2.8inch Capacitive Touch LCD

Waveshare Wiki – technical documentation and setup guide

Product overview
2.8-inch TFT LCD module with capacitive touch panel. Display communication uses SPI; touch communication uses I²C. The module supports 240 × 320 pixels and includes example projects for Raspberry Pi, Raspberry Pi Pico, ESP32-S3 and Arduino.

Parameter	Specification
Supply / logic voltage	3.3 V / 5 V (supply and logic voltage must be compatible)
Display type	TFT
Display interface	4-wire SPI
Touch interface	I²C
Display controller	ST7789 / ST7789T3 (see product revision)
Touch controller	CST328
Resolution	240 (H) × 320 (V) pixels
Active display area	43.20 × 57.60 mm
Pixel pitch	0.180 × 0.180 mm
Module dimensions	50.54 × 73.06 mm
Touch capability	Capacitive, up to 5-point touch (product page specification)

Important electrical note

Make sure the host board’s power supply and logic levels are compatible with the LCD module. Incorrect voltage levels may prevent operation or damage the module.

1. Interface description

13-pin connector

LCD pin	Function	Description
VCC	Power	3.3 V / 5 V input
GND	Ground	Ground reference
MISO	SPI input	Not available on this module
MOSI	SPI output	SPI data to display
SCLK	SPI clock	SPI clock input
LCD_CS	Chip select	Display chip selection
LCD_DC	Data / command	Low = command; High = data
LCD_RST	Reset	Active low
LCD_BL	Backlight	Backlight control; PWM can be used for brightness control
TP_SDA	Touch data	I²C data
TP_SCL	Touch clock	I²C clock
TP_INT	Touch interrupt	Interrupt output when touch is detected
TP_RST	Touch reset	Active low

18-pin FPC connector

Pin no.	Signal	Pin no.	Signal
1	VCC	10	NC
2	LCD_BL	11	NC
3	GND	12	TP_RST
4	SCLK	13	TP_SCL
5	MOSI	14	TP_SDA
6	MISO (not available)	15	TP_INT
7	LCD_DC	16	NC
8	LCD_RST	17	NC
9	LCD_CS	18	NC

NC = not connected. The MISO signal is not available even though it appears in the connector pin description.

2. Raspberry Pi

The Wiki examples are based on Raspberry Pi 4. Use the 13-pin connector wiring below.

LCD pin	Raspberry Pi (BCM)
VCC	3.3 V
GND	GND
MISO	NC
MOSI	10
SCLK	11
LCD_CS	8
LCD_DC	25
LCD_RST	27
LCD_BL	18
TP_SDA	2
TP_SCL	3
TP_INT	4
TP_RST	17

Enable SPI and I²C

Run the Raspberry Pi configuration utility and enable both interfaces under Interfacing Options.

```
sudo raspi-config
# Enable: Interfacing Options -> SPI -> Yes
# Enable: Interfacing Options -> I2C -> Yes
sudo reboot

# Check SPI device nodes
ls /dev/spi*
```

The Wiki recommends checking that /dev/spidev0.0 and /dev/spidev0.1 are present and that SPI is not occupied by another driver. The boot configuration should contain dtparam=i2c_arm=on and dtparam=spi=on.

Python environment

```
sudo apt-get update
sudo apt-get install python3-pip python3-pil python3-numpy
sudo pip3 install spidev
sudo pip3 install Pillow
```

Download and run the demo

```
cd
wget https://files.waveshare.com/wiki/2.8inch-Capacitive-Touch-LCD/2.8inch_Capacitive_Touch_LCD_RaspberryPi.zip
sudo apt-get install unzip
unzip 2.8inch_Capacitive_Touch_LCD_RaspberryPi.zip -d ./2.8inch_Capacitive_Touch_LCD
cd 2.8inch_Capacitive_Touch_LCD/Python
sudo python 2inch8_LCD_test.py
```

C environment

```
git clone https://github.com/WiringPi/WiringPi
cd WiringPi
./build
gpio -v

# In the downloaded demo directory:
cd 2.8inch_Capacitive_Touch_LCD/C
sudo make clean
sudo make -j
sudo ./main
```

3. Raspberry Pi Pico

13-pin connector wiring

LCD pin	Raspberry Pi Pico
VCC	3.3 V
GND	GND
MISO	NC
MOSI	11
SCLK	10
LCD_CS	9
LCD_DC	14
LCD_RST	13
LCD_BL	15
TP_SDA	6
TP_SCL	7
TP_INT	17
TP_RST	16

MicroPython preparation

Install Thonny. Put the Pico into BOOTSEL mode while powering it, then copy the appropriate MicroPython UF2 firmware to the drive that appears. In Thonny, select **MicroPython (Raspberry Pi Pico)** as the interpreter and use Auto-detect for the port. A MicroPython prompt in the Shell confirms the connection.

Demo

Download and extract the sample package. In Thonny, open the RaspberryPi_Pico/Python folder and upload **LCD_2inch8_Touch.py** to the Pico. Open the uploaded file and run it. To launch the demo automatically after power-up, rename the file to **main.py**.

4. ESP32-S3

The Wiki notes that its examples use ESP32 board package / firmware version 2.0.11. Higher versions may be incompatible and may fail to display correctly.

LCD pin	ESP32-S3
VCC	3.3 V
GND	GND
MISO	NC
MOSI	45
SCLK	40
LCD_CS	42
LCD_DC	41
LCD_RST	39
LCD_BL	5
TP_SDA	1
TP_SCL	3
TP_INT	4

LCD pin	ESP32-S3
TP_RST	2

Arduino IDE setup

Install Arduino IDE. Open Boards Manager, search for **esp32**, and install the Espressif Systems package. Restart the IDE after installation. The Wiki specifically warns that the example may require version 2.0.11.

Libraries and demo

Open the supplied LVGL_Arduino.ino example from the ESP32S3/LVGL_Arduino folder. Install the LVGL library if it is not already installed. The Wiki instructs users to copy the libraries supplied with the demo into the Arduino libraries directory, replacing or backing up any conflicting previous installation first. Select the correct board and COM port, then compile and upload the example.

5. Arduino

13-pin connector wiring

LCD pin	Arduino
VCC	5 V
GND	GND
MISO	NC
MOSI	11
SCLK	13
LCD_CS	10
LCD_DC	7
LCD_RST	8
LCD_BL	9
TP_SDA	SDA
TP_SCL	SCL
TP_INT	3
TP_RST	4

Demo

Download and extract the sample demo. Open the **Arduino/LCD_2inch8_Touch/LCD_2inch8_Touch.ino** sketch in Arduino IDE. Select the target board and port, then compile and upload the example.

6. Resources and troubleshooting

The Waveshare Wiki lists the following resources for the module:

- Schematic
- ST7789T3 display controller datasheet
- 2.8inch Capacitive Touch LCD 3D drawing
- 2.8inch Capacitive Touch LCD 2D drawing
- Sample demo packages for supported platforms

FAQ: demo reports communication failure

Check that the GPIO logic levels of the host board are consistent with the LCD module's supply voltage. Also verify the wiring, SPI and I²C enablement, and that the SPI bus is not being used by another driver.

Source and reference

Original documentation: Waveshare Wiki – 2.8inch Capacitive Touch LCD
Product page: Waveshare – 2.8inch Capacitive Touch LCD

This PDF is a reformatted English-language reference based on the available Wiki content. Check the original Wiki and the demo package for revision-specific updates before hardware integration.