

## Objective

This code example demonstrates interfacing PSoC® 6 MCU with BLE Connectivity (PSoC 6 MCU) with user interface functions such as an E-INK display, RGB LED, and touch sensors based on self and mutual capacitance (CapSense® CSD and CSX). These functions provide bi-directional BLE connectivity between the PSoC 6 MCU and a PC running the CySmart™ BLE Host Emulation tool or a mobile device running the CySmart mobile application.

## Overview

This code example demonstrates interfacing PSoC 6 MCU with BLE Connectivity with an “always-on” E-INK display, RGB LED with color and intensity control, touch buttons based on mutual capacitance (CSX), and touch-slider-based on self-capacitance (CSD). This code example also shows connectivity between the PSoC 6 BLE (acting as a Peripheral and GATT Server) and a PC running the CySmart BLE Host Emulation tool or a mobile device running the CySmart mobile application (acting as a Central and GATT Client). Custom BLE services are used for CapSense touch sensing and LED control.

In more detail:

- An “always-on” E-INK display shows the instructions to use the code example. The E-INK display remains ON after a restart, while consuming no power for display retention.
- RGB LED color and intensity control using configurable digital blocks of PSoC 6 MCU
- CapSense slider and buttons
- PSoC 6 MCU's ability to simultaneously scan touch sensors based on self-capacitance as well as mutual-capacitance
- BLE connectivity
  - Advertisement and connection with any Central device
  - Three custom services (CapSense Slider, CapSense Button, and RGB LED)
  - Data transfer over BLE using notifications, read, and write

This code example assumes that you are familiar with the PSoC 6 MCU and the PSoC Creator™ Integrated Design Environment (IDE). If you are new to PSoC 6 MCU, you can find introductions in the application note [AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy \(BLE\) Connectivity](#).

## Requirements

**Tool:** [PSoC Creator 4.2](#)

**Programming Language:** C (Arm® GCC 5.4.1)

**Associated Parts:** [All PSoC 6 MCUs with BLE Connectivity](#)

**Related Hardware:** [CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit](#)

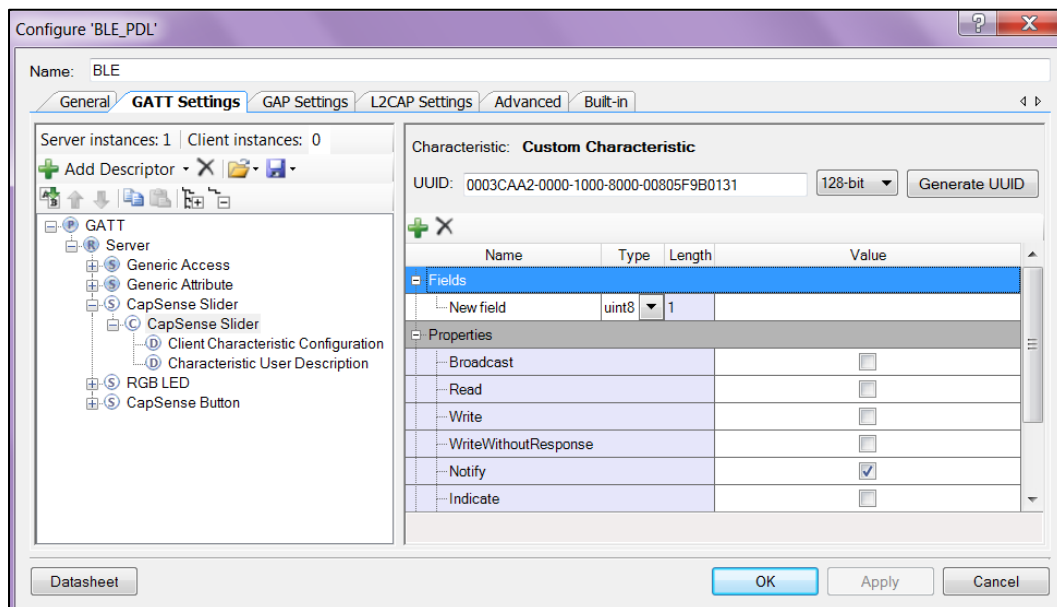
## Design

The E-INK display shows the instructions to use this code example at startup and is then turned OFF to save power. E-INK displays consume no power to retain the display. For more details on E-INK display, see the code example [CE218133 – PSoC 6 MCU E-INK Display with CapSense](#).

This code example contains a 5-element CapSense CSD slider, and two CapSense CSX buttons for providing touch input. Both the slider and the button are scanned with SmartSense™ auto-tuning.

The BLE profile in this code example consists of three BLE custom services: CapSense Slider, CapSense Button, and RGB LED. The two CapSense services consist of custom characteristics that are used to send data as notifications to the GATT client device. The notification data consists of the finger location read by the CapSense Component on the 5-segment slider and the ON/OFF status of the two CapSense buttons. These characteristics support notification, which allows the GATT server to send data to the connected client device whenever new data is available. The RGB LED service consists of one custom characteristic called RGB LED Control. This characteristic supports three operations (read, write, and notify) through which the connected GATT client device can read data as well as write a new value to the characteristic. This data has four single-byte values indicating red, green, blue, and the intensity to control the onboard RGB LED. The properties for the custom service/characteristics are configured in the BLE Component under the **GATT Settings** tab. As an example, [Figure 1](#) shows the configuration of the CapSense Slider Service.

Figure 1. BLE CapSense Slider Service Configuration



[Figure 2](#), [Figure 2](#), and [Figure 4](#) show the TopDesign schematic of this code example.

Figure 2. TopDesign Schematic: BLE and Interrupts

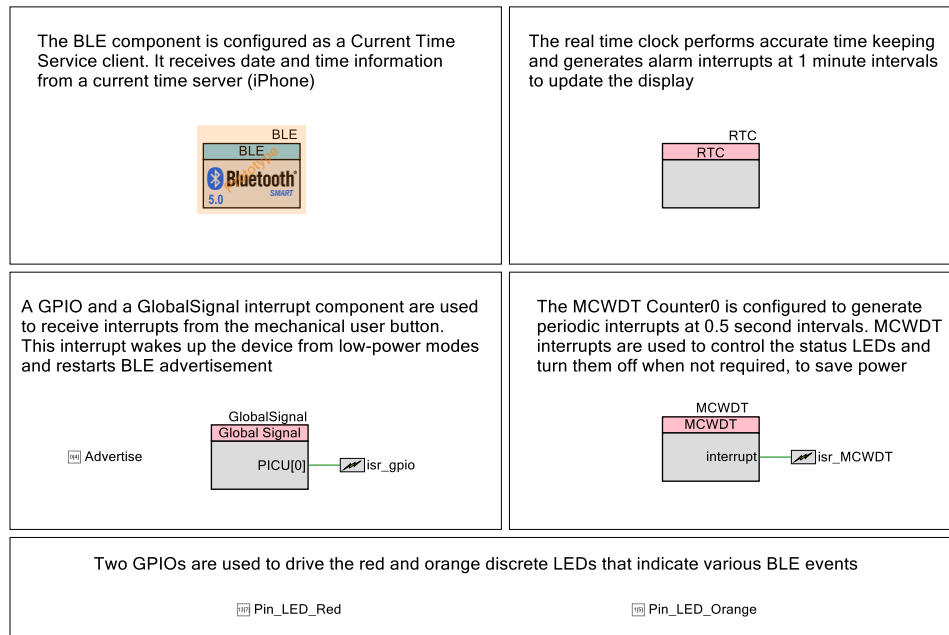


Figure 3. TopDesign Schematic: CapSense and LEDs

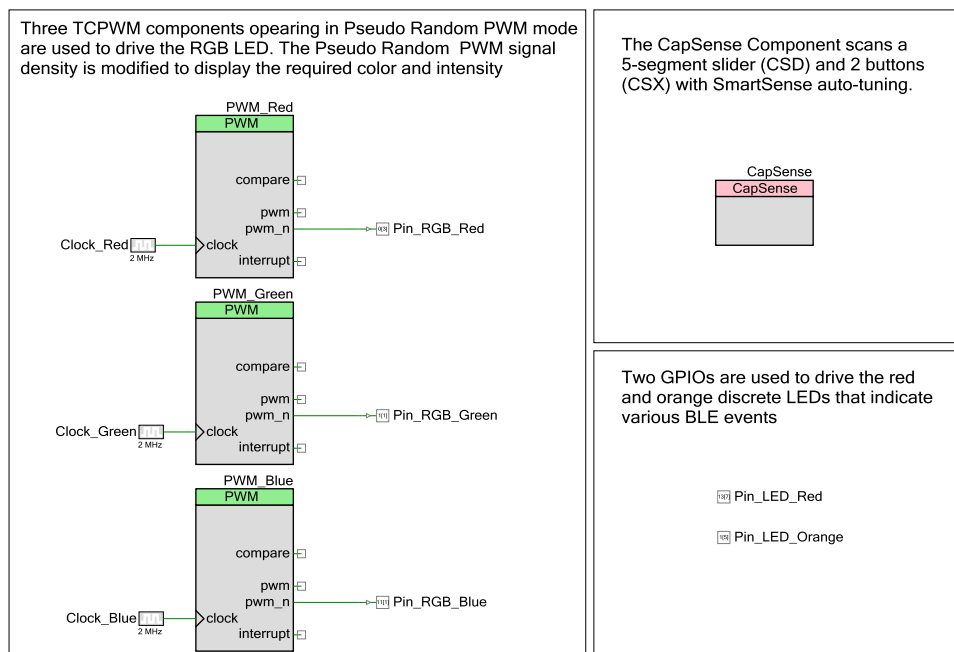
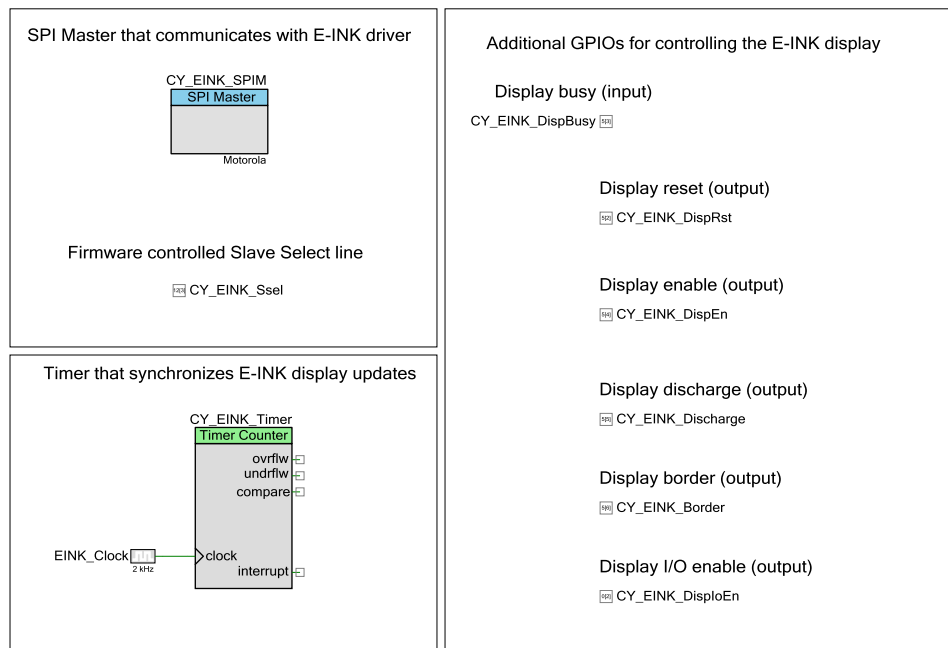


Figure 4. TopDesign Schematic: E-INK Display



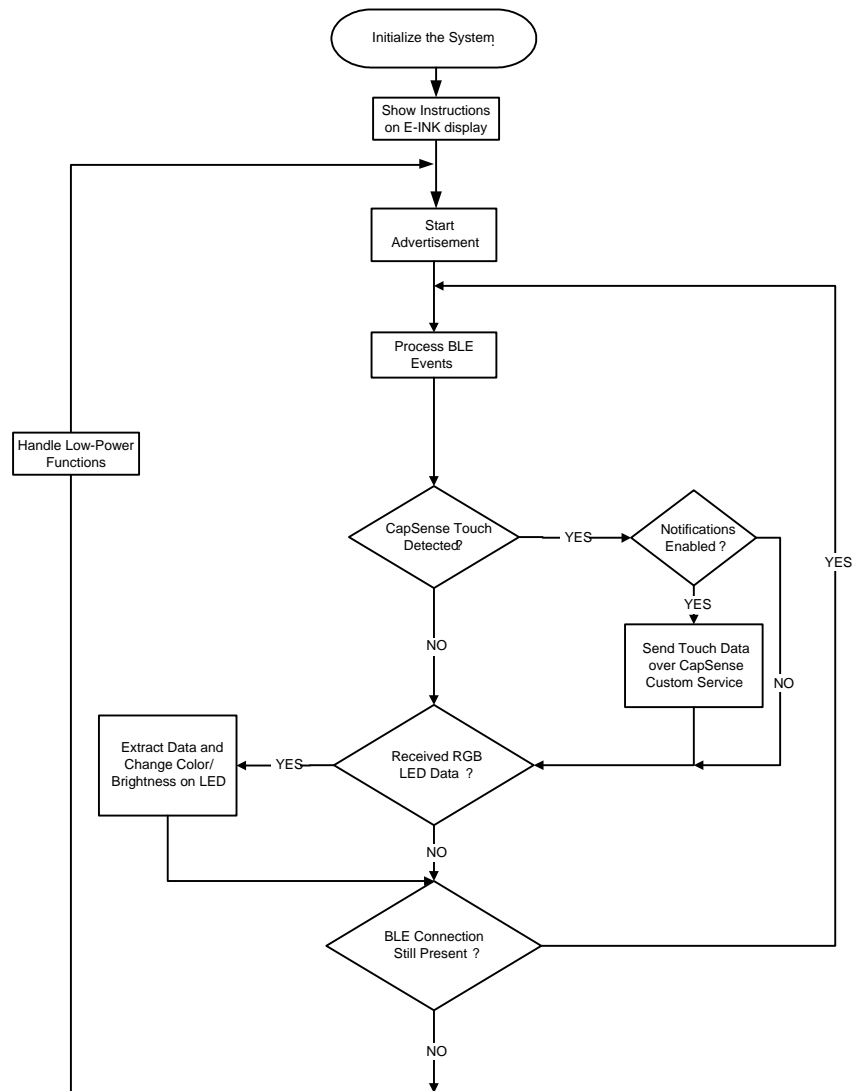
The code example consists of the following files:

- *main\_cm4.c* contains the main function, which is the entry point and execution of the firmware application. The main function calls the initializing and display functions, and continuously processes BLE and CapSense events.
- *main\_cm0p.c* contains functions that starts up the BLE controller, starts up the CM4, and services BLE stack events.
- *ble\_application.c/h* contain all the macros and function definitions related to BLE communication and operation. They include the definition of the event callback function that is registered with the BLE Component at startup. The callback function is used to send BLE-related events from the BLE stack to the application layer for processing. These files contain functions to send CapSense and RGB LED notifications to the GATT client device, and to process the read and write commands on the RGB LED characteristic by the GATT client device.
- *touch.c/h* contain the functions that scan CapSense sensors and process the data.
- *led.c/h* contain the functions that initialize and control the RGB LED color, and the functions that control the status LEDs.
- *display.c/h* contain the functions that initialize the E-INK display and show the instructions to use this code example at startup<sup>1</sup>.
- *screen\_contents.c/h* contain the text and background images used by the display module.
- *low\_power.c/h* contain functions to make the system enter low-power modes and turn OFF the status LEDs depending on system-level conditions.

Figure 5 shows the firmware flow of this code example.

<sup>1</sup> For a detailed list of files included in the E-INK Library, see the code example, [CE218133 – PSoC 6 MCU E-INK Display with CapSense](#).

Figure 5. Firmware Flow



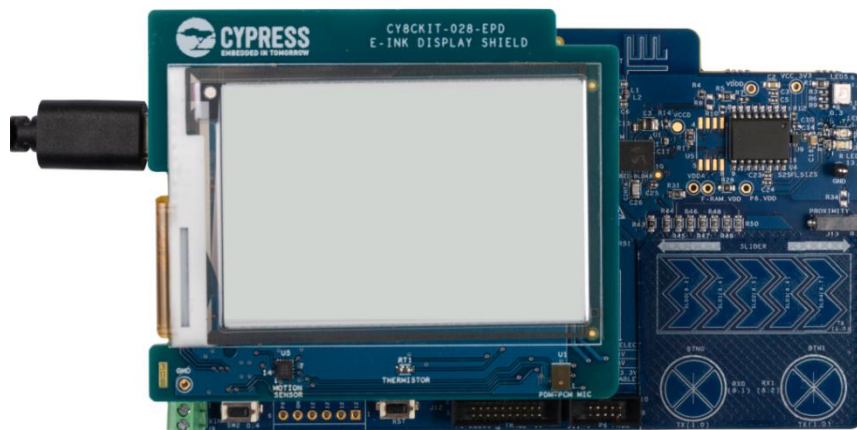
## Hardware Setup

Set the switches and jumpers on the Pioneer Board as shown in Table 1.

Table 1. Switch and Jumper Selection

| Switch/Jumper | Position                   | Location |
|---------------|----------------------------|----------|
| SW5           | 3.3 V                      | Front    |
| SW6           | PSoC 6 BLE                 | Back     |
| SW7           | V <sub>DD</sub> / KitProg2 | Back     |
| J8            | Installed                  | Back     |

Figure 6. Hardware Setup



## Software Setup

Install the CY8CKIT-62-BLE PSoC 6 BLE Pioneer Kit software, which contains all the required software to evaluate this code example. No additional software setup is required.

## Operation

The code example can be verified using either of these methods: the CySmart BLE Host Emulation Tool and BLE Dongle on a PC or the CySmart mobile application.

**Note:** For this code example, the CapSense Button service is not available in the CySmart iOS app. Use the host emulation tool or the Android app to evaluate this service.

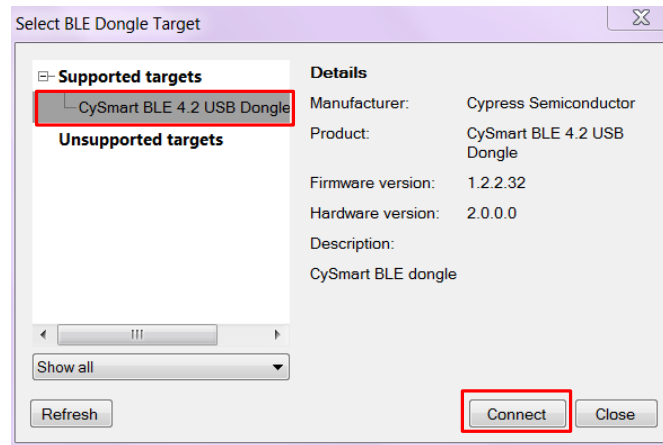
### CySmart BLE Host Emulation Tool

To verify the *CE220167\_BLE\_UI* code example using the CySmart BLE host emulation tool, follow these steps:

**Note:** See the [CySmart BLE host emulation tool documentation](#) to learn how to use the tool.

1. Connect the BLE Dongle to one of the USB ports on the computer.
2. Start the CySmart BLE host emulation tool on the computer by going to **Start > All Programs > Cypress > CySmart <version> > CySmart <version>**. You will see a list of BLE Dongles connected to it. If no dongle is found, click **Refresh**. Select the BLE Dongle and click **Connect**.

Figure 7. Connect to BLE Dongle



3. Power the Pioneer Board through the USB connector **J10**.
4. Program the Pioneer Board with the *CE220167\_BLE\_UI* project. See the [Pioneer Kit guide](#) for details on how to program firmware into the device.

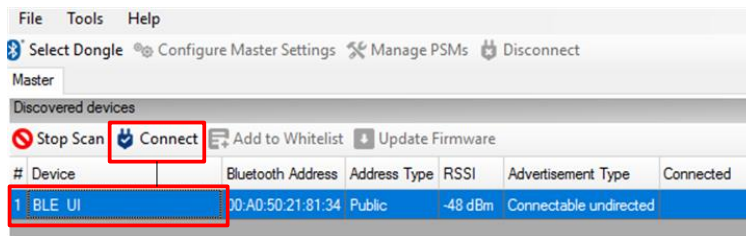
After programming successfully, the E-INK display will refresh and show the instructions to use this project and the BLE will start advertising. The advertising timeout is configured to be 20 seconds. The orange LED (**LED8**) remains ON during this period to indicate the BLE advertising state as [Figure 8](#) shows.

Figure 8. BLE Advertising



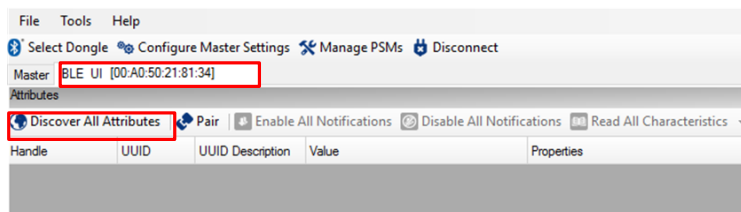
5. If the BLE advertisement has timed out (**LED8** is OFF), press **SW2** to restart advertisement.
6. On the CySmart host emulation tool, click **Start Scan** to see the list of available BLE Peripheral devices. Double-click the **BLE UI** device to connect, or click **BLE UI** and then click **Connect**. A successful connection is indicated by **LED8** continuously blinking at half second intervals.

Figure 9. Connect to BLE Slider and LED Peripheral



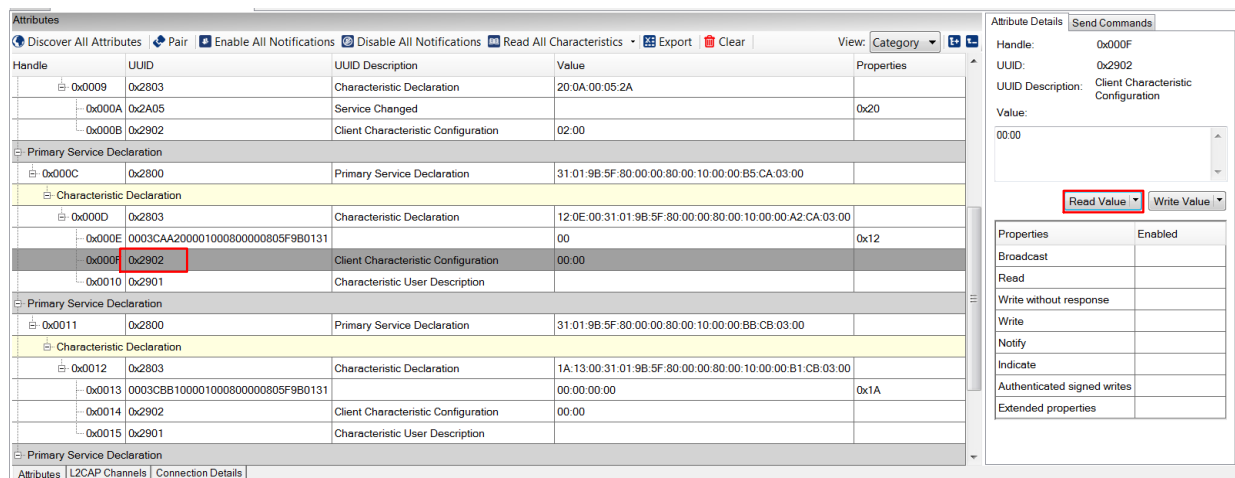
- Click **Discover All Attributes** to find all attributes supported.

Figure 10. Discover All Attributes



- Locate the attribute **Client Characteristic Configuration** descriptor (UUID 0x2902) under the CapSense Slider characteristic (UUID 0x0003CAA200001000800000805F9B0131). Click **Read Value** to read the existing Client Characteristic Configuration Descriptor (CCCD) value as shown in Figure 11.

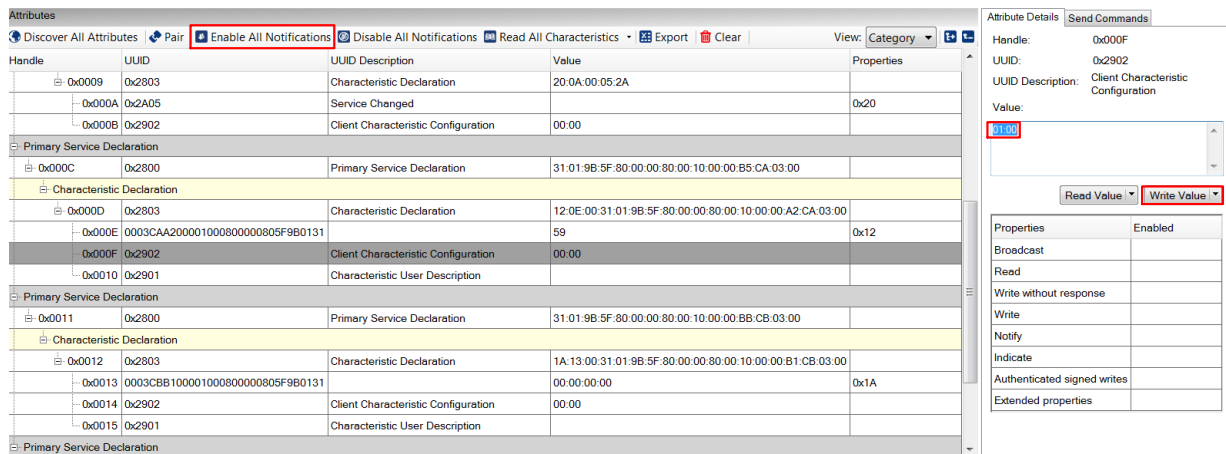
Figure 11. Read CCCD for CapSense Slider Characteristic



- Modify the **Value** field of the CCCD to '01:00' and click **Write Value**. This enables the notifications on the CapSense slider characteristic. Alternatively, you can press the **Enable All Notifications** button to enable the notifications for all services.



Figure 12. Write CCCD to Enable Notifications



The screenshot shows the 'Attributes' window in the Cypress PSoC Creator BLE GUI. The 'Enable All Notifications' button is highlighted with a red box. The table below lists the attributes and their values:

| Handle                             | UUID                             | UUID Description                    | Value  | Properties |
|------------------------------------|----------------------------------|-------------------------------------|--|------------|
| 0x0009                             | 0x2803                           | Characteristic Declaration          | 20:0A:00:05:2A   |            |
| 0x000A                             | 0x2A05                           | Service Changed                     |  | 0x20       |
| 0x000B                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x000C                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B5:CA:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x000D                             | 0x2803                           | Characteristic Declaration          | 12:0E:00:31:01:9B:5F:80:00:00:80:00:10:00:00:A2:CA:03:00 |            |
| 0x000E                             | 0003CAA200001000800000805F9B0131 |                                     | 59   | 0x12       |
| 0x000F                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0010                             | 0x2901                           | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x0011                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:BB:CB:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x0012                             | 0x2803                           | Characteristic Declaration          | 1A:13:00:31:01:9B:5F:80:00:00:80:00:10:00:00:B1:CB:03:00 |            |
| 0x0013                             | 0003CBB100001000800000805F9B0131 |                                     | 00:00:00:00  | 0x1A       |
| 0x0014                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0015                             | 0x2901                           | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |

The 'Write Value' field is highlighted with a red box, showing the value 0000.

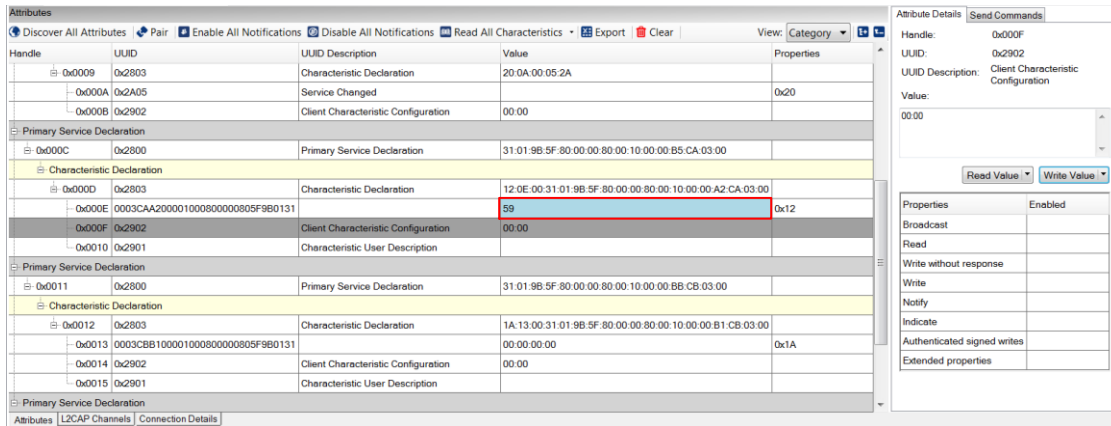
10. Swipe your finger on the CapSense slider on the Pioneer Board, as shown in [Figure 13](#) and see the notification values in the CapSense Slider value field, as shown in [Figure 14](#).

**Note:** The sensor auto-reset feature is enabled for CapSense sensors. Pressing and holding a CapSense sensor for more than three seconds will reset the sensor to the inactive state. This feature will prevent stuck-on sensors under rapidly changing environments – see the CapSense Component datasheet for additional information.

Figure 13. CapSense Slider



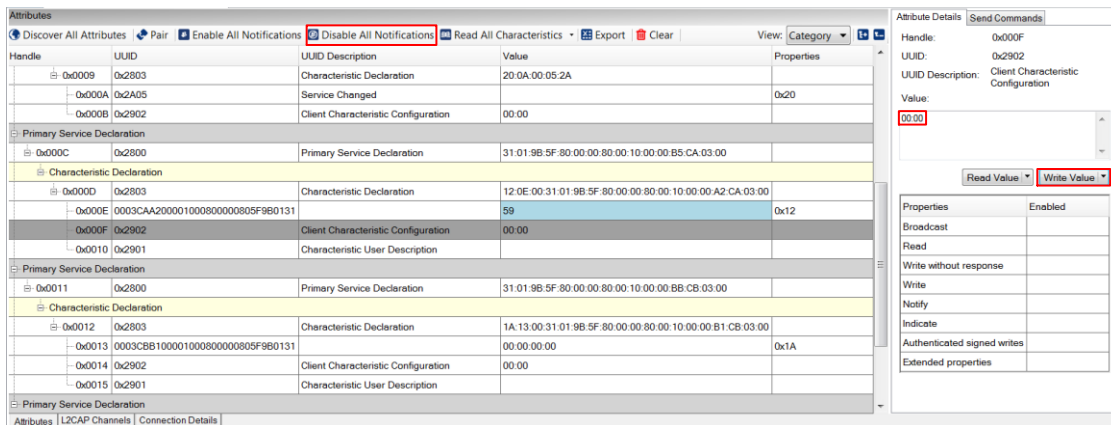
Figure 14. CapSense Slider Notification Received



| Handle                             | UUID                             | UUID Description                    | Value  | Properties |
|------------------------------------|----------------------------------|-------------------------------------|--|------------|
| 0x0009                             | 0x2803                           | Characteristic Declaration          | 20:0A:00:05:2A   |            |
| 0x000A                             | 0x2A05                           | Service Changed                     |  | 0x20       |
| 0x000B                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x000C                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B5:CA:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x000D                             | 0x2803                           | Characteristic Declaration          | 12:0E:00:31:01:9B:5F:80:00:00:80:00:10:00:00:A2:CA:03:00 |            |
| 0x000E                             | 0003CAA200001000800000805F9B0131 |                                     | 59   | 0x12       |
| 0x000F                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0010                             | 0x2901                           | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x0011                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B6:CB:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x0012                             | 0x2803                           | Characteristic Declaration          | 1A:13:00:31:01:9B:5F:80:00:00:80:00:10:00:00:B1:CB:03:00 |            |
| 0x0013                             | 0003CBB100001000800000805F9B0131 |                                     | 00:00:00:00  | 0x1A       |
| 0x0014                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0015                             | 0x2901                           | Characteristic User Description     |  |            |

11. To disable notifications, modify the **Value** field of the **Client Characteristic Configuration** descriptor to '00:00' and click **Write Value**. Alternatively, you can press the **Disable All Notifications** button to disable the notifications of all services.

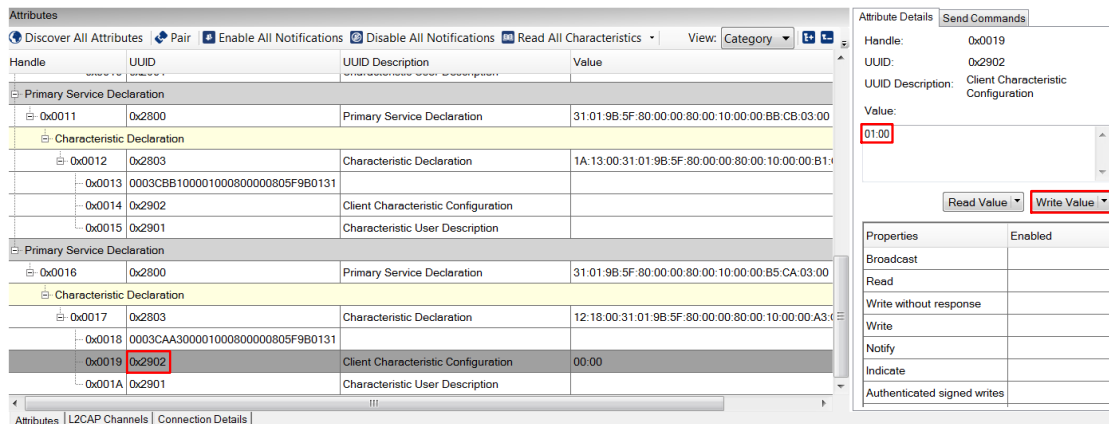
Figure 15. Disable Notifications



| Handle                             | UUID                             | UUID Description                    | Value  | Properties |
|------------------------------------|----------------------------------|-------------------------------------|--|------------|
| 0x0009                             | 0x2803                           | Characteristic Declaration          | 20:0A:00:05:2A   |            |
| 0x000A                             | 0x2A05                           | Service Changed                     |  | 0x20       |
| 0x000B                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x000C                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B5:CA:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x000D                             | 0x2803                           | Characteristic Declaration          | 12:0E:00:31:01:9B:5F:80:00:00:80:00:10:00:00:A2:CA:03:00 |            |
| 0x000E                             | 0003CAA200001000800000805F9B0131 |                                     | 59   | 0x12       |
| 0x000F                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0010                             | 0x2901                           | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                  |                                     |  |            |
| 0x0011                             | 0x2800                           | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B6:CB:03:00          |            |
| <b>Characteristic Declaration</b>  |                                  |                                     |  |            |
| 0x0012                             | 0x2803                           | Characteristic Declaration          | 1A:13:00:31:01:9B:5F:80:00:00:80:00:10:00:00:B1:CB:03:00 |            |
| 0x0013                             | 0003CBB100001000800000805F9B0131 |                                     | 00:00:00:00  | 0x1A       |
| 0x0014                             | 0x2902                           | Client Characteristic Configuration | 00:00  |            |
| 0x0015                             | 0x2901                           | Characteristic User Description     |  |            |

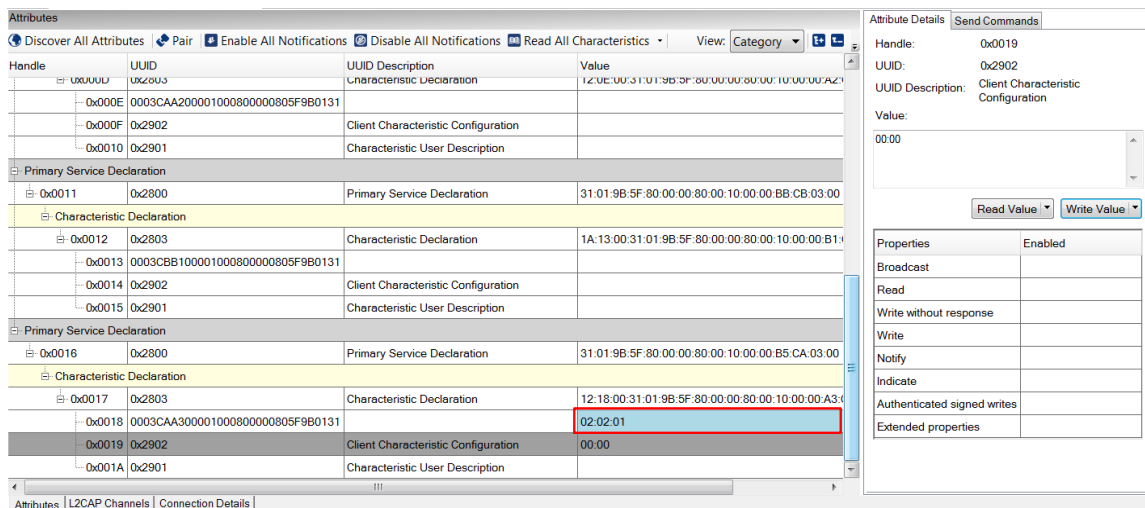
12. Locate the attribute **Client Characteristic Configuration** descriptor (UUID 0x2902) under CapSense Button characteristic (UUID 0x0003CAA300001000800000805F9B0131), read the value and enable the notification as described in steps 8 and 9.

Figure 16. Enable CapSense Button Notification



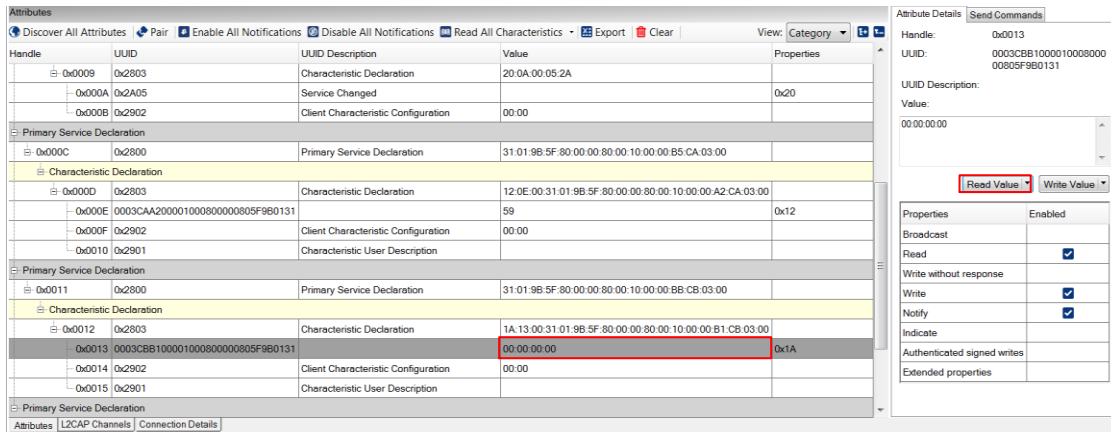
13. Touch the CapSense buttons on the Pioneer Board, and see the notification values in the CapSense Button value field, as shown in Figure 17. The LSB (byte 0) indicates the button mask – 0 when no buttons are active, 1 when BTN0 is active, 2 when BTN1 is active, and 3 when both buttons are active. See step 11 for instructions to disable notifications.

Figure 17. CapSense Button Notification Received



14. Locate the **RGB LED Control** characteristic (UUID 0x0003CBB1-0000-1000-8000-00805F9B0131). Click **Read Value** to read the existing 4-byte onboard RGB LED color information, as shown in Figure 18. The four bytes indicate red, green, blue, and the overall intensity, respectively.

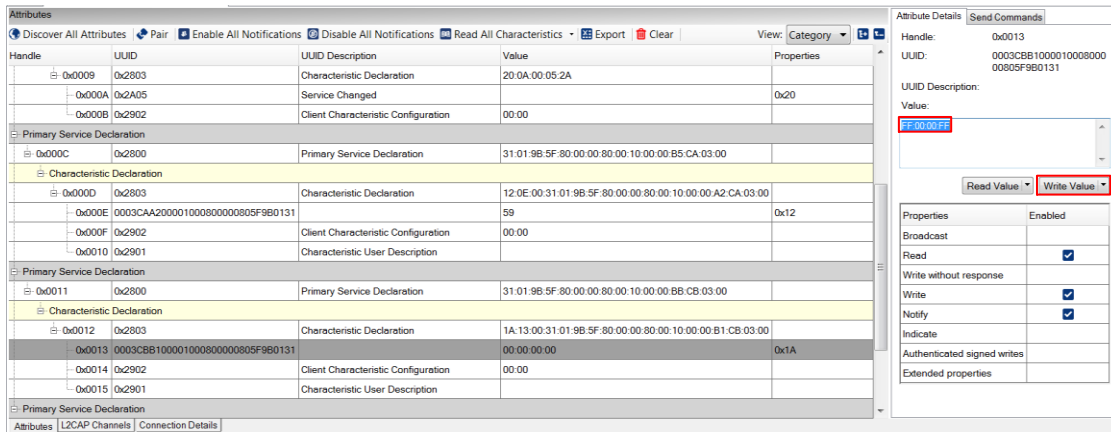
Figure 18. Read RGB LED Control Characteristic Value



| Handle                             | UUID                              | UUID Description                    | Value  | Properties |
|------------------------------------|-----------------------------------|-------------------------------------|--|------------|
| 0x0009                             | 0x2803                            | Characteristic Declaration          | 20:0A:00:05:2A   |            |
| 0x000A                             | 0x2A05                            | Service Changed                     |  | 0x20       |
| 0x000B                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |
| 0x000C                             | 0x2800                            | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B5:CA:03:00          |            |
| <b>Characteristic Declaration</b>  |                                   |                                     |  |            |
| 0x000D                             | 0x2803                            | Characteristic Declaration          | 12:0E:00:31:01:9B:5F:80:00:00:80:00:10:00:00:A2:CA:03:00 |            |
| 0x000E                             | 0003CAA2000010008000000805F9B0131 |                                     | 59   | 0x12       |
| 0x000F                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| 0x0010                             | 0x2901                            | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |
| 0x0011                             | 0x2800                            | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B6:CB:03:00          |            |
| <b>Characteristic Declaration</b>  |                                   |                                     |  |            |
| 0x0012                             | 0x2803                            | Characteristic Declaration          | 1A:13:00:31:01:9B:5F:80:00:00:80:00:10:00:00:B1:CB:03:00 |            |
| 0x0013                             | 0003CBB1000010008000000805F9B0131 |                                     | 00:00:00:00  | 0x1A       |
| 0x0014                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| 0x0015                             | 0x2901                            | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |

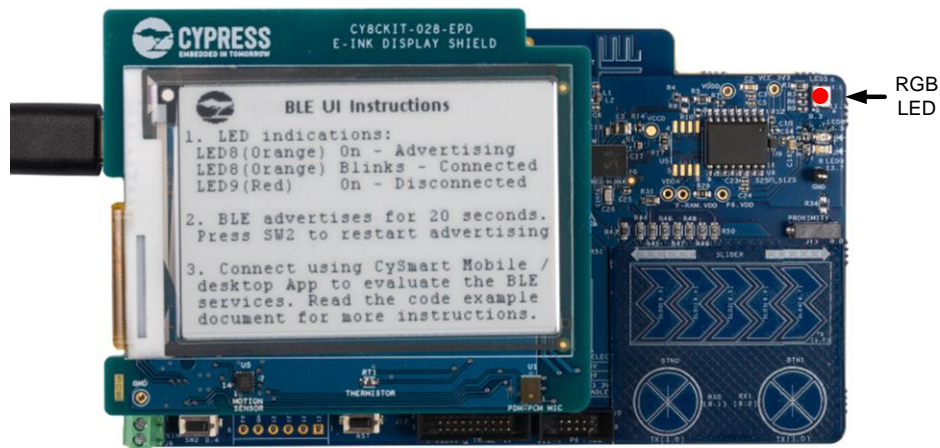
15. Modify the four bytes of data in the **Value** field to **FF:00:00:FF** and click **Write Value**, as shown in Figure 19. You will see the corresponding change in the color (Red) and intensity (full intensity) of the RGB LED on the Pioneer Board as shown in Figure 20.

Figure 19. Write RGB LED Control Characteristic Value



| Handle                             | UUID                              | UUID Description                    | Value  | Properties |
|------------------------------------|-----------------------------------|-------------------------------------|--|------------|
| 0x0009                             | 0x2803                            | Characteristic Declaration          | 20:0A:00:05:2A   |            |
| 0x000A                             | 0x2A05                            | Service Changed                     |  | 0x20       |
| 0x000B                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |
| 0x000C                             | 0x2800                            | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B5:CA:03:00          |            |
| <b>Characteristic Declaration</b>  |                                   |                                     |  |            |
| 0x000D                             | 0x2803                            | Characteristic Declaration          | 12:0E:00:31:01:9B:5F:80:00:00:80:00:10:00:00:A2:CA:03:00 |            |
| 0x000E                             | 0003CAA2000010008000000805F9B0131 |                                     | 59   | 0x12       |
| 0x000F                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| 0x0010                             | 0x2901                            | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |
| 0x0011                             | 0x2800                            | Primary Service Declaration         | 31:01:9B:5F:80:00:00:80:00:10:00:00:B6:CB:03:00          |            |
| <b>Characteristic Declaration</b>  |                                   |                                     |  |            |
| 0x0012                             | 0x2803                            | Characteristic Declaration          | 1A:13:00:31:01:9B:5F:80:00:00:80:00:10:00:00:B1:CB:03:00 |            |
| 0x0013                             | 0003CBB1000010008000000805F9B0131 |                                     | FF:00:00:FF  | 0x1A       |
| 0x0014                             | 0x2902                            | Client Characteristic Configuration | 00:00  |            |
| 0x0015                             | 0x2901                            | Characteristic User Description     |  |            |
| <b>Primary Service Declaration</b> |                                   |                                     |  |            |

Figure 20. RGB LED Control with BLE



16. To disconnect from the device, click **Disconnect**, as shown in Figure 21. The red LED (LED9) will turn ON for three seconds to indicate a disconnect event. Press **SW2** to restart the advertisement, if required.

Figure 21. Disconnect from the Device

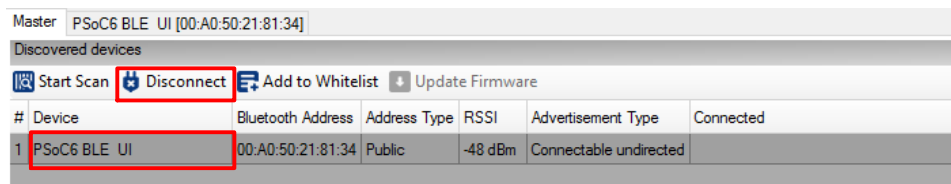
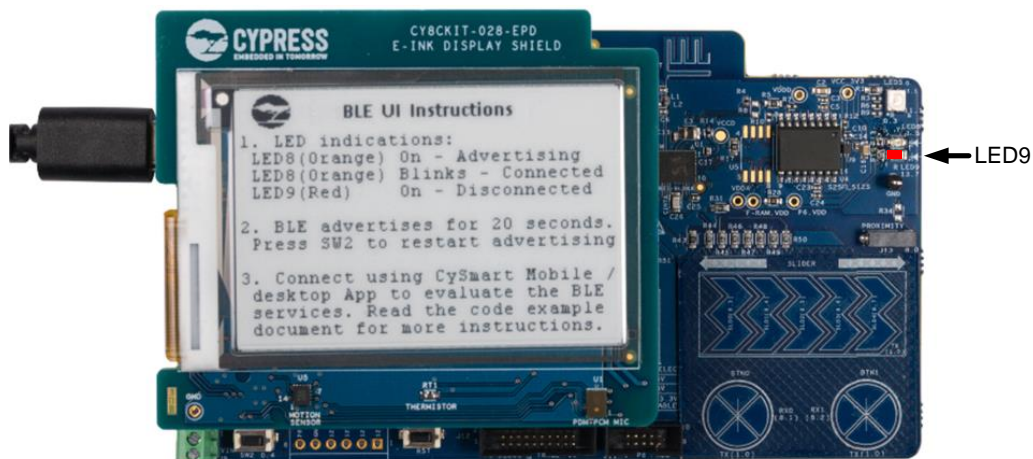


Figure 22. Disconnect Indication



## CySmart Mobile Application

To verify this code example using the CySmart mobile application (refer to the [CySmart Mobile App webpage](#)), follow these steps:

**Note:** For this project, the CapSense Button service is not available in the CySmart iOS app. Use the Android app to evaluate this service.

1. Install the CySmart app.
2. Power the Pioneer Board through the USB connector **J10**.
3. Program the Pioneer Board with the `CE220167_BLE_UI` project. See the [Pioneer Kit guide](#) for details on how to program firmware into the device.

After programming successfully, the E-INK display refreshes and shows the instructions to use this project; BLE starts advertising. The advertising timeout is configured to be 20 seconds. The orange LED (**LED8**) remains ON during this period to indicate the BLE advertising state.

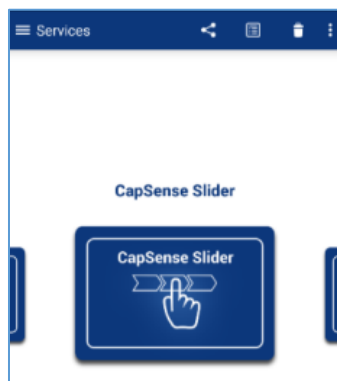
4. If the BLE advertisement has timed out (**LED8** is OFF), press **SW2** to restart advertisement. See the figures in the earlier section for LED and switch locations.
5. Open the CySmart app on the mobile device. If Bluetooth is not enabled on the device, the application will prompt you to enable it.
6. After Bluetooth is enabled, the CySmart mobile application automatically searches for available devices and lists them. Select the **BLE UI** peripheral as shown in [Figure 23](#). A successful connection is indicated by **LED8** continuously blinking at half-second intervals.

Figure 23. BLE UI Peripheral



7. When connected, the CySmart mobile application lists the services supported by the device. Scroll and select the CapSense Slider icon, as shown in [Figure 24](#).

Figure 24. CapSense Slider Service Page



8. Swipe your finger on the CapSense slider on the Pioneer Board and see a similar response on the CapSense Slider page in the CySmart application (see [Figure 25](#)).

Figure 25. CapSense Slider



9. Press the back button to return to the service selection page. Scroll and tap on the CapSense Button service.

Figure 26. CapSense Button Service



10. Touch CapSense buttons on the Pioneer Board and see a similar response on the CapSense Button page in the CySmart application.

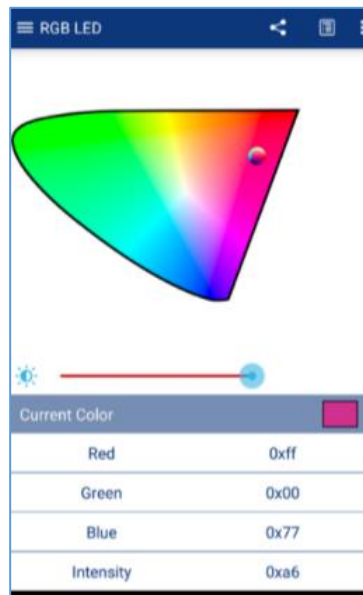
Figure 27. CapSense Buttons



11. Press the back button to return to the service selection page. Scroll and tap on the RGB LED service.
12. On the RGB LED service page, select a color on the color gamut to see a similar color response on the Pioneer Board RGB LED. The slider below the color gamut controls the intensity of the RGB LED color.



Figure 28. RGB LED Control with CySmart Mobile Application



On the service selection page, there is also a “GATT DB” selection, which allows you to examine the GATT database directly. From this page, you can read and write characteristics as well as enable and disable notifications.

13. If the CySmart app is closed, or Bluetooth is turned OFF, the red LED (**LED9**) will turn ON for three seconds to indicate a disconnect event. Press **SW2** to restart the advertisement, if required.

## Components

Table 2. List of PSoC Creator Components

| Component               | Instance Name                                | Function   |
|-------------------------|--|--|
| BLE                     | BLE  | The BLE Component is configured for Limited Discovery with custom characteristics. These characteristics are used for notifying the BLE Central device of CapSense Slider, CapSense Buttons and read/write RGB LED control data. |
| CapSense                | CapSense                                     | The CapSense Component scans a 5-segment slider (CSD) and 2 buttons (CSX) with SmartSense auto-tuning.   |
| MCWDT                   | MCWDT  | The MCWDT Counter0 is configured to generate periodic interrupts at 0.5 second intervals. MCWDT interrupts are used to control the status LEDs and turn them off when not required, to save power.                               |
| Digital Output Pin      | Pin_LED_Red<br>Pin_LED_Orange                | These GPIOs are configured as firmware controlled digital output pins that control status LEDs.  |
|                         | Pin_RGB_Red<br>Pin_RGB_Blue<br>Pin_RGB_Green | These GPIOs are configured as digital output pins with hardware connections. These pins route PWM signals to RGB LED.  |
| Digital Input Pin       | Advertise                                    | This pin is configured as a digital input pin that is used to generate interrupts when the user button ( <b>SW2</b> ) is pressed.  |
| Global Signal Reference | GlobalSignal                                 | The global signal component is configured to extract interrupts from <b>Advertise</b> pin.   |
| PWM                     | PWM_Red<br>PWM_Blue<br>PWM_Green             | These three TCPWMs are configured in PWM mode to control the color of the RGB LED.   |



**Note:** See the code example [CE218133 – PSoC 6 MCU E-INK Display with CapSense](#) for more details on components used by E-INK library.

See the PSoC Creator project for more details of PSoC Component configurations and design wide resource settings.

## Related Documents

| Application Notes   |  |
|---|--|
| <a href="#">AN210781 – Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity</a> | Describes PSoC 63 with Bluetooth Low Energy (BLE) Connectivity and how to build your first PSoC Creator project. |
| PSoC Creator Component Datasheets   |  |
| <a href="#">Bluetooth Low Energy</a>  | Facilitates designing applications requiring BLE connectivity.   |
| <a href="#">CapSense</a>  | Provides guidelines to use the CapSense Component.   |
| Device Documentation  |  |
| <a href="#">PSoC 6 MCU: PSoC 63 with BLE Datasheet</a>  | <a href="#">PSoC 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual</a>                             |
| Development Kit (DVK) Documentation   |  |
| <a href="#">CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit</a>  |  |

## Document History

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Document Number: 002-20167

| Revision | ECN     | Orig. of Change | Submission Date | Description of Change  |
|----------|---------|-----------------|-----------------|--|
| **       | 5790318 | NIDH            | 06/28/2017      | New spec.  |
| *A       | 5840917 | NIDH            | 08/23/2017      | Initial public release version   |
| *B       | 5890172 | NIDH            | 9/20/2017       | Public release version   |
| *C       | 6001007 | NIDH            | 12/13/2017      | Updated template and minor text changes. Updated project to PSoC Creator 4.2 Beta. |

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