WAVESHARE ESP32-S3 4.3 inch Capacitive Touch Display Development Board User Guide

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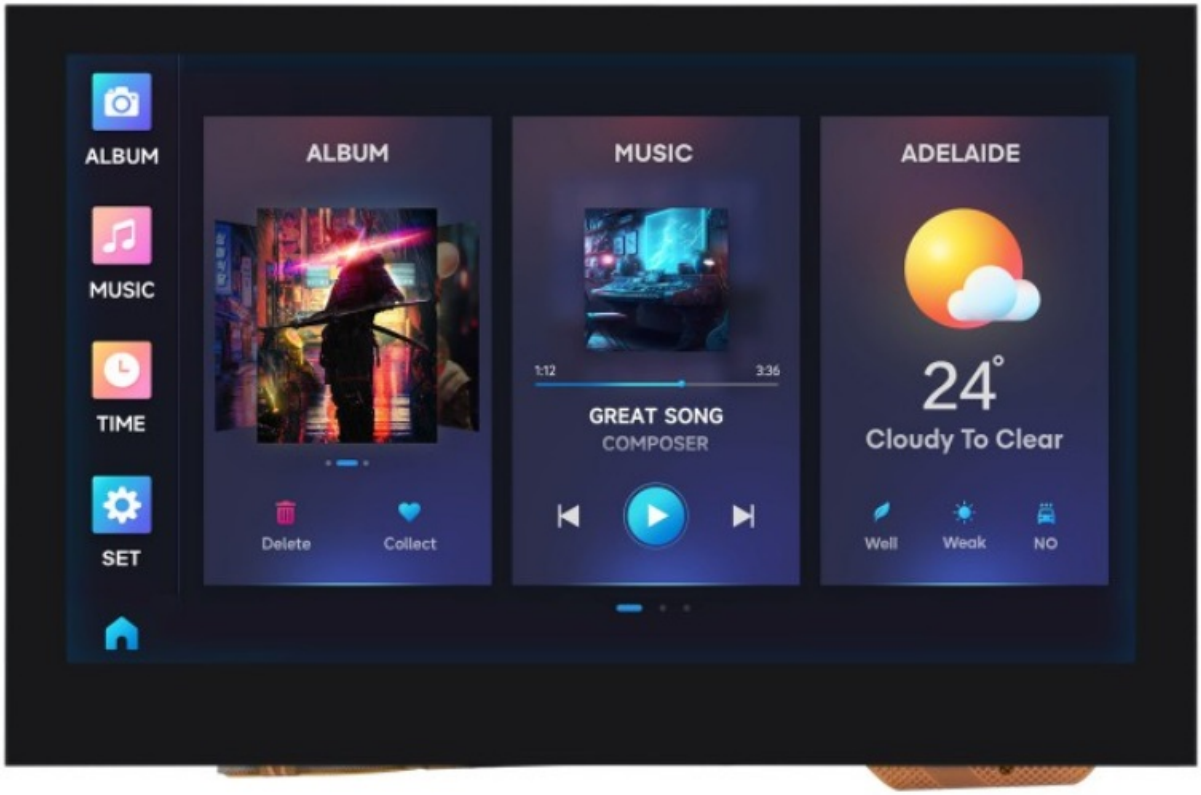


Specifications

- Microcontroller development board with 2.4GHz WiFi and BLE 5 support
- High-capacity Flash and PSRAM integrated
- 4.3-inch capacitive touch screen for GUI programs like LVGL

Product Description
The ESP32-S3-Touch-LCD-4.3 is designed for quick development of HMI and other ESP32-S3 applications. It features a range of interfaces for connectivity and development purposes.

Features

- ESP32-S3N8R8 Type C USB
- Hardware Description
- Onboard Interface
- UART Port, USB Connector, Sensor interface, CAN Interface, I2C interface, RS485 interface, PH2.0 battery header

Hardware Description
The ESP32-S3-Touch-LCD-4.3 comes with various onboard interfaces including UART, USB, sensor, CAN, I2C, RS485, and battery header for efficient charge and discharge management.

Onboard Interface Details

- **UART Port:** CH343P chip for USB to UART connectivity.
- **USB Connector:** GPIO19(DP) and GPIO20(DN) for USB connections.
- **Sensor interface:** Connected to GPIO6 as ADC for sensor kit integration.

- **CAN Interface:** Supports USB interface with FSUSB42UMX chip.
- **I2C interface:** Uses GPIO8(SDA) and GPIO9(SCL) pins for I2C bus connectivity.
- **RS485 interface:** Onboard RS485 interface circuits for direct communication.
- **PH2.0 battery header:** Efficient charge and discharge management chip for lithium battery support.

FAQ

- **Q: What is the average frame rate for running LVGL benchmark on ESP-IDF v5.1?**
  A: The average frame rate is 41 FPS when running the LVGL benchmark example on a single core in ESP-IDF v5.1.
- **Q: What is the recommended battery capacity for the PH2.0 lithium battery socket?**
  A: It is recommended to use a single-cell battery with a capacity below 2000mAh with the PH2.0 lithium battery socket.

ESP32-S3-Touch-LCD-4.3

Overview

Introduction

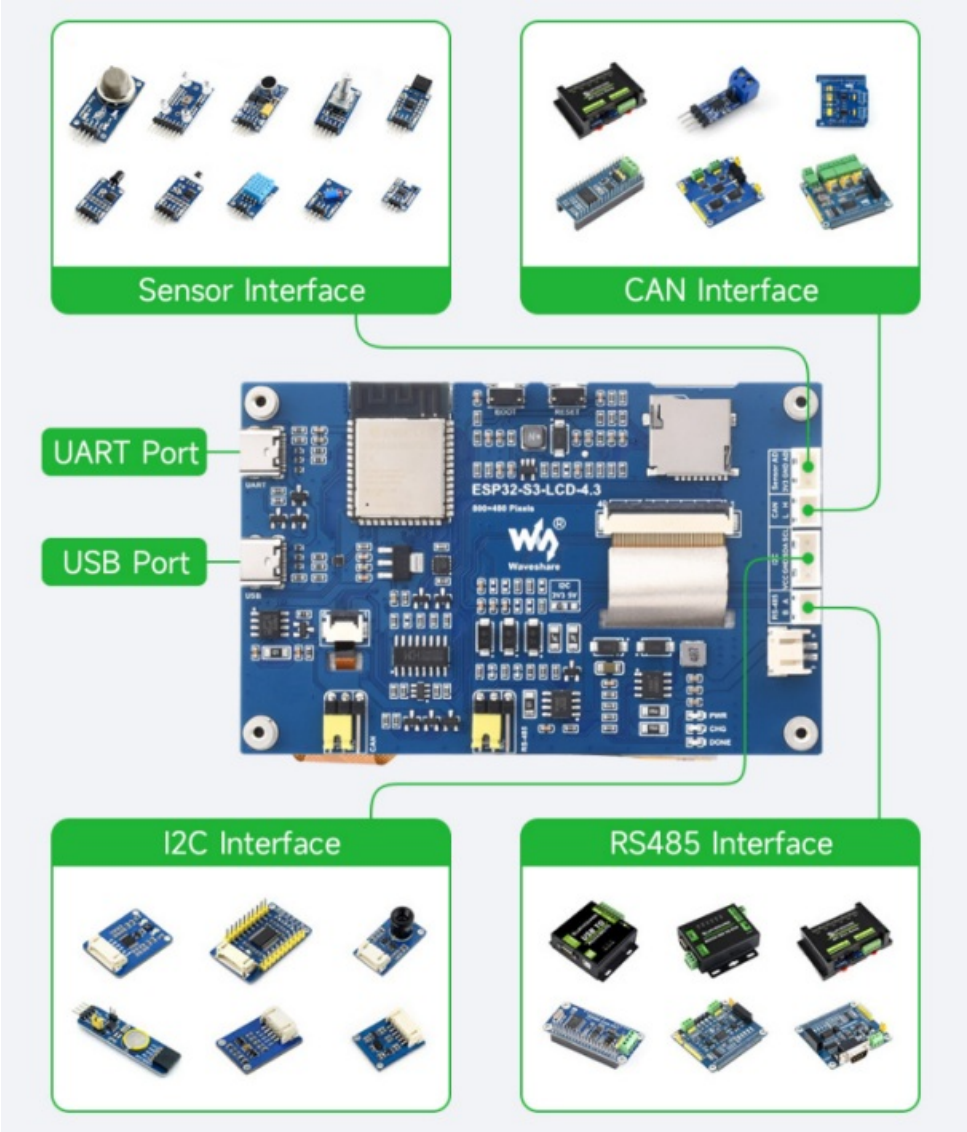
ESP32-S3-Touch-LCD-4.3 is a microcontroller development board with 2.4GHz WiFi and BLE 5 support, and integrates high-capacity Flash and PSRAM. The onboard 4.3-inch capacitive touch screen can smoothly run GUI programs such as LVGL. Combined with various peripheral interfaces, it is suitable for the quick development of the HMI and other ESP32-S3 applications.

Features

- Equipped with Xtensa 32-bit LX7 dual-core processor, up to 240MHz main frequency.
- Supports 2.4GHz Wi-Fi (802.11 b/g/n) and Bluetooth 5 (LE), with an onboard antenna.
- Built-in 512KB of SRAM and 384KB ROM, with onboard 8MB PSRAM and 8MB Flash.
- Onboard 4.3inch capacitive touch display, 800×480 resolution, 65K color.
- Supports capacitive touch control via I2C interface, 5-point touch with interrupt support.
- Onboard CAN, RS485, I2C interface, and TF card slot, integrate full-speed USB port.
- Supports flexible clock, module power supply independent setting, and other controls to realize low power consumption in different scenarios.

Hardware Description

Onboard Interface

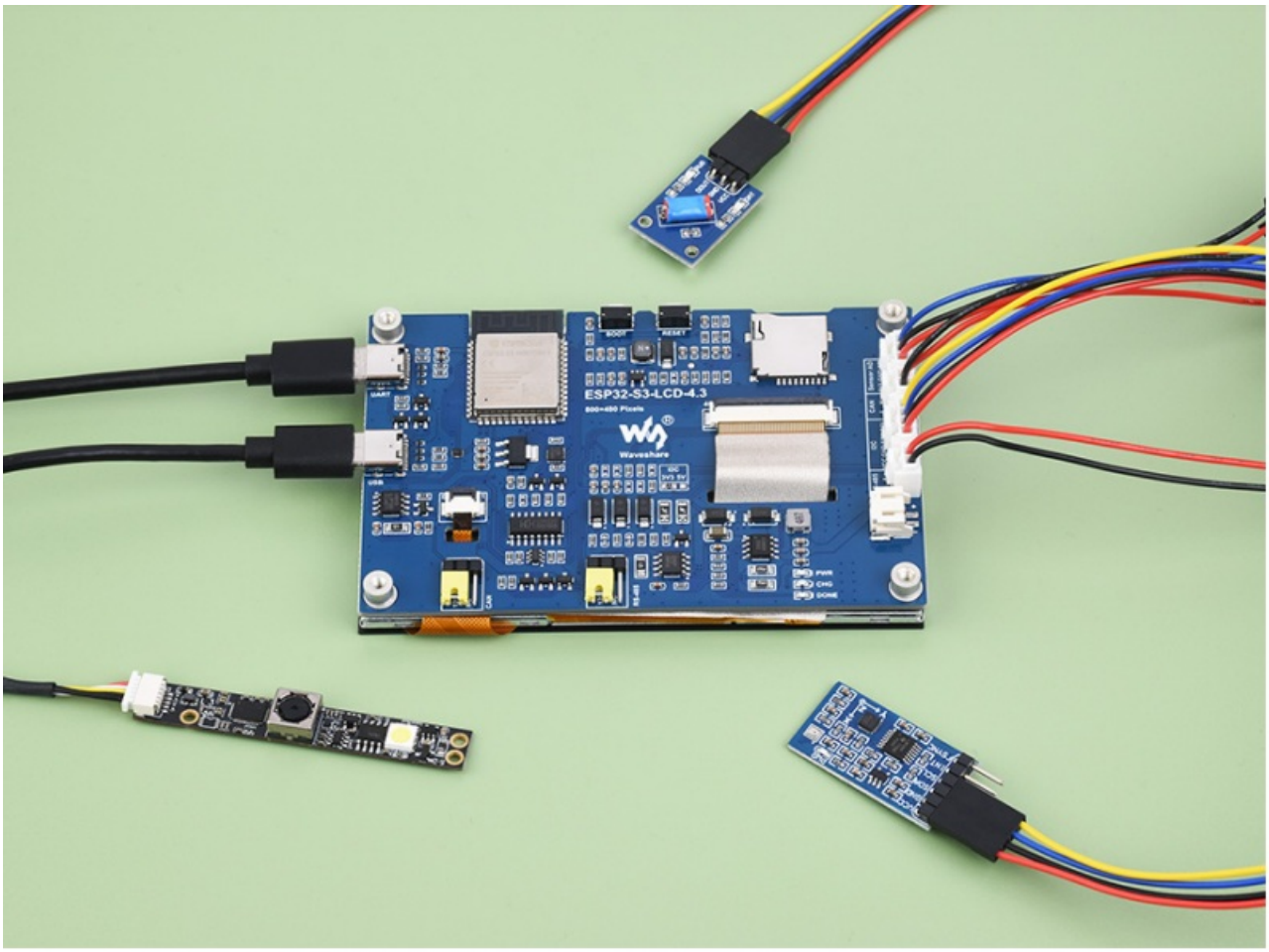


- UART Port : Use CH343P chip for USB to UART for connecting the UART_TXD(GPIO43) and UART_RXD(GPIO44) pin of the ESP32-S3. which is for firmware programming and log printing.
- USB Connector: GPIO19(DP) and GPIO20(DN) are the USB pins of ESP32-S3, which can be connected the cameras with UVC protocol. For more details about the UVC driver, you can refer to this link .
- Sensor interface: This interface is connected to GPIO6 as ADC, which can be connected to Sensor kit .
- CAN Interface: can be used as a USB interface too, you can switch CAN/USB with the FSUSB42UMX chip. The USB interface is used by default (when the USB_SEL pin of FSUSB42UMX is set to LOW).
- I2C interface: ESP32-S3 provides multi-lane hardware, currently uses GPIO8(SDA) and GPIO9(SCL) pins as I2C bus for loading IO expansion chip, touch interface and I2C interface.
- RS485 interface: the development board onboard RS485 interface circuits for directly connecting to RS485 device communication, and support automatic switching of RS485 circuit transceiver mode.
- PH2.0 battery header: The development board utilizes the efficient charge and discharge management chip CS8501. It can boost a single-cell lithium battery to 5V. Currently, the charging current is set at 580mA, and users can modify the charging current by replacing the R45 resistor. For more details, you can refer to Schematic diagram .

PIN Definition

ESP32-S3-WROOM-x	LCD	USB	SD	UART	CAN	Sensor
GPIO0	G3					
GPIO1	R3					
GPIO2	R4					
GPIO3	VSYNC					
GPIO4	TP_IRQ					
GPIO5	DE					
GPIO6						AD
GPIO7	PCLK					
GPIO8	TP_SDA					
GPIO9	TP_SCL					
GPIO10	B7					
GPIO11			MOSI			
GPIO12			SCK			
GPIO13			MISO			
GPIO14	B3					
GPIO15				RS485_TX		
GPIO16				RS485_RX		
GPIO17	B6					
GPIO18	B5					
GPIO19		USB_DN			CANRX	
GPIO20		USB_DP			CANTX	
GPIO21	G7					
GPIO38	B4					
GPIO39	G2					
GPIO40	R7					
GPIO41	R6					
GPIO42	R5					
GPIO43				UART_TXD		
GPIO44				UART_RXD		
GPIO45	G4					
GPIO46	HSYNC					
GPIO47	G6					
GPIO48	G5					
CH422G	-	-	-	-	-	-
EXIO1	TP_RST					
EXIO2	DISP					
EXIO3	LCD_RST					
EXIO4			SD_CS			
EXIO5		USB_SEL(LOW)			USB_SEL(HIGH)	

Hardware Connection

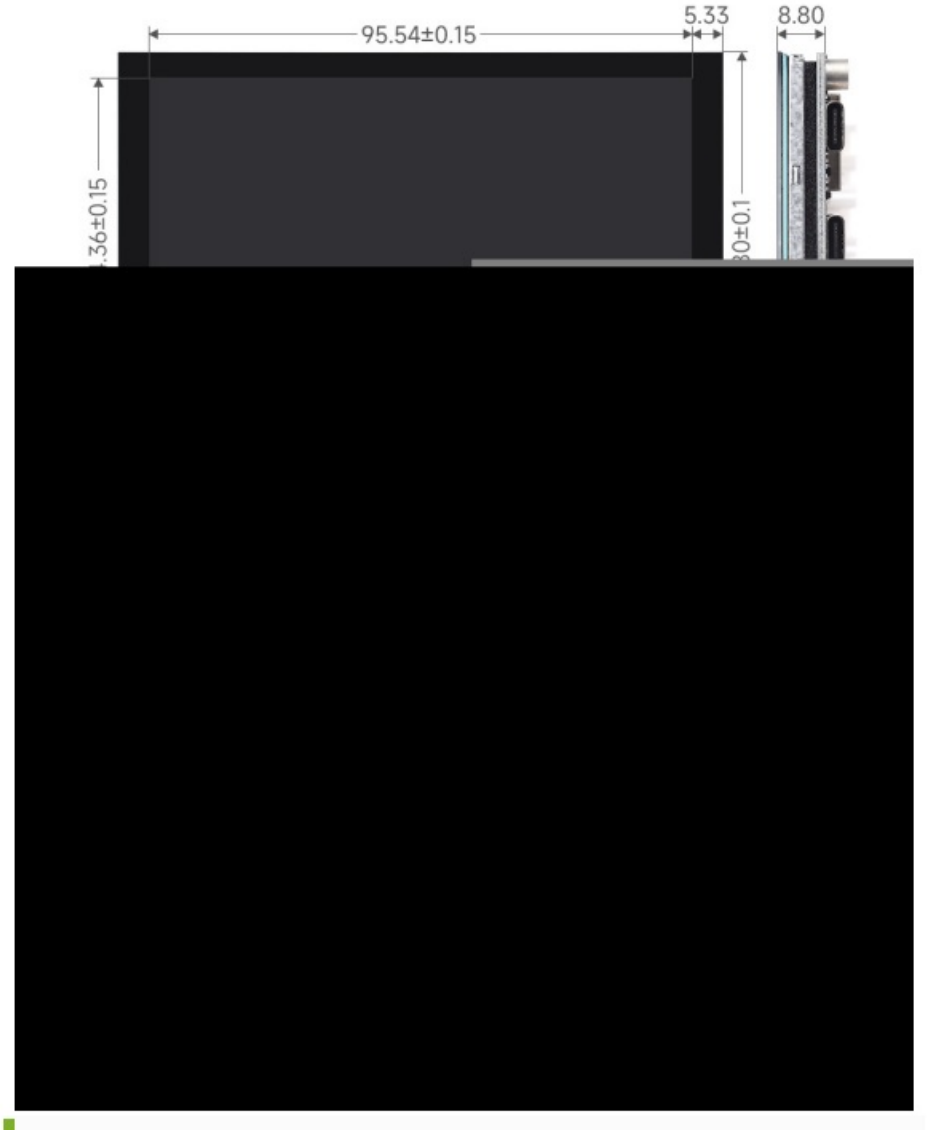


- ESP32-S3-Touch-LCD-4.3 comes with an onboard automatic download circuit. The Type C port, marked UART, is used for program downloads and logging. Once the program is downloaded, run it by pressing the RESET button.
- Please keep other metals or plastic material away from the PCB antenna area during use.
- The development board uses a PH2.0 connector to extend ADC, CAN, I2C, and RS485 peripheral pins. Utilize a PH2.0 to 2.54mm DuPont male connector to link sensor components.
- As the 4.3-inch screen occupies most GPIO pins, you can use a CH422G chip to expand IO for functions like reset and backlight control.
- The CAN and RS485 peripheral interfaces connect to a 120ohm resistor using jumper caps by default. Optionally, connect NC to cancel the termination resistor.
- The SD card employs SPI communication. Note that the SD_CS pin needs to be driven by the EXIO4 of the CH422G.

Other Notes

- The average frame rate for running the LVGL benchmark example on a single core in ESP-IDF v5.1 is 41 FPS. Before compilation, enabling 120M PSRAM is necessary.
- The PH2.0 lithium battery socket only supports a single 3.7V lithium battery. Do not use multiple sets of battery packs for charging and discharging simultaneously. It’s recommended to use a single-cell battery with a capacity below 2000mAh.

Dimensions



Environment Setting
The software framework for ESP32 series development boards is completed, and you can use CircuitPython, MicroPython, and C/C++ (Arduino, ESP-IDF) for rapid prototyping of product development. Here's a brief introduction to these three development approaches:

Official C/C++ library installation:

- ESP32 series Arduino development tutorial.
- ESP32 series ESP-IDF development tutorial.

MicroPython is an efficient implementation of the Python 3 programming language. It includes a small subset of the Python standard library and has been optimized to run on microcontrollers and resource-constrained environments.

- You can refer to development documentation for MicroPython-related application development.
- The GitHub library for MicroPython allows for recompilation for custom development.

Environment setting is supported on Windows 10. Users can select Arduino/Visual Studio Codes (ESP-IDF) as IDE to develop. For Mac/Linux, users can refer to official introduction .

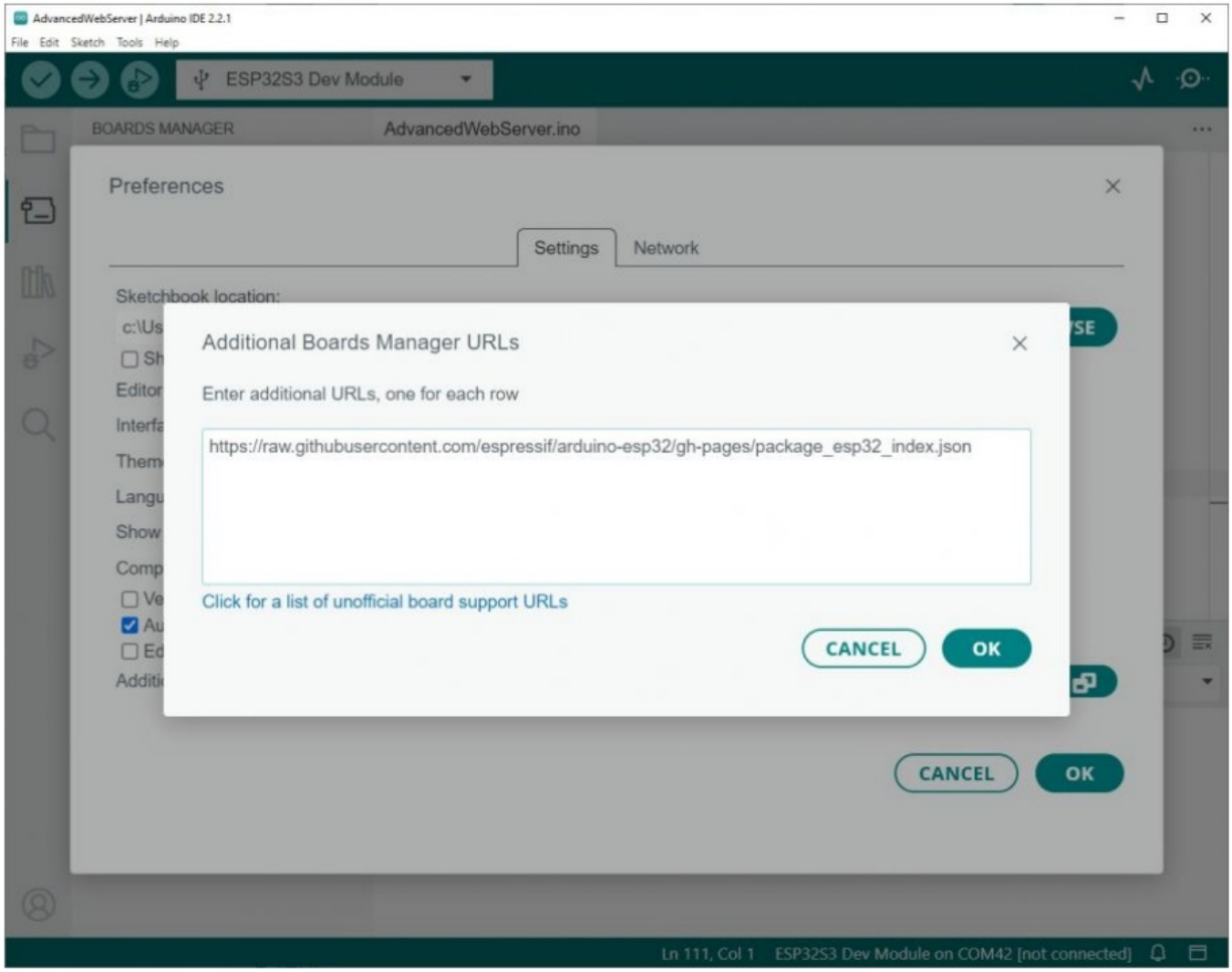
ESP-IDF

- ESP-IDF installation

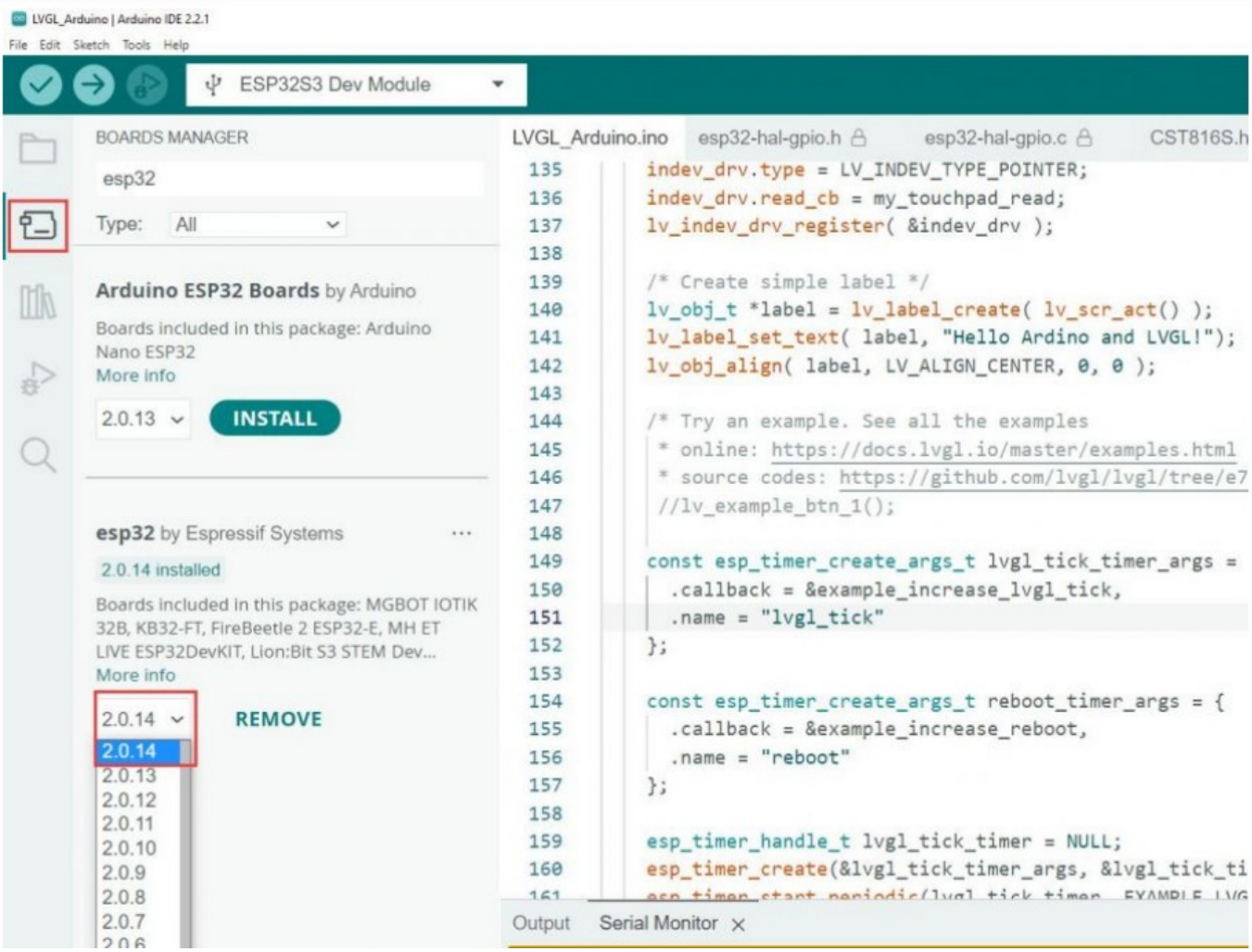
Arduino

- Download and install Arduino IDE .
- Install ESP32 on the Arduino IDE as shown below, and you can refer to this link .
- Fill in the following link in the Additional Boards Manager URLs section of the Settings screen under File -> Preferences and save.

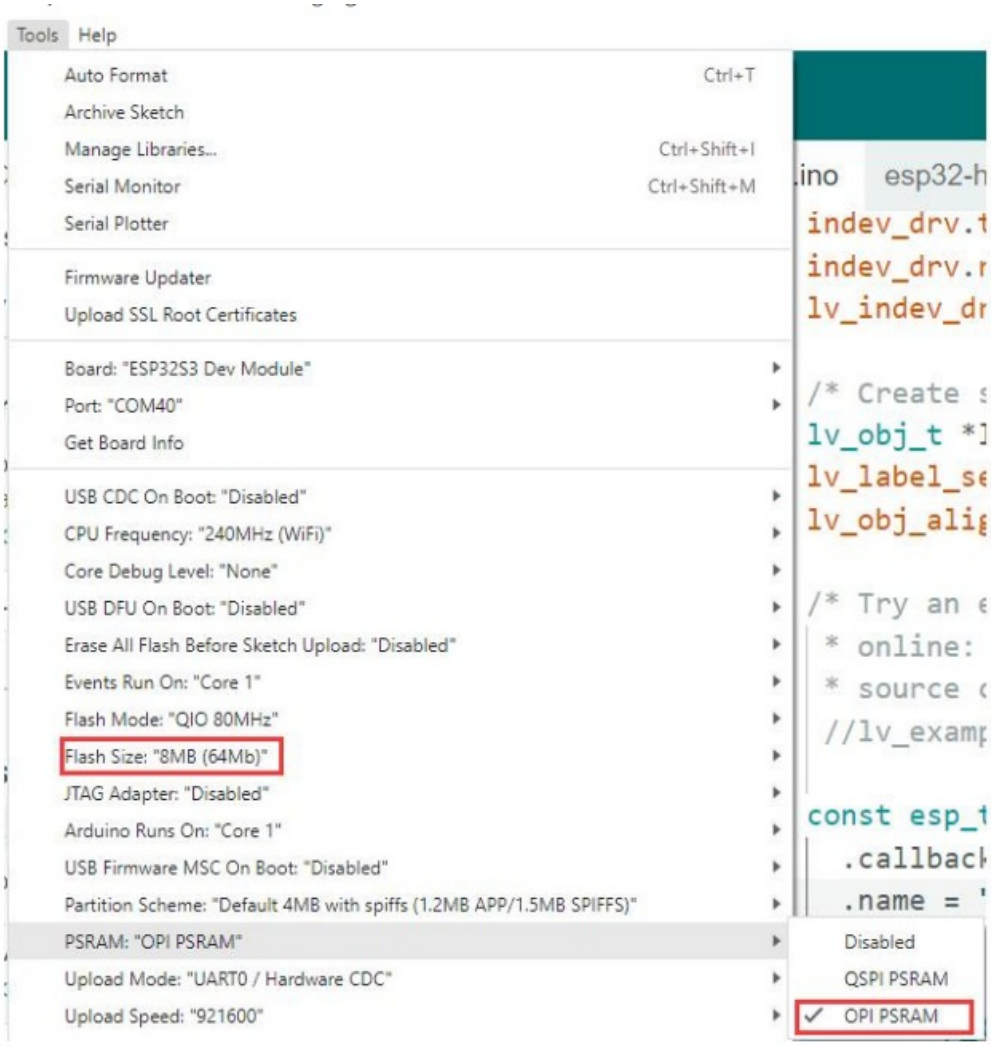
https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json



- Search esp32 on Board Manager to install, and restart Arduino IDE to take effect.

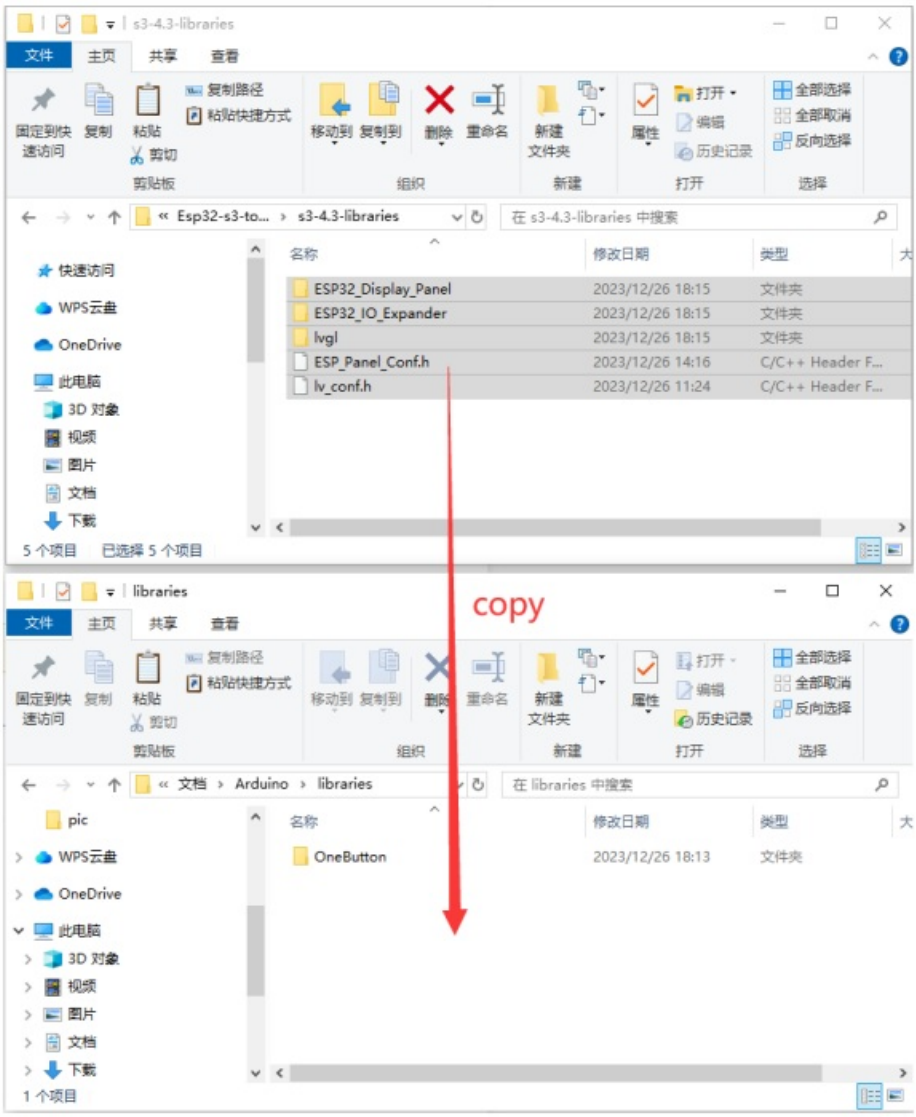


Open the Arduino IDE and note that Tools in the menu bar selects the corresponding Flash (8MB) and enables PSRAM (8MB OPI), as shown in the following figure.

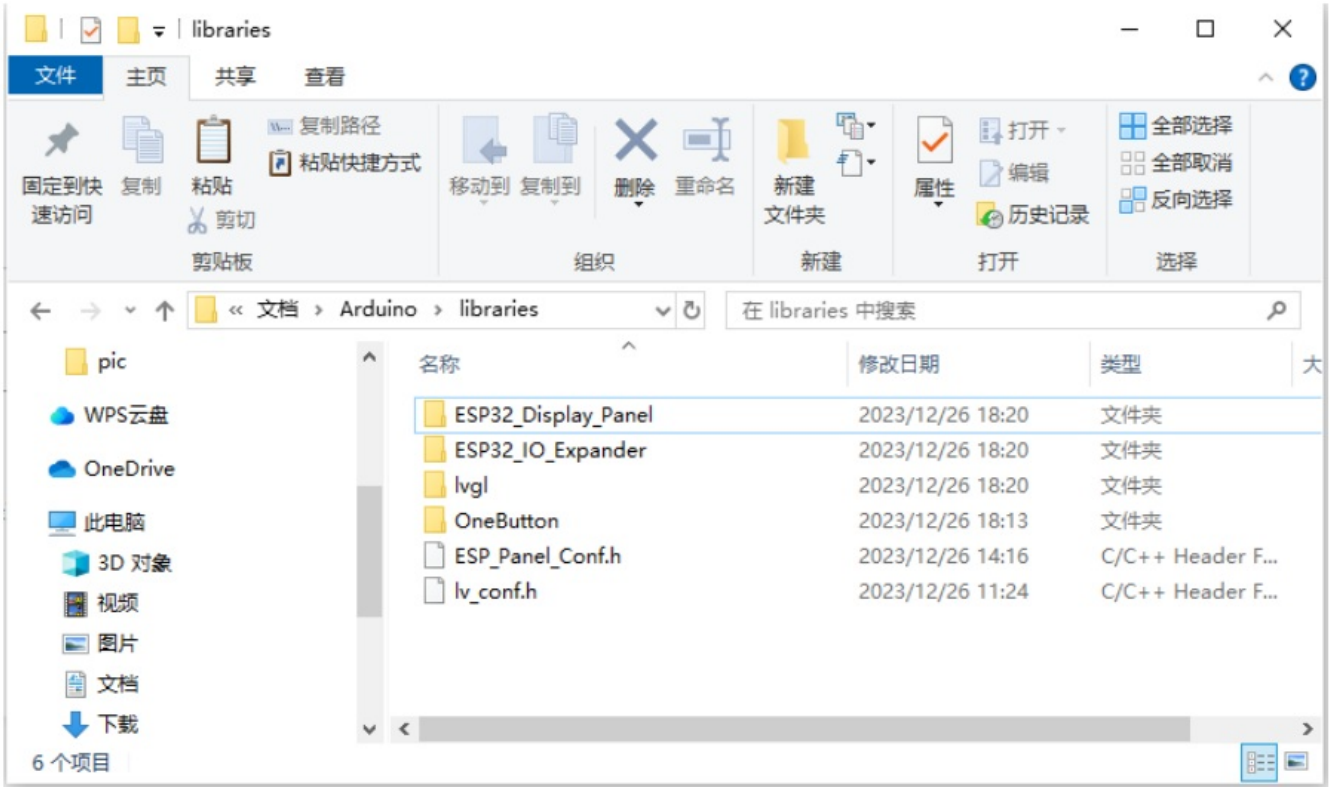


Library Installation

TFT_SPI and lvgl libraries require configuration files after installation. It’s recommended to directly use the ESP32_Display_Panel, ESP32_IO_Expander in the s3-4.3-libraries , and lvgl folders, along with the ESP_Panel_Conf.h and lv_conf.h files, and copy them to the directory C:\Users\xxxx\Documents\Arduino\libraries. Please note that “xxxx” represents your computer username.



After copying:



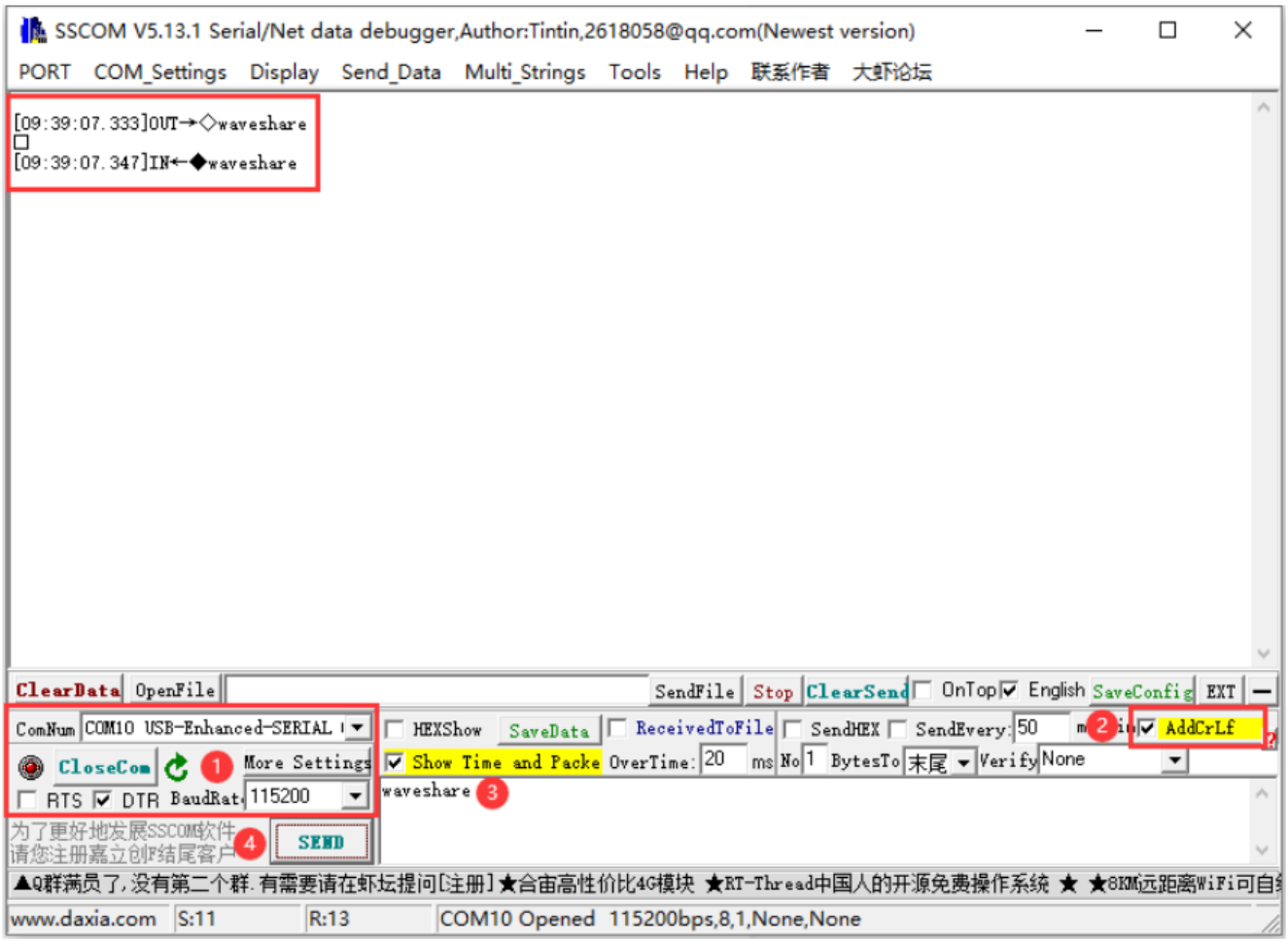
Sample Demo

Arduino

Note: Before using the Arduino demos, please check whether the Arduino IDE environment and download settings are correctly configured, for details, please check the Arduino Configure.

UART_Test
Take UART_Test as an example, UART_Test can be used for testing UART interface. This interface can connect to GPIO43(TXD) and GPIO44(RXD) as UART0.

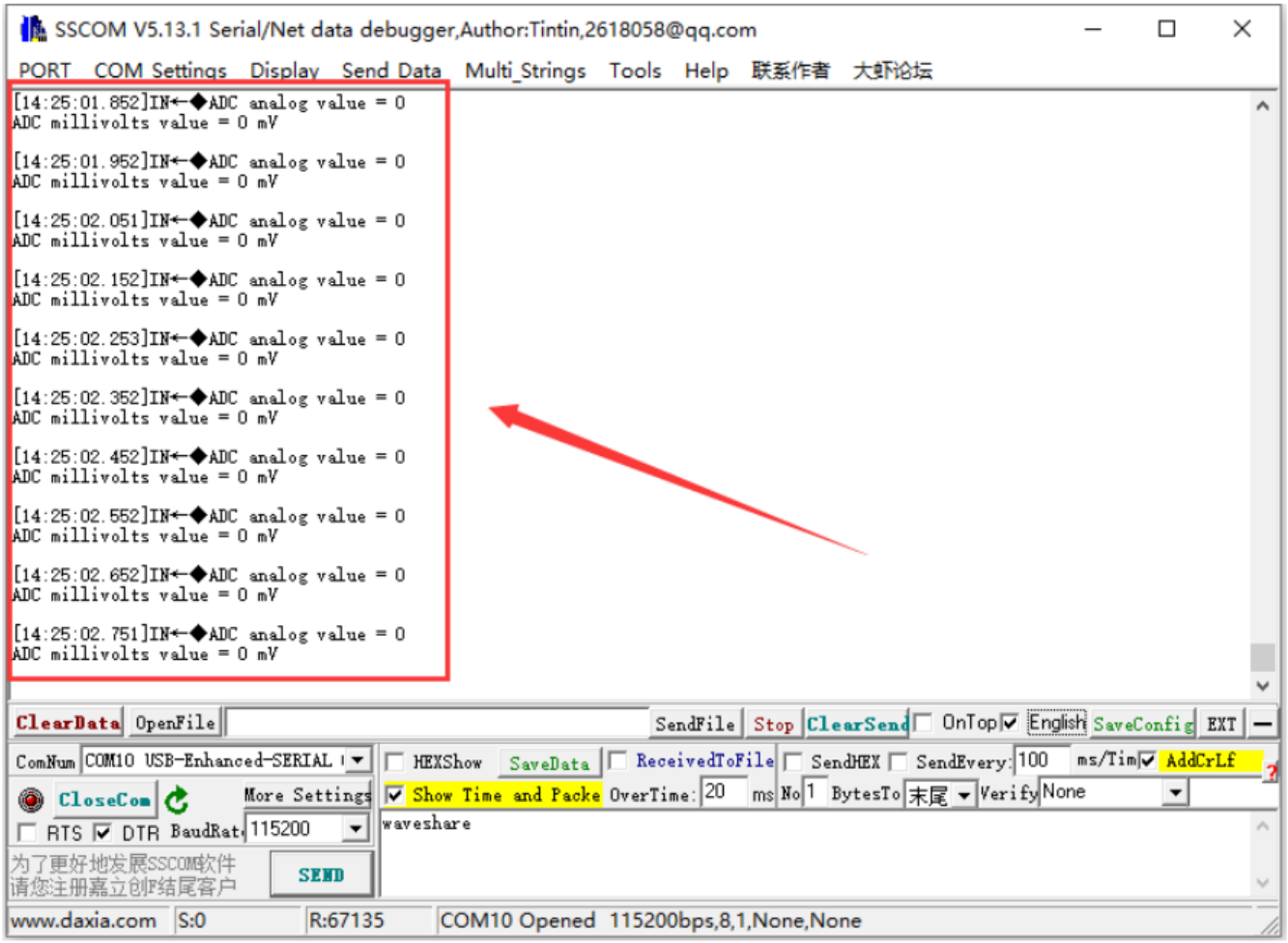
- After programming the code, connect the USB to Type-C cable to the “UART” Type-C interface. Open the serial port debugging assistant , and send a message to ESP32-S3-Touch-LCD-4.3. ESP32-S3-Touch-LCD-4.3 will return the received message to the serial port debugging assistant. Note that you need to select the correct COM port and baud rate. Check “AddCrLf” before sending the message.



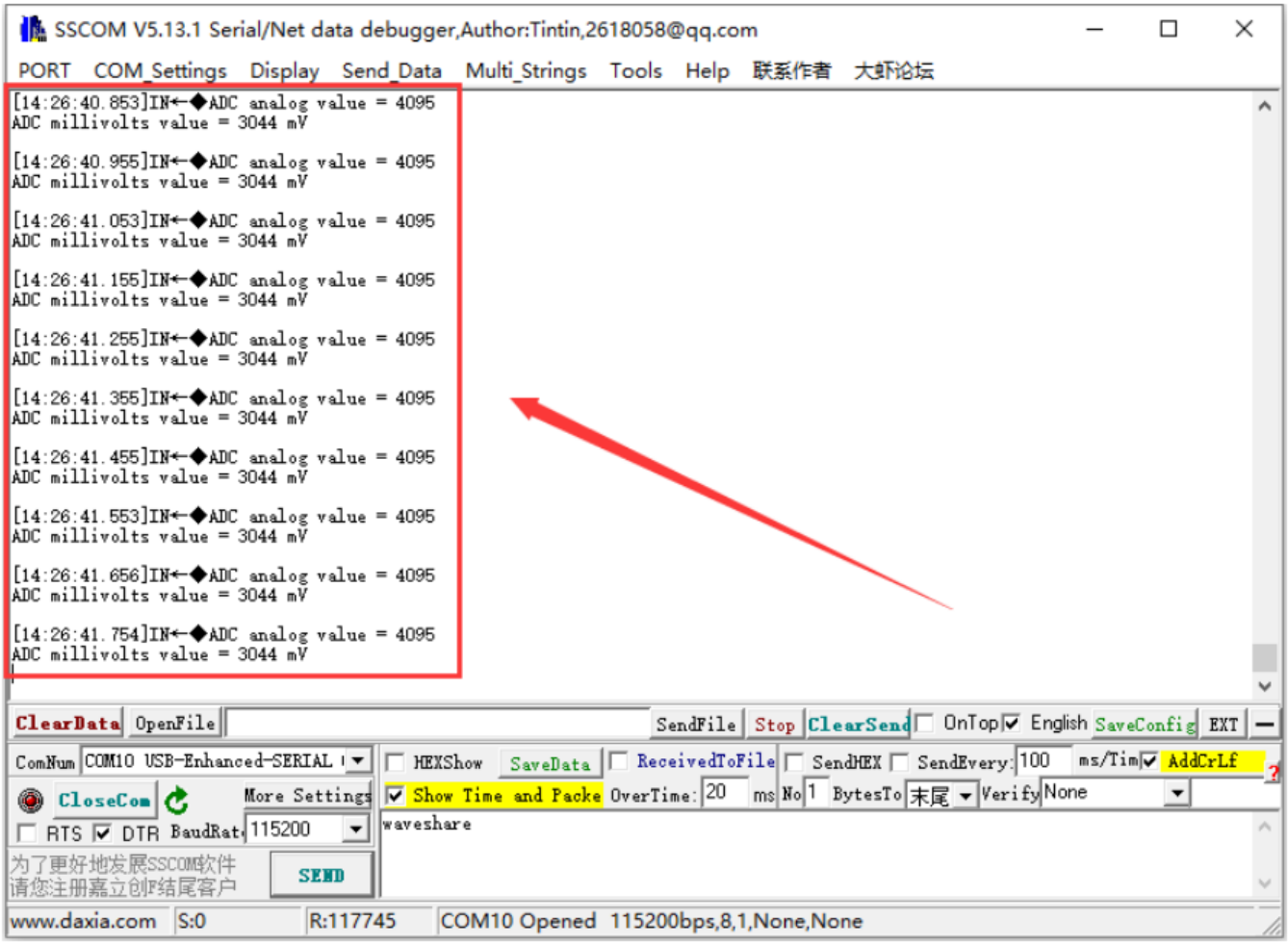
Sensor_AD
Sensor_AD example is used to test the usage of the Sensor AD socket. This interface connects to GPIO6 for ADC usage and can be connected to Sensor kits and so on.

- After burning the code, connect the Sensor AD socket to “HY2.0 2P to DuPont male head 3P 10cm”. You can then open the serial port debugging assistant to observe the data read from the AD pin. “ADC analog value” represents the analog value read from the ADC, while “ADC millivolts value” represents the ADC value converted to millivolts.

- When shorting the AD pin with the GND pin, the read value is as shown in the diagram below:



- When shorting the AD pin with the 3V3 pin, the read value is as shown in the figure below:

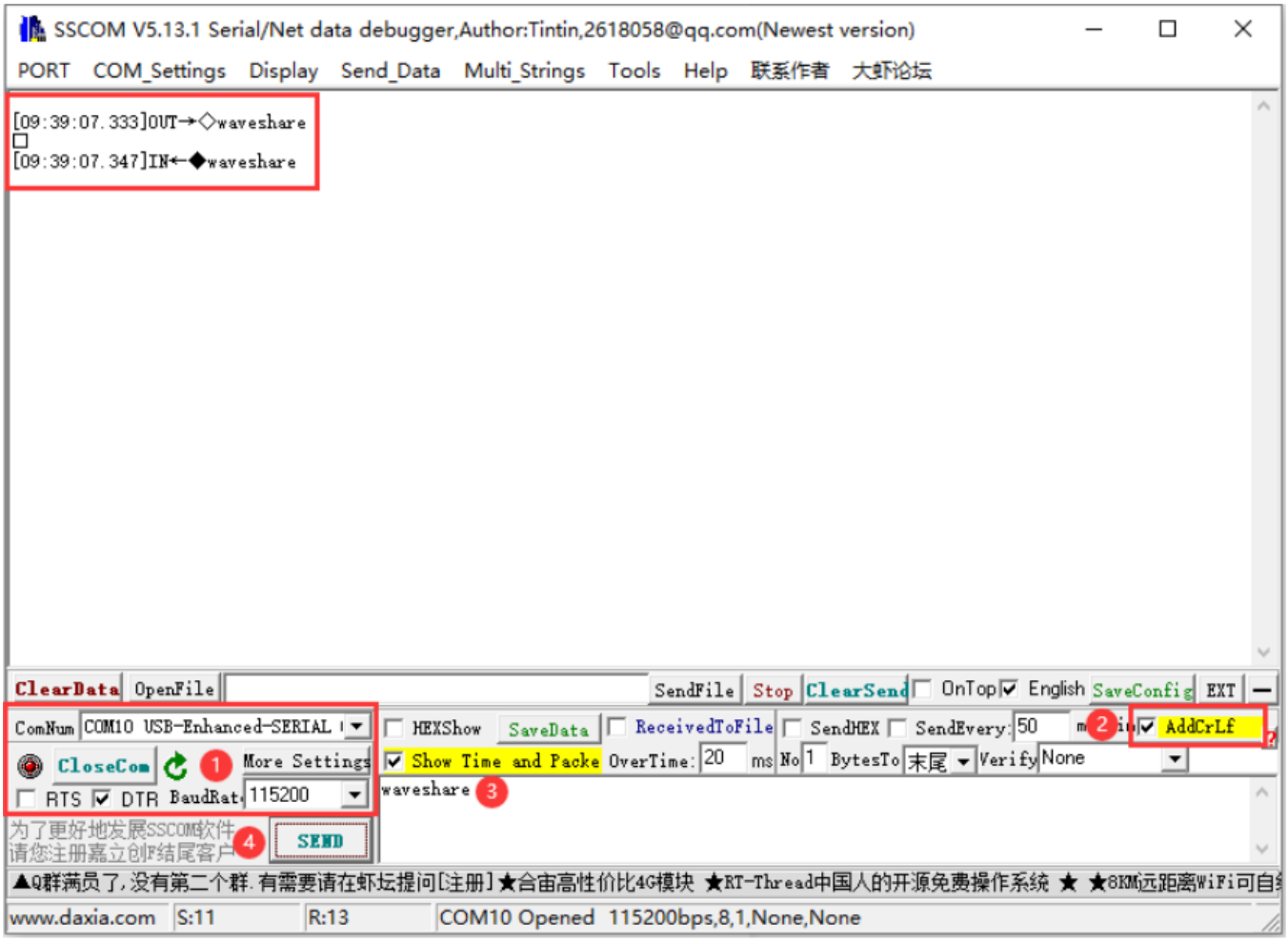


I2C_Test
I2C_Test example is for testing I2C socket, and this interface can connect to GPIO8(SDA) and GPIO9(SCL) for I2C communication.

- Using this example for driving BME680 environment sensor, and before editing, you need to install the “BME68x Sensor library” through LIBRARY MANAGER.
- After programming the code, the I2C socket is connected to “HY2.0 2P to DuPont male head 4P 10cm” and connected to the BME680 environmental sensor . This sensor is capable of detecting temperature, humidity, atmospheric pressure, and gas levels. By opening the serial port debugging assistant, you can observe: ① for temperature (°C), ② for atmospheric pressure (Pa), ③ for relative humidity (%RH), ④ for gas resistance (ohms), and ⑤ for the sensor’s status.

RS485_Test
RS485_Test example is for testing RS-485 socket, and this interface can connect to GPIO15(TXD) and GPIO16(RXD) for RS485 communication.

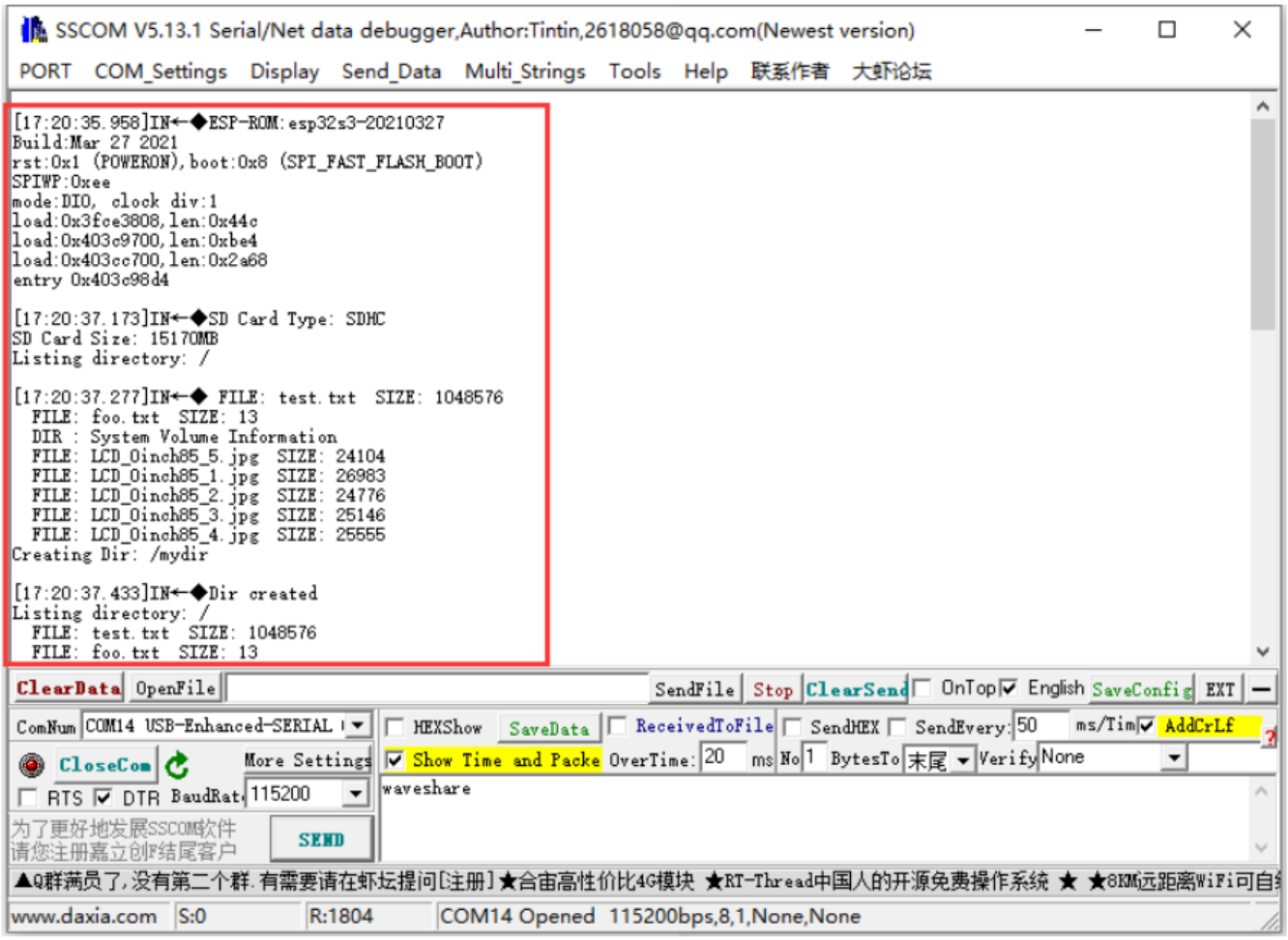
- This demo require USB TO RS485 (B) . After programming the code, the RS-485 socket can connect to USB TO RS485 (B) through a “HY2.0 2P to DuPont male head 2P 10cm” and then connect it to the PC.
- Open the serial port debugging assistant and send an RS485 message to ESP32-S3-Touch-LCD-4.3. The ESP32-S3-Touch-LCD-4.3 will return the received message to the serial port debugging assistant. Ensure to select the correct COM port and baud rate. Before sending the message, check “AddCrLf” to add a carriage return and line feed.



SD_Test

The SD_Test example is used to test the SD card socket. Before using it, insert an SD card.

- After burning the code, the ESP32-S3-Touch-*LCD-4.3 will recognize the type and size of the SD card and proceed with file operations such as creating, deleting, modifying, and querying files.



TWAItransmit
TWAItransmit example is for testing CAN socket, and this interface can connect to GPIO20(TXD) and GPIO19(RXD) for CAN communication.

- After programming the code, using the “HY2.0 2P to DuPont male head 2P red-black 10cm” cable, and connect the CAN H and CAN L pins of the ESP32-S3-Touch-LCD-4.3 to the USB-CAN-A .
- Once you open the serial port debugging assistant, you should observe that the Esp32-s3-touch-lcd-4.3 has started sending CAN messages.

Connect the USB-CAN-A to the computer and open the USB-CAN-A_TOOL_2.0 upper computer software . Select the corresponding COM port, set the baud rate to 2000000 as shown in the image, and set the CAN baud rate to 50.000Kbps. This configuration will allow you to view the CAN messages sent by the Esp32-s3-touch-lcd-4.3.

TWAIreceive
TWAIreceive example is for testing CAN socket, and this interface can connect to GPIO20(TXD) and GPIO19(RXD) for CAN communication.

- After uploading the code, use the “HY2.0 2P to DuPont male head 2P red-black 10cm” cable to connect the CAN H and CAN L pins of the ESP32-S3-Touch-LCD-4.3 to the USB-CAN-A .
- Connect the USB-CAN-A to the computer and open the USB-CAN-A_TOOL_2.0 upper computer software . Select the corresponding COM port, set the port baud rate to 2000000 as indicated in the image, and set the CAN baud rate to 500.000Kbps. With these settings, you’ll be able to send CAN messages to the Esp32-s3-touch-lcd-4.3.

lvgl_Porting

lvgl_Porting example is for testing RGB touch screen.

After uploading the code, you can try to touch it. Also, we provide LVGL porting examples for users (If there's no screen response after burning the code, check if the Arduino IDE -> Tools settings are correctly configured: choose the corresponding Flash (8MB) and enable PSRAM (8MB OPI)).

DrawColorBar
DrawColorBar example is for testing RGB screen.

After uploading the code, you should observe the screen displaying bands of blue, green, and red colors. If the screen shows no response after burning the code, check if the Arduino IDE -> Tools settings are correctly configured: choose the corresponding Flash (8MB) and enable PSRAM (8MB OPI).

ESP-IDF

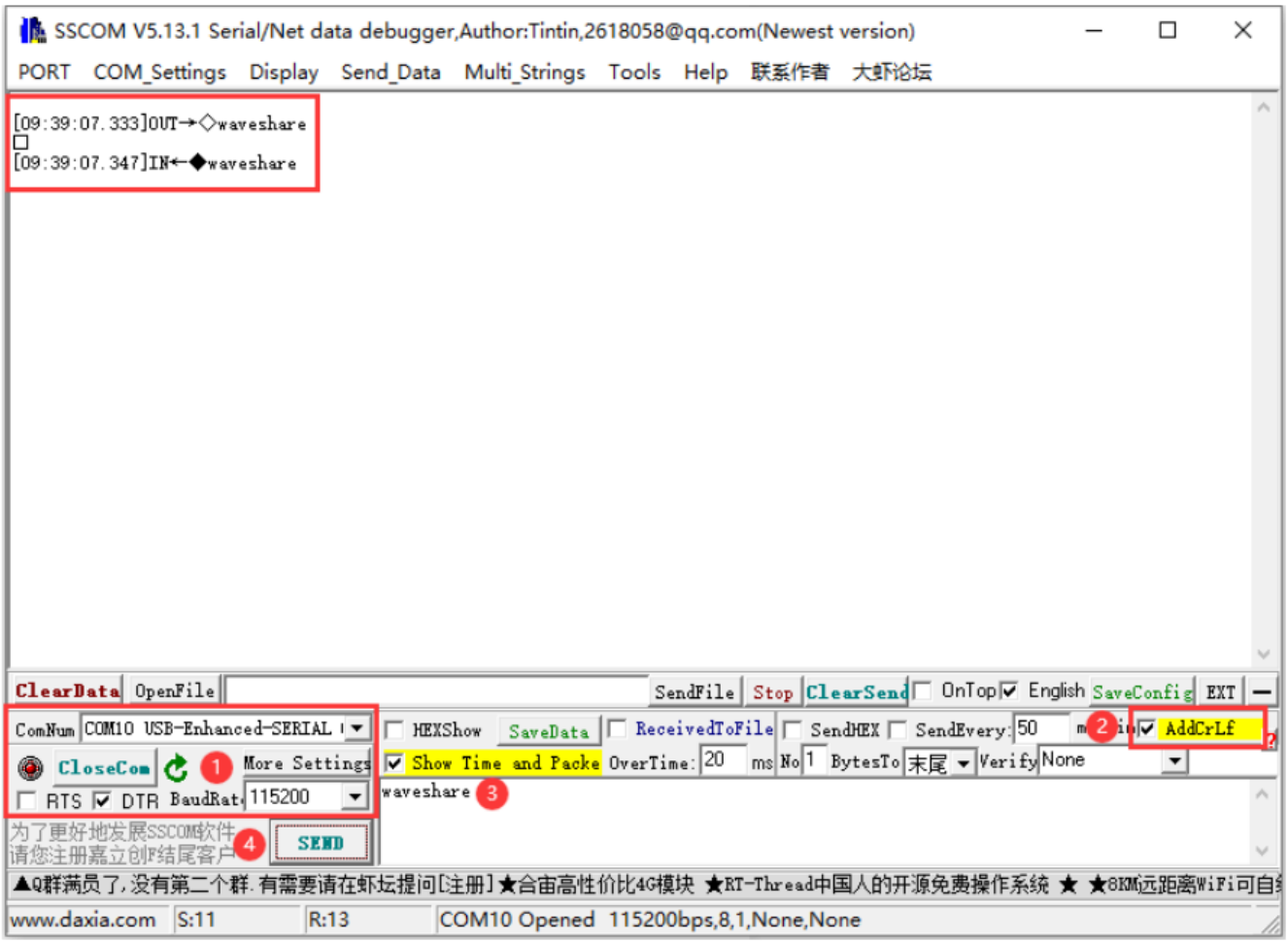
Note: Before using ESP-IDF examples, please ensure that the ESP-IDF environment and download settings are correctly configured. You can refer to the ESP-IDF environment setting for specific instructions on how to check and configure them.

esp32-s3-lcd-4.3-b-i2c_tools

- esp32-s3-lcd-4.3-b-i2c_tools example is used to test the I2C socket by scanning various I2C device addresses.
- After uploading the code, connect the I2C device (for this example, we're using the BME680 Environmental Sensor) to the corresponding pins on the ESP32-S3-Touch-LCD-4.3. Open the serial port debugging assistant , select a baud rate of 115200, and open the corresponding COM port for communication (make sure to disable ESP-IDF's COM port first, as it might occupy the COM port and prevent serial port access).
- Press the Reset key of the ESP32-S3-Touch-LCD-4.3, SSCOM prints message, input "i2cdetect" as shown below. "77" is printed, and the I2C socket test passes.

uart_echo
uart_echo example is for testing RS485 socket.

- After uploading the code, connect the USB TO RS485 and ESP32-S3-Touch-LCD-4.3 through A and B pins. Open SSCOM to select the corresponding COM port for communication after connecting USB TO RS485 to the PC.
- Select the baud rate as 115200 as shown below. When you send any character, it gets looped back and displayed. That's a good indication that the RS485 socket is working as expected.



twai_network_master
twai_network_master example is for testing CAN socket.

- After uploading the code, use the “HY2.0 2P to DuPont male head 2P red-black 10cm” cable to connect the CAN H and CAN L pins of the ESP32-S3-Touch-LCD-4.3 to the USB-CAN-A .
- Connect the USB-CAN-A to the computer and open the USB-CAN-A_TOOL_2.0 upper computer software . Select the corresponding COM port, set the port baud rate to 2000000 as shown in the image, and set a custom baud rate of 25.000Kbps (adjusting phase buffer 1 and phase buffer 2 if necessary).

Pressing the Reset button on the ESP32-S3-Touch-LCD-4.3 causes data to be printed in the data field of USBCANV2.0, confirming the successful test of the CAN socket.

demo1
demo1 example is for testing the display effect of the screen.

Resource

Document

- Schematic diagram
- ESP32 Arduino Core’s documentation arduino-esp32
- ESP-IDF
- ESP32-S3-Touch-LCD-4.3 3D Drawing

Demo

- ESP32-S3-Touch-LCD-4.3_libraries
- Sample demo

Software

- sscom serial port assistant
- Arduino IDE
- UCANV2.0.exe

Datasheet

- ESP32-S3 Series Datasheet
- ESP32-S3 Wroom Datasheet
- CH343 Datasheet
- TJA1051

FAQ

Question:ESP32-S3-Touch-LCD-4.3 CAN reception failure?
Answer:

1. Restart the COM port in UCANV2.0.exe and press the ESP32-S3-Touch-LCD-4.3 reset button multiple times.
2. Uncheck DTR and RTS in the serial port debugging assistant.

Question:ESP32-S3-Touch-LCD-4.3 shows no response after programming an Arduino program for RGB screen display?
Answer:
If there's no screen response after programming the code, check whether the correct configurations are set in Arduino IDE -> Tools: Choose the corresponding Flash (8MB) and enable PSRAM (8MB OPI).

Question:ESP32-S3-Touch-LCD-4.3 fails to compile an Arduino demo for the RGB screen and shows errors?
Answer:
Check if the "s3-4.3-libraries" library is installed. Please refer to installation steps.

Support

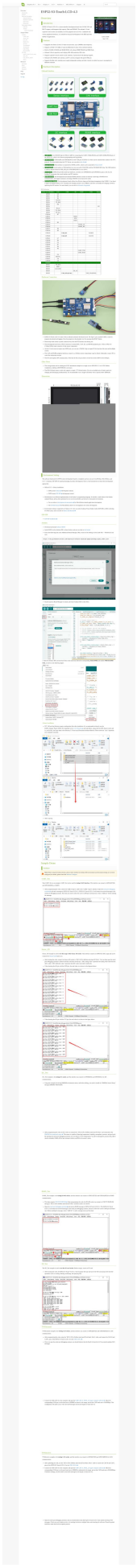
Technical Support

If you need technical support or have any feedback/review, please click the Submit Now button to submit a ticket, Our support team will check and reply to you within 1 to 2 working days. Please be patient as we make every effort to help you to resolve the issue. Working Time: 9 AM – 6 AM GMT+8 (Monday to Friday)

Submit Now

Login / Create Account

Documents / Resources



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ESP32-S3 4.3 inch Capacitive Touch Display Development Board, ESP32-S3, 4.3 inch Capacitive Touch Display Development Board, Touch Display Development Board, Display Development Board, Development Board, Board

References

- Welcome to ESP32 Arduino Core’s documentation - - — Arduino ESP32 latest documentation
- GitHub - espressif/esp-idf: Espressif IoT Development Framework. Official development framework for Espressif SoCs.
- raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json
- Software | Arduino
- User Manual