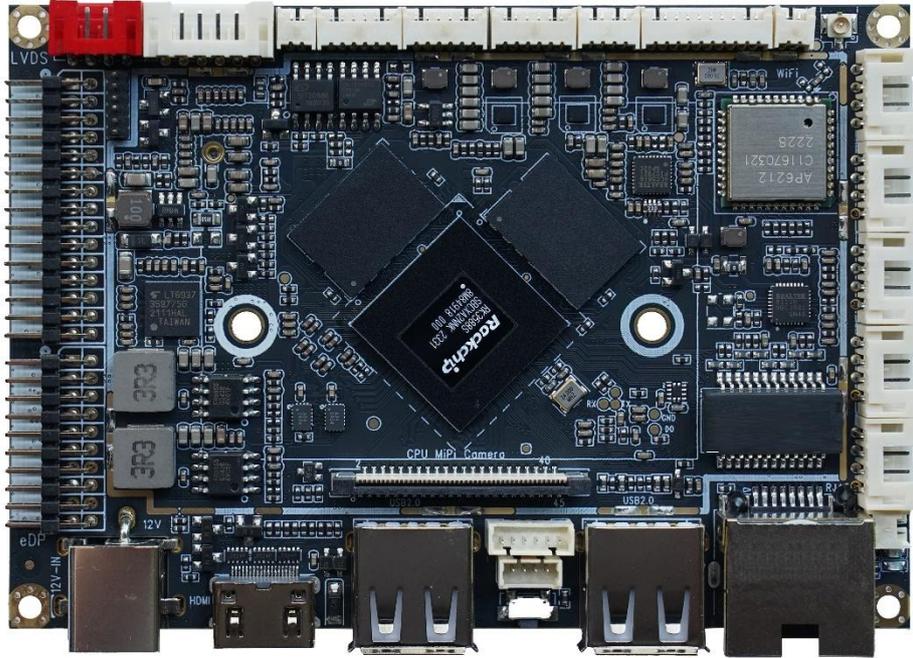


USR-EV208(RK3588S)



Catalogue

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1. Product Overview

The USR-EV208-3588S high-performance motherboard features the Rockchip RK3588S processor, supporting Ubuntu and Android 12.0 systems. Manufactured using 8nm LP process technology, this chip integrates an octa-core 64-bit CPU (Cortex-A76 + Cortex-A55) with a clock speed up to 2.4 GHz, delivering robust general-purpose computing capabilities. Its graphics processing is handled by a quad-core Mali-G610 GPU, enabling smooth HD rendering. The motherboard also incorporates an NPU supporting INT4/INT8/INT16 mixed-precision operations, with AI computing power reaching 6.0 TOPS and compatibility with mainstream AI development tools. Supporting multi-screen display, it features multiple display interfaces including LVDS (1080P), eDP, MIPI, and HDMI (up to 8K) to meet complex visual output requirements. For networking and communication, it integrates Gigabit Ethernet, Wi-Fi, Bluetooth, and POE power supply. In terms of expandability, it provides extensive peripheral interfaces such as USB, CAN, RS232, RS485, GPIO, I²C, MIPI camera, infrared remote control, gravity sensor, and supplementary light control, facilitating system integration and functional expansion. Leveraging the synergistic advantages of hardware platformization and software intelligence, the USR-EV208-3588S is widely deployed across diverse sectors including smart firefighting, smart construction sites, industrial quality inspection, autonomous driving, smart agriculture, intelligent sorting, AI robots, smart NVR systems, ARM PCs, security surveillance, medical equipment, intelligent transportation, financial terminals, industrial control, education, and retail. It efficiently supports various human-machine interaction and device networking scenarios, delivering stable, flexible, and high-performance solutions for smart terminals.

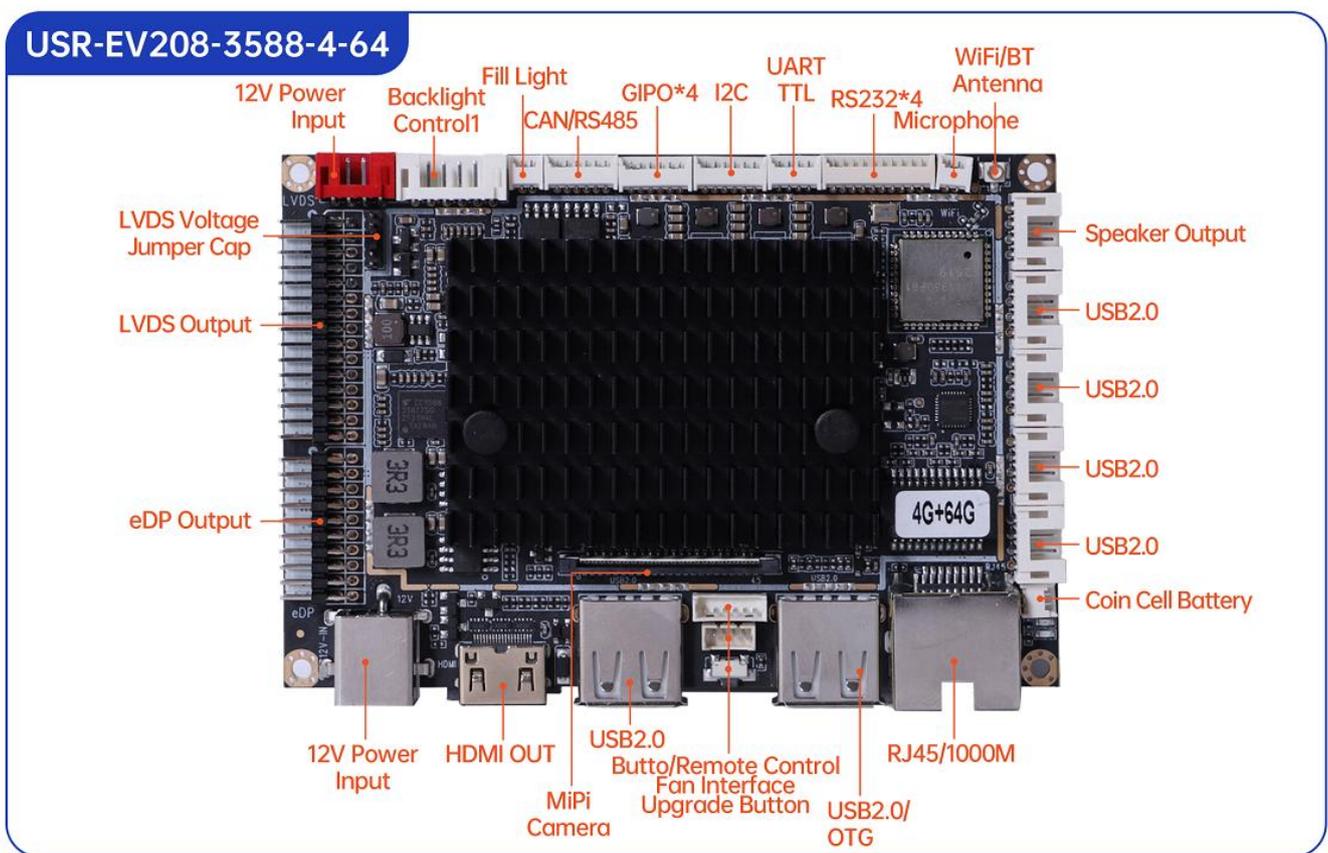
2. Characteristic

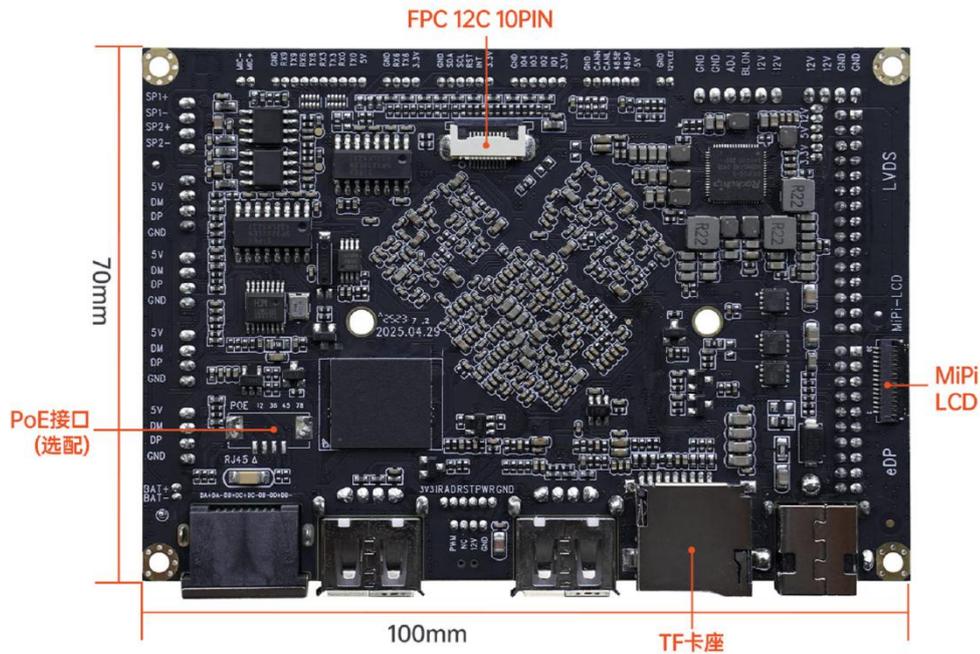
- **High Performance:** The RK3588S is a new-generation flagship high-performance AIoT processor launched by Rockchip, supporting multiple operating systems including Ubuntu and Android 12.0. This chip employs advanced 8nm LP process technology, featuring an octa-core 64-bit CPU based on the Cortex-A76 + Cortex-A55 architecture with a clock speed up to 2.4 GHz, delivering exceptional general-purpose computing performance. Its graphics processing unit integrates a high-end quad-core Mali-G610 GPU, while the CPU incorporates a dedicated AI neural network processor (NPU) that supports INT4/INT8/INT16 mixed-precision operations, achieving an AI computing power of 6.0 TOPS. The RK3588S is compatible with various mainstream AI development tools and interfaces, enabling efficient conversion and deployment of general-purpose models such as TensorFlow, Caffe, MXNet, and PyTorch. It also provides comprehensive AI development support, including the Android NN API, RKNN cross-platform API, and TensorFlow development interface, significantly lowering the barrier to AI application development and accelerating the deployment of intelligent products.
- **High Stability:** The RK3588S 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 RK3588S AI motherboard utilizes military-grade TG170-8-layer ultra-high-density PCB, featuring integrated Gigabit Ethernet, WiFi/Bluetooth, 18W power amplifier, IR remote control, HDMI, LVDS, eDP, MiPi, microphone, and gravity sensor. This significantly simplifies overall design. Its ultra-thin design also enhances the aesthetic appeal of the device.
- High expandability: Six USB ports, four RS232 ports, one UART, one RS485, one CAN, one I2C, four IO expansion ports, one AD interface, and one POE interface, supporting expansion of additional peripheral devices.

3. Product interface

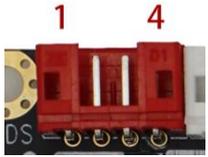




3.1. Hardware specifications

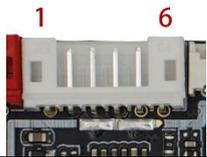
Operating system	Ubuntu22.04/ Android12.0/Debian
Processor cpu	Rockchip RK3588S (8nm LPP process) An ARM 8-core 64-bit processor with a maximum clock speed of 2.4GHz Quad-core Cortex-A76 (large core) + Quad-core Cortex-A55 (small core)
Graphics processing unit gpu	Mail-G610 GPU MP4 Quad-Core GPU Supports OpenGL ES3.2, OpenVG1.1, and OpenCL2.2, with 450GFLOFS
Neural network processor (npu)	Built-in Neural Network Processor (NPU) with powerful AI computing performance Supports IN4/IN8/INT16/FP16 operations with a performance of up to 6.0 TOPS Supports models such as Caffe, Mxnet, TensorFlow, TF Lite, ONNX, and Darknet Provide AI development component package
Internal storage ddr	LPDDR4 4GB (4G/8G/16G/32G available)
Memory	eMMC 64 GB (32 GB/64 GB/128 GB/256 GB available)
Network	Ethernet 10/100/1000Mbps, supports Ethernet.
	2.4G WiFi with 802.11b/g/n compatibility (5G WiFi optional)
	Supports Bluetooth, V2.1+EDR/Bluetooth 3.0/3.0+HS/4.1/4.2/BLE
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), powered by 3.3V/5V
	1 LVDS (dual-channel, 6/8-bit), 1080P 60Hz output, 3.3V/5V/12V power supply
	1* HDMI 2.1 supports 8K 60Hz output (HDMI or eDP, choose one) 1*MiPi supports MiPi screen output (5.7Gbps output)
Board mounted backlight	2*12V backlight power supply

control	
Audio frequency	1*Speaker output (2*18W 4R) 1*Microphone input
Camera	2× MIPI camera input, supports up to 48MP (optional) Supports USB camera (optional)
Rtc	External real-time clock power battery with on/off timer
Usb	4*USB-2.0 HOST , 1* CPU USB2.0, 1*USB2.0 OTG
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 , 1*UART TTL, 1*RS485
Io mouth	4* IO ports, supporting input or output
Can mouth	1 CAN port
I2c port	1I2C port
Ad mouth	1*AD port
Fan interface	Supports 5V/12V fan interface
Poe joggle	1*POE port (optional)
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*14.5mm
Multi-media	Supports 8K 60fps H.265/H.264 video decoding Supports 8K 30fps H.265/H.264 video encoding Supports simultaneous encoding and decoding, with up to 32 channels for 1080P 30 fps decoding and 16 channels for 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

number				
1	GND	earth wire	earth wire	
2	GND	earth wire	earth wire	
3	12V_IN	import	input	
4	12V_IN	import	input	

3.4.screen 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	

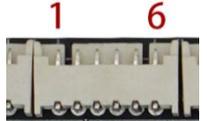
3.5.Backlight

The distance between the two sockets of the backlight jack (BL JACK) is 1.25mm.

order number		definition	attribute	description	
1		12VLED	output	12V power output	
2		GND	earth wire	earth wire	

3.6.RS485/ CAN

RS485/CAN interface (RS485/CAN JACK) with 1.25mm pin spacing

order number	definition	attribute	description	
1	3.3V/5V	output	3.3V/5V voltage output	
2	RS485-A	data	Data-ttyS1	
3	RS485-B	data	Data-ttyS1	
4	CAN-H	data	data	
5	CAN-L	data	data	
6	GND	earth wire	earth wire	

3.7.GPIO

The spacing between IO jack sockets is 1.25mm.

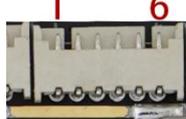
order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IO1 (3.3V level)	Input/Output	Default high level	
3	IO2 (3.3V level)	Input/Output	Default high level	
4	IO3 (3.3V level)	Input/Output	Default low level	
5	IO4 (3.3V level)	Input/Output	Default low level	
6	GND	earth wire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



3.8.I2C

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

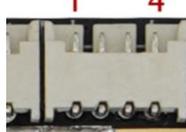
order number	definition	attribute	description	
1	3.3 V	output	3.3V voltage output	
2	INT (3.3V level)	import	external device interrupt	
3	RST (3.3V level)	output	External device reset	
4	SCL (3.3V level)	output	clock	
5	SDA (3.3V level)	output	data	
6	GND	earth wire	earth wire	



3.9.UART

UART serial interface (TTL level) with 1.25mm pin spacing (UART-TTL JACK)

order number	definition	attribute	description	
1	3.3 V (5V optional)	output	3.3V voltage output	
2	TX6	output	Send (TX6)ttyS6	
3	RX6	import	Receive (RX6)ttyS6	
4	GND	earth wire	earth wire	



3.10. RS232

RS232 interface (RS232 JACK) with 1.25mm pin spacing

order number	definition	attribute	description	
1	5V (3.3V optional)	output	5V voltage output	
2	TX0	output	Send (TX0) ttyS0	
3	RX0	import	Receive (RX0)ttyS0	
4	TX3	output	Send (TX3)ttyS3	
5	RX3	import	Receive (RX3)ttyS3	
6	TX8	output	Send (TX8)ttyS8	
7	RX8	import	Receive (RX8)ttyS8	



8	TX9	output	Send (TX9) ttyS9	
9	RX9	import	Receive (RX9)ttyS9	
10	GND	earth wire	earth wire	

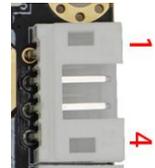
3.11. microphone

The microphone jack socket spacing is 1.25mm.

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

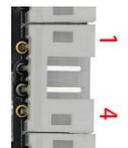
3.12. suona

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	

3.13. USB2.0

The USB 2.0 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	

3.14. RTC

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

order number	definition	attribute	description	

1	BAT+	import	3V input	
2	BAT-	earth wire	earth wire	

3.15. Button/Remote

The key/IR input jack has a socket spacing of 1.25mm.

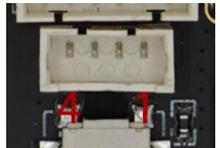
order number	definition	attribute	description	
1	3.3V	output	3.3V voltage output	
2	IR	import	receive	
3	AD	import	AD (Upgrade) button	
4	RST	output	RESET button	
5	PWR	output	POWER power button	
6	GND	earth wire	earth wire	



3.16. electric fan

The spacing between the fan jack sockets is 1.25mm.

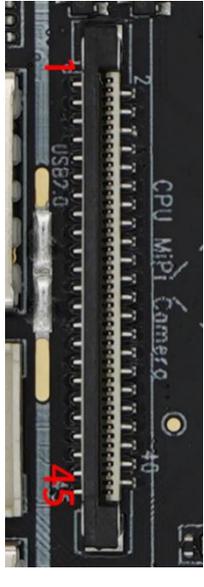
order number	definition	attribute	description	
1	GND	earth wire	earth wire	
2	VDD	output	12V/5V	
3	NC	barefoot	barefoot	
4	PWM	output	PWM	



3.17. FPC MiPi CAMER

FPC MiPi CAMER jack with 0.5mm spacing between sockets

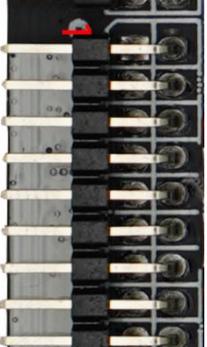
order number	definition	attribute	description	
1	VCC2.8V	source	2.8V output	
2	VCC2.8V	source	2.8V output	
3	MIPI-RX0-PDN	output	enable bit	
4	MIPI0-RST	output	External device reset	
5	I2C1CND-SCL	output	clock	
6	I2C1-SDA	output	data	
7	GND	earth wire	earth wire	
8	MIPI-CSI-CLK0	output	clock	
9	GND	earth wire	earth wire	
10	MIPI-RX0-CKP	output	clock	
11	MIPI-RX0-CKN	output	clock	
12	MIPI-RX0-DOP	output	data	
13	MIPI-RX0-DON	output	data	
14	MIPI-RX0-D1P	output	data	



15	MIPI-RX0-D1N	output	data
16	MIPI-RX0-D2P	output	data
17	MIPI-RX0-D2N	output	data
18	MIPI-RX0-D3P	output	data
19	MIPI-RX0-D3N	output	data
20	GND	earth wire	earth wire
21	VCC1V8	source	1.8V output
22	FSYNC-IN		
23	VCC1V3	source	1.3V output
24	VCC1V3	source	1.3V output
25	MIPI-RX1-PDN	output	enable bit
26	MIPI1-RST	output	External device reset
27	I2C4-SCL	output	clock
28	I2C4-SDA	output	data
29	GND	earth wire	earth wire
30	MIPI-CSI-CLK1	output	clock
31	GND	earth wire	earth wire
32	MIPI-RX1-CKP	output	clock
33	MIPI-RX1-CKN	output	clock
34	MIPI-RX1-DOP	output	data
35	MIPI-RX1-DON	output	data
36	MIPI-RX1-D1P	output	data
37	MIPI-RX1-D1N	output	data
38	MIPI-RX1-D2P	output	data
39	MIPI-RX1-D2N	output	data
40	MIPI-RX1-D3P	output	data
41	MIPI-RX1-D3N	output	data
42	GND	earth wire	earth wire
43	CAM-IR-PWM		
44	VCC5V	source	5V output
45	VCC5V	source	5V output

3.18. eDP

eDP LCD jack with 2.0mm socket spacing

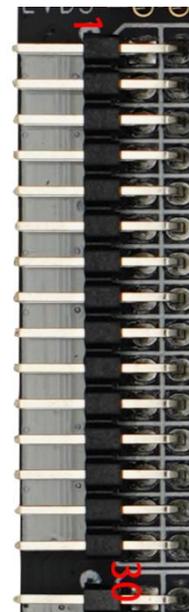
order number	definition	attribute	description	
1	VCC	output	3.3V/5V power supply output	
2	VCC	output		
3	GND	earth wire	earth wire	
4	GND	earth wire	earth wire	
5	D0-	output	data	
6	D0+	output	data	
7	D1-	output	data	
8	D1+	output	data	

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	3.3V	output	3.3V power supply output
20	HPD	import	HPD test foot

3.19. LVDS

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	earth wire	earth wire	
6	GND	earth wire	earth wire	
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	earth wire	earth wire	
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	



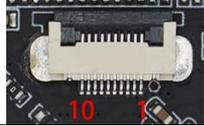
23	TC2-	output	data	
24	TC2+	output	data	
25	GND	earth wire	earth wire	
26	GND	earth wire	earth wire	
27	TCLK2-	output	clock	
28	TCLK2+	output	clock	
29	TD2-	output	data	
30	TD2+	output	data	

LVDS LCD JP JACK with 2.0mm pin spacing

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	

3.20. FPC I2C

FPC I2C Touch Screen Jack with 0.5mm spacing (bottom layer)

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

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+	output	backlight anode	

3	LED+	output	backlight anode
4	GND	earth wire	earth wire
5	LED-	output	backlight anode
6	LED-	output	backlight anode
7	LED-	output	backlight anode
8	LED-	output	backlight anode
9	GND	earth wire	earth wire
10	GND	earth wire	earth wire
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