CE216264 – FM0+ Hardware Watchdog Reset

A watchdog reset is indicated by a permanently lit LED. The watchdog can be "fed", to delay the reset event, by pressing the user switch.

Overview

The application exercises the RESET and HWWDG (Hardware Watchdog) components, and uses a green LED to indicate the state of the application. If the application resets as a result of a watchdog underflow, the LED is lit permanently. Otherwise the watchdog is started with a 5 second period, which will result in a 10 second time period before it resets (the first timer underflow generates an IRQ (unhandled) and the second causes the reset). The reset can be delayed by pressing the user switch, which feeds the watchdog and blinks the LED.

Requirements

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

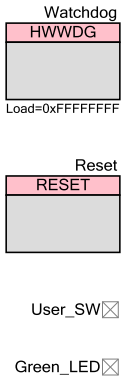
Programming Language: C (GCC 4.9.3)

Associated Parts: All S6E1 parts

Related Hardware: FM0-V48-S6E1A1, FM0-100L-S6E1B8, and FM0-64L-S6E1C3

Design

The schematic file includes the HWWDG, RESET and two GPIO Components, renamed as shown below.



The firmware performs following functions:

1. Initialize the LED (off) and user switch (up)
2. Read the reset cause
3. If reset was because of the watchdog, turn on the LED and loop forever (until user reset)
4. Initialize and start the watchdog
5. Feed the watchdog when the user presses the switch (and blink the LED)

Note that the hardware watchdog must be fed with a pair of 8-bit values to reset the counter. The values are arbitrary but each must be the bit-wise inverse of the other.

Design Considerations

Pin Selection

The project includes control files to automatically place the user switch and LED IO onto the appropriate pins for the supported kit hardware. To change the pin selections, 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

The LED GPIO is connected to a green LED. The switch GPIO is connected to SW3 on FM0-V48-S6E1A1 and SW2 on both FM0-100L-S6E1B8 and FM0-64L-S6E1C3.

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

Table 1. List of Pins

Pin	FM0-V48-S6E1A1	FM0-100L-S6E1B8	FM0-64L-S6E1C3
User_SW:GPIO	P04	P08	P30
Green_LED:GPIO	P61	P3E	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_HWWDG	1.0	HWWDG block
PDL_RESET	1.0	None (enables driver)
PDL_GPIO	1.0	GPIO pin

Parameter Settings

All Components, except the PDL_HWWDG, use their default parameter settings. Only the Component instance names have been changed for readability.

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

Table 3: Component Settings

Tab	Setting	Value
None	Name	Watchdog
Basic	bResetEnable	true
	pfnHwwdgIrqCb	<blank>

Note that the pointer to the watchdog IRQ callback function (pfnHwwdgIrqCb) is cleared. Without this change to the default setting, the user code is required to provide a callback handler function, which is not used in this example.

Operation

After programming, reset the board and wait 10 seconds for the watchdog to expire and reset the board. This is indicated by the LED turning on permanently.

Reset the board again and press the user switch to feed the watchdog. The LED is lit temporarily to indicate that the watchdog is being fed. If the watchdog is not fed for 10 seconds the device resets and the LED turns, and remains, on.

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_HWWDG	Supports watchdog interrupts and device reset (right-click on the Component to access)
PDL_RESET	Enables determination of the reset cause (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
S6E1B	FM0+ S6E1B-Series Ultra Low Power 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
FM0-100L-S6E1B8	ARM® Cortex®-M0+ MCU Starter Kit with USB and SD Card Interface
FM0-64L-S6E1C3	ARM® Cortex®-M0+ MCU Starter Kit with USB and Digital Audio Interface

Document History

Document Title: CE216264 – FM0+ Hardware Watchdog Reset

Document Number: 002-16264

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5421140	YFS	08/30/16	New Code Example.
*A	5448739	YFS	9/29/16	Added workspace file.
*B	5776570	YFS	6/16/17	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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