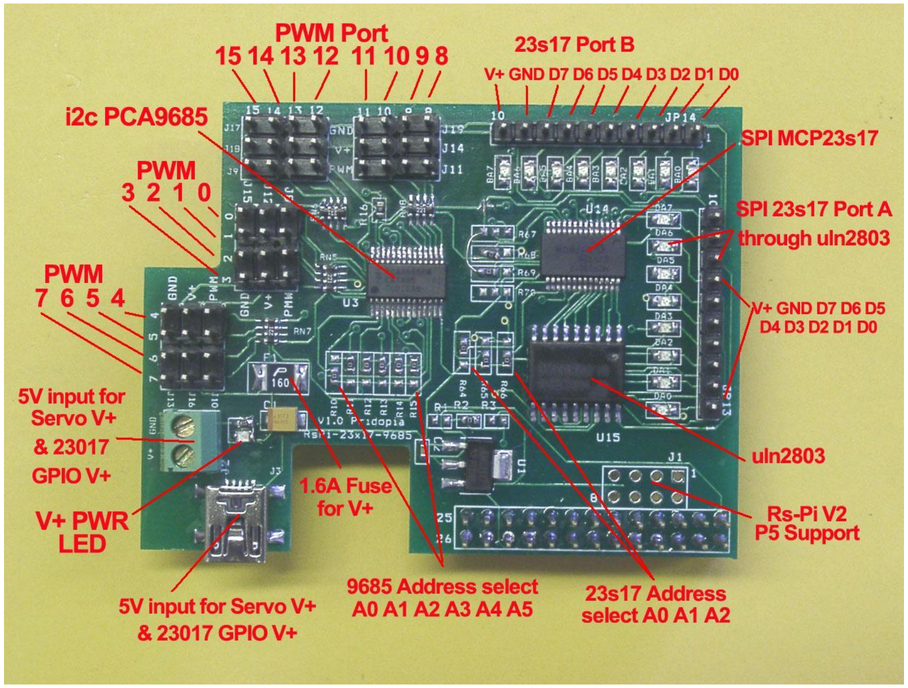
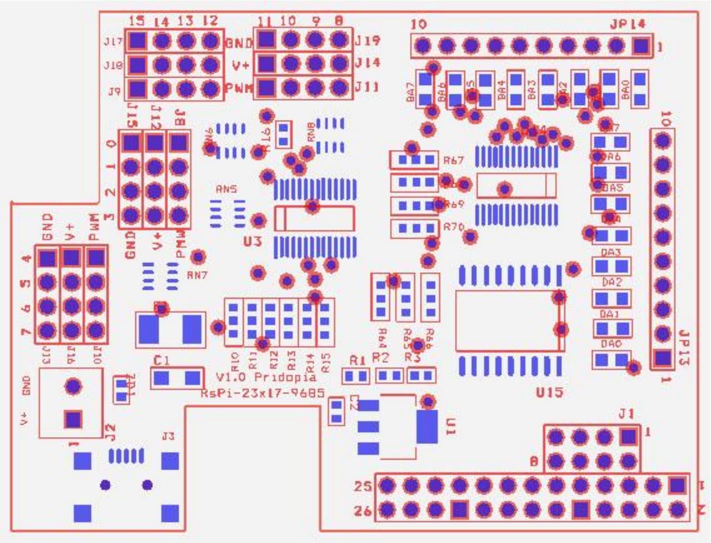
Raspberry Pi I2C 16 Channel PWM / Servo & SPI 23s17 16 GPIO Board





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 SPI 23s17 -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 23s17 port A output you need plug in 5V to Mini USB or 2P Terminal block**

Install python and run the test program

Download test program on our web site 23s17-cs0.py

http://www.pridopia.co.uk/pi-9685-23s17-lp.html

```
# sudo apt-get install python-dev
# wget http://www.pridopia.co.uk/pi-pgm/RPi.GPIO-0.4.1a.tar.gz
# gunzip RPi.GPIO-0.4.1a.tar.gz
# tar –xvf RPi.GPIO-0-4-1a.tar
# cd  RPi.GPIO-0-4-1a
# sudo python setup.py install
# sudo python 23s17-cs0.py
```

Install piface software test U1 (address 000) I/O
Detail information   http://piface.openlx.org.uk/174770794
Java program information
http://www.savagehomeautomation.com/projects/raspberry-pi-programming-pi-face-with-java-pi4j.html

Always enabling SPI

To always enable the SPI driver:

- After logging in, edit /etc/modprobe.d/raspi-blacklist.conf

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

- Insert a # at the start of the line containing blacklist spi-bcm2708

```
#blacklist spi-bcm2708
```

To install and setup the software, ensure your Pi can access the Internet and type:

```
sudo apt-get update
```

```
sudo apt-get install -y python-dev python-gtk2-dev git
pushd ~/
git clone https://github.com/thomasmacpherson/piface.git
pushd piface/python
sudo python setup.py install
popd
sudo piface/scripts/spidev-setup
popd
```

The software will complete installing in a few minutes.

Reboot your Pi by typing:

```
sudo reboot
```

Testing

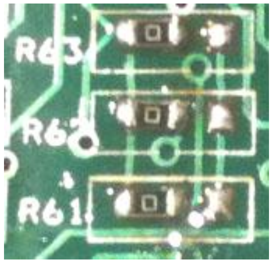
After installing the software and restarting, login and startx.

Start the PiFace emulator by typing in a terminal:

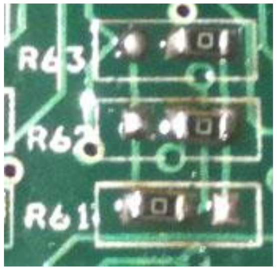
piface/scripts/piface-emulator

A0, A1, A2 address * right side GND low - 0   * left side Vcc High - 1

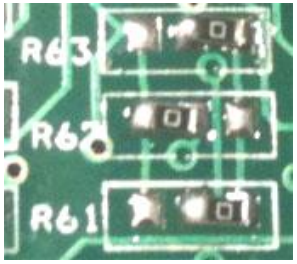
000 -



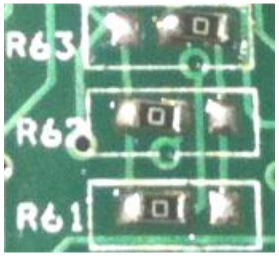
001 -



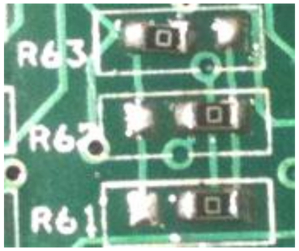
010 -



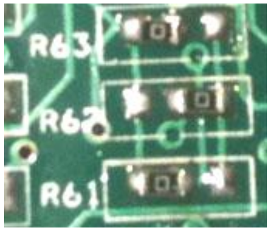
011



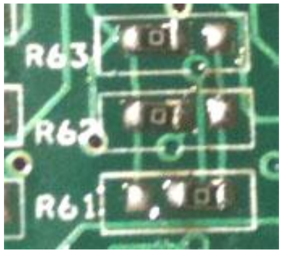
100



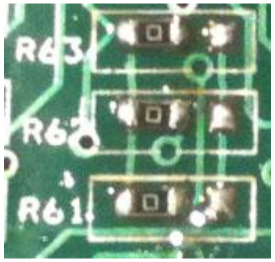
101



110



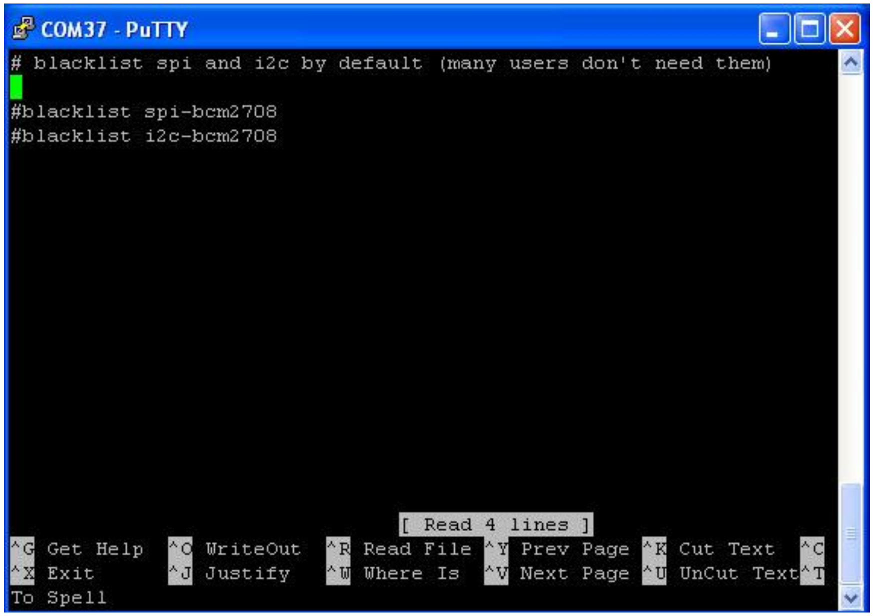
111



```
For I2C 16 channel PWM/servo
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
```

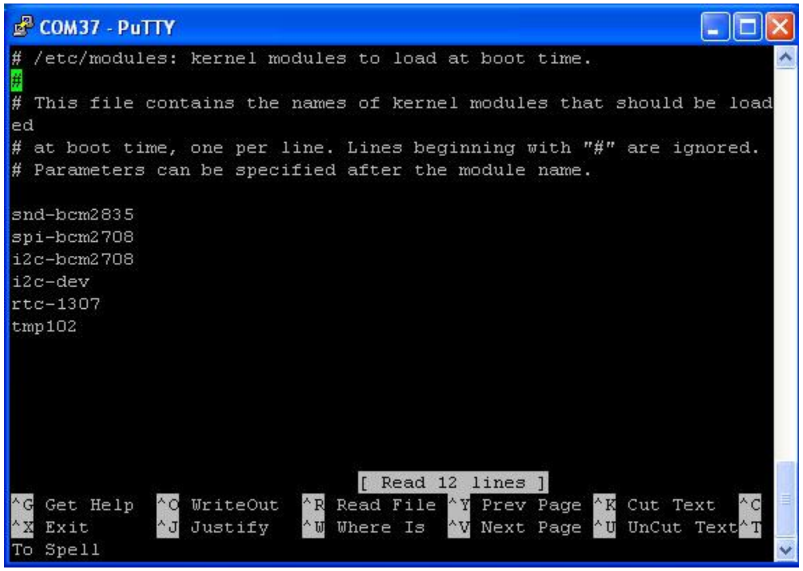


```
# blacklist spi and i2c by default (many users don't need them)

#blacklist spi-bcm2708
#blacklist i2c-bcm2708

                                [ Read 4 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T
To Spell
```

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



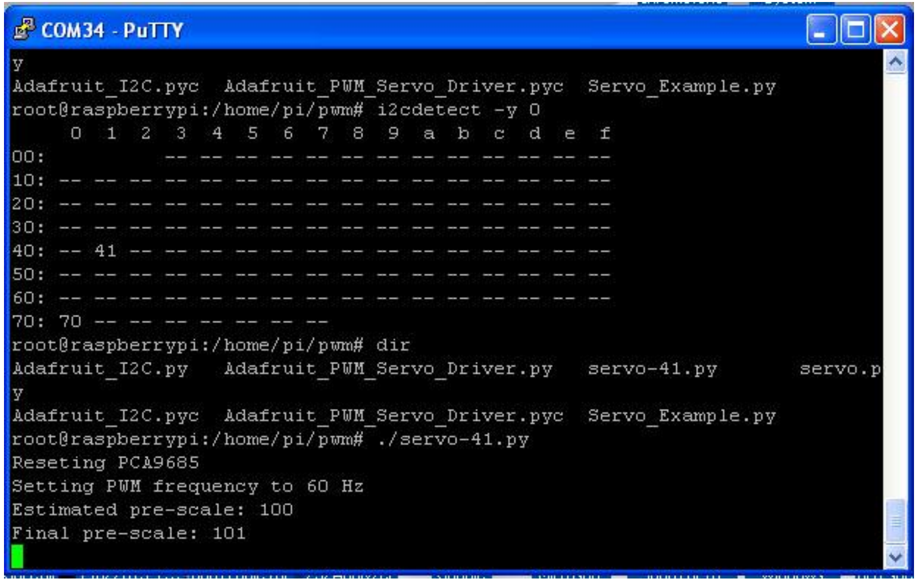
```
# /etc/modules: kernel modules to load at boot time.
#
# This file contains the names of kernel modules that should be load
ed
# at boot time, one per line. Lines beginning with "#" are ignored.
# Parameters can be specified after the module name.

snd-bcm2835
spi-bcm2708
i2c-bcm2708
i2c-dev
rtc-1307
tmp102

                              [ Read 12 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T
To Spell
```

If you already install I2c driver , then

```
i2cdetect -y 0        i2cdetect -y 1
if Rs-Pi-v2 you need change 0 to 1
```



```
y
Adafruit_I2C.pyc  Adafruit_PWM_Servo_Driver.pyc  Servo_Example.py
root@raspberrypi:/home/pi/pwm# i2cdetect -y 0
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- 41 -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: 70 -- -- -- -- -- -- --
root@raspberrypi:/home/pi/pwm# dir
Adafruit_I2C.py   Adafruit_PWM_Servo_Driver.py   servo-41.py      servo.p
y
Adafruit_I2C.pyc  Adafruit_PWM_Servo_Driver.pyc  Servo_Example.py
root@raspberrypi:/home/pi/pwm# ./servo-41.py
Reseting PCA9685
Setting PWM frequency to 60 Hz
Estimated pre-scale: 100
Final pre-scale: 101
```

in i2cdetect you can found 1 device in system (41)

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