

# CY3280-20x66

# Universal CapSense<sup>®</sup> Controller Kit Guide

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Thank you for your interest in the CY3280-20x66 Universal CapSense<sup>®</sup> Controller Kit. This kit is designed for easy prototyping and debug of the 20xx6A/S CapSense family designs using predefined control circuitry and plug-in hardware. The kit includes programming hardware and a CY3240-I2USB bridge for tuning and data acquisition. This module connects to any CY3280 Universal CapSense Module board.

This document describes the CY3280-20x66 Universal CapSense Controller Kit and describes the code examples provided with the kit. 'CY3280\_20x66 CSD PD Project1' is the default project programmed on the CY3280-20x66 Universal CapSense Controller board. For more information on this project, see the Code Examples chapter on page 35.

# 1.1 Kit Contents

The CY3280-20x66 Universal CapSense Controller Kit contains:

- CY3280-20x66 Universal CapSense Controller board
- CY3240-I2USB bridge board
- MiniProg1 programmer
- USB A to Mini-B cable
- CY3280-20x66 Universal CapSense Controller Kit CD
  - PSoC Designer installation file
  - PSoC Programmer installation file
  - □ Bridge Control Panel installation file (packaged along with PSoC Programmer)
  - □ Code examples
  - Hardware files
  - □ Kit guide
  - Quick start guide
  - Release notes

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



### 1.1.1 Prerequisites

The following are required for the functioning of this kit:

- CY3280 Universal CapSense Module board or custom board similar to CY3280 module boards (see CY3280 Universal CapSense Module Boards on page 6)
- 12-V DC adapter (optional)
- CY3215-DK (optional, required to debug programs in PSoC Designer)

Universal CapSense Module boards are available for purchase separately or as part of the combination kits. Visit www.cypress.com/shop for more information.

#### 1.1.2 MiniProg1 Programmer

The PSoC MiniProg gives you the ability to program PSoC parts quickly and easily. It is small, compact, and connects to your PC using the provided USB 2.0 cable. During prototyping, the MiniProg can be used as an in-system serial programmer (ISSP) to program PSoC devices on your PCB.

When the MiniProg is connected, you can use PSoC Programmer to program. PSoC Programmer is a free software, which can either be launched from within PSoC Designer or run as a standalone program.

#### 1.1.3 CY3240-I2USB Bridge

The I2USB bridge allows you to test, tune, and debug hardware and software of a PSoC application by bridging the USB port to I2C. Populated with the CY8C24894 PSoC device, the I2USB bridge can be connected through the ISSP pins on the controller board.

#### 1.1.4 CY3280 Universal CapSense Module Boards

CY3280 Universal CapSense Module boards are available for purchase separately or as part of the combination kits. The CY3280-20x66 Universal CapSense Controller can be connected to CY3280-SLM, CY3280-SRM, CY3280-BMM, and CY3280-BSM CapSense boards.

# 1.2 **PSoC Designer**

PSoC Designer is the integrated development environment (IDE) used to customize your PSoC application. More information about PSoC Designer is available in the PSoC Designer IDE Guide; go to: <Install\_directory>\PSoC Designer\<version>\Documentation.

Default <Install\_directory> on Windows 32-bit OS is C:\Program Files\Cypress and on 64-bit OS it is C:\Program Files (x86)\Cypress.

# 1.3 **PSoC Programmer**

PSoC Programmer offers a simple GUI to configure and program PSoC devices.

# 1.4 Bridge Control Panel

The Bridge Control Panel GUI is used with the CY3240-I2USB bridge to enable communication with I2C slave devices; here, it is used with the CY3280-20x66 Universal CapSense Controller. This software is used to configure I2C devices as well as acquire and process data received from I2C slave devices. The Bridge Control Panel helps in optimizing, debugging, and tuning the target devices.



# 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 the knowledge base article "How to Design with  $PSoC^{\mbox{\sc R}}$  1, PowerPSoC<sup>®</sup>, and PLC – KBA88292". Following is an abbreviated list for PSoC 1:

- Overview: PSoC Portfolio, PSoC Roadmap
- Product Selectors: PSoC 1, PSoC 3, PSoC 4, PSoC 5LP
- PSoC Designer includes a device selection tool
- Application notes: Cypress offers a large number of PSoC application notes covering a broad range of topics, from basic to advanced level. Recommended application notes for getting started with PSoC 1 are:
  - □ Getting Started with PSoC<sup>®</sup> 1 AN75320
  - □ PSoC<sup>®</sup> 1 Getting Started with GPIO AN2094
  - □ PSoC<sup>®</sup> 1 Analog Structure and Configuration AN74170
  - PSoC<sup>®</sup> 1 Switched Capacitor Analog Blocks AN2041
  - □ Selecting Analog Ground and Reference AN2219

Note: For application notes related to CY8C29X66 devices, click here.

- Development Kits:
  - CY3210-PSoCEval1 supports all PSoC 1 Mixed-Signal Array families, including automotive, except CY8C25/26xxx devices. The kit includes an LCD module, potentiometer, LEDs, and breadboarding space.
  - CY3214-PSoCEvalUSB features a development board for the CY8C24x94 PSoC device. Special features of the board include USB and CapSense development and debugging support.

Note: For development kits related to CY8C29X66 devices, click here.

The MiniProg1 and MiniProg3 devices provide interfaces for flash programming and debug.



#### 1.5.1 PSoC Designer

PSoC Designer is a free Windows-based Integrated Design Environment (IDE). Develop your applications using a library of pre-characterized analog and digital peripherals in a drag-and-drop design environment. Then, customize your design leveraging the dynamically generated API libraries of code. Figure 1-1 shows PSoC Designer windows. **Note:** This is not the default view.

- 1. Global Resources all device hardware settings.
- 2. Parameters the parameters of the currently selected User Modules.
- 3. Pinout information related to device pins.
- 4. Chip-Level Editor a diagram of the resources available on the selected chip.
- 5. Datasheet the datasheet for the currently selected UM
- 6. User Modules all available User Modules for the selected device.
- 7. Device Resource Meter device resource usage for the current project configuration.
- 8. Workspace a tree level diagram of files associated with the project.
- 9. Output output from project build and debug operations.

**Note:** For detailed information on PSoC Designer, go to **PSoC Designer > Help > Documentation > Designer Specific Documents > IDE User Guide**.

#### Figure 1-1. PSoC Designer Layout





## 1.5.2 Code Examples

The following webpage lists the PSoC Designer based Code Examples. These Code Examples can speed up your design process by starting you off with a complete design, instead of a blank page and also show how PSoC Designer User modules can be used for various applications.

www.cypress.com/go/CapSenseCodeExamples

To access the Code Examples integrated with PSoC Designer, follow the path **Start Page > Design Catalog > Launch Example Browser** as shown in Figure 1-2.

Figure 1-2. Code Examples in PSoC Designer

	Start Page CYPRESS PERFORM
	Recent Projects
	CY3280_21x34_SLM CY3280_21x34_SLM CY3280_20x34_SLM AN2141 HSSP_CY8Cxxxx AN2272_F14 New Project [Browse [Device Catalog
Ì	Design Catalog
	CE52125 - Push-Pull PWM Exar CE54287 - Using an Incrementa CE54939 - UART User Module I CE82235 - ADCINC User Module CE63845 - USBUART User Moc CE82240 - PRS_PWM Example CE55651 - PRS User Module Ex



In the Example Projects Browser shown in Figure 1-3, you have the following options.

- Keyword search to filter the projects.
- Listing the projects based on Category.
- Review the datasheet for the selection (on the Description tab).
- Review the code example for the selection. You can copy and paste code from this window to your project, which can help speed up code development, or
- 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 1-3. Code Example Projects, with Sample Codes

Example Project Browser	
Search: Group results by:	Not grouped
Name         In           CE52024 - Halt Duplex UART         CE52024 - Halt Duplex UART           CE52125 - Duph-Puil PrvM Example Project         CE52125 - Generate Sine Wave by UUT method in PSoC1           CE52125 - Demonde Sine Wave by UUT method in PSoC1         CE54297 - Using an Incomental ADC to Measure 0 to 5V Project           CE54297 - Using an Incomental ADC to Measure 0 to 5V Project         CE54489 - Using an Incomental ADC to Measure 0 to 5V Project           CE54297 - Using an Incomental ADC to Measure 0 to 5V Project         CE5531 - PDRS Use Module Example Project           CE5902 - Using ADC and UART Example Project         CE59027 - CE20W User Module Example Project           CE59033 - Pulse Width Measurement using Timer Capture in PSoC1         CE59039 - OECI Width Measureme Project           CE59039 - SOLT Width Measuremet using Timer Capture in PSoC1         CE59039 - OECI Width Measuremet Project           CE59039 - SOLT Width Module Example Project         CE59039 - OECI User Module Example Project           CE59039 - SOLT Use Module Example Project         CE59039 - OECI User Module Example Project           CE8200 - PSOLT User Module Example Project         CE8209 - OESIC User Module Example Project           CE8209 - DroBot Example Project         CE8209 - DROBot Example Project           CE8209 - DROB For Width Widthe Example Project         CE8209 - CROBOT Example Project           CE8200 - DROBOT Example Project         CE8200 - DROBOT Example Project	Description       Sample Code       ()         #include <pre>cmbc.h&gt;       // part specific constants and mecros         #include "PSoCAPI.h"       // PSoC API definitions for all User Hk         void welcomeScreen(void);       //Declaration of the function that         void main(void)       (         (// Parameter pointer       char "strPtr;         /// Initialize receiver/cmd Buffer       UART_CmdReset();         //Turn on interrupts       BBC_EnableGInt ;         ///Enable SX interrupts       UART_IntChcl(UART_ENABLE_PX_INT);         //set party as zero and start the UART       UART_Start(UART_PARITY_NONE);         //Clear the screen in Hyper terminal window       UART_PutChar(12);</pre>
¢>	K Deate Project Cancel



## 1.5.3 PSoC Designer Help

Visit the PSoC Designer home page to download the latest version of PSoC Designer. Then, launch PSoC Designer and navigate to the following items:

- IDE User Guide: Choose Help > Documentation > Designer Specific Documents > IDE User Guide.pdf. This guide gives you the basics for developing PSoC Creator projects.
- Simple User module Code Examples: Choose Start Page > Design Catalog > Launch Example Browser. These code examples demonstrate how to configure and use PSoC Designer User modules.
- Technical Reference Manual: Choose Help > Documentation > Technical Reference Manuals. This guide lists and describes the system functions of PSoC devices.
- User module datasheets: Right-click a User module and select "Datasheet." This datasheet explains the parameters and APIs of the selected user module.
- Device Datasheet: Choose Help > Documentation > Device Datasheets to pick the datasheet of a particular PSoC device.
- Imagecraft Compiler Guide: Choose Help > Documentation > Compiler and Programming Documents > C Language Compiler User Guide.pdf. This guide provides the details about the Imagecraft compiler specific directives and Functions.

#### 1.5.4 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 8 at the prompt.

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

- Self-help
- Local Sales Office Locations



# **1.6 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 <i>sourcefile.hex</i> file in the <i>PSoC Designer 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 <b>File</b> icon and then click <b>Open</b> .
Times New Roman	Displays an equation: 2+2=4
Text in gray boxes	Describes cautions or unique functionality of the product.



This chapter describes the installation and configuration of the CY3280-20x66 Universal CapSense Controller Kit.

# 2.1 Kit Installation

2.

To install the kit software, follow these steps:

**Getting Started** 

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 www.cypress.com/go/CY3280-20x66. Three different types of installers are available for download.

- a. CY3280-20X66 Universal CapSense Controller Kit (Rev \*B): This executable file installs only the kit contents, which includes kit code examples, hardware files, and user documents.
- b. CY3280-20X66 KIt Installer (Single Package): This executable file installs PSoC Programmer, PSoC Designer, kit code examples, kit hardware files, and user documents.
- c. CY3280-20X66 Universal CapSense Controller Kit (Rev \*B): 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. This includes the kit installer along with PSoC Programmer, PSoC Designer, and other mandatory non-cypress prerequisites.
- 2. Click Install the CY3280-20x66 to start the installation, as shown in Figure 2-1.

Figure 2-1. Kit Installer Startup Screen







- 3. The **Install Shield Wizard** screen appears. The default setup location is shown on the Install Shield Wizard screen. You can change the location using **Change**.
- 4. Click **Next** to launch the kit installer.
- 5. In 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**, as shown in Figure 2-2.
- 6. Click **Next** to start the installation.

Figure 2-2. Installation Type Options

CyInstaller for CY3280-20x66 1.0  Product Installation Overview Choose the install type that best suits your needs	<u>ः</u>
Choose the type of installation Product: CY3280-20x66 Installation Type: Typical  Installs the most common features of CY3280-20x66.	
Contact Us	Next > Cancel

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



9. Click  $\ensuremath{\textit{Finish}}$  to complete the installation.

Figure 2-3. Installation Completion Page

CyInstaller for CY3280-20x66 1.0	? ×
	CYPRESS
-1.22	Contact Information Name: * saga Company: Email: *
	Indicates a required field         Privacy Policy         ✓ Launch PSoC Designer 5.4 SP1         ✓ View Release Notes
	<ul> <li>View User Guide</li> <li>Launch Update Manager</li> <li>Continue Without Contact Information</li> </ul>
© 2009-2016 Cypress Semiconductor Corporation All rights reserved	
Contact Us	Finish

After software installation, verify your setup by opening PSoC Programmer with the MiniProg attached to the PC. Open Bridge Control Panel with the I2USB bridge attached to the PC to verify driver installation.

Note Advanced users can go to the Code Examples chapter on page 35.



# 2.2 **PSoC Designer**

- 1. Click Start > All Programs > Cypress > PSoC Designer <version> > PSoC Designer <version>.
- Click File > New Project to create new project; click File > Open Project to work with an existing project.



Figure 2-4. PSoC Designer Interconnect View

3. To experiment with the code examples, go to the Code Examples chapter on page 35.

Note For more details on PSoC Designer, see the PSoC Designer IDE Guide at: <Install\_directory>\Cypress\PSoC Designer\<version>\Documentation.

See Additional Learning Resources on page 7 for links to PSoC Designer training.

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



# 2.3 PSoC Programmer

- 1. Click Start > All Programs > Cypress > PSoC Programmer <version> > PSoC Programmer <version>.
- 2. Select the MiniProg from the port selection, as shown in Figure 2-5.

Figure 2-5. PSoC Programmer Window

PSoC Programmer	File Load	_ 7 🛛
File View Options Help	Program Power	
Port Selection	Programmer Utilities JTAG	
MINIProg1/08215B0C331A	Programming Basemeters	
	File Path;         E\Brisa_Cypress1\Data\CY3210-PS0CEVAL1\Firmware\ASM_Example_LED_Logic\ASM_Example_LED_Logic.hex	
	Programmer: MINIProg1/08215B0C331A	
	Programming Mode: O Reset  Power Cycle O Power Detect	
	Verification:      On O Off <u>Connector:</u> 5p      10p	
Device Family	AutoDetection:  On O Off <u>Clock Speed:</u> 1.6 MHz	
29x66	Programmer Characteristics	
Device	Protocol: O JTAG O SWD   ISSP 0 12C  Execution Time: 00.1 seconds	
	Voltage:	
C10C23400-2417A		
Actions	Results	^
Power On at 1:14:10	PM MINIProg1/08215B0C331A	
1:11:05 PM		=
	Programming Succeeded	
	Doing Checksum	
	Doing Protect	
	Verify Succeeded	
	Verify Starting	
	Programming Succeeded	
	Frogramming Statting	
Device set to	Frase Succeeded	
CY8C29466-24PXI at	32768 FLASH bytes	
1:10:00 PM		
Device Family set to 29x66 at 1:10:00 PM		
	Automatically Detected Device: CY8C29466-24PXI	~
For Hole, proce Et		posted
rornep, press ri		moree

- 3. Click the File Load button from the Programmer menu bar, navigate and select the hex file.
- 4. Use **Program** button to program the hex file on to the chip.
- 5. When programming is successful, **Programming Succeeded** appears in the Actions pane.
- 6. Close PSoC Programmer.

**Note** For more details on PSoC Programmer, go to the Programmer user guide at: <Install\_directory>\Cypress\Programmer\<version>\Documents.



# 2.4 Bridge Control Panel

- 1. Click Start > All Programs > Cypress > Bridge Control Panel <version> > Bridge Control Panel <version>.
- 2. Select **5.0V** from **Power Setting** box, as highlighted in Figure 2-6.
- 3. Select the device to be connected from the port window.
- 4. Click the **Variable Settings** option from the **Chart** menu, click **Load**, navigate to and open the \*.ini file.
- 5. Select **File > Open**; navigate to and open the \*.iic file. The iic file contents appear on the Editor pane of the Bridge Control Panel.

Figure 2-6. Selecting the Bridge

👺 Bridge Control Panel	
File Editor Chart Execute Tools Help	
<b>☞ ■ ∰  </b> ∰ 1 1 1 1 1 <b>E   EE EE</b>	
Editor Chart Table File	
w 05 0 1 p r 05 @SensorID @IRawCount @ORawCount @IBaseline @OBaseline @IDifference @ODifference This is a commands window - User must enter command here	
Opening Port Successfully Connected to Bridge/0000011 USB2IIC Bridge version 1.22	<u>()</u>
	1
	2
Image: Stop       Image: Stop       Send all strings:       Connected 12C/SPI-USB converters:       Image: Stop       Protocol       Image: Stop       Image: Stop	
1:1 Syntax: OK Connected Powerad Voltage; -	

**Note** For more details on the Bridge Control Panel, view the help topics from the Bridge Control Panel Menu bar.





# 3.1 Introduction

The CY3280-20x66 Universal CapSense Controller (UCC) connects to any CY3280 Universal CapSense Module board. This kit requires PSoC Designer for development, PSoC Programmer for programming, and Bridge Control Panel to test and tune the CapSense parameters.

# 3.2 Hardware Requirement

- CY3280-20x66 Universal CapSense Controller board (PSoC Device ID: CY8C20666A-24LTXI)
- CY3280-Universal CapSense Linear Slider board or a similar CapSense module board
- MiniProg1
- CY3240-I2USB bridge
- USB A to Mini-B cable

# 3.3 Connecting CapSense Module Board

The CY3280-Universal CapSense Linear Slider Module Board can be connected to the UCC through Port P2 of the UCC board and J1 of the CY3280 Universal CapSense Linear Slider Module. The connection is as shown in the following figure.

Figure 3-1. Connect CapSense Module Board to Universal CapSense Controller



On the CY3280-20x66 Universal CapSense Controller board, place shunts on pins 1 and 2 of J4 (XRES select) to connect the XRES pin of PSoC to the XRES on programming header. On the CY3280-SLM Universal CapSense Linear Slider Module, place a shunt on pins 2 and 3 of J2 to connect the shield electrode to ground.



# 3.4 **Programming PSoC with New Design**

The CY3280-20x66 Universal CapSense Controller is programmed using a MiniProg1 provided with the kit.



Figure 3-2. Connect MiniProg to Controller

- 1. Connect the USB port of your PC to the CY3280-20x66 ISSP connector (J3) using the PSoC MiniProg and a USB cable (A to Mini-B). Programming can be done using PSoC Programmer.
- 2. On the UCC, connect J7 to pin 2 of J1. This enables power supply by the MiniProg1.
- 3. Toggle the **Power** button on PSoC Programmer.
- 4. LED **D1** on the CY3280-20x66 Universal CapSense Controller is ON if powered with Vcc\_Prog. Otherwise, both LEDs **D1** and **D2** light up on powering the device with other power sources.
- 5. Program the hex file onto the CY3280-20x66 Universal CapSense Controller board using the MiniProg. While programming is in progress, the **Target Power** LED on the MiniProg is on, as shown in Figure 3-2.

Note Hex files are available in the installed directory and in the kit CD.

- 6. When **Programming Succeeded** appears in the Actions pane, detach the MiniProg and connect an I2USB bridge to the ISSP connector.
- 7. Connect your computer to the CY3280-20x66's ISSP connector using the I2USB bridge and a USB cable, as shown in Figure 3-3.



Figure 3-3. Connect I2USB Bridge to Controller



# 3.5 Bridge Control Panel

The I2USB bridge is used to read the CapSense parameters from the controller board. These parameters can be viewed using the Bridge Control Panel software. Follow these steps to use the Bridge Control Panel software with the CY3280-20x66 Universal CapSense Controller board.

- 1. Click Start > All Programs > Cypress > Bridge Control Panel <version>.
- 2. Select the device to be connected from the port selection window.
- 3. Select **Variable Settings** option from the **Chart** menu. Load the .ini file, by clicking the **Load** button.

The CY3280\_SLM\_Project1.ini file is the variable setting file, available in the kit CD or at the following location: <Install\_Directory>\CY3280-20X66\<version>\Firmware\I2C-USBBridgeSoftwareConfig.

- 4. Load the CY3280\_SLM\_Project1.iic file for iic commands that can be sent to the board. The .iic file is the configuration setting file, available in the kit CD or at the following location: <Install\_Directory>\CY3280-20X66\<version>\Firmware\ I2C-USBBridgeSoftwareConfig.
- 5. Go to File > Open File > CY3280\_SLM\_Project1.iic to select the file for iic commands.
- 6. Select +5.0V in the Power box. See Figure 3-4.
- 7. Click Toggle Power to power the I2USB bridge; the red LED D1 glows, as shown in Figure 3-3.

Figure 3-4. Toggle Power Button

🗱 Bridge Control Panel	
Eile Editor Chart Execute Iools Help	
Editor Chart Table File	
w 05 0 1 p r 05 @SensorID @lRawCount @ORawCount @lBaseline @OBaseline @lDifference @ODiff	ere
	×
Select Port in the PortList, then try to connect Opening Port Successfully Connected to MiniProg3/1229DD0001F9 MiniProg3 version 2.05 [3.08/2.07]	(S)
Connected I2C/SPI/RX8 Ports:	
	(UART)
1 : 1 Syntax : OK Connected Powered Voltage: 5000 mV	d

Note Close PSoC Designer and PSoC Programmer before opening Bridge Control Panel.



#### Figure 3-5. Bridge Control Panel Editor View

🗱 Bridge Control Panel	
File Editor Chart Execute Tools Help	
🖻 🛛 🗑 🕼 🛍 🖉 🗮 🗮 🕰	IIC File Contents
Editor Chart Table File	
w 05 0 1 p r 05 @SensorID @1RawCount @01	RawCount @1Baseline @0Baseline @1Difference @0Diff

- 8. Place the cursor on the first command (W 05 0 1 P) and click **Send** to send the sensor ID to slave. In this command, 05 is the slave address. 0 and 1 are the offset address and value of the sensor ID, respectively.
- 9. Place the cursor on the second command and click **Repeat** to get the parameters continuously from the controller.
- 10. Touch a button or slider. Each touch lights up the associated LED on the module board, representing where your finger is on the slider.



Figure 3-6. LED2 Glows on Touching Sensor SLD4



11. Click the **Chart** tab to switch to Chart view and see the respective waveforms of CapSense parameters.

🗱 Brid	lge Co	itrol Pa	inel														
File	Editor	Chart	Exec	ute -	Tools	Help	1	o get	Chart \	/iew							
6		g 4	ē   <	> E	1	š 🔯	0	lick he	ere								
Editor	Chart	Table	File														
16290	-															Select.	All
16130	1																-SensorID -RawCount
15970	1																- Baseline Difference
15810	1																MaskInfo ButtonNo
15650	-																SliderPos
15490	-															<	>
15330	-																
15170	-																
15010	-																
14850	+																
14690																💿 Linear	
14530																🔿 Log10	
14370				<u> </u>	<u></u>					-	<u> </u>					cnts	
- Flags	19480					19800				201	20				20440	Chart Quali	v
fgO	fg1	fg2	fg3	fg4	fg5	fg6	fg7	£g8	£g9	fgA	fgB	fgC	fgD	fgE	fgF	💽 High	O Normal
<b>Ø</b> B S	eset itop	<mark>陰::</mark> List <b>荷</b> Repe	at 1	Send	Ser Rep Sca	nd all strin beat cour in period,	gs:	0 💠	Conne Bridge	ected 12(	C/SPI-U!	SB conve	erters:		<b>♦</b> ►	Power +5.0V +3.3V +2.5V +1.8V	Protocol I2C SPI
2:10	Syr	itax : OK			Ct=	20204 Ra	ate=185	smp/s		Connecte	ed	Pow	vered	Volt	age: -		.:

Figure 3-7. Bridge Control Panel Chart View

**Note** In the figure, the brown line represents the axis; the blue line indicates RawCount; and the green line indicates the Baseline.

- 12. View the required parameters by selecting or clearing the checkboxes to the right of the Chart view.
- 13. Click **Stop** to stop scanning.



14. Click the **Table** tab to view the values of the demonstration board variables, as shown in Figure 3-8.

🗱 Brid	ige Control Pa	inel							
File	Editor Chart	Execute T	ools Help						
🖻 🖬			₩ PS F#	loget la click here	ble View				
Editor	Chart Table	File							
#	SensorID	RawCount	Baseline	Difference	MaskInfo	ButtonNo	SliderPos		^
1331	1	14419	14414	0	0	255	0		
1332	1	14419	14414	0	0	255	0		
1333	1	14419	14414	0	0	255	0		
1334	1	14419	14414	0	0	255	0		
1335	1	14419	14414	0	0	255	0		
1336	1	14419	14414	0	0	255	0		
1337	1	14417	14414	0	0	255	0		
1338	1	14417	14414	0	0	255	0		
1339	1	14417	14414	0	0	255	0		
1340	1	14417	14414	0	0	255	0		
1341	1	14417	14414	0	0	255	0		
1342	1	14417	14414	0	0	255	0		
1343	1	14417	14414	0	0	255	0		
1344	1	14419	14414	0	0	255	0		
1345	1	14419	14414	0	0	255	0		
1346	1	14419	14414	0	0	255	0		
1347	1	14419	14414	0	0	255	0		
1348	1	14419	14414	0	0	255	0		-
1249	1	14419	14414	0	0	265	0		<u> </u>
<b>Ø</b> Be	eset 👫:List		Send all string	gs:	Connected 120	/SPI-USB conve	erters:	Power •+5.0V	Protocol
I		at 🕅 o file	Hepeat count	: U 🗘	Bridge/000001			0 +3.3V	O SPI
			<ul> <li>Scan period,</li> </ul>	ms: 0 拿				• +2.5V • +1.8V	
2:13	Syntax : OK		Ct=2331 Rat	e=115 smp/s	Connecte	ed Pow	vered Volta	ge: -	

Figure 3-8. Bridge Control Panel Table View.

# 4. Hardware



# 4.1 System Block Diagram

The CY3280-20x66 Universal CapSense Controller board has the following sections:

- PSoC CY8C20066A-24 LTXI
- Power supply system
- USB Mini-B connector
- CapSense module connector
- ISSP/I2C connector
- ICE-Cube debug connector
- VADJ variable regulator control
- LEDs
- Reset switch
- CMOD

Figure 4-1. System Block Diagram





# 4.2 Functional Description

The CY3280-20x66 Universal CapSense Controller includes PSoC CY8C20066A, ISSP connector, CapSense module connector, USB Mini-B connector, DC supply socket, reset button, ICE-Cube debug connector.

Figure 4-2 shows the different functional blocks on the CY3280-20x66 Universal CapSense Controller board.



Figure 4-2. CY3280-20x66 Universal CapSense Controller Functional Blocks



# 4.2.1 PSoC CY8C20066A-24 LTXI

The PSoC CY8C20066A is initially factory programmed as a CapSense Controller with the control circuitry to work with the CY3280-20x66 Universal CapSense Controller Kit. The PSoC CY8C20066A along with CSA/CSD technology demonstrates the use of CapSense buttons and linear sliders; the module board connected to the CY3280-20x66 Universal CapSense Controller has sensors and LEDs. The configuration number varies with the modules.

A CapSense module board is connected to the PSoC through Port P2. The list of pins connected to different ports is shown in Pin Description of CY8C20066A-24LTXI on page 28.

PSoC CY8C20066A is programmed through ISSP using a MiniProg. Data acquisition and output checking is done using I2USB bridge.



Figure 4-3. Schematic View of PSoC CY8C20066A



# 4.2.1.1 Pin Description of CY8C20066A-24LTXI

Pin No	Name	Description	Connected To
1	OCDOE	OCD mode direction pin	
2	P2[7]	GPIO, LED1	P2
3	P2[5]	Crystal output (XOut), LED0	P2
4	P2[3]	Crystal input (XIn), CapSense	P2
5	P2[1]	CapSense	P2
6	P4[3]	GPIO	P3
7	P4[1]	GPIO	P3
8	P3[7]	GPIO	P3
9	P3[5]	GPIO	P3
10	P3[3]	CapSense	P2
11	P3[1]	GPIO	P2
12	P1[7]	I2C SCL, SPI SS	P2, J2
13	P1[5]	I2C SDA, SPI MISO	P2, J4, J2
14	CCLK	OCD CPU clock output	P1
15	HCLK	OCD high-speed clock output	P1
16	P1[3]	SPI CLK, CapSense	P2
17	P1[1]	ISSP CLK[3], I2C SCL, SPI MOSI	P2, J3, J2
18	VSS	Ground connection	
19	D+	USB D+	J6
20	D–	USB D-	J6
21	VDD	Supply voltage	
22	P1[0]	ISSP DATA[3], I2C SDA, SPI CLK[4]	P2, J3, J2
23	P1[2]	GPIO, LED4	P2
24	P1[4]	Optional external clock input (EXTCLK), CapSense	P2
25	P1[6]	CapSense	P2
26	XRES	Active high external reset with internal pull down	J4
27	P3[0]	CapSense	P2
28	P3[2]	CapSense	P2
29	P3[4]	GPIO	P3
30	P3[6]	GPIO	P3
31	P4[0]	GPIO	P3
32	P4[2]	GPIO	P3
33	P2[0]	CapSense	P2
34	P2[2]	CapSense	P2
35	P2[4]	CapSense	P2
36	P2[6]	CapSense	P2
37	P0[0]	GPIO	P2
38	P0[2]	CapSense	P2
39	P0[4]	CapSense	P2
40	P0[6]	CapSense	P2
41	VDD	Supply voltage	
42	OCDO	OCD even data I/O	P1
43	OCDE	OCD odd data output	P1
44	P0[7]	GPIO	P2
45	P0[5]	GPIO, LED3	P2
46	P0[3]	Integrating input	P2
47	VSS	Ground connection	
48	P0[1]	GPIO, LED2	P2



# 4.2.2 Power Supply System

The power supply system on this board is versatile; it takes input supply from the following sources:

- 12-V DC supply using connector J5
- 9-V battery connector using connectors BH1 and BH2
- USB power (5 V) from communications section using connector J6
- Power from MiniProg and I2USB bridge (Vcc\_Prog) connected at J3
- Power from ICE-Cube (Vcc\_Prog) connected at P1

The board power domain is split into:

- Vin rail: This is the rail where the input of on-board regulators are connected. This domain is powered through protection diodes (by 12-V DC supply and 9-V battery terminal).
- 5V rail: This is the output of the 5-V regulator IC U3. The rail has a fixed 5-V output regardless of jumper settings. The voltage in this rail can be lesser than 5 V only when the board is powered by the USB.
- Vadj rail: This is the output of the variable voltage regulator control.
- VCC\_PROG: This is power from devices such as MiniProg, I2USB bridge, and ICE-Cube debugger.

The following block diagram shows the structure of the power system on the board.



Figure 4-4. Power Supply System Structure





#### Figure 4-5. Schematic View of Power Supply System Structure

#### 4.2.2.1 Power Supply Jumper Setting

The jumper settings for each power setting are as follows

- To allow power to be supplied by the MiniProg, I2USB bridge, and ICE-Cube, connect J7 to pin 2 of J1 with a jumper.
- To allow power from the 12-V DC supply or 9-V battery terminal or USB Mini-B connector, connect pin 2 and 3 of J1 with a jumper.
- To allow power from the variable regulator control (Vadj), connect pins 1 and 2 of J1 with a jumper.



### 4.2.3 USB Mini-B Connector

The USB Mini-B connector is a mini port to communicate between the PC and the board. It is also used to power up the controller, supplying a voltage of 5 V. Protection diode D5 is present so that the 5 V from the board does not flow to the USB connector.

Figure 4-6. Schematic View of USB Mini B Port



### 4.2.4 CapSense Module Connector

The CY3280-20x66 has an expansion port, P2. It is designed to connect CapSense module boards. The CY3280-20x66 controller board can be used with any of the Universal CapSense module boards, such as the CY3280-SLM. Universal CapSense module boards can be interfaced to the CY3280-20x66 controller via the 44-pin connector P2. The pin mapping for the port P2 is shown in the following figure.

Figure 4-7. Schematic View of Port P2





### 4.2.5 ISSP/I2C Connector

In-system serial programming (ISSP) is used to program the PSoC device using MiniProg1 and the USB cable. Plug in the MiniProg device to the ISSP header J3.

The ISSP connector is also used to connect the I2USB bridge to communicate between the PC and the controller board. See Power Supply Jumper Setting on page 30. The pin mapping for the ISSP connector is shown in the following figure.

Figure 4-8. Schematic View of ISSP/I2C Connector.



# 4.2.6 ICE-Cube Debug Connector

The CY3215-DK ICE-Cube in-circuit debugger allows you to debug and view the content of specific memory locations. The ICE-Cube debugger can be connected to the CY3280-20x66 controller through port P1. See Power Supply Jumper Setting on page 30. The following figure shows the schematic view of the ICE-Cube debug connector.

Figure 4-9. Schematic View of ICE-Cube Connector.





## 4.2.7 VADJ Variable Regulator Control

The CY3280-20x66 controller has a variable regulator control used to vary input voltage using the voltage regulator IC U4. The input for the variable regulator control is the output of the 5-V regulator. Vadj is used to demonstrate CapSense at several voltages.

The minimum Vout from IC U4 is 1.242 V when the resistance at R67 is 0. This load at R67 can be varied using the potentiometer. If the load at R67 is 3 K, the output voltage is 2.484 V; if the load at R67 is 9 K, the output voltage is 4.968 V.

See Power Supply Jumper Setting on page 30 for the settings to use input source Vadj.

Figure 4-10. Schematic View of Vadj Regulator.



#### 4.2.8 LEDs

The LEDs are used to show the status of the controller board. LED D2 lights up on connecting power supply from 12-V DC supply or USB or 9-V battery. LED D1 lights up when the board is powered by any of the following power sources: 12-V DC supply, USB, 9-V battery, MiniProg, I2USB bridge, or ICE-Cube.

Figure 4-11. Schematic View of LEDs D1 and D2.





### 4.2.9 Reset Switch

The Reset switch resets PSoC to start of the program (code examples). On reset, after XRES deasserts, the SDA and SCL lines drive resistive low for eight sleep clock cycles and transition to high impedance state.

Figure 4-12. Schematic View of RESET Switch



### 4.2.10 CMOD

CMOD is the test point provided on the Universal CapSense Controller for accessibility of charge and discharge waveforms of the measured capacitance. This test point may increase the noise sensitivity by acting as an antenna.

Figure 4-13. Schematic View of CMOD







All code examples are available in the Firmware folder of the kit CD or at the following location: <Install\_Directory>\CY3280-20x66\<version>\Firmware\

# 5.1 My First Code Example (CY3280\_20x66\_CSD\_PD\_Project1)

#### 5.1.1 Project Description

This project demonstrates the use of CapSense buttons and linear slider on the CY3280-SLM board using CSD technology and CY8C20x66A. The EzI2Cs User Module is used to transfer CapSense parameters related to a sensor from the board to the PC for monitoring.

This project scans five CapSense buttons and a 10-segment slider using the CSD User Module. There are five LEDs on the board, which illuminate when a CapSense button or slider is touched. The EzI2Cs User Module is used to provide a register-based I2C slave communications protocol. The status of CapSense sensors (both button and slider) and their parameters are updated in the I2C register, which can be accessed by any I2C master, similar to the I2USB bridge.

The application starts by executing boot.asm. The boot.asm initializes the hardware and invokes the 'main' function. The main function initializes the EzI2Cs Slave and CapSense user modules. After initialization, the main function enters into a loop, which does the following:

- Scans all sensors
- Reads the sensor ID sent by the I2C master
- Stores CapSense data in the I2C registers
- Updates the LED status for the On/Off sensors

The following user modules are used in this project:

**CSD:** The CSD provides capacitance sensing using the switched capacitor technique with a sigmadelta modulator to convert the sensed switching capacitor current to digital code.

**EzI2Cs:** The EzI2Cs User Module implements an I2C register based slave device. This user module does not require any digital or analog PSoC blocks. It is used to transfer all CapSense parameters related to a sensor to the PC for monitoring

**Note:** To open the project from PSoC Designer, move the Firmware folder to a writable directory and then open it. The firmware folder is located at <Install\_Directory>\CY3280-BK1\<version>\Firmware.



### 5.1.2 Flowchart




### 5.1.3 Creating My First PSoC 1 Project

- 1. Open PSoC Designer.
- 2. To create a new project, click File> New Project.
- 3. In the New Project window, select the **Chip-level** icon. Name the project **Example\_My\_First\_PSoC\_Project**, as shown in Figure 5-1.
- 4. Click **Browse** and navigate to the directory in which the project is created.

Figure 5-1. New Project

New Project		? 🛛
Project types:		
<u>N</u> ame:	Example_My_First_PSoC_Project	
Location:	C:\Documents and Settings\dima\My I	Documents
Workspace Na <u>m</u> e:	Example_My_First_PSoC_Project	Create directory for workspace
Project Creation:	New Project	<b>~</b>
Target Device:	CY8C20666A-24LTXI	<ul> <li>Device Catalog</li> </ul>
Generate 'Main' file using:	C	~
Creates an empty C - base This project type supports	d Chip-level project for CY8C20666A-24L User Module selection and placement.	TXI device.
		<u>DK</u> <u>C</u> ancel

5. Click the **Device Catalog** button, as shown in Figure 5-2, to select the target device.

Figure 5-2. Select Target Device

Example_My_First_PSoC_Project	
C:\Documents and Settings\dima\My [	Documents
Example_My_First_PSoC_Project	Create directory for workspace
New Project	✓
CY8C20666A-24LTXI	Device Catalog
C	v
	Example_My_First_PSoC_Project C:\Documents and Settings\dima\My I Example_My_First_PSoC_Project New Project CY8C20666A-24LTXI



6. The Device Catalog window opens. Select the CY8C20666A-24LTXI device and click Create Project with 'CY8C20666A-24LTXI' as shown in Figure 5-3.

Dev	Device Catalog - Chip-level														
Device Type: All Devices 👻 🖫 Compare Devices 🛛 🦞 Reset 🛛 Find															
Compare	▲ Part Number	Pin Count	Package Type	Analog Blocks	Digital Blocks	CapSense	Flash	RAM	IO Count	Supply Voltage	dWS	USB Interface	Wireless Interface	Temperature	Legacy
	Filters:	T		T	T	T	T	T	T	1 21 - 5 5	T	T	T	T	
	LY8L20646AS-24L1XI	48	QFN		U	res	TEK	ZK	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	No
	CY8C20646L-24LQXI	48	QFN	Ţ	0	Yes	<i>16K</i>	28	36	1.71 10 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	Yes
	CY8C20647-24LQXI	48	QFN	1	0	Yes	16K	2K	34	1.71 to 5.5	N/A	N/A	N/A	Ind(-40 to 85C)	No
	CY8C20647S-24LQXI	48	QFN	1	0	Yes	16K	2K	34	1.71 to 5.5	N/A	N/A	N/A	Ind(-40 to 85C)	No
	CY8C20666-24LTXI	48	QFN	1	0	Yes	32K	2K	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	Yes
	CY8C20666A-24LQXI	48	QFN	1	0	Yes	32K	2K	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	No
	CY8C20666A-24LTXI	48	QFN	1	0	Yes	32K	2K.	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	No
	CY8C20666AS-24LQXI	48	QFN	1	0	Yes	32K	2K	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	No
	CY8C20666AS-24LTXI	48	QFN	1	0	Yes	32K	2K	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	No
	CY8C20666L-24LQXI	48	QFN	7	0	Yes	32K	2K	36	1.71 to 5.5	N/A	Full-Speed	N/A	Ind(-40 to 85C)	Yes
	CY8C20667-24LQXI	48	QFN	1	0	Yes	32K	2K	34	1.71 to 5.5	N/A	N/A	N/A	Ind(-40 to 85C)	No
	CY8C20667S-24LQXI	48	QFN	1	0	Yes	32K	2K	34	1.71 to 5.5	N/A	N/A	N/A	Ind(-40 to 85C)	No
	CY8C20746A-24FDXC	30	CSP	1	0	Yes	16K	2K	27	1.71 to 5.5	N/A	N/A	N/A	Ind(-40 to 85C)	No 🥥
Sele	Selected Device: CY8C20666A-24LTXI Filters applied: 0 Devices found: 363 of 363 Example Project Search for 'CY8C20666A-24LTXI' Create Project with 'CY8C20666A-24LTXI' Cancel														

Figure 5-3. Device Catalog

7. Under Generate 'Main' File Using: select C and then click OK.



8. By default, the project opens in Chip view, as shown in Figure 5-4.

#### Figure 5-4. Default View



9. The next step is to place and configure the modules required for this design, as well as connect the modules together and to the pins of the PSoC. In the User Modules window, expand the **Cap Sensors** folder.







10. In this folder, right-click on **CSD** and select **Place**.

Figure 5-6. User Modules Window - CSD Select



Figure 5-7. CSD User Module Placement





11. Configure the CSD\_1 properties, as shown in Figure 5-8:

Figure 5-8. CSD User Module Properties

Name	CSD			
User Module	CSD			
Version	2.20			
FingerThreshold	85			
NoiseThreshold	60			
BaselineUpdateThreshold	200			
Sensors Autoreset	Disabled			
Hysteresis	20			
Debounce	3			
NegativeNoiseThreshold	50			
LowBaselineReset	50			
iDAC Value	10			
Resolution	14			
Scanning Speed	Fast			
ShieldElectrodeOut	None			
PrechargeSource	Prescaler			
Prescaler	8			
PRS Resolution	12 bit			
Autocalibration	Enabled			
FMEA_Cp_Range_Test	Disable			
Idac Range	8x			

12. Right-click on the **CSD** user module and select the **CSD Wizard** option to assign pins to the sensors.

Figure 5-9. Open CSD Wizard





### Figure 5-10. CSD Wizard

CapSense Wizard	
Global Settings Sensors Settings Buttons 1 Sliders 1 Radial Sliders 0 Modulator Capacitor F None	SWO
Buttons Buttons Sensors Count Chip Pin Assignment View Table Pin Assignment View	21 21 21 21 21 21 21 21 21 21 21 21 21 2
E g g g g g g g g g g g g g g g g g g g	
P2[5]         3         34         P2[2]           P2[3]         4         33         P2[0]           P2[3]         5         CY8C20666A         32         P4[2]           P4[3]         6         31         P4[2]           P4[3]         6         31         P4[2]           P4[3]         6         30         P3[6]           P3[7]         8         29         P3[6]           P3[6]         9         28         P3[2]           P3[3]         10         27         P3[0]           P3[3]         11         26         YEES	
P1[7] 11 13 14 15 16 17 18 19 20 21 22 23 24 13 14 15 16 17 18 19 20 21 22 23 24 13 14 15 16 17 18 19 20 21 22 23 24 13 14 15 16 17 18 19 20 21 22 23 24 13 14 15 16 17 18 19 20 21 22 23 24 15 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Legend for Chip:     Unavailable pins     Locked pins     Locked pins
Total Sensors: 6   Switches: 1   Sliders: 1   Radial Sliders: 0	Assigned pins OK Cancel

13.Configure the Global Settings in the CSD Wizard window.

Figure 5-11. Global Settings - CSD Wizard

Global Settings	Sensors Settings				
Buttons	5				
Sliders	1				
Radial Slider:	s O				
Modulator Ca	apacitor F PO[3]				
Modulator Capacitor Pin Modulator Capacitor Pin					



14. Click on the slider in the CSD Wizard to view sensor settings. Configure the **Sensor Settings**, as shown in Figure 5-12.

Figure 5-12. Sensors Settings - CSD Wizard

alobal Settings	Sensors Settings (for Sliders only)
Diplex	False
Resolution	100
Sensors Col	unt <b>10</b>
Diplex	

15. To assign the sensor on a particular pin, click and drag from the sensor block to the required pin in the Pin Assignment window. Drag and drop SW0 to pin P1 [6]. Sensor pin assignment can be done in Table Pin Assignment View (Figure 5-14) or Chip Pin Assignment View (Figure 5-13).

Figure 5-13. Assign Sensors to Pins - Chip Pin Assignment View

CapSense Wizard	× X
Sensors Count         10           Sensors Count         10           Sensors Count         10           Sensors Count         10           Chip Pin Assignment View         Table Pin Assignment View           Chip Pin Assignment View         Table Pin Assignment View           P2(7)         2           Sensors Count         36           P2(7)         2           P2(7)         2           P2(8)         9           P2(7)         2           Sensors Count         36           P2(7)         2           P2(8)         9           P2(9)         9           P2(9)         9           P2(1)         9 <td< td=""><td>SW0 SW1 SW2 SW3 SW4 SW0 SW1 SW2 SW3 SW4 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10</td></td<>	SW0 SW1 SW2 SW3 SW4 SW0 SW1 SW2 SW3 SW4 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10 S10
	Legend for Chip: Unavailable pins Locked pins Available pins OK Cancel
Total Sensors: 15   Switches: 5   Sliders: 1   Radial Sliders: 0	



CapSense Wizard
Global Settings Sensors Settings
Diplex False SHU SHU SHU SHU SHU SHU
Resolution 100 Sensors Found 10
H H H
Sensors Count
Chip Pin Assignment View Abile Pin Assignment View
P0(1) P1(1) P2(1) P3(1) P4(1)
P0(2) P1(2) P2(2) P3(2) P4(2)
P0(3) P1(3) P2(3) P2(3) P4(5)
P0(41 P1(41 P2(4)/ P3(4)
P0(5) P1(5) \$\vec{y}{2}(5) \$P3(5)\$
P0(6) P1(6) P3(6)
PO[71] P1[71] P2[71] P2[71] Legend for Chip: Help
Assigned pins
Total Sensore 15 Suitcher 5 Slider: 1 Bactal Slider: 0

Figure 5-14. Assign Sensors to Pins - Table Pin Assignment View

16. After assigning a sensor, the CSD Wizard looks as shown in Figure 5-15.



Figure 5-15. Sensor Assigned



17. Similarly, assign all the sensors according to the following table Table 5-1. Sensor Assignment

Sensor	Port Pin
SW0	P1[6]
SW1	P1[3]
SW2	P3[3]
SW3	P2[1]
SW4	P2[3]
S1(0)	P1[4]
S1(1)	P0[6]
S1(2)	P0[4]
S1(3)	P0[2]
S1(4)	P2[6]
S1(5)	P2[4]
S1(6)	P2[2]
S1(7)	P2[0]
S1(8)	P3[2]
S1(9)	P3[0]

18. After assigning all the sensors successfully, the CSD Wizard appears as follows:

Figure 5-16. All Sensors Assigned - Table Pin Assignment View

CapSense Wizard	X
Global Settings Sensors Settings Diplex False Resolution 100 Sensors Count <b>10</b>	SW0         SW1         SW2         SW3         SW4           P1[6]         P1[3]         P3[3]         P2[1]         P2[3]
Sensors Count Slider Sensor Count. Chip Pin Assignment View Table Pin Assignment View	state         state <td< th=""></td<>
P0(0) P1(0) P2(0) P3(0) P4(0) S1(7) S1(9) P4	
P0(1)         P1(1)         P2(1)         P3(1)         P4(1)           90(2)         P1(2)         P2(2)         P3(2)         P4(2)           S1(3)         S1(6)         S1(6)         S1(6)	
P0(3) P1(3) P2(3) P3(3) P4(3) SW1 SW4 SW2	
P0[4]         P1[4]         P2[4]         P3[4]           S1(2)         S1(0)         S1(5)           P0[5]         P1[5]         P2[5]         P3[5]	
P0[6]         P1[6]         P2[6]         P3[6]           S1(1)         SW0         S1(4)	Legend for Chip:
P0[7] P1[7] P2[7] P3[7]	Unavailable pins Locked pins Available pins Assigned pins OK Cancel
Total Sensors: 15 Switches: 5 Sliders: 1 Radial Sliders: 0	



5 5	
CapSense Wizard	X .
Global Settings Sensors Settings Diplex False Resolution 100 Sensors Count 10	Sw0         Sw1         Sw2         Sw3         Sw4           P1[6]         P1[3]         P3[3]         P2[1]         P2[3]
Sensors Count Slider Sensor Count. Chip Pin Assignment View Table Pin Assignment View	
E S E S L U U C S E S L 2 S E S L U U C S E S E S E 48 47 46 45 44 43 42 41 40 39 38 37 1 2 36 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	<>
P2[5]         3         34         S1(6)           SW4         4         33         S1(7)           SW3         5         CY8C20666A         32         P4[2]           P4[3]         6         31         P4[2]           P4[1]         7         QFN         30         P3[6]           P3[7]         8         29         P3[4]           P3[5]         9         28         S1(8)           SW2         10         27         S1(9)           P3[1]         11         26         XRES           P3[1]         12         26         SW0	
(1) 14 15 16 17 18 1920 21 22 23 24 (1) 14 15 16 17 18 1920 21 25 16 16 16 17 18 1920 20 18 16 16 16 16 16 16 16 16 16 16 16 16 16	Legend for Chip: Unavailable pins Locked pins Available pins Assigned pins OK Cancel
Total Sensors: 15 Switches: 5 Sliders: 1 Radial Sliders: 0	

Figure 5-17. All Sensors Assigned - Chip Pin Assignment View

19. In the User Modules window, expand the **Digital Comm** folder, select **Ezl2Cs**, right-click and select **Place** to place an Ezl2Cs in the design.

Figure 5-18. User Module Window - Ezl2Cs Select





20.By default, the EzI2Cs is placed at the I2C/SPI block. The placement of EzI2Cs module is shown in Figure 5-19.

 Stat Page
 example\_m..ject [Chip]\*
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Figure 5-19. Ezl2Cs User Module Placement

21.Configure the properties of EzI2Cs\_1 as shown in Figure 5-20.

	Figure 5-20.	Ezl2Cs	User	Module	Properties
--	--------------	--------	------	--------	------------

Pa	Parameters - EzI2Cs 🚽 🗸 🗙				
	Name	Ezl2Cs			
	User Module	Ezl2Cs			
	Version	1.30			
	Slave_Addr	5			
	Address_Type	Static			
	ROM_Registers	Disable			
	HW Addr Rec	Disable			
	12C Clock	400K Fast			
	12C Pin	P[1]0-P[1]1			
N Ir	Name Indicates the name used to identify this User Module instance				

22. Configure the properties of port pin P2[5] in the Pinout window as shown in Figure 5-21.

	Figure 5-21.	P2[5]	Port Pin	Propertie
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Pin	Pinout - example_my_first_psoc_project 🛛 🗸 🗸 🗙				
Ŧ	P2[4]	CSDSW10	, AnalogMUXInput, High Z 4 🔼		
	P2[5]	LED0, Std0	CPU, Strong, DisableInt, Nor		
	Name	LEDO			
	Port	P2[5]			
	Select	StdCPU			
	Drive	Strong			
	Interrupt	DisableInt			
	AnalogMUXBus	Normal			
	InitiaMalue	0			

23. Configure the properties of P2[7], P0[1], P0[5] and P1[2] as shown in the following figures.

### Figure 5-22. P2[7] Port Pin Properties

Ξ	P2[7]	Port_2_7, StdCPU, Strong, DisableInt,	
	Name	LED1	
	Port	P2[7]	
	Select	StdCPU	
	Drive	Strong	-
	Interrupt	DisableInt	
	AnalogMUXBus	Normal	
	InitiaMalue	0	

#### Figure 5-23. P0[1] Port Pin Properties

Ξ	P0[1]	LED2, StdCPU, Strong, DisableInt, Nor	
	Name	LED2	
	Port	P0[1]	
	Select	StdCPU	
	Drive	Strong	
	Interrupt	DisableInt	
	AnalogMUXBus	Normal	
	InitiaMalue	0	

#### Figure 5-24. P0[5] Port Pin Properties

Ξ	P0[5]	LED3, StdCPU, Strong, DisableInt, Nor
	Name	LED3
	Port	P0[5]
	Select	StdCPU
	Drive	Strong
	Interrupt	DisableInt
	AnalogMUXBus	Normal
	InitiaMalue	0

#### Figure 5-25. P1[2] Port Pin Properties

Ξ	P1[2]	LED4, StdCPU, Strong, DisableInt, Nor
	Name	LED4
	Port	P1[2]
	Select	StdCPU
	Drive	Strong
	Interrupt	DisableInt
	AnalogMUXBus	Normal
	InitiaMalue	0



24. Configure the Global Resources window as follows.

Figure 5-26. Global Resources

Global Resources - example_my_first_psoc_project 🤍 👻 🗶					
	IMO Setting	24MHz			
	CPU_Clock	SysClk/2			
	32K_Select	Internal			
	ILO Setting	32kHz			
	Sleep_Timer	1_Hz			
	SysClk Source	Internal			
	Trip Voltage [LVD]	4.73V			
	LVDThrottleBack	Disable			
	Watchdog Enable	Disable			
	Interrupt Mode	Low			
	P1[0] Data Output	Disable			
	P1[2] Data Output	Disable			
	P1[4] Data Output	Disable			
	P1[6] Data Output	Disable			
	POR Voltage	1.66V			
IMO Setting Selects the speed of the internal main oscillator (IMO). Registers Affected: CPU_SCR1 IMO_TR					

25. Open the existing *main.c* file in Workspace Explorer. Replace the existing *main.c* content with the content of the embedded *Example\_My\_First\_PSoC\_Project\_Main.c* file, which is attached to this PDF.

Figure 5-27. Workspace Explorer





26. Add a new file to the project by clicking **File > New File**.

Figure 5-28. Add New File



27. Select the **C** file type and name the file.

🖐 New F	File				? 🛛
File types	้ กไ	<b>1</b>			9
.c F	ile .h File	.asm File	.inc File	Text File	् ा XML File
C langua	ige source file				
<u>N</u> ame:	display				Add file to current project
Location:					<u>B</u> rowse
					<u>OK</u> <u>C</u> ancel



28. Similarly, create two .h file types and name them as main.h and display.h, respectively.

Figure 5-30. New Files in Project



- 29.Copy content of the *display.C*, *display.h*, and *main.h* files that is attached to this PDF to the respective files in the project.
- 30.Click Build > Generate/Build 'Example\_My\_First\_PSoC\_Project'.
- 31.Connect the CY3280-20X66 board to the PC using a MiniProg1.

Figure 5-31. Connect MiniProg1 to Board



32. The board can be programmed either through the PSoC Designer IDE or PSoC Programmer. To program the board using PSoC Programmer, see Programming PSoC with New Design on page 20. To program the board through PSoC Designer, follow these steps.
Note While programming the board with PSoC Designer, close any open instance of PSoC Programmer.



#### a. Click **Program > Program Part**.

Figure 5-32. Program Part Window



- b. In Program Part window, make sure the following settings:
  Port Selection drop-down, select MiniProg1/xxxxxxxx and Connected
  Acquire Mode: Power Cycle
  Verification: Off
  Power Settings: 5.0 V
- c. Click the **Program** button to start programming the board.

Note Ensure that the shorting jumpers is placed on pin 2 of J1 and pin 1 of J7.

d. The board starts programming and the status is shown on the progress bar.

Figure 5-33. Programming Status

3	Program Part				×
[	Hex file path: C:\My_First_PSoC	_Project\My_	_First_PSoC_P	roject\My_First_PSo	D
	- Programming Set	tings			
	Port Selection:	MINIProg	/07A051CE38	515 🗹 🜗	
	Acquire Mode:	🔿 Reset	Power C	ycle	
	Verification:	🔿 On	Off		
	Power Settings:	5.0 V	~	0	
	Programming Start	ng		>>>	ĩ
					J
	E	USY F	owered	Connected	

33. When the programming is done successfully, the 'Operation Succeeded!' Message is shown.

Figure 5-34. 'Operation Succeeded!' Message

Operation Succeeded!	>>	



### 5.1.4 Verify Output

Follow these steps to verify the output:

- 1. Connect a Linear Slider Module (SLM) on connector P2 of the board.
- 2. Disconnect the MiniProg1 from the header J3 and connect a CY3240-I2USB bridge board in its place.
- 3. Connect a USB cable from the CY3240-I2USB bridge board to a free USB port on a PC.
- 4. Click Start > Programs > Cypress > Bridge Control Panel <version> > Bridge Control Panel <version>. Note Make sure that PSoC Designer and PSoC Programmer are closed before opening the Bridge Control Panel.
- 5. Select Variable Settings from the Chart menu.
- 6. Click Load, navigate to open the CY3280\_SLM\_Project1.ini file and click OK.
- 7. Click **Open File** from the File menu; navigate to and open the CY3280\_SLM\_Project1.iic file.
- Select +5.0V in the Power box. Click Toggle Power to power the CY3240-I2USB bridge, LED (red) D1 glows.

Figure 5-35. SLM Module and CY3240-I2USB Bridge Connected to CapSense Controller

- On the CapSense slider board, touch the button. Each button touch lights up the associated LED on the module board.
- 10. Touch the linear slider. The associated LED on the module board lights up, representing where your finger is on the slider.
- 11. The CapSense parameters such as the RawCount, Baseline, Difference Count and Mask Info (refer to the CSD User Module datasheet for more details of each parameter) for a particular sensor can be seen on the Bridge Control Panel. The current active button number and finger position on slider are also output on the Bridge Control Panel.
- 12. The syntax of the first command line, is as follows:

W	05	0	1	р
Write command	Slave Id	Address Offset	Sensor number	Stop
	(constant)	(constant)	(In hexadecimal, Valid range: 0x1 - 0xF)	

- 13. The first command writes to the Universal CapSense Controller (UCC) board, the sensor number for which the monitoring is required.
- 14. The second command line reads the CapSense parameters from the UCC board.



15. Change the sensor ID for which parameter monitoring is required and click **Send** to write the sensor ID to the Universal CapSense Controller board.

Figure 5-36. Command Line View



- 16.Click the second command line and then click **Repeat** to read I2Cdata received from the Universal CapSense Controller board.
- 17. Switch to the **Chart** tab to view the respective wave forms of CapSense parameters.

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Figure 5-37. Bridge Control Panel Chart View



18. The various parameter values received by the UCC is displayed in the Table tab.

Figure 5-38. Bridge Control Panel Table View

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E	ditor	Chart	Table	File							
٢	#	Senso	orID	RawCount	Baseline	Difference	MaskInfo	ButtonNo	SliderPos		~
ŕ	3828		10	11787	11782	0	0	255	0		=
	3829		10	11787	11782	0	0	255	0		
	3830		10	11782	11782	0	0	255	0		
	3831		10	11782	11782	0	0	255	0		
	3832		10	11782	11782	0	0	255	0		
	3833		10	11782	11782	0	0	255	0		
	3834		10	11782	11782	0	0	255	0		
	3835		10	11782	11782	0	0	255	0		
	3836		10	11782	11782	0	0	255	0		
	3837		10	11782	11782	0	0	255	0		
	3838		10	11782	11782	0	0	255	0		
	3839		10	11782	11782	0	0	255	0		
	3840		10	11788	11782	0	0	255	0		
	3841		10	11788	11782	0	0	255	0		
	3842		10	11788	11782	0	0	255	0		
	3843		10	11788	11782	0	0	255	0		
	3844		10	11788	11782	0	0	255	0		
	3845		10	11788	11782	0	0	255	0		
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# 5.2 CY3280\_20x66\_CSD\_PD\_Project2

#### 5.2.1 Project Description

This project demonstrates the use of CapSense buttons and linear sliders using CSD technology and CY8C20x66A. The EzI2Cs User Module is used to transfer the raw count of CapSense parameters related to all the sensors to PC for monitoring.

This project scans five CapSense buttons and a 10-segment slider using the CSD User Module. There are five LEDs on the board, which illuminate when a CapSense button or slider is touched. The EzI2Cs User Module is used to provide a register-based I2C slave communications protocol. The status of CapSense sensors (both button and slider) and their parameters are updated in the I2C register, which can be accessed by any I2C master, similar to the I2USB bridge.

The application starts by executing *boot.asm*. The *boot.asm* initializes the hardware and invokes the 'main' function. The main function initializes the EzI2Cs slave and CapSense user modules. After initialization, the main function enters into a loop, which does the following:

- Scans all sensors
- Reads the sensor ID sent by the I2C master
- Stores CapSense data in the I2C registers
- Updates the LED status for the On/Off sensors

The following user modules are used in this project:

**CSD:** The CSD User Module provides capacitance sensing using the switched capacitor technique with a sigma-delta modulator to convert the sensed switching capacitor current to digital code.



**EzI2Cs:** The EzI2Cs User Module implements an I2C register based slave device. This user module does not require any digital or analog PSoC blocks. It is used to transfer all CapSense parameters related to a sensor to the PC for monitoring.

**Note:** To open the project from PSoC Designer, move the Firmware folder to a writable directory and then open it. The firmware folder is located at <Install\_Directory>\CY3280-BK1\<version>\Firmware.

### 5.2.2 Device Configurations

Figure 5-39. Device Configuration for CY3280\_20x66 CSD PD Project2.





### 5.2.3 Firmware Architecture





### 5.2.4 Verify Output

Load CY3280\_SLM\_Project2.ini and CY3280\_SLM\_Project2.iic file from the Bridge Control Panel, as explained in Bridge Control Panel on page 21. This file is available in the following location: <Install\_Directory>\CY3280-20X66\<version>\Firmware\I2C-USBBridgeSoftwareConfig. Connect the CY3240-I2USB bridge board to the J3 header and to a free USB port on a PC through a USB cable, as explained in Programming PSoC with New Design on page 20.

- 1. Touch one or more buttons; the associated LEDs light up.
- 2. Touch the linear slider; the associated LEDs light up.
- 3. Touch the linear slider and buttons simultaneously. The associated LEDs light up corresponding to the buttons and the sliders being pressed.
- 4. Click the command line and then click **Repeat** to read I2C data received from the Universal CapSense Controller board.
- 5. Switch to the Chart tab to view respective wave forms of CapSense parameters; see Figure 5-41.

Note The character 'r' in Figure 5-40 defines the start of "read data" command.

Figure 5-40. Command Line View



Figure 5-41. Bridge Control Panel Chart View



**Note** The brown line in the figure represents the axis.



# 5.3 CY3280\_ 20x66\_CSA\_PD\_Project1

#### 5.3.1 Project Description

This project demonstrates the use of CapSense buttons and linear sliders using CSA technology and CY8C20x66A. The EzI2Cs User Module is used to transfer CapSense parameters related to a sensor to a PC for monitoring.

This project scans five CapSense buttons and a 10-segment slider using the CSA User Module. There are five LEDs on the board, which illuminate when a CapSense button or slider is touched. The EzI2Cs User Module is used to provide a register-based I2C slave communications protocol. The status of CapSense sensors (both button and slider) and their parameters are updated in the I2C register, which can be accessed by any I2C master, similar to the I2USB bridge.

The application starts by executing *boot.asm*. The *boot.asm* initializes the hardware and invokes the 'main' function. The main function initializes the EzI2Cs User Module and CapSense User Module. After initialization, the main function enters into a loop, which does the following:

- Scans all sensors
- Reads the sensor ID sent by the I2C master
- Stores CapSense data in the I2C registers
- Updates the LED status for the On/Off sensors

To make the CapSense sensors more sensitive, decrease the IDAC setting in the CSA User Module properties in PSoC Designer. However, this also increases the time it takes to scan each sensor. For more information on these or other parameters and the user module in general, see the CSA User Module datasheet.

The following user modules are used in this project:

**CSA:** The CSA User Module implements an array of capacitive touch sensors using switched capacitor circuitry, an analog multiplexer, digital counting functions, and high-level software routines to compensate for environmental and physical sensor variations.

**EzI2Cs:** The EzI2Cs User Module implements an I2C register based slave device. This user module does not require any digital or analog PSoC blocks. The EzI2Cs User Module is used to transfer all CapSense parameters related to a sensor to the PC for monitoring.

**Note:** To open the project from PSoC Designer, move the Firmware folder to a writable directory and then open it. The firmware folder is located at <Install\_Directory>\CY3280-BK1\<version>\Firmware.



### 5.3.2 Device Configurations

#### Figure 5-42. Device Configuration for CY3280\_20x66 CSA PD Project1.





### 5.3.3 Firmware Architecture





### 5.3.4 Verify Output

Load CY3280\_SLM\_Project1.ini and CY3280\_SLM\_Project1.iic file from the Bridge Control Panel, as explained in Bridge Control Panel on page 21. This file is available in the following location: <Install\_Directory>\CY3280-20X66\<version>\Firmware\I2C-USBBridgeSoft-wareConfig

- 1. Touch one or more buttons; the associated LEDs light up.
- 2. Touch the linear slider; the associated LEDs light up.
- 3. Touch the linear slider and buttons simultaneously. The associated LEDs light up corresponding to the buttons and the sliders being pressed.
- 4. The CapSense parameters such as the RawCount, Baseline, Difference Count and Mask Info (refer CSD User Module datasheet for more details of each parameter) for a particular sensor is displayed on the Bridge Control Panel. The current active button number and finger position on slider are also output on the Bridge Control Panel.
- 5. The syntax of the first command line, is as follows:

W	05	0	1	р
Write command	Slave Id	Address Offset	Sensor number	Stop
	(constant)	(constant)	(In hexadecimal, Valid range: 0x1 - 0xF)	

- 6. The first command writes to the Universal CapSense Controller (UCC) board, the sensor number for which the monitoring is required.
- 7. The second command line reads the CapSense parameters from the UCC board.
- 8. Change the sensor ID for which parameter monitoring is required and click **Send** to write the sensor ID to the Universal CapSense Controller board.
- 9. Switch to Chart tab to view the respective waveforms of CapSense parameters; see Figure 5-44.

**Note** The character 'w' in Figure 5-43 defines the start of "write data" command. Similarly, the character 'p' generates stop condition on the I2C bus and 'r' defines start of "read data" command.

Figure 5-43. Command Line View







Figure 5-44. Bridge Control Panel Chart View

**Note** In the figure, the grey line represents the axis, the blue line indicates RawCount, and the green line indicates the Baseline.

## 5.4 CY3280\_20x66\_CSA\_PD\_Project2

#### 5.4.1 Project Description

This project demonstrates the use of CapSense buttons and linear sliders using CSA technology and CY8C20x66A. The EzI2Cs User Module is used to transfer the raw count of CapSense parameters related to all the sensors to PC for monitoring.

This project scans five CapSense buttons and a 10-segment slider using the CSA User Module. There are five LEDs on the board, which illuminate when either a CapSense button or slider is touched. The EzI2Cs User Module is used to provide a register-based I2C slave communications protocol. The status of CapSense sensors (both button and slider) and their parameters are updated in the I2C register, which can be accessed by any I2C master, similar to the I2USB bridge.

The application starts by executing *boot.asm*. The *boot.asm* initializes the hardware and invokes the 'main' function. The main function initializes the EzI2Cs slave and CapSense user modules. After initialization, the main function enters into a loop, which does the following:

- Scans all sensors
- Reads the sensor ID sent by the I2C master
- Stores CapSense data in the I2C registers
- Updates the LED status for the On/Off sensors



To make the CapSense sensors more sensitive, you can decrease the IDAC setting in the CSA User Module properties within PSoC Designer. However, this also increases the time it takes to scan each sensor. For more information on these or other parameters, and the user module in general, see the CSA User Module datasheet.

The following user modules are used in this project:

**CSA:** The CSA User Module implements an array of capacitive touch sensors using switched capacitor circuitry, an analog multiplexer, digital counting functions, and high-level software routines to compensate for environmental and physical sensor variations.

**EzI2Cs:** The EzI2Cs User Module implements an I2C register based slave device. This user module does not require any digital or analog PSoC blocks. The EzI2Cs User Module is used to transfer all CapSense parameters related to a sensor to the PC for monitoring.

**Note:** To open the project from PSoC Designer, move the Firmware folder to a writable directory and then open it. The firmware folder is located at <Install\_Directory>\CY3280-BK1\<version>\Firmware.



### 5.4.2 Device Configurations

#### Figure 5-45. Device Configuration for CY3280\_20x66 CSA PD Project2





### 5.4.3 Firmware Architecture





### 5.4.4 Verify Output

Load CY3280\_SLM\_Project2.ini and CY3280\_SLM\_Project2.inc file from the Bridge Control Panel, as explained in Bridge Control Panel on page 21. This file is available in the following location: <Install\_Directory>\CY3280-20X66\<version>\Firmware\I2C-USBBridgeSoft-wareConfig

- 1. Touch one or more buttons; the associated LEDs light up.
- 2. Touch the linear slider: the associated LEDs light up.
- 3. Touch the linear slider and buttons simultaneously. The associated LEDs light up corresponding to the buttons and the sliders being pressed.
- 4. Click the command line and then click **Repeat** to read I2C data received from the Universal CapSense Controller board.
- 5. Switch to the Chart tab to view respective waveforms of CapSense parameters; see Figure 5-47.

Figure 5-46. Command Line View

1	Brid	lge Co	ntrol Pa	nel												
	File	Editor	Chart	Execute	Tools	Help										
1	28		<b>B B</b>	12   🗇 🛛		e 🛚										
F	ditor	Chart	Table	File												
	r 05	6 0 0	BO @1	BO @OB	1 011	B1 @0B2	@1B2	@0B3	@1B3	@ <b>0B4</b>	@1B4	@ <b>1SO</b>	0050	@ <b>1</b> 51	0051	01: <u>^</u>

Figure 5-47. Bridge Control Panel Chart View



Note The brown line in the figure represents the axis.



The schematic, board layouts, and BOM are available on the CY3280-20x66 kit CD or at: <Install\_directory>\CY3280-20x66\<version>\Hardware.

# A.1 Schematic

Α.

Appendix





# A.2 Board Layout

# A.2.1 PDCR-9492 Top





A.2.2 PDCR-9492 Bottom





# A.3 BOM

No	Qty	Reference	Part	Manufacturer	Manuf. Part#
1	1	C2	CAP CER 10UF 16V X5R 0805	Murata Electronics North America	GRM21BR61C106KE15L
2	2	C3,C4	CAP .1UF 16V CERAMIC Y5V 0402	Panasonic - ECG	ECJ-0EF1C104Z
3	1	C7	CAP CER 2200PF 50V 5% C0G 0805	Murata Electronics North America	GRM2165C1H222JA01D
4	1	C9	CAP 100PF 50V CERAMIC 0402 SMD	Panasonic - ECG	ECJ-0EC1H101J
5	2	C10,C12	CAP 2.2UF 10V TANTALUM 10% 3216	AVX	TPSA225K010R1800
6	2	C11,C14	CAP 470PF 50V CERAMIC 0402 SMD	Panasonic - ECG	ECJ-0EB1H471K
7	1	C13	CAP 10000PF 16V CERAMIC 0402 SMD	Panasonic - ECG	ECJ-0EB1C103K
8	2	D1,D2	LED GREEN CLEAR 0805 SMD	LITE-ON	LTST-C170GKT
9	2	D4,D5	DIODE SCHOTTKY 0.5A 20V SOD-123	Fairchild Semiconductor	MBR0520L
10	2	J1,J4	CONN HEADER VERT 3POS .100 30AU	AMP Division of TYCO	87220-3
11	1	J3	CONN HEADER 5POS 0.1 VERT KEYED	Molex	22-23-2051
12	1	J5	CONN 2.1MM PWRJACK RT ANGLE PCB	Switchcraft	RAPC722X
13	1	J6	CONN USB MINI AB SMT RIGHT ANGLE	ТҮСО	1734035-2
14	1	J7	CONN HEADER VERT 1POS .100	TYCO	9-146280-0-01
15	1	P1	RECP VERT 20POS HIROSE	Hirose	DF12-5.0-20DP-0.5V-81
16	1	P2	CONN FMALE 44POS DL .1" R/A GOLD	Sullins Electronics Corp.	PPPC222LJBN-RC
17	1	P3	CONN RCPT .100 DUAL STR 10POS	3M	929852-01-05-RA
18	5	R1,R4,R21,R38,R56	RES 1.0K OHM 1/16W 5% 0402 SMD	Phycomp USA Inc	9C1A04021001JLHF3
19	2	R2,R3	RES 1K OHM 1/10W 5% 0805 SMD	Panasonic - ECG	ERJ-6GEYJ102V
20	4	R5,R7,R8,R9	RES 56 OHM 1/16W 5% 0402 SMD	Panasonic - ECG	ERJ-2GEJ560X
21	30	R10,R14,R15,R18,R23, R24,R25,R27,R28,R29, R30,R31,R32,R33,R34, R35,R36,R37,R39,R40, R41,R42,R43,R44,R46, R47,R48,R50,R51,R53	RES 560 OHM 1/16W 5% 0402 SMD	Yageo Corporation	RC0402JR-07560RL
22	6	R11,R12,R16,R19,R55, R63	RES 100 OHM 1/16W 5% 0402 SMD	Rohm	MCR01MZPJ101
23	1	R26	RES 7.5K OHM 1/8W 5% 0805 SMD	Panasonic - ECG	ERJ-6GEYJ752V
24	2	R52,R54	RES 22 OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3EKF22R0V
25	2	R57,R58	RES ZERO OHM 1/16W 0402 SMD	Panasonic - ECG	ERJ-2GE0R00X
26	1	R64	RES 3.00K OHM 1/16W 1% 0603 SMD	Yageo America	9C06031A3001FKHFT
27	1	R65	POT 10K CARBON LAYDOWN (103)	Panasonic - ECG	EVN-D8AA03B14
28	1	R66	RES 100K OHM 1/16W 5% 0402 SMD	Panasonic - ECG	ERJ-2GEJ104X
29	1	S1	LT SWITCH 6MM 100GF H=7MM TH	Panasonic - ECG	EVQ-PAC07K
30	3	TP1,TP4,TP7	TEST POINT 43 HOLE 65 PLATED BLACK	Keystone Electronics	5001
31	4	TP2,TP3,TP5,TP6	TEST POINT 43 HOLE 65 PLATED RED	Keystone Electronics	5000
32	1	U1	IC, 48QFN PSoC Device w/ OCD	Cypress Semiconductor	CY8C20066A-24LTXI
33	1	U3	IC REG LDO 150MA 5.0V 1% SOT23-5	Micrel	MIC5205-5.0YM5
34	1	U4	IC REG LDO 150MA ADJ 1% SOT23-5	Micrel	MIC5205YM5



No	Qty	Reference	Part	Manufacturer	Manuf. Part#						
Do No	Do Not Load										
35	1	BH1	BATTERY HOLDER 9V Female PC MT	Keystone Electronics	594						
36	1	BH2	BATTERY HOLDER 9V Male PC MT	Keystone Electronics	593						
37	1	D3	DIODE SCHOTTKY 0.5A 20V SOD-123	Fairchild Semiconductor	MBR0520L						
38	1	J2	CONN HEADER VERT 6POS .100 TIN	Molex/Waldom Electronics	22-28-4060						
39	3	R59,R60,R61,R62	RES 560 OHM 1/16W 5% 0402 SMD	Panasonic - ECG	ERJ-2GEJ563X						
40	6	R6,R13,R17,R20,R22, R67	RES NO LOAD 0805 SMD NA		NA						
41	1	U2	IC DGTL POT SPI 10K 10-MSOP	Analog Devices Inc	AD5161BRMZ10						
42	2	R45,R49	RES NO LOAD 0805 SMD	NA	NA						
43	1	Y1	CRYSTAL 32.768 KHZ CYL 12.5PF CFS308	Citizen America Corpora- tion	CFS308-32.768KDZF-UB						
44	4	C1,C5,C6,C8	CAP NO LOAD 0805	NA	NA						
45	4	C15,C16	CAP NO LOAD 0603	NA	NA						
Addit	ional A	Assembly Instructions		<u>.</u>							
46	46 Place jumper (0.100" pitch) across pins 2 and 3 of J1										
47	47 Place jumper (0.100" pitch) across pins 1 and 2 of J4.										
Insta	Install On Bottom of PCB As Close To Corners As Possible										
48	4	n/a	BUMPER CLEAR.370 x 19" CYLINDER	Richco Plastic Co	RBS-35						
## **Revision History**



## **Document Revision History**

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*A	3279588	06/10/2011	SASH	Updated Code Examples chapter on page 35: Added "My First Code Example (CY3280_20x66_CSD_PD_Project1)" on page 35. Text and image updates throughout the document.			
*В	3983114	05/26/2013	ZINE	Updated Introduction chapter on page 5:			
				Updated "Additional Learning Resources" on page 7:			
				Added "Code Examples".			
*C	4309193	03/14/2014	SSHH	No technical updates.			
				Completing Sunset Review.			
*D	4497435	09/08/2014	DIMA	Updated the kit code examples and user guide to support the latest ver- sion of PSoC Designer (v5.4).			
*E	4737229	04/23/2015	DCHE	Updated Introduction chapter on page 5:			
				Updated "Additional Learning Resources" on page 7:			
				Updated description.			
				Removed "Code Examples".			
				Added "PSoC Designer" on page 8.			
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				Added "Technical Support" on page 11.			
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				Updated "My First Code Example (CY3280_20x66_CSD_PD_Project1)" on page 35:			
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				Updated diagram.			
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				Updated description.				
				Removed figure "Root Directory of the CD".				
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				Updated Figure 2-2.				
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