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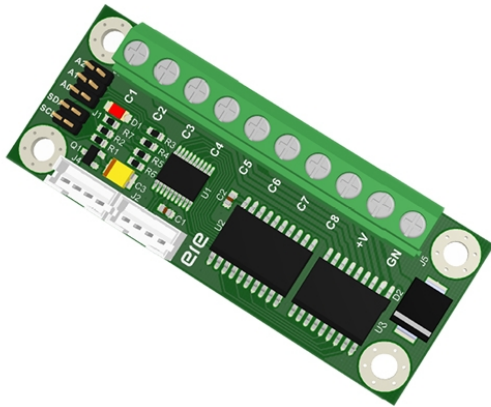
I2C-OC805S, I2C-OC805SA
I2C Bus 8-Output Open Collectors

Features
- PCF8574 and PCF8574A I2C bus I/O expander
- 8 Outputs Open Collectors
- Operating voltage 2.5V to 5.5V
- Inverse polarity protection circuits
- 100kHz I2C Bus frequency
- Address by 3 jumpers for use of up to 8 addresses
- Up to 16 boards on one bus
- Compatible with most microcontrollers
- Max. Load voltage 50V
- 500mA Rated Collector Current(using single output)
- PCB size 67x27mm

Description
This is I2C bus output board for remote 8-output expander via I2C bus based on PCF8574 and PCF8574A. It is called I2C Output board. Making it ideal as open collector expander for I2C bus. They are designed to compatible with most microcontrollers.

The PCF8574 and the PCF8574A are the I2C bus controllers which talk to microcontroller and then take commands to output ports. The PCF8574 and the PCF8574A support 100kHz bus frequency. And they can be connected to I2C port of most microcontrollers.

The boards uses ULN2803 and ULN2803A for output drivers. Each board has 8 open collectors. Each output supports 500mA when using single output. And the maximum voltage is 50V.

The board is addressed by 3 jumpers to make 8 different addresses. So that 8 boards can be connected together on one bus. Moreover 16 boards can be connected together on the bus when each board has different address. By this way, 8 boards of the PCF8574 and 8 boards of the PCF8574A can be connected together on the same bus. Because the PCF8574 does not have the same address as the PCF8574A.

The boards have inverse polarity protection circuit for power supply input voltage to prevent damage from a mistake of connection. Also the board has LED to show status of the power supply voltage.

The difference between the I2C-OC805S and the I2C-OC805SA is the I2C-OC805S uses PCF8574 ,but the I2C-OC805SA uses PCF8574A. The PCF8574 and PCF8574A have different addresses.

Power dissipation of ULN2803A chip is an importance for each application. So it must be calculated for each application. Load current must not make a temperature of the chip rise over the limit of the power dissipation.
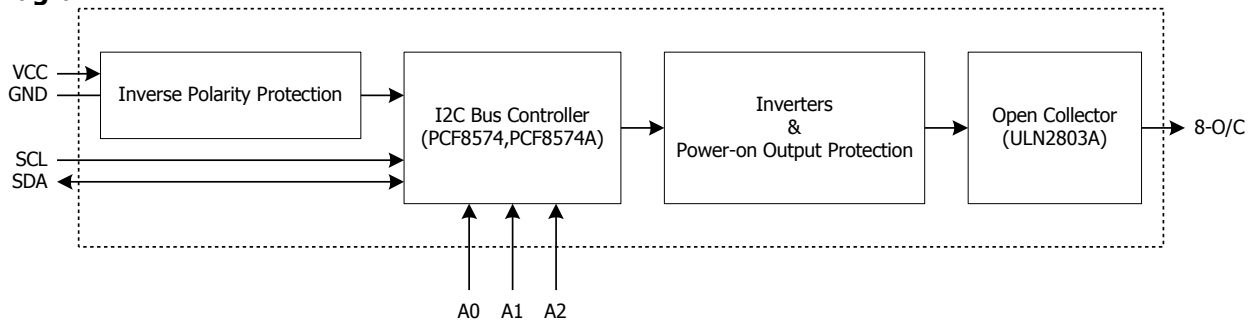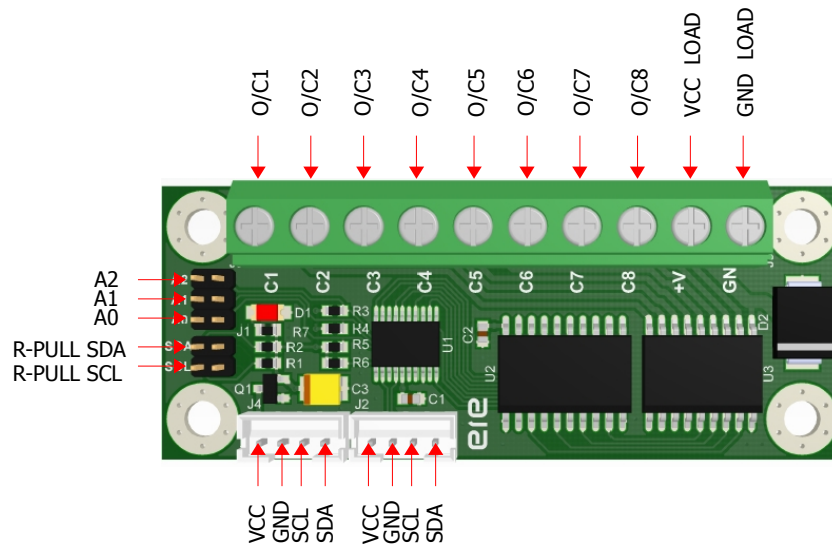
Diagram

Figure 1: Board Diagram

Figure 2: Board Diagram

Table 1: Pin Descriptions

Symbol	Description
VCC	Power supply input voltage 2.5V to 5.5V.
GND	Ground.
SCL	I2C bus serial clock signal.
SDA	I2C bus serial data signal.
A0	A jumper for selecting address of A0.
A1	A jumper for selecting address of A1.
A2	A jumper for selecting address of A2.
R-PULL (SCL)	A jumper for selecting 10K pull-up resistor of SDA.
R-PULL (SDA)	A jumper for selecting 10K pull-up resistor of SCL.
O/C1... O/C8	Open collector1 to Open collector8.
VCC LOAD	Power supply input voltage for load. 0.. 50V.
GND LOAD	Ground of Load.

I2C Bus Pull-Up Resistors

The I2C bus needs resistors for SCL and SDA lines. There are 10K ohm resistors on-board for this purpose. These resistors can be enabled by jumpers and have to be enabled if there is no resistor on the bus.

The bus usually **needs only a pair of resistors** when the boards are connected together on bus. More pull-up resistors make bus stronger. The strong bus is needed for high speed bus. The 10K ohm is suitable for 100Khz bus.
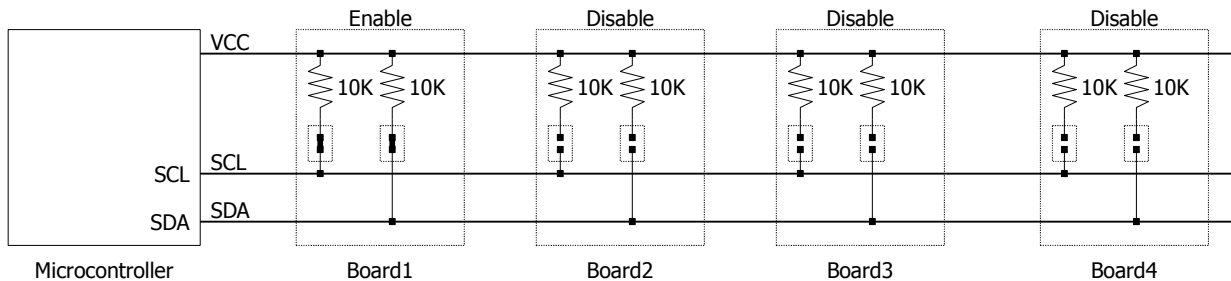

Figure 3: Pull-Up Resistors

Interface To Microcontroller

When VCC and GND are connected to the board. LED shows status of voltage. The SCL and SDA pins must be connected to SCL and SDA pins of microcontroller respectively.

I2C-OC805S and I2C-OC805SA can be connected together up to 16 boards on bus.
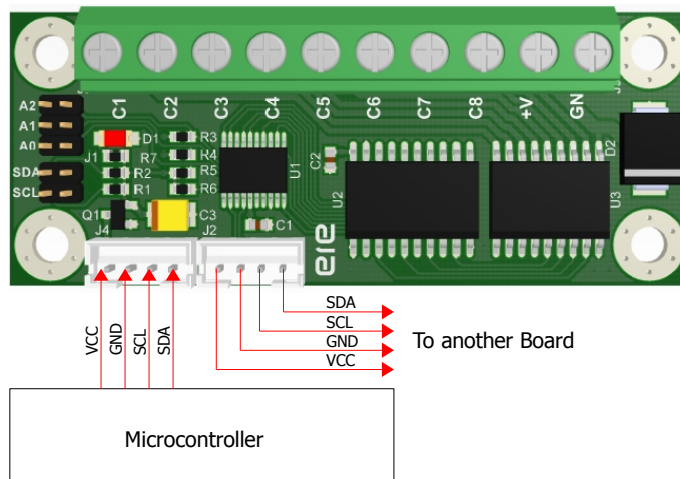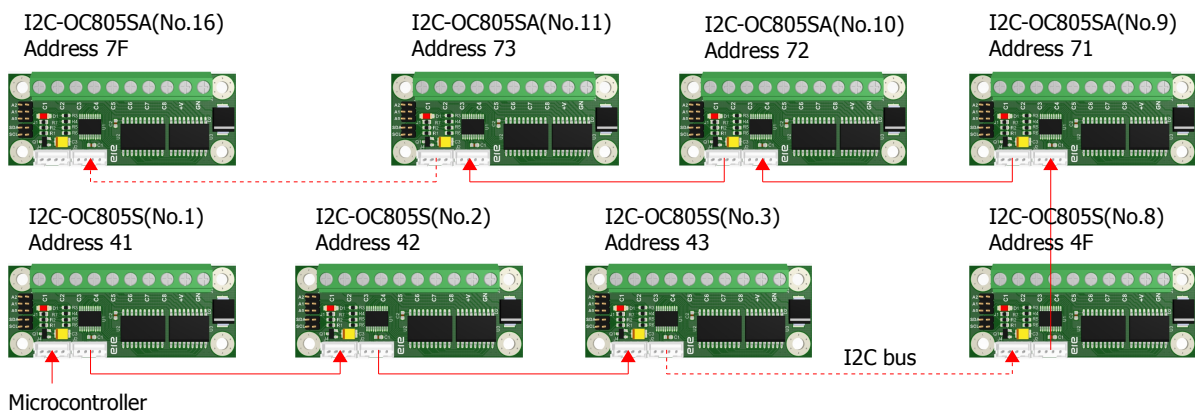

Figure 4: Connect to Microcontroller

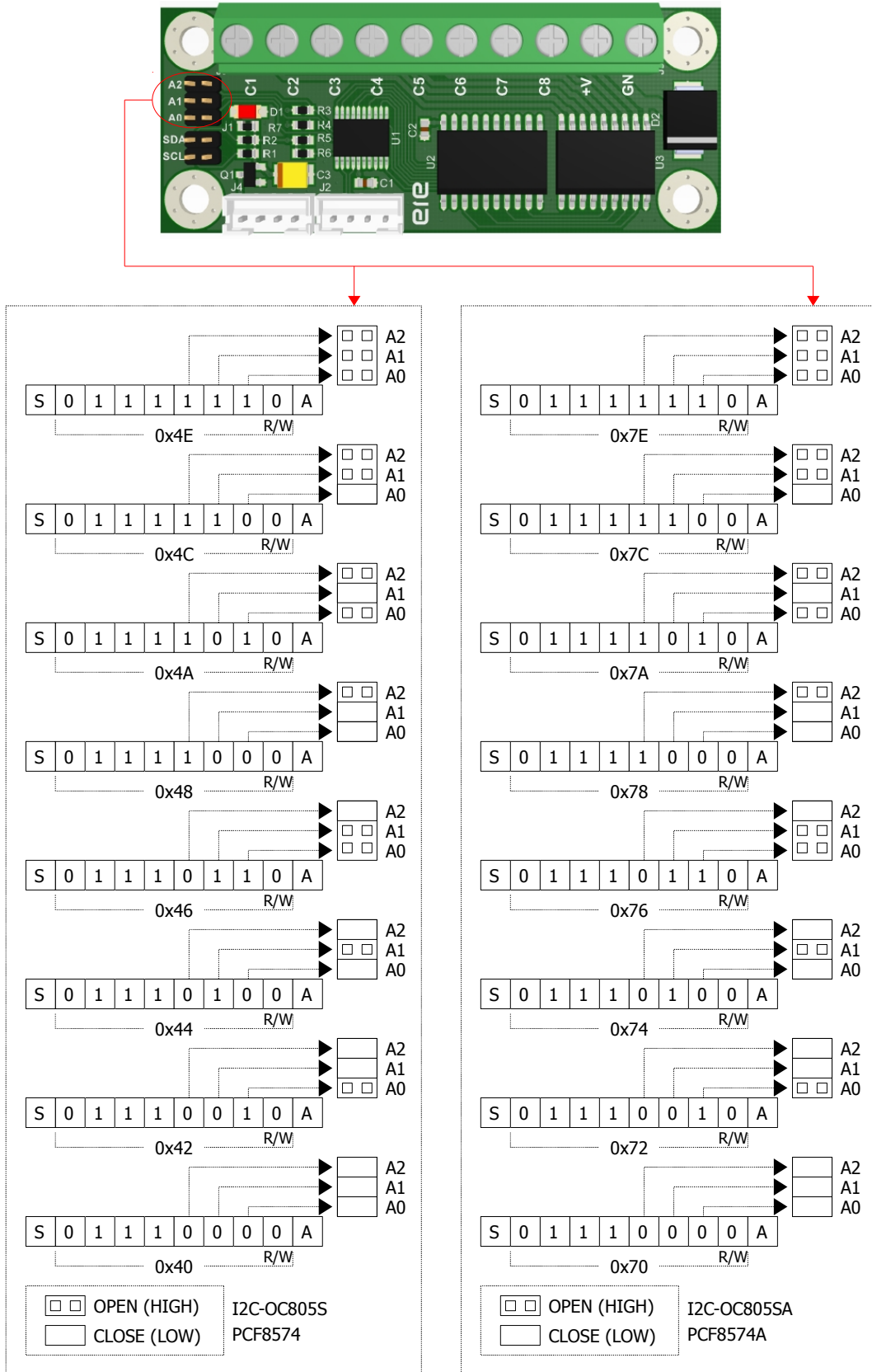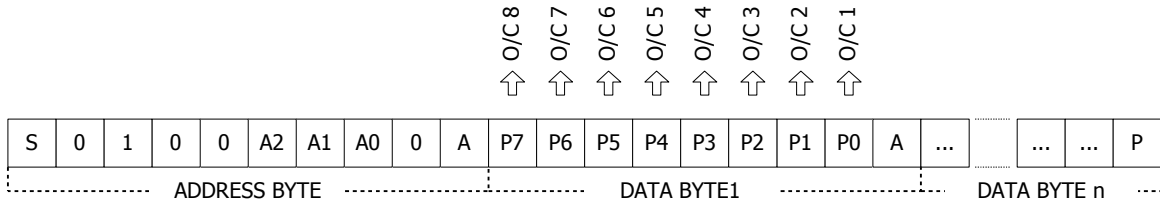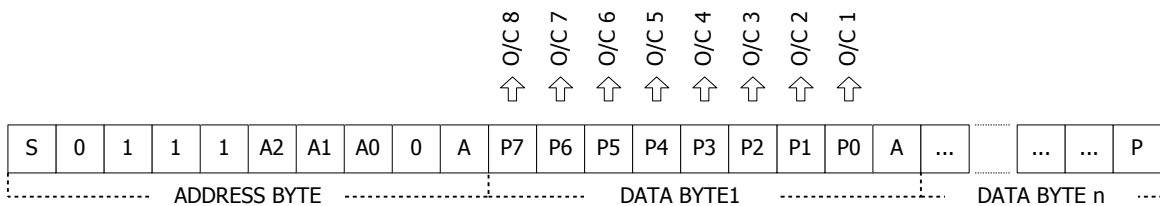Figure 5: Multi-Boards Connection

Bus Address

Figure 6: Addressing

Data Frame of Output

When user send data from microcontroller to output board via I2C bus. The first byte is address byte. The second byte is data for outputs. The bit0 of the second byte controls O/C1. Bit value '1' means output off and bit value '0' means output on.

S	0	1	0	0	A2	A1	A0	0	A	P7	P6	P5	P4	P3	P2	P1	P0	A	...		...	...	P

ADDRESS BYTE .... DATA BYTE1 .... DATA BYTE n

(O/C 8, O/C 7, O/C 6, O/C 5, O/C 4, O/C 3, O/C 2, O/C 1 point to P7, P6, P5, P4, P3, P2, P1, P0)

PCF8574

S	0	1	1	1	A2	A1	A0	0	A	P7	P6	P5	P4	P3	P2	P1	P0	A	...		...	...	P

ADDRESS BYTE .... DATA BYTE1 .... DATA BYTE n

(O/C 8, O/C 7, O/C 6, O/C 5, O/C 4, O/C 3, O/C 2, O/C 1 point to P7, P6, P5, P4, P3, P2, P1, P0)

PCF8574A

Figure 7: Output Data Frame of PCF8574 and PCF8574A

Load Connection

Boards have 8 outputs which can be connected to 8 loads. Each output is open collector that can support 500mA of load current and up to 50V. The resistive and inductive loads can be connected to the board directly because there are free-wheeling diodes on the driver chip. All free-wheeling diodes must be connected to VCC of load. So that, the VCC and GND of loads must be supplied into the boards via +V and GND terminals.

This is an example shows how to connect loads to terminals of board. The one end of load terminal is connected to board and the opposite end is connected to VCC of loads. Also the VCC and GND are connected to board too. This VCC is voltage for loads. This VCC can be up to 50V.
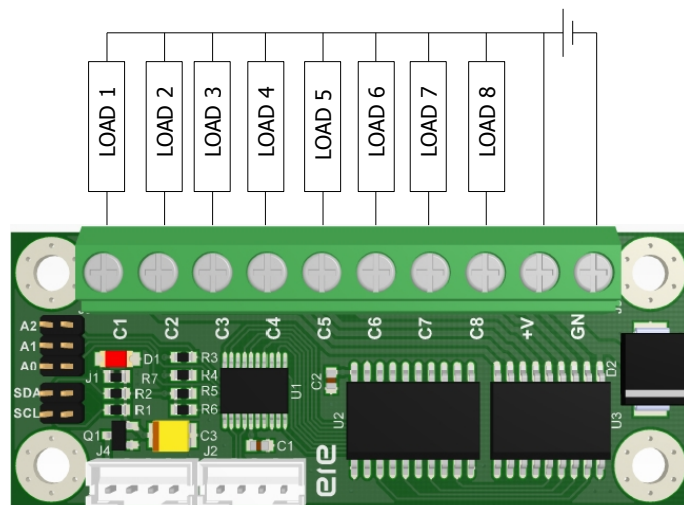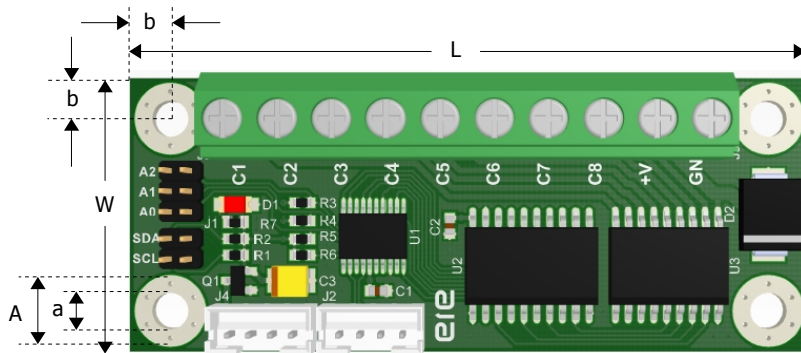
Figure 8: Load Connection

Specification

Table 2: Maximum Absolute Rating

Bus frequency	100kHz
Maximum board on bus	8(16) boards
Maximum load voltage	50V
Maximum load current	500mA (single output)
Output channels	8
Power supply input voltage	2.5V – 5.5V

Dimensions

unit	inch	mm
L	2.6378	67.00
W	1.0629	27.00
A	0.2795	7.10
a	0.1417	3.60
b	0.1574	4.00

Figure 9: Dimension