ADC_SAR_Seq_DieTemp_PSoC4 example project

2.0

Features

- Project uses ADC_SAR_SEQ_P4 component
- Indicates temperature and ADC channel measurements through UART
- LED brightness depends on ADC_SAR_SEQ (channel0)

General Description

This project demonstrates two channels measurements by sequencing the SAR ADC and transferring results using an ISR to the UART and PWM.

Development kit configuration

This example project is designed to run on the CY8CKIT-042 kit from Cypress Semiconductor. A description of the kit, along with more example programs and ordering information, can be found at http://www.cypress.com/go/cy8ckit-042.

The project requires configuration settings changes to run on other kits from Cypress Semiconductor. Table 1 is the list of the supported kits. To switch from CY8CKIT-042 to any other kit, change the project's device with the help of Device Selector called from the project's context menu.

Table 1. Development Kits vs Parts

Development Kit	Device
CY8CKIT-042	CY8C4245AXI-483
CY8CKIT-042-BLE	CY8C4247LQI-BL483
CY8CKIT-044	CY8C4247AZI-M485
CY8CKIT-046	CY8C4248BZI-L489
CY8CKIT-041	CY8C4146AZI-S433

The pin assignments for the supported kits are in Table 2.

Table 2. Pin Assignment

Pin Name	Development Kit				
	CY8CKIT-042	CY8CKIT-042 BLE	CY8CKIT-044	CY8CKIT-046	CY8CKIT-041
Pin_LED	P0[2]	P3[6]	P2[6]	P5[3]	P2[6]
Pin_Vin	P0[4]	P3[0]	P3[0]	P3[0]	P0[2]
\UART_tx\	P0[5]*	P1[5]	P7[1]	P3[1]	P0[5]

* Connect P0[5] to pin P12[6] on header J8.

Note ADC component has “Vref select” parameter set to “Internal 1.024 volts” by default in the component customizer. For PSoC 4100S (CY8CKIT-041 kit) “Internal 1.024 volts” option is not supported and “Internal Vref” option should be set in the component customizer instead. Building Example Project without changing default “Vref select” parameter value for PSoC 4100S (CY8CKIT-041 kit) will cause a building error – “Error in component: ADC. The selected type of voltage reference is not supported for the current device type”.

The following steps should be performed to observe the project operation:

1. The kit board should be configured to the default switch and jumper settings. Verify that J9 (J16 on BLE Kit, VDD SELECT) is connected to 5V.
2. Connect Pin_Vin to GND.
3. Connect the Pioneer kit board to the PC using a USB cable.
4. Launch any of the RS-232 terminal applications on the PC and configure it to use the 'KitProg USB-UART' port with the speed of 115200bps.
5. Build the project and program the hex file on to the PSoC4 Pioneer kit.
6. Observe the results on the terminal application.
7. Connect Pin_Vin to V3.3, that is located at J1, observe changes in ADC measurements and LED brightness. The ADC measurement result will be out of range (1024mV) for the voltage larger than 1.024V. You may use an external voltage divider to get the expected voltage in range (0-1.024V). Please note for PSoC 4100S (CY8CKIT-041 kit) upper voltage limit will be 1.2V, because “Internal 1.024 volts” option is not supported for this device/kit.

Project configuration

The example project consists of the following components: an ADC_SAR_Seq, PWM, DieTemp, SW_Tx_UART, Clock, digital output pin, analog pin, and Interrupts. The ADC_SAR_Seq is used with one sequenced channel and Injection channel measurement. The PWM is used in the Right align the PWM mode. The output pin is used to reflect the line signal output on the LED. The DieTemp is used to obtain a rough temperature of the device. The SW_Tx_UART is used for transmitting measurements through the UART. The analog pin is used as an external voltage input pin.

- The top design schematic is shown in Figure 1.
- The ADC_SAR_Seq component GUI configuration (Figure 2, Figure 3).
- The TCPWM component (PWM mode) GUI configuration (Figure 4, Figure 5).
- The SW_Tx_UART component GUI configuration (Figure 6).

Figure 1. Top design schematic

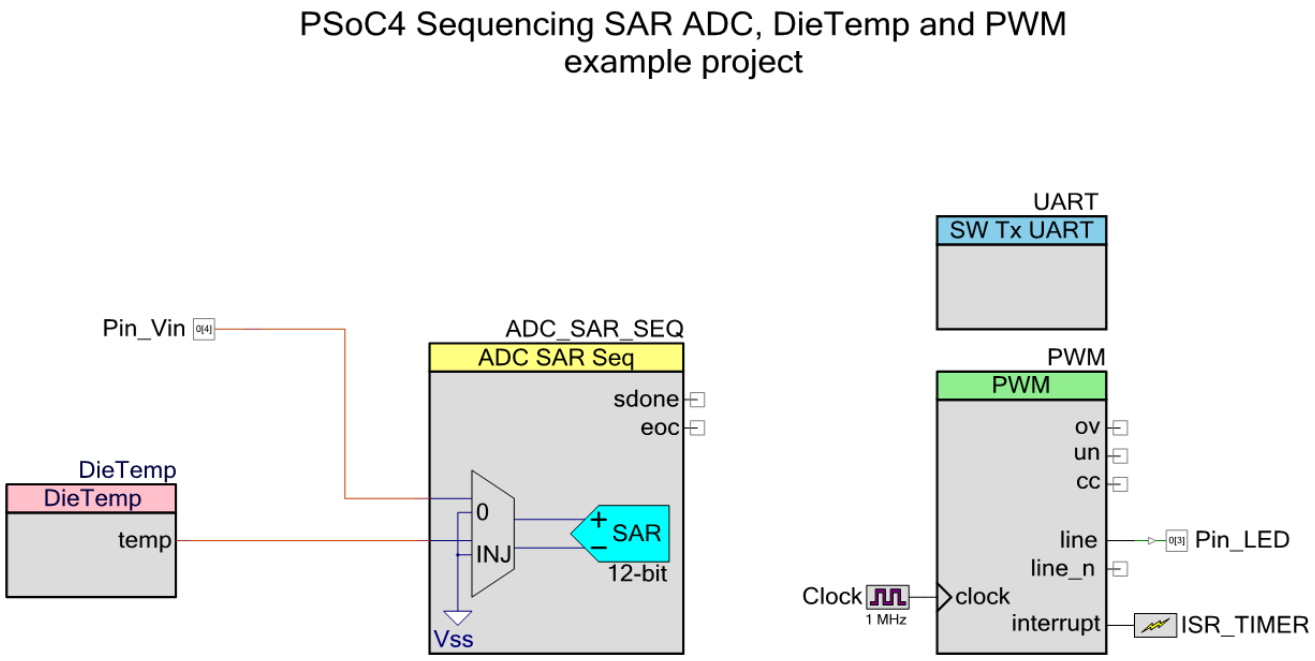


Figure 2. ADC_SAR_Seq Component General Tab

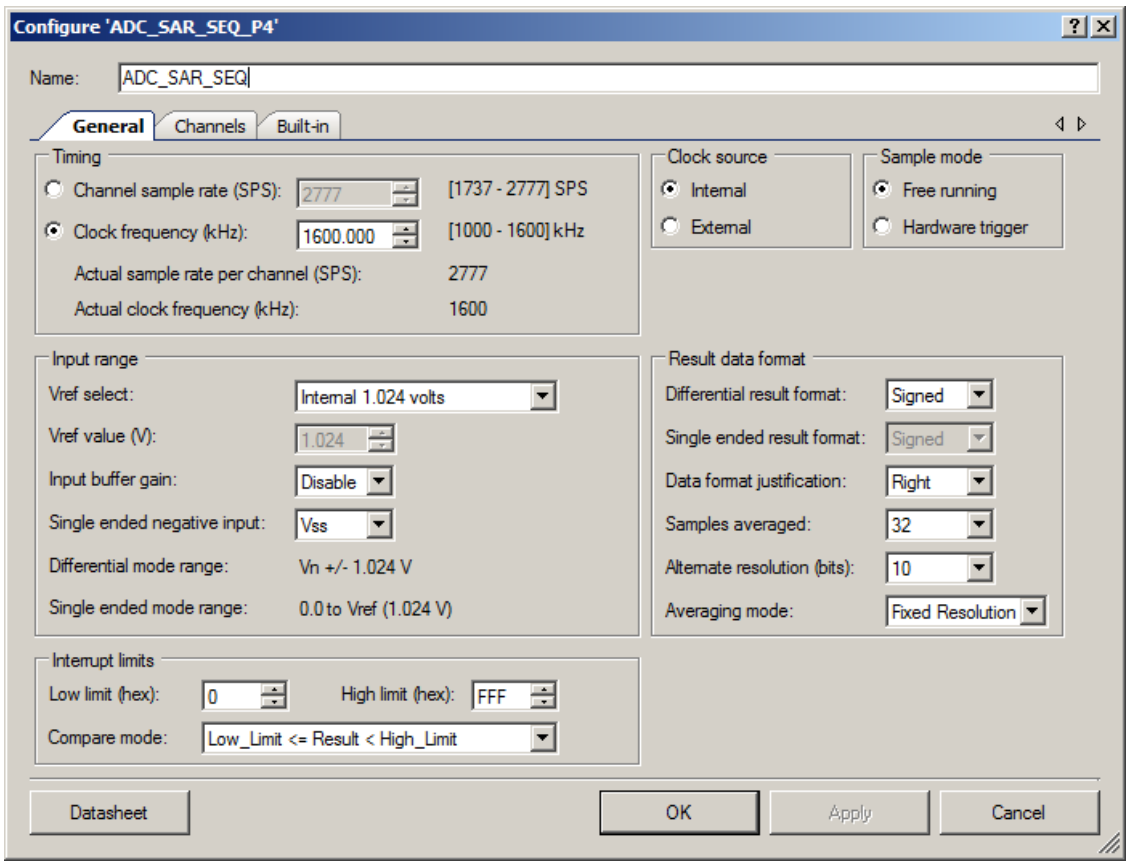


Figure 3. ADC_SAR_Seq Component Channels Tab

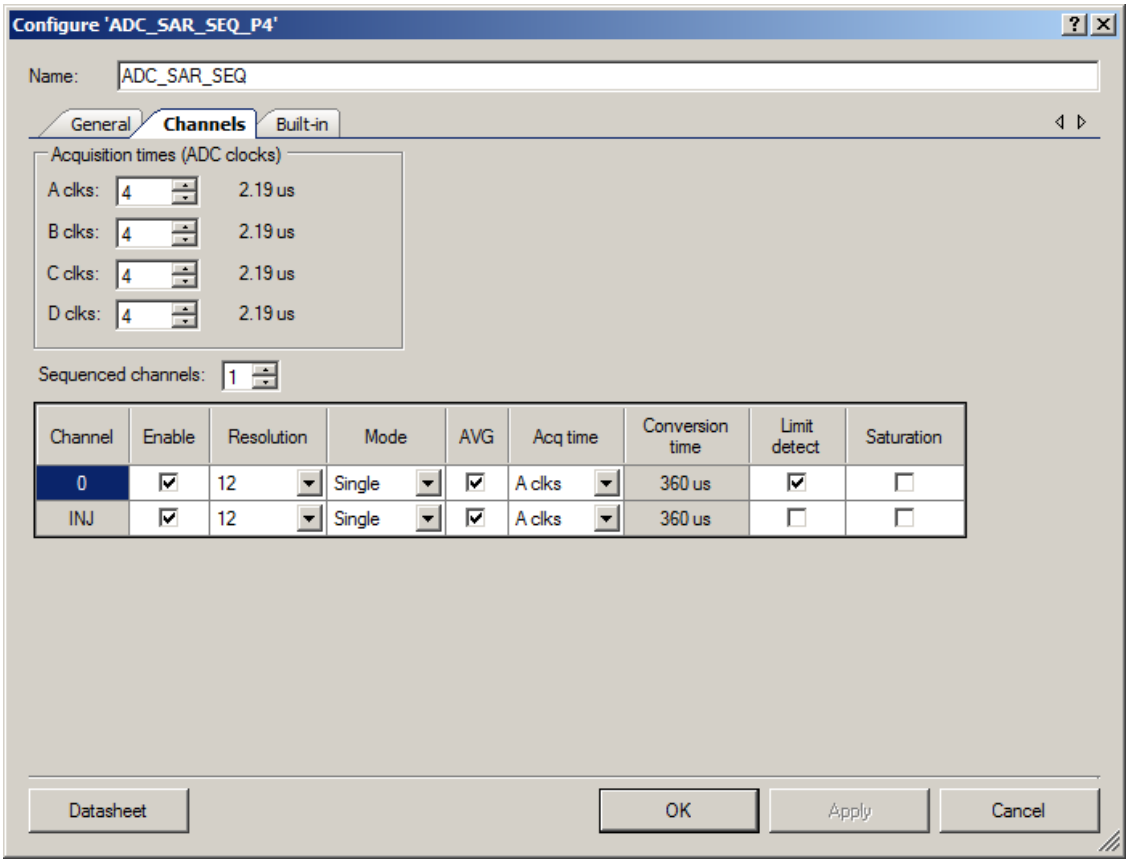


Figure 4. TCPWM Component Configuration Tab

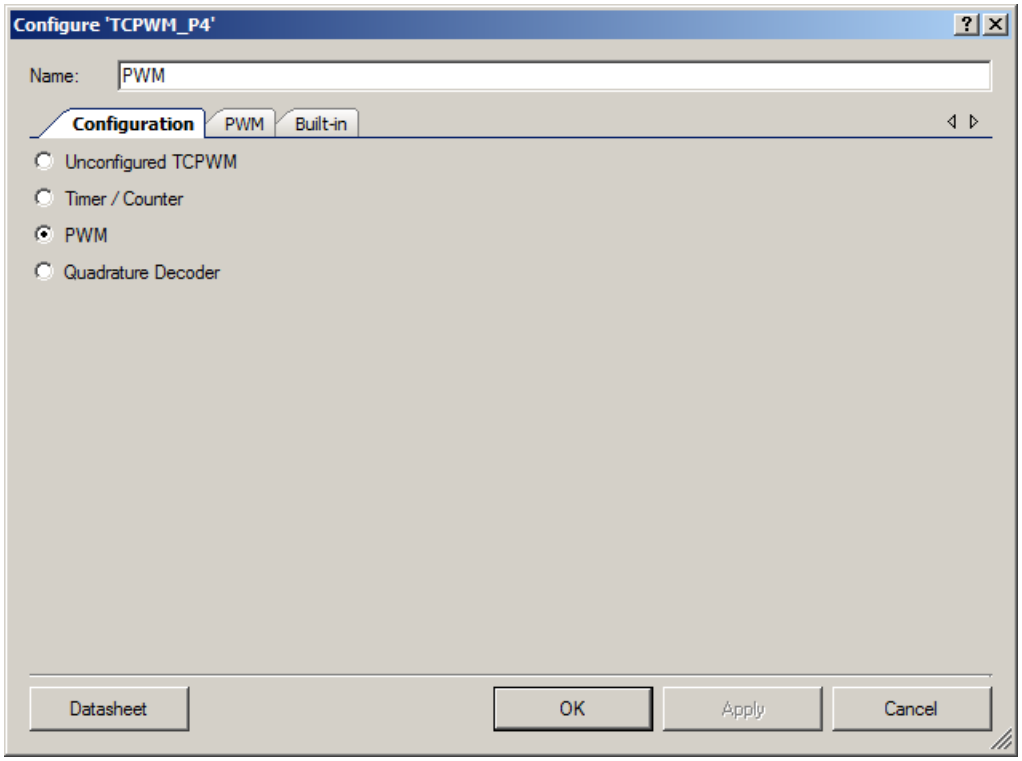


Figure 5. TCPWM Component PWM Tab

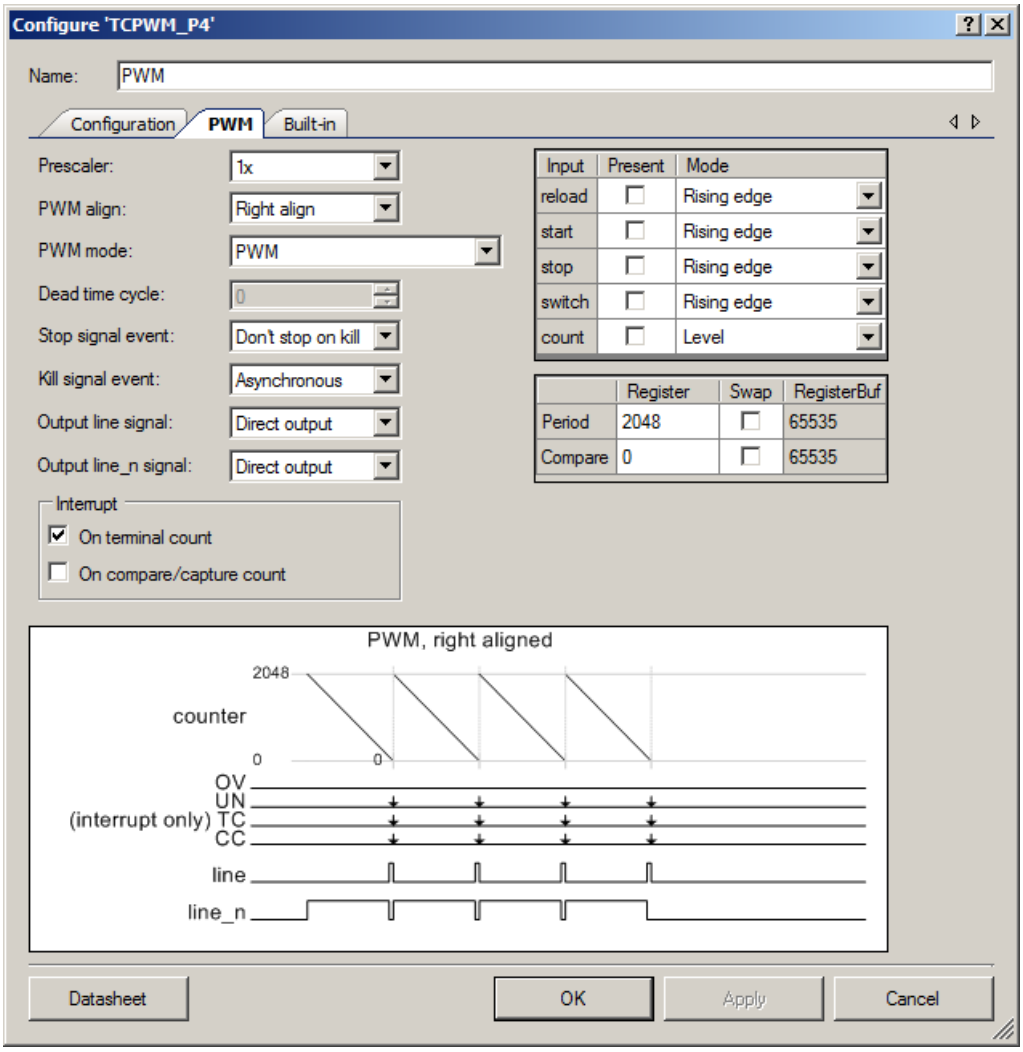
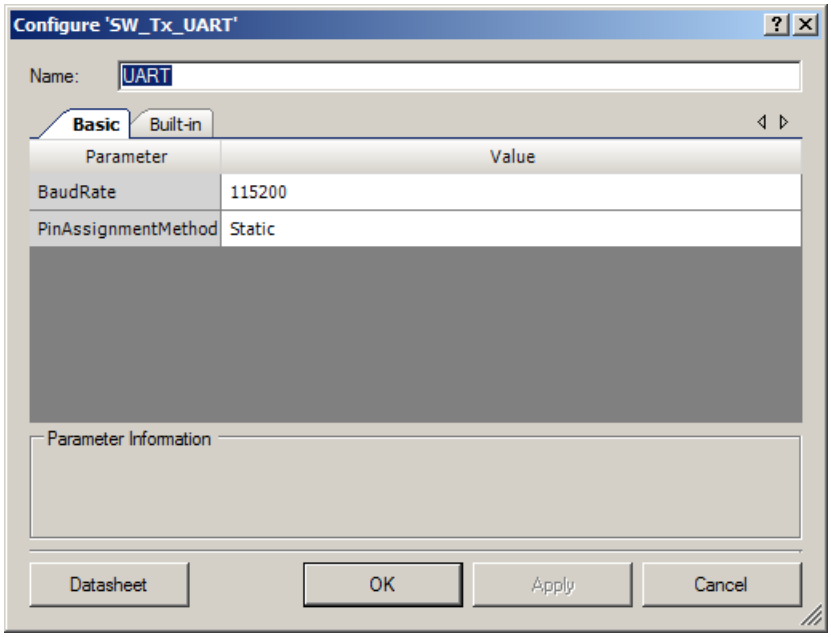


Figure 6. SW_Tx_UART Component Basic Tab



Project description

The measurement of the injection channel is triggered by an ISR_TIMER interrupt each second. The injection channel measurements are triggered by the software unlike measurements of channel 0. The reason for it is that the temperature sensor is not recommended to poll with a frequency higher that 1 sample per second. When the PWM line output is high, the LED brightness is in low power so changing the input voltage that is measured by the ADC (channel 0) changes PWM output which results in changing LED brightness. During all these manipulations the temperature value is reported through the UART.

Note: if the value of Vref in the ADC SAR Sequencer settings is different from the proposed ones, DieTemp component accuracy may degrade. Please refer to the PSoC 4 Die Temperature datasheet for details.

Expected results

The temperature value in Celsius and ADC measured voltage in mV are reflected through the UART. The green color LED changes its brightness (if Vin voltage value is changed).