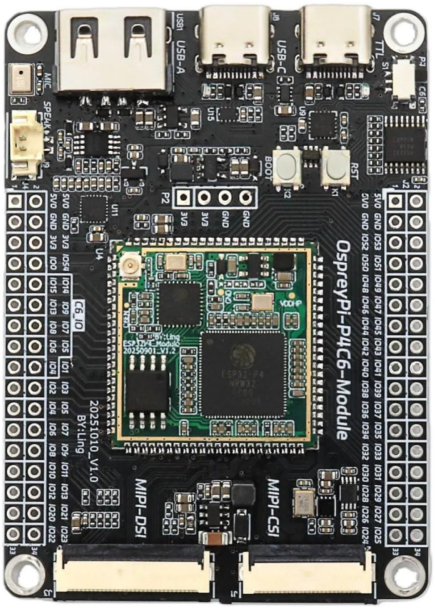
Product Manual of ESP32P4C5

ESP32-P4-Module osptek®



ESP32-P4-Module

Support wi-fi6 and bluetooth module

The esp32-p4 module is a high-performance, multi-functional embedded core system module. its design core is the esp32p4c6/esp32p4c5 core board

This module provides extremely rich peripheral interfaces and functional units, including cameras, displays, audio, usb and a variety of power supplies

Circuit protection, specifically designed for advanced iot applications requiring complex human-machine interaction, multimedia processing, multi-protocol wireless connectivity, and high-speed data communication

It greatly simplifies the product development process and enables alot (artificial intelligence internet of things), multimedia processing, industrial control and complex human-machine

The cross application provides a highly integrated, stable and reliable development platform.

Essential hardware

1 x esp32-p4 module
1xusb2.0 data cable (standard a type to micro-b type)
1 x computer (windows, linux or macos)

Note:please make sure to use the correct usb data cable.some data cables can only be used for charging and cannot be used for data transmission and programming.

Development and debugging

Software settings: use visualstudiocode, set up with esp-idf, and use flash_download_ tool to download firmware

Serial port debugging: connect to the computer through the onboard usbtottl interface (ch343), and the serial port can be recognized in the device manager for log printing and debugging.

Firmware download: via the rs2233 analog switch, you can select to flash firmware to either the esp32-p4 or esp32-c6 core independently. software development: supports the esp-idf development framework, enabling the development of p4 core applications.

Hardware version

Date	Version	Change content
20251023	V1.1	1. initial release
20251024	V1.2	2. optimize pcb and add power input tvs
20260228	V1.3	3. mipi_csi interface reset pull-up resistor should be changed to 1.8v. for i/o, open-drain output is recommended 4. the bottom board is compatible with p4c6 module and p4c5 module

Schematic diagram

Functional features

High-performance mcu equipped with risc-v32 slot dual-core and single-core processor

· 128 KB HP ROM,16 KB LP ROM，768 KB HP L2MEM，32 KB LP SRAM，8 KB TCM

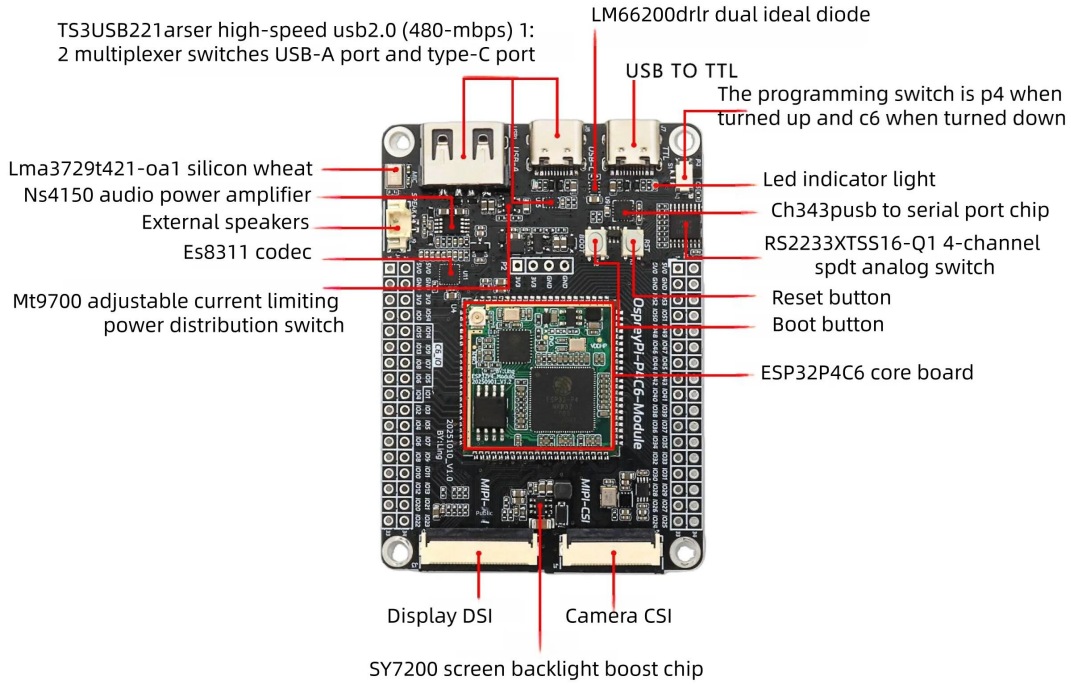
·powerful image and voice processing capabilities, image and voice processing interfaces include jpeg codec, pixel processing accelerator (ppa), image signal processor (isp), and h264 video encoder.

·32mbpsram is stacked inside the chip package, and 16mb serial flash is integrated outside the package

·2*2*17 pins are led out on the board, 55 remaining programmable gpios of esp32-p4 are led out, and 9 gpios of esp32-c6/esp32-c5 are led out

Security mechanisms: secure boot, flash encryption, hardware encryption accelerator, and hardware random number generator. it also supports hardware access protection, enabling access control management (apm) and separation of duties.

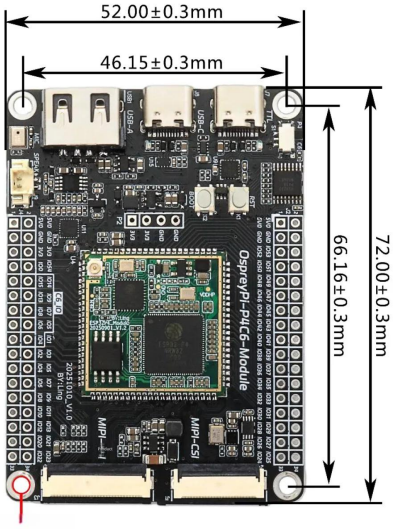
Introduction to components



Core configuration

Category	Components	Function description
Main controller	Esp32p4c6 core board	Esp32-p4: high-performance xtensa? or risc-v application processor with a clock frequency of up to 400 mhz and integrated rich peripherals. Esp32-c6: wireless coprocessor supporting 2.4ghz wi-fi 6, bluetooth 5.0(le) and 802.15.4(zigbee/thread).
	Esp32p4c5 core board	Esp32-p4: high-performance xtensa? or risc-v application processor with a clock frequency of up to 400 mhz and integrated rich peripherals. Esp32-c5: supports 2.4&5ghz dual-band wi-fi6, bluetooth5(le) and ieee802.15.4 (zigbee, thread) wireless coprocessor.
Usb system	TS3USB221ARSER	High-speed usb2.0 (480mbps) 1:2 multiplexer for switching between type-c and usb-a interfaces.
Audio system	ES8311、NS4150 LMA3729T421-OA1	Es8311: low-power, high-performance mono audio codec. ns4150: 3w mono class d audio power amplifier, driving the speaker. lma3729t421-oa1: silicon-based microphone for high-precision audio acquisition.
Display system	SY7200	High-efficiency screen backlight boost chip, providing constant current drive for dsi displays.
Power management	LM66200DRLR、MT9700	Lm66200drlr: dual ideal diode, implementing oring logic to prevent reverse current flow between different power supply inputs. mt9700: adjustable current-limiting power distribution switch, providing overcurrent and short-circuit protection for usb-a output ports.
Interface		Front: csi camera interface (24p0.5mm upper and lower connections), dsi display interface (30p0.5mm upper and lower connections) supports ydp400bt001-v4 screen back: mipi-csi (15p1.0 mm upper and lower connections, compatible with raspberry pi interface), mipi-dsi (15p1.0mm upper and lower connections, compatible with raspberry pi interface)

Product Size



Suitable for m3 screws