CE220818 - PSoC 6 MCU I2C Master

Objective

This example demonstrates the use of I2C SCB (Serial Control Block) Component for PSoC® 6 MCU in master mode. Three different subprojects show the use of Peripheral Driver Library (PDL) functions to communicate with I²C and EzI2C slave.

Overview

The I²C master for PSoC 6 MCU is designed to send command packets to control the RGB LED color on the slave. Three different projects developed in this example are: I²C master using high-level PDL functions, I²C master using low-level PDL functions, and I²C master communication with EzI2C slave.

Requirements

Tool: PSoC Creator™ 4.2

Programming Language: C (ARM® GCC 5.4-2016-q2-update, ARM MDK 5.22)

Associated Parts: All PSoC 6 MCU parts

Related Hardware: CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit

Design

In all three projects, the ARM Cortex®-M4 (CM4) core acts as a master and the Cortex-M0 (CM0+) core acts as a slave. Different pins are configured for SCL and SDA for master and slave. Master sends command packets to control the color of an RGB LED connected to the slave. In this document, master-related Components are explained.

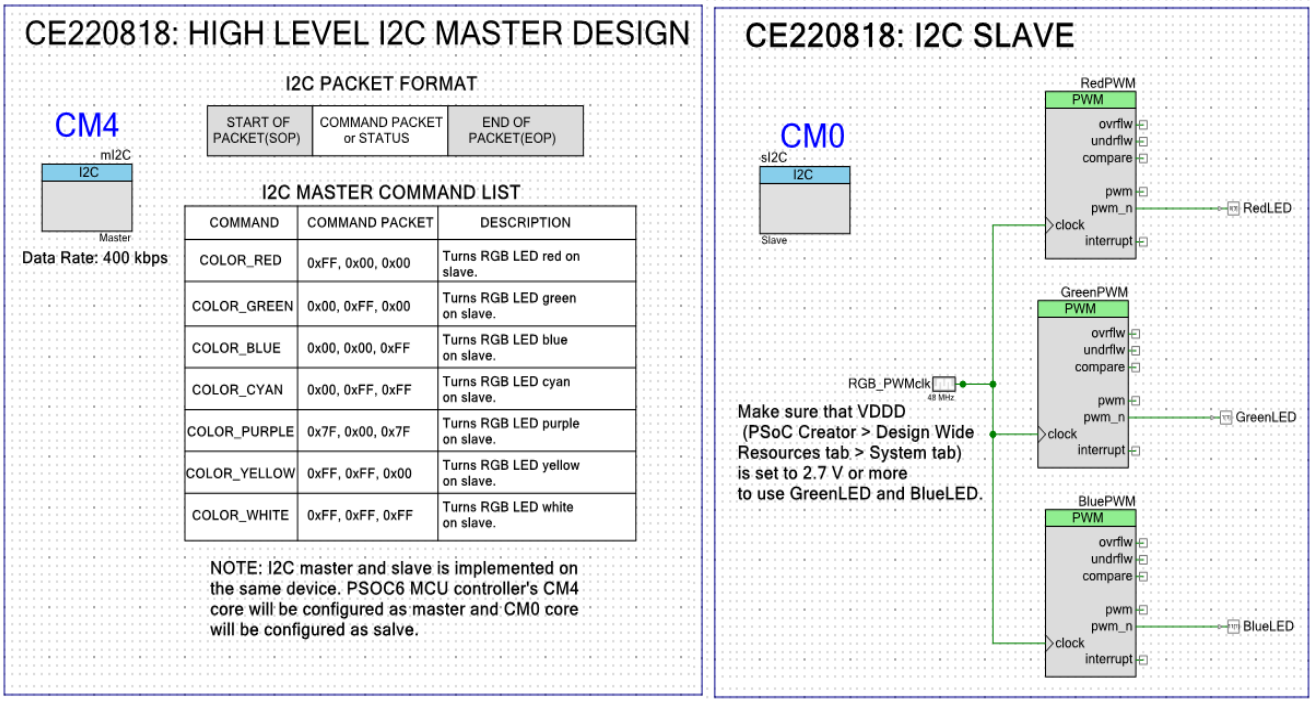
The master APIs are divided into two categories: **Master High-Level** and **Master Low-Level**. Refer PDL documentation to know more about **High-Level** and **Low-Level** functions. To open PDL documentation, right click on the I2C Component in PSoC Creator schematics window and click **Open PDL Documentation.**

The SCB I2C PSoC Creator Component is used in all three I2C master example projects. The master sends different command packets to the slave every two seconds. A command packet has the information to set the compare value for three PWM signals that controls the color of the RGB LED connected to the slave.

I2C Master Using High-Level Functions

The I2C master shown in Figure 1 has mI2C (SCB_I2C_PDL) Component configured for master mode and sI2C (SCB_I2C_PDL) Component configured for slave mode at 400-kbps speed. I2C master design uses high-level PDL functions to communicate with the slave.

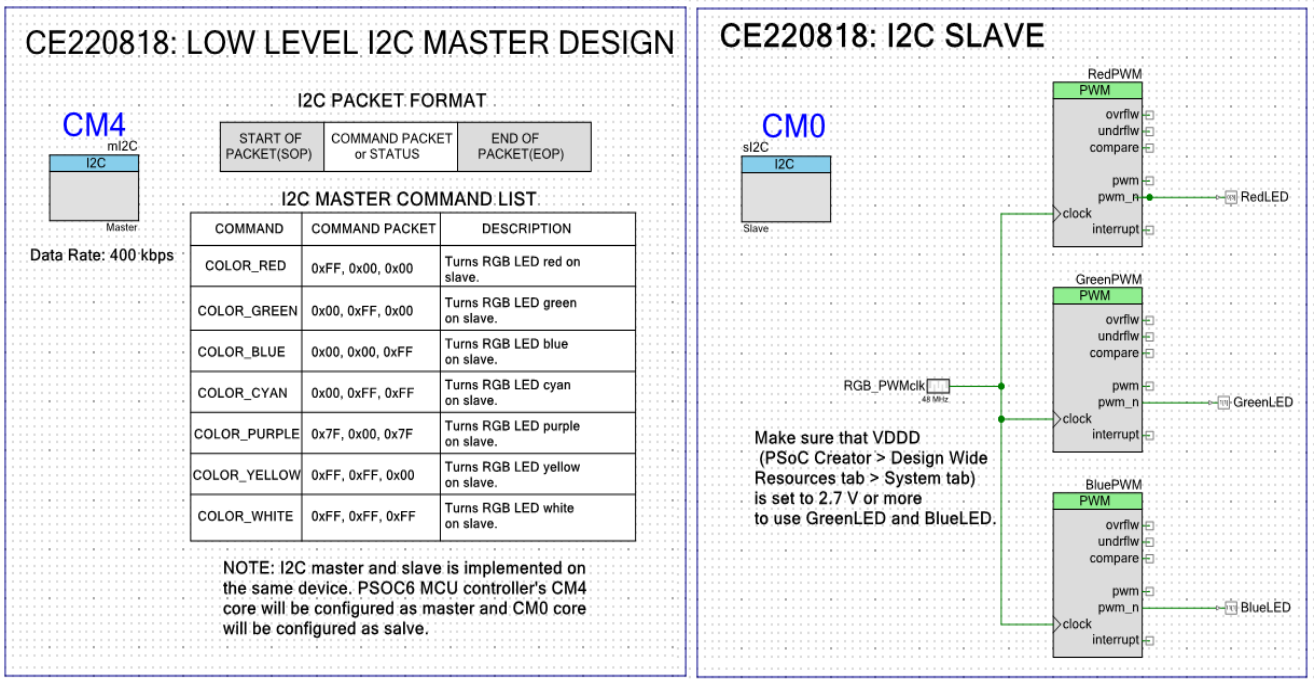
Figure 1. I2C Master and Slave Schematic for High-Level Design



I2C Master Using Low-Level Functions

The I2C master shown in Figure 2 has mI2C (SCB_I2C_PDL) Component configured for master mode and sI2C (SCB_I2C_PDL) Component configured for slave mode at 400-kbps speed. It uses low-level PDL functions to communicate with the slave.

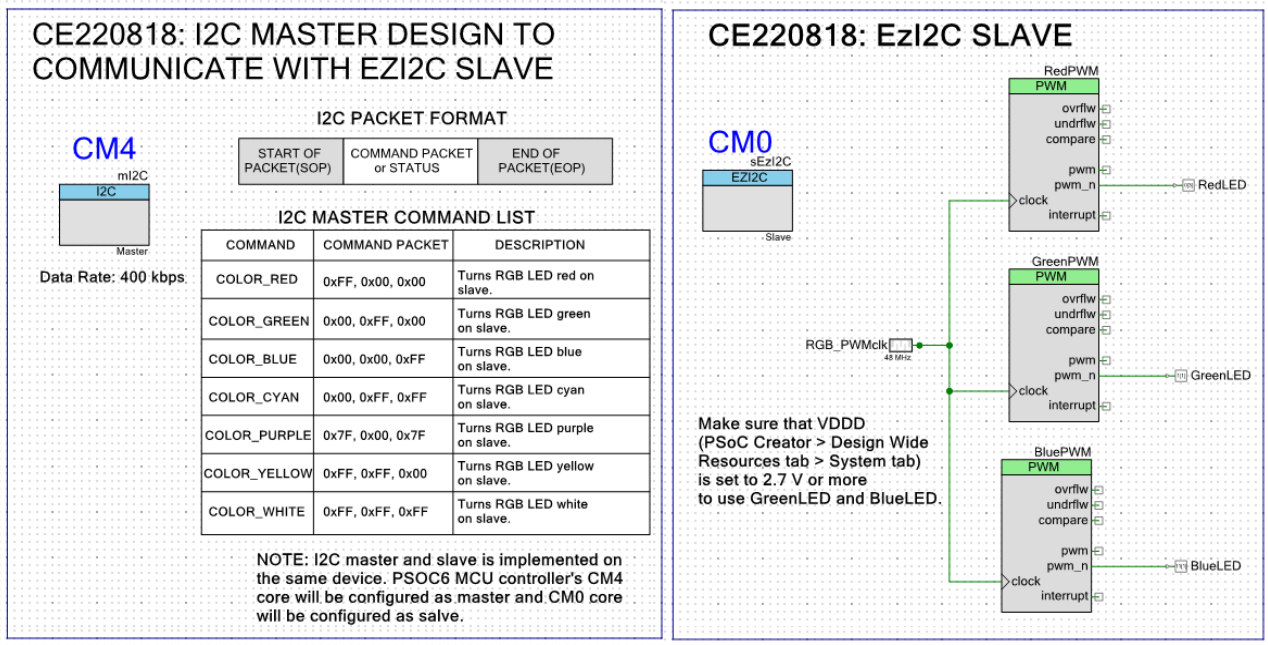
Figure 2. I2C Master and Slave Schematic for Low-Level Design



I2C Master for Communication with EzI2C Slave

The I2C master shown in Figure 3 has the mI2C (SCB_I2C_PDL) Component configured for master mode and sEzI2C (SCB_EZI2C_PDL) Component configured for slave mode at 400-kbps speed. PDL functions are used to communicate with the EzI2C slave.

Figure 3. I2C Master and EzI2C Slave Schematic



Design Considerations

This code example is designed to run on CY8CKIT-062-BLE with PSoC 6 MCU. To port the design to other devices and kits, you must change the target device in Device Selector, and change the pin assignments in the *cydwr* settings.

I2C master projects designed in this example can be used to communicate with other slave devices not located on the same board. Interrupts to be enabled are shown in Table 3.

Hardware Setup

The code example works with the default settings on the CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit. If the settings are different from the default values, see the 'Selection Switches' table in the kit guide to reset to the default settings.

Table 2 lists the PSoC Creator pin connection settings required on the CY8CKIT-062-BLE Kit. Since the master and slave are on the same device, pins related to both Components are shown in Table 2.

Jumper wires are used to establish connection between the master and slave on CY8CKIT-062-BLE Kit. P6[0] is connected to P9[0] and P6[1] is connected to P9[1].

Operation

1. Connect CY8CKIT-062-BLE to a USB port on your PC.
2. Connect jumper wires as explained in hardware setup.
3. Build and program each I2C master project into CY8CKIT-062-BLE. For more information on building a project or programming a device, see PSoC Creator Help.
4. Observe the RGB LED on the board which changes its color every two seconds. Color changes in the sequence red, green, blue, cyan, purple, yellow, white. After white, the same sequence from red continues.

Components

Table 1 lists the PSoC Creator Components used in all three sub-examples and the hardware resources used by each Component.

Table 1. PSoC Creator Components.

Component	Instance Name	Hardware Resources
I2C (SCB_I2C_PDL)	mI2C, sI2C	Two SCB peripheral blocks
EzI2C(SCB_EZI2C_PDL)	sEzI2C	Single SCB peripheral block

Parameter Settings

Non-default settings for each Component are outlined in red in the following figures.

Figure 4 shows the master I2C Component parameter settings. Same settings are used in all the three projects.

Figure 4. I2C Master Component Parameter Settings

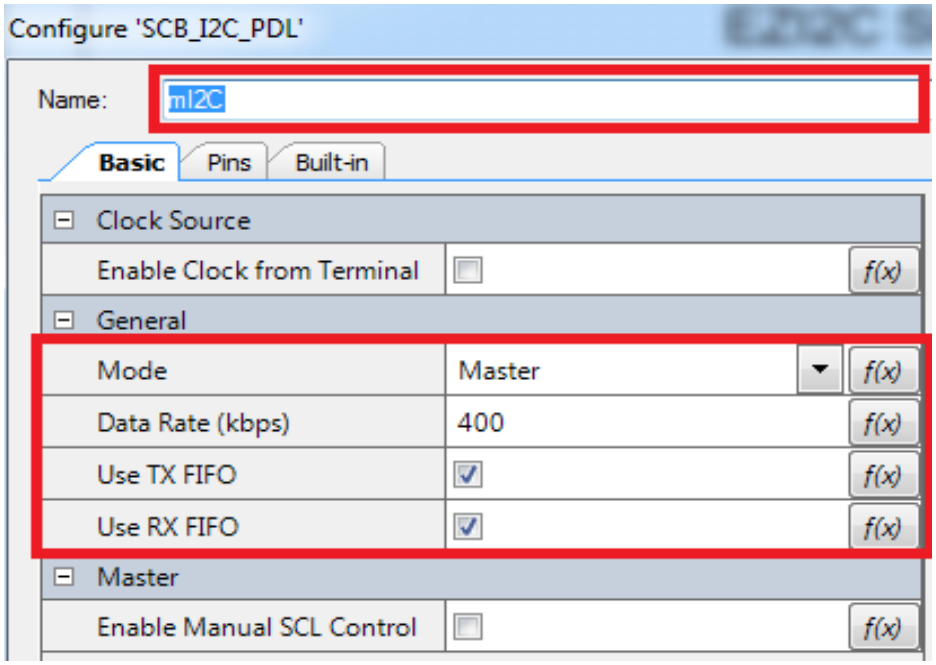


Figure 5 shows the I2C slave Component parameter settings. Same settings are used in for the projects: I2C master using high-level functions, I2C master using low-level functions.

Figure 6 shows the EzI2C slave Component parameter settings for the project I2C master communication with EzI2C slave.

Figure 5. I2C Slave Component Parameter Settings

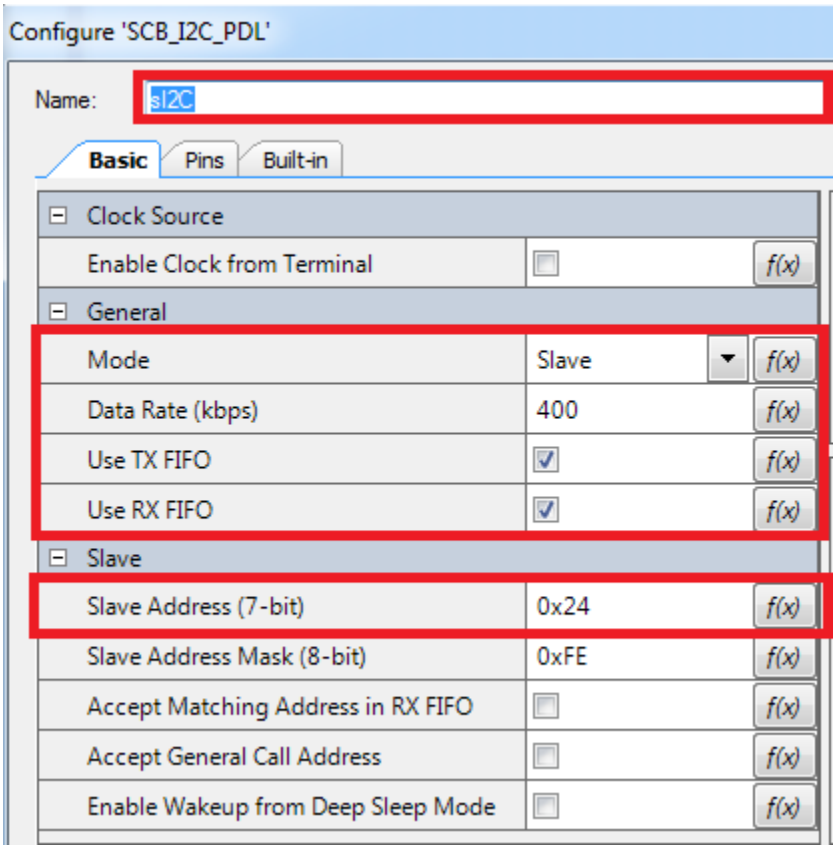
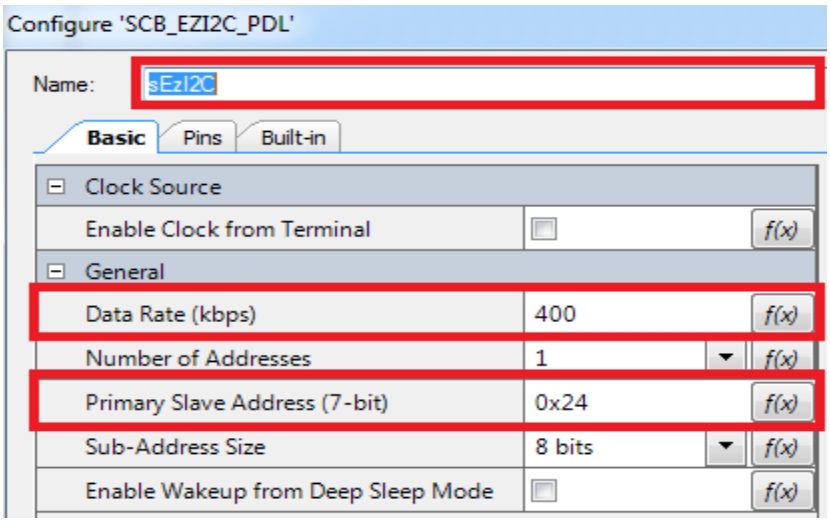


Figure 6. EzI2C Slave Component Parameter Settings



Design-Wide Resources

Make sure that V_{DDD} (**PSoC Creator** > **Design Wide Resources** tab > **System** tab) is set to 2.7 V or more to use greenLED and blueLED.

Table 2 shows the pin assignment for the code example.

Table 2. Pin Names and Location

Pin Name	Location
mI2C:sda	P6[1]
mI2C:scl	P6[0]
sI2C:sda	P9[1]
sI2C:scl	P9[0]
RedLED	P0[3]
GreenLED	P1[1]
BlueLED	P11[1]

Table 3 and Table 4 show the interrupts to be enabled and priority to be set.

Table 3. Interrupt Settings for High- and Low-Level Master Design

Instance Name	Interrupt Number	CM0Enable	CM0Priority(1-3)	CM0Vector(3-29)	CM4Enable	CM4Priority(0-7)
mI2C_SCB_IRQ	44	▫	–	–	✓	7
sI2C_SCB_IRQ	43	✓	3	9	▫	–

Table 4. Interrupt Settings for CE220818_I2C_Master_EzI2C_Slave.

Instance Name	Interrupt Number	CM0Enable	CM0Priority(1-3)	CM0Vector(3-29)	CM4Enable	CM4Priority(0-7)
mI2C_SCB_IRQ	44	▫	–	–	✓	7
sEzI2C_SCB_IRQ	43	✓	3	9	▫	–

Related Documents

Application Notes	
AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity	Describes PSoC 63 with Bluetooth Low Energy (BLE) Connectivity and how to build your first PSoC Creator project
PSoC Creator Component Datasheets	
I2C	Supports I^2C communication
EzI2C	Supports EzI2C slave communication
Device Documentation	
PSoC 6 MCU: PSoC 63 with BLE Datasheet	PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual
Development Kit (DVK) Documentation	
CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit	

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5880339	VJYA	09/18/2017	New Code Example

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