CE220541 – PSoC 6 MCU SCB EZI2C

Objective

This code example demonstrates the implementation of an EZI2C Slave using the SCB resource on the PSoC® 6 MCU, using ModusToolbox™ IDE. It also demonstrates how to control the intensity of an LED using a TCPWM.

Requirements

Tool: ModusToolbox™ IDE 1.1; Bridge Control Panel

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-BT Prototyping Kit

Overview

This code example implements an I^2C Slave using an SCB resource (configured as EZI2C), which receives the data required to control an LED from an I^2C Master. In this example, a host PC running Cypress' Bridge Control Panel (BCP) software is used as the I^2C Master. LED control is implemented using a TCPWM resource (configured as PWM). The intensity of the LED is controlled by changing the duty cycle of the PWM signal.

Hardware Setup

This example uses the kit's default configuration. Refer to the kit guide to ensure the kit is configured correctly.

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 If you do not upgrade, you will see an error like "unable to find CMSIS-DAP device" or "KitProg firmware is out of date".

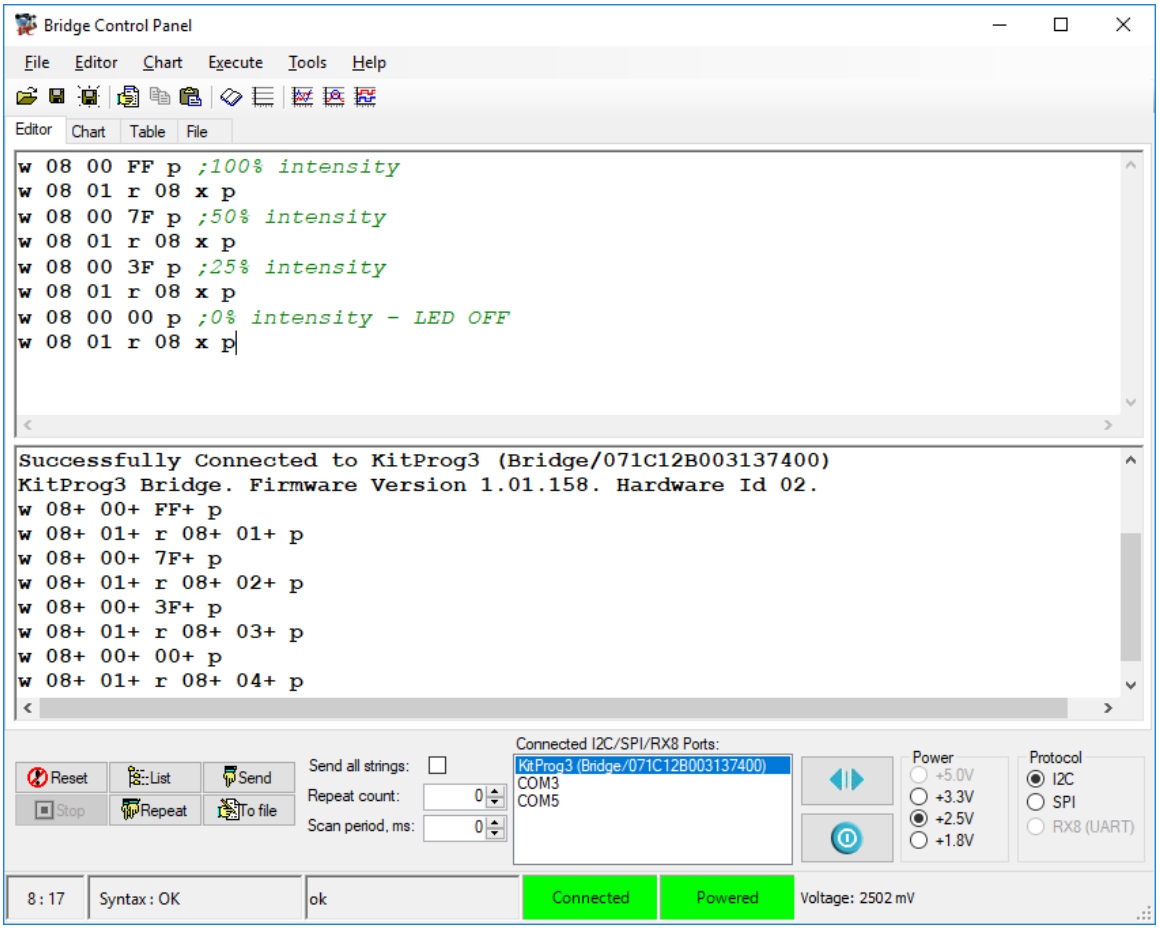
Software Setup

This section describes how to set up the BCP software for transmitting and receiving data over I^2C.

The BCP software is installed automatically as part of the PSoC Programmer installation. Follow these steps to configure BCP:

1. Open the BCP from **Start** > **All Programs** > **Cypress** > **Bridge Control Panel <version>** > **Bridge Control Panel <version>.**
2. Select **KitProg3/<serial_number>** under **Connected I2C/SPI/RX8 Ports** (see Figure 1). Note that the PSoC 6 Kit must be connected to the USB port of your computer.

Figure 1. Bridge Control Panel



3. Select **Tools** > **Protocol Configuration**, navigate to the **I2C** tab, and set the **I2C speed** to '100 kHz'. Click **OK**.

BCP is now ready for transmitting and receiving data.

Operation

1. Connect the kit to your PC using the provided USB cable.
2. Import the code example into a new workspace. If you aren't familiar with this process, see KBA225201.
3. Program the PSoC 6 MCU device. In the project explorer, select the **mainapp** project. In the Quick Panel, scroll to the **Launches** section and click the **Program (KitProg3)** configuration.
4. Configure the BCP software as described in the section Software Setup.
5. In the **Editor** tab of BCP, type the command to send LED intensity data and then click **Send**. Observe that the LED turns ON with the specified intensity.

   For example, sending the command '`w 08 00 FF p`' will turn the LED ON with full intensity; sending the command '`w 08 00 00 p`' will turn the LED OFF.
6. Type the command '`w 08 01 r 08 x p`' to read the number of Write operations performed after device program/reset.

Debugging

You can debug the example to step through the code. Use **Debug (KitProg3)** configuration. If you are unfamiliar with how to start a debug session with ModusToolbox IDE, see KBA224621.

Design and Implementation

In this example, EZI2C is configured with a 2-byte buffer (memory), which can be accessed by the I²C Master. The first byte is writable and holds the LED intensity and the second byte, which is read-only, holds the number of Write operations performed after the device reset.

EZI2C allows an I²C Master to either access the individual byte from the Slave memory (by specifying the memory address in the Write command) or all memory bytes at once.

To control the intensity of the LED, a PWM resource with a period value of 255 is used. The duty cycle of the PWM resource is controlled in firmware and specified by the I²C Master. Changing the duty cycle of the PWM signal will result in change in the LED intensity. The intensity range in this example is 0x01 to 0xFF; 0x00 turns the LED OFF.

Resources and Settings

Table 1 lists some of the ModusToolbox resources used in the example, and how they are used in the design. The *design.modus* file contains all the configuration settings. For example, for pin usage and configuration, open the **Pins** tab of the design file.

To see all the settings, review the *design.modus* file in the project.

Table 1. ModusToolbox Resources

Resource	Alias	Purpose	Non-default Settings
SCB3	KIT_I2C	Provide I2C communication between Master and Slave	**Clock:** 8 bit Divider 0 clk **SCL**: P6[0] **SDA**: P6[1]
TCPWM[0] Counter 3	KIT_LED2_PWM	Generate the PWM signal	**Clock:** 8 bit Divider 1 clk **Period:** 255u **Compare**: 0u
GPIO P13[7]	KIT_LED2	Drive the PWM signal to LED	**Drive Mode:** Strong Drive, Input buffer off **Digital Output**: TCPWM[0] 32-bit Counter 3 pwm_n

Reusing This Example

This example is configured for the supported kit(s). To use the design on a different PSoC 6 MCU kit, import the application for that kit. If you are unsure how to import an application, see KBA225201. If changing to a different kit, you may need to reassign pins.

Table 2. Device and Pin Mapping Across PSoC 6 MCU Kits

Kit Name	Device Used	LED	I2C_SCL	I2C_SDA
CY8CKIT-062-WiFi-BT	CY8C6247BZI-D54	P13[7]	P6[0]	P6[1]
CY8CKIT-062-BLE	CY8C6347BZI-BLD53	P13[7]	P6[0]	P6[1]
CY8CPROTO-062-4343W	CY8C624ABZI-D44	P13[7]	P6[0]	P6[1]

In some cases, a resource used by a code example (for example, a peripheral) is not supported on another device. In that case, the example will not work. If you build the code targeted at such a device, you will get errors. See the device datasheet for information on which resources a device supports.

Related Documents

Application Notes	
AN221774 – Getting Started with PSoC 6 MCU	Describes PSoC 6 MCU devices and how to build your first ModusToolbox application and PSoC Creator project
AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity	Describes PSoC 6 MCU with BLE Connectivity 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	
Visit the Cypress GitHub site for a comprehensive collection of code examples using ModusToolbox IDE	
Device Documentation	
PSoC 6 MCU: PSoC 62 Datasheet	PSoC 6 MCU: PSoC 62 Architecture Technical Reference Manual (TRM)
PSoC 6 MCU: PSoC 63 with BLE Datasheet	PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual
Development Kits	
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 IDE	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
**	6369410	SNVN	11/21/2018	New code example
*A	6481994	SNVN	02/06/2019	Code example updated for ModusToolbox 1.1

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