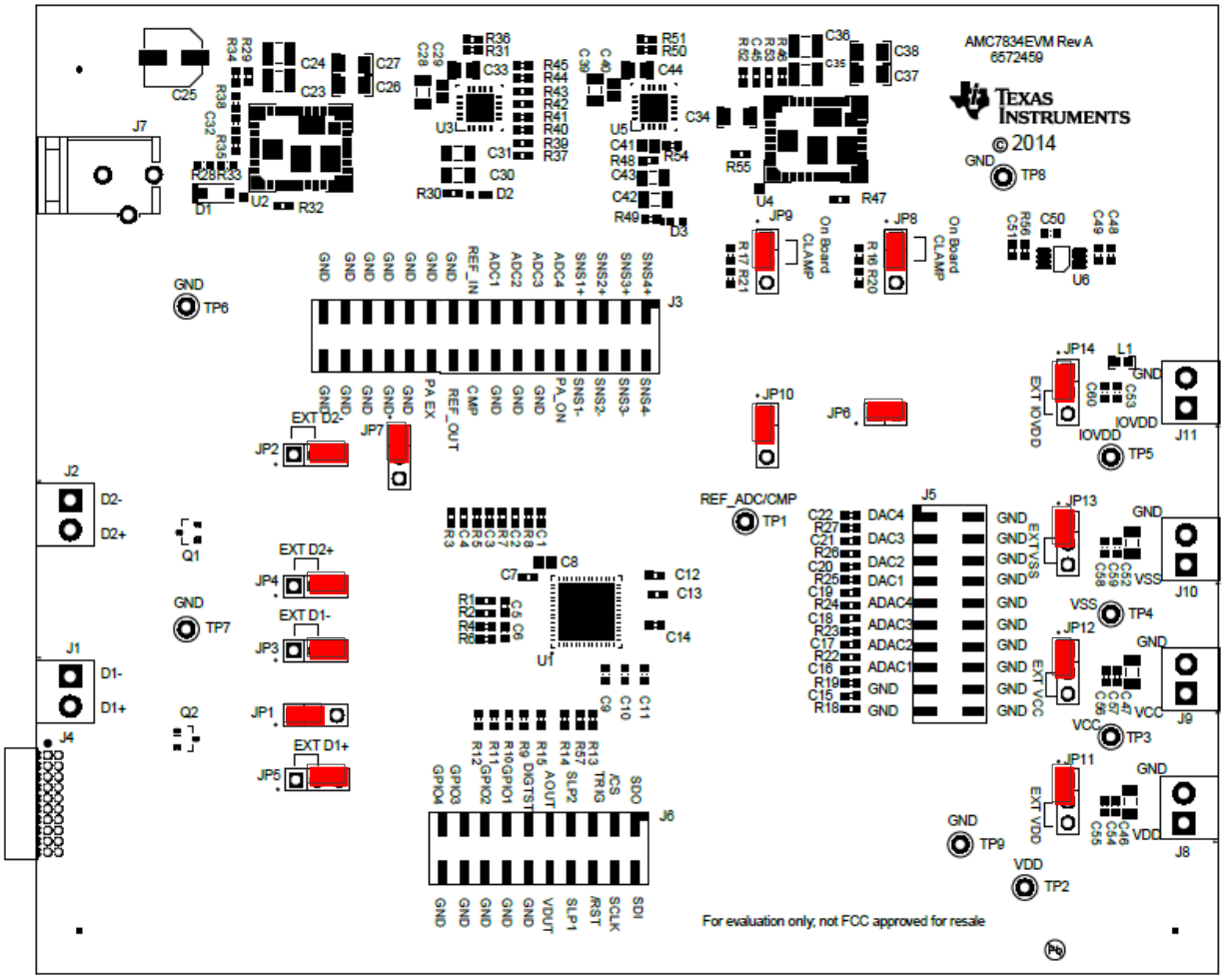

Figure 32. AMC7834EVM PCB Components Layout

6.3 AMC7834 Test Board Bill of Materials

Table 15 lists the BOM for this EVM.

Table 15. AMC7834EVM Bill of Materials

Item	Quantity	Designator	Description	Manufacturer	Part Number
1	1		Printed Circuit Board	Any	6572459
2	0	C1, C2, C3, C4, C14, C15, C16, C17, C18, C19, C20, C21, C22, C32, C45	Not Installed		
3	2	C5, C6	CAP, CERM, 1000pF, 50V, +/-5%, C0G/NP0, 0603	MuRata	GRM1885C1H102JA01D
4	6	C7, C9, C10, C11, C12, C13	CAP, CERM, 0.1uF, 50V, +/-10%, X7R, 0603	AVX	06035C104KAT2A
5	1	C8	CAP, CERM, 4.7uF, 50V, +/-10%, X5R, 0805	TDK	C2012X5R1H475K125AB
6	4	C23, C24, C35, C36	CAP, CERM, 4.7uF, 50V, +/-10%, X7R, 1210	MuRata	GRM32ER71H475KA88L
7	1	C25	CAP, AL, 22uF, 35V, +/-20%, 1 ohm, SMD	Panasonic	EEE-FC1V220P
8	6	C26, C27, C30, C37, C38, C42	CAP, CERM, 47uF, 25V, +/-20%, X5R, 1206	TDK	C3216X5R1E476M160AC
9	7	C28, C31, C39, C43, C46, C47, C52	CAP, CERM, 10uF, 25V, +/-10%, X7R, 1206	MuRata	GRM31CR71E106KA12L
10	5	C29, C33, C40, C41, C44	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0805	TDK	C2012X5R1E105K
11	1	C34	CAP, CERM, 2.2uF, 25V, +/-10%, X5R, 1206	AVX	12063D225KAT2A
12	6	C48, C50, C53, C54, C56, C58	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0603	TDK	C1608X5R1E105K080AC
13	5	C49, C55, C57, C59, C60	CAP, CERM, 0.1uF, 25V, +/-5%, X7R, 0603	AVX	06033C104JAT2A
14	1	C51	CAP, CERM, 10uF, 6.3V, +/-20%, X5R, 0603	TDK	C1608X5R0J106M
15	1	D1	Diode, Zener, 5.1V, 500mW, SOD-123	Vishay-Semiconductor	MMSZ4689
16	2	D2, D3	LED, Green, SMD	Lumex	SML-LX0603GW-TR
17	6	J1, J2, J8, J9, J10, J11	Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	On-Shore Technology, Inc.	ED555/2DS
18	1	J3	Header, 100mil, 16x2, SMT	Samtec, Inc.	TSM-116-01-T-DV-P
19	1	J4	Receptacle, 50mil 10x2, R/A, TH	Mill-Max	853-43-020-20-001000
20	2	J5, J6	Header, 100mil, 10x2, SMD	Samtec, Inc.	TSM-110-01-T-DV-P
21	1	J7	Connector, DC Jack 2.1X5.5 mm, TH	CUI Inc.	PJ-102A
22	13	JP1, JP2, JP3, JP4, JP5, JP7, JP8, JP9, JP10, JP11, JP12, JP13, JP14	Header, TH, 100mil, 3x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-103-07-G-S
23	1	JP6	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-102-07-G-S
24	1	L1	Ferrite Bead, 600 ohm @ 100MHz, 0.2A, 0603	MuRata	BLM18HG601SN1D
25	1	Q1	Transistor, NPN, 40V, 0.2A, SOT-23	Fairchild Semiconductor	MMBT3904
26	1	Q2	Transistor, PNP, 40V, 0.2A, SOT-23	Fairchild Semiconductor	MMBT3906
27	20	R1, R2, R3, R4, R5, R6, R7, R8, R18, R19, R22, R23, R24, R25, R26, R27, R36, R40, R43, R51	RES, 0 ohm, 5%, 0.1W, 0603	Yageo America	RC0603JR-070RL
28	8	R9, R10, R11, R12, R13, R14, R15, R57	RES, 10.0k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0710KL
29	2	R16, R17	RES, 274k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07274KL
30	2	R20, R21	RES, 100k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07100KL
31	1	R28	RES, 49.9k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0749K9L
32	2	R29, R46	RES, 174k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07174KL
33	2	R30, R49	RES, 300 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07300RL
34	0	R31, R37, R38, R39, R41, R42, R44, R45, R47, R50, R52	Not Installed		
35	2	R32, R55	RES, 165k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07165KL
36	1	R33	RES, 24.9k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0724K9L
37	2	R34, R53	RES, 13.7k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0713K7L
38	1	R35	RES, 178k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07178KL
39	1	R48	RES, 332k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07332KL
40	1	R54	RES, 102k ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-07102KL
41	1	R56	RES, 0.47 ohm, 1%, 0.1W, 0603	Panasonic	ERJ-3RQFR47V
42	5	TP1, TP2, TP3, TP4, TP5	Test Point, Miniature, Red, TH	Keystone	5000
43	4	TP6, TP7, TP8, TP9	Test Point, Miniature, Black, TH	Keystone	5001
44	0	U1	INTEGRATED POWER AMPLIFIER MONITOR AND CONTROL SYSTEM, RTQ0056F	Texas Instruments	AMC7834IRTQ
45	1	U2	7-V to 50-V Input, 2.5-A Step-Down, Integrated Power Solution	Texas Instruments	LMZ35003RKG

Table 15. AMC7834EVM Bill of Materials (continued)

Item	Quantity	Designator	Description	Manufacturer	Part Number
46	1	U3	36-V, 1-A, 4.17-µVRMS, RF LDO Voltage Regulator, RGW0020A	Texas Instruments	TPS7A4700RGW
47	1	U4	4.5-V to 40-V Input, 15-W, Negative Output, Integrated Power Solution	Texas Instruments	LMZ34002RKG
48	1	U5	–36-V, –1-A, Ultralow-Noise Negative Voltage Regulator, Adjustable, RGW0020A	Texas Instruments	TPS7A3301RGW
49	1	U6	Low-Noise, Very Low Drift, Precision VOLTAGE REFERENCE, DGK0008A	Texas Instruments	REF5025IDGK
50	14	NA	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
51	4	NA	Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)

Revision History

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

Changes from A Revision (January 2016) to B Revision **Page**

- Changed text "An optional +24V wall supply..." in Section 2 4
- Changed J1 Connection To: J7 Connection in Figure 1 4
- Changed "Default" and "Optional" blocks in Figure 2 4

Revision History

Changes from Original (December 2014) to A Revision **Page**

- Added note and removed last row in the *Contents of AMC7834EVM Kit* table. 3
- Modified the *AMC7834EVM Hardware Setup* image. 4
- Modified the *AMC7834 Test Board Block Diagram* image. 4
- Added a note to the *Default Jumper Settings* table. 8
- Changed the text in the *AMC7834EVM Power Configurations* section. 9
- Deleted JP6 row (the last row) of the *AMC7834EVM Power Shunt Jumper Settings* table. 10
- Changed the *Reference Configuration Settings* table. 10
- Added the *Optional 2.5-V Reference Generated From Wall Adapter* table. 11

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   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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