EVM User's Guide: AMC6V704EVM
AMC6V704 Evaluation Module

TEXAS INSTRUMENTS

Description

This EVM features the AMC6V704, a highly integrated current-output and voltage-output control device optimized for electroabsorption modulated laser (EML) applications. The AMC6V704 includes:

- Four dedicated 12-bit, 200mA, current output digital-to-analog converters (IDACs)
- Four dedicated 12-bit voltage output DACs (VDACs)
- A dedicated 12-bit, 1-MSPS analog-to-digital converter (ADC)

The ADC can be used to monitor external and internal signals. The AMC6V704 also includes supply and temperature alarm monitors, and a high-precision internal reference that eliminates the need for an external reference in most applications.

Get Started

1. Order the EVM on ti.com
2. Download and install the AMC6V704EVM software.
3. Configure the hardware jumper settings.
4. Connect the USB and external AMC6V704EVM supplies.
5. Launch the AMC6V704EVM-GUI.

Features

- Jumpers to evaluate different device configurations
- Onboard FT4222 controller for SPI or I^2C communication

Applications

- Optical module
- Optical line cards
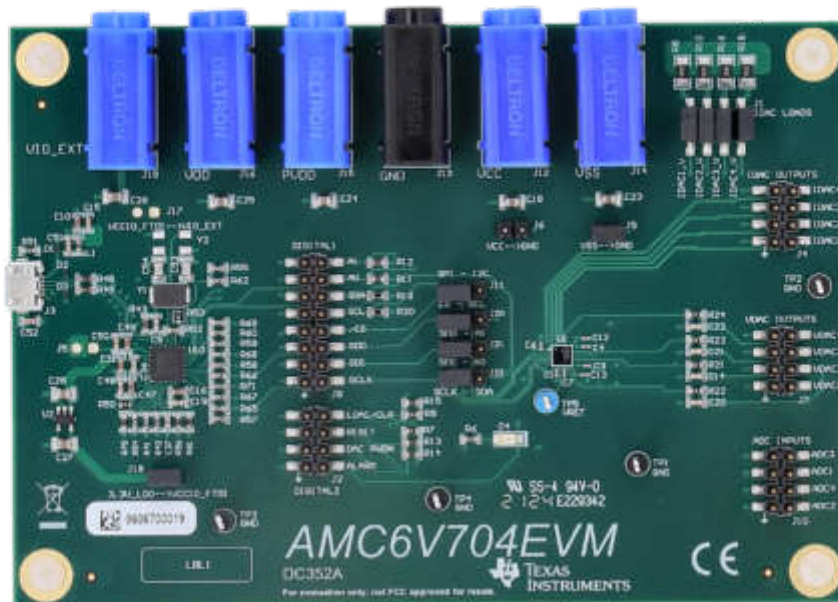
AMC6V704EVM

1 Evaluation Module Overview

1.1 Introduction

This user's guide describes the characteristics, operation, and use of the AMC6V704EVM evaluation model (EVM). This document provides examples and instructions on how to use the AMC6V704EVM board and software. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the AMC6V704EVM. This document includes schematics, printed circuit board (PCB) layouts, and a complete bill of materials (BOM).

1.2 Kit Contents

Table 1-1 details the contents of the EVM kit. Contact the TI Product Information Center at (972) 644-5580 if any component is missing. Make sure to verify the latest versions of the related software at the Texas Instruments website, www.ti.com.

Table 1-1. AMC6V704EVM Kit Contents

Item	Quantity
AMC6V704EVM board	1
USB micro-B plug to USB-A plug cable	1

1.3 Specification

Figure 1-1 shows a block diagram of the AMC6V704EVM. The AMC6V704EVM is connected to the onboard FTDI digital controller using the USB cable that is supplied with the EVM. The EVM features connectors and test points for all digital communication lines, IDAC outputs, VDAC outputs, supplies, and the ADC inputs.
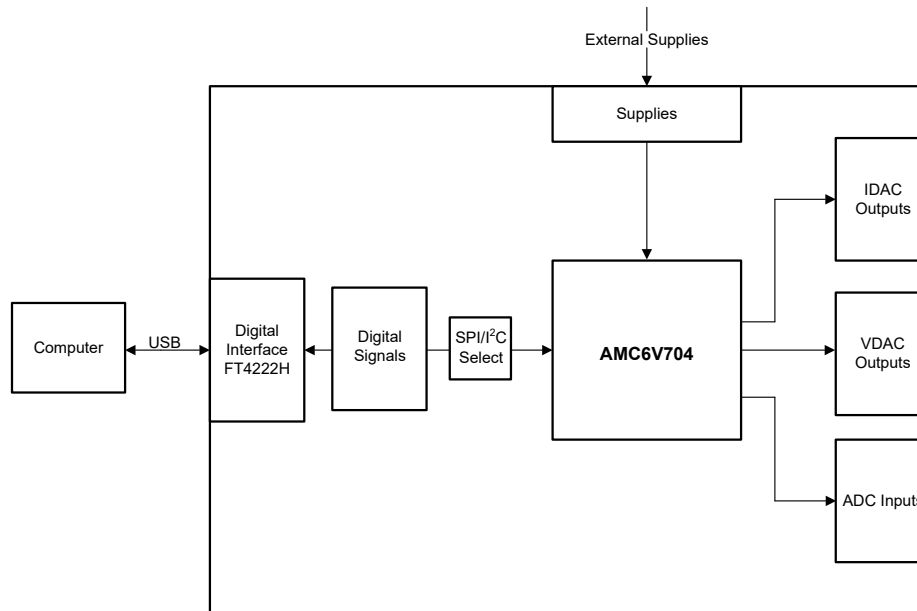

Figure 1-1. AMC6V704EVM Block Diagram

1.4 Device Information

The AMC6V704 controller consists of four 12-bit IDACs and four 12-bit VDACs. Each IDAC can source 200mA and has a dedicated power supply that enables the power consumption optimization of each channel. The device VDACs support –5V, –2.5V, 2.5V, and 5V full-scale output ranges with 50mA drive capability. The AMC6V704 is available in a very-small 2.56mm x 2.56mm, 36-pin DSBGA package. See the *AMC6V704 4-Channel Optical Monitor and Controller With Current and Voltage Output DACs and Multichannel ADC Data Sheet* for more information.

2 Hardware

2.1 Hardware Setup

This section describes the overall system setup for the EVM. A computer runs the software that provides an interface to the AMC6V704EVM through the onboard FTDI controller using I²C or SPI. Power supplies for the EVM must be supplied externally.

2.1.1 Electrostatic Discharge Caution

CAUTION
Many of the components on the AMC6V704EVM 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.

2.1.2 Power Configurations and Jumper Settings

Table 2-1 and Figure 2-1 show the supply connections to the AMC6V704EVM. Make sure 2.5V ≤ VCC – VSS ≤ 5.5V.

Table 2-1. Power Supply Inputs

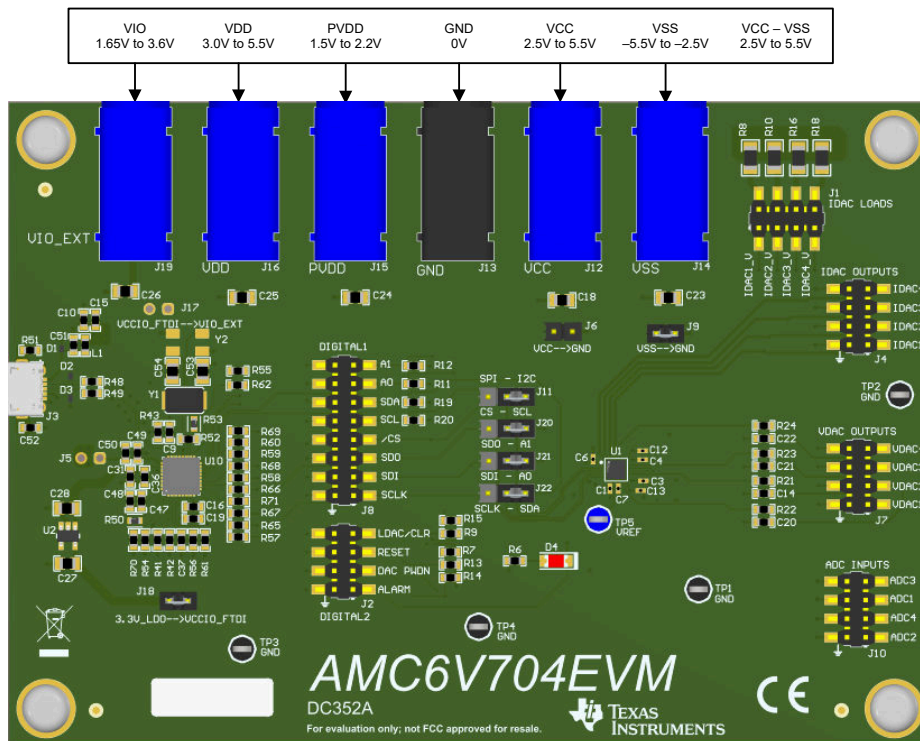| Designator	Supply Name	Voltage Range
J19	VIO	1.65V to 3.6V
J16	DVDD	3V to 5.5V
J15	PVDD	1.5V to 2.2V
J13	GND	0V
J12	VCC	2.5V to 5.5V
J14	VSS	–5.5V to –2.5V

Figure 2-1. Power Supply Inputs

Table 2-2 shows the details of the configurable jumper settings on the AMC6V704EVM

Table 2-2. Jumper Definitions

Designator	Default Position	Available Positions	Description
J1	All open: IDAC outputs disconnected from 4.99Ω load resistors	Closed: IDACx output connected to 4.99Ω load resistor	Connects the IDAC outputs to the on-board 4.99Ω load resistor to measure the current as a function of the voltage
J6	Open: VCC not connected to ground	Closed: VCC connected to ground	Connects the VCC supply input to ground in negative voltage output mode
J9	Closed: VSS connected to ground	Open: VSS not connected to ground	Connects the VSS supply input to ground in positive voltage output mode
J11, J20, J21, J22,	All 1-2: SPI enabled	All 2-3: I^{2}C enabled	I^{2}C or SPI selector
J18	Closed: FTDI VCCIO supply connected to 3.3V LDO	Open: FTDI VCCIO supply not connected to 3.3V LDO. If left open, populate J5 or J15 to connect the FTDI VCCIO input to VCCIO3V3_FTDI or VIO_EXT respectively.	FTDI VCCIO supply selector

The onboard FT4222 controller supports 3.3V, 2.5V, and 1.8V logic levels. By default, the controller is configured to use 3.3V. To use 2.5V or 1.8V, open J18, populate J17 to connect the FTDI VCCIO input to VIO_EXT.

2.1.3 Connecting the FTDI Digital Controller

After the power and jumper configurations are set up as per Section 2.1.2, connect the USB cable from the AMC6V704EVM USB port to the computer.

2.2 Hardware Description

The following sections provide detailed information on the EVM hardware and signal definitions.

2.2.1 Connector Definitions

Table 2-3 shows the connector definitions of the AMC6V704EVM.

Table 2-3. Connector Definitions

Designator	Definition
J2	I^{2}C and SPI signals
J3	USB connector
J4	IDAC outputs
J7	VDAC outputs
J8	Digital Signals
J10	ADC inputs
TP1, TP2, TP3, TP4	Ground test points
TP5	VREF test point

3 Software

3.1 Software Setup

This section provides the procedure for EVM software installation.

3.1.1 Software Installation

Make sure the AMC6V704EVM is not connected to the computer during software installation.

Download the AMC6V704EVM software from the device product folders or AMC6V704EVM tool folder. After the software is downloaded, navigate to the download folder, and run the AMC6V704EVM-GUI installer executable.

When the AMC6V704EVM-GUI installer is launched, an installation dialog window opens and prompts the user to select an installation directory. The default software path is C:\Program Files (x86)\Texas Instruments\AMC6V704EVM.

The software installation also installs the FTDI USB drivers. The FTDI USB drivers install in a second executable.

3.2 Software Description

This section discusses the features of the AMC6V704EVM software and how to use these features. The software provides basic control of all the AMC6V704 registers and functions.

3.2.1 Launching the Software

To launch the software, navigate to the Texas Instruments folder in the *Start* menu, and select the *AMC6V704EVM* icon.

Figure 3-1 shows the *Interface Settings* window. When the GUI starts, the *Interface Settings* window pops up. This window contains drop-down menus that select protocol (SPI or I^{2}C) and, if I^{2}C protocol is selected, the I^{2}C device address. The menu does not pop up if the GUI starts in Demo mode. In this case, uncheck the *Demo Mode* checkbox (see Figure 3-3, upper-right corner). If the interface must be updated again, then toggle the *Demo Mode* checkbox for the menu to reappear.
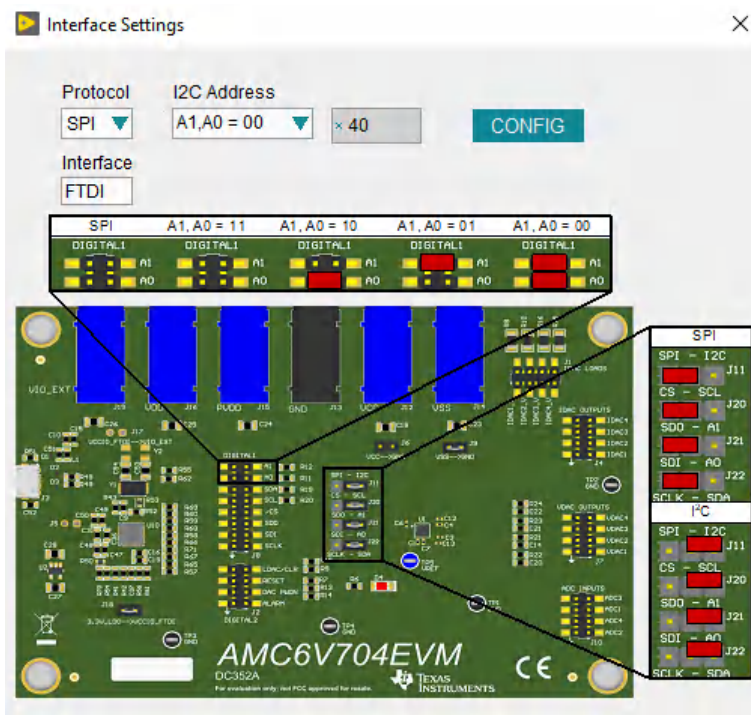

Figure 3-1. AMC6V704EVM Interface Settings at Launch

Figure 3-2 shows that if the onboard controller is connected correctly, the status bar at the bottom of the screen displays *CONNECTED*. If status bar displays *DEMO*, then uncheck the *Demo Mode* checkbox. If the controller is not properly connected or not connected at all, then the status displays *DEMO*. If the GUI is not displaying the *CONNECTED* status while the EVM is connected and the *Demo Mode* checkbox is unchecked, then unplug and reconnect the EVM, and then relaunch the GUI software.
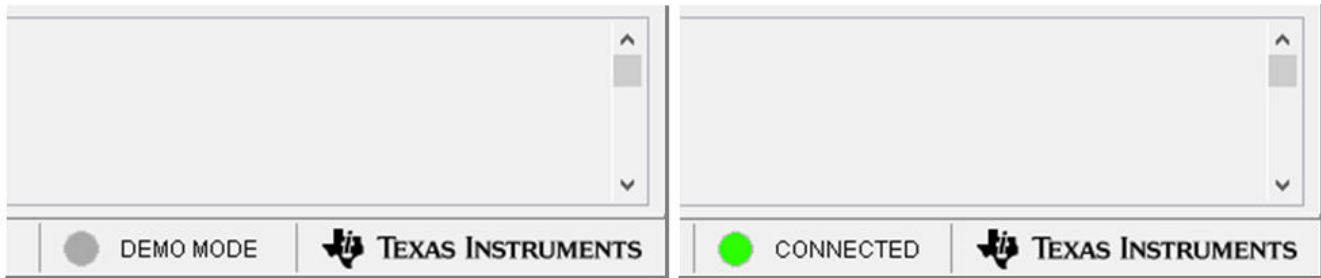

Figure 3-2. FTDI Digital Controller Connection Status

3.2.2 Software Features

The AMC6V704EVM-GUI uses I^{2}C or SPI communication to control the AMC6V704. These functions are built into several GUI pages, as shown in the following subsections. The menu bar on the far left of the GUI allows the user to switch between pages. The menu bar displays the *High Level Configuration* page with *AMC Control*, and *ADC MUX Control* subpages, and the *Low Level Configuration* page.

See the respective device data sheet for detailed AMC6V704 programming instructions before using the GUI.

3.2.2.1 High Level Configuration Page

The AMC6V704EVM-GUI has a *High Level Configuration* page that provides an interface to quickly configure the parameters and relevant register settings for the respective AMC6V704 device. The *High Level Configuration* page is comprised of two subpages: *AMC Control* and *ADC MUX Control*.

Figure 3-3 shows the *AMC Control* subpage that is used to set the range and outputs for the IDAC and VDACs. Alarms and status information is also displayed on this tab.

Figure 3-3. AMC Control Subpage

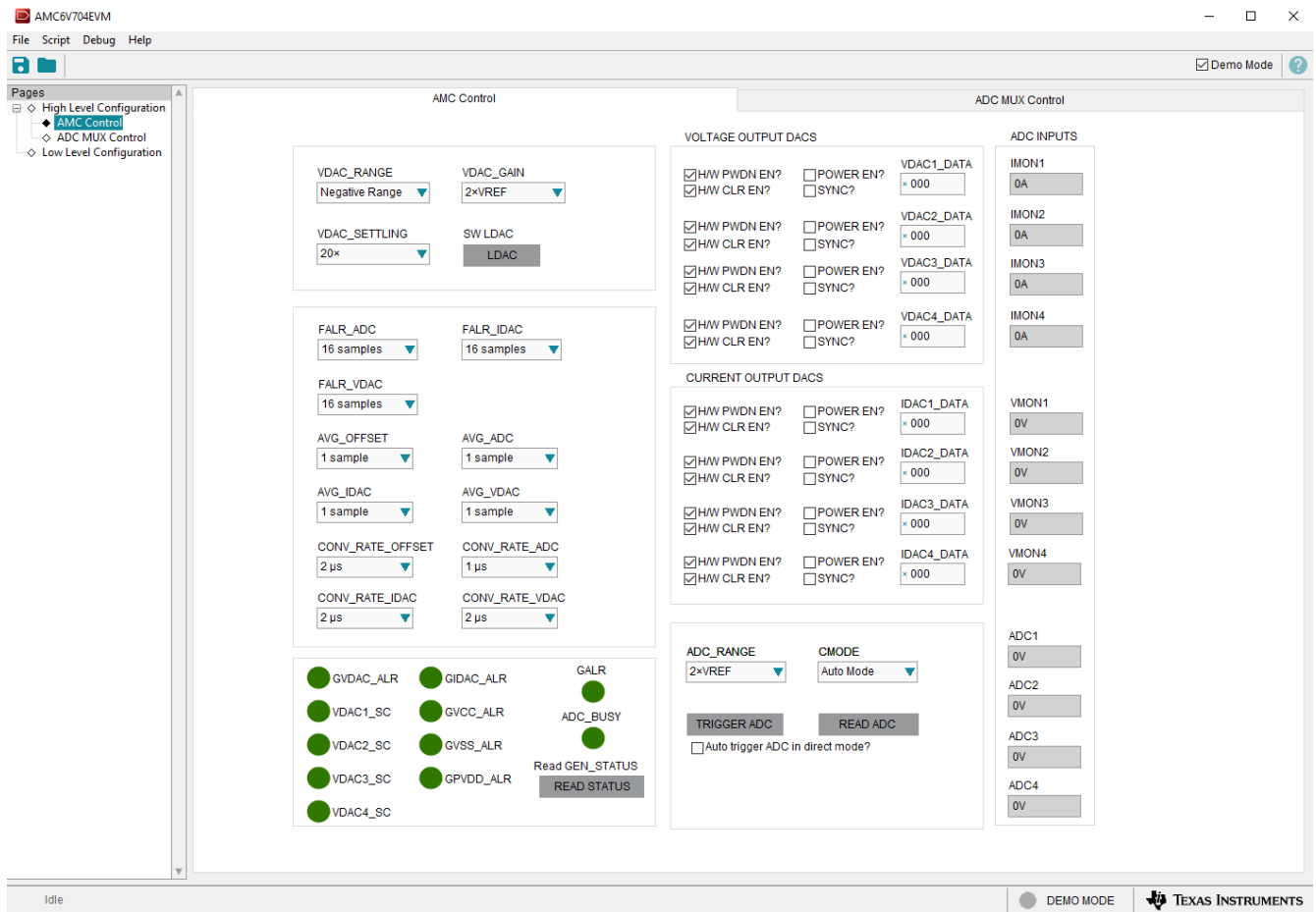Figure 3-4 shows the *ADC MUX Control* subpage. The ADC in the AMC6V704 measures four input pins, as well as the voltages at the IDAC output pins and the current by the VDACs. The *ADC MUX Control* subpage sets the ADC sequencer controls to select which channels are measured and the order in which the channels are read.
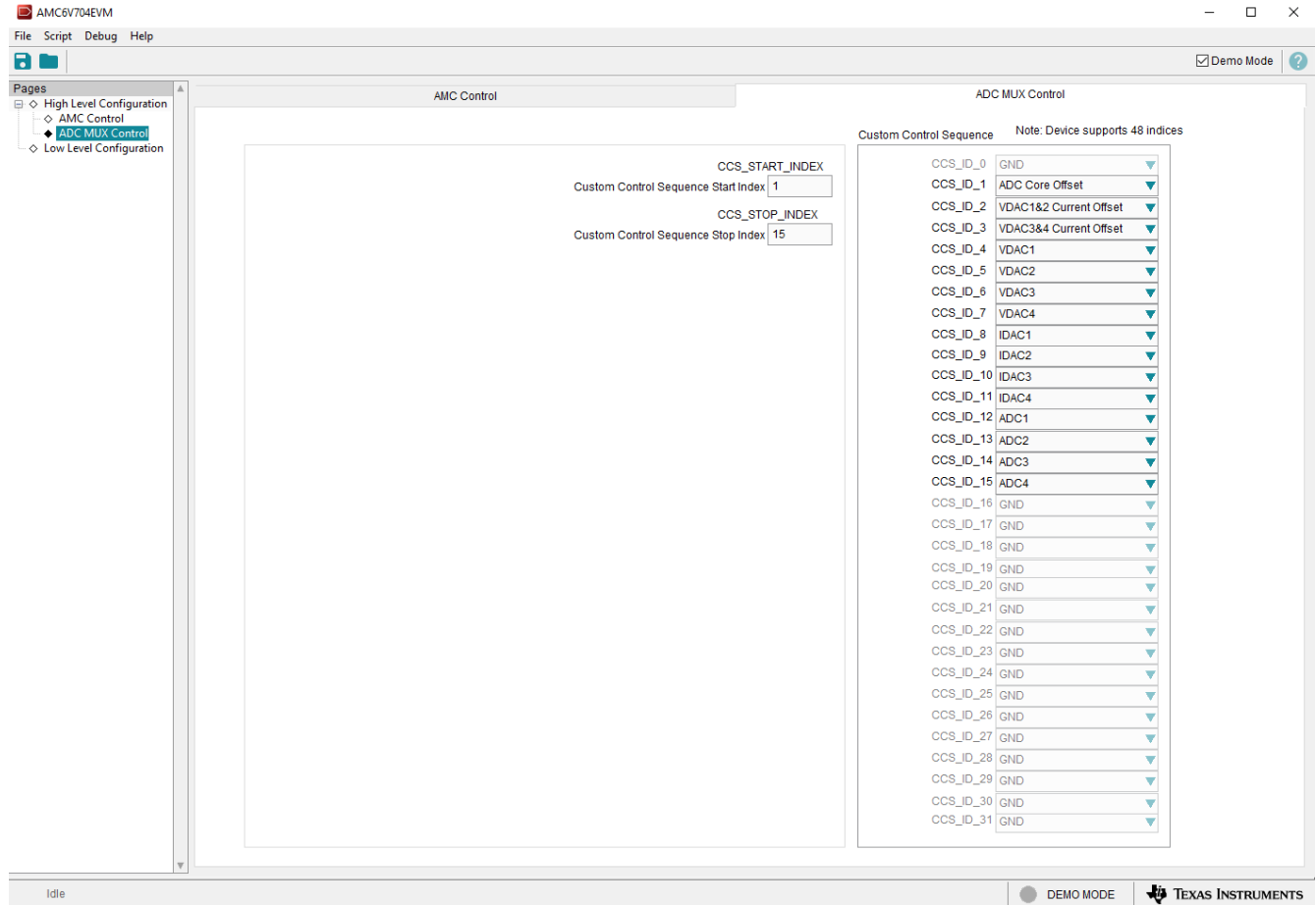

Figure 3-4. ADC MUX Control Tab of the High Level Configuration Page

3.2.2.2 Low Level Configuration Page

Figure 3-5 shows the *Low Level Configuration* page of the AMC6V704EVM-GUI. This page allows access to low-level communication directly with the respective AMC6V704 device registers.

The *Register Map* section in the center of the window lists all the registers, grouped by the pages in the device. The GUI automatically addresses the correct page based on the register selected. Selecting a register on the *Register Name* list shows a description of the values in that register, as well as information on the register address, default value, size, and current value. Data are written to the registers by entering a value in the value column of the GUI.
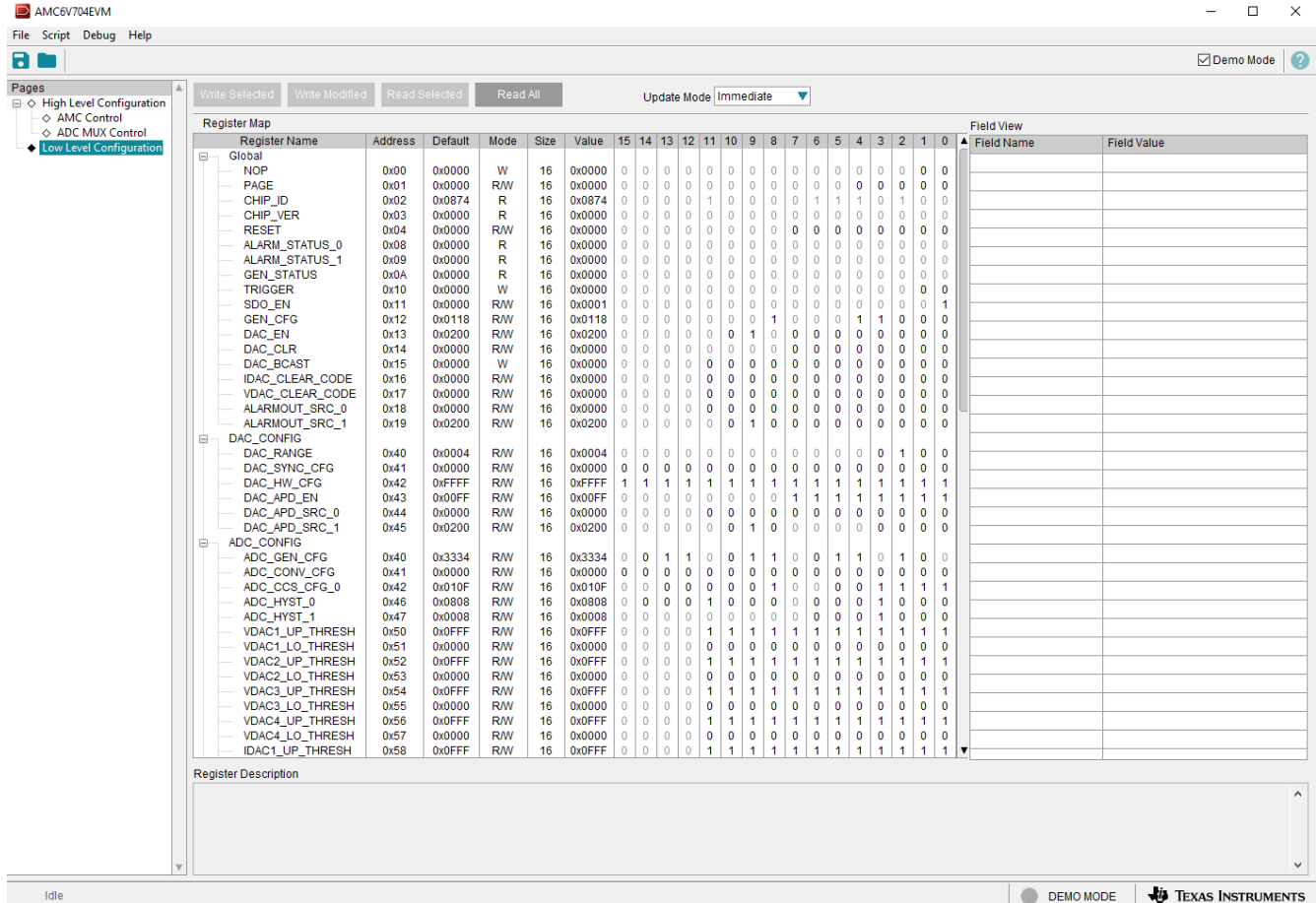
Register Name	Address	Default	Mode	Size	Value	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Global																					
NOP	0x00	0x0000	W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAGE	0x01	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHIP_ID	0x02	0x0874	R	16	0x0874	0	0	0	0	1	0	0	0	0	1	1	1	0	1	0	0
CHIP_VER	0x03	0x0000	R	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RESET	0x04	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALARM_STATUS_0	0x08	0x0000	R	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALARM_STATUS_1	0x09	0x0000	R	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GEN_STATUS	0x0A	0x0000	R	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRIGGER	0x10	0x0000	W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SDO_EN	0x11	0x0000	R/W	16	0x0001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
GEN_CFG	0x12	0x0118	R/W	16	0x0118	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0
DAC_EN	0x13	0x0200	R/W	16	0x0200	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
DAC_CLR	0x14	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAC_BCAST	0x15	0x0000	W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDAC_CLEAR_CODE	0x16	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VDAC_CLEAR_CODE	0x17	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALARMOUT_SRC_0	0x18	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALARMOUT_SRC_1	0x19	0x0200	R/W	16	0x0200	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
DAC_CONFIG																					
DAC_RANGE	0x40	0x0004	R/W	16	0x0004	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
DAC_SYNC_CFG	0x41	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAC_HW_CFG	0x42	0xFFFF	R/W	16	0xFFFF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DAC_APD_EN	0x43	0x00FF	R/W	16	0x00FF	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
DAC_APD_SRC_0	0x44	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAC_APD_SRC_1	0x45	0x0200	R/W	16	0x0200	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
ADC_CONFIG																					
ADC_GEN_CFG	0x40	0x3334	R/W	16	0x3334	0	0	1	1	0	0	1	1	0	0	1	1	0	1	0	0
ADC_CONV_CFG	0x41	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADC_CCS_CFG_0	0x42	0x010F	R/W	16	0x010F	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1
ADC_HYST_0	0x46	0x0808	R/W	16	0x0808	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
ADC_HYST_1	0x47	0x0008	R/W	16	0x0008	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
VDAC1_UP_THRESH	0x50	0x0FFF	R/W	16	0x0FFF	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
VDAC1_LO_THRESH	0x51	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VDAC2_UP_THRESH	0x52	0x0FFF	R/W	16	0x0FFF	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
VDAC2_LO_THRESH	0x53	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VDAC3_UP_THRESH	0x54	0x0FFF	R/W	16	0x0FFF	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
VDAC3_LO_THRESH	0x55	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VDAC4_UP_THRESH	0x56	0x0FFF	R/W	16	0x0FFF	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
VDAC4_LO_THRESH	0x57	0x0000	R/W	16	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDAC1_UP_THRESH	0x58	0x0FFF	R/W	16	0x0FFF	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1

Figure 3-5. Low Level Configuration Page

To store the values of the register map locally, select *Save Configuration* under the *File* menu option. The stored configuration files can be recalled and loaded by selecting *Open Configuration.*

Figure 3-6 shows the four configuration buttons provided on the *Low Level Configuration* page that allow the user to read from and write to the device registers:

- Write Selected
- Write Modified
- Read Selected
- Read All

The *Write Modified* button is enabled only in *Deferred Update Mode*. *Deferred Update Mode* initiates a write operation only when the *Write Selected* or *Write Modified* buttons are pressed. By default, *Immediate Update Mode* is selected for the *Low Level Configuration* page write operations.

The AMC6V704 SDO pin must be enabled in the SDO_EN register before reading any device registers.
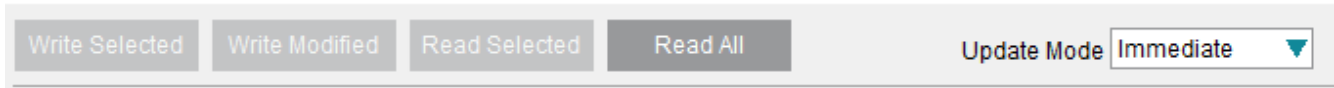
Figure 3-6. Low Level Configuration Page Options

4 Hardware Design Files

4.1 EVM Schematics

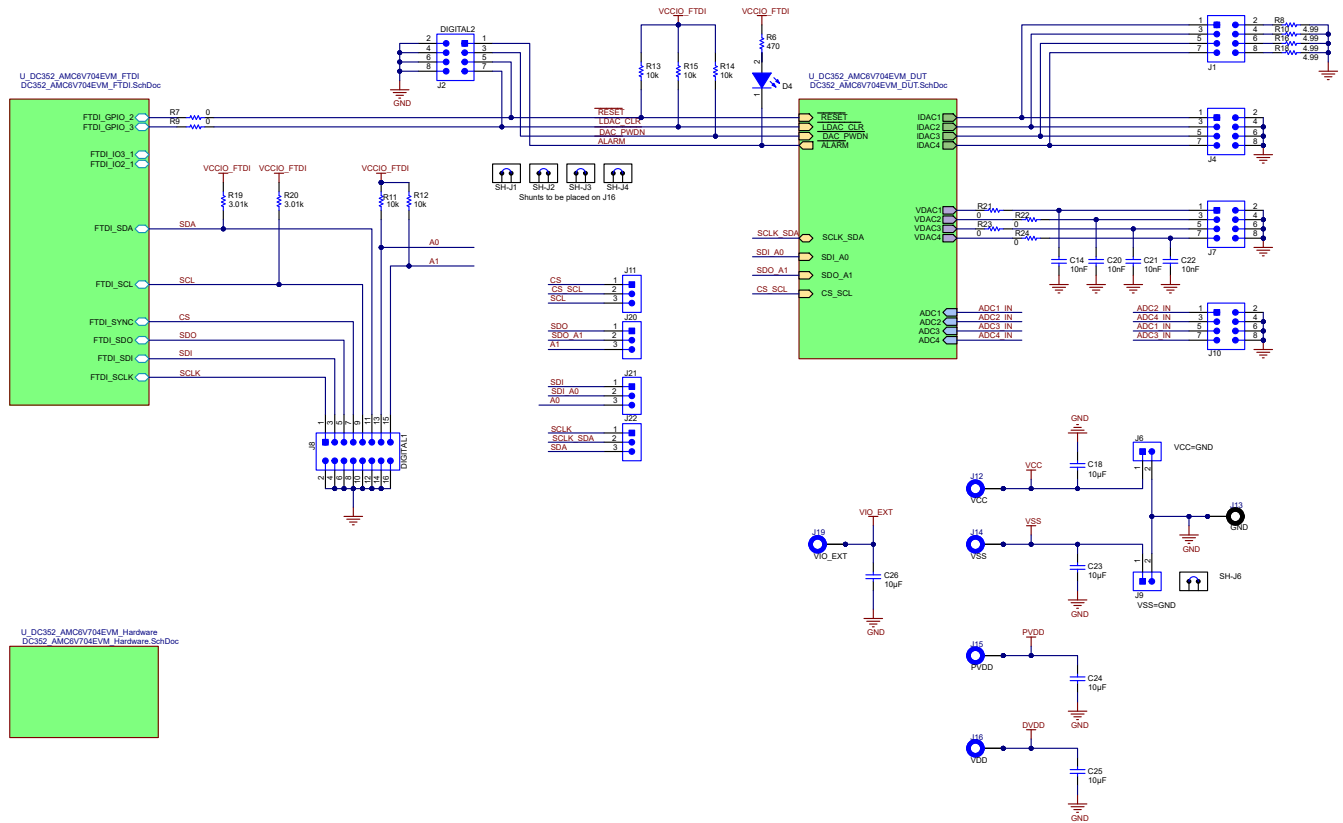The AMC6V704EVM schematics are shown in Figure 4-1 through Figure 4-3.
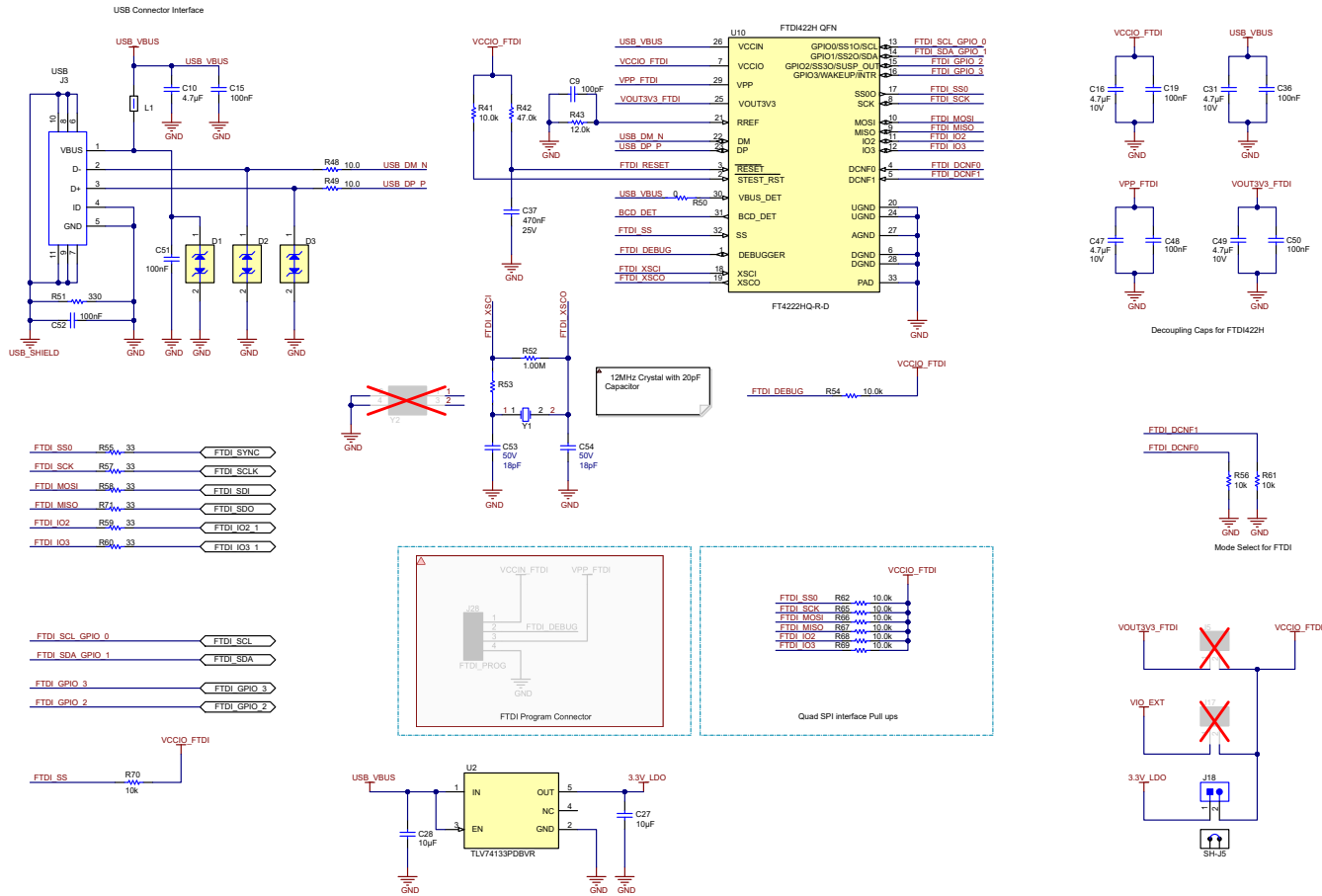

Figure 4-1. AMC6V704EVM Schematic Page 1

USB Connector Interface
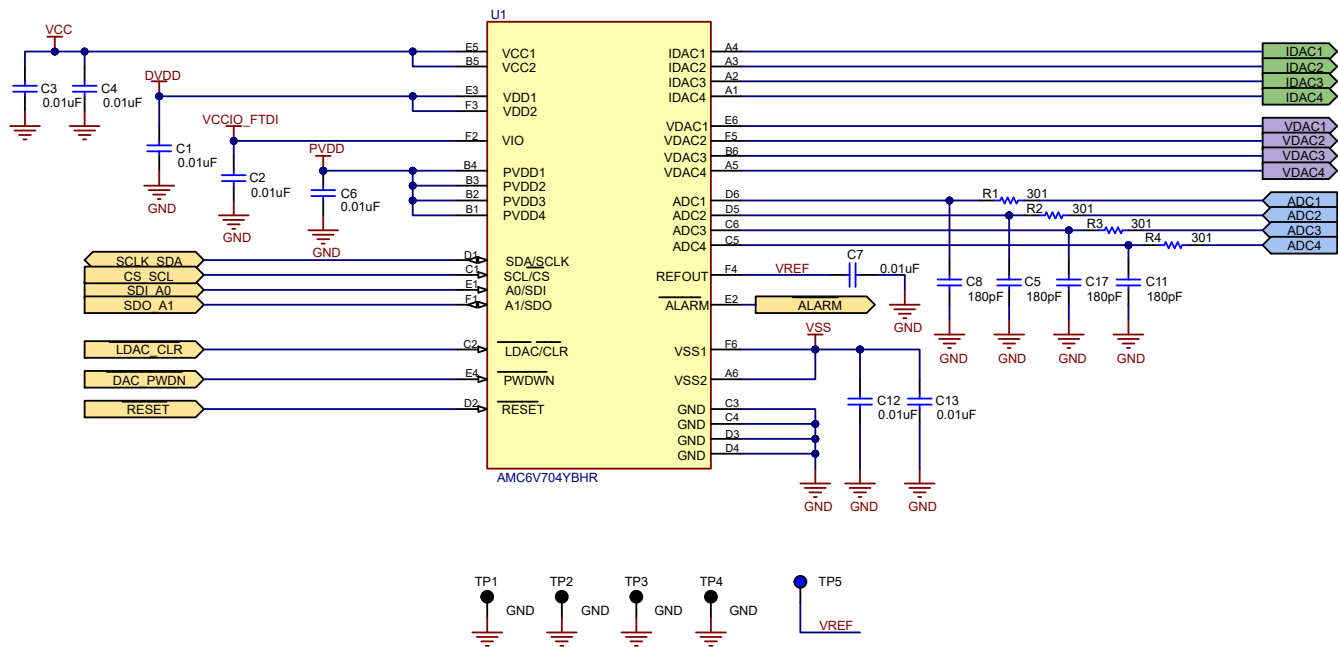
Figure 4-2. AMC6V704EVM Schematic Page 2

Figure 4-3. AMC6V704EVM Schematic Page 3

4.2 PCB Layout

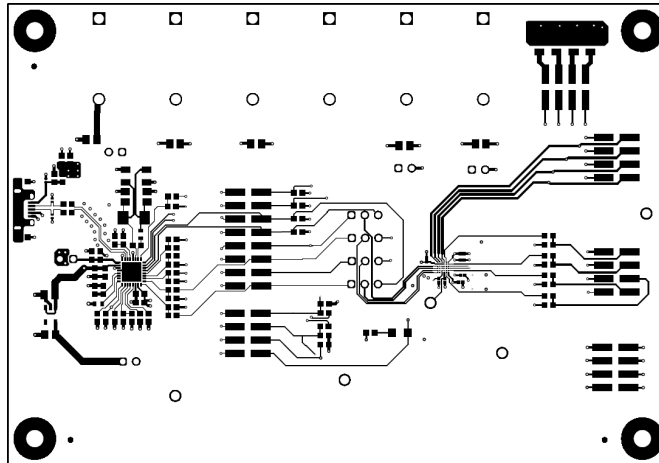Figure 4-4 through Figure 4-9 show the board layout for the AMC6V704EVM.
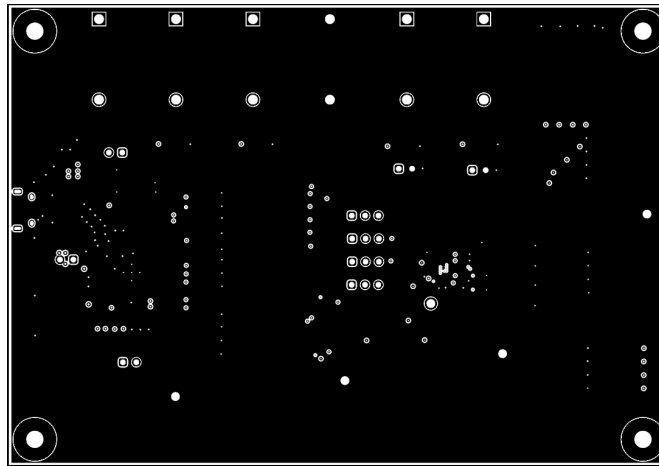

Figure 4-4. AMC6V704EVM PCB Top Layer Layout

Figure 4-5. AMC6V704EVM PCB Mid Layer 1 Layout (Ground Plane)
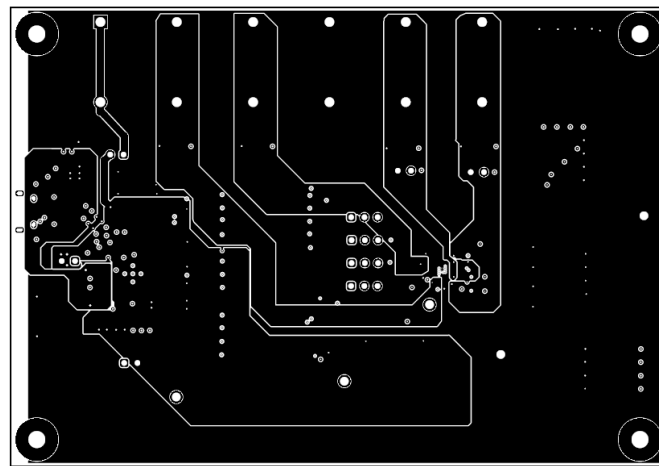
Figure 4-6. AMC6V704EVM PCB Mid Layer 2 Layout (Power Layer)
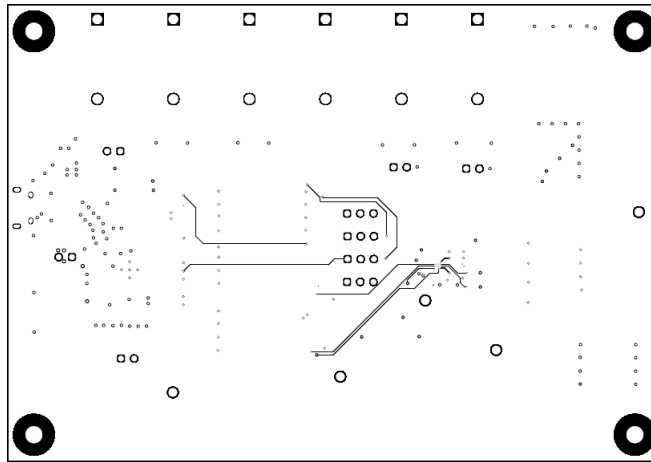
Figure 4-7. AMC6V704EVM PCB Mid Layer 3 Layout (Signal Layer)
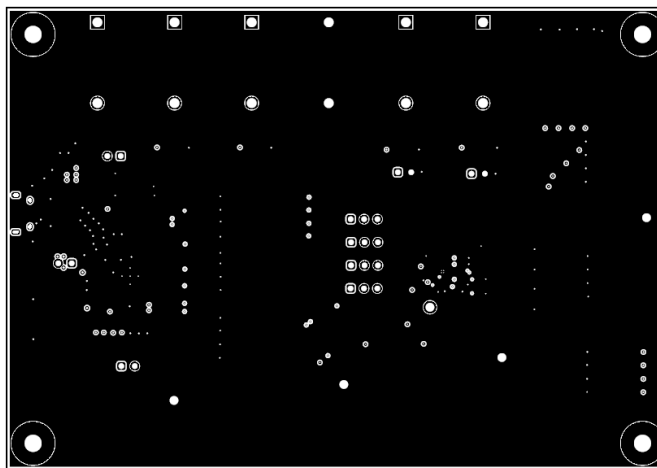
Figure 4-8. AMC6V704EVM PCB Mid Layer 4 Layout (Ground Plane)
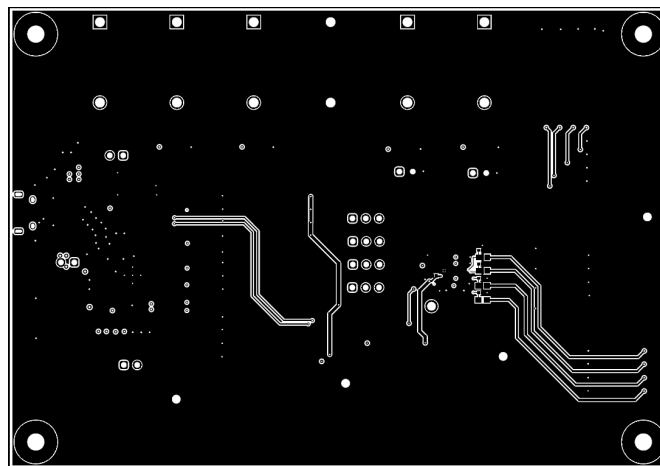
Figure 4-9. AMC6V704EVM PCB Bottom Layer Layout

4.3 Bill of Materials

lists the AMC6V704EVM bill of materials (BOM).

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
C1, C2, C3, C4, C6, C7, C12, C13	8	0.01µF	CAP, CERM, 0.01µF, 10V, +/- 10%, X7R, AEC-Q200 Grade 1, 0201	0201	CGA1A2X7R1A103K030BA	TDK
C5, C8, C11, C17	1	180pF	CAP, CERM, 180pF, 25V, +/- 10%, X7R, 0201	0201	GRM033R71E181KA01D	MuRata
C9	1	100pF	CAP, CERM, 100pF, 25V, +/- 10%, X7R, 0603	0603	06033C101KAT2A	AVX
C10	1	4.7µF	CAP, CERM, 4.7µF, 16V,+/- 10%, X7R, 0603	0603	GRM188Z71C475KE21D	MuRata
C14, C20, C21, C22	4	0.01µF	CAP, CERM, 0.01µF, 16V, +/- 10%, X7R, 0603	0603	885012206040	Wurth Elektronik
C15, C19, C36, C48, C50, C51, C52	7	0.1µF	CAP, CERM, 0.1µF, 50V,+/- 5%, X7R, 0603	0603	06035C104JAT2A	AVX
C16, C31, C47, C49	4	4.7µF	CAP, CERM, 4.7µF, 10V, +/- 20%, X7R, 0603	0603	GRM188Z71A475ME15D	MuRata
C18, C23, C24, C25, C26, C27, C28	7	10µF	CAP, CERM, 10µF, 16V, +/- 20%, X7R, 0805	0805	EMK212BB7106MG-T	Taiyo Yuden
C37	1	0.47µF	CAP, CERM, 0.47µF, 25V, ±10%, X7R, 0603	0603	GRM188R71E474KA12D	MuRata
C53, C54	2	18pF	CAP, CERM, 18pF, 50V, +/- 5%, C0G/NP0, 0805	0805	08055A180JAT2A	AVX
D1, D2, D3	3		Single-Channel ESD Protection in 0402 Package With 10pF Capacitance and 9V Breakdown, DPY0002A (X1SON-2)	DPY0002A	TPD1E10B09DPYR	Texas Instruments
D4	1	Red	LED, Red, SMD	3.2 x 1.6mm	150120RS75000	Wurth Elektronik
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5	Standoff	1902C	Keystone
J1, J2, J4, J7, J10	5		Header, 2.54mm, 4x2, Gold, SMT	Header, 2.54mm, 4x2, SMT	TSM-104-01-L-DV	Samtec
J3	1		Receptacle, USB 2.0, Micro-USB Type B, R/A, SMT	USB-micro B USB 2.0, 0.65mm, 5 Pos, R/A, SMT	10118194-0001LF	FCI
J6, J9, J18	3		Header, 2.54mm, 2x1, Tin, TH	Header, 2.54mm, 2x1, TH	TSW-102-23-T-S	Samtec
J8	1		Header, 2.54mm, 8x2, Gold, SMT	Header, 2.54mm, 8x2, SMT	TSM-108-01-L-DV	Samtec
J11, J20, J21, J22	4		Header, 2.54mm, 3x1, Gold, TH	Header, 2.54mm, 3x1, TH	TSW-103-08-G-S	Samtec
J12, J14, J15, J16, J19	5		Standard Banana Jack, insulated, 10A, blue	571-0200	571-0200	DEM Manufacturing
J13	1		Standard Banana Jack, insulated, 10A, black	571-0100	571-0100	DEM Manufacturing
L1	1	600Ω	Ferrite Bead, 600Ω at 100MHz, 1A, 0603	603	782633601	Wurth Elektronik
R1, R2, R3, R4	4	301Ω	RES, 301, 0.5%, 0.1W, 0603	0603	RT0603DRE07301RL	Yageo America

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R6	1	470Ω	RES, 470, 1%, 0.1W, 0603	0603	RC0603FR-07470RL	Yageo
R7, R9, R21, R22, R23, R24	6	0Ω	RES, 0, 5%, 0.1W, 0603	0603	RC0603JR-070RL	Yageo America
R8, R10, R16, R18	4	4.99Ω	RES, 4.99, 0.1%, 0.25W, 1206	1206	RP73D2B4R99BTG	TE Connectivity
R11, R12, R13, R14, R15, R56, R61, R70	8	10kΩ	RES, 10 k, 5%, 0.1W, 0603	0603	RC0603JR-0710KL	Yageo
R19, R20	2	3.01kΩ	RES, 3.01 k, 0.1%, 0.1W, 0603	0603	RT0603BRD073K01L	Yageo America
R41, R54, R62, R65, R66, R67, R68, R69	8	10kΩ	RES, 10.0 k, 1%, 0.1W, 0603	0603	RC0603FR-0710KL	Yageo
R42	1	47kΩ	RES, 47.0 k, 1%, 0.1W, AEC-Q200 Grade 0, 0603	0603	CRCW060347K0FKEA	Vishay-Dale
R43	1	12kΩ	RES, 12.0 k, 0.1%, 0.1W, 0603	0603	RT0603BRD0712KL	Yageo America
R48, R49	2	10Ω	RES, 10.0, 1%, 0.1W, 0603	0603	RC0603FR-0710RL	Yageo
R50, R53	2	0Ω	0 Ohms Jumper 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200 Thick Film	0603	ERJ-3GEY0R00V	Panasonic
R51	1	330Ω	RES, 330, 1%, 0.1W, 0603	0603	RC0603FR-07330RL	Yageo
R52	1	1.00MΩ	RES, 1.00M, 1%, 0.1W, AEC-Q200 Grade 0, 0603	0603	CRCW06031M00FKEA	Vishay-Dale
R55, R57, R58, R59, R60, R71	6	33Ω	RES, 33, 5%, 0.1W, AEC-Q200 Grade 0, 0603	0603	CRCW060333R0JNEA	Vishay-Dale
TP1, TP2, TP3, TP4	4		Test Point, Compact, Black, TH	Black Compact Test point	5006	Keystone Electronics
TP5	1		Test Point, Compact, Blue, TH	Blue Compact Test point	5122	Keystone Electronics
U1	1		4-Channel, EML Monitor and Controller With Current and Voltage Output DACs and a Multichannel ADC	DSBGA36	AMC6V704YBHR	Texas Instruments
U2	1		Low-Dropout Regulator, DBV0005A (SOT-23-5)	DBV0005A	TLV74133PDBVR	Texas Instruments
U10	1		USB2.0 to QuadSPI/I2C Bridge IC, VQFN-32	VQFN-32	FT4222HQ-D-R	FTDI
Y1	1		Crystal, 12MHz, 18pF, SMD	ABM3	ABM3-12.000MHZ-D2Y-T	Abracon Corporation

5 Additional Information

5.1 Trademarks

All trademarks are the property of their respective owners.

6 Related Documentation From Texas Instruments

The document in Table 6-1 provides information regarding Texas Instruments integrated circuits used in the assembly of the AMC6V704EVM. This user's guide is available from the TI web site under literature number SLAU943. 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 can be available from the TI web site at https:// 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 6-1. Related Documentation

Document	Literature Number
AMC6V704 product data sheet	SLASFI2

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

    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 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 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 a nonconforming EVM if (a) the nonconformity was 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, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

    2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, 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.

WARNING

Evaluation Kits 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 shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:
EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3   *Regulatory Notices:*

   3.1   *United States*

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

FCC NOTICE: 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 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

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 to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けて

いないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの

措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用 いただく。

2. 実験局の免許を取得後ご使用いただく。

3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿６丁目２４番１号

西新宿三井ビル

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

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧くださ い。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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.

6.   *Disclaimers:*

    6.1   EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

    6.2   EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7.   *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

    8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

    8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

IMPORTANT NOTICE AND DISCLAIMER