CE210558 - PSoC® 4 GPIO Interrupt

Objective

This example demonstrates how to set up PSoC 4 GPIO interrupts. It also shows how to create your own interrupt handler function (ISR) instead of using the default ISR generated by PSoC Creator.

Overview

This example demonstrates PSoC 4 GPIO interrupts. It uses two GPIO pins to generate interrupts – one on the rising edge and one on the falling edge. The interrupt handler function (ISR) turns a GPIO pin on or off, depending on the input edge. This causes an LED connected to the pin to show which edge was received.

Requirements

Tool: PSoC Creator™ 3.3 SP1 or higher.

Programming Language: C (GCC 4.9-2015-q1-update).

Associated Parts: All PSoC 4 parts

Related Hardware: All PSoC 4 kits; see Table 1 and Table 2 for pin assignments.

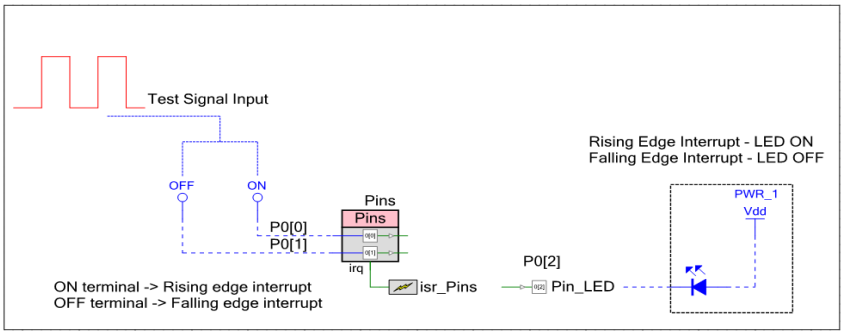
Design

The hardware part of the design features two GPIO pins configured as inputs as Figure 1 shows. They are also configured to generate interrupts – one on a rising edge and the other on a falling edge. The two pins selected are from the same port. So, there is only one interrupt request line (IRQ) signal in the schematic for that physical port. Port 0 is selected for this purpose in this code example.

In the firmware design, the ISR code distinguishes between these two interrupts and controls the state of an output pin depending on the interrupt source. The output pin drives an LED; therefore the LED shows which edge was received.

Two pins are configured to generate the interrupt. The “Pins” Component is configured such that ON terminal generates an interrupt on the rising-edge signal and the OFF terminal generate an interrupt on the falling-edge signal as Figure 1 shows. The interrupt service routine has a code to distinguish between these two interrupts. On the rising-edge interrupt, the LED is turned ON; on the falling-edge interrupt, the LED is turned OFF.

Figure 1. GPIO Interrupt Schematic



Components

Table 1 lists the PSoC Creator Components used in this example as well as the placement used by each.

Table 1. List of PSoC Creator Components

Component	Placement
Pins	2 pins
isr_Pins	One entry in interrupt vector memory
Pin_LED	1 pin

Parameter Settings

Figure 2, Figure 3, and Figure 4 show the changed settings for the Pins Component.

Figure 2. PIns Configuration

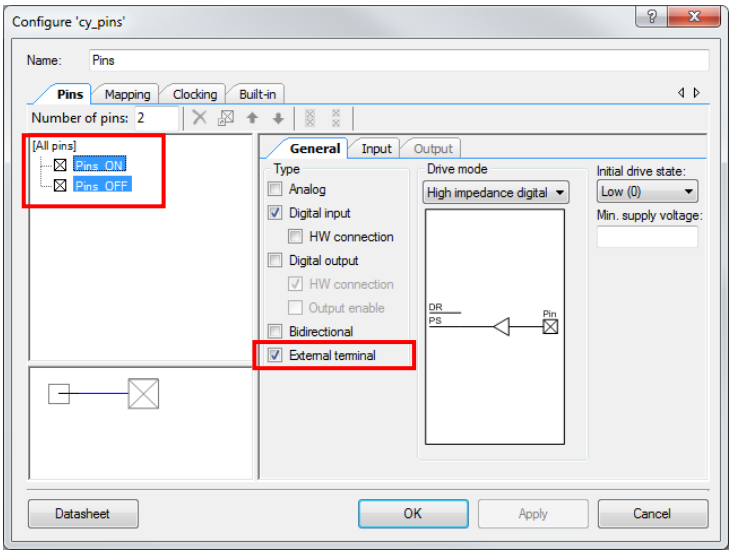


Figure 3. Pins Component Configuration Tool – Input Tab for Pins_ON

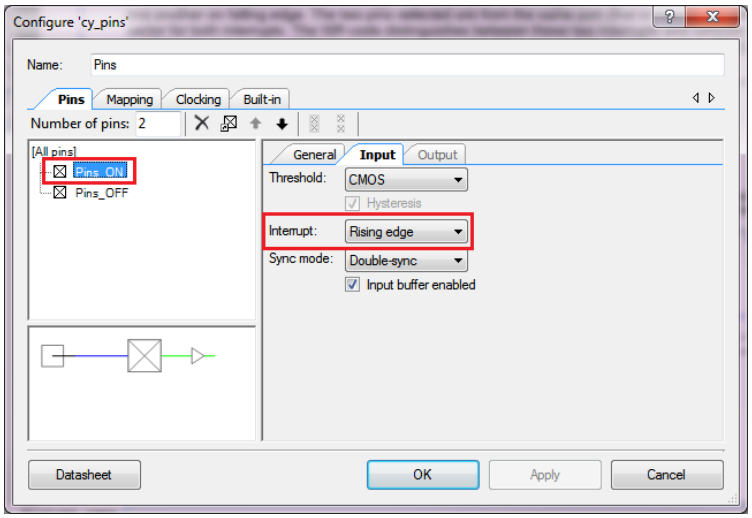


Figure 4. Pins Component Configuration Tool – Input Tab for Pins_OFF

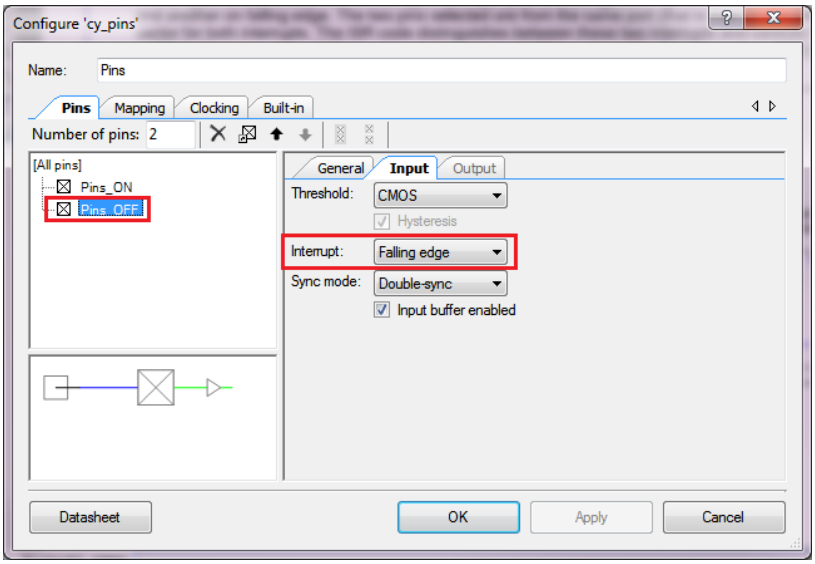


Figure 5 shows the changed settings for the isr_Pins Component.

Figure 5. isr_Pins Configuration

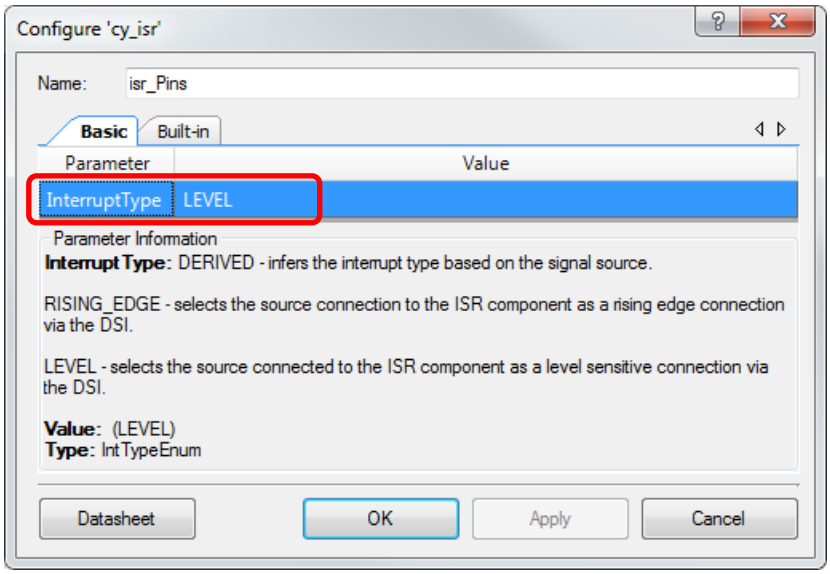
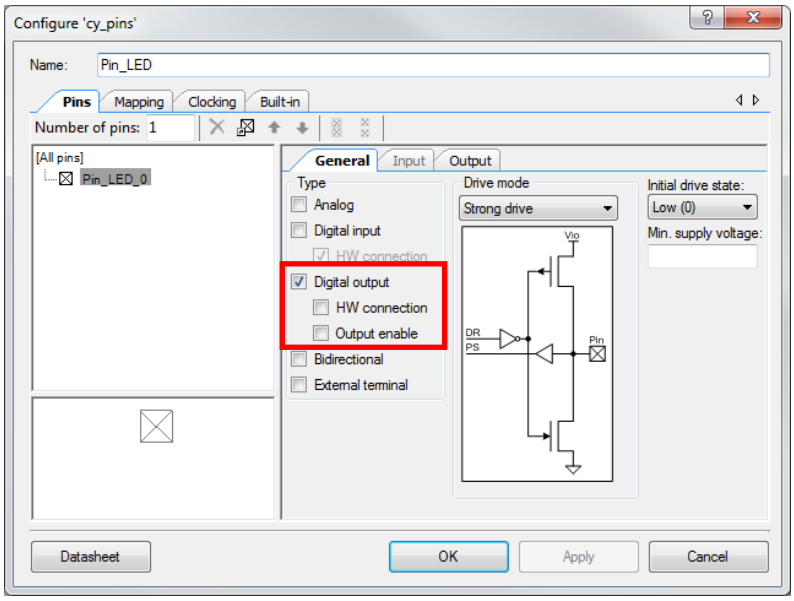


Figure 6 shows the changed settings for the Pin_LED Component.

Figure 6. Pin_LED Configuration



Design-Wide Resources

By default, the code example is for development kit CY8CKIT-042. If you are developing the project on other development kit, change the pin assignment for Pin_LED per Table 2.

Table 2. Pin assignment for Pin_LED

Name of the Component	Port No.	Development Board
Pin_LED	P0[2]	CY8CKIT-042
Pin_LED	P0[2]	CY8CKIT-040
Pin_LED	P2[6]	CY8CKIT-042-BLE
Pin_LED	P2[6]	CY8CKIT-044
Pin_LED	P5[2]	CY8CKIT-046

Table 3 shows the pin assignment for component Pins.

Table 3. Pin assignment for Pins

Name of the component	Port No.	Development Board
Pins	P0[1:0]	All

Operation

After the completing the schematic, follow the step given below to test the project:

1. Build the project to generate the hex file.
2. Connect the PC to the development board with the USB cable.
3. Download the hex file to the PSoC 4 chip.
4. Short P0[0] with P0[1].
5. Connect a signal generator output to P0[0] and turn ON the signal generator.
6. Notice that the LED on the development board toggles on every edge of the square-wave signal.

Related Documents

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

Table 4. Related Documents

Document	Title	Comment
AN79953	Getting Started with PSoC® 4	Introduces you to PSoC 4, an ARM® Cortex®-M0 MCU based programmable system-on-chip. It helps you explore the architecture and Creator development tools
AN90799	PSoC® 4 Interrupts	Provides interrupts architecture and its configuration
AN86439	PSoC® 4 - Using GPIO Pins	How to use PSoC 4 GPIO pins effectively and take full advantage of their features. Major topics include GPIO basics, configuration options, mixed-signal use, registers, interrupts, and low-power behavior.
AN89610	PSoC® 4 and PSoC 5LP ARM Cortex Code Optimization	This application note shows how to optimize C and assembler code for the ARM Cortex CPUs in PSoC 4 and PSoC 5LP. GCC and Keil Microcontroller Development Kit (MDK) C compilers are supported.
001-94480	System Reference Guide	This System Reference Guide describes functions supplied by the PSoC Creator cy_boot Component. The cy_boot Component provides the system functionality for a project to give better access to chip resources. The functions are not part of the Component libraries but may be used by them. You can use the function calls to reliably perform needed chip functions.
CE210557	PSoC® 4 GPIO Interrupt	This example demonstrates how to generate a periodic interrupt using a fixed-function timer/counter/PWM (TCPWM).
CE95400	Watchdog Timer Reset and Interrupt for PSoC® 4 Devices	This example demonstrates how to use the watchdog in PSoC 4 devices to both reset the system and wake up from the Deep Sleep low power mode.
PSoC Creator Component Datasheets		
Pins	Controls interface with physical I/O port pins	
Interrupt	The Interrupt component defines hardware triggered interrupts. It also provides a software method to genrate interrupt.	
Device Documentation		
PSoC 4 Datasheets		PSoC 4 Technical Reference Manuals
Development Kit (DVK) Documentation		
PSoC 4 Kits		

PSoC Resources

Cypress provides a wealth of data at www.cypress.com to help you to select the right PSoC device for your design, 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:

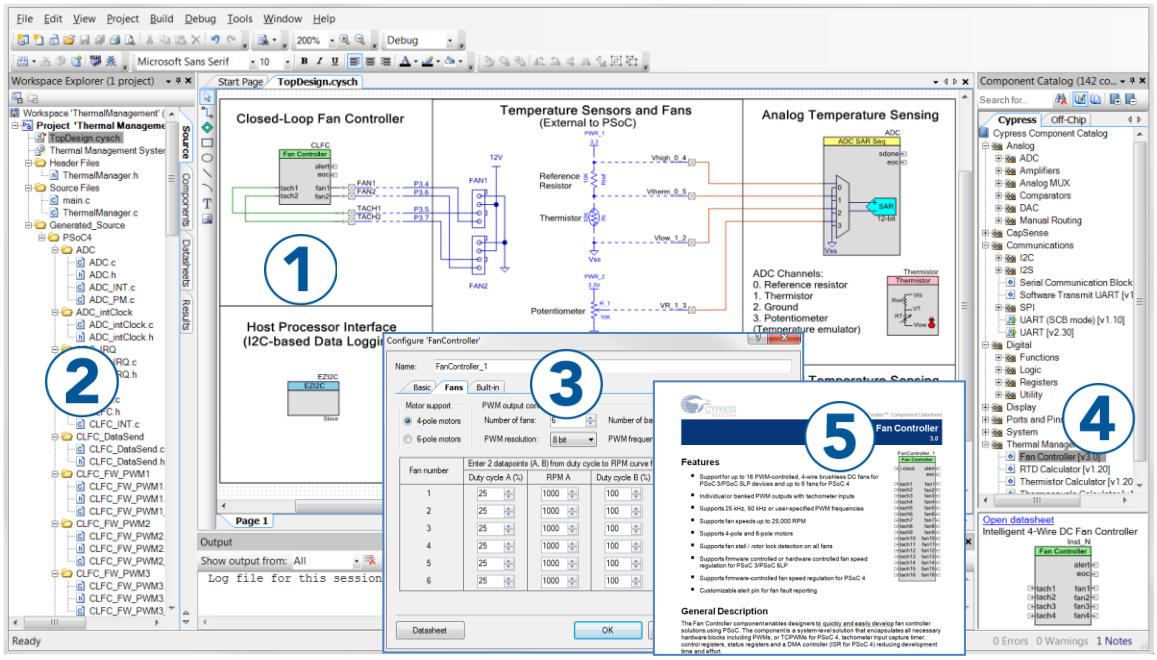
- **Overview:** PSoC Portfolio, PSoC Roadmap
- **Product Selectors:** PSoC 1, PSoC 3, PSoC 4, or PSoC 5LP. In addition, PSoC Creator includes a device selection tool.
- **Datasheets** describe and provide electrical specifications for the PSoC 4 device families
- **CapSense Design Guide:** Learn how 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.
- **Technical Reference Manuals (TRM)** provide detailed descriptions of the architecture and registers in each PSoC 4 device family.
- **Development Kits:**
  - CY8CKIT-042 PSoC 4 Kit, is an easy-to-use and inexpensive development platform. These kits include connectors for Arduino™ compatible shields and Digilent® Pmod™ daughter cards.
  - CY8CKIT-044 PSoC 4 Kit, is platform enabling design and debug of PSoC 4 M-Series devices.
  - CY8CKIT-046 is a low-cost hardware and software platform to enable design and debug of the PSoC 4200L device.
  - CY8CKIT-001 is a common development platform for all PSoC family devices.
- The MiniProg3 device provides an interface for flash programming and debug.

PSoC Creator

PSoC Creator is a free Windows-based Integrated Design Environment (IDE). It enables concurrent hardware and firmware design of systems based on PSoC 3, PSoC 4, and PSoC 5LP. See Figure 7 – 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 7. PSoC Creator Features



Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5096932	ASRI	01/21/2016	New code example
*A	5741063	AESATP12	05/26/2017	Updated logo and copyright.

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