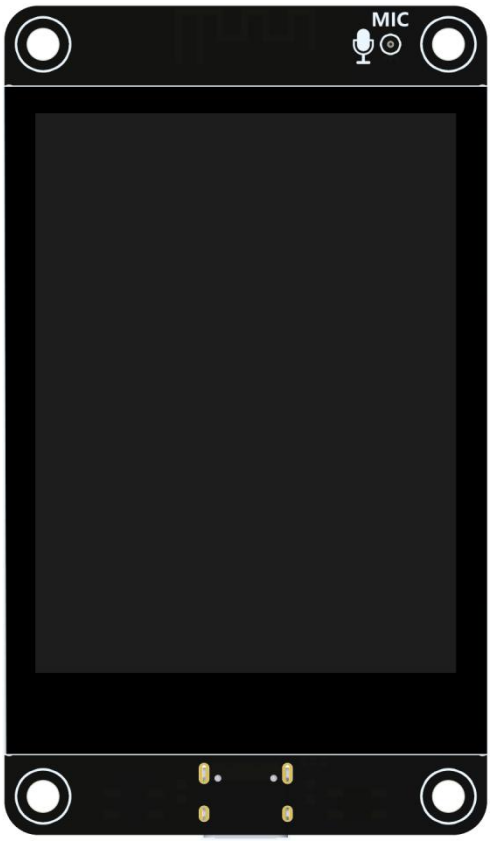
3.5 inch IPS ESP32-S3 Display Module Specification



REV	Record	Date
V1.0	First Release	2025-06-14

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1. GENERAL DESCRIPTION

1.1. Product Introduction

ES3C35P are 3.5-inch IPS display module and ESP32-S3 main control, with capacitive touch screen.opt ST77922 screen display driver IC, the resolution is 320x480, which can connect a variety of peripherals, such as IC interface devices, audio speakers, lithium batteries, MicroSD cards, serial ports, extended IO devices, etc., and also has a built-in microphone and touch function, greatly facilitates users to carry out various DIY, while meeting users to carry out Internet of Things and human-computer interaction function development.

1.2. Image

Front

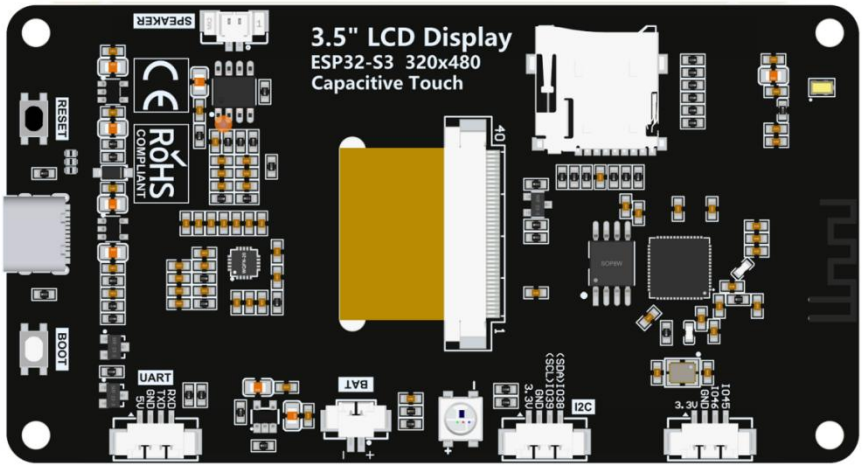

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Figure 1.1 ES3C28Pproduct diagram

1.3. Accessory List

Configure a 4P 1.25mm to 2.54mm terminal wire and a Type-C data power line. The terminal wire is 20cm long, and the Type-C line is about 1m long.

Figure 1.3 4P 1.25mm to 2.54mm terminal wire connector

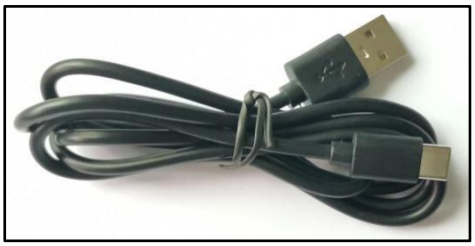

Figure 1.4 Type-C data power cable

2. PRODUCT FEATURES

2.1. Feature Description

- Equipped with ESP32-S3 main control chip, sufficient development resources, and convenient development
- 3.5-inch IPS color screen with320x480 resolution,, offering rich display colors
- Rich interfaces for easy connection various peripherals (IIC,UART,extended IO,etc.)
- Supports external speakers to play audio
- Equipped with a microphone, supporting audio input
- Equipped with RGB three-color indicator lights, offering rich status indications
- Equipped with a capacitive touch screen, facilitating human-machine interaction
- Standard TYPE-C interface for convenient program and power supply
- Equipped with a micro TF card slot, convenient for expanding storage
- Supports external lithium batteries, lightweight and portable
- Equipped with battery charging management circuit, safe battery charging and discharging
- Provides rich example programs for easy learning
- Provides low-level driver technical support, and WIKI materials are updated online
- The module undergone aging tests and multiple inspections to meet military-grade standards, supporting long-term stable operation

3. PRODUCT PARAMETERS

3.1. ESP32S3 main control parameters

item	Parameters	Unit
Main control chip	ESP32-S3	-
CPU	Xtensa LX7 32-bit dual-core processor	-
Clock frequency	240MHz (max)	-
Storage	84KB ROM+512KB SRAM+16KB RTC SRAM+8M internal OPI PSRAM +16M external SPI Flash	-
WIFI	2.4GHz, 802.11b/g/n mode	-
Bluetooth	Bluetooth V5.0 BR/EDR and Bluetooth LE standard	-
Working voltage	3.0~3.6	V

3.2. TFT Parameters

item	Parameters	Unit
Screen size	3.5	inch
Screen type	IPS TFT	-
Touch screen type	Capacitive touch screen	-
Screen resolution	320xRGBx480	pixels
Effective display area	48.96(W)x73.44(H)	mm
Visible window size	49.96±0.15(W)x74.44±0.15(H)	mm
Effective touch area	54.50(W)x83.00(H)	mm
Driver IC	ST77922	-
Display interface	QSPI(Received on ESP32-S3)	-
Communication interface	I2C（From device address:0x38）	-
Viewing angle	ALL 0'CLOCK	deg
Number of colors	MAX：16M（RGB888） TYP：65K（RGB565）	-
Back brightness (typical value)	300	cd/m^2
Backlight lamp type	White LED	-
Operating temperature	-30~80	℃
Storage temperature	-30~80	℃

3.3. Size Parameters

item	Parameters	Unit
LCD screen size	54.50±0.2(W)x83.00±0.2(H)x3.2±0.1(D)	mm
Module size	54.50(W)x101.50(H)x10.00(D)	mm

3.4. Battery charging parameters

item	Parameters	Unit
Charging voltage;	Range: 4.2~6.5 Typical value: 5.0	V
Charging current;	Maximum value: 500; Module actual: 290;	mA
Charging saturation voltage;	4.24	V
Charging temperature;	Module actual maximum value: 62	℃
Charging battery specifications	3.7V lithium polymer battery	-

3.5. Electrical Parameters

item	Parameters	Unit
Working voltage	5.0	V
Backlight current	120	mA
Backlight brightness (actual value)	300	cd/m^2
Total current	ESP32-S3 reset: 0 Only display works:198 Display, speaker, battery charging work:401	mA
Consumption power	（Only the display works）0.97 （Display, speaker, battery charging all work）1.76	W
Supported speaker power (max)	1.5(8Ω) or 2(4Ω)	W

3.6. Basic Parameters

item	Parameters	Unit
SKU	ES3C35P	-
Power interface	TYPE-C	-

Weight (including packaging)		g

4. PRODUCT INTERFACE

4.1. Interface Function Description

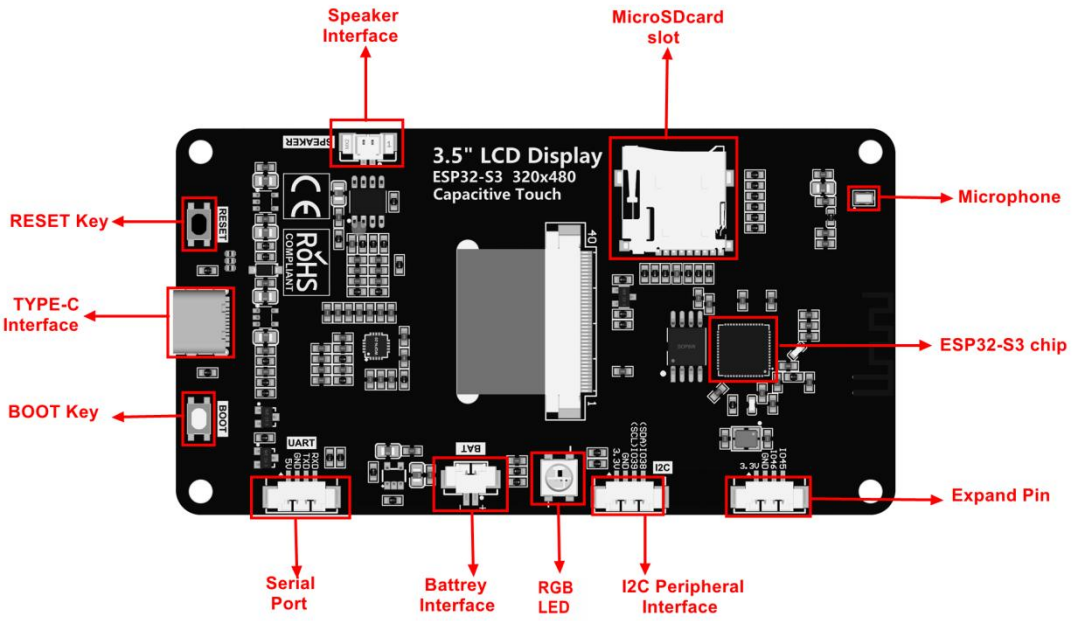

Figure 4.1 E32R28T product interface diagram

Interface name	Function Description
ESP32-S3 chip	Main control of the display module, working together with the peripheral circuit, is used to control on-board peripherals and external peripherals.
MicroSD card slot	Insert a SD card to expand storage space, such as storing large data content such as font libraries, images, audio files, etc.
RGB tricolor light	Contains LEDs of three colors: red, green, blue. It has a built-in control IC and only needs one IO port to control. It can be used for LED testing and status indication.
Serial port	1.25mm4P socket. It can be used for serial port debugging, downloading, and communication. An external USB to serial port module is required.
Battery interface	1.25mm 2P socket. Used to connect to a 3.7V polymer lithium battery, charge the battery through the battery management circuit, and can also be used for battery power supply. Note the positive and negative terminals of the interface.

BOOT button	Used to enter the download mode or key test. Press and this key to power up, then release to enter the download mode, or after powering up, press and hold this key, then press the RESET key, release the RES key and then release this key, you can also enter the download mode. When you don't need to enter the download mode, this key can be used as a normal key
TYPE-C interface	It is used for module power supply and program download, debugging. This interface is connected to the internal USB bus of ESP32-S3, which can generate a USB serial port. Note: win10 and above systems support USB virtual serial port function. If you use this interface on other versions of the system, you need to solve the problem USB virtual serial port not working by yourself.
RESET button	For ESP32-S3 main control and LCD reset, press to reset low level.
Expansion pin	1.25mm 4P socket. Two pins are GPIO45, GPIO46. It can be used to connect other peripherals.
Loudspeaker interface	1.25mm P socket. Used to connect the speaker to play audio. Used to connect the speaker to play audio (maximum support 1.5W (8Ω) or 2W4Ω) speaker).
I2C peripheral interface	1.25mm 4P socket. Used for external I2C communication device. This I2C interface and the capacitive touch and audio codec IC share. If the touch and audio functions are not used, it can be used as a normal IO.
Microphone	Downward-facing MEMS silicon microphone. Used to capture external sound. Can be used for those projects that require audio input function.

4.2. ESP32-S3 pin allocation

Device	ESP32-S3 pin	pin allocation

LCD	IO10	LCD screen chip select control signal, low level active
	IO12	LCD QSPI bus clock signal
	IO11	LCD QSPI data bus D0~D3
	IO13	
	IO14	
	IO9	
	CHIP_PU	LCD screen reset control signal, low level reset (share reset pin with ESP32-S3 main control)
	IO41	LCD screen backlight control signal (level turn on backlight, low level turn off backlight)
Capacitive touch screen	IO38	Capacitive touch screen I2C bus data signal (share with audio codec IC and extended I2C)
	IO39	Capacitive touch screen I2C bus clock signal (share with audio codec IC and extended I2C)
	IO48	Capacitive touch screen reset control signal, low level
	IO47	Capacitive touch screen interrupt input signal, input low level when touch event occurs.
RGB light	IO40	RGB three-color LED light control signal with built-in control IC. Different timing can be input to control the internal red, green and blue three kinds of beads respectively.
MicroSD Card	IO5	SD card SDIO bus clock signal
	IO4	SD card SDIO bus command signal
	IO6	SD SDIO bus data signal DATA0
	IO7	SD card SDIO bus data signal DATA1
	IO2	SD card SDIO bus data signal DATA2
	IO3	SD card SDIO bus data signal DATA3
Battery	IO8	Battery voltage ADC value acquisition input signal
Audio	IO1	Audio power amplifier IC enable pin, low level enable
	IO17	Audio I2S bus master clock signal
	IO18	Audio I2S bus bit clock signal

	IO16	Audio I2S bus bit output data signal
	IO21	Audio I2S bus left and right channel selection signal. High level: right channel; low level: left channel
	IO15	I2S bus bit input data signal
	IO38	Audio codec IC's I2C bus data signal (share with capacitive touch screen and extended I2C)
	IO39	Audio codec's I2C bus clock signal (share with capacitive touch screen and extended I2C)
Button	IO0	Download mode selection button (hold this button to power up, then release enter download mode)
	CHIP_PU	ESP32-S3 reset button, low level reset (share with LCD screen reset)
USB	IO19	USB bus differential signal data line negative
	IO20	USB bus signal data line positive
Serial port	IO43	ESP32-S3 serial port 0 receive signal interface (if the serial port communication function is not used, it can be used as a IO port)
	IO44	ESP32-S3 serial port 0 receive signal interface (if the serial port communication function is not used, it can be used as a general port)
Internal PSRAM	IO26	Internal OPI PSRAM chip select pin, active low
	IO30	Internal OPI PSRAM clock pin (shared with external flash)
	IO32	Internal O PSRAM DATA0 pin (shared with external flash)
	IO31	Internal OPI PSRAM DATA1 pin (shared with external flash)
	IO28	Internal OPI PSRAM DATA2 pin (with external flash)
	IO27	Internal OPI PSRAM DATA3 pin (shared with external flash)
	IO33	Internal OPI PSRAM DATA4 pin
	IO34	Internal OPI PSRAM DATA5
	IO35	Internal OPI PSRAM DATA6 pin
	IO36	Internal OPI PSRAM DATA7 pin

	IO37	Internal OPI PSRAM data mask and data clock read pin
External Flash	IO29	External QSPI FL chip select pin, active low
	IO30	External QSPI FLASH clock pin (shared with internal PSRAM)
	IO32	External QSPI FLASH DATA0 pin (shared with internal PSRAM
	IO31	External QSPI FLASH DATA1 pin (shared with internal PSRAM)
	IO28	External QSPI FLASH DATA2 pin (shared with internal PSRAM)
	IO27	External QSPIASH DATA3 pin (shared with internal PSRAM)
I2C expansion	IO38	Expansion interface I2C bus data signal (shared with capacitive touch screen and audio codec IC, can be used a general IO when touch and audio functions are not used, otherwise it can only be used as an I2C interface)
	IO39	Expansion interface I2C bus clock signal (with capacitive touch screen and audio codec IC, can be used as a general IO when touch and audio functions are not used, otherwise it can only be used as an I2 interface)
Expansion pin	IO45	This is 2 idle IO ports that can be used to connect peripherals
	IO46	
	GND	
	VCC	

5. PRODUCT OUTLINE DRAWING

5.1. ( ) OUTLINE DRAWING

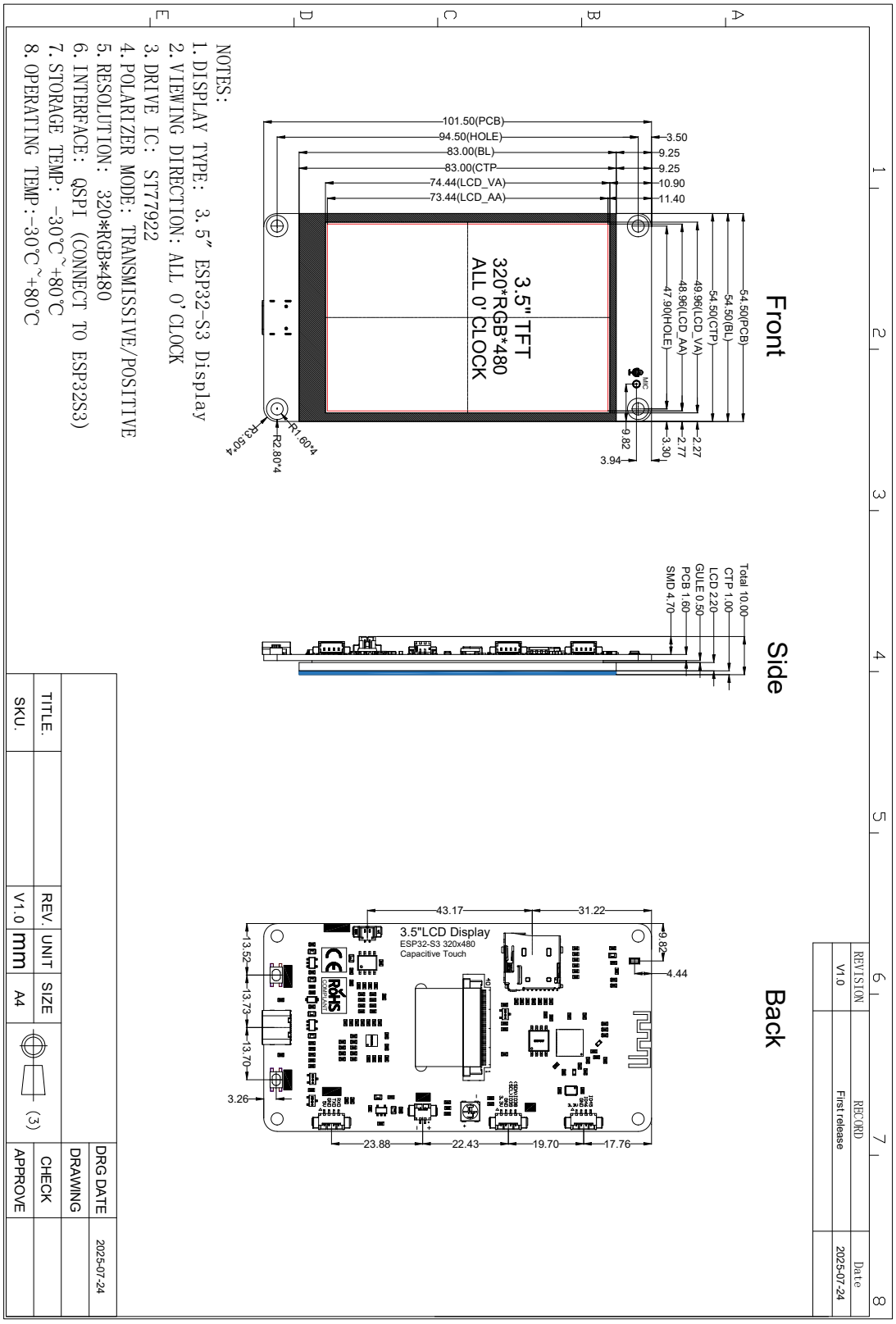

Figure 5.1 ( )Outline Drawing

6. PRECAUTIONS

6.1. Safe Use of Products

- Do not press or hit the screen violently to avoid damaging the screen
- Do not scrape the screen with hard objects to avoid scratching the screenDo not place heavy objects on the product to avoid crushing the screen
- Please keep the product clean, do not drop water or oil on the screen
- Please use a clean, soft dry cloth to wipe the screen, do not spray water or cleaning agent directly on the screen
- Do not disassemble the product at will to avoid damaging the screen or the F
- Do not place the product in a high temperature and high humidity environment
- Please place the product face up on a flat surface to avoid falling and breaking the product
- Please use the voltage to connect the product to avoid damage to the product due to excessive voltage
- When using the product, do not touch the components or pins with wet hands to avoid causing a short and damaging the product
- When not using the product for a long time, please unplug the power supply
- When charging the battery, pay attention to ventilation and heat dissipation to avoid damage the product due to high temperature
- When charging the battery, pay attention to do not touch the charging management IC to avoid being burned by high

6.2. Frequently asked questions FAQ

- **Question 1：No response after powering up the product after burning the program; the screen is also not lit.**

  Analysis：

  This product needs to pull up the backlight control pin to turn on the backlight, so make sure that the ESP32-S3 main control has flashed with a program that contains the function to turn on the backlight. If the relevant program has been flashed and the backlight is still not on, check the voltage the power interface and the contact of the power line. If using battery power, check if the battery is sufficiently charged.

If the backlight still does not respond after the operations, it is speculated that there may be a hardware circuit fault.

- **Question 2：The backlight is on after powering up the product after burning the program, but there is no display.**

Analysis：

The backlight being on indicates that the module has been powered up normally, but to display images properly, the SPI communication and control signals must also fully functional. It is necessary to check if the programmed code matches correctly, including the selection of the display driver IC, GPIO definitions, etc.

It is recommended to use tested example program for the first time, compile and download the program without any modifications to rule out the possibility of the display not lighting up due to code changes. Also, pay attention whether the compilation and download of the example program prompts success and whether the display module operates normally.

If the display still cannot be normal after multiple attempts following the above steps, it necessary to use necessary tools such as a multimeter/oscilloscope/logic analyzer to analyze and detect the signals, and contact our technical staff for assistance.

- **Question 3：The product can display normally, but there is no response to the touch.**

Analysis：

This situation may be due to the following reasons：

- The test program that is burned into the device does not have touch functionality;
- The GPIO related to touch screen control in the test software is not or defined incorrectly;
- Hardware damage, including damage to the touch control IC, damage or breakage of the touch screen flex cable, etc.

- **Question 4：The product can display, but the backlight brightness is unstable and sometimes dark.**

  Analysis：

  The backlight circuit of this product uses field-effect transistors to drive, the backlight control pin inputs a high level to turn on the backlight, low level to turn off the backlight, and the PWM signal can also be input through the backlight control pin to achieve the purpose of adjusting the brightness. If the voltage the backlight control pin changes, the brightness of the backlight will also change, which may cause the backlight to be unstable. In addition, unstable power supply voltage can also this phenomenon.

- **Question 5：The external battery of the product cannot be charged.**

  Analysis：

  The battery charging management circuit of this product is only suitable for charging 3.7V polymer lithium batteries. There may be several reasons why an external battery cannot be.：

  - The external battery category is incorrect;
  - The positive and negative poles of the battery are connected in reverse;
  - The battery power has reached saturation, and will stop charging if it is connected;
  - The charging management IC is damaged.

- **Question 6：Product burning program failed**

  Analysis：

  This product uses USB to simulate serial port (via Type-C) or external USB to serial port module (via extended serial port) to burn the program. The burning fails, there may be the following reasons.：

  - The program being flashed runs abnormally, causing the ESP32-S3 main controller to be unable to enter the flash mode. this case, you need to press and hold the BOOT key, then power on the module, and then release the BOOT key, or press and hold the BOOT key it is already powered on, then press the RESET key and release it, and finally release

the BOOT key. This will force the ESP32-S3 main controller enter the download mode, and then you can re-flash it.

- Use the Type-C interface to flash the program under the win10 system. Because the TypeC interface of this product is connected to USB, and uses USB to simulate the serial port, while the win10 system does not support the USB to simulate the serial port function In this case, you need to find another way to make the win10 system support the USB to simulate the serial port function, or flash it through the external USB to serial module.
- Computer serial port working abnormally, the serial port number selected for the product is incorrect, and the serial port is occupied by other programs, etc., cause the flash to fail.

➢ **Question 7：No sound output after connecting the product to the speaker.**

Analysis：

This situation may be due to the following reasons.：

- The programmed program is incorrect, or the program runs abnormally
- The speaker interface is in poor contact
- The speaker itself is damaged
- The speaker is too large, and the product's power amplifier circuit cannot support it