

Fusion Digital Power Designer GUI for Isolated Power Applications

User Guide (for UCD3138, UCD3138A, UCD3138064, UCD3138A64, UCD3138128 applications)



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	00 01
	91 00
	72
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2 About This User's Guide

2.1 Introduction

The Fusion Digital Power Designer is a GUI tool that supports the evaluation and development of power supply solutions based on Texas Instruments' UCD3xxx and UCD9xxx family of digital power controllers.

This User Guide specifically addresses the following Texas Instrument controllers geared towards Isolated Power applications:

- UCD3138
- UCD3138064
- UCD3138A64

This tool is available for free download here: http://www.ti.com/fusion-gui.

There are a number of tools available upon installation. This user guide will focus on describing the functions of two important tools namely, the Fusion Digital Power Designer (Designer GUI) and the Device GUI. These two essential GUIs, in addition to providing key functionality, serve as a launch-pad to many of the other tools provided.

2.2 The Fusion Digital Power Designer (Designer GUI)

The Fusion Digital Power Designer or Designer GUI, essentially emulates a Host in a PMBUS-based power supply system (pmbus.org). If PMBUS commands are implemented in the firmware of the device under test, then the Designer GUI aids in establishing communication and delivering the supported PMBUS functions (such as telemetry etc). Additionally, when used in conjunction with TI-provided reference firmware, the Designer GUI provides certain additional capabilities related to optimizing the power supply such as adjusting loop compensation etc. Currently TI provides reference firmware for the 4 isolated power topologies listed in table below, which are supported by the Designer GUI and can be used in conjunction with associated EVMs available for purchase from www.ti.com:

Power Supply Topology	EVM Part #
Power Factor Correction	UCD3138PFCEVM-026
Phase Shifted Full Bridge	UCD3138PSFBEVM-027
Half-Bridge Resonant LLC	UCD3138LLCEVM-028
Hard Switching Full Bridge	UCD3138HSFBEVM-029

2.3 The Device GUI or Engineering GUI

The Device GUI or Engineering GUI, is a launch-pad for several invaluable device-related tools that are necessary for working with the UCD3138 (064, A64) devices and developing successful firmware. These tools allow the designer to execute critical tasks associated with the devices during the development phase such as switching between ROM mode and Program Flash mode, downloading firmware, debugging, investigating the contents of registers etc.

A PMBUS-based hardware interface, which allows communication between the GUI tool and the UCD3138 (064, A64) devices, is available from Texas Instruments (part #: USB-to-GPIO, <u>http://www.ti.com/tool/usb-to-gpio</u>). One unit of this interface adaptor is provided with the abovementioned EVMs, but the adaptor is available for standalone purchase, for use with other UCD3138 (064, A64) EVMs available from Texas Instruments that are not provided with one:

EVM Part #	Description
UCD3138CC64EVM-030	Control card featuring UCD3138RGC



UCD3138OL64EVM-031	Open Loop Evaluation board for UCD3138RGC
UCD3138OL40EVM-032	Open Loop Evaluation board for UCD3138RHA
UCD3138064EVM-166	Control card featuring UCD3138064RGC
UCD3138A64CEVM-660	Control card featuring UCD3138A64PFC

The reference firmware, EVMs, GUI and interface adaptor constitute a complete and powerful development system that is available for designers to successfully develop power supplies based on UCD3138 (064, A64).

2.4 Conventions

Any hexadecimal number will be prefixed by 0x. For example, 0xFF. Any other number should be assumed to be decimal.

2.5 User Interface Terminology & Tips

Checkbox

User can select any number of boxes.

Radio Button

User can only select one of the circles at a time. For example, clicking "High" will deselect "None."

Spin Edit

Used for numeric entry. User can type in a number directly or click the up and down arrows to increment or decrement the number. The up/down usually changes the last decimal place (adding or subtracting 0.001 in this example).

Widget

A generic term used to describe a user interface component such as a button or checkbox.

Disabled (Grayed Out)

User cannot edit the widget. This is usually because the GUI has determined that a particular item is a "don't care" or does not make sense given the setting of some other widget or PMBus command.

2.6 Terminology

'Designer GUI' or 'GUI' - refers to Fusion Digital Power Designer GUI (main tool), described above

'Device GUI' or 'Engineering GUI' – refers to UCD3xxx Device GUI that delivers device-related functions indispensable for development purposes

2.7 Additional Technical Support

For additional questions or clarifications please take advantage of TI's E2E community: <u>http://e2e.ti.com/support/power_management/digital_power/default.aspx</u>

Alternately, please contact your Texas Instruments local representative.

	🗸 Vin	Vout	🔽 Iout	🔽 Temp
ample,	None	e 🔾 Low	🔵 High	
ctly or ht the I place	0.8	80		
onent such				
e GUI has es not	() On	💿 off		



3 Getting Started

3.1 PC Requirements

The GUI requires the following:

- A PC running Windows XP/Windows 7
- Microsoft.NET Framework version 4.0

Microsoft.NET is the runtime application framework that the GUI uses. The GUI's installer will ensure version 4.0 of .NET is installed, and install if necessary.

3.2 USB Adapter

As mentioned earlier, the EVM is attached to the PC through a Texas Instruments serial bus adapter, part number USB-to-GPIOⁱ. The user should have received this adapter with certain EVMs, but is also orderable stand-alone. The serial adapter must be running firmware v. 1.0.5 or higher. If the adapter's firmware does not meet this requirement, a warning message will appear when the GUI first starts. The GUI can be run in "Offline mode" without the serial bus adapter, which allows the user to edit an existing device configuration or experiment with a default "virtual device."

3.3 Download & Installation

The latest public production versions can be found at <u>http://www.ti.com/tool/fusion_digital_power_designer</u>. In addition to what is found at that address, your TI representative may provide you with more recent releases that are not available from the website mentioned.

If you would like to be added to our release mailing list for Isolated GUI builds send an email to: <u>iso-fusion-gui-releases.owner@list.ti.com</u>.

Download the ZIP file to your hard drive. You do not need to unzip the ZIP: you can launch the installer from within WinZip or similar ZIP utility.

The following figure displays some extra tools you can create shortcuts for in addition to the main Fusion Digital Power Designer GUI.

👸 Setup - Texas Instruments Fusion Digital Power Designer		
Select Additional Tasks Which additional tasks should be performed?	Ð	
Select the additional tasks you would like Setup to perform while installing Texas Instruments Fusion Digital Power Designer, then dick Next.		
Create a desktop icon	~	
Create a Quick Launch icon		
Other desktop shortcuts		
Fusion Design Offline		
✓ SMBus SAA Debug Tool	=	
UCD3xxx Device GUI		
Additional Tasks:		
Add application directory to your system PATH		
	*	
< Back Next >	Cancel	



3.4 Upgrading the GUI

When upgrading to a new release of the GUI, there is no need to un-install the current installed version first. In fact, doing so will remove your program preferences, and is not recommended. The GUI installer will take care of updating all necessary files. The program preferences will not be modified by the installer.

3.5 Multiple Installations of the GUI

You *can* install different versions of the GUI on same the PC. Because the preferences are stored within the program folder as described in Section 6.1.1.1, each version of the GUI installed on your PC will have its own set of preferences.

When you install a second copy of the GUI, you need to ensure the name of the folder for the additional copy is named differently from the default folder name, "Texas Instruments Fusion Digital Power Designer." The easiest way to do this is to append something descriptive to the folder name. For example, in the following example "– Beta" was appended to the installation folder pathname:



You will also need to rename the Start Menu folder that gets created. Again, " – Beta" has been appended to the default:





Finally, you'll need to decide whether you want to install desktop or quick launch shortcuts for this version of the GUI. These shortcuts will overwrite any existing shortcuts. In the "beta" example used here, it is probably best to skip the creation of shortcuts:

😰 Setup - Texas Instruments Fusion Digital Power Designer	🛛
Select Additional Tasks Which additional tasks should be performed?	
Select the additional tasks you would like Setup to perform while installing Texas Instruments Fusion Digital Power Designer, then click Next.	
Additional icons:	
Create a desktop icon	
Create a Quick Launch icon	
(Back Next>	Cancel

Using this technique, you'll be able to launch either version of the GUI from the Start Menu:



4 Fusion Digital Power Designer (Designer GUI)

4.1 Starting the GUI

The previous form in the installer controls whether GUI "shortcuts" are added to the desktop and quick launch area. The quick launch area is the area next to the Start menu which contains shortcuts to commonly used applications.







Figure 1 - Accessing Designer GUI from Start Menu

When you launch the GUI, it attempts to find a supported device attached to the PMBus. The following sequence is followed:

1. The GUI looks for an attached USB serial bus adapter. If it is not found you will see the following figure:

Texas Instruments
Fusion Digital Power Designer Version 1.0.0.27650 [2011-10-27]
No USB Adapter Found! A Texas Instruments USB serial bus adapter does not appear to be connected to your PC. Please check your connection. You should see a green light on the adapter when it is attached to the PC.
Retry Adapter Mode Offline Mode Exit Program



- 2. The GUI sends SMBus commands to the "broadcast" address 11 telling any devices that are in ROM mode to execute their program (go to flash mode). While this is not necessary for production devices, it may be necessary for in-development products that are set to boot to ROM mode.
- 3. The GUI scans addresses 1 through 127 for an attached device. It does this by reading a special manufacturer command, DEVICE_ID, on each address. This parameter contains information about the device, including part number and firmware version. Address 12 is skipped because this is reserved for use in the SMBus Alert Response Protocol. After this command has been read then the SETUP_ID is analyzed. If the SETUP_ID is not recognized due to being part of new firmware, for example, then there are some steps that can be taken to still allow for communication with the GUI. See "Section 6.1.1.1 SETUP_ID in firmware is not recognized by the GUI".
- 4. While the scanning process occurs, you will see a dialog box:





Figure 3 - Device scanning

5. If a supported device cannot be found, you will see this error message:

TEXAS INSTRUMENTS						
Fusion Digital Power Designer Version 1.0.0.27650 [2011-10-27]						
No Devices Found! No compatible PMBus devices were found. Please check that the serial cable end of your USB adapter is attached to your device and power is supplied to your device.						
USB Adapter I	Firmware Version: 1.0.10	_				
Bus Speed:	Packet Error Checking:		ALERT Pullup:	2.2 kΩ 🗸		
○ 100 kHz	 Enabled 	 Serial 	CLOCK Pullup:	2.2 kΩ 🗸		
● 400 kHz O Disabled O Parallel DATA Pullup: 2.2 kΩ V						
Change Device Scanning Options Retry Adapter Mode Offline Mode Exit Program						

Figure 4 - No devices found

Double check your USB adapter connection and power to your device and click "Retry" to re-scan.

If the GUI is still unable to detect the device see the following troubleshooting tips in the Section "Connection Troubleshooting Tips 4.2.4".

If you expect the device not to be detected and are interested in working with the offline features for your device, simply click "Offline Mode". This allows you to use most of the GUI's features while not electrically connected to a device. Offline Mode is described in more detail in Section 6.8.

4.2 Connecting to a Remote USB Adapter

The Fusion GUI supports connecting to a remote USB adapter on another PC running the Fusion GUI Adapter Server.



The client computer, i.e. the one without the USB Adapter desired, needs to configure the scan process with the IP, port, and password for the other PC. The computer with the desired USB Adapter will need to run a server that is part of the Fusion GUI. The client will be discussed first and then the server.

4.2.1 Client configuration

The following are two ways to get to the client configuration. The first way is from the "Start" menu:

Click "Start>Texas Instruments Fusion Digital Power>Tools>USB Adapter Mode Selector" as shown in Figure 5.



Figure 5 - USD Adapter Mode Selector from Start menu

The second way is after the initial startup scan fails, there will be an option to click "Adapter Mode ..." as shown in Figure 6.



Texas Instruments						
FUSION Version 1.0.0	Digital Power !	Designe	r			
No Devices I No compatible attached to yo Scanning Mo	Found! PMBus devices were found our device and power is sup ode: DEVICE_ID and DEVI	I. Please check plied to your d ICE_CODE sca	that the serial cab evice. n	le end of	your USB adapter is	
USB Adapter	Firmware Version: 1.0.10					
Bus Speed:	Packet Error Checking:	Bis Notes	ALERT Pullup:	2.2 kΩ	~	
🔿 100 kHz	Enabled	• (2575)	CLOCK Pullup:	2.2 kΩ	\checkmark	
④ 400 kHz		• Parallel	DATA Pullup:	2.2 kΩ	~	
Change Dev	ice Scanning Options	Retry	Adapter Mode)	Offlin	e Mode Exit Program	

Figure 6 - Adapter Mode button from "No Devices Found!" screen

The default setting is to have the GUI use the local USB adapter. However to access the remote USB adapter the user will select "Remote" as shown in the figure below. The host's IP and Port will need to be specified (and password if one is set). This information is automatically available in the Fusion GUI Server running as shown in Figure 10 (a few figures below). After entering the server information click "Test Connection" as shown in Figure 7.



🌵 USB I2C Adap	iter Local/Remote Mode Selection						
— Overview —							
All tools bundled USB I2C adapte debug the GUI (Instruments.	All tools bundled with the Fusion Digital Power Designer can be configured to use a USB I2C adapter on a remote PC. This is used by the Fusion development team to debug the GUI while it runs on a remote board, such as in one of our labs at Texas Instruments.						
Customers and TIers can also use this special mode to connect to a remote adapter on your company LAN/WAN. In order to connect to the remote adapter, you must have Fusion Digital Power Designer installed on a PC attached to the adapter and run a special adapter "server" tool. This tool can be found in Start Menu->Fusion Digital Power Designer->Tools->USB Adapter Server.							
The GUI can no Running the GU remote PC view and back before it is fairly speed	The GUI can not connect to an adapter that is beyond your firewall and vice versa. Running the GUI in this way may also be slower than using remote desktop or other remote PC viewing applications, as each I2C request must travel to the remote PC and back before the GUI can move onto the next I2C request. When run on a LAN it is fairly speedy. When run over a slow WAN link or VPN, speed will be poor						
- Mode Select	ion & Settings						
O Local - use	USB adapter(s) connected to this PC						
Remote - u	se LISB adapter(s) connected to another PC						
Host:	172 24 38 145 -						
	IP address or PC name						
Port:	8090						
Password:	Show						
This is not a password to a user account on the PC; it is an optional password defined at the time the server is started							
Test Connection							
	Close						

Figure 7 - Adapter Mode Selection

If you click "Test Connection" you will be able to test whether you are connected to the server and observe the following figure indicating success. If unsuccessful, ensure you are connected to the internet and that the information is entered correctly. Note: the GUI cannot connect to an adapter that is beyond your firewall and vice versa.



Figure 8 - Remote Adapter Connection Test Success



4.2.2 Remote Server Configuration

The server machine will need to run the "USB Adapter Server" to allow clients to connect. The USB Adapter Server can be found in the Start>Texas Instruments Fusion Digital Power>Tools menu as shown in Figure 9.



Figure 9 - USB Adapter Server from Start menu

The USB Adapter Server shows its IP Address that the client will need to use. Also, in order for clients to connect to the server the user must click the "Start Server" button.



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🚸 TI USB 12C /	🖓 TI USB I2C Adapter Server					
This tool lets a remote GUI connect to and use your TI USB-based I2C adapter. You will not be able to launch other Fusion tools on this local PC while this tool is running. To run a remote GUI against this adapter server, configure to use the server using the Adapter Preferences tool.						
TCP Port:	8090 💭	Your IP Address (Server):	172.24.38.145	Send Invite via E-Mail		
Password:	Show	Last Client IP:	Not Connected	Copy Invite to Clipboard		
(r	not required; can be empty)	Total # SAA Requests:	0	<u> </u>		
Log:				✓ Detailed Logging		
Timestamp	Message					
16:28:49.760	Server started, listening for conn	ections on port 8090				
16:28:53.901	Server stopped					
16:29:29.274	Server started, listening for conn	ections on port 8090				
16:29:55.811	Server stopped					
Pause Log	Copy Log Clear Log	Start Ser	ver	ai		

Figure 10 - Remote Adapter Server

If the user clicks "Send Invite via E-Mail", a prefilled email will appear populated with the relevant information for the client to connect to the server. It includes the IP address, Port and Password if any. It also includes instructions on how to configure the client. The Figure 11 below shows the content of the prefilled email. The user will need to replace "my-client-friend@firend.com" in the "To:" with the appropriate email address of the client.

	То	my-client-friend@friend.com	_				
Send	Сс						
	Bcc						
	Subject:	Fusion GUI Remote Adapter Invite					
Pleas	e connect to	my TI USB I2C adapter:					
- IP - Po - Pa	address: 172 rt: 8090 ssword: none	.24.38.145 e, leave empty					
You c	an configure	Fusion Digital Power Designer to use a remote adapter server by:					
Clicl switc	Clicking the Start Menu, selecting "Texas Instruments Fusion Digital Power Designer", selecting "Tools", and then selecting "USB Adapter Mode Selector". This can be used to switch between local adapter mode and remote mode.						
or:							
Disc popu	onnecting yo). You can clie	our local adapter and run whatever tool you want (the full GUI or a tool). There is an "Adapter Mode" button on the "No USB Adapter Found" form that will ck this button to connect to a remote adapter server.	=				
Your	adapter mod	e selection is saved between restarts of GUI tools.					
		Figure 11 - E-mail invite with Remote Server settings					

4.2.3 Client and Server running

The following are some figures of a live client and server interacting. For the client, the experience of running the GUI remotely would be the same as running it on a local USB adapter except for the speed being slower.



Fusion Digital Power Designer GUI (ver.2.0.13) for Isolated Power

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👆 TI USB 120	C Adapter Server					
This tool lets a while this tool i	This tool lets a remote GUI connect to and use your TI USB-based I2C adapter. You will not be able to launch other Fusion tools on this local PC while this tool is running. To run a remote GUI against this adapter server, configure to use the server using the Adapter Preferences tool.					
TCP Port:	8090 💭 Your IP Address (Server): 172.24.38.145 Send Invite via E-Mail					
Password:	Show Last Client IP: 158.218.99.224 Copy Invite to Clipboard					
	(not required; can be empty) Total # SAA Requests: 391					
Log:	✓ Detailed Lo	gging				
Timestamp	Message					
16:44:18.082	2 158.218.99.224: ReadWord (Address 89d Cmd 0x8B): ACK 0x11CF					
16:44:18.158	158.218.99.224: BlockRead (Address 89d, Cmd 0xF0); ACK 0x0102030405060708					
16:44:18.219	9 158.218.99.224: ReadWord (Address 89d, Cmd 0x95): ACK 0x0000					
16:44:18.285	5 158.218.99.224: ReadWord (Address 89d, Cmd 0x8C): ACK 0xD2E9					
16:44:18.356	5 158.218.99.224: ReadWord (Address 89d, Cmd 0x8E): ACK 0xF21D					
16:44:18.420	158.218.99.224: ReadWord (Address 89d, Cmd 0x8D): ACK 0xDA09					
16:44:18.489	9 158.218.99.224: ReadWord (Address 89d, Cmd 0x79): ACK 0x0841					
16:44:18.556	5 158.218.99.224: PollPmbusSignalLines: ACK SMBALERT# is High					
16:44:18.660	158.218.99.224: PollPmbusSignalLines: ACK SMBALERT# is High					
16:44:18.725	5 158.218.99.224: ReadWord (Address 89d, Cmd 0x88): ACK 0xE31F					
16:44:18.796	5 158.218.99.224: ReadWord (Address 89d, Cmd 0x8B): ACK 0x11E8					
16:44:18.860	158.218.99.224: BlockRead (Address 89d, Cmd 0xF0): ACK 0x0102030405060708					
16:44:18.924	4 158.218.99.224: ReadWord (Address 89d, Cmd 0x95): ACK 0x0000					
16:44:18.989	9 158.218.99.224: PollPmbusSignalLines: ACK SMBALERT# is High					
		~				
Pause Log	Copy Log Clear Log Stop Server					

Figure 12 - Running a remote server connected to a client

TEXAS INSTRUMENTS
Fusion Digital Power Designer Version 1.8.306 [2013-03-06]
Scanning USB Adapter #1 for devices





Fusion Digital Power Designer GUI (ver.2.0.13) for Isolated Power SLUA676A - Jan 2015

🦑 Fusion Digital Power Designer - DC-DC LLC @ Address 89d - Page 0x0 - Texas Instruments 🔹 💷 🗙						
File Device Tools	Debug Help	DC-DC LLC @ 89d - Page 0x0	\checkmark			
Monitor	Readings - Page 0x0	Vin - Input Voltage	×			
Show/Hide Plots: Vin Vout Jout Pout(calc) Temp Int Temp Ext All Temp Freq Fit All Plots on Screen Scale Plots to Screen Width Height: 200 💭	Vin: 49.938 V Vout: 8.918 V Iout: 11.64 A Temp Int: 16 °C Temp Ext: 135 °C Status Registers/Lines Vout: OK Iout: OK	OVF: 430.000 + V OVW: 400.000 + V UVW: 350.000 + V UVF: 320.000 + V V VinON: 320.000 + V V 500.00 + V VinON: 320.000 + V V VinOFF: 310.000 + V 500.00	Write			
 ✓ Show Warn & Fault Limit Editors ✓ Show Value Labels on Plots Polling Rate: 500 ≑ (msec) Stop Polling Launch Dashboard 	Input: OK CML: OK Misc: Output Off, POWER_GOOD# Debug Buffer: 0x0102030405060708 Mfr: OK SMBALERT# Not Asserted Clear Faults Control Line (USB) Migh © Low	Vout - Output Voltage OVF: 14.000 💬 V OVW: 13.000 💬 V Vout: 12.000 💬 V UVW: 11.000 💬 V UVF: 3.000 💬 V Write 16.00 14.00 12.00 14.00 12.00 10.00 8.390 4 Y 0 0 0 0.00 8.00 8.904 Y 0 0	×			
		46:00 46:20 46:40 47:00	47:20			
Configure	Tips & Hints YOUT_OY_FAULT_LIMIT [0x40] Sets the value of the output voltage measure the sense or output pins that causes an output overvoltage fault.	PMBus Log	P			
V Monitor		MBus Log	 ✓ ✓ 			
Fusion Digital Power Desig	gner v1.8.306 [2013-03-06] DC-DC LLC Firm	ware v0.0.49.76 @ Address 89d 🛛 USB Adapter v1. 🛛 🚸 Texas Instruments fusion d	ligital power			

Figure 14 – Client's machine interacting with a remote USB Adapter connected to a device

4.2.4 Connection Troubleshooting Tips

5 Problem	6 Resolution
The scan never occurs. The GUI immediately comes up with the error form. When retry is clicked, the error form reappears immediately.	This usually indicates the USB serial adapter is not attached to the PC or is malfunctioning. Verify that the green LED on the serial adapter is ON. If it is not, unplug the adapter, power off your device, reconnect the adapter, and then power on your device.
The GUI scans each address, but cannot find the device	Verify that power is on to the device. Try re-applying power to the EVM. Also, try resetting the USB adapter as described above.



6.1.1.1 SETUP_ID in firmware is not recognized by the GUI

Generally in order for the GUI to recognize your firmware it needs to recognize the manufacturer commands Device_ID and SETUP_ID. However in the case where you are developing a new firmware and the SETUP_ID is not supported by the GUI you can change your scan preferences to ignore your SETUP_ID and continue to try to communicate with your device through the GUI. If communication can be established, then you will have the ability to interact with the PMBus commands that you have implemented in your firmware. You will not be able to access the Design features of model compensation and the stage of your topology since this requires knowledge of your SETUP_ID which indicates to the GUI the device's topology.

You can skip the SETUP_ID recognition scan by doing the following.

6.1.1.1.1 Change the Device Scanning Options

Texas Instruments							
Fusion Digital Power Designer Version 1.0.0.27650 [2011-10-27]							
No Devices F No compatible attached to yo Scanning Mo	No Devices Found! No compatible PMBus devices were found. Please check that the serial cable end of your USB adapter is attached to your device and power is supplied to your device.						
USB Adapter I	 Firmware Version: 1.0.10	-					
Bus Speed:	Packet Error Checking:		ALERT Pullup:	2.2 kΩ 🗸			
🔾 100 kHz	◯ 100 kHz						
● 400 kHz O Disabled O Parallel DATA Pullup: 2.2 kΩ V							
Change Device Scanning Options Retry Adapter Mode Offline Mode Exit Program							

Figure 15 - Select Change Device Scanning Options

The following dialog allows you tell the scanner what type of device is to be expected at each address. Click the button "UCD3XXX Isolated" at the top right. Click "OK" and then "Retry" the scan.



🜵 Device Scan Editor				_ • ×
Set All Addresses To: Skip	DEVICE_ID DEVICE_CODE	DEVICE_ID & DEVICE_COD		
1d 0x01 UCD3XXX 🗸	19d 0x13 UCD3XXX 🖂	36d 0x24 UCD3XXX 🗸	53d 0x35 UCD3XXX 🗸	70d 0x46 UCD3XXX 🗸 🗸
2d 0x02 UCD3XXX 🗸	20d 0x14 UCD3XXX 🗸	37d 0x25 UCD3XXX 🗸	54d 0x36 UCD3XXX 🗸	71d 0x47 UCD300X 🖂
3d 0x03 UCD3XXX 🖂	21d 0x15 UCD3XXX 🖂	38d 0x26 UCD3XXX 🖂	55d 0x37 UCD3XXX 🗸	72d 0x48 UCD3X0X
4d 0x04 UCD3XXX 🖂	22d 0x16 UCD3XXX 🗸	39d 0x27 UCD3XXX 🗸	56d 0x38 UCD3XXX 🗸	73d 0x49 UCD3XXX 🖂
5d 0x05 UCD3XXX 🔽	23d 0x17 UCD3XXX 🖂	40d 0x28 UCD3XXX 🖂	57d 0x39 UCD3XXX 🗸	74d 0x4A UCD3XXX 🗹
6d 0x06 UCD3XXX 🗸	24d 0x18 UCD3XXX 🗸	41d 0x29 UCD3XXX 🗸	58d 0x3A UCD3XXX 🗸	75d 0x4B UCD3X0X
7d 0x07 UCD3XXX 🖂	25d 0x19 UCD3XXX 🗸	42d 0x2A UCD3XXX 🖂	59d 0x3B UCD3XXX 🗸	76d 0x4C UCD3XXX
8d 0x08 UCD3XXX 🗸	26d 0x1A UCD3XXX 🗸	43d 0x2B UCD3XXX 🗸	60d 0x3C UCD3XXX V	77d 0x4D UCD3XXX ✓ =
9d 0x09 UCD3XXX 🗸	27d 0x1B UCD3XXX 🗸	44d 0x2C UCD3XXX 🖂	61d 0x3D UCD3XXX 🗸	78d 0x4E UCD3XXX
10d 0x0A UCD3XXX 🗸	28d 0x1C UCD3XXX 🖂	45d 0x2D UCD300X V	62d 0x3E UCD3XXX 🗸	79d 0x4F UCD3XXX ✓
11d 0x08 UCD3XXX 🗸	29d 0x1D UCD3XXX 🗸	46d 0x2E UCD3000	63d 0x3F UCD3XXX 🗸	80d 0x50 UCD3XXX
13d 0x0D UCD3XXX 🖂	30d 0x1E UCD3XXX 🖂	47d 0x2F UCD3000	64d 0x40 UCD3XXX 🗸	81d 0x51 UCD3XXX
14d 0x0E UCD3XXX 🗸	31d 0x1F UCD3XXX 🗸	48d 0x30 UCD3XXX 🗸	65d 0x41 UCD3XXX 🗸	82d 0x52 UCD3XXX 🖂
15d 0x0F UCD3XXX V	32d 0x20 UCD3XXX 🗸	49d 0x31 UCD3XXX ⊻	66d 0x42 UCD3XXX ⊻	83d 0x53 UCD3XXX 🗹
16d 0x10 UCD3XXX V	33d 0x21 UCD3XXX 🗸	50d 0x32 UCD3XXX V	67d 0x43 UCD3XXX 🗸	84d 0x54 UCD3000 🗸
17d 0x11 UCD3XXX 🗸	34d 0x22 UCD3XXX ✓	51d 0x33 UCD3XXX V	68d 0x44 UCD3XXX 🗸	85d 0x55 UCD300X 🗸
<				>
		ОК		🕐 Help

Figure 16 - Click UCD3XXX Isolated at top

6.1.1.1.2 Click Fallback Mode from Start Menu

An alternative way to change the scanning options is to select this scan mode from the Start Menu as shown below.



Figure 17 - Start>Texas Instruments...>Special>UCD3XXX Isolated Fallback Device Scan Mode

6.2 Enable GUI Protected Features

Figure 18 shows how to access the configuration screen to enable the GUI protected features. Figure 19 shows the screen. Make sure the selections are checked as shown and in the password box type the word "forestin." Click OK and then many features will be available.



-10	Fus	sion Digital Power	Designer	r - DC-DC LLC @ Address 88 -	Page
	File	Device Tools	Debug	Help	
N		Import Project		gs - Page 0x0	
5		Save Project As		45.375 V	
ļ		E-Mail Project		5.156 V	
		Import		8.34 A	
		Export		l: 139 ℃	
		Preferences	- 4	2: 29 °C	
(USB Adapter Settin	ngs		
(Exit		Registers/Lines	_	
5	Lini	abt. 200 A	11	ОК	
		gnu 200 🗸	Iout:	OK	
	Tem		Temp:	OK	
	∠ Sh	ow Warn & Fault hit Editors	Input:	OK	

Figure 18: GUI Preferences

投 Fusion Digital Power Designer Preferences 🛛 🗙										
Preferences										
Move device dashboard window when main window is moved or resized										
Use PAGE_PLUS_READ and PAGE_PLUS_WRITE to read/write PAGEd commands on PMBus 1.2 capable devices										
Show advanced editors and features that are normally hidden (e.g. "Advanced Config" on UCD92xx and "All Config" on UCD90xxx)										
Enable GUI protected features (e.g. pflash export):										
Password: •••••• Valid										
Enable GUI customer-specific features										
Configure Device Scan Mode and Addresses										
Enable all Standard Warnings/Confirmations										
Delete All Application Preferences										
Cancel OK										

Figure 19: GUI Protected Features



6.3 Monitor

After a device is found, the first screen that appears is the Monitor Screen. Depending on which commands are implemented the corresponding monitor graphs will be available. In the figure below the commands for reading Vin, Vout, Iout, Pout, Temp 1, Temp 2, Frequency were all implemented so the graphs are available. The Monitor tab gives you a live view of the active power supply. In addition to plotting the values it also shows the latest values in the "Readings" group. It also shows a snapshot of the "Status Registers/Lines". The word "Fault" appears in red when a register is at fault, otherwise a green "OK" is visible. The polling of the parameters being read can also be halted by clicking "Stop Polling" on the left side.



Figure 20 - Monitor mode displays some of the live parameters being read from the device.

6.4 Configure

As can be seen from the above figure there are a four clickable categories on the bottom left. To get to the Configure mode the user selects "Configure". The following figure displays some of the features of the Configure mode.



6.4.1 PMBus commands, Edits, and Writing to Hardware

🕴 Fusion Digital Power Designer - DC-DC HSFB @ Address 88 - Page 0x0 - Texas Instruments										
File Device Tools Debug Help										
Configure	Configuration Click here to write edits to RAM of device									
Write to Hardware	Command	Code	Value/Edit	Hex/Edit						
Auto write on rail or	CMD5_DCDC_NONPAGED [MFR 21]	0xE5	0x10006 🗸	0x10 🗸						
Discard Changes	CMD5_DCDC_PAGED [MFR 20]	0xE4	0x00000 🗸	0x00 🗸						
	CPCC [MFR 36]	0xF4	0x01680 🗸	Clicking the combo box						
Store RAM To Flash	DEADBAND_CONFIG [MFR 26]	0×EA	0x01900 🗸	causes this dialog to						
Restore Flash to RAM	DEVICE_ID [MFR 45]	0xFD	UCD3100ISO1	appear. Making the						
Clear Restore Notices	IC_DEVICE_ID	0xAD	UCD3138RGC	IMAX: 40.0 C A command editable.						
Show:	IC_DEVICE_REV	0×AE	0	TON: 100.0 w msec						
Global Device	IDEAL DIODE EMUL CONFIG	0×FE	Enabled 🖂	Enable: OFF V						
Parameters	IIN_OC_FAULT_LIMIT	0×5B	39.00 🐳	Timer: OFF 🗸						
this Rail	IIN_OC_WARN_LIMIT	0x5D	35.00 💭							
 All Parameters 	IOUT_OC_FAULT_LIMIT	0x46	40.00 💭 म	.:: A UX0020						
Sort Parameters By:	IOUT_OC_WARN_LIMIT	0x4A	30.00 🊔 A	A 0x001E						
Command Name	LIGHT_LOAD_CONFIG [MFR 02]	0xD2	0x0007 🗸							
Command Code	MFR_DATE	0x9D	YYMMDD	0x59 v edited						
Group by Category	MFR_ID Click to Undo edit	0x99	П	0x54 🗸						
	MFR_LOCATION	0x9C	Dallas, TX	0x44 🗸						
	MFR_MODEL	0x9A	UCD3138HSFBI	0x55 🗸						
	MFR_REVISION	0x9B	E1	0x45 🗸						
	MFR_SERIAL	0×9E	XXXXX	0x58 V						
			(A)							
🚸 Configure 🎇	Tips & Hints			PMBus Log						
Design	Configure Constant Power Constant Current		^	19:23:30:02: USD-SAA #1: CUNIKULI NOW LOW 19:23:38:361: DC-DC HSFB @ 88: USER_RAM_00 [MFR 10,0xDA]: wrote 1 [0v01] to PAM						
- Design	Description of command	being	edited	[0X04] (0 KHI)						
W Monitor		2	~							
🚸 Status			E	MBus Log F 🗑						
Fusion Digital Power Designer v1.0.0.27650 [2011-10-27] DC-DC HSFB Firmware v0.0.11.228 @ Address 88 USB Adapter v1.0.10 [PEC; 400 k 😽 TEXAS INSTRUMENTS fusion digital power										

Figure 21 - Configure mode

When the Configure mode appears all of the implemented PMBus Commands are visible. A discussion of the relationship between what is visible and what is implemented in the firmware will be discussed in "Section6.4.2 How does Implemented Commands on the Firmware Appear in the GUI?." A read was done on all the PMBus Commands and their values are immediately visible.

On the left there are some controls to decide how they can be ordered to help view them. They may be listed by category, or sorted by name, or by hex code.

Some values are read-only (uneditable) and some are writable. In the above figure the parameter

LIGHT_LOAD_CONFIG was edited by changing the value. When a command is edited a uppears beside it. This indicates that the value can be undone, or reverted back to the device value stored in RAM. As a command is edited the value is not automatically written to the device. To write all edits to the device the user needs to click "Write to Hardware." Then if the user would like to store those to flash the button "Store RAM To Flash" would need to be clicked. Section "6.7 Capturing the State of the Device - Saving a Project File" discusses storing the current state of all commands to a local file that can be used to write to another device.



Another feature that is highlighted in this figure is the dialog box that appears to edit the Constant Power Constant Current "CPCC" command. Not all commands are direct value edits like "IIN_OC_WARN_LIMIT" that is set for "35 A" rather some of them are more complex and require unique dialogs to edit them. CCPC is just one example from many.

6.4.2 How does Implemented Commands on the Firmware Appear in the GUI?

The Designer GUI is dynamic. It automatically lays out the PMBus commands that are implemented in the firmware. The firmware developer can make a change and then restart the GUI noticing the change immediately without a new Designer GUI installation. How does the GUI know which commands are implemented? The answer is there are certain Manufacturer commands that indicate which commands are implemented. The command "CMDS_DCDC_NONPAGED [MFR 21] 0xE5" is one such important command that helps the GUI to configure itself. It contains a bitmask. That bitmask is determined in firmware. Each bit in the bitmask indicates whether a command is implemented or not. Each bit refers to a specific command according to the PMBus 1.2 spec. When the GUI reads this bitmask it looks for all the "1"s and then displays those commands in the GUI.

The Isolated Bitmask Tool, discussed in section 7.6 of this document, is a valuable tool to help firmware developers set this important bitmask. The figure below displays the read-only command "CMDS_DCDC_NONPAGED [MFR 21] 0xE5".

Command		Value/Edit	Hex/Edit		Firmware
CMD5_DCDC_NONPAGED [MFR 21]	0xE5	0x10006 🖂 🗲	UX 10 🗸		hitmask
CHEDS_DEDIC_PAGED [HER 20]	D-EH	(Decembra)	3 CLEAR_FAI	JLTS	indicatês
CPCC (MER. 36)	0.64		11 STORE_DE 12 RESTORE	FAULT_ALL DEFAULT ALL	supported
DEADDAND_CONTIG[VER.26]	0.EA	(Deff 11900	20 VOUT_MOE)E	command.
DEMICE_30 (1999) 453	0.60		21 VOUT_CON 27 VOUT TRA	1MAND NSITION RATE	
R_DRWICE_ID	(DuAD)		35 VIN_ON	=	
IC_DEWICE_REW	DURE	0x	36 VIN_OFF 40 VOUT_OV_	FAULT_LIMIT	
IDEAL DODDE EMIL CONTIG	DIFE		42 VOUT_OV_	WARN_LIMIT	
EN_SK_FAURT_LEPET	0.58	0x-	43 VOUT_UV_ 14 VOUT_UV_	FAULT_LIMIT	
EPI CK WINNER LIMET	0.50		46 IOUT_OC_	FAULT_LIMIT	
IOUT_DC_FAULT_LIMIT	DrH5		F OT_FAULT	LIMIT	
BORUT DC WIRKIN LIMET	(D:198)		51 OT_WARN 55 VIN OV FA		
LIGHT_LOND_COMPIG[MER.02]	0.62	(1+0001.*	57 VIN_OV_W	ARN_LIMIT	
MER_DATE	0,90	0x	58 VIN_UV_W. 59 VIN_UV_FA	ARN_LIMIT	
MER_3D	0,99	0x	5B IIN_OC_FA	ULT_LIMIT	
HER_LOCATION	0.90	Continue, The Oxid	5D IIN_OC_W	ARN_LIMIT DOD ON	
HER_HODEL	0,56	BI Ox	5F POWER_G	DOD_OFF	
MER_REWISSION	0,98	0xi	51 TON_RISE 78 STATUS B	ſΤΕ	
FIETE_SERIEAL	D/RE	NIX NIX	79 STATUS_W	ORD	
		0x	38 READ_VIN		T

Figure 22 - Displays the list of commands the firmware supports



6.5 Design – Model Stage and Compensator

To get to the Design mode click the "Design" button on the bottom left. The following figure should appear. The number of loops to configure and parameters in the power stage may differ depending on which of the 4 power supply topologies is represented by the firmware in the device. The example below illustrates what is available with the "Hard Switching Full Bridge (HSFB)" firmware (featured in UCD3138HSFBEVM-029).



Figure 23 - Design mode selected

6.5.1 Power Stage

Depending on which topology is being modeled, the relevant parameters for the stage will be displayed. In the example shown above for HSFB the following parameters for the stage were shown:



Power Stage - Rail #1										
- Power Stage Parameters										
Vbus:	48.00	0 (‡	v	Vout:	12.0	00 鏱	v			
Fs:	200.00	0 鏱	kHz	Iout:	5.	00 鏱	A			
Rds-on-Q1:	10.00	0	mΩ	RpT:	4.0	00 鏱	mΩ			
Rds-on-Q2:	10.00	0	mΩ	RsT:	1.000 🐳		mΩ			
Rds-on-Q3:	10.00	0	mΩ	np:	5.0	00 鏱	turns			
Rds-on-Q4:	10.00	0	mΩ	ns:	2.0	00 鏱	turns			
Rds-on-Q5:	5.00	0	mΩ	R1:	16.	20 🌲	kΩ			
Rds-on-Q6:	5.00	0	mΩ	R2:	2: 1.74		kΩ			
<u>TDelay:</u>	1,000	0	%	Cp:	3,500.0 💭		pF			
RL1:	1.00	0	mΩ	L1:	2.	200 🕀	μH			
R3:	1.0	1.00 💭		R4:	75.	00 鏱	kΩ			
R5:	0.1	0	kΩ	R6:	3.	09 鏱	kΩ			
Rs:	1.00	00 🗘	mΩ	Cp1:	1.0 🜩	pF				
Schematic View										
— Capacitor	Legs—									
	С (µF)	ESR	(mΩ)	E		# Legs				
> 4	47.000	:	22.000 4.000				2			
100.000 130.000 15.000 1										
Add NewLeg Delete Selected Leg										

Figure 24 - Stage parameters for HSFB for Voltage Loop (CLA #0)

To model the power stage for the topology, certain parameters need to be specified. Based on the values set, the Bode plot for the power stage is calculated and displayed on the right. This powerful feature is provided to aid designers with fast loop compensation based on analytical models built inside the GUI, representing the power stage equations appropriate for the topology. The power stage equation differs from loop to loop. The figure above is part of the voltage loop as shown in Figure 23.





Figure 25 - Bode plots

There are three lines. The green line indicates the power stage. The other two lines are the Compensator and the Loop. Lines can be deselected as shown in the figure above. The Compensator will be discussed in "Section 6.5.2 Compensator."

Clicking "Schematic View" in Figure 24 will open a dialog with a picture of the schematic. See below.





Figure 26 - HSFB schematic being modelled

The bode plots are updated automatically as the values are set.

6.5.2 Compensator

To model the compensator there are a number of values to configure. The values to configure for the compensator are the Coefficient Sets (A to G), Alphas (0 and 1), Bins (0 to 6) and Threshold Limits (0 to 5). This needs to be done for each loop. The compensator area is just below the Power Stage Parameters. Simply scroll down to bring the controls into view.





Figure 27 - Scroll down the stage parameters to see the compensator

The GUI comes equipped with 3 different ways to program the UCD3138 digital compensator. The figure below lists these options. The compensator hardware is described by the forth equation (Device PID). In this context; Kp, Ki, Kd and α are the raw register values used to configure the positions of the poles and zeros of the compensator. SC is a gain scaling term. Although it is normally set to zero, it provides additional gain for situations where the power stage gain may be low. PRD is used to configure the minimum operating period and KCOMP is used to configure the maximum operating period. In the context of the compensator they are simply gain terms that modify the overall transfer function by a fixed value. It is important to be aware that the proper way to configure PRD and KCOMP varies based on the control topology implemented. Please consult the relevant EVM user guide and training materials for details.

System Name	Transfer Function
Complex Zeros	$2 \square K = \frac{s^2}{4} \square \frac{s}{12^2} \square \frac{s}{2} \square \frac{s}{12} \square \frac{s}{12} \square \frac{s}{12}$
K, fz, Qz, fp	
Real Zeros	$2 \square K $
K , fz1, fz2, fp	$s \frac{s}{2 \Box \hat{f} p} \Box l$
Device PID	1000 Kn \Box Ki $1 \Box z^{\Box}$ \Box Kd $1 \Box z^{\Box}$ 2SC KCOMP 2 \Box 9 1
⊾Kp, Ki, Kd, □_	$1 \bigcirc 0 \bigcirc 1 \searrow p \square \operatorname{Kr} \frac{1}{1 \square z^{\square}} \square \operatorname{Kr} \frac{1}{1 \square 2^{\square 8} z^{\square}} \square 2^{4} \operatorname{RCOIVII} 2 \qquad 2^{4} \operatorname{RCOIVII} 2$

Figure 28 - Three ways to program the compensator



6.5.2.1 Coefficient sets and Alpha

Coefficient Set & Alpha Configuration	1
Coefficient Set Configuration	Select Coefficient set to configure from Set A, B, C,
Mode: Real Zeros (K, Fz1, Fz2) (info)	D, E, F, G. Three modes to program the compensator.
✓ Use practical limits (info) K: 7.0E+3 → Actual K: 3.03321E+003 1.00 248473.07 Fz1: 1.75E+4 → Hz Actual Fz1: 1.75107E+004 1.00 100000.00 Fz2: 5.49E+3 → Hz Actual Fz2: 5.48818E+003	 NP, NJ, NJ. Real Zeros (K, Fz1, Fz2) Complex Zeros (K, Q, Fz) Values can be set by editting the value directly or by dragging the track bar. Since the values written to the device are integers (Kp, Ki, Kd) there will be some rounding. The effect of the rounding shows up in the "Actual"s
1.00 100000.00	
Alpha Configuration Alpha: 0 V • Fp: 4.29E+4 + Hz • Alpha: 50 +	 Select from Alpha 0 or Alpha 1 Three ways to edit Alpha. Set Fp, set Alpha directly, or set it to
Fp = infinite, Alpha = 0 (Simple Integrator) Actual Alpha: 50 124.58	Simple Integrator. While setting Fp the "Actual" Alpha is shown below
Other Front End Resolution: 1 mV Oversample: 1x	 Has an effect on what threshold limits can be selected.
Save Plot Settings to Favorites Design Favorites Compensator line in the Bode plot	Save Set Kp, Ki, Kd and Alpha combination to Favorites so they can be used for other sets or simply for record keeping. t is based on which Set and Alpha are selected.

Figure 29 - Coefficient Set and Alpha Configuration

6.5.2.2 Bode Plot

The Bode plot located on the right of Figure 27 is based on the selected Set and Alpha.

6.5.2.3 Saving Favorites

Sometimes the user would like to keep copies of their Sets and Alphas so they may use them later or apply them to another Set and Alpha. This is possible by clicking the "Save Plot Settings to Favorites" button in Figure 29.



Users can also access the "Favorites" tab directly to view all their Alpha-Set combinations. They can also copy favorites and add descriptions. See Figure 30.



Figure 30 - Favorites

6.5.2.4 Coefficient Set and Alpha Summary

Immediately below the Set configuration is the "Coefficient Set and Alpha Summary." This section displays all the alphas and coefficient sets.

Fusion Digital Power Designer GUI (ver.2.0.13) for Isolated Power SLUA676A - Jan 2015



Figure 31 - Coefficient Set & Alpha Summary

Another way to discard all GUI edits globally is to click "Upload Compensation" as described in Section 6.5.2.5

6.5.2.5 Bin Assignment & Non-Linear Table Configuration

To configure the non-linear table the user specifies which sets and alphas are to be used within the configurable limits. One of the rules of the limits is that Lim 0 should be less than Lim 1 and Lim 1 should be less than Lim 2 etc... Lim (n) < Lim (n+1). If the limits are not configured validly then the "Write Loop Coefficients" button will be disabled.

6.5.2.5.1 Make Non-Linear table Linear – Apply Bin 0 to all.

TEXAS

If the user wishes to simply use the same Set and Alpha for all the limits, making it essentially Linear, then the user can select the convenience option "Apply Bin 0 configuration to all bins". All the errors will be removed in this case even though all the Limits are the same. See figure below where all the bins are configured for Set C and Alpha 1.





Figure 32 - Apply Bin 0 to all bins (Linear)

6.5.2.5.2 Non-Symmetric and Symmetric

There is an option to make the Limits Symmetric or Non-Symmetric. For Non-Symmetric the limits can be positive or negative. For Symmetric the limits specified must be positive since the symmetric part is automatic and negates all the positive limits. See figure below.



Bin Assignment & Non-Linear Table Configuration					Bin Assignment & Non-Linear Table Configuration										
O Symmetric) Symme	tric						
Non-Symme	etric	>					0) Non-Sy	mmetric						
Apply Bin 0	configuration to	o all bins		Devi	~~			Apply E	8in 0 con	figuration to	all bin	s		De	vice
Threshold Coefficient Alpha			Set A	Alpha				Thre	shold	C	Coefficient	Alpha	Set	Alpha	
GUI	Device	Bin 6: Set G 🗸	1	G	1				GUI	Device	Bin 6:	Set G 🖂	1 🗸	G	1
Lim 5: 5	✓ 5 mV	Bin 5: Set E		F	1			Lim 5:	5 🗸	5 mV	Bin 5:	Set F 🔽	1	F	1
Lim 4: 4	✓ 4 mV			-	-			Lim 4:	4 🗸	4 mV	Bin 4	Set F 🔽		F	0
Lim 3: 3	✓ 3 mV	bin 4: Set E 🔍		E				Lim 3:	3 🗸	3 mV				-	
Lim 2: 2	√ 2 mV	Bin 3: Set D 🗸	1 🗸	D	1			Lim 2:	2 🗸	2 mV	Bin 3:	set D		D	1
Lim 1: 1		Bin 2: Set C 🖂	0 🗸	С	0			Lim 1:	1 🗸	1 mV	Bin 2:	Set C 🖂	0 🗸	С	0
		Bin 1: Set B 🖂	1 🗸	в	1			Lim 0:		0 mV	Bin 1:	Set B 🖂	1 🗸	в	1
	⊻ Umv	Bin 0: Set A 🖂	1 🗸	Α	1				•••		Bin 0:	Set A 🖂	1 🗸	Α	1
1						,		-104 0:	0	U mv	Bin 1:	Set B	1	в	1
ative values				3				-Lim 1:	1	1 mV	Bin 2:	Set C	0	с	0
ed1	Othe			3		/	1	-Lim 2:	2	2 mV	Dia 2	Set D	-	-	
-3	Front	End Resolution:		🗸 Mu	st be	e po	sitiv	e _{Lim 3} :	3	3 mV	Diri 3:	Serb	1	0	
-4		Save Die	+ Sattie	3				-Lim 4:	4	4 mV	Bin 4:	Set E	0	E	0
-5		Save Pic						-Lim 5:	5	5 mV	Bin 5:	Set F	1	F	1
-7	Leon	man -m	m					200 01	5	5 111	Bin 6:	Set G	1	G	1
							_							_	

Figure 33 - Symmetric and Non-Symmetric

6.5.2.6 Writing Loop Coefficients, C code, Upload Compensation

After the user is satisfied with their configuration they can then proceed to writing it to the hardware. This does not happen automatically but requires the user to "Write Loop Coefficients." If there are errors they need to be corrected before the writing can proceed. What will be written? All the highlighted values are an indication of what is different from what is on the device so those values will be written. If the user wishes to discard all their GUI edits, or the highlighted values they can do a global discard by simply clicking "Upload Compensation." These buttons mentioned are located on the left side. The user can also view the C code that represents the coefficients in firmware by clicking "View Coeff 'C' Code". See figure below.





Figure 34 - Writing Loop Coefficients, and global reset of GUI edits to hardware coefficients

6.6 Status

The final mode is the status tab. It provides additional details on the type of fault or warning. Figure 35 - Status Mode shows a screen shot of this tab.




Figure 35 - Status Mode

6.7 Capturing the State of the Device - Saving a Project File

After editing PMBus commands in Configuration Mode or editing the Compensation, users can simply click the "Write …" button on the left to commit those changes to the hardware's RAM. They can then follow that with a "Store RAM to Flash" to save the hardware changes to Flash so that they would remain after the device undergoes a reset. If the changes on the hardware are not flashed then a reset would simply restore what is in flash and overwrite what was previously written to RAM.

However, the above only covers writing device-related parameters. What about the parameters set in the Power Stage in Design mode? These are not stored on the device. The only way these can be stored is by saving a "Project File". The Project File is an .XML file stored on the PC. Not only does it contain design parameters, but it also stores the current state of all PMBus commands. So it is a snapshot of the device and more.

To save a "Project File" simply click File> Save Project As ...



👆 Fus	ion Digital I	Power	Designe	r - DC-DC HS	
File	Device 1	Fools	Debug	Help	ŀ
	Import Proj	ject		age Loop (CL	7
	Save Projec	ct As			ľ
	E-Mail Proj	iect		wer Stage - I	
	Import			Vbus:	1
	Export			Fs:	,
	Preferences	s		on-Q1:	
	USB Adapte	er Setti	ngs	on-Q2:	ŀ
	Exit			on-03:	1
and a second			1	N	

Figure 36 - Save Project File

What can be done with a project file? If a new device was hooked up to the PC the user can simply import the project file and write that to the device. The project file can also be used in Offline mode and act as a virtual device.



6.8 Miscellaneous Tools

6.8.1 Multi image

🚸 Fusion Digit	al Po	wer Designer - DC-DC LLC @ Address 8
File Device	То	ols Debug Help
Monitor		Device/Project Configuration Compare
Show/Hide Plots:		Voltage Switching Tool
Vin 🗸		Debug Console
✓ Iout		Data Logging
		PMBus Logging
		Memory Debugger
Fit All Plots on		Memory Peek/Poke/Dump
 Scale Plots to Width 		SMBus & SAA Tool
Height: 2		Numeric Encode/Decode Tester
Cham Ware 9		Device Read/Write Stress Tester
Limit Editors		Group Command Protocol Tester
Show Value L		Configuration Import Tester
		ASCII Tool
Polling Rate: (msec)		EEPROM File Tool
		EEPROM File Compare Tool
Stop Pollir		Isolated GUI Bit Mask Generator
Launch Dashl		Decimal & Mantissa Exponent Tool
		PEC & SMBus -> I2C Translation Tool
		Clear Configuration
		Download Firmware
		Multi Image
		Download USB Adapter Firmware

Figure 37 - Multi image

There are a number of other functions that can be performed from the "Tools" menu. Clicking "Multi Image ..." will show a dialog with a number of multi image functions as shown in Figure 37. These functions are also available from the Device GUI and are covered in detail in "Section 7.5 Multi Image Functions". One feature that can be observed in the Fusion Designer that isn't seen in the Device GUI is the ability to download to a non-executing image and still observe the device monitoring various parameters. This can be seen in the background of Figure 38.



eadings - Pa	age 0x0	Vin - Input Voltage	🙁 🛛 Vout - Output Voltage 🔹 🕷
in:	49.938 V	OVE: 430.000 🕀 V OVW: 400.000 🕀 V	OVE: 14.000 🗇 V OVW: 13.000 🗇 V
out:	8.939 V		
out:	11.64 A		
emp Int:	17 °C	VinON: 320.000 😴 V	UVF: 3.000 V Write
emp Ext:	135 °C	VinOFF: 310.000 💭 V Write	16.00
		500.00	14.00
tatus Regis	ters/Lines		
out:	ок	400.00	12.00
ut:	OK		
nut:	OK		10.00
ML:	OK	300.00	8 00 A 8.939 V
isc:	Output Off, POWER_GOOD#		
ebug Buffer:	0x0102030405060708	200.00	
fr: MBALERT#	OK Not Asserted	100.00	4.00
	Clear Faults	100.00	2.00
Firmware f	 File: C: \Users \a0389316\DC Image checksum write r DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image checc Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging 	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfo Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" output COWNIOACING t	Select File Download For image: 1 will execute its I "File->Export" ut. o image 1
Firmware f	File: C:\Users\a0389316\Dc Image checksum write r DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image checc Select this option f image. PASS THRU whate This option can be tool PFlash +DFlast d logging	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfo Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it will wer image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" output downloading t and still monitor	Select File Download For image: 1 For image 1 For image 1
Firmware I	File: C: \Users \a0389316\Do Image checksum write m DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image chec Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfor Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" output of the UCD3XXX Device GUI's "Export Flash" output of the UCD3XXX Device GUI's "Export Flash" output and still monitor	orm low-level I stay in Boot Will execute its I "File->Export" ut. O image 1 Cing image 0
Firmware I	File: C:\Users\a0389316\Do Image checksum write m DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image chec Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfo Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" outpu output or the UCD3XXX Device GUI's "Export Flash" outpu downloading t and still monitor	Select File Download For image: 1 For image: 1 For image 1 For image 1 For image 0
Firmware I	File: C:\Users\a0389316\Do Image checksum write r DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image check Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging ng to EEPROM Message	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfo Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" output downloading t and still monitor	Select File Download For image: 1 For image 1 to image 0
Firmware I Firmware I Downloadin Timestam 16:56:06.	File: C:\Users\a0389316\Do Image checksum write r DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image chec Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging ng to EEPROM Message 835 Pausing for Block Era	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfo Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI output or the UCD3XXX Device GUI's "Export Flash" output of the UCD3XXX Device GUI's "Export Flash" output and still monitor	Select File Download For image: 1 For image 1 to image 1 ting image 0
Firmware I Firmware I Downloadin Timestam 16:56:06. 16:56:06.	File: C: \Users \a0389316\Do Image checksum write r DO NOT write image Select this option f debugging via the Flash/ROM mode. WRITE image chec Select this option f image. PASS THRU whate This option can be tool PFlash +DFlash d logging ng to EEPROM Message 835 Pausing for Block Era 859 Downloading to EEPR	cuments\Technical\Apec 2013\Image switch\lc002 002.x0 node (power up mode): e checksum (Stay in Boot Flash/ROM) or experimental firmware or if you need to be able to perfor Boot Flash/ROM. When the UCD3XXX is powered on, it will ksum (Automatically execute image) or production devices. When the device is powered on, it w ver image checksum is in the firmware used to test a firmware image produced by the Fusion GUI o output or the UCD3XXX Device GUI's "Export Flash" output of the UCD3XXX Device GUI's "Export Flash" output of the UCD3XXX Device GUI's "Export Flash" output and still monitor se: 65535 ms OM	orm low-level I stay in Boot will execute its I "File->Export" ut. O image 1 oing image 0

Figure 38 - Downloading to an image while monitoring at the same time

Clicking "Switch" in the Multi Image window will activate the new image. The GUI will need to restart to load the new image. NOTE: The power supply is not reset.



6.8.2 Isolated Bitmask Tool

Device/Project Configuration Compare
Voltage Switching Tool
Debug Console
Data Logging
PMBus Logging
Memory Debugger
Memory Peek/Poke/Dump
SMBus & SAA Tool
Numeric Encode/Decode Tester
Device Read/Write Stress Tester
Group Command Protocol Tester
Configuration Import Tester
ASCII Tool
EEPROM File Tool
EEPROM File Compare Tool
Isolated GUI Bit Mask Generator
Decimal & Mantissa Exponent Tool
PEC & SMBus -> I2C Translation Tool
Clear Configuration
Download Firmware
Multi Image
Download USB Adapter Firmware

Figure 39 - Tools> Isolated GUI Bit Mask Generator ...

The "Isolated GUI Bit Mask Generator" is also detailed in the part of this document describing the functions of the Device GUI in "Section 7.6 Isolated Bitmask Tool." One feature that is available in the Online Fusion Designer that is not in the Device GUI is the ability to view the PMBus command bitmasks set in the firmware. The user simply clicks "Upload bitmask from device" as shown in Figure 40. This is a quick way to debug why a command may not be visible in the configuration tab if the reason is the command's bit was not set in the bitmask.



🖑 Isolated Bitmask Generator Tool		. 🗆 🔀
Isolated Bitmask Generator Tool 1. Select PMBus Revision 1.2 2. Select PMBus commands to generate bitmask. 3. Or paste the Hex Code bitmask to see which commands are being 4. Or Upload bitmask from device CMDS_DCDC_NON_PAGE Select PMBus Commands Hex Code Entry PMBUS_CMD_PAGE (0x00) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_OPERATION (0x01) PMBUS_CMD_PAGE (0x00) PMBUS_CMD_PAGE (0x00) PMBUS_CMD_PAGE_PLUS_WRITE (0x03) = PMBUS_CMD_PAGE_PLUS_READ (0x06) PMBUS_CMD_STORE_DEFAULT_ALL (0x11) PMBUS_CMD_STORE_DEFAULT_CODE (0x13) PMBUS_CMD_STORE_DEFAULT_CODE (0x13) PMBUS_CMD_STORE_USER_ALL (0x15) PMBUS_CMD_STORE_USER_CODE (0x17) PMBUS_CMD_CAPABILITY (0x19) PMBUS_CMD_CMD_STORE_USER_CODE (0x18) PMBUS_CMD_CMD_STORE_USER_CODE (0x18) PMBUS_CMD_CMD_STORE_USER_CODE (0x18) </td <td>used. D Bitmask Generated //***PMBUS_CMD_PAGE (0x00) //PMBUS_CMD_PAGE (0x00) //PMBUS_CMD_CLEAR_FAULTS (0x03) //PMBUS_CMD_STORE_DEFAULT_ALL (0x11) //PMBUS_CMD_VOUT_OPFAULT_ALL (0x12) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x40) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_WARN_LIMIT (0x43) //PMBUS_CMD_VOUT_OV_WARN_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_VIN_CON_SE) //PMBUS_CMD_VIN_OV_FAULT_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_SE) //PMBUS_CMD_VIN_VIN_VIN_SE) /</td> <td></td>	used. D Bitmask Generated //***PMBUS_CMD_PAGE (0x00) //PMBUS_CMD_PAGE (0x00) //PMBUS_CMD_CLEAR_FAULTS (0x03) //PMBUS_CMD_STORE_DEFAULT_ALL (0x11) //PMBUS_CMD_VOUT_OPFAULT_ALL (0x12) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_COMMAND (0x21) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x40) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_WARN_LIMIT (0x43) //PMBUS_CMD_VOUT_OV_WARN_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x44) //PMBUS_CMD_VOUT_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_WARN_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_LIMIT (0x55) //PMBUS_CMD_VIN_OV_FAULT_VIN_CON_SE) //PMBUS_CMD_VIN_OV_FAULT_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_CON_SE) //PMBUS_CMD_VIN_VIN_VIN_SE) //PMBUS_CMD_VIN_VIN_VIN_SE) /	
PMBUS_CMD_VOUT_COMMAND (0x21) PMBUS_CMD_VOUT_TRIM (0x22) PMBUS_CMD_VOUT_CAL_OFFSET (0x23) PMBUS_CMD_VOUT_MAX (0x24) PMBUS_CMD_VOUT_MARGIN_HIGH (0x25) PMBUS_CMD_VOUT_MARGIN_LOW (0x26) PMBUS_CMD_VOUT_TRANSITION_RATE (0x27) PMBUS_CMD_VOUT_DROOP (0x28) PMBUS_CMD_VOUT_SCALE_LOOP (0x29) PMBUS_CMD_VOUT_SCALE_MONITOR (0x2A) PMBUS_CMD_POUT_MAX (0x31) PMBUS_CMD_MAX_DUTY (0x32)	<pre>//PMBUS_CMD_TON_RISE (0x61) //PMBUS_CMD_STATUS_BYTE (0x78) //PMBUS_CMD_STATUS_WORD (0x79) //PMBUS_CMD_READ_VIN (0x88) //PMBUS_CMD_READ_TOUT (0x86) //PMBUS_CMD_READ_TEMPERATURE_1 (0x8D) //PMBUS_CMD_READ_TEMPERATURE_2 (0x8E) //PMBUS_CMD_READ_REQUENCY (0x95) //PMBUS_CMD_PMBUS_REVISION (0x98) //PMBUS_CMD_MFR_ID (0x99) //PMBUS_CMD_MFR_REVISION (0x98) //PMBUS_CMD_MFR_REVISION (0x98) //PMBUS_CMD_MFR_LOCATION (0x9C) //PMBUS_CMD_MFR_ID (0x9P) //PMBUS_CMD_MFR_IC_DEVICE (0xAD) //PMBUS_CMD_MFR_IC_DEVICE (0xAD) //PMBUS_CMD_MFR_IC_DEVICE (0xAD) //PMBUS_CMD_MFR_IC_DEVICE_REV (0xAE)</pre>	*
🔄 Copy to Clipboard) 🔚 Save As 🚇 Print 🕙 Print	Preview Ok	

Figure 40 - Isolated Bitmask Tool in Fusion Designer(Online)

6.9 Offline Mode

So far all the discussion has been related to communicating with a device that is connected and online. There is also a concept of working with the device in offline mode. This is done by working with a previously saved Project File as discussed in the last section or by working with Sample Project Files that are already embedded in the GUI. In offline mode the user can write PMBUS commands to a "virtual device" and they can also do modeling in Design mode. When the user gets a device they can simply import this project file that they've worked offline with and sync the device to that.



6.9.1 Starting in Offline mode

To start offline you can click the other shortcut that came when the GUI was installed. See following figure.



Figure 41 - Starting in offline mode

Another way to start in offline mode is to unplug any connected devices and start the GUI normally with the other shortcut. This will cause the GUI to scan for devices and then upon the fail will prompt the user to Retry, or work in offline mode.

6.9.2 Open Existing Project File

In offline mode the user selects from three options. The first option is to open an existing project file that has been previously saved.



Figure 42 - Offline options



6.9.3 Open Sample Project

The user can also open a sample project file and work with that. They can then save that afterwards as a project file to their PC and use it later to import to a device. The following Sample projects are available at this time. Isolated UCD3138 (064) users should click "UCD31xx Isolated Digital Power Controllers" See figure below.

😽 Fusion Digital Power Designer Offline Wizard 📃 🗖 🗙
Select Device Category
UCD92xx Fusion Digital Power Controllers A family of fully configurable multi-output and multi-phase DC/DC Point of Load controllers. Devices available for 1 to 4 rails and from 2 to 8 phases.
UCD30xx Isolated Digital Power Controllers The UCD30xx family of digital power controllers is a family of IC's provided by Texas Instruments to support customers developing Isolated Power Supplies. The UCD30xx family of ICs supports a wide range of isolated topologies with a high level of integration, including up to eight high-resolution Digital Pulse Width Modulated (DPWM) outputs, Power Management, and Protection Features. Applications include Isolated AC/DC (including PFC) and Isolated DC/DC power supplies.
UCD31xx Isolated Digital Power Controllers The UCD31xx family of digital power controllers is a family of IC's provided by Texas Instruments to support customers developing Isolated Power Supplies. The UCD31xx family of ICs supports a wide range of isolated topologies with a high level of integration, including up to eight high-resolution Digital Pulse Width Modulated (DPWM) outputs, Power Management, and Protection Features. Applications include Isolated AC/DC (including PFC) and Isolated DC/DC power supplies.
UCD91xx Fusion Digital Power Controllers Single and dual-phase synchronous buck digital PWM controller designed for point of load power applications.
 TPS40xxx Analog Power Controllers and TPS539xx Analog Power Converters User friendly analog control power ICs with a PMBus compliant interface.
UCD90xx Sequencers and System Health Controllers A family of power supply managers that monitor and sequence up to 13 independent voltage rails. Devices integrate a 12-bit ADC with a 2.5V internal reference for monitoring of up to 13 power supply voltage, current, temperature inputs, or fan tachometers. Up to 26 GPIO pins can be used for power supply enables, voltage margining, power-on reset signals, external interrupts, cascading multiple UCD90124 devices, or other system functions.
Need help deciding what product is right for you? Visit the <u>Texas Instruments Power Management website</u> to learn more about TI's full range of Power Management IC solutions.
If you can't find your device family listed here, it may be a device supported by <u>Switcher Pro</u> ™, TI's interactive tool to design power supplies with TPS40K™ controllers, TPS60xxx low-power DC/DC converters, and SWIFT™ (TPS54xxx) point-of-load step-down DC/DC products.
< Prev Next > Cancel

Figure 43 - UCD3138(064) sample projects

After clicking "Next" the sample projects will appear. This list will increase as new topologies are supported.



🖗 Fusion Digital Power De	signer Offline Wizard	X
Select Sample Design t	o Open	
Select a sample project file be	low. Click a row in the grid and then click the Next button.	-
Device	Description	
HSFB Center-Tap	UCD31XX HSFB Center Tap with Feed Forward	
LLC	UCD31XX LLC Half Bridge	
PFC Bridgeless	UCD31XX PFC Bridgeless	
PFC Interleave	UCD31XX PFC Interleave	
PFC Single phase	UCD31XX PFC Single Phase	
PSFB Peak Current Mode	UCD31XX PSFB Center Tap - Peak Current Mode	
PSFB Voltage Mode	UCD31XX PSFB Center Tap - Voltage Mode	
	< Prev Next > Cancel)

Figure 44 - Offline sample topologies

7 Device GUI (Engineering GUI)

In the previous section the Fusion Designer GUI was described. In this section the Device GUI will be described. The device GUI provides an entry point to a number of important development tools indispensable for working with the UCD3138(064, A64) devices. Users will also find out that a number of these tools are also available in the Designer GUI under the Tools menu. Users may use whichever entry point they wish to launch these tools. The following figure shows the entry point to some of the tools that will be described now from the Designer GUI previously discussed. Note you will need to enable the "Protected Features" with the password "forestln" in the Designer GUI to see this. See Section 6.2 Enable GUI Protected Features. This password should also be used for the Device GUI if prompted for a password.





Figure 45 - Designer GUI Tools menu

7.1 Launching Device GUI

During the installation users had the option to create a shortcut for the UCD3xxx Device GUI. If that option was not selected the UCD3xxx Device GUI can be accessed from the Start Menu.



È	Texas Instruments Fusion Digital Power Designer	•	Ē	Device GUIs	V	UCD3xx:	x Device GUI
è	Texas Instruments Fusion Digital Power Manufacturing Tool	×	è	Special	49	U	on: C:\Program File
6	TI-COMM for Windows	×	6	Tools	49	U <mark>Power</mark>	Designer\bin
è	TN3270 Web	×	0	Documentation & Help Center	49	UCD724	2 Device GUI
6	WebEx	×	-0	Fusion Digital Power Designer	49	UCD741	Dx Device GUI
b	WinZip	×	-0	Fusion Digital Power Designer Offline Mode			
Å	Adobe Reader 9		P	License Agreement			
Ø	Internet Explorer			Texas Instruments Home Page			
\$	Outlook Express		ß	Uninstall			

Figure 46 - Opening UCD3xxx & UCD9xxx Device GUI

The Device GUI looks as follows,

teres and the second	
itatus	Tools
Attached: Unknown	Scan Device in ROM Mode
Last ROM Found: IC Info: ROM Info: Package ID: Last Program Found: Address: DEVICE_ID: MFR_MODEL: MFR_REVISION:	Scan for Device in Program Mode: DEVICE ID DEVICE CODE IC DEVICE ID PMBUS REVISION When a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9) Flash Checksums (SMBus/I2C) (Debug) (Utilities) (Trim) (Multi-image) Eirmware Download Download firmware to data/program/boot flash Set PFlash: 0 0xFE 0xAA Dump Flash File Displays the contents of a flash file Set DFlash: 0 0xFE 0xAA Export Flash Reads program and/or data flash from the device to a file Compare Flash Files Compares two flash file contents Full Export Tool Reads program and/or data flash from the device Flash Test Tool Erases, writes a pattern, and then verifies that the pattern is present X0 to Hex Tool Converts a Tektronix Extended x0 to Intel Hex or S-Record Set PFlash
og Timestamp Message 10:20:26.713 Click one of the scan buttons to find a	device in ROM or program mode
Copy Log Clear Log	Display all SMBus/I2C activity in lo

Figure 47 - UCD3XXX Device GUI



After the Device GUI starts up there are a number of links that are enabled and some disabled. Which links are clickable depends on whether the GUI is in ROM mode or Program mode. To start off the user should click "Scan Device in Rom Mode" if the device is in ROM mode. If the user clicks this and the device isn't in ROM mode a message will be logged that there is No ROM detected. If the device is in Program mode then the user should select "Device ID" or "PMBus REVISION".

Settings	ROM scan
itatus	Tools
Attached: ROM UCD31xx A64 Rev1	Scan Device in ROM Mode
Last ROM Found: IC Info: UCD31xx A64 Rev1 ROM Info: ROM v6 IC v1 Package ID: 64-pin Last Program Found: Address: DEVICE_ID: MFR_MODEL: MFR_REVISION:	Scan for Device in Program Mode: DEVICE ID DEVICE CODE IC DEVICE ID PMBUS REVISION ✓ When a device is found, dump additional PMBus commands ✓ ✓ Main a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9) Program scan Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image Eirmware Download Download firmware to data/program/boot flash Set PFlash: 0 ✓ 0xFE 0xAA Dump Flash File Displays the contents of a flash file Set DFlash: 0 ✓ 0xFE 0xAA Export Flash Reads program and/or data flash from the device to a file Compare Flash Files Compares two flash file contents Euli Export Tool Reads program and/or data flash from the device Elash Test Tool Erases, writes a pattern, and then verifies that the pattern is present X0 to Hex Tool Converts a Tektronix Extended x0 to Intel Hex or S-Record Converts Textended x0
og	
Timestamp Message	
10:32:35.060 Reading ROM version	
10:32:35.077 SAA: BlockRead (Address 11d, Cmd 0xEC): A	CK 0x00060001
10:32:35.165 Reading PKGID version	
10:32:35.171 SAA: BlockWrite (Address 11d, Cmd 0xFD, 0x	/FFF7F010): ACK
10:32:35.174 SAA: BlockRead (Address 11d, Cmd 0xFA): A	CK 0x0000000
10:32:35.182 Found ROM v6 IC v1 - UCD31xx A64 Rev1	
Copy Log Clear Log	☑ Display all SMBus/I2C activity in log

Figure 48 - Program scan and Rom scan

7.2 Moving between ROM and Program mode

To move between ROM mode and Program mode the user can select the following links respectively:

- Command ROM to execute its program (SendByte 0xF0 to Address 11)
- Command Program to jump to ROM (SendByte 0xD9 to Address xx)

Figure 49 displays these links in the Device GUI.



-hus	Taak
attached: ROM UCD31xx A64 Rev1	Scan Device in ROM Mode Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>IC DEVICE ID</u> <u>PMBUS REVISION</u>
IC Info: UCD31xx A64 Rev1 ROM Info: ROM v6 IC v1 Package ID: 64-pin	Command Program to jump to ROM (SendByte 0xF0 to Address 11)
ast Program Found: Address: DEVICE_ID: MFR_MODEL: MFR_REVISION:	Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image Eirmware Download Download firmware to data/program/boot flash Set PFlash: 0 0xFF 0xAA Dump Flash File Displays the contents of a flash file Set DFlash: 0xFF 0xAA Export Flash Reads program and/or data flash from the device to a file Compare Eash Files Compares two flash file contents Euli Export Tool Reads program and/or data flash from the device Elash Files Files Compares and/or data flash from the device Flash Tool Reads program and/or data flash from the device Elash Files Compares a pattern, and then verifies that the pattern is present X0 to Hex Tool Converts a Tektronix Extended x0 to Intel Hex or S-Record Second
g	
Timestamp Message	4
0:32:35.060 Reading ROM version	
0:32:35.077 SAA: BlockRead (Address 11d, Cm	i 0xEC): ACK 0x00060001
0:32:35.165 Reading PKGID version	
0:32:35.171 SAA: BlockWrite (Address 11d, Cm	d 0xFD, 0xFFF7F010): ACK
0:32:35.174 SAA: BlockRead (Address 11d, Cm	1 0xFA): ACK 0x00000000
0:32:35.182 Found ROM v6 IC v1 - UCD31xx A	54 Rev1 ☑ Display all SMBus//2C activity in loc

Figure 49 - Moving between ROM mode to Program mode

7.2.1 ROM mode to Program mode for multiple flashes

In devices that have multiple flash blocks, the user has more than one option when commanding ROM to execute its program. This applies to devices that allow execution from more than one block. For example in the UCD3138064, a device with two flash blocks, the user would send a different byte depending on which block they wanted to execute. They would send byte 0xF0 to execute Block 0. This would be the same byte to send if the firmware they wanted to run was the size of both blocks. This is due to the address beginning at the same place as Block 0. To execute Block 1 the user would send 0xF7. See Figure 50 and Figure 51 showing what to click to send the device from ROM to Program mode. The options for the two blocks appear after scanning for the device in ROM mode.



Figure 50 - Executing Program for Block 0 (0xF0)



Scan Device in ROM Mode
Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>IC DEVICE ID</u> <u>PMBUS REVISION</u> When a device is found, dump additional PMBus commands
Command ROM to execute its program (SendByte 0xF7 to Address 11) O Block 0 O Block 1
Command Program to jump to ROM (SendByte 0xD9 to Address 88)
Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image

Figure 51 - Executing Program for Block 1 (0xF7)

7.3 Firmware Download Tool

To open the Firmware Download tool click "Firmware Download" as shown in Figure 52.

Settings		
Status		Tools
Attached: Unknow	n	Scan Device in ROM Mode
Last ROM Found: IC Info:	UCD31xx A64 Rev1	Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> IC <u>DEVI</u>
ROM Info:	ROM v6 IC v1	Command ROM to execute its program (SendByte 0xF0 to Address 11)
Package ID:	64-pin	Command Program to jump to ROM (SendByte 0xD9)
Last Program Found	l:	Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image
Address:		Eirmware Download Download firmware to data foregram (boot flagb
DEVICE_ID:		Dump Elach Eila District and a familia and a
MFR_MODEL:		Dump riash rile Displays the contents of a flash file
MFR_REVISION:	777	Export Flash Reads program and state flash from the device to a file
		Compare Flash Files Compares two flash file contents
		Full Export Tool Reads program and/or data flash from the device
		Flash Test Tool Erases, writes a pattern, and then verifies that the patt
		X0 to Hex Tool Converts a Tektronix Extended x0 to Intel Hex or S-Rer

Figure 52 - Firmware Download

The firmware download screen launched will differ due to the available block configurations specific to each IC. For UCD3138 the screen will look as follows:



Fusion Digital Power Firmware Download Tool	X							
ote: Use the Fusion GUI's built-in firmware download tool if you need to download/reset data flash but want to keep your current PMBus configuration. Unlike the Fusion GUI, this tool does not require that the device have firmware loaded or be able to execute its program.								
irmware File: C: \Users\a0389316.ENT\Documents\Wew technical\TEMP\main program_201406100939_PMBUS_EBECEDEE_with_Password\main progr								
1 mode: Program flash checksum write mode (power up mode):								
Download data flash O DO NOT write program checksum (Stay in ROM)								
(mass erases first) Select this option for experimental firmware or if you need								
Erase data flash to be able to perform low-level debugging via the KOM. When the UCD3XXX is powered on, it will stay in ROM								
Skip data flash mode.								
WRITE program checksum (Automatically execute								
Owner Select this option for production devices. When the device Inva.a is powered on, it will execute its program flash.								
Validate with checksum 0x 3039								
Boot support Help ASS THELL whatever program checksum is in the formulare								
This option can be used to test a firmware image produced by the Fusion GUI "File->Export" tool PFlash +DFlash output or the UCD3XXX Device GUI's "Export Flash" output.								
Execute program when download is complete (boot device, one time only)								
Timestamp Message	_							
U3:44:56.360 USB Adapter v1.0.11 [PEC; 400 kHz] Found (Adapter #1)								
10:44:56.360 Looking for device in ROM mode								
10:44:56.397 ROM v4 IC v1 detected								
10:44:56.397 Ready to download firmware								
Copy Log Clear Log Other Scan for Devices in Program Mode Scan for Devices in ROM Mode Close								
ision Digital Power Designer v1.0.0.15439 [2014-06-17] ROM v4 IC v1 🛛 🐺 Texas Instruments fusion digital pow	ver							

Figure 53 - Firmware download screen for UCD3138

For UCD3138064, notice the flash block selection available:

Firmware File: C:\Users\	a0389316.ENT\Documents\New technical\TEMP\main program_201406100939_PMBUS_EBECEDEE_with_Password\main progr	Select File
Data flash mode: Download data flash (mass erases first) Frase data flash	Program flash checksum write mode (power up mode): DO NOT write program checksum (Stay in ROM) Select this option for experimental firmware or if you need to be able to perform low-level debugging via the ROM.	Download
Skip data flash Write pattern: 0xAA Boot support Help	When the UCD3XXX is powered on, it will stay in ROM mode. Block 1 (32 kB) WRITE program checksum (Automatically execute Select this option for production devices. When the device is powered on, it will execute its program flash. Both (64 kB) Validate with checksum 0x 3039 PASS THRU whatever program checksum is in the firmware	
] Execute program whe	This option can be used to test a firmware image produced by the Fusion GUT File-SExport For DFlash holds output or the UCD3XXX Device GUI's "Export Flash" output.	
] Execute program whe 2 Scan for device after Timestamp Message	This option can be used to test a firmware image produced by the Fusion GUI 'File->Export' to PFlash +OFlash output or the UCD3XXX Device GUI's 'Export Flash" output. n download is complete (boot device, one time only) orogram is executed (What's this?) Abort firmware download if device has not been factory trimmed (<u>What's this?</u>)	
Execute program whe Scan for device after Timestamp Messagi 10:44:56.360 USB Ada	This option can be used to test a firmware image produced by the Fusion GUT "File->Export" to PFlash -OFIash output or the UCD3XXX Device GUI's "Export Flash" output. n download is complete (boot device, one time only) program is executed. (What's this?) Abort firmware download if device has not been factory trimmed (<u>What's this?</u>) pter v1.0.11 [PEC; 400 kHz] Found (Adapter #1)	
Execute program whe Scan for device after Timestamp Messagi 10:44:56.360 USB Ada 10:44:56.360 Looking	This option can be used to test a firmware image produced by the Fusion GUT "File->Export" to PFlash -OFIash output or the UCD3XXX Device GUI's "Export Flash" output. n download is complete (boot device, one time only) program is executed. (What's this?) Abort firmware download if device has not been factory trimmed (<u>What's this?</u>) pter v1.0.11 [PEC; 400 kHz] Found (Adapter #1) for device in ROM mode	
Execute program whe Scan for device after Timestamp Messagi 0:44:56.360 USB Ada 10:44:56.360 Looking 10:44:56.397 ROM v4	This option can be used to test a firmware image produced by the Fusion GUT "File->Export For Flash" output or the UCD3XXX Device GUI's "Export Flash" output. n download is complete (boot device, one time only) program is executed. (What's this?) Abort firmware download if device has not been factory trimmed (<u>What's this?</u>) pter v1.0.11 [PEC; 400 kHz] Found (Adapter #1) for device in ROM mode IC v1 detected	

Figure 54 - Firmware download for UCD3138064



For UCD3138A64:

🕴 Fusion Digital Power Firmware Download Tool								
Note: Use the Fusion GUI's built-in firmware download tool if you need to download/reset data flash but want to keep your current PMBus configuration. Unlike the Fusion GUI, this tool does not require that the device have firmware loaded or be able to execute its program.								
Firmware File: C:\Users\a0	389316.ENT\Documents\New technical\TEMP\main program_201406100939_PMBUS_EBECEDEE_with_Password\main progr	Select File						
Data flash mode: P	node: Program flash checksum write mode (power up mode):							
 Download data flash (mass erases first) 	DO NOT write program checksum (Stay in ROM) Select this option for experimental firmware or if you need Flash block:	Download						
 Erase data flash 	to be able to perform low-level debugging via the ROM. When the UCD3XXX is powered on, it will stay in ROM							
🔵 Skip data flash	mode. O Both (64 kB)							
O Write pattern:	WRITE program checksum (Automatically execute Select this option for production devices. When the device is powered on, it will execute its program flash.							
	Validate with checksum 0x 3039							
Boot support Help	PASS THRU whatever program checksum is in the firmware							
	This option can be used to test a firmware image produced by the Fusion GUI "File->Export" tool PFlash +DFlash output or the UCD3XXX Device GUI's "Export Flash" output.							
Execute program when a Scan for device after pro	download is complete (boot device, one time only) ogram is executed (What's this?) Abort firmware download if device has not been factory trimmed (<u>What's this?</u>)							
Timestamp Message								
11:45:30.701 USB Adapt	er v1.0.11 [PEC; 400 kHz] Found (Adapter #1)							
11:45:30.701 Looking for	r device in ROM mode							
11:45:30.734 ROM v6 IC	t v1 detected							
11:45:30.734 Ready to d	Jownload firmware							
Copy Log Clear Lo	Other Scan for Devices in Program Mode Scan for Devices in ROM Mode	Close						
Fusion Digital Power Desig	jner v1.0.0.15439 [2014-06-17] ROM v6 IC v1 🛛 🕸 Texas Instruments	fusion digital power						

Figure 55 - Firmware download UCD3138A64

The user can choose what they would like to download with regards to the Program Flash, and Data Flash.

WARNING: It is important to note that if the program checksum is written, the device will boot up in program mode upon a reset. This may be a source for a device lockup if the firmware has not implemented the commands to jump back to ROM. Hence, it is advised not to write the program checksum for firmware in initial stages or implement the commands to jump back to ROM first.

For devices that have multiple flashes an extra set of radio buttons will appear for the user to decide which block to download to as shown in the previous figures.

The user picks the firmware file and clicks download.

NOTE: Sometimes this tool may be launched when the device is running in program mode. In that case they can use the button "Other ..." at the bottom to put the device in ROM mode so that they can proceed with the download.



7.3.1 Boot support

To write firmware to the boot flash click "Boot support" as shown in Figure 56.



Figure 56 - Boot support

The following screen shows the new options circled below related to boot flash.

	ter_0_0_45_0672_130311_with_checksum_command.x0	Select File
a flash mode: Program flash checksum write mode (power up mode): Download data flash (mass erases first) DO NOT write program checksum (Stay in ROM) Erase data flash Do NOT write program checksum (Stay in ROM) Erase data flash Select this option for experimental firmware or if you nee to be able to perform low-level debugging via the ROM. When the UCD3XXX is powered on, it will stay in ROM mode. Write pattern: WRITE program checksum (Automatically execute progra Select this option for production devices. When the devi is powered on, it will execute its program flash. Pota support Help Boot support Help Pflash checksum(includes boot) PASS THRU whatever program checksum is in the firmware This option can be used to test a firmware image produc by the Fusion GUI "File->Export" tool PFlash out or the UCD3XXX Device GUI's "Export Flash" output. Boot flash only oot size: 2 w kB	 Boot flash checksum write mode (power up mode): 2kB DO NOT write boot checksum (Stay in ROM) Select this option for experimental firmware or if you need to be able to perform low-level debugging via the ROM. When the UCD3XXX is powered on, it will stay in ROM mode. WRITE boot checksum (Automatically execute boot) Select this option for production devices. When the device is powered on, it will execute its boot flash. PASS THRU whatever boot checksum is in the firmware Select if boot flash feature is not being used or boot checksum is simply to be copied from the firmware. 	Download Flash block:

Figure 57 - Bootflash options



Each of the options will be described. Figure 58 shows the "Help" screen describing the various options that the firmware can be written to and the checksums related to it.

The first option to configure for Boot Support is "Write firmware to:" as circled in Figure 57.

- Write firmware to "Entire block": The program and the boot will be taken from the firmware file.
- Write firmware to "Above boot flash": Only the program will be taken from the firmware file.
- Write firmware to "Boot flash only": Only the boot will be taken from the firmware file.
- "Boot size": Can range from 2 kB to 31 kB. For a boot size of 2 kB then there is only one option for the boot flash checksum as shown in Figure 57. If the boot size is greater than 2 kB there is another option to set a checksum for the remainder of the boot flash as shown in Figure 59.



Figure 58 - Firmware writing options





Figure 59 - Two checksums for boot flash greater than 2kB

There are two options if the user is writing the program checksum after downloading program flash. The user needs to specify if the checksum calculated should include in addition to the program, the boot or not. See Figure 60.

Prog	ram flash checksum write mode (power up mode):
0	DO NOT write program checksum (Stay in ROM)
	Select this option for experimental firmware or if you need to be able to perform low-level debugging via the ROM. When the UCD3XXX is powered on, it will stay in ROM mode.
۲	WRITE program checksum (Automatically execute program)
	Select this option for production devices. When the device is powered on, it will execute its program flash.
	Pflash checksum(includes boot)
0	Pflash checksum(includes boot)
0	Pflash checksum excludes boot
	by the Fusion GUI "File->Export" tool PFlash +DFlash output or the UCD3XXX Device GUI's "Export Flash" output.

Figure 60 - Writing pflash checksum options

7.3.2 Data flash download





7.3.2.1 Data flash download options

There are three options regarding downloading of data flash.

7.3.2.1.1 Download

The option "Download data flash" writes the data flash portion defined in the .x0 file to the data flash location on the device. Before the writing of data flash, a mass erase is issued where all the pages are cleared simultaneously.

7.3.2.1.2 Erase

The option "Erase data flash" simply issues the mass erase without downloading the .x0 file.

7.3.2.1.3 Partial download

The second option is "Download partial." For this case the user must specify an initial start page index and a final page index of the pages defined in their .x0 they wish to download. The data flash pages outside the range of these indices on the device will not be edited.

7.3.2.2 Download partial flash clarification

7.3.2.2.1 Erase time

Before the continuous set of pages (defined by the start and final page indices) are written, the page erase command is issued sequentially beginning with the "Start page." This erase is done sequentially, one page at a time, including the appropriate wait time after a page erase has been issued. Therefore, if there are 10 pages and "y" is the wait time per page erase, then the total wait time needed would be 10y. For the first option above, the wait time is only "y", as the mass erase applies a simultaneous erase to all the pages as opposed to the sequential erase in this option.

7.3.2.2.2 Identifying the pages

Once the data flash beginning address, and the address of the data variables with their respective data lengths are known then finding the start page index and final page index for a partial download can be found as follows:

Start_page_index = (data_variables_begin_address - data_flash_begin_address)/0x20

Final_page_index = Start_page_index + (sum_of_data_lengths/0x20) -1



Note: usually the data that is being partially downloaded to the device is defined in the firmware along page boundaries.

7.3.2.2.3 Helpful tools

The "Memory Peek/Poke" tool is helpful for observing the flash.

After the user specifies the begin and end address they can view the flash contents in the "Memory Dump" tab.



In the image above the data flash(0x18800-0x18FFF for UCD3138) was set initially to all 0xAA. Then a data flash partial download was done where the start and final page indices were defined to be 3 and 7 respectively.

Note: To set the data flash to 0xAA click the 0xAA link found in the "Flash" tab as shown below:

7.4 Checksum functions

In the Checksums tab there are a number of functions available to view, calculate, create, validate and clear checksums on the device as shown in

Figure 61. The tab visually displays the checksums to more easily apply the appropriate function. Depending on the boot flash size or whether boot flash is even needed the visualization of the checksums will update as shown in the following figures.

	Scan Device in ROM Mode Scan for Device in Program Mode: DEVICE ID DEVICE CODE IC DEVICE ID PMBUS REVISION Image: When a device is found, dump additional PMBus commands When a device is found, dump additional PMBus commands								
	Command ROM to execute its program (SendByte 0xF7 to Address 11) O Block 0 O Block 1 Command Program to jump to DEM (SendByte 0xD9)								
[Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image 0x00007FF8 Program checksum Dump Calculate Recreate Validate Clear Program size: 32768 Bytes Dump Calculate Recreate Validate Clear								
Chapter 7	0x00000000	Boot	e 58 of 95						





Checksum functions



7.5 Multi Image Functions



functions for firmware that implement multiple images. See Figure 64.



Scan Device in ROM Mode								
Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>PMBUS REVISION</u>								
When a device is found, dump additional PMBus commands								
Command ROM to execute its program (SendByte 0xF0 to Address 11)								
Command Program to jump to ROM (SendByte 0xD9)								
Default Multi-image								
Read Multi-image parameters								
All functions below will be applied to image: 1 \bigcirc (Valid Images between 1 and 20)								
Image Download Image Peek/Poke Switch Export Image Erase Image								
Image Checksum: Dump Calculate Recreate Validate Clear								

Figure 64 - Scan for Device ID to activate Multi-image

The Multi-image tab provides functions for working with other images while an image is executing. After scanning for "Device ID" as shown in the figure above, the user will see the link "<u>Read Multi-image parameters</u>" become enabled. The user then clicks this to read important parameters that describe the images and how the GUI will interact with them as shown in Figure 65 and Figure 66.

Default Multi-image							
Read Multi-image parameters							
All functions below will be applied to image: (Valid Images between 1 and 20)							
Image Download Image Peek/Poke Switch Export Image Erase Image							
Image Checksum: <u>Dump</u> <u>Calculate</u> <u>Recreate</u> <u>Validate</u> <u>Clear</u>							

Figure 65 - Click Read Multi-image parameters to activate functions



UCD3XXX / UCD9XXX Device GUI		
itatus	Tools	
Attached: UCD310064V1 @ Address 89d	Scan Device in ROM Mode	
Last ROM Found: IC Info: ROM Info: Package ID: Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0.49.007 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	Scan for Device in Program Mode: <u>DEVICE ID</u> When a device is found, dump additional PM <u>Command ROM to execute its program (SendByte</u> <u>Command Program to jump to ROM (SendByte</u> <u>Default</u> Multi-image <u>Read Multi-image parameters</u> All functions below will be applied to image: <u>Image Download</u> <u>Image Peek/Poke Switch</u> <u>Image Checksum: Dump Calculate Recreat</u>	Image: DEVICE CODE PMBUS REVISION MBus commands yte 0xF0 to Address 11) 0xD9 to Address 89) 1 (a) (Valid images between 0 and 1) h Export Image Erase Image te Validate Clear
og		s are enabled
17:53:14.391 SAA: BlockRead (Address 89d, Cmd 0xE	B): ACK 0x44EEEEEEEEEEEEEEEEE0001040E100/	Δ
17:53:14.461 Write Delay = 255 ms Page Write Delay = 255 ms Block Erase Delay = 65535 ms Checksum Calculate Delay = 65535 ms Image Switch Delay = 65535 ms Memory Read Delay = 255 ms Boot Block Used = No Block Erase Needed = Image Erase com Page Size = 16 bytes Block Size = 32768 bytes Memory Size = 65536 bytes Erase Page Size = 1024 bytes	mand must be sent out before writing to an image	multi-image parameters
Copy Log Clear Log		Display all SMBus/I2C activity in k
ion Digital Power Decigner v1 0 0 20222 (2012-02-12	Ba Texas Instruments I fusion diaital nomer	

Figure 66 - Functions enabled after reading multi-image parameters

The following sections are descriptions of the functions for multi images.

7.5.1 Setting Image Index

Before using any of the functions shown in Figure 66 above the user must set which image index they will be working with.

7.5.2 Multi-image Download

After setting the appropriate image index and clicking "Image Download", the following image will be displayed.



🜵 Fusion Digit	al Power Image Firmware Download Tool	_ 0 🛛
Firmware File:	C:\Users\a0389316\Documents\Technical\Apec 2013\Image switch\lc002 002.x0	Select File
Ir	nage checksum write mode (power up mode):	Download
(DO NOT write image checksum (Stay in Boot Flash/ROM)	
	Select this option for experimental firmware or if you need to be able to perform low-level debugging via the Boot Flash/ROM. When the UCD3XXX is powered on, it will stay in Boot Flash/ROM mode.	For image: 1
(WRITE image checksum (Automatically execute image)	
	Select this option for production devices. When the device is powered on, it will execute its image.	
(PASS THRU whatever image checksum is in the firmware	
	This option can be used to test a firmware image produced by the Fusion GUI "File->Export" tool PElash+DElash output or the UCD3YYX Device GUI's "Export Elash" output	
	ing	
Timestamp	Message	
18:21:02.870	USB Adapter v1.0.10 [PEC; 400 kHz] Found (Adapter #1)	
18:21:02.872	Looking for device in program mode	
18:21:03.614	Found DC-DC LLC Firmware v0.0.49.76 @ Address 89d in program mode	
18:21:03.614	Found PFC SinglePhase Firmware v0.0.49.76 @ Address 89d in program mode	
18:21:03.619	Ready to download firmware to image 1	
Copy Log	Clear Log Scan for Devices in Program Mode	Close
Fusion Digital P	ower Designer v1.0.0.30323 [2013-03-12] DC-DC LLC Firmware v0.0.49.76 @ Address 89d	TEXAS INSTRUMENTS fusion digital power

Figure 67 - Image download

7.5.3 Switch

In order to activate the image downloaded the user will need to click "Switch". See Figure 68.



Figure 68 - Image to switch to

7.5.4 Image Peek/Poke/Dump

The user can specify which address to read/write to as shown in Figure 69 and Figure 70.



🌵 In	iage Peek/F	Poke/Du	ımp 🗲 🗕 🗕	_							_ = 🔀
	ak/Daka		Support	fo	8/16/32/	varia	able block	sizes	Read	and Write	support
Pe	Address	emory Du	Data Type	/	HerValue		Numeric Value		1		
	0x0000080	2	UInt8		0x00			= d	Read	Write	
				X		1					
	0x0000080	2	UInt16		0x0078		120		Read	Write	
	0x000080	2	UInt32	$\overline{}$	0x00784678		7882360		Read	Write	
	0x000080	2	Int8	\checkmark	0x00		0		Read	Write	
	0x000080	2	Int16	\checkmark	0x0078		120		Read	Write	
	0x000080	2	Int32	\checkmark	0x00784678		7882360		Read	Write	
	0x000080	2	Linear 11	\checkmark	0x0078		120.000		Read	Write	
	0x000080	2	L16 0 Unsigned		0x0078		120.000		Read	Write	
	0x000080	2	Block[16]		0x0078467800015	C01	.xFx		Read	Write	
	0x000080	2	UInt8	\checkmark					Read	Write	
					UInt8				- 1		
	Check All	Uncheck	AII		O UInt16)	Write Checked		
					O UInt32						
	og / Output				O Int8						
Tir	mestamp	Message	e		0 Int 16						
00	:06:15.547	Read ad	dr 0x00000802L1	5 O UI	○ Int20						
00	:06:16.082	Read ad	dr 0x00000802 Lin	ear1:	0 Int32						
00	:06:16.541	Read ad	dr 0x00000802 Int	32: 7	🔿 Linear 11				-		
00	:06:17.091	Read ad	dr 0x00000802 Int	:16: 1	◯ Linear 16 Ex	(D):	0 🕀 Mantissa	a: Unsigne	d 🔽 –		
00	:06:17.587	Read ad	dr 0x00000802 Int	8:0	0						
С	ear Log	Copy Lo	g to Clipboard		O Block / ASCII	Length	1: 4			(ок
					×						

Figure 69 - Image Peek/Poke



Image Pe	ek/F	oke	/Du	mp																				-	
Peek/Poke	Me	mory	/ Dun	np)	•				-	-															
tart Addre	ss:	0x00	0008	00		Er	nd Ad	ldre	ss:	0x00	0000	310		#1	Bytes	to Re	ead:	17	^ ~	Rea	Ы	Сору	to Clipbo	ard	
00	01	02	03	04	05	06	07	-	08	09	0A	0B	00	0D	0E	OF	01234	5678	9AB(DEF					~
																		·							
800 ES	80	00	/8	40	/8	00	01	-	50	01	11	21	E3	AU	03	21	xr	x\	••••	•••					
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	tout																								
	-																								
0+11+18-3	01	Pear	sage ting a	addre	ee 0	~800	throu	uah i	0~81	10 (13	7 byt	ec)													_
0:11:18.4	52	Done	ang a > with	n rea	d	1000	unou	ign	0.01	10 (1)	/ Dyu	es)	•												
	52	Done			-																				
		-																					_		
Clear Log		CODY	v Loc	ito (lipho	and																		OK	

Figure 70 - Image Dump

7.5.5 Erase Image

Click Erase image to send the firmware command to erase the image selected as shown in Figure 71.



	I LOCEN		
 .		3XXX	eau

A OCDOWN DEVICE GOI	
Status	Tools
Attached: UCD310064V1 @ Address 89d Last ROM Found: IC Info: ROM Info: Package ID: Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	Scan Device in ROM Mode Scan for Device in Program Mode: DEVICE_ID_DEVICE_CODE_PMBUS_REVISION ✓ When a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89) Default Multi-image Read Multi-image parameters Switch image executing to: 0 Switch (Valid images between 0 and 1) Image Download Image Peek/Poke Image Checksum: Dump_Calculate_Recreate_Validate_Clear
Log	
Timestamp Message 00:16:13.347 SAA: BlockWrite (Address 89d, Cmd 0 00:16:13.347 Image Erased 0 Copy Log Clear Log	DxEB, 0x4100000000000000000000000000000000000
Fusion Digital Power Designer v1.0.0.41869 [2012-08-	24] 🙀 Texas Instruments fusion digital power

Figure 71 - Erase Image

7.5.6 Export Image

The user can also export the image currently on the device.

7.5.7 Image Checksums

The following pictures illustrate the image checksum commands.

7.5.7.1 Calculate Image Checksum

To calculate a checksum based on the image selected click "Calculate."



- 2			C R	10.0	10.00	W 1		1000	
- 14		U		1.7	A A		DEV		GUI
	-		_						

A OCD2VVV DEAICE GOT	
Status	Tools
Attached: UCD310064V1 @ Address 89d	Scan Device in ROM Mode
Last ROM Found: IC Info: ROM Info: Package ID:	Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>PMBUS REVISION</u> When a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89)
Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	Default Multi-image Read Multi-image parameters Switch image executing to: 0 ÷ Switch (Valid images between 0 and 1) Image Download Image Peek/Poke Export Image Erase Image Image Checksum: Dump Calculate Recreate Validate Clear
Log	
Timestamp Message	
00:17:44.076 SAA: BlockRead (Address 89d, C	nd 0xEB): ACK 0x000000012D0072B0DC0077840400000000
00:17:44.090 SAA: BlockRead (Address 89d, C	nd 0xEB): ACK 0x000000012D0075DDAC0077840400000000
00:17:44.104 SAA: BlockRead (Address 89d, C	nd 0xEB): ACK 0x0000000000778404007784040000000
00:17:44.108 SAA: BlockRead (Address 89d, C	nd 0xEB): ACK 0x0000000000778404007784040000000
00:17:44.108 Calculated checksum on device is	: 0x00778404
Copy Log Clear Log	☑ Display all SMBus/I2C activity in log
Fusion Digital Power Designer v1.0.0.41869 [2012	-08-24] 😽 Texas Instruments fusion digital power

Figure 72 - Calculate image checkum

7.5.7.2 Dump Image Checksum

To display the last written checksum or bytes currently in the location of where the image checksum would be click "Dump."



1				
- 42	LICE NO.	VV Deu	ica Cl	i m
	UCD3A		ICE GI	

	<u>ما ال</u>
Status Tools	
Attached: UCD310064V1 @ Address 89d Scan Device in ROM Mode	
Last ROM Found: Scan for Device in Program Mode: <u>DEVICE ID DEVICE CODE PMBUS REVISION</u> IC Info: ROM Info: Package ID: Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89)	
Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	
Timestamp Message	
00:18:24.656 SAA: BlockRead (Address 89d, Cmd 0xEB): ACK 0x00000012D0071A1EC0077840400000000	
00:18:24.670 SAA: BlockRead (Address 89d, Cmd 0xEB): ACK 0x000000012D0074CEBC0077840400000000	
00:18:24.684 SAA: BlockRead (Address 89d, Cmd 0xEB): ACK 0x0000000000778404007784040000000	
00:18:24.689 SAA: BlockRead (Address 89d, Cmd 0xEB): ACK 0x0000000000778404007784040000000	
00:18:24.689 Checksum on device is: 0x00778404	
Copy Log Clear Log 🔽 Display all SMBus/I2C activity in log	
Fusion Digital Power Designer v1.0.0.41869 [2012-08-24] 🎝 Texas Instruments fusion digital power	

Figure 73 - Dump image checksum

7.5.7.3 Create Image Checksum

To create a checksum in the checksum location for the image selected click "Recreate."



1				
- 43	LICEN'S	WWW.	Douteo	CIT
	UCD.		Device	GUL

V GEBOINGE DEVICE DOI	
Status	Tools
Attached: UCD310064V1 @ Address 89d	Scan Device in ROM Mode
Last ROM Found: IC Info: ROM Info: Package ID:	Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>PMBUS REVISION</u> When a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89)
Last Program Found:	Default Multi-image
Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3 Log	Read Multi-image parameters Switch image executing to: 0 ÷ Switch (Valid images between 0 and 1) Image Download Image Peek/Poke Export Image Image Checksum: Dump Calculate Recreate Validate Clear
Timestamp Message	A
00:18:37.233 SAA: BlockWrite (Address 89d, Cmd 0:	xEB, 0x06007FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
00:18:37.237 SAA: BlockWrite (Address 89d, Cmd 0)	IXEB, 0x07007FF0FFFFFFFFFFFFFFFFFFFFFFFFFFFFF
00:18:37.251 SAA: BlockRead (Address 89d, Cmd 0)	xEB): ACK 0x0000000000778404007784040000000
00:18:37.252 Success!	
Copy Log Clear Log	address 0x00007FFC
usion Digital Power Designer v1.0.0.41869 [2012-08-2	24] 😽 TEXAS INSTRUMENTS fusion digital power

Figure 74 - Recreate image checksum

7.5.7.4 Validate Image Checksum

To validate that the calculated checksum equals the dump checksum click "Validate."



		-					۰.		1.0			 	-	
u,				.	Γ.	л	w	v.			120		1	
		_	_			-		_		_		 _		

A OCDOWN DEVICE GOT	
Status	Tools
Attached: UCD310064V1 @ Address 89d	Scan Device in ROM Mode
Last ROM Found: IC Info: ROM Info: Package ID:	Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE</u> <u>PMBUS REVISION</u> When a device is found, dump additional PMBus commands Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89)
Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	Default Multi-image Read Multi-image parameters Switch image executing to: 0 ÷ Switch (Valid images between 0 and 1) Image Download Image Peek/Poke Export Image Image Checksum: Dump Calculate Recreate Validate Clear
Log	
Timestamp Message	<u>A</u>
00:18:51.289 SAA: BlockRead (Address 89d, Cmd	0xEB): ACK 0x00000012D0072F4980077840400000000
00:18:51.303 SAA: BlockRead (Address 89d, Cmd	0xEB): ACK 0x00000012D007621680077840400000000
00:18:51.317 SAA: BlockRead (Address 89d, Cmd	0xEB): ACK 0x0000000000778404007784040000000
00:18:51.321 SAA: BlockRead (Address 89d, Cmd	0xEB): ACK 0x000000000007784040077840400000000
00:18:51.321 Checksum is valid for image 0: checks	sum on device = 0x778404, calculated checksum = 0x778404
Fusion Digital Power Designer v1.0.0.41869 [2012-08	-24] 🏘 Texas Instruments fusion digital power

Figure 75 - Validating image checksum

7.5.7.5

To clear the checksum for the image selected click "Clear" and 0xFFFFFFF will be written to that location.



1.0		_		_													_
- 12	11	۲	D	r.	2	0	х	х	r	D	e١	11	e	2	G		1
	-	-	_	-	-	-				-	-		-	_	-	-	_

OCD2XXX Device G01	
Status	Tools
Attached: UCD310064V1 @ Address 89d	Scan Device in ROM Mode
Last ROM Found: IC Info: ROM Info: Package ID:	Scan for Device in Program Mode: DEVICE ID DEVICE CODE PMBUS REVISION Image: When a device is found, dump additional PMBus commands Image: Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9 to Address 89) Image: Command ROM to jump to ROM (SendByte 0xD9 to Address 89)
Last Program Found: Address: 89d 0x59 DEVICE_ID: UCD310064V1 0.0 MFR_MODEL: UCD3138LLCEVM-028 MFR_REVISION: E3	Default Multi-image Read Multi-image parameters Switch image executing to: 0 - Switch image executing to: 0 - Image Download Image Peek/Poke Export Image Erase Image Image Checksum: Dump Calculate Recreate Validate Clear
Log	
Timestamp Message	A
00:19:02.695 SAA: BlockWrite (Address 89d, Cmd 0x	<pre><b, 0x06007fe0ffffffffffffffffffffffffffffffff<="" td=""></b,></pre>
00:19:02.699 SAA: BlockWrite (Address 89d, Cmd 0x	«EB, 0x07007FF0FFFFFFFFFFFFFFFFFFFFFFFFFFFFF
00:19:02.713 SAA: BlockRead (Address 89d, Cmd 0xi	(EB): ACK 0x0000000000778404007784040000000
00:19:02.714 Success: 00:19:02.714 Checksum deared to 0xFFFFFFF at ad	ddress 0x00007FFC
Copy Log Clear Log	✓ Display all SMBus/I2C activity in log
Fusion Digital Power Designer v1.0.0.41869 [2012-08-24] 🏘 Texas Instruments fusion digital power	

Figure 76 - Clearing image checksum

7.6 Isolated Bitmask Tool

The Isolated Bitmask Tool provides firmware developers with a tool to help them set the bitmask for the commands that inform the GUI of what PMBus commands are supported. See "Section 6.4.2 How does Implemented Commands on the Firmware Appear in the GUI?"





Figure 77 - Click Iso Bitmask Tool



Figure 78 - Bitmask tool

2. Select commands desired in the bitmask and the bitmask code on the right will automatically be generated.





3. The user can also work in reverse by pasting a known bitmask in C code and then see what commands those bitmasks were indicating. They can also go back to the Select PMBus commands tab and all the indicated ones will be checked.


👆 Isolated Bitmask Generator Tool 1. Select PMBus commands to generate bitmask. 2. Or paste the Hex Code bitmask to see which commands are being used. Select PMBus Commands Hex Code Entry **Bitmask Generated** {0x80, 0x00, \ PMBUS_CMD_PAGE 0x54, 0x00, \ PMBUS_CMD_STORE_DEFAULT_ALL 0x00, 0x00, \ PMBUS_CMD_STORE_DEFAULT_CODE 0x00, 0x00, \ PMBUS_CMD_STORE_USER_ALL 0x00, 0x00, \ 0x00, 0x00, \ // 0 1000000 00000000 0x00, 0x00, \ // 1 0 10 10 100 00000000 0x00, 0x00, \ // 2 0000000 00000000 0x00, 0x00, \ // 3 0000000 00000000 0x00, 0x00, \ // 4 0000000 00000000 0x00, 0x00, \ 2. We work backwards // 5 0000000 0000000 0x00, 0x00, \ // 6 0000000 00000000 0x00, 0x00, \ and figure out which // 7 0000000 00000000 0x00, 0x00, \ // 8 0000000 00000000 0x00, 0x00, \ commands created // 9 0000000 00000000 0x00, 0x00 \ // A 0000000 00000000 that bitmask. // B 0000000 00000000 // C 0000000 0000000 1. Paste your C code bit // D 0000000 0000000 // E 0000000 0000000 mask into here. // F 00000000 00000000 3. Also, you can continue editting that bit mask by switching to "Select PMBus Commands" and continue working from there. 🔠 Print Preview ... Copy to Clipboard Print ... Save As... Help OK

7.7 Firmware Memory Debugger

Included with the Fusion Digital Power Design software suite a powerful low level GUI is available for debug using the PMBus. Click the Debug tab and click Memory Debugger.



Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image
Memory Debugger Read and write using memory maps
Memory Peek/Poke Peek/Poke at specific addresses
Device Debug Tool "One click" analysis of a UCD3xxx-based device's firmware, ROM, config, and trim state. Devices supported: UCD92xx, UCD90xxx, UCD30xx.

Figure 79 - Memory Debugger

All 😾 Watch List									
ister/Variable Name:	~	Substring Match	✓ Fil	ter Clea	ar Filter She	ow: 💿 All	O Registers		Flash O Pl
ction: All () > pmbus_checksum ()									
me	Description	Туре	Value	Hex	Address	Size	Category		
parm_index		UInt8			0x0001901F	1 byte	RAM		
parm_mem_length		Array unsig			0x00004FBC	38 bytes	PFlash		
parm_mem_start		Array unsig			0x00004F70	76 bytes	PFlash		
parm_offset		Int16			0x00019020	2 bytes	RAM		
parm_size		UInt8			0x00019023	1 byte	RAM		
period		UInt16	0	0x0000	0x000193F2	2 bytes	RAM		
pfc_command	for APEC demo	UInt8			0x000193E9	1 byte	RAM		
pfc_os_enable	for APEC demo	UInt8			0x000193EC	1 byte	RAM		
pfc_out_struct		Struct PFC			0x000193C8	27 bytes	RAM		
pfc_phase_2_enable	for APEC demo	UInt8			0x000193EA	1 byte	RAM		
pfc_zvs_enable	for APEC demo	UInt8			0x000193EB	1 byte	RAM		
pmbus_buffer		Array unsig			0x00019024	40 bytes	RAM		
pmbus_buffer_position		UInt8			0x0001904E	1 byte	RAM		
pmbus_checksum		UInt32	2,271,5	0x87654	0x00018910	4 bytes	DFlash	REFRESH	
pmbus_checksum_b	For Portability, It Is	UInt32			0x00018A30	4 bytes	DFlash		
pmbus_dcdc_cal		Array PMBU			0x00019108	12 bytes	RAM		
pmbus_dcdc_cal_constants		Array PMBU			0x00018880	12 bytes	DFlash		
pmbus_dcdc_cal_constants_b		Array PMBU			0x000189A0	12 bytes	DFlash		
pmbus_dcdc_cal_nonpaged	second rail default v	Struct PMBU			0x00019174	4 bytes	RAM		
pmbus_dcdc_cal_nonpaged_constant	s second rail default v	Struct PMBU			0x0001888C	4 bytes	DFlash		
pmbus_dcdc_cal_nonpaged_consta	second rail default v	Struct PMBU			0x000189AC	4 bytes	DFlash		
pmbus_dcdc_config		Array PMBU			0x00019068	76 bytes	RAM		
pmbus_dcdc_config_constants		Array PMBU			0x00018890	76 bytes	DFlash		
notive data confia constants h		Areau DMDI I			0-00010000	76 huter	nelash		
Expand All Collapse Al	Refresh All	Write Changes	Ir	nport	Export Sele	ected)	Export All	Clear Wat	tch List
estamp Message								Copy Log	Clear Log

Figure 80 - GUI Debugger

To also access the GUI through the Design GUI click the "Memory Debugger" item under tools, shown in Figure 81.





Figure 81 - Fusion Designer GUI Debugger Tool

By default the tool comes up displaying all of the hardware based device registers.

Nam	e	Description	Туре	Value	Hex	Address	Size	Category			
+	AdcRegs	IRQ Index Offset Ve	Struct ADC			0x00040000	152 bytes	Register	REFRESH	WRITE	
	CimRegs	Memory Fine Base A	Struct CIM		-	0xFFFFFF20	24 bytes	Register			
•	DecRegs	DPWM Individual Reg	Struct DEC			0xFFFFFE00	156 bytes	Register			
÷	Dpwm0Regs		Struct DPWM			0x000D0000	140 bytes	Register			
٠	Dpwm1Regs		Struct DPWM			0x000A0000	140 bytes	Register			
÷	Dpwm2Regs		Struct DPWM			0x00070000	140 bytes	Register			
•	Dpwm3Regs	Analog Comparator	Struct DPWM			0x00050000	140 bytes	Register			
Đ	FaultMuxRegs	Ramp Control Register	Struct FAULT			0x00030000	128 bytes	Register			
b	FeCtrl0Regs		Struct FE_CT			0x000E0000	68 bytes	Register			
•	FeCtrl 1Regs		Struct FE_CT			0x00080000	68 bytes	Register			
÷	FeCtrl2Regs	Filter Status Register	Struct FE_CT			0x00080000	68 bytes	Register			
Ð	FilterORegs		Struct FILTE			0x000C0000	100 bytes	Register			
0	Filter 1Regs		Struct FILTE			0x00090000	100 bytes	Register			
•	Filter 2Regs	Fault Port I/O Directi	Struct FILTE			0x00060000	100 bytes	Register			
•	GioRegs	Front End Control 0	Struct GIO			0xFFF7FA00	64 bytes	Register			
œ۰ ا	LoopMuxRegs	Clock Trim Register	Struct LOOP			0x00020000	120 bytes	Register			
•	MiscAnalogRegs	Static Memory Contr	Struct MISC			0xFFF7F000	72 bytes	Register			
(±)	MmcRegs	PMBus Control Regist	Struct MMC			0xFFFFFD00	60 bytes	Register			
•	PMBusRegs	Clock Control Registe	Struct PMBU			0xFFF7F600	36 bytes	Register			
•	SysRegs	T24 Counter Data Re	Struct SYS_R			0xFFFFFFD0	48 bytes	Register			
0	TimerRegs	UART Control Regist	Struct TIMER			0xFFF7FD00	156 bytes	Register			
•	Uart0Regs		Struct UART			0xFFF7EC00	56 bytes	Register			
+	Uart1Regs	: allow reading const	Struct UART			0xFFF7ED00	56 bytes	Register			

Figure 82: GUI UCD3138 Debugger – Defaults

If you expand any item on this list you will have access to every bit field inside the UCD3138 device. This access extends to both reading and writing to these registers.



Vame			Description	Type	Value	Hex	Address	Size	Category		_	
¢٠	FeC	trl 1Regs		Struct FE_C			0x000B0000	68 bytes	Register			
÷.	FeC	trl2Regs	Filter Status Register	Struct FE_C			0x00080000	68 bytes	Register			
Ġ.	Filte	erORegs		Struct FILTE			0x000C0000	100 bytes	Register			
Ð	*	FILTERSTATUS	Filter Status Register	Union FILTE			0x000C0000	4 bytes	Register			
Ð	-	FILTERCTRL	Filter Control Register	Union FILTE			0x000C0004	4 bytes	Register			
Ð	t	CPUXN	CPU XN Register	Union CPUX			0x000C0008	4 bytes	Register			
Ð	-	FILTERXNREAD	Filter XN Read Register	Union FILTE			0x000C000C	4 bytes	Register			
Ð	dr I	FILTERKIYNREAD	Filter KI YN Read Re	Union FILTE			0x000C0010	4 bytes	Register			
Ð		FILTERKDYNREAD	Filter KD YN Read R	Union FILTE			0x000C0014	4 bytes	Register			
Ð	the l	FILTERYNREAD	Filter YN Read Register	Union FILTE			0x000C0018	4 bytes	Register			
Ð	*	COEFCONFIG	Coefficient Configur	Union COEF			0x000C001C	4 bytes	Register			
ė	-shr	FILTERKPCOEF0	Filter KP Coefficient	Union FILTE		0x00007	0x000C0020	4 bytes	Register			
		📩 all		UInt32	29,033	0x00007	0x000C0020	4 bytes	Register			
	÷	bit		Struct FILTE		0x00007	0x000C0020	4 bytes	Register			
		Bit Fields		Bit Fields		0x00007	0x000C0020	4 bytes	Register			
			KP Coefficient 1	S Bit Field: 16	0	0x0000	0x000C0020	16 bits	Register			
		KP_COEF_0 [15:0]	KP Coefficient 0	S Bit Field: 16	29,033	0x7169	0x000C0022	16 bits	Register	REFRESH	WRITE	

Figure 83 - Device Debugger Bit Field Selector

Figure 83 displays one register set fully expanded in the debugger. Clicking the "REFRESH" button on the right will force the debugger to read the corresponding register from the device. Entering a new value in the "Value" or "Hex" fields and then clicking "WRITE" will write the new values to the device. *Keep in mind that reading and writing to any register in the device is very powerful and also dangerous. Some registers should not be changed and others are cleared on read so care should be used when selecting which registers you want to access. Please see the appropriate programmer's manual for further details.*

Since there are so many different fields inside of the UCD3xxx devices a "Watch List" is available to create a convenient place to both read and write to the addresses of interest. Clicking one of the stars next to a variable name will turn it gold indicating that it has been added to the watch list. To remove an item from the watch list, simply click the star again. Clicking the "Watch List" tab at the top of the window will now display the selected.

🕅 bit		5
🖃 🤺 Bit Fields		E
	KP Coefficient 1	5
COEF_0 [15:0]	KP Coefficient 0	5
CTI TEDI/DOOFE4	rdan in on ferral	

Figure 84 - Watch List Selection Star

The debugger also has the ability to read and write to any global firmware variable. This can be done by providing the GUI with the path to find the ".map" and ".pp" files from the firmware build. Click the item shown in Figure 85.

F	ile	
		Change Map
		Close

Figure 85 - Map File Selection

After clicking this item, a window will pop up providing detailed instruction on what to do. For an example, see Figure 86.



÷ – 🛛
About Map/PP Files
While only IC registers can be debugged by default, if you tell the debugger where certain Code Composer output files are located, non-local global (extern) variables can be debugged. The Code Composer files that are used are:
 *.map - A map file defines the top-level variables in your "C" source code and at what address in memory they have been located. There is only one map file. *.pp - Contains declarations from your source code, after they have been run through the C pre-processor. There will be one .pp file for each source code file.
Add the -m xxxxx.map linker option to create a map file during compilation. Add the -ppa -ppo pre-processor options to create the .pp files, one per source file.
Note that IC register definitions are taken from your .map and .pp files, overriding the default definitions bundled with the GUI.
_ Select Files & Ontions
Settings are saved for each unique DEVICE_ID. So for example, if you switch between UCD9244 and UCD9222, the debugger will automatically use the apprpriate files. Current Setting: Show Register Only - Manually Select Map UCD3100 100
Select Folder Containing Map/PP Files Select ZIP File Containing Map/PP Files
Show Registers Only - Auto Select Map Show Registers Only - Manually Select Map
Collapse unions in favor of bit fields Because the debugger allows you to edit bit field structures full "hex" values in addition to the lower level bit fields, you may find that alternative byte and word representations of a struct bitfield complicate debugging. Checking this box simplifies the variable node tree by only showing bit field structs when other members of a union are only simple types.
Code Composer small enums mode was used Check this if thesmall-enums mode was used in Code Composer when the target firmware was compiled. Small enums mode reduces the size that enums take up in memory (varable length instead of fixed 4 byte llength).
OK Cancel

Figure 86 - Debugger Customization Tool

The creation of the ".pp" files can be configured by modifying the Code Composer build options as shown in Figure 87.



Build Options for U	JCD3138LLCEVM_028.pjt (Debug)	×
General Compiler	Linker Link Order	_
·g + -ppa -ppc -al fs"\$(Proj_dir)∖Deb endian=big	-as -o2 -ea.asm -fr"\$(Proj_dir)\Debug" - oug" -i"/header files" -d"_DEBUG" -mt -mv4abi=tiabi	
Basic Advanced Advanced Opt. Feedback Files Assembly Parser Preprocessor Diagnostics	Include Search Path (i):/header files Pre-Define Symbol (-d):DEBUG Undefine Symbol (-u): Preprocessing: With Comments (-ppc) Continue with Compilation (-ppa)	
	OK Cancel Help	

Figure 87 - ".pp" Generation Parameters

The "*.map" file name and location can be specified in the code compose build options as shown in Figure 88.



Build Options f	for UCD3138LLCEVM_028.pjt (Debug)
General Com	piler Linker Link Order
-c-heap10-m	".\cyclone.map" -o".\Debug\cyclone.out" -stack200 -w -x
Category: Basic Libraries Advanced	Basic ABI (abi=): None, default to ARM9 Suppress Banner (-q) Output Module:
	Map Filename (-o): \\Cyclone.map
	Autoinit Model: Run-Time Autoinitialization (-c) Heap Size (-her o). 10
	Stack Size (mack): 200 Fill Value (m):
	Code E try Point (-e):
	OK Cancel Help

Figure 88 - Map Filename

After selecting the location of the ".map" and ".pp" files the debugger will extract the information it needs to allow read/write access to all global firmware variables. Depending on the speed of the system this can take a few moments. The GUI will create a local cache of the data it extracts. So as long as the files do not change subsequent launches of the debugger will be much faster.

You now can interact with RAM, DFLASH or PFLASH variables in the same way described above for device registers. Figure 89 shows an example where variables from RAM and DFLASH have been added to the watch list. "vout_cmd" is the mantissa of a linear16 variable and "supply_state" is a variable indicating the state of the IRQ state machine. Notice that the debugger picks up comments as well as the details of enumerated data types. These variables can be read or written to just like any other variable in the system.

File									
All 👷 Watch List									
egister/Variable Name:	S IS	ubstring Match 🕟	Filter Clea	ar Fil	ter Show:		Registers OR/		lash 🔿 P
election: Watch List () > supply_state ()	(Supply state enum for si	tate machine)							_
lame	Description	Туре	Value		Address	Size	Category		
	DPWM Module Regist	Struct DPWM			0x000D0000	140 bytes	Register		
DPWMEV1	_	Union DPWM			0x000D0010	4 bytes	Register		
È-☆ bit	DPWM Event 1 Regis	Struct DPWM			0x000D0010	4 bytes	Register		
i 🕁 Bit Fields	_	Bit Fields			0x000D0010	4 bytes	Register		
EVENT1 [17:4]	Event 1 configuration	U Bit Field: 14	44		0x000D0011	14 bits	Register		
FeCtrl0Regs	Front End Control Mo	Struct FE CT			0x000E0000	68 bytes	Register		
- RAMPCTRL	Ramp Control Register	Union RAMP			0x000E0000	4 bytes	Register		
i 📩 bit	Ramp Control Register	Struct RAMP			0x000E0000	4 bytes	Register		
🖃 🤺 Bit Fields		Bit Fields			0x000E0000	4 bytes	Register		
ANALOG_PCM_INT_E	Analog Peak Current	U Bit Field: 1	0		0x000E0002	1 bit	Register		
MASTER_SEL [6:5]	Master Ramp I/F Select	U Bit Field:2	0		0x000E0003	2 bits	Register		
Hilter0Regs	Filter Module Registe	Struct FILTE			0x000C0000	100 bytes	Register		
E + FILTERKPCOEF0	Filter KP Coefficient	Union FILTE			0x000C0020	4 bytes	Register		
🖻 🛧 bit	Filter KP Coefficient	Struct FILTE			0x000C0020	4 bytes	Register		
😑 🥢 Bit Fields		Bit Fields			0x000C0020	4 bytes	Register		
	KP Coefficient 0	S Bit Field: 16	29,033		0x000C0022	16 bits	Register		
mbus_dcdc_config_constants		Array PMBUS			0x00018890	76 bytes	DFlash		
mbus_dcdc_config_constants[0]	must be even numbe	Struct PMBU			0x00018890	76 bytes	DFlash		
		UInt16	6,144		0x00018890	2 bytes	DFlash		
	Supply state enum fo	Enum SUPPL	0 - STATE_IDLE 🖂		0x0001936C	4 bytes	RAM	REFRESH	WRITE
			0 - STATE_IDLE 1 - STATE_RAMP_UP 2 - STATE_RAMP_DOV 3 - STATE_REGULATE	WN D					
Expand All Collapse All	Refresh Watch List	Write Changes	5 - STATE_LIGHT_LO	AD	t Selecte	d) Ex	port All	Clear Wate	ch List
mestamp Message			V-STATE_VOUT_TRA	1121	NON			Copy Log	Clear Log
:51:48.488 0x000E0000: read 4 byte(s) 0	x00000001								

Figure 89 - Watch List with Firmware Variables

For the editable values there are up and down arrows.

0. 🔶

The increment is normally 1. However, the firmware developer has the ability to specify how large the increments are and what the max and min of the variable is. They do this by specifying it in the comments. See highlights in comments below,

extern Uint16 my_uint16; // test root node [min=5, max=200, step=5]

typedef struct



{

Uint8 a;	// [step=10]
Uint8 b;	// [min=0, max=100, res=5]
Uint8 c;	// [min=100, res=5]
float d;	// [min=-1e-3, max=1e3] step/res do not make sense with floats
Int8 e;	// [min=-100, max=100]
} struct1;	

Order within the brackets does not matter. White space also does not matter.

Note there are two different ways to change how the up/down arrows work in the decimal editor:

- step: simple increment/decrement. If the current value is 2 and the step is 5, clicking up, will change the value to 7.
- res: modulo oriented resolution. If the current value is 2 and the res is 5, clicking up, will change the value to 5.

7.8 SMBus Debug



Figure 90 - SMBus Debug Link

The tool looks as follows when launched,



🔱 SMBus & SAA Tool								
Target / Miscellaneous Device Address: 88 0 58 h (All Values Below Are Hex)	 Specify 	address			(Group Prot	:ocol (SAA Settings
Read Data		— Write Data—						
Cmd Data	Status		<u>Cmd</u>	Data				Status
	n/a	 Send Byte 	00					n/a
	n/a	O Write Byte	00	00				n/a
Read Word 00	n/a	O Write Word	00	0000				n/a
Read Block E1 2233445566778899AABBCCDDEEFF01	ACK	O Write Block	00	00				n/a
O Read Block 00	n/a							
(96 byte)				Length: 1				
Send		Send		Note: do n	ot include o	ount/length b	yte; it is auto	omatically
				defined for	you (and a	also in block p	rocess call be	low)
Process Calls		Signals —						
Cmd Data	Status	SMBALERT#: H	ligh	Refresh				
Process Call OO 0000	n/a	Control Lines:	#1	#2	#3	#4	#5	
		(clicking sets)	🔿 High	🔿 High	🔿 High	🔿 High	🔵 High	Refresh All
(Block write, block read)	n/a		Low	Low	Low	Low	Low	
Write Length: 1		- GPIO Peek/Pe	oke					
Read Length: Read:		b7	b6	b5 b4	b3	b2 b1	Ь0	
Ford		Read:						Read/Write
Senu		Write:						
_ Log								
10:26:05.772: SAA #1: PollPmbusSignalLines: ACK signal 5 is High 10:26:05.773: SMBALERT# now High								^
10:26:59.905; SAA #1: BlockRead (Address 11d, Cmd 0xE1); NACK	2770000AADD							
	0770033AADD							
Copy Log Clear Log	Adapte	er Overview						Close

Figure 91 - SMBus Debug

In order to use this tool the user needs to specify the device address. This tool can be used to interact with PMBus commands. It can be used to Read commands by specifying the hex command and it can be used to write to commands specifying the command and the data.

7.9 CCS conversion

This tool converts UCD31XX device projects from CCS 3.3 to CCS 5.5. NOTE: Although the project should compile after conversion, in rear cases some manual steps may be required. All files in the original folder will end up in the new folder. Only relevant files will be updated or used. All files used, updated or simply copied will be reported in the log.

7.9.1 How to access

To access from the "Start" menu, click Texas Instruments Fusion Digital Power Designer->Tools->Isolated CCS Conversion Tool.





Figure 92 - CCS conversion tool access from Start Menu

From the "UCD3XXX/UCD9XXX Device GUI" it can be found in the "Utilities" tab.

Flash Checksums SMBus/I2C Debug Utilities Trim Multi-image
Iso Bitmask Tool Used to decode/encode command bitmasks set in firmware to communicate to the GUI which PMBus commands are supported.
Mantissa/Exponent Tool Decimal to mantissa exponent conversion tool for 16 bit signed values
CCS Conversion 3.3 to 5.5 (Beta) Converts CCS projects from 3.3 to 5 for UCD31XX devices only.

Figure 93 - Conversion tool access from Device GUI

7.9.2 Usage

1) Browse to the location of the CCS 3.3 UCD31XX project file (*.pjt).



Figure 94 - Browse to CCS 3.3 project

2) Browse to the location of where the new CCS 5.5 project will be stored. By clicking the browse button it will suggest the new "Project name" based on the project name from CCS 3.3. The newly created project will create a folder with the "Project name" and a timestamp appended (for example "UCD3138LLCEVM_028_25-12-2014-12-05-22").



Figure 95 - Browse to new location of converted project

3) Click "Convert."



Figure 96 - Click to convert

4) After the project has completed (usually after a couple seconds) the log will be updated with the results. Sometimes it will indicate warnings in yellow (for example "Stale file zoiw.asm" may appear if the file was in the old folder but was not referenced in the project file, i.e. the original project was not even using this file). All updates made by the tool will be displayed in the log. Code changes will be displayed in a light green. The old and new versions of the code will both be shown. Below are some snapshots of the log. A copy of the log is automatically stored in the converted project folder with a timestamp (for example "Conversion-Log-2014-04-17-16-13-54.html").

a. Conversion completed

Figure 97 - Conversion completed



b. Code changes made including filename, line number, old and new code

Figure 98 - Displays file, line # and change made

c. The log can be copied or opened in a web browser. The log opened from the button is the same one stored in the converted project folder.

Figure 99 - Buttons to access the log generated

d. Display Log in web browser



Figure 100 - Conversion log opened in browser

5) To quickly access the newly converted project click "Open Folder" in the "New CCS 5 Project Location" area.



The project can now be imported to CCS 5.5!



7.10 Function Command Summary

The following table lists the ROM/Program commands called for some of the common functions used in the Device GUI.

Device GUI	Device GUI Mode: Commands				Description	
Function	ROM/	Code	Command	Trans.	Data	
	Program	(hex)		type	Format	
Scan Device in	ROM (0xEC	Read Version			Scans for the device in ROM
ROM Mode		0xFD	Configure Read Address			address 0xFFF7F010 using 0xFD and 0xFA.
		0xFA	Read 4 Bytes			
Scan for Device in Program Mode: DEVICE ID	Program	0xFD	DEVICE_ID	Read Block (up to 32 bytes)	String	MFR command supported by UCD devices. Ex.
						"UCD310128V1 0.1.0.0 010 131009"
	Program	0xE4	CMDS_DCDC_PA GED	Read only	Bitmask	Contains bitmask of paged DCDC supported commands in the firmware
	Program	0xE5	CMDS_DCDC_NO NPAGED	Read only	Bitmask	Contains bitmask of non paged DCDC supported commands in the firmware
	Program	0x E6	CMDS_PFC	R e a d	Bit ma sk	Contains bitmask of PFC supported commands in the firmware.
				o n l y		
	Program	0xE7	SETUP_ID	Read only	String	Special value that maps to a topology and how it is compensated within the Fusion Designer GUI. Ex. "VERSION1 LLC001"
Scan for Device in Program Mode: DEVICE CODE	Program	0xFC	-		-	Not applicable for UCD devices
Scan for Device in Program	Program	0xAD	-	-	-	Not applicable for UCD



Mode: IC DEVICE ID						devices	
Scan for Device in Program Mode: PMBUS REVISIO N	Pro gra m	0x9 8	PMBUS_REVI SION	R e a d B y t e	Byt e	Defined spec. <i>A</i> devices sup	by PMBus All PMBus oport it.
[Check] When a device is found, dump additional	Program	0x9A	MFR_MODEL	R/W Block	String	Ex. "UCD3138LLC EVM-028"	If this box is checked then after
commands		0X9B	MFR_REVISION	R/W Block	Str ing	Ex. "E3"	scans above are
	0)	0X9E	MFR_SERIAL	R/W Block	String	Ex. "SV001" – unique identifier	these commands will be
		0X99	MFR_ID	R/W Block	String	Ex. "TI"	read.
		0X9D	MFR_DATE	R/W Block	String	Ex. "14033" YYMMDD	
		0X9C	MFR_LOCATION	R/W Block	String	Ex. "Dallas, TX"	
Command ROM to execute its program (SendByte 0xF0 to Address 11) First Block	ROM	0xF0		Send Byte		Executes the First program flash	st Block of
Command ROM to execute its program (SendByte 0xF7 to Address 11) Second executable block	ROM	0xF7		Send Byte		For devices that multiple program command execu from the second third block for UC	support flashes this tes the flash block (or the CD3138 128).
Command Program to jump to ROM (SendByte	Program	0xD9	ENABLE_ROM	-	-	Send device to R and clears the checksum. 0xF9	OM mode



0xD9)						password protected.
Command Program to jump to ROM (SendByte 0xD9) with 0xF9 implemented	Program	0xF9	ENABLE_ROM2	W	String	When pressing the command to jump to ROM if 0xF9 is implemented the user must enter a password and it will be sent with 0xF9
Memory Debugger/Peek	Program	0xE2	PARM_INFO	W	Block	PARM_INFO and PARM VALUE are both
Poke	Program	0xE3	PARM_VALUE	R	Block	used. The first sets the address to be read and the second returns the value at that location.

7.11 Override commands

🚸 исрзххх / иср	9XXX Device GUI	
Settings		
Custom Mod	le	Tools
Override Cor	nmands 🚽	Scan Device in RO
Last ROM Found:	UCD31xx 64Rev1	Scan for Device in
ROM Info: Package ID:	ROM v4 IC v1 64-pin	Command ROM to
Last Program Foun	d:	Flash Checksum

Figure 102 - Access to Override Commands

In the previous "Section 7.10 Function Command Summary", a description was provided for the various commands used by the Device GUI. By default, the Device GUI assumes that certain MFR commands use a default hex code and are implemented a certain way. Sometimes this assumption is not valid and the user needs to override which command codes are used due to a conflict with another command having the same hex code. Assuming the implementation of the command is the same, the Device GUI provides a way to override or change the command code that the Device GUI assumes so that users can still benefit from the Device GUI. The following figure displays the available MFR commands that the user can override, assuming implementation has remained the same.



Override PMBus Command hex codes							
Override command code(s):							
Commands [Default Code	Override Code	2				
ENABLE_ROM_MODE	D9	0x d9	Override?				
PARM_INFO	E2	0x e5	Verride?				
PARM_VALUE	E3	0x e6	Verride?				
CMDS_DCDC_PAGED	E4	0x e1	Verride?				
CMDS_DCDC_NONPAG	GED E5	0x e2	✓ Override?				
CMDS_PFC	E6	0x e6	Override?				
ENABLE_ROM_MODE2	2 F9	0x f9	Override?				
DEVICE_ID	FD	0x fd	Override?				
			OK Cancel				

Figure 103 - four commands have been overridden

After overriding a link will appear on the top right saying "Override(4)" indicating the number of commands overridden. Clicking the link will launch the override screen again.

	×
Override(4)	
IC DEVICE ID PMBUS REVISION	
ress 11) Block 0 Block 1	
<u>; 88)</u>	

Figure 104 - Override in top right shown

8 API – Application Programming Interface

www.ti.com/tool/fusion_digital_power_api



There is a reusable API behind most of the functionality covered. It can be used via .NET: VB or C#. This can be used to automate tests or even create new custom GUIs. TI will provide binary libraries, source code for examples, and documentation.

9 Manufacturing Tool

www.ti.com/fusion-mfr-gui

When it is time for production there is another tool that has been used to speed up the process of configuring devices. It is called the Manufacturing GUI. This graphical tool can be used to run scripts on the devices and provide a pass/fail result. All functions done through the device GUI can be automated through the MFR GUI. Some of the functions included are downloading or updating firmware, importing a project file on to a device, writing serial numbers and MFR date, calibrating devices using instrumentation(GPIB, SCPI, USB) or manual measurements, testing the device's output and various other functions. Users can also develop their own functions to include in the manufacturing scripts.

10 Documentation and References

10.1 References

[1] PMBus[™] specification <u>http://PMBus.org/specs.html</u>.

ⁱ USB Interface Adapter EVM (HPA172)



Revision History

Version	Date	Comment		
SLUA676	26 November 2013	Initial Document		
SLUA676A	2 July 2014	Updated Device GUI screenshots		
		Updated Firmware download section		
		Added CCS conversion section		
		Added Override command section		
		Added Function command summary		
		Added device GUI checksum section		
		Added link for Fusion-API		
SLUA676A	January 2015	Include devices UCD3138128 and UCD3138A		
		Added section on device respins and program mode detection		
		Added section on partial dataflash download		



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