

## Overview

The PmodCDC1 demonstrates capacitance-to-digital proximity sensing through two “buttons.” Diligent engineers designed and built this Pmod around the Analog Devices AD7156 Capacitance – to – Digital Converter.

Features include:

- I<sup>2</sup>C™ communication interface
- two capacitance input channels
- adaptive proximity threshold

## Functional Description

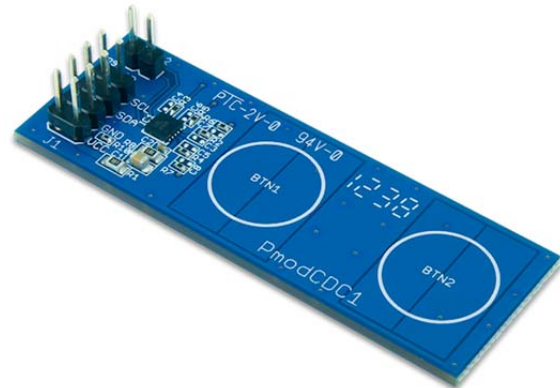
The PmodCDC1 has two capacitive buttons for user input and two output pins on header J2 that signal when they reach a proximity threshold. (See Table 1) The PmodCDC1 measures this threshold in capacitance, the users can program the threshold, and it can be either positive or negative. A logic high output on header J2 will indicate which channel has reached its threshold.

Connector J2 – AD7156 Output Pins		
Pin	Signal	Description
1	OUT1	Threshold detected on CIN1
2	OUT2	Threshold detected on CIN2

**Table1. Interface Connector Signal Description**

## Capacitance to Digital Conversion

The PmodCDC1 uses the AD7156 to measure the capacitances of the two channels separately by exciting the capacitance and sampling the response. It stores data as a 16-bit word that you can read by accessing the correct data registers via I<sup>2</sup>C in the AD7156. The PmodCDC1 averages the capacitance of each channel, which allows users to configure



the PmodCDC1 to adapt its threshold level. The adaptive threshold is a programmable feature of the AD7156.

For more detailed information on controlling the AD7156, please see the device’s data sheet, available from [www.analog.com](http://www.analog.com).

## I<sup>2</sup>C Interface

The Analog Devices AD7156 acts as a slave device using I<sup>2</sup>C communication protocol. The following instructions provide procedures for reading and writing to the device.

The host device is the master when reading from the PmodCDC1. If the host device acknowledges the receipt of data, then the AD7156 will auto increment the address pointer and send the next byte of data in its memory. The host device must assert a No Acknowledge to the PmodCDC1 to cease receiving data.

When reading a conversion value, assert an Acknowledge between the first and second byte in order to receive the bytes back to back. Receiving them back to back will ensure that data is not skipped between conversions. Writing to the device is similar to reading from it. After sending the first data byte, the address pointer in the AD7156 will auto increment. If the master sends another byte, then the

AD7156 will store that byte in this location and it will increment the address pointer again. This process will continue until the host device asserts a `Stop` condition.

The PmodCDC1 has an 8-pin connector that allows for communication via I<sup>2</sup>C. The I<sup>2</sup>C interface standard uses two signal lines. These are I<sup>2</sup>C Data and I<sup>2</sup>C Clock. These signals map to the serial data (SDA) and serial clock (SCL) respectively on the AD7156. (See Table 2)

Connector J1 – I2C Communications		
Pin	Signal	Description
1, 2	SCL	I2C Clock
3, 4	SDA	I2C Data
5, 6	GND	Power Supply Ground
7, 8	VCC	Power Supply (3.3V/5V)

*Table 2. Interface Connector Signal Description*

## Power Supply

You must keep any external voltage you apply to VCC between 1.8V and 3.6V to avoid damaging the PmodCDC1.

Standard Pmod headers on Digilent boards provide both 3.3 V and 5.0 V power supplies for Pmods. Make sure that the jumper next to the Pmod header shorts to the 3V3 supply.

## Register Addresses

The AD5933 data sheet has a complete table of register addresses and is available at [www.analog.com](http://www.analog.com).

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