# CE222494 – PSoC 6 WICED WiFi Demo

## Objective

This example demonstrates how to use a PSoC 6 MCU device to connect to a WiFi network and serve a webpage. The webpage displays the voltage of a light sensor, date and time, and controls the brightness of an LED.

## Overview

The CY8CKIT-062-WiFi-BT contains a PSoC 62 and a CYW4343W WiFi/BT combo chip. This code example demonstrates that PSoC 6 can communicate with the 4343W chip and connect to WiFi networks.

In this example, the PSoC 6 MCU acts as an http web server. It hosts a webpage that displays the voltage of the light sensor on the CY8CKIT-028-TFT shield. It also displays the current duty cycle of a PWM controlling the brightness of the red LED on the kit. Buttons on the webpage control the duty cycle of that PWM. CapSense buttons and sliders on the kit can also control the PWM duty cycle and thus the brightness of the LED.

This example also demonstrates the PSoC 6 MCU driving a TFT LCD display, and printing commands over a UART to a terminal window.

This example assumes the user is familiar with the WICED development environment. It does not teach how to use WICED or the WICED API.

## Requirements

**Tool:** WICED 6.1

**Programming Language:** C (Arm® GCC 4.9.0)

**Associated Parts:** PSoC 6 62 series MCU parts.

**Related Hardware:** CY8CKIT-062-WiFi-BT PSoC 6 Pioneer Kit and the CY8CKIT-028-TFT Shield

## Hardware Setup

This example uses the kit's default configuration. Refer to the kit guide to ensure the kit is configured correctly. Ensure that the CY8CKIT-028-TFT Shield is plugged into the CY8CKIT-062-WiFi-BT before continuing.

## Software Setup

This example uses a terminal emulation program.

1. Download TeraTerm or any other terminal emulator program.
2. Connect your PC to the CY8CKIT-062-WiFi-BT through the USB Type C cable. Ensure that LED2 on the CY8CKIT-062-WiFi-BT is off. If it is not, press SW3 "mode select".
3. Once the kit is connected, open a terminal emulator program. Connect to the KitProg2 USB-UART(COMxyz) COM port. Configure the serial connection for 8N1 115200 baud.

This example also requires a non-enterprise WiFi network. This could be a secured or unsecured network. The example will connect to this network. Also, ensure you have another device, such as a PC/Laptop/Mobile, that can connect to this same network

## Operation

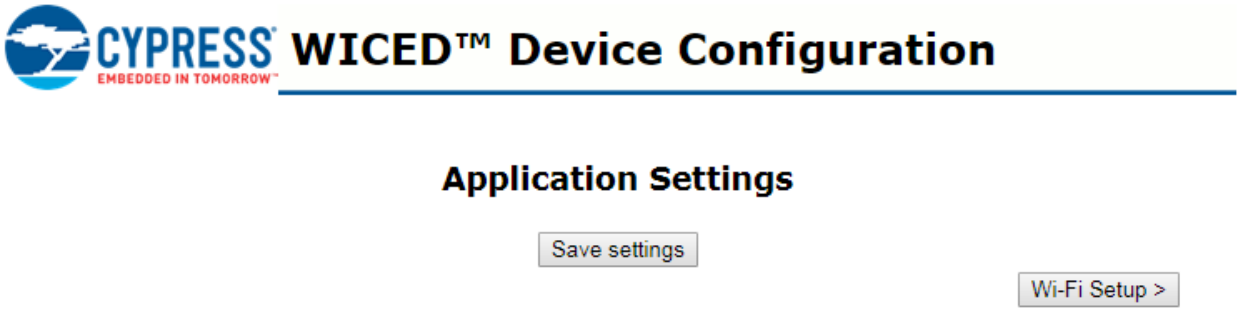
1. Unzip the *CE222494.zip* file
2. Open the `apps\demo` folder (from the location you unzipped *CE222494.zip)* and copy the CE222494_PSoC6_WICED_WiFi folder into `WICED-Studio-6.1\43xxx_Wi-Fi\apps\demo`

3. Open the `resources\apps` folder (from the location where you unzipped *CE222494.zip)* and copy the CE222494_PSoC6_WICED_WiFi folder into `WICED-Studio-6.1\43xxx_Wi-Fi\resources\apps`
4. Open WICED 6.1
5. Plug the CY8CKIT-062-WiFi-BT kit board into your computer's USB port.
6. Ensure that LED2 on the CY8CKIT-062-WiFi-BT is off. If it is not, press SW3 "mode select".
7. Open and configure terminal software as described in the Software Setup section.
8. In the Make Target window, right-click and select **New**, and give it the following **Target Name:**

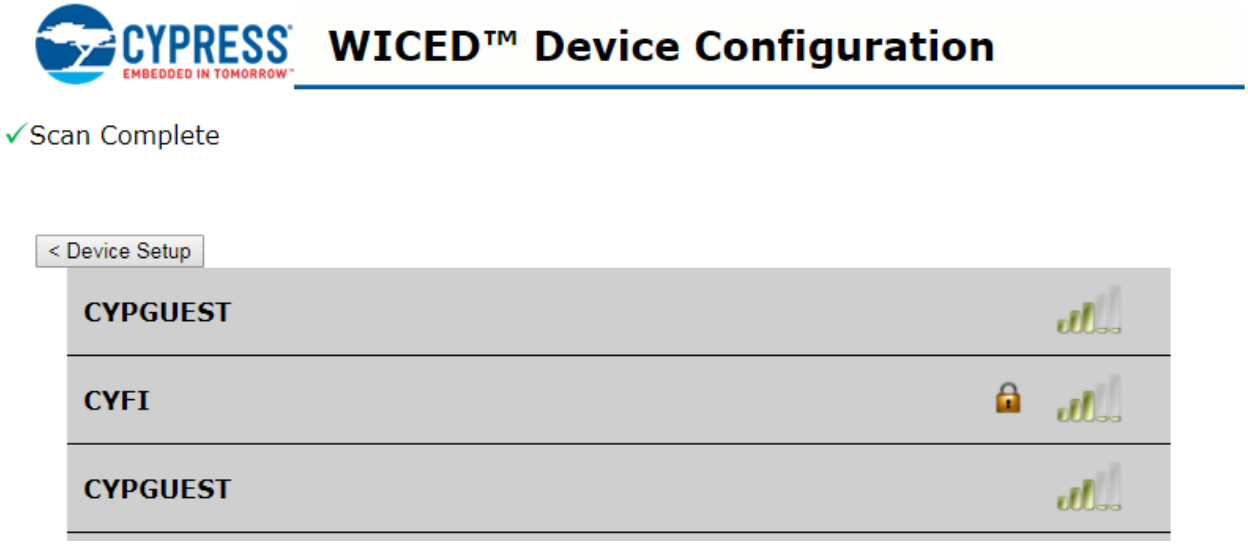
   demo.CE222494_PSoC6_WICED_WiFi-CY8CKIT_062 download_apps download run
9. Double-click the newly created make target to build the code, program the kit, and run the example. Note that this may take a few minutes.
10. After the project is downloaded, the UART and TFT LCD print out instructions. The device starts a WiFi Access Point (AP). This AP allows you to select your own WiFi network to be used for the rest of the demo.
11. Using another device (laptop, PC, mobile phone, tablet), connect to the following WiFi network:

    ssid: WICED Config

    password: 12345678
12. Once connected, open a web browser and type 192.168.0.1. The following webpage appears:

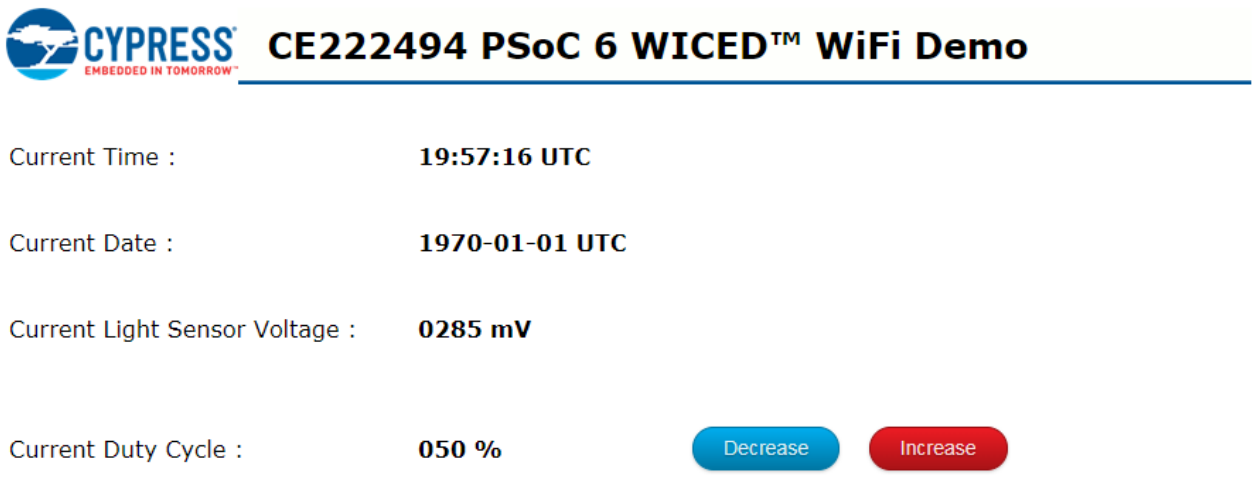



13. Click the **Wi-Fi Setup** button; the following page appears listing the available WiFi networks.




14. Select the network you wish to connect to, enter your password, and click **Connect**. After this, the device turn off its AP and connects to the network selected, connects to a time server, and servers and HTTP page.

15. Wait until “Capsense Ready, Website Ready” is printed in the terminal emulator program.
16. Next, on a device connected to the same network as selected in step 13, open a web browser and type the IP address shown on the LCD or UART output. A page such as the following will appear:




**Note:** If your WiFi network does not have internet access, then the data will start at 1970-01-01 and the time will start at 00:00:00.

17. Click or tap the Increase/Decrease buttons on the page to change the brightness of the Red LED on the kit. The CapSense BTN0/BTN1 buttons on the kit do the same thing. The CapSense slider can also be used to change the brightness of the LED.
18. Cover the light sensor on the CY8CKIT-028-TFT shield and observe the voltage change on the webpage and LCD.

**Note:** If for some reason, in step 13, you enter an incorrect password, the Terminal/LCD indicates a failure to connect. Pressing and holding SW2 for 1 second erases the saved password, at which point you must reset the device and follow all the steps again.

# Design and Implementation

## WICED and PSoC 6

WICED 6.1 is the first version of WICED to support the PSoC 6 architecture.

WICED 6.1 integrates PDL 3.0.1. PDL functions can be called directly from WICED. WICED also has an abstraction layer built on top of the PDL for several drivers. This includes GPIO, $I^2C$, UART, PWM, ADC, and so on. To learn more about the WICED API, navigate to `WICED-Studio-6.1\43xxx_Wi-Fi\docs` and open the *API.html* file. A list of all the platform APIs is available under **Components** > **Platform Functions**.

The PSoC 6 MCU and the CYW4343W device communicate with each other over an SDIO interface. The PSoC 62 found on CY8CKIT-062-WiFi-BT does not contain an SDIO hardware block. However, it does have Universal Digital Blocks (UDBs). These UDBs were used to construct an SDIO interface. WICED contains all the necessary UDB configuration and code to interact with the SDIO block. The user does not need to worry about this interaction.

For more information on the integration of PSoC 6 MCU in WICED, see the CY8CKIT-062-WiFi-BT user guide.

## RTOS Usage

This code example uses the ThreadX RTOS. There are three threads/events to consider in this example:

| Thread Name | Stimulus | Purpose |
|---|---|---|
| httpServer | Button press on website or webpage requesting refresh of data. | This thread runs each time a button is pressed. Depending on the button it will increase/decrease the PWM duty cycle.<br>When the webpage requests a refresh of the data, a function is called to push out the latest light sensor voltage, time stamp, and PWM duty cycle. |
| LightSensorTimedEvent | 250-msec timer expiration | The voltage of the light sensor is read every 250 ms, along with the current time. This data is then printed to the LCD and saved for pushing out to the webpage. |
| Capsense | 10-msec timer expiration | The CapSense loop runs every 10 ms. It checks for button presses or slider presses. If any of those occur it updates the PWM duty cycle, and saves the value for pushing out to the webpage. |

## Startup

On device startup, the device checks to see if there are credentials for a WiFi network stored in the device configuration table (DCT). If there are, it tries to connect to that network.

If the connection fails, then the program displays a message indicating failure and indicating that if SW2 is held down for 1 second the saved network will be removed from the DCT. After the saved network is removed, the device must be reset by the user.

If there is no saved network on startup, the device configures itself as a soft Access Point. Another device needs to connect to this soft Access Point. After the other device is connected, the user navigates to a web page to provide the login information for the network they want to connect to. This information is then saved into the DCT. At this point the device tries to connect to this saved network.

On successful connection, the device gets the current time, and starts the https web server. At this point, another device can access this server and see the time, date, light sensor voltage, and PWM duty cycle. The duty cycle can also be controlled via this page.

## Light Sensor Reading

The light sensor is connected to the SAR ADC of the PSoC 6 MCU. The SAR ADC is configured for single-ended measurement. It is configured to give a 12-bit output in the range of 0 to VDDD (3.3 V). To convert the reading to milivolts, the reading is multiplied by 3300 and then divided by 4096.

## LED Control

The LED is controlled by a PWM. WICED API calls are used to change the duty cycle of the PWM. Note that since WICED does not have a change duty cycle API, the Init function must be called followed by the start function.

## TFT Display Control

The TFT display is controlled via four control lines and eight data lines. The four control lines are bit-banged GPIOs, while the data lines are controlled by an 8-bit control register made from PSoC UDBs. This control register is part of the pre-programmed UDB configuration that is part of WICED.

The uGui display library is used for writing to the LCD. This library is integrated into WICED.

## CapSense

WICED 6.1 has a prebuilt configuration for CapSense. This configuration only supports the CY8CKIT-062-WiFi-BT. Specifically it supports the two buttons and the 5-element slider. The buttons and sliders are configured to use the CSD sensing method.

## Reusing This Example

Currently this code example can only be used in the CY8CKIT-062-WiFi-BT.

## Related Documents

| | |
|---|---|
| **Training** | |
| WICED Wi-Fi 101 | |
| **Software** | |
| WICED Studio | |
| **Device Documentation** | |
| PSoC 6 MCU: PSoC 62 Datasheet | PSoC 6 MCU: PSoC 62 Architecture Technical Reference Manual |
| CYW4343W Datasheet | |
| **Development Kit Documentation** | |
| CY8CKIT-062-WiFi-BT PSoC 6 Pioneer Kit<br>CY8CKIT-028-TFT Shield | |

# Document History

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| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
|---|---|---|---|---|
| ** | 6062750 | TDU | 02/08/2018 | New code example |

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