



# **Touch Think Intelligence Product Specification**

## **Mainboard series**

CX-3576-A

V1.0

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# Chapter 1 Product Introduction

## 1.1 Overview

The RK3576 is a high - performance, low - power application processor chip with an advanced 8nm manufacturing process. It features an 8 core, 64 bit core architecture. The four A72 big cores can have a main frequency of up to 2.2GHz, and the four A53 small cores can have a main frequency of up to 1.8GHz. It is equipped with an NPU with 6TOPS of AI computing power, and the GPU uses the ARM Mali G52 MC3.

## 1.2 Function Introduction

The CX3576 - A is equipped with the RK3576, running Android 14, Linux 6.1, Debian 12, and Ubuntu 22.04 systems. It has on-board LVDS, eDP, MIPI, and HDMI display output interfaces, a built-in universal backlight board interface, and screen voltage jumpers, which are compatible with more types of display screens. It has stronger performance, faster speed, and richer interfaces, making it the best choice for HMI, intelligent terminals, and industrial control projects.

## 1.3 Features

Rich expansion interfaces: 6 USB interfaces (1 USB 2.0 standard interface, 1 SUB3.0 OTG interface, and 4 USB 2.0 sockets), 1 RS485 interface, 1 TTL interface, 2 RS232 interfaces, 2 interfaces that can be switched between RS232/RS485 via jumpers, 8 GPIO interfaces, and 1 ADC interface, which can meet the requirements of various peripherals on the market. Multiple network interfaces: 1 1000M Ethernet interface, supporting 5G and 2.4G WIFI, and a built - in MINI PCIE - standard 4G module interface, supporting Internet access and calls. High definition: HDMI supports a maximum output of 4096x2160@120Hz, supports LCD display screens and cut - off screens of LVDS/eDP/MIPI/HDMI interfaces, and supports multi - screen different - display.

It supports Android system customization, provides system calling interface API reference code, and perfectly supports customers upper layer application APP development.

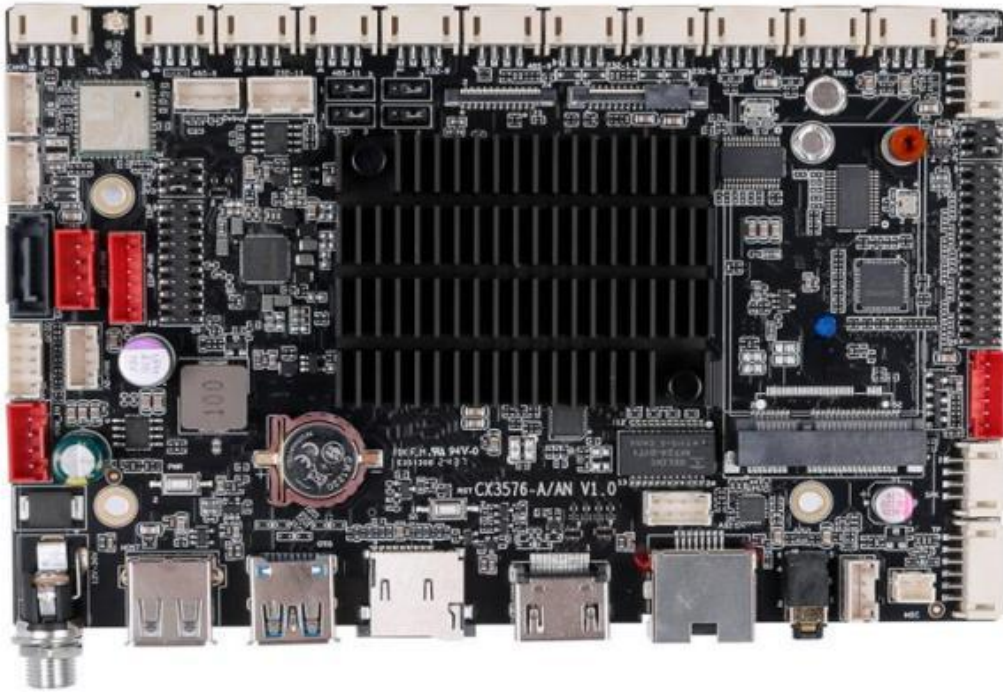
## Chapter 2 Product Specification Parameters.

Type	Specification parameter
<b>CPU</b>	Four Cortex-A72+Four Cortex-A53 64-bit CPU, Highest frequency 2.2GHz
<b>GPU</b>	ARM Mali G52 MC3
<b>RAM</b>	4GB ( 8GB/16GB Optional)
<b>Memory</b>	32GB ( 64GB/128GB/256GB Optional)
<b>ROM</b>	4KB EEPROM
<b>Resolution</b>	Highest support 4096x2160@120Hz
<b>OS</b>	Android14, Linux6.1, Debian12 , Ubuntu22.04
<b>Play mode</b>	Supports various playback modes such as loop, timer, interrupt, etc.
<b>Network</b>	4G、 Ethernet、 support 2.4G/5G dual Wi Fi、 support bluetooth 5.3
<b>video display</b>	Support wmv、 avi、 flv、 rm、 rmvb、 mpeg 、 ts、 mp4
<b>Picture format</b>	Support BMP、 JPEG、 PNG、 GIF
<b>USB interface</b>	1*USB3.0 OTG peripheral interface, 1* USB2.0 peripheral interface,
<b>Mipi Camera</b>	30pin FPC interface,support 1300W Camera
<b>Mipi LCD</b>	24pin FPC interface,support 2560x1600@60Hz MIPI display
<b>Serial port</b>	6 serial sockets ( 2*RS232,1 ↑ 485,1*TTL,2*RS232/RS485)
<b>GPS</b>	External GPS ( optional)
<b>Wi-Fi、 BT</b>	Built-in Wi-Fi,BT5.3 supports dual-band Wi-Fi, single antenna.
<b>4G</b>	4G module holder with built-in MINI PCIE interface, supporting voice calls.
<b>Ethernet</b>	1* 1000M Ethernet interface
<b>TF Card</b>	Support
<b>LVDS output</b>	1 single/dual LVDS output
<b>eDP output</b>	The LCD screen with eDP interface with multiple resolutions can be directly driven.
<b>HDMI output</b>	1HDMI OUTPUT , SUPPORT 4096x2160@120Hz
<b>Audio output</b>	Support left and right channel output, built-in dual 4R/10W and 8R/5W power amplifiers.
<b>RTC</b>	Support
<b>Timing</b>	Support
<b>System</b>	Support USB upgrade

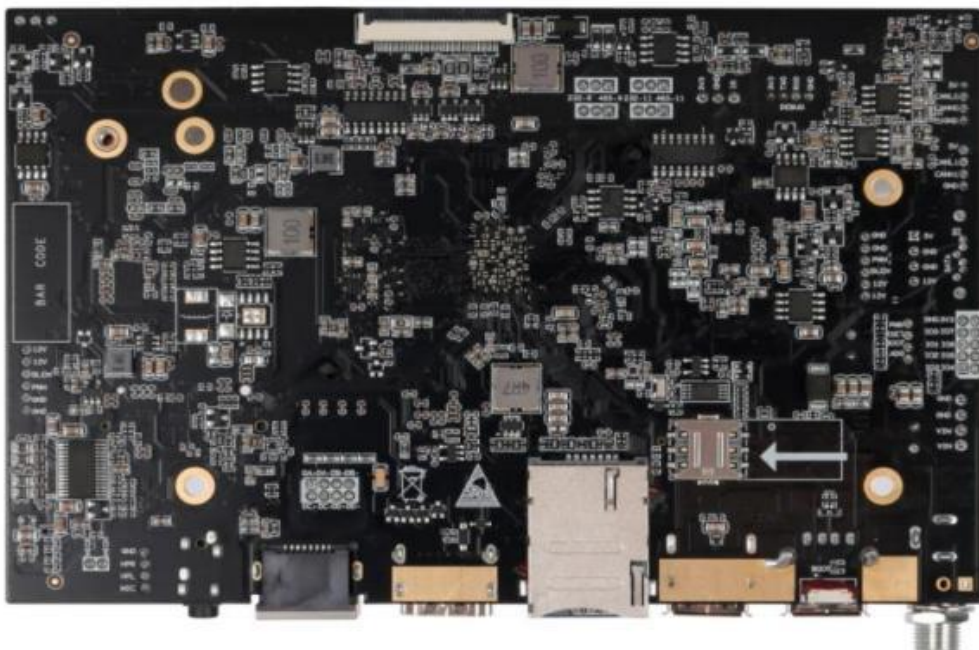




## Chapter 3 Product Interface Definitions.



Front

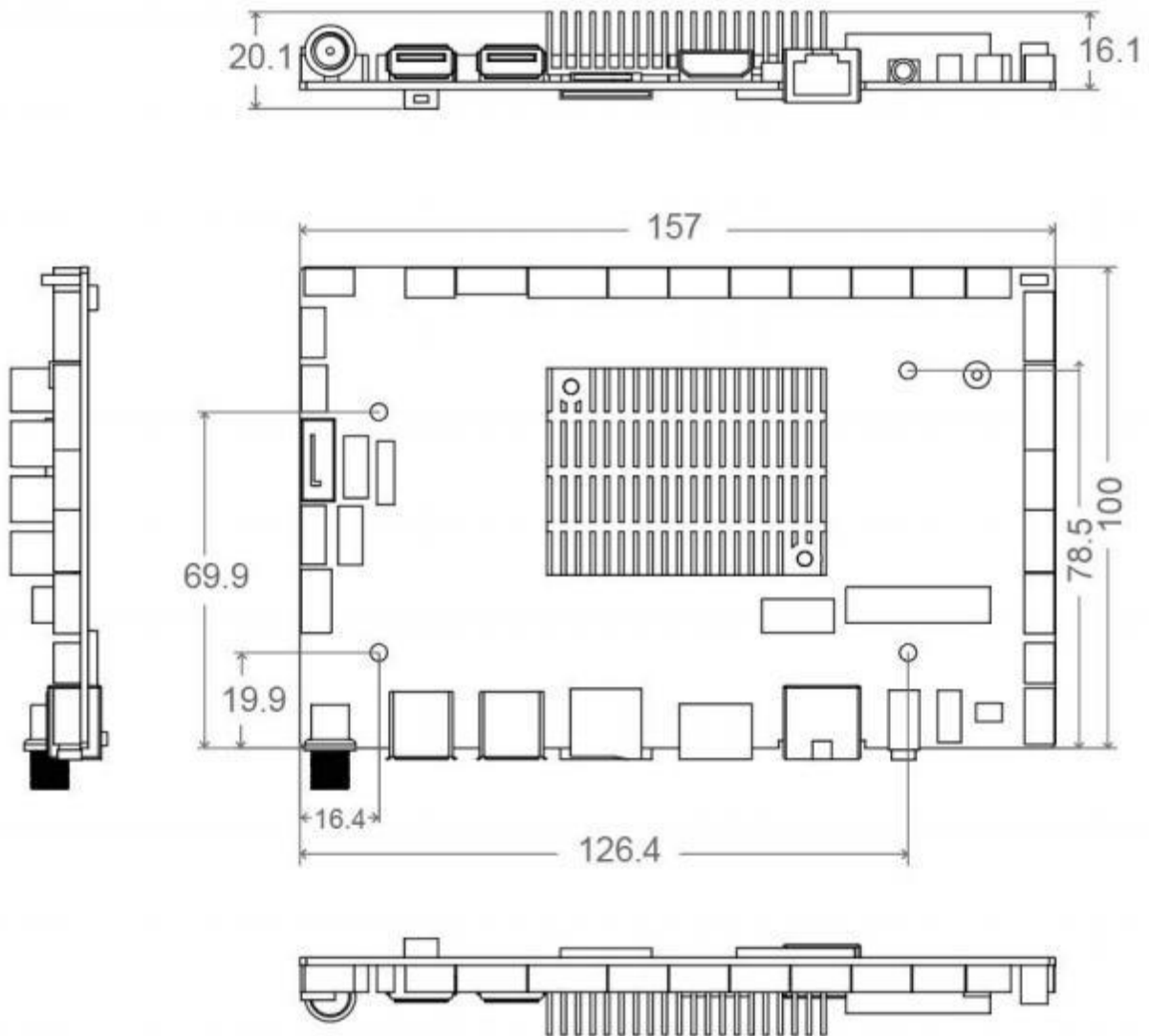


Back

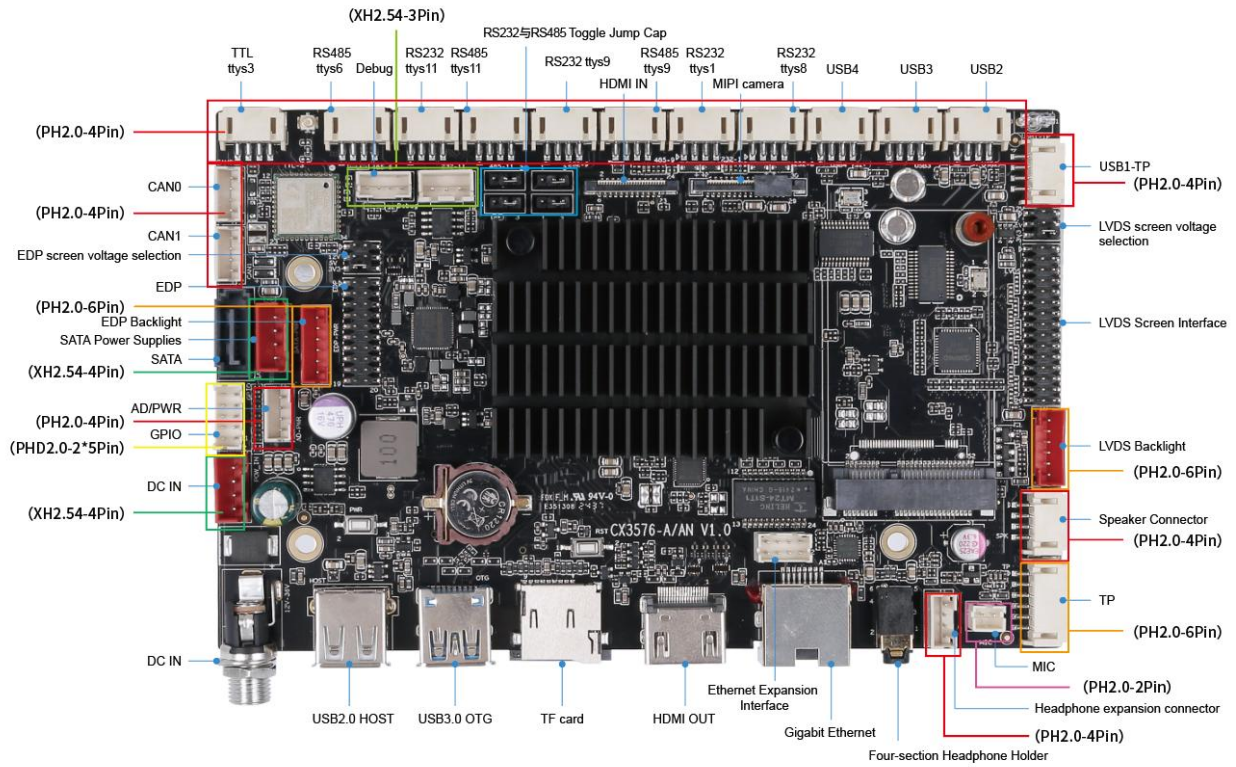


Side

### 3.1 PCB Dimension

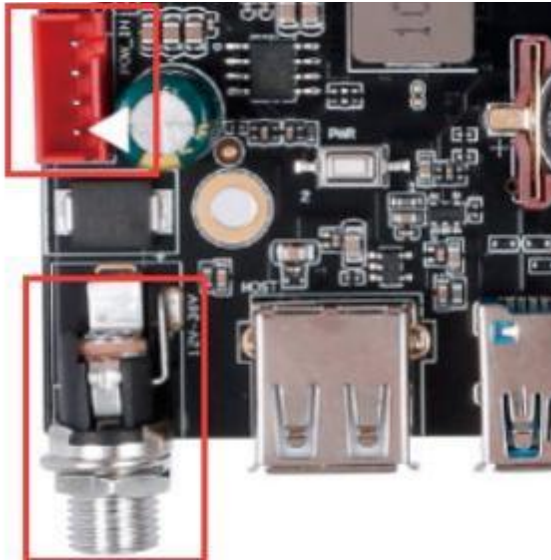


## 3.2 Interfaces



### ◆ 3.2.1 Power Input Interface

The board system is powered by a 12V - 36V DC power supply. Power can only be supplied to the board system through the DC socket and power socket. The specification of the plug DC IN of the power adapter is a D5.5, d2.0 threaded head. In the case of no-load with no peripherals connected, the 12V DC power supply shall support a minimum current of 1.5A.



The interface definition of the power socket is as follows: it can be powered by a power supply board, and the socket specification is 4PIN with a pitch of 2.54mm.

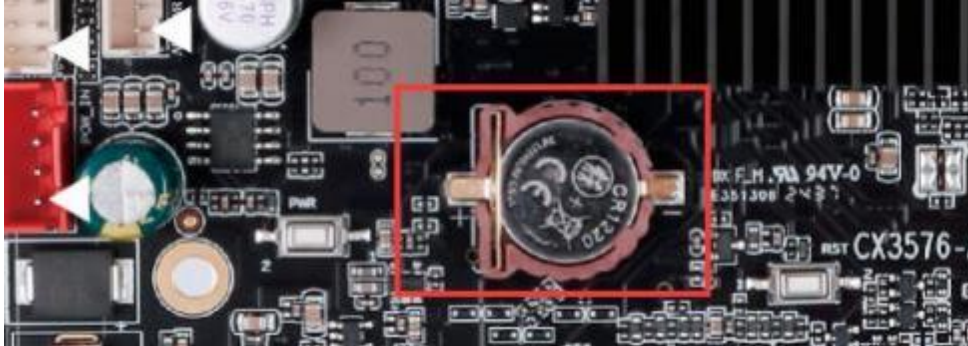
No.	Definition	Attribute	Describe
1	VCC	Input	12V-36V Input
2	VCC	Input	12V-36V Input
3	GND	ground wire	ground wire
4	GND	ground wire	ground wire





### ◆ 3.2.2 RTC Battery Holder

It is used to power the system clock when the power is off.



### ◆ 3.2.3 MIC Interface

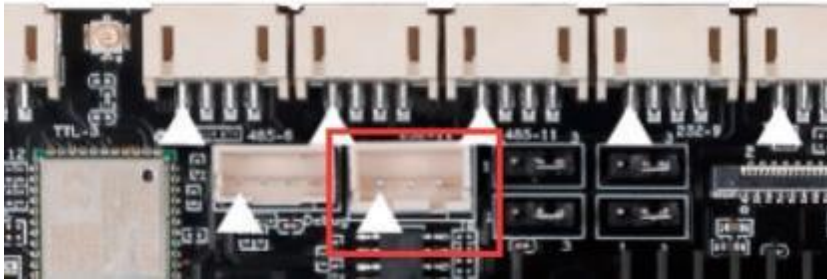
Please pay attention to the connection of the positive and negative poles of the MIC and do not connect them reversely.



No.	Definition	Attribute	Describe
1	MICP	Input	MIC+
2	MICN	Input	MIC-

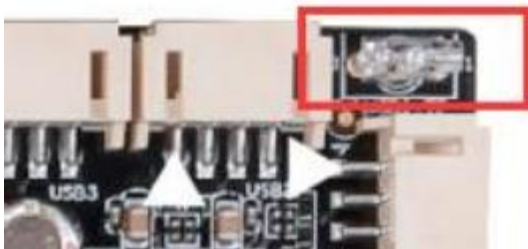


### ◆ 3.2.4 Remote - control receiving interface



No.	Definition	Attribute	Describe
1	IR	Input	Remote control signal input
2	GND	ground wire	ground wire
3	3V3	Power Supply	3.3V output

### ◆ 3.2.5 Working indicator light

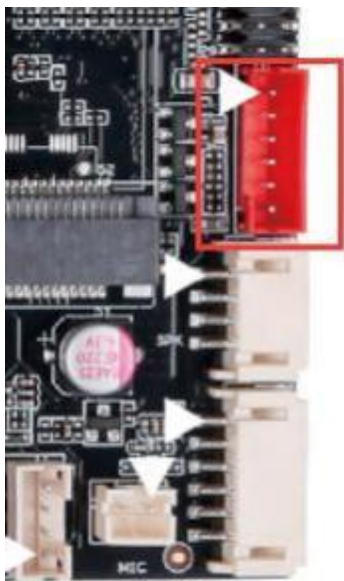


No.	Definition	Attribute	Describe
1	LED_B	Blue light	Working indicator light
2	VCC	Power Supply	3.3V output
3	LED_R	Red light	Standby indicator light



### ◆ 3.2.6 LVDS Backlight Control Interface

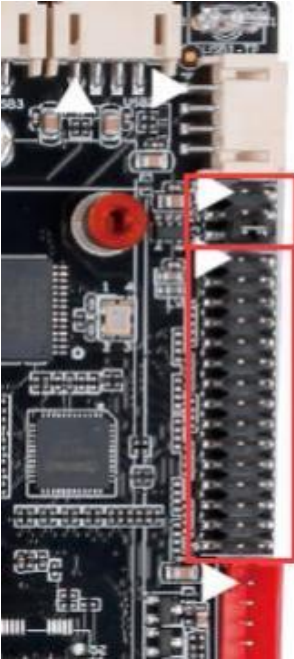
It is used for backlight control of the LVDS screen. The 12V supply current should not exceed 2A. If the power of the screen backlight is more than 24W, the backlight power supply should be taken from other power supply boards to avoid system instability. The backlight enable voltage is 5V. If it is other voltages, an IO level - conversion circuit should be added. This 12V power supply can only be used as the backlight power output and must not be used as a power input to supply the system.



No.	Definition	Attribute	Describe
1	VCC	Power Supply	12V Output
2	VCC	Power Supply	12V Output
3	EN	Output	Backlight Control
4	PWM	Output	Backlight Control
5	GND	ground wire	ground wire
6	GND	ground wire	ground wire

### ◆ 3.2.7 LVDS interface

The general-purpose LVDS interface is defined and supports single - / double - channel, 6 - / 8 - bit 1080P LVDS screens. The screen voltage can be selected through a jumper cap, and 3.3V/5V/12V screen power supplies can be selected for support. You can refer to the PCB silkscreen beside the jumper cap socket.



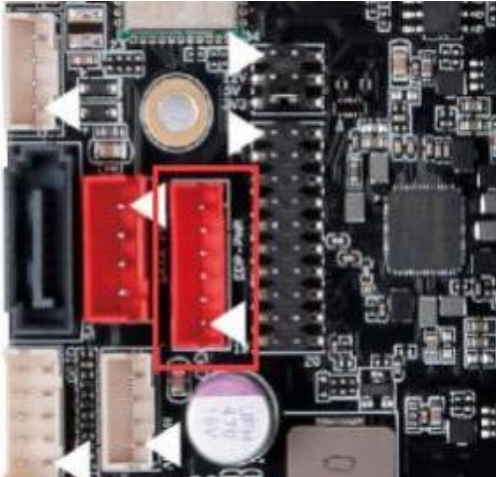
No.	Definition	Attribute	Describe
1	VCC	Power output	LCD power output, +3.3V/+5V/ +12V optional
2			
3			
4	GND	ground wire	ground wire
5			
6			
7	D0N	Output	Pixel0 Negative Data (Odd)
8	D0P	Output	Pixel0 Positive Data (Odd)
9	D1N	Output	Pixel1 Negative Data (Odd)
10	D1P	Output	Pixel1 Positive Data (Odd)
11	D2N	Output	Pixel2 Negative Data (Odd)
12	D2P	Output	Pixel2 Positive Data (Odd)



13	GND	ground wire	ground wire
14	GND	ground wire	ground wire
15	CLK0N	Output	Negative Sampling Clock (Odd)
16	CLK0P	Output	Positive Sampling Clock (Odd)
17	D3N	Output	Pixel3 Negative Data (Odd)
18	D3P	Output	Pixel3 Positive Data (Odd)
19	D5N	Output	Pixel0 Negative Data (Even)
20	D5P	Output	Pixel0 Positive Data (Even)
21	D6N	Output	Pixel1 Negative Data (Even)
22	D6P	Output	Pixel1 Positive Data (Even)
23	D7N	Output	Pixel2 Negative Data (Even)
24	D7P	Output	Pixel2 Positive Data (Even)
25	GND	ground wire	ground wire
26	GND	ground wire	ground wire
27	CLK1N	Output	Negative Sampling Clock (Even)
28	CLK1P	Output	Positive Sampling Clock (Even)
29	D8N	Output	Pixel3 Negative Data (Even)
30	D8P	Output	Pixel3 Positive Data (Even)

### ◆ 3.2.8 EDP Backlight Control Interface

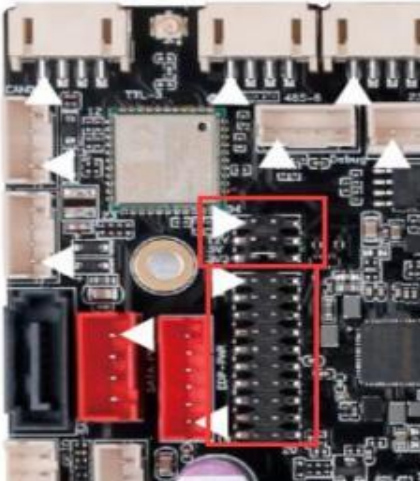
It is used for backlight control of the EDP screen. The 12V supply current should not exceed 2A. If the power of the screen backlight is above 24W, the backlight power supply should be obtained from other power supply boards to avoid system instability. The backlight enable voltage is 5V. If it is other voltages, an IO level-conversion circuit should be added. This 12V power supply can only be used as the backlight power output and must not be used as a power input to supply the system.



No.	Definition	Attribute	Describe
1	VCC	Power Supply	12V Output
2	VCC	Power Supply	12V Output
3	EN	Output	Backlight Control
4	PWM	Output	Backlight Control
5	GND	ground wire	ground wire
6	GND	ground wire	ground wire

### ◆ 3.2.9 EDP Interface

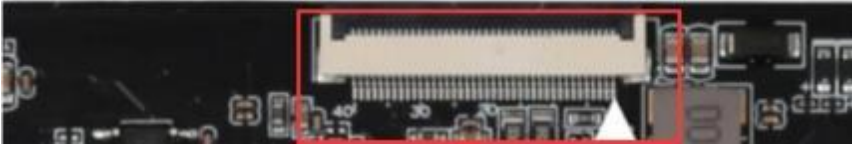
In the figure below, a jumper cap is used for EDP screen power supply selection, and the options are: 12V/5V/3.3V. You can refer to the PCB silkscreen beside the jumper cap socket. The electrical definition of the output interface. Pay attention to the position of the first pin of the 20 - PIN connector. If it is plugged in reverse, the EDP screen is easily burned out.



No.	Definition	Attribute	Describe
1	VCC	Power output	LCD power output, +3.3V/+5V/ +12V optional
2			
3	GND	ground wire	ground wire
4			
5	TX0P	Output	EDP Pixel0 Positive Data (Odd)
6	TX0N	Output	EDP Pixel0 Negative Data (Odd)
7	TX1P	Output	EDP Pixel1 Positive Data (Odd)
8	TX1N	Output	EDP Pixel1 Negative Data (Odd)
9	TX2P	Output	EDP Pixel2 Positive Data (Odd)
10	TX2N	Output	EDP Pixel2 Negative Data (Odd)
11	TX3P	Output	EDP Pixel3 Positive Data (Odd)
12	TX3N	Output	EDP Pixel3 Negative Data (Odd)
13	GND	ground wire	ground wire
14	GND	ground wire	ground wire
15	AUXP	Output	EDP AUX Positive Data (Odd)
16	AUXN	Output	EDP AUX Negative Data (Odd)
17	GND	ground wire	ground wire
18			
19			
20	HPD	Input	EDP DETECT

### ◆ 3.3.0 MIPI Screen Interface

The MIPI interface supports single - channel MIPI liquid - crystal screens, and the 4 - channel MIPI interface can support up to 2560\* 1600@60fps.



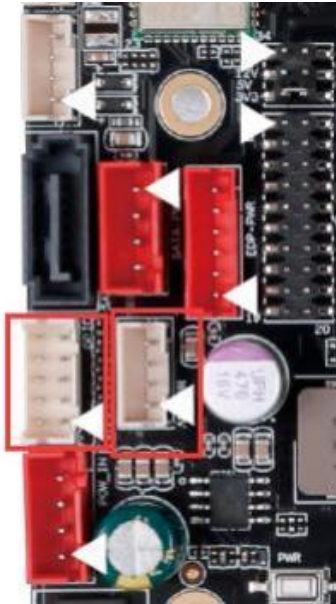
No.	Definition	Attribute	Describe
40	NC	-	Not connect
39	VDD	Power Supply	Digital power
38	VDD	Power Supply	Digital power
37	GND	Ground	Ground
36	REST	Output	Global reset pin
35	NC	-	Not connect
34	GND	Ground	Ground
33	D0N	Output	Negative MIPI differential data output
32	D0P	Output	Positive MIPI differential data output
31	GND	Ground	Ground
30	Output	Output	Negative MIPI differential data output
29	D1P	Output	Positive MIPI differential data output
28	GND	Ground	Ground
27	CLKN	Output	Negative MIPI differential data output
26	CLKP	Output	Positive MIPI differential data output
25	GND	Ground	Ground
24	D2N	Output	Negative MIPI differential data output
23	D2P	Output	Positive MIPI differential data output
22	GND	Ground	Ground
21	D3N	Output	Negative MIPI differential data output
20	D3P	Output	Positive MIPI differential data output



19	GND	Ground	Ground
18	NC	-	Not connect
14	NC	-	Not connect
16	GND	Ground	Ground
15	NC	-	Not connect
14	NC	-	Not connect
13	NC	-	Not connect
12	NC	-	Not connect
11	GND	Ground	Ground
10	LED-	Power Supply	LED Cathode
9	LED-	Power Supply	LED Cathode
8	NC	-	Not connect
7	NC	-	Not connect
6	NC	-	Not connect
5	NC	-	Not connect
4	NC	-	Not connect
3	NC	-	Not connect
2	LED+	Power Supply	LED Anode
1	LED+	Power Supply	LED Anode

### ◆ 3.3.1 IO Interface, AD/PWR Interface

The IO is used for input/output of control signals for peripherals, with a level of 3.3V. The ADC signal is for analog input signals and the analog voltage does not exceed 1.8V. The power - on/off key component is also led out from this socket.



#### IO Interfaces

No.	Definition	Attribute	Describe
1	I/O3	Input/Output	IO3
2	I/O4	Input/Output	IO4
3	I/O2	Input/Output	IO2
4	I/O5	Input/Output	IO5
5	I/O1	Input/Output	IO1
6	I/O6	Input/Output	IO6
7	I/O0	Input/Output	IO0
8	I/O7	Input/Output	IO7
9	GND	ground wire	ground wire
10	3V3	Power supply	3.3V power output

## AD/PWR interface

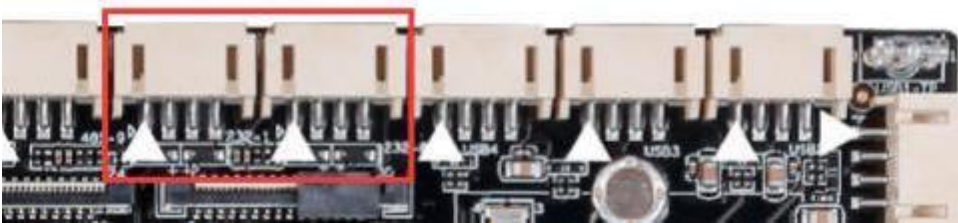
No.	Definition	Attribute	Describe
1	AD0	analog input	analog input ( no more than1.8V)
2	RECOVERY	analog input	Used as an upgrade signal input.
3	REST	reset	System reset input
4	PWON	power on /off	On-off signal

### ◆ 3.3.2 232-Serial-Port Sockets \* 2

Two groups of common 232-serial-port are directly led out from the board card, which can support the commonly-used 232-serial-port devices on the market.

Matters needing attention:

1. Whether the serial - port voltages are matched.
2. Whether the connections of TX and RX are correct.



No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	PC-RX	Input	232-RX
3	PC-TX	Output	232-TX
4	VCC	Power	5V Output



### ◆ 3.3.3 TTL Serial - Port Socket Interface \* 1

The board card directly leads out one group of common two - wire serial - port, which can support the commonly - used serial - port devices on the market. The level of the serial - port is from 0V to 3.3V. If the level of the connected serial -

port is higher than 3.3V, an isolation circuit or a level - conversion circuit is required; otherwise, the main control and the device will be burned out.

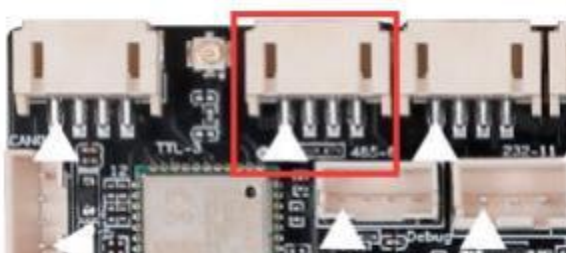
Matters needing attention:

1. Whether the TTL serial - port voltages are matched. It cannot be directly connected to MAX232 and 485 devices.
2. Whether the connections of TX and RX are correct.



No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	UART-RX	Input	RX
3	UART-TX	Output	TX
4	VCC	Power	3.3V Output

### ◆ 3.3.4 485 Interface





The board card directly leads out a group of 485 communication interfaces, which can support the commonly - used 485 - interface devices on the market. The interface level is 3.3V. If the level of the connected interface is higher than 3.3V, an isolation circuit or a level - conversion circuit is required; otherwise, the main control and the device will be burnt out.

Precautions:

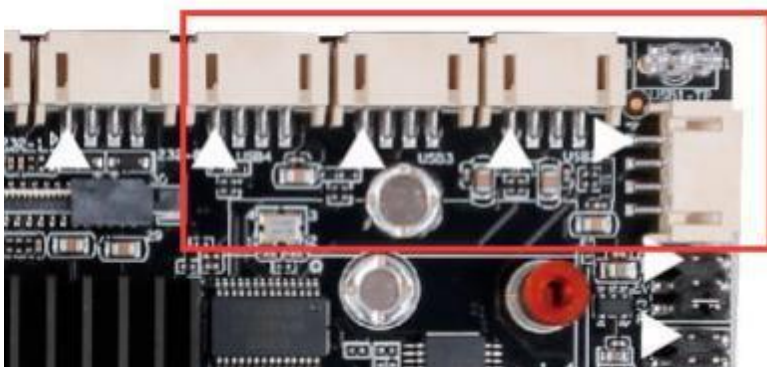
1. Check whether the voltages of the 485 interfaces match.
2. Check whether the wire - sequence connections of 485A and 485B are correct.

No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	485B	Input/output	RX
3	485A	Input/output	TX
4	VCC	Power	3V3output

### ◆ 3.3.5 USB interface

The board card has four built - in USB sockets for the expansion of peripheral devices.

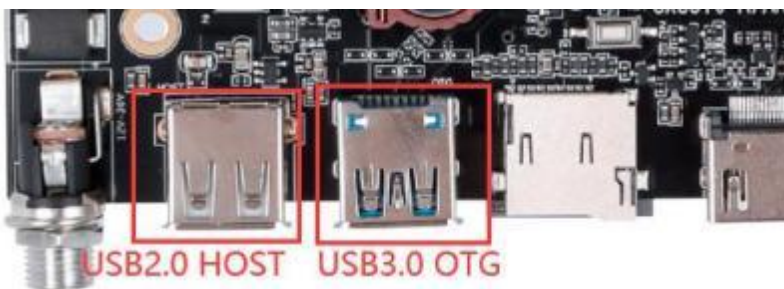
They are HOST by default, and the standard supply current is 500mA for each.



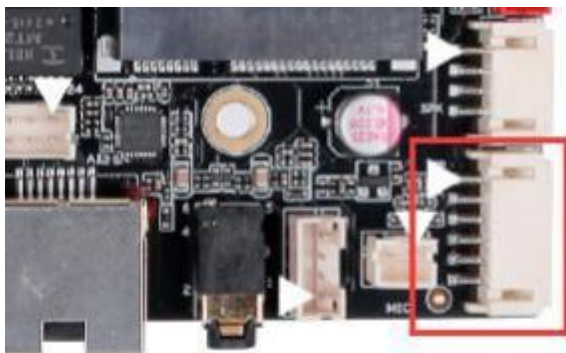


No.	Definition	Attribute	Describe
4	VCC	Power	5V output
3	DM	Input/output	DM
2	DP	Input/output	DP
1	GND	ground wire	ground wire

It has a standard OTG 3.0 interface and a standard USB 2.0 HOST interface.

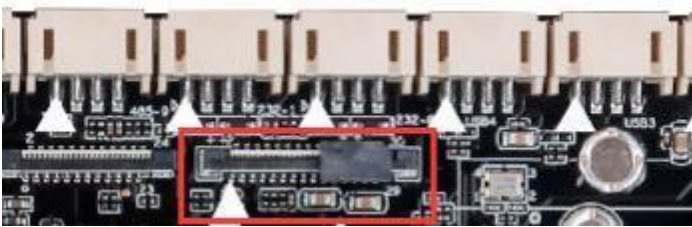


### ◆ 3.3.6 Touchscreen Interface.



No.	Definition	Attribute	Describe
1	VCC	Power	3.3V output
2	SCK	Input/output	I2C clock
3	SDA	Input/output	I2C data
4	INT	Input/output	interrupt
5	RST	Input/output	reset
6	GND	ground wire	ground wire

### ◆ 3.3.7 Camera\_IN Interface



It supports MIPI cameras with a maximum of 13 million pixels. The electrical definitions of the socket are as follows:

No.	Definition	Attribute	Describe
1	NC	/	/
2	VDD	Power	2.8V output
3	DVDD	Power	1.2V output
4	DOVDD	Power	1.8V output
5	NC	/	/
6	GND	ground wire	ground wire
7	VDD	Power	2.8V output
8	GND	ground wire	ground wire
9	I2C3_SDA	Input/output	SDA signal
10	I2C3_SCL	output	SCL signal
11	RST	output	Reset signal
12	PWDN	output	Power failure control



13	GND	ground wire	ground wire
14	MCLK	output	Main clock
15	GND	ground wire	ground wire
16	D3P	Input/output	MIPI Data channel 3 is positive
17	D3N	Input/output	MIPI Data channel 3 negative
18	GND	ground wire	ground wire
19	D2P	Input/output	MIPI Data channel 2 is positive
20	D2N	Input/output	MIPI Data channel 2 negative
21	GND	ground wire	ground wire
22	D1P	Input/output	MIPI Data channel 1 is positive
23	D1N	Input/output	MIPI Data channel 1 negative
24	GND	ground wire	ground wire
25	CLKP	Input/output	MIPI Clock channel positive
26	CLKN	Input/output	MIPI Clock channel negative
27	GND	ground wire	ground wire
28	D0P	Input/output	MIPI Data channel 0 is positive
29	D0N	Input/output	MIPI Data channel 0 negative
30	GND	ground wire	ground wire

### ◆ 3.3.8 Speaker interface

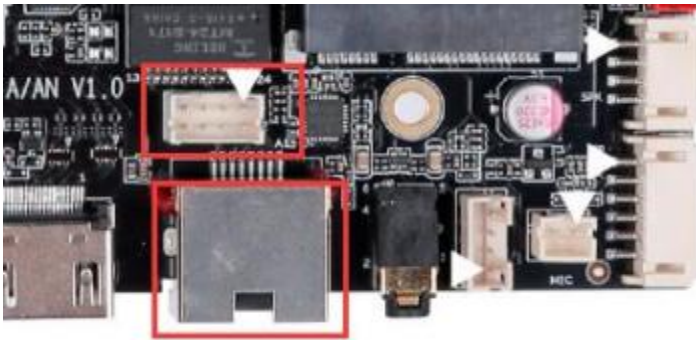






No.	Definition	Attribute	Describe
4	OUP-L	output	Audio output left+
3	OUN-L	output	Audio output left-
2	OUN-R	output	Audio output right-
1	OUP-R	output	Audio output right+

### ◆ 3.3.9 Ethernet

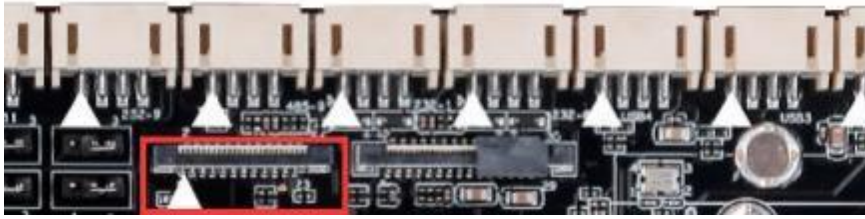


No.	Definition	Attribute	Describe
1	DA+	RJ45 Signal	DA+Signal
2	DC+	RJ45 Signal	DC+Signal
3	DA-	RJ45 Signal	DA-Signal
4	DC-	RJ45 Signal	DC-Signal
5	DB+	RJ45 Signal	DB+Signal
6	DD+	RJ45 Signal	DD+Signal
7	DB-	RJ45 Signal	DB-Signal
8	DD-	RJ45 Signal	DD-Signal

It supports up to a gigabit network port. The socket reserves a standard RJ45 interface and an 8-PIN socket with a double-row 2.0-pitch spacing, but only one of them can be used. The 8-PIN socket can cooperate with our self-developed POE module to achieve POE function.



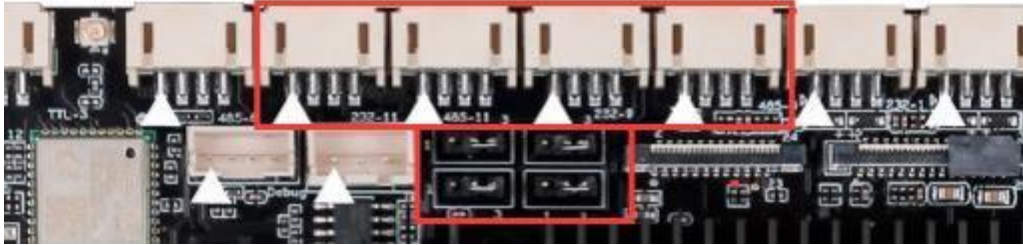
### ◆ 3.4.0 HDMI IN Interface



No.	Definition	Attribute	Describe
1	VCC	ground wire	5V output
2	PWREN	output	power
3	GND	ground wire	ground wire
4	GND	ground wire	ground wire
5	D0N	Input/output	MIPI Data channel 0 negative
6	D0P	Input/output	MIPI Data channel 0 is positive
7	D1N	Input/output	MIPI Data channel 1 negative
8	D1P	Input/output	MIPI Data channel 1 is positive
9	D2N	Input/output	MIPI Data channel 2 negative
10	D2P	Input/output	MIPI Data channel 2 is positive
11	D3N	Input/output	MIPI Data channel 3 negative
12	D3P	Input/output	MIPI Data channel 3 is positive
13	CLKN	Input/output	MIPI Clock channel negative
14	CLKP	Input/output	MIPI Clock channel positive
15	INT	Input	interrupt signal
16	STBY	output	Standby control
17	IR	Input	pending
18	RST	output	Reset signal
19	I2S_LRCK_RX	Input/output	I2S Intra-group signal
20	I2S_SCLK	Input/output	I2S Intra-group signal
21	I2S_MCLK	output	I2S Intra-group signal
22	I2S_SDI	Input	I2S Intra-group signal
23	I2C4_SDA	Input/output	SDA Signal
24	I2C4_SCL	output	SCL Signal

### ◆ 3.4.1 Two-way RS232/RS485 switchable interfaces.

There are two RS232 interfaces and two RS485 interfaces on the board, and they can be switched to RS232 or RS485 through jumpers.



#### The definition of the RS232 interface.

No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	PC-RX	Input	232-RX
3	PC-TX	output	232-TX
4	VCC	power	5V output

#### The definition of the RS485 interface.

No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	485B	Input/output	RX
3	485A	Input/output	TX
4	VCC	power	3V3 output

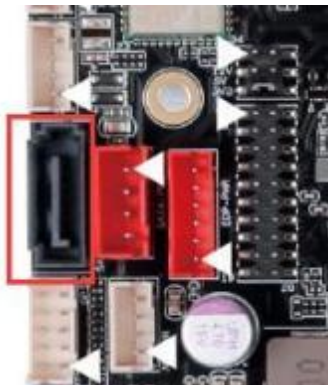


### ◆ 3.4.2 Two-way CAN Interfaces

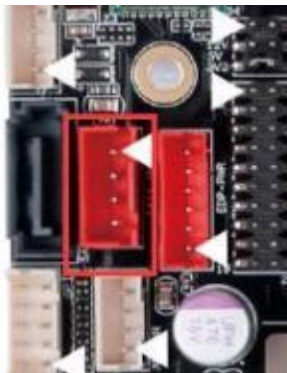


No.	Definition	Attribute	Describe
1	GND	ground wire	ground wire
2	CANH	High signal	CAN
3	CANL	Low signal	CAN
4	VCC5V	power	5V power output

### ◆ 3.4.3 Standard SATA Interface



#### SATA Power Supply Interface





No.	Definition	Attribute	Describe
1	5V	power output	5V power output
2	GND	Ground	Ground
3	GND	Ground	Ground
4	12V	power output	12V power output

### ◆ 3.4.4 The Headphone Expansion Interface



No.	Definition	Attribute	Describe
1	MIC	voice input	mic input
2	HPR	audio frequency	Right channel output
3	HPL	audio frequency	Left channel output
4	GND	Ground	Ground

### ◆ 3.4.5 Debug Interface

The TTL interface is used for debugging.



No.	Definition	Attribute	Describe
1	GND	Ground wire	Ground wire
2	UART-RX	input	RX
3	UART-TX	output	TX
4	VCC	power	3.3V output



### ◆ 3.5.0 Other standard interfaces and functions.

Memory interface	TF card	data storage, the maximum support is 1T
	USB	HOST interface, supporting data storage, data import, USB mouse and keyboard, camera,
Ethernet interface	RJ45 interface	Support 1 way 1000M/100M wired network.
HDMI interface	Standard interface	Support HDMI data output, up to 4K HD.
Headphone jack	Standard interface	3.5mm Standard interface
4G interface	MINI PCIE Standard interface	Support mobile, Huawei, ZTE and other 4G modules.
SIM interface	Standard interface	Support various standards



## Chapter 4 Electrical Performance.

Project		Minimum	Type	Maximum
Power supply parameters	voltage	--	12V	36V
	ripple	--	--	100mV
	electric current			
Power supply current (HDMI output, no other peripherals connected)	12V current	--	500mA	1000mA
	Standby current	--		
	USB power current	--	--	500mA
power current(LVDS)	3.3V working current			
	5V working current			
	12V working current			
	USB power current	--	--	
power current(eDP)	3.3V working current			
	5V working current	--		
	12V working current	--		
	USB power current	--	--	
static electricity	Contact discharge			4KV
	Air discharge			8KV



environment	relative humidity	--	--	80%
	Working temperature	-10°C	--	60°C
	Storage temperature	-20°C		70°C

**Note 1:**

When connecting an LVDS screen, pay attention to selecting the correct backlight working voltage of 3.3V, 5V, or 12V. Users are requested not to apply it to peripherals that exceed the corresponding maximum current.

**Note 2:**

When connecting an eDP/LVDS screen, the overall working current and standby current of the board card depend on the connected screen and are not listed one by one in the above table.



## Chapter 5 Precautions for Assembly and Use

During the process of assembly and use, please pay attention to the following (but not limited to) issues:

1. Short - circuit problems between the bare board and peripherals;
2. During the installation and fixation process, avoid the deformation of the bare board due to fixation reasons;
3. When installing an eDP/LVDS screen, pay attention to whether the screen voltage and current are in line, and pay attention to the direction of pin 1 of the screen socket;
4. When installing an eDP/LVDS screen, pay attention to whether the screen backlight voltage and current are in line. If the screen backlight power is above 20W, consider whether to use other power supply boards for power supply;
5. When installing peripherals (USB, IO, serial ports), pay attention to the peripheral IO level and current output issues;
6. When installing serial ports, pay attention to whether 232 or 485 devices are directly connected. Check whether the TX and RX connections are correct;
7. Check whether the input power is connected to the power input interface. Based on the evaluation of the total peripherals, check whether the input power voltage, current, etc. meet the requirements. Avoid connecting the power input from the backlight socket for the convenience of operation.



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