

Idea3588s Android14 User Manual

V1.0



Boardcon Embedded Design

Overview

The content of this document is only described for the development board Idea3588s, aiming to help users quickly understand, apply and develop the Idea3588s development board.

System Support

Development Board	Android14	N
Idea3588S_V2	Y	N
CM3588S_V2		

Revision History

Version	Date	Author	Revision History
V1.0	2025-02-20	Wugk	Initial version

Disclaimer

The information provided in this document is not warranted for accuracy and is subject to change without notice. Boardcon explicitly reserves the right to amend or alter the content of this document at any time without prior notification.

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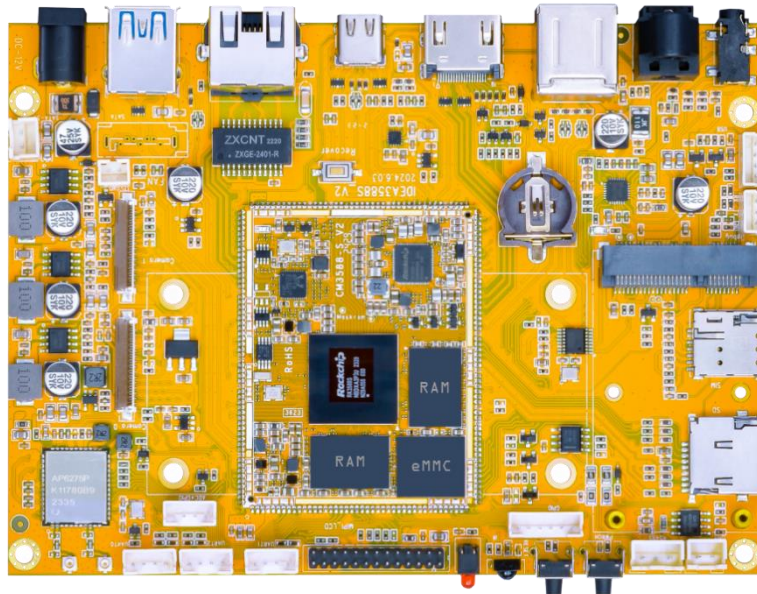
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1.Introduction

1.1 Overview

The Idea3588S adopts the Rockchip RK3588S next-generation octa-core 64 bit low-power high-performance processor, supporting 8K video encoding and decoding, 8K video output, and rich interfaces, supporting 4G, WiFi & BT, Gigabit Ethernet, and more. It is designed for ARM-based PC and Edge Computing device, personal mobile internet device and other digital multimedia applications.



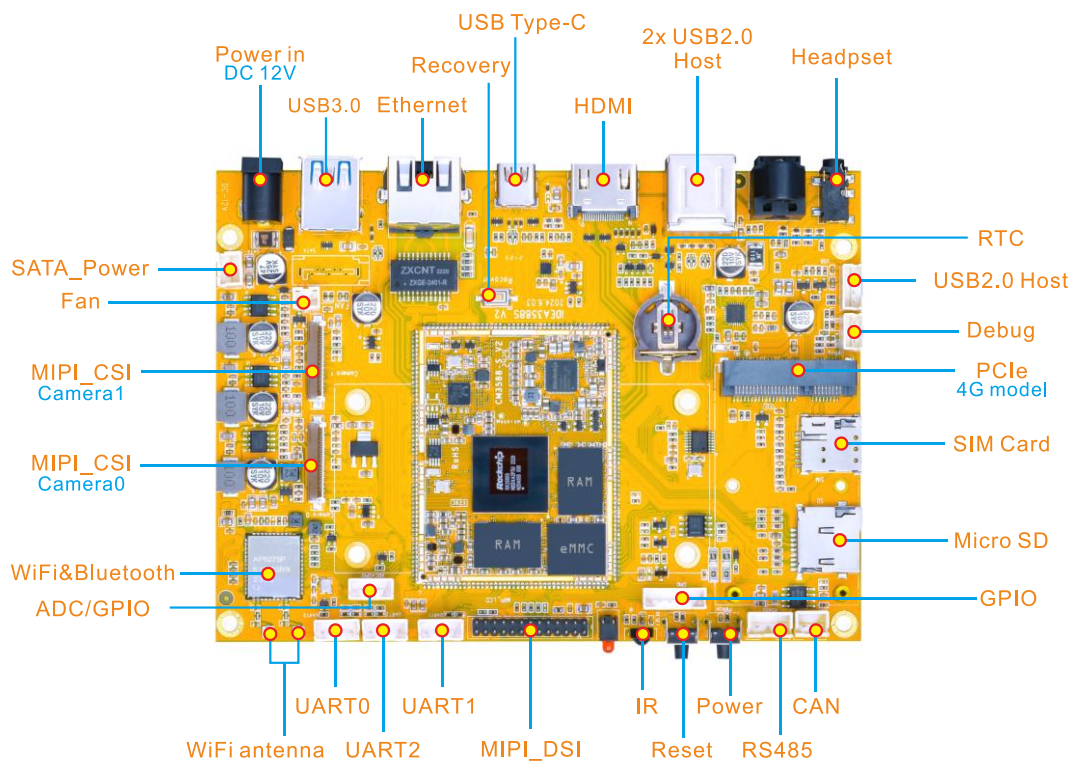
1.2 Product Parameters

Basic Parameters	
SOC	RK3588S
CPU	Octa-core 64-bit size core architecture, Quad-core Cortex-A76 + Quad-core Cortex-A55
GPU	• ARM Mali-G610 MP4 • OpenGL ES 1.1/2.0/3.2 • Vulkan 1.2

		• OpenCL up to 2.2
NPU		6TOPS AI computing power, three-core architecture, supporting int4/int8/int16/F16/BF16/TF32
Video	Decoder	• Support 8K@60fps H.265/VP9/AVS2 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 LPDDR4X (up to 16GB)
ROM		32GB eMMC (up to 128GB)
Support system		Debian, Buildroot
Hardware Parameters		
Extended Storage		• Support MicroSD Card
Display		• Support HDMI2.1 TX 8K@60fps display • Support MIPI_DSI 800 x 1280@60fps display • Support DisplayPort Alt Mode over USB-C
Audio		• Support HDMI TX audio output • Support Headset output/input
USB		• Support USB3.0 • Support 3xUSB2.0 • Support USB Type-C (ADB/USB3.0/DP)
Network		• Support Gigabit Ethernet • Support WIFI/BT module • Support 4G module
Camera		Support Camera (Camera0 or Camera1)
Peripheral communication		• Support CAN • Support RS485

	• Support 3xUART
Other parameters	Support Debug, IR, RTC, Fan, ADC+GPIO, GPIO, Power key, Reset key, Recover key
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	45.0mm x 57.5mm
Motherboard dimensions	145.0mm x 105.0mm

1.3 Hardware Interface Introduction



Interface parameters	
Power in	12V DC power input interface
USB3.0	USB3.0 Host interface
Ethernet	Gigabit Ethernet RJ45 interface
Recovery	Recovery key
USB Type-C	USB Type-C interface use for OTG download
HDMI	HDMI2.1 TX interface
2XUSB2.0 Host	Dual-layer USB2.0 HOST interface
Headset	Earphone output/input
RTC	RTC coin cell connector
USB2.0 Host	USB expansion interface
Debug	Debug the serial port
mPcle	4G model interface (EC20)
SIM Card	SIM card slot
Mirco SD	Mirco SD card slot
GPIO	GPIO interface
CAN	CAN communication interface
RS485	RS485 communication interface
Power	Power key
Reset	Reset key
IR	infrared receiver
MIPI_DSI	MIPI DSI display interface
UART1	UART1, TTL level interface
UART2	UART2, TTL level interface
UART0	UART0, TTL level interface
WIFI antenna	WIFI&BT antenna interface
ADC/GPIO	ADC+GPIO interface

WIFI&BT	WIFI&Bluetooth module (AP6275P)
MIPI_CSI (1)	Camera0 interface
MIPI_CSI (2)	Camera1 interface
Fan	Fan interface, PWM control
SATA_Power	SATA Power out interface, 5V

2.Install Drivers and Tool

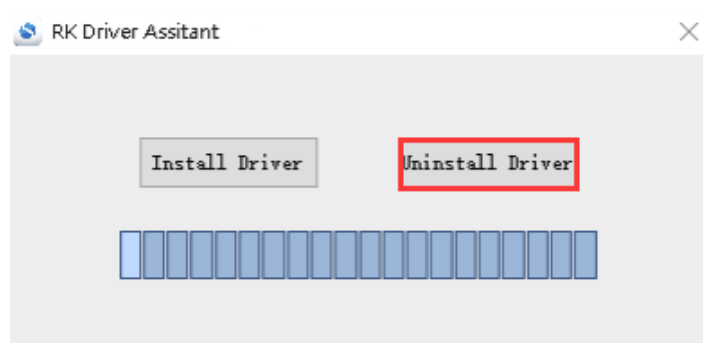
To download firmware and debug in the terminal, the following drivers and software need to be installed (for Windows computers):

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

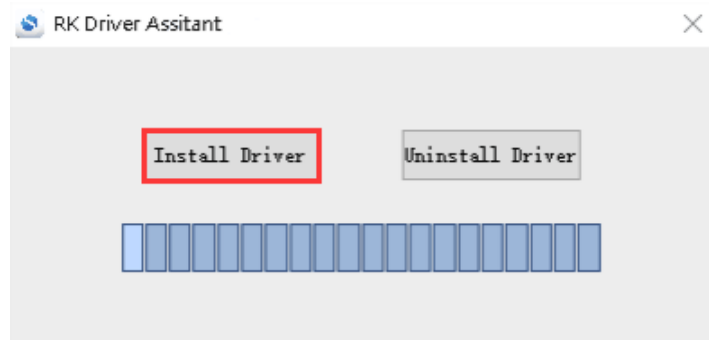
2.1 Install RK Driver Assitant

Step 1: Open [DriverAssitant_v5.1.3/DriverInstall.exe](#).

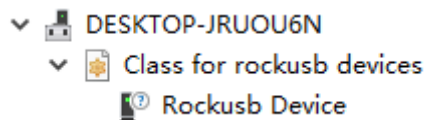
Step 2: To avoid driver conflicts, click **“Uninstall Driver”** to uninstall the driver.



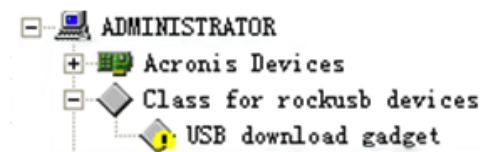
Step 3: Click button **“Install Driver”** to install.



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.



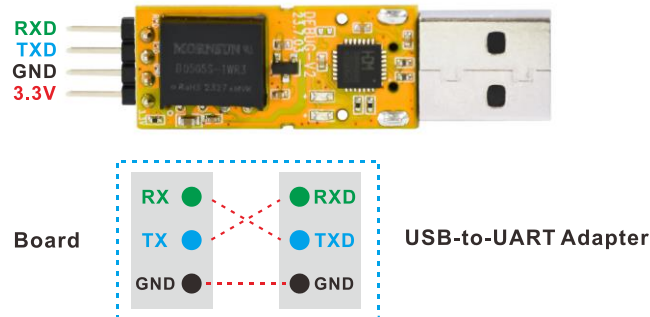
Step 6: The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select: [DriverAssitant_v5.1.3/ADBDriver](#).

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



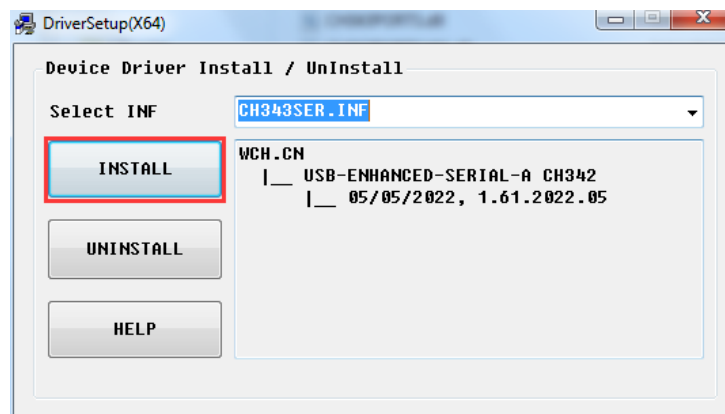
Pin	Connection Description
RXD	Receive, connect to TX pin of the board.
TXD	Transmit, connect to RX pin of the board.
GND	Ground, connect to GND pin of the board.
3V3	No need to connect.

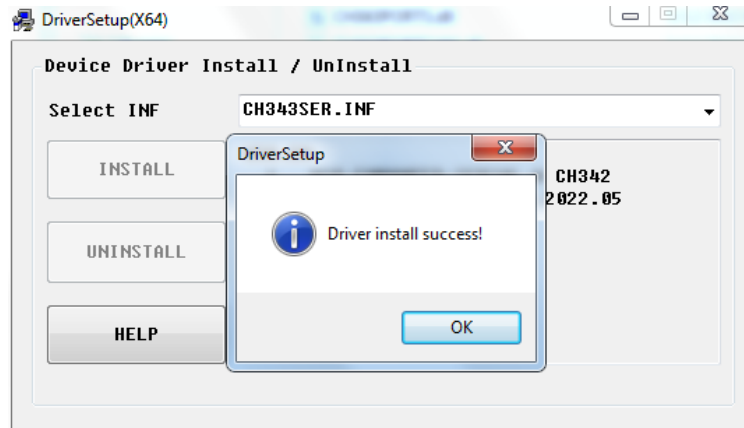
2.2.2 Install Driver

Step 1: Plug the CH9102X Module to the PC

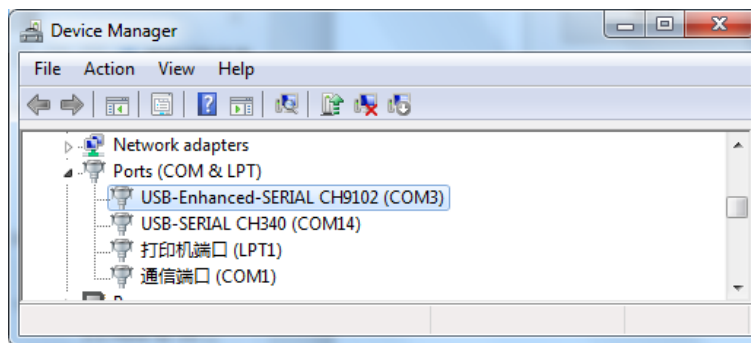
Step 2: Unzip [CH343SER.ZIP](#) on Windows.

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.

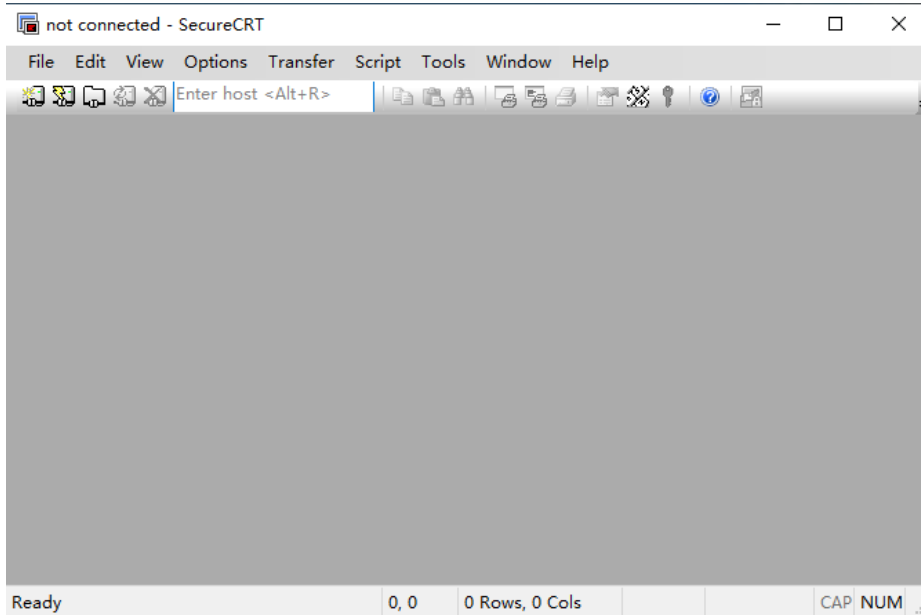


2.3 Install Serial Terminal Tool

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

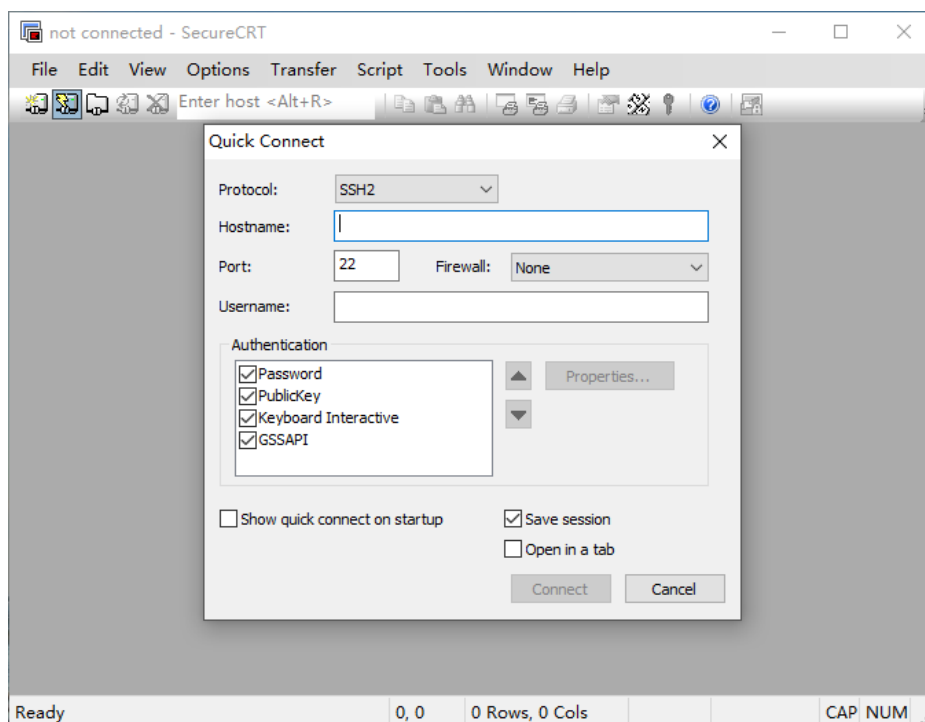
Step 1: Unzip *Platform/SecureCRT.rar* on PC.

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

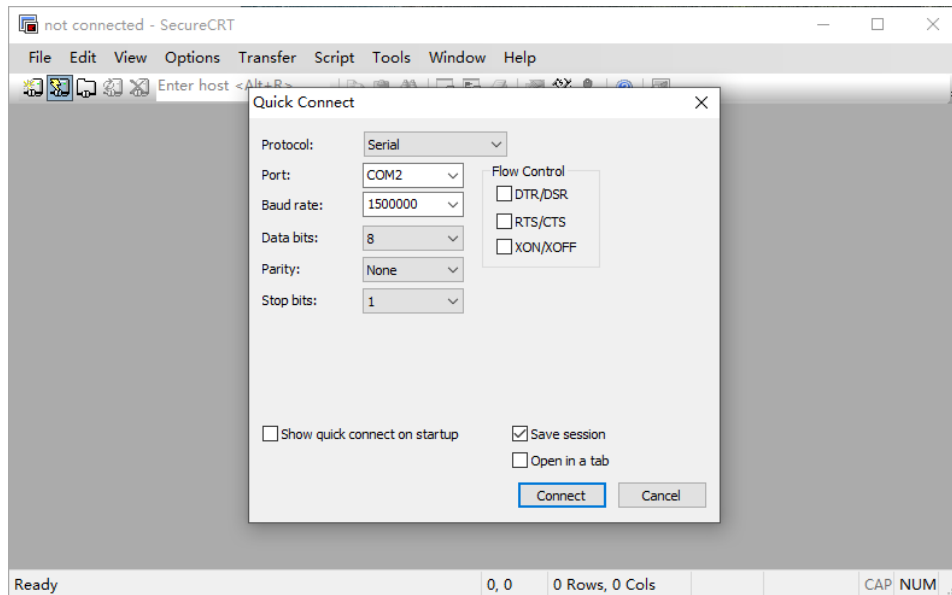


Step 3: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

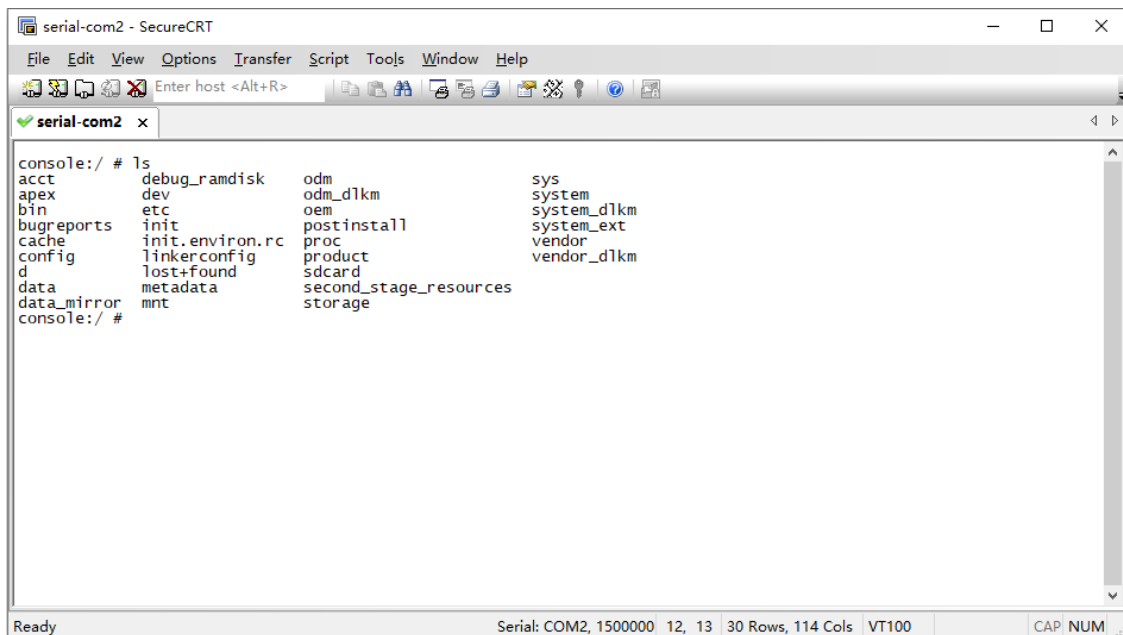
Step 4: Click the **“Quick Connect”** button to go to the Quick Connect configuration screen.



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

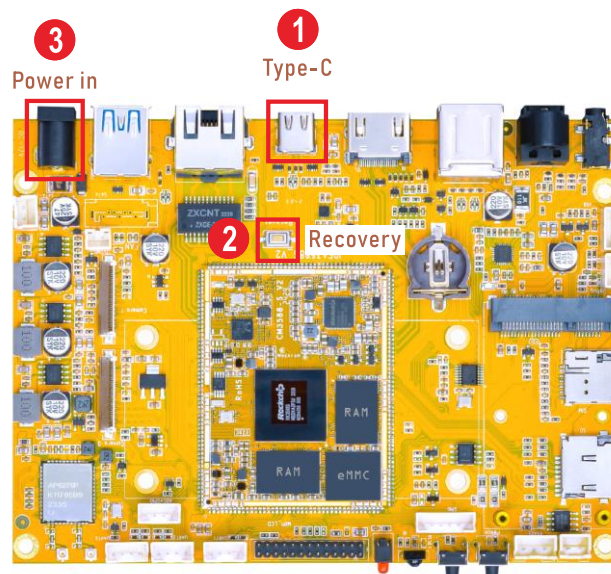
3.1.1.1 Hardware

Step 1: Disconnect the power adapter.

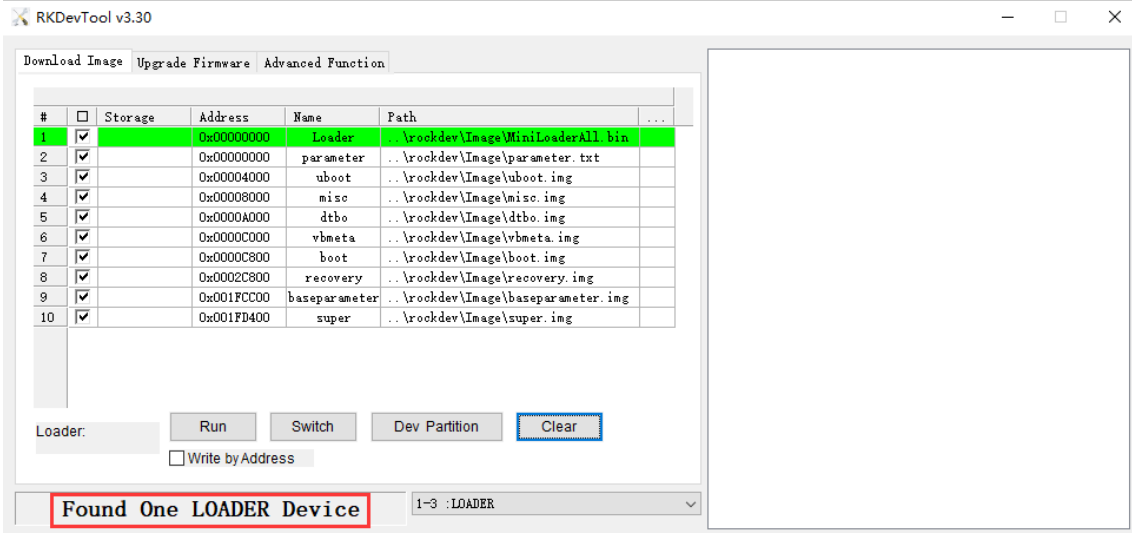
Step 2: Connect one end of the Type-C cable to the host and the other end to the development board.

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.

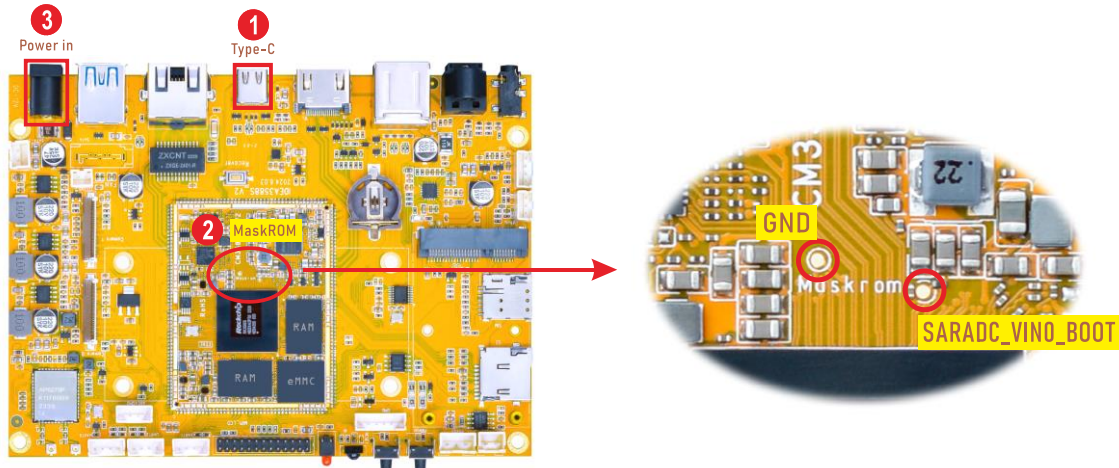
```
# reboot loader
```

3.1.2 How to Enter MaskRom Mode

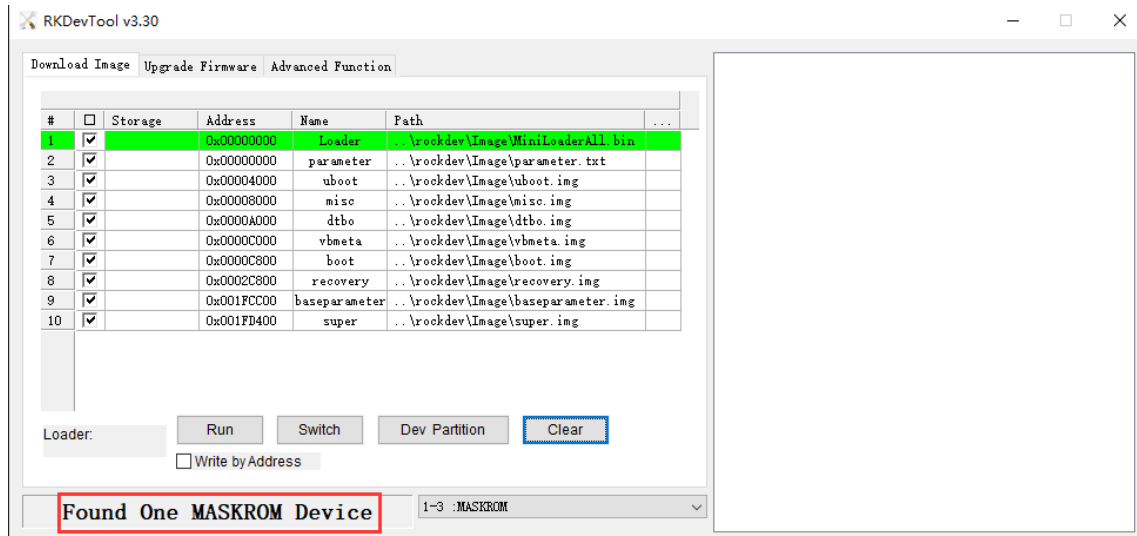
Step 1: Disconnect the power adapter.

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-S.



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



3.2 Burn firmware

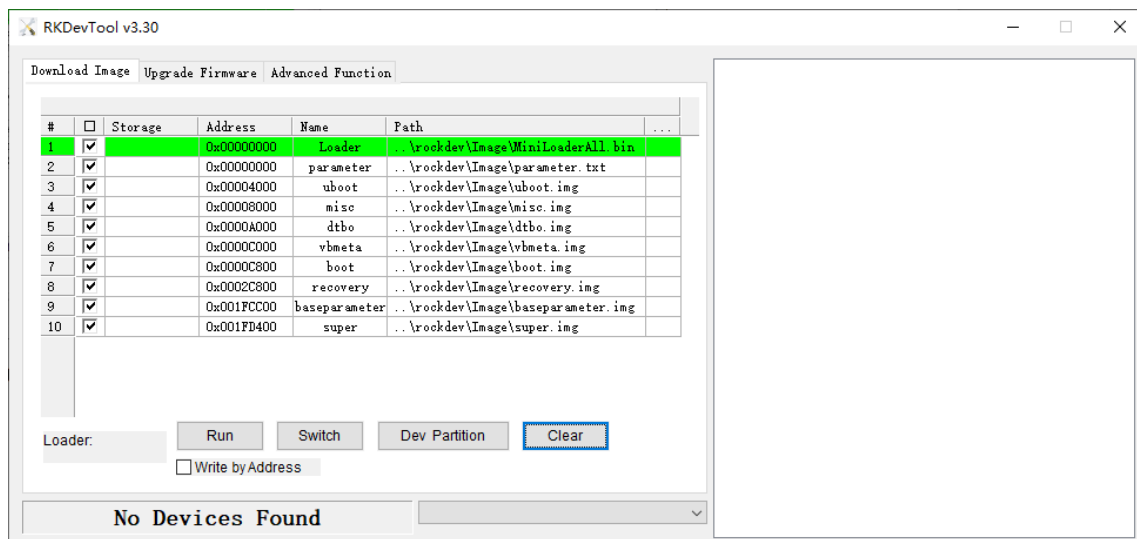
Environment: Windows OS (Operating System).

3.2.1 Burn Update.img Firmware

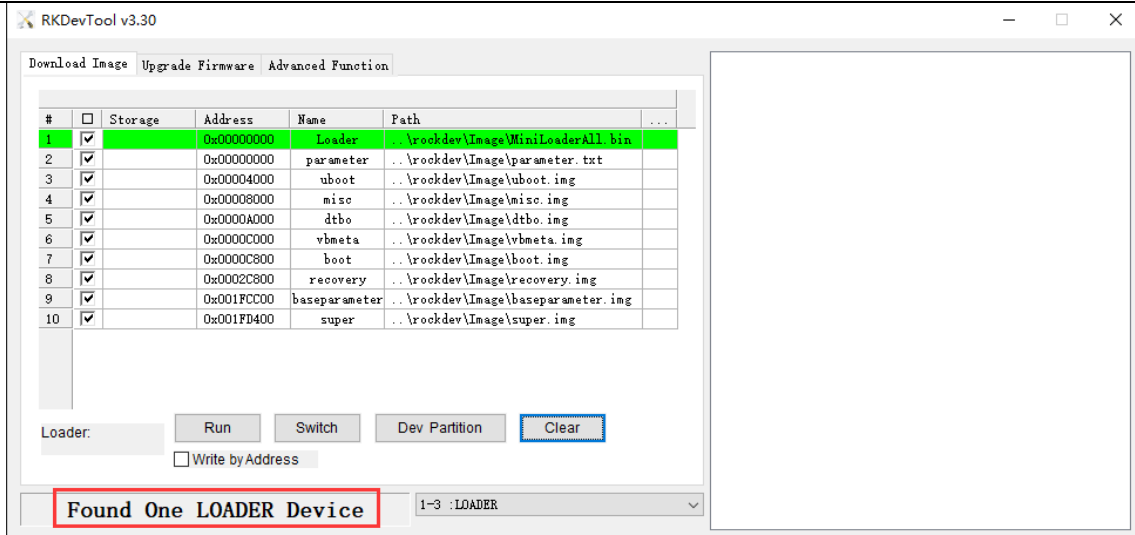
Step 1: Unzip *RKDevTool_v3.30_for_window.zip* on Windows.

Step 2: Open

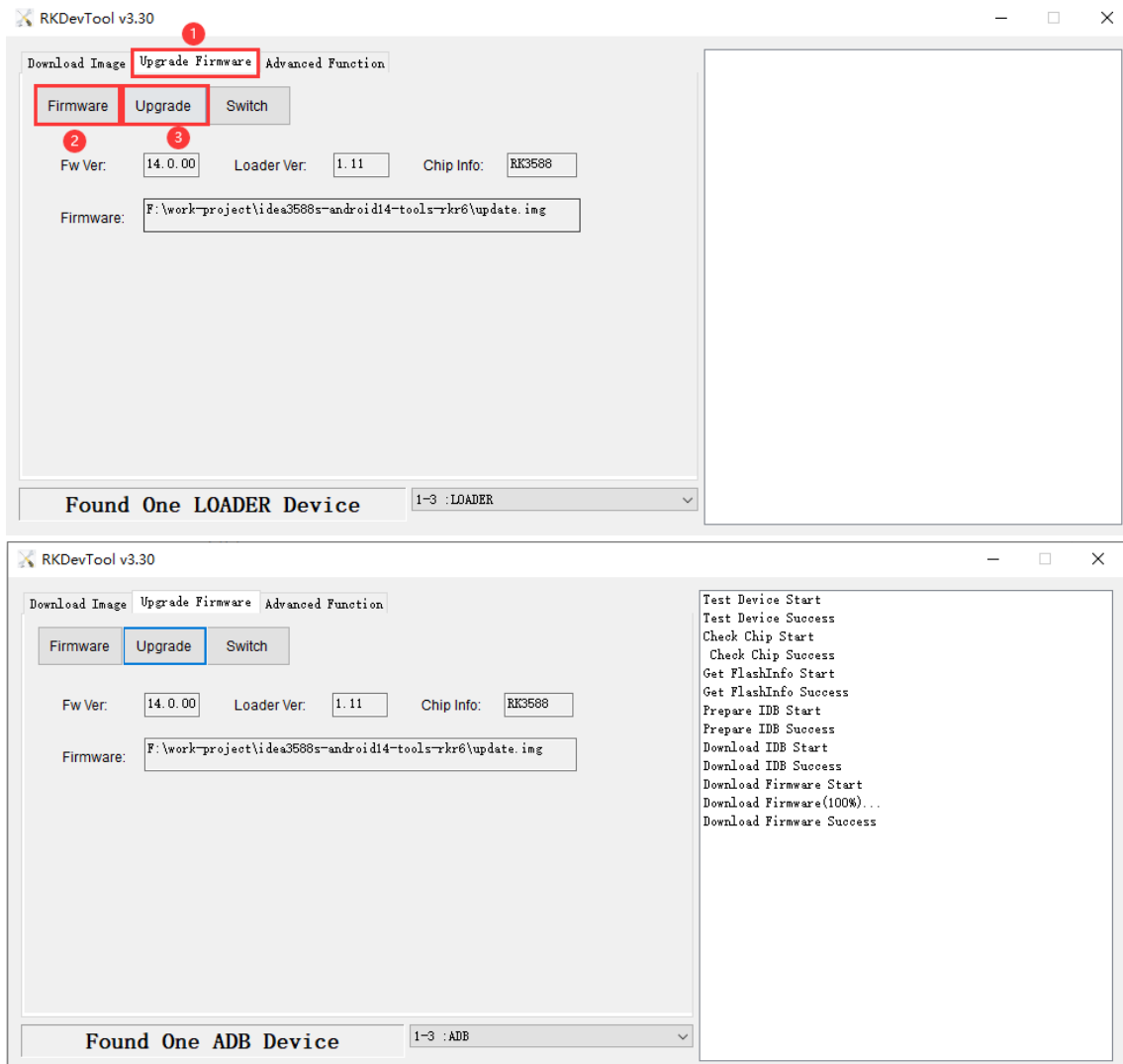
RKDevTool_v3.30_for_window\RKDevTool_v3.30_for_window\RKDevTool.exe.



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.

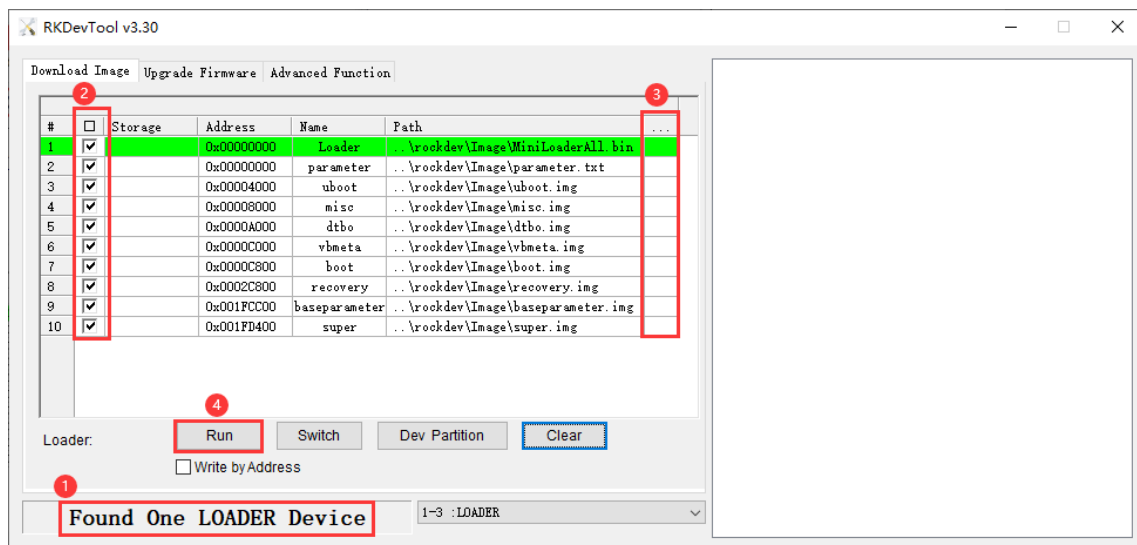
3.2.2 Burn Split Firmware

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

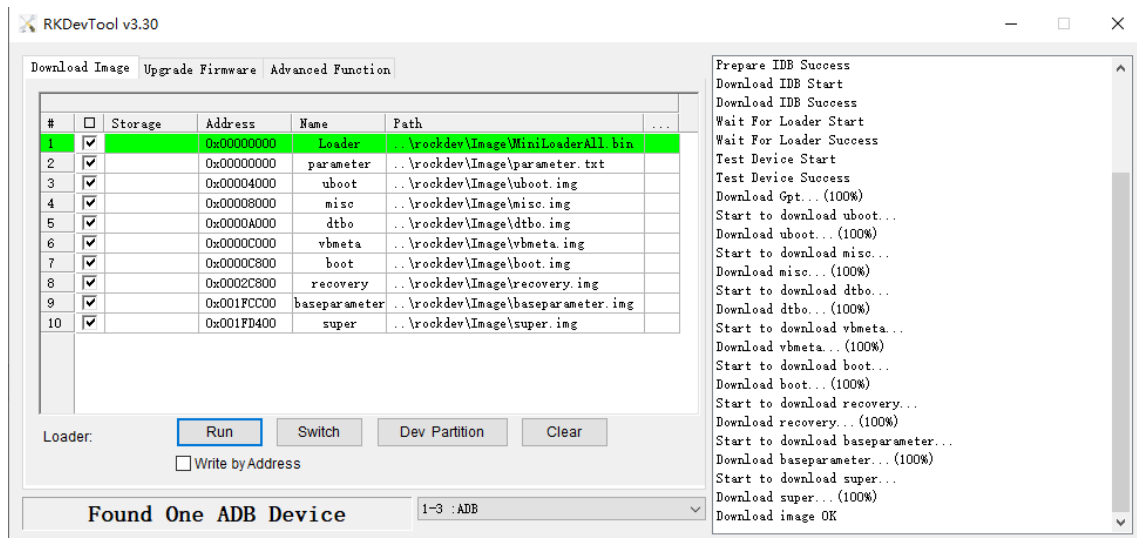
Step 2: Check the partitions to be flashed, multiple partitions can be selected.

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

Step 1: Unzip the Source

To extract the source files, execute the following commands:

```
$ tar xvf idea3588s-android14-250221.tar.gz  
$ cd idea3588s-android14-rkr6
```

Step 2: Select the corresponding board level

```
$ source build/envsetup.sh  
$ lunch rk3588s_u-userdebug
```

Step 3: Compile U-Boot

To compile U-Boot, execute the following command:

```
$ ./build.sh -U
```

Step 4: Compile the Kernel

To compile the kernel, execute the following command:

```
$ ./build.sh -K
```

Other compiling instruction

Only compile kernel to generate boot.img

Export clang to the environment:

```
$ cd kernel-6.1
$ export PATH=./prebuilts/clang/host/linux-x86/clang-r487747c/bin:$PATH
$ alias msk='make CROSS_COMPILE=aarch64-linux-gnu- LLVM=1 LLVM_IAS=1'
$ msk ARCH=arm64 rockchip_defconfig android-14.config pcie_wifi.config
$ msk ARCH=arm64 BOOT_IMG=./rockdev/Image-rk3588s_u/boot.img rk3588s-evb4-lp4x-v10.img -j8
```

user can flash **boot.img** under the catalogue of kernel-6.1 directly to boot position of machine after compiling, and please load the partition table (**parameter.txt**) when flashing, for fear of flashing to the wrong place.

Step 5: Compile Android

To compile android, execute the following command:

```
$ ./build.sh -A
```

Step 6: Generate and Check Firmwares

To generate firmware, execute the following command:

```
$ ./build.sh -u
```

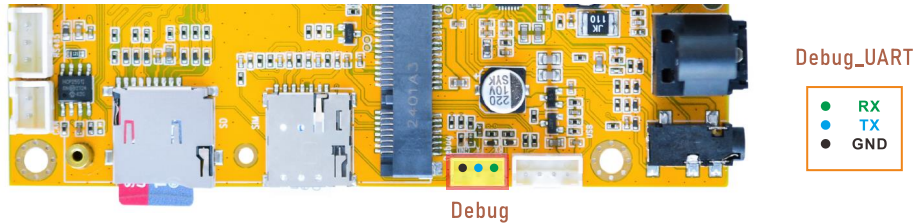
Images and **update.img** are generated in *rockdev/* directory.

One-click compilation

```
$ source build/envsetup.sh
$ lunch rk3588s_u-userdebug
$ ./build.sh -AUCKu
```

6.Android14 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.

```

serial-com2 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com2 x
NTF manifest.
[ 17.472702][ T301] servicemanager: could not find android.hardware.radio.config.IRadioConfig/default in the VI
NTF manifest.
[ 17.481932][ T301] servicemanager: could not find android.hardware.radio.config.IRadioConfig/default in the VI
NTF manifest.
[ 17.641871][ T146] platform pwm-fan: deferred probe pending
[ 18.438914][ T314] type=1400 audit(1735961761.936:264): avc: denied { read } for comm="android.hardware" nam
e="u:object_r:vendor_sculptor_prop:s0" dev="tmpfs" ino=347 scontext=u:r:hal_power_default:s0 tcontext=u:object_r:v
endor_sculptor_prop:s0 tclass=file permissive=0
[ 18.469263][ T314] type=1400 audit(1735961761.968:265): avc: denied { read } for comm="android.hardware" nam
e="u:object_r:vendor_sculptor_prop:s0" dev="tmpfs" ino=347 scontext=u:r:hal_power_default:s0 tcontext=u:object_r:v
endor_sculptor_prop:s0 tclass=file permissive=0
[ 19.164026][ T314] type=1400 audit(1735961762.660:266): avc: denied { write } for comm="binder:545_4" name=
"mtu" dev="sysfs" ino=61727 scontext=u:r:netd:s0 tcontext=u:object_r:sysfs:s0 tclass=file permissive=0
[ 19.219819][ T314] type=1400 audit(1735961762.716:267): avc: denied { write } for comm="binder:545_4" name=
"mtu" dev="sysfs" ino=61727 scontext=u:r:netd:s0 tcontext=u:object_r:sysfs:s0 tclass=file permissive=0
[ 19.793994][ T301] servicemanager: Found android.hardware.security.keymint.IRemotelyProvisionedComponent/defau
lt in device VINTF manifest.
[ 19.830621][ T1433] logd: start watching /data/system/packages.list ...
[ 19.835813][ T1433] logd: ReadPackageList, total packages: 105

console:/ $
console:/ $ [ 21.271348][ T1] init: Sending signal 9 to service 'idmap2d' (pid 656) process group...
[ 21.283111][ T1] libprocessgroup: Successfully killed process cgroup uid 1000 pid 656 in 11ms
[ 21.285603][ T1] init: Control message: Processed ctl.stop for 'idmap2d' from pid: 737 (system_server)
[ 21.286328][ T1] init: Service 'idmap2d' (pid 656) received signal 9

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

Execute the following command to switch to root mode:

```
$ su
```

```

serial-com2 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>

serial-com2 x
[ 19.219819][ T314] type=1400 audit(1735961762.716:267): avc: denied { write } for comm="binder:545_4" name=
[ 19.219819][ T314] type=1400 audit(1735961762.716:267): avc: denied { write } for comm="binder:545_4" name=
[ 19.793994][ T301] servicemanager: Found android.hardware.security.keymint.IRemotelyProvisionedComponent/defau
[ 19.793994][ T301] servicemanager: Found android.hardware.security.keymint.IRemotelyProvisionedComponent/defau
[ 19.830621][ T1433] logd: start watching /data/system/packages.list ...
[ 19.830621][ T1433] logd: start watching /data/system/packages.list ...
[ 19.835813][ T1433] logd: ReadPackageList, total packages: 105
[ 19.835813][ T1433] logd: ReadPackageList, total packages: 105

console:/ $
console:/ $
console:/ $
[ 21.271348][ T1] init: Sending signal 9 to service 'idmap2d' (pid 656) process group...
[ 21.283111][ T1] libprocessgroup: Successfully killed process cgroup uid 1000 pid 656 in 11ms
[ 21.285603][ T1] init: Control message: Processed ctl.stop for 'idmap2d' from pid: 737 (system_server)
[ 21.286328][ T1] init: Service 'idmap2d' (pid 656) received signal 9
[ 21.286328][ T1] init: Service 'idmap2d' (pid 656) received signal 9

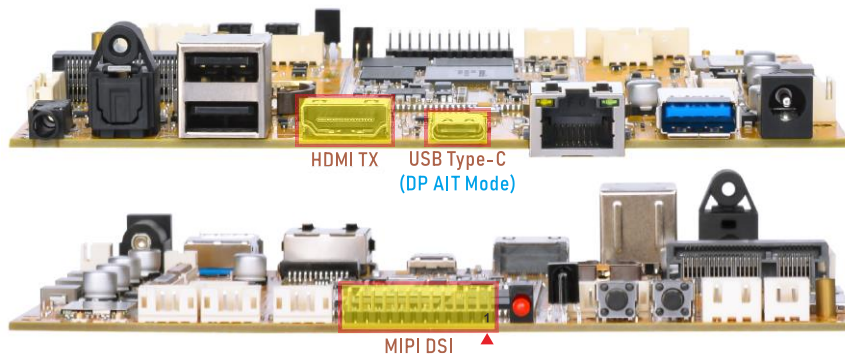
console:/ $
console:/ $
console:/ $
[ 39.473015][ T340] [WLAN_RFKILL]: wlan_late_resume :enter
[ 39.473015][ T340] [WLAN_RFKILL]: wlan_late_resume :enter
[ 39.473088][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] update mode to 1920x1200p55, type
[ 39.473088][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] update mode to 1920x1200p55, type
: 14(if:edp1, flag:0x0) for vp1 dclk: 150000000
: 14(if:edp1, flag:0x0) for vp1 dclk: 150000000
[ 39.474134][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] dclk_out1 div: 0 dclk_core1 div:
[ 39.474134][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] dclk_out1 div: 0 dclk_core1 div:
2
2
[ 39.474208][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] set dclk_vop1 to 150000000, get 1
[ 39.474208][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_enable] set dclk_vop1 to 150000000, get 1
50000000
50000000
[ 49.992203][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_disable] Crtc atomic disable vp1
[ 49.992203][ T340] rockchip-vop2 fdd90000.vop: [drm:vop2_crtc_atomic_disable] Crtc atomic disable vp1
[ 50.004913][ T340] [WLAN_RFKILL]: wlan_early_suspend :enter
[ 50.004913][ T340] [WLAN_RFKILL]: wlan_early_suspend :enter

console:/ $
console:/ $ su
console:/ #
console:/ # █
  
```

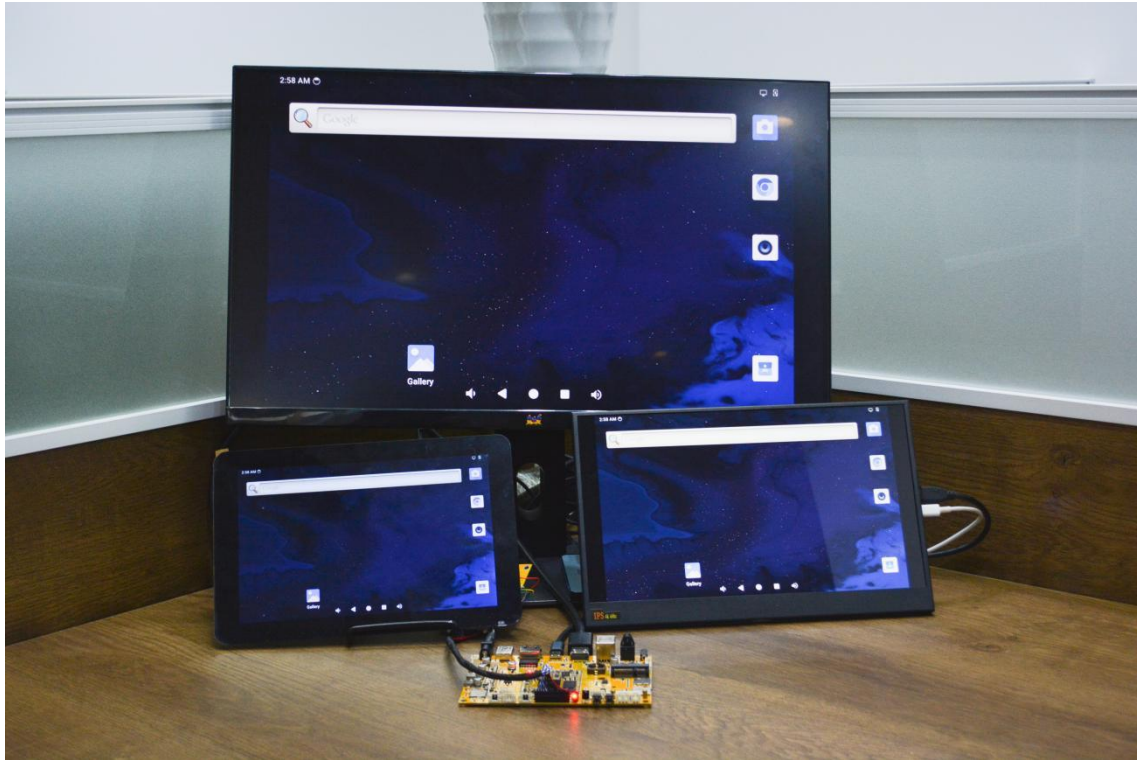
Ready Serial: COM2, 1500000 30, 13 30 Rows, 114 Cols VT100 CAP NUM

6.2 Display

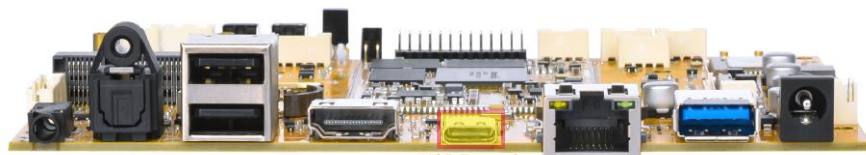
Idea3588s Android14 supports eDP, HDMI TX, DP three-screen display at the same time, and it is the same display.



The display effect diagram is as follows:



6.3 USB Type-C



USB3.0



HDMI



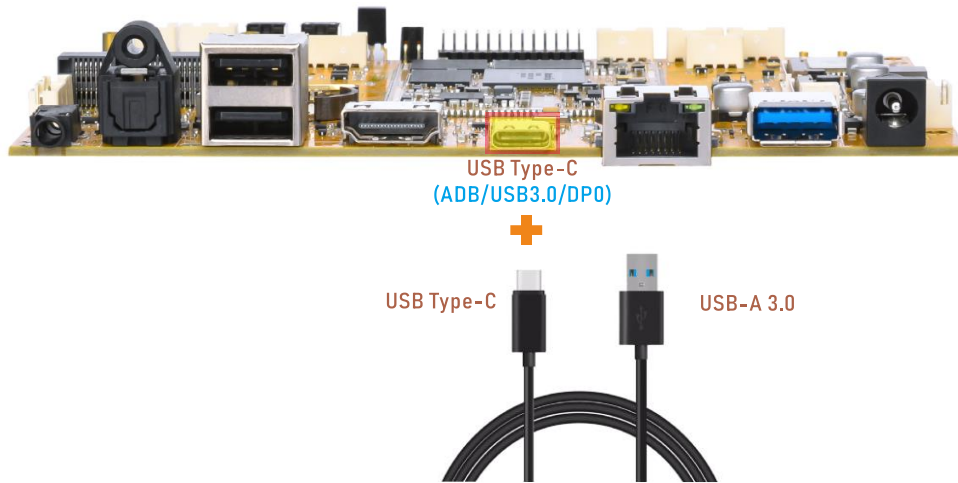
DisplayPort

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.

6.3.1 ADB

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

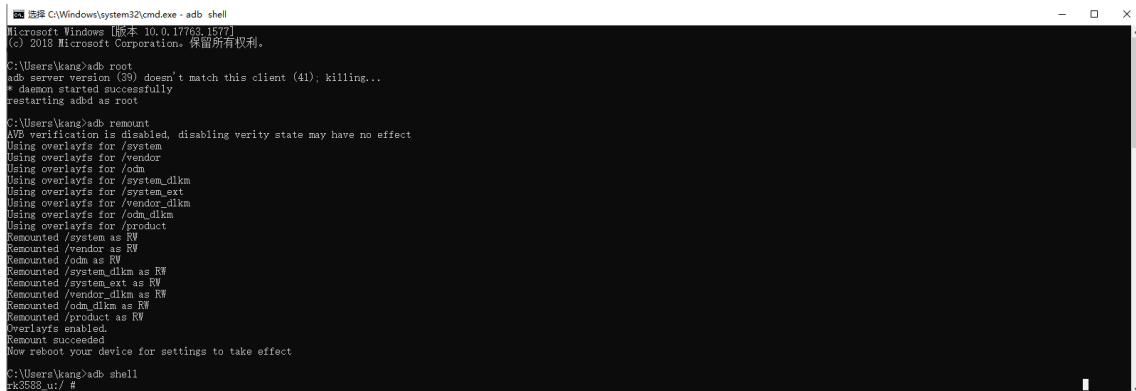


Step 2: Install ADB driver on Windows system.

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
```



```
Microsoft Windows [版本 10.0.17763.1577]
(c) 2018 Microsoft Corporation. 保留所有权利。

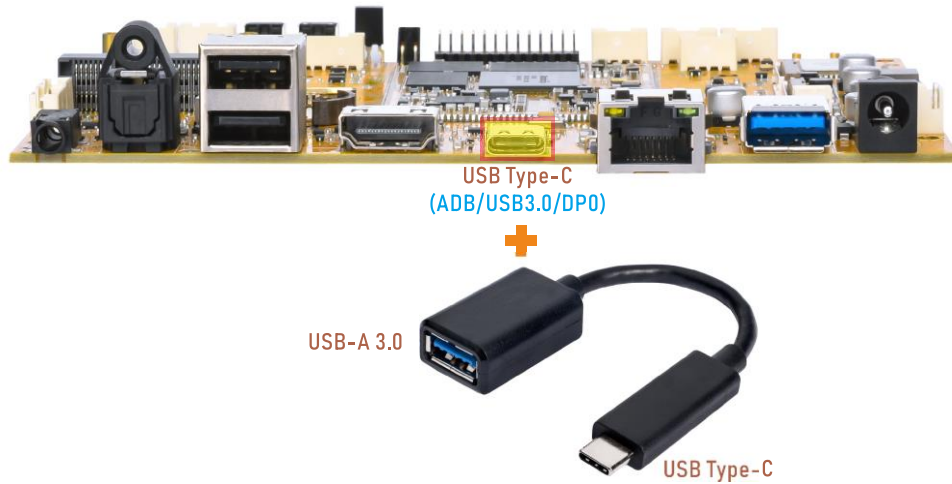
C:\Users\kang>adb root
adb server version (39) doesn't match this client (41); killing...
* daemon started successfully
restarting adb as root

C:\Users\kang>adb remount
ADB verification is disabled, disabling verity state may have no effect
Using overlays for /system
Using overlays for /vendor
Using overlays for /odm
Using overlays for /system_dkdm
Using overlays for /system_ext
Using overlays for /vendor_dkdm
Using overlays for /odm_dkdm
Using overlays for /product
Remounted /system as RW
Remounted /vendor as RW
Remounted /odm as RW
Remounted /system_dkdm as RW
Remounted /system_ext as RW
Remounted /vendor_dkdm as RW
Remounted /odm_dkdm as RW
Remounted /product as RW
Overlays enabled.
Remount succeeded
Now reboot your device for settings to take effect

C:\Users\kang>adb shell
rk3588-ut/ #
```

6.3.2 Type-C to USB3.0

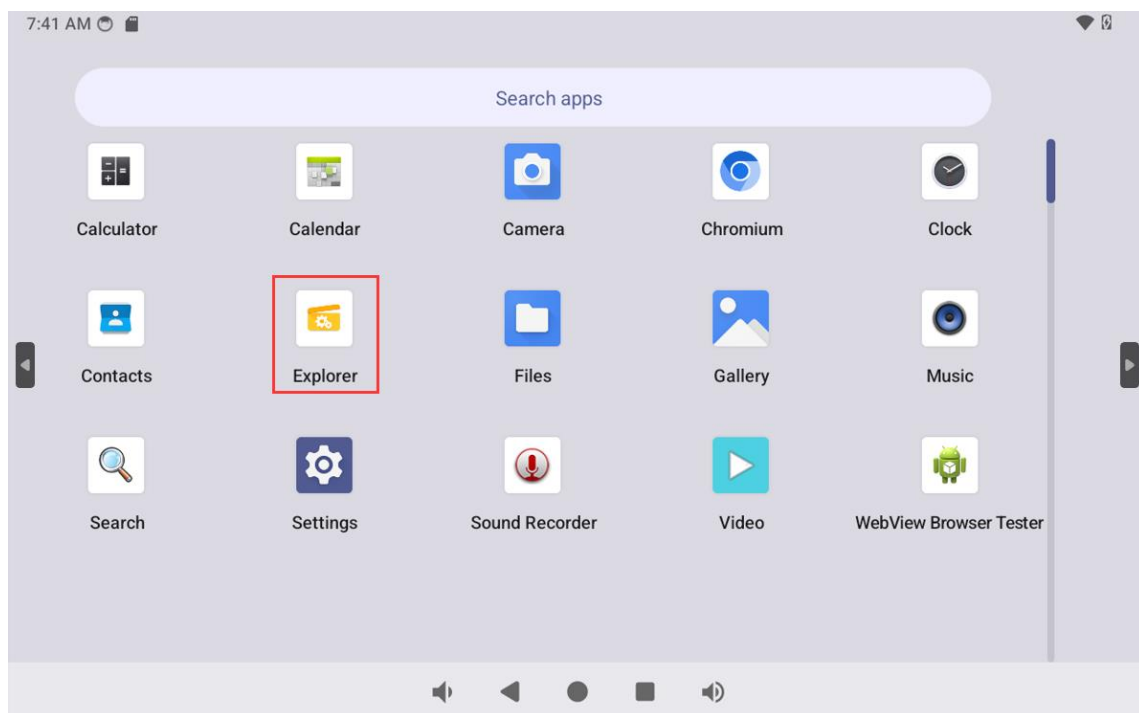
Step 1: Connect the Type-C to USB3.0 converter to the Type-C port of the development board, and then insert the USB3.0 flash drive into the USB3.0 port of the docking station.

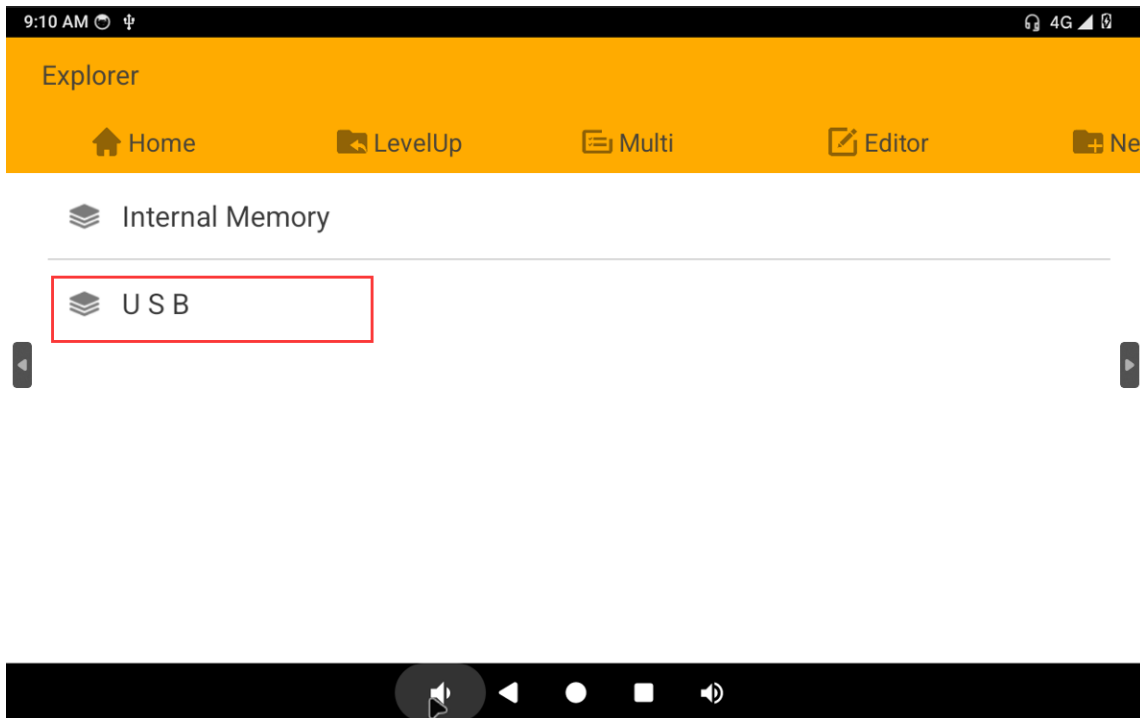


The log prints the following message, indicating that the USB3.0 device is successfully recognized.

```
[ 2398.507303][ T2991] usb 8-1: new SuperSpeed USB device number 2 using xhci-hcd
[ 2398.529821][ T2991] usb 8-1: New USB device found, idVendor=0951, idProduct=1666, bcdDevice= 1.10
[ 2398.529838][ T2991] usb 8-1: New USB device strings: Mfr=2, Product=3, SerialNumber=4
[ 2398.529849][ T2991] usb 8-1: Product: DataTraveler 3.0
[ 2398.529859][ T2991] usb 8-1: Manufacturer: Kingston
[ 2398.529868][ T2991] usb 8-1: SerialNumber: E0D55E6B64661881D8300029
[ 2398.531351][ T2991] usb-storage 8-1:1.0: USB Mass Storage device detected
[ 2398.532408][ T2991] scsi host0: usb-storage 8-1:1.0
```

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



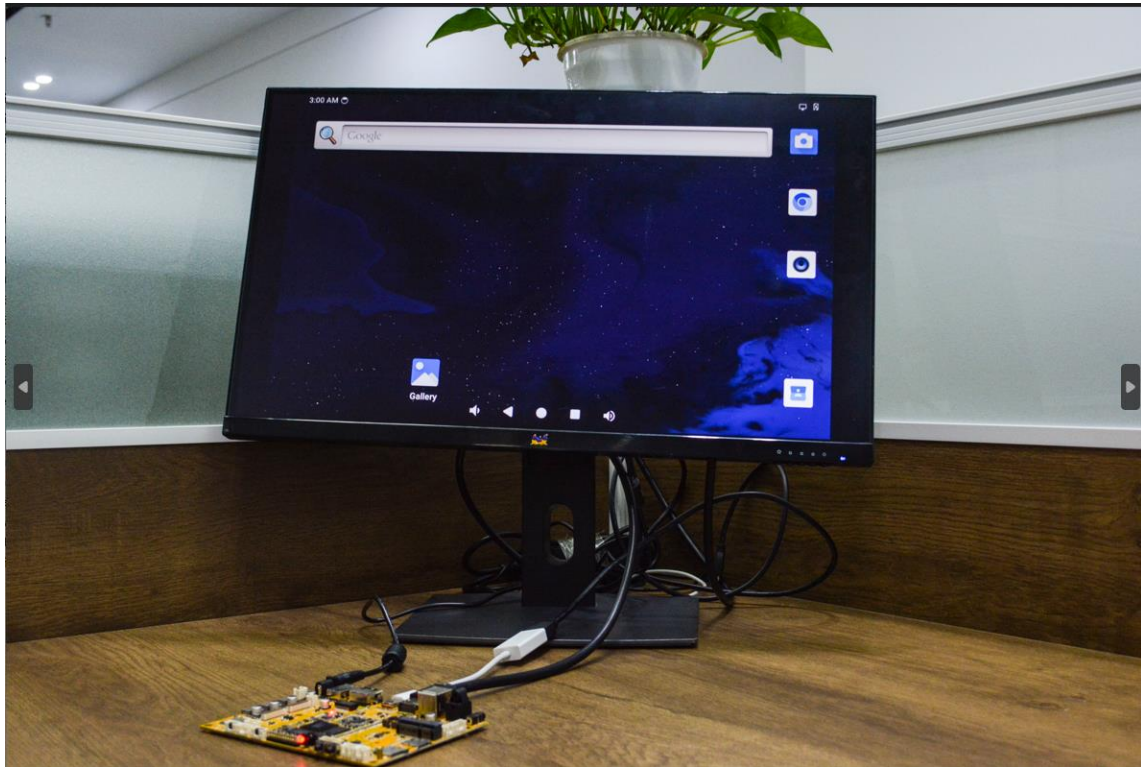


6.3.3 DP Alt Mode

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.

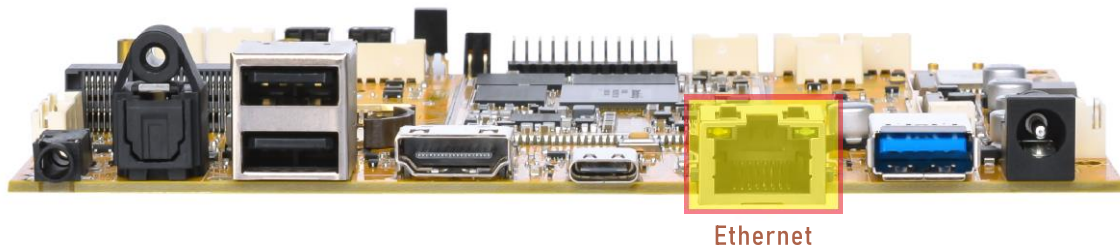
Currently, Boardcon has conducted the following output tests:

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



6.4 Ethernet

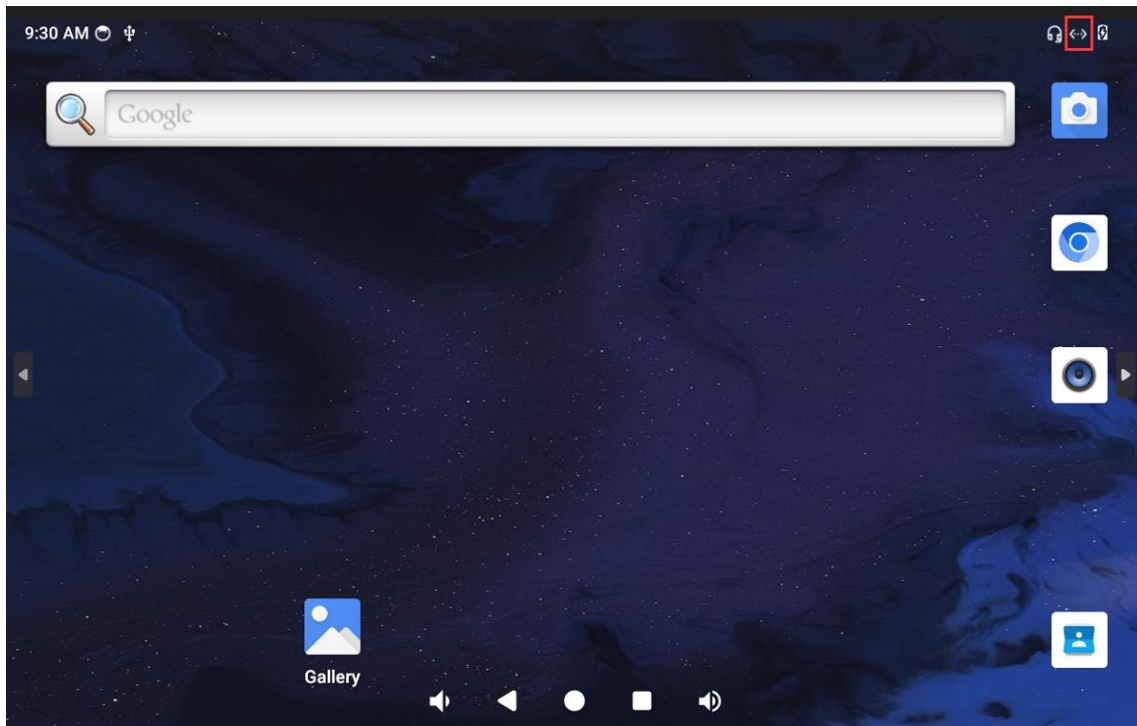
Step 1: Connect the network cable to the Ethernet port.



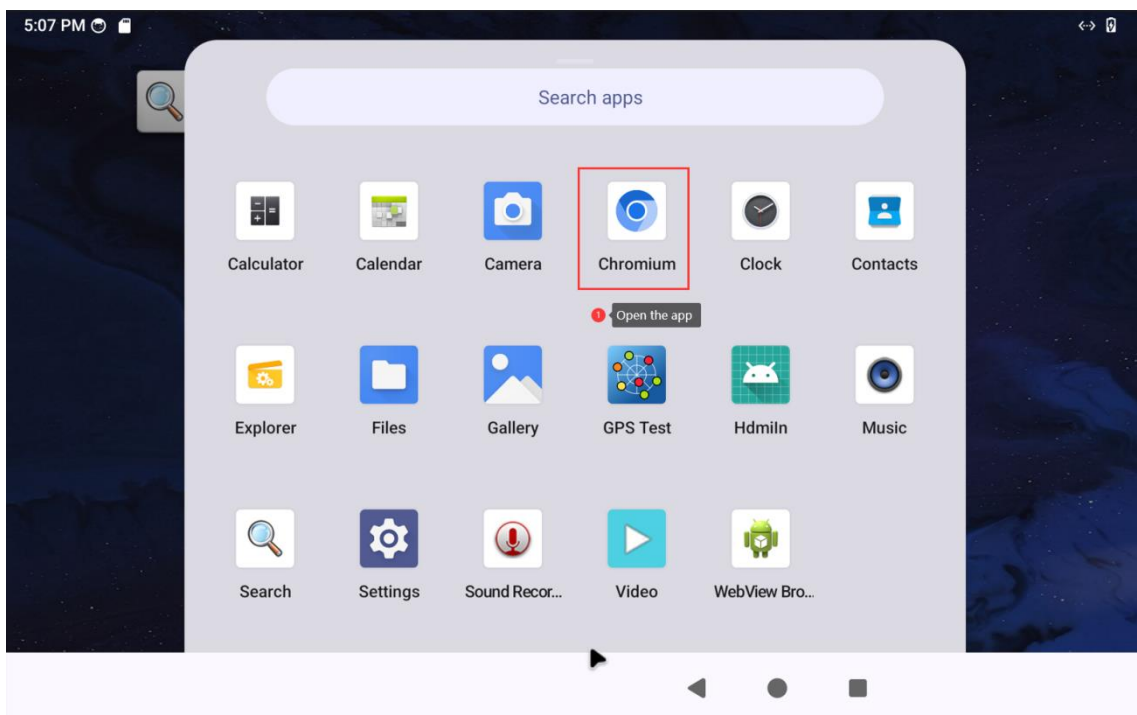
According to the log, it can be seen that the Gigabit Ethernet recognition is successful.

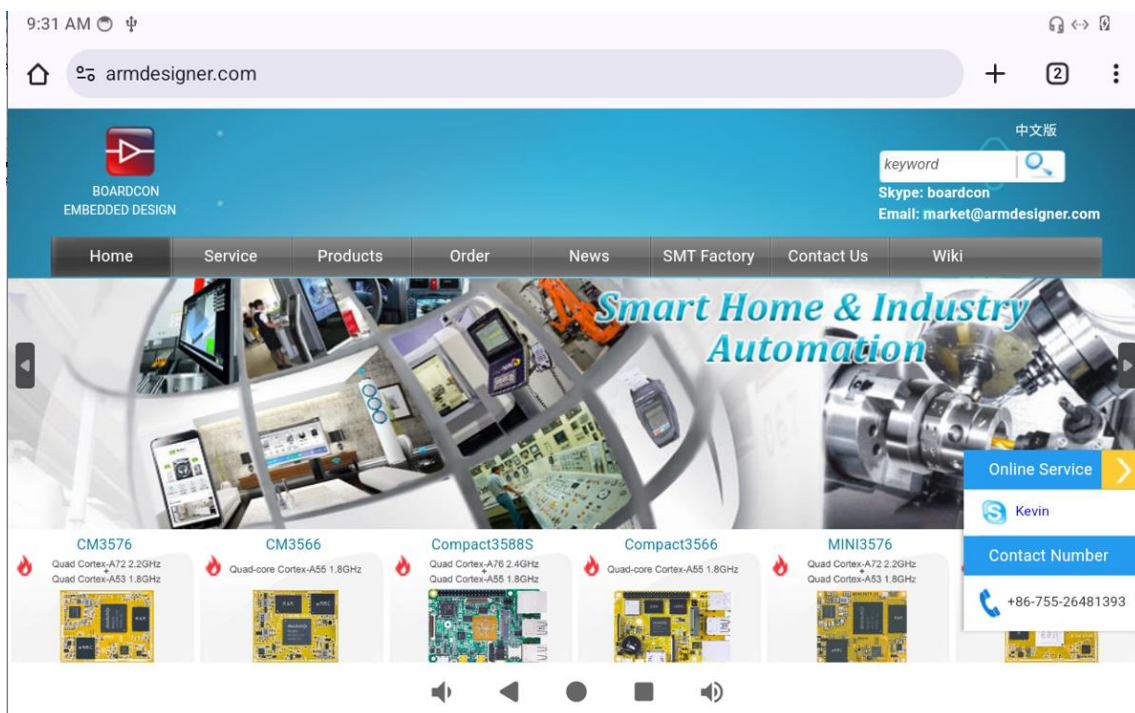
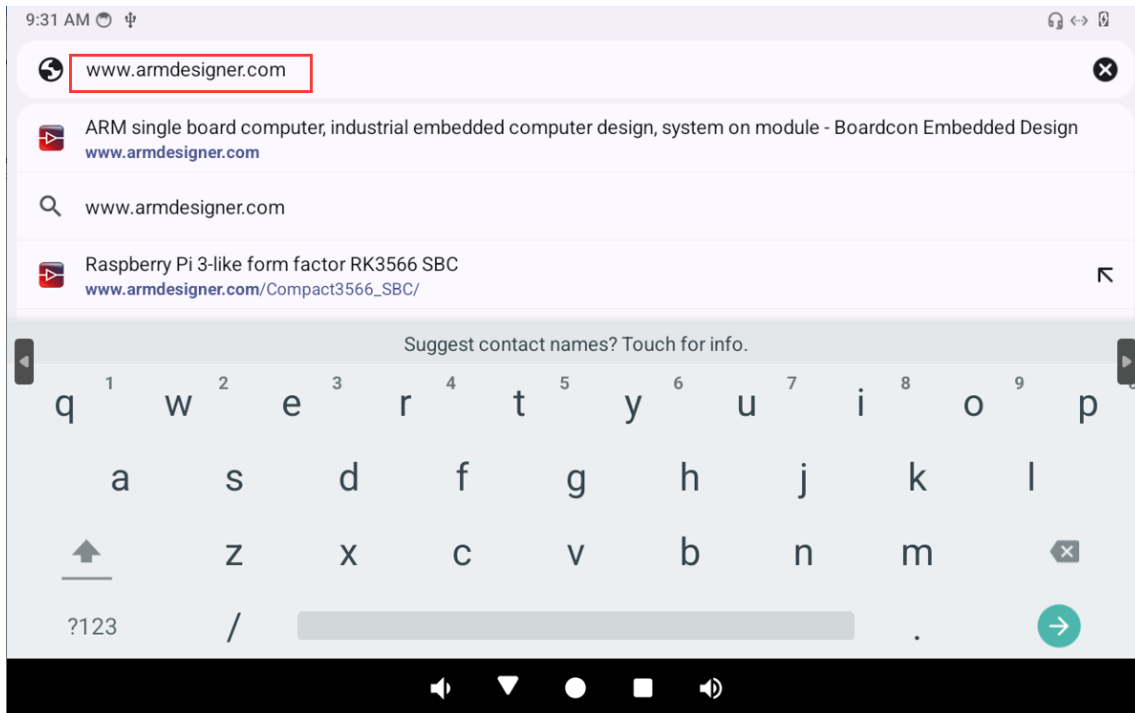
```
console:/ # [ 1557.959326][ T2286] rk_gmac-dwmac fe1c0000.ethernet eth0: Link is Up - 1Gbps/Full - flow control rx/tx  
[ 1557.959416][ T2286] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

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
```

```
console:/ # ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope: Host
          UP LOOPBACK RUNNING  MTU:65536  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

dummy0    Link encap:Ethernet  HWaddr 0a:08:79:72:0a:08
          inet6 addr: fe80::808:79ff:fe72:a08/64 Scope: Link
          UP BROADCAST RUNNING NOARP  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:9 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 TX bytes:630

eth0      Link encap:Ethernet  HWaddr 2a:98:78:a2:1c:15  Driver rk_gmac-dwmac
          inet addr:192.168.0.157 Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::829e:4817:dc5c:477c/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:8403 errors:0 dropped:0 overruns:0 frame:0
          TX packets:3494 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7796822 TX bytes:437766
          Interrupt:70

console:/ #
```

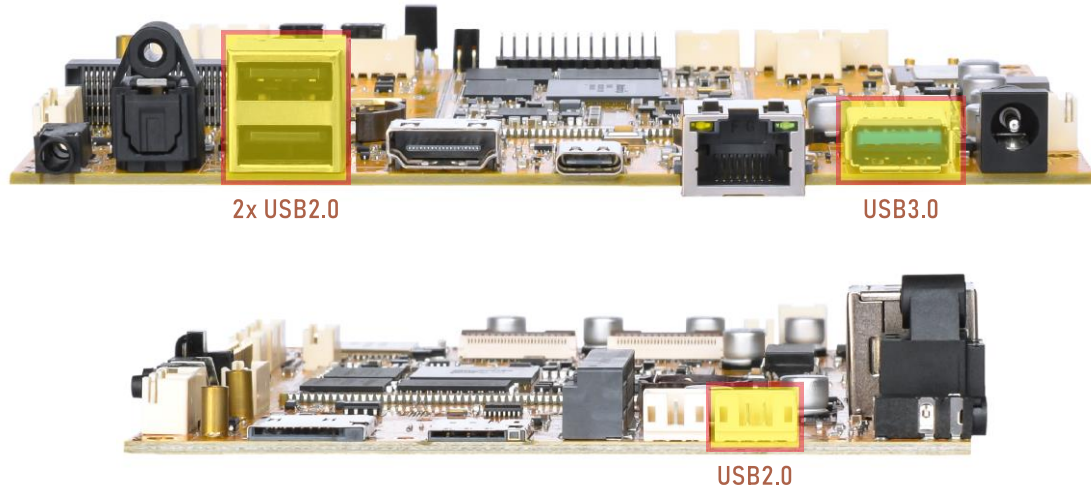
- Network connection test.

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

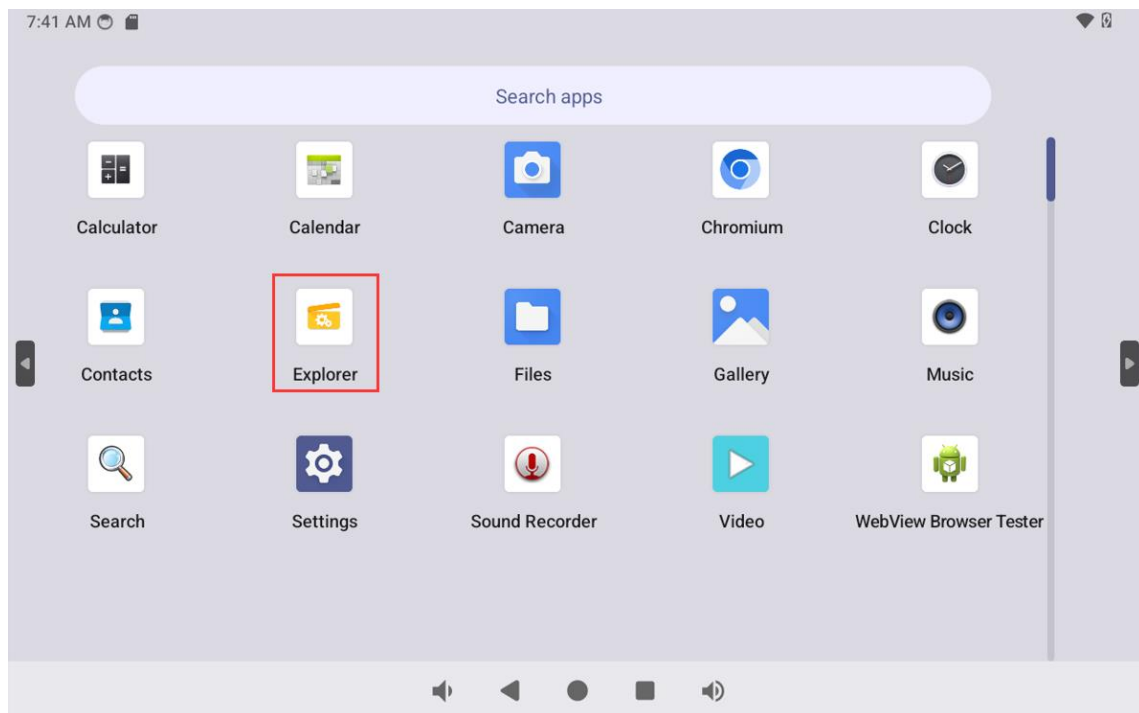
```
console:/ # ping -I eth0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.157 eth0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=188 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=48 time=187 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=48 time=188 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=48 time=187 ms
```

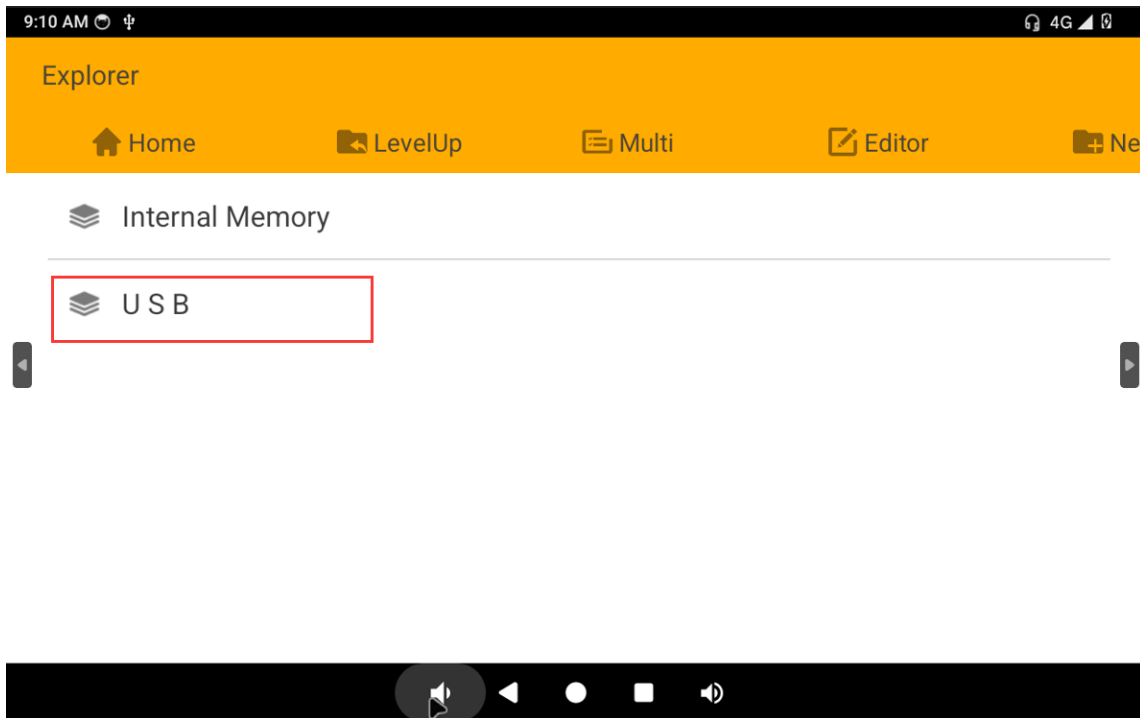
6.5 USB Host

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:/ # [ 2838.023263][ T2991] usb 3-1.2: new high-speed USB device number 11 using ehci-platform
[ 2838.134976][ T2991] usb 3-1.2: New USB device found, idVendor=0951, idProduct=1666, bcdDevice= 2.00
[ 2838.134995][ T2991] usb 3-1.2: New USB device strings: Mfr=2, Product=3, SerialNumber=4
[ 2838.135007][ T2991] usb 3-1.2: Product: DataTraveler 3.0
[ 2838.135016][ T2991] usb 3-1.2: Manufacturer: Kingston
[ 2838.135025][ T2991] usb 3-1.2: SerialNumber: E0D55E6B64661881D8300029
[ 2838.136074][ T2991] usb-storage 3-1.2:1.0: USB Mass Storage device detected
[ 2838.141484][ T2991] scsi host0: usb-storage 3-1.2:1.0
[ 2839.160700][ T3095] scsi 0:0:0:0: Direct-Access Kingston DataTraveler 3.0 0000 PQ: 0 ANSI: 4
[ 2839.161993][ T3095] sd 0:0:0:0: Attached scsi generic sg0 type 0
[ 2839.162868][ T3111] sd 0:0:0:0: [sda] 242155520 512-byte logical blocks: (124 GB/115 GiB)
[ 2839.163541][ T3111] sd 0:0:0:0: [sda] Write Protect is off
[ 2839.164293][ T3111] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
```

- USB3.0 print information in **SuperSpeed** mode.

```
[ 2914.895296][ T2991] usb 2-1: new SuperSpeed USB device number 5 using xhci-hcd
[ 2914.917755][ T2991] usb 2-1: New USB device found, idVendor=0951, idProduct=1666, bcdDevice= 1.10
[ 2914.917775][ T2991] usb 2-1: New USB device strings: Mfr=2, Product=3, SerialNumber=4
[ 2914.917787][ T2991] usb 2-1: Product: DataTraveler 3.0
[ 2914.917797][ T2991] usb 2-1: Manufacturer: Kingston
[ 2914.917805][ T2991] usb 2-1: SerialNumber: E0D55E6B64661881D8300029
[ 2914.919043][ T2991] usb-storage 2-1:1.0: USB Mass Storage device detected
[ 2914.920126][ T2991] scsi host0: usb-storage 2-1:1.0
[ 2915.931053][ T3103] scsi 0:0:0:0: Direct-Access Kingston DataTraveler 3.0 0000 PQ: 0 ANSI: 6
[ 2915.932573][ T3103] sd 0:0:0:0: Attached scsi generic sg0 type 0
[ 2915.933257][ T3095] sd 0:0:0:0: [sda] 242155520 512-byte logical blocks: (124 GB/115 GiB)
[ 2915.933444][ T3095] sd 0:0:0:0: [sda] Write Protect is off
[ 2915.933629][ T3095] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
```

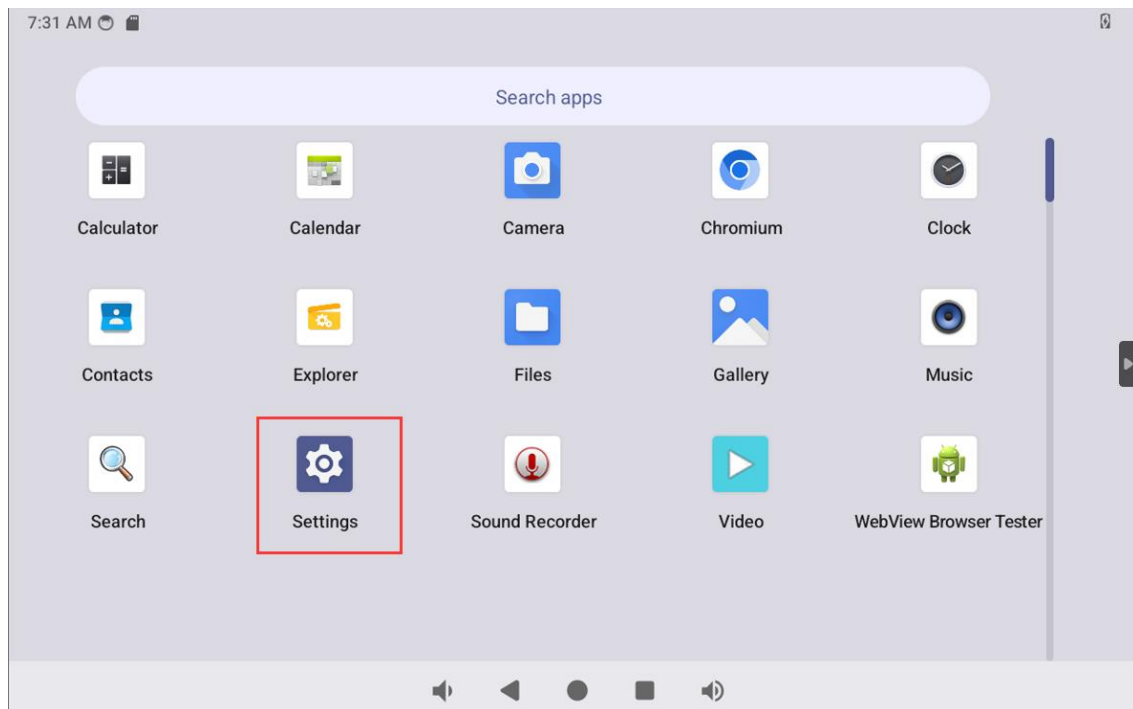
6.6 WiFi & Bluetooth

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

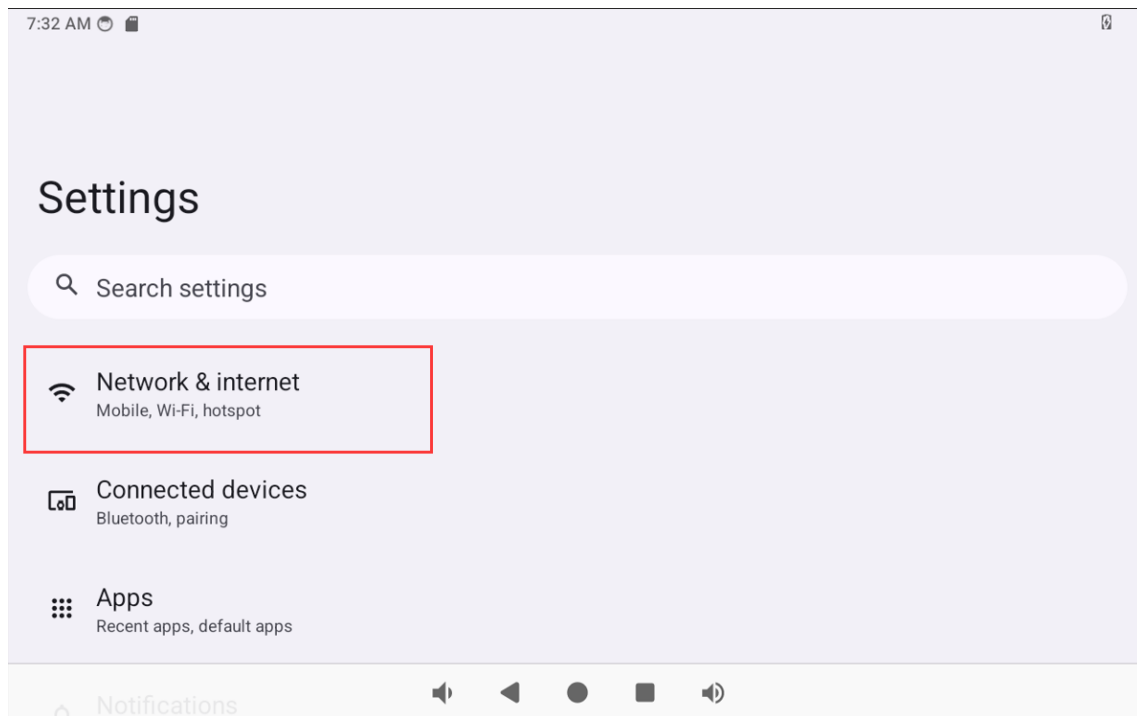


6.6.1 WiFi

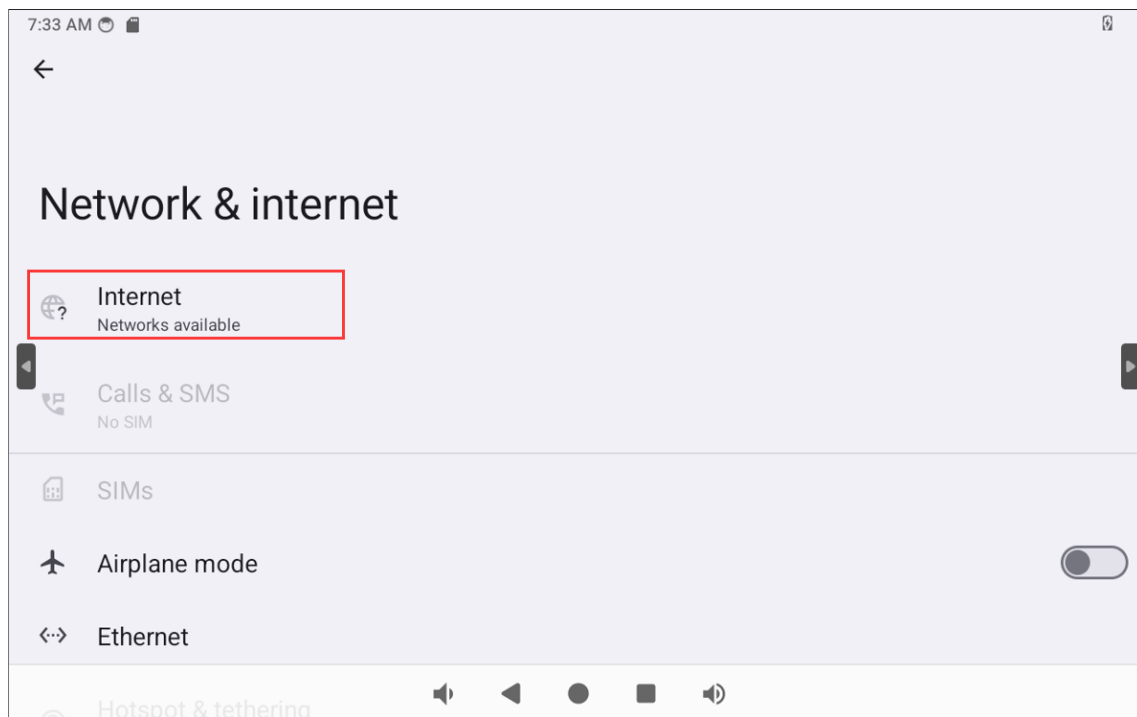
Step 1: Open the **Settings** app.



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

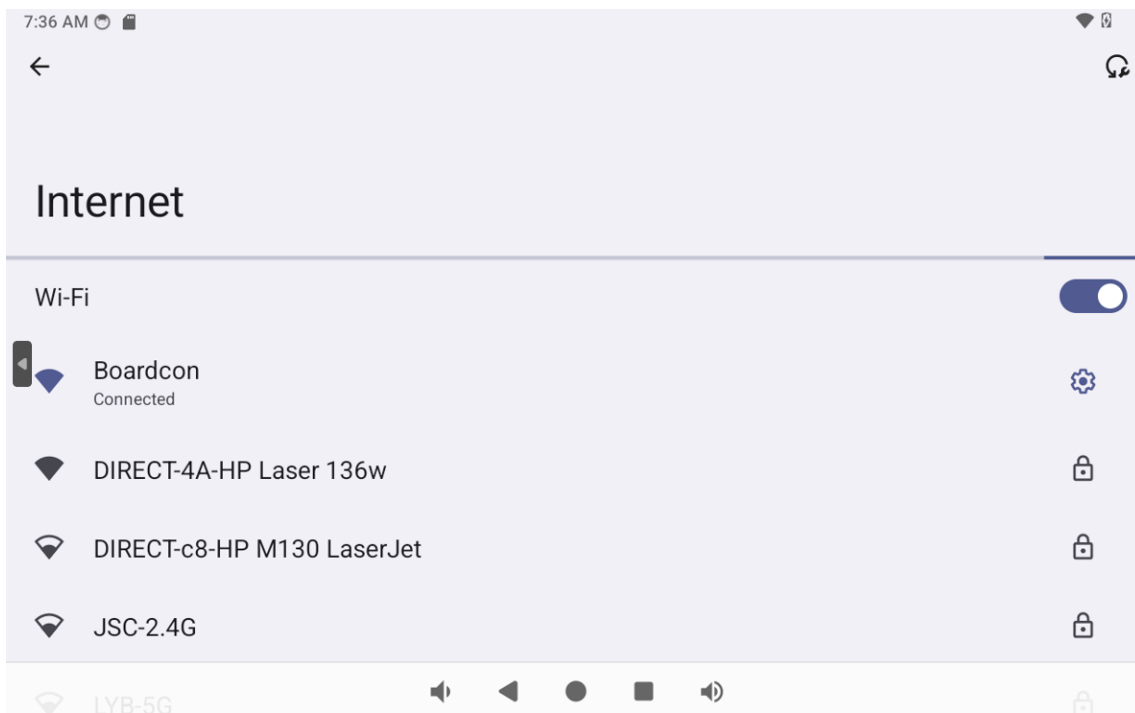


Step 3: Open the **"Internet"** option.

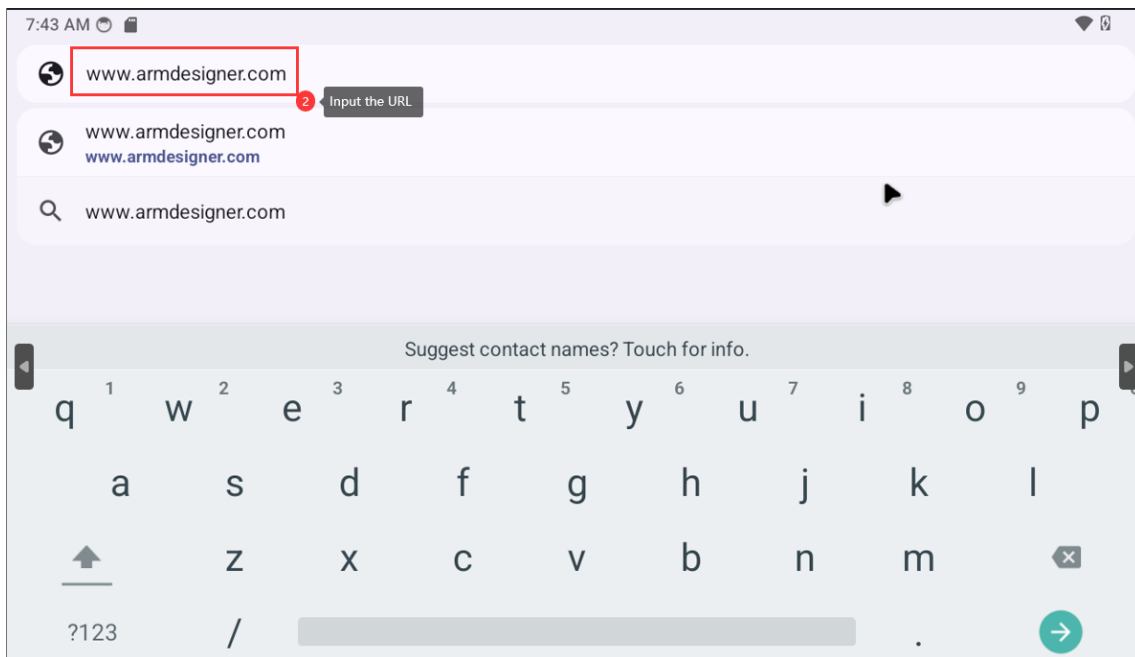
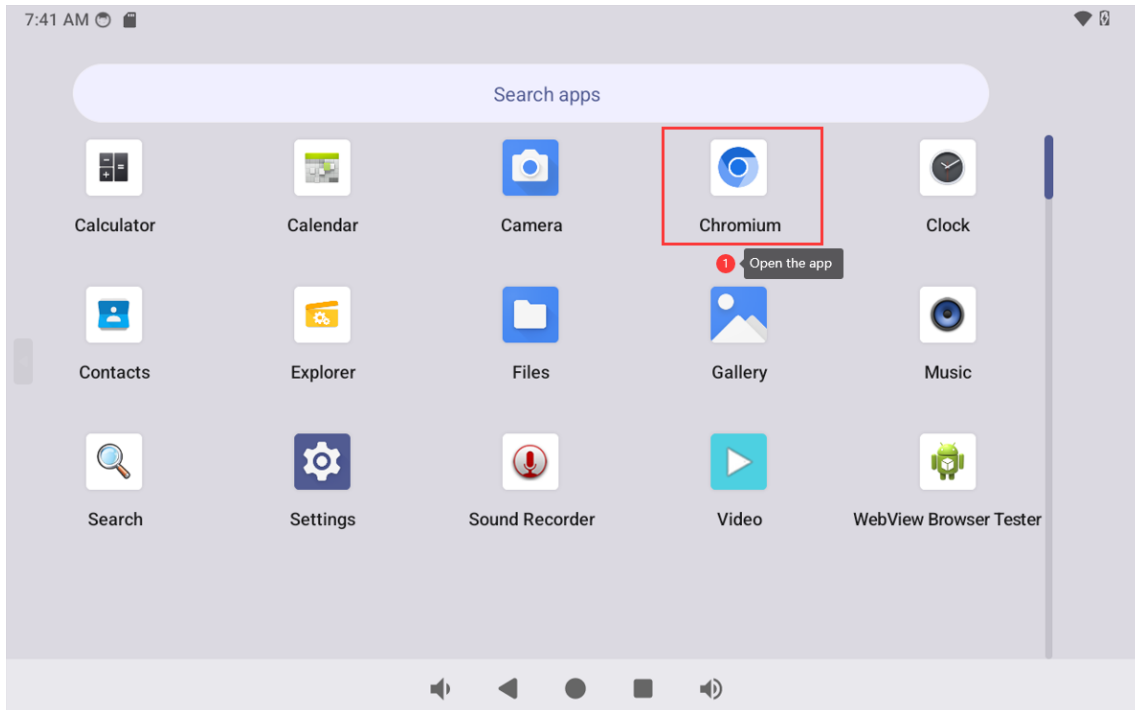




Step 4: Select and connect to the hotspot from the Wi-Fi list.



Step 5: 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
```

```

console:/ # ifconfig
lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope: Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:2 errors:0 dropped:0 overruns:0 frame:0
        TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:100 TX bytes:100

dummy0  Link encap:Ethernet  HWaddr 7e:3b:6b:f7:f2:e9
        inet6 addr: fe80::7c3b:6bff:fef7:f2e9/64 Scope: Link
        UP BROADCAST RUNNING NOARP  MTU:1500  Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 TX bytes:770

eth0    Link encap:Ethernet  HWaddr a2:9c:79:b3:49:75  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:68

wlan0   Link encap:Ethernet  HWaddr b8:2d:28:7e:1f:06
        inet addr:192.168.0.218 Bcast:192.168.0.255  Mask:255.255.255.0
        inet6 addr: fe80::7b1a:c480:33fd:234/64 Scope: Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:16172 errors:0 dropped:889 overruns:0 frame:0
        TX packets:3499 errors:0 dropped:19 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:8531926 TX bytes:901734

console:/ #
  
```

(2) Network connection test.

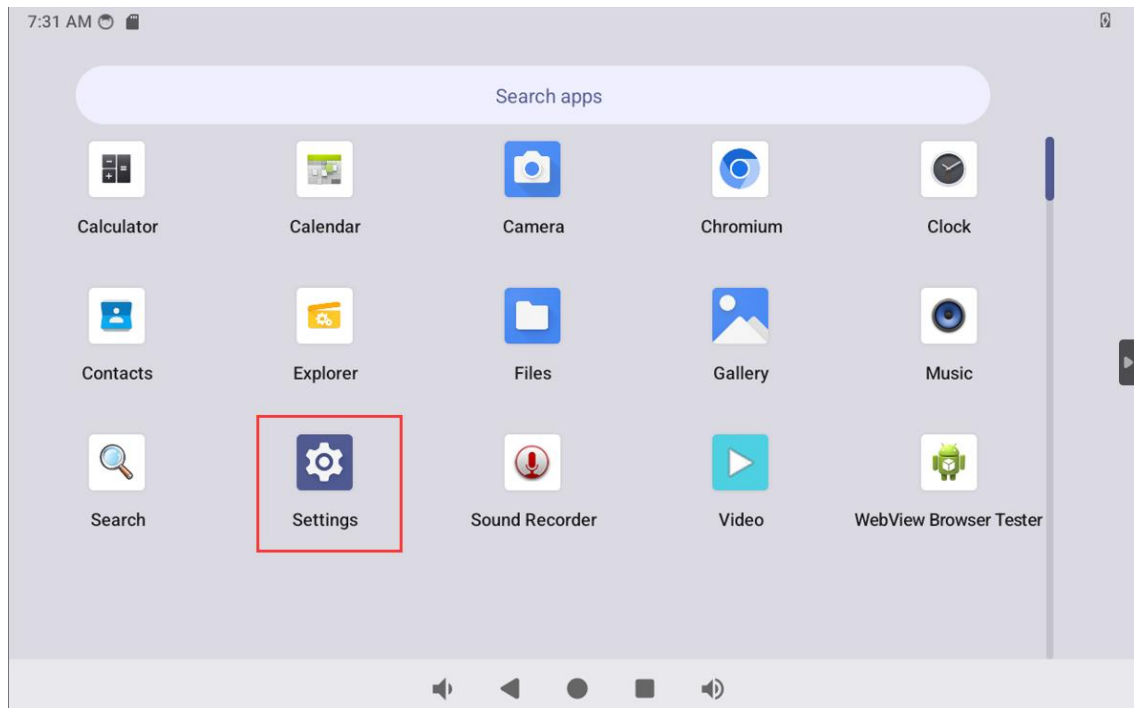
```
# ping -I wlan0 www.armdesigner.com
```

```

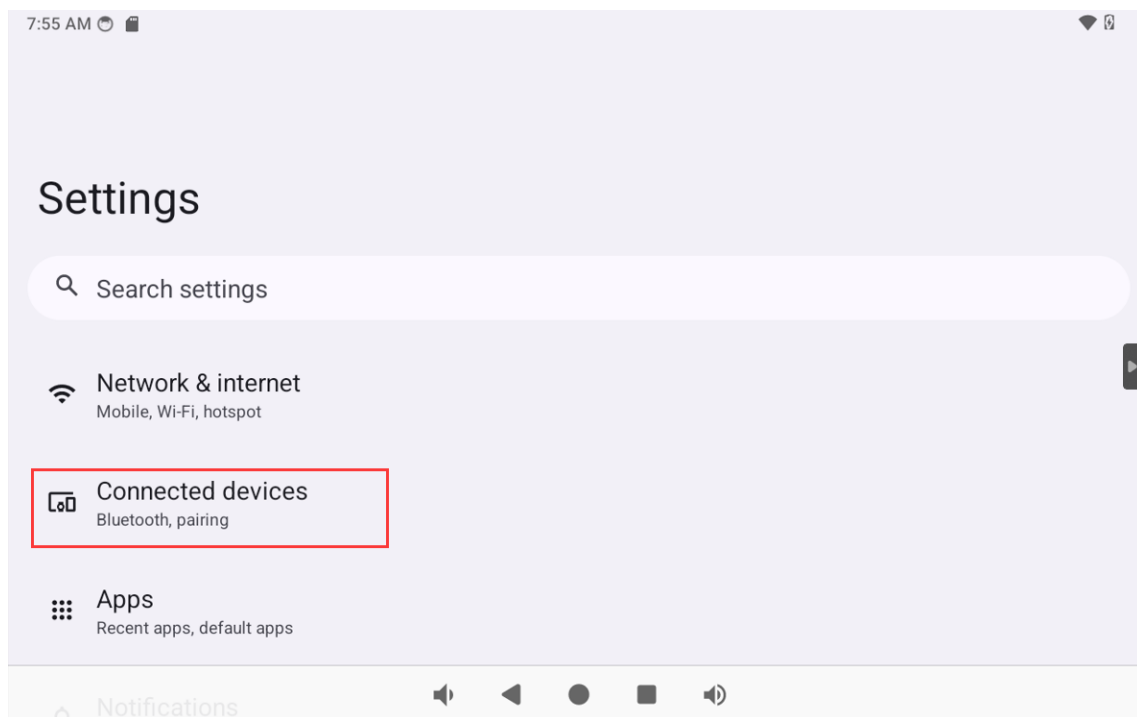
console:/ # ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.165 wlan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=189 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=191 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=193 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=190 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=427 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=332 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=48 time=213 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=48 time=404 ms
  
```

6.6.2 Bluetooth

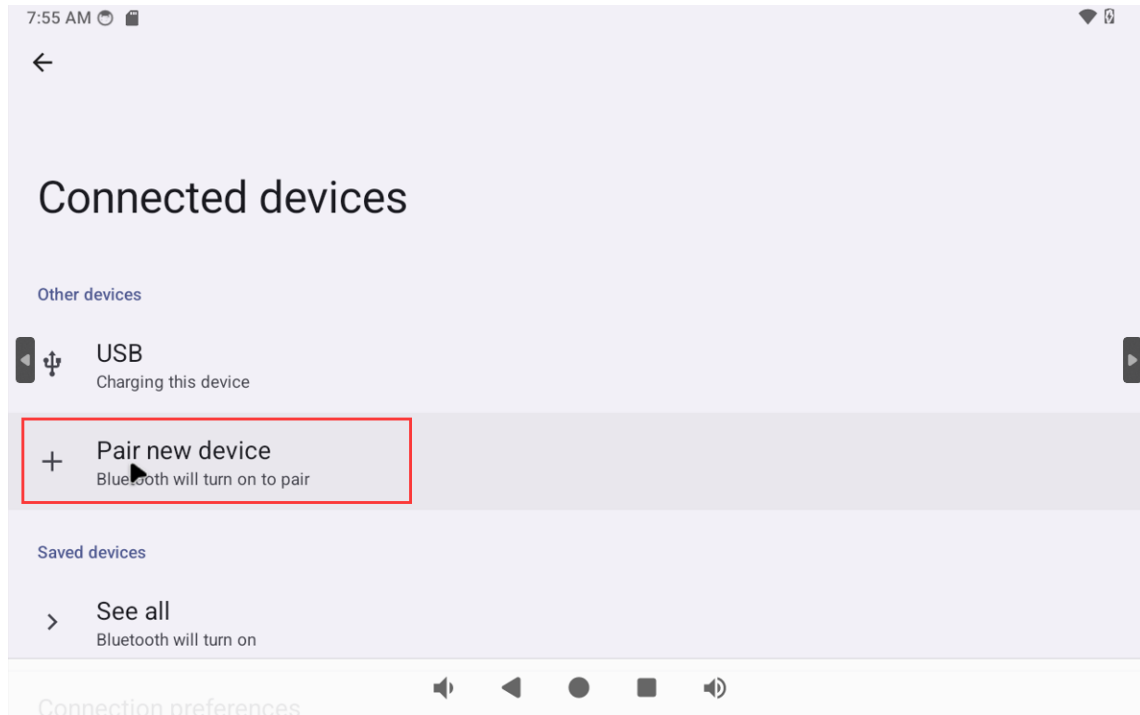
Step 1: Open the **Settings** app.



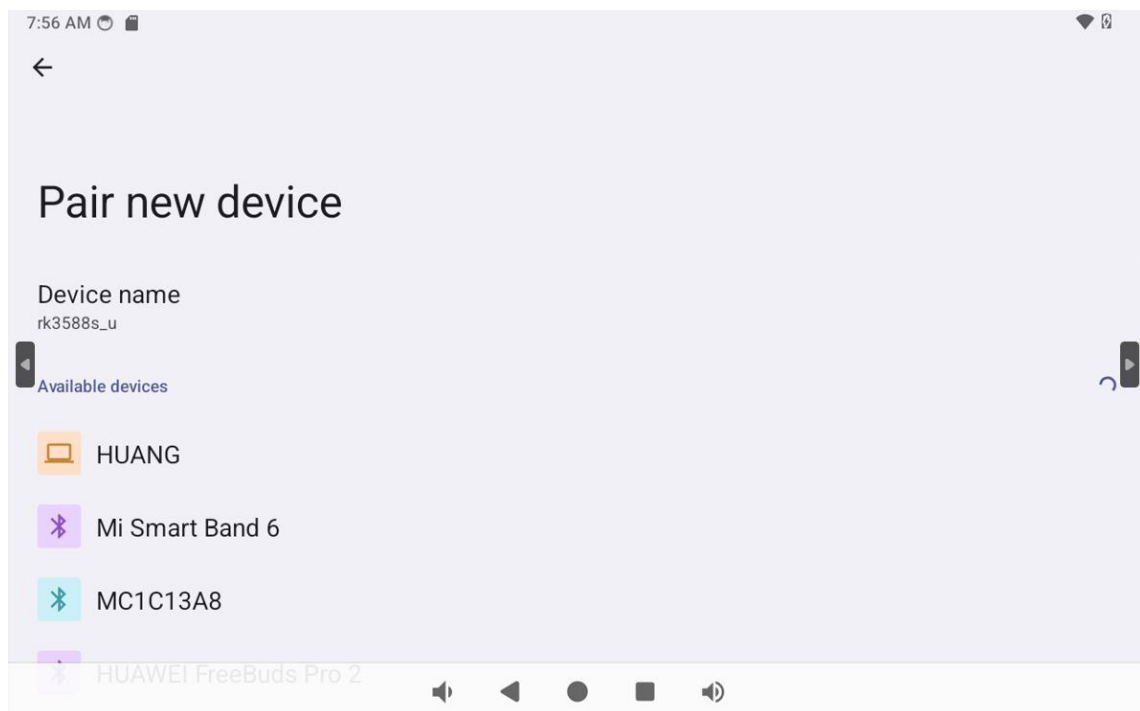
Step 2: Open the **"Connected devices"** option.



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



Step 3: User can pair themselves in the Bluetooth device list.



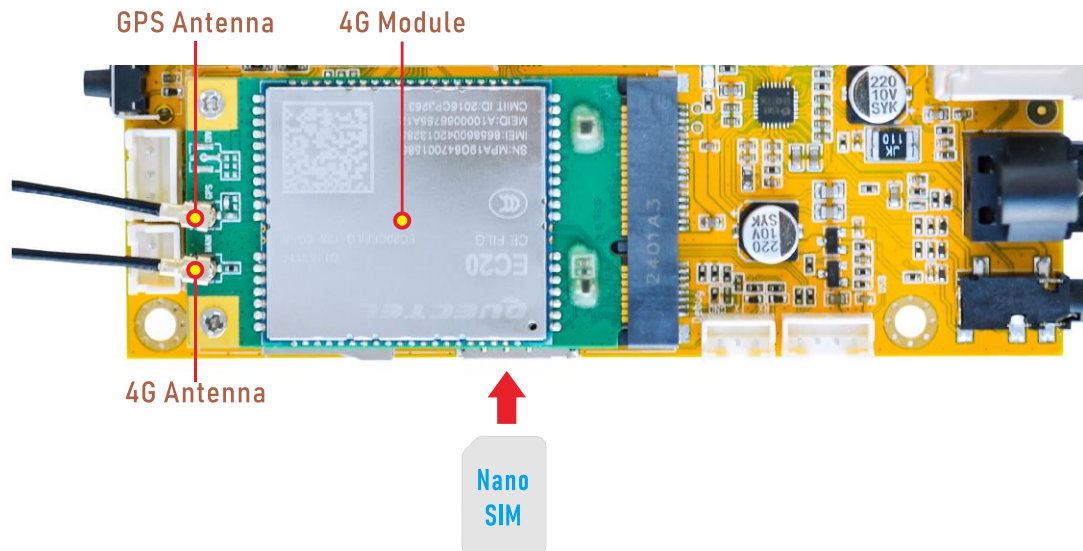
After successful configuration, Bluetooth devices can communicate with each other directly.

6.7 4G

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

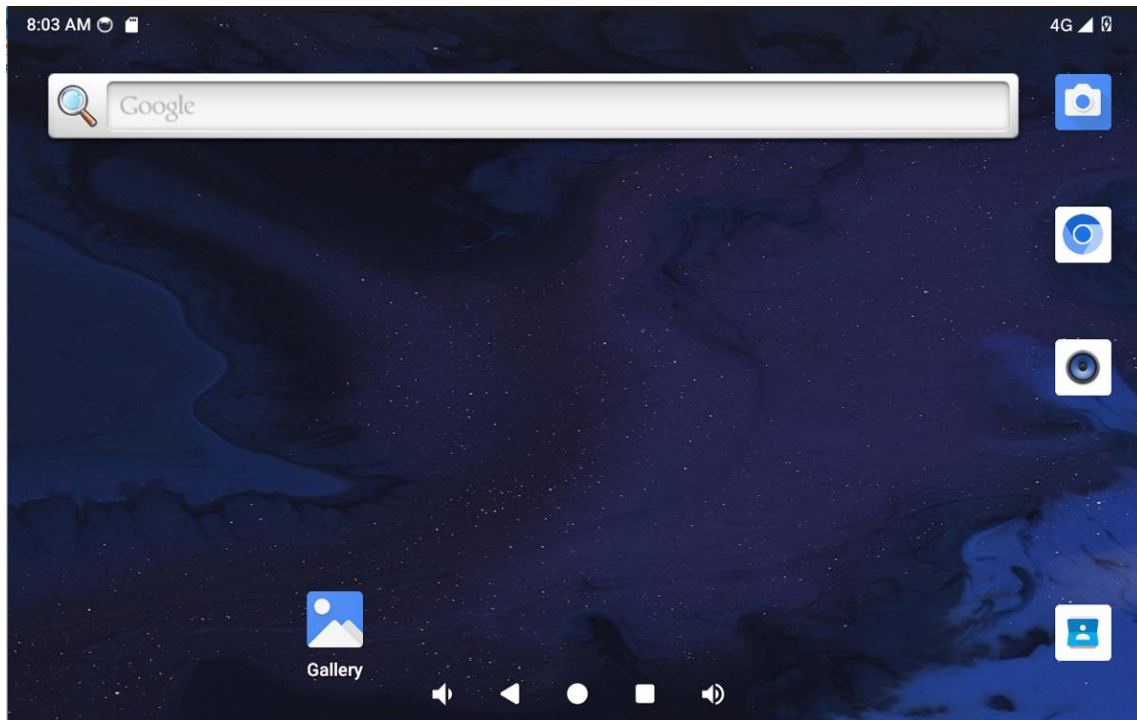
Step 2: Connect antenna and insert SIM card.

Step 3: Power on.

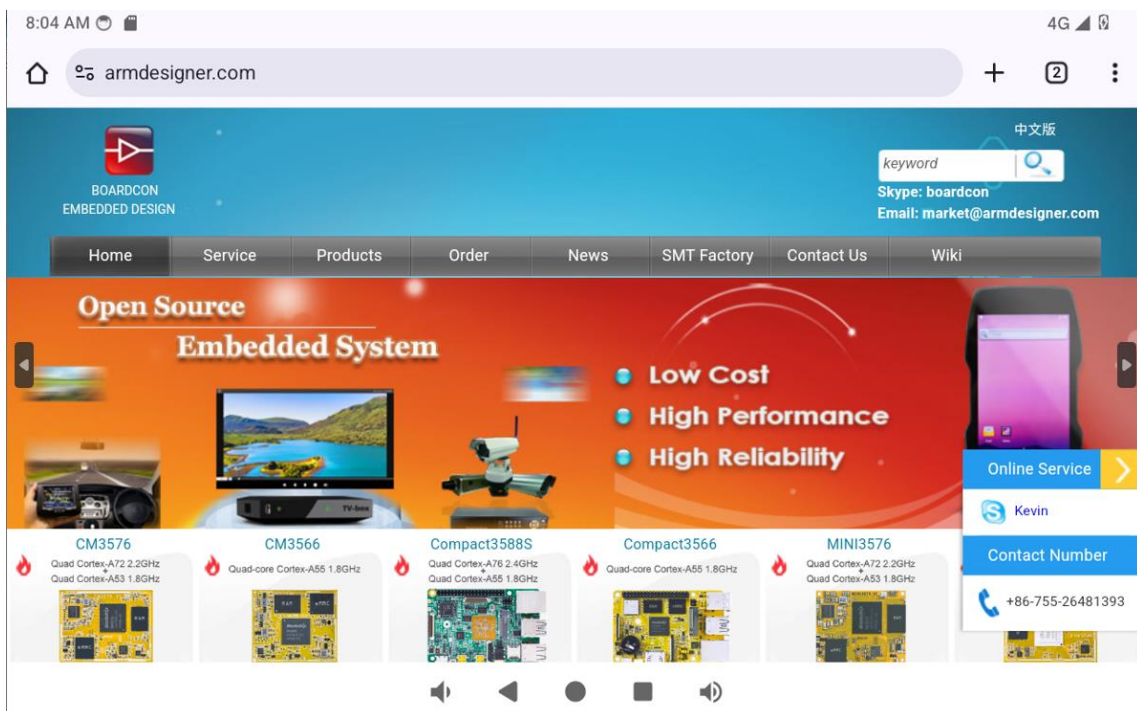


6.7.1 4G Test

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
```

```
console:/ # ifconfig
lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope: Host
        UP LOOPBACK RUNNING  MTU:65536  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

dummy0  Link encap:Ethernet  HWaddr 72:ff:03:86:d3:dc
        inet6 addr: fe80::70ff:3ff:fe86:d3dc/64 Scope: Link
        UP BROADCAST RUNNING NOARP  MTU:1500  Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 TX bytes:420

eth0     Link encap:Ethernet  HWaddr a2:9c:79:b3:49:75  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:68

wwan0    Link encap:Ethernet  HWaddr 0a:22:62:69:c5:98  Driver qmi_wwan_q
        inet addr:10.151.8.51  Mask:255.255.240.0
        inet6 addr: fe80::822:62ff:fe69:c598/64 Scope: Link
        UP RUNNING NOARP  MTU:1500  Metric:1
        RX packets:550 errors:0 dropped:0 overruns:0 frame:0
        TX packets:673 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:436639 TX bytes:167138

console:/ #
```

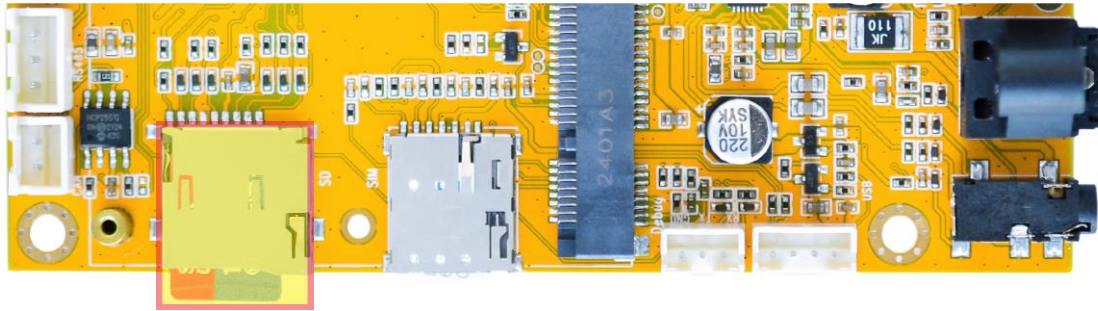
- Network connection test.

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

```
console:/ # ping -I wwan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.38.103.75 wwan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=46 time=232 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=287 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=46 time=238 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=46 time=223 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=46 time=249 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=46 time=239 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=46 time=247 ms
```

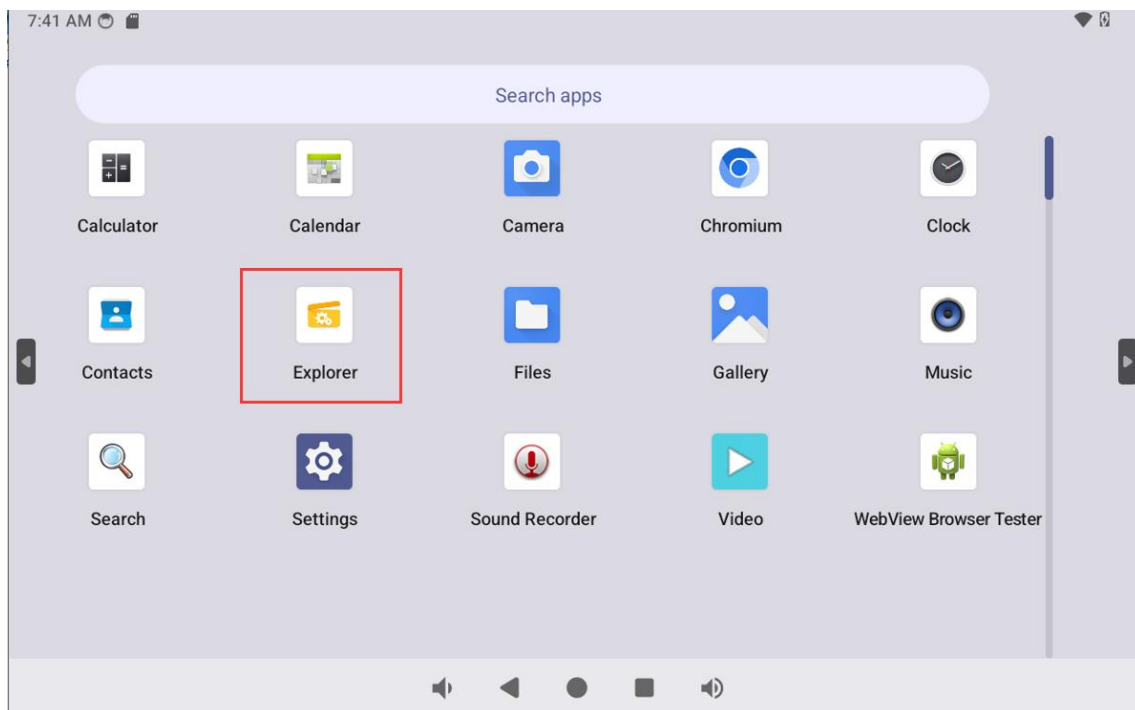
6.8 SD Card

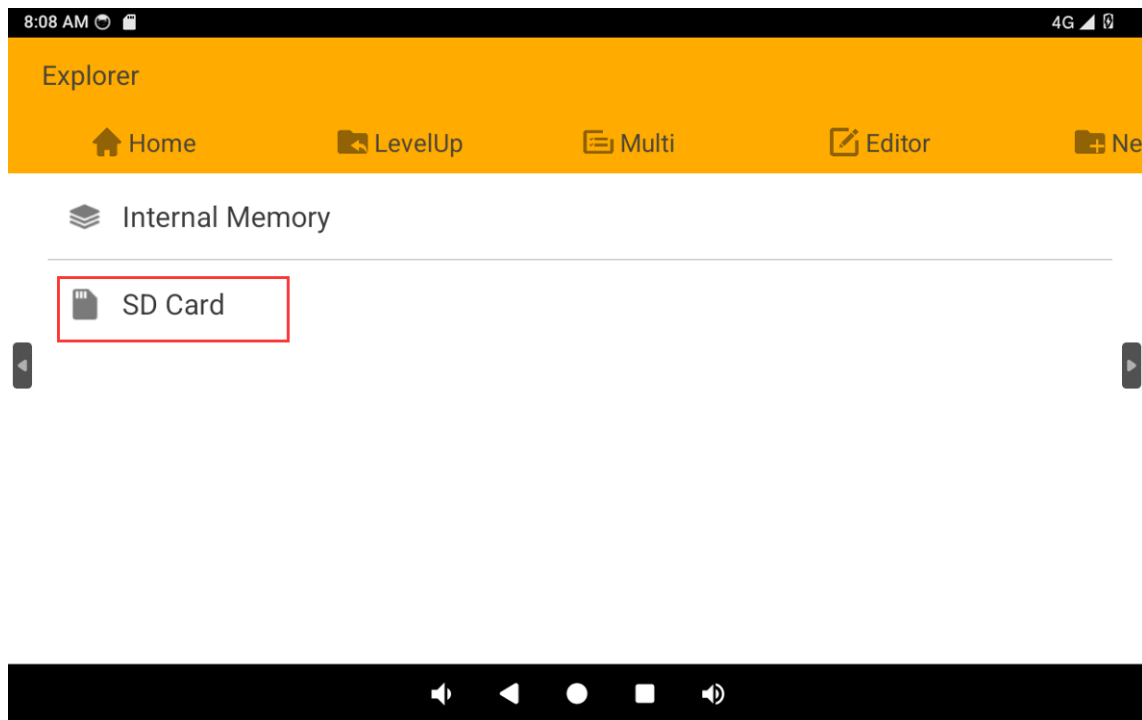
Step 1: Insert the micro SD card into the card slot.



Micro SD

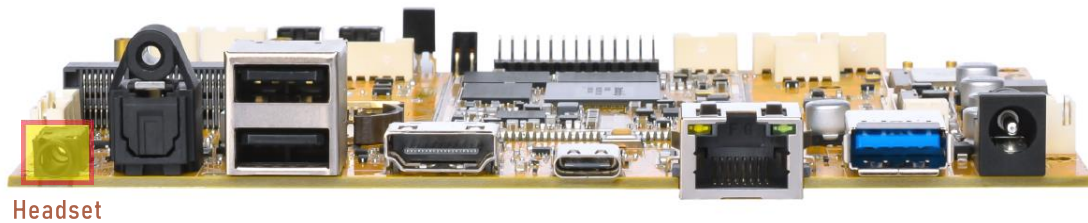
Step 2: Users can open the app to check the auto-mount status, and then access the device contents.



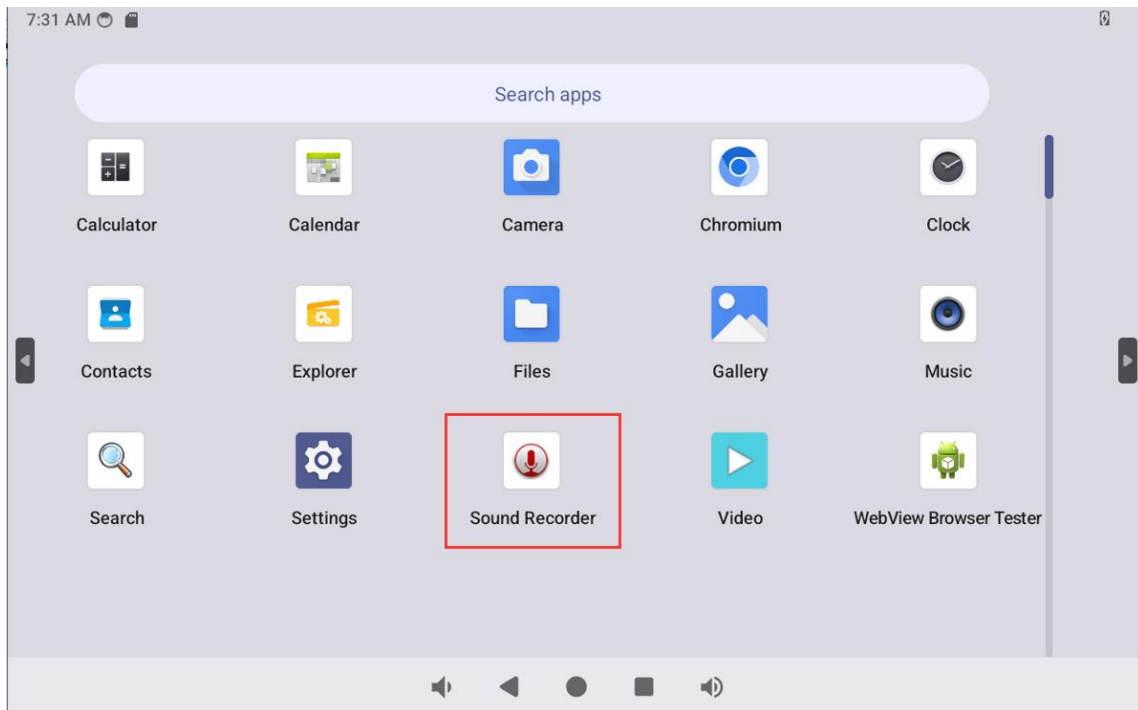


6.9 Headset

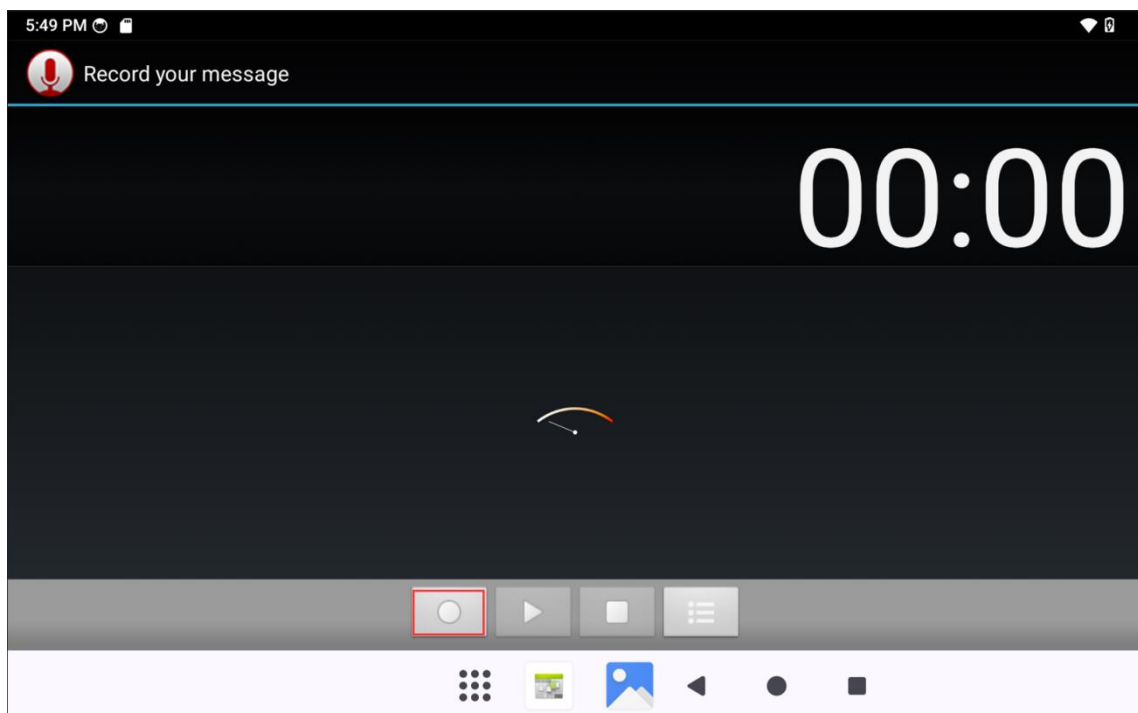
Step 1, plug the headphones into the headphone jack.



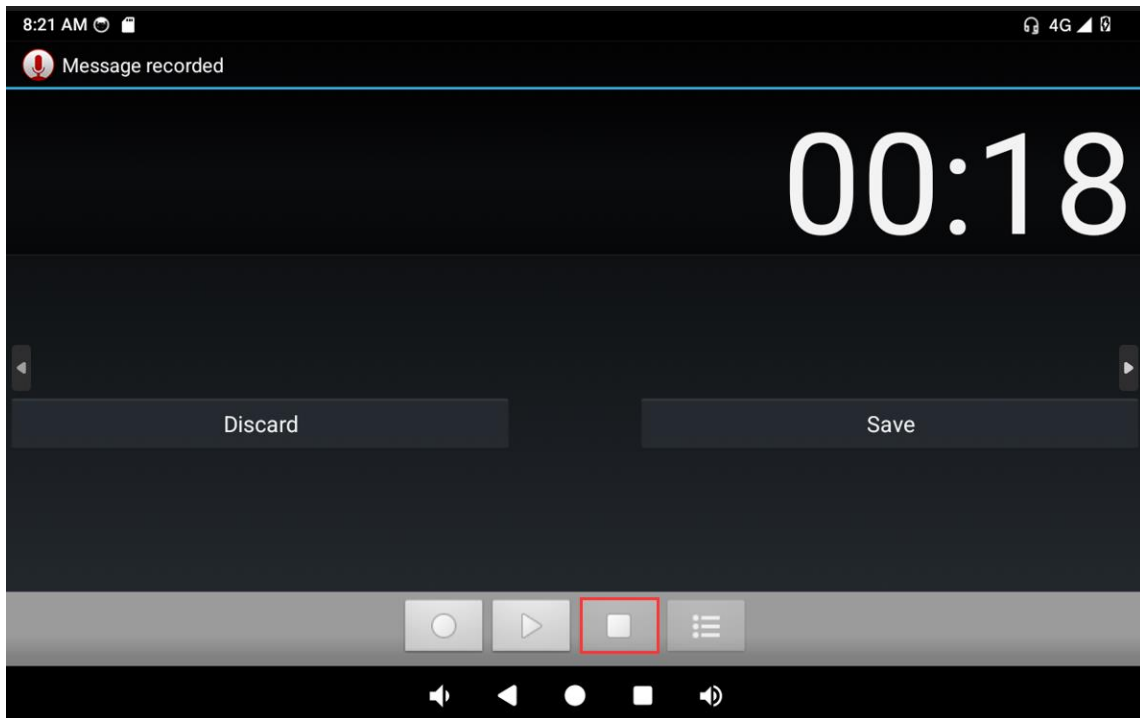
Step 2, open the **Sound Recorder** app for a recording test.



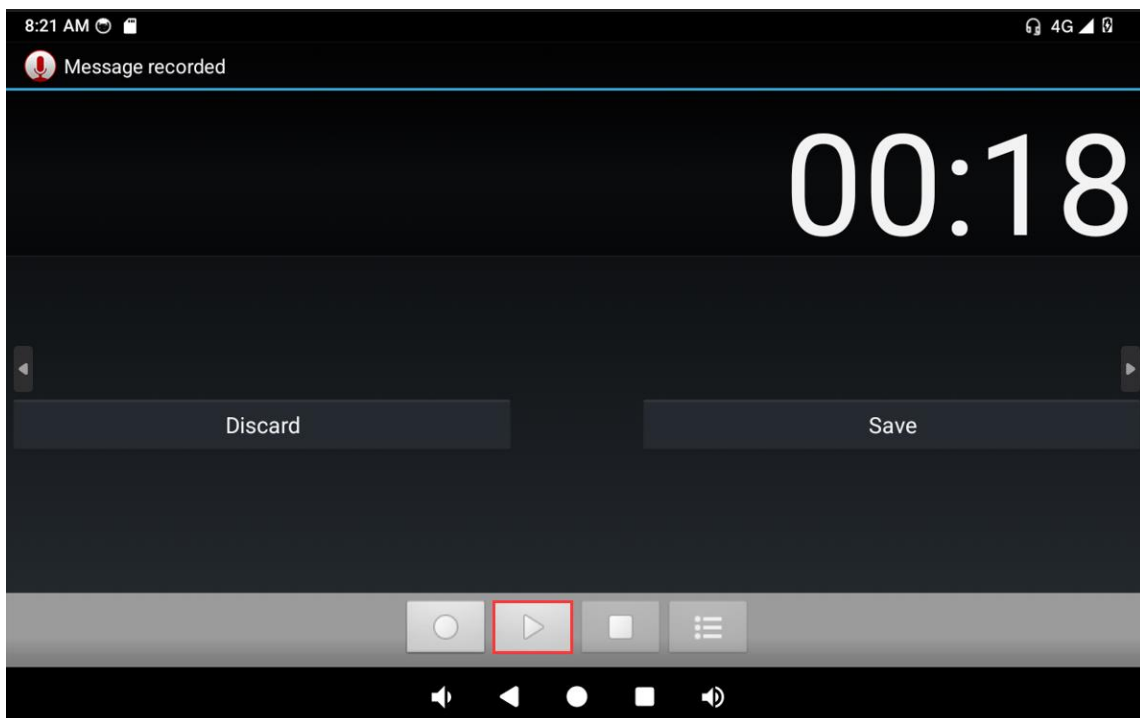
Step 3, click the button as shown below to start recording.



Step 4, click the button as shown below to end the recording.

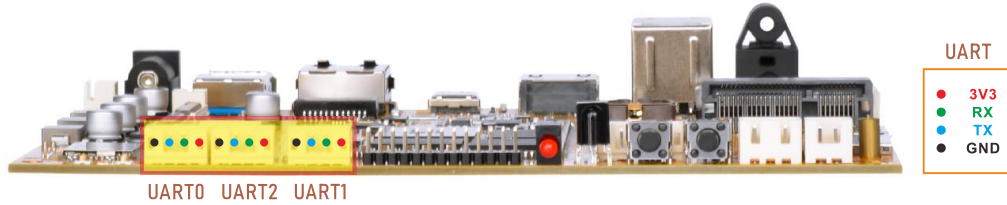


Step 5, click the button as shown below to play the recording.



6.10 UART

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



Step 2: UART0 test.

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

```
console:/ # com /dev/ttyS0 115200 8 0 1
port = /dev/ttyS0
baudrate = 115200
cs = 8
parity = 0
stopb = 1
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
```

Step 3, UART1 test.

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

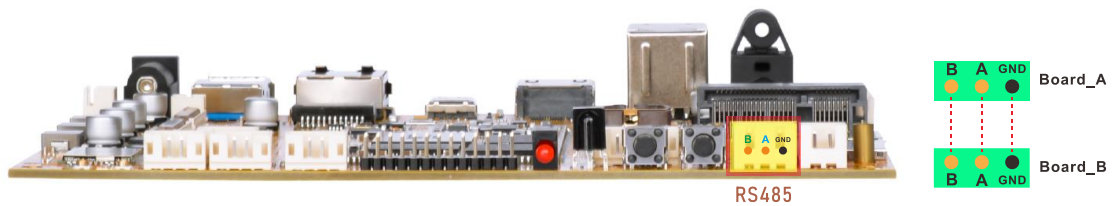
```
console:/ # com /dev/ttyS7 115200 8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
```

Step 3, UART2 test.

```
# com /dev/ttyS4 115200 8 0 1
```

```
console:/ # com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
```

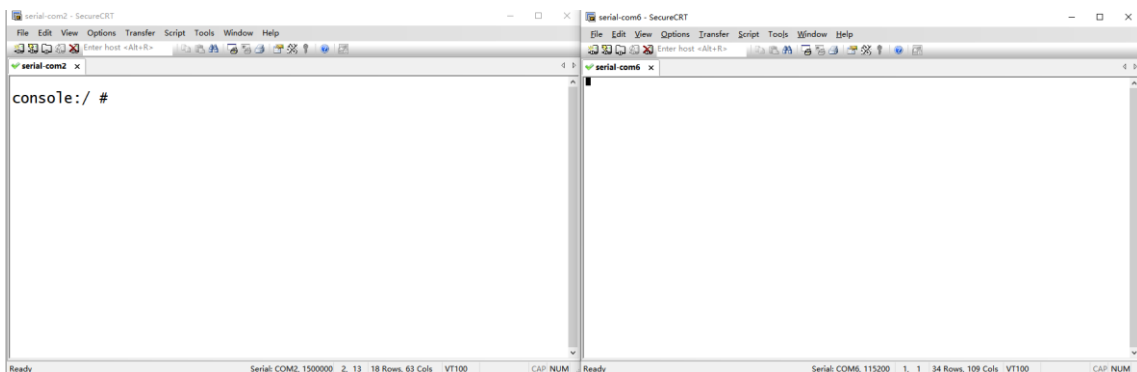
6.11 RS485



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

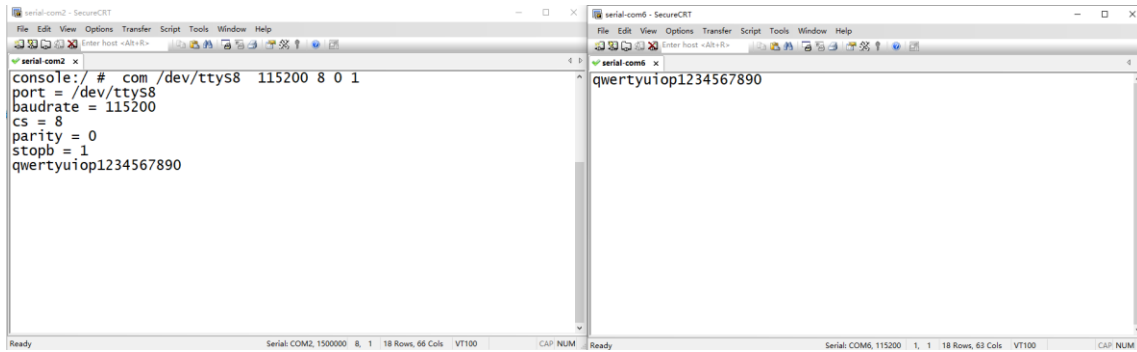


Step 2: Open the corresponding serial terminal, set the baud rate of the board to 1500000, and set the baud rate of the RS485 test tool to 115200.

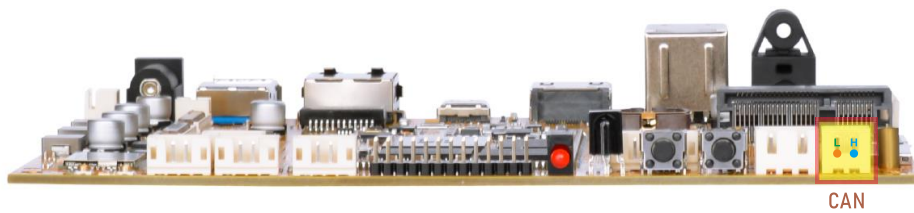


Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

```
# com /dev/ttyS8 115200 8 0 1
```



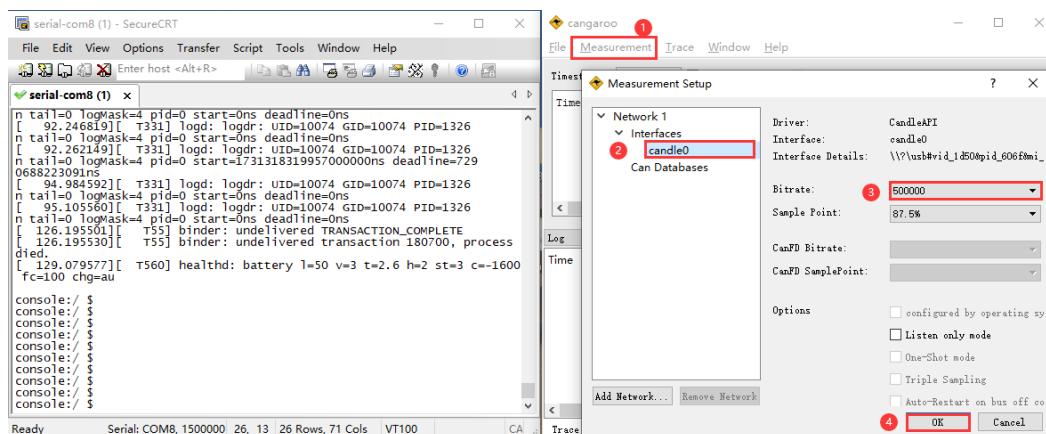
6.12 CAN



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

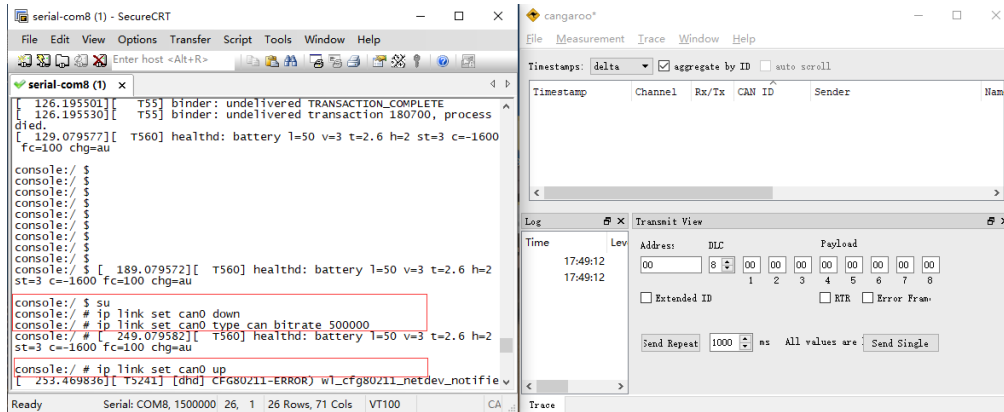


Step 2: Open the CAN test software and set the baud rate to 500000.



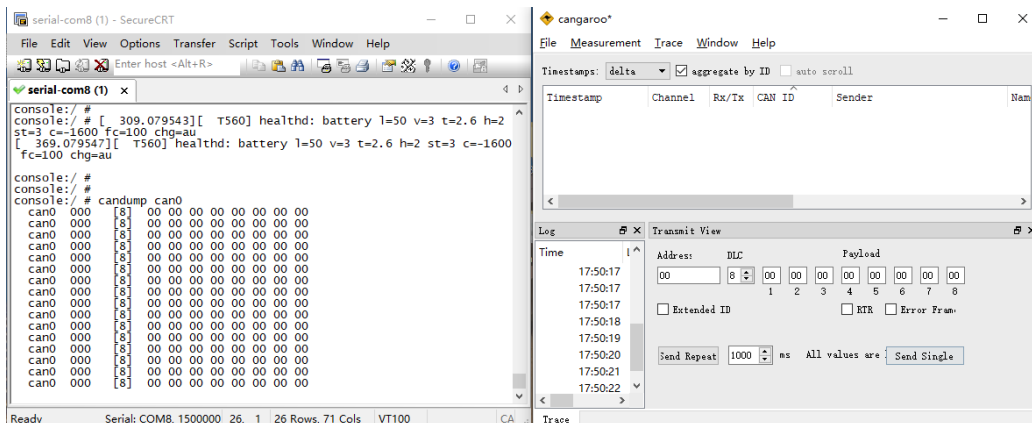
Step 3: Configure and activate the CAN network, setting the bitrate to 500000.

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



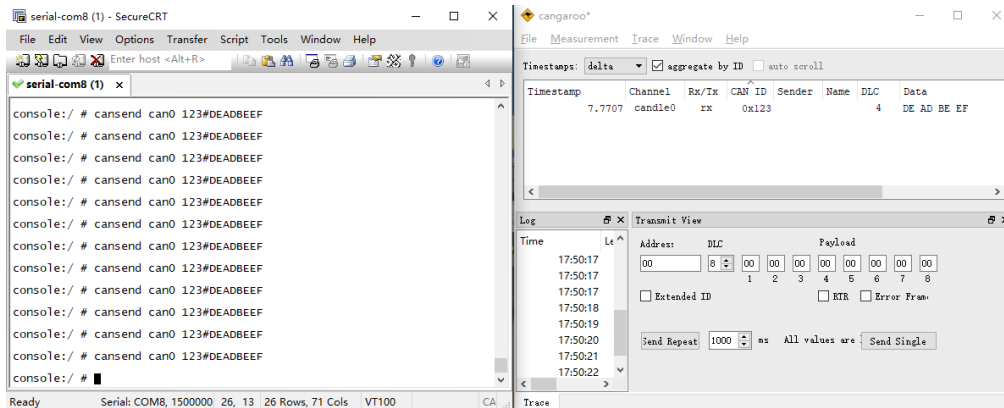
Step 4: Configure CAN as the receiver.

```
# candump can0
```

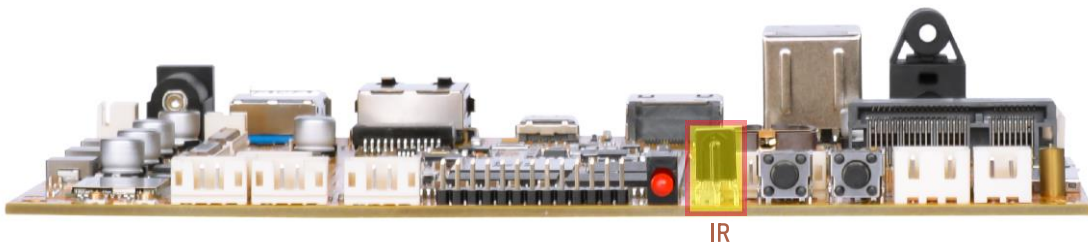


Step 5: Configure CAN as the sender.

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



6.13 IR



Step 1: Open IR debugging print.

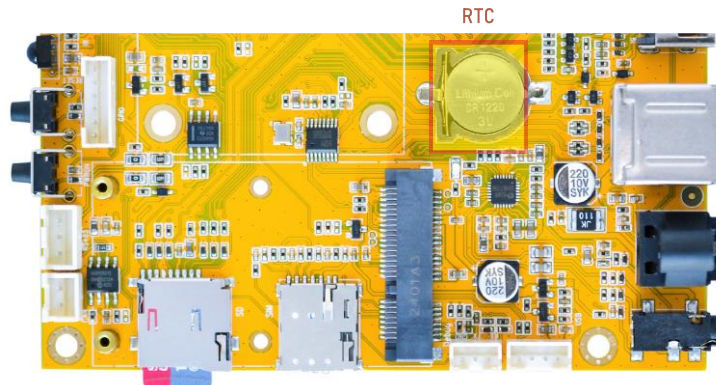
```
# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

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

```
console:/ # [ 1967.907721][ C1] USERCODE=0xd728
[ 1967.934810][ C1] RMC_GETDATA=f8
[ 1968.347910][ C1] USERCODE=0xd728
[ 1968.375002][ C1] RMC_GETDATA=f8
[ 1968.705226][ C1] USERCODE=0xd728
[ 1968.732323][ C1] RMC_GETDATA=f8
[ 1969.033860][ C1] USERCODE=0xd728
[ 1969.060954][ C1] RMC_GETDATA=f8
[ 1969.312642][ C1] USERCODE=0xd728
[ 1969.339736][ C1] RMC_GETDATA=f8
[ 1970.707625][ C1] USERCODE=0xd728
[ 1970.734722][ C1] RMC_GETDATA=e8
[ 1971.099773][ C1] USERCODE=0xd728
[ 1971.126869][ C1] RMC_GETDATA=e8
[ 1971.429100][ C1] USERCODE=0xd728
[ 1971.456110][ C1] RMC_GETDATA=e8
[ 1971.805290][ C1] USERCODE=0xd728
[ 1971.832385][ C1] RMC_GETDATA=e8
```

6.14 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
# date -s "2025-02-20 16:29:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

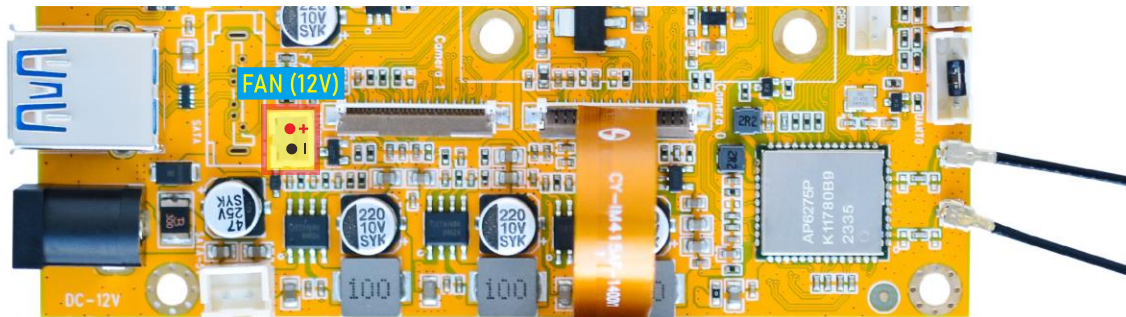
```
console:/ # date -s "2025-02-20 16:29:00"
Thu Feb 20 16:29:00 GMT 2025
console:/ # hwclock -w
console:/ # hwclock
2025-02-20 16:29:05+0000
console:/ # hwclock
2025-02-20 16:29:07+0000
console:/ # hwclock
2025-02-20 16:29:09+0000
```

```
# hwclock
```

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

```
console:/ # hwclock
2025-02-20 16:38:15+0000
console:/ # hwclock
2025-02-20 16:38:18+0000
console:/ # hwclock
2025-02-20 16:38:18+0000
console:/ # hwclock
2025-02-20 16:38:19+0000
console:/ # hwclock
2025-02-20 16:38:19+0000
console:/ # hwclock
2025-02-20 16:38:20+0000
console:/ # hwclock
2025-02-20 16:38:21+0000
```

6.15 Fan



Execute the following command to check the temperature of the cpu center.

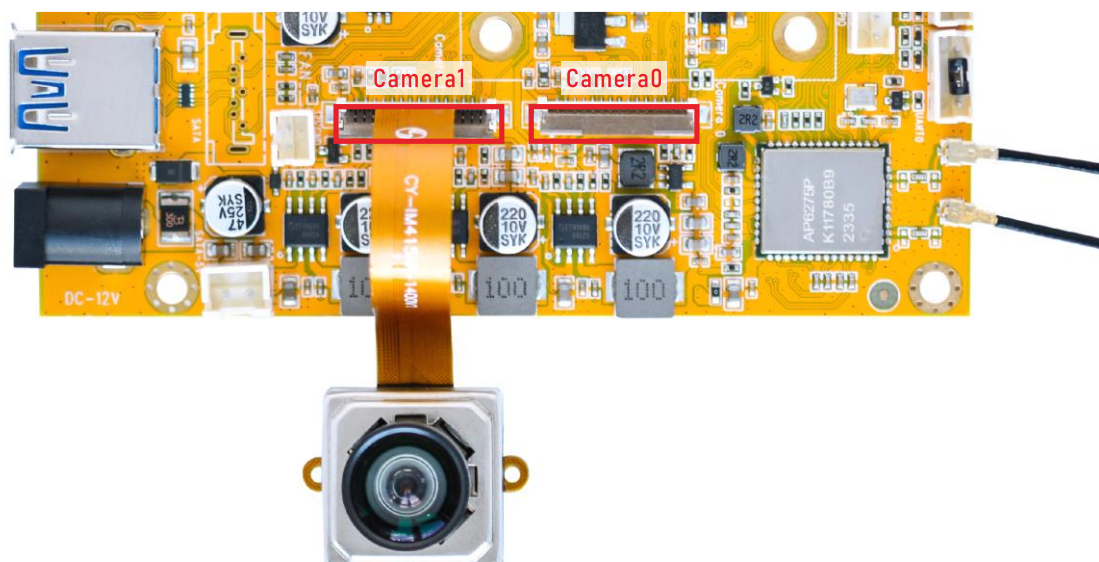
```
# cat /sys/class/thermal/thermal_zone0/temp
```

```
console:/ # cat /sys/class/thermal/thermal_zone0/temp
57307
console:/ #
```

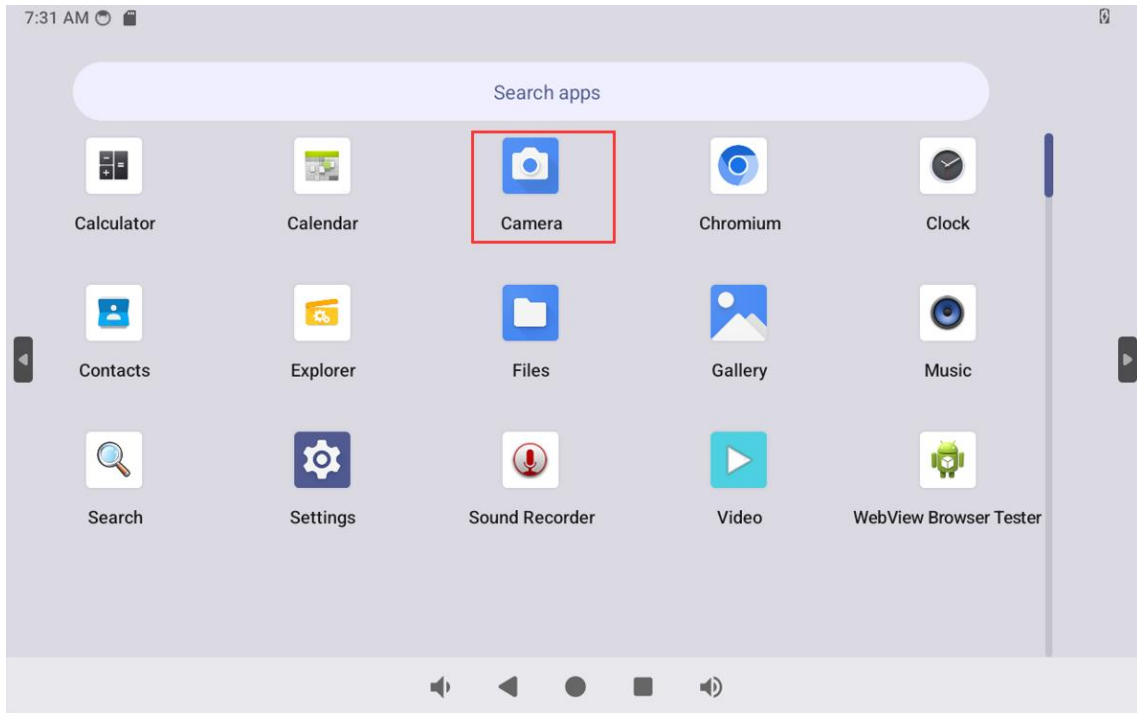
When the printed value exceeds 50000, indicating that the temperature has exceeded 50 degrees Celsius, the FAN interface outputs 12V and the fan automatically starts working.

6.16 Camera

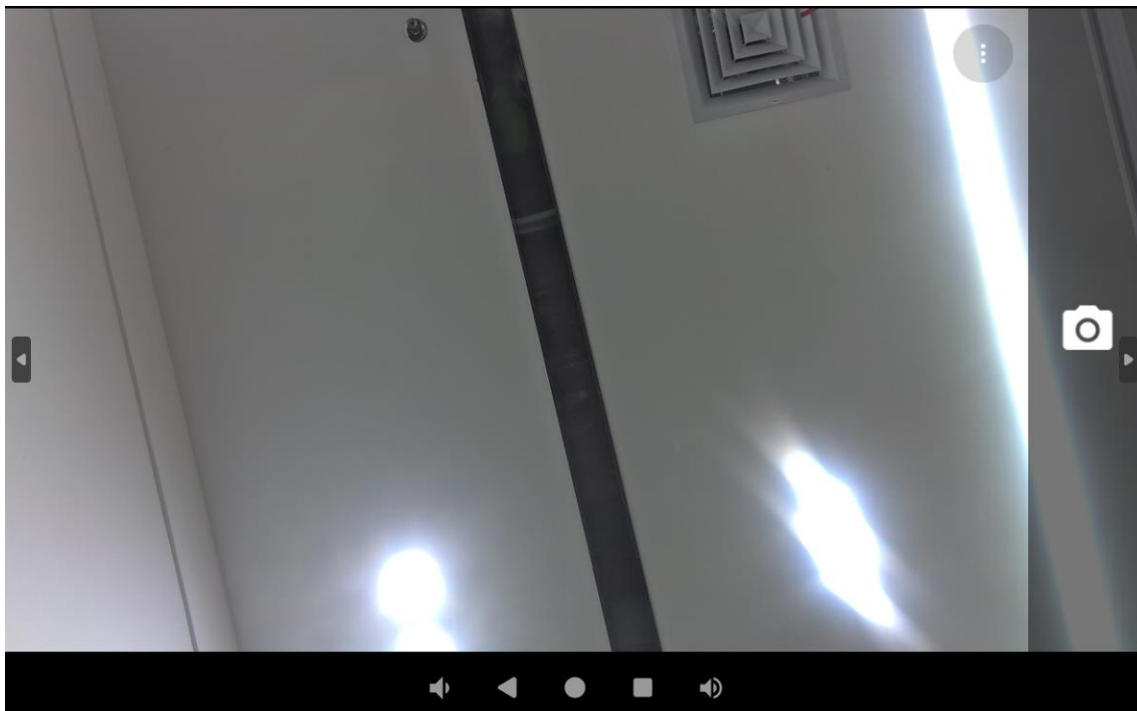
Idea3588s Android14 system is configured with the camera0 by default, as shown in the figure below.



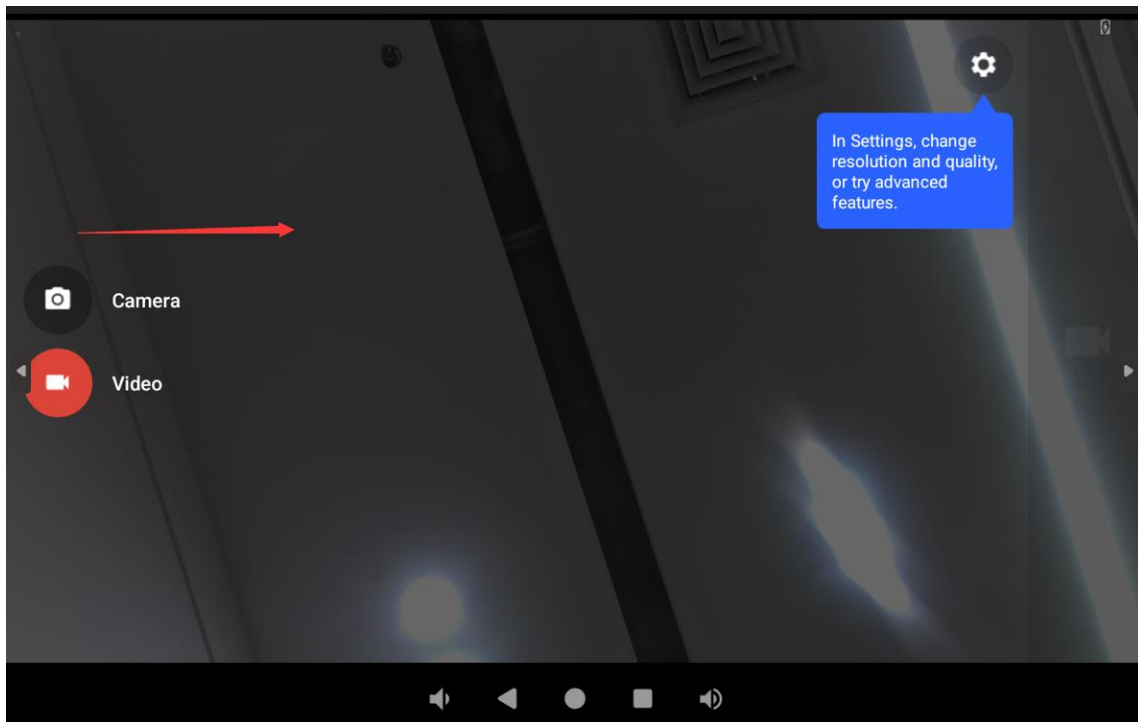
Step 1: Open the **Camera** app.



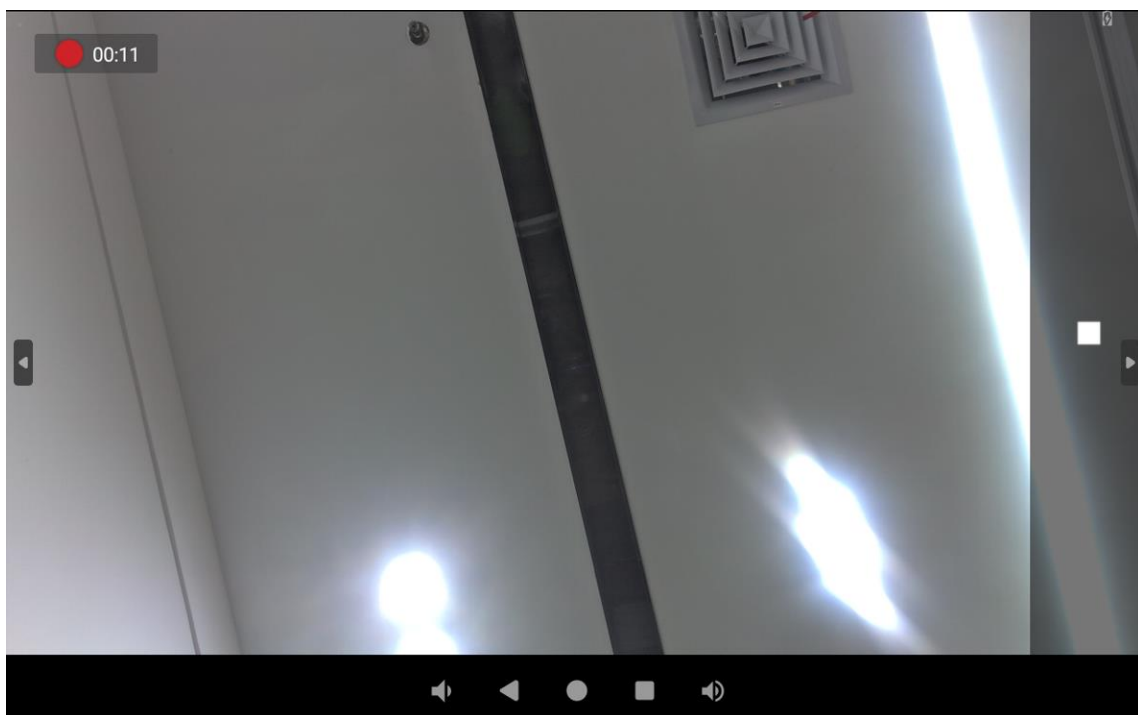
Step 2: Take a picture.



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



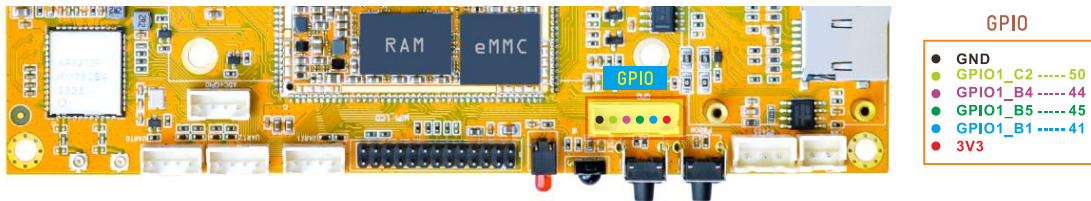
Step 4: Video recording.



6.17 Power Key

When the Power key is pressed, the system goes to sleep. When the key is pressed again, the system wakes up. Press and hold the key to force the system to restart.

6.18 GPIO



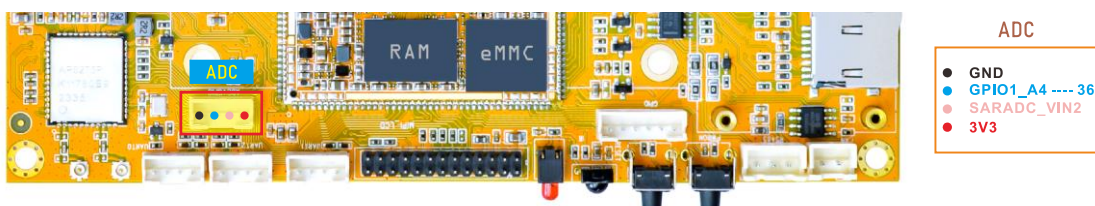
Execute the following commands to control GPIO1_C2.

```
# echo 50 > /sys/class/gpio/export           // Create a GPIO node
# echo out > /sys/class/gpio/gpio50/direction // Set GPIO direction to output
# echo 0 > /sys/class/gpio/gpio50/value       // Assignment 0
# cat /sys/class/gpio/gpio50/value           // Gets the current value
# echo 1 > /sys/class/gpio/gpio50/value       // Assignment 1
# cat /sys/class/gpio/gpio50/value           // Gets the current value
# echo 50 > /sys/class/gpio/unexport         // Destory a GPIO node
```

```
console:/ # echo 50 > /sys/class/gpio/export
console:/ # echo out > /sys/class/gpio/gpio50/direction
console:/ # echo 0 > /sys/class/gpio/gpio50/value
console:/ # cat /sys/class/gpio/gpio50/value
0
console:/ # echo 1 > /sys/class/gpio/gpio50/value
console:/ # cat /sys/class/gpio/gpio50/value
1
console:/ # echo 50 > /sys/class/gpio/unexport
console:/ #
```

Other GPIO pins can be controlled using the same command, just by changing the number of the GPIO.

6.19 ADC+GPIO



6.19.1 ADC

Step1: Connect the SARADC_VIN2 pin to the 3.3V pin or GND pin.

Step2: Execute the following command to compare the obtained value change.

```
# cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
```

Connect 3.3V pin:

```
console:/ # cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
4095
```

Connect GND pin:

```
console:/ # cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
4095
```

6.19.2 GPIO

Execute the following commands to control GPIO1_A4.

```
# echo 36 > /sys/class/gpio/export           // Create a GPIO node
# echo out > /sys/class/gpio/gpio36/direction // Set GPIO direction to output
# echo 0 > /sys/class/gpio/gpio36/value       // Assignment 0
# cat /sys/class/gpio/gpio36/value            // Gets the current value
# echo 1 > /sys/class/gpio/gpio36/value       // Assignment 1
# cat /sys/class/gpio/gpio36/value            // Gets the current value
# echo 36 > /sys/class/gpio/unexport          // Destory a GPIO node
```

```
console:/ # echo 36 > /sys/class/gpio/export
console:/ # echo out > /sys/class/gpio/gpio36/direction
console:/ # echo 0 > /sys/class/gpio/gpio36/value
console:/ # cat /sys/class/gpio/gpio36/value
0
console:/ # echo 1 > /sys/class/gpio/gpio36/value
console:/ # cat /sys/class/gpio/gpio36/value
1
console:/ # echo 36 > /sys/class/gpio/unexport
console:/ #
```