CE220823 - PSoC 6 MCU SMIF Memory Write and Read Operation

Objective

This example demonstrates interfacing with an external NOR flash memory in Quad-SPI mode using the Serial Memory Interface (SMIF) block in PSoC® 6 MCU and ModusToolbox™ IDE.

Requirements

Tool: ModusToolbox™ IDE 1.1

Programming Language: C

Associated Parts: All PSoC 6 MCU parts

Related Hardware: PSoC 6 BLE Pioneer Kit, PSoC 6 WiFi-BT Pioneer Kit, PSoC 6 Wi-Fi BT Prototyping Kit

Overview

Demonstrates interfacing with an external NOR flash memory using the Serial Memory Interface (SMIF) block in Quad Serial Peripheral Interface (QSPI) mode. This example also checks the integrity of the read data against written data.

Hardware Setup

This example uses the PSoC 6 WiFi-BT Pioneer Kit's default configuration. Refer to the kit guide to ensure the kit is configured correctly. You can also use PSoC 6 BLE Pioneer Kit or PSoC 6 Wi-Fi BT Prototyping Kit by importing the application for that kit.

Note: The PSoC 6 BLE Pioneer kit and the PSoC 6 WiFi-BT Pioneer kit ship with KitProg2. ModusToolbox only works with KitProg3. Before using this code example, make sure that the kit is upgraded to KitProg3. See ModusToolbox Help > ModusToolbox IDE Documentation > User Guide; section PSoC 6 MCU KitProg Firmware Loader. If you do not upgrade, you will see an error like "unable to find CMSIS-DAP device" or "KitProg firmware is out of date".

Software Setup

This example uses a serial terminal program. Install one on your PC if you don't have one. The instructions use Tera Term.

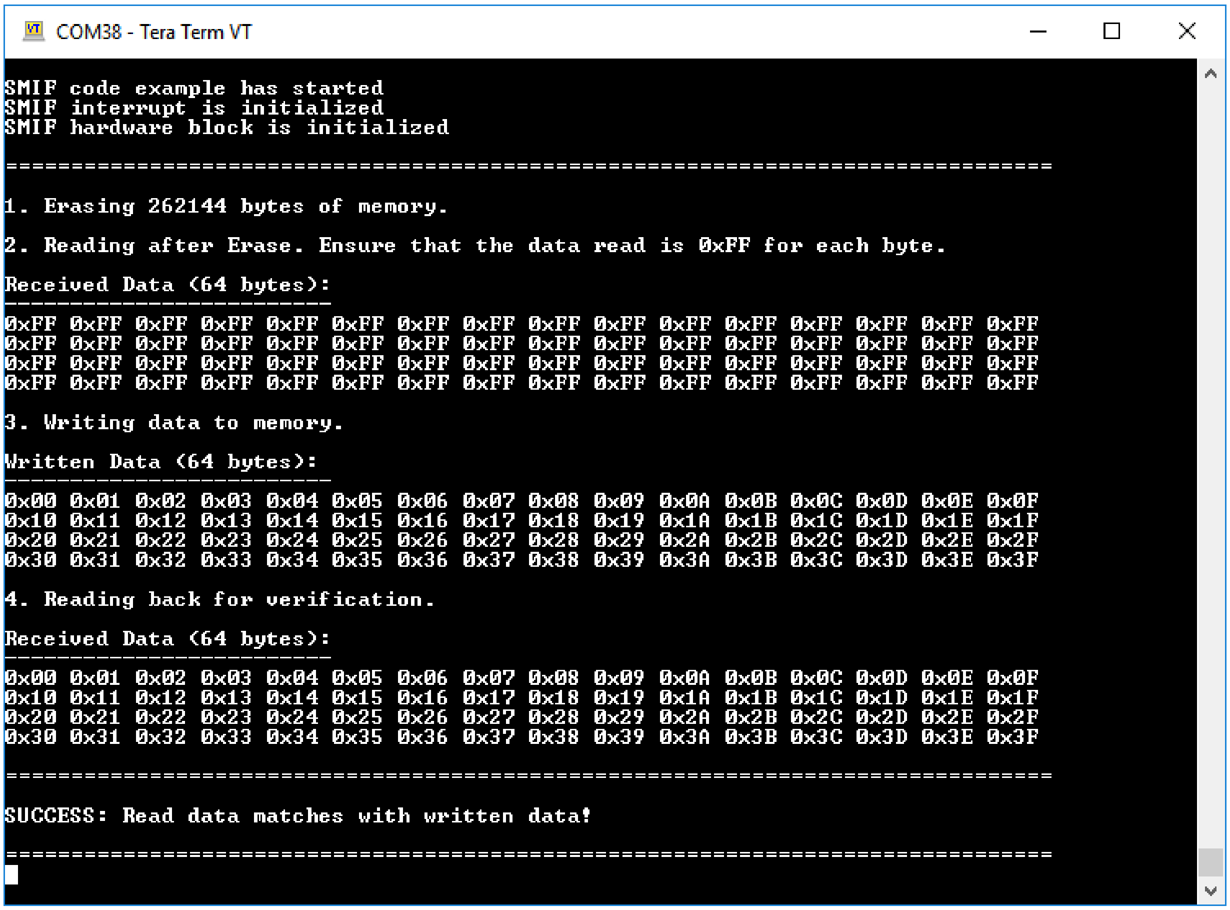
Operation

1. Connect the Pioneer board to your PC using the provided USB cable through the USB connector.
2. Open a terminal program and select the KitProg COM port. Set the other serial port parameters as follows:
    a) Baud Rate: 115200
    b) Data: 8 bits
    c) Parity: None
    d) Stop: 1 bit
    e) Flow Control: None
3. Import the application into a new workspace. See KBA225201.
4. Build the application. Choose **Project** > **Build All**.
5. Program the PSoC 6 MCU device. Select the **mainapp** project. In the **QuickPanel**, scroll down and click the **Program Kitprog3** item.

6. Press and release the USER button on the kit when prompted on the terminal window. This is required only the first time the example is run on a kit to enable Quad mode in the memory. Enabling Quad mode is required for communicating in QSPI mode.
7. Observe the KIT_LED1 to determine the status of the SMIF operation.
   a) LED is blinking: Successful operation
   b) LED is on : Failed operation

Make sure that debug messages displayed in the terminal window are as expected. Figure 1 is a snapshot of the serial terminal output.

Figure 1. Serial Terminal Output



Debugging

You can debug the example to step through the code. Use the **Debug (KitProg3)** configuration. See KBA224621 to learn how to start a debug session with ModusToolbox IDE.

Design and Implementation

The QSPI resource implements a SPI-based communication for interfacing external memory devices with PSoC. QSPI resource is configured with four data lines and single slave select line. This example writes 64 bytes of data to external memory in Quad SPI mode. The written data is read back to check its integrity. The UART resource outputs debug information to a terminal window. A user LED indicates the status of read and write operation.

The firmware uses source code (*cycfg_qspi_memslot.c* and *cycfg_qspi_memslot.h* files) generated from the QSPI Configurator. This source code defines data structures that hold the memory configuration.

Resources

Table 1 lists the resources used in this example, and how they are used in the design.

Table 1. ModusToolbox Resources

Resource	Alias	Purpose	Non-Default Settings
Quad Serial Memory Interface (QSPI) 0	KIT_QSPI	Communicate with QSPI NOR Flash	Figure 2, Figure 3
Serial Communication Block (SCB) 5	KIT_UART	UART to transmit debug data	Figure 4
General Purpose Input / Output (GPIO)	KIT_BTN1	User button for enabling Quad mode	Figure 5
General Purpose Input / Output (GPIO)	KIT_LED1	LED to indicate SMIF transfer status	Figure 6

Parameter Settings

Non-default settings for each resource is outlined in red in the following figures.

Figure 2 shows the KIT_QSPI resource parameter settings.

ModusToolbox supports a stand-alone application called QSPI Configurator (star-marked section in Figure 2), which enables a user to configure the memory commands through a Graphical User Interface (GUI). This application is invoked from the *Parameters* pane of the QSPI resource under *Peripherals* tab. Configure the device as shown in the below image. Save the file in the *GeneratedSource* folder.

Figure 2. QSPI Resource Parameter Settings

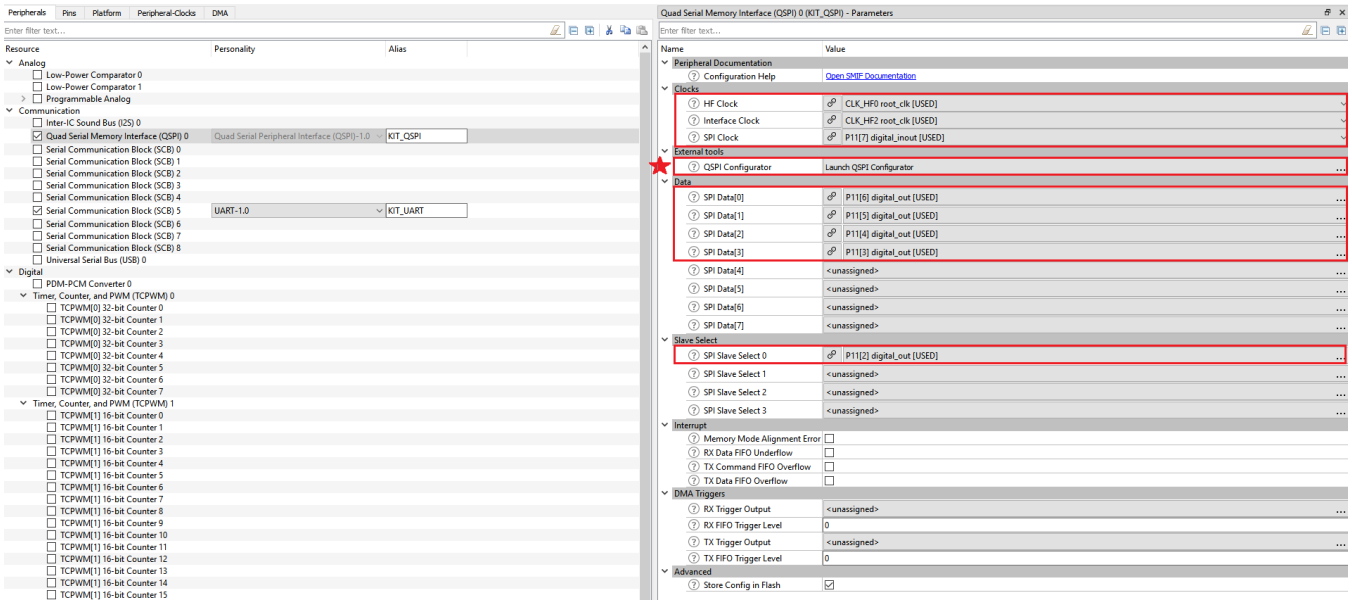


Figure 3 shows the QSPI Configurator.

Figure 3. QSPI Configurator

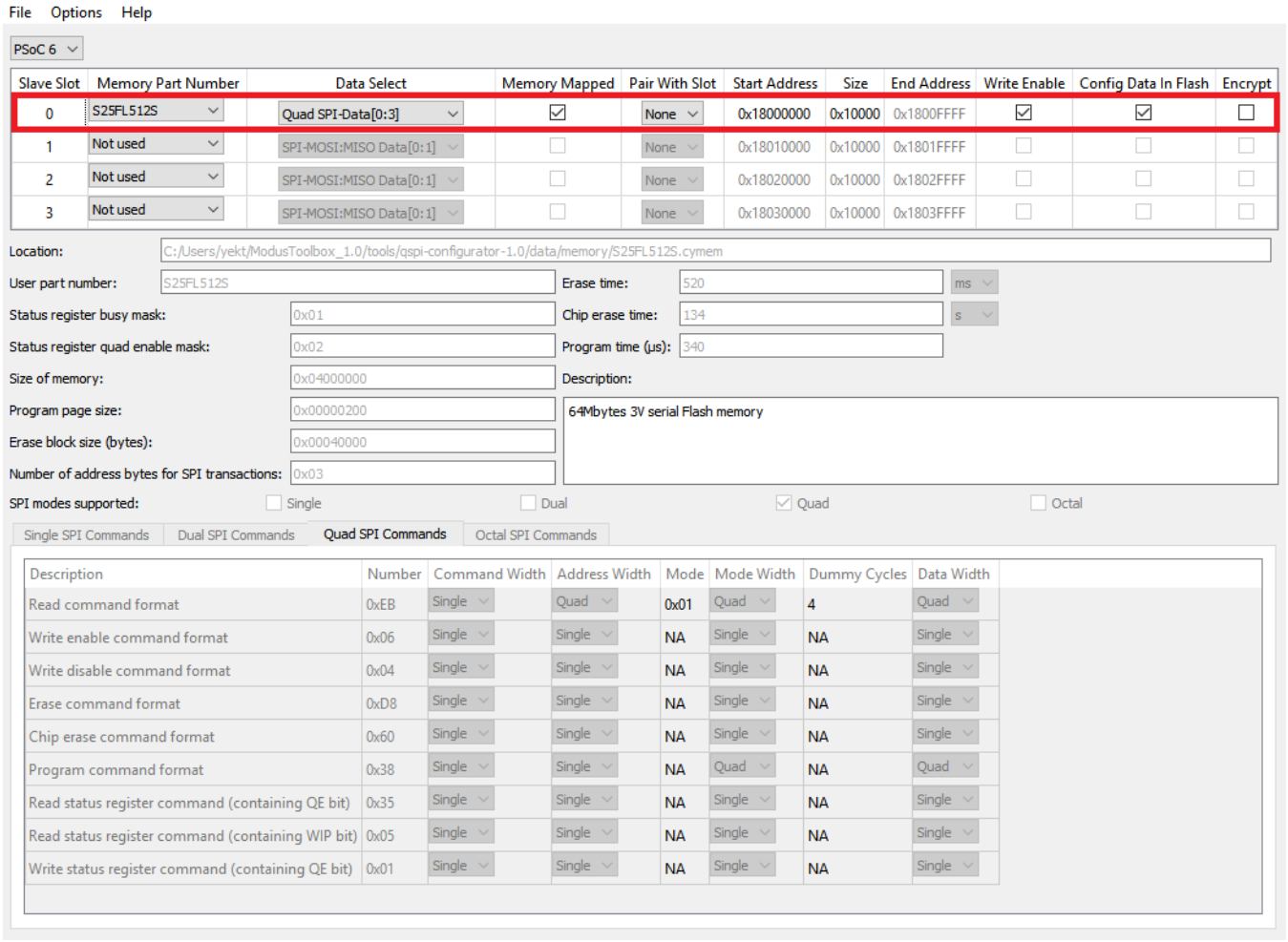


Figure 4. KIT_UART Configuration

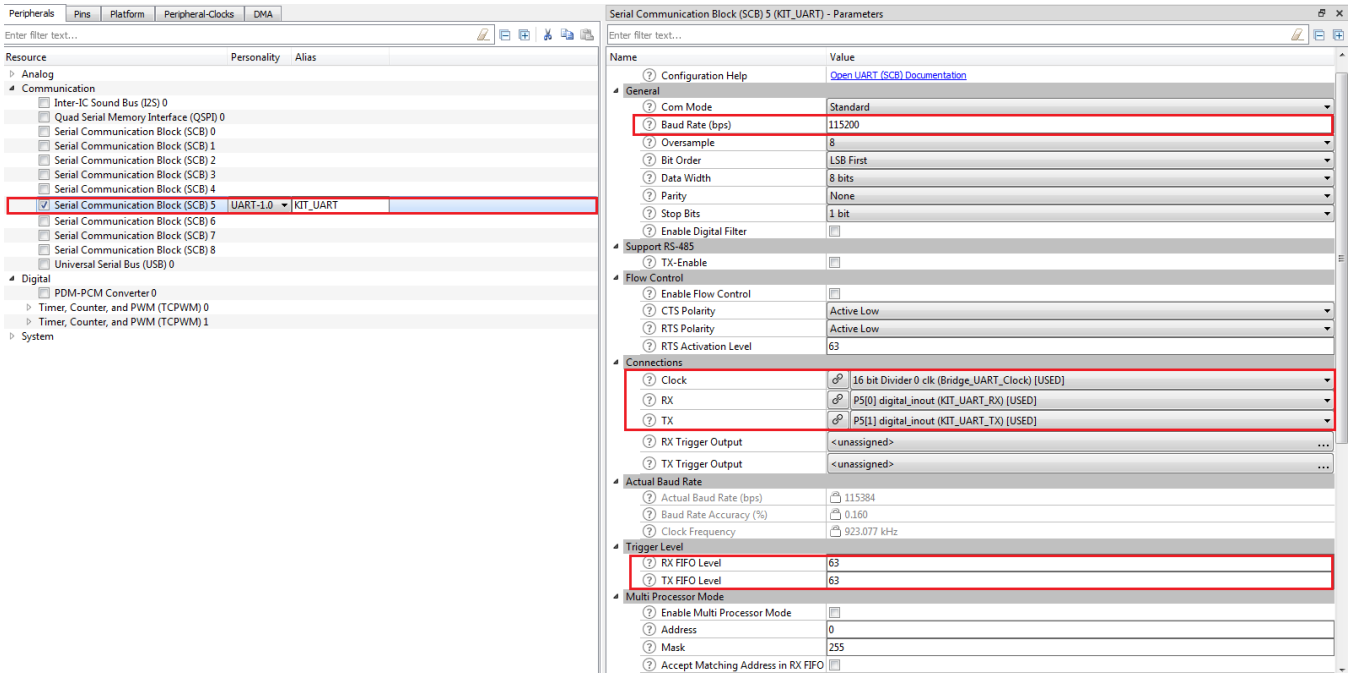


Figure 5. KIT_BTN1 Configuration

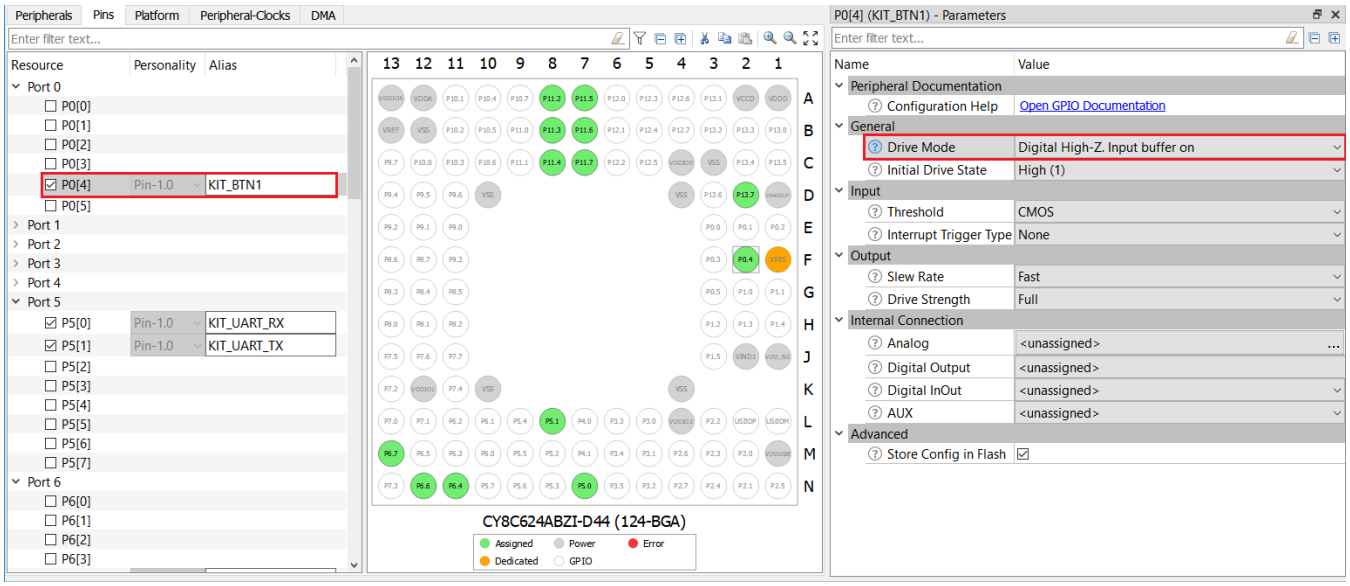
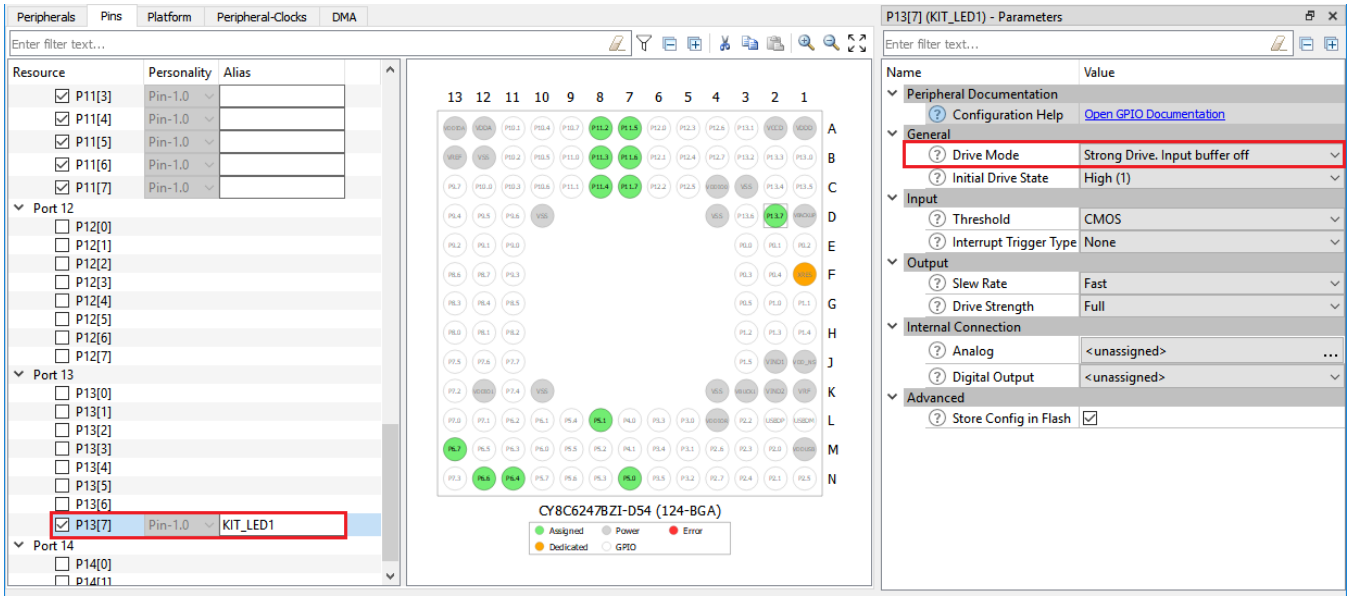


Figure 6. KIT_LED1 Configuration



Related Documents

For a comprehensive list of PSoC 6 MCU resources, see KBA223067 in the Cypress community.

Application Notes	
AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity	Describes PSoC 6 MCU with BLE Connectivity devices.
AN221774 – Getting Started with PSoC 6 MCU	Describes PSoC 6 MCU devices and how to build your first ModusToolbox application and PSoC Creator project.
AN215656 – PSoC 6 MCU: Dual-CPU System Design	Describes the dual-CPU architecture in PSoC 6 MCU and shows how to build a simple dual-CPU design.
Code Examples	
CE218472 - PSoC 6 MCU Comparing External Voltages Using a Low-Power Comparator	
Visit the Cypress GitHub site for a comprehensive collection of code examples using ModusToolbox IDE	
Device Documentation	
PSoC 6 MCU: PSoC 63 with BLE Datasheet	PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual
Development Kit Documentation	
CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit	
CY8CKIT-062-WiFi-BT PSoC 6 WiFi-BT Pioneer Kit	
CY8CPROTO-062-4343W PSoC 6 Wi-Fi BT Prototyping Kit	
Tool Documentation	
ModusToolbox	The Cypress IDE for IoT designers

Cypress Resources

Cypress provides a wealth of data at www.cypress.com to help you to select the right device, and quickly and effectively integrate the device into your design.
For the PSoC 6 MCU devices, see KBA223067 in the Cypress community for a comprehensive list of PSoC 6 MCU resources.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	6369719	YEKT	11/2/2018	Initial public release
*A	6484271	YEKT	4/16/2019	Code example updated for ModusToolbox 1.1
*B	6544943	VAIR	4/16/2019	Code example has been revised completely for clarity and correctness

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198 Champion Court
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