PSoC 4 BLE – Hue Control

Objective

This example showcases the use of PSoC 4 BLE to control a 10W RGB Flood Light. The IR receiver in the RGB Flood Light is replaced with PSoC 4 BLE, thus allowing the use of a BLE central device to control the color and intensity of the light.

Overview

This example uses the PSoC 4 BLE Pioneer Kit to control the color, intensity and status of a 10W RGB Flood Light.

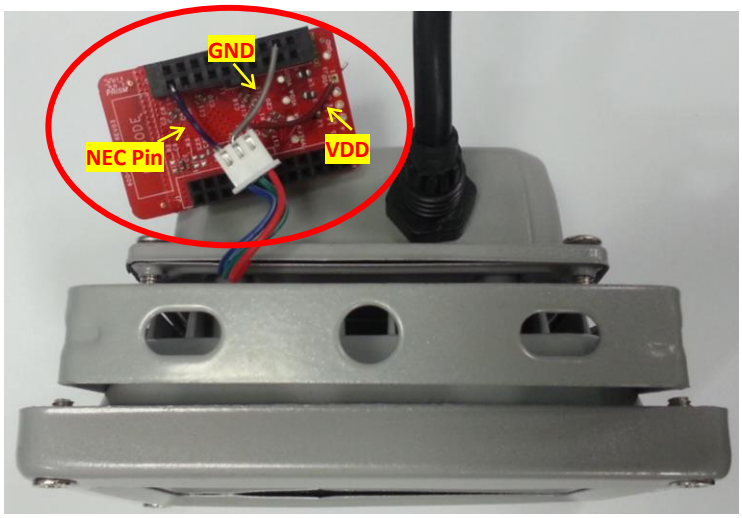
The RGB Flood Light used in this example has an inbuilt IR receiver and comes with an IR Remote Control. This Remote sends commands for changing color/brightness of the light over an IR link, in the NEC protocol format. The IR receiver present in the flood light converts the IR data to electrical signals, which are then decoded by a driver circuitry to drive appropriate signals to the R, G and B LEDs for achieving required color or intensity.

In this example, the IR Receiver is replaced with PSoC 4 BLE. The PSoC 4 BLE is configured as a GAP Peripheral device, which receives commands from a central device, and translates them to NEC data format to drive appropriate electrical signals on the IR Receiver line.

Note that it is also possible to directly drive the RGB LED with PSoC 4 BLE and external current amplifiers; however this project just replaces the IR receiver. Refer to the "PSoC_4_BLE_CapSense_Slider_LED" example project that comes with CY8CKIT-042-BLE kit installer for an example project on RGB color Control using PSoC 4 BLE.

Figure 1: Original RGB Flood light with Remote

Figure 2: Modified RGB Flood Light, with IR receiver replaced by CY8CKIT-142 PSoC 4 BLE Module



Requirements

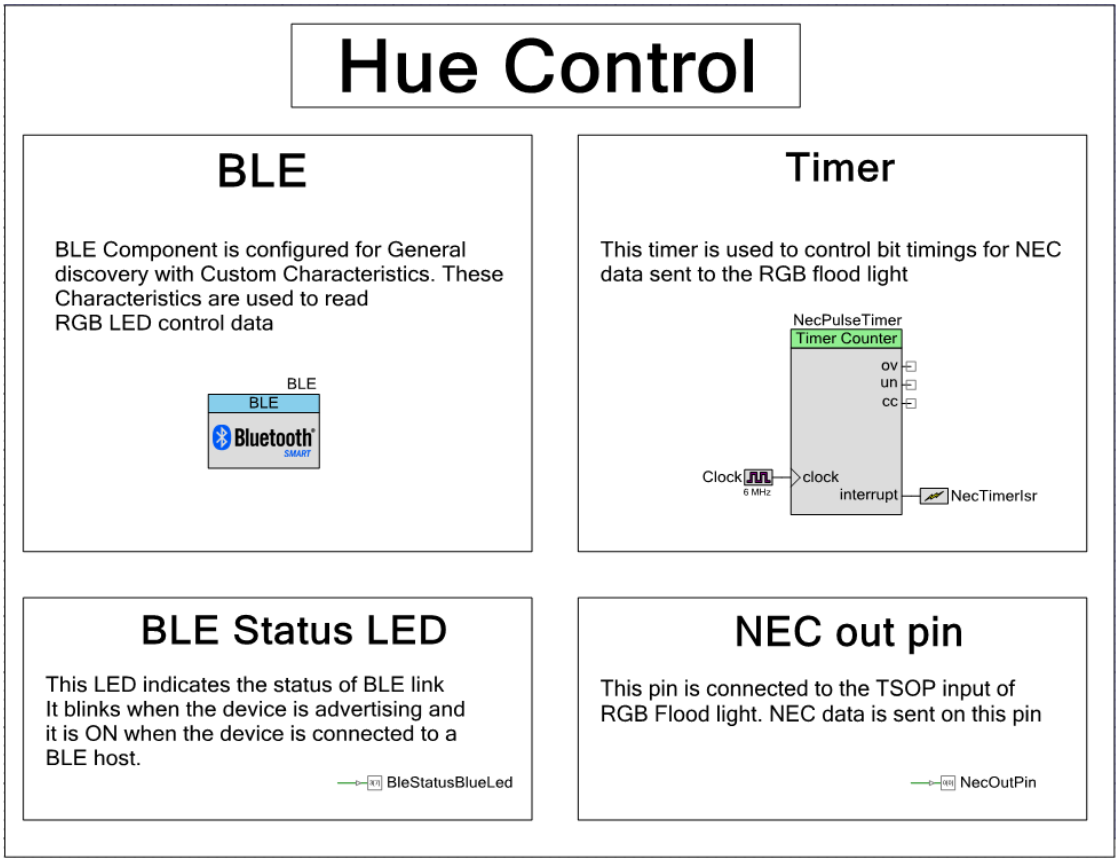
Design Tool: PSoC Creator 3.1 SP1 with built-in GCC 4.8.4

Associated Devices: All PSoC 4 BLE & PRoC BLE devices

Required Hardware: CY8CKIT-042-BLE Bluetooth® Low Energy (BLE) Pioneer Kit, 10W RGB Flood Light

PSoC Creator Schematic

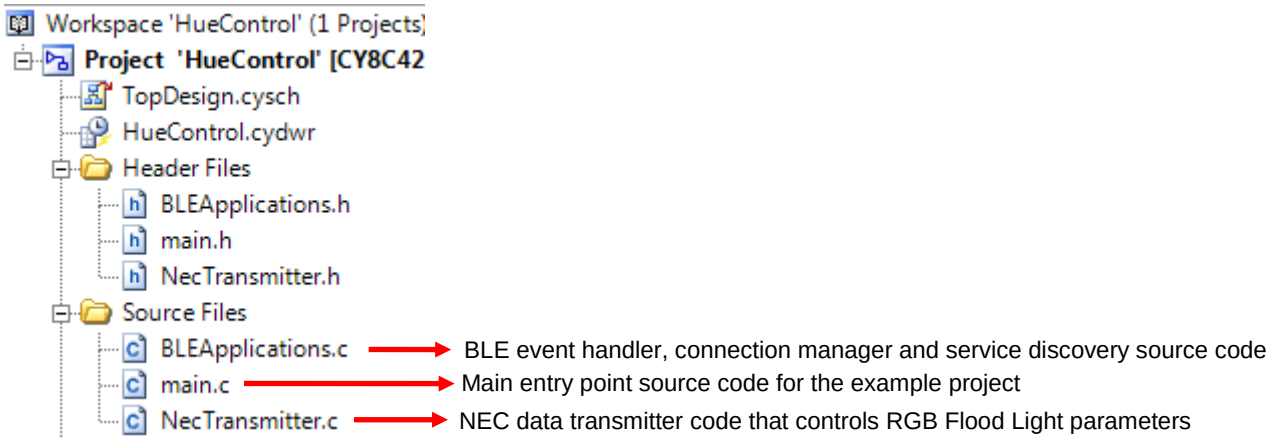
Figure 3. PSoC Creator Schematic



Firmware

The firmware source files for this example project and a short description of each of the source files is shown in Figure 4.

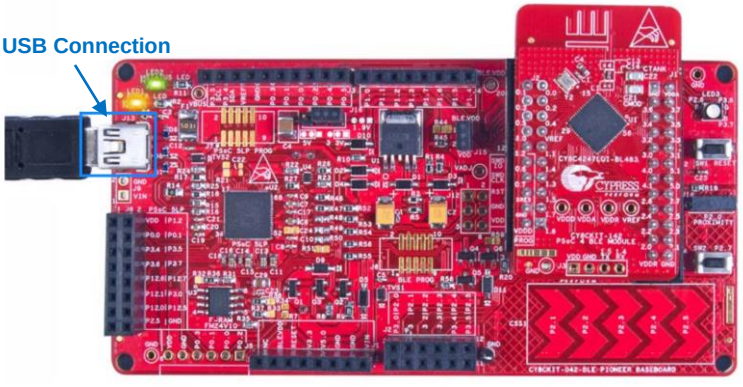
Figure 4. Hue Control Example Project Source Files



Test Setup

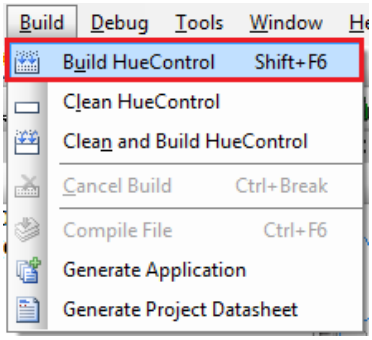
- Connect the CY8CKIT-142 PSoC 4 BLE Module to the CY8CKIT-042-BLE Pioneer Baseboard.
- Connect the CY8CKIT-042-BLE to PC using a USB cable as Figure 5 shows.

Figure 5. USB Cable Connected to CY8CKIT-042-BLE



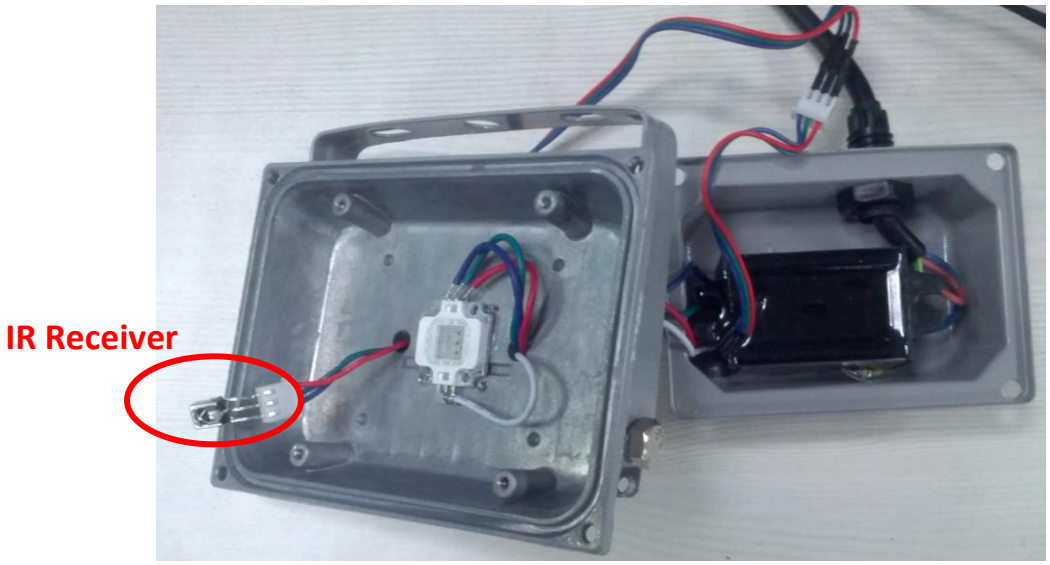
- Build this example project in PSoC Creator 3.1 SP1 (or later) by going to Build -> Build HueControl as Figure 6 shows.

Figure 6. Building the Project



- Program the hex file generated onto BLE-Pioneer kit Baseboard by going to Debug -> Program.
- Connect the CY8CKIT-042-BLE to the RGB Flood Light as explained below and as shown in Figure 2.
    - Disassemble the RGB Flood Light by opening all the screws.
    - Once the Flood Light is disassembled, an IR Receiver can be noticed, mounted on a connector as Figure 7 shows. (The Flood Light that I used has a VS1838B). Based on the IR Receiver datasheet, note the VDD, GND and data pin on the connector.

Figure 7. Disassembled RGB Flood Light

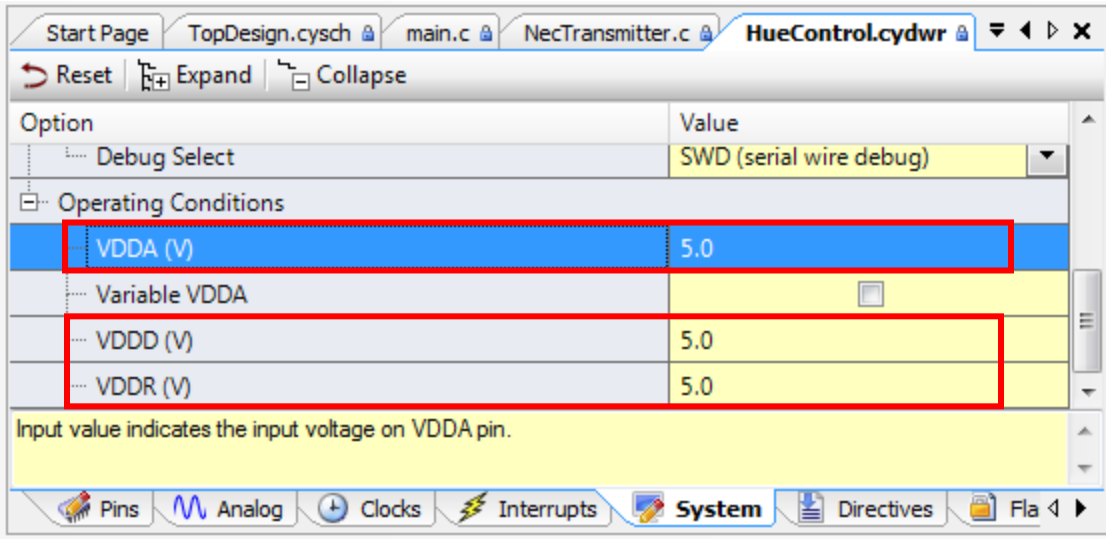


- Remove this IR receiver from the connector.
- Connect either the complete CY8CKIT-042-BLE with the CY8CKIT-142 module to the Flood Light, or just the CY8CKIT-142 PSoC 4 BLE Module to the Flood Light as explained below:

Connecting only CY8CKIT-142 BLE Module to the Flood Light

- Connect the VDD pin on the IR Receiver Connector to Vdd on J3 of CY8CKIT-142 PSoC 4 BLE Module. Note that the voltage driven by Flood Light on the Vdd line should meet the Vdd specifications mentioned in the PSoC 4 BLE datasheet. Also, set the VDDD, VDDA and VDDR values in .cydwr file of the PSoC Creator project to be the same value as that driven on the VDD pin, as Figure 8 shows.

Figure 8 VDDA, VDDR and VDDD configuration in cydwr file in PSoC Creator Project



- Connect the GND pin on the IR Receiver Connector to GND on CY8CKIT-142 PSoC 4 BLE Module.
- Connect the data pin on the IR Receiver Connector to pin 0.0 on J2 of CY8CKIT-142 PSoC 4 BLE Module.

Connecting the baseboard along with CY8CKIT-142 BLE Module to the Flood Light

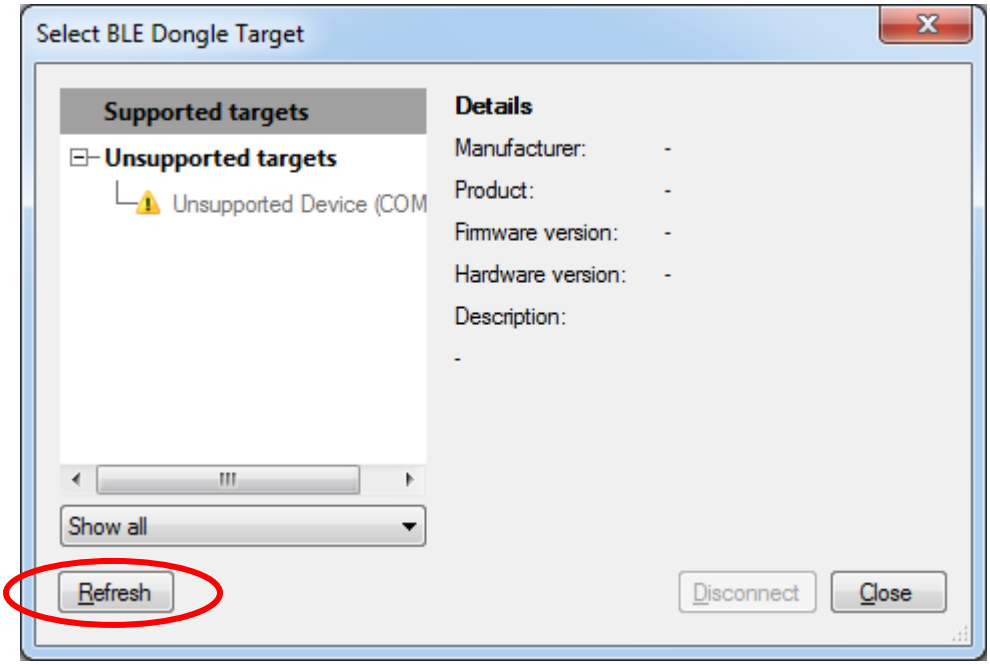
- Connect the GND pin on the IR Receiver Connector to GND on J1 of CY8CKIT-042-BLE.
- Connect the data pin on the IR Receiver Connector to pin P0.0 on J3 of CY8CKIT-042-BLE.
- Connect the CY8CKIT-042-BLE kit BaseBoard to a PC using a USB Cable for powering the BaseBoard. The Blue LED on the BaseBoard will start blinking once it is powered.

- Power ON the RGB LED Flood Light.
- Connect the BLE dongle that comes with CY8CKIT-042-BLE to PC.

Test Procedure

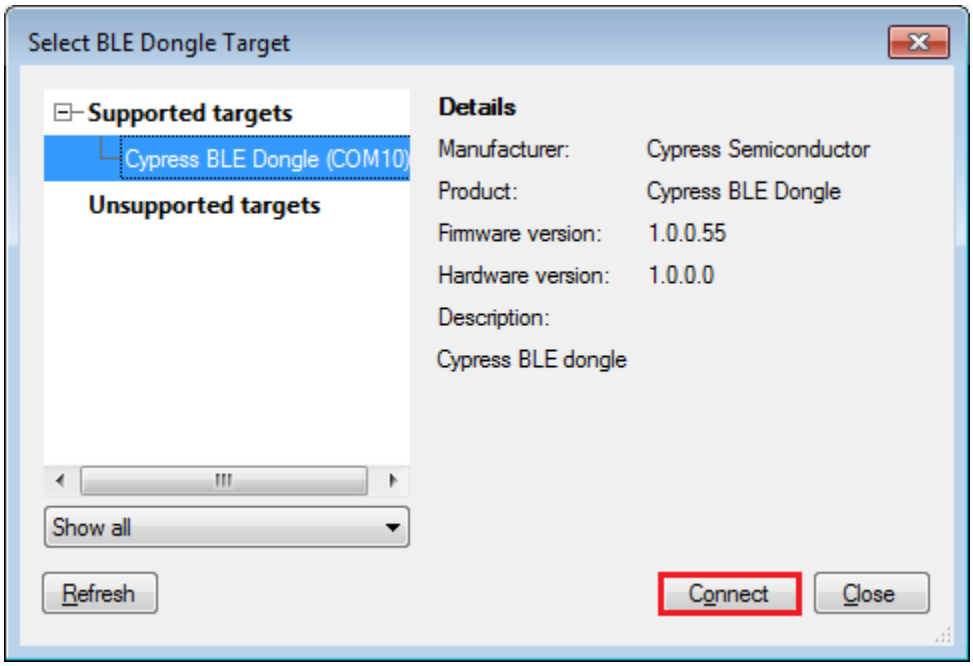
- Open the CySmart Tool on the PC by going to Start -> All Programs -> Cypress -> CySmart 1.0.
- In the "Select BLE Dongle Target" window that opens by default, Click Refresh as Figure 9 shows.

Figure 9. Select BLE Dongle Target Window



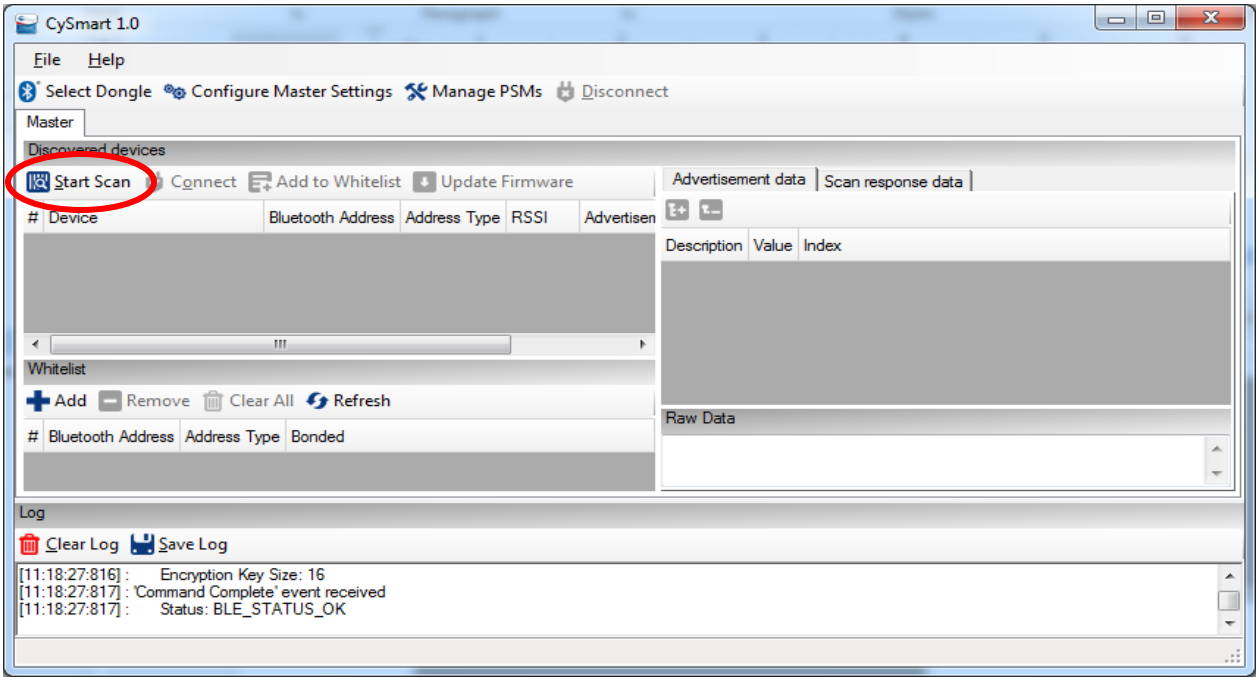
- Select "Cypress BLE Dongle (COMxx)" and click on Connect as Figure 10 shows.

Figure 10. Connect to Cypress BLE Dongle



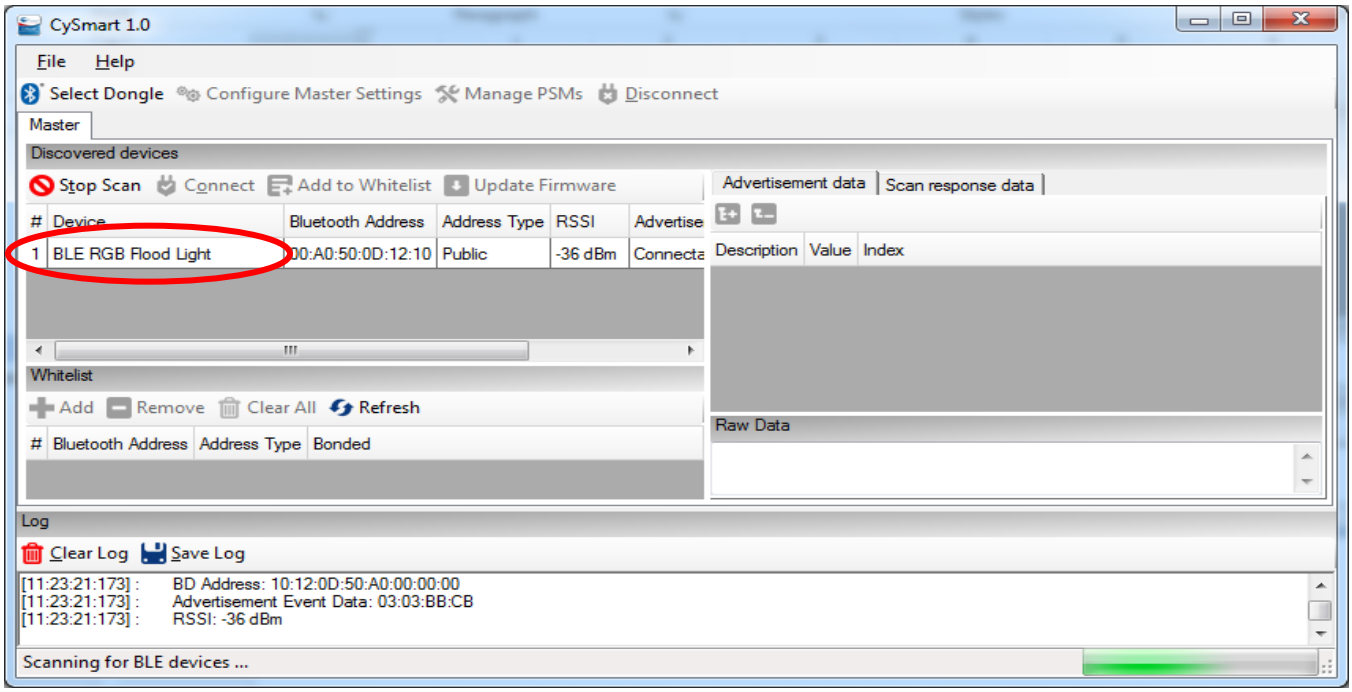
- In the CySmart main window, click on the **Start Scan** button as Figure 11 shows.

Figure 11. Select Start Scan in CySmart main window on connecting to the BLE Dongle.



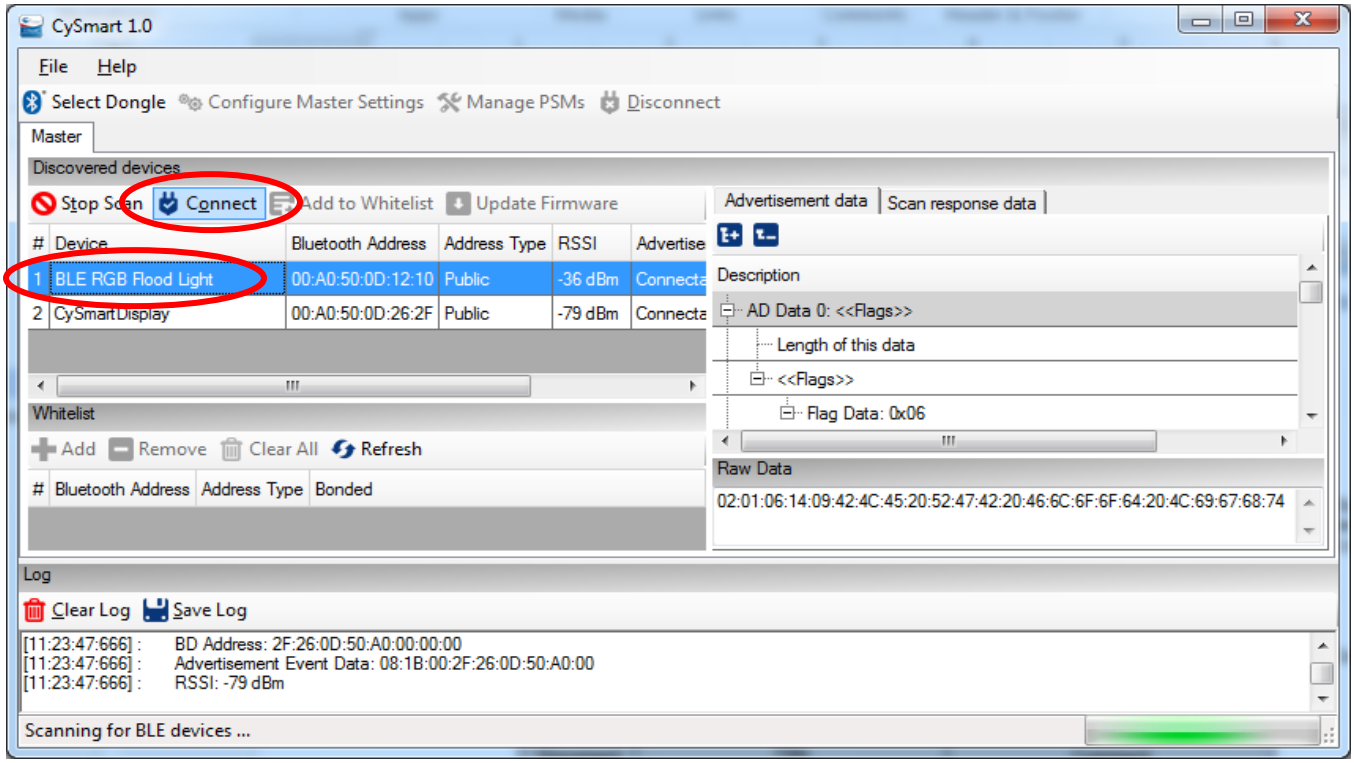
- BLE RGB Flood Light appears in the Discovered devices as Figure 12 shows

Figure 12. BLE RGB Flood Light appears in the Discovered devices



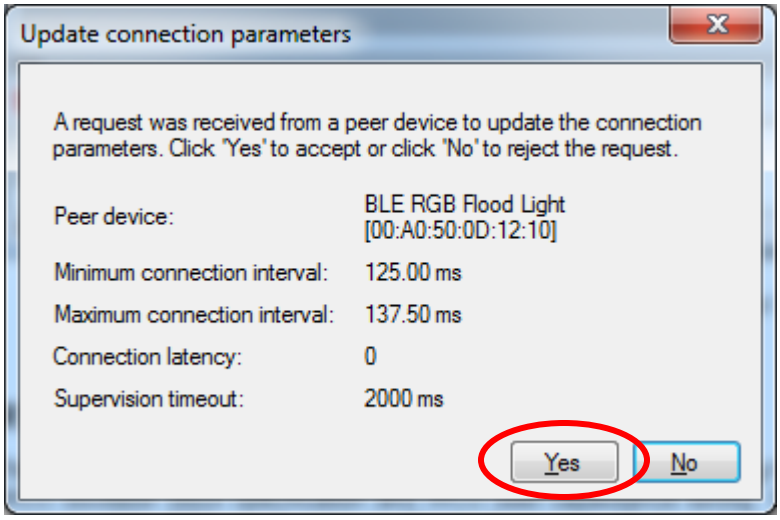
- Click on the “BLE RGB Flood Light” and click “Connect” as Figure 13 shows. If the CY8CKIT-142 Module is connected to the Baseboard, the Blue LED on the baseboard stops blinking and remains ON always

Figure 13. Connect to BLE RGB Flood Light



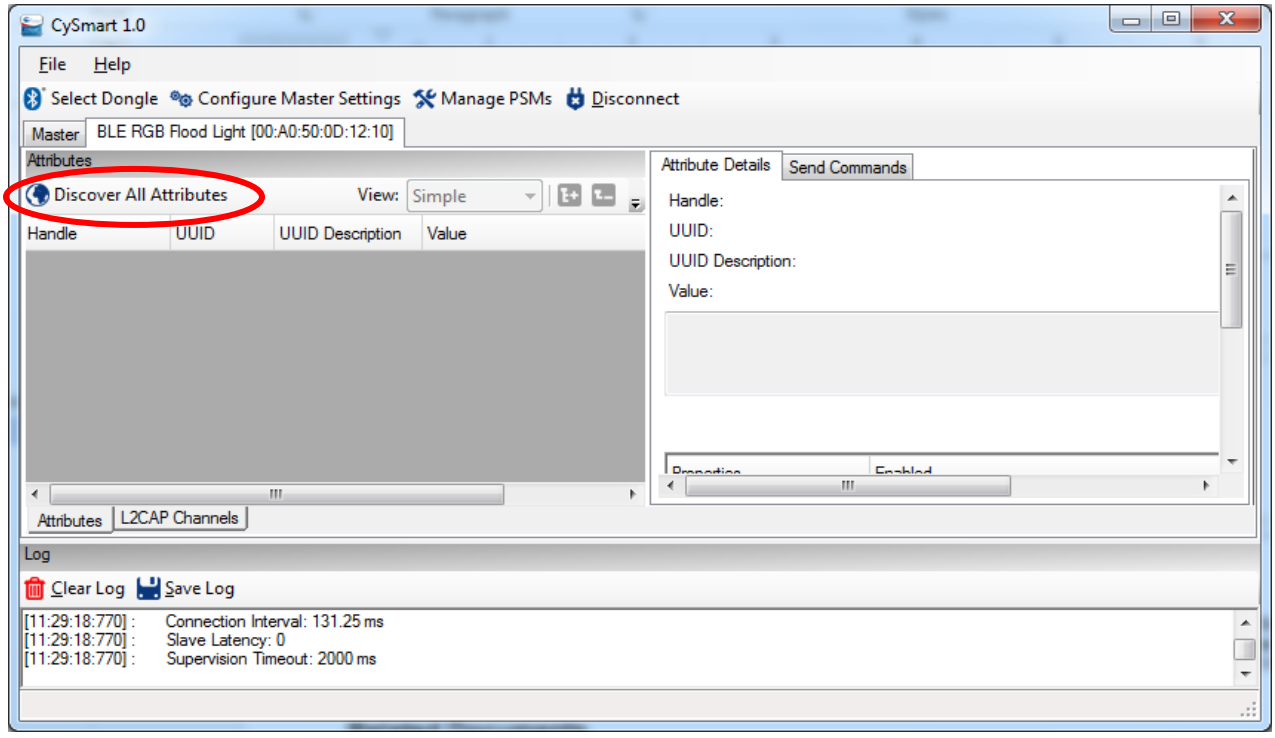
- “Update connection parameters” window appears on connecting to the BLE RGB LED Flood light. Select “Yes” in the window as Figure 14 shows.

Figure 14. Select “Yes” in the Update connection parameters window



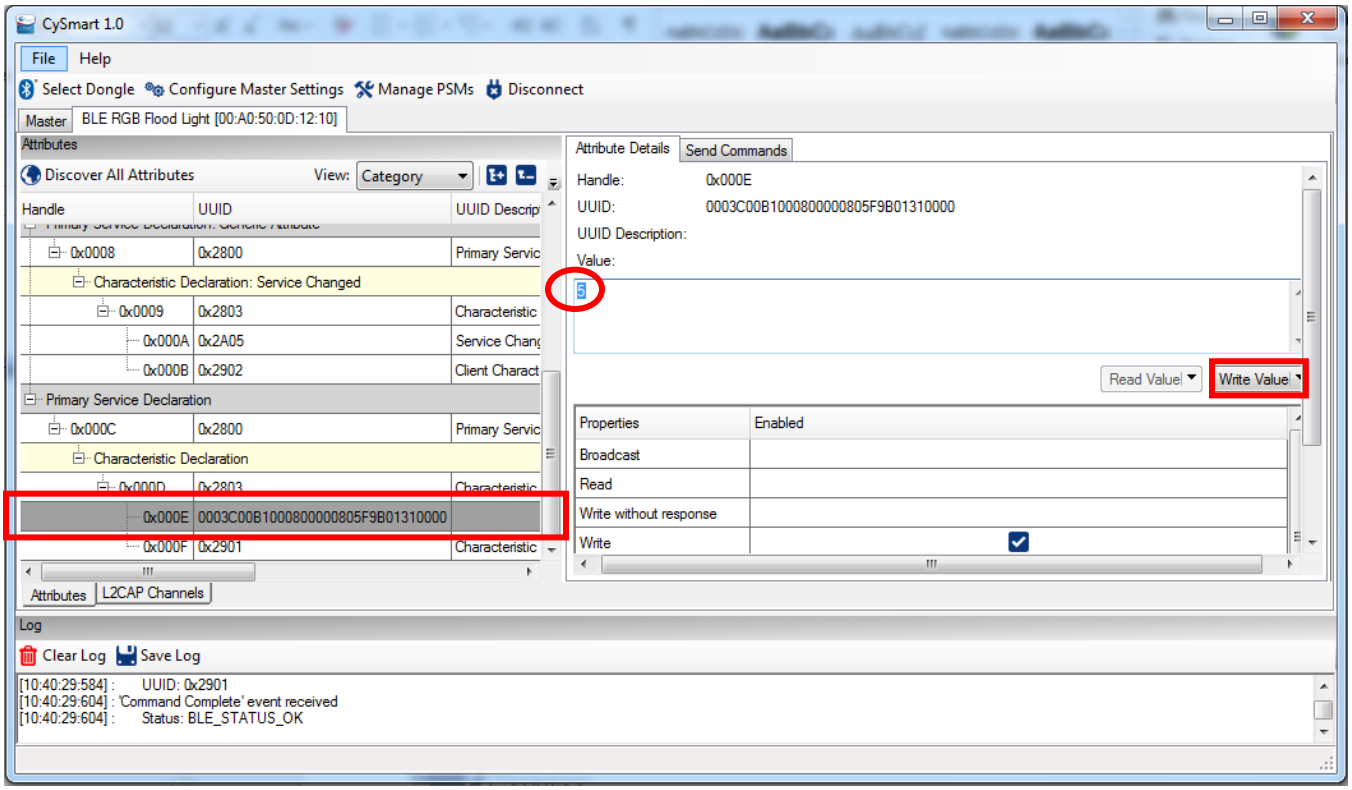
- Click “Discover All Attributes” as Figure 15 shows.

Figure 15. Click on “Discover All Attributes” in CySmart main window



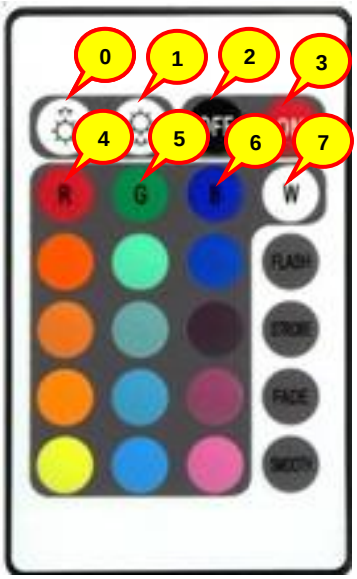
- As Figure 16 shows, in the discovered “Attributes”, scroll down to the Primary Service Declaration, click on the characteristic UUID “”0003C00B…” and type the command value “5” in the “Attribute Details” tab on the right. Now click on “Write Value”. The color of the RGB Flood Light now turns Green.

Figure 16. Write the requisite RGB flood light command for characteristic UUID 0xCBB1



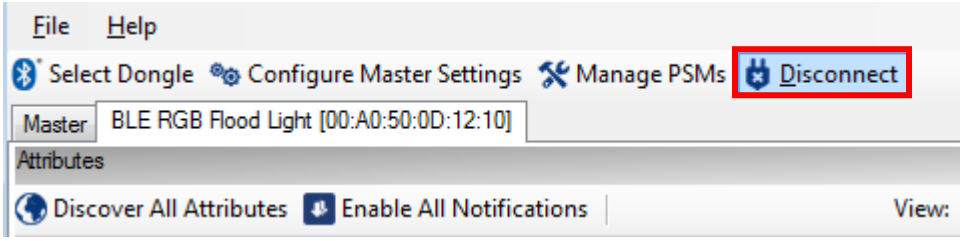
- The different IR Remote control commands have been sequentially mapped to hexadecimal numbers 0x00 through 0x17. Callouts marked in Figure 17 show the commands for few of the RGB Flood Light operations.

Figure 17. BLE Commands corresponding to different operations supported by RGB Flood Light Remote



- To disconnect, click on the Disconnect tab in CySmart.

Figure 18. Disconnecting BLE connection to RGB Flood Light



Related Documents

Table 1 lists all relevant application notes and code examples.

Table 1. Related Documents

Document	Title	Comment
AN91267	Getting Started with PSoC 4 BLE	Provides an introduction to PSoC 4 BLE device that integrates a Bluetooth Low Energy radio system along with programmable analog and digital resources.
PSoC 4 BLE TRM	PSoC 4 BLE device TRM	A detailed description of all the features and internal architecture of PSoC 4 BLE device.
CY8CKIT-042 BLE Kit Guide	CY8CKIT-042 BLE Kit Guide	Explains the CY8CKIT-042-BLE setup and provides a description of the PSoC_4_BLE_CapSense_Slider_LED example project to control RGB LEDs using PSoC 4 BLE.
AN91184	Designing BLE Applications	Describes how to create BLE applications using standard BLE profiles and services.
AN91162	Creating a BLE Custom Profile	Provides methodology to create BLE custom service/characteristic and use it for data transfer.