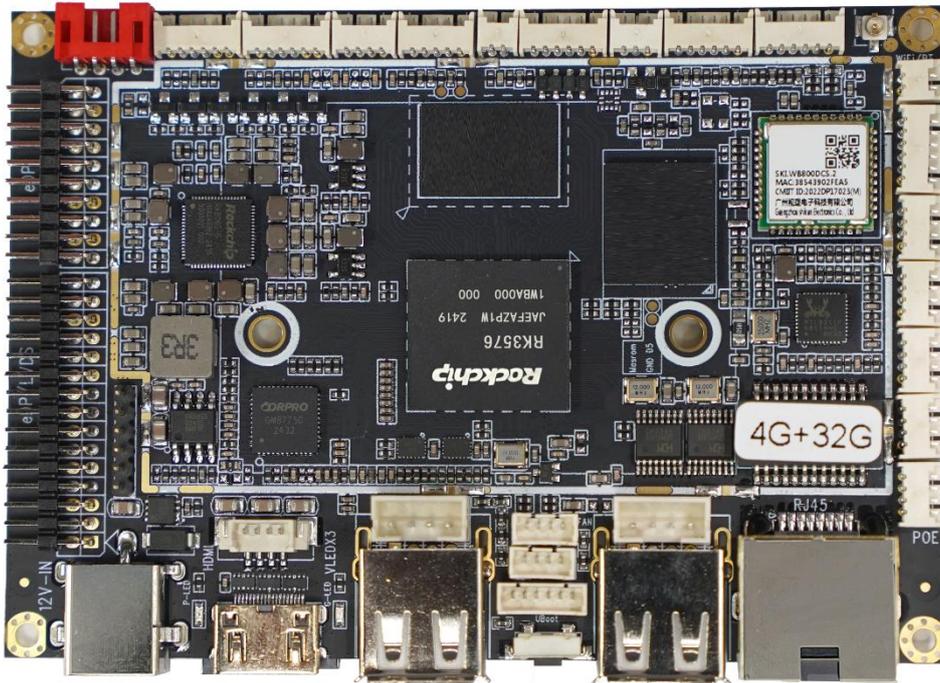


USR-EV208(RK3576)



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1. Product Overview

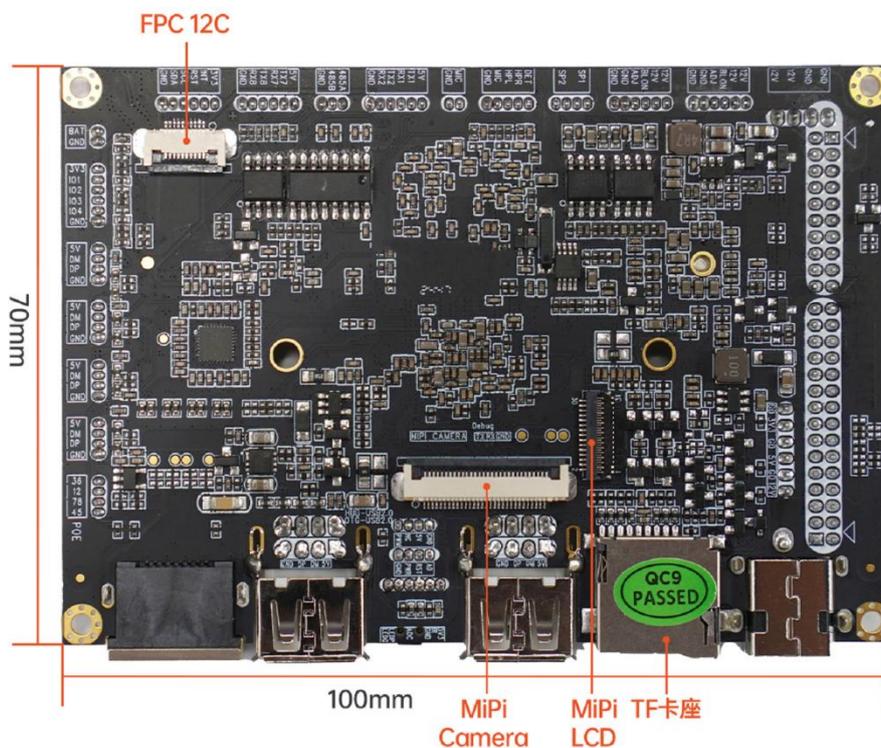
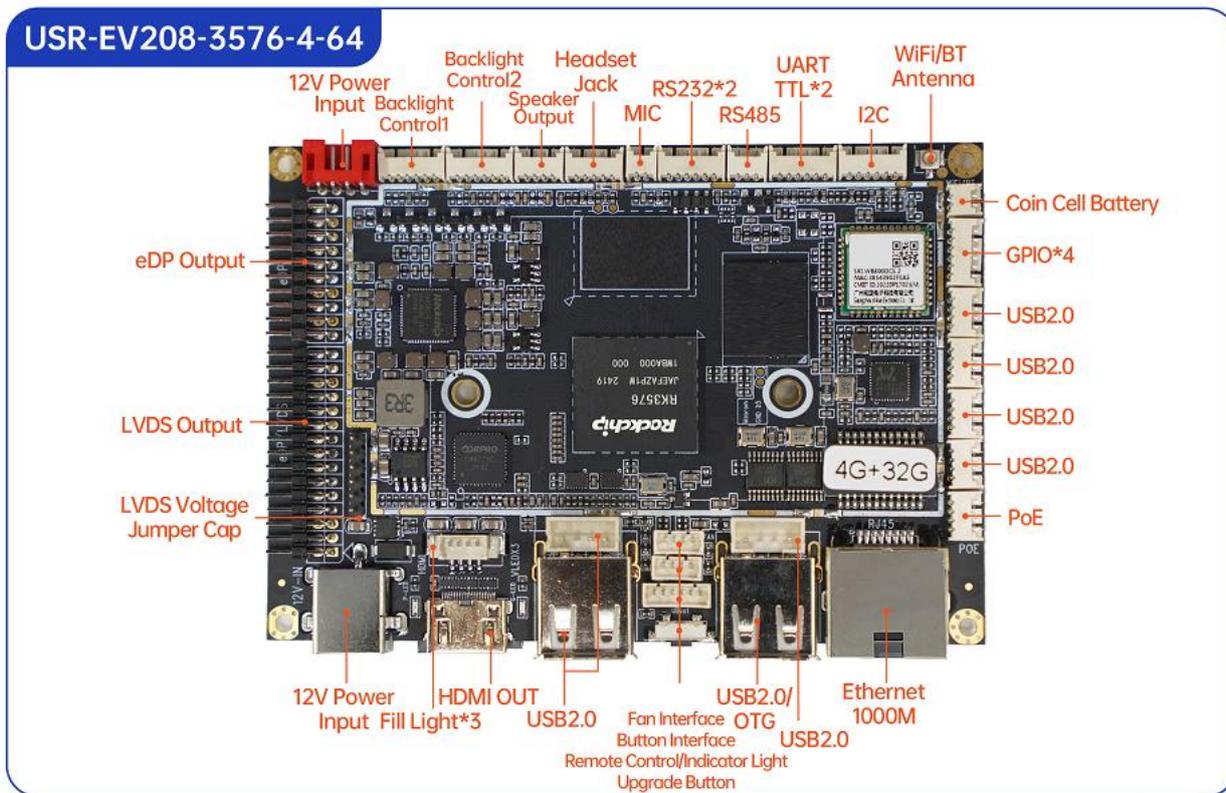
The USR-EV208-3576 high-performance smart motherboard features the Rockchip RK3576 AI processor with integrated Neural Processing Unit (NPU), supporting Android 14.0, Debian, and Ubuntu operating systems. The RK3576 employs an advanced 8nm process based on a quad-core Cortex-A72 + quad-core Cortex-A53 architecture, delivering a clock speed of up to 2.2GHz and exceptional general-purpose computing capabilities. Its quad-core Mali-G52 MC3 GPU ensures robust graphics processing performance. The built-in NPU provides up to 6.0 TOPS of AI computing performance, fully compatible with various AI development tools and interfaces.

The motherboard supports dual-screen display functionality, offering LVDS 1080P output, eDP and MIPI display interfaces, along with HDMI 4K ultra-HD output. It also features a range of peripheral interfaces including Gigabit Ethernet, Wi-Fi, USB expansion, gravity sensor, RS232, RS485, IO expansion, I²C expansion, MIPI camera interface, and infrared remote control. With its highly integrated hardware platform and the intelligent capabilities of the Ubuntu system, this motherboard is widely used in AI servers, facial payment terminals, smart security systems, medical devices, transportation systems, financial terminals, industrial control, smart education, and intelligent retail sectors. It is suitable for various intelligent terminal scenarios requiring human-machine interaction or network device collaboration.

2. Characteristic

- **High Performance:** The RK3576 features a quad-core Cortex-A72 and quad-core Cortex-A53 architecture with a clock speed of up to 2.2GHz, delivering exceptional general-purpose computing performance. Its GPU incorporates a quad-core Mali-G52 MC3 for outstanding graphics processing. The CPU integrates an AI Neural Network Processor (NPU) with 6.0 TOPS computing power, supporting multiple mainstream AI development tools and interfaces. It enables direct conversion of general models like TensorFlow, Caffe, and MXNet, along with a comprehensive AI development suite compatible with Android NN API, RKNN cross-platform API, and TensorFlow development interfaces, significantly lowering the barrier to AI application development and enhancing deployment efficiency.
- **High Stability:** The RK3576 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 RK3576 AI motherboard utilizes military-grade TG170-8-layer ultra-high-density PCB, integrating Ethernet, WiFi, 5W power amplifier, IR remote control, HDMI, LVDS, eDP, MiPi, microphone, and gravity sensor functions, significantly simplifying overall design. Its ultra-thin design also enhances the aesthetic appeal of the device.
- **High expandability:** Featuring eight USB ports, two UART ports, one I2C port, four IO expansion slots, one AD port, two RS232 ports, one RS485 port, one headset jack, one POE port, and three flash ports, enabling seamless expansion of peripheral devices.

3. Product interface



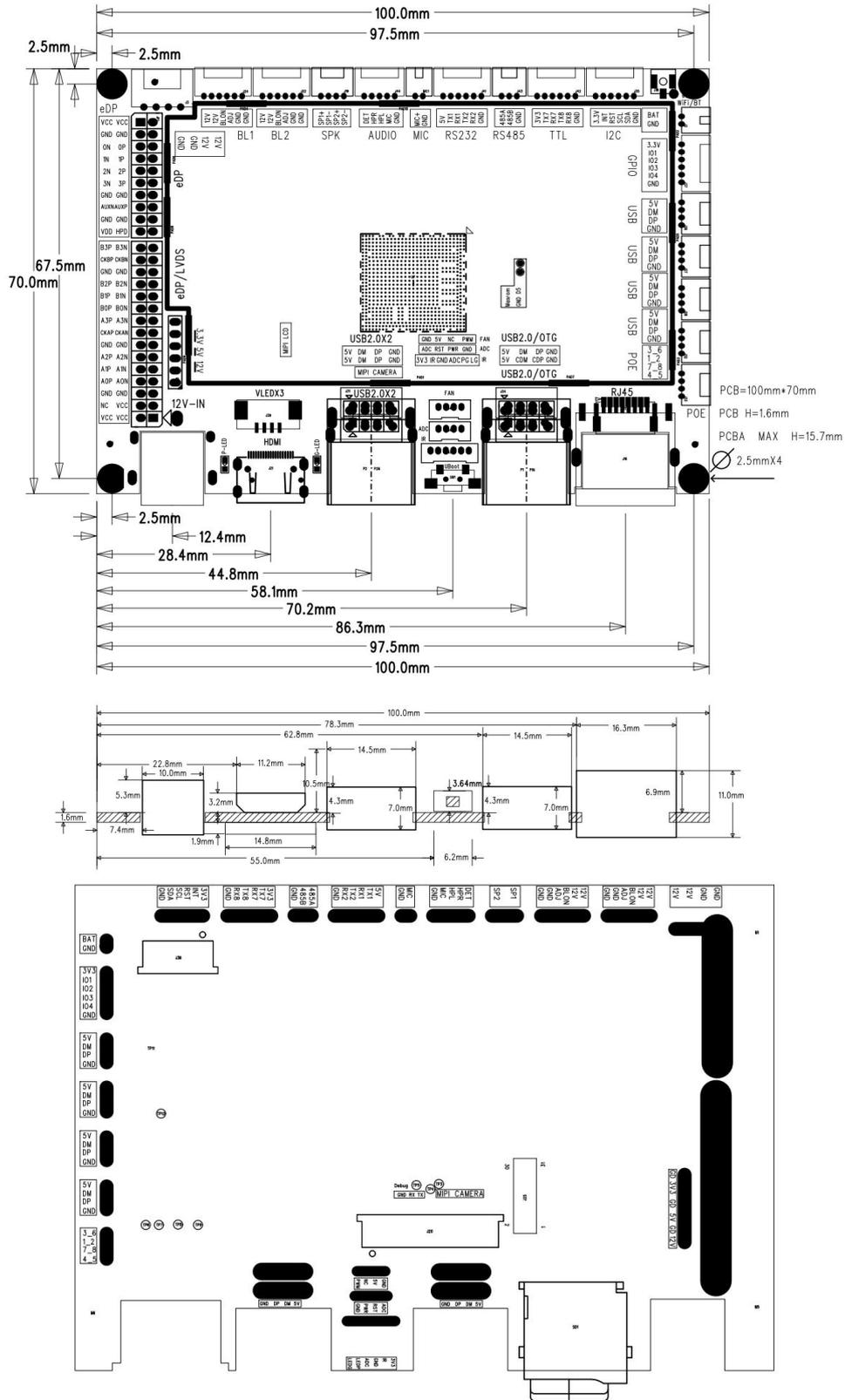
3.1. Hardware specifications

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)	Built-in Neural Network Processor (NPU) with 6.0 TOPS @INT8 performance. Supports models such as Caffe, Mxnet, TensorFlow, PyTorch, TF Lite, ONNX, and Darknet. Provides AI development tools: enables rapid model conversion.
INTERNAL STORAGE DDR	LPDDR4 4GB (4G/8G/16G available, supports up to 16G)
MEMORY	eMMC 64 GB (32 GB/64 GB/128 GB/256 GB available)
NETWORK	Supports Ethernet 10/100/1000M
	Supports 2.4GHz and WiFi 6 (802.11 b/g/n/ax) (5G WiFi optional)
	Supports Bluetooth, V2.1+EDR/3.0/4.x/5.2
PICTURE ORIENTATION	Supports manual rotation at 0°,90°,180°, and 270°, and gravity-sensing auto-screen rotation (optional)
DISPLAY INTERFACE	1*eDP (eDP1.3, 5.4 Gbps, 4K@60Hz output, 3.3V/5V power supply) 1*eDP/DP (eDP 1.3, 5.4 Gbps, 4K@60Hz output, compatible with DP 1.2) 1 LVDS (dual-channel, 6/8-bit), 1080P@60Hz output, 3.3V/5V/12V power supply 1* HDMI OUT 2.1,4K @120Hz 1*MiPi interface, 2560*1600@60Hz output
BOARD MOUNTED BACKLIGHT CONTROL	2*12V backlight power supply
AUDIO FREQUENCY	1*Speaker output (2*5W 4R) 1* Earpiece output (with earpiece) 1*Microphone input
TOUCH SCREEN	1* I ² C (Supports multi-point resistive and capacitive touch). Supports multiple touch modes including USB multi-point infrared, capacitive, nano-film, acoustic, and optical touch.
CAMERA	1* MIPI 4-Lane camera input with 5MP/13MP resolution (optional) Supports USB camera (optional)
RTC	External real-time clock power battery with on/off timer
USB	6*USB-2.0 HUB , 1*USB2.0 OTG& 1*USB2.0 HUB
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	2*RS232,1*RS485, 2*UART TTL
IO MOUTH	4* IO ports, supporting input or output
AD MOUTH	1*AD port
FAN INTERFACE	Supports 5V/12V fan interface
FILL LIGHT	3*Fill light socket (5V/12V optional, for controlling high-current devices)

INTERFACE	like fill lights and cash registers), maximum current 3A
POWER INPUT	DC12V/5.5mm core, 2.1mm DC head, 2A-5A (requires surge voltage below 18V and ripple voltage below 100mV), supports automatic startup upon power-up or startup via power button
WORKING TEMPERATURE	-10 to 70 degrees
STORAGE TEMPERATURE	-20 to 70 degrees
STORAGE HUMIDITY	10%-80%
MAINBOARD SIZE	100mm*70mm*15.7mm
MULTI-MEDIA	Supports 4K@60fps video decoding with H.265/H.264/AV1/VP9/AVS2 Supports 1080P 60fps H.265/H.264 video encoding Supports 8M ISP and HDR
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

Power input interface (red) (12V IN JACK) with 2.0mm socket spacing

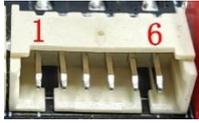
No.	definition	attribute	description
1	12V_IN	import	12V power input
2	12V_IN	import	12V power input



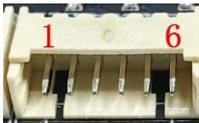
3	GND	earth wire	earth wire	
4	GND	earth wire	earth wire	

3.4.Screen backlight

The distance between the backlit interface 1 (LCD BL JACK) sockets is 1.25mm.

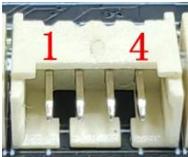
No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	LCD-PWM	output	backlight adjustment	
4	LCD-EN	output	backlight control	
5	12V	output	12V output	
6	12V	output	12V output	

The distance between the two LCD backlight jack sockets is 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	LCD-PWM	output	backlight adjustment	
4	LCD-EN	output	backlight control	
5	12V	output	12V output	
6	12V	output	12V output	

3.5.suona

The speaker output jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	RP	output	Right channel output positive	
2	RN	output	Right channel output negative pole	
3	LP	output	positive output of left channel	
4	LN	output	Left channel output negative pole	

3.6.Microphone

The speaker output jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	MIC	import	MIC positive input	

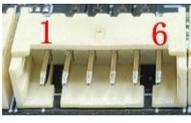
3	HPL	output	Left channel output
4	HPR	output	Right channel output
5	DET	import	Headphone detection

The microphone jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	MIC+	import	MIC positive input	

3.7.RS232

RS232 interface (RS232 JACK) with a 1.25mm pin spacing

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX2	import	Receive (RX2)ttyS2	
3	TX2	output	Send (TX2)ttyS2	
4	RX1	import	Receive (RX1)ttyS1	
5	TX1	output	Send (TX1) ttyS1	
6	3.3V/5V	output	3.3V/5V voltage output	

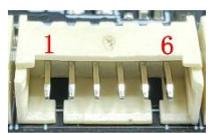
3.8.RS485

The RS485 interface jack has a socket spacing of 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	485B	output	Send (B)ttyS5	
3	485A	import	Receive (A)ttyS5	

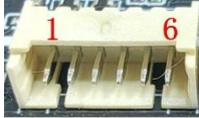
3.9.UART

UART TTL interface (UART TTL JACK) with a pin pitch of 1.25mm

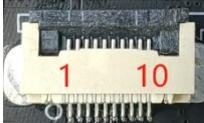
No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	RX8	import	Receive (RX8)ttyS8	
3	TX8	output	Send (TX8)ttyS8	
4	RX7	import	Receive (RX7)ttyS7	
5	TX7	output	Send (TX7)ttyS7	
6	3.3V/5V	output	3.3V/5V voltage output	

3.10. I2C

The I2C interface (I2C JACK) has a pin pitch of 1.25mm.

No.	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	External device reset	
5	INT (3.3V level)	import	external device interrupt	
6	3.3V	output	3.3V voltage output	

FPC I2C 10-pin jack with 0.5mm pin spacing (bottom layer)

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	3.3V	output	3.3V voltage output	
4	SDA (3.3V level)	output	data	
5	SCL (3.3V level)	output	clock	
6	GND	earth wire	earth wire	
7	INT (3.3V level)	import	external device interrupt	
8	RST (3.3V level)	output	External device reset	
9	GND	earth wire	earth wire	
10	GND	earth wire	earth wire	

3.11. RTC cell

The battery jack (BAT JACK) has a socket spacing of 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	BATT+	import	BATT positive input	

3.12. GPIO

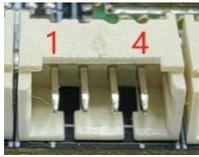
The distance between the sockets of the GPIO detection interface (IO DET JACK) is 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	IO4 (3.3V level)	import	Default low level	

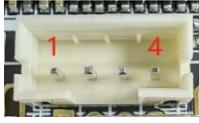
3	IO3 (3.3V level)	import	Default low level	
4	IO2 (3.3V level)	import	Default high level	
5	IO1 (3.3V level)	import	Default high level	
6	3.3V	output	3.3V voltage output	

3.13. USB2.0

The USB2.0-HOST jack features a 1.25mm socket spacing.

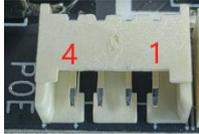
No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	DP	import	DP+	
3	DM	import	DM-	
4	5V	output	5V voltage output	

The USB 2.0 HOST JACK connector features a 2.0mm socket spacing.

No.	definition	attribute	description	
1	5V	output	5V voltage output	
2	DM	import	DM-	
3	DP	import	DP+	
4	GND	earth wire	earth wire	

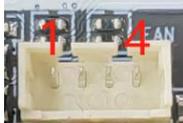
3.14. POE joggle

The POE jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	POE3_6	import	POE3_6	
2	POE1_2	import	POE1_2	
3	POE7_8	import	POE7_8	
4	POE4_5	import	POE4_5	

3.15. electric fan

The spacing between the fan jack sockets is 1.25mm.

No.	definition	attribute	description	
1	GND	earth wire	earth wire	
2	12V/5V	output	12V/5V	
3	NC	barefoot	barefoot	
4	PWM	output	PWM	

3.16. LED/ remote control

LED/IR IN JACK socket spacing: 1.25mm

No.	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IR	import	receive	
3	GND	earth wire	earth wire	
4	ADC	import	AD check	
5	LEDR	output	power light	
6	LEDG	output	system indicator light	

3.17. Key

The key jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	AD	output	AD (Upgrade) button output	
2	RST	output	RESET button	
3	PWR	output	POWER power button	
4	GND	earth wire	earth wire	

3.18. Backlight

The LED jack socket spacing is 1.25mm.

No.	definition	attribute	description	
1	VLED1	output	5V/12V power output	
2	VLED2	output	5V/12V power output	
3	VLED3	output	5V/12V power output	
4	GND	earth wire	earth wire	

3.19. LVDS

The LVDS jack has a socket spacing of 2.0mm.

No.	definition	attribute	description	
1	POWER	output	3.3V/5V/12V power	

2	POWER		output
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	earth wire	earth wire
27	TCLK2-	output	clock
28	TCLK2+	output	clock
29	TD2-	output	data
30	TD2+	output	data

LVDS LCD JP JACK with 2.0mm pin spacing

No.	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	

3.20. eDP LED

eDP LCD jack with 2.0mm socket spacing

No.	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	3.3V	output	3.3V power supply output
20	HPD	import	HPD test foot



3.21. MIPI Camera

The MIPI CAMER interface jack has a 0.5mm spacing between its sockets (bottom layer).

No.	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	

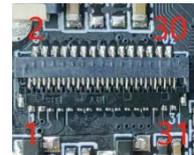


19	DP2	output	data
20	DN2	output	data
21	GN1	earth wire	earth wire
22	DP2	output	data
23	DN1	output	data
24	GND	earth wire	earth wire
25	CLKP	output	clock
26	CLKN	output	clock
27	GND	earth wire	earth wire
28	DPO	output	data
29	DN0	output	data
30	GND	earth wire	earth wire

3.22. MiPi LED

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

No.	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	