

5-inch TFT ESP32-S3 Display Module Product Specification



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Contents

1. Overview	3
1.1. Product Introduction	3
1.2. Image Display	3
1.3. Accessory List	4
2. Product Features	5
2.1. Feature Description	5
3. Product Parameters	5
3.1. ESP32-S3 Parameters	5
3.2. LCD Screen Parameters	6
3.3. Dimension Parameters	6
3.4. Electrical Parameters	7
3.5. Other Parameters	7
4. Product Interfaces	8
4.1. Interface Function Description	8
4.2. ESP32-S3 Pin Assignment	9
5. Product Dimension Drawing	11
5.1. Product Dimension Drawing	11
6. Precautions	13
6.1. Safe Product Usage	13
6.2. Frequently Asked Questions (FAQ)	13

1. Overview

1.1. Product Introduction

ES3R50T is a 5-inch TFT display module with a built-in ESP32-S3 main controller and a resistive touch screen. It adopts display driver IC with a resolution of 800*480, and can connect to a variety of peripherals such as I2C interface devices, MicroSD cards, UART, and extended IO devices. It also has a built-in touch function, which greatly facilitates users to perform various DIY projects and meets the needs of IoT and human-computer interaction function development.

1.2. Image Display

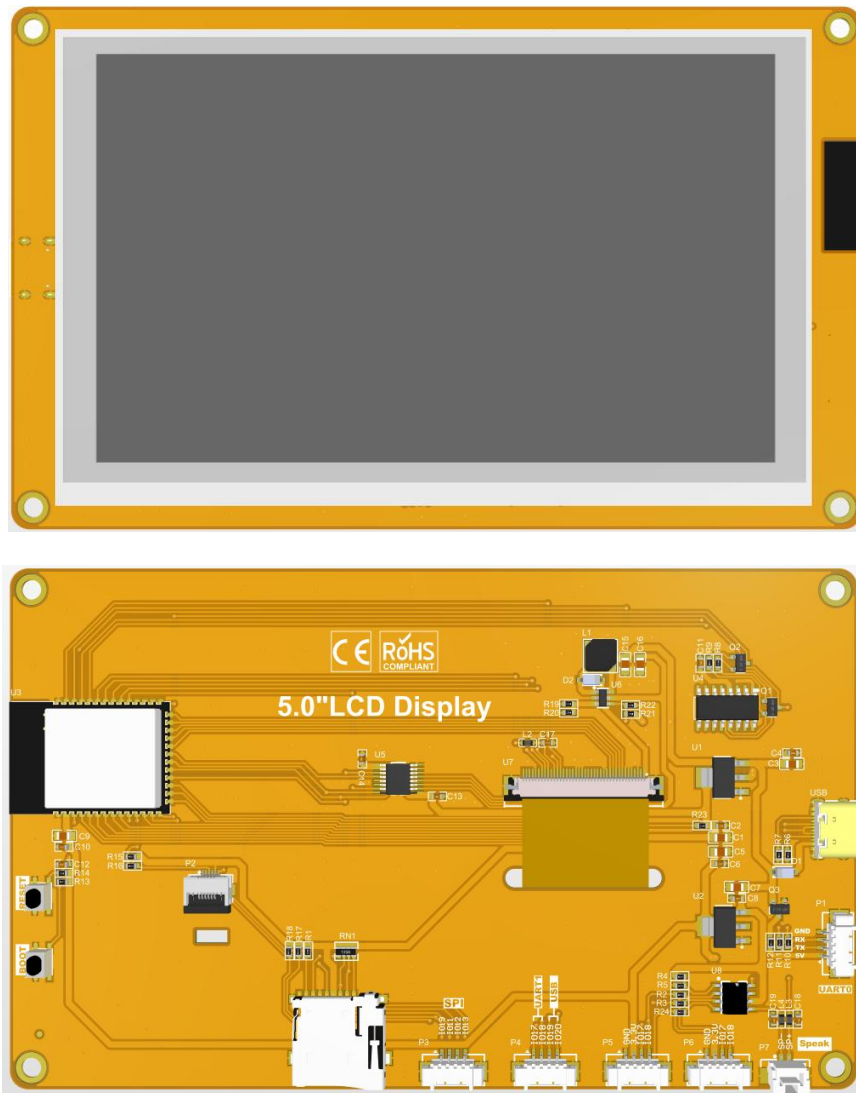


Figure 1.1 Product Diagram

1.3. Accessory List

Equipped with one 4P 1.25mm to 2.54mm terminal wire and one Type-C data power cable. The terminal wire is about 20cm in length, and the Type-C cable is about 1m in length.



Figure 1.2 4P 1.25mm to 2.54mm Terminal Wire



Figure 1.3 Type-C Data Power Cable

2. Product Features

2.1. Feature Description

- Built-in ESP32-S3 main control chip with sufficient development resources and easy development
- 5-inch color screen with 800*480 resolution, supporting RGB565 for rich display colors
- Rich interfaces for connecting various peripherals (SPI, UART, extended IO, etc.)
- Built-in resistive touch screen for convenient human-computer interaction
- Standard TYPE-C interface for easy program downloading and power supply
- Built-in micro TF card slot for convenient storage expansion
- Provides abundant demo programs for easy learning
- Offers underlying driver technical support and online updates of WIKI materials
- The module undergoes multiple aging tests to meet military-grade standards, supporting long-term stable operation

3. Product Parameters

3.1. ESP32S3 Parameters

Item	Parameter	Unit
Main Control Chip	ESP32-S3	-
CPU	Xtensa LX7 32-bit dual-core processor	-
Maximum Frequency	240MHz (MAX)	-
Storage	384 KB ROM + 512KB SRAM + 16 KB RTC SRAM + 8M Built-in OPI PSRAM + 16M External QSPI Flash	-
WIFI	2.4GHz, 802.11b/g/n mode	-
Bluetooth	Bluetooth V5.0 BR/EDR and Bluetooth LE standards	-
Operating Voltage	3.0~3.6	V

3.2. LCD Screen Parameters

Item	Parameter	Unit
Screen Size	5.0	inch
Screen Type	TN	-
Touch Screen Type	Resistive Touch Screen	-
Screen Resolution	800xRGBx480	pixels
Active Display Area	108.0(W)x64.8(H)	mm
Visible Window Size	109.2±0.15(W)x66.05±0.15(H)	mm
Active Touch Area	120.7±0.15(W)x75.9±0.15(H)	mm
Display Interface	RGB (connected to ESP32-S3)	-
Viewing Angle	ALL O'CLOCK	deg
Number of Colors	65K (RGB565)	-
Backlight Brightness (Typical Value)	450	cd/m ²
Backlight Type	White LED 2 * 6	-
Operating Temperature	-20~60	°C
Storage Temperature	-30~70	°C

3.3. Dimension Parameters

Item	Parameter	Unit
LCD Dimension	120.7 (W) x75.9 (H) x4.2 (D)	mm
Module Dimension	137 (W) x84 (H) x13.75 (D)	mm

3.4. Electrical Parameters

Item	Parameter	Unit
Operating Voltage	5.0	V
Backlight Current	40	mA
Backlight Brightness (Actual Value)	490	cd/m ²
Total Current	250	mA
Power Consumption	1.25	W

3.5. Other Parameters

Item	Parameter	Unit
SKU	ES3R50T	-
Power Supply Interface	TYPE-C	-
Weight (Including Packaging)	198	g

4. Product Interfaces

4.1. Interface Function Description

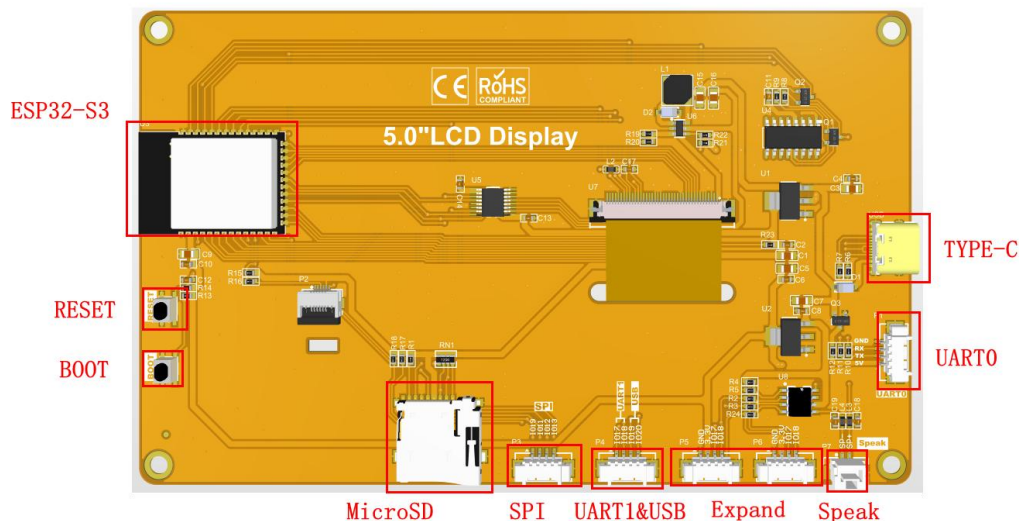


Figure 4.1 Product Interface Diagram

Interface Name	Function Description
ESP32-S3 Chip	The main controller of the display module, working with
MicroSD Card Slot	Insert a Micro SD card to expand storage space for storing large data such as font libraries, pictures, and audio files.
UART	1.25mm 4P socket. Can be used for UART debugging, downloading, and communication. An external USB-to-UART module is required.
BOOT Button	Used to enter download mode or for button testing. Press and hold this button to power on, then release to enter download mode; or after powering on, press and hold this button, then press the RESET button, release the RESET button, and then release this button to enter download mode. When download mode is not needed, this button can be used as a normal button.
TYPE-C Interface	Used for module power supply, program downloading, and debugging. This interface is connected to the internal USB bus of ESP32-S3 and can generate a USB virtual serial port. Note: Only Windows 10 and above systems support the USB virtual serial port function. If using this interface on other versions of systems, you need to solve the problem of the USB virtual serial port not being usable by yourself.
RESET Button	Used for resetting the ESP32-S3 main controller and LCD. Pressing it triggers a low-level reset.
Extended Pins	1.25mm 4P socket. Leads out two free pins: GPIO17 and GPIO18. Can be used to connect other peripherals

UART1 and USB Interface	1.25mm 4P socket. Leads out four free pins: GPIO17, GPIO18, GPIO19, and GPIO20. GPIO17 and GPIO18 can be used for UART1, and GPIO19 and GPIO20 can be used for USB protocol.
SPI Peripheral Interface	1.25mm 4P socket. Used for connecting external SPI communication devices. This SPI interface is shared with the resistive touch screen and SD card. If the touch screen or SD card is not used, it can be used as normal IO.

4.2. ESP32-S3 Pin Assignment

ESP32-S3 Pin Assignment Description			
On-board Device	On-board Device Pin	ESP32-S3 Connected Pin	Description
LCD	LCD_DE	IO40	Data Enable Control Pin
	LCD_VSYNC	IO41	Vertical Sync Signal Pin
	LCD_HSYNC	IO39	Horizontal Sync Signal Pin
	LCD_PCLK	IO42	Pixel Clock Pin
	PIN_R0	IO45	5-bit RED Data Pin
	PIN_R1	IO48	
	PIN_R2	IO47	
	PIN_R3	IO21	
	PIN_R4	IO14	
	PIN_G0	IO5	6-bit GREEN Data Pin
	PIN_G1	IO6	
	PIN_G2	IO7	
	PIN_G3	IO15	
	PIN_G4	IO16	
	PIN_G5	IO4	
	PIN_B0	IO8	5-bit BLUE Data Pin
	PIN_B1	IO3	
	PIN_B2	IO46	

	PIN_B3	IO9	
	PIN_B4	IO1	
RTP	TP_SCK	IO12	Resistive Touch Screen SPI Bus Clock Control Pin
	TP_MISO	IO13	Resistive Touch Screen SPI Bus Data Write Control Pin
	TP_MOSI	IO11	Resistive Touch Screen SPI Bus Data Read Control Pin
	TP_CS	IO38	Resistive Touch Screen SPI Bus Chip Select Control Pin
SD	SD_CS	IO10	SD Card SPI Bus Chip Select Control Pin
	SD_MOSI	IO11	SD Card SPI Bus Data Read Control Pin
	SD_MISO	IO13	SD Card SPI Bus Data Write Control Pin
	SD_SCLK	IO12	SD Card SPI Bus Clock Control Pin
KEY	KEY_BOOT	IO0	Download Mode Selection Button (Press this button to power on, then release to enter download mode)
	KEY_RESET	EN	ESP32-S3 Reset Button, Active Low Reset
UART0	TX0	IO43	ESP32-S3 UART0 Transmit Signal Pin
	RX0	IO44	ESP32-S3 UART0 Receive Signal Pin
AUDIO	I2S_BCLK	IO0	I2S Audio Data Pin
	I2S_SDATA	IO17	I2S Left/Right Clock
	I2S_LRCLK	IO18	I2S Bit Clock

5. Product Dimension Drawing

5.1. Product Dimension Drawing

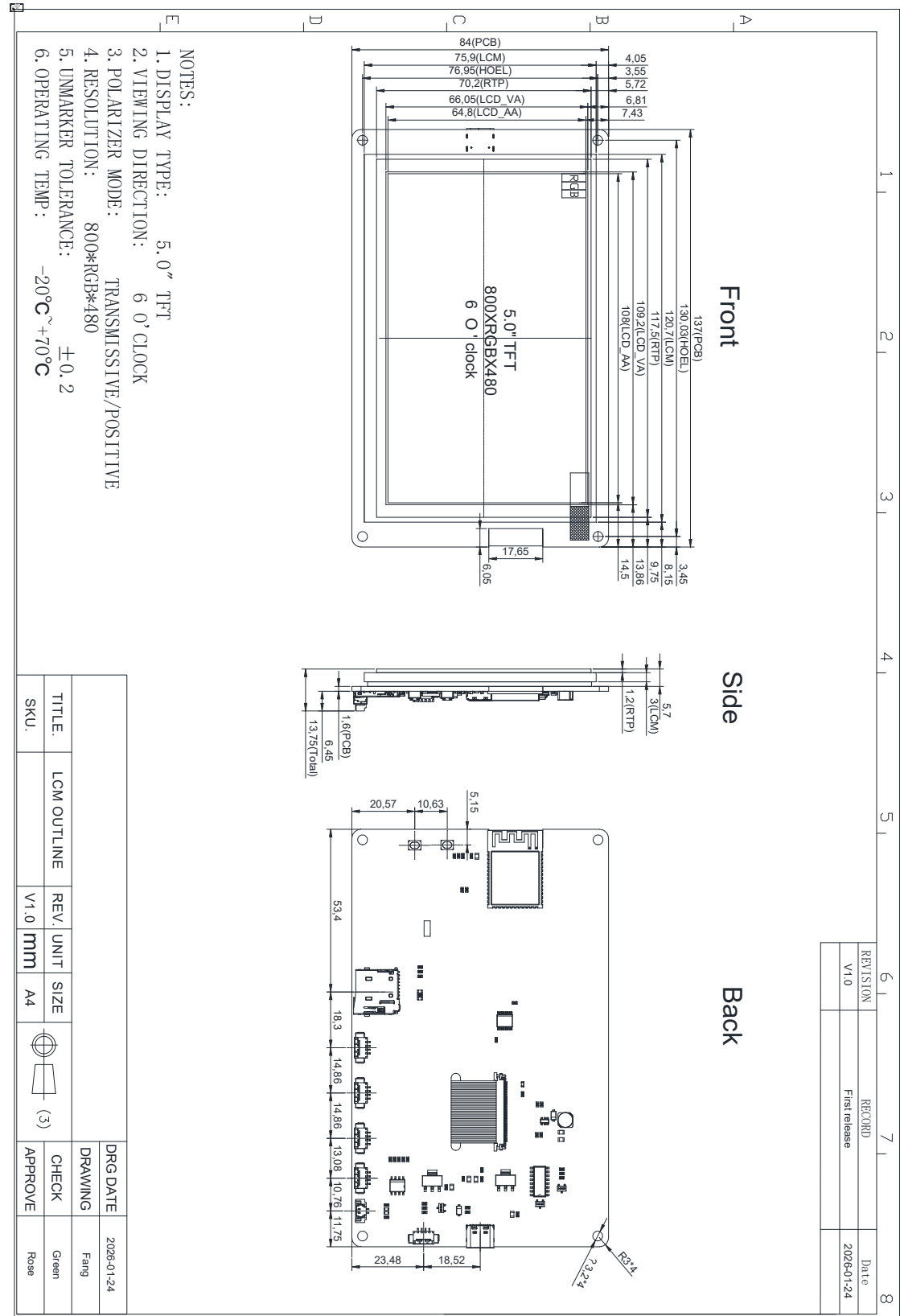


Figure 5.1 Product Dimension Drawing

6. Precautions

6.1. Safe Product Usage

- Do not press or strike the screen violently to avoid damaging it
- Do not scratch the screen with hard objects to avoid scratching
- Do not place heavy objects on the product to avoid crushing the screen
- Keep the product clean and do not drop water or oil on the screen
- Wipe the screen with a clean, soft, and dry cloth; do not spray water or cleaning agents directly on the screen
- Do not disassemble the product at will to avoid damaging the screen or cable
- Do not place the product in a high-temperature or high-humidity environment
- Place the product upwards on a stable surface to avoid falling and breaking
- Use the correct voltage to power the product to avoid damage due to excessive voltage
- When using the product, do not touch components or pins with wet hands to avoid short circuits and damage to the product
- When the product is not in use for a long time, please unplug the power supply

6.2. Frequently Asked Questions (FAQ)

- Q1: After uploading firmware and powering on the module, the backlight turns on but no screen content is displayed

Analysis:

A lit backlight indicates the module receives power normally. Proper screen display requires intact RGB communication signals and all control signals to work correctly. Check whether the uploaded firmware matches the module, including upload configuration parameters such as Flash size, partition table, PSRAM settings, etc.

For first-time use, it is recommended to upload our pre-verified demo sketches without any code modifications to rule out display failure caused by customized code. Confirm that the compilation and upload process completes successfully and the display module runs normally. If the screen still fails to display after repeated troubleshooting above, test related signals with measuring tools including a multimeter, oscilloscope or logic analyzer, and contact our technical support for assistance.

- Q2: The screen displays normally, but the touch function does not respond

Analysis:

This issue may be caused by the following factors:

- The uploaded test firmware does not integrate touch driver functions;
- The GPIOs assigned to touch screen control are missing or incorrectly defined in the firmware;
- Hardware damage, such as a faulty touch controller IC or broken touch screen FPC cable.
- Q3: The screen works normally, yet the backlight brightness flickers or fluctuates unstably

Analysis:

The backlight circuit of this module is driven by a MOSFET. The backlight turns on when a high level is applied to the backlight control pin and turns off under a low level. PWM signals can also be input to this pin to realize brightness adjustment. Fluctuating voltage on the backlight control pin will lead to unstable brightness. In addition, unstable power supply voltage can also trigger this problem.

- Q4: Firmware upload fails

Analysis:

When uploading firmware via USB-to-serial adapter, failures may result from the following reasons:

- CH340 driver is not installed. The CH340 driver package is included in the tool software provided in our resource package for direct installation;
- Abnormal runtime of the uploaded firmware prevents the ESP32-S3 main chip from entering upload mode. Force the chip into download mode by either holding the BOOT button while powering on the module then releasing BOOT, or holding BOOT on a powered module, pressing and releasing the RESET button, then releasing BOOT. Re-upload the firmware afterward;
- Malfunction of the computer serial port, incorrect selection of the module's COM port, or serial port occupation by other software;
- Defective USB cable. Replace the cable (original mobile charging cables are recommended).