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CE216686 - FM0+ Base Timer With ADC

This example uses an ADC to modify the duty cycle of a PWM, changing the brightness of the LED.

Overview

This code example uses analog input from the potentiometer on the board to modify the duty cycle of a base timer operating in PWM mode. The output pin of the PWM causes the LED to dim or brighten as the duty cycle changes.

Requirements

Tool: PSoC Creator 4.0

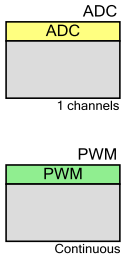
Programming Language: C (GCC 4.9.3)

Associated Parts: All S6E1C parts

Related Hardware: FM0-64L-S6E1C3

Design

The schematic includes the ADC and PWM components. The ADC component uses default values and no interrupts. The PWM uses the TIOA ouput pin to drive the green LED. The initial value of the output pin is set to high so that the LED is off by default. The timer's underflow interrupt is enabled. The interrupt handler modifies the duty cycle of the PMW when the timer reaches zero.



The firmware performs following functions:

1. Sets the pin function for the TIOA pin to be an output pin
2. Initializes and enables the ADC
3. Initializes and enables the PWM (including setting the PWM's peak count and initial duty cycle)
4. Then repeatedly starts an ADC scan and puts the result in the `duty` global variable
5. The underflow interrupt handler modifies the duty cycle every time the timer reaches zero

Design Considerations

Pin Selection

The project includes control files to automatically place the analog input and PWM output onto the appropriate pins for the supported kit hardware. To change the pin selection, delete the control file or over-ride the control file selections in the Design Wide Resources Pin Editor.

PDL Installation

The project assumes that you have installed the PDL in the location specified in the **Project Management** panel of the **Tools** > **Options** dialog. If that location is incorrect, you will see the build error "The given PDL path is invalid. Unable to find required PDSC file." To correct this problem in a newly-created project open the **Project** > **Properties** dialog and enter the correct path to the PDL. To avoid the problem in projects you create in the future, make sure you put the correct path in the **Tools** > **Options** dialog.

Hardware Setup

Table 1 lists the pin connections required to use this code example on supported FM0+ kits.

Table 1. List of Pins

Pin	FM0-64L-S6E1C3
ADC:CH0	P10
PWM:TIOA	P3E

Components

Table 2 lists the PSoC Creator Components used in this example, as well as the hardware resources used by each.

Table 2. List of PSoC Creator Components

Component	Version	Hardware Resources
PDL_ADC	1.0	ADC block
PDL_PWM	1.0	Base timer block
PDL_GPIO	1.0	Two GPIO pins

Parameter Settings

The PDL_ADC Component uses default parameter settings, except for the item shown in Table 3.

Table 3: ADC Component Settings

Tab	Setting	Value
none	Name	ADC

The PDL_PWM Component uses default parameter settings, with the exceptions shown in Table 4.

Table 4: PWM Component Settings

Tab	Setting	Value
Basic	ConnectTIOA	True
Interrupts	bTouchNvic	True
Interrupts	bPwmUnderflowIrq	True
PWM	enPwmOutputPolarity	Initially high

Operation

Program the kit, then click the **Resume Execution** button. Turn the potentiometer on the board and observe the LED brightness change.

Related Documents

Table 5 lists relevant application notes, code examples, knowledge base articles, device and Component datasheets.

Table 5: Related Documents

PSoC Creator Component Datasheets	
PDL_BT	Supports PWM, PPG, PWC, and Reload timers, in either continuous or one-shot mode
PDL_ADC	Supports scan and priority conversions on multiple channels (right-click on the Component to access)
PDL_GPIO	Supports firmware access to physical pins (right-click on the Component to access)
Device Documentation	
S6E1C	FM0+ S6E1C-Series Ultra Low Power ARM® Cortex®-M0+ Microcontroller (MCU) Family
Development Kit (DVK) Documentation	
FM0-64L-S6E1C3	ARM® Cortex®-M0+ MCU Starter Kit with USB and Digital Audio Interface

Document History

Document Title: CE216686 - FM0+ Base Timer With ADC

Document Number: 002-16686

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5443685	YFS	09/20/16	New Code Example.
*A	5453487	YFS	09/28/16	Changed the workspace folder name. Moved the PDF file.
*B	5823657	JETT	07/18/2017	Added search keyword so that user can quickly find Code Examples from the component instance popup menu. Updated logo and copyright date. Added FM0+ as prefix to title.
*C	5988588	YFS	12/8/17	Removed S6E1B support.

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Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

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