C2000Ware DigitalPower SDK

The DigitalPower SDK for C2000 microcontrollers (MCU) is a cohesive set of software infrastructure, tools, and documentation designed to minimize C2000™ MCU-based digital power system development time targeted for various AC-DC, DC-DC and DC-AC power supply applications. The software includes firmware that runs on C2000 digital power evaluation modules (EVMs) and TI designs (TIDs), which are targeted for solar, telecom, server, electric vehicle chargers and industrial power delivery applications. A copy of C2000Ware is provided as part of the SDK and offers device-specific drivers and support software to complete examples in sophisticated system applications. The Digital Power SDK provides all of the needed resources at every stage of development and evaluation in a digital power application.

The powerSUITE package is installed as part of the DigitalPower SDK. In order to utilize the powerSUITE graphical user interfaces (GUIs) and toolset, you need to ensure that you use Code Composer Studio™ (CCS) v9.3.0 or greater.

DigitalPower SDK requires:

- CCS v9.3.0 or newer
- C2000 Compiler v18.12.4 LTS or newer

Contents

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1 Package Structure

The C2000Ware DigitalPower SDK software package is organized into the directory structure shown in Table 1.

Table 1. DigitalPower SDK Root Directories

Directory Name	Description
.metadata	Contains the DigitalPower SDK resource explorer GUI files (Do not modify)
c2000ware	Contains the C2000Ware development software and documentation
docs	Contains the DigitalPower SDK package user guides and a document HTML page
libraries	Contains libraries with algorithm modules specific to digital power applications
powerSUITE	Contains set of digital power supply design software tools used to traverse through different design stage of various applications
solutions	Contains the development kits solutions for the C2000 devices targeting different application areas
uninstallers	Contains the DigitalPower SDK uninstaller

1.1 Documentation

Within DigitalPower SDK, there is an extensive amount of development documentation ranging from development kit hardware documentation to library user's guides. To assist with locating the necessary documentation, an HTML page is provided that contains a full list of all the docs in the DigitalPower SDK package. Locate this page in the "docs" directory.

1.2 C2000Ware

DigitalPower SDK contains the necessary software and support for C2000 microcontrollers. C2000Ware is a cohesive set of development software and documentation designed to minimize software development time. From device-specific drivers and libraries to device peripheral examples, C2000Ware provides a solid foundation to begin development and evaluation of your product.

To learn more about C2000Ware, visit www.ti.com/tool/c2000ware.

1.3 Libraries

The libraries included in DigitalPower SDK range from ramp generator and power measurement libraries to specialized software phase lock loop libraries as well as the SFRA ibrary. The libraries directory includes documentation and examples where applicable.

1.4 powerSUITE

powerSUITE is a suite of digital power supply design software tools for Texas Instruments' C2000 real-time microcontroller (MCU) family. powerSUITE helps power supply engineers drastically reduce development time as they design digitally-controlled power supplies based on C2000 real-time control MCUs. Many power supply designers are transitioning from analog-based power supply designs to digital-based designs and intuitive tools are needed to assist in the evaluation phase, the development phase, and the testing phase of the design.

powerSUITE consists of three tools designed to help engineers more easily traverse through the different design stages of a digital power supply systems:

- The **Solution Adapter** allows modification of existing code examples from TI's C2000 digital power library and allows for configuration for a custom digital power board design. This tool is now based on TI's System Configuration Tool instead of the previously used RTSC, GUI Composer v1 and XDCTools. The solution adapter steps through the process of selecting the power topology to adapt, selecting the relevant options for that topology (such as magnetic values), and allowing for customization of those options to adapt the solution to a custom design.

- The **Compensation Designer** allows the design of different styles of compensators (PID, 2p2z, 3p3z) to achieve the desired closed loop performance. The coefficients that need to be programmed on the device are generated by the Solution Adapter and can be copied into the code directly.

- The **Software Frequency Response Analyzer (SFRA)** enables the measurement of the open loop gain of a closed loop digitally controller power converter using software. This makes measurement of the bandwidth, the gain margin, and the phase margin of your power supply design quick and easy.

1.4.1   powerSUITE Solution Adapter GUI Migration to TI System Configuration Tool

As of C2000Ware_DigitalPower_SDK v3_00_00_00, the powerSUITE solution adapter GUI supported in the system solutions is now based on TI's System Configuration tool. There is a slight difference in the look and feel, but the overall operation and functionality of the tool is still the same. You will still be able to adapt the power topology by selecting relevant options and customizing the options to a custom design.

The previous version of the powerSUITE solution adapter GUI tool was based on legacy TI tools Real-Time Software Components (RTSC), GUI Composer v1 and XDCTools. The powerSUITE tool is now updated to use the TI's System Configuration Tool (SysConfig) to help capture custom power topology options and output a header file with the custom settings for inclusion in the project. The SysConfig tool is delivered integrated and native to Code Composer Studio (CCS) whereas the previous dependencies (RTSC, XDCTools, and GUI Composer v1) were external to CCS and required installation before using the C2000Ware DigitalPower SDK.

With the move to the SysConfig tool, the Compensation Designer tool now reads and writes the digital compensator coefficients used by the solution adapter SysConfig based tool to a JSON file instead of an XML file. The functionality of the Compensation Designer tool remains the same in the context of the solution adapter. The only change is the file type used by the tool.

With the use of the SysConfig based solution adapter tool, there is now the addition of a <solution>_user_settings.h to the project files. This file now contains the information that previously resided in the User Code Section in the <solution>_settings.h file. The powerSUITE generated settings are now separated from user-defined settings for the solution by splitting the content into the two aforementioned files.

While users are able to leverage SysConfig's ability to preview code changes based on GUI inputs, it should be noted that in order to update to the project files, you will need to rebuild the project.

For additional support using the new powerSUITE solution adapter tool, see the FAQ page in the TI Resource Explorer content for the software product C2000Ware DigitalPower SDK available on the web: http://dev.ti.com/tirex/#/

2   DigitalPower SDK GUI

DigitalPower SDK provides a graphical user interface (GUI) for intuitive navigation of software, libraries, user's guides, and other package content. The GUI is integrated into Code Composer Studio (CCS) upon installation. Within Code Composer Studio (CCS) v9.3.0 or newer, go to "View → Resource Explorer" to locate the C2000Ware DigitalPower SDK GUI explorer.

DigitalPower SDK uses the new online Resource Explorer, which includes many updated features. This includes full package navigation on the web or in CCS without requiring installation of DigitalPower SDK.

View DigitalPower SDK Resource Explorer on the web: http://dev.ti.com/tirex/#/

3   Updating DigitalPower SDK

Within the DigitalPower SDK installation directory, an update checking application, "DigitalPowerSDKUpdater.exe", is provided to check for a newer version of the DigitalPower SDK. When the updater is run, a window is displayed in order to state that the current version installed is the newest version or that a newer version is available for download. When a new version is available, the option is given to download and install the new version. The application proceeds to download the latest DigitalPower SDK installer to the specified download directory. Upon completing the download, the installer automatically runs and continues with the standard installer steps.

4 Code Composer Studio

Code Composer Studio is an integrated development environment (IDE) that supports TI's Microcontroller and Embedded Processors portfolio. Code Composer Studio comprises a suite of tools used to develop and debug embedded applications. The latest version of Code Composer Studio can be obtained at the following link: http://www.ti.com/ccstudio.

All projects and examples in the DigitalPower SDK are built for and tested with TI's Code Composer Studio. Although Code Composer Studio is not included with the DigitalPower SDK installer, it is easily obtainable in a variety of versions.

> **NOTE:** CCS version 9.3.0 is the minimum required version to use the DigitalPower SDK. Free licenses are available for download.

Revision History

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

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