

CY3240-I2USB

I2C-USB Bridge Guide

Doc. # 001-66660 Rev.**

Cypress Semiconductor 198 Champion Court San Jose, CA 95134-1709 Phone (USA): 800.858.1810 Phone (Intnl): 408.943.2600 http://www.cypress.com



Copyrights

© Cypress Semiconductor Corporation, 2011. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems, where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use, and in doing so indemnifies Cypress against all charges.

Any Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress), and is protected by, and subject to worldwide patent protection (United States and foreign), United States copyright laws, and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and/or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer: CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application, or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems, where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use, and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.

PSoC Designer[™] and Programmable System-on-Chip[™] are trademarks and PSoC[®] is a registered trademark of Cypress Semiconductor Corp. All other trademarks or registered trademarks referenced herein are property of the respective corporations.

Flash Code Protection

Cypress products meet the specifications contained in their particular Cypress PSoC Data Sheets. Cypress believes that its family of PSoC products is one of the most secure families of its kind on the market today, regardless of how they are used. There may be methods, unknown to Cypress, that can breach the code protection features. Any of these methods, to our knowledge, would be dishonest and possibly illegal. Neither Cypress nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Cypress is willing to work with the customer who is concerned about the integrity of their code. Code protection is constantly evolving. We at Cypress are committed to continuously improving the code protection features of our products.

Contents



1.	Introdu	ction	5
	1 1	Kit Contents	5
	1.1	Bridge Control Panel Software	5
	1.3	Additional Learning Resources	6
	1.4	Document History	6
	1.5	Documentation Conventions	6
2.	Getting	Started	7
	2.1	CD Installation	7
	2.2	PSoC Designer	10
	2.3	PSoC Programmer	12
	2.4	Bridge Control Panel	12
	2.5	Install Hardware	13
3.	Kit Ope	ration	15
	3.1	Introduction	15
	3.2	Connect Bridge to Device	16
		3.2.1 Program I2C-USB Bridge	16
	3.3	Connect Demonstration Board to Bridge	17
		3.3.1 Run Demonstration Board Test	17
4.	Hardwa	ire	23
4.	Hardwa 4.1	I re System Block Diagram	23 23
4.	Hardwa 4.1 4.2	I re System Block Diagram Functional Description	23 23 24
4.	Hardwa 4.1 4.2	I re System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset	23 23 24 25
4.	Hardwa 4.1 4.2	Ire System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector	23 23 24 25 25
4.	Hardwa 4.1 4.2	Ire System Block Diagram Functional Description	23 23 24 25 25 26
4.	Hardwa 4.1 4.2	Ire System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins	23 23 24 25 25 26 27
4.	Hardwa 4.1 4.2	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector	23 23 24 25 25 26 27 28
4.	Hardwa 4.1 4.2	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board	23 23 24 25 25 26 27 28 29
4.	Hardwa 4.1 4.2 Exampl	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects	23 23 24 25 25 26 27 28 29 31
4. 5.	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project	23 23 24 25 25 26 27 28 29 29 23 21 23 24 25 25 25 25 26 27 26 27 21 25 25 26 27 27 26 27 28 29
4. 5.	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description	23 23 24 25 25 26 26 27 28 29 29 28 29 23 24 25 25 25 26 27 27 28 23 24 25 25 25 26 27 27 27 27 27 27 27 27 27 27 27 27 27 27 27 27 27 27 28 29 29
4. 5.	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections	23 23 24 25 25 26 26 27 28 29 31 31 31 31 32
4. 5.	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart	23 23 24 25 25 26 26 27 28 29 31 31 31 31 32 33
4 . 5 .	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart 5.1.4 Verify Output	23 23 24 25 25 26 27 28 29 29 29 29 31 31 31 31 31 32 33 34
4.	Hardwa 4.1 4.2 Exampl 5.1	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart 5.1.4 Verify Output Example Project 2: I2C-USB Bridge Board Project	23 23 24 25 25 26 27 28 29 29 29 29 31 31 31 31 31 31 33 34 34
4.	Hardwa 4.1 4.2 Exampl 5.1 5.2	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart 5.1.4 Verify Output Example Project 2: I2C-USB Bridge Board Project 5.2.1 Project Description	23
4.	Hardwa 4.1 4.2 Exampl 5.1 5.2	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart 5.1.4 Verify Output Example Project 2: I2C-USB Bridge Board Project 5.2.1 Project Description 5.2.2 Hardware Connections	23
4.	Hardwa 4.1 4.2 Exampl 5.1 5.2	System Block Diagram Functional Description 4.2.1 PSoC CY8C24849 Chipset 4.2.2 USB Mini B Connector 4.2.3 ISSP Programming Header 4.2.4 GPIO Pins 4.2.5 I2C Slave Interface Connector 4.2.6 Demo Target Board e Projects Example Project 1: I2C-USB Demo Target Board Project 5.1.1 Project Description 5.1.2 Hardware Connections 5.1.3 I2C-USB Demo Target Board Flowchart 5.1.4 Verify Output Example Project 2: I2C-USB Bridge Board Project 5.2.1 Project Description 5.2.2 Hardware Connections 5.2.3 I2C-USB Bridge Flowchart	23



Α.	Appendi	x	39
	A.1	Schematic	
		A.1.1 I2C-USB Bridge Schematic	
		A.1.2 Demo Target Board Schematic	42
	A.2	I2C-USB Bridge Board Layout	43
		A.2.1 Demo Target Board Layout	43
	A.3	BOM	44
		A.3.1 I2C-USB Bridge BOM Rev. E	44
		A.3.2 Demo-Target Board R	45
		5	



Thank you for your interest in the CY3240-I2USB Kit. The CY3240-I2USB can be used with the Bridge Control Panel that is installed with PSoC Programmer. The kit is designed to test, tune, and debug programs that have an I2C slave interface. This document describes the working of CY3240 and includes example projects, which will help you get started with the bridging tool. You can also develop custom programs using PERL, Python, C++, and C# languages. These custom applications allow generating complex testing, debugging, and validation systems using PSoC Programmer COM.

You can evaluate the kit using the example projects provided with the kit. The example projects help to:

- Explore I2C-USB communication between the PC and slave interfaced via I2C slave interface connector of the bridge
- Customize the designs provided along with the kit

The CY3240 I2C-USB Bridge board is configured with the I2C-USB Bridge Board example project when shipped. See Chapter 5 for more details.

Chapter 2 of this document describes the installation and configuration of CY3240-I2USB. Chapter 3 explains the programming of a PSoC 1 device with PSoC Programmer and how to use the kit with the help of an example project. Chapter 4 describes the hardware operation. Chapter 5 provides instructions to create a simple example project. The Appendix section provides the schematics and BOM for the CY3240-I2USB kit.

Evaluate the sample projects provided with the kit and then experiment with the kit hardware and software to create your own designs.

1.1 Kit Contents

The CY3240-I2USB Bridge Kit contains:

- I2C-USB Bridge
- I2C demo target board
- USB A to Mini B cable
- CY3240-I2USB kit CD

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

1.2 Bridge Control Panel Software

Bridge Control Panel is installed along with PSoC Programmer and enables the bridge to communicate with the PC. It is used to send and receive data from the device connected to the bridge.



1.3 Additional Learning Resources

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

- Application Note Using Cypress I²C Port Expander with Flash Storage: http://www.cypress.com/?rID=2694
- PSoC CY8C24894 Features and Chip functionality: http://www.cypress.com/?rID=37765
- PSoC CY8C21123 Features and Chip functionality: http://www.cypress.com/?rID=3335
- For more information regarding PSoC Designer functionality and releases: www.cypress.com/go/psocdesigner
- For more information regarding PSoC Programmer, supported hardware and COM layer: www.cypress.com/go/psocprogrammer
- For a list of PSoC Designer-related trainings: http://www.cypress.com/?rID=40543

1.4 Document History

Revision	PDF Creation Date	Origin of Change	Description of Change
**	01/25/2011	RKPM	Initial version of kit guide

1.5 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 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.





This chapter describes the installation and configuration of CY3240-I2USB.

2.1 CD 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/CY3240-I2USB. Download the ISO file and create an installer CD or extract the ISO using WinRar and install the executables.

2. Click Install CY3240-I2USB Bridge Kit to start the installation, as shown in Figure 2-1.

Figure 2-1. CY3240-I2USB Menu



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



Figure 2-2. Root Directory of CD

Address 🎱 F:\			
File and Folder Tasks	CY3240-I2USB Bridge Kit	Documentation	Firmware
 Make a new folder Publish this folder to the Web Share this folder 	Hardware	Prerequisite	PSoC Designer
Other Places 📎	PSoC Programmer	autorun.inf Setup Information 1 KB	cyautorun.dat DAT File 1 KB
Details	Cypress Autorun Applet Cypress Semiconductor	setup.ico 48 × 48 Icon	

- 3. On the startup screen, click **Next** to start the installer.
- 4. In the **InstallShield Wizard**, choose the folder location to install the setup files. You can change the location of the folder for the setup files using **Change**, as shown in Figure 2-3.
- 5. Click **Next** to launch the installer.

Figure 2-3. InstallShield Wizard

CY3240-I2USB Bridge Kit -	InstallShield Wizard	×
	Welcome to the InstallShield Wizard for CY3240-12USB Bridge Kit The InstallShield Wizard will install CY3240-12USB Bridge Kit on your computer. To continue, click Next.	
	Select folder where setup will install files. Install CY3240-12USB Bridge Kit C:\Program Files\Cypress Change	ן
	< Back Next > Cancel	

- 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**, as shown in Figure 2-4.
- 7. Click Next to start the installation.



Figure 2-4. Installation Type Options

🐣 CyInstaller for CY3240-I2USB Bridge Kit	? 🗙
Product Installation Overview Choose the install type that best suits your needs	
Choose the type of installation Product: CY324012USB Bridge Kit Installation Type: Typical Installs the most common features of CY324012USB Bridge Kit Installs the most common features of CY324012USB Bridge Kit	
Adobe Reader	
Contact Us Next > Car	ncel

- 8. When the installation begins, a list of packages appears on the Installation Page.
- 9. A green checkmark appears against every package that is downloaded and installed, as shown in Figure 2-5.
- 10. Wait until all the packages are downloaded and installed successfully.

Figure 2-5. Installation Page





11. Click **Finish** to complete the installation, as shown in Figure 2-6.

Figure 2-6. Installation Complete Page



After the software installation, verify that you have all hardware and drivers set up for the I2C-USB kit by connecting the bridge to your PC via its USB interface. Because this is the first time you have connected this board to the PC, initial drivers are installed. Follow the instructions to complete the installation process. Also, verify your installation by opening PSoC Programmer with the kit board attached to USB.

2.2 **PSoC Designer**

PSoC Designer 5.1 is the revolutionary integrated design environment (IDE) that helps to customize PSoC to meet specific application requirements. PSoC Designer software accelerates system bringup and time-to-market.

- To open PSoC Designer, click Start > Programs > Cypress > PSoC Designer 5.1 > PSoC Designer 5.1
- To create a new project, click **File > Create New Project**
- To open an existing project, click File > Open
- To experiment with the example projects, go to Example Projects on page 31





Figure 2-7. PSoC Designer Interconnect View

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



2.3 **PSoC Programmer**

To open PSoC Programmer, click Start > Programs > Cypress > PSoC Programmer 3.12 > PSoC Programmer 3.12.

To successfully program the device, follow these steps:

1. Select the I2C-USB bridge in Port Selection, as shown in Figure 2-8.

Figure 2-8. PSoC Programmer Window

PSoC Programmer	File Load	
File View Options Help	Program Power	
Port Selection	Programmer Utilities JTAG	
MINIProg1/08215B0C331A	Programming Parameters <u>File Path:</u> E:\Brisa_Oypress1\Data\CY32 <u>Programmer:</u> MINIProg1/08215B0C331A	210-PSOCEVAL1\Firmware\ASM_Example_LED_Logic\ASM_Example_LE[
	Programming Mode: O Reset O Power Cycle	Power Detect
	Verification: On Off	Connector: 5p • 10p
Device Family	AutoDetection: On Off 	Clock Speed: 1.6 MHz
29x66	Programmer Characteristics Protocol: JTAG SWD ● ISSP 12C Voltage: ● 5.0 V 3.3 V 2.5 V 1.8 V	Status <u>Execution Time:</u> 66.0 seconds <u>Power Status:</u> ON <u>Voltage:</u> NA
Actions	Results	
Power On at 1:14:10 Program Finished at 1:11:05 PM	<pre>PM MINIProg1/08215B0C331A Programming Succeeded Doing Checksum Doing Protect Verify Succeeded Verify Starting Programming Succeeded Programming Starting</pre>	
	Erase Succeeded	
Device set to CY8C29466-24PXI at	32768 FLASH bytes	

- 2. Click the File Load button to load the hex file.
- 3. Click the **Program** button to program the hex file on the chip.
- 4. Close PSoC Programmer.

2.4 Bridge Control Panel

The Bridge Control Panel is used with CY3240 I2C-USB Bridge to enable communication with I2C slave devices. This program is used to configure I²C devices and also to acquire and process data received from I2C slave devices. The Bridge Control Panel helps in optimizing, debugging, and calibrating the target application.

- 1. Click Start > Programs > Cypress > Bridge Control Panel 1.2 > Bridge Control Panel
- 2. Select Power Supply, as highlighted in Figure 2-9.
- 3. Select the port connectivity.



Figure 2-9. Selecting the Bridge

Bridge Control Panel	
File Editor Chart Execute Tools Help	
◎ ■ 🗑 🕲 🕸 🕲 ◇ E 歴 歴 歴	
Editor Chart Table File	
	0
This is a commands window - I key must enter command here	
	~
Opening Port	~
Successfully Connected to Bridge/0000011 USB2IIC Bridge version 1.22	
	0
	2
1:1 Syntax:OK Connected Powered Voltage:-	

Note For more information, go to Bridge Control Panel > Help > Help Contents.

2.5 Install Hardware

No hardware installation is required for this kit.

Getting Started







3.1 Introduction

The device meets the requirements of I2C Specification for standard and fast speed I^2C devices, and supports USB HID devices. The bridge is powered by the USB and consumes less than 500 mA. The device can be configured for several I^2C clock rates such as 50 kHz, 100 kHz, and 400 kHz.

The number of devices that can be connected is constrained only by the I²C address limit and physical ability of the I²C bus. For more details, see the I2C Specifications.

The USB communication function uses two 64-byte packets: one for input data flow and the other for output data flow. The maximum bandwidth of this configuration is 64 bytes. This is sufficient for most I2C-USB bridge applications (Figure 3-1).

Figure 3-1. I2C-USB Bridge





3.2 Connect Bridge to Device

Figure 3-2. Bridge to Device Connection



Perform the following steps to connect the device to I2C-USB bridge, as shown in Figure 3-2:

- 1. Connect GND of the device to GND of the bridge.
- 2. Connect the SDA and SCL lines to the bridge.

Bridge has 2.2 k pull-up resistors connected to +5 V. The INT pin is a pull-down bidirectional pin that can be used as an additional signal between the bridge and I^2C slave device for functions such as sleep mode control.

- 3. Power the device from the Vdd pin on the bridge, if it does not have its own power supply. Note that the Vdd connection between the bridge and target board is required, even if the board is self-powered. Optionally, the bridge can provide 3.3 V or 5 V, or work with an externally powered board using 2.4 V to 5.6 V.
- 4. When the connection between the bridge and USB is successful, the LED (green) lights up, as shown in Figure 3-3.

	D4 000 R12		U6 Ĕ
U1 R1 C2 C2			

Figure 3-3. Connecting Bridge to USB.

5. Open the Bridge Control Panel from the PC to work with the bridge.

3.2.1 Program I2C-USB Bridge

The CY3240 I2C-USB Bridge can be programmed using a MiniProg at the programming header of the bridge. To use MiniProg, use the ISSP Programming Header (J2) on the board as highlighted in Figure 3-4.







3.3 Connect Demonstration Board to Bridge

1. Connect I2C slave demonstration board to bridge, as shown in Figure 3-5.

Figure 3-5. Demonstration Board and Bridge Connection



2. Select **+5V** as power supply to the board from Bridge Control Panel. The LED (red) on the bridge board lights up, as shown.

Figure 3-6. LED (Red) on the Bridge Board



3. Click List; the bridge will find I2C slave demonstration board at 0x00 address.

3.3.1 Run Demonstration Board Test

The demonstration board has built-in temperature sensor and photodiode. The measurement results of these are sent over I^2C .

1. Open the Variable Setting dialog box from the Chart menu.



Figure 3-7. Variable Setting Box

👺 Bridge Control Panel								_ # X
File Editor Chart Execute Tools He	slp							
	₩.							
Editor Chart Table File	00002							
=								
	🕸 Variable S	ettings					$\mathbf{\overline{X}}$	
	Variables Flag	ps						
	N Active	Variable Name	Type S	gn Scale	Offset	Color	^	
	1	Key1	byte	1	0	Black	集	
	2	Key2	byte	1	0	Blue	100	
	3	Key3	byte	1	0	Lime		
	4	Key4	byte	1	0	Red		
	5	Key5	byte	1	0	BlueViolet		
	6 🔲	Key6	byte	1	U	Lawnbireen		
		Var8	bute	1	0	Magenta	~	
	•	Value (Second	Dyte L			UNVE		
	Print packet ev	rery 1	AxisX is a co	unt 🕒	Auto Hange of A	kasY		
	Sc	roll 0 😂	AxisX is a tin	e M	lin 0 N	fax 500		
	Load	Save	✓ОК	X Cance				
_								
	12420					-		
Beset B-List Send	all strings:	Connect	ed I2C/SPI-USB c	onverters:		● +5.0V	Protocol I2C	
Stop Beneat Stople	it count:	0 C Bridge/U	000011			O +3.3V	O SPI	
Scan p	period, ms:	0 🗘		_		0 +1.8V		
1:1 Syntax:OK		Co	nected	t Powered	Voltage: -			

- 2. Load the *demo.ini* file by clicking the **Load** button, as shown in Figure 3-7. The *demo.ini* file initializes light and temperature variables and is available in the CY3240-I2USB kit CD or at the following location: <Installed_directory>:\Cypress\CY3240-I2USB.
- 3. Load *demo.iic* file for iic commands that can be sent to demo target board; the *demo.iic* file is available in the CY3240-I2USB kit CD or at the following location: <Installed_directory>:\Cypress\CY3240-I2USB

Go to File > Open File > demo.iic to select the file.

4. The first two lines in the demo.iic file show how to control the LEDs on the board. Position the cursor in the first line and press **[Enter]** to send the command. Repeat for the second command line. Observe that, on sending the first command, the LED1 turns off. The second command reduces the LED intensity by 50 percent.



Bridge Control Panel	
File Editor Chart Execute Tools Help	
¥■¥ 過908 ◇E 兩兩類	
Editor Chart Table File	
s 00 00 00 00 00 1 0f 1 ; OPF s 00 00 00 00 00 2 00 1 ; 50% ; ; / /	
; Led 1,2 Brightness 00 - FF c 00 @lTemperature @lLight @0Light	
This is a commands window - User must enter command here	
This is a commands window - User must enter command here	2
This is a commands window - User must enter command here Image: Command window - User must enter command here Image: Com	
This is a commands window - User must enter command here Image: Commands window - User must enter command here <tr< td=""><td> (a) (b) (c) (c)</td></tr<>	 (a) (b) (c) (c)
This is a commands window - User must enter command here Image: Commands window - User must enter command here <tr< td=""><td>2</td></tr<>	2

Figure 3-8. Bridge Control Panel Editor Screen View

- 5. Click in the last line, which reads temperature and light data from the device and then click the **Repeat** button. On clicking **Repeat**, the command that is sent last is repeated until **Stop** is clicked. This makes data collection easier. The data received from slave can be viewed either graphically or in a tabular form.
- 6. Click the **Chart** tab to view data graphically, as shown in Figure 3-9.





Figure 3-9. Bridge Control Panel Graphical Screen View

- 7. Click the **Stop** button to stop scanning.
- 8. Click the **Table** tab to view data in a tabular form, as shown in Figure 3-10.



📓 Brid	Bridge Control Panel							
File	Editor	Chart	Execute To	ols Help				
i 🛱 🖬		國用	® ⊘ E	医医尿				
Editor	Chart	Table	File					
#	Temp	erature	Light					
31051		171	322					
31052		171	322					
31053		171	322					
31054		171	322					
31055		171	322					
31056		171	322					
31057		171	322					
31058		171	322					
31059		171	322					
31060		171	322					
31061		171	322					
31062		171	322					
31063		171	322					
31064		171	322					
31065		171	322					
31066		170	322					
31067		170	322					
31068		170	322					
31069		170	322					
31070		170	322					
31071		170	322					
31072		170	324					
31073		170	324					
	eset	B:List	Send	Send all strings:	Connected I2C/SPI-	USB converters:		Power Protocol +5.0V I2C
I S	top	Repea	at 🕅 To file	Repeat count: 0 🗘	Bridge/0000011			- 0 +3.3V 0 SPI
-		44		Scan period, ms: 0				0 +1.8V
7:49	Sy	ntax : OK		Ct=31551 Rate=236 smp/s	Connected	Powered	Voltage: -	

Figure 3-10. Bridge Control Panel Tabular Screen View

The File menu has these options:

- **Save Send Data** To save the data sent to the demo target board from Bridge Control Panel.
- **Save Receive Data** To save received data shown on the status window of Bridge Control Panel.

Go to **Bridge Control Panel Help** from the **Help** menu for more information on the Bridge Control Panel and iic command format.

Kit Operation



4. Hardware



4.1 System Block Diagram

The CY3240-I2USB kit has two boards:

- I2C-USB Bridge board
- Demo target board

I2C-USB Bridge board consists of:

- PSoC CY8C24894 chip
- USB Mini B connector
- ISSP programming header.
- GPIO pins
- I2C slave interface connector

Figure 4-1. I2C-USB Bridge Board



Demo target board consists of:

- CY8C21123 chip
- LED
- Photodiode
- ISSP programming header/data connector







4.2 Functional Description

The I2C-USB Bridge is connected to the PC in the same way as an HID device. It requires no additional driver when connected to a PC installed with Windows. This I2C-USB Bridge works as a master in the I²C bus and is controlled by the PC program via USB. In addition, a demonstration PC program is included with the project to demonstrate bridge operation with connected I2C slave.

Figure 4-3. I2C-USB Bridge with Demo Target Board





4.2.1 PSoC CY8C24849 Chipset

The PSoC CY8C24894 on CY3240-I2USB Bridge board is pre-programmed to function as full featured, full speed (12 Mbps) USB. This device enables creating customized peripheral (I/O) configurations that match the requirements of each individual application.

The PSoC device also performs the following functions:

- Lights up LED (green) on connecting the bridge to host via USB.
- Lights up LED (red) on external power supply to target device.
- Acts as interface between the host and target device.

Figure 4-4. PSoC CY8C24894 Hardware Schematic



4.2.2 USB Mini B Connector

USB Mini B connector communicates between the PC and bridge. It is used to power up the bridge and supply voltage range of 3.3 V or 5 V to target board. These plugs are always oriented down-stream towards the USB device. It has SN65220, a single transient voltage suppressor, to provide electrical noise transient protection to USB port.







4.2.3 ISSP Programming Header

The in-system serial programming header is used to:

- burn the hex code onto the chip
- connect the MiniProg for programming the chip

The ISSP connector consists of the following:

Table 4-1. IS	SP Programming	Header Con	nection Details
---------------	----------------	------------	-----------------

Pin No	Connection	Description		
1 +V Device		To supply voltage to the bridge		
2	GND	Ground pin of the bridge		
3	INT	Interrupt pin		
4	SDA	Serial data line		
5	SCL	Serial clock line		





Figure 4-6. ISSP Programming Header Schematic

4.2.4 GPIO Pins

GPIO plays an important role in customizing the applications.

Table 4-2. GPIO Pin Connectivity table

Terminal Connection	Port	PIN No.	Description
TP12	P2[4]	43	External Analog Ground (AGND) input
TP11	P2[6]	44	External Voltage Reference (VREF) input
TP10	P0[0]	45	Analog column mux input
TP9	P0[2]	46	Analog column mux input
TP8	P0[4]	47	Analog column mux input
TP7	P0[6]	48	Analog column mux input
TP6	P0[7]	51	Analog column mux input
TP5	P0[5]	52	Analog column mux input and column output
TP4	P0[3]	53	Analog column mux input and column output
TP3	P0[1]	54	Analog column mux input
TP2	P2[7]	55	GPIO
TP1	P2[5]	56	GPIO
TP13	P2[2]	42	GPIO







4.2.5 I2C Slave Interface Connector

The I2C slave interface connector is used to communicate data between the target device and bridge board. It consists of two devices, MAX3378 and SN721.

MAX3378

- Is used to convert the voltage level between the target device (Vcc) and host level voltage (VL)
- Has bidirectional level translation, accepts V_L +1.2 V (Min) to +5.5 V (Max); V_{out}(High) is 0.6 times V_L (if source current is 0.02 mA) and V_{out}(Low) is 0.4 V

SN721

An array of SCR/diode bipolar structure for ESD and over-voltage protection



Figure 4-8. I2C Slave Interface Schematic



4.2.6 Demo Target Board

The target board is used to light up the two LEDs on receiving data from host and transfer the data, acquired from photo diode to host.

PSoC device (CY8C21123) is used to control the two LEDs based on input from the host using Bridge Control Panel. The PSoC device updates the I2C register with the sensor information, which can be read by any I2C master.

Pin No.	Port No	Description	
6	P0[4]	LED1	
7	P0[2]	LED2	
1	P0[5]	Photo-diode	
8	P1[0]	Voltage supply	
3	P1[1]	Ground	
2	P0[3]	Interrupt	
5	Vcc	Serial clock	
4	GND	Serial data	

Table 4-3. CY8C21123 Pin Connectivity









All example projects are available in the CY3240-I2USB kit CD or at the following location: <Installed_directory>:\Cypress\CY3240-I2USB\Firmware

5.1 Example Project 1: I2C-USB Demo Target Board Project

5.1.1 Project Description

5.

This example project demonstrates the data transfer between target board and host. The target board has a photodiode to measure light intensity and temperature values, which are acquired by the PSOC device (CY8C21123) to transmit to host.

This project uses the following modules to display temperature and light intensity values:

ADC10: Used to obtain the digital values for light intensity and temperature. Input to the ADC module is switched between light input and temperature input once every 551 scan cycles.

EzI2C: Configures the PSoC on target board as I2C slave and is used to transfer data to the bridge board where the PSoC configured as I2C master.

PWM8: Used to handle the LED command from the host and vary the LED intensity accordingly.



5.1.2 Hardware Connections

Figure 5-1. Functional Blocks





5.1.3 I2C-USB Demo Target Board Flowchart





5.1.4 Verify Output

Load *demo.iic* file from the Bridge Control Panel, as explained in Run Demonstration Board Test on page 17. The light intensity and temperature transmitted by target board to host is shown on the Bridge Control Panel screen, as shown in Figure 5-2.



🖉 Brid	ge Control Pa	inel		ЪX
File	Editor Chart	Execute To	ools Help	
🗃 🖬	10 h	® ⊘ E I	₩ 医器	
Editor	Chart Table	File		
#	Temperature	Light		^
31051	. 171	322		
31052	171	322		
31053	171	322		
31054	171	322		
31055	171	322		
31056	171	322		
31057	171	322		
31058	171	322		
31059	171	322		
31060	171	322		
31061	171	322		
31062	171	322		
31063	171	322		
31064	171	322		
31065	171	322		
31066	170	322		
31067	170	322		
31068	170	322		
31069	170	322		
31070	170	322		
31071	170	322		
31072	170	324		
31073	170	324		~
(Re	set 18 ::List		Send all strings: Connected 12C/SPI-USB converters: Protocol +5.0V i 12C	
I St	op 🗍 🐺 Repe	at 🕅 🎢 To file	Scan period.mst 0 135/20000011 0 135/20000011 Scan period.mst 0 135/20000011 0 135/20000011	
7:49	Syntax : OK		Ct=31551 Rate=236 smp/s Connected Powered Voltage: -	

5.2 Example Project 2: I2C-USB Bridge Board Project

5.2.1 Project Description

This project demonstrates communication between the bridge and host. After each packet is received by the bridge, an acknowledgement is sent to the host before the next transfer operation begins.

This project uses the following modules:

CMPRG: Used to compare the data programmable reference threshold.

PWRFB: Used to set the power level for this application.

TIMER8: Used to wake up the application from sleep mode.



5.2.2 Hardware Connections

Figure 5-3. Functional Bocks





5.2.3 I2C-USB Bridge Flowchart









5.2.4 Verify Output

When connected to the demonstration board, LED (green) blinks on the bridge indicating transfer operation between the bridge and PC.

Figure 5-4. Verify Output



A. Appendix



A.1 Schematic

A.1.1 I2C-USB Bridge Schematic

Figure A-1. Reverse Current Protection Schematic









Figure A-3. Diode Schematic





Figure A-4. Voltage Regulator Schematic







Figure A-5. PSoC CY8C24894 Schematic

A.1.2 Demo Target Board Schematic Figure A-6. Demo Board Schematic





A.2 I2C-USB Bridge Board Layout

Figure A-7. Top View



Figure A-8. Bottom View



A.2.1 Demo Target Board Layout Figure A-9. Top View





A.3 BOM

A.3.1 I2C-USB Bridge BOM Rev. E

ltem	Qty	Reference	ence Description Manuf		Mfr Part Number	
-			РСВ	Cypress Semiconductor	PDC-9334	
1	1	C1	CAP CER .10UF 25V X7R 10% 0805	ТDК	C2012X7R1E104K	
2	1	C2	CAP CER 1.0UF 10V 10% X7R 0805	Murata Electronics North America	GRM21BR71A105KA01L	
3	1	C3	CAP CER 2.2UF 16V Y5V 1206	Murata	GRM31MF51C225ZA01L	
4	1	C4	CAP CER 10000PF 50V 10% X7R 1206	Murata	GRM319R71H103KA01D	
5	2	C5, C6	CAP CERAMIC .01UF 100V X7R 0603	Kemet	C0603C103K1RACTU	
6	1	R1	RES 52.3K OHM 1/10W 1% 0603 SMD	Yageo	RC0603FR-0752K3L	
7	1	R2	RES 5.1K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-075K1L	
8	1	R3	RES 24.0K OHM 1/10W 1% 0603 SMD	Yageo	RC0603FR-0724KL	
9	1	R4	RES 6.8K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-076K8L	
10	1	R5	RES 51K OHM 1/8W 5% 0805 SMD	Yageo	RC0805JR-0751KL	
11	1	R6	RES 10K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-0710KL	
12	1	R7	RES 30.1K OHM 1/10W 1% 0603 SMD	Yageo	RC0603FR-0730K1L	
13	1	R8	RES 51K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-0751KL	
14	2	R9, R10	RES 22 OHM 1/8W 5% 0805 SMD	Panasonic - ECG	ERJ-6GEYJ220V	
15	2	R11, R12	RES 300 OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-07300RL	
16	1	R13	RES 100K OHM 1/10W 5% 0603 SMD	Rohm	MCR03EZPJ104	
17	2	R14, R15	RES 7.5K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-077K5L	
18	2	R16, R17	RES 30K OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-0730KL	
19	3	R18, R19, R20	RES 47 OHM 1/10W 5% 0603 SMD	Yageo	RC0603JR-0747RL	
20	1	J1	CONN HEADER VERT 2POS .100 TIN	Molex/Waldom Electronics Corp	22-28-4020	
21	1	J2	CONN HEADER VERT 5POS .100 TIN	Molex/Waldom Electronics Corp	22-28-4050	
22	1	J3	CONN HEADER .100 SNGL STR 5POS	3M Electronics	929850-01-05-10	
23	1	J4	CONN USB RCPT MINI-B 5POS RT ANG	Delphi Connection Sys- tems	15430262-110	
24	2	F1, F2	POLYSWITCH 1.10A RESET FUSE SMD	Tyco Electronics/Ray- chem Circuit Protection	MINISMDC110-2	
25	1	D1 *	LED 660NM RED WTR CLR 1206 SMD	Lumex Opto/Components Inc	SML-LX1206SRC-TR	
26	1	D2 *	LED 565NM WTR CLR GREEN 1206 SMD	Lumex Opto/Components Inc	SML-LX1206GC-TR	
27	2	D3, D4	Supressor 5V SMB package	Littelfuse Inc	SMBJ5.0CA	
28	1	U1	IC LDO REG 1A SOT223-6 TPS73701	Texas Instruments	TPS73701DCQ	
29	1	U2	CY8C24894	Cypress Semiconductor	CY8C24894-24LFXI	
30	1	U4 *	IC Single USB Port TVS SOT-23-6	Texas Instruments	SN65220DBVT	
31	1	U5	IC LVL XLTR LV 8MBPS 14-TSSOP	Maxim	MAX3378EEUD+	
32	1	U6	TVS Array ESD 6 Input 8-SOIC	Littelfuse Inc	SP721ABG	
33	2	* 000	RES 0.0 OHM 1/8W 5% 0805 SMD	Rohm	MCR10EZHJ000	
34	1	* 000	RES 0.0 OHM 1/8W 5% 0603 SMD	Rohm	MCR03EZPJ000	
35	1	J1 *	Shunt	3M	929950-00	



A.3.2 Demo-Target Board R

Item	Qty	Reference	Description	Manufacturer	Mfr Part Number	Digi-Key Part Number
			РСВ	Cypress Semiconductor	PDC-9355	
1	1	C1	CAP 100nF 25V CERAMIC X7R 0805	Panasonic - ECG	ECJ-2VB1E104K	PCC1828CT-ND
2	1	R1	RES 75K OHM 1/8W 5% 0805 SMD	Yageo America	RC0805JR-0775KL	311-75KARCT-ND
3	2	R2, R3	RES 1.0K OHM 1/8W 5% 0805 SMD	Yageo America	RC0805JR-071KL	311-1.0KARCT-ND
4	1	D1	Visible Light Sensor	Microsemi Inc	LX1972IBC	
5	2	D2, D3	LED RED CLEAR 0805 SMD	LITE-ON INC	LTST-C170CKT	160-1176-2-ND
6	1	U1	IC PSoC 21x23 8SOIC	Cypress Semiconductor	CY8C21123-24SXI	
7	1	J1	CONN HEADER .100 SNGL STR 5POS	Samtec	TSW-105-07-T-S	SAM1035-05-ND

