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CE220923 - PSoC 6 MCU VDAC Sawtooth Wave Generator

Objective

This example demonstrates how to use the Voltage DAC (12-bit) Component as a sawtooth wave generator in a PSoC® 6 MCU.

Overview

This example generates a sawtooth wave by incrementing through all 4096 unique codes of the Voltage DAC (12-bit) Component using an interrupt service routine. Both the PSoC Creator™ Voltage DAC (12-bit) Component and underlying low-level Peripheral Driver Library (PDL) Continuous Time DAC (CTDAC) function calls are shown.

Requirements

Tool: PSoC Creator™ 4.2 with PDL 3.0.1

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

Associated Parts: PSoC 6 MCU family of devices

Related Hardware: CY8CKIT-062-BLE PSoC 6 MCU BLE Pioneer Kit and CY8CKIT-062-WiFi-BT PSoC 6 MCU Pioneer Kit

Design

The design shown in Figure 1 implements continuous updating of the VDAC Component's output voltage using CPU register writes. Register writes occur in an interrupt service routine initiated by the buffer empty interrupt signal. The VDAC Component is placed into an available CTDAC hardware block and the output voltage waveform is routed to pin P9[6]. An oscilloscope connected to pin P9[6] can display the waveform.

Figure 1. PSoC Creator Component Schematic



There is one global interrupt for all CTDACs in PSoC 6 MCU. The Global Signal Resource (GSR) Component routes this interrupt signal to an interrupt Component, which assigns an interrupt vector.

The interrupt service routine increments through all 4096 unique codes of the VDAC to produce a sawtooth waveform. With the 50-kHz VDAC clock, the sawtooth waveform frequency is 50 kHz / 4096 = 12.2 Hz.

Design Considerations

This code example is designed to run on the CY8CKIT-062-BLE Pioneer Kit with the CY8C6347BZI-BLD53 device. To port the design to a different PSoC 6 MCU device and/or kit, change the target device using **Device Selector** and update the pin assignments in the **Design Wide Resources Pins** settings as needed. For single-CPU PSoC 6 MCU devices, port the code from *main_cm4.c* to *main.c*.

Note that a higher-priority interrupt could delay the servicing of the VDAC interrupt resulting in a distorted waveform. Avoid this by making the VDAC interrupt the highest priority.

Hardware Setup

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

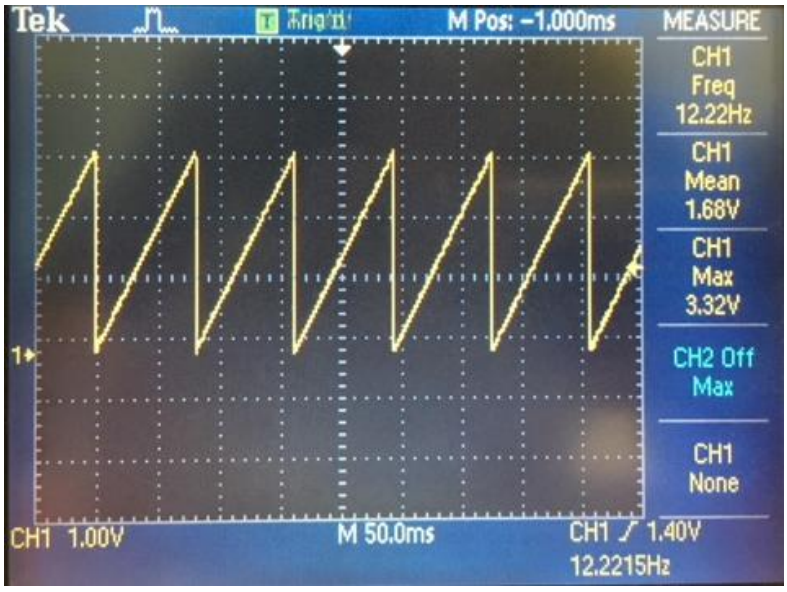
Software Setup

By default, the code example uses Component API function calls. Alternatively, the `PDL_CONFIGURATION` macro can be set to (1u) to demonstrate how to use the low-level PDL CTDAC function calls.

Operation

1. Plug the CY8CKIT-062 BLE board into your computer's USB port.
2. Build the project and program it into the PSoC 6 MCU device. Choose **Debug** > **Program**. For more information on device programming, see PSoC Creator Help. Flash for both CPUs is programmed in a single program operation.
3. Connect an oscilloscope probe to pin P9[6] (on the J2 connector for the pioneer kit). With the oscilloscope properly configured, confirm that the waveform is a 12.2-Hz sawtooth wave with a 0–V_{DDA} voltage range.

Figure 2. VDAC Sawtooth Wave Output



Components

Table 1 lists the PSoC Creator Components used in this example, the hardware resources used by each, and non-default settings.

Table 1. PSoC Creator Components

Component	Instance Name	Hardware Resources	Non-default Settings
Voltage DAC (12-bit)	VDAC_1	1 Continuous time DAC	DAC Mode: 12-bit unsigned
Global Signal Resource	GlobalSignal_1	1 Interrupt	Global signal name: Combined CTDAC interrupt (DACInt)
Clock	Clock_1	1 Peripheral clock divider	Frequency: 50 kHz
Analog Pin	VDAC_Out_P9_6	1 Analog output pin	Default

Design-Wide Resources

Table 2 shows the pin assignment for the code example.

Table 2. Pin Names and Location

Pin Name	Pin Location
VDAC_Out_P9_6	P9[6]

Related Documents

Application Notes	
AN210781	Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity
PSoC Creator Component Datasheets	
VDAC12	Supports continuous-time DAC functions
Direct Memory Access	Supports data transfers to and from memory, components, and registers
General Purpose Input / Output (GPIO)	Supports all GPIO pin features
Device Documentation	
PSoC 6 MCU: PSoC 63 with BLE Datasheet	
PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual	
PSoC 6 MCU: PSoC 63 with BLE Register Technical Reference Manual	
PSoC 6 MCU: PSoC 62 Datasheet	
Development Kit (DVK) Documentation	
PSoC 6 MCU BLE Pioneer Kit	
PSoC 6 MCU WiFi BT Pioneer Kit	

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**	5947221	GJV	02/19/2018	New code example

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