

This application uses the RTC (Real-Time Clock) component to keep track of time and change the output of a green LED based on half-second, alarm and periodic timer events.

## Overview

The component is configured with a start time of 00:00:55 (hh:mm:ss) and an alarm time of 00:01 (hh:mm). Both have a start date of 16/01/01. In addition, a timer is set to be periodic with a cycle time of 2 seconds. The firmware demonstrates the use of the RTC to track time and handle the alarm and timer. The LED is driven by three events (interrupts), as follows.

HalfSecond	- Turns off the LED every half a second
AlarmMinute	- Turns on the LED after 5 seconds (and starts the timer)
Timer	- turns on the LED every 2 seconds

## Requirements

**Tool:** PSoC Creator 4.0 and Peripheral Driver Library (PDL) 2.1

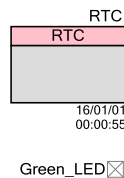
**Programming Language:** C (GCC 4.9.3)

**Associated Parts:** All S6E1A parts

**Related Hardware:** [FM0-V48-S6E1A1](#)

## Design

The schematic file includes the RTC and a GPIO component, renamed as shown below.



The firmware performs following functions:

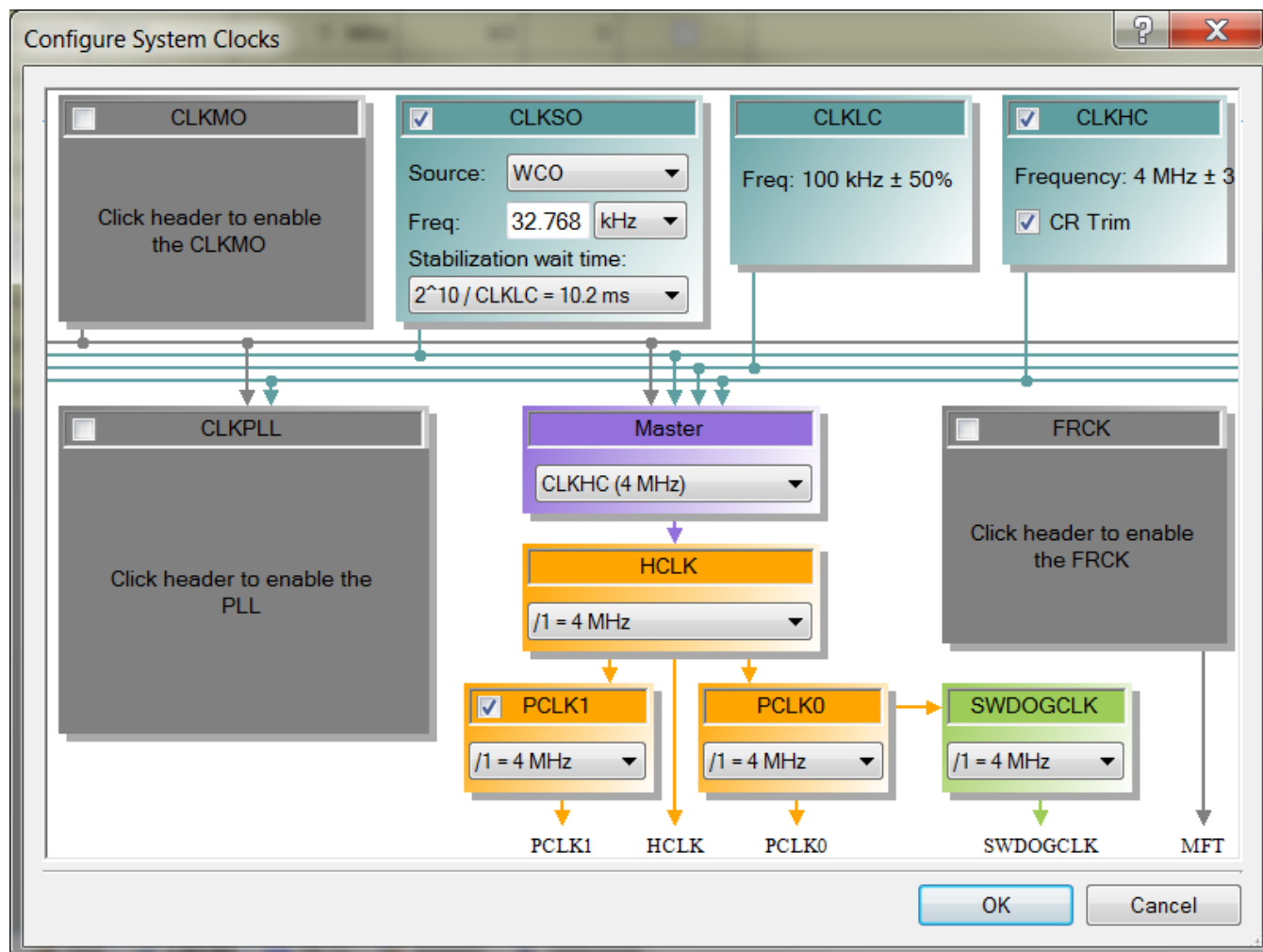
1. Initialize the LED (on)
2. Initialize the RTC
3. Enable alarms on matching minutes
4. Enable the time (counting)
5. Three RTC events are handled
  - a. After 5 seconds the alarm lights the LED and enables the timer
  - b. Thereafter every 2 seconds the timer lights the LED
  - c. Every half second the LED is turned off

## Design Considerations

### Watch Crystal Oscillator (WCO)

The RTC requires a watch crystal to provide accurate timing. The CLKSO (referred to as the sub clock in the RTC enClkSel parameter) is set up to use the WCO in the **System Clocks** editor by simply enabling the CLKSO block.

The **System Clocks** editor, shown below, is launched by double-clicking on any system clock in the DWR 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

The LED GPIO is connected to a green LED.

Table 1 lists the pin connection required to use this code example on the [FM0-V48-S6E1A1](#) FM0+ kit.

Table 1. List of Pins

Pin	FM0-V48-S6E1A1
Green_LED:GPIO	P61

## 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_RTC	1.0	Real-Time Clock block
PDL_GPIO	1.0	GPIO pin

## Parameter Settings

The GPIO component uses the default parameter settings. Only the component instance name has been changed for readability.

The PDL\_RTC Component uses default parameter settings, with these exceptions.

Table 3: Component Settings

Tab	Setting	Value
None	Name	RTC
Basic	u32ClkPrescaler	32768
Interrupts	bTouchNvic	True
	bHalfSecondIrq	True
	bAlarmIrq	True
	bTimerIrq	True
Time	u8Second	55
Alarm	u8AlarmMinute	1
Timer	enMode	Periodic
	u32TimerCycle	2

Note that the clock prescaler is set to 32768 in order to match the (sub clock) frequency of the WCO in the System Clocks editor. This enables one (and half) second granularity in the rate of RTC interrupts.

## Operation

After reset, the LED lights up for one half second. After 5 seconds the LED lights, again, for one half second. Thereafter the LED lights up repeatedly for a half second every 2 seconds.

## 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_RTC	Supports Real-Time Clock operation with interrupts for time, alarm and timer events (right-click on the Component to access)
PDL_GPIO	Supports firmware access to physical pins (right-click on the Component to access)
Device Documentation	
<a href="#">S6E1A</a>	FM0+ S6E1A-Series 5 V Robust ARM® Cortex®-M0+ Microcontroller (MCU) Family
Development Kit (DVK) Documentation	
<a href="#">FM0-V48-S6E1A1</a>	ARM® Cortex®-M0+ FM0+ MCU Evaluation Board

## Document History

Document Title: CE215816 – FM0+ RTC Blinky Code Example

Document Number: 002-15816

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5429588	YFS	09/7/16	New Code Example.
*A	5775161	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.

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