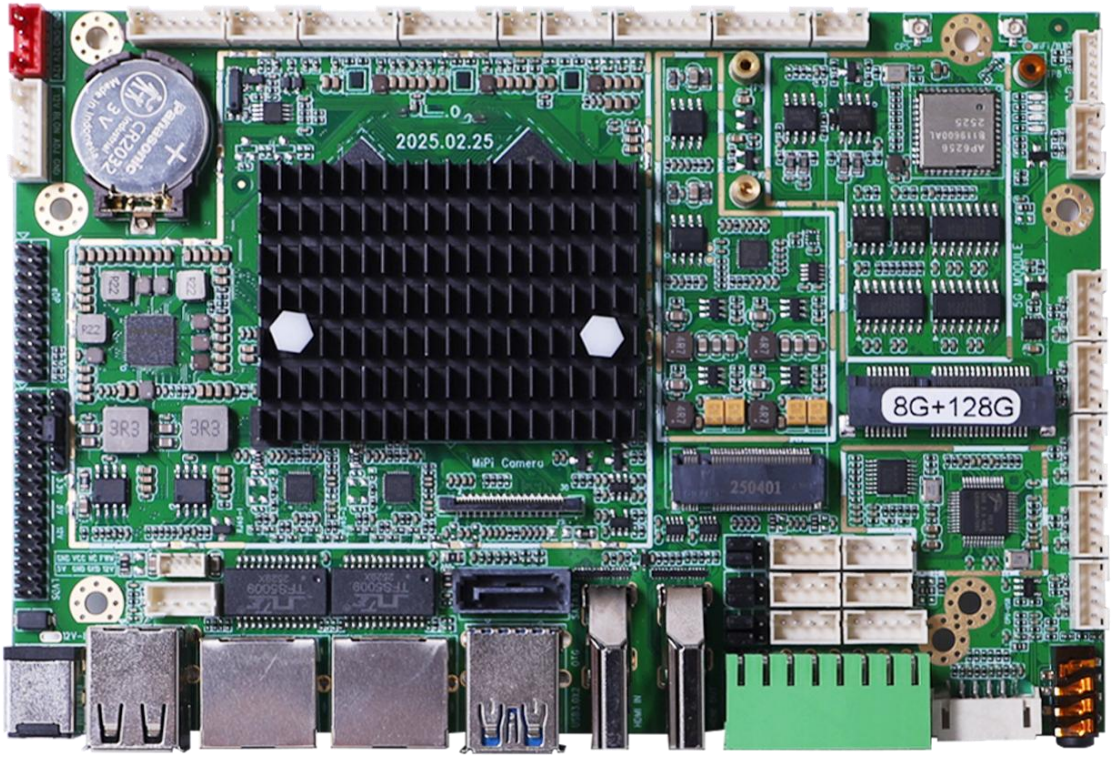
USR-EV808(RK3588)



Catalogue

1. Product Overview

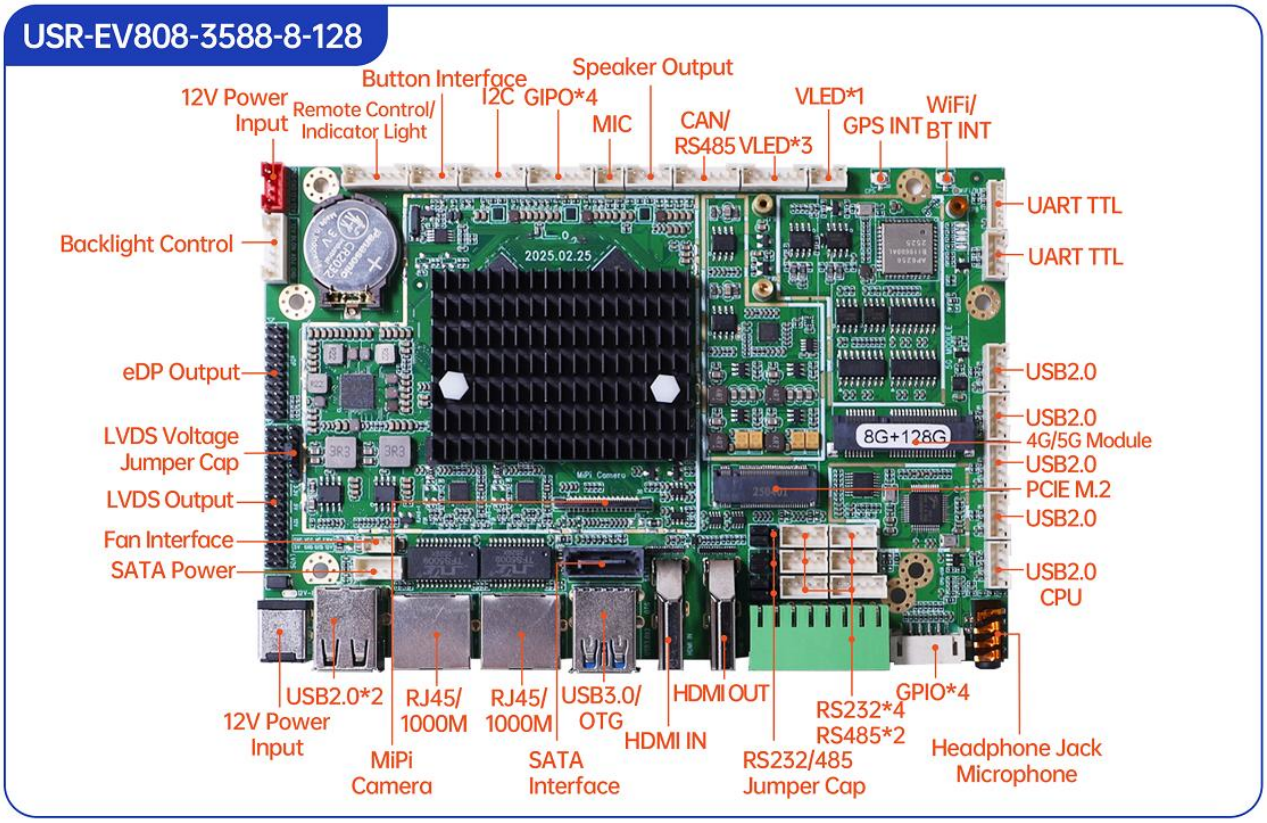
The USR-EV808-3588 high-performance motherboard features the Rockchip RK3588, a next-generation flagship AIoT processor, supporting multiple operating systems including Android, Debian, and Ubuntu. Manufactured using 8nm LP process technology, the RK3588 boasts an 8-core 64-bit CPU architecture (four-core Cortex-A76 + four-core Cortex-A55) with a clock speed of up to 2.4 GHz, delivering exceptional general-purpose computing capabilities. It integrates a high-end quad-core Mali-G610 GPU for robust graphics processing and a dedicated AI neural network processor (NPU) supporting INT4/INT8/INT16 mixed-precision operations, achieving an AI computing power of 6.0 TOPS. The motherboard is compatible with various mainstream AI development tools and interfaces. Supporting multi-screen display, it offers 6/8-bit LVDS (1080P), eDP, MIPI display outputs, HDMI 8K output, and HDMI 4K input, meeting the demands of complex visual applications. The network architecture supports dual-gigabit Ethernet, dual-band Wi-Fi (2.4/5GHz), and Bluetooth 5.0, with expandable 4G/5G and GPS modules. It features versatile storage and expansion interfaces including M.2, SATA, USB 3.0, as well as CAN, RS232, RS485, GPIO, I^2C, MIPI cameras, infrared remote control, and gravity sensors, enabling flexible peripheral integration. Leveraging its platform-based hardware and intelligent software, this motherboard is widely deployed in smart fire protection, smart construction sites, industrial quality inspection, autonomous driving, smart agriculture, intelligent sorting machines, AI robots, cloud servers, smart NVRs, metaverse, ARM PCs, security, healthcare, transportation, finance, industrial control, education, and retail sectors, delivering efficient and stable intelligent terminal experiences in human-machine interaction and device networking scenarios.

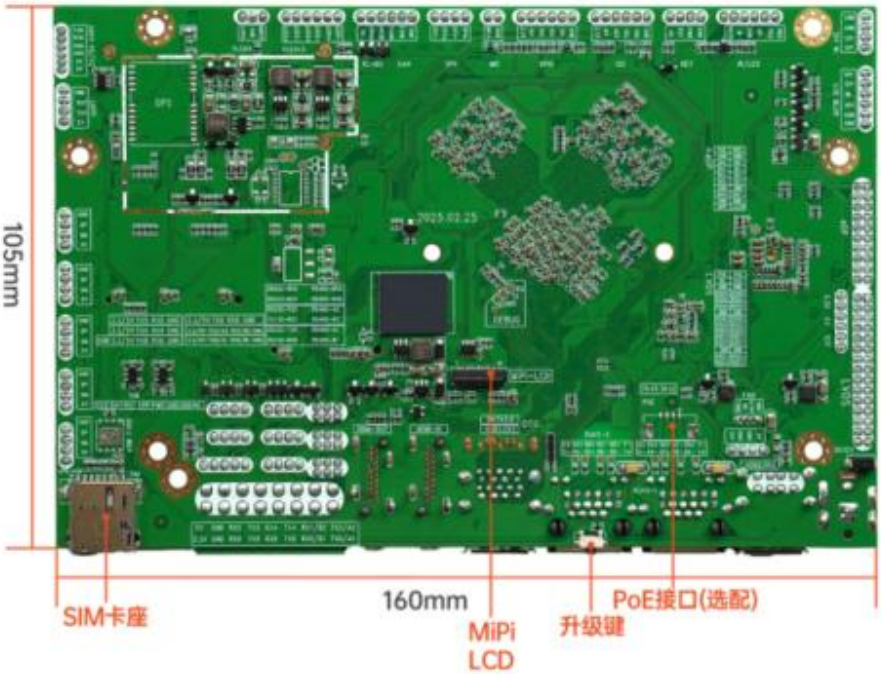
2. Characteristic

- High Performance: The RK3588 is a new-generation flagship high-performance AIoT processor launched by Rockchip, supporting operating systems such as Android 12.0 and Linux. This chip employs an 8nm LP process and features an octa-core 64-bit CPU architecture (four-core Cortex-A76 + four-core Cortex-A55), with a clock speed up to 2.4 GHz, delivering outstanding general-purpose computing capabilities. Graphics processing is handled by a high-end quad-core Mali-G610 GPU, efficiently supporting complex graphics and high-definition display tasks. It integrates a dedicated AI neural network processor (NPU) internally, supporting INT4/INT8/INT16 mixed-precision operations with AI computing power reaching 6.0 TOPS. The NPU is compatible with various mainstream AI development tools and frameworks, enabling direct conversion of general models such as TensorFlow, Caffe, MXNet, and PyTorch. It provides comprehensive development support, including the Android NN API, RKNN cross-platform API, and TensorFlow development interface, facilitating efficient deployment and optimization of AI applications for developers.
- High Stability: The RK3588 AI motherboard incorporates proprietary technologies in both hardware and software to ensure product stability, enabling the final product to operate 24/7 without human intervention.

- High Integration: The RK3588 AI motherboard features a 10-layer ultra-high-density PCB (TG170-10), integrating dual Gigabit Ethernet, 2.4/5G dual-band WiFi, Bluetooth 5.0, 18W power amplifier, M.2 expansion, SATA, built-in 4G/5G module interface, IR remote control, HDMI output and input, LVDS, eDP, MiPi, microphone, gravity sensor, GPS, and other functionalities, significantly simplifying the overall design. Its ultra-thin design also enhances the aesthetic appeal of the device.
- High expandability: 9 USB ports, 4 RS232 ports, 2 UART ports, 1 RS485 port, 2 RS232/RS485 ports (with jumper selection), 1 CAN port, 1 I2C interface, 8 IO expansion ports, 4 5/12V high-current control ports, 1 AD port, and 1 POE port for additional peripheral devices.

3. Product interface



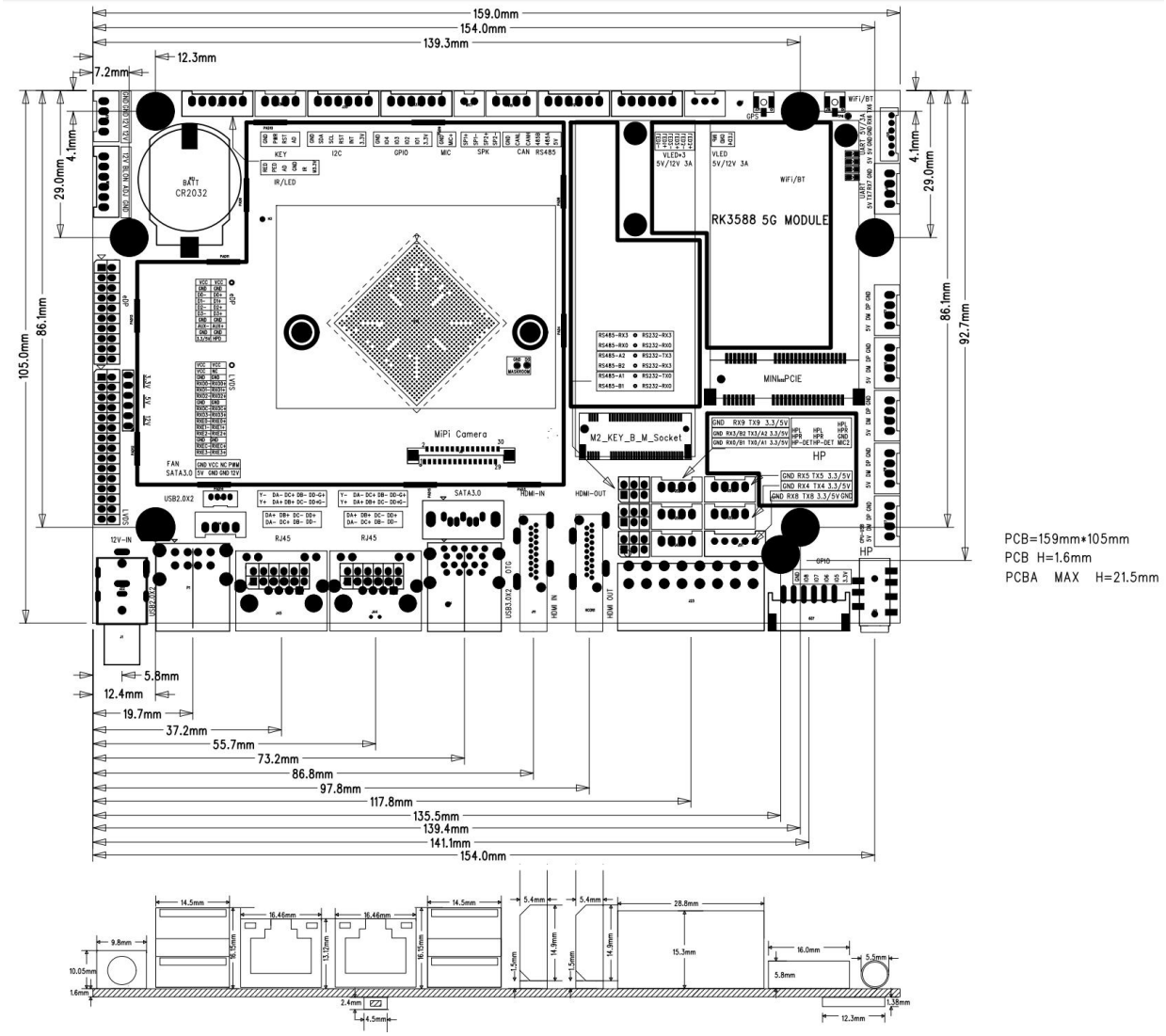


3.1.Hardware specifications

Operating system	Ubuntu22.04/ android12/debian11
Graphics processing unit gpu	Mali-g610 gpu mp4 quad-core gpu Supports opengl es3.2, openvg1.1, and opencl2.2, with 450gflofs
Neural network processor (npu)	Equipped with a 6tops neural processing unit (npu), supporting int4/int8/int16/fp16 arithmetic operations Supports models such as caffe, mxnet, tensorflow, tf lite, onnx, and darknet Provide ai development tools: Enable rapid model conversion.
Internal storage ddr	Lpddr4 8gb （4g/8g/16g/32g）
Built-in storage capacity	Emmc 128gb (32g/64g/128g/256g) Sata hdd expansion
Pcie expand	Pcie m.2 supports 4lanes high-speed communication with m2242 and m2260 sizes.
Network	Supports 2 ethernet ports (10/100/1000mbps)
	Supports dual-band wifi (2.4g/5g) and wi-fi 802.11b/g/n/ac protocols (wifi 6 optional).
	Supports bluetooth, v2.1+edr/bluetooth 3.0/3.0+hs/4.1/4.2/5.0/ble
	Supports 4g/5g (optional)
Gps navigation	Built-in gps/bd module (optional)
Picture orientation	Supports manual rotation at 0°,90°,180°, and 270°, and gravity-sensing auto-screen rotation (optional)
Display interface	1*edp (edp1.3, 4 lanes with 5.4gbps), supports 3.3v/5v power supply 1 lvds interface (single/dual channel, 6-bit/8-bit), 1080p 60hz output Supports 3.3v/5v/12v power supply 1*hdmi 2.1 supports 8k 60hz output 1*hdmi 2.0 supports 4k 60hz input 1*mipi, supports 5.7gbps output
Board mounted backlight control	12v backlight power supply
Audio frequency	1*speaker output (2*18w 4r) 1*earpiece output 2*microphone input

Camera	1* mipi camera input, supports up to 48mp (optional) Supports usb camera (optional)
Rtc	Built-in real-time clock power battery with on/off timer
Usb	6*usb-2.0 host , 1*usb-2.0 cpu , 1*usb3.0 cpu , 1*usb3.0 otg
Pcie	1*mini pcie (for 4g/5g lte)
Sim	1*sim card slot for mini pcie 4g/5g lte expansion module
Infrared	1* infrared receiver, supports infrared remote control
Led	1* power status led (red), 1* system led (blue, default flashing)
Key	1*reset button, 1*power button, 1*upgrade button
Gorge line	4 rs232 ports, 1 uart ttl port (bluetooth shared), 1 uart ttl port (bluetooth shared), 1 rs485 port, 2 rs485/rs232 ports (jump cap selection)
Io mouth	8* io ports, supporting input or output
Can mouth	1 can port
I2c port	1i2c port
Ad mouth	1*ad port
Fill light interface	4*fill light ports (5v/12v optional, for controlling high-current devices like fill lights and cash registers)
Fan opening	Supports 5v/12v fan interface
Power input	Dc12v/2a-5a (requires a surge voltage below 18v and ripple voltage below 100mv)
Working temperature	-10℃-70℃
Storage temperature	-20℃-70℃
Storage humidity	10%-80%
Mainboard size	160mm*105mm*20mm
Multi-media	Supports 8k 60fps h.265/h.264 video decoding Supports 8k 30fps h.265/h.264 video encoding Supports same compilation and same solution Supports up to 32-channel 1080p 30 fps decoding and 16-channel 1080p 60 fps encoding
Linguistic support	Multilingual
System management	The native ubuntu system with root access for custom product development
	Real-time remote monitoring, automatic recovery after system crashes, 24/7 unattended operation
	Enable wi-fi display
System watchdog	Support software watchdog

3.2.structure size



3.3.power input

The power interface (12V IN) has a socket spacing of 2.0mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	12V_IN	import	12V power input	
4	12V_IN	import	12V power input	

3.4.Backlight

The LCD backlight jack (BL JACK) has a socket spacing of 2.0mm.

order number	definition	attribute	description

1	12V	output	12V output	
2	12V	output	12V output	
3	LCD-BLON	output	backlight control	
4	LCD-ADJ	output	backlight adjustment	
5	GND	earth wire	earth wire	
6	GND	earth wire	earth wire	

3.5.Remote control/indicator light

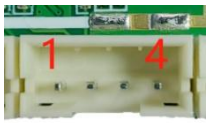
Remote control/indicator light receiving interface (LED/IR IN JACK) 2.0mm

order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IR	import	receive	
3	GND	earth wire	earth wire	
4	AD	import	AD import	
5	LEDR	output	power light	
6	LEDG	output	system indicator light	

3.6.key

The key jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	AD	import	AD (Upgrade) button input	
2	RES	import	RESET Reset button	
3	PWR	import	POWER Power button	
4	GND	earth wire	earth wire	



3.7.I2C

The I2C interface (I2C JACK) has a pin spacing of 2.0mm.

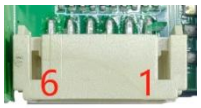
order number	definition	attribute	description	
1	3.3 V	output	3.3V voltage output	
2	INT (3.3V level)	import	external device interrupt	
3	RST (3.3V level)	output	External device reset	
4	SCL (3.3V level)	output	clock	
5	SDA (3.3V level)	output	data	
6	GND	earth wire	earth wire	

3.8.GPIO

The distance between the two IO JACK sockets is 2.0mm.

order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IO1 (3.3V level)	Input/Output	Default high level	
3	IO2 (3.3V level)	Input/Output	Default high level	
4	IO3 (3.3V level)	Input/Output	Default low level	
5	IO4 (3.3V level)	Input/Output	Default low level	
6	GND	earth wire	earth wire	

IO JACK

order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IO5 (3.3V level)	import	Default high level	
3	IO6 (3.3V level)	import	Default high level	
4	IO7 (3.3V level)	import	Default low level	
5	IO8 (3.3V level)	import	Default low level	
6	GND	earth wire	earth wire	

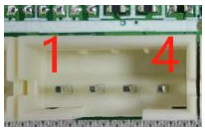
3.9.microphone

The microphone jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	MIC+	import	MIC positive input	
2	MIC-	earth wire	earth wire	

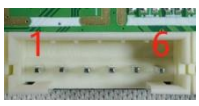
3.10. suona

The speaker output jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	LP	output	positive output of left channel	
2	LN	output	Left channel output negative pole	
3	RP	output	Right channel output positive	
4	RN	output	Right channel output negative pole	

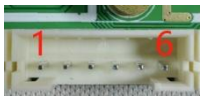
3.11. RS485/ CAN

RS485/CAN interface (RS485/CAN JACK) with 2.0mm pin spacing

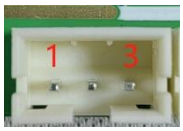
order number	definition	attribute	description	
1	3.3V/5V	output	3.3V/5V voltage output	
2	RS485-A	data	data	
3	RS485-B	data	data	
4	CAN-H	data	data	
5	CAN-L	data	data	
6	GND	earth wire	earth wire	

3.12. Backlight

VLED JACK interface with 2.0mm socket spacing

order number	definition	attribute	description	
1	LED3	output	5V/12V voltage output	
2	GND	earth wire	earth wire	
3	LED2	output	5V/12V voltage output	
4	GND	earth wire	earth wire	
5	LED1	output	5V/12V voltage output	
6	GND	earth wire	earth wire	

VLED JACK interface with 2.0mm socket spacing

order number	definition	attribute	description	
1	LED4	output	5V/12V voltage output	
2	GND	earth wire	earth wire	
3	INPUT	output	GPIO control (3.3V level)	

3.13. UART

UART interface (UART JACK) with 1.5mm pin spacing

order number	definition	attribute	description	
1	5V	output	5V voltage output	
2	5V	output	5V voltage output	
3	GND	earth wire	earth wire	
4	GND	earth wire	earth wire	
5	RX6	import	Receive (RX6)ttyS6	
6	TX6	output	Send (TX6)ttyS6	

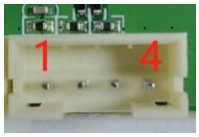
The UART interface jack has a 2.0mm pin spacing and shares the same port with Bluetooth.

order number	definition	attribute	description	
1	5V	output	5V voltage output	

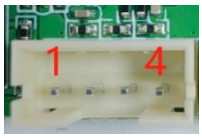
2	TX7	output	Send (TX7)ttyS7	
3	RX7	import	Receive (RX7)ttyS7	
4	GND	earth wire	earth wire	

3.14. USB2.0

The USB2.0-HOST jack features a 2.0mm socket spacing.

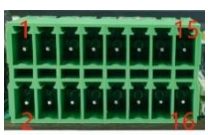
order number	definition	attribute	description	
1	5V	output	5V voltage output	
2	DM	import	DM-	
3	DP	import	DP+	
4	GND	earth wire	earth wire	

The USB 2.0-CPU jack has a 2.0mm socket spacing.

order number	definition	attribute	description	
1	5V	output	5V voltage output	
2	DM	import	DM-(CPU)	
3	DP	import	DP+(CPU)	
4	GND	earth wire	earth wire	

3.15. RS232/RS485

RS232/RS485 interface (RS232/RS485 jack) with 2.0mm pin spacing

order number	definition	attribute	description	
1	TX3/A2	output	Send (TX3/A2)ttyS3	
2	TX0/A1	output	Send (TX0/A1) ttyS0	
3	RX3/B2	import	Receive (RX3/B2)ttyS3	
4	RX0/B1	import	Receive (RX0/B1)ttyS0	
5	TX4	output	Send (TX4)ttyS4	
6	TX8	output	Send (TX8)ttyS8	
7	RX4	import	Receive (RX4)ttyS4	
8	RX8	import	Receive (RX8)ttyS8	
9	TX5	output	Send (TX5)ttyS5	
10	TX9	output	Send (TX9) ttyS9	
11	RX5	import	Receive (RX5)ttyS5	

12	RX9	import	Receive (RX9)ttyS9	
13	GND	earth wire	earth wire	
14	GND	earth wire	earth wire	
15	5V	output	5V voltage output	
16	3.3V	output	3.3V voltage output	

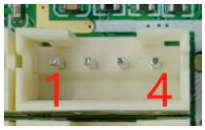
RS232 interface (RS232 JACK) with 2.0mm pin spacing

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	3.3V/5V	output	3.3V/5V voltage output	
3	RX8	import	Receive (RX8)ttyS8	
4	TX8	output	Send (TX8)ttyS8	
5	GND	earth wire	earth wire	

RS232 interface (RS232 JACK) with 2.0mm pin spacing

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX4	import	Receive (RX4)ttyS4	
3	TX4	output	Send (TX4)ttyS4	
4	3.3V/5V	output	3.3V/5V voltage output	

RS232 interface (RS232 JACK) with 2.0mm pin spacing

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX5	import	Receive (RX5)ttyS5	
3	TX5	output	Send (TX5)ttyS5	
4	3.3V/5V	output	3.3V/5V voltage output	

RS232/RS485 interface (RS232/RS485 jack) with 2.0mm pin spacing

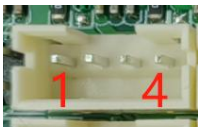
order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX0/B1	import	Receive	

			(RX0/B1)ttyS0	
3	TX0/A1	output	Send (TX0/A1) ttyS0	
4	3.3V/5V	output	3.3V/5V voltage output	

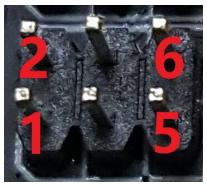
RS232/RS485 interface (RS232/RS485 jack) with 2.0mm pin spacing

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX3/B2	import	Receive (RX3/B2)ttyS3	
3	TX3/A2	output	Send (TX3/A2)ttyS3	
4	3.3V/5V	output	3.3V/5V voltage output	

RS232 interface (RS232 JACK) with 2.0mm pin spacing

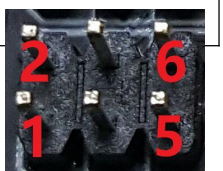
order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX9	import	Receive (RX9)ttyS9	
3	TX9	output	Send (TX9) ttyS9	
4	3.3V/5V	output	3.3V/5V voltage output	

The RS232/RS485 interface jack has a 2.0mm spacing between its sockets.

order number	definition	attribute	description	
1	RS485-B1	data	data	
2	RS485-A1	data	data	
3	RX0/B1-COM	data	data	
4	TX0/A1-COM	data	data	
5	RX0	data	data	
6	TX0	data	data	

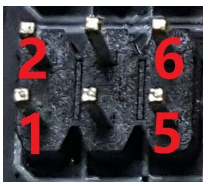
The RS232/RS485 interface jack has a 2.0mm spacing between its sockets.

order number	definition	attribute	description	
1	RS485-B2	data	data	
2	RS485-A2	data	data	



3	RX3/B2-COM	data	data	
4	TX3/A2-COM	data	data	
5	RX3	data	data	
6	TX3	data	data	

The RS232/RS485 interface jack has a 2.0mm spacing between its sockets.

order number	definition	attribute	description	
1	RS485-RX0	data	data	
2	RS485-RX3	data	data	
3	RX0	data	data	
4	RX3	data	data	
5	RS232-RX0	data	data	
6	RS232-RX3	data	data	

3.16. MIPI Camera

MIPI Camera jack spacing: 0.5mm

order number	definition	attribute	description	
	NC	barefoot	barefoot	
	VDD28	source	2.8V output	
	VDD13	source	1.3V output	
	VDD18	source	1.8V output	
	NC	barefoot	barefoot	
	GND	earth wire	earth wire	
	VDD28	source	2.8V output	
	GND	earth wire	earth wire	
	SDA	output	data	
	SCL	output	clock	
	RST	output	reset	
	PWDN	output	enable bit	
	GND	earth wire	earth wire	
	MLCK	output	clock	
	GND	earth wire	earth wire	
	DP3	output	data	
	DN3	output	data	
	GND	earth wire	earth wire	
	DP2	output	data	

	DN2	output	data	
	GND	earth wire	earth wire	
	DP1	output	data	
	DN1	output	data	
	GND	earth wire	earth wire	
	CLKP	output	clock	
	CLKN	output	clock	
	GND	earth wire	earth wire	
	DP0	output	data	
	DN0	output	data	
	GND	earth wire	earth wire	

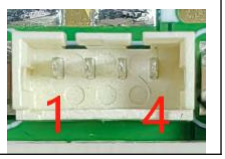
3.17. SATA

The SATA power jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	5V	output	5V voltage output	
2	GND	earth wire	earth wire	
3	GND	earth wire	earth wire	
4	12V	output	12V voltage output	

3.18. electric fan

The spacing between the fan jack sockets is 1.25mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	VDD	output	12V/5V	
3	NC	barefoot	NC	
4	PWM	output	PWM	

3.19. LVDS

LVDS LCD JP JACK with 2.0mm pin spacing

order number	definition	attribute	description	
1	12V	output	12V output	
2	LCD-VDD-IN	import	LCD voltage input	
3	5V	output	5V output	

4	LCD-VDD-IN	import	LCD voltage input	
5	3.3V	output	3.3V output	
6	LCD-VDD-IN	import	LCD voltage input	

The LVDS jack has a socket spacing of 2.0mm.

order number	definition	attribute	description	
1	POWER	output	3.3V/5V/12V power output	
2	POWER			
3	POWER			
4	GND	earth wire	earth wire	
5	GND			
6	GND			
7	TA1-	output	data	
8	TA1+	output	data	
9	TB1-	output	data	
10	TB1+	output	data	
11	TC1-	output	data	
12	TC1+	output	data	
13	GND	earth wire	earth wire	
14	GND			
15	TCLK1-	output	clock	
16	TCLK1+	output	clock	
17	TD1-	output	data	
18	TD1+	output	data	
19	TA2-	output	data	
20	TA2+	output	data	
21	TB2-	output	data	
22	TB2+	output	data	
23	TC2-	output	data	
24	TC2+	output	data	
25	GND	earth wire	earth wire	
26	GND			
27	TCLK2-	output	clock	
28	TCLK2+	output	clock	
29	TD2-	output	data	
30	TD2+	output	data	

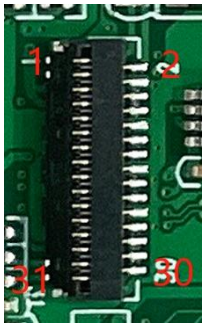
3.20. eDP

eDP LCD jack with 2.0mm socket spacing

order number	definition	attribute	description	
1	VCC	output	3.3V/5V power supply output	
2	VCC	output		
3	GND	earth wire	earth wire	
4	GND	earth wire	earth wire	
5	D0-	output	data	
6	D0+	output	data	
7	D1-	output	data	
8	D1+	output	data	
9	D2-	output	data	
10	D2+	output	data	
11	D3-	output	data	
12	D3+	output	data	
13	GND	earth wire	earth wire	
14	GND	earth wire	earth wire	
15	AUX-	output	data	
16	AUX+	output	data	
17	GND	earth wire	earth wire	
18	GND	earth wire	earth wire	
19	3V3	output	3.3V power supply output	
20	HPD	import	HPD test foot	

3.21. FPC MiPi LCD

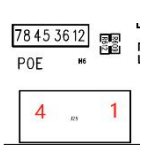
FPC MiPi LCD jack with 0.3mm spacing between sockets (bottom layer)

order number	definition	attribute	description	
1	LED+	output	backlight anode	
2	LED+			
3	LED+			
4	GND	earth wire	earth wire	
5	LED-	output	backlight anode	
6	LED-			
7	LED-			
8	LED-			

9	GND	earth wire	earth wire	
10	GND			
11	MiPi2+	output	data	
12	MiPi 2-	output	data	
13	GND	earth wire	earth wire	
14	MiPi 1+	output	data	
15	MiPi 1-	output	data	
16	GND	earth wire	earth wire	
17	MiPi CLK+	output	clock	
18	MiPi CLK-	output	clock	
19	GND	earth wire	earth wire	
20	MiPi 0+	output	data	
21	MiPi 0-	output	data	
22	GND	earth wire	earth wire	
23	MiPi 3+	output	data	
24	MiPi 3-	output	data	
25	GND	earth wire	earth wire	
26	NC	NC	NC	
27	RESET	output	reset	
28	NC	NC	NC	
29	VDDIO1.8V	output	VDD1.8V	
30	VDD3.3V	output	VDD3.3V	
31	VDD3.3V	output	VDD3.3V	

3.22. POE

POE jack socket spacing: 1.25mm (bottom layer) (optional)

order number	definition	attribute	description	
1	POE1_2	import	POE1_2	
2	POE3_6	import	POE3_6	
3	POE4_5	import	POE4_5	
4	POE7_8	import	POE7_8	