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CY3214

PSoCEVALUSB Kit Guide

Doc No. 001-67030 Rev. *B

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Contents

1. Introduction

Thank you for your interest in the CY3214-PSoCEVALUSB Kit. This kit includes a development board for the CY8C24894-24LTXI PSoC® device. Note that the board has the CY8C24094 device, which is an on-chip debug part for the CY8C24x94 family. You can design your own projects with PSoC Designer™ or by altering the code examples provided with this kit. It is a combination of technologies that create opportunities for a new range of low-cost, mixed-signal USB products. This architecture enables creating customized peripheral configurations that match the requirements of individual applications.

The CY3214-PSoCEVALUSB Kit is based on the PSoC 1 family of devices. PSoC is a Programmable System-on-Chip™ platform for 8-bit applications. It combines precision analog and digital logic with a high-performance CPU. With PSoC, you can create the exact combination of peripherals and integrated proprietary IP to meet the needs of your applications.

Chapter 2 describes the installation and configuration of the CY3214-PSoCEVALUSB Kit, PSoC Designer and PSoC Programmer. Chapter 3 describes the kit operation, with the help of the 'Square Mouse' project, which comes as a demonstration with the CY3214-PSoCEVALUSB kit. It also explains the programming connections of a PSoC 1 device with the PSoC MiniProg and power supply. Chapter 4 describes the hardware operations. Chapter 5 provides the description of the execution of simple projects. The Appendix section provides the schematics and bill of materials (BOM).

1.1 Kit Contents

The CY3214-PSoCEVALUSB Kit includes:

- PSoCEVALUSB board
- LCD module
- MiniProg Programmer
- USB A to Mini B cable
- CY3214-PSoCEVALUSB Kit CD
  - PSoC Designer installation file
  - PSoC Programmer installation file
  - Code examples
  - Hardware files
  - Kit guide
  - Quick start guide
  - Release notes
- Jumper wire pack
- CY8C24894-24LTXI sample silicon

Inspect the contents of the kit; if any parts are missing, contact your nearest Cypress sales office for further assistance.

1.2 Additional Learning Resources

Visit www.cypress.com for additional learning resources in the form of data sheets, technical reference manuals, and application notes.

1.2.1 Reference Documents

- Schematic diagram for the CY3214 PSoCEVALUSB board:
  http://www.cypress.com/go/CY3214-PSoCEvalUSB
- *CY8C24894-24LTXI data sheet:*
  http://www.cypress.com/?mpn=CY8C24894-24LTXI
- PSoC MiniProg1 details:
  http://www.cypress.com/go/CY3217-MiniProg1
- ICE-Cube details:
  http://www.cypress.com/go/CY3215-DK
- PSoC Designer: PSoC Designer Overview
  http://www.cypress.com/go/psocdesigner
- PSoC Designer Training: PSoC Designer On-Demand Training Series and videos
  http://www.cypress.com/psoctraining
- PSoC Programmer, COM Hardware Layer Supported Languages
  http://www.cypress.com/go/psocprogrammer

1.3 Document History

Revision	PDF Creation Date	Origin of Change	Description of Change
**	01/31/2011	RKPM	Initial version of kit guide
*A	04/27/2011	SASH	Added My First Code Example section. Content updates throughout the document
*B	05/03/2012	RKPM	Updated screenshots in the Kit Installation section. Updated Figure 5-13. Updated installer file names.

1.4 Documentation Conventions

Table 1-1. Document Conventions for Guides

Convention	Usage
`Courier New`	Displays file locations, user entered text, and source code: `C:\ ...cd\icc\`
Italics	Displays file names and reference documentation: Read about the *sourcefile.hex* file in the *PSoC Designer User Guide*.
[**Bracketed, Bold**]	Displays keyboard commands in procedures: [**Enter**] or [**Ctrl**] [**C**]

Table 1-1. Document Conventions for Guides

Convention	Usage
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.

2. Getting Started

This chapter describes how to install and configure the CY3214-PSoCEVALUSB Kit.

2.1 Kit Installation

To install the kit software, follow these steps:

1. Insert the kit CD into the CD drive of your PC. The CD is designed to auto-run and the kit installer startup screen appears.

   Note You can also download the latest kit installer from http://www.cypress.com/go/CY3214-PSoCEvalUSB. Three different types of installers are available for download.

   a. CY3214-PSoCEVALUSB Kit ISO: This file (ISO image) is an archive file of the optical disc provided with the kit. You can use this to create an installer CD or extract information using WinRar or similar tools.

   b. CY3214-PSoCEVALUSB Kit Setup: This executable file installs the contents of the kit CD, which includes PSoC Programmer, PSoC Designer, kit code examples, kit hardware files, and user documents.

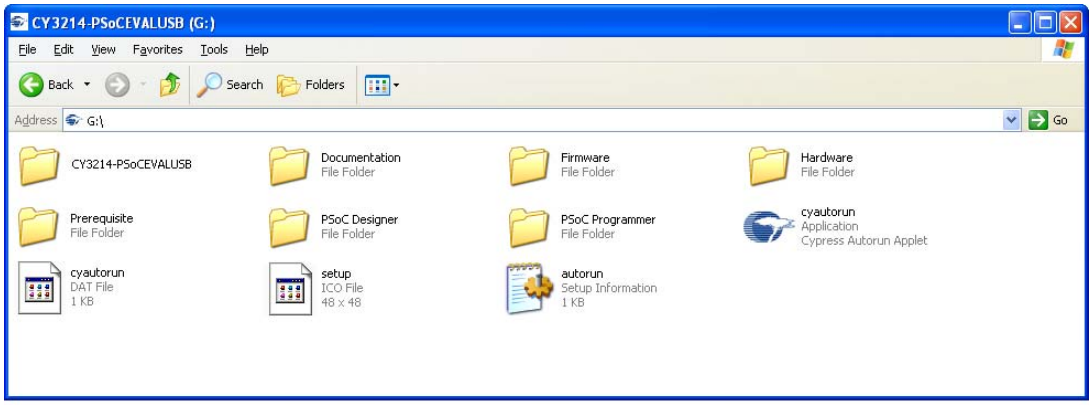
   c. CY3214-PSoCEVALUSB Kit Only (without prerequisites): This executable file installs only the kit contents, which includes kit code examples, hardware files, and user documents.

2. Click **Install the CY3214-PSoCEVALUSB** to start the installation, as shown in Figure 2-1.

   Figure 2-1. Kit Installer Startup Screen

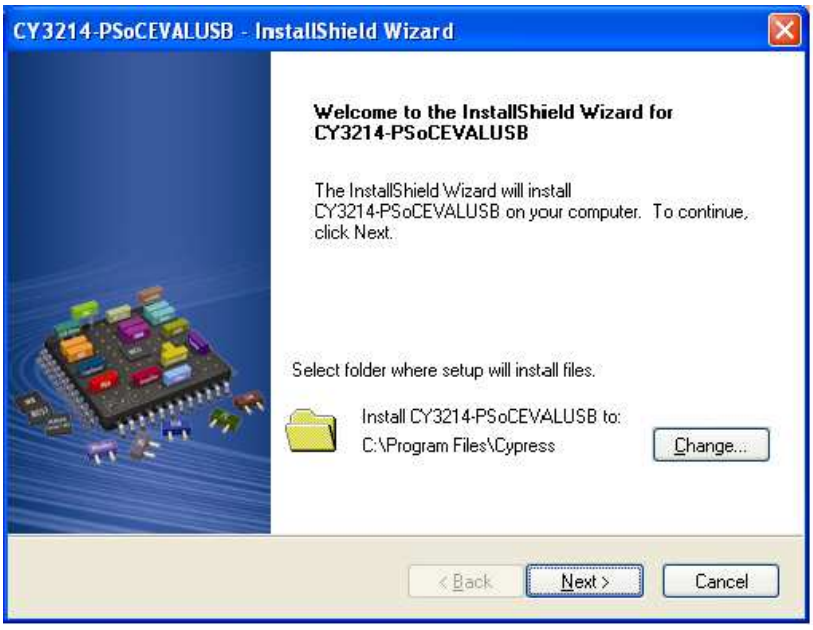
Note If auto-run does not execute, double-click **cyautorun.exe** file on the root directory of the CD/DVD, as shown in Figure 2-2.

Figure 2-2. Root directory of the CD/DVD



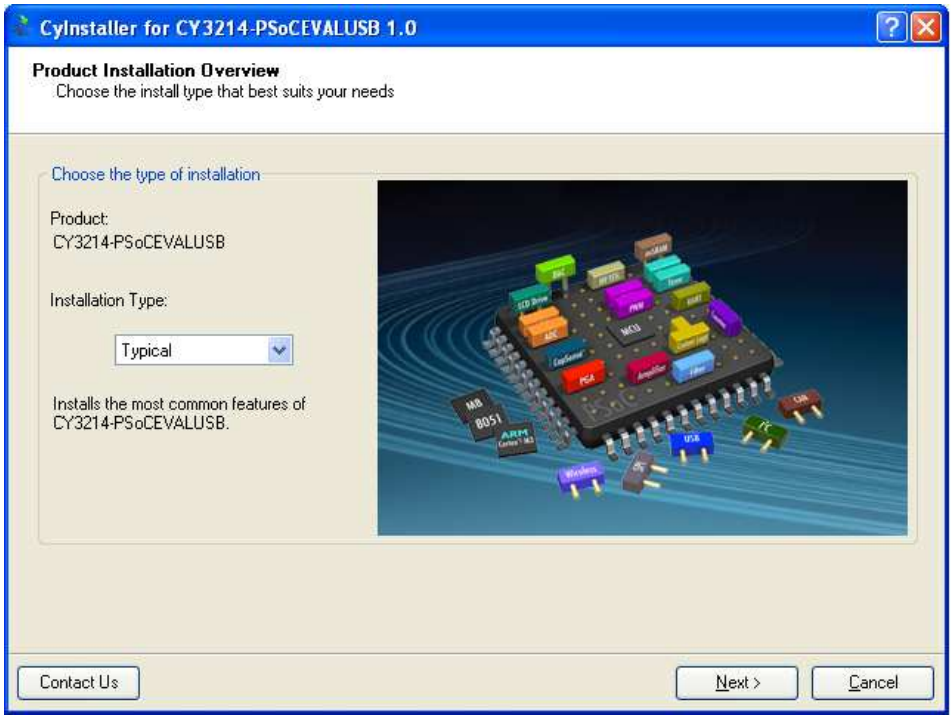
3. On the startup screen, click **Next** to start the installer.
4. The **InstallShield Wizard** screen is displayed, with the default location for setup. You can change the location using **Change**, as shown in Figure 2-3.
5. Click **Next** to launch the kit installer.

Figure 2-3. InstallShield Wizard



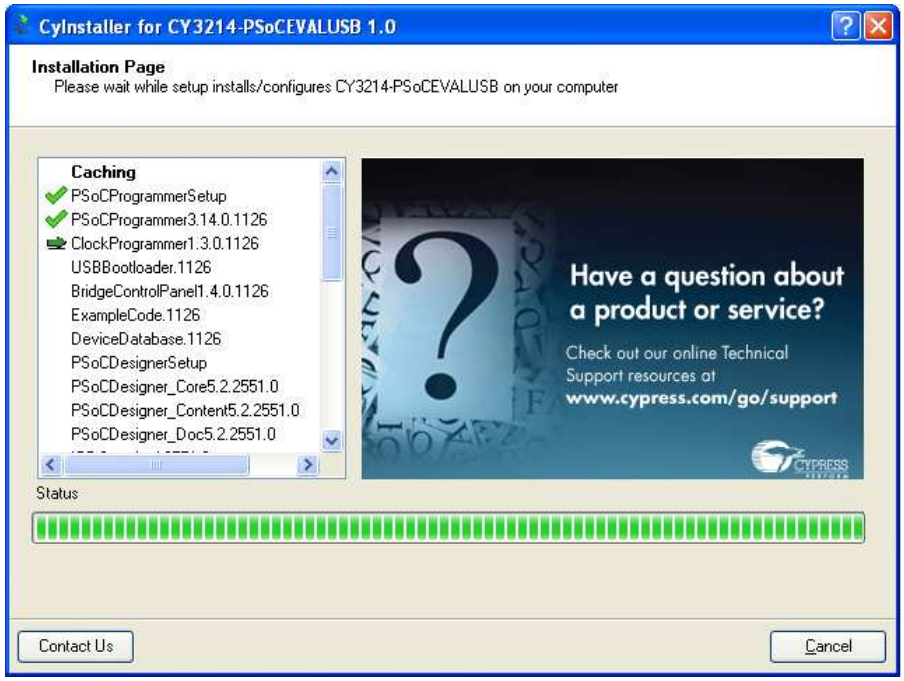
6. On the **Product Installation Overview** screen, select the installation type that best suits your requirement. The drop-down menu has three options: **Typical, Complete,** and **Custom**; see Figure 2-4**.**
7. Click **Next** to continue the installation.

Figure 2-4. Installation Type Options



8. When the installation begins, a list of all packages appears on the **Installation Page**.
9. A green check mark appears adjacent to every package that is cached and installed. Wait until all the packages are downloaded and installed successfully.

Figure 2-5. Installation Page



10. Click **Finish** to complete the installation of the CY3214-PSoCEVALUSB Kit, as shown in Figure 2-6.

Figure 2-6. Installation Completion Page

Note Advanced users can skip to Code Examples chapter on page 31.

2.2 PSoC Designer

PSoC Designer is the revolutionary easy-to-use Integrated Development Environment (IDE) that helps to customize PSoC to meet your specific application requirements. PSoC Designer accelerates system bring-up and time-to-market.

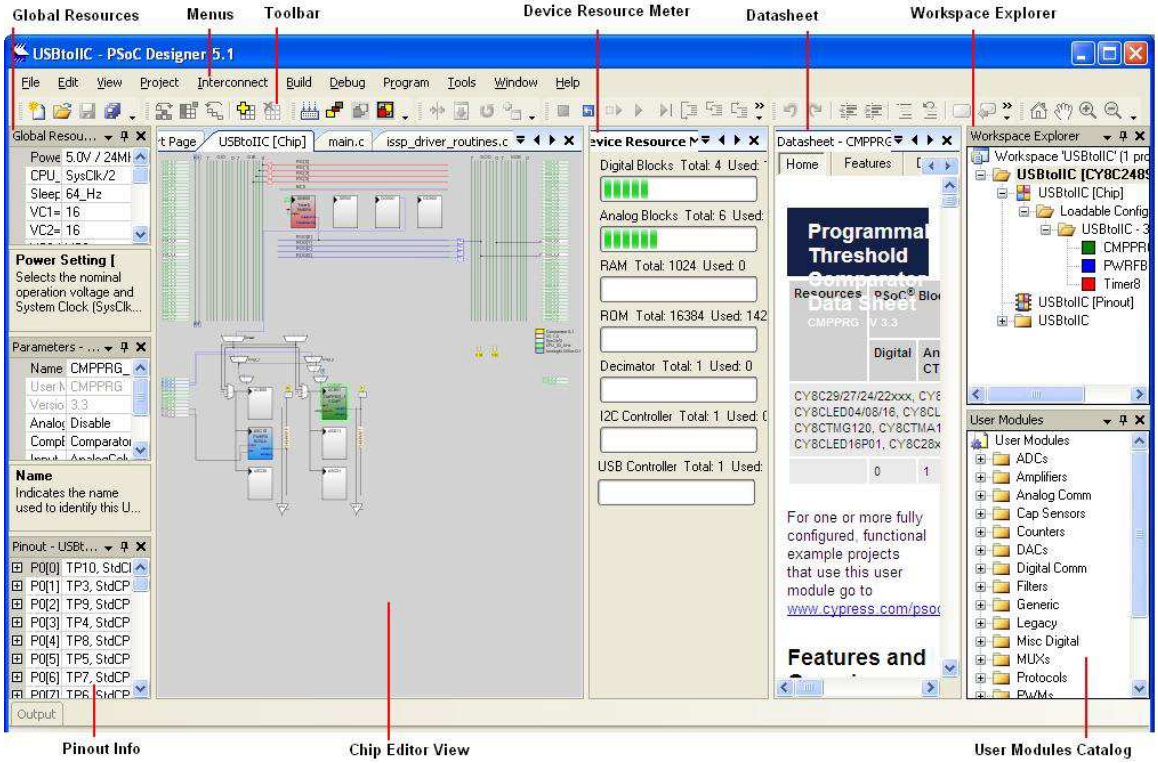
1. Click **Start > All Programs > Cypress > PSoC Designer <version> > PSoC Designer <version>**.
2. To create a new project, click **File > New Project**; click **File > Project Workspace** to open an existing project.

See Additional Learning Resources on page 6 for links to PSoC Designer training.

The PSoC Designer quick start guide is available at: http://www.cypress.com/?rID=47954.

For more details on PSoC Designer, go to:
`<Install_Directory>:\Cypress\PSoC Designer\<version>\Documentation`

Figure 2-7. PSoC Designer Interconnect View



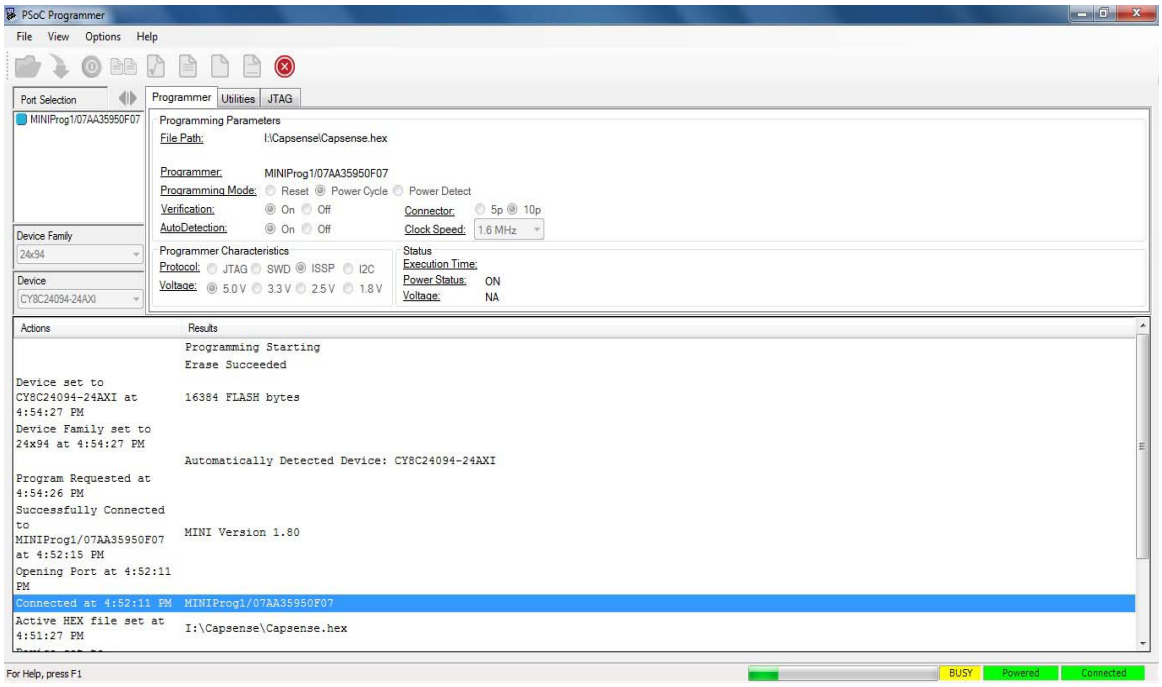
2.3 PSoC Programmer

To open the PSoC Programmer, click **Start** > **All Programs** > **Cypress** > **PSoC Programmer <version>** > **PSoC Programmer <version>**.

To successfully program the device, follow these steps:

1. Use the **Power** button to power up the CY3214-PSoCEVALUSB kit before loading the hex file on to the kit.

Figure 2-8. PSoC Programmer



2. Click the **File Load** button to load the respective hex file.
3. Click the **Program** button to program the hex file to the chip.
4. When programming is successful, **Programming Succeeded** appears in the Actions pane.
5. Close PSoC Programmer.

Note For more details on PSoC Programmer, go to:
`<Install_Directory>:\Cypress\Programmer\<version>\Documents`

2.4 SuiteUSB 3.4

The Cypress SuiteUSB 3.4 is a generic USB driver environment that you can freely use to develop host applications that interact with a USB device.

CyConsole is used to communicate with USB devices that match the CyUSB.sys device driver. The console supports hot-plugging of USB devices. When a device that matches the driver is plugged into the PC, it automatically appears in the device list near the top of the CyConsole window.

SuiteUSB 3.4 software can be installed from the link http://www.cypress.com/?rID=34870.

3. Kit Operation

3.1 Introduction

The CY3214-PSoCEVALUSB kit examples helps you to exchange data between a PC application and real world I/O. The kit includes a full-speed USB User Module with programmable I/O user modules to provide instant connection.

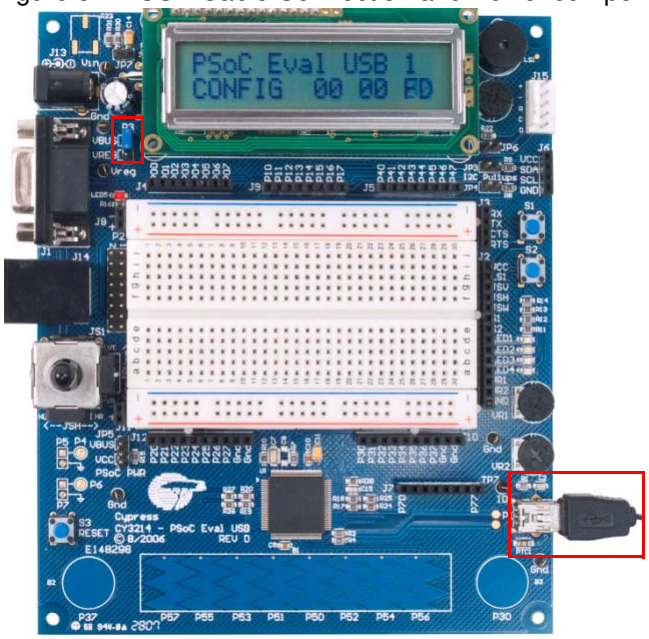
3.2 Square Mouse Example

The Square Mouse example is programmed to the CY3214-PSoCEVALUSB board as a default project for demonstration purposes. If the PSoC on the board has been reprogrammed or erased, follow the steps in the section, Programming Specifications and Connections on page 16 to program the board with the square mouse hex file provided in the kit CD (`<Install_Directory>:\Cypress\CY3214-PSoCEVALUSB\<version>\Firmware\squaremouse2_reset.hex`).

To execute the program, follow these steps:

1. Connect the USB2 cable to the Mini USB type B connector on P1, as shown in Figure 3-1. Ensure that the power selection jumper (shunt) is place on the first two pins (designated as VBUS).
2. The message ”PSoC Eval USB 1” is displayed on the LCD.
3. Check the movement of the mouse pointer on the screen; note that it moves in a square fashion.

Figure 3-1. USB Cable Connection and Power Jumper Setting



3.2.1 Programming Specifications and Connections

When the MiniProg is connected, you can use PSoC Programmer to program the CY3214-PSoCEVALUSB kit. Plug in the USB cable into the MiniProg before attaching it to the ISSP header on the board. When using a USB cable with MiniProg, keep the length under six feet to avoid signal integrity issues.

When using MiniProg, the LEDs blink at a variable rate to track connection status. The green LED near the USB connector turns on after MiniProg is plugged into the computer and is configured by the operating system. If MiniProg cannot find the correct driver in the system, this LED does not turn on. After the device is configured, the LED stays on at about a 4-Hz blink rate. This changes during programming, where the blink duty cycle increases.

The red LED (Figure 3-2) at the bottom turns on when the MiniProg powers the part. The LED is off when power is provided by the target board.

Figure 3-2. Programming PSoC Device

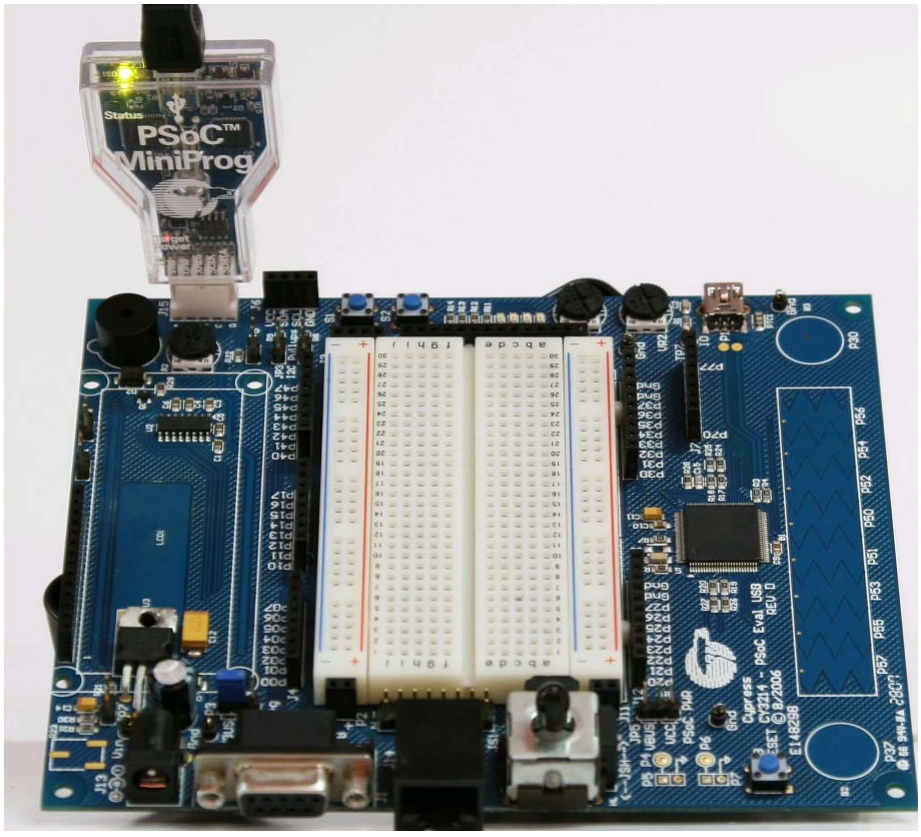
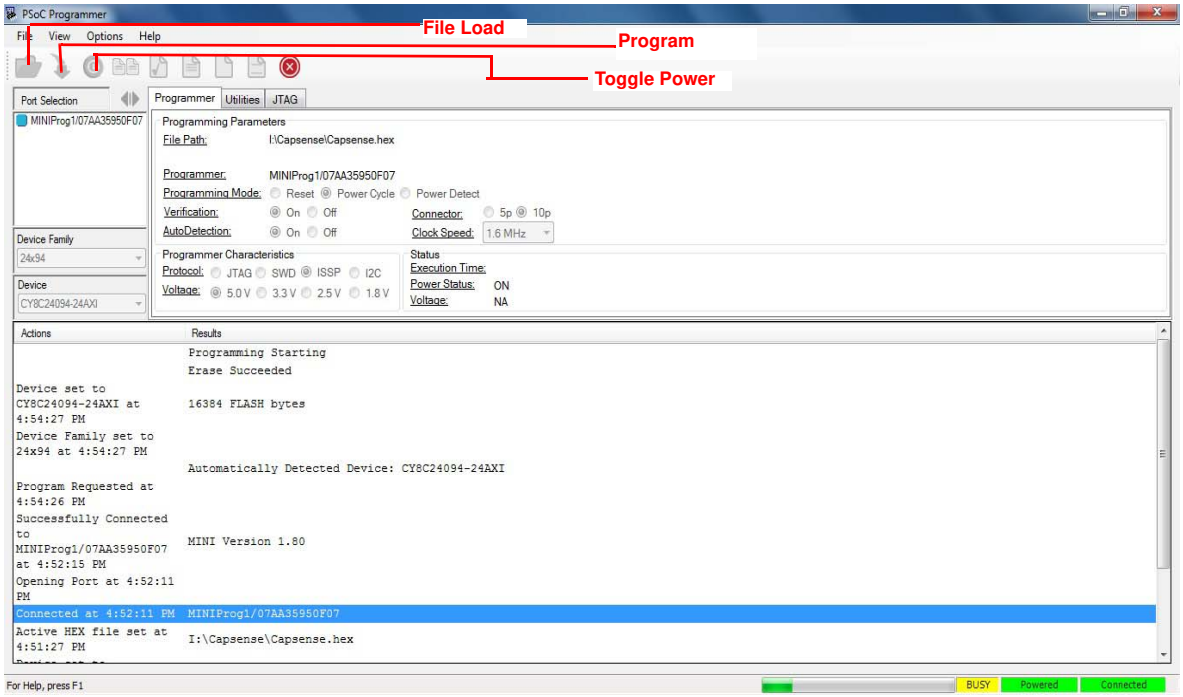


Figure 3-3. PSoC Programmer Screen



Follow these steps to program using MiniProg1:

1. Connect the USB cable to the PC and MiniProg1
2. Plug in the MiniProg1 to the ISSP header on the CY3214-PSoCEVALUSB board
3. When USB is connected to the MiniProg1, the LED (green) glows in the MiniProg1
4. Open PSoC Programmer
5. Click the **Load File** button and browse to the hex file location. Click **Open** to select the hex file
6. Click **Connect** or double-click on the respective MiniProg under Port Selection to select or connect to MiniProg
7. Click **Program** or press **[F5]** to initiate programming
8. The green LED on the MiniProg1 blinks to indicate the progress of programming
9. After successful programming, the red LED on MiniProg1 is powered off
10. Select the **Toggle Power** button in PSoC Programmer to power the board and verify output

4. Hardware

This section provides an overview of the hardware, including power system, jumper setting, and programming interface. To start using the board, go to Code Examples chapter on page 31.

4.1 System Block Diagram

The CY3214-PSoCEVALUSB Kit has the following sections:

- Character LCD module
- Buzzer (LS1)
- Contrast potentiometer (R2)
- Buttons (S1 and S2)
- ISSP connector(J15)
- LEDs (LED 1–4)
- Potentiometer (VR1 and VR2)
- USB connector (P1)
- CapSense buttons (P3[0], P3[7]), and sliders (Port5)
- Power supply connector (J13)
- Joystick (JS1)
- Reset button (S3)
- Legacy DB9 connector (J1)
- ICE-Cube connector (J14)

Figure 4-1. CY3214-PSoCEVALUSB Board

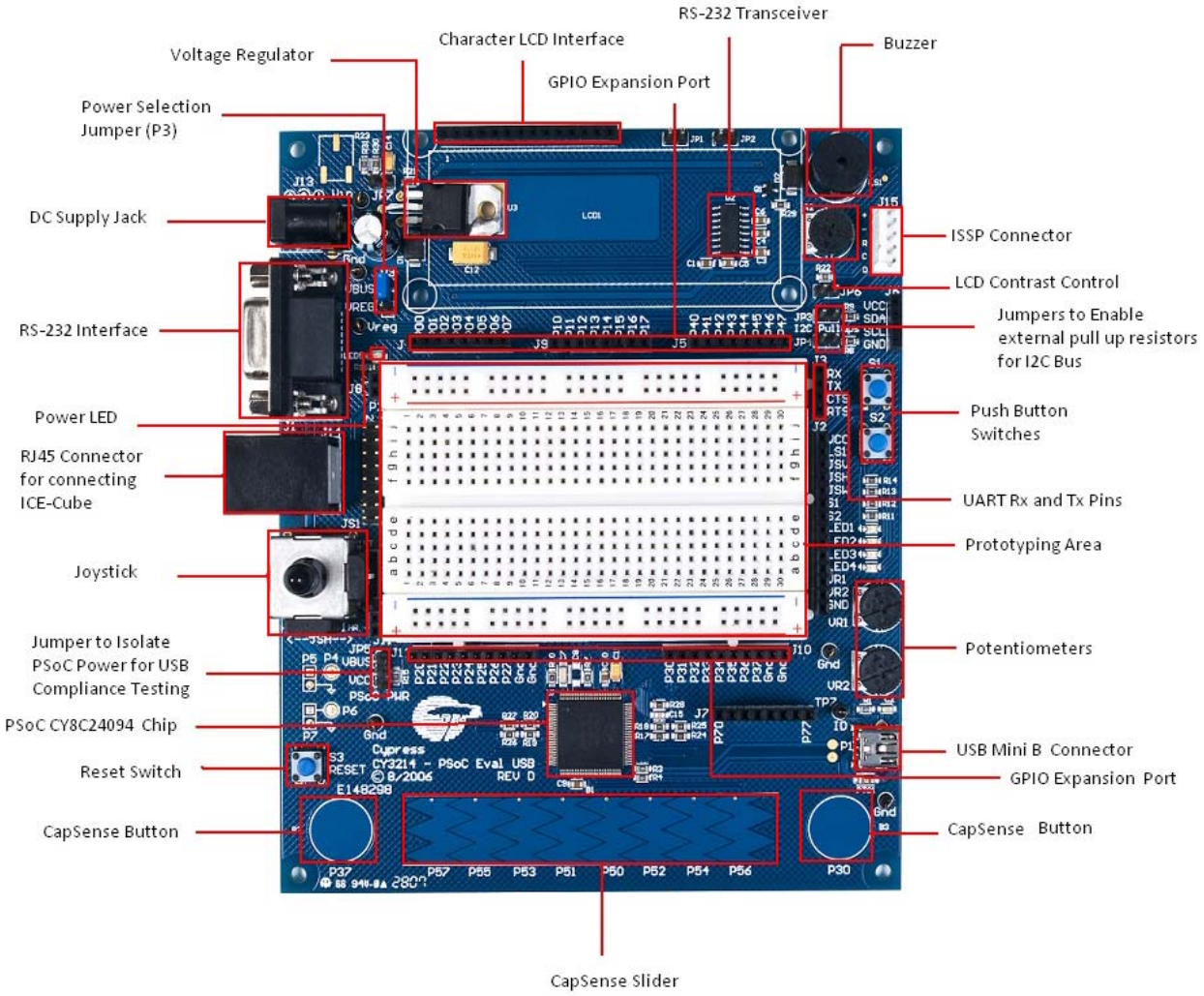


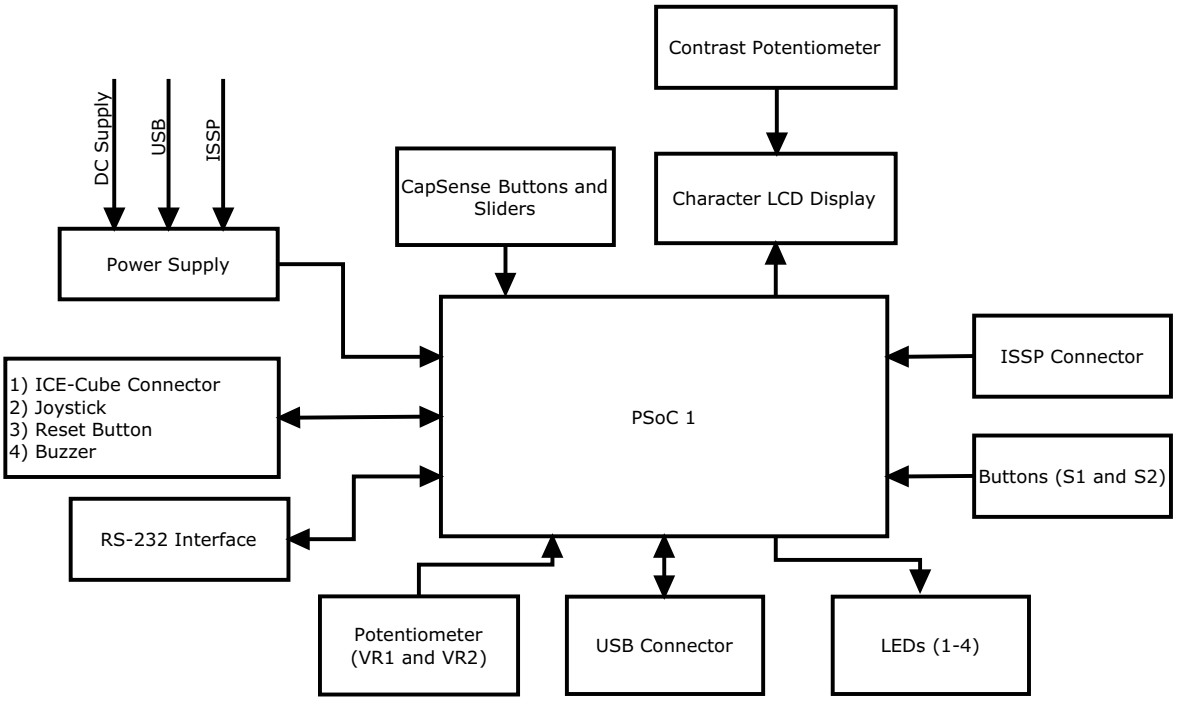
Table 4-1. Functional Pin Table

Pin No.	Pin Name	Description
1	P2[3]	Direct switched capacitor block input
2	P2[1]	Direct switched capacitor block input
3	P4[7]	GPIO
4	P4[5]	GPIO
5	P4[3]	GPIO
6	P4[1]	GPIO
7	P3[7]	GPIO
8	P3[5]	GPIO
9	P3[3]	GPIO
10	P3[1]	GPIO
11	P5[7]	GPIO
12	P5[5]	GPIO
13	P5[3]	GPIO
14	P5[1]	GPIO

Table 4-1. Functional Pin Table

Pin No.	Pin Name	Description
15	P1[7]	I^2C serial clock (SCL)
16	P1[5]	I^2C serial data (SCA)
17	P1[3]	GPIO
18	P1[1]	I^2C serial clock (SCL), ISSP SCLK[2]
19	Vss	Ground connection
20	D+	GPIO
21	D–	GPIO
22	Vdd	Supply voltage
23	P7[7]	GPIO
24	P7[0]	GPIO
25	P1[0]	I^2C serial data (SDA), ISSP SDATA[2]
26	P1[2]	GPIO
27	P1[4]	Optional external clock input (EXTCLK)
28	P1[6]	GPIO
29	P5[0]	GPIO
30	P5[2]	GPIO
31	P5[4]	GPIO
32	P5[6]	GPIO
33	P3[0]	GPIO
34	P3[2	GPIO
35	P3[4]	GPIO
36	P3[6]	GPIO
37	P4[0]	GPIO
38	P4[2]	GPIO
39	P4[4]	GPIO
40	P4[6]	GPIO
41	P2[0]	Direct switched capacitor block input
42	P2[2]	Direct switched capacitor block input
43	P2[4]	External analog ground (AGND) input
44	P2[6]	External voltage reference (VREF) input
45	P0[0]	Analog column mux input
46	P0[2]	Analog column mux input
47	P0[4]	Analog column mux input VREF
48	P0[6]	Analog column mux input
49	Vdd	Supply voltage
50	Vss	Ground connection
51	P0[7]	Analog column mux input
52	P0[5]	Analog column mux input and column output
53	P0[3]	Analog column mux input and column output
54	P0[1]	Analog column mux input
55	P2[7]	GPIO
56	P2[5]	GPIO

Figure 4-2. Hardware Block Diagram

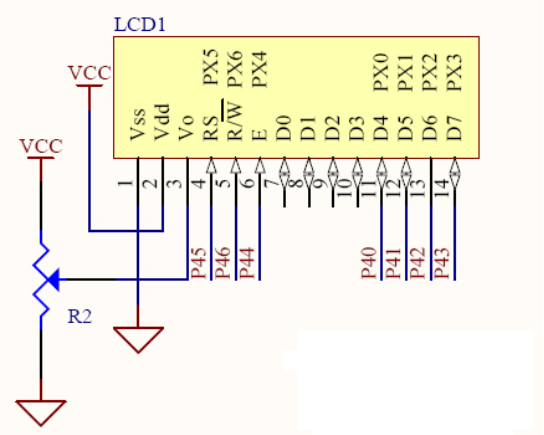


4.2 Functional Description

4.2.1 Character LCD Module

The kit has a character LCD module, which goes into the character LCD header, P8. The LCD runs on a 5-V supply and can function regardless of the voltage on which PSoC is powered. There is a zero-ohm resistor setting available on the LCD section making it possible to convert it to a 3.3-V LCD. The variable resistor R2 is a contrast potentiometer. It is used to control the LCD contrast.

Figure 4-3. LCD Module



4.2.2 CapSense® Buttons (P3[0], P3[7]), and Sliders (Port5)

There are two CapSense buttons and eight element CapSense sliders on the CY3214-PSoCEVALUSB kit. CapSense Sigma Delta uses an external modulation capacitor (CMOD), the copper sensor pad on the CY3214 PSoCEVALUSB board, and bleed resistor (Rb) in addition to the sensor capacitor (Cx).

Bleed Resistor (Rb): The CSD uses the switched capacitor circuitry to convert the sensor capacitance into a voltage, which is compared to a reference voltage. When the capacitor voltage reaches the reference voltage, the comparator triggers a bleed resistor discharging the capacitor. After the capacitor voltage discharges below the reference voltage, the bleed resistor is left floating to allow the capacitor to continue charging. The comparator output becomes a bit-stream as it toggles the bleed resistor and manipulates its input voltage. This bit stream is ANDed with a pulse width modulator (PWM) to provide consistent stream framing. The number of counts in each frame is analyzed to determine if the capacitive sensor is activated.

Modulation Capacitor (CMOD): The capacitor CMOD acts to attenuate high-frequency noise. The pin assignment for CapSense buttons used in the CapSense code example (see My First Code Example on page 31) are as follows:

B2 – P3[7]

B3 – P3[0]

The slider segments pin assignment used in My First Code Example on page 31 are as follows:

Slider 0 – P5[7]

Slider 1 – P5[5]

Slider 2 – P5[3]

Slider 3 – P5[1]

Slider 4 – P5[0]

Slider 5 – P5[2]

Slider 6 – P5[4]

Slider 7 – P5[6]

Figure 4-4. CapSense Sliders

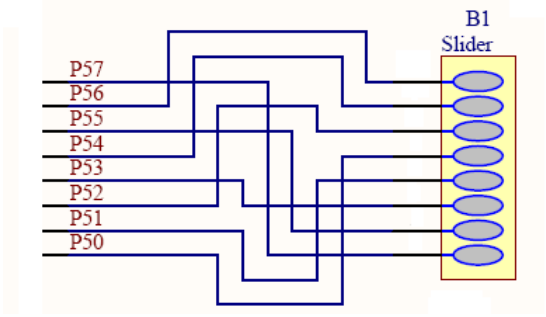
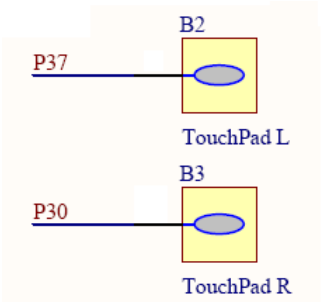


Figure 4-5. CapSense Buttons



4.2.3 Legacy DB9 Connector (J1)

This connector is used for serial interface. Connect the serial cable to the DB9 connector and the serial port on the PC. The supply voltage is 3.3 V to 5 V; the output voltage Vout (high) is Vcc–0.6 V and Vout (low) is 0.4 V.

Figure 4-6. DB9 Connector

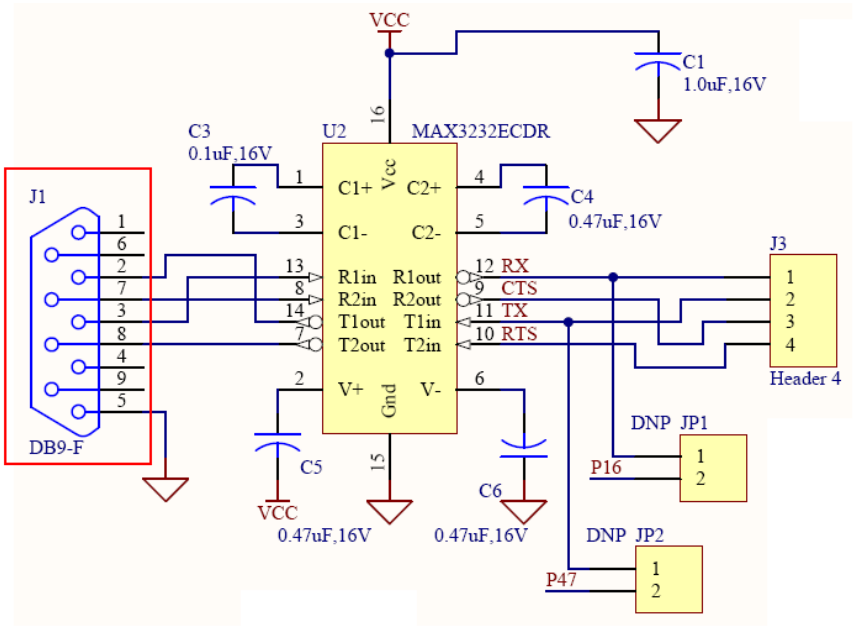


Table 4-2. IC Description

Pin No.	Pin Name	Description
1	C1+	Connected to +ve of capacitor C3
2	V+	Vcc supply
3	C1–	Connected to –ve of capacitor C3
4	C2+	Connected to +ve of capacitor C4
5	C2–	Connected to –ve of capacitor C4
6	V–	Vcc ground
7	T2 out	Request to send (OUT)

Table 4-2. IC Description

Pin No.	Pin Name	Description
8	R2in	Clear to send (IN)
9	R2out	Clear to send (OUT)
10	T2in	Request to send (IN)
11	T1in	Transmitted data (IN)
12	R1out	Receive data (OUT)
13	R1in	Receive data (IN)
14	T1out	Transmitted data (OUT)
15	Gnd	Ground
16	Vcc	Vcc supply

Table 4-3. DB9 Connector Description

Pin No	Pin Name	Description
1	DCD	Carrier detect
2	RD	Receive data
3	TD	Transmit data
4	DTR	Data terminal ready
5	SGND	System ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

4.2.4 Power Supply Connector (J13)

You can power the board from the USB cable or from an external 9 V to 12 V power supply. D1 is used as a protecting diode. The protecting diodes are necessary if the load discharges are slower than the filter capacitor after the rectification process.

Figure 4-7. Power Supply Connector