

Objective

This example demonstrates the write and read operations to the Serial Memory Interface (SMIF) in PSoC® 6 MCU using 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 WiFi-Prototyping Kit](#)

Overview

Demonstrates read/write operation to external memory by using Serial memory interface (SMIF) 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 WiFi-BT Stamp Board 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 If you do not upgrade, you will see an error like “unable to find CMSIS-DAP device” or “KitProg firmware is out of date”.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 terminal emulator 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: 115200bps
 - 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. Observe the KIT_LED2 to determine the status of the SMIF operation.

- Make sure that debug messages display in the terminal window as expected.

Figure 1 is a snapshot of the debug UART terminal output.

Figure 1. Debug UART Terminal Output



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 SMIF resource implements a SPI-based communication for interfacing external memory devices with PSoC. SMIF resource is configured with four data lines and single slave select line. This example writes 64 bytes of data to external memory in single 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 is also used to indicate 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 SMIF Configurator. This source code provides declarations for the SMIF driver memory configuration.

Resources

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

Table 1. ModusToolbox Resources

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 SMIF through a GUI-based interface. This application is invoked from the SMIF resource. Configure the device as shown in the below image. Save the file in the *GeneratedSource* folder.

Figure 2. SMIF Resource Parameter Settings

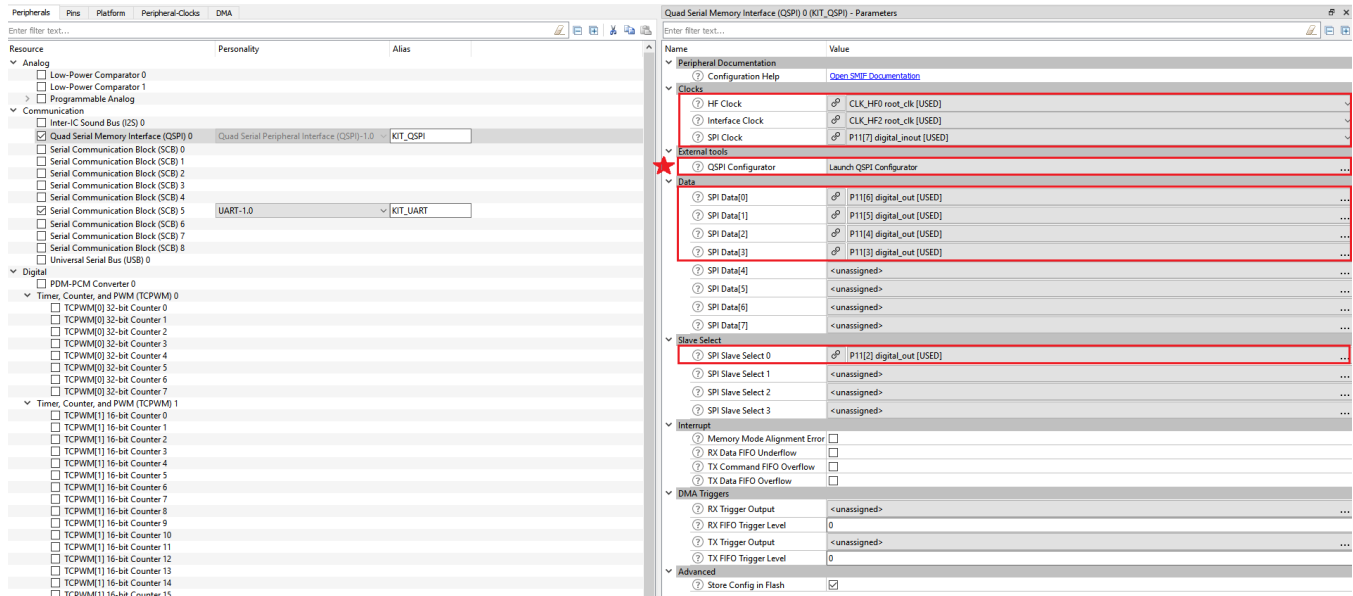


Figure 3 shows the QSPI Configurator.

Figure 3. QSPI Configurator

File Options Help

PSoC 6 ▾

Slave Slot	Memory Part Number	Data Select	Memory Mapped	Pair With Slot	Start Address	Size	End Address	Write Enable	Config Data In Flash	Encrypt
0	S25FL512S ▾	Quad SPI-Data[0:3] ▾	<input checked="" type="checkbox"/>	None ▾	0x18000000	0x10000	0x1800FFFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1	Not used ▾	SPI-MOSI:MISO Data[0:1] ▾	<input type="checkbox"/>	None ▾	0x18010000	0x10000	0x1801FFFF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Not used ▾	SPI-MOSI:MISO Data[0:1] ▾	<input type="checkbox"/>	None ▾	0x18020000	0x10000	0x1802FFFF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Not used ▾	SPI-MOSI:MISO Data[0:1] ▾	<input type="checkbox"/>	None ▾	0x18030000	0x10000	0x1803FFFF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Location: C:/Users/yejt/ModusToolbox_1.0/tools/qspi-configurator-1.0/data/memory/S25FL512S.cymem

User part number: S25FL512S Erase time: 520 ms ▾

Status register busy mask: 0x01 Chip erase time: 134 s ▾

Status register quad enable mask: 0x02 Program time (μs): 340

Size of memory: 0x04000000 Description: 64Mbytes 3V serial Flash memory

Program page size: 0x00000200

Erase block size (bytes): 0x00040000

Number of address bytes for SPI transactions: 0x03

SPI modes supported: ☐ Single ☐ Dual ☒ Quad ☐ Octal

Single SPI Commands								Dual SPI Commands								Quad SPI Commands								Octal SPI Commands							
Description	Number	Command Width	Address Width	Mode	Mode Width	Dummy Cycles	Data Width																								
Read command format	0xEB	Single ▾	Quad ▾	0x01	Quad ▾	4	Quad ▾																								
Write enable command format	0x06	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Write disable command format	0x04	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Erase command format	0xD8	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Chip erase command format	0x60	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Program command format	0x38	Single ▾	Single ▾	NA	Quad ▾	NA	Quad ▾																								
Read status register command (containing QE bit)	0x35	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Read status register command (containing WIP bit)	0x05	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								
Write status register command (containing QE bit)	0x01	Single ▾	Single ▾	NA	Single ▾	NA	Single ▾																								

Figure 4. KIT_UART Configuration

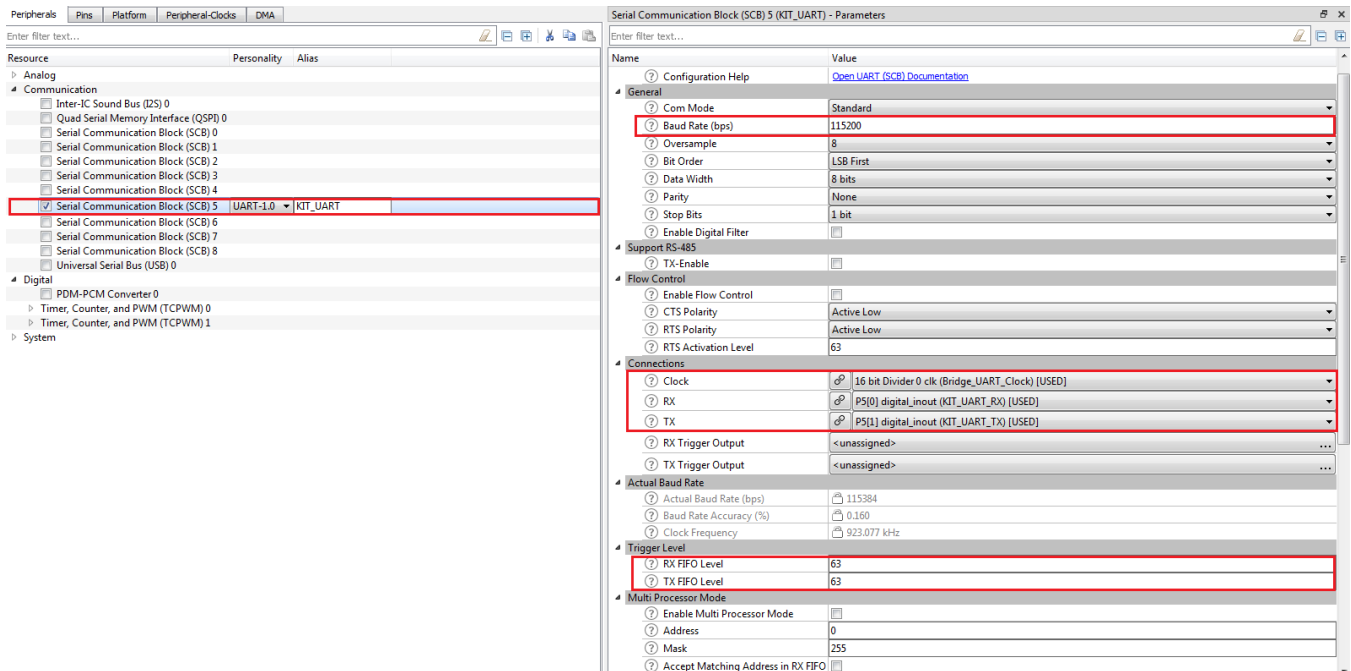
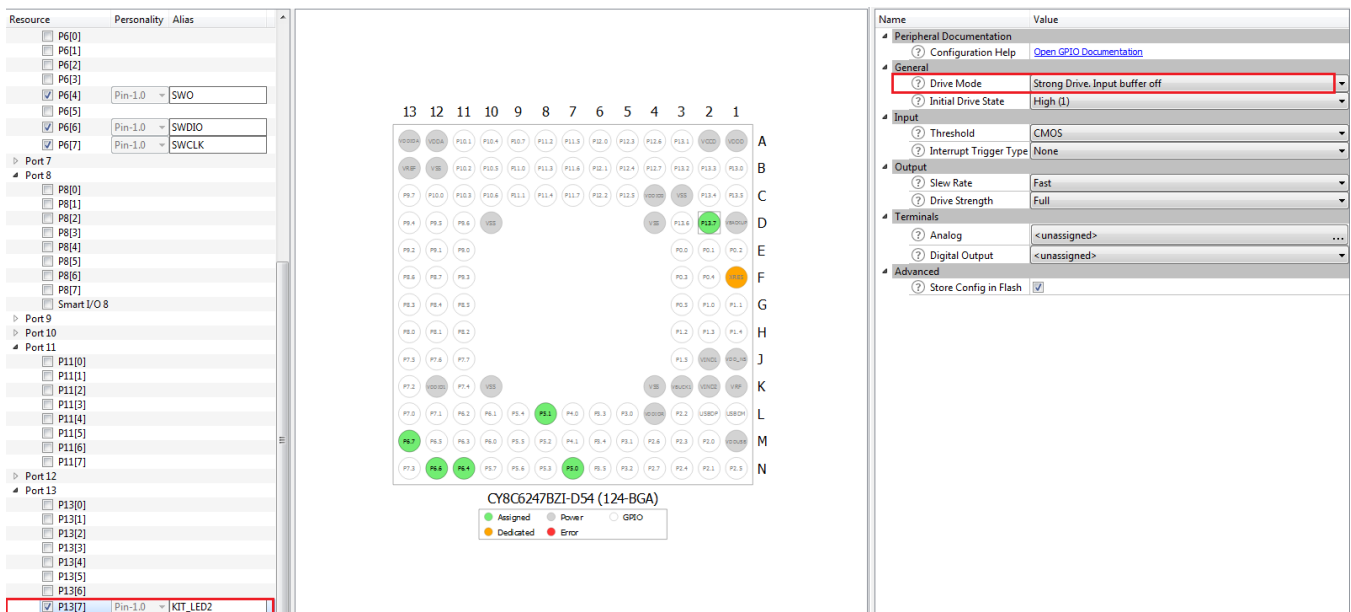


Figure 5. KIT_LED2 Configuration



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

Document Title: CE220823 - PSoC 6 MCU SMIF Memory Write and Read Operation

Document Number: 002-25536

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	6369719	YEKT	11/2/2018	Initial public release
*A	6484271	YEKT	2/20/2019	Code example updated for ModusToolbox 1.1

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