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CE195325 – I2C LCD with PSoC 4

Objective

This code example demonstrates how to use the I2C LCD Component with the NXP PCF2119x-compatible LCD modules. It also demonstrates the usage of address macros and custom commands.

Overview

This code example uses the I2C LCD and I2C Components to display data on an NXP PCF2119x-compatible LCD module. The firmware shows test strings on the LCD and switches the row display mode every two seconds.

Requirements

Tool: PSoC® Creator™ 4.2

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

Associated Parts: All PSoC 4 parts

Related Hardware: CY8CKIT-040, CY8CKIT-041-40XX, CY8CKIT-041-41XX, CY8CKIT-042, CY8CKIT-042-BLE, CY8CKIT-042-BLE-A, CY8CKIT-044, CY8CKIT-046, CY8CKIT-048, CY8CKIT-149

Hardware Setup

This example uses the kit's default configuration and requires external LCD module connections.

To connect the NXP PCF2119x-compatible LCD module to the PSoC 4 kit, use two 1k - 10k I2C pull-up resistors and a 10k LCD contrast potentiometer. Figure 1 shows the LCD connections schematic. For the LCD module pinout, refer to your LCD module datasheet.

This example project is designed to run on the development kits listed in Table 1. By default, example project has selected device for the CY8CKIT-042 kit. The project requires changes to configuration settings to run on other kits. To switch from CY8CKIT-042 to any other kit, change the project's device with the **Device Selector** called from the project's context menu.

Note: For Cypress kits, you can quickly select the target device. In **Device Selector**, right-click anywhere in the table area and select **Select Default Device**, then pick your kit's device series. For the series name, refer to Table 1.

Table 1. Supported Kits and Devices

Development Kit	Series	Device
CY8CKIT-040	PSoC 4000	CY8C4014LQI-422
CY8CKIT-041-40XX	PSoC 4000S	CY8C4045AZI-S413
CY8CKIT-041-41XX	PSoC 4100S	CY8C4146AZI-S433
CY8CKIT-042	PSoC 4200	CY8C4245AXI-483
CY8CKIT-042-BLE	PSoC 4200 BLE	CY8C4247LQI-BL483
CY8CKIT-042-BLE-A	PSoC 4200 BLE	CY8C4248LQI-BL483
CY8CKIT-044	PSoC 4200M	CY8C4247AZI-M485
CY8CKIT-046	PSoC 4200L	CY8C4248BZI-L489
CY8CKIT-048	PSoC Analog Coprocessor	CY8C4A45LQI-483
CY8CKIT-149	PSoC 4100S Plus	CY8C4147AZI-S475

Pin assignments for supported kits are provided in Table 2. For these kits, the project includes control files to automatically assign pins with respect to the kit hardware connections during the project build. To change pin assignments, override control file selections in the Pin Editor of the Design Wide Resources by selecting the new port or pin number.

Table 2. Pin Assignments

Development Kit	Pin Assignment		
	\I2C:scl\	\I2C:sda\	LCD_RST
CY8CKIT-040	P1[2]	P1[3]	P1[7]
CY8CKIT-041-40XX	P3[0]	P3[1]	P1[2]
CY8CKIT-041-41XX	P3[0]	P3[1]	P1[2]
CY8CKIT-042	P4[0]	P4[1]	P0[6]
CY8CKIT-042-BLE	P3[5]	P3[4]	P0[3]
CY8CKIT-042-BLE-A	P3[5]	P3[4]	P0[3]
CY8CKIT-044	P4[0]	P4[1]	P6[2]
CY8CKIT-046	P4[0]	P4[1]	P6[2]
CY8CKIT-048	P4[0]	P4[1]	P0[6]
CY8CKIT-149	P3[0]	P3[1]	P3[5]

Software Setup

None.

Operation

1. Plug your kit board into your computer's USB port.
2. Build the project and program it into the PSoC 4 device. Choose **Debug** > **Program**. For more information on device programming, see PSoC Creator Help.
3. Observe text changes on the LCD: the row display mode switches every two seconds: from normal to flipped with mirroring and vice versa (Table 3).

Note: If the LCD does not show anything or filled rectangles, adjust the contrast using potentiometer, which connected to the Vo pin of the display. For more details, refer to your LCD module datasheet.

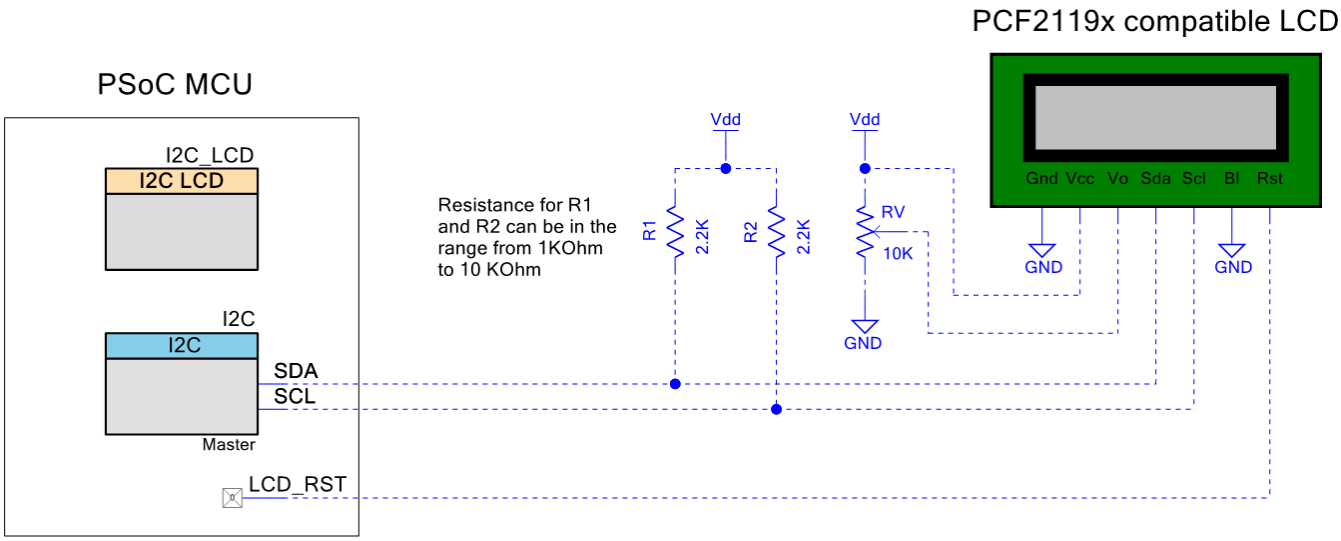
Table 3. Text Output on LCD

	Original text	Flipped text
First row	CYPRESS!	CYPRESS!
Second row	Cypress!	CYPRESS!

Design and Implementation

The Top Design Schematic of the project is in Figure 1.

Figure 1. PSoC Creator Project Schematic



The I2C_LCD Component provides a library for generating transactions defined by the NXP PCF2119x chip and drives the I2C Master interface to communicate with the LCD module. The LCD_RST pin is used to output a reset signal for the LCD.

The firmware does the following:

- Initializes the I2C and I2C_LCD Components
- Prints two strings: first with custom characters and second with characters from the LCDs internal character set
- Every two seconds switches the row display mode: from normal to flipped with mirroring and vice versa.

Components and Settings

Table 4 lists the PSoC Creator Components used in this example, how they are used in the design, and the non-default settings required so they function as intended.

Table 4. PSoC Creator Components

Component	Instance Name	Purpose	Non-default Settings
Character LCD with I2C interface	I2C_LCD	Control the LCD module via I2C.	See Figure 2 and Figure 3
I2C (SCB mode)	I2C	Handle communication with the LCD module.	Mode: Master
Digital Output Pin	LCD_RST	Initial reset of LCD.	HW connection: OFF

For information on the hardware resources used by the Component, see the Component datasheet.

Figure 2 and Figure 3 highlight the non-default settings for the I2C_LCD Component.

Figure 2. I2C LCD Component Parameters Settings: General Tab

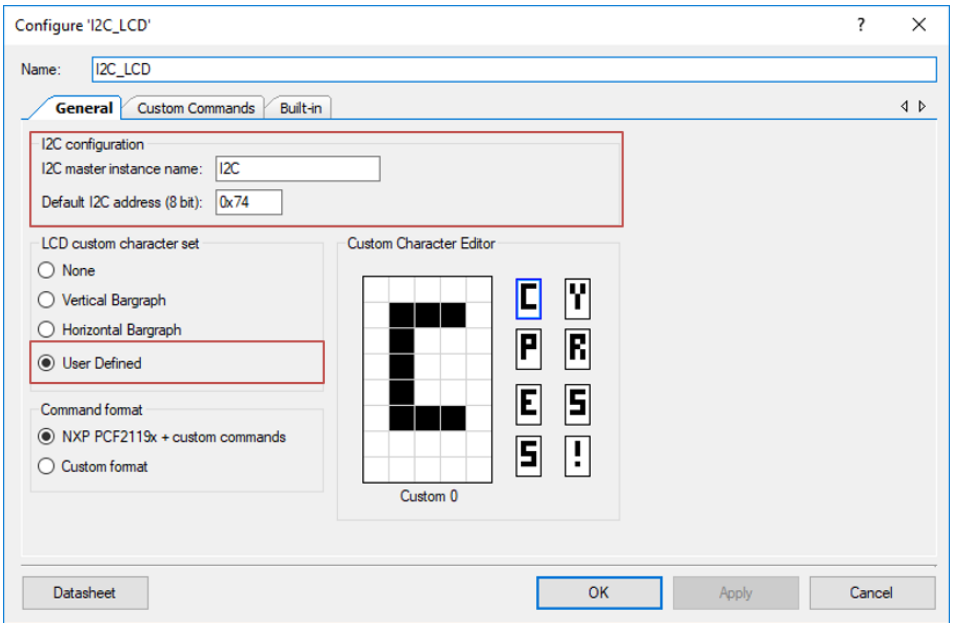
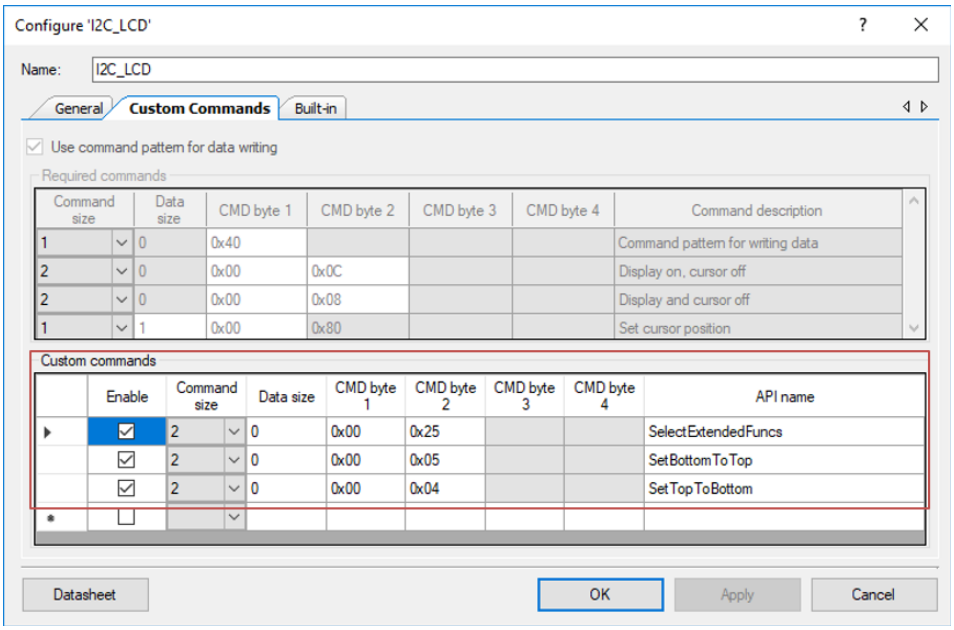


Figure 3 shows the I2C LCD Component Custom Commands Tab configuration. In this tab, you can specify custom commands to control the LCD. For this code example, the custom commands are: selection of the extended function set and two display row configurations: normal and flipped.

Figure 3. I2C LCD Component Parameters Settings: Custom Commands Tab



Reusing This Example

This example is designed to run on the PSoC 4 Cypress kits listed in Table 1. To port the design to a different PSoC 4 device, change the target device using the Device Selector and update the pin assignments in the Design Wide Resources Pins settings as needed.

You can add other custom commands in the I2C LCD Component Parameters Settings. Refer to your LCD module datasheet for the list of supported commands.

Related Documents

Application Notes	
AN79953 – Getting Started with PSoC 4	Introduces the PSoC 4 architecture and development tools
PSoC Creator Component Datasheets	
Character LCD with an I2C Interface (I2C LCD)	Supports an I2C interfaced 2 line by 16 character LCD.
Serial Communication Block (SCB)	Supports the hardware SCB block
Pins	Supports connection of hardware resources to physical pins
Device Documentation	
PSoC 4 Datasheets	PSoC 4 Technical Reference Manuals
Development Kit Documentation	
PSoC 4 Kits	

Document History

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**	5963599	MYKZTMP1	01/10/2018	New code example

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