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

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

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More Info				

Select Board

Select the TTGO Lora32-OLED board

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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

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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.

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TFT_22_ILI922	5			
by Nkawu				
ILI9225 2.2" 176: More info	<220 TFT LCD shield Arduino drive	r for the ILI9225 based	. TFT with SPI Interface	
TET aSPI				
by Bodmer				
TFT graphics libra	ry for Arduino processors with	performance optimisa	ation for RP2040, STM32, ESP8266 and ESP32 Supports TF	т
displays using drive More info	rs (ILI9341 etc) that operate with I	nardware SPI or 8 bit pa	arallel.	
			Version 2.4.72 😴 Install	
TFT_eWidget				
TFT_eWidget				
TFT_eWidget by Bodmer A TFT GUI widget	library A TFT_eSPI support library	providing button, graph	h, meter, and slider class functions.	

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



```
#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

Font Converter Preview Display: OLED 0.96" (128x64)	•	
Font Family: Orbitron	•	Hill and 123 \$26°. The quick brown fox jumps over the lazy dog.
Font Style: Plain	Ŧ	eLES 13844 51316 1312 140 140 140 140 140 140 140 140
Size:		
10	٢	
Library Version:		
Adafruit GFX Font	*	
Generate Say Thanks: Teleport a Beer		

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=sIYZz61u8RY
Volos Projects	https://github.com/VolosR
How to Install and Setup TTGO T-Display (Getting Started tutorial)	https://www.youtube.com/watch?v=b8254ibmM
Transparent Sprites - Programming Tutorial (TFT_eSPI library)	https://www.youtube.com/watch?v=U4jOFLFNZBI