# *SBC3588 Android14 User Manual*

V1.0

**Boardcon Embedded Design**

## Overview

The content of this document is intended solely for the SBC3588 development board, aiming to help users quickly understand, apply, and test the SBC3588 development board.

## System Support

| Development Board | Android14 |
|---|---|
| SBC3588 V2<br>CM3588 V2.0 | Y |

## Revision History

| Version | Date | Author | Revision History |
|---|---|---|---|
| V1.0 | 2025-08-05 | Liu Yuan | Initial version |

## Disclaimer

The information in this manual is for reference only. While Boardcon strives to ensure its accuracy, no guarantees are made regarding its completeness or correctness. All content is subject to change without prior notice. Boardcon reserves the right to revise the content of this manual without prior notification.

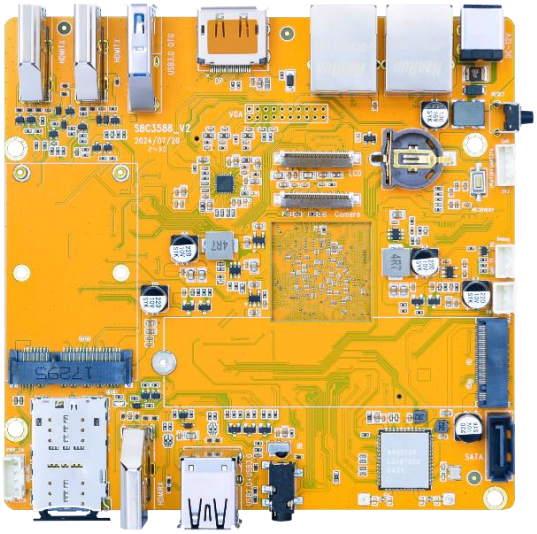
**Boardcon embedded design limited**
2007-11 Haofang Tianji Plaza, 11008 Beihuan Avenue, Nanshan District,
Shenzhen, Guangdong, China. 518051
**URL:** www.armdesigner.com | www.boardcon.com
**Email:** market@armdesigner.com
**Technical Support Inquiries:** support@armdesigner.com
**Tel:** +86-755-26481393 | +86-755-27571591

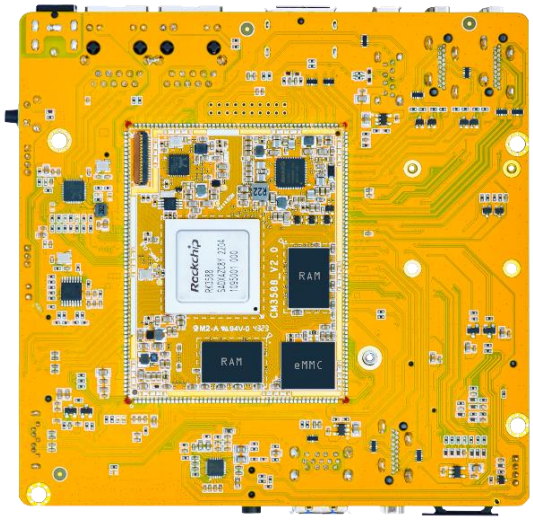
# *Contents*

# 1.Introduction

## 1.1 Overview

The SBC3588 is a high-performance, low-power processor platform built on an octa-core 64-bit architecture, featuring four Cortex-A76 and four Cortex-A55 cores. It integrates a powerful NPU with up to 6 TOPS computing power, supports 8K video encoding and decoding, and includes advanced image processing capabilities with a 48MP ISP. The EM3588 provides extensive multimedia support, flexible display interfaces, rich peripheral connectivity, and high-speed communication interfaces, making it ideal for edge computing, intelligent vision systems, industrial control, and other embedded AI applications.





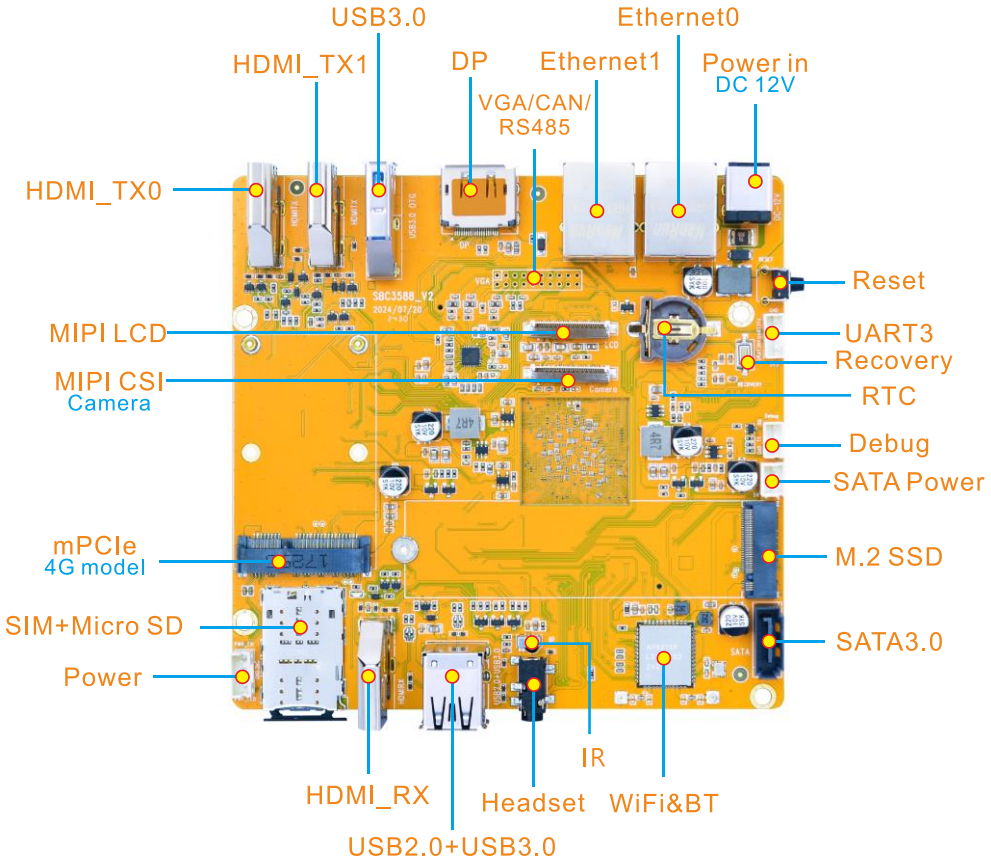

## 1.2 Product Parameters

| Basic Parameters | |
|---|---|
| SOC | RK3588 |
| CPU | • Octa-core 64-bit architecture: Quad-core Cortex-A76 + Quad-core Cortex-A55 |
| GPU | • ARM Mali-G610 MC4 |

| | | |
|---|---|---|
| | | • OpenGL ES 1.1/2.0/3.2<br>• Vulkan 1.2<br>• OpenCL 2.2<br>• Embedded high performance 2D image acceleration module |
| NPU | | • Up to 6 TOPS AI computing power<br>• Supports int4, int8, int16, FP16, BF16, TF32 operation |
| Video | Decoder | • Support 8K@60fps H.265/VP9/AVS2 video decoding<br>• Support 8K@30fps H.264 video decoding<br>• Support 4K@60fps AV1 video decoding<br>• 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 |
| ROM | | 32GB eMMC |
| Support system | | Android, Debian, Buildroot |
| **Hardware Parameters** | | |
| Extended Storage | | • Support 1x M.2 PCIe3.0 SSD<br>• Support 1xSATA3.0<br>• Support 1x MicroSD Card |
| Display | | • Support 2x HDMI2.1 TX, up to 7680x4320@60fps<br>• Support 1x DP TX 1.4a, up to 7680x4320@30fps<br>• Support 1x MIPI DSI, up to 4K@60fps<br>• Support 1x VGA |
| Audio | | • Support 2x HDMI TX audio output<br>• Support 1x DP audio output<br>• Support 1x Headset output/input<br>• Support 1x HDMI RX audio input |

| | |
|---|---|
| USB | • Support 2xUSB3.0 (1x OTG)<br>• Support 1x USB2.0 |
| Network | • Support 2x Gigabit Ethernet<br>• Support 1x WIFI/BT module<br>• Support 1x 4G module |
| Camera | • Support 1x MIPI Camera |
| Peripheral communication | • Support 1xCAN<br>• Support 1xRS485<br>• Support 1xRS232 |
| Other parameters | Support 1xDebug, 1xRTC, 1xIR |
| **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 | 125mm x 121.7mm |

# 1.3 Hardware Interface Introduction




| Interface parameters | |
|---|---|
| Power in DC 12V | 12V DC power input interface |
| Ethernet0 | Gigabit Ethernet0 RJ45 interface |
| Ethernet1 | Gigabit Ethernet1 RJ45 interface |
| VGA/CAN/RS485 | VGA display / CAN / RS485 interface |
| DP | DP display interface |
| USB3.0 | USB3.0 OTG interface |
| HDMI_TX1 | HDMI TX1 interface |
| HDMI_TX0 | HDMI TX0 interface |
| MIPI LCD | MIPI display interface |
| MIPI CSI Camera | MIPI camera interface |

| | |
|---|---|
| mPCIe 4G module | 4G model interface |
| SIM + Mirco SD | All-in-one card holder |
| Power | Sleep/Wake GPIO control interface |
| HDMI_RX | HDMI RX interface |
| USB2.0 + USB3.0 | Dual-layer USB HOST interface |
| Headset | Headset output/input interface |
| IR | Infrared receiver |
| WIFI&BT | WIFI&Bluetooth module |
| SATA | SATA3.0 interface |
| M.2 SSD | PCIe M.2 SSD interface |
| SATA Power | SATA Power interface, 5V |
| Debug | Debug the serial port |
| RTC | RTC coin cell connector |
| Recovery | Recovery key |
| UART3 | UART3 serial interface |
| Reset | Reset key |

# 2.Install Drivers and Tool

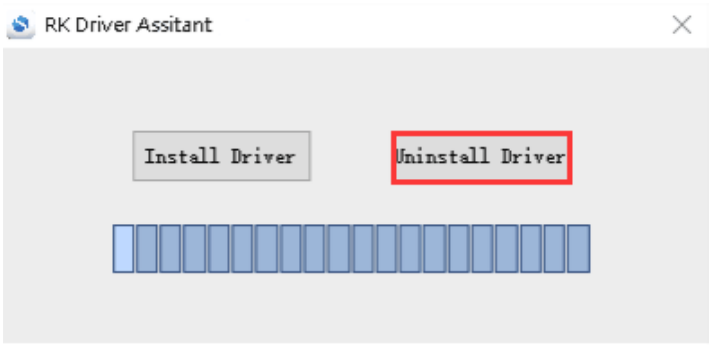
To download firmware and debug in the terminal, the following drivers and software need to be installed (for Windows computers):

| 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 |

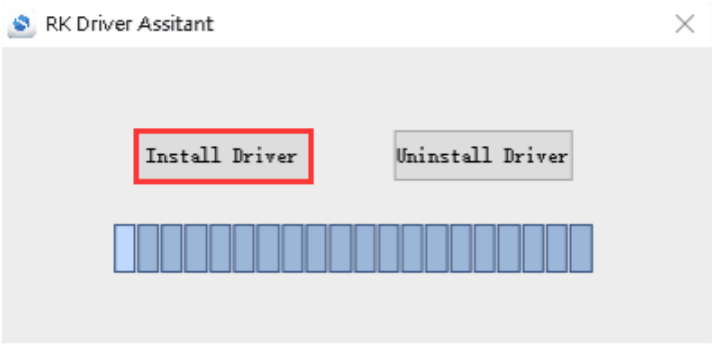
## 2.1 Install RK Driver Assitant

**Step 1**: Open *DriverAssitant_v5.1.1/DriverInstall.exe*.

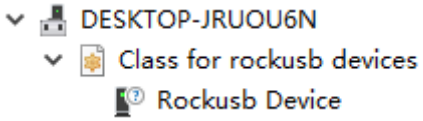
**Step 2**: To avoid driver conflicts, click **"Uninstall Driver"** to uninstall the driver.



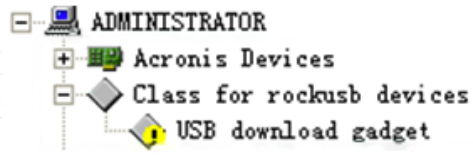

**Step 3**: Click button **"Install Driver"** to install.




**Step 4**: After the installation is complete, connect the board and PC with Type_A 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.

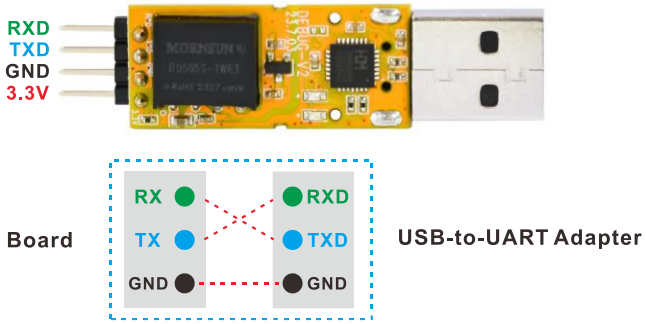



**Step 6**: The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select: *DriverAssitant_v5.1.1/ADBDriver.*

**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



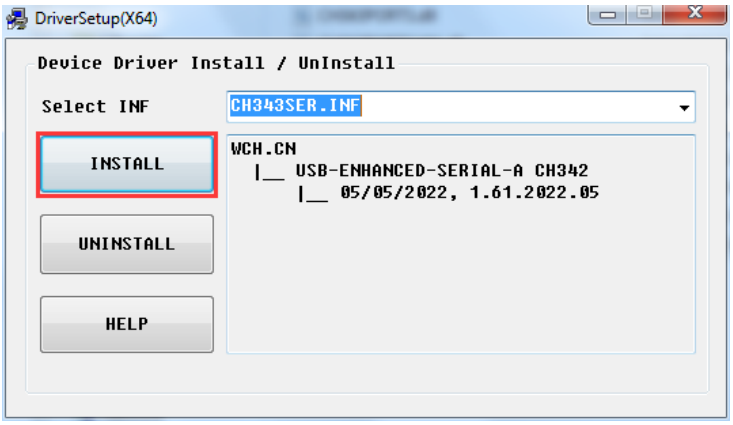

| Pin | Connection Description |
|---|---|
| RXD | Receive, connect to TX pin of the board. |
| TXD | Transmit, connect to RX pin of the board. |
| GND | Ground, connect to GND pin of the board. |
| 3V3 | No need to connect. |

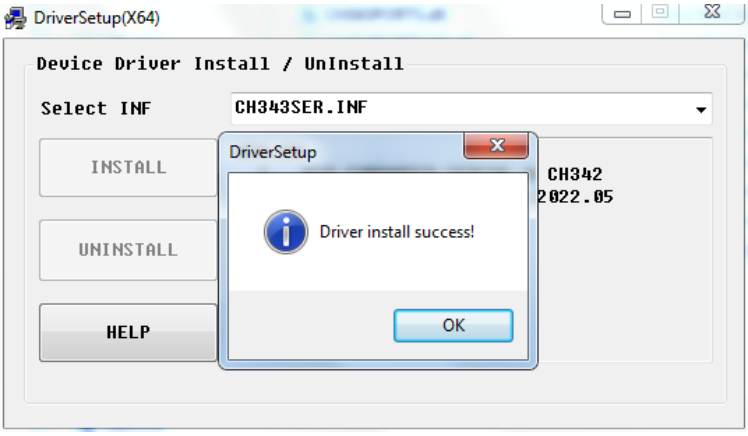
## 2.2.2 Install Driver

**Step 1**: Plug the CH9102X Module to the PC

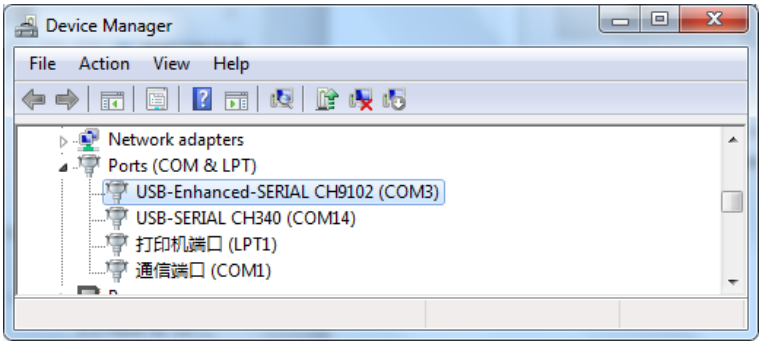
**Step 2**: Unzip *CH343SER.ZIP* on Windows.

**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.

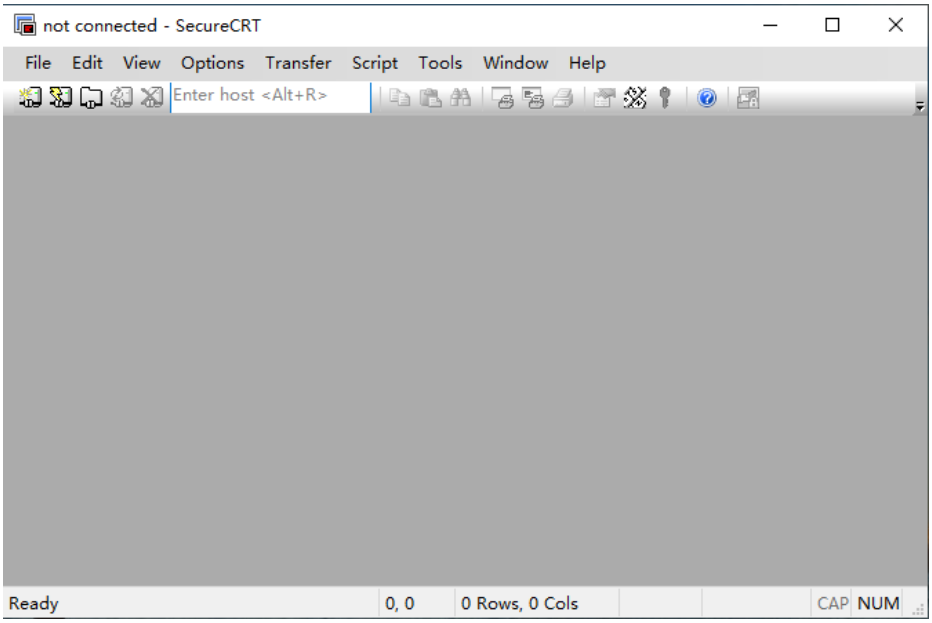



# 2.3 Install Serial Terminal Tool

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

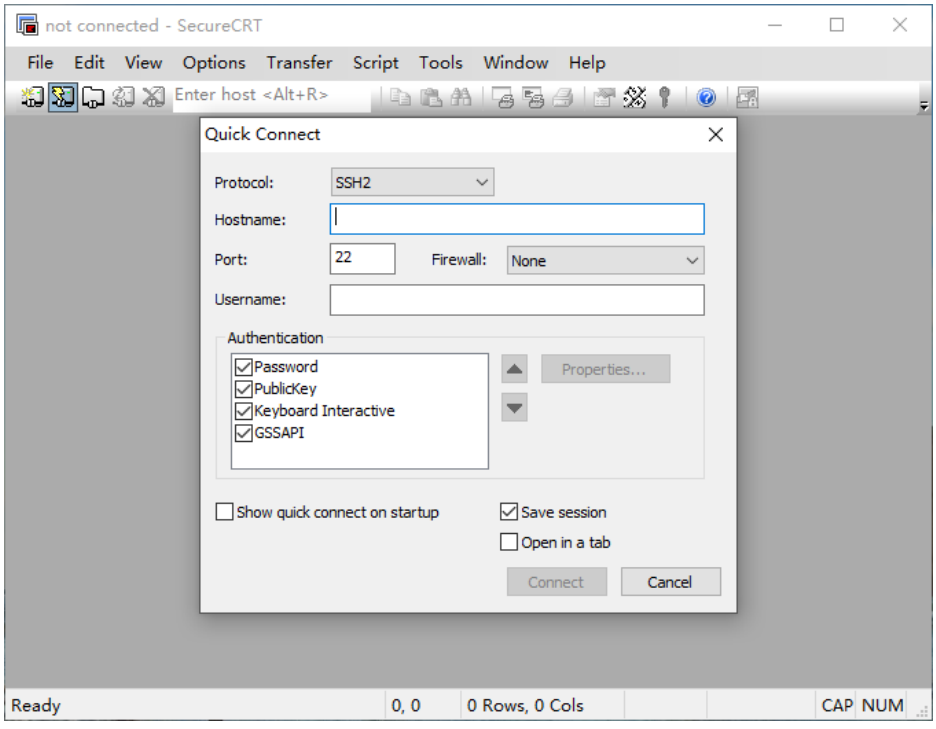
**Step 1**: Unzip *Platform/SecureCRT.rar* on PC.

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

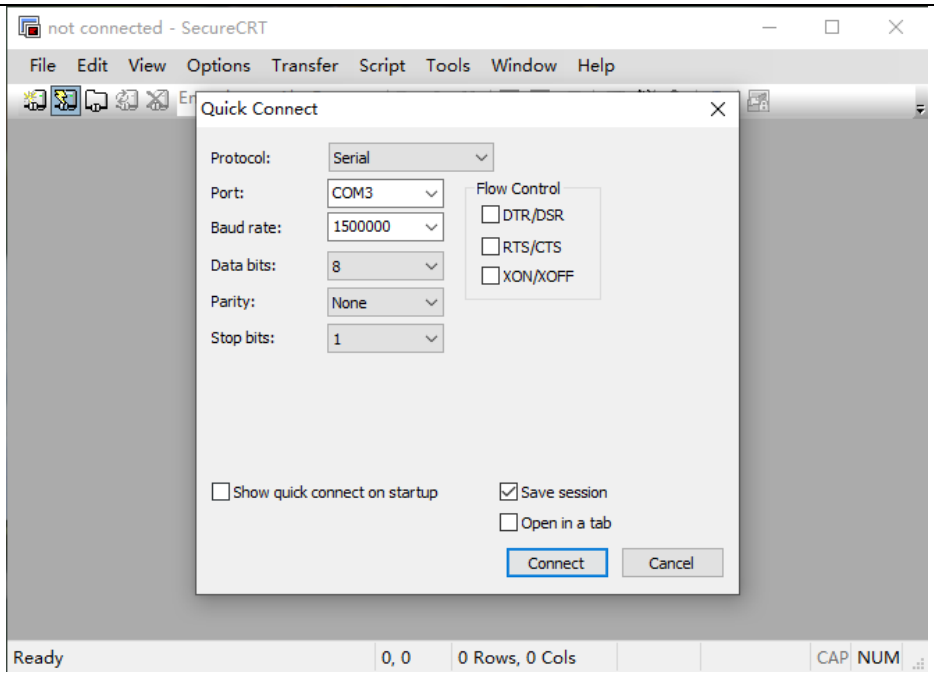



**Step 3**: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

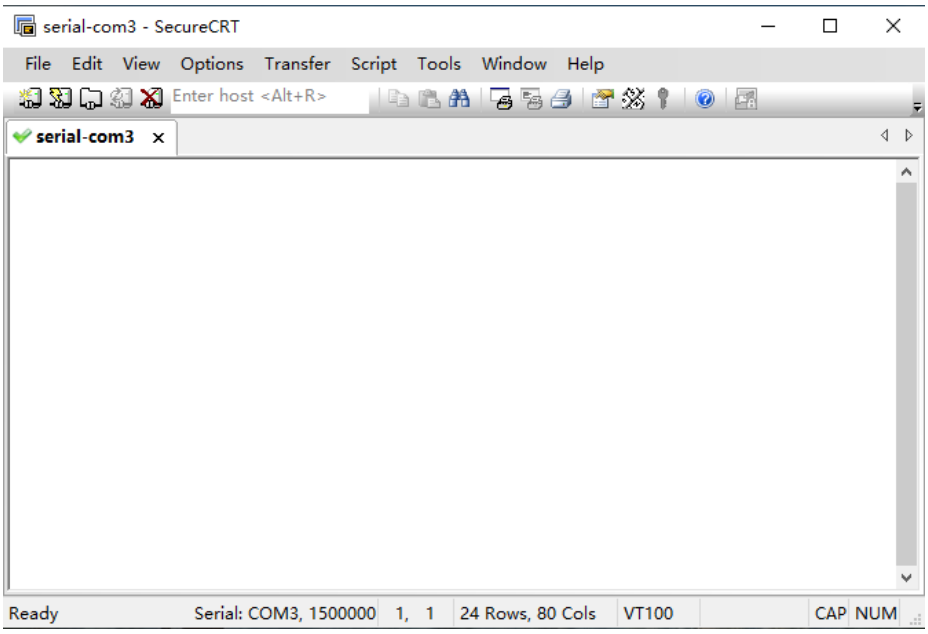
**Step 4**: Click the **"Quick Connect"** button to go to the Quick Connect configuration screen.




**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

The firmware can be upgraded via USB cable in two modes:

1. **Loader Mode:**

   The standard mode used for firmware upgrades.

2. **MaskRom Mode:**

   A last-resort mode used when the device is bricked. Entering MaskRom mode requires hardware manipulation, which involves certain risks. It should only be attempted if Loader mode is unavailable.

**• Prerequisite**

Before upgrading the firmware via USB cable, ensure that the necessary drivers are installed. For installation instructions, refer to the section Install RK Driver Assistant.

## 3.1.1 How to Enter Loader Mode

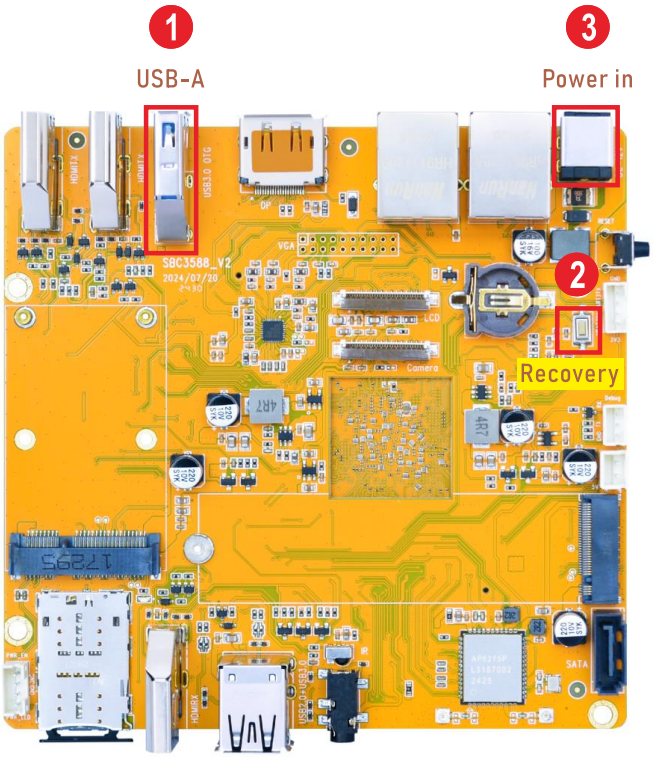
### 3.1.1.1 Hardware

**Step 1**: Disconnect the power adapter.

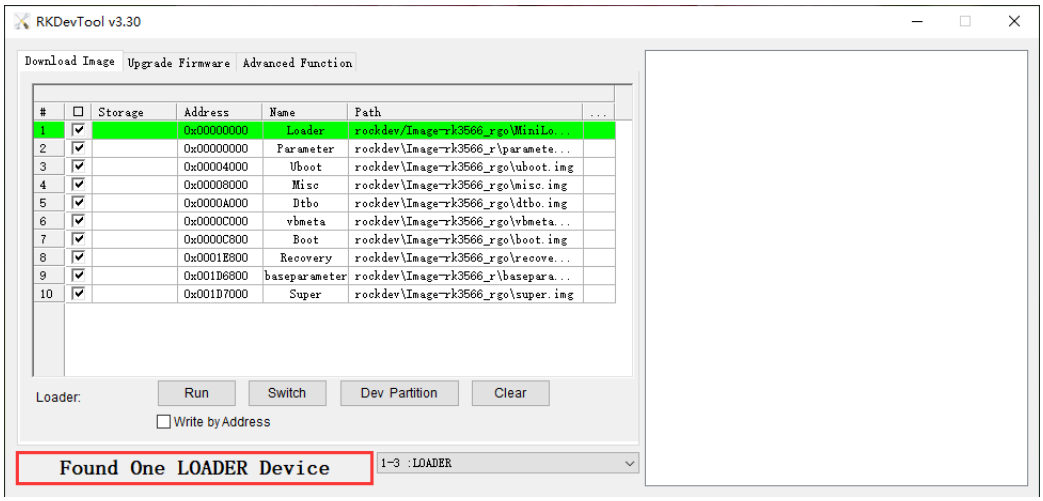
**Step 2**: Connect one end of the Type_A cable to the host and the other end to the development board.

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

**Step 4**: Connect the power supply.



**Step 5**: After a few seconds, release the **Recovery** button when the flashing tool shows **"Found one LOADER Devic"**.




### 3.1.1.2 Software

After connecting the Type_A USB cable, execute the following command in the serial debug terminal or adb shell.

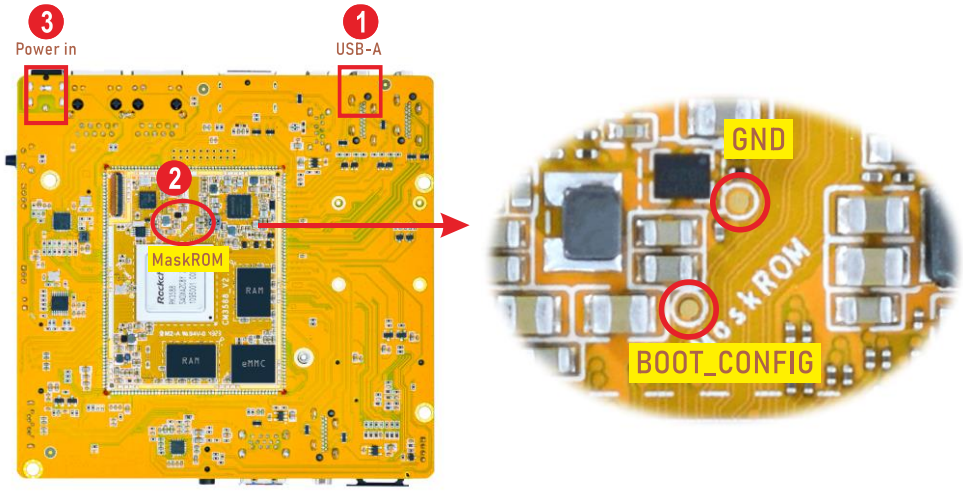
```
# reboot loader
```

## 3.1.2 How to Enter MaskRom Mode

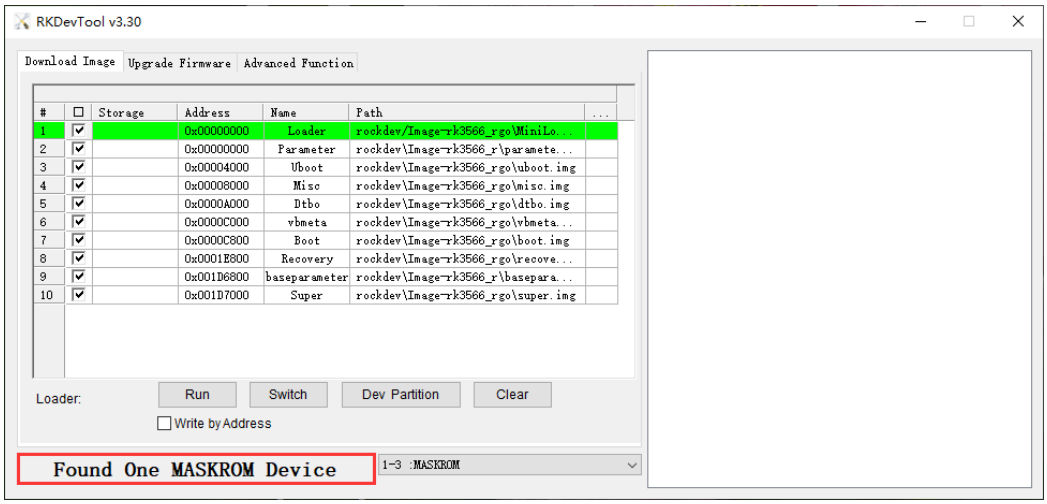
**Step 1**: Disconnect the power adapter.

**Step 2**: Connect one end of the Type_A 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.



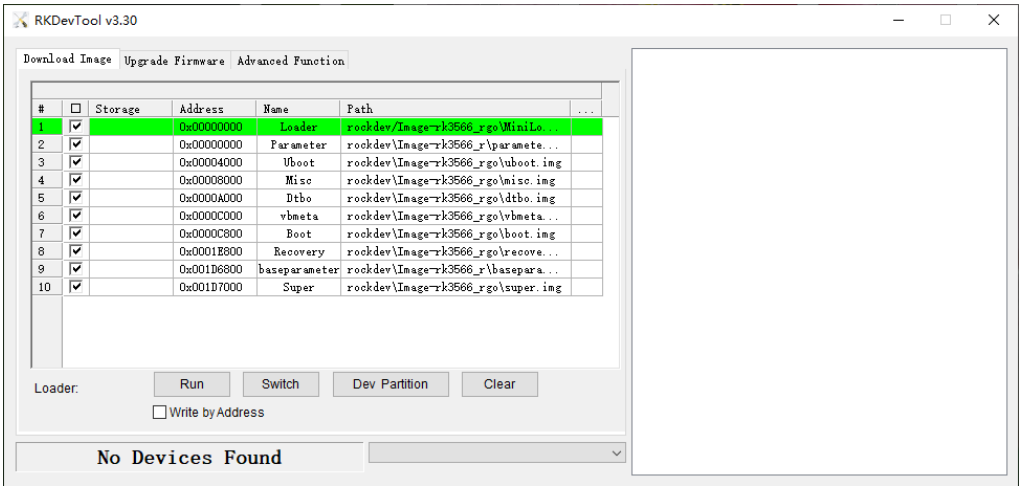

# 3.2 Burn firmware

**Environment:** Windows OS (Operating System).

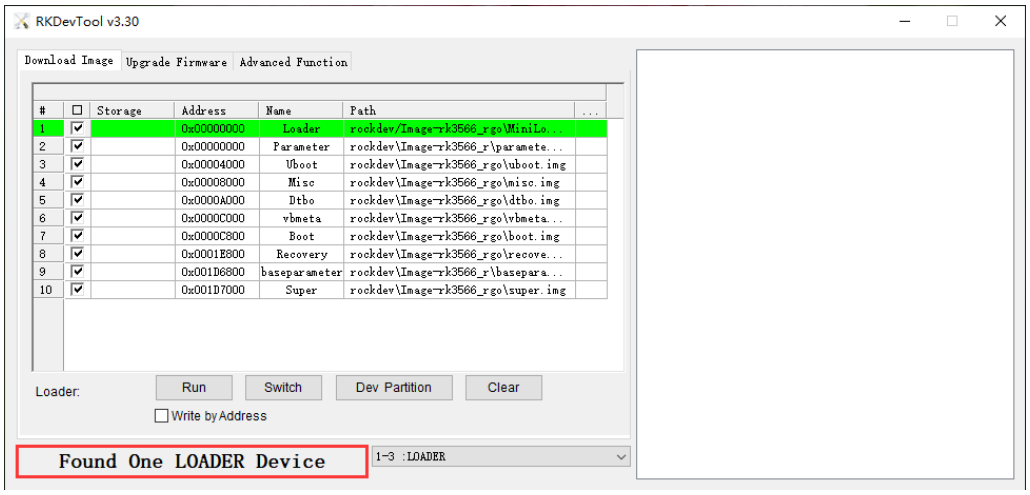
## 3.2.1 Burn Update.img Firmware

**Step 1**: Unzip *RKDevTool.rar* on Windows.

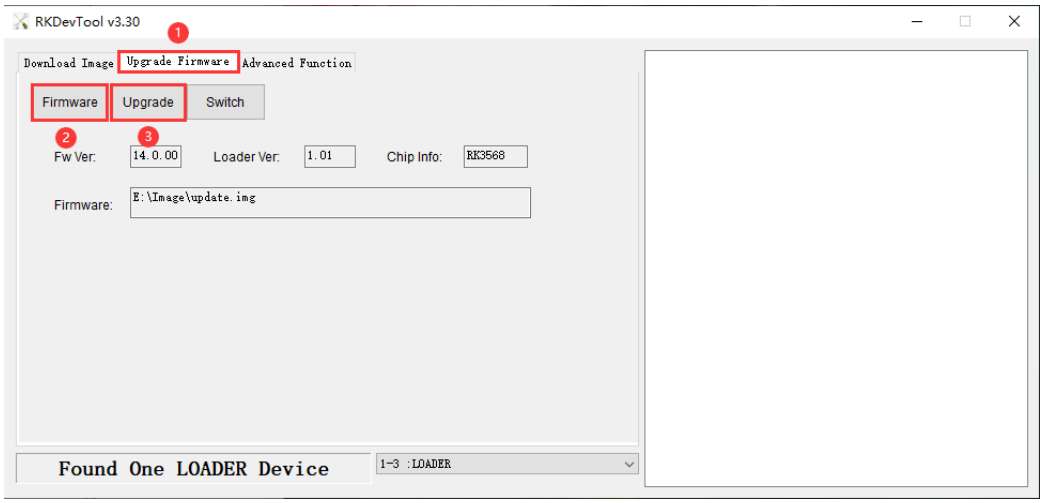
**Step 2**: Open *RKDevTool\RKDevTool_Release\RKDevTool.exe.*



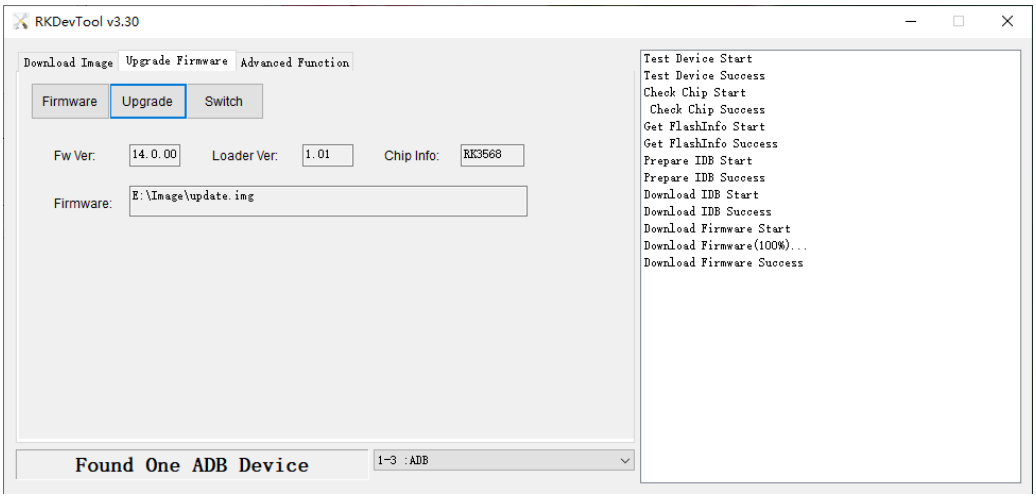

**Step 3**: Switch to **loader mode**. (*How to Enter Loader Mode*)




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




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



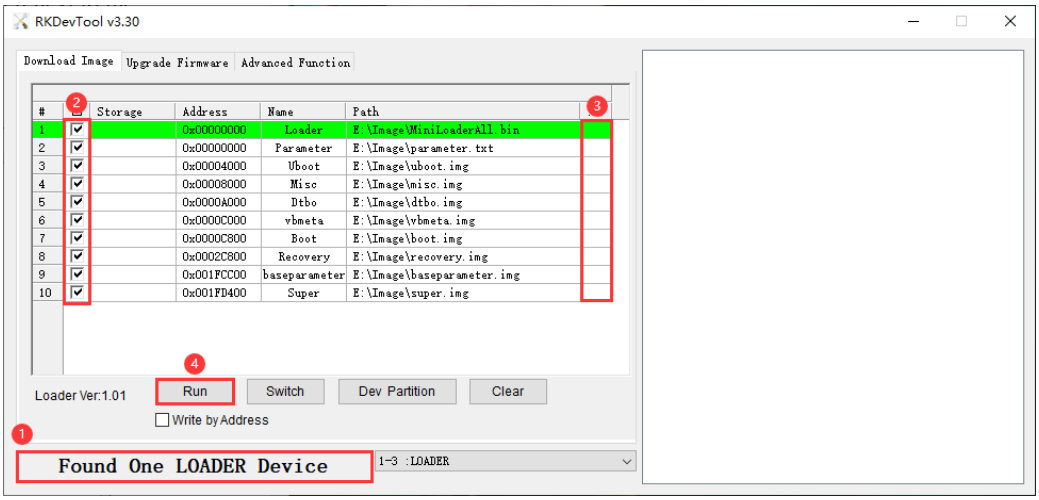
### 3.2.2 Burn Split Firmware

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

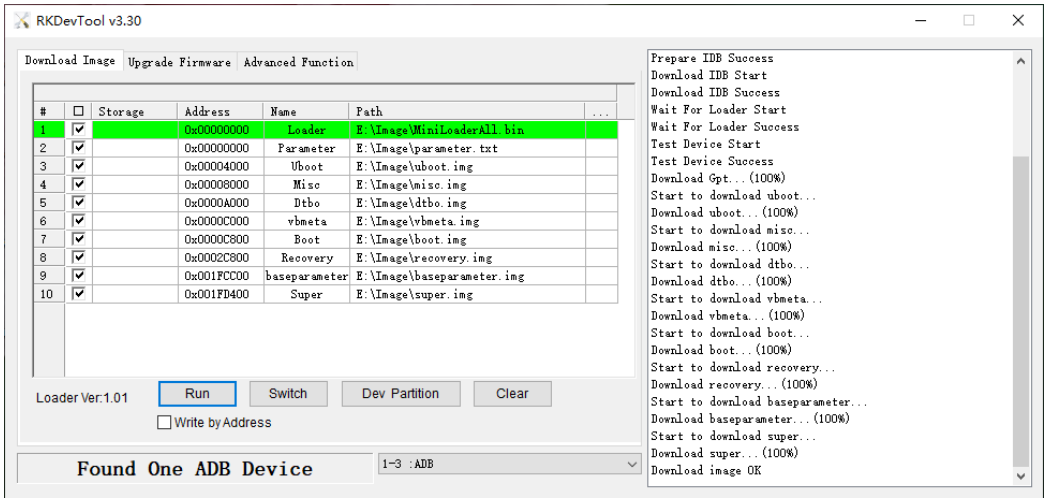
**Step 2**: Check the partitions to be flashed, multiple partitions can be selected.

**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 ssh make gcc libssl-dev liblz4-tool libmpc-dev
$ sudo apt-get install expect g++ patchelf chrpath gawk texinfo chrpath diffstat
$ sudo apt-get install binfmt-support live-build bison flex fakeroot libgmp-dev
$ sudo apt-get install cmake gcc-multilib g++-multilib unzip device-tree-compiler
$ sudo apt-get install ncurses-dev libgucharmap-2-90-dev bzip2 expat gpgv2
$ sudo apt-get install cpp-aarch64-linux-gnu g++-aarch64-linux-gnu
$ sudo apt install python2 python-is-python3
```

## 4.3 Installing the 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 rk3588-android14-rkr*.tar.bz2
$ cd rk3588-android14-rkr6
```

### Step 2: Configure the Compiled Platform

To configure the board, execute:

```
$ source build/envsetup.sh
$ lunch sbc3588_u-userdebug
```

### Step 3: One key compiling command

To compile uboot, kernel, and Android, execute the following command:

```
$ ./build.sh -AUCKu
```

```
./build.sh -UKAup
( WHERE: -U = build uboot
     -C = build kernel with Clang
     -K = build kernel
     -A = build android
     -p = will build packaging in IMAGE
     -o = build OTA package
     -u = build update.img
     -v = build android with 'user' or 'userdebug'
     -d = huild kernel dts name
     -V = build version
     -J = build jobs
------------you can use according to the requirement, no need to record
uboot/kernel compiling commands-----------------
)
============================================================
Please remember to set the environment variable before using the one key
compiling command, and select the platform to be compiled, for example:
source build/envsetup.sh
lunch rk3588_t-userdebug
============================================================
```

Images and **update.img** are generated in *rockdev/ Image-sbc3588_u* directory.

**Other compiling instruction:**

Android14 cannot directly flash **kernel.img** and **resource.img**. Using ./build.sh -AK will recompile the entire Android system, which is time-consuming. If the user only needs to compile the kernel, it is recommended to use the following command:

Export clang to the environment:

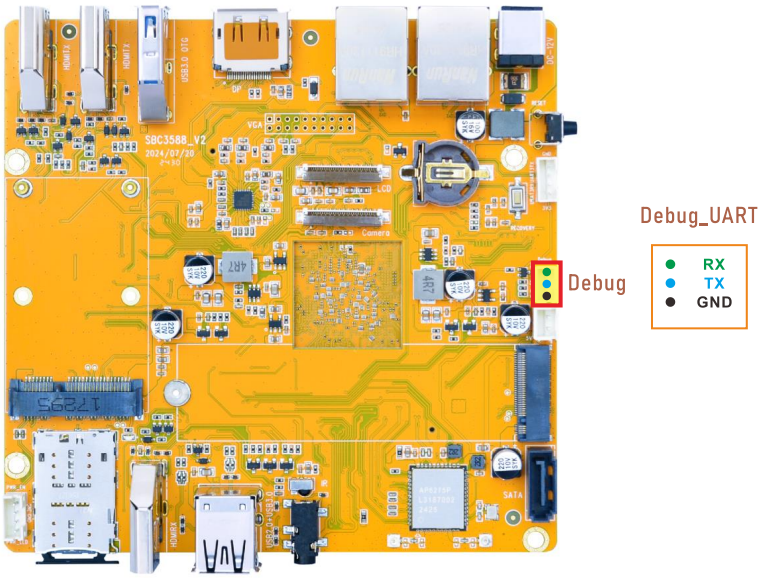
```
$ cd kernel-6.1
$ export PATH=../prebuilts/clang/host/linux-x86/clang-r487747c/bin:$PATH
$ alias msk='make CROSS_COMPILE=aarch64-linux-gnu- LLVM=1 LLVM_IAS=1'
```

```
$ msk ARCH=arm64 rockchip_defconfig android-14.config;
$ msk ARCH=arm64 BOOT_IMG=../rockdev/Image-sbc3588_u/boot.img boardcon-
sbc3588.img -j32
```

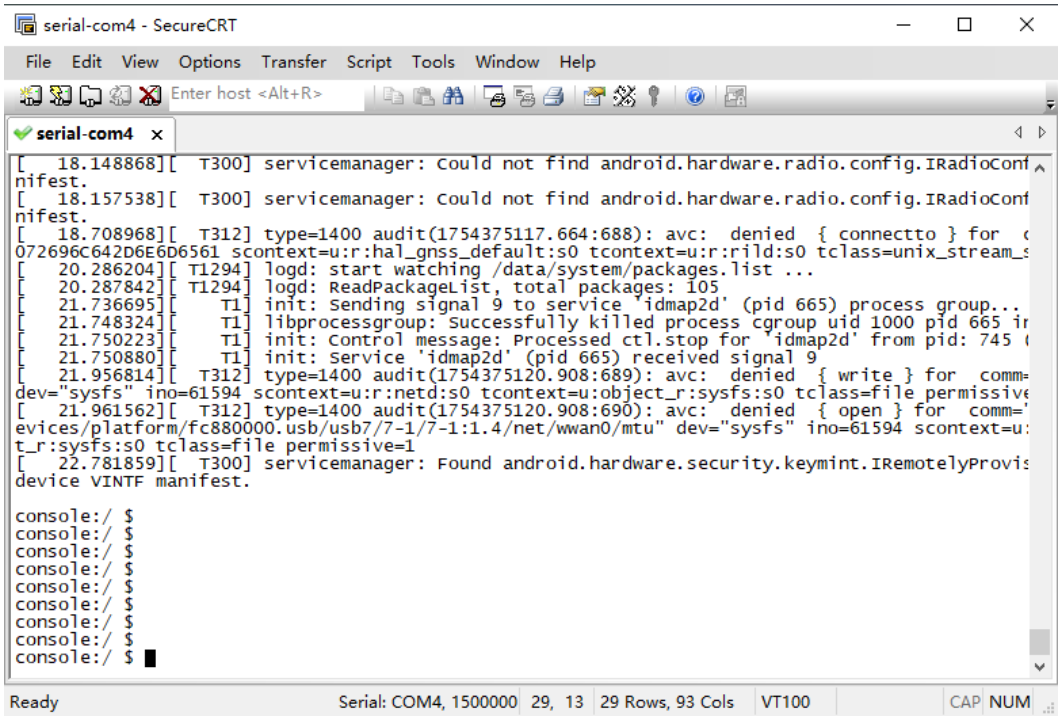
The user can flash **boot.img** under the catalogue of *kernel-6.1/* directly to boot position of machine after compiling, and please load the partition table（**parameter.txt**）when flashing, for fear of flashing to the wrong place.

# 6. Android14 Test

## 6.1 Serial Terminal

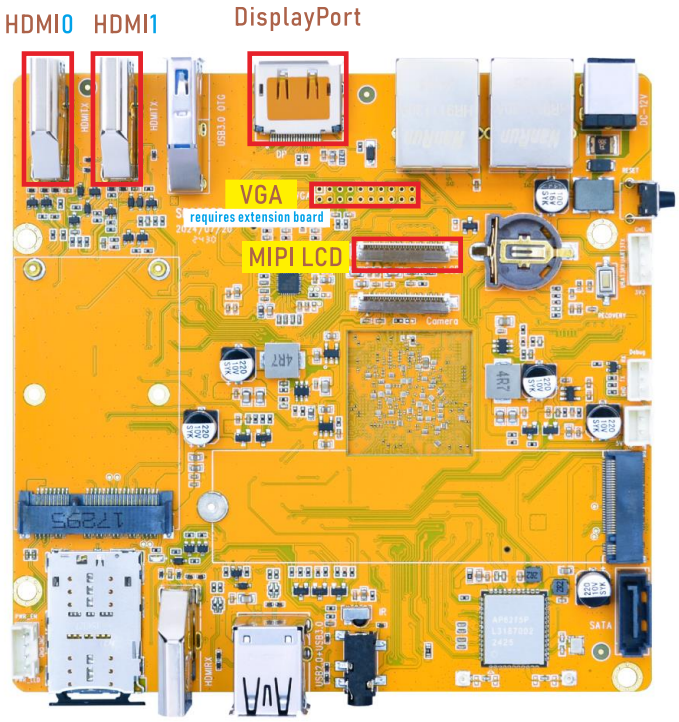



Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.

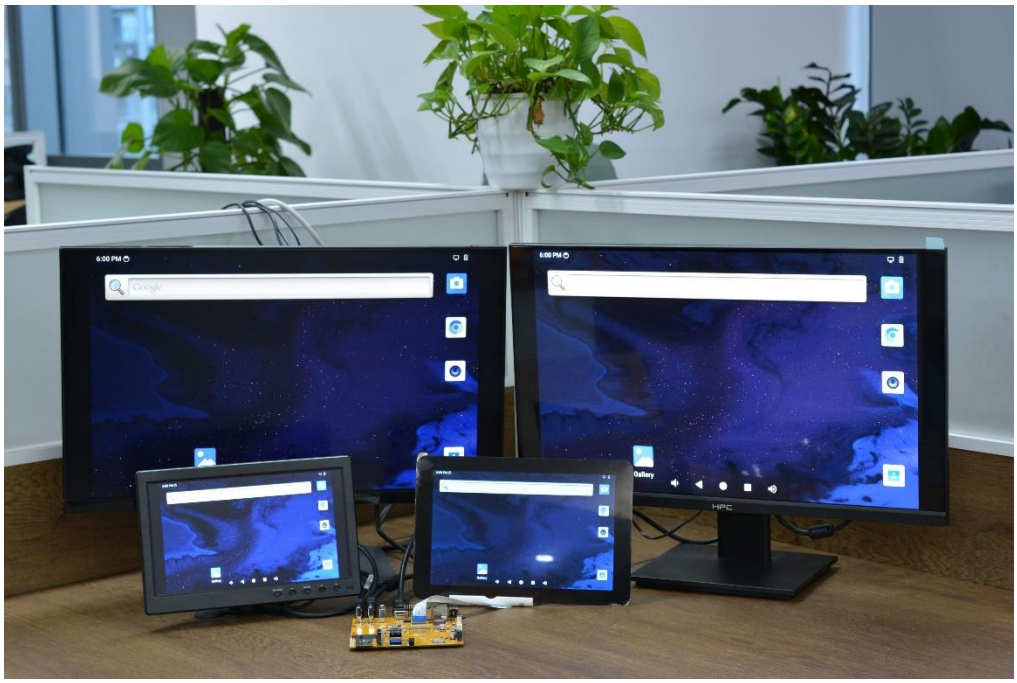


# 6.2 Display

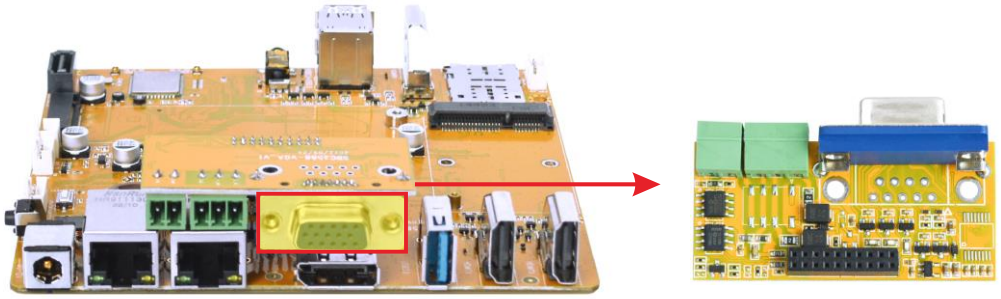
The SBC3588 supports quad-display output on the default Android14 image, with interfaces including HDMI0, HDMI1, DP/VGA (selectable), and MIPI DSI.



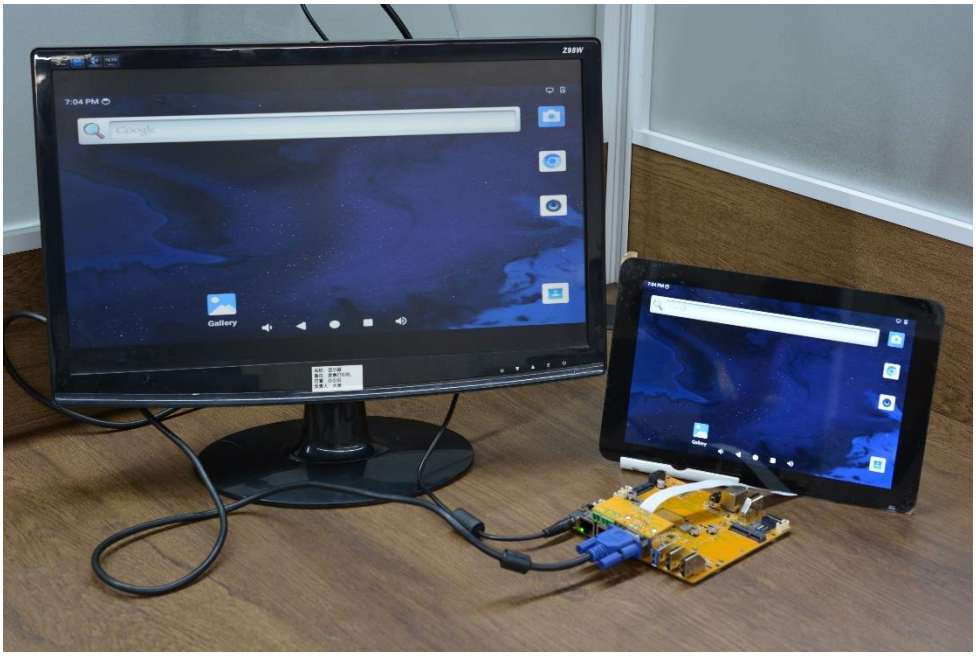

The display effect diagram is as follows:



**Note:** DP and VGA share the same VOP and cannot be used simultaneously with different display timings—only one output will be active at a time.



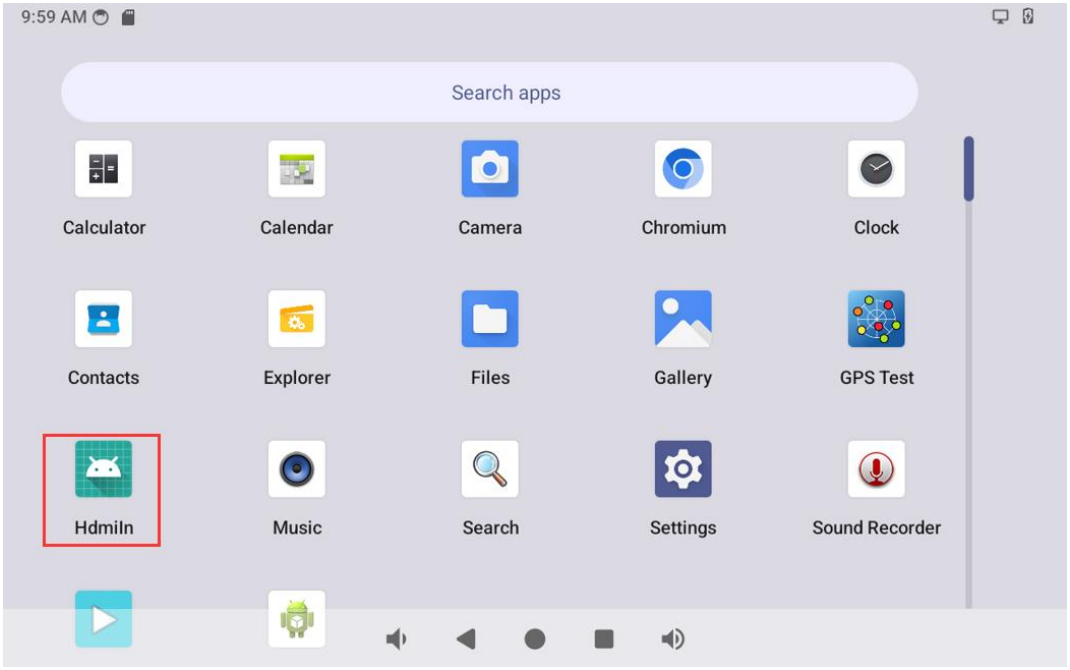

**Preview effect:**



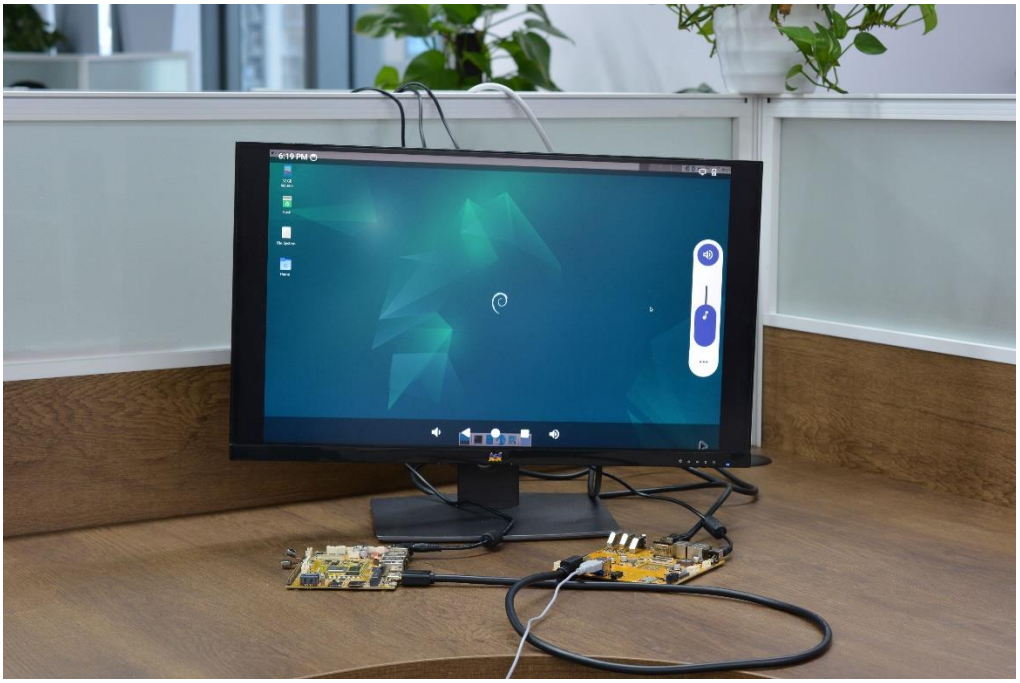
# 6.3 HDMI RX

**Step 1**: Connect the HDMI OUT port of the source device to the HDMI IN port of the SBC3588.

**Step 2**: Open the **HdmiIn** app：



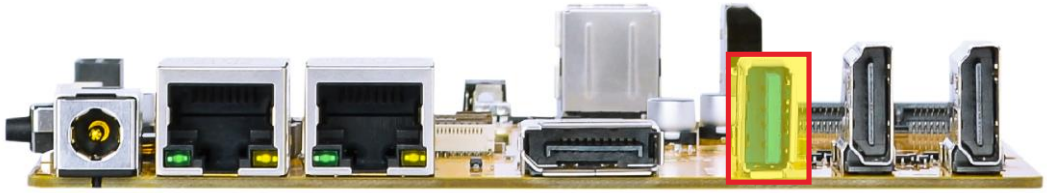

**Preview effect:**



# 6.4 USB

## 6.4.1 USB OTG

**Default mode on boot**: Device mode, functioning as a USB device for ADB debugging and file transfer.




### 6.4.1.1 Host mode

In this mode, the board functions as a USB host, allowing connection to:

- USB keyboard
- USB mouse
- USB flash drive

To switch to host mode, execute the following command:

```
# echo host > /sys/devices/platform/fd5d0000.syscon/fd5d0000.syscon:usb2-phy@0/otg_mode
```

```
console:/ #
sys/devices/platform/fd5d0000.syscon/fd5d0000.syscon:usb2-phy@0/otg_mode      <
console:/ # [ 1160.242464][ T2285] dwc3 fc000000.usb: request 0000000000000000 was not queued to ep0out
[ 1160.243847][ T2291] android_work: did not send uevent (0 0 0000000000000000)
[ 1160.350084][ T2285] xhci-hcd xhci-hcd.16.auto: xHCI Host Controller
[ 1160.351021][ T2285] xhci-hcd xhci-hcd.16.auto: new USB bus registered, assigned bus number 8
[  1160.351161][  T2285]  xhci-hcd  xhci-hcd.16.auto:  hcc  params  0x0220fe64  hci  version  0x110  quirks
0x0000808002010010
[ 1160.351199][ T2285] xhci-hcd xhci-hcd.16.auto: irq 87, io mem 0xfc000000
[ 1160.351540][ T2285] xhci-hcd xhci-hcd.16.auto: xHCI Host Controller
[ 1160.352714][ T2285] xhci-hcd xhci-hcd.16.auto: new USB bus registered, assigned bus number 9
[ 1160.352738][ T2285] xhci-hcd xhci-hcd.16.auto: Host supports USB 3.0 SuperSpeed
[ 1160.352990][ T2285] usb usb8: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice= 6.01
[ 1160.353009][ T2285] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 1160.353023][ T2285] usb usb8: Product: xHCI Host Controller
[ 1160.353036][ T2285] usb usb8: Manufacturer: Linux 6.1.99 xhci-hcd
[ 1160.353048][ T2285] usb usb8: SerialNumber: xhci-hcd.16.auto
[ 1160.354941][ T2285] hub 8-0:1.0: USB hub found
[ 1160.355036][ T2285] hub 8-0:1.0: 1 port detected
[ 1160.356743][ T2285] usb usb9: We don't know the algorithms for LPM for this host, disabling LPM.
[ 1160.356910][ T2285] usb usb9: New USB device found, idVendor=1d6b, idProduct=0003, bcdDevice= 6.01
[ 1160.356928][ T2285] usb usb9: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 1160.356942][ T2285] usb usb9: Product: xHCI Host Controller
[ 1160.356954][ T2285] usb usb9: Manufacturer: Linux 6.1.99 xhci-hcd
[ 1160.356966][ T2285] usb usb9: SerialNumber: xhci-hcd.16.auto
[ 1160.359590][ T2285] hub 9-0:1.0: USB hub found
[ 1160.359730][ T2285] hub 9-0:1.0: 1 port detected
[ 1160.693034][ T2291] usb 9-1: new SuperSpeed USB device number 2 using xhci-hcd
[ 1160.723948][ T2291] usb 9-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 1160.724044][ T2291] usb 9-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1160.724086][ T2291] usb 9-1: Product: OnlyDisk
[ 1160.724121][ T2291] usb 9-1: Manufacturer: Netac
[ 1160.724156][ T2291] usb 9-1: SerialNumber: C0E8BFA3EC38F796
[ 1160.729185][ T2291] usb-storage 9-1:1.0: USB Mass Storage device detected
[ 1160.730660][ T2291] scsi host1: usb-storage 9-1:1.0
[ 1162.169256][ T2316] scsi 1:0:0:0: Direct-Access     Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[ 1162.173683][ T2316] sd 1:0:0:0: Attached scsi generic sg0 type 0
[ 1162.173927][ T2317] sd 1:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 1162.174637][ T2317] sd 1:0:0:0: [sda] Write Protect is off
[ 1162.174980][ T2317] sd 1:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO
or FUA
 [ 1162.180050][ T2317]  sda: sda1
[ 1162.181237][ T2317] sd 1:0:0:0: [sda] Attached SCSI removable disk
```

### 6.4.1.2 Device mode

To switch back to Device mode, execute the following command:

```
# echo peripheral > /sys/devices/platform/fd5d0000.syscon/fd5d0000.syscon:usb2-
phy@0/otg_mode
```

```
m/fd5d0000.syscon/fd5d0000.syscon:usb2-phy@0/otg_mode                    <
console:/ # [ 1471.971256][ T2849] xhci-hcd xhci-hcd.16.auto: remove, state 4
[ 1471.971291][ T2849] usb usb9: USB disconnect, device number 1
[ 1471.974851][ T2849] xhci-hcd xhci-hcd.16.auto: USB bus 9 deregistered
[ 1471.975257][ T2849] xhci-hcd xhci-hcd.16.auto: remove, state 4
[ 1471.975278][ T2849] usb usb8: USB disconnect, device number 1
[ 1471.976376][ T2849] xhci-hcd xhci-hcd.16.auto: USB bus 8 deregistered
[ 1472.215218][ T2297] android_work: did not send uevent (0 0 0000000000000000)
[ 1472.425037][ T3025] dwc3 fc000000.usb: device reset
[ 1472.517585][ T2297] android_work: sent uevent USB_STATE=CONNECTED
[ 1472.548004][ T2297] android_work: sent uevent USB_STATE=CONFIGURED
[ 1473.237169][ T3025] dwc3 fc000000.usb: device reset
[ 1473.292668][  T723] dwc3 fc000000.usb: request 0000000000000000 was not queued to ep0out
[ 1473.292763][ T2426] android_work: sent uevent USB_STATE=DISCONNECTED
[ 1473.399018][ T3045] dwc3 fc000000.usb: device reset
[ 1473.575020][ T3045] dwc3 fc000000.usb: device reset
[ 1473.668766][ T2297] android_work: sent uevent USB_STATE=CONNECTED
[ 1473.700813][ T2297] android_work: sent uevent USB_STATE=CONFIGURED
```

## 6.4.2 USB Host

The USB host interface provides connectivity for standard peripherals, including USB keyboards, mice, flash drives, and other USB-compatible devices.


**USB version identification based on kernel log output:**

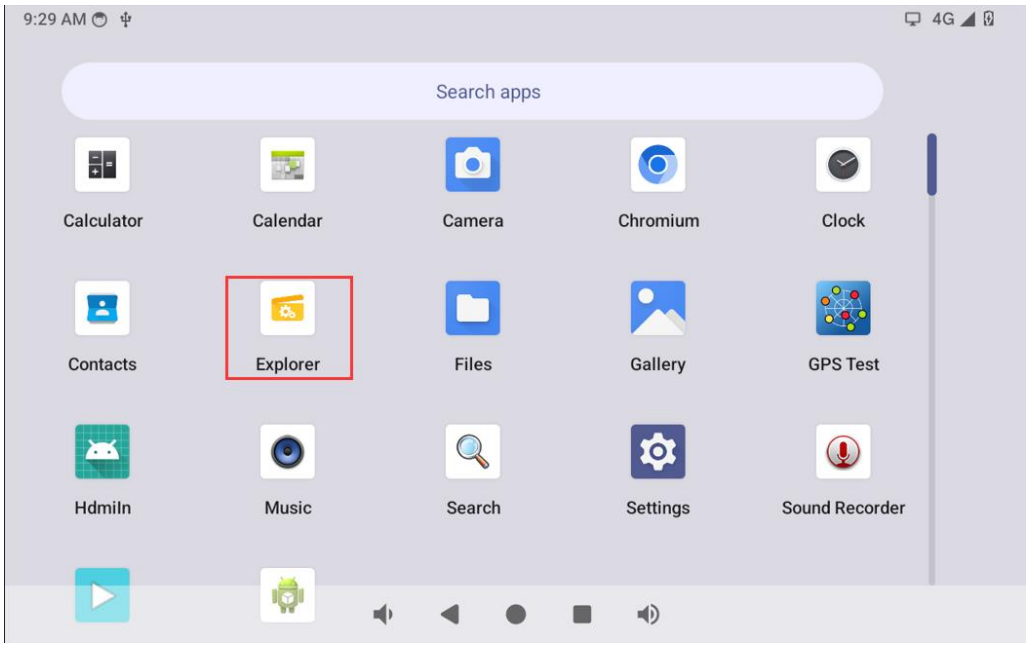
• **USB 2.0**: Displays as high-speed.

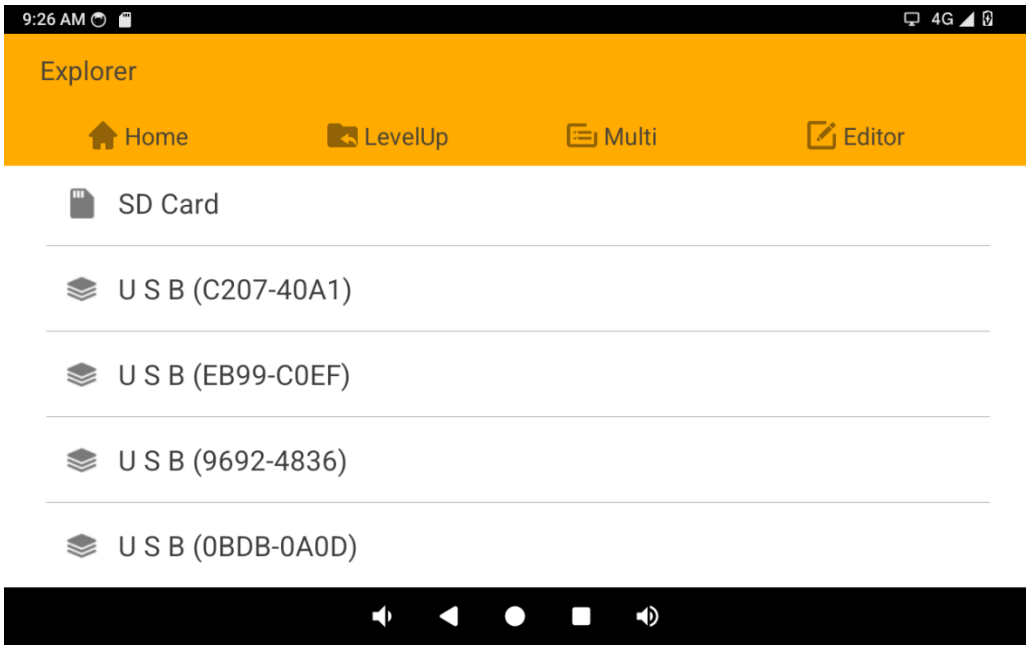
```
console:/ # [ 2404.113642][ T2849] usb 3-1: new high-speed USB device number 2 using xhci-hcd
[ 2404.263958][ T2849] usb 3-1: New USB device found, idVendor=346d, idProduct=5678, bcdDevice= 3.20
[ 2404.264057][ T2849] usb 3-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 2404.264101][ T2849] usb 3-1: Product: HIKSEMI
[ 2404.264137][ T2849] usb 3-1: Manufacturer:
[ 2404.264173][ T2849] usb 3-1: SerialNumber: FC054E5F74301
[ 2404.266718][ T2849] usb-storage 3-1:1.0: USB Mass Storage device detected
[ 2404.268074][ T2849] scsi host1: usb-storage 3-1:1.0
[ 2405.299650][ T2304] scsi 1:0:0:0: Direct-Access            HIKSEMI         3.20 PQ: 0 ANSI: 4
[ 2405.306476][ T2304] sd 1:0:0:0: Attached scsi generic sg0 type 0
[ 2405.308170][ T2319] sd 1:0:0:0: [sda] 245760000 512-byte logical blocks: (126 GB/117 GiB)
[ 2405.308561][ T2319] sd 1:0:0:0: [sda] Write Protect is off
[ 2405.308894][ T2319] sd 1:0:0:0: [sda] No Caching mode page found
[ 2405.308911][ T2319] sd 1:0:0:0: [sda] Assuming drive cache: write through
 [ 2405.312679][ T2319]  sda: sda1
[ 2405.313122][ T2319] sd 1:0:0:0: [sda] Attached SCSI removable disk
 [ 2405.995540][ T1558] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please
run fsck.
```

• **USB 3.0**: Displays as SuperSpeed.

```
console:/ # [ 2471.950185][ T3141] usb 2-1: new SuperSpeed USB device number 3 using xhci-hcd
[ 2471.981398][ T3141] usb 2-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 2471.981646][ T3141] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 2471.981694][ T3141] usb 2-1: Product: OnlyDisk
[ 2471.981730][ T3141] usb 2-1: Manufacturer: Netac
[ 2471.981766][ T3141] usb 2-1: SerialNumber: C0E8BFA3EC38F796
[ 2471.991364][ T3141] usb-storage 2-1:1.0: USB Mass Storage device detected
[ 2471.994222][ T3141] scsi host2: usb-storage 2-1:1.0
[ 2473.428951][ T3139] scsi 2:0:0:0: Direct-Access     Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[ 2473.430738][ T3139] sd 2:0:0:0: Attached scsi generic sg1 type 0
[ 2473.433481][ T2304] sd 2:0:0:0: [sdb] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 2473.433786][ T2304] sd 2:0:0:0: [sdb] Write Protect is off
[ 2473.434002][ T2304] sd 2:0:0:0: [sdb] Write cache: disabled, read cache: enabled, doesn't support DPO
or FUA
[ 2473.440559][ T2304]  sdb: sdb1
[ 2473.441365][ T2304] sd 2:0:0:0: [sdb] Attached SCSI removable disk
```

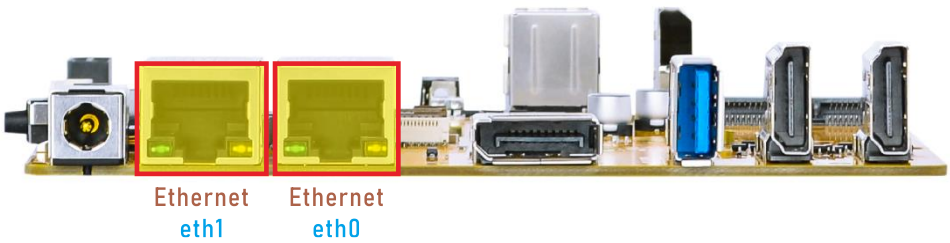
After connection, a USB flash drive is mounted automatically and becomes accessible via the File Explorer.




# 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:/ # [   35.711227][  T152] rk_gmac-dwmac fe1b0000.ethernet eth1: Link is Up - 1Gbps/Full - flow
control rx/tx
[   35.711304][  T152] IPv6: ADDRCONF(NETDEV_CHANGE): eth1: link becomes ready
console:/ # [   49.023202][  T156] rk_gmac-dwmac fe1c0000.ethernet eth0: Link is Up - 1Gbps/Full - flow
control rx/tx
[   49.023279][  T156] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

**Step 2**: View network interface information.

```
# ifconfig
```

```
console:/ # ifconfig
eth0      Link encap:Ethernet  HWaddr fe:5d:9a:19:c0:aa  Driver rk_gmac-dwmac
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:160 errors:0 dropped:27 overruns:0 frame:0
          TX packets:28 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:19254 TX bytes:3733
          Interrupt:73

eth1      Link encap:Ethernet  HWaddr fa:5d:9a:19:c0:aa  Driver rk_gmac-dwmac
          inet addr:192.168.0.195  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::da6b:4622:5ec6:1160/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:206 errors:0 dropped:0 overruns:0 frame:0
          TX packets:44 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:30520 TX bytes:4925
          Interrupt:75
```

**Note**: When eth0 and eth1 are enabled simultaneously, eth0 is dedicated to internal network communication, while eth1 is dedicated to external network communication.

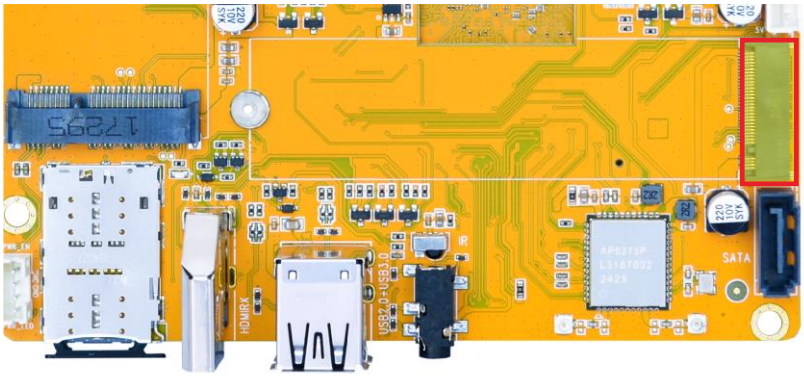
**Step 3**: Network connection test.

```
# ping -I eth0 192.168.0.1
# ping -I eth1 www.armdesigner.com
```

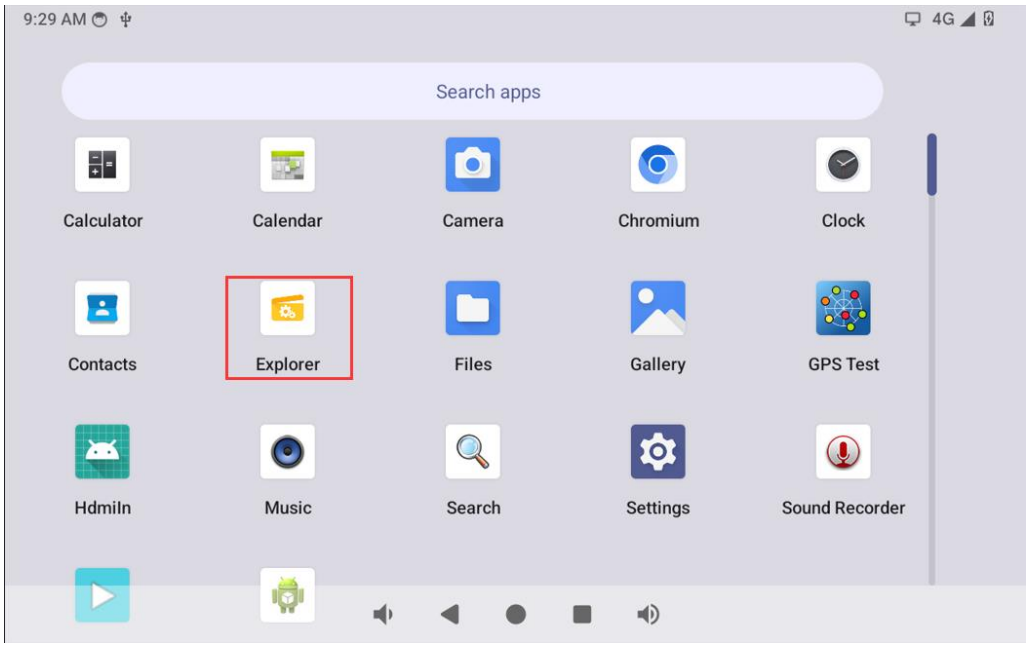
```
console:/ # ping -I eth0 192.168.0.1
ping: Warning: source address might be selected on device other than eth0.
PING 192.168.0.1 (192.168.0.1) from 192.168.0.195 eth0: 56(84) bytes of data.
64 bytes from 192.168.0.1: icmp_seq=1 ttl=255 time=3.61 ms
64 bytes from 192.168.0.1: icmp_seq=2 ttl=255 time=0.558 ms
64 bytes from 192.168.0.1: icmp_seq=3 ttl=255 time=0.421 ms
64 bytes from 192.168.0.1: icmp_seq=4 ttl=255 time=0.452 ms
64 bytes from 192.168.0.1: icmp_seq=5 ttl=255 time=0.485 ms
64 bytes from 192.168.0.1: icmp_seq=6 ttl=255 time=0.374 ms
^C
--- 192.168.0.1 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5072ms
rtt min/avg/max/mdev = 0.374/0.984/3.618/1.179 ms
console:/ #
console:/ # ping -I eth1 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.195 eth1: 56(84) bytes of data.
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=1 ttl=50 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=2 ttl=50 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=3 ttl=50 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=4 ttl=50 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=5 ttl=50 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=6 ttl=50 time=189 ms
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5009ms
rtt min/avg/max/mdev = 189.001/189.282/189.739/0.434 ms
```

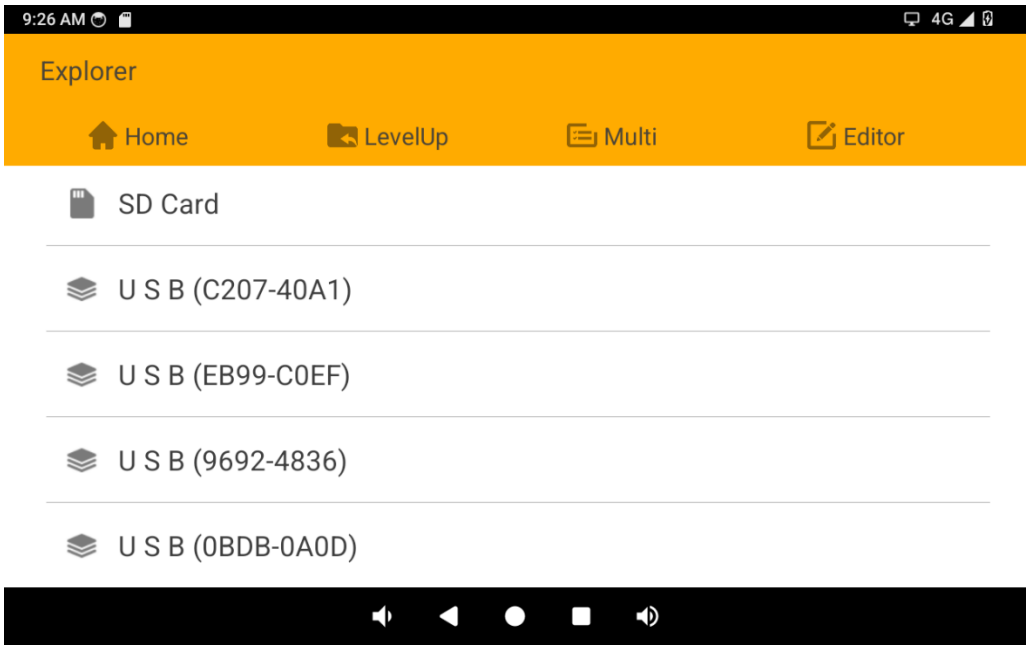
# 6.6 PCIe M.2 SSD

**Step 1**: Insert the M.2 SSD into the M.2 card slot, then power on the device.



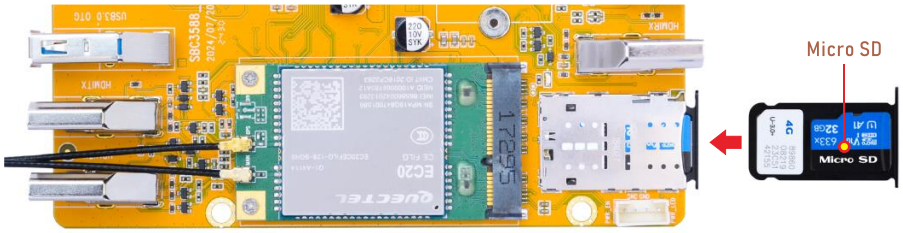

**Step 2**: The system will automatically detect and mount the SSD, and it can be accessed directly through the **Explorer** app.



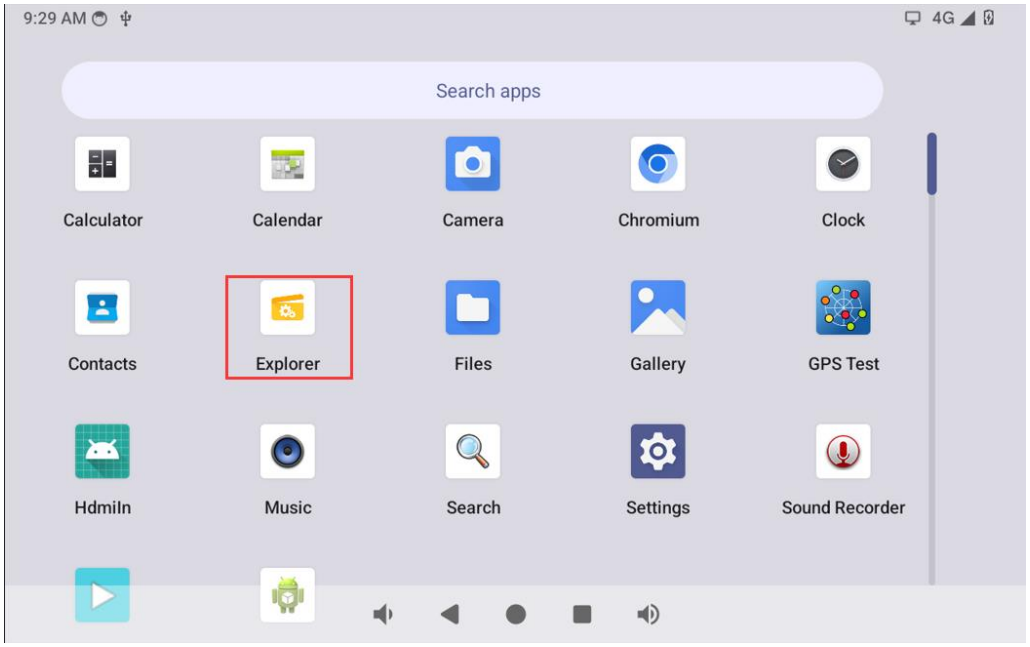

# 6.7 SD Card

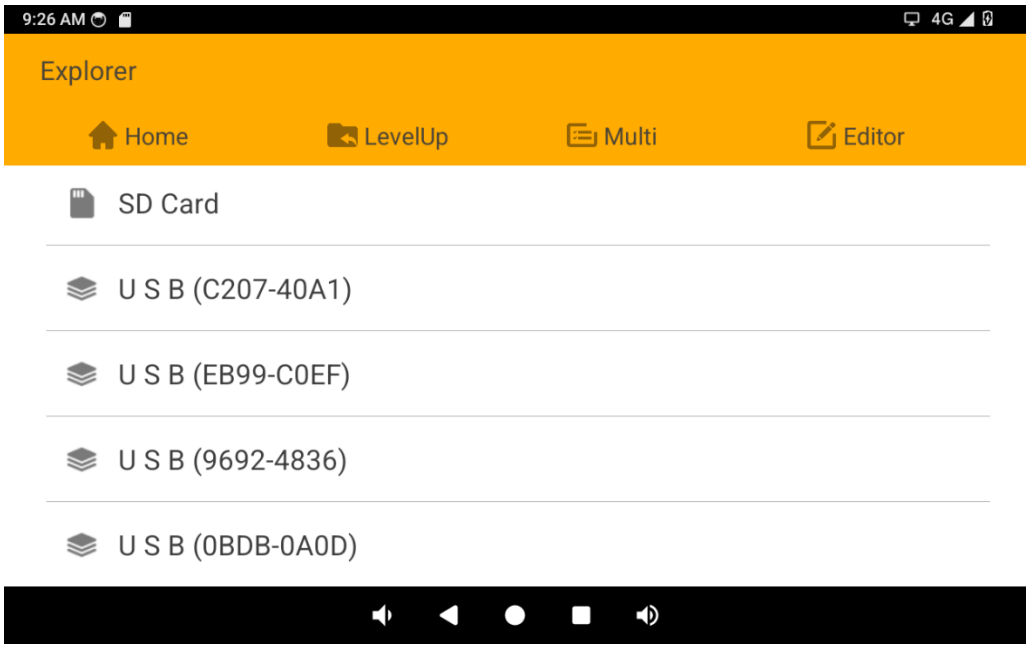
**Step 1**: Insert the micro SD card into the card slot.




**Step 2**: After connecting the SD card drive, the device will automatically mount, and it

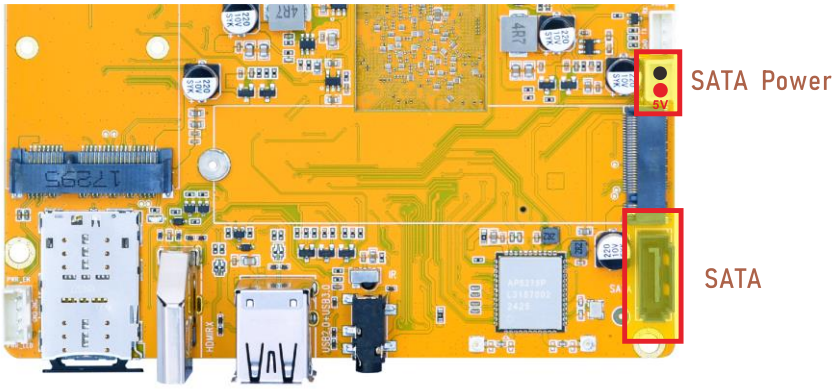
can be accessed directly through the **Explorer** app.



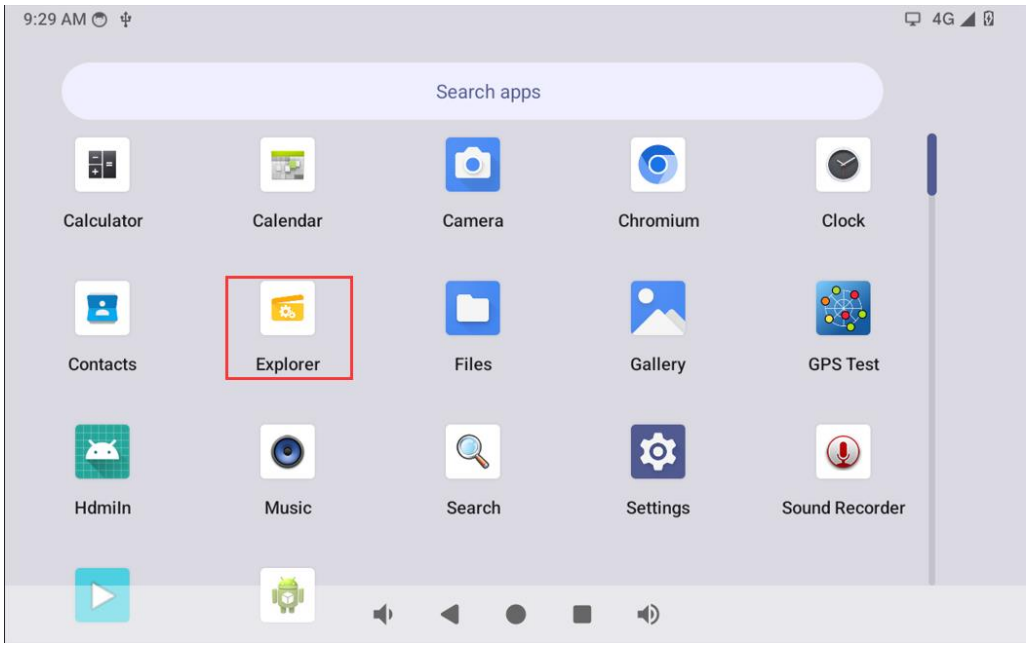



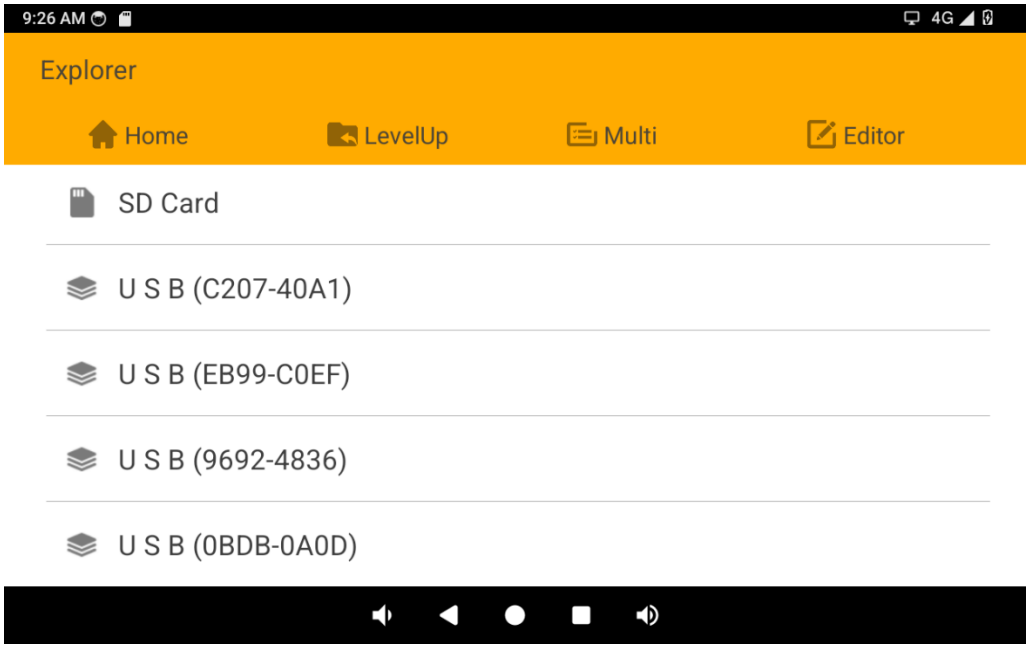

# 6.8 SATA

**Step 1**: Connect the sata and sata power, then power on.



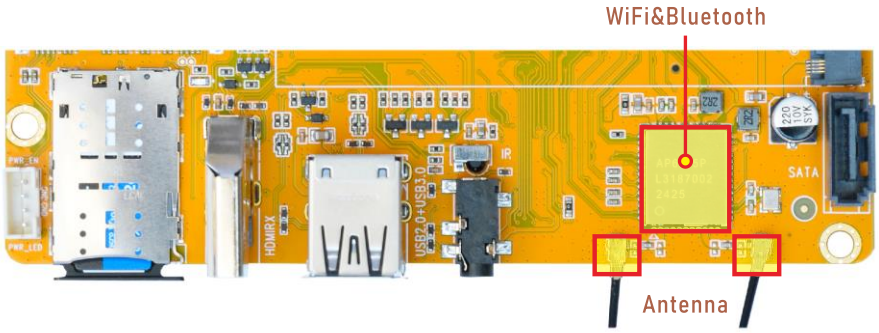

**Step 2**: After connecting the sata drive, the device will automatically mount, and it can be accessed directly through the **Explorer** app.





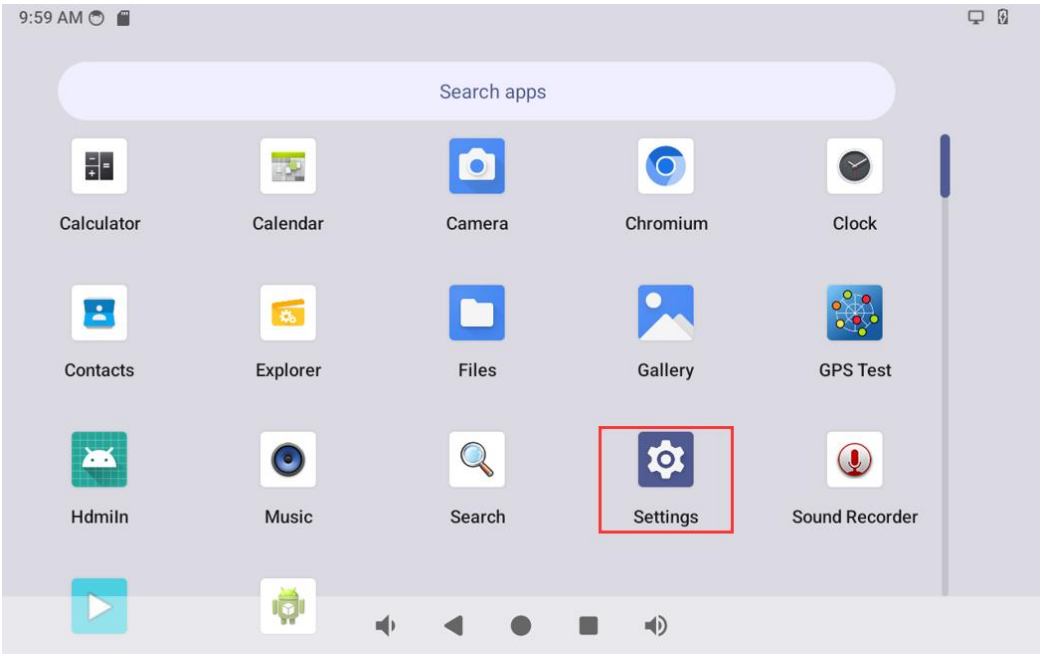

# 6.9 WiFi & Bluetooth

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

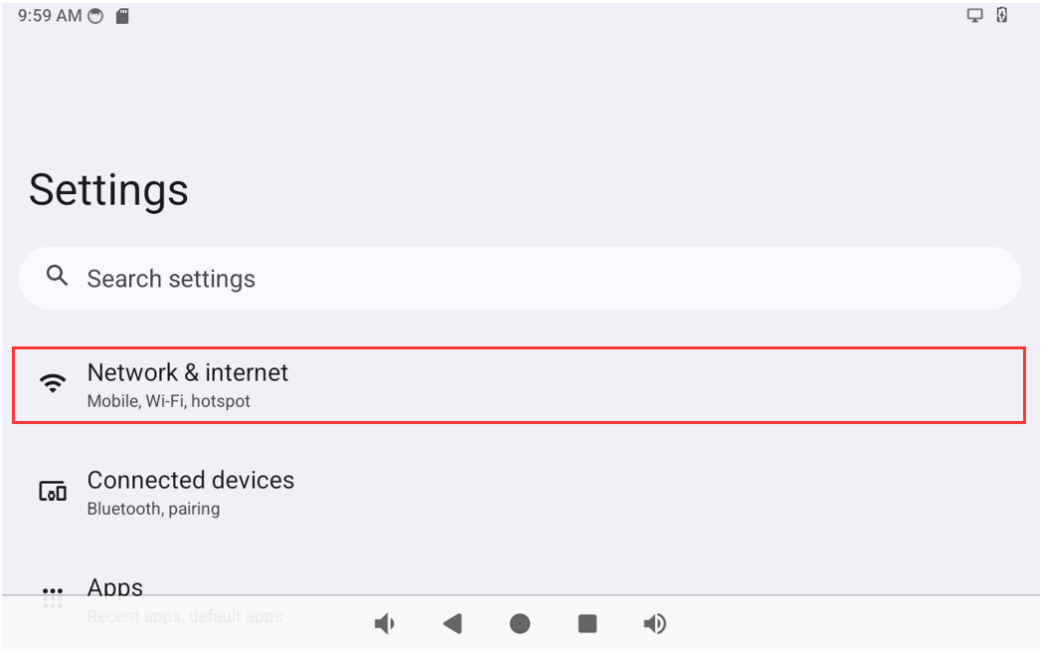



## 6.9.1 WiFi test

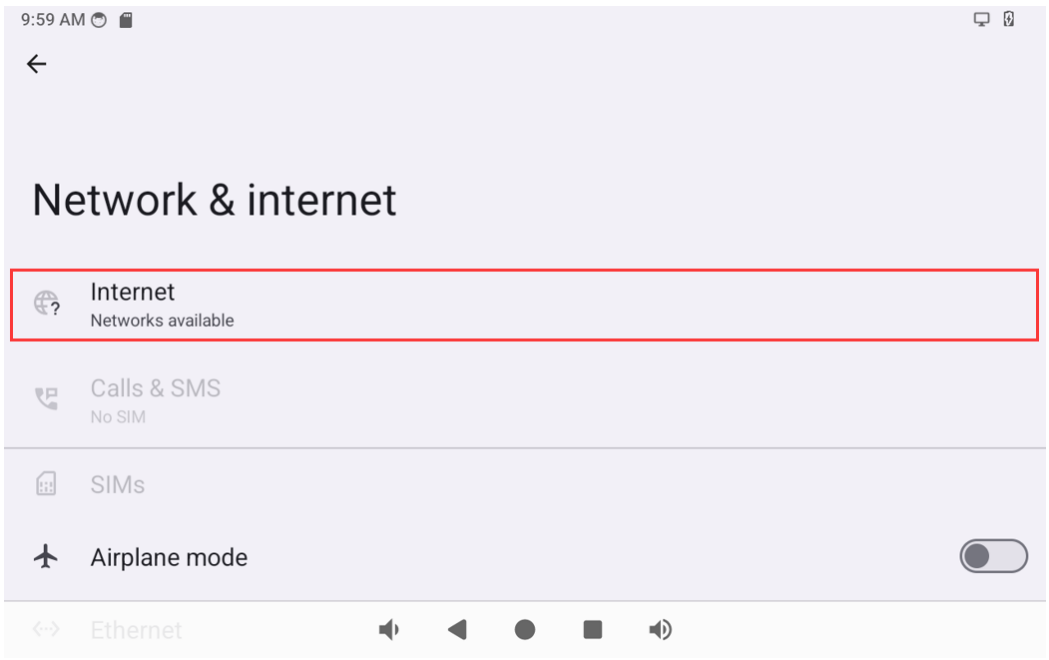
**Step 1**: Open the **Settings** app：



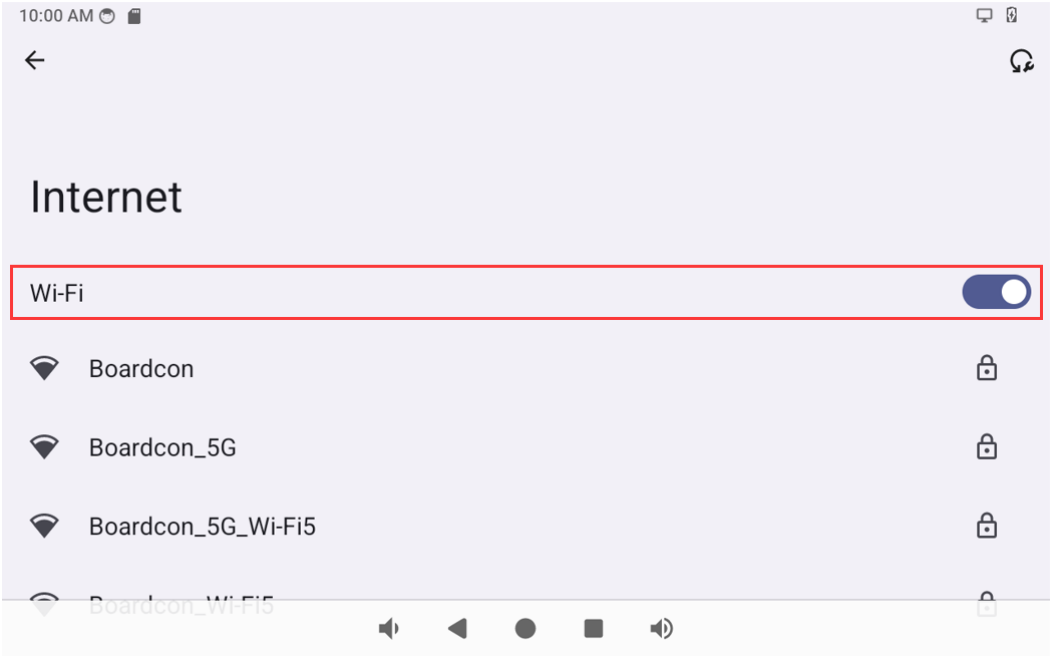

**Step 2**: Go to **Network & Internet**:




**Step 3**: Tap **Internet**:

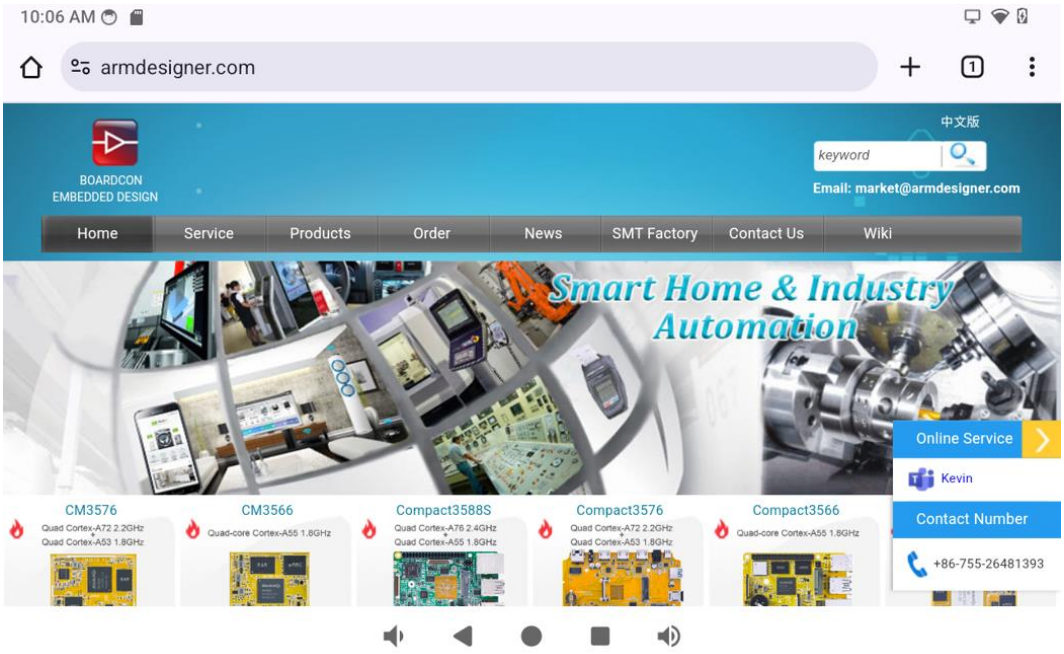



**Step 4**: Turn on the **Wi-Fi** switch:




**Step 5**: Select an available Wi-Fi hotspot from the list and connect:


**Step 6**: Internet 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.

```
# ifconfig
```

```
console:/ # ifconfig
 wlan0     Link encap:Ethernet  HWaddr 54:78:c9:88:4b:34
          inet addr:192.168.0.47  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::851d:7db4:219d:5435/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:51 errors:0 dropped:27 overruns:0 frame:0
          TX packets:38 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:12076 TX bytes:4280
```

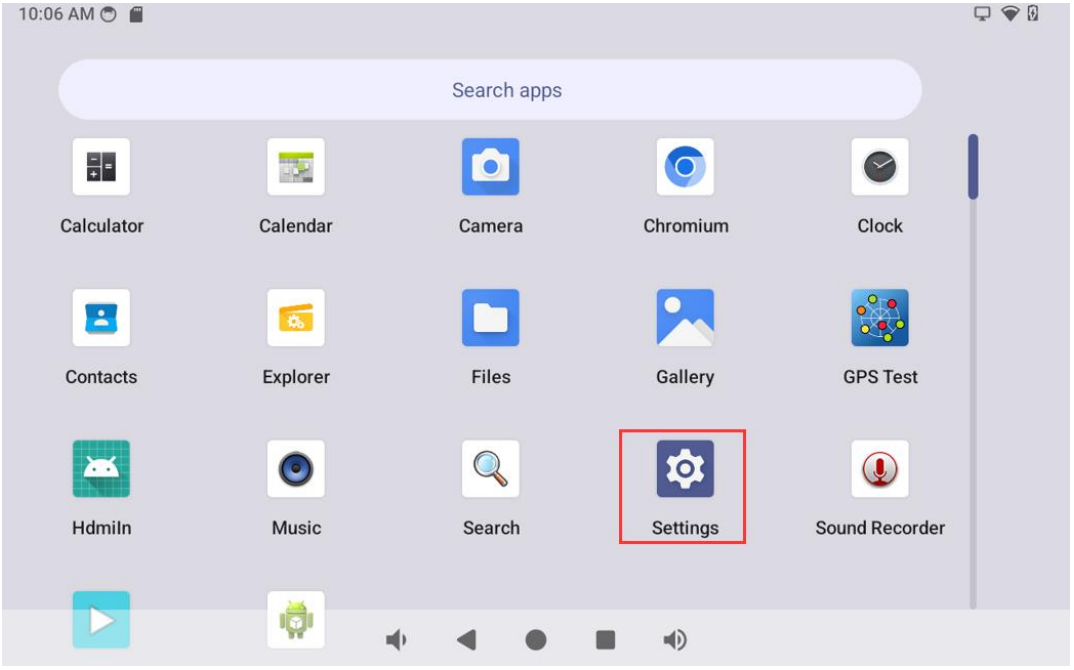
(2) Network connection test.

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

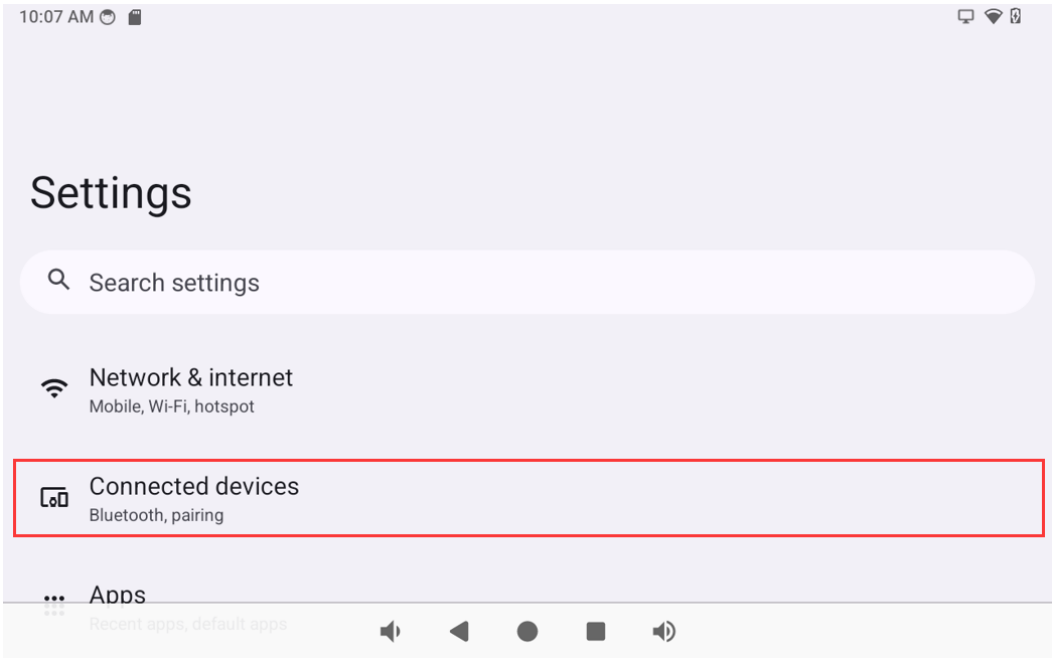
```
console:/ # ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.47 wlan0: 56(84) bytes of data.
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=1 ttl=50 time=198 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=2 ttl=50 time=193 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=3 ttl=50 time=197 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=4 ttl=50 time=200 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=5 ttl=50 time=194 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=6 ttl=50 time=416 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=7 ttl=50 time=197 ms
^C
--- www.armdesigner.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6008ms
rtt min/avg/max/mdev = 193.611/228.356/416.423/76.809 ms
```

## 6.9.2 Bluetooth test

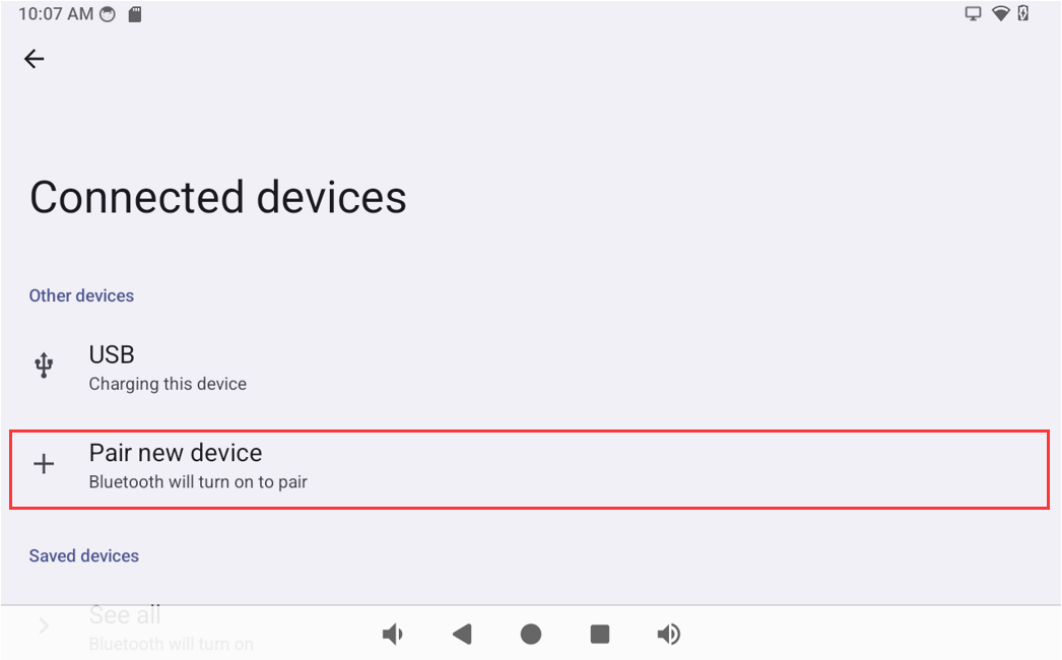
**Step 1**: Open the **Settings** app.



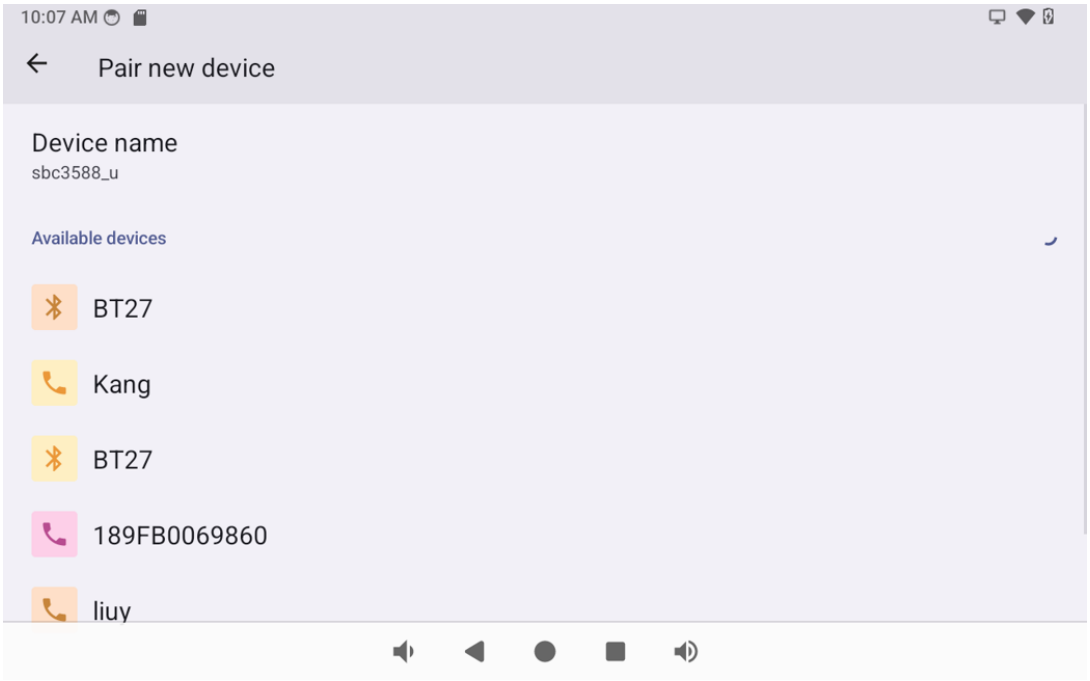

**Step 2**: Click on the option **Connected devices**




**Step 3**: Click on the option **Pair new device.**




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

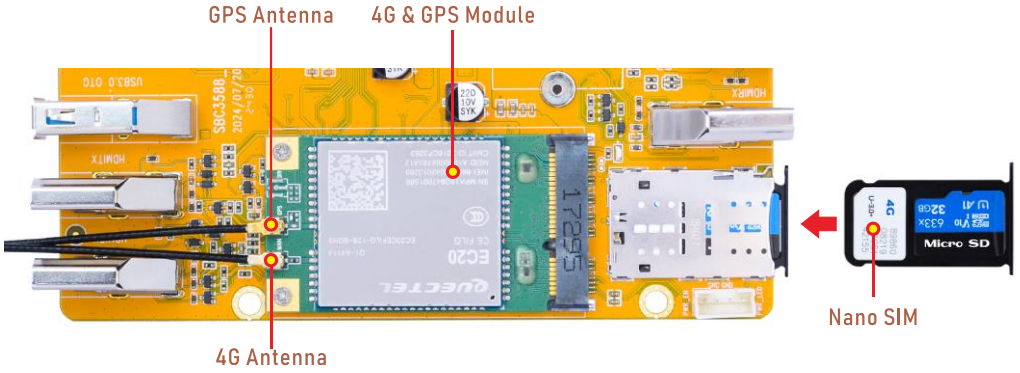



# 6.10 4G & GPS

**Step 1**: Insert 4G module to PCIe socket (4G model: EC20/EC25).

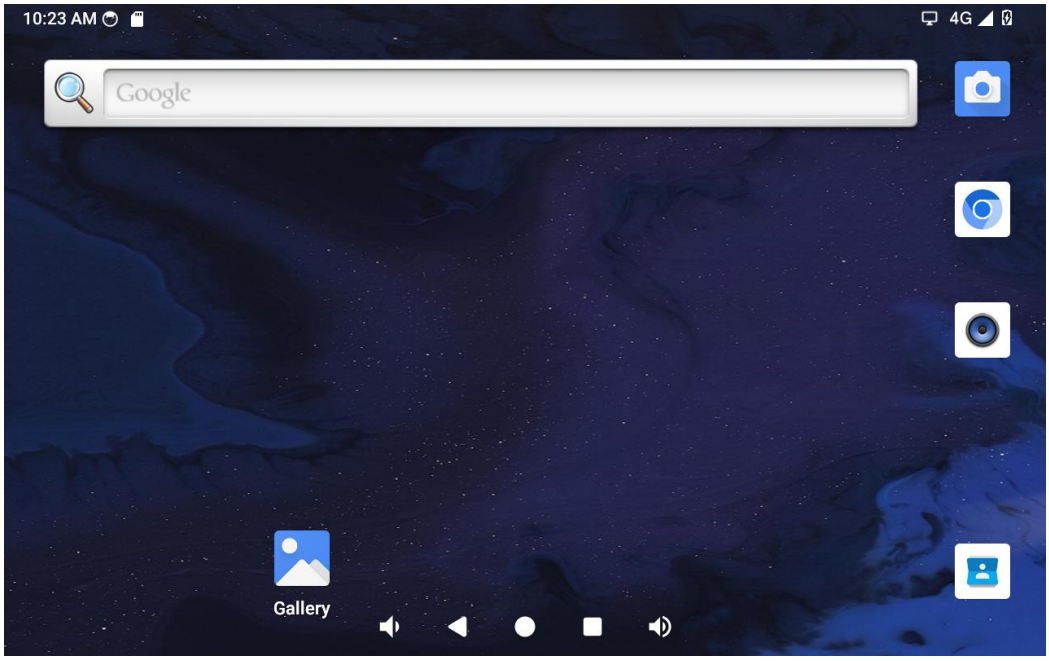
**Step 2**: Connect antenna and insert SIM card.

**Step 3**: Power on.

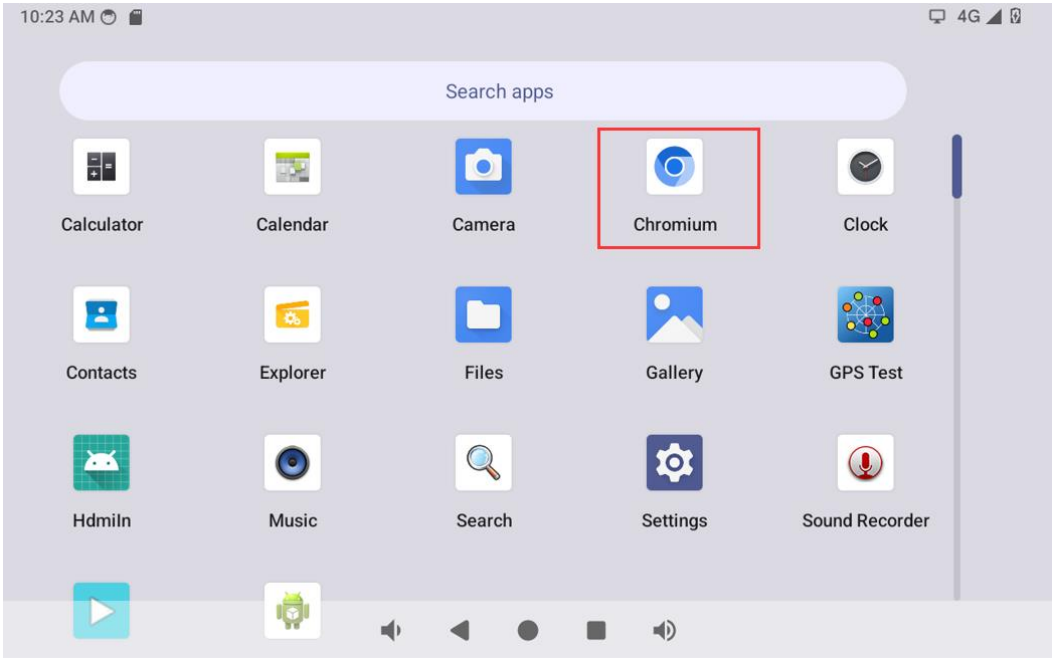


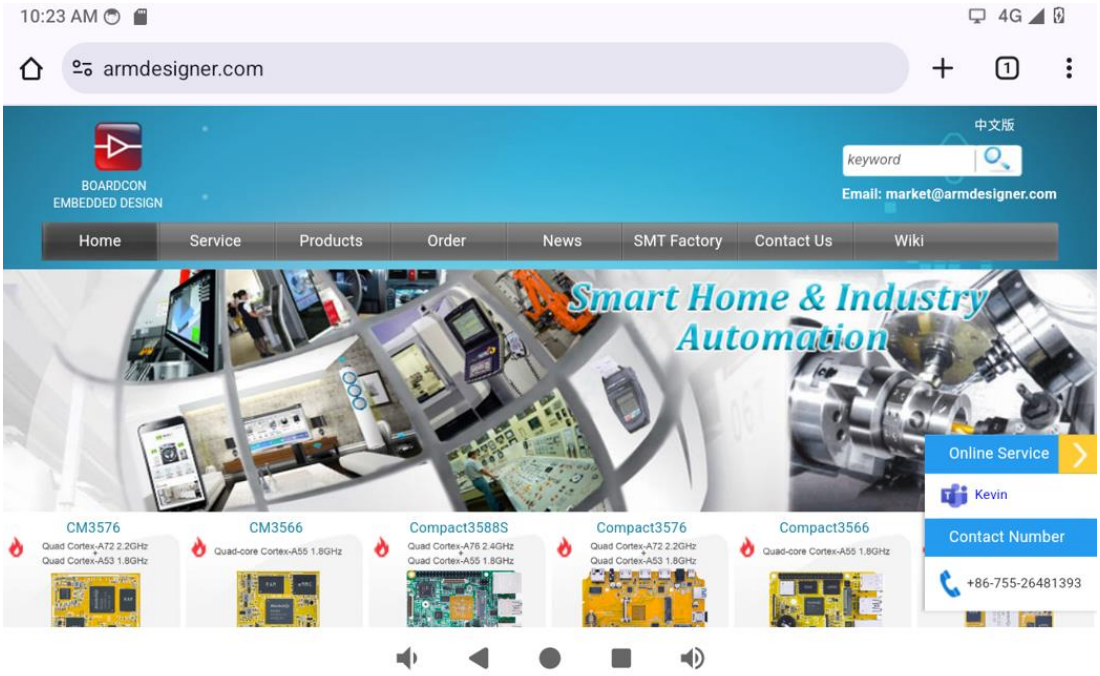

## 6.10.1 4G Test

After boot, the device defaults to 4G mode, and the corresponding icon will appear in the upper right corner of the desktop.




Test the 4G connection:






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

(1) View network interface information.

```
# ifconfig
```

```
console:/ # ifconfig
wwan0     Link encap:Ethernet  HWaddr 2e:09:6a:41:34:64  Driver qmi_wwan_q
          inet addr:10.66.48.99  Mask:255.255.240.0
          inet6 addr: fe80::2c09:6aff:fe41:3464/64 Scope: Link
          UP RUNNING NOARP  MTU:1500  Metric:1
          RX packets:317 errors:0 dropped:0 overruns:0 frame:0
          TX packets:369 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:211782 TX bytes:81353
```

(2) Network connection test.

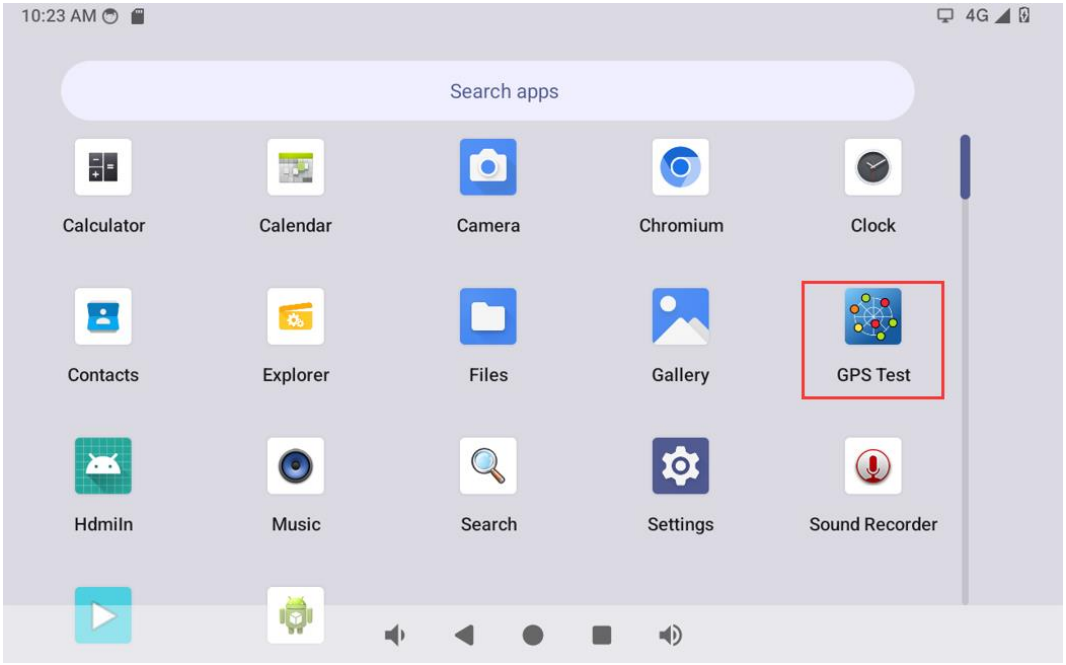
```
# ping -I wwan0 www.armdesigner.com
```

```
console:/ # ping -I wwan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.66.48.99 wwan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=45 time=559 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=45 time=511 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=45 time=284 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=45 time=255 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=45 time=258 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=45 time=337 ms
[  301.022986][   T98] binder: undelivered transaction 118897, process died.
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5005ms
rtt min/avg/max/mdev = 255.895/368.032/559.048/121.994 ms
```

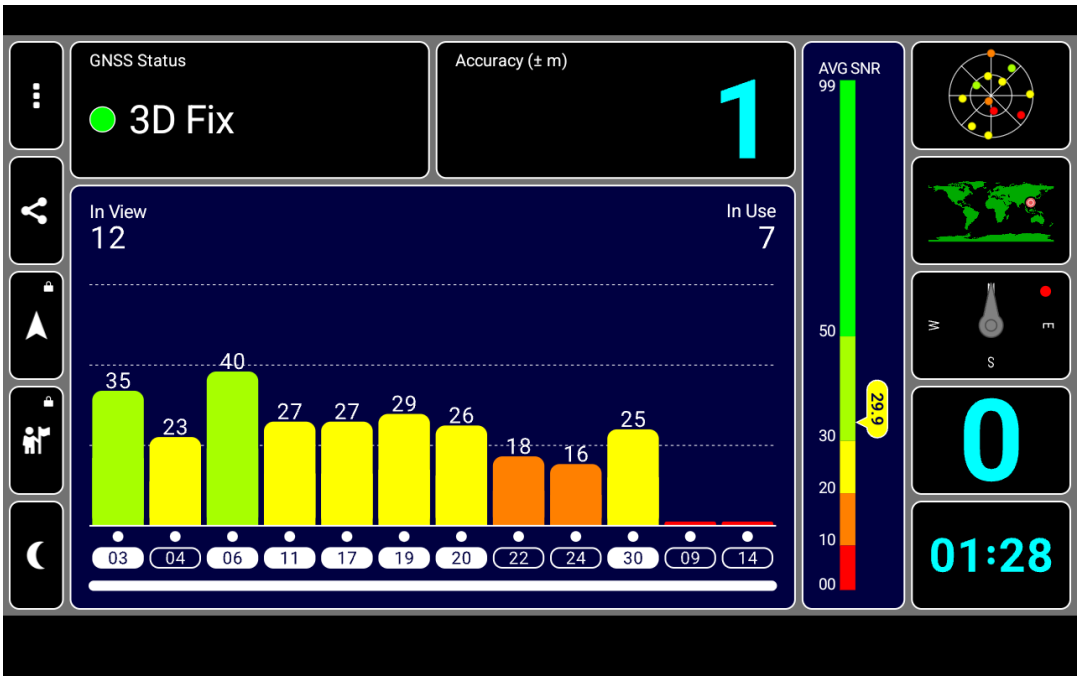
## 6.10.2 GPS Test

GPS positioning needs to be tested in open outdoor areas.

**Step 1**: Open **GPS Test** APP.

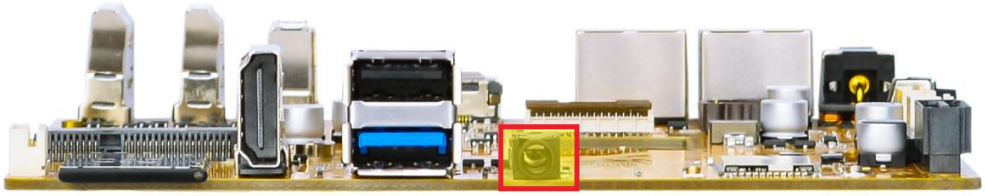



**Step 2**: Wait a moment to successfully obtain the location.

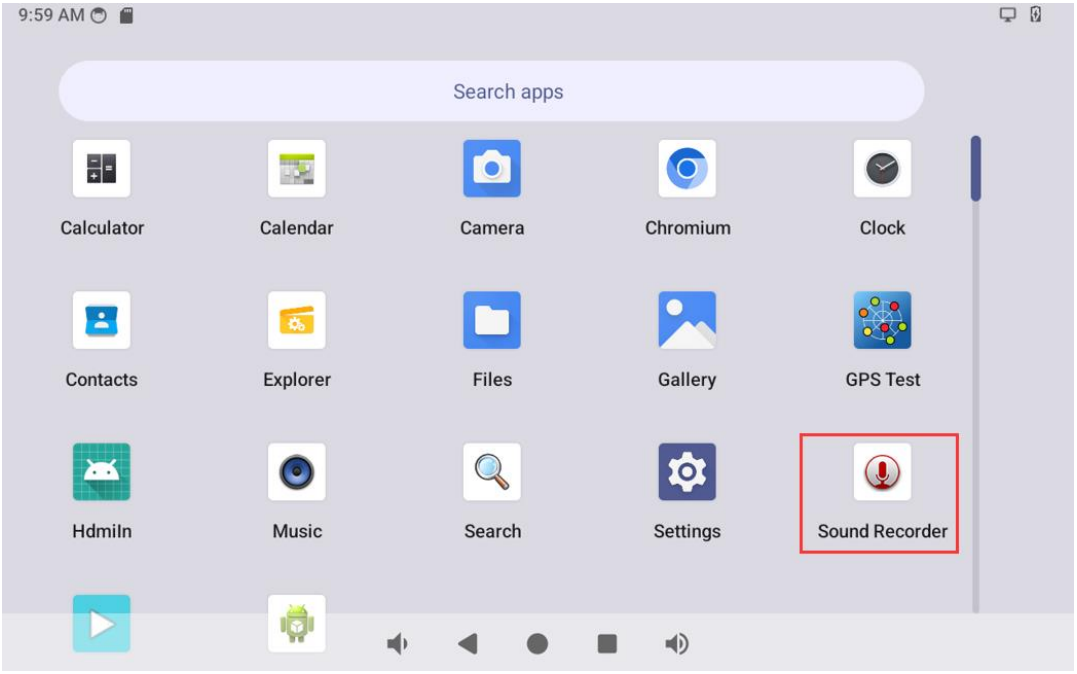


# 6.11 Headset

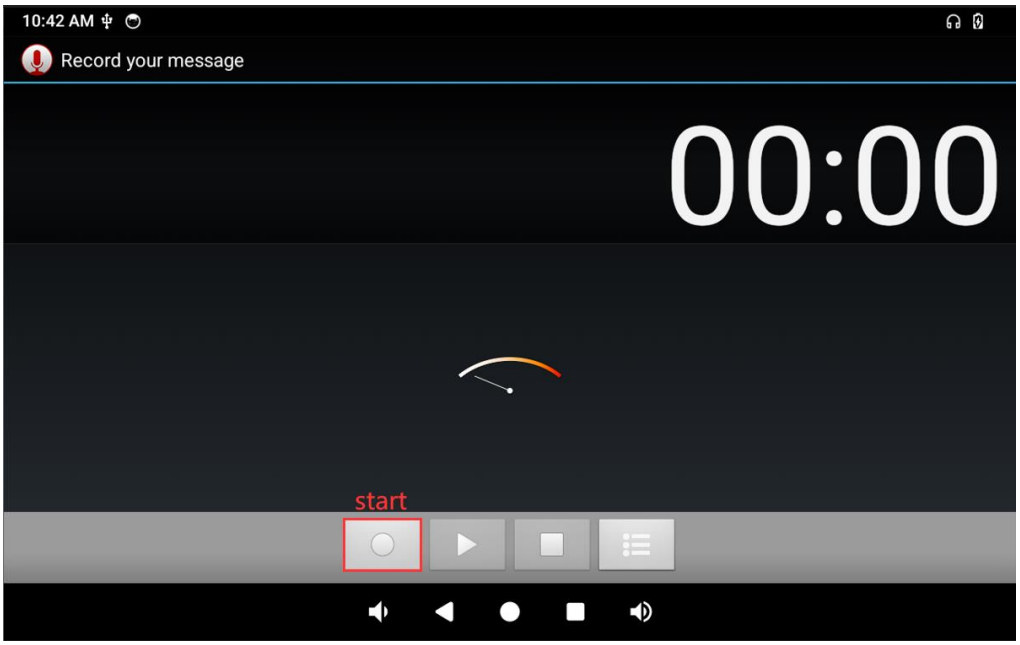
**Step 1**: Plug the headset into the headset jack.



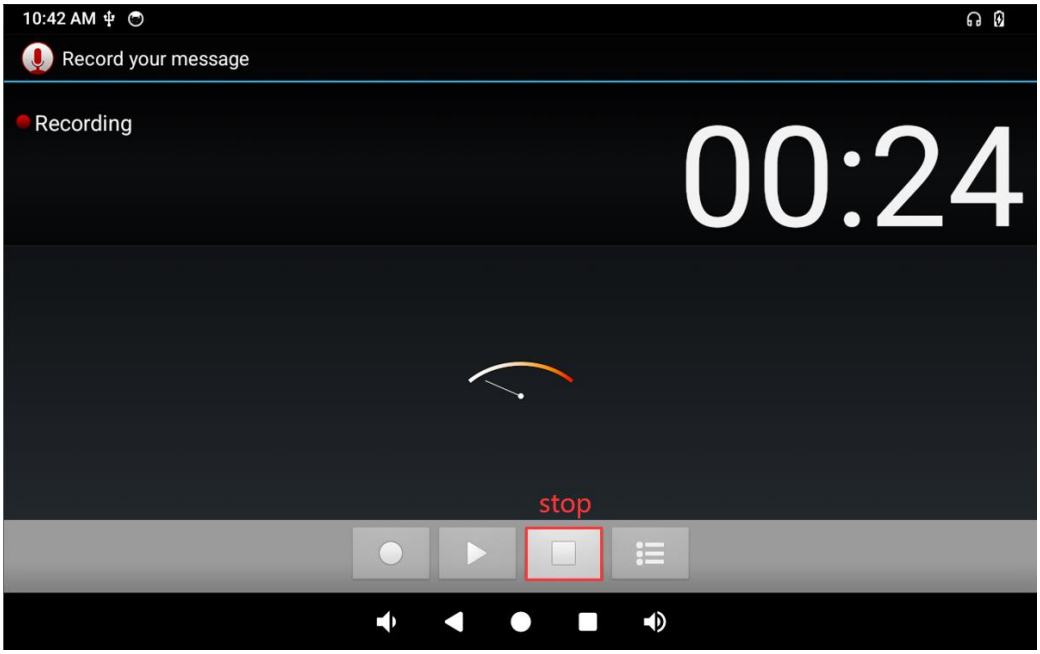

**Step 2**: Open the **Sound Recorder** app.



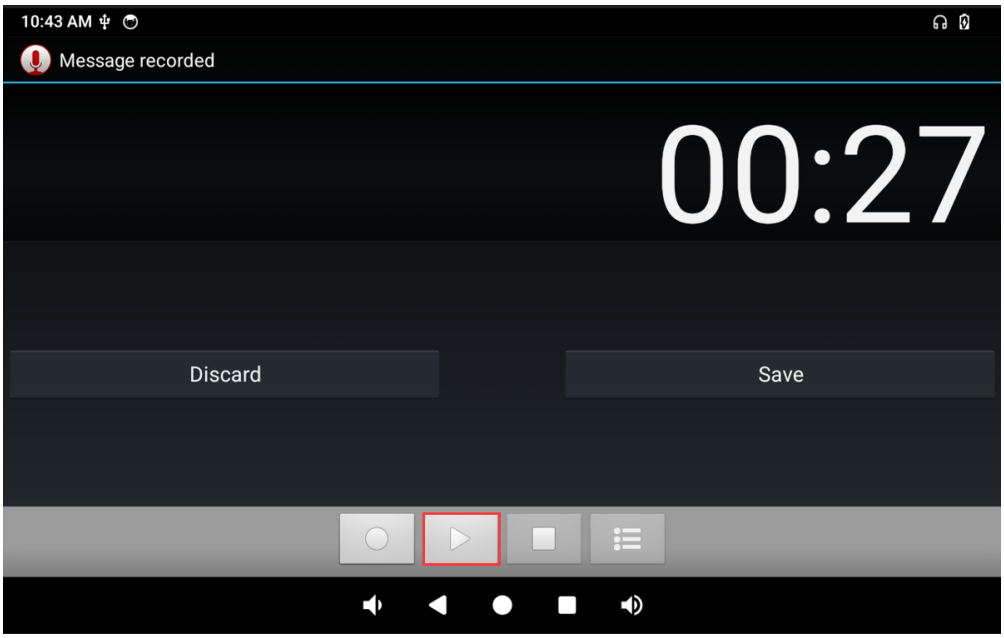

**Step 3**: Click the following button to start recording.




**Step 4**: Click the following button to stop recording.

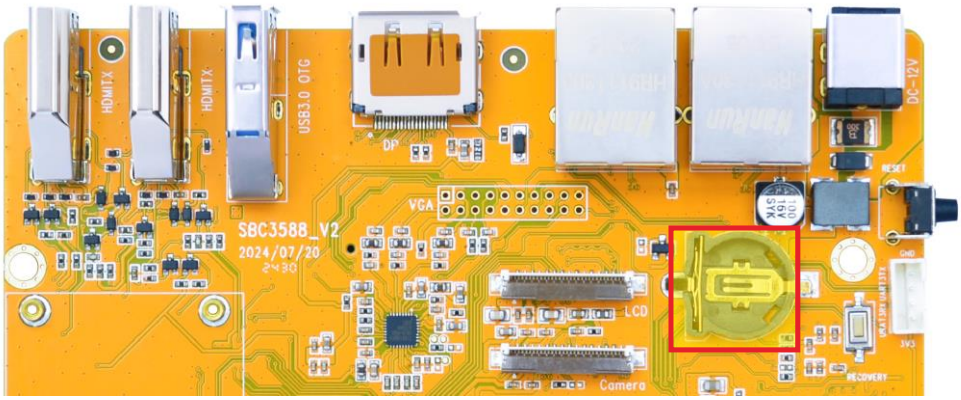



**Step 5**: Click the following button to play back the recording.




# 6.12 RTC

**Step 1**: Install the coin cell battery.




**Step 2**: Set the system time.

```
# date -s "2025-08-05 18:48:00"
```

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

```
# hwclock -w
```

**Step 4**: Display the current hardware clock time.

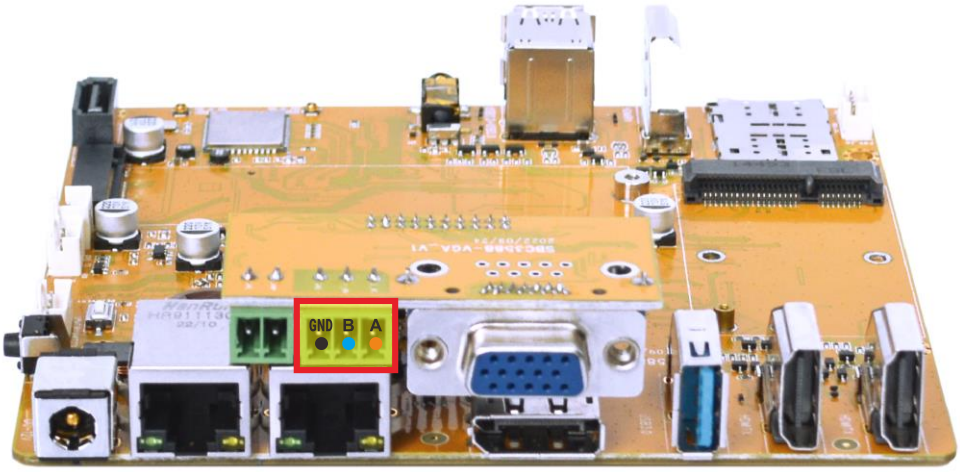
```
# hwclock
```

```
console:/ # date -s "2025-08-05 18:48:00"
Tue Aug  5 18:48:00 GMT 2025
console:/ # hwclock -w
console:/ # hwclock
2025-08-05 18:48:08+0000
console:/ # hwclock
2025-08-05 18:48:16+0000
console:/ # hwclock
2025-08-05 18:48:27+0000
```

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

```
console:/ # hwclock
2025-08-05 19:43:49+0000
console:/ # hwclock
2025-08-05 19:44:09+0000
console:/ # hwclock
2025-08-05 19:44:37+0000
console:/ # hwclock
2025-08-05 19:44:51+0000
```

# 6.13 RS485

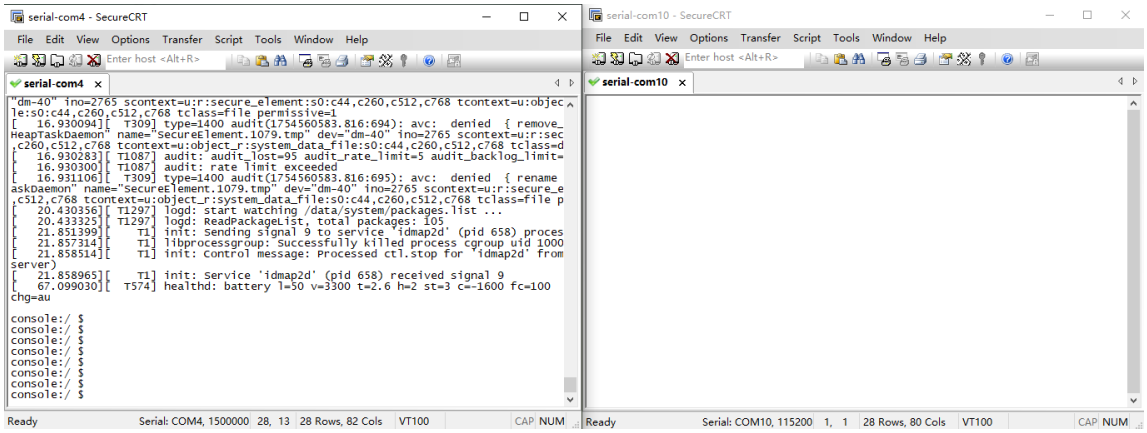



RS485

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

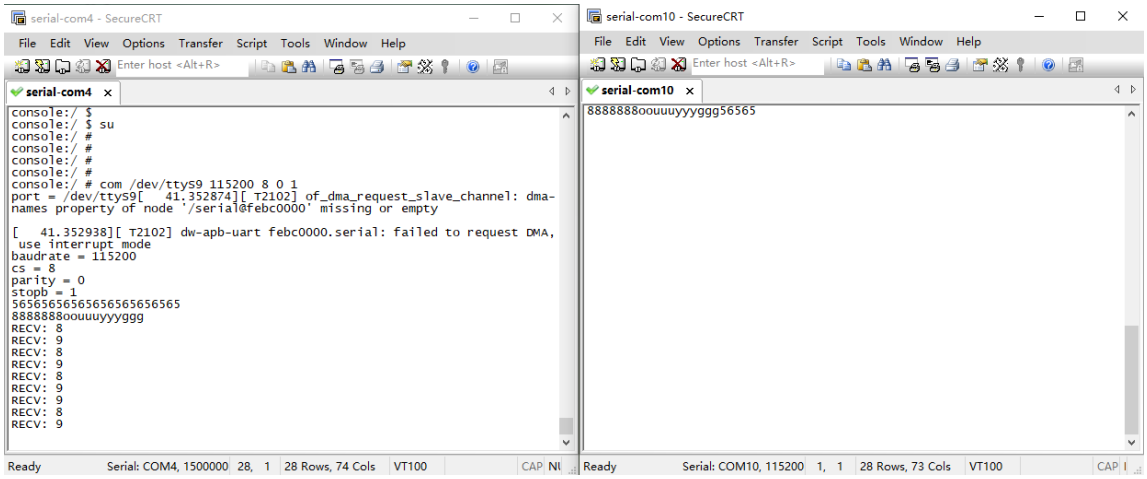

**Step 2**: Open the corresponding serial terminal, set the baud rate of the board to 1500000,

and set the baud rate of the RS485 test tool to 115200.

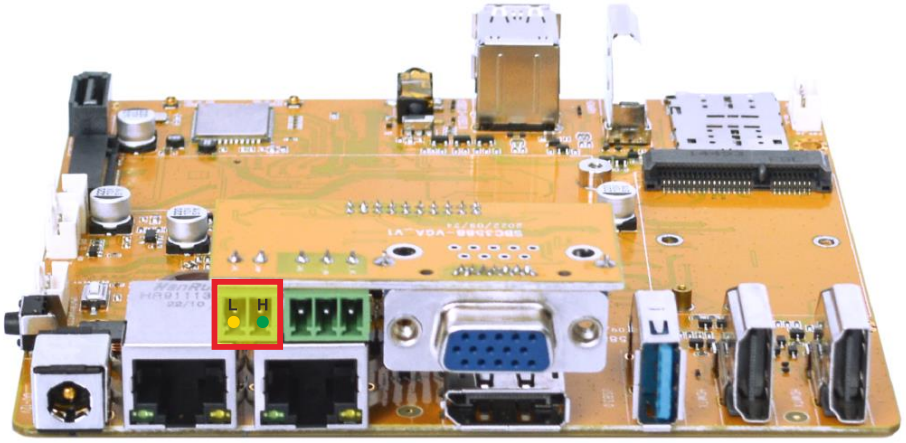



**Step 3**: Execute the following command on the board to test the RS485 transmission and reception functionality.

```
# com /dev/ttyS9 115200 8 0 1
```



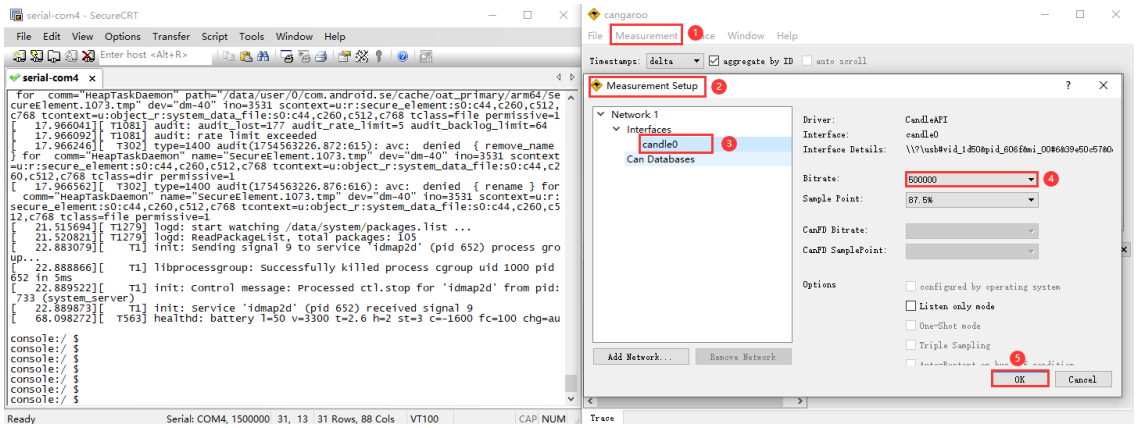
# 6.14 CAN




CAN

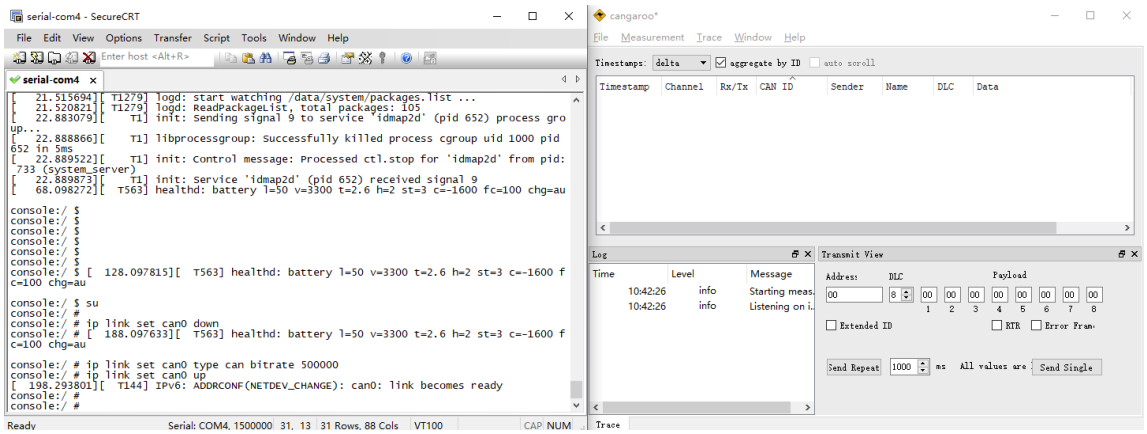
**Step 1**: Connect the CAN test tool to the board as shown in the diagram below.


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



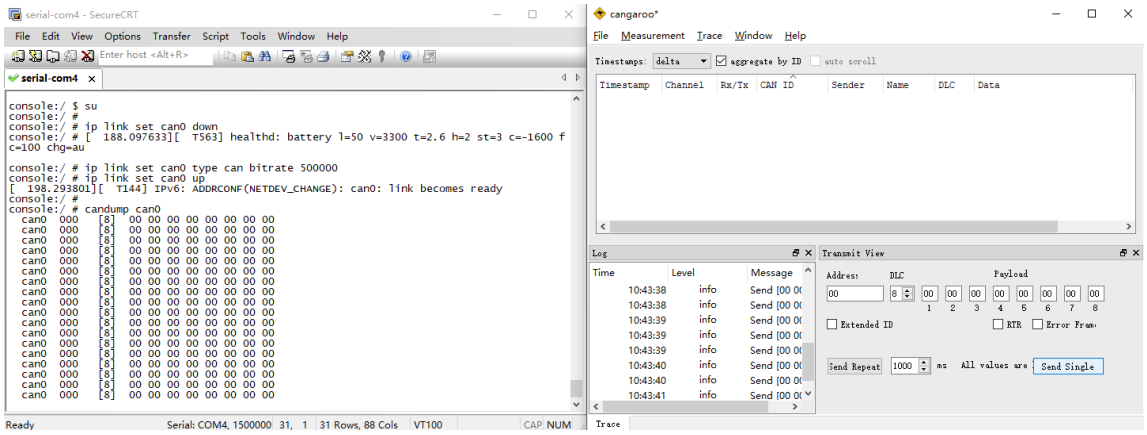

**Step 3**: Configure and activate the CAN network, setting the bitrate to 500000.

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



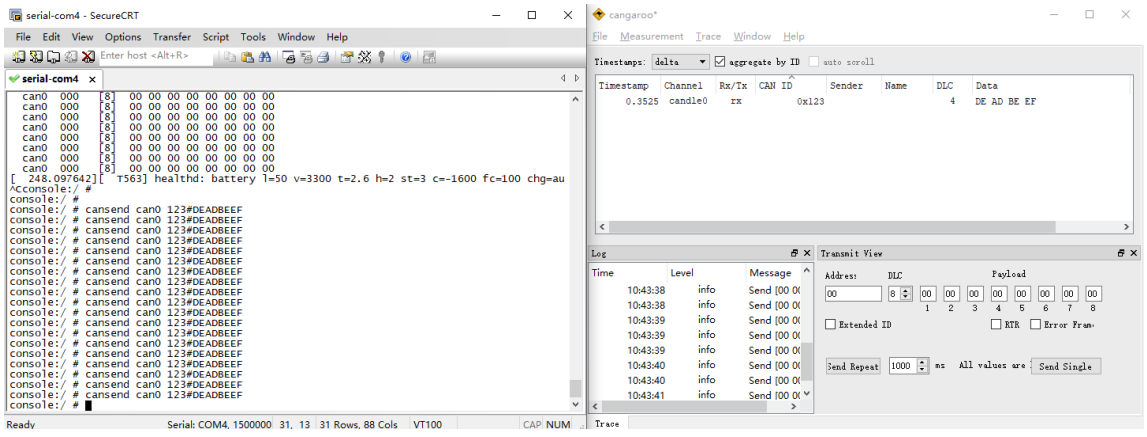

**Step 4**: Configure CAN as the receiver.

```
# candump can0
```



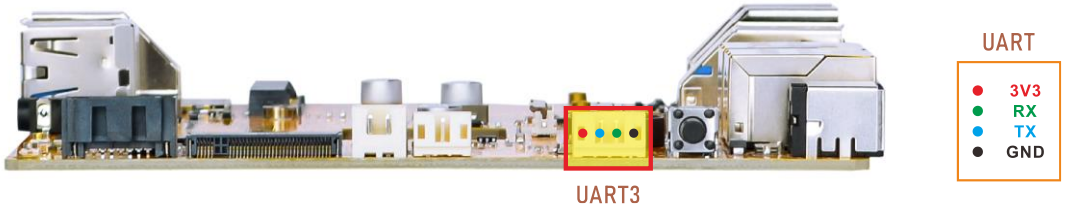

**Step 5**: Configure CAN as the sender.

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



# 6.15 RS232

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



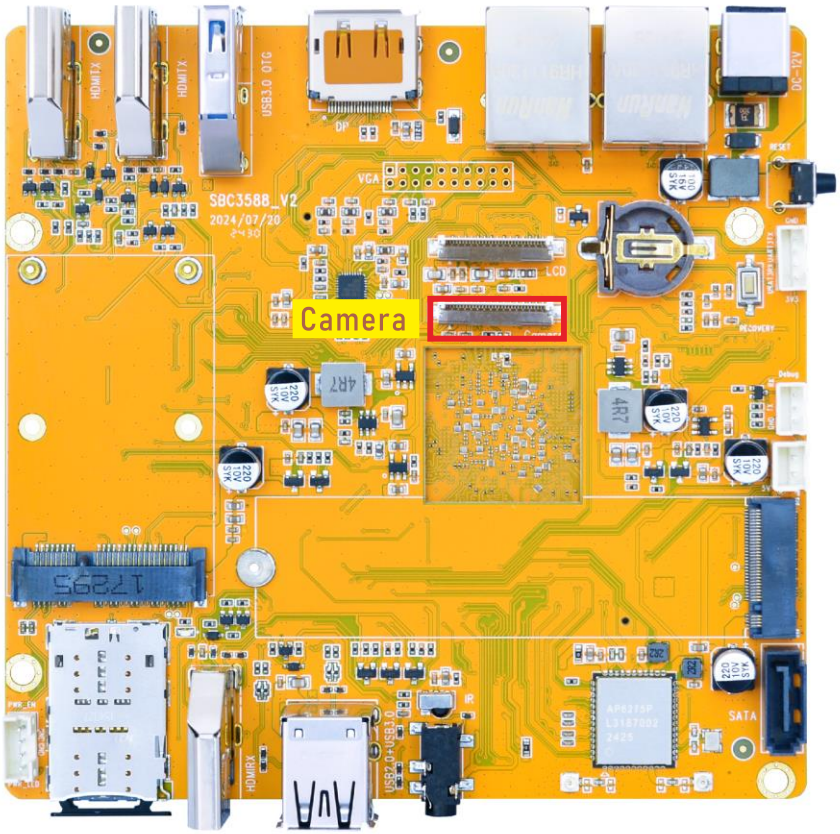

**Step 2**: RS232 test.

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

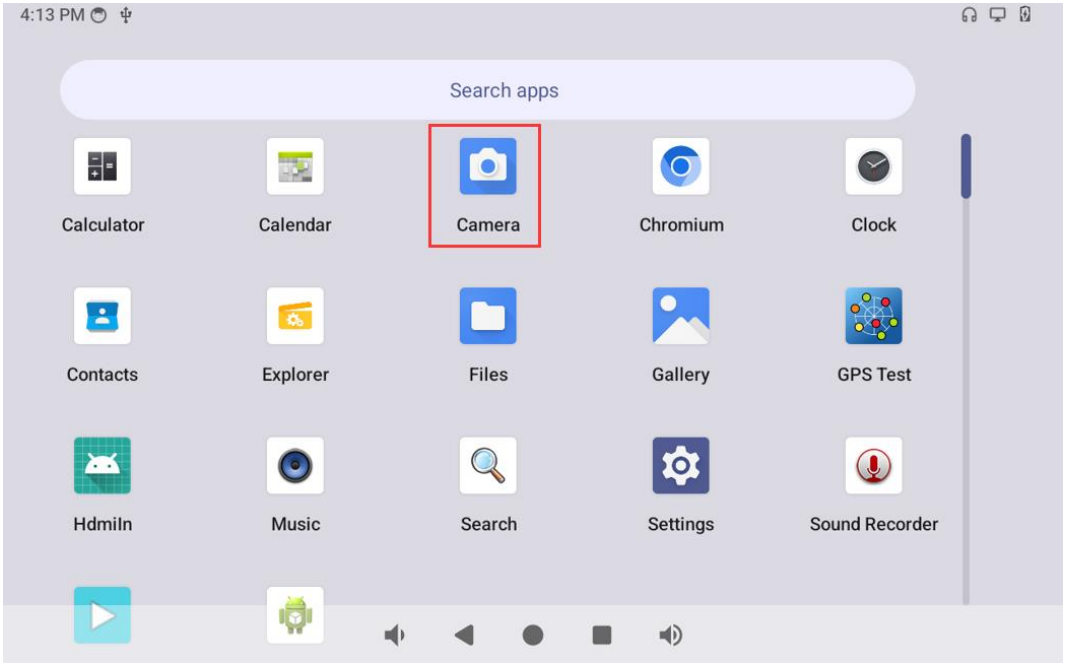
```
130|console:/ # com /dev/ttyS3 115200 8 0 1
port = /dev/ttyS3
baudrate = 115200
cs = 8
parity = 0
stopb = 1
hhhhhhhhh
RECV: hhhhhhhhh
opopopopopo
RECV: opopopopopo
89898hjhjhj
RECV: 89898hjhjhj
iiiiiii
RECV: iiiiiii
iii
RECV: iii
tttyt00
RECV: tttyt00
```

# 6.16 Camera

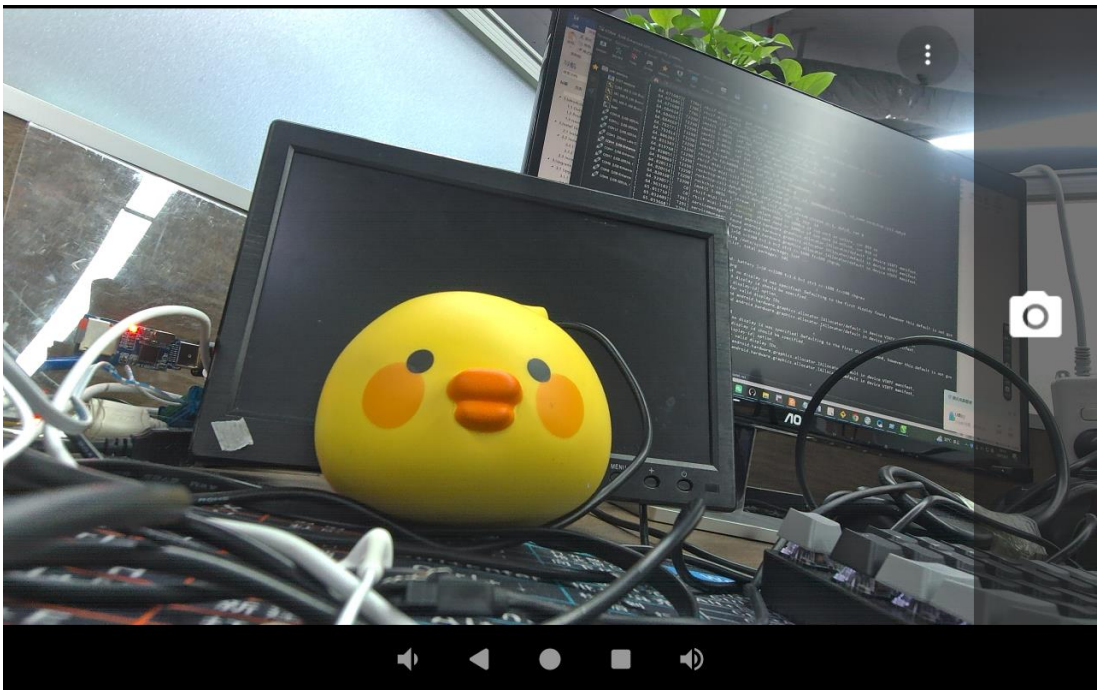
**Step 1**: Connect the camera (IMX415), and then power on the board.



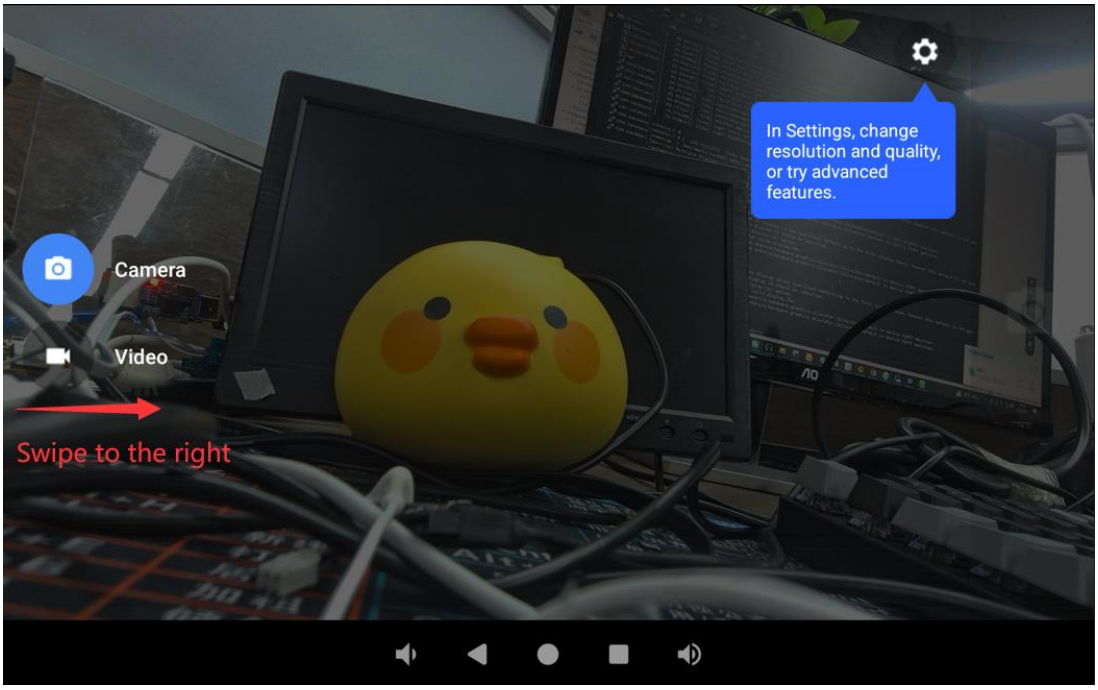

**Step 2**: Open the **Camera** app.

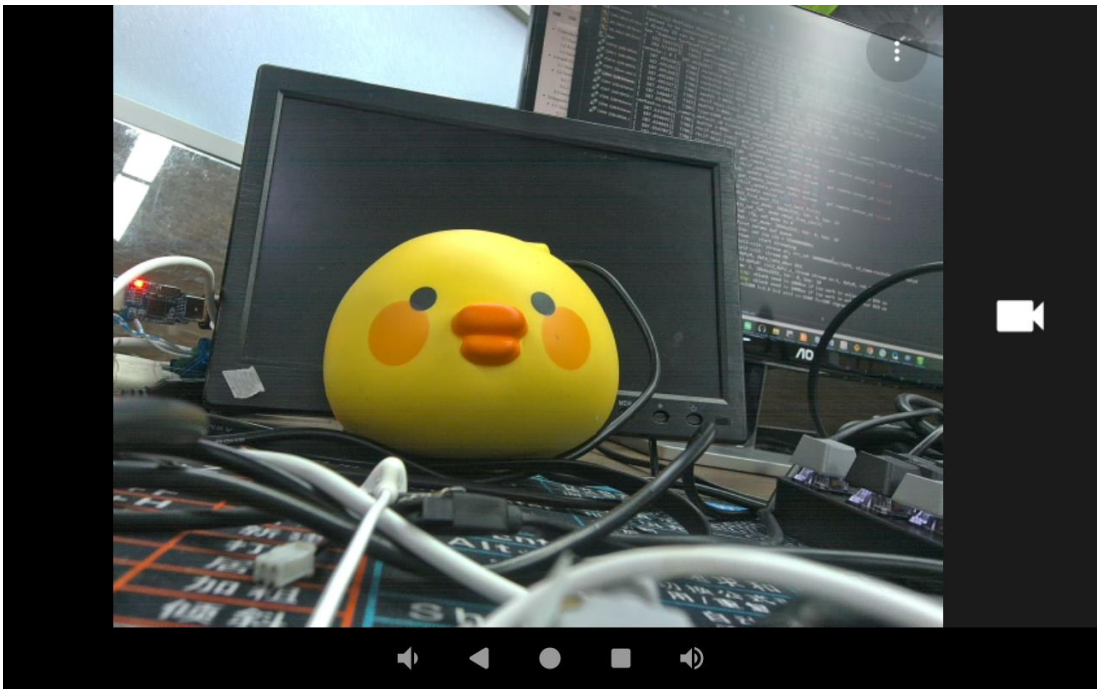



**Step 3**: Default photo mode.

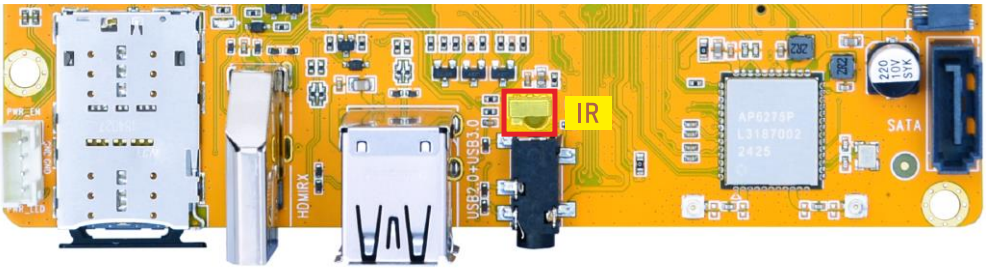


**Step 4**: Switch to video recording mode.





# 6.17 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.

```
130|console:/ #
/sys/module/rockchip_pwm_remotectl/parameters/code_print                    <
console:/ # [  665.572857][    C1] USERCODE=0x1818
[  665.599986][    C1] RMC_GETDATA=e4
[  665.888749][    C1] USERCODE=0x1818
[  665.915886][    C1] RMC_GETDATA=e4
[  666.176718][    C1] USERCODE=0x1818
[  666.203853][    C1] RMC_GETDATA=e4
[  666.456843][    C1] USERCODE=0x1818
[  666.483978][    C1] RMC_GETDATA=e4
[  666.964738][    C1] USERCODE=0x1818
[  666.991872][    C1] RMC_GETDATA=99
[  667.244938][    C1] USERCODE=0x1818
[  667.272071][    C1] RMC_GETDATA=98
[  667.669519][    C1] USERCODE=0x1818
[  667.696650][    C1] RMC_GETDATA=9b
[  668.084776][    C1] USERCODE=0x1818
 [  668.111957][    C1] RMC_GETDATA=e6
[  670.001191][    C1] USERCODE=0x1818
[  670.028296][    C1] RMC_GETDATA=99
```