Please note that Cypress is an Infineon Technologies Company.
The document following this cover page is marked as “Cypress” document as this is the company that originally developed the product. Please note that Infineon will continue to offer the product to new and existing customers as part of the Infineon product portfolio.

Continuity of document content
The fact that Infineon offers the following product as part of the Infineon product portfolio does not lead to any changes to this document. Future revisions will occur when appropriate, and any changes will be set out on the document history page.

Continuity of ordering part numbers
Infineon continues to support existing part numbers. Please continue to use the ordering part numbers listed in the datasheet for ordering.

CE215816 – FM0+ RTC Blinky Code Example

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

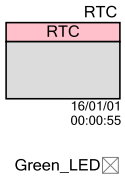
Programming Language: C (GCC 4.9.3)

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:

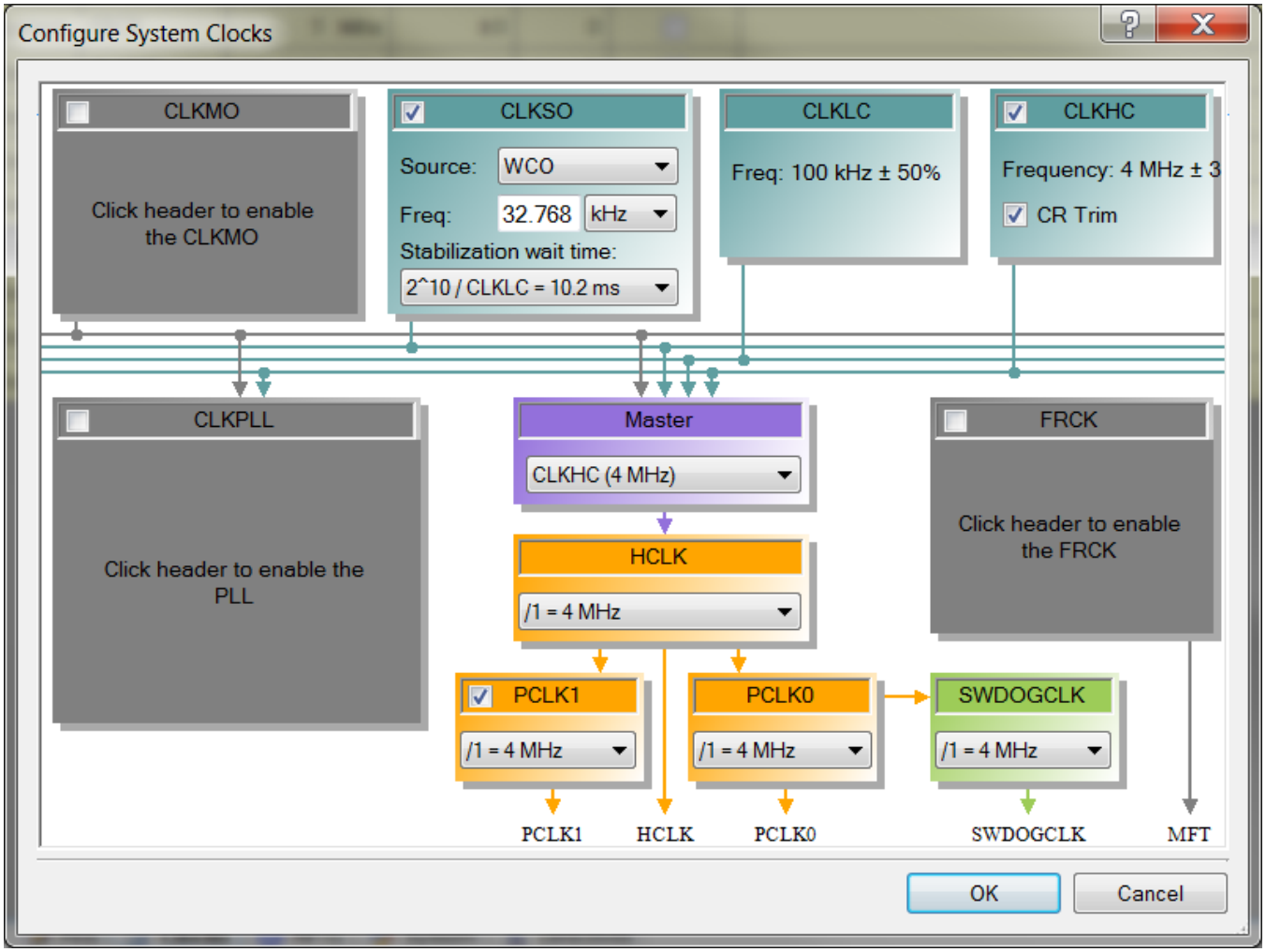
1. Initialize the LED (on)
2. Initialize the RTC
3. Enable alarms on matching minutes
4. Enable the time (counting)
5. Three RTC events are handled
    a. After 5 seconds the alarm lights the LED and enables the timer
    b. Thereafter every 2 seconds the timer lights the LED
    c. Every half second 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	
S6E1A	FM0+ S6E1A-Series 5 V Robust ARM® Cortex®-M0+ Microcontroller (MCU) Family
Development Kit (DVK) Documentation	
FM0-V48-S6E1A1	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.

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
Lighting & Power Control	cypress.com/powerpsoc
Memory	cypress.com/memory
PSoC	cypress.com/psoc
Touch Sensing	cypress.com/touch
USB Controllers	cypress.com/usb
Wireless/RF	cypress.com/wireless

PSoC® Solutions

PSoC 1 | PSoC 3 | PSoC 4 | PSoC 5LP

Cypress Developer Community

Forums | Projects | Videos | Blogs | Training | Components

Technical Support

cypress.com/support

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

Phone : 408-943-2600
Fax : 408-943-4730
Website : www.cypress.com

© Cypress Semiconductor Corporation, 2016-2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.