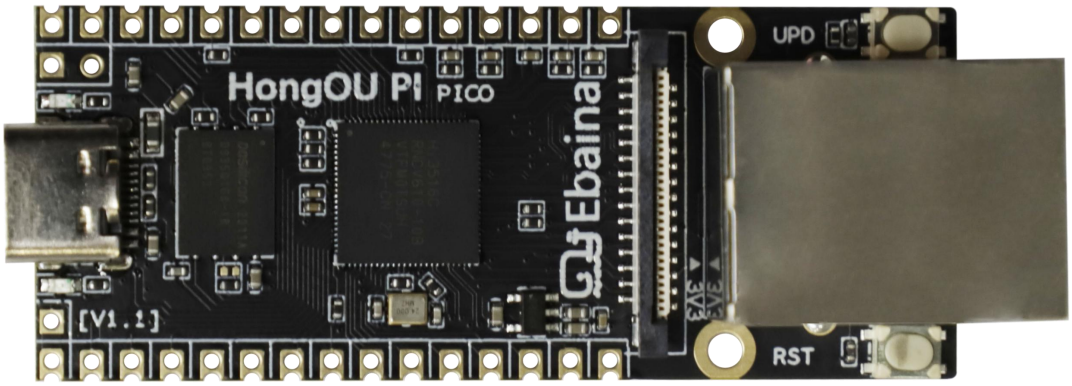
1. Product overview

1.1 Product Introduction

HongOU PI PICO Development board is a circuit board specially designed for fast hardware and software development and learning. Provide a basic hardware platform for developers. Help developers quickly build and test hardware systems, reduce development costs and time. Support developers to start quickly and customer products fast mass production.

HongOU PI PICO The development board uses HI3516CV610 (ARM Cortex-A7 MP2) chip, supports up to 2 sensor input, supports ISP image processing capacity of up to 6 M @ 30 fps, supports multi-level noise reduction and other traditional image enhancement and processing algorithms to support efficient neural network inference engine, up to 1 Tops computing power. Support for the industry's mainstream neural network framework. Support Transformer feature acceleration, built-in exclusive multi-modal large model, tools support model efficient production and evolution. Built-in face shape car shape detection / package detection / pet detection algorithm. Development board miniaturization PICO version, can expand the interface.

Provide stable and reliable soft and hard platform, official SDK, board card source code, bottom board source files, official documents, rapid development documents, etc.



Product appearance

1.2 Product Configuration

- NPU: 1 Tops computing performance supports Transformer feature acceleration
- DDR: internal DDR 3 / 3L 2133Mbps
- Ethernet: 1 * RJ45 10 M / 100 M Adaptive Ethernet port

- Video code: 38402160 @ 20 fps + 1280720@20fps H264 / 265 / SVAC 3.0 code
- Image code: 38402160 @ 20 fps (YUV420) JPEG code
- RST: 1 * Reset button
- USB2.0:1 * Type C Host / Device interface supports dynamic switching
- UART: Side needle placement
- Power supply: Type C 5V / 2A, power consumption: 3W

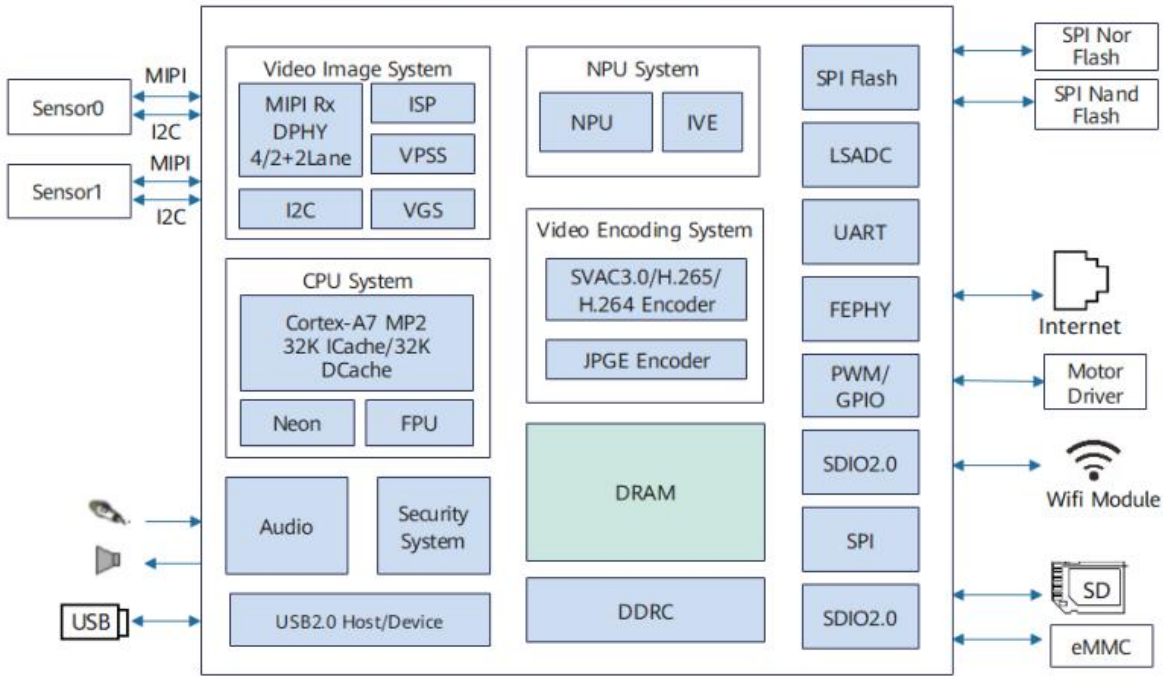
1.3 Application field

- Intelligent monitoring: used to build high-definition monitoring system, such as security monitoring, traffic monitoring, etc.
- Smart home: it can be integrated into the smart home system to realize the monitoring and control of home devices.
- Industrial automation: in the industrial production environment, used to monitor the status of equipment, production process, etc.
- Robotics: used for the visual perception and control of robots.
- Intelligent traffic: such as traffic signal light control, vehicle identification, etc.
- Medical imaging: used in image acquisition and processing in medical devices.
- Educational research: for students and researchers to develop and experiment on related projects.

2. product presentation

2.1 Chip parameters

Hi3516CV610 20S Based on the ARM Cortex-A7 main frequency of 950 MHz, Hi3516CV610 is an IPC SoC applied in the security market. In the open development of the industry, the new generation of video, codec standard network security and privacy protection, artificial intelligence, mainly for the indoor and outdoor scene, gun machine, hemisphere machine, conch machine, gun ball machine, binocular long and short coke machine and other product forms, to create highly competitive solutions and products. According to the different functions, the Hi3516CV610 is divided into 00B / 10B / 20B / 00S / 20S models.



Hi3516CV610 Chip block diagram

The video encoder embedded in Hi3516CV610 not only supports ultra HD H.265/H.264/SVAC3.0 code. It also supports multi-stream encoding, up to 38402160 @ 20 fps + 1280720 @ 20 fps. With this feature, the camera's video can be encoded to a higher resolution and stored in local memory, while transferring another low-resolution video to cloud storage.

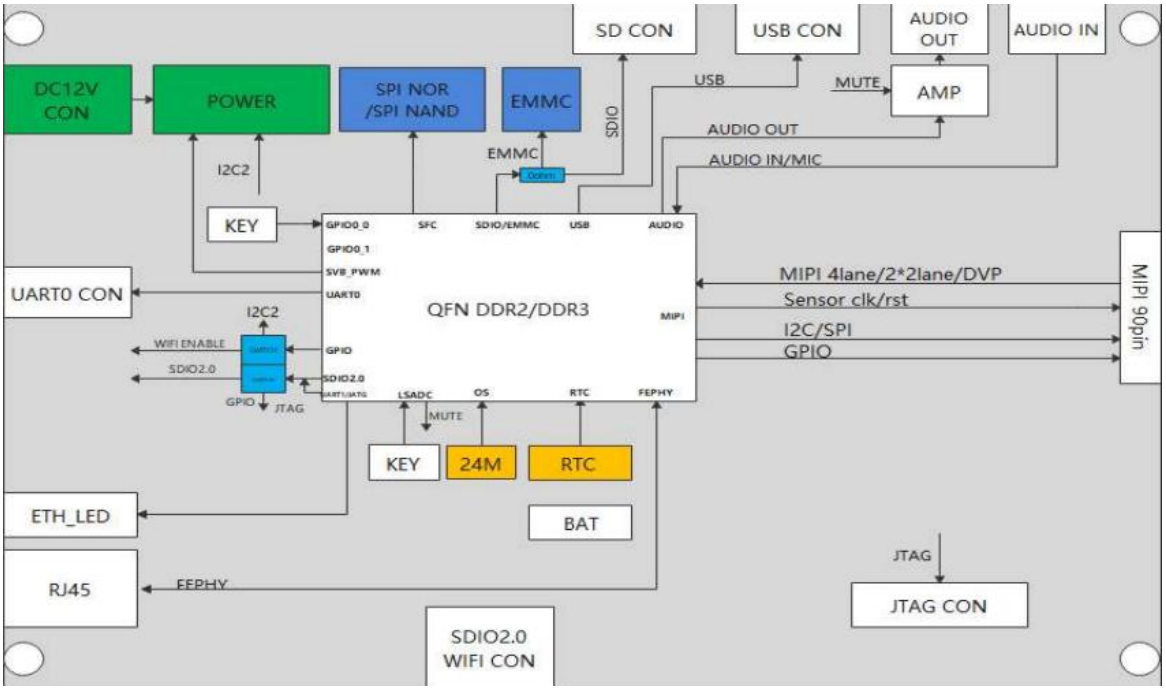
2.2 Product Parameter

function	type	Hardware parameters
processor	CPU	Support for the ARM Cortex-A7 MP2 clock rate of 950 MHz,
	NPU	1 Tops computing performance supports Transformer feature acceleration
memory	DDR	Built-in DDR 3 / 3L 2133Mbps
	eMMC	N/A
	FLASH	SPI NAND FLASH 128MB

Codec performance	video coding	3200x1800@30fps+1280x720@30fps -3840x2160@20fps+1280x720@20fps H264 / 265 / SVAC 3.0 code
	Video decoding	N/A
	Picture coding	38402160 @ 20 fps (YUV420) JPEG code
	Picture decoding	N/A
Video interface	MIPI RX	4Lane MIPI RX DPHY
network interface	Ethernet (Ethernet)	1 * RJ45 10 M / 100 M Adaptive Ethernet port
USB joggle	USB2.0	The 1 * Type C Host / Device interface supports dynamic switching
Serial port interface	DEBUG	3P debug Debug the interface
	UART	Side row needle
Alarm interface	electric relay	N/A
	GPIO	Side row needle
Other interfaces	LED	1 * PWR LED (red) 1 * RUN LED (green)
Key interface	RST	The 1 * Reset button is pressed
	UPD	The 1 * Update button is pressed
Encryption function	Cryptochip	N/A
Side row needle extended function	TF card slot	Expanded 1 * Micro SD card holder
	audio frequency	Expansible audio input and output
	WIFI/BT	Scalable for SDIO 2.0 WIFI / BT
extension plate	SENSOR board	SC4336P/SC450AI/SC500AI
	baseboard	Support for MIC \ SPK \ Star Flash \ WIFI \ Bluetooth \ UART \ TF \ Debug
Specification requirements	Power supply interface	Power supply: Type C 5V / 2A, power consumption: 3W
	reliability	7 * 24 hours 70℃ high temperature test is stable and reliable
	lightning protection	Comprehensive lightning protection, in line with the national and international standards;
	ESD	GB / T17626.2 grade is grade 4
	EMC	GB / T17626.5 and GB / T17626.9 test grade 5
	Version size	PICO type

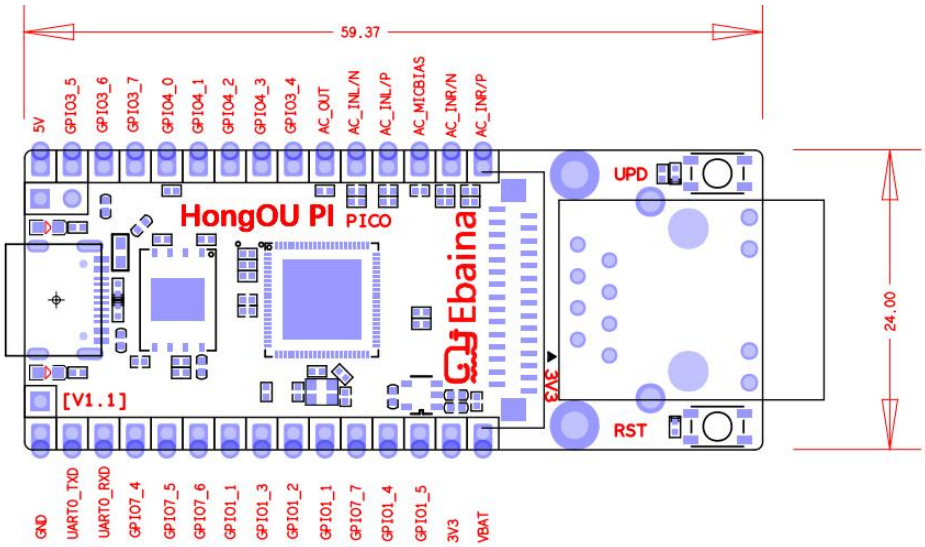
2.3 Product block diagram

HongOU PI PICO The hardware block diagram is shown below:

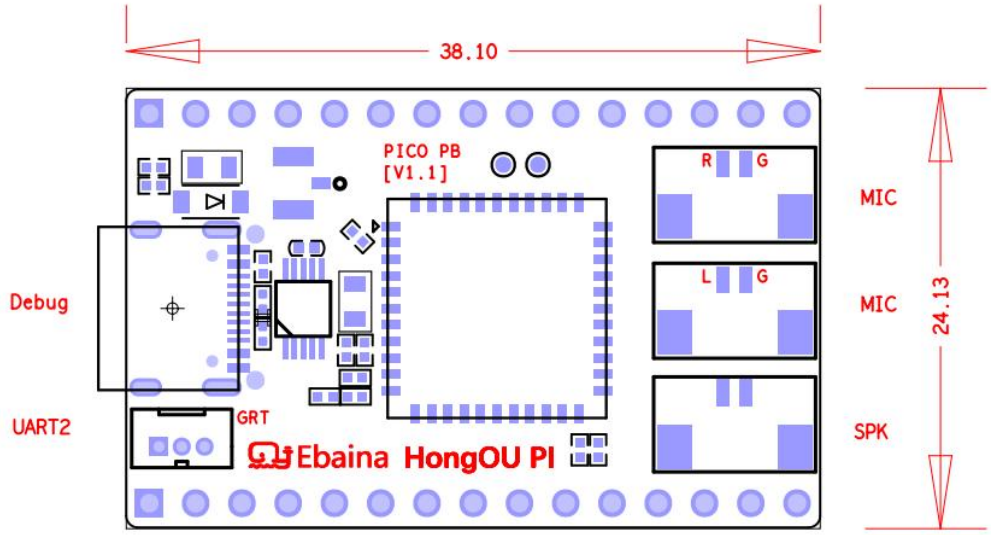


2.4 Product dimensions

The mechanical dimensions of HongOU PI PICO motherboard and HongOU PI PICO PB motherboard (i. e., the bottom plate of HongOU PI PICO) is shown in the following figure (unit: mm), and the inner hole diameter of the 4 positioning holes in the figure is 4 mm. For more detailed mechanical size drawings, consult the HongOU PI PICO Mechanical Size Drawing. The Mechanical dimensions of HongOU PI PICO PB, pdf.pdf》



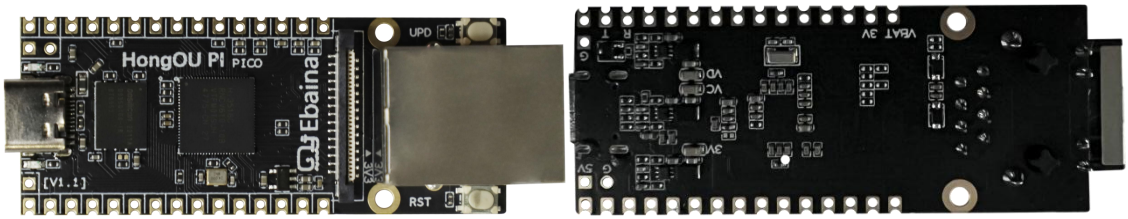
HongOU PI PICO Mechanical dimension diagram



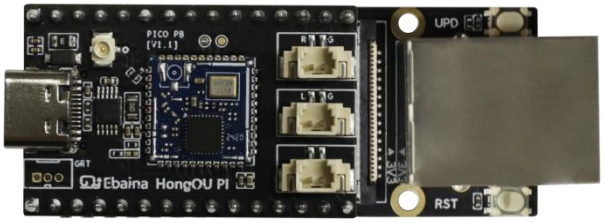
HongOU PI PICO PB Mechanical dimension diagram

2.5 Product pictures

The physical diagram of HongOU PI PICO motherboard is shown in the following figure. 20S specification is used by default. 10B \ 20B \ 20S \ 20G is pin to pin compatible and can be shared for different performance and scene requirements.



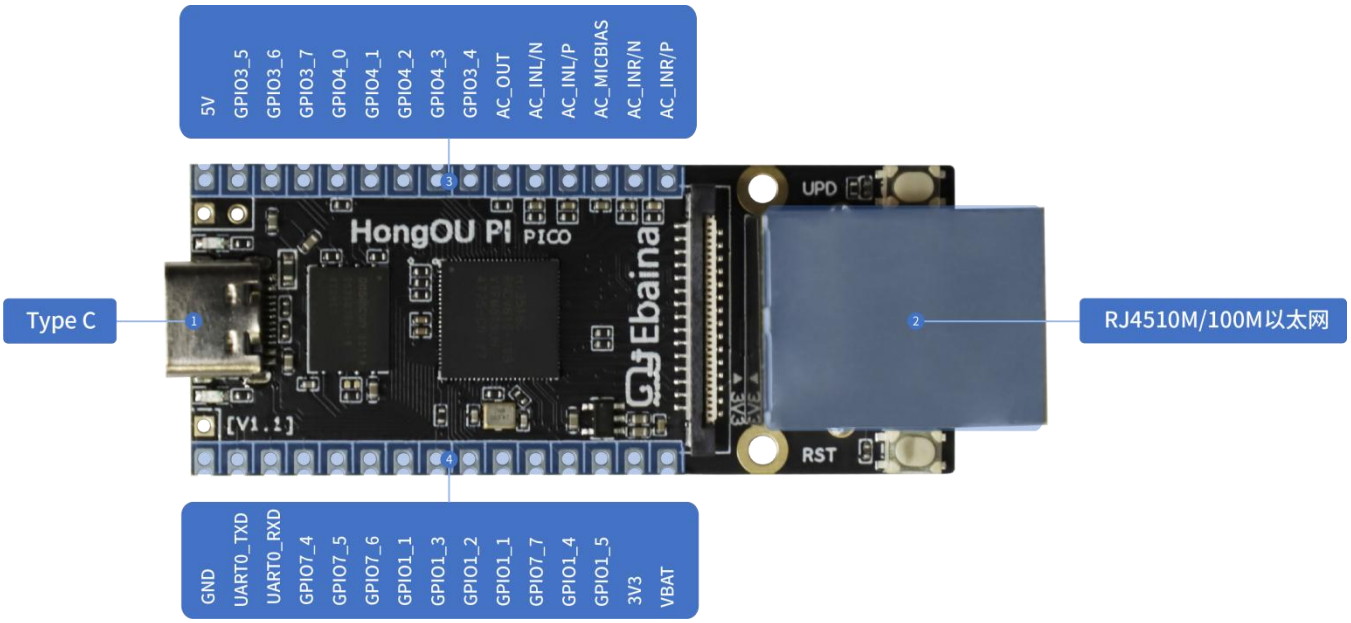
HongOU PI PICO Front view HongOU PI PICO Back image



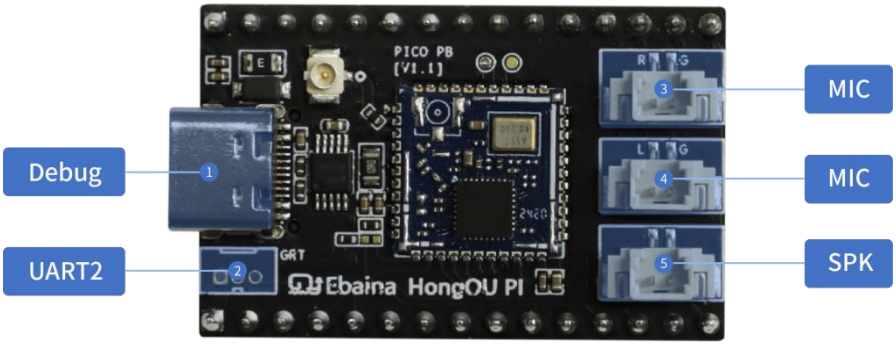
The HongOU PI PICO + HongOU PI PICO PB combination of Fig

2.6 Peripheral resources

HongOU PI PICO Motherboard and HongOU PI PICO PB motherboard contain a large number of interface resources, must be designed reliable peripheral circuit to cooperate with it. This manual gives the reference design method for some of the peripheral circuits, all circuits are strict functional verified.



HongOU PI PICO Schematic diagram of the peripheral interface

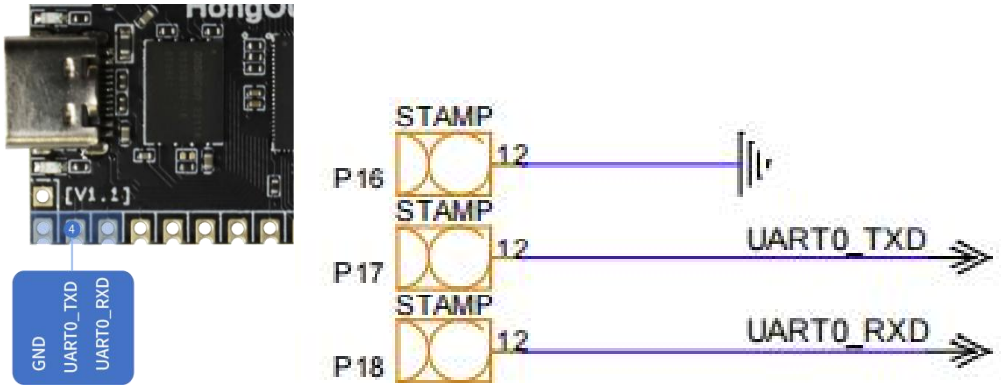


HongOU PI PICO PB Schematic diagram of the peripheral interface

3. Product interface

3.1 Commissioning serial port (HongOU PI PICO)

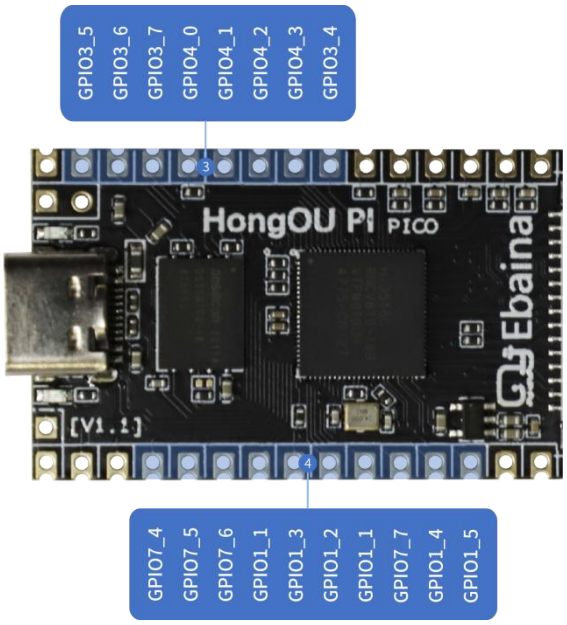
HongOU PI PICO Debug debugging serial port, interface corresponding PCB screen position number J2, seat specification model 1x3P / spacing: 1.25mm / direct, the reference circuit of this part is shown in the figure below:

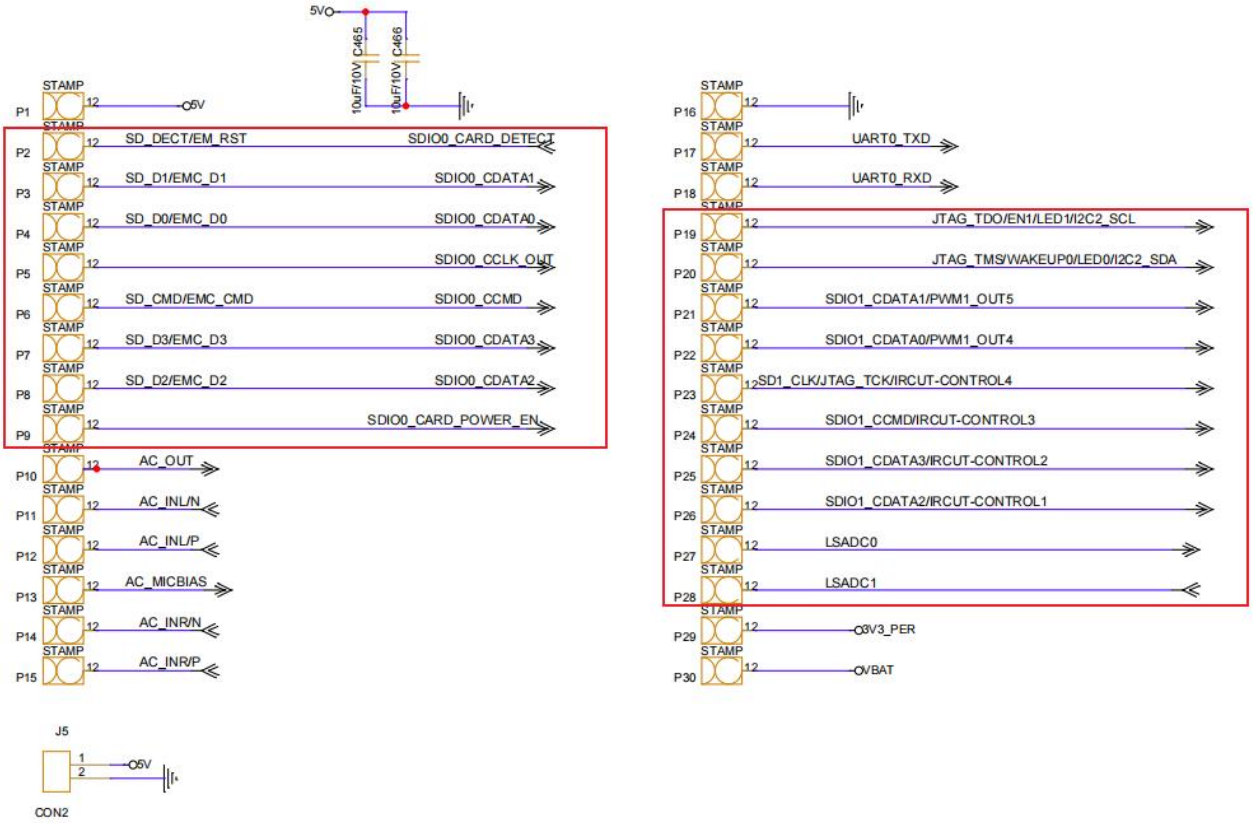


The pin number	Signal description	function
PIN16	GND	the earth
PIN17	UART0_TXD	Debug the TTL serial data sending
PIN18	UART0_RXD	Debug the TTL serial data reception

3.2 GPIO（HongOU PI PICO）

HongOU PI PICO GPIO, interface corresponding PCB screen position number J10, seat size model 1.25MM spacing / 5P / vertical patch cover, the reference circuit for this part is shown in the figure below:



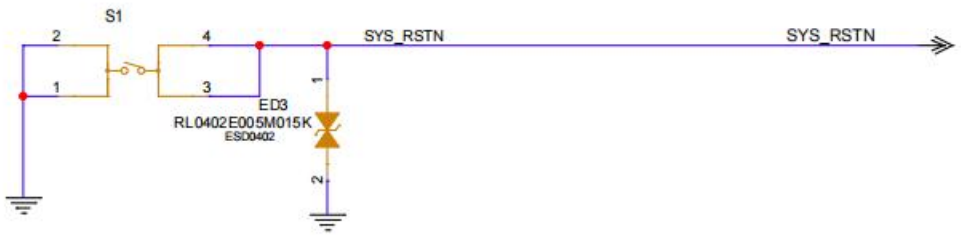


The pin number	Signal description	function
PIN1	5V	5V input
PIN2	SD_DECT/EM_RST/SDIO0_CARD_DETECT	SD card / EM _ RST / SD card, WiFi
PIN3	SD_D1/EMC_D1/SDIO0_CDATA1	SD card / EMC _ D 1 / SD card, WiFi
PIN4	SD_D0/EMC_D0/SDIO0_CDATA0	SD card / EMC _ D 0 / SD card, WiFi

PIN5	SDIO0_CCLK_OUT	SD block, WiFi
PIN6	SD_CMD/EMC_CMD/SDIO0_CCMD	SD card / EMC _ CMD / SD card, WiFi
PIN7	SD_D3/EMC_D3/SDIO0_CDATA3	SD card / EMC _ D 3 / SD card, WiFi
PIN8	SD_D2/EMC_D2/SDIO0_CDATA2	SD card / EMC _ D 2 / SD card, WiFi
PIN9	SDIO0_CARD_POWER_EN	SD block, WiFi
PIN19	JTAG_TDO/EN1/LED1/I2C2_SCL	JTAG data output / EN1 / LED1 / I2C2
PIN20	JTAG_TMS/WAKEUP0/LED0/I2C2_SDA	JTAG mode select input / WAKEUP0 /
PIN21	SDIO1_CDATA1/PWM1_OUT5	WiFi, SD card / PWM
PIN22	SDIO1_CDATA0/PWM1_OUT4	WiFi, SD card / PWM
PIN23	SD1_CLK/JTAG_TCK/IRCUT-CONTROL4	SD card / JTAG Clock input / IRCUT
PIN24	SDIO1_CCMD/IRCUT-CONTROL3	WiFi, SD card / IRCUT
PIN25	SDIO1_CDATA3/IRCUT-CONTROL2	WiFi, SD card / IRCUT
PIN26	SDIO1_CDATA2/IRCUT-CONTROL1	WiFi, SD card / IRCUT
PIN27	LSADC0	LSADC0
PIN28	LSADC1	LSADC1

3.3 RST（HongOU PI PICO）

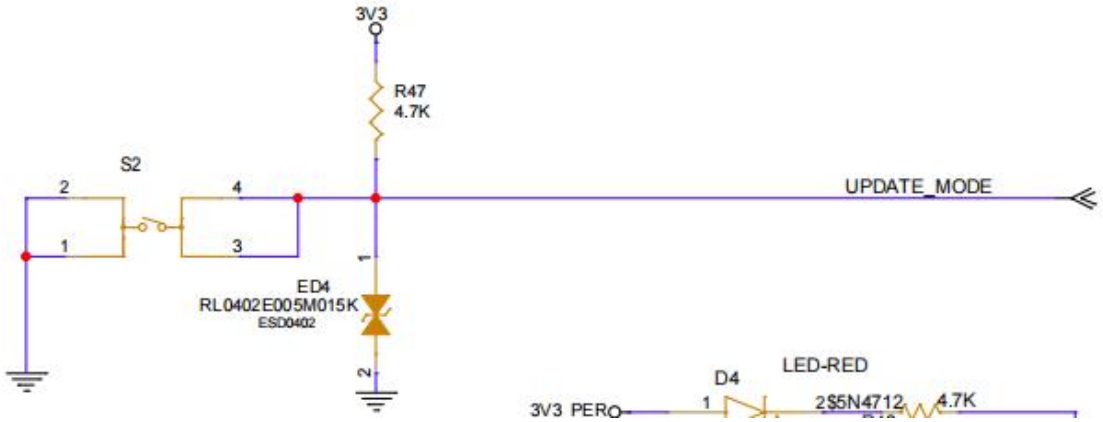
The reset button on HongOU PI PICO, the interface corresponds to PCB screen mark number J6, seat specification model is 1.25MM spacing / 6P / vertical patch cover, the reference circuit for this part is shown in the figure below:



The pin number	Signal description	function
PIN1	GND	the earth
PIN2	GND	the earth
PIN3	SYS_RSTN	reset
PIN4	SYS_RSTN	reset

3.4 UPD（HongOU PI PICO）

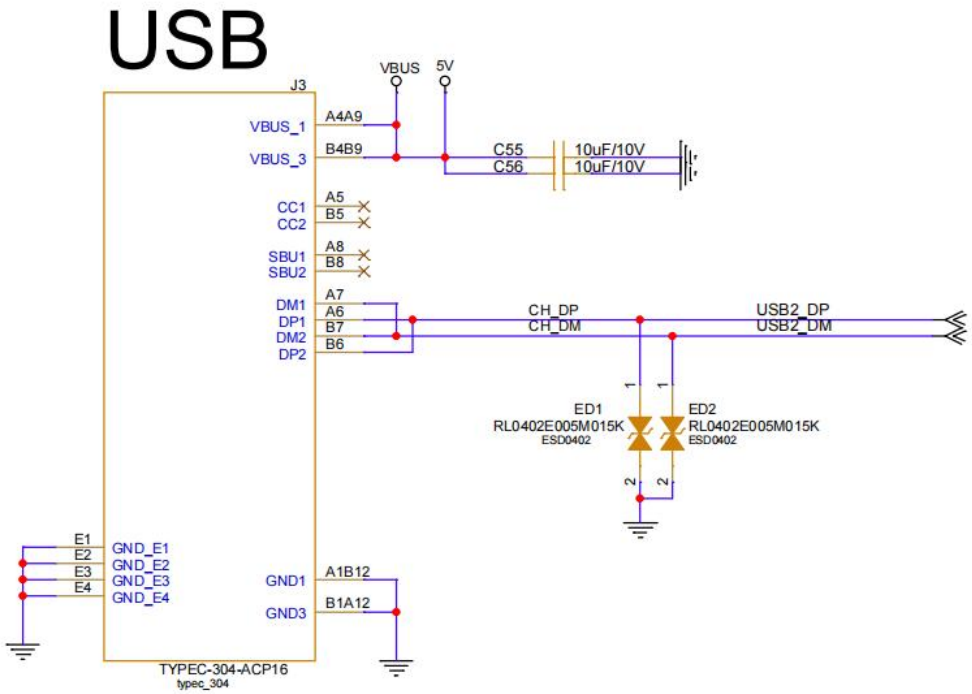
The update button on HongOU PI PICO, corresponding PCB screen position number J4200, seat size model 1.25MM spacing / 2P / vertical patch cover, the reference circuit of this part is shown in the figure below:



The pin number	Signal description	function
PIN1	GND	the earth
PIN2	GND	the earth
PIN3	UPDATE_MODE/3V3	Update upgrade
PIN4	UPDATE_MODE/3V3	Update upgrade

3.5 USB 2.0 typec power supply (HongOU PI PICO)

USB-typec power supply on HongOU PI PICO, interface corresponding PCB screen mark number J15, seat specification model 1.25MM spacing / 3P / vertical patch cover, reference circuit for this part is shown in the figure below:

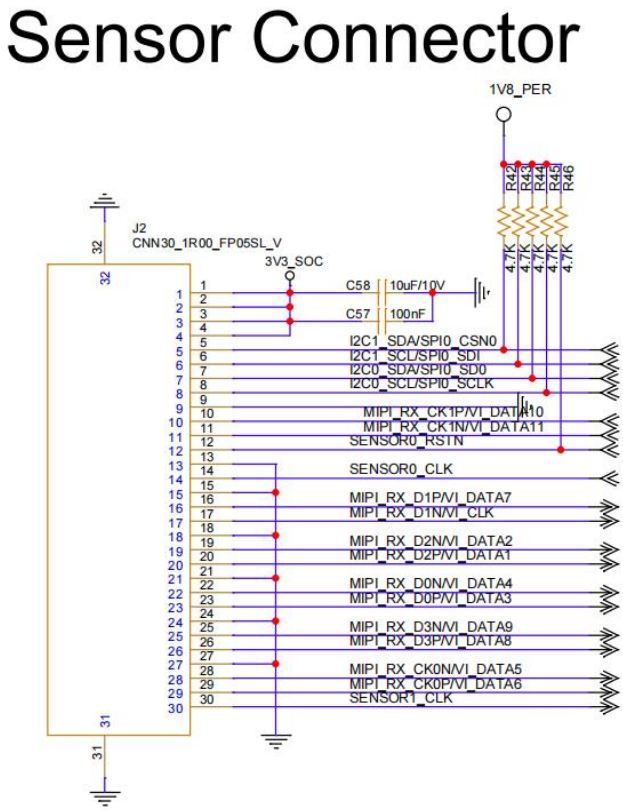


The pin number	Signal description	function
A4A9	VBUS	power line
B4B9	5V	5V input
A7	GND	the earth
A6	USB2_DP	Transfer positive signal
B7	USB2_DM	Transmission of negative signals
B6	GND	the earth
A1B12	GND	the earth
A1A12	GND	the earth
E1	GND	the earth
E2	GND	the earth
E3	GND	the earth
E4	GND	the earth

3.6 Sensor Connector （HongOU PI PICO）

For Sensor Connector on HongOU PI PICO, the interface has PCB screen number J13, and the seat specification is 1.25MM spacing / 10P / vertical patch. This interface has not only the network

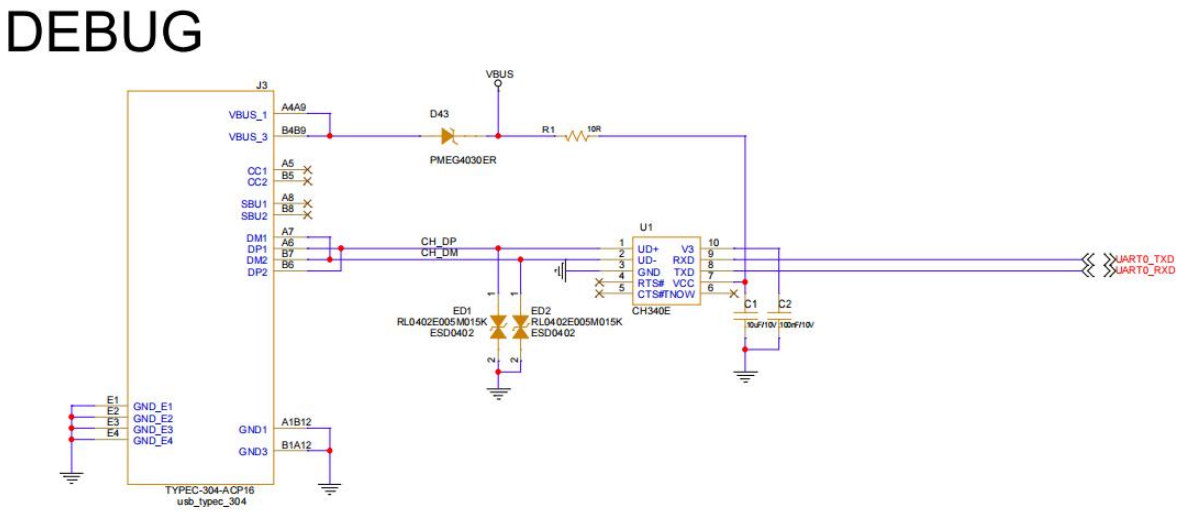
interface but also 12V power input. The reference circuit for this part is shown in the figure below:



The pin number	Signal description	function
PIN1	3V3_SOC	3V3 power supply
PIN2	3V3_SOC	3V3 power supply
PIN3	3V3_SOC	3V3 power supply
PIN4	3V3_SOC	3V3 power supply
PIN5	1V8_PER	Voltage: 1 V 8 _ PER
PIN6	1V8_PER	Voltage: 1 V 8 _ PER
PIN7	1V8_PER	Voltage: 1 V 8 _ PER
PIN8	1V8_PER	Voltage: 1 V 8 _ PER
PIN9	GND	the earth
PIN10	MIPI_RX_CK1P/VI_DATA10	MIPI receive
PIN11	MIPI_RX_CK1N/VI_DATA11	MIPI receive
PIN12	1V8_PER	Voltage: 1 V 8 _ PER
PIN13	GND	the earth
PIN14	SENSOR0_CLK	SENSOR0 Data transfer
PIN15	GND	the earth

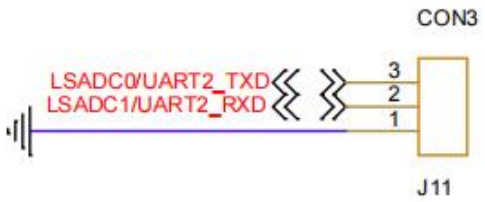
PIN16	MIPI_RX_D1P/VI_DATA7	MIPI receive
PIN17	MIPI_RX_D1N/VI_CLK	MIPI receive
PIN18	GND	the earth
PIN19	MIPI_RX_D2N/VI_DATA2	MIPI receive
PIN20	MIPI_RX_D2P/VI_DATA1	MIPI receive
PIN21	GND	the earth
PIN22	MIPI_RX_D0N/VI_DATA4	MIPI receive
PIN23	MIPI_RX_D0P/VI_DATA3	MIPI receive
PIN24	GND	the earth
PIN25	MIPI_RX_D3N/VI_DATA9	MIPI receive
PIN26	MIPI_RX_D3P/VI_DATA8	MIPI receive
PIN27	GND	the earth
PIN28	MIPI_RX_CK0N/VI_DATA5	MIPI receive
PIN29	MIPI_RX_CK0P/VI_DATA6	MIPI receive
PIN30	SENSOR1_CLK	SENSOR1 Data transfer
PIN31	GND	the earth
PIN32	GND	the earth

3.7 DEBUG（HongOU PI PICO PB）



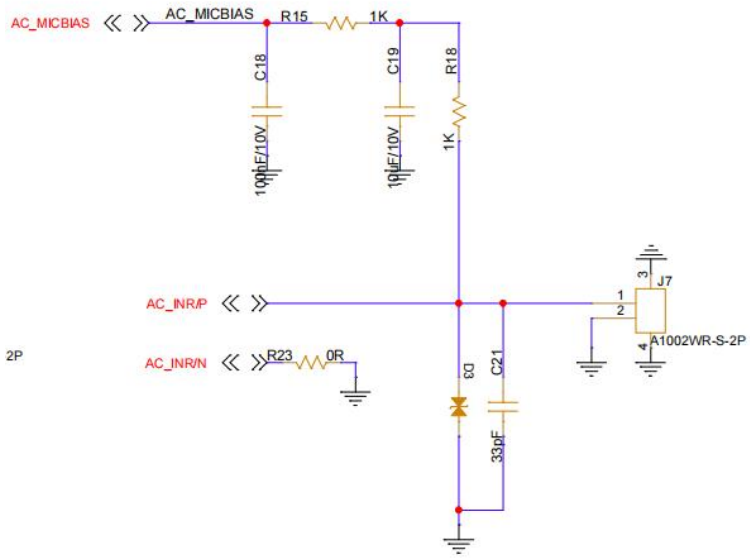
The pin number	Signal description	function
PIN1	CH_DP	DP
PIN2	CH_DM	DM
PIN3	GND	earth wire
PIN4	X	X
PIN5	X	X
PIN6	X	X
PIN7	GND	earth wire
PIN8	UART0_RXD	receive
PIN9	UART0_TXD	transmit by radio
PIN10	GND	earth wire

3.8 UART2（HongOU PI PICO PB）



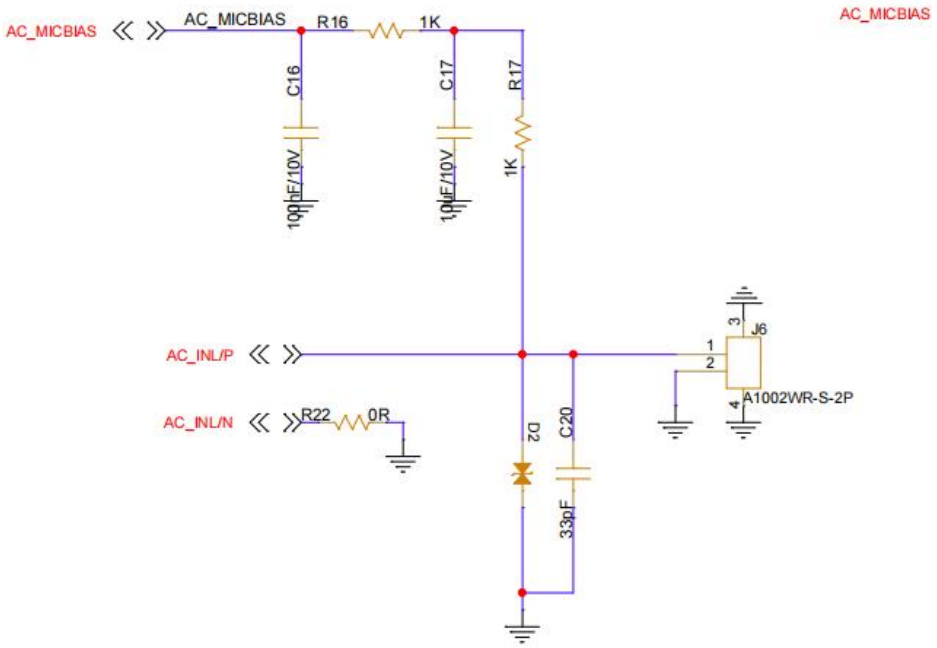
The pin number	Signal description	function
PIN1	GND	earth wire
PIN2	LSADC1/UART2_RXD	LSADC1 / Receiving
PIN3	LSADC0/UART2_TXD	LSADC0 / Send

3.9 J7 Audio Input (Right) (HongOU PI PICO PB)



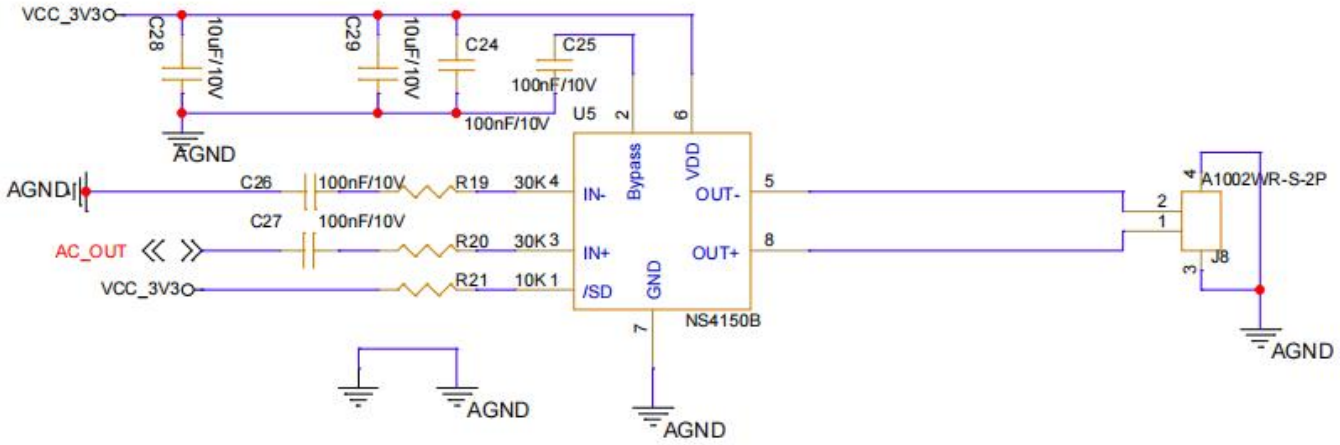
The pin number	Signal description	function
PIN1	AC_INR/P	Audio input right
PIN2	GND	earth wire

3.10 J6 Audio Input (left) (HongOU PI PICO PB)



The pin number	Signal description	function
PIN1	AC_INL/P	Audio input left
PIN2	GND	earth wire

3.11 J8 Audio Output (HongOU PI PICO PB)



The pin number	Signal description	function
PIN1	AC_OUT	Audio output
PIN2	AGND	earth wire

4. Product accessories

4.1 SENSOR board

G SC 4336P-SEN 38	sensor	1/3" CMOS GC4336P
	pixel	400W
	Maximum resolution	2560H x 1440V @30fps 10bit
	sensitivity	7072mV/lux ·3
	dynamic range	Linear mode: 87 db wide dynamic mode:> 100dB
	noise-signal ratio	> 37.3dB
	operating temperature range	-30°~+85°
	Plate size	Dimensions: 38mm * 38mm

G SC 450AI-SEN 38	sensor	1/1.8" CMOS GC450AI
	pixel	400W
	Maximum resolution	2688H x 1520V @60fps
	sensitivity	7072mV/lux ·3
	dynamic range	Linear mode: 87 db wide dynamic mode:> 100dB
	noise-signal ratio	42dB
	operating temperature range	-30°~+85°
	Plate size	Dimensions: 38mm * 38mm

G SC 500AI-SEN 38	sensor	1/2.7" CMOS GC500AI
	pixel	500W
	Maximum resolution	2880H x 1620V @60fps 10bit
	sensitivity	3628mV/lux ·3
	dynamic range	Linear mode: 79 db wide dynamic mode:> 100dB
	noise-signal ratio	> 39dB
	operating temperature range	-30°~+85°
	Plate size	Dimensions: 38mm * 38mm

Note: Please check the SENSOR specification for more details.

4.2 HongOU PI PCIO PB (bottom plate of HongOU PI PCIO)

baseboard	functional interface	Support for MIC \ SPK \ Star Flash \ WIFI \ Bluetooth \ UART \ TF \ Debug
Specification requirements	Power supply interface	Power supply: Type C 5V / 2A, power consumption: 2W
	reliability	7 * 24 hours 70℃ high temperature test is stable and reliable
	lightning protection	Comprehensive lightning protection, in line with the national and international standards;
	ESD	GB / T17626.2 grade is grade 4
	EMC	GB / T17626.5 and GB / T17626.9 test grade 5