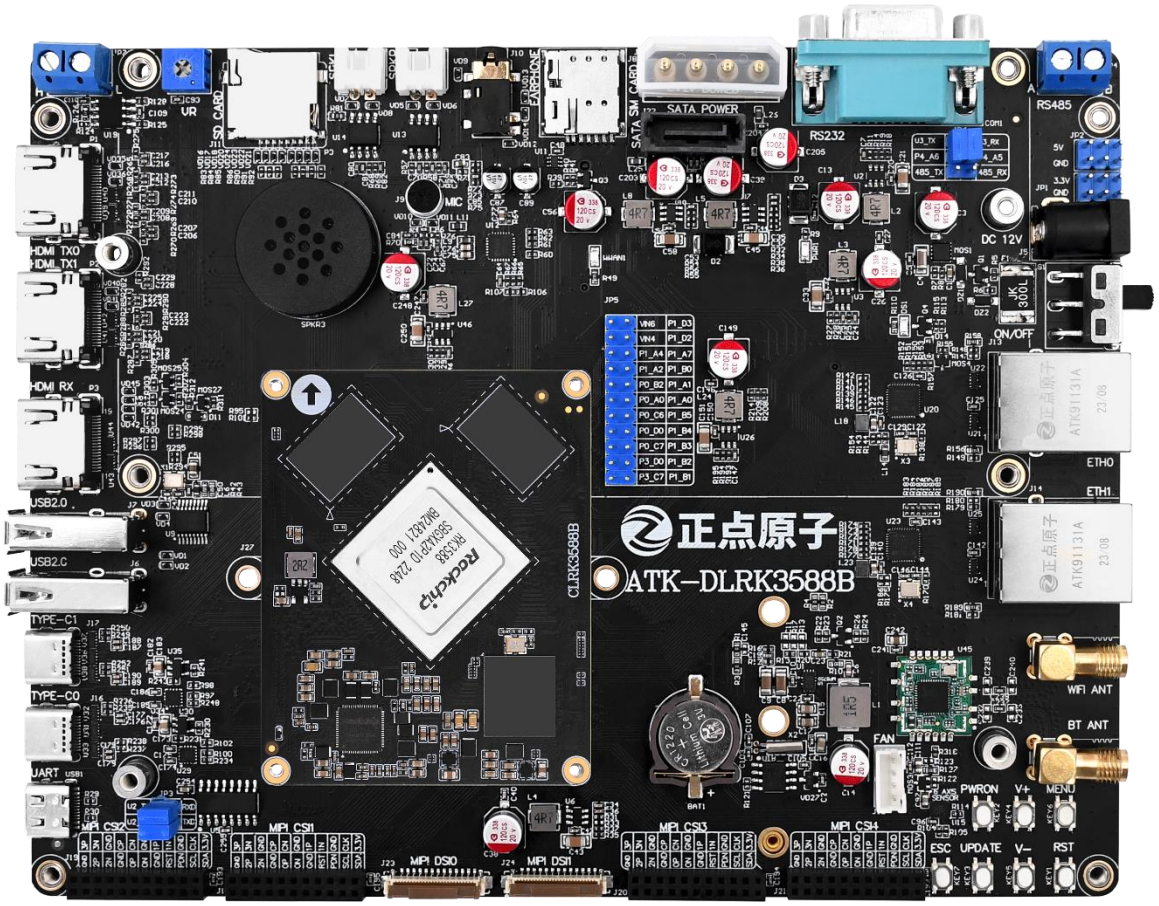
# ATK-DLRK3588

## Android System Quick test manual

## V1.0



ALIENTEK

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## Disclaimer

The product specifications and instructions mentioned in this document are for reference only and subject to update without prior notice; Unless otherwise agreed, this document is intended as a product guide only, and none of the representations made herein constitutes a warranty of any kind. 

In order to get the latest version of product information, please regularly visit the download center or contact the customer service of Taobao ALIENTEK flagship store. Thank you for your tolerance and support.

**Revision History:**

| Version | Version Update Notes | Responsible person | Proofreading | Date |
|---|---|---|---|---|
| V1.0 | release officially | ALIENTEK | ALIENTEK | 2024.06.01 |

# Brief

This document is a quick experience guide for the ALIENTEK ATK-DLRK3588 development board. It can be regarded as a hardware testing document. Here, we can learn about the usage method of the development board and the testing methods for peripheral devices, as well as the peripheral resources on the board. Therefore, this document is quite important.

The environment used in this document:

- Windows 10 64-bit, it is also applicable to Windows 7-10 (Window 11 has not been tested, we all develop using Windows 10. If you are using Window 11, theoretically it is also applicable.) . The documents are all introduced based on the 64-bit operating system.
- Ubuntu 20.04: Please use 20.04 for Ubuntu. If you have used a new version of Ubuntu and the installation environment is different, it may cause errors. Please solve it by yourself!
- The readers are required to be able to use FileZilla, WinSCP and Windows Git to transfer files between Ubuntu and Windows.

This document is the Android system test document for the ALIENTEK ATK-DLRK3588 development board.

# Catalogue

# Chapter 1. Preparation for using the ATK-DLRK3588 development board

Here we will introduce the matters that need to be paid attention to when using the development board. Please read carefully. Because if you don't pay attention to these matters, it may lead to the failure of your experiment or damage to the development board, etc. So, please be sure to pay attention.

## 1.1 Precautions before powering on

- Firstly, check if the power supply is plugged in. If it is, then check if the power plug switch is turned on and if the power supply is normal.
- Before leaving the factory, the entire board was made of acrylic and covered with a screen protector. However, in some cases, users may remove the acrylic board or the screen. At this time, it is necessary to observe that the bottom board should not be placed on the clutter table. A protective film should be placed under the bottom board, otherwise it is easy to come into contact with metal objects, which may cause the development board to short circuit; in addition, it is also necessary to pay attention to waterproofing, moisture-proofing, and dust-proofing.

## 1.2 Serial Port Software Installation

Here is a brief introduction to the installation of the CH343 USB serial port driver and the installation of the MobaXterm software. No detailed installation tutorials will be provided as it is relatively basic.

- Install the CH343 USB serial port driver (for the computer to communicate with the development board's serial port, we need to install this driver)

On the development board CD-ROM A - Basic Materials -> 4_softwares -> CH343SER.EXE (actually, it is also applicable to Windows 10. If you have already installed it, you don't need to install again). Double-click to run it, and then the pop-up window, directly click to install, wait for the pre-installation or the successful installation window to appear. Note: The default baud rate for debugging the development board's serial port is 1500000 (1.5M).

- Install the MobaXterm terminal software (or install Xshell, SecureCRT, etc. as terminal software) This article takes MobaXterm as an example. The installation package of MobaXterm is located at: development board CD-ROM A - Basic Materials -> 3_software -> MobaXterm_Installer_v12.3.zip. Double-click to open this compressed file, after decompression, directly double-click MobaXterm_installer_12.3.msi to install. The MobaXterm installation program will guide the user to install.

## 1.3 Install ADB Tool

During the Android development process, we can debug through the serial port or use adb to debug Android devices. For reference, see the document: Development Board CD-ROM Disk A - Basic Materials -> 10_user_manual -> 03. Auxiliary Documents -> [ALIENTEK] adb Tool Usage Instructions V1.0.pdf. Refer to this document to install the adb tool on Windows.

## 1.4 Hardware connection of the development board

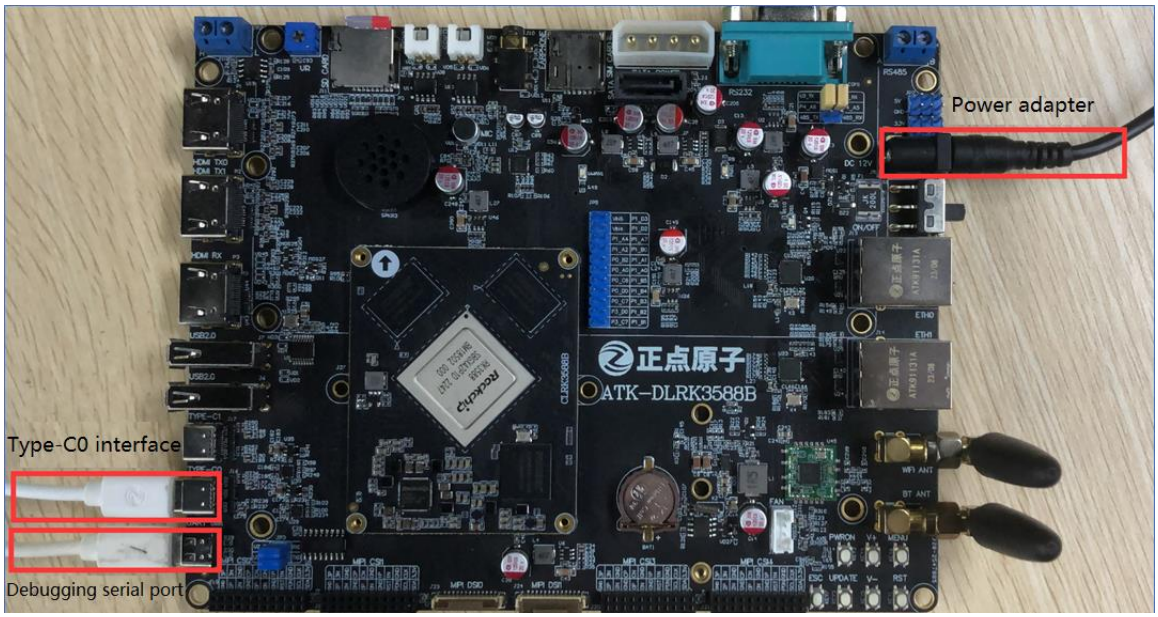
This section introduces the hardware connection of the ATK-DLRK3588 development board. We need to connect the debug serial port, the TYPE-C0 interface (for adb and image burning), and the power supply of the development board.

- The ATK-DLRK3588 development board is pre-configured with two USB cables. Find the debug serial port (the Type-C socket marked with "UART") on the development board, and connect one end of the USB cable to it, and the other end to the USB port of the computer host.

- Find the TYPE-C0 interface (the Type-C socket marked with "TYPE-C0") on the development board base, and connect one end of the USB cable to it, and the other end to the USB port of the computer host.

- In addition, connect the power adapter (use the 12V-2.5A power adapter that comes with the ATK-DLRK3588 development board).

The connection diagram is as follows.



# Chapter 2. Burn the Android system image

The ATK-DLRK3588 development board is pre-installed with the Linux buildroot system when it leaves the factory. If you want to run the Android system on the development board, you need to burn the Android system image provided by ALIENTEK (including Android 12 and Android 13 images). Please visit "[ALIENTEK]ATK-DLRK3588 Factory Image Burn-in Guide" to view the details and follow the instructions in the document to burn the Android system image.

# Chapter 3. Android System Function Testing

This chapter describes how to test the ATK-DLRK3588 development board.

## 3.1 Power on startup

Turn on the power switch of the development board and start the Android system; during the system startup process, a logo and the Android startup animation will be displayed, as shown below:


Figure 3.1-1 Boot-up logo

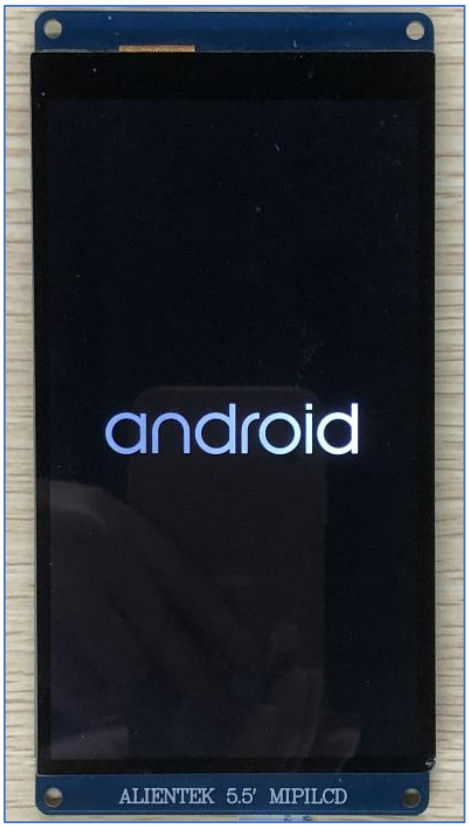



Figure 3.1-2 Android startup animation

After successful startup, the Android system main interface will be displayed, as shown below:

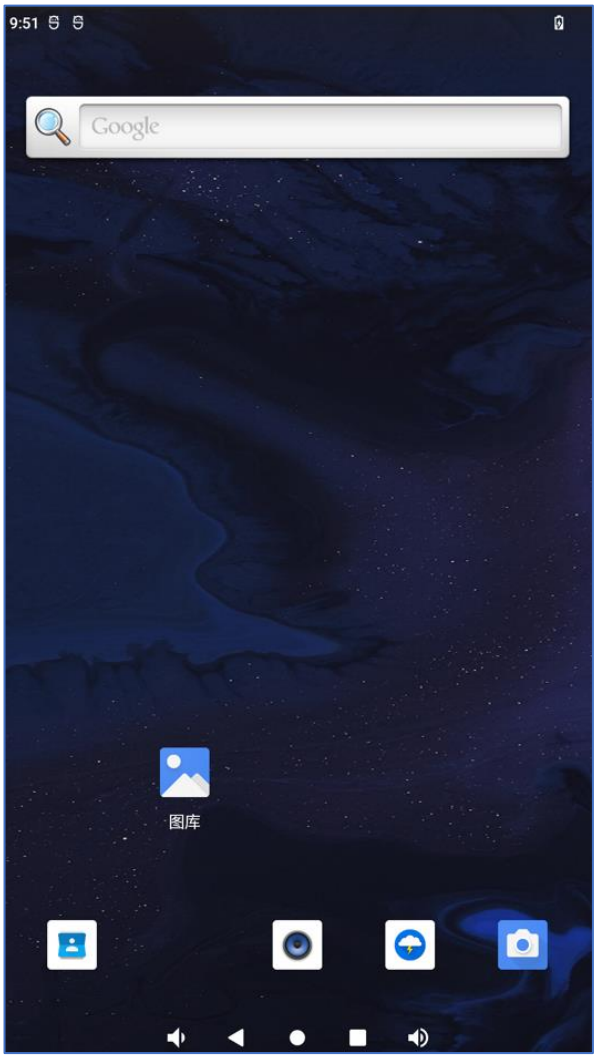
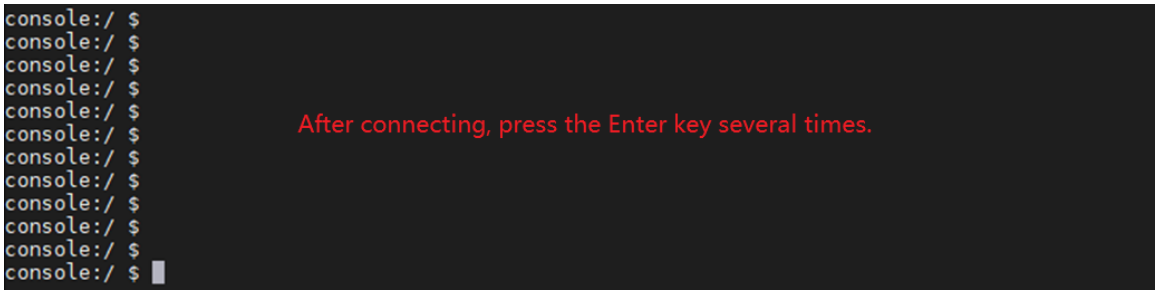



Figure 3.1-3 Android system main interface (MIPI screen)

## 3.2 Connect serial port terminal

Connect the debugging serial port (UART) of the development board to the computer using a USB cable. Open the MobaXterm software, create a Serial port session (select USB SERIAL CH343), set the serial port baud rate to 1500000 (1.5M). After the connection is successful, it will be as follows:




We can execute commands through the serial port terminal, such as ls and ifconfig, etc.

## 3.3 ADB connection

Connect the TYPE-C0 interface of the development board to the computer using a USB cable, and open the command prompt window of Windows (make sure to install the ADB tool first), as shown below:

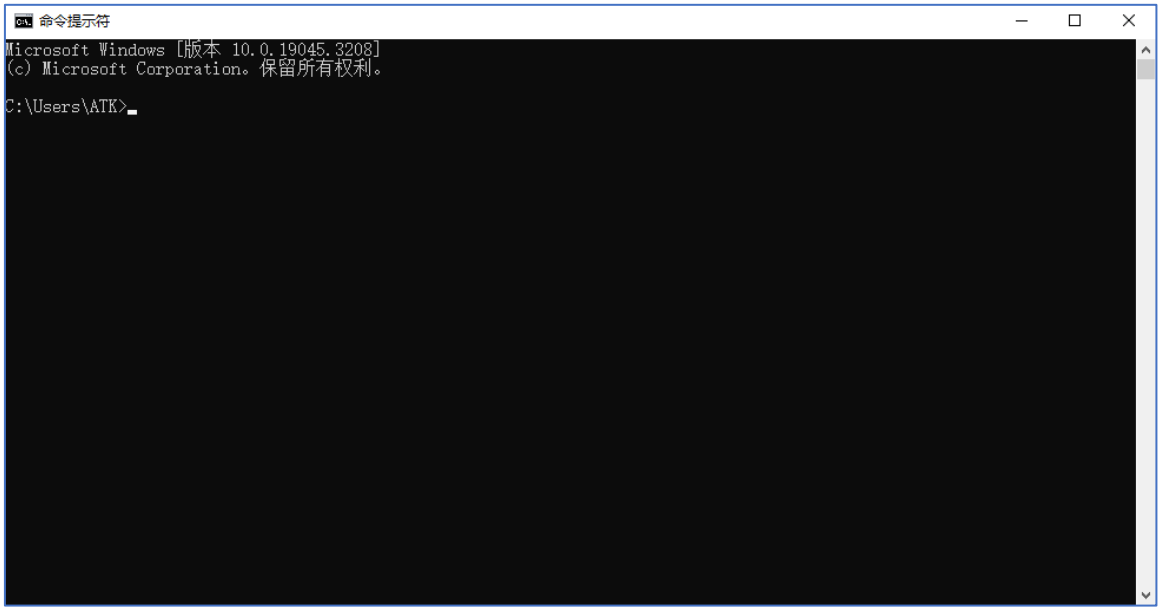



Figure 3.3-1 Windows command prompt window

Enter the command "adb devices" to check if the development board is currently connected:

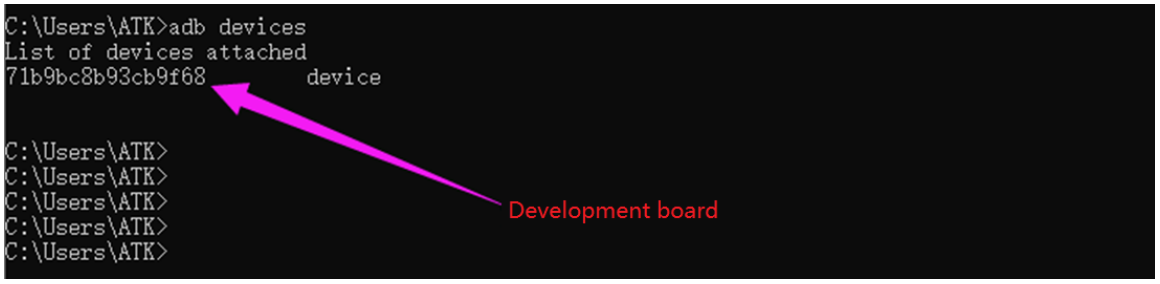



Figure 3.3-2 Check if it is connected to the development board

If the connection fails, you can try unplugging the USB cable from the TYPE-C0 port of the development board, then reinsert it. If that doesn't work, you can try several more times!

After confirming that adb is connected to the development board, execute the "adb shell" command to run the shell of the Android device, as shown below:


Figure 3.3-3 Run the shell of the device

Run the shell command line of the Android device, and you can execute commands to conduct corresponding tests.

## 3.4 LED Testing

The ALIENTEK ATK-DLRK3588 development board is equipped with a user LED. As shown in the following figure:

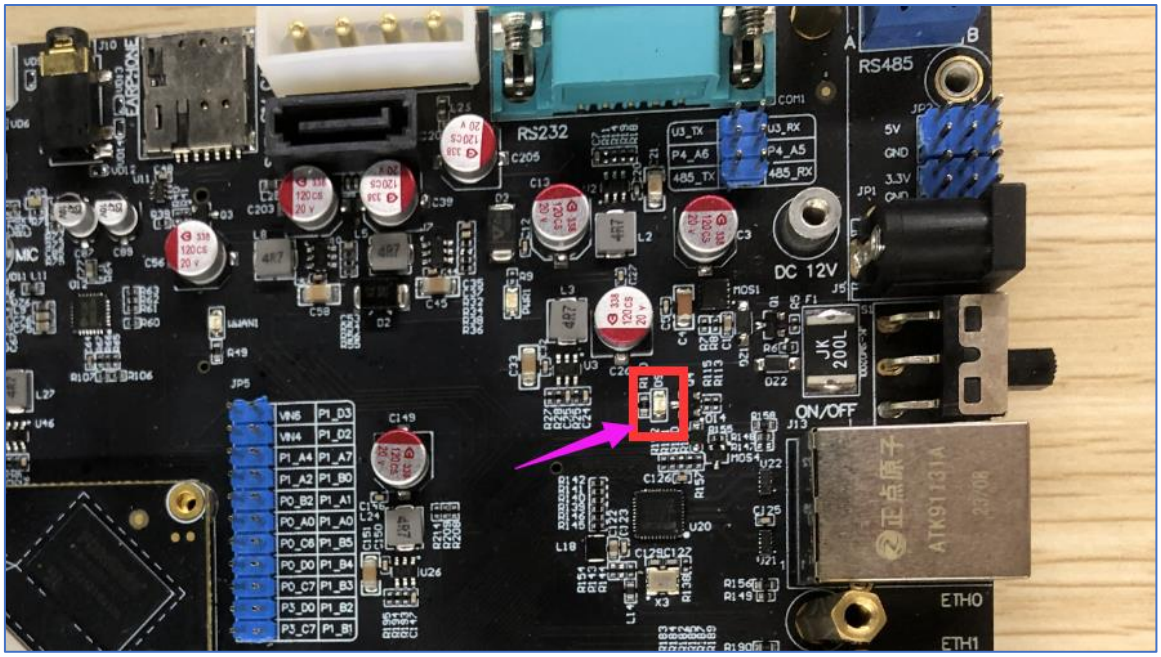



Figure 3.4-1 The distribution of LEDs on the development board

After the system starts, the small LED lights will flash (heartbeat lights), which are generally used to indicate whether the system is running.

In the Android system, we can control the state of the LEDs by using the serial port terminal or adb and execute the following commands:

```
su root
#Switch to the root user first, otherwise you won't have permission to execute the following commands
cat /sys/class/leds/work/trigger
#View the current trigger mode and supported trigger modes of LED0. The default is [heartbeat]
echo none > /sys/class/leds/work/trigger        #Change the trigger mode of LED0
echo 1 > /sys/class/leds/work/brightness
# Turn on LED0. At this time, it is in a constantly on state. The value ranges from 1 to 255
echo 0 > /sys/class/leds/work/brightness
# Turn off LED0. At this time, it is in a off state. The value is 0
```

## 3.5 Key Test

The ALIENTEK ATK-DLRK3588 development board is equipped with 7 keys. As shown in the following figure:

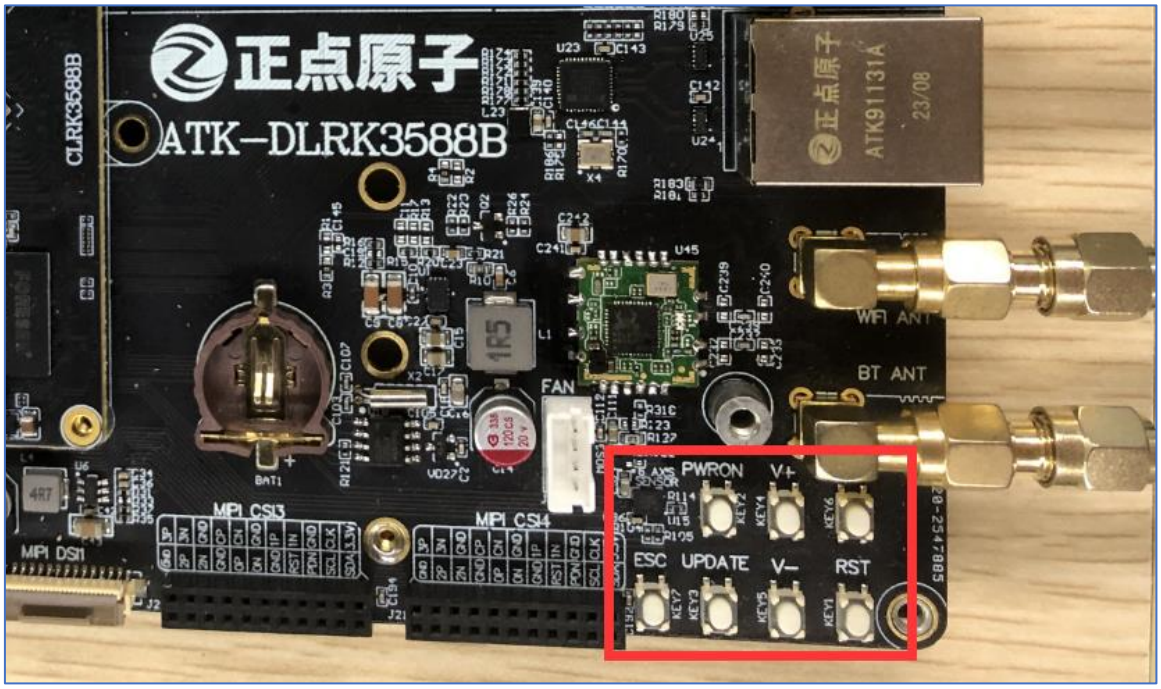



Figure 3.5-1 The distribution of buttons on the development board

There are 4 user buttons: V-, V+, MENU, and ESC. These 4 user buttons are analogized through ADC. When different buttons are pressed, their corresponding ADC values are different, as shown in the following table:

| | KEY4 | KEY5 | KEY6 | KEY7 |
|---|---|---|---|---|
| Name of the button | V+ | V- | MENU | ESC |
| ADC value collected | 40 | 950 | 2035 | 2818 |

In the Android system, when you press the V+ button, the media volume will increase; when you press the V- button, the media volume will decrease. Therefore, these two buttons can be used to adjust the volume level, as shown below:

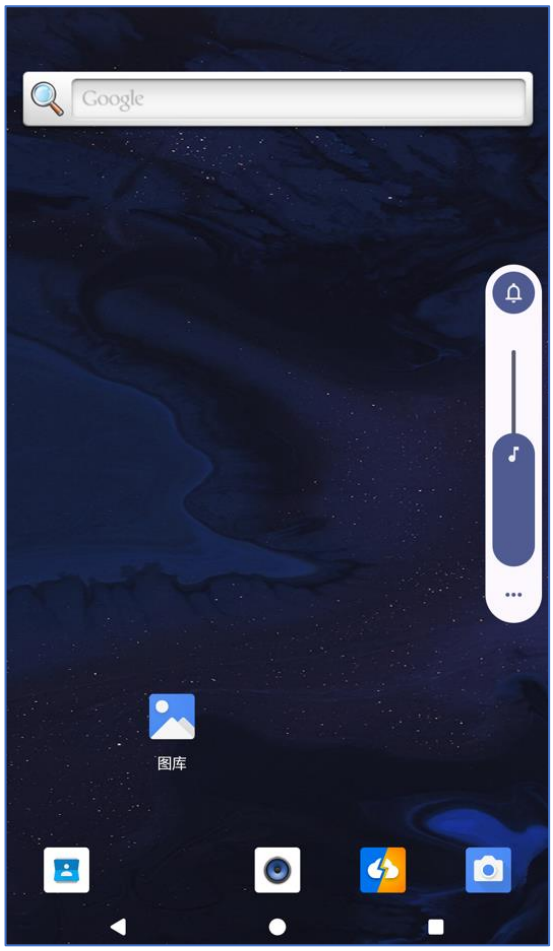



Figure 3.5-2 Adjust volume by pressing the buttons

Pressing the MENU button will display the menu, as shown below:


Figure 3.5-3 Press the MENU button to display the menu.

## 3.6 Brightness Adjustment

Slide down on the Android system interface to open the Android pull-down menu, and find the brightness adjustment slider, as shown below:


Figure 3.6-1 Brightness adjustment control

Move the slider to adjust the screen brightness (only effective for MIPI screens), test it yourself!

## 3.7 RTC clock test

The ATK-DLRK3588 development board has an external RTC hardware clock unit, and a RTC clock chip PCF8563 is board-mounted on the baseboard. As shown below:

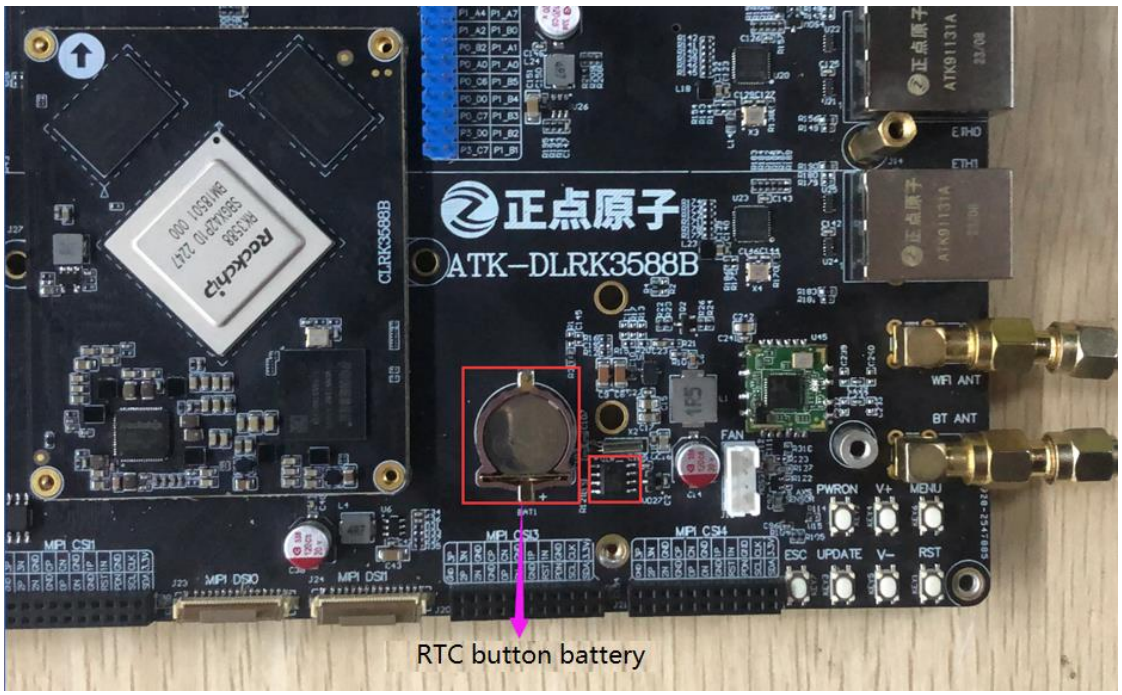



Figure 3.7-1 RTC clock chip and button battery

Please check if the RTC button battery is installed on the battery holder on the bottom plate of the development board. You can measure the voltage of the button battery with a multimeter to see if it is approximately 3.3v. If the voltage is too low, it needs to be replaced to prevent the RTC chip from not working properly during the power-off period of the development board (note: the battery is a consumable item. If you find that its voltage is too low, please replace the button battery).

Open the "Settings" app, find "System" "Date and Time" to set the system time, as shown in the following picture:


系统
语言和输入法
手势
日期和时间
GMT+08:00 中国标准时间
备份
多用户
目前的登录身份：机主
重置选项


日期和时间
自动设置时间
日期
2024年3月19日
时间
20:32
Set the date and time
时区
时区
GMT+08:00 中国标准时间
Set the time zone
时间格式
使用默认语言区域
使用 24 小时制
13:00


Here, you can modify the date and time. The modified time will be written to the hardware RTC, thus ensuring that the time on the development board can remain synchronized even after power loss (provided that a button battery is installed and the voltage is normal).

## 3.8 Audio Interface Test

The ATK-DLRK3588 development board has an onboard audio codec chip ES8388 on its baseboard, which is used to implement audio playback and recording functions.

There is a headphone interface (for connecting headphones, allowing both playback and recording) on the baseboard, a microphone (for the recording function), and a speaker (for implementing the audio output function). As shown below:

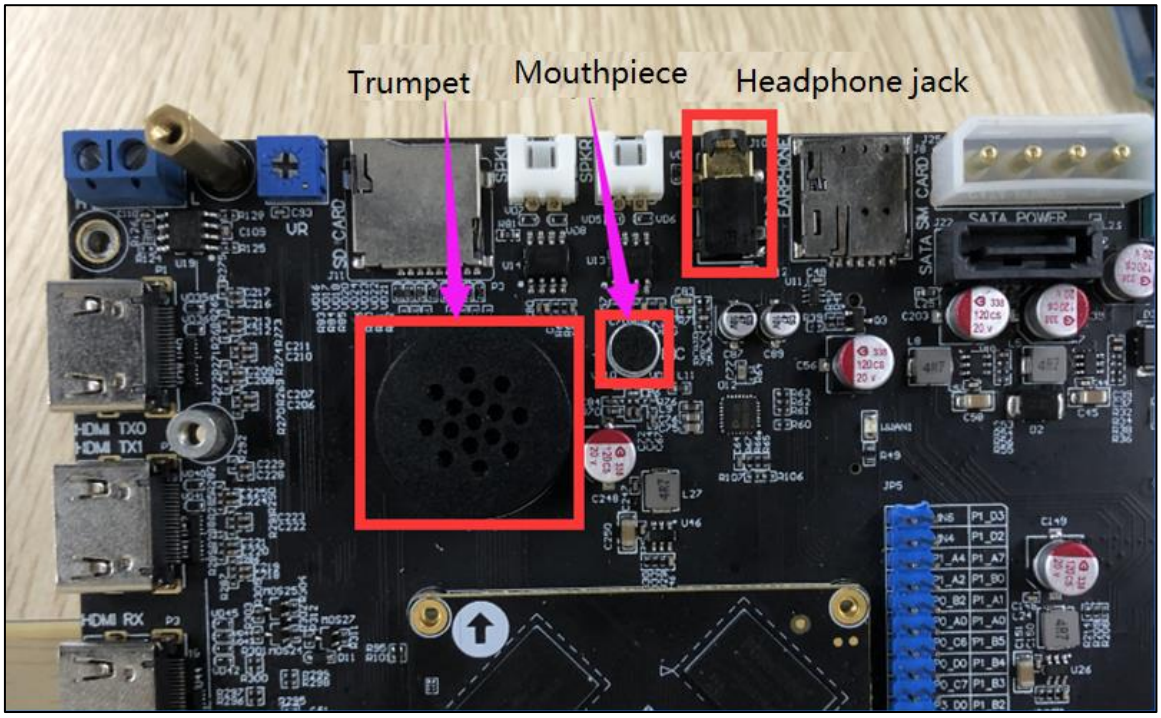



Figure 3.8-1 Headphones, microphone and speaker

### 3.8.1 Audio playback test

Before the test, prepare an MP3 audio file. Open the Windows Command Prompt window, and execute the following command in the Windows Command Prompt window to push the prepared MP3 audio file to the /sdcard/Music directory of the development board:

```
adb root                                  #Obtain root access
adb remount                               #Re-mount the root file system
adb push ./test_music.mp3 /sdcard/Music   #Send the "test_music.mp3" file in the current directory to the development board.
```

```
C:\Users\ATK\Desktop\测试音频文件>
C:\Users\ATK\Desktop\测试音频文件>
C:\Users\ATK\Desktop\测试音频文件>adb root
restarting adbd as root

C:\Users\ATK\Desktop\测试音频文件>adb remount
remount succeeded

C:\Users\ATK\Desktop\测试音频文件>adb push ./test_music.mp3 /sdcard/Music
./test_music.mp3: 1 file pushed, 0 skipped. 210.0 MB/s (3908271 bytes in 0.018s)

C:\Users\ATK\Desktop\测试音频文件>
```

You can also place the prepared audio file on a USB drive, and then insert the USB drive into the USB HOST interface of the development board.

After the push operation is completed, then execute the following command again to restart the Android system:

```
adb shell sync      # Synchronize
adb shell reboot    # Restart the system
```

```
C:\Users\ATK\Desktop>
C:\Users\ATK\Desktop>adb shell sync

C:\Users\ATK\Desktop>adb shell reboot

C:\Users\ATK\Desktop>
```

After the Android system is restarted, then open the "Music" app as shown below:

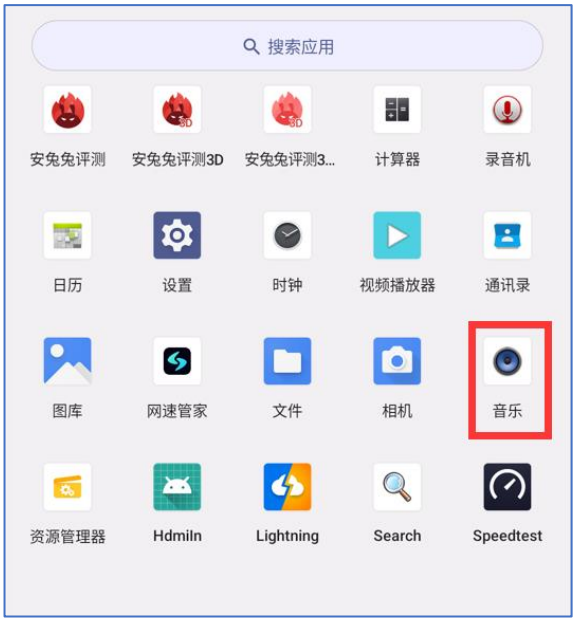



Figure 3.8-2 Music App

Open the music app and then play music to test if the speaker of the development board and the headphones are working properly!

The development board uses 3.5mm round-hole headphones. Insert it into the headphone jack of the development board. At this time, the Android system will detect the insertion of the headphones, and a headphone icon will appear in the upper right corner (the icon disappears when the headphones are unplugged), as shown below:


Figure 3.8-3 Headphone icon

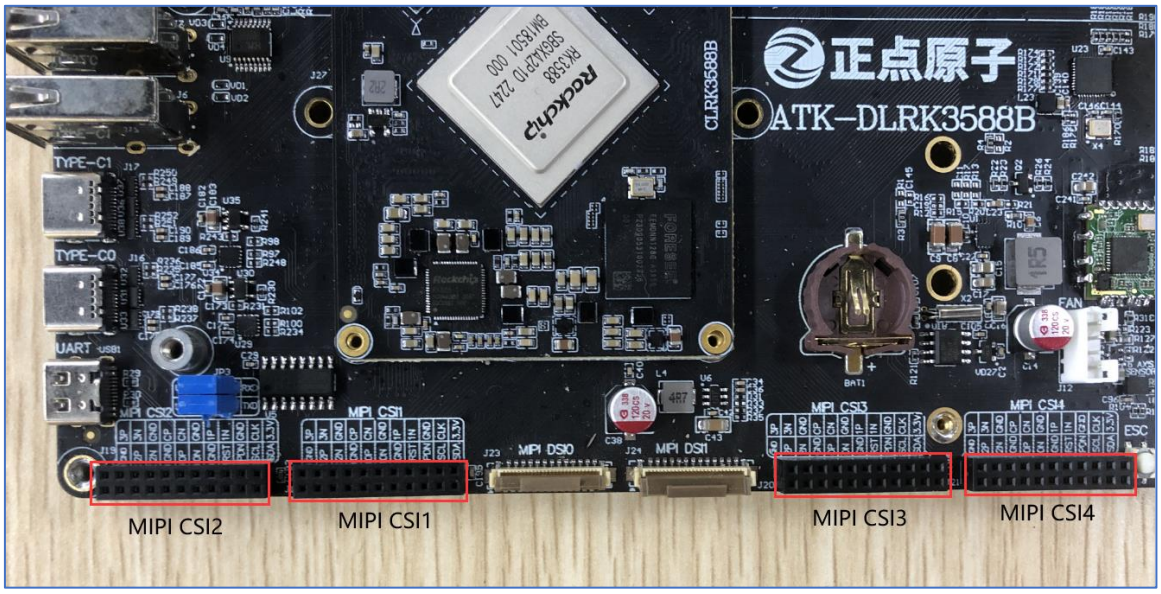
### 3.8.2 Recording test

Open the "Recorder" app in the Android system and conduct a test on the recording function (you can record using the built-in microphone or through the built-in microphone of the headphones). As shown below:


Figure 3.8-4 Audio Recorder App

## 3.9 Camera Test

The base board of the ATK-DLRK3588 development board has 4 MIPI CSI camera interfaces, supporting the simultaneous use of 4 MIPI cameras. It supports the IMX415 camera sold by ALIENTEK Store. The distribution of the camera interfaces is as shown in the following figure:




Before the test, the development board should be powered off first. Then, insert the camera into the MIPI CSI interface on the board (any one of the four interfaces will do). The installation method is shown in the following figure (taking imx415 as an example):

Note: The camera module should be connected when the development board is powered off. Do not operate with power on!

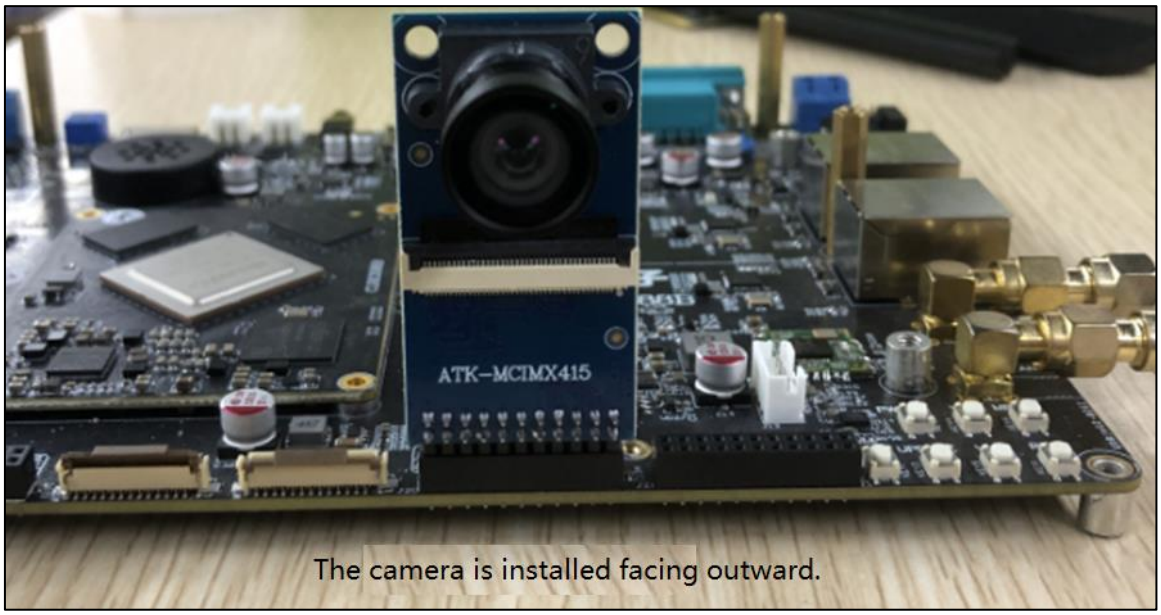



Figure 3.9-1 Camera Installation Example Diagram

After installing the camera, power on the development board and enter the Android system. Then, open the "Camera" app for testing, as shown below:

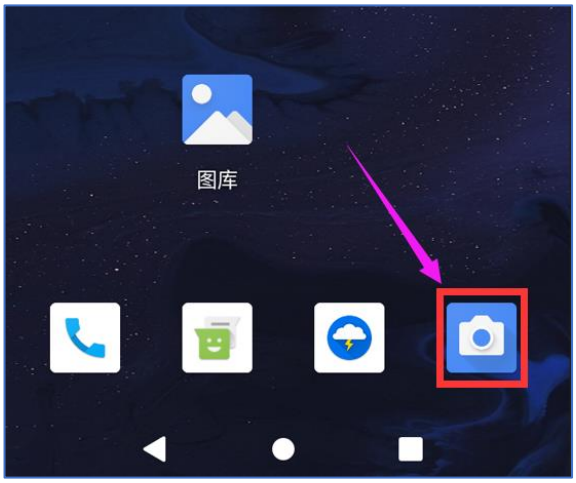
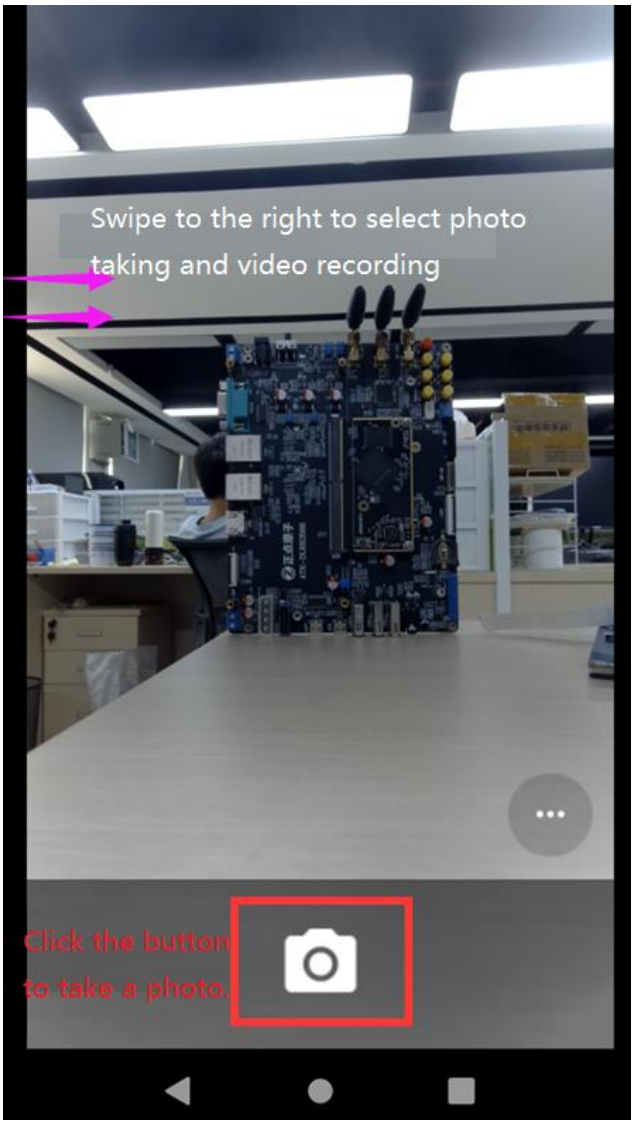
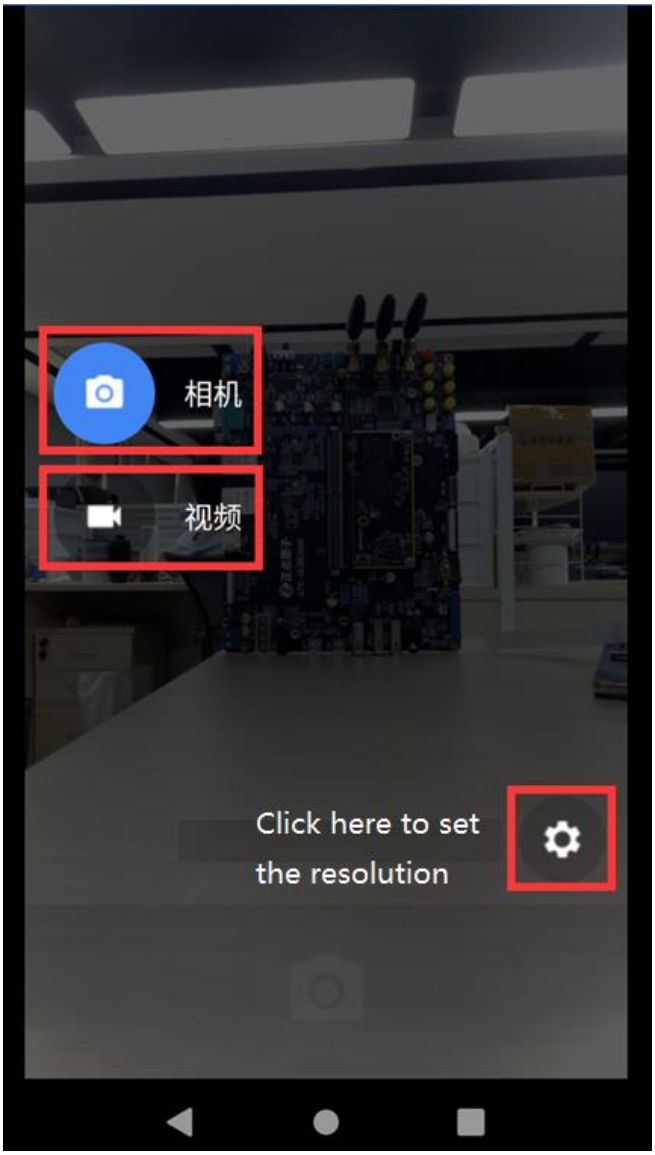



Figure 3.9-2 Camera App icon




相机
视频
Click here to set
the resolution


设置
分辨率和画质
Resolution setting
拍照声音
保存位置信息
高级
还原默认设置

If the user has multiple cameras, they can also test functions such as simultaneous preview of multiple cameras and switching between front and rear cameras. The specific testing methods can be referred to in the document: Development Board CD-ROM A Disk - Basic Materials -> 10_user_manual -> 03. Supplementary Documents -> [ALIENTEK] ATK-DLRK3588 Camera User Manual.pdf.

## 3.10 Six-axis Sensor Test

On the bottom board of the ATK-DLRK3588 development board, there is a six-axis sensor SH3001 onboard. SH3001 Introduction:

SH3001 is a six-axis IMU (Inertial Measurement Unit) inertial measurement unit. It integrates a three-axis gyroscope and a three-axis accelerometer inside, with a small size and low power consumption. It is suitable for applications in the consumer electronics market and can provide high-precision real-time angular velocity and linear acceleration data. SH3001 has excellent temperature stability and maintains high resolution within the operating range of -40°C to 85°C. Application scenarios: smartphone games, optical image stabilization; smart watches, fitness bands for posture detection and positioning navigation; TWS headphones for posture detection and 3D sound effects; automatic counting and motion trajectory recording for smart sports equipment such as rope skipping, pull-up bars, and abdominal wheel exercises; smart electric toothbrushes, smart water cups for posture detection; attitude control of twisty vehicles; combined navigation for intelligent farming, cleaning robots; attitude measurement for platforms in intelligent industrial applications.

- Technical parameters brand: Senodia
- Model: SH3001
- Package: 14 Pins LGA
- Gyroscope range: 262, 131, 65.5, 32.8, 16.4 (LSB/°/s)
- Gyroscope sensitivity: 262, 131, 65.5, 32.8, 16.4 (LSB/°/s)
- Acceleration range: ±2, ±4, ±8, ±16 (g)
- Accelerometer sensitivity: 16384, 8192, 4096, 2048 (LSB/g)
- Minimum operating temperature: -40°C Maximum operating temperature: 100°C
- Minimum power supply voltage: 3V Maximum power supply voltage: 8V
- Size: 2.5×3.0×0.9mm³

### 3.10.1 Gravity sensor test

Turn on the automatic screen rotation function of Android, as shown in the following picture:


Then open an App that supports switching between portrait and landscape orientations (such as a calculator, clock, or recorder, etc.). Rotate the development board to test if the gravity sensor is working properly and see if the App interface will switch between portrait and landscape orientations, as shown in the following picture:

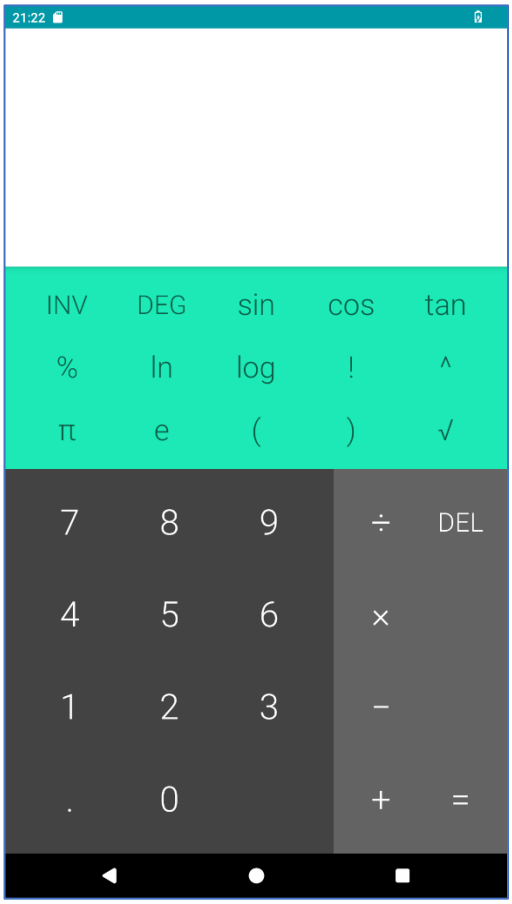



Figure 3.10-1 Portrait mode


Figure 3.10-2 Landscape mode

### 3.10.2 Gyroscope test

Upcoming update!

## 3.11 USB HOST interface test

The base board of the ATK-DLRK3588 development board has two USB 2.0 HOST interfaces, as shown below:

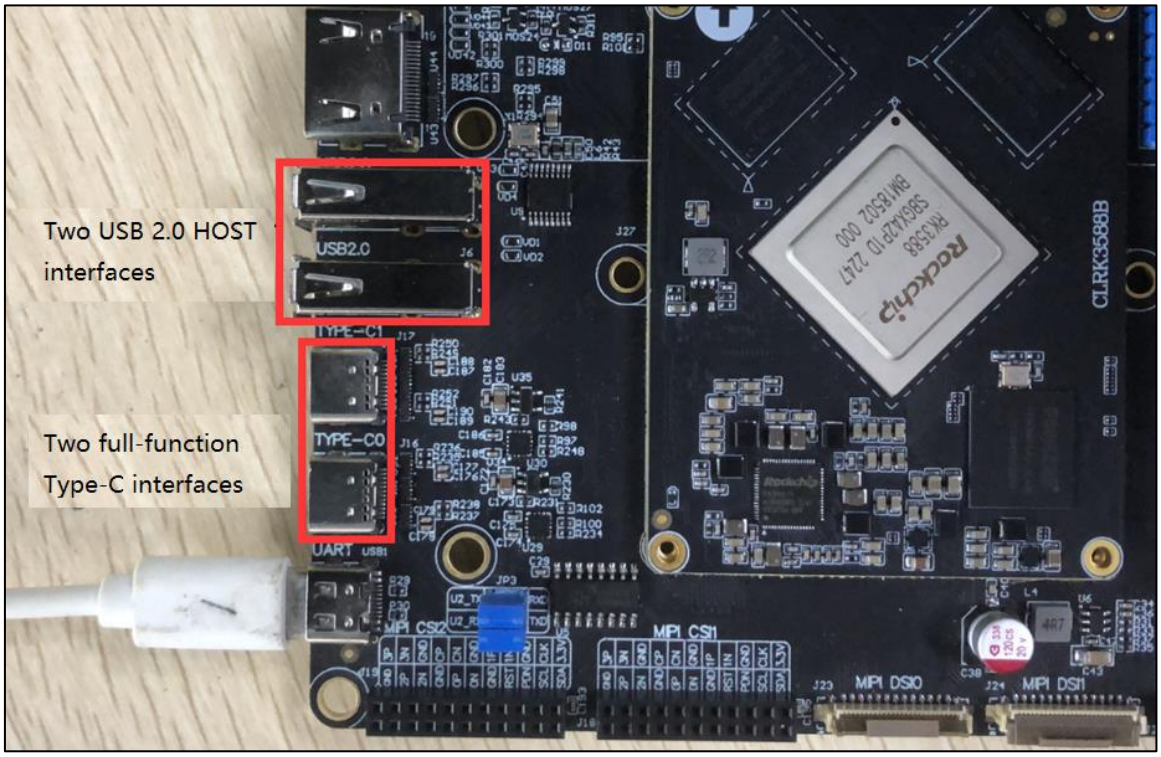



Figure 3.11-1 USB interface distribution map

The USB HOST interface of the development board can be connected to USB peripherals to test whether the USB HOST interface functions properly. For example, USB drives, USB mice, USB keyboards, etc. can be used.

①Testing with a USB mouse: After the USB HOST interface is connected to the mouse, a mouse pointer will appear on the Android system desktop. We can operate using the mouse.

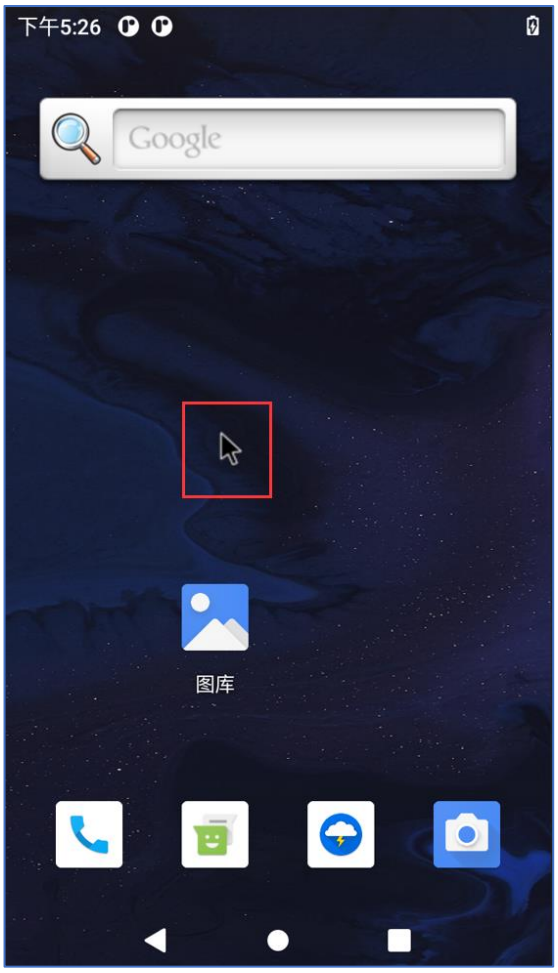



Figure 3.11-2 Connect the mouse

② Connection test for USB drive: After connecting the USB drive (supporting formats such as FAT32 and exFAT) to the USB HOST interface, a prompt will appear at the top of the Android system interface:


Figure 3.11-3 Identified the insertion of the USB drive

Click on "General USB Drive" to view the contents of this USB drive, as shown in the following picture:

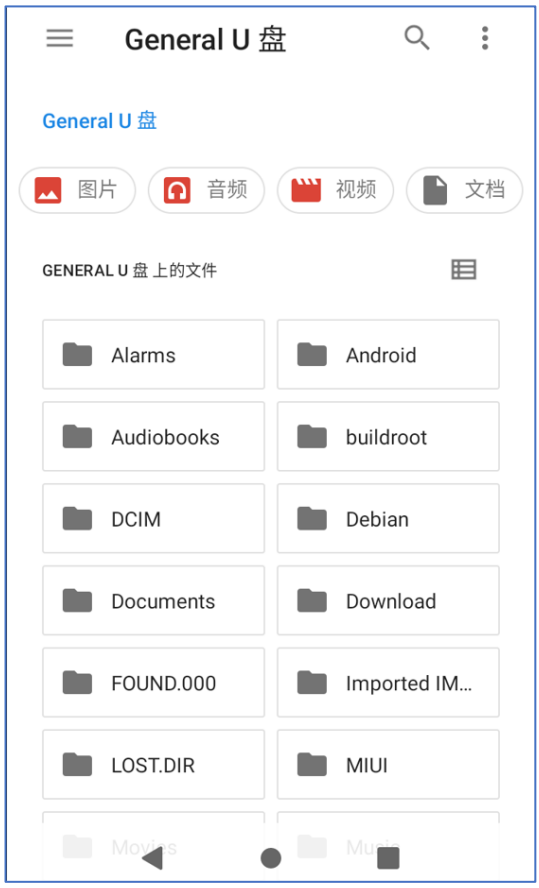
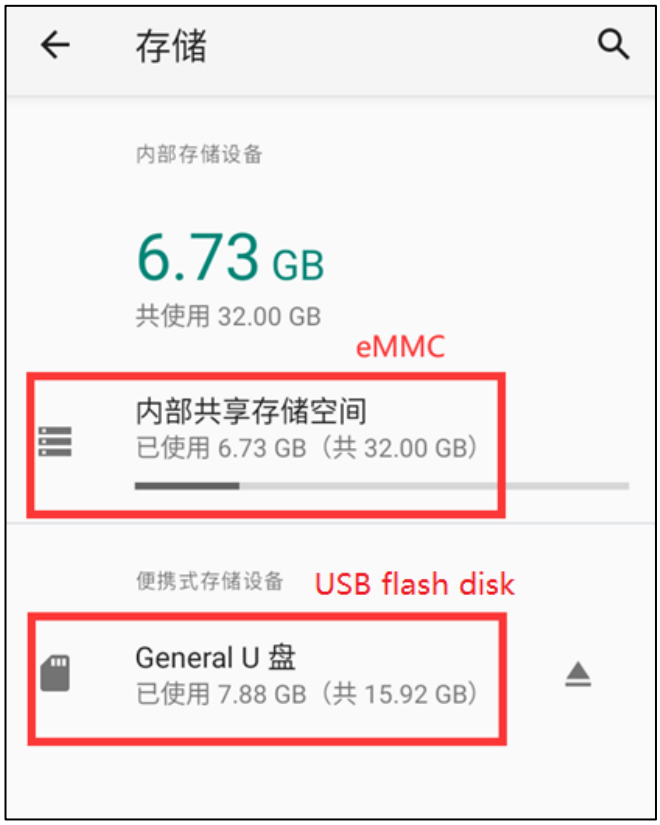



Figure 3.11-4 View the contents in the USB device

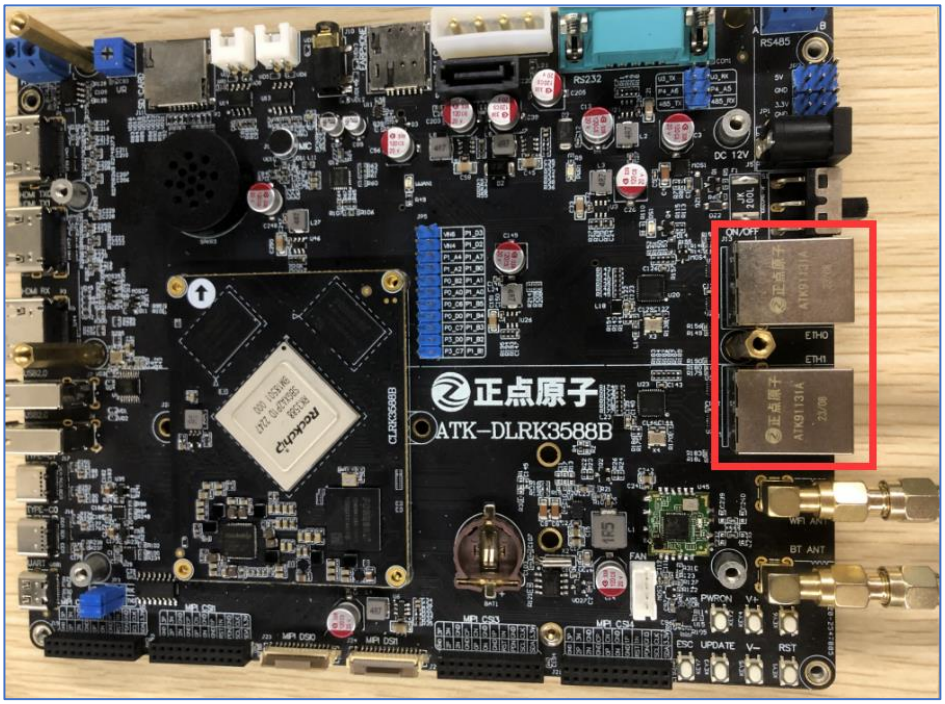
Similarly, we can open the "Settings" app, find the "Storage" item, and we can see the USB device we have inserted:



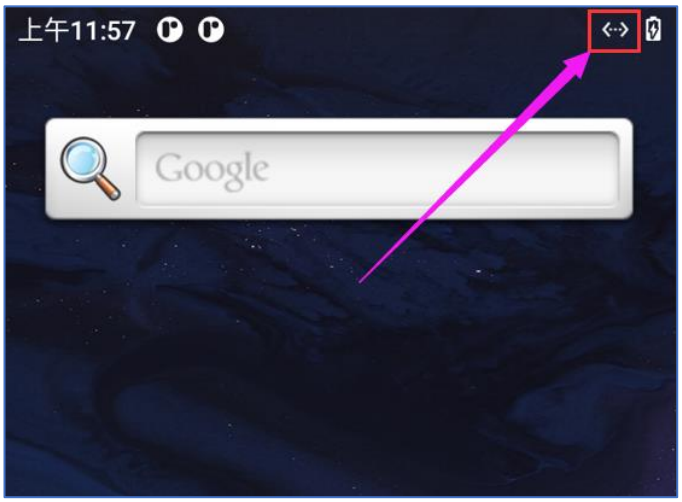

If you want to test the read and write speed of the USB flash drive device, you can install the "Antutu Benchmark" App for testing, or directly use commands (such as the dd command) for testing.

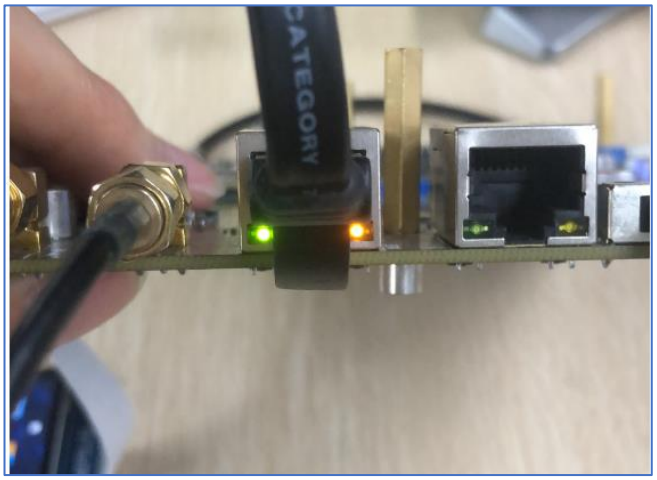
### 3.12 Gigabit Ethernet Test

The ATK-DLRK3588 development board baseboard is equipped with two Gigabit Ethernet interfaces, which can adapt to 10/100/1000M working modes. Each network port has two indicator lights, with the left one being light green and the right one being yellow:




Connect the network cable (preferably a gigabit one) to the gigabit Ethernet interface of the development board (either of the two network ports will do. Do not turn on the Wi-Fi or 4/5G modules yet). After the connection is successful, a "<•••>" icon will appear in the upper right corner of the Android system, as shown in the following picture:





At this moment, the wired network connection is normal, and the yellow indicator light of the network port will flash, while the light of the light green indicator remains constantly on (it will only light up when working in the 1000M rate mode, so this light can be used to determine whether the current mode is 1000M rate). By executing the "ifconfig" command in the serial port terminal, you can view the IP address of the Ethernet, as shown below:

```
console:/ #
console:/ # ifconfig
eth1      Link encap:Ethernet  HWaddr d2:33:20:75:0c:e7  Driver rk_gmac-dwmac
          inet addr:192.168.6.247  Bcast:192.168.6.255  Mask:255.255.255.0
          inet6 addr: fe80::762b:538f:4c2:6174/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:106898 errors:0 dropped:0 overruns:0 frame:0
          TX packets:60719 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:84223631 TX bytes:129411536
          Interrupt:53

eth0      Link encap:Ethernet  HWaddr d6:33:20:75:0c:e7  Driver rk_gmac-dwmac
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 TX bytes:0
          Interrupt:41
```

Figure 3.12-1 Check the Gigabit Ethernet IP address

We open the built-in browser "Lightning" of Android to test whether the development board can access the external network:



Figure 3.12-2 Browser Internet Speed Test

We can also configure the Ethernet. Open the "Settings" app, and then navigate through "Network and Internet"→"Ethernet".

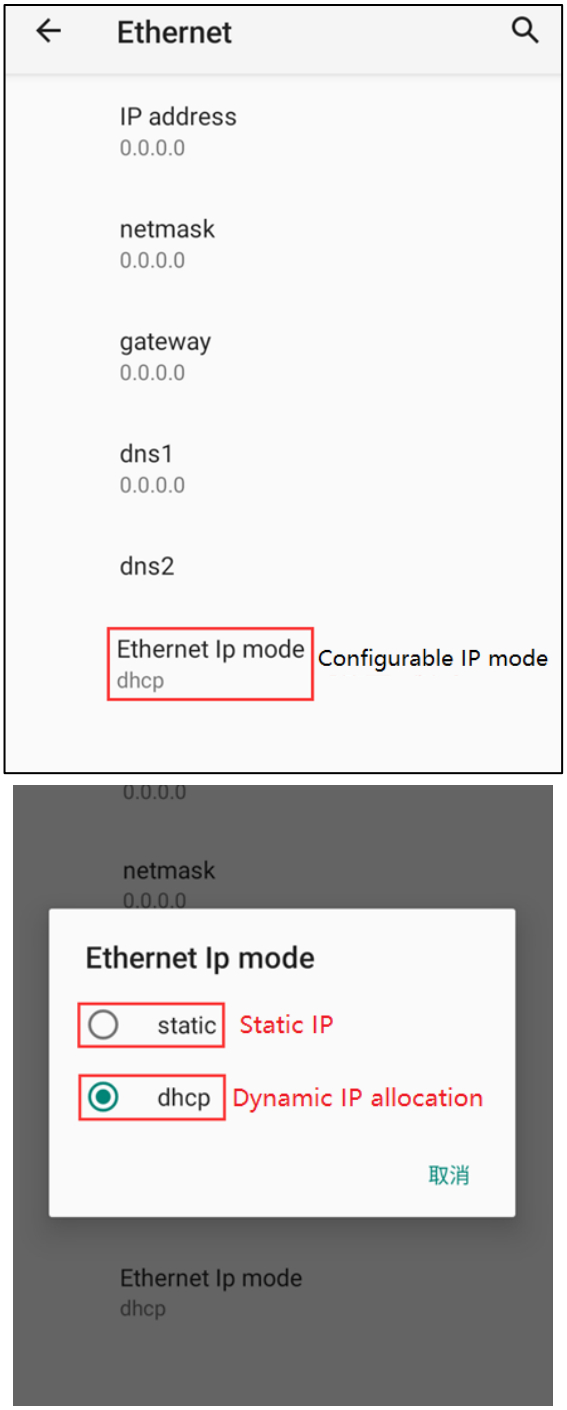



Figure 3.12-3 Configure IP mode

If you need to test the bandwidth of Gigabit Ethernet, you can use the iperf3 tool in the serial terminal (or adb) for testing (the specific testing method can be referred to in the ATK-DLRK3588_Linux System Quick Test Manual).

## 3.13 On-board USB WIFI Test

The baseboard of the ATK-DLRK3588 development board is equipped with a RTL8733BU WIFI&Bluetooth dual-module. It supports dual-band WiFi and WiFi 4 + Bluetooth 5.2. As shown in the following figure:

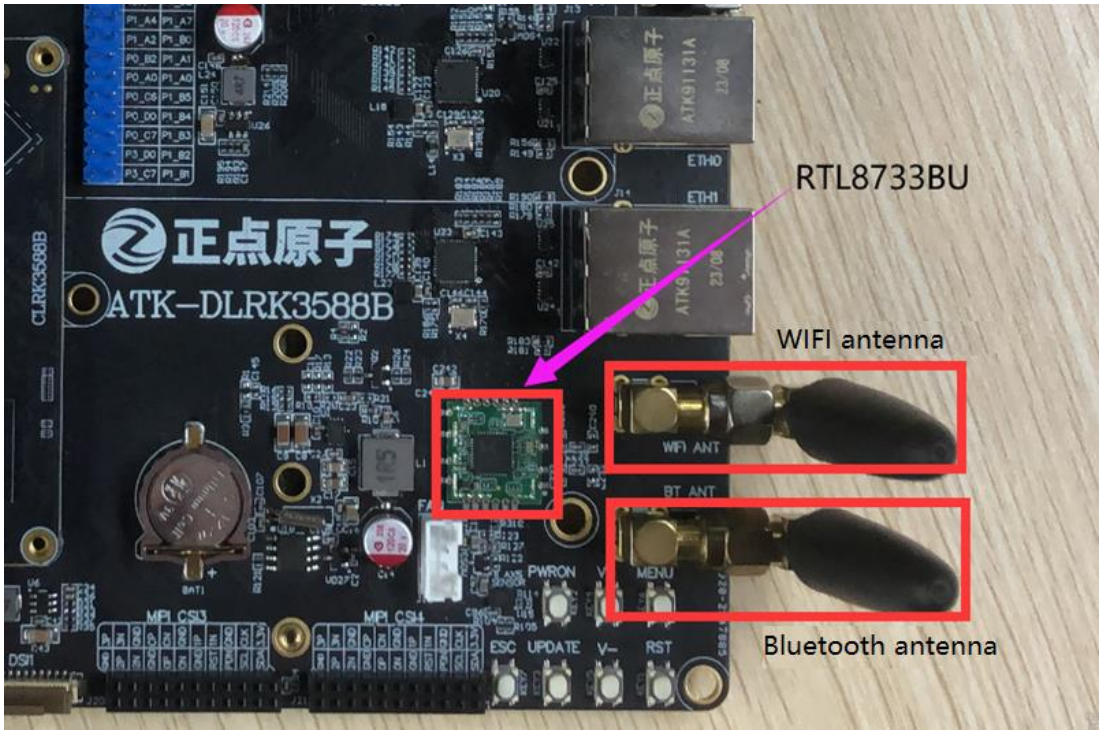



Figure 3.13-1 Installation of RTL8733BU module and antenna

Before using WiFi or Bluetooth (disconnect the network cable and break the wired network connection), you need to connect the corresponding antenna first (as shown in the picture above, the ATK-DLRK3588 development board packaging box comes with two antennas).

Open the "Settings" App of the Android system, find "Network and Internet" "Internet" "WLAN", and turn on WiFi:

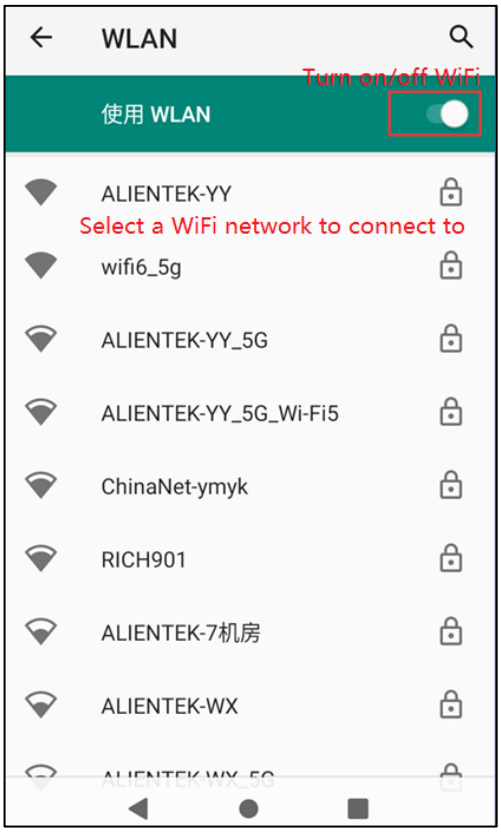



Figure 3.13-2 WiFi connection

Select a WiFi hotspot to connect. Once the WiFi connection is successful, you can open a browser to test if you can access the external network.

If you want to test the WiFi speed, you can download and install the "Antutu Benchmark" or "Speed Manager" App for testing. Here is a result of the test using the "Speed Manager" App (the router connected by the author is a WiFi6 router):


The test results are for reference only, as the actual test results can be affected by various factors:

- Try to use a WiFi6 router;
- Stay as close to the router as possible, within one meter is best;

- Disconnect other networked devices and programs;
- Conduct multiple tests to reduce the impact of network fluctuations (network environment) on the results.
- The influence of the test nodes

Next, we will conduct the WLAN hotspot test. First, open the "Settings" app, then find "Network and Internet"→"Hotspots and Network Sharing"→"WLAN Hotspot":

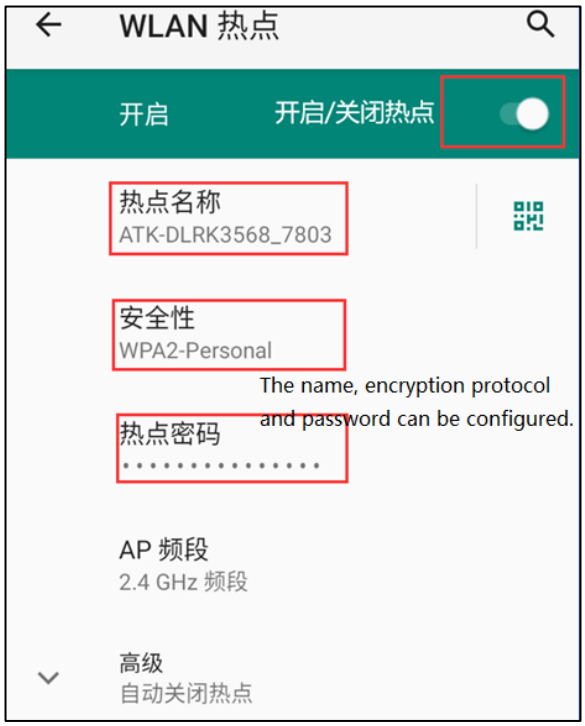
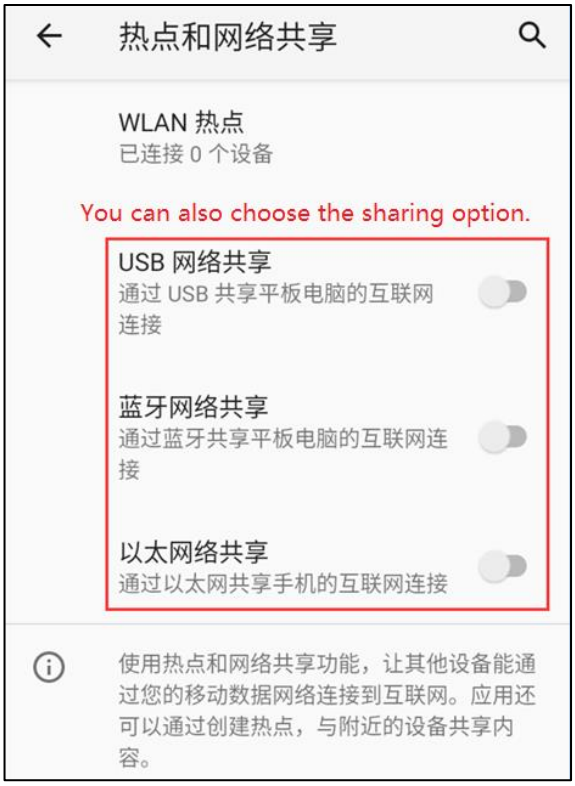



Figure 3.13-3 Hotspot configuration

You can also select the sharing method under "Network and Internet"→"Hotspots and Network Sharing", such as Ethernet network sharing, USB network sharing, and Bluetooth network sharing:




## 3.14 Onboard USB Bluetooth Test

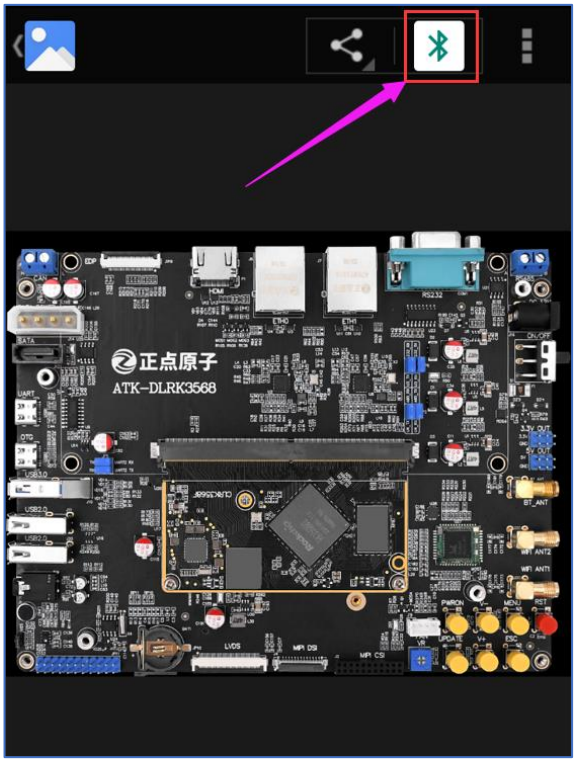
The Bluetooth function is hardware-supported by the RTL8733BU WiFi & Bluetooth dual-module onboard the ATK-DLRK3588 development board. Open the "Settings" app and find "Connected Devices" to perform the Bluetooth test:



Figure 3.14-1 Scan the surrounding Bluetooth devices

You can connect Bluetooth headphones, Bluetooth speakers, and so on.

Of course, we can also use Bluetooth to transfer files (including receiving files via Bluetooth, sending files via Bluetooth), open the "Gallery" app, select an image, and then click the Bluetooth button on the upper right corner to send it via Bluetooth to other devices:





Select a Bluetooth device that needs to receive this file. Once the transmission is successful, the system will prompt the user.

## 3.15 TF (SD) Card Test

There is a TF card slot on the base board of the ATK-DLRK3588 development board, which is used to insert a TF card. The TF card can be used as an external storage device for the Android system (eMMC is an internal storage device and cannot be moved).

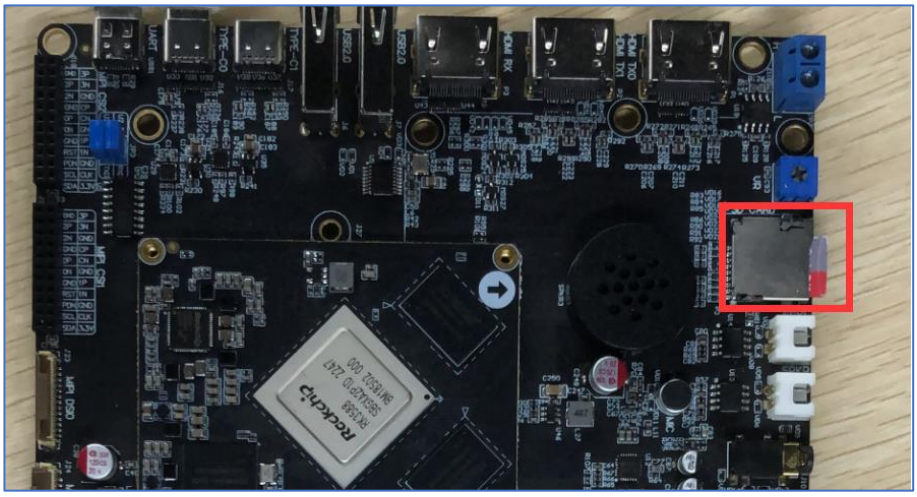
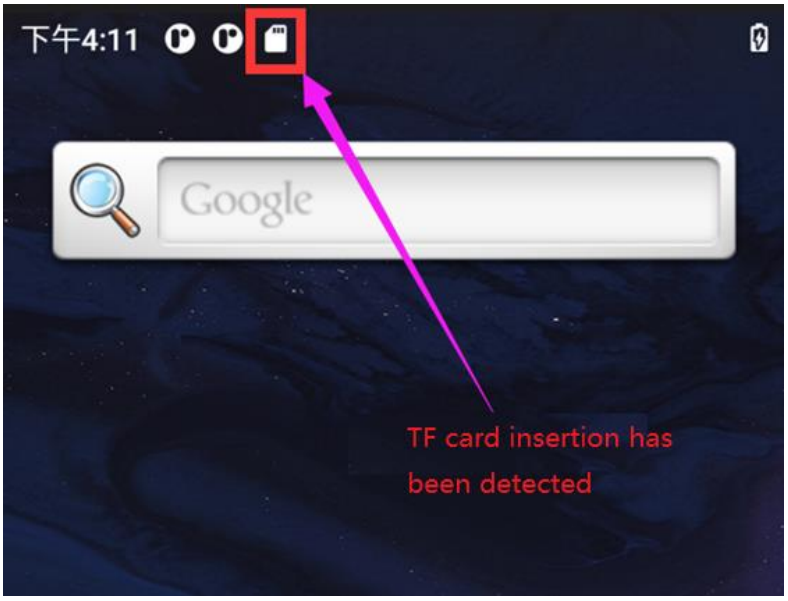


Figure 3.15-1 The TF card slot on the back of the base plate

Prepare a TF card and insert it into the TF card slot of the development board. After insertion, the Android system will recognize the insertion of the TF card:




Click on "SD card" to view the contents on the TF card, as shown in the following picture:

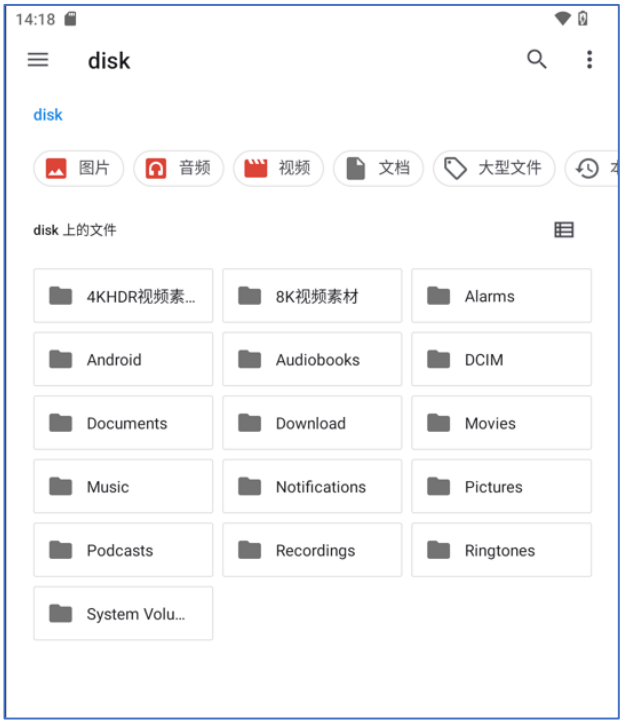



Figure 3.15-2 View the contents on the TF card

Open the "Settings" app, then find the "Storage" option. You can view the TF card device as shown in the following picture:


If you want to test the read and write speed of the TF card, you can do it through a command (such as the dd command) in the serial port terminal.

## 3.16 ADC Test

The ATK-DLRK3588 development board is equipped with a variable potentiometer, which is connected to ADC channel 2 of RK3588 (with 12-bit accuracy and a reference voltage of 1.8V), and can be used for ADC acquisition experiments:

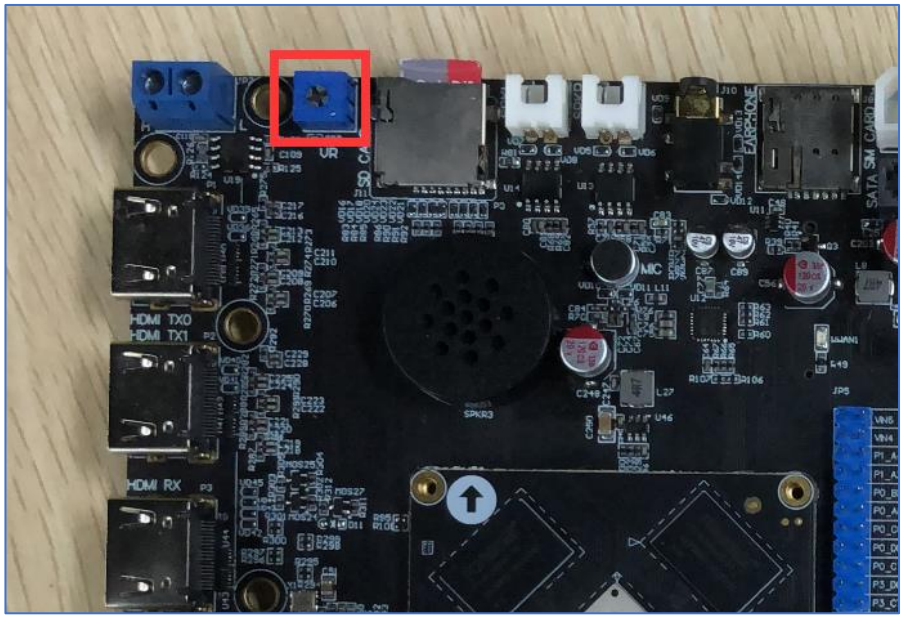


Figure 3.16-1 Adjustable potentiometer

To read the current ADC value using the serial port terminal, execute the following command: Execute the command to view the original data collected by the ADC:

```
cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw          # Read ADC channel 2
```

```
ATK_DLRK3588:/ $
ATK_DLRK3588:/ $ cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
2302
ATK_DLRK3588:/ $
```

Figure 3.16-2 Execute the command to read the ADC value.

The original data can be converted into voltage values through the following formula, and its calculation formula is as follows:

```
Vref / (2^n-1) = Vresult / raw
```

Note: Vref represents the reference voltage of 1.8V, n indicates the number of bits for AD conversion (12 bits), raw represents the original data collected by ADC, and Vresult represents the converted voltage value.

```
Vresult = (1800mv * 2302) /4095 = 1011.86mv
```

The voltage value collected this time can be calculated using the formula and is approximately 1.01186V.

The potentiometer can be adjusted to conduct multiple collection tests.

## 3.17 CPU temperature

Execute the "cat" command in the serial port terminal (or via adb) to view the current CPU temperature. The unit of the value is millikelvin:

```
cat /sys/class/thermal/thermal_zone0/temp    # Check the temperature of CPU1
cat /sys/class/thermal/thermal_zone1/temp    # Check the temperature of CPU2
cat /sys/class/thermal/thermal_zone*/temp    # Check the temperatures of all CPU cores
```

```
ATK_DLRK3588:/ #
ATK_DLRK3588:/ # cat /sys/class/thermal/thermal_zone*/temp
40692
40692
40692
40692
40692
40692
40692
2600
ATK_DLRK3588:/ #
```

40692 represents 40.692 degrees Celsius. RK3588 is an eight-core processor, so this will display the current temperatures of the eight CPU cores.

## 3.18 CPU Frequency

To view the current running frequency of the CPU, execute the following command in the serial port terminal (or adb):

```
cat /sys/devices/system/cpu/cpu*/cpufreq/cpuinfo_cur_freq
```

```
ATK_DLRK3588:/ #
ATK_DLRK3588:/ # cat /sys/devices/system/cpu/cpu*/cpufreq/cpuinfo_cur_freq
408000
1200000
1200000
1200000
1416000
1416000
408000
408000
ATK_DLRK3588:/ #
```

Figure 3.18-1 Check the current running frequency of the CPU

The RK3588 is an eight-core processor, so here it will display the current running frequencies of the eight CPU cores.

## 3.19 PCIE WiFi&BT Test

On the bottom plate (back side) of the ATK-DLRK3588 development board, there is a PCIE WiFi interface (M.2 E-Key) that can be used to connect a PCIE WiFi module, supporting Bluetooth (Bluetooth via USB, WiFi via PCIE). Currently, the ATK-DLRK3588 Android system (including Android 12 and Android 13) has been adapted to support multiple PCIE WiFi modules, as shown in the table below:

| PCIE WiFi module | Characteristics | Manufacturer | Compatibility status |
|---|---|---|---|
| **RTL8852BE** | 2.4G/5G dual-band WiFi6, built-in Bluetooth 5.2 | Realtek | Both WiFi and BT are compatible. |
| **RTL8822BE** | 2.4G/5G dual-band WiFi, built-in Bluetooth 4.2 | | |
| **RTL8822CE** | 2.4G/5G dual-band WiFi, built-in Bluetooth 5.0 | | |
| **RTL8723BE** | 2.4G single-band WiFi, built-in Bluetooth 4.0 | | |
| **AX200NGW** | 2.4G/5G dual-band WiFi6, built-in Bluetooth 5.2 | Intel | Only compatible with WiFi |
| **AX210NGW** | 2.4G/5G/6G tri-band WiFi6E, built-in Bluetooth 5.3 | | |
| **9260NGW** | 2.4G/5G dual-band WiFi, built-in Bluetooth 5.0 | | |
| **8265NGW** | 2.4G/5G dual-band WiFi, built-in Bluetooth 4.2 | | |
| **3165NGW** | 2.4G/5G dual-band WiFi, built-in Bluetooth 4.2 | | |

The above are the currently supported PCIE WiFi modules for the Android system. You can purchase the PCIE WiFi modules online (the module models that have been supported in the table above). If the USB WiFi module built into the development board already meets your requirements, there is no need to spend money on it.

It should be noted that: If you want to use the PCIE WiFi module on the development board, a simple modification of the kernel device tree is required. The Android image we provide does not support this by default. The modification method is as follows (users need to first set up the development environment and install the SDK): In the root directory of the SDK, open the file kernel-5.10/arch/arm64/boot/dts/rockchip/rk3588-atk-evb7-lp4-v10.dts, remove the // in front of the following line, and then save and exit.

// #define ATK_DISABLE_USB_WIFI_BT

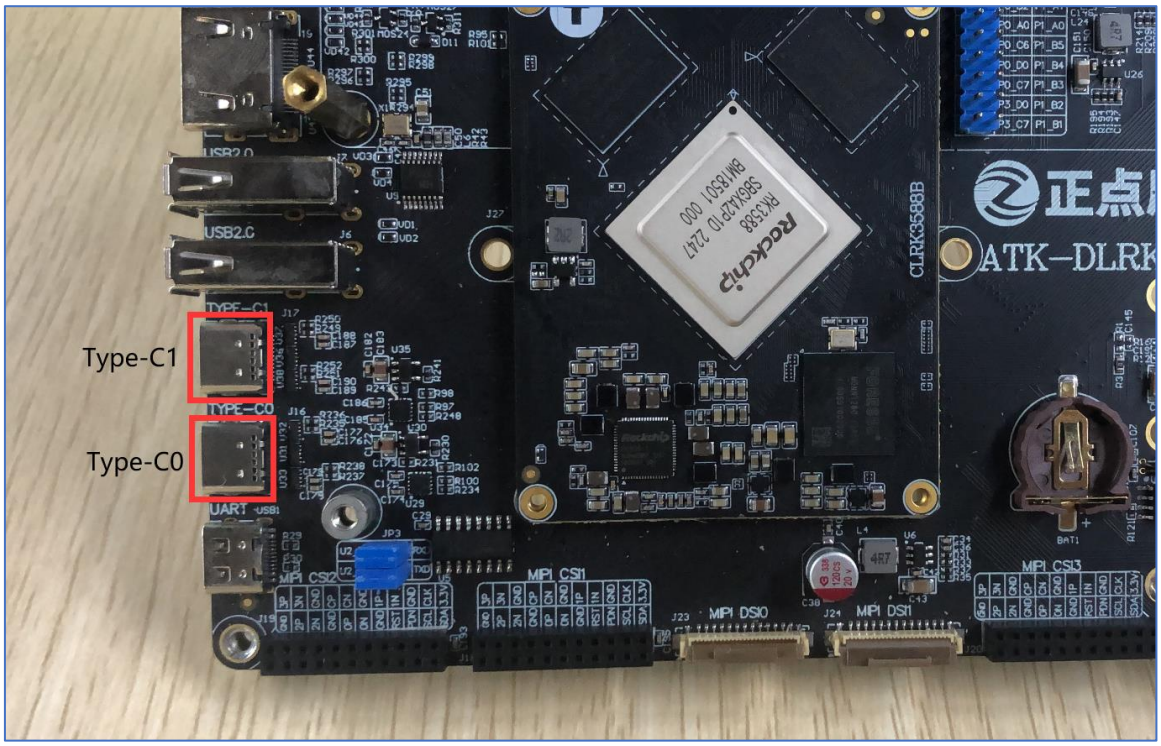
```
/dts-v1/;

#include "rk3588-atk-evb7-lp4.dtsi"
#include "rk3588-atk-cameras.dtsi"
#include "rk3588-atk-screen_choose.dtsi"
#include "rk3588-atk-lcds.dtsi"
#include "rk3588-android.dtsi"

#define ATK_DISABLE_USB_WIFI_BT   Remove the previous comments and define this macro

/ {
        model = "Rockchip RK3588 EVB7 LP4 V10 Board";
        compatible = "rockchip,rk3588-evb7-lp4-v10", "rockchip,rk3588";
};

#if defined(ATK_DISABLE_USB_WIFI_BT)
&usb_host0_ehci {
        status = "disabled";
};

&usb_host0_ohci {
```

After modifying according to the above requirements, recompile the SDK and then burn the generated image onto the development board.

Finally, one more point needs to be clarified. If you purchase a PCIE WiFi module online (the model listed in the table has been compatible and supported), and modify the kernel device tree according to the above requirements, and recompile and burn the image onto the development board, but find that the WiFi function cannot be used in the Android system, this situation does exist. The reason lies in the pid and vid of the module. We will not go into the details of the specific situation. We will provide a document to teach you how to adapt the PCIE WiFi module. The document path is: Development Board CD-ROM A Drive - Basic Materials -> 10_user_manual -> 03, Auxiliary Documents -> 28 [ALIENTEK] ATK-DLRK3588_PCIe_WiFi Module Usage Manual V1.0.pdf.

## 3.20 Full Function Type-C Interface Test

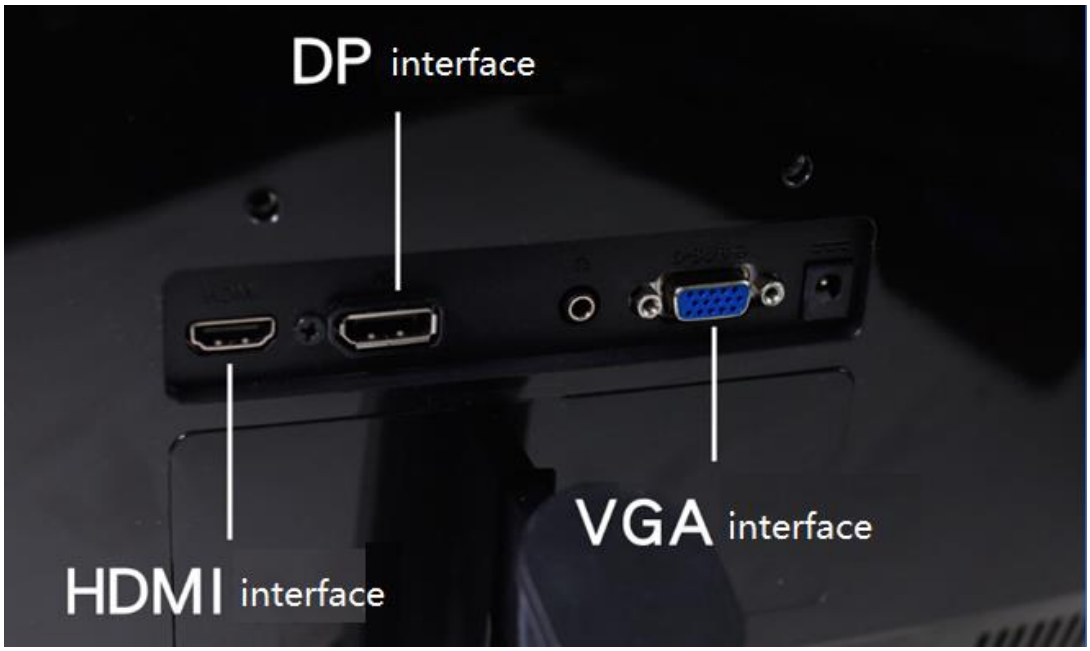
The bottom board of the ALENTEK ATK-DLRK3588 development board has two full-function Type-C interfaces, both supporting USB 3.0 and DP display (DisplayPort), as shown in the following figure:




Type-C0 serves not only as a mirroring burn-in port but also as an Android system adb port (for adb connection), and it can also be used as a display interface to connect a DP monitor. Both of the former two functions are implemented as USB interface capabilities, while the latter one is for video output display functionality.

### 3.20.1 DP Display Test

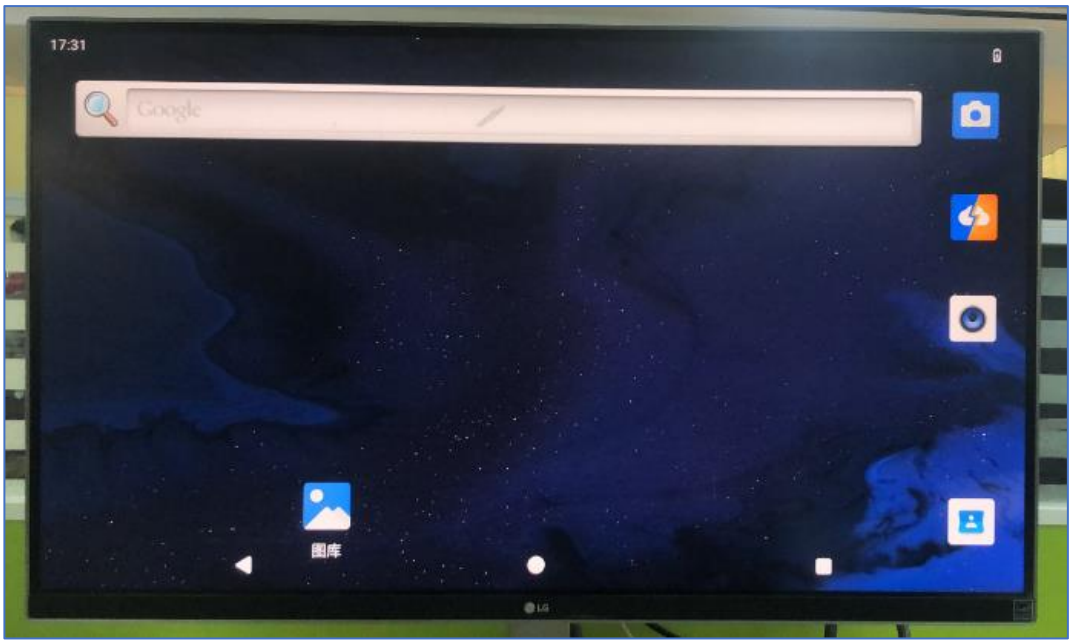
First, you need to prepare one or two monitors that support the DP interface, as shown in the following figure:



In addition, you will need to prepare one or two type-C to DP cables (bring your own, available for purchase online, DP 1.4). As shown in the following picture:


Use the type-C to DP cable, with one end connected to the development board and the other end connected to the DP display. If a MIPI screen is connected, remove the MIPI screen before starting the development board; otherwise, the DP display will not display (only for the Android image provided by ALIENTEK).

After the Android system is started, the screen will display.




After entering the Android system, open the "Settings" app, find "Display"→"HDMI"→ "Resolution Settings" (DisplayPort), and you can set the resolution of the DP display (in this test, the author used a DP display that supports 4K resolution), as shown below:

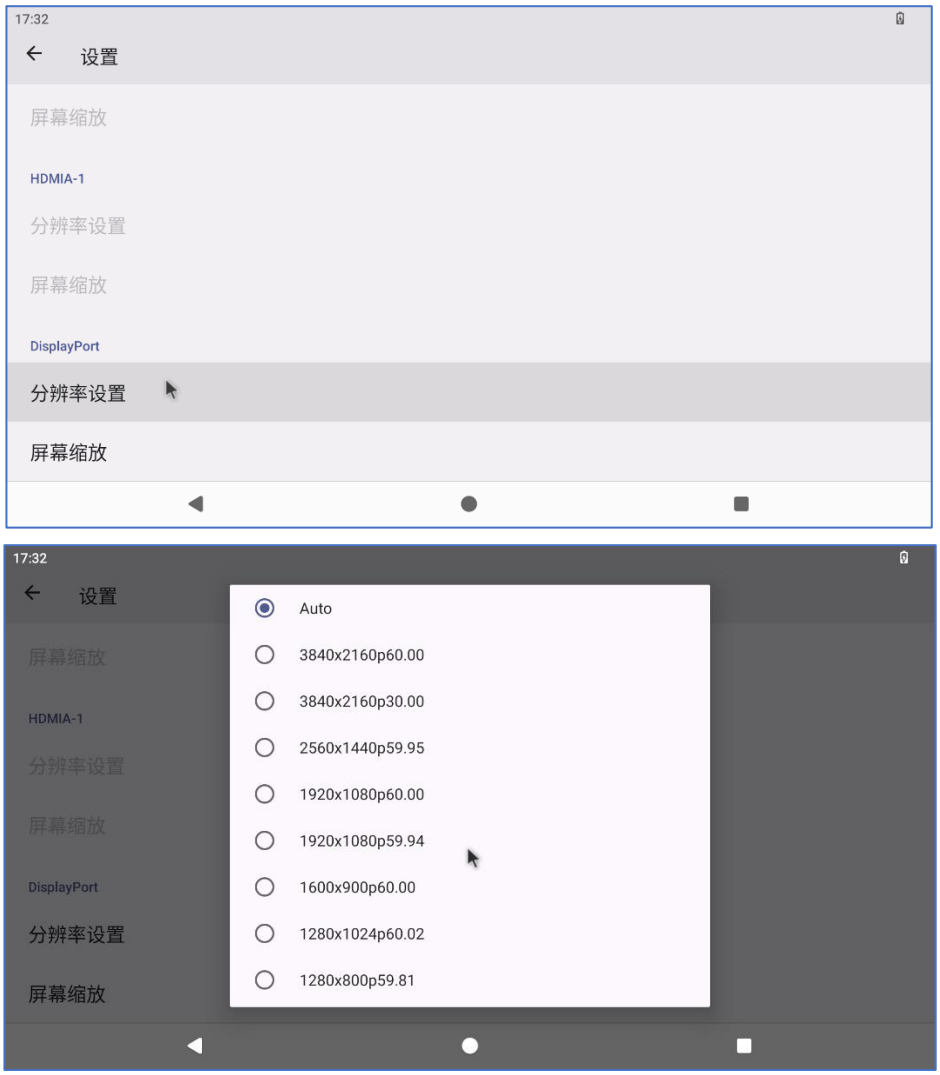


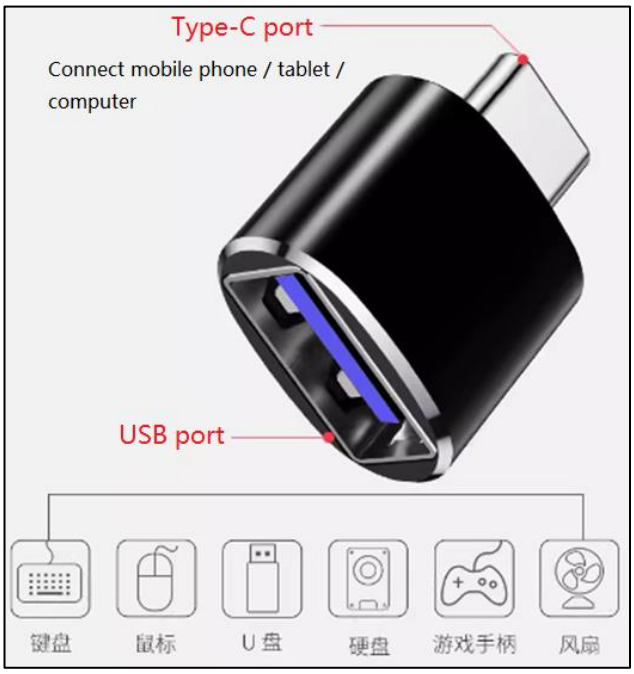

Figure 3.20-1 Set the resolution of the DP display

Both of the two full-function Type-c interfaces of ATK-DLRK3588 support audio. Users can test it themselves. It is necessary for the DP display to support the audio function.

### 3.20.2 USB 3.0 test

Both of the two full-function Type-c interfaces support high-speed data transmission of USB 3.0 and OTG. It can automatically switch between host/device modes. This section mainly tests the USB 3.0 HOST function. Find a USB drive that supports Type-c interface, such as the one shown in the following picture, which supports both USB interface and Type-c interface (USB interface on the left, Type-c interface on the right):


Or you can use a Type-c to USB adapter for connection:




Insert the USB drive into the Type-C0 or Type-C1 port of the development board. The Android system will recognize the insertion of the USB drive, and then you can view the files in the USB drive. No further explanation is needed here!

You can also use a Type-C to USB adapter to connect USB peripherals such as a USB mouse and keyboard to the Type-C0 or Type-C1 port of the development board for testing. Users are advised to conduct the test themselves!

## 3.21 Serial port test

The ALIENTEK ATK-DLRK3588 development board is equipped with 3 serial ports, including the debugging serial port, RS232 and RS485, as shown in the following figure:

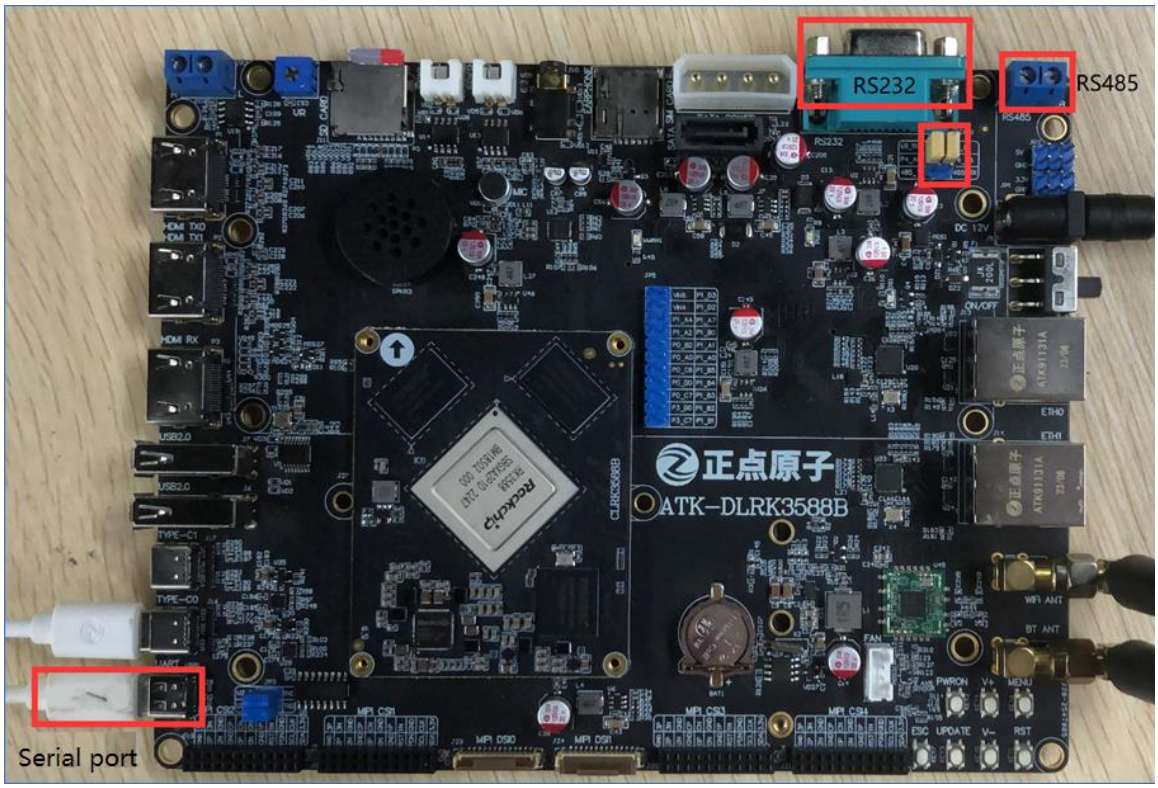
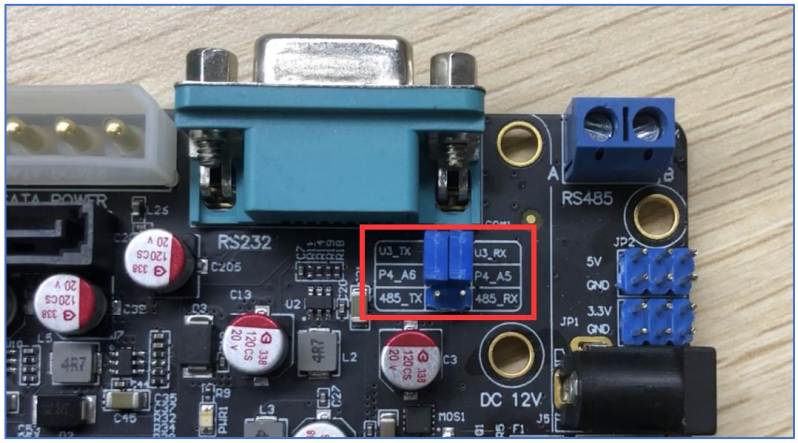
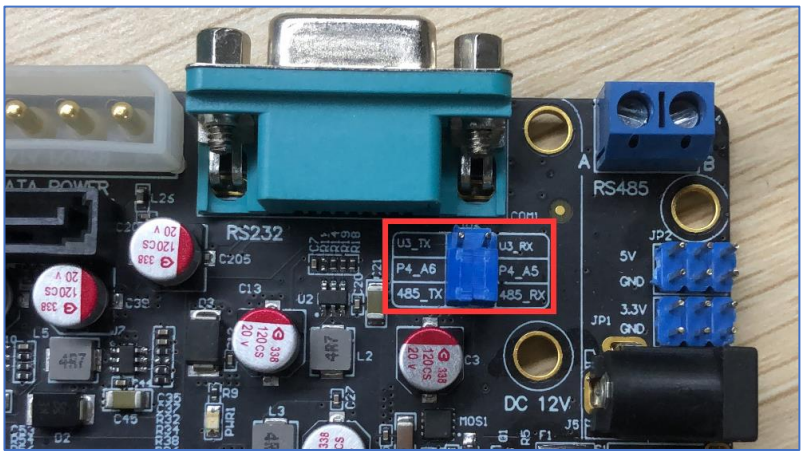



Figure 3.21-1 The serial port distribution diagram on the development board.

Notes: RS232 and RS485 are not two separate serial ports and cannot be used simultaneously; when using the RS232 interface, connect U3_TX to P4_A6 pin and U3_RX to P4_A5 pin, as shown in the following figure:




When using the RS485 interface, connect the 485_TX pin to the P4_A6 pin and the 485_RX pin to the P4_A5 pin, as shown in the following diagram.




### 3.21.1 Debugging serial port test

The serial port terminal connection is the debugging serial port of the development board, and it is connected via a USB cable. The default baud rate of the debugging serial port is 1500000 (1.5M). Through the serial port terminal, commands can be input and executed, and print information can be displayed to indicate that the debugging serial port function is normal.

### 3.21.2 RS232 serial port test

The development board is equipped with an RS232 serial port, which is connected to external devices through a standard DB9 interface (female head). First, prepare a USB-to-RS232 serial port cable (the USB-to-RS232 serial port cable is not an accessory for the ATK-DLRK3588 development board, please users to purchase it by themselves):

Figure 3.21-2 USB to RS232 Serial Cable

Use the USB to RS232 serial cable to connect the RS232 interface of the development board to the USB port of the computer. Then, execute the following commands in the Android system serial terminal to set the baud rate of the RS232 serial port to 115200 (switch to root mode first):

```
stty -F /dev/ttyS3 115200
```

```
console:/ #
console:/ # stty -F /dev/ttyS3 115200
[ 7650.436340] of_dma_request_slave_channel: dma-names property of node '/serial@fe670000' missing or empty
[ 7650.436449] ttyS3 - failed to request DMA, use interrupt mode
console:/ #
```

Using the upper-level machine software Mobaxterm, create a Serial port session. Select the corresponding COM port for the RS232 serial port and set the baud rate to 115200. As shown in the figure below, the left side is the session corresponding to the debugging serial port (the serial port terminal used to execute commands), and the right side is the newly created RS232 serial port session:


Next, data transmission and reception tests were conducted between the development board and the computer host via the RS232 serial port.

Test ①: Computer host → Development board (the computer sends data and the development board receives data), execute the following commands in the serial port terminal:

```
cat /dev/ttyS3
```

After executing the above command, then enter the string to be sent in the corresponding session of the RS232 serial port, press the Enter key to send it. At this time, the cat command of the serial port terminal will read the corresponding data, as shown below:

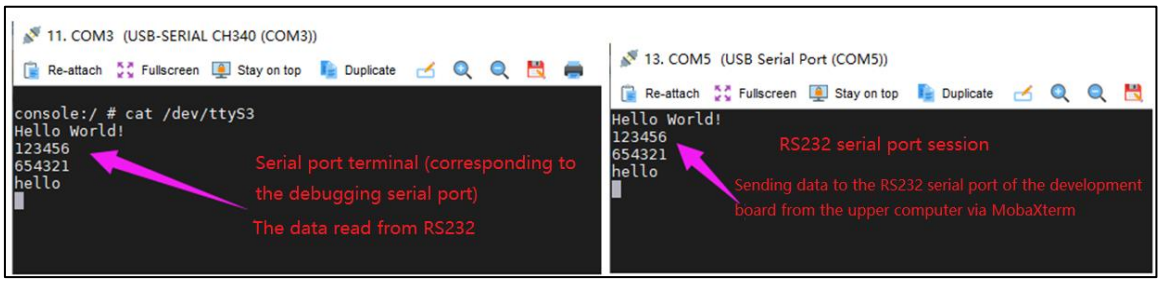



Figure 3.21-3 RS232 serial port data reception test (computer→development board)

Test 2: Development board→Computer host (the development board sends data, the computer end receives data). First, terminate the cat command in the serial port terminal, then execute the echo command in the serial port terminal to write data to the RS232 serial port (that is, to send data to the computer end):

```
echo "123456" > /dev/ttyS3
echo "Hello World!" > /dev/ttyS3
```

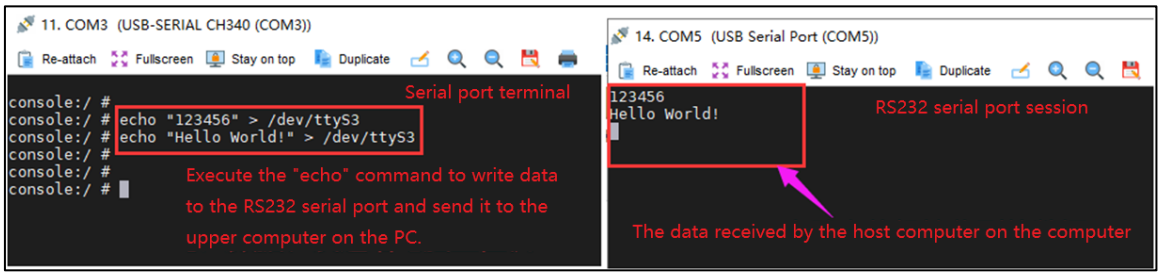



Figure 3.21-4 RS232 Serial Port Data Transmission Test (Development Board→Computer)

If both of the above two test items are without any problems, it indicates that the RS232 serial port function is normal.

### 3.21.3 RS485 Serial Port Test

The testing method for RS485 is the same as that for RS232. It will not be repeated here!

It should be noted that a USB to RS485 module needs to be prepared for testing the RS485 interface. This module is available for purchase in the ALIENTEK store. Of course, other tools for testing 485 can also be used for the test.

The USB serial port converter three-in-one (supporting 485 testing) sold by ALIENTEK Store is shown in the following picture. During the testing, use the DuPont cable for connection. Connect A to A, B to B to the RS485 interface of the development board. Just follow the steps in the previous section for the test.


Figure 3.21-5 USB serial converter, three-in-one

## 3.22 CAN test

ATK-DLRK3588 supports the can-utils tool in the Android system. Using the can-utils toolkit, the CAN interface on the development board can be tested. The specific testing method can be referred to in the document: Development Board CD-ROM A Disk - Basic Materials -> 10_user_manual -> 01, Test Documents -> 01 [ALIENTEK] ATK-DLRK3588_Buildroot System Quick Test Manual.pdf. Refer to the can test section in this document.

Note: Before executing commands in the Android terminal, you can execute "su root" to obtain root privileges before conducting the test.

## 3.23 SATA hard disk test

The ATK-DLRK3588 development board has a SATA hard disk interface that can be used to connect SATA hard disks, as shown in the following figure:

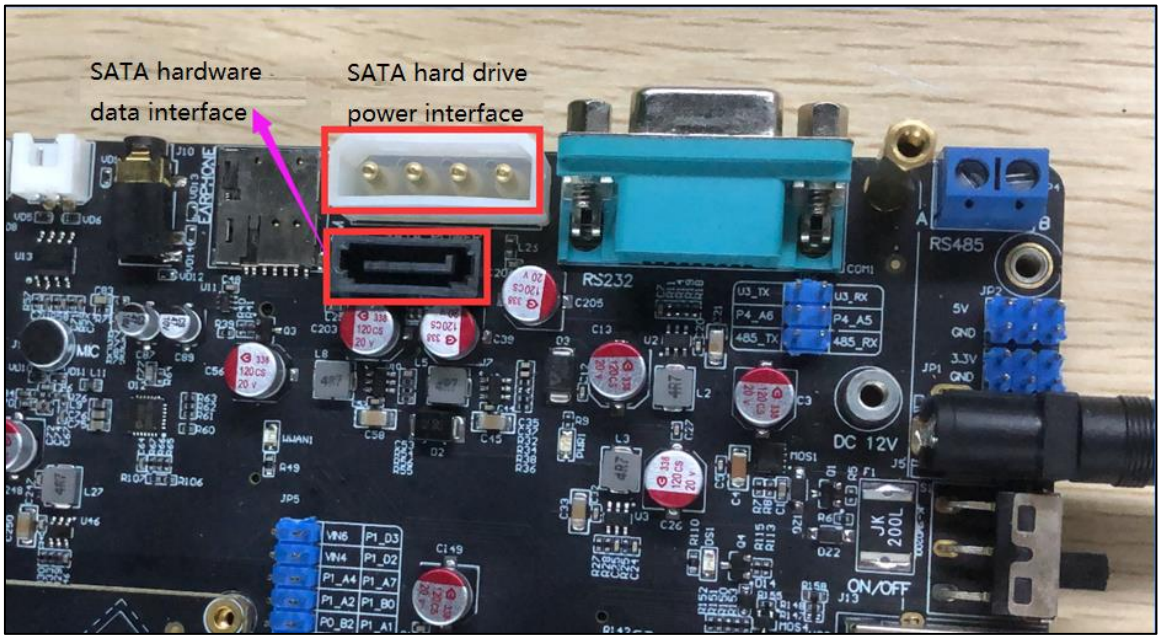


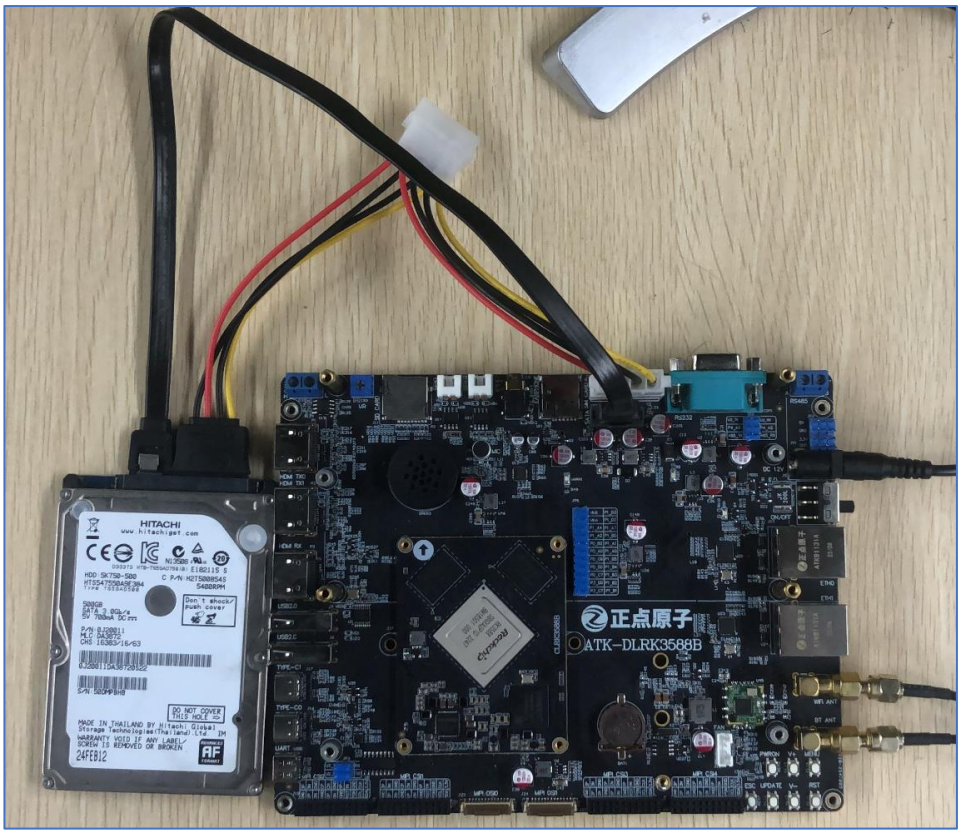

Figure 3.23-1 SATA hard disk interface

First of all, a SATA hard drive needs to be prepared, along with the necessary data cable and power cord.

Figure 3.23-2 SATA data cable

Figure 3.23-3 SATA power cable

First, turn off the power supply of the development board, then connect the SATA hard drive as shown below:




For this test, the author used a SATA hard drive with a storage capacity of 500GB. After the hard drive was properly connected, the development board was powered on and entered the Android system. On the Android system interface, a icon would appear:


Click on "USB Drive" (marked as USB Drive, but it is actually not connected to a USB drive, but a SATA hard drive), and you can view the contents of the SATA hard drive.

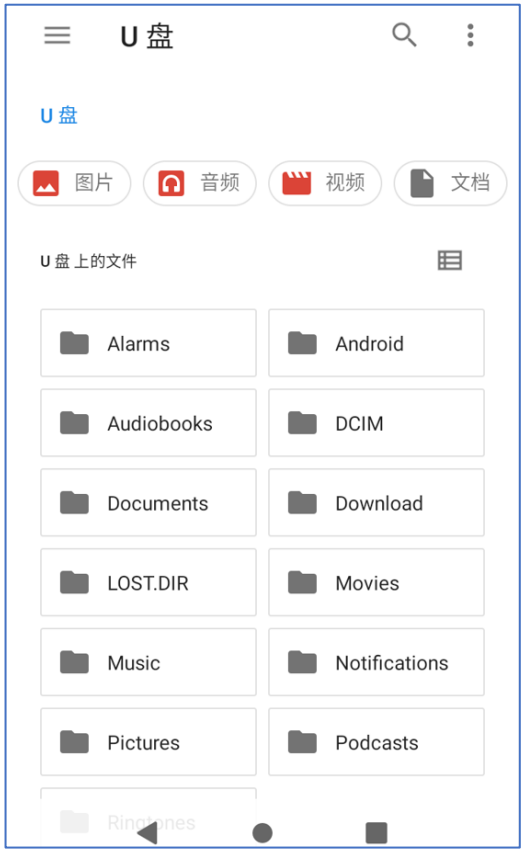



Figure 3.23-4 View the contents of the SATA hard drive

Open the "Settings" app, find the "Storage" item, and you can view the capacity of the SATA hard drive:


If you need to test the read and write speeds of a SATA hard drive, you can download and install the "Antutu Benchmark" App for testing, or directly use commands (such as the dd command) in the serial port terminal for testing.

## 3.24 M.2 Hard Disk Test

On the bottom plate (back side) of the ATK-DLRK3588 development board, there is a PCIE3.0x4 M.2 hard disk interface (M.2 B_Key interface type), which can be connected to common 2280 M.2 hard disks, as shown in the following figure:

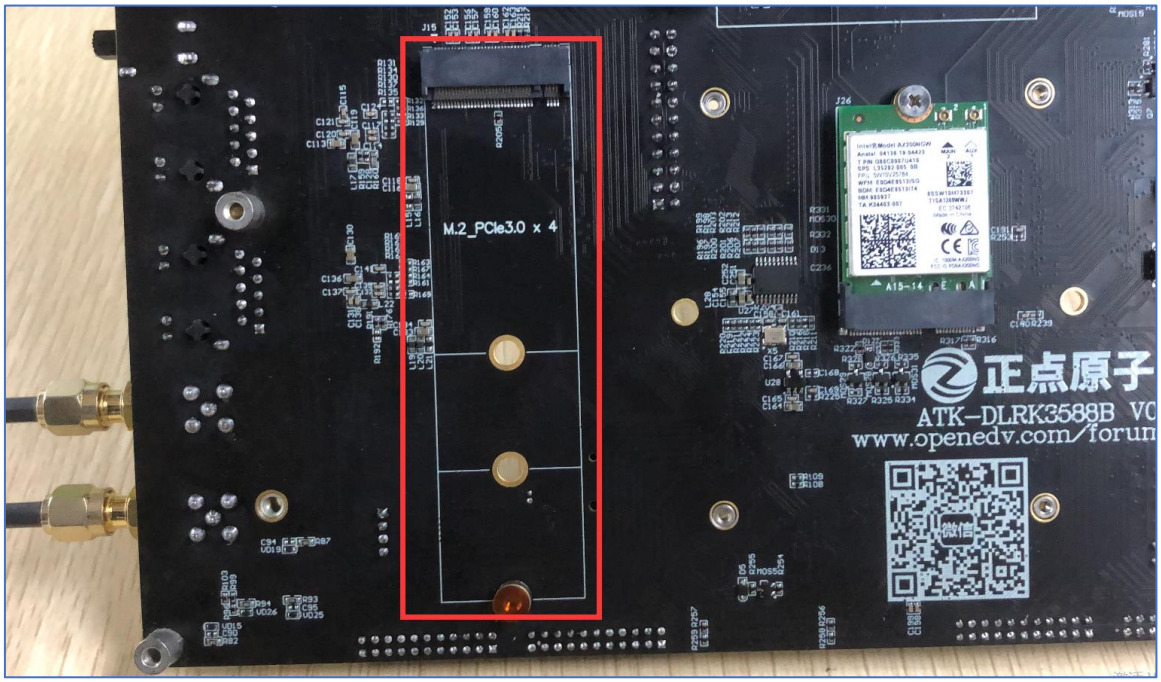



Figure 3.24-1 PCIe M.2 hard disk interface

PCIe is a high-speed serial bus used to connect internal components of a computer, such as graphics cards, network cards, storage devices, etc.

Before the test, prepare an M.2 solid-state hard disk, disconnect the power supply of the development board, insert the M.2 solid-state hard disk into the M.2 slot on the back of the development board's base plate, and fix it with screws (the screws used here belong to the development board accessories, and the development board accessory package provides them). In this test, the author used an M.2 hard disk with a storage capacity of 256GB:


Figure 3.24-2 The M.2 hard drive used for testing

Next, power on the development board and enter the Android system. After that, an icon will appear at the top of the Android system interface:


Click on "0x1987 USB Drive" (marked as a USB drive, but in fact it is not connected to a USB drive, but a M.2 hard drive), and you can view the contents of the M.2 hard drive:

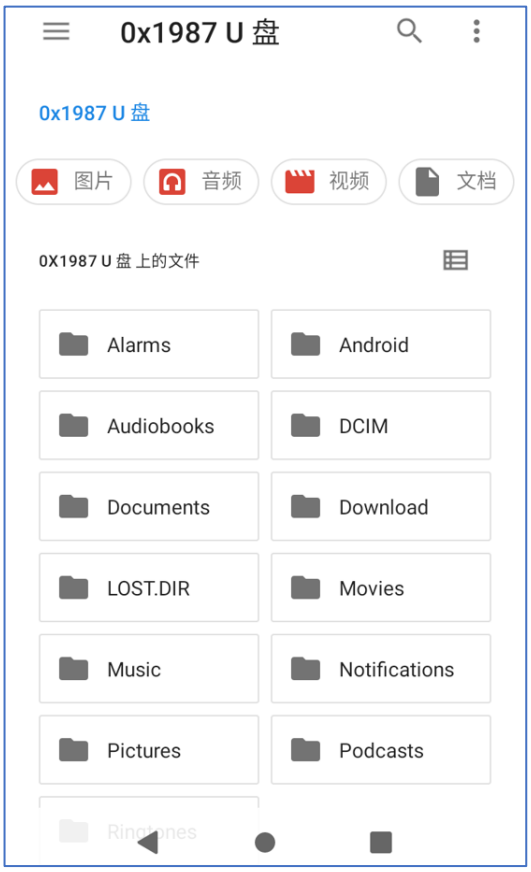



Figure 3.24-3 View the contents of the M.2 hard drive

Open the "Settings" app, find the "Storage" option, and you can view the capacity of the hard drive:


If you need to test the read and write speed of the M.2 hard drive, you can directly use commands (such as the dd command) in the serial port terminal for the test.

## 3.25 HDMI TX Test

If the user has connected a MIPI screen, the MIPI screen must be removed; otherwise, the HDMI will not display (only for the Android image provided by us).

The bottom board of the ATK-DLRK3588 development board has two HDMI output interfaces (namely HDMI_TX0 and HDMI_TX1), which can be used to connect HDMI monitors, as shown in the following figure:

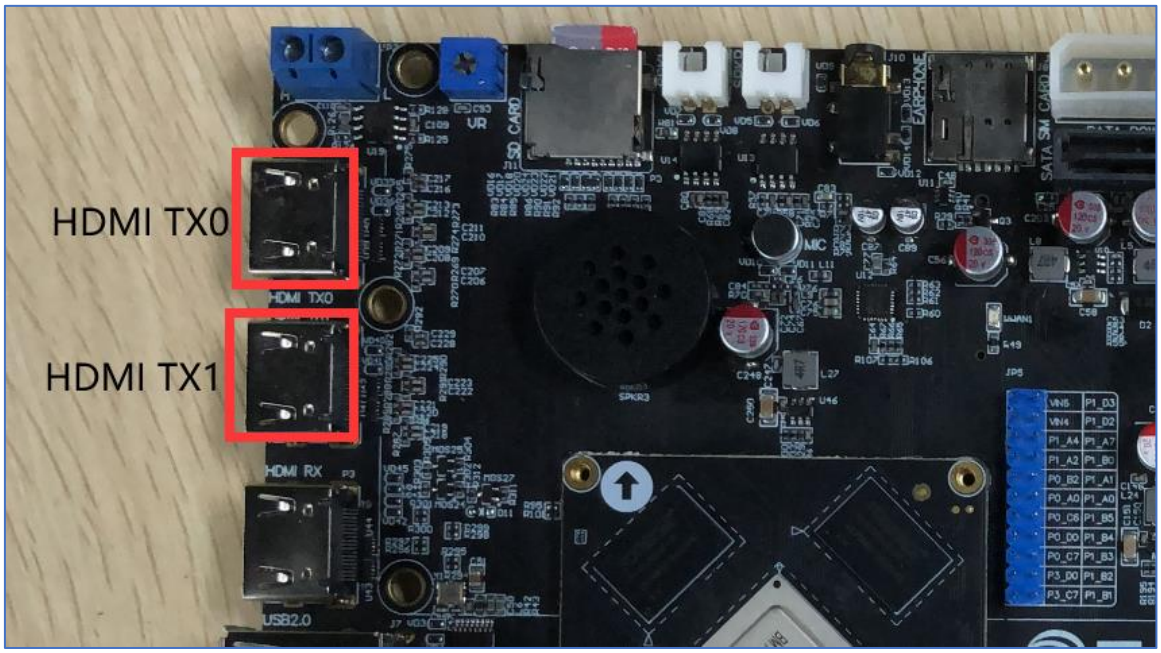
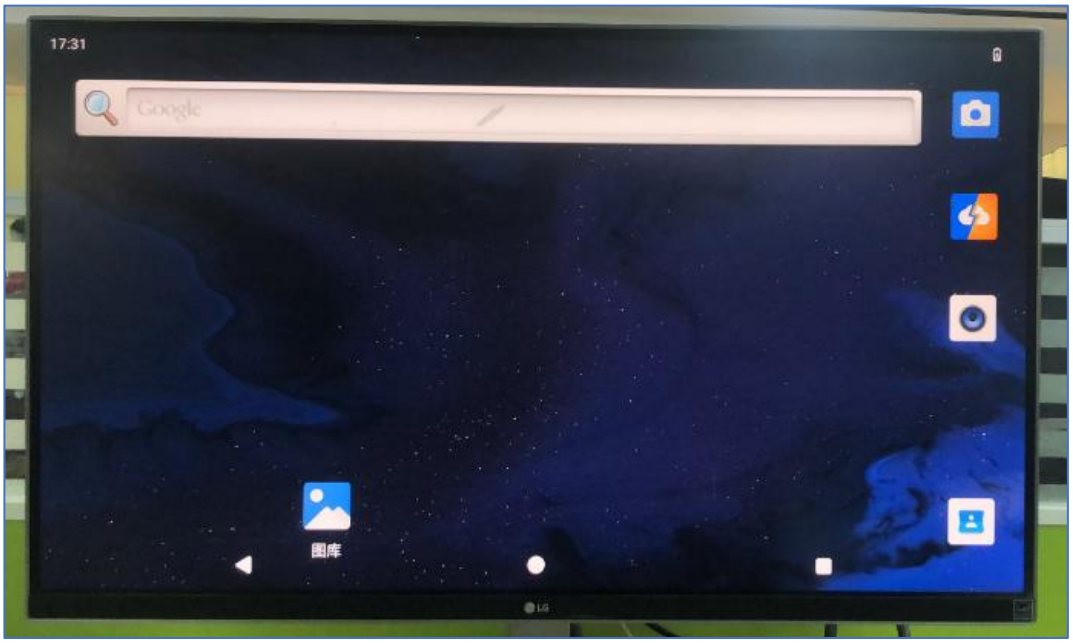


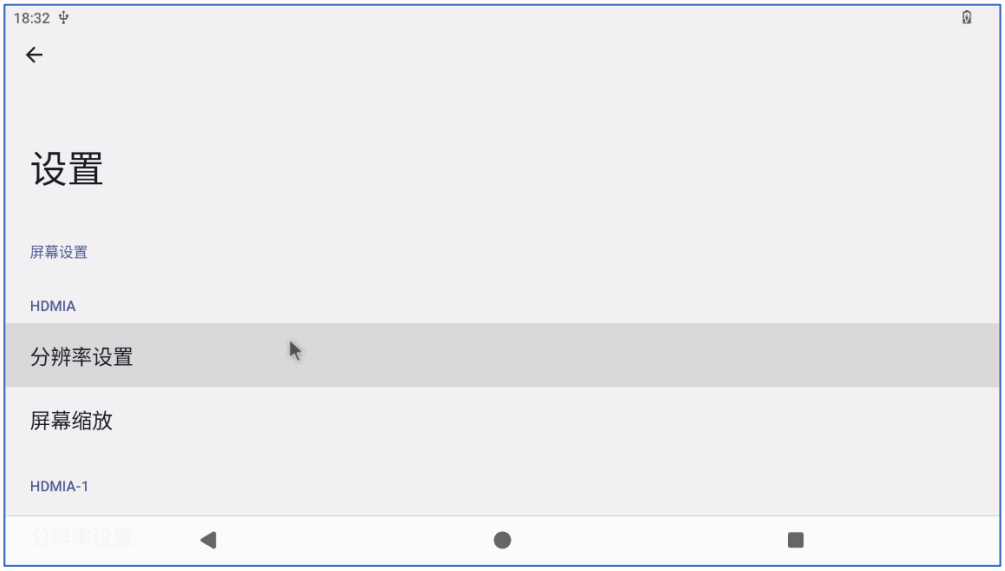

Figure 3.25-1 HDMI output interface

Before the test, prepare one or two monitors with HDMI interfaces and one or two HDMI cables. Connect one end of the HDMI cable to the development board and the other end to the monitor. If a MIPI screen is connected, remove the MIPI screen first, then start the development board. Otherwise, the HDMI monitor will not display (only for the Android image provided by ALIENTEK).

During the Android system startup process, a startup logo and Android startup animation will be displayed.




After entering the Android system, open the "Settings" app, find "Display"→"HDMI"→ "Resolution Settings" (HDMIA), and you can set the resolution of the HDMI display (in this test, the author used an HDMI display that supports 4K resolution), as shown below:



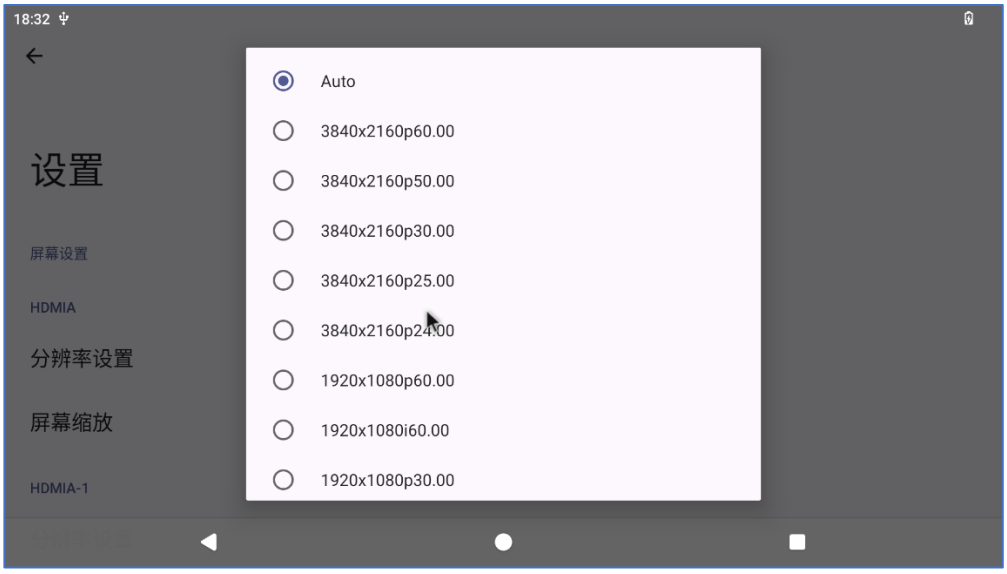
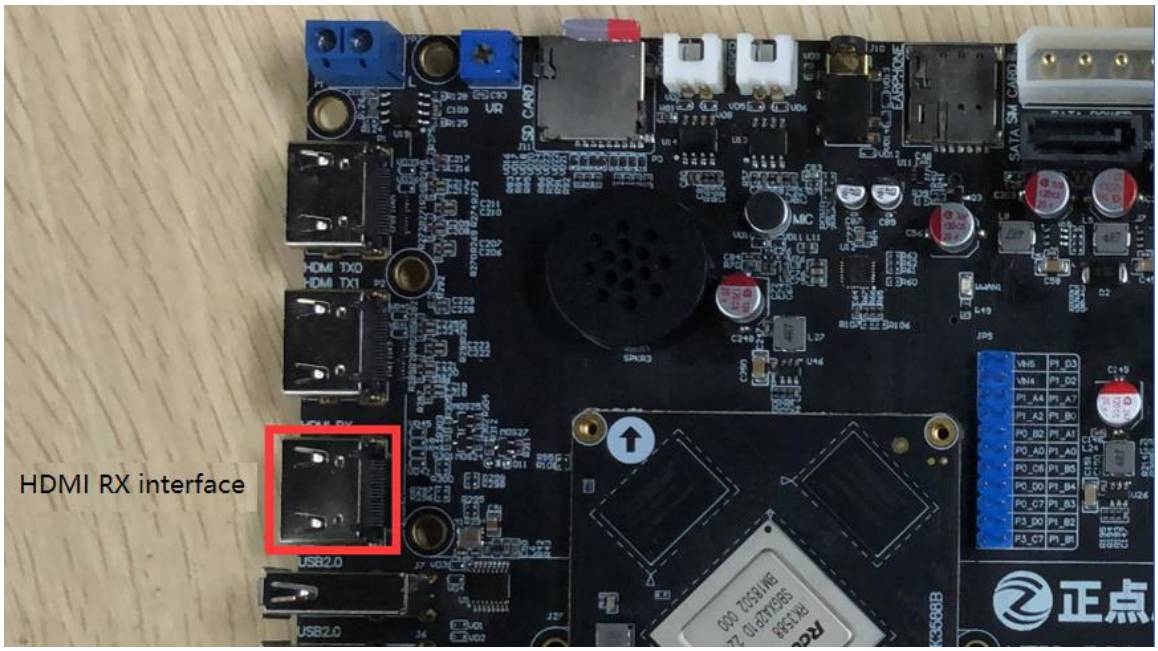



Figure 3.25-2 Set the resolution of the HDMI display

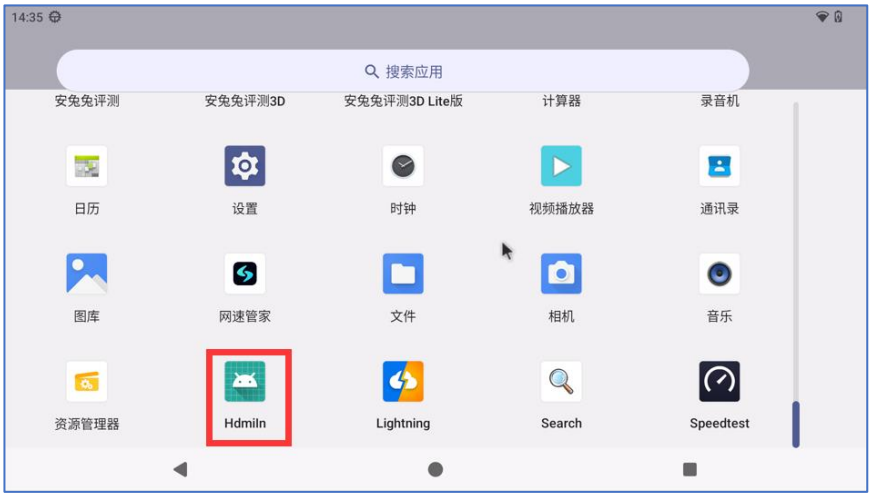
Both the two HDMI TX interfaces of ATK-DLRK3588 support audio. Users can test it themselves. An HDMI display that supports audio function is required.

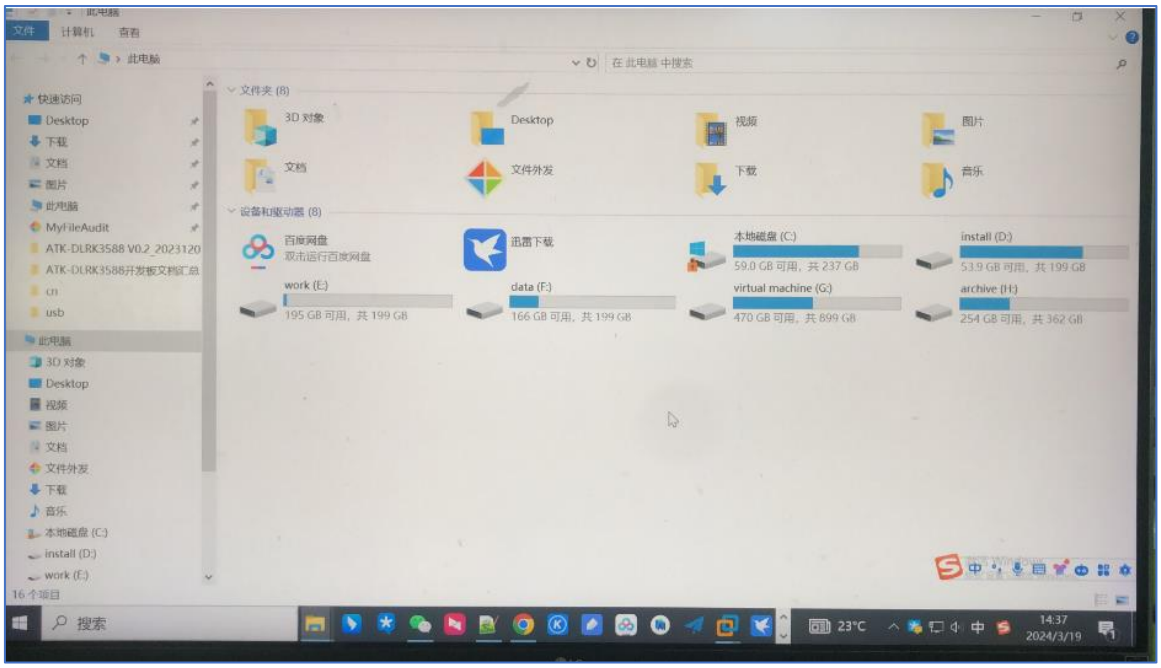
## 3.26 HDMI RX test

There is an HDMI RX interface on the base board of the ALIENTEK ATK-DLRK3588 development board, which is used to connect HDMI video output devices, such as connecting to the computer host or connecting to the HDMI output interface of another development board. As shown in the following figure:




First, connect one end of the HDMI cable to the HDMI RX port of the development board, and the other end to the HDMI port of the computer host (or connect it to another development board's HDMI TX port). In the Android system, click on the "HdmiIn" application, and you will be able to see:



## 3.27 4G/5G Module Testing

On the bottom plate (back side) of the ATK-DLRK3588 development board, there is a 4G/5G module interface with an M_Key slot (back side of the bottom plate), which can be used to connect 4G or 5G modules, and it also provides a Nano SIM card slot. As shown in the following figure:

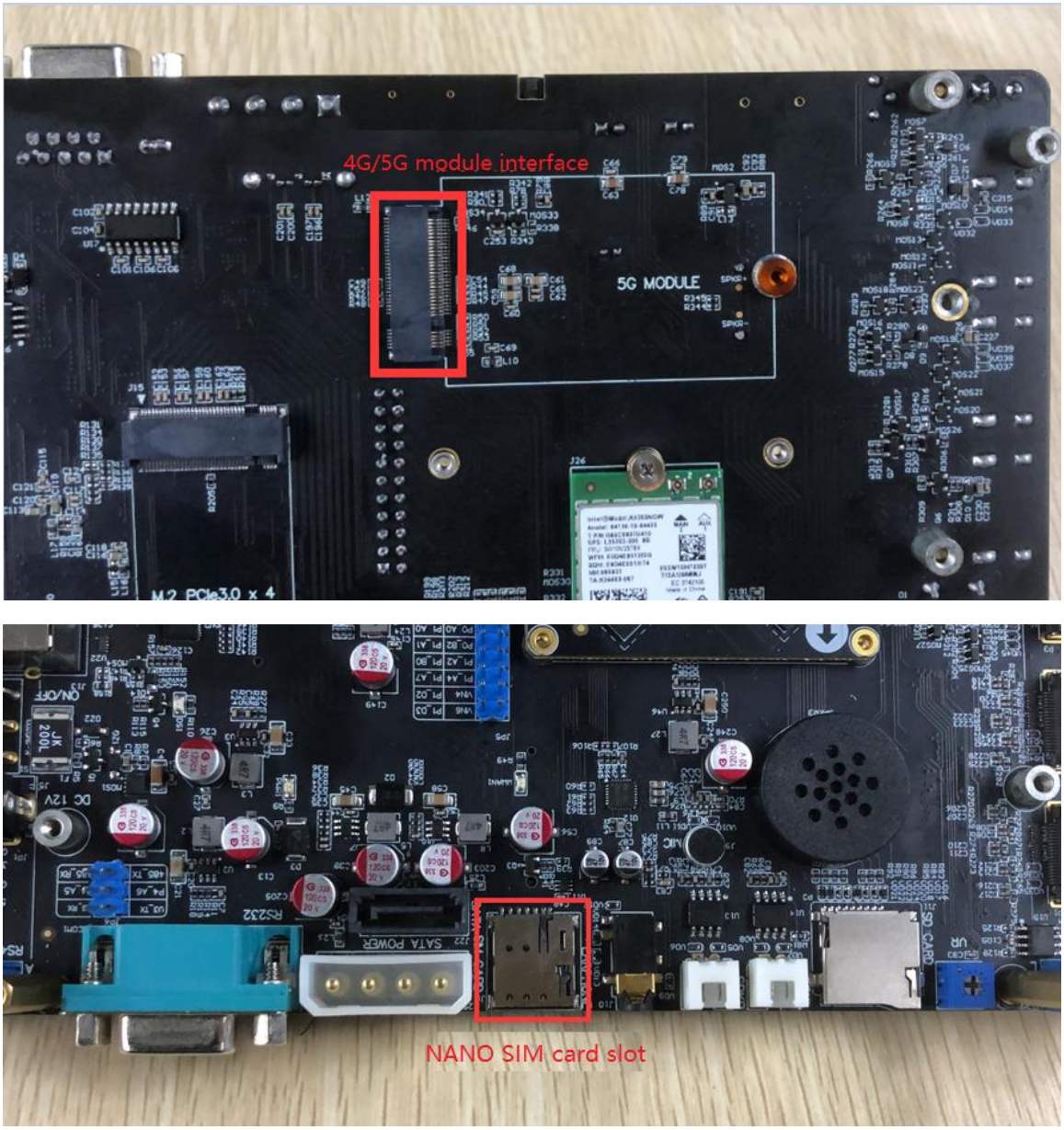



Figure 3.27-14G/4G module interface and SIM card slot

Although the 4/5G module adopts the M_Key interface, it actually uses the USB bus and ultimately connects to the USB 3.0 interface of the RK3588.

Currently, the Android12/Android13 images provided by ALIENTEK only support the Quectel5G module RM500U-CN (all-network compatible) and the Mianwei 4G module EM05-CE (all-network compatible). Users can purchase these two models directly from the Quectelofficial store.

Before testing, prepare the 4G module or 5G module first; disconnect the development board and insert the 4G or 5G module into the 4G/5G module slot on the bottom board of the development board, fix it with screws (note that the lengths of the 4G module and 5G module are different; the 4G module is shorter and cannot be fixed with screws, so users need to use other methods for fixation), and connect the antenna; prepare a SIM card that can access the internet, and insert it into the Nano SIM card slot. In this test, the author used the 5G module RM500U-CN, as shown in the following picture:


Figure 3.27-2 RM500U-CN


Figure 3.27-3Comparison of 4G and 5G module sizes

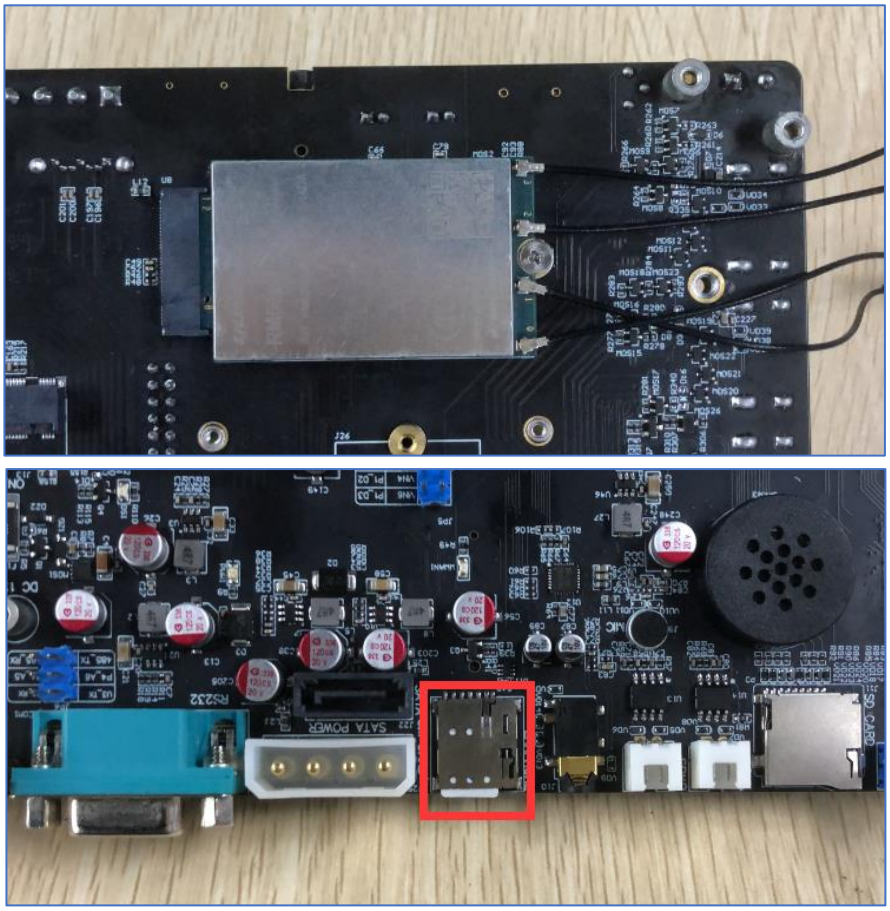


Figure 3.27-4 RM500U-CN and SIM Card Connection Diagram

After the module is connected, the development board is powered on and the Android system is entered. Once the Android system starts successfully, a 5G signal icon will appear in the upper right corner (for the 5G module, it is necessary to wait for a little while after entering the Android system), as shown in the following picture:

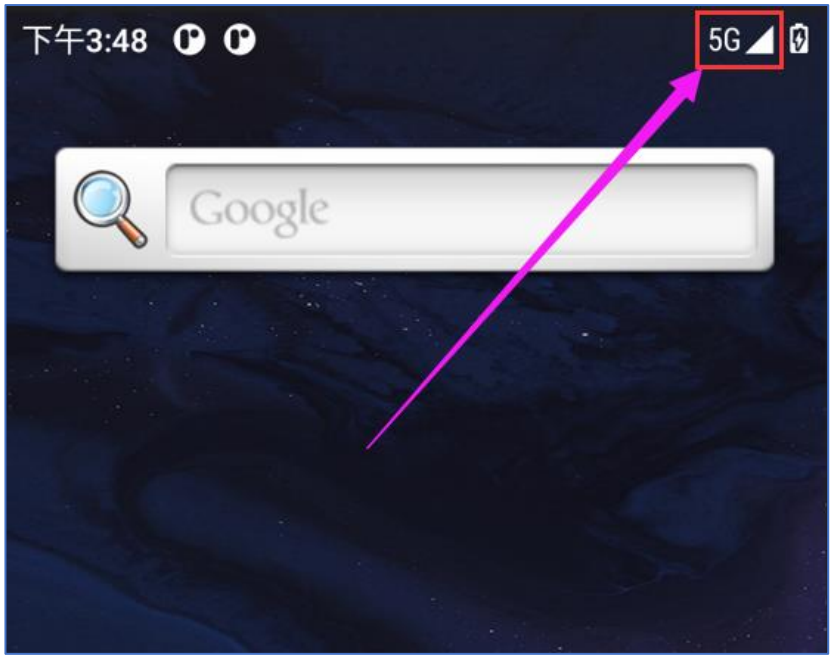



Figure 3.27-55G signal icon

If the 4G module EM05-CN is used, it corresponds to the 4G signal icon, as shown in the following figure:

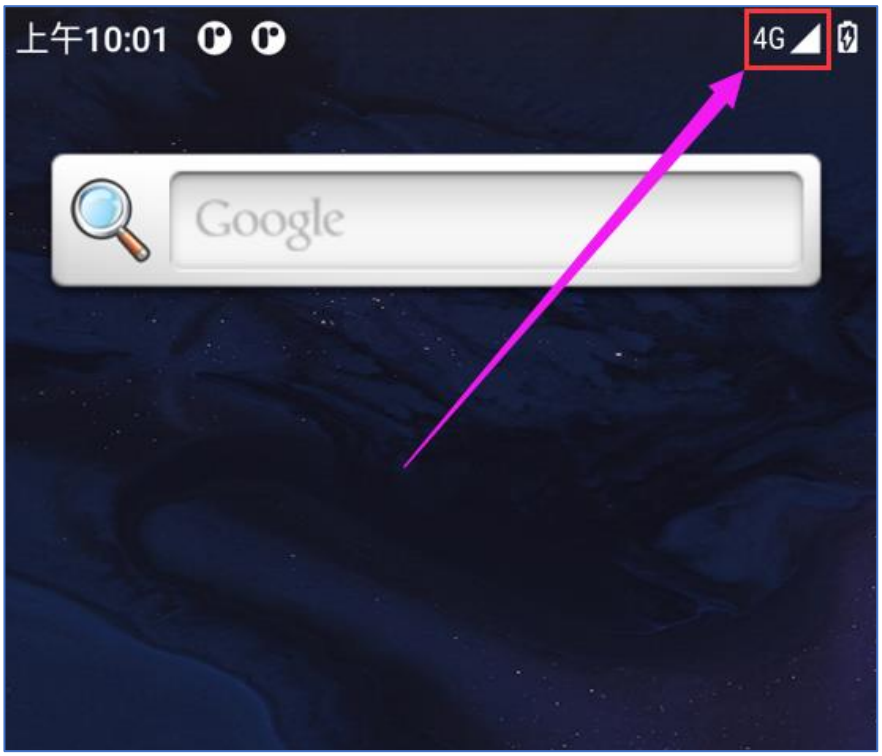



Figure 3.27-6 4G signal icon

You can open the built-in browser of the Android system to test whether the 4G/5G module can access the internet.

If you need to test the network speed of the 4G/5G module, you can download and install the "Antutu Benchmark" or "Speed Manager" App for testing; the test results are for reference only, as the actual test results can be affected by various factors.

## 3.28 View NPU information

To view the usage rate of the NPU, execute the following command in the serial terminal:

```
cat /sys/kernel/debug/rknpu/load
```

```
ATK_DLRK3588:/ #
ATK_DLRK3588:/ # cat /sys/kernel/debug/rknpu/load
NPU load:  Core0:  0%, Core1:  0%, Core2:  0%,
ATK_DLRK3588:/ #
ATK_DLRK3588:/ #
```

## 3.29 Thermal fan test

The thermal fan is an optional accessory. If the user selects the thermal fan, they can follow the instructions below to test whether the fan's cooling function is working properly.

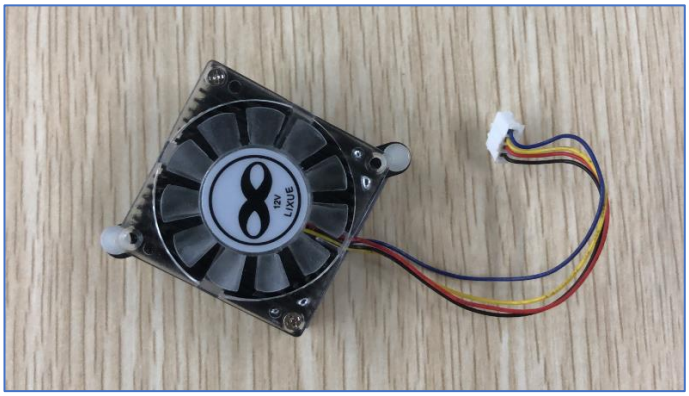


Figure 3.29-1 Fan cooling fan

Before conducting the test, the development board should be powered off first. Install the fan on the development board (just align the two self-locking seats of the fan with the two reserved holes on the base plate and install it. During the installation process, apply thermal silicone on the surface of the RK3588 chip to achieve better heat dissipation effects!) ; Connect the 4-pin terminals of the fan to the corresponding positions on the development board, as shown in the following figure:

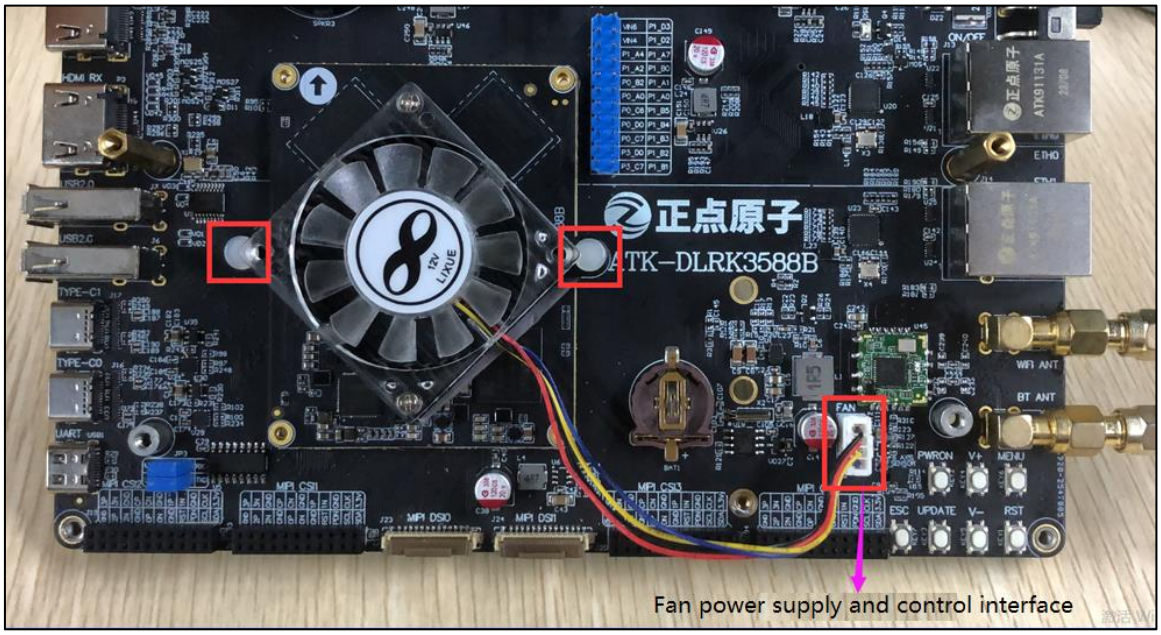



Figure 3.29-2 Fan Installation Diagram

After installing the fan, power on the development board. The fan will keep rotating. If it doesn't rotate, please immediately cut off the power and check!

In fact, we can also manually start or stop the fan rotation by executing the following instructions (switch to the root user first).

```
echo 0 > /sys/class/hwmon/hwmon13/pwm1          # Write "0" to stop the rotation.
```

You can write a number between 0 and 255 (including 0 and 255) into the file /sys/class/hwmon/hwmon13/pwm1. The higher the number, the faster the fan speed will be.

```
echo 255 > /sys/class/hwmon/hwmon13/pwm1        # The fan is running at full speed.
```

```
console:/ #
console:/ #
console:/ # echo 255 > /sys/class/hwmon/hwmon13/pwm1
console:/ #
console:/ #
```

## 3.30 PWRON button test

There is a PWRON button on the bottom board of the ATK-DLRK3588 development board, as shown in the following picture:

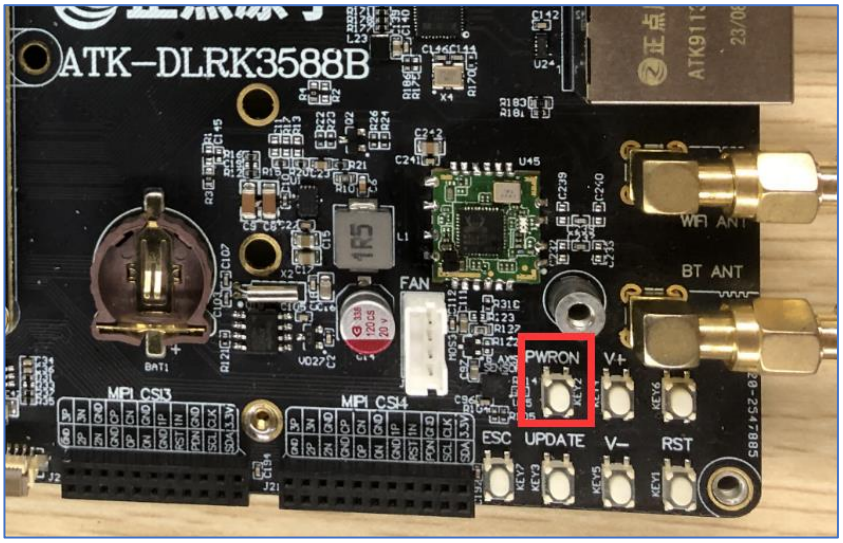
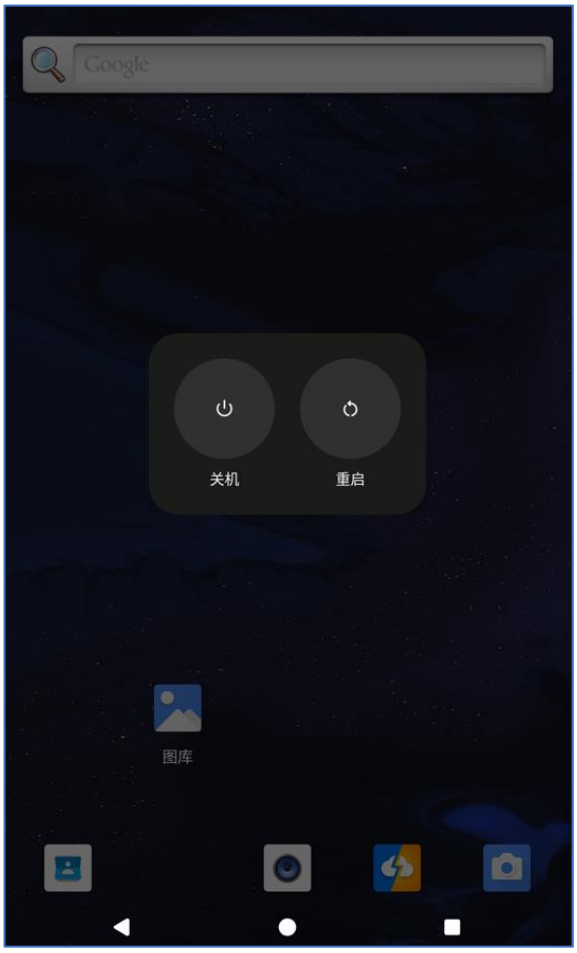



Figure 3.30-1 PWRON button

In the Android system, when this button is pressed, the screen will turn off (pressing it again will turn the screen on). You can test it yourself.

Apart from the screen-sleeping function, the PWRON button is also used for system shutdown/startup operations. By simultaneously pressing the PWRON button and the V+ button (the volume increase button), the Android system interface will display two buttons as shown in the following picture:



They correspond respectively to the "shut down" and "restart" functions.

Clicking the "Shutdown" button will put the system into a shutdown state. During this shutdown state, pressing the PWRON button again will activate the system.