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# CE210292 - PSoC 4S Watchdog Timer

## Objective

This code example demonstrates how to use the watchdog timer (WDT) to reset the device (PSoC®) and to periodically generate interrupts. It also shows how to use the internal low-speed oscillator (ILO) trimming APIs to improve the accuracy of the WDT interrupt.

## Overview

This code example demonstrates the basic capabilities of the WDT such as Deep Sleep wakeup source and system reset counter. It configures the WDT to generate an interrupt every 500 ms and a reset on the third unserved interrupt (1.5 seconds). It turns ON an LED to show the device reset caused by the WDT and toggles an LED to show the periodic interrupt generated by the WDT. The example also uses the ILO compensate APIs to improve the accuracy of the WDT interrupt generation.

## Requirements

**Tool:** PSoC Creator™ 4.3 or higher

**Programming Language:** C (Arm® GCC 5.4-2016-q2-update)

**Associated Parts:** PSoC 4000, PSoC 4000S, PSoC 4100S, and PSoC Analog Coprocessor

**Related Hardware:** CY8CKIT-040, CY8CKIT-048, CY8CKIT-041-40xx, and CY8CKIT-041-41xx

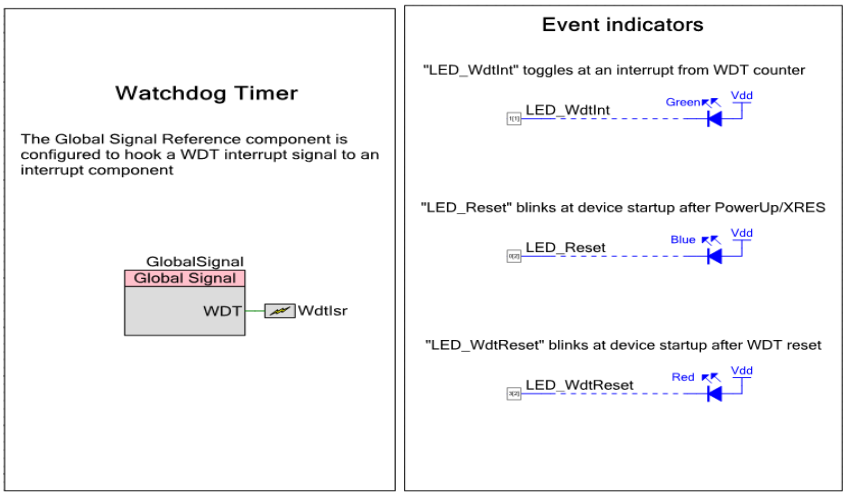
## Design

This example project consists of a global signal reference and interrupt Components. Figure 1 shows the Component schematics for this project. The Global Signal Reference Component is configured as a WDT to generate an interrupt every 500 ms and a reset on the third unserved interrupt (1.5 seconds).

This example uses the RGB LED to show the basic WDT functionality.

- Turns ON red to show WDT reset.
- Toggles green to show an interrupt generated by the WDT.
- Turns ON blue to show device startup after power up or external reset (XRES).

Figure 1. Component Schematics

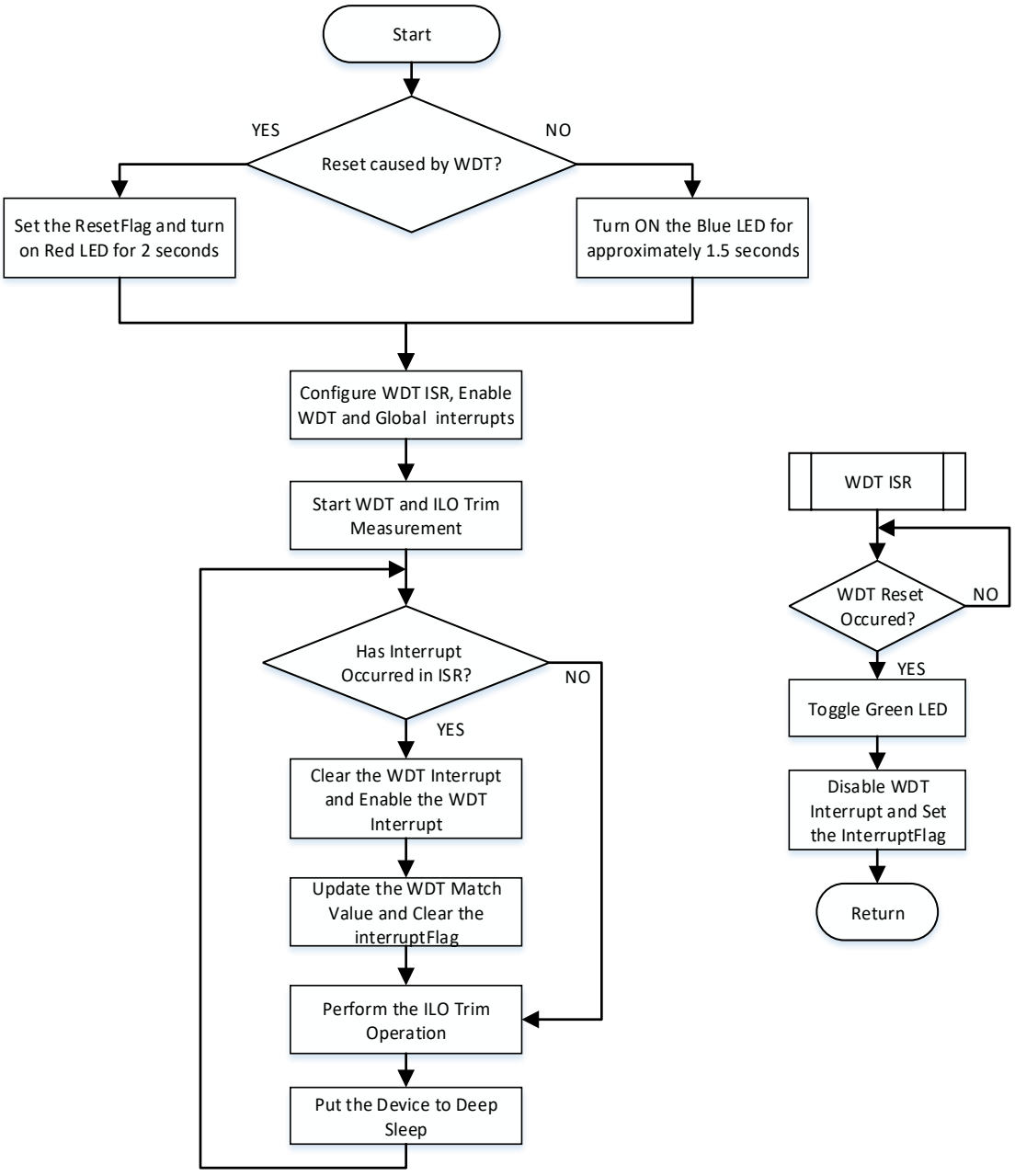


After programming, the WDT is configured and enabled to generate an interrupt every 500 ms. Initially, the WDT interrupt is not served, which leads to a device reset on the third interrupt. The global variable “resetFlag” is updated to indicate that the device has been running after WDT reset.

After the initial device reset caused by the WDT, the WDT interrupt is served periodically. The green LED toggles to show the periodic interrupt. Figure 2 shows the firmware flow chart of this project.

This example also demonstrates how to use the ILO compensate APIs to improve the accuracy of the WDT interrupt.

Figure 2. WDT Flow Chart



## Design Considerations

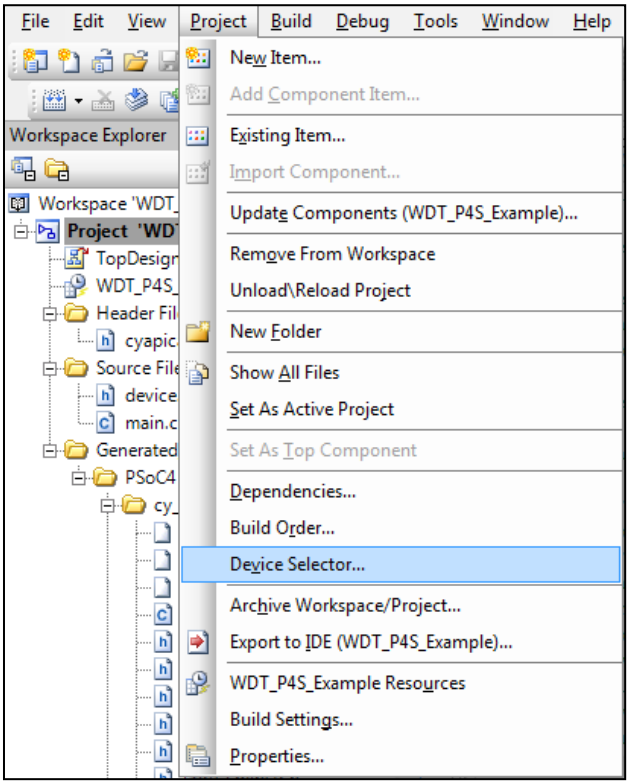
The code example is designed for the PSoC 4000 family and the associated CY8CKIT-040 kit. The design is easily portable to other PSoC devices and kits, typically by simply changing the device and pin assignments.

To switch from the CY8CKIT-040 to other PSoC pioneer kits, follow these steps:

1. Select the appropriate device with a device selector called from the project's context menu (Figure 3). Table 1 lists the device number for each pioneer kit.
2. When you select the device, PSoC Creator assigns pins automatically for it in the Design-Wide Resource file.

   **Note:** If the assigned Component pins are not as shown in Table 1 or you want to overwrite the existing pin assignments, double-click the project's Design-Wide Resource file in the **Workspace Explorer** window and assign the pins. See the device datasheet for information on pin assignments.

Figure 3. Select Device Selector from Project's Context Menu




3. Build the project and ensure that there are no errors or warnings.

Table 1. Pin Assignments for the WDT_P4S_Example Project

| Pin Name | Development Kit | | | |
|---|---|---|---|---|
| | CY8CKIT-040 (CY8C4014LQI-42) | CY8CKIT-048 (CY8C4A45LQI-483) | CY8CKIT-041-40xx (CY8C4045AZI-S423) | CY8CKIT-041-41xx (CY8C4146AZI-S433) |
| LED_WdtInt | P1[1] | P2[6] | P2[6] | P2[6] |
| LED_WdtReset | P3[2] | P1[4] | P3[4] | P3[4] |
| LED_Reset | P0[2] | P1[6] | P3[6] | P3[6] |

## PSoC Creator Components

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

Table 2. PSoC Creator Components

| Component | Hardware Resources |
|---|---|
| Global Signal | 1 WDT, 1 interrupt |
| LEDs | 3 pins |

## Operation

After you build and install the example in the CY8CKIT-040 kit, test the example by simply observing the following sequence of events:

1. RGB LED turns blue for approximately 1.5 seconds to show device startup after power up/XRES.
2. RGB LED turns red for 2 seconds to show that the WDT reset has occurred.
3. RGB LED toggles green for a period of 0.5 seconds to show the interrupt generated by the WDT.

## Related Documents

Table 3 lists the relevant application notes, code examples, PSoC Creator Component datasheets, device documentation, and development kit (DVK) documentation.

Table 3. Related Documents

| | | |
|---|---|---|
| **Application Notes** | | |
| AN79953 | Getting Started with PSoC 4 | Describes the PSoC 4 device and how to build your first PSoC Creator project |
| **Code Examples** | | |
| CE210292 | WDT P4S Example | |
| **PSoC Creator Component Datasheets** | | |
| Global Signal Reference | Supports configuration of the WDT | |
| Pins | Supports connection of hardware resources to physical pins | |
| **Device Documentation** | | |
| PSoC 4 Datasheets | | |
| PSoC 4 Technical Reference Manuals | | |
| **DVK Documentation** | | |
| CY8CKIT-041-40xx PSoC 4 S-Series Pioneer Kit | | |
| CY8CKIT-041-41xx PSoC 4 S-Series Pioneer Kit | | |
| CY8CKIT-040 PSoC 4000 Pioneer Kit | | |
| CY8CKIT-048 PSoC Analog Coprocessor Pioneer Kit | | |

## PSoC Resources

Cypress provides a wealth of data at www.cypress.com to help you select the right PSoC device and quickly and effectively integrate the device into your design. For a comprehensive list of resources, see KBA86521, How to Design with PSoC 3, PSoC 4, and PSoC 5LP. The following is an abbreviated list for PSoC 4:

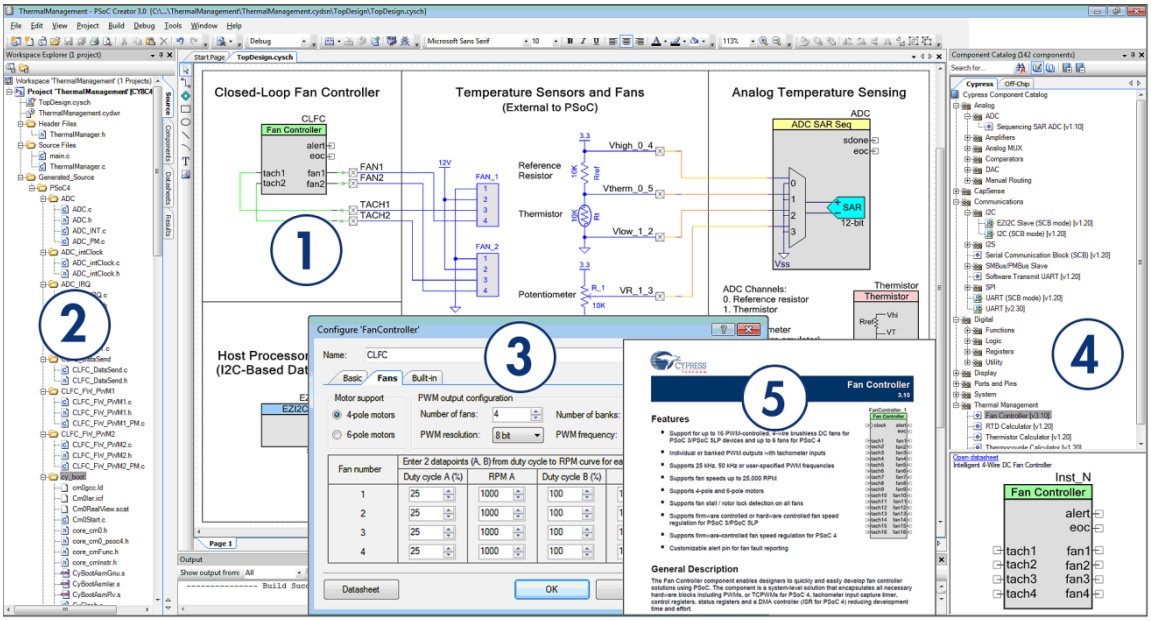
- **Overview:** PSoC Portfolio, PSoC Roadmap
- **Product Selectors:** PSoC 1, PSoC 3, PSoC 4, or PSoC 5LP. In addition, PSoC Creator includes a device selection tool.
- **Datasheets**: Describe and provide electrical specifications for the PSoC 4000, PSoC 4000S, PSoC 4100S, PSoC 4100 and PSoC 4200, PSoC 4xx7 BLE, PSoC 4200-M, and PSoC Analog Coprocessor device families
- **CapSense® Design Guide:** Learn how to design capacitive touch-sensing applications with the PSoC 4 family of devices.
- **Application Notes and Code Examples:** Cover a broad range of topics, from basic to advanced level. Many of the application notes include code examples. PSoC Creator provides additional code examples.
- **Technical Reference Manuals (TRM):** Provide detailed descriptions of the architecture and registers in each PSoC 4 device family.
- **Development Kits:**
  - CY8CKIT-040, CY8CKIT-041-40xx, CY8CKIT-041-41xx, CY8CKIT-042, CY8CKIT-042-BLE, CY8CKIT-044, and CY8CKIT-048 PSoC Pioneer Kits are easy to use and inexpensive development platforms. These kits include connectors for Arduino™ compatible shields and Digilent® Pmod™ daughter cards.
  - CY8CKIT-049 is a very low-cost prototyping platform for sampling PSoC 4 devices.
  - CY8CKIT-001 is a common development platform for all PSoC family devices.
  - CY8CKIT-002 – The MiniProg3 device provides an interface for flash programming and debugging.

### PSoC Creator

PSoC Creator is a free, Windows-based Integrated Design Environment (IDE) that enables the concurrent hardware and firmware design of systems based on PSoC 3, PSoC 4, and PSoC 5LP. See Figure 4. With PSoC Creator, you can:

1. Drag and drop Components to build your hardware system design in the main design workspace
2. Codesign your application firmware with the PSoC hardware
3. Configure Components using configuration tools
4. Explore the library of 100+ Components
5. Review Component datasheets

Figure 4. PSoC Creator Features



## Document History

Document Title: CE210292 - PSoC 4S Watchdog Timer

Document Number: 002-10292

| Revision | ECN | Submission Date | Description of Change |
|---|---|---|---|
| ** | 5142837 | 02/22/2016 | New code example. |
| *A | 5739909 | 05/25/2017 | Updated logo and copyright. |
| *B | 6900657 | 06/17/2020 | Updated CE to PSoC Creator 4.3 and renamed CE |

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