Idea3588 Android16 SSI User Manual

V1.0

Boardcon Embedded Design

Overview

The content of this document is only described for the development board Idea3588, aiming to help users quickly understand, apply and develop the Idea3588 development board.

System Support

Development Board	Android14	N
Idea3588_V4 CM3588_V2	Y	N

Revision History

Version	Date	Author	Revision History
V1.0	2026-03-24	Xue Junchao	Initial version

Disclaimer

The information in this manual is provided for reference only. While Boardcon has made every effort to ensure the accuracy and reliability of the content, no guarantee is given regarding its completeness or correctness. All information in this manual is subject to change without prior notice.

Boardcon reserves the right to revise or update the contents of this manual at any time without prior notification. Boardcon shall not be held liable for any direct or indirect loss or damage arising from the use of this document or the products described herein.

Boardcon embedded design limited

2007-11 Haofang Tianji Plaza, 11008 Beihuan Avenue, Nanshan District, Shenzhen, Guangdong, China. 518051

URL: www.armdesigner.com | www.boardcon.com

Email: market@armdesigner.com

Technical Support Inquiries: support@armdesigner.com

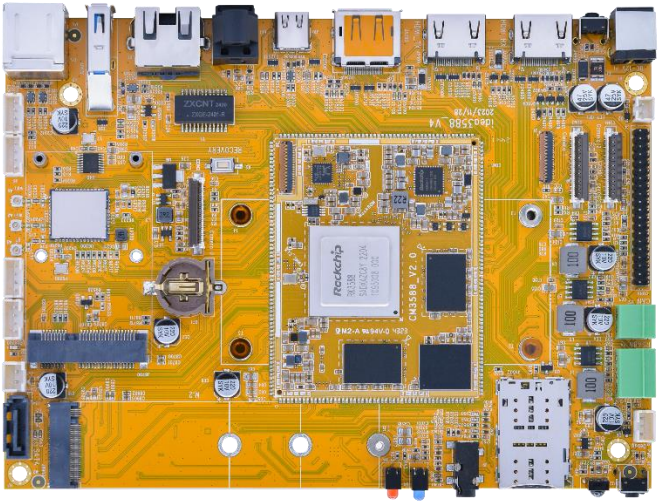
Tel: +86-755-26481393 | +86-755-27571591

Content

1.Introduction

1.1 Overview

The idea3588 CPU integrates quad-core Cortex-A76 and quad-core Cortex-A55 with separately NEON coprocessor, NPU computing power up to 6TOPs, enable various AI scenarios, it can process up to 8K video encoding and decoding, ultra-high definition rendering, with super image processing capability and powerful network communication function, 48MP ISP, supporting multi-camera input, Which is suitable for ARM-based PC and edge computing devices, personal mobile Internet devices and other digital multimedia applications.



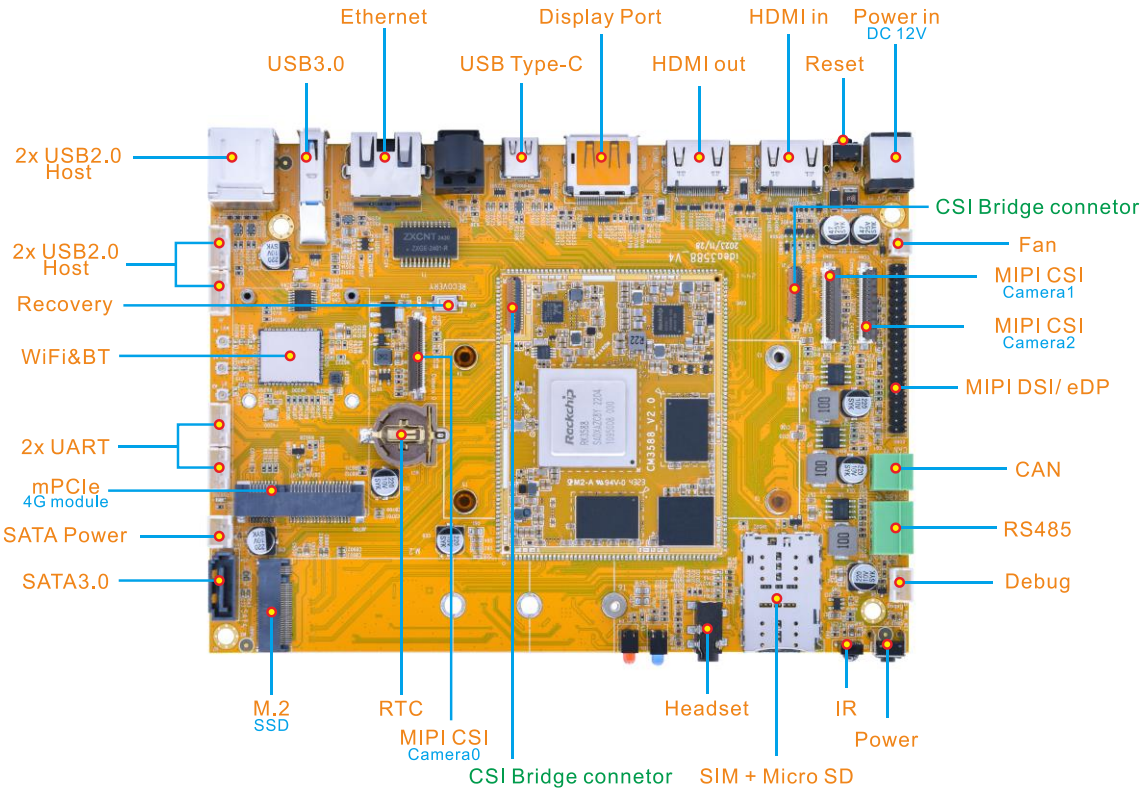
1.2 Product Parameters

Basic Parameters	
SOC	RK3588
CPU	Octa-core 64-bit size core architecture, Quad-core Cortex-A76 + Quad-core Cortex-A55
GPU	• ARM Mali-G610 MC4 • OpenGL ES 1.1/2.0/3.1/3.2 • Vulkan 1.1, 1.2 • OpenCL 1.1, 1.2, 2.0

		• Embedded high performance 2D image acceleration module
NPU		6TOPS AI computing power, three-core architecture, supporting int4/int8/int16/FP16/BF16/TF32
Video	Decoder	• Support 8K@60fps H.265/VP9 video decoding • Support 8K@30fps H.264 video decoding • Support 4K@60fps AV1 video decoding • Support 1080P@60fps MPEG-2/MPEG-1/VC-1/VP8 video decoding
	Encoder	Support H.264/H.265 video encoding, up to 8K@30fps
RAM		8GB LPDDR4
ROM		32GB eMMC
Support system		Android16
Hardware Parameters		
Extended Storage		• Support 1x M.2 PCIe3.0 SSD • Support 1xSATA3.0 • Support 1x MicroSD Card
Display		• Support 1x HDMI2.1 TX 8K@60fps output • Support 1xDP1.4 8K@30fps output • Support 1xeDP 1920x1200@60fps output • Support 1x HDMI RX 4K@60fps output
Audio		• Support 1x HDMI TX/RX audio output • Support 1x DP audio output • Support 1x Headphone output/input
USB		• Support 1xUSB3.0 • Support 4xUSB2.0 • Support 1x USB3.1 Type-C (ADB/USB3.0/HDMI)
Network		• Support 1x Gigabit Ethernet

	• Support 1x WIFI/BT module • Support 1x 4G module
Camera	Support 3xCamera
Peripheral communication	• Support 1xCAN • Support 1xRS485 • Support 2xUART
Other parameters	Support 1xDebug, 1xIR, 1xRTC, 1xFan
Electrical Parameters	
Power supply input voltage	12V/3A
RTC input voltage	3V/0.6uA
Operating temperature	0~70°
Storage temperature	-40~85°
Structural Parameters	
Core board dimensions	67mm x 53mm
Motherboard dimensions	165mm x 120mm

1.3 Hardware Interface Introduction



Interface parameters	
Power in	12V DC power input interface
Reset	Reset key
HDMI_IN	HDMI RX interface
HDMI_OUT	HDMI2.1 TX interface
Display_Port	DP interface
USB Type-C	USB Type-C interface, OTG download interface
Ethernet	Gigabit Ethernet RJ45 interface
USB3.0	USB3.0 Host interface
2XUSB2.0 Host(1)	Dual-layer USB2.0 HOST interface
2XUSB2.0 Host(2)	USB expansion interface
Recover	Recovery key
WIFI&BT	WIFI&Bluetooth module

2XUART	• UART0, TTL level interface • UART3, TTL level interface
PCIe2.0 4G model	4G model interface
SATA _Power	SATA Power interface, 5V
SATA3.0	SATA3.0 interface
M.2_PCIe3.0	M.2 PCIe3.0 SSD interface
RTC	RTC coin cell connector
MIPI_CSI0	Camera0 interface
CSI Bridge connetor	CSI Bridge connetor, must be connected when using the camera
Audio I/O	Earphone output/input
Nano SIM + Micro SD	All-in-one card holder
IR	infrared receiver
Power	Power key
Debug	debug the serial port
RS485	RS485 communication interface
CAN	CAN communication interface
MIPI_DSI/eDP	DSI/eDP display interface
MIPI_DPHY1	MIPI DPHY1 interface
MIPI_CSI1	Camera1 interface
Fan	Fan interface, 12V
CSI Bridge connetor	CSI Bridge connetor, must be connected when using the camera

2.Install Drivers and Tool

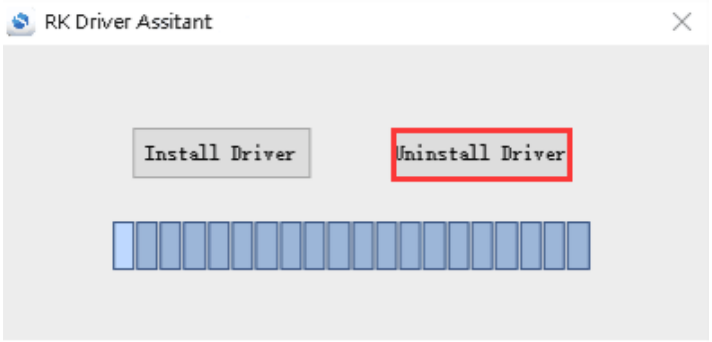
To download firmware and debug in the terminal, the following drivers and software need to be installed (for Windows computers):

Number	Driver name	Driver	Use
1	RK Driver Assitant	DriverInstall.exe	OTG USB driver installation assitant
2	CH9102x	SETUP.EXE	Serial port debugging driver
3	Serial Terminal Tool	SecureCRT.exe	Debugging tool

2.1 Install RK Driver Assitant

Step 1: Open *DriverAssitant_v5.1.3/DriverInstall.exe*.

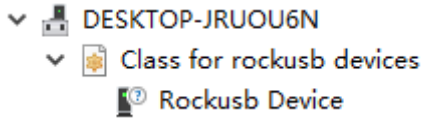
Step 2: To avoid driver conflicts, click **"Uninstall Driver"** to uninstall the driver.



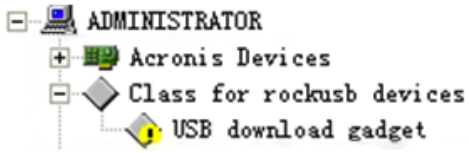
Step 3: Click button **"Install Driver"** to install.

Step 4: After the installation is complete, connect the board and PC with Type-C USB cable and press the **Recovery** key and hold then power the board, the following information is displayed in the Computer **Device Manager**, indicating that the USB

driver was successfully installed.

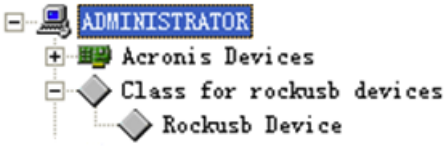


Step 5: If the following device information appears in the **Device Manager** after the operation in Step 4, user need to proceed to the next step.



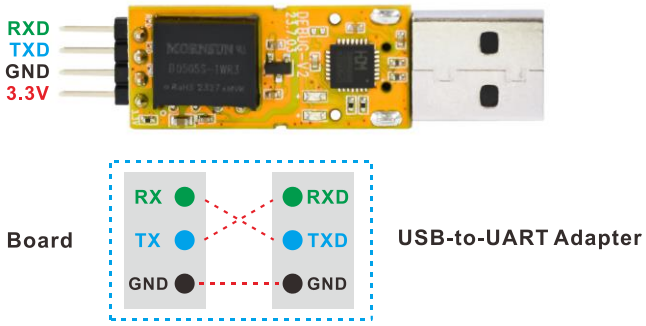
Step 6: The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select: *DriverAssitant_v5.1.3/ADBDriver.*

Step 7: After the installation is completed, the following device information can be seen in the Computer **Device Manager**.



2.2 Install CH9102X Driver

2.2.1 How to Connect the Serial Port Tool



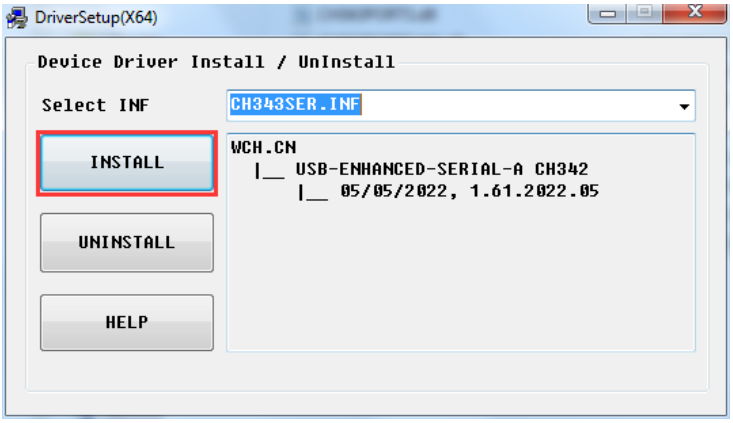
Pin	Connection Description
RXD	Receive, connect to TX pin of the board.
TXD	Transmit, connect to RX pin of the board.
GND	Ground, connect to GND pin of the board.
3V3	No need to connect.

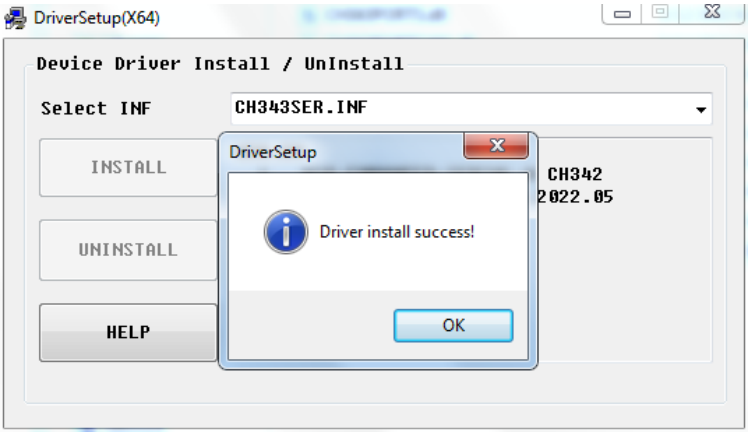
2.2.2 Install Driver

Step 1: Plug the CH9102X Module to the PC

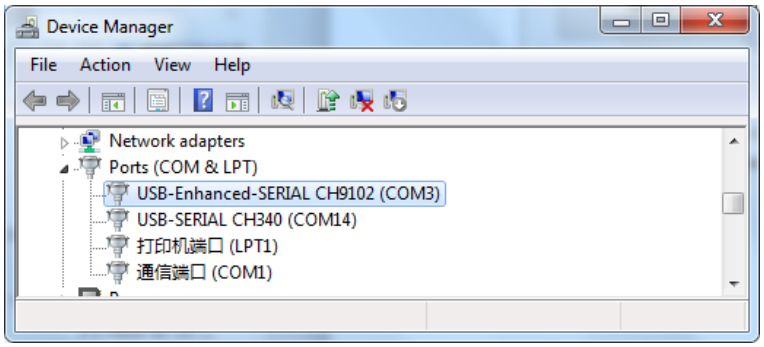
Step 2: Unzip *CH343SER.ZIP* on Windows.

Step 3: Select and install the corresponding *SETUP.EXE* according to the computer properties.





Step 4: After the installation is completed, the device will be listed under **Device Manager** ports with unique serial port assigned.

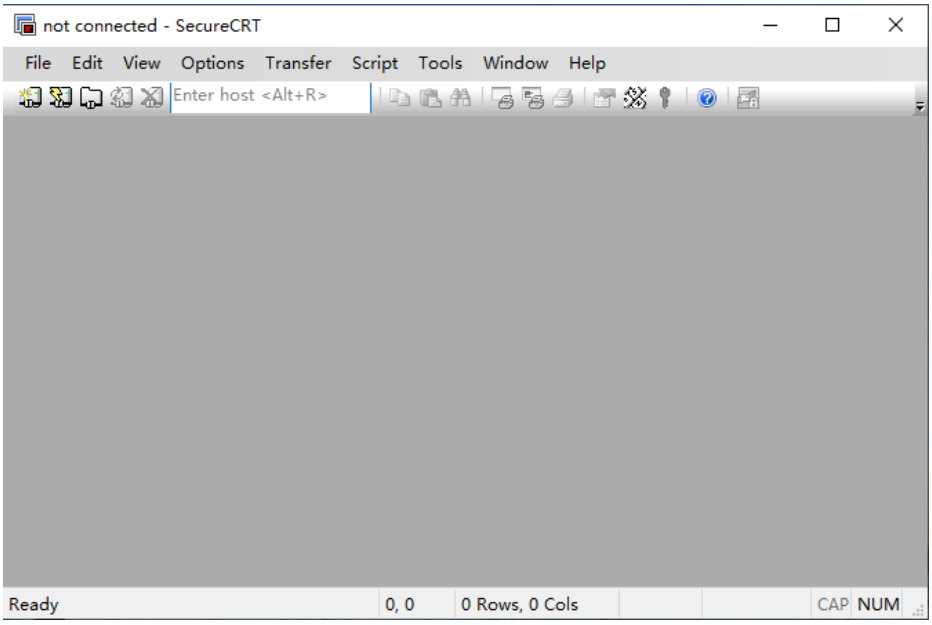


2.3 Install Serial Terminal Tool

The serial terminal SecureCRT is used for debugging in Windows. It can be used directly after decompression.

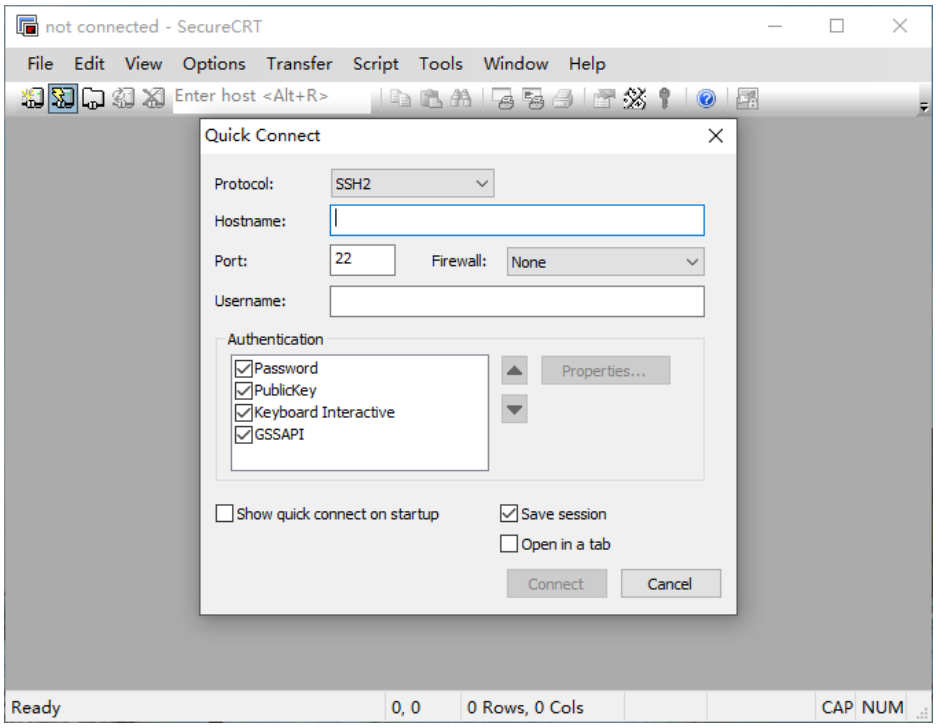
Step 1: Unzip *Platform/SecureCRT.rar* on PC.

Step 2: Click *SecureCRT/SecureCRT.exe* open the SecureCRT.

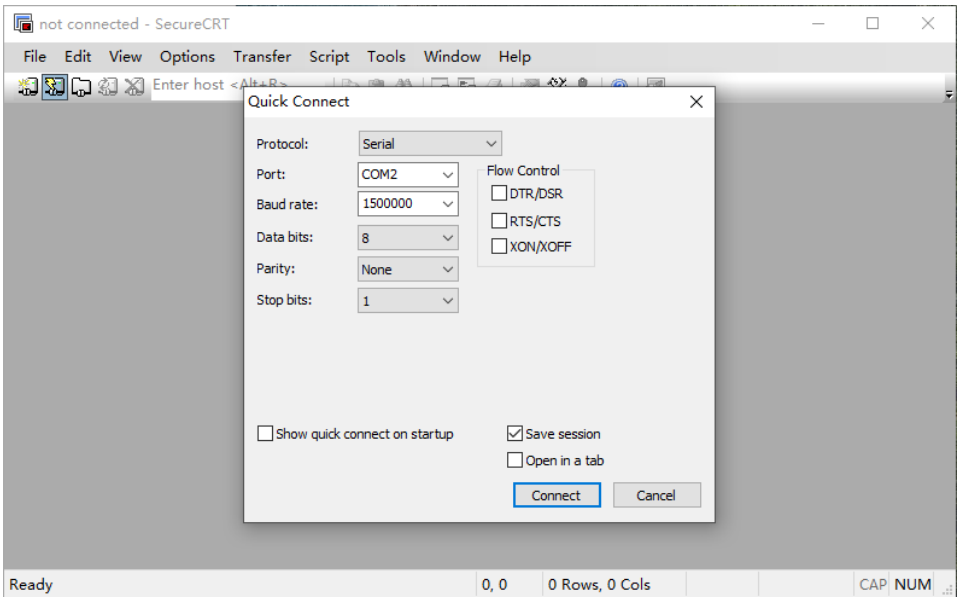


Step 3: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

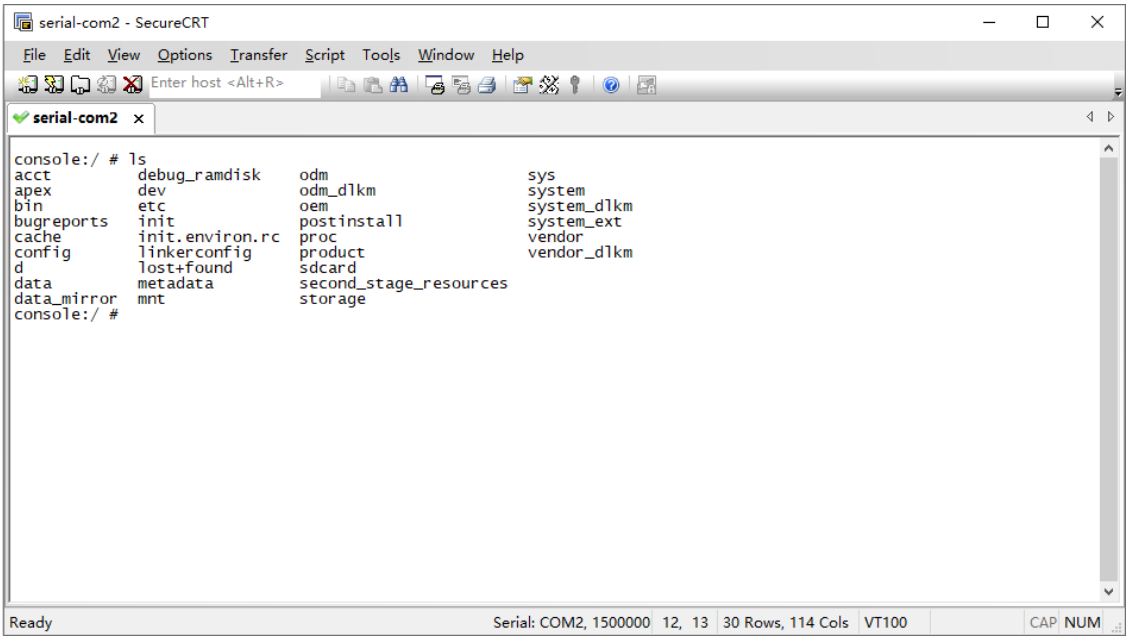
Step 4: Click the **"Quick Connect"** button to go to the Quick Connect configuration screen.



Step 5: Configure as shown in the following figure.



Step 6: After clicking **"Connect"** button, the terminal serial interface will be successfully accessed.



3.Upgrade Introduction

3.1 Upgrade Mode

(1) Before upgrading the firmware via USB cable, ensure the necessary drivers are installed. Please refer to the section *Install RK Driver Assistant* for installation instructions.

(2) There are two modes for upgrading the firmware via USB cable:

- **Loader Mode:** This is the standard mode used for firmware upgrades.
- **MaskRom Mode:** This is the last resort when the device is bricked. Forcing entry into MaskRom requires hardware manipulation, which carries certain risks, and should only be attempted when Loader mode is unavailable.

3.1.1 How to Enter Loader Mode

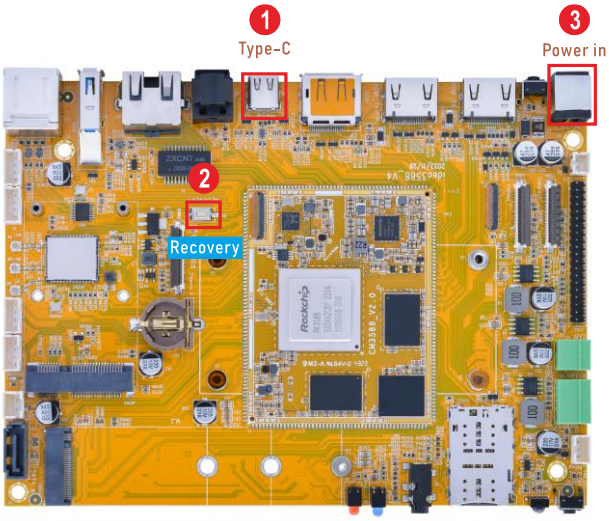
3.1.1.1 Hardware

Step 1: Disconnect the power adapter.

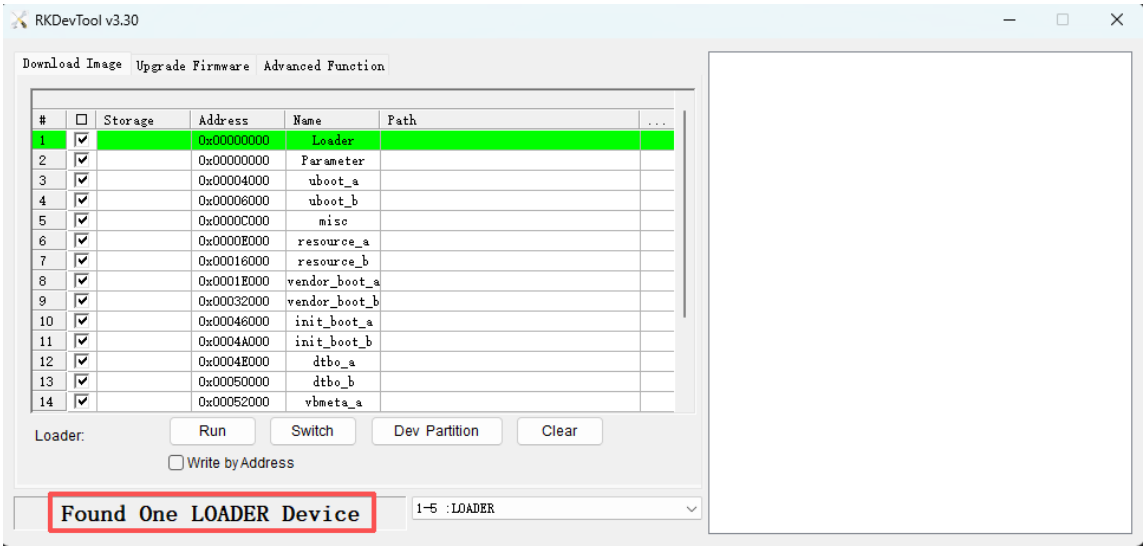
Step 2: Connect one end of the Type-C cable to the host and the other end to the development board.

Step 3: Press and hold the **Recovery** button on the board.

Step 4: Connect the power supply.



Step 5: After about two seconds, release the **Recovery** button.



In the flashing tool, **"Found one LOADER Device"** indicates that the device is in Loader mode.

3.1.1.2 Software

After connecting the Type-C cable, execute the following command in the serial debug terminal or adb shell.

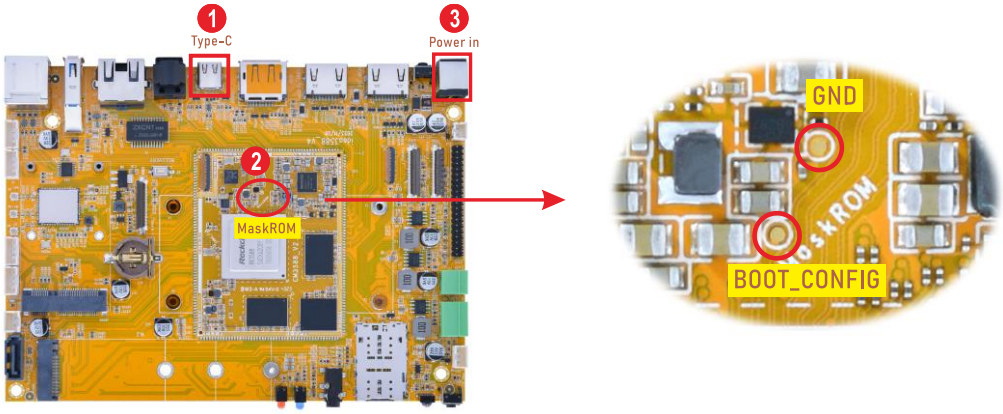
```
# reboot loader
```

3.1.2 How to Enter MaskRom Mode

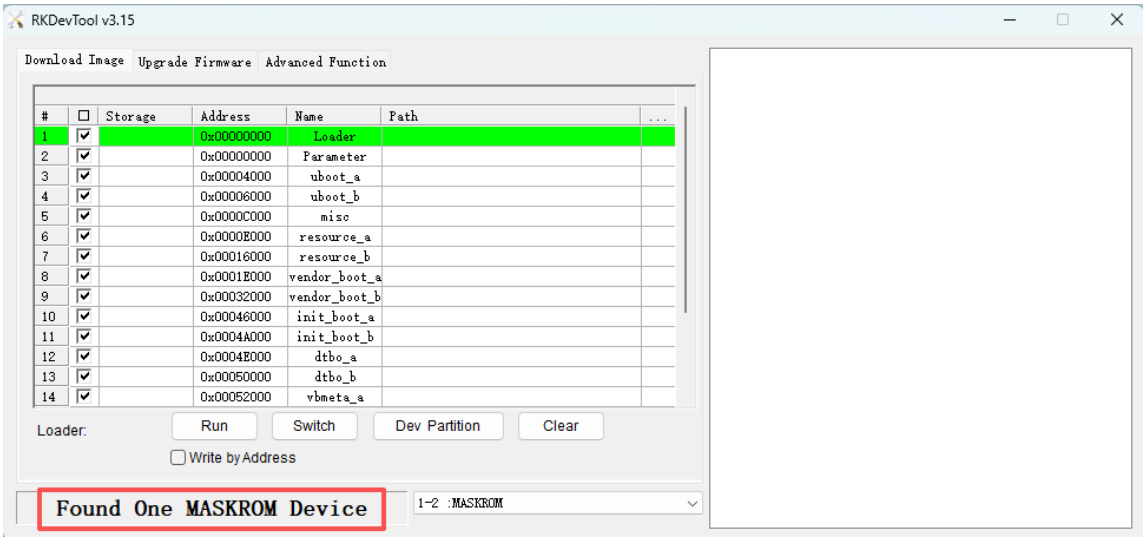
Step 1: Disconnect the power adapter.

Step 2: Connect one end of the Type-C cable to the host and the other end to the development board.

Step 3: Use tweezers to short the two test points on the CM3588.



Step 4: After connecting the power cable, the device will enter MaskRom mode.



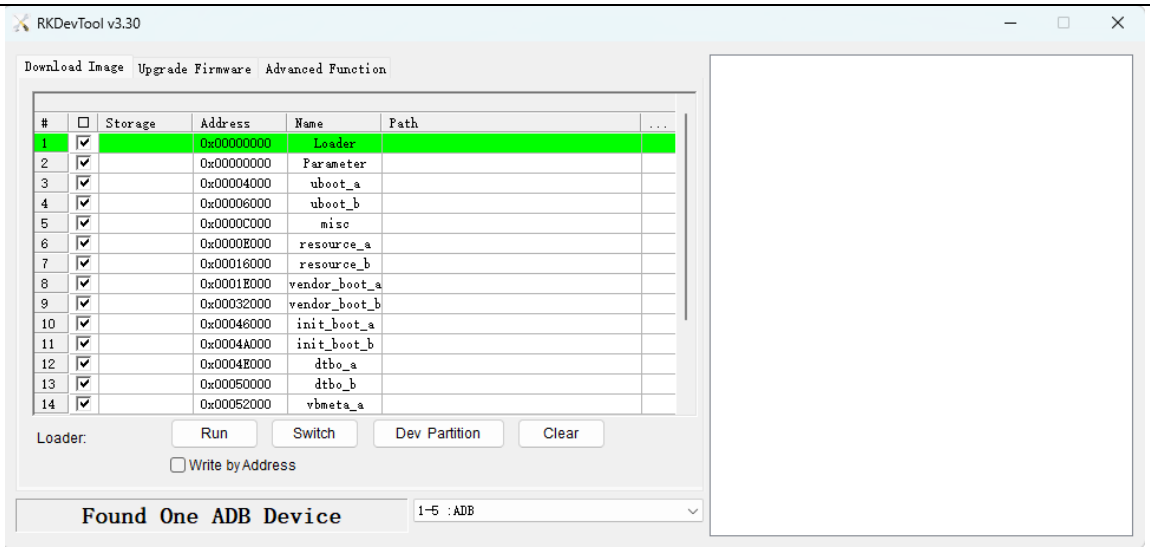
3.2 Firmware Flashing

Environment: Windows OS (Operating System).

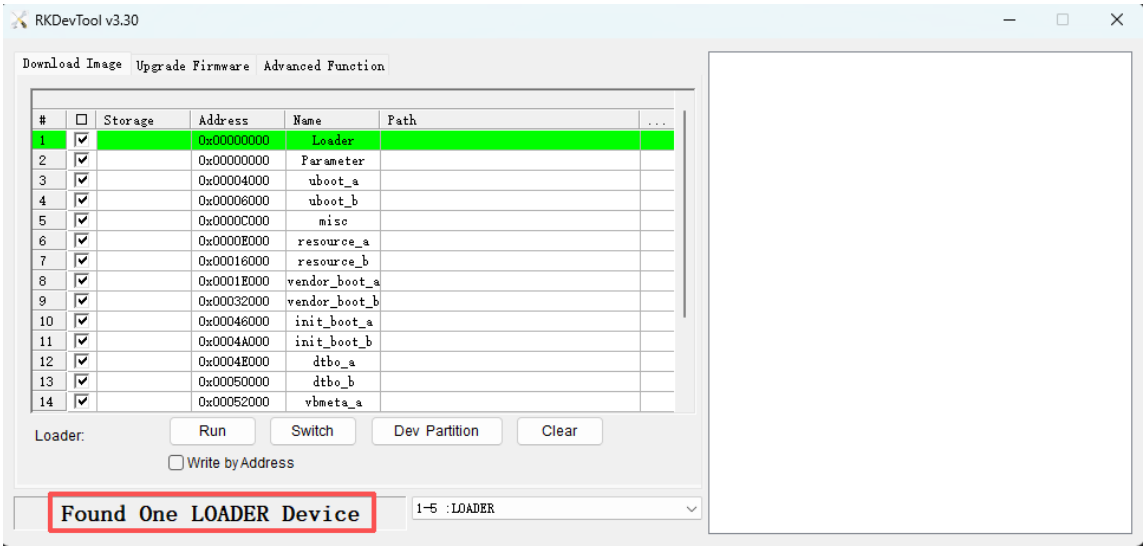
3.2.1 Flash Full Firmware Image

Step 1: Unzip *RKDevTool_v3.30_for_window.rar* on Windows.

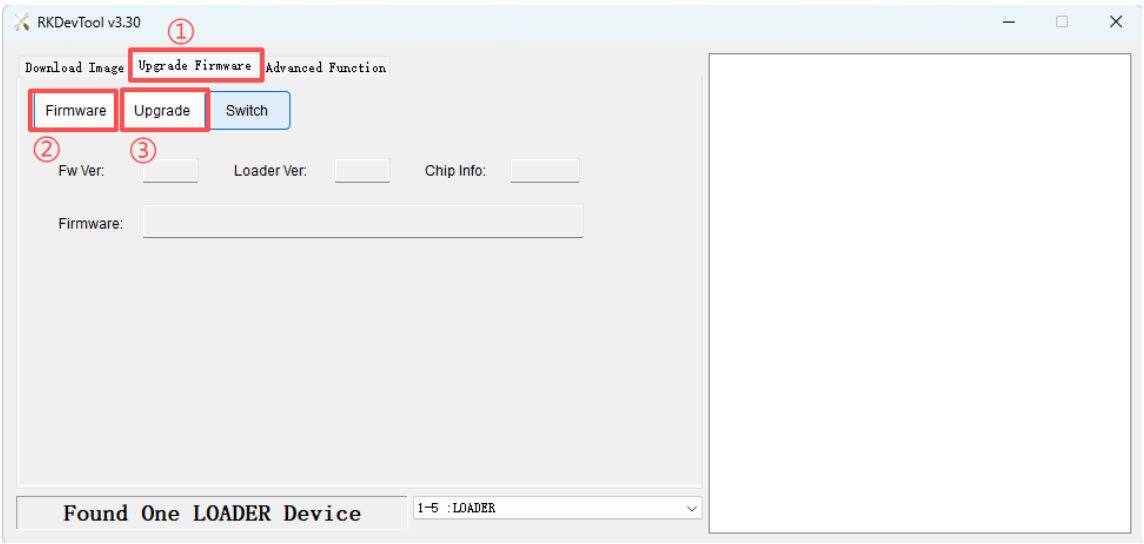
Step 2: Open *RKDevTool_v3.30_for_window\RKDevTool.exe*.

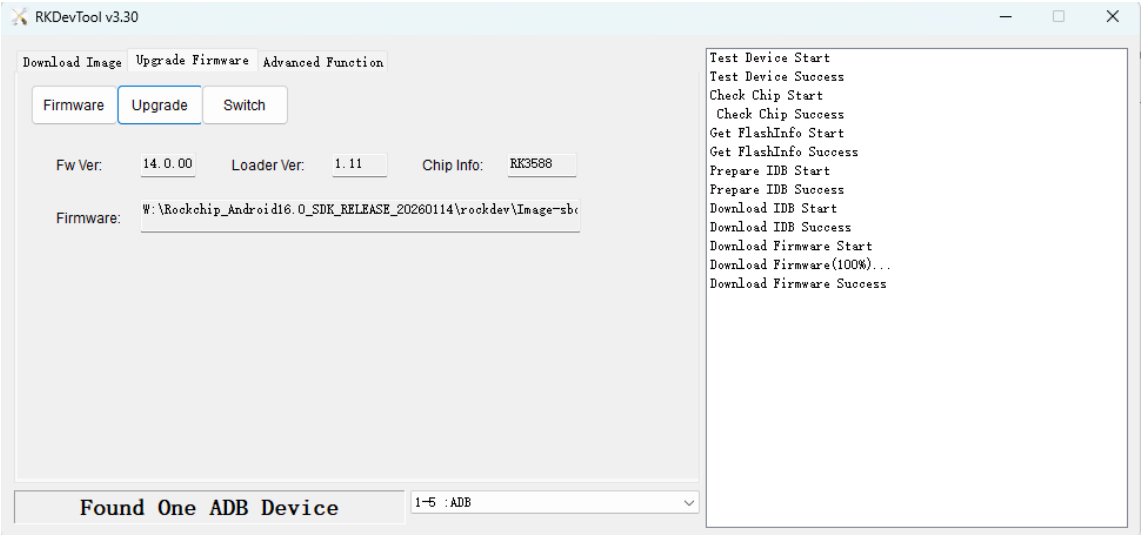


Step 3: Switch to **loader mode**.



Step 4: Click **Upgrade Firmware** -> **Firmware**, select **update.img**, then click **Upgrade** to flash.





After the flashing is complete, the board will automatically reboot.

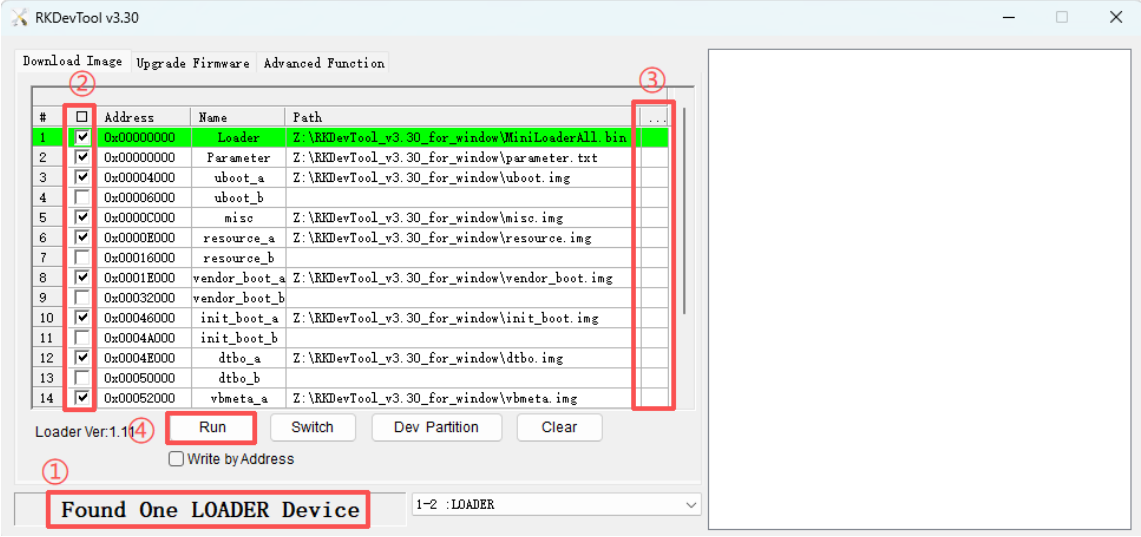
3.2.2 Flash Separate Partition Images

Step 1: Switch to **Loader mode**.

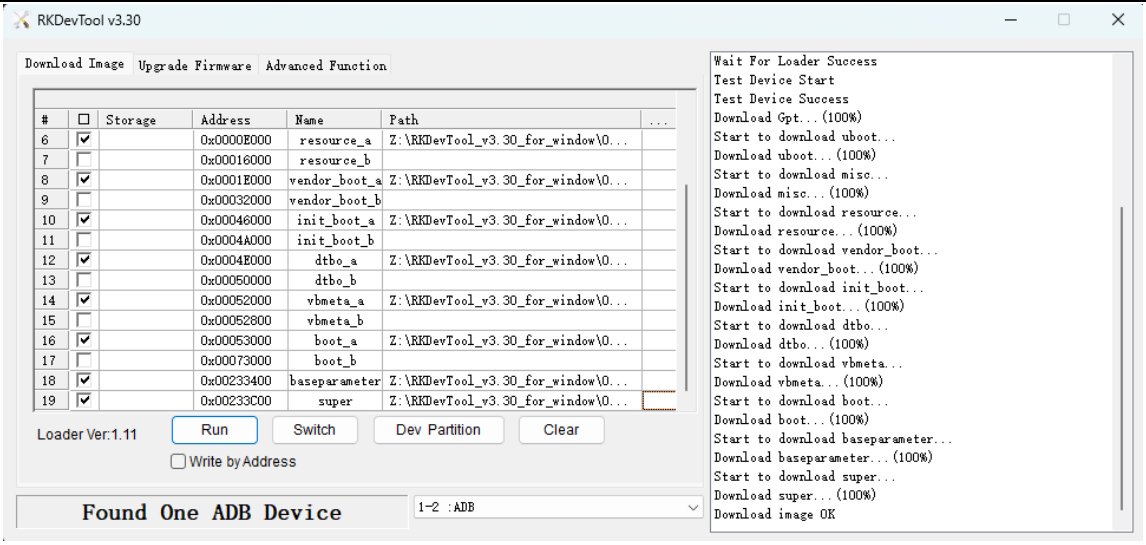
Step 2: Check the partitions to be flashed, multiple partitions can be selected.

Step 3: Ensure the image file path is correct. If necessary, click the blank cell next to the path to reselect it.

Step 4: Click the **Run** button to flash the image.



After the flashing is complete, the board will automatically reboot.



4.Development Environment

4.1 Preparing the Development Environment

It is recommended to use Ubuntu 22.04 or higher version for compilation. If you encounter an error during compilation, user can check the error message and install the corresponding software packages accordingly. Other Linux versions may need to adjust the software package accordingly. In addition to the system requirements, there are other hardware and software requirements.

Hardware requirements	Software requirements
64-bit system, hard disk space should be greater than 200G. If you do multiple builds, you will need more hard drive space.	Ubuntu 22.04

4.2 Installing Libraries and Toolkits

The contents of this directory only provide the software package installation commands that are needed to build the compiled SDK environment. Please install other tools such as samba and ssh yourself.

PC OS	Network	Permission

Ubuntu 22.04	online	root

To install the required tools, execute the following commands:

```
$ sudo apt-get install git-core gnupg flex bison gperf build-essential zip curl \
zlib1g-dev gcc-multilib g++-multilib libc6-dev-i386 \
lib32ncurses5-dev x11protocore-dev \
libx11-dev lib32z-dev ccache libgl1-mesa-dev libxml2-utils xsltproc \
unzip python-pyelftools python3-pyelftools device-tree-compiler libfdt-dev \
libfdt1 libssl-dev liblz4-tool python-dev
```

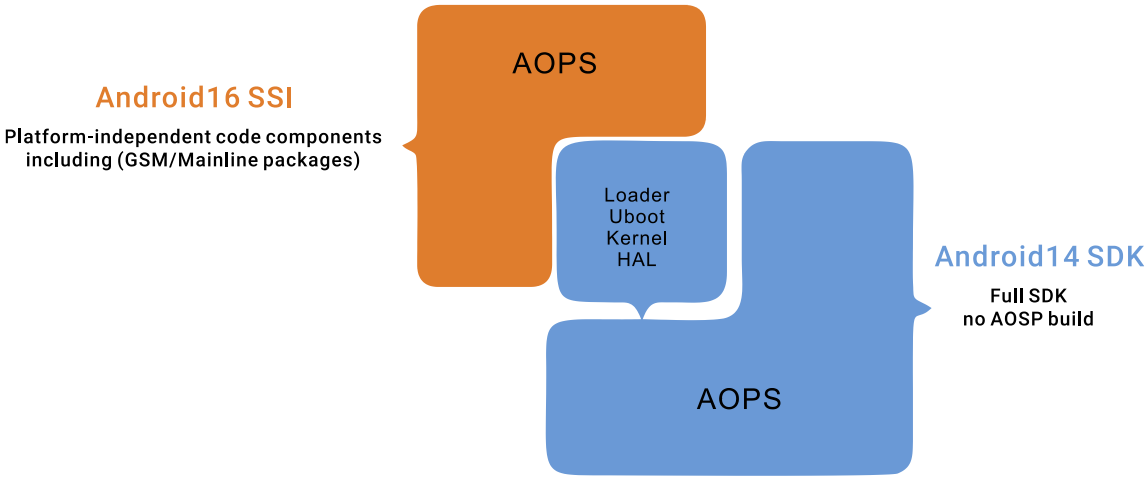
4.3 Install JDK

```
$ sudo apt-get update
$ sudo apt-get install openjdk-8-jdk
```

5.Compile Source

Rockchip Android 16.0 SSI SDK only releases aosp code, and after compilation it only generates system related images such as system.img, system_ext.img, product.img, which are identical to Google's GSI firmware. Other parts of the code need to be compiled using the Android 14 SDK, so Rockchip Android 16.0 SSI SDK needs to be used in conjunction with the Android 14 SDK.

The architecture diagram of the complete SDK composed of Rockchip Android 16.0 SSI SDK and Android14 SDK is as follows:



Step 1: To extract the source files, execute the following commands:

```
$ tar xvf Rockchip_Android16.0_SDK_RELEASE_20260114.tar.bz2
$ tar xvf Rockchip_Android14.0_SDK_RELEASE_20260115.tar.bz2
$ cd Rockchip_Android16.0_SDK_RELEASE_20260114
```

Step 2: Select the corresponding lunch, execute the following commands:

```
$ source build/envsetup.sh
$ lunch ssi_16_arm64-bp2a-userdebug
```

```
xuejunchao@boardcon:~/Rockchip_Android16.0_SDK_RELEASE_20260114$ source build/envsetup.sh
including device/rockchip/rockchip_generic/vendorsetup.sh
xuejunchao@boardcon:~/Rockchip_Android16.0_SDK_RELEASE_20260114$ lunch ssi_16_arm64-bp2a-userdebug
build/make/core/product_config.mk:489: warning: PRODUCT_INSTALL_DEBUG_POLICY_TO_SYSTEM_EXT is set but
PRODUCT_NAME (ssi_16_arm64) doesn't look like a GSI for compliance testing. This is a special
configuration for compliance GSI, so do make sure you understand the security implications before setting
this option. If you don't know what this option does, then you probably shouldn't set this.
build/make/core/product_config.mk:489: warning: PRODUCT_INSTALL_DEBUG_POLICY_TO_SYSTEM_EXT is set but
PRODUCT_NAME (ssi_16_arm64) doesn't look like a GSI for compliance testing. This is a special
configuration for compliance GSI, so do make sure you understand the security implications before setting
this option. If you don't know what this option does, then you probably shouldn't set this.

============================================
PLATFORM_VERSION_CODENAME=REL
PLATFORM_VERSION=16
TARGET_PRODUCT=ssi_16_arm64
TARGET_BUILD_VARIANT=userdebug
TARGET_ARCH=arm64
TARGET_ARCH_VARIANT=armv8-a
TARGET_CPU_VARIANT=generic
HOST_OS=linux
HOST_OS_EXTRA=Linux-6.8.0-101-generic-x86_64-Ubuntu-22.04.5-LTS
HOST_CROSS_OS=windows
BUILD_ID=BP2A.250605.031.A3
OUT_DIR=out
SOONG_ONLY=false
============================================
```

Step 3: Linking Android14 SDK and configuring build parameters:

```
$ rkbuild_setup
```

```
xuejunchao@boardcon:~/Rockchip_Android16.0_SDK_RELEASE_20260114$ rkbuild_setup
[WARN] rkbuild_setup -d <kernel_dts> -l <vendor_lunch> -f <build_number> -p <vendor_sdk_path> -j
<build_thread>
Enter parameters in the specified format or press Enter to input as prompted: Enter

Please enter the directory of Android_VENDOR_SDK (for example: /home/hcq/4_Android14_0409):
/Rockchip_Android14.0_SDK_RELEASE_20260115

[WARN] The optional lunch projects for Android_VENDOR_SDK are as follows:

You're building on Linux

Lunch menu .. Here are the common combinations:
     1. PX30_u-user
     2. PX30_u-userdebug
     3. aosp_arm-eng
     4. aosp_arm64-eng
     5. aosp_x86-eng
     6. aosp_x86_64-eng
     7. em3588_u-user
     8. em3588_u-userdebug
     9. idea3588_u-user
     10. idea3588_u-userdebug
      ……
     45. sbc3588_u-user
     46. sbc3588_u-userdebug

Please enter the lunch option for Android_VENDOR_SDK (for example: rk3588_u-user):idea3588_u-userdebug

Do you need to specify the build number? (Press Enter to automatically generate, or directly enter the
required build number):10

Current PRODUCT_KERNEL_DTS=idea3588-u, If you need to modify the DTS, please enter. Press Enter to use the
default value: Enter
```

Step 4: Start compilation.

Full Compilation:

```
$ rkbuild_build all
```

Partial Compilation:

```
$ rkbuild_build { uboot | kernel | ssi | vendor | all }

     - uboot: Build the uboot in Android_VENDOR_SDK

     - kernel: Build the kernel modules in Android_VENDOR_SDK

     - ssi: Build the system SDK

     - vendor: Build the GRF SDK

     - all: Build the uboot & kernel & ssi & vendor, then pack the images to

     update.img
```

For partial compilation, need to perform merge operation after compilation:

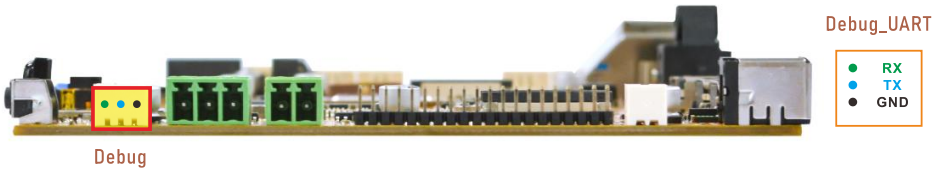
```
$ rkbuild_merge

$ rkbuild_mkupdate
```

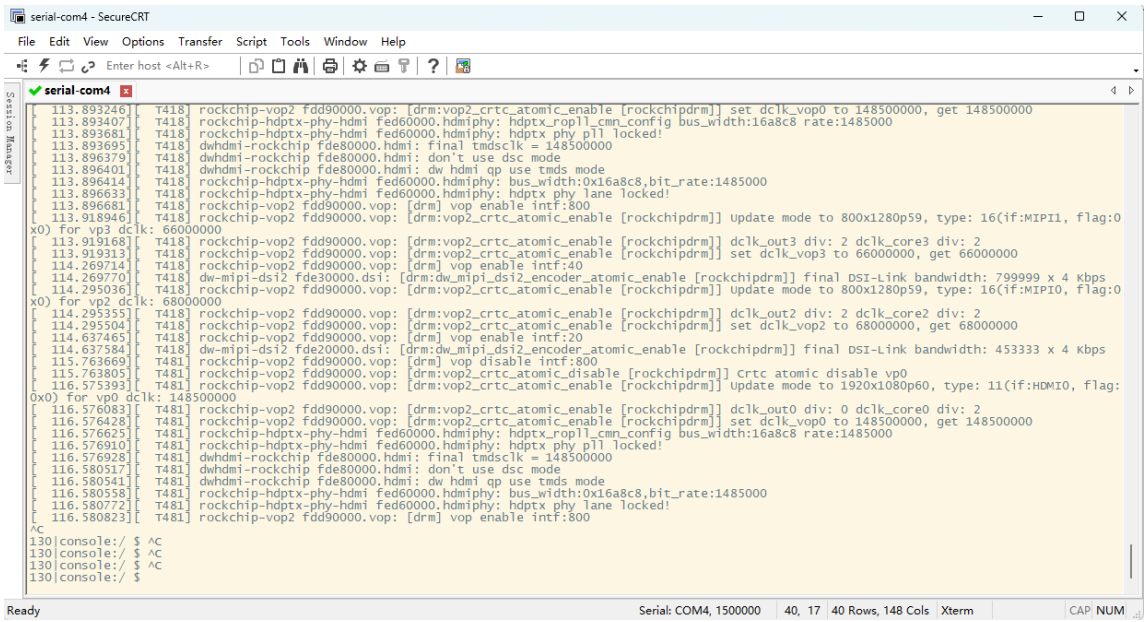
The path of the compiled firmware is /Rockchip_Android16.0_SDK_RELEASE_20260114/rockdev/Image-idea3588_u/.

6.Android16 Test

6.1 Serial Terminal

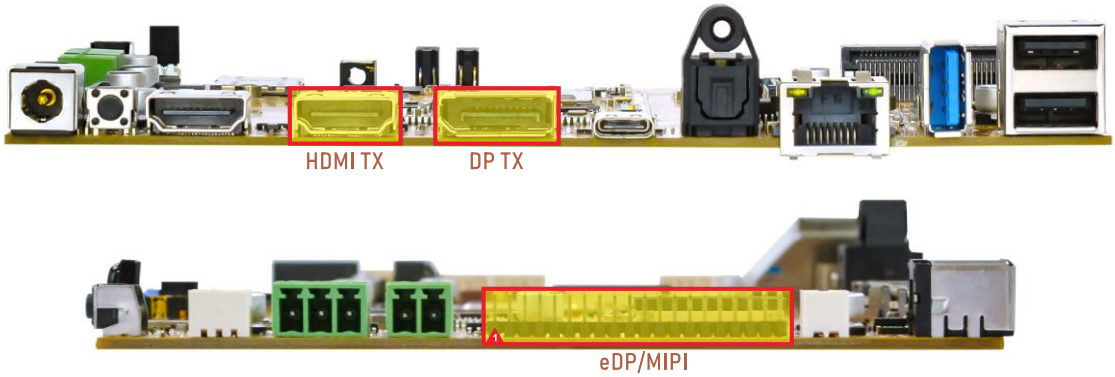


Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.



6.2 Display

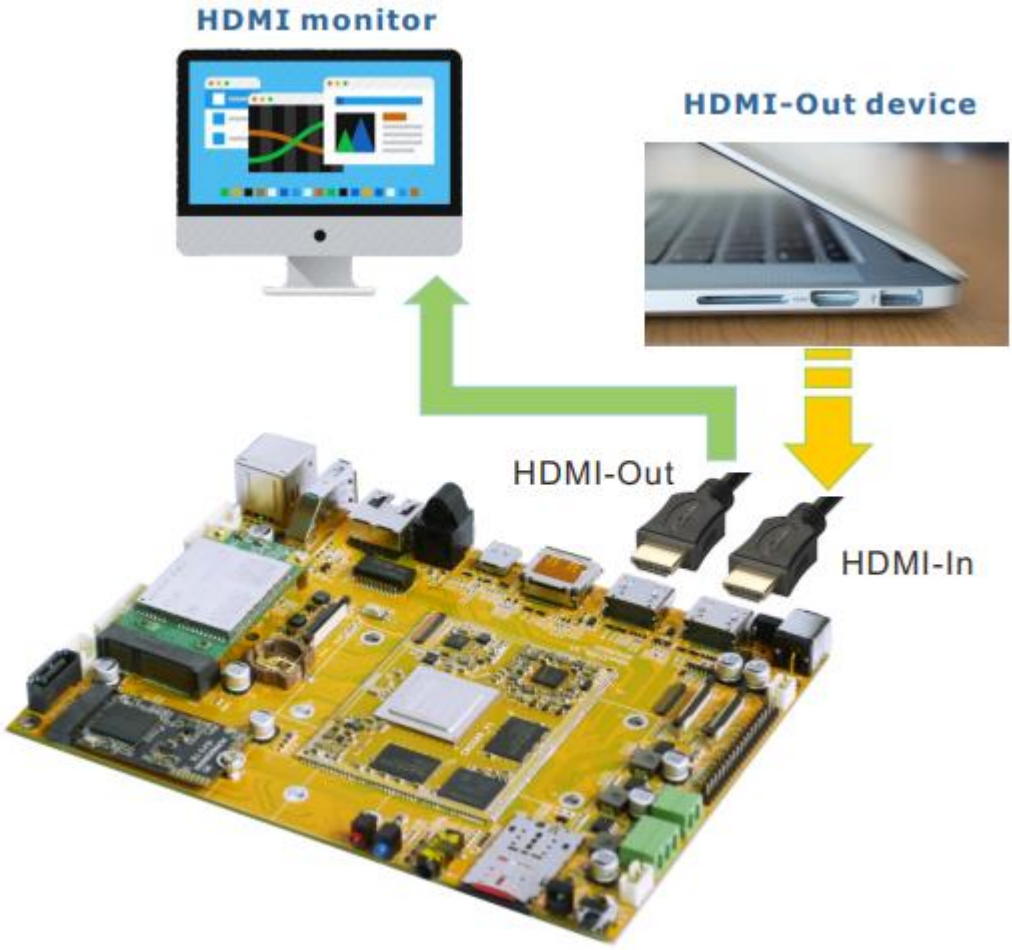
Idea3588 Android16 supports eDP, HDMI TX, DP three-screen display at the same time, and it is the same display.



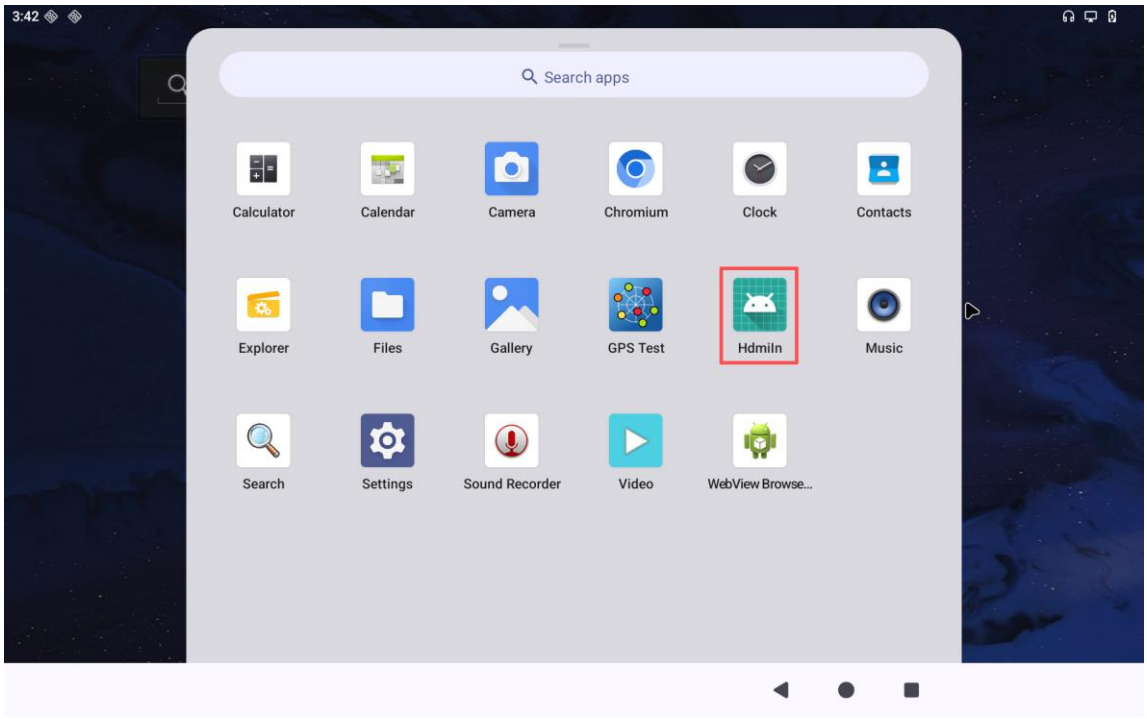
The display effect diagram is as follows:

6.3 HDMI RX display

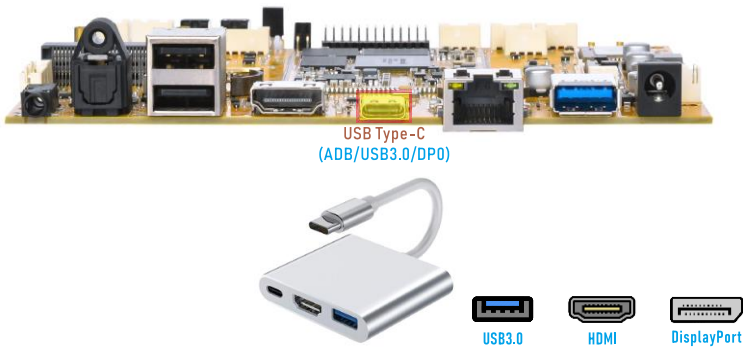
Step 1, connect the HDMI OUT on the output device to the HDMI IN on the Idea3588 and connect the HDMI OUT on the Idea3588 to the HDMI monitor, then power on.



Step 2, open **HdmiIn** application on Idea3588 will display the screen of output device.



6.4 USB Type-C



Features Supported by the Type-C Interface:

• **Reversible Design:** Allows insertion in either orientation for user convenience.

• **Data Transmission Roles:** Supports flexible designation of host and device roles.

• **Multiple Protocol Support:** Compatible with USB 3.0 and DisplayPort, enabling high-speed data transmission.

6.4.1 ADB

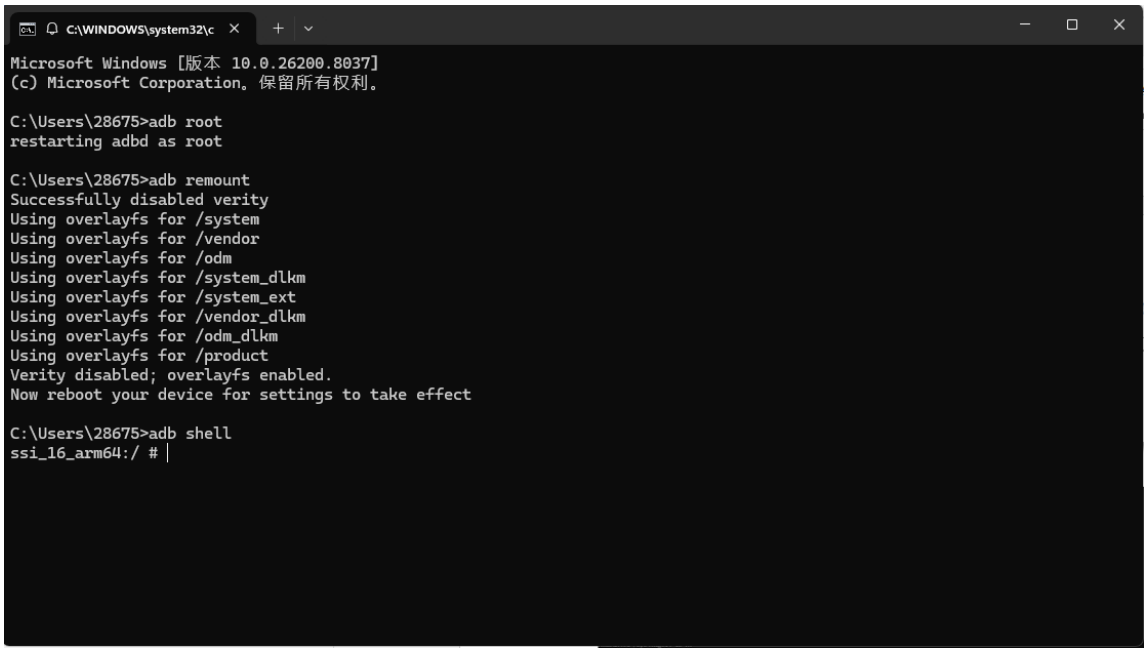
Step 1: Connect the board and PC host with Type-C cable.

Step 2: Install ADB driver on Windows system.

Step 3: Press **Windows + R** to open the Run program. Type "cmd" and press Enter.

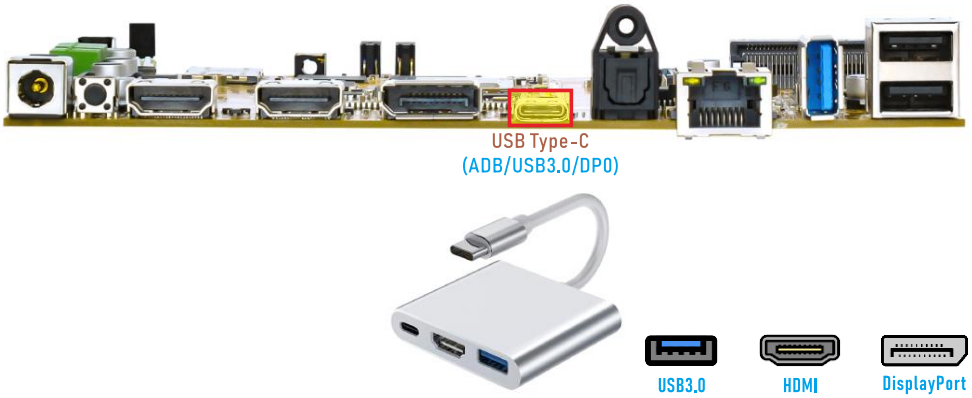
Step 4: Execute the following command to enable ADB.

```
# adb root
# adb remount
# adb shell
```



6.4.2 Type-C to USB3.0

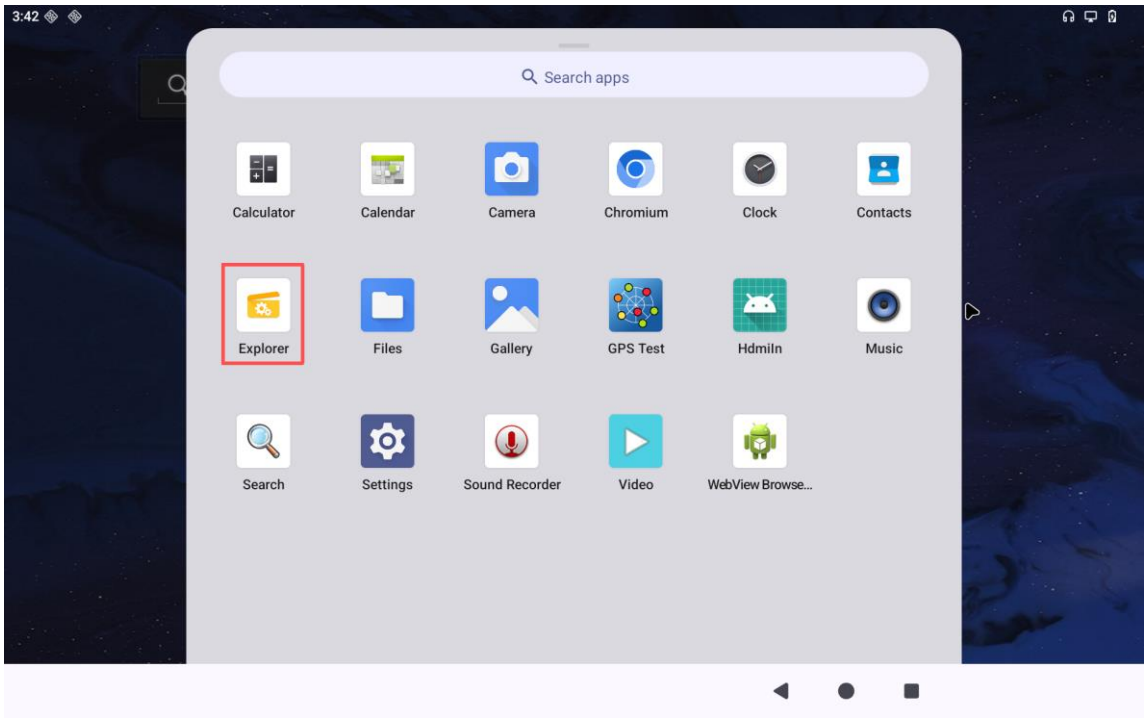
Step 1: Connect the Type-C to USB3.0 converter to the Type-C port of the development board, and then insert the USB3.0 flash drive into the USB3.0 port of the docking station.

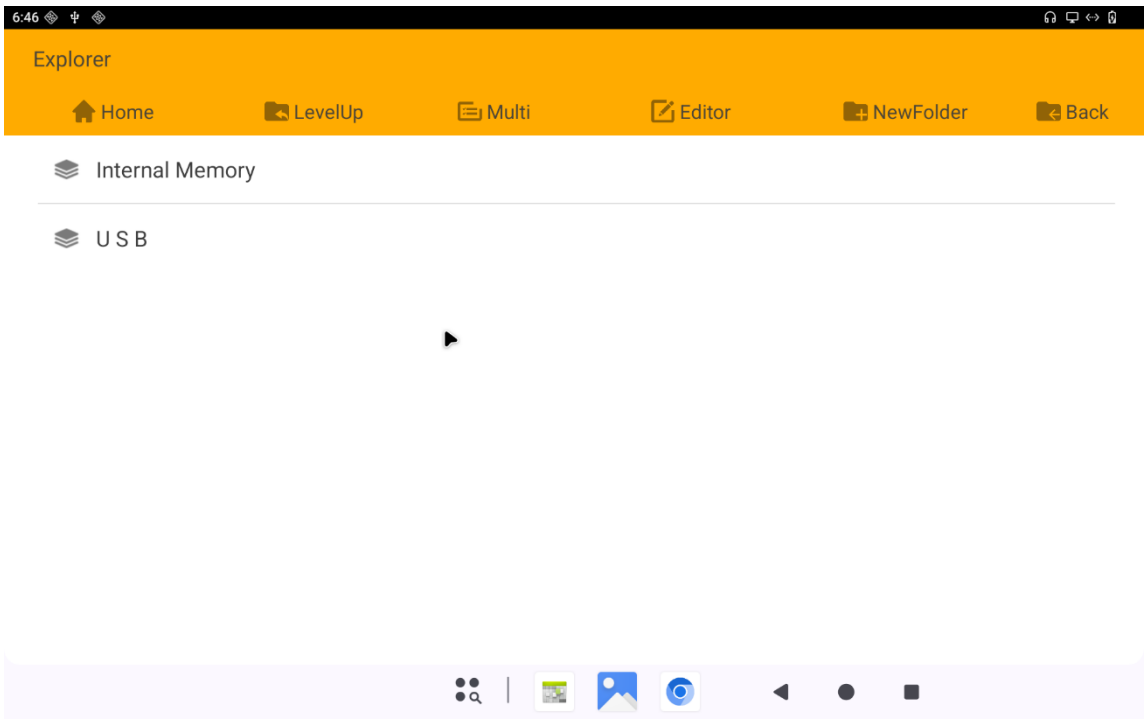


The log prints the following message, indicating that the USB3.0 device is successfully recognized.

```
console:/ $ [  376.594529][  T152] phy phy-fd5d0000.syscon:usb2-phy@0.8: charger = USB_DCP_CHARGER
[  376.600952][   T64] dwc3 fc000000.usb: request 0000000000000000 was not queued to ep0out
[  376.601061][  T140] android_work: did not send uevent (0 0 0000000000000000)
[  376.659775][ T2768] read descriptors
[  376.659880][ T2768] read strings
[  376.711002][   T64] phy phy-fd5d0000.syscon:usb2-phy@0.8: illegal mode
[  376.711047][   T64] xhci-hcd xhci-hcd.14.auto: xHCI Host Controller
[  376.711077][   T64] xhci-hcd xhci-hcd.14.auto: new USB bus registered, assigned bus number 8
[  376.711223][   T64] xhci-hcd xhci-hcd.14.auto: hcc params 0x0220fe64 hci version 0x110 quirks
0x0000008002010010
[  376.711265][   T64] xhci-hcd xhci-hcd.14.auto: irq 82, io mem 0xfc000000
[  376.711524][   T64] xhci-hcd xhci-hcd.14.auto: xHCI Host Controller
[  376.711547][   T64] xhci-hcd xhci-hcd.14.auto: new USB bus registered, assigned bus number 9
[  376.711567][   T64] xhci-hcd xhci-hcd.14.auto: Host supports USB 3.0 SuperSpeed
[  376.712321][   T64] usb usb8: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice= 6.01
[  376.712349][   T64] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[  376.712366][   T64] usb usb8: Product: xHCI Host Controller
[  376.712382][   T64] usb usb8: Manufacturer: Linux 6.1.145-android14-11-g4f184da362d5-ab14200214 xhci-hcd
[  376.712398][   T64] usb usb8: SerialNumber: xhci-hcd.14.auto
[  376.713636][   T64] hub 8-0:1.0: USB hub found
[  376.714058][   T64] hub 8-0:1.0: 1 port detected
[  376.715173][   T64] usb usb9: We don't know the algorithms for LPM for this host, disabling LPM.
[  376.715310][   T64] usb usb9: New USB device found, idVendor=1d6b, idProduct=0003, bcdDevice= 6.01
[  376.715329][   T64] usb usb9: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[  376.715345][   T64] usb usb9: Product: xHCI Host Controller
[  376.715360][   T64] usb usb9: Manufacturer: Linux 6.1.145-android14-11-g4f184da362d5-ab14200214 xhci-hcd
[  376.715374][   T64] usb usb9: SerialNumber: xhci-hcd.14.auto
[  376.716317][   T64] hub 9-0:1.0: USB hub found
[  376.716721][   T64] hub 9-0:1.0: 1 port detected
[  377.114511][ T2867] usb 8-1: new high-speed USB device number 2 using xhci-hcd
[  377.265173][ T2867] usb 8-1: New USB device found, idVendor=346d, idProduct=5678, bcdDevice= 2.00
[  377.265271][ T2867] usb 8-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[  377.265316][ T2867] usb 8-1: Product: HIKSEMI
[  377.265354][ T2867] usb 8-1: SerialNumber: FC0767D6251F4
[  377.269323][ T2867] usb-storage 8-1:1.0: USB Mass Storage device detected
[  377.271174][ T2867] usb-storage 8-1:1.0: Quirks match for vid 346d pid 5678: 420
[  377.271683][ T2867] scsi host1: usb-storage 8-1:1.0
[  377.695559][ T2768] read descriptors
[  377.695723][ T2768] read strings
[  378.274734][ T2867] scsi 1:0:0:0: Direct-Access            HIKSEMI         3.00 PQ: 0 ANSI: 4
[  378.275315][ T2867] sd 1:0:0:0: Attached scsi generic sg0 type 0
[  378.275703][  T114] sd 1:0:0:0: [sda] 122880000 512-byte logical blocks: (62.9 GB/58.6 GiB)
[  378.277306][  T114] sd 1:0:0:0: [sda] Write Protect is off
[  378.277544][  T114] sd 1:0:0:0: [sda] No Caching mode page found
[  378.277558][  T114] sd 1:0:0:0: [sda] Assuming drive cache: write through
[  378.280577][  T114]  sda: sda1
[  378.283262][  T114] sd 1:0:0:0: [sda] Attached SCSI removable disk
[  378.367721][    T1] init: Untracked pid 2888 received signal 15
[  378.367773][    T1] init: Untracked pid 2888 did not have an associated service entry and will not be
reaped
[  378.439650][    T1] init: Untracked pid 2891 received signal 15
[  378.439695][    T1] init: Untracked pid 2891 did not have an associated service entry and will not be
reaped
```

Step 2: The USB mount status can be viewed on the Android desktop.





6.4.3 DP Alt Mode

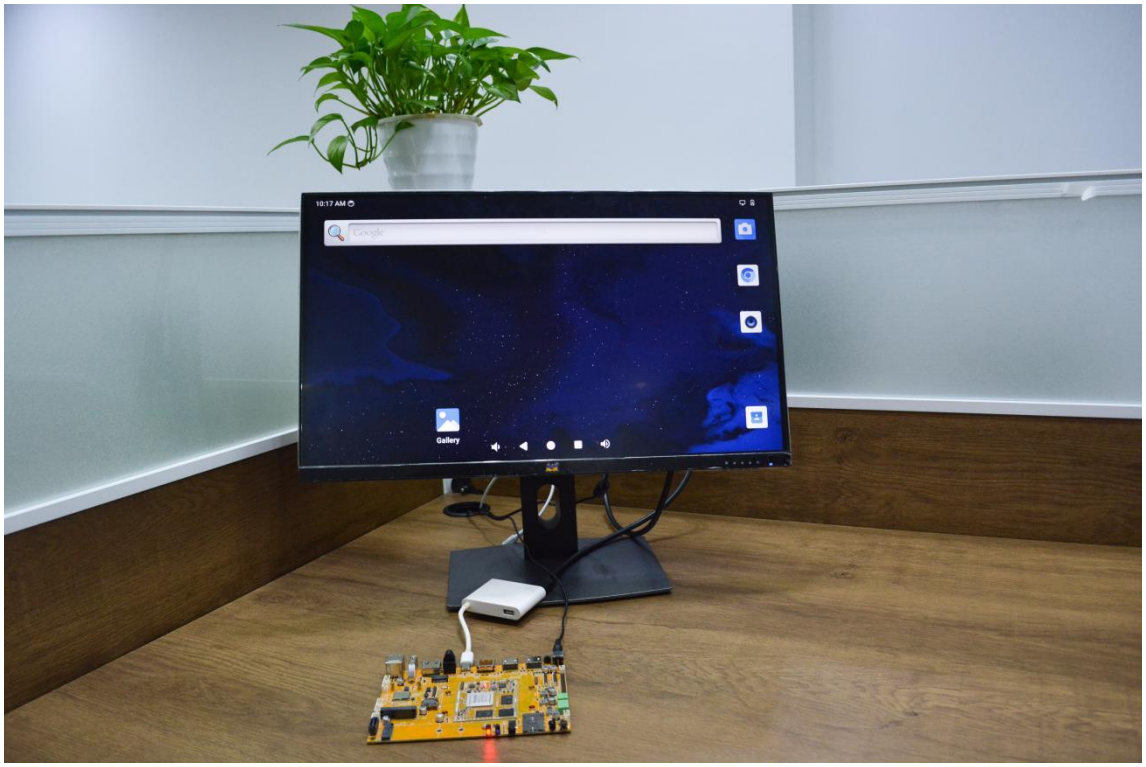
DisplayPort Alternate Mode (DP Alt Mode) is a technology that facilitates the transmission of DisplayPort video signals through a USB Type-C interface. It enables devices to output video and audio via a USB-C connection without requiring a dedicated

DisplayPort connector. This allows users to connect a display using a single USB-C port while transmitting video, audio, and additional data.

Currently, Boardcon has conducted the following output tests:

• **Type-C to HDMI:** Supports 3840x2160p60 resolution.

• **Type-C to DisplayPort (DP):** Supports 3840x2160p60 resolution.



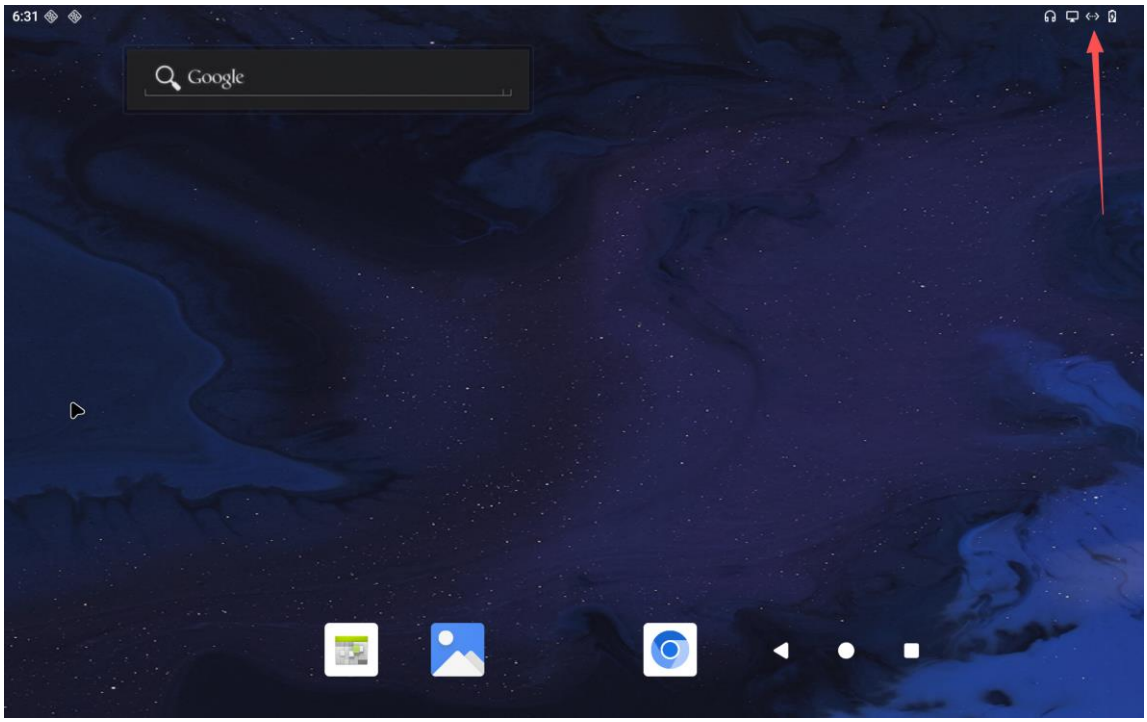
6.5 Ethernet

Step 1: Connect the network cable to the Ethernet port.

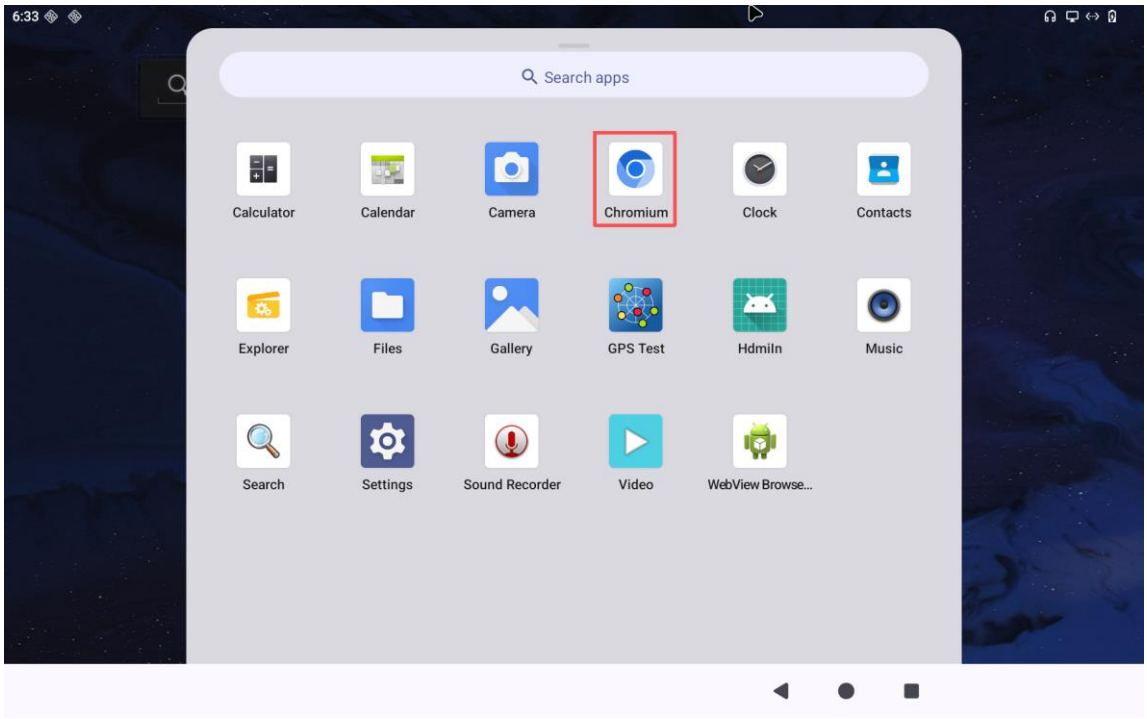
According to the log, it can be seen that the Gigabit Ethernet recognition is successful.

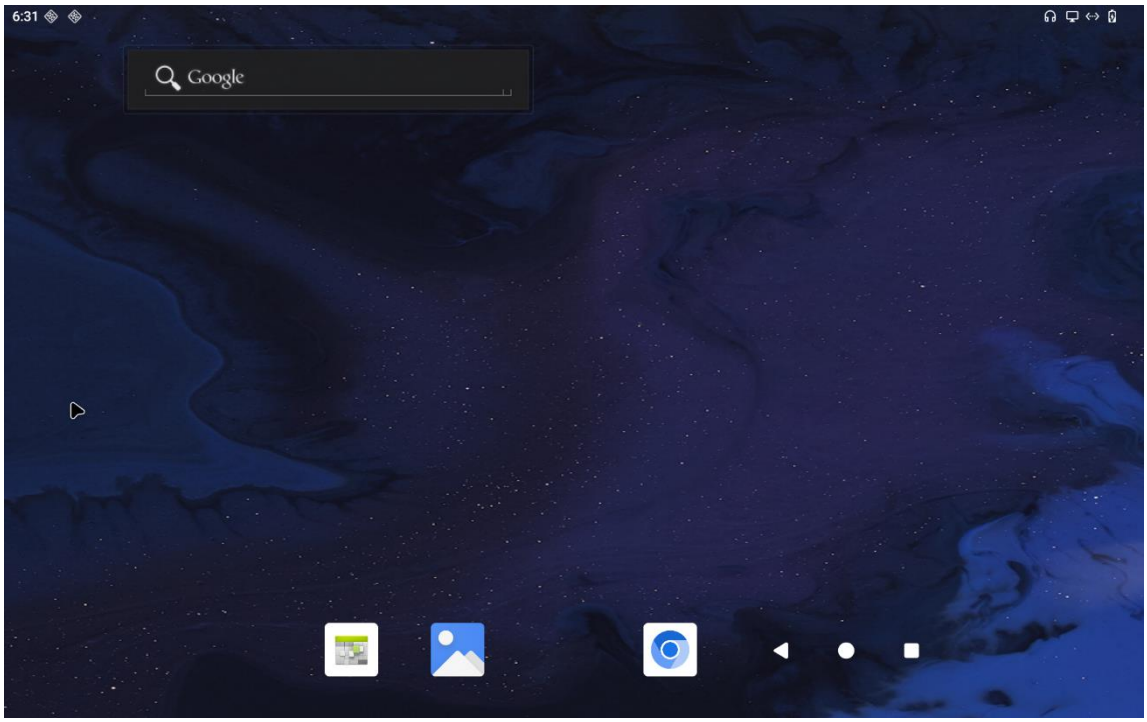
```
console:/ $ [  160.612644][  T134] rk_gmac-dwmac fe1c0000.ethernet eth0: Link is Up - 1Gbps/Full - flow
control rx/tx
[  160.612816][    T8] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

Step 2: After connecting the Ethernet cable, the following icon will appear in the upper right corner of the desktop, indicating that the Ethernet connection is successful.



Step 3: Test the ethernet connection.





Users can also choose to use the ping command to test the connectivity of the Ethernet, as shown below:

- View network interface information.

```
$ su
# ifconfig eth0
```

```
130|console:/ $ su
console:/ # ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 22:5f:f9:59:2b:d0  Driver rk_gmac-dwmac
          inet addr:192.168.0.73  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::85bd:8294:4d35:bc5a/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:18565 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6517 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:19148088 TX bytes:775916
          Interrupt:74
```

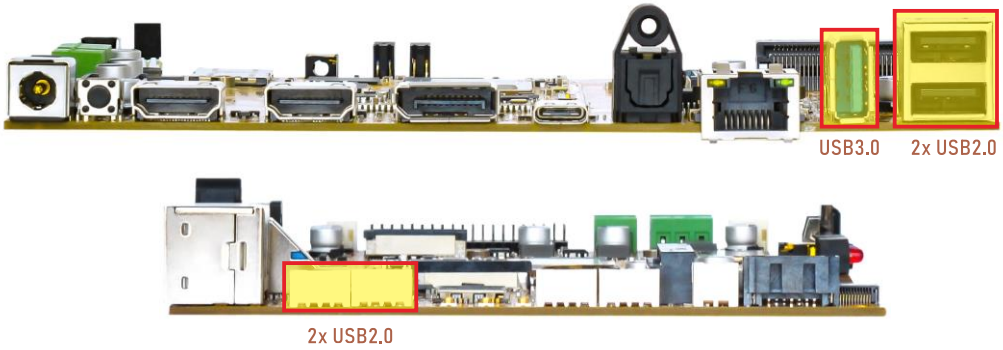
- Network connection test.

```
# ping -I eth0 www.armdesigner.com
```

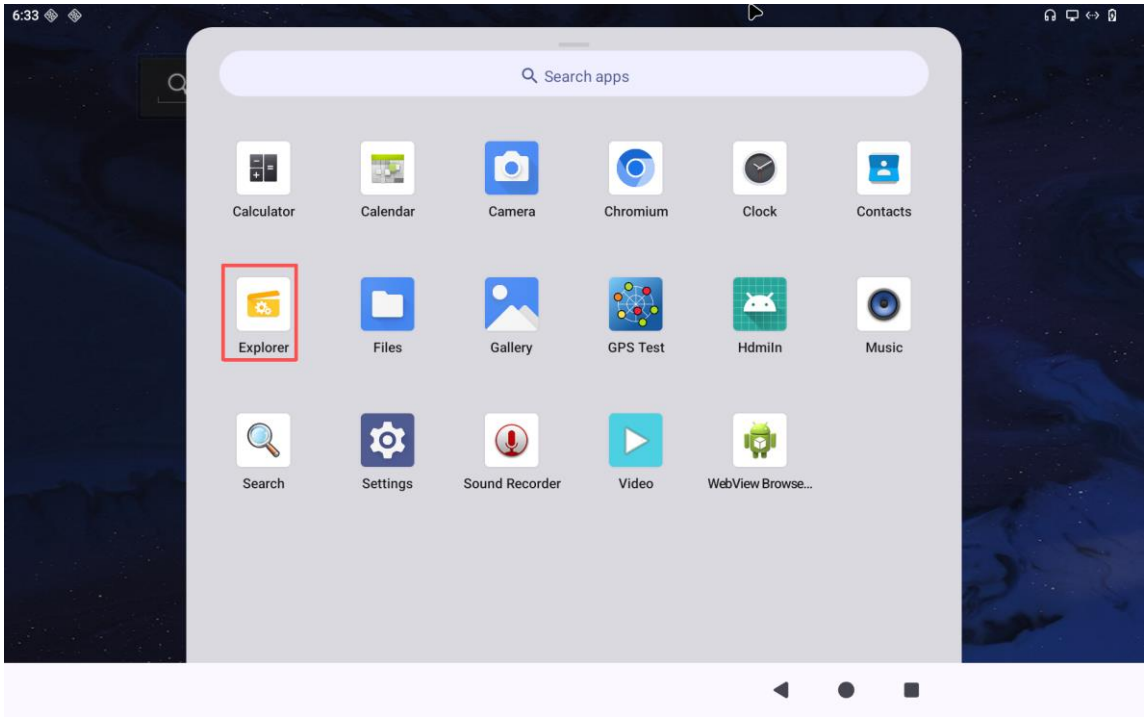
```
ing -I eth0 www.armdesigner.com^C
130|console:/ # ping -I eth0 www.armdesigner.com
PING d3dsoj86mhwkk6.cloudfront.net (13.249.126.124) from 192.168.0.73 eth0: 56(84) bytes of data.
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=2 ttl=246 time=167 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=3 ttl=246 time=167 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=4 ttl=246 time=168 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=6 ttl=246 time=167 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=7 ttl=246 time=167 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=8 ttl=246 time=168 ms
64 bytes from www.armdesigner.com (13.249.126.124): icmp_seq=9 ttl=246 time=167 ms
^C
--- d3dsoj86mhwkk6.cloudfront.net ping statistics ---
9 packets transmitted, 7 received, 22% packet loss, time 8058ms
rtt min/avg/max/mdev = 167.910/167.989/168.256/0.330 ms
```

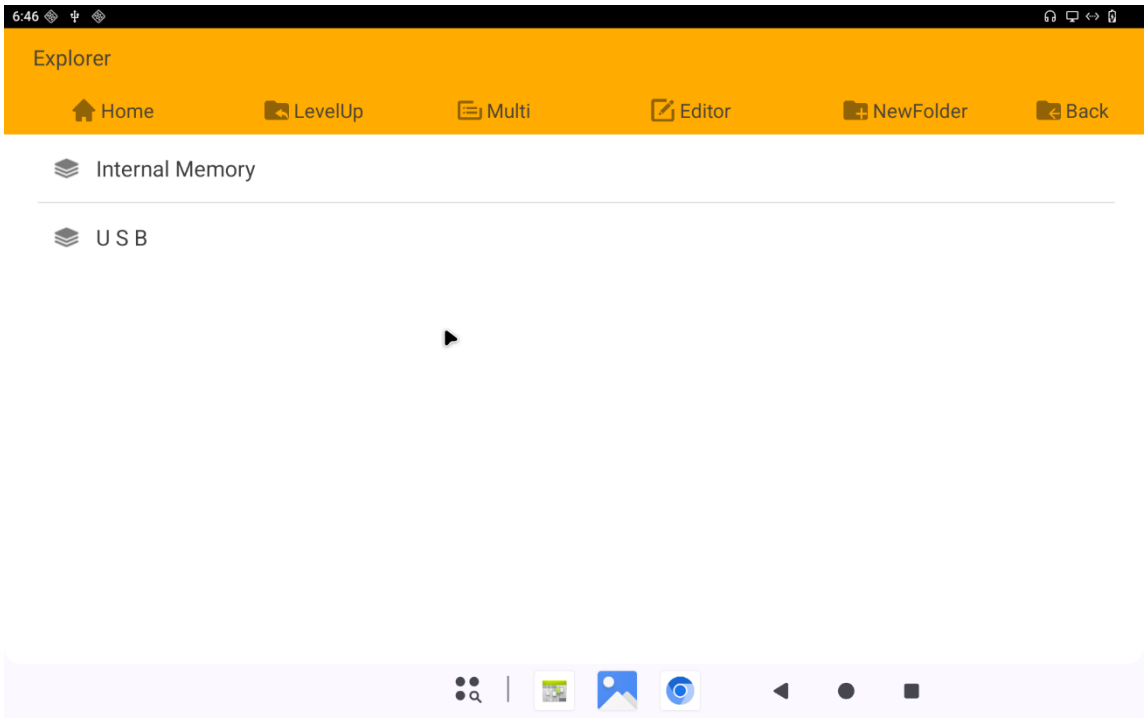
6.6 USB Host

The USB host can be used to connect devices such as USB mouse, USB keyboards, USB flash drives, and other USB peripherals.



After connecting the USB flash drive, users can open the app to check the auto-mount status, and then access the device contents.





The user can identify whether the mounted flash drive is USB 2.0 or USB 3.0 from the debug log.

• USB2.0 print information in high-speed mode.

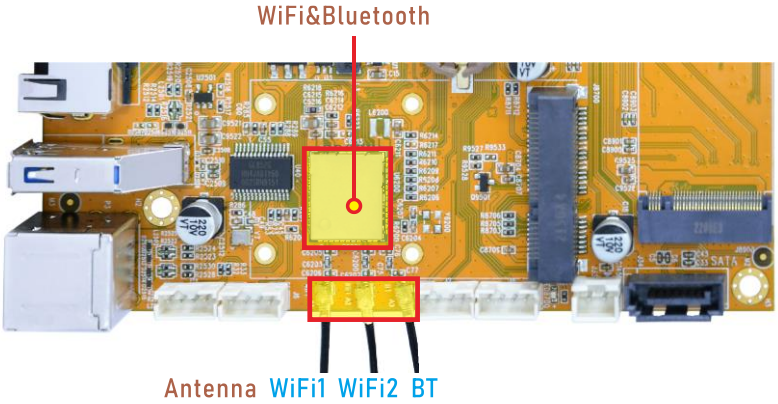
```
console:/ $ [  546.277137][ T2864] rk_gmac-dwmac fe1c0000.ethernet eth0: Link is Up - 1Gbps/Full - flow
[ 1210.114244][  T786] healthd: battery l=50 v=3300 t=2.6 h=2 st=3 c=-1600 fc=100 chg=au
[ 1236.050359][   T22] usb 2-1: new SuperSpeed USB device number 2 using xhci-hcd
[ 1236.070919][   T22] usb 2-1: LPM exit latency is zeroed, disabling LPM.
[ 1236.071866][   T22] usb 2-1: New USB device found, idVendor=346d, idProduct=5678, bcdDevice= 2.00
[ 1236.071928][   T22] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1236.071972][   T22] usb 2-1: Product: HIKSEMI
[ 1236.072010][   T22] usb 2-1: SerialNumber: FC0767D6251F4
[ 1236.076739][   T22] usb-storage 2-1:1.0: USB Mass Storage device detected
[ 1236.080057][   T22] usb-storage 2-1:1.0: Quirks match for vid 346d pid 5678: 420
[ 1236.080868][   T22] scsi host1: usb-storage 2-1:1.0
[ 1237.090392][   T22] scsi 1:0:0:0: Direct-Access     HIKSEMI         3.00 PQ: 0 ANSI: 4
[ 1237.094041][   T22] sd 1:0:0:0: Attached scsi generic sg0 type 0
[ 1237.095989][    T8] sd 1:0:0:0: [sda] 122880000 512-byte logical blocks: (62.9 GB/58.6 GiB)
[ 1237.096123][    T8] sd 1:0:0:0: [sda] Write Protect is off
[ 1237.096253][    T8] sd 1:0:0:0: [sda] No Caching mode page found
[ 1237.096266][    T8] sd 1:0:0:0: [sda] Assuming drive cache: write through
[ 1237.099758][    T8]  sda: sda1
[ 1237.100051][    T8] sd 1:0:0:0: [sda] Attached SCSI removable disk
```

• USB3.0 print information in SuperSpeed mode.

```
1390.115196][  T786] healthd: battery l=50 v=3300 t=2.6 h=2 st=3 c=-1600 fc=100 chg=au
[ 1391.414204][   T22] usb 7-1.4: new high-speed USB device number 6 using xhci-hcd
[ 1391.516266][   T22] usb 7-1.4: New USB device found, idVendor=346d, idProduct=5678, bcdDevice= 2.00
[ 1391.516394][   T22] usb 7-1.4: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1391.516449][   T22] usb 7-1.4: Product: HIKSEMI
[ 1391.516491][   T22] usb 7-1.4: SerialNumber: FC0767D6251F4
[ 1391.528738][   T22] usb-storage 7-1.4:1.0: USB Mass Storage device detected
[ 1391.530523][   T22] usb-storage 7-1.4:1.0: Quirks match for vid 346d pid 5678: 420
[ 1391.531541][   T22] scsi host1: usb-storage 7-1.4:1.0
[ 1392.548581][   T22] scsi 1:0:0:0: Direct-Access            HIKSEMI         3.00 PQ: 0 ANSI: 4
[ 1392.551777][   T22] sd 1:0:0:0: Attached scsi generic sg0 type 0
[ 1392.554093][   T90] sd 1:0:0:0: [sda] 122880000 512-byte logical blocks: (62.9 GB/58.6 GiB)
[ 1392.555723][   T90] sd 1:0:0:0: [sda] Write Protect is off
[ 1392.556055][   T90] sd 1:0:0:0: [sda] No Caching mode page found
[ 1392.556072][   T90] sd 1:0:0:0: [sda] Assuming drive cache: write through
[ 1392.559601][   T90]  sda: sda1
[ 1392.560170][   T90] sd 1:0:0:0: [sda] Attached SCSI removable disk
```

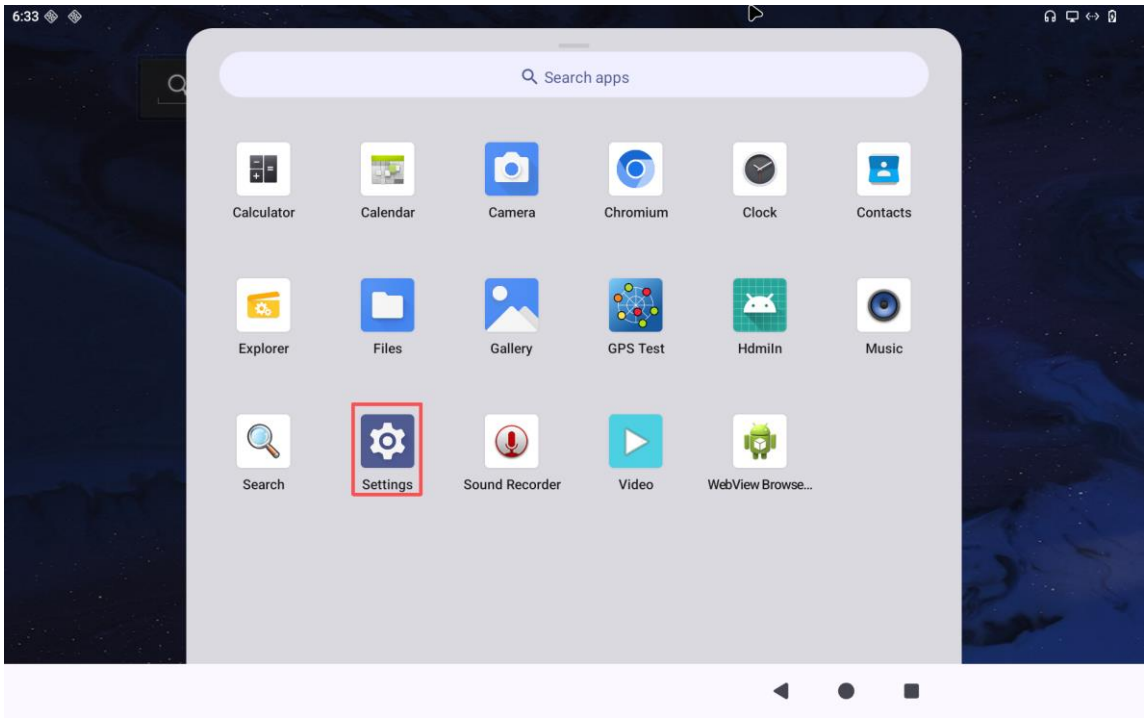
6.6 WiFi & Bluetooth

To use Wi-Fi and Bluetooth functions properly, the antenna needs to be connected.

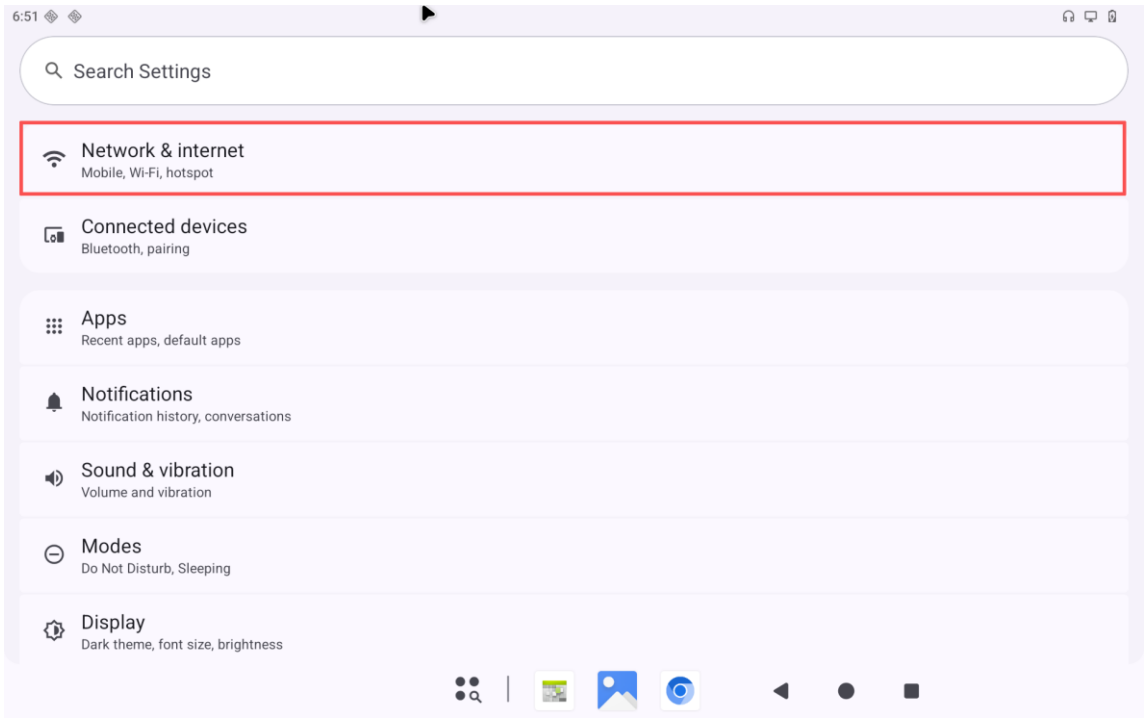


6.6.1 WiFi

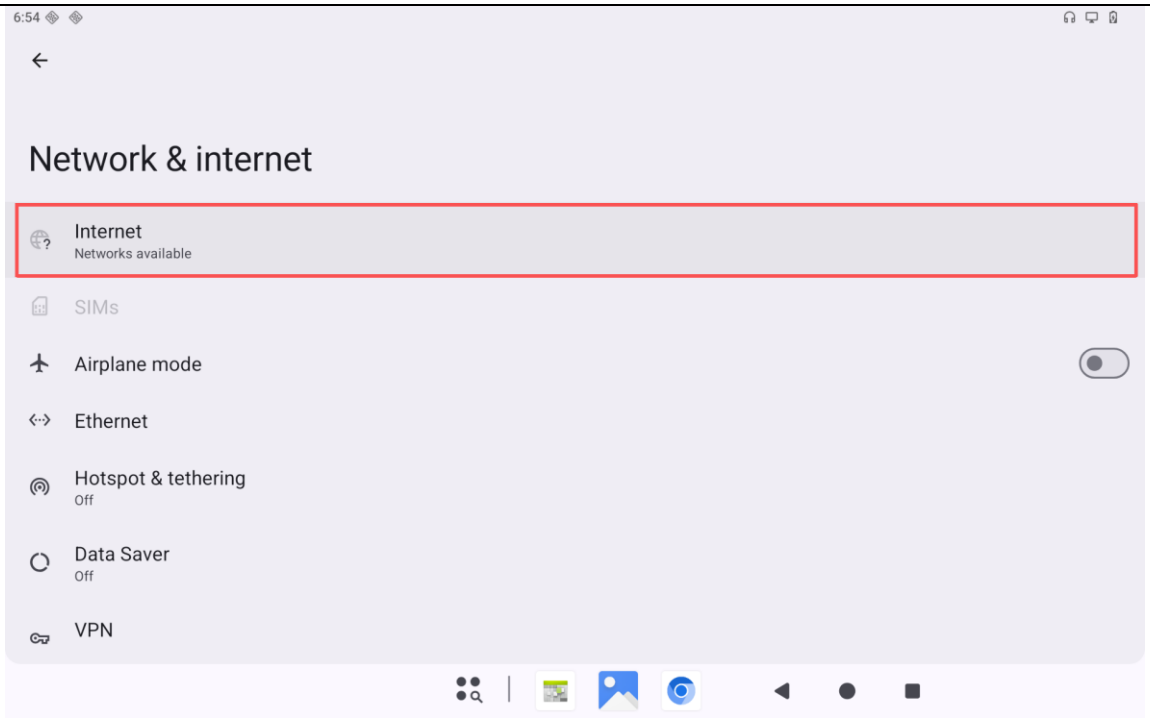
Step 1: Open the **Settings** app.



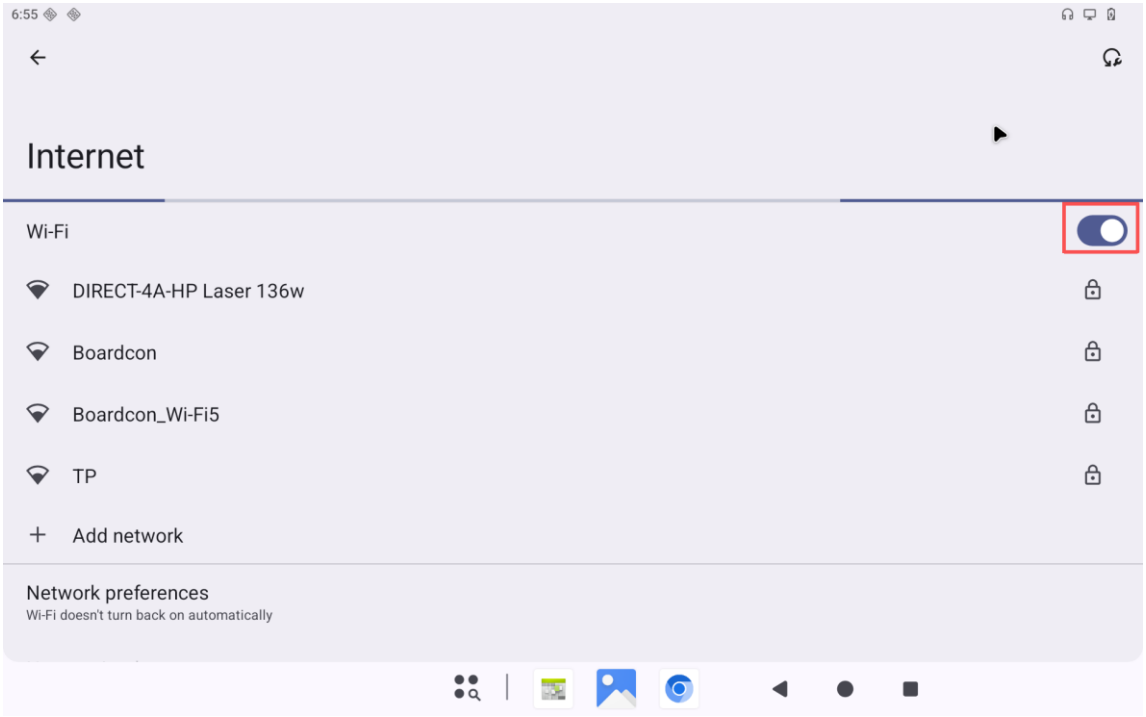
Step 2: Open the **"Network & Internet"** option.



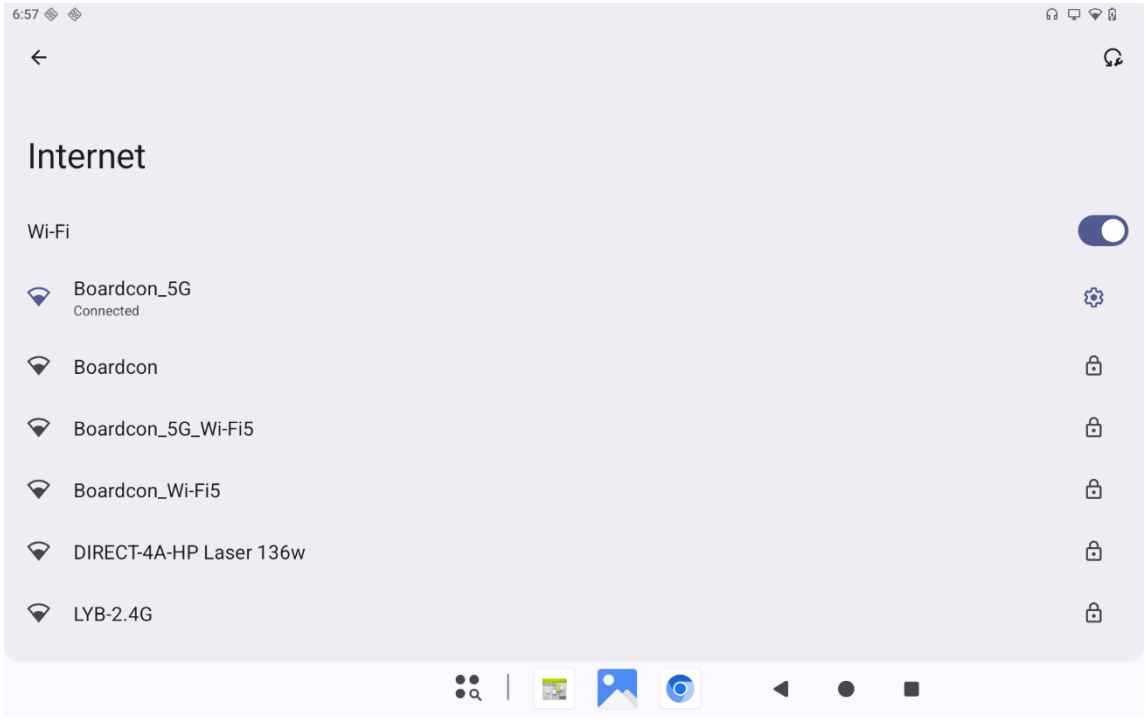
Step 3: Open the **"Internet"** option.



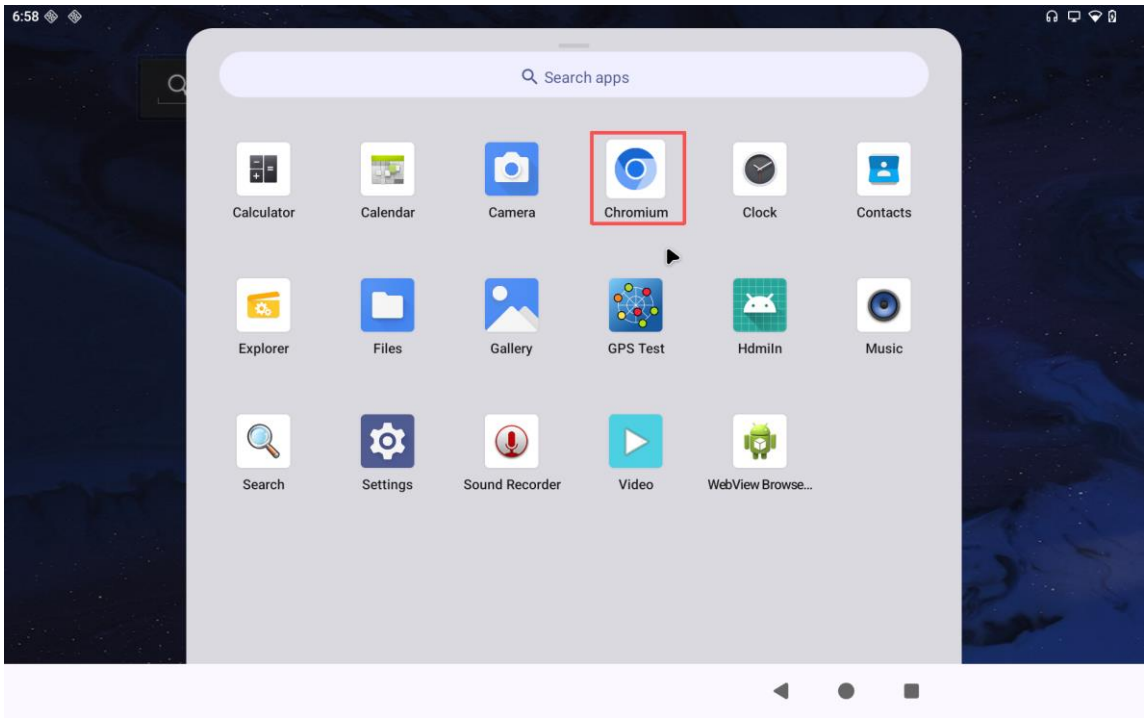
Step 4: Turn on the **Wi-Fi** switch:

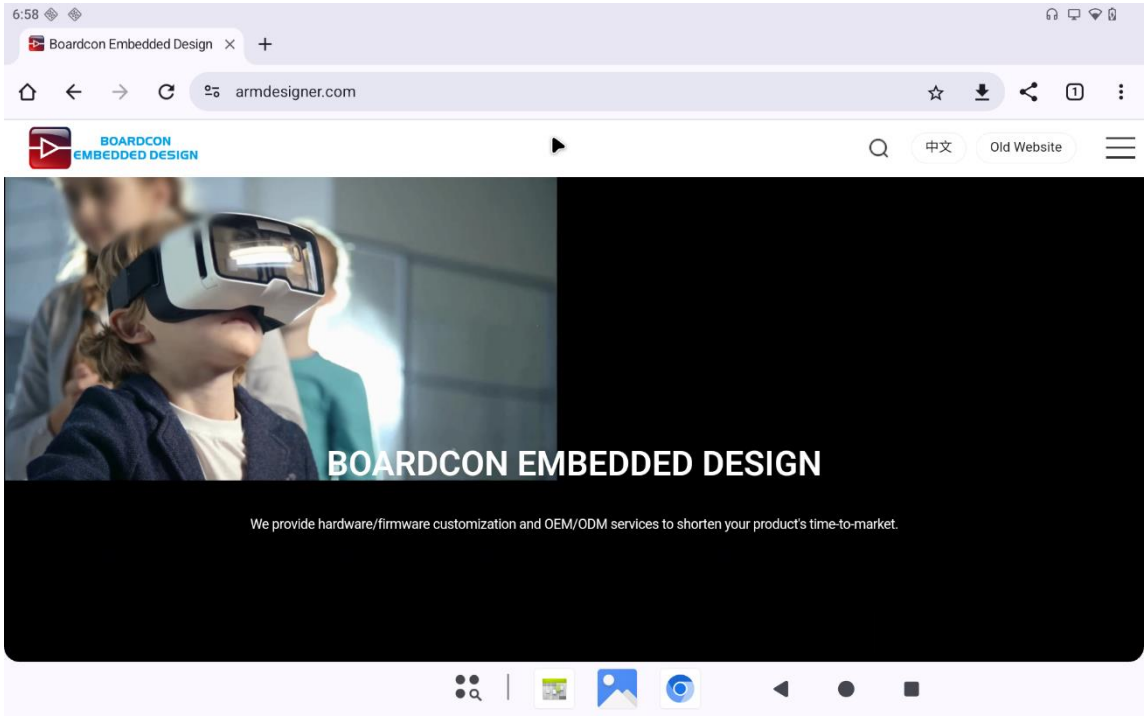


Step 5: Select and connect to the hotspot from the Wi-Fi list.



Step 6: Wi-Fi connection test.





Users can also choose to use the ping command to test the connectivity of the wifi, as shown below:

(1) View network interface information.

```
$ su
# ifconfig wlan0
```

```
console:/ # ifconfig wlan0
wlan0     Link encap:Ethernet  HWaddr cc:64:1a:32:8b:90  Driver rtl8852bs
          inet addr:192.168.0.65  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::990e:87c5:589a:5694/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1627 errors:0 dropped:0 overruns:0 frame:0
          TX packets:253 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:214706 TX bytes:25055
```

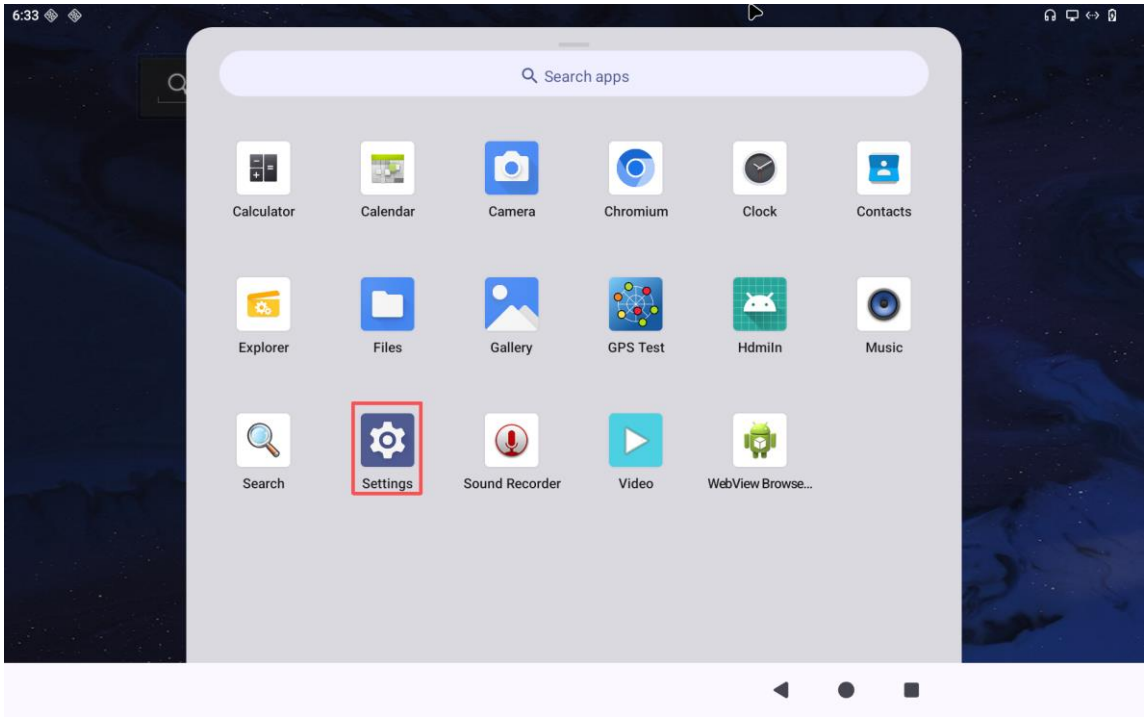
(2) Network connection test.

```
# ping -I wlan0 www.armdesigner.com
```

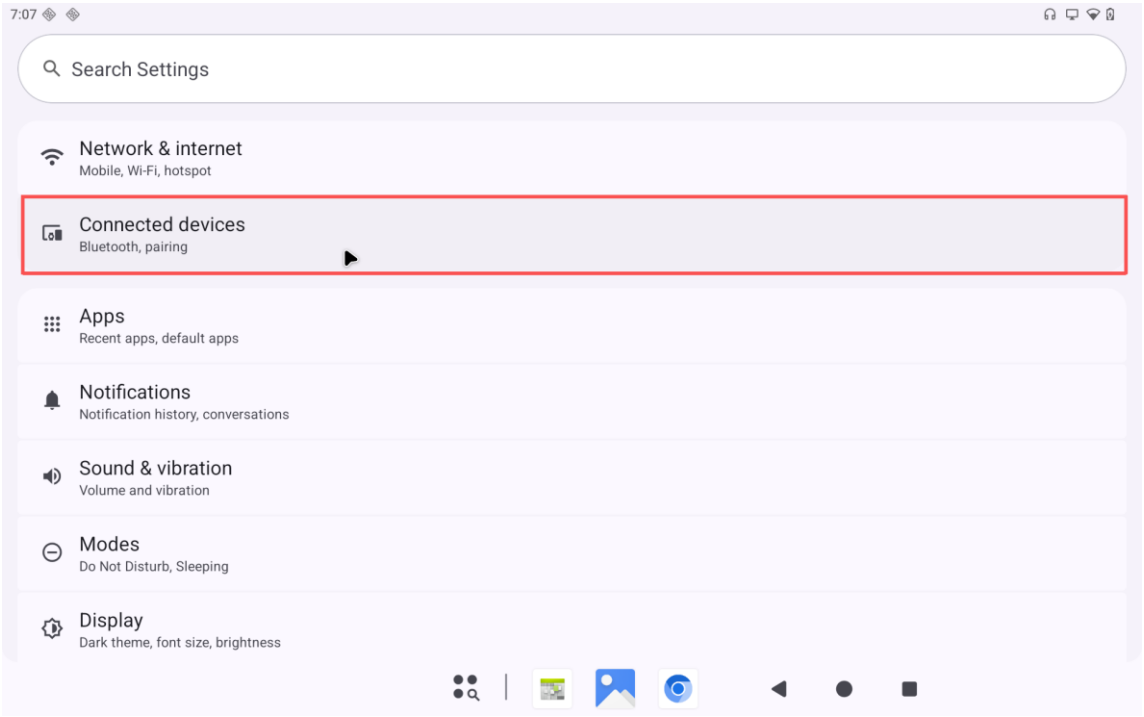
```
130|console:/ # ping -I wlan0 www.armdesigner.com
PING d3dsoj86mhwkk6.cloudfront.net (108.138.246.8) from 192.168.0.65 wlan0: 56(84) bytes of data.
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=1 ttl=246 time=158 ms
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=2 ttl=246 time=159 ms
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=3 ttl=246 time=158 ms
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=4 ttl=246 time=161 ms
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=5 ttl=246 time=158 ms
64 bytes from www.armdesigner.com (108.138.246.8): icmp_seq=7 ttl=246 time=158 ms
--- d3dsoj86mhwkk6.cloudfront.net ping statistics ---
7 packets transmitted, 6 received, 14% packet loss, time 6021ms
rtt min/avg/max/mdev = 158.343/159.267/161.826/1.276 ms
```

6.6.2 Bluetooth

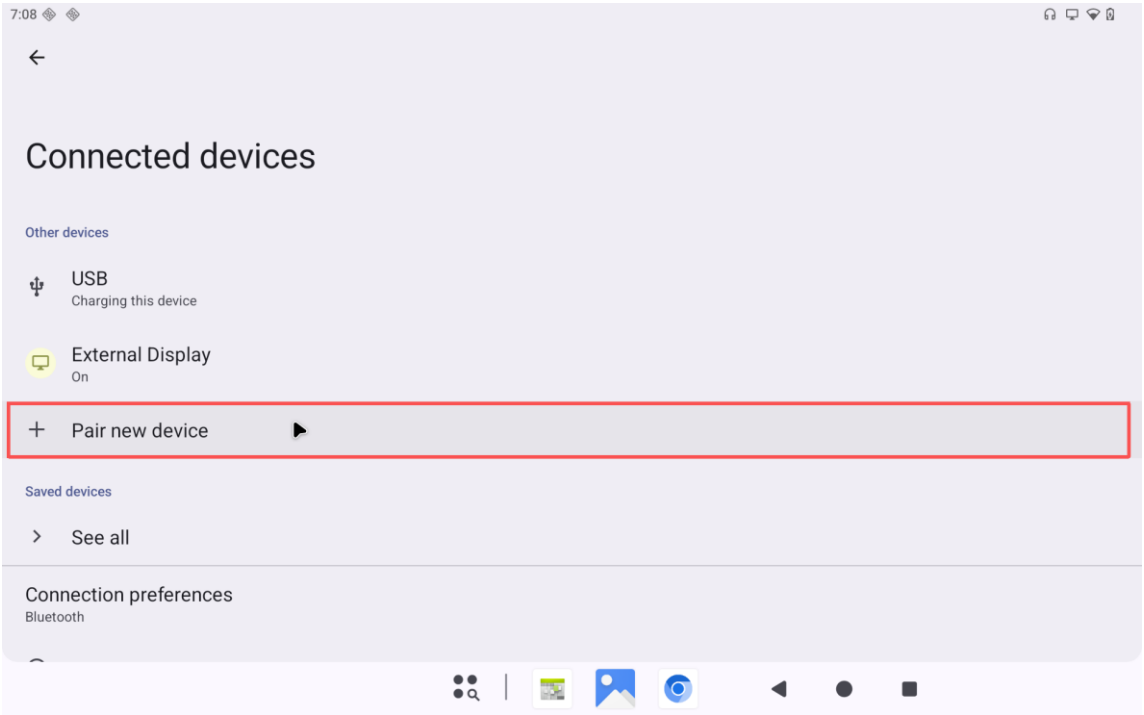
Step 1: Open the **Settings** app.



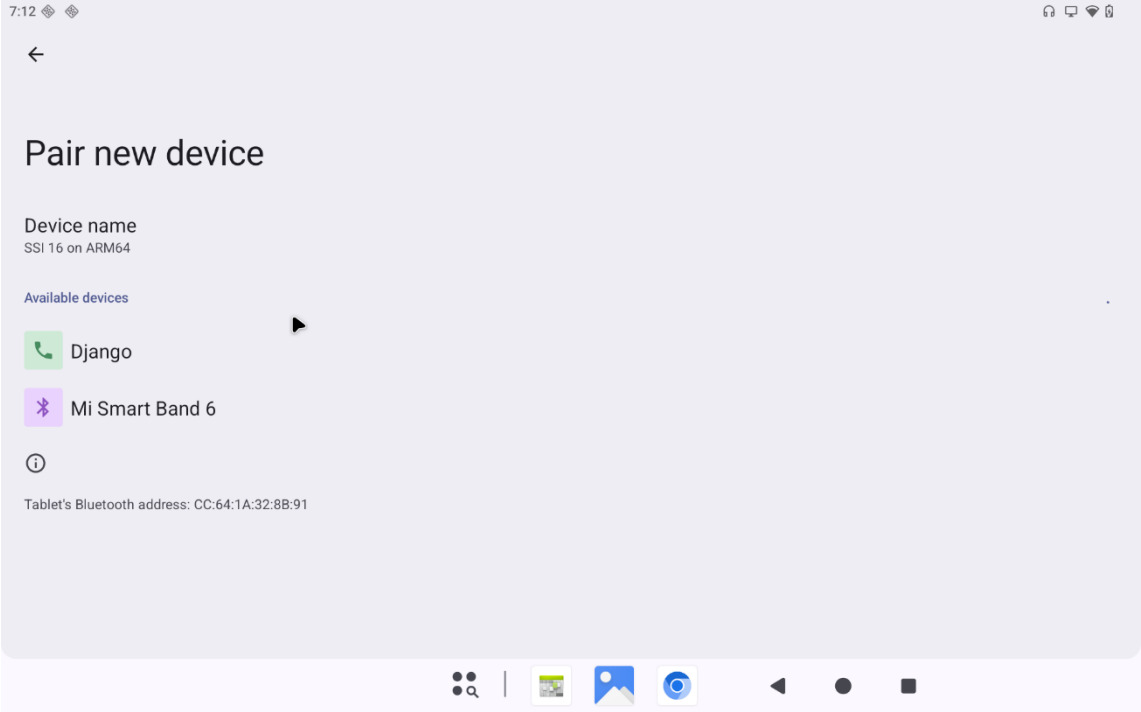
Step 2: Open the **"Connected devices"** option.



Step 3: Open the **"Pair new device"** option, and start scanning for devices.

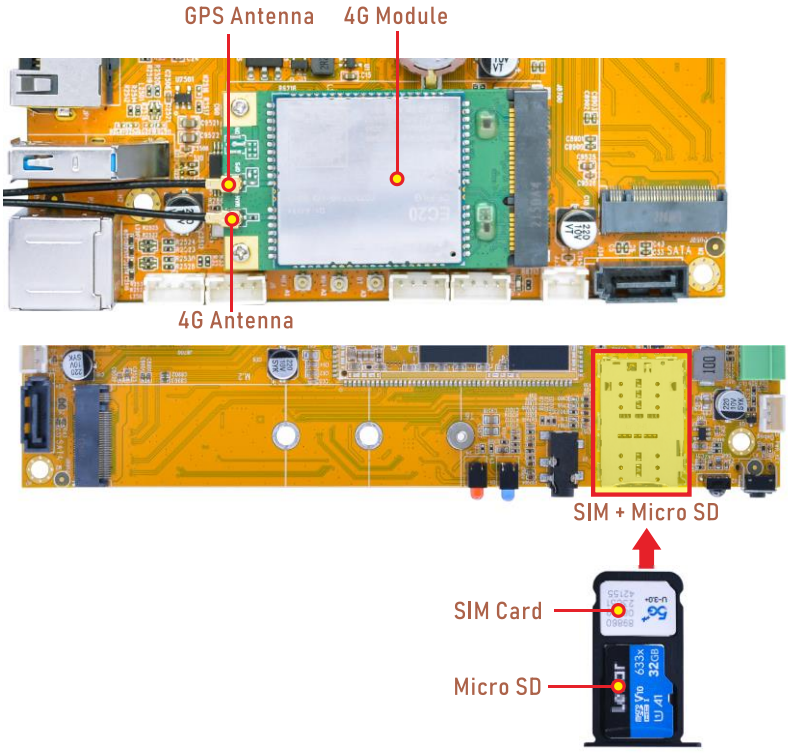


Step 4: User can pair themselves in the Bluetooth device list.



After successful configuration, Bluetooth devices can communicate with each other directly.

6.7 4G & GPS



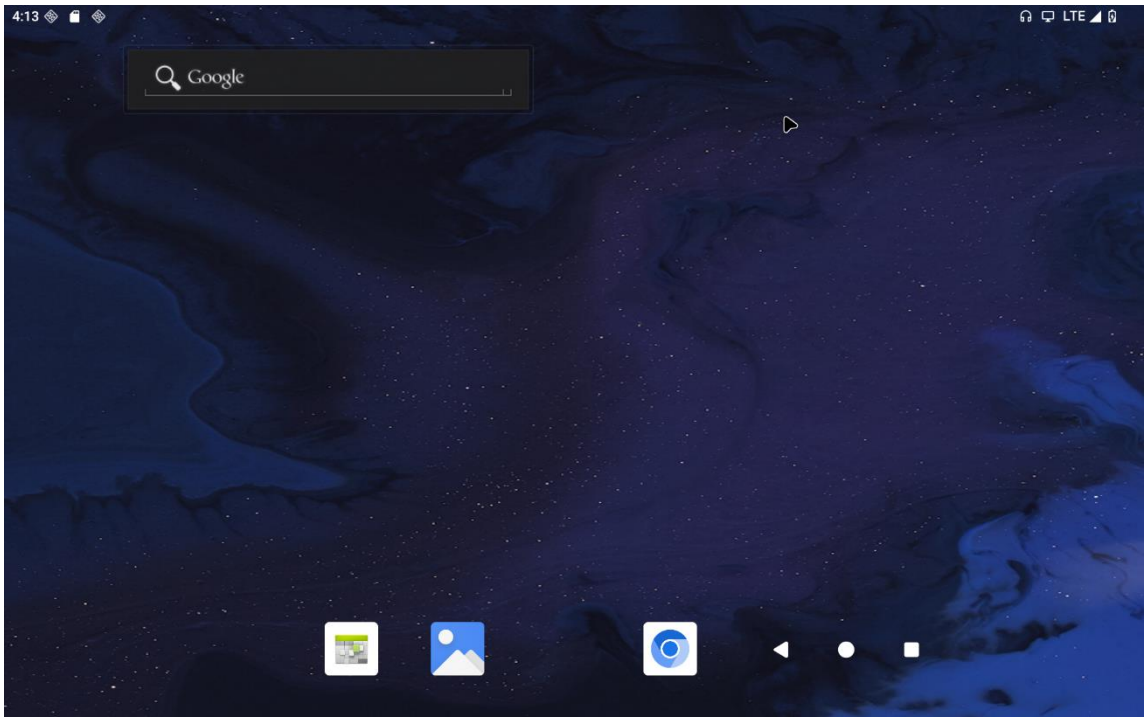
Step 1: Insert 4G module to PCIe socket (4G model: EC20).

Step 2: Connect antenna and insert SIM card.

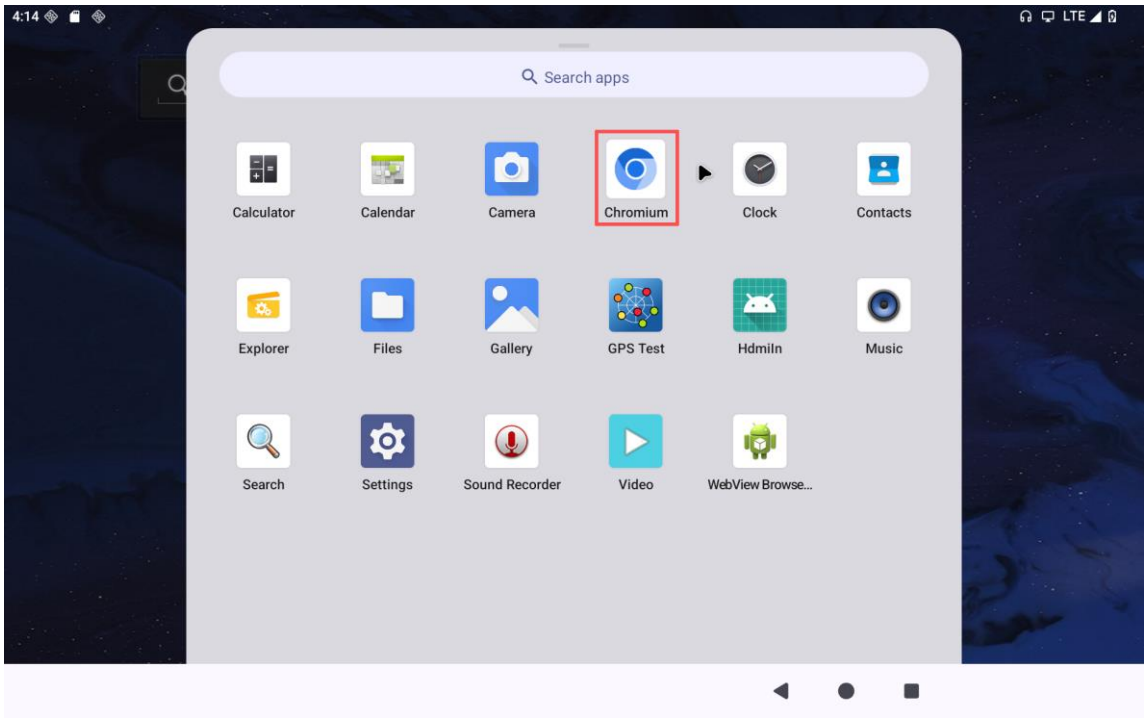
Step 3: Power on.

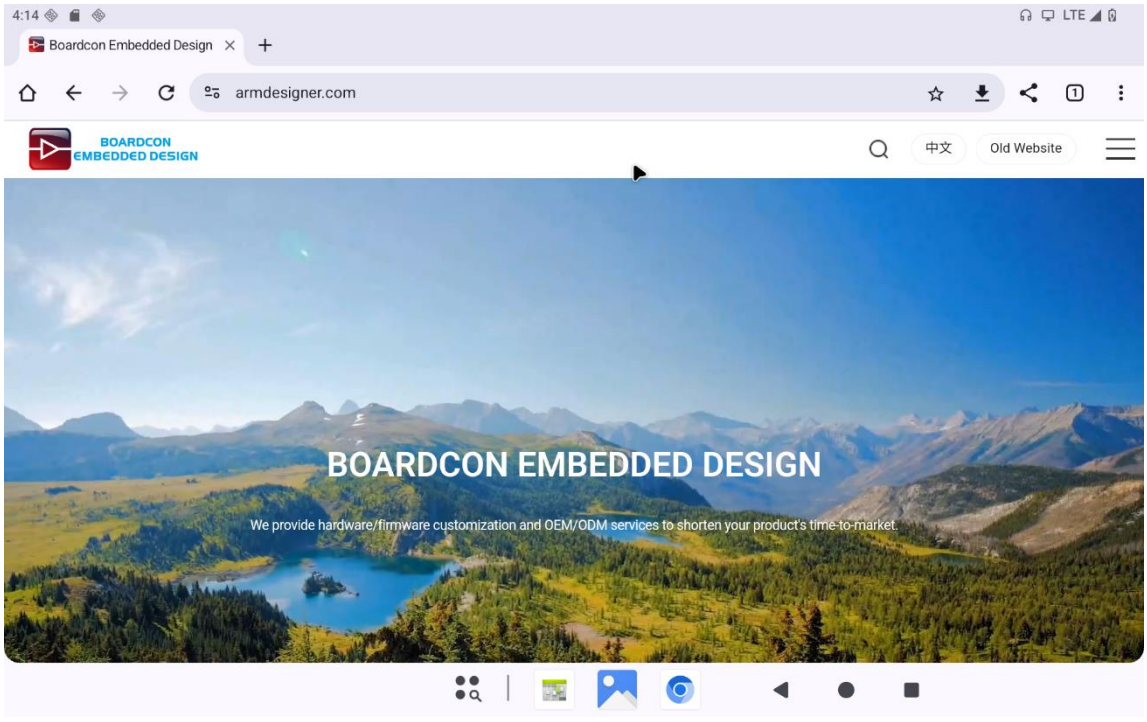
6.7.1 4G Test

The following icon appears in the upper right corner of the desktop, indicating that the 4G connection is successful.



Test the 4G connection:





Users can also choose to use the ping command to test the connectivity of the 4G, as shown below:

• View network interface information.

```
$ su
# ifconfig wwan0
```

```
console:/ # ifconfig wwan0
wwan0     Link encap:Ethernet  HWaddr 52:46:5c:a6:b5:72  Driver qmi_wwan_q
          inet addr:10.10.94.235  Mask:255.255.240.0
          inet6 addr: 240e:47c:3080:55c:5046:5cff:fea6:b572/64 Scope: Global
          inet6 addr: fe80::5046:5cff:fea6:b572/64 Scope: Link
          inet6 addr: 240e:47c:3080:55c:98b7:2176:c7f6:61f0/64 Scope: Global
          UP RUNNING NOARP  MTU:1500  Metric:1
          RX packets:163 errors:0 dropped:0 overruns:0 frame:0
          TX packets:300 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:66072 TX bytes:36520
```

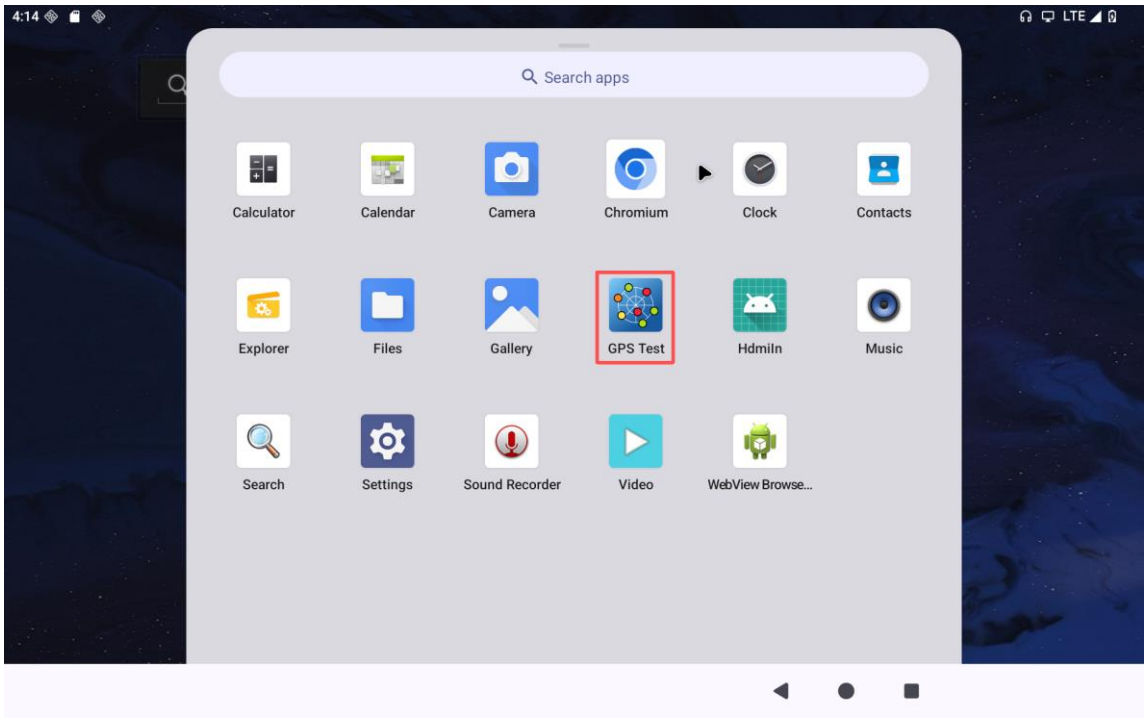
• Network connection test.

```
# ping -I wwan0 www.armdesigner.com
```

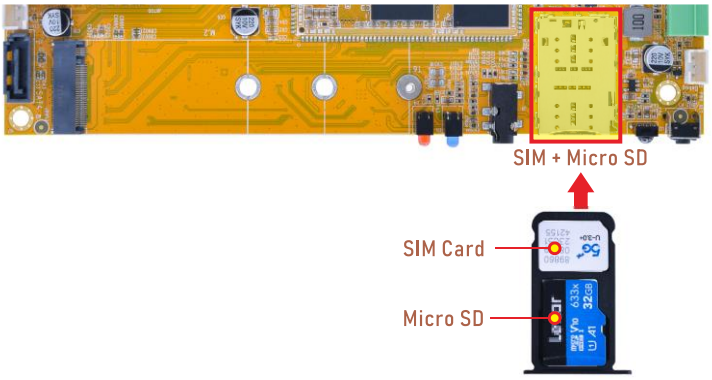
```
console:/ # ping -I wwan0 www.armdesigner.com
PING d3dsoj86mhwkk6.cloudfront.net (108.138.246.71) from 10.5.43.33 wwan0: 56(84) bytes of data.
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=1 ttl=244 time=346 ms
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=2 ttl=244 time=297 ms
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=3 ttl=244 time=265 ms
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=5 ttl=244 time=174 ms
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=6 ttl=244 time=454 ms
64 bytes from server-108-138-246-71.sfo5.r.cloudfront.net (108.138.246.71): icmp_seq=7 ttl=244 time=415 ms
^C
--- d3dsoj86mhwkk6.cloudfront.net ping statistics ---
7 packets transmitted, 6 received, 14% packet loss, time 6003ms
rtt min/avg/max/mdev = 174.441/325.665/454.985/93.476 ms
```

6.7.2 GPS Test

Open the app to check the number of satellites and their positioning.

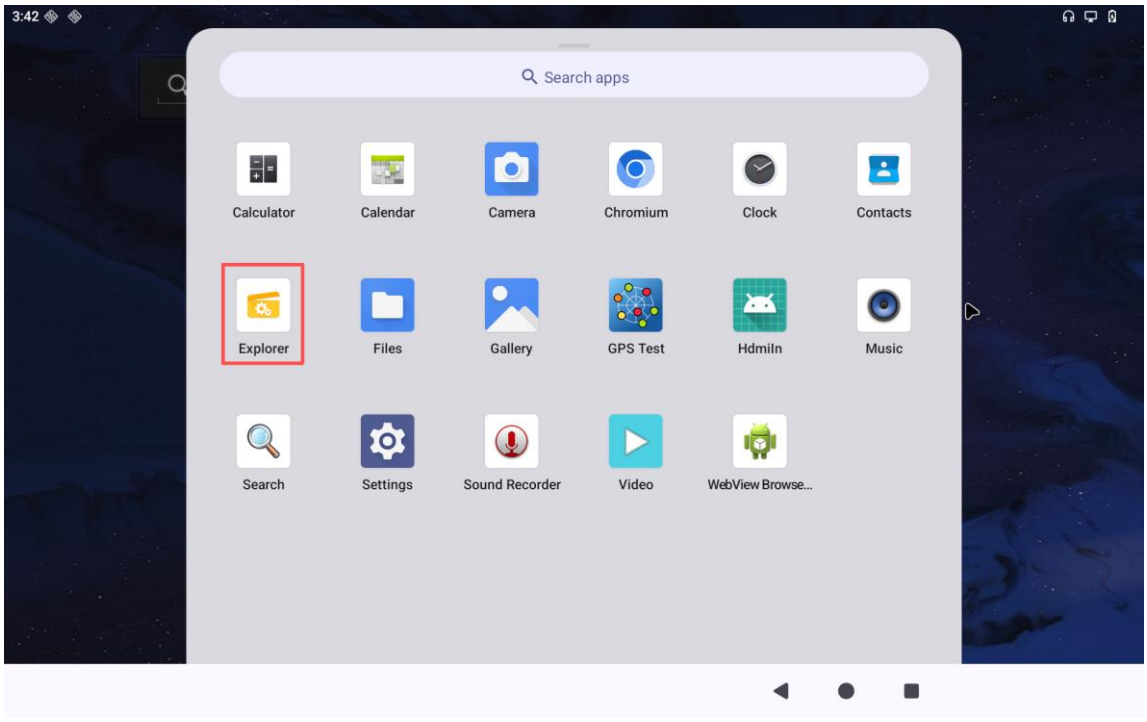


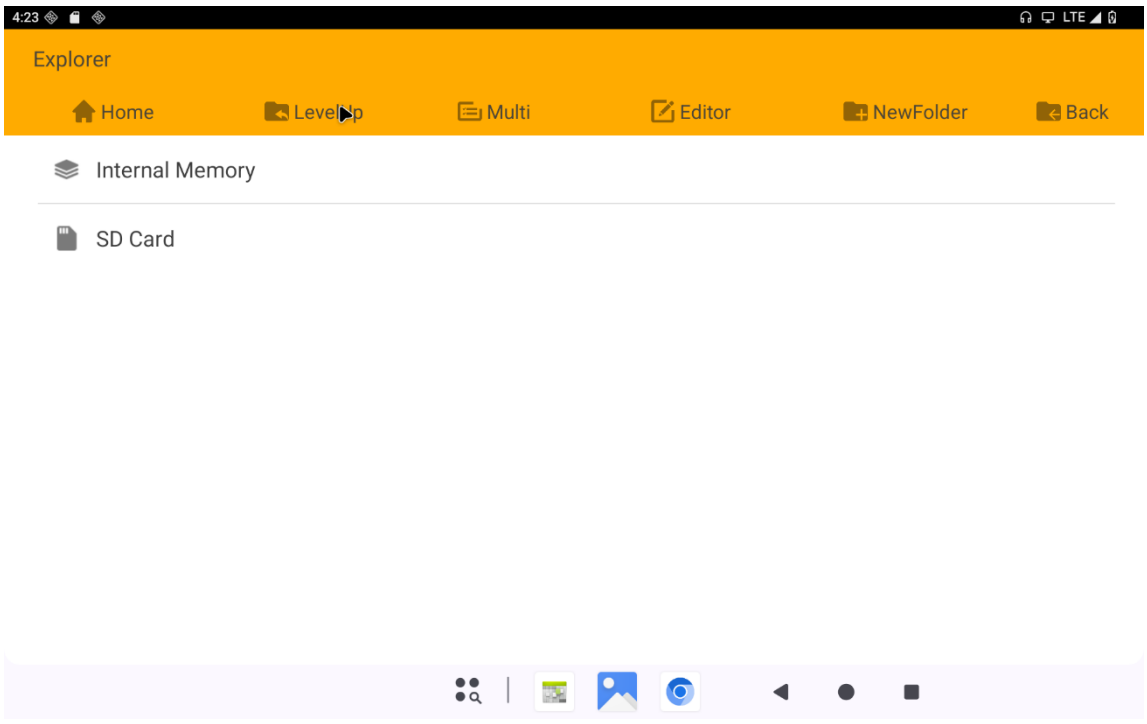
6.8 SD Card



Step 1: Insert the micro SD card into the card slot.

Step 2: Users can open the app to check the auto-mount status, and then access the device contents.

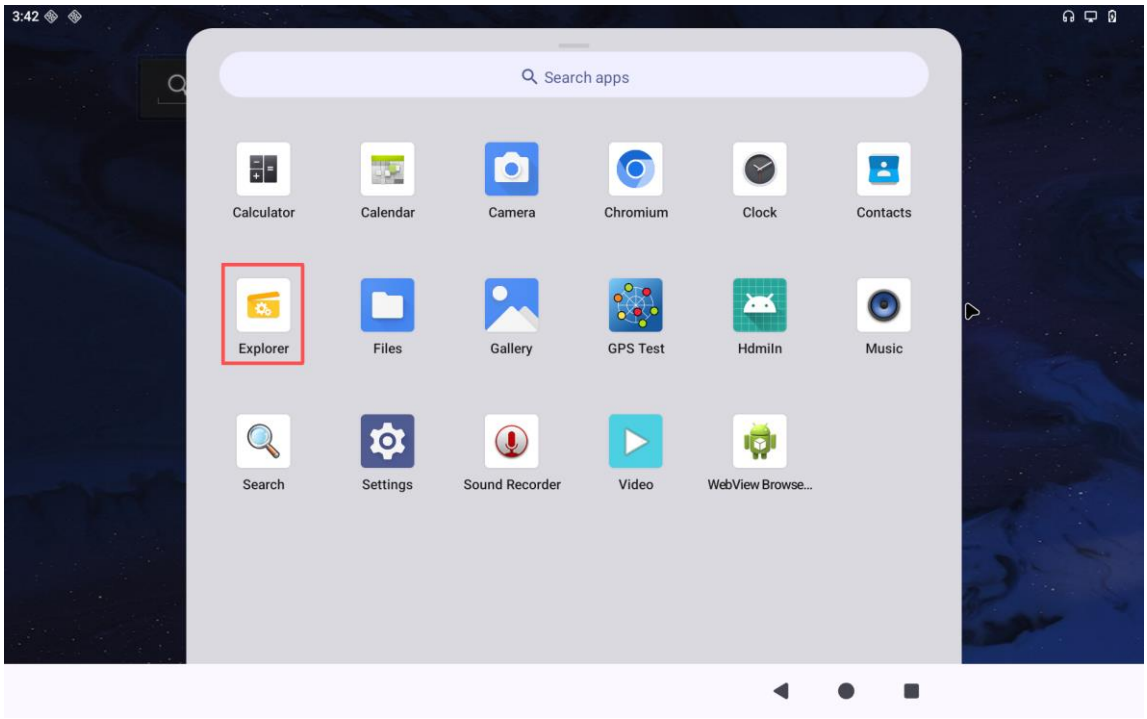


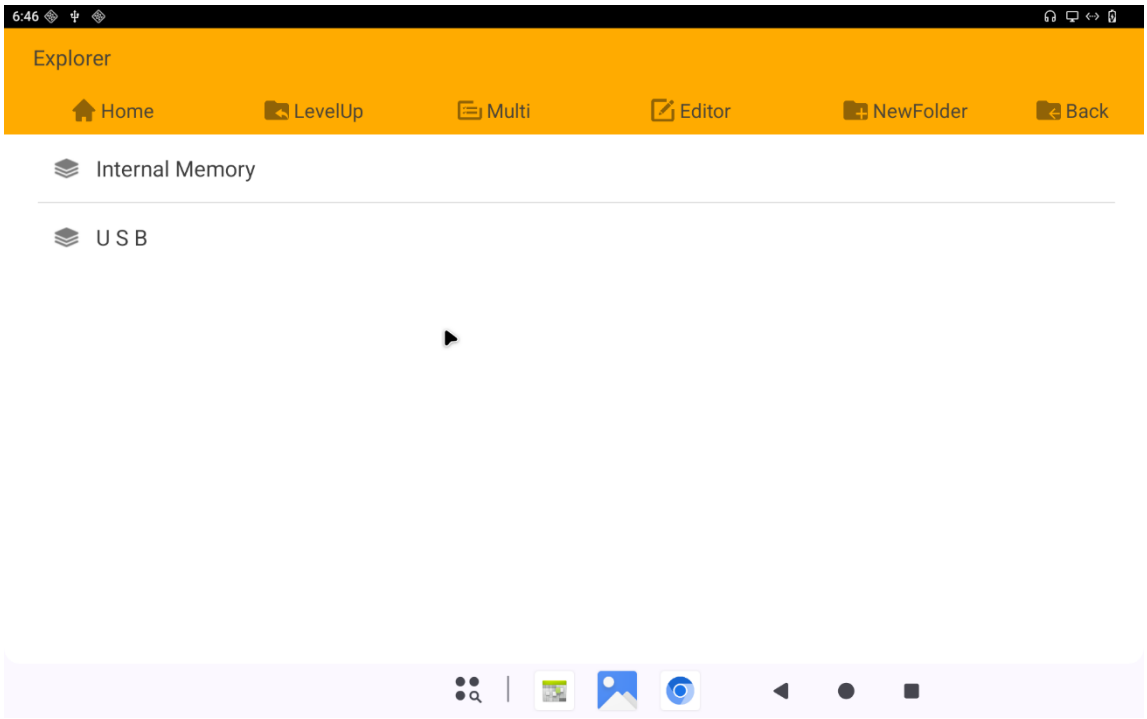


6.9 SATA3.0

Step 1, connect SATA and SATA power.

Step 2, open the **Explorer** APP to view the SATA device auto-mount directory.

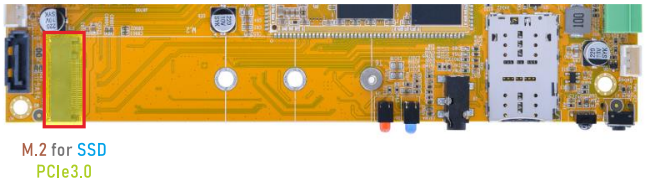




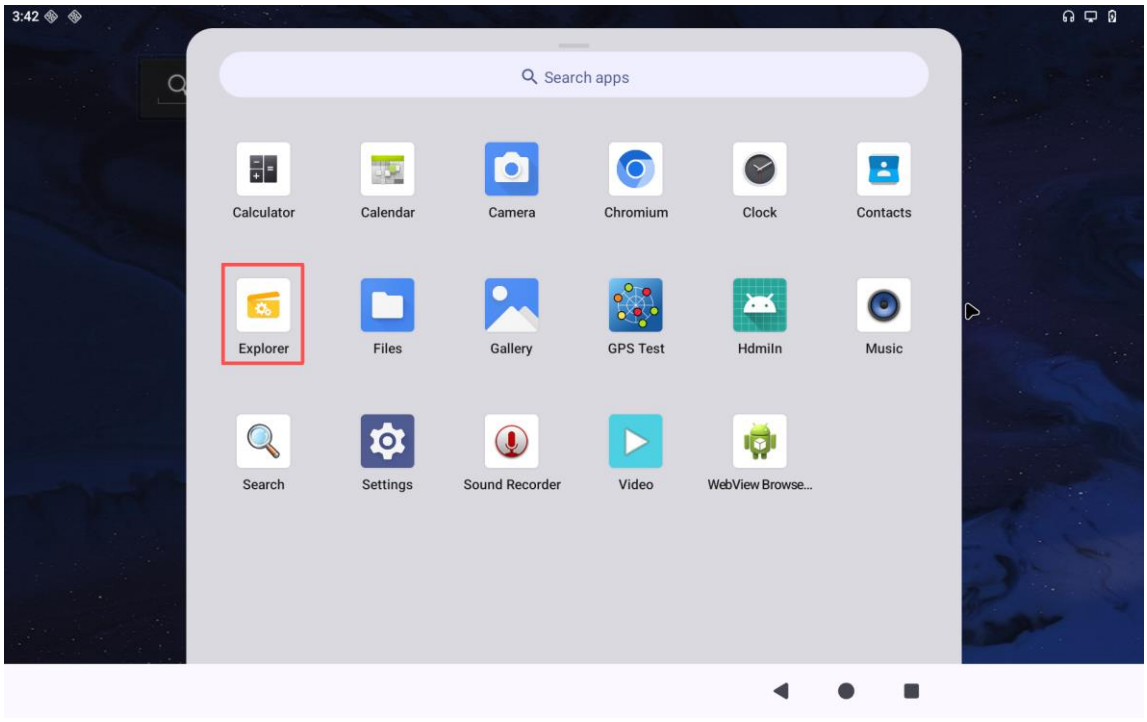
6.10 M.2 SSD

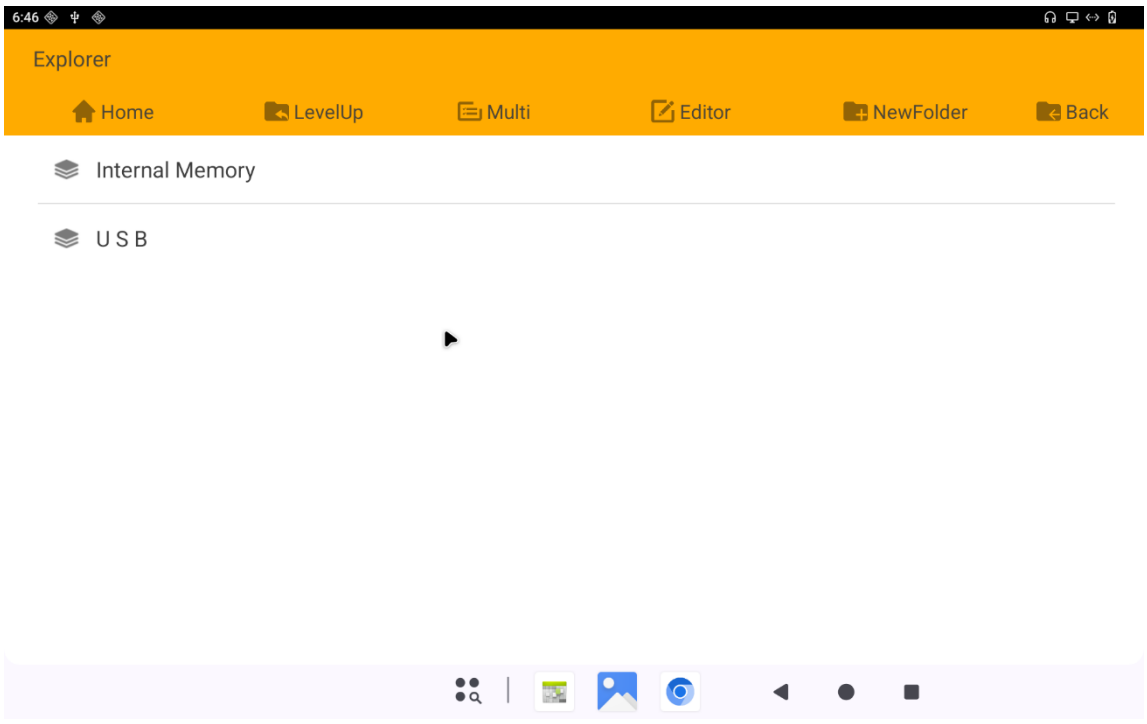
For the first time, format the m.2 ssd on the Android operating system.

Step 1, connect M.2 SSD device.



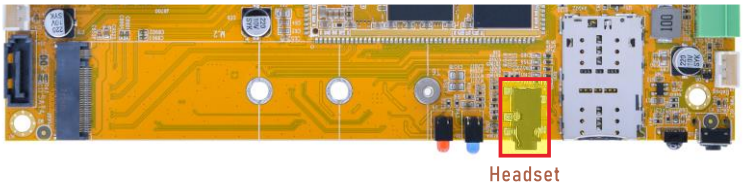
Step 2, open the **Explorer** APP to view the M.2 SSD device auto-mount directory.



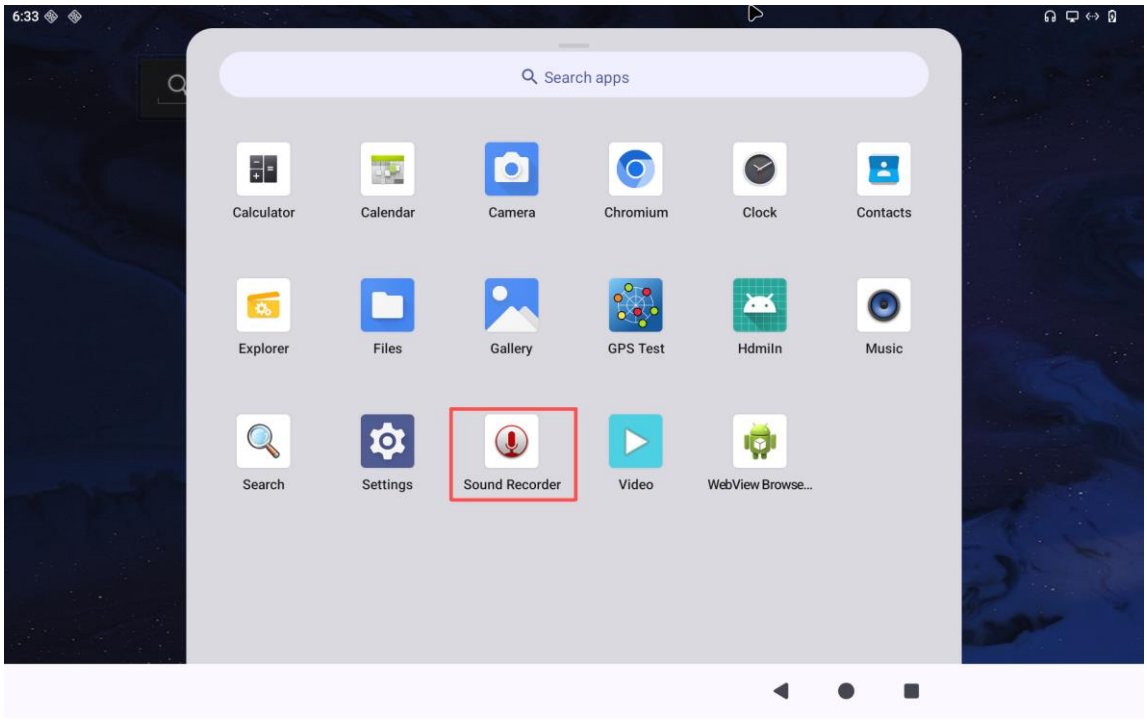


6.11 Headset

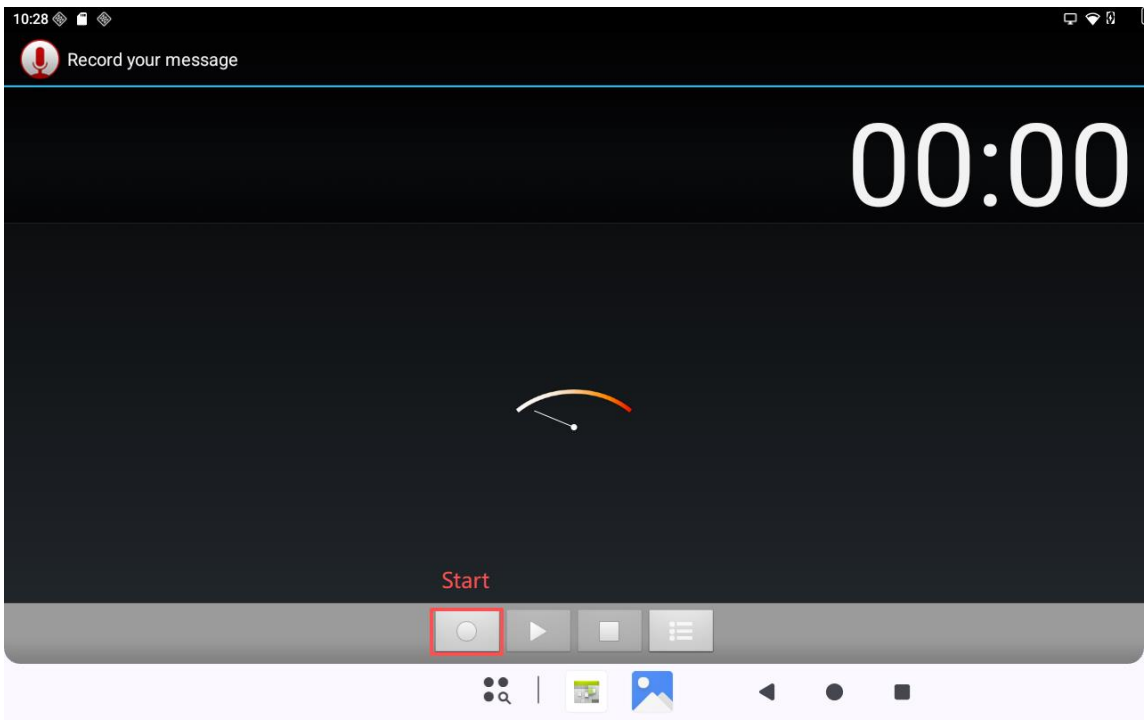
Step 1, plug the headphones into the headphone jack.



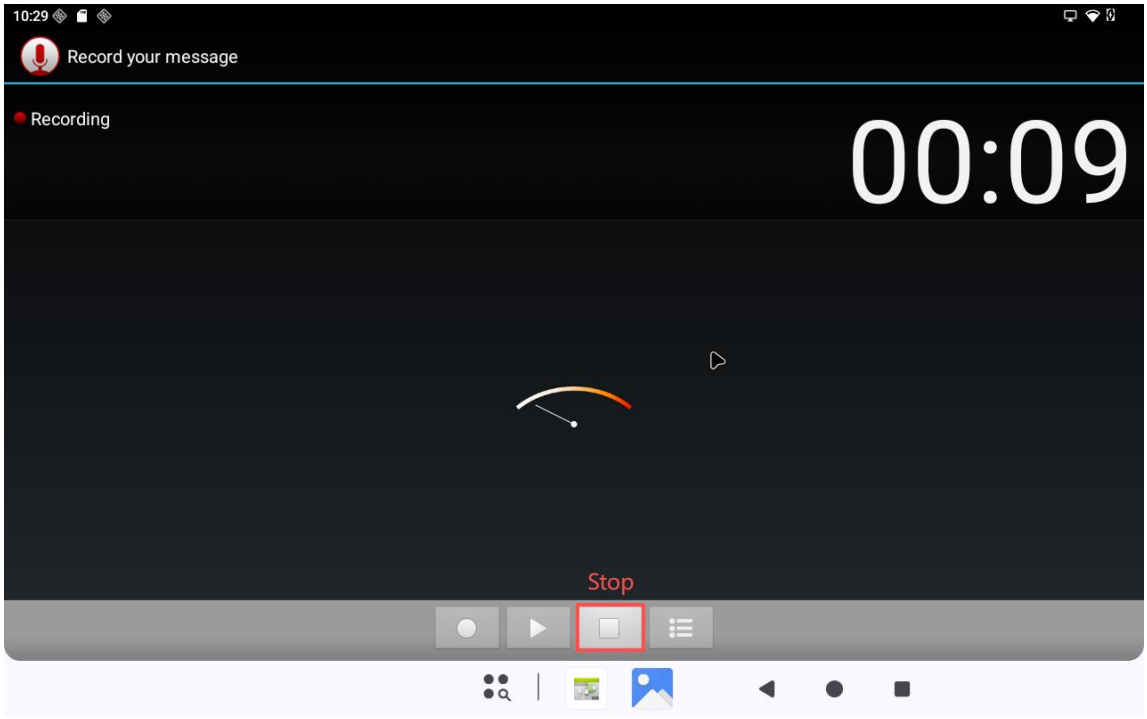
Step 2, open the **Sound Recorder** app for a recording test.



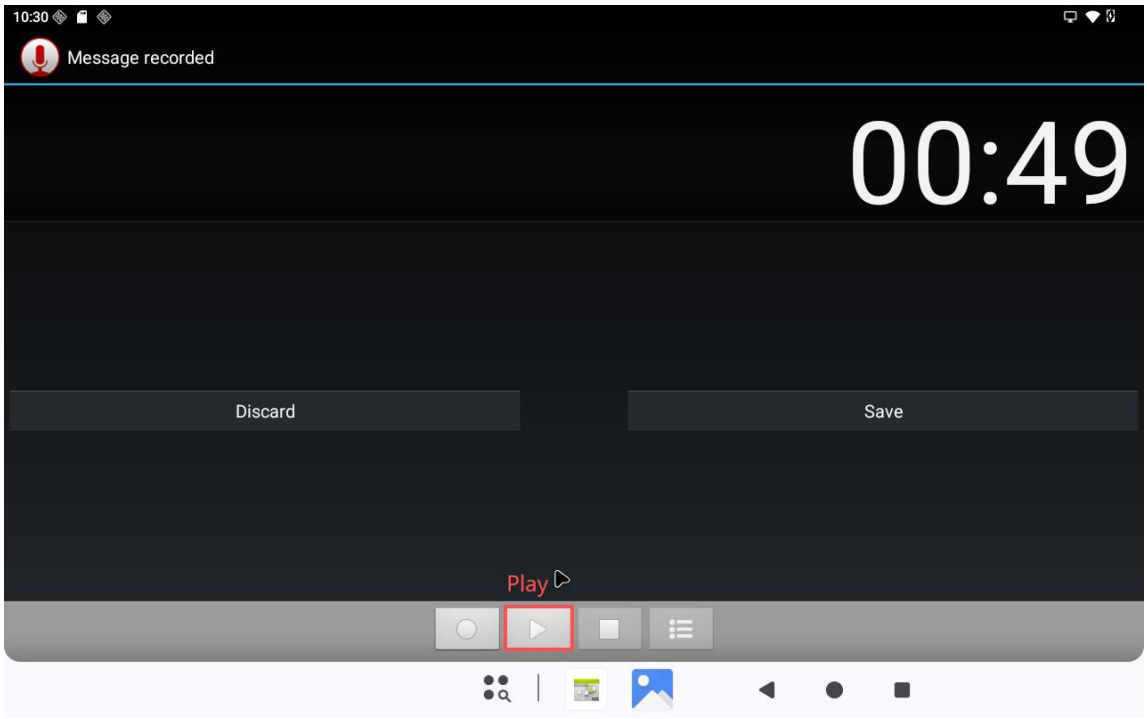
Step 3, Click the following button to start recording.



Step 4, Click the following button to stop recording.



Step 5, Click the following button to play back the recording.



6.12 UART

Step 1: Short circuit RX and TX pins of UART.

Step 2: UART0 test.

```
# com /dev/ttyS0 115200 8 0 1
```

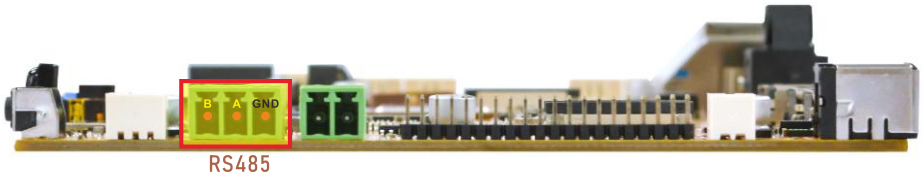
```
130|console:/ # com /dev/ttyS0 115200 8 0 1
port = /dev/ttyS0
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[  444.214174][ T3030] of_dma_request_slave_channel: dma-names property of node '/serial@fd890000' missing
or empty
[  444.214213][ T3030] dw-apb-uart fd890000.serial: failed to request DMA
123
RECV: 123
456789
RECV: 456789
abcdefg
RECV: abcdefg
```

Step 3, UART3 test.

```
# com /dev/ttyS3 115200 8 0 1
```

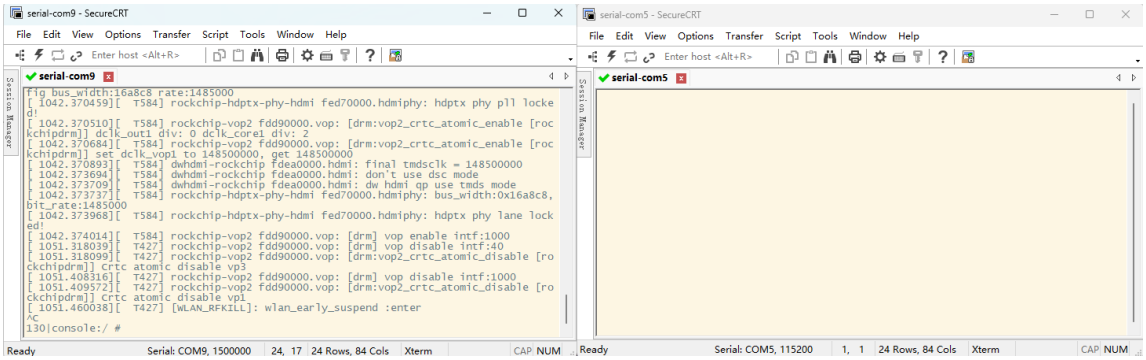
```
130|console:/ # com /dev/ttyS3 115200 8 0 1
port = /dev/ttyS3
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[  473.861642][ T3034] of_dma_request_slave_channel: dma-names property of node '/serial@feb60000' missing
or empty
[  473.861660][ T3034] dw-apb-uart feb60000.serial: failed to request DMA
123456
RECV: 123456
abdcefg
RECV: abdcefg
```

6.13 RS485



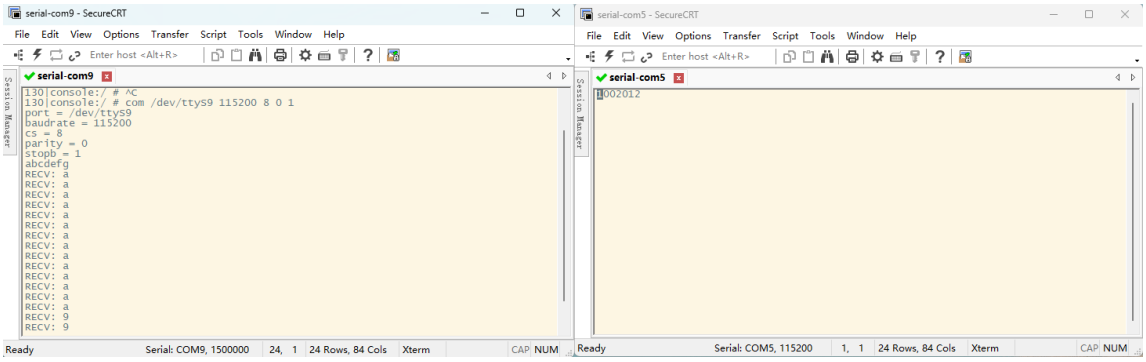
Step 1: As shown in the diagram, connect the RS485 test tool to the development board.

Step 2: Open the corresponding serial terminal, set the baud rate of the board to 1500000, and set the baud rate of the RS485 test tool to 115200.

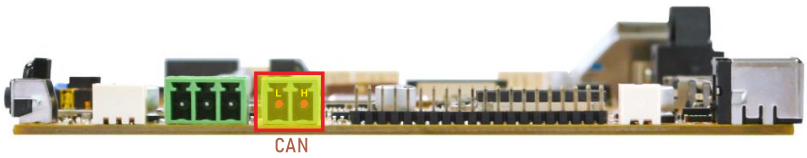


Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

```
# com /dev/ttyS7 115200 8 0 1
```

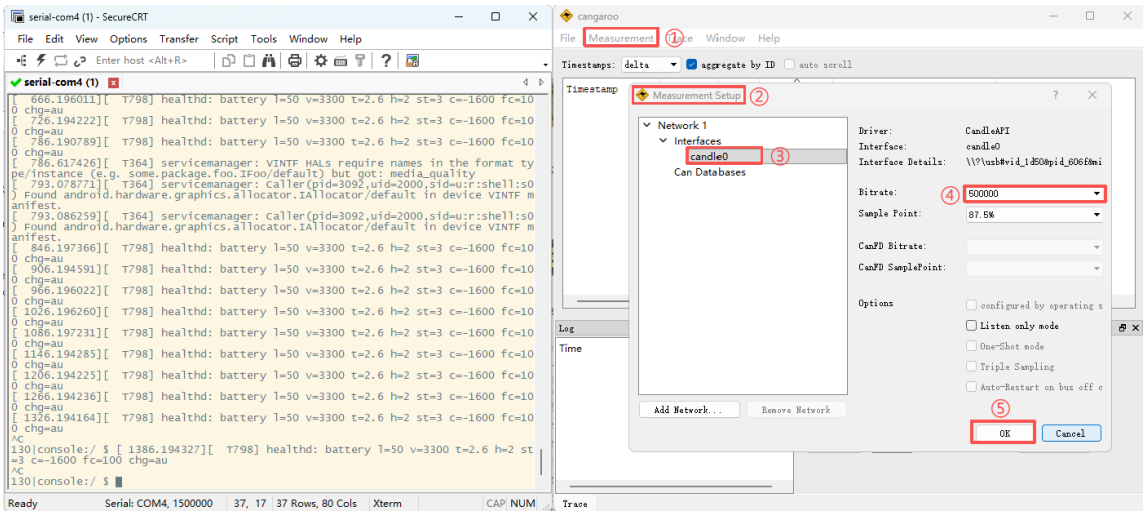


6.14 CAN



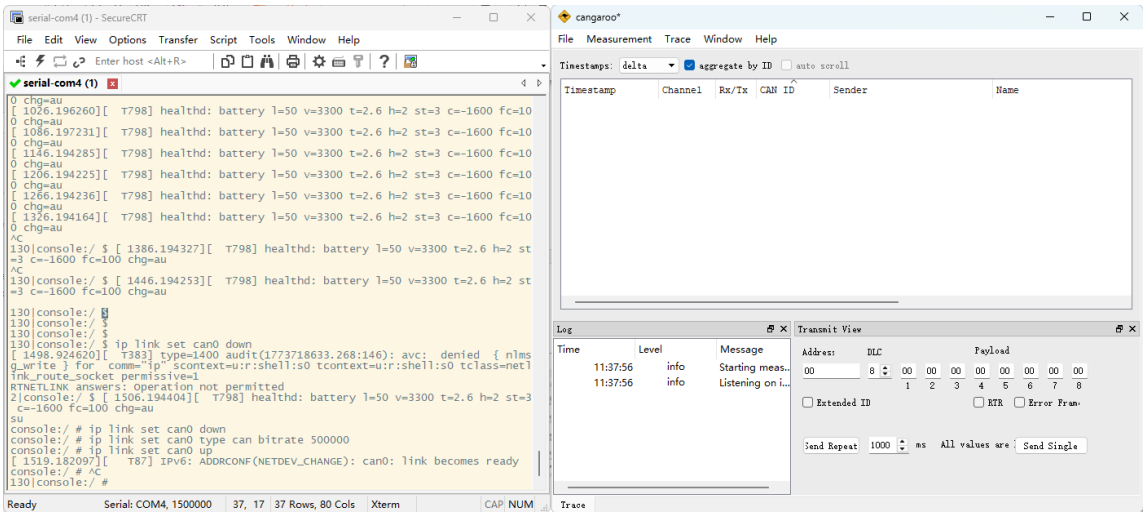
Step 1: Connect the CAN test tool to the board as shown in the diagram below.

Step 2: Open the CAN test software and set the baud rate to 500000.



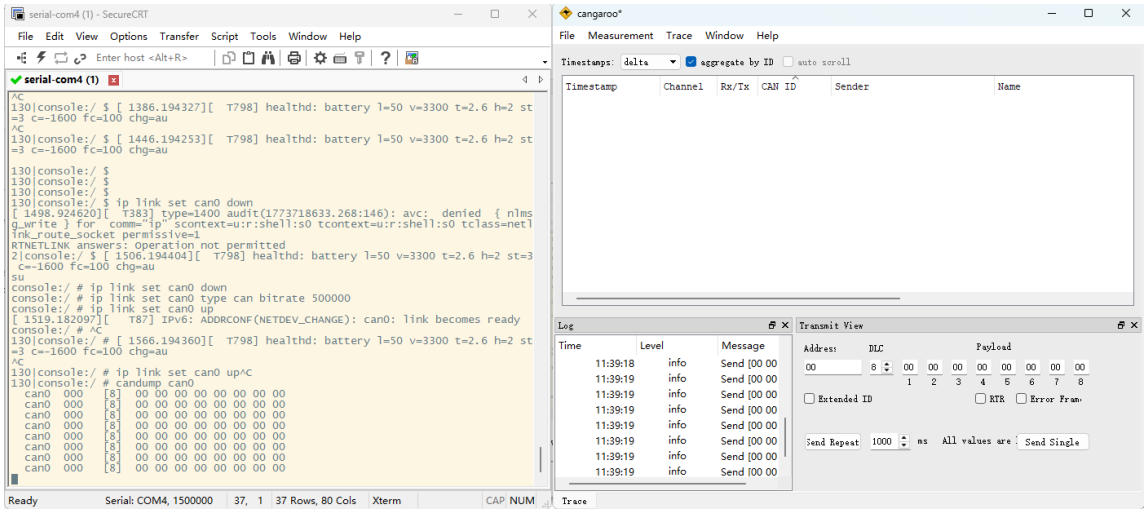
Step 3: Configure and activate the CAN network, setting the bitrate to 500000.

```
# ip link set can0 down
# ip link set can0 type can bitrate 500000
# ip link set can0 up
```



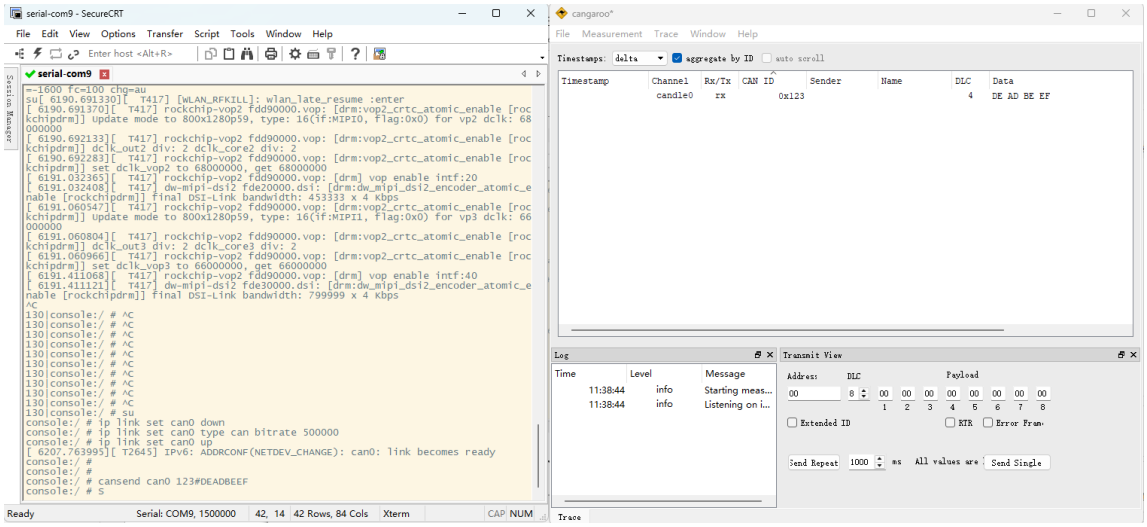
Step 4: Configure CAN as the receiver.

```
# candump can0
```

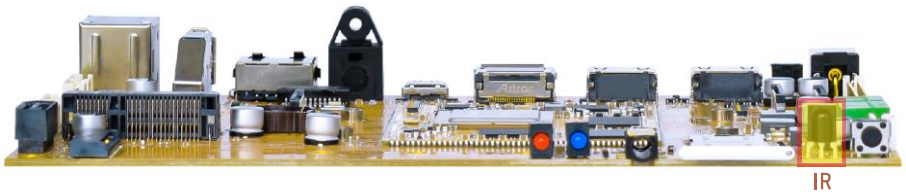


Step 5: Configure CAN as the sender.

```
# cansend can0 123#DEADBEEF
```



6.15 IR



Step 1: Open IR debugging print.

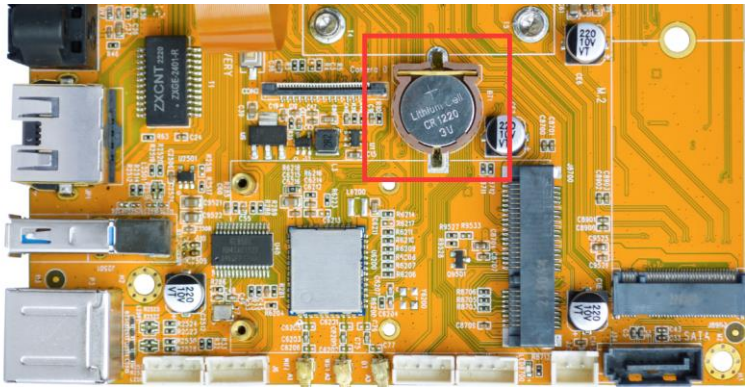
```
# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

Step 2: When pressing a button on the remote control towards the IR receiver, the key value will be printed to the log.

```
[  682.890943][    C1] USERCODE=0xd728
[  682.918142][    C1] RMC_GETDATA=f8
[  683.090571][    C1] USERCODE=0xd728
[  683.117587][    C1] RMC_GETDATA=f8
[  683.300782][    C1] USERCODE=0xd728
[  683.327982][    C1] RMC_GETDATA=f8
[  683.609429][    C1] USERCODE=0xd728
[  683.636535][    C1] RMC_GETDATA=e8
[  684.088650][    C1] USERCODE=0xd728
[  684.115700][    C1] RMC_GETDATA=f2
[  684.438375][    C1] USERCODE=0xd728
[  684.465479][    C1] RMC_GETDATA=e9
[  684.782143][    C1] USERCODE=0xd728
[  684.809247][    C1] RMC_GETDATA=e9
[  684.915057][    C1] USERCODE=0xd728
[  684.942193][    C1] RMC_GETDATA=e1
```

6.16 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
$ su
# date -s "2026-08-05 18:48:00"
```

Step 3: Write the system time to the hardware clock.

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

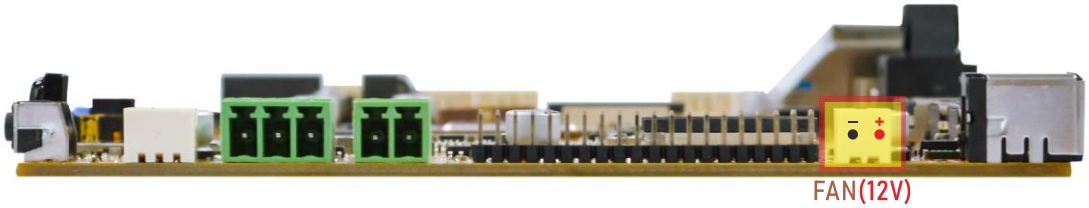
```
# hwclock
```

```
1|console:/ $ su
console:/ # date -s "2026-08-05 18:48:00"
Wed Aug  5 18:48:00 GMT 2026
console:/ # hwclock -w
console:/ # hwclock
2026-08-05 18:48:02+0000
console:/ # hwclock
2026-08-05 18:48:13+0000
console:/ # hwclock
2026-08-05 18:48:16+0000
```

Step 5: Power off, after a period of time to turn on the power again, check whether the time is saved.

```
1|console:/ $ su
console:/ # hwclock
2026-08-05 18:49:15+0000
console:/ # hwclock
2026-08-05 18:49:19+0000
console:/ # hwclock
2026-08-05 18:49:21+0000
```

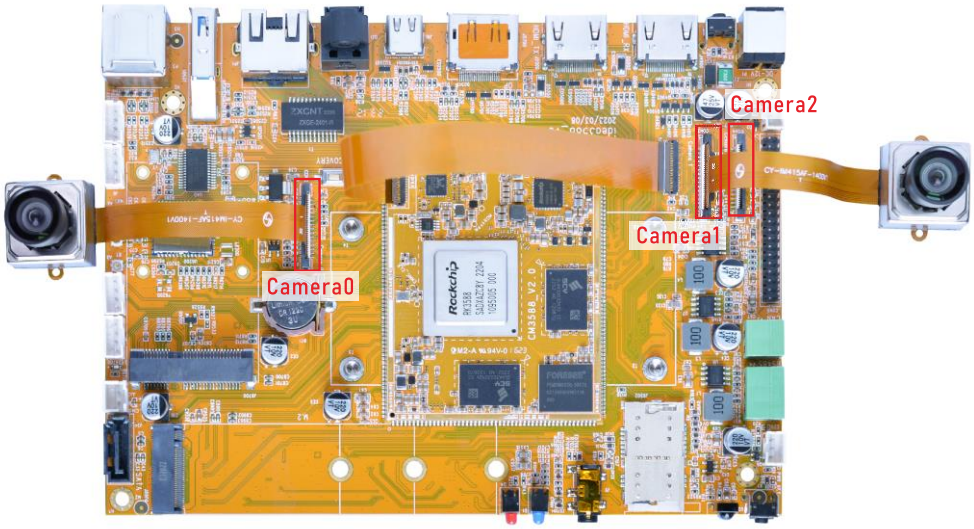
6.17 Fan



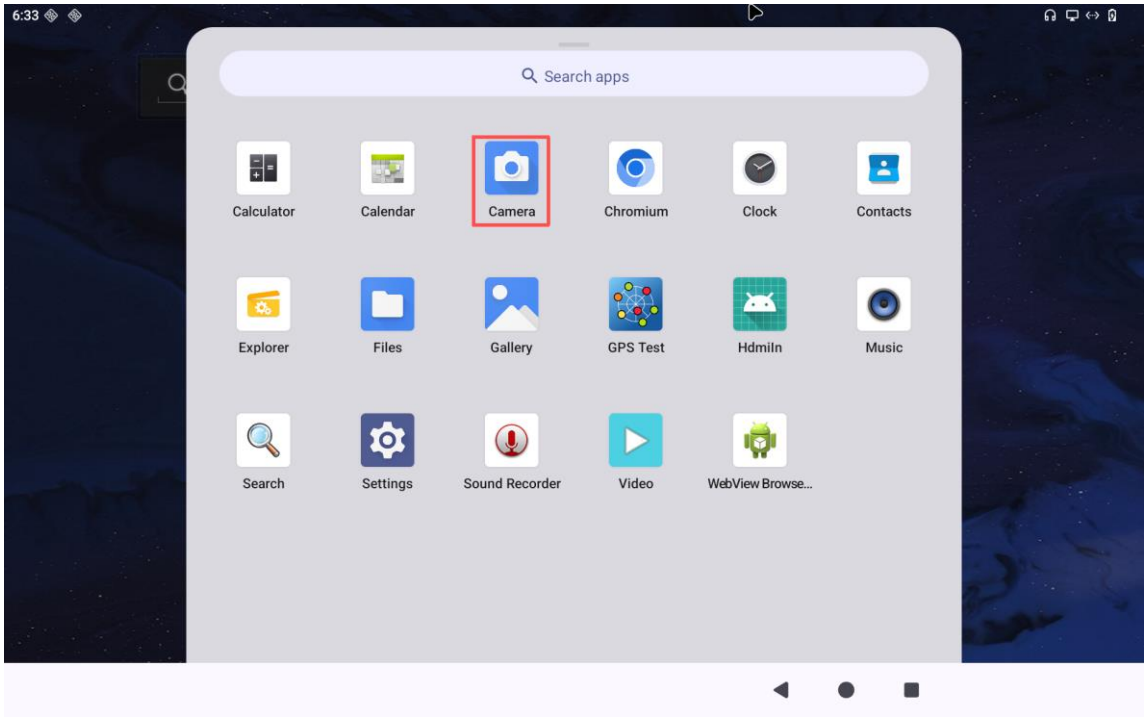
12V voltage output.

6.18 Camera

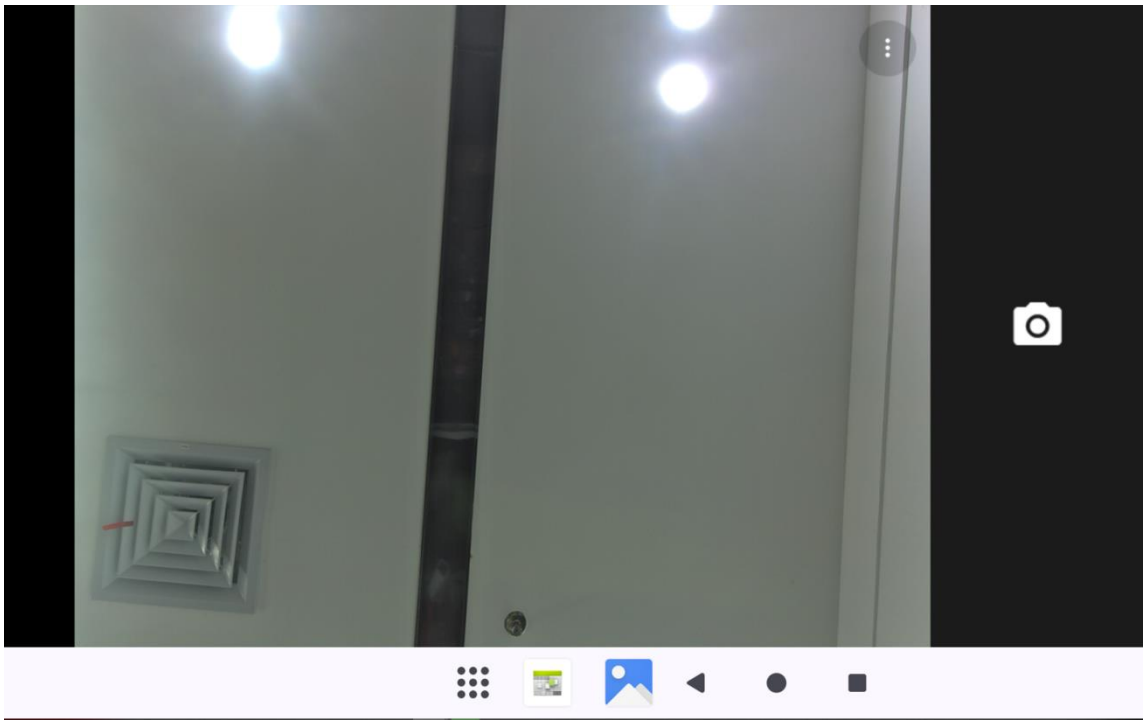
Idea3588 Android14 system is configured with the camera0 by default, as shown in the figure below.



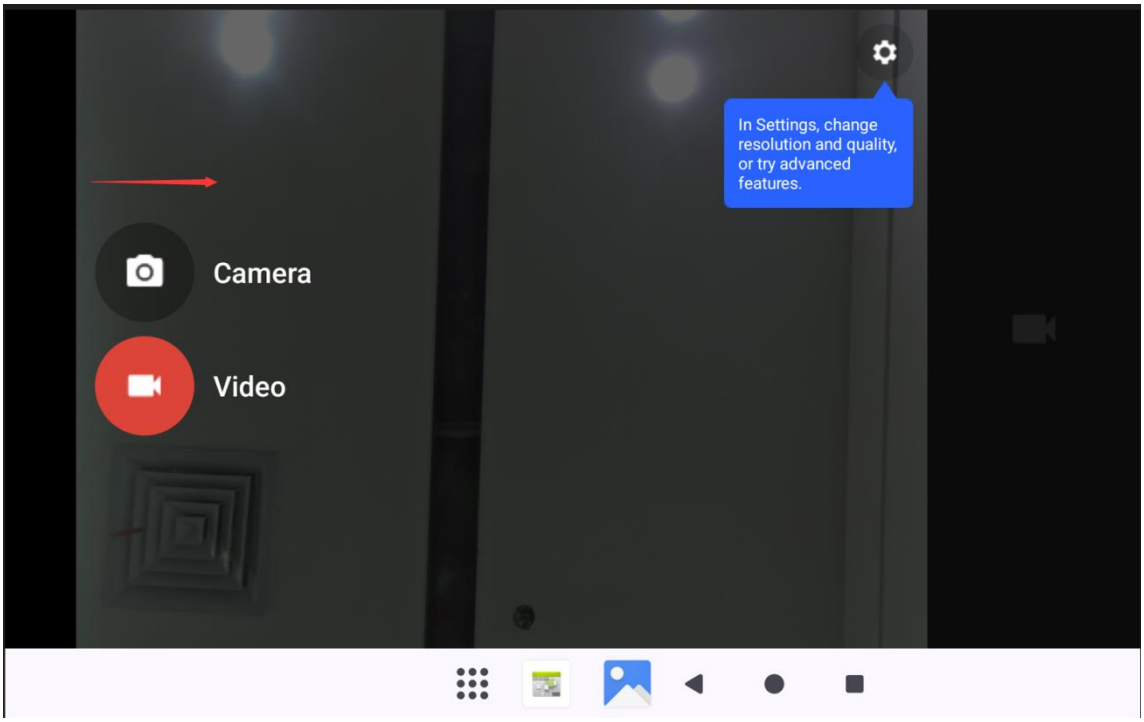
Step 1: Open the **Camera** app.



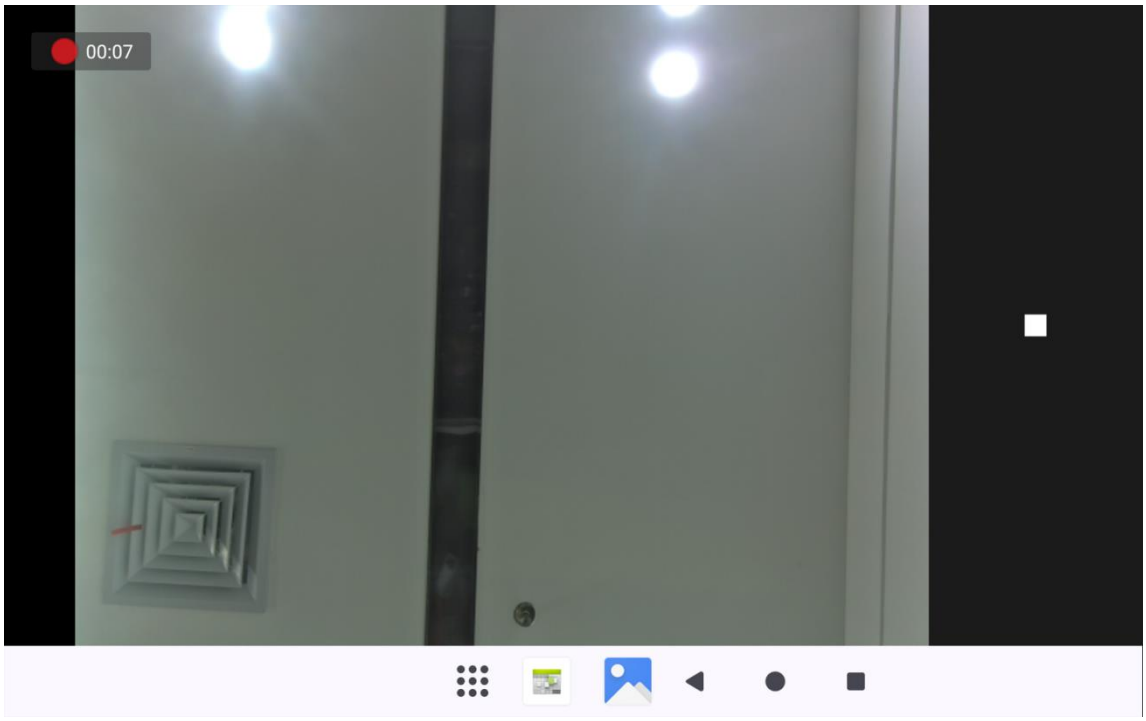
Step 2: Take a picture.



Step 3: Switch to video recording mode by swiping from the left side of the screen to the right.



Step 4: Video recording.


00:07