0.91inch OLED Module User Manual

OVERVIEW

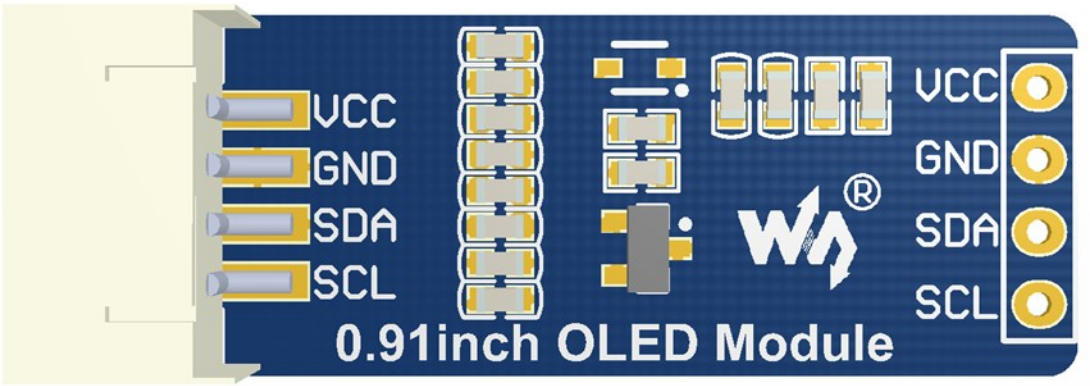
This is a general OLED display Module, 0.91inch diagonal, 128x32 pixels, with embedded controller, communicating via I2C interface.

FEATURES

Controller:	SSD1306
Interface:	I2C
Resolution:	128*32
Display Size:	0.91inch
Display Color:	White
Operating Voltage:	2.2V/5V

PINS

PIN	Description
VCC	Power
GND	Ground
SDA	Data input
SCL	Clock input

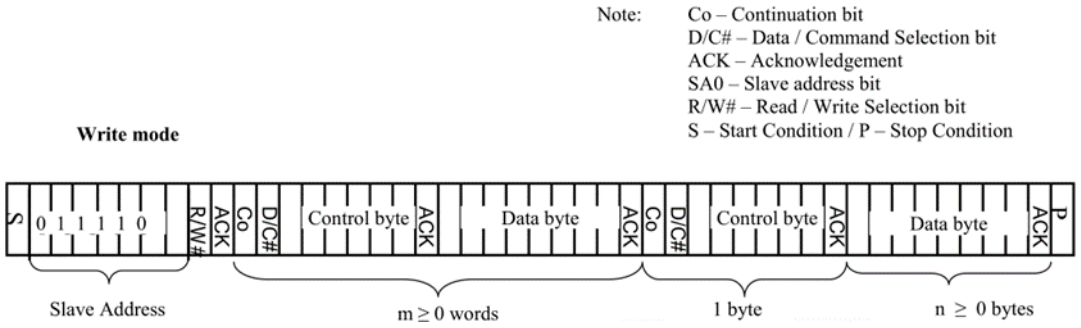


WORKING PROTOCOL

SSD1306 is a controller for 128*64 OLED. This OLED has only 128*32 pixels, so it uses part of SSD1306' s buffer.

In theory, the OLED supports 8-bit 8080, 8-bits 6800, 3-wires SPI, 4-wires SPI and I2C, however, to save IO resources and because of the small size of OLED, we only pinout I2C interface.

I2C COMMUNICATION



When working, MCU will first send a byte that the first 7bits are address of slave device and 1 bit write/read bit, and wait for response.

After received response from slave device, MCU will send a control byte, this byte defined the data following is command or data.

Slave response again, if sending command, MCU will send the command which is one byte. If sending data, MCU will sending data

For more details about I2C, please refer to Datasheet Page20 Figure 8-7

HOW TO USE

We provide STM32, Arduino and Raspberry Pi demo code for this module. The demo code will release basic functions that: draw point, draw line, draw rectangle, draw circle.

STM32 DEMO CODE

1. Hardware configuration

   Development board: XNUCLEO-F103RB

PIN	XNUCLEO-F103RB
VCC	3V3/5V
GND	GND
SDA	SDA/D14
SCL	SCL/D15

2. Project files:

   Project is compiled in MDK-ARM v5, generated by STM32CubeMX

   ../Src:

   Adafruit_SSD1306.cpp: Bottom interface of OLED, provide functions that OLED initialize, basic display pixels and configure;

   Adafruit_GFX.cpp: Application function of OLED, provide display, drawing

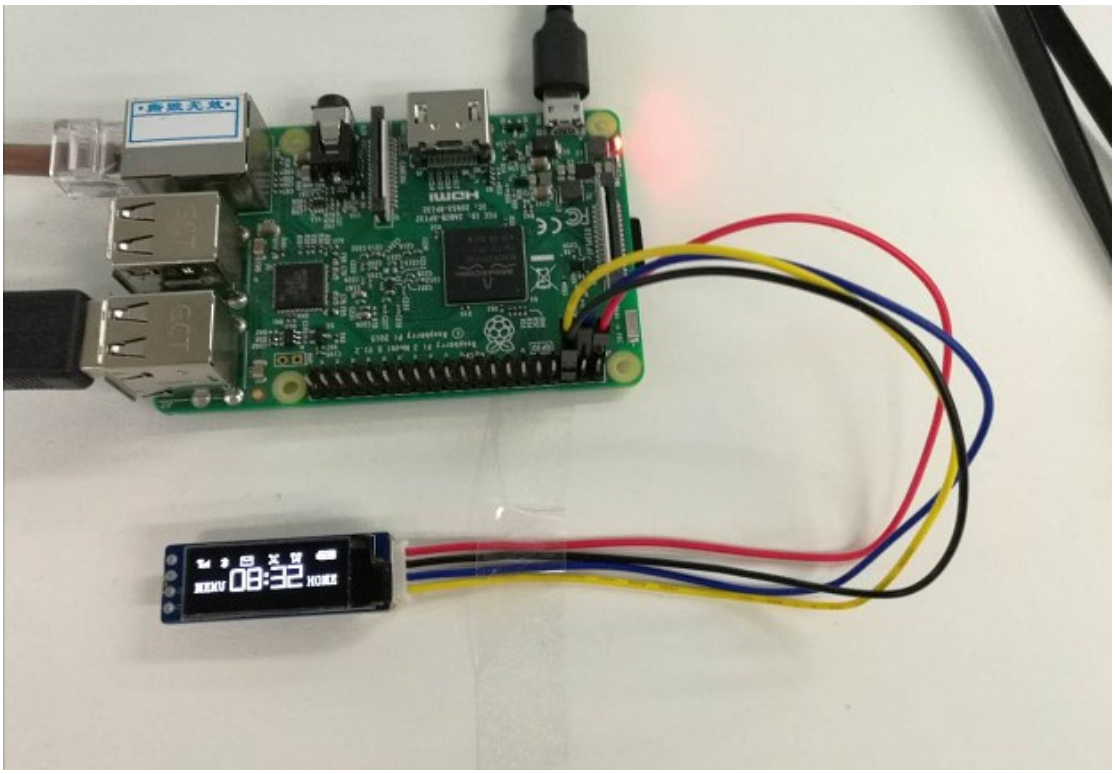
functions.

glcdfont.h: LCD font, provide English fonts which size 6*8 and 8*16

RASPBERRY PI CODE

1. Hardware connection

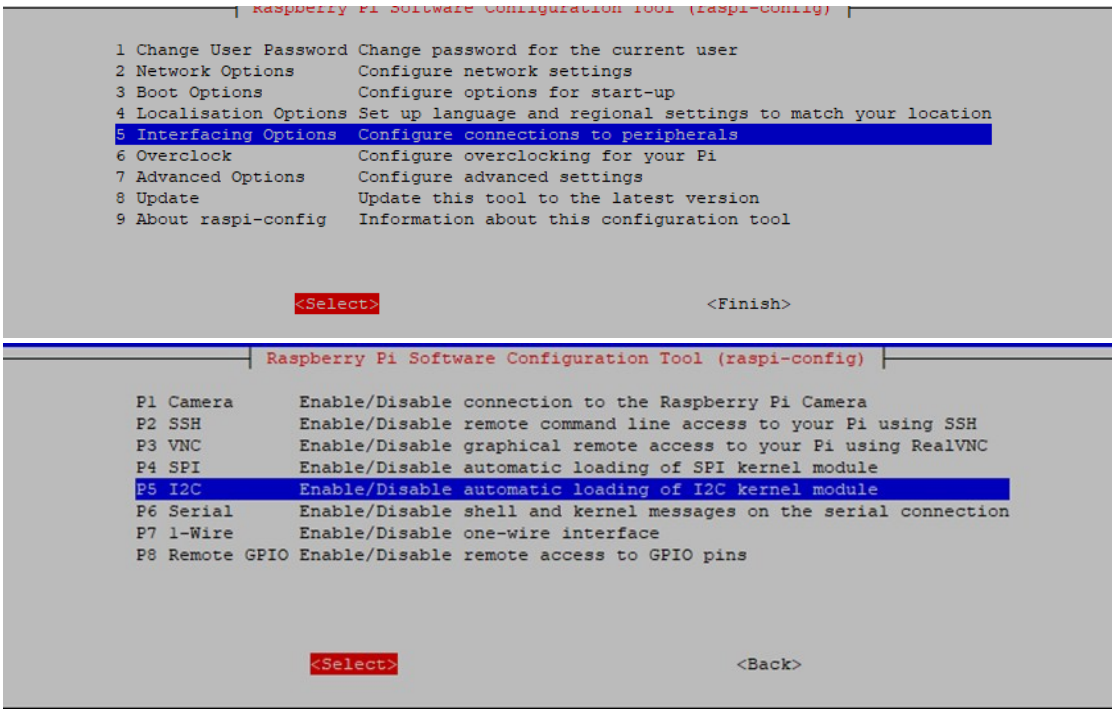
PIN	Pi
VCC	3V3/5V
GND	GND
SDA	SDA
SCL	SCL



2. Enable I2C

sudo raspi-config

choose Interfacing Options->I2C ->Yes



3. Libraries installation

   About how to install I2C libraries, you can refer to Waveshare Wiki:

   https://www.waveshare.com/wiki/Libraries_Installation_for_RPi

4. Using

   Copy demo code which you can download from Wiki to Raspberry Pi. The demo code we described are all copied to /home/pi

   a) BCM2835

      (1) Install bcm2835 libraries

      (2) use **ls** command to list the files:

```
pi@raspberrypi:~/0in91/bcm2835 $ ls
bin  Fonts  Makefile  obj  oled_0in91
```

      bin：./o files

      Fonts: Include five fonts files

      Obj: project files are saved here, include main.c, OLED_Driver.c,

OLED_Config.c, OLED_GUI.c and their header files.

mian.c: main function

OLED_Config.c: Hardware configuration, define pins and communication type

OLED_Driver.c: Hardware (OLED) driver.

OLED_GUI.c: Application functions, included functions that draw point, line, rectangle, display string, pictures and so on.

Show_Pic.h: Pictures data which are used to display. You should convert your pictures to data. (description in net chapter)

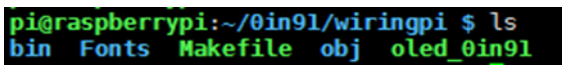
oled_0in91: executable files, generated by command **make**

To run this code, you can execute the command: **sudo ./oled_0in91**

b) WiringPi

(1) Install WiringPi libraries

(2) use **ls** command to list the files:



The folders included are similar to BCM2835’ s. The only differences are that:

- WiringPi oprates by read/write the device files of Linux OS. and the bcm2835 is library function of Raspberry Pi’ s CPU, it operates registers directly. Thus, if you have used bcm2835 libraries firstly, the usage of WiringPi code will be failed. In this case, you just need to reboot the system and try again.

- Due to the first difference, they underlying configuration are different. In DEV_Config.c, use wiringpiPi and the corresponding wiringPiSPI to provide

underlay interfaces.

To run the code, use the command: **sudo ./oled_0in91**

c) Python

(1) use **ls** command to list the files:

```
pi@raspberrypi:~/0in91/python $ ls
Adafruit_Python_SSD1306  stats.py
```

(2) Here we used Adafruit libraries

before run code, you need to install llibraries as below:

sudo apt-get update

sudo apt-get install build-essential python-dev python-pip

sudo pip install RPi.GPIO

sudo apt-get install python-imaging python-smbus

(3) Enter directory of python code, execute commands:

sudo python Adafruit_Python_SSD1306/setup.py install

sudo python stats.py

d) Auto-run

To make the code run automatically after booting, you can configure

/etc/rc.local file:

sudo vim /etc/rc.local

Add a statement in front of exit 0:

sudo python /home/pi/0in91/python/stats.py &

Note that if you put the code to different directory, you need to change the

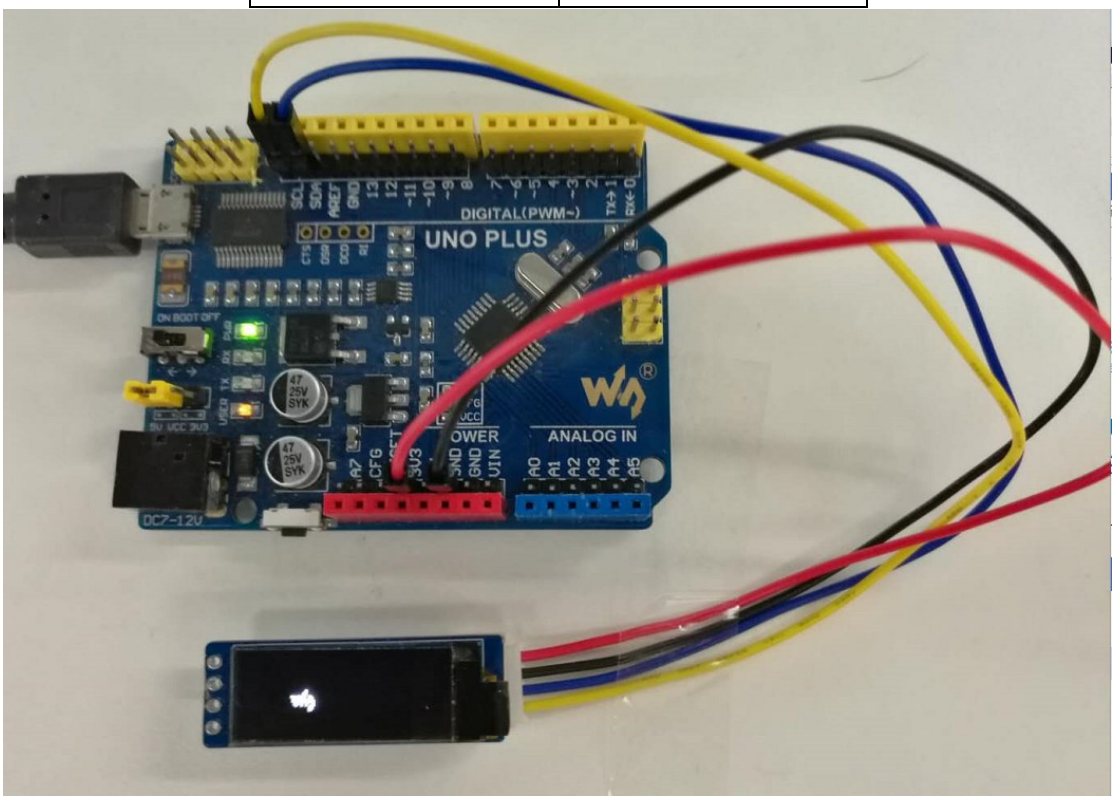
path: **/home/pi/** to the correct one. & is necessary at the end, otherwise, you may cannot login to Raspberry Pi and need to re-burn image)

ARDUINO CODE

1. Hardware Connection

   Development board: UNO PLUS

PIN	UNO PLUS
VCC	3V3/5V
GND	GND
SDA	SDA
SCL	SCL



2. Files Description:

   ../oled:

oled.ino: Project file of Arduino, double click to open

Project directory:

Adafruit_SSD1306.cpp: Bottom interfaces of OLED, includes OLED initialize, basic display and configuration functions.

Adafruit_GFX.cpp： Application functions of OLED

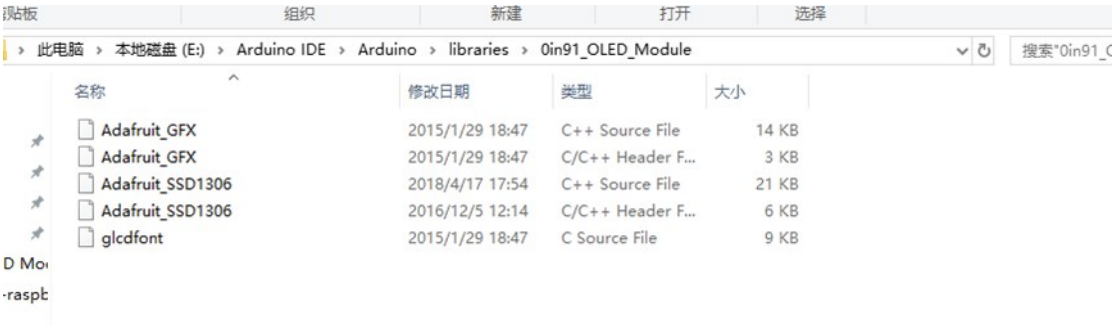
Adafruit_SSD1306.h、Adafruit_GFX.h: Header files

glcdfont.h：LCD font, provide English fonts which size 6*8 and 8*16

3. Running

Before running the code, you should copy the libraries files of this project to the **libraries** directory of IDE, which is under the installation directory of Arduino IDE.

Note that you cannot put files directly to the libraries directory, you need to save them on a folder, for example 0in91_OLED_Module as below:



Then, open olde.ino then download the code

IMAGE DATA

Use software Image2Lcd to open picture (Monochrome picture) and configure:

输出数据类型（Data types）：C 语言数据(*.c)

扫描方式(Scanning way)：数据水平（data horizonal），字节垂直（byte vertical)

输出灰度(gray scale)：单色（monochrome)

最大宽度和高度(height and width)：128 32 （Resolution of OLED）

And then check the option that color invert.