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CY8CKIT-041-40XX

PSoC® 4 S-Series Pioneer Kit Guide

Doc. # 002-10238 Rev. *B

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Safety Information



Regulatory Compliance

The CY8CKIT-041-40XX PSoC[®] 4 S-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. This may cause interference to other electrical or electronic devices in close proximity. In a domestic environment, this product may cause radio interference. In such cases, you may be required to take adequate preventive measures. In addition, 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 PSoC 4 S-Series Pioneer Kit, as shipped from the factory, has been verified to meet with the requirements of CE as a Class A product.



The PSoC 4 S-Series Pioneer Kit contains electrostatic discharge (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 PSoC 4 S-Series Pioneer kit in the protective shipping package.



End-of-Life/Product Recycling

The end-of life for this kit is five years from the date of manufacture mentioned as bar code on the back of the box. Contact your nearest recycler for discarding the kit.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. Cypress recommends that you 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

PSoC 4 S-Series Pioneer Kit 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-041-40XX PSoC[®] 4 S-Series Pioneer Kit. This kit enables you to evaluate and develop your application using the PSoC 4000S device family.

The PSoC 4000S device family is an expansion to the PSoC 4 device family. PSoC 4000S 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 S-Series Pioneer Kit offers footprint-compatibility with Arduino[™] shields. This kit features a CapSense[®] trackpad, two CapSense buttons, a CapSense proximity sensor that lets you evaluate Cypress's fourth-generation CapSense technology, an RGB LED, two user-configurable push-button switches, potentiometer, an onboard programmer/debugger with USB-UART/I2C bridge functionality block (KitProg2), a Cypress F-RAM[™], an EZ-BLE[™] PSoC[™] Module, and a rechargeable battery. This kit supports operating voltages of 1.9 V, 3 V (battery), 3.3 V or 5 V.

You will use PSoC Creator[™] to develop and debug your PSoC 4000S device projects. PSoC Creator is Cypress's 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-041-40XX PSoC 4 S-Series Pioneer Kit contains the following, as shown in [Figure 1-1](#).

- PSoC 4 S-Series Pioneer Kit
- USB Standard-A to Micro-B cable
- Water dropper
- Four press-fit connectors (one 8x2, one 10x1, two 8x1)
- Four jumper wires
- Quick Start Guide

Figure 1-1. Kit Contents

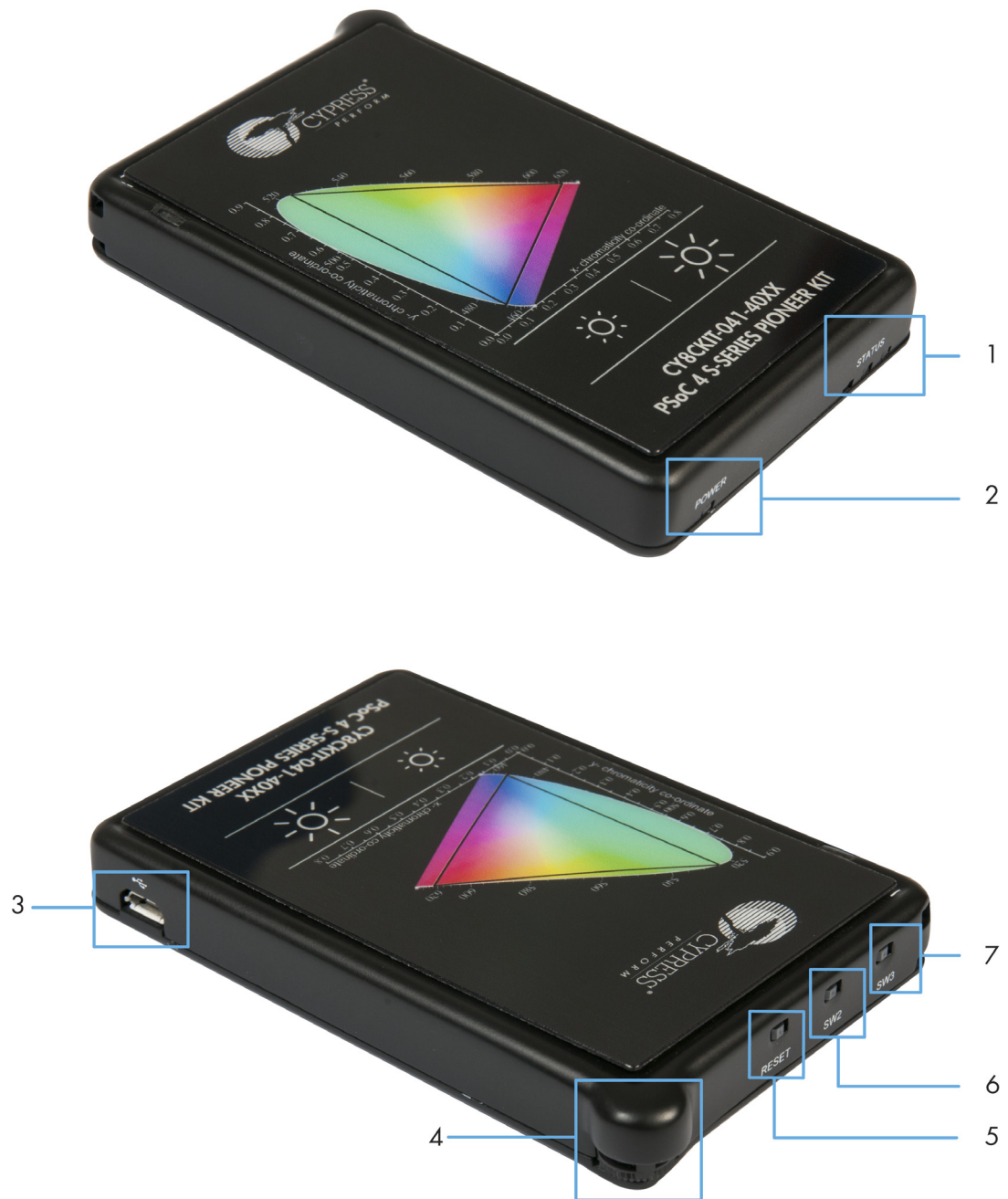


Inspect the contents of the kit; if you find any part missing, contact your nearest Cypress sales office for help: www.cypress.com/support.

1.2 Board Details

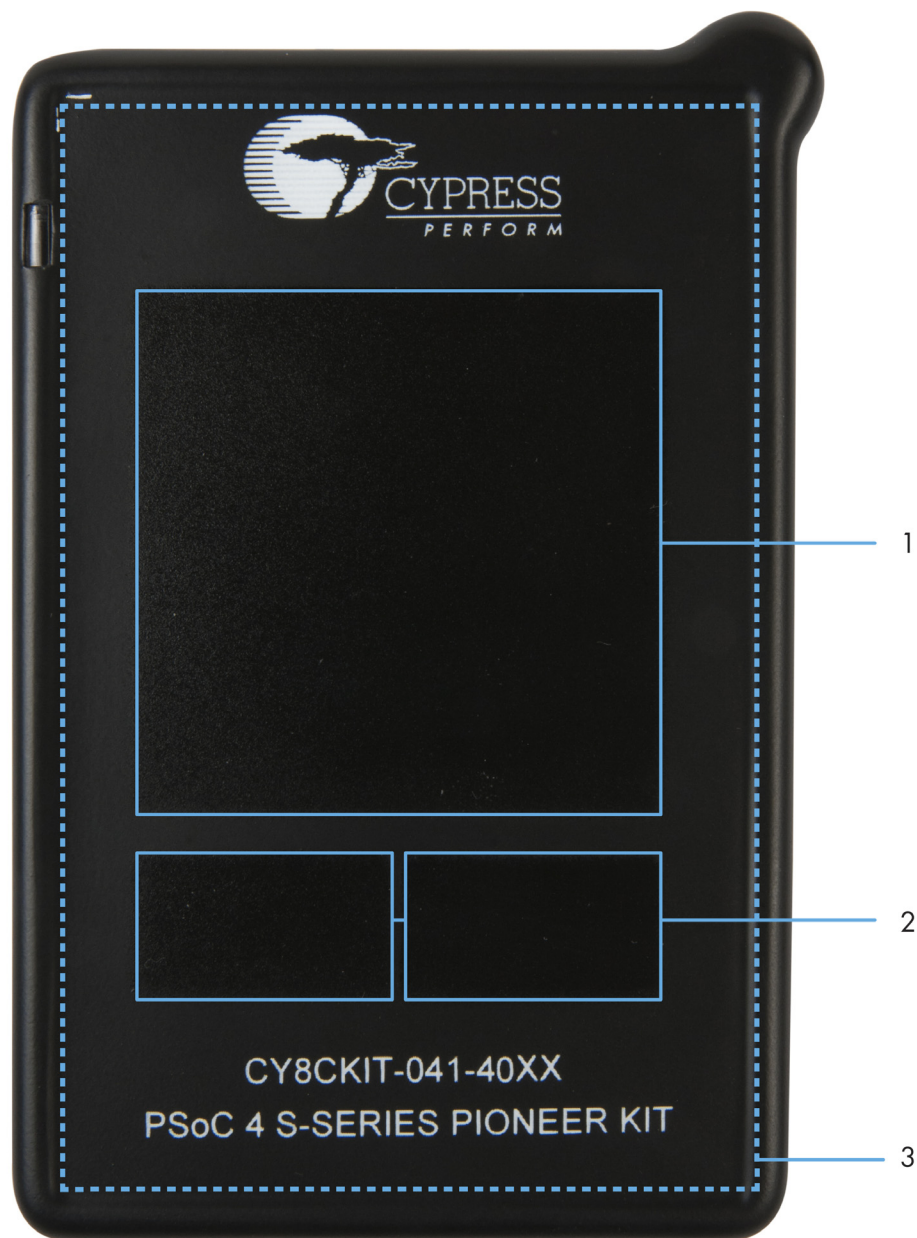
As shown in [Figure 1-2](#), the PSoC 4 S-Series Pioneer Kit features a CapSense trackpad, two CapSense buttons, and a proximity sensor loop (not visible on the case) that lets you evaluate Cypress's fourth-generation CapSense technology. The kit has two user buttons, an RGB LED and a potentiometer that can be used in your applications. It also has a reset button and three status LEDs. The kit can be powered from three power sources: USB connector, rechargeable battery or external power supply. The kit can operate at 1.9 V, 3.3 V, and 5 V when powered from the USB connector or external power supply and will operate at 3 V when powered from the battery. The USB connector is also used for programming and debugging your application on PSoC 4000S.

Figure 1-2. PSoC 4 S-Series Pioneer Kit



- | | |
|-----------------------------------|-------------------------|
| 1. KitProg2 Status LEDs | 4. Potentiometer |
| 2. Power LED | 5. Reset button |
| 3. KitProg2 USB Micro-B connector | 6. User button |
| | 7. KitProg2 user button |

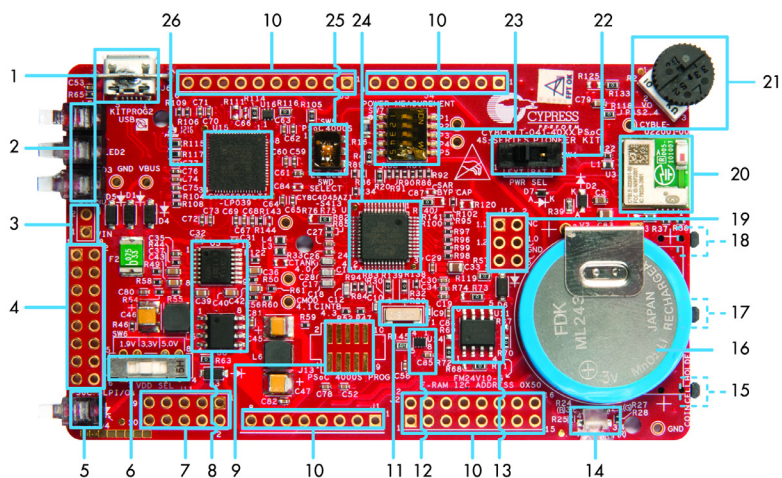
Figure 1-3. PSoC 4 S-Series Pioneer Kit without Overlay



- | | |
|----------------------|--------------------------|
| 1. CapSense trackpad | 2. CapSense buttons |
| | 3. Proximity sensor loop |

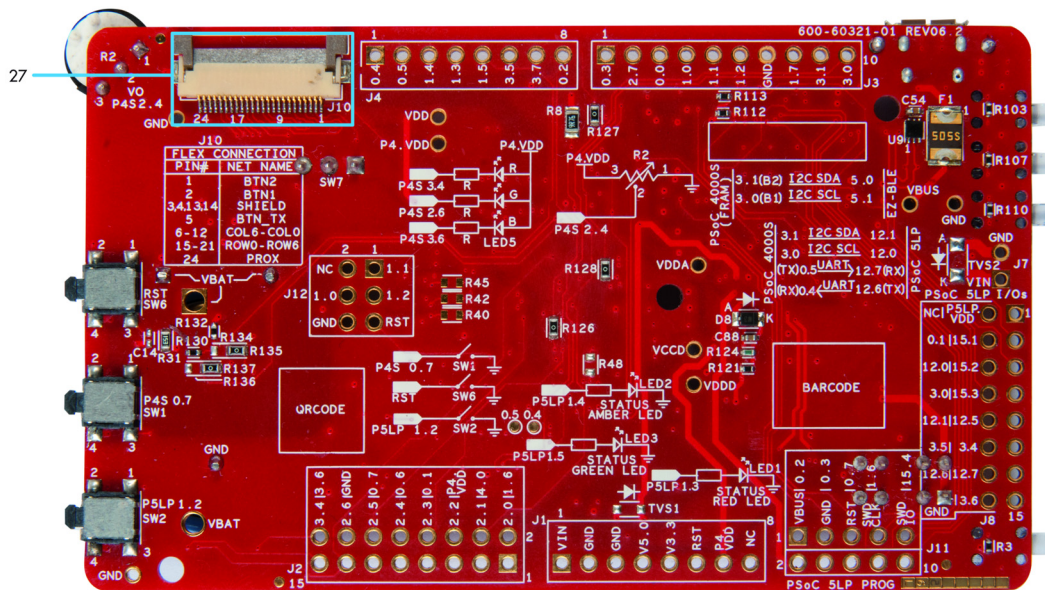
Note: The above figure shows the kit without color gamut overlay

Figure 1-4. PSoC 4 S-Series Pioneer board (Top View)



- | | |
|---|---|
| 1. KitProg2 USB Micro-B connector (J6) | 14. RGB LED (LED5) |
| 2. KitProg2 status LEDs (LED1, LED2 and LED3) | 15. KitProg2 user button (SW3) |
| 3. External power supply header (J7) | 16. Rechargeable battery (ML2430-HS1, V2) |
| 4. KitProg2 (PSoC 5LP) I/O header (J8) | 17. User Button (SW2) |
| 5. Power LED (LED4) | 18. Reset button (SW1) |
| 6. System power (VDD) selection switch (SW6) | 19. Arduino ICSP compatible header (J12) |
| 7. KitProg2 custom application/programming header (J11) | 20. EZ-BLE™ PSoC™ Module (CYBLE-022001-00, U3) |
| 8. Voltage regulator circuit | 21. Potentiometer (R2) |
| 9. PSoC 4000S 10-pin program and debug header (J13) | 22. VDD source selection switch (SW4) |
| 10. Arduino™ compatible power and I/O headers (J1, J2, J3 and J4) | 23. Current measurement selection switch (SW7) |
| 11. 32.768 kHz crystal oscillator (Y1) | 24. PSoC 4000S (U1) |
| 12. Voltage Level Translator for F-RAM (U14) | 25. Programming target (PSoC 4000S/EZ-BLE PSoC) module selection switch (SW5) |
| 13. Cypress F-RAM 1Mb (FM24V10-G, U11) | 26. KitProg2 (PSoC 5LP) programmer and debugger (U15) |

Figure 1-5. PSoC 4 S-Series Pioneer board (Bottom View)



27. Flex connector

Figure 1-6. PSoC 4 S-Series Pioneer Board Pinout

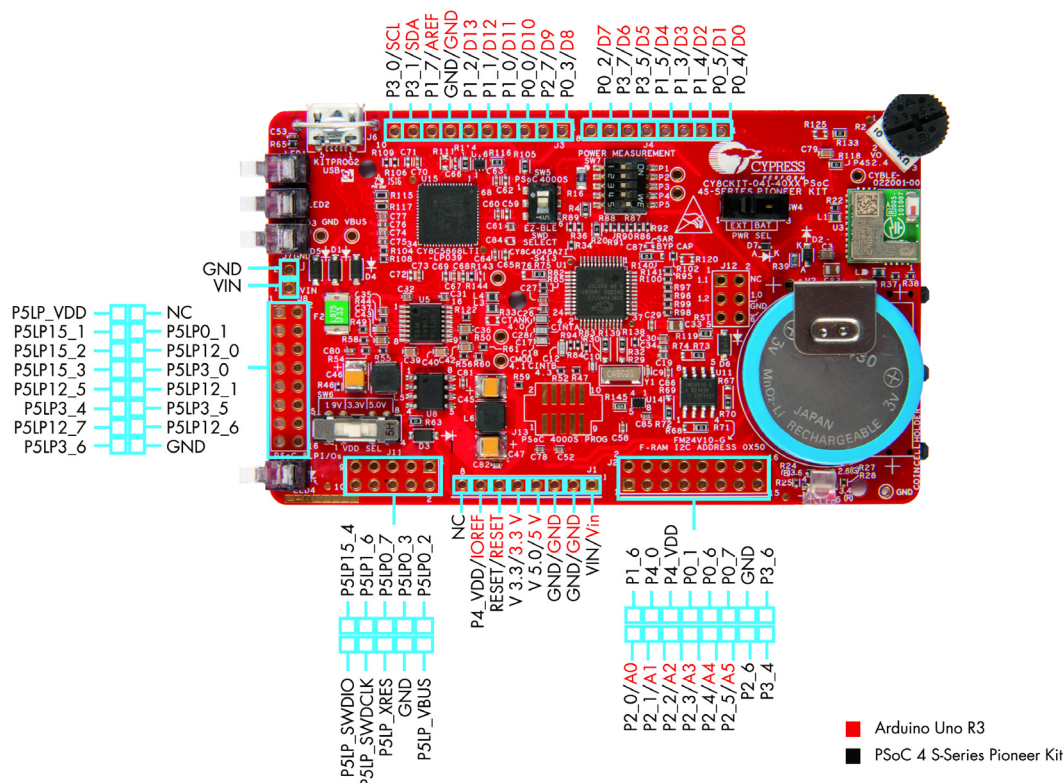


Table 1-1. Jumpers/Switches Default Position

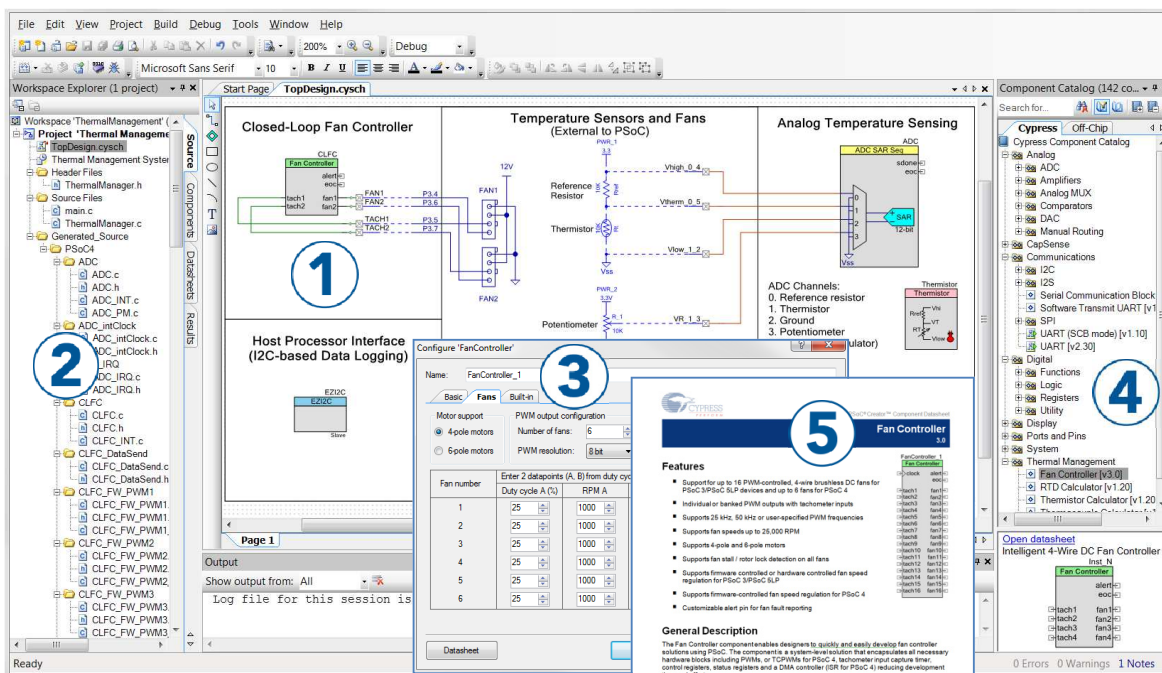
Jumper/Switch	Purpose	Default Position
SW4 (PWR SEL)	VDD Source Selection	EXT (VREG/VBUS)
SW5	Programming Target Selection	PSoC 4000S
SW6	System Power (VDD) Selection	5 V
SW7	Current Measurement Selection	Switches P1, P2, P3, and P4 – OFF; Switch P5 – ON

1.3 PSoC Creator

PSoC Creator is a state-of-the-art, easy-to-use IDE. It introduces revolutionary hardware and software co-design, powered by a library of fully verified and characterized PSoC Components™, as shown in Figure 1-7. With PSoC Creator, you can:

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

Figure 1-7. 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 examples. These examples are accessible from the PSoC Creator Start Page, as shown in [Figure 1-8](#).

Code examples can speed up your design process by starting you off with a complete design. The code examples also show how to use PSoC Creator Components for various applications. Code examples and documentation are included, as shown in [Figure 1-9](#).

In the **Find Code Example** dialog shown in [Figure 1-9](#), 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 on the **Sample Code** tab. You can also copy and paste code from this window to your project, which can help speed up code development.
- Create a new workspace for the code example or add to your existing workspace. 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 1-8. Code Examples in PSoC Creator

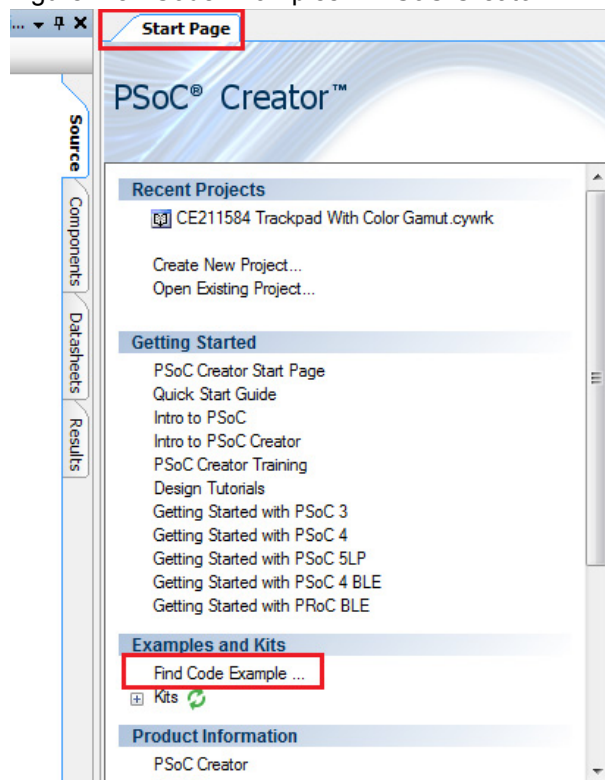
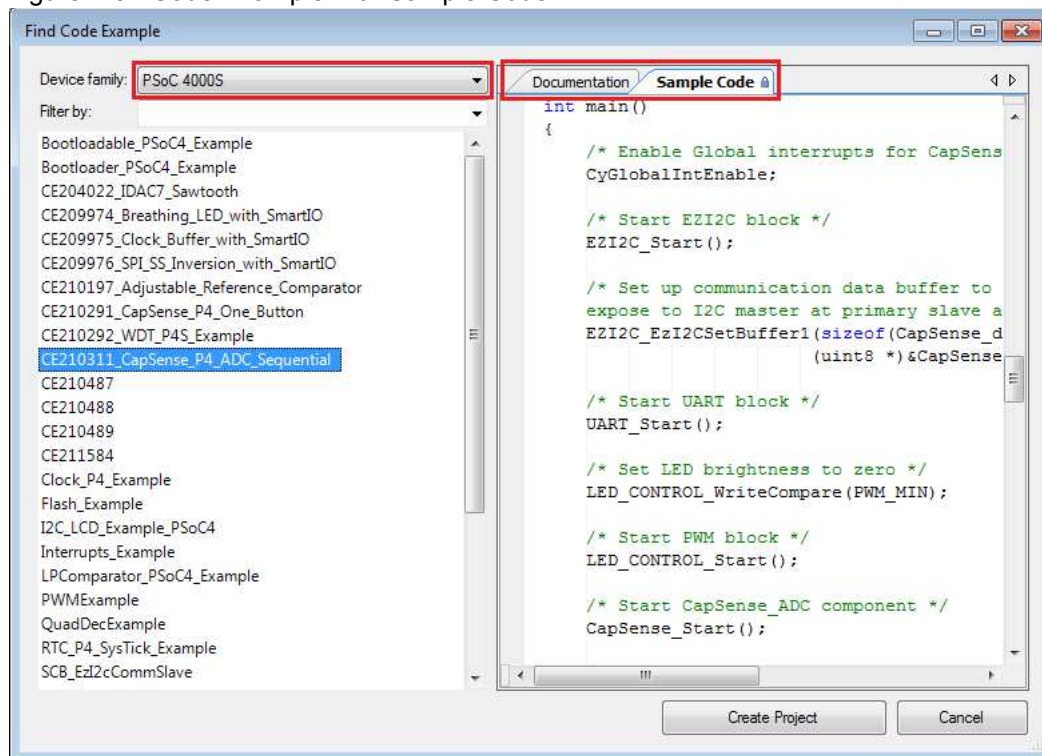


Figure 1-9. Code Example with Sample Code



1.3.2 Kit Code Examples

You can access the installed kit code examples from the PSoC Creator Start Page. To access these examples, expand the Kits under the section Examples and Kits; then, expand the specific kit to see the code examples. Refer to the [Code Examples chapter on page 32](#) for a list of code examples that you can use on this kit.

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 Code Examples:** Choose **File > Code Example**. These examples demonstrate how to configure and use PSoC Creator Components. To access examples related to a specific Component, right-click on the Component in the schematic or in the Component Catalog. Select the **Find Code Example** option in the context menu that appears.
- **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 PSoC 4 S-Series Pioneer Kit:

- The [Software Installation chapter on page 17](#) 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 on page 20](#) describes the major features of the PSoC 4 S-Series Pioneer Kit and functionalities such as programming, debugging, and the USB-UART and USB-I2C bridges.
- The [Code Examples chapter on page 32](#) describes multiple PSoC 4000S code examples that will help you understand how to create your own PSoC 4 projects.
- The [Appendix on page 36](#) provides the detailed hardware description, method to use the onboard F-RAM, method to use the on board EZ-BLE PSoC Module, 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](#), [PSoC 4200M](#), [PSoC 4200L](#), [PSoC 4000S](#) and [PSoC 4100S](#) 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 on page 12](#).
- [Technical Reference Manuals \(TRM\)](#): Provide detailed descriptions of the architecture and registers in each PSoC 4 device family.
- [Development Kits](#):
 - [CY8CKIT-041-40XX](#), [CY8CKIT-041-41XX](#), [CY8CKIT-046](#), [CY8CKIT-044](#), [CY8CKIT-042](#) and [CY8CKIT-040](#) are easy-to-use and inexpensive development platforms. These kits include connectors for Arduino-compatible shields. Additionally, [CY8CKIT-046](#), [CY8CKIT-044](#), and [CY8CKIT-042](#) include connectors for Digilent Pmod Peripheral Modules.
 - [CY8CKIT-049](#), [CY8CKIT-043](#) and [CY8CKIT-145-40XX](#) are 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.
- Visit www.cypress.com/training for a set of tutorials, including PSoC Creator training. Each tutorial is a series of videos that provide practical examples on various topics starting with basic concepts and moving on to more advanced features.

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).

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

- [Self-help \(Technical Documents\)](#)
- [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\iccc\
<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
BLE	Bluetooth Low Energy
BOM	Bill of Materials
CINT	Integration Capacitor
CMOD	Modulator Capacitor
CPU	Central Processing Unit
CSD	CapSense Sigma Delta
CTANK	Shield Tank Capacitor
DC	Direct Current
Del-Sig	Delta-Sigma
ESD	Electrostatic Discharge
F-RAM	Ferroelectric Random Access Memory

Table 1-3. Acronyms Used in this Document (*continued*)

Acronym	Definition
FPC	Flexible Printed Circuit
GPIO	General-Purpose Input/Output
HID	Human Interface Device
I ² C	Inter-Integrated Circuit
IC	Integrated Circuit
ICSP	In-Circuit Serial Programming
IDAC	Current Digital-to-Analog Converter
IDE	Integrated Development Environment
LED	Light-emitting Diode
PC	Personal Computer
PTC	Positive Temperature Coefficient
PRoC	Programmable Radio-on-Chip
PSoC	Programmable System-on-Chip
PWM	Pulse Width Modulation
RGB	Red Green Blue
SAR	Successive Approximation Register
SPI	Serial Peripheral Interface
SRAM	Serial Random Access Memory
SWD	Serial Wire Debug
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
WCO	Watch Crystal Oscillator

2. Software Installation



This chapter describes the steps to install the software tools and packages on a PC for using the PSoC 4 S-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 PSoC 4 S-Series Pioneer Kit software:

1. Download the CY8CKIT-041-40XX PSoC 4 S-Series Pioneer Kit software from www.cypress.com/CY8CKIT-041. The kit software is available in three different formats for download.
 - a. **CY8CKIT-041-40XX Kit Complete Setup:** This installation package contains the files related to the kit including PSoC Creator and PSoC Programmer. 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-041-40XX 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-041-40XX 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 on 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 computer. 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.

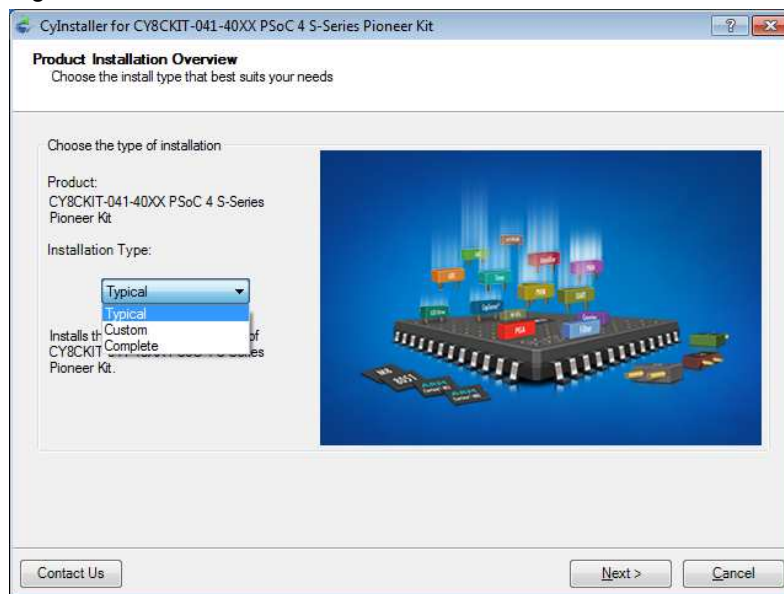
- Click **Install CY8CKIT-041-40XX** to start the PSoC 4 S-Series Pioneer Kit installation, as shown in Figure 2-1.

Figure 2-1. Kit Installer Screen



- Select the folder in which you want to install the PSoC 4 S-Series Pioneer Kit-related files. Choose the directory and click **Next**.
- When you click **Next**, the installer automatically installs the required software, if it is not present on your computer. Following are the required software:
 - PSoC Creator 4.0 or later: This software is available for download separately at www.cypress.com/psoccreator.
 - PSoC Programmer 3.25 or later: This is installed as part of PSoC Creator installation or is available separately at www.cypress.com/programmer.
- Choose the **Typical**, **Custom**, or **Complete** installation type (select **Typical** if you do not know which one to select) 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-041-40XX PSoC 4 S-Series Pioneer Kit software installation.
10. After the installation is complete, the kit contents are available at the following location:
<Install_Directory>\CY8CKIT-041-40XX PSoC 4 S-Series Pioneer Kit

Default location:

Windows 7 (64-bit): C:\Program Files (x86)\Cypress\CY8CKIT-041-40XX PSoC 4 S-Series Pioneer Kit

Windows 7 (32-bit): C:\Program Files\Cypress\CY8CKIT-041-40XX PSoC 4 S-Series Pioneer Kit

Note: For Windows 7/8/8.1/10 users, the installed files and the folder are read only. To use the installed code examples, follow the steps outlined in the [Code Examples chapter on page 32](#). These steps will create an editable copy of the example in a path that you choose so the original installed example is not modified.

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; choose the product and select the **Uninstall/Change** button.

3. Kit Operation

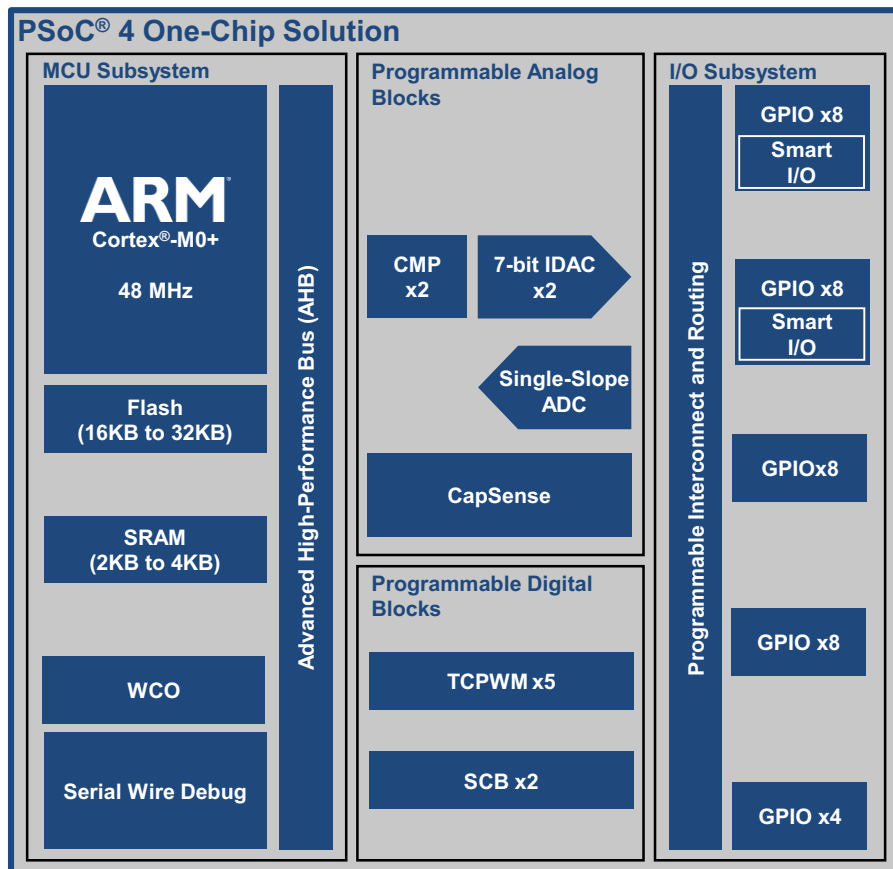


This chapter introduces you to the various features of the PSoC 4 S-Series Pioneer Kit, including the theory of operation and the onboard programming and debugging functionality, KitProg2 USB-UART and USB-I2C bridges.

3.1 Theory of Operation

The PSoC 4 S-Series Pioneer Kit is built around the PSoC 4000S device. [Figure 3-1](#) shows the block diagram of the PSoC 4000S device.

Figure 3-1. PSoC 4000S Block Diagram



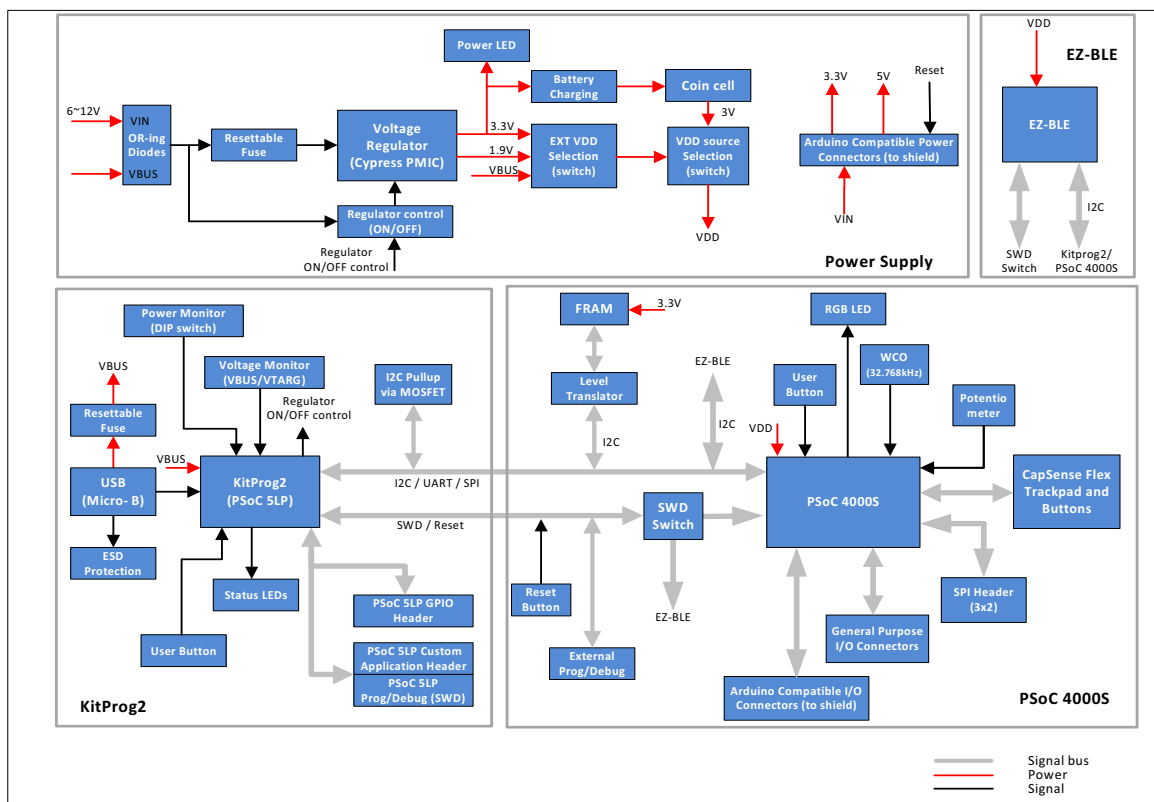
Given below is a list of major features of PSoC 4000S device.

- 32-Bit MCU Subsystem
 - 48-MHz ARM[®] Cortex[®]-M0+ CPU
 - Up to 32KB flash, 4KB SRAM
 - Real-time clock capability with a WCO
- Programmable Analog Blocks
 - One 10-bit, 46.8-Ksps Single-Slope ADC
 - Two low-power comparators (CMP)
 - One CapSense[®] block that supports low-power operation with self- and mutual-capacitance sensing
 - Two 7-bit IDACs configurable as a single 8-bit IDAC
- Programmable Digital Blocks
 - Five 16-bit Timer, Counter, PWM (TCPWM) blocks
 - Two serial communication blocks (SCBs) that are configurable as I²C, SPI or UART
- Packages
 - 25-ball WLCSP, 24-pin QFN, 32-pin QFN, 48-pin TQFP
 - Up to 36 GPIOs, including 16 Smart I/Os

Refer to the [PSoC 4000S datasheet](#) for details on device features.

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

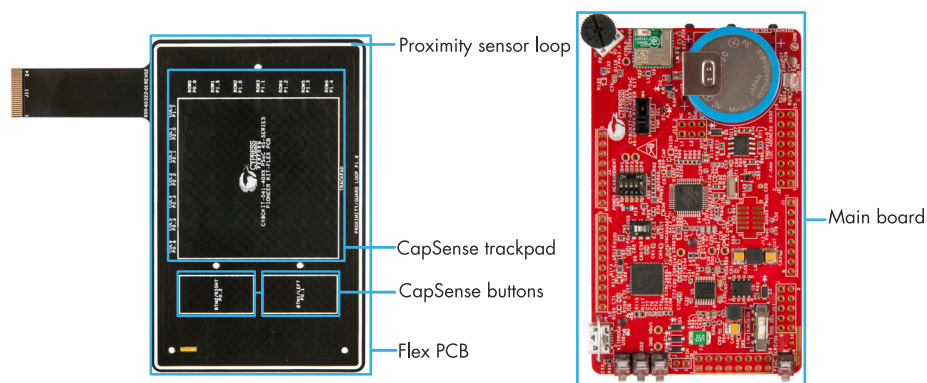
Figure 3-2. Block Diagram of PSoC 4 S-Series Pioneer Kit



The PSoC 4 S-Series Pioneer Kit comes with a case that houses the PSoC 4 S-Series Pioneer board (main board) and a Flex PCB. Refer to [How to open the Kit Case](#) chapter on page 26 for details on opening the case.

Figure 3-3 shows the markup of PSoC 4 S-Series Pioneer board and the CapSense Flex PCB.

Figure 3-3. PSoC 4 S-Series Pioneer Board and Flex PCB



- PSoC 4 S-Series Pioneer Board (main board):

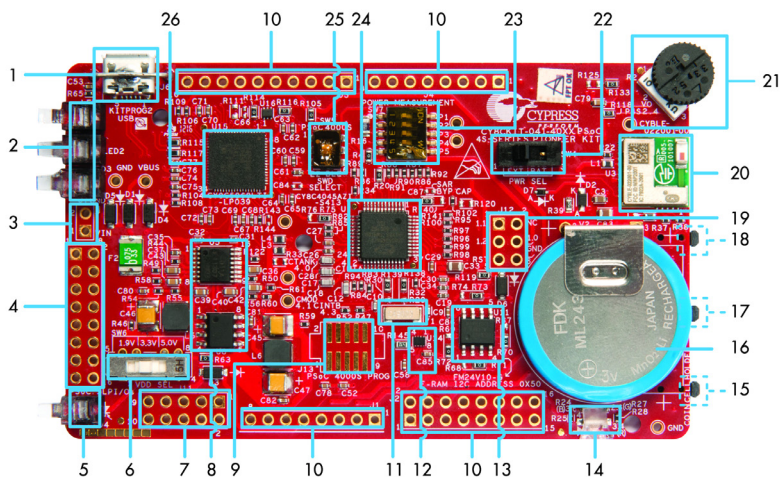
The PSoC 4 S-Series Pioneer board contains PSoC 4000S, KitProg2 circuit, rechargeable battery, EZ-BLE PRoC Module, F-RAM, switches, LEDs and voltage regulator.

- CapSense Flex PCB:

The Flex PCB has CapSense sensors including buttons, trackpad and proximity. The Flex PCB has two capacitive sensing buttons, a trackpad with seven row seven column, and a proximity sensor loop which is used for CapSense proximity sensing.

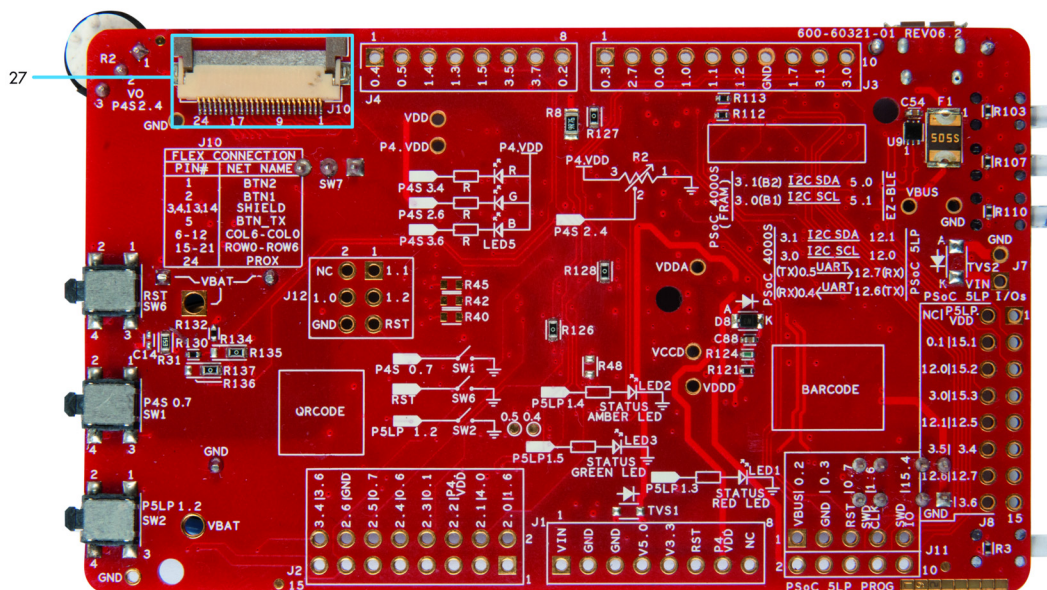
Figure 3-4 and Figure 3-5 shows the markup of the PSoC 4 S-Series Pioneer board.

Figure 3-4. PSoC 4 S-Series Pioneer Board (Top View)



- | | |
|---|---|
| 1. KitProg2 USB Micro-B connector (J6) | 14. RGB LED (LED5) |
| 2. KitProg2 status LEDs (LED1, LED2 and LED3) | 15. KitProg2 user button (SW3) |
| 3. External power supply header (J7) | 16. Rechargeable battery (ML2430-HS1, V2) |
| 4. KitProg2 (PSoC 5LP) I/O header (J8) | 17. User Button (SW2) |
| 5. Power LED (LED4) | 18. Reset button (SW1) |
| 6. System power (VDD) selection switch (SW6) | 19. Arduino ICSP compatible header (J12) |
| 7. KitProg2 custom application/programming header (J11) | 20. EZ-BLE™ PRoC™ Module (CYBLE-022001-00, U3) |
| 8. Voltage regulator circuit | 21. Potentiometer (R2) |
| 9. PSoC 4000S 10-pin program and debug header (J13) | 22. VDD source selection switch (SW4) |
| 10. Arduino™ compatible power and I/O headers (J1, J2, J3 and J4) | 23. Current measurement selection switch (SW7) |
| 11. 32.768 kHz crystal oscillator (Y1) | 24. PSoC 4000S (U1) |
| 12. Voltage Level Translator for F-RAM (U14) | 25. Programming target (PSoC 4000S/EZ-BLE PRoC) module selection switch (SW5) |
| 13. Cypress F-RAM 1Mb (FM24V10-G, U11) | 26. KitProg2 (PSoC 5LP) programmer and debugger (U15) |

Figure 3-5. PSoC 4 S-Series Pioneer Board (Bottom View)



27. Flex connector

The PSoC 4 S-Series Pioneer board has the following peripherals:

1. **KitProg2 USB Micro-B connector (J6):** The USB cable provided along with the PSoC 4 S-Series Pioneer Kit connects between this USB connector and the PC.
2. **KitProg2 Status LEDs:** Red, amber, and green LEDs (LED1, LED2, and LED3) indicate the status of the KitProg2. For details on the KitProg2 status, refer to the [KitProg2 User Guide](#).
3. **External power supply (VIN) header (J7):** This header connects the external power supply input to the onboard regulator. The voltage input from the external supply can be between 6 V and 12 V.
4. **KitProg2 I/O header (J8):** This header brings out a few GPIOs of the onboard PSoC 5LP. This includes the USB-I2C bridge and USB-UART bridge lines. The additional PSoC 5LP pins are direct connections to the internal programmable analog logic of PSoC 5LP. You can also use these pins for custom applications. For more details on the KitProg2, refer to the [KitProg2 User Guide](#).
5. **Power LED (LED4):** The Amber power LED turns on when the kit is connected to a power source.
6. **System power (VDD) selection switch (SW6):** This switch selects the kit operating voltage. It can select between 1.9 V, 3.3 V and 5 V.
7. **KitProg2 custom application/programming header (J11):** This header brings out more GPIOs of the PSoC 5LP. It also contains a 5-pin SWD programming header for PSoC 5LP.
8. **Voltage regulator circuit:** The kit can operate at four voltage levels, 1.9 V, 3.3 V, 5 V from USB or external power supply and 3 V from the rechargeable battery. The kit has an onboard 2-channel regulator from Cypress that provides 3.3 V on one channel and 1.9 V on the other. 3 V is derived from the onboard battery and 5 V from the USB.
9. **PSoC 4000S 10-pin program and debug header (J13):** This 10-pin header allows you to program and debug the PSoC 4000S using an external programmer such as [MiniProg3](#). This header is not populated by default.

10. **Arduino-compatible power and I/O headers:** This kit is compatible and operates flawlessly with third-party Arduino shields. The Arduino-compatible power header (J1) powers Arduino shields. This header also has provision to power the kit through the VIN input pin. The Arduino-compatible I/O headers (J1, J2, J3 and J4) bring out the pins from PSoC 4000S to interface with the Arduino shields.
11. **32.768 kHz crystal oscillator (Y1):** This kit has a 32.768 kHz crystal oscillator to provide an accurate low-frequency clock for the PSoC 4000S.
12. **Voltage Level Translator for F-RAM (U14):** The F-RAM operates at 3.3 V, while the PSoC 4000S can operate at 1.9 V, 3.3 V, 5 V or 3 V. This bidirectional level translator translates the I2C signals between the F-RAM and the PSoC 4000S.
13. **Cypress F-RAM (U11):** This kit features a Cypress F-RAM device (FM24V10-G) of 1 Mb capacity. The F-RAM is connected to the I2C interface of the PSoC 4000S. The F-RAM device can be used similar to an external EEPROM memory for data logging operations. Refer to [Using the FM24V10 F-RAM chapter on page 44](#) for details on using the F-RAM.
14. **RGB LED (LED5):** The onboard RGB LED can be controlled from the PSoC 4S00S.
15. **KitProg2 user button (SW3):** This button is used to switch between the KitProg2 modes. You can also use this button to provide input to the PSoC 5LP in custom applications. Note that the switch connects the PSoC 5LP pin to ground when pressed. Refer to the [KitProg2 User Guide](#) for more details.
16. **Rechargeable battery (V2):** This kit features an onboard rechargeable battery (ML2430-HS1) to power the kit at 3 V.
17. **User Button (SW2):** This button can be used to provide input to the PSoC 4000S. Note that the switch connects the PSoC 4000S pin to ground when pressed, so you need to configure the PSoC 4000S pin as resistive pull-up for detecting the switch press.
18. **Reset button (SW1):** This button is used to reset the PSoC 4000S and the EZ-BLE PSoC Module.
19. **Arduino ICSP compatible header (J12):** This kit features Arduino ICSP compatible header for SPI interface.
20. **EZ-BLE PSoC Module (U3):** The kit includes a Cypress EZ-BLE PSoC Module which can be used for custom applications.
21. **Potentiometer (R2):** This kit features a potentiometer which connects to an ADC input pin of the PSoC 4000S.
22. **VDD source selection switch (SW4):** This switch selects the power source for the kit, either USB connector/external power supply or battery.
23. **Current measurement selection switch (SW7):** This switch is used to measure the PSoC 4000S current consumption by turning off all the switches of SW7 and connecting an ammeter between VDD and P4.VDD test points. Refer to the [Current Measurement Switch chapter on page 39](#) for more details on how to measure the current.
24. **PSoC 4000S (U1):** This kit is designed to highlight the features of the PSoC 4000S device (CY8C4045AZI-S413).
25. **Programming target selection switch (SW5):** This switch selects the SWD lines between PSoC 4000S or EZ-BLE PSoC Module for programming and debugging.
26. **KitProg2 (PSoC 5LP) programmer and debugger (U15):** The PSoC 5LP device (CY8C5868LTI-LP039) serving as KitProg2, is a multi-functional system, which includes a programmer, debugger, USB-I2C bridge, and a USB-UART bridge. Refer to the [KitProg2 User Guide](#) for more details.
27. **FPC connector (J10):** This connects the Flex PCB to the main board.

See [Hardware Functional Description chapter on page 36](#) for details on various hardware blocks.