CE216825 - PSoC 6 MCU Real-Time Clock Basics

Objective

This example demonstrates the usage of the real-time clock (RTC) in PSoC® 6 MCU using ModusToolbox™ IDE.

Requirements

Tool: ModusToolbox™ IDE 1.1

Programming Language: C

Associated Parts: All PSoC 6 MCU parts

Related Hardware: PSoC 6 BLE Pioneer Kit, PSoC 6 WiFi-BT Pioneer Kit, PSoC 6 WiFi-Prototyping Kit

Overview

This code example demonstrates how to get and set the time in the real-time clock (RTC), using the RTC driver API. The UART interface is used to input user data and print the result on the terminal.

Hardware Setup

This example uses the kit's default configuration. See the kit guide to ensure that the kit is configured correctly.

Note: The PSoC 6 BLE Pioneer kit and the PSoC 6 WiFi-BT Pioneer kit ship with KitProg2. ModusToolbox only works with KitProg3. Before using this code example, make sure that the kit is upgraded to KitProg3. See **ModusToolbox Help** > **ModusToolbox IDE Documentation** > **User Guide**; section PSoC 6 MCU KitProg Firmware Loader. If you do not upgrade, you will see an error like "unable to find CMSIS-DAP device" or "KitProg firmware is out of date".

Software Setup

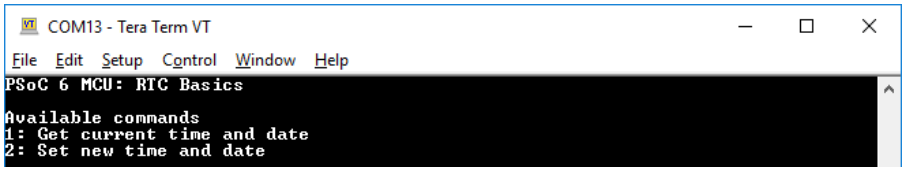
This example uses a terminal emulator. Install one if you don't have one. The instructions use Tera Term.

Operation

Follow the instructions that came with your kit to make sure that your kit is connected to your PC.

1. Open terminal software such as Tera Term and select the KitProg3's COM port with a baud rate setting of 115200 bps, data bits 8, parity none, and stop bit 1. Make sure the terminal sends a line feed (LF) character for a new line and enable local echo to see entered commands.
2. Add the code example to the IDE, in a new workspace. See KBA225201.
3. Program the PSoC 6 MCU device. In the project explorer, select the **mainapp** project. In the Quick Panel, scroll to the **Launches** section and click the **Program (KitProg3)** configuration.
4. Confirm that the terminal program is working. It should show a message with the available commands, like Figure 1.

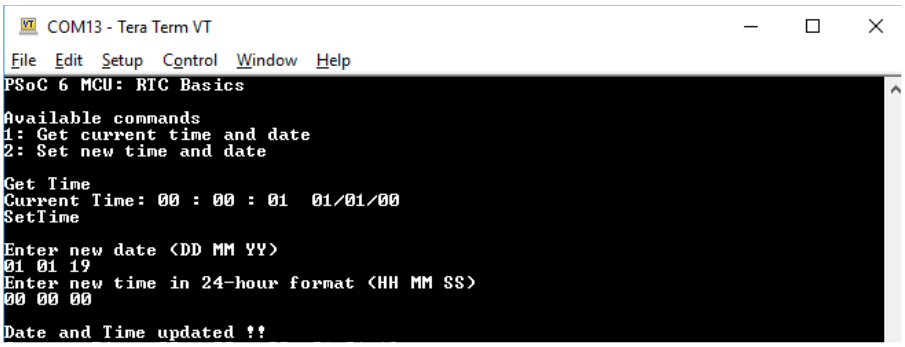
Figure 1. Available Commands in Terminal Window



5. Type "1". The terminal program shows the current time from the RTC, as shown in Figure 2.

6. Type “2”. After that it will ask for new date and time. Enter the new date and time, and press **Enter** (Figure 2).

Figure 2. Display Terminal Messages



Debugging

You can debug the example to step through the code. Use the **Debug (KitProg3)** configuration. See KBA224621 to learn how to start a debug session with ModusToolbox IDE.

Design and Implementation

This code example features the Real Time Clock resource and one UART resource. The RTC provides time and date information – second, minute, hour, day of the week, date, month, and year. The time and date information are updated every second with automatic leap year compensation performed by the RTC hardware block.

The CPU waits for the line feed (LF) character from the serial terminal. When it is received, the code parses the commands that have been sent.

- If the input command is ‘1’, display the current date and time.
- If the input command is ‘2’, update the RTC with new date and time.

Resources and Settings

Table 1 lists the ModusToolbox resources used in this example, and how they are used in the design. For pin usage and configuration, open the **Pins** tab of the *design.modus* file.

Table 1. ModusToolbox Resources

Resource	Alias	Purpose	Non-default Settings
Real-Time Clock	RTC	Provides date and time information	Default
KIT_UART	KIT_UART	Prints messages on terminal program.	See Figure 3
Digital Output Pin	KIT_UART_TX	Used for UART transmit (Tx)	See Figure 5
	KIT_LED2	Provides visual feedback	See Figure 6
Digital Input Pin	KIT_UART_RX	Used for UART receive (Rx)	See Figure 4

Figure 3 to Figure 6 show non-default configuration settings for the resources.

Figure 3. UART Configuration

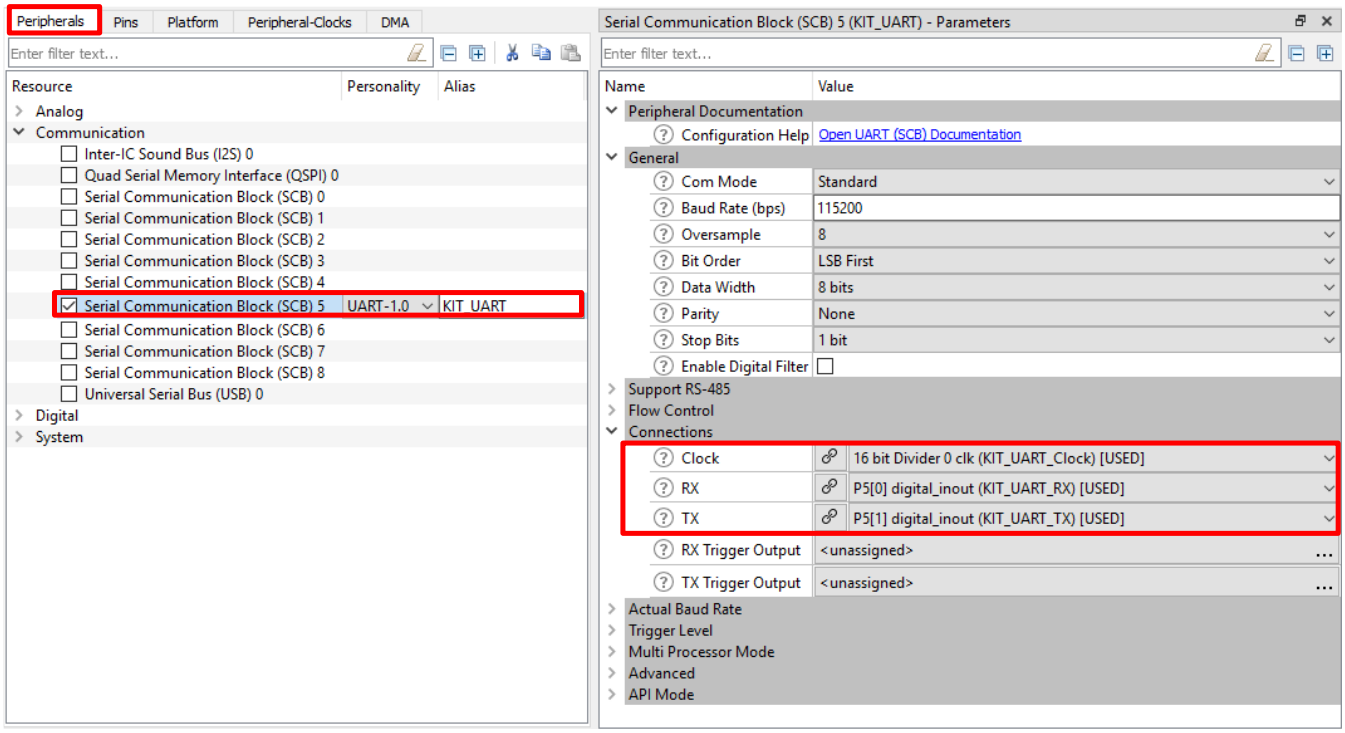


Figure 4. GPIO Pin Configuration for UART Rx

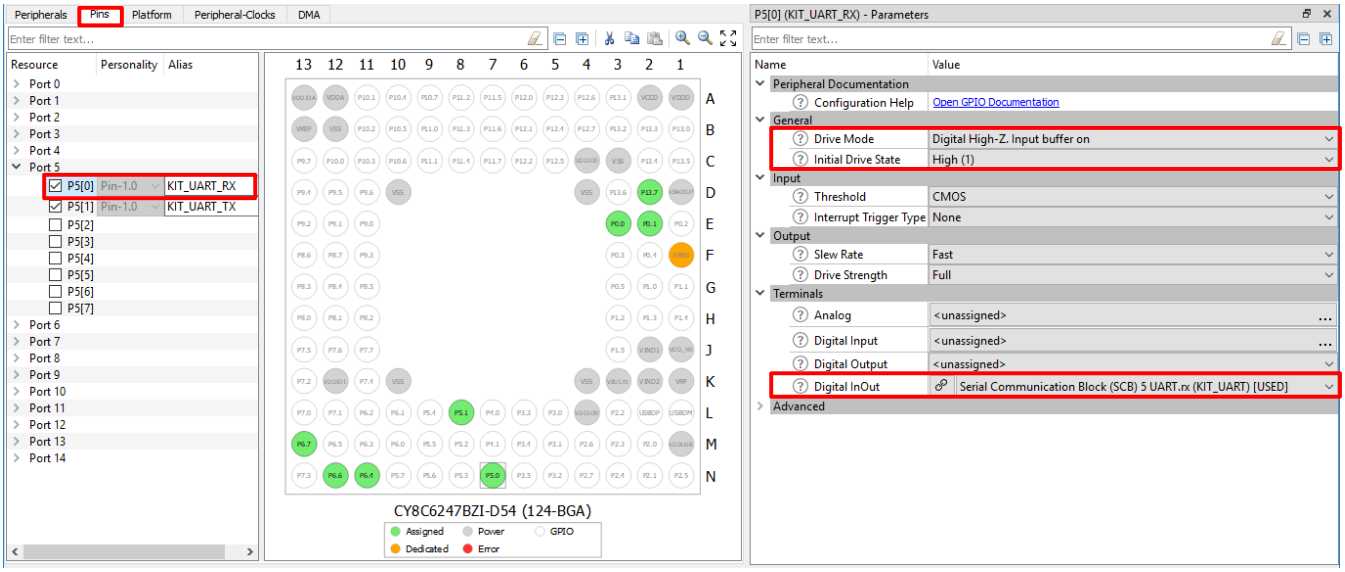


Figure 5. GPIO Pin Configuration for UART Tx

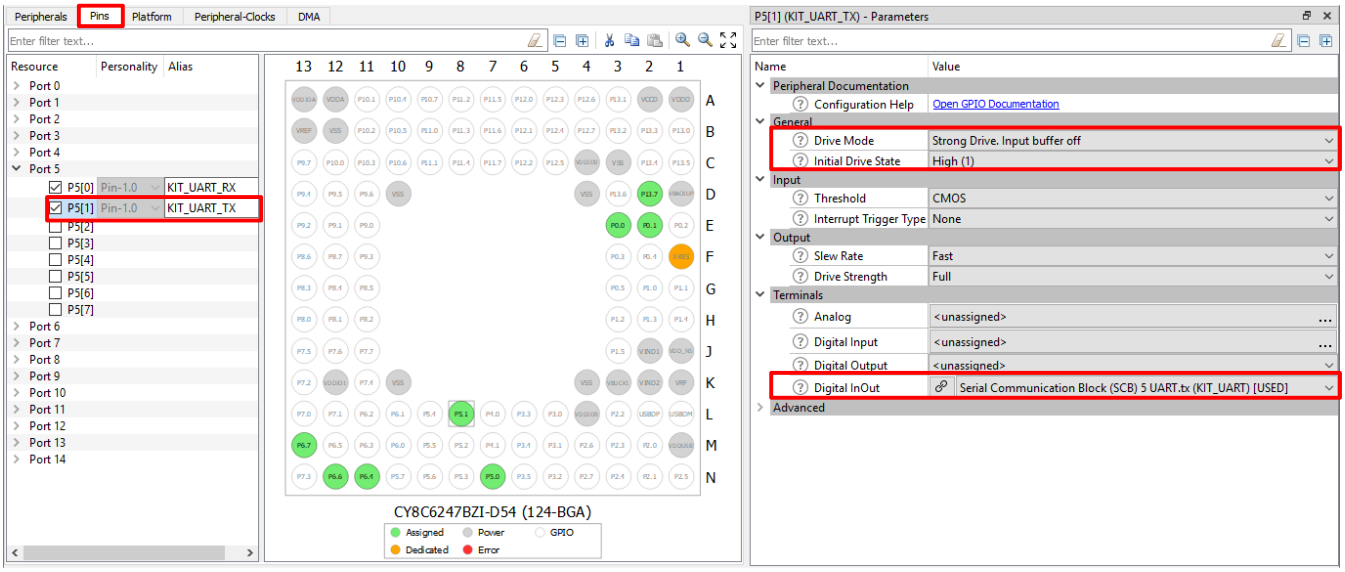


Figure 6. GPIO Pin Configuration for LED Pin

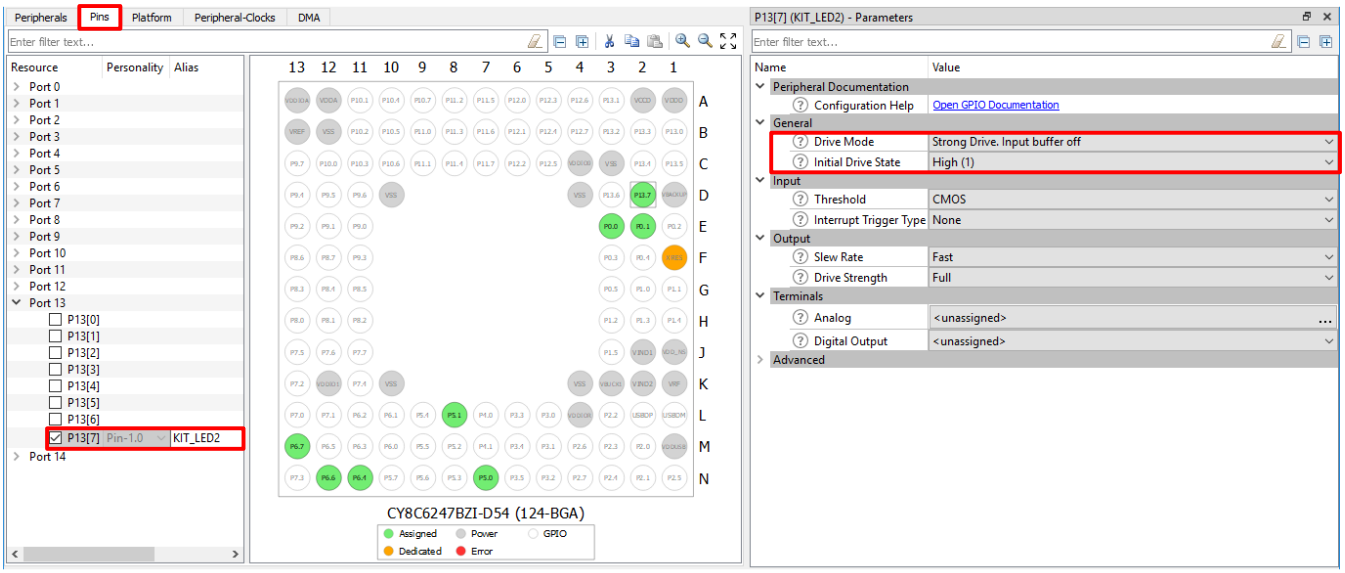
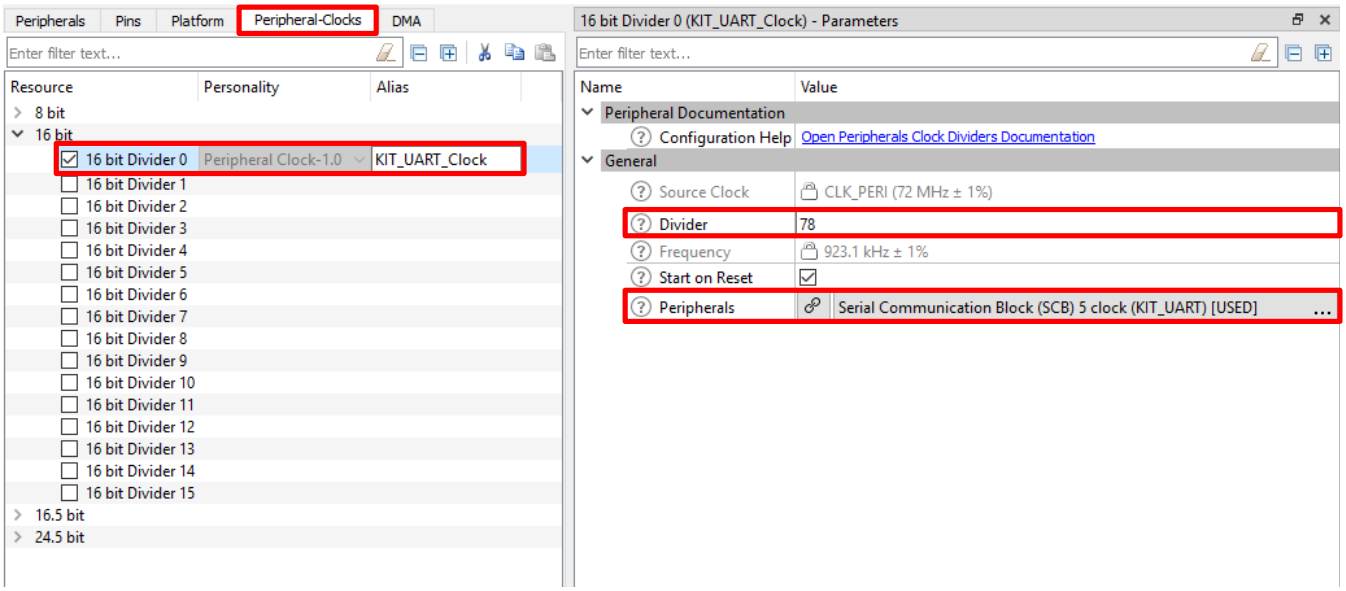


Figure 7 shows the Peripheral-Clock configuration for UART resource to get 115200 bps baud rate.

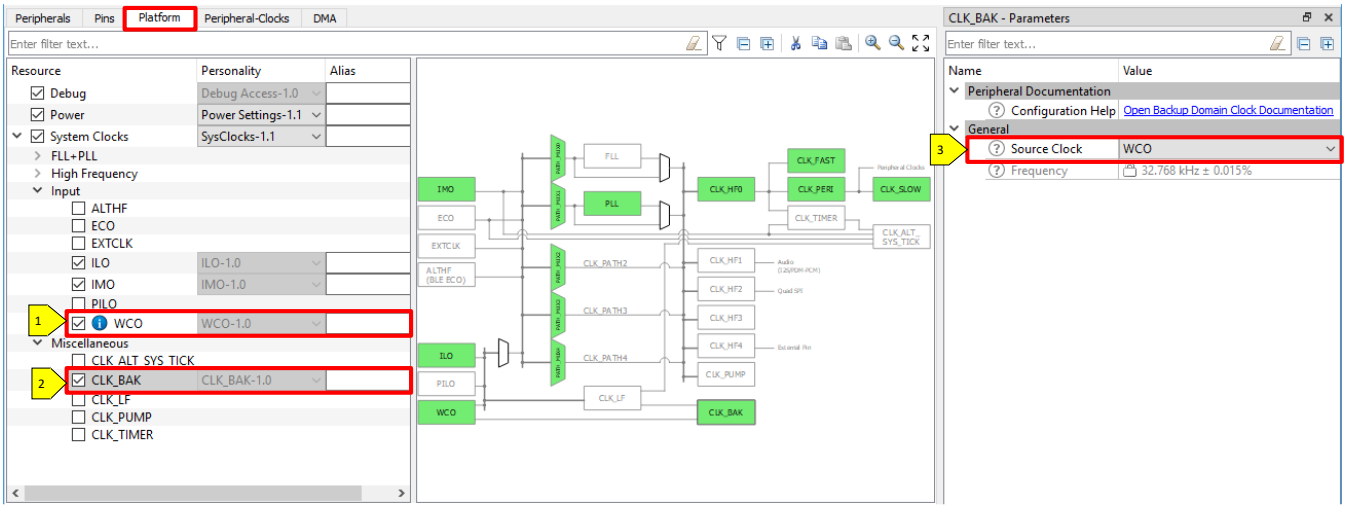
Figure 7. Peripheral-Clock Configuration for UART



Design Considerations

It is necessary to provide a 32.768-kHz clock for the RTC function in the backup power domain. For accurate RTC operation, it is recommended that you use a Watch Crystal Oscillator (WCO). Figure 8 shows the backup clock configuration used in this project.

Figure 8. Backup Clock Configuration



Reusing This Example

This example is designed for the supported kits. To port the design to a different PSoC 6 MCU device, right-click an application project and choose **Change Device**. If changing to a different kit, you may need to reassign pins.

Table 2. Device and Pin Mapping Table across PSoC 6 MCU Kits

Kit Name	Device Used	KIT_LED2	UART_RX	UART_TX
CY8CKIT-062-WiFi-BT	CY8C6247BZI-D54	P13[7]	P5[0]	P5[1]
CY8CKIT-062-BLE	CY8C6347BZI-BLD53	P13[7]	P5[0]	P5[1]
CY8CPROTO-062-4343W	CY8C624ABZI-D44	P13[7]	P5[0]	P5[1]

In some cases, a resource used by a code example (for example, an IP block) is not supported on another device. In that case, the example will not work. If you build the code targeted at such a device, you will get errors. See the device datasheet for information on what a particular device supports.

Related Documents

For a comprehensive list of PSoC 6 MCU resources, see KBA223067 in the Cypress community.

Application Notes	
AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity	Describes PSoC 6 MCU with BLE Connectivity devices and how to build your first PSoC Creator project
AN221774 – Getting Started with PSoC 6 MCU	Describes PSoC 6 MCU devices and how to build your first ModusToolbox application and PSoC Creator project
AN215656 – PSoC 6 MCU: Dual-CPU System Design	Describes the dual-CPU architecture in PSoC 6 MCU, and shows how to build a simple dual-CPU design
Code Examples	
Visit the Cypress GitHub site for a comprehensive collection of code examples using ModusToolbox IDE	
Device Documentation	
PSoC 6 MCU: PSoC 63 with BLE Datasheet	PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual
Development Kit Documentation	
CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit	
CY8CKIT-062-WiFi-BT PSoC 6 WiFi-BT Pioneer Kit	
CY8CPROTO-062-4343W PSoC 6 Wi-Fi BT Prototyping Kit	
CY8CPROTO-063 BLE PSoC 6 BLE Prototyping Kit	
Tool Documentation	
ModusToolbox	ModusToolbox simplifies development for IoT designers. It delivers easy-to-use tools and a familiar microcontroller (MCU) integrated development environment (IDE) for Windows, macOS, and Linux.

Cypress Resources

Cypress provides a wealth of data at www.cypress.com to help you to select the right device, and quickly and effectively integrate the device into your design.

For the PSoC 6 MCU devices, see KBA223067 in the Cypress community for a comprehensive list of PSoC 6 MCU resources.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	6409432	AJYA	02/20/2019	New code example

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