

Objective

This example demonstrates the Wireless Power Transfer service in the Power Transmitter Unit and Power Receiver Unit role.

Overview

The design demonstrates the Wireless Power Transfer Profile operation of the BLE Component. The example consists of two projects: the Wireless Power Transmitter (GATT Client) and Wireless Power Receiver (GATT Server).

This example demonstrates the communication between Power Receiver Unit (PRU) and Power Transmitter Unit (PTU) in the Wireless Power Transfer systems. The PTU Central device supports connection with up to four PRU Peripheral devices. The PRU simulates the power receiver data and reports the simulated data to a PTU using the Wireless Power Transfer Service (WPTS).

Requirements

Tool: PSoC Creator™ 4.2

Programming Language: C (Arm® GCC 5.4-2016-q2-update)

Associated Parts: All PSoC 6 BLE parts

Related Hardware: CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit

Hardware Setup

This example uses the kit's default configuration. Refer to the [kit guide](#) to ensure the kit is configured correctly.

1. Connect the BLE Pioneer Kit to the computer's USB port.
2. Connect the BLE Dongle to one of the USB ports on the computer.

LED Behavior

If the V_{DD} voltage is set to less than 2.7 V in the DWR settings **System** tab, only the red LED is used. The red LED blinks to indicate that the device is advertising. The red LED is OFF when a device is connected to a peer device. When the device is in Hibernate mode, the red LED stays ON.

LED behavior for V_{DD} Voltage > 2.7 volts is described in **Operation** section.

Software Setup

BLE Host Emulation Tool

This example requires the CySmart application. Download and install either the [CySmart Host Emulation Tool](#) PC application or the CySmart app for [iOS](#) or [Android](#). You can test behavior with any of the two options, but the CySmart app is simpler. Scan one of the following QR codes from your mobile phone to download the CySmart app.

iOS



Android



Terminal Tool

This example uses a terminal window. You must have terminal software, such as Tera Term, or PuTTY.

Operation

The Wireless Power Receiver device (PRU) can be connected to any BLE (4.0 or later) - compatible device configured as GAP Central role and GATT Client which supports the Wireless Power Profile. The green LED blinks while the device is advertising. The red LED is turned ON after disconnection to indicate that no Client is connected to the device. When the Client connects successfully, the red and green LEDs are turned OFF. When a Client enables charging, the blue LED turns ON.

The project simulates voltage changes at the charge/battery port (Vrect) and writes the result to the PRU Dynamic Parameter characteristic. It increases when the charger is enabled by the PTU and decreases when charging is complete. Press the **SW2** button to increase the simulation step. The simulation interval value is set to 1 second.

The Wireless Power Transmitter project (PTU) automatically connects to the PRU devices. The PTU uses the WPT Service handle from the advertising packet for quick PRU discovery instead of the classic device discovery procedure.

When a connection is established, the PTU automatically initiates a basic information exchange procedure, i.e., sends a read request to the PRU Static Parameter characteristic, a write request to PTU Static Parameter characteristic, enables notification of the Alert characteristic, and enables charging. A read request to PRU Dynamic Parameter characteristic is sent every second.

The red LED blinks while the device is scanning. The red LED is turned ON after disconnection to indicate that no Peripheral is connected to the device. When the device connects successfully with any Peripheral, the red LED is turned OFF.

Advertising packets received during the scanning procedure from Peripheral devices are parsed and filtered. Only packets with WPT service-specific data are handled and showed in the debug terminal.

The example project uses the UART Component for displaying debug information and for sending commands through a terminal emulator app. The commands are the procedures, which the user can perform.

Table 1. List of Commands

| Command | Description |
|---------|--|
| 's' | Start discovery procedure. |
| '1' | Enable notifications for the Alert characteristic. |
| '2' | Enable indications for the Alert characteristic. |
| '3' | Disable notifications and indications for the Alert characteristic. |
| '4' | Send Read request for the PRU Static Parameter characteristic. |
| '5' | Send Read request for the PRU Dynamic Parameter characteristic. |
| '6' | Send "Enable Charging" command to the PRU control characteristic. |
| '7' | Send "Disable Charging" command to the PRU Control characteristic. |
| '8' | Enable sequential read of the PRU Dynamic Parameter characteristic. |
| '9' | Disable sequential read of the PRU Dynamic Parameter characteristic. |

The above list is prompted to the terminal emulator when 'h' is entered in the app.

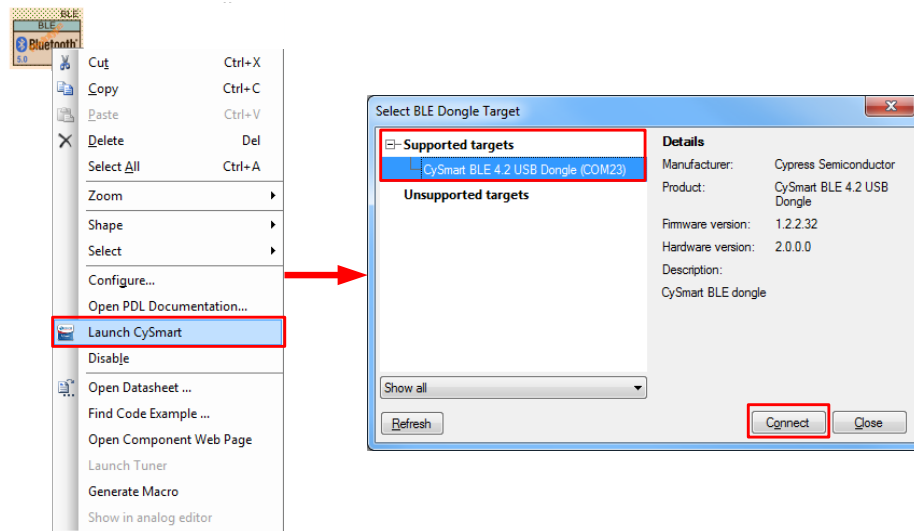
Use the '6' and '7' commands to send the **Enable** and **Disable Charging** commands to the PRU Control characteristic. The PRU device will indicate charging with the blue LED.

Operation Steps

1. Plug the CY8CKIT-062-BLE kit board into your computer's USB port.
2. Open a terminal window and perform following configuration: Baud rate – 115200, Parity – None, Stop bits – 1, Flow control – XON/XOFF. These settings must match the configuration of the PSoC Creator UART Component in the project.
3. Build the Wireless Power Receiver project and program it into the PSoC 6 MCU device. Choose **Debug > Program**. For more information on device programming, see PSoC Creator Help. Flash for both CPUs is programmed in a single program operation.

4. Observe the blue LED blinks while the device is advertising, and the output in the terminal window.
5. Do the following to test example, using the CySmart Host Emulation Tool application:
 - a. Connect the BLE Dongle to your Windows PC. Wait for the driver installation to complete, if necessary.
 - b. Launch the CySmart Host Emulation Tool by right-clicking on the BLE Component and selecting **Launch CySmart**. Alternatively, you can launch the tool by navigating to **Start > Programs > Cypress** and clicking on **CySmart**.
 - c. CySmart automatically detects the BLE dongle connected to the PC. Click **Refresh** if the BLE dongle does not appear in the **Select BLE Dongle Target** pop-up window. Click **Connect**, as shown in Figure 1.

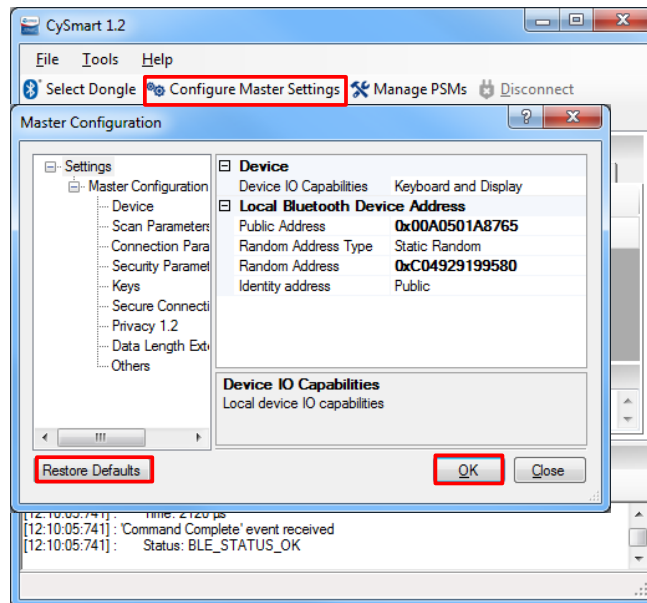
Figure 1. CySmart BLE Dongle Selection



Note: If the dongle firmware is outdated, you will be alerted with an appropriate message. You must upgrade the firmware before you can complete this step. Follow the instructions in the window to update the dongle firmware.

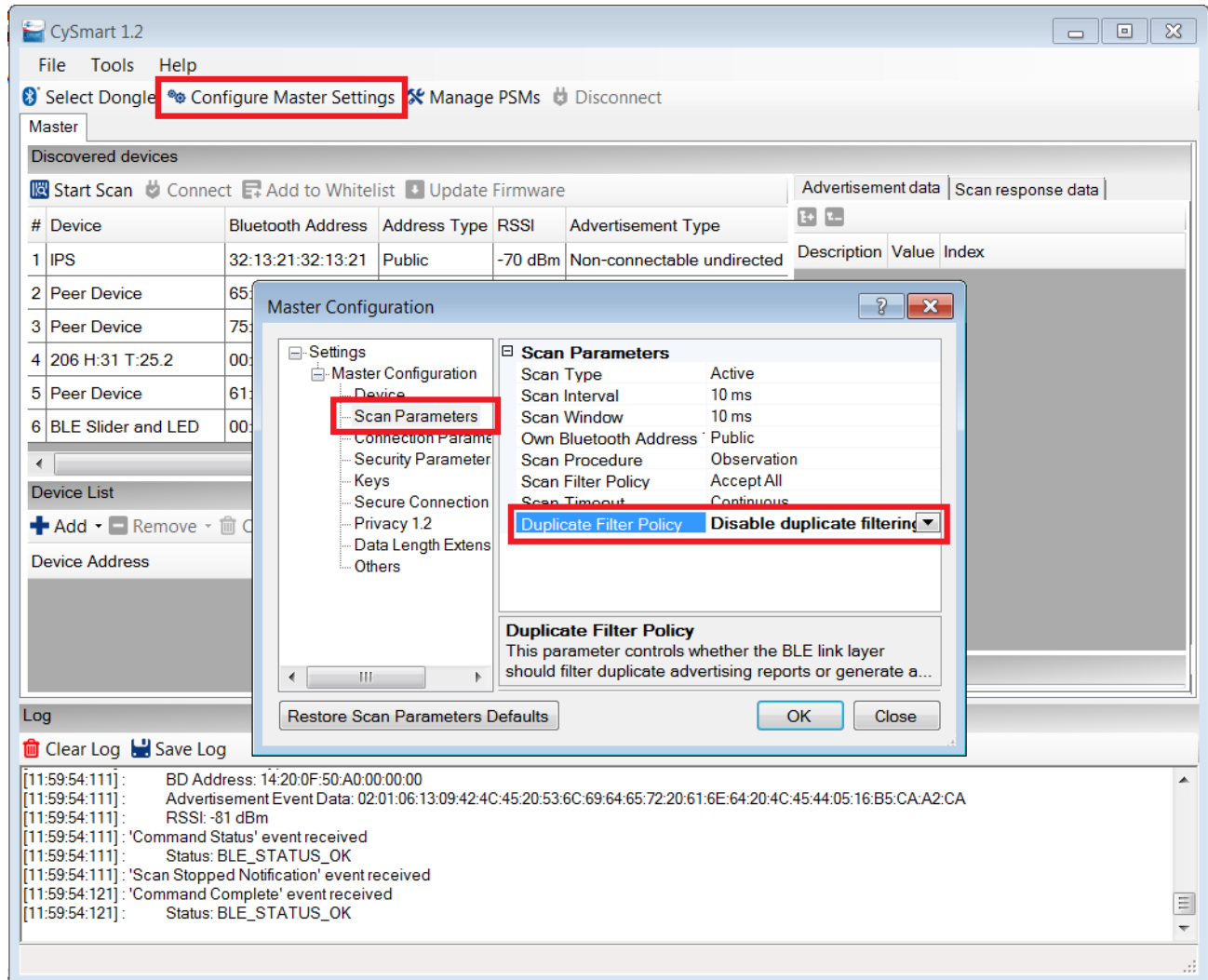
- d. Select **Configure Master Settings** and then click **Restore Defaults**, as Figure 2 shows. Then click **OK**.

Figure 2. CySmart Master Settings Configuration



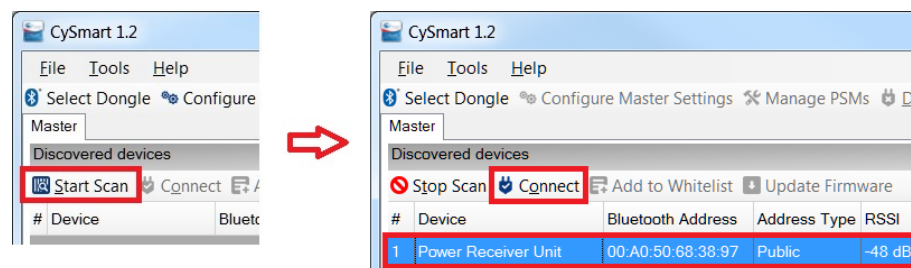
- e. Set the **Duplicate Filter Policy = Disable duplicate filtering** in the **Master Configuration > Scan parameters** window. See Figure 3.

Figure 3. Master Configuration → Scan Parameters



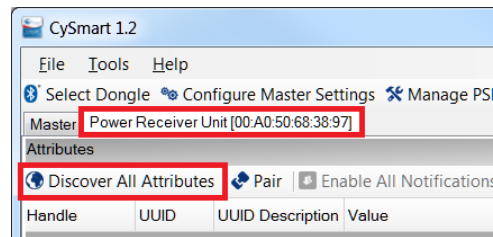
- f. Press the reset switch on the Pioneer Kit to start BLE advertisement if no device is connected or device is in Hibernate mode (red LED is on). Otherwise, skip this step.
- g. On the CySmart Host Emulation Tool, click **Start Scan**. Your device name (configured as **Power Receiver Unit**) should appear in the Discovered devices list, as Figure 4 shows. Select the device and click **Connect** to establish a BLE connection between the CySmart Host Emulation Tool and your device.

Figure 4. CySmart Device Discovery and Connection



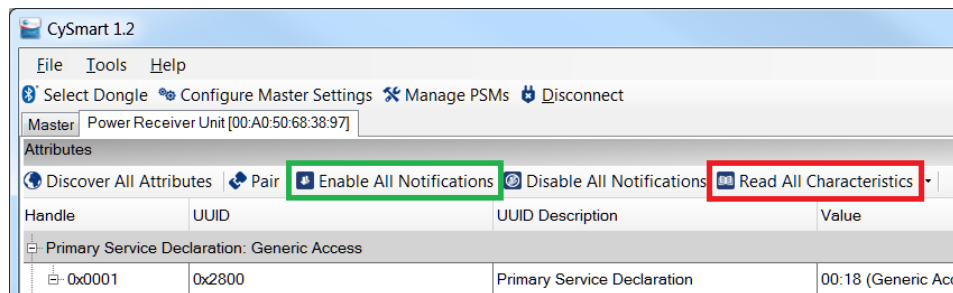
- h. Once connected, switch to the '**Power Receiver Unit**' device tab and '**Discover all Attributes**' on your design from the CySmart Host Emulation Tool, as shown in Figure 5.

Figure 5. CySmart Attribute Discovery



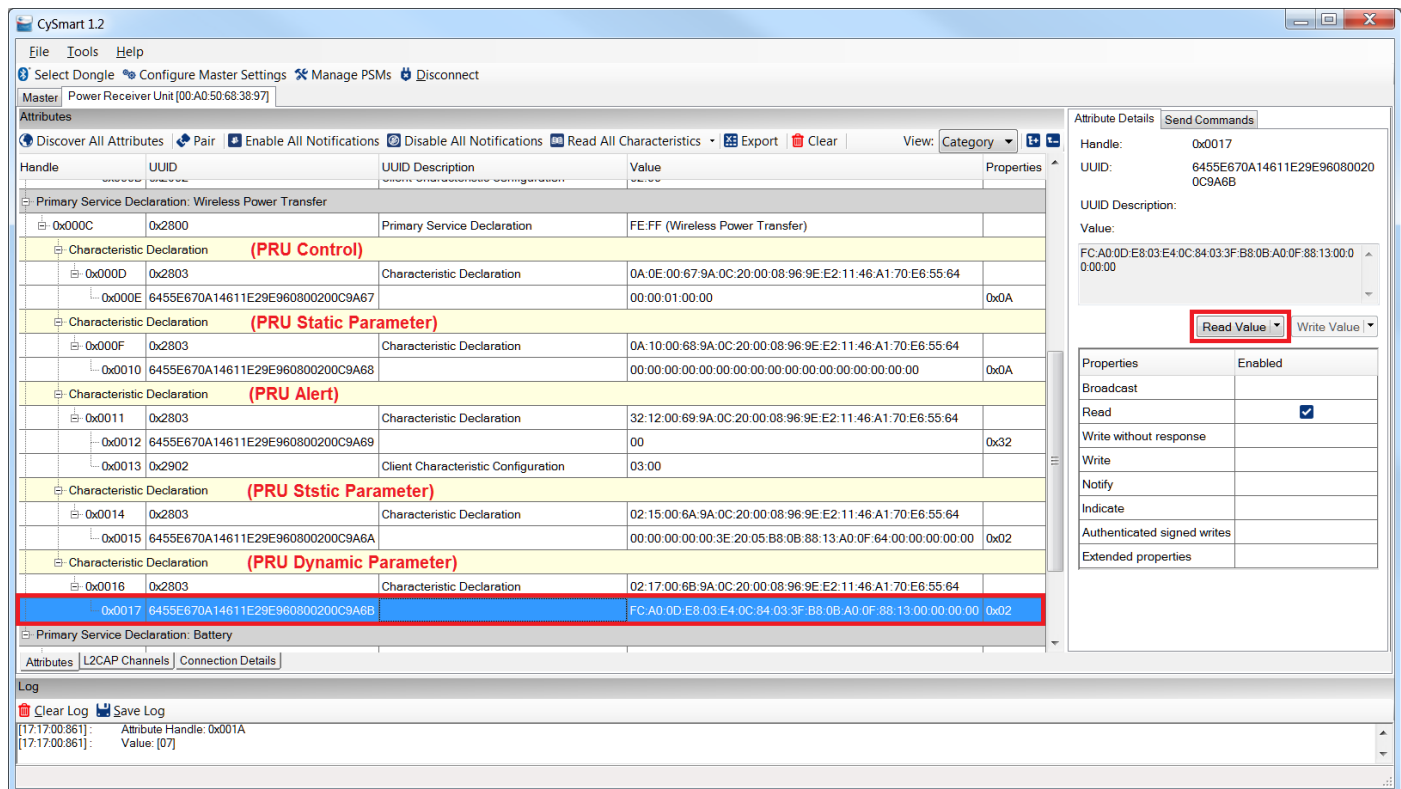
- i. Click **Pair** after discovery finishes, then **Enable All Notifications** and **Read All Characteristics**. Observe the received characteristic values as shown in [Figure 6](#).

Figure 6. CySmart Enable All Notification and Read All Characteristics



- j. Select the **PRU Dynamic Parameter** characteristic and press Read Value to observe the simulated values. Refer to the [A4WP Wireless Power Transfer System Baseline System Specification](#) for details on characteristic structure.

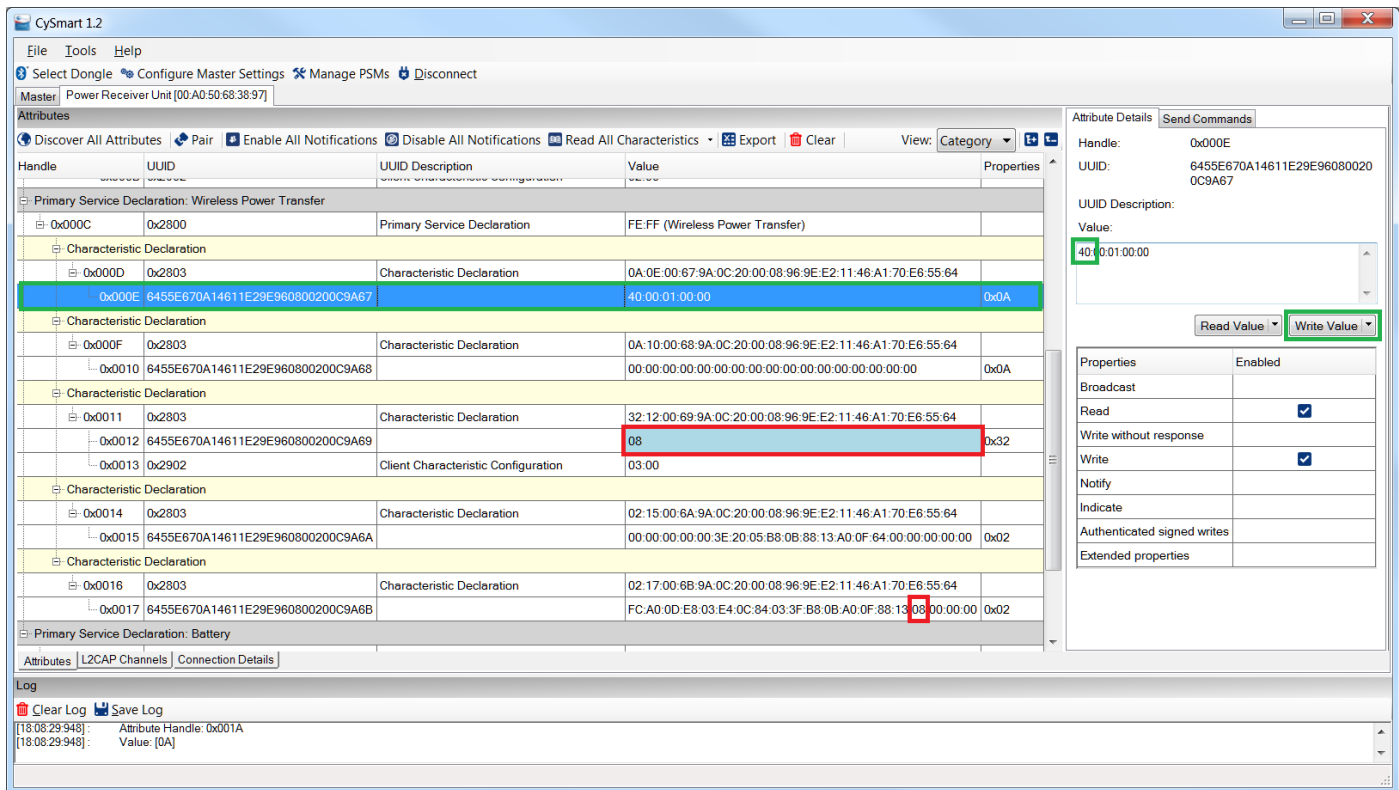
Figure 7. CySmart Windows App



- k. Select the **PRU Control** characteristic, write the 0x40 value (charge enable) to the first byte and press **Write Byte**. Observe that the blue LED indicates that the PRU device received the command.

- I. After some time, observe the Notification of the Alert characteristic received with value 0x08 (Charge Complete). Read the PRU Dynamic Parameter characteristic and observe the same value in the PRU Alert position (17th byte):

Figure 8. CySmart Windows App



- m. If you have some problems with the usage of the CySmart app, refer to the [CySmart User Guide](#).
6. The CySmart mobile app ([Android/iOS](#)) does not have Wireless Power Service implementation, but still can be used in GATT Data Base mode for test this example. You can repeat test flow for CySmart mobile app in step 5. Refer to [Android](#) and [iOS](#) CySmart User Guide.
7. The code example ships with the UART debug port enabled. To disable it, set the macro `DEBUG_UART_ENABLED` in `common.h` to `DISABLED` and rebuild the code.
8. The BLE Wireless Power Transmitter project is intended to work in a pair with BLE Wireless Power Receiver. Do the following to test Wireless Power Receiver project, using Wireless Power Transmitter project:
 - a. Plug the CY8CKIT-062-BLE kit board into your computer's USB port.
 - b. Open a terminal window and perform following configuration: Baud rate – 115200, Parity – None, Stop bits – 1, Flow control – XON/XOFF. These settings must match the configuration of the PSoC Creator UART Component in the project.
 - c. Build the BLE Wireless Power Transmitter project and program it into the PSoC 6 MCU device. Choose **Debug** > **Program**. For more information on device programming, see PSoC Creator Help. Flash for both CPUs is programmed in a single program operation.
 - d. Plug the CY8CKIT-062-BLE kit board into your computer's USB port.
 - e. Open a terminal window and perform following configuration: Baud rate – 115200, Parity – None, Stop bits – 1, Flow control – XON/XOFF. These settings must match the configuration of the PSoC Creator UART Component in the project.
 - f. Build the BLE Wireless Power Receiver project and program it into the PSoC 6 MCU device. Choose **Debug** > **Program**. For more information on device programming, see PSoC Creator Help. Flash for both CPUs is programmed in a single program operation.

- g. Two projects send log messages through UART. After starting, the PTU project logs Advertising and Scan response reports from the PRU, for example:

```
Advertisement report: peerBdAddr -00 a0 50 e1 61 a8 , rssi - -36 dBm, data - 02 01 05
07 16 fe ff 0c 00 a0 00
```

- h. The PTU automatically connects with the advertised PRU. Observe the initialization procedure. The blue LED on PRU indicates charging. After Vrect reaches VrectHighDyn, the PRU sends the simulated Alert Notification with the Complete Charge status and switches off the blue LED.
- i. The output of the debug serial port looks like the sample below:

The PTU example log:

BLE Wireless Power Transmitter Code Example

```
CY_BLE_EVT_STACK_ON, StartScanning
CY_BLE_EVT_SET_TX_PWR_COMPLETE
CY_BLE_EVT_SET_TX_PWR_COMPLETE
CY_BLE_EVT_SET_DEVICE_ADDR_COMPLETE
CY_BLE_EVT_LE_SET_EVENT_MASK_COMPLETE
CY_BLE_EVT_GAPC_SCAN_START_STOP, state: 2
Advertisement report: peerBdAddr -00 a0 50 06 00 00 , rssi - -47 dBm, data - 02 01 05 07 16 fe ff 0c 00 a0 00
Connecting to the device (address - 00a050060000)
CY_BLE_EVT_GATT_CONNECT_IND: 3, 3
Get PRU Static Parameter char value, attId: 3, apiResult: 0
CY_BLE_EVT_GAP_DEVICE_CONNECTED: bdHandle=3, connIntv = 53 ms
Device 3<--PRU_STATIC_PARAMETER: flags: 0, protocol rev: 0, category: Category 0 , information: 0 , hardware rev: 62 , firmware
rev: 32 Prect_max: 500 mV, Vrect_min_static: 3000 mV, Vrect_high_static: 5000 mV, Vrect_set: 4000 mV,
Device 3-->Set PTU Static Parameter char value, apiResult: 0
Device 3<--CY_BLE_EVT_WPTSC_WRITE_CHAR_RESPONSE: charIndex =1
Device 3-->Enable Alert Notification, apiResult: 0
Device 3<--CY_BLE_EVT_WPTSC_WRITE_DESCR_RESPONSE charIndex =2
Device 3-->Send Connection Parameter Update Request to Peripheral, apiResult: 0
Device 3-->Set PRU Control char (enable charging), apiResult: 0
Device 3<--CY_BLE_EVT_WPTSC_WRITE_CHAR_RESPONSE: charIndex =0
CY_BLE_EVT_GAP_CONNECTION_UPDATE_COMPLETE: bdHandle=3, connIntv = 250 ms
N of Devices: 1; #3 Charge=1, Vrect: 3996 mV;
N of Devices: 1; #3 Charge=1, Vrect: 3998 mV;
N of Devices: 1; #3 Charge=1, Vrect: 4000 mV;
N of Devices: 1; #3 Charge=1, Vrect: 4003 mV;
N of Devices: 1; #3 Charge=1, Vrect: 4006 mV;
```

The PRU example log:

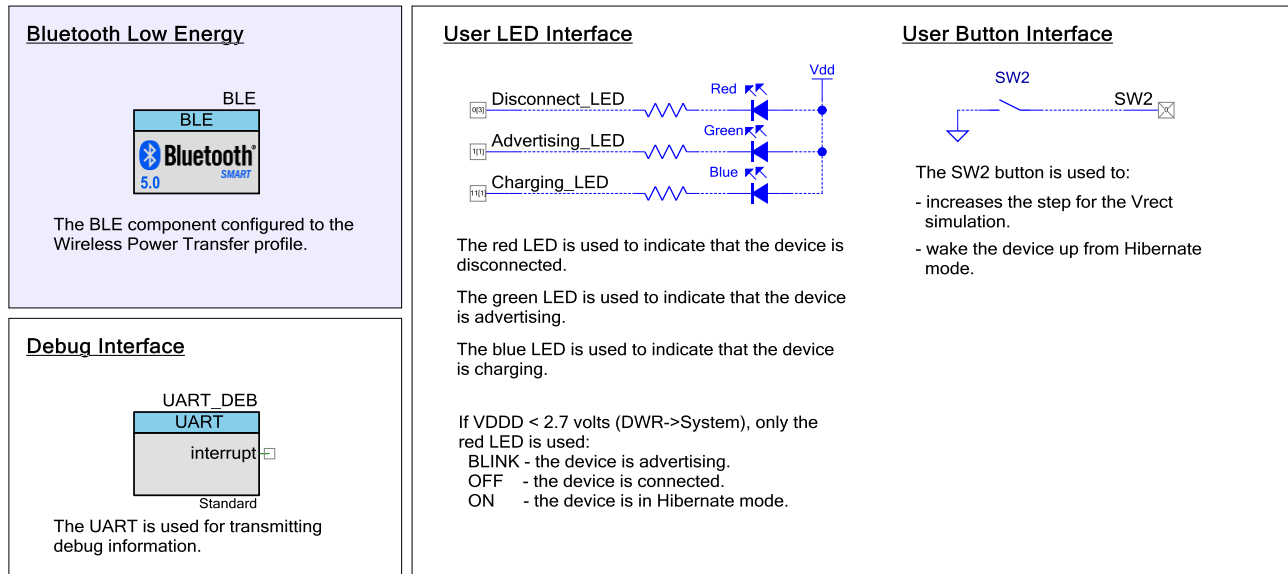
BLE Wireless Power Receiver Code Example

```
CY_BLE_EVT_STACK_ON, StartAdvertisement
CY_BLE_EVT_SET_TX_PWR_COMPLETE
CY_BLE_EVT_SET_TX_PWR_COMPLETE
CY_BLE_EVT_SET_DEVICE_ADDR_COMPLETE
CY_BLE_EVT_LE_SET_EVENT_MASK_COMPLETE
CY_BLE_EVT_GET_DEVICE_ADDR_COMPLETE: 00a050060000
CY_BLE_EVT_GAPP_ADVERTISEMENT_START_STOP, state: 2
CY_BLE_EVT_GATT_CONNECT_IND: 3, 3
CY_BLE_EVT_GAP_DEVICE_CONNECTED: connIntv = 53 ms
Simul Vrect: 3999 mV
CY_BLE_EVT_GATTS_READ_CHAR_VAL_ACCESS_REQ: handle: 15
PTU_STATIC_PARAMETER: flags: c0, power: watts, maxLoadResistance: 50 ohms, supported devices number: 1 , class: Class4 ,
hardware rev: 62, firmware rev: 32, protocol rev: 0
CY_BLE_EVT_WPTS_NOTIFICATION_ENABLED: char: 2
CY_BLE_EVT_WPTS_INDICATION_DISABLED: char: 2
CY_BLE_EVT_GATTS_READ_CHAR_VAL_ACCESS_REQ: handle: 17
Simul Vrect: 3998 mV
PRU_CONTROL: enables: 40, Output - DISABLE, Charge indicator -ENABLE ,Power:Max permission: 0, Permitted,timeSet 0 ms
CY_BLE_EVT_CONNECTION_UPDATE_COMPLETE: connIntv = 250 ms
SimulBatteryLevelUpdate: 3
CY_BLE_EVT_GATTS_READ_CHAR_VAL_ACCESS_REQ: handle: 17
Simul Vrect: 3999 mV
CY_BLE_EVT_GATTS_READ_CHAR_VAL_ACCESS_REQ: handle: 17
Simul Vrect: 4000 mV
Simul Vrect: 4001 mV
SimulBatteryLevelUpdate: 4
Simul Vrect: 4002 mV
```

Design and Implementation

Figure 9 shows Wireless Power Receiver design schematic.

Figure 9. BLE Wireless Power Receiver Code Example Schematic



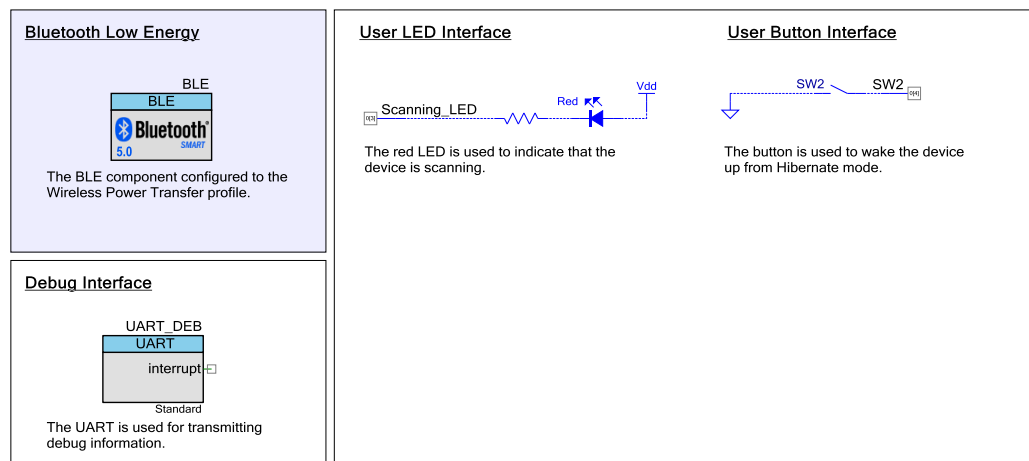
The project demonstrates the core functionality of the BLE Component configured as the PRU with an additional Battery Service (BAS). The purpose of the BAS service is to demonstrate the battery level measurement possibilities along with measurement of other parameters for a wireless power-transfer system.

After a startup, the device performs BLE Component initialization. In this project, two callback functions are required for the BLE operation. The AppCallback() callback function is required to receive generic events from the BLE stack and the service-specific-callback WptsCallback() is required for WPTS service-specific events. The CY_BLE_EVT_STACK_ON event indicates successful initialization of the BLE Stack. After this event is received, the component starts advertising with the packet structure as configured in the BLE Component Customizer. The BLE Component stops advertising after a 180-second advertising period expires.

On an advertisement timeout, the system remains in Hibernate mode. Press the mechanical button **SW2** to wake the system and start re-advertising. While connected to the Client and between the connection intervals, the device is put into Deep Sleep mode.

Figure 10 shows the top Wireless Power Transmitter design schematic.

Figure 10. BLE Wireless Power Transmitter Code-Example Schematic



The project demonstrates the core functionality of the BLE Component configured as a PTU.

After a startup, the device performs the BLE Component initialization. In this project, three callback functions are required for BLE operation. The `AppCallBack()` callback function is required to receive generic events from the BLE stack and the service-specific callback `WptsCallBack()` is required for WPTS service-specific events. The `CY_BLE_EVT_STACK_ON` event indicates a successful initialization of the BLE stack. After this event is received, the Component starts scanning. The BLE Component stops scanning after a 180-second scanning period expires.

On the scanning timeout, the system remains in Hibernate mode. Press the mechanical button **SW2** to wake the system and start re-scanning.

Pin assignments

Table 2 lists the pin assignments and connections required on the development board for supported kits for Wireless Power Receiver project.

Table 2. Pin Assignment for Wireless Power Receiver project

| Pin Name | Development Kit | Comment |
|-----------------|-----------------|--------------------------------|
| | CY8CKIT-062 | |
| \UART_DEB:rx\ | P5[0] | |
| \UART_DEB:tx\ | P5[1] | |
| \UART_DEB:rts\ | P5[2] | |
| \UART_DEB:cts\ | P5[3] | |
| Disconnect_LED | P0[3] | The red color of the RGB LED |
| Advertising_LED | P1[1] | The green color of the RGB LED |
| Charging_LED | P11[1] | The blue color of the RGB LED |
| SW2 | P0[4] | |

Table 3 lists the pin assignments and connections required on the development board for supported kits for Wireless Power Transmitter project.

Table 3. Pin Assignment for Wireless Power Transmitter project

| Pin Name | Development Kit | Comment |
|----------------|-----------------|------------------------------|
| | CY8CKIT-062 | |
| \UART_DEB:rx\ | P5[0] | |
| \UART_DEB:tx\ | P5[1] | |
| \UART_DEB:rts\ | P5[2] | |
| \UART_DEB:cts\ | P5[3] | |
| Scanning_LED | P0[3] | The red color of the RGB LED |
| SW2 | P0[4] | |

Components and Settings

Table 4 lists the PSoC Creator Components used in Wireless Power Receiver project, how they are used in the design, and the non-default settings required so they function as intended.

Table 4. PSoC Creator Components used in Wireless Power Receiver project

| Component | Instance Name | Purpose | Non-default Settings |
|----------------------------|---|--|---|
| Bluetooth Low Energy (BLE) | BLE | The BLE component configured to the Wireless Power Transfer profile. | Refer to Parameter Settings for Wireless Power Receiver project |
| Digital Input Pin | SW2 | This pin is used to connection the user button (SW2). | [General tab] Uncheck HW connection Drive mode: Resistive Pull Up |
| Digital Output pin | Disconnect_LED Advertising_LED Charging_LED | These GPIOs are configured as firmware-controlled digital output pins that control LEDs. | [General tab] Uncheck HW connection Drive mode: Strong Drive |
| UART (SCB) | UART_DEBUG | This Component is used to print messages on a terminal program. | Default |

Table 5 lists the PSoC Creator Components used in Wireless Power Transmitter project, how they are used in the design, and the non-default settings required so they function as intended.

Table 5. PSoC Creator Components used in Wireless Power Transmitter project

| Component | Instance Name | Purpose | Non-default Settings |
|----------------------------|---------------|---|--|
| Bluetooth Low Energy (BLE) | BLE | The BLE component configured to the Wireless Power Transfer profile. | Refer to Parameter Settings for Wireless Power Transmitter project |
| Digital Input Pin | SW2 | This pin is used to connection the user button (SW2). | [General tab] Uncheck HW connection Drive mode: Resistive Pull Up |
| Digital Output pin | Scanning_LED | This GPIO is configured as firmware-controlled digital output pin that control LED. | [General tab] Uncheck HW connection Drive mode: Strong Drive |
| UART (SCB) | UART_DEBUG | This Component is used to print messages on a terminal program. | Default |

For information on the hardware resources used by a Component, see the Component datasheet.

Parameter Settings for Wireless Power Receiver project

The BLE Component is configured as the WPT Power Receiver Unit (GATT Server) in the GAP Peripheral role. The PRU Advertisement packet is configured to the connectable undirected advertising type with WPTS specific-service data. The scan response packet includes a complete local name.

Figure 11. General Settings

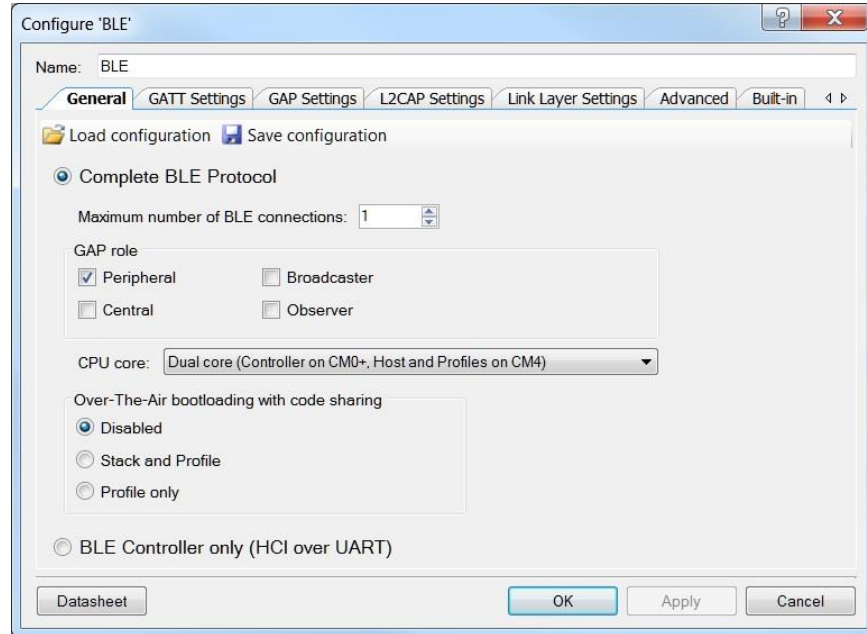


Figure 12. GATT Settings

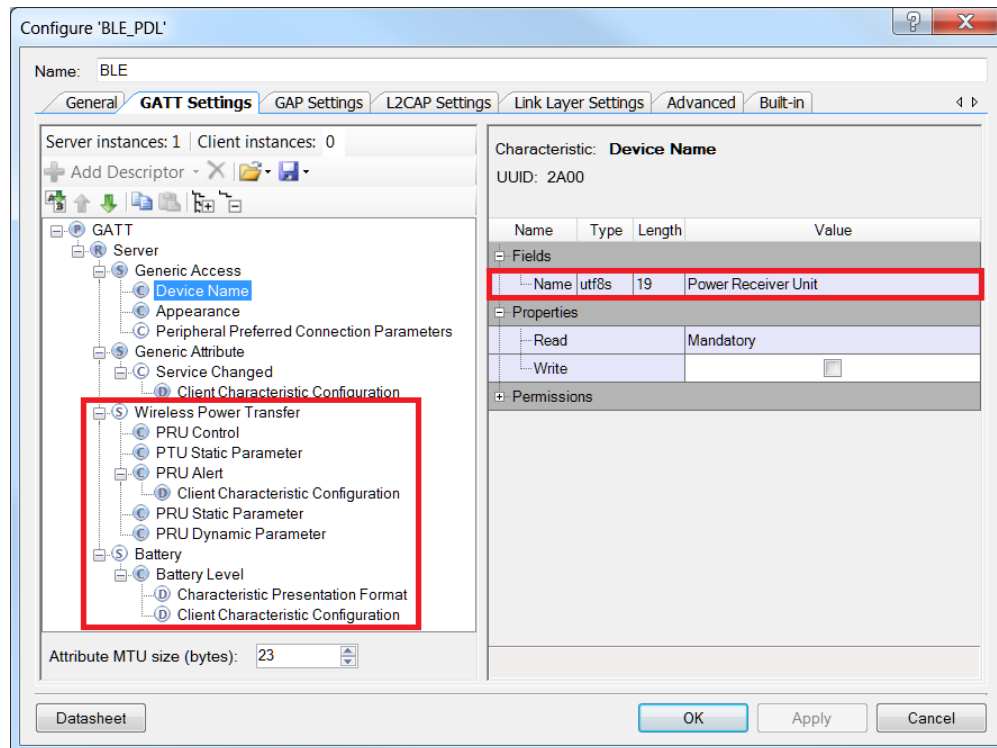
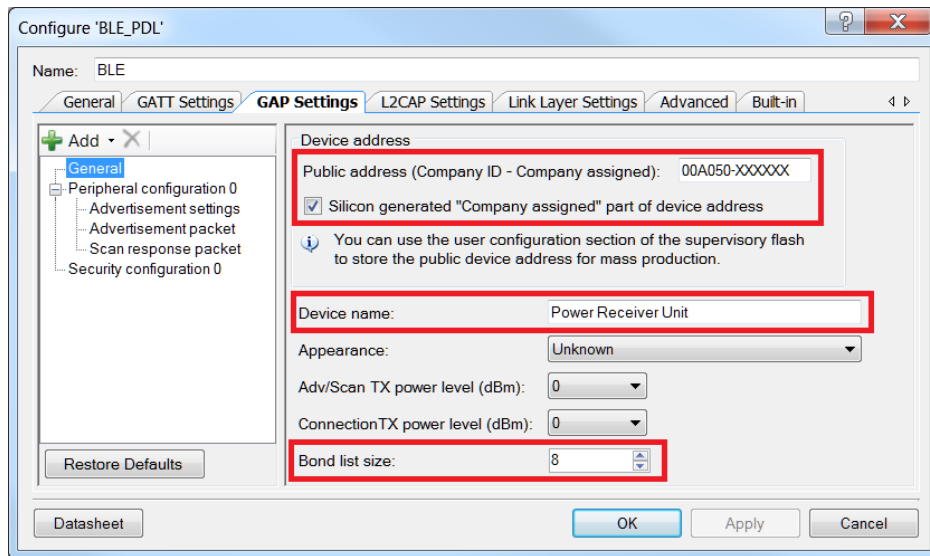


Figure 13. GAP Settings



Configure 'BLE_PDL'

Name: BLE

General | GATT Settings | **GAP Settings** | L2CAP Settings | Link Layer Settings | Advanced | Built-in

+ Add - X

General

- Peripheral configuration 0
 - Advertisement settings
 - Advertisement packet
 - Scan response packet
 - Security configuration 0

Restore Defaults

Device address

Public address (Company ID - Company assigned): 00A050-XXXXXX

☒ Silicon generated "Company assigned" part of device address

You can use the user configuration section of the supervisory flash to store the public device address for mass production.

Device name: Power Receiver Unit

Appearance: Unknown

Adv/Scan TX power level (dBm): 0

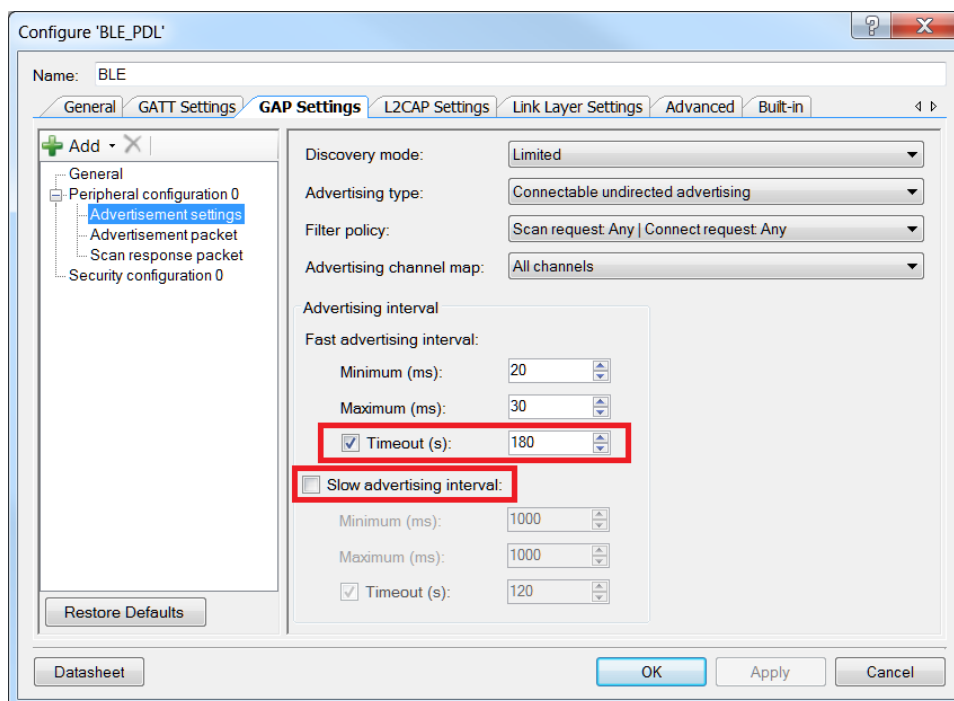
Connection TX power level (dBm): 0

Bond list size: 8

Datasheet

OK Apply Cancel

Figure 14. GAP Settings: Advertisement Settings



Configure 'BLE_PDL'

Name: BLE

General | GATT Settings | **GAP Settings** | L2CAP Settings | Link Layer Settings | Advanced | Built-in

+ Add - X

General

- Peripheral configuration 0
 - Advertisement settings
 - Advertisement packet
 - Scan response packet
 - Security configuration 0

Restore Defaults

Discovery mode: Limited

Advertising type: Connectable undirected advertising

Filter policy: Scan request Any | Connect request Any

Advertising channel map: All channels

Advertising interval

Fast advertising interval:

Minimum (ms): 20

Maximum (ms): 30

☒ Timeout (s): 180

☐ Slow advertising interval:

Minimum (ms): 1000

Maximum (ms): 1000

☒ Timeout (s): 120

Datasheet

OK Apply Cancel

Figure 15. GAP Settings: Advertisement Packet

Configure 'BLE_PDL'

Name: BLE

General GATT Settings **GAP Settings** L2CAP Settings Link Layer Settings Advanced Built-in

+ Add - X
 General
 Peripheral configuration 0
 Advertisement settings
 Advertisement packet
 Scan response packet
 Security configuration 0

Advertisement data settings:

| Name | Value |
|---|--------------|
| <input checked="" type="checkbox"/> Flags | |
| <input checked="" type="checkbox"/> Limited discoverable mode | |
| <input checked="" type="checkbox"/> BR/EDR not supported | |
| <input type="checkbox"/> Local Name | |
| <input type="checkbox"/> TX Power Level | |
| <input type="checkbox"/> Slave Connection Interval Range | |
| <input type="checkbox"/> Service UUID | |
| <input type="checkbox"/> Service Solicitation | |
| <input checked="" type="checkbox"/> Service Data | |
| <input checked="" type="checkbox"/> Wireless Power Transfer | |
| WPT Service handle | 0x000C |
| PRU RSSI parameters | |
| PRU output power (dBm) | 0 |
| PRU antenna gain (dBi) | -5 |
| ADV flags | |
| Impedance shift | Can never... |
| Reboot | 0 |
| OVP status | 0 |
| Time offset | 0 |
| <input type="checkbox"/> Battery | |
| <input type="checkbox"/> Service Manager TK Value | |
| <input type="checkbox"/> Appearance | |
| <input type="checkbox"/> Public Target Address | |
| <input type="checkbox"/> Random Target Address | |
| <input type="checkbox"/> Advertising Interval | |
| <input type="checkbox"/> LE Bluetooth Device Address | |
| <input type="checkbox"/> LE Role | |
| <input type="checkbox"/> URI | |
| <input type="checkbox"/> Manufacturer Specific Data | |

Advertisement packet:

| Description | Value | Index |
|--|-------|-------|
| AD Data 1: <<Flags>> | | |
| Length | 0x02 | [0] |
| <<Flags>> | 0x01 | [1] |
| BR/EDR not supported Limited discoverable mode | 0x05 | [2] |
| AD Data 2: <<Service Data>> | | |
| Length | 0x07 | [3] |
| <<Service Data>> | 0x16 | [4] |
| Service: Wireless Power Transfer | | |
| [0] | 0xFE | [5] |
| [1] | 0xFF | [6] |
| Data: 0C:00:A0:00 | | |
| [0] | 0x0C | [7] |
| [1] | 0x00 | [8] |
| [2] | 0xA0 | [9] |
| [3] | 0x00 | [10] |

Restore Defaults

Datasheet

OK Apply Cancel

Figure 16. Security Settings

Configure 'BLE_PDL'

Name: BLE

General GATT Settings **GAP Settings** L2CAP Settings Link Layer Settings Advanced Built-in

+ Add - X
 General
 Peripheral configuration 0
 Advertisement settings
 Advertisement packet
 Scan response packet
 Security configuration 0

Security mode: Mode 1

Security level: No Security (No authentication, No encryption)

I/O capabilities: No Input No Output

Keypress notifications: No

Bonding requirement: No Bonding

Encryption key size (bytes): 16

Restore Defaults

Datasheet

OK Apply Cancel

Parameter Settings for Wireless Power Transmitter project

The BLE Component is configured as the WPT Power Transmitter Unit (GATT Client) in the GAP Central role.

Figure 17. General Settings

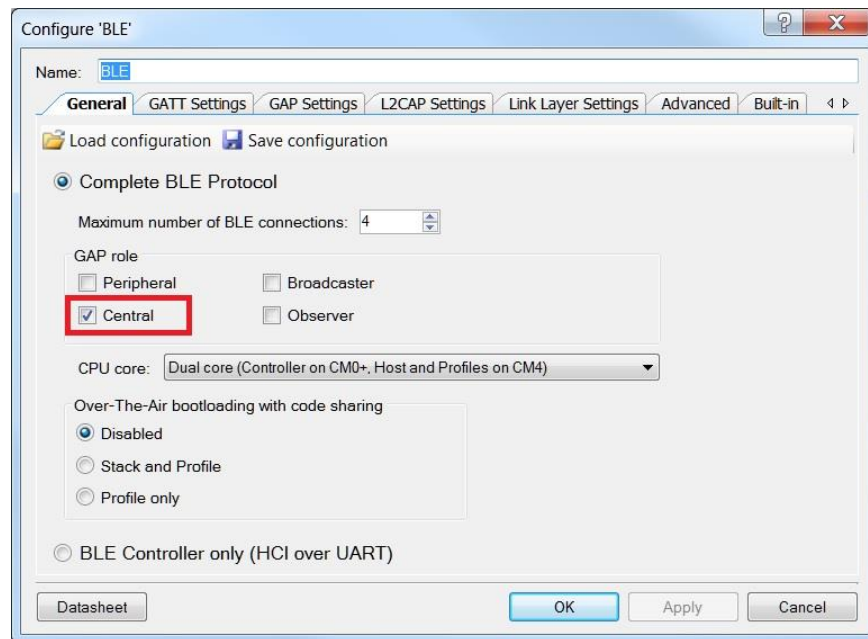


Figure 18. GATT Settings

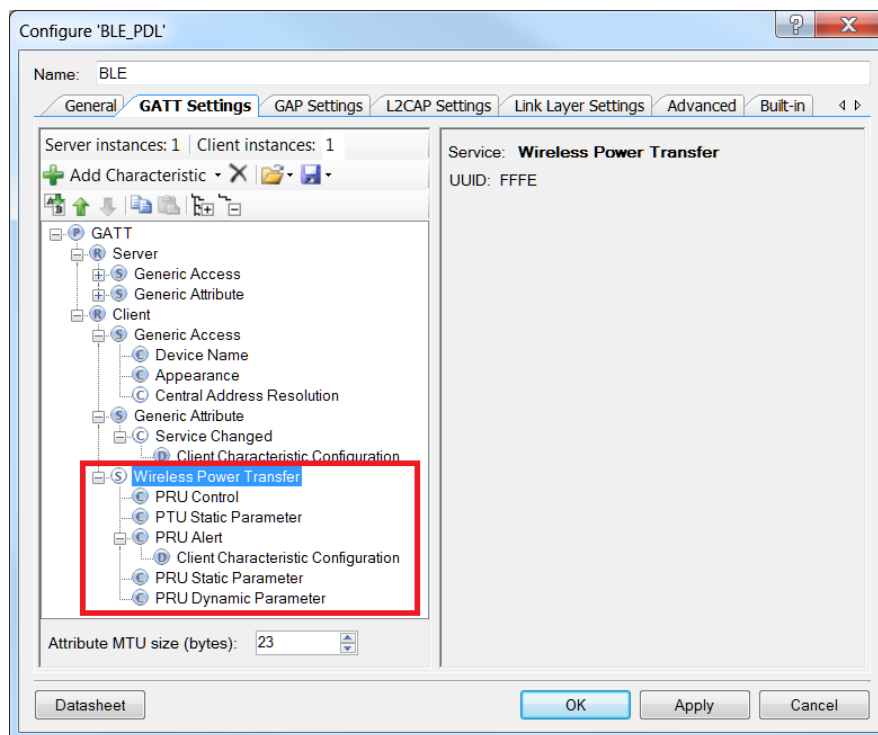
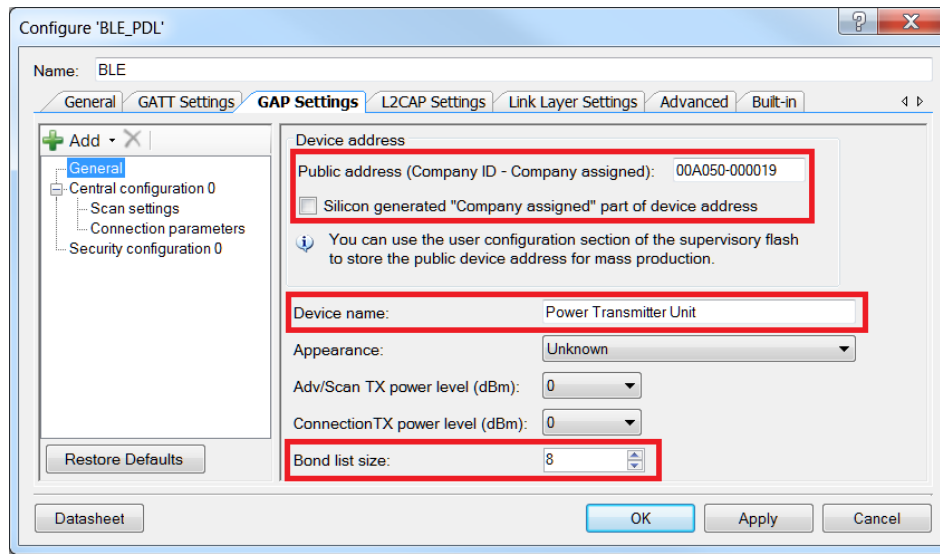


Figure 19. GAP Settings



Configure 'BLE_PDL'

Name: BLE

General | GATT Settings | **GAP Settings** | L2CAP Settings | Link Layer Settings | Advanced | Built-in

General configuration 0
 Scan settings
 Connection parameters
 Security configuration 0

Device address
 Public address (Company ID - Company assigned): 00A050-000019
☐ Silicon generated "Company assigned" part of device address
 You can use the user configuration section of the supervisory flash to store the public device address for mass production.

Device name: Power Transmitter Unit

Appearance: Unknown

Adv/Scan TX power level (dBm): 0

Connection TX power level (dBm): 0

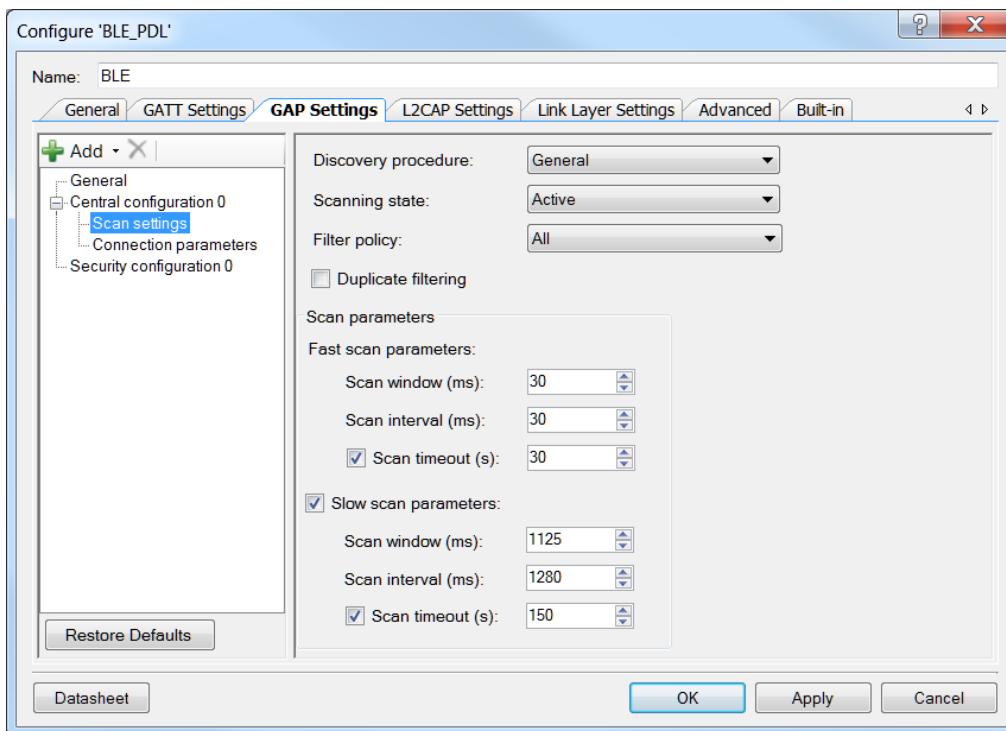
Bond list size: 8

Restore Defaults

Datasheet

OK Apply Cancel

Figure 20. GAP Settings: Scan Settings



Configure 'BLE_PDL'

Name: BLE

General | GATT Settings | **GAP Settings** | L2CAP Settings | Link Layer Settings | Advanced | Built-in

General configuration 0
 Scan settings
 Connection parameters
 Security configuration 0

Discovery procedure: General

Scanning state: Active

Filter policy: All

☐ Duplicate filtering

Scan parameters

Fast scan parameters:

Scan window (ms): 30

Scan interval (ms): 30

☒ Scan timeout (s): 30

☒ Slow scan parameters:

Scan window (ms): 1125

Scan interval (ms): 1280

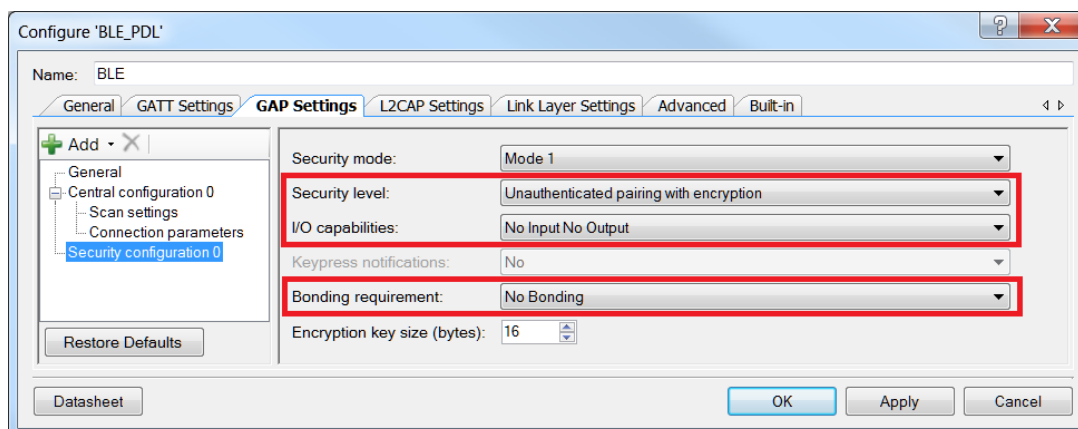
☒ Scan timeout (s): 150

Restore Defaults

Datasheet

OK Apply Cancel

Figure 21. Security Settings



Switching the CPU Cores Usage

This section describes how to switch between different CPU cores usage (Single core / Dual core) in the BLE PDL examples.

The BLE component has the CPU Core parameter that defines the cores usage. It can take the following values:

- Single core (Complete Component on CM0+) – only CM0+ will be used.
- Single core (Complete Component on CM4) – only CM4 will be used.
- Dual core (Controller on CM0+, Host and Profiles on CM4) – CM0+ and CM4 will be used: CM0+ for the Controller and CM4 for the Host and Profiles.

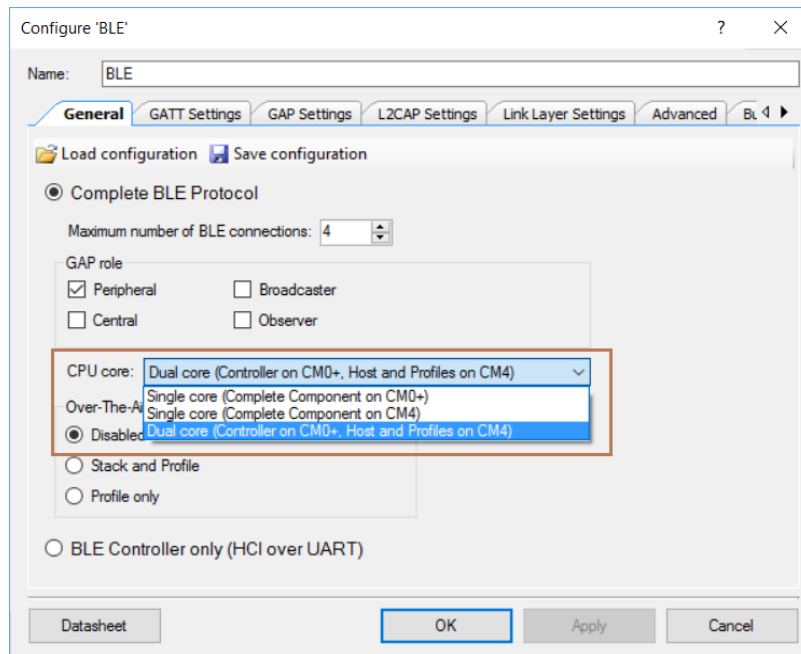
The BLE example structure allows easy switching between different CPU cores options. Important to remember:

- All application host-files must be run on the host core.
- The BLE subsystem (BLESS) interrupt must be assigned to the core where the controller runs.
- All additional interrupts (SW2, etc.) used in the example must be assigned to the host core.

Steps for switching the CPU Cores usage:

1. In the BLE customizer **General** tab, select appropriate CPU core option.

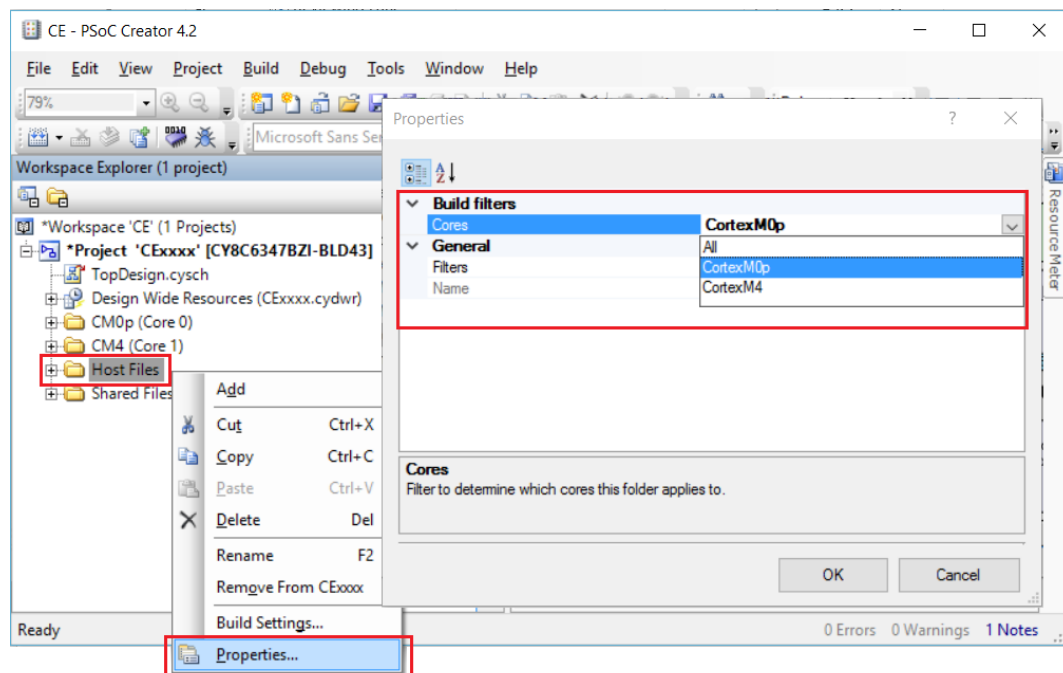
Figure 22. Select CPU Core



- Identify the CPU on which host files will run. In the workspace explorer panel, right-click **Host Files**, choose **Properties**. Set the **Cores** property corresponding to the CPU core chosen in Step 1, as shown in [Figure 23](#).

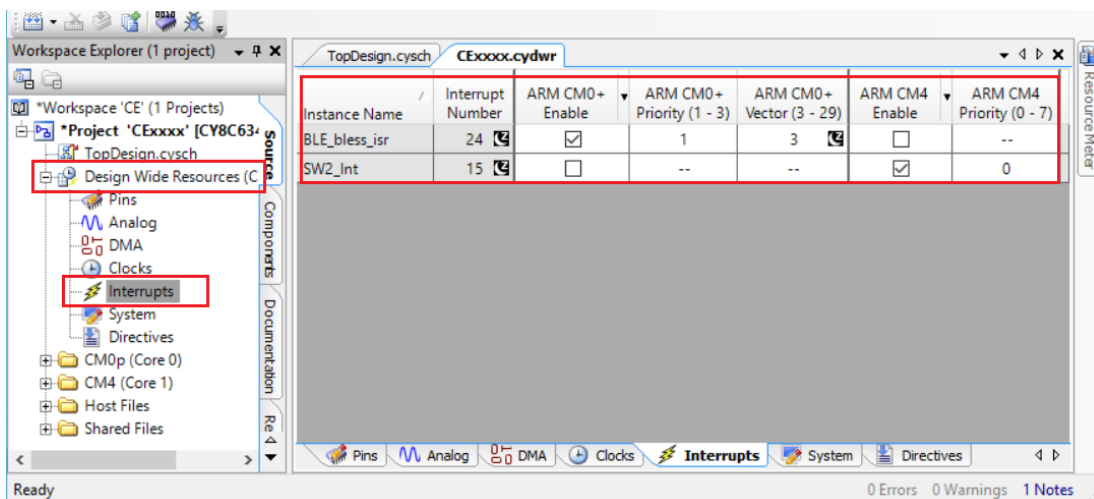
- for Single core (Complete Component on CM0+) option – CM0+
- for Single core (Complete Component on CM4) option – CM4
- for Dual core (Controller on CM0+, Host and Profiles on CM4) option – CM4

Figure 23. Change Core Properties



3. Assign BLE_bless_isr and other peripheral (button – SW2, timer(s) etc.) interrupts to the appropriate core in **DWR > Interrupts** tab:
 - for **Single core (Complete Component on CM0+)** option: BLE_bless_isr and peripheral interrupts on **CM0+**
 - for **Single core (Complete Component on CM4)** option: BLE_bless_isr and peripheral interrupts on **CM4**
 - for **Dual core (Controller on CM0+, Host and Profiles on CM4)** option: BLE_bless_isr interrupt on **CM0+**, other peripheral interrupts on **CM4**

Figure 24. Assign Interrupts



Reusing This Example

This example is designed for the CY8CKIT-062-BLE pioneer kit. To port the design to a different PSoC 6 MCU device and/or kit, change the target device using the Device Selector and update the pin assignments in the Design Wide Resources Pins settings as needed.

Related Documents

| Application Notes | | |
|---|--|--|
| AN210781 | Getting Started with PSoC 6 MCU with Bluetooth Low Energy (BLE) Connectivity | Describes PSoC 6 BLE, and how to build a basic code example. |
| AN215656 | PSoC 6 MCU Dual-CPU System Design | Presents the theory and design considerations related to this code example. |
| Software and Drivers | | |
| CySmart – Bluetooth® LE Test and Debug Tool | | CySmart is a Bluetooth® LE host emulation tool for Windows PCs. The tool provides an easy-to-use Graphical User Interface (GUI) to enable the user to test and debug their Bluetooth LE peripheral applications. |
| PSoC Creator Component Datasheets | | |
| Bluetooth Low Energy (BLE_PDL) Component | | The Bluetooth Low Energy (BLE_PDL) Component provides a comprehensive GUI-based configuration window to facilitate designing applications requiring BLE connectivity. |
| Device Documentation | | |
| PSoC® 6 MCU: PSoC 63 with BLE. Datasheet. | | PSoC® 6 MCU: PSoC 63 with BLE Architecture Technical Reference Manual |
| Development Kit (DVK) Documentation | | |
| CY8CKIT-062-BLE PSoC 6 BLE Pioneer Kit | | |

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|----------|---------|-----------------|-----------------|-----------------------|
| ** | 6092397 | NPAL | 06/07/2018 | New spec |

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