CE195352 – Fixed-Function PWM with PSoC 3/5LP

Objective

This code example demonstrates how fixed-function PWMs operate in PSoC® 3 and PSoC 5LP.

Overview

This is a straightforward example that demonstrates the use of a fixed-function PWM. The PWM is set up to output a 50 percent duty cycle digital signal with a period of 1 second. The signal can be used to drive an LED for visual testing of the PWM output. A switch is routed into the kill input of the PWM. When the switch is pressed, the PWM output is shut off.

Requirements

Tool: PSoC Creator™ 4.2

Programming Language: C (Arm® GCC 5.4.1)

Associated Parts: PSoC 3 and PSoC 5LP parts

Related Hardware: CY8CKIT-059, CY8CKIT-001, CY8CKIT-050, CY8CKIT-030

Hardware Setup

If using the CY8CKIT-059 PSoC 5LP Prototyping Kit, no external hardware connections are required. If using a different kit or hardware platform, two connections are required. An SPST switch needs to be connected to P2[2] to enable the kill functionality. The switch should be open when not pressed and should short the pin to ground when pressed. P2[1] should be connected to an LED to view the PWM output. An oscilloscope can also be used to view the output if an LED is not available.

If you are not using CY8CKIT-059, you may need to target a different PSoC device. To do so, right-click the project in the Workspace Explorer and select **Device Selector**. Select the appropriate PSoC device for your hardware platform.

Software Setup

None.

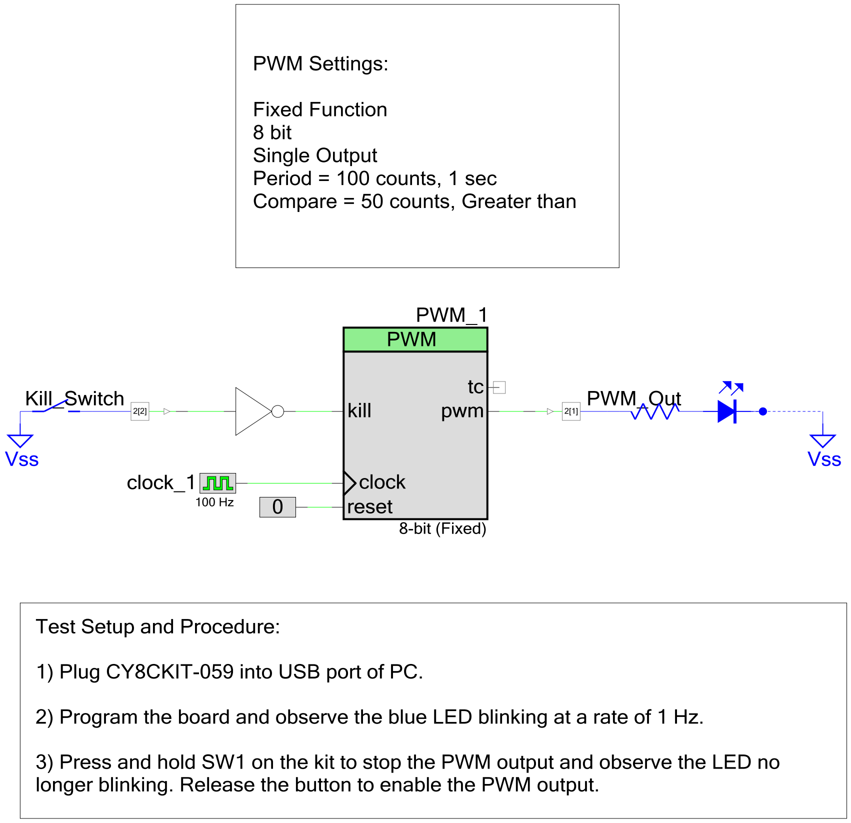
Operation

After you program the device, the PWM will start generating its output signal. Press and hold the switch to turn OFF the PWM output. Release the switch to turn ON the PWM output.

Design and Implementation

Figure 1 shows the PSoC Creator schematics of this code example. This code example uses PWM Component.

Figure 1. PSoC Creator Schematic of Code Example



PWM Settings:

Fixed Function
8 bit
Single Output
Period = 100 counts, 1 sec
Compare = 50 counts, Greater than

Test Setup and Procedure:

1) Plug CY8CKIT-059 into USB port of PC.

2) Program the board and observe the blue LED blinking at a rate of 1 Hz.

3) Press and hold SW1 on the kit to stop the PWM output and observe the LED no longer blinking. Release the button to enable the PWM output.

All functionality for this code example is implemented in hardware. The only firmware required is to configure and enable the PWM. After that, the CPU enters an idle loop.

This code example was created to operate completely in the hardware peripherals of the PSoC device, specifically the universal digital blocks (UDBs) and fixed-function PWM. This frees the CPU to handle other tasks. The UDBs also contain the inverter connecting the pin to the kill input of the PWM. Using the UDBs in PSoC allows you to design full circuits without external components.

Components and Settings

Table 1 lists the PSoC Creator Components used in this example, as well their placement.

Table 1. PSoC Creator Components

Component	Instance Name	Purpose	Non-default Settings

PWM	PWM_1	Generate square wave and bring out the signal to GPIO	Fixed Function
			One Output
			Period = 100 counts, 1 sec
			Compare = 50 counts, Greater than

Inverter	not_1	Invert the output of Digital Input Pin	-
Clock	clock_1	Drive the PWM at 100 Hz	100 Hz
Digital Input Pin	Kill_Switch	Stop the PWM signal	Initial drive state: High (1)
Digital Output Pin	PWM_Out	Drive the PWM signal to LED	Show External Terminal

Table 2 shows the pin selections for this code example, which is targeted at the CY8CKIT-059 Prototyping Kit. To target the project at other PSoC development kits, go to the *CE195352_Blinking_LED.cydwr* file and change the pin assignments accordingly.

Table 2. Pin Selections

Pin Name	Location
Kill_Switch	P2[2]
PWM_Out	P2[1]

Reusing This Example

This code example is designed to run on CY8CKIT-059. To port the design to a different PSoC device and/or kit, change the target device in **Device Selector**, and update the pin assignments in the **Design Wide Resources Pins** settings as needed.

Related Documents

Application Notes	
AN82156 - PSoC 3, PSoC 4, and PSoC 5LP – Designing PSoC Creator Components with UDB Datapaths	Explains how to create digital Components using PSoC UDBs
AN81623 - PSoC 3, PSoC 4, and PSoC 5LP Digital Design Best Practices	Gives best practices for creating digital designs with PSoC
AN82250 - PSoC 3, PSoC 4, and PSoC 5LP – Implementing Programmable Logic Designs with Verilog	Describes how to program PSoC digital resources with Verilog
Code Examples	
CE95294	7-Bit Down Counter with PSoC 3/4/5LP
CE95295	8-Bit UDB Counter with PSoC 3/5LP
CE95308	Digital Utility Components with PSoC 3/5LP
CE95351	Fixed-Function PWM with PSoC 4
CE95298	Switch Debouncer with PSoC 3/4/5LP
PSoC Creator Component Datasheet	
PWM	Details the use of the PWM Component
Device Documentation	
PSoC 3 Datasheets	PSoC 3 Technical Reference Manuals
PSoC 4 Datasheets	PSoC 4 Technical Reference Manuals
PSoC 5LP Datasheets	PSoC 5LP Technical Reference Manuals
Development Kit (DVK) Documentation	
PSoC 3 and PSoC 5LP Kits	
PSoC 4 Kits	

PSoC Resources

Cypress provides a wealth of data at www.cypress.com to help you select the right PSoC device for your design and quickly and effectively integrate it into your design. For a comprehensive list of resources, see KBA86521 – How to Design with PSoC 3, PSoC 4, and PSoC 5LP. The following is an abbreviated list:

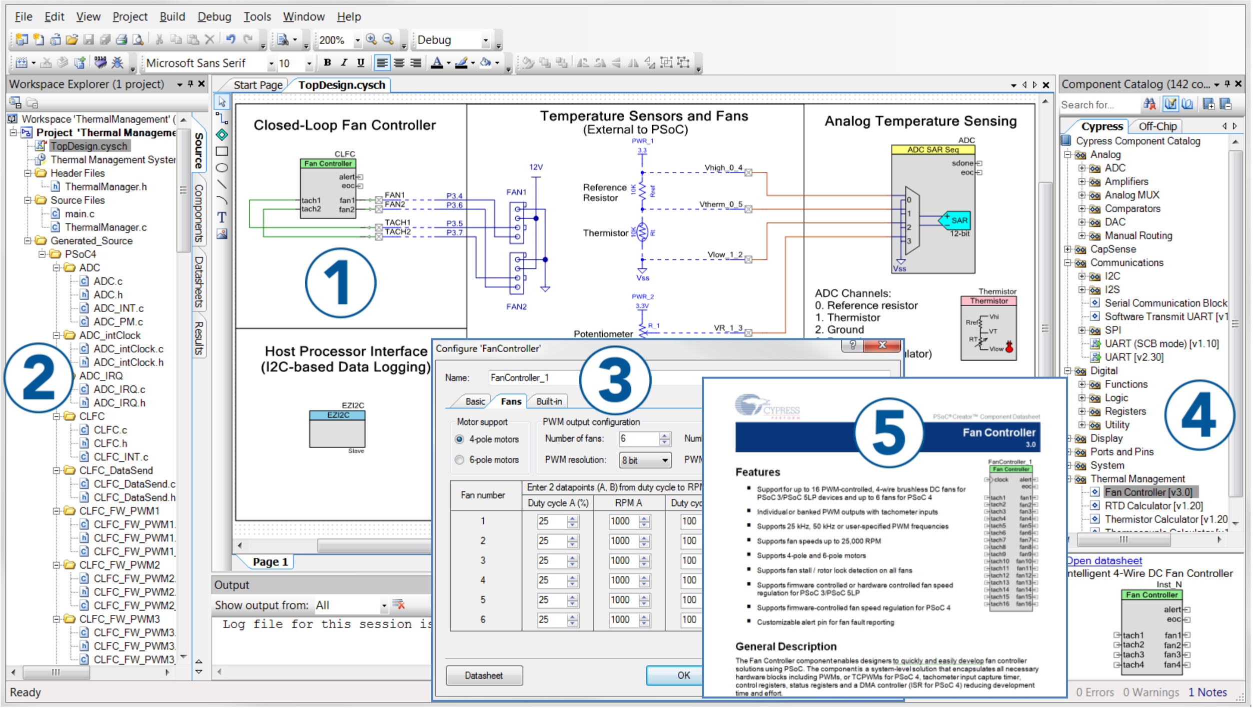
- **Overview:** PSoC Portfolio, PSoC Roadmap
- **Product Selectors:** PSoC 1, PSoC 3, PSoC 4, PSoC 5LP, or PSoC 6. In addition, PSoC Creator includes a device selection tool.
- **Datasheets:** Describe and provide electrical specifications for the PSoC device families.
- **CapSense Design Guides:** Learn how to design capacitive touch-sensing applications.
- **Application Notes:** Cover a broad range of topics, from basic to advanced level.
- **Code Examples**: for PSoC 3, PSoC 4, and PSoC 5LP; or for PSoC 6.
- **PSoC Technical Reference Manuals (TRM):** Provide detailed descriptions of the architecture and registers for PSoC device family.
- **Training Videos**: These videos provide guidance on getting started with various Cypress product families and tools.
- **Development Kits:** Some examples include**:**
    - PSoC 6 BLE Pioneer Kit is a low-cost hardware platform that enables design and debug of the PSoC 63 series. It comes with an E-Ink display shield board.
    - CY8CKIT-042 and CY8CKIT-040, Pioneer kits, are easy-to-use and inexpensive development platforms. These kits include connectors for Arduino™ compatible shields and Digilent® Pmod™ daughter cards.
    - CY8CKIT-049 is a series of very low-cost prototyping platform for sampling PSoC 4 devices.
    - CY8CKIT-030 and CY8CKIT-050 are designed for analog performance. They enable you to evaluate, develop, and prototype high-precision analog, low-power, and low-voltage applications powered by PSoC 3 and PSoC 5LP, respectively.
    - CY8CKIT-001 is a common development platform for all PSoC family devices.
    - CY8CKIT-059 is a rapid prototyping kit for PSoC 5LP.
- The MiniProg3 device provides an interface for flash programming and debug.

PSoC Creator

PSoC Creator is a free, Windows based Integrated Design Environment (IDE). It enables you to design system hardware and firmware concurrently based on PSoC 3, PSoC 4, PSoC 5LP, and PSoC 6 MCU (see Figure 2). With PSoC Creator, you can do the following:

1. Drag and drop Components to build your hardware system design in the main design workspace.
2. Codesign your application firmware with the PSoC hardware.
3. Configure Components using configuration tools.
4. Explore the library of 100+ Components.
5. Review Component datasheets.

Figure 2. PSoC Creator Features



Fan number	Duty cycle A (%)	RPM A
1	25	1000
2	25	1000
3	25	1000
4	25	1000
5	25	1000
6	25	1000

Document History

Document Title: CE195352 – Fixed-Function PWM with PSoC 3/5LP

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	4753117	KLMZ	01/17/2016	New spec
*A	6012100	SAGA	01/16/2018	Updated template

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