EM3562 Linux6.10 User Manual

V1.0

Boardcon Embedded Designer

Overview

The content of this document is intended solely for the EM3562 development board, aiming to help users quickly understand, apply, and test the EM3562 development board.

System Support

Development Board	Debian12	Buildroot
Mini3562 V1 EM3562-V2 2025.3.20	Y	Y

Revision History

Version	Date	Author	Revision History
V1.0	2025-04-10	Boardcon Team	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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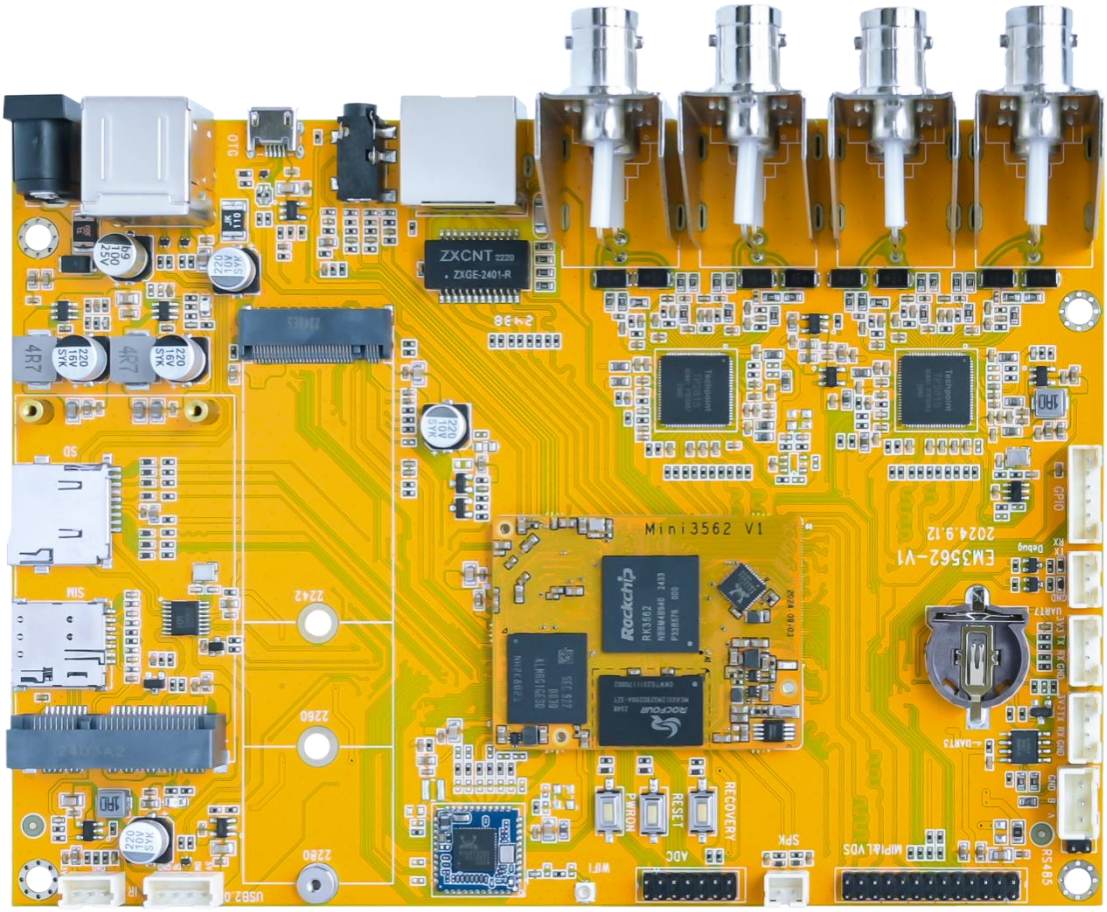
Content

1.Introduction

1.1 Overview

The EM3562 development board is equipped with the RK3562 processor, featuring a quad-core ARM Cortex-A53 CPU, ARM G52 2EE GPU(compatibility with OpenGL ES 1.1/2.0/3.2, OpenCL 2.0, and Vulkan 1.1), 1 TOPS NPU and , and 13-Megapixel ISP. EM3562 is high-performance and low-power quad-core application processor designed for consumer electronics equipments.

The H.265 video decoder supports up to 4K@30fps and full-format H.264 decoding at 1080@60fps, while the H.264 video encoder supports up to 1080p@60fps. EM3562 is equipped with 4GB (up to 8GB) LPDDR4X RAM, 8GB (up to 128GB) eMMC storage.



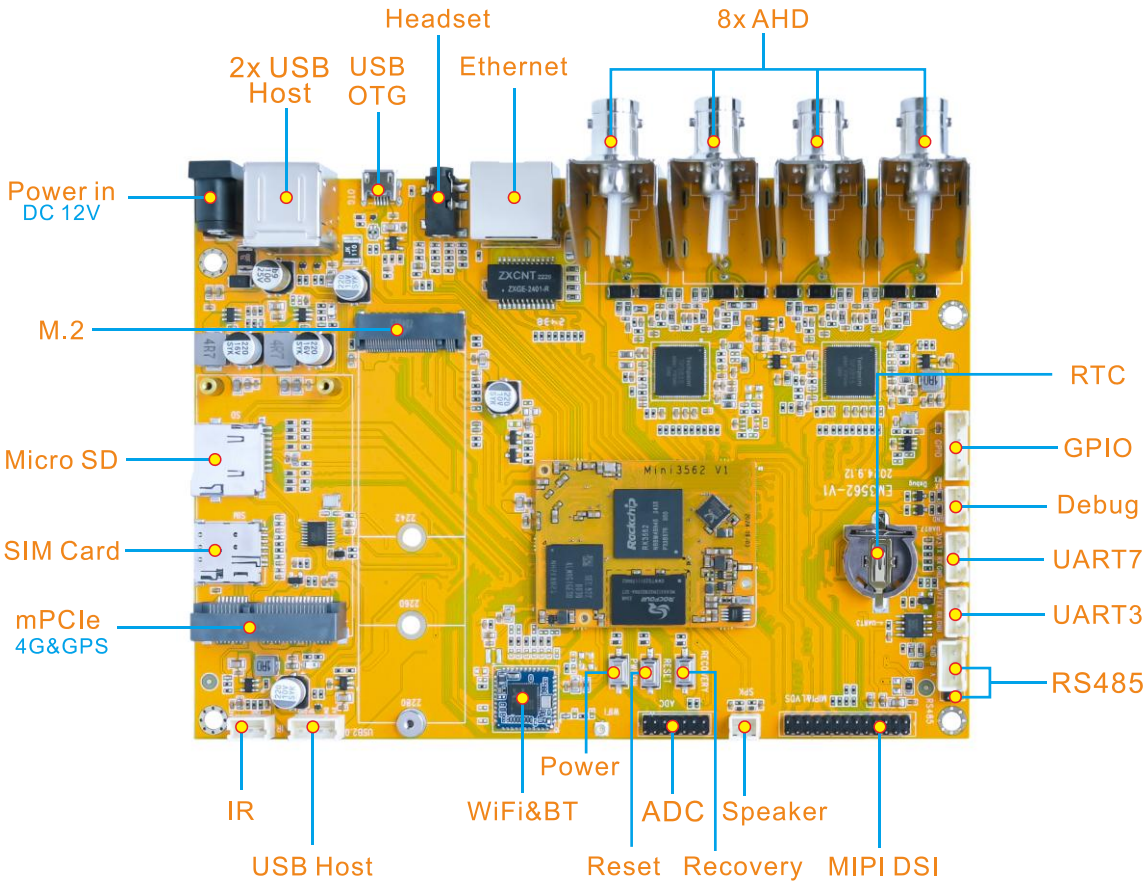
1.2 Product Parameters

Basic Parameters		
SOC		RK3562
CPU		• Quad-core ARM Cortex-A53 MPCore processor
GPU		• Mali-G52 1-Core-2EE • Support OpenGL ES 1.1/2.0/3.2 • Support Vulkan 1.0/1.1 • Support OpenCL 2.0 • Support a special 2D hardware engine
NPU		• 1 TOPS • Supports int8, int16, FP16, BP16, TF32 operation
Video	Decoder	• Supports up to 4K@30fps for H.265/HEVC, MVC video decoding • Supports up to 1080p@60fps for H.264/AVC, MVC, video decoding • Supports up to 4K@30fps for VP9 video decoding
	Encoder	• Supports H.264 video encoding up to 1080p@60fps
RAM		4GB/8GB LPDDR4X
ROM		8GB/16GB/32GB/64GB/128GB eMMC
Support system		Debian, Buildroot
Hardware Parameters		
Extended Storage		• Support 1x M.2 PCIe2.1 SSD

	• Support 1x MicroSD Card
Display	• Support 1xMIPI(4-lane) output, up to 2048x1080@60fps Or LVDS, up to 800 x 1280@60Hz
Audio	• Support 1x Speaker, 2-pin connecter • Support 1x Headphone output/input
USB	• Support 3xUSB2.0 Host • Support 1x USB2.0 OTG (ADB/USB)
Network	• Support 1x Gigabit Ethernet • Support 1x WIFI/BT module • Support 1x 4G/GPS module
Camera	• Support 8x AHD
Peripheral communication	• Support 1x RS485 • Support 2x UART • Support 9x adc • Support 4x GPIO
Other parameters	Support 1x Debug, 1x RTC, 1x IR
Electrical Parameters	
Power supply input voltage	12V/3A
RTC input voltage	3V/0.6uA
Operating temperature	0~70^{o}
Storage temperature	-40~85^{o}
Structural Parameters	

Core board dimensions	45mm x 34mm
Motherboard dimensions	160mm x 115mm

1.3 Hardware Interface Introduction



Interface parameters	
Power in DC 12V	12V DC power input interface
8x AHD	8-channel AHD camera input interface
Ethernet	Gigabit Ethernet RJ45 interface
USB Host	Dual USB2.0 Host interface and 4-pin connector
USB OTG	USB OTG interface, OTG download interface

Speaker	Speaker output interface, 2-pin connector
Audio out/in	Audio I/O interface
RS485	RS485 communication interface
Micro SD	Micro SD card slot
M.2	M.2 interface for connecting SSD
MIPI DSI	MIPI DSI interface
GPIO	General Purpose Input/Output pins
Debug	debug the serial port
UART	• UART3, TTL level serial interface • UART7, TTL level serial interface
ADC	ADC interface
WIFI&BT	WIFI&Bluetooth module
4G&GPS	4G mPCIe interface
RTC	RTC coin cell connector
IR	ADC interface, 3-pin connector
Recovery	Recovery key
Reset	Reset key
Power	Power key

2.Install Drivers and Tool

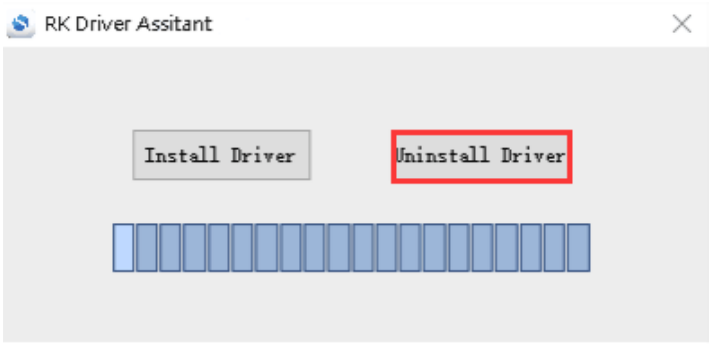
To download firmware and debug in the terminal, the following drivers and software need to be installed (for Windows computers):

Number	Driver name	Driver	Use
1	RK Driver Assitant	DriverInstall.exe	USB OTG download 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

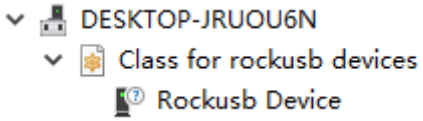
Step 1: Open *DriverAssitant_v5.1.1/DriverInstall.exe*.

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

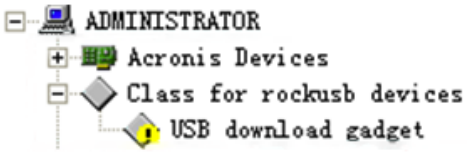


Step 3: Click button **"Install Driver"** to install.

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

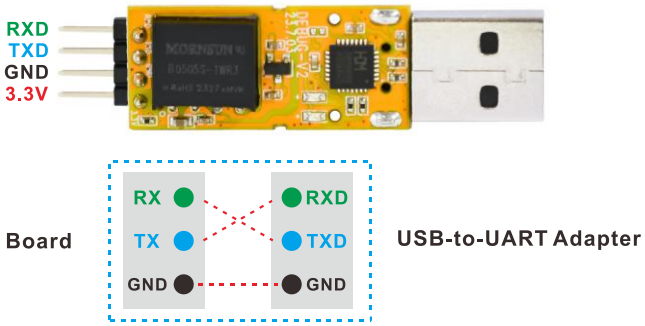


Step 6: The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select: *DriverAssitant_v5.1.1/ADBDriver*.

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



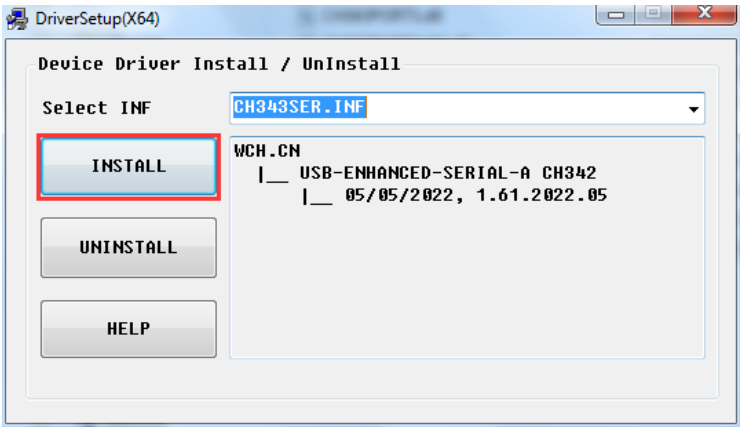
Pin	Connection Description
RXD	Receive, connect to TX pin of the board.
TXD	Transmit, connect to RX pin of the board.
GND	Ground, connect to GND pin of the board.
3V3	No need to connect.

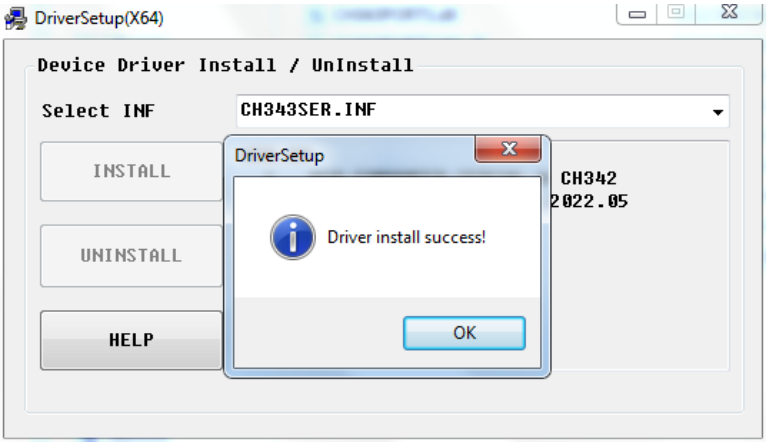
2.2.2 Install Driver

Step 1: Plug the CH9102X Module to the PC

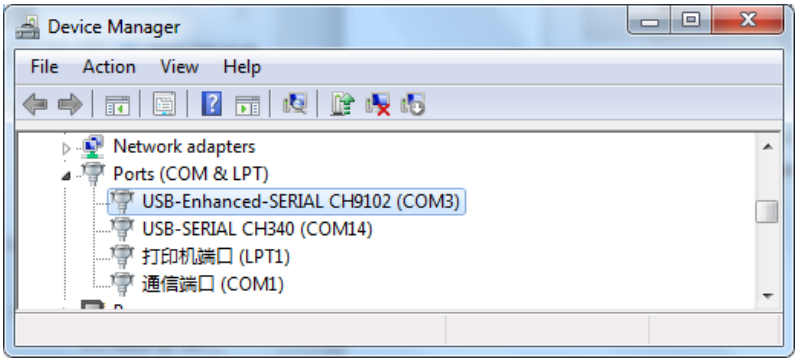
Step 2: Unzip *CH343SER.ZIP* on Windows.

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.

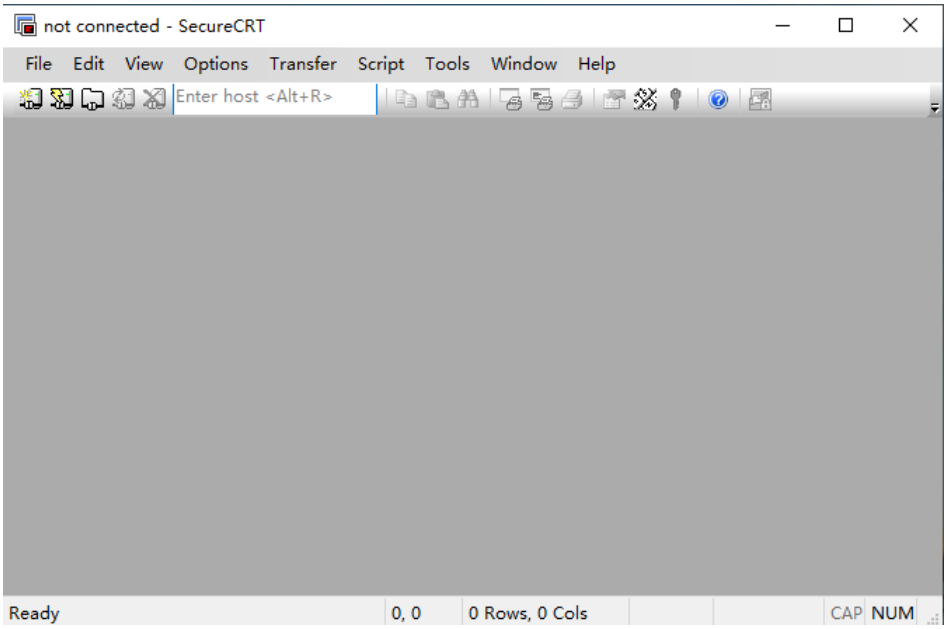


2.3 Install Serial Terminal Tool

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

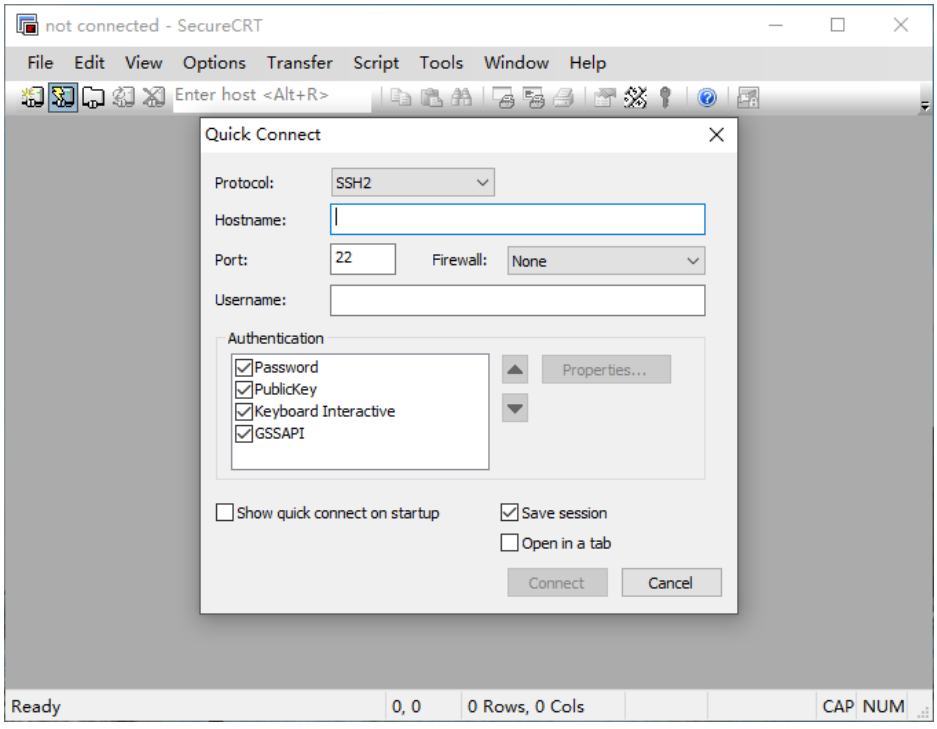
Step 1: Unzip *Platform/SecureCRT.rar* on PC.

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

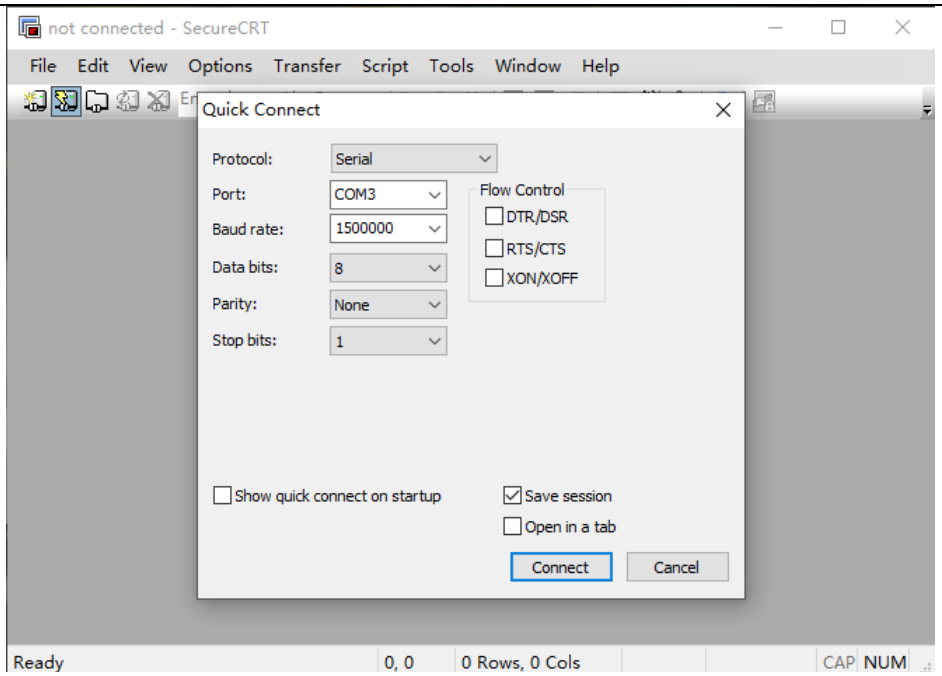


Step 3: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

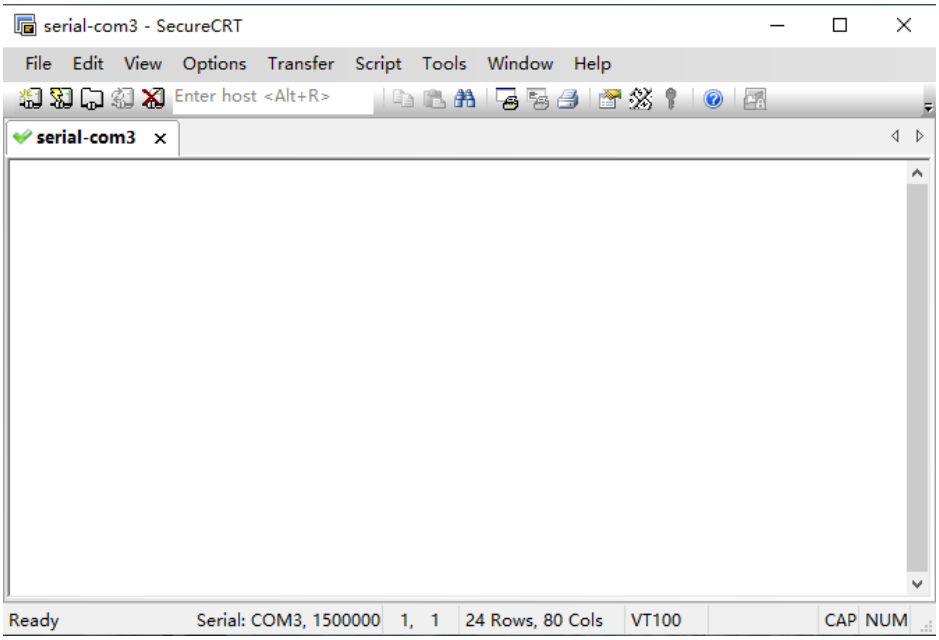
Step 4: Click the **"Quick Connect"** button to go to the Quick Connect configuration screen.



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

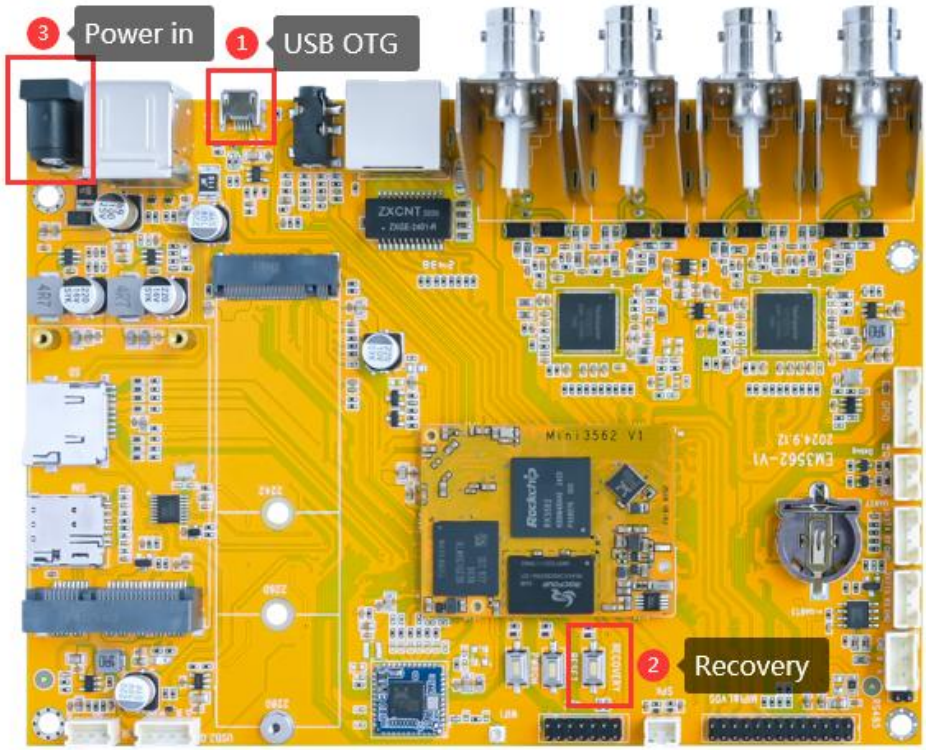
3.1.1.1 Hardware

Step 1: Disconnect the power adapter.

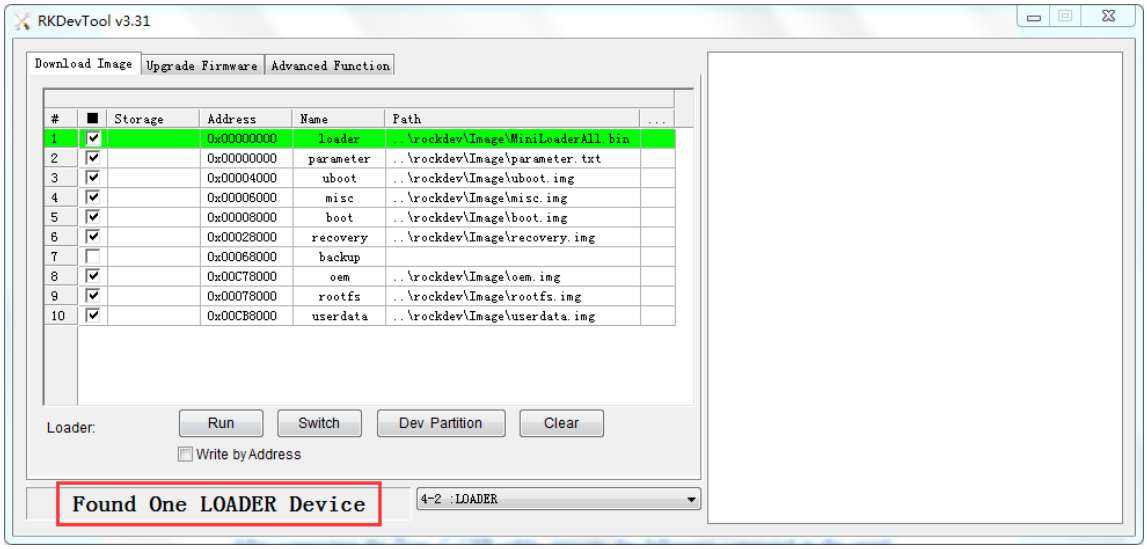
Step 2: Connect one end of the Micro USB cable to the PC host and the other end to the development board.

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 Device"**.



3.1.1.2 Software

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

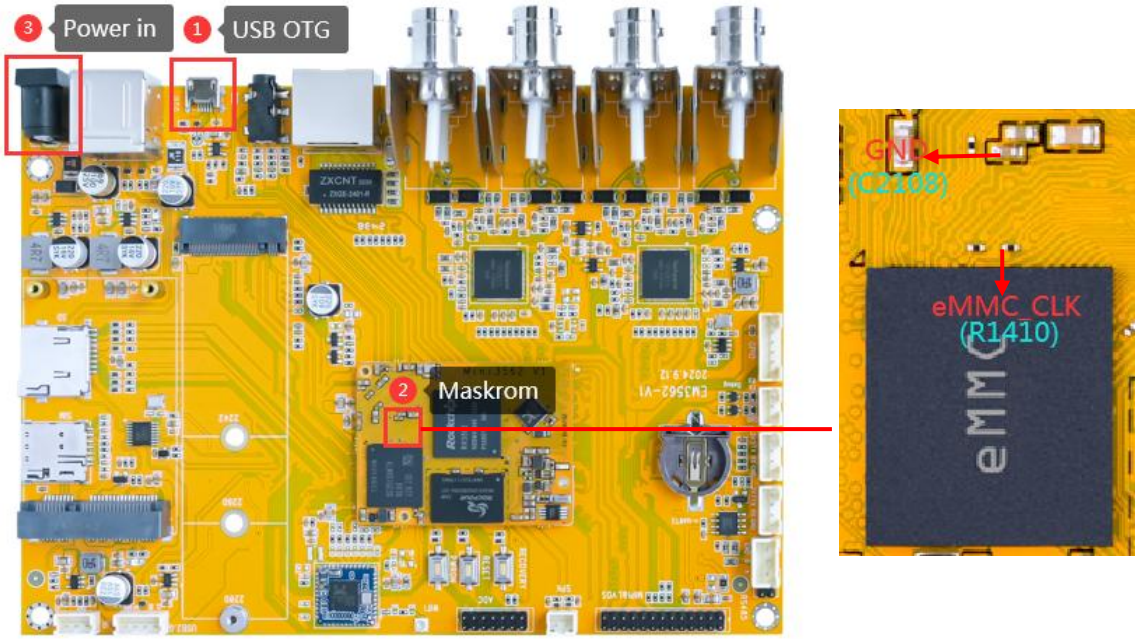
```
# reboot loader
```

3.1.2 How to Enter MaskRom Mode

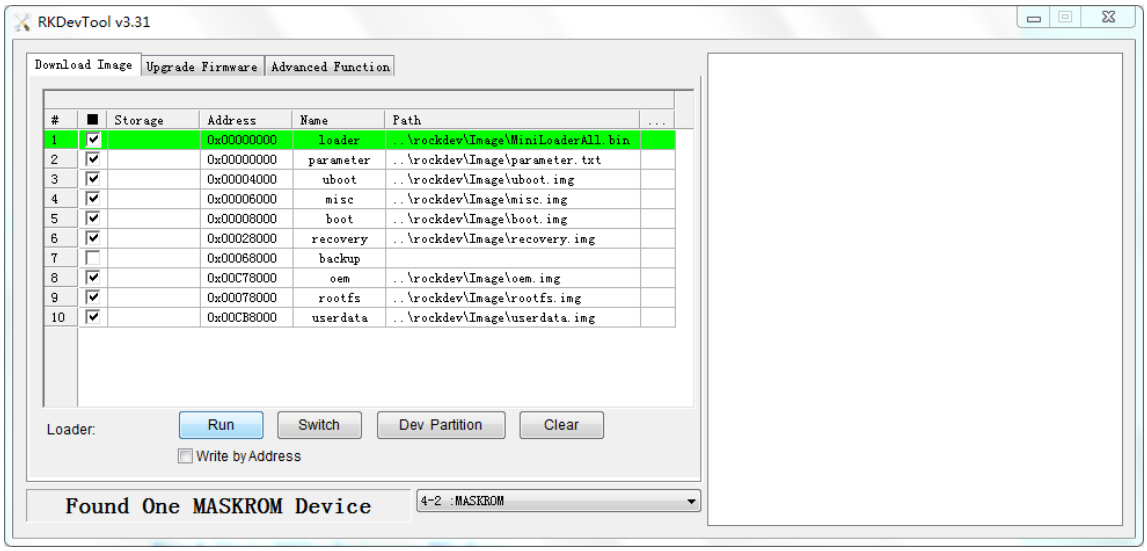
Step 1: Disconnect the power adapter.

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

Step 3: Use tweezers to short the two test points on the Mini3562.



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



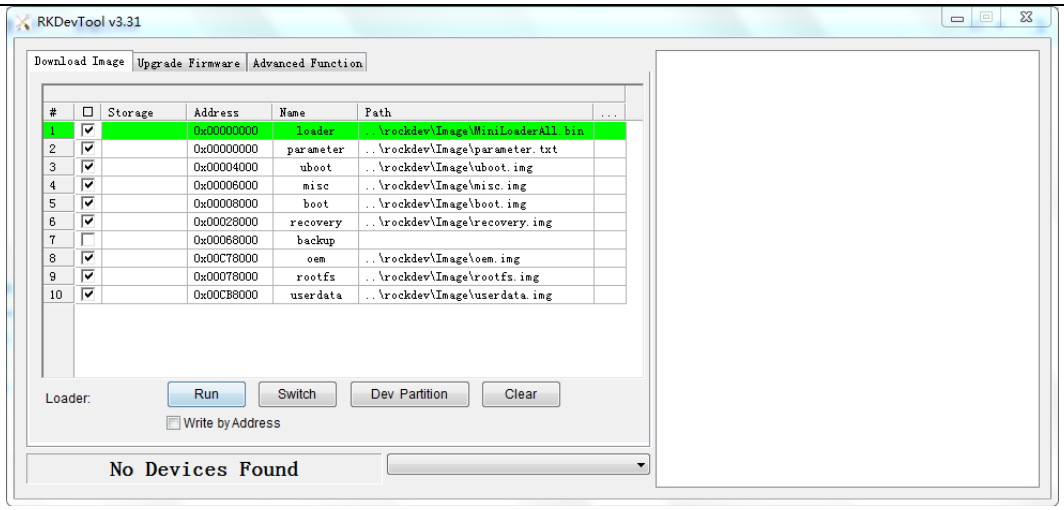
3.2 Burn firmware

Environment: Windows OS (Operating System).

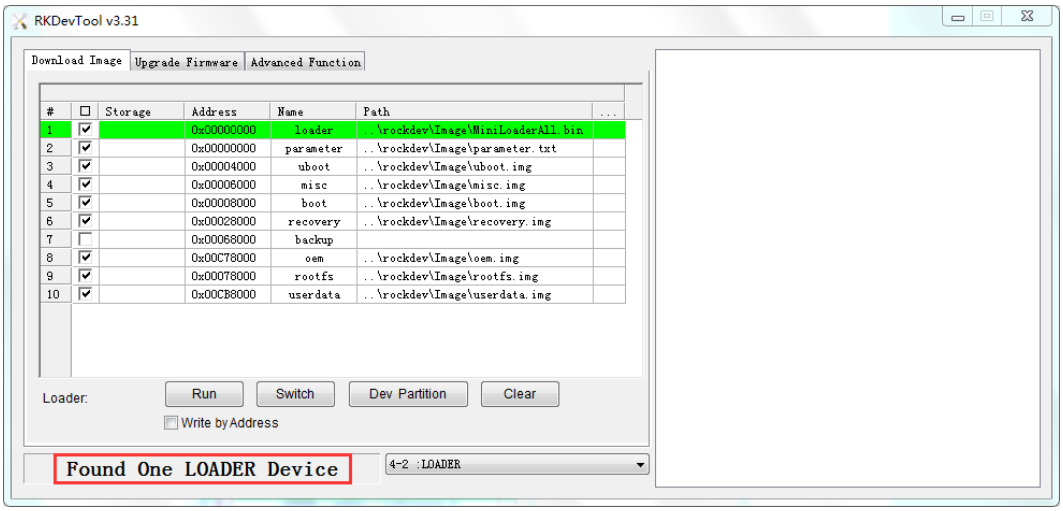
3.2.1 Burn Update.img Firmware

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

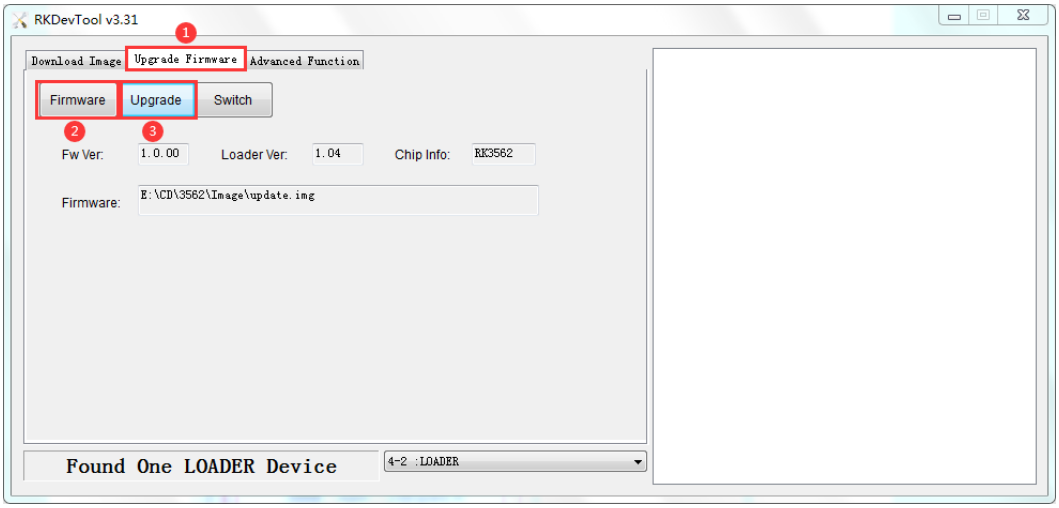
Step 2: Open *RKDevTool\RKDevTool_Release\RKDevTool.exe*.



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.

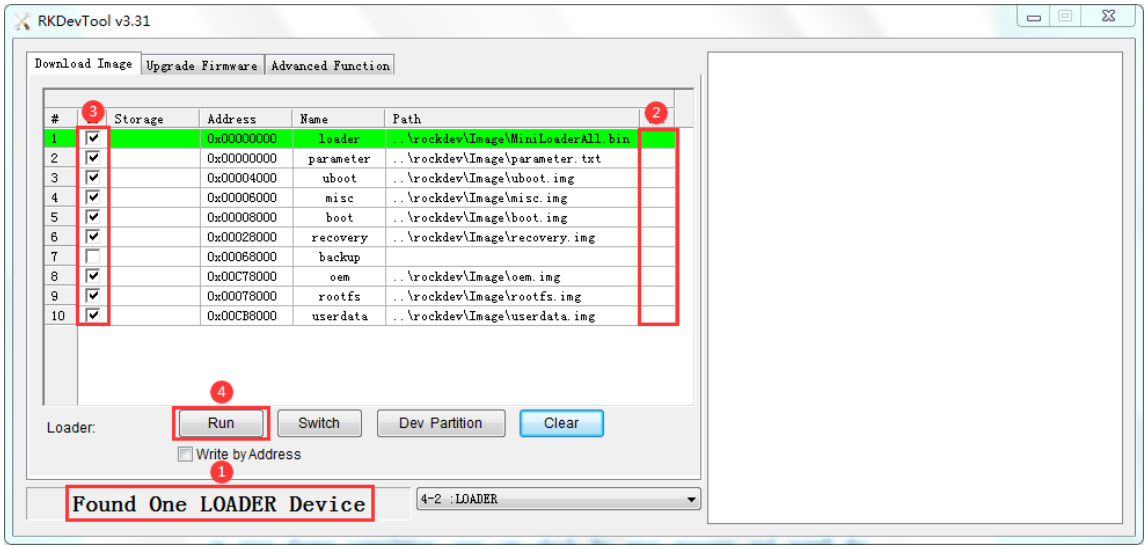
3.2.2 Burn Split Firmware

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

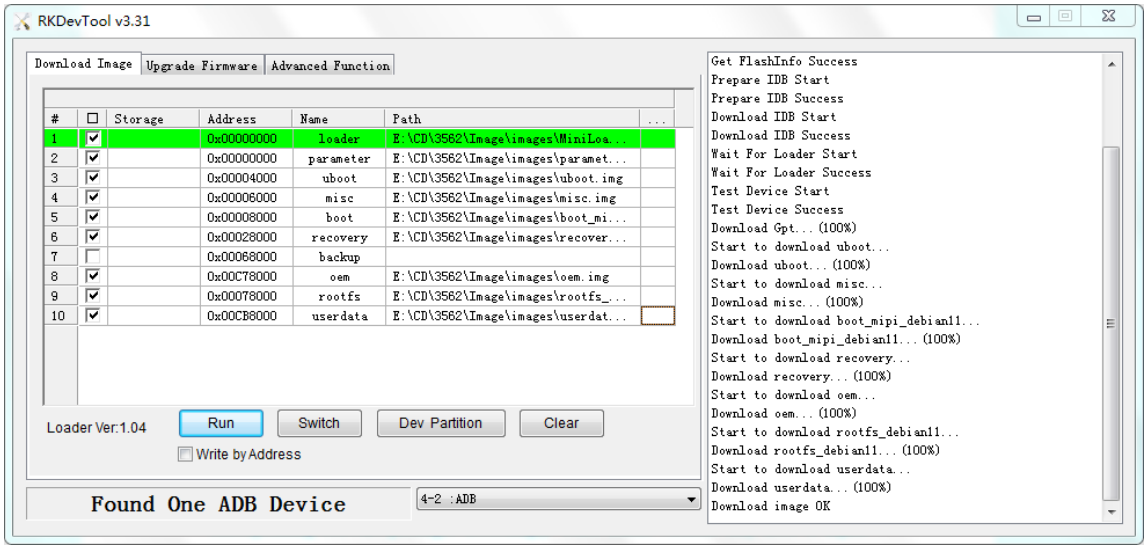
Step 2: Click the column on the right side for the path of the file want to flash.

Step 3: Select the checkbox on the left and check the partitions to be flashed, multiple partitions can be selected.

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



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



①Note

① Without burning the parameter.txt file, please check the "Write by Address" checkbox, otherwise the flashing may fail with the "Image is larger than partition size" error.

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
```

①Note

① The Debian system, Buildroot system, use the same SDK source package.

②The difference is in the rootfs.img, resulting in different filesystem building steps, while all other steps remain the same.

5.Compile Source

Step 1: Unzip the Source

To extract the source files, execute the following commands:

```
$ tar xvfj rk3562_linux6.1_sdk-20250410.tar.bz2
$ cd rk3562_linux6.1_sdk
```

Step 2: Configure the Compiled Board

To configure the board, execute:

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

```
\yangjing@yangjing:~/opt/develop/rk3562/em3562/rk3562_linux6.1_sdk$ ./build.sh lunch

################ Rockchip Linux SDK ###############

Manifest: rk3562_linux6.1_release.xml

Log colors: message notice warning error fatal

Log saved at
/home/yangjing/opt/develop/rk3562/em3562/rk3562_linux6.1_sdk/output/sessions/2025-04-11_14-21-55
Pick a defconfig:

1. rockchip_defconfig
2. rockchip_rk3562_dictpen_test3_v20_defconfig
3. rockchip_rk3562_evb1_lp4x_v10_amp_defconfig
4. rockchip_rk3562_evb1_lp4x_v10_defconfig
5. rockchip_rk3562_evb2_ddr4_v10_amp_defconfig
6. rockchip_rk3562_evb2_ddr4_v10_defconfig
7. rockchip_rk3562_robot_evb1_lp4x_v10_defconfig
8. rockchip_rk3562_robot_evb2_ddr4_v10_defconfig
Which would you like? [1]: 4
Switching to defconfig:
/home/yangjing/opt/develop/rk3562/em3562/rk3562_linux6.1_sdk/device/rockchip/.chip/rockchip_rk3562_evb1_lp
4x_v10_defconfig
mkdir -p /home/yangjing/opt/develop/rk3562/em3562/rk3562_linux6.1_sdk/output/kconf/lxdialog
make CC="gcc" HOSTCC="gcc" \
    obj=/home/yangjing/opt/develop/rk3562/em3562/rk3562_linux6.1_sdk/output/kconf -C
```

Step 3: Compile uboot, kernel, recovery, buildroot

```
$ ./build.sh      //compile all in one step
```

After compile the firmwares are generated in `rk3562_linux5.10_sdk\rockdev`

User can also use the single-step to compile.

```
$ ./build.sh uboot       //compile uboot
$ ./build.sh kernel      //compile kernel
```

Touch under different system modifications：

kernel-6.1\drivers\input\touchscreen\gt9xx\gt9xx.c

```
#if 1 //for 10.1inch lvds or mipi for debian
                    gtp_change_x2y =TRUE;
                    gtp_x_reverse = TRUE;
                    gtp_y_reverse = TRUE;
#endif

#if 0 //for 10.1inch mipi for buildroot
                    gtp_change_x2y =FALSE;
                    gtp_x_reverse = FALSE;
                    gtp_y_reverse = TRUE;
#endif
```

```
$ ./build.sh recovery    //compile recovery
Or
$ source envsetup.sh
$ cd buildroot
$ make recovery-rebuild
$ cd ..
$ ./build.sh recovery
$ ./build.sh rootfs      //compile buildroot
```

Step 4: 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
```

Step 5: Generate and Check Firmwares

Execute the following command to generate firmware:

```
$ ./build.sh updateimg
```

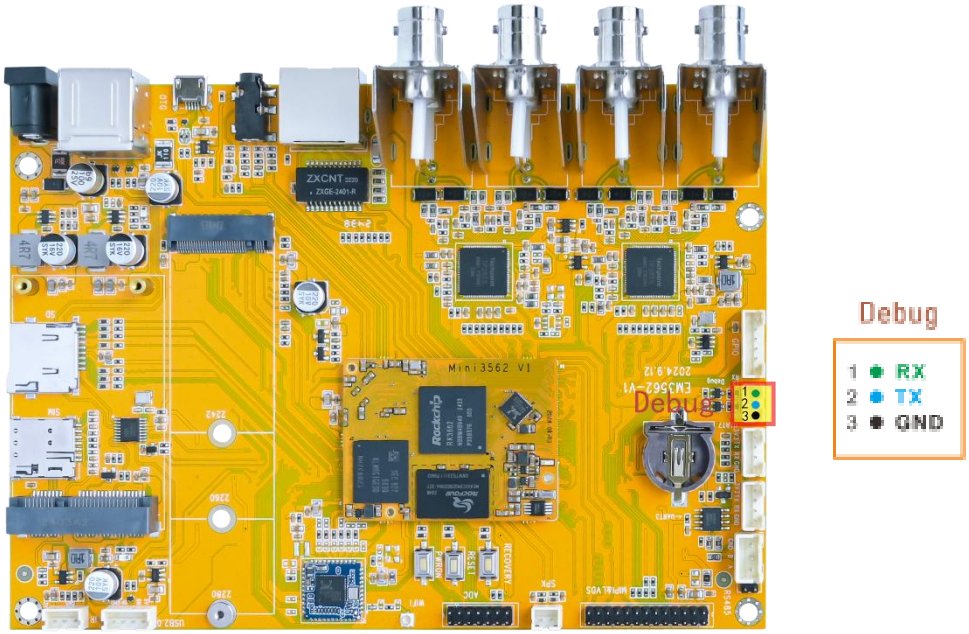
Images and **update.img** are generated in *rockdev/* directory.

6.Debian12 Test

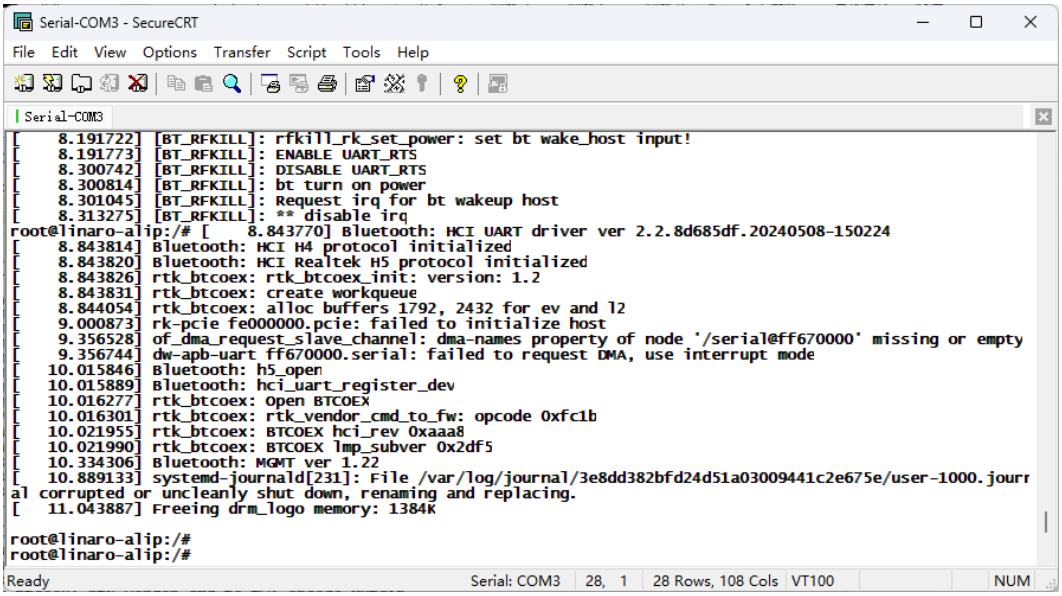
Account: linaro

Password: linaro

6.1 Serial Terminal

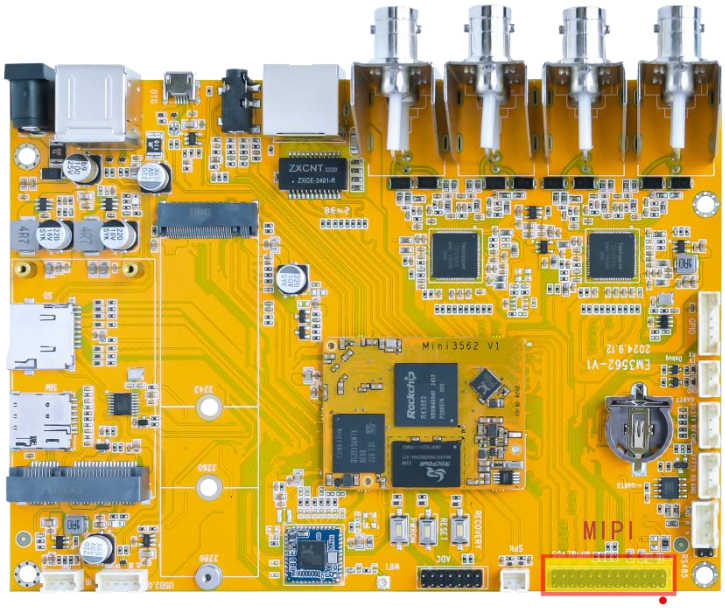


Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.



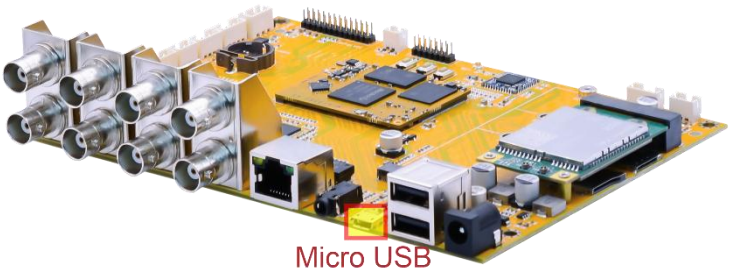
6.2 Display

The EM3562 default support for MIPI DSI interfaces.



The display effect diagram is as follows:

6.3 Micro USB



The Micro USB is mainly used for firmware upgrades and ADB function.

6.3.1 ADB

ADB is the command-line debugging tool. It can use for system logs, uploading and downloading the files, installing the applications, etc.

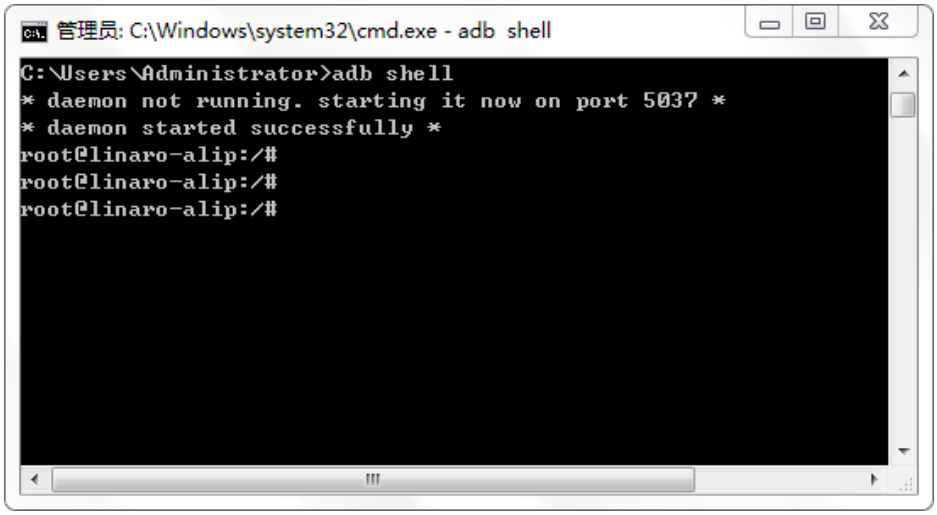
Step 1: connect the board and PC host with Micro USB cable.

Step 2: Install ADB driver on Windows system.

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

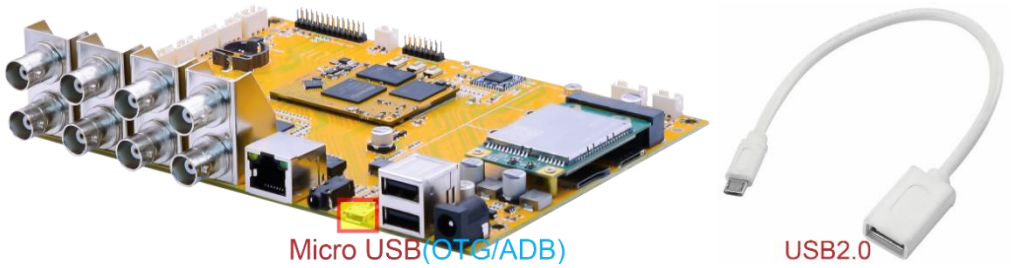
Step 4: Execute the following command to enable ADB.

```
# adb shell
```

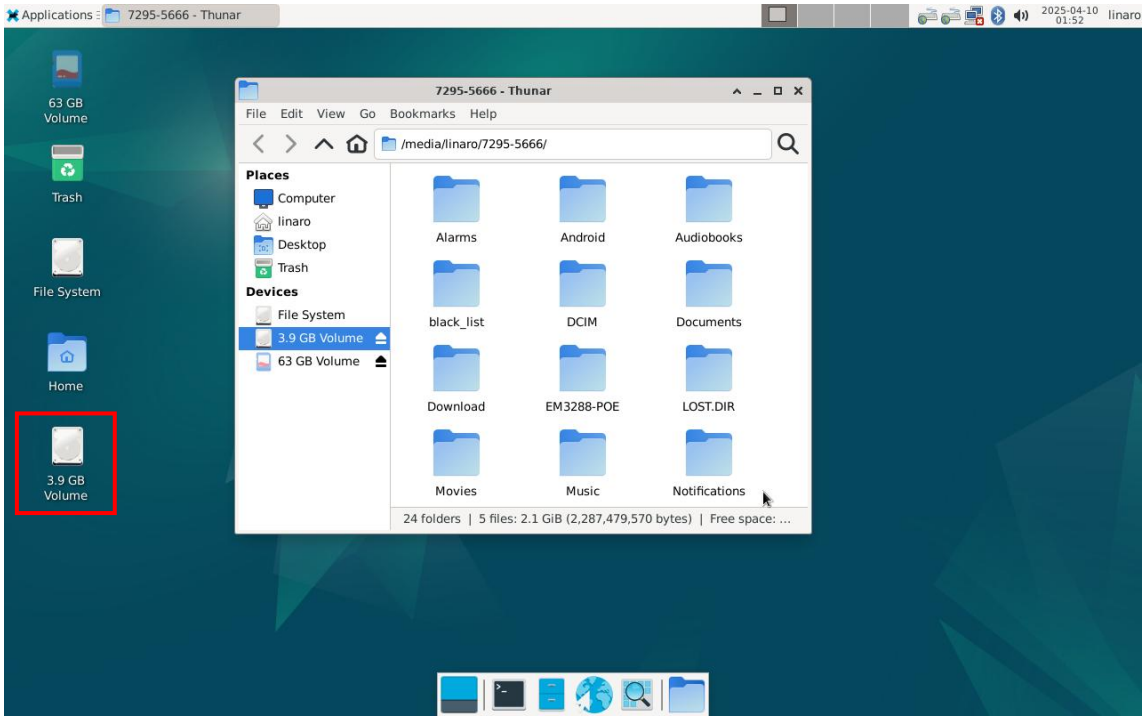


6.3.2 Micro USB to USB HOST

Step 1: Connect the Micro to USB OTG Host converter to the Micro USB port of the development board, and then insert the USB flash drive into the USB port of the docking station.

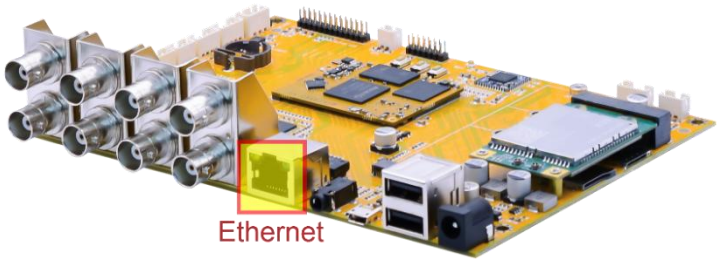


Step 2: After inserting the USB flash drive, if it is recognized successfully, an icon will appear on the desktop. Click the icon to automatically mount the device.



6.4 Ethernet

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



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

```
root@linaro-alip:/# [  327.461213] rk_gmac-dwmac ffa80000.ethernet end0: Link is Up - 1Gbps/Full - flow control
rx/tx
[  327.461404] IPv6: ADDRCONF(NETDEV_CHANGE): end0: link becomes ready
```

Step 2: View network interface information(default DHCP=Yes).

```
# ifconfig
```

```
root@linaro-alip:/# ifconfig
end0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
       inet 192.168.0.50  netmask 255.255.255.0  broadcast 192.168.0.255
       inet6 fe80::d3e1:d56a:260f:3833  prefixlen 64  scopeid 0x20<link>
       ether ce:85:1e:f6:a3:bd  txqueuelen 1000  (Ethernet)
       RX packets 484  bytes 50059 (48.8 KiB)
       RX errors 0  dropped 58  overruns 0  frame 0
       TX packets 152  bytes 13682 (13.3 KiB)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
       device interrupt 48
```

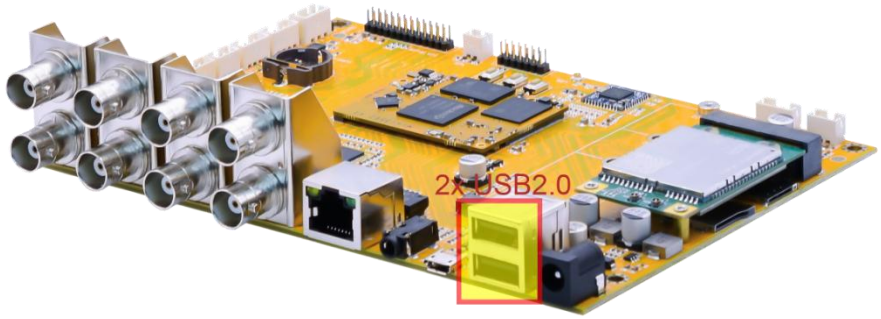
Step 3: Users can ping URL/IP at terminal, or open the browser to test Network.

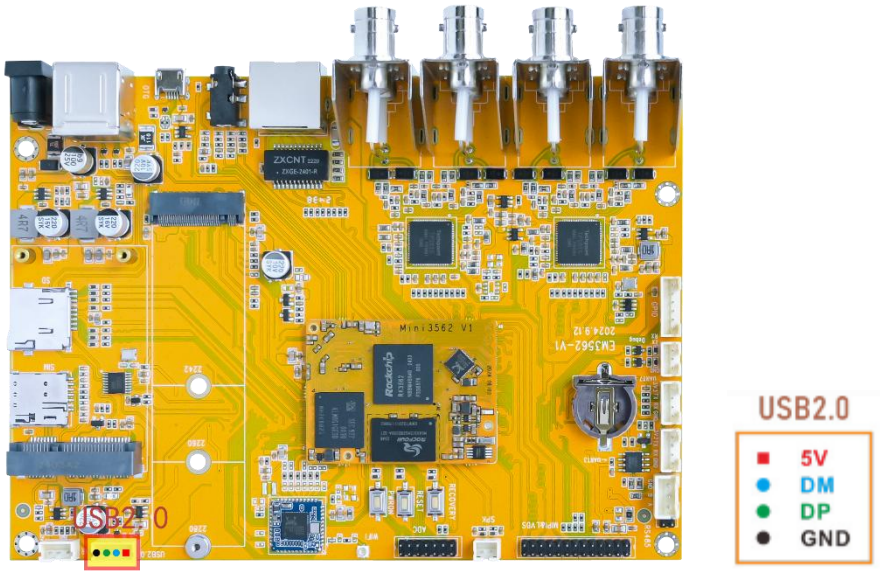
```
# ping -I end0 www.armdesigner.com
```

```
root@linaro-alip:/# ping -I end0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.50 end0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=183 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=183 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=183 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=183 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=186 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=183 ms
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5007ms
rtt min/avg/max/mdev = 182.677/183.464/186.169/1.216 ms
root@linaro-alip:/#
```

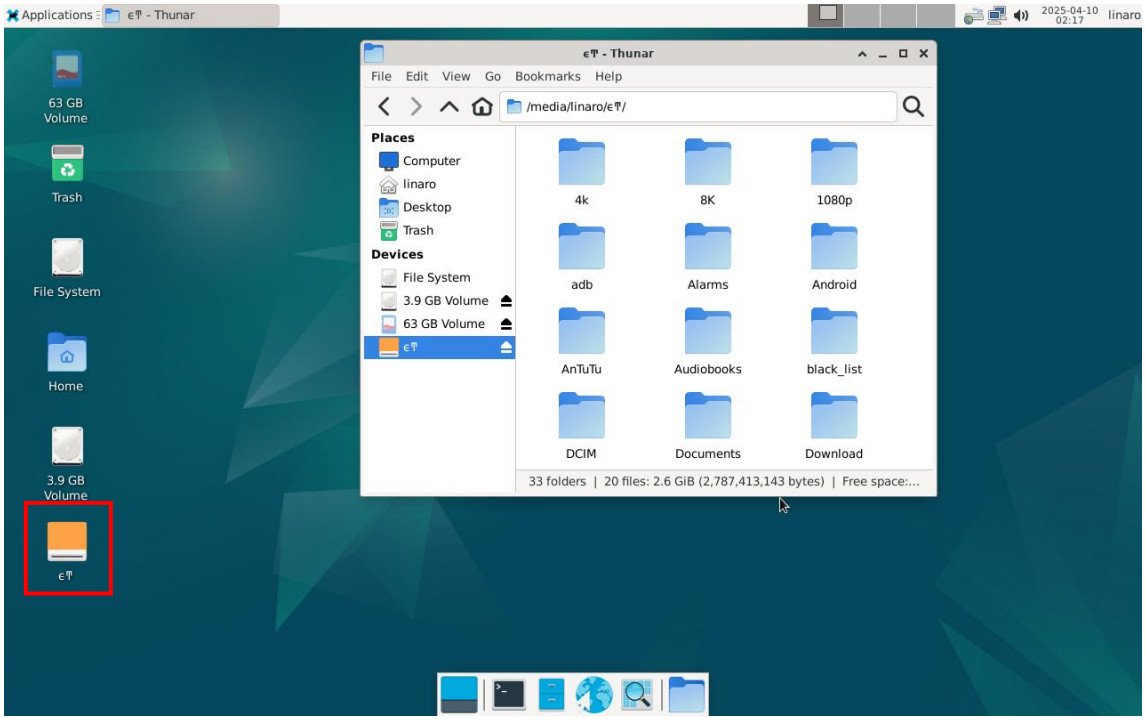
6.5 USB Host

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



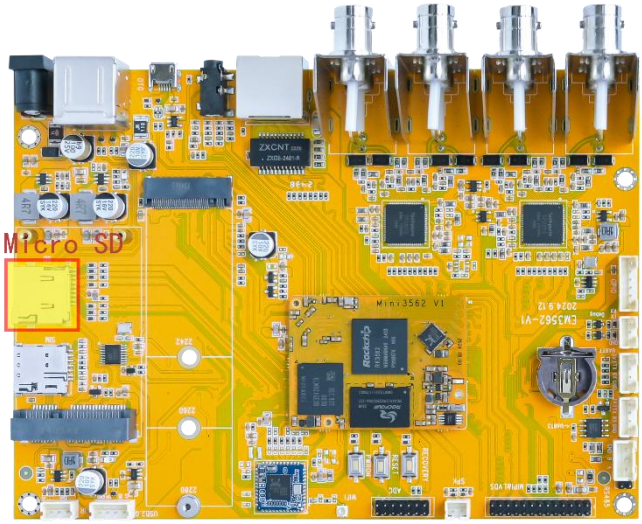


After connecting the USB flash drive, if the device is successfully recognized, an icon will appear on the desktop. Click the icon to automatically mount the device.

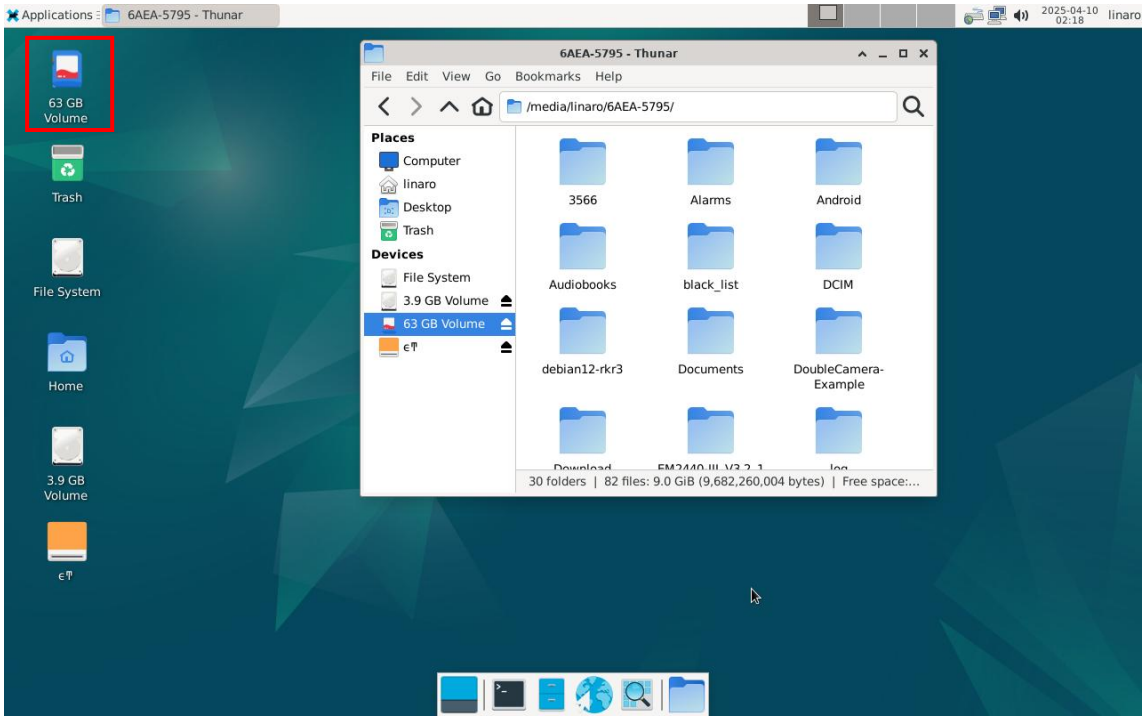


6.6 SD Card

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



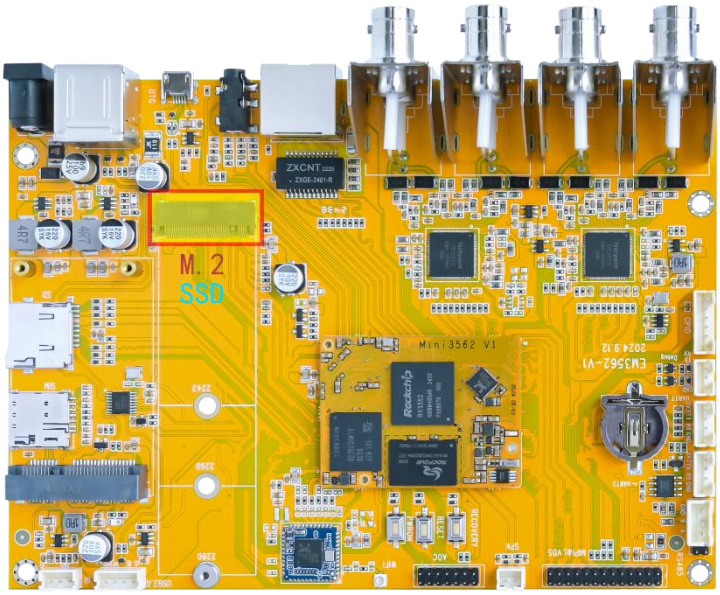
Step 2: After inserting the SD card, if it is recognized successfully, an icon will appear on the desktop. Click the icon to automatically mount the device.



6.7 M.2 NVME SSD

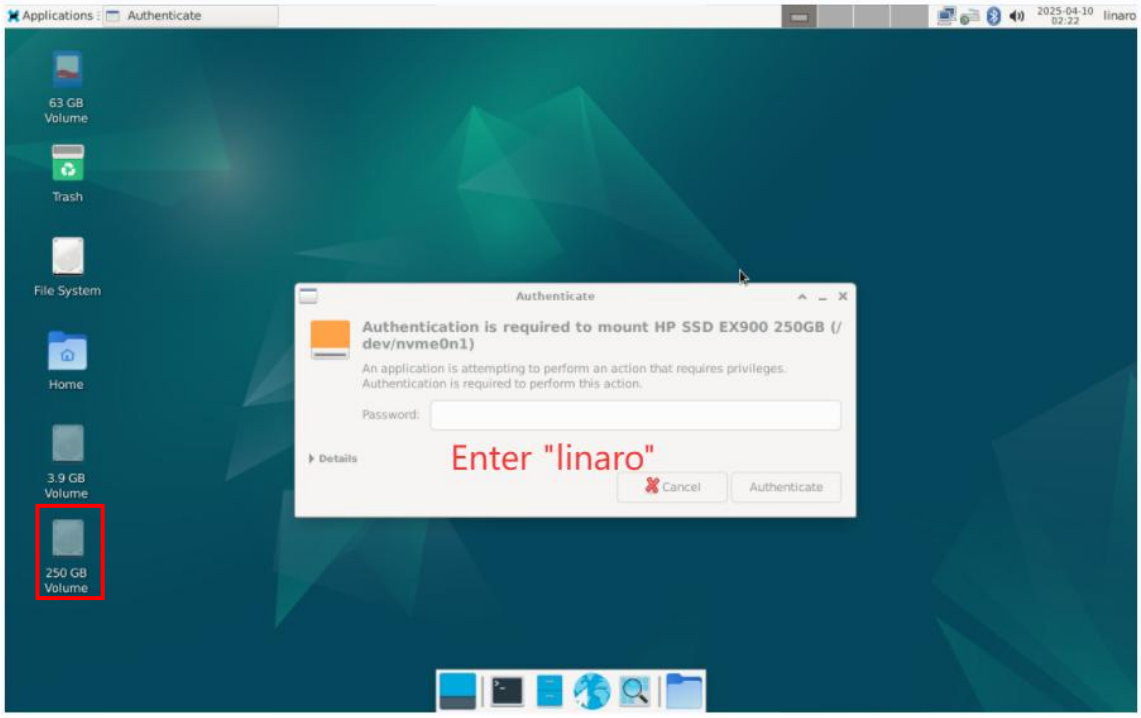
The SSD on Debian11 only supports ext4 format.

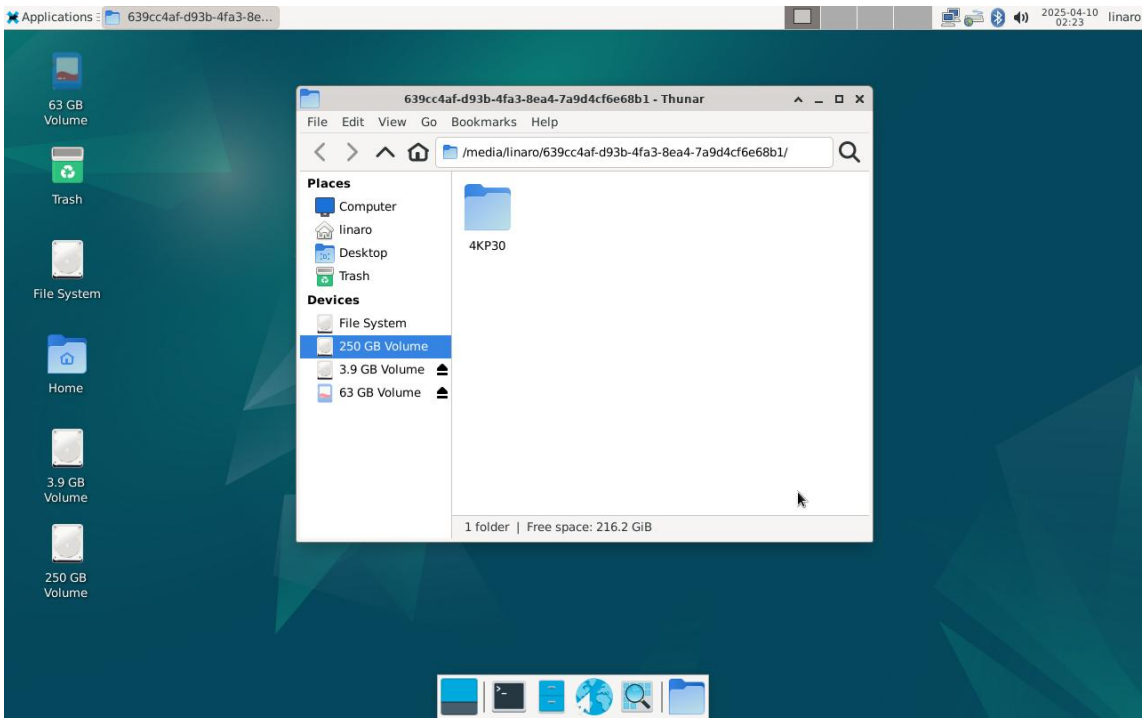
Step 1: Connect the SSD, then power on.



Step 2: If the SSD device is successfully recognized, an icon will appear on the desktop.

Click the icon and enter Password “linaro” to automatically mount the device.





Note: If devices that are not in ext4 format, the user can choose to format them on the board first.

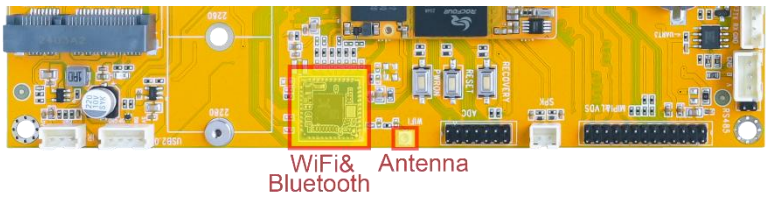
```
# ls /dev                          //view the SSD device name
# mke2fs -t ext4 /dev/nvme0n1      //format SSD
```

User also can execute follow command to mount SSD:

```
# mkdir /mnt/ssd                        //create a mount point
# mount /dev/nvme0n1 /mnt/ssd          //mount SSD
# ls /mnt/ssd
```

```
root@linaro-alip:/# mkdir /mnt/ssd
root@linaro-alip:/# mount /dev/nvme0n1 /mnt/ssd
root@linaro-alip:/# ls /mnt/ssd
4KP30  lost+found
root@linaro-alip:/#
```

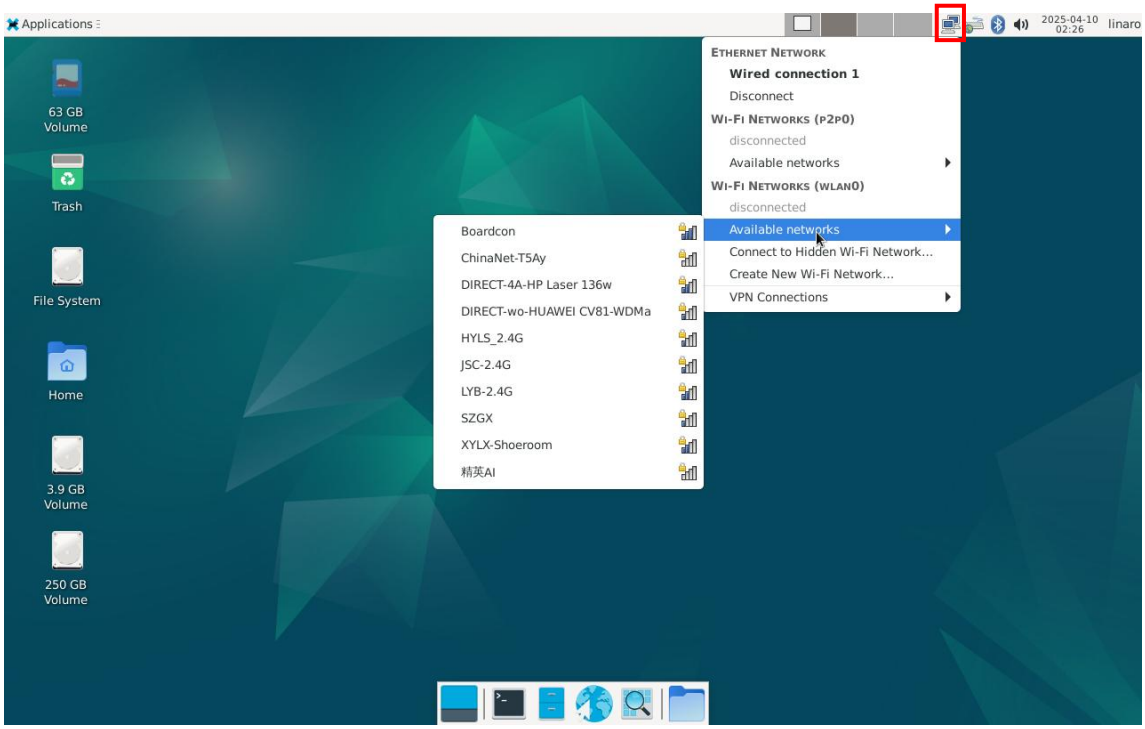
6.8 WiFi & Bluetooth



6.8.1 WiFi

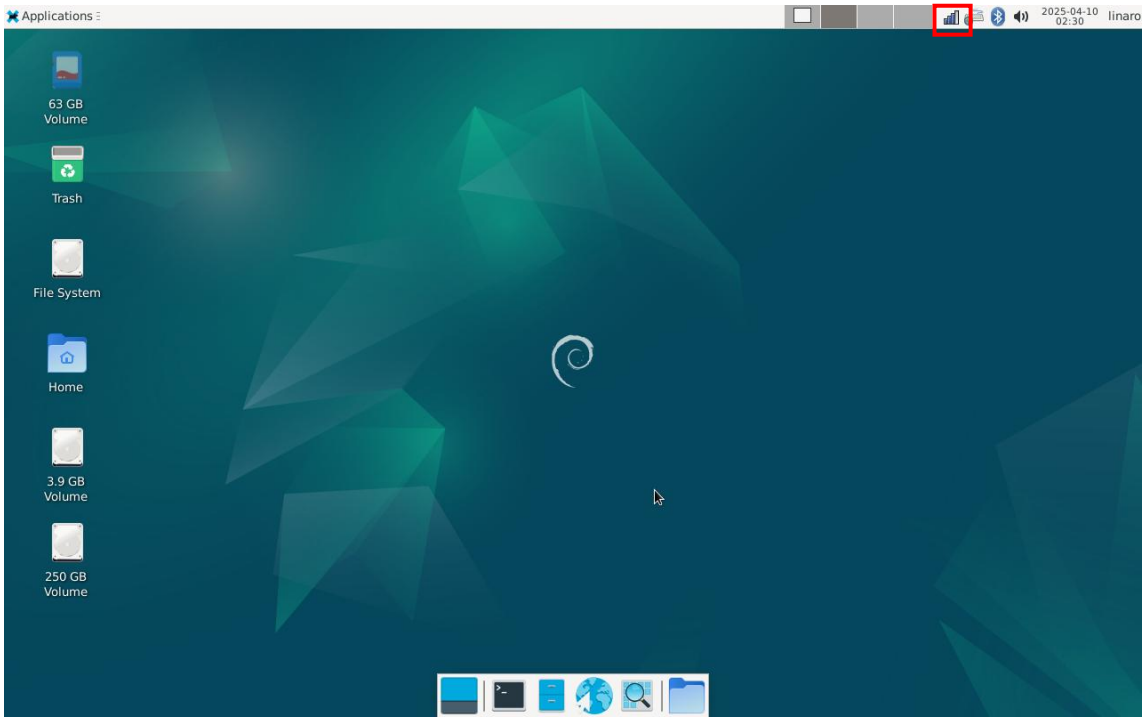
Step 1: Connect the WiFi antenna.

Step 2: Click the network icon in the top right corner of the UI interface.



Step 3: Select the SSID from the list of available networks and enter the password.

Step 4: After the WiFi successfully connects to the hotspot, the system will display the corresponding connection status icon in the top right corner.



Step 5: After connected, users can ping URL/IP at terminal, or open the browser to test Network.

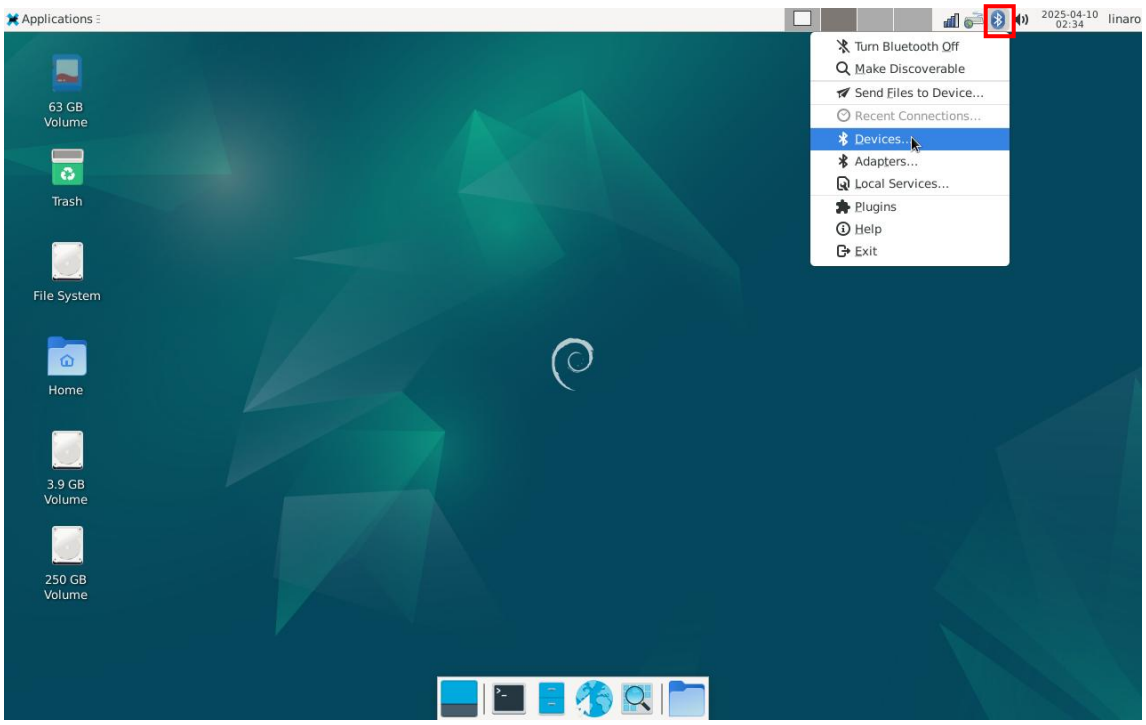
```
# ifconfig
# ping -I wlan0 www.armdesigner.com
```

```
root@linaro-alip:/# ifconfig
end0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
       ether ce:85:1e:f6:a3:bd  txqueuelen 1000  (Ethernet)
       RX packets 2091  bytes 191901 (187.4 KiB)
       RX errors 0  dropped 332  overruns 0  frame 0
       TX packets 300  bytes 25976 (25.3 KiB)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
       device interrupt 48

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
       inet 127.0.0.1  netmask 255.0.0.0
       inet6 ::1  prefixlen 128  scopeid 0x10<host>
       loop  txqueuelen 1000  (Local Loopback)
       RX packets 50  bytes 4538 (4.4 KiB)
       RX errors 0  dropped 0  overruns 0  frame 0
       TX packets 50  bytes 4538 (4.4 KiB)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

p2p0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
       ether ce:64:1a:96:5c:1d  txqueuelen 1000  (Ethernet)
       RX packets 0  bytes 0 (0.0 B)
       RX errors 0  dropped 0  overruns 0  frame 0
       TX packets 0  bytes 0 (0.0 B)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
       inet 192.168.0.206  netmask 255.255.255.0  broadcast 192.168.0.255
       inet6 fe80::be34:ffa5:aabc:c07  prefixlen 64  scopeid 0x20<link>
       ether cc:64:1a:96:5c:1d  txqueuelen 1000  (Ethernet)
       RX packets 360  bytes 46717 (45.6 KiB)
       RX errors 0  dropped 41  overruns 0  frame 0
       TX packets 55  bytes 6550 (6.3 KiB)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

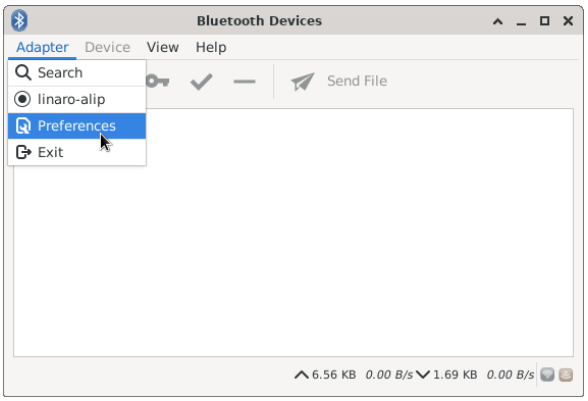
```
root@linaro-alip:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.206 wlan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=333 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=255 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=232 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=231 ms
^C
--- www.armdesigner.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3001ms
rtt min/avg/max/mdev = 230.946/262.862/333.474/41.824 ms
root@linaro-alip:/#
```

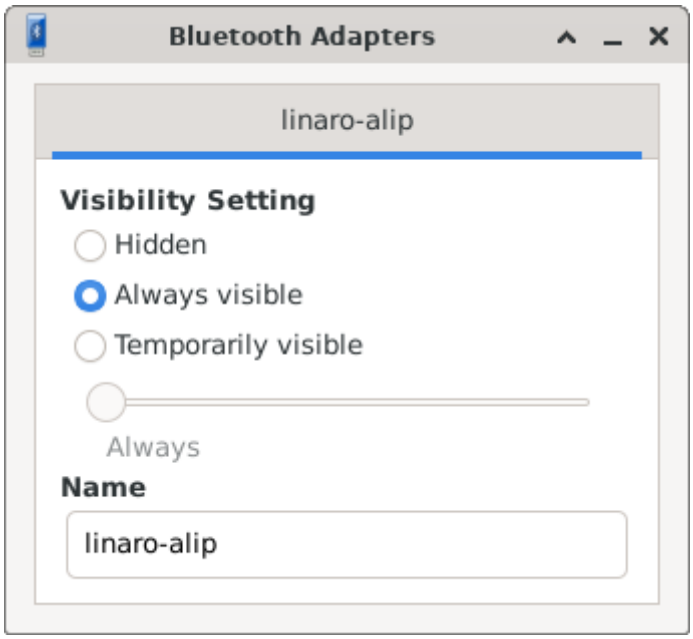
6.8.2 Bluetooth

Step 1: Click the Bluetooth icon in the top right corner of the UI interface. Select **Devices..** enter the Bluetooth Devices.

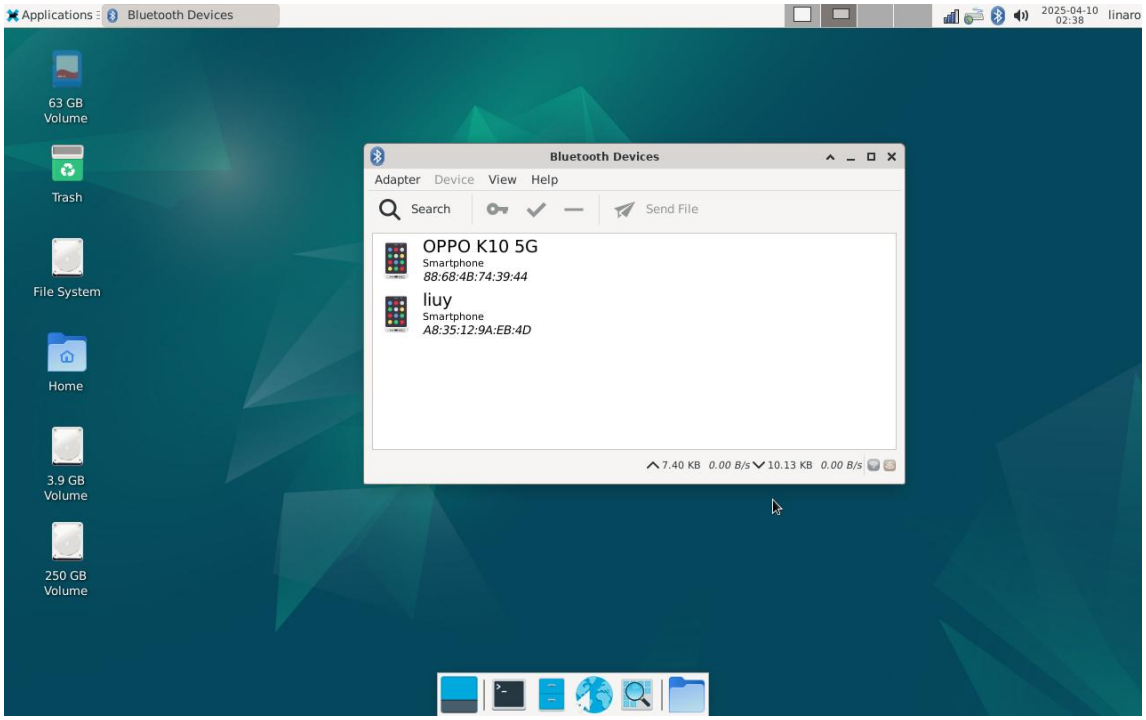


Step 2: The Bluetooth device name is hidden by default. Set the Bluetooth device name to be visible. Click **Adapter** -> **Preferences** -> **Always visible**.





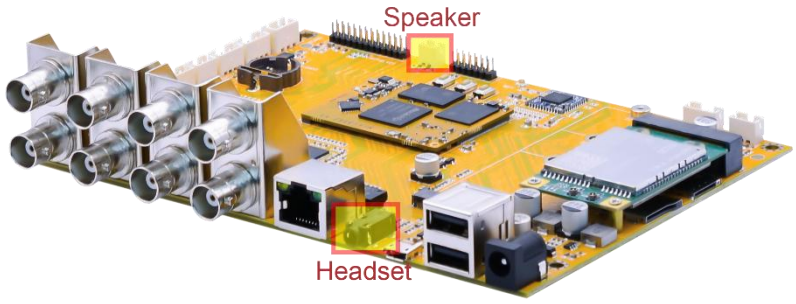
Step 3: Click **Search** to start searching and select the available device in the list to pair.



After pairing, devices can connect with each other automatically.

6.9 Audio I/O

The audio support Headset input, supports Headset and speaker output.



Step 1: Plug the headphone into the Audio jack.

Step 2: View sound card.

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

```
root@linaro-alip:/# cat /proc/asound/cards
 0 [rockchiprk809  ]: rockchip-rk809 - rockchip-rk809
                      rockchip-rk809

root@linaro-alip:/#
```

Step 3: Execute the following command to record.

```
# arecord -D hw:0,0 -d 10 -f cd -r 44100 -c 2 -t wav test.wav //-D hw:0,0 is card0 and device0
```

```
root@linaro-alip:/# arecord -D hw:0,0 -d 10 -f cd -r 44100 -c 2 -t wav test.wav
Recording WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@linaro-alip:/#
```

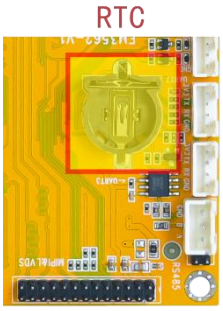
Step 4: Execute the following command to playback.

```
# aplay -D plughw:0,0 test.wav
```

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

Play priority: Headset output greater than speaker output.

6.10 RTC



Step 1: insert a CR1220 battery before test. It keeps the time running when the main power is off.

Step 2: Set the system time.

```
# date -s "2025-04-10 11:38:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

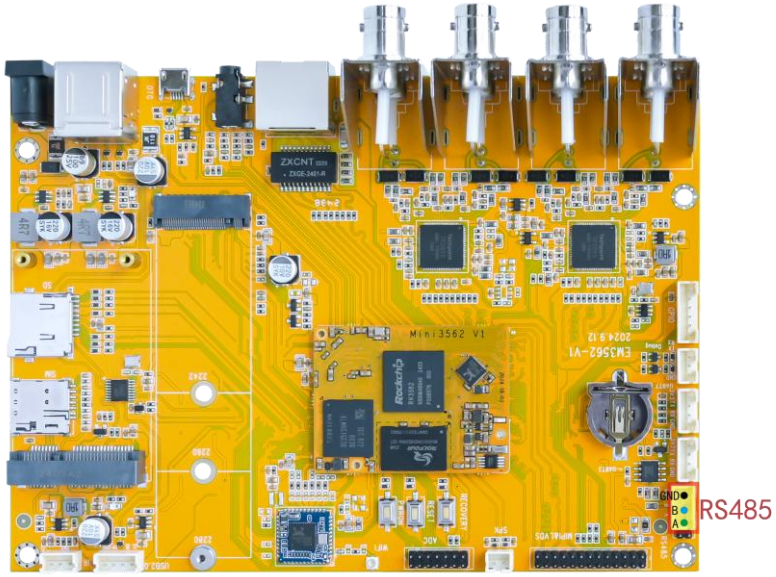
```
# hwclock
```

```
root@linaro-alip:/# date -s "2025-04-10 11:38:00"
Thu Apr 10 11:38:00 AM UTC 2025
root@linaro-alip:/# hwclock -w
root@linaro-alip:/# hwclock
2025-04-10 11:38:10.623459+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:38:12.101322+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:38:13.766749+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:38:15.878158+00:00
root@linaro-alip:/#
```

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

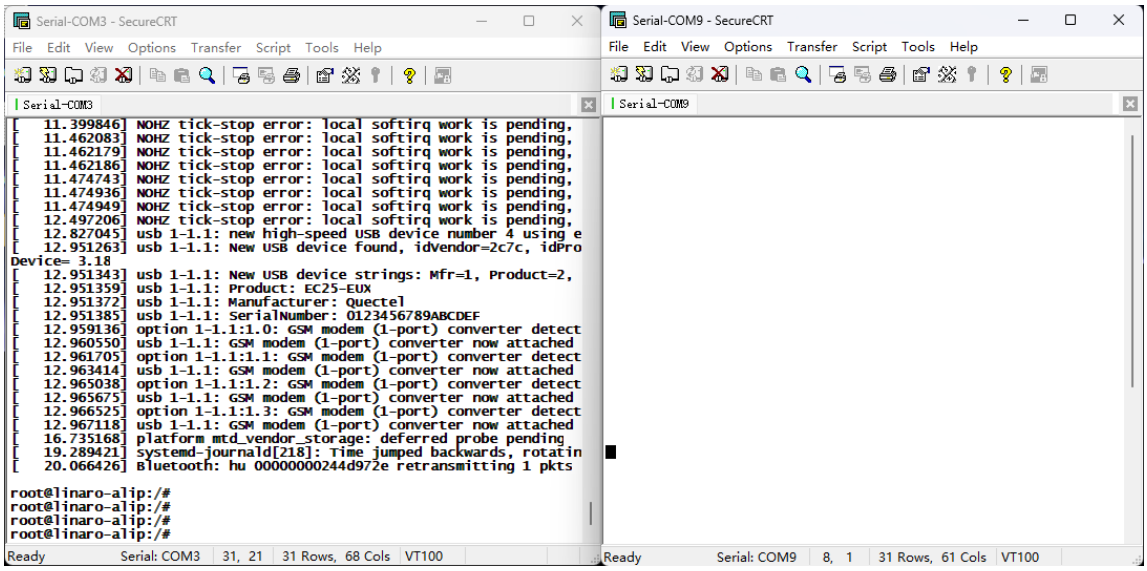
```
root@linaro-alip:/# hwclock
2025-04-10 11:43:16.740350+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:43:17.779188+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:43:18.793291+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:43:19.812260+00:00
root@linaro-alip:/# hwclock
2025-04-10 11:43:20.886162+00:00

root@linaro-alip:/#
```

6.11 RS485



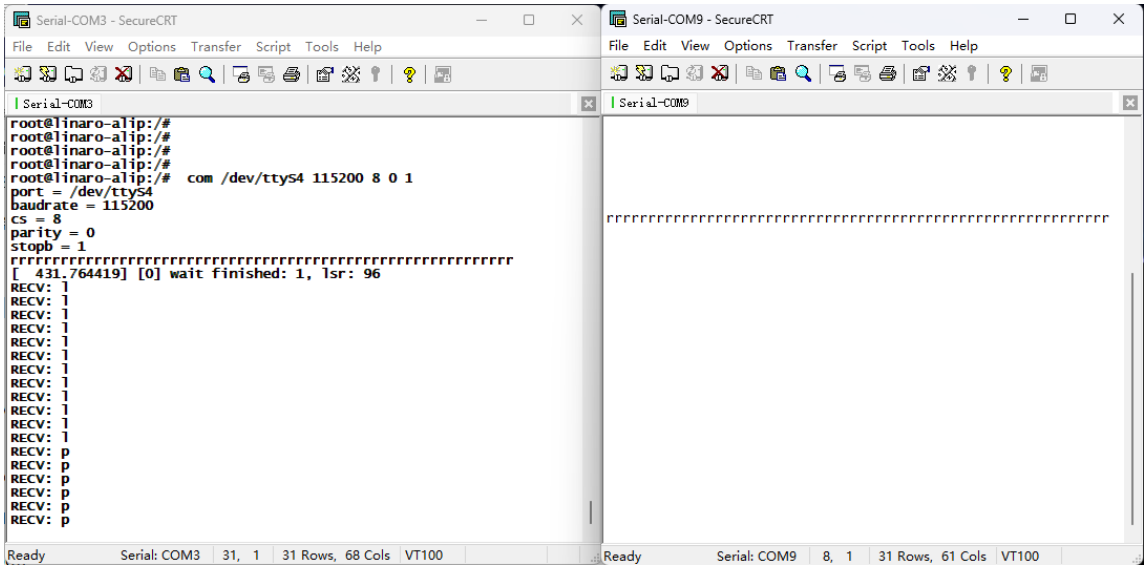
Step 1: As shown in the diagram, connect the RS485 test tool to the development board.

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



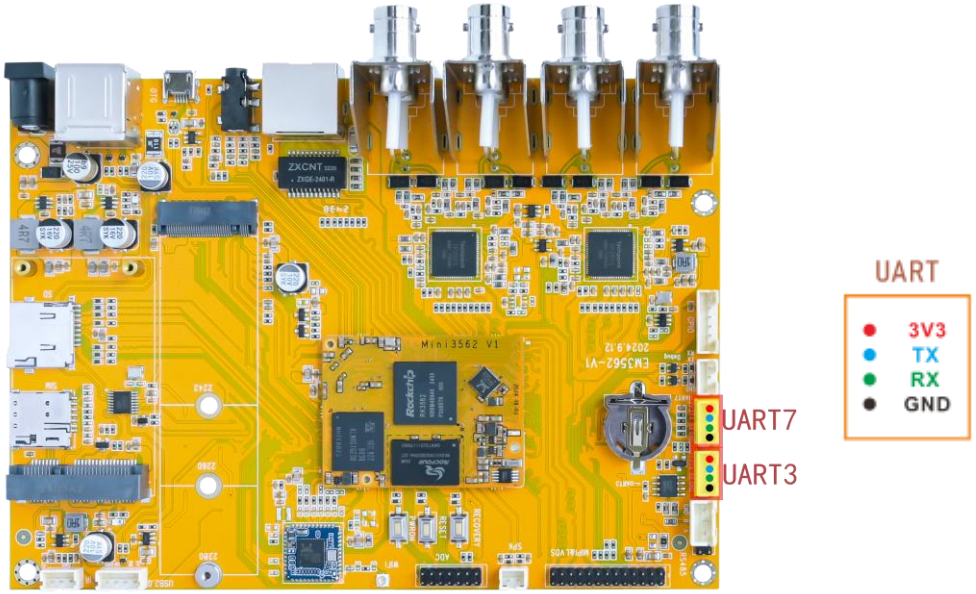
Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

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



6.12 UART

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



Step 2: UART3 test.

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

```
root@linaro-alip:/# com /dev/ttyS3 115200 8 0 1
port = /dev/ttyS3
baudrate = 115200
cs = 8
parity = 0
stopb = 1
ggggggggggggggggggg
RECV: ggggggggggggggggggg
yyyyyyyyyyyyyyyyyyy
RECV: yyyyyyyyyyyyyyyyyyy
rrrrrrrrrrrrrrrr
RECV: rrrrrrrrrrrrrrrr
```

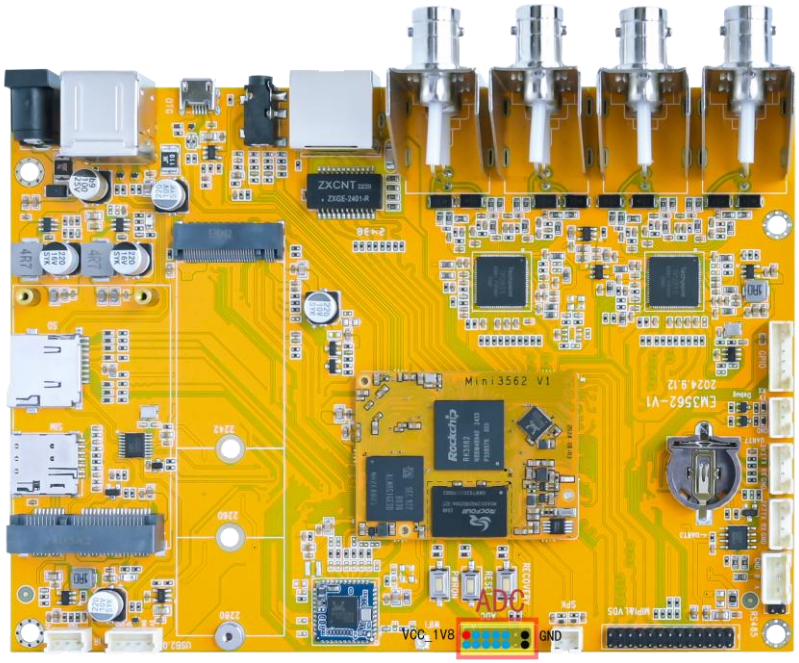
Step 3: UART7 test.

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

```
root@linaro-alip:/# com /dev/ttyS7 115200 8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
hhhhhhhhhhhh
RECV: hhhhhhhhhhhh
yyyyyyyyyyyyyyyyy
RECV: yyyyyyyyyyyyyyyyy
ddddddddddddd
RECV: ddddddddddddd
```

6.13 ADC

Step 1: short circuit SARADC1_IN1 and GND or SARADC1_IN1 and VCC_1V8 pins of ADC.

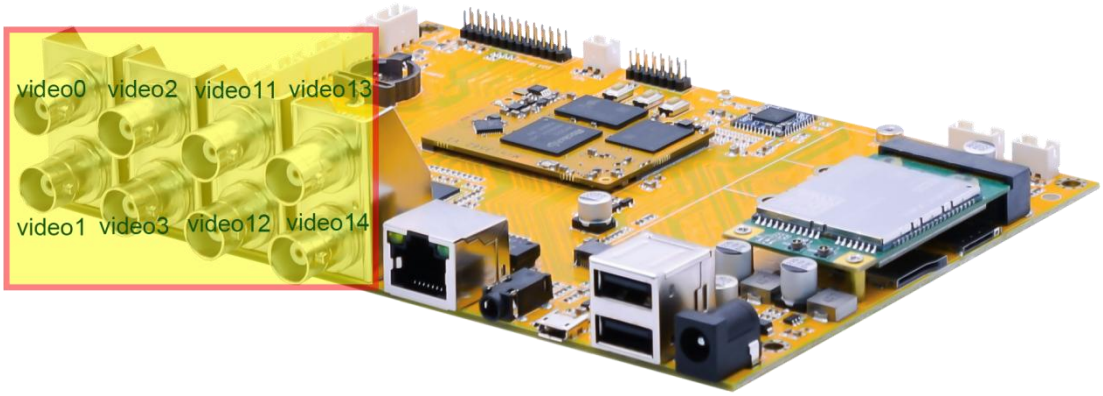


Step 2: Execute the test command.

```
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage1_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage2_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage3_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage5_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage2_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage5_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage6_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage7_raw
```

```
root@linaro-alip:/# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
187
root@linaro-alip:/# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
0
root@linaro-alip:/# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
1022
root@linaro-alip:/#
```

6.14 Camera



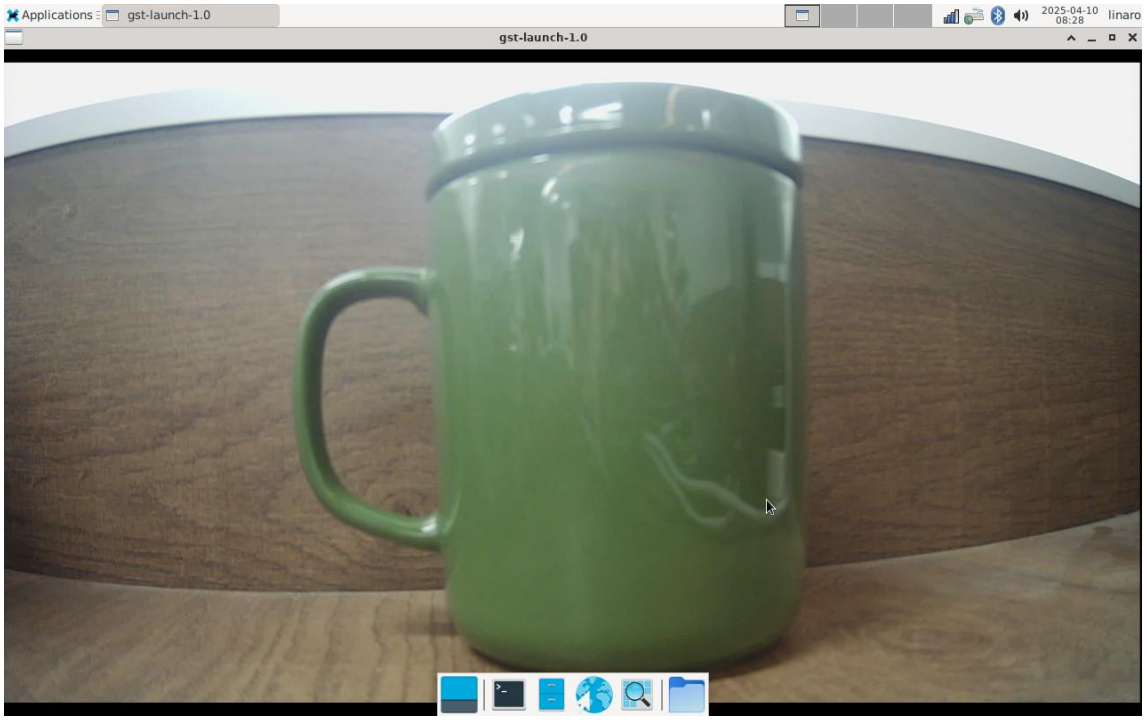
• Preview the footage from 8 cameras simultaneously. Copy camera_ahd_test_debian.sh to SDCARD.

```
# cp /media/linaro/6AEA-5795/camera_ahd_test_debian.sh /
# chmod 777 camera_ahd_test_debian.sh
# ./camera_ahd_test_debian.sh
```

• Single-camera preview, using video0 as an example.

```
# gst-launch-1.0 v4l2src device=/dev/video0 !

video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink

//The format is NV16 or NV12, If use 1280p AHD camera change to “width=1280,height=720”
```

```
root@linaro-alip:/# gst-launch-1.0 v4l2src device=/dev/video0 ! video/x-raw, format=NV16, width=1920,
height=1080, framerate=25/1 ! xvimagesink
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
[  366.922357] rkcif-mipi-lvds: stream[0] start streaming
[  366.923375] rkcif-mipi-lvds: Allocate dummy buffer, size: 0x003f5000
[  366.923421] rockchip-mipi-csi2 mipi0-csi2: stream on, src_sd: 0000000024bfa1d9, sd_name:rockchip-csi2-dphy0
[  366.923434] rockchip-mipi-csi2 mipi0-csi2: stream ON
[  366.923475] rockchip-csi2-dphy0: dphy0, data_rate_mbps 594
[  366.923504] rockchip-csi2-dphy csi2-dphy0: csi2_dphy_s_stream stream on:1, dphy0, ret 0
[  366.924866] techpoint 4-0047: detect channel 0 1080P_25
[  366.925634] techpoint 4-0047: set channel 0 1080P_25
[  366.962590] techpoint 4-0047: detect channel 1 is not supported, default 1080P_25
[  366.963365] techpoint 4-0047: set channel 1 1080P_25
[  366.998955] techpoint 4-0047: detect channel 2 is not supported, default 1080P_25
[  366.999739] techpoint 4-0047: set channel 2 1080P_25
[  367.037177] techpoint 4-0047: detect channel 3 is not supported, default 1080P_25
[  367.037963] techpoint 4-0047: set channel 3 1080P_25
[  367.084746] (0xff380000)MIPI_CSI2 ERR1:0x4000440 (fs/fe mis,vc: 2) (f_seq,vc: 2) (crc,vc: 2)
[  367.084809] (0xff380000)MIPI_CSI2 ERR1:0xbb0 (fs/fe mis,vc: 0 1 3) (f_seq,vc: 0 1 3)
[  368.083589] rkcif-mipi-lvds: get vblank fail, vblank_def 0, vblank_curr 0
[  368.083654] rkcif-mipi-lvds: Warning: vblank need >= 1000us if isp work in online, cur 0 us
[  368.123590] rkcif-mipi-lvds: get vblank fail, vblank_def 0, vblank_curr 0
[  368.123660] rkcif-mipi-lvds: Warning: vblank need >= 1000us if isp work in online, cur 0 us
Redistribute latency...
```




```
# gst-launch-1.0 v4l2src device=/dev/video0 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video1 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video2 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video3 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video11 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video12 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video13 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
# gst-launch-1.0 v4l2src device=/dev/video14 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! xvimagesink
```

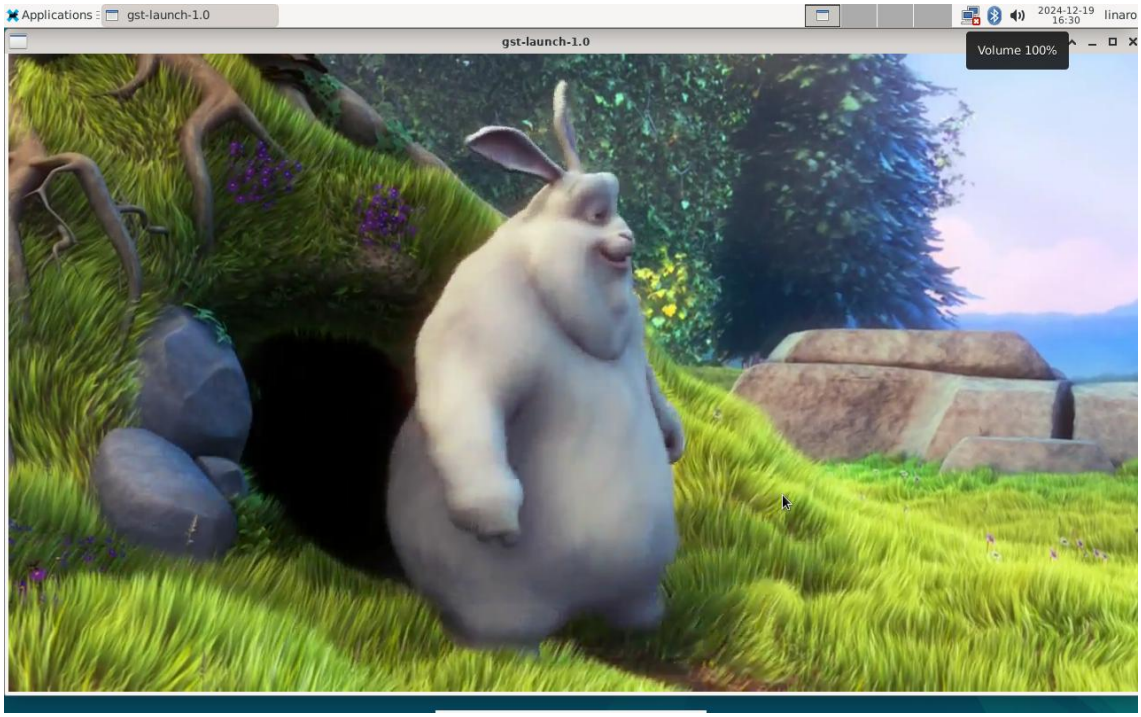
6.15 Video Playback

(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.sh
test_dec-mpv.sh     test_gst_multivideo.sh   video_stresstest.sh
test_dec-parole.sh  test_gst_video_fps.sh    video_test.sh
test_dec-qt.sh      test_gst_video_maxfps.sh
```

Simply execute the script.

```
root@linaro-alip:/# ./rockchip-test/video/test_gst_video.sh
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
mpp[2281]: mpp_info: mpp version: 48962a10 author: Hongjin Li    2024-09-19 fix[avsd]: Fix attach dev error
issue
mpp[2281]: mpp_info: mpp version: 48962a10 author: Hongjin Li    2024-09-19 fix[avsd]: Fix attach dev error
issue
mpp[2281]: mpp_info: mpp version: 48962a10 author: Hongjin Li    2024-09-19 fix[avsd]: Fix attach dev error
issue
mpp[2281]: mpp: unable to create enc vp8 for soc rk3576 unsupported
mpp[2281]: mpp_info: mpp version: 48962a10 author: Hongjin Li    2024-09-19 fix[avsd]: Fix attach dev error
issue
mpp[2281]: mpp_info: mpp version: 48962a10 author: Hongjin Li    2024-09-19 fix[avsd]: Fix attach dev error
issue
Redistribute latency...
mpp[2281]: h264d_api: is_avcC=1
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:03.5 / 0:00:29.5 (12.1 %)
```

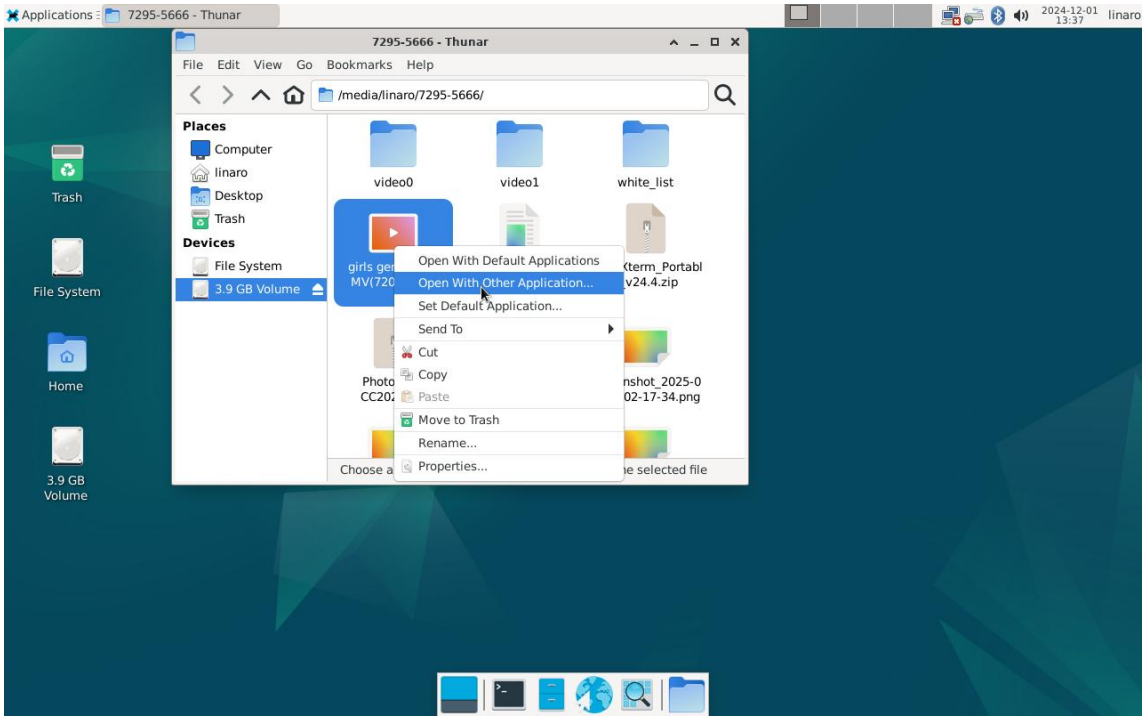


(2) Play the video using Google Chrome.

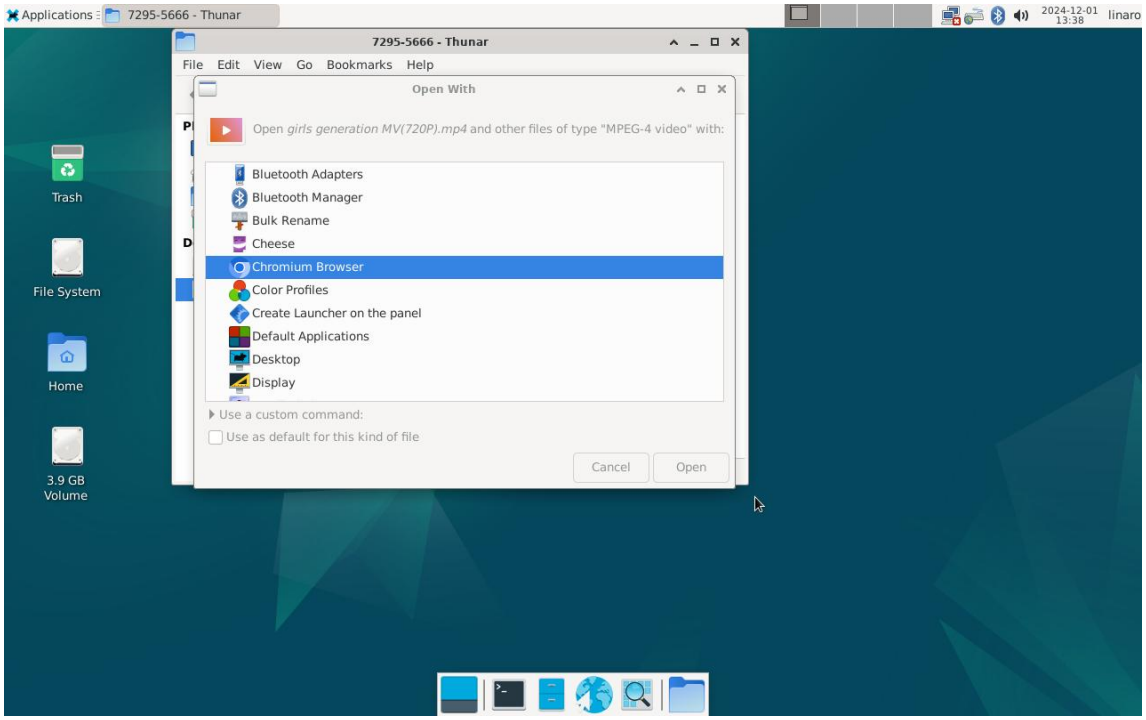
• Google Chrome supports video playback up to 4K at 30Hz for H265/VP9, with support for the following decoding formats: H.264, H.265, VP9.

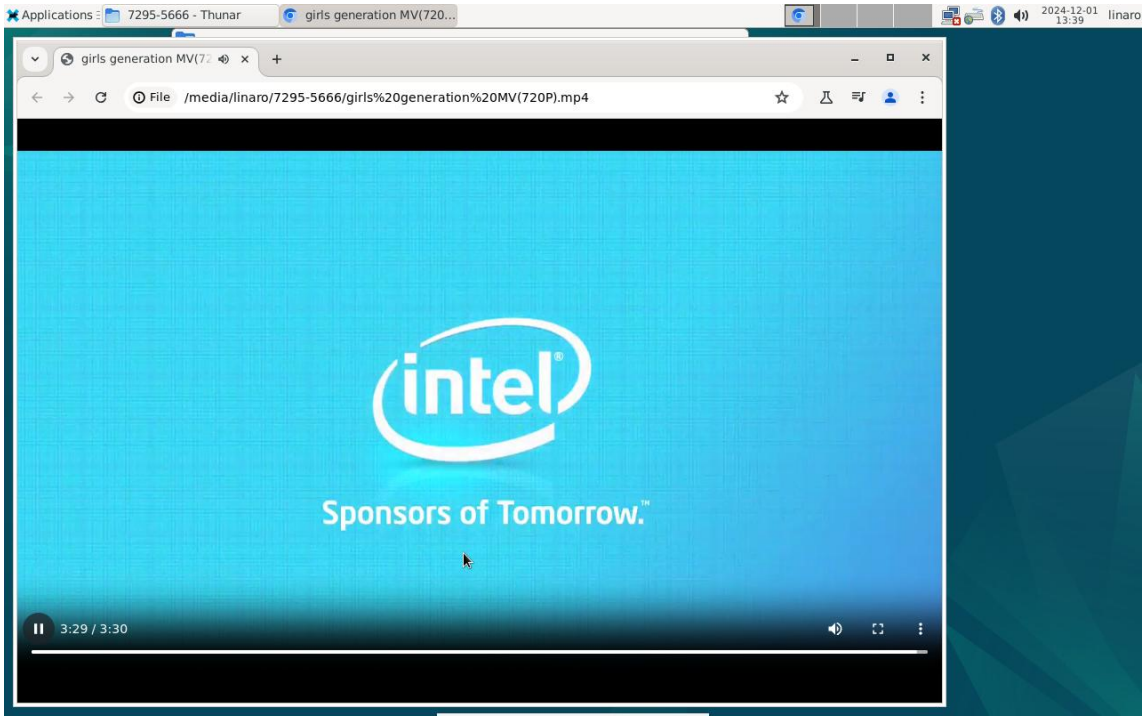
• However, it is only compatible with certain H.265 video files.

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.





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

```
# gst-play-1.0 --videosink=xvimagesink /media/linaro/7295-5666/720P.mp4
--audiosink="alsasink device=hw:0,0"
```

Command explanation:

• /media/linaro/7295-5666/720P.mp4: The media file path to be played.

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

```
roroot@linaro-alip:/# gst-play-1.0 --videosink=xvimagesink /media/linaro/7295-5666/720P.mp4
--audiosink="alsasink device=hw:0,0"
Press 'k' to see a list of keyboard shortcuts.
Now playing /media/linaro/7295-5666/720P.mp4
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:16.4 / 0:03:30.9
```

6.16 4G&GPS

Step 1: Insert 4G module to PCIe socket (4G model: EC20), and connect antenna.

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.

6.16.1 4G Test

Step 1: Initiate the PPP connection.

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

```
root@linaro-alip:/# pppd call quectel-ppp &
[1] 2340
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)
^M
```

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 10.69.44.54  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 11  bytes 156 (156.0 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 10.69.44.54 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=477 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=443 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=46 time=394 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=46 time=360 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=46 time=311 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=46 time=269 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=46 time=550 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=46 time=508 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=46 time=468 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=10 ttl=46 time=426 ms
^C
--- www.armdesigner.com ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9011ms
rtt min/avg/max/mdev = 269.450/420.566/550.441/83.508 ms
```

6.16.2 GPS Test

Step 1: Enable GPS functionality.

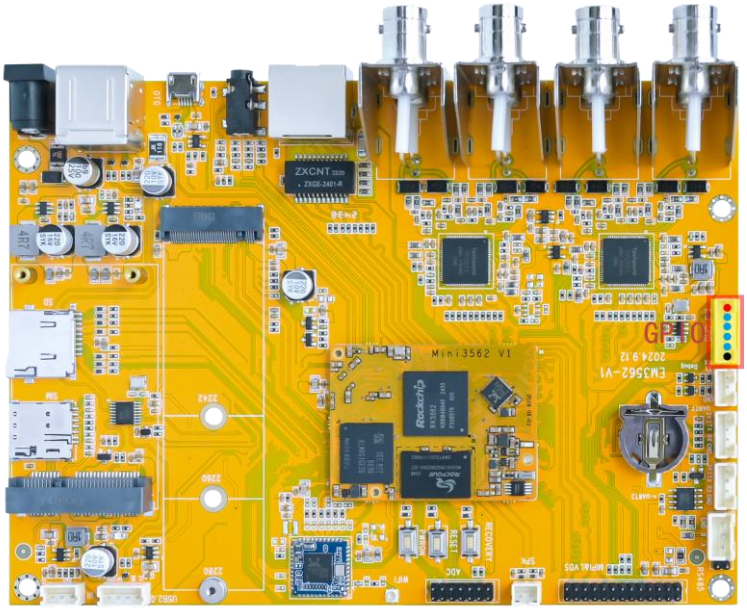
```
# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
```

Step 2: Read GPS data.

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

```
root@linaro-alip:/# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@linaro-alip:/#
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
```

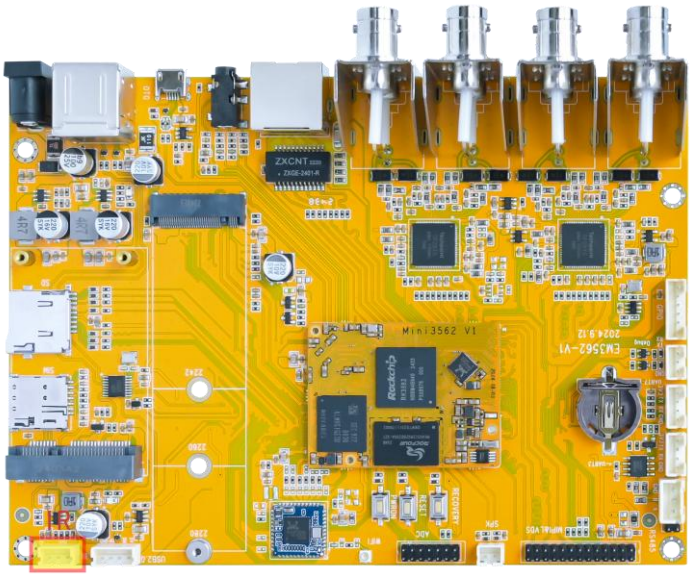
6.17 GPIO



The GPIO value is: 65/55/56/107.

```
# echo 65 > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio65/direction
# echo 1 > /sys/class/gpio/gpio65/value
# echo 0 > /sys/class/gpio/gpio65/value
```

6.18 IR



Step 1: Open IR debugging print.

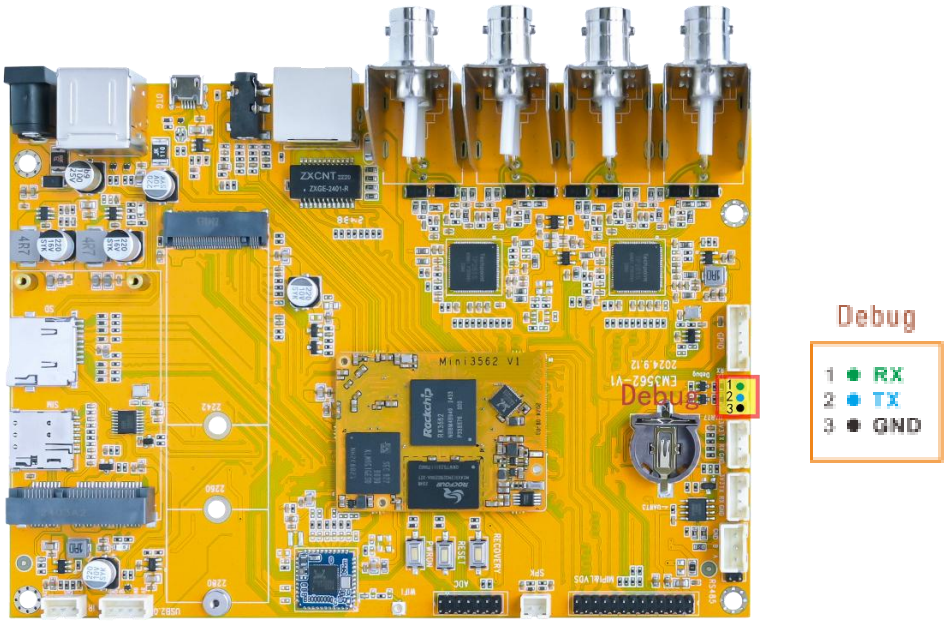
```
# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
```

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

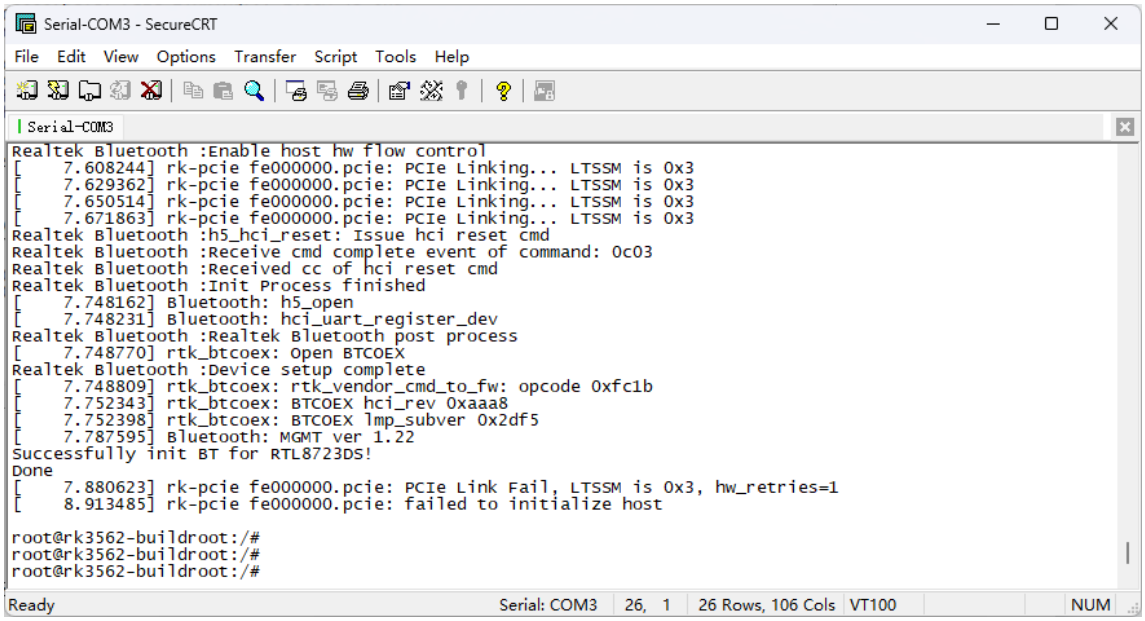
```
root@linaro-alip:/# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
root@linaro-alip:/#
root@linaro-alip:/# [ 1399.441475] USERCODE=0x1818
[ 1399.468566] RMC_GETDATA=98
[ 1400.697516] USERCODE=0x1818
[ 1400.724713] RMC_GETDATA=9b
[ 1401.989368] USERCODE=0x1818
[ 1402.016497] RMC_GETDATA=99
[ 1402.602880] USERCODE=0x1818
[ 1402.630028] RMC_GETDATA=97
[ 1403.949393] USERCODE=0x1818
[ 1403.976453] RMC_GETDATA=e4
[ 1407.249589] USERCODE=0x1818
[ 1407.276752] RMC_GETDATA=e6
[ 1409.685665] USERCODE=0x1818
[ 1409.712799] RMC_GETDATA=96
[ 1421.533865] USERCODE=0x1818
[ 1421.560884] RMC_GETDATA=97
```

7.Buildroot Test

7.1 Serial Terminal

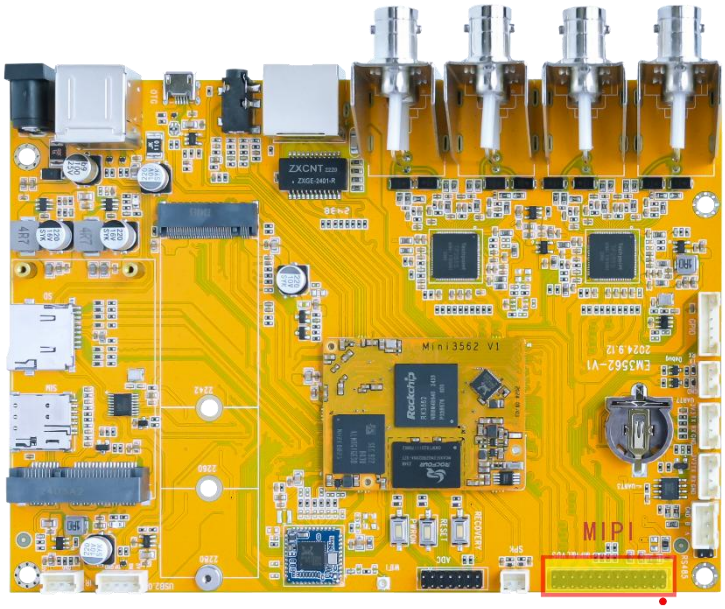


Connect the board and PC with USB Serial cable, then power on, the terminal will output boot information. The default baudrate is 1500000.



7.2 Display

The EM3562 default support for MIPI DSI interfaces.



The display effect diagram is as follows:

7.3 Micro USB

The Micro USB is mainly used for firmware upgrades and ADB function.

7.3.1 ADB

ADB is the command-line debugging tool. It can use for system logs, uploading and downloading the files, installing the applications, etc.

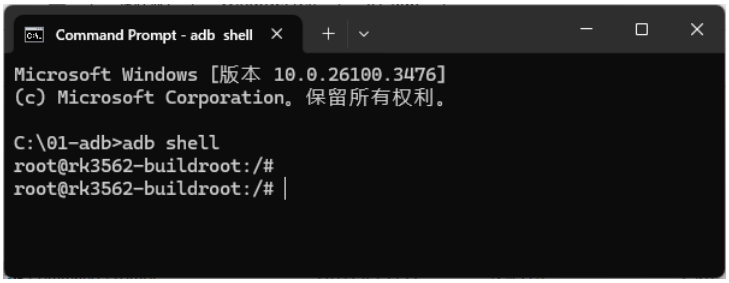
Step 1: connect the board and PC host with Micro USB cable.

Step 2: Install ADB driver on Windows system.

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

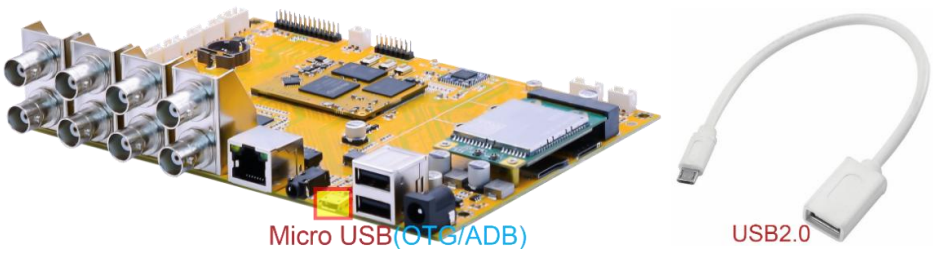
Step 4: Execute the following command to enable ADB.

```
# adb shell
```



7.3.2 Micro USB to USB HOST

Step 1: Connect the Micro to USB OTG Host converter to the Micro USB port of the development board, and then insert the USB flash drive into the USB port of the docking station.

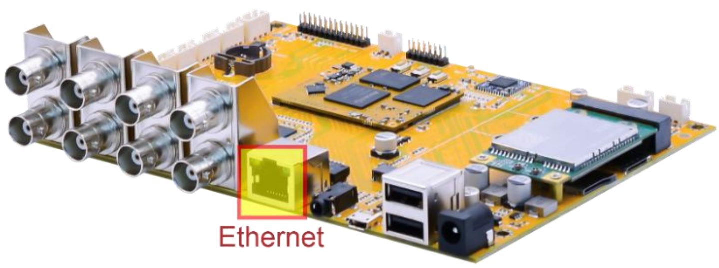


Step 2: After inserting the USB flash drive, if it is recognized successfully, It will automatically mount the device.

```
root@rk3562-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  716M  5.0G  13% /
devtmpfs        970M  8.0K  970M   1% /dev
tmpfs           982M  140K  982M   1% /tmp
tmpfs           982M  440K  982M   1% /run
tmpfs           982M  164K  982M   1% /var/log
tmpfs           982M     0  982M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  352K  920M   1% /userdata
/dev/sda        3.6G  2.2G  1.5G  60% /mnt/udisk
root@rk3562-buildroot:/# ls /mnt/udisk
 720P.mp4                                Screenshot_2025-04-10_02-17-34.png
 Alarms                                  Screenshot_2025-04-10_02-18-06.png
 Android                                 Screenshot_2025-04-10_02-22-15.png
 Audiobooks                              Screenshot_2025-04-10_02-23-08.png
 DCIM                                    Screenshot_2025-04-10_02-27-06.png
 Documents                               Screenshot_2025-04-10_02-28-04.png
 Download                                Screenshot_2025-04-10_02-29-08.png
 EM3288-POE                              Screenshot_2025-04-10_02-30-10.png
 LOST.DIR                                Screenshot_2025-04-10_02-35-06.png
 MINI3288_Hardware_User_manual_V4.docx   Screenshot_2025-04-10_02-35-48.png
 MobaXterm_Portable_v24.4.zip            Screenshot_2025-04-10_02-36-48.png
 Movies                                  Screenshot_2025-04-10_02-37-25.png
 Music                                   Screenshot_2025-04-10_02-38-34.png
 Notifications                          'System Volume Information'
'Photoshop CC2020.zip'                   black_list
 Pictures                                photo0
 Podcasts                                photo1
 Recordings                              snapshot
 Ringtones                               test
 Screenshot_2024-12-01_13-37-34.png      video0
 Screenshot_2024-12-01_13-38-37.png      video1
 Screenshot_2024-12-01_13-39-48.png      white_list
 Screenshot_2025-04-10_01-54-47.png     '鎴愰兘.閲戝叾鍟?鏃犳敼鐨勫埚(480P).mp4'
root@rk3562-buildroot:/#
```

7.4 Ethernet

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



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

```
root@rk3562-buildroot:/# [ 3283.694858] rk_gmac-dwmac ffa80000.ethernet eth0: Link is Up - 1Gbps/Full - flow
control rx/tx

root@rk3562-buildroot:/#
```

Step 2: View network interface information.

```
# ifconfig
```

```
root@rk3562-buildroot:/# ifconfig
eth0      Link encap:Ethernet  HWaddr CE:85:1E:F6:A3:BD
          inet addr:192.168.0.50  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::fb91:9ed6:c8ea:f128/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:319 errors:0 dropped:15 overruns:0 frame:0
          TX packets:21 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:30312 (29.6 KiB)  TX bytes:2478 (2.4 KiB)
          Interrupt:48
```

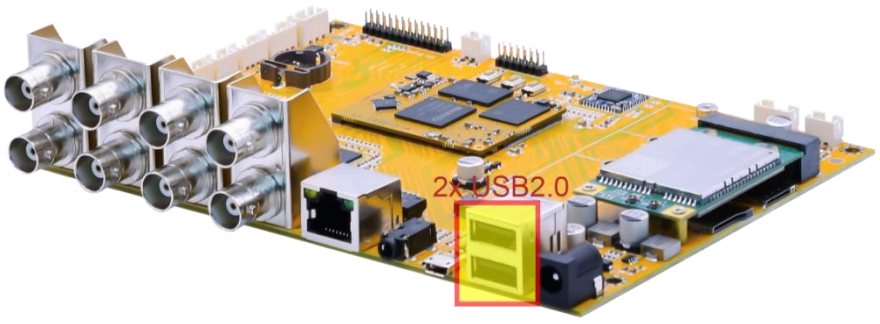
Step 3: Users can test network connectivity using the desktop's built-in browser or verify it through the following command method.

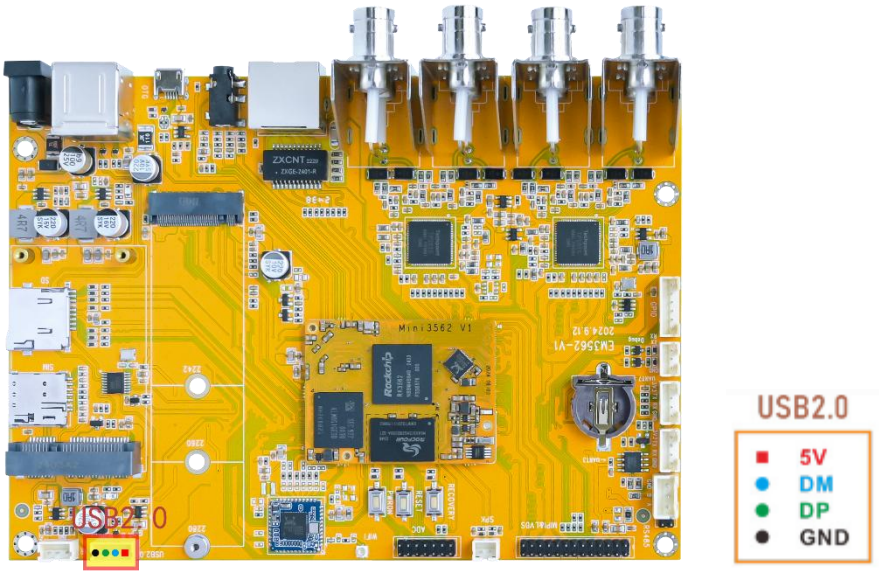
```
# ping -I eth0 www.armdesigner.com
```

```
root@rk3562-buildroot:/# ping -I eth0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.50 eth0: 56(84) bytes of data.
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=1 ttl=48 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=2 ttl=48 time=184 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=3 ttl=48 time=183 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=4 ttl=48 time=183 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=5 ttl=48 time=183 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=6 ttl=48 time=183 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=7 ttl=48 time=202 ms
^C
--- www.armdesigner.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6010ms
rtt min/avg/max/mdev = 182.590/186.469/201.636/6.530 ms
root@rk3562-buildroot:/#
```

7.5 USB Host

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





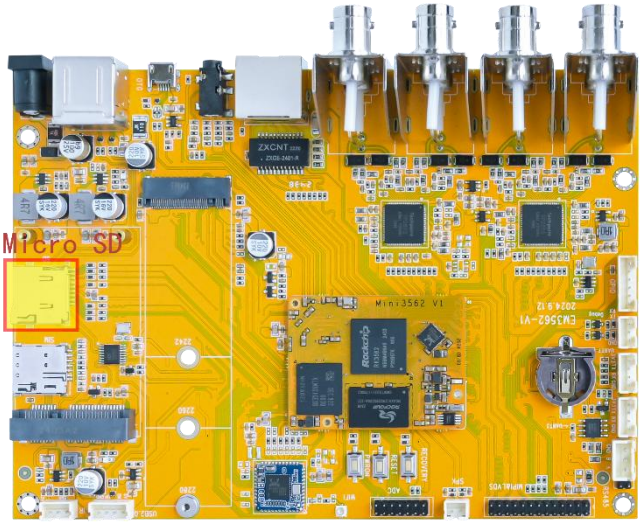
After connecting the USB flash drive, it will be automatically mounted, execute the following command to view the path where the device is mounted:

```
# df -h
```

```
root@rk3562-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  716M  5.0G  13% /
devtmpfs        970M  8.0K  970M   1% /dev
tmpfs           982M  140K  982M   1% /tmp
tmpfs           982M  440K  982M   1% /run
tmpfs           982M  164K  982M   1% /var/log
tmpfs           982M     0  982M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  368K  920M   1% /userdata
/dev/sda        3.6G  2.2G  1.5G  60% /mnt/udisk
root@rk3562-buildroot:/#
```

7.6 SD Card

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



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

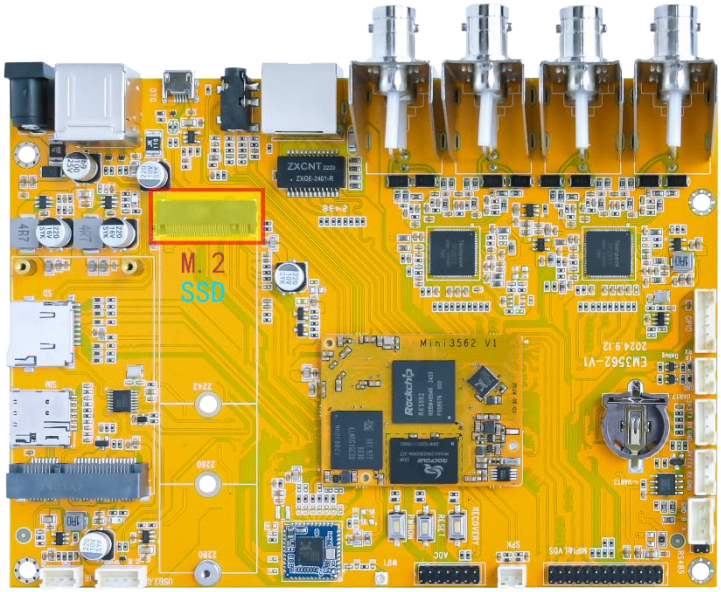
```
# df -h
```

```
root@rk3562-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       5.9G  716M  5.0G  13% /
devtmpfs        970M  8.0K  970M   1% /dev
tmpfs           982M  140K  982M   1% /tmp
tmpfs           982M  448K  982M   1% /run
tmpfs           982M  180K  982M   1% /var/log
tmpfs           982M     0  982M   0% /dev/shm
/dev/mmcblk0p7  123M   12M  108M  10% /oem
/dev/mmcblk0p8  936M  368K  920M   1% /userdata
/dev/sda        3.6G  2.2G  1.5G  60% /mnt/udisk
/dev/mmcblk1p1   59G   40G   19G  69% /mnt/sdcard
root@rk3562-buildroot:/#
```

7.7 M.2 NVME SSD

The SSD on Buildroot only supports the ext4 format.

Step 1: Connect the SSD, then power on.



Step 2: Execute follow command to mount it.

```
# mkdir /mnt/ssd                          //create a mount point
# mount /dev/nvme0n1 /mnt/ssd             //mount SSD
# ls /mnt/ssd
```

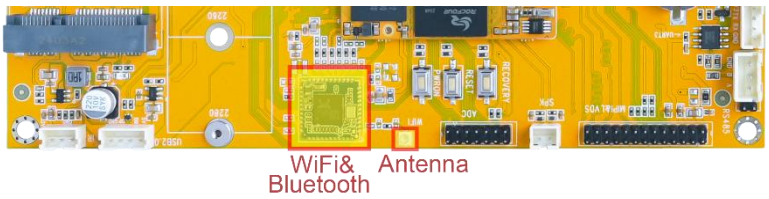
```
root@rk3562-buildroot:/# ls /dev/nvme0
nvme0    nvme0n1
root@rk3562-buildroot:/# mkdir /mnt/ssd
root@rk3562-buildroot:/# mount /dev/nvme0n1 /mnt/ssd
[  130.770896] EXT4-fs (nvme0n1): recovery complete
[  130.771000] EXT4-fs (nvme0n1): mounted filesystem with ordered data mode. Quota mode: disabled.
root@rk3562-buildroot:/# ls /mnt/ssd
4KP30  lost+found
root@rk3562-buildroot:/#
```

Note: If devices that are not in ext4 format, the user can choose to format them on the board. After formatting, the files on the device will be permanently lost, so please proceed with caution.

```
# mke2fs -t ext4 /dev/nvme0n1
```

7.8 WiFi & Bluetooth

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



7.8.1 WiFi

Step 1: View the device information.

```
# ifconfig
```

```
root@rk3562-buildroot:/# ifconfig
eth0      Link encap:Ethernet  HWaddr CE:85:1E:F6:A3:BD
          inet addr:192.168.0.50  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::fb91:9ed6:c8ea:f128/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:955 errors:0 dropped:2 overruns:0 frame:0
          TX packets:53 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:97316 (95.0 KiB)  TX bytes:4590 (4.4 KiB)
          Interrupt:48

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:8 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:576 (576.0 B)  TX bytes:576 (576.0 B)

p2p0      Link encap:Ethernet  HWaddr CE:64:1A:96:5C:1D
          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)

wlan0     Link encap:Ethernet  HWaddr CC:64:1A:96:5C:1D
          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)

root@rk3562-buildroot:/#
```

Step 2: Scan for available WiFi hotspots.

```
# iwlist wlan0 scan
```

```
root@rk3562-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=60/100  Signal level=17/100
                    Extra:fm=0003
                060050F204000110110009544337313032 2D313010080002078010 3C000101104900060037 2A000120
                    Quality=92/100  Signal level=25/100
                    Extra:fm=0003
```

Step 3: Connect to the hotspot.

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

```
root@rk3562-buildroot:/# wifi-connect.sh Boardcon Boardcon43435656
connect to WiFi ssid: Boardcon, Passwd: Boardcon43435656
Successfully initialized wpa_supplicant
root@rk3562-buildroot:/#
```

Step 4: View the network interface status.

```
# ifconfig
```

```
root@rk3562-buildroot:/# ifconfig
p2p0      Link encap:Ethernet  HWaddr CE:64:1A:96:5C:1D
          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)

wlan0     Link encap:Ethernet  HWaddr CC:64:1A:96:5C:1D
          inet addr:192.168.0.206  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::31f8:d29f:6a14:cea2/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:95 errors:0 dropped:29 overruns:0 frame:0
          TX packets:18 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:12301 (12.0 KiB)  TX bytes:2584 (2.5 KiB)
```

Step 5: Test the WiFi network.

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

```
root@rk3562-buildroot:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.206 wlan0: 56(84) bytes of data.
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=1 ttl=48 time=202 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=2 ttl=48 time=189 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=3 ttl=48 time=192 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=4 ttl=48 time=194 ms
64 bytes from www.armdesigner.com (67.222.54.196): icmp_seq=5 ttl=48 time=187 ms
^C
--- www.armdesigner.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 186.866/192.774/202.227/5.248 ms
root@rk3562-buildroot:/#
```

7.8.2 Bluetooth

Step 1: View the Bluetooth device status.

```
# hciconfig -a
```

```
root@rk3562-buildroot:/# hciconfig -a
hci0:   Type: Primary  Bus: UART
        BD Address: CC:64:1A:96:5C:1E  ACL MTU: 1021:8  SCO MTU: 255:12
        UP RUNNING
        RX bytes:1529 acl:0 sco:0 events:51 errors:0
        TX bytes:4044 acl:0 sco:0 commands:51 errors:0
        Features: 0xff 0xff 0xff 0xfe 0xdb 0xfd 0x7b 0x87
        Packet type: DM1 DM3 DM5 DH1 DH3 DH5 HV1 HV2 HV3
        Link policy: RSWITCH HOLD SNIFF PARK
        Link mode: PERIPHERAL ACCEPT
[  969.225075] Bluetooth: hu 00000000eb6368ea retransmitting 1 pkts
        Name: 'BlueZ 5.77'
        Class: 0x6c0414
        Service Classes: Rendering, Capturing, Audio, Telephony
        Device Class: Audio/Video, Loudspeaker
[  969.233067] rtk_btcoex: BTCOEX hci_rev 0xaaa8
[  969.233155] rtk_btcoex: BTCOEX lmp_subver 0x2df5
        HCI Version: 4.1 (0x7)  Revision: 0xaaa8
        LMP Version: 4.1 (0x7)  Subversion: 0x2df5
        Manufacturer: Realtek Semiconductor Corporation (93)

root@rk3562-buildroot:/#
```

Step 2: Set the Bluetooth adapter to be discoverable.

```
# hciconfig hci0 piscan
```

Step 3: Control and configure the Bluetooth device.

```
# bluetoothctl
```

```
root@rk3562-buildroot:/# hciconfig hci0 piscan
[ 1007.551577] Bluetooth: hu 00000000eb6368ea retransmitting 1 pkts
root@rk3562-buildroot:/# bluetoothctl
hci0 new_settings: powered connectable discoverable bondable ssp br/edr le secure-conn
Agent registered
[CHG] Controller CC:64:1A:96:5C:1E Pairable: yes
[bluetooth]#
```

Step 4: Scanning for nearby Bluetooth devices.

• Run *scan on* to start searching for devices.

• After scanning, run *scan off* to stop the search and prevent continuous refreshing.

• Run *devices* to view the list of detected devices.

```
[bluetooth]# scan on
[bluetooth]# scan off
[bluetooth]# devices
```

```
[bluetooth]# scan on
SetDiscoveryFilter success
hci0 type 7 discovering on
Discovery started
[CHG] Controller 38:7A:CC:2A:11:88 Discovering: yes
[NEW] Device 88:68:4B:74:39:44 OPPO K10 5G
[NEW] Device 4B:73:65:34:5F:5D 4B-73-65-34-5F-5D
[NEW] Device D4:6C:27:DF:40:46 D4-6C-27-DF-40-46
[NEW] Device 10:0E:A1:1C:13:A8 10-0E-A1-1C-13-A8
[CHG] Device A8:35:12:9A:EB:4D RSSI: 0xfffffffe1 (-31)
[NEW] Device 7D:B8:B6:62:89:47 7D-B8-B6-62-89-47
[NEW] Device 2C:A0:42:D1:14:D5 Kang
 [NEW] Device 5D:9A:E9:D5:D8:9B 5D-9A-E9-D5-D8-9B
[NEW] Device 14:DE:39:72:B3:C3 Mate 40 Pro
[NEW] Device 43:C7:3D:C0:16:E4 43-C7-3D-C0-16-E4
[CHG] Device 14:DE:39:72:B3:C3 RSSI: 0xffffffb3 (-77)
[NEW] Device 7B:7E:22:4C:1B:08 7B-7E-22-4C-1B-08
[bluetooth]# scan off
hci0 type 7 discovering off
Discovery stopped
[CHG] Device 7B:7E:22:4C:1B:08 TxPower is nil
[CHG] Device 7B:7E:22:4C:1B:08 RSSI is nil
[CHG] Device 43:C7:3D:C0:16:E4 RSSI is nil
[CHG] Device 14:DE:39:72:B3:C3 RSSI is nil
[CHG] Device 5D:9A:E9:D5:D8:9B TxPower is nil
[CHG] Device 5D:9A:E9:D5:D8:9B RSSI is nil
[CHG] Device 2C:A0:42:D1:14:D5 RSSI is nil
[CHG] Device 7D:B8:B6:62:89:47 TxPower is nil
[CHG] Device 7D:B8:B6:62:89:47 RSSI is nil
[CHG] Device A8:35:12:9A:EB:4D RSSI is nil
[CHG] Device 10:0E:A1:1C:13:A8 RSSI is nil
[CHG] Device D4:6C:27:DF:40:46 RSSI is nil
[CHG] Device 4B:73:65:34:5F:5D TxPower is nil
[CHG] Device 4B:73:65:34:5F:5D RSSI is nil
[CHG] Device 88:68:4B:74:39:44 RSSI is nil
[CHG] Controller 38:7A:CC:2A:11:88 Discovering: no
[bluetooth]# devices
Device A8:35:12:9A:EB:4D liuy
Device 88:68:4B:74:39:44 OPPO K10 5G
Device 4B:73:65:34:5F:5D 4B-73-65-34-5F-5D
Device D4:6C:27:DF:40:46 D4-6C-27-DF-40-46
Device 10:0E:A1:1C:13:A8 10-0E-A1-1C-13-A8
Device 7D:B8:B6:62:89:47 7D-B8-B6-62-89-47
Device 2C:A0:42:D1:14:D5 Kang
Device 5D:9A:E9:D5:D8:9B 5D-9A-E9-D5-D8-9B
Device 14:DE:39:72:B3:C3 Mate 40 Pro
Device 43:C7:3D:C0:16:E4 43-C7-3D-C0-16-E4
Device 7B:7E:22:4C:1B:08 7B-7E-22-4C-1B-08
[bluetooth]#
```

Step 5: Pair the device.

```
[bluetooth]# pair A8:35:12:9A:EB:4D
```

```
[bluetooth]# pair A8:35:12:9A:EB:4D
Attempting to pair with A8:35:12:9A:EB:4D
hci0 device_flags_changed: A8:35:12:9A:EB:4D (BR/EDR)
     supp: 0x00000000  curr: 0x00000000
[bluetooth]# [  173.017134] rtk_btcoex: hci create connection, start paging
[  174.380179] rtk_btcoex: connected, handle 0001, status 0x00
[  174.380268] rtk_btcoex: Page success
hci0 A8:35:12:9A:EB:4D type BR/EDR connected eir_len 11
[CHG] Device A8:35:12:9A:EB:4D Connected: yes
[liuy]# [  174.460956] rtk_btcoex: io capability request
Request confirmation
[agent] Confirm passkey 622774 (yes/no): yes
[liuy]# [  178.036444] rtk_btcoex: link key notify
hci0 new_link_key A8:35:12:9A:EB:4D type 0x05 pin_len 0 store_hint 1
[CHG] Device A8:35:12:9A:EB:4D Bonded: yes
[liuy]# [  178.187364] rtk_btcoex: l2cap op 2, len 16, out 0
[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
[CHG] Device A8:35:12:9A:EB:4D ServicesResolved: yes
[CHG] Device A8:35:12:9A:EB:4D Paired: yes
Pairing successful
[DEL] Device 4C:3E:56:53:EC:2D 4C-3E-56-53-EC-2D
[liuy]# [  181.164278] rtk_btcoex: l2cap op 6, len 16, out 1
[  181.164408] rtk_btcoex: TX l2cap disconn req, hndl 0x0001, dcid 0x0059, scid 0x0040
[DEL] Device 2C:A0:42:D1:14:D5 Kang
[  181.164442] rtk_btcoex: handle_l2cap_discon_req: handle 0x0001, dcid 0x0059, scid 0x0040, dir 1
[DEL] Device 78:AE:22:6E:47:2C 78-AE-22-6E-47-2C
[DEL] Device CC:64:1A:B6:C3:AE ubuntu
[liuy]# connect [  185.247311] rtk_btcoex: disconn cmpl evt: status 00, handle 0001, reason 13
hci0 A8:35:12:9A:EB:4D type BR/EDR disconnected with reason 3
[  185.247391] rtk_btcoex: process disconn complete event.
[CHG] Device A8:35:12:9A:EB:4D ServicesResolved: no
[CHG] Device A8:35:12:9A:EB:4D Connected: no
```

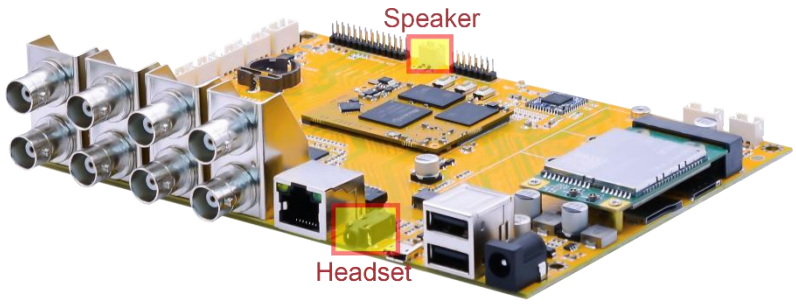
Step 6: Connect the device.

```
[bluetooth]# connect A8:35:12:9A:EB:4D
```

```
[bluetooth]# connect A8:35:12:9A:EB:4D
Attempting to connect to A8:35:12:9A:EB:4D
[bluetooth]# [  189.910955] rtk_btcoex: hci create connection, start paging
[  190.709669] rtk_btcoex: connected, handle 0002, status 0x00
[  190.709733] rtk_btcoex: Page success
hci0 A8:35:12:9A:EB:4D type BR/EDR connected eir_len 11
[CHG] Device A8:35:12:9A:EB:4D Connected: yes
[liuy]# [  190.914878] rtk_btcoex: l2cap op 2, len 16, out 1
```

7.9 Audio I/O

The audio support Headset input, supports Headset and speaker output.



Step 1: Plug the headphone into the Audio jack.

Step 2: View sound card.

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

```
root@rk3562-buildroot:/# cat /proc/asound/cards
 0 [rockchiprk809  ]: rockchip-rk809 - rockchip-rk809
                      rockchip-rk809
root@rk3562-buildroot:/#
```

Step 3: Execute the following command to record.

```
# arecord -D hw:0,0 -d 10 -f cd -r 44100 -c 2 -t wav test.wav //-D hw:0,0 is card0 and device0
```

```
root@rk3562-buildroot:/# arecord -D hw:0,0 -d 10 -f cd -r 44100 -c 2 -t wav test.wav
Recording WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@rk3562-buildroot:/#
```

Step 4: Execute the following command to playback.

```
# aplay -D plughw:0,0 test.wav
```

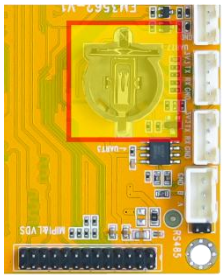
```
root@rk3562-buildroot:/# aplay -D plughw:0,0 test.wav
Playing WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@rk3562-buildroot:/#
```

Play priority: Headset output greater than speaker output.

7.10 RTC

Step 1: Install the coin cell battery.

RTC



Step 2: Set the system time.

```
# date -s "2025-04-10 20:37:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

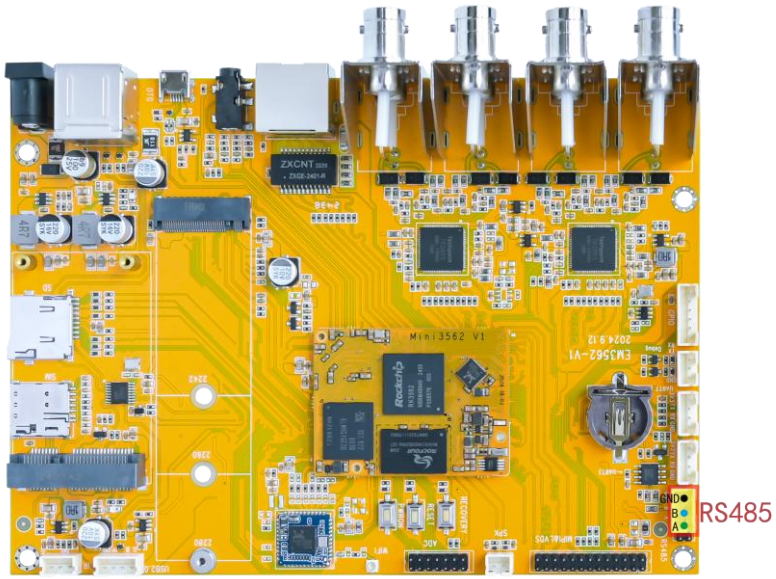
```
# hwclock
```

```
root@rk3562-buildroot:/# date -s "2025-04-10 20:37:00"
Thu Apr 10 20:37:00 UTC 2025
root@rk3562-buildroot:/# hwclock -w
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:37:13 2025  0.000000 seconds
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:37:14 2025  0.000000 seconds
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:37:15 2025  0.000000 seconds
root@rk3562-buildroot:/#
```

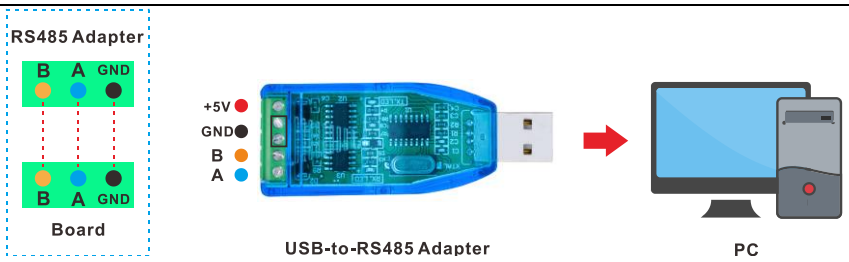
Step 5: Power off, after a period of time to turn on the power again, check whether the time is saved.

```
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:39:19 2025  0.000000 seconds
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:39:20 2025  0.000000 seconds
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:39:21 2025  0.000000 seconds
root@rk3562-buildroot:/# hwclock
Thu Apr 10 20:39:22 2025  0.000000 seconds
root@rk3562-buildroot:/#
```

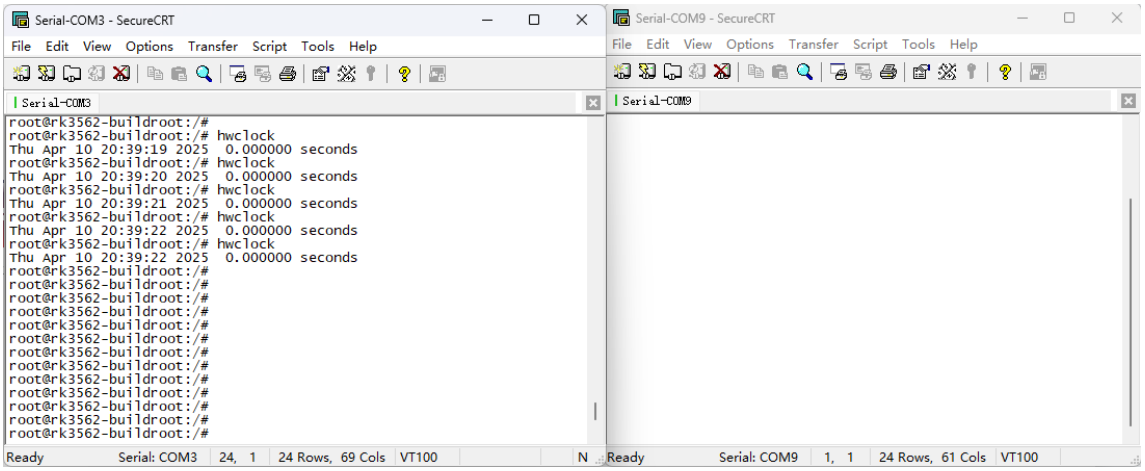
7.11 RS485



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

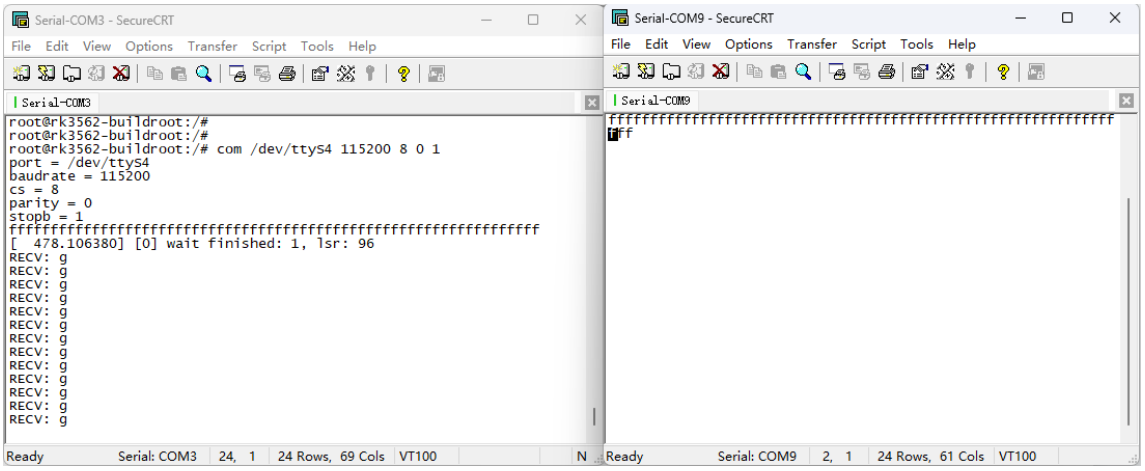


Step 2: Open the corresponding serial terminal, set the baud rate of the board to 1500000, and set the baud rate of the RS485 test tool to 115200.



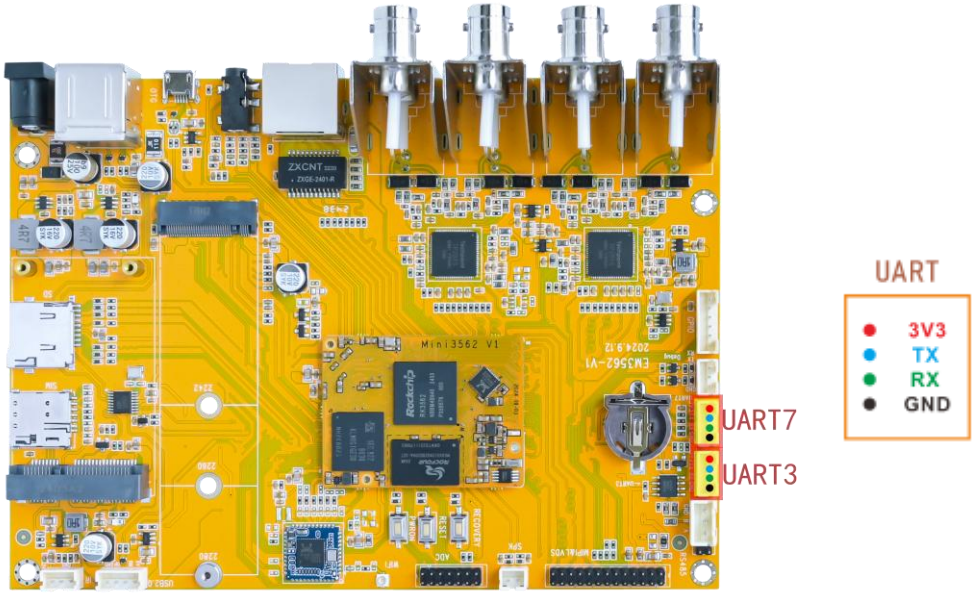
Step 3: Execute the following command on the board to test the RS485 transmission and reception functionality.

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



7.12 UART

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



Step 2: UART3 test.

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

```
root@rk3562-buildroot:/# com /dev/ttyS3 115200 8 0 1
port = /dev/ttyS3
baudrate = 115200
cs = 8
parity = 0
stopb = 1
yyyyyyyyyyyyyyy
RECV: yyyyyyyyyyyyyyy
oooooooooooooooo
RECV: oooooooooooooooo
fffffffffffff
RECV: fffffffffffff
^C
root@rk3562-buildroot:/#
```

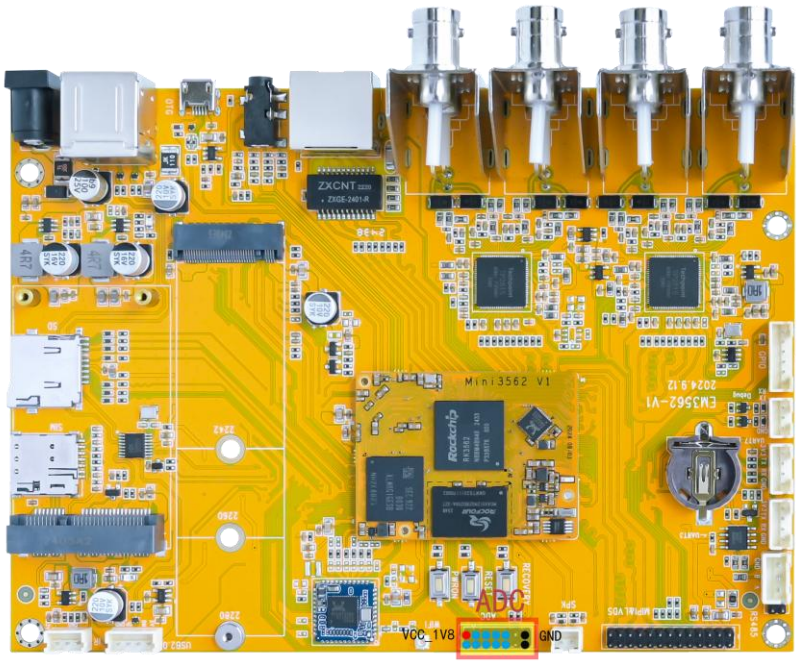
Step 3: UART7 test.

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

```
root@rk3562-buildroot:/# com /dev/ttyS7 115200 8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
hhhhhhhhhhhhh
RECV: hhhhhhhhhhhhh
iiiiiiiiiiiiiii
RECV: iiiiiiiiiiiiiii
ddddddddddddddd
RECV: ddddddddddddddd
^C
root@rk3562-buildroot:/#
```

7.13 ADC

Step 1: short circuit SARADC1_IN1 and GND or SARADC1_IN1 and VCC_1V8 pins of ADC.

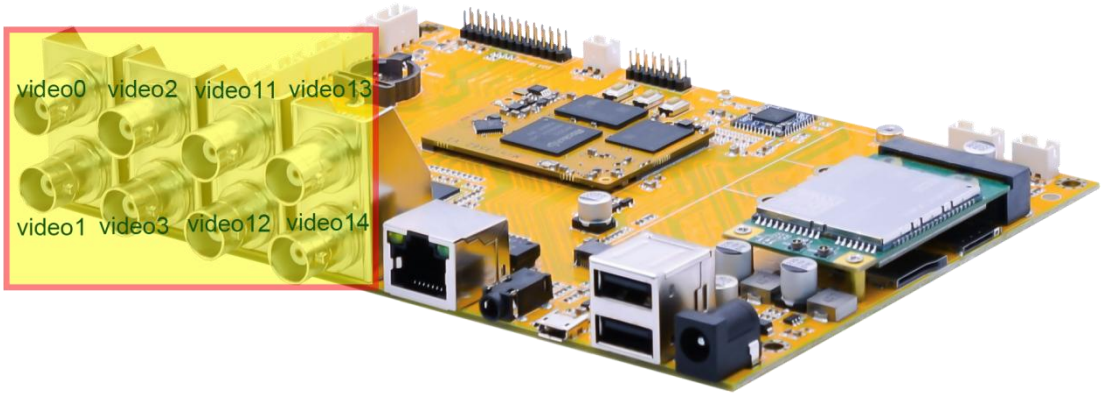


Step 2: Execute the test command.

```
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage1_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage2_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage3_raw
# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage5_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage2_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage5_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage6_raw
# cat /sys/devices/platform/ff730000.saradc/iio:device0/in_voltage7_raw
```

```
root@rk3562-buildroot:/# cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
208

root@rk3562-buildroot:/#  cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
0

root@rk3562-buildroot:/#  cat /sys/devices/platform/ffaa0000.saradc/iio:device1/in_voltage0_raw
1022
root@rk3562-buildroot:/#
```

7.14 Camera



• Preview the footage from 8 cameras simultaneously, copy camera_ahd_test_buildroot.sh to SDCARD.

```
# cp /mnt/sdcard/camera_ahd_test_buildroot.sh /
# chmod 777 camera_ahd_test_buildroot.sh
# ./camera_ahd_test_buildroot.sh
```

• Single-camera preview, using video0 as an example.

```
# gst-launch-1.0 v4l2src device=/dev/video0 !

video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink

//The format is NV16 or NV12, If use 1280p AHD camera change to “width=1280,height=720”
```

```
root@rk3562-buildroot:/#  gst-launch-1.0 v4l2src device=/dev/video0 ! video/x-raw, format=NV16, width=1920,
height=1080, framerate=25/1 ! waylandsink
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
[   75.995069] rkcif-mipi-lvds: stream[0] start streaming
[   75.997772] rkcif-mipi-lvds: Allocate dummy buffer, size: 0x003f5000
[   76.008063] rockchip-mipi-csi2 mipi0-csi2: stream on, src_sd: 000000008d8e1ea7, sd_name:rockchip-csi2-dphy0
[   76.008079] rockchip-mipi-csi2 mipi0-csi2: stream ON
[   76.008114] rockchip-csi2-dphy0: dphy0, data_rate_mbps 594
[   76.008138] rockchip-csi2-dphy csi2-dphy0: csi2_dphy_s_stream stream on:1, dphy0, ret 0
[   76.009382] techpoint 4-0047: detect channel 0 1080P_25
[   76.010168] techpoint 4-0047: set channel 0 1080P_25
[   76.046726] techpoint 4-0047: detect channel 1 is not supported, default 1080P_25
[   76.047503] techpoint 4-0047: set channel 1 1080P_25
[   76.084499] techpoint 4-0047: detect channel 2 is not supported, default 1080P_25
[   76.085264] techpoint 4-0047: set channel 2 1080P_25
[   76.126570] techpoint 4-0047: detect channel 3 is not supported, default 1080P_25
[   76.127400] techpoint 4-0047: set channel 3 1080P_25
[   76.180898] (0xff380000)MIPI_CSI2 ERR1:0x2000bb0 (fs/fe mis,vc: 0 1 3) (f_seq,vc: 0 1 3) (crc,vc: 1)
[   76.180986] (0xff380000)MIPI_CSI2 ERR1:0x440 (fs/fe mis,vc: 2) (f_seq,vc: 2)
[   77.192840] rkcif-mipi-lvds: get vblank fail, vblank_def 0, vblank_curr 0
[   77.192872] rkcif-mipi-lvds: Warning: vblank need >= 1000us if isp work in online, cur 0 us
[   77.232887] rkcif-mipi-lvds: get vblank fail, vblank_def 0, vblank_curr 0
[   77.232931] rkcif-mipi-lvds: Warning: vblank need >= 1000us if isp work in online, cur 0 us
Redistribute latency...
```

```
# gst-launch-1.0 v4l2src device=/dev/video0 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video1 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video2 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video3 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video11 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video12 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video13 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
# gst-launch-1.0 v4l2src device=/dev/video14 !
video/x-raw,format=NV16,width=1920,height=1080, framerate=25/1 ! waylandsink
```

• Single-camera record a video, using video0 as an example.

```
# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=100 ! \

video/x-raw,format=NV16,width=1920,height=1080,framerate=30/1 ! \

videoconvert ! mpph264enc ! h264parse ! mp4mux ! \

filesink location=/tmp/h264.mp4
```

• Single-camera take picture, using video0 as an example.

```
gst-launch-1.0 -v v4l2src device=/dev/video0 num-buffers=10 ! \

video/x-raw,format=NV16,width=1920,height=1080 ! mppjpegenc ! \

multifilesink location=/tmp/test%05d.jpgfilesink location=/tmp/h264.mp4
```

7.15 Video Playback

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

```
root@rk3562-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
root@rk3562-buildroot:/#
```

Simply execute the script.

```
root@rk3562-buildroot:/# ./rockchip-test/video/test_gst_video.sh
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
mpp[1377]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1377]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1377]: mpp: unable to create enc h265 for soc rk3562 unsupported
mpp[1377]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1377]: mpp: unable to create enc vp8 for soc rk3562 unsupported
mpp[1377]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
mpp[1377]: mpp_info: mpp version: ab796560 author: Herman Chen   2024-12-30 docs: Update 1.0.8 CHANGELOG.md
Redistribute latency...
mpp[1377]: h264d_api: is_avcC=1
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
0:00:03.5 / 0:00:29.5 (12.1 %)
```

(2) Play the video using Google Chrome.

• Google Chrome supports video playback up to 4K at 30Hz for H265/VP9, with support for the following decoding formats: H.264, H.265, VP9.

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

Execute follow command to test:

```
# chromium /mnt/sdcard/1080P30-H264.mp4
```

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

```
# gst-play-1.0 --videosink=xvimagesink /mnt/sdcard/1080P30-H264.mp4
--audiosink="alsasink device=hw:0,0"
```

Command explanation:

• /mnt/sdcard/1080P30-H264.mp4: The media file path to be played.

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

```
root@rk3562-buildroot:/# gst-play-1.0 --videosink=xvimagesink /mnt/sdcard/1080P30-H264.mp4
--audiosink="alsasink device=hw:0,0"
 (gst-play-1.0:1401):  gst-play-1.0-WARNING  **:  11:09:01.281:  Couldn't  create  specified  video  sink
'xvimagesink'
Press 'k' to see a list of keyboard shortcuts.
Now playing /mnt/sdcard/1080P30-H264.mp4
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency
```

7.16 4G&GPS

Step 1: Insert 4G module to PCIe socket (4G model: EC20), and connect antenna.

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.

7.16.1 4G Test

Step 1: Initiate the PPP connection.

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

```
root@rk3562-buildroot:/# pppd call quectel-ppp &
[1] 1327
root@rk3562-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
```

Step 2: Check the status of the network interfaces.

```
# ifconfig
```

```
root@rk3562-buildroot:/# ifconfig
ppp0      Link encap:Point-to-Point Protocol
          inet addr:10.226.24.150  P-t-P:10.64.64.64  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:52 (52.0 B)  TX bytes:198 (198.0 B)
```

Step 3: Test the PPP connection.

Add nameserver 8.8.8.8 in /etc/resolv.conf

```
root@rk3562-buildroot:/# cat /etc/resolv.conf
# Generated by dhcpcd
# /etc/resolv.conf.head can replace this line
# /etc/resolv.conf.tail can replace this line
nameserver 8.8.8.8
nameserver 192.168.0.2
root@rk3562-buildroot:/#
```

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

```
root@rk3562-buildroot:/# ping -I ppp0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.226.24.150 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=311 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=270 ms
^C
--- www.armdesigner.com ping statistics ---
3 packets transmitted, 2 received, 33.3333% packet loss, time 2001ms
rtt min/avg/max/mdev = 270.146/290.485/310.825/20.339 ms
root@rk3562-buildroot:/#
```

7.16.2 GPS Test

Step 1: Enable GPS functionality.

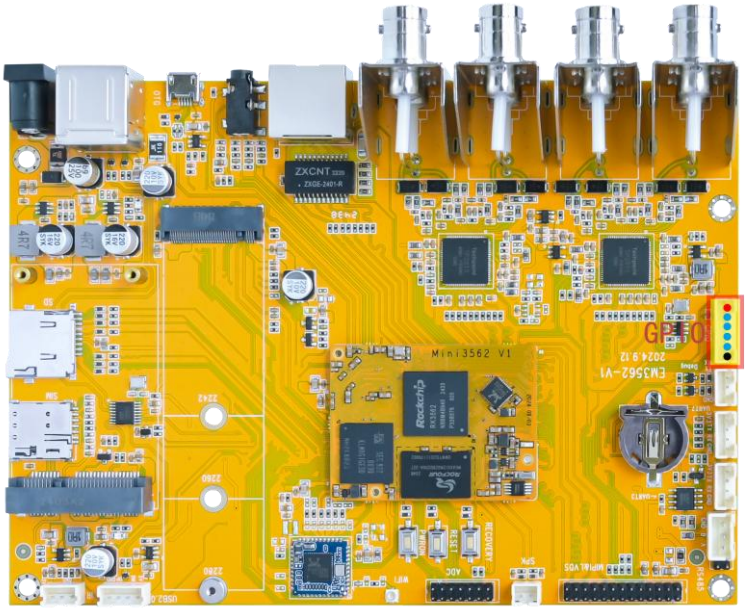
```
# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
```

Step 2: Read GPS data.

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

```
root@rk3562-buildroot:/#  echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@rk3562-buildroot:/# cat /dev/ttyUSB1
$GPVTG,,T,,M,,N,,K,N*2C

$GPGSA,A,1,,,,,,,,,,,,,,,*1E

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

$GPRMC,,V,,,,,,,,,,N*53

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

$GPGSA,A,1,,,,,,,,,,,,,,,*1E

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

$GPRMC,,V,,,,,,,,,,N*53

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

$GPGSA,A,1,,,,,,,,,,,,,,,*1E

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

$GPRMC,,V,,,,,,,,,,N*53

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

$GPGSA,A,1,,,,,,,,,,,,,,,*1E

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

$GPRMC,,V,,,,,,,,,,N*53

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

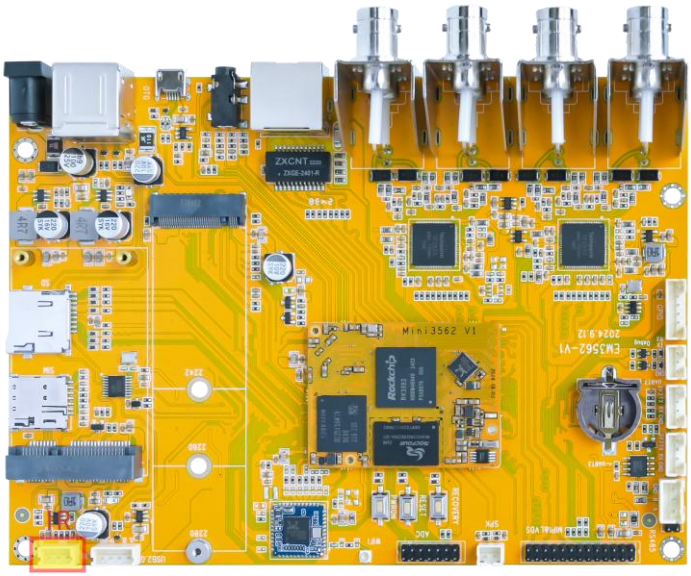
7.17 GPIO



The GPIO value is: 65/55/56/107.

```
# echo 65 > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio65/direction
# echo 1 > /sys/class/gpio/gpio65/value
# echo 0 > /sys/class/gpio/gpio65/value
```

7.18 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@rk3562-buildroot:/# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
root@rk3562-buildroot:/# [  453.996994] USERCODE=0xd728
[  454.023992] RMC_GETDATA=f2
[  454.217598] USERCODE=0xb728
[  454.550713] USERCODE=0x7496
[  454.710935] USERCODE=0xd728
[  454.738140] RMC_GETDATA=f2
[  454.868318] USERCODE=0xd728
[  454.895432] RMC_GETDATA=f2
[  455.029522] USERCODE=0xd728
[  455.056665] RMC_GETDATA=f2
[  455.192288] USERCODE=0xd728
[  455.219334] RMC_GETDATA=f2
[  455.454806] USERCODE=0xd728
[  455.481951] RMC_GETDATA=f2
[  455.602653] USERCODE=0xd728
[  455.629790] RMC_GETDATA=f2
[  455.755324] USERCODE=0xd728
```