Evaluation Kit CY3242-IOX

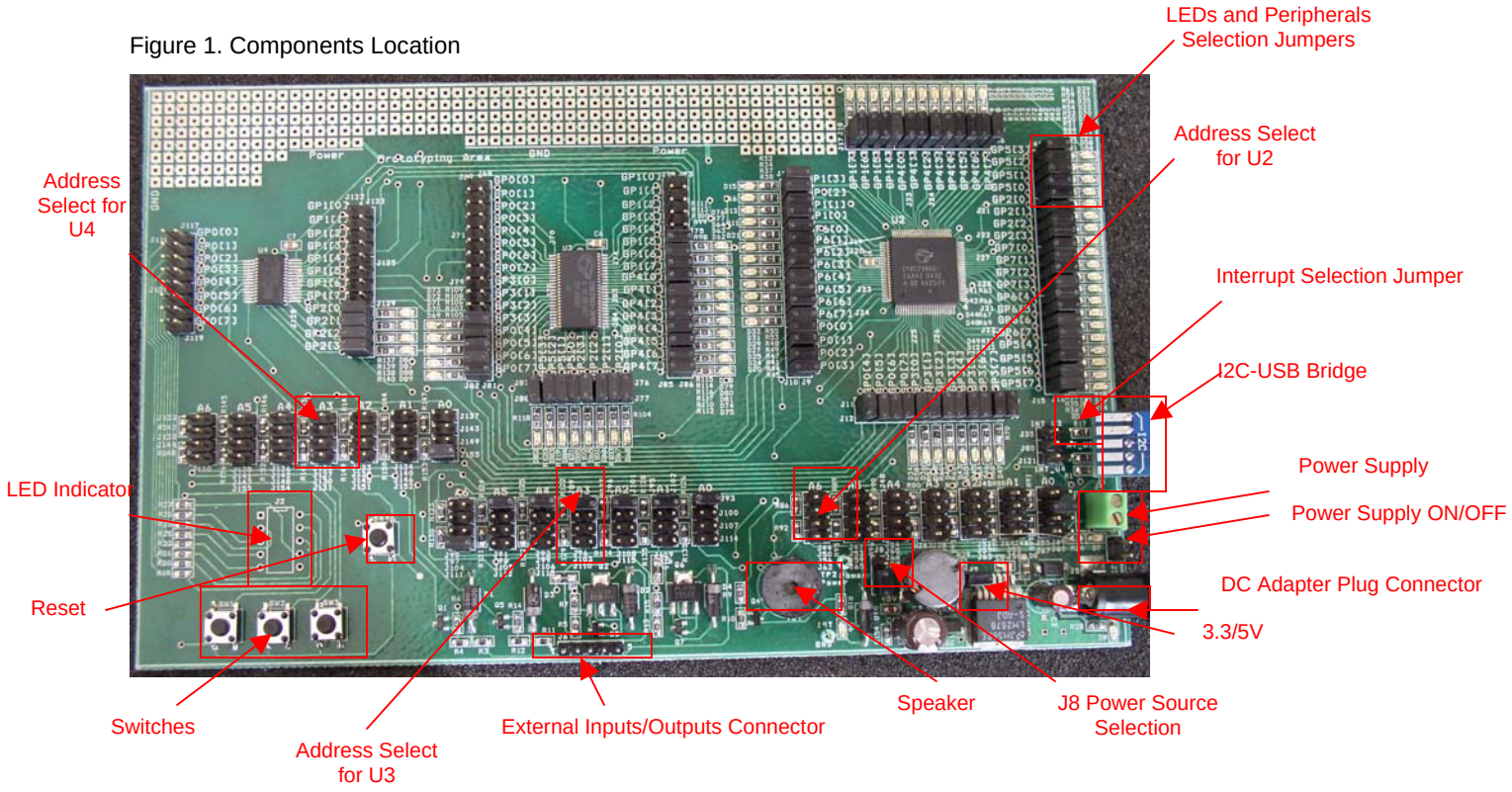
I²C Port Expander Guide

Associated Project: Yes
Associated Part Family: CY8C9520A
Software Version: PSoC Designer™ v. 4.2
Associated Application Notes and Kits: AN2352, CY3240-I2USB

Table 1. Board Specifications

Feature	Description
Number of Port Expander Devices	3
Device Part Number	CY8C9520A, CY8C9540A, CY8C9560A
Communication Interface	I^2C
Power Sources	DC Adapter 9-15V 0.3A, External 3.3V/5V 0.5A Power Supply, USB-I2C Bridge 3.3V/5V
Maximum Power Consumption	5V 400 mA, 3.3V - 150 mA
Device Power Consumption	5V 28 mA, 3.3V - 16 mA
Board Size	7656x4560 mils (194x116 mm)
Additional Features	Speaker, 7-segment LED indicator, 3 buttons, 2 external protected inputs, 2 external protected outputs with Open Drain (High or Low) drive mode, prototyping area

Figure 1. Components Location



Jumper Settings and Connector Descriptions

J1 I2C-USB Bridge Board

1	2	3	4	5
+5V	Gnd	Int	Clk	Data

J3 External 3.3V/5V Power Supply ON/OFF Jumper

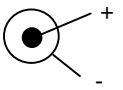
Closed - External Power Supply ON

Open - External Power Supply OFF (Default)

J4 External Power Supply Connector

1	2
+5V	Gnd

J5 DC Adapter Plug Connector



DC 9-15V 0.3A

J6 External Inputs/Outputs Connector

1	2	3	4	5
In1	In2	Out1	Out2	Gnd

J7 Internal Regulator Output Voltage-Select Jumper

This jumper selects regulator output voltage when board is powered from external DC adapter.

Closed - 3.3V

Open - 5V (Default)

J8 Expander Device Power Source Selection Jumper

Open 1, 2, 3 - All devices are powered from external 3.3V/5V power supply if J3 is closed

Closed 1, 2 - Devices are powered from I2C-USB bridge

Closed 2, 3 - Devices are powered from external DC power supply via internal regulator (Default)

J9 - J34 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J35 U2 Interrupt Selection Jumper

Make sure that the I^2C interrupt line is available before connection. Only one device can use this line.

Open - U2 interrupt pin is disconnected from I^2C interrupt line (Default)

Closed - U2 interrupt pin is connected to I^2C interrupt line

J36 - J37 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J38 - J39 U2 Address Selection Jumper

See description below for details about Port Expander address selection.

J40 - J41 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J42 - J67 U2 Address Selection Jumper

See description below for details about Port Expander address selection.

J68 - J79 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J80 U3 Interrupt Selection Jumper

Make sure that the I^2C interrupt line is available before connection. Only one device can use this line.

Open - U3 interrupt pin is disconnected from I^2C interrupt line (Default)

Closed - U3 interrupt pin is connected to I^2C interrupt line

J81 - J88 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J89 - J116 U3 Address Selection Jumper

See description below for details about Port Expander address selection.

J117 - J120 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J121 U4 Interrupt Selection Jumper

Make sure that the I^2C interrupt line is available before connection. Only one device can use this line.

Open - U4 interrupt pin is disconnected from I^2C interrupt line (Default)

Closed - U4 interrupt pin is connected to I^2C interrupt line

J121 - J125 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J126 – J127 U4 Address Selection Jumper

See description below for details about Port Expander address selection.

J128 - J129 LEDs and Peripherals to Expander Pins Connection Selection Jumper

See schematic for details.

Open - Expander pin is disconnected from LEDs and peripherals

Closed - Expander pin is connected to LED or/and peripheral

J130 - J155 U4 Address Selection Jumper

See description below for details about Port Expander address selection.

I^2C Port Expander Address Selection Jumpers

The I^2C Port Expander board includes three different expander devices. Every device must be configured to an individual I^2C address. For I^2C address configuration, the address selection jumper is used.

Table 2. Address Selection Jumper

	Jumper Addresses						
	A6	**A5**	**A4**	**A3**	**A2**	**A1**	**A0**
Jumpers	LW	LW	LW	LW	LW	LW	LW
	LS	LS	LS	LS	LS	LS	LS
	HW	HW	HW	HW	HW	HW	HW
	HS	HS	HS	HS	HS	HS	HS

LW - Weak pull down.
LS - Strong pull down.
HW - Weak pull up.
HS - Strong pull up.

The A0 line is always used to define the corresponding bit of the I^2C address. This pin should be pulled up or down. If A0 is a strong pull up or a strong pull down (connected through a resistor, 330 ohms or less, to Vdd or Vss), then that is the only address line being specified and the A1-A6 lines are used as GPIO. If A0 is a weak pull up or a weak pull down (connected to Vdd or Vss through 75 - 200-kohm resistor), then A0 is not the only externally defined address bit.

There is a pin assigned to be A1 if it is needed. This pin can be pulled up or pulled down strong or weak with a resistor. As with A0, the type of pull determines whether the address bit is the last externally defined address bit. Different from A0, A1 is not dedicated as an address pin. It is only used if A0 is not the only address bit externally defined. There are also predefined pins for A2, A3, A4, A5 and A6 that will only be used for addressing if needed. The last address bit in the chain is pulled strong. That way, only the number of pins needed to assign the address desired for the part are allocated as address pins; any pins not used for address bits are available to be used as GPIO pins. The table, “Device Addressing,” on page 3 of the I^2C Port Expander Data Sheet defines the resulting device I^2C address.

For example, to set the I^2C address to 0x40 (0100000), we simply set A0 to LS, Strong Pull Down. The other address pins have their jumpers removed, making them available for use as GPIO. The resulting I^2C address is as follows.

A6	A5	A4	A3	A2	A1	A0	N/A	Jumper Address Pins
7	6	5	4	3	2	1	0	I2C Address Bits
0	1	0	0	0	0	0	0	Bit Value
Open	Open	Open	Open	Open	Open	LS	N/A	Jumper Setting

Note before using, make sure all address pins that use the address selection jumper are not connected to any peripherals (LEDs, inputs/outputs, etc.).

I²C Port Expander Address Select Examples

Table 3. Example 1

A6	A5	A4	A3	A2	A1	A0
LW	LW	LW	LW	LW	LW	LW
LS	LS	LS	LS	LS	LS	**LS**
HW	HW	HW	HW	HW	HW	HW
HS	HS	HS	HS	HS	HS	HS

Black - Jumper is closed.
White - Jumper is open.

I²C address is set to 0x40.

Table 4. Example 2

A6	A5	A4	A3	A2	A1	A0
LW	LW	LW	LW	LW	LW	LW
LS	LS	LS	LS	LS	LS	LS
HW	HW	HW	HW	HW	HW	HW
HS	HS	HS	HS	HS	HS	**HS**

Black - Jumper is closed.
White - Jumper is open.

I²C address is set to 0x42.

Table 5. Example 3.

A6	A5	A4	A3	A2	A1	A0
LW	**LW**	**LW**	**LW**	**LW**	**LW**	**LW**
LS	LS	LS	LS	LS	LS	LS
HW	HW	HW	HW	HW	HW	HW
HS	HS	HS	HS	HS	HS	HS

Black - Jumper is closed.
White - Jumper is open.

I²C address is set to 0x80.

Demonstration Example Scripts

Code 1. Script 1

1 kHz tone to speaker. U2 address is 0x40. Jumper U2 - GP1[3] must be installed.

```
s40 28 00 04 25 10 2     ;select and configure PWM
s40 09 08                ;select output port register
s40 18 01                ;select the Gport to be configured
s40 1c 00                ;configure port as output
s40 1a 08                ;connect port to PWM output
s40 21 08                ;select strong drive mode
```

Code 2. Script 2

Read buttons state. U2 address is 0x40. Jumpers U2 - GP1[0], GP1[1], and GP1[2] must be installed.

```
s40 09 00                ;write to port zero
s40 18 01                ;select the Gport to be configured
s40 1c ff                ;set the port direction to input
s40 1e ff                ;select resistive pull down drive mode
s40 01                   ;start reading
s41 01 x                 ;repeat this line to continuously read button state
```

Code 3. Script 3

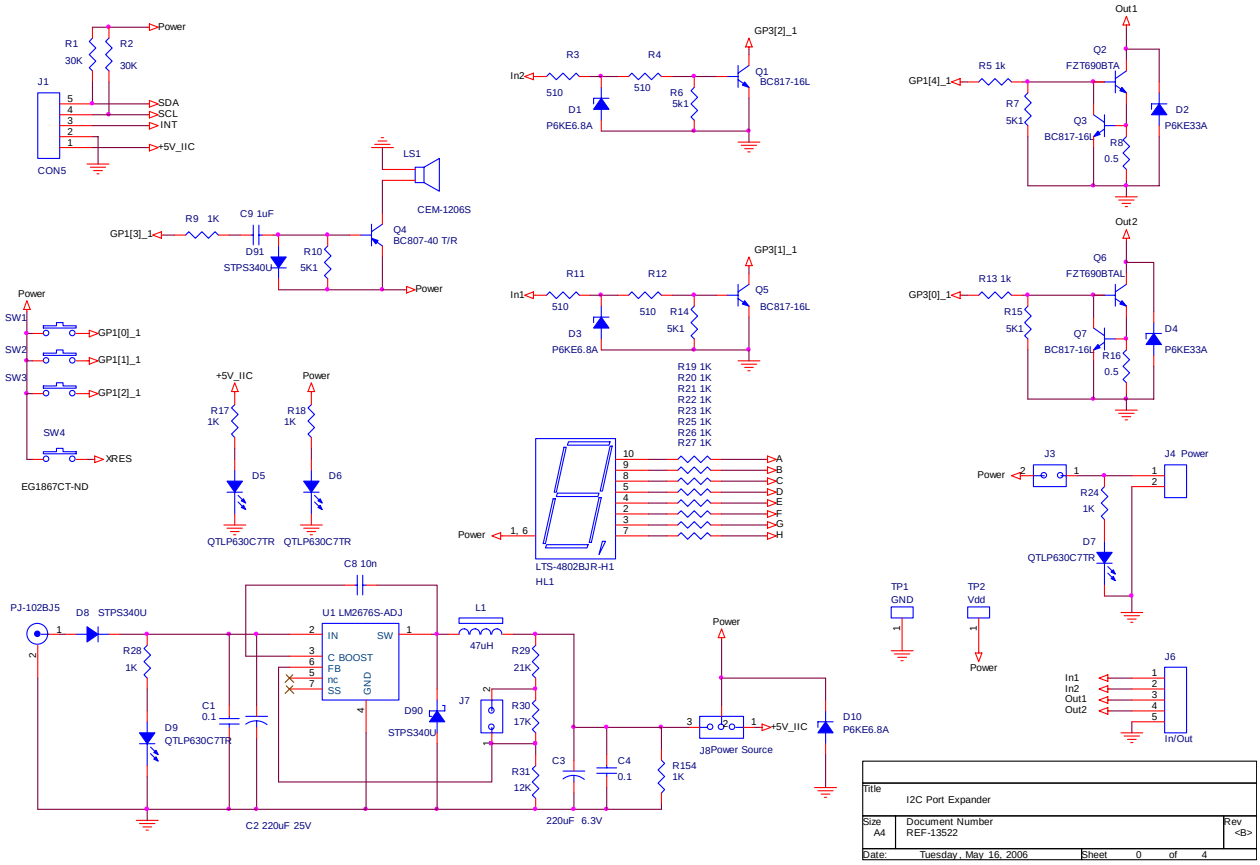
Turn on external outputs. U2 address is 0x40. Jumpers U2 - GP1[4] and GP3[0] must be installed.

```
s40 09 10                ;set bit 4 port 1
s40 18 01                ;select the Gport1 to be configured
s40 1c 00                ;set the port direction to output
s40 21 10                ;select strong drive mode

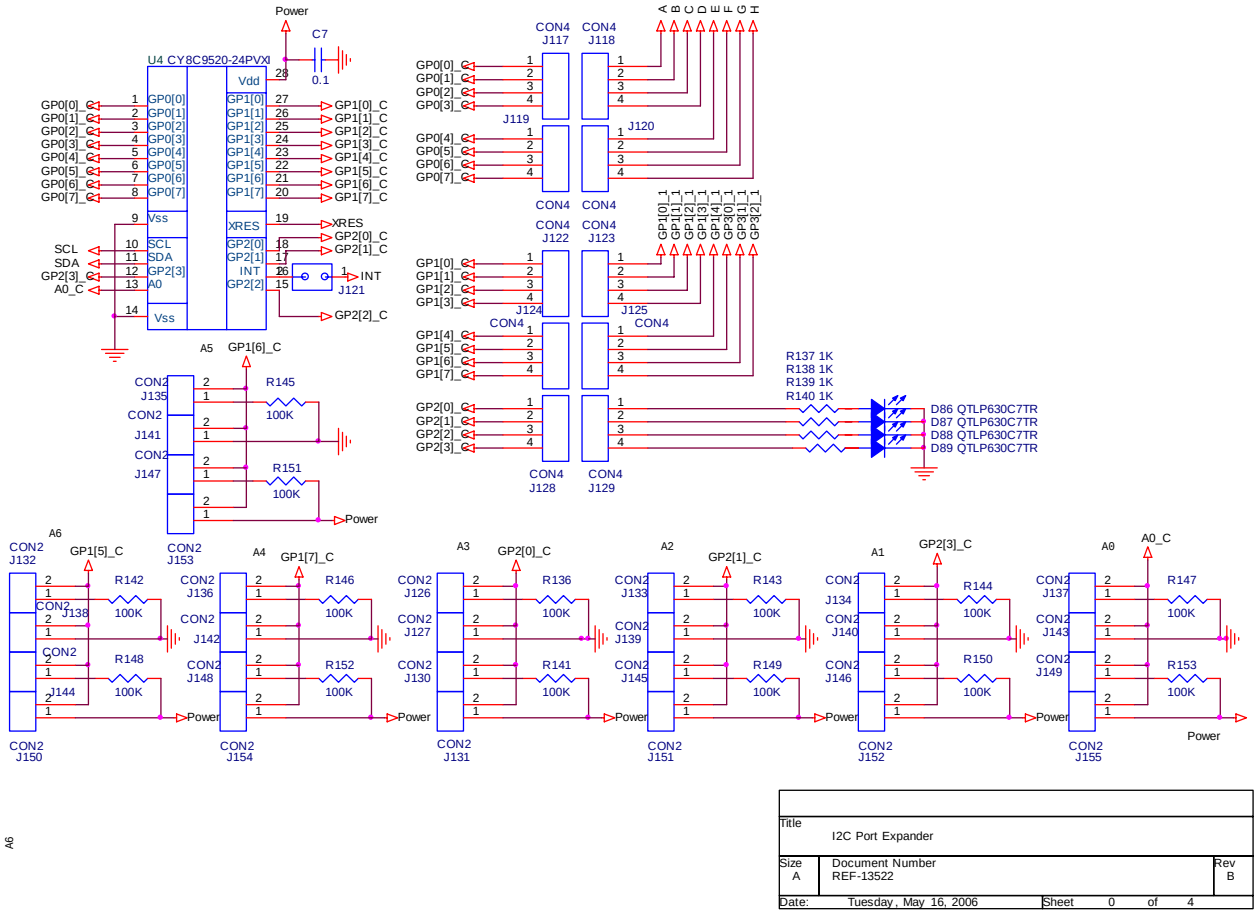
s40 0b 01                ;set bit 0 port 3
s40 18 03                ;select the Gport3 to be configured
s40 1c 00                ;set the port direction to output
s40 21 01                ;select strong drive mode
```

See the I^2C Port Expander Data Sheet for more details about configuration.

I²C Port Expander Board Schematics




U2
CY8C9560-24PVXI
U3 CY8C9540-24PVXI
I2C Port Expander
Document Number REF-13522
Rev B
Sheet 0 of 4
Friday, May 19, 2006
Sheet 3 of 4
Thursday, May 11, 2006



Title	I2C Port Expander	
Size A	Document Number REF-13522	Rev B
Date: Tuesday, May 16, 2006	Sheet 0 of 4	

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709
Phone: 408-943-2600
Fax: 408-943-4730
http://www.cypress.com

© Cypress Semiconductor Corporation, 2006. 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.