Banggood ST7789 LCD Display Module Instructions

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Contents

Instruction

This is a general LCD display Module, IPS screen, 2inch diagonal, 240×320 resolution, with embedded controller, communicating via SPI interface

Feature

SPI interface, requires minimum GPIO for controlling Comes with development resources and manual

Specifications

- Driver: ST7789
- Interface: SPI
- Display color: RGB, 262K color
- Resolution: 240×320
- Backlight: LED
- Operating voltage: 3.3V

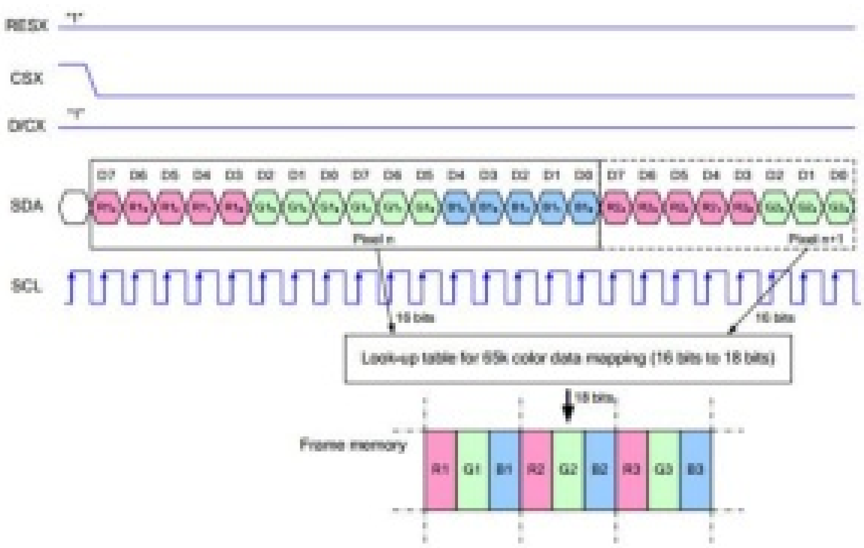
Interface

SYMBOL	Description
VCC	Power (33V input)
GND	Ground
DIN	SPI data input
CLK	SPI clock input
CS	Chip selection, low active
DC	Data/Command selection (high for data, low for command)
RST	Reset low active
BL	Backlight

Hardware description

ST7789V supports RGB444, RGB565 and RGB666 three formats. This LCD uses RGB565. For most of the LCD controller, there are several interfaces for choosing, this module we use SPI interface which is fast and simple.

Communication protocol



Note: It is not like the tradition SPI protocol, it only uses MOSI to send data from master to slave for LCD display. For details please refer to Datasheet Page 105.

RESX: Reset, should be pull-down when power on, set to 1 other time. CSX: Slave chip select. The chip is enabled only CS is set Low

D/CX: Data/Command selection; DC=0, write command; DC=1, write data
SDA: Data transmitted. (RGB data)

SCL: SPI clock

The SPI communication protocol of the data transmission uses control bits: clock phase (CPHA) and clock polarity (CPOL):

CPOL defines the level while the synchronization clock is idle. If CPOL=0, then it is LOW. CPHA defines at whish clock's tick the data transmission starts. CPHL=0 – at the first one, otherwise at the second one

This combination of two bits provides 4 modes of SPI data transmission. The commonly used is SPI0 mode, i.e. GPHL=0 and CPOL=0.

According to the figure above, data transmitting begins at the first falling edge, 8bit data are transmitted at one clock cycle. It is SPI0. MSB

Raspberry Pi examples

For Raspberry Pi we provide examples based on C and python

Enable SPI

Open terminal and run commands to enable SPI interface

```
sudo raspi-config
```

Choose Interfacing options-> SPI-> Yes
Then reboot Raspberry Pi

Libraries Installation

https://www.waveshare.com/wiki/File:2inch_LCD_Module_manual_1.png

BCM2835

```
wget http://www.airspayce.com/mikem/bcm2835/bcm2835-1.60.tar.gz
tar zxvf bcm2835-1.60.tar.gz
cd bcm2835-1.60/
sudo ./configure
sudo make
sudo make check
sudo make install
```

WiringPi

```
sudo apt-get install wiringpi
cd /tmp
wget https://project-downloads.drogon.net/wiringpi-latest.deb
sudo dpkg -i wiringpi-latest.deb
gpio -v
```

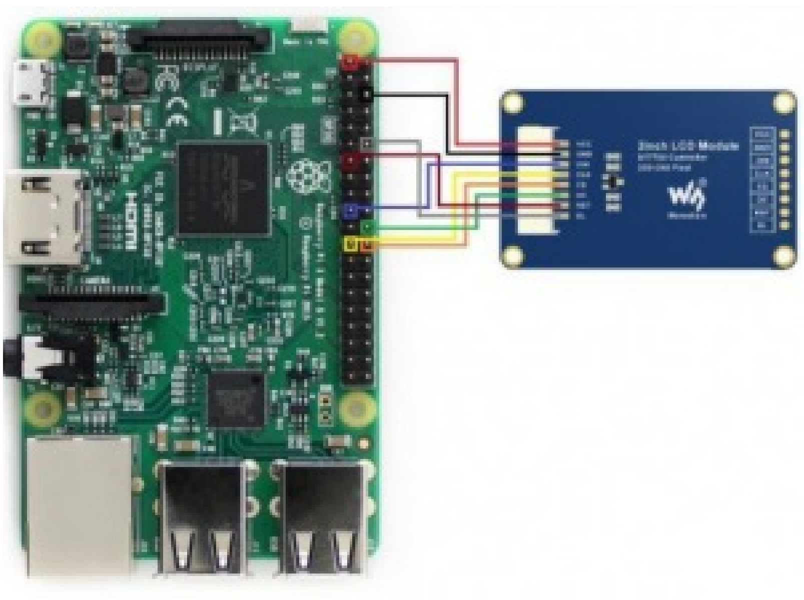
Python2

```
sudo apt-get update
sudo apt-get install python-pip
sudo pip install RPi.GPIO
sudo pip install spidev
sudo apt-get install python-imaging
```

Python3

```
sudo apt-get update
sudo apt-get install python3-pip
sudo pip3 install RPi.GPIO
sudo pip3 install spidev
sudo apt-get install python3-imaging
```

Hardware connection



Please notice, that wires colors may vary. Use pins designations for

Wiring

2inch LCD	Board number	BCM number
VCC	3.3V	3.3V
GND	GND	GND
DIN	19	MOSI
CLK	23	SCLK
CS	24	CE0
DC	22	P25
RST	13	P27
BL	12	P18

Download examples

Open terminal and download examples

```
sudo apt-get install p7zip-full
wget http://www.waveshare.net/w/upload/1/19/2inch_LCD_Module_code.7z
7z x 2inch_LCD_Module_code.7z -r -o./2inch_LCD_Module_code
```

```
sudo chmod 777 -R 2inch_LCD_Module_code
cd 2inch_LCD_Module_code/RaspberryPi&JetsonNano/
```

[Test Example]

C codes

```
cd c
sudo make clear
sudo make
sudo ./main
```

Python codes

```
cd python/examples
sudo python main.py
```

Expected result

1. The display is cleaned to white
2. Display numbers and strings

3. Draw a rectangle
4. Draw a line
5. Draw five circles
6. Display a 100×100 image
7. display a 240×320 image

STM32 examples

- Download the demo codes from Waveshare wiki, the path of STM32 codes is ~/STM32/
- Open the project from \XNUCLEO-F103RB\MDK ARM\ with Keil software. Note that the codes are based on HAL libraries.
- The development board we use is WaveshareXNUCLEO-F103RB

Hardware connection

2inch LCD	XNUCLEO-F103RB
VCC	5V
GND	GND
DIN	PA7
CLK	PAS
CS	PB6
DC	PA8
RST	PA9
BL	PC7

Expected result

1. The display is cleaned to white
2. Display numbers and strings
3. Draw a rectangle
4. Draw a line
5. Draw five circles
6. Display a 70×70 image

Arduino

- Download examples from wiki. Unzip it. The path of Arduino examples is ~/Arduino UNO/…
- Copy the folders in Arduino directory to Installation directory /libraries/ (Generally the installation directory is C:\Program Files (x86)\Arduino\libraries)
- Open Arduino IDE software, and click File -> Examples to check if LCD_2inch codes are there.
- The development board used is Arduino UNO.

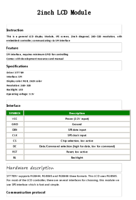
Hardware connection

2inch LCD	UNO PLUS
VCC	5V
GND	GND
DIN	D11
CLK	D12
CS	D10
DC	D7
RST	D8
BL	D9

Expected result

1. The display is cleaned to white
2. Display numbers and strings
3. Draw a rectangle
4. Draw a line
5. Draw five circles
6. Display a 70×70 image

Documents / Resources

 2inch LCD Module	**Banggood ST7789 LCD Display Module** [pdf] Instructions ST7789, LCD Display Module

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