

# CY3242-IOXlite

# I2C Port Expander Lite Demo Kit Getting Started Guide

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# Getting Started with the I2C Port Expander Lite Demo Kit



Associated Project: Yes Associated Part Family: CY8C9520A Software Version: PSoC Designer™ V4.3 Associated Application Notes and Kits: AN2352, CY3242-IOX, and CY3240-I2USB

# Step 1. Expander Configuration Software Installation

- 1. Insert CD into CD-ROM drive.
- 2. Run "ExpanderConfigSetup.exe."
- 3. Click the Next button.

🔀 Setup - I2C Expander Visu	al Configurator 📃	
	Welcome to the I2C Expander Visual Configurator Setup Wizar This will install I2C Expander Visual Configurator version 2.0. on your computer. It is recommended that you close all other applications befor continuing. Click Next to continue, or Cancel to exit Setup.	d 6 e
	Canc	el



4. Specify software destination. Click the **Next** button.

🚰 Setup - I2C Expander Visual Configurator	
Select Destination Location Where should I2C Expander Visual Configurator be installed?	
Setup will install I2C Expander Visual Configurator into the following folder.	
To continue, click Next. If you would like to select a different folder, click Browse.	
Program Files\Cypress MicroSystems\I2C Port Expander Configurator Browse.	
At least 6.8 MB of free disk space is required	
< <u>B</u> ack <u>N</u> ext > 0	Cancel

5. Select the Start Menu folder. Click the **Next** button.

🔀 Setup - I2C Expander Visual Configurator	_ 🗆 🗙
Select Start Menu Folder Where should Setup place the program's shortcuts?	
Setup will create the program's shortcuts in the following Start Menu folder.	
To continue, click Next. If you would like to select a different folder, click Browse.	
Cypress MicroSystems\I2C Port Expander Configurator Browse	
< <u>B</u> ack <u>N</u> ext > C	ancel



6. Select installation options.

🚰 Setup - I2C Expander Visual Configurator	
Select Additional Tasks Which additional tasks should be performed?	
Select the additional tasks you would like Setup to perform while installing I2C Expande Visual Configurator, then click Next. Additional icons:	r
Create a desktop icon	
For all users	
O For the current user only	
Create a Quick Launch icon	
< <u>B</u> ack <u>N</u> ext > Car	ncel

7. Confirm installation settings. If everything is fine, click Install.

🖶 Setup - I2C Expander Visual Configurator	
<b>Ready to Install</b> Setup is now ready to begin installing I2C Expander Visual Configurator on your computer.	
Click Install to continue with the installation, or click Back if you want to review or change any settings.	
Destination location: C:\Program Files\Cypress MicroSystems\I2C Port Expander Configurator	~
Start Menu folder: Cypress MicroSystems\I2C Port Expander Configurator	
Additional tasks: Additional icons: Create a desktop icon	
1	▼ }
< <u>B</u> ack	Cancel



8. Wait until program installation finishes. Click the **Finish** button.

🕞 Setup - I2C Expander Visu	al Configurator	
	Completing the I2C Expander Visual Configurator Setup Wiza Setup has finished installing I2C Expander Visual Configu on your computer. The application may be launched by selecting the installed icons. Click Finish to exit Setup.	ard <sub>irator</sub>
	[	

Installation is complete. The Program icon is located under Start Menu >> Programs >> Cypress MicroSystems... by default.

The remainder of this quick start guide outlines creating an example project, configuring the hardware, setting up and generating a project in the Expander Configuration software, and downloading the project to the target device.

The example project uses the Port Expander CY8C9520 device with I2C address 0x2B. It shows how to obtain two timing signals with frequencies 1 Hz and 4 Hz at pins GP1\_0 and GP1\_1, respectively. The EEPROM will contain the familiar string, "Hello world!" at address 0x0000.

### Step 2. Hardware Configuration

1. Remove the Port Expander Lite demonstration board from the kit box.



 Select power source. The demonstration board can be powered by one of three independent power sources: an external 7-14V DC supply via a linear regulator, a regulated 3.3-5V supply by connection to J11, or 5V power supply from a PC via the USB cable. This example will use the third option, which requires J14 to be set in the 2-3 position, as shown in the photo below.



3. Set I2C Port Expander device address to 0x2B. Use the eight dedicated jumpers, J2-J9, to set the device address. The settings of these jumpers are shown below. Note that the corresponding EEPROM device address is 0x5B.





- 4. Be sure that jumper J10 and switch SW2 are set as shown below.
- 5. Connect the USB cable to the PC and the board as shown below. Once the connection is made, the green LED, D15, will light up. The red power LED, D16, should also light.



Hardware configuration is now complete.

## Step 3. Software Configuration

 Open an existing or create a new Expander Configuration software project (the software was installed in Step 1). The software program icon is located under Start Menu >> Programs >> Cypress MicroSystems. To open an existing project, click the menu item File >> Open Project. In the Open Project dialog box select your project and click the Open button.



Open Project		?×
Look jn:	i: 🔁 IOXlite_example 💽 🗲 🗈 📸 🎫	
History Desktop	TOXlite_example.epr	
My Documents		
My Computer		
	File <u>n</u> ame:	<u>O</u> pen
My Network P	Files of type: Expander Project	Cancel

Or, to create a new project, click the menu item File >> New Project. In the New Project dialog box specify project location, part type and project name. Click the **OK** button.

New Project	×
MiniProg misc OLED PIR Port Expander Expander Lite Problem Board Problem Example Problem Example Problem Scripts Problem USB_Testing Problem USC Design	4
D:\Work\CMS\Port Expander\Expander Lite	
Select Project Part New Project Name CY8C9520 IDXlite_Example	
OK Cancel	



You will then see a workspace similar to the image below. The I2C Port Expander window shows all internal resources of the target device. The I2C EEPROM window shows an image of the EEPROM data.



 Set the Port Expander address. To do this, click the I2C Port Expander tab. In the Address Assignment Section (upper-right corner), specify address length and expander address. Note that the EEPROM device address is automatically defined, and not accessible for user editing. Assign address length to 4 pins and define expander address as 0101011 (0x2Bh). The corresponding EEPROM device address is 1011011 (0x5Bh).

Address Assignment								
Address Length	4						•	[
Expander Address	0	1	0	1	0	1	1	1
	1	0	1	1	0	1	1	1



- 3. Configure Port Expander internal resources. To do this we must generate two output signals on pins P1[0] and P1[1]. The signal frequencies are 1 Hz and 4 Hz, respectively. For this purpose we utilize three PWMs, and two pins and the clock divider resources. Also, the EEPROM must contain the "Hello world!" text string placed at address 0x0000. Follow these steps:
  - a. Click the PWM Clock Sources on the device image to select it. The relevant resource properties are shown in the Properties window.
  - b. Enter DIVIDER value equal to 128. This can be done either in the Properties window or directly on the DIVIDER space of PWM Clock Sources.

PVVM Clock Sources	
32 kHz	Г
24 MHz	L
1.5 MHz	
93.75KHz	
DIMDER 128 732.4 Hz	L
L	

c. Click on the PWM0 resource and define its properties as follows:

Clock:	cv_Divider		
IntLogic:	Falling_Edge		
Period:	183		

PulseWidth: 91

Note that the Clock, Period and PulseWidth properties can be defined directly in the corresponding areas of PWM0 resource.

[	PWMD		
Divider	Period	183	3:
	Pulse Width	91	
I	4.00 H	2	_
	P106-42		

d. Click on the PWM1 resource and define its properties as follows:

Clock:	cv_PrevPWM
IntLogic:	Falling_Edge
Period:	2
PulseWidth:	1



e. Click on the PWM2 resource and define its properties as follows:

Clock:	cv_PrevPWM
IntLogic:	Falling_Edge
Period:	2
PulseWidth:	1

f. Select P1[0] and P1[1] pins by holding the [**Shift**] key down and clicking the corresponding pin images. Some editing can be done at this time in the Properties window. Configure the selected pin properties as follows:

Data:	High
Direction:	Output
DriveMode:	Strong
Interrupt:	Disable
Inversion:	Not Checked (Disable)
PinMode:	PWM

				Ē	<u>PINs</u>
28		VDD		Data	High
27		PWM2	P1[0]	Direction	Output
		PWMD	P1[1]	DriveMode	Strong
25	<b>&gt;</b>	PWM2	P1[2]	Interrupt	Disable
24		PWMD	P1[3]	Inversion	
23		PWM2	P1[4]	PinMode	PWM
22	<b>&gt;</b>	PWMD	P1[5]		
21	<b></b>	PWM2	P1[6]		

g. Enable the switch inputs

Select all of the P0[x] pins by dragging a box around them in the window, or by using the <SHIFT> key. Set them all to:

Data:	Low
Direction:	Input
DriveMode:	Pull-down
Interrupt:	Disable
Inversion:	Not Checked (Disable)
PinMode:	GPIO



i.

h. Turn off the other LEDs

Select all the unused P1[x] and P2[x] pins and set them to:

Data: Low Direction: Output DriveMode: Strong Interrupt: Disable Inversion: Not Checked (Disable) PinMode: GPIO Enable the EEPROM Click on the EEPROM block and set the options using the Properties Window: EnableEEPROM: Checked ReadOnly: Unchecked

WriteDisablePin: Unchecked

The result of the Port Expander configuration is shown below:





4. Define EEPROM image addresses/text string. Click the I2C EEPROM tab. You can type characters in the far right column or HEX digits in the individual HEX columns. See the following:

6	IOXlite_ex	ampl	e [CY	8C95	20]-	I2C	Ехра	nder	Visua	al Co	nfigu	rator												
File	<u>E</u> dit <u>S</u> ea	irch y	<u>/</u> iew	Tools	; <u>H</u> e	lp																		
	🥩 🖬 🎙	2 4	6	ংশ	Ð	Q	$\mathbb{Q}$	120%	~		n (	en 🛛	b 🖸	<u>ı</u> Q	a°	01 911	×	<b>2</b>	.iic	.h	₽.	۽ 📢	<b>*</b>	
120	Port Expan	der lä	2C EE	PRO	4   HC	CScri	pt ]																	
Г		00	01	02	03	04	05	06	07	08	09	0a	Ов	0C	ΟD	ΟE	OF	012	345	67	89A	BCD	EF	
	$0 \times 000$	<mark>48</mark>	65	6C	6C	6F	20	57	6F	72	6C	64	21	2e	00	00	00	Hel	10	Wo	rld	1.		
	0x010	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00							
	0x020	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00							
	0x030	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00							
	0x040	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00			• •			• •	-
Pos:	os: 0x00C Size: 0xC00 * OVW WIN																							

5. Set configuration script options. To set the options, click the menu item Tools >> Script Generator Options. In the Script Generator Options dialog box (shown below) click a check in all options to generate a full configuration script. Click **OK**.

😴 Script Generator Options	
<ul> <li>Generate Port Expander Configuration Script</li> <li>Generate Script for Port Expander Immediate</li> </ul>	Reconfiguration
🔽 Generate EEPROM Image Script	
Generate Script for WDT Configuration	
OK	Cancel



6. Generate configuration script. To generate the configuration script, click the menu item Tools >> Generate Configuration Script File. Once generation is complete, the script is located in the project folder and has the same name as the project and "iic" extension, for example, *FirstExpanderProject.iic*.



7. Save your project.

## Step 4. Download Configuration Script to Target Device

The generated script file can be downloaded to the target device using the download command or using the separate I2C-USB Bridge software, also included in this kit.

### Step 4a Download Configuration Using the Expander Configurator GUI

- 1. Select Download Configuration from the Tools menu, or press the Download button on the toolbar. The Download Window will open.
- 2. Select the IOXlite target board from the upper box.
- 3. Select +5V power or External power if the board is powered externally.
- 4. Select 100k for the IIC speed.
- 5. Press the Device List button and verify that the port expander device appears in the lower box. The address should show 0x2B and the device type is CY8C9520. (Note that if the device was previously programmed, the EEPROM address may also show up in the list.)
- 6. Select the port expander device from the lower box and press the Download button.
- 7. Downloading should proceed without error, the board should reset, and the LEDs on GP1\_0 and GP1\_1 should begin blinking.

😴 Download	_ 🗆 🗵
Target Device	Bridge Power
Connected I2C <-> USB Bridges	C External Power
0000011 Version: 1.22	● +5V
	C + 3.3V
Devices Connected to Bridge	IIC Bus Speed
0x2B CY8C9520	C 400 K
	💿 100 K
	С 50 K
Device List Reset Bridge [	Download Stop
	ASS IDLE Connected

### Step 4b Download Configuration using the I2C-USB Bridge GUI

If this software is not installed, you will need to install it in order to download the script and program the target device. For details, refer to the *I2C-USB Bridge Quick Start Guide*. Following is a simplified version of the instructions:

1. Run the "I2C-USB Bridge" software program.



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2. Select +5V to supply the Port Expander board with power from the bridge board.

nected I2C-USB bridges: N=	Power C External C +5V C +3.3V
Powered	1.





The red and green LEDs on the bridge portion of the board will light up.

- 3. Click the button and make sure that the corresponding device (CY8C9520) with address 0x2B is connected.
- 4. Click the 崖 button. Load the *.iic* file you created in the last step.
- 5. Click a check in the "Send all strings" field.
- 6. Click the **Send** button.



WUSB to I2C Bridge - D:\Work\CMS\Port Expander\Expander Lite\Example\IOXlite_example\IOXlite_example.iic	
<u>File Editor Chart Execute Tools Help</u>	
Editor Chart Table File	1
;**************************************	*****
;**************************************	*****
; FILENAME: IOXLite_example.iic	
; Genegated by 12C Expander Visual Configurator, Version: 1.0	
, Date: 12/19/2006 Time: 4:21:40 PM	
; DESCRIPTION: IIC configuration script for Cypress Port Expander CY ;	BC952(
; Copyright (c) Cypress Semiconductor 2006. All Rights Reserved.	
***************************************	*****
·····	*****
	<b>_</b>
00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+	+ 00+ 🔺
00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+ 00+	+ 00+
p ; SCRIPT FOR DEVICE RECONFIGURATION WITH ACTUAL POR DEFAULTS	
s 56+ 30+ 07+ p	
; SCRIPT FOR WDT STARTING	
s 56+ 2F+ 00+ p	
; <end configuration="" of="" script=""></end>	الح
🕐 Reset 🛛 🛱 Send Send all strings: 🔽 Connected I2C-USB bridges:	ower Evternal
USB-I2C converter N=0000011, Ver1.22	D +5V
Stop W Repeat Scan period, ms:	
	) +3.3V

## Step 5. Your first project is finished.

If everything was done correctly, there will be 1 Hz and 4 Hz frequencies on pins P1[0] and P1[1] and the corresponding LEDs should be blinking. Also, the EEPROM will contain the "Hello World!" string. This can be verified using the I2C-USB Bridge GUI by sending the following command strings.

;Read from EEPROM									
sB6 00 00	;Set	EEF	PROM	addres	ss t	20	sta	rt r	reading
sB7 x	;repe	eat	this	s line	to	re	ad	each	byte

The switch operation can be verified using the following command strings.

;Read switches	
s56 00	;start reading
s57 x	;repeat this line to read the switch state



🗱 USB to I2C Bridge - D:\We	ork\CMS\Port Expander\Expander Lite\Scripts\scratch.iic	
<u>File E</u> ditor <u>C</u> hart E <u>x</u> ecute	<u>T</u> ools <u>H</u> elp	
🖻 🖷 📳 🔂 🖻 🛍		
Editor Chart Table File	1	
;Read switches		<b>A</b>
s56 00	;start reading	
s57 x	;repeat this line for continiously reading button state	
;Read from EEPROM		
sB6 00 00	;Set EEPROM address to read	
sB7 x	;repeat this line to read each byte	
		<b>T</b>
र		
😮 Reset 🛛 🛱 Eist 🛛 🖗	Send Send all strings: Connected I2C-USB bridges:	External
🔲 Stop 🐺 Repeat	To file Comparing the second s	+5V
00	Scan period, ms: 0	+3.3V
7 : 16 Syntax : OK	ok connected to N=1 No power	1.