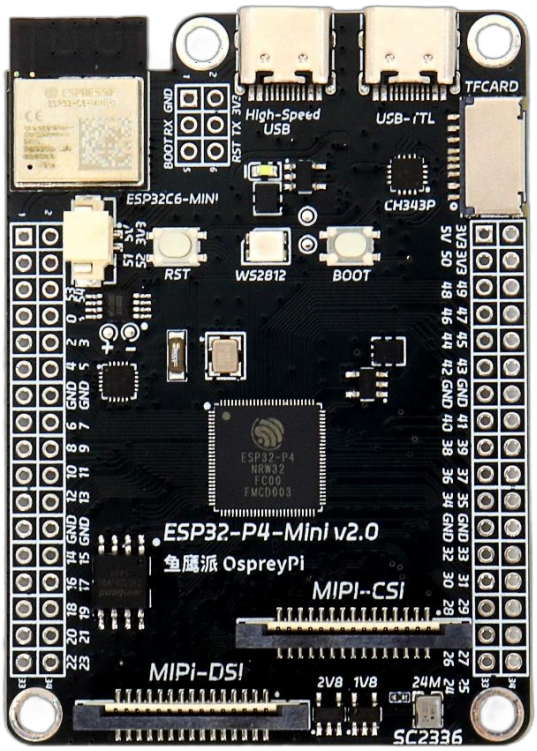
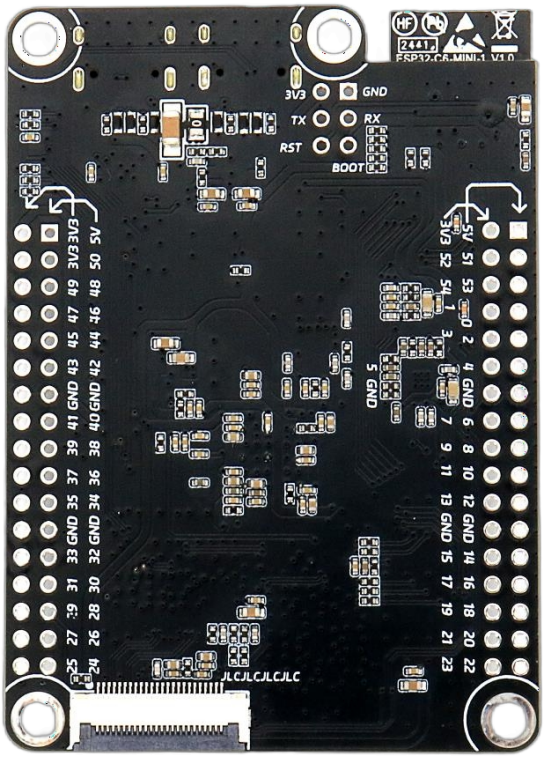




ESP32-P4-MINI V2.0 Development Board

Supports Wi-Fi 6 and Bluetooth modules

The ESP32-P4-MINI is a powerful, feature-rich, high-performance IoT development board. At its core lies the ESP32-P4 dual-core RISC-V application processor and the ESP32-C6 Wi-Fi 6 + Bluetooth 5 (LE) dual-mode module, forming a robust architecture comprising a main controller and a coprocessor. The development board integrates camera interfaces, display interfaces, and audio output

, and high-capacity storage, and features a dual Type-C interface design. It is specifically designed for advanced applications such as AIoT, multimedia, smart home, and industrial control that require powerful processing capabilities, extensive connectivity, and multimedia functions.

Features

· **Powerful dual-core main controller**: Equipped with the ESP32-P4 NRW32, featuring a built-in dual-core 400MHz RISC-V processor, providing robust main controller computing power.

High-speed wireless connectivity: Features an on-board ESP32-C6-MINI-1-N4 module, providing Wi-Fi 6 (802.11ax) and Bluetooth 5 Low Energy connectivity to ensure high-speed, stable wireless communication.

Extensive multimedia interfaces: Supports CSI cameras and DSI displays, enabling easy implementation of image capture and display functions.

High-quality audio capabilities: Integrated with the ES8311 high-performance audio codec and NS4150B Class D audio amplifier, supporting microphone input and speaker output for voice recognition and audio playback.

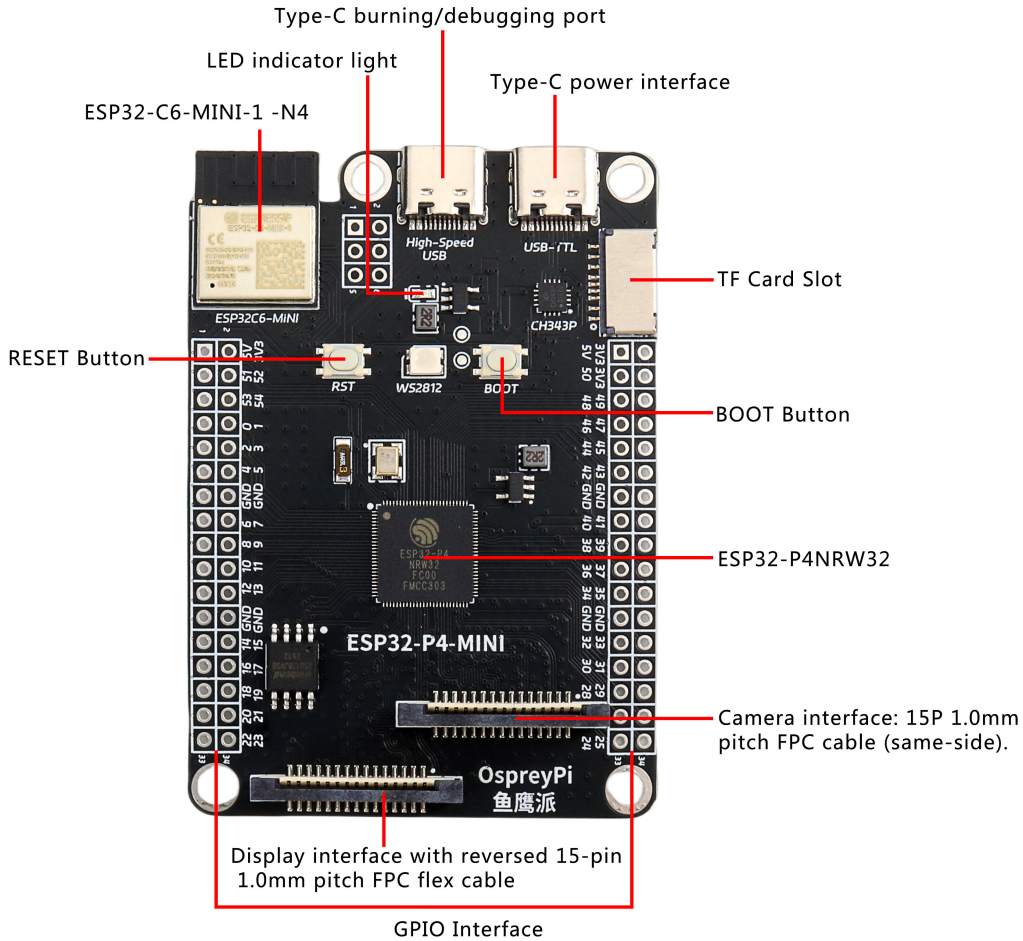
Flexible storage expansion: Features 128M-bit on-board SPI Flash and a TF card (MicroSD) slot for further storage expansion.

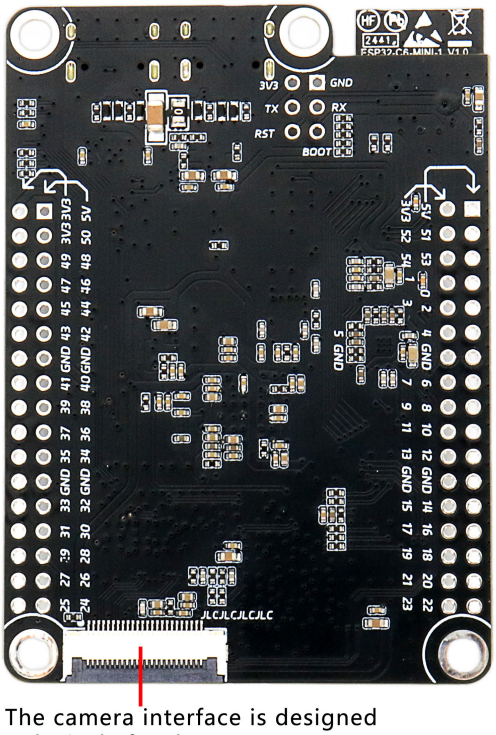
Stable and efficient power supply: Utilises the TLV62569 synchronous buck converter to provide efficient and stable 5V to 3.3V and 3.3V to 1.2V power conversion.

Convenient development and debugging: A dedicated USB Type-C debugging interface is separated from the power interface to avoid conflicts and simplify the development process.

- 32 MB PSRAM integrated within the chip package, with 16 MB NOR Flash integrated externally
- The board features a 2×2×34-pin header, providing 55 remaining programmable GPIO pins
- Security mechanisms: Secure boot, Flash encryption, hardware encryption accelerator and hardware random number generator. It also supports hardware access protection, enabling access permission management (APM) and privilege separation.

Component Overview





The camera interface is designed exclusively for the SC2336 camera.

Essential Hardware

- 1 x ESP32-P4-MINI V2.0 development board
- 1 x USB 2.0 cable (Standard Type-A to Micro-B)
- 1 x computer (Windows, Linux or macOS)

Note: Please ensure you use a suitable USB cable. Some cables are designed for charging only and cannot be used for data transfer or programming.

Hardware Setup

1. Insert the USB cable, connecting the PC to the development board’s Type-C programming and debugging ports respectively.

Software Setup

Use Visual Studio Code and ESP-IDF to configure the settings.

Hardware Reference

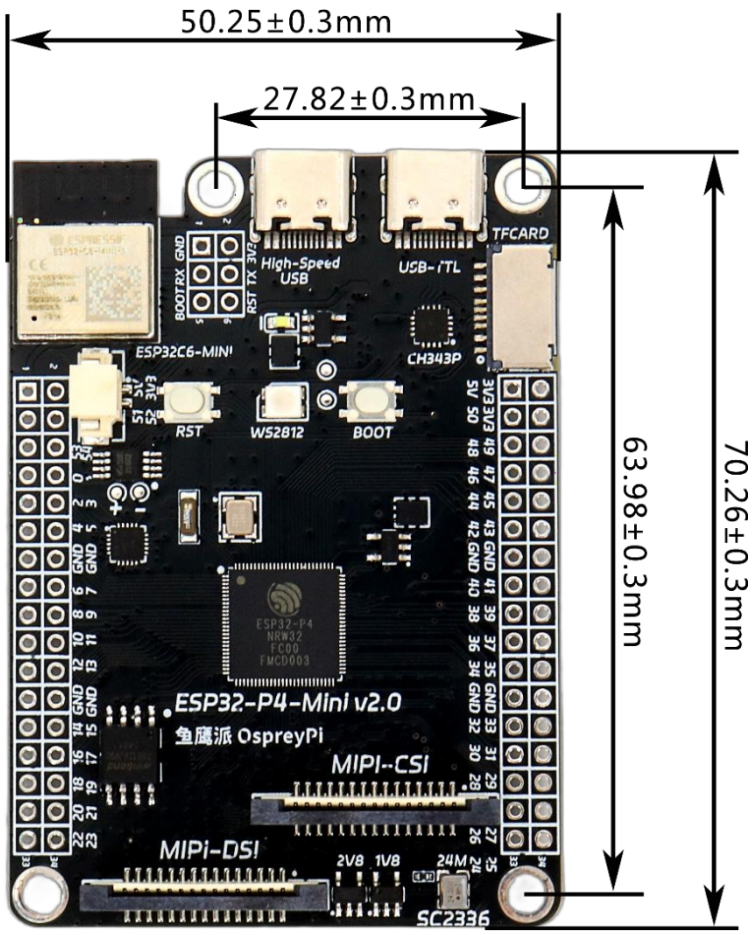
Hardware Configuration Options

Automatic Download

There are two ways to put the ESP development board into download mode:

- Manually press the Boot and RST buttons, then release the RST button first, followed by the Boot button.
- Have the software perform the download automatically. The software uses the DTR and RTS signals on the serial port to control the state of the ESP development board's EN and IO0 pins. For further details, please refer to the ESP32-P4-MINI V2.0 development board schematic diagram.

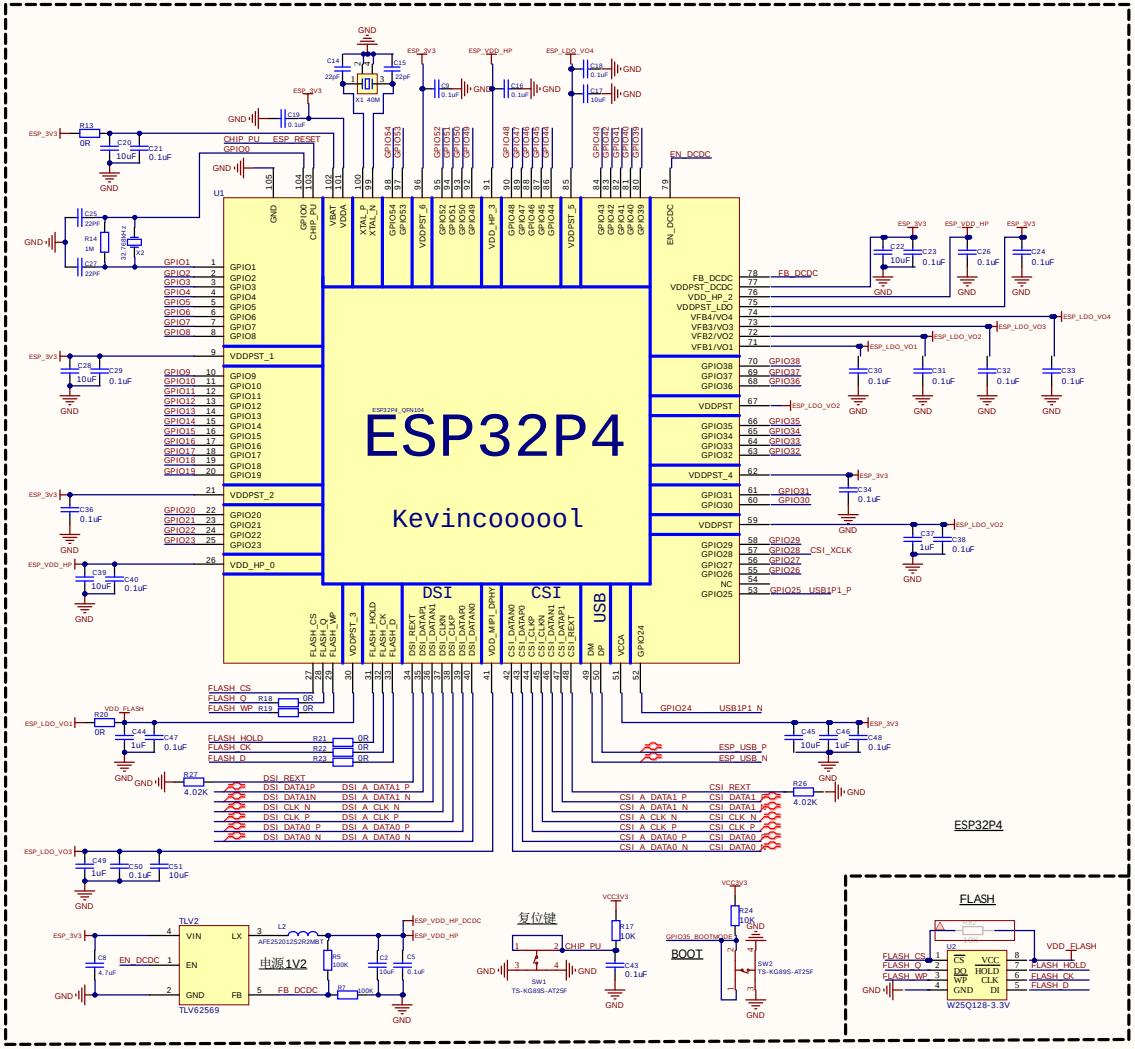
Dimensions

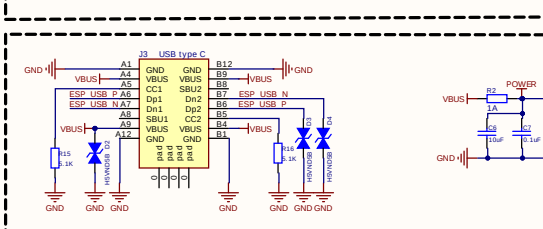


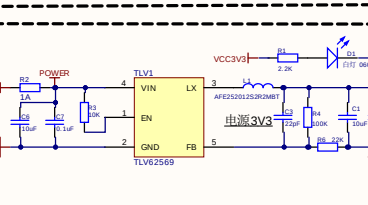
Hardware Versions

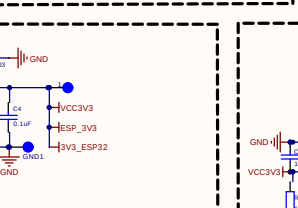
Historical Versions of the ESP32-P4-MINI Development Board

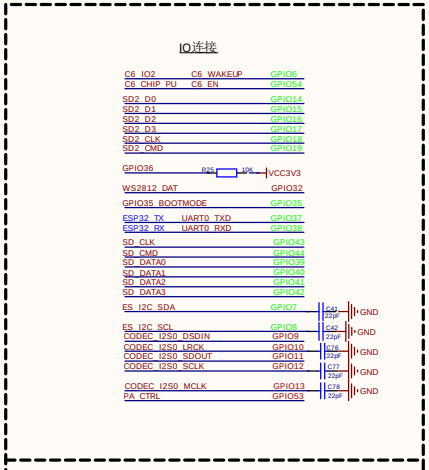
Schematic

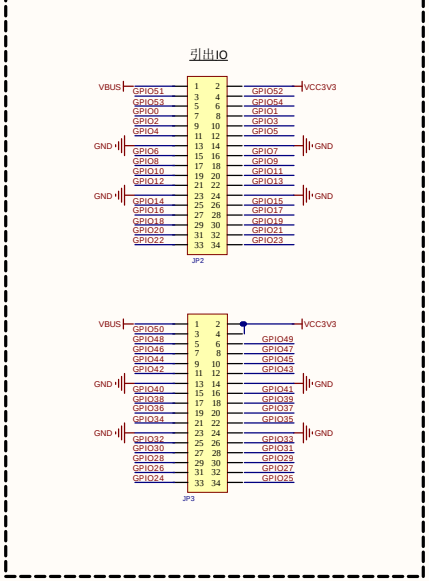

ESP32P4
Kevincoooool
ESP32P4_QFN104
DSI
CSI
USB
GND
ESP_3V3
ESP_VDD_HP
ESP_LDO_VO4
ESP_LDO_VO1
ESP_LDO_VO2
ESP_LDO_VO3
VDD_HP_0
VDDPST_1
VDDPST_2
VDDPST_3
VDDPST_4
VDDPST_5
FLASH_CS
FLASH_Q
FLASH_WP
FLASH_HOLD
FLASH_CK
FLASH_D
DSI_REXT
DSI_DATA1P
DSI_DATA1N
DSI_CLKN
DSI_CLKP
DSI_DATA0P
DSI_DATA0N
CSI_REXT
CSI_DATA1P
CSI_DATA1N
CSI_CLKN
CSI_DATA0P
CSI_DATA0N
CSI_RESET
DM
DP
VCCA
GPIO24
USB1P1_N
USB1P1_P
CSI_XCLK
EN_DCDC
FB_DCDC
CHIP_PU
ESP_RESET
GPIO0
ESP_USB_P
ESP_USB_N
ESP32P4

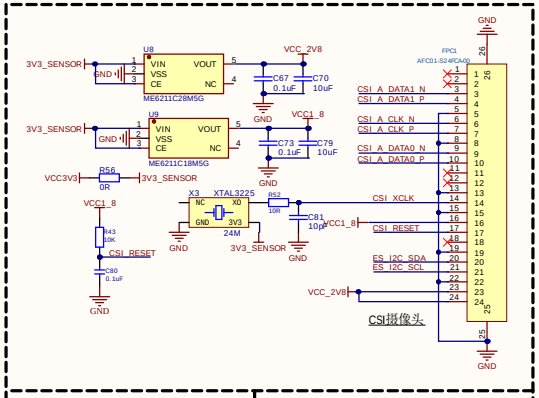

TLV2
TLV62569
电源1V2
EN_DCDC_1
FB_DCDC
ESP_VDD_HP_DCDC
ESP_VDD_HP

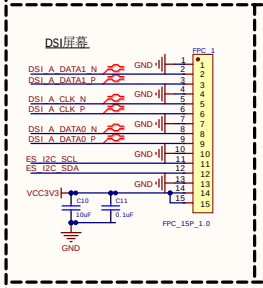

复位键
CHIP_PU
BOOT
GPIO35_BOOTMODE
SW1
SW2
TS-KG89S-AT25F

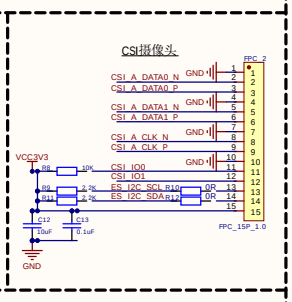

FLASH
W25Q128-3.3V
FLASH_CS
FLASH_Q
FLASH_WP
FLASH_HOLD
FLASH_CK
FLASH_D
VDD_FLASH

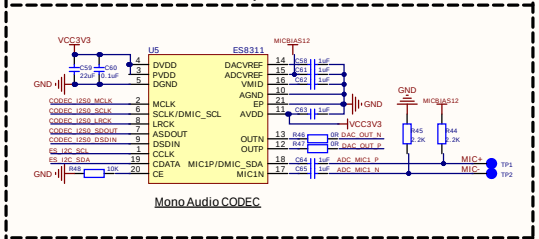

IO连接
C6_IO2
C6_WAKEUP
C6_CHIP_PU
C6_EN
SD2_D0
SD2_D1
SD2_D2
SD2_D3
SD2_CLK
SD2_CMD
GPIO36
WS2812_DAT
GPIO35_BOOTMODE
ESP32_TX
UART0_TXD
ESP32_RX
UART0_RXD
SD_CLK
SD_CMD
SD_DATA0
SD_DATA1
SD_DATA2
SD_DATA3
ES_I2C_SDA
ES_I2C_SCL
CODEC_I2S0_DSDIN
CODEC_I2S0_LRCK
CODEC_I2S0_SDOUT
CODEC_I2S0_SCLK
CODEC_I2S0_MCLK
PA_CTRL

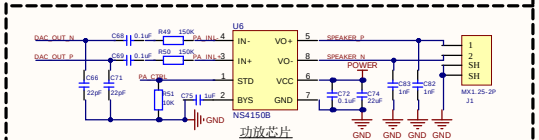

引出IO
JP2
JP3


3V3_SENSOR
VCC_2V8
VCC1_8
ME6211C28M5G
ME6211C18M5G
XTAL3225
24M
CSI_XCLK
CSI_RESET
CSI_A_DATA0_N
CSI_A_DATA0_P
CSI_A_DATA1_N
CSI_A_DATA1_P
CSI_A_CLK_N
CSI_A_CLK_P
ES_I2C_SDA
ES_I2C_SCL
CSI摄像头

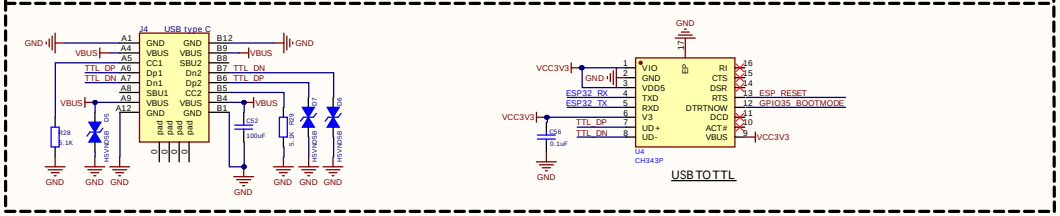

DSI屏幕
DSI_A_DATA1_N
DSI_A_DATA1_P
DSI_A_CLK_N
DSI_A_CLK_P
DSI_A_DATA0_N
DSI_A_DATA0_P
ES_I2C_SCL
ES_I2C_SDA
FPC_15P_1.0

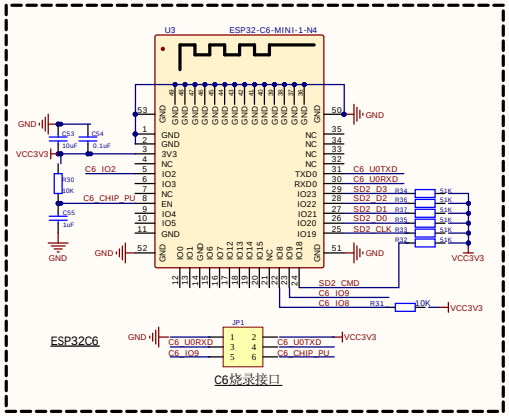

CSI摄像头
CSI_A_DATA0_N
CSI_A_DATA0_P
CSI_A_DATA1_N
CSI_A_DATA1_P
CSI_A_CLK_N
CSI_A_CLK_P
CSI_IO0
CSI_IO1
ES_I2C_SDA
ES_I2C_SCL
FPC_15P_1.0

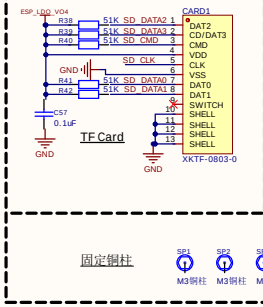

U5
ES8311
Mono Audio CODEC
MIC1P
MIC1N
MICBIAS12

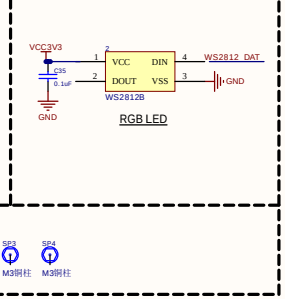

U6
NS4150B
功放芯片
SPEAKER_P
SPEAKER_N
PA_CTRL

J3 USB type C
POWER
TLV1
TLV62569
电源3V3
VCC3V3
ESP_3V3
3V3_ESP32


J4 USB type C
TTL_DP_A6
TTL_DN_A7
TTL_DP
TTL_DN
USB TO TTL
CH343P
ESP_RESET
GPIO35_BOOTMODE


U3
ESP32-C6-MINI-1-N4
ESP32C6
C6烧录接口
C6_U0RXD
C6_U0TXD
C6_IO9
C6_CHIP_PU
C6_IO8
SD2_CMD
SD2_CLK
SD2_D0
SD2_D1
SD2_D2
SD2_D3


CARD1
TF Card
XKTF-0803-0


WS2812B
RGB LED
WS2812_DAT

固定铜柱
SP1
SP2
SP3
SP4
M3铜柱