

CY3215-DK

PSoC[®] 1 In-Circuit Emulator Development Kit Guide

Doc. # 001-66514 Rev. *B

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Contents





Thank you for your interest in the CY3215-DK PSoC[®] 1 In-Circuit Emulator Development Kit. You can use this kit with PSoC Designer[™] or PSoC Programmer. The CY3215-DK provides debugging functionality that requires two-way communication between the in-circuit emulator (ICE) and your computer.

The MiniEval board, provided with the kit, is a programming and evaluation board that connects to the ICE-Cube via an In-System Serial Programming (ISSP) cable and enables programming of PSoC 1 devices. The MiniEval also includes LEDs and a potentiometer for simple evaluation and demonstration.

The CY3215-DK Kit supports the following 8-bit PSoC 1 families, including automotive, except CY8C25/26xxx devices.

- CY8C20x34
- CY8C20xx6A
- CY8C21x23
- CY8C21x34
- CY8C22xxx/CY8C21x45
- CY8C23x33
- CY8C24x23A
- CY8C24x94
- CY8C27x43
- CY8C28xxx
- CY8C29x66
- CY8C95xx

1.1 Kit Contents

The CY3215-DK Kit includes the following:

- ICE-Cube in-circuit emulator
- ISSP cable
- USB 2.0 cable
- Blue Cat-5e cable
- MiniEval programming board
- 2 units of 28-pin DIP samples (CY8C29466-24PXI)
- ZIF socket
- CY3250 flex cable
- Backward compatibility adapter
- 29000-28 PDIP kit



- 12-V 1-A adapter
- CY3215-DK kit CD
 - PSoC Designer installation file
 - PSoC Programmer installation file
 - □ Bridge Control Panel installation file (packaged along with PSoC Programmer)
 - □ 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.

1.2 Additional Learning Resources

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

- For more information regarding PSoC Designer functionality and releases: http://www.cypress.com/go/psocdesigner
- For more information regarding PSoC Programmer, supported hardware and COM layer: http://www.cypress.com/go/psocprogrammer
- For a list of PSoC Designer-related trainings: http://www.cypress.com/?rID=40543
- For more information on CY3250-29xxxQFN ICE Pod Schematic: http://www.cypress.com/?rID=3451
- For more information on CY3250-FLEXCABLE Mechanical Layout Drawing: http://www.cypress.com/?rID=3451
- For more information on CY3250-29xxxQFN ICE Pod Mechanical Layout Drawing: http://www.cypress.com/?rID=3451



1.3 Document History

Table 1-1. Revision History

Revision	PDF Creation Date	Origin of Change	Description of Change				
**	01/27/2011	RKPM	Initial version of kit guide				
*A	05/11/2011	RKPM	Added Code Examples chapter. Updated images in section 2.1. Content updates throughout the document.				
*В	01/30/2012	PAVA	Added information on the devices that CY3215-DK supports in the Introduction chapter. Updated Figure 2-2.				

1.4 Documentation Conventions

Table 1-2. 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.					

Introduction







This chapter describes how to install the CY3215-DK PSoC 1 In-Circuit Emulator Development Kit.

2.1 Kit Installation

To install the CY3215-DK kit, follow these steps:

1. Insert the kit CD into the CD/DVD 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/CY3215-DK. Three different types of installers are available for download.

- a. CY3215-DK_ISO: This file (ISO image) is an archive file of the optical disc provided with the kit. You can use this to create an installer CD or extract information using WinRar or similar tools.
- b. CY3215-DK_ Single Package: This executable file installs the contents of the kit CD, which includes PSoC Programmer, PSoC Designer, and user documents.
- c. CY3215-DK_Single Package (without prerequisites): This executable file installs only the kit contents, which includes kit user documents.
- 2. Click Install CY3215-DK to start the installation, as shown in Figure 2-1.

Figure 2-1. Kit Installer Startup Screen





Note If auto-run does not execute, double-click the *cyautorun.exe* file on the root directory of the CD, as shown in Figure 2-2. To access the root directory, click **Start > My Computer > CY3215-DK <drive:>**.

Figure 2-2. CD Root Directory

🗣 CY3215-DK (F:)				
<u> Eile Edit View Favorites Iools E</u>	jelp			
🌀 Back 👻 🕥 - 🏂 🔎 Sear	rch 😥 Folders 🛄 -			
Address 🗇 F:\				💌 🄁 Go
Сүз215-DК	Documentation	Prerequisite	PSoC Designer	
PSoC Programmer	Reference	autorun Setup Information 1 KB	cyautorun DAT File 1 KB	
Cypress Autorun Applet Cypress Semiconductor	setup 48 x 48 ICO File			

- 3. 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.
- 4. Click **Next** to launch the kit installer.

Figure 2-3. InstallShield Wizard

CY3215-DK - InstallShield	Wizard 🛛 🔀
	Welcome to the InstallShield Wizard for CY3215-DK The InstallShield Wizard will install CY3215-DK on your computer. To continue, click Next.
	Select folder where setup will install files. Install CY3215-DK to: C:\Program Files\Cypresshange
	< <u>B</u> ack <u>N</u> ext > Cancel

- 5. 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.
- 6. Click **Next** to start the installation.



Figure 2-4. Installation Type Options

👶 CyInstaller for CY3215-DK 1.0	? 🗙
Product Installation Overview Choose the install type that best suits your needs	
Choose the type of installation Product: CY3215-DK Installation Type: Typical Installs the most common features of CY3215-DK The following products need to be installed manually Adobe Reader	
Contact Us Next > Can	ncel

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

Figure 2-5. Installation Page

👶 Cyinstaller for CY3215-DK 1.0	? 🛛
Installation Page Please wait while setup installs/configures CY32	15-DK on your computer
Downloading PSoCProgrammerSetup PSoCProgrammer3.12.4.866 ClockProgrammer1.30.866 USBBootloader.866 BridgeControlPanel1.20.866 PSoCDesigner_Core5.1.2110.0 CY3215-DK In-Circuit Emulation Deve Installing PSoCDerogrammerSetup Status	 Single-Click Integrated Build Process synthesize hardware, place and route hardware, compile and link software in one simple step wild times may be longer for initial build or after making large scale changes to both hardware and software Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be shorter when not all steps are required for incremental design changes Will be sh
Contact Us	<u><u>C</u>ancel</u>



9. Click Finish to complete the kit installation, as shown in Figure 2-6.

Figure 2-6. Installation Complete Page



After software installation, verify that you have all hardware and drivers set up for the CY3215-DK kit by connecting the kit to your PC via its USB interface. Because this is the first time you have connected this board to this PC, initial drivers are installed. Follow the instructions to complete the installation process.

2.2 **PSoC Designer**

PSoC Designer is the revolutionary integrated design environment (IDE) that helps to customize PSoC 1 to meet specific application requirements. PSoC Designer software accelerates system bring-up and time-to-market.

- 1. To open PSoC Designer, click Start > All Programs > Cypress > PSoC Designer <version> > PSoC Designer <version>.
- 2. To create a new project in PSoC Designer, click File > New Project.
- 3. To open an existing project in PSoC Designer, click **File > Open**.





Figure 2-7. PSoC Designer Interconnect View

To experiment with the code examples, go to Code Examplesn page 28.

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

See Additional Learning Resources on page 5 for links to PSoC Designer training.

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



2.3 **PSoC Programmer**

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

To successfully program the device, follow these steps:

1. Select the ICE-Cube connectivity in **Port Selection**, as shown in Figure 2-8.

Figure 2-8. PSoC Programmer Window

Soc Programmer	Power	
File View Options Help	File Load Program	
Port Selection	Programmer Utilities JTAG	
USB/0735C749	Programming Parameters File Path; File Is Not Present Programmer; USB/0735C749 Programming Mode: ○ Reset ● Power Cycle ○ Power Detect	
	Verification: On O Off Connector: D 5p 10p	
Device Family	AutoDetection: On Off Clock Speed: 1.6 MHz	
60100	Programmer Characteristics Protocol: JTAG SWD ⊙ ISSP 2C Voltage: Q Development Open Q De	
CY7C60113-PVXC 🛛 🗸	Voltage: NA	
Actions	Results	<u>^</u>
Successfully Connect to USB/0735C749 at 2:00:17 PM Opening Port at 2:00	ted IceCube	=
PM Device set to CY7C60113-PVXC at 2:00:15 PM	8192 FLASH bytes	
Device Family set to 60100 at 2:00:15 PM	o	
Active HEX file set	at	M
For Help, press F1	Cor	nected

- 2. Click the File Load button to load the hex file.
- 3. Select the device and device family from the list.
- 4. Click the Program button to program the selected PSoC 1 device.
- 5. Close PSoC Programmer.

Note For more details on PSoC Programmer, see the user guide at the following location: <Install_directory>\Cypress\Programmer\<version>\Documents

3. Using ICE-Cube Connector



3.1 Introduction

The CY3215-DK is used for prototyping and developing applications with PSoC Designer IDE. This kit supports in-circuit emulation and the software interface allows access to the contents of specific memory locations.

3.1.1 Software Installation

After the physical connection is made, you are ready to configure the internal connection from the computer to the ICE. The ICE enables communication and debugging between PSoC Designer and the pod. To connect the ICE from within PSoC Designer, perform the following steps:

- 1. Confirm that the flex cable and pod are attached to the ICE-Cube.
- 2. Confirm that the ICE is powered from the power adapter.
- 3. Confirm that the USB cable is connected from the ICE-Cube to the PC.
- 4. Create a project using PSoC Designer. For more information, see My First Code Example on page 28.
- 5. To access the debugger subsystem, go to **Project > Settings > Debugger** and click the **Debugger** icon.
- Select the correct port from the drop-down window. The target board may either be powered by ICE-Cube or an external source. Select 5V as Pod Supply Voltage if the board is powered by ICE-Cube.
- 7. Click **OK**.



Figure 3-1. Debugger Project Setting

👾 Project Settings	? 🔀
I2Cm_EEPROM Build Linker Debugger Chip Editor	Select ICE Device: ICE 0, Cube (SN: 0735C445)
	OK Cancel

8. On successful connection, you receive a notification in the Output tab of the Status window; a green indicator displays **Connected** in the lower-right corner of the program.

Figure 3-2. PSoC Designer Connected with ICE-Cube

A: 00	X: 00	SP: 00	PC: 0000	F: 00	0.0 KHz	ICE 0	Connected	Ln 33	Col 2	INS	



3.2 Connecting the ICE-Cube

PSoC Designer supports the ICE-Cube. This new in-circuit emulator replaces the ICE-4000 and the USB adapter for seamless USB connection, debugging, and programming.



Figure 3-3. ICE-Cube

3.2.1 Connect using a USB Port

The ICE-Cube connects to any computer using a standard USB 2.0 cable, included in Cypress development kits. To connect the ICE-Cube to your computer, plug the USB cable into your computer and attach the other end to the ICE-Cube.

The ICE-Cube is a plug-and-play device and it should be recognized automatically by any computer with PSoC Designer and PSoC Programmer installed. If USB connection problems occur, refer to Microsoft Windows Help for troubleshooting Windows connectivity issues.



Figure 3-4. USB Port in ICE-Cube.

3.2.2 Connect using a Flex Cable

A flex cable is used to connect the ICE-Cube to the pod main board.

Pod: Pods connect to target circuits via foot. As each pod contains a fully functional PSoC bondout device, pods may be used instead of devices for test purposes. Simply plug a pod into the circuit without connecting it to an ICE base station. The pod power LED lights up when it is powered and operational.



Figure 3-5. Flex Cable and 29000-28 DIP



Foot: A foot is used to connect the pod to the MiniEval board. Each foot has a pinout that models a PSoC, for example, a 28-pin DIP. A foot that emulates surface-mount components must be soldered to target circuits. The main board of the pod can then be attached or removed, as desired.

Figure 3-6. 28-Pin DIP Feet



 Plastic Mask: The plastic mask is used to orient the foot. Plastic masks are provided to expose only the pins that connect to the foot.

Figure 3-7. Plastic Mask





Before connecting the flex cable to the ICE-Cube, assemble the three pieces (pod, plastic mask, and foot), as shown in Figure 3-6.

- 1. Select a foot. The foot should match the pinout of the PSoC 1 device used in the target circuit.
- 2. Next, select the mask that matches the desired foot.
- 3. Insert the mask into the bottom of the pod, aligning the chamfered corners of the mask to the pin-1 triangle on the pod.
- 4. Insert the foot through the plastic mask. Use the alignment triangles to orient the foot to the pod.
- 5. Plug the pod into the MiniEval board via ZIF socket.

Figure 3-8. Assembled Pod with Flex Cable



- 6. Connect the other end of the flex cable to the ICE-Cube pod connector, as shown in Figure 3-6.
- 7. Start debugging the project, as explained in Debug a Project on page 20.

Figure 3-9. Flex Pod Connected to ICE-Cube Pod





Pin No.	Pin Name	Pin Description
1	POD EXTRA3	Future use
2	GND	Ground
3	-	-
4	POD_OCDDE	POD_OCD even data I/O
5	GND	Ground
6	POD_OCDD)	POD_OCD odd data output
7	POD EXTRA1	Future use
8	POD_XRES	Reset signal (required only for Reset programming mode)
9	GND	Ground
10	POD_OCDHC	POD_OCD high speed clock output
11	GND	Ground
12	POD_OCDCC	POD_OCD CPU clock output
13	POD EXTRA4	Future use
14	PODVCC	Supply voltage
15	-	-
16	PODVCC	Supply voltage

Table 3-1. Pin Description of Pod Connector

3.2.3 Connect using a Backward Compatibility Adapter

A backward compatibility adapter can be used to debug and program the PSoC 1 chips.

Figure 3-10. Backward Compatibility Adapter



Figure 3-11. Connector in ICE-Cube





To program the device, follow these steps:

- 1. Using a USB cable, plug the ICE-Cube into the installed application. Make sure the ICE-Cube is powered on.
- 2. Connect the ISSP cable to the ICE-Cube through the backward compatibility adapter.
- 3. Place the 5-pin end of the ISSP cable on the 5-pin header(J2) of the MiniEval board.
- 4. Place the CY8C29466 chip on the MiniEval board via ZIF socket.
- 5. Launch PSoC Programmer.
- 6. Load the hex file using the **File Load** button.
- 7. Program it successfully.

Figure 3-12. Backward Compatibility Adapter Connected to ICE-Cube Pod



3.2.4 Debug a Project

To successfully debug a project, follow these steps:

- 1. Connect the ICE-Cube to the PSoC 1 development board.
- 2. Click Start > All Programs > Cypress > PSoC Designer <version> > PSoC Designer <version>.
- Create a new project in PSoC Designer by clicking File > New Project.
 Note To open an existing project, click File > Open.
- 4. To connect the ICE-Cube and PSoC 1 development board, go to **PSoC Designer > Debug**.
- 5. Click on Connect/Disconnect or press F9.
- 6. Right-click on a line in the project from where the debugging process should start. The **Insert/ Delete Breakpoint** option appears.



Figure 3-13. Break Points in main.c



- 7. To view memory, registers, and watch variables at a particular location, go to **Debug > Windows**.
- To start the debugging process, go to Debug > Go or press F5.
 Use one of the following options for the debugging process:
 - a. Debug > Step Over (or press F8): Steps over next statement
 - b. Debug > Step Into (or press F9): Steps into next statement
 - c. Debug > Step Out (or press Shift + F11): Steps out of current function
 - d. **Debug > Step ASM** (or press **Shift + F10**): If the current line is C code, the line is located in the first file and that line is executed



Figure 3-14. Debug Options

San Strain (Running) - PS	SoC D	esigner	5.1							
Eile Edit Yiew Project Interco	Innect	Build	Deb	ug P <u>r</u> ogram <u>T</u> ools	<u>W</u> indow <u>H</u> elp	_				
1000.265	<u>ا</u>	1		<u>W</u> indows	•		Memory	Ctrl+Alt+M	建建 三〇 0]₽ ₽ , 600, €.
Global Resources - i2cm_eeprom 🚽 📮 🗙		Start Pa		Output files	•	ΰx	Registers	Ctrl+Alt+G	* 4 Þ *	Workspace Explorer 🛛 👻 🕂 🗙
Power Settin 5.0V / 24MHz	1É	153		Execute Program	F4	63	Watch	Ctrl+Alt+W	-	Workspace "12Cm_EEPROM" (1
CPU_Clock SysClk/8 32K Select Internal		154		Go	F5		Locals	Ctrl+Alt+L	-	IZUM_EEPRUM [LY8L2
PLL_Mode Disable		155	►I	Run To Cursor	Ctrl+F5		Break Points	Ctrl+Alt+B		😑 🎦 Loadable Configurat
Sleep_Timer 512_Hz		150		Halt	Shift+F5		Events	Ctrl+Alt+E		😑 🧁 i2cm_eeprom - 2
VC1= SysClk 16		158	5	Reset	Ctrl+Shift+F5	M	Trace	Ctrl+Alt+T		- 12Cm
VC2=VC1// 10 VC3 Source VC2		159	F=	Step Over	F8	4	USB Endpoint Data	Ctrl+Alt+U		12Cm_EEPROM (Pinout)
VC3 Divider 256		160	4= 6=	Step Into	E11	-			Juffer. You c	ia 🦲 I2Cm_EEPROM
SysClk Sour Internal	-	161		Step Into	Chille Chill	4))	;			
Analog Pow SC 0n/Bef Low		163		Step Out	51 III C+FII					<
Ref Mux (Vdd/2)+/-BandGap		164		эсер жым	Shirt+F10	-				User Modules 🗸 🗣 🗙
AGndBypas: Disable		165		Connect / Disconnect	F9					User Modules
A Buff Pow Low		166		Download to emulator .	Shift+F9					Amplifiers
SwitchMode OFF		168	U	Refresh M8C Views		RA	MBuffer into	the EEPROM		🗄 🧰 Analog Comm
Trip Voltage 4.81V (5.00V)		169		<u>T</u> race Mode	•	is	the address	at which th	ne data should	E Counters
LVDThrottlel Disable		170	0	Get next trace data		Buf	fer, 17, 0);			DACs Digital Comm
Watchidog E Disable		171		Get all trace data					2	
		173		Configure USB Data Tr	ecking	the	n that taken	by the 12Cm Cycle timir	n to write. Ng parameter i -	🗊 🧰 Generic
		174	-	for (1=0; 1<200	; 1++)	J	2 011011 02200	oyote offici	ig parameter i	😟 🚰 Legacy 🦢
Power Setting [Vcc / SysClk	1	175		LCD_Delay	750u();					Image Miles
and System Clock (SysClk) source, fro		176							~	🗈 🧰 Protocols
			_	ш					>	📙 📄 PWMs 🔛 👱
Output										
				A: 00	X: 05 SP: 07 PC	: 096	1 F: C7 3.03	MHz ICE 0	Connected	

3.2.4.1 Break Points

The break point feature allows you to stop program execution at predetermined address locations. When a break point is encountered, the program stops at the address of the break point, without executing the address code. The program is restarted using the available menu or icon options.

To set break points, first open the file to debug. Right-click the mouse at specific points and select **Insert Break Point**. You can view and remove active break points in the Break Points window. To open the Break Points window, select **Debug > Windows > Break Points**.

Break Points								~ ₽ X
: X % 🖉 🔂 🖅								
🔶 boot.asm, line 122								
main.c, line 181								
main.c, line 174								
main.c, line 146								
main.c, line 170								
main.c, line 161								
Output								
	A: 00	X: 00	SP: 00	PC: 0000	F: 02	3.03 MHz	ICE 0	Connected

Figure 3-15. Break Points Window

3.2.4.2 CPU and Register Views

During debugging, you can read and write in five areas: CPU registers, bank registers 0, bank registers 1, RAM, and flash. The CPU registers are shown in their own window (**Debug > Windows > Registers**) and in the notification area at the bottom of PSoC Designer. The other four areas can be viewed in the Memory Window (**Debug > Windows > Memory**). Select one of the four memory areas from the **Address Space** box.



CPU Registers: This window allows you to examine and change the contents of the CPU registers. Data is entered in hexadecimal notation. CPU register values can be viewed across the bottom of PSoC Designer.

Figure 3-16. CPU Register in Memory Window



RAM: RAM locations can be modified by clicking the data at the specific location and typing in the new value. Data is entered in hexadecimal notation.

Flash: The flash window displays the data stored in flash. This is the program memory; it is readonly.

Bank Registers 0 and 1: You can scroll through the register bank to view the values in the register bank. Type a new value into the Offset to scroll directly to that offset. Click next to a value and type a new value for the register.

Figure 3-17. Memory Window

Memory																	┯ 中
Address:	0×0000	-	Columns	8	-	Views											_
FLASH	H RAM (1)		D Bank 0	IO B	ank 1	RAM											→ 4 ▷ :
0000	00 00 00	FF '	7F 80 0	0 01	ÿ.												-
0008	02 03 04	05 (06 07 0	8 09													
0010	OA OB OC	OD (DE OF 1	0 00													
0018	00 00 00	00 (0 00 00	0 00													
0020	00 00 00	00 (0 00 00	0 00													
0028	00 00 00	00 3	2E 00 0	0 00													
0030	00 00 00	00 (0 00 00	0 00													
0038	00 00 00	00 (0 00 00	0 00													
0040	00 00 00	00 (00 00 00	0 00													
0048	00 00 00	00 (0 00 00	0 00													
0050	00 00 00	00 (0 00 00	0 00													
Output																	
							A: 00	X: 05	SP: 07	PC: 0961	F: C7	3.03 MHz	ICE 0	Connected	Ln 170	Col 1	INS

3.2.4.3 Watch Variables

To set watch variables, right-click a variable in a source file and select **Add Watch**. You can also select **Global Variables**. Right-click **Add**, **Delete**, or **Properties** in the Watch/Global Name window to add, delete, or modify values.

Figure 3-18.	Watch	Variables	Window
--------------	-------	-----------	--------

Watch			· · · · · · · · · · · · · · · · · · ·
Name	Value	Location	Туре
💣 12Cm_bWriteBytes	0x70	Flash 0x06A1	char
(1.1		
Output		ay (t)	
	A: 00	X: 05 SP: 07 PC: 0961	F: C7 3.03 MHz ICE 0 Connected



3.2.4.4 Trace

The Trace window is displayed when **Debug > Windows > Trace** is chosen. It displays a continuous, configurable listing of project symbols and operations from the last breakpoint. The trace shows symbolic, rather than address data, to enhance readability.

Each time the program executes, the trace buffer is cleared. When the trace buffer becomes full, it continues to operate and overwrite old data.



Star	t Page	i2cm_eeprom [Chip] main.c boot.asm Trace.txt						→ 4 Þ	×
1	PC /	SYMBOL INSTRUCTION							~
2	095E	MOV X, SP							
3	095D	main.c.WriteFromRAM PUSH X							
4	0942	CALL main.c.WriteFr	omRAM						
5	0940	OR F, Olh							
6	093F	POP X							
7	063A	RET							
8	0638	MOV REG[04h], A							
9	0636	MOV A, [0000h]							~
2	095E	MOV X, SP							~
3	095D	main.c.WriteFromRAM PUSH X							
4	0942	CALL main.c.WriteFr	omRAM						
5	0940	OR F, O1h							
6	093F	POP X							
7	063A	RET							
8	0638	MOV REG[04h], A							
9	0636	MOV A, [0000h]							
10	0633	AND [0000h], 5Fh							
11	0631	AND F, EFh							
12	062F	MOV REG[04h], A							
13	062D	MOV A, [0002h]							
14	062B	MOV REG[05h], A							~
Output									
		A: 00 X: 05	SP: 07	PC: 0961	F: C7	3.03 MHz	ICE 0	Connected	

3.2.4.5 Locals

A separate window is available for local variables. Whenever execution halts, the local variables are updated to the current value.

Figure 3-20	Locals	Window
-------------	--------	--------

Locals			~ ₽ X
Name	Value	Location	Туре
i i	843	RAM 0x0705	int
Output			
F	A: 00 X: 05 SP: 07 PC: 0961 F: C7 3.	03 MHz ICE 0 Connec	ted .;;

WARNING: The time taken to execute a system supervisory call (SSC) such as FlashRead/Write, Table Read, and Erase Block is significantly more while emulating a code through ICE-Cube when compared to the time taken when running the code on chip.



3.3 **PSoC Programmer**

PSoC Programmer is used as a standalone application to program PSoC devices. It can be launched within PSoC Designer or accessed from the desktop as a standalone program.

Figure 3-21. PSoC Programmer Interface

PSoC Programmer		- 7 🛛
File View Options Help		
🗃 🍹 🔘 BB		
Port Selection	Programmer Utilities JTAG	
USB/0736C749	Programming Parameters File Path: CVDscumments and SettingsISagar KangolMy DocumentsIDownloadsI/I2Cm_EEPROMI2Cm_EEPROMI2Cm_EEPROMI2Cm_EEPROMIAcm_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACMEEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMIACM_EEPROMI	
Device Family	AutoDetection: O On O Off Clock Speed: 1.6 MHz V	
29x66 💌	Programmer Characteristics Protectic Trace Sub @ ISSR 100	
Device CY8C29466-24PXI V	Voltaae: 0 50 V O 33 V O 25 V 0 1.8 V Voltaae: NA	
Actions	Results	^
Program Finished at 12:52:39 PN Device set to CV9C29466-24PXI at 12:52:07 PN Device Family set t 29x66 at 12:52:07 P	Programming Succeeded Doing Checksum Doing Protect Verify Succeeded Verify Starting Programming Succeeded Programming Succeeded Succeeded 32768 FLASH bytes	
Program Requested a	varonarically necessar nevice: closestoo-elevi N	~
For Help, press F1		innected

To program a target board using PSoC Programmer via ICE-Cube pod connector, follow these steps:

- 1. Set up all hardware, including the device to be programmed.
- 2. Disconnect power from the target board.
- 3. Launch PSoC Programmer:
 - a. From the desktop, click Windows Start > All Programs > Cypress > PSoC Programmer.
 - b. From within PSoC Designer, click **Program > Program Part**.
- 4. Click File Load to select a file for programming.
- 5. Select the port used to connect the programmer.
- 6. Select the device family and device used to generate the hex file.
- 7. Select Reset under programming mode.
- 8. Apply power to the target board.
- 9. Click **Program** to start device programming.
- 10. The action window reports the status and success of programming.





Figure 3-22. Hardware Configuration with ICE-Cube

Using ICE-Cube Connector







4.1 My First Code Example

4.1.1 Project Objective

This project is used to demonstrate blinking an LED at a varying duty cycle using a hardware pulse width modulator (PWM). Another LED is caused to blink using a software delay. The clock dividers VC1, VC2, and VC3 are used to divide the 24-MHz system clock by 16, 16, and 256, respectively. The resulting 366-Hz clock is used as the input to an 8-bit PWM. This in turn produces an LED blink period of 1.4 Hz. The project also demonstrates how an LED can toggle on/off with a delay of approximately 1 second.

The following user modules are used in this project:

- PWM An 8-bit PWM is used to generate a 366-Hz signal. An LED is connected to the PWM output. This LED blinks at 1.4 Hz.
- LED This module is used to toggle an LED on/off.

4.1.2 Creating My First PSoC 1 Project

- 1. Open PSoC Designer 5.1.
- 2. To create a new project, click File > New Project. The New Project window opens.
- 3. In this window, select the **Chip-level** icon. Name the project **Example_My_First_PSoC_Project**, as shown in Figure 4-1.
- 4. Click **Browse** and navigate to the directory in which the project should be created.

Figure 4-1. New Project Window

lew Project	? ×
Project types:	
Chip-level	
Creates an empty p	roject, that supports User Module selection and placement.
<u>N</u> ame:	Example_My_First_PSoC_Project
Location:	C:\ Browse
Workspace na <u>m</u> e:	Example_My_First_PSoC_Project Create directory for workspace
-	<u> </u>

5. Click OK. The Select Project Type window opens.



In this window, under Select Target Device, click View Catalog, as shown in Figure 4-2.
 Figure 4-2. Select Project Type Window

Selec	t Project Type - Chip-level		?
Clone p	project:		
<u>P</u> ath:			<u>B</u> rowse
	○ <u>U</u> se the same target device	○ <u>S</u> elect target device	Clear Path
Select	Target Device		
<u>D</u> evice	x CY8C24894-24LTXI	View Catalog	
	Generate 'Main' file using:		
	<u>⊙</u> <u>C</u>		
	O Assembler		
			K <u>C</u> ancel

- 7. The Device Catalog window opens. Click on the **PSoC** tab and scroll down to the **CY8C29466**, **CY8C29566**,... section.
- 8. For this project, click CY8C29466-24PXI and then click Select; see Figure 4-3.



Part Number	Analog Blocks	Digital Blocks	Flash	RAM	IO Count	Supply Voltage	SMP	Tem
A.¥	*	* *	* *	A 🔻	*	**	**	
Click here to Remove All Filters	all 🗸	all 💙	all 💙	all 🗸	all 💌	all 💙	all 🔽	all
CY8C28452-24PVXI	12 + *4	8	16K	1K	24	3.0 to 5.25	Yes	inc 🔨
CY8C28513-24AXI	0 + *4	12	16K	1K	40	3.0 to 5.25	Yes	Inc
CY8C28533-24AXI	6 + *4	12	16K	<mark>1</mark> K	40	3.0 to 5.25	Yes	Inc
CY8C28545-24AXI	12 + *4	12	16K	1K	40	3.0 to 5.25	Yes	Inc
CY8C28623-24LTXI	6	12	16K	1K	44	3.0 to 5.25	Yes	Inc
CY8C28643-24LTXI	12	12	16K	<mark>1</mark> K	44	3.0 to 5.25	Yes	Inc
CY8C28645-24LTXI	12 + *4	12	16K	1K	44	3.0 to 5.25	Yes	Inc
🗄 🔄 CY8C29466, CY8C29	566, CY8C29666,	CY8C29866 (Da	itasheet) (He	lp Me Choos	e a Part)			
CY8C29466-24PVXI	12	16	32K	2K	24	3.0 to 5.25	Yes	Inc
CY8C29466-24PXI	12	16	32K	2K	24	3.0 to 5.25	Yes	Inc
CY8C29466-24SXI	12	16	32K	2K	24	3.0 to 5.25	Yes	Inc
CY8C29566-24AXI	12	16	32K	2K	40	3.0 to 5.25	Yes	Inc
CY8C29666-24LFXI	12	16	32K	2K	44	3.0 to 5.25	Yes	Inc
CY8C29666-24PVXI	12	16	32K	2K	44	3.0 to 5.25	Yes	Inc
CY8C29866-24AXI	12	16	32K	2K	64	3.0 to 5.25	Yes	Inc
CY8CPLC20 (Datas)	heet) (Help Me C	hoose a Part)						
CY8CPLC20-28PVXI	12	16	32K	2K	24	4.75 to 5.25	No	Inc
CY8CPLC20-48LFXI	12	16	32K	2K	44	4.75 to 5.25	No	Inc
🗄 🖂 CYONS2000 (Datash	neet) (Help Me C	hoose a Part)						
CYONS2000-LBXC	1	0	16K	2K	28	2.7-3.6V and	N/A	Cor 🛩
								>

9. Under Generate 'Main' File Using:, select C, then click OK.

10.By default, the project opens in chip view, as shown in Figure 4-4.





11. In the User Modules window, expand the **PWMs** folder. In this folder, right-click on **PWM8** and select **Place**. The user module (UM) is placed in the first available digital block.

User Modules **→** ₽ X 🔬 User Modules 🗄 🚞 ADCs 🗄 🛅 Amplifiers 🗄 🚞 Analog Comm 🗄 🚞 Counters 🗄 🚞 DACs 🗄 🛅 Digital Comm 🗄 🚞 Filters 🗄 🚞 Generic 🗄 🧰 Legacy 🗄 🚞 Misc Digital 🗄 🚞 MUXs 🗄 🚞 Protocols 🖻 🗁 PWMs 💣 PWM16 PWM8 🚰 TWMDB16 💣 PWMDB8 🗄 🚞 Random Seq 🗄 🚞 RF 🗄 🚞 Temperature 🗄 🚞 Timers

Figure 4-5. User Modules Window



12.Configure the PWM8_1 properties, as shown in the following figure.

Figure 4-6. PWM8 User Module Properties

Parameters - PWM8_1 🛛 🗸 🦊 🗙			
	Name	PWM8_1	
	User Module	PWM8	
	Version	2.60	
	Clock	VC3	
	Enable	High	
	CompareOut	Row_0_Output_0	
	TerminalCountOut	None	
	Period	100	
	PulseWidth	50	
	CompareType	Less Than Or Equal	
	InterruptType	Terminal Count	
	ClockSync	Sync to SysClk	
	InvertEnable	Normal	
Name Indicates the name used to identify this User Module in			

13.Next, route the PWM CompareOut signal to **P2[0]**. The first step is to configure the lookup table (LUT) on Row_0_Output3.

Figure 4-7. Route PWM CompareOut Signal to P2[0]



14. Double-click the LUT, the Digital Interconnect window opens.

15. In this window, enable Row_0_Output_0_Drive_0 to connect to GlobalOutEven_0.



Figure 4-8. Digital Interconnect Window



16.Click Close.

17. Click GlobalOutEven_0. In the window that appears, configure the pin for Port_2_0.

Figure 4-9. Configur Pin for Port_2_0



- 18. Click **OK** to continue.
- 19. In the User Modules window, expand the Misc Digital folder. In this folder, right-click LED and select Place; this adds the UM to the project. This UM does not use digital or analog blocks. It appears in Workspace Explorer > Example_My_First_PSoC_Project[CY8C29466-24PXI] > Example_My_First_PSoC_Project[Chip] > Loadable Configurations > example_my_first_psoc_project 2 User Modules.



Figure 4-10. Workspace Explorer



20.Configure the LED properties, as shown in the following figure.

Figure 4-11.	LED	User	Module	Properties
rigulo + 11.		0001	modulo	roportioo

Pa	arameters - LED_1	→ ∓ X	
	Name	LED_1	
	User Module	LED	
	Version	1.40	
	Port	Port_2	
	Pin	Port_2_1	
	Drive	Active High	
N Ir in	l ame ndicates the name use istance	d to identify this User Module	

21. Configure the Global Resources window to match the following figure.

Figure 4-12. Global Resources Window

Global Resources - example_my_first_psoc_p 👻 📮 🗙			
Power Setting [V	cc 5.0V / 24MHz		
CPU_Clock	SysClk/2		
32K_Select	Internal		
PLL_Mode	Disable		
Sleep_Timer	512_Hz		
VC1= SysClk/N	16		
VC2= VC1/N	16		
VC3 Source	VC2		
VC3 Divider	256		
SysClk Source	Internal		
SysClk*2 Disable	Yes		
Analog Power	SC Off/Ref Low		
Ref Mux	(Vdd/2)+/-(Vdd/2)		
AGindBypass	Disable		
Op-Amp Bias	Low		
A_Buff_Power	Low		
SwitchModePump	OFF		
Trip Voltage [LVD	(£ 4.81∨ (5.00∨)		
LVDThrottleBack	Disable		
Watchdog Enable	e Disable		
Ref Mux Selects the range and accuracy of various analog references. This sets the analog ground and peak-to-p			



22. Open the existing *main.c* file in Workspace Explorer. Replace the existing *main.c* content with the content of the *My_First_Example_Project_Main.c* file, which is available as an attachment to this PDF document.

Figure 4-13. Wo	rkspace Explore	r Window
-----------------	-----------------	----------



- 23. Save the project.
- 24. Click Build > Generate/Build 'Example_My_First_PSoC_Project' .
- 25.Connect the ICE-Cube to the PC. Connect the ICE-Cube to the MiniEval board, as explained in Connecting the ICE-Cube on page 16.
- 26. In PSoC Designer, select Debug > Connect/Disconnect to connect the ICE to PSoC Designer.

Figure 4-14. Connecting ICE to PSoC Designer

Example_My_First_PSoC_Project - PSoC Designer 5.1					
<u>File E</u> dit <u>V</u> iew <u>P</u> r	oject <u>I</u> nterconnect <u>B</u> uild	Deb	ug P <u>r</u> ogram <u>T</u> ools	<u>W</u> indow <u>H</u> elp	_
1 😂 🖬 🖉 🚬	金属之情推进		<u>W</u> indows	•	
Global Resources - examp	ole_my_first_p 🗸 🕈 🗙 📃		Output files	•	ain.c
Power Setting [\ 5.0V	/ / 24MHz		Execute Program	F4	*****
CPU_Clock Syst	Clk/2		Go	F5	ess Sem:
32K_Select Inter	inal Ible		Rup To Cursor	Ctrl+E5	******
Sleep Timer 512	Hz		Liste	Chiftures	by Cypi
VC1= SysClk/N 16				511111-1-5	d subjec
VC2=VC1/N 16			Reset	Ctrl+Shift+F5	nited St
VC3 Source VC2			Step Over	F8	reby gra
VC3 Divider 256		G =	Step Into	F11	se to co
SysClk Source Inter	nal		Deep Into	1 1 1	s source
SysClk*2 Disable Yes			Step Out	Shift+F11	stom sol
Analog Power SC 0	Off/Ref Low	32	Step ASM	Shift+E10	on with
Ref Mux (Vdd	1/2)+/-(Vdd/2)	:=			nt. Any
AGndBypass Disa	ble	\$ \$	Connect / Disconnect	F9	entation
Op-Amp Bias Low			Download to emulator .	Shift+F9	the exp
A_Buff_Power Low			- / 1		



27.On successful connection, the status bar at the bottom of the PSoC Designer IDE shows the status as 'Connected'.

Figure 4-15. ICE-Cube Connected



28. If there is an error, ensure that the Debugger settings in **Project > Settings** match the following figure.

Figure 4-16. Debugger Settings

👾 Project Settings	? 🔀
Example_My_First_PSoC_Project Build Compiler Linker Debugger Chip Editor	Select ICE Device: ICE 0, Cube (SN: 09180811)
	<u> </u>

Note The pod may be powered by the ICE-Cube or through external power. If external power is used, ensure that the power is on for the ICE to get connected.

29.Click on **Debug > Execute Program** or the keyboard shortcut **F4**. The project starts compiling; it is downloaded to the pod and starts running.

4.1.3 Verify Output

Verify the output as follows:

- 1. Two LEDs connected to P2[0] and P2[1] start blinking.
- 2. Right-click on any line in the while(1) loop in the code and select **Insert/Delete Breakpoint** to include a breakpoint at that point. The execution of the code stops at the point where breakpoint is inserted. The line is highlighted in yellow when the code execution stops.
- At this point, you may either continue running the code by selecting Debug > Run (keyboard shortcut F5) or step through the code by selecting either Debug > Step Over (keyboard shortcut F8) or Debug > Step Into (keyboard shortcut F11).

Note The Step Over command executes statement one by one and does not enter into the function calls whereas the Step Into command enters the function calls as well.

For more details on debugging, debug menu options, and debug strategies, see **Help > Help Topics > Debugger**.

Code Examples

