CE95341 – PSoC4® Non Inverting Opamp

Objective

This code example demonstrates the use of an opamp as a non-inverting operational amplifier.

Overview

This code example shows how to use the Operational Amplifier (Opamp) Component as a non-inverting amplifier.

Requirements

Tool: PSoC Creator™ 4.0 or higher

Programming Language: C (ARM® GCC 4.9.3)

Associated Parts: PSoC® 4

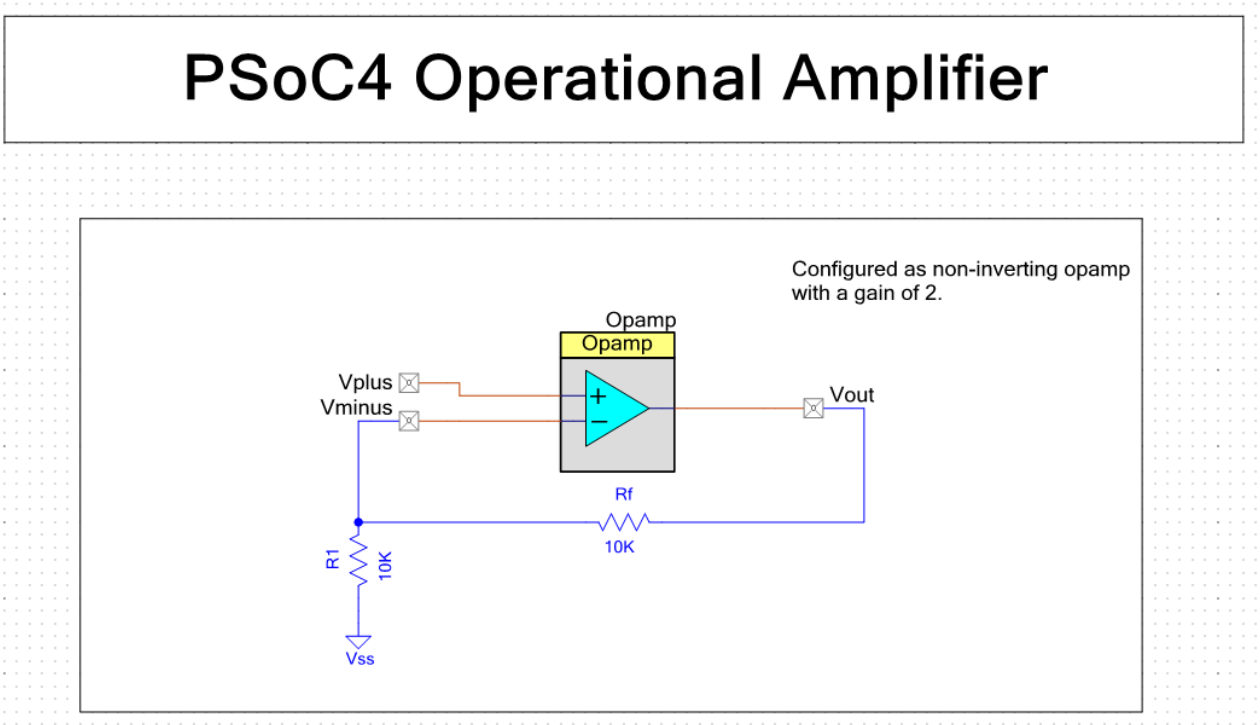
Hardware: CY8CKIT-041, CY8CKIT-042, CY8CKIT-042-BLE, CY8CKIT-044, CY8CKIT-046

Design

The example uses an Opamp Component to construct a non-inverting operational amplifier with a gain of 2, as depicted in Figure 1. The gain is calculated based on the following equation:

$$Gain = 1 + \frac{R_f}{R_1} = 1 + \frac{10\ k\Omega}{10\ k\Omega} = 2$$

Figure 1. Top Design Schematic



Kit Configuration and Pin Assignments

1. Select the appropriate device in the project's Design-Wide Resources file (.cydwr file) according to Table 1.

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
CY8CKIT-041	CY8C4146AZI-S433

2. The project is designed for the CY8CKIT-042, and therefore, the pin assignments are made accordingly. Should a different development kit be used, the pin assignments may be modified using the project's Design-Wide Resources file (.cydwr file) according to Table 2.

Table 2. Pin Assignments for Different Kits

Pin Name	Development Kit				
	CY8CKIT-042	CY8CKIT-042-BLE	CY8CKIT-044	CY8CKIT-046	CY8CKIT-041
Vplus	P1[0]	P1[0]	P1[0]	P1[0]	P1[0]
Vminus	P1[1]	P1[1]	P1[1]	P1[1]	P1[1]
Vout	P2[2]	P2[2]	P2[2]	P2[2]	P2[2]

3. Set jumper J9 (J16 for CY8CKIT-042-BLE) to the 5.0-V position
4. Connect the external resistors (R_1 =10 kΩ and R_f =10 kΩ) as shown in the top design schematic, based on the pinouts shown in Table 2.

Components

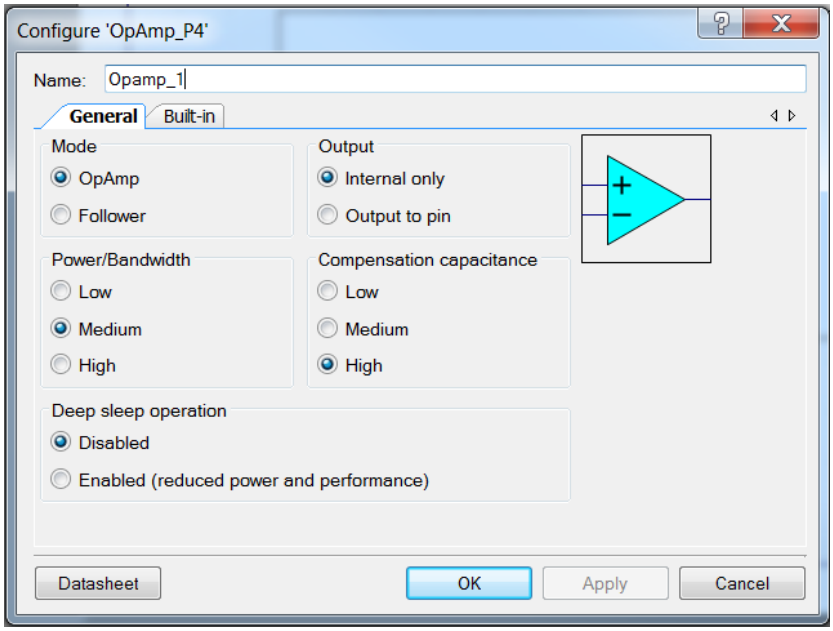
Table 3 lists the PSoC Creator Components used in this example, as well as the hardware resources used by each.

Table 3. List of PSoC Creator Components

Component	Version	Hardware Resources
Opamp	1.2	CTBm

The Opamp Components are configured for medium power and output to pin mode (which enables 10-mA output current), as shown in Figure 2.

Figure 2. Opamp Configuration



Operation

This example project requires a multimeter or an oscilloscope to measure the output voltage.

Follow these steps to communicate with the PC host.

1. Make sure that the kit has been configured as instructed in the Kit Configuration and Pin Assignment section.
2. Connect the USB cable between the PC and the PSoC 4 Pioneer Kit.
    a. For CY8CKIT-046, the USB connector should be connected to header J10.
3. Connect the input voltage source (such as 0.5 V) to the Vplus pin.
4. Measure the voltage at the Vout pin using a multimeter. Since the gain is 2, as mentioned in the Design section, the output voltage will be 1 V when the input is 0.5 V.

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.
Code Examples		
CE95340	PSoC 4: Amplifier with Dynamic Gain Switching with PSoC 4	Demonstrates how to multiplex three different channels with ADC using analog mux and send results to HyperTerminal (PC) using UART.
PSoC Creator Component Datasheets		
Operational Amplifier	An opamp that supports internal only and output to pin output modes	
Pins	A Component that 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: CE95341 – PSoC 4® Non-Inverting Opamp

Document Number: 001-95341

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5526057	WESL	09/26/16	New code example

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at Cypress Locations.

Products

ARM® Cortex® Microcontrollers	cypress.com/arm
Automotive	cypress.com/automotive
Clocks & Buffers	cypress.com/clocks
Interface	cypress.com/interface
Lighting & Power Control	cypress.com/powerpsoc
Memory	cypress.com/memory
PSoC	cypress.com/psoc
Touch Sensing	cypress.com/touch
USB Controllers	cypress.com/usb
Wireless/RF	cypress.com/wireless

PSoC® Solutions

PSoC 1 | PSoC 3 | PSoC 4 | PSoC 5LP

Cypress Developer Community

Forums | Projects | Videos | Blogs | Training | Components

Technical Support

cypress.com/support

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

Phone : 408-943-2600
Fax : 408-943-4730
Website : www.cypress.com