8 I/O Port with LEDs and Relay

September 29, 2009

Contents

1 Introduction

SIP8574 is a simple 8 bit I/O port module using the NXP PCF8574

This is the simplest I/O chip for I2C, with no input, output or data direction registers to configure. It has open drain outputs, which can be written or read.
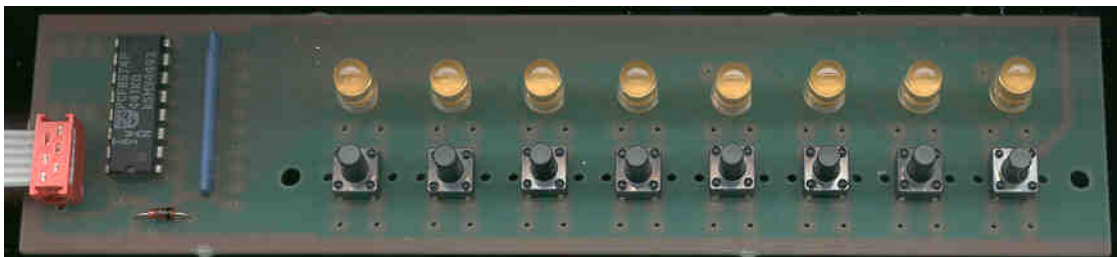

- 8 Open Drain I/O's, 20mA
- Interrupt on pin change output
- TI 2nd source available

The SIP8574 module is included in the I2C Starter Kit.

I2C Keyboard

I2CKBD is a simple 8 buttons+leds pcb using the 8574.

2 I2C Communications

The base address if PCF8574 is 0x40. 8 sub-addresses are available through J1-6.

There are no internal registers, all reads and write are direct to/from the port.

3 Operation

3.1 Input

Any pin you want to use as an input should be set HI.

S40 FF P //set all pins to be inputs

S41 01 P //read the input value

3.2 Output

The LED's are ON when the outputs are LOW. So 00 will turn all LED's on, FF will turn them off.

```
S40 00 P //all leds on
S40 FF P //all leds off
S40 FE P //relay only ON
```

You can write sequential bytes to the port to toggle the pins.

S40 FE FF FE FF P //toggle P0 twice

3.3 Paralleling Boards on Same Address

You might want to have a couple of boards in different spots, but you are only using a few pins. It might suit you to only have to write to a single location for both boards

You can actually parallel two boards without changing the address is you want. Just use different pins on each board, and leave the unused pins on each board open. This is possible because the I2C bus is open drain.

3.4 Reading Keyboards Switches

The I2CKBD has LED's and buttons connected together.

To read the buttons the outputs are changed to all off - FF, then the port is read, then the LED state is restored.

So if LED state is F0, we can read the inputs, and set the leds like this:

```
S40 FF R01 W F0 P
```

ie Write FF, read 1 byte button values, write FF (led state).
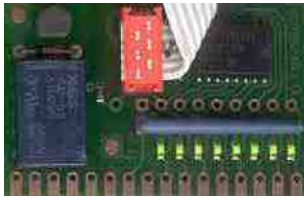
3.5 Interrupt Pin

The IRQ pin is not connected by default. Bridge J7/IRQ to connect it to the bus.

4 Relay

You can order with a DPDT relay fitted. The PCB is labelled

- C - common
- NO - normally open
- NC normally closed.

4.1 Relay Specifications

Spec	Value	Units
Type	NAIS TQ2-5V, DPDT	
Max Voltage	110 DC / 125 AC	V
Max Current	1A	A
Nominal Switching	30V 1A DC / 125VAC, 0.5A	
Coil Current	28	mA

4.2 Adding the Relay

If not fitted you can add the relay yourself. You require:

- NAIS TQ2 type relay, 5V or equivalent,

- BC557 PNP 100mA transistor

- 1N4148, 1N914 or equivalent signal diode

4.3 Changing the Relay Port

By default the relay is connected to P0. To control it with another port, cut link J9. Use a wire to link the pad adjacent to R4, to the desired pad of RP2

[ADD photo]

4.4 Using the Relay Driver Without a Relay

The relay is high side driven by a PNP transistor. If you need a high current output, then you can fit Q1. Link across the relay pins to get the signal to the edge connector.

If you are driving an inductive load (eg external relay) be sure to fit D1.

5 Misc Modifications

5.1 Disable LED's

To disable the LED's cut J8.

You might want to do this to reduce current consumption, or if you want to drive the input from a source than cannot turn the LED on.

5.2 Adding Extra Pullup Resistors

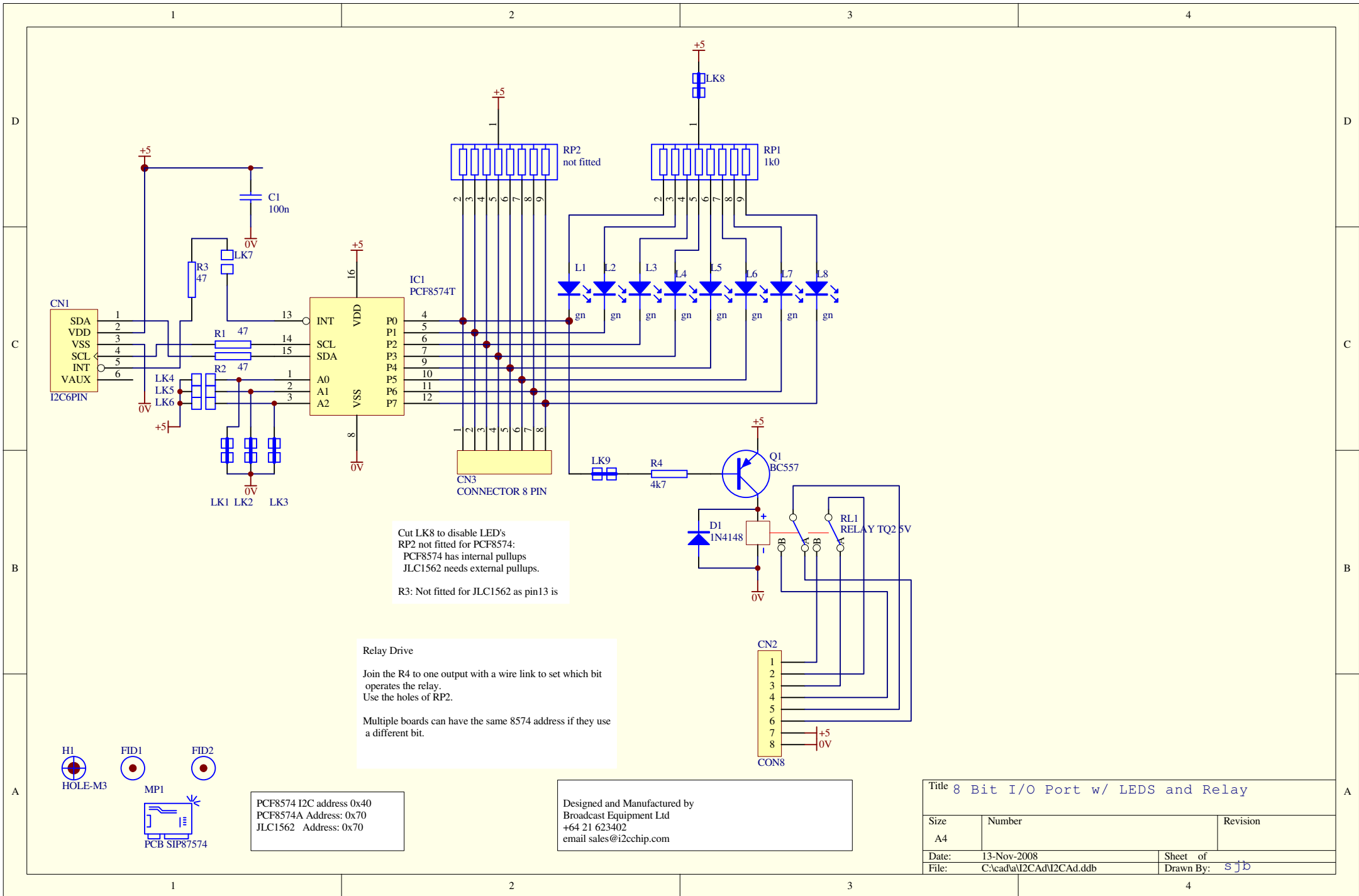The PCF8574 has built in weak pullups. If you want to increase the pullup current, fit RP2.

6 Jumpers

J#	Function	default	
J1-6	I2C Sub Address	joined to 0	
J7	IRQ	open	
J8	Cut to disable LED's	closed	
J9	Cut to change Relay Port	closed	

7 Edge Connector

Pin	Function	
1	normally open 1	
2	normally closed 1	
3	common 1	
4	normally open 2	
5	normally closed 2	
6	common 2	
7	+5	
8	GND	
9	IO 0	
10	IO 1	
11	IO 2	
12	IO 3	
13	IO 4	
14	IO 5	
15	IO 6	
16	IO 7	

8 Drawings

8.1 Circuit Diagram

CN1 — I2C6PIN
- 1 SDA
- 2 VDD
- 3 VSS
- 4 SCL
- 5 INT
- 6 VAUX

IC1 PCF8574T
- 13 INT
- 16 VDD
- 14 SCL
- 15 SDA
- 1 A0
- 2 A1
- 3 A2
- 8 VSS
- 4 P0
- 5 P1
- 6 P2
- 7 P3
- 9 P4
- 10 P5
- 11 P6
- 12 P7

R3 47
LK7
C1 100n
R1 47
R2 47
LK4 LK5 LK6
LK1 LK2 LK3

RP2 not fitted
RP1 1k0
LK8

L1 L2 L3 L4 L5 L6 L7 L8

CN3 CONNECTOR 8 PIN

LK9
R4 4k7
Q1 BC557
D1 1N4148
RL1 RELAY TQ2 5V

CN2 CON8
- 1
- 2
- 3
- 4
- 5
- 6
- 7 +5
- 8 0V

Cut LK8 to disable LED's
RP2 not fitted for PCF8574:
 PCF8574 has internal pullups
 JLC1562 needs external pullups.

R3: Not fitted for JLC1562 as pin13 is

Relay Drive

Join the R4 to one output with a wire link to set which bit
 operates the relay.
Use the holes of RP2.

Multiple boards can have the same 8574 address if they use
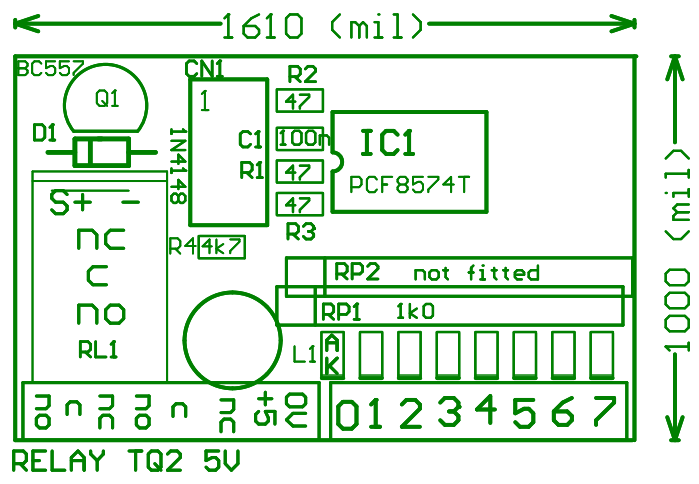 a different bit.

H1 HOLE-M3
FID1
FID2
MP1
PCB SIP87574
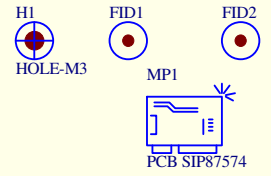
PCF8574 I2C address 0x40
PCF8574A Address: 0x70
JLC1562   Address: 0x70

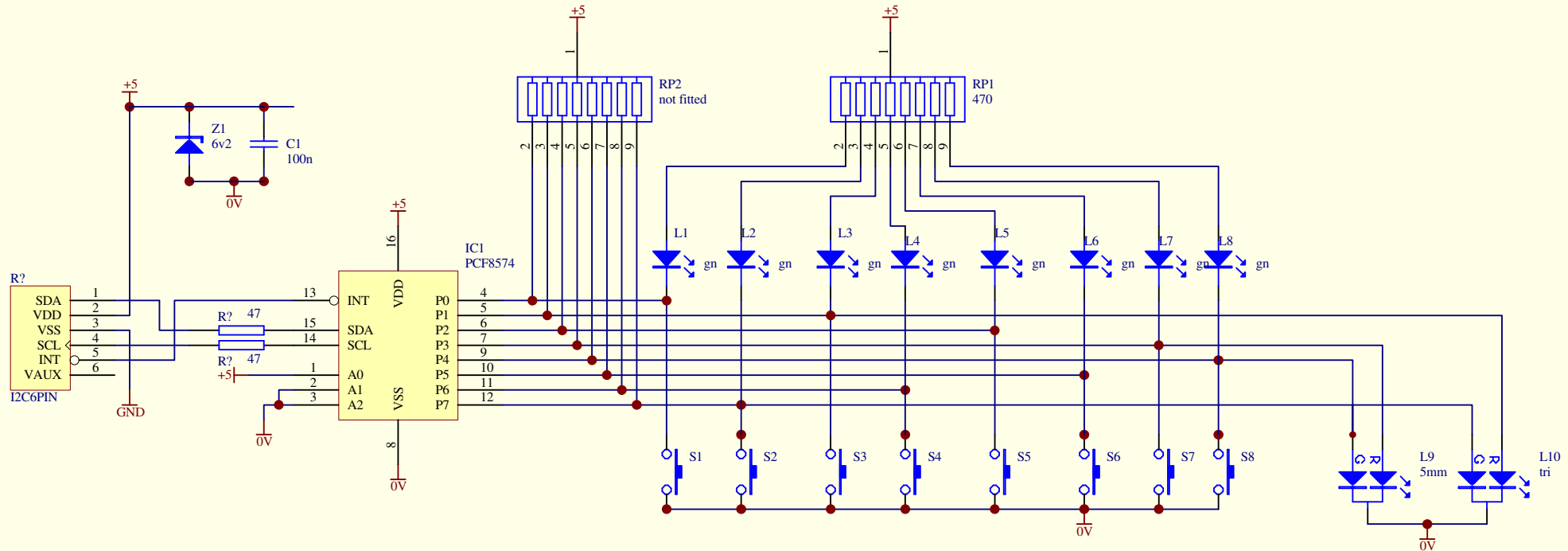| Title	8 Bit I/O Port w/ LEDS and Relay		
Size A4	Number		Revision
Date:	13-Nov-2008	Sheet of	
File:	C:\cad\a\I2CAd\I2CAd.ddb	Drawn By:	sjb

8.2 PCB Drawings

SIP8574_Relay
Bottom View
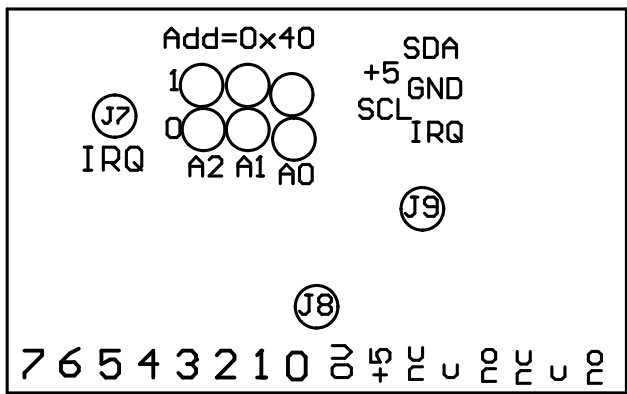
J7: IRQ
J8: Cut to disable LED's
J9: Cut to link relay to another port

9 I2C Keyboard Drawings

9.1 Circuit Diagram

RP2 only fitted if internal PCF8574 pullups are too weak or if
 using JLC1562
L9 / L10 are optional footprints for bi-color or single leds.
PCB has additional foot prints for leds that can be fitted and
 wired by hand if desired

I2C address 0x40

D0 sw1 / L1
D1 sw3 / L3 or L10 red
D2 sw5 / L5
D3 sw7 / L7 or L9 red
D4 sw8 / L8 or L9 green
D5 sw6 / L6
D6 sw4 / L4
D7 sw2 / L2 or L10 green

Designed and Manufactured by
Broadcast Equipment Ltd
+64 21 623402
email sales@i2cchip.com

Title			
I2C Keyboard/display			

Size	Number		Revision
A4			

Date:	29-Sep-2009	Sheet of	
File:	C:\cad\a\I2CAd\I2CAd.ddb	Drawn By:	sjb

10 Revision History

Date	Rev#	Changes
	0	pre-release