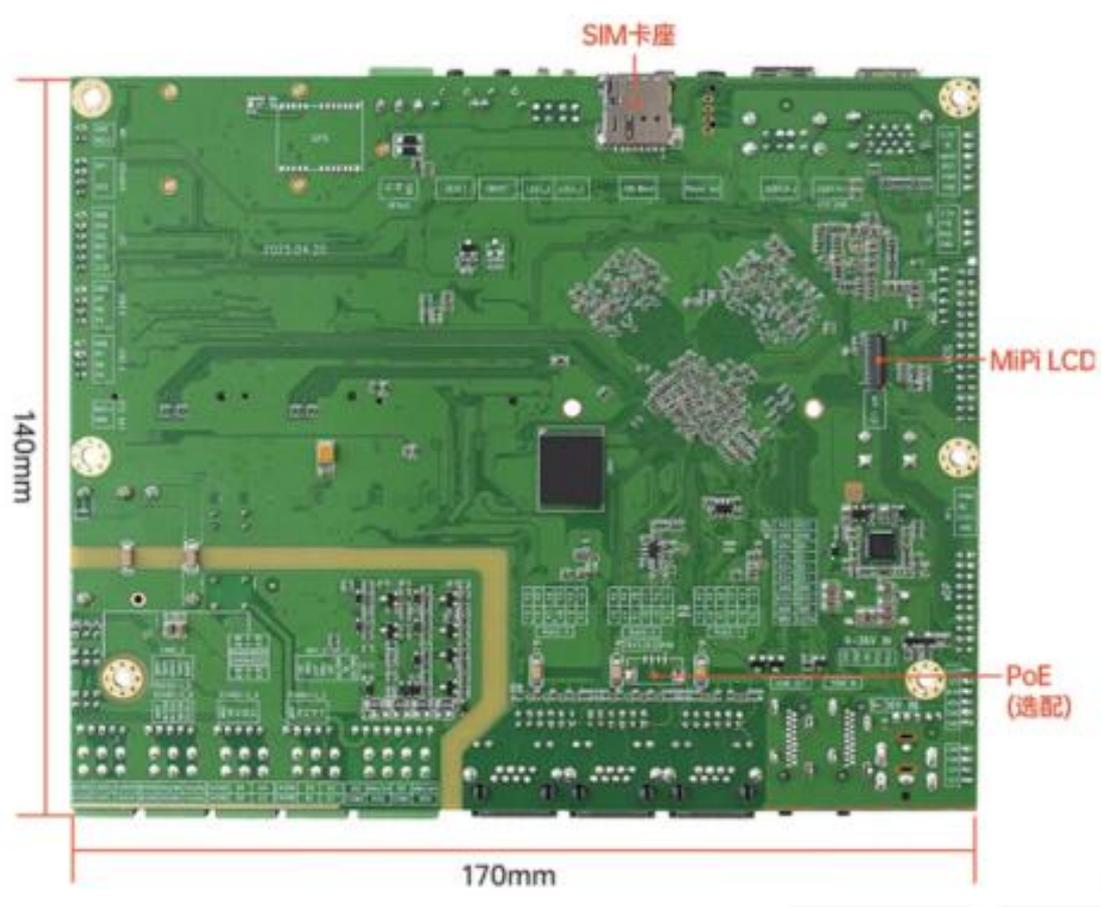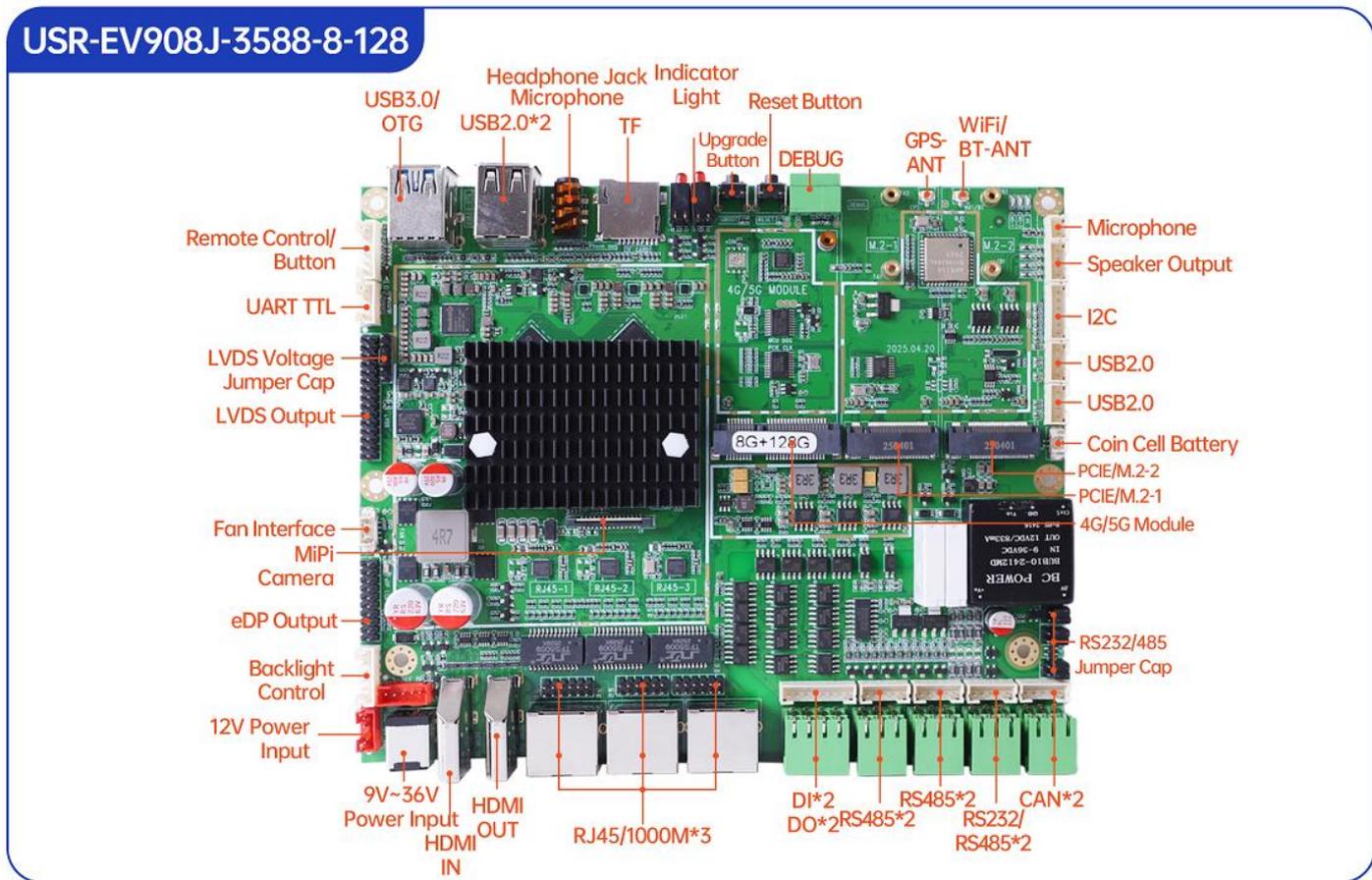# USR-EV908J(RK3588)

Catalogue

1. Product Overview

The USR-EV908J-3588 motherboard features Rockchip's RK3588J industrial-grade octa-core 64-bit CPU with a clock speed up to 2.4GHz, supporting operating systems including Ubuntu, Android, and Debian while delivering exceptional general-purpose computing performance. It integrates a quad-core Mali-G610 GPU for robust graphics processing and a built-in AI Neural Processing Unit (NPU) capable of INT4/INT8/INT16 mixed-precision operations with 6.0TOPS computing power. The system supports dual PCIe M.2 AI expansion slots and compatibility with mainstream AI development tools and interfaces. Designed for industrial-grade wide-temperature environments (-40°C to +85°C), it incorporates 4000V high-voltage electrical isolation in expansion ports to ensure stable performance under extreme operating conditions. The display system supports LVDS, eDP, and MIPI outputs, along with HDMI 8K output and HDMI 4K input, enabling multi-screen display functionality. The network communication features three Gigabit Ethernet ports, dual-band 2.4G/5G Wi-Fi, Bluetooth 5.2, and supports 4G/5G modules with GPS positioning. The storage and expansion capabilities are comprehensive, including PCIe M.2, USB, and TF card slots, as well as UART, RS232, RS485, CAN, GPIO, I²C, gravity sensor, fan control, MIPI/USB camera, infrared remote control, and POE power supply interfaces, fully meeting the diverse needs of industrial smart terminals in complex scenarios such as AI inference, human-machine interaction, and device networking.

2. Characteristic

- High performance: The RK3588J industrial-grade octa-core 64-bit CPU processor delivers a clock speed of up to 2.4 GHz.
- High computing power: 6 Tops computing capacity with expandable GPUs, supporting multiple AI development tools and interfaces.
- High stability: The DI/DO/RS232/RS485/CAN interfaces feature 4000V full isolation.
- High voltage input: 9V to 36V DC voltage.
- Wide temperature range: The motherboard materials utilize industrial-grade components with a wide temperature range of -40 to 85 degrees Celsius.
- High definition: HDMI 8K output and HDMI 4K input.
- Highly integrated: Featuring multiple interface options including 3 Gigabit Ethernet ports, WIFI/BT, 4G/5G connectivity, GPS, 2 CAN bus channels, 4 RS485 ports, 2 RS232/RS485 ports, 2 DI channels, 2 DO channels, 4 USB ports, and POE expansion capabilities.
- Easy upgrades: Supports multiple upgrade methods including USB drives, TF cards, remote OTA, and computer USB cables.
- Extensive compatibility: Fully supports mainstream USB/serial devices including printers, card readers, password keyboards, fingerprint scanners, cameras, ID card readers, and QR code scanners, with demo test programs provided.

3. Product interface

USR-EV908J-3588-8-128

USB3.0/OTG | Headphone Jack Microphone | USB2.0*2 | TF | Indicator Light | Upgrade Button | Reset Button | DEBUG | GPS-ANT | WiFi/BT-ANT

Remote Control/Button
UART TTL
LVDS Voltage Jumper Cap
LVDS Output
Fan Interface
MiPi Camera
eDP Output
Backlight Control
12V Power Input

Microphone
Speaker Output
I2C
USB2.0
USB2.0
Coin Cell Battery
PCIE/M.2-2
PCIE/M.2-1
4G/5G Module
RS232/485 Jumper Cap

9V~36V Power Input | HDMI OUT | HDMI IN | RJ45/1000M*3 | DI*2 DO*2 | RS485*2 | RS485*2 | RS232/RS485*2 | CAN*2

SIM卡座

MiPi LCD

PoE
(选配)

140mm

170mm

3.1.Hardware specifications

operating system	Ubuntu22.04/Android12.0/Debian
processor CPU	Rockchip RK3588J (8nm LPP process) An 8-core processor with 64-bit ARM architecture, capable of reaching a maximum clock speed of 2.4GHz. Based on quad-core Cortex-A76 (large core) + quad-core Cortex-A55 (small core)
graphics processing unit GPU	Mali-G610 GPU MP4 Quad-Core GPU Supports OpenGL ES3.2, OpenVG 1.1, and OpenCL 2.2, with 450GFLOF precision floating-point operations
Neural Network Processor (NPU)	Equipped with a 6Tops neural network processor (NPU), supporting INT4/INT8/INT16/FP16 arithmetic operations and an external PCIE interface for M.2-packaged computing power cards. Supports models such as Caffe, Mxnet, TensorFlow, TF Lite, ONNX, and Darknet Provide AI development tools: enable rapid model conversion.
internal storage	LPDDR4 8GB (4G/8G/16G available)
memory	eMMC 128GB (available in 32 GB, 64 GB, 128 GB, or 256 GB options)
PCIE continuation	2×PCIE M.2 expansion slots with 4 lanes for high-speed communication, compatible with M.2242 and M.2260 form factors, supports NVMe protocol, and features Gen4.0 x4 interfaces.
network	Supports 3 Ethernet ports with speeds of 10/100/1000 Mbps
	Supports dual-band WiFi (2.4G/5G) and Wi-Fi 802.11b/g/n/ac protocols (WiFi 6 optional).
	Supports Bluetooth functionality, including V2.1+EDR, Bluetooth 3.0, Bluetooth 3.0+HS, Bluetooth 4.1, Bluetooth 4.2, Bluetooth 5.2, and BLE.
	Supports 4G/5G (optional)
GPS navigation	Board-mounted 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 LVDS channel (dual-channel, 6-bit/8-bit), 1080P 60Hz output, power supply options: 3.3V/5V/12V 1*eDP (eDP1.3, 4 lanes with 5.4Gbps), powered by 3.3V/5V supply 1* HDMI 2.1, 8K,60Hz output

	1* HDMI 2.0, K 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 capability, supporting up to 48MP resolution (optional)
	Supports USB camera (optional)
RTC	External real-time clock power battery with on/off timer support
USB	4*USB-2.0 HOST，1*USB3.0 CPU，1*USB3.0 OTG
PCIe	1*Mini PCIe (for 4G/5G LTE)
SIM	1*SIM card slot for Mini PCIe expansion of 4G/5G LTE modules
infrared	1* Infrared receiver base, supporting infrared remote control function
LED	1* Power status LED (red), * System LED (blue, default flashing)
key	1*Reset button, *Power button, 1*Upgrade button
gorge line	1*UART TTL, 4*RS485 (with 4000V isolation support), 2*RS232/RS485 (with 4000V isolation support)
IO mouth	2 DO ports, 2 DI ports (supporting 4000V isolation)
CAN	2 CAN ports (supporting 4000V isolation)
I2C port	1*I2C port
Fan opening	Supports 5V/12V fan interface
POE	1*POE interface
power input	DC9V~36V,5A (requires surge voltage below 14V and ripple voltage below 100mV), supports automatic startup upon power-up or manual activation via power button
working temperature	-40℃~85℃
Storage temperature	-40℃~85℃
Storage humidity	10%~80%
Mainboard size	170mm*140mm*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, system crash self-recovery, 7*24-hour unattended operation
system watchdog	Support software watchdog

3.2.structure size

3.3.Source

The spacing between power input interface sockets is 2.0 mm.

order number	definition	attribute	description	
1	9V~36V_IN	import	9V~36V power supply input	
2	9V~36V_IN	import	9V~36V power supply input	
3	NC	NC	barefoot	
4	GND	earth wire	earth wire	
5	GND	earth wire	earth wire	

The distance between the output interface sockets is 2.0mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	12V_OUT	import	12V power supply output	
4	12V_OUT	import	12V power supply output	

3.4.Screen backlight

The LCD backlight jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	12V	output	12V power supply output	
2	12V	output	12V power supply 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.eDP

The eDP LCD jack socket has a spacing of 2.0mm between sockets.

order number	definition	attribute	description	
1	VCC	output	3.3V/5V power	
2	VCC	output	supply 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	

3.6.electric fan
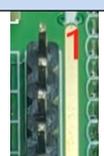
The spacing between the fan jack sockets is 1.25mm.

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

3.7.LVDS

The LVDS jack socket has a spacing of 2.0mm.

order number	definition	attribute	description	
1	POWER		3.3V/5V/12V	
2	POWER	output	power supply	
3	POWER		output	
4	GND			
5	GND	earth wire	earth wire	
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	

LVDS LCD JP JACK interface with 2.0mm socket spacing

order number	definition	attribute	description	
1	3.3V	output	3.3V output	
2	LCD-VDD-IN	import	LCD voltage input	
3	5V	output	5V output	

4	LCD-VDD-IN	import	LCD voltage input	
5	12V	output	12V output	
6	LCD-VDD-IN	import	LCD voltage input	

3.8.MIPI Camera

MIPI Camera jack spacing: 0.5mm

order number	definition	attribute	description	
1	NC	barefoot	barefoot	
2	VDD28	source	2.8V output	
3	VDD13	source	1.3V output	
4	VDD18	source	1.8V output	
5	NC	barefoot	barefoot	
6	GND	earth wire	earth wire	
7	VDD28	source	2.8V output	
8	GND	earth wire	earth wire	
9	SDA	output	data	
10	SCL	output	clock	
11	RST	output	reset	
12	PWDN	output	enable bit	
13	GND	earth wire	earth wire	
14	MLCK	output	clock	
15	GND	earth wire	earth wire	
16	DP3	output	data	
17	DN3	output	data	
18	GND	earth wire	earth wire	
19	DP2	output	data	
20	DN2	output	data	
21	GND	earth wire	earth wire	
22	DP1	output	data	
23	DN1	output	data	
24	GND	earth wire	earth wire	
25	CLKP	output	clock	
26	CLKN	output	clock	
27	GND	earth wire	earth wire	
28	DP0	output	data	
29	DN0	output	data	
30	GND	earth wire	earth wire	
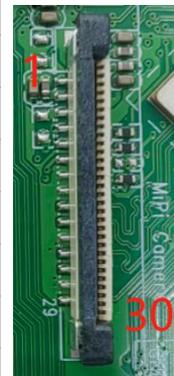
3.9.UART TTL

UART TTL interface (UART TTL jack) with 2.0mm pin pitch

order number	definition	attribute	description	
1	3.3V	output	3.3V output	
2	TX6	output	Send (TX6) ttyS6	
3	RX6	import	Receive (RX6) ttyS6	
4	GND	earth wire	earth wire	

3.10. Button/Remote Control

KEY/IR IN JACK 2.0MM

order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IR	import	receive	
3	UBOOT	import	Upgrade key	
4	RST	import	reset key	
5	PWR	import	Power On/Off Key	
6	GND	earth wire	earth wire	

3.11. DEBUG

JACK 3.5MM

order number	definition	attribute	description	
1	TX	output	transmit by radio	
2	RX	import	receive	
3	GND	earth wire	earth wire	

3.12. MIC

The microphone jack socket spacing is 2.0mm.

order number	definition	attribute	description

er				
1	MIC-	earth wire	earth wire	
2	MIC+	import	MIC positive input	

3.13. suona

The speaker output jack socket spacing is 2.0mm.

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

3.14. I2C

The I2C interface (I2C JACK) socket spacing is 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	Redeploy external devices	
4	SCL (3.3V level)	output	clock	
5	SDA (3.3V level)	output	data	
6	GND	earth wire	earth wire	

3.15. USB

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

order	definition	attribute	description

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

3.16. RTC

3V button battery socket (BAT JACK) with 1.25mm spacing

order number	definition	attribute	description	
1	BAT+	import	3V input	
2	GND	earth wire	earth wire	

3.17. CAN

CAN interface (CAN JACK) with 2×3.5mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	CAN1H	data	data	
2	CAN1L	data	data	
3	GND	simulated ground	simulated ground	
4	CAN2H	data	data	
5	CAN2L	data	data	
6	GND	simulated ground	simulated ground	

CAN interface (CAN JACK) with 2.0mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	CAN1H	data	data	
2	CAN1L	data	data	
3	CAN2H	data	data	
4	CAN2L	data	data	
5	GND	simulated ground	simulated ground	

3.18. RS232/RS485

RS232/RS485 interface (RS232/RS485 JACK) with 2×3.5mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	TX1/RS485-A5	output	Transmit (TX1/A5) ttyS1	
2	RX1/RS485-B5	import	Receive (RX1/B5) ttyS1	
3	GND	simulated ground	simulated ground	
4	TX2/RS485-A6	output	Transmit (TX2/A6) ttyS4	
5	RX2/RS485-B6	import	Receive (RX2/B6)ttyS4	
6	GND	simulated ground	simulated ground	

RS232/RS485 interface (RS232/RS485 JACK) with 2.0mm pin spacing (interface equipped with isolation)

| order number	definition	attribute	description	
1	TX1/RS485-A5	output	Transmit (TX1/A5) ttyS1	
2	RX1/RS485-B5	import	Receive (RX1/B5) ttyS1	
3	TX2/RS485-A6	output	Transmit (TX2/A6) ttyS4	
4	RX2/RS485-B6	import	Receive (RX2/B6)ttyS4	
5	GND	simulated ground	simulated ground	

3.19. RS485

RS485 interface (RS485 JACK) with 2×3.5mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	RS485-A3	output	Send (A3)ttyS8	

2	RS485-B3	import	Receive (B3)ttyS8	
3	GND	simulated ground	simulated ground	
4	RS485-A4	output	Send (A4) ttyS9	
5	RS485-B4	import	Receive (B4)ttyS9	
6	GND	simulated ground	simulated ground	

RS485 interface (RS485 JACK) with 2.0mm pin spacing (interface equipped with isolation)
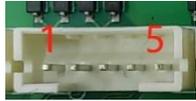
order number	definition	attribute	description	
1	RS485-A3	output	Send (A3)ttyS8	
2	RS485-B3	import	Receive (B3)ttyS8	
3	RS485-A4	output	Send (A4) ttyS9	
4	RS485-B4	import	Receive (B4)ttyS9	
5	GND	simulated ground	simulated ground	

RS485 interface (RS485 JACK) with 2×3.5mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	RS485-A1	output	Send (A1) ttyS0	
2	RS485-B1	import	Receive (B1)ttyS0	
3	GND	simulated ground	simulated ground	
4	RS485-A2	output	Send (A2) ttyS3	
5	RS485-B2	import	Receive (B2)ttyS3	
6	GND	simulated ground	simulated ground	

RS485 interface (RS485 JACK) with 2.0mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	RS485-A1	output	Send (A1) ttyS0	
2	RS485-B1	import	Receive (B1)ttyS0	
3	RS485-A2	output	Send (A2) ttyS3	
4	RS485-B2	import	Receive (B2)ttyS3	
5	GND	simulated ground	simulated ground	

3.20. IO

IO JACK with 2×3.5mm pin spacing (interface equipped with isolation)

order number	definition	attribute	description	
1	DO1	data	data	
2	COM1	data	data	
3	DO2	data	data	
4	COM2	data	data	
5	12V/GND	Output/Analog Ground	12V output/analog ground	
6	DI1	data	data	
7	12V/GND	Output/Analog Ground	12V output/analog ground	
8	DI2	data	data	

IO JACK with 2.0mm socket spacing (interface equipped with isolation)

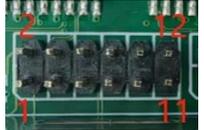| order number	definition	attribute	description	
1	12V/GND	Output/Analog Ground	12V output/analog ground	
2	DI1	data	data	
3	12V/GND	Output/Analog Ground	12V output/analog ground	
4	DI2	data	data	
5	COM2	data	data	
6	DO2	data	data	
7	COM1	data	data	
8	DO1	data	data	

3.21. RJ45

RJ45-3 jack socket spacing: 2×2.0mm

order number	definition	attribute	description

1	Y+_3	output	Yellow LED+	
2	Y-_3	output	Yellow LED-	
3	D-_3	import	data	
4	D+_3	import	data	
5	B-_3	import	data	
6	C-_3	import	data	
7	C+_3	import	data	
8	B+_3	import	data	
9	A-_3	import	data	
10	A+_3	import	data	
11	G-_3	output	Green LED-	
12	G+_3	output	Green LED+	
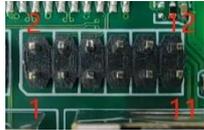
RJ45-2 jack socket spacing: 2×2.0mm

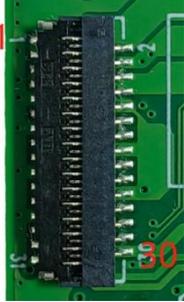| order number	definition	attribute	description	
1	Y+_2	output	Yellow LED+	
2	Y-_2	output	Yellow LED-	
3	D-_2	import	data	
4	D+_2	import	data	
5	B-_2	import	data	
6	C-_2	import	data	
7	C+_2	import	data	
8	B+_2	import	data	
9	A-_2	import	data	
10	A+_2	import	data	
11	G-_2	output	Green LED-	
12	G+_2	output	Green LED+	

RJ45-1 jack socket spacing: 2×2.0mm

order number	definition	attribute	description	
1	Y+_1	output	Yellow LED+	
2	Y-_1	output	Yellow LED-	
3	D-_1	import	data	
4	D+_1	import	data	
5	B-_1	import	data	
6	C-_1	import	data	
7	C+_1	import	data	
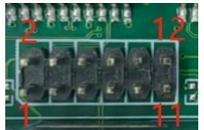
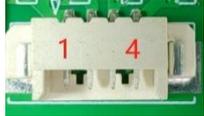| 8	B+_1	import	data
9	A-_1	import	data
10	A+_1	import	data
11	G-_1	output	Green LED-
12	G+_1	output	Green LED+

3.22. 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	

3.23. POE

POE interface (POE JACK) socket spacing: 1.25mm (bottom layer) (optional)

order number	definition	attribute	description	
1	POE7-8	import	Input 7-8	
2	POE4-5	import	4-5 inputs	
3	POE3-6	import	Input 3-6	
4	POE1-2	import	Input 1-2	