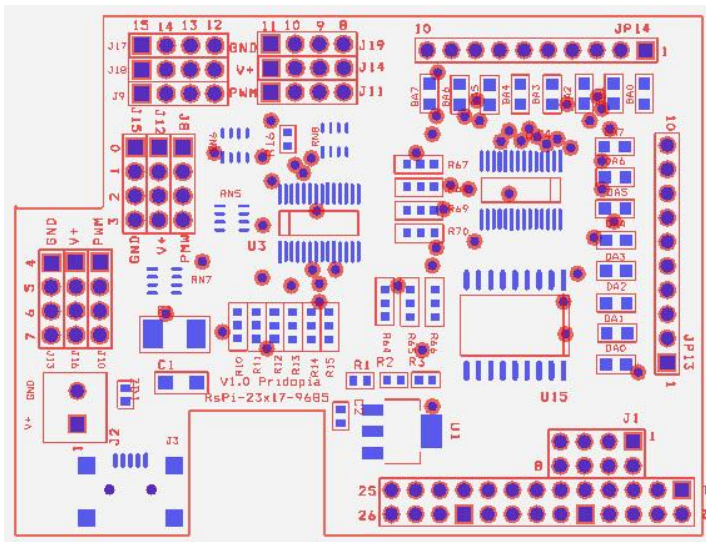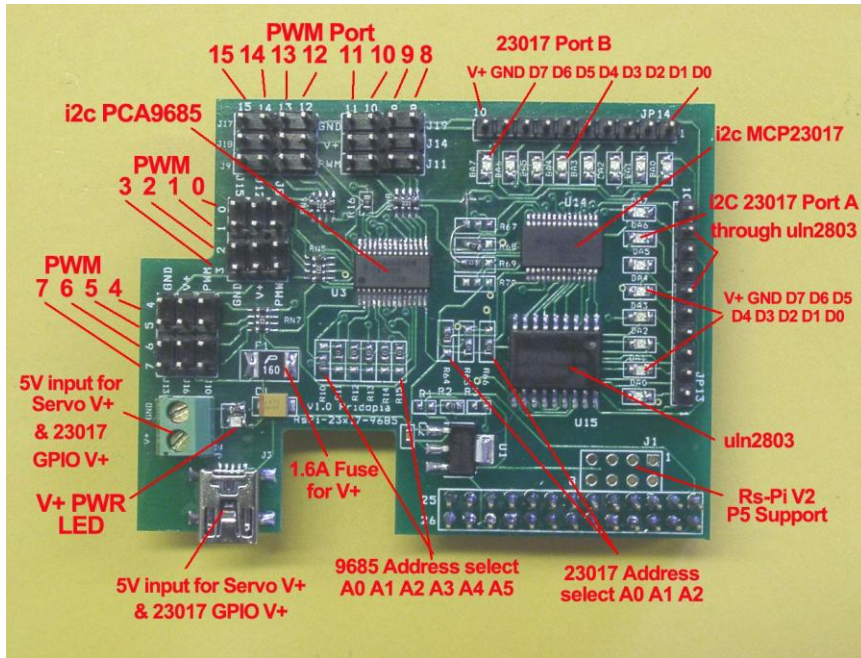# Raspberry Pi I2C 16 Channel PWM / Servo & I2C 23017 16 GPIO Board

The PCA9685 is an I2C-bus controlled 16-channel LED controller optimized for LCD Red/Green/Blue/Amber (RGBA) color backlighting applications. Each LED output has its own 12-bit resolution (4096 steps) fixed frequency individual PWM controller that operates at a programmable frequency from a typical of 40 Hz to 1000 Hz with a duty cycle that is adjustable from 0 % to 100 % to allow the LED to be set to a specific brightness value.
All outputs are set to the same PWM frequency.

PCA9685 also has a built-in oscillator for the PWM control.
However, the frequency used for PWM control in the PCA9685 is adjustable from about 40 Hz to 1000 Hz as compared to the typical 97.6 kHz frequency of the PCA9635. This allows the use of PCA9685 with external power supply controllers. All bits are set at the same frequency.

1. J3 Mini USB 5V input for PWM V+ & GPIO output pin10   V+

   J2 2P Terminal Block 5V input for PWM V+ & GPIO output pin 10 V+

2. J1 Rs-Pi V2 GPIO output

3 JP13 DA0 ~ DA7 U14 Port A   . JP14 BA0 ~ BA7   U14 Port B

4. R64,R65,R66 (for U14 Address select A0,A1,A2)

5. U14 I2C 23017 -1 Port A,B

6. U15 uln2803

7. U3 PCA9685 (PWM Port 0 ~ 15)

8. R10,R11,R12,R13,R14,R15(for U3 Address select A0,A1,A2,A3,A4,A5)

9.Red power-good V+ LED

10. 1.6A PolySwitch Fuse for V+ input protect.

** for 23017 port A output you need plug in 5V to Mini USB or 2P Terminal block

1.Make sure you I2C driver are enable

To enable it all you need to do is comment out a line by putting # in front

sudo nano /etc/modprobe.d/raspi-blacklist.conf

2. Add `i2c-dev` in `/etc/modules` by use
`sudo nano /etc/modules`

If you already install I2c driver , then
`i2cdetect -y 0`   `i2cdetect -y 1`
`if Rs-Pi-v2 you need change 0 to 1`

in i2cdetect you can found 2 device in system (21,41)

21 - 23017   41 - 9685

 Next install the python-smbus python module:

`sudo apt-get install python-smbus`
`sudo apt-get install i2c-tools`

Now you are ready to use the i2c with python.

9685 test code information

http://learn.adafruit.com/adafruit-16-channel-servo-driver-with-raspberry-pi/using-the-adafruit-library

23017 program information
http://nathan.chantrell.net/20120524/python-tools-for-the-mcp23017-io-expander/

http://nathan.chantrell.net/20120602/raspberry-pi-io-expander-board

http://learn.adafruit.com/mcp230xx-gpio-expander-on-the-raspberry-pi/hooking-it-all-up