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CY8CKIT-044

PSoC[®] 4 M-Series Pioneer Kit Guide

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Safety Information



The CY8CKIT-044 PSoC[®] 4 M-Series Pioneer Kit is intended for use as a development platform for hardware or software in a laboratory environment. The board is an open system design, which does not include a Shielded enclosure. For this reason, the board may cause interference with other electrical or electronic devices in close proximity. In a domestic environment, this product may cause radio interference. In such cases, the user may be required to take adequate preventive measures. Also, this board should not be used near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

The CY8CKIT-044 as shipped from the factory has been verified to meet with the requirements of CE as a Class A product.

 A yellow square warning symbol with a black border. Inside, there is a black triangle containing a lightning bolt striking a hand, representing electrostatic discharge (ESD) sensitivity.	<p>The CY8CKIT-044 board contains electrostatic discharge (ESD) sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment which can cause a discharge without detection. Permanent damage may occur to devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused CY8CKIT-044 boards in the protective shipping package.</p>
 A black and white icon of a recycling bin with a large 'X' over it, indicating that the product is not to be disposed of in a standard trash bin. Below the bin is a solid black rectangular bar.	<p>End-of-Life/Product Recycling</p> <p>The end-of-life cycle for this kit is five years from the date of manufacture mentioned on the back of the box. Contact the nearest recycler to discard the kit.</p>

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 a grounded metal object.

Handling Boards

CY8CKIT-044 board is 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.

1. Introduction



Thank you for your interest in the CY8CKIT-044 PSoC[®] 4 M-Series Pioneer Kit. The PSoC 4 M-Series Pioneer Kit enables customers to evaluate and develop projects using the PSoC 4200M device family.

PSoC 4200M device family is an expansion to the PSoC 4 device family that offers more flash, GPIOs, and programmable analog and digital blocks. PSoC 4200M device is a true programmable embedded system-on chip, integrating custom analog and digital peripheral functions, memory, and an ARM[®] Cortex[®]-M0 microcontroller on a single chip. The programmable analog and digital peripheral functions allow higher flexibility, in-field tuning of the design, and faster time-to-market.

The PSoC 4 M-Series Pioneer Kit offers footprint-compatibility with Arduino[™] Shields, 6-pin Digilent[®] Pmod[™] Peripheral Modules, and Raspberry Pi boards. This kit features two CapSense[®] Proximity headers, a CapSense Gesture Pad, an ambient light sensor, a 3-Axis accelerometer, a PWM temperature sensor, an RGB LED, a push button switch, an onboard programmer/debugger and USB-UART/I2C bridge functionality block (KitProg), and a Cypress F-RAM[™]. This kit supports operating voltages of 3.3 V or 5 V.

You will use PSoC Creator[™] to develop and debug your PSoC 4200M device projects. PSoC Creator is Cypress' standard integrated design environment (IDE). If you are new to PSoC Creator, see the documentation on the [PSoC Creator home page](#). You can also refer the application note [AN79953 – Getting Started with PSoC 4](#), which gives an introduction to the PSoC 4 device.

1.1 Kit Contents

The CY8CKIT-044 PSoC 4 M-Series Pioneer Kit contains the following, as shown in [Figure 1-1](#).

- PSoC 4 M-Series Pioneer board
- USB Standard-A to Mini-B cable
- Four jumper wires (4 inches each)
- Two proximity sensor wires (5 inches each)
- Micrium[®] μ C/Probe[™] license card
- Quick Start Guide

Note: The Micrium μ C/Probe license is valid only for one month from the date of activation.

Figure 1-1. Kit Contents



Inspect the contents of the kit; if you find any part missing, contact your nearest Cypress sales office for help: www.cypress.com/go/support.

1.2 Board Details

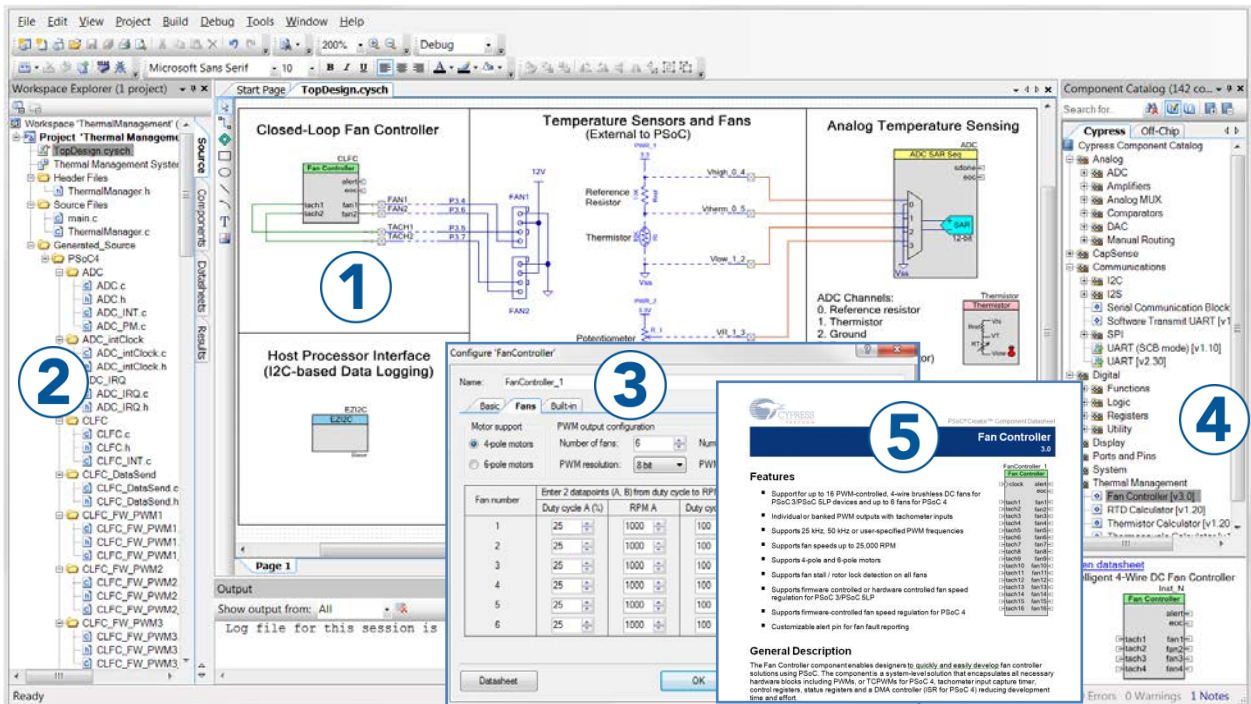
The PSoC 4 M-Series Pioneer Kit consists of the following blocks, as shown in [Figure 1-2](#). It also shows the complete kit headers pin mapping.

1.3 PSoC Creator

PSoC Creator is a state-of-the-art, easy-to-use IDE. It introduces revolutionary hardware and software codesign, powered by a library of preverified and precharacterized PSoC Components™, as shown in Figure 1-3. With PSoC Creator, you can:

- Drag and drop Components to build your hardware system design in the main design workspace
- Codesign your application firmware with the PSoC hardware
- Configure Components using configuration tools
- Explore the library of 100+ Components
- Access Component datasheets

Figure 1-3. PSoC Creator Features



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

For more information, visit www.cypress.com/psoccreator.

1.3.1 PSoC Creator Code Examples

PSoC Creator includes a large number of code example projects. These projects are accessible from the PSoC Creator Start Page, as shown in Figure 1-4.

Example projects can speed up your design process by starting you off with a complete design, instead of a blank page. The example projects also show how to use PSoC Creator Components for various applications. Code examples and documentation are included, as shown in Figure 1-5.

In the Find Example Project dialog shown in Figure 1-5, you have several options:

- Filter for examples based on device family or keyword.
- Select from the list of examples offered based on the Filter Options.
- View the project documentation for the selection (on the Documentation tab).
- View the code for the selection. You can also copy and paste code from this window to your project, which can help speed up code development.
- Create new workspace for the example project. 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 1-4. Code Examples in PSoC Creator

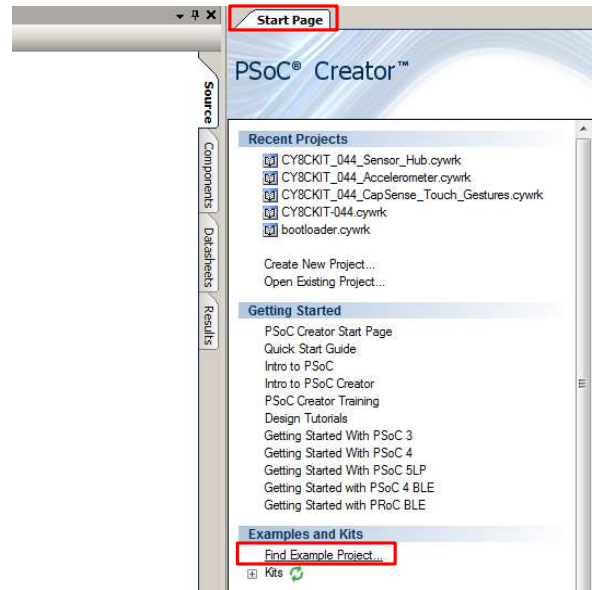
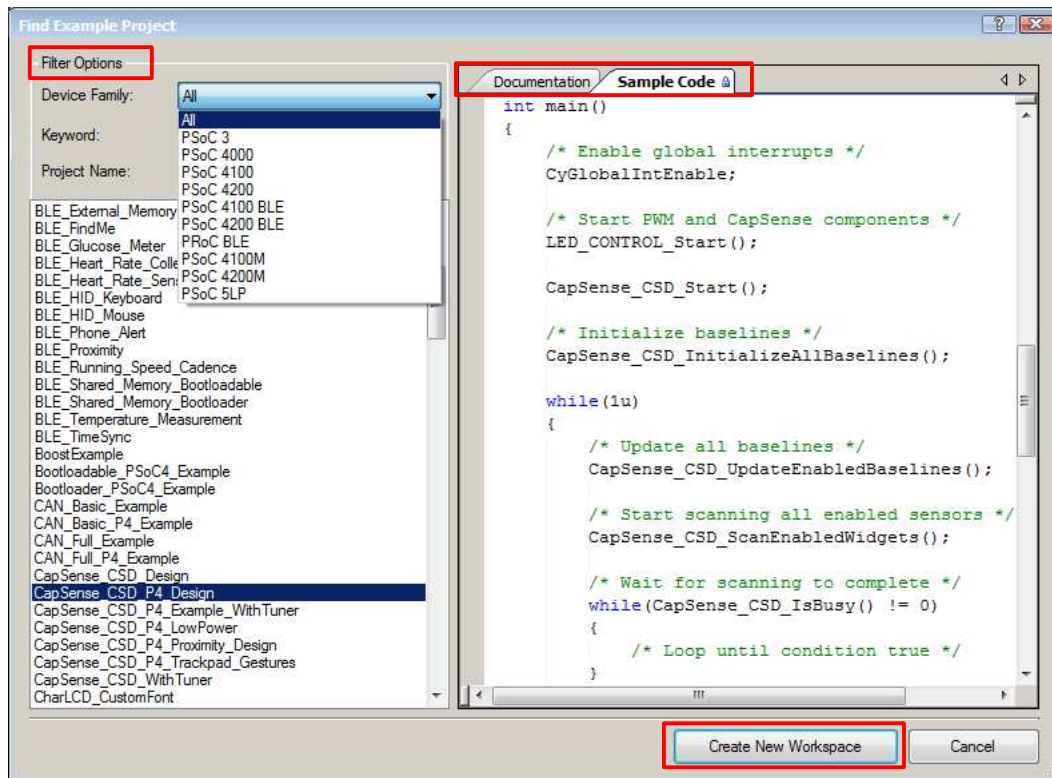


Figure 1-5. Code Example Projects with Sample Code



1.3.2 Kit Example Projects

You can access the installed kit example projects from the PSoC Creator Start Page. To access these example projects, expand the **Kits** under the section **Examples and Kits**; then, expand the specific kit to see the example projects. Refer to the [Using the Kit Example Projects](#) section for a detailed explanation on how to access the kit example projects.

1.3.3 PSoC Creator Help

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 > Open > Example Projects**. These example projects demonstrate how to configure and use PSoC Creator Components. To access example projects related to a specific Component, place the Component on the TopDesign schematic and right-click on the Component. Select the **Find Example Project** option in the context menu that appears.
- **Starter Designs:** Choose **File > New > Project** and select **PSoC 4100M / PSoC 4200M Starter Design**. These starter designs demonstrate the unique features of PSoC 4200M.
- **System Reference Guide:** Choose **Help > System Reference > 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**. 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 easily find and access the document resources. To open the document manager, choose the menu item **Help > Document Manager**.

1.4 Getting Started

This guide will help you be acquainted with the CY8CKIT-044 PSoC 4 M-Series Pioneer Kit:

- The [Installation](#) chapter describes the installation of the kit software. This includes the PSoC Creator IDE to develop and debug the applications, and PSoC Programmer to program the `.hex` files on to the device.
- The [Kit Operation](#) chapter describes the major features of the PSoC 4 M-Series Pioneer Kit and functionalities such as programming, debugging, and the USB-UART and USB-I2C bridges.
- The [Example Projects](#) chapter describes multiple PSoC 4200M code examples that will help you understand how to create your own PSoC 4 projects.
- The [Appendix](#) provides the method to use the Micrium μ C/Probe, detailed hardware description, method to use the onboard F-RAM, kit schematics, and the bill of materials (BOM).

1.5 Additional Learning Resources

Cypress provides a wealth of data 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](#). The following is an abbreviated list for PSoC 4:

- **Overview:** [PSoC Portfolio](#) and [PSoC Roadmap](#).
- **Product Selectors:** [PSoC 4 Product Selector](#). In addition, [PSoC Creator](#) includes a device selection tool.
- **Datasheets:** Describe and provide electrical specifications for the [PSoC 4000](#), [PSoC 4100](#), [PSoC 4200](#), [PSoC 4100M](#), and [PSoC 4200M](#) device families.
- **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. Many of the application notes include code examples. Visit the [PSoC 3/4/5 Code Examples](#) web page for a list of all available PSoC Creator code examples. To access code examples from within PSoC Creator – see [PSoC Creator Code Examples](#).
- **Technical Reference Manuals (TRM):** Provide detailed descriptions of the architecture and registers in each PSoC 4 device family.

- **Development Kits:**
 - **CY8CKIT-042** and **CY8CKIT-040** are easy-to-use and inexpensive development platforms. These kits include connectors for Arduino compatible Shields and Digilent Pmod Peripheral Modules.
 - **CY8CKIT-049** is a very low-cost prototyping platform for sampling PSoC 4 devices.
 - **CY8CKIT-001** is a common development platform for all PSoC family devices.
 - **MiniProg3** device provides an interface for flash programming and debug.
- **Knowledge Base Articles (KBA):** Provide design and application tips from experts on using the device. For instance, [KBA93541](#) explains how to use CY8CKIT-049 to program another PSoC 4.
- **PSoC Creator Training:** Visit www.cypress.com/go/creatorstart/creatortraining for a comprehensive list of video trainings on PSoC Creator.
- **Learning from Peers:** Visit www.cypress.com/forums to meet enthusiastic PSoC developers discussing the next generation embedded systems on Cypress Developer Community Forums.

1.6 Technical Support

For assistance, visit [Cypress Support](#) or contact customer support at +1(800) 541-4736 Ext. 2 (in the USA) or +1 (408) 943-2600 Ext. 2 (International).

1.7 Document Conventions

Table 1-1. 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 1-2. Acronyms Used in this Document

Acronym	Description
ADC	Analog-to-Digital Converter
ESD	Electrostatic Discharge
F-RAM	Ferroelectric Random Access Memory
GPIO	General Purpose Input/Output
I2C	Inter-Integrated Circuit
IDE	Integrated Development Environment
LDO	Low Drop Out (voltage regulator)
LED	Light-Emitting Diode
LSB	Least Significant Byte
MSB	Most Significant Byte
PSoC	Programmable Systems-on-Chip
PWM	Pulse Width Modulation
RGB	Red Green Blue
SAR	Successive Approximation Register
SPI	Serial Peripheral Interface
SWD	Serial Wire Debug
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

2. Installation



This chapter describes the steps to install the software tools and packages on a PC for using the CY8CKIT-044 PSoC 4 M-Series Pioneer Kit. This includes the IDE on which the projects will be built and used for programming.

2.1 Before You Begin

To install Cypress software, you will require administrator privileges. However, they are not required to run software that is already installed. 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 CY8CKIT-044 PSoC 4 M-Series Pioneer Kit software:

1. Download the PSoC 4 M-Series Pioneer Kit software from www.cypress.com/CY8CKIT-044. The kit software is available in three different formats for download.
 - a. **CY8CKIT-044 Kit Complete Setup:** This installation package contains the files related to the 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-044 Kit Only:** This executable file installs only the kit contents, which include kit 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 PC.
 - c. **CY8CKIT-044 DVD ISO:** This file is a complete package, stored in a DVD-ROM image format, which 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 like 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 in a virtual drive. Extract the ISO contents if you do not have a virtual drive to mount. Double-click *cyautorun.exe* in the root directory of the extracted content or the mounted ISO if “Autorun from CD/DVD” is not enabled on the PC. The installation window will appear automatically.

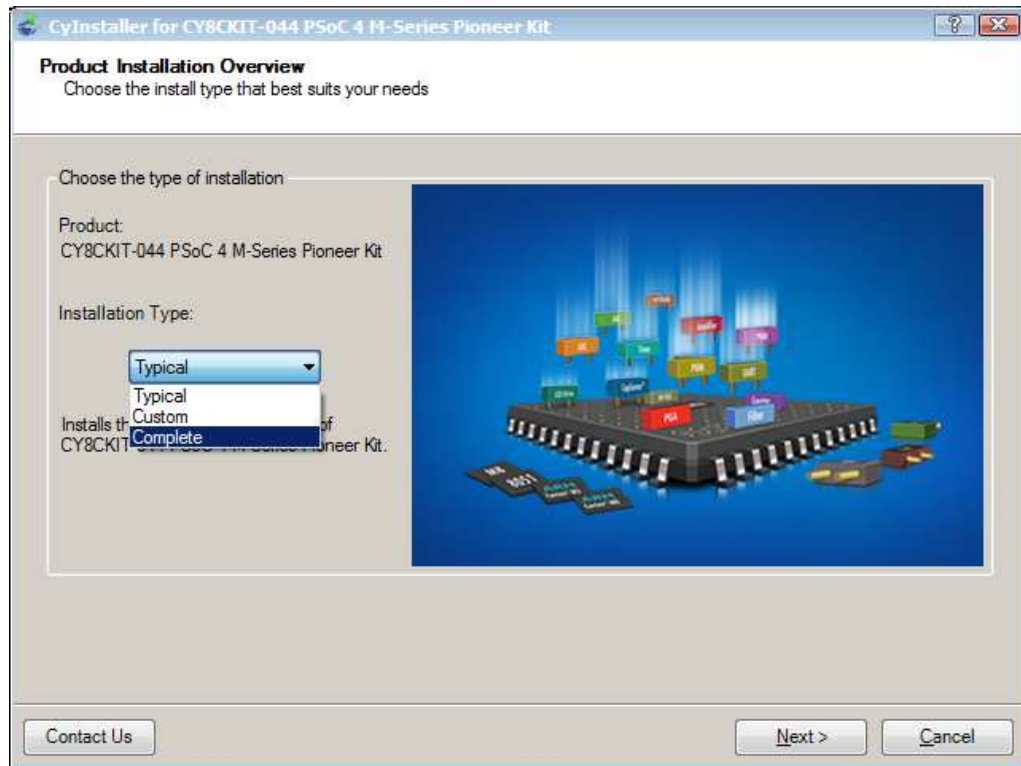
Note: If you are using the “Kit Complete Setup” or “Kit Only” file, then go to step 4 for installation.
3. Click **Install CY8CKIT-044** to start the kit installation, as shown in [Figure 2-1](#).

Figure 2-1. Kit Installer Screen



4. Select the folder in which you want to install the CY8CKIT-044 kit-related files. Choose the directory and click **Next**.
5. When you click **Next**, the CY8CKIT-044 installer automatically installs the required software, if it is not present on your computer. Following is the required software:
 - a. PSoC Creator 3.2 or later: This software is available separately from www.cypress.com/psoccreator.
 - b. PSoC Programmer 3.23 or later: This is installed as part of PSoC Creator installation or is available separately from www.cypress.com/programmer.
6. 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



7. Read the License agreement and select **I accept the terms in the license agreement** to continue with installation. Click **Next**.
8. 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.
9. Enter your contact information or select the check box **Continue Without Contact Information**. Click **Finish** to complete the CY8CKIT-044 kit software installation.
10. After the installation is complete, the kit contents are available at the following location:

<Install_Directory>\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit

Default location:

Windows 7 (64-bit): C:\Program Files (x86)\Cypress\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit

Windows 7 (32-bit): C:\Program Files\Cypress\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit

Note: For Windows 7/8/8.1 users, the installed files and the folder are read only. To use the installed example projects, follow the steps outlined in the Example Projects chapter.

2.3 Uninstall Software

The software can be uninstalled using one of the following methods:

- Go to **Start > All Programs > Cypress > Cypress Update Manager** and select the **Uninstall** button that corresponds to the kit software.
- Go to **Start > Control Panel > Programs and Features** for Windows 7 or **Add/Remove Programs** for Windows XP; select the **Uninstall/Change** button.

3. Kit Operation



This chapter introduces you to PSoC 4 M-Series Pioneer Kit features.

3.1 Theory of Operation

The PSoC 4 M-Series Pioneer Kit is built around the PSoC 4200M device. Figure 3-1 shows the block diagram of the PSoC 4200M device. Refer to the PSoC 4200M datasheet for details on device features.

Figure 3-1. PSoC 4200M Block Diagram

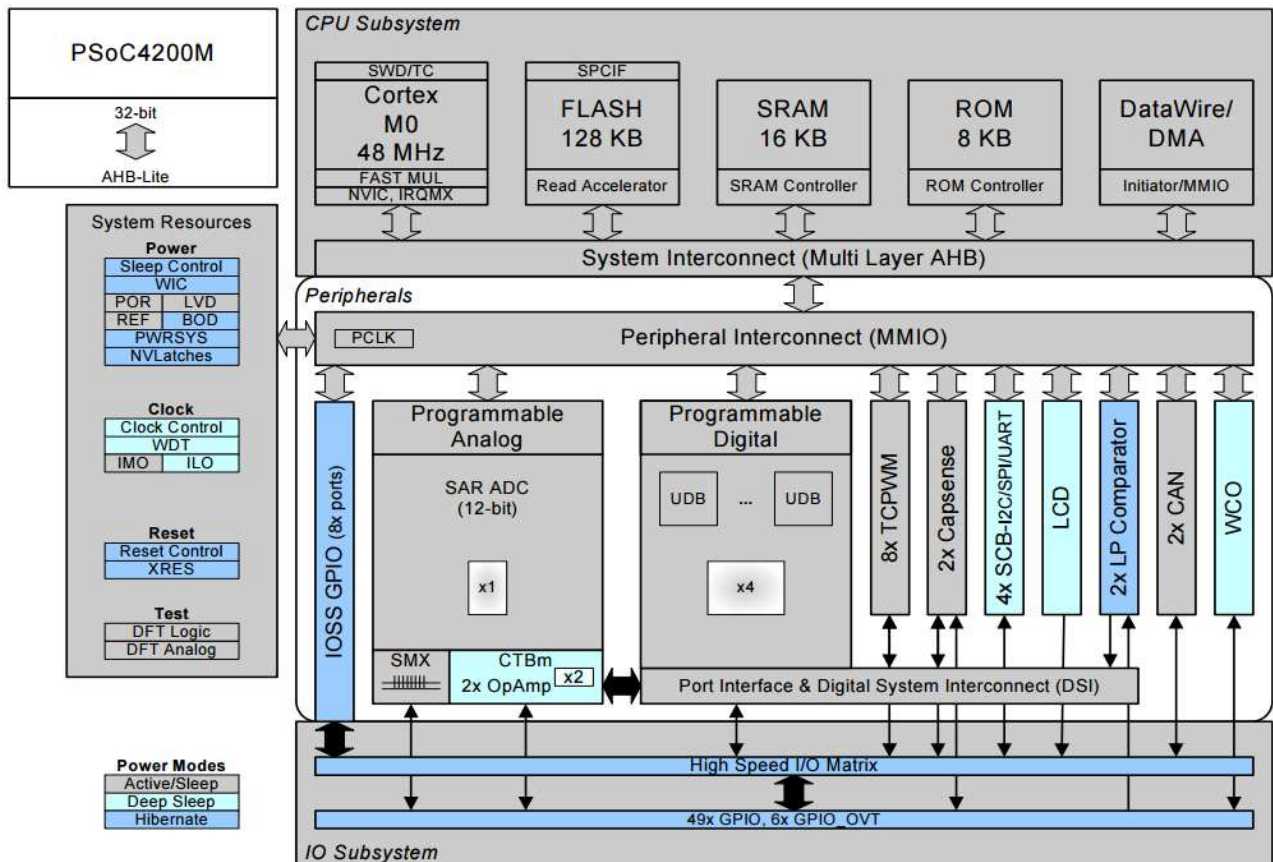


Figure 3-2 shows the block diagram for the PSoC 4 M-Series Pioneer Kit.

Figure 3-2. Block Diagram of PSoC 4 M-Series Pioneer Kit

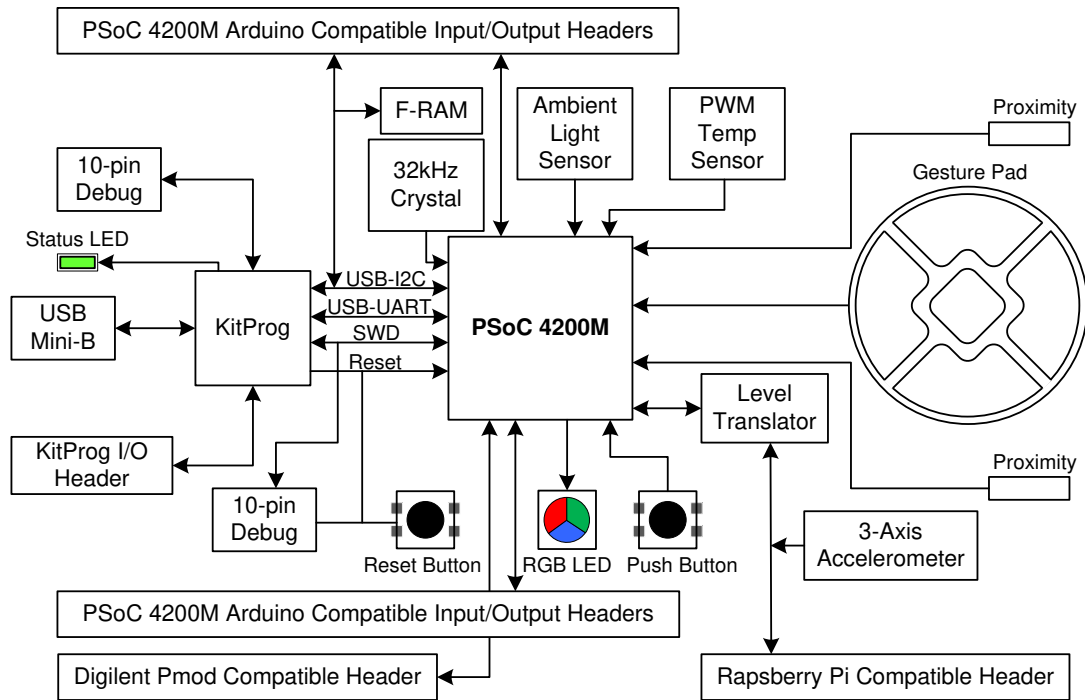
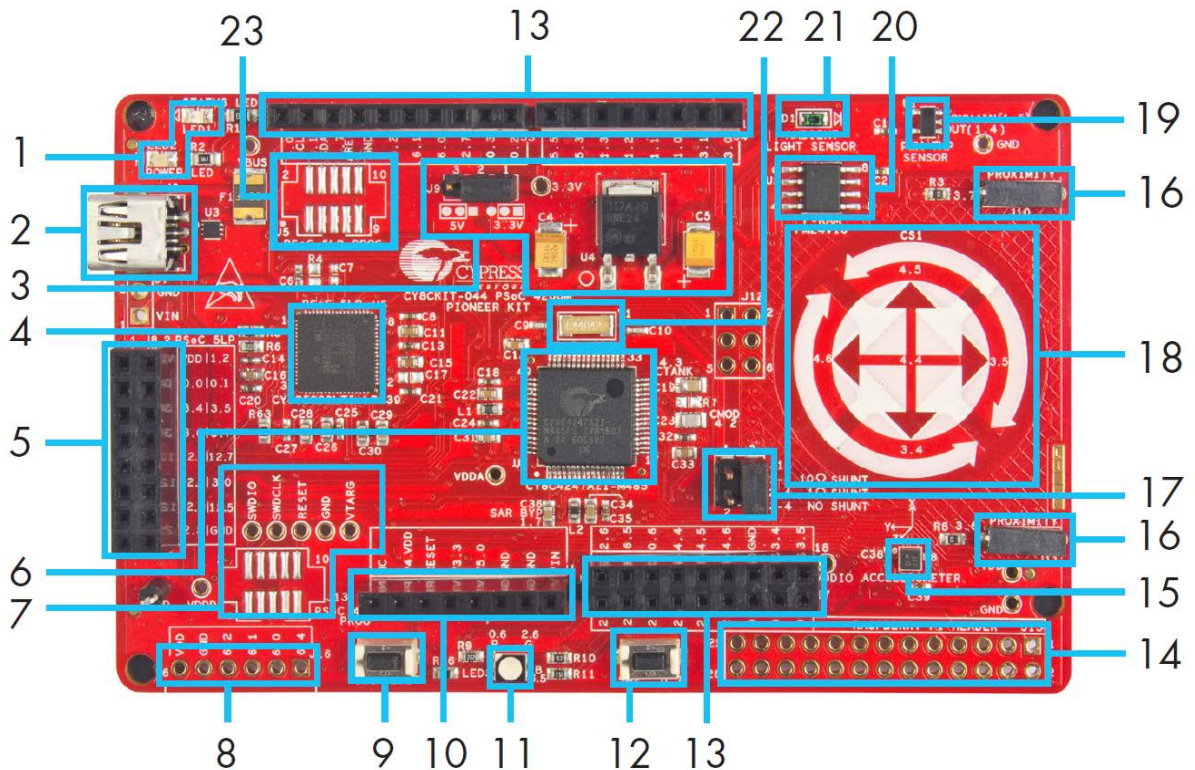


Figure 3-3. PSoC 4 M-Series Pioneer Kit Board Diagram



This kit has the following peripherals:

1. **Power and Status LED:** The amber power LED is turned on when the kit is connected to a power source. The green status LED indicates the status of the [KitProg](#).
2. **USB Mini-B connector:** The USB cable provided along with the PSoC 4 M-Series Pioneer Kit connects between this connector and the PC.
3. **Power Supply:** The kit can operate at two voltage levels, 3.3 V and 5 V. The power selection jumper J9 is used to select between the two voltage levels. The kit has an onboard 3.3-V Low Drop Out (LDO) regulator that converts the 5-V input to 3.3 V.
4. **KitProg:** The KitProg is a multi-functional system, which includes a programmer, debugger, USB-I2C bridge, and a USB-UART bridge. Refer to the *KitProg User Guide* in the installation folder `<Install_Directory>\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit\<version>\Documentation\KitProg_User_Guide.pdf` for more details on the KitProg.
5. **KitProg (PSoC 5LP) I/O Header:** This header brings out a few Input/Output lines of the onboard PSoC 5LP device. This includes the KitProg USB-I2C bridge lines and USB-UART bridge lines. The additional PSoC 5LP pins are direct connections to the internal programmable analog logic of PSoC 5LP. You can use these pins as General-purpose input/output (GPIO) also. For more details on the KitProg functionality, refer to the *KitProg User Guide*.
6. **PSoC 4200M:** This kit is designed to highlight the features of [PSoC 4200M](#).
7. **10-pin programming header for PSoC 4200M:** This header allows you to program/debug the PSoC 4200M using an external programmer such as [MiniProg3](#). PSoC 4 M-Series Pioneer Kit also has through-hole test points to allow you to program and debug external PSoC 4 and PSoC 5LP devices using the KitProg. You must remove the zero-ohm resistors R51, R53, and R55 to disconnect the connection between KitProg and the onboard PSoC 4200M device before programming an external PSoC.
8. **Digilent Pmod Peripheral Module compatible header:** This header allows you to connect to the PSoC 4200 device to Pmod Peripheral Modules through I2C and SPI interfaces.
9. **Reset Button:** This button is used to reset the PSoC 4200M device.
10. **Arduino Uno Shield compatible power header:** This header powers third-party Arduino Shields. This header also has a provision to power the PSoC 4 M-Series Pioneer Kit through the VIN input on the header.
11. **RGB LED:** The onboard RGB LED can be controlled from the PSoC 4200M device.
12. **User Button:** This button can be used to provide input to the PSoC 4200M. Note that the switch connects the PSoC 4200M pin to ground when pressed, so you need to configure the PSoC 4200M pin as resistive pull-up for detecting the switch press.
13. **Arduino Uno Shield compatible I/O headers:** The PSoC 4 M-Series Pioneer Kit is compatible and operates flawlessly with third-party Arduino Shields.
14. **Raspberry Pi compatible header:** A header which is compatible with Raspberry Pi Model B is included on the kit for enabling advanced embedded systems. A Raspberry Pi can communicate to the PSoC 4200M device using I2C, SPI, or UART communication protocols. One of the applications of this header is to enable the PSoC 4200M to act as an analog input processor for Raspberry Pi. The PSoC 4200M, with its CapSense capability, can also enable user interface functions such as gesture and proximity detection.
15. **3-Axis Accelerometer:** This kit features a 3-Axis digital accelerometer device from Kionix[®] (KXTJ2-1009). The accelerometer is interfaced to the PSoC 4200M using the I2C protocol.
16. **CapSense Proximity Headers:** These headers are located on both sides of the CapSense Gesture Pad. They can be used as individual proximity sensors or can be used together to detect CapSense proximity gestures. The example project included with this kit demonstrates the detection of wave up and wave down proximity gestures. Remember to connect wires into the proximity headers before using the proximity functionality. Note that if these inputs are not used for proximity sensing, then the connectors and the associated I/Os are available for general-purpose use.
17. **Current Measurement Jumper:** This jumper can be used to measure the current consumed by the PSoC 4200M device by connecting an ammeter between the pins 3 and 4 of the jumper. Remember to connect the jumper between pin 3 and pin 4 if the current measurement functionality is not used.
18. **CapSense Gesture Pad:** The CapSense Gesture Pad is a five-element CapSense peripheral specifically intended for touch gesture recognition. This peripheral can be used to detect swipe left, swipe right, swipe up, swipe down, clockwise swipe, and counter-clockwise swipe gestures.

Note: The Gesture Pad can also be used as five individual capacitive touch buttons. The Gesture Pad is not intended to be used as a radial slider.

19. PWM Temperature Sensor: The kit features a digital temperature sensor from Analog Devices (TMP05). This sensor measures the ambient temperature and reports it to the PSoC 4200M device by varying duty cycle of the PWM output generated by the sensor.
20. F-RAM: This kit features a Cypress F-RAM device of 1 Mb capacity. The F-RAM is connected to the I2C interface of the PSoC 4200M device. The Cypress F-RAM device can be used similar to an external EEPROM memory for data logging operations. The F-RAM can also be used for bootloading the PSoC 4200M device.
21. Ambient Light Sensor: This is a photodiode connected in photoconductive mode to detect variations in the ambient light intensity. The conductivity of this sensor increases when the ambient light intensity increases and results in a higher current flow through the sensor. The PSoC 4200M internal opamps are used to implement a current to voltage converter to detect these current variations. The resultant output voltage is measured using the internal SAR ADC of the PSoC 4200M device to determine the ambient light intensity. Refer to the TEMD6200FX01 datasheet from Vishay® Semiconductors for more information on the electrical characteristics of the sensor.
22. 32-kHz Crystal Oscillator: The PSoC 4 M-Series Pioneer Kit has a 32-kHz crystal oscillator to provide an accurate low-frequency clock for the 4200M device.
23. 10-pin programming header for PSoC 5LP: This header is used to program/debug the PSoC 5LP using an external programmer such as [MiniProg3](#).

The subsequent sections explain the method to interface the PSoC 4 M-Series Pioneer Kit to a PC.

3.2 KitProg

The KitProg is a multi-functional system, which includes a programmer, debugger, USB-I2C bridge, and a USB-UART bridge. The PSoC 4 M-Series Pioneer Kit also supports Mass Storage Programming using KitProg. Cypress PSoC 5LP device is used to implement KitProg functionality. The KitProg is integrated in most PSoC development kits. For more details on the KitProg functionality, refer to the *KitProg User Guide* in the kit installation directory: <Install_Directory>\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit\<version>\Documentation\KitProg_User_Guide.pdf.

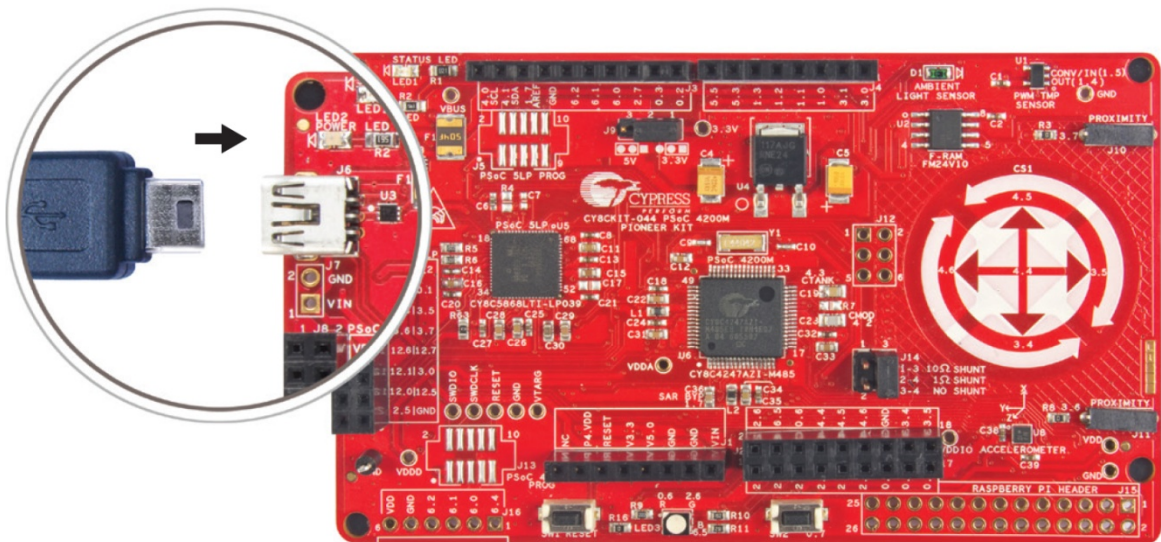
3.3 Programming and Debugging PSoC 4200M Device

The PSoC 4 M-Series Pioneer Kit can be programmed and debugged using the KitProg. Before programming the device, ensure that PSoC Creator and PSoC Programmer software are installed on the PC. See the [Install Software](#) section for more information.

3.3.1 Programming using PSoC Creator

1. Connect the USB cable into the USB connector, J6, as shown in [Figure 3-4](#). The kit enumerates as a composite device if you are plugging in the PSoC 4 M-Series Pioneer Kit to your PC for the first time.

Figure 3-4. Connect USB Cable to J6



2. Open the desired project in PSoC Creator. For this, go to **File > Open > Project/Workspace**. This provides the option to browse to and open your saved project.
3. Select the option **Build > Build Project** or pressing **[Shift] [F6]** to build the project.
4. If there are no errors during build, program the firmware into the kit by choosing **Debug > Program** or pressing **[Ctrl] [F5]**. This programs the device on the PSoC 4 M-Series Pioneer Kit.

3.3.2 Debugging using PSoC Creator

PSoC Creator has an integrated debugger. You can start the debugger by selecting **Debug > Debug** or by pressing **[F5]**. Refer to section 3.2 of the [KitProg User Guide](#) for a detailed explanation on how to debug using PSoC Creator.

3.3.3 Programming using PSoC Programmer

PSoC Programmer (3.22.2 or later) can be used to program existing *.hex* files into the PSoC 4 M-Series Pioneer Kit. Refer to section 3.3 of the [KitProg User Guide](#) for a detailed explanation on how to program using PSoC Programmer.

3.4 USB-UART Bridge

The KitProg on the PSoC 4 M-Series Pioneer Kit can act as a USB-UART bridge. The UART lines between the PSoC 4200M and the KitProg are hard-wired on the board, with UART_RX assigned to **P7[0]** and UART_TX assigned to **P7[1]** on PSoC 4200M. For more details on the KitProg USB-UART functionality, refer to the [KitProg User Guide](#).

3.5 USB-I2C Bridge

The KitProg can function as a USB-I2C bridge and communicate with the software utility Bridge Control Panel (BCP). The I2C lines on PSoC 4200M device are **P4[1] (SDA)** and **P4[0] (SCL)**, which are hardwired on the board to the I2C lines of the KitProg. The USB-I2C supports I2C speeds of 50 kHz, 100 kHz, 400 kHz, and 1 MHz. For more details on the KitProg USB-I2C functionality, refer to the [KitProg User Guide](#).

3.6 Mass Storage Programmer

The KitProg in PSoC 4 M-Series Pioneer Kit supports programming through a USB Mass Storage interface. This interface allows you to program the PSoC 4200M by copying *.hex* files into an emulated USB Mass Storage device. For more details on KitProg Mass Storage Programmer, refer to the [KitProg User Guide](#).

3.7 Updating the KitProg Firmware

The KitProg firmware normally does not require any update. You can use the PSoC Programmer software to update the KitProg firmware. Refer to the [KitProg User Guide](#) for a detailed explanation on how to update the KitProg firmware.

4. Example Projects



The CY8CKIT-044 PSoC 4 M-Series Pioneer Kit includes six example projects. This chapter explains how to use these example projects.

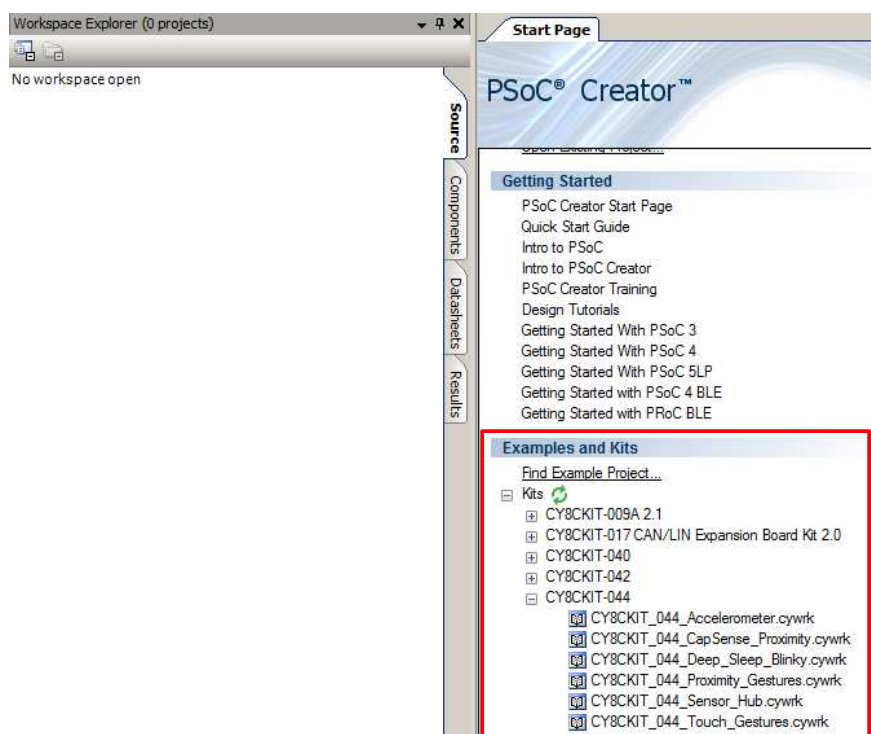
4.1 Using the Kit Example Projects

To access the example projects, download and install the CY8CKIT-044 PSoC 4 M-Series Pioneer Kit setup file from the kit [web page](#). After installation, the example projects are available in the *Firmware* folder in the installation directory.

Follow these steps to open and use the example projects.

1. Launch PSoC Creator from **Start > All Programs > Cypress > PSoC Creator <version> > PSoC Creator <version>**.
2. On the Start page, click **CY8CKIT-044** under **Examples and Kits > Kits**. A list of example projects appears, as shown in [Figure 4-1](#).
3. Click on the desired example project, select a location to save the project and click **OK**.

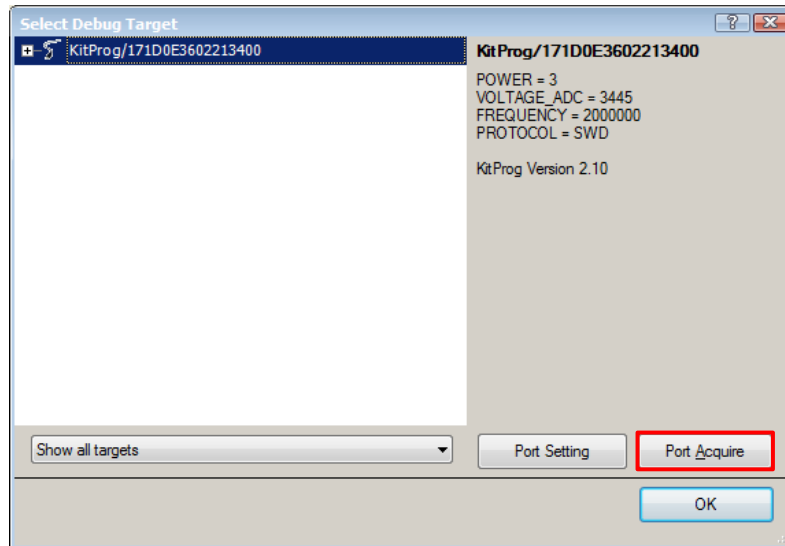
Figure 4-1. Open Example Project from PSoC Creator



4. Build the example project by choosing **Build > Build <Project Name>**. A *.hex* file is generated after the build process.
5. Connect the PSoC 4 M-Series Pioneer Kit to the PC using the USB cable connected to connector J6 as shown in [Figure 3-4](#), to program the kit with this example project.
6. Choose **Debug > Program** in PSoC Creator.

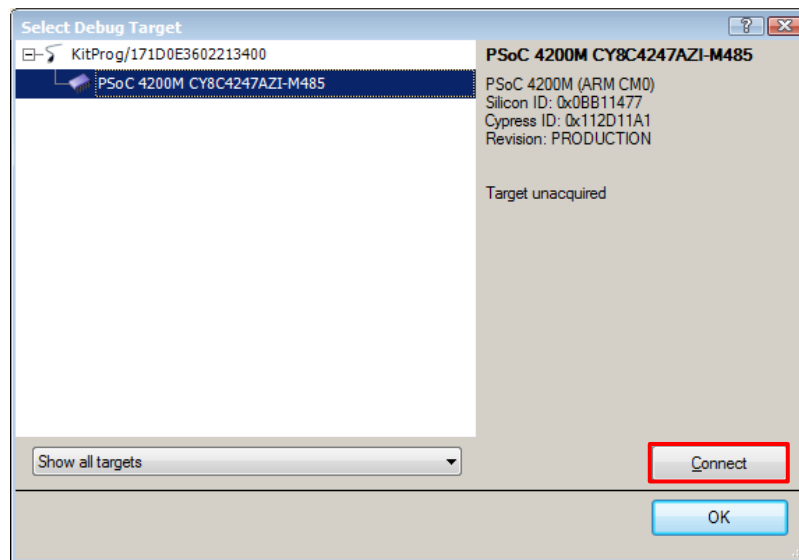
- If the device is already acquired, programming will complete automatically – the result will appear in the PSoC Creator status bar at the bottom left side of the screen. If the device is yet to be acquired, the Select Debug Target window will appear. Select **KitProg/<serial number>** and click the **Port Acquire** button, as shown in [Figure 4-2](#).

Figure 4-2. Port Acquire



- After the device is acquired, it is shown in a tree structure below the **KitProg/<serial number>**. Click the **Connect** button and then **OK** to exit the window and start programming, as shown in [Figure 4-3](#).

Figure 4-3. Connect Device From PSoC Creator and Program



4.2 Using the Micrium® μ C/Probe™ Projects

The Micrium μ C/Probe is a revolutionary software development tool that incorporates Micrium’s proprietary Graphical Live Watch to graphically visualize the internals of any embedded system. With μ C/Probe, you can test your embedded design effortlessly, with a few mouse clicks. Cypress provides pre-designed μ C/Probe project (workspace) files for all the example projects associated with the PSoC 4 M-Series Pioneer Kit except the [Deep-Sleep Blinky](#) example project. These projects can be found in the kit installation directory in the following folder:

```
<Install_Directory>\Cypress\CY8CKIT-044 PSoC 4 M-Series Pioneer Kit\1.0\Firmware\PSoC 4200M\uC Probe Workspace\
```

Refer to the [Appendix](#) for more details on how to use the Micrium μ C/Probe. To learn more about the μ C/Probe, visit: micrium.com/tools/ucprobe/overview.

Note: When using μ C/Probe with CapSense example projects provided with this kit, ensure that the line `#define uCProbeEnabled` is set to TRUE instead of FALSE in the firmware (*main.c* file).

4.3 Deep-Sleep Blinky

4.3.1 Project Description

This project demonstrates the Deep-Sleep low-power mode of the PSoC 4200M device. The PSoC 4200M device is configured to be in Deep-Sleep power mode and wakes-up once every second. The PSoC 4200M toggles the state of the GPIO each time the device wakes up from Deep-Sleep power mode. The GPIO is connected to the LED on the kit which turns on and off depending upon the GPIO state. The project also demonstrates the method to calibrate the ILO clock based on the IMO clock signal for better ILO accuracy. The calibrated LFCLK is used to source the Watchdog Timer.

4.3.2 Hardware Connections

No specific hardware connections are required for this project. All connections are hardwired on the board.

4.3.3 Verify Output

To verify the Deep-Sleep Blinky example project, follow these steps.

1. Power the PSoC 4 M-Series Pioneer Kit through USB connector J6.
2. Program the PSoC 4 M-Series Pioneer Kit with the *CY8CKIT_044_Deep_Sleep_Blinky* example project.
3. After programming successfully, you will see the green LED toggling state every one second.
4. Power off the PSoC 4 M-Series Pioneer Kit by unplugging the USB cable. Remove the jumper shunt from power measurement jumper of PSoC 4200M on the PSoC 4 M-Series Pioneer Kit (J14).
5. Connect an ammeter across the terminals 3 and 4 of the power measurement header, as shown in [Figure 4-4](#).

Figure 4-4. Current Measurement When Powered From USB Port

