USR-EV808(RK3576)

Catalogue

1. Product Overview

The USR-EV808-3576 high-performance smart motherboard features the Rockchip RK3576 processor, supporting operating systems including Android 14.0, Debian, and Ubuntu. The RK3576 employs an 8nm process technology, integrating a quad-core Cortex-A72 and quad-core Cortex-A53 8-bit CPU with a clock speed of up to 2.2 GHz, delivering robust general-purpose computing capabilities. Graphics processing is handled by a quad-core Mali-G52 MC3 GPU, enabling smooth HD graphics rendering. The chip incorporates a high-performance neural network processor (NPU) with 6.0 TOPS AI computing power, supporting INT4/INT8/INT16 mixed-precision operations and compatibility with various AI development tools and interfaces, facilitating deployment of mainstream models such as TensorFlow, Caffe, and MXNet. The motherboard supports dual-screen display with multiple output options including LVDS (1080P), eDP, MIPI, and HDMI (4K). For networking, it features dual Gigabit Ethernet, 4G/5G, and Wi-Fi to meet high-speed communication needs. Extensive expansion ports include USB, CAN, RS232, RS485, GPIO, I²C, MIPI camera, infrared remote control, and gravity sensor, enabling flexible peripheral integration. Leveraging its hardware platform capabilities and Android-based intelligence advantages, this motherboard is widely deployed across AI-powered domains including AI servers, facial payment terminals, security surveillance systems, medical equipment, intelligent transportation networks, financial terminals, industrial control systems, smart education solutions, and smart retail applications. It delivers efficient support for diverse human-machine interaction scenarios and network device connectivity environments.
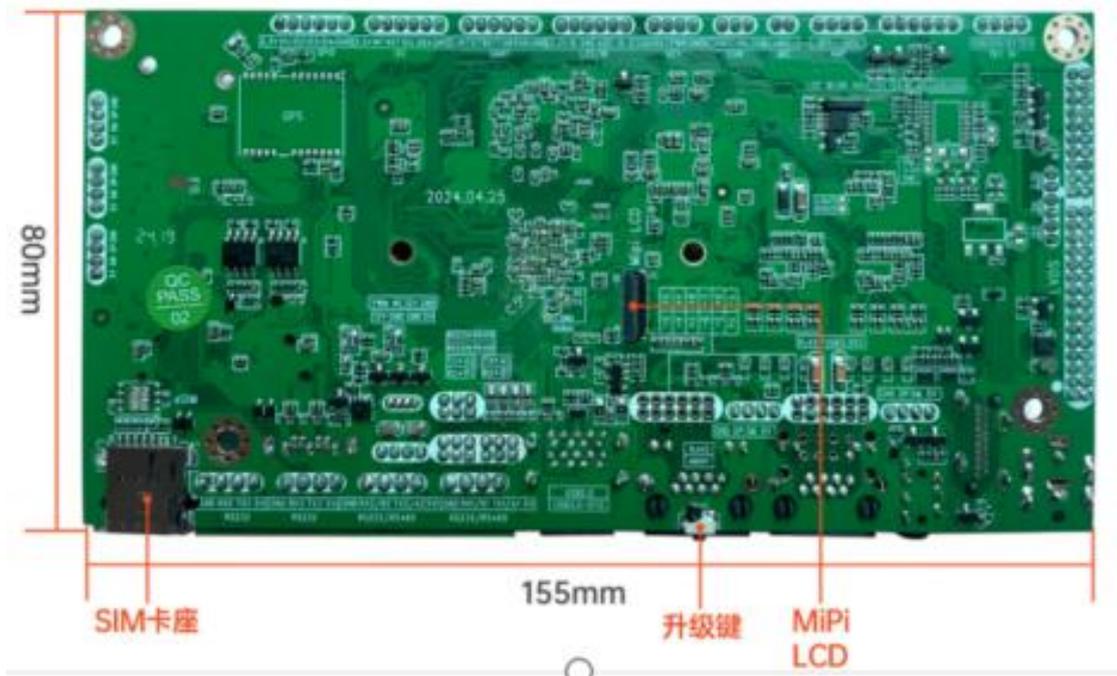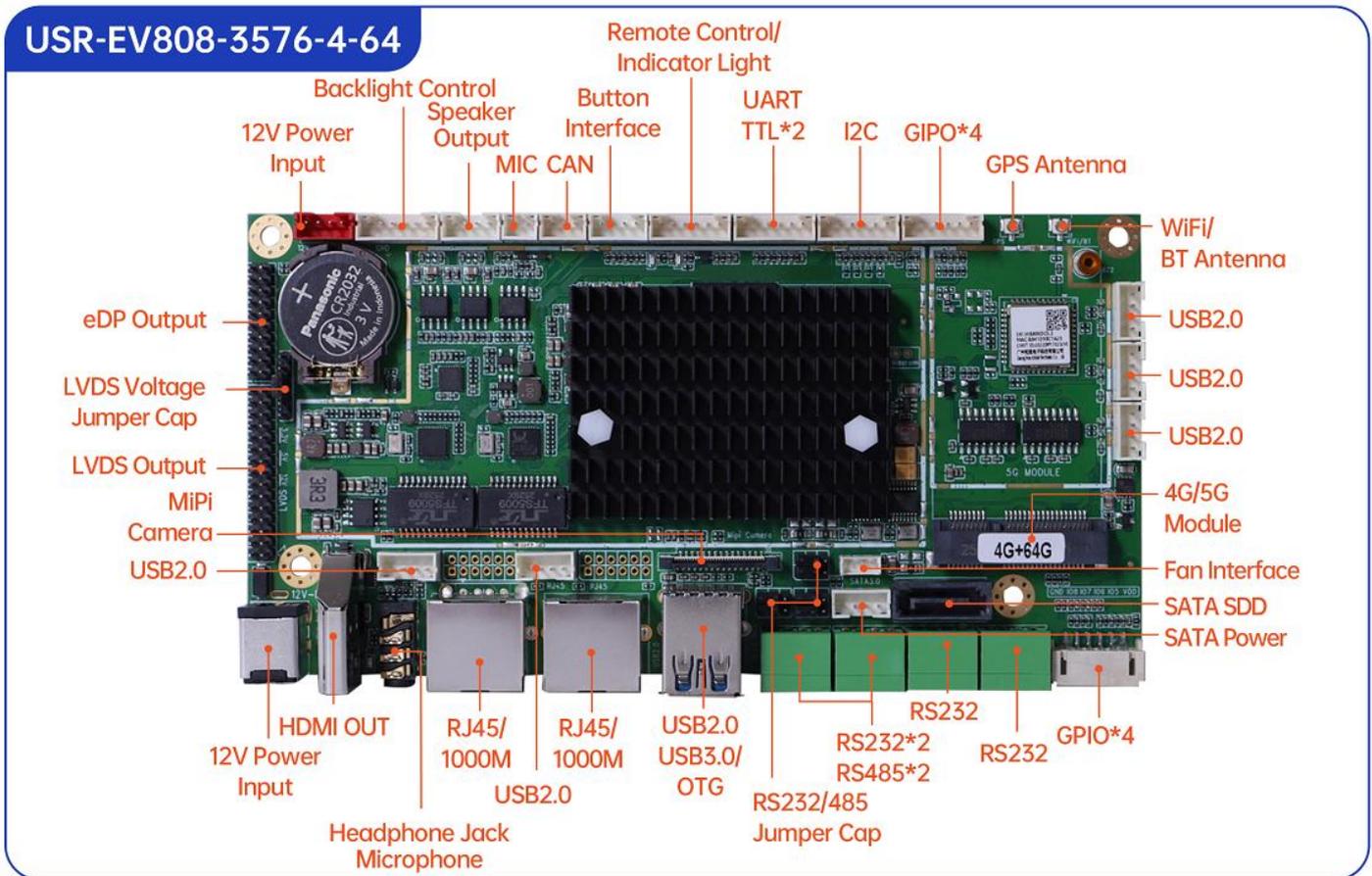
2. Characteristic

- High Performance: The RK3576 features an eight-core 64-bit CPU architecture combining four Cortex-A72 cores and four Cortex-A53 cores, with a clock frequency up to 2.2 GHz, delivering exceptional general-purpose computing performance. Graphics processing is handled by a quad-core Mali-G52 MC3 GPU, enabling efficient high-definition rendering and graphics acceleration. The chip integrates a dedicated AI neural network processor (NPU) with up to 6.0 TOPS computing power, supporting mixed-precision operations including INT4, INT8, and INT16. This NPU is compatible with mainstream AI development tools and frameworks, allowing direct conversion of general-purpose models such as TensorFlow, Caffe, and MXNet. Comprehensive development support is provided, including Android NN API, RKNN cross-platform API, and TensorFlow development interfaces, facilitating rapid deployment and optimization of AI applications.
- High Stability: The RK3576 AI motherboard incorporates proprietary technologies in both hardware and software to ensure product stability, enabling the final product to achieve 7×24-hour unattended operation.
- High Integration: The RK3576 AI motherboard utilizes military-grade TG170-8-layer ultra-high-density PCB, integrating Ethernet, WiFi, 18W power amplifier, IR remote control, HDMI, LVDS, eDP, MiPi, microphone, and gravity sensing functions, significantly simplifying overall design.

Its ultra-thin motherboard design enhances the aesthetic appeal of the entire system.

- High expandability: Featuring seven USB ports, one CAN bus, two UART ports, one I2C port, eight IO expansion slots, one AD interface, two RS232 ports, and two RS232/RS485 ports, enabling seamless integration of additional peripheral devices.

3. Product interface

USR-EV808-3576-4-64

Remote Control/Indicator Light
Backlight Control
Speaker Output
Button Interface
UART TTL*2
I2C
GIPO*4
12V Power Input
MIC CAN
GPS Antenna
WiFi/BT Antenna
eDP Output
USB2.0
LVDS Voltage Jumper Cap
USB2.0
LVDS Output
USB2.0
MiPi Camera
4G/5G Module
USB2.0
Fan Interface
SATA SDD
SATA Power
HDMI OUT
RJ45/1000M
RJ45/1000M
USB2.0 USB3.0/OTG
RS232
RS232*2 RS485*2
RS232
GPIO*4
12V Power Input
USB2.0
RS232/485 Jumper Cap
Headphone Jack Microphone

80mm
155mm
SIM卡座
升级键
MiPi LCD

3.1.Hardware specifications

|	
Operating system	Ubuntu22.04/ Android14.0/debian
Processor CPU	RK3576, featuring quad-core Cortex-A72 and quad-core Cortex-A53 processors with a maximum clock speed of 2.2GHz
Graphics Processing Unit GPU	Quad-core Mali-G52 MC3 Supports OpenGL ES 1.1/2.0/3.2, OpenCL 2.0, and Vulkan 1.1, with built-in high-performance 2D acceleration hardware.
Neural Network Processor (NPU)	Equipped with a built-in neural network processor (NPU) delivering 6.0 TOPS @INT8 performance. Supports models including Caffe, Mxnet, TensorFlow, PyTorch, TF Lite, ONNX, and Darknet. Provide AI development tools: enable rapid model conversion.
RAM	LPDDR4 4GB (8G/16G)
ROM	eMMC 64GB (32G/64G/128G/256G) 1*SATA 3.0 (for SSD/HDD hard disk expansion)
Network	Supports dual Ethernet ports with speeds of 10Mbps, 100Mbps, and 1000Mbps
	Supports 2.4GHz frequency band and WiFi 6 802.11b/n/g/ax protocols. (5GHz dual-band option available)
	Supports Bluetooth functionality, including Bluetooth 2.1+EDR/3.0/4.x/5.2
	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 supports 4K@60Hz output at 5.4Gbps), powered by 3.3V/5V supply 1 LVDS channel (dual-channel, 6-bit/8-bit), 1080P@60Hz output, power supply options: 3.3V/5V/12V 1*HDMI OUT 2.0 supports output up to 4K at 60Hz 1*MiPi interface (supports MiPi 2560*1600@60Hz output) Choose between eDP and HDMI, or MIPI and LVDS.
Board-mounted backlight control	12V Backlight Power Supply and Control
Audio	1*Speaker output (2*18W 4R) 1* Earpiece output (with earpiece) 1*Microphone input

Screen	1* I²C interface (supports multi-point resistive and capacitive touch). Supports multi-point infrared touch, capacitive touch, nano-film touch, and acoustic wave touch via USB. Multi-point optical touch and so on.
Camera	1* MIPI 4-Lane camera input with 5MP/13MP resolution (optional) Supports USB camera (optional)
RTC	Built-in real-time clock power battery with on/off timer support
USB	5*USB-2.0 HUB , 1*USB3.0 OTG& 1*USB2.0 HUB
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), 1* System LED (blue, default flashing)
key	1*Reset button, 1*Power button, 1*Upgrade button
gorge line	2×RS232,2×RS232/2×RS485 (skip cap selection), 2×UART TTL
IO mouth	8* IO ports, supporting input or output
CAN mouth	1*CAN port
AD	1*AD port
Fan opening	Supports 5V/12V fan interface
POE mouth	1*POE interface (optional)
Power input	DC12V/5.5mm core, 2.1mm DC head, 2A-5A current rating (requires surge voltage below 18V and ripple voltage below 100mV). Supports automatic startup upon power-on or manual activation via power button.
Working temperature	-10 to 70 degrees
Storage temperature	-20 to 70 degrees
Storage humidity	10%-80%
Mainboard size	155mm*80mm*20mm
Multi-media	Supports 4K@60fps video decoding with H.265/H.264/AV1/VP9/AVS2 formats Supports 1080P 60fps H.265/H.264 video encoding Supports 8M ISP and HDR
Linguistic support	Multilingual
System	The native Ubuntu system with root access for custom product

management	development
System management	Real-time remote monitoring, system crash self-recovery, 7*24-hour unattended operation
	Enable Wi-Fi display
System watchdog	Support software watchdog

3.2.Structure size
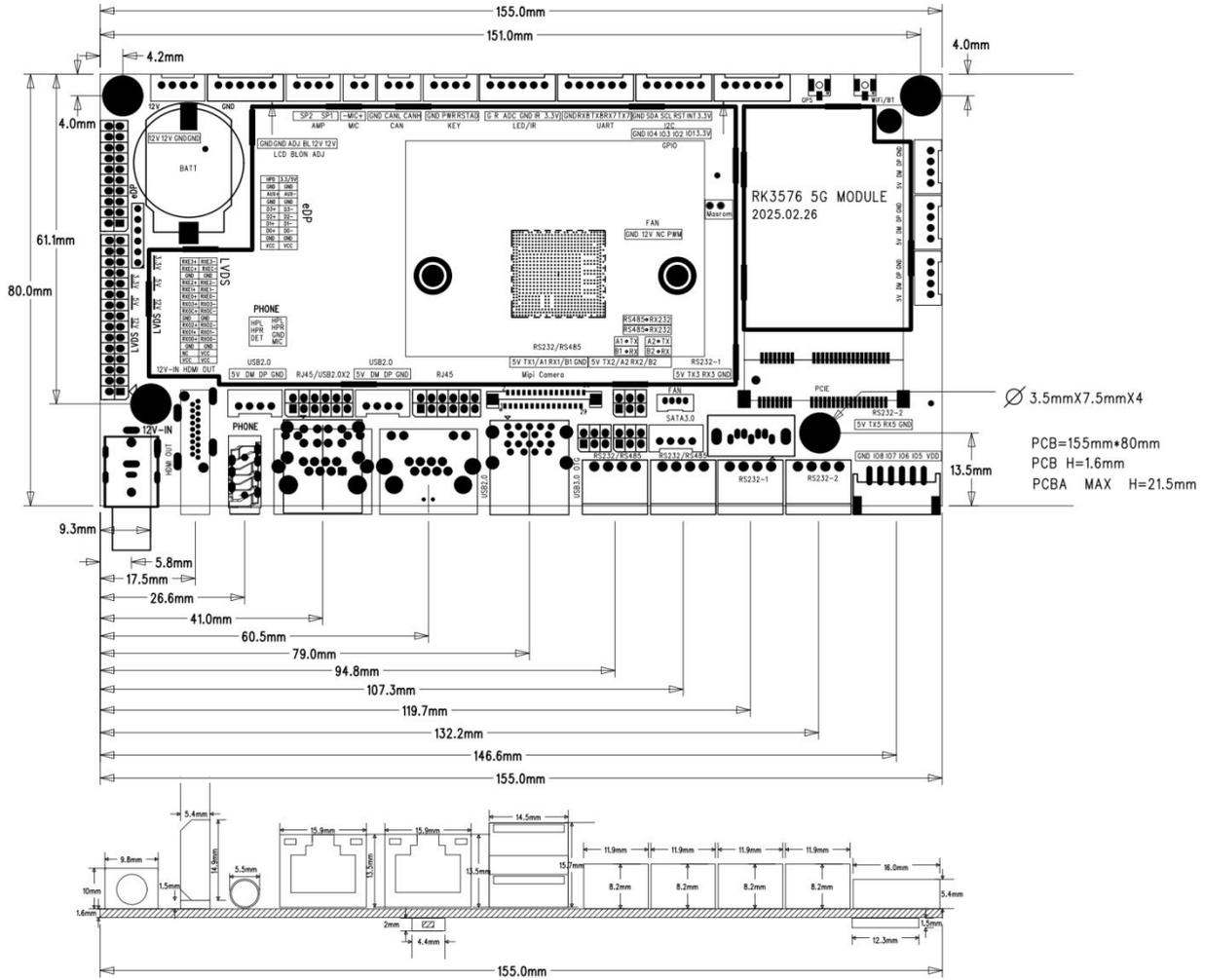
3.3.Power input

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

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

3.4.Screen backlight

The distance between the LCD backlight jack (BL JACK) sockets is 2.0mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	LCD-ADJ	output	Backlight adjustment	
4	LCD-BLON	output	Backlight control	
5	12V	output	12V output	
6	12V	output	12V output	

3.5.suona

The speaker output jack socket spacing is 2.0mm.

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

3.6.Microphone

The microphone jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	MIC-	import	MIC negative electrode input	

2	MIC+	import	MIC positive input	

3.7.CAN

The CAN interface jack has a socket spacing of 2.0mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	CANL	data -FD	data	
3	CANH	data -FD	data	

3.8.key

The key jack socket spacing is 2.0mm.

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	PWR	output	POWER power button	
3	RST	output	RESET Reset button	
4	AD	output	AD (Upgrade) button output	

3.9.LED/ remote control

LED/Remote Control Receiver Interface (LED/IR IN JACK) with 2.0mm socket spacing

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

3.10. UART

UART serial interface (TTL level) with 2.0mm pin spacing (UART-TTL JACK)

order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX8	import	Receive (RX8)ttyS8	
3	TX8	output	Send (TX8) ttyS8	
4	RX7	import	Receive (RX7) ttyS7	
5	TX7	output	Send (TX7) ttyS7	
6	3.3V/5V (optional)	output	3.3V/5V voltage output	

3.11. I2C

The I2C interface (I2C JACK) socket spacing is 2.0mm.

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

3.12. GPIO

The distance between the sockets of the GPIO detection interface (IO DET JACK) is 2.0mm.

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

The IO detection jack (IO DET JACK) has a socket spacing of 2.0 mm.

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

3.13. USB2.0

The USB 2.0-HUB interface (USB 2.0 HOST JACK) features a socket spacing of 2.0mm.

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	

3.14. RS232

RS232 interface (RS232 JACK) with pin spacing of 2.0mm

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

order number	definition	attribute	description	
1	5V/3.3V (optional)	output	3.3V/5V voltage output	

2	TX3	output	Send (TX3) ttyS3		RS232 interface (RS232 JACK) with pin spacing of 2.0mm
3	RX3	import	Receive (RX3) ttyS3		
4	GND	earth wire	earth wire		

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

3.15. RS232/RS485

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

order number	definition	attribute	description	
1	5V/3.3V (optional)	output	3.3V/5V voltage output	
2	TX2/A2	output	Send (TX2/A2)ttyS2	
3	RX2/B2	import	Receive (RX2/B2) ttyS2	
4	GND	earth wire	earth wire	

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

order number	definition	attribute	description	
1	5V3.3V (optional)	output	3.3V/5V voltage output	
2	TX1/A1	output	Send (TX1/A1)ttyS1	
3	RX1/B1	import	Receive (RX1/B1) ttyS1	
4	GND	earth wire	earth wire	

RS232/485 jumper cap interface (WEIGAND JACK) with 2.0mm socket spacing

order number	definition	attribute	description

1	RS485-B1	data	data	
2	RS485-A1	data	data	
3	RX1/B1-COM	data	data	
4	TX1/A1-COM	data	data	
5	RS232-RX1	data	data	
6	RS232-TX1	data	data	
7	RS485-B2	data	data	
8	RS485-A2	data	data	
9	RX1/B2-COM	data	data	
10	TX1/A2-COM	data	data	
11	RS232-RX2	data	data	
12	RS232-TX2	data	data	
13	RS485-RX3	data	data	
14	RS485-RX3	data	data	
15	RX3-COM	data	data	
16	TX3-COM	data	data	
17	RS232-RX5	data	data	
18	RS232-TX5	data	data	

3.16. SATA

SATA power interface (SATA DC JACK) with 2.0mm pin spacing

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	

3.17. electric fan

The spacing between fan jack sockets is 1.25mm.

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

3.18. MiPi CAMER

The MiPi CAMER interface (MiPi CAMER JACK) socket spacing is 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	earth wire	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	GN1	earth wire	earth wire	
22	DP2	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	

3.19. LVDS

LVDS LCD jack with 2.0mm socket spacing

order	definition	attribute	description

number				
1	POWER	output	3.3V/5V/12V power supply 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	

LVDS LCD JP JACK interface with 2.0mm socket spacing

order number	definition	attribute	description	
1	LCD-VDD-IN	import	LCD voltage input	
2	3.3V	output	3.3V output	
3	LCD-VDD-IN	import	LCD voltage input	
4	5V	output	5V output	

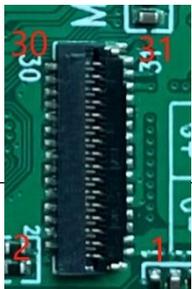| 5 | LCD-VDD-IN | import | LCD voltage input | |
| 6 | 12V | output | 12V output | |

3.20. eDP

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

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	3.3V	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+			
2	LED+	output	backlight anode	
3	LED+			
4	GND	earth wire	earth wire	
5	LED-	output	Backlight anode	

6	LED-			
7	LED-			
8	LED-	earth wire	earth wire	
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 interface (POE JACK) with 1.25mm socket spacing (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	