Using the UCD3138064AEVM149

User's Guide

Literature Number: SLUUBD9
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Contents

List of Figures

List of Tables

Using the UCD3138064AEVM149

1 Introduction

This UCD3138064AEVM149 evaluation module is to help evaluate the UCD3138064A digital controller device from Texas Instruments and aid in design of digitally controlled isolated power converters. The UCD3138064A device belongs to the UCD3138 family of highly-integrated digital controller devices optimized for isolated power-supply applications.

The UCD3138064AEVM149 is quite similar to the UCD3138ACCEVM149. The UCD3138064AEVM149 is to be used either as a stand-alone control card to study the UCD3138064A controller IC or as a DPWM controller board working with a power stage board to implement a fully-regulated power converter. To help the targeted off-line isolated power applications, this EVM has been designed to work seamlessly with a power-converter EVM offered by TI: UCD3138ALLCEVM150. Please contact Texas Instruments for assistance with firmware needed to configure the UCD3138064A device and successfully interface UCD3138064AEVM149 with the UCD3138ALLCEVM150 power-converter EVM.

Alternately, the EVM can also be loaded with the user's custom developed firmware. In order to communicate with the UCD3138064A digital controller in this EVM, a separate USB Interface Adapter EVM from Texas Instruments known as the "USB-TO-GPIO Adapter" is required. The USB-TO-GPIO adapter is NOT supplied with UCD3138064AEVM149 evaluation module and must be purchased separately. Texas Instruments also offers a Graphical User Interface (GUI) in order to program the UCD3138064A controller and configure parameters when used with the UCD3138ALLCEVM150 power-converter EVM.

2 Description

The UCD3138064AEVM149 is an EVM board, functioning as a control card for UCD3138064ARGC digital power supply applications. This EVM is used to control a power converter topology such as LLC Resonant Half-Bridge DC converter, and so forth, by downloading the associated firmware and interfacing with an appropriate power stage board. The EVM works seamlessly with the following EVM boards, together with corresponding firmware, all developed by Texas Instruments.

- UCD3138PFCEVM-026, a digitally-controlled parallel flange channel (PFC) pre-regulator evaluation board
- UCD3138PSFBEVM-027, a digitally-controlled phase shift full bridge dc-dc converter evaluation board
- UCD3138ALLCEVM150, a digital controlled LLC half-bridge dc-dc converter evaluation board

Contact Texas Instruments for assistance with firmware needed to configure the UCD3138064A device and successfully interface the UCD3138064AEVM149 with the UCD3138ALLCEVM150 power-converter EVM.

2.1 Typical Applications

Typical applications for this EVM include:

- Off-line isolated power supply applications such as PFC, LLC resonant half-bridge dc-dc power converter, and phase-shifted full-bridge dc-dc power converter
- Server systems
- Telecommunication systems

2.2 Features

This EVM has the following features:

- 40-pin digital signal connector to connect digital signals to power converters
- 40-pin analog signal connector to connect analog signals to power converters
- JTAG connector
- LED indicator
- PMBus connector to personal computer (PC) connection through USB-TO-GPIO adapter
- Rich test points to facilitate the IC evaluation, system design, and circuit and firmware debugging
- 12-V input capable with onboard regulator, 3.3 V

3 Specifications

Table 1. UCD3138064AEVM149 Specifications

Parameter	Test Conditions	MIN	TYP	MAX	Units
Connector J1					
PMBus connector	Port of connection to USB-TO-GPIO, pin definition refer to TI standard USB-TO-GPIO document SLLU093	Standard			
Connector J2					
3.3-V connection to PMBus	Port to use on-board 3.3 VD to bias PMBus(1)	3.25	3.30	3.36	VDC
Connector J3					
Analog signal connection	Pin definition in compliance with UCD3138	40-pin			
Connector J4					
Digital signal connection	Pin definition in compliance with UCD3138	40-pin			
Pin 39	External voltage source input	11.5	12.0	12.5	VDC
Connector J5					
JTAG	Standard JTAG communication connection	Standard			
Connector J6					
3.3 V on board to external use	Port to use 3.3 V on board to bias external circuit	3.27	3.30	3.32	VDC
Connector J7					
TDI pullup connection	Jump to use JTAG, open for DTC functionality	2-pin			
Connector J8					
TDO pullup connection	Jump to use JTAG, open for DTC functionality	2-pin			
Operation Environment					
Operating temperature range	Natural convection		25		°C
Mechanical Characteristics					
Dimensions	Width		1.8		in
	Length		3.4		
	Component height		0.5		

(1) Apply jumper to provide a 3.3-V bias to board from USB-TO-GPIO adapter.

4 Schematics

Figure 1 and Figure 2 illustrate the EVM schematics.

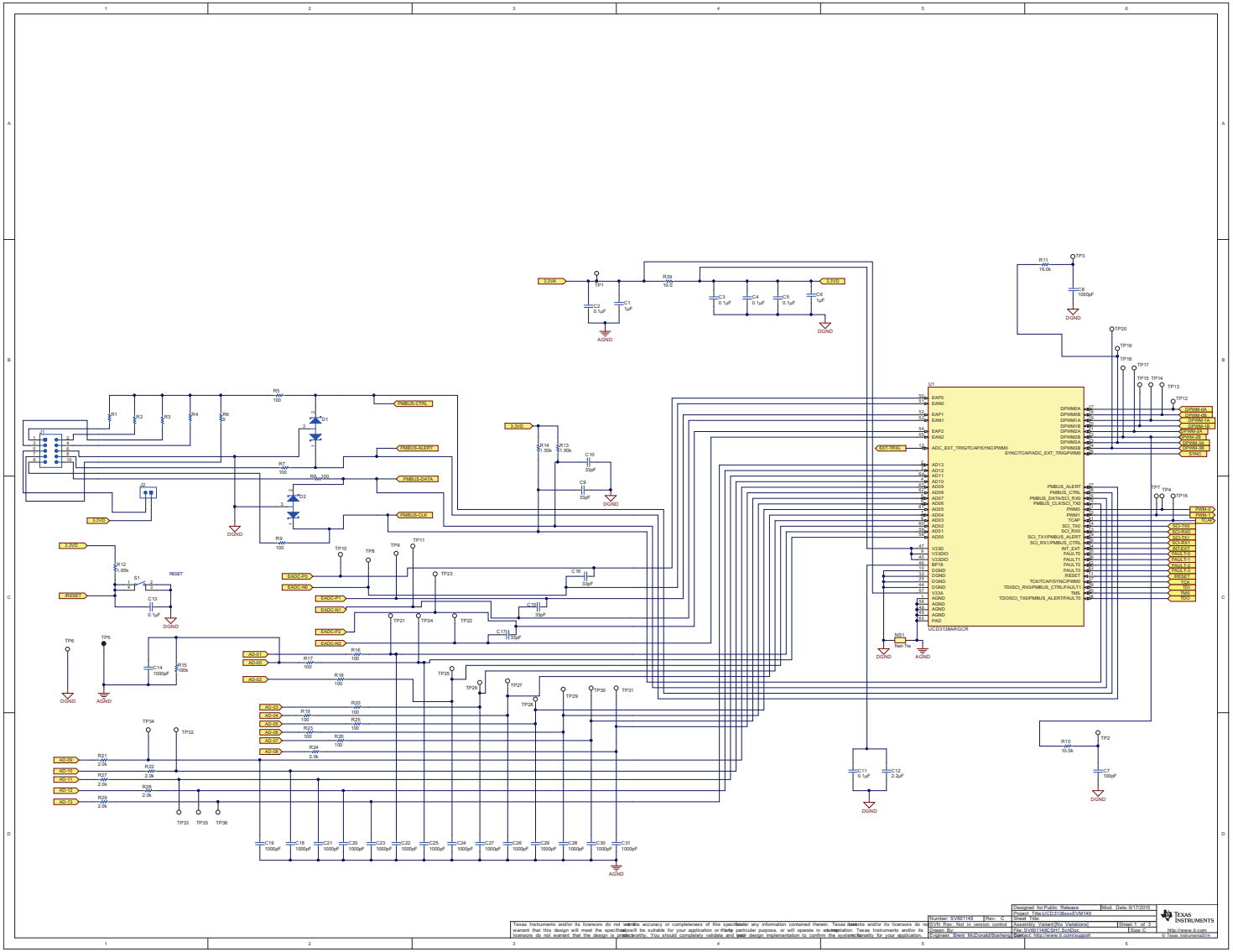

Figure 1. UCD3138064AEVM149 Schematic (1 of 2)

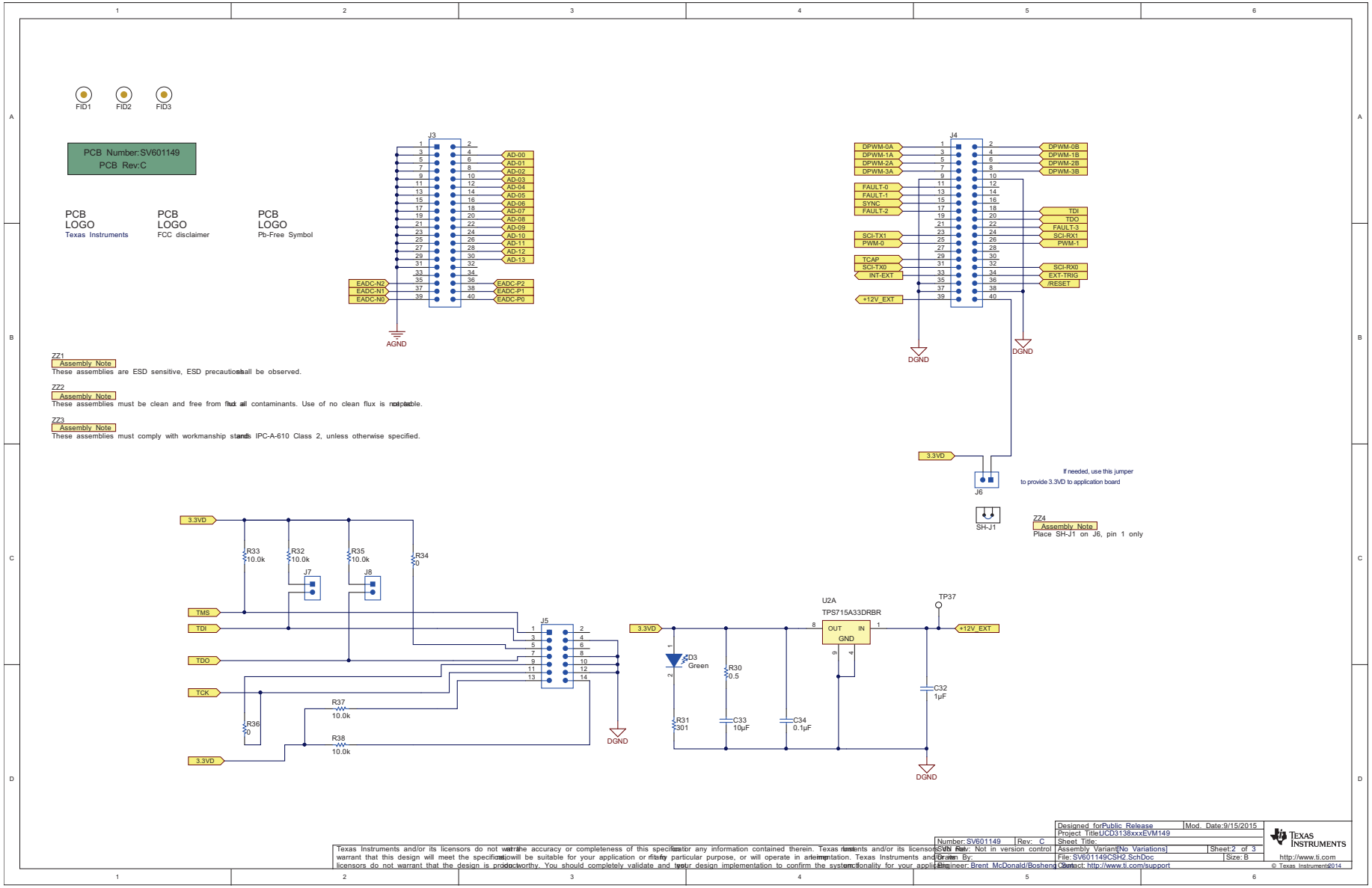

Figure 2. UCD3138064AEVM149 Schematic (2 of 2)

5 Test Equipment

Section 5.1 through Section 5.3 list the equipment required for tests while using this EVM.

5.1 Operating System

Microsoft® Windows® XP (32-bit), or Vista (32-bit), or Windows 7 (32-bit).

5.2 USB-TO-GPIO Interface Adapter

This adapter establishes the communication between the control card UCD3138064AEVM149 and the PC through the PMBus and the **GUI, Texas Instruments Fusion Digital Power Designer**. To order the USB-TO-GPIO adaptor, visit: http://www.ti.com/tool/usb-to-gpio

5.2.1 USB-TO-GPIO Interface Adapter (HPA172)

Accessories including:

(a) USB interface adapter (HPA172)

(b) USB cable, 5-pin B mini male to Type A male

(c) Ribbon cable, socket-to-socket, 10-pin, 2-headers, polarized

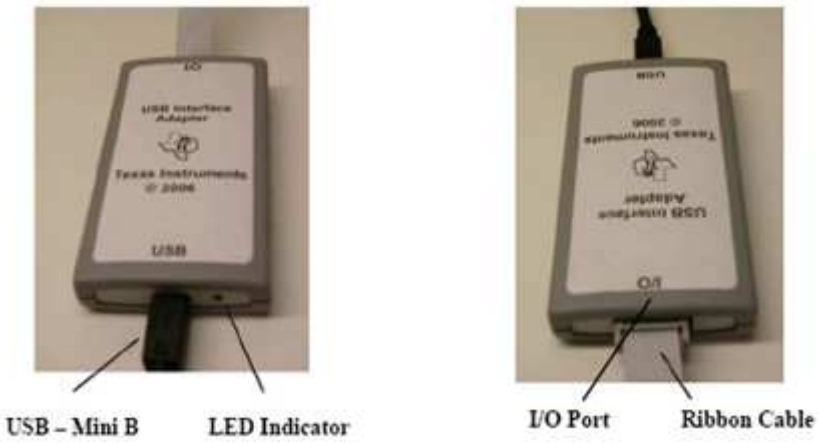

Figure 3. USB-TO-GPIO Interface Adapter (HPA172)

5.3 Oscilloscope

An analog or digital oscilloscope capable of 200-MHz bandwidth with an appropriate accompanying oscilloscope probe.

6 Equipment Setup

6.1 Graphical User Interface (GUI)

6.1.1 File for Installation

The GUI installation file is **TI-Fusion-Digital-Power-Designer-Version-2.0.16.exe** or newer version. To obtain the latest version of the GUI, visit http://www.ti.com/tool/fusion_digital_power_designer

6.1.2 Installation

Double click and launch the **.exe** file to start the installation. Click **Next** all the way through. When present, click **I accept the agreement** after reading it. Then click **Install**. After the installation, click **Finish** to exit setup. Then click **Exit Program**.

6.1.3 Launch UCD3138 Device GUI

Launch the UCD3138064AEVM149 board GUI with the following:

- Click the window **Start** → click **All Programs** → click **Texas Instruments Fusion Digital Power Designer** → click **Device GUIs** → click **UCD3xxx & UCD9xxx Device GUI**.

6.2 Hardware Setup

6.2.1 Setup Overview

Figure 4 shows the connection between the UCD3138064AEVM149 and the PC through the USB-TO-GPIO interface adapter.

USB Adapter Connection:

1. Connect one end of the ribbon cable to the EVM (SV601149), and connect the other end to the USB interface adapter.
2. Connect the Mini-USB connector of the USB cable to the USB interface adapter, and connect the other end to the USB port of the PC.

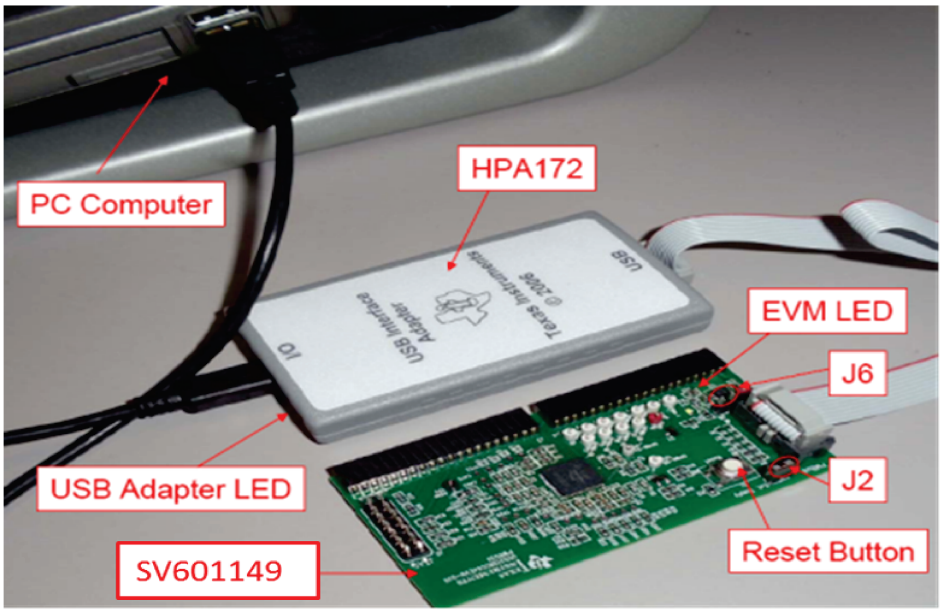

Figure 4. UCD3138064AEVM149 Test Connections

6.3 List of Test Points

Table 2. Functions of Each Test Point

Test Points	Name	Description
TP1	3.3VA	3.3-V analog on board
TP2	RC filter 2B	DPWM2B RC filter
TP3	RC filter 3A	DPWM3A RC filter
TP4	PWM-0	PWM0
TP5	AGND	Analog GND
TP6	DGND	Digital GND
TP7	PWM-1	PWM1
TP8	EADC-N0	EAN0
TP9	EADC-P1	EAP1
TP10	EADC-P0	EAP0
TP11	EADC-N1	EAN1
TP12	DPWM-0A	DPWM0A
TP13	DPWM-0B	DPWM0B
TP14	DPWM-1A	DPWM1A
TP15	DPWM-1B	DPWM1B
TP16	TCAP	TCAP
TP17	DPWM-2A	DPWM2A
TP18	DPWM-2B	DPWM2B
TP19	DPWM-3A	DPWM3A
TP20	DPWM-3B	DPWM3B
TP21	AD-00	ADC channel AD01
TP22	EADC-N2	EAN2
TP23	EADC-P2	EAP2
TP24	AD-01	A to D converter channel AD00
TP25 to TP36	AD-02 to -13	A to D converter channels AD02 to AD13
TP37	12V_EXT	External 12 V
J1	PMBus Connection	PMBus connector, 10 pins
J2	3.3VD	Jumper header, if jump across, 3.3 V supplied from the USB connection
J3	Analog Connection	40-pin header, analog signals
J4	Digital Connection	40-pin header, digital signals
J5	JTAG Connection	14-pin header, JTAG connector
J6	3.3VD	Jumper header, if jump across, 3.3 V supplied to outside need
J7	TDI	Jump across to use JTAG
J8	TDO	Jump across to use JTAG
S1	Reset	UCD3138 reset, press to reset.

7 Test Procedure

7.1 Download Firmware Codes to UCD3138064AEVM149

Set up the EVM connection based on Figure 4.

1. After setting up the EVM connection, the USB adapter LED light should be on.
2. Use the provided jumper to jump across J2. The EVM LED will light up.
3. Launch the UCD3XXX / UCD9XXX device GUI following the steps described in section 6.1.3. A window like the one shown in Figure 5 appears.

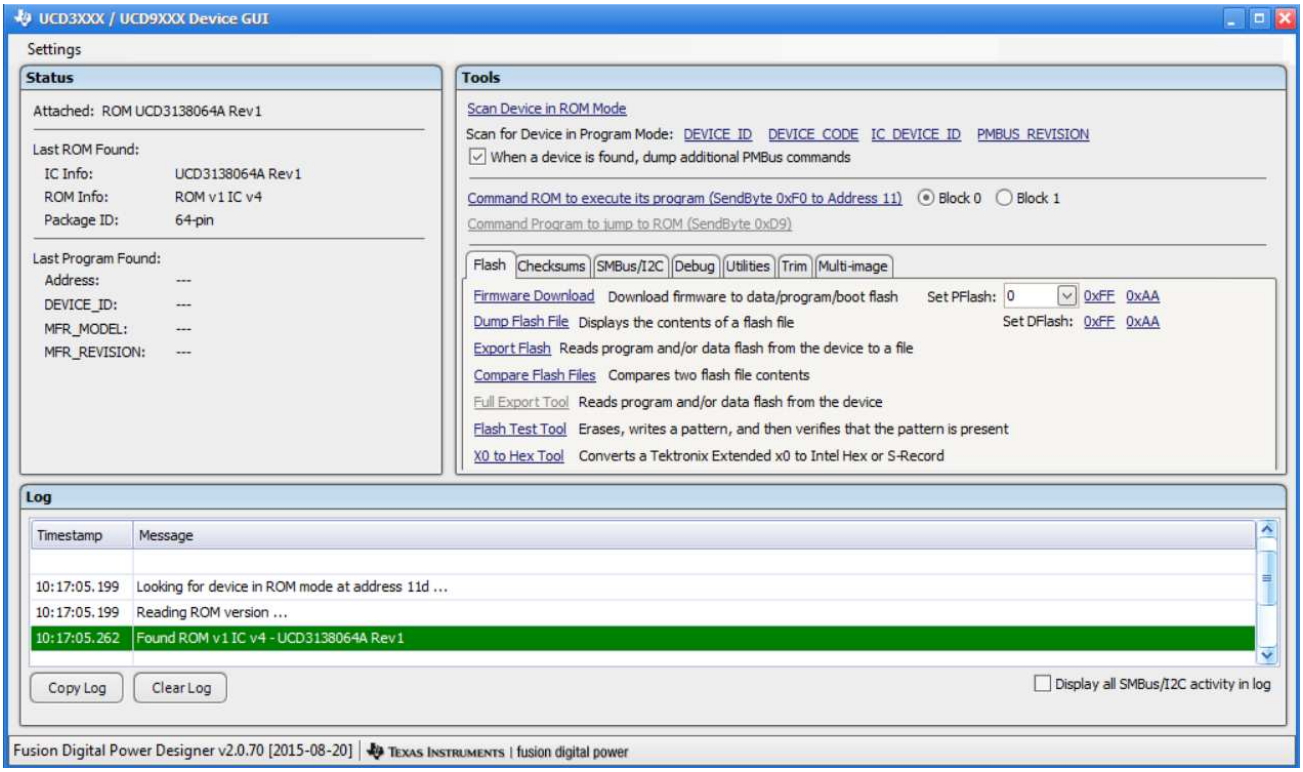

Figure 5. UCD3XXX / UCD9XXX Device GUI

4. Click **Firmware Download**; then a new window appears as shown in Figure 6. Click **Select File** and browse an intended firmware code file with file extension **.x0** (for example, **cyclone.x0**), then click **Download**. The firmware of **cyclone.x0** will be downloaded to the UCD3138064A device on the UCD3138064AEVM149. When prompted, click **Yes** to complete the download. Click **Close** to exit the download window.

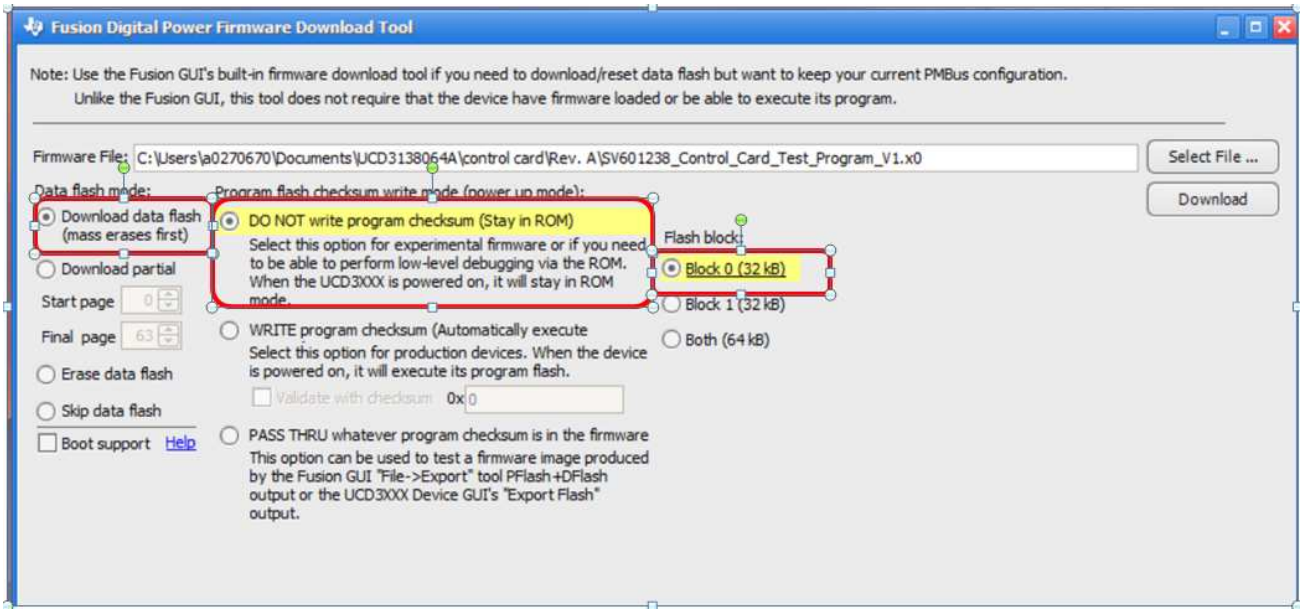

Figure 6. Firmware Code Downloading

5. After the firmware code downloads to the UCD3138064A device, the intended test can be performed.

7.2 Erasing Firmware Code from UCD3138064AEVM149

Erasing the downloaded firmware from the UCD3138064A flash memory is done with the following steps and by referencing Figure 5:

1. Click **Device ID**
2. Click **Command Program to jump to ROM (SendByte 0xD9)**
3. Click **Set PFlash: 0xFF**

7.3 Equipment Shutdown

1. Exit the GUI.
2. Disconnect the USB cable and the ribbon cable.

8 EVM Assembly Drawing and PCB Layout

Figure 7 through Figure 12 show the design of the UCD3138064AEVM149 printed circuit board (PCB). PCB dimensions are as follows: L x W = 3.400 x 1.8 *in*, PCB material: FR4 or compatible, four layers and 1-oz copper on each layer.

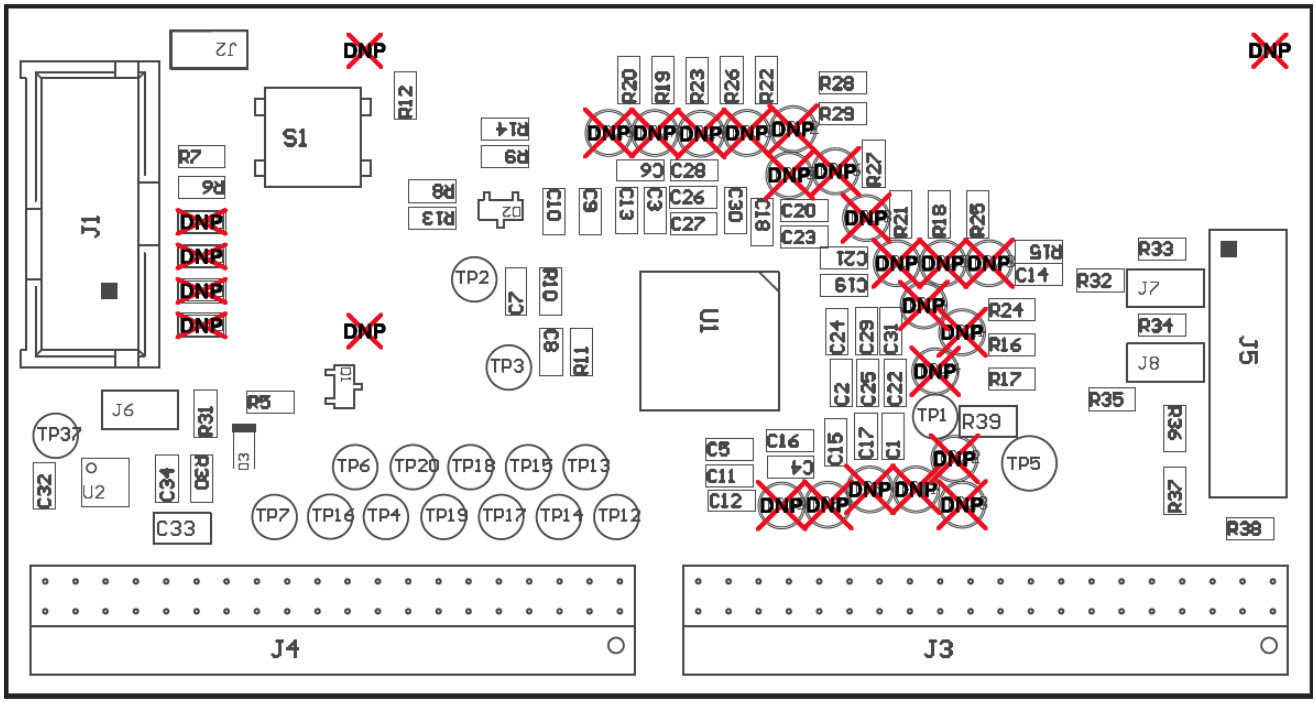

Figure 7. UCD3138064AEVM149 Top Layer Assembly Drawing (Top View)

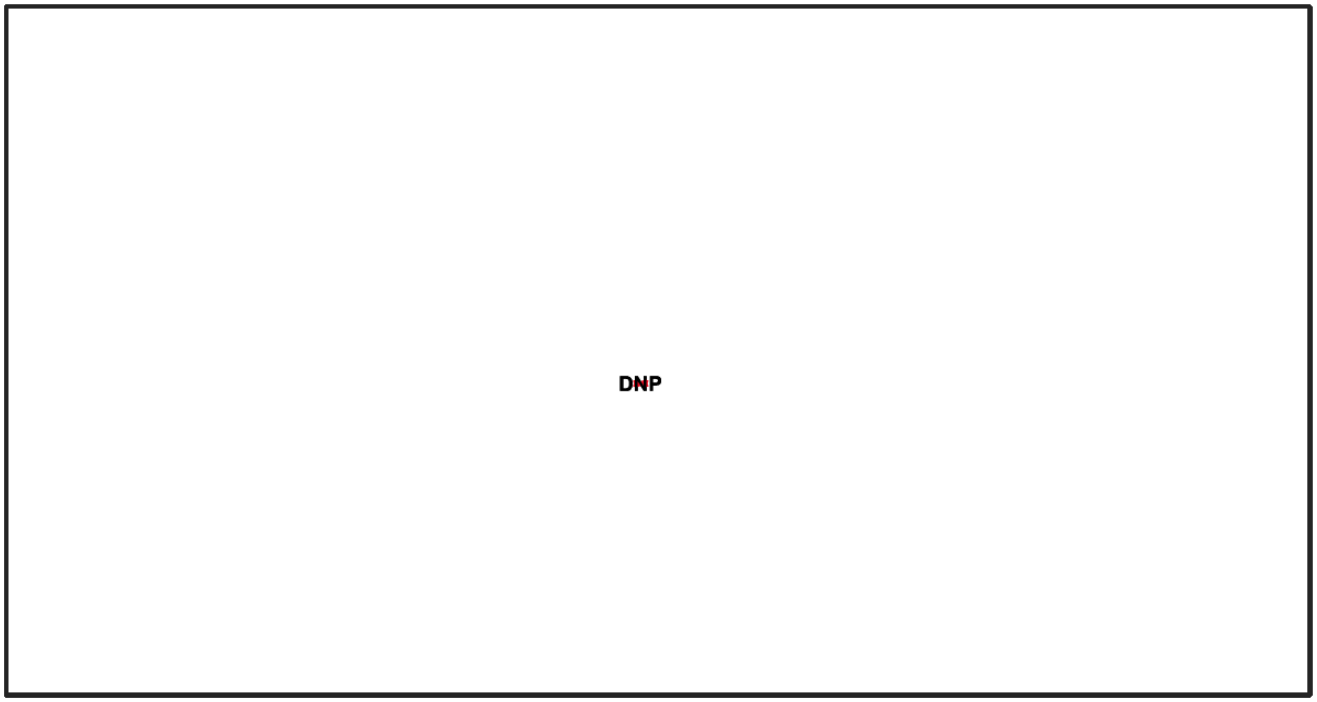

Figure 8. UCD3138064AEVM149 Bottom Assembly Drawing (no Components on This Side)

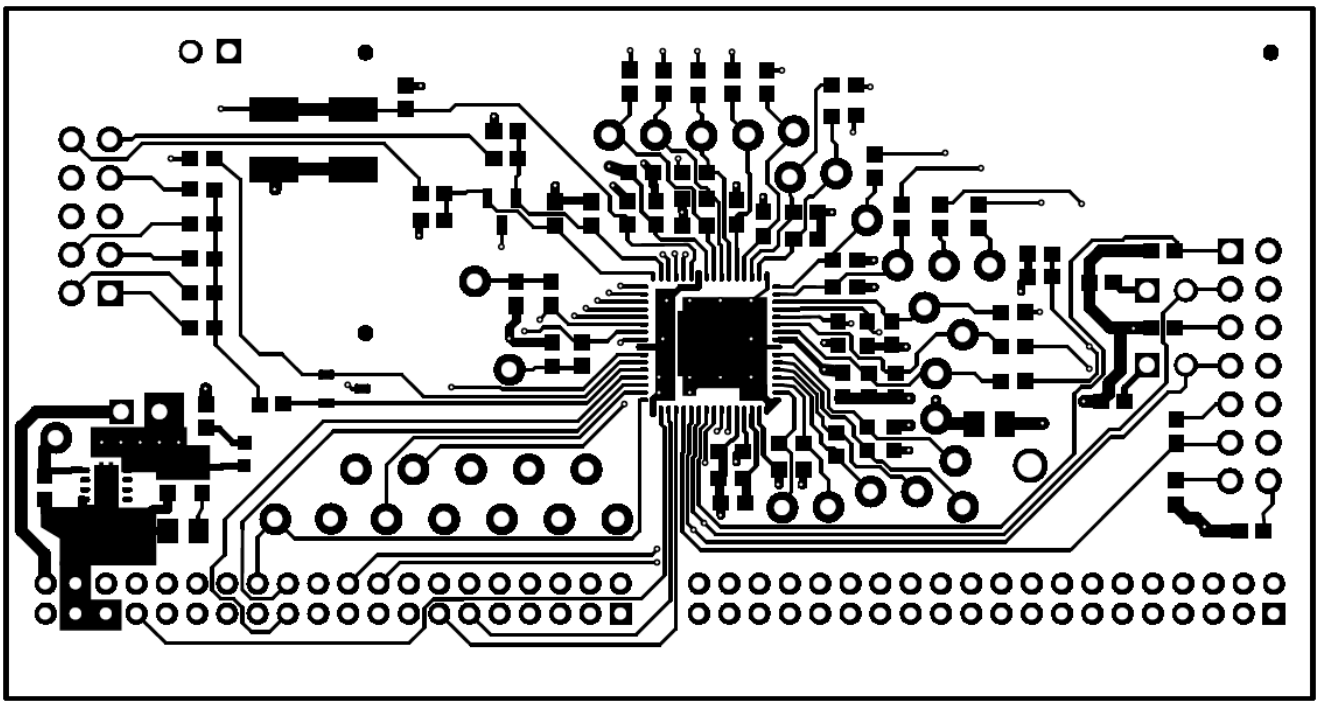

Figure 9. UCD3138064AEVM149 Top Copper (Top View)

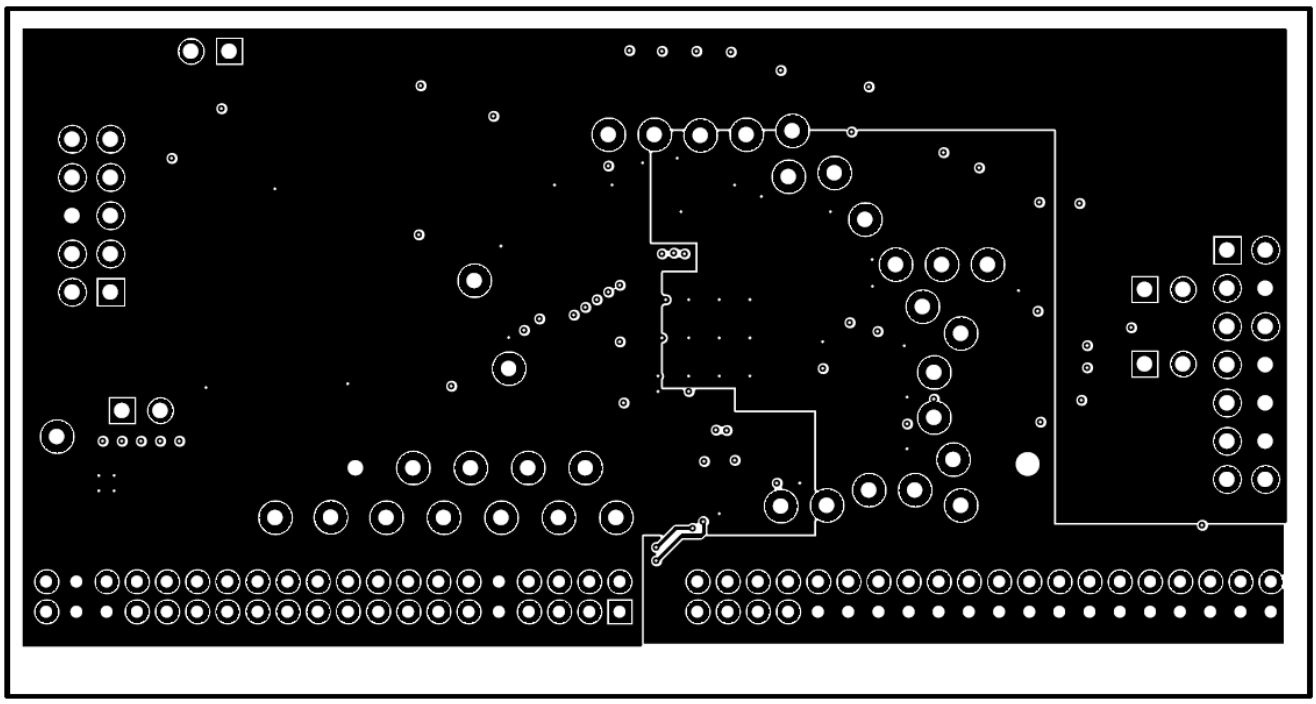

Figure 10. UCD3138064AEVM149 Internal Layer 1 (Top View)

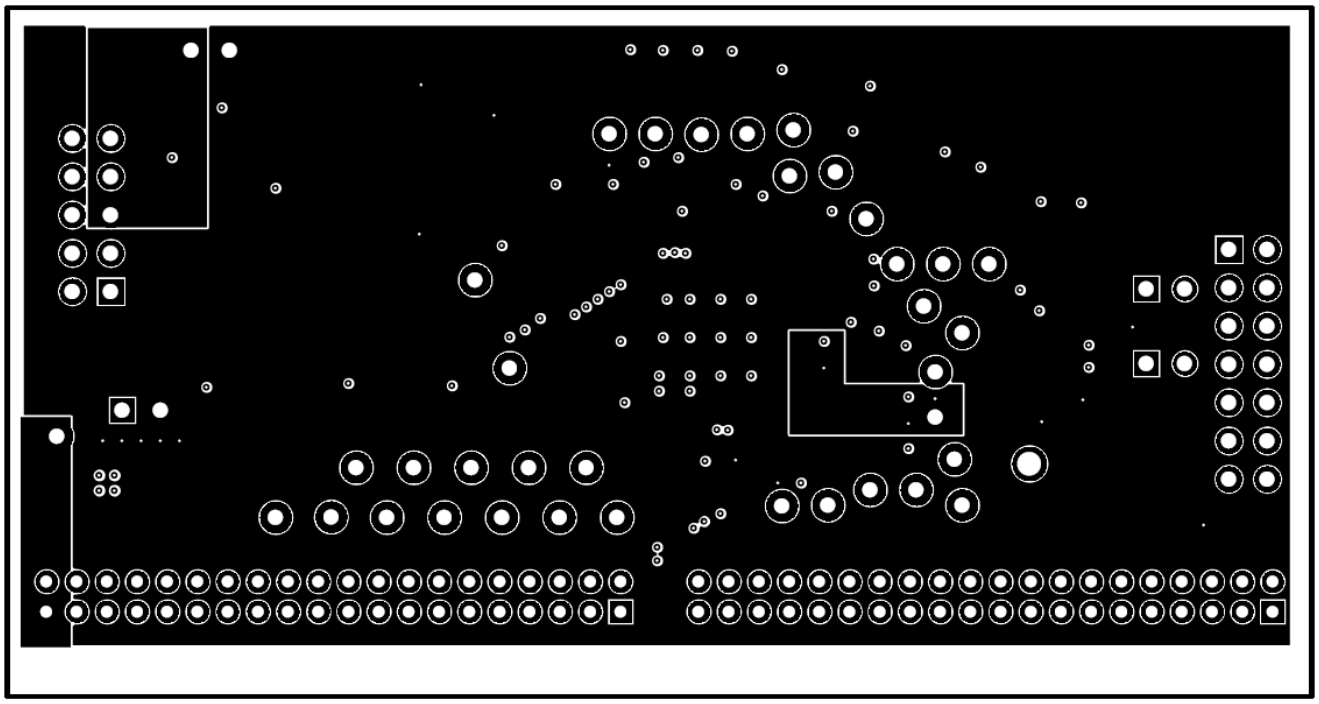

Figure 11. UCD3138064AEVM149 Internal Layer 2 (Top View)

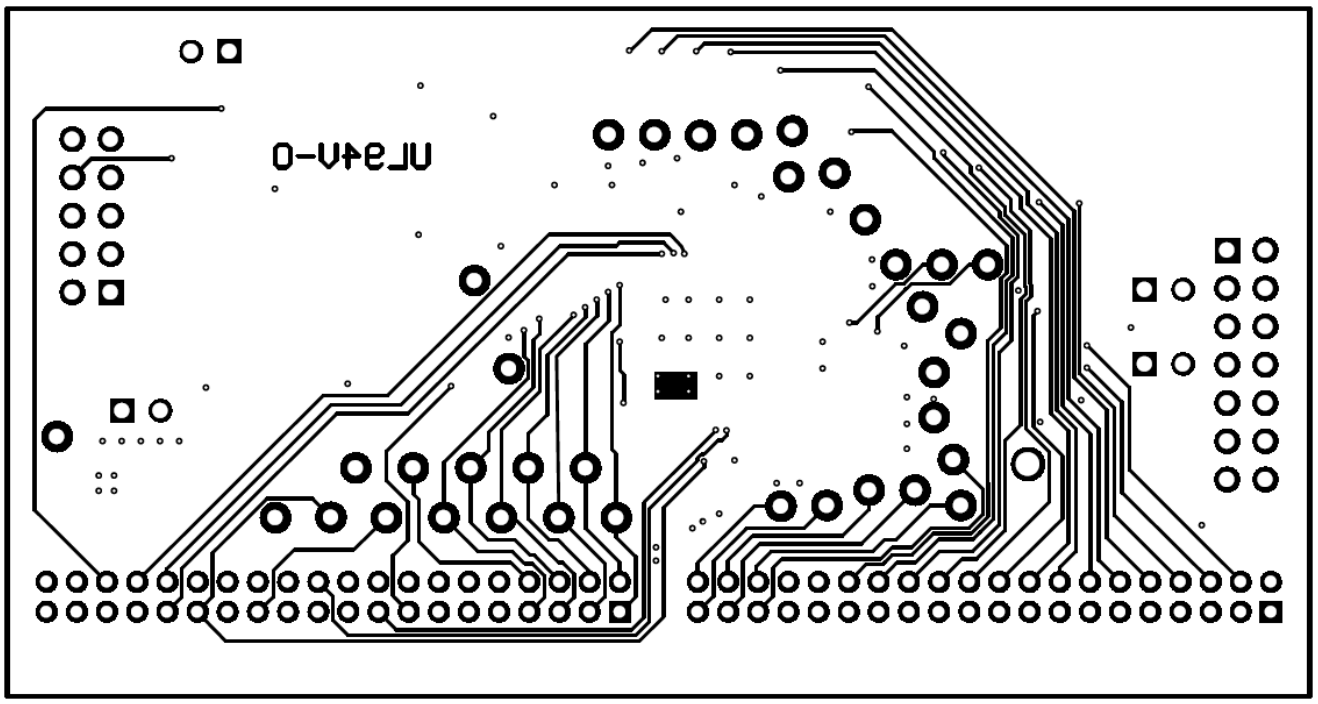

Figure 12. UCD3138064AEVM149 Bottom Copper (Top View)

9 List of Materials

The EVM components list according to the schematics shown in Figure 1 and Figure 2, are listed in Table 3.

Table 3. List of Materials

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
!PCB	1		Printed Circuit Board		SV601149	Any
C1, C6, C32	3	1uF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet
C2, C3, C4, C5, C11, C13, C34	7	0.1uF	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603	0603	C0603C104K4RACTU	Kemet
C7	1	100pF	CAP, CERM, 100 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	CGA3E2NP01H101J080AA	TDK
C8, C14, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31	16	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0603	0603	C0603C102K5RACTU	Kemet
C9, C10, C15, C16, C17	5	33pF	CAP, CERM, 33 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	06035A330JAT2A	AVX
C12	1	2.2uF	CAP, CERM, 2.2 µF, 10 V, +/- 10%, X5R, 0603	0603	C0603C225K8PACTU	Kemet
C33	1	10uF	CAP, CERM, 10 µF, 10 V, +/- 10%, X5R, 0805	0805	C0805C106K8PACTU	Kemet
D1, D2	2	40V	Diode, Schottky, 40V, 0.3A, SOT-23	SOT-23	BAT54AFILM	ST Microelectronics
D3	1	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On
J1	1		Header (shrouded), 100mil, 5x2, Gold, TH	5x2 Shrouded header	5103308-1	TE Connectivity
J2, J6, J7, J8	4		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
J3, J4	2		Receptacle, 2mm, 20x2, R/A, TH	Header, 20x2 2 mm pitch receptacle Right Angle	NPPN202FJFN-RC	Sullins Connector Solutions
J5	1		Header, 100mil, 7x2, Tin, TH	Header, 7x2, 100mil, Tin	PEC07DAAN	Sullins Connector Solutions
R5, R7, R8, R9, R16, R17, R18, R19, R20, R23, R25, R26	12	100	RES, 100, 1%, 0.1 W, 0603	0603	CRCW0603100RFKEA	Vishay-Dale
R6, R34, R36	3	0	RES, 0, 5%, 0.1 W, 0603	0603	CRCW06030000Z0EA	Vishay-Dale
R10, R32, R33, R35, R37, R38	6	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
R11	1	16.0k	RES, 16.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0716KL	Yageo America
R12	1	1.65k	RES, 1.65 k, 1%, 0.1 W, 0603	0603	CRCW06031K65FKEA	Vishay-Dale
R13, R14	2	1.50k	RES, 1.50 k, 1%, 0.1 W, 0603	0603	CRCW06031K50FKEA	Vishay-Dale
R15	1	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	CRCW0603100KFKEA	Vishay-Dale
R21, R22, R24, R27, R28, R29	6	2.0k	RES, 2.0 k, 5%, 0.1 W, 0603	0603	CRCW06032K00JNEA	Vishay-Dale
R30	1	0.5	RES, 0.5, 1%, 0.1 W, 0603	0603	RL0603FR-070R5L	Yageo America
R31	1	301	RES, 301, 1%, 0.1 W, 0603	0603	CRCW0603301RFKEA	Vishay-Dale
R39	1	10.0	RES, 10.0 ohm, 1%, 0.125W, 0805	0805	CRCW080510R0FKEA	Vishay-Dale
S1	1		Switch, Tactile, SPST-NO, 1VA, 32V, SMT	Switch, 6.3x5.36x6.6 mm, SMT	KT11P2JM34LFS	C&K Components
SH-J1	1	1x2	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN	Sullins Connector Solutions

Table 3. List of Materials (continued)

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
TP1, TP2, TP3, TP4, TP6, TP7, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP37	16	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
TP5	1	Black	Test Point, Compact, Black, TH	Black Compact Testpoint	5006	Keystone
U1	1		Highly Integrated Digital Controller for Isolated Power, RGC0064B	RGC0064B	UCD3138064ARGC	Texas Instruments
U2	1		Single Output LDO, 80 mA, Fixed 3.3 V Output, 2.5 to 24 V Input, with Low IQ, 8-pin SON (DRB), -40 to 125 degC, Green (RoHS & no Sb/Br)	DRB0008A	TPS715A33DRBR	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
R1, R2, R3, R4	0	0	RES, 0, 5%, 0.1 W, 0603	0603	CRCW06030000Z0EA	Vishay-Dale
TP8, TP9, TP10, TP11, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP36	0	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone

10 References

1. *UCD3138064A Data Manual* (SLUSCA5)
2. *UCD3138 Monitoring and Communications Programmer's Manual* (SLUU996)
3. *UCD3138 Digital Power Peripherals Programmer's Manual* (SLUU995)
4. *UCD3138 ARM and Digital System Programmer's Manual* (SLUU994)
5. *Fusion Digital Power Designer GUI for Isolated Power Applications User Guide* (for UCD3138, UCD3138064, UCD3138064A applications) (SLUA676)
6. ***Code Composer Studio v6 Wiki***, Texas Instruments, http://processors.wiki.ti.com/index.php/Category:Code_Composer_Studio_v6
7. *Converting UCD3138 Firmware Project from Code Composer Studio Version 3.3 to 5.2* (SLUA679)
8. *UCD3138064A Migration Guide* (SLUAxxx)

Summary of Using Code Composer Studio v6

In this appendix, the basic usage of Code Composer Studio v6 to compile firmware for UCD3138 family of devices is described. A design flow is described while detailed steps for firmware code creation, and firmware debugging along with hardware are obviously beyond the scope of this user's guide and this appendix.

A.1 Importing a CCSv6 project

Upon running CCSv6 for the first time, the **Workspace Launcher** window appears as shown in Figure 13. It is left to the user to decide whether or not to use a workspace, where it is located, and/or to check the box that says **Use this as the default and do not ask again**. For this guide, a workspace will not be used, so click **OK**.

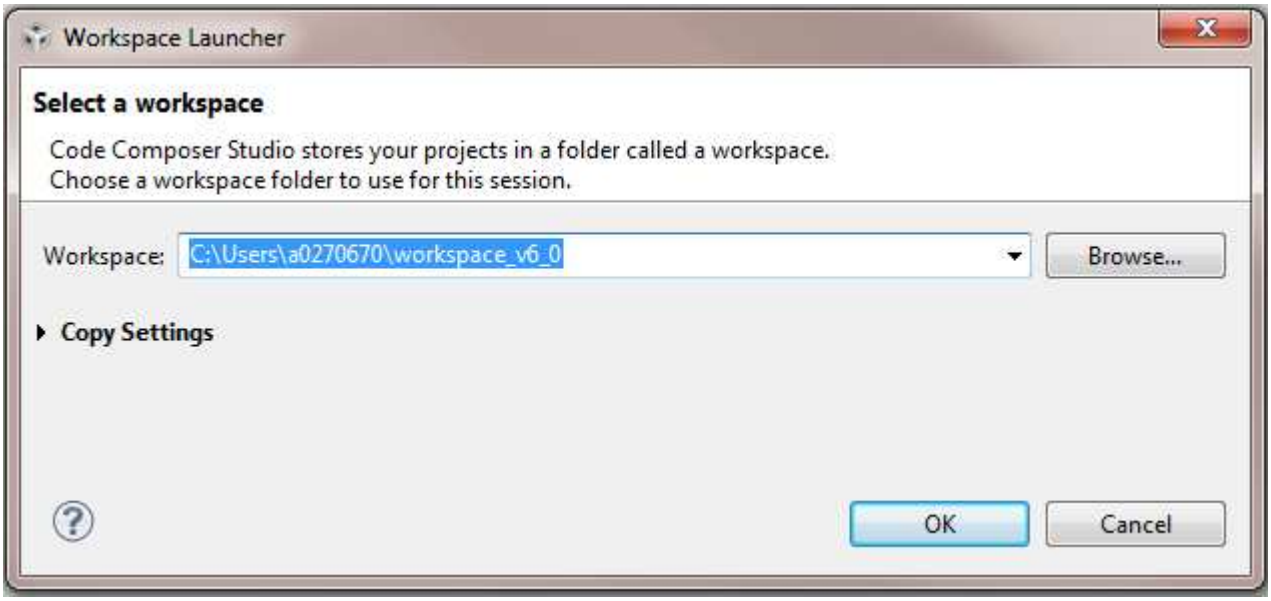

Figure 13. CCSv6 Workspace Launcher

When the main window opens, click **Project** in the top navigation menu, then choose **Import CCS Project…** as shown in Figure 14.

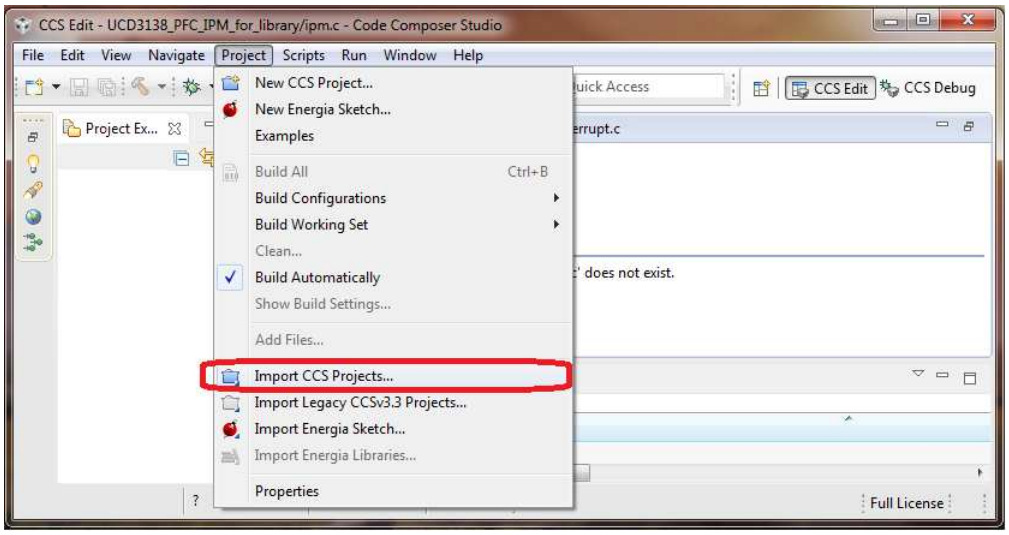

Figure 14. Import Existing CCS Project

This opens the window shown in Figure 15. Under **Select-search directory**, click **Browse**, navigate to the target project, and click **OK**. For this example, the project is called **UCD3138_Lab_02_solution**. Check the box next to the discovered project, and do not check **Copy projects into workspace**, or **Automatically import referenced projects**. Click **Finish.**

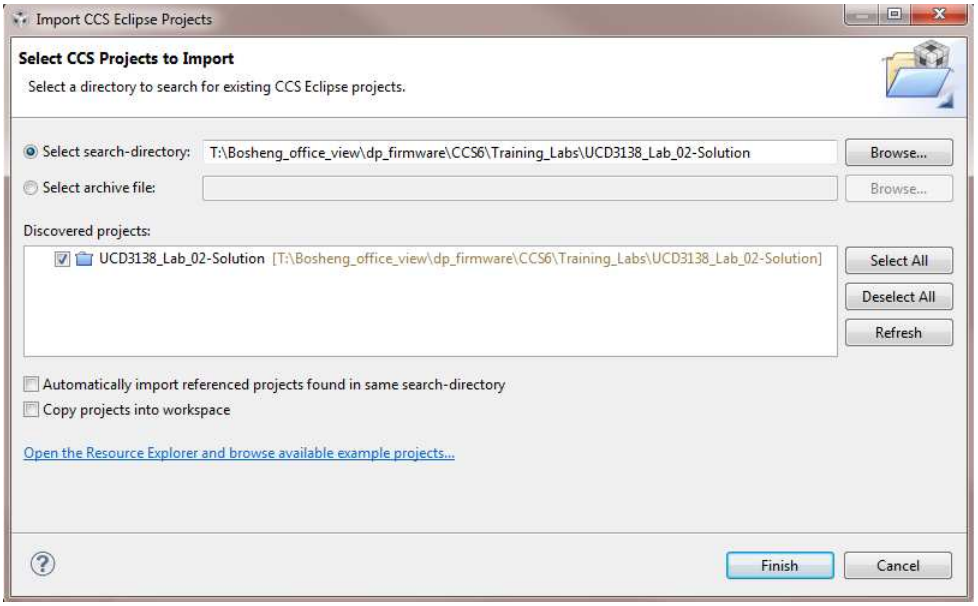

Figure 15. Importing a CCSv6 Project

The project should be imported into CCSv6 and should be shown in the **Project Explorer** as shown in Figure 16. At this point, files in the project can be edited as required.

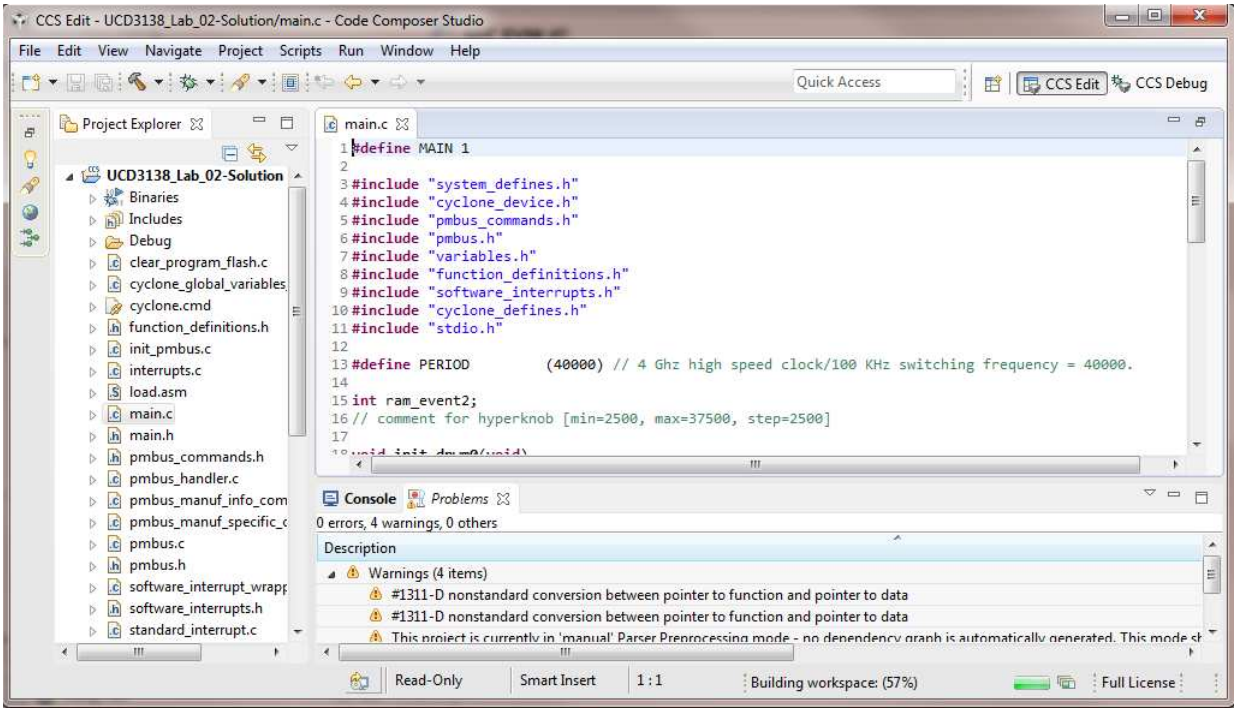

Figure 16. Project Explorer

A.2 Build/Compile a Project Using Code Composer Studio v6

For the UCD3138 family of devices, compiling a project produces an **Intel-hex** (**.x0**) firmware file that can be downloaded to, and run on the UCD3138 or related target device using the **UCD3XXX / UCD9XXX Device GUI** (part of the Fusion Design Online software from TI).

After editing the project files, Right-Click on the project in the Project explorer, and choose **Build Project**.

NOTE: If this is the first time building a UCD3138 or related project, and Cygwin is also installed on the PC that is performing the compilation, the instructions in Section 3.3 of the Application Note entitled *Converting UCD3138 Firmware Project from Code Composer Studio Version 3.3 to 6.0* (SLUA679) must be followed. Mainly, the C:\CYGWIN or other similarly named directory must be renamed **temporarily** during this first build. This allows the new ARM library to be built properly. After this first build, the CYGWIN directory can be rolled back to its original name, and future builds can compile successfully.

First-time builds may take a minute or longer to compile. Figure 17 shows the state of a successful build:

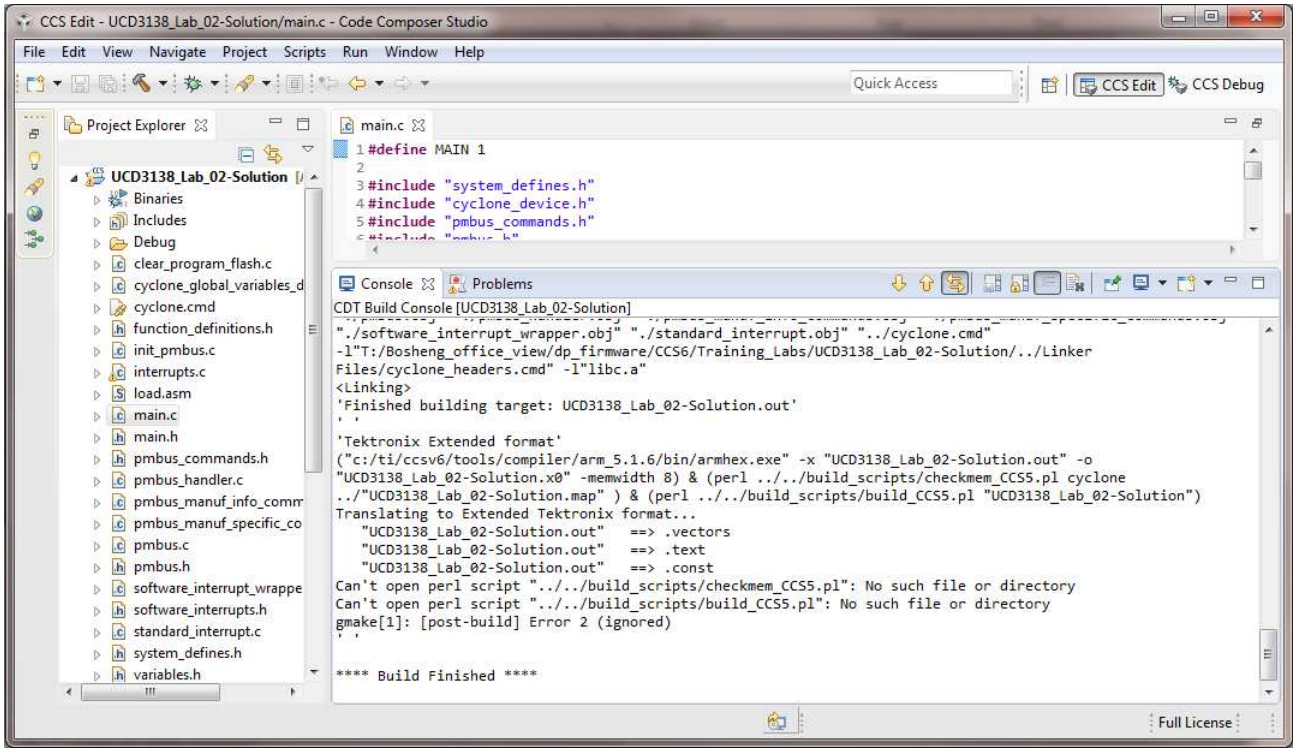

Figure 17. Successful Build of UCD3138-Related Source Code

When the build is finished, the **.x0** file is automatically created and placed in the project directory's **debug** folder. The filename that prefaces the **.x0** is the name of the project that was built (that is, a project named **UCD3138_Lab_02_solution** will create **UCD3138_Lab_02_solution.x0** as its firmware file). However, it must be noted that *the project name must have no spaces*, otherwise the .x0 file is not generated.

This **.x0** file can be and run on the UCD3138 target device using the **UCD3XXX / UCD9XXX Device GUI**.

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   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.

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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

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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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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