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CE95327 – PSoC® 4 Current Digital-to-Analog Converter

Objective

This code example demonstrates the use of the current digital-to-analog converter (IDAC).

Overview

This code example shows the capability of the Current Digital-to-Analog Converter (IDAC) to change its current output with firmware. The current increases when a switch is pressed. Once the output reaches its maximum value, it resets to zero and starts to increase the value again. If switch is not pressed, the last value is maintained.

Requirements

Tool: PSoC Creator™ 4.2 or higher

Programming Language: C (ARM® GCC 5.4)

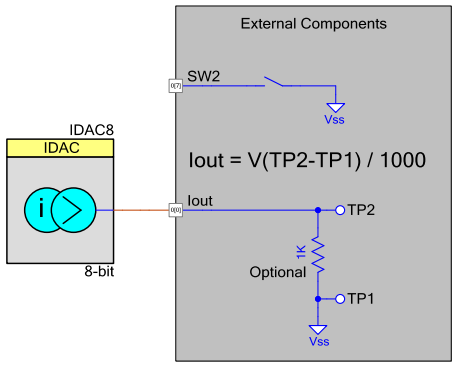
Associated Parts: PSoC® 4

Hardware: CY8CKIT-042, CY8CKIT-042-BLE, CY8CKIT-044, CY8CKIT-046

Design

The example demonstrates one way of using the IDAC Component. It is configured as an 8-bit IDAC with a range of 0–612 µA (2.4 µA/count). Firmware detects when the switch (SW2) is pressed and slowly increases the IDAC output with the `IDAC8_SetValue()` function, until the switch is released. See Figure 1 below for schematic.

Figure 1. Top Design Schematic



Kit Configuration and Pin Assignments

1. Select the appropriate device for the kit you are using according to Table 1. By default the project is configured for the CY8CKIT-042. To select the correct device, click on the “Project” menu and select the “Device Selector” sub-menu.

Table 1. Development Kits and Associated Devices

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

2. You can change the pins used by selecting the “Pins” tab in the “Design Wide Resources” view to match Table 2. As mentioned above, the project is initially configured for the CY8CKIT-042 kit, so all references to GPIO pins used will be for the CY8CKIT-042 kit.

Table 2. Pin Assignments

Pin Name	Development Kit			
	CY8CKIT-042	CY8CKIT-042-BLE	CY8CKIT-044	CY8CKIT-046
Iout	P0[0]	P0[0]	P0[0]	P1[2]
SW2	P0[7]	P2[7]	P0[7]	P0[7]

Components

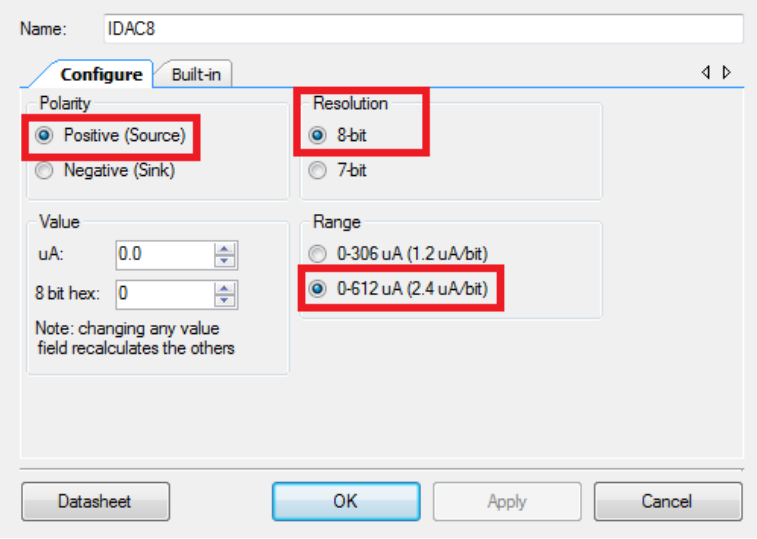
Table 3 lists the PSoC Creator Components used in this example (CY8CKIT-042), as well as the hardware resources used by each.

Table 3. PSoC Creator Components

Component	Usage	Hardware Resources
IDAC	Current DAC	CSIDAC0/1
Pin	IDAC output	GPI0 (pin P0[0])
Pin	SW2 Input	GPIO (pin P0[7])

The IDAC is configured for positive polarity (source), 8-bit resolution and the 612 uA range, as shown in Figure 2. Initial value doesn’t matter since it will be over written by the firmware to 0 uA.

Figure 2. IDAC Configuration



Operation

This example project requires a multi-meter to measure the output current. Follow these steps below to exercise the project.

1. Make sure that the kit has been configured as instructed in the Kit Configuration and Pin Assignments section.
2. Connect the USB cable between the PC and the kit.
3. Build the project and program the PSoC 4 device.

4. Measure the current between pin Iout (P0[0]) and Vss. This can be done in two ways:
   a. Use a sensitive amp meter that can resolve down to a couple uAmps and connect it across pin Iout (P0[0]) and Vss. (Remove the 1K resistor shown in the schematic.)
   b. Leave the 1K resistor in the circuit as shown and use a voltmeter to measure the voltage across the resistor. The conversion between amps and volts is just ohms law, I = V/R. With a 1K shunt resistor, the voltage output will be between 0 and 612mV instead of 0 to 612uA.
5. Press and hold the switch (SW2) to observe the current (or voltage) increase until it exceeds 612uA (or 612mV) then starts back at 0.

Related Documents

Table 4 lists the relevant application notes, code examples, Component datasheets, and device and DVK documentation.

Table 4. Related Documents

Application Notes		
AN79953	Getting Started with PSoC 4	Describes PSoC 4 and shows how to build the attached code example
AN60590	PSoC 3, PSoC 4, and PSoC 5LP – Temperature Measurement with a Diode	Explains the use of a diode and an IDAC as a temperature sensor
Code Examples		
CE204022	PSoC 4 IDAC7 Sawtooth Waveform Generator	Shows the basics of using the IDAC7 available in some PSoC 4 devices. A simple sawtooth or voltage ramp waveform is generated using the IDAC7 current output digital-to-analog converter.
PSoC Creator Component Datasheets		
Current Digital to Analog Converter	Supports the IDAC Component	
Pins	Supports the connection of hardware resources to physical pins	
Device Documentation		
PSoC 4 Datasheets		
PSoC 4 Technical Reference Manuals		
Development Kit (DVK) Documentation		
PSoC 4 Kits		

Document History

Document Title: CE95327 – PSoC® 4 Current Digital-to-Analog Converter

Document Number: 001-95327

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5526019	WESL	11/23/2016	New code example
*A	6097931	MEH	04/20/2017	Changed project operation and fixed errors in document and firmware listing. Updated example to PSoC Creator 4.2. Updated template

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