CE95286 - PSoC® 4 CapSense_CSD Slider and Tuner

Objective

This code example demonstrates the use of the CapSense_CSD Component as a Linear Slider. The position of the finger on the linear slider is used to control the LED. The Tuner GUI is used to display the scanning result

Features

- CapSense® Sensing elements: 5-Segment linear slider
  - CY8CKIT-042 and CY8CKIT-042-BLE use the onboard linear slider
  - CY8CKIT-040 uses five rows of the trackpad on the trackpad shield (provided with CY8CKIT-040)
- Visualization of the scan results in the Tuner GUI
- Tuning the parameters using the Tuner GUI
- Visual indication of the slider touch position with a tri-color LED

Requirements

Tool: PSoC® Creator™ 3.3 CP3 or higher

Programming Language: C (ARM® GCC 4.9.3)

Associated Parts: PSoC 4

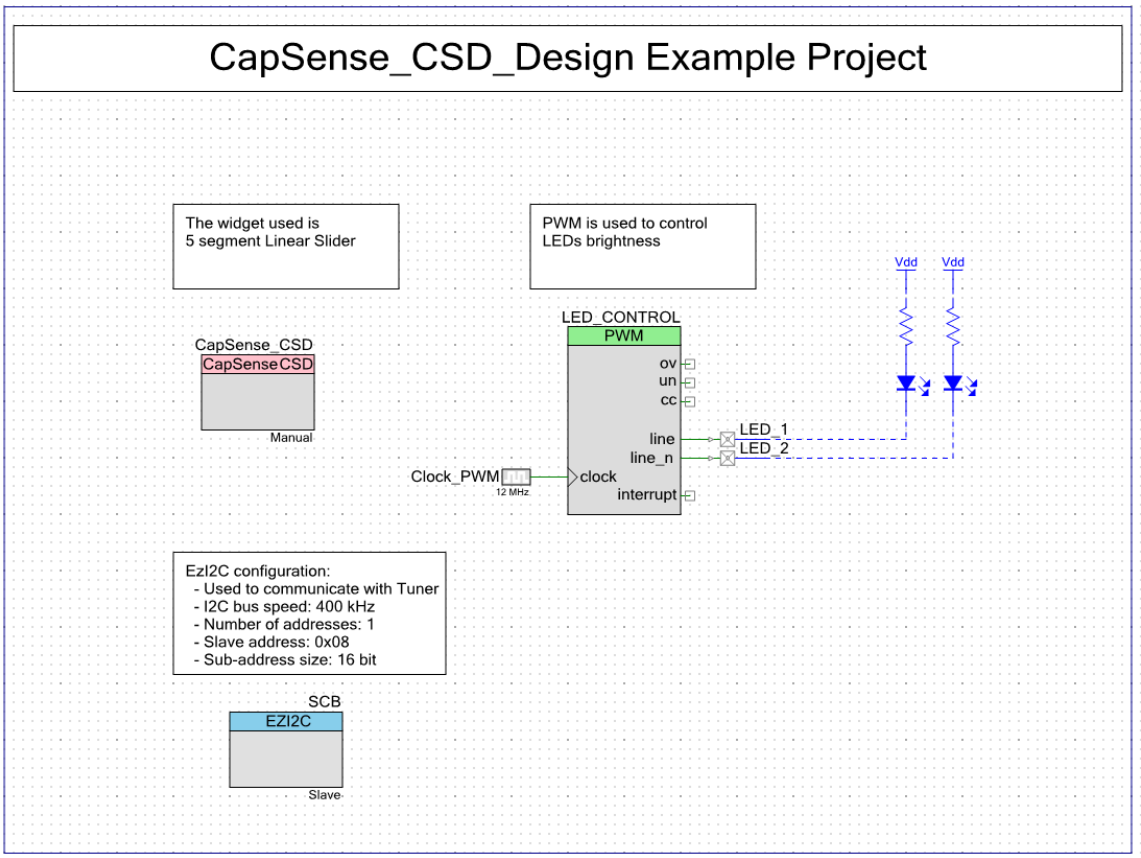
Hardware: CY8CKIT-040, CY8CKIT-042, CY8CKIT-042-BLE

Design

This project demonstrates the use of the CapSense Sigma Delta (CapSense_CSD) Component in conjunction with the onboard LEDs on the kits. The Tuner GUI in PSoC Creator is also used to show the output of the CapSense_CSD Component. The CapSense CSD Component is configured as a 5-segment linear slider in a manual with runtime tuning mode. The Component determines the finger position on the linear slider, and uses a pulse width modulation (PWM) Component, which is set up as PWM from a timer/counter pulse-width modulation (TCPWM) block, to control the brightness of the two LEDs in the tri-color LED. The serial communication block (SCB) Component is set up in the EzI2C mode to work with the Tuner GUI.

The PSoC Creator top design schematic is shown in Figure 1.

Figure 1. Top Design Schematic



The linear slider in the project is implemented using five sensor elements that use five sensor pins (CapSense_CSD_Sns[0:4]). The CapSense_CSD Component needs a modulation capacitor for its functioning, which is connected to the Cmod pin. There are also two pins to connect to the two LEDs as shown in Figure 1.

Pin Assignment

The project is designed for the CY8CKIT-042 and therefore, the pin assignments are made accordingly. See Table 1 for the pin assignment changes to make the project work with CY8CKIT-042 BLE.

Edit the project's design-wide resource file (.cydwr file) to modify the physical pins for CapSense_CSD, LED_1 (green), and LED_2 (blue) according to Table 1.

Table 1. Pin Assignment for the CapSense_CSD_P4_Design Project

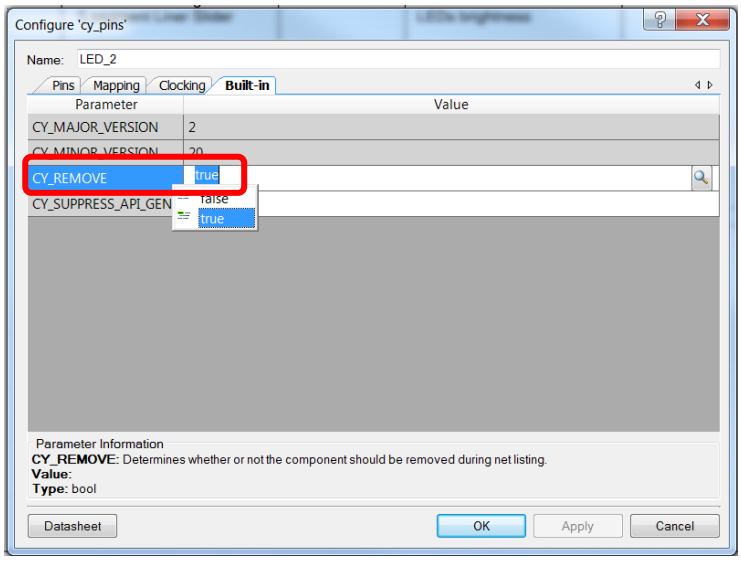
Pin Name	Development Kit		
	CY8CKIT-042	CY8CKIT-042-BLE	CY8CKIT-040
\Capsense_CSD:Cmod\	P4[2]	P4[0]	P0[4]
\Capsense_CSD:Sns[0]\	P1[1]	P2[1]	P1[4]
\Capsense_CSD:Sns[1]\	P1[2]	P2[2]	P1[5]
\Capsense_CSD:Sns[2]\	P1[3]	P2[3]	P1[6]
\Capsense_CSD:Sns[3]\	P1[4]	P2[4]	P1[0]
\Capsense_CSD:Sns[4]\	P1[5]	P2[5]	P1[7]
LED_1	P0[2]	P3[6]	P1[1]
LED_2	P0[3]	P3[7]	-

Using CY8CKIT-040

The CY8CKIT-040 does not support a linear slider; however, you can use the track pad shield shipped along with the kit that implements a track pad, which uses column sensors of the track pad to implement a linear slider. See Table 1 for the assignment of sensor pins associated with the CY8CKIT-040.

In addition, CY8CKIT-040 does not support hardware routing from the timer/counter pulse width modulation (TCPWM) to a second LED; this requires that you to remove LED_2 from the project. To remove the LED_2 pin from the project schematic, double-click the LED_2 pin, select the Built-in tab, and set the “CY_REMOVE” parameter to “true”. Figure 2 shows this setting.

Figure 2. LED_2 Configuration



Components

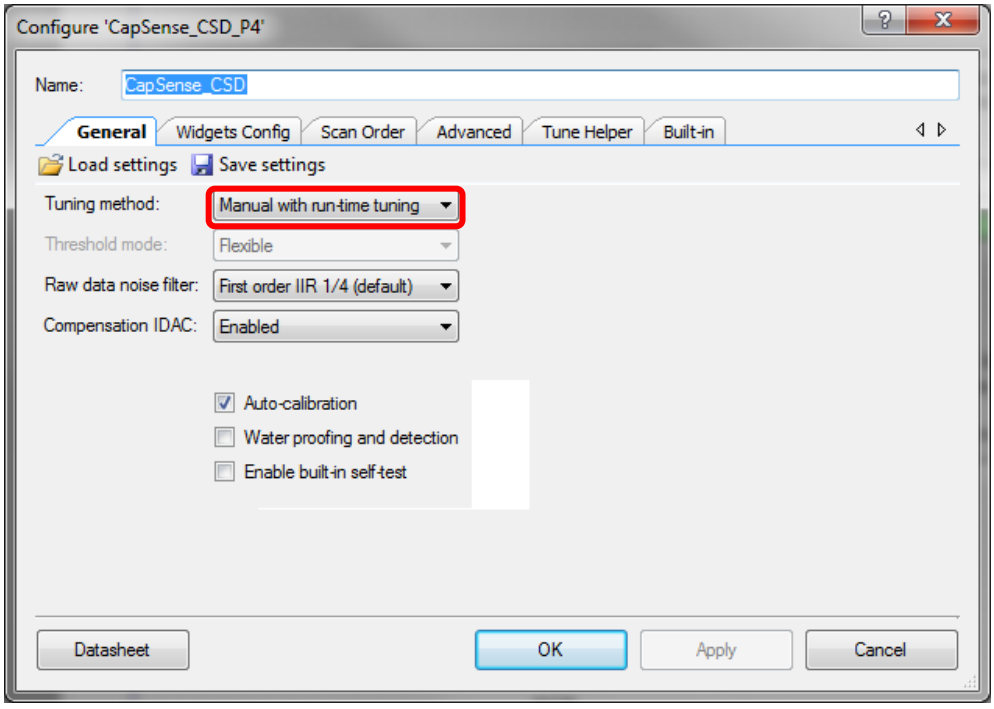
Table 2 lists the PSoC Creator Components used in this example, as well as the hardware resources used by each.

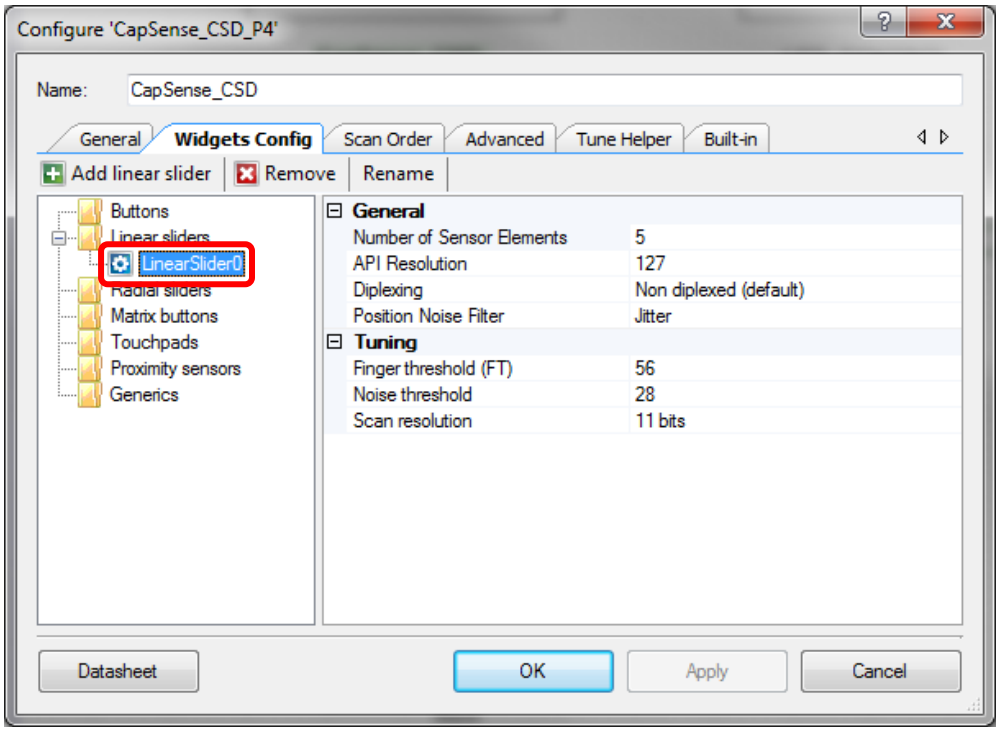
Table 2. List of PSoC Creator Components

Component	Version	Hardware Resources
CapSense_CSD	2.4	CapSense
PWM	2.1	TCPWM
EZI2C	3.2	SCB
Clock	2.2	Clock
LED_1	2.2	GPIO
LED_2	2.2	GPIO

The CapSense_CSD Component is configured with the tuning method as ‘Manual with run-time tuning’ for the linear slider.

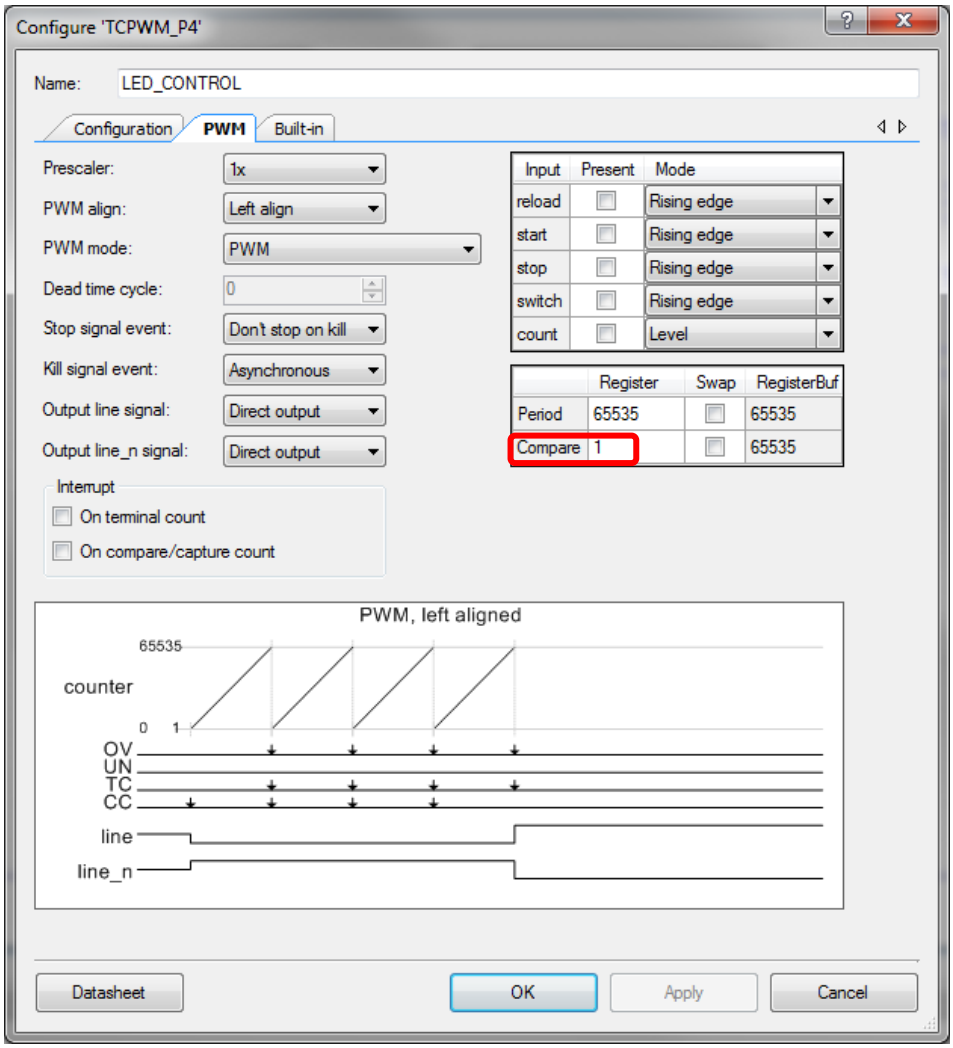
Figure 3. CapSense_CSD Widget Config Tab





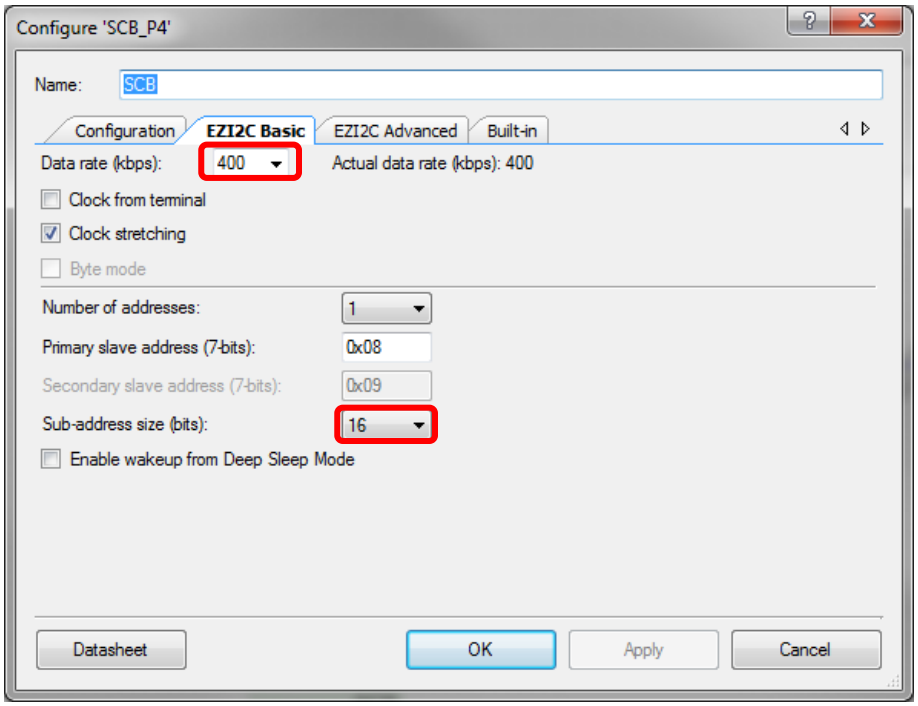
The PWM is configured to drive two LEDs (one LED for CY8CKIT-040) from the tri-color LED. The compare value is initially set to ‘1’ to display the green LED.

Figure 4. PWMs Configuration



The SCB Component is configured with the following settings:

Figure 5. EzI2C Basic Configuration Tab



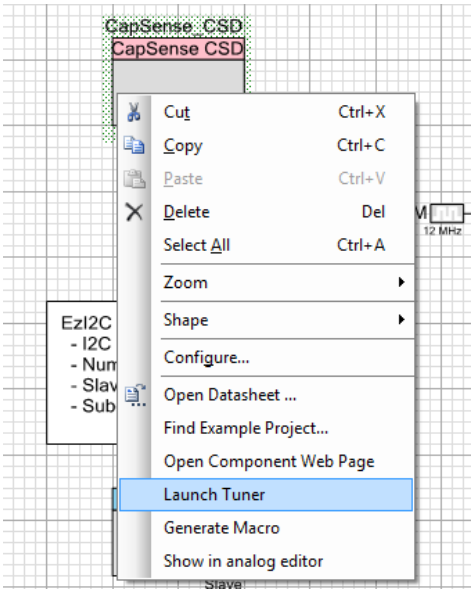
Operation

Build the design and program the kit, and then do the following to verify the design:

Launch the Tuner GUI

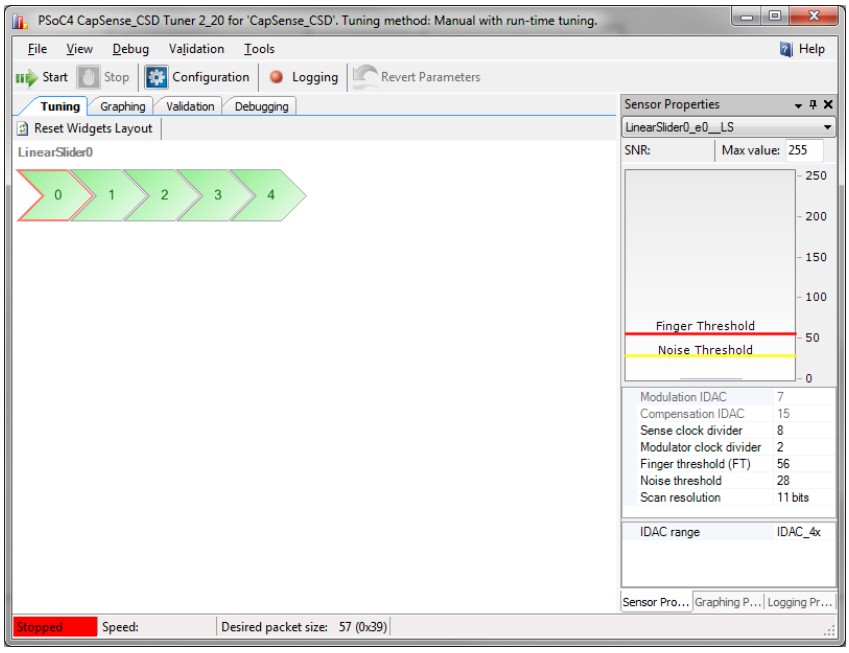
Right-click the CapSense_CSD Component and select **Launch Tuner**.

Figure 6. CapSense_CSD Instance Context Menu



The Tuner GUI application opens to show the linear slider widget.

Figure 7. Tuner Main Window

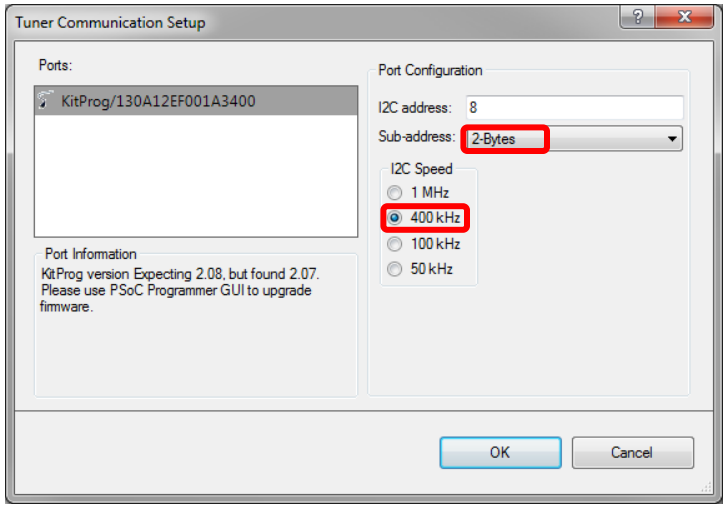


Configure Communication Parameters

1. Click **Configuration** to open the Tuner Communication dialog.
2. Set the communication parameters as shown in Figure 8.

   Important: These properties must be identical to the following parameters of the EzI2C Component shown in Figure 5: I2C Speed, I2C Address, and Sub-address.

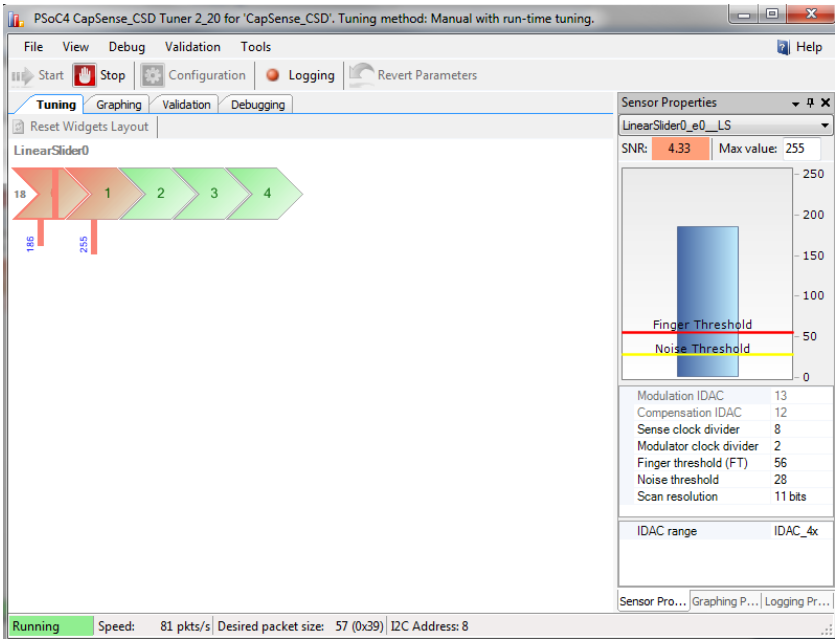
Figure 8. Tuner Communication Setup Dialog



Start Tuning

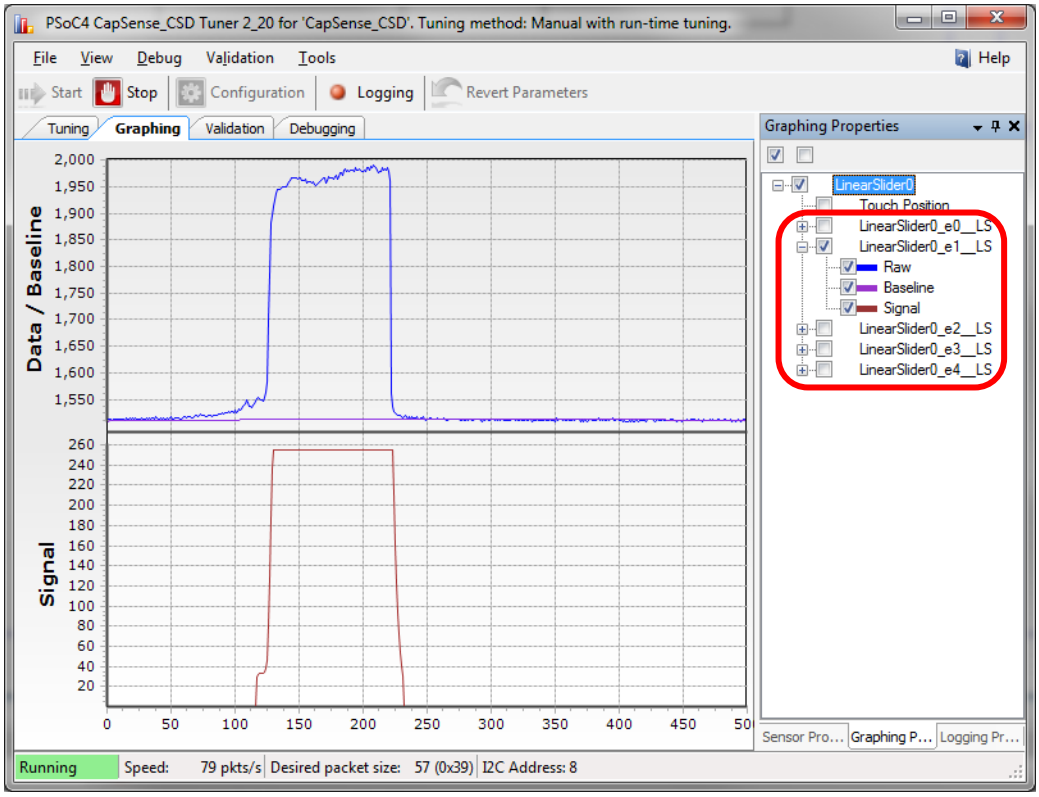
Click **Start** on the Tuning GUI. The scanning results as shown for the sensing elements as shown in Figure 9

Figure 9. Scanning Results



Use the Graphing tab to display detailed information for the scanning results of the selected sensors. See Figure 10.

Figure 10. Graphing



In addition to the Tuner GUI displaying the scanning results, you can configure the LEDs on the kits.

Using CY8CKIT-042 and CY8CKIT-042 BLE

There are no additional hardware connections required in the kit because the pins are already routed to the respective sensors/LEDs. After programming the kit, verify that the color of the LED changes as the finger position on the linear slider changes. The LED should show blue when the finger is at P1.5 on the kit and should show green when the finger is at P1.1 for the CY8CKIT-042 kit. The LED should show blue when the finger is at P2.5 on the kit and should show green when the finger is at P2.1 for the CY8CKIT-042.

Using CY8CKIT-040

Mount the trackpad shield onto the kit. Verify that on the trackpad shield, as the touch position changes vertically (as indicated as the brightness label on the shield), the brightness of the green LED changes.

Related Documents

Table 3 lists all relevant application notes, code examples, device datasheets, and Component datasheets.

Table 3. Related Documents

Application Notes		
AN79953	Getting Started with PSoC 4	Describes PSoC 4, and shows how to build the attached code example.
AN64846	Getting Started with CapSense	Describes CapSense and provides a list of related documents
AN210998	PSoC 4 Low-Power CapSense Design	Describes how to design low-power CapSense applications with PSoC 4 devices.
Code Examples		
CE210289	PSoC 4 CapSense Linear Slider	Shows how to configure and use the CapSense linear slider
CE210291	PSoC 4 CapSense One Button	Shows how to achieve very low power consumption for a single CapSense button
PSoC Creator Component Datasheets		
CapSense® CSD	Supports capacitance measurement and finger detection	
TCPWM	A block that supports Timer/Counter, PWM, and Quadrature Decoder	
SCB	A multifunction block that supports I2C, SPI, UART, and EZI2C	
Pins	Supports 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

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	5423009	WESL	09/01/2016	New Spec

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