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CE216127 - FM0+ Reload Timer

This code example uses the base timer in reload timer mode (BT RT) to drive the green LED.

Overview

This example uses the Base Timer (BT) in Reload Timer (RT) mode. The RT is a 16-bit down counter that generates an interrupt when the count reaches zero (underflow). The application enables the interrupt in the BT_RT Component. When the interrupt occurs, it modifies the timer cycle to pulse the green LED.

Requirements

Tool: PSoC Creator 4.0

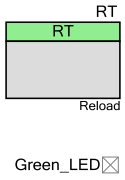
Programming Language: C (GCC 4.9.3)

Associated Parts: All S6E1A and S6E1C parts

Related Hardware: FM0-V48-S6E1A1 and FM0-64L-S6E1C3

Design

The schematic includes the PDL_BT Component in RT mode. On the **Interrupts** tab the **bTouchNvic** and **bRtUnderflowIrq** fields are set to true. Otherwise the Component uses default values. The RT uses no pins. A GPIO pin is set up for the green LED.



The firmware performs following functions:

1. Initialize the base timer peripheral as a reload timer
2. Set the initial timer cycle
3. Enables the peripheral and starts the timer
4. Toggles the LED and modifies cycle time to pulse the LED

Design Considerations

Use the RT underflow interrupt to trigger a task in your design. You can also poll for the interrupt. In that case you must clear the interrupt flag yourself. The code example uses the reload timer to create a duty cycle that pulses the LED. The base timer's PWM and PPG modes may be better choices if you want to generate a duty cycle.

Pin Selection

The project includes control files to automatically place the LED IO onto the appropriate pin 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

As configured for this example, the RT Component does not require pin setup. Table 1 lists the pin connections required to use this code example on FM0+ kits.

Table 1. List of Pins

Pin	FM0-V48-S6E1A1	FM0-64L-S6E1C3
Green_LED:GPIO	P61	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_BT (as RT)	1.0	Base Timer block
PDL_GPIO	1.0	GPIO pin

Parameter Settings

The PDL_BT Component uses default parameter settings, with these exceptions.

Table 3: Component Settings

Tab	Setting	Value
none	Name	RT
Basic	BTConfig	RT
Interrupts	bRtUnderflowIrq	True
	bTouchNvic	True

Operation

Program the kit and observe the brightness of the green LED cycle rapidly from dim to bright.

Related Documents

Table 4 lists relevant application notes, code examples, knowledge base articles, device datasheets, and Component datasheets.

Table 4. Related Documents

PSoC Creator Component Datasheets	
PDL_BT	Supports PWM, PPG, PWC, and RT modes, with interrupts appropriate to the mode of operation. Right-click the Component to access.
Device Documentation	
S6E1A	FM0+ S6E1A-Series 5V Robust ARM® Cortex®-M0+ Microcontroller (MCU) Family
S6E1C	FM0+ S6E1C-Series Ultra Low Power ARM® Cortex®-M0+ Microcontroller (MCU) Family
Development Kit (DVK) Documentation	
FM0-V48-S6E1A1	ARM® Cortex®-M0+ FM0+ MCU Evaluation Board
FM0-64L-S6E1C3	ARM® Cortex®-M0+ MCU Starter Kit with USB and Digital Audio Interface

Document History

Document Title: CE216127 - FM0+ Reload Timer

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5443722	YFS	09/20/16	New Code Example.
*A	5472621	YFS	10/12/16	Improved the operating instructions.
*B	5775344	YFS	6/15/17	Added search keyword so that user can quickly find Code Examples from the component instance popup menu. Updated logo and copyright date.
*C	5987660	YFS	12/7/17	Removing S6E1B support.

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