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Mechanical design



## SMART DISPLAY MODULE SPECIFICATION

| 4.0 Inch Smart Display with TOUCH |              |
|-----------------------------------|--------------|
| <b>Model:</b>                     | ET040SM01-VT |
| <b>Version:</b>                   | V3.1         |
| <b>Date:</b>                      | 2024-08-07   |

### Customer Confirmation

| Approved by | Notes |
|-------------|-------|
|             |       |



## REVISION HISTORY

| Revision | Date     | Contents of Revision Change                                             | Remark |
|----------|----------|-------------------------------------------------------------------------|--------|
| V1.0     | 20240611 | Preliminary release                                                     |        |
| V1.1     | 20240623 | Optimize PCB positioning holes                                          |        |
| V2.0     | 20240709 | Change to English version                                               |        |
| V2.1     | 20240716 | Change header                                                           |        |
| V2.2     | 20240725 | Updated mechanical drawing                                              |        |
| V3.0     | 20240807 | Add schemata, GitHub project links, and environment configuration links |        |
| V3.1     | 20241112 | Add more hardware details and link to LCD specification                 |        |
|          |          |                                                                         |        |
|          |          |                                                                         |        |
|          |          |                                                                         |        |
|          |          |                                                                         |        |
|          |          |                                                                         |        |



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# 1. Introduction

## 1.1 Features

### Brief Info:

- 1) Button control: one is the reset button, the other is the boot button.
- 2) Backup IO: download ports and multiple IO leads to use on both sides of the periphery.
- 3) Power: DC 5V, 260mA

### System

- 1) OS: RTOS
- 2) CPU: ESP32-S3-WROOM-1 240Mhz
- 3) RAM: 8MB
- 4) Flash: 16MB
- 5) Support 2.4GHz Wi-Fi、BLE 5、BLE Mesh
- 6) Support Peripherals:  
GPIO, SPI, LCD interface, Camera interface, UART, I2C, I2S, remote control, pulse counter, LED PWM, full-speed USB 2.0 OTG, USB Serial/JTAG controller, MCPWM, SDIO host, GDMA, TWAI® controller (compatible with ISO 11898-1), ADC, touch sensor, temperature sensor, timers and watchdogs

For more information on ESP32-S3-WROOM-1, please refer to the following link:[datasheet\\_en.pdf](#)

### Display

- 1) Size: 4.0 Inch
- 2) Resolution: 480\*480
- 3) Pixel Arrangement: RGB Vertical Stripe
- 4) Interface Mode: 3SPI-RGB 18bits
- 5) Driver IC: GC9503V TP IC: FT6336U
- 6) Brightness: 350 cd/m<sup>2</sup>
- 7) Backlight Type: White LED
- 8) Display mode: Normally Black,
- 9) Pixel Density: 169 PPI

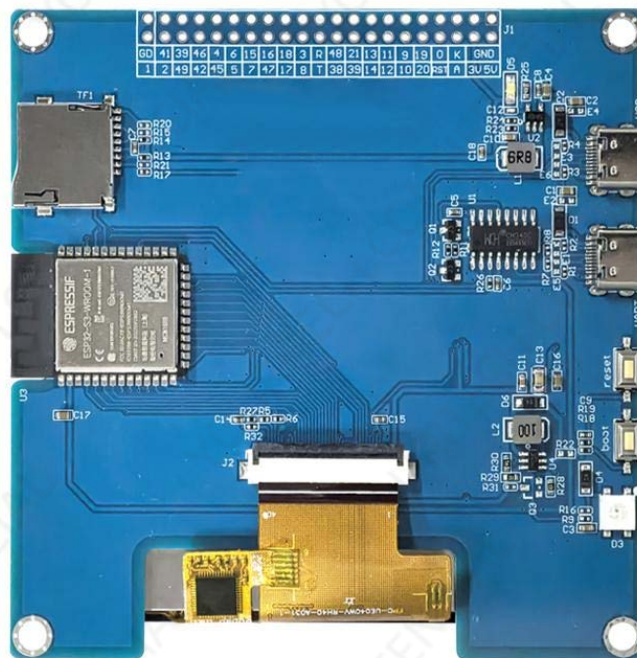
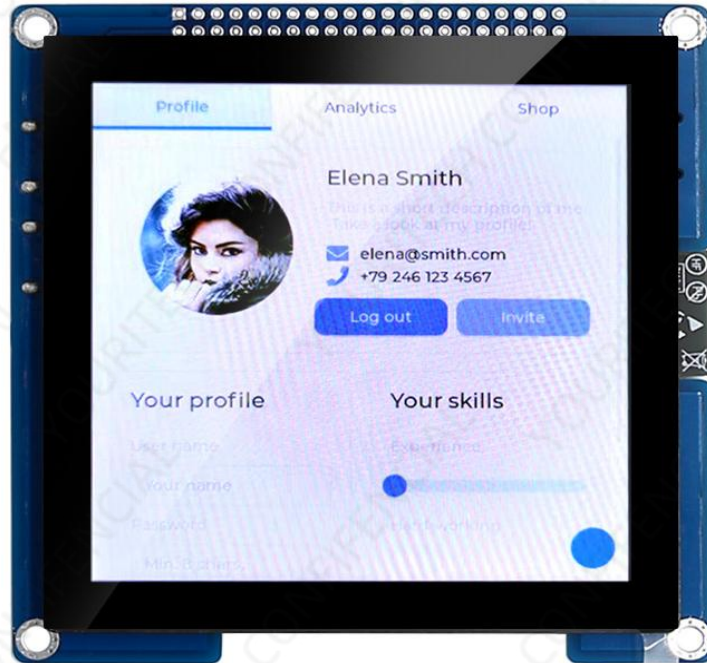
More information about Display can be found here:[Display Specification.pdf](#)

### Other

- 1) Operation Temperature: -20~70°C
- 2) Storage Temperature: -30~80°C

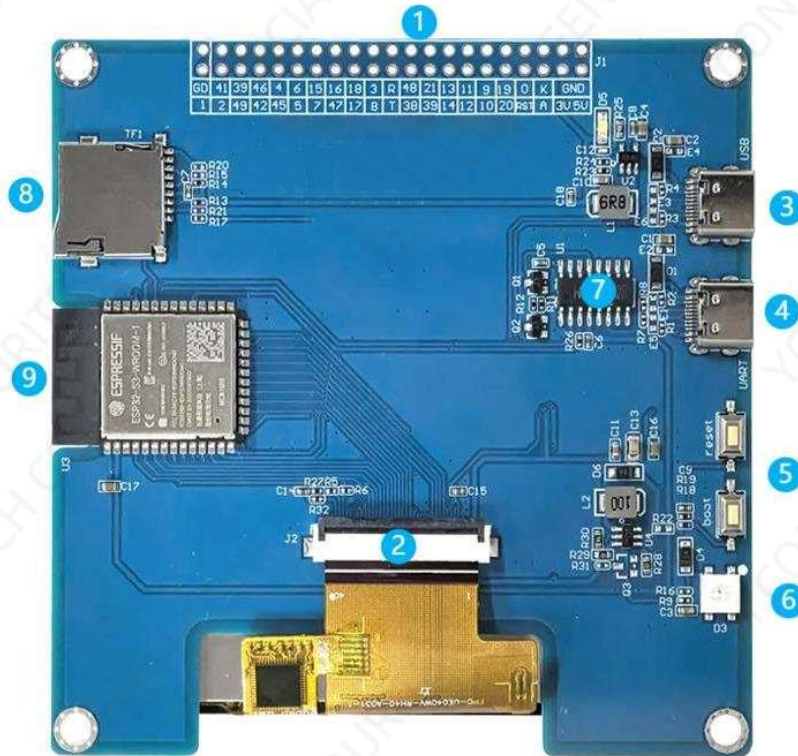


## 1.2 Appearance picture



## 2. Product information

### 2.1 Interface Description



#### ① External GPIO

| Pin NO. | Symbol | Description        | Voltage Range | Remarks |
|---------|--------|--------------------|---------------|---------|
| 1       | GD     | Grounds            | 0V            |         |
| 2       | 41     | GPIO41, Reserve IO | 0-3.3V        |         |
| 3       | 39     | GPIO39, Reserve IO | 0-3.3V        |         |
| 4       | 46     | GPIO46, Reserve IO | 0-3.3V        |         |
| 5       | 4      | GPIO4, Reserve IO  | 0-3.3V        |         |
| 6       | 6      | GPIO6, Reserve IO  | 0-3.3V        |         |
| 7       | 15     | GPIO15, Reserve IO | 0-3.3V        |         |
| 8       | 16     | GPIO16, Reserve IO | 0-3.3V        |         |
| 9       | 18     | GPIO18, Reserve IO | 0-3.3V        |         |
| 10      | 3      | GPIO3, Reserve IO  | 0-3.3V        |         |



|    |     |                                               |        |  |
|----|-----|-----------------------------------------------|--------|--|
| 11 | R   | UART Receive                                  | 0-3.3V |  |
| 12 | 48  | GPIO48, Reserve IO                            | 0-3.3V |  |
| 13 | 21  | GPIO21, Reserve IO                            | 0-3.3V |  |
| 14 | 13  | GPIO13, Reserve IO                            | 0-3.3V |  |
| 15 | 11  | GPIO11, Reserve IO                            | 0V     |  |
| 16 | 9   | GPIO9, Reserve IO                             | 0-3.3V |  |
| 17 | 19  | GPIO19, Reserve IO                            | 0-3.3V |  |
| 18 | 0   | GPIO0, Reserve IO                             | 0-3.3V |  |
| 19 | K   | BL-                                           | TDB    |  |
| 20 | GND | Grounds                                       | 0V     |  |
| 21 | GND | Grounds                                       | 0V     |  |
| 22 | 1   | GPIO1, Reserve IO                             | 0-3.3V |  |
| 23 | 2   | GPIO2, Reserve IO                             | 0-3.3V |  |
| 24 | 49  | GPIO49, Reserve IO                            | 0-3.3V |  |
| 25 | 42  | GPIO42, Reserve IO                            | 0-3.3V |  |
| 26 | 45  | GPIO45, Reserve IO                            | 0-3.3V |  |
| 27 | 5   | GPIO5, Reserve IO                             | 0-3.3V |  |
| 28 | 7   | GPIO7, Reserve IO                             | 0-3.3V |  |
| 29 | 47  | GPIO47, Reserve IO                            | 0-3.3V |  |
| 30 | 17  | GPIO17, Reserve IO                            | 0-3.3V |  |
| 31 | 8   | GPIO8, Reserve IO                             | 0-3.3V |  |
| 32 | T   | UART Transmit                                 | 0-3.3V |  |
| 33 | 38  | GPIO38, Reserve IO                            | 0-3.3V |  |
| 34 | 39  | GPIO39, Reserve IO                            | 0-3.3V |  |
| 35 | 14  | GPIO14, Reserve IO                            | 0-3.3V |  |
| 36 | 12  | GPIO12, Reserve IO                            | 0-3.3V |  |
| 37 | 10  | GPIO10, Reserve IO                            | 0-3.3V |  |
| 38 | 20  | GPIO20, Reserve IO                            | 0-3.3V |  |
| 39 | RST | Reset signal,<br>do not connect if not in use | 0-3.3V |  |



|    |    |            |      |  |
|----|----|------------|------|--|
| 40 | A  | BL+        | TDB  |  |
| 41 | 3V | Power 3.3V | 3.3V |  |
| 42 | 5V | Power 5V   | 5V   |  |

The following picture shows the pins with 2\*21pin spacing between 2.54mm

Note:

- A pin can be used for other purposes when it is not used at the same time, When using Display interface, most of the pins are occupied because the RGB interface is used.
- You can also use an external gpio to drive other interface types, such as SPI interface, MCU interface, MIPI interface, etc., without using the Display interface provided by us
- If the Display interface is used but the SD is not used, then the SD pins are freely usable.
- For all pin occupancy, please see [2.2 pin occupancy](#)

## ② Display Interface:

| Pin No. | Symbol      | I/O | Description                                                                                             |
|---------|-------------|-----|---------------------------------------------------------------------------------------------------------|
| 1       | LEDA        | P   | Power supply for backlight anode, Controlled by GPIO38                                                  |
| 2       | LEDK1/GND   | P   | Power supply for backlight cathode, Control the backlight with LEDA                                     |
| 3       | LEDK2/GND   | P   | Power supply for backlight cathode, Control the backlight with LEDA                                     |
| 4       | GND         | P   | Power Ground                                                                                            |
| 5       | VDD_3V3     | P   | Power supply to the internal logic power regulator( 3.3V)                                               |
| 6       | RESET       | I   | The signal will reset the LCM, Signal is active low. but no connection                                  |
| 7-8     | NC          | -   | no connection                                                                                           |
| 9       | SDA,GPIO47  | I/O | Serial in/out signal, for initial RGB I/F.<br>The data is applied on the rising edge of the SCL signal. |
| 10      | SCK,GPIO48  | I   | serial interface clock, for initial RGB I/F.                                                            |
| 11      | CS,GPIO39   | I   | Chip select input pin ("Low" enable), for initial RGB I/F.                                              |
| 12      | PCLK,GPIO21 | I   | Pixel clock input pin, Negative polarity                                                                |
| 13      | DE,GPIO18   | I   | Data input enable. Display access is enabled when DE is "H"                                             |



|       |                 |     |                                                                      |
|-------|-----------------|-----|----------------------------------------------------------------------|
| 14    | VSYNC,GPIO17    | I   | Vorizontal sync signal, Negative polarity                            |
| 15    | HSYNC,GPIO16    | I   | Hertical sync signal, Negative polarity                              |
| 16-21 | B0-B5,GPIO15-11 | I   | Blue data input.                                                     |
| 22-27 | G0-G5,GPIO10-5  | I   | Green data input.                                                    |
| 28-33 | R0-R5,GPIO4-0   | I   | Red data input.                                                      |
| 34    | GND             | P   | Power Ground                                                         |
| 35    | TP_INT          | O   | Interrupt signals for TP,but no connection                           |
| 36    | TP_SDA,GPIO40   | I/O | I2C data signals for TP                                              |
| 37    | TP_SCL,GPIO41   | I   | I2C clock signals for TP                                             |
| 38    | TP_RST          | I   | The signal will reset the TP, Signal is active low,but no connection |
| 39    | TP_VCI          | P   | TP_VDD(2.8V) Power Supply for TP                                     |
| 40    | GND             | P   | Power Ground                                                         |

### ③ USB:

The USB interface belongs to Type-C and is mainly used to power the board. The picture on the left shows serial communication and the picture on the right shows the download port.

### ④ UART:

Used for serial communication, such as burning, serial debugging, etc

### ⑤ button:

Boot button and the reset button.

### ⑥ RGB LCD:

Can emit red, green, blue three colors of light, and through different combinations to produce a variety of colors

### ⑦ USB to serial chip: CH340C

The CH340 is a USB bus conversion chip that implements USB-to-serial port or USB-to-print port. In serial port mode, the CH340 provides common MODEM communication signals, which can be used to extend the asynchronous serial port for a computer or upgrade a common serial device to the USB bus.

### ⑧ SD:

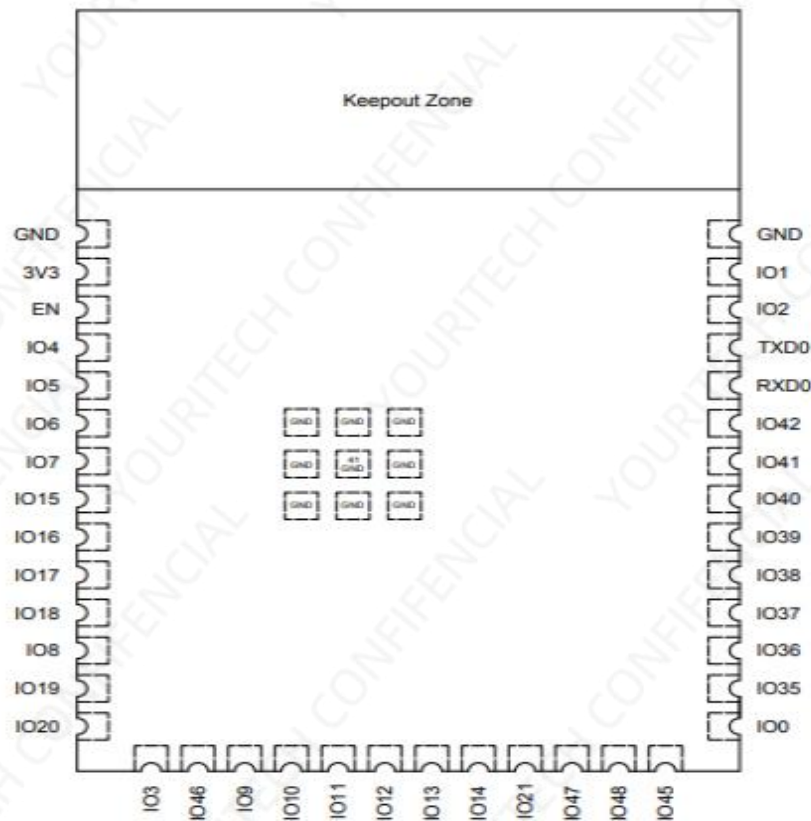
A port or slot for inserting an SD card, usually for storing data

### ⑨ Main Control Chip: ESP32S3-MCN16R8

Dual-core processor, up to 240MHz operating frequency



## 2.2 pin occupancy



| Symbol | service condition             | Remarks                         |
|--------|-------------------------------|---------------------------------|
| GPIO0  | Display interface R4          |                                 |
| GPIO1  | Display interface R3          |                                 |
| GPIO2  | Display interface R2          |                                 |
| GPIO3  | Display interface R1          |                                 |
| GPIO4  | Display interface R0/KEY-Boot | But the boot button is not used |
| GPIO5  | Display interface G5          |                                 |
| GPIO6  | Display interface G4          |                                 |
| GPIO7  | Display interface G3          |                                 |
| GPIO8  | Display interface G2          |                                 |
| GPIO9  | Display interface G1          |                                 |
| GPIO10 | Display interface G0          |                                 |
| GPIO11 | Display interface B4          |                                 |
| GPIO12 | Display interface B3          |                                 |
| GPIO13 | Display interface B2          |                                 |
| GPIO14 | Display interface B1          |                                 |
| GPIO15 | Display interface B0          |                                 |
| GPIO16 | Display interface HS          |                                 |
| GPIO17 | Display interface VS          |                                 |



|             |                             |                                                                 |
|-------------|-----------------------------|-----------------------------------------------------------------|
| GPIO18      | Display interface DE        |                                                                 |
| GPIO19      | USB-DN                      |                                                                 |
| GPIO20      | USB-DP                      |                                                                 |
| GPIO21      | Display interface PCLK      |                                                                 |
| GPIO35      | Not used                    | However, the pin is not led out                                 |
| GPIO36      | Not used                    | However, the pin is not led out                                 |
| GPIO37      | Not used                    | However, the pin is not led out                                 |
| GPIO38      | Display interface LCD-BL-EN |                                                                 |
| GPIO39      | Display interface SPI-CS    |                                                                 |
| GPIO40      | TP-SDA                      | The data line used to touch the I2C                             |
| GPIO41      | TP-SCL                      | The clock line used to touch the I2C                            |
| GPIO42      | SD-MOSI/RGB-LED             | If SD or RGB-LED is not used, it can be used for other purposes |
| RXD0/GPIO43 | UARTRX                      |                                                                 |
| TXD0/GPIO44 | UARTTX                      |                                                                 |
| GPIO45      | SD-CLK                      | If SD is not used, it can be used for other purposes            |
| GPIO46      | SD-MISO                     | If SD is not used, it can be used for other purposes            |
| GPIO47      | SPI-SDA                     |                                                                 |
| GPIO48      | SPI-CLK                     |                                                                 |

## 2.3 Display Information

| Item                            | Specification        | Unit              | Remark   |
|---------------------------------|----------------------|-------------------|----------|
| <b>Pixel Driving element</b>    | A-Si TFT             | -                 |          |
| <b>Screen Size</b>              | 4.0                  | Inch              | Diagonal |
| <b>Resolution</b>               | 480(W)*3(RGB)*480(H) | Dots              |          |
| <b>Interface</b>                | 3SPI_RGB 18bits      | -                 | 40PIN    |
| <b>Module Power Consumption</b> | 0.883                | Watt              | Typ.     |
| <b>VActive VArea</b>            | 72.46(W)*71.78(H)    | mm                |          |
| <b>CTP_Pixel pitch (W*H)</b>    | 0.1497(W)*0.1462(H)  | mm                |          |
| <b>Module Size (W*H*D)</b>      | 84(W)*84(H)*3.22(D)  | mm                |          |
| <b>Luminance</b>                | 350                  | cd/m <sup>2</sup> | Typ.     |
| <b>Viewing Direction</b>        | All                  | O'clock           | -        |
| <b>Display Color</b>            | 262K                 | Colors            | 18bits   |



## 2.4 Voltage & Current

| Item                              | Conditions                          | Min | Typ | Max | Unit |
|-----------------------------------|-------------------------------------|-----|-----|-----|------|
| Power Voltage                     | DC                                  | 4.0 | 5.0 | 5.5 | V    |
| Operation Current                 | VCC= +5V, Maximum backlight current |     | 260 |     | mA   |
|                                   | VCC= +5V,backlight off              | -   | 150 | -   | mA   |
| Recommended power supply:5V 1A DC |                                     |     |     |     |      |

## 2.5 Reliability Test

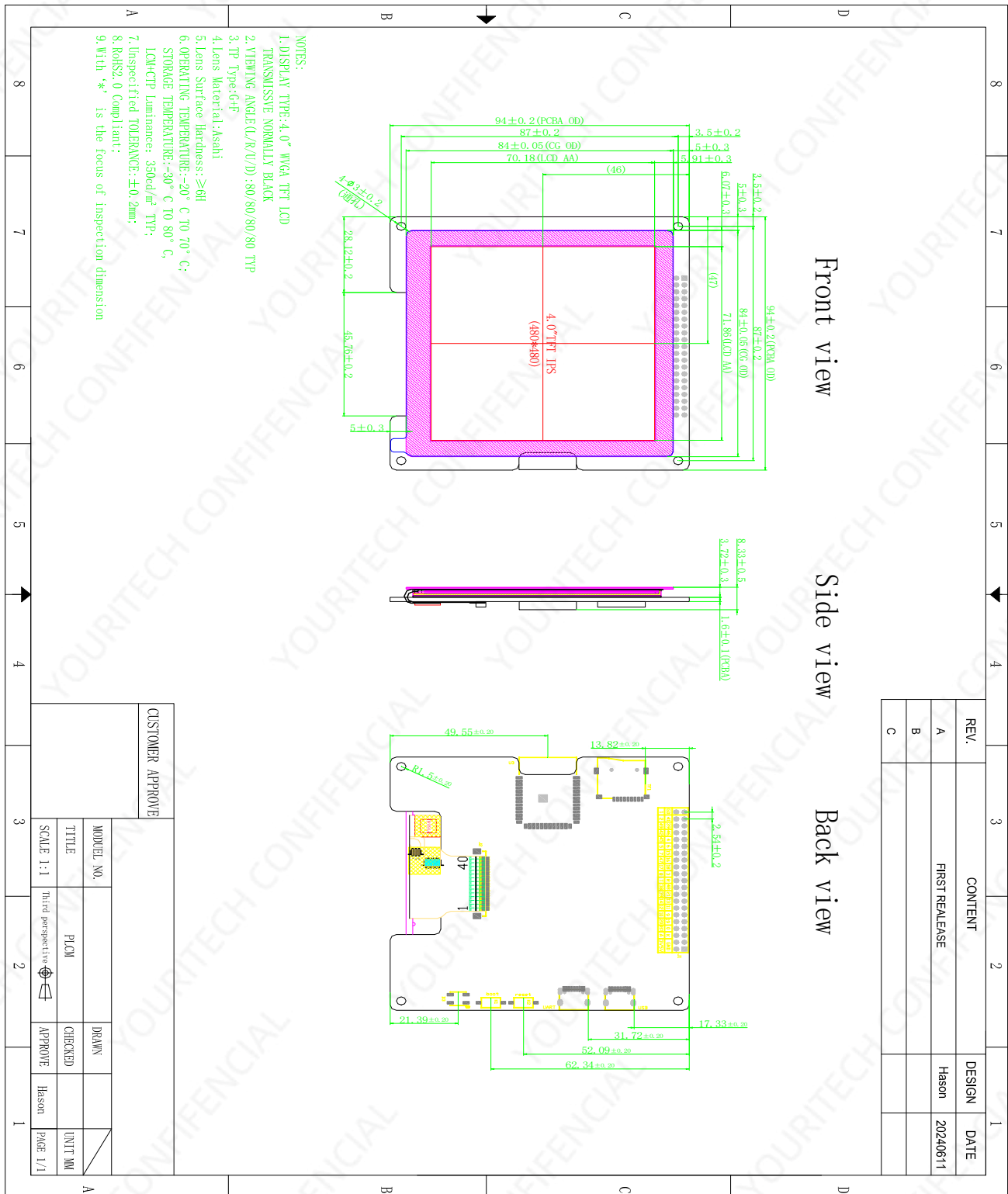
| Item                | Conditions          | Min                        | Typ | Max | Unit |
|---------------------|---------------------|----------------------------|-----|-----|------|
| Working Temperature | 60%RH at 5V voltage | -20                        | 25  | 70  | C    |
| Storage Temperature | ---                 | -30                        | 25  | 85  | C    |
| Working Humidity    | 25°C                | 10%                        | 60% | 90% | RH   |
| ESD                 | ---                 | Contact: ±4KV<br>Air: ±8KV |     |     | KV   |

## 2.6 Related software

| Software name | Version        | Software associated configuration                                                                                                                                                                                                                                                                                                                  | Development environment configuration link        |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Arduino IDE   | 3.0.4 (esp32)  | <ol style="list-style-type: none"> <li>Board: ESP32S3 Dev Module</li> <li>CPU Frequency: 240MHz (WiFi)</li> <li>Flash Frequency: NO</li> <li>Flash Mode: QIO 80MHz</li> <li>Flash Size: 16MB (128Mb)</li> <li>Partition Scheme: Default 4MB with spiffs (1.2MB APP/1.5MB SPIFFS)</li> <li>PSRAM: OPI PSRAM</li> <li>Programmer: Esptool</li> </ol> | <a href="#">ESP32-Arduino config (github.com)</a> |
| ESP-IDF       | 5.1.1<br>5.2.2 | Once configured, no configuration is required<br>(If you have any problem with the configuration, please contact us, we will help you)                                                                                                                                                                                                             | <a href="#">ESP-IDF config (github.com)</a>       |



### 3. MECHANICAL DRAWING



## 4. Schematic

