Objective

This code example demonstrates how to use the PSoC® 4 fixed function PWM to generate signal with a variable duty cycle.

Overview

This code example uses the PSoC 4 TCPWM Component configured in PWM mode to control LED brightness. Brightness increases with time. When it reaches the maximum level, the LED turns off and the cycle repeats.

Requirements

Tool: PSoC Creator™ 4.2

Programming Language: C (Arm® GCC 5.4.1 and Arm 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 project is configured by default to run on the CY8CKIT-042 development kit from Cypress Semiconductor. The project can be migrated to any supported kit by changing the target device with **Device Selector** called from the project's context menu. Table 1 lists the supported kits, corresponding devices, and pin assignments.

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

For kits from Table 1, the project includes control files to automatically assign pins with respect to the kit hardware connections during the project build. To change the pin assignments, override the control file selections in the Pin Editor of the Design Wide Resources by selecting the new port or pin number.

Table 1. Supported Kits, Devices, and Pin Assignments

Development Kit	Series	Device	Pin Assignments
			LED_Green
CY8CKIT-040	PSoC 4000	CY8C4014LQI-422	P1[1]
CY8CKIT-041-40XX	PSoC 4000S	CY8C4045AZI-S413	P2[6]
CY8CKIT-041-41XX	PSoC 4100S	CY8C4146AZI-S433	P2[6]
CY8CKIT-042	PSoC 4200	CY8C4245AXI-483	P0[2]
CY8CKIT-042-BLE	PSoC 4200 BLE	CY8C4247LQI-BL483	P3[6]
CY8CKIT-042-BLE-A	PSoC 4200 BLE	CY8C4248LQI-BL483	P3[6]
CY8CKIT-044	PSoC 4200M	CY8C4247AZI-M485	P2[6]
CY8CKIT-046	PSoC 4200L	CY8C4248BZI-L489	P5[3]
CY8CKIT-048	PSoC Analog Coprocessor	CY8C4A45LQI-483	P2[6]
CY8CKIT-149	PSoC 4100S Plus	CY8C4147AZI-S475	P2[2]

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 the green LED brightness increase. When the brightness reaches the maximum level, the LED turns off and the cycle repeats.

Design and Implementation

This example configures an instance of the PWM Component to generate signal with a desired duty cycle. The Component interrupt output is configured to generate interrupts on a terminal count event. This interrupt is used to periodically change the duty cycle of PWM signal.

The firmware initializes the TCPWM Component and assigns the `Isr_TC_Handler()` function as the interrupt handler. On a terminal count event, the PWM duty cycle is decreased by a value defined by the `BRIGHTNESS_CHANGE`. The kit`s LED is active LOW, so PWM duty decrease will increase the LED brightness. You can change the speed of the brightness increase by changing the `BRIGHTNESS_CHANGE` value in the *main.c* file.

Figure 1 shows the PSoC Creator schematic for this code example.

Figure 1. Top Design Schematic
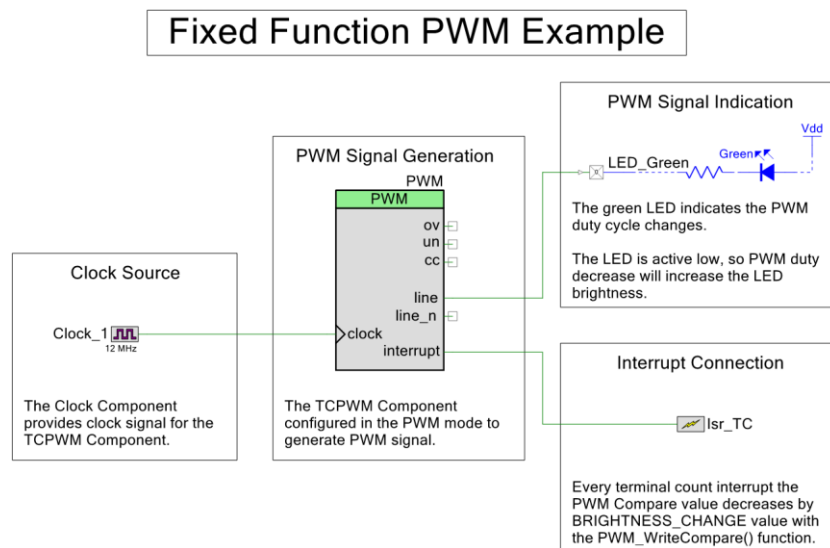
Components and Settings

Table 2 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 2. PSoC Creator Components

Component	Instance Name	Purpose	Non-default Settings
PWM (TCPWM mode)	PWM	Generate PWM signal with a variable duty cycle.	None.
Clock	Clock_1	The clock source for the PWM Component.	None.
Interrupt	Isr_TC	The interrupt for the PWM terminal count event.	None.
Digital Output Pin	LED_Green	Hardware connection to LED	None.

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

Reusing This Example

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

Related Documents

Application Notes	
AN79953 – Getting Started with PSoC 4	Introduces the PSoC 4 architecture and development tools
PSoC Creator Component Datasheets	
TCPWM	Supports fixed-function Timer/Counter implementation
Clock	Supports local clock generation
Interrupt	Supports generating interrupts from hardware signals
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

Document Title: CE195351 – PSoC 4 Fixed-Function PWM

Document Number: 001-95351

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5996072	MYKZTMP1	01/09/2018	New code example

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at Cypress Locations.

Products

Arm® Cortex® Microcontrollers	cypress.com/arm
Automotive	cypress.com/automotive
Clocks & Buffers	cypress.com/clocks
Interface	cypress.com/interface
Internet of Things	cypress.com/iot
Memory	cypress.com/memory
Microcontrollers	cypress.com/mcu
PSoC	cypress.com/psoc
Power Management ICs	cypress.com/pmic
Touch Sensing	cypress.com/touch
USB Controllers	cypress.com/usb
Wireless Connectivity	cypress.com/wireless

All other trademarks or registered trademarks referenced herein are the property of their respective owners.

PSoC® Solutions

PSoC 1 | PSoC 3 | PSoC 4 | PSoC 5LP | PSoC 6 MCU

Cypress Developer Community

Community Forums | Projects | Videos | Blogs | Training | Components

Technical Support

cypress.com/support