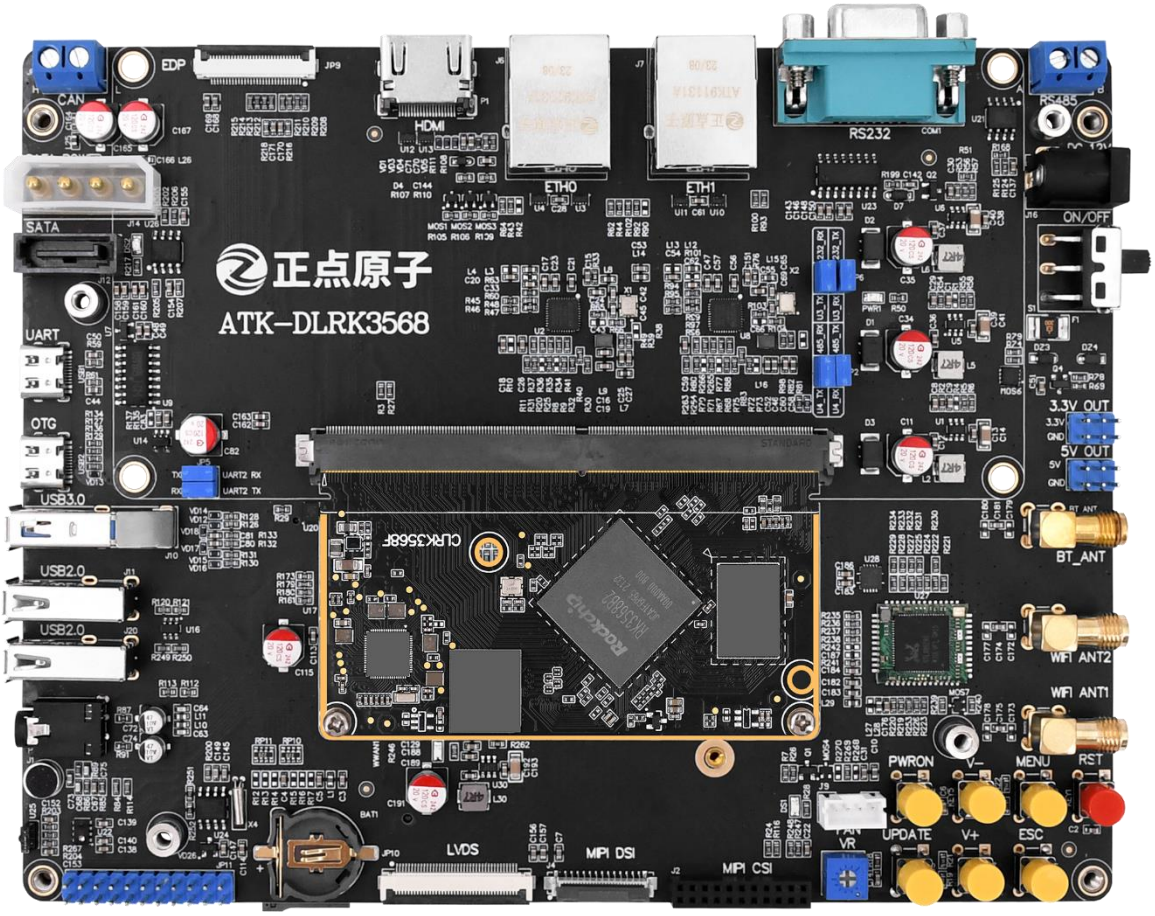
ATK-DLRK3568

Android System Quick test manual

V1.2



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Revision History:

Version	Version Update Notes	Responsible person	Proofreading	Date
V1.0	release officially	ALIENTEK	ALIENTEK	2022.07.03
V1.1	Partial screenshots have been updated.	ALIENTEK	ALIENTEK	2023.08.30
V1.2	Add the test description for "can"	ALIENTEK	ALIENTEK	2024.02.01

Brief

This document is a quick experience guide for the ALIENTEK ATK-DLRK3568 development board. It can be regarded as a hardware testing document. Here, we can learn about the usage methods of the development board and the testing methods for peripheral devices. We can also understand 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-DLRK3568 development board.

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Chapter 1. Preparation for using the ATK-DLRK3568 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 CH340 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 CH340 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 -> CH340SER.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 -> 4_softwares -> 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

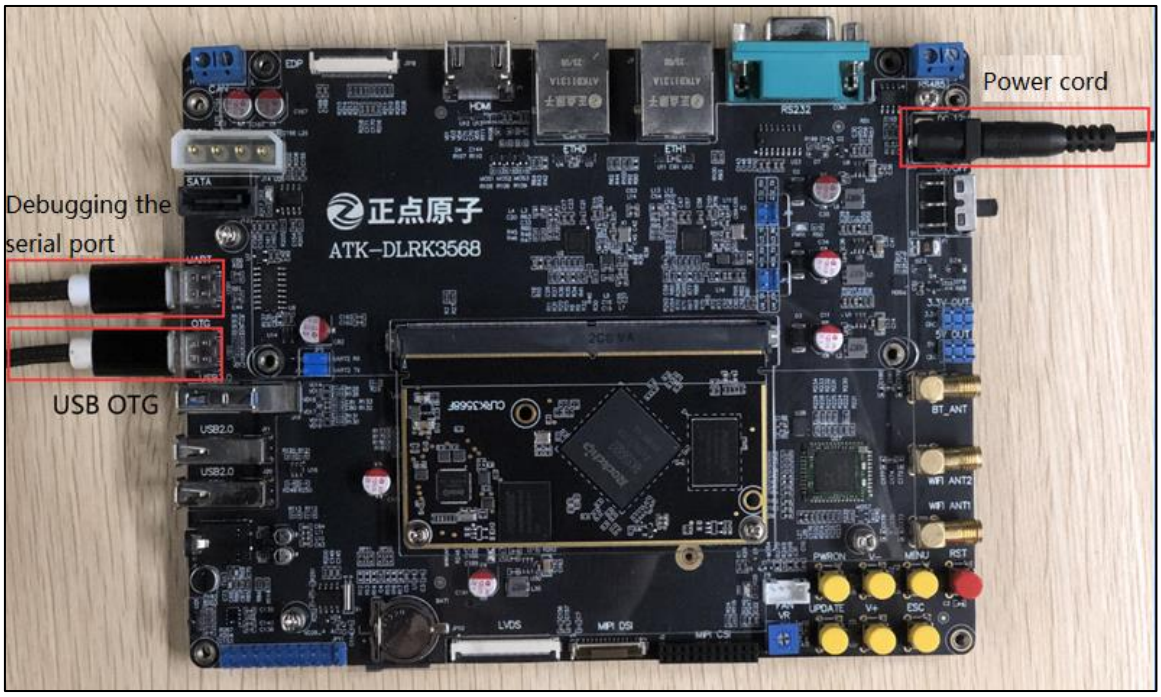
This section introduces the hardware connection of the ATK-DLRK3568 development board. We need to connect the debug serial port, the TYPE-C0 interface (for adb and image burning), and the power supply of the development board.

- The ATK-DLRK3568 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-DLRK3568 development board).

The connection diagram is as follows.



Chapter 2. Burn the Android system image

The ATK-DLRK3568 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 11 and Android 12 images). Please visit "[ALIENTEK]ATK-DLRK3568 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 11 System Function Testing

This chapter will introduce how to conduct function testing on the ATK-DLRK3568 development board on the Android 11 system.

Before the test, it is necessary to first burn the Android 11 system image provided by ALIENTEK. For the specific burning method, please refer to "[ALIENTEK] ATK-DLRK3568 Factory Image Burning Guide", and follow the requirements of the document to burn the Android 11 system image.

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

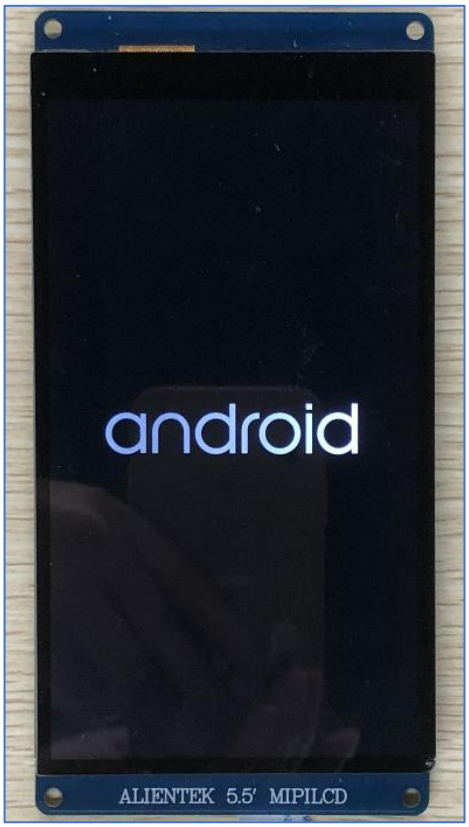


Figure 3.1-2 Android startup animation

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

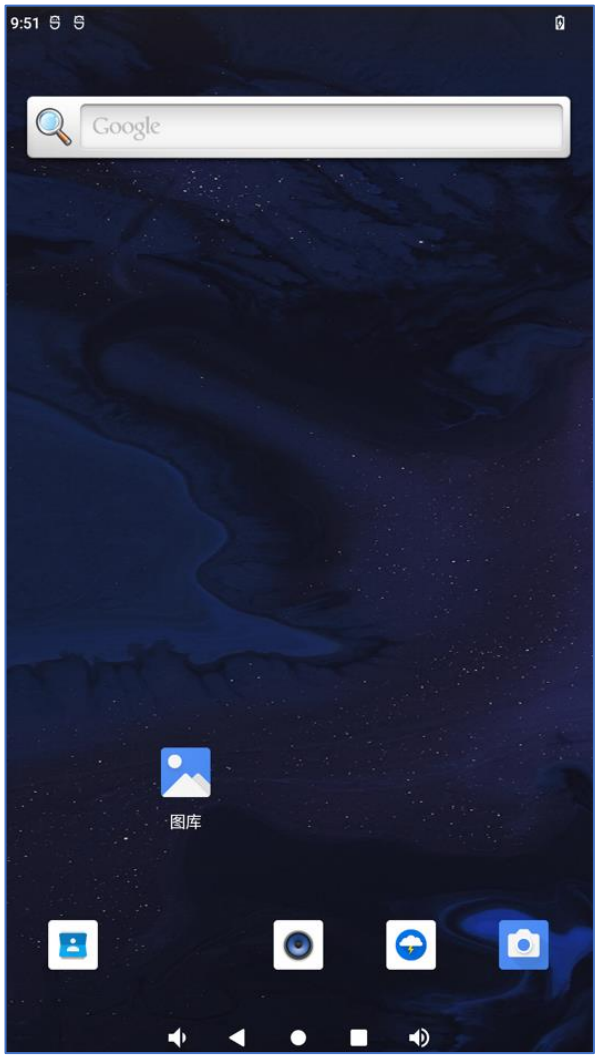


Figure 3.1-3 Android system main interface (MIPI screen)

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 CH340), set the serial port baud rate to 1500000 (1.5M). After the connection is successful, it will be as follows:

```
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
console:/ $
```

After connecting, press the Enter key several times.

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

3.3 ADB connection

Connect the TYPE-C 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:

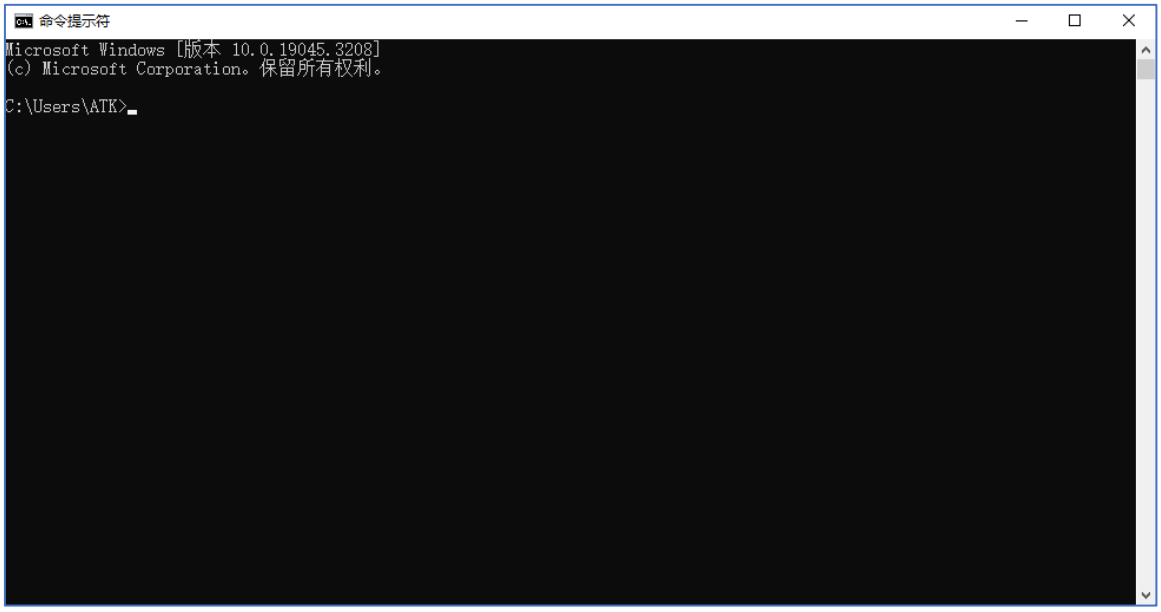


Figure 3.3-1 Windows command prompt window

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

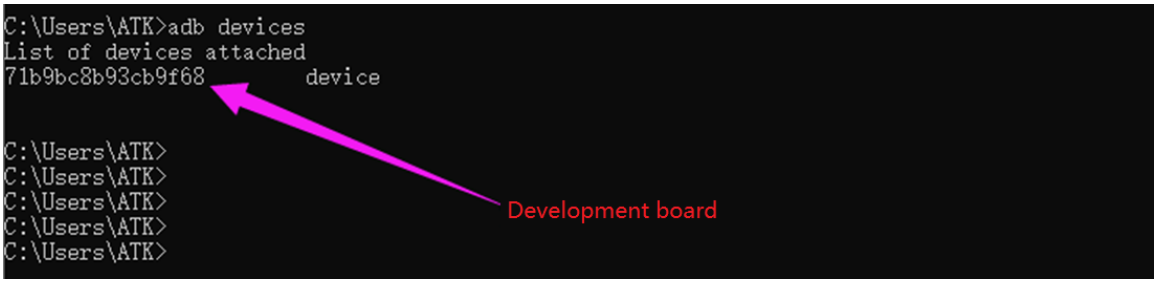


Figure 3.3-2 Check if it is connected to the development board

If the connection fails, you can try unplugging the USB cable from the TYPE-C 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-DLRK3568 development board is equipped with a user LED. As shown in the following figure:

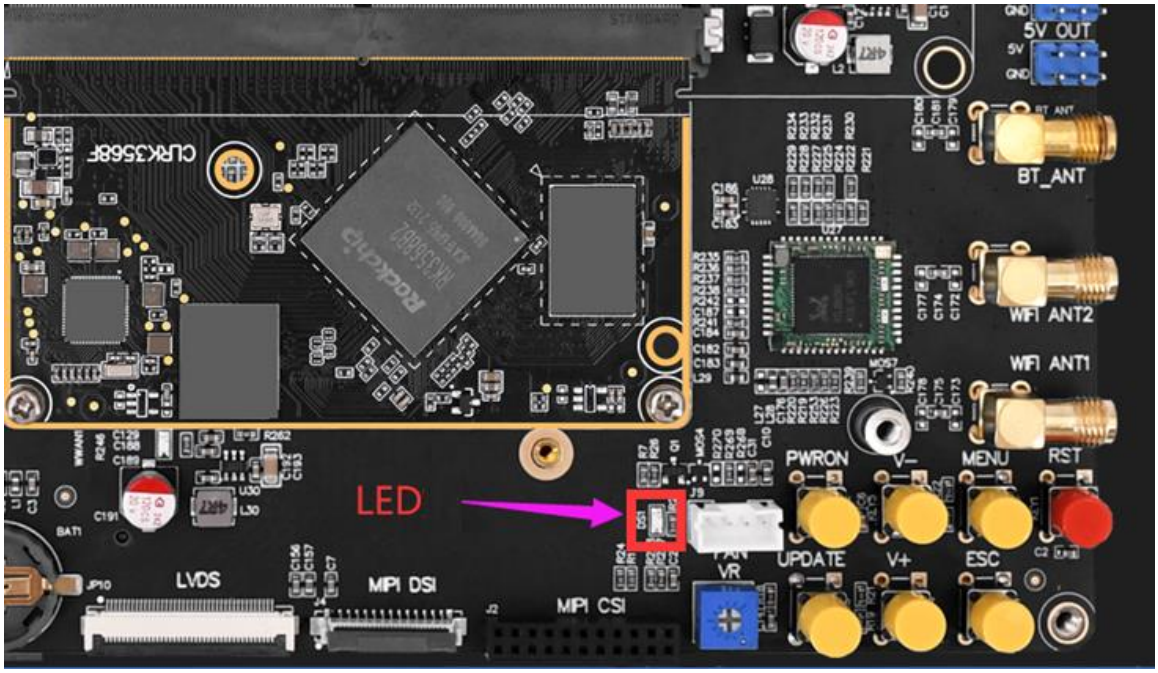


Figure 3.4-1 The distribution of LED on the development board

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-DLRK3568 development board is equipped with 7 keys. As shown in the following figure:

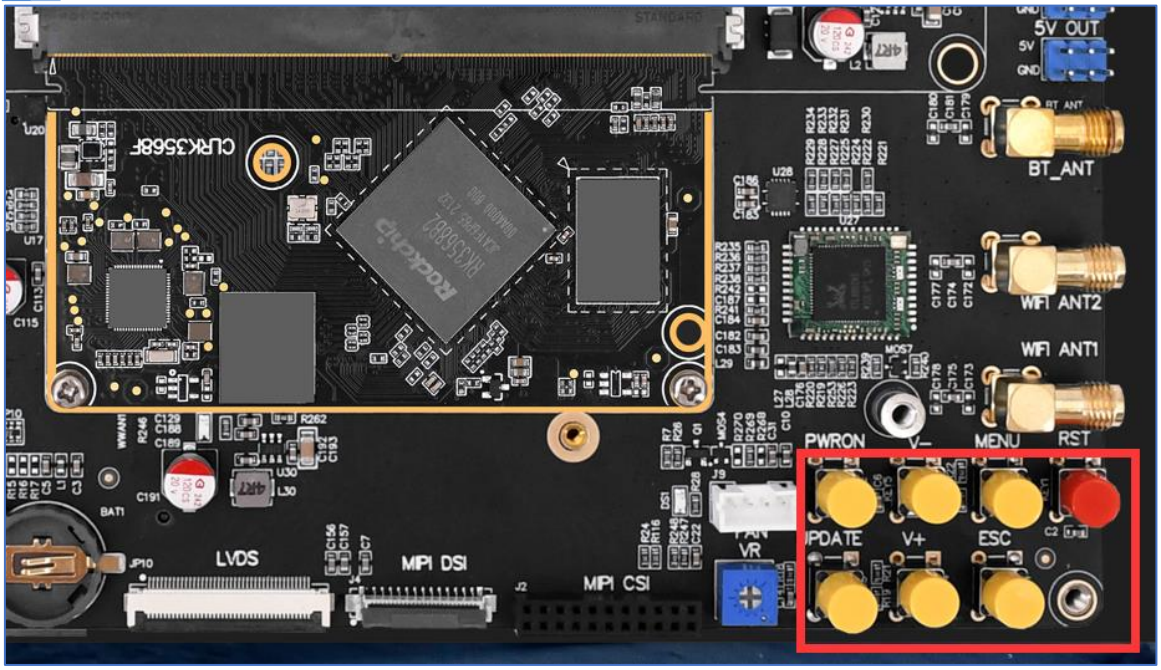


Figure 3.5-1 The distribution of buttons on the development board

There are 4 user buttons: V-, V+, MENU, and ESC. These 4 user buttons are analogized through ADC(ADC Channel 0). 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
ADC0 value collected	22	247	468	691

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:

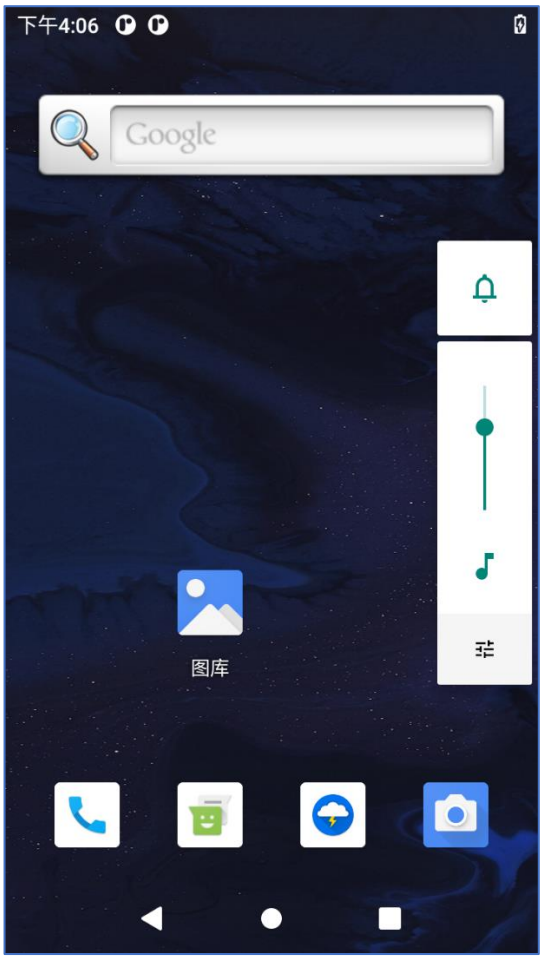


Figure 3.5-2 Adjust volume by pressing the buttons

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-DLRK3568 development board has two external RTC hardware clock units:

- Firstly, the PMIC chip RK809 on the core board is internally equipped with a RTC module;
- Secondly, a RTC clock chip PCF8563 is onboard on the bottom plate of the development board. As shown below:

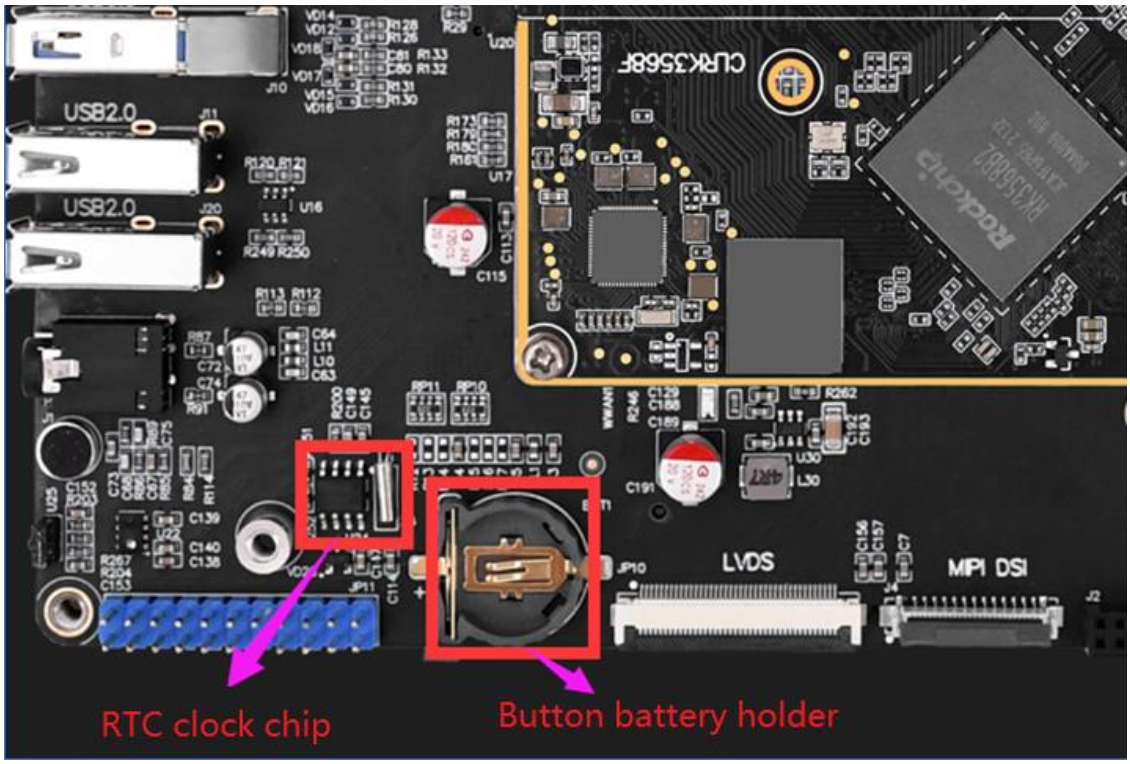


Figure 3.7-1 RTC clock chip and button battery

If you want to improve the clock accuracy, a high-precision crystal oscillator needs to be used.

Please check if the RTC button battery is installed on the button 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 that the battery is a consumable item. If you find that its voltage is too low, please replace the button battery).

In the Android system, the clock can be divided into two types: system time (the clock of the Android system) and hardware clock. The time displayed in the upper left corner of the Android system interface is the system time. To set the system time, open the "Settings" app and find "System" -> "Date and Time". As shown in the following picture:

Usually, when connected to the network, the system time is synchronized from the network; if there is no network connection, after the Android system starts, the system time is synchronized from the RTC hardware clock.

The following command can also be executed on the serial port terminal (or via adb) to view the current system time:

```
date
```

```
console:/ #
console:/ # date
Mon Jul 17 16:31:27 CST 2023
console:/ #
console:/ #
```

Figure 3.7-2 Check system time

To view the RTC hardware time, execute the following command:

hwclock -f /dev/rtc0 # Check the RTC hardware time (where rtc0 refers to the RTC module inside the RK809)

hwclock -f /dev/rtc1 -w # Write the system time to the RTC hardware (where rtc1 refers to the RTC chip (pcf8563) on the baseboard)

hwclock -f /dev/rtc1 # Check the RTC hardware time (PCF8563)

```
console:/ #
console:/ # hwclock -f /dev/rtc0
Mon Jul 17 09:51:10 2023  0.000000 seconds
console:/ #
console:/ # hwclock -f /dev/rtc1 -w
console:/ #
console:/ # hwclock -f /dev/rtc1
Mon Jul 17 17:51:21 2023  0.000000 seconds
console:/ #
console:/ #
```

For thepcf8563, the write operation needs to be performed first, followed by the reading of the RTC hardware time.

3.8 Audio Interface Test

The ATR-DLRK3568 development board has a PMIC (Power Management Integrated Circuit) chip RK809 onboard on its core board. This chip integrates an audio codec module inside, which is used to achieve 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:

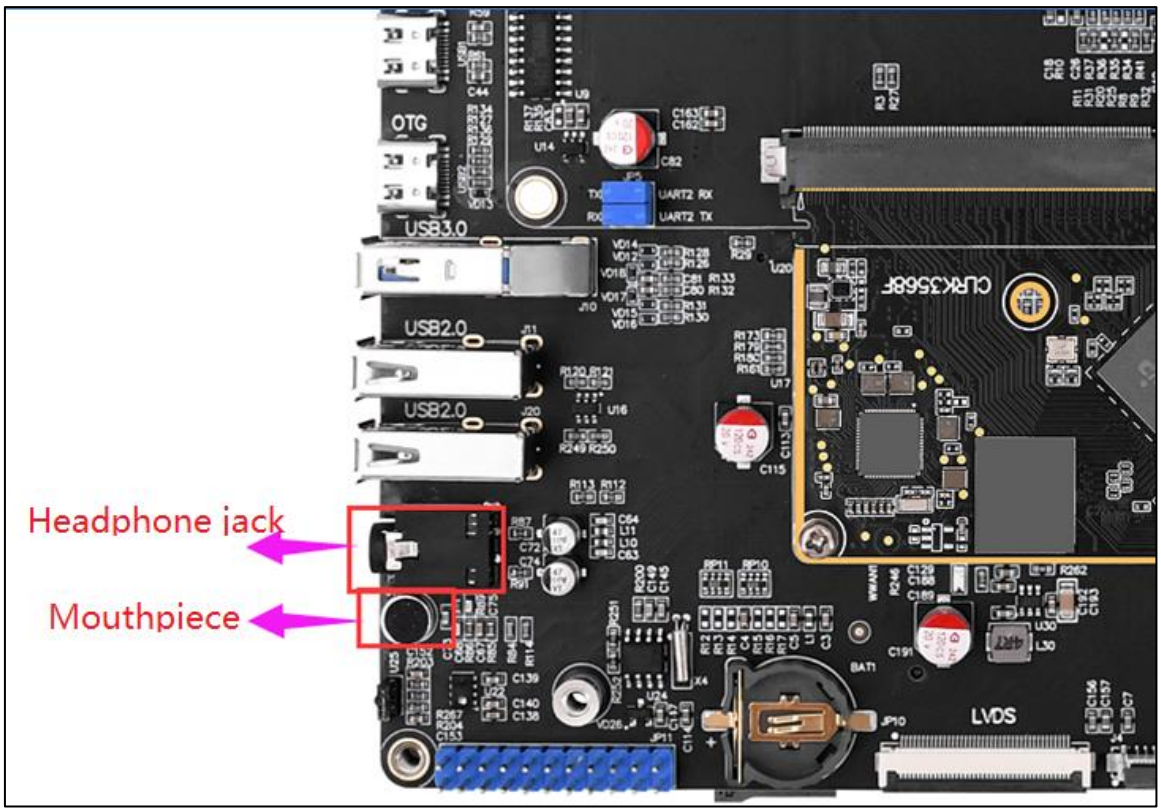
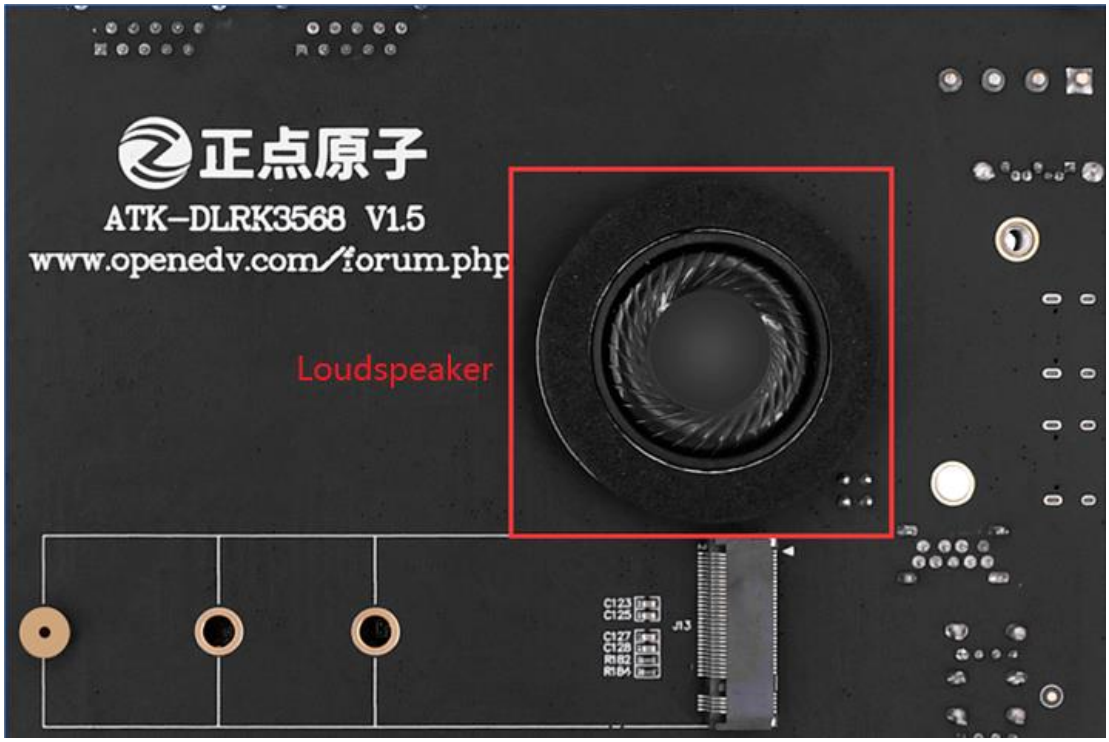


Figure 3.8-1 Headphones, microphone and speaker



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>
```

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:

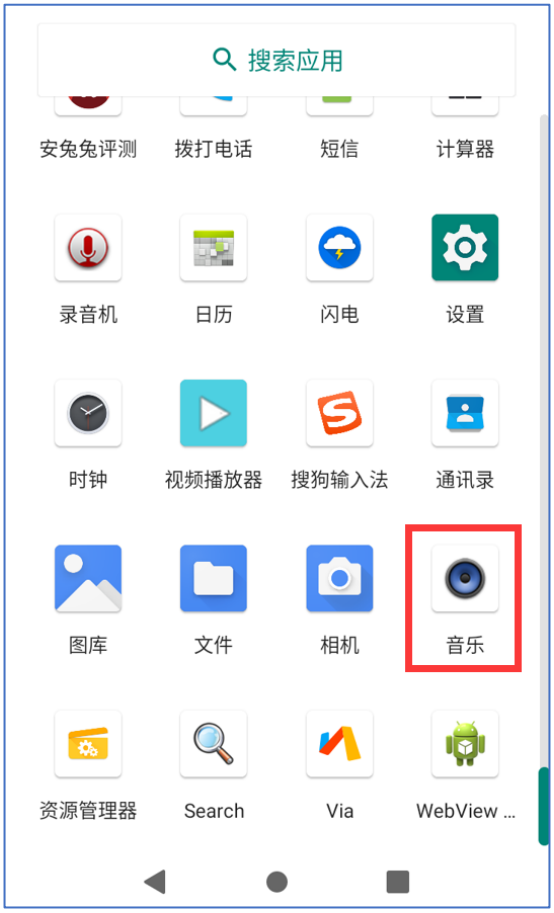


Figure 3.8-2 Music App

Then play the music. At this point, the sound will be emitted from the speaker (do not insert the headphones or HDMI display yet).

Next, test the headphone interface. First, prepare a **3.5mm** round-hole headphone and insert it into the headphone jack on the development board. At this time, the Android system will detect the insertion of the headphone, and a headphone icon will appear on the upper right corner (the headphone icon disappears when the headphone is unplugged), as shown below:

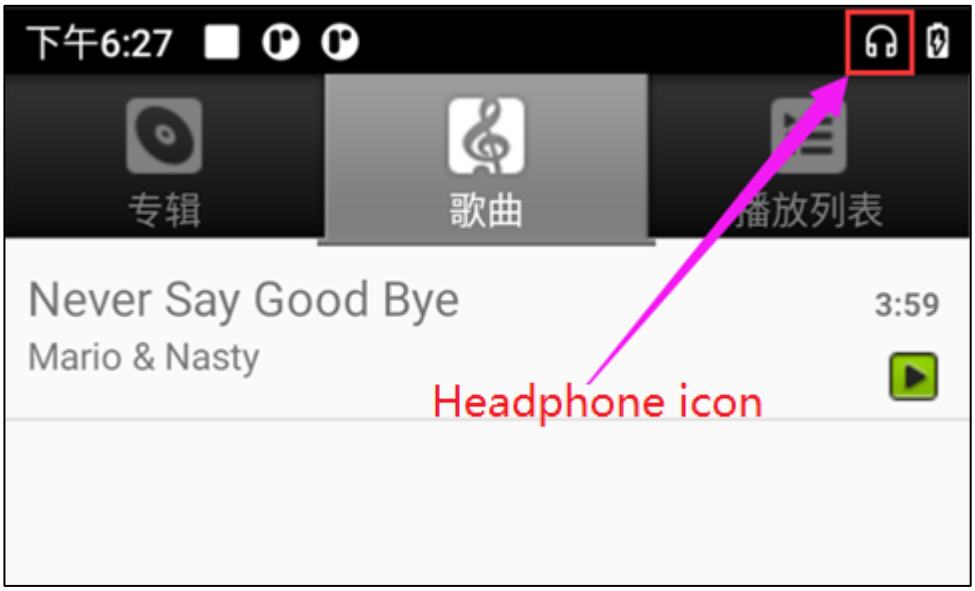
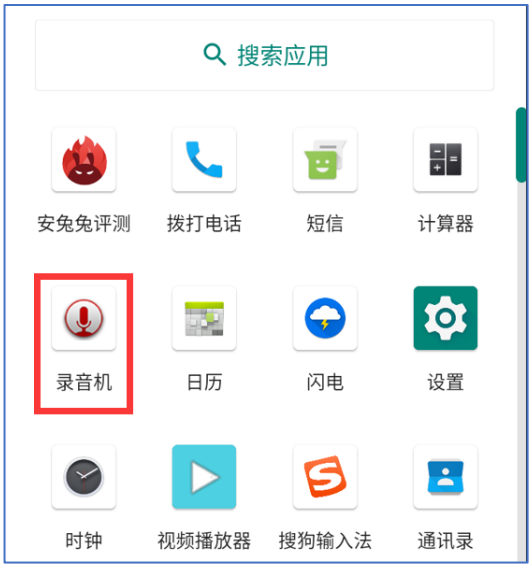


Figure 3.8-3 Headphone icon

After inserting the earphone, the sound will come from the earphone and the speaker will stop outputting; when the earphone is removed, the sound will again be output from the speaker. You can test it yourself.

3.8.2 Recording test

Open the "Recorder" app in the Android system and conduct a test of the recording function, as shown below:



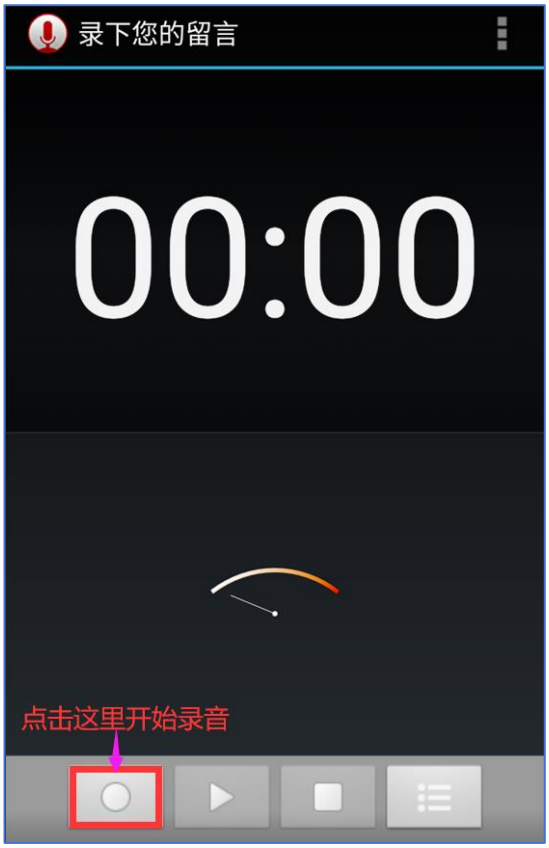


Figure 3.8-4 Audio Recorder App

3.9 Camera Test

On the bottom board of the ATK-DLRK3568 development board, there is a MIPI CSI camera interface, which supports the IMX415 and IMX335 cameras sold by ALIENTEK Store. Later, the OV13850 camera will also be launched.

The IMX415 is an 8M pixel camera, capable of recording 4K (3840x2160) videos at maximum; the IMX335 is a 5M pixel camera, capable of recording 2K (2592x1944) videos at maximum.

Before testing, the development board is powered off first. Then, insert the camera into the MIPI CSI interface on the bottom board. The installation method is as 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!

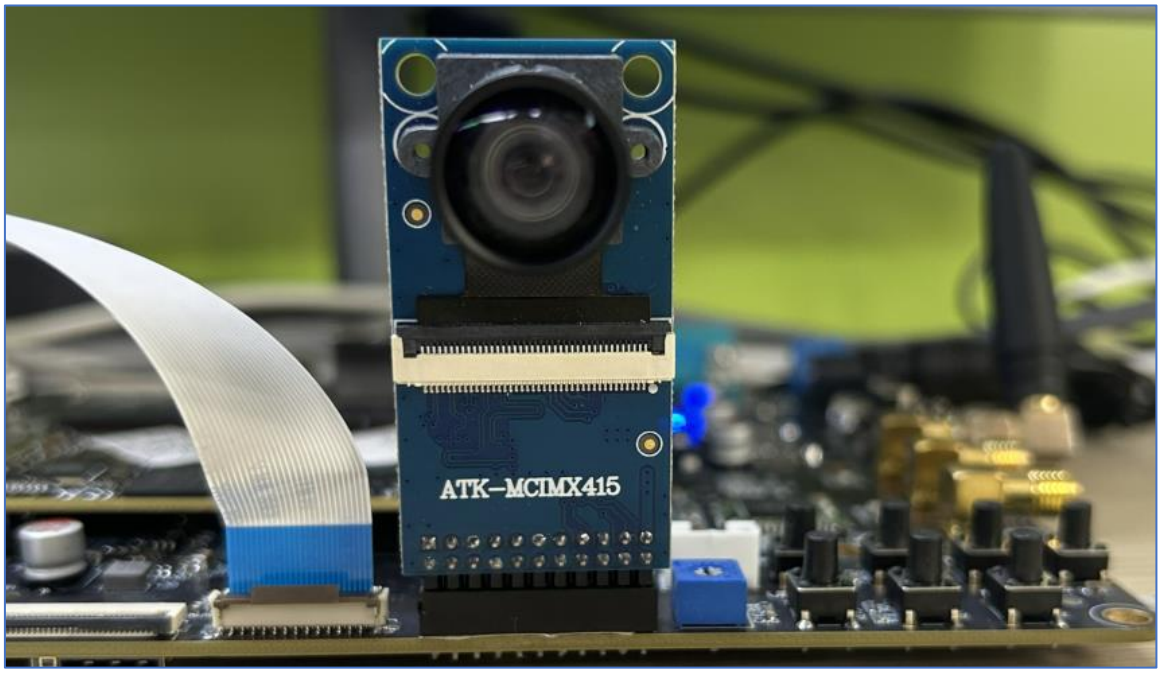


Figure 3.9-1 Camera Installation Example Diagram

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

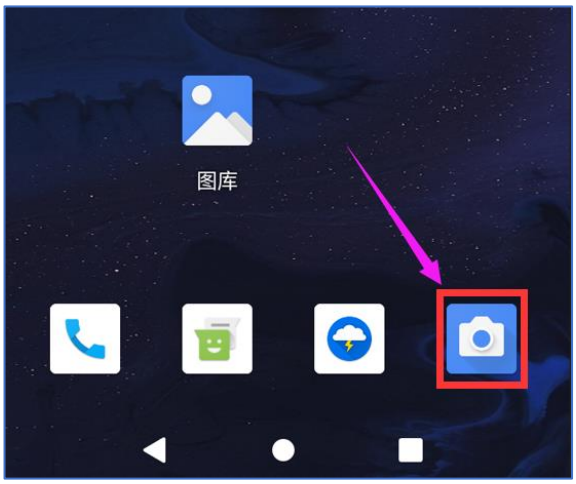
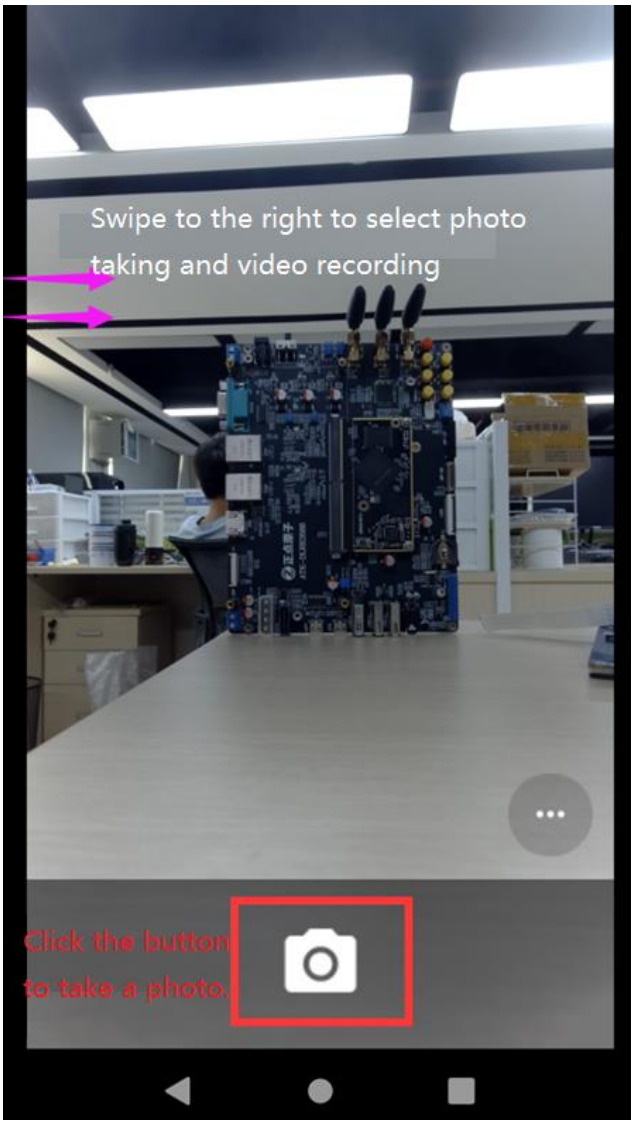
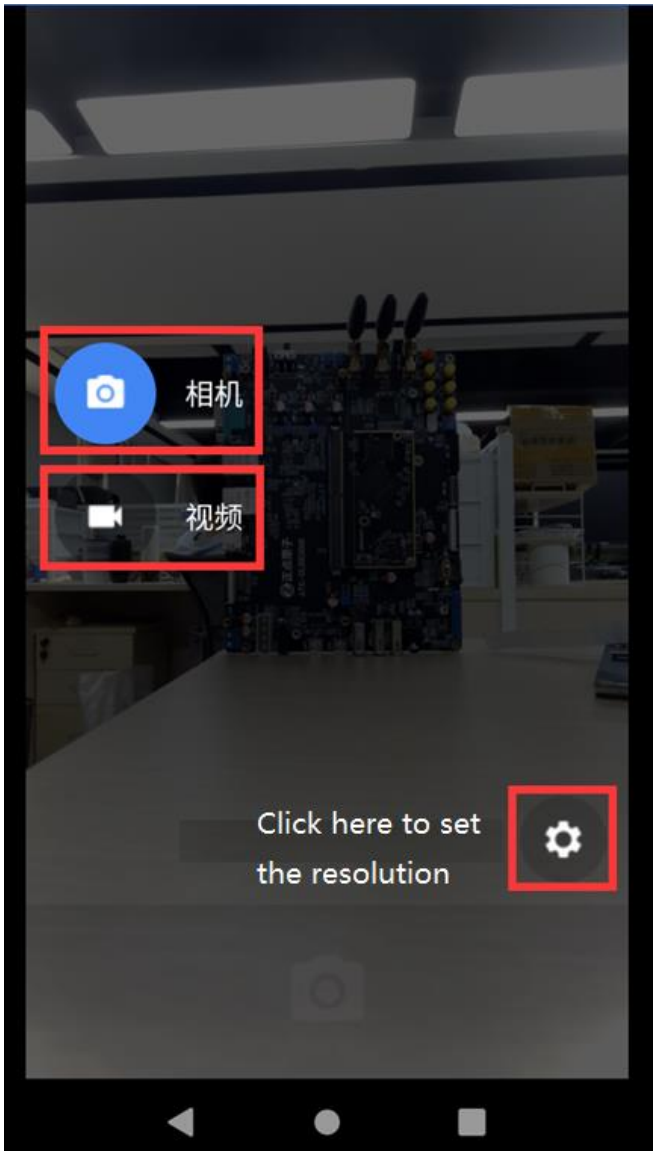


Figure 3.9-2 Camera App icon


Swipe to the right to select photo
taking and video recording
Click the button
to take a photo.


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

3.10 Six-axis Sensor Test

On the bottom board of the ATK-DLRK3568 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

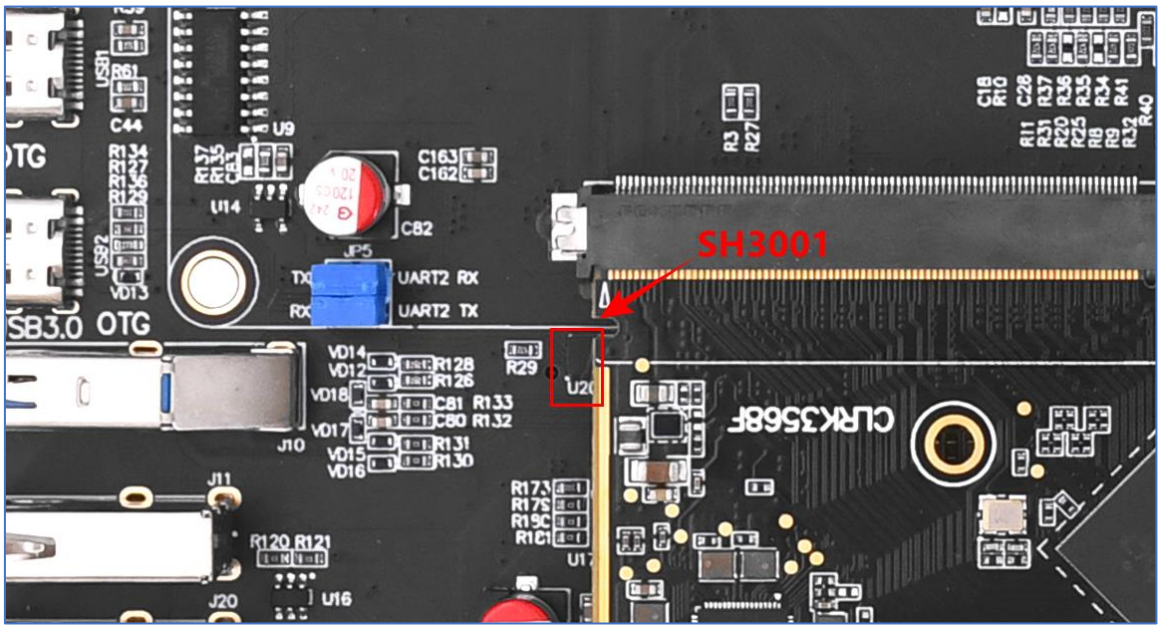


Figure 3.10-1 The position of the six-axis sensor sh3001 on the development board

3.10.1 Gravity sensor test

Upcoming update!

3.10.2 Gyroscope test

Upcoming update!

3.11 USB HOST interface test

There are a total of 4 USB interfaces on the bottom board of the ATK-DLRK3568 development board, namely: two USB HOST 2.0 interfaces, one USB HOST 3.0 interface, and one USB OTG interface (used for burning images and adb connection). The interface distribution diagram is as follows:

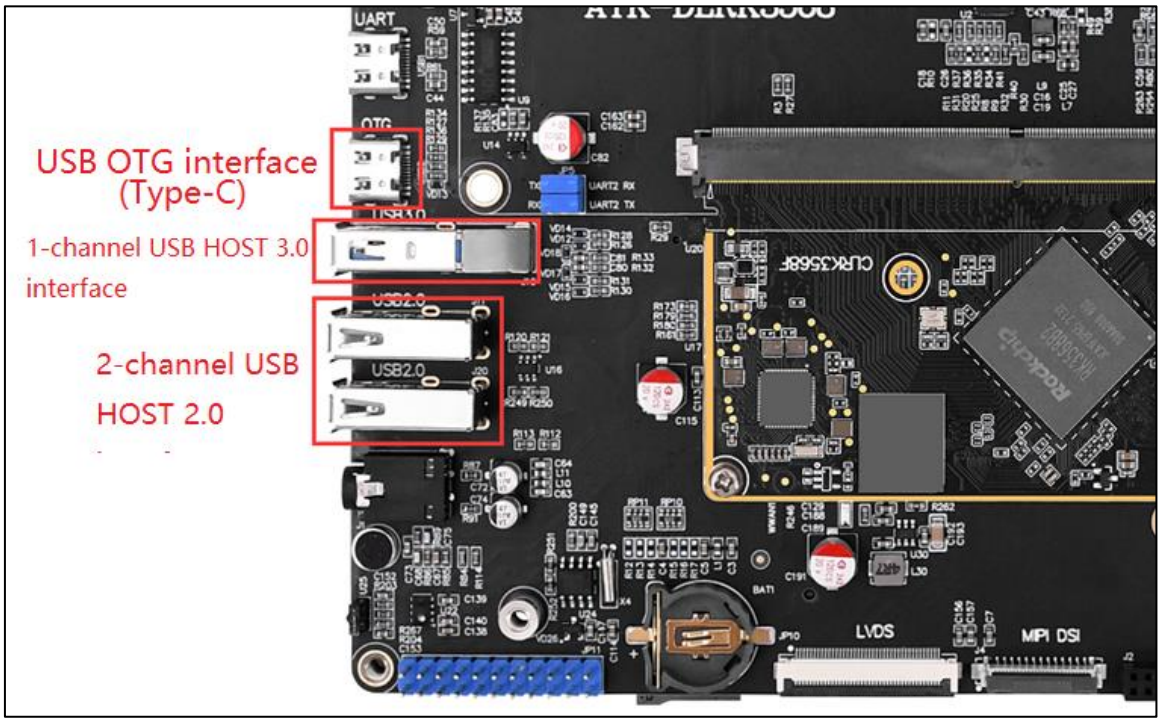


Figure 3.11-1 USB Interface Distribution Chart

It should be noted that: The USB HOST 3.0 interface and the USB OTG interface cannot be used simultaneously. This is determined by the hardware design. When using the USB HOST 3.0 interface, the USB OTG interface cannot connect external devices; when using the USB OTG interface, the USB HOST 3.0 interface cannot connect external devices.

3.11.1 USB HOST test

The USB HOST interface of the development board can be connected to USB peripherals to test the functionality of the USB HOST interface (including 2.0 and 3.0). This can be done to check if the interface is functioning properly, such as with USB drives, USB mice, USB keyboards, etc.

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.

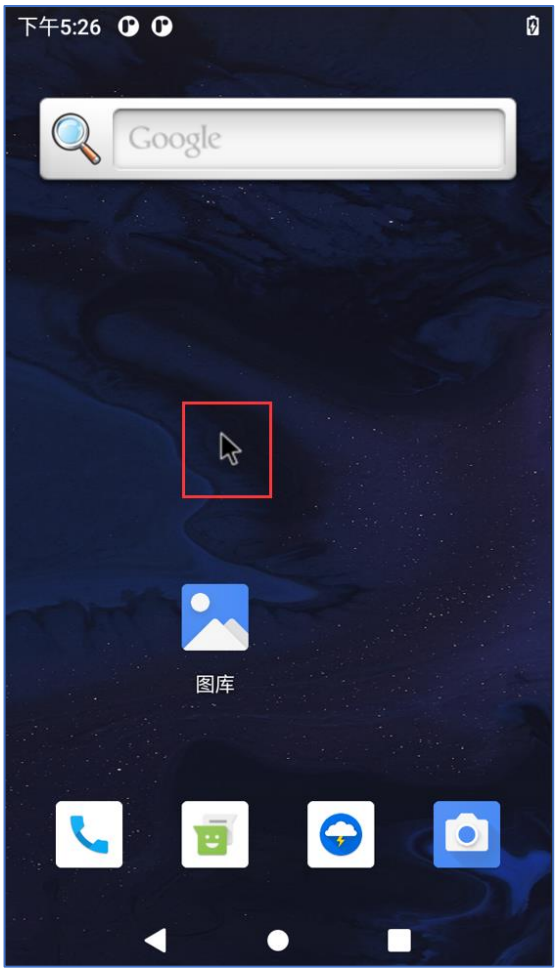


Figure 3.11-2 Connect the mouse

② Connection test for USB drive: After connecting the USB flash drive 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:

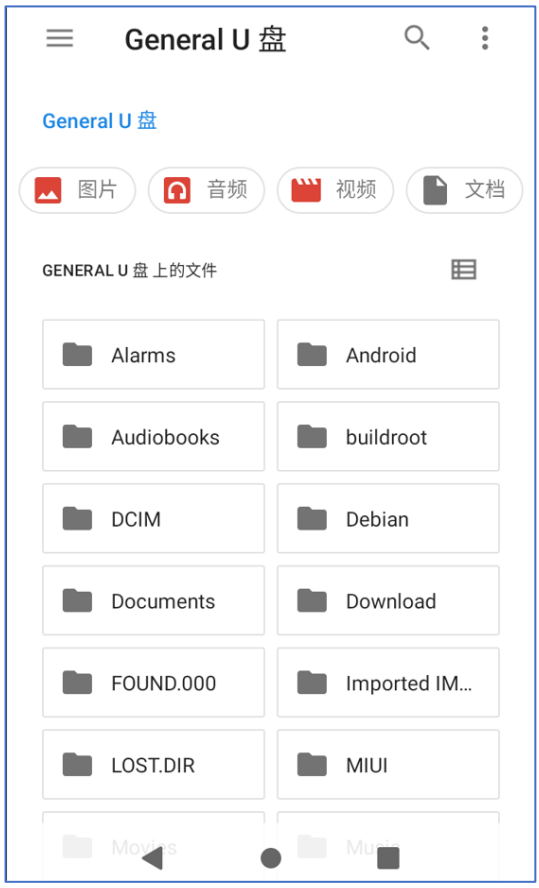
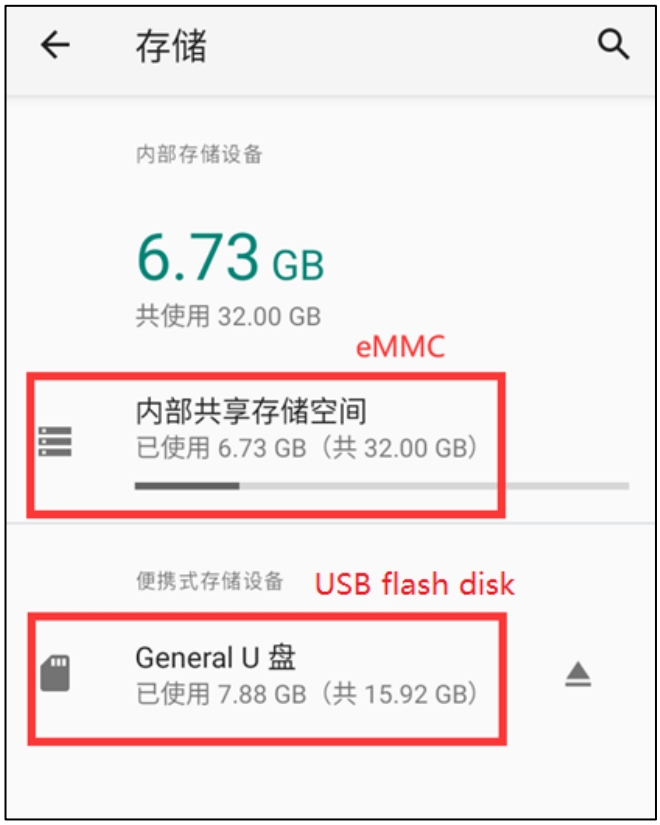


Figure 3.11-4 View the contents in the USB device

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



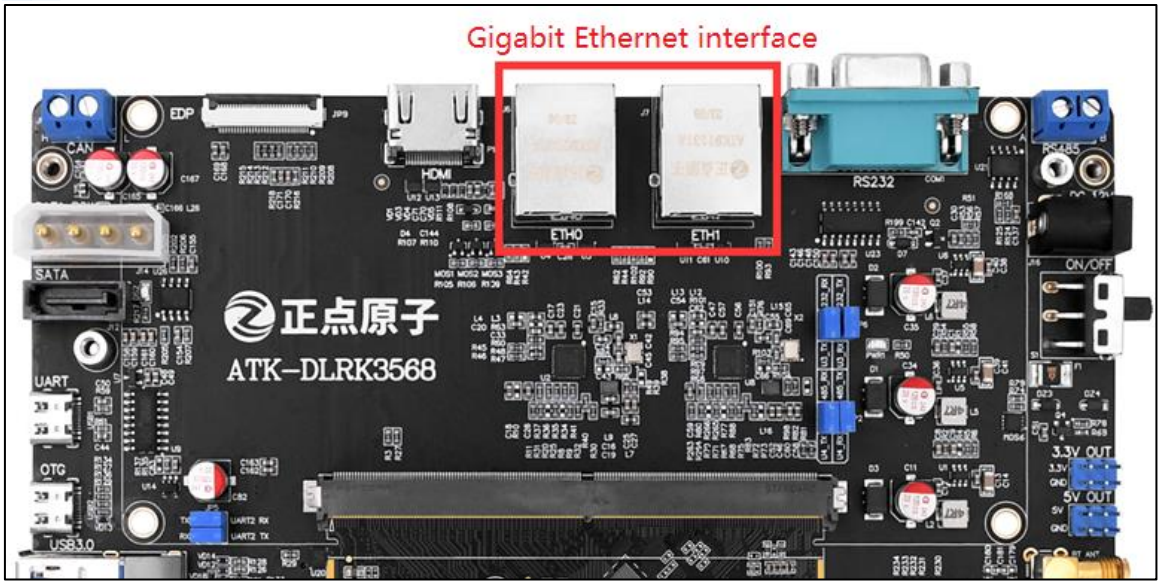
If you want to test the read and write speed of the USB flash drive device, you can install the "Antutu Benchmark" App for testing, or directly use commands (such as the dd command) for testing.

3.11.2 USB OTG Interface Test

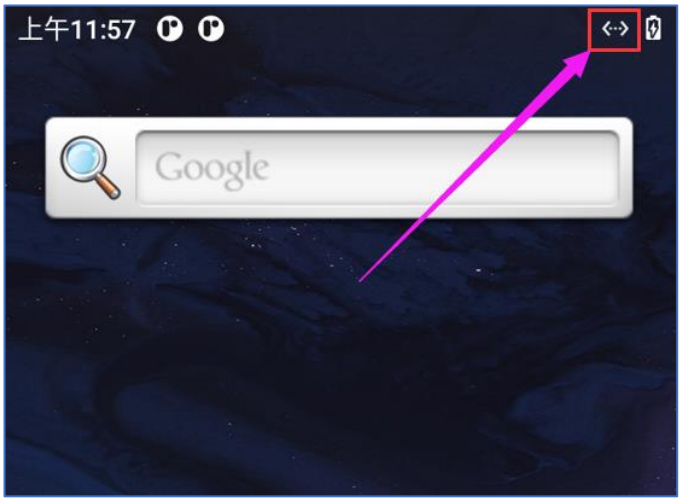
The USB OTG interface on the baseboard of the ATK-DLRK3568 development board is generally used for image mirroring burning and adb connection. If the development board can perform normal image burning, erase operations, and has normal adb functions, it indicates that the interface is functioning properly.

3.12 Gigabit Ethernet Test

The ATK-DLRK3568 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 "Via" browser and test whether we can currently access the external network.

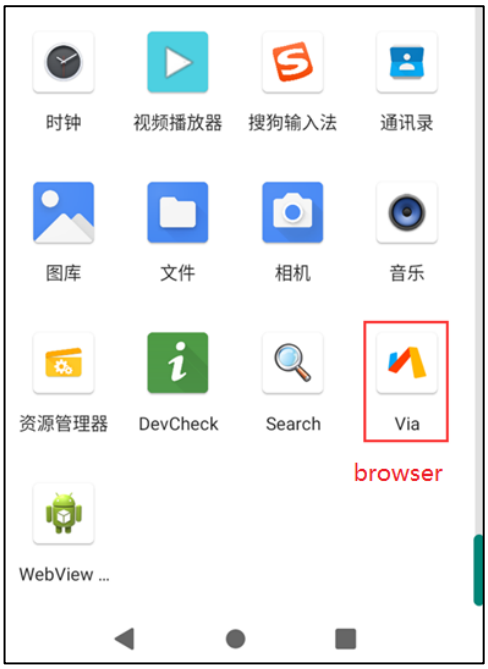
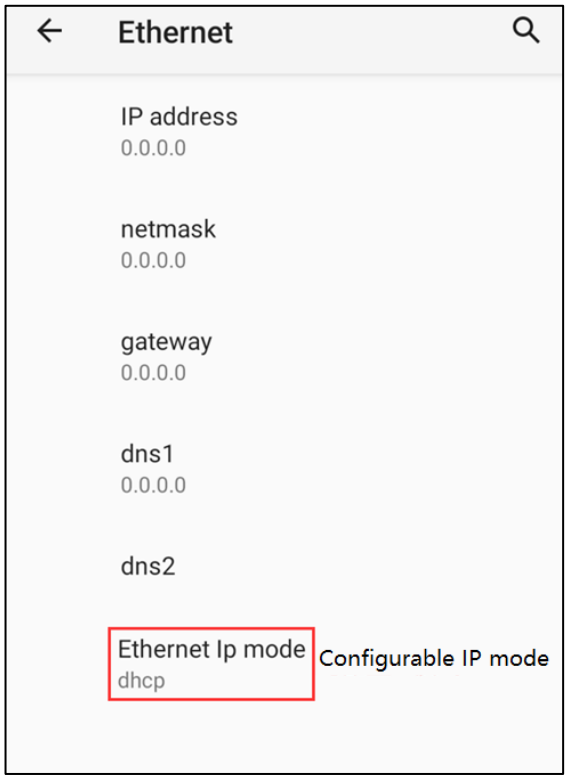


Figure 3.12-2 Browser Internet Speed Test

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



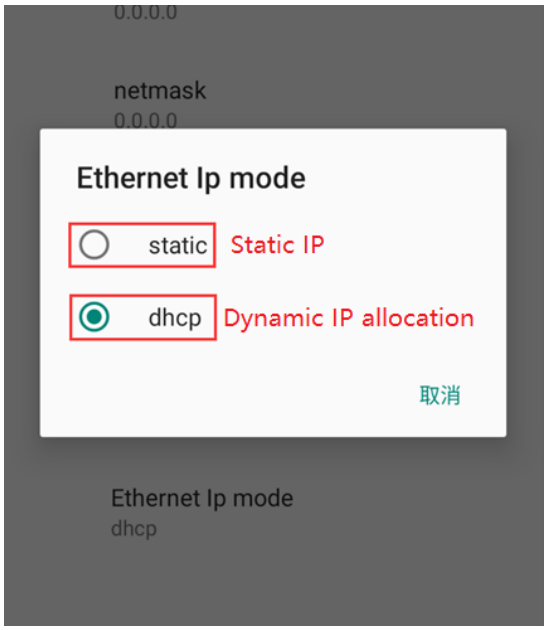


Figure 3.12-3 Configure IP mode

If you need to test the bandwidth of Gigabit Ethernet, you can use the iperf3 tool in the serial terminal for testing (the specific testing method can be referred to in the ATK-DLRK3568_Linux System Quick Test Manual).

3.13 On-board USB WIFI Test

The baseboard of the ATK-DLRK3568 development board is equipped with a RTL8852BS dual-band WIFI & Bluetooth integrated module, featuring dual-band WIFI and support for WIFI6. As shown in the following figure:

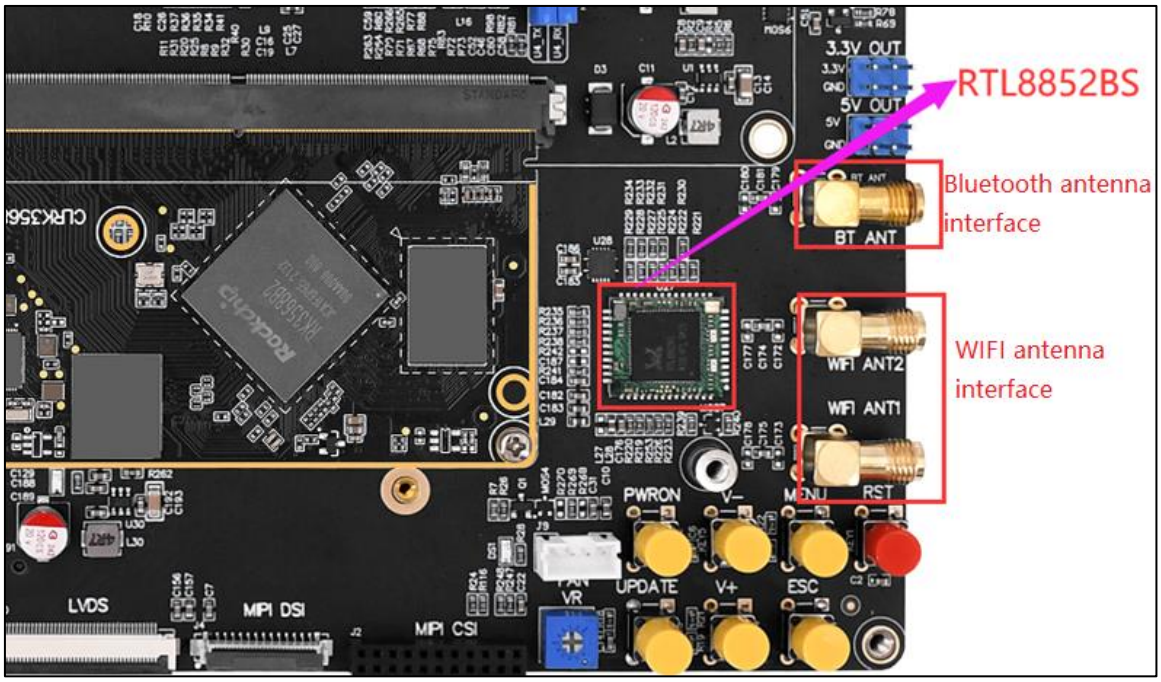


Figure 3.13-1 Location of the RTL8852BS module

Before using WiFi and Bluetooth (unplug the network cable and disconnect the wired network connection), you need to connect the corresponding antennas (the 5G dual-band WiFi antenna and Bluetooth antenna provided by the ATK-DLRK3568 development board), as shown below:

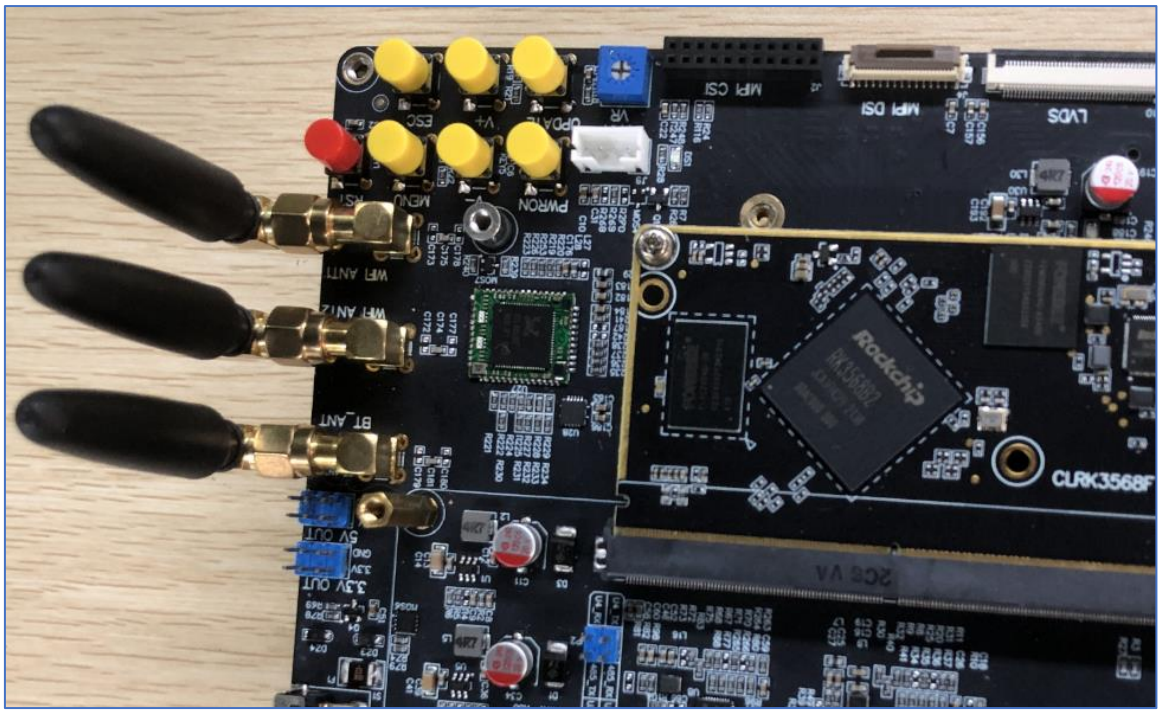


Figure 3.13-2 WiFi & Bluetooth Antenna Installation

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

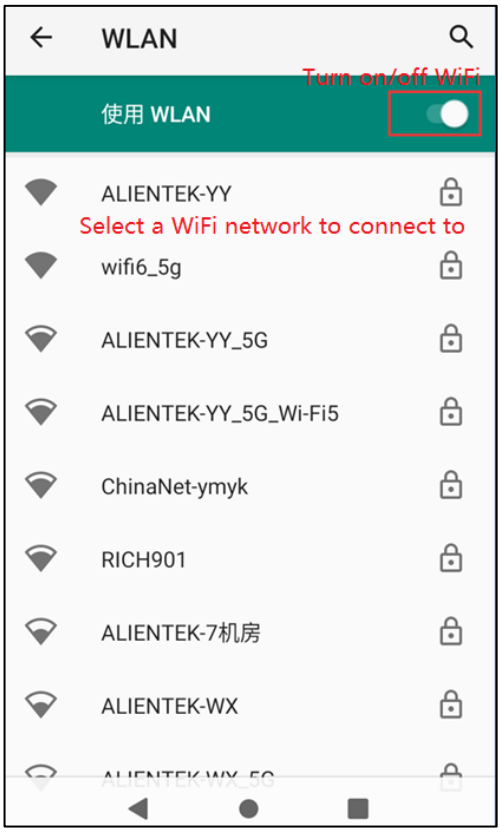


Figure 3.13-3 WiFi connection

After the WiFi connection is successful, you can open the "Via" browser to test whether 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):

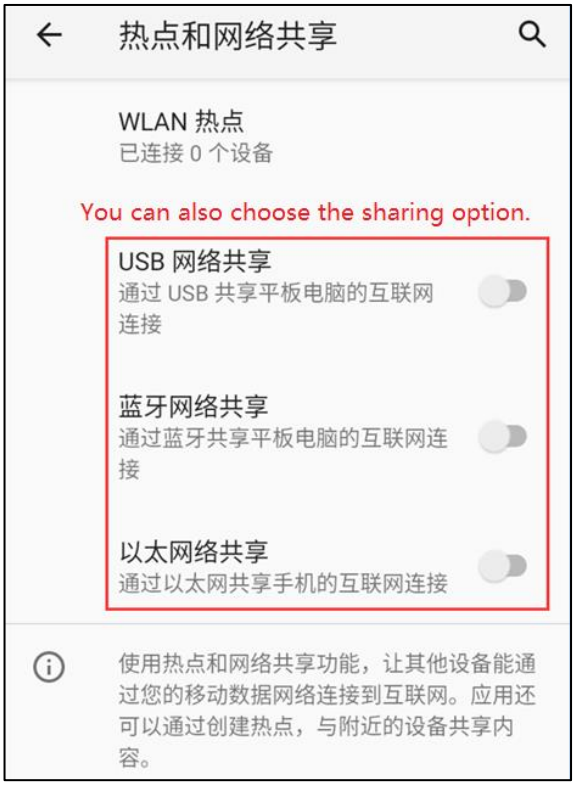
The test results are for reference only, as the actual test results can be affected by various factors:

- 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.

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 3.13-4 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 supported by the RTL8852BS WiFi & Bluetooth dual-module onboard the ATK-DLRK3568 development board. Open the "Settings" app and find "Connected Devices" to perform the Bluetooth test:

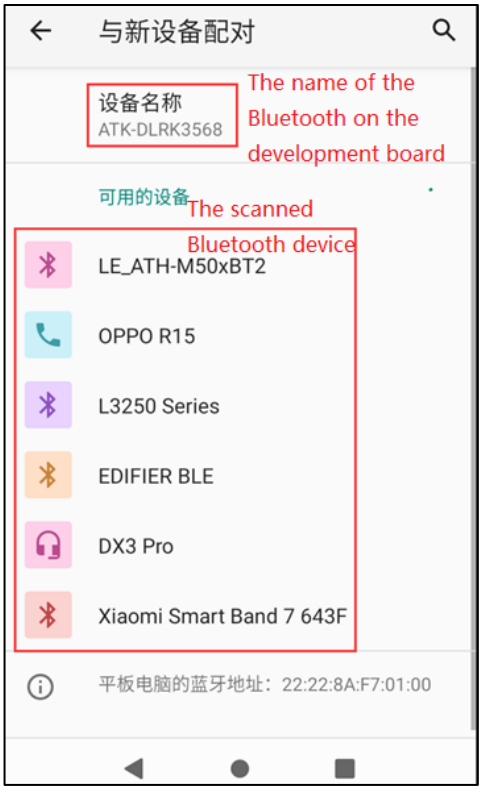
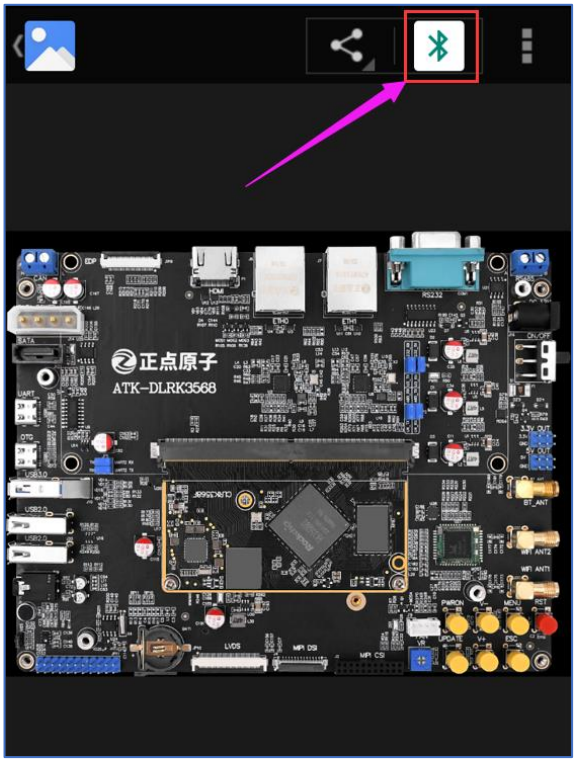


Figure 3.14-1 Scan the surrounding Bluetooth devices

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-DLRK3568 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).

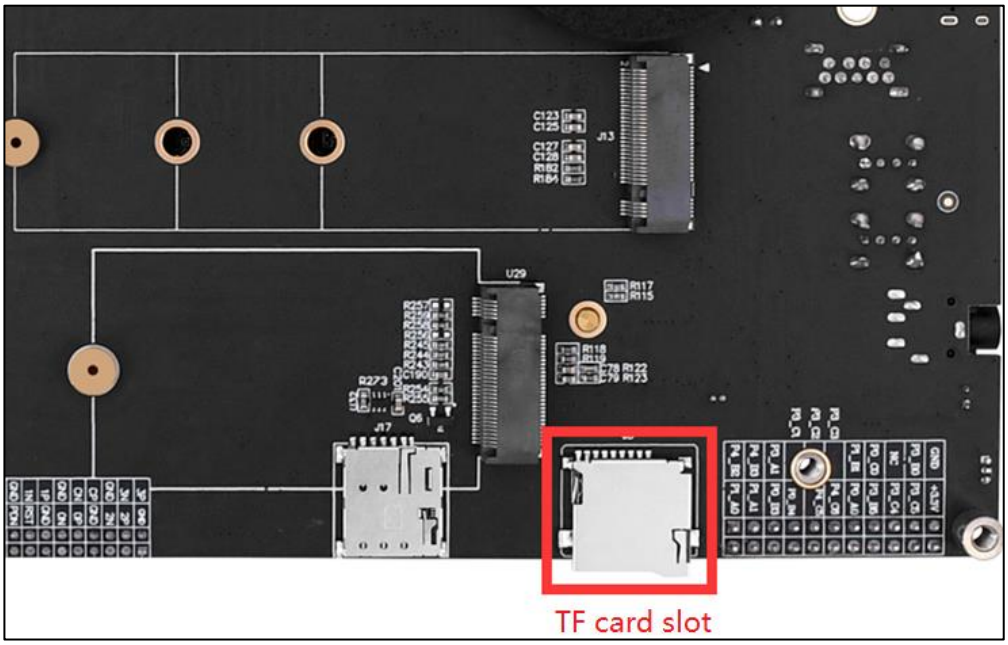
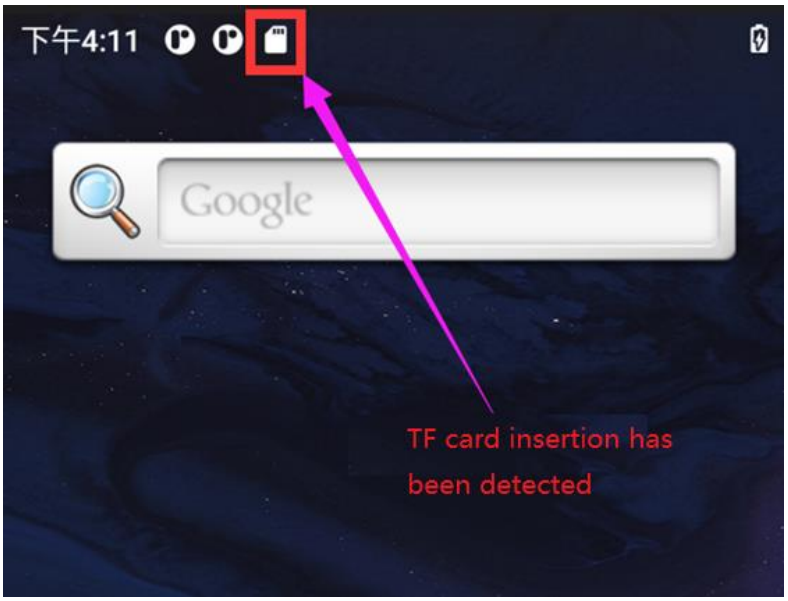


Figure 3.15-1 The TF card slot on the back of the base plate

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

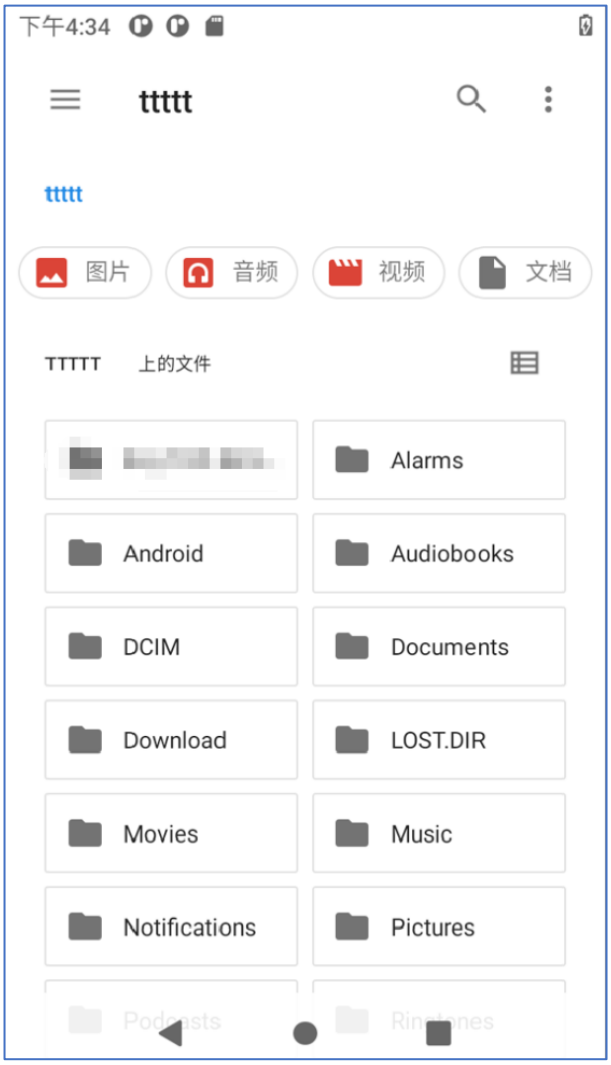


Figure 3.15-2 View the contents on the TF card

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-DLRK3568 development board is equipped with a variable potentiometer, which is connected to ADC channel 3 of RK3568 (with 10-bit accuracy and a reference voltage of 1.8V). This can be used for ADC acquisition experiments:

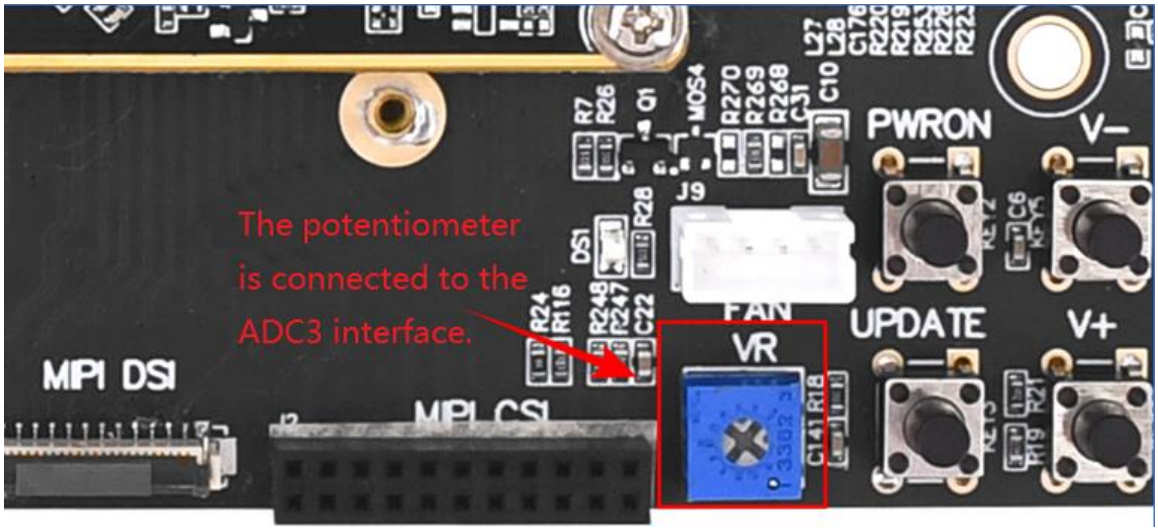


Figure 3.16-1 Adjustable potentiometer

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_voltage3_raw          # Read ADC channel 3
```

```
console:/ #
console:/ #
console:/ # cat /sys/bus/iio/devices/iio\:device0/in_voltage3_raw
475
console:/ #
```

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 (10 bits), raw represents the original data collected by ADC, and Vresult represents the converted voltage value.

Vresult = (1800mv * 475) /1023 = 835.78mv

The voltage value collected this time can be calculated using the formula and is approximately 0.835V.

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
```

```
console:/ #
console:/ # cat /sys/class/thermal/thermal_zone0/temp
37222
console:/ # cat /sys/class/thermal/thermal_zone1/temp
35555
console:/ #
```

37222 represents 37.222 degrees Celsius.

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
```

```
console:/ #
console:/ # cat /sys/devices/system/cpu/cpu*/cpufreq/cpuinfo_cur_freq
1416000
1416000
1416000
1416000
console:/ #
```

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

The RK3568 is a quad-core processor, so here you will see the current operating frequencies of the four CPU cores.

3.19 Infrared module test

On the base board of the ATK-DLRK3568 development board, an infrared receiving module is installed, which can be used to receive infrared signals, such as those from infrared remote controls, etc.

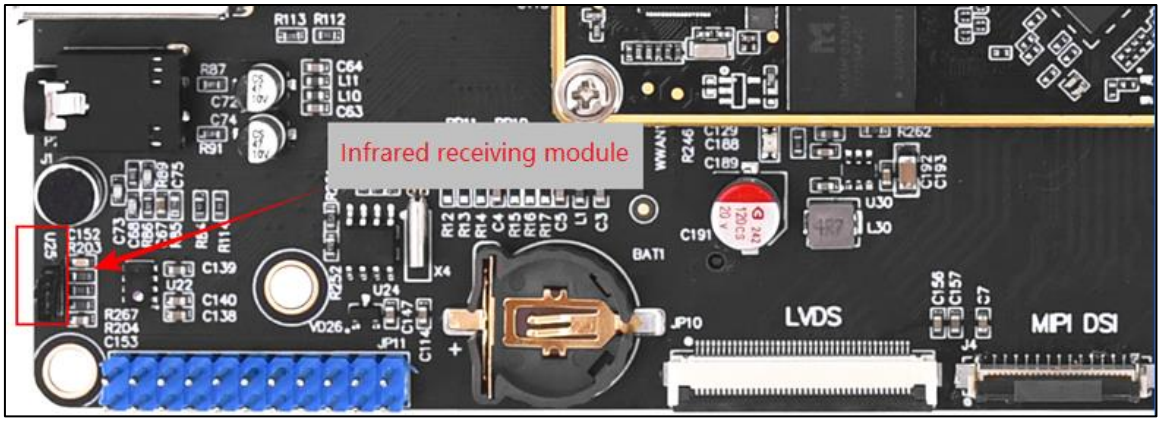


Figure 3.19-1 Infrared receiver

We need to prepare an infrared remote control, such as the infrared remote control module sold by ALIENTEK Store, as shown in the following picture:

Figure 3.19-2 ALIENTEK Infrared Remote Control Module

It should be noted that the Android 11/12 system images provided by ALIENTEK only support the infrared remote control modules sold by ALIENTEK stores. For other infrared remote controls and Android systems, they may not respond. It is necessary to add corresponding key-value pairs in the kernel device tree to be able to use them in the Android system.

When we press the VOL- button on the ALIENTEK infrared remote control, the volume will decrease, and when we press the VOL+ button, the volume will increase. You can test it yourself.

For other infrared remote controls (such as the infrared remote control of a TV, the infrared remote control of an air conditioner, etc.), we can also test them using the serial port terminal. First, execute the following command to open the debugging switch (you need to switch to the root user, "su root"):

```
echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

Then, press any button on the remote control, and the serial port terminal will print out the corresponding key value, as shown in the following figure:

```
console:/ #
console:/ # [ 5667.867399] USERCODE=0xff00
[ 5667.894448] RMC_GETDATA=e9
[ 5668.885356] USERCODE=0xff00
[ 5668.912490] RMC_GETDATA=e6
[ 5669.365878] USERCODE=0xff00
[ 5669.393048] RMC_GETDATA=e6
[ 5670.059945] USERCODE=0xff00
[ 5670.087048] RMC_GETDATA=e7
[ 5670.537104] USERCODE=0xff00
[ 5670.564267] RMC_GETDATA=e7
[ 5671.109331] USERCODE=0xff00
[ 5671.136466] RMC_GETDATA=e3
[ 5672.328411] USERCODE=0xff00
[ 5672.355541] RMC_GETDATA=a1
[ 5672.796520] USERCODE=0xff00
[ 5672.823658] RMC_GETDATA=a1
[ 5673.671927] USERCODE=0xff00
[ 5673.699059] RMC_GETDATA=f6
[ 5674.414863] USERCODE=0xff00
[ 5674.442028] RMC_GETDATA=ea
[ 5674.959419] USERCODE=0xff00
[ 5674.986551] RMC_GETDATA=f8
[ 5675.257681] USERCODE=0xff00
[ 5675.284799] RMC_GETDATA=f8
```

USERCODE is used to identify the type of remote control, and RMC_GETDATA indicates the key value.

3.20 Light environment sensor test

An onboard light environment sensor AP3216C is installed on the base board of the ATK-DLRK3568 development board. It can be used to detect the surrounding light intensity, proximity distance and infrared intensity. The AP3216C is a three-in-one environmental sensor that supports the detection of three environmental parameters: ambient light intensity (ALS), proximity distance (PS), and infrared intensity (IR). The features of the AP3216C are as follows:

①, The I2C interface allows a baud rate of up to 400Kbit/S in fast mode.

②, Multiple working modes are available: ALS, PS + IR, ALS + PS + IR, PD, etc.

③, Built-in temperature compensation circuit.

④, Wide operating temperature range (-30° C to +80° C).

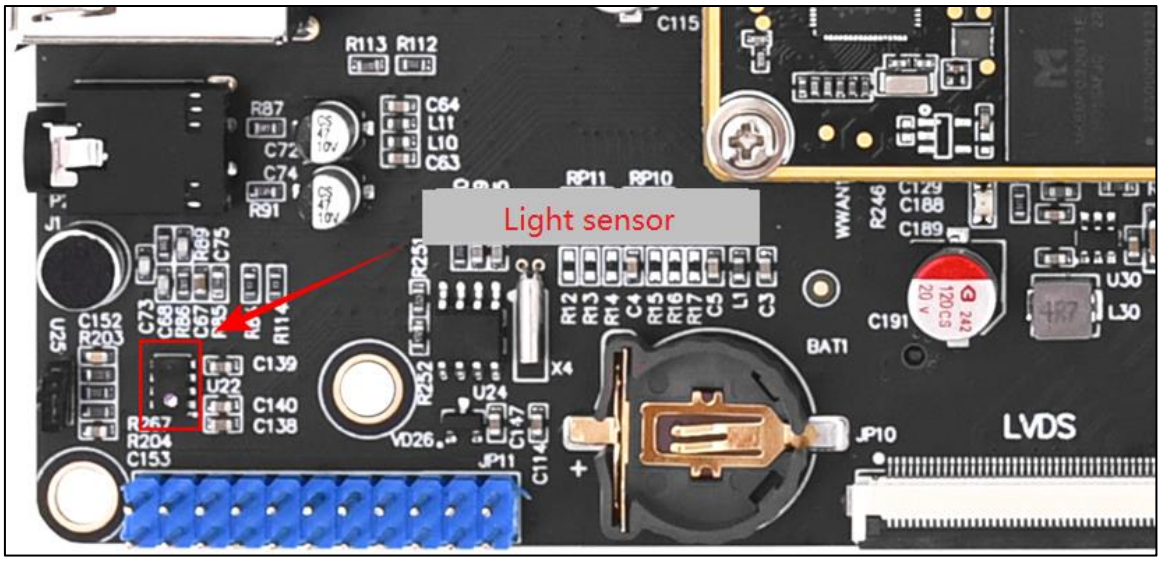
⑤, Ultra-small package, 4.1mm x 2.4mm x 1.35mm.

⑥, The ambient light sensor has a 16-bit resolution.

⑦, The proximity sensor and infrared sensor have a 10-bit resolution.

The AP3216C is commonly used in mobile phones, tablets, navigation devices, etc. Its built-in proximity sensor can be used to detect whether there is an object approaching. For example, on a mobile phone, it is used to detect whether the ear is touching the earpiece. If it detects that a call is in progress, the phone will automatically turn off the screen to save power. It can also use the ambient light sensor to detect the light intensity to achieve automatic adjustment of the backlight brightness.

The position of the sensor is shown in the following figure:



3.20.1 Light intensity test

Further update!

3.20.2 Close-range Test

Further update!

3.21 Serial port test

The ALIENTEK ATK-DLRK3568 development board is equipped with 3 serial ports, including the debugging serial port, RS232 and RS485, as shown in the following figure:

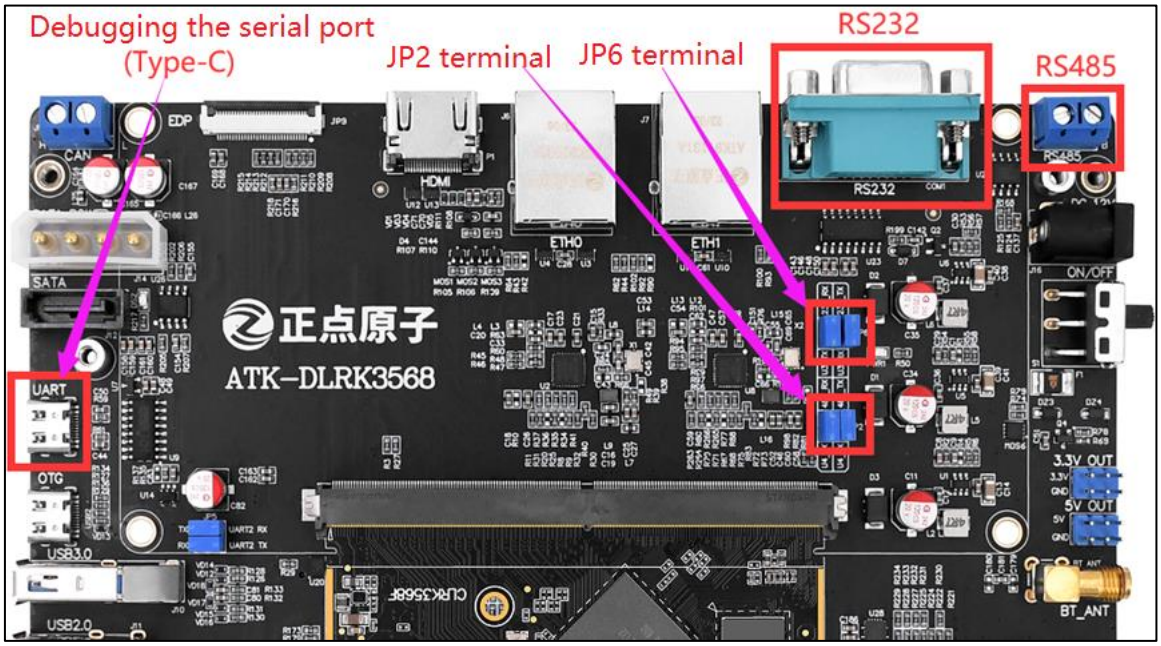


Figure 3.21-1 The distribution diagram of the serial ports on the development board

It should be noted that when using the RS232 serial port, the two jumper caps at the JP6 terminal need to be properly connected (these will be connected by default when the development board is manufactured); when using the RS485 serial port, the two jumper caps at the JP2 terminal need to be properly connected (these will also be connected by default when the development board is manufactured). Before testing, please check whether the jumper caps at these two locations are properly connected.

3.21.1 Serial port debugging test

The serial port terminal used to execute commands was connected to the debugging serial port of the development board, using a USB Type-C 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, connected through a standard DB9 interface (female head) to an external serial port. First, prepare a USB-to-RS232 serial port cable (the USB-to-RS232 serial port cable is not an accessory for the ATK-DLRK3568 development board, please users to prepare it by themselves):

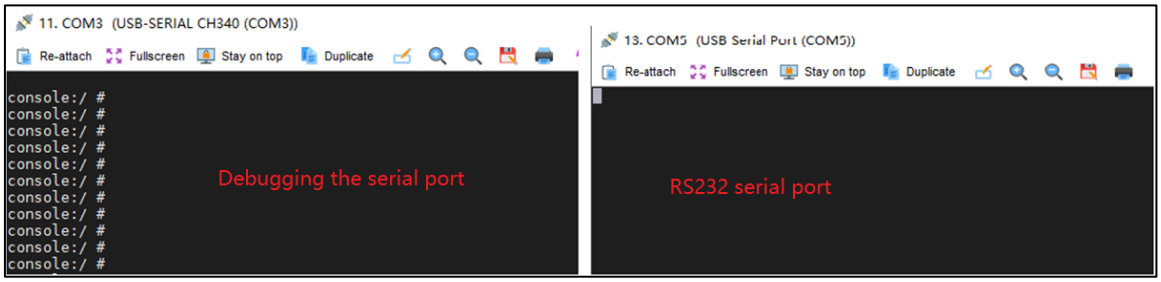
Figure 3.21-2 USB to RS232 Serial Cable

Using the USB to RS232 serial cable, connect the RS232 interface of the development board to the USB interface of the computer. Then, in the Android system serial terminal, execute the following command 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 another 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:

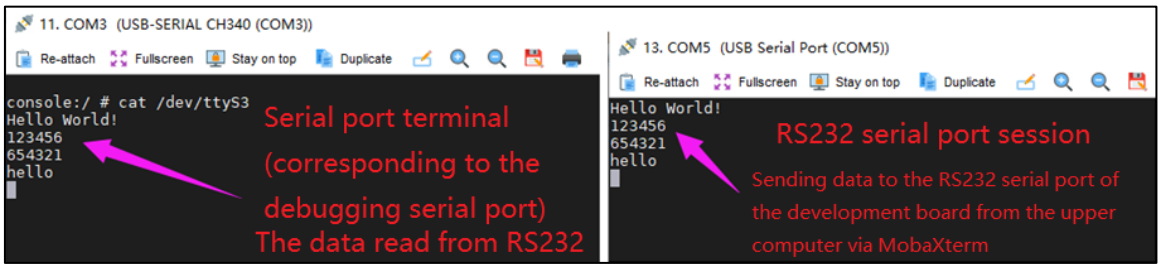


Figure 3.21-3 RS232 serial port data reception test (computer→development board)

Test ②: Development board→Computer host (The development board sends data, and 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
```

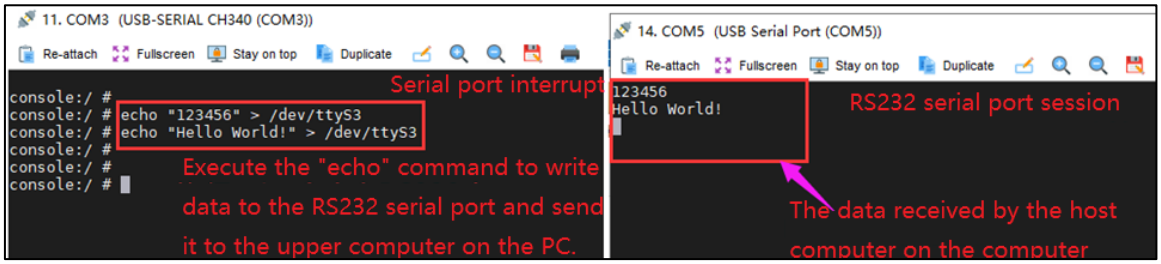


Figure 3.21-4 RS232 Serial Port Data Transmission Test (Development Board→Computer)

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 serial port. This module is available for purchase in the ALIENTEK store. Of course, other tools for testing 485 can also be used for testing.

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

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

3.22 CAN test

Starting from version 1.2, the can-utils tool is supported. For specific testing methods, please refer to the document: Development Board CD-ROM A Disk - Basic Materials→10_user_manual→01, Test Documents→01 [ALIENTEK] ATK-DLRK3568_Buildroot System Quick Experience 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 testing.

3.23 SATA Hard Disk Test

There is a SATA hard disk interface on the base board of the ATK-DLRK3568 development board, which can be used to connect SATA hard disks. As shown in the figure below:

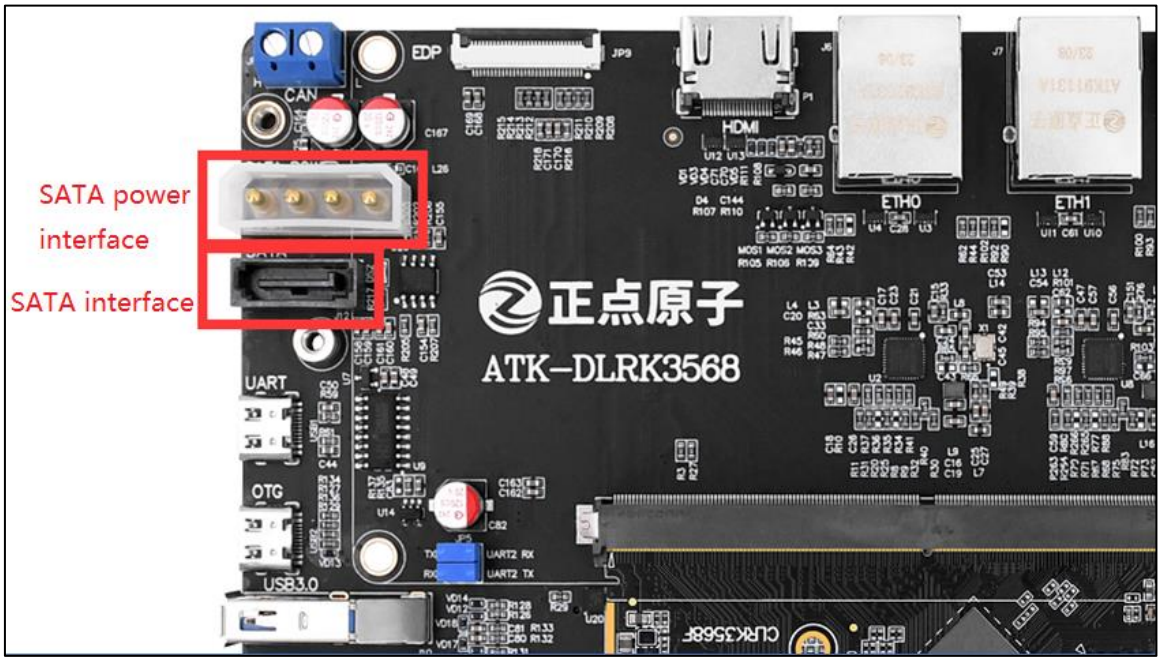


Figure 3.23-1 SATA hard drive interface

SATA hard drives support hot plugging and can be connected to the system while the Android system is running. First, before testing, connect the SATA hard drive to the SATA interface of the development board, including the SATA data interface and the SATA power interface. Please let the user connect it themselves. In this test, the author used a 500GB SATA hard drive, as shown in the following picture:

Figure 3.23-2 Test SATA hard drive

After the SATA hard drive is successfully connected, the red indicator light at the SATA interface on the base board will light up (when data is accessed by the SATA hard drive), and a icon will appear at the top of the Android system interface.

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.

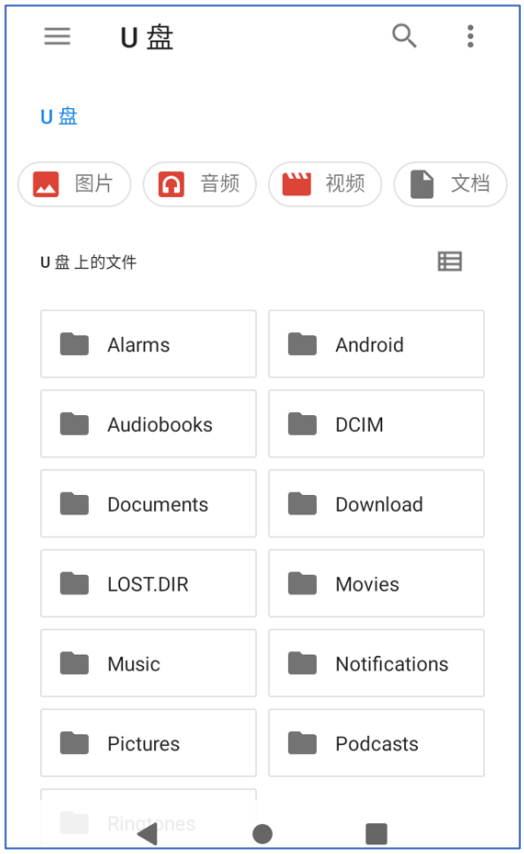
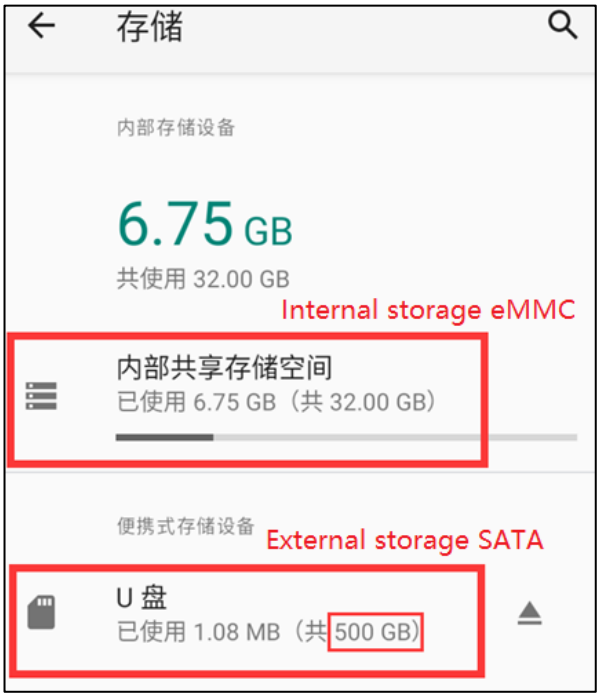


Figure 3.23-3 View the contents of the SATA hard drive

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-DLRK3568 development board, there is a PCIE M.2 hard drive interface (of the M.2 B-Key type), which can be connected to common 2280 M.2 hard drives, as shown in the following figure:

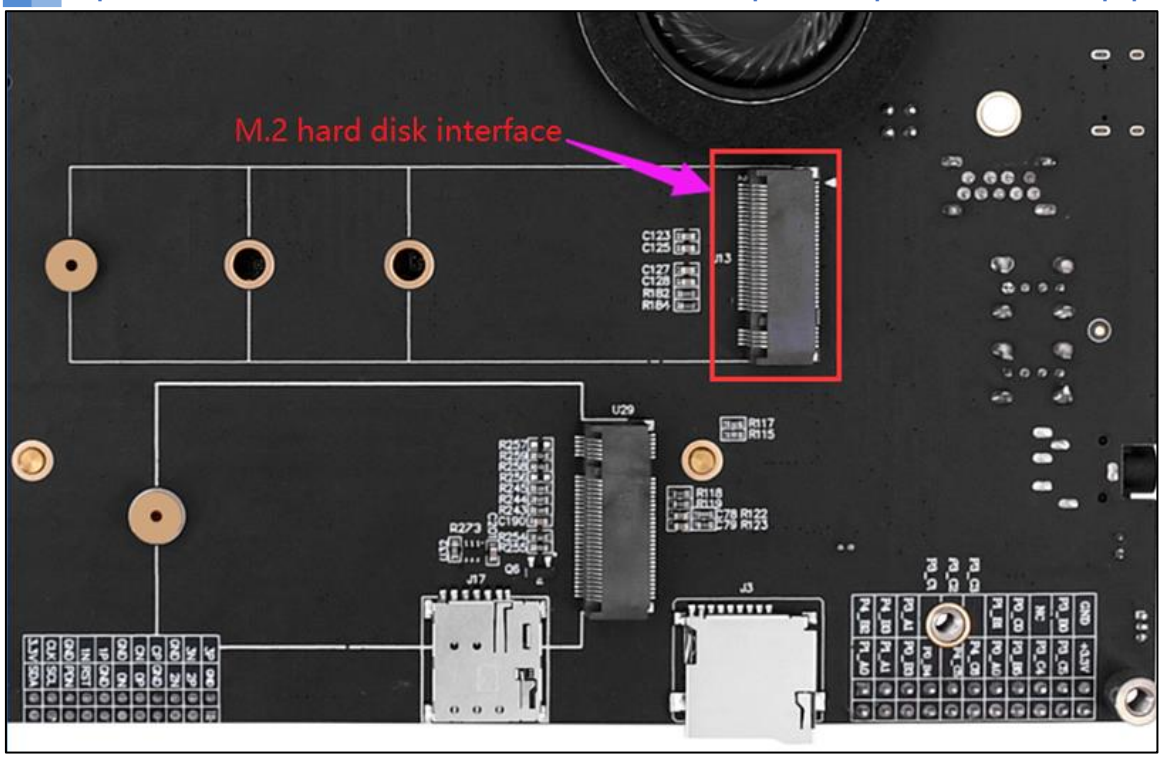


Figure 3.24-1 PCIe M.2 hard disk interface

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:

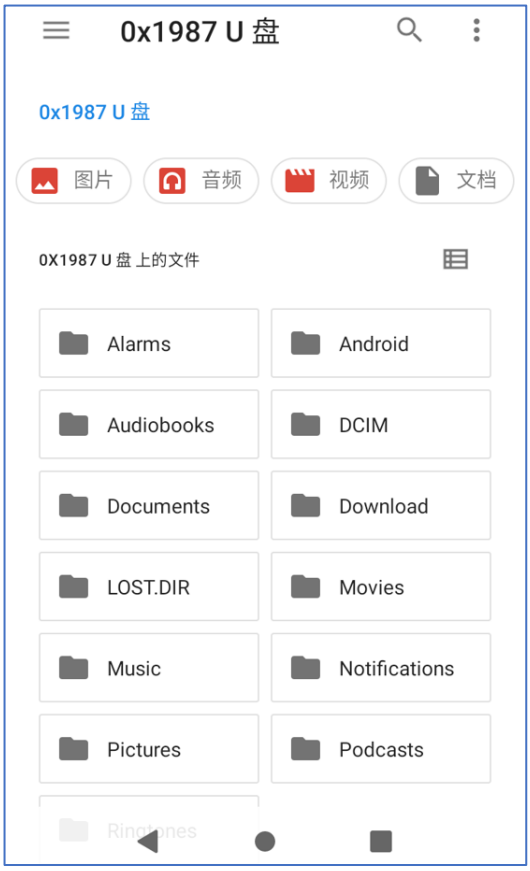
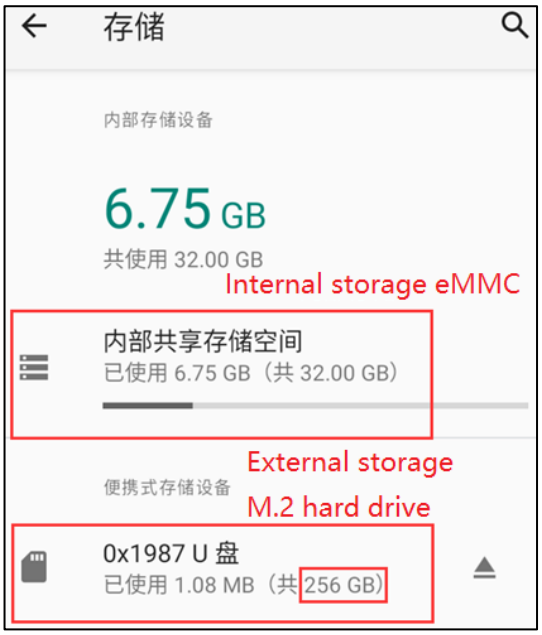


Figure 3.24-3 View the contents of the M.2 hard drive

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 Test

To test the HDMI interface, an Android 11 image that supports HDMI displays needs to be burned.

On the bottom board of the ATK-DLRK3568 development board, there is an HDMI output interface, which can be used to connect an HDMI display, as shown in the following figure:

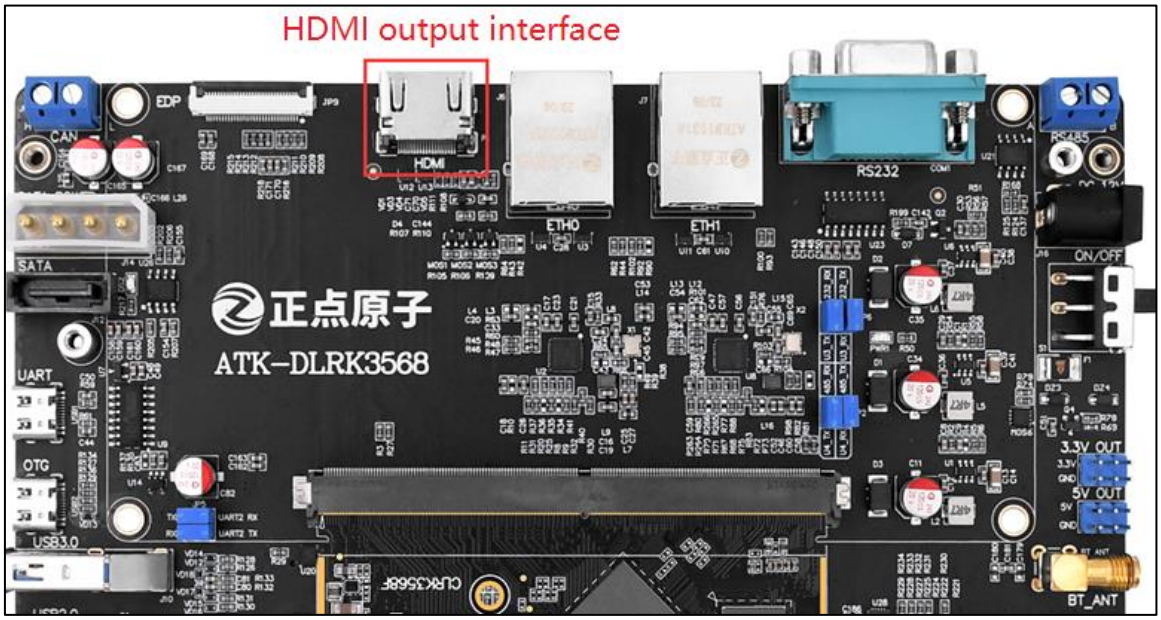


Figure 3.25-1 HDMI output interface

Connect the HDMI display to the HDMI output interface of the development board via an HDMI cable, burn an Android 11 image that supports HDMI display onto the development board, and start the development board.

During the Android system startup process, the HDMI display will show the startup logo and the Android startup animation.

Open the "Settings" app, find "Display"→"Advanced"→"HDMI"→"Resolution Settings", 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:

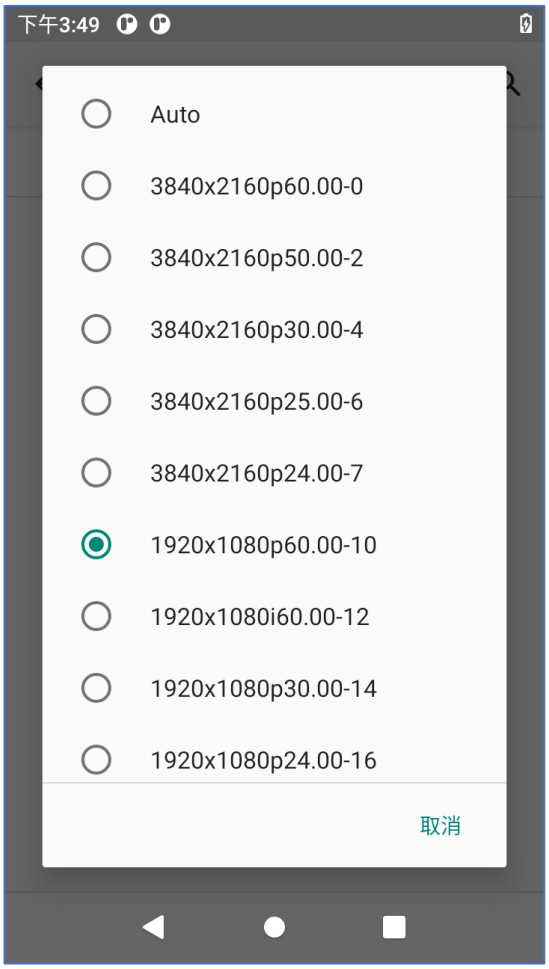


Figure 3.25-2 Set the resolution of the HDMI display

HDMI audio test: If the HDMI display connected by the user supports audio function, an HDMI audio test can also be conducted. When connected to the HDMI display, play music. The sound will default to be output from the built-in speaker of the HDMI display (do not connect headphones first). Please conduct the test yourself.

3.26 4G/5G Module Testing

On the bottom plate (back side) of the ATK-DLRK3568 development board, there is a 4G/5G module interface with an M_Key slot (on the back side of the bottom plate), which can be used to connect a 4G or 5G module, and it also provides a Nano SIM card slot. As shown in the following picture:

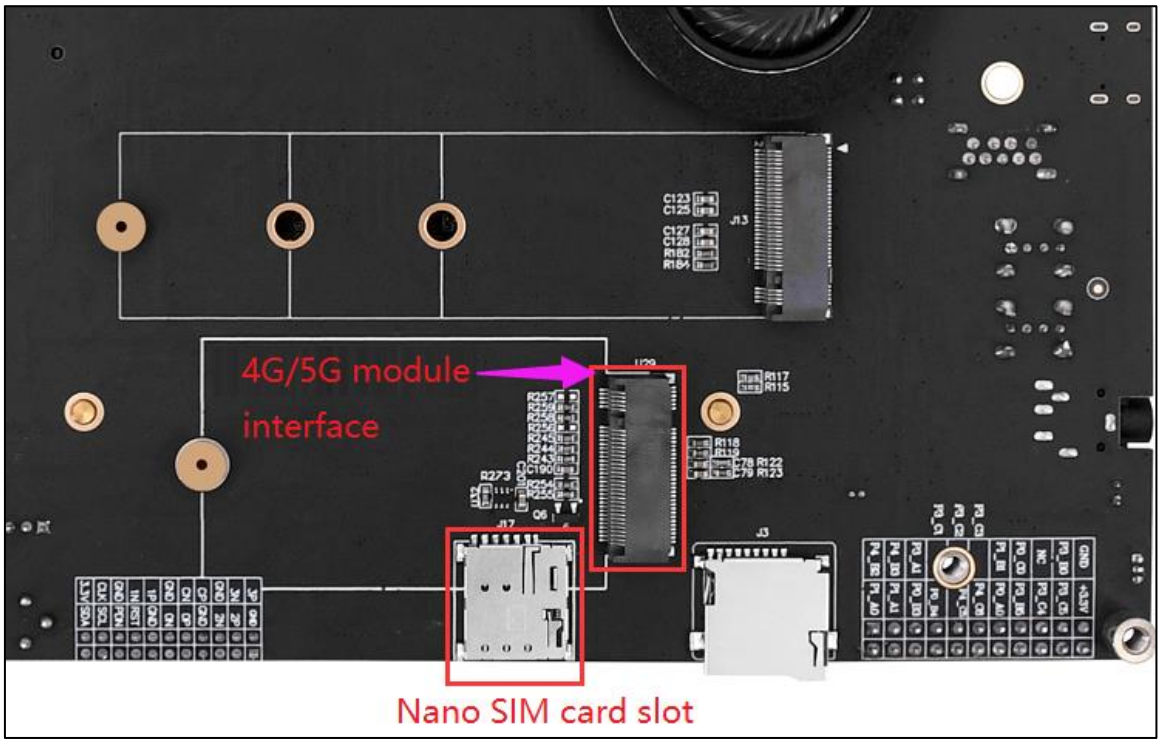


Figure 3.26-14G/4G module interface and SIM card slot

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 RK3568.

Currently, the Android 11 image provided by ALIENTEK only supports the Quectel 5G module RM500U-CN (all-network compatible) and the Quectel 4G module EM05-CE (all-network compatible). Users can purchase these two models directly from the Quectel official store.

Before the test, the development board was powered off first. Then, the 4G or 5G module was inserted into the 4G/5G module slot on the bottom board of the development board, fixed with screws (note that the lengths of the 4G module and the 5G module are different; the 4G module is shorter and cannot be fixed with screws, so other methods are needed for fixation), and the antenna was connected; a SIM card with internet access capability was prepared and inserted into the Nano SIM card slot (it can also be inserted after starting the Android system). In this test, the author used the 5G module RM500U-CN, as shown in the following picture:

Figure 3.26-2 RM500U-CN

Figure 3.26-3Comparison of 4G and 5G module sizes

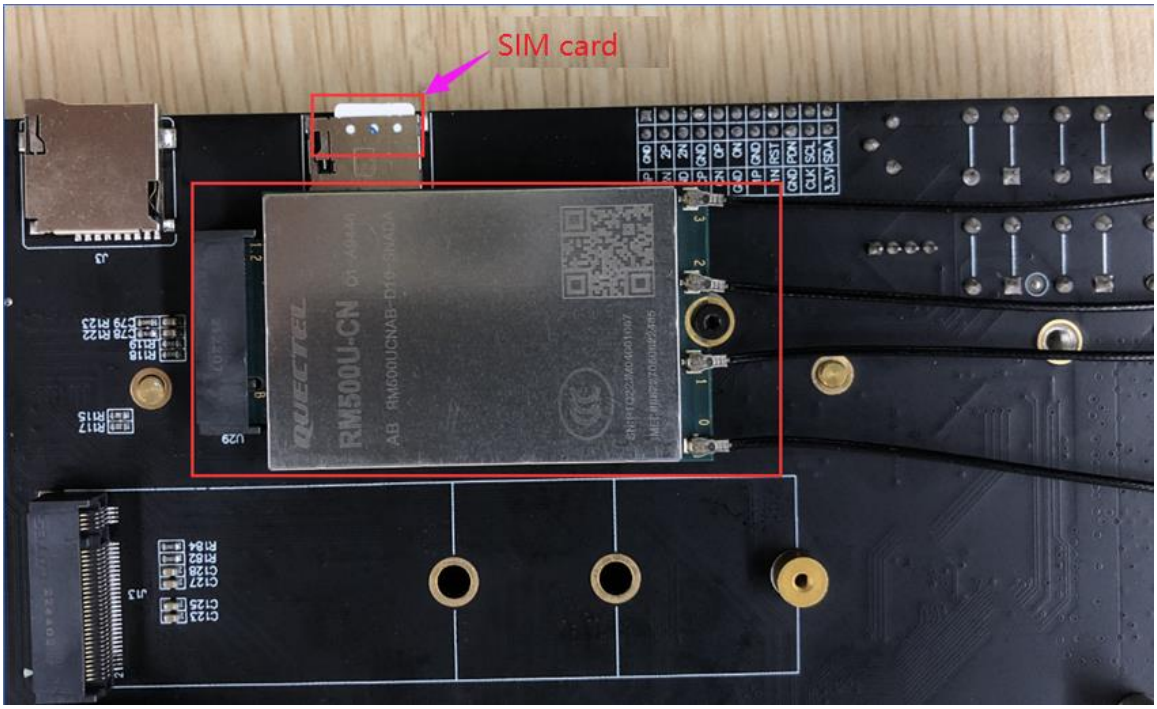


Figure 3.26-4 RM500U-CN and SIM Card Connection Diagram

After the modules are connected, then power on the development board and enter the Android system. After the Android system starts successfully, a 5G signal icon will appear on the upper right corner, as shown in the following picture:

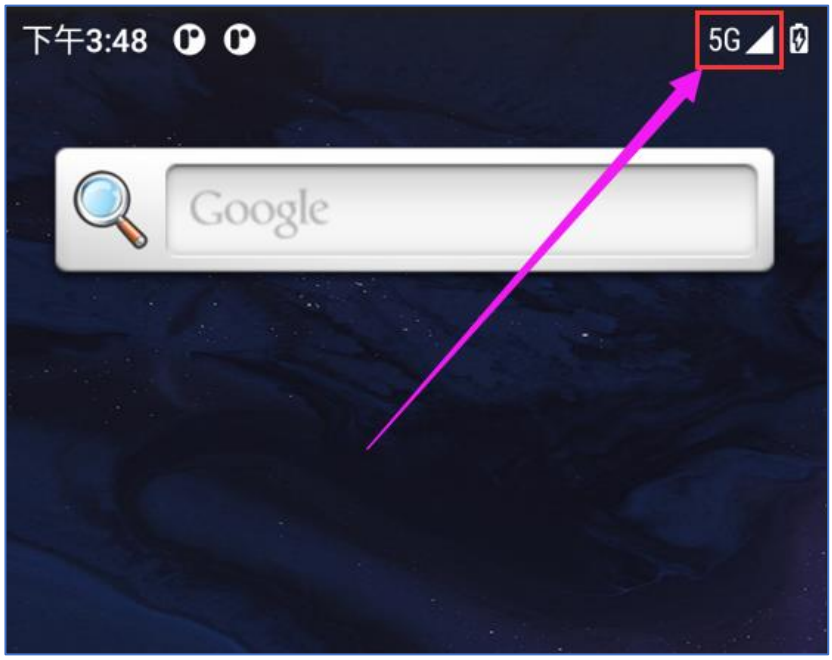


Figure 3.26-55G signal icon

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

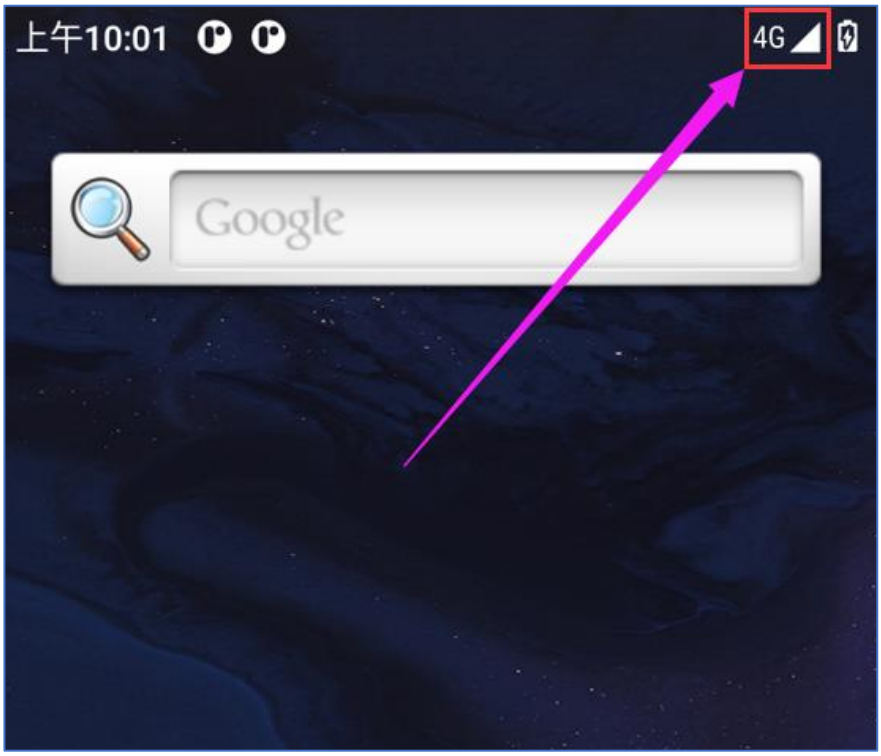


Figure 3.26-6 4G signal icon

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.

3.27 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
```

```
console:/ #
console:/ # cat /sys/kernel/debug/rknpu/load
NPU load:  0%
console:/ #
```

3.28 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.

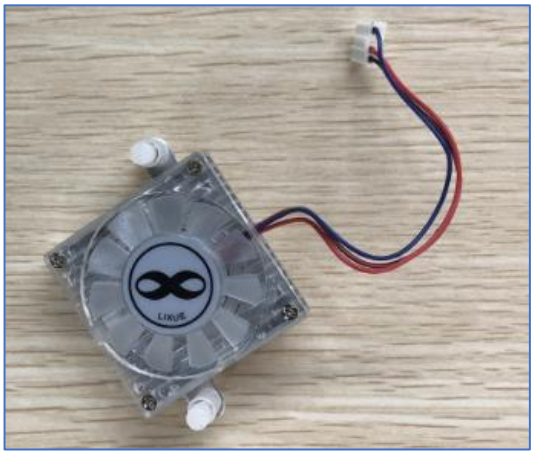


Figure 3.28-1 Fan cooling fan

Before the test, power off the development board first. Install the fan onto the core board (just align the two self-locking sockets of the fan with the two reserved holes on the core board and install them. When installing, apply thermal grease on the core board for better heat dissipation effect!) ; When disassembling the fan, you need to remove the core board from the connection socket on the base plate, and then remove the self-locking socket from the back of the core board.

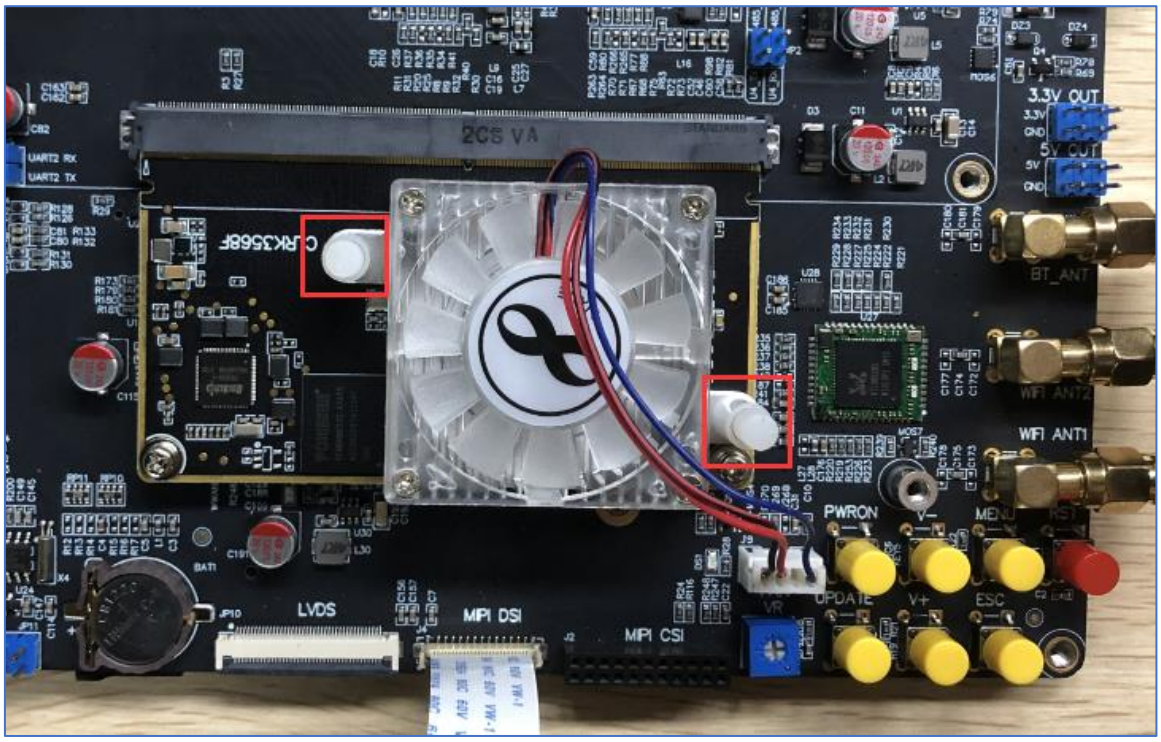


Figure 3.28-2 Fan Installation Diagram

After installing the fan, power on the development board. During the power-on startup process of the development board, the fan will initially rotate for a while (at this time, it is in the U-Boot stage). After entering the Linux kernel stage, the temperature control system will be initialized, and the fan, as a cooling device, will be taken over by the temperature control system, at which point the fan will stop rotating.

This is because the temperature control threshold has not been reached. The fan will only start rotating for cooling when the CPU temperature exceeds 64 degrees. The purpose of this is also to reduce the power consumption of the development board.

Generally, when we use it in a room temperature environment, the CPU temperature will not easily reach 64 degrees, so the fan will not rotate. To make the fan rotate, you need to increase the CPU load or place the development board in a high-temperature environment to make the CPU temperature exceed 64 degrees.

In fact, we can also manually start the fan. First, you need to disable the temperature control strategy and execute the following command (switch to the root user first).

```
echo disabled > /sys/class/thermal/thermal_zone0/mode
```

Check the current wind force level of the fan. By default, it is divided into 22 levels.

```
cat /sys/class/thermal/cooling_device0/cur_state
```

```
console:/ #
console:/ # echo disabled > /sys/class/thermal/thermal_zone0/mode
console:/ # cat /sys/class/thermal/cooling_device0/cur_state
0
console:/ #
```

Then set the wind force level and set the cur_state attribute to 10. The range of adjustable levels is from 0 to 22. The higher the value, the faster the fan rotates and the stronger the cooling capacity.

```
echo 10 > /sys/class/thermal/cooling_device0/cur_state
```

```
console:/ #
console:/ # echo 10 > /sys/class/thermal/cooling_device0/cur_state
console:/ # cat /sys/class/thermal/cooling_device0/cur_state
10
console:/ #
```

In practical applications, it is not recommended to disable the temperature control strategy. This experiment is only for testing whether the fan is working properly.

3.29 PWRON button test

There is a PWRON button on the bottom board of the ATK-DLRK3568 development board, as shown in the following picture:

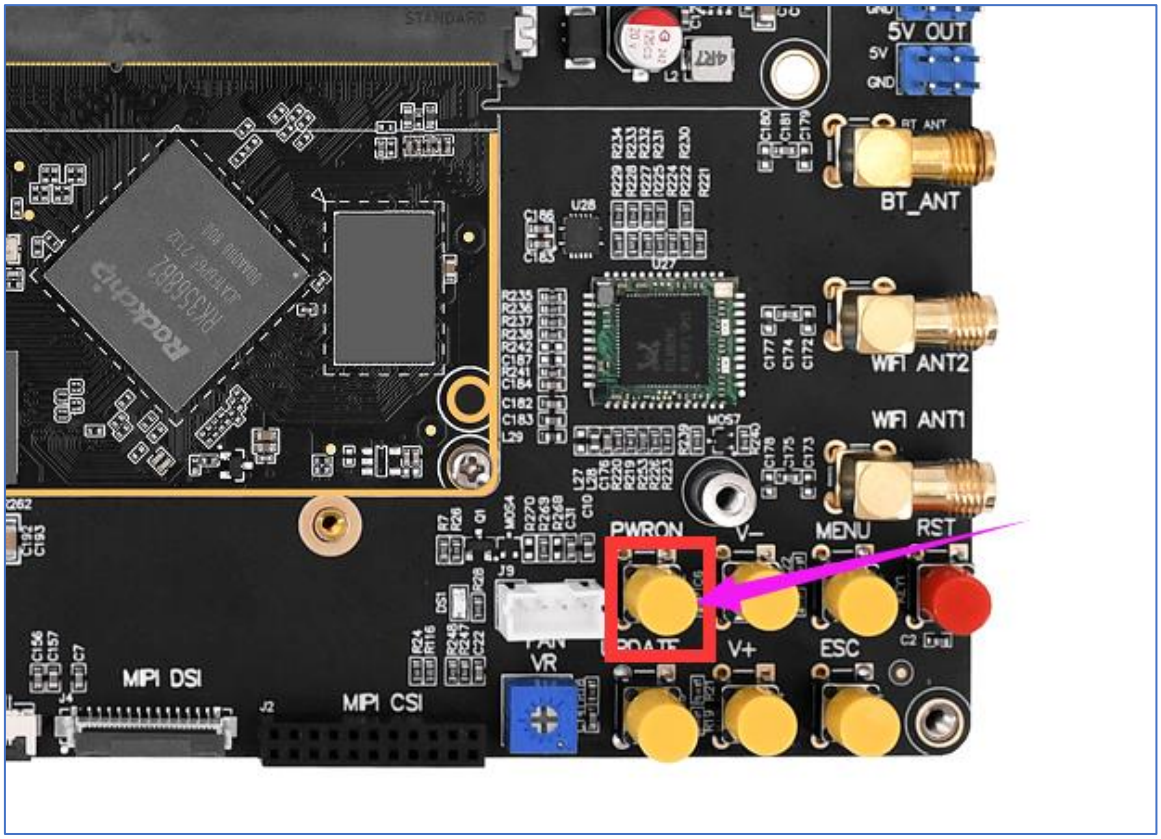
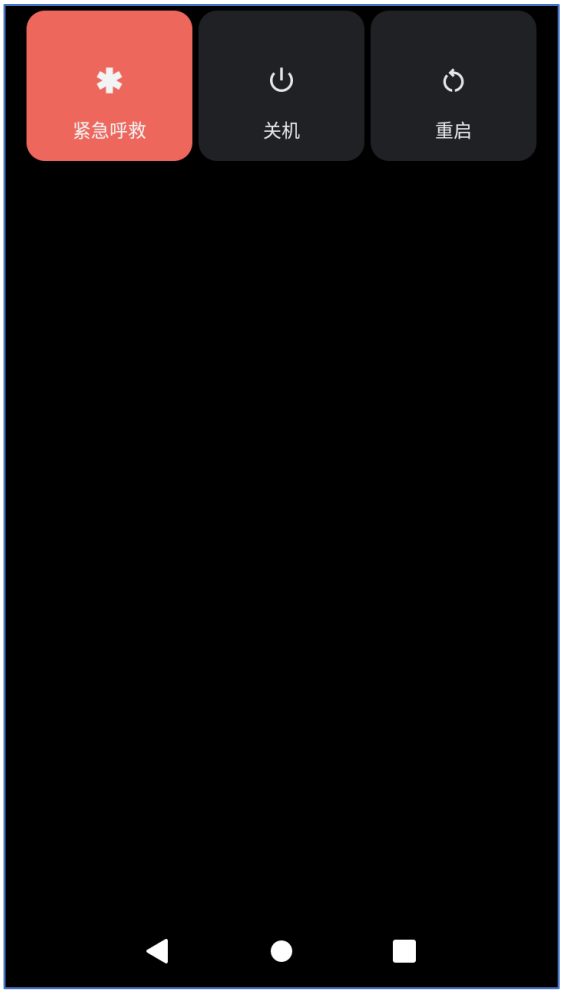


Figure 3.29-1 PWRON button

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.

Chapter 4. Android 12 System Function Testing

This chapter will introduce how to conduct function testing on the ATK-DLRK3568 development board on the Android 12 system.

Before the test, it is necessary to first burn the Android 12 system image provided by ALIENTEK. For the specific burning method, please refer to "[ALIENTEK] ATK-DLRK3568 Factory Image Burning Guide", and follow the document requirements to burn the Android 12 system image.

4.1 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 4.1-1 Boot-up logo

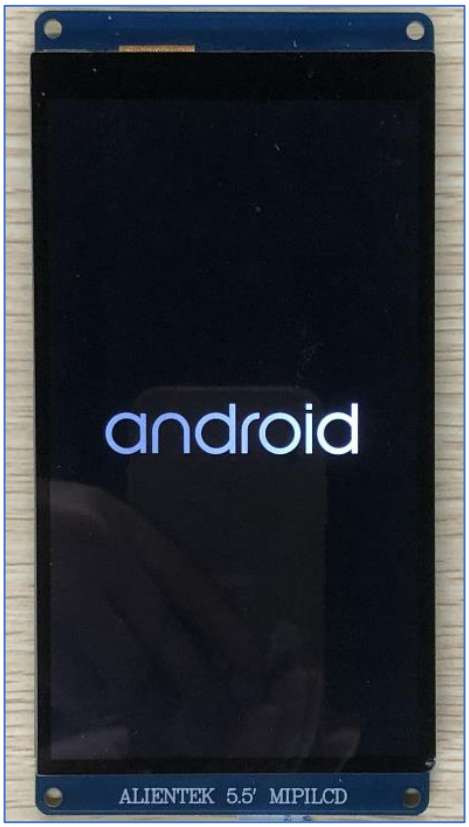


Figure 4.1-2 Android startup animation

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

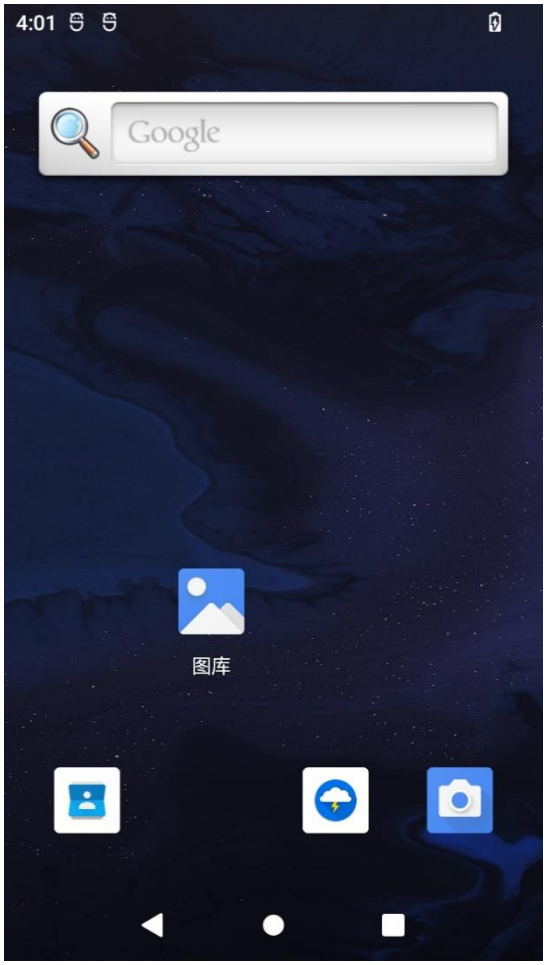
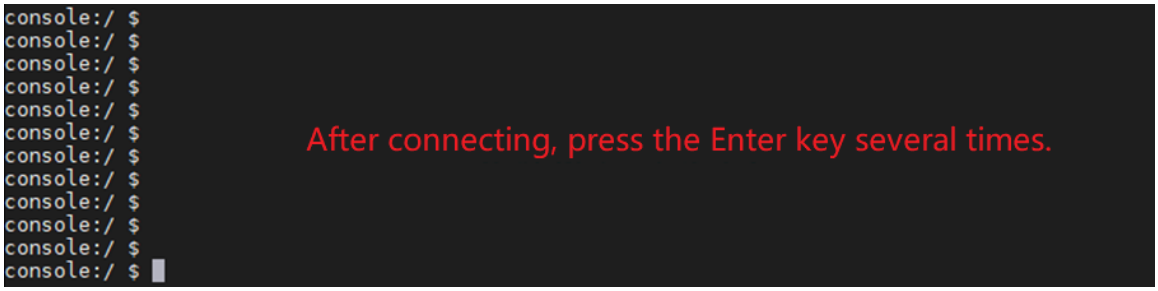


Figure 4.1-3 The main interface of Android 12 system

4.2 Connect the serial port terminal

Connect the debugging serial port (UART) of the development board to the computer using a USB Type-C cable. Open the MobaXterm software, create a Serial port session, and connect to the debugging serial port of the development board (with a baud rate set to 1500000), as shown below



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

4.3 ADB Connection

Connect the USB OTG interface of the development board to the computer using a USB Type-C cable. Open the command prompt window in Windows as shown below:

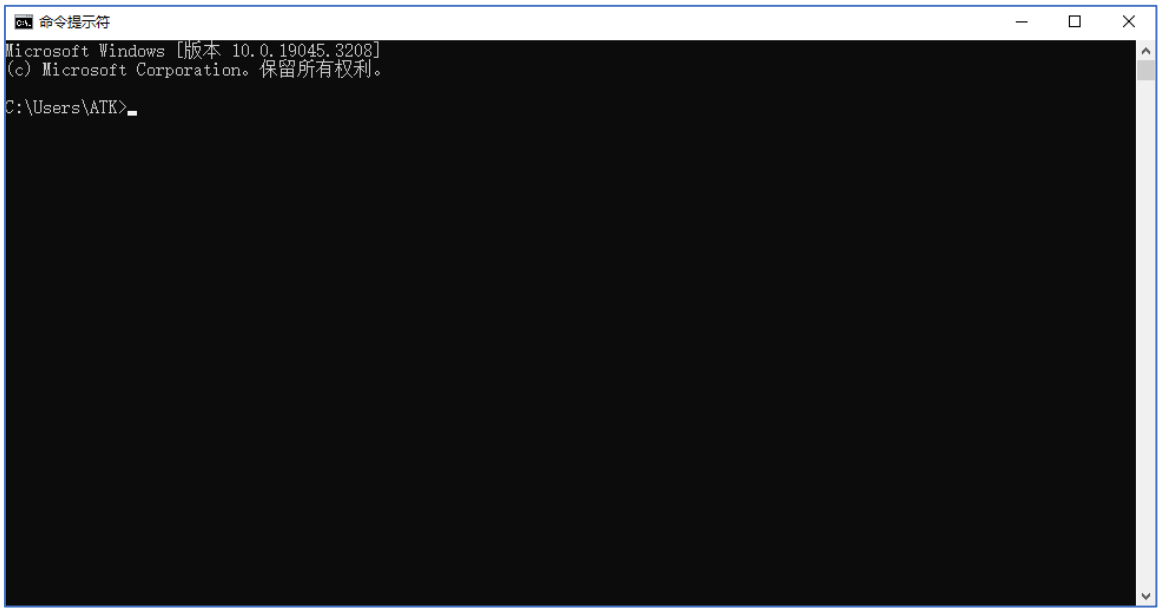


Figure 4.3-1 Windows command prompt window

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

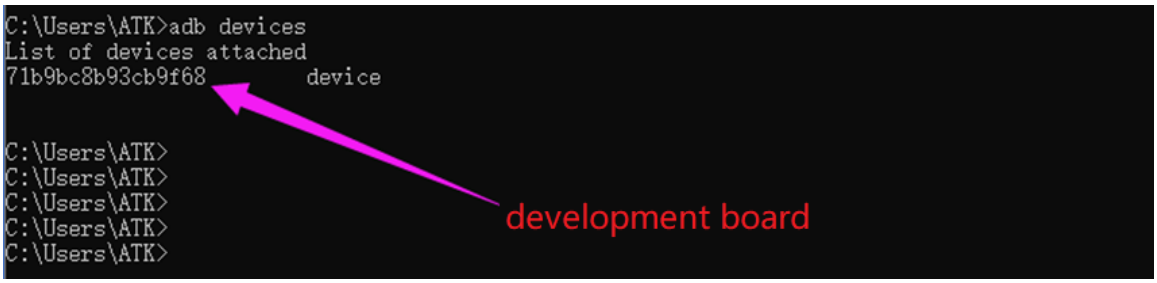


Figure 4.3-2 Check if it is connected to the development board

If the connection fails, you can try to remove the USB Type-C cable from the USB OTG interface of the development board, then reinsert it!

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

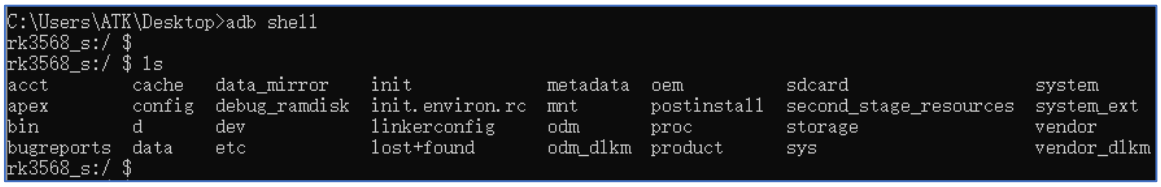


Figure 4.3-3 Run the shell of the device

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

4.4 LED Testing

The ALIENTEK ATK-DLRK3568 development board is equipped with a user LED. As shown in the following figure:

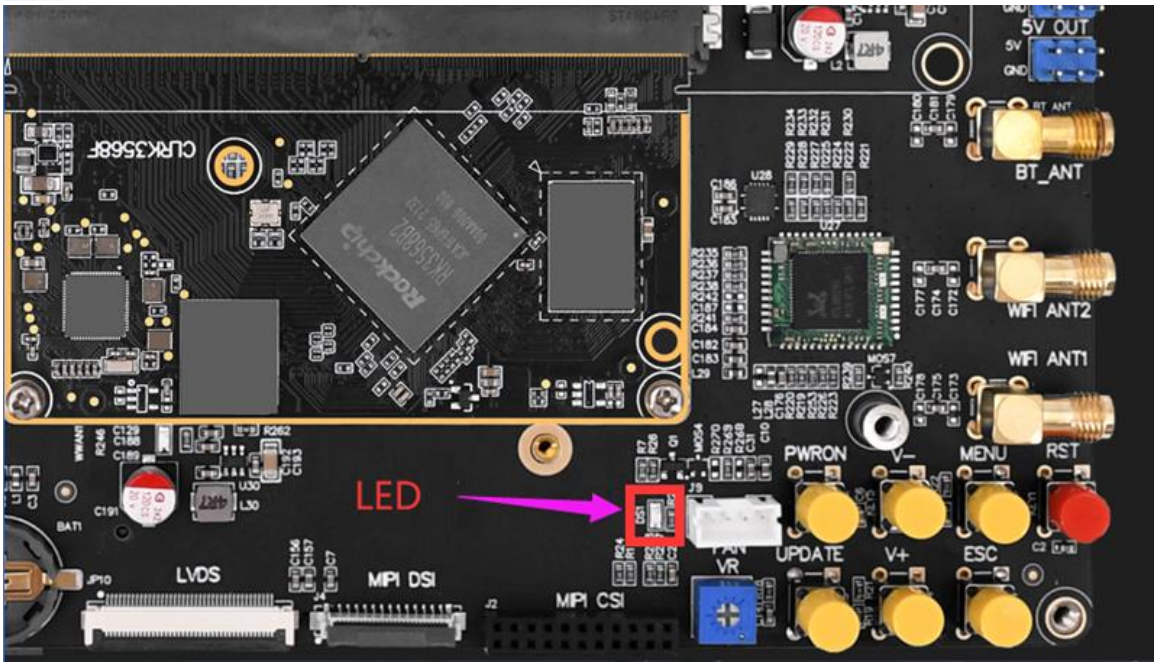


Figure 4.4-1 The distribution of LEDs on the development board

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
```

4.5 Key Test

The ALIENTEK ATK-DLRK3568 development board is equipped with 7 keys. As shown in the following figure:

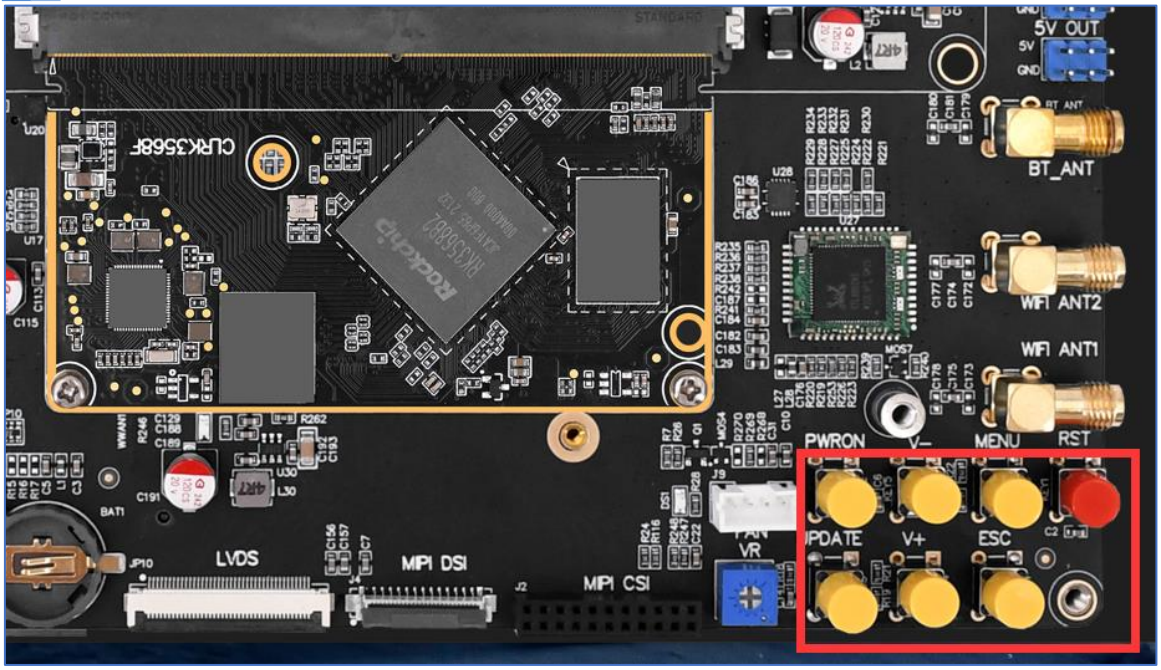


Figure 4.5-1 The distribution of buttons on the development board

There are 4 user buttons: **V-, V+, MENU, and ESC**. These 4 user buttons are analogized through ADC (ADC channel 0). 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
Value of ADC0	22	247	468	691

In the Android system, pressing the **V+** button will increase the media volume, and pressing the **V-** button will decrease it. Therefore, these two buttons can be used to adjust the volume level, as shown below:

Figure 4.5-2 Adjust volume by pressing the buttons

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

Figure 4.5-3 Press the MENU button to display the menu.

4.6 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 4.6-1 Brightness adjustment control

Move the slider to adjust the screen brightness. Please test it yourself!

4.7 RTC clock test

The ATK-DLRK3568 development board has two external RTC hardware clock units:

- Firstly, the PMIC chip RK809 on the core board is internally equipped with an RTC module;
- Secondly, a RTC clock chip PCF8563 is onboard on the bottom plate of the development board. As shown below:

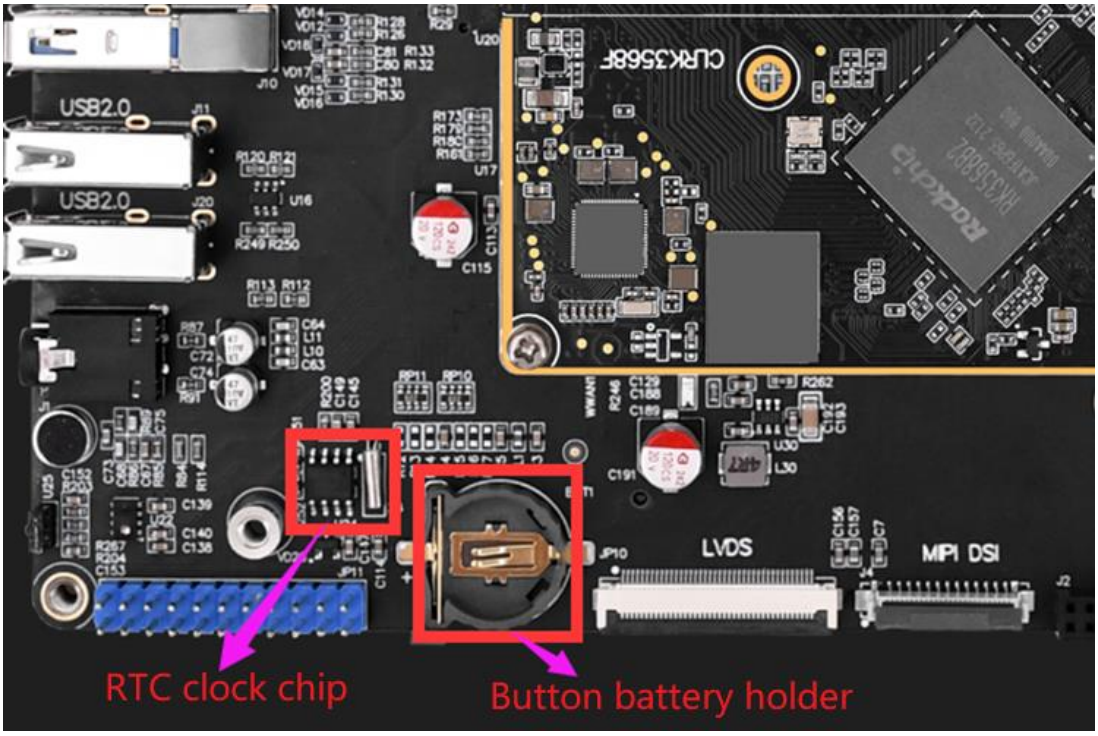


Figure 4.7-1 RTC clock chip and button battery

If you want to improve the clock accuracy, a high-precision crystal oscillator is required.

Please check if the RTC button battery is installed on the button 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).

The clock in the Android system can be divided into two types: system time (the clock of the Android system) and hardware clock. The time displayed in the upper left corner of the Android system interface is the system time. Open the "Settings" app, find "System" -> "Date and Time" to set the system time, as shown in the following figure:

Figure 4.7-2 Set system time

Usually, when connected to the network, the system time will be synchronized from the network; if there is no network connection, after the Android system starts, the system time will be synchronized from the RTC hardware clock.

The following command can also be executed in the serial port terminal (or through adb) to view the current system time:

```
date
```

```
console:/ #
console:/ # date
Mon Jul 17 16:31:27 CST 2023
console:/ #
console:/ #
```

Figure 4.7-3 Check system time

To view the RTC hardware time, execute the following command:

hwclock -f /dev/rtc0 # View the RTC hardware time (rtc0 refers to the RTC module inside the RK809)

hwclock -f /dev/rtc1 -w # Write the system time to the RTC hardware (rtc1 refers to the RTC chip PCF8563 on the baseboard)

hwclock -f /dev/rtc1 # View the RTC hardware time (PCF8563)

```
console:/ #
console:/ # hwclock -f /dev/rtc0
2023-07-20 08:47:23+0000
console:/ #
console:/ # hwclock -f /dev/rtc1 -w
console:/ #
console:/ # hwclock -f /dev/rtc1
2023-07-20 08:47:28+0000
console:/ #
```

For the pcf8563, the write operation needs to be performed first, followed by the reading of the RTC hardware time.

4.8 Audio Interface Test

The core board of the ATR-DLRK3568 development board is equipped with a PMIC (Power Management Chip) chip RK809 on it. This chip integrates an audio codec module internally, which is used to implement audio playback and recording functions.

On the baseboard, there is a headphone interface (for connecting headphones), a microphone (for recording function), and a speaker (for implementing audio output function). As shown below:

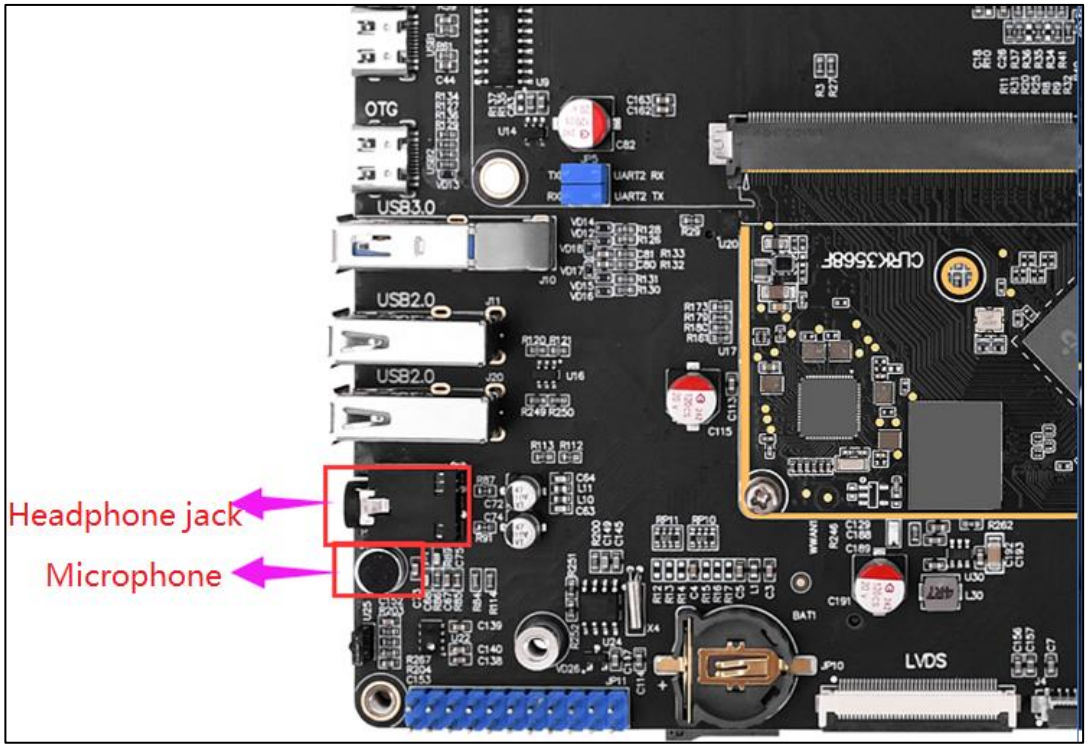


Figure 4.8-1 Headphone jack and microphone pickup

4.8.1 Audio playback test

Before conducting the test, prepare an MP3 audio file first. Open the Windows Command Prompt window, and execute the following command in the Windows Command Prompt window to push the prepared MP3 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>
```

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 4.8-2 Music App

After playing the music, the sound will be emitted from the speaker (do not insert the headphones or HDMI display at this time).

Next, test the headphone interface. First, prepare a **3.5mm** round-hole headphone and insert it into the headphone jack on the development board. At this point, the Android system will detect the insertion of the headphone, and a headphone icon will appear on the upper right corner (the headphone icon disappears when the headphone is unplugged), as shown below:

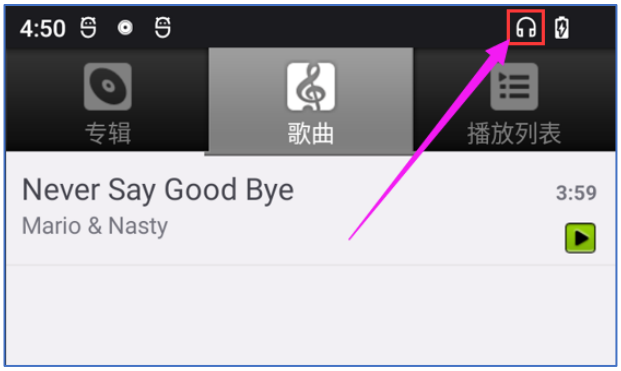


Figure 4.8-3 Headphone icon

After inserting the headphones, the sound will come from the headphones and the speaker will stop outputting; when the headphones are removed, the sound will again be output from the speaker. You can conduct the test by yourself.

4.8.2 Recording Test

Open the "Recorder" App in the Android system and conduct the recording function test as follows:

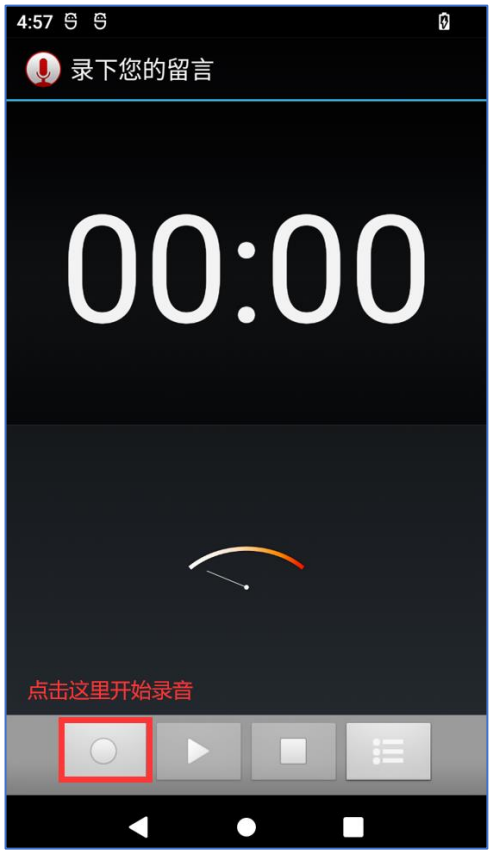


Figure 4.8-4 Audio Recorder App

4.9 Camera Test

There is a MIPI CSI camera interface on the base board of the ATK-DLRK3568 development board, supporting the IMX415 and IMX335 cameras sold by ALIENTEK Store. Later, the OV13850 camera will also be launched.

The IMX415 is an 8M pixel camera, capable of recording 4K (3840x2160) videos at maximum; the IMX335 is a 5M pixel camera, capable of recording 2K (2592x1944) videos at maximum.

Before the test, the development board is powered off first, and the camera is inserted into the MIPI CSI interface on the base board. The installation method is as 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!

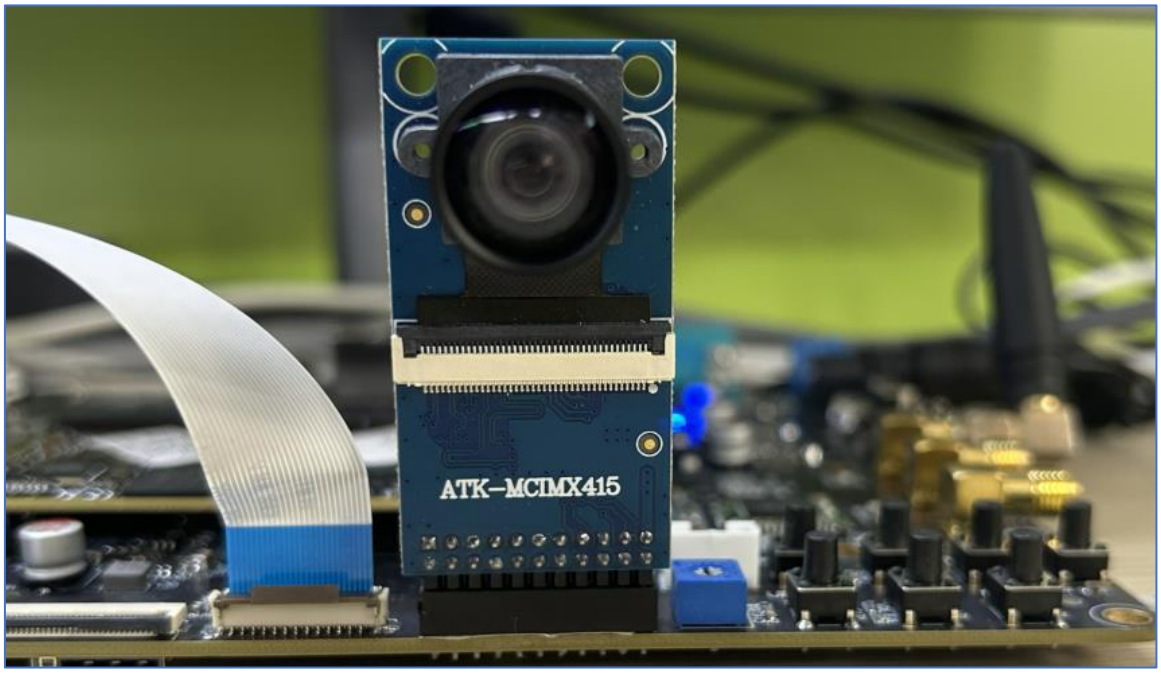


Figure 4.9-1 Camera Installation Example Diagram

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

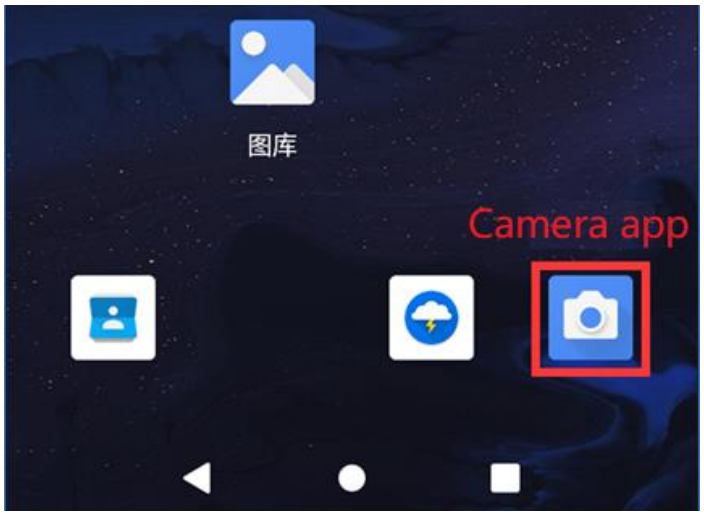
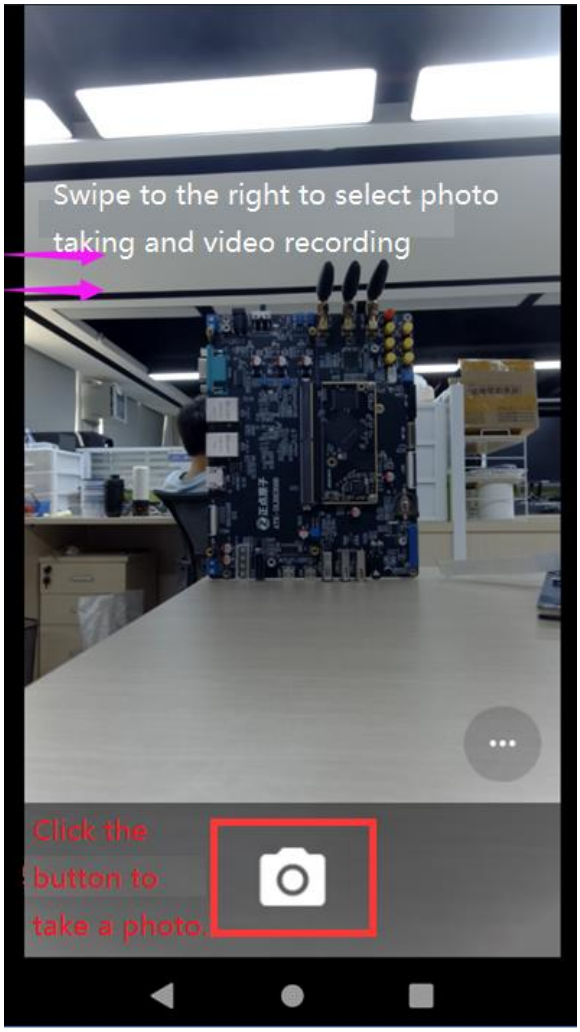
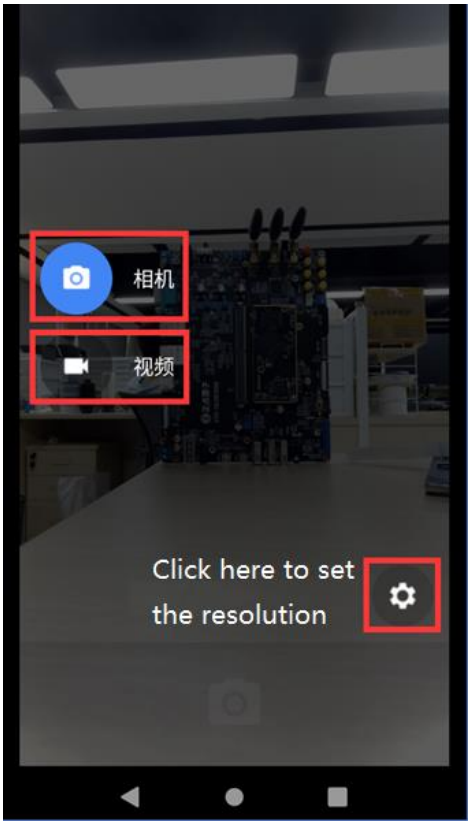


Figure 4.9-2 Camera App icon


Swipe to the right to select photo
taking and video recording
Click the
button to
take a photo.



4.10 Six-axis sensor test

An onboard six-axis sensor SH3001 was installed on the base board of the ATK-DLRK3568 development board. Brief introduction of SH3001:

SH3001 is a six-axis IMU (Inertial Measurement Unit) inertial measurement unit. Inside SH3001, there are integrated three-axis gyroscope and three-axis accelerometer. It is small in size, has low power consumption, and is suitable for applications in the consumer electronics market. It can provide high-precision real-time angular velocity and linear acceleration data. SH3001 has excellent temperature

stability and can maintain high resolution within the operating range of -40°C to 85°C. Application scenarios: smartphone games, optical image stabilization; smart watches, fitness bands - posture detection, positioning and navigation; TWS headphones - posture detection, 3D sound effect; automatic counting and motion trajectory recording for smart sports equipment such as rope skipping, pull rope, abdominal wheel, etc.; smart electric toothbrush, smart water cup - posture detection; attitude control of twisty vehicles; combined navigation for intelligent farming, cleaning robots; platform stability and attitude measurement in intelligent industrial applications.

- Technical Specifications 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 Measurement 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

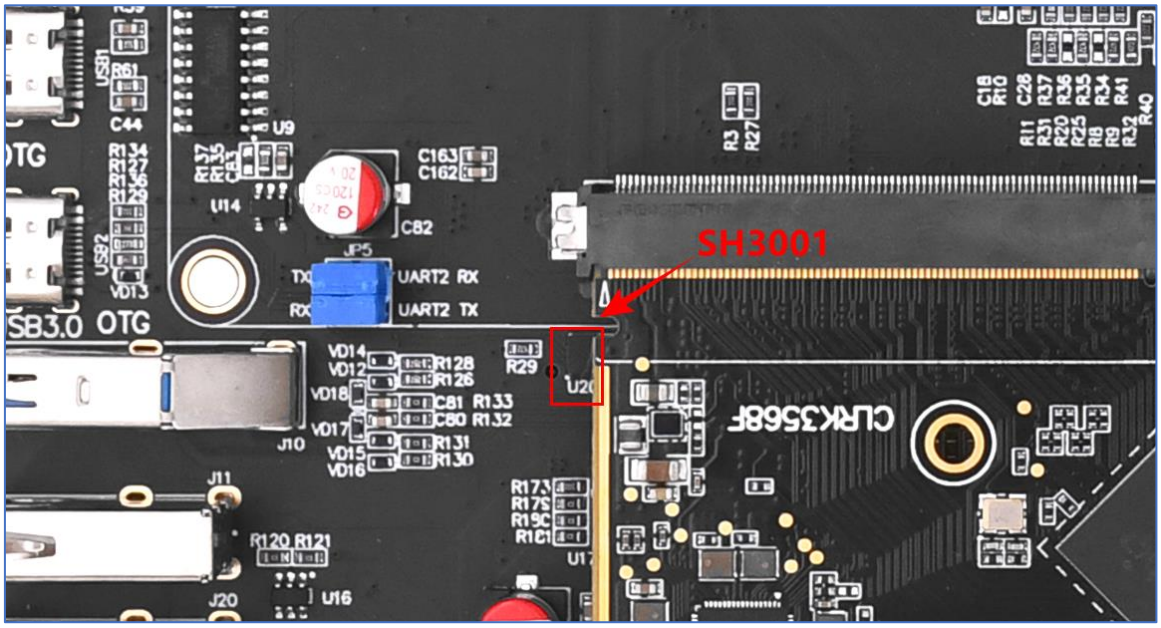


Figure 4.10-1 The position of the six-axis sensor sh3001 on the development board

4.10.1 Gravity sensor test

Subsequent update!

4.10.2 Gyroscope test

Subsequent update!

4.11 USB interface test

There are a total of 4 USB interfaces on the base board of the ATK-DLRK3568 development board, namely: two USB HOST 2.0 interfaces, one USB HOST 3.0 interface, and one USB OTG interface (used for burning images and adb connection). The interface distribution diagram is as follows:

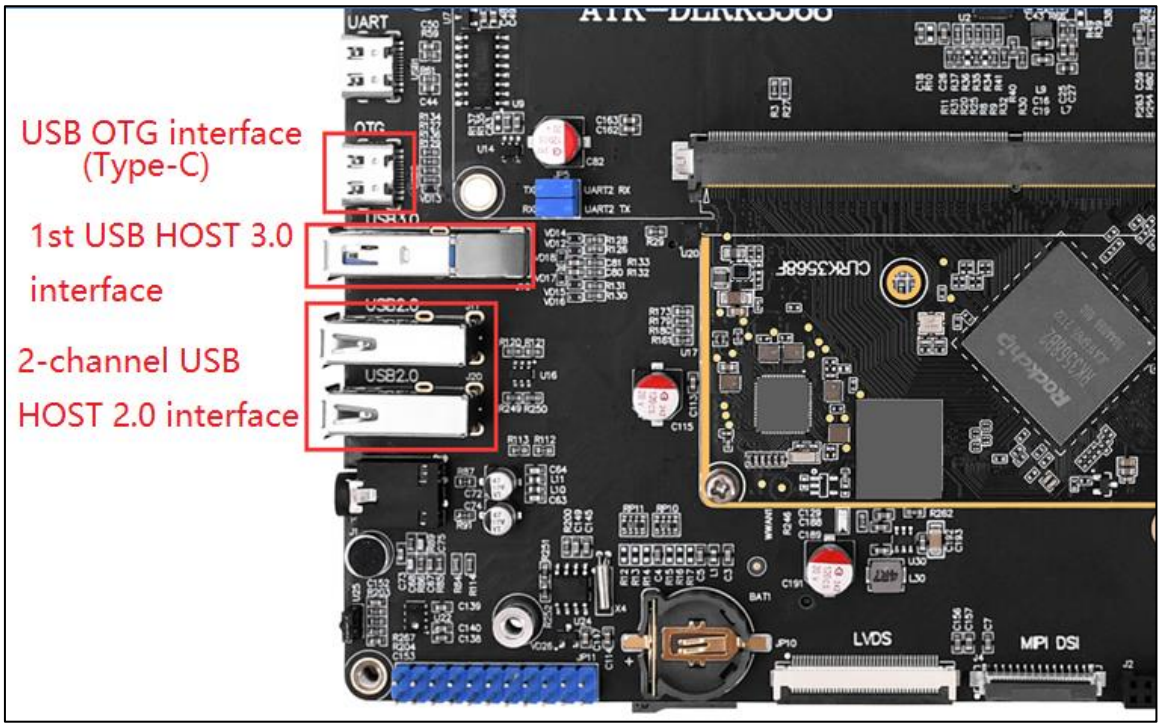


Figure 4.11-1 USB Interface Distribution Diagram

It should be noted that: The USB HOST 3.0 interface and the USB OTG interface cannot be used simultaneously. This is determined by the hardware design. When using the USB HOST 3.0 interface, the USB OTG interface cannot connect external devices; when using the USB OTG interface, the USB HOST 3.0 interface cannot connect external devices.

4.11.1 USB HOST TEST

This test can be conducted by connecting a USB peripheral to the USB HOST interface of the development board to verify the functionality of the USB HOST interface (including 2.0 and 3.0). Examples include USB flash drives, USB mice, USB keyboards, etc.

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

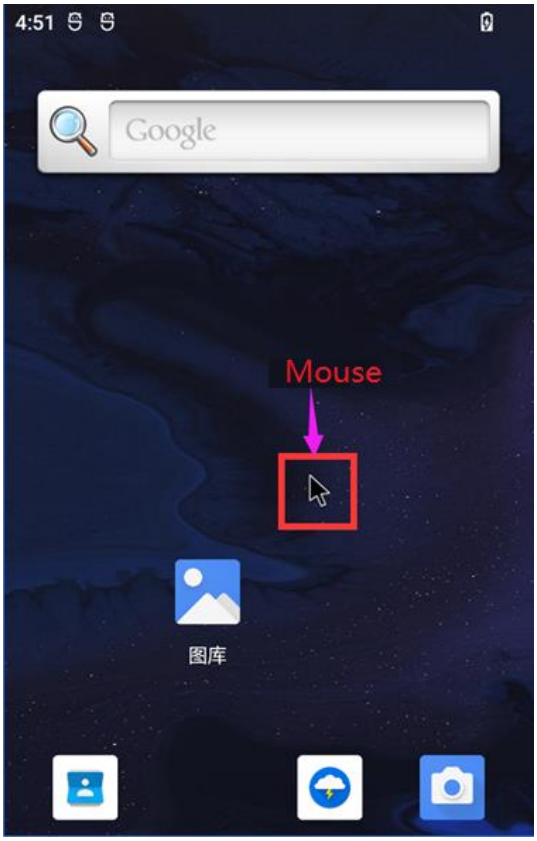


Figure 4.11-2 Connect the mouse

② Connection test for USB flash drive: After connecting the USB flash drive to the USB HOST interface, a prompt will appear on the upper part of the Android system interface:

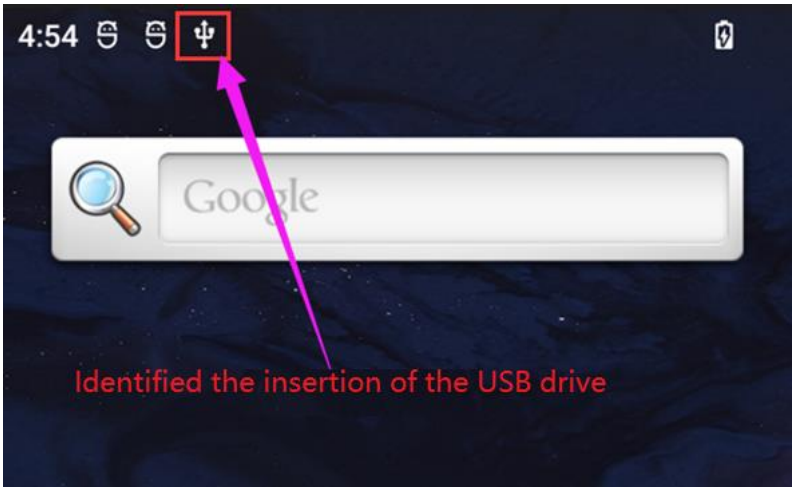


Figure 4.11-3 Identified the insertion of the USB drive

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

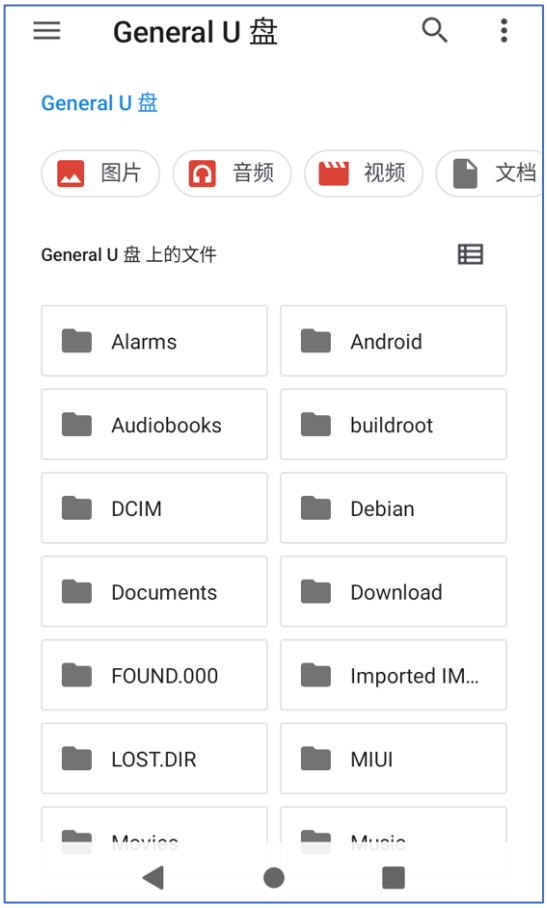


Figure 4.11-4 View the contents in the USB device

Similarly, we can open the "Settings" app, find the "Storage" option, and then we can view the USB device that we have inserted.

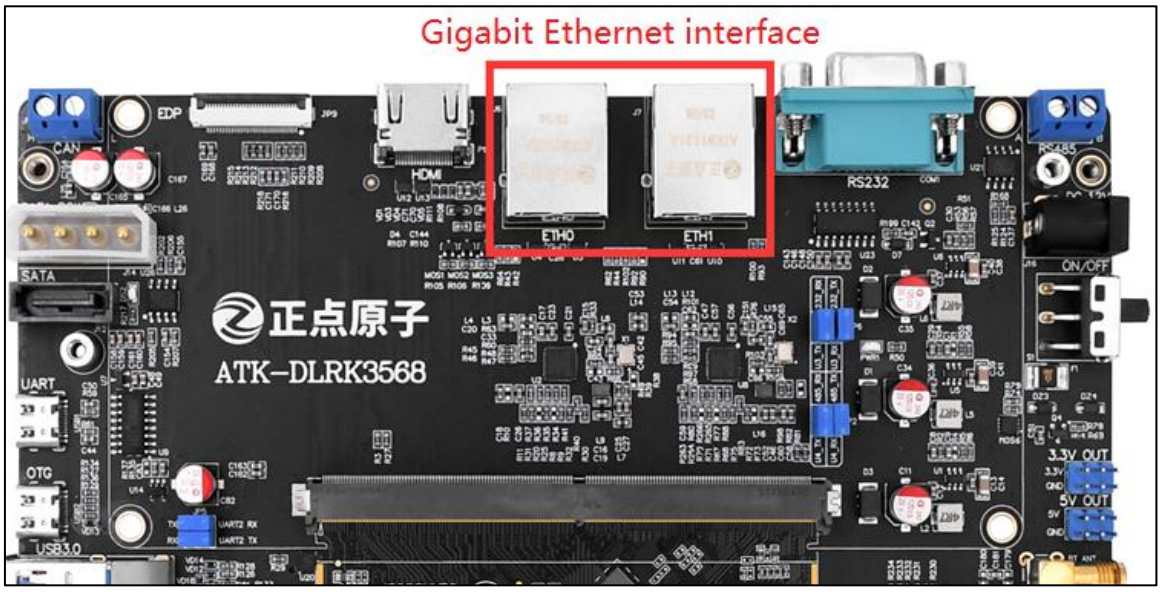
If you want to test the read and write speed of the USB device, you can install the "Antutu Benchmark" App for testing, or directly use commands (such as the dd command) for testing.

4.11.2 USB OTG Interface Test

The USB OTG interface on the baseboard of the ATK-DLRK3568 development board is generally used for image burning and adb connection. If the development board can burn images, erase images, and the adb function is normal, it indicates that the interface function is normal.

4.12 Gigabit Ethernet Test

The baseboard of the ATK-DLRK3568 development board is equipped with two gigabit Ethernet interfaces, which can adapt to 10/100/1000M working modes. Each network port has two indicator lights, the left one is light green and the right one is yellow:



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

Indicates that 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). Executing the "ifconfig" command in the serial port terminal 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 4.12-1 Check the Gigabit Ethernet IP address

We open the "Lightning" browser and test whether we can access the external network at present:

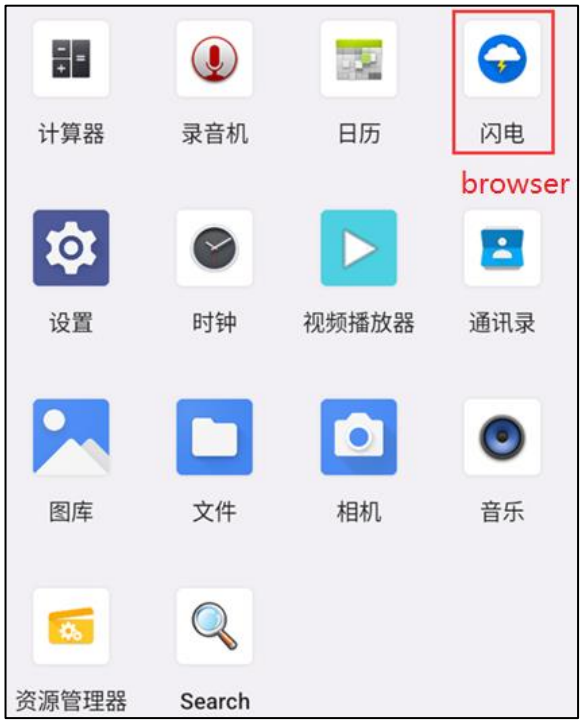
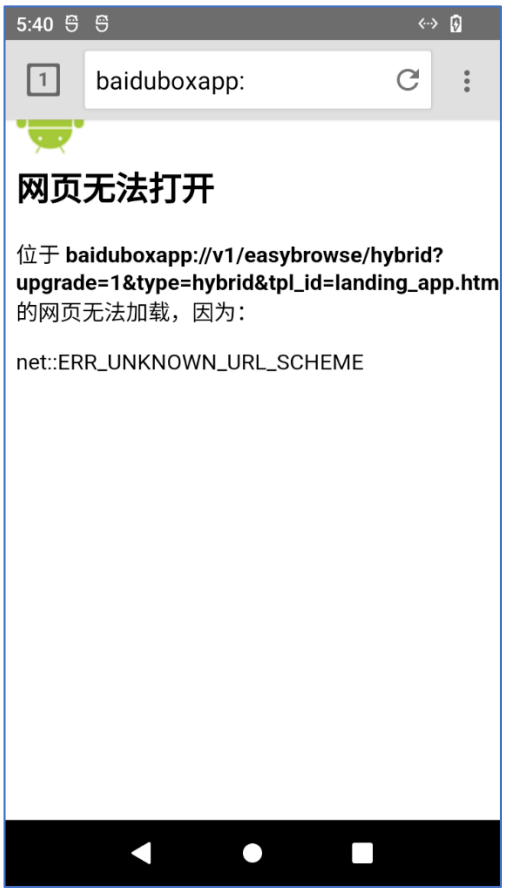


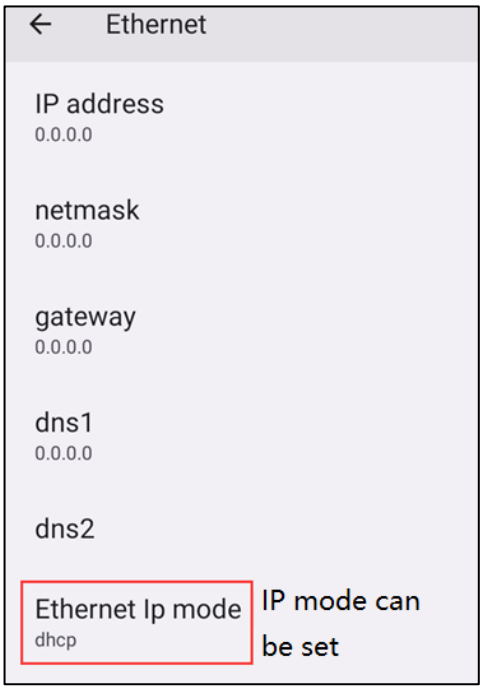
Figure 4.12-2 Browser Internet Testing

Note: "Lightning" browser is the built-in browser software for the Android system. This browser software has some compatibility issues. When using it, problems such as "webpage cannot be opened" often occur, as shown below:



Users can download other browser software by themselves for testing.

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



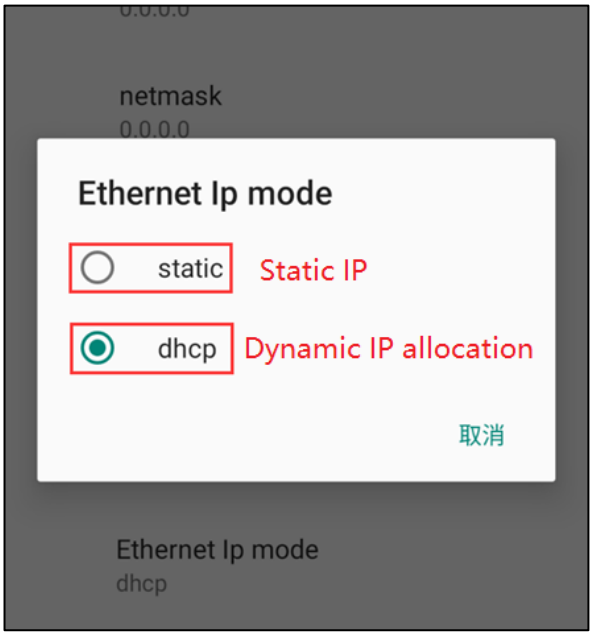


Figure 4.12-3 Configure IP mode

If you need to test the bandwidth of Gigabit Ethernet, you can use the iperf3 tool in the serial terminal for testing (refer to the ATK-DLRK3568_Linux System Quick Experience Document).

4.13 On-board WIFI test

The baseboard of the ATK-DLRK3568 development board is equipped with a RTL8852BS WIFI&Bluetooth dual-module. It supports dual-band WiFi and is compatible with WiFi6. As shown in the following figure:

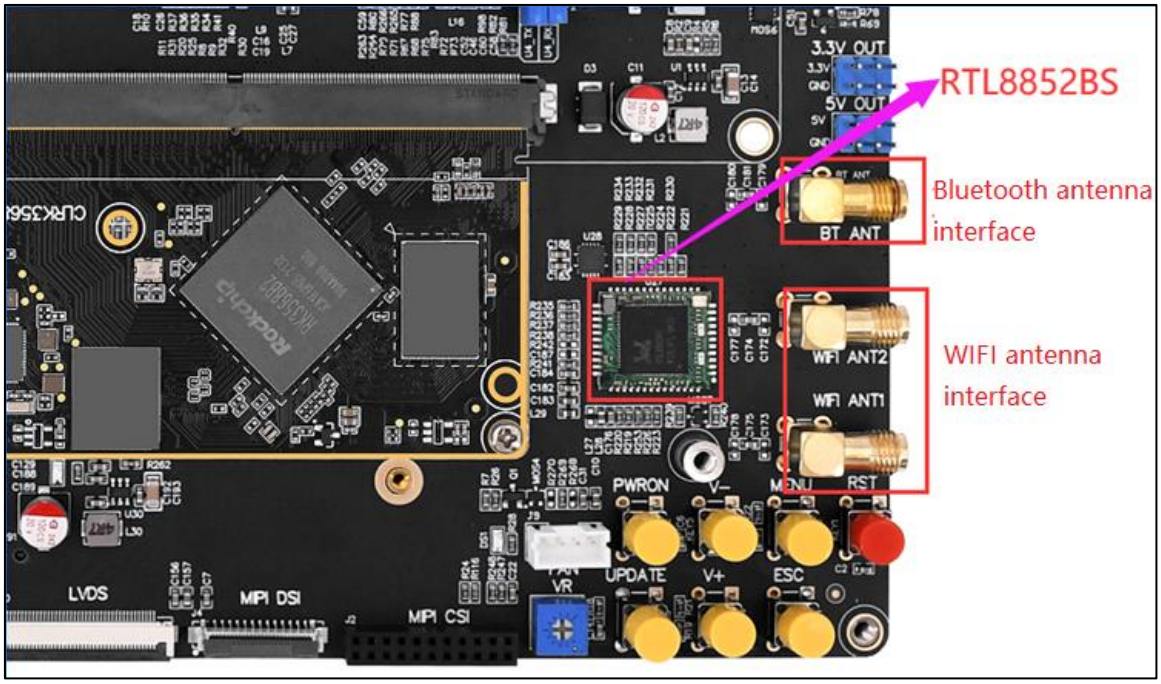


Figure 4.13-1 Location of the RTL8852BS module

Before using WiFi and Bluetooth (unplug the network cable and disconnect the wired network connection), you need to connect the corresponding antennas (the 5G dual-band WiFi antenna and Bluetooth antenna provided with the ATK-DLRK3568 development board) as shown below:

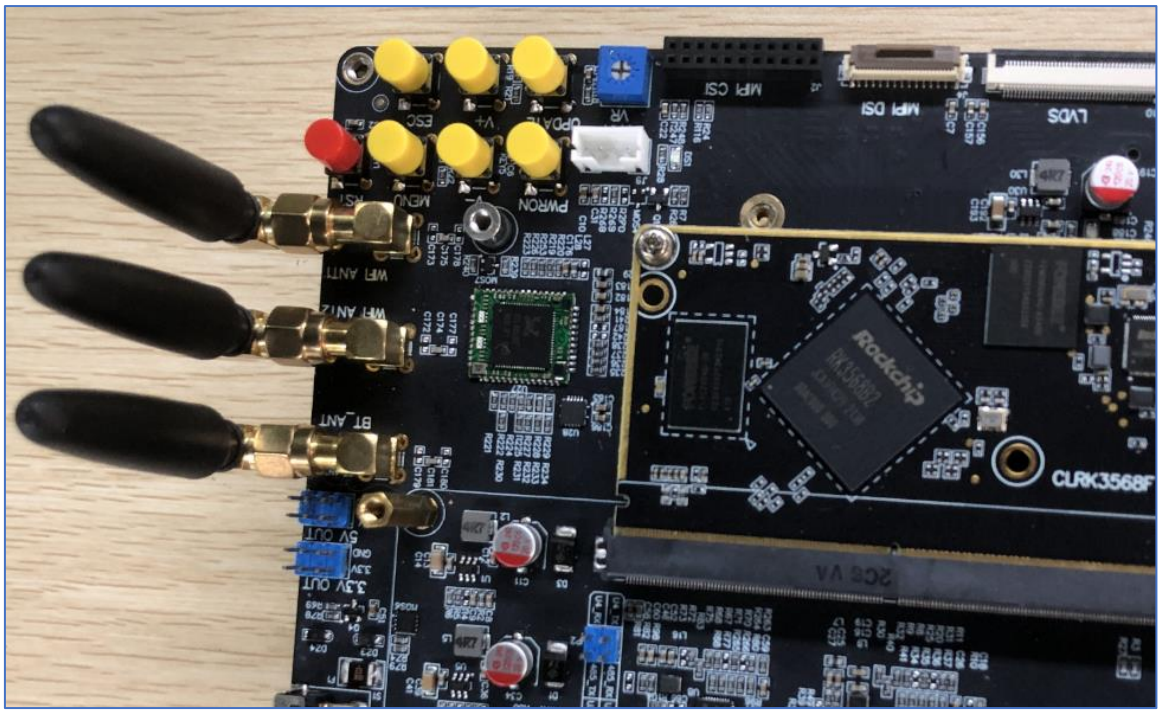


Figure 4.13-2 WiFi & Bluetooth Antenna Installation

Open the "Settings" app in the Android system, find "Network & Internet"→"Internet"→"WLAN", and turn on WiFi:

Figure 4.13-3 WiFi connection

After the WiFi connection is successful, you can open the "Lightning" browser to test whether 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 by the author (the author's WiFi router is of WiFi6 type):

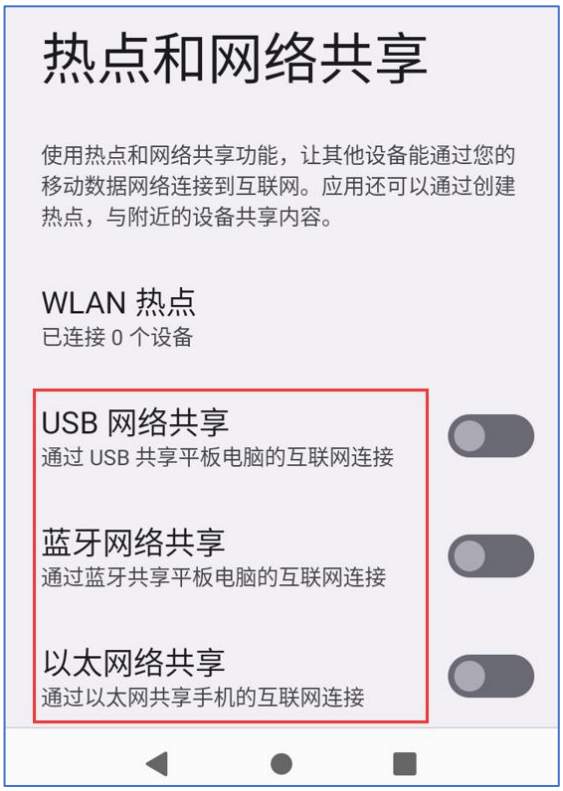
The test results are for reference only. As the actual test results are influenced by various factors:

- 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.

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 4.13-4 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:



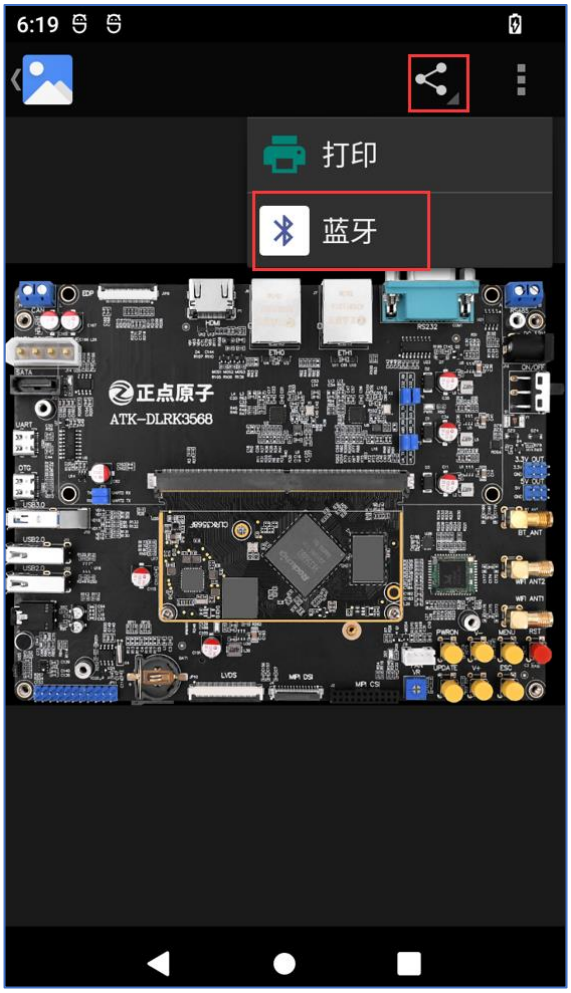
4.14 Built-in Bluetooth Test

The Bluetooth function is supported by the RTL8852BS WiFi & Bluetooth dual-module onboard the ATK-DLRK3568 development board. Open the "Settings" app and find "Connected Devices" to perform the Bluetooth test.

Figure 4.14-1 Scan the nearby Bluetooth devices

It can be connected to 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.

4.15 TF (SD) Card Test

There is a TF card slot on the bottom plate (back side) of the ATK-DLRK3568 development board. It is used to insert a TF card and can be used as an external storage device for the Android system (eMMC is an internal storage device and cannot be moved).

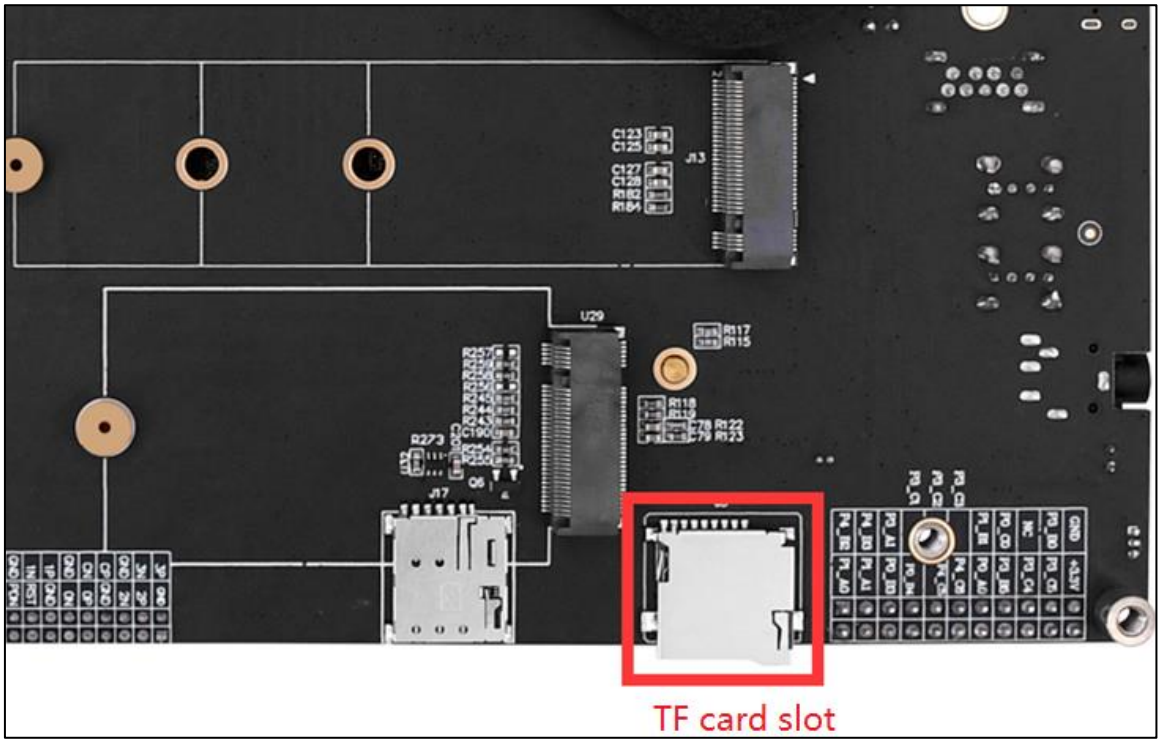
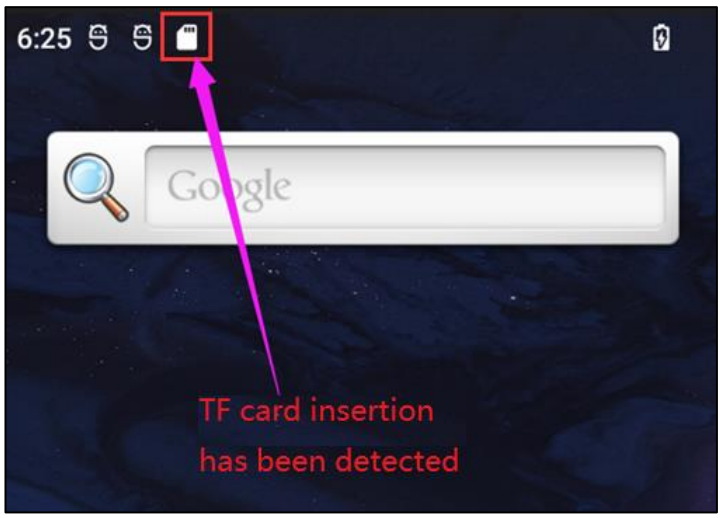


Figure 4.15-1 The TF card slot on the back of the base plate

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



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

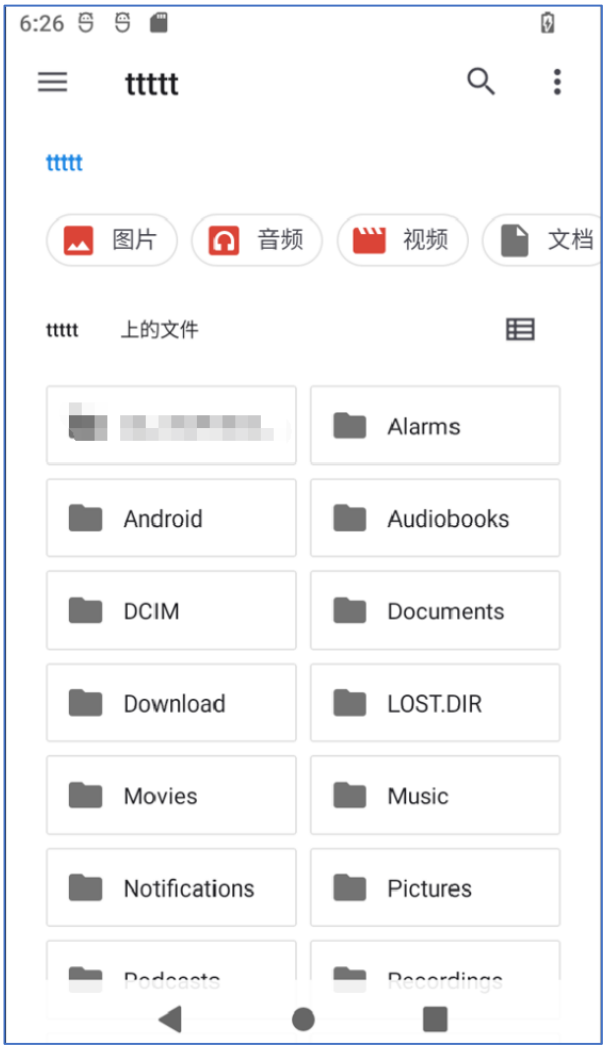


Figure 4.15-2 View the contents on the TF card

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

If you need 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.

4.16 ADC Test

The ATK-DLRK3568 development board is equipped with a variable potentiometer, which is connected to ADC channel 3 of RK3568 (with 10-bit accuracy and a reference voltage of 1.8V), and can be used for ADC acquisition experiments:

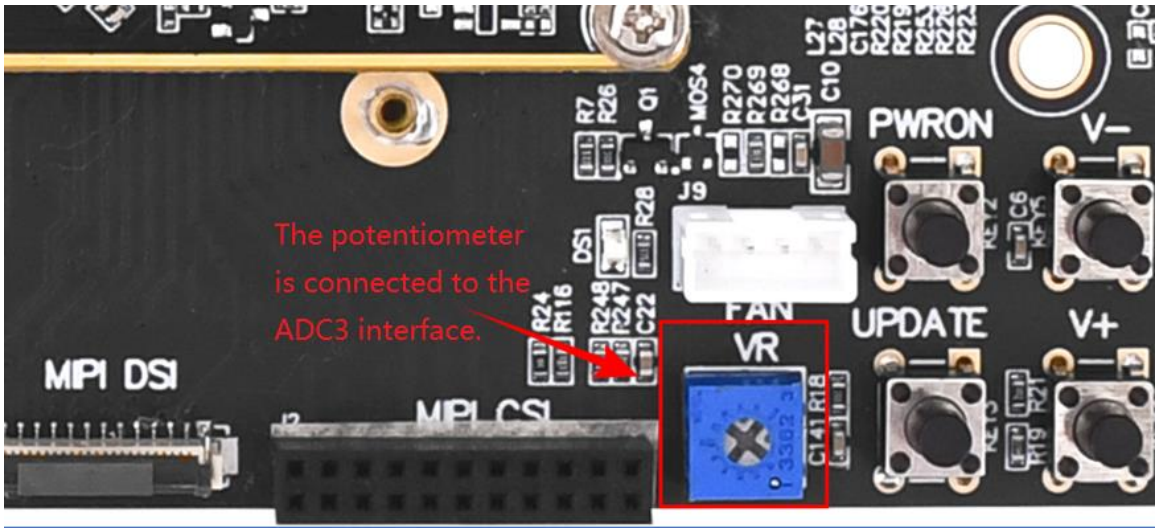


Figure 4.16-1 Adjustable potentiometer

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_voltage3_raw          # Read ADC channel 3
```

```
console:/ #
console:/ #
console:/ # cat /sys/bus/iio/devices/iio\:device0/in_voltage3_raw
475
console:/ #
```

Figure 4.16-2 Execute the command to read the ADC value.

The original data can be converted into a voltage value 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 is the number of bits for AD conversion (10 bits), raw is the original data collected by ADC, and Vresult is the converted voltage value.

Vresult = (1800mv * 475) /1023 = 835.78mv

The voltage value collected this time can be calculated using the formula and is approximately 0.835V.

The potentiometer can be adjusted to conduct multiple collection tests.

4.17 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

```
console:/ #
console:/ # cat /sys/class/thermal/thermal_zone0/temp
37222
console:/ # cat /sys/class/thermal/thermal_zone1/temp
35555
console:/ #
```

37222 represents 37.222 degrees Celsius.

4.18 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

```
console:/ #
console:/ # cat /sys/devices/system/cpu/cpu*/cpufreq/cpuinfo_cur_freq
1416000
1416000
1416000
1416000
console:/ #
```

Figure 4.18-1 Check the current running frequency of the CPU

The RK3568 is a quad-core processor, so here it will display the current running frequencies of the four CPU cores.

4.19 Infrared module test

The ATK-DLRK3568 development board has an onboard infrared receiving module on the base board, which can be used to receive infrared signals, such as infrared remote controls, etc.

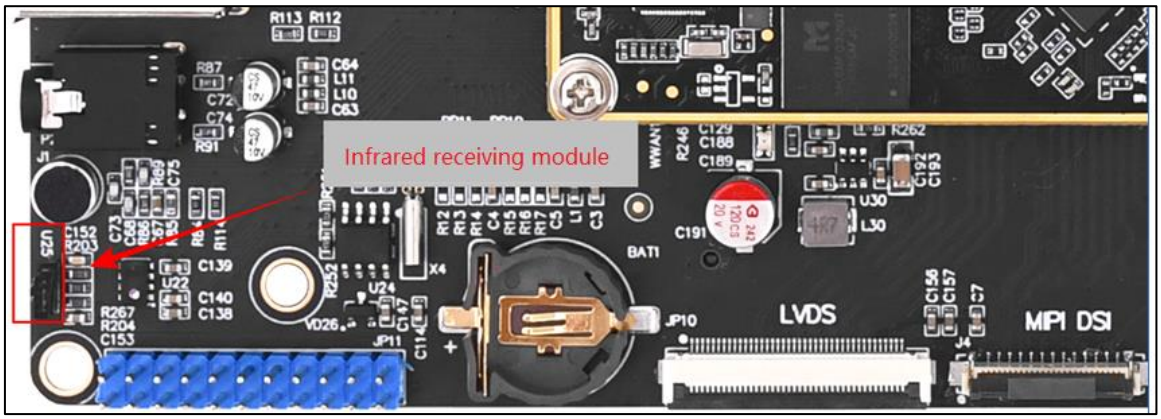


Figure 4.19-1 Infrared receiver

We need to prepare an infrared remote control, such as the infrared remote control module sold by ALIENTEK Store, as shown in the following picture:

Figure 4.19-2 ALIENTEK Infrared Remote Control Module

It should be noted that the Android 11/12 system images provided by ALIENTEK only support the infrared remote control modules sold by ALIENTEK stores. For other infrared remote controls and Android systems, they may not respond. It is necessary to add corresponding key-value pairs in the kernel device tree to be able to use them in the Android system.

When we press the VOL- button on the ALIENTEK infrared remote control, the volume will decrease, and when we press the VOL+ button, the volume will increase. You can test it yourself.

For other infrared remote controls (such as the infrared remote control of a TV, the infrared remote control of an air conditioner, etc.), we can also test them using the serial port terminal. First, execute the following command to open the debugging switch (you need to switch to the root user, "su root"):

```
echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

Then, press any button on the remote control, and the serial port terminal will print out the corresponding key value, as shown in the following figure:

```
console:/ #
console:/ # [ 5667.867399] USERCODE=0xff00
[ 5667.894448] RMC_GETDATA=e9
[ 5668.885356] USERCODE=0xff00
[ 5668.912490] RMC_GETDATA=e6
[ 5669.365878] USERCODE=0xff00
[ 5669.393048] RMC_GETDATA=e6
[ 5670.059945] USERCODE=0xff00
[ 5670.087048] RMC_GETDATA=e7
[ 5670.537104] USERCODE=0xff00
[ 5670.564267] RMC_GETDATA=e7
[ 5671.109331] USERCODE=0xff00
[ 5671.136466] RMC_GETDATA=e3
[ 5672.328411] USERCODE=0xff00
[ 5672.355541] RMC_GETDATA=a1
[ 5672.796520] USERCODE=0xff00
[ 5672.823658] RMC_GETDATA=a1
[ 5673.671927] USERCODE=0xff00
[ 5673.699059] RMC_GETDATA=f6
[ 5674.414863] USERCODE=0xff00
[ 5674.442028] RMC_GETDATA=ea
[ 5674.959419] USERCODE=0xff00
[ 5674.986551] RMC_GETDATA=f8
[ 5675.257681] USERCODE=0xff00
[ 5675.284799] RMC_GETDATA=f8
```

USERCODE is used to identify the type of remote control, and RMC_GETDATA represents the key value.

4.20 Light Environment Sensor Test

An ambient light sensor AP3216C is onboard the base board of the ATK-DLRK3568 development board, which can be used to sense the surrounding light intensity, proximity distance, and infrared intensity. The AP3216C is a three-in-one environmental sensor that supports the detection of three environmental parameters: ambient light intensity (ALS), proximity distance (PS), and infrared intensity (IR). The features of the AP3216C are as follows:

①, The I2C interface allows a baud rate of up to 400Kbit/S in fast mode.

② , Multiple working modes are available: ALS, PS + IR, ALS + PS + IR, PD, etc.

③, Built-in temperature compensation circuit.

④, Wide operating temperature range (-30℃ to + 80℃).

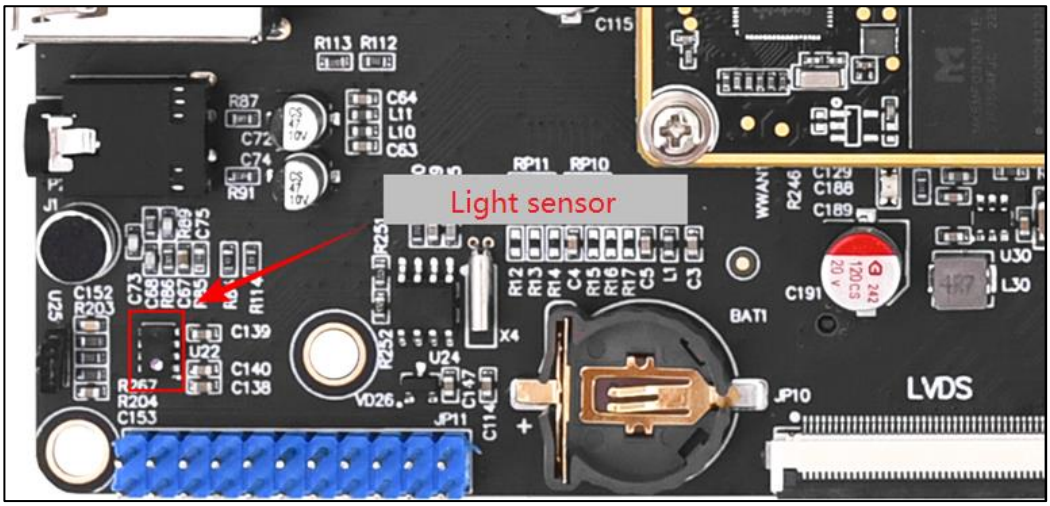
⑤, Ultra-small package, 4.1mm x 2.4mm x 1.35mm.

⑥, The ambient light sensor has a 16-bit resolution.

⑦, The proximity sensor and infrared sensor have a 10-bit resolution.

The AP3216C is commonly used in mobile phones, tablets, navigation devices, etc. Its built-in proximity sensor can be used to detect whether an object is approaching, such as detecting whether the ear is touching the earpiece on a mobile phone. If it detects that a call is in progress, the phone will automatically turn off the screen to save power. It can also use the ambient light sensor to detect the light intensity to achieve automatic adjustment of the backlight brightness.

The position of the sensor is shown in the following figure:



4.20.1 Light Intensity Test

Upcoming update!

4.20.2 Close Distance Test

Upcoming update!

4.21 Serial port test

The ALIENTEK ATK-DLRK3568 development board is equipped with 3 serial ports, including the debugging serial port, RS232 and RS485, as shown in the following figure:

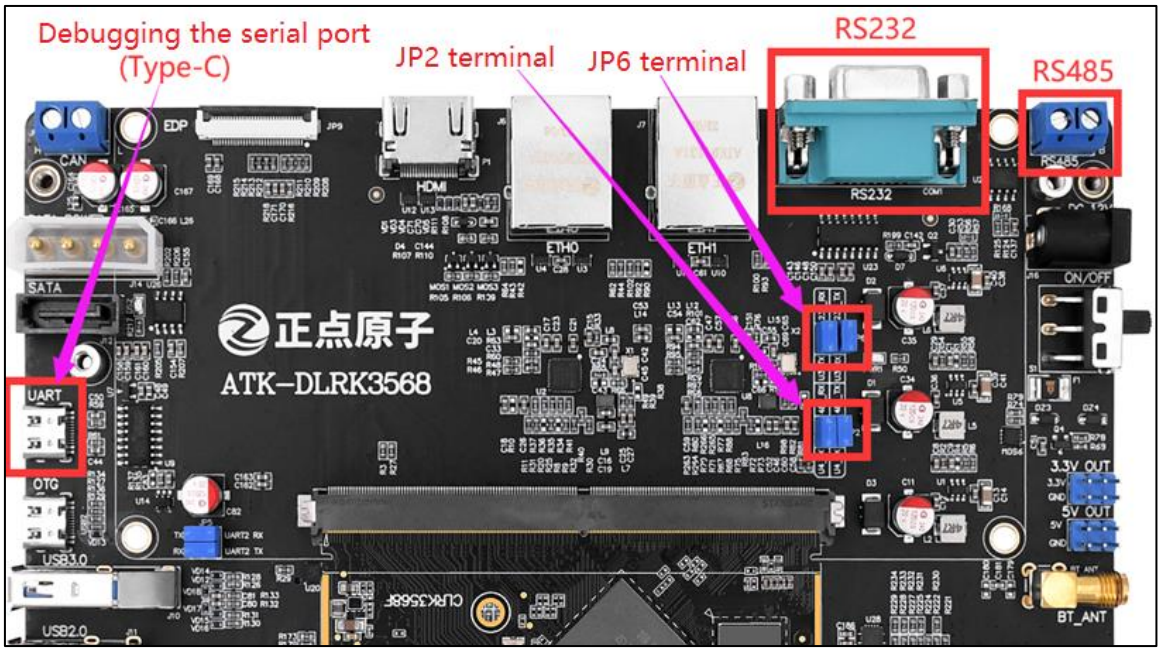


Figure 4.21-1 The distribution diagram of the serial ports on the development board

It should be noted that when using the RS232 serial port, the two jumper caps at the JP6 terminal need to be properly connected (these will be connected by default when the development board is

manufactured); when using the RS485 serial port, the two jumper caps at the JP2 terminal need to be properly connected (these will also be connected by default when the development board is manufactured). Before testing, please check whether the jumper caps at these two locations are properly connected.

4.21.1 Debugging Serial Port Test

The serial port terminal used to execute commands is connected to the debugging serial port of the development board and is connected via the USB Type-C 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.

4.21.2 RS232 Serial Port Test

The development board is equipped with an RS232 serial port, which is connected to an external serial port through a standard DB9 interface (female connector). First, prepare a USB to RS232 serial port cable (the USB to RS232 serial port cable is not an accessory for the ATK-DLRK3568 development board, please have users purchase it themselves):

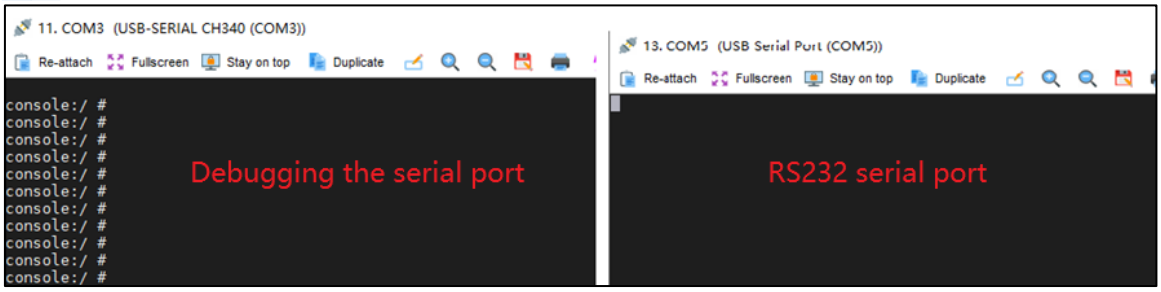
Figure 4.21-2 USB to RS232 Serial Cable

Using the USB to RS232 serial cable, connect the RS232 interface of the development board to the USB interface of the computer. Then, in the Android system serial terminal, execute the following command 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 another 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:

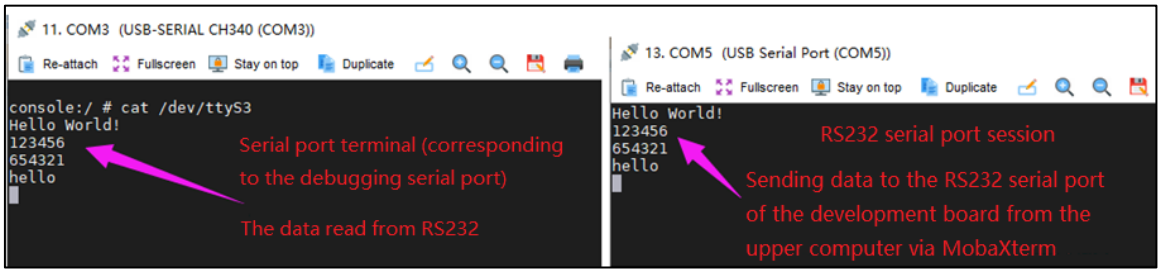


Figure 4.21-3 RS232 serial port data reception test (computer→development board)

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
```

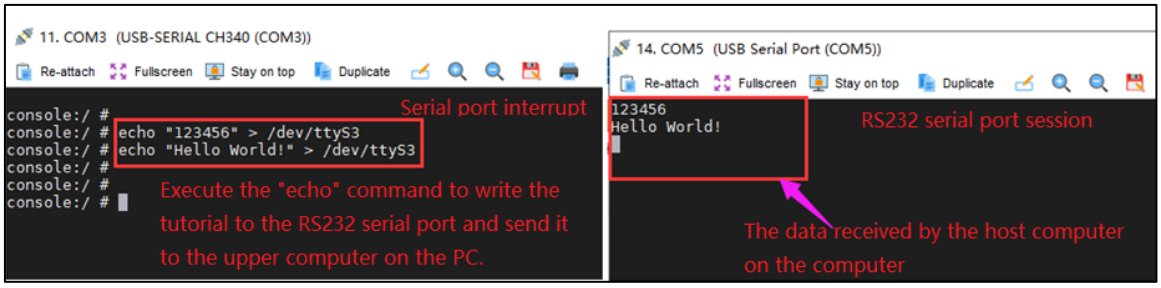


Figure 4.21-4 RS232 Serial Port Data Transmission Test (Development Board→Computer)

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

4.21.3 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 serial port. This module is available for purchase in the ALIENTEK store. Of course, other tools for testing 485 can also be used for testing.

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

Figure 4.21-5 USB serial converter, three-in-one

4.22 CAN test

Starting from version 1.2, the can-utils tool is supported. For specific testing methods, please refer to the document: Development Board CD-ROM A Disk - Basic Materials→10_user_manual→ 01, Test Documents→01 [ALIENTEK] ATK-DLRK3568_Buildroot System Quick Experience 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 testing.

4.23 SATA Hard Disk Test

There is a SATA hard disk interface on the base board of the ATK-DLRK3568 development board, which can be used to connect SATA hard disks. As shown in the figure below:

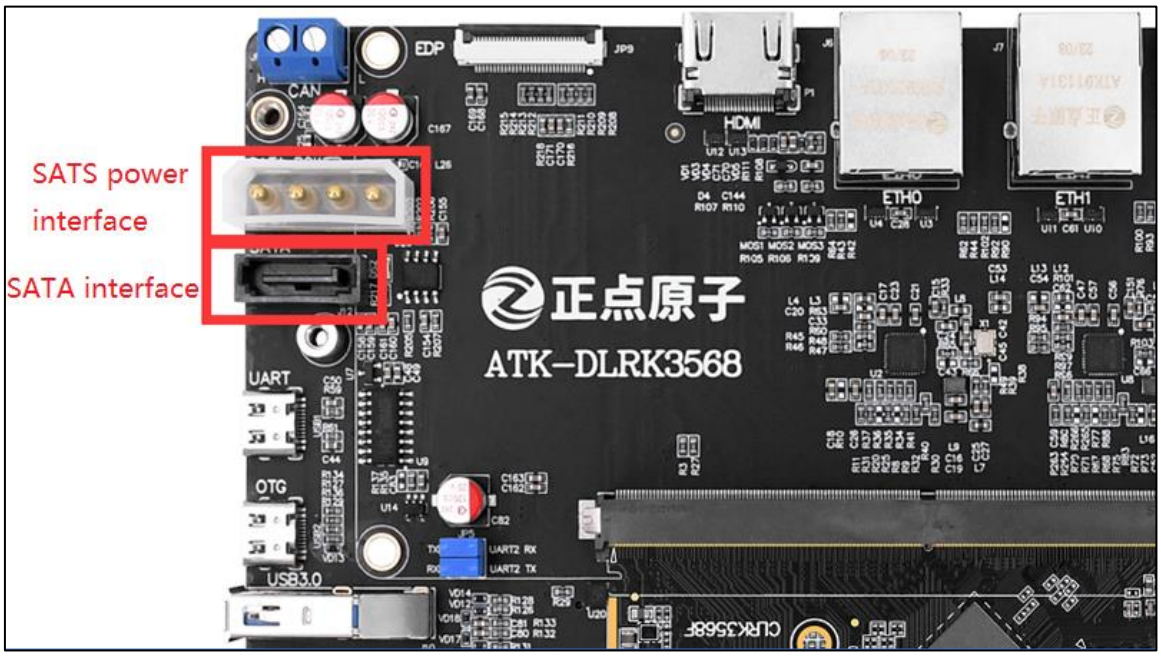


Figure 4.23-1 SATA hard drive interface

SATA hard drives support hot plugging and can be connected to the system while the Android system is running. First, before testing, connect the SATA hard drive to the SATA interface of the development board, including the SATA data interface and the SATA power interface. Please have the user connect it themselves. In this test, the author used a 500GB SATA hard drive, as shown in the following picture:

Figure 4.23-2 Test-purpose SATA hard drive

After the SATA hard drive is successfully connected, the red indicator light at the SATA interface on the base plate will light up (when the SATA hard drive performs data access), and an icon will appear at the top of the Android system interface.

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:

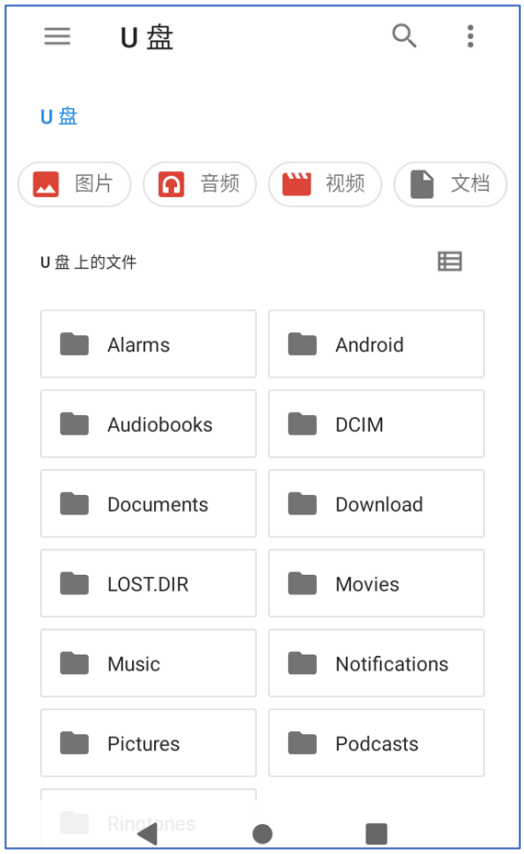


Figure 4.23-3 View the contents of the SATA hard drive

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.

4.24 M.2 Hard Disk Test

On the bottom plate (back side) of the ATK-DLRK3568 development board, there is a PCIE 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:

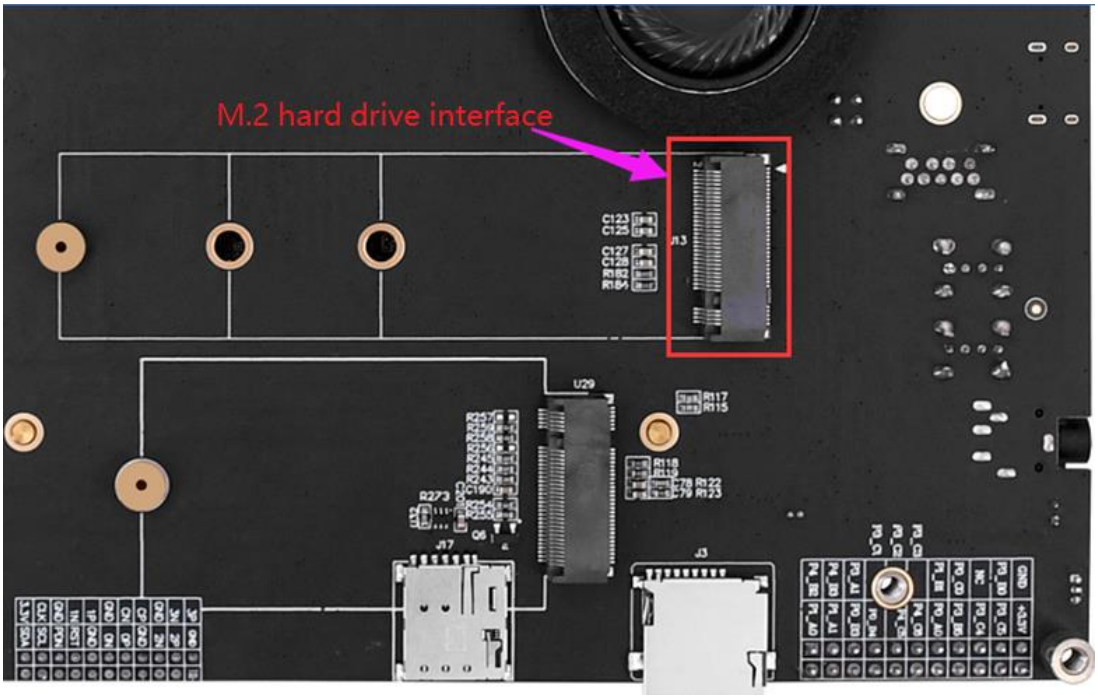


Figure 4.24-1 PCIe M.2 hard drive interface

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, disconnect the power supply of the development board first, insert the M.2 hard drive into the M.2 slot on the back of the development board's base plate, and fix it with screws (screws provided). In this test, the author used a 256GB M.2 hard drive:

Figure 4.24-2 The M.2 hard drive used for testing

Next, power on the development board and start the Android system. After entering the Android system interface, a icon will appear at the top of the 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:

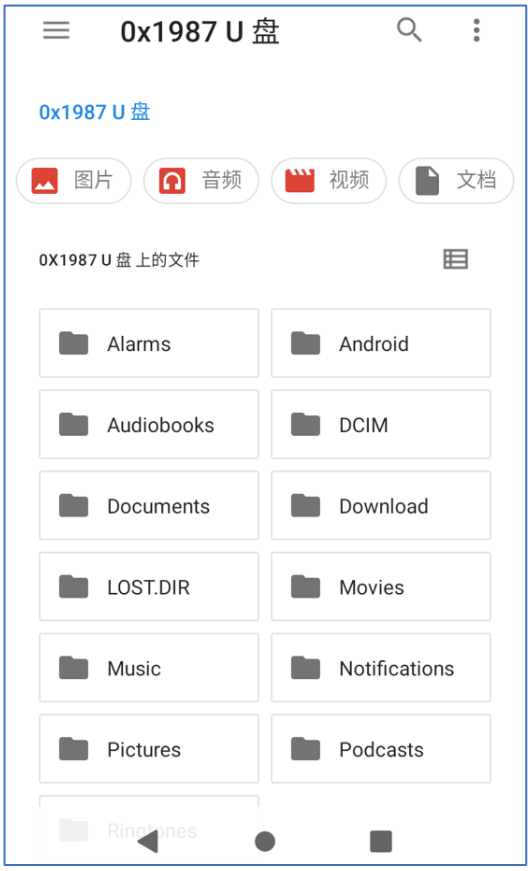


Figure 4.24-3 View the contents of the M.2 hard drive

Open the "Settings" app, find the "Storage" item, 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.

4.25 HDMI Test

To test the HDMI interface, you need to burn an Android 12 image that supports HDMI displays.

On the bottom plate of the ATK-DLRK3568 development board, there is an HDMI output interface, which can be used to connect an HDMI display as shown in the following figure:

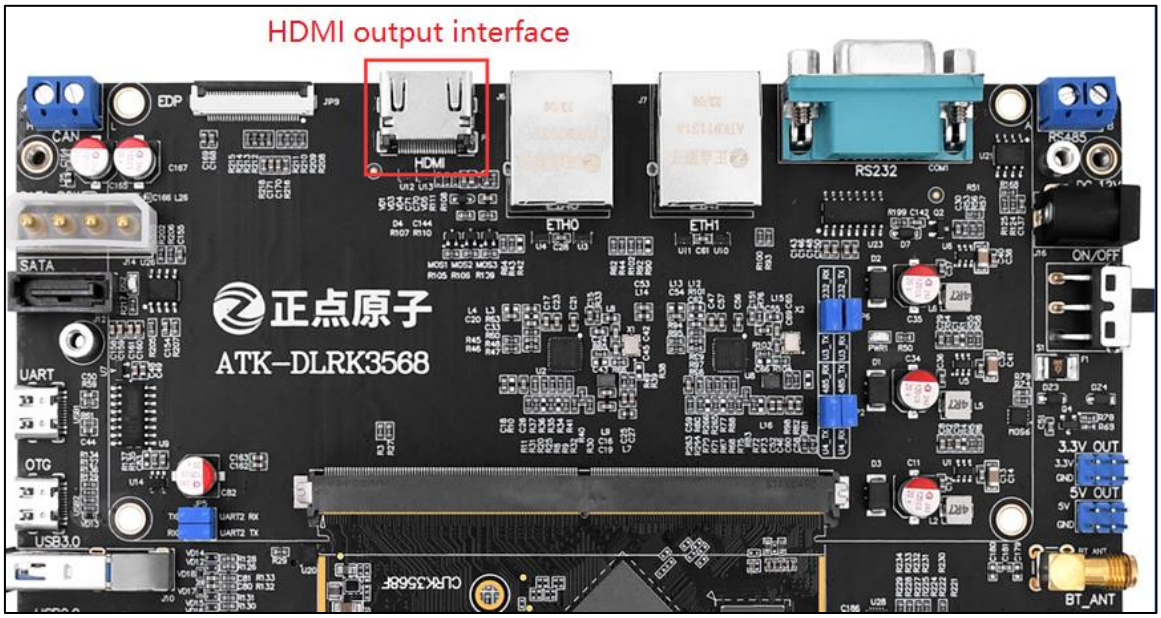


Figure 4.25-1 HDMI output interface

Connect the HDMI display to the HDMI output interface of the development board via an HDMI cable, burn an Android 12 image that supports HDMI display onto the development board, and start the development board.

During the Android system startup process, the HDMI display will show the startup logo and the Android startup animation.

Open the "Settings" app, find "Display"→"HDMI"→"Resolution Settings", 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:

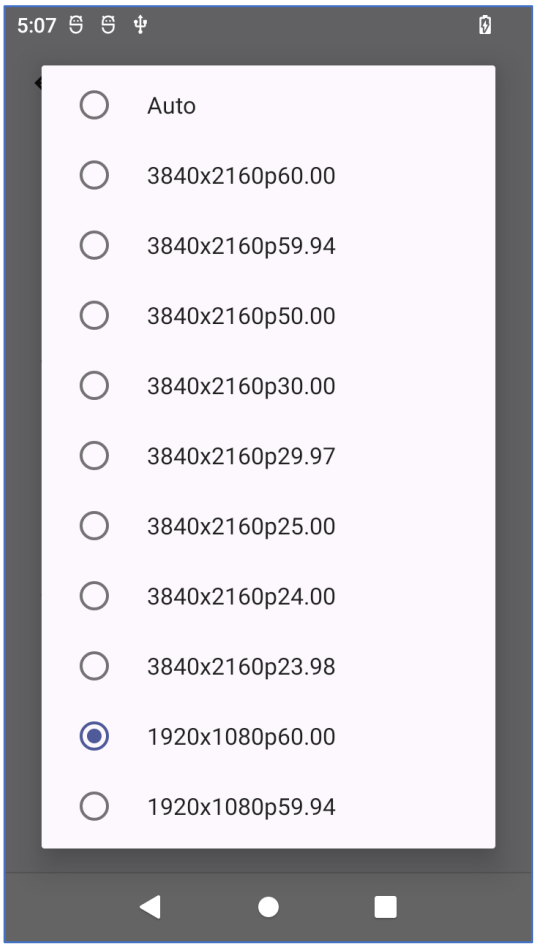


Figure 4.25-2 Set the resolution of the HDMI display

HDMI audio test: If the HDMI display connected by the user supports audio function, an HDMI audio test can also be conducted. When connected to the HDMI display, play music. The sound will default to be output from the built-in speaker of the HDMI display (don't connect headphones first). Please conduct the test yourself.

4.26 4G/5G module test

The 4G/5G module is awaiting adaptation on the Android 12 system!

4.27 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
```

```
console:/ #
console:/ # cat /sys/kernel/debug/rknpu/load
NPU load:  0%
console:/ #
```

4.28 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.

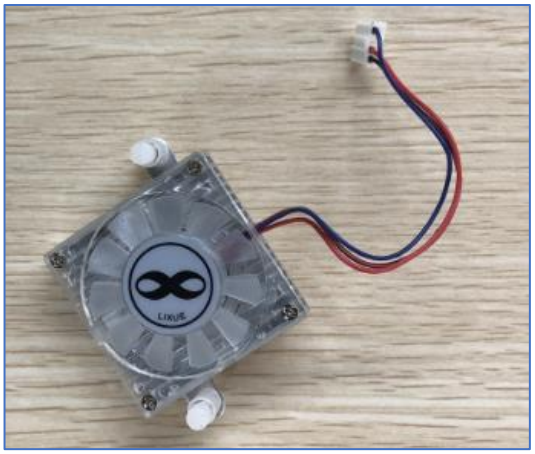


Figure 4.28-1 Fan cooling fan

Before conducting the test, the development board should be powered off first. Install the fan onto the main board (Just align the two self-locking seats of the fan with the two reserved holes on the main board and install it. When installing, apply thermal silicone on the main board for better cooling effect!) ; When disassembling the fan, you need to remove the core board from the connection seat on the base plate, and then remove the self-locking seat from the back of the core board.

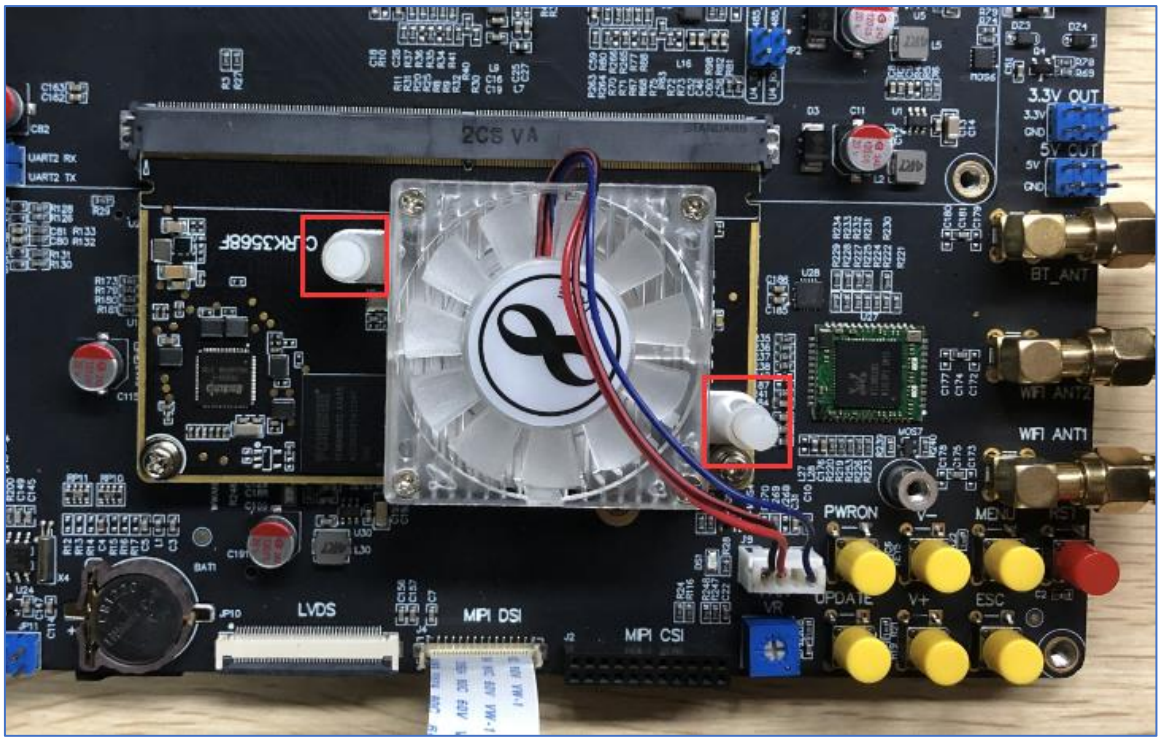


Figure 4.28-2 Fan Installation Diagram

After installing the fan, power on and start the development board. During the power-on startup process of the development board, initially the fan will rotate for a while (this is in the U-Boot stage). After entering the Linux kernel stage, the temperature control system will be initialized. The fan, as a

cooling device, will be taken over by the temperature control system. At this point, the fan will stop rotating.

This is because the temperature has not reached the temperature control threshold. Only when the CPU temperature exceeds 64 degrees will the fan start to dissipate heat. This is also to reduce the power consumption of the development board.

Generally, when we use it in a room temperature environment, the CPU temperature will not easily reach 64 degrees, so the fan will not rotate. To make the fan rotate, you need to increase the CPU load or place the development board in a high-temperature environment, so that the CPU temperature exceeds 64 degrees.

In fact, we can also manually turn on the fan. First, you need to disable the temperature control strategy and execute the following command (switch to the root user)

```
echo disabled > /sys/class/thermal/thermal_zone0/mode
```

View the current wind speed level of the fan. By default, it is divided into 22 levels.

```
cat /sys/class/thermal/cooling_device0/cur_state
```

```
console:/ #
console:/ # echo disabled > /sys/class/thermal/thermal_zone0/mode
console:/ # cat /sys/class/thermal/cooling_device0/cur_state
0
console:/ #
```

Then set the wind force level and set the cur_state attribute to 10. The range of adjustable levels is from 0 to 22. The higher the value, the faster the fan rotates and the stronger the cooling capacity.

```
echo 10 > /sys/class/thermal/cooling_device0/cur_state
```

```
console:/ #
console:/ # echo 10 > /sys/class/thermal/cooling_device0/cur_state
console:/ # cat /sys/class/thermal/cooling_device0/cur_state
10
console:/ #
```

In practical applications, it is not recommended to disable the temperature control strategy. This experiment is only for testing whether the fan is working properly.

4.29 PWRON Button Test

There is a PWRON button on the bottom board of the ATK-DLRK3568 development board, as shown in the following figure:

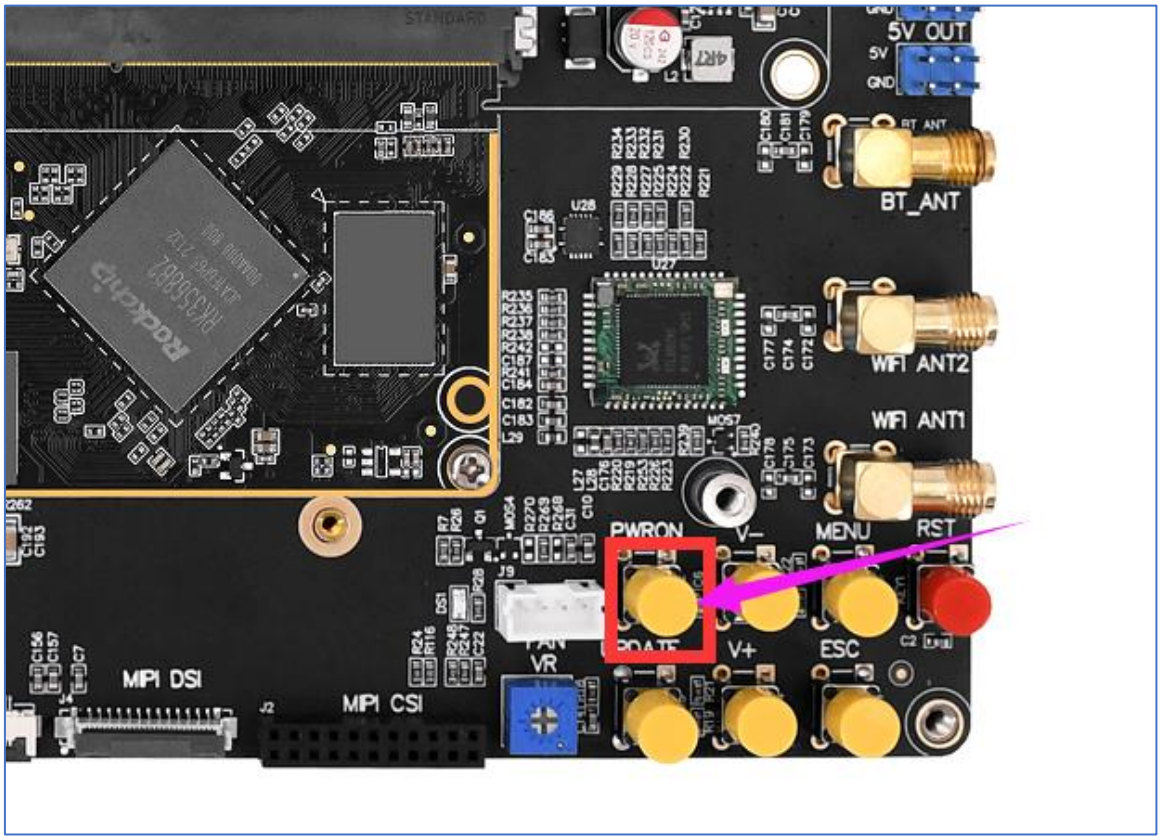


Figure 4.29-1 PWRON button

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. Pressing the PWRON button simultaneously with the V+ (volume+) button will cause the Android system interface to display three buttons, as shown below:

They respectively represent "emergency call", "shut down" and "restart".

Clicking the "Shut Down" button will put the system into the shutdown state. During the shutdown state, pressing the PWRON button again will restart the system.