User's Guide
SLUUB53–July 2014

Control Card in Digitally Controlled Off-Line Isolated Power Converters

This user's guide describes the characteristics, operation, and use of the UCD3138A64CEVM-660 evaluation module (EVM). The UCD3138A64CEVM-660 is a fully assembled and tested platform for evaluating the performance of the UCD3138A64 digital controller device from Texas Instruments. This document includes schematic diagrams, a printed circuit board (PCB) layout, bill of materials, and test data. Throughout this document, the abbreviations EVM, UCD3138A64CEVM, and the term evaluation module are synonymous with the UCD3138A64CEVM-660, unless otherwise noted.

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1 Introduction

This UCD3138A64CEVM-660 evaluation module helps evaluate the UCD3138A64 digital controller device from Texas Instruments and aids in design of digitally controlled isolated power converters. The UCD3138A64 device belongs to the UCD3138 family of highly-integrated digital controller devices optimized for isolated power supply applications. Compared to the UCD3138 device, the UCD3138A64 device offers the following features:

Table 1. Key Differences Between UCD3138 and UCD3138A64

Product Features	UCD3138	UCD3138A64
Program Flash Memory	32 kB	64 kB
RAM	4 kB	8 kB
Number of Memory Banks	1 (32 kB)	2 (32 kB each)
SPI Communication Hardware	Not Available	Available (Pin Numbers 50, 51, 52, 53)
I^2C Communication Hardware (in addition to PMBUS)	Not Available	Available (Pin Numbers 19, 20)
Peak Current Mode Control	EADC2 Only	Available on all EADC channels
EADC A0 Min Output Voltage (Max)	100 mV	21 mV
RTC Function - External Clock Input	Not Available	Available (Pin Numbers 45, 62)
External PWM Timers	2	4
Timer Capture Modules	1	2
Total GPIO	30	43
ADC12 Inputs	14	15

For additional device information, see http://www.ti.com/product/ucd3138a64.

The UCD3138A64CEVM-660 is similar to the UCD3138CC64EVM-030. The UCD3138A64CEVM-660 is used either as a stand-alone control card to study the UCD3138A64 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 two power converter EVMs offered by TI: UCD3138PSFBEVM-027, and UCD3138LLCEVM-028. Contact Texas Instruments for assistance obtaining the firmware source code used to interface the UCD3138A64 with these EVMs, which were originally developed to support the UCD3138 device. Alternately, the EVM can also be loaded with custom-developed firmware. In order to communicate with the UCD3138A64 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 UCD3138A64CEVM-660 evaluation module and must be purchased separately. Texas Instruments also offers a Graphical User Interface (GUI) in order to program the UCD3138A64 controller and configure parameters when used with the two power converter EVMs.

2 Description

UCD3138A64CEVM-660 is an EVM board, functioning as a control card for UCD3138A64PFC digital power supply applications. This EVM is used to control a power converter topology such as LLC Resonant Half-Bridge DC converter, and Phase-Shifted Full-Bridge DC converter, and so forth, by downloading the associated firmware and interfacing with an appropriate power stage board. When coupled with the appropriate corresponding firmware, the EVM works seamlessly with the following EVM boards:

- UCD3138PSFBEVM-027, *A Digital Controlled Phase-Shifted Full-Bridge DC-to-DC Converter Evaluation Board*
- UCD3138LLCEVM-028, *A Digital Controlled LLC Half-Bridge DC-to-DC Converter Evaluation board*

Contact Texas Instruments for assistance with obtaining the firmware source code used to interface the UCD3138A64 with these EVMs.

2.1 Typical Applications

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

2.2 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
- 2-Mbit SPI and I2C accessible EEPROMs for additional, onboard memory storage capacity
- JTAG connector
- LED indicator
- PMBus connector to PC computer connection through USB-to-GPIO adapter
- Rich test points to facilitate the IC evaluation, system design and circuit and firmware debugging

2.3 Configuring the EVM to Access EEPROM SPI or I^2C Communication with UCD3138A64

The UCD3138A64CEVM-660 contains all the features of the UCD3138CC64EVM-030. However, the UCD3138A64CEVM-660 adds two programmable EEPROM devices for use with the UCD3138A64 device – one accessed via SPI communication port and the other via the 2^{nd} I^2C port in UCD3138A64. Additionally, unlike the UCD3138064EVM-166, both EEPROMs can be accessed by the device simultaneously, since both SPI and I^2C hardware have been assigned dedicated pins. Appropriate firmware is necessary to configure the UCD3138A64 device to choose the communication port desired. No hardware changes are required to interface with either the SPI or I^2C EEPROMs.

- To choose I^2C EEPROM, connect jumpers J9 and J10, each in position 1 (Pins 1 and 2). Also, make sure J7 and J8 are disconnected.
- To choose SPI EEPROM, connect jumpers J7 and J8 as well as jumpers J9 and J10, each in position 2 (Pins 2 and 3).

3 Specifications

Table 2. UCD3138A64EVM-660 Specifications

Parameter	Notes and Conditions	Min	TYP	Max	Unit
Connector J1					
Analog signal connection	Pin definition in compliance with UCD3138	40 pin			
Connector J2					
Digital signal connection	Pin definition in compliance with UCD3138	40 pin			
Pin 39	External voltage source input	11.5	12.0	12.5	VDC
3.3-V connection to PMBus	Port to use on-board 3.3 V_{DC} to bias PMBus	3.25	3.30	3.35	VDC
Connector J3					
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 J4					
3.3-V connection to PMBus	Port to use on board 3.3 V_{DC} to bias or receive bias from PMBus	3.25	3.30	3.32	VDC
Connector J5					
PMBus connector	PMBus Connection to USB to GPIO pin definition refer to TI standard USB-to-GPIO document SLLU093	Standard			
JTAG	Standard JTAG communication connection	Standard			
Connector J6					
JTAG	Standard JTAG communication connection	Standard			
Operation Environment					
Operating Temperature Range	Natural Convection	25			°C
Mechanical Characterstics					
Dimensions	Width	1.965			inches
	Length	3.400			
	Component height	0.5			

4 Schematics

Figure 1 and Figure 2 illustrate the schematic information for this EVM.

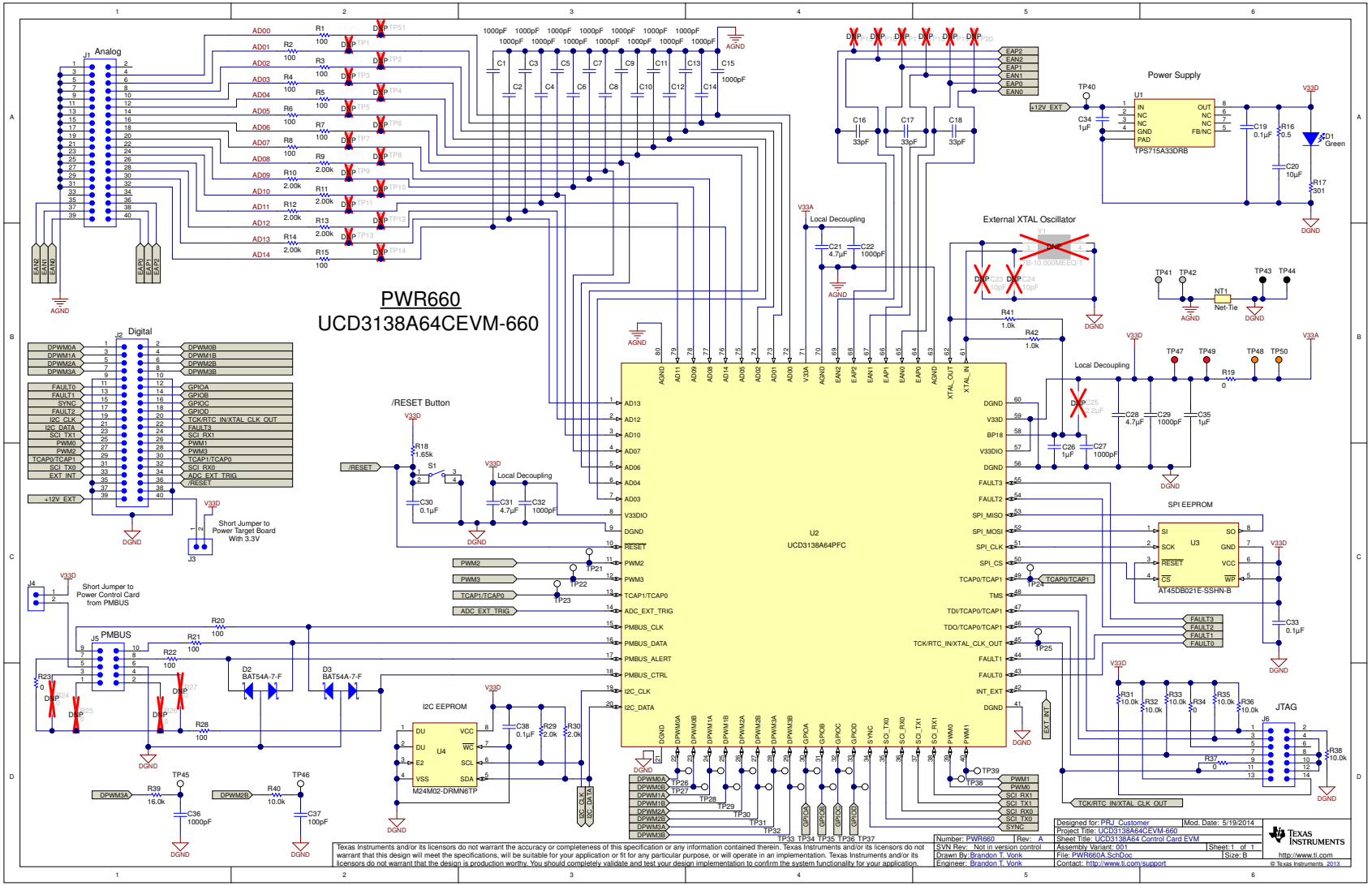

Figure 1. UCD3138A64EVM-660 Schematics (1 of 2)

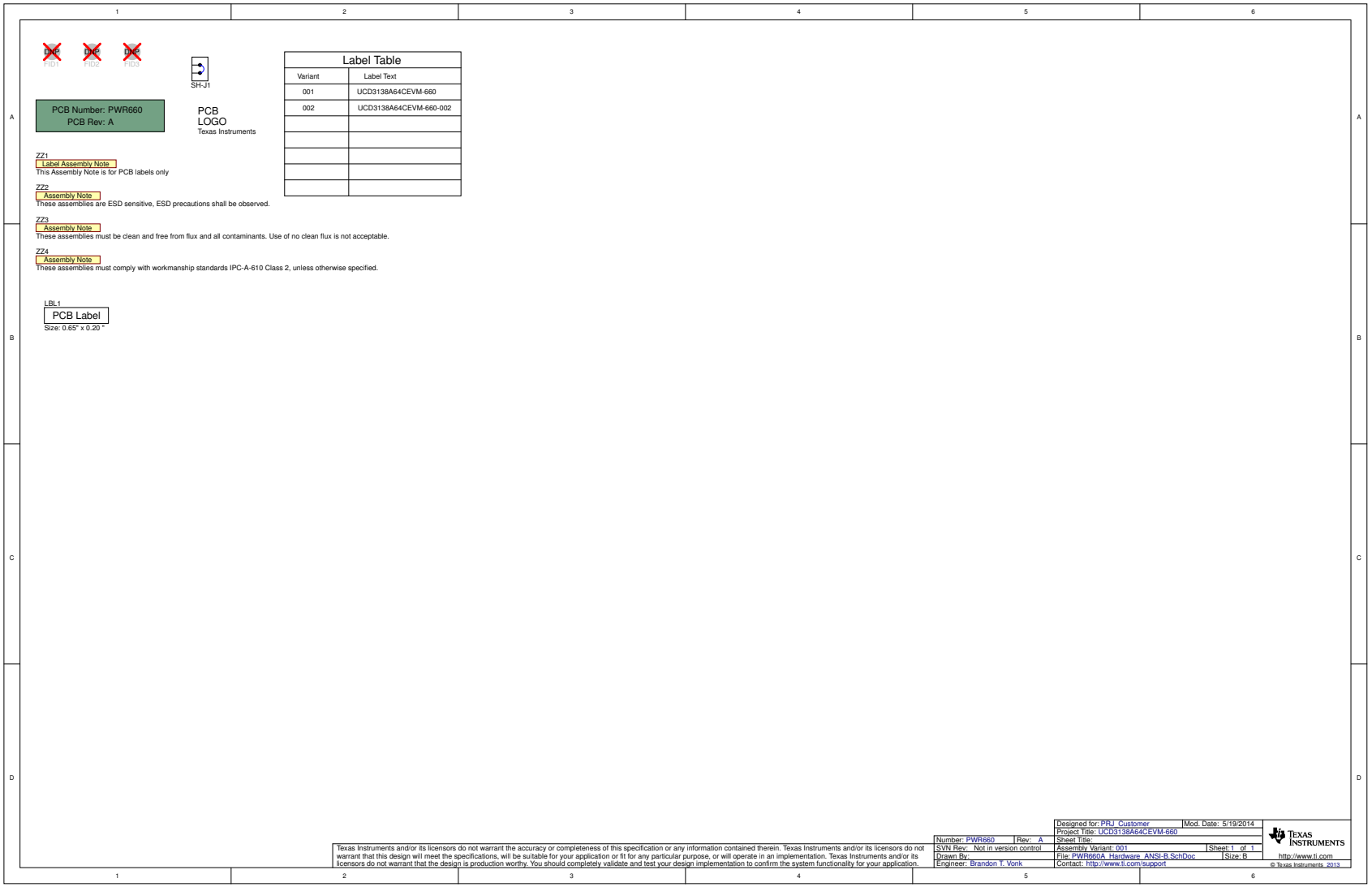

Figure 2. UCD3138A64EVM-660 Schematics (2 of 2)

5 Test Equipment

5.1 PC Computer

5.1.1 Operating System

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

5.1.2 USB-to-GPIO Interface Adapter

This adapter is to establish the communication between the control card UCC3138A64EVM-660 and the PC computer 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

5.1.2.1 USB-to-GPIO Interface Adapter

Accessories including:

- USB interface adapter (HPA172)
- USB cable, 5-pin B Mini Male to Type A Male
- Ribbon cable, socket to socket, 10 pin, 2 headers, polarized

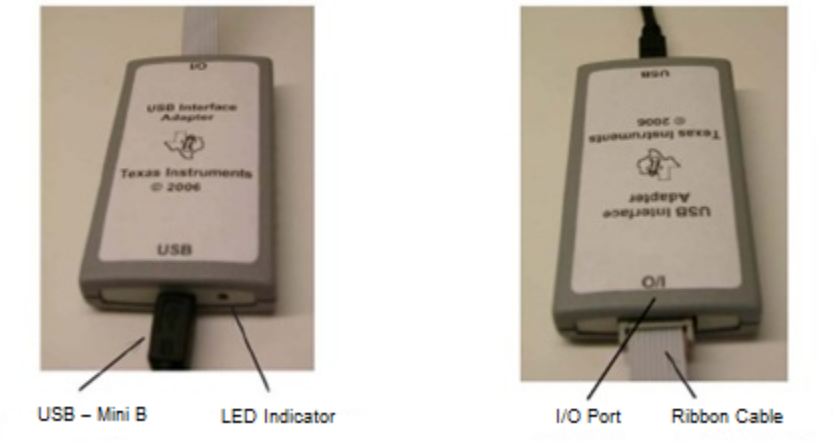

Figure 3. USB-to-GPIO Interface Adapter (HPA172)

5.2 Oscilloscope

An analog or digital oscilloscope capable of 200-MHz bandwidth, with 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-1.9.54.exe*** or newer version. Obtain the latest version of GUI from 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** on the subsequent dialog windows. 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 UCD3138A64 Device GUI

The GUI for the UCD3138A64EVM-660 board is launched with the following steps:

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

6.2 Hardware Setup

6.2.1 Setup Overview

Figure 4 shows the connection between UCD3138A64EVM-660 and the PC computer through USB-to-GPIO Interface Adapter.

USB Adapter Connection:

- Connect one end of the ribbon cable to the EVM (PWR660) and connect the other end to the USB interface adapter.
- 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 computer.

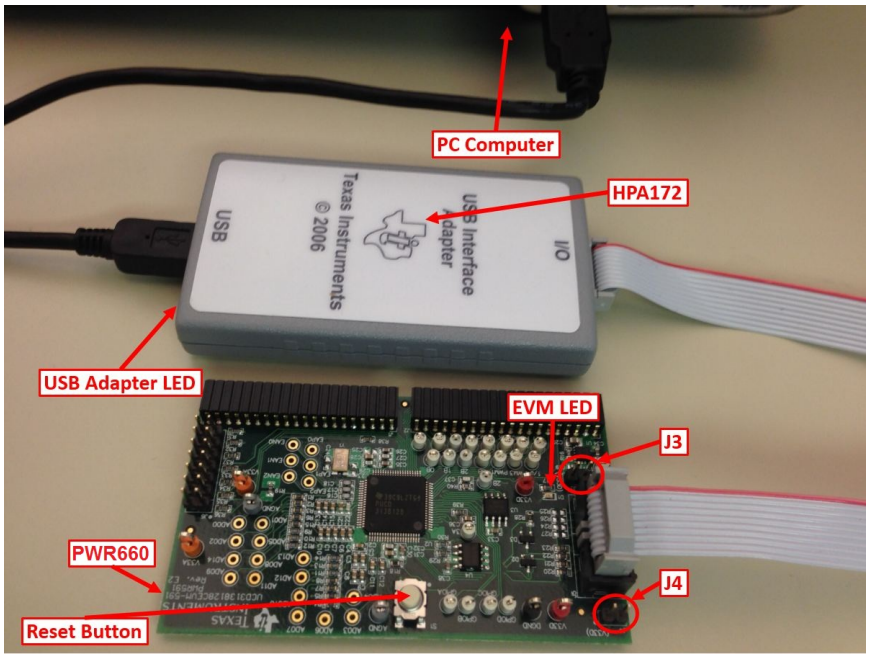

Figure 4. UCD3138A64EVM-660 Test Connections

6.3 List of Test Points

Table 3. Test Point Functions

Test Points	Name	Description
TP1	3.3 VA	3.3-V analog on board
TP51	AD00	A to D converter channel AD00
TP1 to TP14	AD01 to AD14	A to D converter channels AD01 to AD14
TP15	EAP2	Error A to D converter channel EAP2
TP16	EAN2	Error A to D converter channel EAN2
TP17	EAP1	Error A to D converter channel EAP1
TP18	EAN1	Error A to D converter channel EAN1
TP19	EAP0	Error A to D converter channel EAP0
TP20	EAN0	Error A to D converter channel EAN0
TP21	PWM2	Pulse-width modulated channel PWM2
TP22	PWM3	Pulse-width modulated channel PWM3
TP23	TCAP1/TCAP0	Timer capture input TCAP1 (or TCAP0, if alternately assigned)
TP24	TCAP0/TCAP1	Timer capture input TCAP0 (or TCAP1, if alternately assigned)
TP25	TCK/RTC_IN/RTC_OUT	JTAG TCK, or RTC_IN or RTC_OUT (10-MHz external digital clock input/output, if alternately assigned)
TP26	DPWM0A	Digital pulse-width modulated channel 0A
TP27	DPWM0B	Digital pulse-width modulated channel 0B
TP28	DPWM1A	Digital pulse-width modulated channel 1A
TP29	DPWM1B	Digital pulse-width modulated channel 1B
TP30	DPWM2A	Digital pulse-width modulated channel 2A
TP31	DPWM2B	Digital pulse-width modulated channel 2B
TP32	DPWM3A	Digital pulse-width modulated channel 3A
TP33	DPWM3B	Digital pulse-width modulated channel 3B
TP34	GPIOA	General purpose I/O pin A
TP35	GPIOB	General purpose I/O pin B
TP36	GPIOC	General purpose I/O pin C
TP37	GPIOD	General purpose I/O pin D
TP38	PWM0	Pulse-width modulated channel PWM2
TP39	PWM1	Pulse-width modulated channel PWM2
TP40	+12V_EXT	External 12 V_{DC} input to 3.3-V regulator
TP41	AGND	Analog ground test point
TP42	AGND	Analog ground test point
TP43	DGND	Digital ground test point
TP44	DGND	Digital ground test point
TP45	RC Filter 3A	DPWM3A RC Filter
TP46	RC Filter 2B	DPWM2B RC Filter
TP47	V33D	Digital 3.3-V_{DC} test point
TP48	V33A	Analog 3.3-V_{DC} test point
TP49	V33D	Digital 3.3-V_{DC} test point
TP50	V33A	Analog 3.3-V_{DC} test point
J1	Analog Connection	40-pin header, analog signals, connects to target power stage EVM
J2	Digital Connection	40-pin header, digital signals, connects to target power stage EVM
J3	V33D	Jumper header, connect jumper to supply target board with 3.3 V_{DC}
J4	V33D	Jumper header, if jump across, 3.3 V supplied from USB connection
J5	PMBus Connection	PMBus connector, 10 pins
J6	JTAG Connection	JTAG connector, 14 pin header
S1	RESET	UCD3138A64 reset, push to reset

7 Test Procedure

7.1 Download Firmware Code to UCD3138A64EVM-660

Use the following steps to download the firmware code:

1. Set up the EVM connection based on Figure 4. The LED of the USB adapter lights.
2. Use provided jumper and jump across J4. The LED of the EVM lights.
3. Launch the UCD3xxx/UCD9xxx device GUI following the steps described in Section 6.1.3. A window shown in Figure 5 appears.
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, **cycloneA64.x0**; then click **Download**. The firmware of **cycloneA64.x0** is downloaded to the UCD3138A64 device on the UCD3138A64CEVM-660 EVM. When prompted, click **Yes** to complete the download. Click **Close** to exit the download window.
5. After the firmware code downloads to the UCD3138A64 device, the intended test can be performed.

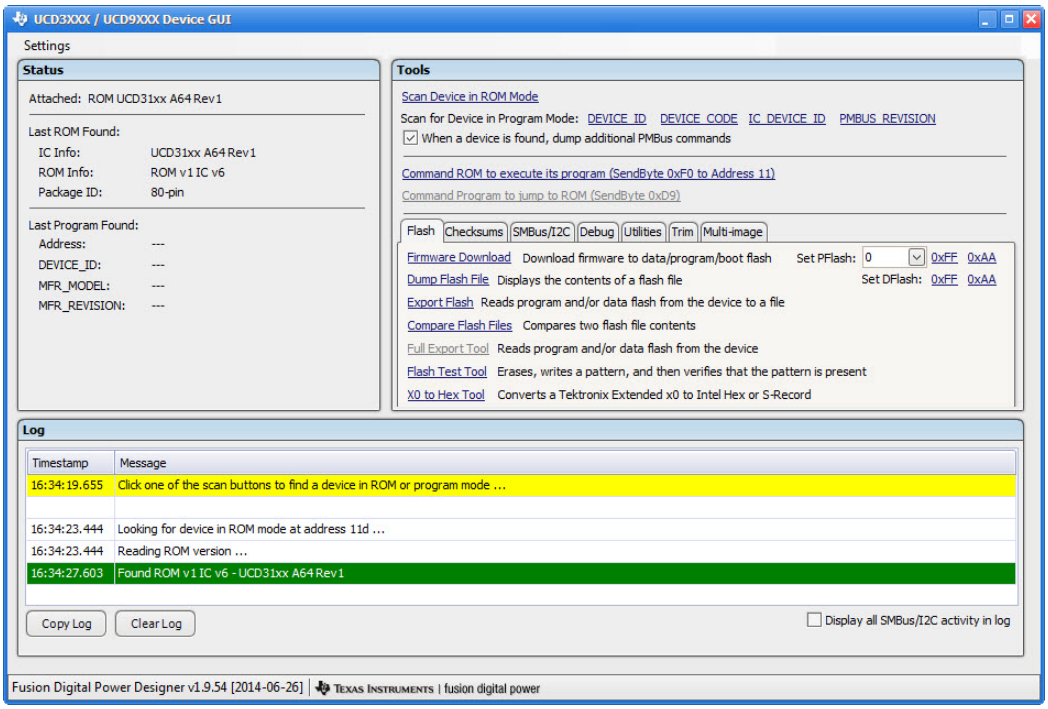

Figure 5. UCD3xxx/UCD9xxx Device GUI

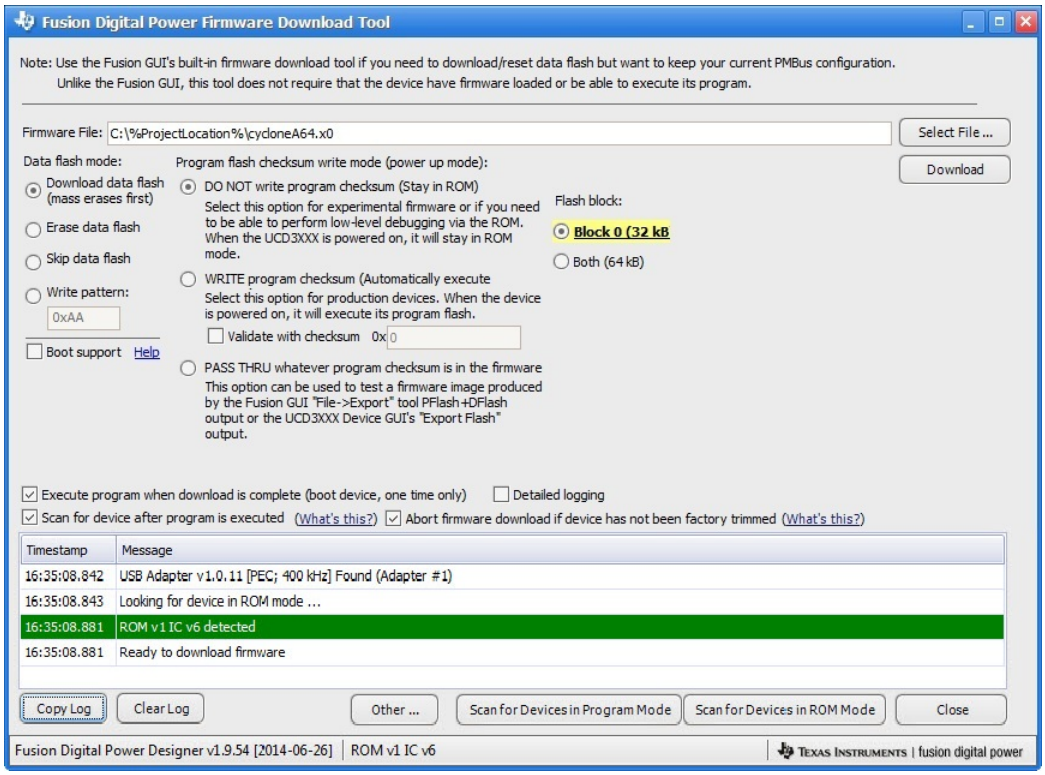

Figure 6. Firmware Code Downloading

7.2 Erase Firmware Code from UCD3138A64EVM-660

Erase the downloaded firmware from UCD3138A64 flash memory with the following steps and referencing Figure 6.

1. Click **Device ID**
2. Click **Command Program to jump to ROM (SendByte 0xD9)**
3. Click **Erase/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 UCD3138A64CEVM-166 printed circuit board. PCB dimensions: L x W = 3.400 in x 1.965 in, PCB material: FR4 or compatible, four layers and 1-oz copper on each layer.

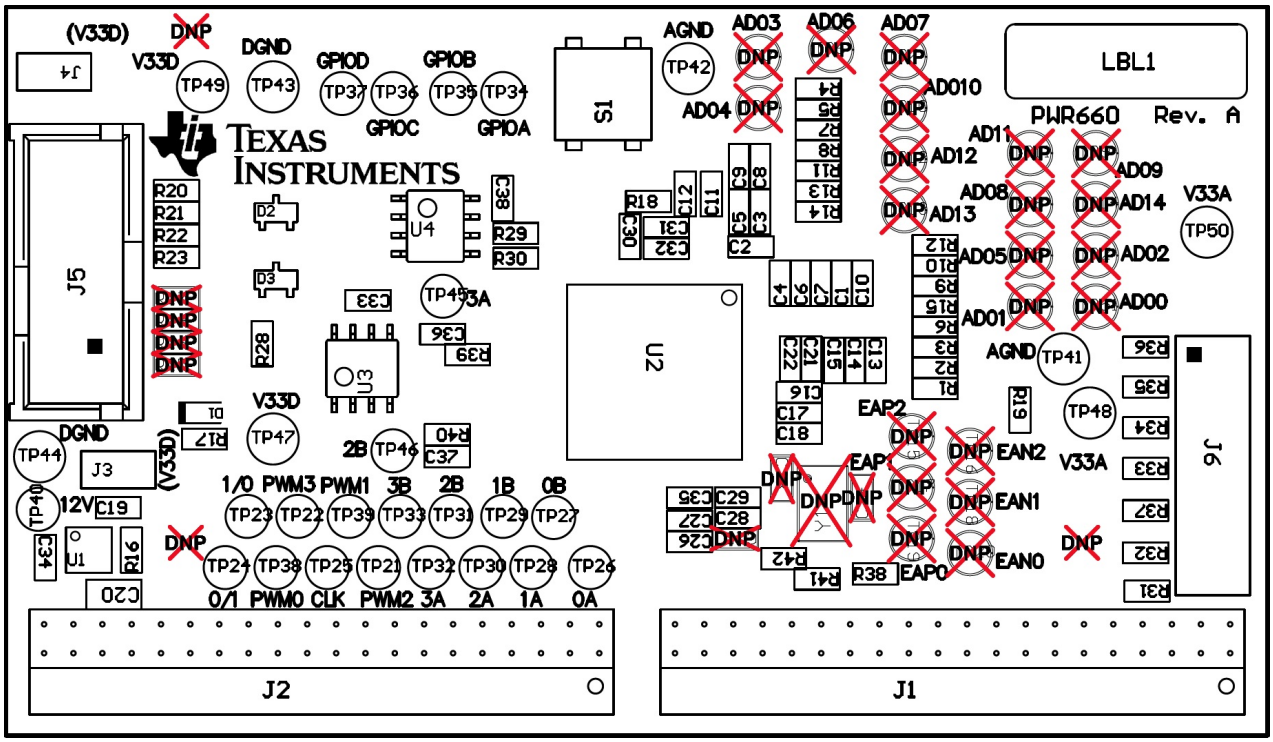

Figure 7. UCD3138A64EVM-660 Top Layer Assembly Drawing (Top View)

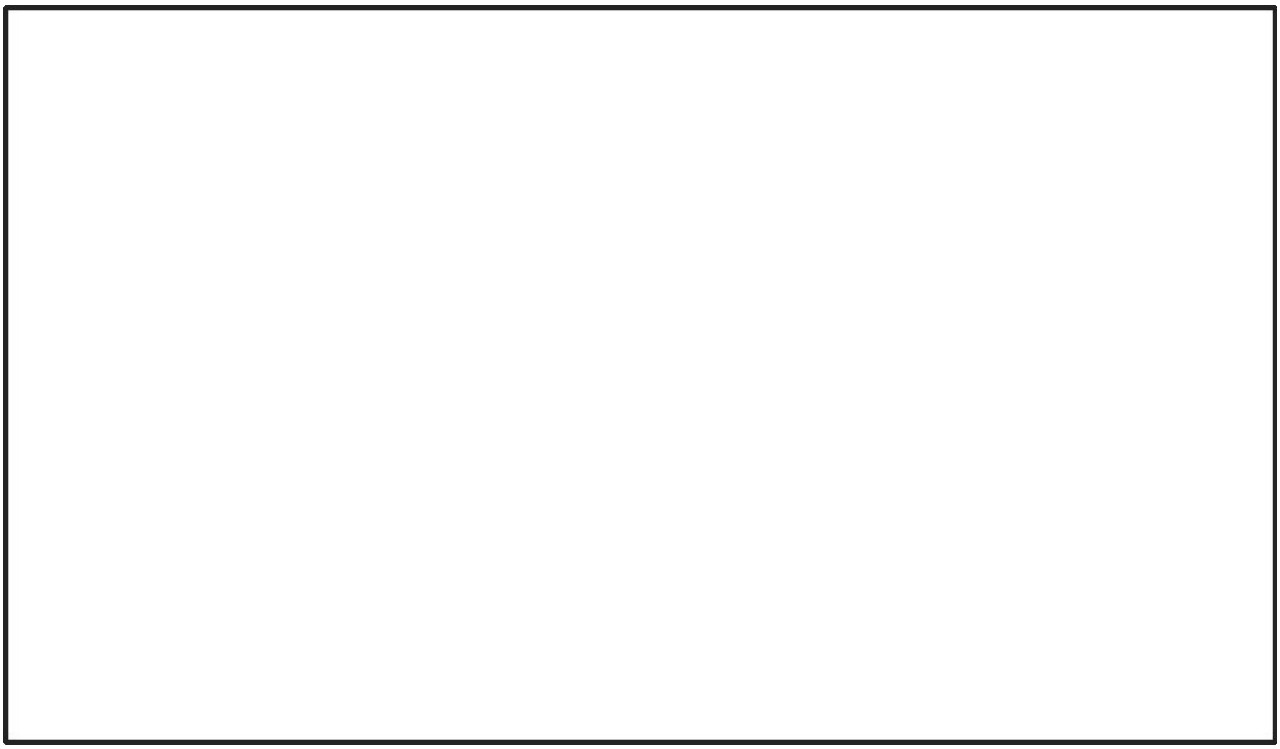

Figure 8. UCD3138A64EVM-660 Bottom Assembly Drawing (No Components)

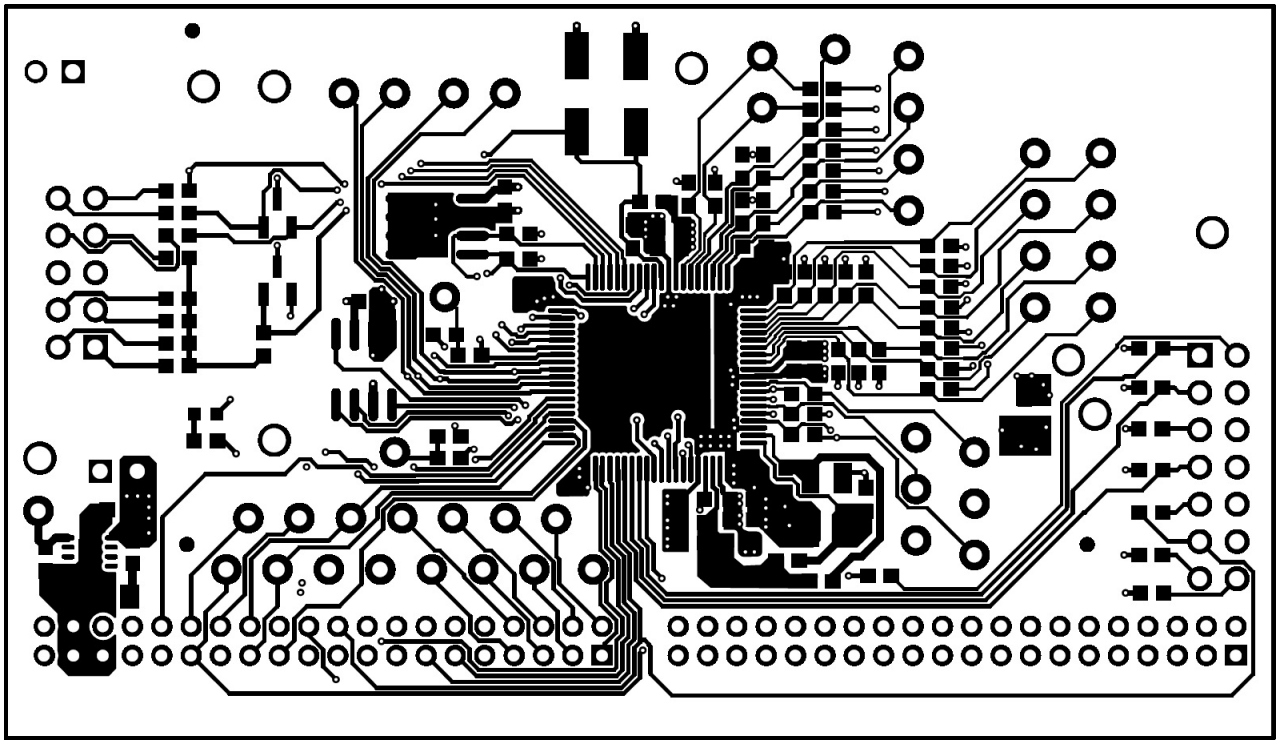

Figure 9. UCD3138A64EVM-660 Top Copper (Top View)

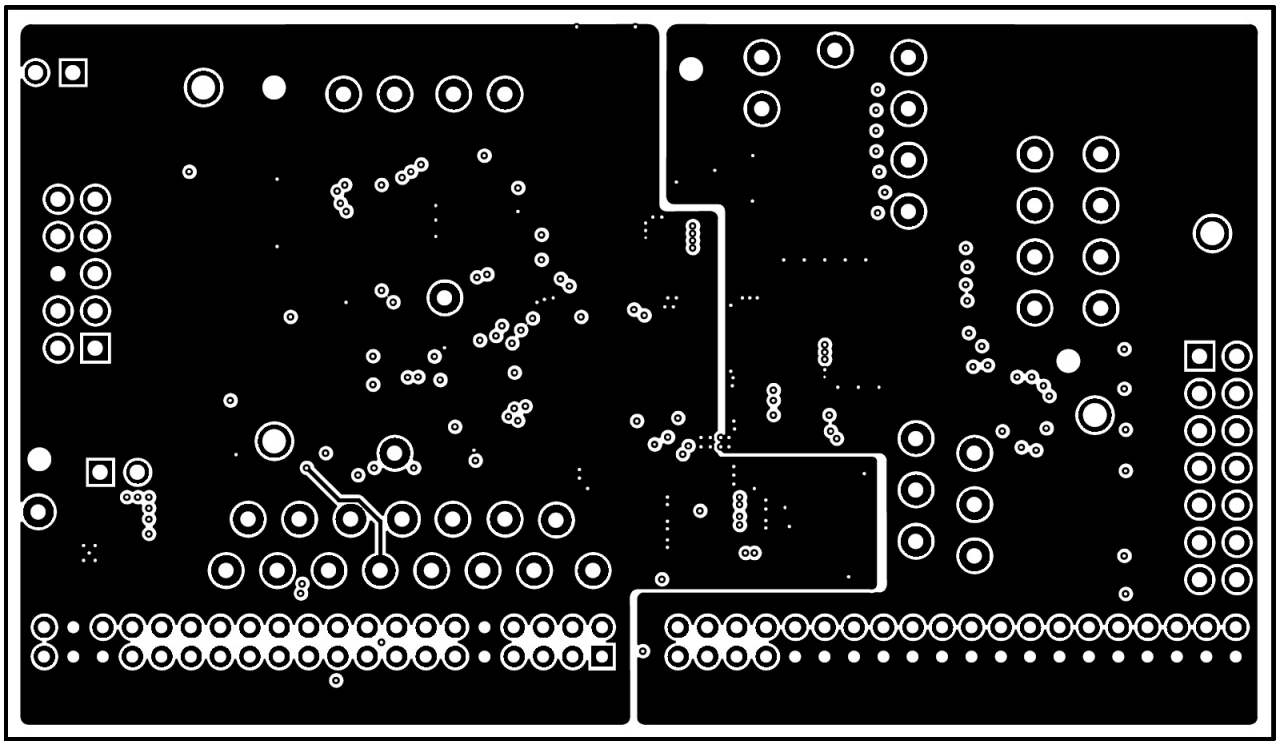

Figure 10. UCD3138A64EVM-660 Internal Layer 1 (Top View)

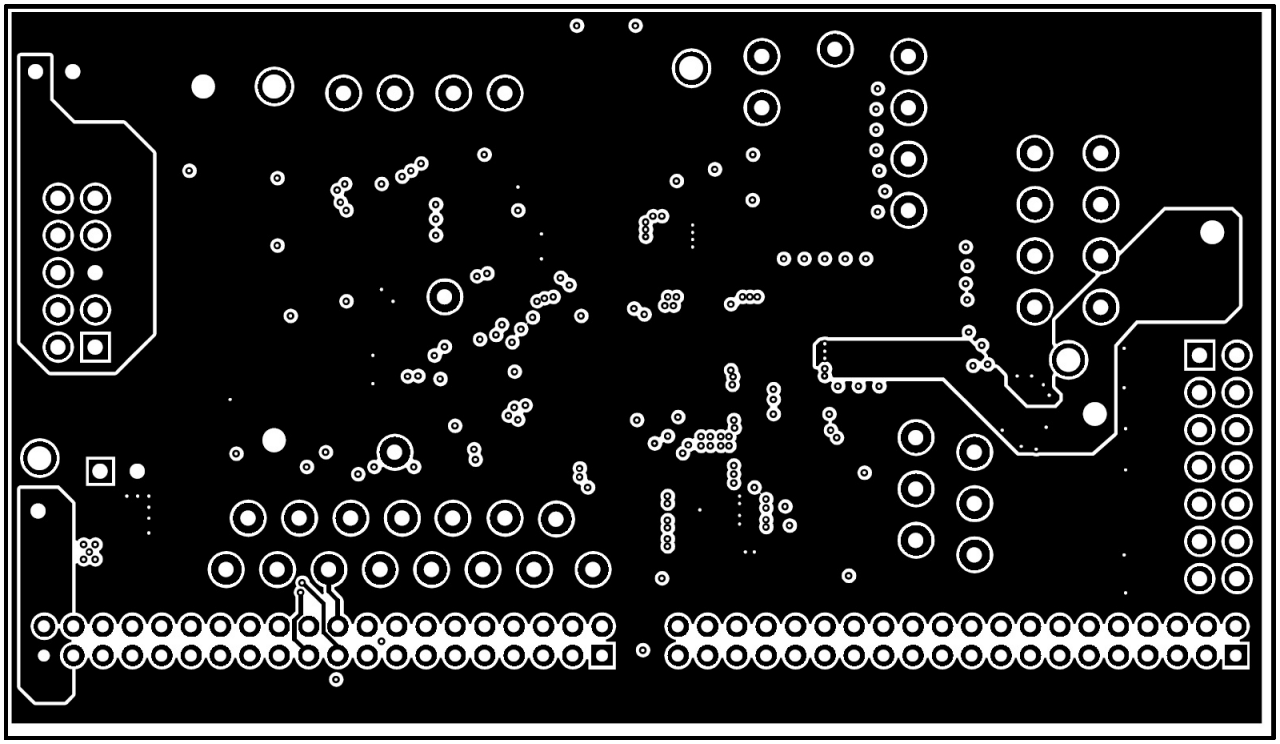

Figure 11. UCD3138A64EVM-660 Internal Layer 2 (Top View)

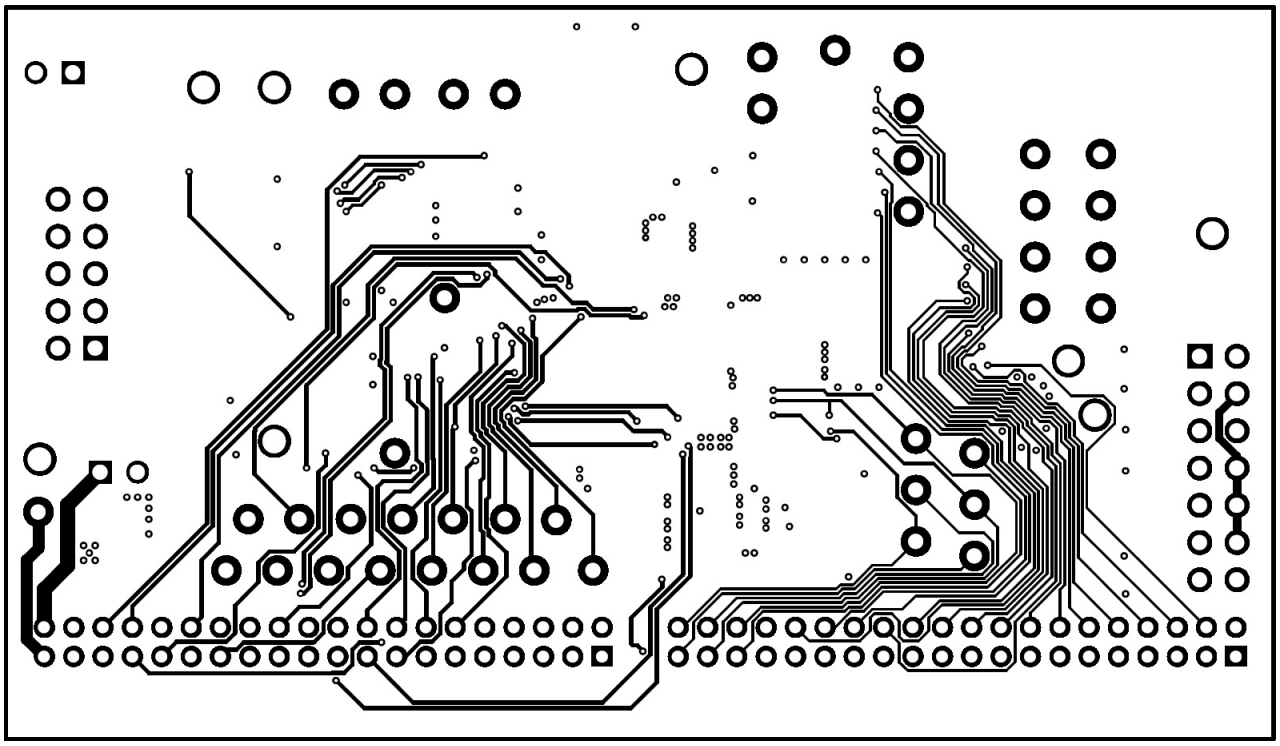

Figure 12. UCD313A64CEVM-660 Bottom Copper (Top View)

9 Bill of Materials

Table 4 lists the EVM components according to the schematic shown in Figure 1 and Figure 2.

Table 4. Bill of Materials[1]

Designator	Qty.	Value	Description	Pkg. Reference	PartNumber	Manufacturer
PCB	1		Printed Circuit Board		PWR660	Any
C1–C15, C36	16	1000pF	CAP, CERM, 1000pF, 50V, ±10%, X7R, 0603	0603	GRM188R71H102KA01D	Murata
C16–C18	3	33pF	CAP, CERM, 33pF, 50V, ±5%, C0G/NP0, 0603	0603	GRM1885C1H330JA01D	Murata
C19, C30	2	0.1µF	CAP, CERM, 0.1µF, 16V, ±10%, X7R, 0603	0603	GRM188R71C104KA01D	Murata
C20	1	10µF	CAP, CERM, 10µF, 10V, ±10%, X5R, 0805	0805	GRM21BR61A106KE19L	Murata
C21, C28, C31	3	4.7µF	CAP, CERM, 4.7µF, 16V, ±10%, X5R, 0603	0603	GRM188R61C475KAAJ	Murata
C22, C27, C29, C32	4	1000pF	CAP, CERM, 1000pF, 50V, ±5%, C0G/NP0, 0603	0603	C0603C102J5GAC	Kemet
C26, C35	2	1µF	CAP, CERM, 1µF, 16V, ±10%, X7R, 0603	0603	GRM188R71C105KA12D	Murata
C33	1	0.1µF	CAP, CERM, 0.1µF, 25V, ±10%, X7R, 0603	0603	GRM188R71E104KA01D	Murata
C34	1	1µF	CAP, CERM, 1µF, 25V, ±10%, X7R, 0603	0603	GRM188R71E105KA12D	Murata
C37	1	100pF	CAP, CERM, 100pF, 50V, ±5%, C0G/NP0, 0603	0603	C0603C101J5GAC	Kemet
C38	1	0.1µF	CAP, CERM, 0.1µF, 25V, ±10%, X5R, 0603	0603	GRM188R61E104KA01D	Murata
D1	1	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On
D2, D3	2	30V	Diode, Schottky, 30V, 0.2A, SOT-23	SOT-23	BAT54A-7-F	Diodes Inc.
J1, J2	2		Receptacle, 2mm, 20x2, R/A, TH	Header, 20x2 2 mm pitch receptacle Right Angle	NPPN202FJFN-RC	Sullins Connector Solutions
J3, J4	2		Header, 100mil, 2x1, Tin plated, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
J5	1		Header (shrouded), 100mil, 5x2, Gold, TH	5x2 Shrouded header	5103308-1	TE Connectivity
J6	1		Header, 100mil, 7x2, Tin plated, TH	Header, 7x2, 100mil, Tin	PEC07DAAN	Sullins Connector Solutions
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650"H x 0.200"W	THT-14-423-10	Brady
R1–R8, R15, R20–R22, R28	13	100	RES, 100 Ω, 1%, 0.1W, 0603	0603	CRCW0603100RFKEA	Vishay-Dale
R9–R14	6	2.00k	RES, 2.00kΩ, 1%, 0.1W, 0603	0603	CRCW06032K00FKEA	Vishay-Dale
R16	1	0.5	RES, 0.5 Ω, 1%, 0.1W, 0603	0603	RL0603FR-070R5L	Yageo America
R17	1	301	RES, 301 Ω, 1%, 0.1W, 0603	0603	CRCW0603301RFKEA	Vishay-Dale
R18	1	1.65k	RES, 1.65kΩ, 1%, 0.1W, 0603	0603	CRCW06031K65FKEA	Vishay-Dale
R19, R23, R34, R37	4	0	RES, 0 Ω, 5%, 0.1W, 0603	0603	CRCW06030000Z0EA	Vishay-Dale
R29, R30	2	2.0k	RES, 2.0kΩ, 5%, 0.1W, 0603	0603	RC0603JR-072KL	Yageo America
R31–R33, R35, R36, R38	6	10.0k	RES, 10.0kΩ, 1%, 0.1W, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
R39	1	16.0k	RES, 16.0kΩ, 1%, 0.1W, 0603	0603	RC0603FR-0716KL	Yageo America
R40	1	10.0k	RES, 10.0kΩ, 1%, 0.1W, 0603	0603	RC0603FR-0710KL	Yageo America
R41, R42	2	1.0k	RES, 1.0kΩ, 5%, 0.1W, 0603	0603	CRCW06031K00JNEA	Vishay-Dale
S1	1		Switch, Tactile, SPST-NO, 1VA, 32V, SMT	Switch, 6.3x5.36x6.6 mm, SMT	KT11P2JM34LFS	C&K Components

(1) Unless otherwise noted, all parts may be substituted with equivalents.

Table 4. Bill of Materials[(1)] (continued)

Designator	Qty.	Value	Description	Pkg. Reference	PartNumber	Manufacturer
SH-J1	1	1x2	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN	Sullins Connector Solutions
TP21–TP40, TP45, TP46	22	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
TP41, TP42	2	Grey	Test Point, Multipurpose, Grey, TH	Grey Multipurpose Testpoint	5128	Keystone
TP43, TP44	2	Black	Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone
TP47, TP49	2	Red	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
TP48, TP50	2	Orange	Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone
U1	1		HIGH INPUT VOLTAGE, MICROPOWER SON PACKAGED, 80mA, LDO LINEAR REGULATORS, DRB0008A	DRB0008A	TPS715A33DRB	Texas Instruments
U2	1		UCD3138A64PFC, PFC0080	PFC0080A	UCD3138A64PFC	Texas Instruments
U3	1		2-Mbit DataFlash (with Extra 64-Kbits), 1.65V Minimum SPI Serial Flash Memory, SOIC-8	SOIC-8	AT45DB021E-SSHN-B	Adesto Technologies
U4	1		IC, EEPROM, 2MBIT, 1MHz, 8SOIC	SOIC-8	M24M02-DRMN6TP	STMicroelectronics
C23, C24	0	10pF	CAP, CERM, 10pF, 50V, ±5%, C0G/NP0, 0603	0603	C0603C100J5GACTU	Kemet
C25	0	2.2µF	CAP, CERM, 2.2µF, 10V, ±10%, X7R, 0603	0603	GRM188R71A225KE15D	Murata
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
R24–R27	0	0	RES, 0 ohm, 5%, 0.1W, 0603	0603	CRCW06030000Z0EA	Vishay-Dale
TP1–TP20, TP51	0	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
Y1	0		Crystal, 10.000MHz, 10pF, SMD	5x0.9x3.2mm	7B-10.000MEEQ-T	TXC Corporation

Appendix A Summary of Using Code Composer Studio v5.5

In this appendix, the basic steps of using Code Composer Studio v5.5 to compile firmware for the UCD3138 family of devices is described. A design flow is described but detailed steps for firmware code creation, and firmware and hardware debugging are beyond the scope of this user's guide.

A.1 Importing a CCSv5 Project

Upon running CCSv5.5 for the first time, the **Workspace Launcher** window appears as shown in Figure 13. The user decides whether or not to use a workspace, where it is located, or to check the box that says **Use this as the default and do not ask again**. For this guide, a workspace is not used, so click **OK**.

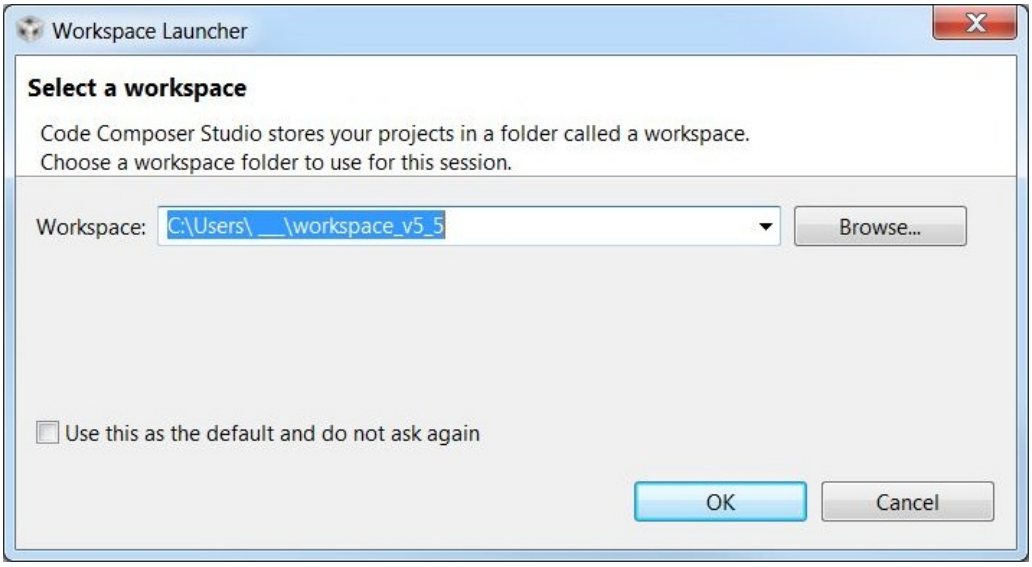

Figure 13. CCSv5.5 Workspace Launcher

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

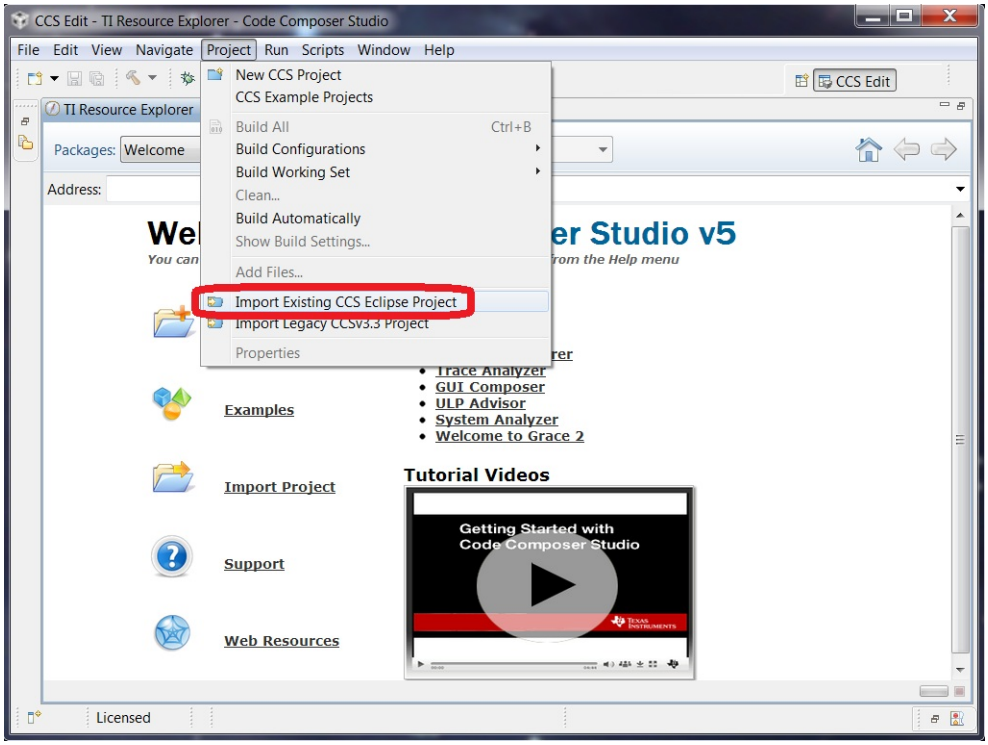

Figure 14. Import Existing CCS Eclipse Project

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 **Training_CCSv5.5** and is located in a folder called **Training_CCS5v5**. Check the box next to the discovered project, and do not check **Copy projects into workspace**, or **Automatically import referenced projects.** Click **Finish**.

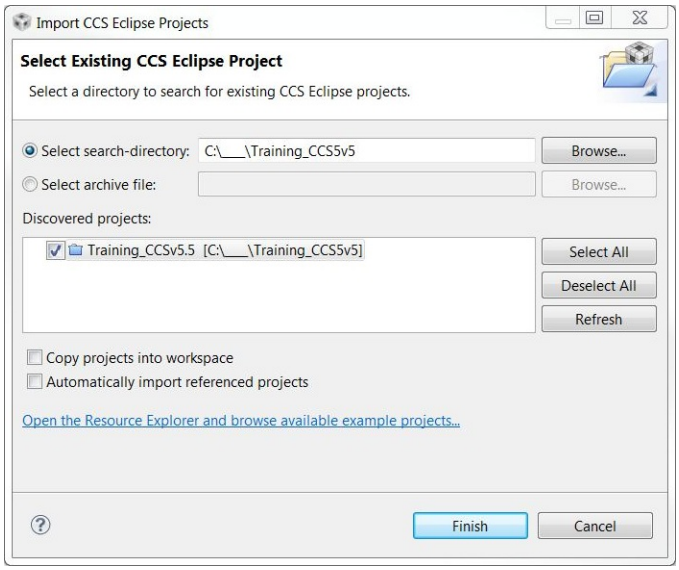

Figure 15. Importing a CCSv5.5 Project

The project should be imported into CCSv5.5 and shown in the **Project Explorer** as shown in Figure 16. At this point, files in the project can be edited as required.

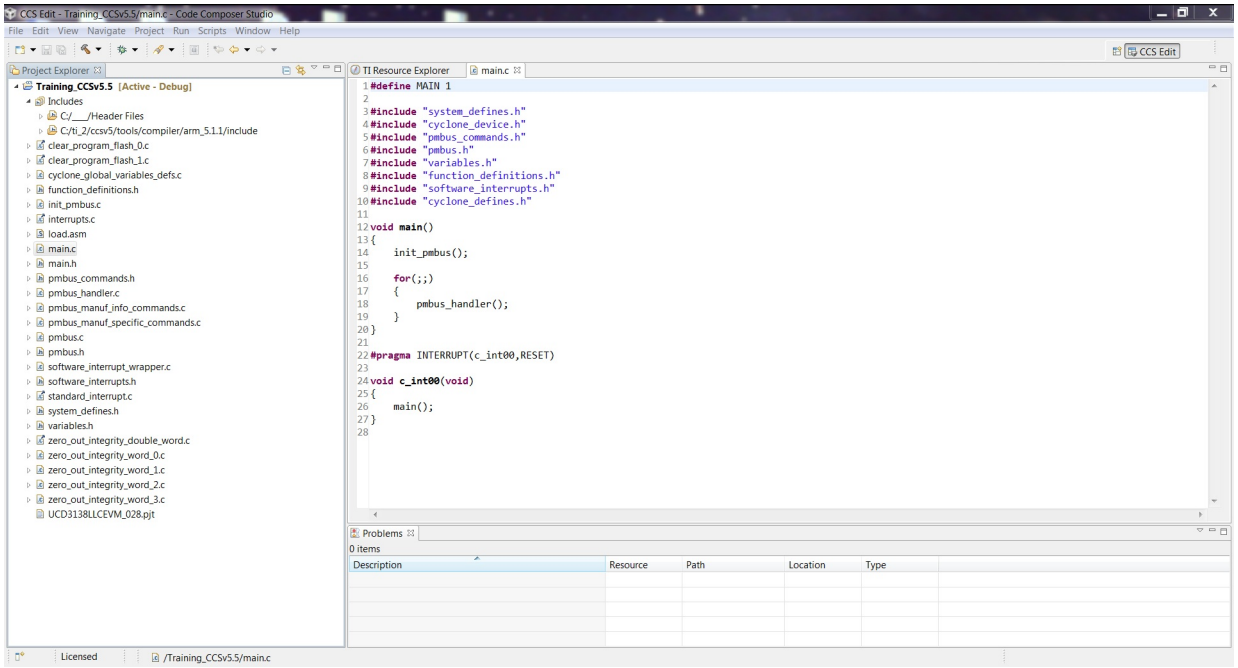

Figure 16. Project Explorer

A.2 Build/Compile a Project Using Code Composer Studio v5.5

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 *Converting UCD3138 Firmware Project from Code Composer Studio Version 3.3 to 5.2* (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.

Builds may take up to a minute or longer to compile for a first time build. Figure 17 shows the state of a successful build:

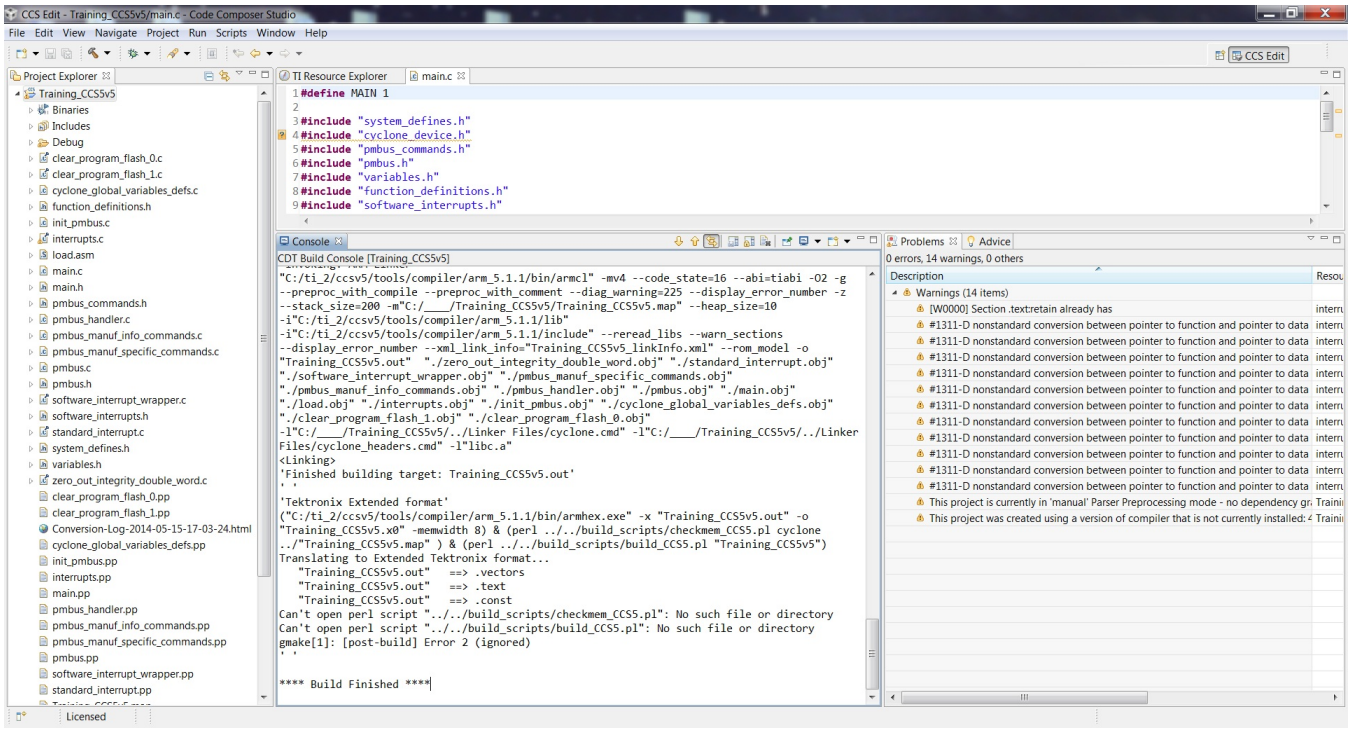

Figure 17. Successful Build of UCD3138-Related Source Code

When the build has finished, the **.x0** file is created and is 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 **Training_CCS5v5** creates **Training_CCS5v5.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 run on the UCD3138 target device using the **UCD3XXX / UCD9XXX Device GUI**.

A.3 References

1. *UCD3138A64 Data Manual* (SLUSBZ8)
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, UCD3138A64 applications) (SLUA676)
6. *Code Composer Studio v5 Wiki*, Texas Instruments, http://processors.wiki.ti.com/index.php/Category:Code_Composer_Studio_v5
7. *Converting UCD3138 Firmware Project from Code Composer Studio Version 3.3 to 5.2* (SLUA679)
8. *UCD3138A64 Programmer's Manual* (SLUUB54)

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