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CY8CKIT-042-BLE-A

Bluetooth[®] Low Energy (BLE)
Pioneer Kit Guide

Doc. # 002-11468 Rev. **

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Safety Information



The CY8CKIT-042-BLE-A Bluetooth® Low Energy (BLE) Pioneer Kit is intended for development purposes only. Users are advised to test and evaluate this kit in an RF development environment.

This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required authorizations are first obtained. Contact support@cypress.com for details.



CY8CKIT-042-BLE-A boards contain ESD-sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused CY8CKIT-042-BLE-A boards in the protective shipping package.



End-of-Life/Product Recycling

The end-of-life cycle for this kit is five years from the date of manufacture mentioned on the back of the box. Contact your nearest recycler to discard the kit.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. Cypress recommends that the user perform procedures only at an ESD workstation. If an ESD workstation is not available, use appropriate ESD protection by wearing an antistatic wrist strap attached to the chassis ground (any unpainted metal surface) on the board when handling parts.

Handling Boards

CY8CKIT-042-BLE-A boards are sensitive to ESD. Hold the board only by its edges. After removing the board from its box, place it on a grounded, static-free surface. Use a conductive foam pad if available. Do not slide the board over any surface.

Battery Care and Use

- Use the correct size and type of battery specified in this guide.
- Keep battery contact surfaces and battery compartment contacts clean by rubbing them with a clean pencil eraser or a rough cloth each time you replace batteries.
- Remove the battery from a device when it is not expected to be in use for several months.
- Make sure that you insert the battery into your device properly, with the + (plus) and – (minus) terminals aligned correctly.
- Do not place the battery next to metallic objects such as keys and coins.
- Never throw the battery into fire.
- Do not open up the battery.
- Do not short the battery.
- Do not subject the battery to high temperatures or high humidity.
- Store the battery in a dry place.
- Do not recharge a battery unless it is marked “rechargeable.”

Battery Disposal

Batteries can be safely disposed with normal household waste. Never dispose batteries in fire because they can explode. It is important not to dispose large amounts of batteries in a group. Used batteries are often not completely “dead.” Grouping used batteries together can bring these “live” batteries into contact with one another, creating safety risks.

1. Introduction



Thank you for your interest in the CY8CKIT-042-BLE-A Bluetooth® Low Energy (BLE) Pioneer Kit. The BLE Pioneer Kit enables customers to evaluate and develop BLE projects using the PSoC® 4 BLE and PRoC™ BLE (Programmable Radio-on-Chip) devices.

Bluetooth SMART™ or Bluetooth Low Energy (BLE) is a full-featured, layered, communication protocol that includes a 2.4-GHz radio, a link layer, and an application layer. However, you do not need to understand the complex protocol to implement your projects using PSoC 4 BLE or PRoC BLE. The Cypress BLE solution, which includes the device, the BLE Component, and the BLE firmware stack will take care of it for you. The Cypress BLE firmware stack is royalty free.

You will use two software tools, PSoC Creator™ and CySmart™ Central Emulation Tool, to develop and debug your BLE project. PSoC Creator is Cypress' standard integrated design environment (IDE). The BLE protocol has been abstracted into an easy drag-and-drop BLE Component in PSoC Creator. The CySmart Central Emulation Tool is a host tool for Windows PCs, which provides an easy-to-use GUI to enable customers to test and debug their BLE projects.

The BLE Pioneer Kit offers footprint-compatibility with Arduino™ shields as well as 6-pin Digilent® Pmod™ daughter cards. In addition, the kit features a CapSense® slider, an RGB LED, a push-button switch, an onboard programmer/debugger and the USB-UART/I²C bridge functionality block (KitProg), a coin cell battery holder, and a Cypress F-RAM™. The BLE Pioneer Kit supports 1.9 V, 3 V, 3.3 V, or 5 V as operating voltages. The BLE Pioneer Kit supports two devices:

- PSoC 4 BLE is a 32-bit, 48-MHz ARM® Cortex®-M0 BLE solution with CapSense, 12-bit analog front end (1x SAR ADC, 4x low-power opamps, 2x low-power comparators, and 2x current DACs), 4x TCPWM¹, 2x SCBs², 4x UDBs³, LCD⁴, I²S⁵, and 36 GPIOs. PSoC 4 BLE provides a complete solution for sports and fitness monitors, wearable electronics, medical devices, home automation systems, and sensor-based low-power systems for the Internet of Things (IoT).
- PRoC BLE is a 32-bit, 48-MHz ARM Cortex-M0 BLE solution with CapSense, 12-bit ADC, 4x TCPWM¹, 2x SCBs², LCD⁴, I²S⁵, and 36 GPIOs. PRoC BLE provides a complete solution for BLE connectivity, HID, remote controls, and toys.

Two different versions of the BLE Pioneer Kit are currently available. These kits differ in the BLE modules and the dongle that are included. The baseboard in both kits are identical, so any BLE module can be used interchangeably with either baseboard. [Table 1-1](#) lists the modules and dongle included in each kit.

Table 1-1. Default BLE Modules and BLE Dongle in the Two BLE Pioneer Kits

Kit	PSoC Module	PRoC Module	Dongle	Flash Size	Bluetooth Version
CY8CKIT-042-BLE	CY8CKIT-142	CY5671	CY5670	128 KB	4.1
CY8CKIT-042-BLE-A	CY8CKIT-143A	CY5676A	CY5677	256 KB	4.1 and 4.2

1. Configurable timer, counter, and pulse-width modulator.
2. Serial communication blocks (configurable to I²C, SPI, or UART).
3. Universal digital blocks
4. Configurable liquid crystal display driver.
5. Configurable integrated interchip sound serial bus interface.

1.1 Kit Contents

The BLE Pioneer Kit contains the following items (see [Figure 1-1](#)):

- BLE Pioneer Baseboard preloaded with the CY8CKIT-143A PSoc 4 BLE 256KB Module
- CY5676A PProC BLE 256KB Module
- CY5677 CySmart BLE 4.2 USB Dongle (BLE Dongle)
- Quick start guide
- USB Standard-A to Mini-B cable
- Four jumper wires (4 inch) and two proximity sensor wires (5 inch)
- Coin cell (3-V CR2032)

Figure 1-1. Kit Contents



If any part of the BLE Pioneer Kit is missing, contact your nearest Cypress sales office for help: www.cypress.com/go/support.

1.2 BLE Pioneer Baseboard Details

The BLE Pioneer Baseboard consists of the blocks shown in [Figure 1-2](#).

1. RGB LED
2. BLE device reset button
3. CapSense proximity header
4. User button
5. CapSense slider
6. Arduino-compatible I/O headers (J2/J3/J4)
7. Arduino-compatible power header (J1)
8. Digilent Pmod-compatible I/O header (J5)
9. Cypress F-RAM 1 Mb (FM24V10-G)
10. PSoc 5LP I/O header (J8)
11. PSoc 5LP programmer and debugger (CY8C5868LTI-LP039)
12. Coin cell holder (bottom side)
13. USB connector (J13)
14. Power LED and Status LED
15. System power supply jumper (J16) - LDO 1.9 V~5 V
16. BLE power supply jumper / current measurement (J15)
17. BLE module headers (J10/J11)

Figure 1-2. BLE Pioneer Baseboard

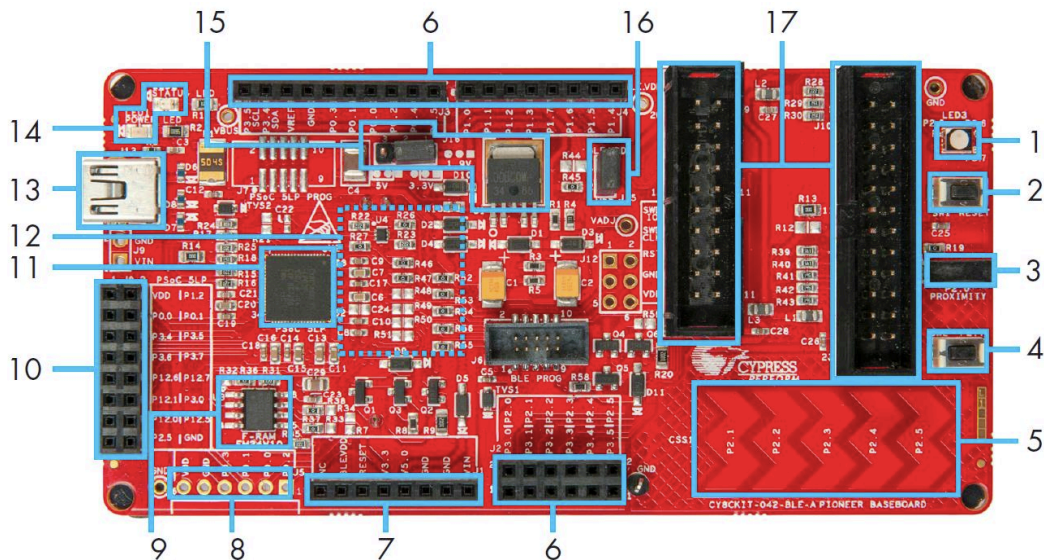


Figure 1-3 shows a markup of the onboard components of the PSoC 4 BLE module (in red) and the PRoC BLE module (in black). See [BLE Modules and BLE Dongles Compatible with the BLE Pioneer Kit on page 128](#) for more details. [Figure 1-4](#) shows the BLE Dongle board blocks.

Figure 1-3. BLE Module Markup

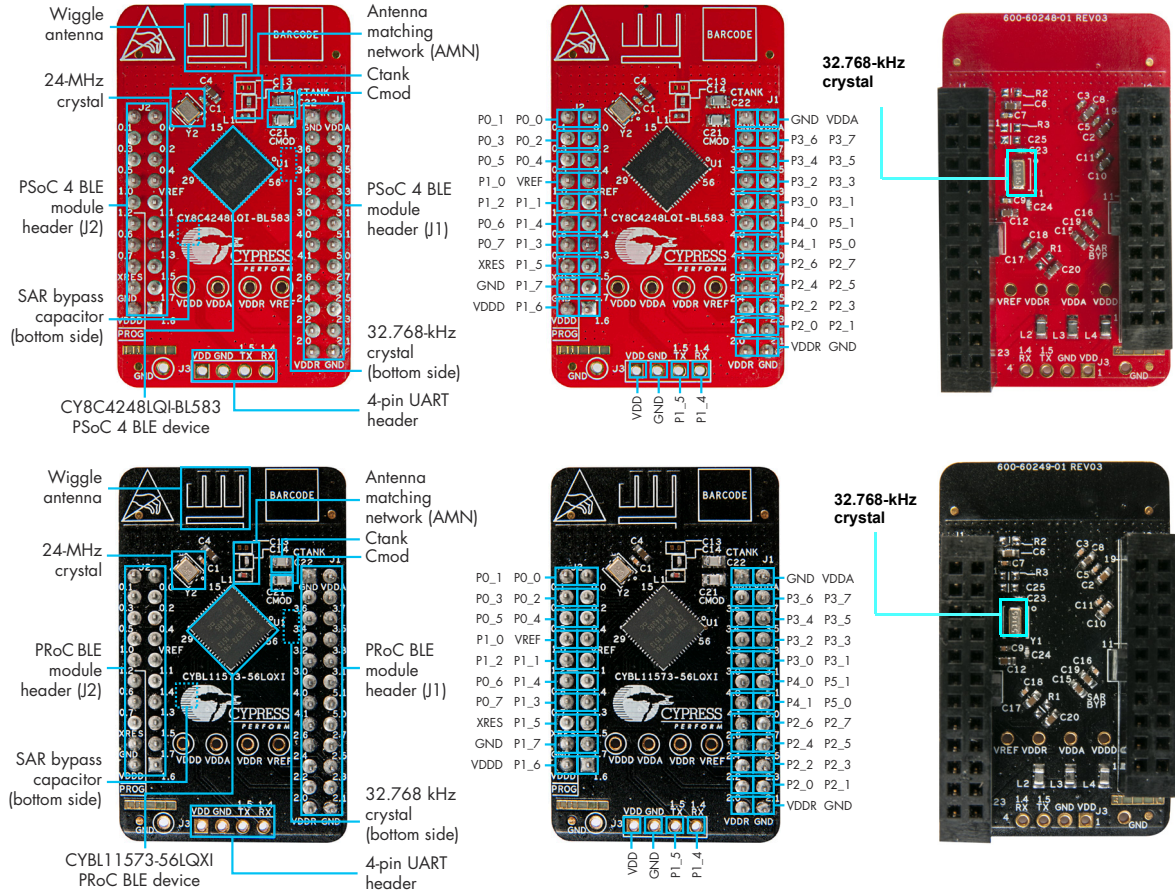
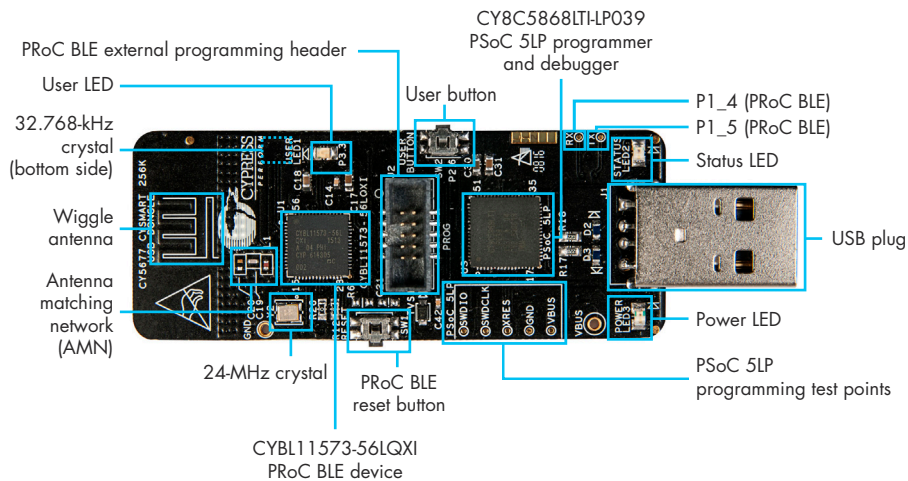


Figure 1-4. BLE Dongle Markup

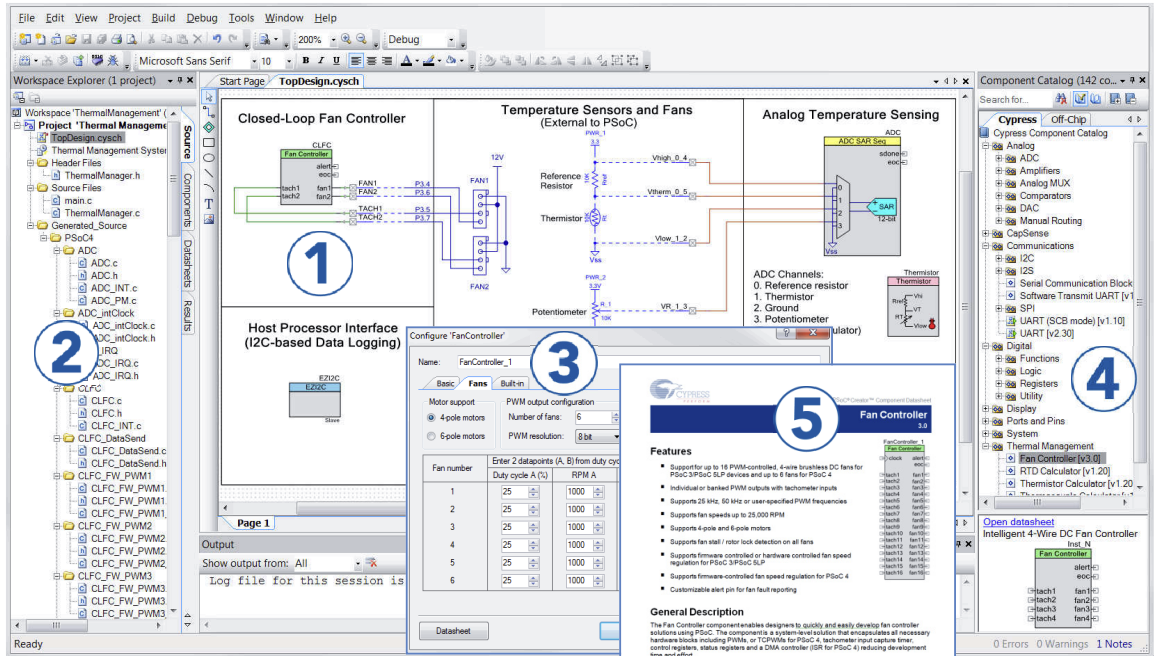


1.3 PSoC Creator

PSoC Creator™ is a state-of-the-art, easy-to-use integrated design environment (IDE). It introduces revolutionary hardware and software co-design, powered by a library of pre-verified and pre-characterized PSoC Components. With PSoC Creator, you can:

1. Drag and drop Components to build your hardware system design in the main design workspace
2. Codesign your application firmware with the PSoC hardware
3. Configure Components using configuration tools
4. Explore the library of 100+ Components
5. Review Component datasheets

Figure 1-5. PSoC Creator Features



PSoC Creator also enables you to tap into an entire tool ecosystem with integrated compiler chains and production programming programmers for PSoC devices.

For more information, visit www.cypress.com/psoccreator. Visit [PSoC Creator training page](#) for video tutorials on learning and using PSoC Creator.

1.3.1 PSoC Creator Code Examples

PSoC Creator includes a large number of code examples. These examples are available from the PSoC Creator Start Page, as [Figure 1-6](#) shows.

Code examples can speed up your design process by starting you off with a complete design, instead of a blank page. The code examples also show how PSoC Creator Components can be used for various applications. Code examples and documentation are included, as shown in [Figure 1-7 on page 14](#).

In the **Find Example Project** dialog shown in [Figure 1-7](#), you have several options:

- Filter for examples based on architecture or device family, that is, PSoC 3, PSoC 4 or PSoC 5LP; project name; or keyword.
- Select from the menu of examples offered based on the **Filter Options**.
- Review the example project's description (on the **Documentation** tab).
- Review the code from the **Sample Code** tab. You can copy the code from this window and paste to your project, which can help speed up code development.
- Create a new project (and a new workspace if needed) based on the selection. This can speed up your design process by starting you off with a complete, basic design. You can then adapt that design to your application.

Figure 1-6. Code Examples in PSoC Creator

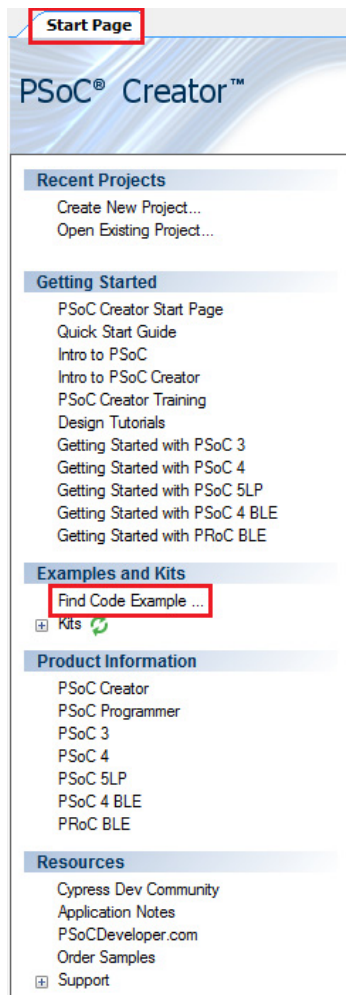
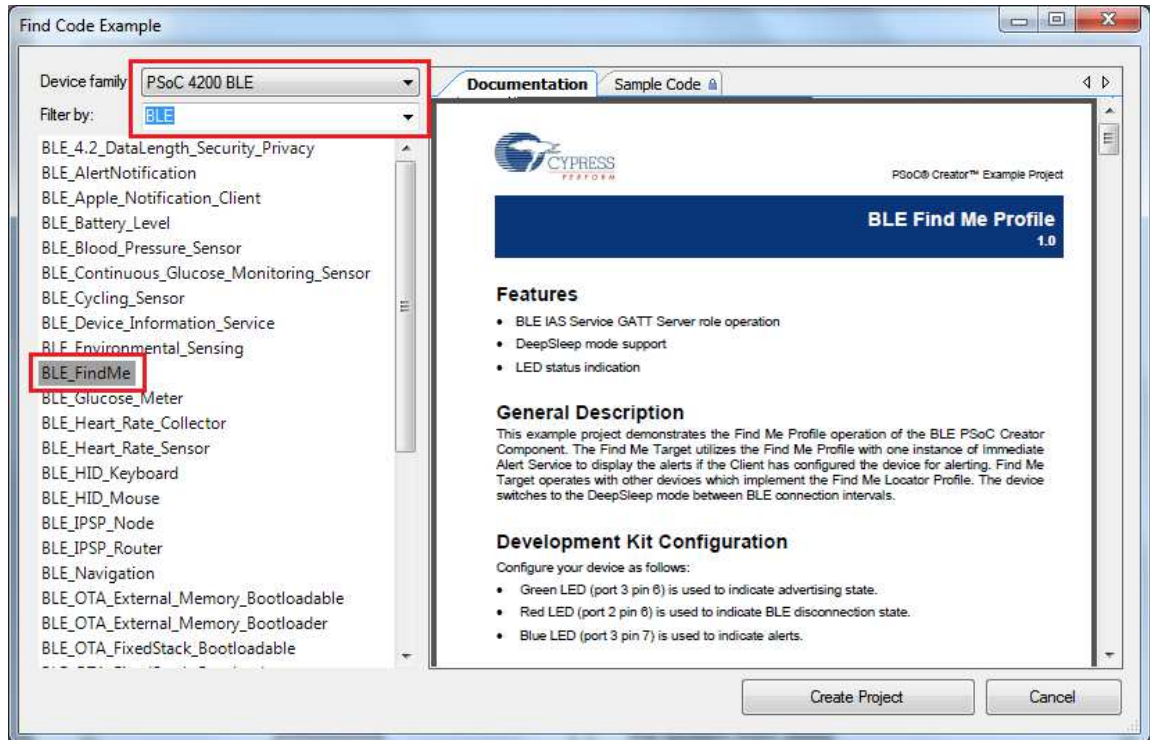


Figure 1-7. Code Example Projects with Sample Code



1.3.2 Kit Code Examples

This kit includes a number of code examples, which can be used to quickly evaluate the functionality of this kit. These examples are described in the [Example Projects chapter on page 35](#).

If you are a beginner in BLE, refer to the PSoC Creator code examples such as BLE_FindMe and BLE_Device_Information_Service as described in [1.3.1 PSoC Creator Code Examples](#). You may also refer the application note [Getting Started with PSoC 4 BLE](#).

The four Kit code examples viz CapSense Slider and LED, CapSense Proximity, BLE Central Mode and Eddystone are intermediary level examples that will help to design a system around the kit. Refer to the [4.2 CapSense Slider and LED](#) and later for details.

The CySmart Dongle code example is an advanced level example that will demonstrate a complete solution around the kit. Refer to [4.6 BLE Dongle and LED Control](#) for details.

1.3.3 PSoC Creator Help

Visit the [PSoC Creator home page](#) to download the latest version of PSoC Creator. Then, launch PSoC Creator and navigate to the following items:

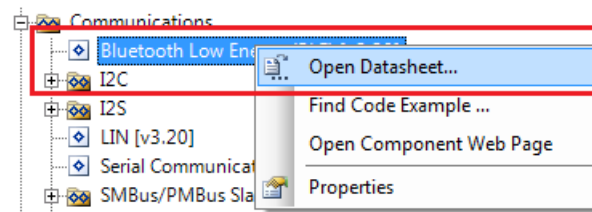
- **Quick Start Guide:** Choose **Help > Documentation > Quick Start Guide**. This guide gives you the basics for developing PSoC Creator projects.
- **Simple Component example projects:** Choose **File > Code Example**. These example projects demonstrate how to configure and use PSoC Creator Components.
- **System Reference Guide:** Choose **Help > System Reference Guide**. This guide lists and describes the system functions provided by PSoC Creator.

- **Component datasheets:** Right-click a Component and select **Open Datasheet**, as shown in [Figure 1-8 on page 15](#). Visit the [PSoC 4 Component Datasheets](#) page for a list of all PSoC 4 Component datasheets.
- **Document Manager:** PSoC Creator provides a document manager to help you to easily find and review document resources. To open the document manager, choose the menu item **Help > Document Manager**.

1.3.4 Component Datasheets

Right-click a Component and select **Open Datasheet** (see [Figure 1-8 on page 15](#)).

Figure 1-8. Opening Component Datasheet



1.4 Getting Started

This guide will help you get acquainted with the BLE Pioneer Kit:

- The [Software Installation chapter on page 19](#) describes the installation of the kit software. This includes the PSoC Creator IDE for development and debugging applications, PSoC Programmer for programming hex files, and the CySmart Central Emulation Tool for BLE Central emulation.
- The [Kit Operation chapter on page 23](#) describes the major features of the BLE Pioneer Kit such as USB-UART and USB-I²C bridges and functionalities such as programming and debugging.
- The [Example Projects chapter on page 35](#) describes multiple PSoC 4 BLE and PSoC 4 BLE code examples that will help you understand how to create your own BLE application using the BLE Component and device.
- The [Hardware chapter on page 87](#) details the hardware content of the BLE Pioneer Kit and BLE Dongle, and the hardware operation.
- The [Advanced Topics chapter on page 114](#) explains the functionality of FM24V10 F-RAM.
- The [Appendix on page 116](#) provides the bill of materials (BOM), KitProg LED states, list of BLE modules and dongles compatible with the BLE Pioneer Kit, migrating projects across Pioneer series kits, and programming BLE modules using MiniProg3.

1.5 Additional Learning Resources

Cypress provides a wealth of information at www.cypress.com to help you to select the right PSoC device for your design, and to help you to quickly and effectively integrate the device into your design. For a comprehensive list of resources, see [KBA86521](#), [How to Design with PSoC 3](#), [PSoC 4](#), and [PSoC 5LP](#).

Visit www.cypress.com/go/psoc4ble and www.cypress.com/procble for additional learning resources including datasheets, technical reference manuals, and application notes. The following is an abbreviated list:

- Overview: [PSoC 4 BLE Portfolio](#) and [PSoC Roadmap](#)
- Product Selectors: [PSoC 1](#), [PSoC 3](#), [PSoC 4](#), or [PSoC 5LP](#). In addition, [PSoC Creator](#) includes a device selection tool.

- **Datasheets:** Describe and provide electrical specifications for the PSoC 4 device family
- **CapSense Design Guide:** Learn how to design capacitive touch-sensing applications with the PSoC 4 family of devices.
- **Application Notes and Code Examples:** Cover a broad range of topics, from basic to advanced level. Many of the application notes include code examples. Visit the [PSoC 3/4/5 Code Examples](#) webpage for a list of all available PSoC Creator code examples. To access code examples from within PSoC Creator, see [PSoC Creator Code Examples on page 13](#).
- **Technical Reference Manuals (TRM):** Provide detailed descriptions of the architecture and registers in each PSoC 4 device family.
- **Development Kits:**
 - [CY8CKIT-040](#), [CY8CKIT-042](#), and [CY8CKIT-044](#) are easy-to-use and inexpensive development platforms. These kits include connectors for Arduino-compatible shields and Digilent Pmod peripheral modules.
 - [CY8CKIT-141](#), [CY8CKIT-142](#), [CY8CKIT-143](#), [CY5671](#), [CY5674](#), and [CY5676](#) are additional BLE Modules compatible with the BLE Pioneer Kit.
 - [CY5670](#) is additional BLE Dongle compatible with the BLE Pioneer Kit.
 - [CY8CKIT-049](#) is a very low-cost prototyping platform for PSoC 4100/4200 families.
 - The [MiniProg3](#) kit provides an interface for flash programming and debug.
 - [CY5672 PSoC BLE Remote Control Reference Design Kit](#) provides a production-ready implementation of a Bluetooth Low Energy remote control.
 - [CY5682 PSoC BLE Touch Mouse Reference Design Kit](#) provides a production-ready implementation of a Bluetooth Low Energy touch mouse.
- **Knowledge Base Articles (KBA):** Provide design and application tips from experts on using the device.
- **PSoC Creator Training:** Visit www.cypress.com/go/creatorstart/creatortraining for a comprehensive list of video trainings on PSoC Creator.
- **Cysmart Central Emulation Tool:** Visit www.cypress.com/go/cysmart for information on the CySmart Central Emulation Tool.
- **Learning From Peers:** Visit www.cypress.com/forums to meet enthusiastic PSoC developers discussing the next generation embedded systems on Cypress Developer Community Forums.

1.5.1 Bluetooth Learning Resources

The [Bluetooth Developer Portal](#) provides material by the Special Interest Group (SIG) for learning various aspects of the Bluetooth Low Energy protocol and systems. Some of them are:

- [Training videos](#)
- [GATT profiles](#)
- [Bluetooth community forum](#)

1.5.2 Other Related Resources

- Digilent Pmod: www.digilentinc.com/pmods/
- Arduino: <http://arduino.cc/en/Main/ArduinoBoardUno>

1.6 Technical Support

If you have any questions, our technical support team is happy to assist you. You can create a support request on the [Cypress Technical Support](#) page.

If you are in the United States, you can talk to our technical support team by calling our toll-free number: +1-800-541-4736. Select option 2 at the prompt.

You can also use the following support resources if you need quick assistance.

- [Self-help](#)
- [Local Sales Office Locations](#)

1.7 Documentation Conventions

Table 1-2. Document Conventions for Guides

Convention	Usage
Courier New	Displays file locations, user entered text, and source code: C:\...\cd\icc\
<i>Italics</i>	Displays file names and reference documentation: Read about the <i>sourcefile.hex</i> file in the <i>PSoC Creator User Guide</i> .
[Bracketed, Bold]	Displays keyboard commands in procedures: [Enter] or [Ctrl] [C]
File > Open	Represents menu paths: File > Open > New Project
Bold	Displays commands, menu paths, and icon names in procedures: Click the File icon and then click Open .
Times New Roman	Displays an equation: $2 + 2 = 4$
Text in gray boxes	Describes cautions or unique functionality of the product.

1.8 Acronyms

Table 1-3. Acronyms Used in this Document

Acronym	Definition
ADC	analog-to-digital converter
API	application programming interface
BD address	Bluetooth device address
BLE	Bluetooth Low Energy
CDC	Communications Device Class
COM	communication port
DLE	data length extension
ECDH	Elliptic Curve Diffie-Hellman
DVD	digital video disc
ESD	electrostatic discharge
F-RAM	ferroelectric random access memory
GATT	generic attribute profile

Table 1-3. Acronyms Used in this Document

Acronym	Definition
GUI	graphical user interface
GPIO	general-purpose input/output
I ² C	inter-integrated circuit
IAS	immediate alert service
IDAC	current output digital-to-analog converter
IDE	integrated development environment
LDO	low drop out (voltage regulator)
LE	low energy
LED	light-emitting diode
LP	low power
LPT	line print terminal
MTU	maximum transmission unit
OTA	over-the-air
PHY	physical layer
PriSM	Precise Illumination Signal Modulation
PRoC	Programmable Radio-on-Chip
PSM	protocol service multiplexer
PSoC	Programmable System-on-Chip
PWM	pulse width modulation
QFN	quad flat no-lead (package)
RDK	reference design kit
RGB	red green blue
SAR	successive approximation register
SIG	special interest group
SMA	SubMiniature version A
SPI	serial peripheral interface
SWD	serial wire debug
TLM	telemetry
UART	universal asynchronous receiver transmitter
UID	universal identifier
URI	uniform resource identifier
URL	uniform resource locator
USB	Universal Serial Bus
UUID	universal unique identifier

2. Software Installation



This chapter describes the steps to install the software tools and packages on a computer for using the BLE Pioneer Kit. This includes the IDE in which the projects will be built and used for programming.

2.1 Before You Begin

All Cypress software installations require administrator privileges. Ensure you have the required privileges on the system for successful installation. Before you install the kit software, close any other Cypress software that is currently running.

2.2 Install Software

Follow these steps to install the BLE Pioneer Kit software:

1. Download the kit software from www.cypress.com/CY8CKIT-042-BLE-A. The software is available in the following formats:
 - a. CY8CKIT-042-BLE-A Kit Complete Setup: This installation package contains the files related to the BLE Pioneer Kit. However, it does not include the Windows Installer or Microsoft .NET framework packages. If these packages are not on your computer, the installer directs you to download and install them from the Internet.
 - b. CY8CKIT-042-BLE-A Kit Only Package: This executable file installs only the BLE Pioneer Kit contents, which include code examples, hardware files, and user documents. This package can be used if all the software prerequisites (listed in step 5) are installed on your computer.
 - c. CY8CKIT-042-BLE-A DVD ISO: This file is a complete package, stored in a DVD-ROM image format, that you can use to create a DVD or extract using an ISO extraction program such as WinZip or WinRAR. The file can also be mounted similar to a virtual CD/DVD using virtual drive programs such as 'Virtual CloneDrive' and 'MagicISO'. This file includes all the required software, utilities, drivers, hardware files, and user documents.
2. If you have downloaded the ISO file, mount it on a virtual drive; if you do not have a virtual drive to mount, extract the ISO contents using the appropriate ISO extractor (such as MagicISO or PowerISO). Double-click **cyautorun.exe** in the root directory of the extracted content or mounted ISO if "Autorun from CD/DVD" is not enabled on the computer. The installation window will appear automatically.

Note: If you are using the "Kit Complete Setup" or "Kit Only Package" file, then go to step 4 for installation.

3. Click **Install CY8CKIT-042-BLE-A Kit** to start the installation, as shown in [Figure 2-1](#).

Figure 2-1. Installer Screen



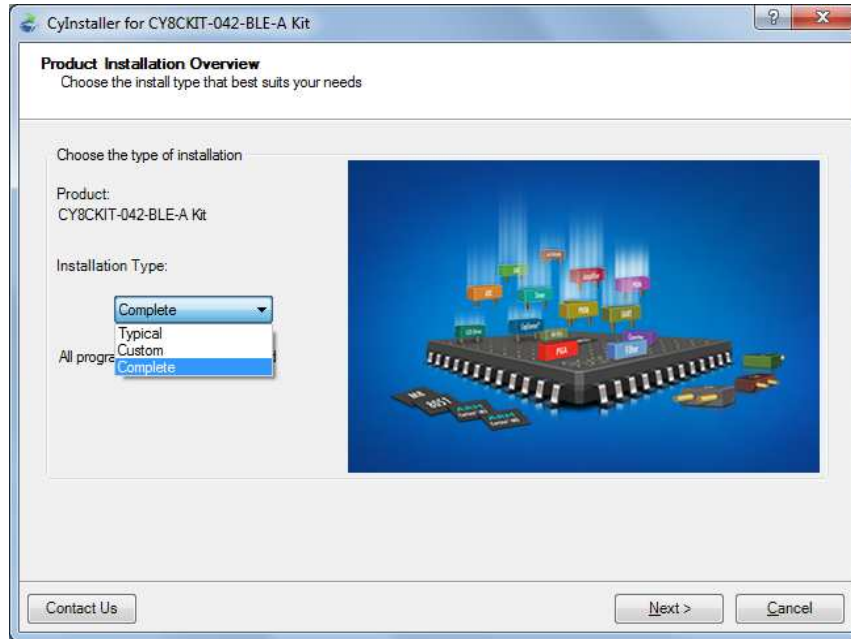
4. Select the folder in which you want to install the CY8CKIT-042-BLE-A kit-related files. Choose the directory and click **Next**.
5. When you click **Next**, the CY8CKIT-042-BLE-A Kit installer automatically installs the required software, if it is not present on your computer. The following software packages are required:

Note: For the Kit Only Package, download and install the following prerequisites.

 - a. PSoC Creator 3.3 or later: Download the latest version from www.cypress.com/psoccreator.
 - b. PSoC Programmer 3.24 or later: This is installed as part of PSoC Creator installation (www.cypress.com/programmer).
 - c. CySmart 1.2 or later: Download the latest version from www.cypress.com/cysmart.

- Choose the Typical/Custom/Complete installation type in the **Product Installation Overview** window, as shown in [Figure 2-2](#). Click **Next** after you select the installation type.

Figure 2-2. Product Installation Overview



- Read the license agreement and select **I accept the terms in the license agreement** to continue with installation. Click **Next**.
- When the installation begins, a list of packages appears on the installation page. A green check mark appears next to each package after successful installation.
- Click **Finish** to complete the CY8CKIT-042-BLE-A kit installation.
- Enter your contact information or select the **Continue Without Contact Information** check box. Click **Finish** to complete the CY8CKIT-042-BLE-A kit installation.
- After the installation is complete, the kit contents are available at the following location:

<Install_Directory>\CY8CKIT-042-BLE-A Kit

Default location:

Windows 7 (64-bit): C:\Program Files (x86)\Cypress\CY8CKIT-042-BLE-A Kit

Windows 7 (32-bit): C:\Program Files\Cypress\CY8CKIT-042-BLE-A Kit

Note: For Windows 7/8/8.1 users, the installed files and the folder are read only. To use the installer example projects, follow the steps outlined in the [Example Projects chapter on page 35](#).

The BLE Pioneer Kit installer also installs the CySmart Central Emulation Tool on your computer. This software, along with the BLE Dongle, allows the computer to emulate as a BLE Central device.

2.3 Windows 8.1 and Windows 10 USB Selective Suspend Setting

The Windows 8.1 and Windows 10 operating systems issue a suspend command to a connected USB device if there is no activity on its USB bus. This may happen to the BLE Pioneer Kit/BLE Dongle if the driver installation is not complete or the driver is not found. In this situation, as a response to the suspend command from the operating system, the KitProg will shut down the onboard LDO to remain within the USB suspend current requirement. Due to this, the BLE Pioneer Kit will not be powered and will not be functional.

To prevent this, do either of the following:

- Install the kit software on the Windows 8.1 or Windows 10 operating system before using the BLE Pioneer Kit.
- Disable the USB selective suspend setting for the BLE Pioneer Kit from Power Options on Windows 8.1, by following these steps:
 - a. From **Control Panel**, go to **Power Options**.
 - b. Click **Change Plan Settings** corresponding to your power plan.
 - c. Click **Change Advanced Power Settings**.
 - d. Under Advanced settings, expand **USB Settings > USB selective suspend setting**.
 - e. Select the **Disabled** option for **Plugged in** and **On battery** operation.
 - f. Click **OK**.

3. Kit Operation

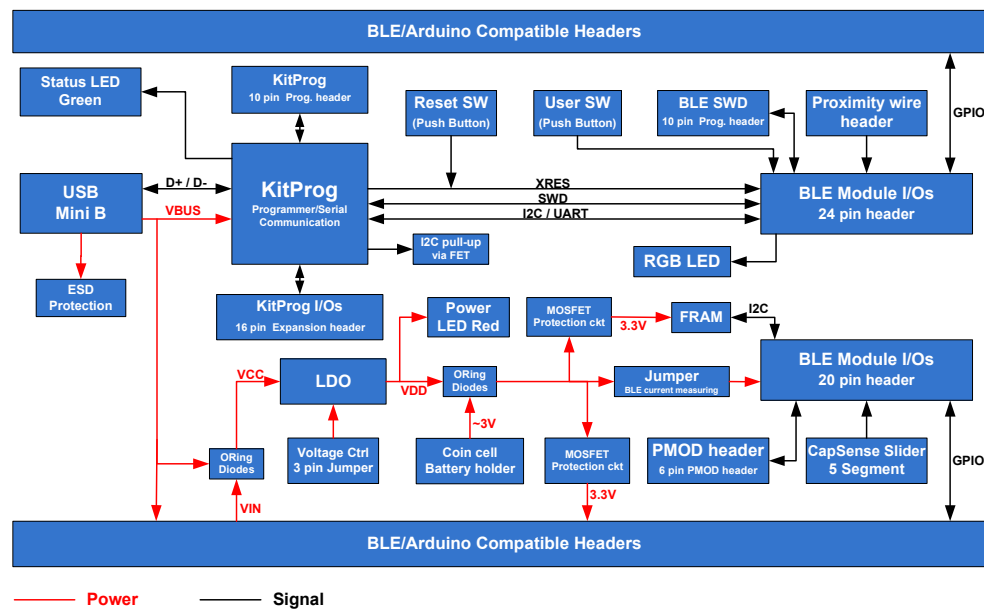


This chapter introduces you to the BLE Pioneer Kit and the features that will be used as part of its operation. We will discuss features such as USB connection, programming/debugging, and programmer firmware update. The chapter also describes the USB-UART and USB-I²C bridges along with the PC tools that can be used to communicate with the BLE device on the BLE Pioneer Kit.

3.1 Theory of Operation

Figure 3-1, Figure 3-2, and Figure 3-3 show the block diagrams for the BLE Pioneer Baseboard, PSoC 4 BLE/PRoC BLE Module, and BLE Dongle.

Figure 3-1. BLE Pioneer Baseboard Block Diagram

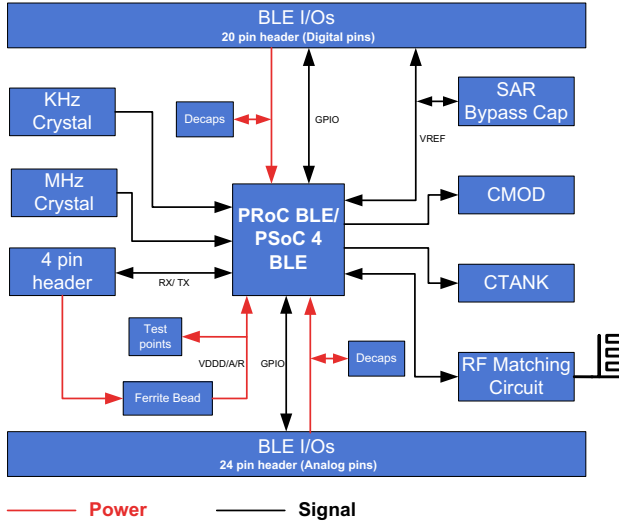


The BLE Pioneer Baseboard acts as the baseboard for the PSoC 4 BLE (red module) and PRoC BLE (black module). The BLE Pioneer Baseboard contains a PSoC 5LP device, that has KitProg firmware, used as an onboard programmer or debugger, and for the USB-Serial interface.

The baseboard is Arduino form-factor compatible, enabling Arduino shields to be connected on top of the board to extend the functionality of BLE modules. The board also features a 1-Mb F-RAM, an RGB LED, a five-segment CapSense slider, a proximity header, a user switch, and a reset switch for the PSoC 4 BLE and PRoC BLE devices on the module. The Pioneer board supports three voltage levels: 1.9 V, 3.3 V, and 5 V.

The BLE Pioneer Baseboard can also be used as a standalone programmer to program and debug other BLE devices using SWD, and as a USB-Serial interface. The KitProg firmware on PSoC 5LP device enables bootloading PSoC 5LP over USB to upgrade the firmware.

Figure 3-2. PSoC 4 BLE/PRoC BLE Module Block Diagram

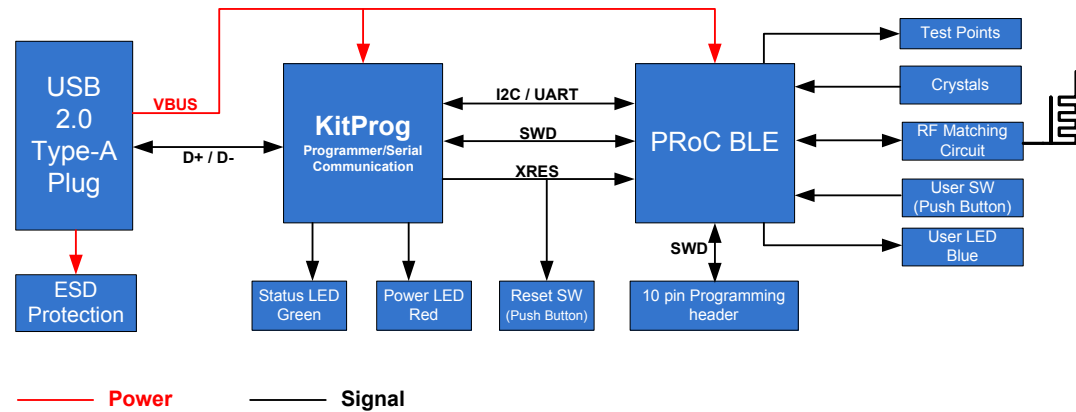


This BLE Pioneer Kit includes two modules. These modules act as a basic breakout board for the CY8C4248LQI-BL583 (PSoC 4 BLE) and CYBL11573-56LQXI (PRoC BLE) device. The PSoC 4 BLE and PRoC BLE Modules are identical except for the BLE device. Besides these two modules, there are additional modules available, which can be ordered separately. The complete list is available in [BLE Modules and BLE Dongles Compatible with the BLE Pioneer Kit](#) on page 128.

The BLE Dongle is the wireless interface for the CySmart Central Emulation Tool. It has a PRoC BLE device for BLE communication and KitProg for onboard programming, debugging, and for the USB-Serial interface, as shown in Figure 3-3.

The BLE Dongle has a USB Type-A plug to connect the KitProg to the USB port of the host computer. The KitProg then communicates with the PRoC BLE device over UART or multiplexed I²C or an SPI bus. The BLE Dongle also features a user LED, a user switch, and a reset switch for the PRoC BLE device. The dongle is powered directly through the USB port (VBUS) at 5.0 V.

Figure 3-3. BLE Dongle Block Diagram



3.2 KitProg

KitProg is the hardware/firmware block for onboard programming, debugging, and bridge functionality. It is a common reusable hardware/firmware block used across many Cypress kit platforms. It consists of a PSoC 5LP, which connects to the computer over an USB interface and connects to the PSoC 4 BLE or PSoC BLE device over SWD, I²C, and UART pins.

The KitProg communicates with PSoC Programmer and PSoC Creator software to program/debug the target PSoC 4 BLE or PSoC BLE over the SWD interface. The main advantage of an onboard programmer/debugger is that users do not have to buy an extra programmer/debugger hardware.

3.3 BLE Pioneer Kit USB Connection

The BLE Pioneer Kit powers from a computer over the USB interface (J13). It enumerates as a composite device, as shown in Table 3-1. USB drivers required for this enumeration are part of the kit installer. The kit should be installed properly for its correct operation.

Visit www.cypress.com/CY8CKIT-042-BLE for the latest kit installer.

Table 3-1. BLE Pioneer Kit Enumerated Interfaces

Port	Description
USB Composite Device	Composite device
USB Input Device	USB-I ² C bridge, KitProg command interface
KitProg	USB-I ² C bridge, programmer, and debugger
KitProg USB-UART	USB-UART bridge, which appears as a COM# port

Figure 3-4. KitProg Driver Installation (appearance may differ depending on Windows version)

