LILYGO ESP32 T-Display Module

Specifications

Hardware Specifications	
Chipset	ESPRESSIF-ESP32 240MHz Xtensa® single-/dual-core 32-bit LX6 microprocessor
FLASH	QSPI flash 4MB /16MB
SRAM	520 kB SRAM
Button	Reset
Modular interface	UARTSPISDIOI2CLED PWMTV PWMI2SIRGPIOADCcapacitor touch sensorDACLNA pre-amplifier
Display	IPS ST7789V 1.14 Inch **Resolution: 135 x 240**
Working voltage	2.7V-4.2V
Working current	About 67MA
Sleep current	About 350uA
Working temperature range	-40 ~ +85
Size&Weight	51.52*25.04*8.54mm(7.81g)
Power Supply Specifications	
Power Supply	USB 5V/1A
Charging current	500mA
Battery	3.7V lithium battery
JST Connector	2Pin 1.25mm
USB	Type-C
Wi-Fi	
Standard	FCC/CE-RED/IC/TELEC/KCC/SRRC/NCCesp32 chip
Protocol	802.11 b/g/n(802.11nspeed up to150Mbps)A-MPDU and A-MSDU polymerizationsupport 0.4S Protection interval
Frequency range	2.4GHz~2.5GHz(2400M~2483.5M)

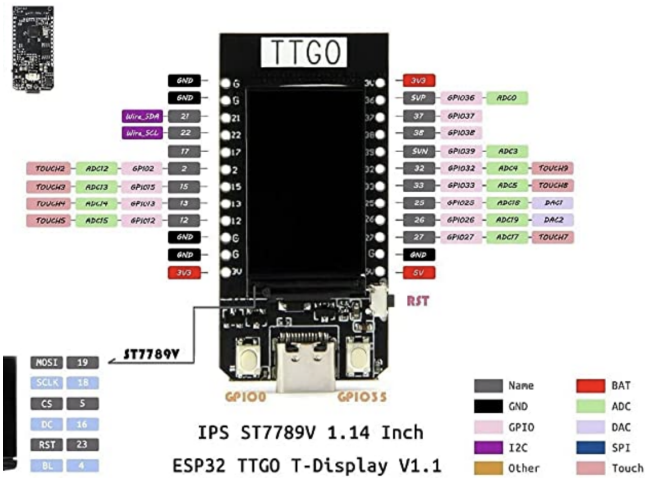
Transmit Power	22dBm
Communication distance	300m
Bluetooth	
Protocol	Meet bluetooth v4.2BR/EDR and BLE standard
Radio frequency	With -97dBm sensitivity NZIF receiver Class-1,Class-2&Class-3 emitter AFH
Audio frequency	CVSD&SBC audio frequency
Software specification	
Wi-Fi Mode	Station/SoftAP/SoftAP+Station/P2P
Security mechanism	WPA/WPA2/WPA2-Enterprise/WPS
Encryption Type	AES/RSA/ECC/SHA
Firmware upgrade	UART download/OTAThrough network/host to download and write firmware
Software Development	Support cloud server development /SDK for user firmware development
Networking protocol	IPv4IPv6SSLTCP/UDP/HTTP/FTP/MQTT
User Configuration	AT + Instruction set, cloud server, android/iOSapp
OS	FreeRTOS

Github Link

https://github.com/Xinyuan-LilyGO/TTGO-T-Display

```
git clone https://github.com/Xinyuan-LilyGO/TTGO-T-Display.git
cd TTGO-T-Display
cp -R TFT_eSPI ~/Documents/Arduino/libraries/.
```

Pinout



Schematic

ESP32-TFT(6-26).pdf

Install the Serial Driver

https://www.wch.cn/downloads/CH34XSER_MAC_ZIP.html

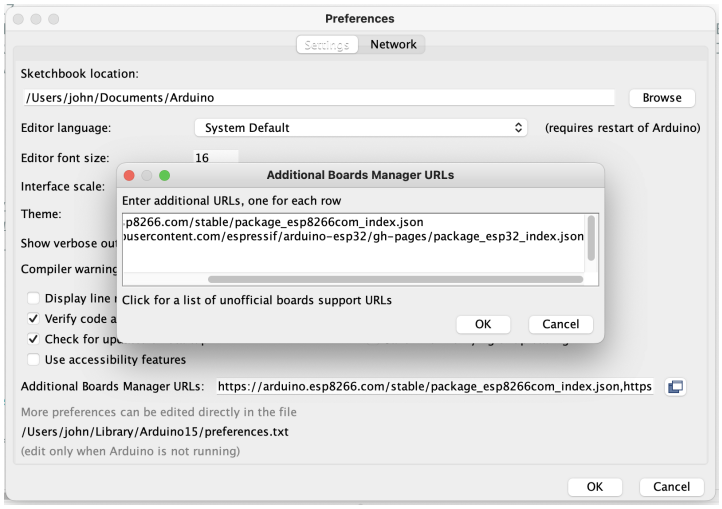
See instructions in PDF

Arduino

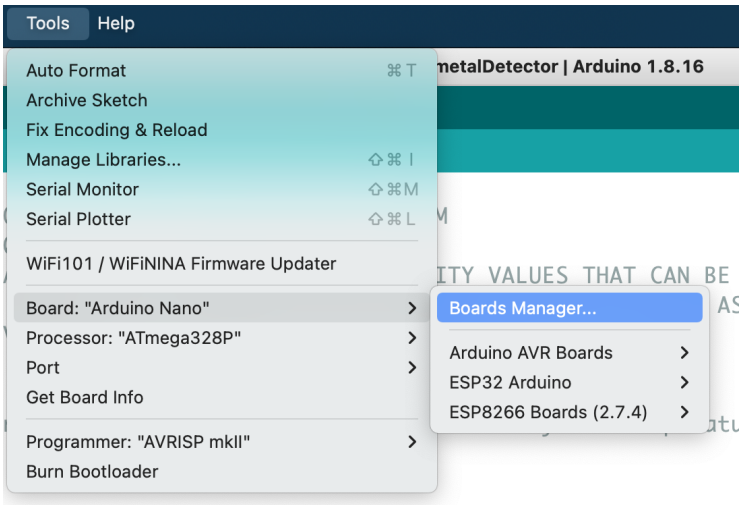
Install Board Manager

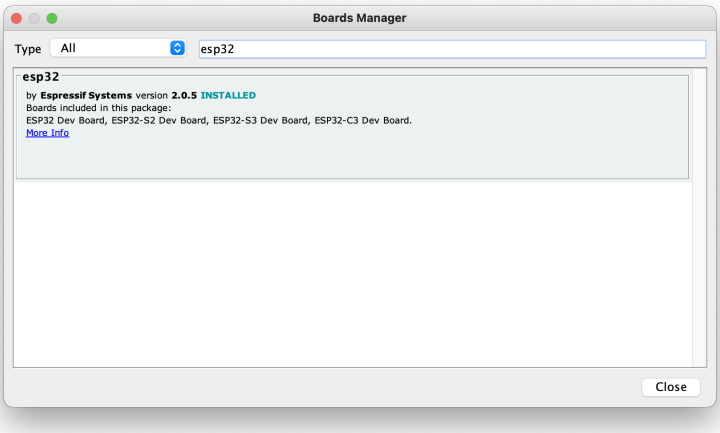
Install the board manager for ESP32. Click Arduino preferences and add the url for the ESP32 board manager.

ESP32 Board Manager URL: https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json



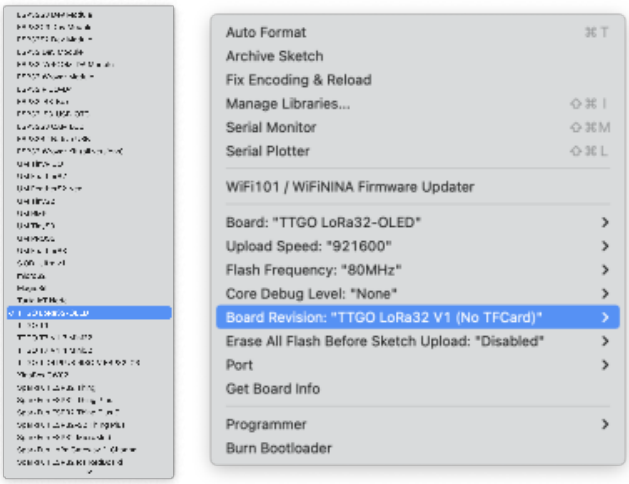
Install the ESP32 board by selecting Tools Board Manager and inputing esp32. Install the latest version.





Select Board

Select the TTGO Lora32-OLED board

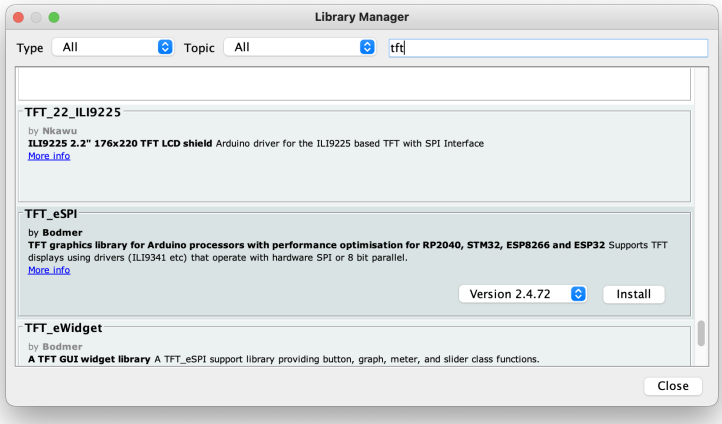


Optional, select the development board **ESP32 Dev Module**, **select Disable in the PSRAM option**, **select 4-16MB in the Flash Size option**, Other keep the default

Note, the port should start with **cu.wchubserial**.

Install the TFT_eSPI Library

From the Library Manager, search for the TFT_eSPI library by Bodmer and click Install.



After installing the library, browse to it's location and modify the **User_Setup_Select.h** file located in ~/Documents/Arduino/libraries/.

Comment out the line:

```
//#include <User_Setup.h>
```

Uncomment the line:

```
#include <User_Setups/Setup25_TTGO_T_Display.h>    // Setup file for ESP32 and TTGO T-Display ST7789V SPI bus TFT
```

Color Picker Example

Project	https://www.youtube.com/watch?v=0P5OyN8uz-o
Code	https://github.com/VolosR/ColorPickerTTGO/blob/main/colorPicker.ino
Display	

```
#include <TFT_eSPI.h>
#include "orbitron20.h"
TFT_eSPI    tft = TFT_eSPI();         // Create object "tft"
TFT_eSprite img = TFT_eSprite(&tft);

#define gray 0x94B2

const int pwmFreq = 5000;
const int pwmResolution = 8;
const int pwmLedChannelTFT = 0;
int brightnes=80;

uint16_t color2=TFT_WHITE;
uint16_t color1=TFT_BLACK;

void setup() {
  pinMode(35,INPUT_PULLUP);
  pinMode(12,INPUT_PULLUP);
  pinMode(27,INPUT_PULLUP);
  pinMode(26,INPUT_PULLUP);
  pinMode(0,INPUT_PULLUP);
  tft.init();
  tft.fillScreen(TFT_WHITE);
  tft.setRotation(1);
  img.setFreeFont(&Orbitron_Medium_18);
  img.setTextColor(color1,color2);
  img.createSprite(240, 135);
  ledcSetup(pwmLedChannelTFT, pwmFreq, pwmResolution);
  ledcAttachPin(TFT_BL, pwmLedChannelTFT);
  ledcWrite(pwmLedChannelTFT, brightnes);

}

void loop() {
drawS();
}

void drawS()
{
img.setTextColor(color1,color2);
img.fillSprite(color2);
int r=map(analogRead(2),4095,0,0,255);
int g=map(analogRead(15),4095,0,0,255);
```

```
int b=map(analogRead(13),4095,0,0,255);

img.drawRect(4,24,132,20,gray);
img.drawRect(4,68,132,20,gray);
img.drawRect(4,112,132,20,gray);

img.drawString("RED: "+String(r),6,0);
img.fillRect(6,26,r/2,16,TFT_RED);
img.drawString("GREEN: "+String(g),6,44);
img.fillRect(6,70,g/2,16,TFT_GREEN);
img.drawString("BLUE: "+String(b),6,88);
img.fillRect(6,114,b/2,16,TFT_BLUE);

if(digitalRead(26)==0)
{
brightnes=map(analogRead(13),4095,0,0,255);
ledcWrite(pwmLedChannelTFT, brightnes);
}





 uint16_t chosen=tft.color565(r, g, b);
 img.drawString("COLOR",148,0);
 img.drawString("0x"+String(chosen,HEX),148,90,4);
 img.drawString("BRIGHT: "+String(brightnes),148,118,2);
 img.fillRect(148,24,80,62,chosen);
 img.drawRect(146,22,84,66,gray);

 if(digitalRead(12)==0)
color1=chosen;

 if(digitalRead(27)==0)
color2=chosen;

 if(digitalRead(0)==0)
{ color1=TFT_BLACK; color2=TFT_WHITE;}

 if(digitalRead(35)==0)
{
img.fillScreen(color2);
img.drawString("text:0x"+String(color1,HEX),6,10,4);
img.drawString("back:0x"+String(color2,HEX),6,30,4);
img.drawString("select:0x:"+String(chosen,HEX),6,50,4);
}

img.pushSprite(0,0);
}
```

Loading an Image

Find an image no bigger than the screen resolution (**135 x 240**).

Try: https://iconarchive.com/

Convert to .c with the following converter:

http://www.rinkydinkelectronics.com/t_imageconverter565.php

Rename output file to .h

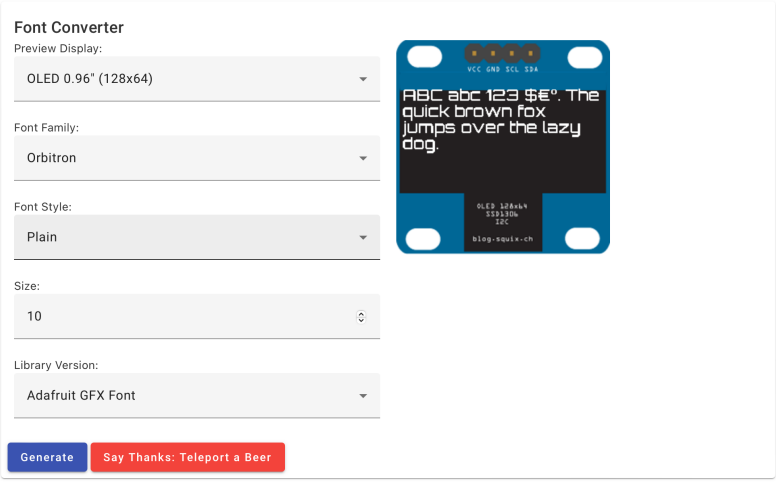
```
#include <TFT_eSPI.h>
#include "bmp.h"

...

void initScreen(){

  tft.init();
  tft.setRotation(1);
  tft.fillScreen(TFT_BLACK);
  tft.setTextSize(2);
  tft.setTextColor(TFT_GREEN);
  tft.setCursor(0, 0);
  tft.setTextDatum(MC_DATUM);
  tft.setTextSize(1);

  tft.setSwapBytes(true);
  tft.pushImage(0, 0,  240, 135, ttgo);
  espDelay(5000);
}
```

Using Fonts

```
#include "orbitron10.h"
#include <TFT_eSPI.h>
#include "bmp.h"

...

void initScreen(){

  tft.init();
  tft.setRotation(1);
  tft.setTextColor(TFT_GREEN);
  tft.setCursor(0, 0);
  tft.setFreeFont(&Orbitron_Medium_10);

  tft.fillScreen(TFT_BLACK);
  tft.setTextDatum(MC_DATUM);
  tft.drawString("CHARGING",  tft.width() / 2, tft.height() / 2 );
}
```

Generating a Font File

Navigate to https://oleddisplay.squix.ch



Download or copy generated output to include file.

ie.

`orbitron10.h`

References

Reference	URL
LilyGo Product Page	http://www.lilygo.cn/claprod_view.aspx?TypeId=62&Id=1126&FId=t28:62:28
Datasheet	https://github.com/Xinyuan-LilyGO/T-Display-S3/blob/main/doc/esp32-s3_datasheet_en.pdf
Reference Manual	https://github.com/Xinyuan-LilyGO/T-Display-S3/blob/main/doc/esp32-s3_technical_reference_manual_en.pdf
New sketches for TTGO T-Display (FREE)	https://www.youtube.com/watch?v=Th4IdigA6xE
*** Internet Weather Station and Clock Project	https://www.youtube.com/watch?v=slYZz61u8RY
Volos Projects	https://github.com/VolosR
How to Install and Setup TTGO T-Display (Getting Started tutorial)	https://www.youtube.com/watch?v=b8254--ibmM
Transparent Sprites - Programming Tutorial (TFT_eSPI library)	https://www.youtube.com/watch?v=U4jOFLFNZBI