EM3566 Linux6.1 User Manual

V1.0

Boardcon Embedded Designer

Overview

The content of this document is intended solely for the EM3566 development board, aiming to help users quickly understand, apply, and test the EM3566 development board.

System Support

Development Board	Debian12	Buildroot
CM3566 V3.0 EM3566-V3	Y	Y

Revision History

Version	Date	Author	Revision History
V1.0	2025-03-21	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.

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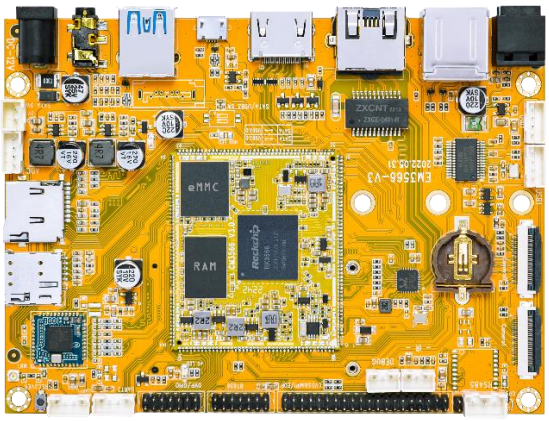
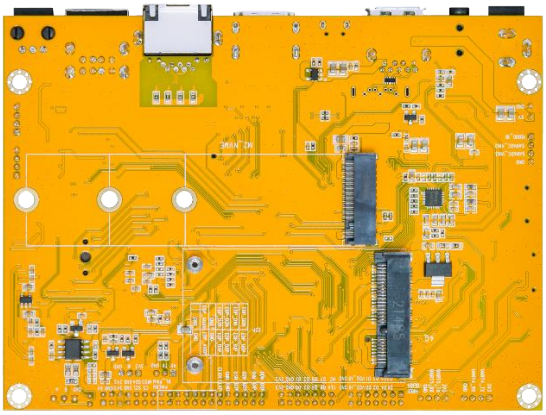
Content

1.Introduction

1.1 Overview

The EM3566 development board is powered by the RK3566 quad-core ARM Cortex-A55 processor and adopts Boardcon's CM3566 core board solution. It delivers low power consumption and high performance, making it ideal for mobile internet and AIoT applications. It supports 4K@60fps H.264/H.265 decoding, 1080p@60fps encoding, and high-quality JPEG codec, with a high-performance GPU for advanced multimedia processing. The board integrates a wide range of interfaces, including 4K display, Ethernet, Wi-Fi, Bluetooth, USB 3.0, and 4G modules, enabling flexible development.





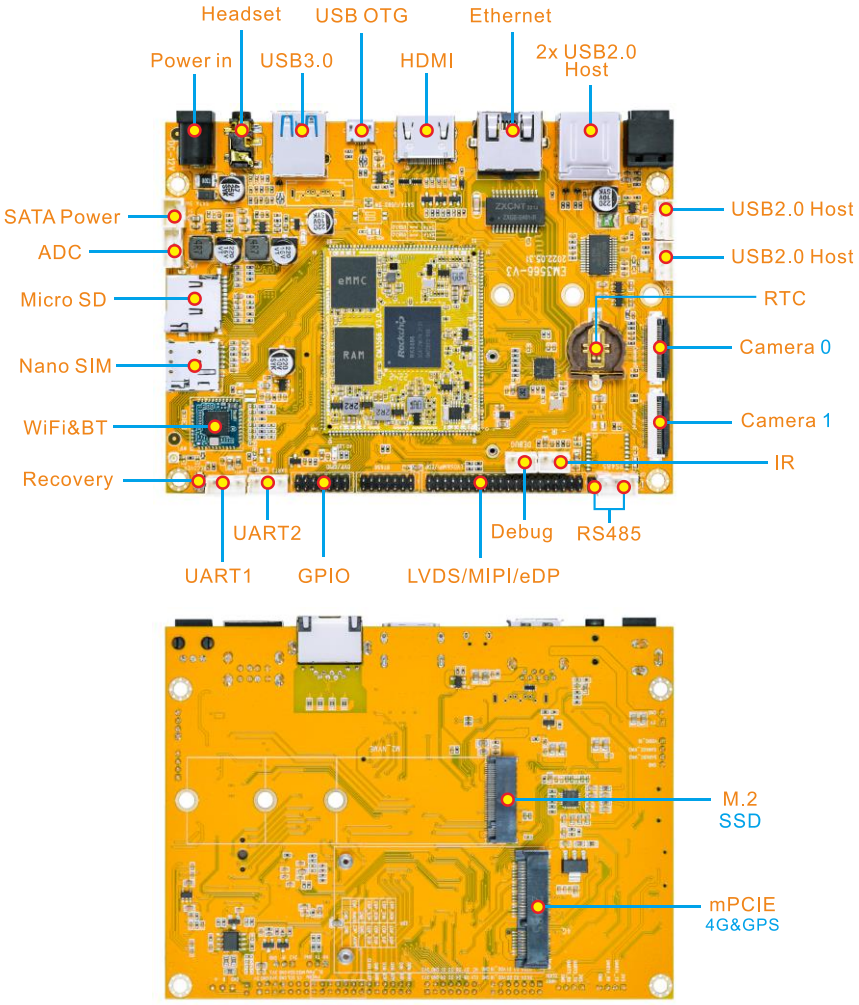
1.2 Product Parameters

Basic Parameters	
SOC	• RK3566
CPU	• Quad-core 64-bit ARM Cortex-A55@ up to 1.8GHz
GPU	• OpenCL 2.0 • OpenGLES 1.1/2.0/3.2 • Vulkan 1.1
NPU	• 1 TOPS AI computing power • Supports int8/int16/fp16/bfp16 MAC operations

Video	Decoder	• Support 4096x2306@60fps H.265/H.264/VP9 video decoding • Support 1920x1088@60fps VP8/VC1/MPEG-4,2,1 video decoding • Support 720x576@60fps H.263 video decoding
	Encoder	• Support 1080P@60fps H.265/H.264 video encoding • Support YUV/RGB video source with rotation and mirror
RAM		• 2GB LPDDR4X (up to 8GB)
ROM		• 8GB eMMC (up to 64GB)
Support system		Android, Debian, Buildroot
Hardware Parameters		
Extended Storage		• Support M.2 PCIe NVME SSD • Support MicroSD Card
Display		• Support HDMI TX 4K@60fps display • Support LVDS display
Audio		• Support HDMI TX audio output • Support Headphone output/input
USB		• Support USB3.0 • Support 4x USB2.0
Network		• Support Gigabit Ethernet • Support WIFI/BT module • Support 4G module
Camera		• Support 1x Camera (ov13850)
Peripheral communication		• Support RS485 • Support 2xUART
Other parameters		Support Debug, IR, RTC, OTG.
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	47.0mm x 40.0mm
Motherboard dimensions	135.0mm x 95.0mm

1.3 Hardware Interface Introduction



Interface parameters	
Power in	12V DC power input interface
Headset	Headset output/input
USB3.0	USB3.0 Host interface
USB OTG	OTG download interface
HDMI	HDMI TX interface
Ethernet	Gigabit Ethernet RJ45 interface
2xUSB2.0 Host	Dual-layer USB2.0 HOST interface
USB2.0 Host	USB2.0 HOST interface
USB2.0 Host	USB2.0 HOST interface
RTC	RTC coin cell connector
Camera0	MIPI camera interface
Camera1	MIPI camera interface
IR	IR interface
RS485	RS485 communication interface
Debug	UART2, debug the serial port
LVDS/MIPI/eDP	LVDS/MIPI/eDP screen display interface
GPIO	GPIO extension interface
UART2	UART5,TTL level interface
UART1	UART4,TTL level interface
Recover	Recovery key
WIFI&BT	Realtek RTL8723DS module
Nano SIM	Nano SIM card port
Micro SD	MicroSD card slot
ADC	ADC interface
SATA Power	SATA power interface(5V)

M.2 SSD	M.2 SSD interface
mPCIE 4G&GPS	4G module interface

2.Install Drivers and Tool

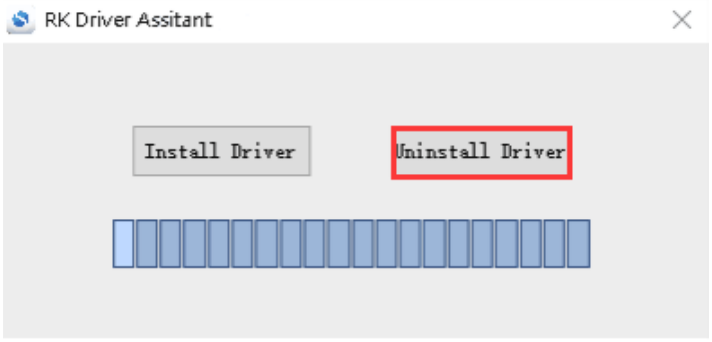
To download firmware and debug in the terminal, the following drivers and software need to be installed (for Windows computers):

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

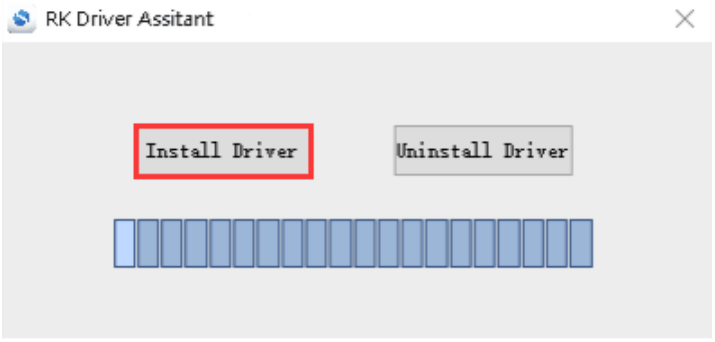
2.1 Install RK Driver Assitant

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

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

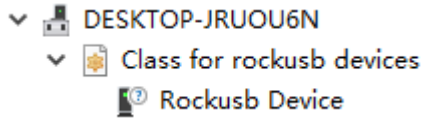


Step 3: Click button **"Install Driver"** to install.

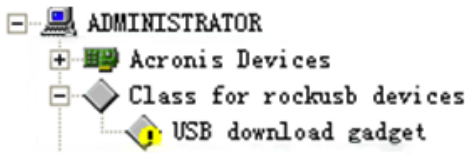


Step 4: After the installation is complete, connect the board and PC with Micro USB

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.

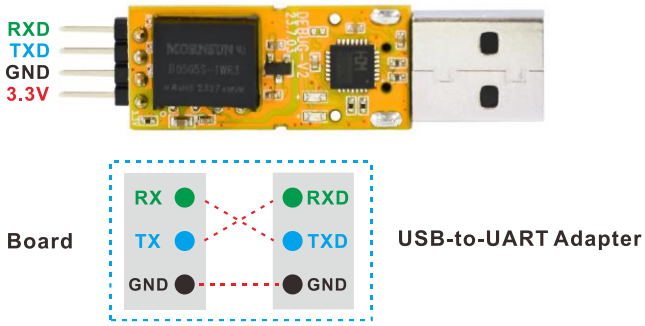


Step 6: The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select: *DriverAssitant_v5.1.1/ADBDriver*.

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.

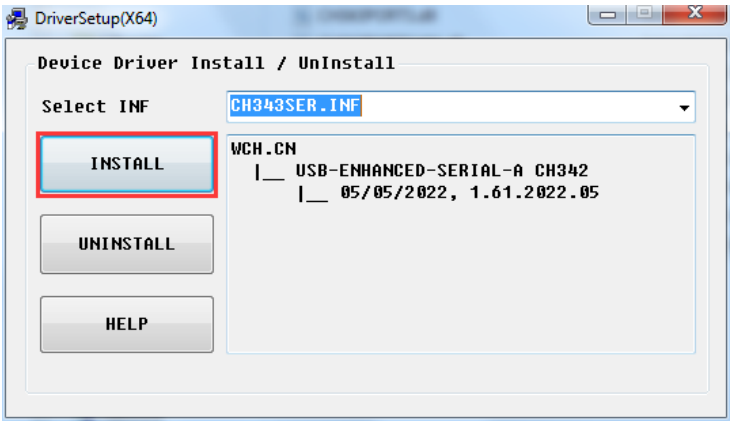
GND	Ground, connect to GND pin of the board.
3V3	No need to connect.

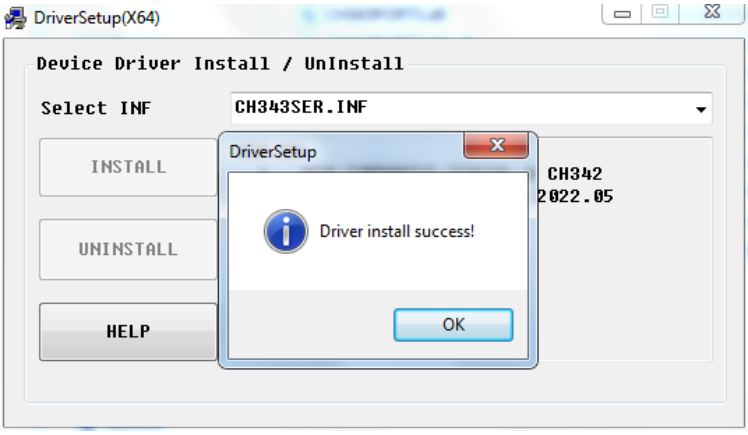
2.2.2 Install Driver

Step 1: Plug the CH9102X Module to the PC

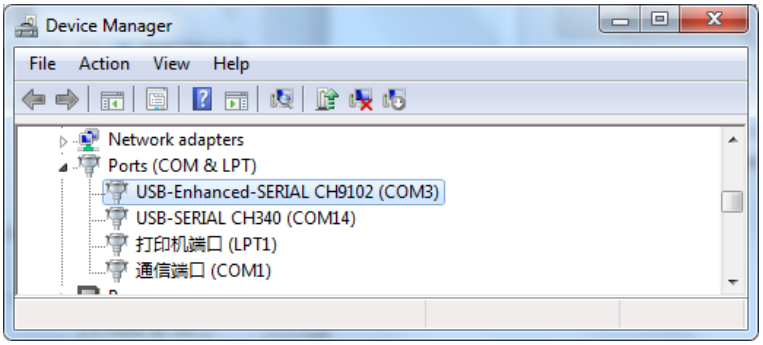
Step 2: Unzip *CH343SER.ZIP* on Windows.

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.

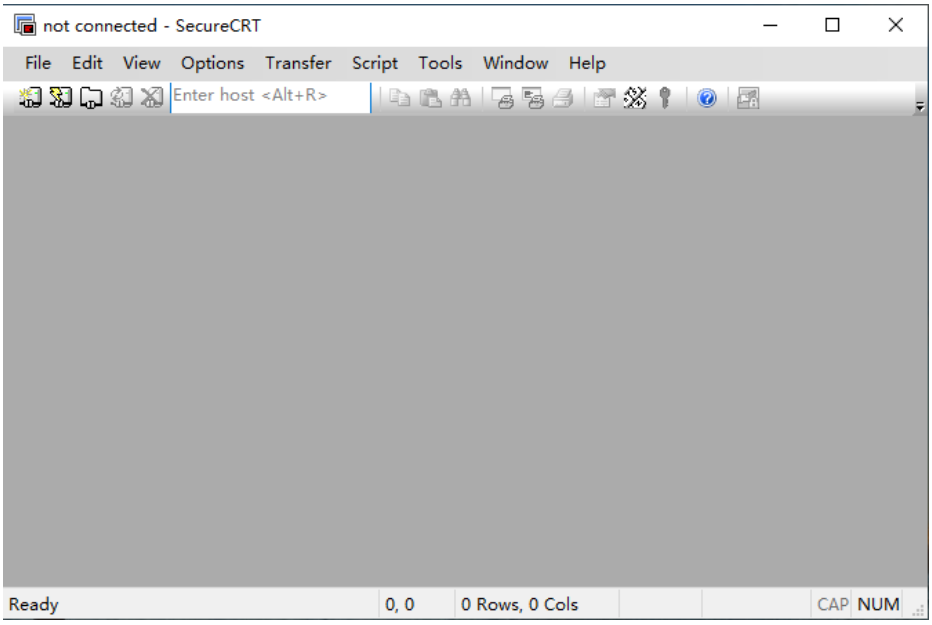


2.3 Install Serial Terminal Tool

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

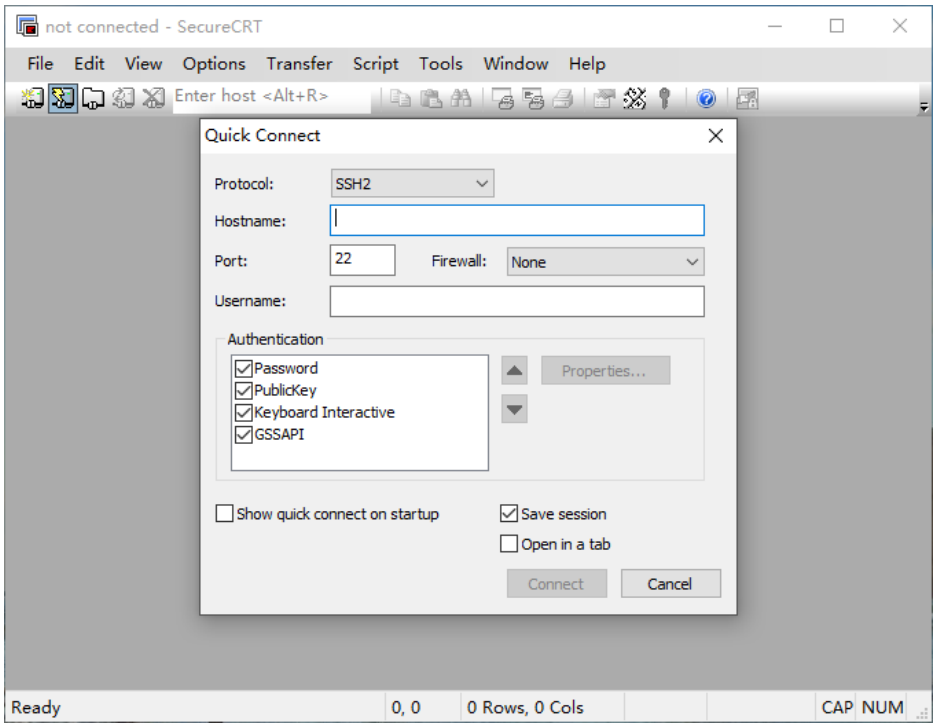
Step 1: Unzip *Platform/SecureCRT.rar* on PC.

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

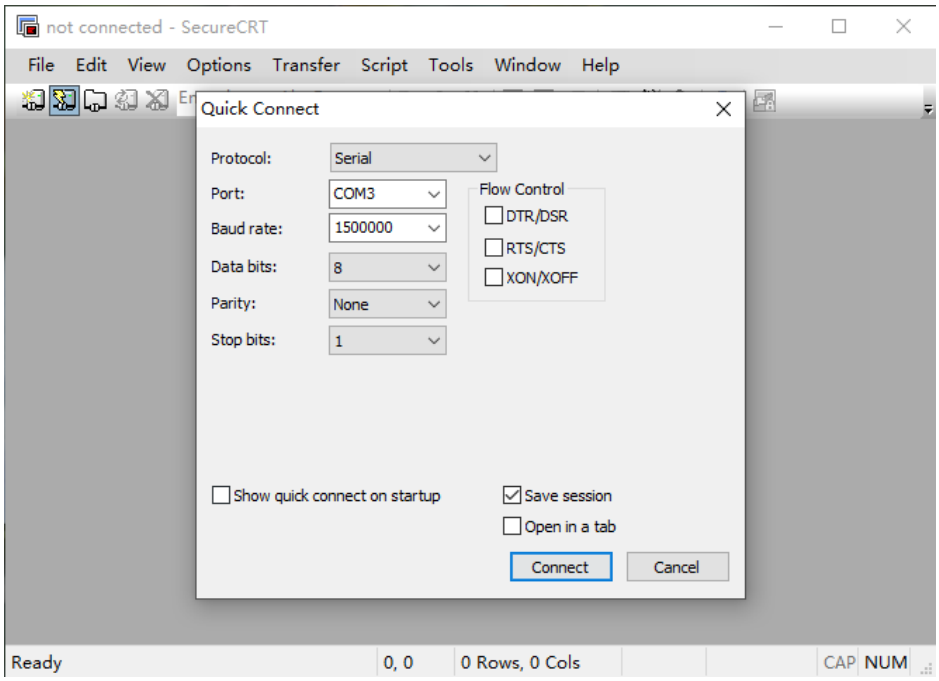


Step 3: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

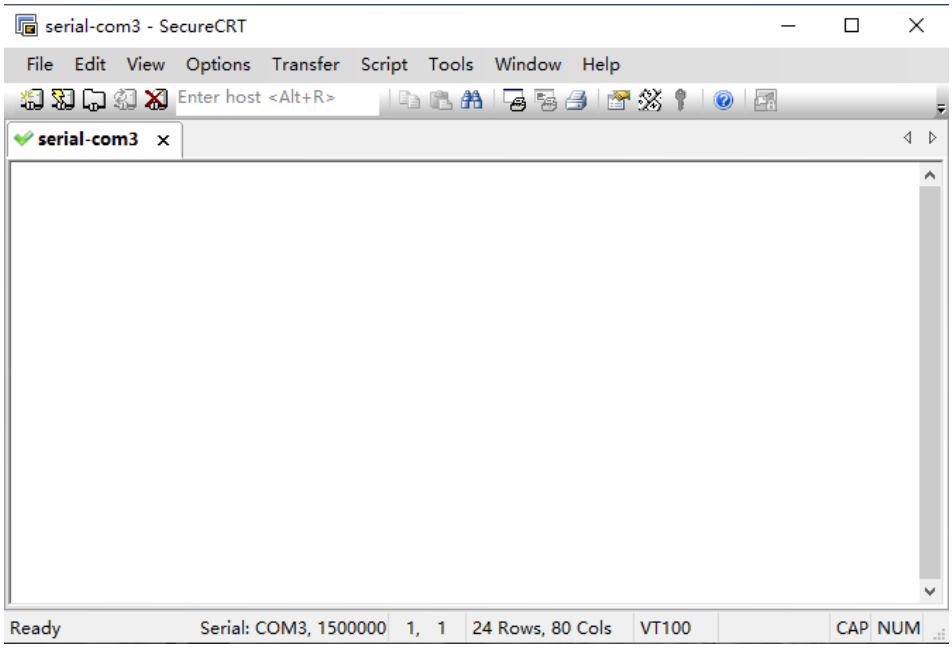
Step 4: Click the **"Quick Connect"** button to go to the Quick Connect configuration screen.



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

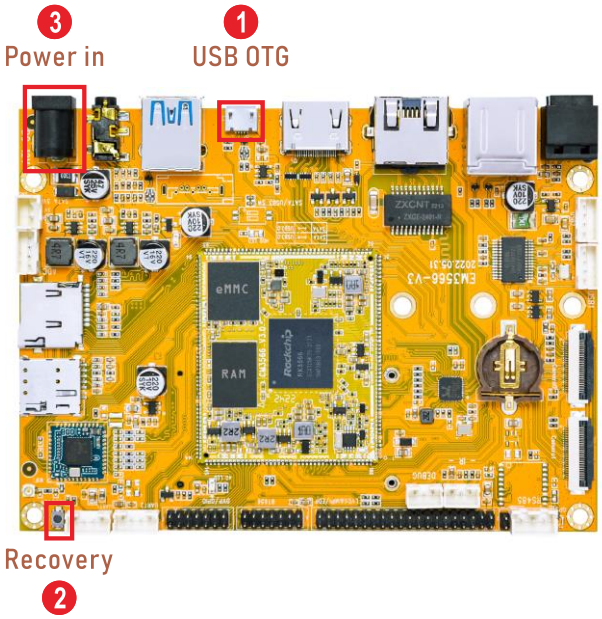
3.1.1.1 Hardware

Step 1: Disconnect the power adapter.

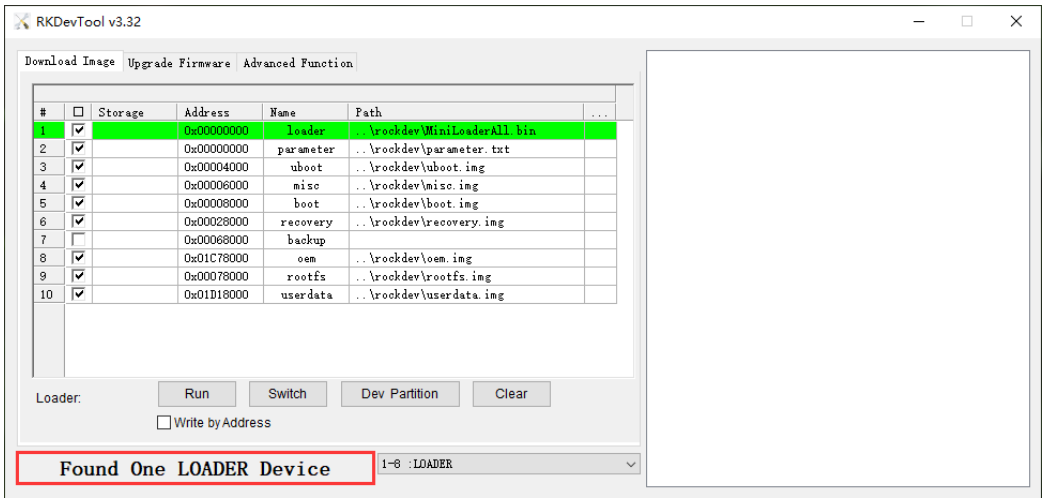
Step 2: Connect one end of the Micro cable to the host and the other end to the development board.

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 Micro cable, execute the following command in the serial debug terminal or adb shell.

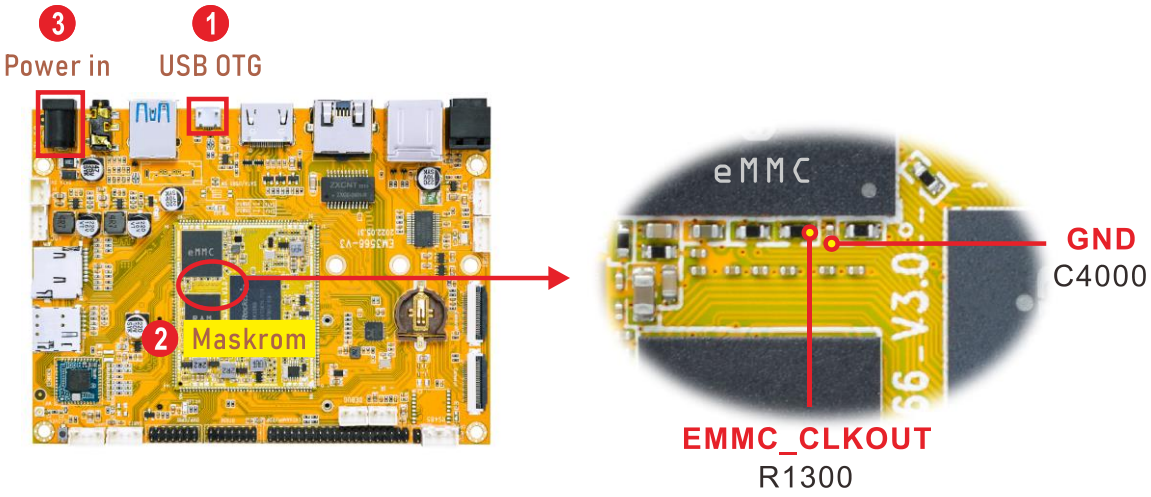
```
# reboot loader
```

3.1.2 How to Enter MaskRom Mode

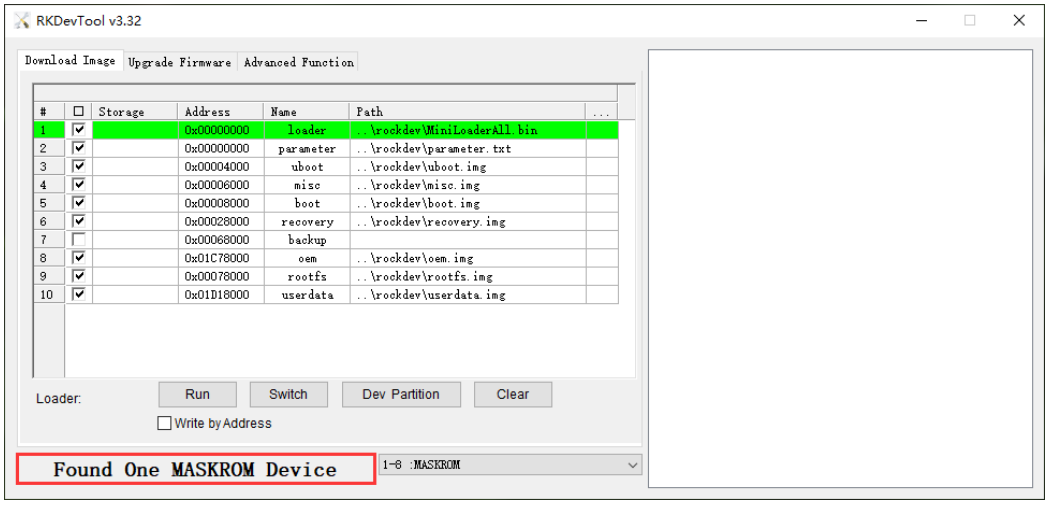
Step 1: Disconnect the power adapter.

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

Step 3: Use tweezers to short the two test points on the CM3568.



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



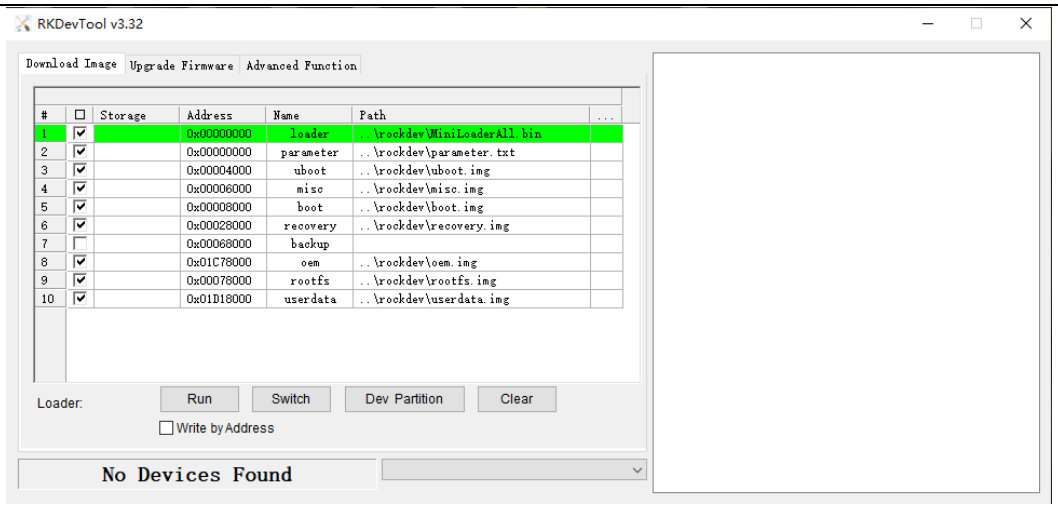
3.2 Burn firmware

Environment: Windows OS (Operating System).

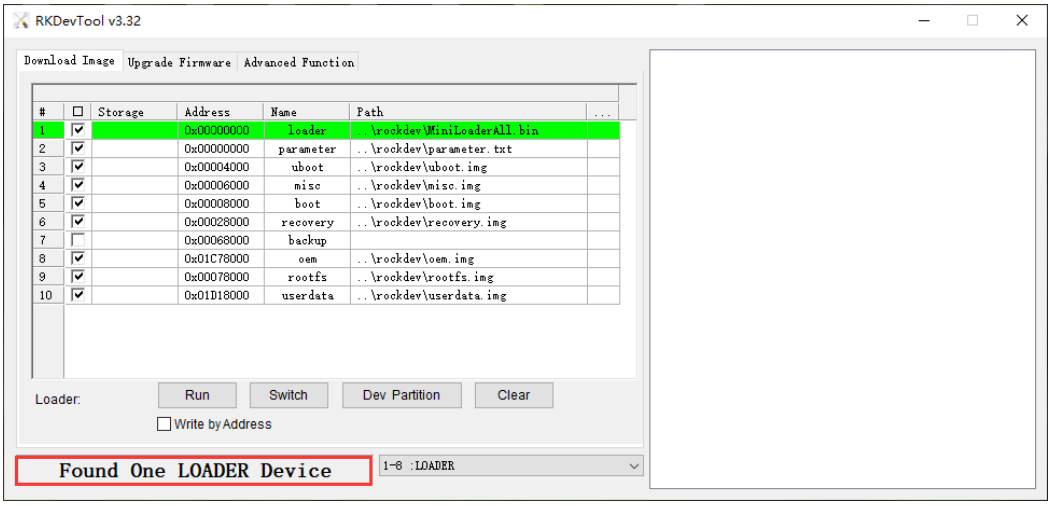
3.2.1 Burn Update.img Firmware

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

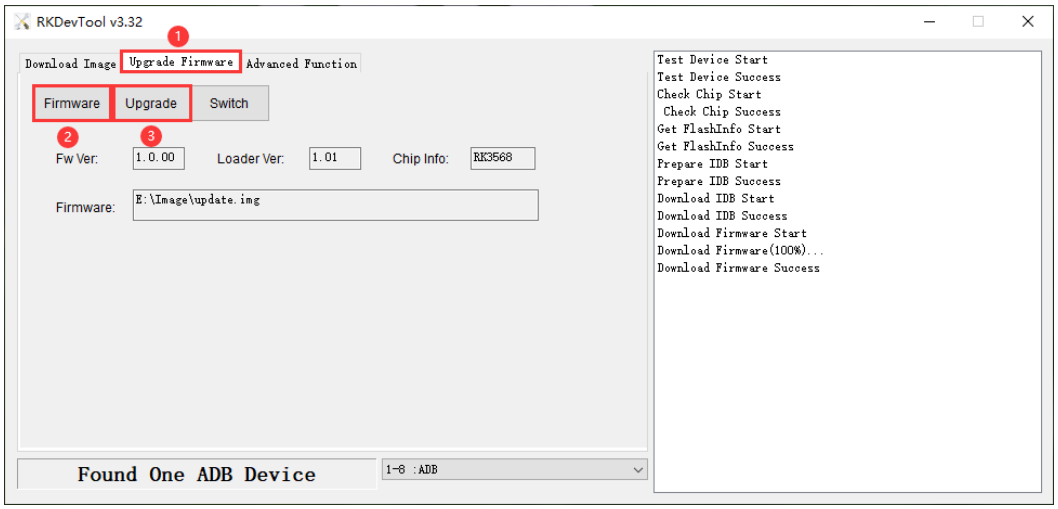
Step 2: Open *RKDevTool\RKDevTool_Release\RKDevTool.exe.*



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.

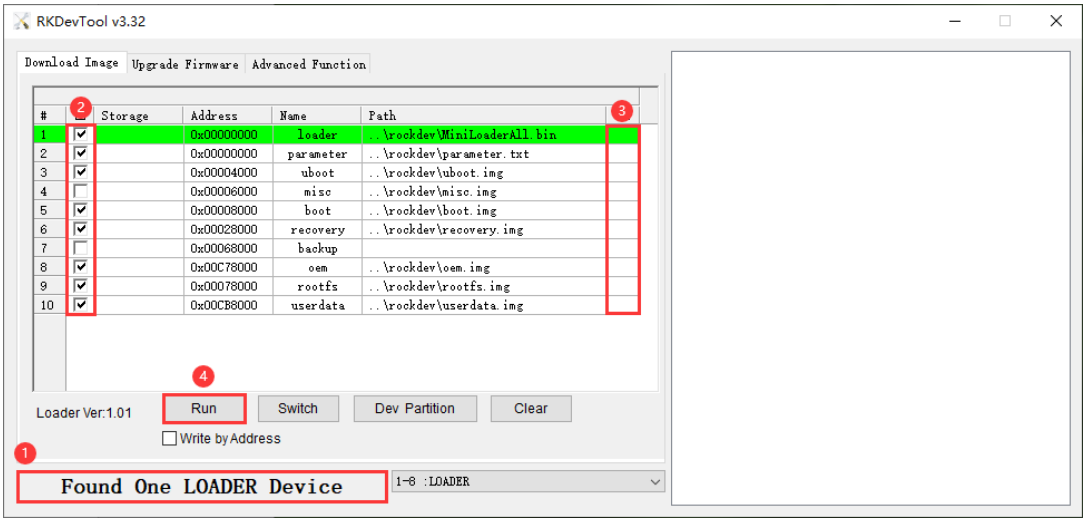
3.2.2 Burn Split Firmware

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

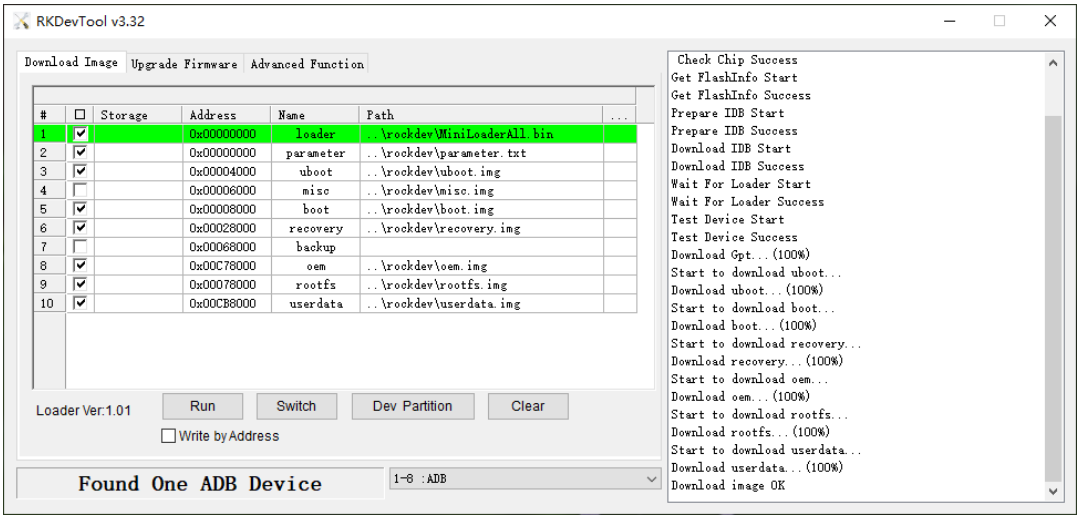
Step 2: Check the partitions to be flashed, multiple partitions can be selected.

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 120G. 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
```

5.Compile Source

Note: The Debian system and Buildroot system use the same SDK source package. The difference lies in the rootfs.img used, meaning the steps for building the filesystem are different, while the other steps are the same.

Step 1: Unzip the Source

To extract the source files, execute the following commands:

```
$ tar xvf em3566_linux6.1-rkr*.tar.bz2
$ cd EM3566_Linux6.1-rkr5/
```

Step 2: Configure the Compiled Board

To configure the board, execute:

```
$ ./build.sh lunch
```

After running **./build.sh lunch**, the system will list available defconfig files.

• To use HDMI as the display, select:

2. boardcon_rk3566_v3_v3.0_hdmi_defconfig

• To use LVDS (1280x800) as the display, select:

3. boardcon_rk3566_v3_v3.0_lvds_defconfig

Example (HDMI display):

```
liuyuan@boardcon:~/opt/EM3566/em3566_linux6.1-rkr5$ ./build.sh lunch
############### Rockchip Linux SDK ###############
Manifest: rk3566_rk3568_linux6.1_release_v1.1.0_20241220.xml
Log colors: message notice warning error fatal
Log saved at /home/liuyuan/opt/EM3566/em3566_linux6.1-rkr5/output/sessions/2025-03-20_15-47-56
Pick a defconfig:
1. rockchip_defconfig
2. boardcon_rk3566_v3_v3.0_hdmi_defconfig
3. boardcon_rk3566_v3_v3.0_lvds_defconfig
4. rockchip_rk3566_evb2_lp4x_v10_32bit_defconfig
5. rockchip_rk3566_evb2_lp4x_v10_defconfig
6. rockchip_rk3568_evb1_ddr4_v10_32bit_defconfig
7. rockchip_rk3568_evb1_ddr4_v10_defconfig
8. rockchip_rk3568_evb8_lp4_v10_32bit_defconfig
9. rockchip_rk3568_evb8_lp4_v10_defconfig
10. rockchip_rk3568_pcie_ep_lp4x_v10_defconfig
Which would you like? [1]: 2
Switching to defconfig: /home/liuyuan/opt/EM3566/em3566_linux6.1-
rkr5/device/rockchip/.chip/boardcon_rk3566_v3_v3.0_hdmi_defconfig
#
# configuration written to /home/liuyuan/opt/EM3566/em3566_linux6.1-rkr5/output/.config
#
Using last kernel version(6.1)
```

Step 3: Compile U-Boot

To compile uboot, execute the following command:

```
$ ./build.sh uboot
```

Step 4: Compile the Kernel

To compile the kernel, execute the following command:

```
$ ./build.sh kernel
```

Step 5: Compile Recovery

To compile recovery, execute the following command:

```
$ ./build.sh recovery
```

Step 6: Compile rootfs

(1) Compile Debian12 (Permission: root)

To compile debian12, execute the following command:

```
$ sudo ./build.sh debian
```

After compilation, a linaro-rootfs.img is generated in the debian directory.

Note: Related dependencies must be installed beforehand.

```
$ cd debian
$ sudo apt-get install binfmt-support qemu-user-static live-build
$ sudo dpkg -i ubuntu-build-service/packages/*
$ sudo apt-get install -f
```

(2) Compile Buildroot

To compile buildroot, execute the following command:

```
$ ./build.sh buildroot
```

Step 7: Generate and Check Firmwares

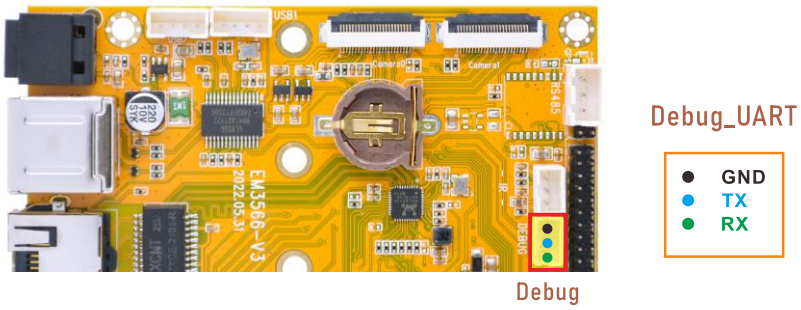
To generate firmware, execute the following command:

```
$ ./build.sh firmware
```

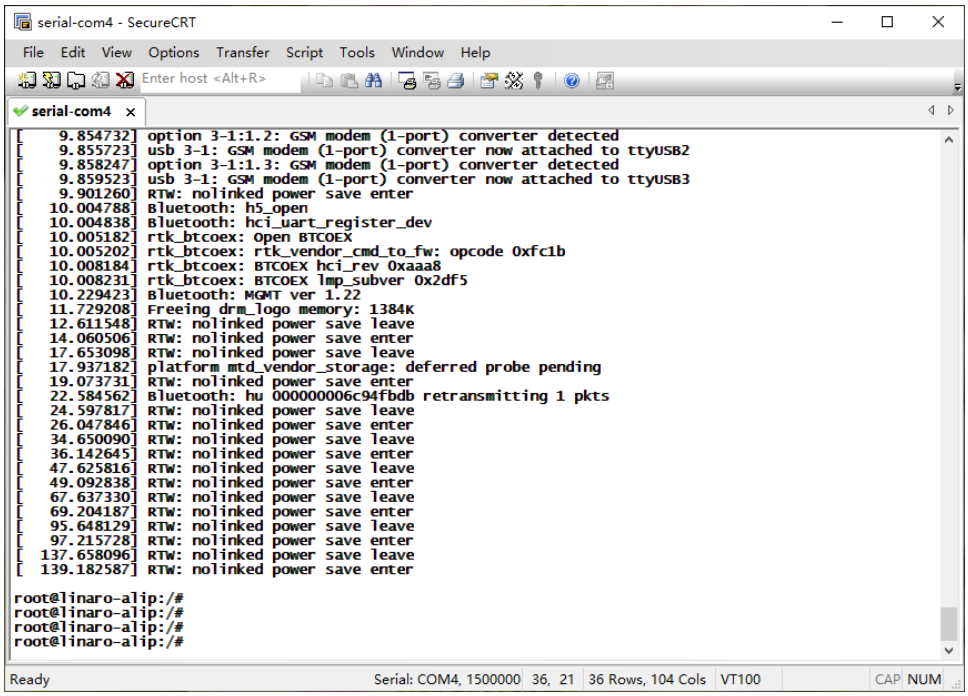
Images and **update.img** are generated in *rockdev/* directory.

6.Debian12 Test

6.1 Serial Terminal

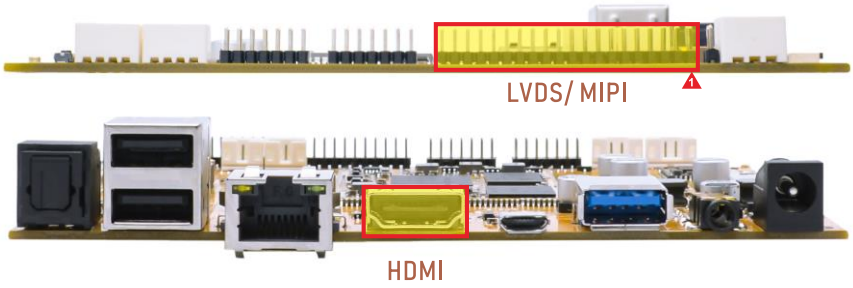


Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.



6.2 Display

The EM3566 can only output to a single display (either HDMI or LVDS) at a time.



The display effect diagram is as follows:

6.3 Headset

Step 1: Plug the headset into the headset jack.

Step 2: View sound card.

```
# cat /proc/asound/cards
```

```
root@linaro-alip:/# cat /proc/asound/cards
 0 [rockchiphdmi   ]: rockchip-hdmi - rockchip-hdmi
                      rockchip-hdmi
 1 [rockchipes8388c]: simple-card - rockchip,es8388-codec
                      rockchip,es8388-codec
```

Step 3: Headset recording.

• To use HDMI as the display:

```
# arecord -Dhw:1,0 -f cd record.wav
```

```
root@linaro-alip:/# arecord -Dhw:1,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

• To use LVDS (1280x800) as the display:

```
# arecord -Dhw:0,0 -f cd record.wav
```

```
root@linaro-alip:/# arecord -Dhw:0,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

Step 4: Play audio through headset.

• When using HDMI as the display:

```
# aplay -Dhw:1,0 record.wav
```

```
root@linaro-alip:/# aplay -Dhw:1,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

Note: Supplementary instructions on audio output.

```
# aplay -Dhw:0,0 record.wav   // HDMI TX audio output
# aplay -Dhw:1,0 record.wav   // Headset audio output
```

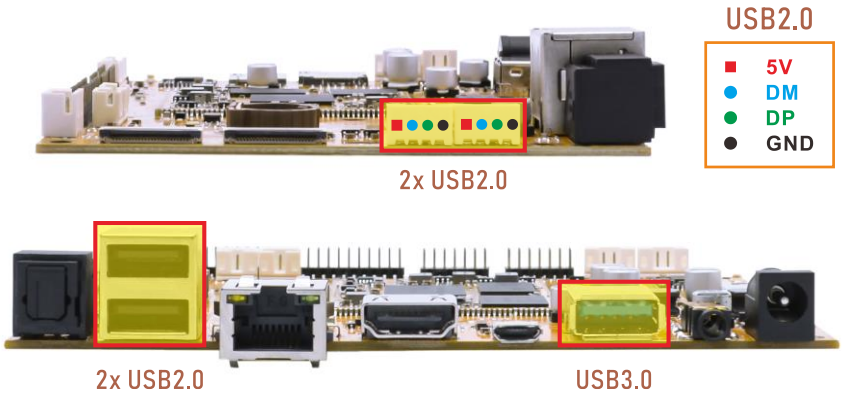
• When using LVDS (1280x800) as the display:

```
# aplay -Dhw:0,0 record.wav
```

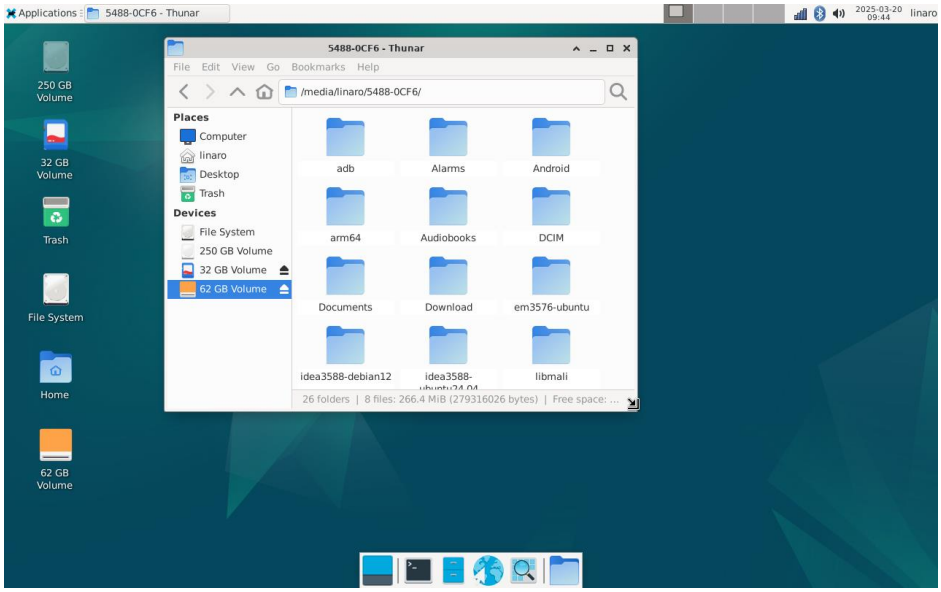
```
root@linaro-alip:/# aplay -Dhw:0,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

6.4 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, if the device is successfully recognized, an icon will appear on the desktop. Users need to click the icon in order to access the files on the device.



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.

```
root@linaro-alip:/# [  100.401796] usb 5-1.1: new high-speed USB device number 5 using ehci-platform
[  100.540580] usb 5-1.1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[  100.540631] usb 5-1.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[  100.540654] usb 5-1.1: Product: OnlyDisk
[  100.540674] usb 5-1.1: Manufacturer: Netac
[  100.540715] usb 5-1.1: SerialNumber: 0A6544CD10427AB2
[  100.542566] usb-storage 5-1.1:1.0: USB Mass Storage device detected
[  100.543718] scsi host1: usb-storage 5-1.1:1.0
[  101.684785] scsi 1:0:0:0: Direct-Access     Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[  101.690705] sd 1:0:0:0: [sdb] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[  101.691923] sd 1:0:0:0: [sdb] Write Protect is off
[  101.692854] sd 1:0:0:0: [sdb] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[  101.701334]  sdb: sdb1
[  101.701915] sd 1:0:0:0: [sdb] Attached SCSI removable disk
```

• USB3.0 print information in SuperSpeed mode.

```
root@linaro-alip:/# [  667.590292] usb 2-1: new SuperSpeed USB device number 2 using xhci-hcd
[  667.621251] usb 2-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[  667.621301] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[  667.621324] usb 2-1: Product: OnlyDisk
[  667.621343] usb 2-1: Manufacturer: Netac
[  667.621363] usb 2-1: SerialNumber: 0A6544CD10427AB2
[  667.623814] usb-storage 2-1:1.0: USB Mass Storage device detected
[  667.625045] scsi host1: usb-storage 2-1:1.0
[  668.863371] scsi 1:0:0:0: Direct-Access     Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[  668.867339] sd 1:0:0:0: [sdb] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[  668.868328] sd 1:0:0:0: [sdb] Write Protect is off
[  668.869049] sd 1:0:0:0: [sdb] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[  668.874950]  sdb: sdb1
[  668.875290] sd 1:0:0:0: [sdb] Attached SCSI removable disk
```

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.

```
root@linaro-alip:/#
[   95.287411] rk_gmac-dwmac fe010000.ethernet end1: Link is Up - 1Gbps/Full - flow control rx/tx
[   95.287655] IPv6: ADDRCONF(NETDEV_CHANGE): end1: link becomes ready
```

Step 2: View network interface information.

```
# ifconfig
```

```
root@linaro-alip:/# ifconfig
end1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.226  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::d687:ef8d:e73a:7018  prefixlen 64  scopeid 0x20<link>
        ether 2a:59:46:ae:68:59  txqueuelen 1000  (Ethernet)
        RX packets 130  bytes 16541 (16.1 KiB)
        RX errors 0  dropped 8  overruns 0  frame 0
        TX packets 107  bytes 9461 (9.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 54
```

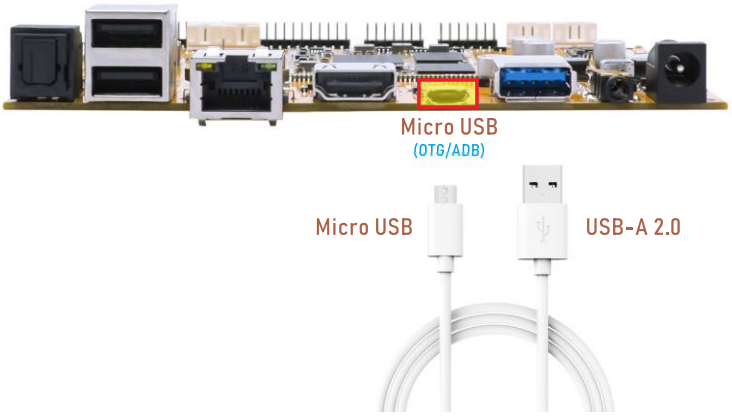
Step 3: Network connection test.

```
# ping -I end1 www.armdesigner.com
```

```
root@linaro-alip:/# ping -I end1 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.226 end1: 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=186 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=189 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=185 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=185 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=185 ms
^C
--- www.armdesigner.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6004ms
rtt min/avg/max/mdev = 185.119/186.494/189.162/1.532 ms
```

6.6 ADB

Step 1: Connect the board and PC host with Micro usb cable.

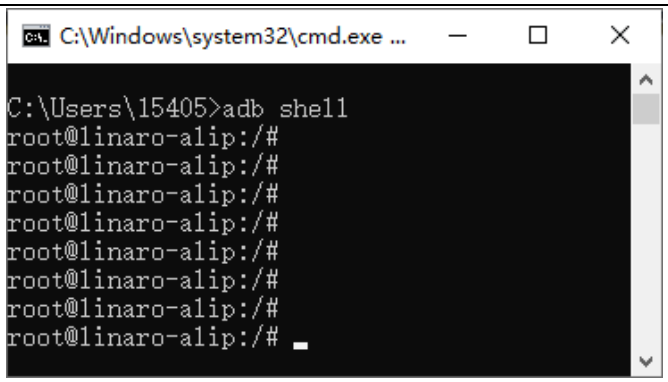


Step 2: Install ADB driver on Windows system.

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 shell
```

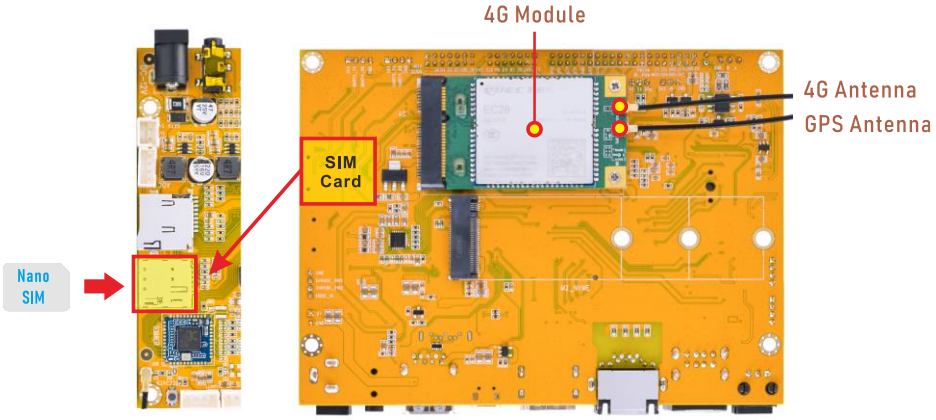


6.7 4G & GPS

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

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.



6.7.1 4G Test

Step 1: Initiate the PPP connection.

```
# pppd call quectel-ppp &
```

```
root@linaro-alip:/# pppd call quectel-ppp &
[1] 2491
root@linaro-alip:/# pppd options in effect:
debug          # (from /etc/ppp/peers/quectel-ppp)
nodetach               # (from /etc/ppp/peers/quectel-ppp)
dump           # (from /etc/ppp/peers/quectel-ppp)
noauth         # (from /etc/ppp/peers/quectel-ppp)
user test              # (from /etc/ppp/peers/quectel-ppp)
password ??????         # (from /etc/ppp/peers/quectel-ppp)
remotename 3gppp               # (from /etc/ppp/peers/quectel-ppp)
/dev/ttyUSB3           # (from /etc/ppp/peers/quectel-ppp)
115200         # (from /etc/ppp/peers/quectel-ppp)
lock           # (from /etc/ppp/peers/quectel-ppp)
connect chat -s -v -f /etc/ppp/peers/quectel-chat-connect             # (from /etc/ppp/peers/quectel-ppp)
disconnect chat -s -v -f /etc/ppp/peers/quectel-chat-disconnect       # (from /etc/ppp/peers/quectel-ppp)
nocrtscts              # (from /etc/ppp/peers/quectel-ppp)
modem          # (from /etc/ppp/peers/quectel-ppp)
asyncmap 0             # (from /etc/ppp/options)
lcp-echo-failure 4             # (from /etc/ppp/options)
lcp-echo-interval 30           # (from /etc/ppp/options)
hide-password          # (from /etc/ppp/peers/quectel-ppp)
novj           # (from /etc/ppp/peers/quectel-ppp)
novjccomp              # (from /etc/ppp/peers/quectel-ppp)
ipcp-accept-local              # (from /etc/ppp/peers/quectel-ppp)
ipcp-accept-remote             # (from /etc/ppp/peers/quectel-ppp)
ipparam 3gppp          # (from /etc/ppp/peers/quectel-ppp)
noipdefault            # (from /etc/ppp/peers/quectel-ppp)
ipcp-max-failure 30            # (from /etc/ppp/peers/quectel-ppp)
defaultroute           # (from /etc/ppp/peers/quectel-ppp)
usepeerdns             # (from /etc/ppp/peers/quectel-ppp)
noccp          # (from /etc/ppp/peers/quectel-ppp)
noipx          # (from /etc/ppp/options)
abort on (BUSY)
abort on (NO CARRIER)
abort on (NO DIALTONE)
abort on (ERROR)
abort on (NO ANSWER)
timeout set to 30 seconds
send (AT^M)
expect (OK)
AT^M^M
OK
 -- got it

send (ATE0^M)
expect (OK)
```

Step 2: Check the status of the network interfaces.

```
# ifconfig
```

```
root@linaro-alip:/# ifconfig
ppp0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST>  mtu 1500
       inet 10.136.168.253  netmask 255.255.255.255  destination 10.64.64.64
       ppp  txqueuelen 3  (Point-to-Point Protocol)
       RX packets 4  bytes 52 (52.0 B)
       RX errors 0  dropped 0  overruns 0  frame 0
       TX packets 14  bytes 198 (198.0 B)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Step 3: Test the PPP connection.

```
# ping -I ppp0 www.armdesigner.com
```

```
root@linaro-alip:/# ping -I ppp0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.136.168.253 ppp0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=46 time=662 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=311 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=46 time=669 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=46 time=550 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=46 time=511 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=46 time=470 ms
^C64 bytes from 67.222.54.196: icmp_seq=7 ttl=46 time=422 ms

--- www.armdesigner.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6000ms
rtt min/avg/max/mdev = 311.082/513.597/668.628/118.606 ms
```

6.7.2 GPS Test

Step 1: Enable GPS functionality.

```
# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
```

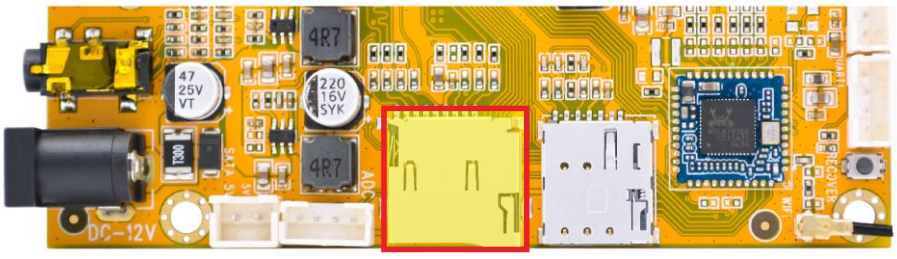
Step 2: Read GPS data.

```
# cat /dev/ttyUSB1
```

```
root@linaro-alip:/# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@linaro-alip:/# cat /dev/ttyUSB1
$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,*32

$GPGGA,,,,,,0,,,,,,,,*66

$GPRMC,,V,,,,,,,,,,N,V*29

$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,*32

$GPGGA,,,,,,0,,,,,,,,*66

$GPRMC,,V,,,,,,,,,,N,V*29
```

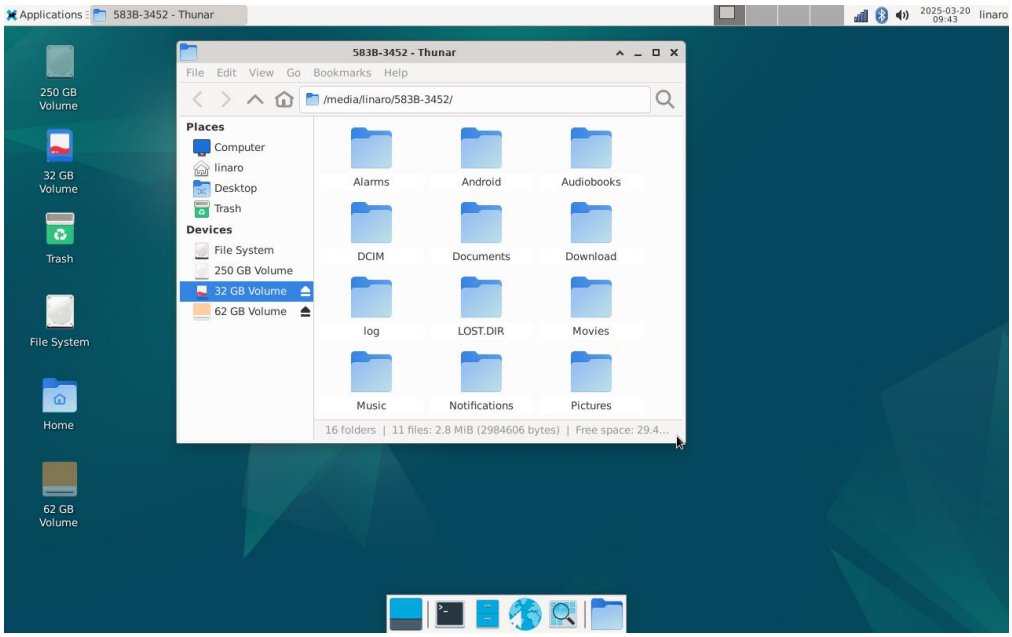
6.8 SD Card

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



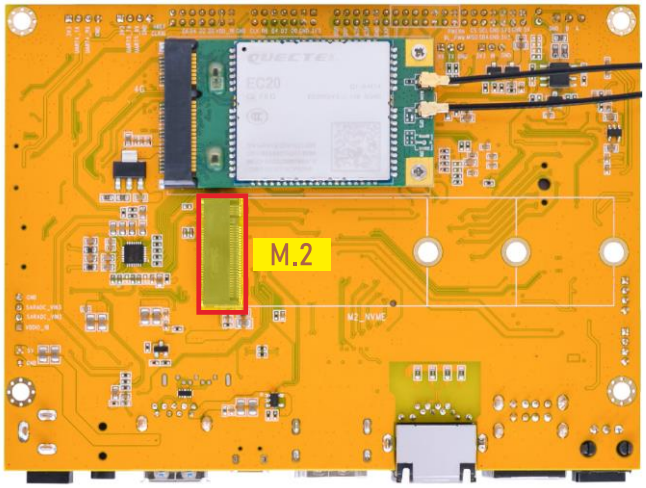
Step 2: After inserting the SD card, if it is recognized successfully, an icon will appear

on the desktop. Users need to click the icon in order to access the SD card.

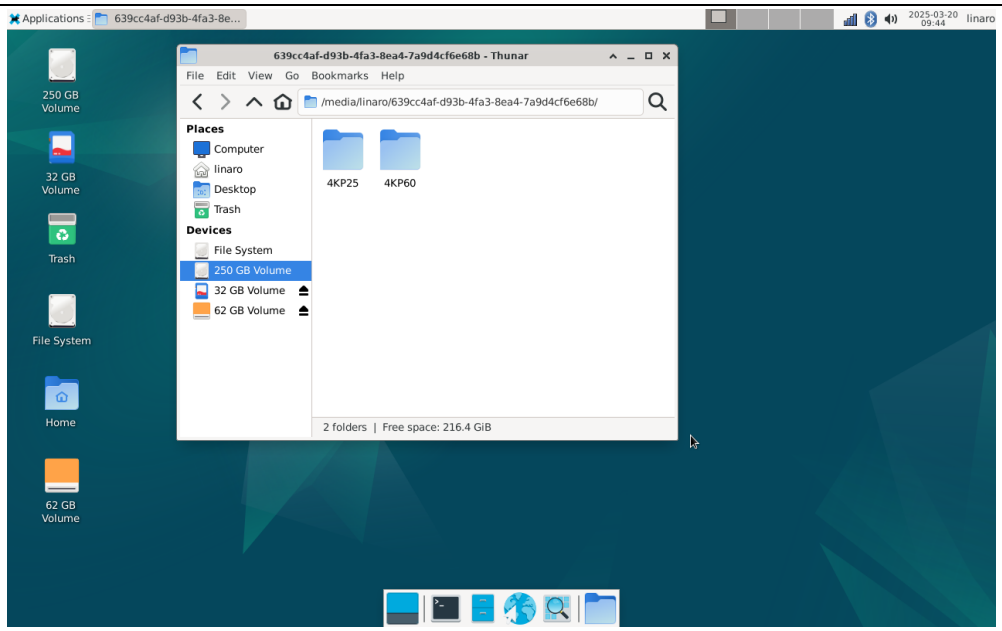


6.9 M.2 NVME SSD

Step 1: Connect the SSD, then power on.

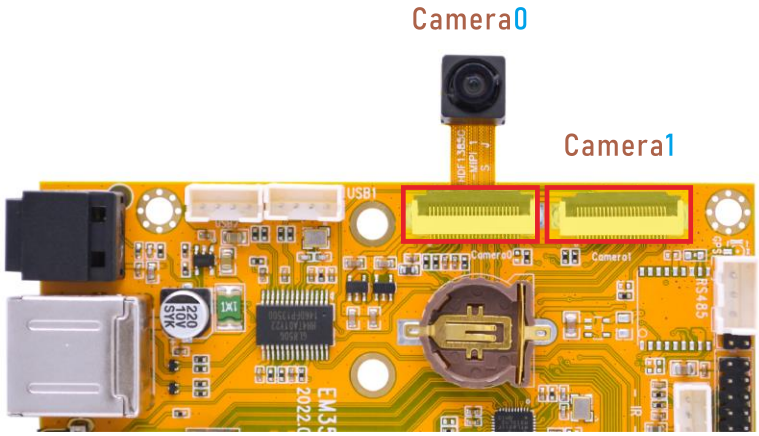


Step 2: If the SSD device is successfully recognized, an icon will appear on the desktop. Users can click the icon to access the SSD device.



6.10 Camera

The EM3566 Debian 12 system only supports camera0 by default.



Step 2: Preview camera.

```
# /rockchip-test/camera/camera_rkisp_test.sh
```

```
root@linaro-alip:/# /rockchip-test/camera/camera_rkisp_test.sh
Start RKISP Camera Preview!
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[  630.402506] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[  630.415403] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
[  630.415545] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:1, dphy1, ret 0
Redistribute latency...
0:00:18.8 / 99:99:99.
```

Step 3: Record the video.

```
# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=100 ! \
video/x-raw,format=NV12,width=1920,height=1088,framerate=30/1 ! \
videoconvert ! mpph264enc ! h264parse ! mp4mux ! \
filesink location=/tmp/h264.mp4
```

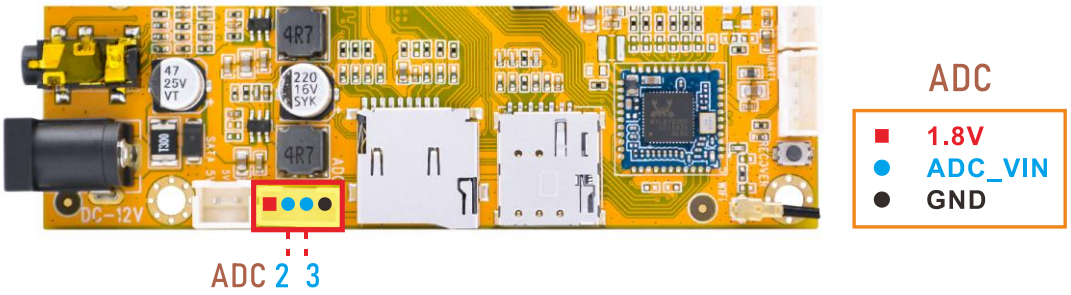
```
root@linaro-alip:/# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=100 ! video/x-
raw,format=NV12,width=1920,height=1088,framerate=30/1 ! videoconvert ! mpph264enc ! h264parse ! mp4mux !
filesink location=/tmp/h264.mp4
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[  710.949230] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[  710.962501] rkisp rkisp-vir0: first params buf queue
[  710.962832] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
[  710.962897] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:1, dphy1, ret 0
Redistribute latency...
Redistribute latency...
0:00:01.9 / 99:99:99.
```

Step 4: Take photos.

```
# gst-launch-1.0 -v v4l2src device=/dev/video0 num-buffers=10 ! \
video/x-raw,format=NV12,width=1280,height=800 ! mppjpegenc ! \
multifilesink location=/tmp/test%05d.jpg
```

```
 root@linaro-alip:/# gst-launch-1.0 -v v4l2src device=/dev/video0 num-buffers=10 ! \
video/x-raw,format=NV12,width=1280,height=800 ! mppjpegenc ! \o0 num-buffers=10 ! \
multifilesink location=/tmp/test%05d.jpgt=800 ! mppjpegenc ! \
Setting pipeline to PAUSED ...st%05d.jpg
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
/GstPipeline:pipeline0/GstV4l2Src:v4l2src0: crop-bounds = < (int)0, (int)0, (int)2112, (int)1568 >
New clock: GstSystemClock
/GstPipeline:pipeline0/GstV4l2Src:v4l2src0.GstPad:src: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstCapsFilter:capsfilter0.GstPad:src: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstMppJpegEnc:mppjpegenc0.GstPad:src: caps = image/jpeg, width=(int)1280,
height=(int)800, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)120/1, interlace-
mode=(string)progressive, colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstMultiFileSink:multifilesink0.GstPad:sink: caps = image/jpeg, width=(int)1280,
height=(int)800, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)120/1, interlace-
mode=(string)progressive, colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstMppJpegEnc:mppjpegenc0.GstPad:sink: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstCapsFilter:capsfilter0.GstPad:sink: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
[  735.988844] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[  736.003630] rkisp rkisp-vir0: first params buf queue
[  736.004069] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
```

6.11 ADC

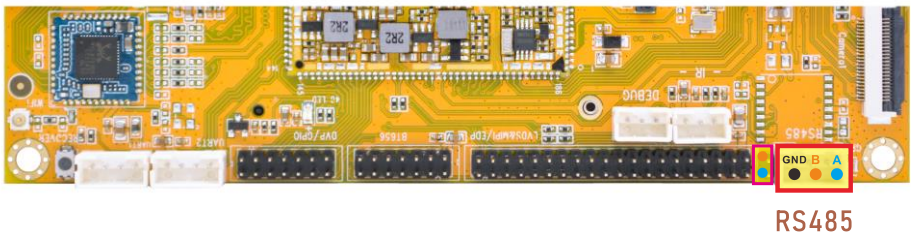


Connect the ADC_VIN pin to high and low levels respectively, then run the following command to observe the data changes.

```
# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
```

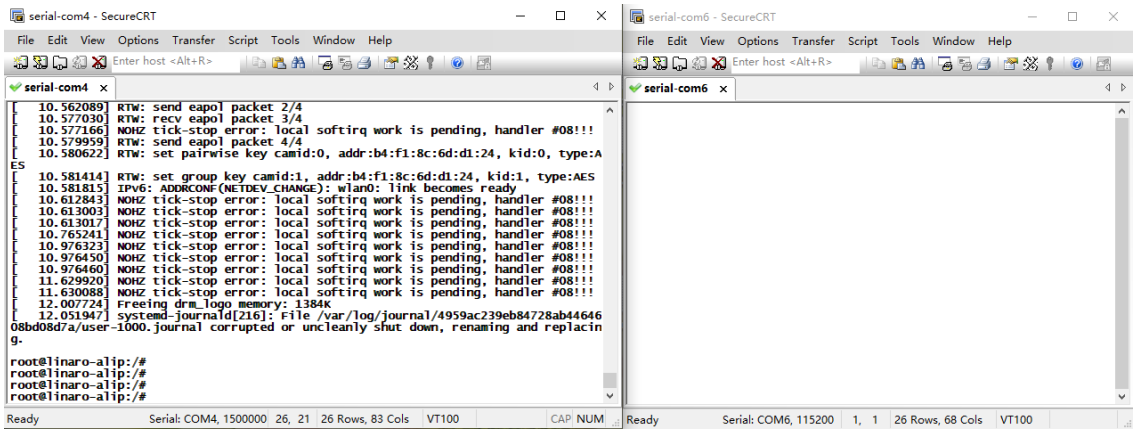
```
root@linaro-alip:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
1023
583
883
15
447
525
541
537
root@linaro-alip:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
1023
585
875
1023
562
547
543
539
```

6.12 RS485



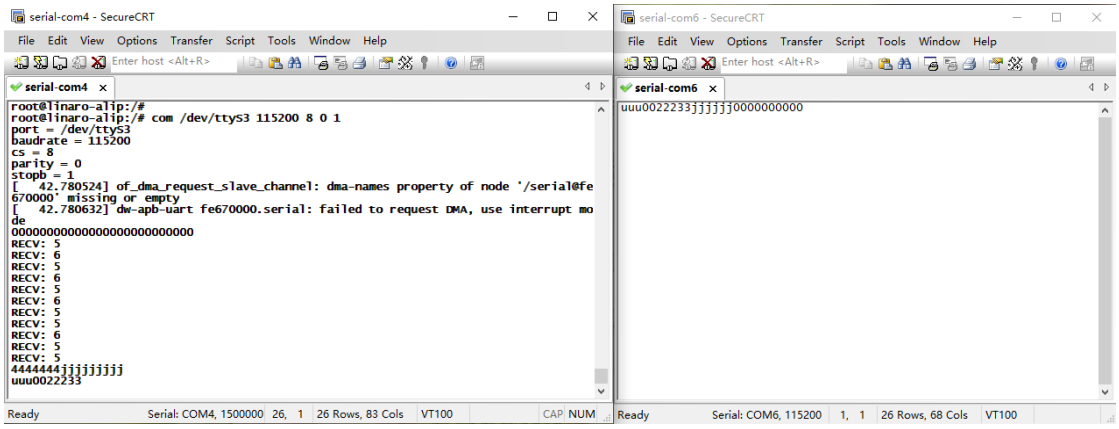
Step 1: As shown in the diagram, connect the RS485 test tool to the development board.

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.



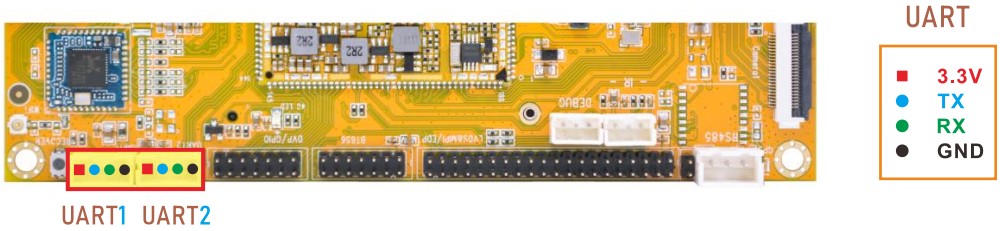
Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

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



6.14 UART

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



Step 2: UART1 test.

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

```
root@linaro-alip:/# com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
000000000
RECV: 000000000
1111111
RECV: 1111111
ggggg
RECV: ggggg
uuu
RECV: uuu
```

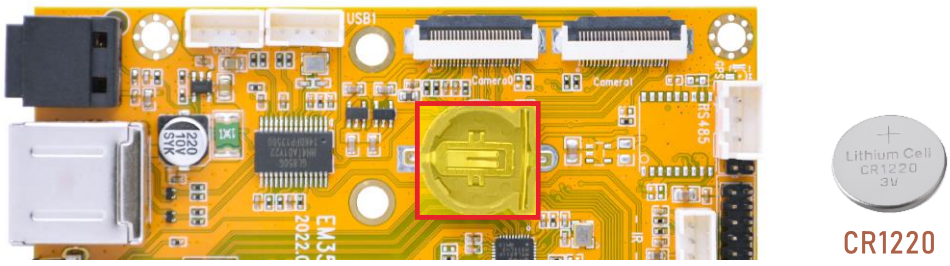
Step 3: UART2 test.

```
# com /dev/ttyS5 115200 8 0 1
```

```
root@linaro-alip:/# com /dev/ttyS5 115200 8 0 1
port = /dev/ttyS5
baudrate = 115200
cs = 8
parity = 0
stopb = 1
8888888
RECV: 8888888
yyyyyy
RECV: yyyyyy
rrrr
RECV: rrrr
k
RECV: k
```

6.15 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
# date -s "2025-03-20 18:29:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

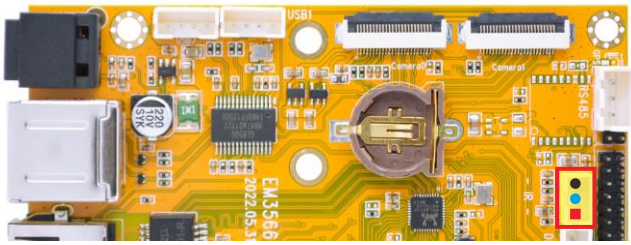
```
# hwclock
```

```
root@linaro-alip:/# date -s "2025-03-20 18:29:00"
Thu Mar 20 18:29:00 UTC 2025
root@linaro-alip:/# hwclock -w
root@linaro-alip:/# hwclock
2025-03-20 18:29:15.640263+00:00
root@linaro-alip:/# hwclock
2025-03-20 18:29:29.292932+00:00
root@linaro-alip:/# hwclock
2025-03-20 18:29:58.857756+00:00
root@linaro-alip:/# hwclock
2025-03-20 18:30:02.172581+00:00
```

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

```
root@linaro-alip:/# hwclock
2025-03-21 09:09:52.739874+00:00
root@linaro-alip:/# hwclock
2025-03-21 09:10:06.916376+00:00
root@linaro-alip:/# hwclock
2025-03-21 09:11:21.950144+00:00
root@linaro-alip:/# hwclock
2025-03-21 09:11:48.814721+00:00
```

6.16 IR



Step 1: Open IR debugging print.

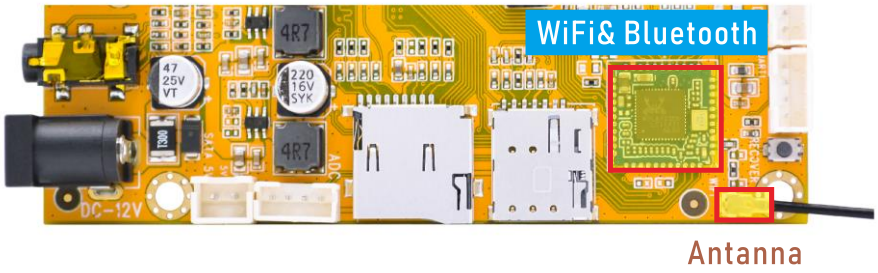
```
# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

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

```
root@linaro-alip:/#                                                    echo 1 >
/sys/module/rockchip_pwm_remotectl/parameters/code_printip_pwm_remotectl/parameters/code_print
root@linaro-alip:/# [  464.078416] USERCODE=0x1818
[  464.105422] RMC_GETDATA=9b
[  464.842401] USERCODE=0x1818
[  464.869507] RMC_GETDATA=98
[  466.198537] USERCODE=0x1818
[  466.225687] RMC_GETDATA=99
[  466.862289] USERCODE=0x1818
[  466.889468] RMC_GETDATA=9a
[  467.578254] USERCODE=0x1818
[  467.605320] RMC_GETDATA=97
[  468.358371] USERCODE=0x1818
[  468.385553] RMC_GETDATA=e6
[  468.954431] USERCODE=0x1818
[  468.981577] RMC_GETDATA=e4
```

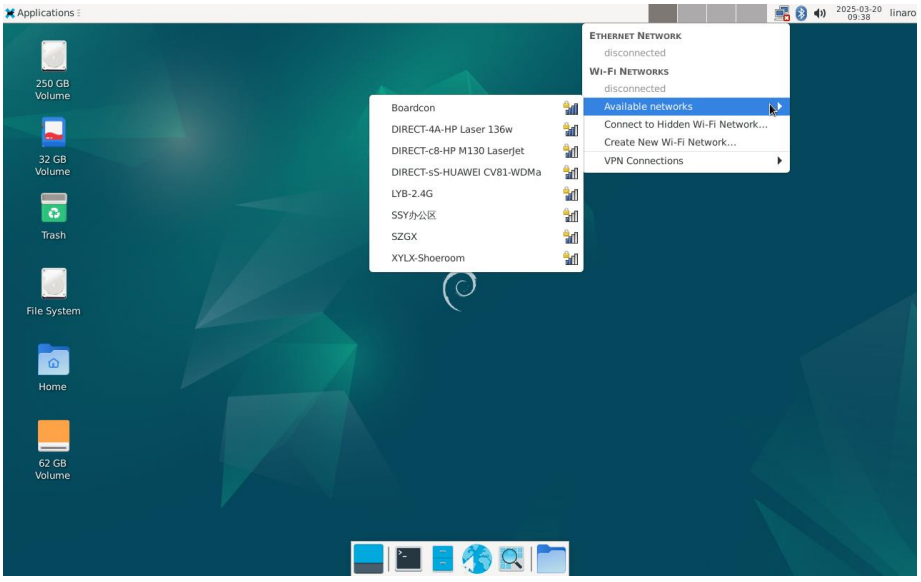
6.17 WiFi & Bluetooth

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

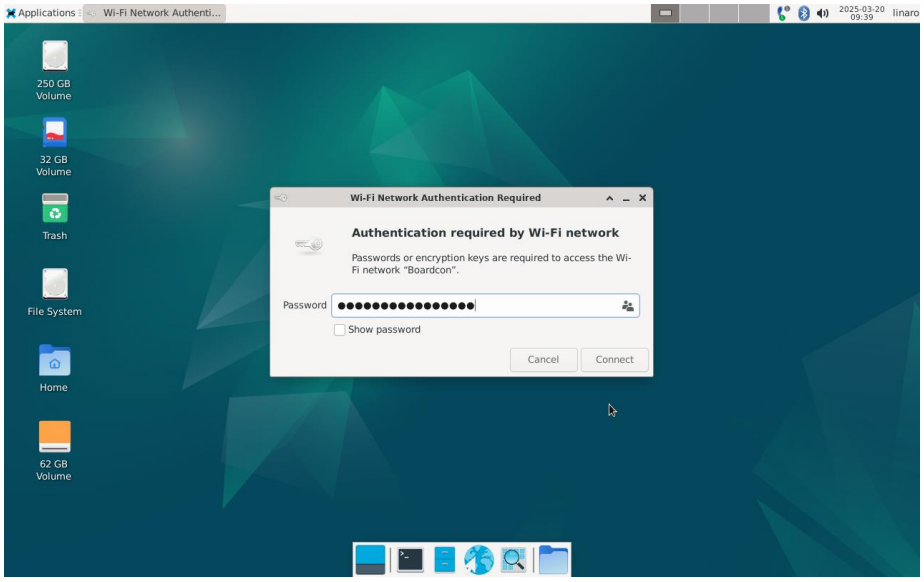


6.17.1 WiFi

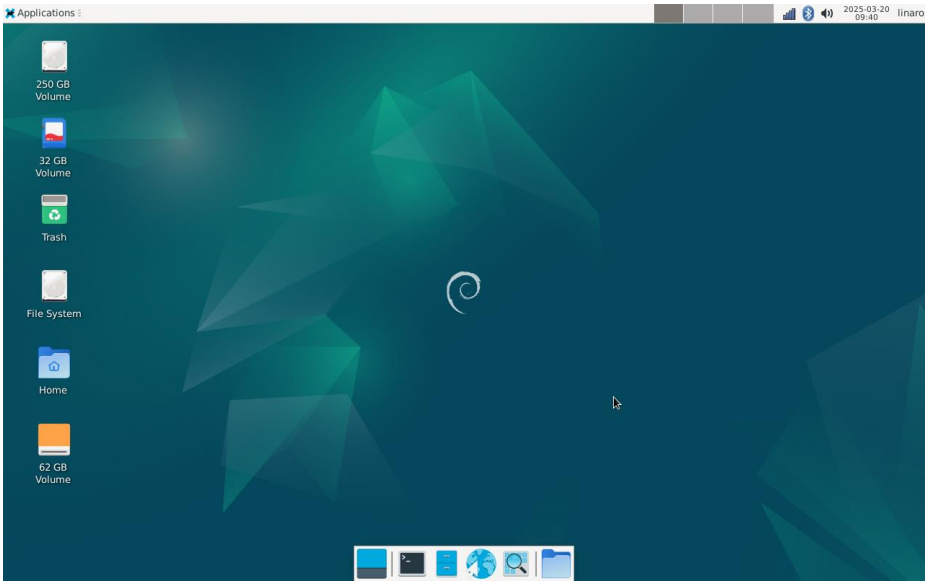
Step 1: Click the network icon in the top right corner of the interface, then select the **"Available Networks"** option to view the list of available hotspots.



Step 2: Select the SSID from the list of available networks and enter the password.



Step 3: After the WiFi successfully connects to the hotspot, the system will display the corresponding connection status icon in the top right corner.



Step 4: Users can test network connectivity using the desktop's built-in browser or verify it through the following command method.

(1) View network interface information.

```
# ifconfig
```

```
root@linaro-alip:/# ifconfig
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
       inet 192.168.0.223  netmask 255.255.255.0  broadcast 192.168.0.255
       inet6 fe80::a511:3be7:929a:7aa5  prefixlen 64  scopeid 0x20<link>
       ether 60:fb:00:75:ac:d4  txqueuelen 1000  (Ethernet)
       RX packets 516  bytes 72339 (70.6 KiB)
       RX errors 0  dropped 70  overruns 0  frame 0
       TX packets 183  bytes 22938 (22.4 KiB)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

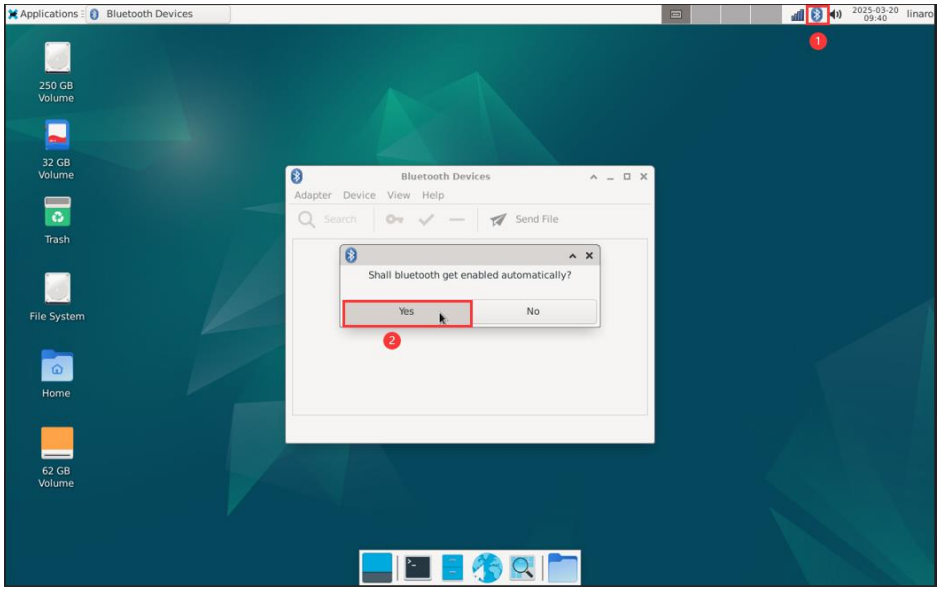
(2) Network connection test.

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

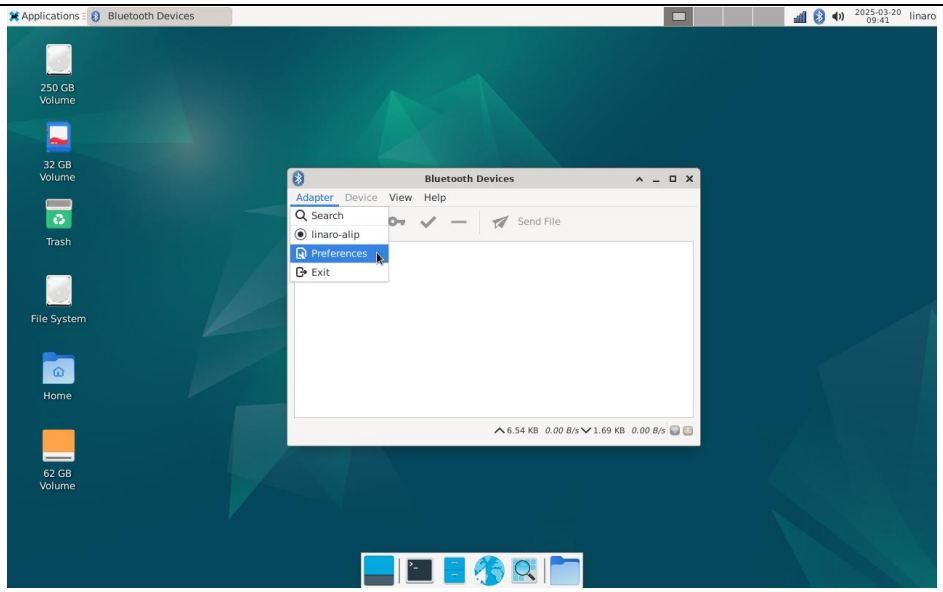
```
root@linaro-alip:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.223 wlan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=323 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=348 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=274 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=325 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=214 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=237 ms
^C64 bytes from 67.222.54.196: icmp_seq=7 ttl=48 time=190 ms

--- www.armdesigner.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6002ms
rtt min/avg/max/mdev = 190.139/272.991/347.654/56.663 ms
```

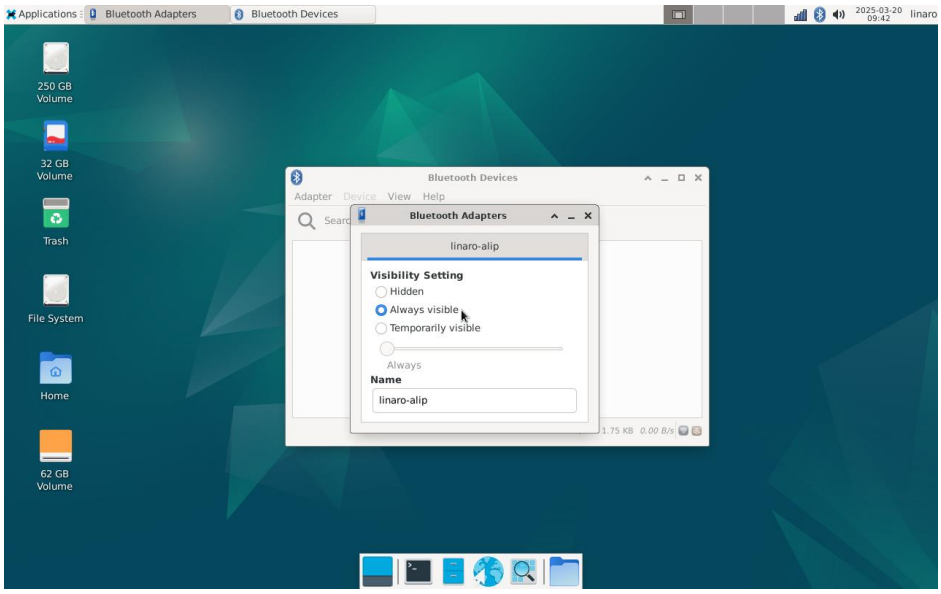
6.17.2 Bluetooth

Step 1: Click the Bluetooth icon in the top right corner of the desktop.

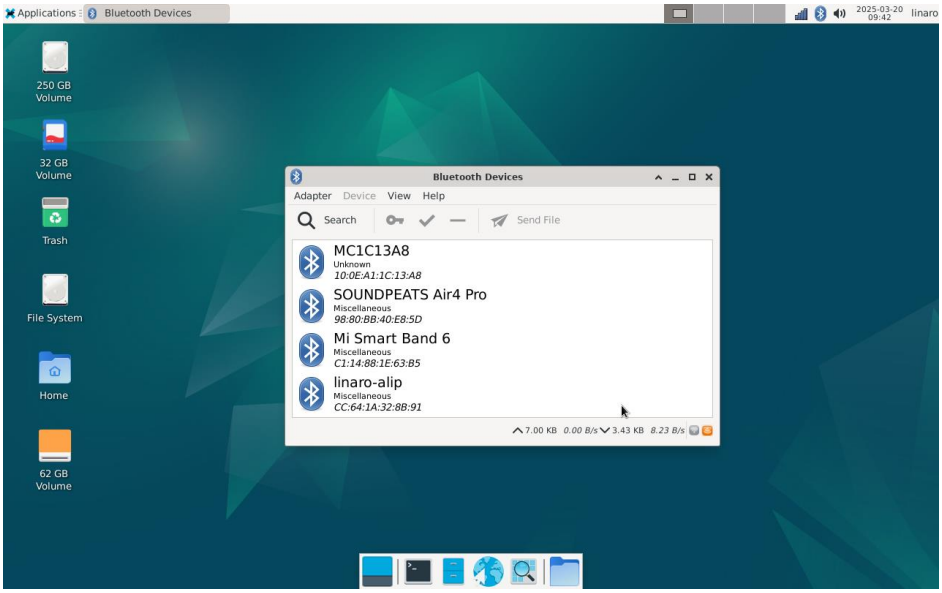


Step 2: The Bluetooth device name is hidden by default. Set it to be visible by clicking **Adapter** -> **Preferences** -> **Always visible**.





Step 3: Click **Search** to start searching and select the available device in the list to pair.



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

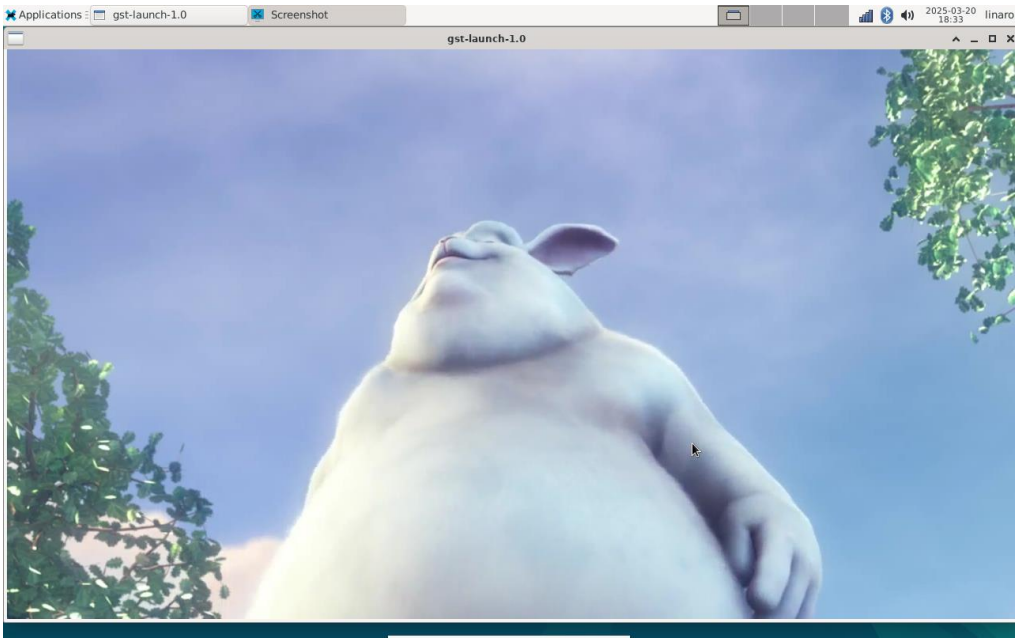
6.18 Video Playback

(1) The directory for the built-in video testing scripts in the system: */rockchip-test/video*

```
root@linaro-alip:/# ls /rockchip-test/video/
test_dec-gst.sh     test_enc-gst.sh         test_gst_video_maxfps.sh
test_dec-mpv.sh     test_gst_multivideo.sh  video_stresstest.sh
test_dec-parole.sh  test_gst_video.sh       video_test.sh
test_dec-qt.sh      test_gst_video_fps.sh
```

Simply execute the script.

```
root@linaro-alip:/# cd /rockchip-test/video/
root@linaro-alip:/rockchip-test/video# ./test_gst_video.sh
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
mpp[2097]: mpp_info: mpp version: 331ee68f author: nyanmisaka    2024-12-11 fix[mpp]: Fix input_task_count
for async enc
mpp[2097]: mpp_info: mpp version: 331ee68f author: nyanmisaka    2024-12-11 fix[mpp]: Fix input_task_count
for async enc
mpp[2097]: mpp_info: mpp version: 331ee68f author: nyanmisaka    2024-12-11 fix[mpp]: Fix input_task_count
for async enc
mpp[2097]: mpp: unable to create enc vp8 for soc rk3566 unsupported
mpp[2097]: mpp_info: mpp version: 331ee68f author: nyanmisaka    2024-12-11 fix[mpp]: Fix input_task_count
for async enc
mpp[2097]: mpp_info: mpp version: 331ee68f author: nyanmisaka    2024-12-11 fix[mpp]: Fix input_task_count
for async enc
Redistribute latency...
mpp[2097]: h264d_api: is_avcC=1
Pipeline is PREROLLED ...0 %)
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:09.6 / 0:00:29.5 (32.7 %)
```

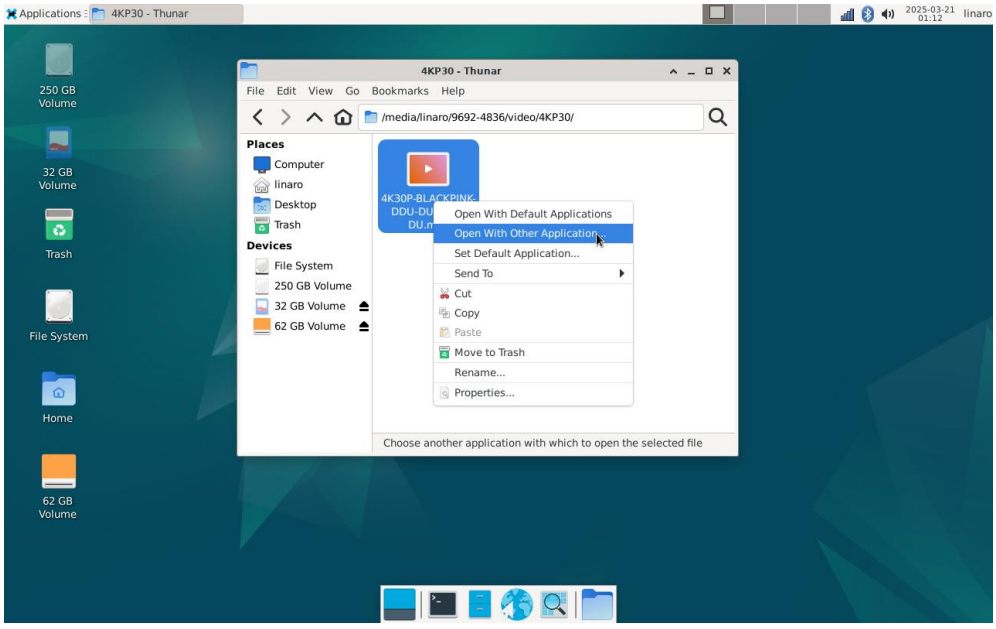


(2) Play the video using Google Chrome.

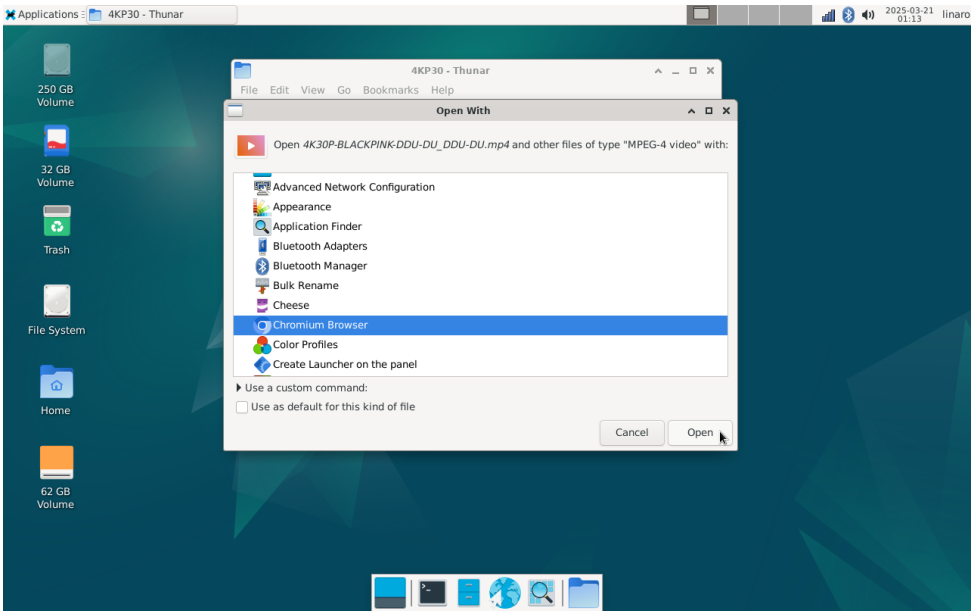
• Google Chrome supports video playback up to 4K, with support for the following decoding formats: VP8, H.264, H.265, VP9, and AV1.

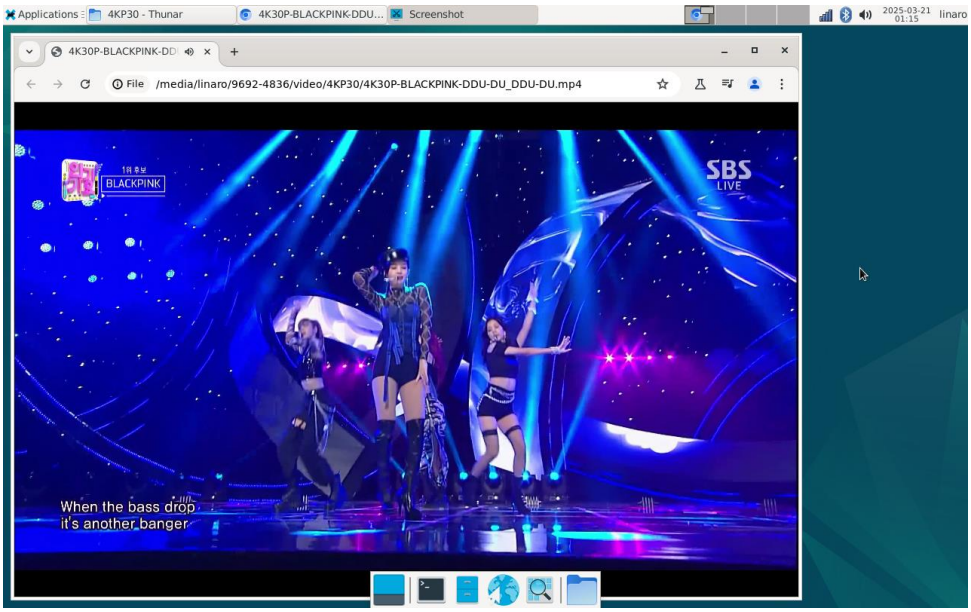
• However, it is only compatible with certain H.265 video files.

Step 1: Select the video file, right-click, and choose **"Open With Other Application…"**.



Step 2: Find **Chromium Browser** in the list, select it, and click **"Open"** to play the video file.





(1) Use the gst-play-1.0 command to play the video.

```
# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
# gst-play-1.0 --flags=3 --videosink="kmssink plane-id=96" /media/linaro/9692-4836/video/4KP60/4KP60-exist.mp4  --audiosink="alsasink device=hw:0,0"
```

Command explanation:

• export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1: Open AFBC.

• --videosink="kmssink plane-id=96": Specifies the plane. Which can be viewed using the command: cat /sys/kernel/debug/dri/0/state | grep "plane\[".

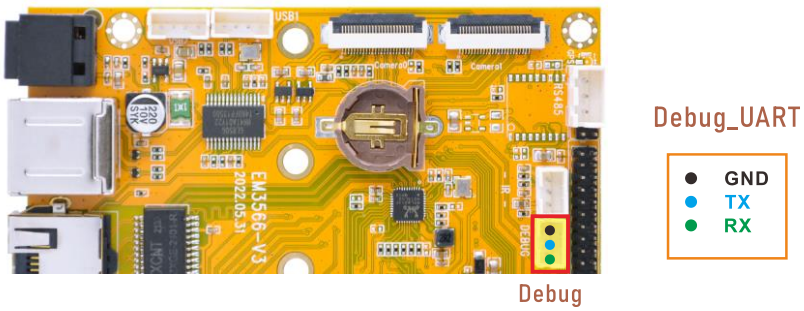
• /media/linaro/9692-4836/video/4KP60/4KP60-exist.mp4: The media file path to be played.

• --audiosink="alsasink device=hw:0,0": Specifies the audio output device as hw:0,0.

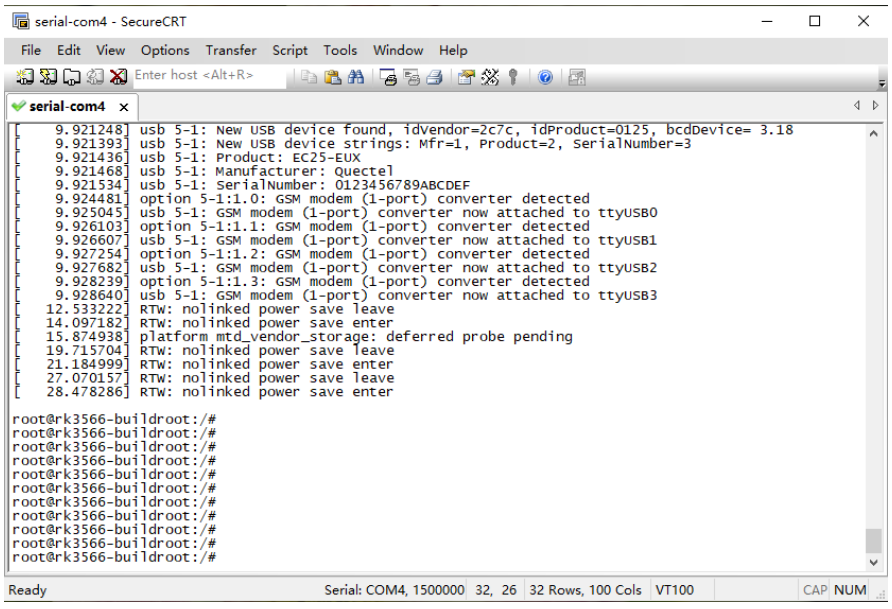
```
root@linaro-alip:/# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
root@linaro-alip:/#                          gst-play-1.0 --flags=3 --videosink="kmssink plane-id=96"
/media/linaro/9692-4836/video/4KP60/4KP60-exist.mp4      --audiosink="alsasink   device=hw:0,0"nk="kmssink
plane-id=96"  /media/linaro/9692-4836/video/4KP60/4KP60-exist.mp4    --audioPress 'k' to see a list of
keyboard shortcuts.
Now playing /media/linaro/9692-4836/video/4KP60/4KP60-exist.mp4
Redistribute latency...
Redistribute latency...
WARNING No volume control found
WARNING     debug     information:     ../gst/playback/gstplaysink.c(2908):     gen_audio_chain     ():
/GstPlayBin:playbin/GstPlaySink:playsink:
Volume/mute is not available
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:17.0 / 0:04:01.9
```

7.Buildroot Test

7.1 Serial Terminal

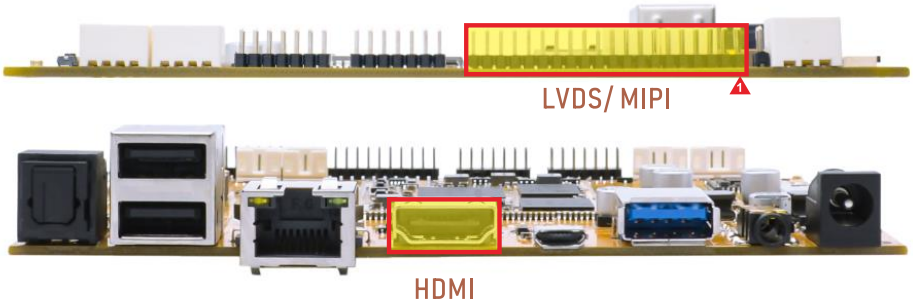


Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.



7.2 Display

The EM3566 can only output to a single display (either HDMI or LVDS) at a time.



The display effect diagram is as follows:

7.3 Headset

Step 1: Plug the headset into the headset jack.

Step 2: View sound card.

```
# cat /proc/asound/cards
```

```
root@rk3566-buildroot:/# cat /proc/asound/cards
 0 [rockchiphdmi   ]: rockchip-hdmi - rockchip-hdmi
                      rockchip-hdmi
 1 [rockchipes8388c]: simple-card - rockchip,es8388-codec
                      rockchip,es8388-codec
```

Step 3: Headset recording.

• To use HDMI as the display:

```
# arecord -Dhw:1,0 -f cd record.wav
```

```
root@rk3566-buildroot:/# arecord -Dhw:1,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

• To use LVDS (1280x800) as the display:

```
# arecord -Dhw:0,0 -f cd record.wav
```

```
root@rk3566-buildroot:/# arecord -Dhw:0,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

Step 4: Play audio through headset.

• When using HDMI as the display:

```
# aplay -Dhw:1,0 record.wav
```

```
root@rk3566-buildroot:/# aplay -Dhw:1,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

Note: Supplementary instructions on audio output.

```
# aplay -Dhw:0,0 record.wav   // HDMI TX audio output
# aplay -Dhw:1,0 record.wav   // Headset audio output
```

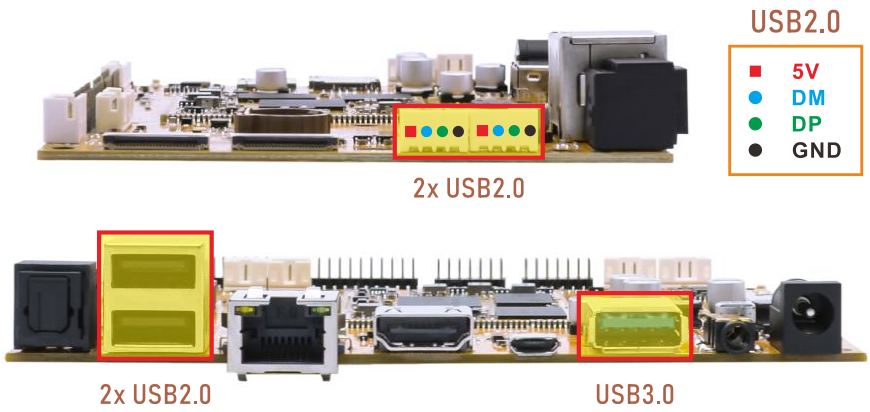
• When using LVDS (1280x800) as the display:

```
# aplay -Dhw:0,0 record.wav
```

```
root@rk3566-buildroot:/# aplay -Dhw:0,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

7.4 USB Host

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



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.

```
root@rk3566-buildroot:/# [   98.279786] RTW: nolinked power save leave
[   99.512575] usb 3-1.1: new high-speed USB device number 5 using ehci-platform
[   99.622832] usb 3-1.1: New USB device found, idVendor=21c4, idProduct=0cc7, bcdDevice= 1.00
[   99.622971] usb 3-1.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[   99.623014] usb 3-1.1: Product: USB Flash Drive
[   99.623047] usb 3-1.1: Manufacturer: Lexar
[   99.623078] usb 3-1.1: SerialNumber: 04102800000031D7
[   99.625693] usb-storage 3-1.1:1.0: USB Mass Storage device detected
[   99.628291] scsi host1: usb-storage 3-1.1:1.0
[   99.837386] RTW: nolinked power save enter
[  100.643885] scsi 1:0:0:0: Direct-Access     Lexar    USB Flash Drive  1.00 PQ: 0 ANSI: 4
[  100.648207] sd 1:0:0:0: [sdb] 120861886 512-byte logical blocks: (61.9 GB/57.6 GiB)
[  100.649143] sd 1:0:0:0: [sdb] Write Protect is off
[  100.649905] sd 1:0:0:0: [sdb] No Caching mode page found
[  100.649929] sd 1:0:0:0: [sdb] Assuming drive cache: write through
```

• USB3.0 print information in SuperSpeed mode.

```
root@rk3566-buildroot:/# [   25.165426] usb 2-1: new SuperSpeed USB device number 2 using xhci-hcd
[   25.196607] usb 2-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[   25.196702] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[   25.196744] usb 2-1: Product: OnlyDisk
[   25.196777] usb 2-1: Manufacturer: Netac
[   25.196809] usb 2-1: SerialNumber: C0E8BFA3EC38F796
[   25.203056] usb-storage 2-1:1.0: USB Mass Storage device detected
[   25.206126] scsi host0: usb-storage 2-1:1.0
[   26.563955] scsi 0:0:0:0: Direct-Access     Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[   26.569195] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[   26.569704] sd 0:0:0:0: [sda] Write Protect is off
[   26.569998] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[   26.576508]  sda: sda1
[   26.577560] sd 0:0:0:0: [sda] Attached SCSI removable disk
```

After connecting the USB flash drive, it will be automatically mounted, execute the following command to view the path where the device is mounted:

```
# df -h
```

```
root@rk3566-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  693M  5.0G  13% /
devtmpfs        967M  8.0K  967M   1% /dev
tmpfs           979M  140K  979M   1% /tmp
tmpfs           979M  432K  979M   1% /run
tmpfs           979M  176K  979M   1% /var/log
tmpfs           979M     0  979M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  412K  920M   1% /userdata
/dev/nvme0n1    229G  138M  217G   1% /mnt/storage
/dev/sda1        58G   30G   29G  51% /mnt/udisk
/dev/sdb1        32G  4.7G   28G  15% /media/udisk1
```

7.5 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.

```
root@rk3566-buildroot:/# [  270.948764] rk_gmac-dwmac fe010000.ethernet eth0: Link is Up - 1Gbps/Full -
flow control rx/tx
[  270.948942] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

Step 2: View network interface information.

```
# ifconfig
```

```
root@rk3566-buildroot:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 2A:59:46:AE:68:59
          inet addr:192.168.0.226  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::4724:3f74:1777:3489/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:123 errors:0 dropped:8 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:16809 (16.4 KiB)  TX bytes:1410 (1.3 KiB)
          Interrupt:54
```

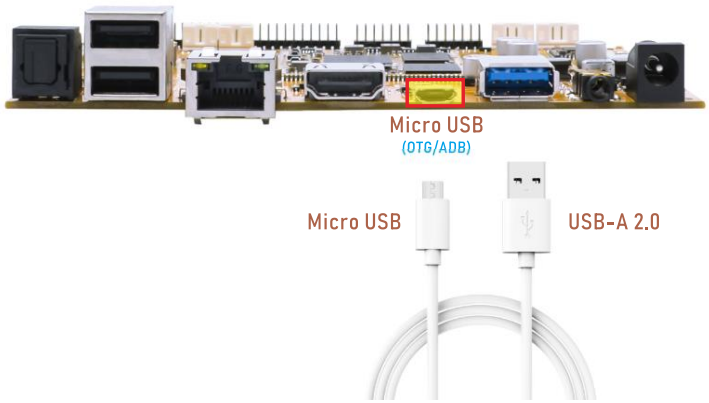
Step 3: Network connection test.

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

```
PING www.armdesigner.com (67.222.54.196) from 192.168.0.226 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=220 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=220 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=220 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=222 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=48 time=219 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=11 ttl=48 time=220 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=13 ttl=48 time=220 ms
^C
--- www.armdesigner.com ping statistics ---
14 packets transmitted, 7 received, 50% packet loss, time 13124ms
rtt min/avg/max/mdev = 219.453/220.111/221.670/0.720 ms
```

7.6 ADB

Step 1: Connect the board and PC host with Micro usb cable.

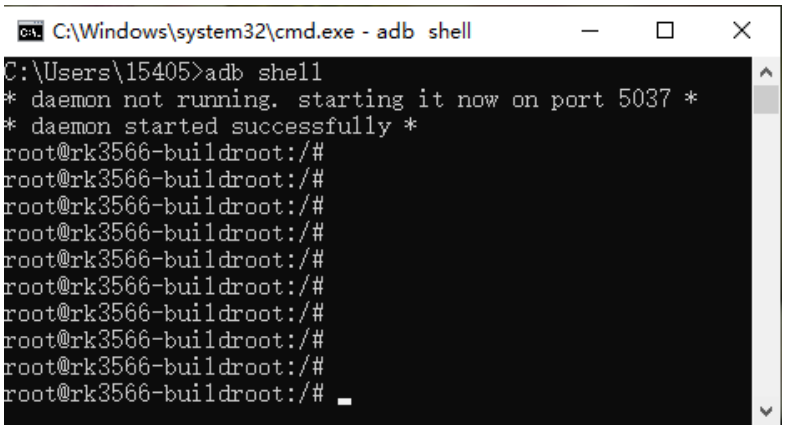


Step 2: Install ADB driver on Windows system.

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 shell
```

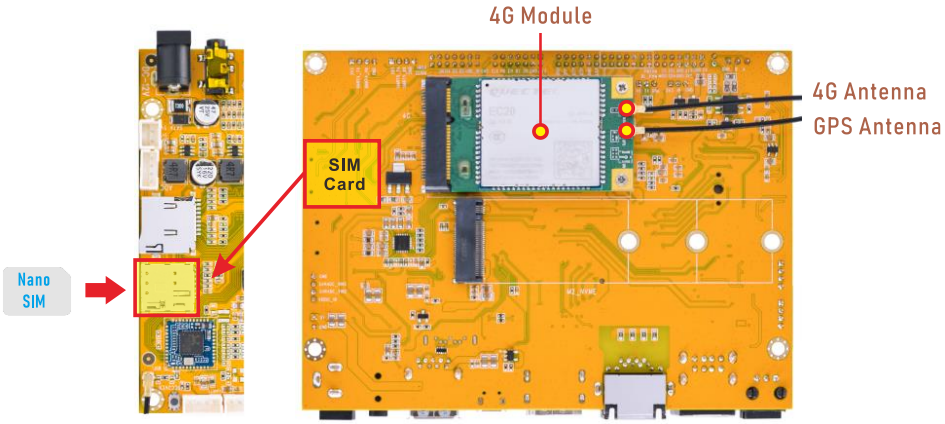


7.7 4G & GPS

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

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.



7.7.1 4G Test

Step 1: Initiate the PPP connection.

```
# mkdir -p var/run/pppd/lock
# pppd call quectel-ppp &
```

```
root@rk3566-buildroot:/# mkdir -p var/run/pppd/lock
root@rk3566-buildroot:/# pppd call quectel-ppp &
[1] 1475
root@rk3566-buildroot:/# pppd options in effect:
debug          # (from /etc/ppp/peers/quectel-ppp)
nodetach              # (from /etc/ppp/peers/quectel-ppp)
dump           # (from /etc/ppp/peers/quectel-ppp)
noauth         # (from /etc/ppp/peers/quectel-ppp)
user test             # (from /etc/ppp/peers/quectel-ppp)
password ??????        # (from /etc/ppp/peers/quectel-ppp)
remotename 3gppp              # (from /etc/ppp/peers/quectel-ppp)
/dev/ttyUSB3           # (from /etc/ppp/peers/quectel-ppp)
115200         # (from /etc/ppp/peers/quectel-ppp)
lock           # (from /etc/ppp/peers/quectel-ppp)
connect chat -s -v -f /etc/ppp/peers/quectel-chat-connect             # (from /etc/ppp/peers/quectel-ppp)
disconnect chat -s -v -f /etc/ppp/peers/quectel-chat-disconnect       # (from /etc/ppp/peers/quectel-ppp)
nocrtscts             # (from /etc/ppp/peers/quectel-ppp)
modem          # (from /etc/ppp/peers/quectel-ppp)
hide-password          # (from /etc/ppp/peers/quectel-ppp)
novj           # (from /etc/ppp/peers/quectel-ppp)
novjccomp             # (from /etc/ppp/peers/quectel-ppp)
ipcp-accept-local             # (from /etc/ppp/peers/quectel-ppp)
ipcp-accept-remote            # (from /etc/ppp/peers/quectel-ppp)
ipparam 3gppp          # (from /etc/ppp/peers/quectel-ppp)
noipdefault           # (from /etc/ppp/peers/quectel-ppp)
ipcp-max-failure 30           # (from /etc/ppp/peers/quectel-ppp)
defaultroute          # (from /etc/ppp/peers/quectel-ppp)
usepeerdns            # (from /etc/ppp/peers/quectel-ppp)
noccp          # (from /etc/ppp/peers/quectel-ppp)
abort on (BUSY)
abort on (NO CARRIER)
abort on (NO DIALTONE)
abort on (ERROR)
abort on (NO ANSWER)
timeout set to 30 seconds
send (AT^M)
expect (OK)
AT^M^M
OK
 -- got it

send (ATE0^M)
expect (OK)
^M
ATE0^M^M
OK
 -- got it

send (ATI;+CSUB;+CSQ;+CPIN?;+COPS?;+CGREG?;&D2^M)
expect (OK)
^M
```

Step 2: Check the status of the network interfaces.

```
# ifconfig
```

```
root@rk3566-buildroot:/# ifconfig
ppp0      Link encap:Point-to-Point Protocol
          inet addr:10.137.30.185  P-t-P:10.64.64.64  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:22 errors:0 dropped:0 overruns:0 frame:0
          TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:1525 (1.4 KiB)  TX bytes:1552 (1.5 KiB)
```

Step 3: Test the PPP connection.

```
# ping -I ppp0 www.armdesigner.com
```

```
root@rk3566-buildroot:/# ping -I ppp0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.137.30.185 ppp0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=46 time=316 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=269 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=46 time=547 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=46 time=508 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=46 time=468 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=46 time=428 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=46 time=387 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=46 time=345 ms
^C
--- www.armdesigner.com ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7004ms
rtt min/avg/max/mdev = 269.016/408.291/546.505/90.381 ms
```

7.7.2 GPS Test

Step 1: Enable GPS functionality.

```
# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
```

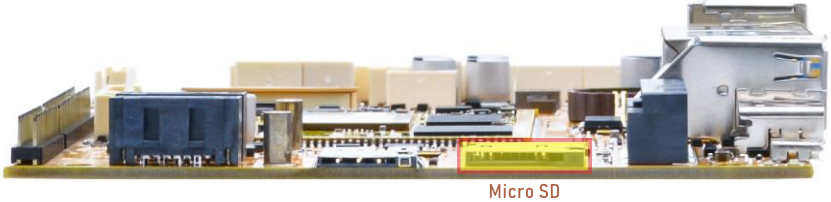
Step 2: Read GPS data.

```
# cat /dev/ttyUSB1
```

```
root@rk3566-buildroot:/# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@rk3566-buildroot:/# cat /dev/ttyUSB1
$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,*32

$GPGGA,,,,,,0,,,,,,,,*66

$GPRMC,,V,,,,,,,,,,N,V*29

$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,*32

$GPGGA,,,,,,0,,,,,,,,*66

$GPRMC,,V,,,,,,,,,,N,V*29

$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,*32

$GPGGA,,,,,,0,,,,,,,,*66

$GPRMC,,V,,,,,,,,,,N,V*29
```

7.8 SD Card

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



Micro SD

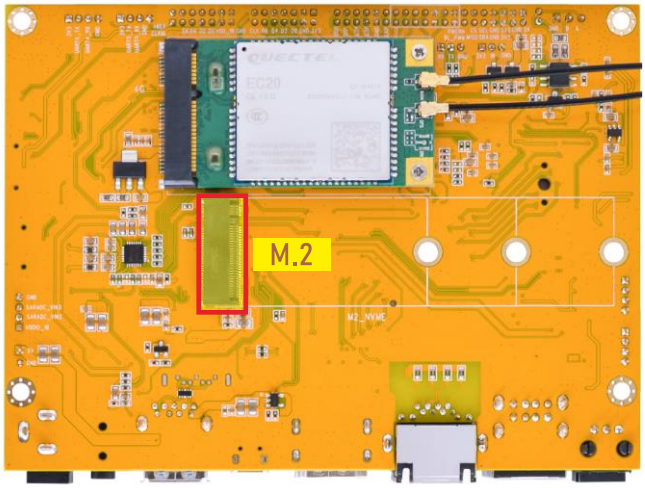
Step 2: The system will automatically mount it, view the device mount path.

```
# df -h
```

```
root@rk3566-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  693M  5.0G  13% /
devtmpfs        967M  8.0K  967M   1% /dev
tmpfs           979M  140K  979M   1% /tmp
tmpfs           979M  444K  979M   1% /run
tmpfs           979M  204K  979M   1% /var/log
tmpfs           979M     0  979M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  412K  920M   1% /userdata
/dev/nvme0n1    229G  138M  217G   1% /mnt/storage
/dev/sda1        58G   30G   29G  51% /mnt/udisk
/dev/sdb1        32G  4.7G   28G  15% /media/udisk1
/dev/mmcblk1p1   30G  572M   30G   2% /mnt/sdcard
```

7.9 M.2 NVME SSD

Step 1: Connect the SSD, then power on.



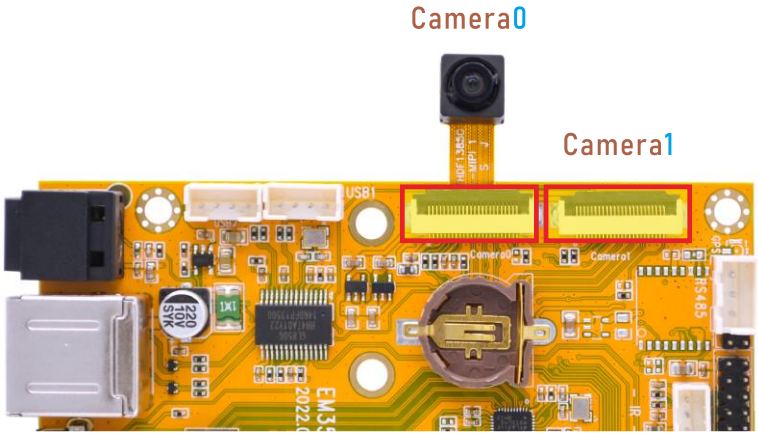
Step 2: The system will automatically mount it, view the device mount path.

```
# df -h
```

```
root@rk3566-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  693M  5.0G  13% /
devtmpfs        967M  8.0K  967M   1% /dev
tmpfs           979M  140K  979M   1% /tmp
tmpfs           979M  444K  979M   1% /run
tmpfs           979M  204K  979M   1% /var/log
tmpfs           979M     0  979M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  412K  920M   1% /userdata
/dev/nvme0n1    229G  138M  217G   1% /mnt/storage
/dev/sda1        58G   30G   29G  51% /mnt/udisk
/dev/sdb1        32G  4.7G   28G  15% /media/udisk1
/dev/mmcblk1p1   30G  572M   30G   2% /mnt/sdcard
```

7.10 Camera

The EM3566 Buildroot system only supports camera0 by default.



Step 2: Preview camera.

```
# /rockchip-test/camera/camera_rkisp_test.sh
```

```
root@rk3566-buildroot:/# /rockchip-test/camera/camera_rkisp_test.sh
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[  980.565034] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[  980.569761] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
[  980.569835] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:1, dphy1, ret 0
Redistribute latency...
[  984.906616] RTW: nolinked power save leave
[  986.427631] RTW: nolinked power save enter
0:00:09.2 / 99:99:99.
```

Step 3: Record the video.

```
# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=100 ! \
video/x-raw,format=NV12,width=1920,height=1088,framerate=30/1 ! \
videoconvert ! mpph264enc ! h264parse ! mp4mux ! \
filesink location=/tmp/h264.mp4
```

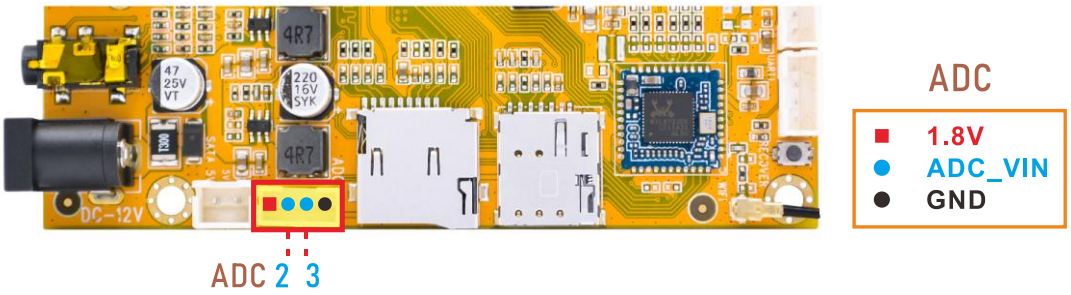
```
root@rk3566-buildroot:/#
00 ! \k3566-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=10
> video/x-raw,format=NV12,width=1920,height=1088,framerate=30/1 ! \
> videoconvert ! mpph264enc ! h264parse ! mp4mux ! \
> filesink location=/tmp/h264.mp4
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[ 1022.851135] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[ 1022.862572] rkisp rkisp-vir0: first params buf queue
[ 1022.862872] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
[ 1022.862935] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:1, dphy1, ret 0
Redistribute latency...
Redistribute latency...
0:00:02.5 / 99:99:99.
```

Step 4: Take photos.

```
# gst-launch-1.0 -v v4l2src device=/dev/video0 num-buffers=10 ! \
video/x-raw,format=NV12,width=1280,height=800 ! mppjpegenc ! \
multifilesink location=/tmp/test%05d.jpg
```

```
root@rk3566-buildroot:/#
s=10 ! \566-buildroot:/# gst-launch-1.0 -v v4l2src device=/dev/video0 num-buffers
> video/x-raw,format=NV12,width=1280,height=800 ! mppjpegenc ! \
> multifilesink location=/tmp/test%05d.jpg
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
/GstPipeline:pipeline0/GstV4l2Src:v4l2src0: crop-bounds = < (int)0, (int)0, (int)2112, (int)1568 >
/GstPipeline:pipeline0/GstV4l2Src:v4l2src0.GstPad:src: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstCapsFilter:capsfilter0.GstPad:src: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
New clock: GstSystemClock
/GstPipeline:pipeline0/GstMppJpegEnc:mppjpegenc0.GstPad:src: caps = image/jpeg, width=(int)1280,
height=(int)800, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)120/1, interlace-
mode=(string)progressive, colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstMultiFileSink:multifilesink0.GstPad:sink: caps = image/jpeg, width=(int)1280,
height=(int)800, pixel-aspect-ratio=(fraction)1/1, framerate=(fraction)120/1, interlace-
mode=(string)progressive, colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstMppJpegEnc:mppjpegenc0.GstPad:sink: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
/GstPipeline:pipeline0/GstCapsFilter:capsfilter0.GstPad:sink: caps = video/x-raw, format=(string)NV12,
width=(int)1280, height=(int)800, framerate=(fraction)120/1, interlace-mode=(string)progressive,
colorimetry=(string)1:3:5:1
[ 1078.990845] rkisp_hw fdff0000.rkisp: set isp clk = 297000000Hz
[ 1079.008021] rkisp rkisp-vir0: first params buf queue
[ 1079.008389] rockchip-csi2-dphy1: dphy1, data_rate_mbps 600
[ 1079.008454] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:1, dphy1, ret 0
Redistribute latency...
Got EOS from element "pipeline0".
Execution ended after 0:00:00.573828820
Setting pipeline to NULL ...
[ 1079.570163] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream_stop stream stop, dphy1
[ 1079.570220] rockchip-csi2-dphy csi2-dphy1: csi2_dphy_s_stream stream on:0, dphy1, ret 0
Freeing pipeline ...
```

7.11 ADC

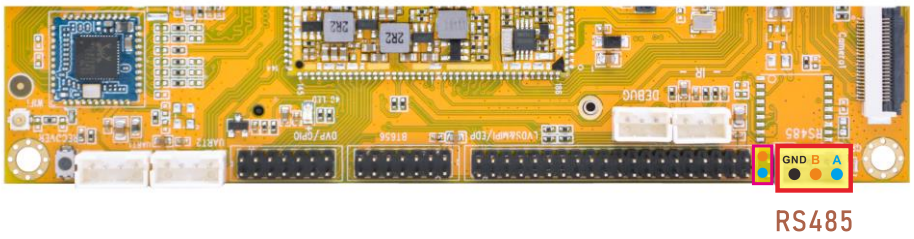


Connect the ADC_VIN pin to high and low levels respectively, then run the following command to observe the data changes.

```
# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
```

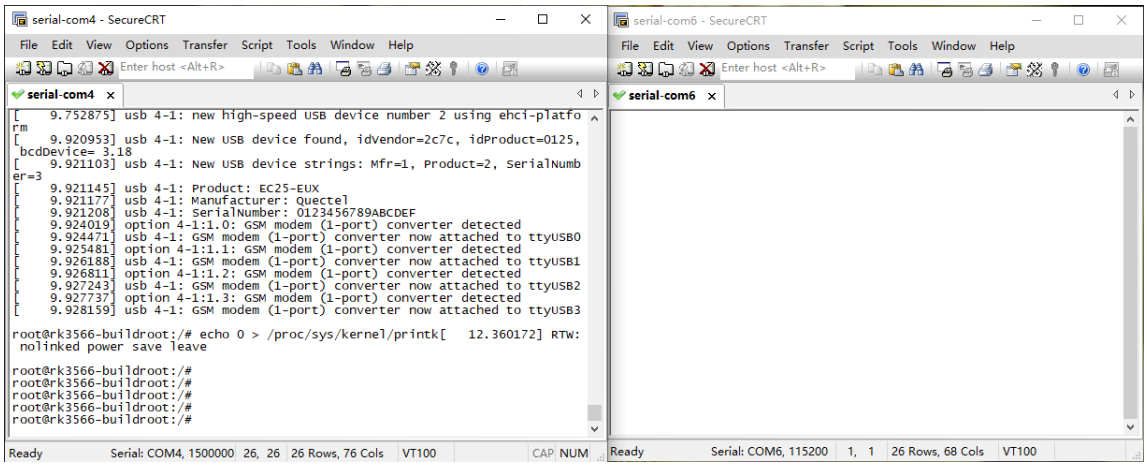
```
root@rk3566-buildroot:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
1023
581
895
15
447
524
543
539
root@rk3566-buildroot:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage*_raw
1023
585
830
1023
559
547
547
539
```

7.12 RS485



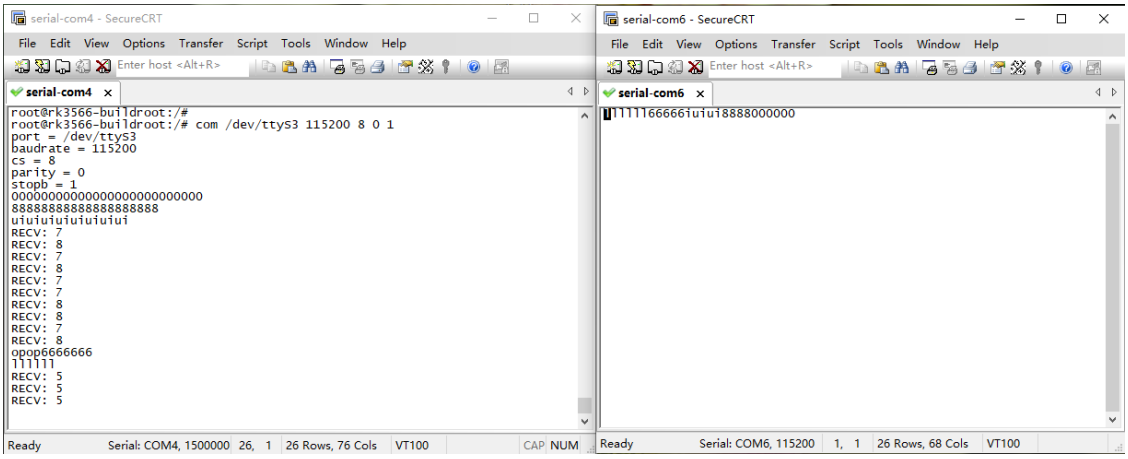
Step 1: As shown in the diagram, connect the RS485 test tool to the development board.

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.



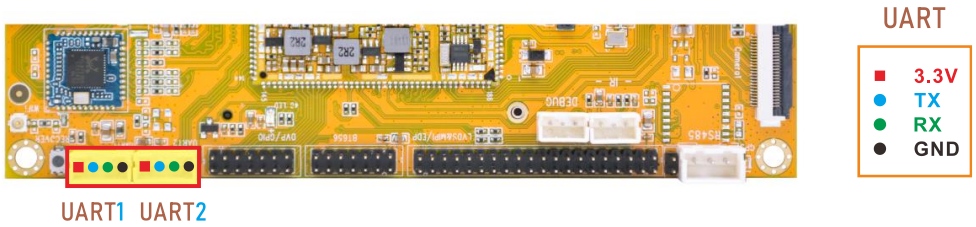
Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

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



7.14 UART

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



Step 2: UART1 test.

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

```
root@rk3566-buildroot:/# com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
FFFFF
RECV: FFFFF
56565656
RECV: 56565656
KKKKK000
RECV: KKKKK000
KK
RECV: KK
```

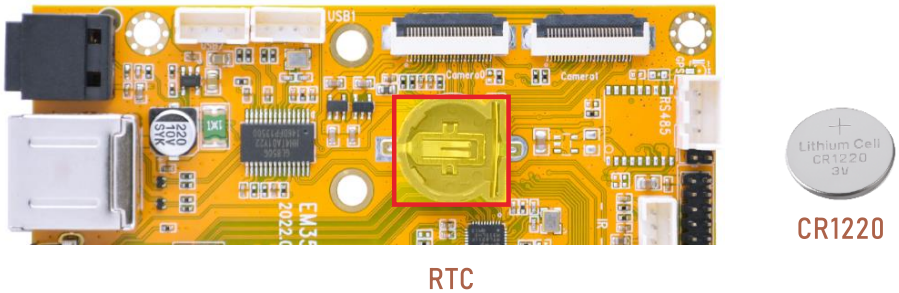
Step 3: UART2 test.

```
# com /dev/ttyS5 115200 8 0 1
```

```
root@rk3566-buildroot:/# com /dev/ttyS5 115200 8 0 1
port = /dev/ttyS5
baudrate = 115200
cs = 8
parity = 0
stopb = 1
222200000
RECV: 222200000
PPPPP666
RECV: PPPPP666
YUYUYUYUYUUYUY
RECV: YUYUYUYUYUUYUY
KKKK0
RECV: KKKK0
```

7.15 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
# date -s "2025-03-21 10:33:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

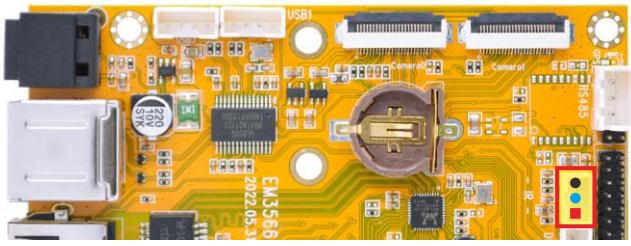
```
# hwclock
```

```
root@rk3566-buildroot:/# date -s "2025-03-21 10:33:00"
Fri Mar 21 10:33:00 UTC 2025
root@rk3566-buildroot:/# hwclock -w
root@rk3566-buildroot:/# hwclock
Fri Mar 21 10:33:09 2025  0.000000 seconds
root@rk3566-buildroot:/# hwclock
Fri Mar 21 10:33:19 2025  0.000000 seconds
root@rk3566-buildroot:/# hwclock
Fri Mar 21 10:33:39 2025  0.000000 seconds
```

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

```
root@rk3566-buildroot:/# hwclock
Fri Mar 21 11:19:14 2025  0.000000 seconds
root@rk3566-buildroot:/# hwclock
Fri Mar 21 11:19:35 2025  0.000000 seconds
root@rk3566-buildroot:/# hwclock
Fri Mar 21 11:20:02 2025  0.000000 seconds
root@rk3566-buildroot:/# hwclock
Fri Mar 21 11:20:11 2025  0.000000 seconds
```

7.16 IR



Step 1: Open IR debugging print.

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

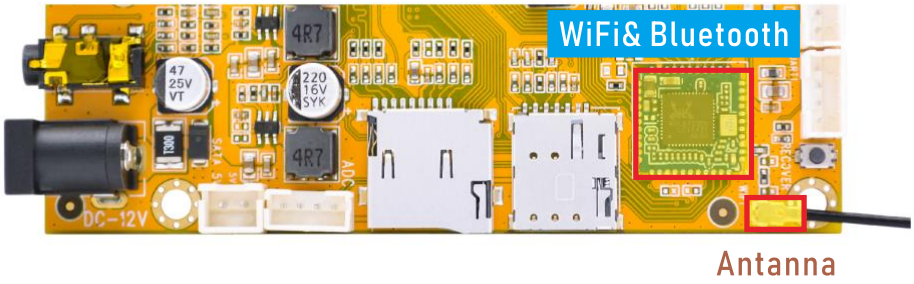
Step 2: When pressing a button on the remote control towards the IR receiver, the key

value will be printed to the log.

```
code_print6-buildroot:/# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/c
root@rk3566-buildroot:/# [   25.228147] USERCODE=0x1818
[   25.314086] RMC_GETDATA=26
[   25.520397] USERCODE=0x1818
[   25.547530] RMC_GETDATA=98
[   25.817104] USERCODE=0x1818
[   25.844232] RMC_GETDATA=98
[   26.095907] USERCODE=0x1818
[   26.122997] RMC_GETDATA=98
[   26.372248] USERCODE=0x1818
[   26.399371] RMC_GETDATA=98
[   26.652092] USERCODE=0x1818
[   26.679112] RMC_GETDATA=98
[   26.928095] USERCODE=0x1818
[   26.955212] RMC_GETDATA=98
[   27.212297] USERCODE=0x1818
[   27.239426] RMC_GETDATA=98
[   27.503980] USERCODE=0x1818
[   27.531156] RMC_GETDATA=98
```

7.17 WiFi & Bluetooth

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



7.17.1 WiFi

Step 1: View the device information.

```
# ifconfig
```

```
root@rk3566-buildroot:/# ifconfig
wlan0     Link encap:Ethernet  HWaddr 60:FB:00:75:AC:D4
          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 (0.0 B)  TX bytes:0 (0.0 B)
```

Step 2: Scan for available WiFi hotspots.

```
# iwlist wlan0 scan
```

```
root@rk3566-buildroot:/# iwlist wlan0 scan
wlan0     Scan completed :
          Cell 01 - Address: B2:22:7A:5A:B6:4A
                    ESSID:"DIRECT-4A-HP Laser 136w"
                    Protocol:IEEE 802.11gn
                    Mode:Master
                    Frequency:2.412 GHz (Channel 1)
                    Encryption key:on
                    Bit Rates:72 Mb/s
                    Extra:rsn_ie=30140100000fac040100000fac040100000fac020c00
                    IE: IEEE 802.11i/WPA2 Version 1
                        Group Cipher : CCMP
                        Pairwise Ciphers (1) : CCMP
                        Authentication Suites (1) : PSK
                    Quality=89/100  Signal level=45/100
                    Extra:fm=0003
          Cell 02 - Address: 06:70:AB:A5:B6:F8
                    ESSID:"XYLX-Shoeroom"
                    Protocol:IEEE 802.11bgn
                    Mode:Master
                    Frequency:2.412 GHz (Channel 1)
                    Encryption key:on
                    Bit Rates:300 Mb/s
                    Extra:wpa_ie=dd160050f20101000050f20401000050f20401000050f202
```

Step 3: Connect to the hotspot.

```
# wifi-connect.sh SSID PSK
```

```
root@rk3566-buildroot:/# wifi-connect.sh Boardcon Boardcon43435656
connect to WiFi ssid: Boardcon, Passwd: Boardcon43435656
Successfully initialized wpa_supplicant
```

Step 4: View the network interface status.

```
# ifconfig
```

```
root@rk3566-buildroot:/# ifconfig
wlan0     Link encap:Ethernet  HWaddr 60:FB:00:75:AC:D4
          inet addr:192.168.0.223  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a284:1a9:6654:7366/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:123 errors:0 dropped:14 overruns:0 frame:0
          TX packets:18 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:15578 (15.2 KiB)  TX bytes:2584 (2.5 KiB)
```

Step 5: Test the WiFi network.

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

```
root@rk3566-buildroot:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.223 wlan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=210 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=204 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=48 time=207 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=48 time=264 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=48 time=208 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=11 ttl=48 time=217 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=12 ttl=48 time=248 ms
^C
--- www.armdesigner.com ping statistics ---
12 packets transmitted, 7 received, 41.6667% packet loss, time 11990ms
rtt min/avg/max/mdev = 203.841/222.427/263.640/21.838 ms
```

7.17.2 Bluetooth

On Buildroot, Bluetooth is by default configured to be used as a Bluetooth speaker.

Step 1: Set the Bluetooth adapter to be discoverable.

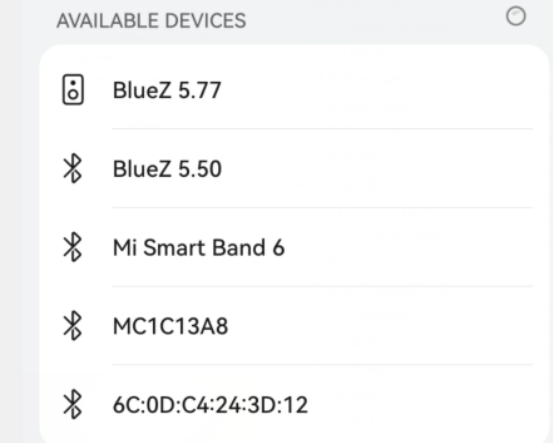
```
# hciconfig hci0 piscan
```

Step 2: Control and configure the Bluetooth device.

```
# bluetoothctl
```

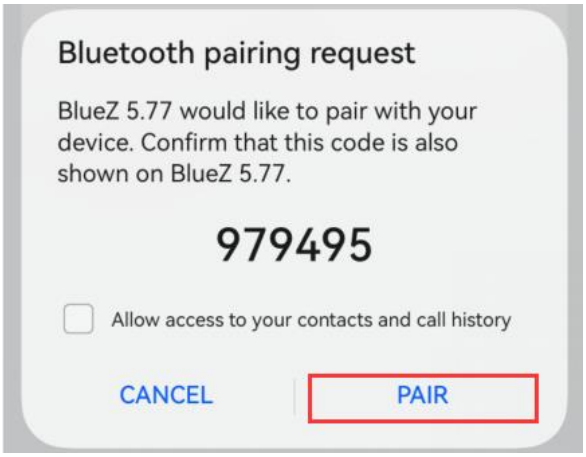
```
root@rk3566-buildroot:/# hciconfig hci0 piscan
root@rk3566-buildroot:/# bluetoothctl
hci0 new_settings: powered connectable discoverable bondable ssp br/edr le secure-conn
Agent registered
[CHG] Controller 60:FB:00:75:AC:D5 Pairable: yes
[bluetooth]#
```

Step 3: On the phone, locate the device name of the speaker: **BlueZ 5.77**, and click to connect.



Step 4: Permissions must be confirmed on both the phone and the speaker.

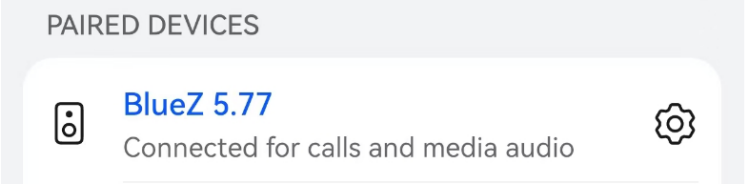
Phone:



Bluetooth speaker:

```
root@rk3566-buildroot:/# hciconfig hci0 piscan
root@rk3566-buildroot:/# bluetoothctl
hci0 new_settings: powered connectable discoverable bondable ssp br/edr le secure-conn
Agent registered
[CHG] Controller 60:FB:00:75:AC:D5 Pairable: yes
hci0 A8:35:12:9A:EB:4D type BR/EDR connected eir_len 11
[CHG] Device A8:35:12:9A:EB:4D INFO: 0x000f (15)
[CHG] Device A8:35:12:9A:EB:4D Connected: yes
Request confirmation
[agent] Confirm passkey 979495 (yes/no): yes
hci0 new_link_key A8:35:12:9A:EB:4D type 0x05 pin_len 0 store_hint 1
Authorize service
[agent] Authorize service 00001108-0000-1000-8000-00805f9b34fb (yes/no): yes
Authorize service
[agent] Authorize service 0000110d-0000-1000-8000-00805f9b34fb (yes/no): yes
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000046a-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001105-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000110a-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000110d-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001112-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001115-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001116-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000111f-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000112f-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001132-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001200-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001800-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 00001801-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 0000fe35-0000-1000-8000-00805f9b34fb
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 11c8b310-80e4-4276-afc0-f81590b2177f
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 8ce255c0-200a-11e0-ac64-0800200c9a66
[CHG] Device A8:35:12:9A:EB:4D UUIDs: 9664aa26-d76c-43ad-9775-d310f253a408
[NEW] Endpoint /org/bluez/hci0/dev_A8_35_12_9A_EB_4D/sep1
[NEW] Endpoint /org/bluez/hci0/dev_A8_35_12_9A_EB_4D/sep2
[NEW] Endpoint /org/bluez/hci0/dev_A8_35_12_9A_EB_4D/sep3
[NEW] Endpoint /org/bluez/hci0/dev_A8_35_12_9A_EB_4D/sep4
[NEW] Transport /org/bluez/hci0/dev_A8_35_12_9A_EB_4D/fd0
[liuy]#
```

Step 5: The connection is successful.



7.18 Video Playback

(1) The directory for the built-in video testing scripts in the system: */rockchip-test/video*

```
root@rk3566-buildroot:/# ls /rockchip-test/video/
test_gst_multivideo.sh  test_gst_video_fps.sh     video_stresstest.sh
test_gst_video.sh       test_gst_video_maxfps.sh  video_test.sh
```

Simply execute the script.

```
root@rk3566-buildroot:/# /rockchip-test/video/test_gst_video.sh
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
mpp[1471]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1471]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1471]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1471]: mpp: unable to create enc vp8 for soc rk3566 unsupported
mpp[1471]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1471]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
Redistribute latency...
mpp[1471]: h264d_api: is_avcC=1
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
[11:05:19.952] seeing the first app
0:00:01.8 / 0:00:29.5 (6.3 %)
```

(2) Play the video using Google Chrome.

• Google Chrome supports video playback up to 4K, with support for the following decoding formats: VP8, H.264, H.265, VP9, and AV1.

• However, it is only compatible with certain H.265 video files.

Execute the following command to play the video using Google Chrome：

```
#  chromium /media/udisk1/video/4KP30/4K30P-BLACKPINK-DDU-DU_DDU-DU.mp4
```

Command explanation:

• chromium: Launches the Chromium browser.

• /mnt/udisk/video/4KP30/4K30P-BLACKPINK-DDU-DU_DDU-DU.mp4: The media file path to be played.

```
root@rk3566-buildroot:/#
DU_DDU-DU.mp4uildroot:/# chromium /media/udisk1/video/4KP30/4K30P-BLACKPINK-DDU-D
[1629:1648:0321/110716.777707:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1648:0321/110716.778172:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1648:0321/110716.778652:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1648:0321/110716.778773:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1648:0321/110716.898893:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1648:0321/110716.899222:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1695:0321/110716.971124:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1654:0321/110716.971311:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")

(process:1629): GLib-GIO-CRITICAL **: 11:07:16.978: g_settings_schema_source_lookup: assertion 'source !=
NULL' failed
[1629:1629:0321/110717.240370:ERROR:object_proxy.cc(576)]       Failed       to       call       method:
org.freedesktop.DBus.NameHasOwner: object_path= /org/freedesktop/DBus: unknown error type:
[1629:1629:0321/110717.240501:ERROR:object_proxy.cc(576)]       Failed       to       call       method:
org.freedesktop.DBus.NameHasOwner: object_path= /org/freedesktop/DBus: unknown error type:
[1629:1644:0321/110717.241210:ERROR:bus.cc(407)] Failed to connect to the bus: Could not parse server
address: Unknown address type (examples of valid types are "tcp" and on UNIX "unix")
[1629:1718:0321/110717.305515:ERROR:object_proxy.cc(576)]       Failed       to       call       method:
org.freedesktop.DBus.Properties.Get:                object_path=               /org/freedesktop/UPower:
org.freedesktop.DBus.Error.ServiceUnknown: The name org.freedesktop.UPower was not provided by any .service
files
[1629:1718:0321/110717.306669:ERROR:object_proxy.cc(576)]       Failed       to       call       method:
```

(3) Use the gst-play-1.0 command to play the video.

```
# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
# gst-play-1.0 --videosink="waylandsink fullscreen=true"
/media/udisk1/video/4KP60/4KP60-exist.mp4 --audiosink="alsasink device=hw:0,0"
```

Command explanation:

• export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1: Open AFBC.

• /mnt/udisk/video/4KP60/4KP60-exist.mp4: The media file path to be played.

• --audiosink="alsasink device=hw:0,0": Specifies the audio output device as hw:0,0.

```
root@rk3566-buildroot:/# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
root@rk3566-buildroot:/#
/media/udisk1/video/4KP60/4KP60-exist.mp4 --audiosink="alsasink device=hw:0,0"" /
Press 'k' to see a list of keyboard shortcuts.
Now playing /media/udisk1/video/4KP60/4KP60-exist.mp4
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:13.8 / 0:04:01.9
```