

Idea3588S Linux6.1 User Manual

V1.1



Boardcon Embedded Design

Overview

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

System Support

Development Board	Debian12	Buildroot
Idea3588S_V2	Y	Y
CM3588S_V2		

Revision History

Version	Date	Author	Revision History
V1.0	2025-01-05	Xue Junchao	Initial version
V1.1	2025-06-03	Xue Junchao	Update compile

Disclaimer

The information provided in this document is not warranted for accuracy and is subject to change at any time without prior notification.

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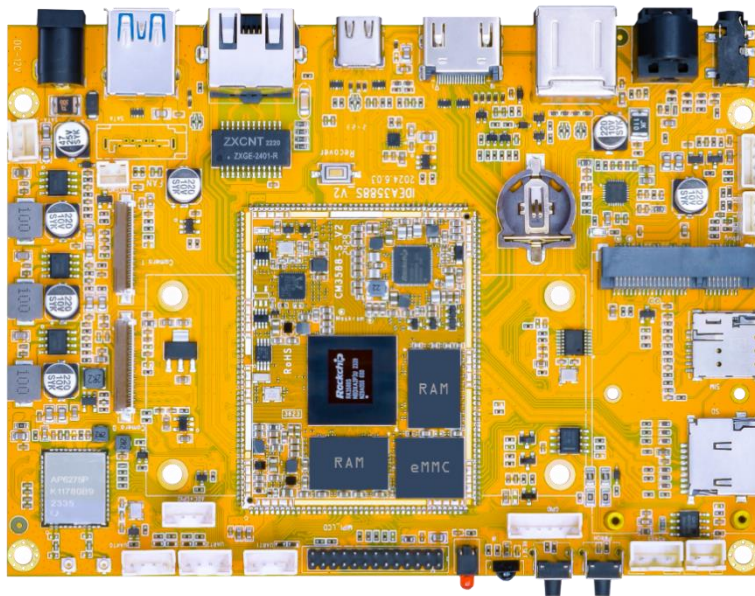
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Introduction

1.1 Overview

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



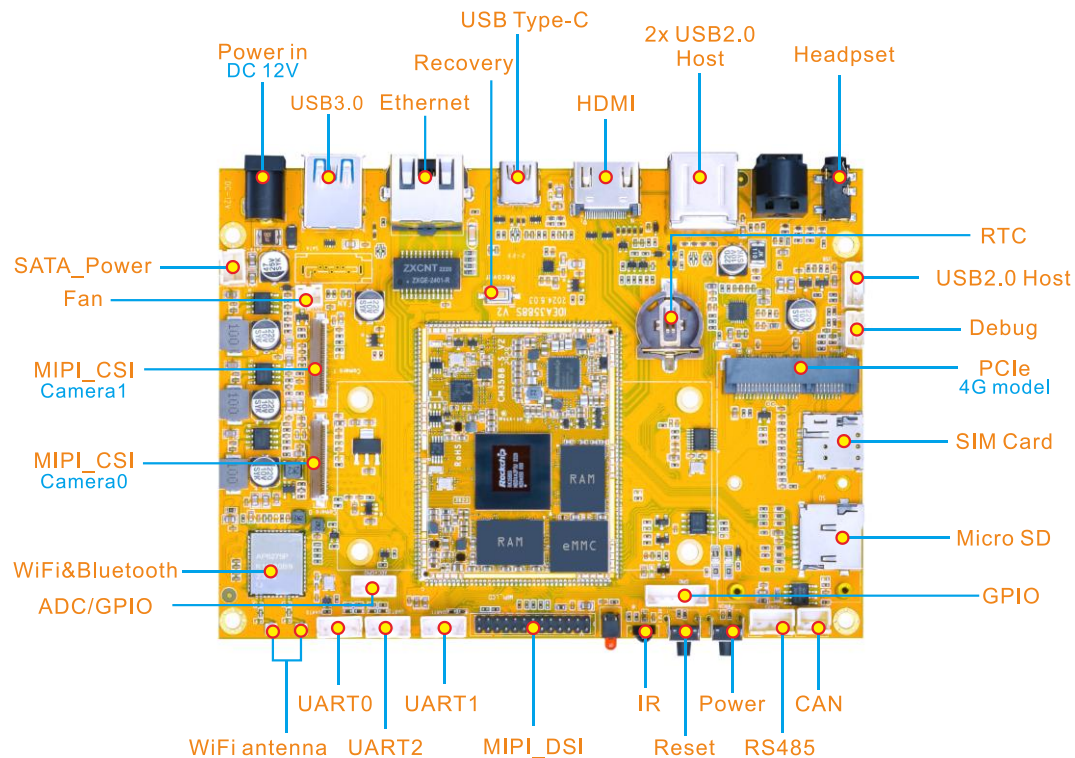
1.2 Product Parameters

Basic Parameters	
SOC	RK3588S
CPU	Octa-core 64-bit size core architecture, Quad-core Cortex-A76 + Quad-core Cortex-A55
GPU	• ARM Mali-G610 MP4

		• OpenGL ES 1.1/2.0/3.2 • Vulkan 1.2 • OpenCL up to 2.2
NPU		6TOPS AI computing power, three-core architecture, supporting int4/int8/int16/F16/BF16/TF32
Video	Decoder	• Support 8K@60fps H.265/VP9/AVS2 video decoding • Support 8K@30fps H.264 video decoding • Support 4K@60fps AV1 video decoding • Support 1080P@60fps MPEG-2/MPEG-1/VC-1/VP8 video decoding
	Encoder	Support H.264/H.265 video encoding, up to 8K@30fps
RAM		8GB LPDDR4X (up to 16GB)
ROM		32GB eMMC (up to 128GB)
Support system		Debian, Buildroot
Hardware Parameters		
Extended Storage		• Support MicroSD Card
Display		• Support HDMI2.1 TX 8K@60fps display • Support MIPI_DSI 800 x 1280@60fps display • Support DisplayPort Alt Mode over USB-C
Audio		• Support HDMI TX audio output • Support Headset output/input
USB		• Support USB3.0 • Support 3xUSB2.0 • Support USB Type-C (ADB/USB3.0/DP)
Network		• Support Gigabit Ethernet • Support WIFI/BT module

	• Support 4G module
Camera	Support Camera (Camera0 or Camera1)
Peripheral communication	• Support CAN • Support RS485 • Support 3xUART
Other parameters	Support Debug, IR, RTC, Fan, ADC+GPIO, GPIO, Power key, Reset key, Recover key
Electrical Parameters	
Power supply input voltage	12V/3A
RTC input voltage	3V/0.6uA
Operating temperature	0 ~ 70°
Storage temperature	-40 ~ 85°
Structural Parameters	
Core board dimensions	45.0mm x 57.5mm
Motherboard dimensions	145.0mm x 105.0mm

1.3 Hardware Interface Introduction



Interface parameters	
Power in	12V DC power input interface
USB3.0	USB3.0 Host interface
Ethernet	Gigabit Ethernet RJ45 interface
Recovery	Recovery key
USB Type-C	USB Type-C interface use for OTG download
HDMI	HDMI2.1 TX interface
2XUSB2.0 Host	Dual-layer USB2.0 HOST interface
Headset	Earphone output/input
RTC	RTC coin cell connector

USB2.0 Host	USB expansion interface
Debug	Debug the serial port
mPCIe	4G model interface (EC20)
SIM Card	SIM card slot
Mirco SD	Mirco SD card slot
GPIO	GPIO interface
CAN	CAN communication interface
RS485	RS485 communication interface
Power	Power key
Reset	Reset key
IR	infrared receiver
MIPI_DSI	MIPI DSI display interface
UART1	UART1, TTL level interface
UART2	UART2, TTL level interface
UART0	UART0, TTL level interface
WIFI antenna	WIFI&BT antenna interface
ADC/GPIO	ADC+GPIO interface
WIFI&BT	WIFI&Bluetooth module (AP6275P)
MIPI_CSI (1)	Camera0 interface
MIPI_CSI (2)	Camera1 interface
Fan	Fan interface, PWM control
SATA_Power	SATA Power out interface, 5V

Install Drivers and Tool

To download firmware and debug in the terminal, the following drivers and software

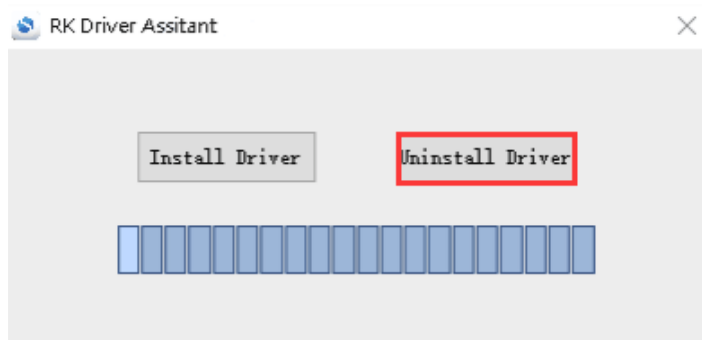
need to be installed (for Windows computers):

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

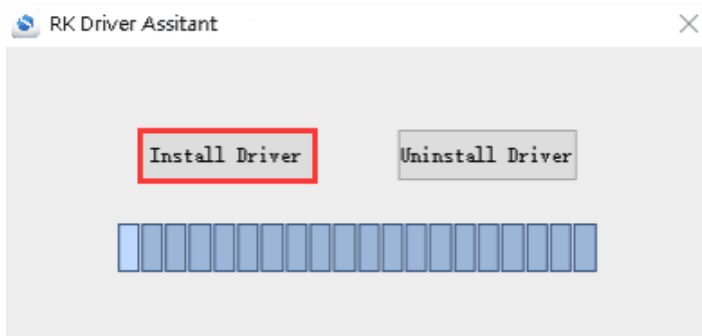
2.1 Install RK Driver Assitant

Step 1: Open [DriverAssitant_v5.1.1/DriverInstall.exe](#).

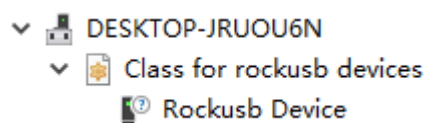
Step 2: To avoid driver conflicts, click “**Uninstall Driver**” to uninstall the driver.



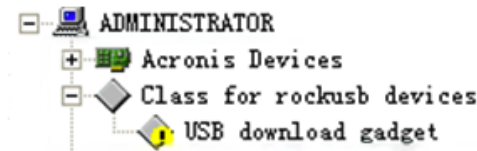
Step 3: Click button “**Install Driver**” to install.



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



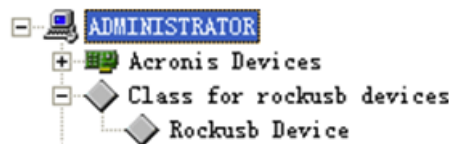
Step 5: If the following device information appears in the Device Manager after the operation in Step 4, go to the next step.



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

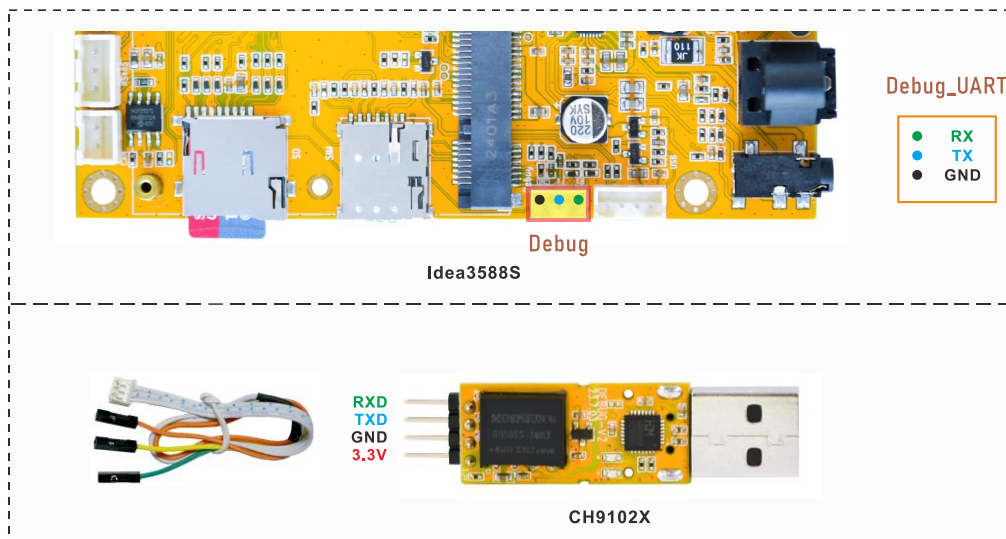
DriverAssitant_v5.1.1/ADBDriver.

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.

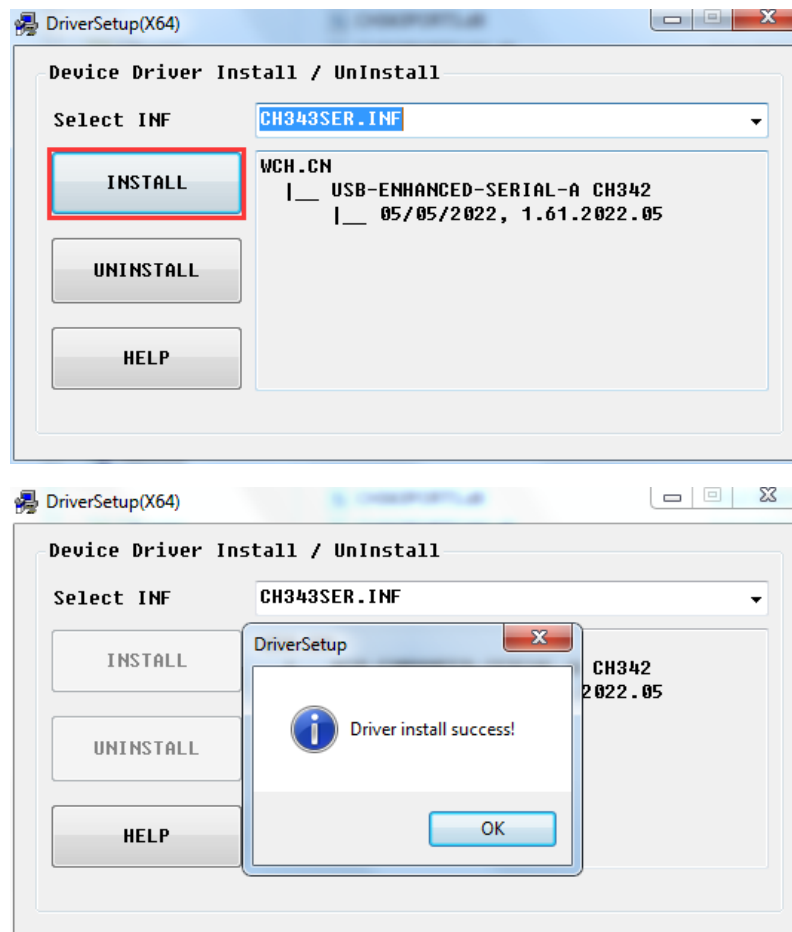
TXD	Transmit, connect to RX pin of the board.
GND	Ground, connect to GND pin of the board.
3V3	No need to connect.

2.2.2 Install Driver

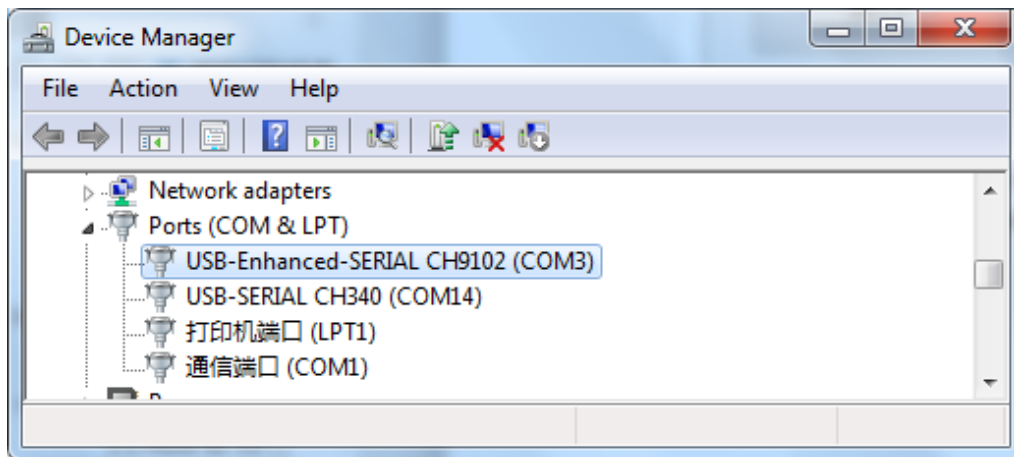
Step 1: Plug the CH9102X Module to the PC

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.

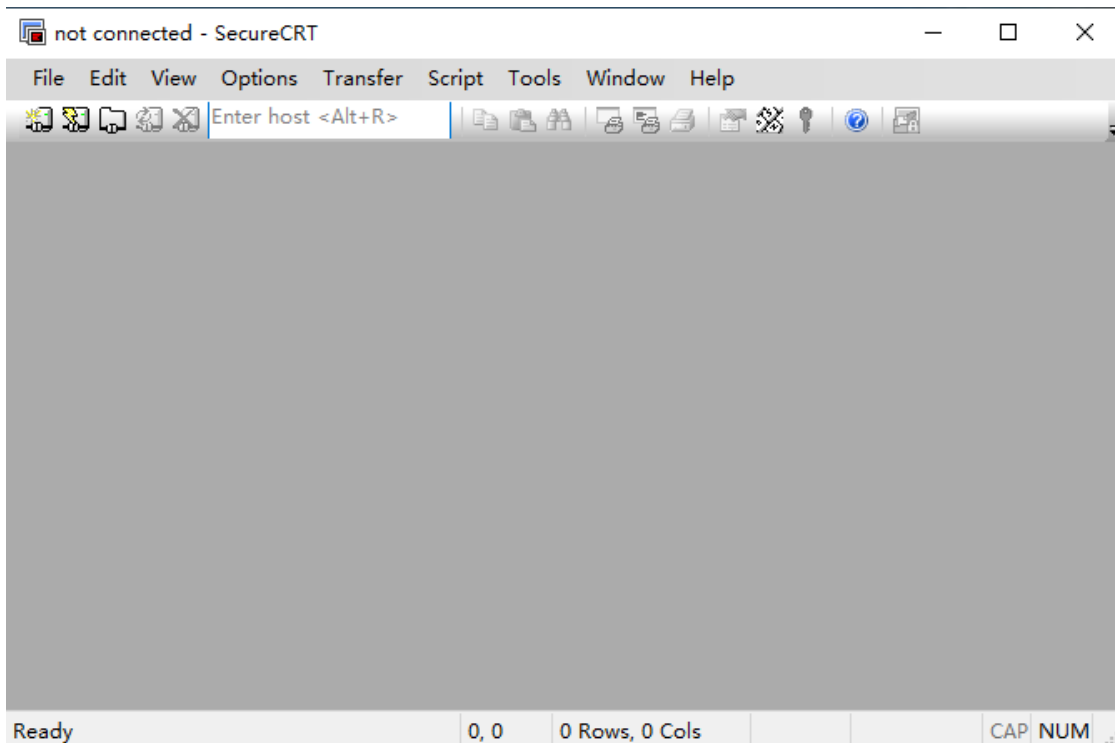


2.3 Install Serial Terminal Tool

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

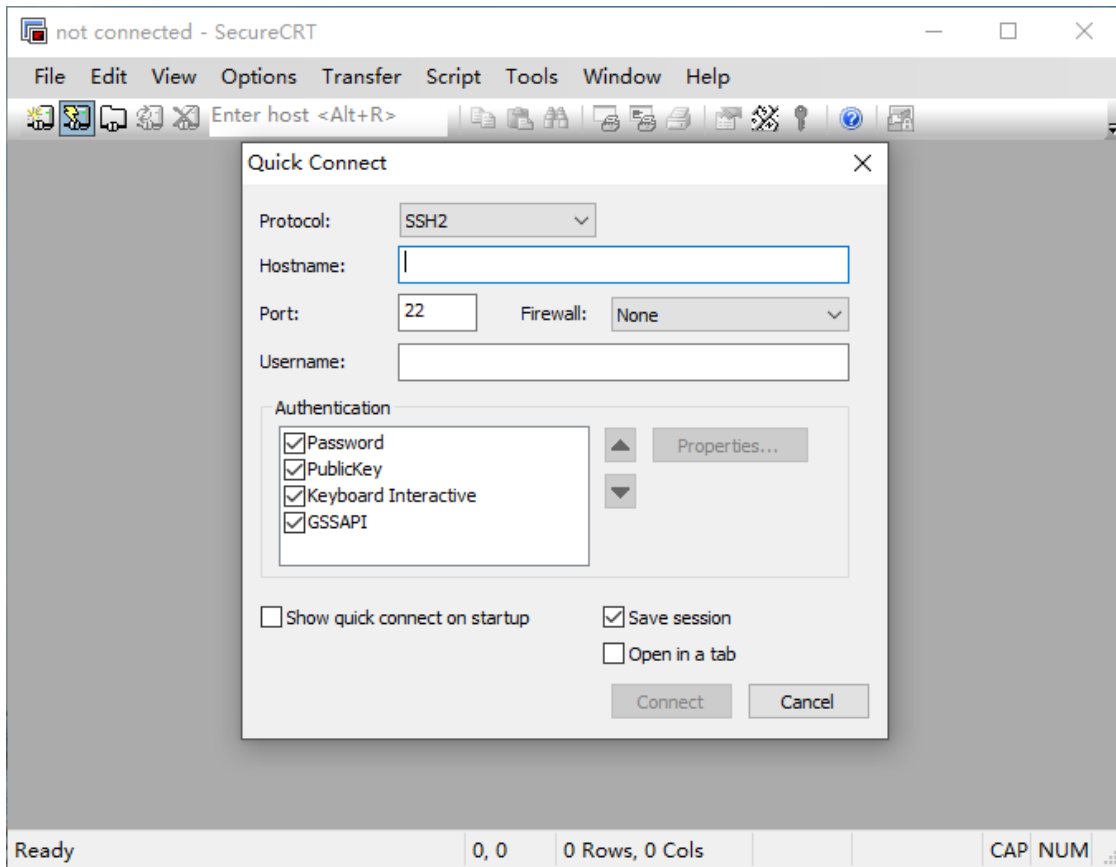
Step 1: Unzip *Platform/SecureCRT.rar* on PC.

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

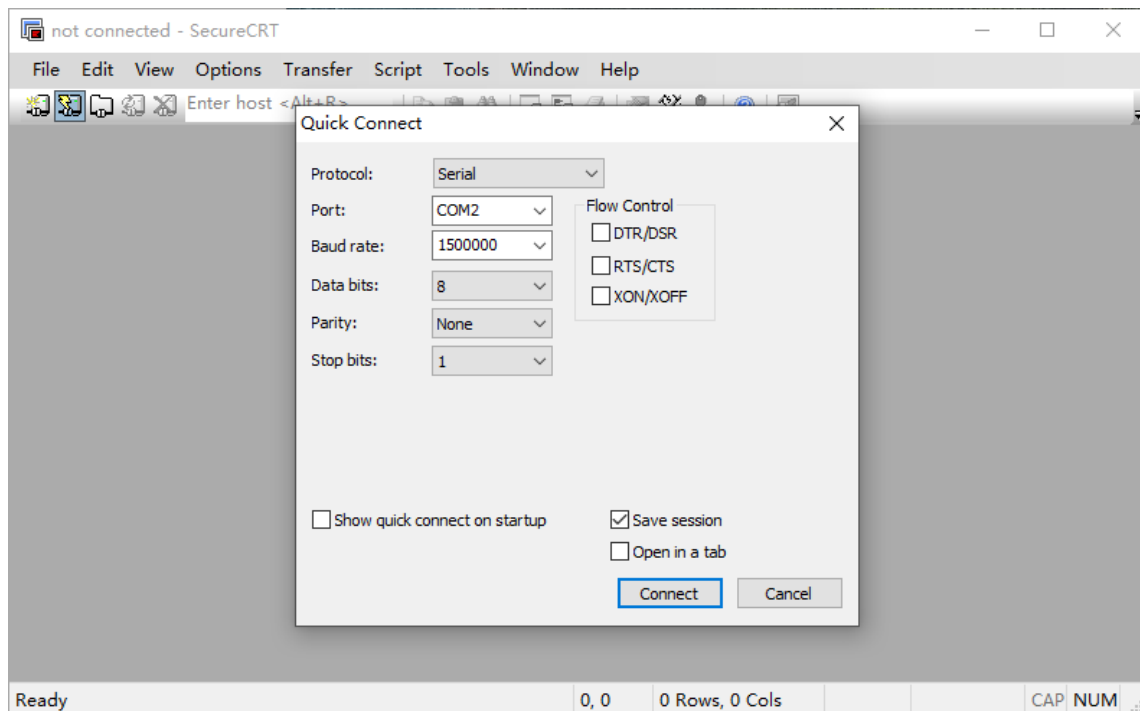


Step 3: Confirm that the CH9102X driver has been installed and the CH9102X module is connecting to the PC.

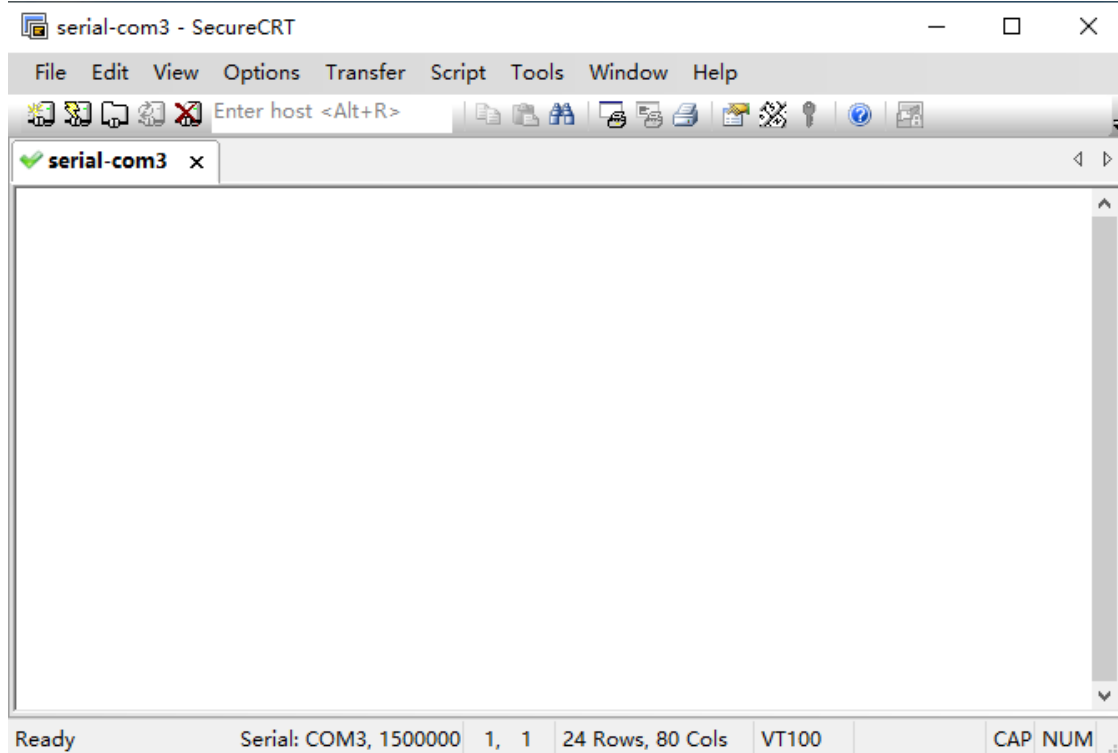
Step 4: Click the “Quick Connect” button to go to the Quick Connect configuration screen.



Step 5: Configure as shown in the following figure.



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



Development Environment

It is recommended to use Ubuntu 22.04 or above. If encounter errors during compilation, please check the error message and install the corresponding software packages accordingly. Other Linux versions may need to adjust the software package accordingly. In addition to the system requirements, there are other hardware and software requirements.

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

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.

PC OS	Network	Permission
Ubuntu 22.04	online	root

To install the required libraries and tools, run 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 bintfmt-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
```

Buildroot

1. Compile Source

Step 1: Unzip the Source

To extract the source files, run the following commands.

```
$ tar -xvf idea3588s_linux6.1-rkr5_20250530.tar.bz2  
  
$ cd idea3588s linux6.1-rkr5 20250530/
```

Step 2: SDK Board-Level Configuration

To configure the board, run the following command.

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

```
xuejunchao@boardcon:~/idea3588s_linux6.1-rkr5_20250425$ ./build.sh lunch  
Pick a defconfig:  
1. rockchip_defconfig  
2. rockchip_rk3588_evb1_lp4_v10_amp_defconfig  
3. rockchip_rk3588_evb1_lp4_v10_defconfig  
4. rockchip_rk3588_evb1_lp4_v10_mcu_defconfig  
5. rockchip_rk3588_evb7_v11_defconfig  
6. rockchip_rk3588_ipc_evb1_v10_defconfig  
7. rockchip_rk3588_ipc_evb7_lp4_v11_defconfig  
8. rockchip_rk3588_multi_ipc_evb1_v10_defconfig  
9. rockchip_rk3588s_evb1_lp4x_v10_defconfig  
Which would you like? [1]: 9  
Switching to defconfig: Switching to defconfig: /home/xuejunchao/3588/idea3588s/linux6.10/idea3588s_linux6.1-rkr5_20250425/device/rockchip/.chip/rockchip_rk3588s_evb1_lp4x_v10_defconfig
```

Step 3: Compile U-Boot

To compile U-Boot, run the following command.

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

Step 4: Compile Kernel

To compile kernel, run the following command.

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

Step 5: Compile Recovery

To compile recovery, run the following command.

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

Step 6: Compile Buildroot

To compile buildroot, run the following commands.

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

Step 7: Generate and Check Firmwares

To generate firmware, run the following command.

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

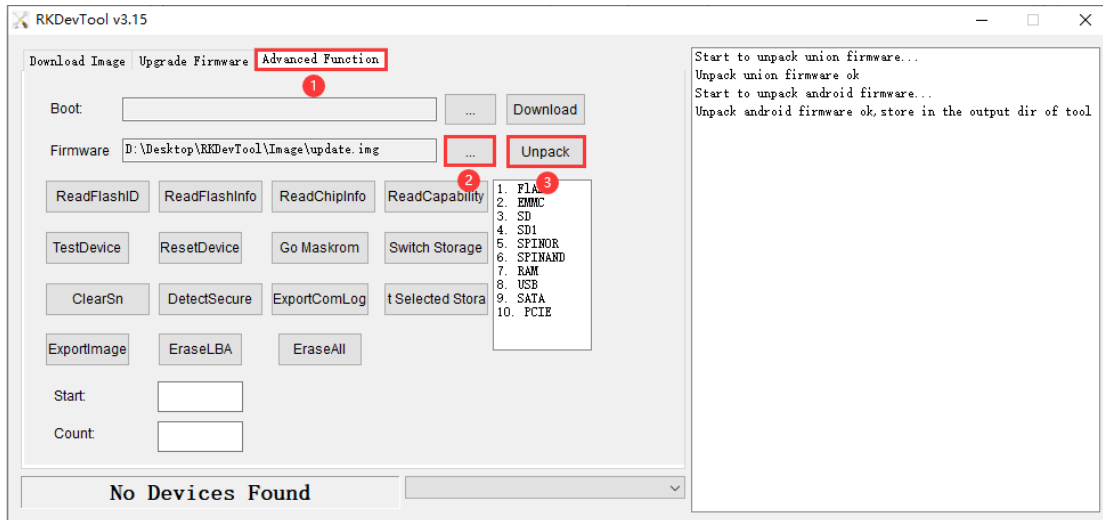
Images and **update.img** are generated in *rockdev/* directory.

2. Images Operation

2.1 Unzip Firmware

Step 1: Open *RKDevTool\RKDevTool_Release\RKDevTool.exe*.

Step 2: Click **Advanced Function** -> **Firmware**, select **update.img**, then click **Unpack** to unzip.



Step 3: The unzip files will be generated in

RKDevTool\RKDevTool_Release\Output\Android and

\RKDevTool\RKDevTool_Release\Output\Android\Image directory.

RKDevTool > RKDevTool_Release > Output > Android >

名称

Image
MiniLoaderAll.bin
package-file
parameter.txt

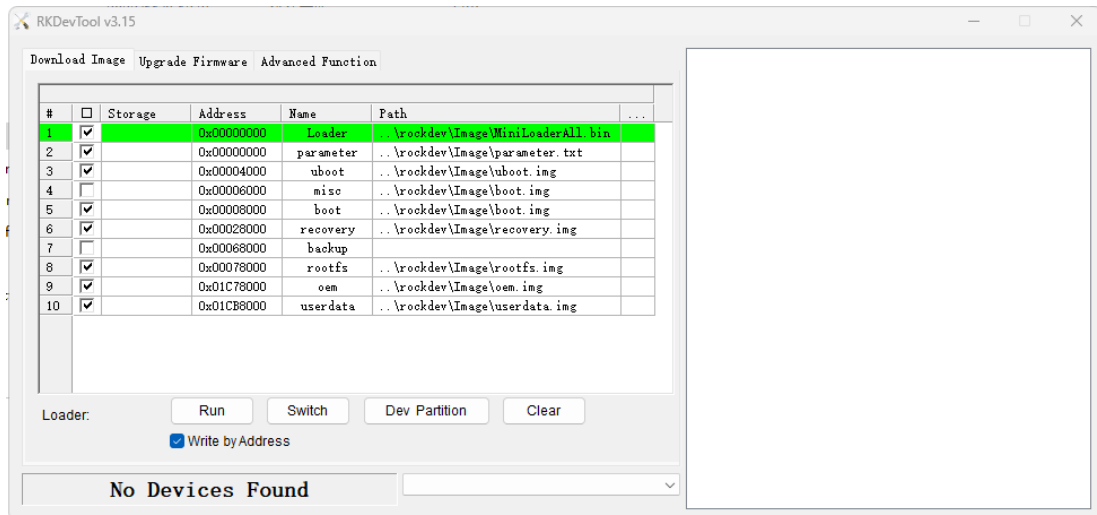
RKDevTool > RKDevTool_Release > Output > Android > Image			
名称	修改日期	大小	
boot.img	2024/11/6 10:48	38,090 KB	
oem.img	2024/11/6 10:49	18,364 KB	
recovery.img	2024/11/6 10:48	44,702 KB	
rootfs.img	2024/11/6 10:49	879,616 KB	
uboot.img	2024/11/6 10:48	4,096 KB	
userdata.img	2024/11/6 10:49	4,408 KB	

3. Image Burning Tool

3.1 Image Unite Burning

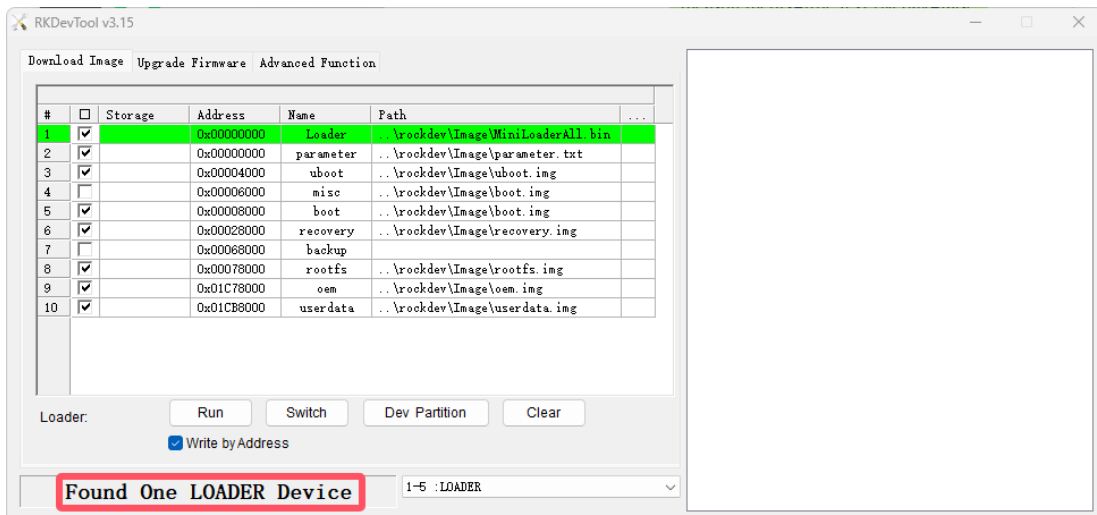
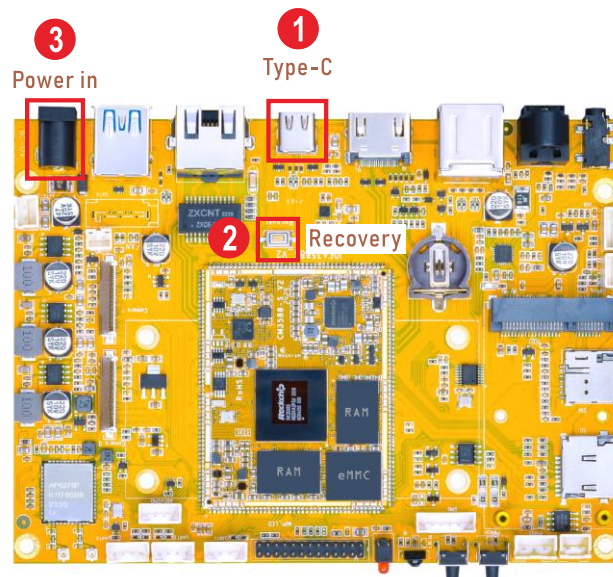
Step 1: Unzip *RKDevTool.rar* on Windows.

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

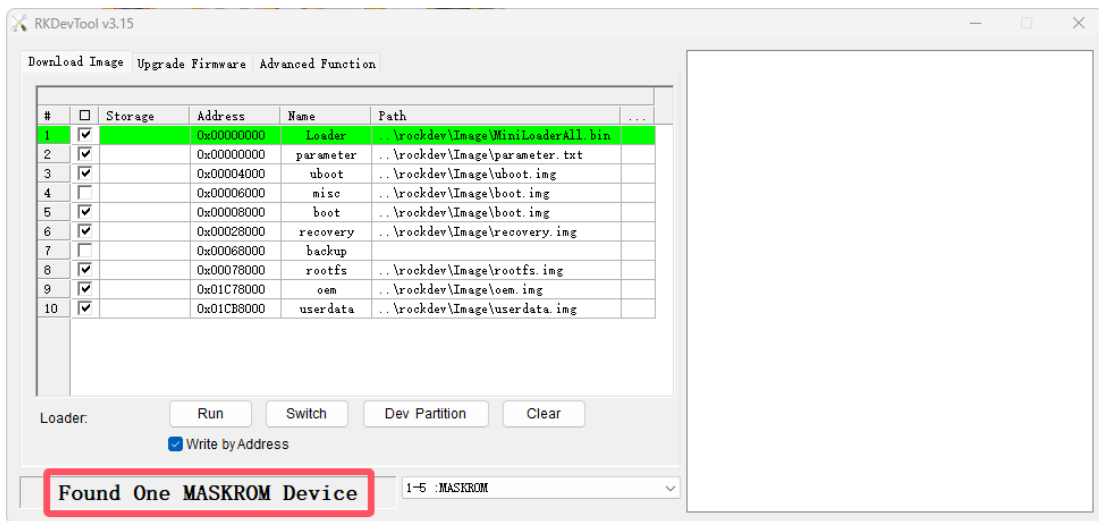
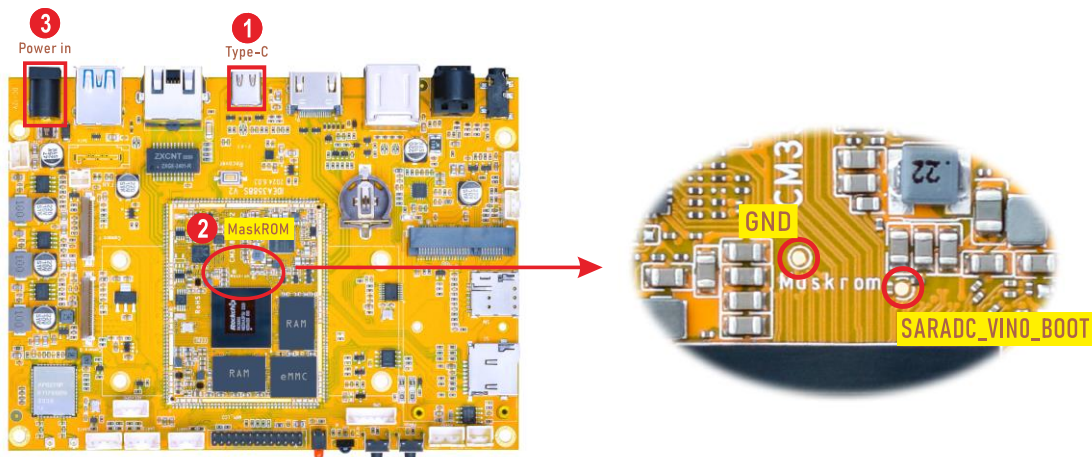


Step 3: Enter the burning mode.

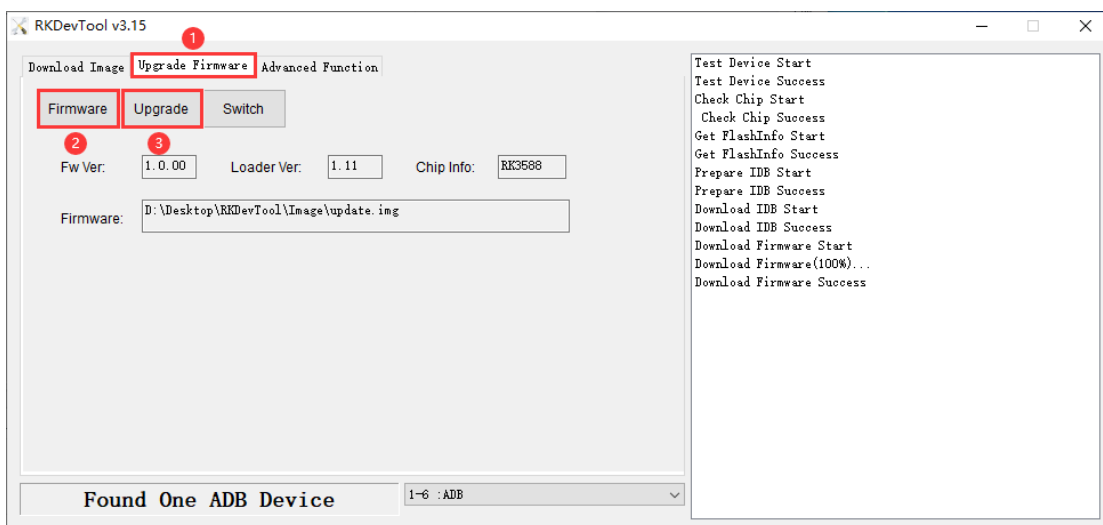
LOADER mode: Connect PC and development board with Type-C USB cable, keep pressing the Recovery Key and power the board until the windows PC shows “Found One LOADER Device”.Then release the Recovery Key, the development board enters LOADER mode. If the LOADER mode cannot be accessed or uboot cannot be boot properly, burn the firmware in MASKROM mode.



MASKROM mode: Connect PC and development board with Type-C USB cable. Short circuit SARADC_VINO_BOOT and GND on the development board, power the board until the windows PC shows “Found One MASKROM Device”. Then disconnect SARADC_VINO_BOOT and GND, and the development board enters MASKROM mode.



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



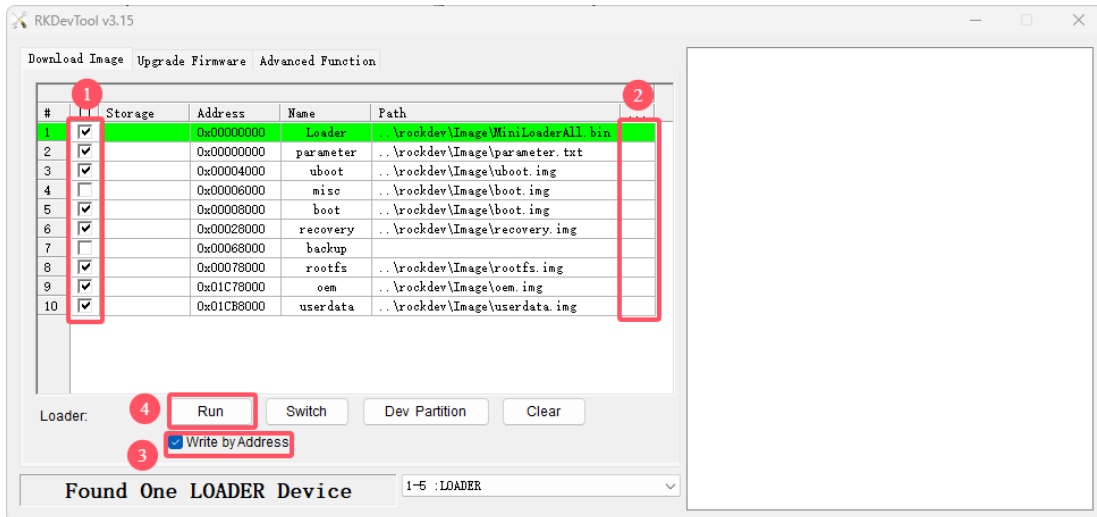
3.2 Image Split Burning

Step 1: Select the checkbox on the left.

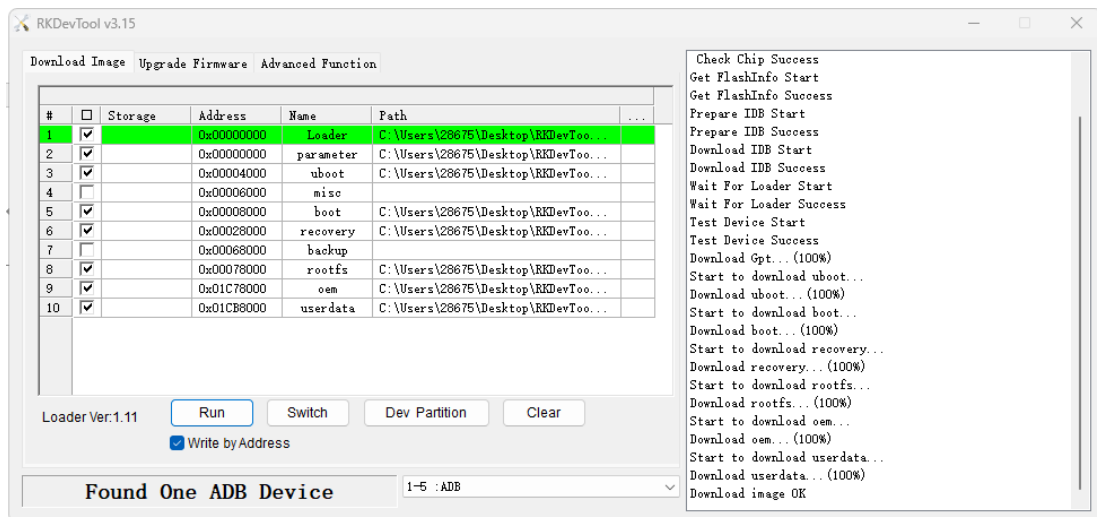
Step 2: Slick the column on the right side for the path of the file want to burn.

Step 3: Select the **Write by Address** button.

Step 4: Slick **Run** button to burn the images.



Wait for the completion of burning.



4. Buildroot Test

4.1 Change Log Level

To get more log information from the device, execute the following command.

```
$ echo "8 4 1 7" > /proc/sys/kernel/printk
```

8: The default print level, meaning that messages of all levels from 1 (emergency) to 8 (debug) are printed to the system log.

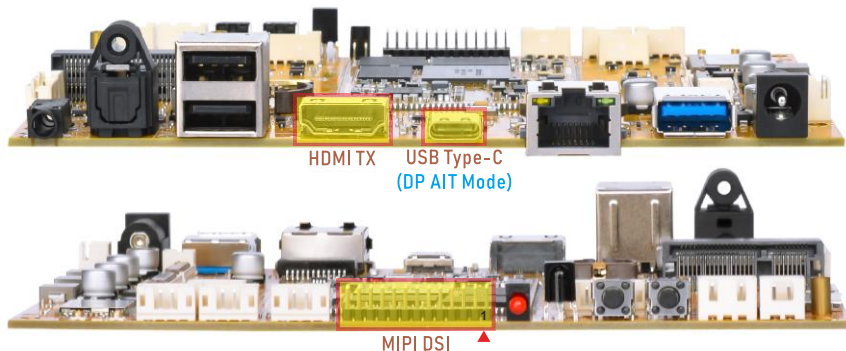
4: Console print level, meaning that only messages with levels 1 (critical) to 4 (error) will be printed to the console.

1: Minimum message level, meaning that any message below the emergency level will not be printed.

7: The console's minimum message level means that any messages below the emergency and alert levels will not be printed to the console.

4.2 Display

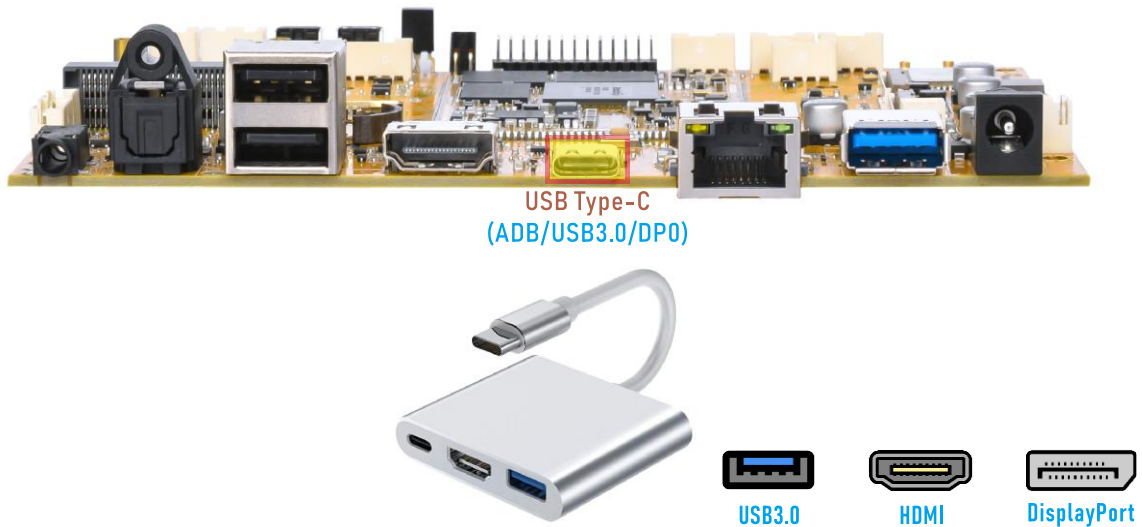
The Idea3588S Buildroot default supports MIPI display (800x1280) and HDMI display, with MIPI not supporting hot plug, while HDMI does.



The display effect diagram is as follows: (Dual or triple Display)



4.3 USB Type-C

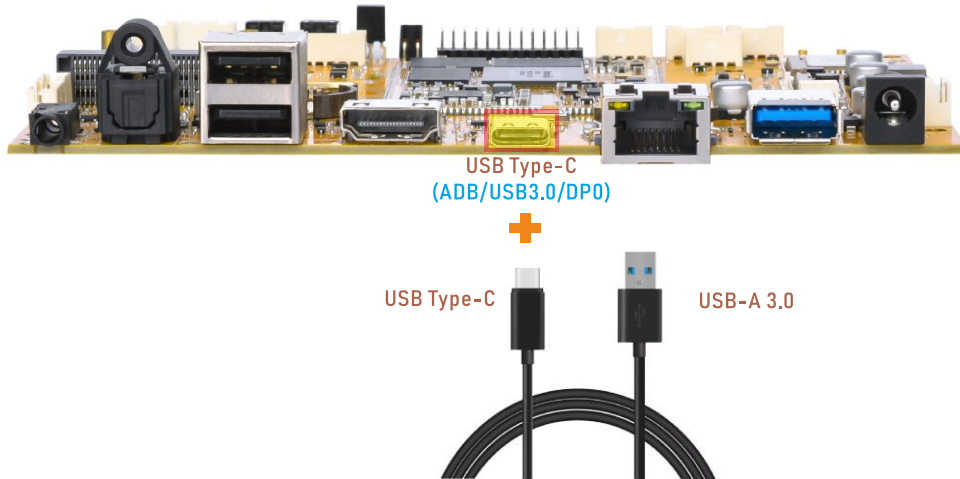


Features Supported by the Type-C Interface:

- (1) Reversible Design: Allows insertion in either orientation for user convenience.
- (2) Data Transmission Roles: Supports flexible designation of host and device roles.
- (3) Multiple Protocol Support: Compatible with USB 3.0 and DisplayPort, enabling high-speed data transmission.

4.3.1 ADB

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



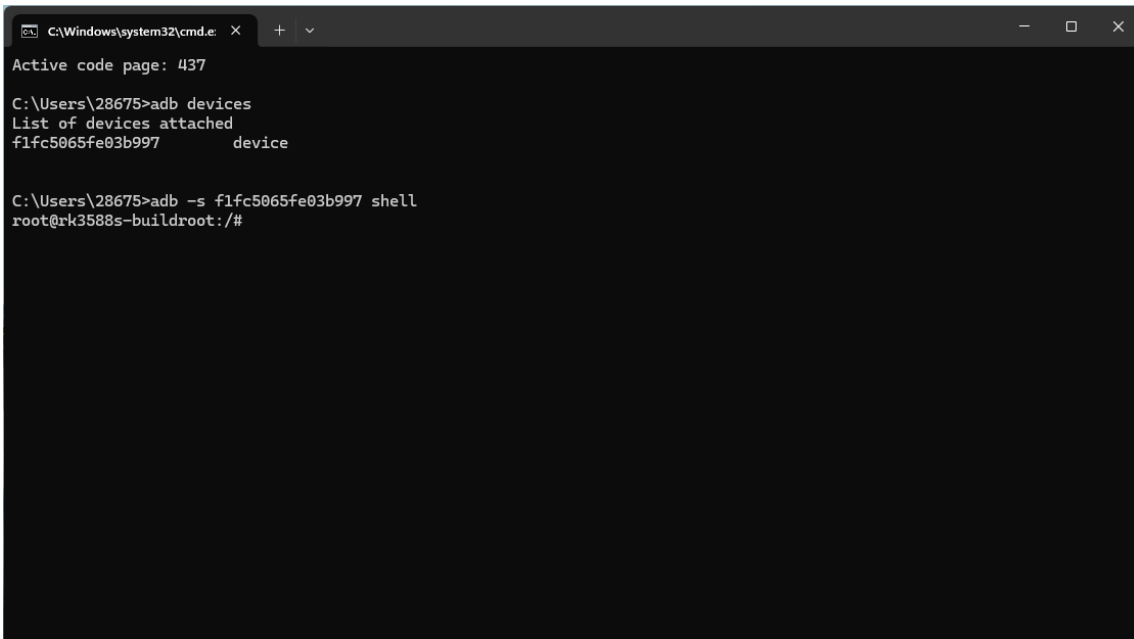
Step 2: Install ADB driver on Windows system.

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

Step 4: Execute the following commands to view and connect adb device.

```
# adb devices
```

```
# adb -s <device number> shell
```

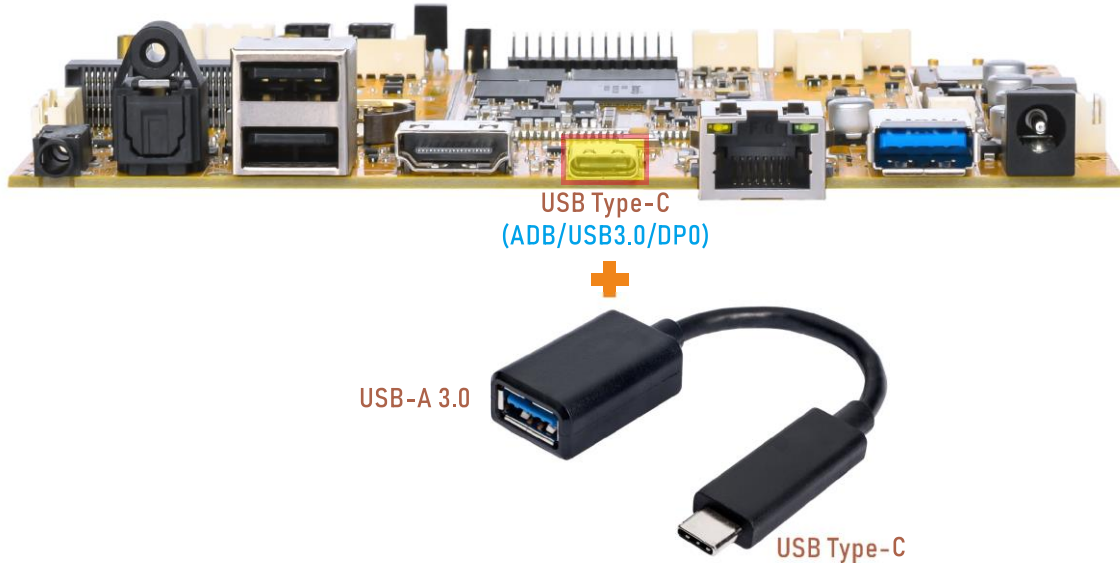
A screenshot of a Windows command prompt window. The title bar shows 'C:\Windows\system32\cmd.e.' and standard window controls. The text inside the window shows the following commands and their outputs:

```
Active code page: 437
C:\Users\28675>adb devices
List of devices attached
f1fc5065fe03b997    device

C:\Users\28675>adb -s f1fc5065fe03b997 shell
root@rk3588s-buildroot:/#
```

4.3.2 Type-C to USB3.0

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



The serial port of the terminal will display the following message, indicating that the USB3.0 flash disk is successfully recognized.

```
root@idea3588s-buildroot:/# [ 151.039727] usb 8-1: new SuperSpeed USB device number 2 using xhci-hcd
[ 151.070447] usb 8-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 151.070492] usb 8-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 151.070508] usb 8-1: Product: OnlyDisk
[ 151.070522] usb 8-1: Manufacturer: Netac
[ 151.070534] usb 8-1: SerialNumber: 0A6544CD10427AB2
[ 151.072623] usb-storage 8-1:1.0: USB Mass Storage device detected
[ 151.074046] scsi host0: usb-storage 8-1:1.0
[ 153.102292] scsi 0:0:0:0: Direct-Access Netac OnlyDisk 8.01 PQ: 0 ANSI: 6
[ 153.106216] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 153.106733] sd 0:0:0:0: [sda] Write Protect is off
[ 153.107376] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 153.113446] sda: sda1
[ 153.113763] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 153.307542] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT filesystems, filesystem will be case sensitive!
[ 153.312422] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please run fsck.arset for FAT filesystems, filesystem will be case sensitive!
[ 153.322300] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please run fsck
```

After connecting the USB3.0 flash disk, the system will automatically mount it to the /mnt/udisk directory , execute the following command check USB device.

```
# df -h
```

```

root@idea3588s-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        14G   719M   13G   6% /
devtmpfs         3.9G   8.0K   3.9G   1% /dev
tmpfs            3.9G  140K   3.9G   1% /tmp
tmpfs            3.9G  512K   3.9G   1% /run
tmpfs            3.9G  256K   3.9G   1% /var/log
tmpfs            3.9G    0   3.9G   0% /dev/shm
/dev/mmcblk0p7  123M   12M   108M  10% /oem
/dev/mmcblk0p8   15G  523M   14G   4% /userdata
/dev/sda1        58G   34G   25G  59% /mnt/udisk
  
```

4.3.3 DP Alt Mode

DisplayPort Alternate Mode (DP Alt Mode) is a technology that facilitates the transmission of DisplayPort video signals through a USB Type-C interface. It enables devices to output video and audio via a USB-C connection without requiring a dedicated DisplayPort connector. This allows users to connect a display using a single USB-C port while transmitting video, audio, and additional data.

Currently, Boardcon has conducted the following output tests:

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



4.4 Ethernet

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



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

```
root@idea3588s-buildroot:/# [ 152.716085] rk_gmac-dwmac fe1c0000.ethernet eth0: Link is Up - 1Gbps/Full - flow control rx/tx
[ 152.716298] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

Step 2: View network interface information.

```
# ifconfig eth0
```

```
root@idea3588s-buildroot:/# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 52:F7:0B:86:C3:20
          inet addr:192.168.0.219  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::b245:ae2:4fd7:1806/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:57 errors:0 dropped:7 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7038 (6.8 KiB)  TX bytes:1410 (1.3 KiB)
          Interrupt:70
```

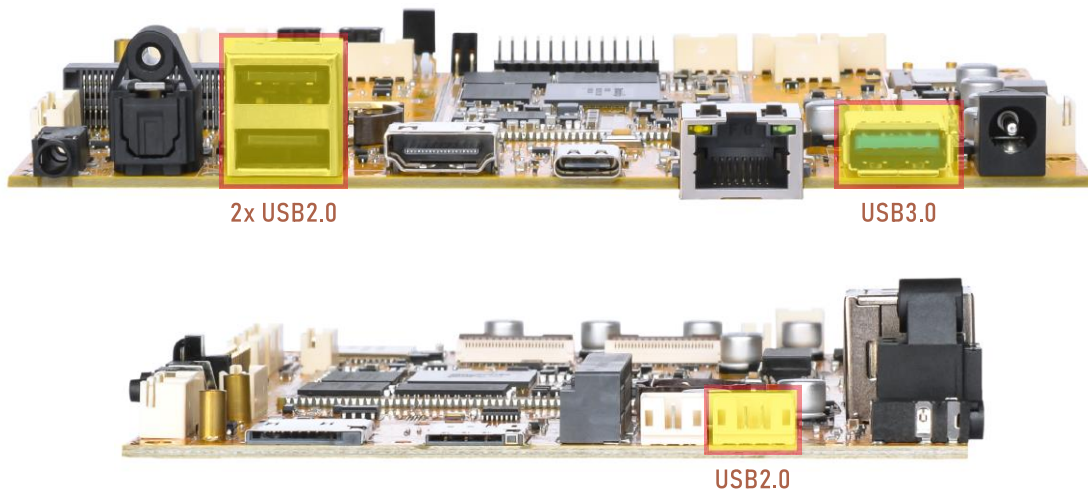
Step 3: Network connection test.

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

```
root@idea3588s-buildroot:/# ping -I eth0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.219 eth0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=196 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=196 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=196 ms
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5007ms
rtt min/avg/max/mdev = 195.229/195.526/196.146/0.330 ms
```

4.5 USB Host

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



After connecting the USB flash disk, the system will automatically mount it to the /mnt/udisk directory , execute the following command check USB device.

```
# df -h
```

```
root@idea3588s-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        14G   719M   13G   6% /
devtmpfs        3.9G   8.0K   3.9G   1% /dev
tmpfs           3.9G  140K   3.9G   1% /tmp
tmpfs           3.9G   500K   3.9G   1% /run
tmpfs           3.9G  352K   3.9G   1% /var/log
tmpfs           3.9G   0     3.9G   0% /dev/shm
/dev/mmcblk0p7  123M   12M   108M  10% /oem
/dev/mmcblk0p8   15G   348K   15G   1% /userdata
/dev/sda1        58G   34G   25G   59% /mnt/udisk
```

Identify whether the mounted flash disk is USB 2.0 or USB 3.0 through the serial port output.

(1) USB2.0 print information in high-speed mode:

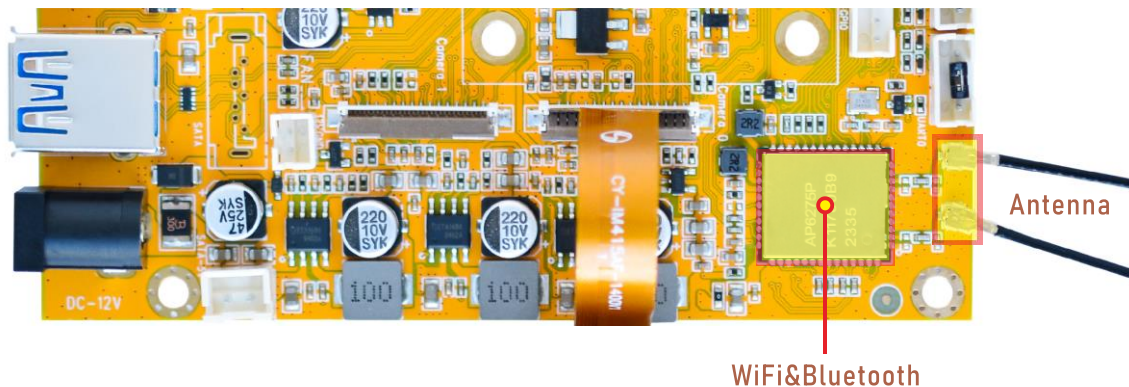
```
root@idea3588s-buildroot:/# [ 60.527307] usb 3-1.1: new high-speed USB device number 4 using ehci-platform
[ 60.677792] usb 3-1.1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 60.677837] usb 3-1.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 60.677855] usb 3-1.1: Product: OnlyDisk
[ 60.677869] usb 3-1.1: Manufacturer: Netac
[ 60.677881] usb 3-1.1: SerialNumber: 0A6544CD10427AB2
[ 60.679533] usb-storage 3-1.1:1.0: USB Mass Storage device detected
[ 60.680847] scsi host0: usb-storage 3-1.1:1.0
[ 61.968991] scsi 0:0:0:0: Direct-Access Netac OnlyDisk 8.01 PQ: 0 ANSI: 6
[ 61.974048] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 61.974914] sd 0:0:0:0: [sda] Write Protect is off
[ 61.975551] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 61.984019] sda: sda1
[ 61.984532] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 62.284314] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT filesystems, filesystem will be case sensitive!
[ 62.291717] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please run fsck.
```

(2) USB3.0 print information in **SuperSpeed** mode:

```
[ 16.099498] usb 2-1: new SuperSpeed USB device number 2 using xhci-hcd
[ 16.129584] usb 2-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 16.129618] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 16.129634] usb 2-1: Product: OnlyDisk
[ 16.129647] usb 2-1: Manufacturer: Netac
[ 16.129659] usb 2-1: SerialNumber: 0A6544CD10427AB2
[ 16.131128] usb-storage 2-1:1.0: USB Mass Storage device detected
[ 16.131946] scsi host0: usb-storage 2-1:1.0
[ 17.383617] scsi 0:0:0:0: Direct-Access    Netac    OnlyDisk        8.01 PQ: 0 ANSI: 6
[ 17.387672] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 17.388105] sd 0:0:0:0: [sda] Write Protect is off
[ 17.388311] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 17.393628] sda: sda1
[ 17.394794] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 17.583744] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT filesystems, filesystem will be case
sensitive!
[ 17.588808] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please run fsck..
```

4.6 WiFi & Bluetooth

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



4.6.1 WiFi

Step 1: Check whether the wifi device **wlan1** exists.

```
# ifconfig wlan0
```

```
root@idea3588s-buildroot:/# ifconfig wlan0
wlan0  Link encap:Ethernet  HWaddr B8:2D:28:7E:1F:1C
        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)lan0    Link encap:Ethernet  HWaddr B8:2D:28:7E:1F:1
```

Step 2: Connecting hotspots.

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

```

root@idea3588s-buildroot:/# wifi-connect.sh Boardcon Boardcon43435656
connect to Wifi ssid: Boardcon, Passwd: Boardcon43435656
Successfully initialized wpa_supplicant
[ 270.589434] [dhd] P2P interface registered
nl80211: kernel reports: Registration to specific type not supported
[ 270.611999] [dhd] CFGP2P-ERROR) wl_cfgp2p_set_discovery : p2p_disc 1 error -16
[ 270.612045] [dhd] CFGP2P-ERROR) wl_cfgp2p_init_discovery : set discover error
[ 270.618255] [dhd] CFGP2P-ERROR) wl_cfgp2p_enable_discovery : init discovery error -16
[ 270.618288] [dhd] CFGP2P-ERROR) wl_cfgp2p_disable_discovery : do nothing, not initialized
[ 270.623964] [dhd] CFGP2P-ERROR) wl_cfgp2p_start_p2p_device : P2P enable discovery failed, ret=-16
nl80211: Could not set interface 'p2p-dev-wlan0' UP
[ 270.624584] [dhd] CFGP2P-ERROR) wl_cfgp2p_disable_discovery : do nothing, not initialized
nl80211: deinit ifname=p2p-dev-wlan0 disabled_11b_rates=0
[ 270.624884] [dhd] CFGP2P-ERROR) wl_cfgp2p_del_p2p_disc_if : P2P interface unregistered
p2p-dev-wlan0: Failed to initialize driver interface
p2p-dev-wlan0: CTRL-EVENT-DSCP-POLICY clear_all
P2P: Failed to enable P2P Device interface
root@idea3588s-buildroot:/# [ 273.332332] [dhd] [wlan0] wl_ext_set_chanspec : channel 5g-44(0xe22a 80MHz)
[ 273.334059] [dhd] [wlan0] wl_conn_debug_info : Connecting with b4:f1:8c:6d:d1:28 ssid "Boardcon", len (8),
channel=5g-44(chan_cnt=1), sec=wpa2/psk/mfpn/aes, rssi=-46
[ 273.453308] [dhd] dhd_update_interface_flow_info: ifindex:0 previous role:0 new role:0
[ 273.453388] [dhd] dhd_update_multiclient_flow_rings: ifindex 0
[ 273.476670] [dhd] [wlan0] wl_iw_event : Link UP with b4:f1:8c:6d:d1:28
[ 273.476753] [dhd] [wlan0] wl_ext_iapsta_link : [S] Link UP with b4:f1:8c:6d:d1:28
[ 273.480834] [dhd] [wlan0] wl_bss_connect_done : Report connect result - connection succeeded
[ 273.484808] [dhd] dhd_prot_flow_ring_create: Send Flow Create Req flow ID 37 for peer b4:f1:8c:6d:d1:28 prio
3 ifindex 0 items 512
[ 273.485114] [dhd] dhd_prot_flow_ring_create_response_process: Flow Create Response status = 0 Flow 37
[ 273.497541] [dhd] [wlan0] wl_add_keyext : key index (0) for b4:f1:8c:6d:d1:28
[ 273.519297] [dhd] [wlan0] wl_cfg80211_set_suspend_bcn_li_dtim : bcn_li_dtim:0 lpas:0 bcn_to_dly:0
[ 273.546335] [dhd] dhd_prot_flow_ring_create: Send Flow Create Req flow ID 41 for peer 33:33:00:00:00:16 prio
0 ifindex 0 items 2048
[ 273.546579] [dhd] dhd_prot_flow_ring_create_response_process: Flow Create Response status = 0 Flow 41

```

Step 3:View wlan0 IP address.

```
# ifconfig wlan0
```

```

root@idea3588s-buildroot:/# ifconfig wlan0
wlan0      Link encap:Ethernet  HWaddr B8:2D:28:7E:1F:1C
           inet addr:192.168.0.155  Bcast:192.168.0.255  Mask:255.255.255.0
           inet6 addr: fe80::15c4:5a6f:e27:1005/64 Scope:Link
           UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
           RX packets:393 errors:0 dropped:27 overruns:0 frame:0
           TX packets:19 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:53920 (52.6 KiB)  TX bytes:2130 (2.0 KiB)

```

Step 4: Internet test.

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

```

root@idea3588s-buildroot:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.155 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=191 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=184 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=185 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=185 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=185 ms
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5002ms
rtt min/avg/max/mdev = 183.092/185.263/190.582/2.437 ms
root@idea3588s-buildroot:/#

```

4.6.2 Bluetooth

Step 1: Check whether the bluetooth device **hci0** exists.

```
# hciconfig hci0
```

```
root@idea3588s-buildroot:/# hciconfig hci0
hci0:   Type: Primary  Bus: UART
        BD Address: B8:2D:28:7E:1F:1D  ACL MTU: 1021:8  SCO MTU: 64:1
        UP RUNNING
        RX bytes:918 acl:0 sco:0 events:67 errors:0
        TX bytes:3308 acl:0 sco:0 commands:67 errors:0
```

Step 2: Allow Bluetooth to search and be found.

```
# hciconfig hci0 piscan
```

Step 3: Enter **bluetoothctl** for Bluetooth connection testing.

```
# bluetoothctl
```

```
root@idea3588s-buildroot:/# bluetoothctl
hci0 new_settings: powered connectable discoverable bondable ssp br/edr le secure-conn
Agent registered
[CHG] Controller B8:2D:28:7E:1F:1D Pairable: yes
[bluetooth]#
```

Step 4: Search for Bluetooth devices then close search.

```
[bluetooth]# scan on
```

```
[bluetooth]# scan on
SetDiscoveryFilter success
hci0 type 7 discovering on
Discovery started
[CHG] Controller B8:2D:28:7E:1F:1D Discovering: yes
[NEW] Device 67:C2:90:FC:9B:86 67-C2-90-FC-9B-86
[NEW] Device D4:6C:27:DF:40:46 D4-6C-27-DF-40-46
[NEW] Device 10:0E:A1:1C:13:A8 MC1C13A8
[NEW] Device 14:DE:39:72:B3:C3 Mate 40 Pro
hci0 type 7 discovering off
hci0 type 7 discovering on
[CHG] Device D4:6C:27:DF:40:46 RSSI: 0xfffffa0 (-96)
[NEW] Device 63:40:8E:7C:9D:E5 63-40-8E-7C-9D-E52
```

```
[bluetooth]# scan off
```

```
[bluetooth]# scan off
hci0 type 7 discovering off
Discovery stopped
[CHG] Device 63:40:8E:7C:9D:E5 TxPower is nil
[CHG] Device 63:40:8E:7C:9D:E5 RSSI is nil
[CHG] Device 88:68:4B:74:39:44 RSSI is nil
[CHG] Device 14:DE:39:72:B3:C3 RSSI is nil
[CHG] Device 28:D0:43:39:FE:0E TxPower is nil
[CHG] Device 28:D0:43:39:FE:0E RSSI is nil
[CHG] Device C1:14:88:1E:63:B5 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 67:C2:90:FC:9B:86 TxPower is nil
[CHG] Device 67:C2:90:FC:9B:86 RSSI is nil
[DEL] Device 14:DE:39:72:B3:C3 Mate 40 Pro
[DEL] Device 10:0E:A1:1C:13:A8 MC1C13A8
[DEL] Device 67:C2:90:FC:9B:86 67-C2-90-FC-9B-86
[DEL] Device D4:6C:27:DF:40:46 D4-6C-27-DF-40-46
[DEL] Device 63:40:8E:7C:9D:E5 63-40-8E-7C-9D-E5
```

Step 5: Pair to Bluetooth device, and enter yes.

```
[bluetooth]# pair <MAC address>
```

```
[bluetooth]# pair 14:DE:39:72:B3:C3
Attempting to pair with 14:DE:39:72:B3:C3
hci0 device_flags changed: 14:DE:39:72:B3:C3 (BR/EDR)
  supp: 0x00000000 curr: 0x00000000
hci0 14:DE:39:72:B3:C3 type BR/EDR connected eir_len 18
[CHG] Device 14:DE:39:72:B3:C3 Connected: yes
Request confirmation
[agent] Confirm passkey 247608 (yes/no): yes
hci0 new_link_key 14:DE:39:72:B3:C3 type 0x08 pin_len 0 store_hint 1
[CHG] Device 14:DE:39:72:B3:C3 Bonded: yes
[CHG] Device 14:DE:39:72:B3:C3 Modalias: bluetooth:v010Fp107Ed1436
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000046a-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001105-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000110a-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001112-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001115-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001116-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000111f-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000112f-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001132-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001200-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001800-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 00001801-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000fdd1-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 0000fe35-0000-1000-8000-00805f9b34fb
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 11c8b310-80e4-4276-afc0-f81590b2177f
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 8ce255c0-200a-11e0-ac64-0800200c9a66
[CHG] Device 14:DE:39:72:B3:C3 UUIDs: 9664aa26-d76c-43ad-9775-d310f253a408
[CHG] Device 14:DE:39:72:B3:C3 ServicesResolved: yes
[CHG] Device 14:DE:39:72:B3:C3 Paired: yes
Pairing successful
```

Step 6: Connect to Bluetooth device.

```
[bluetooth]# connect <MAC address>
```

```
[bluetooth]# connect 14:DE:39:72:B3:C3
Attempting to connect to 14:DE:39:72:B3:C3
hci0 14:DE:39:72:B3:C3 type BR/EDR connectedeir_len 18
[CHG] Device 14:DE:39:72:B3:C3 Connected: yes
[NEW] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep1
[NEW] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep2
[NEW] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep3
[NEW] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep4
[NEW] Transport /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep1/fd0
Connection successful
```

Step 7: Command to Disconnect the current Bluetooth device.

```
[bluetooth]# disconnect <MAC address>
```

```
[Mate 40 Pro]# disconnect 14:DE:39:72:B3:C3
Attempting to disconnect from 14:DE:39:72:B3:C3
[Mate 40 Pro]# [02:33:16.127] event10 - Mate 40 Pro (AVRCP): device removed
[DEL] Player /org/bluez/hci0/dev_14_DE_39_72_B3_C3/player0 [default]
[DEL] Transport /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep1/fd0
[DEL] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep1
[DEL] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep2
[DEL] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep3
[DEL] Endpoint /org/bluez/hci0/dev_14_DE_39_72_B3_C3/sep4
hci0 14:DE:39:72:B3:C3 type BR/EDR disconnected with reason 2
[CHG] Device 14:DE:39:72:B3:C3 ServicesResolved: no
Successful disconnected
[CHG] Device 14:DE:39:72:B3:C3 Connected: no
```

4.7 Headset

Step 1: Plug the headset into the headset jack.



Headset

Step 2: Verify that the sound card is successfully registered with proc fs.

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

```
root@linaro-alip:/# cat /proc/asound/cards
0 [rockchipdp0 ]: rockchip_dp0 - rockchip_dp0
rockchip_dp0
1 [rockchiphdmi0]: rockchip-hdmi0 - rockchip-hdmi0
rockchip-hdmi0
2 [rockchipes8388]: rockchip-es8388 - rockchip-es8388
rockchip-es8388
3 [rockchipspdiftx]: simple-card - rockchip_spdif-tx0
rockchip_spdif-tx0
```

Step 3: Headset recording.

```
# arecord -Dhw:2,0 -f cd record.wav
```

```
root@idea3588s-buildroot:/# arecord -Dhw:2,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@idea3588s-buildroot:/#
```

Step 4: Headset play audio.

```
# aplay -Dhw:2,0 record.wav
```

```
root@idea3588s-buildroot:/# aplay -Dhw:2,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@idea3588s-buildroot:/#
```

Supplementary instructions on audio output.

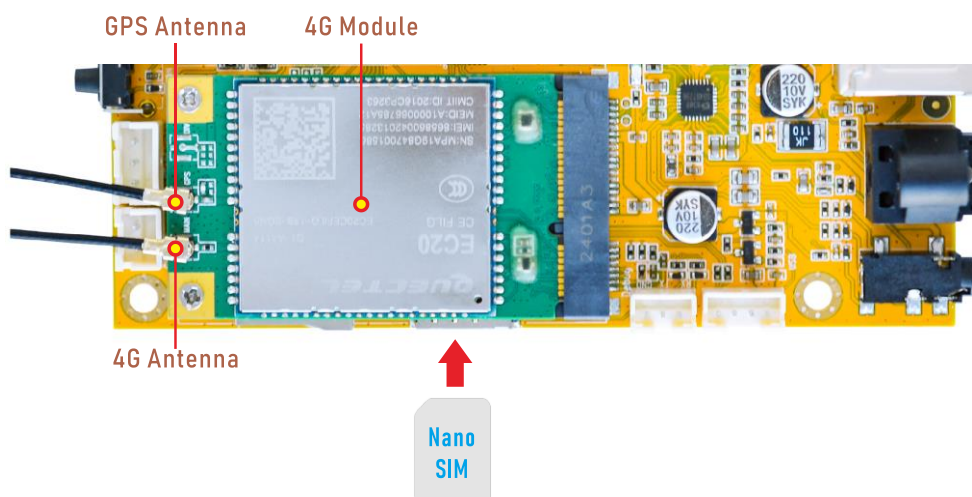
```
# aplay -Dhw:0,0 record.wav // Type-C interface display audio output
# aplay -Dhw:1,0 record.wav // HDMI TX audio output
# aplay -Dhw:2,0 record.wav // Headset audio output
```

4.8 4G & GPS

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

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.



4.8.1 4G Test

Step 1: Execute the following command to start the PPP connection.

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

```
root@idea3588s-buildroot:/# mkdir -p /var/run/pppd/lock
root@idea3588s-buildroot:/# pppd call quectel-ppp &
[1] 1684
root@idea3588s-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)
asynmap 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)
noccip      # (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)
^M
OK
-- got it

send (ATE0^M)
expect (OK)
^M
^M
OK
-- got it
send (ATI;+CSUB;+CSQ;+CPIN?;+COPS?;+CGREG?;&D2^M)
expect (OK)
^M
^M
Quectel^M
EC25^M
Revision: EC25EUXGAR08A17M1G^M
```

```

^M
SubEdition: V01^M
^M
+CSQ: 31,99^M
^M
+CPIN: READY^M
^M
+COPS: 0,0,"CHINA MOBILE",7^M
^M
+CGREG: 0,1^M
^M
OK
-- got it
send (AT+CGDCONT=1,"IP","3gnet",,0,0^M)
expect (OK)
^M
^M
OK^t it^M)
ex (CONNECT)
^M
^M
CONNECT

```

```

send (ATD*99#^M)
expect (CONNECT)
^M
^M
CONNECT
-- got it

Script chat -s -v -f /etc/ppp/peers/quectel-chat-connect finished (pid 1685), status = 0x0
Serial connection established.
using channel 1
Using interface ppp0
Connect: ppp0 <-> /dev/ttyUSB3
sent [LCP ConfReq id=0x1 <asynmap 0x0> <magic 0x6ac41f98> <pcomp> <accomp>]
rcvd [LCP ConfReq id=0x2 <asynmap 0x0> <auth chap MD5> <magic 0x8a3cf91a> <pcomp> <accomp>]
sent [LCP ConfAck id=0x2 <asynmap 0x0> <auth chap MD5> <magic 0x8a3cf91a> <pcomp> <accomp>]
rcvd [LCP ConfAck id=0x1 <asynmap 0x0> <magic 0x6ac41f98> <pcomp> <accomp>]
sent [LCP EchoReq id=0x0 magic=0x6ac41f98]
rcvd [LCP DiscReq id=0x3 magic=0x8a3cf91a]
rcvd [CHAP Challenge id=0x1 <5fdf5eaf8dbc87868298152a8e1caa46>, name = "UMTS_CHAP_SRVR"]
sent [CHAP Response id=0x1 <7cd74cbdf2f9bda3a5e09ac52c34e7b8>, name = "test"]
rcvd [LCP EchoRep id=0x0 magic=0x8a3cf91a 6a c4 1f 98]
rcvd [CHAP Success id=0x1 ""]
CHAP authentication succeeded
CHAP authentication succeeded
sent [IPCP ConfReq id=0x1 <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2 0.0.0.0>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
rcvd [IPCP ConfReq id=0x2]
sent [IPCP ConfNak id=0x2 <addr 0.0.0.0>]
rcvd [IPCP ConfNak id=0x1 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
sent [IPCP ConfReq id=0x2 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
rcvd [IPCP ConfReq id=0x3]
sent [IPCP ConfAck id=0x3]
rcvd [IPCP ConfAck id=0x2 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
Could not determine remote IP address: defaulting to 10.64.64.64
Script /etc/ppp/ip-pre-up started (pid 1701)
Script /etc/ppp/ip-pre-up finished (pid 1701), status = 0x0
local IP address 10.29.47.207
remote IP address 10.64.64.64
primary DNS address 120.196.165.7
secondary DNS address 221.179.38.7
Script /etc/ppp/ip-up started (pid 1705)
Script /etc/ppp/ip-up finished (pid 1705), status = 0x0
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::dd6f:e7de:4bc0:e496>]

```

Step 2: Check the status of the network interfaces.

```
# ifconfig ppp0
```

```
root@idea3588s-buildroot:/# ifconfig ppp0
ppp0      Link encap:Point-to-Point Protocol
          inet addr:10.29.47.207  P-t-P:10.64.64.64  Mask: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: Check the connectivity of the detection network.

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

```
root@idea3588s-buildroot:/# ping -I ppp0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.89.142.219 ppp0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=47 time=319 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=47 time=280 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=47 time=247 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=47 time=298 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=47 time=256 ms
^C64 bytes from 67.222.54.196: icmp_seq=6 ttl=47 time=217 ms
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 6345ms
rtt min/avg/max/mdev = 217.257/269.431/319.037/33.564 ms
root@idea3588s-buildroot:/#
```

4.8.2 GPS Test**Step 1: Verify pppd process is running. If it is, please kill the associated process.**

```
# ps
# kill -9 <PID>
```

```
root@idea3588s-buildroot:/# ps
  PID TTY          TIME CMD
  882 ttyFIQ0  00:00:00 sh
 1568 ttyFIQ0  00:00:00 pppd
 1617 ttyFIQ0  00:00:00 ps
root@idea3588s-buildroot:/# kill -9 1568
root@idea3588s-buildroot:/#
[1]+  Killed                  pppd call quectel-ppp
```

Step 2: Enable GPS functionality.

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

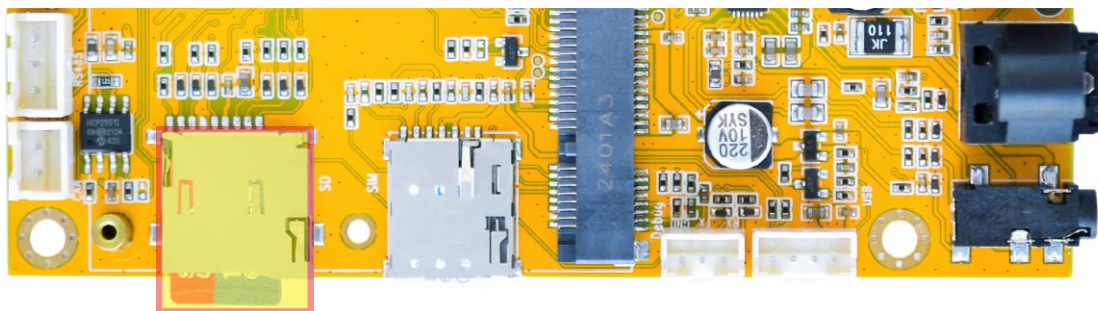
Step 3: Get GPS data.

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

```
root@idea3588s-buildroot:/# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@idea3588s-buildroot:/# cat /dev/ttyUSB1
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
```

4.9 SD Card

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



Micro SD

```
root@idea3588s-buildroot:/# [ 14.495927] mmc_host mmc1: Bus speed (slot 0) = 148500000Hz (slot req
150000000Hz, actual 148500000Hz div = 0)
[ 14.508621] dwmmc_rockchip fe2c0000.mmc: Successfully tuned phase to 231
[ 14.508719] mmc1: new ultra high speed SDR104 SDHC card at address 13ab
[ 14.511325] mmcblk1: mmc1:13ab SE032 28.8 GiB
[ 14.513783] mmcblk1: p1 p2
[ 14.603801] FAT-fs (mmcblk1p1): utf8 is not a recommended IO charset for FAT filesystems, filesystem will
be case sensitive!
[ 14.610154] FAT-fs (mmcblk1p1): Volume was not properly unmounted. Some data may be corrupt. Please run
fsck.
[ 14.703647] EXT4-fs (mmcblk1p2): recovery complete
[ 14.703754] EXT4-fs (mmcblk1p2): mounted filesystem with ordered data mode. Quota mode: disabled.
[ 15.075578] platform mtd_vendor_storage: deferred probe pending
```

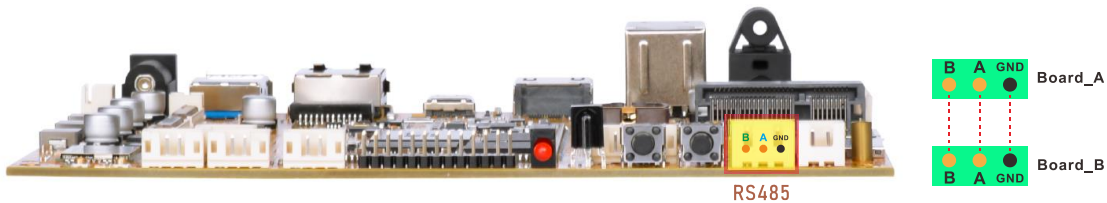
Step 2: After inserting the SD card, the system will automatically mount it to the

/mnt/sdcard directory , execute the following command check SD card device.

```
# df -h
```

```
root@idea3588s-buildroot:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        14G   719M   13G   6% /
devtmpfs         3.9G   8.0K   3.9G   1% /dev
tmpfs            3.9G  140K   3.9G   1% /tmp
tmpfs            3.9G  492K   3.9G   1% /run
tmpfs            3.9G  248K   3.9G   1% /var/log
tmpfs            3.9G    0   3.9G   0% /dev/shm
/dev/mmcblk0p7  123M   12M   108M  10% /oem
/dev/mmcblk0p8   15G   332K   15G   1% /userdata
/dev/mmcblk1p1   16M   12M   4.5M  73% /mnt/sdcard
```

4.10 RS485



Step 1: Connect the RS485 ports of board A and board B.

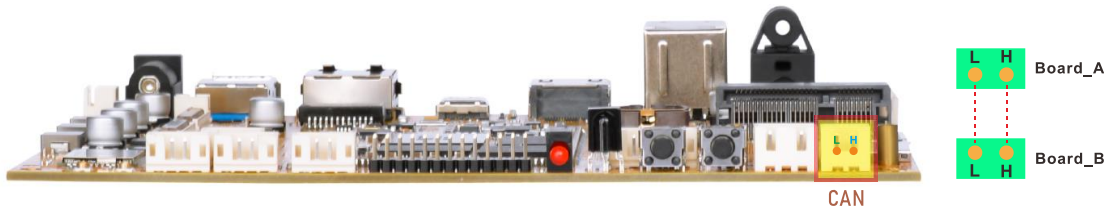
Step 2: Execute command on the terminal serial ports of board A and board B respectively to begin testing.

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

```
root@idea3588s-buildroot:/# com /dev/ttyS8 115200 8
0 1
port = /dev/ttyS8
baudrate = 115200
cs = 8
parity = 0
stopb = 1
RECV: 5656565656
RECV: 898989
RECV: 00000222
yuyuyuyu
2313132323
77777777
```

```
root@idea3588s-buildroot:/# com /dev/ttyS7 115200
8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
5656565656
898989
00000222
RECV: yuyuyuyu
RECV: 2313132323
RECV: 77777777
```

4.11 CAN



Step 1: Connect the CAN ports of board A and board B.

Step 2: Execute the following commands on the serial terminal of board A and board B respectively.

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

Step 3: Execute the following command as the receiver.

```
# candump can0
```

Step 4: Execute the following command as the transmitter.

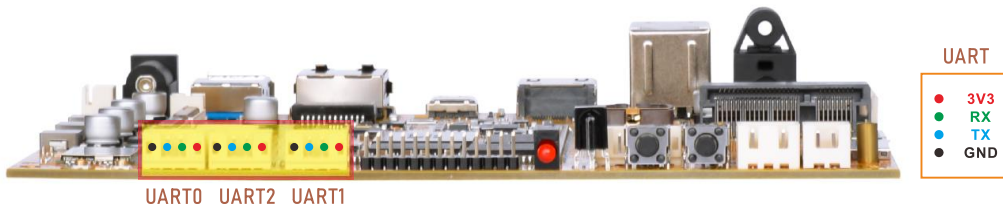
```
# cansend can0 123#DEADBEEF
```

```
root@idea3588s-buildroot:/# ip link set can0 down
root@idea3588s-buildroot:/# ip link set can0 type
can bitrate 500000
root@idea3588s-buildroot:/# ip link set can0 up
[17302.549568] IPv6: ADDRCONF(NETDEV_CHANGE): can0:
link becomes ready
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/# candump can0
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
```

```
root@idea3588s-buildroot:/# ip link set can0 down
root@idea3588s-buildroot:/# ip link set can0 type
can bitrate 500000
root@idea3588s-buildroot:/# ip link set can0 up
[ 1259.784189] IPv6: ADDRCONF(NETDEV_CHANGE):
can0: link becomes ready
root@idea3588s-buildroot:/# candump can0
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
root@idea3588s-buildroot:/#      cansend      can0
123#DEADBEEF
```

4.12 UART

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



Step 2: UART0 test.

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

```
root@idea3588s-buildroot:/# com /dev/ttyS0 115200 8 0 1
port = /dev/ttyS0
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 231.624394] of_dma_request_slave_channel: dma-names property of node '/serial@fd890000' missing or empty
[ 231.624449] dw-apb-uart fd890000.serial: failed to request DMA, use interrupt mode
abcdefg
RECV: abcdefg
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
```

Step 3: UART1 test.

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

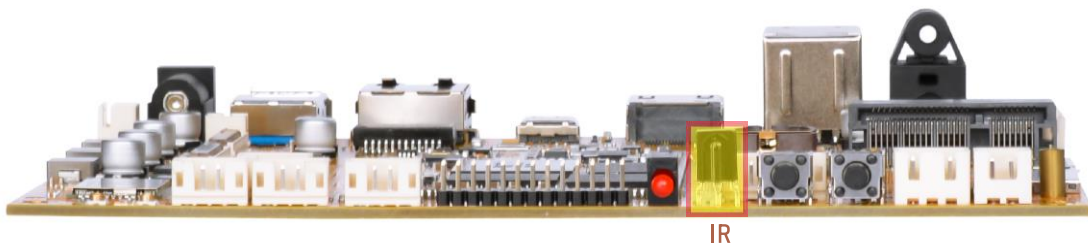
```
root@idea3588s-buildroot:/# com /dev/ttyS7 115200 8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 173.530648] of_dma_request_slave_channel: dma-names property of node '/serial@feba0000' missing or empty
[ 173.530702] dw-apb-uart feba0000.serial: failed to request DMA, use interrupt mode
1234567890
RECV: 1234567890
abcdefg
RECV: abcdefg
qwertyuiop
RECV: qwertyuiop
```

Step 4: UART2 test.

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

```
root@idea3588s-buildroot:/# com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 283.002965] of_dma_request_slave_channel: dma-names property of node '/serial@feb70000' missing or empty
[ 283.003022] dw-apb-uart feb70000.serial: failed to request DMA, use interrupt mode
abcdefg
RECV: abcdefg
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
```

4.13 IR



Step 1: Enable IR debugging print.

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

Step 2: Change log print level.

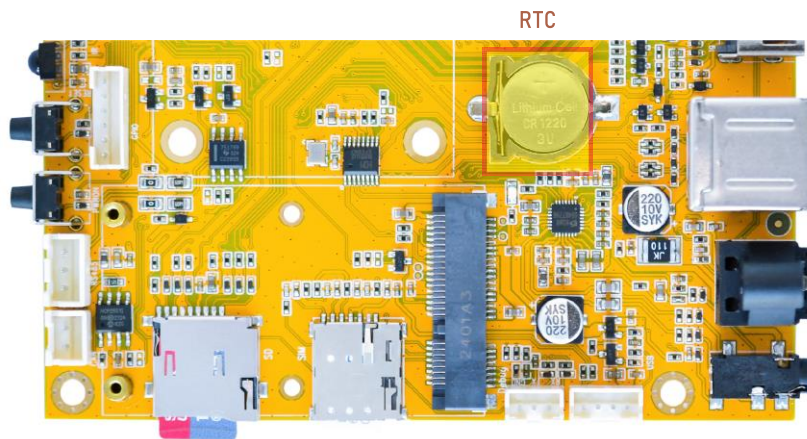
```
# echo 8 > /proc/sys/kernel/printk
```

Step 3: Using the infrared remote control to press a button and the IR receiver will print the key code in the log.

```
root@idea3588s-buildroot:/# [ 103.075323] USERCODE=0x95b
[ 103.097719] RMC_GETDATA=50
[ 103.244334] USERCODE=0x95b
[ 103.267839] RMC_GETDATA=70
[ 104.383366] USERCODE=0x953
[ 104.405766] RMC_GETDATA=50
[ 104.554587] USERCODE=0x953
[ 104.578084] RMC_GETDATA=70
[ 106.695187] USERCODE=0x95b
[ 106.717592] RMC_GETDATA=50
[ 106.864204] USERCODE=0x95b
[ 106.887707] RMC_GETDATA=70
[ 107.506652] USERCODE=0x85b
[ 107.529049] RMC_GETDATA=50
[ 107.678970] USERCODE=0x85b
[ 107.702475] RMC_GETDATA=70
[ 108.823552] USERCODE=0x87b
[ 108.845949] RMC_GETDATA=50
[ 108.996967] USERCODE=0x87b
[ 109.020469] RMC_GETDATA=70
[ 110.331672] USERCODE=0x85a
[ 110.354071] RMC_GETDATA=50
[ 110.501786] USERCODE=0x85a
[ 110.525291] RMC_GETDATA=70
```

4.14 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
# date -s "2025-01-08 11:00:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

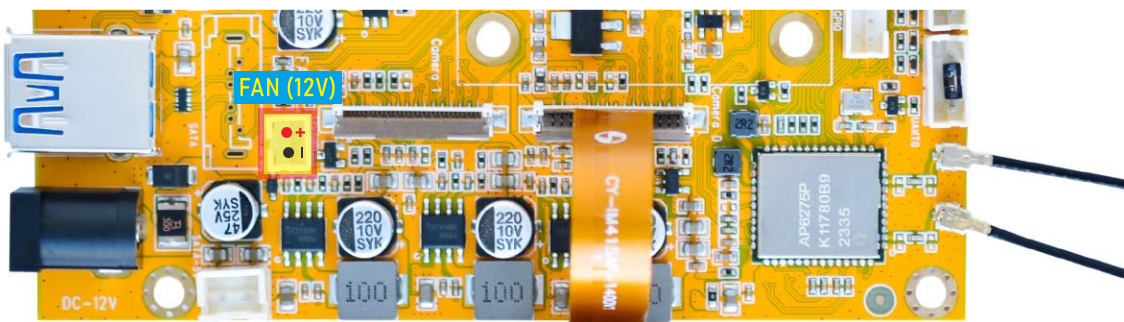
```
# hwclock
```

```
root@idea3588s-buildroot:/# date -s "2024-01-08 11:00:00"
Mon Jan 8 11:00:00 UTC 2024
root@idea3588s-buildroot:/# hwclock -w
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:00:09 2024 0.000000 seconds
root@idea3588s-buildroot:/# ^C
root@idea3588s-buildroot:/# ^C
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:00:40 2024 0.000000 seconds
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:00:44 2024 0.000000 seconds
```

Step 5: Turn off the development board, and turn on after a period of time to check whether the time is saved.

```
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:01:16 2024 0.000000 seconds
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:01:31 2024 0.000000 seconds
root@idea3588s-buildroot:/# hwclock
Mon Jan 8 11:01:37 2024 0.000000 seconds
```

4.15 Fan



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

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

```
root@idea3588s-buildroot:/# cat /sys/class/thermal/thermal_zone0/temp
48076
```

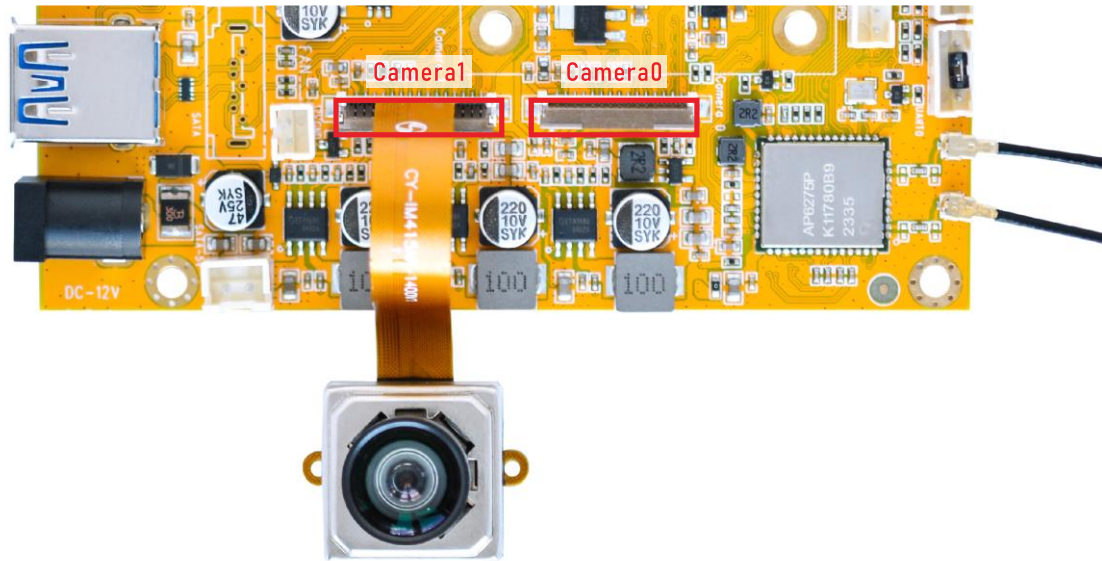
When the printed value exceeds 45000, indicating that the temperature has exceeded 45 degrees Celsius, the FAN interface outputs 12V and the fan automatically starts working.

4.16 Camera

4.16.1 Camera1

Idea3588S Buildroot system the camera1 port and imx415 camera are configured by

default, as shown in the figure below.



Step 1: Execute the following commands to view the device channel.

```
# grep "" /sys/class/video4linux/v*/name | grep mainpath
# grep "" /sys/class/video4linux/v*/name | grep selfpath
```

```
root@idea3588s-buildroot:/# grep "" /sys/class/video4linux/v*/name | grep mainpath
/sys/class/video4linux/video11/name:rkisp_mainpath
root@idea3588s-buildroot:/# grep "" /sys/class/video4linux/v*/name | grep selfpath
/sys/class/video4linux/video12/name:rkisp_selfpath
```

Step 2: Preview camera1 in three ways.

(1) Execute the command.

```
# gst-launch-1.0 v4l2src device=/dev/video-camera0 !
video/x-raw,format=NV12,width=640,height=480, framerate=30/1 ! waylandsink
```

```
root@idea3588s-buildroot:/#          gst-launch-1.0          v4l2src          device=/dev/video11          !
video/x-raw,format=NV12,width=1920,height=1080, framerate=30/1 ! xvimagesink

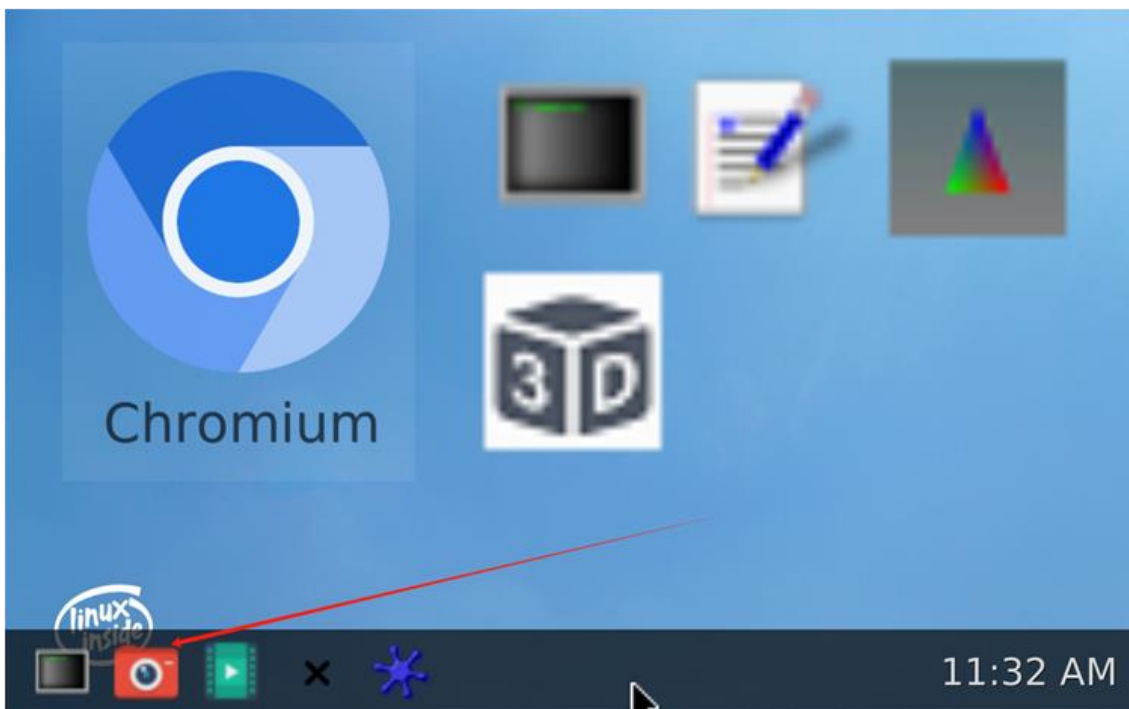
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[ 2040.588619] rkisp_hw fdc00000.rkisp: set isp clk = 594000000Hz
[ 2040.589064] rkcif-mipi-lvds1: stream[0] start streaming
[ 2040.589223] rockchip-mipi-csi2 mipi1-csi2: stream on, src_sd: 00000000d09d4069, sd_name:rockchip-csi2-dphy0
[ 2040.589234] rockchip-mipi-csi2 mipi1-csi2: stream ON
[ 2040.589267] rockchip-csi2-dphy0: dphy0, data_rate_mbps 892
[ 2040.589765] rockchip-csi2-dphy csi2-dcphy1: csi2_dphy_s_stream stream on:1, dphy0, ret 0
```

(2) Execute the script.

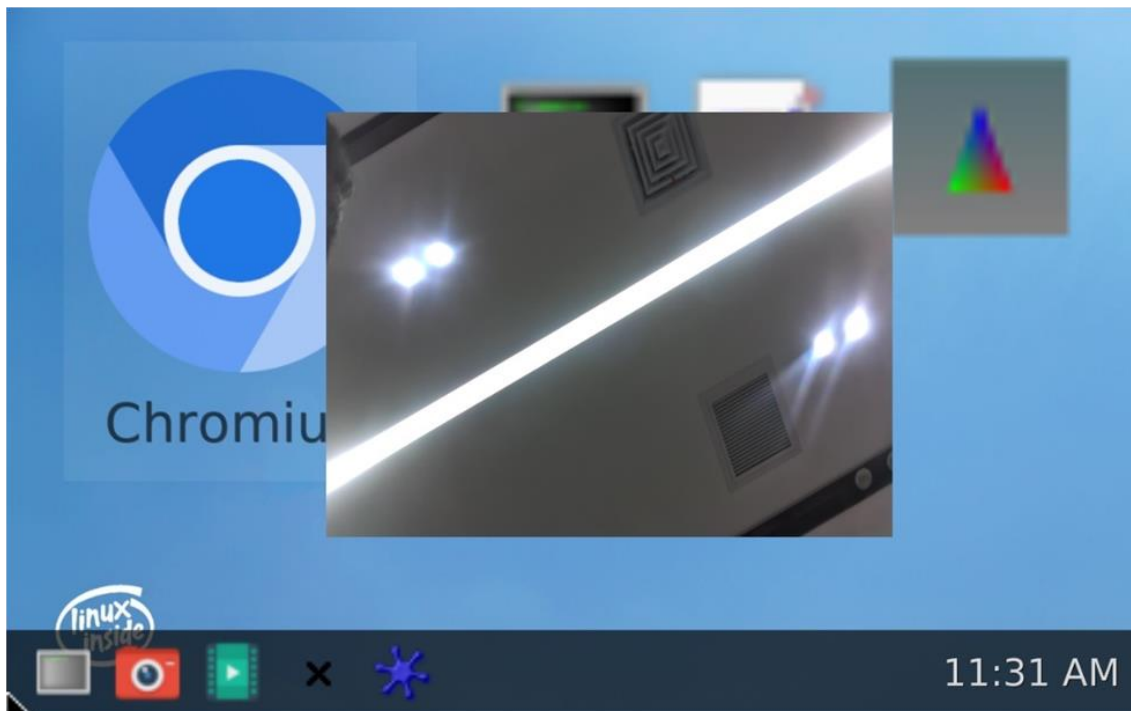
```
# /rockchip-test/camera/camera_rkisp_test.sh
```

```
root@idea3588s-buildroot:/# /rockchip-test/camera/camera_rkisp_test.sh
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[ 2073.964554] rkisp_hw fdc00000.rkisp: set isp clk = 594000000Hz
[ 2073.966999] rkisp rkisp0-vir1: first params buf queue
[ 2073.967433] rkCIF-mipi-lvds1: stream[0] start streaming
[ 2073.967594] rockchip-mipi-csi2 mipi1-csi2: stream on, src_sd: 0000000d09d4069, sd_name:rockchip-csi2-dphy0
[ 2073.967604] rockchip-mipi-csi2 mipi1-csi2: stream ON
[ 2073.967633] rockchip-csi2-dphy0: dphy0, data_rate_mbps 892
[ 2073.968122] rockchip-csi2-dphy csi2-dcphy1: csi2_dphy_s_stream stream on:1, dphy0, ret 0
[ 2073.968133] imx415 3-0036: s_stream: 1. 3864x2192, hdr: 0, bpp: 10
Redistribute latency...
0:00:03.7 / 99:99:99.
```

(3) Touch desktop application.



(4) Preview camera effect as shown in the figure, support Auto Zoom function.



4.16.2 Camera0

Only one interface of camera1 or camera0 can be used at same time. To use the interface of camera0, modify the device tree in the kernel.

Step 1: Open the board level device tree file.

```
$ vim kernel-6.1/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
```

Step 2: Annotate the camera1 device tree file and open the camera0 file.

```
#include "rk3588s-evb4-imx415-dphy0.dtsi"
//#include "rk3588s-evb4-imx415-dcphy1.dtsi"
```

```
// SPDX-License-Identifier: (GPL-2.0+ OR MIT)
/*
 * Copyright (c) 2021 Rockchip Electronics Co., Ltd.
 *
 */
#include "dt-bindings/usb/pd.h"
#include "rk3588s.dtsi"
#include "rk3588s-evb.dtsi"
#include "rk3588-rk806-single.dtsi"
#include "rk3588s-evb4-imx415-dphy0.dtsi"
//#include "rk3588s-evb4-imx415-dcphy1.dtsi"
```

Step 3: Back to source directory and recompile the kernel , **boot.img** will be

generated in the *output/firmware* directory and burned using the RKDevTool.

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

Step 4: Use camera0 in the same way as using camera1.

4.17 Video Playback

Step 1: Execute the following command to switch to performance mode.

```
# echo performance | tee $(find /sys/ -name *governor)
```

```
root@idea3588s-buildroot:/# echo performance | tee $(find /sys/ -name *governor)
tee: /sys/module/cpuidle/parameters/governor: Permission denied
tee: /sys/module/cpufreq/parameters/default_governor: Permission denied
performance
tee: /sys/devices/system/cpu/cpuidle/current_governor: Invalid argument
```

Step 2: Execute the following command to test the user's built-in video playback, with sound output via Headset.

```
# gst-play-1.0 --videosink=waylandsink /userdata/test.mp4 --audiosink="alsasink
device=hw:2"
```

```
root@idea3588s-buildroot:/# gst-play-1.0 --videosink=xvimagesink /userdata/test.mp4 --audiosink="alsasink
device=hw:2"
(gst-play-1.0:1691): gst-play-1.0-WARNING **: 02:37:33.215: Couldn't create specified video sink ''
Press 'k' to see a list of keyboard shortcuts.
Now playing /waylandsink
ERROR Resource not found. for file:///waylandsink
ERROR debug information: ../plugins/elements/gstfilesrc.c(553): gst_file_src_start ():
/GstPlayBin:playbin/GstURIDecodeBin:uridecodebin0/GstFileSrc:source:
No such file "/waylandsink"
Now playing /userdata/test.mp4
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:02.4 / 0:00:05.2
```

Change the output device of the audio, and change the sound card device number at the end of the previous command. The sound card device number can be obtained by using the following command.

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

```
root@linaro-alip:/# cat /proc/asound/cards
0 [rockchipdp0 ]: rockchip_dp0 - rockchip,dp0
rockchip,dp0
1 [rockchiphdmi0 ]: rockchip-hdmi0 - rockchip-hdmi0
rockchip-hdmi0
2 [rockchipes8388 ]: rockchip-es8388 - rockchip-es8388
rockchip-es8388
3 [rockchipspdiftx]: simple-card - rockchip,spdif-tx0
rockchip,spdif-tx0
```

For example, change the playback audio device to HDMI.

```
# gst-play-1.0 --videosink=waylandsink /userdata/test.mp4 --audiosink="alsasink
device=hw:1"
```

The Idea3588s Buildroot has been tested to decode and play 8K 30fps video content stably, and print the fps in real time.

```
# GST_DEBUG=fps*:7 gst-play-1.0 --flags=3 --videosink="fpsdisplaysink
video-sink=waylandsink signal fps-measurements=true text-overlay=false sync=True"
--audiosink="alsasink device=hw:2,0" /userdata/H265_8KP30.mp4
```

```
root@idea3588s-buildroot:/# GST_DEBUG=fps*:7 gst-play-1.0 --flags=3 --videosink="fpsdisplaysink
video-sink=waylandsink signal fps-measurements=true text-overlay=false sync=True" --audiosink="alsasink
device=hw:2,0" /userdata/H265_8KP30.mp4
Press 'k' to see a list of keyboard shortcuts.
Now playing /userdata/H265_8KP30.mp4
0:00:00.007947598 1747 0x556b192160 DEBUG fpsdisplaysink
fpsdisplaysink.c:441:fps_display_sink_start:<fpsdisplaysink0> Use text-overlay? 1
0:00:00.007960723 1747 0x556b192160 WARN fpsdisplaysink
fpsdisplaysink.c:448:fps_display_sink_start:<fpsdisplaysink0> text-overlay element could not be created
Redistribute latency...
Redistribute latency...
WARNING No volume control found
WARNING debug information: ../gst/playback/gstplaysink.c(2908): gen_audio_chain ():
/GstPlayBin:playbin/GstPlaySink:playsink:
Volume/mute is not available
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:00.571620981 1747 0x7fa0001480 DEBUG fpsdisplaysink
fpsdisplaysink.c:373:display_current_fps:<fpsdisplaysink0> Updated max-fps to 33.536021
0:00:00.571637022 1747 0x7fa0001480 DEBUG fpsdisplaysink
fpsdisplaysink.c:377:display_current_fps:<fpsdisplaysink0> Updated min-fps to 33.536021
0:00:01.104556265 1747 0x7fa0001480 DEBUG fpsdisplaysink
fpsdisplaysink.c:377:display_current_fps:<fpsdisplaysink0> Updated min-fps to 30.022358
0:00:01.604572452 1747 0x7fa0001480 DEBUG fpsdisplaysink
fpsdisplaysink.c:377:display_current_fps:<fpsdisplaysink0> Updated min-fps to 29.999046
0:00:02.138496446 1747 0x7fa0001480 DEBUG fpsdisplaysink
fpsdisplaysink.c:377:display_current_fps:<fpsdisplaysink0> Updated min-fps to 29.966779
0:00:03.2 / 0:04:57.3
```

Execute the following command to specify the render range when the video is playing, but the fps cannot be viewed.

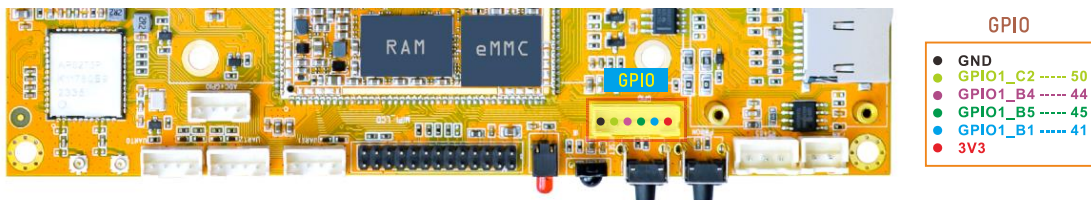
```
# gst-play-1.0 --videosink="waylandsink render-rectangle=\"<0,0,500,500>\""
/userdata/H265_8KP30.mp4 --audiosink="alsasink device=hw:2,0"
```

```
root@idea3588s-buildroot:/# gst-play-1.0 --videosink="waylandsink render-rectangle=\"<0,0,500,500>\""/
/userdata/H265_8KP30.mp4 --audiosink="alsasink device=hw:2,0"
Press 'k' to see a list of keyboard shortcuts.
Now playing /userdata/H265_8KP30.mp4
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:03.8 / 0:04:57.3
```

4.18 Power Key

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

4.19 GPIO



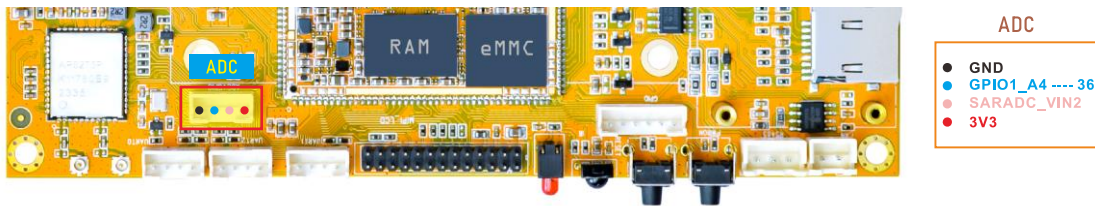
Execute the following commands to control GPIO1_C2.

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

```
root@idea3588s-buildroot:/# echo 50 > /sys/class/gpio/export
root@idea3588s-buildroot:/# echo out > /sys/class/gpio/gpio50/direction
root@idea3588s-buildroot:/# echo 0 > /sys/class/gpio/gpio50/value
root@idea3588s-buildroot:/# cat /sys/class/gpio/gpio50/value
0
root@idea3588s-buildroot:/# echo 1 > /sys/class/gpio/gpio50/value
root@idea3588s-buildroot:/# cat /sys/class/gpio/gpio50/value
1
root@idea3588s-buildroot:/# echo 50 > /sys/class/gpio/unexport
```

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

4.20 ADC+GPIO



4.20.1 ADC

Step 1: Connect the SARADC_VIN2 pin to the 3.3V pin or GND pin.

Step 2: Execute the following command to compare the obtained value change.

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

Connect 3.3V pin:

```
root@idea3588s-buildroot:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
4095
```

Connect GND pin:

```
root@idea3588s-buildroot:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
3
```

4.20.2 GPIO

Execute the following commands to control GPIO1_A4.

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

```
root@idea3588s-buildroot:/# echo 36 > /sys/class/gpio/export
root@idea3588s-buildroot:/# echo out > /sys/class/gpio/gpio36/direction
root@idea3588s-buildroot:/# echo 0 > /sys/class/gpio/gpio36/value
root@idea3588s-buildroot:/# cat /sys/class/gpio/gpio36/value
0
root@idea3588s-buildroot:/# echo 1 > /sys/class/gpio/gpio36/value
root@idea3588s-buildroot:/# cat /sys/class/gpio/gpio36/value
1
root@idea3588s-buildroot:/# echo 36 > /sys/class/gpio/unexport
```

Debian12

1. Compile Source

Step 1: Unzip the Source

To extract the source files, run the following commands.

```
$ tar -xvf idea3588s_linux6.1-rkr5_20250530.tar.bz2  
  
$ cd idea3588s linux6.1-rkr5 20250530/
```

Step 2: SDK Board-Level Configuration

To configure the board, run the following command.

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

```
xuejunchao@boardcon:~/idea3588s_linux6.1-rkr5_20250425$ ./build.sh lunch  
Pick a defconfig:  
1. rockchip_defconfig  
2. rockchip_rk3588_evb1_lp4_v10_amp_defconfig  
3. rockchip_rk3588_evb1_lp4_v10_defconfig  
4. rockchip_rk3588_evb1_lp4_v10_mcu_defconfig  
5. rockchip_rk3588_evb7_v11_defconfig  
6. rockchip_rk3588_ipc_evb1_v10_defconfig  
7. rockchip_rk3588_ipc_evb7_lp4_v11_defconfig  
8. rockchip_rk3588_multi_ipc_evb1_v10_defconfig  
9. rockchip_rk3588s_evb1_lp4x_v10_defconfig  
Which would you like? [1]: 9  
Switching to defconfig: Switching to defconfig: /home/xuejunchao/3588/idea3588s/linux6.10/idea3588s_linux6.1-rkr5_20250425/device/rockchip/.chip/rockchip_rk3588s_evb1_lp4x_v10_defconfig
```

Step 3: Compile U-Boot

To compile U-Boot, run the following command.

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

Step 4: Compile Kernel

To compile kernel, run the following command.

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

Step 5: Compile Recovery

To compile recovery, run the following command.

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

Step 6: Compile Debian

Description: When compiling Debian for the first time, you need to install dependency packages.(Permission:root)

Debian compilation requires a dependent environment.

```
$ 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
```

To compile debian, run the following commands.

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

After compilation, generate **linaro-rootfs.img** in the *debian/* directory.

Step 7: Generate and Check Firmwares

To generate firmware, run the following command.

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

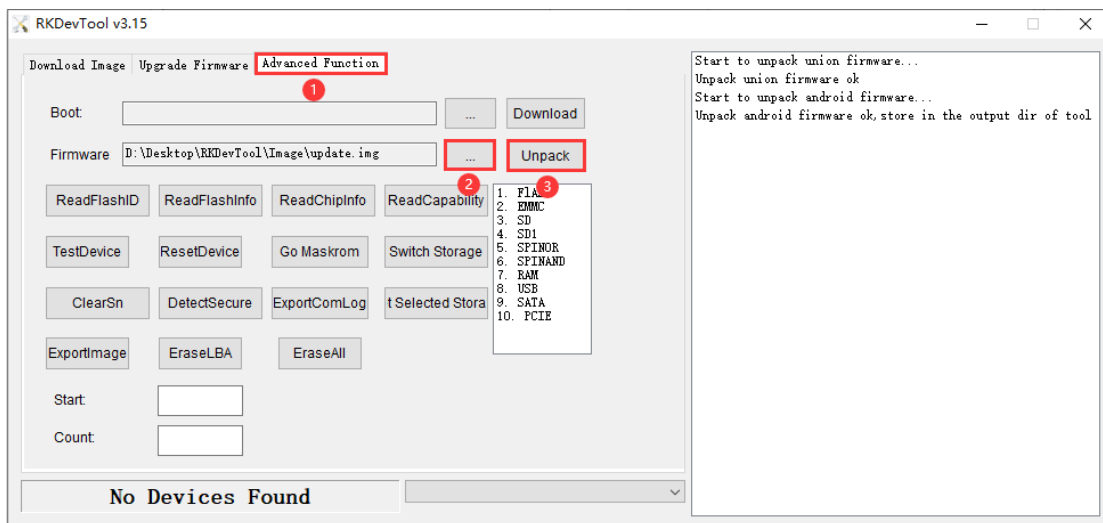
Images and **update.img** are generated in *rockdev/* directory.

2. Images Operation

2.1 Unzip Firmware

Step 1: Open *RKDevTool\RKDevTool_Release\RKDevTool.exe*.

Step 2: Click **Advanced Function** -> **Firmware**, select **update.img**, then click **Unpack** to unzip.



Step 3: The unzip files will be generated in

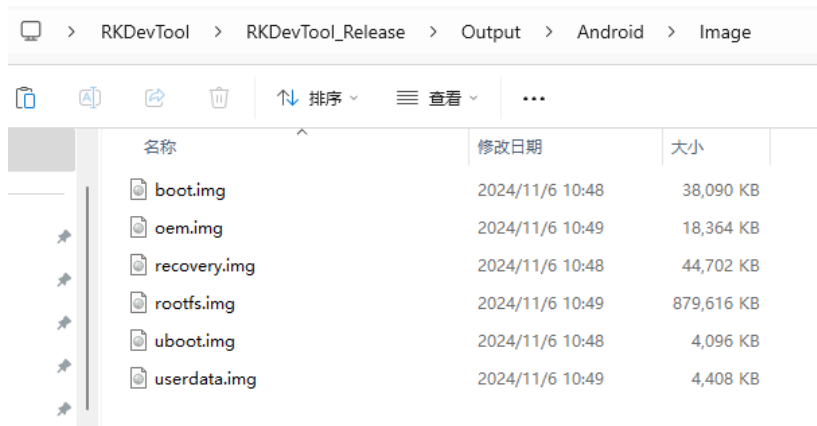
RKDevTool\RKDevTool_Release\Output\Android and

\RKDevTool\RKDevTool_Release\Output\Android\Image directory.

RKDevTool > RKDevTool_Release > Output > Android >

名称

- Image
- MiniLoaderAll.bin
- package-file
- parameter.txt

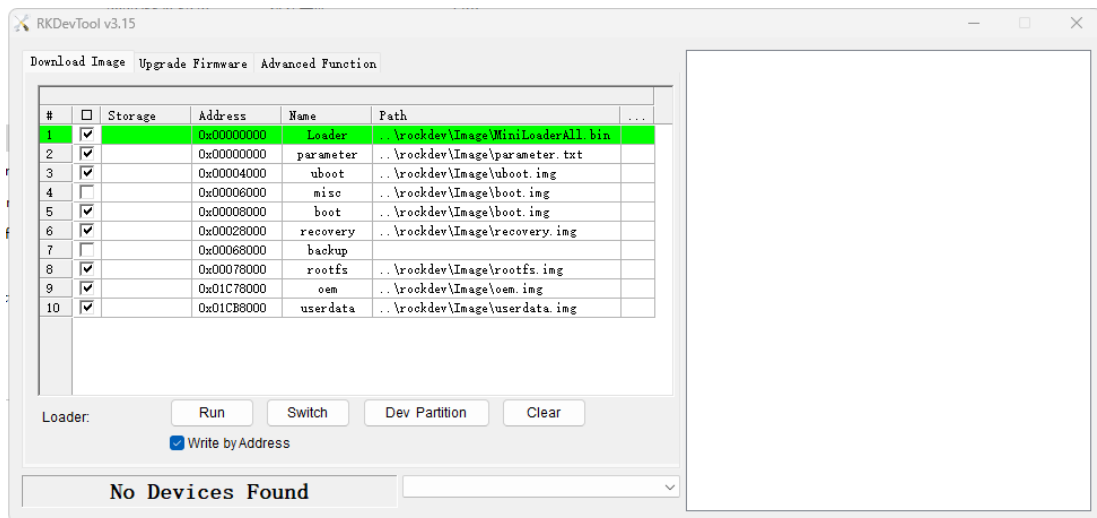


3. Image Burning Tool

3.1 Image Unite Burning

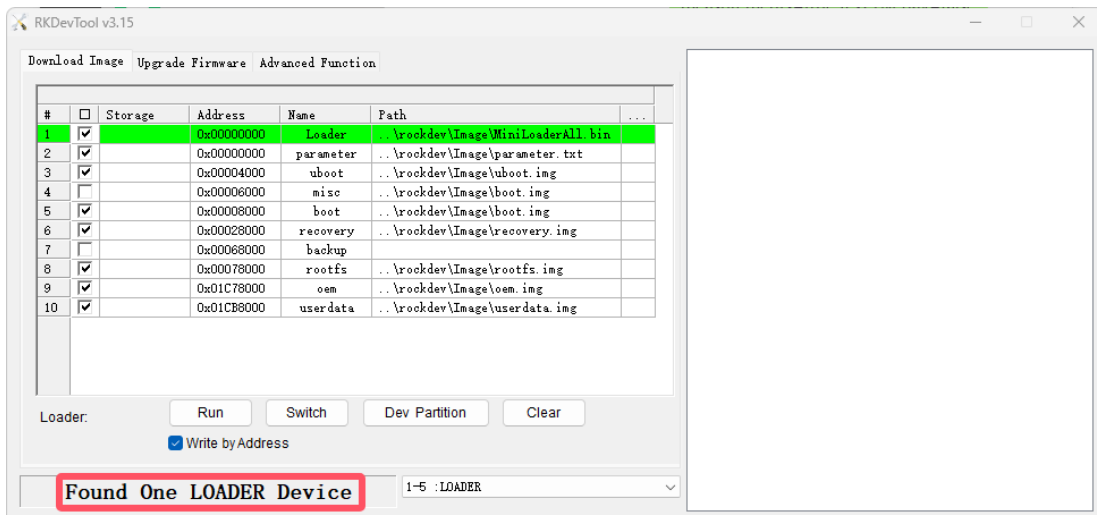
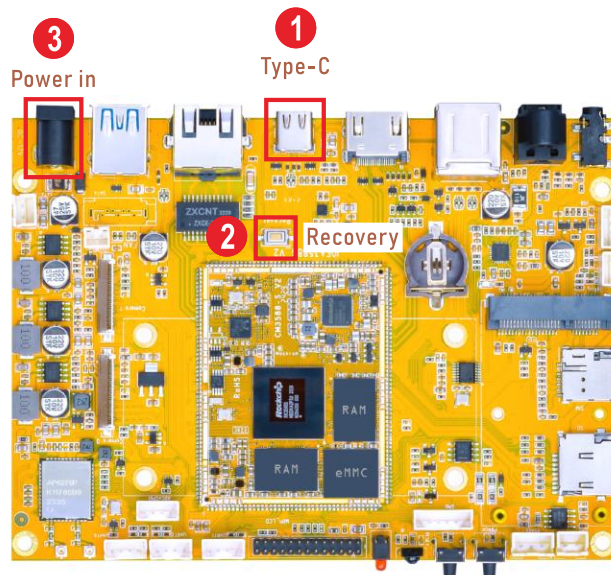
Step 1: Unzip *RKDevTool.rar* on Windows.

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

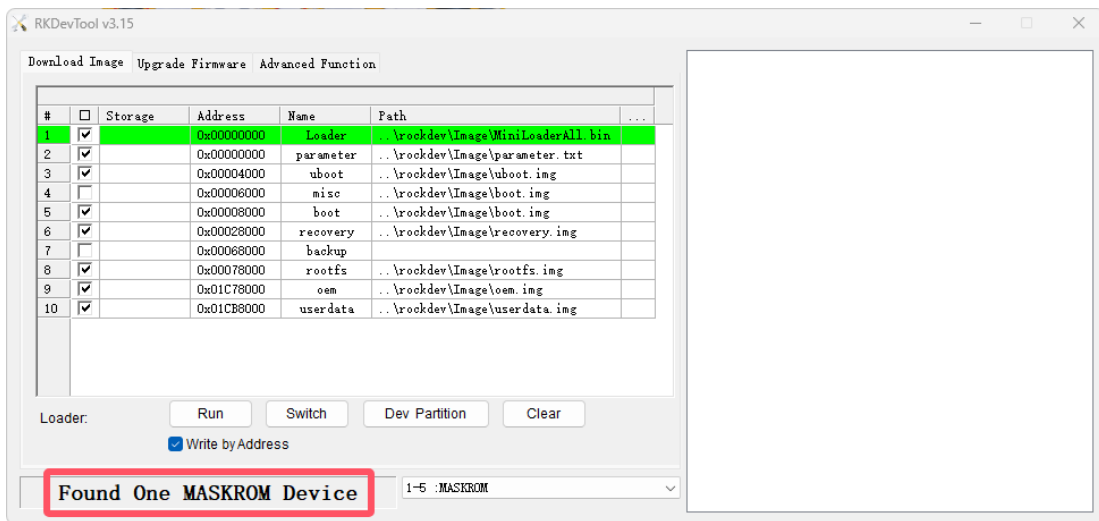
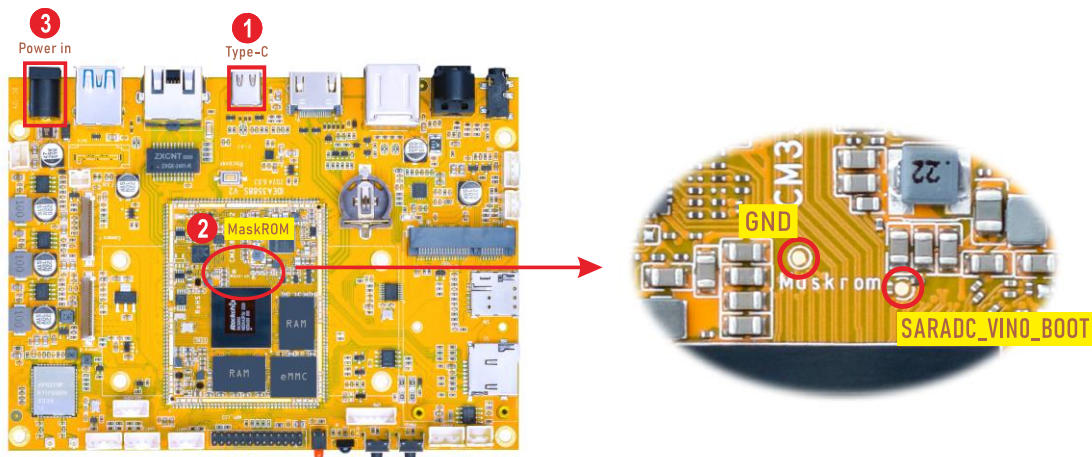


Step 3: Enter the burning mode.

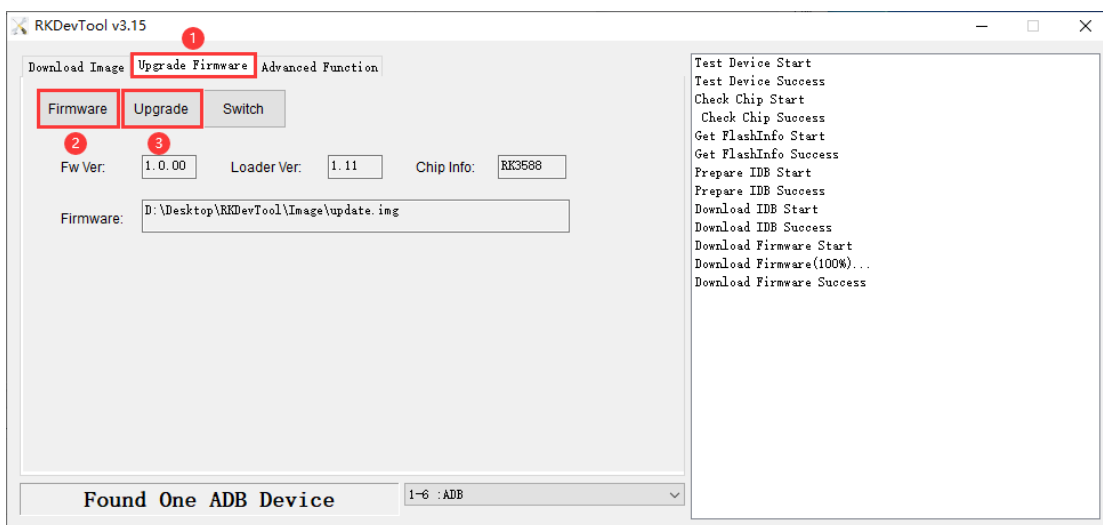
LOADER mode: Connect PC and development board with Type-C USB cable, keep pressing the Recovery Key and power the board until the windows PC shows “Found One LOADER Device”.Then release the Recovery Key, the development board enters LOADER mode. If the LOADER mode cannot be accessed or uboot cannot be started properly, burn the firmware in MASKROM mode.



MASKROM mode: Connect PC and development board with Type-C USB cable. Short circuit SARADC_VINO_BOOT and GND on the development board, power the board until the windows PC shows “Found One MASKROM Device”. Then disconnect SARADC_VINO_BOOT and GND, and the development board enters MASKROM mode.



Step 4: Click Upgrade Firmware -> Firmware, select [update.img](#), then click Upgrade to burn.



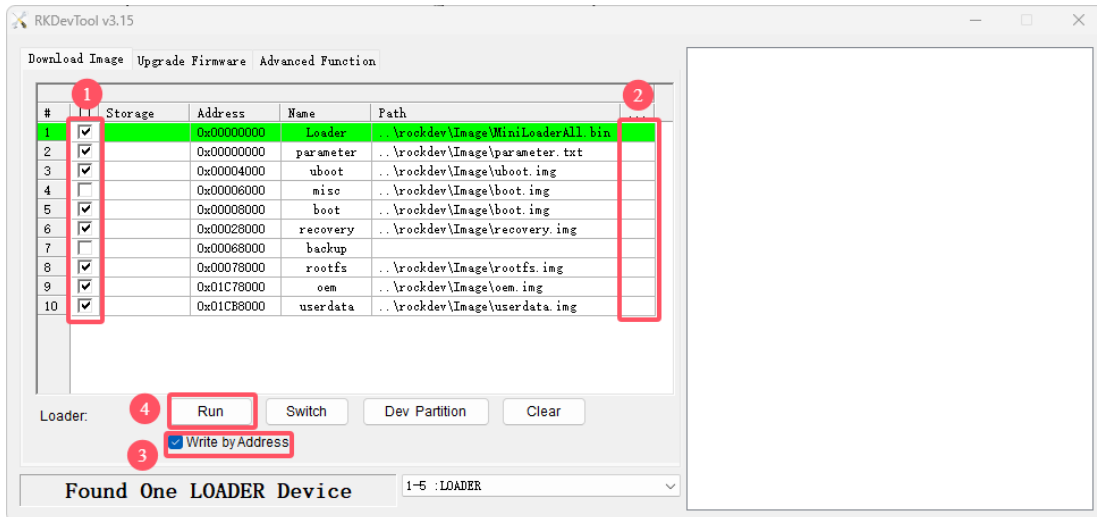
3.2 Image Split Burning

Step 1: Select the checkbox on the left.

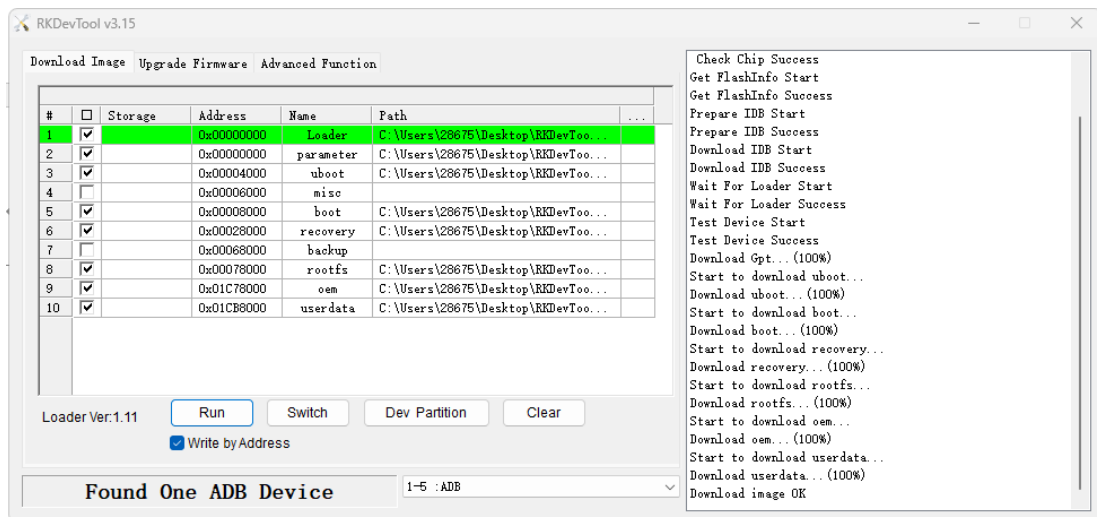
Step 2: Slick the column on the right side for the path of the file want to burn.

Step 3: Select the **Write by Address** button.

Step 4: Slick **Run** button to burn the images.



Wait for the completion of burning.



4. Debian12 Test

4.1 Change Log Level

To get more log information from the device, execute the following command.

```
$ echo "8 4 1 7" > /proc/sys/kernel/printk
```

8: The default print level, meaning that messages of all levels from 1 (emergency) to 8 (debug) are printed to the system log.

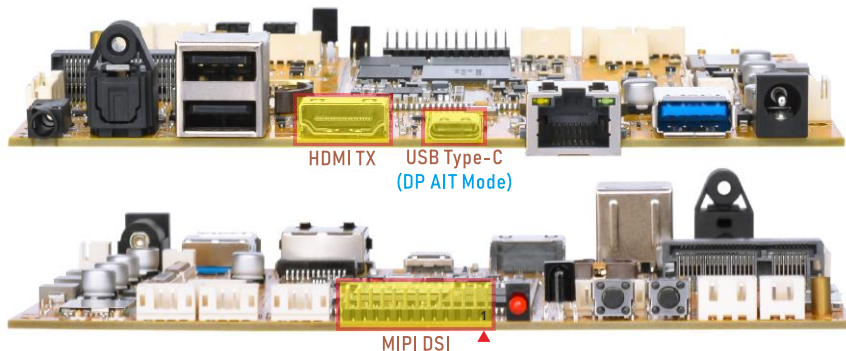
4: Console print level, meaning that only messages with levels 1 (critical) to 4 (error) will be printed to the console.

1: Minimum message level, meaning that any message below the emergency level will not be printed.

7: The console's minimum message level means that any messages below the emergency and alert levels will not be printed to the console.

4.2 Display

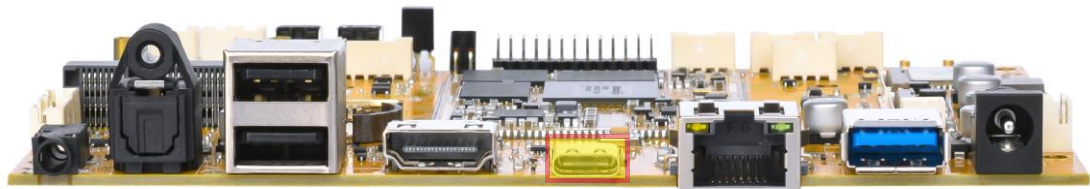
The Idea3588S Debian12 default supports MIPI display (800x1280) and HDMI display, with MIPI not supporting hot plug, while HDMI does.



The display effect diagram is as follows: (Dual or triple Display)



4.3 USB Type-C



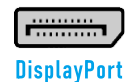
USB Type-C
(ADB/USB3.0/DP0)



USB3.0



HDMI



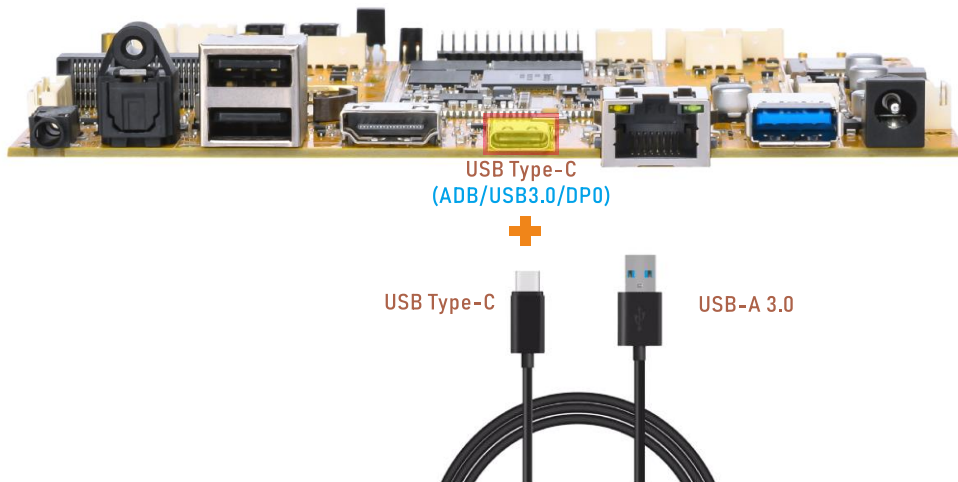
DisplayPort

Features Supported by the Type-C Interface:

- (1) Reversible Design: Allows insertion in either orientation for user convenience.
- (2) Data Transmission Roles: Supports flexible designation of host and device roles.
- (3) Multiple Protocol Support: Compatible with USB 3.0 and DisplayPort, enabling high-speed data transmission.

4.3.1 ADB

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



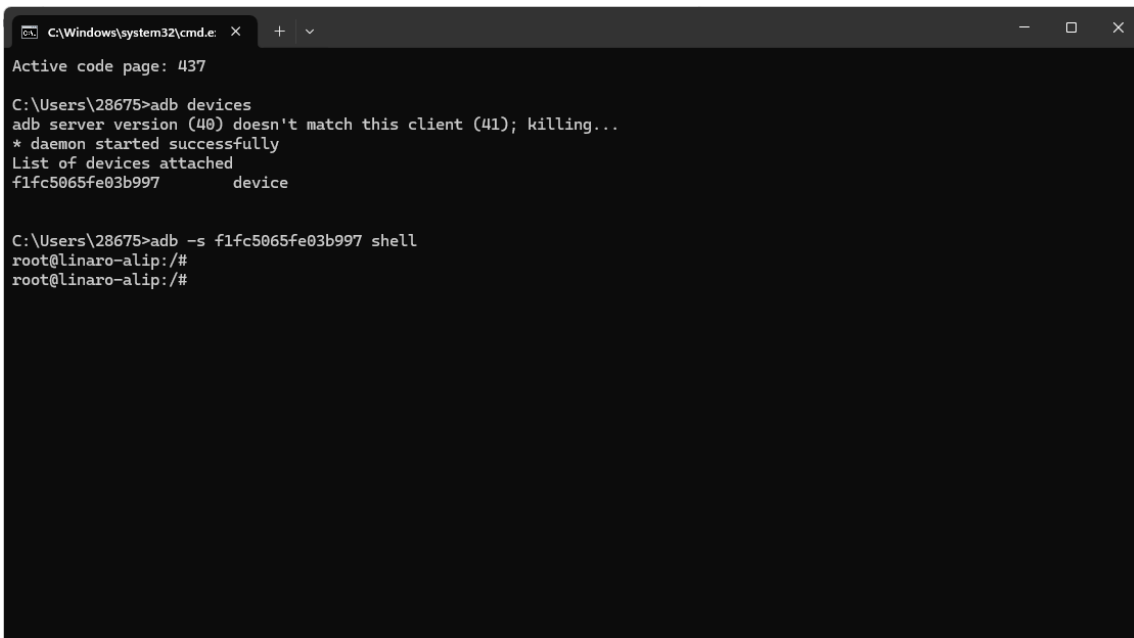
Step 2: Install ADB driver on Windows system.

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

Step 4: Execute the following commands to view and connect adb device.

```
# adb devices
```

```
# adb -s <device number> shell
```

The screenshot shows a Windows command prompt window with the title "C:\Windows\system32\cmd.e". The active code page is 437. The user has entered the command "adb devices", and the output shows that the adb server version (40) doesn't match the client (41), so it is killing the server and starting a new one. The output also shows a list of devices attached, with the device "f1fc5065fe03b997" listed. The user then enters the command "adb -s f1fc5065fe03b997 shell", and the prompt changes to "root@linaro-alip:/#".

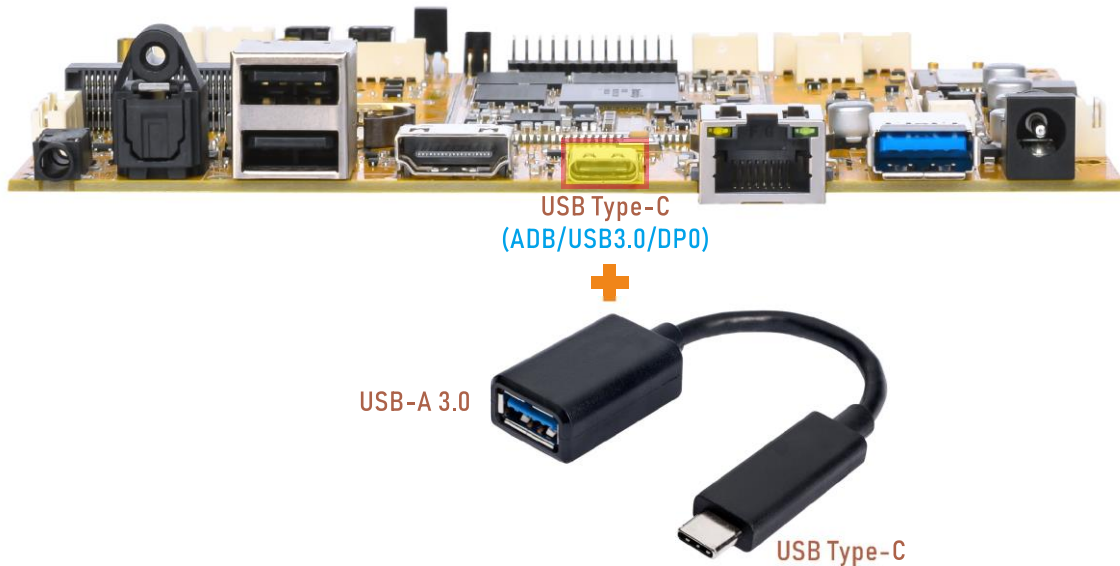
```
C:\Windows\system32\cmd.e: X + v
Active code page: 437
C:\Users\28675>adb devices
adb server version (40) doesn't match this client (41); killing...
* daemon started successfully
List of devices attached
f1fc5065fe03b997    device

C:\Users\28675>adb -s f1fc5065fe03b997 shell
root@linaro-alip:/#
root@linaro-alip:/#
```

4.3.2 Type-C to USB3.0

Step 1: Connect the Type-C to USB3.0 converter to the Type-C port of the

development board, and then insert the USB3.0 flash disk into the USB3.0 port of the docking station.

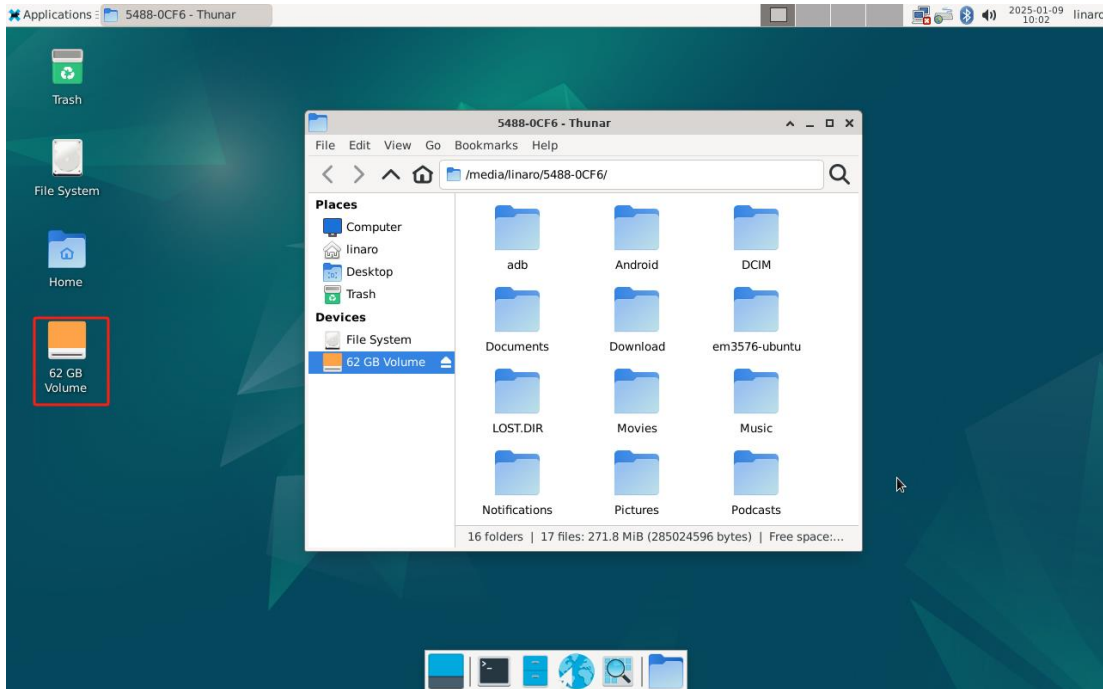


The serial port of the terminal will display the following message, indicating that the USB3.0 flash disk is successfully recognized.

```

root@linaro-alip:/# echo "8 4 1 7" > /proc/sys/kernel/printk
root@linaro-alip:/# [ 131.030298] dwc3 fc000000.usb: request 00000000b5b4e2ef was not queued to ep0out
[ 131.030408] android_work: did not send uevent (0 0 0000000000000000)
[ 131.136243] xhci-hcd xhci-hcd.10.auto: xHCI Host Controller
[ 131.136686] xhci-hcd xhci-hcd.10.auto: new USB bus registered, assigned bus number 7
[ 131.136873] xhci-hcd xhci-hcd.10.auto: hcc params 0x0220fe64 hci version 0x110 quirks 0x0000802002010010
[ 131.136912] xhci-hcd xhci-hcd.10.auto: irq 137, io mem 0xfc000000
[ 131.137054] xhci-hcd xhci-hcd.10.auto: xHCI Host Controller
[ 131.137311] xhci-hcd xhci-hcd.10.auto: new USB bus registered, assigned bus number 8
[ 131.137334] xhci-hcd xhci-hcd.10.auto: Host supports USB 3.0 SuperSpeed
[ 131.137475] usb usb7: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice= 5.10
[ 131.137486] usb usb7: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 131.137496] usb usb7: Product: xHCI Host Controller
[ 131.137505] usb usb7: Manufacturer: Linux 5.10.209 xhci-hcd
[ 131.137514] usb usb7: SerialNumber: xhci-hcd.10.auto
[ 131.138083] hub 7-0:1.0: USB hub found
[ 131.138119] hub 7-0:1.0: 1 port detected
[ 131.138459] usb usb8: We don't know the algorithms for LPM for this host, disabling LPM.
[ 131.138552] usb usb8: New USB device found, idVendor=1d6b, idProduct=0003, bcdDevice= 5.10
[ 131.138563] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 131.138572] usb usb8: Product: xHCI Host Controller
[ 131.138582] usb usb8: Manufacturer: Linux 5.10.209 xhci-hcd
[ 131.138591] usb usb8: SerialNumber: xhci-hcd.10.auto
[ 131.139107] hub 8-0:1.0: USB hub found
[ 131.139138] hub 8-0:1.0: 1 port detected
[ 131.469466] usb 8-1: new SuperSpeed Gen 1 USB device number 2 using xhci-hcd
[ 131.497134] usb 8-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 131.497168] usb 8-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 131.497176] usb 8-1: Product: OnlyDisk
[ 131.497182] usb 8-1: Manufacturer: Netac
[ 131.497188] usb 8-1: SerialNumber: 0A6544CD10427AB2
[ 131.500147] usb-storage 8-1:1.0: USB Mass Storage device detected
[ 131.500961] scsi host0: usb-storage 8-1:1.0
[ 132.616243] scsi 0:0:0:0: Direct-Access Netac OnlyDisk 8.01 PQ: 0 ANSI: 6
[ 132.623223] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 132.624008] sd 0:0:0:0: [sda] Write Protect is off
[ 132.624030] sd 0:0:0:0: [sda] Mode Sense: 23 00 00 00
[ 132.624327] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 132.630600] sda: sda1
[ 132.634454] sd 0:0:0:0: [sda] Attached SCSI removable disk [ 638.312946] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT filesystems, filesystem will be case sensitive!
[ 638.322300] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt. Please run fsck.
  
```

Step 2: After inserting the USB3.0 flash disk, the system will automatically mount the device, and an appropriate icon will appear on the desktop. Users can double-click the icon to access the files in the USB3.0 flash disk.



4.3.3 DP Alt Mode

DisplayPort Alternate Mode (DP Alt Mode) is a technology that facilitates the transmission of DisplayPort video signals through a USB Type-C interface. It enables devices to output video and audio via a USB-C connection without requiring a dedicated DisplayPort connector. This allows users to connect a display using a single USB-C port while transmitting video, audio, and additional data.

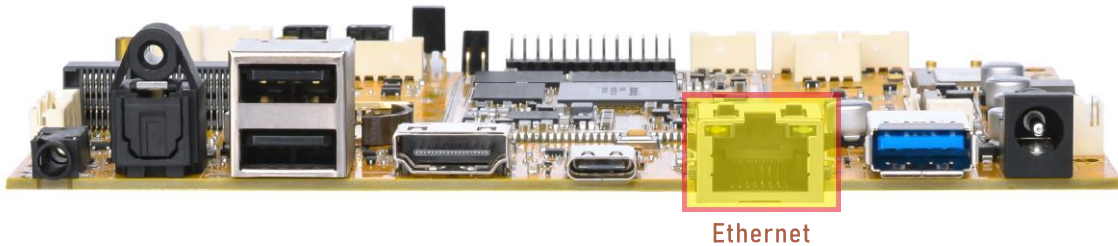
Currently, Boardcon has conducted the following output tests:

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



4.4 Ethernet

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



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

```
root@linaro-alip:/# [ 83.359999] rk_gmac-dwmac fe1c0000.ethernet end1: Link is Up - 1Gbps/Full - flow control rx/tx
[ 83.360144] IPv6: ADDRCONF(NETDEV_CHANGE): end1: link becomes ready
```

Step 2: View network interface information.

```
# ifconfig end1
```

```
root@linaro-alip:/# ifconfig end1
end1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.219 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::a24a:8b9f:ba76:d931 prefixlen 64 scopeid 0x20<link>
    ether 52:f7:0b:86:c3:20 txqueuelen 1000 (Ethernet)
    RX packets 142 bytes 15601 (15.2 KiB)
    RX errors 0 dropped 4 overruns 0 frame 0
    TX packets 141 bytes 12755 (12.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 70
```

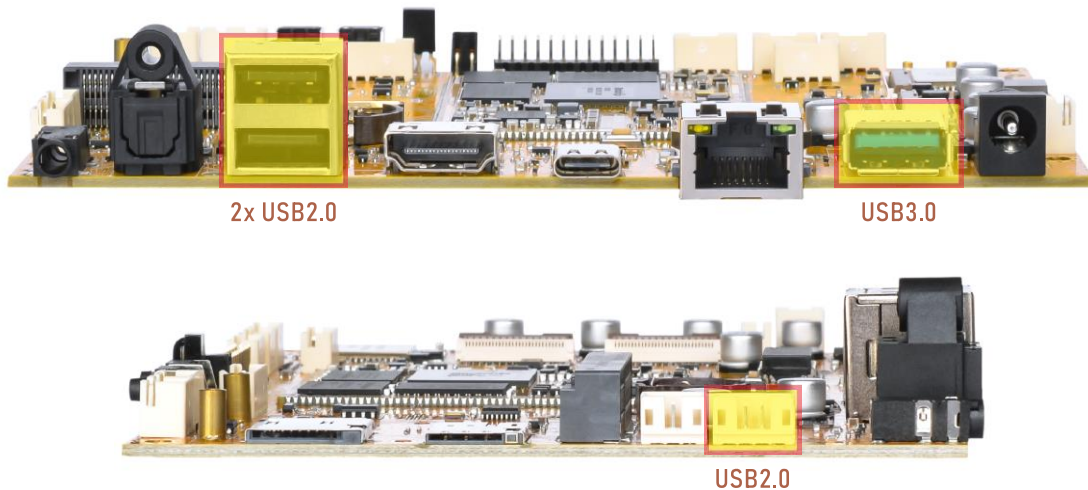
Step 3: Network connection test.

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

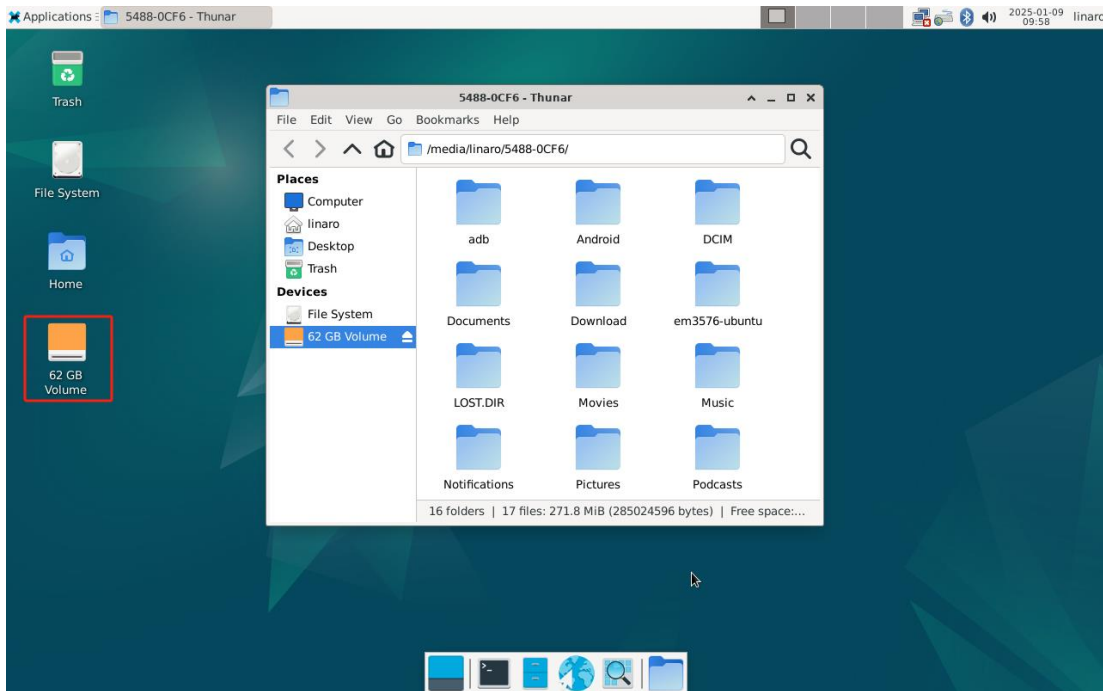
```
root@linaro-alip:/# ping -I end1 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.219 end1: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=196 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=195 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=195 ms
^C
--- www.armdesigner.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5217ms
rtt min/avg/max/mdev = 195.061/195.331/195.520/0.158 ms
```

4.5 USB Host

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



After connecting the USB flash disk, it will be automatically mounted. Once successfully mounted, an icon will appear on the desktop, allowing users to access the device by double-clicking on it.



Identify whether the mounted flash disk is USB 2.0 or USB 3.0 through the serial port output.

(3) USB2.0 print information in high-speed mode:

```
root@linaro-alip:~# [ 1120.318127] usb 4-1.2: new full-speed USB device number 5 using ohci-platform
[ 1120.451783] usb 4-1.2: not running at top speed; connect to a high speed hub
[ 1120.469716] usb 4-1.2: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 1120.469763] usb 4-1.2: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1120.469775] usb 4-1.2: Product: OnlyDisk
[ 1120.469785] usb 4-1.2: Manufacturer: Netac
[ 1120.469794] usb 4-1.2: SerialNumber: 0A6544CD10427AB2
[ 1120.472057] usb-storage 4-1.2:1.0: USB Mass Storage device detected
[ 1120.472766] scsi host0: usb-storage 4-1.2:1.0
[ 1121.596001] scsi 0:0:0:0: Direct-Access    Netac    OnlyDisk           8.01 PQ: 0 ANSI: 6
[ 1121.616761] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 1121.622876] sd 0:0:0:0: [sda] Write Protect is off
[ 1121.628835] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 1121.673916] sda: sda1
[ 1121.707820] sd 0:0:0:0: [sda] Attached SCSI removable disk

root@linaro-alip:~# [ 1299.987484] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt.
```

(4) USB3.0 print information in SuperSpeed mode:

```
root@linaro-alip:~# [ 1031.475374] usb 6-1: new SuperSpeed Gen 1 USB device number 5 using xhci-hcd
[ 1031.502619] usb 6-1: New USB device found, idVendor=0dd8, idProduct=3b00, bcdDevice= 0.02
[ 1031.502653] usb 6-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1031.502661] usb 6-1: Product: OnlyDisk
[ 1031.502668] usb 6-1: Manufacturer: Netac
[ 1031.502675] usb 6-1: SerialNumber: 0A6544CD10427AB2
[ 1031.503930] usb-storage 6-1:1.0: USB Mass Storage device detected
[ 1031.504810] scsi host0: usb-storage 6-1:1.0
[ 1032.852995] scsi 0:0:0:0: Direct-Access    Netac    OnlyDisk           8.01 PQ: 0 ANSI: 6
[ 1032.857245] sd 0:0:0:0: [sda] 121610240 512-byte logical blocks: (62.3 GB/58.0 GiB)
[ 1032.858152] sd 0:0:0:0: [sda] Write Protect is off
[ 1032.858560] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 1032.865096] sda: sda1
[ 1032.869051] sd 0:0:0:0: [sda] Attached SCSI removable disk

root@linaro-alip:~# [ 1313.140576] FAT-fs (sda1): Volume was not properly unmounted. Some data may be corrupt.
Please run fsck.
```

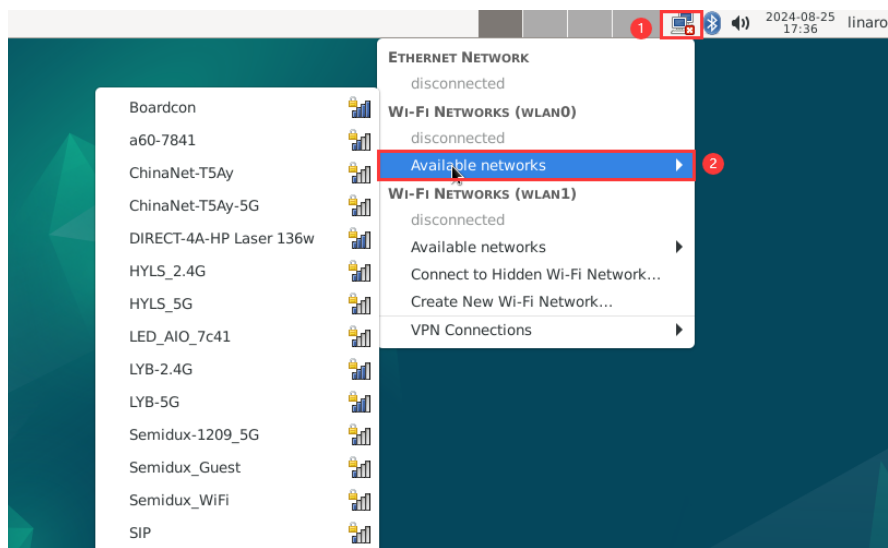
4.6 WiFi & Bluetooth

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

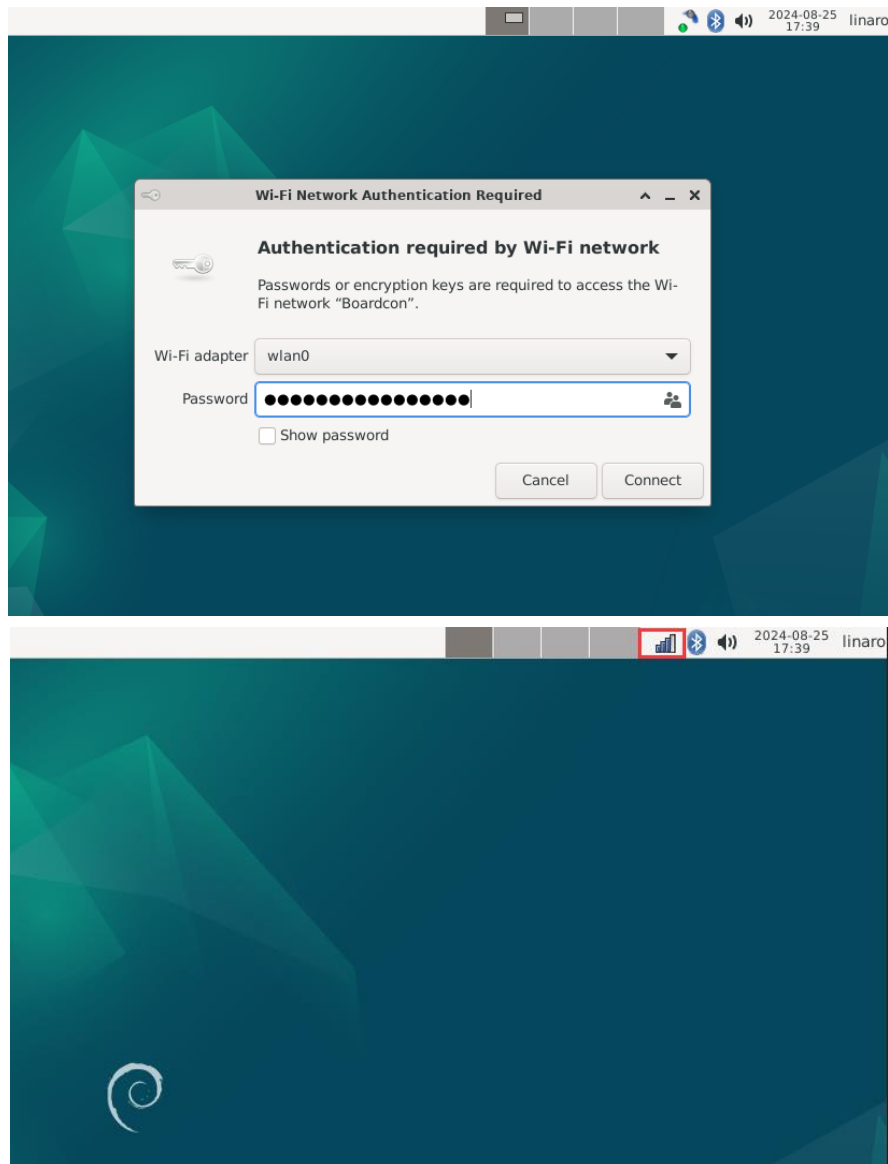


4.6.1 WiFi

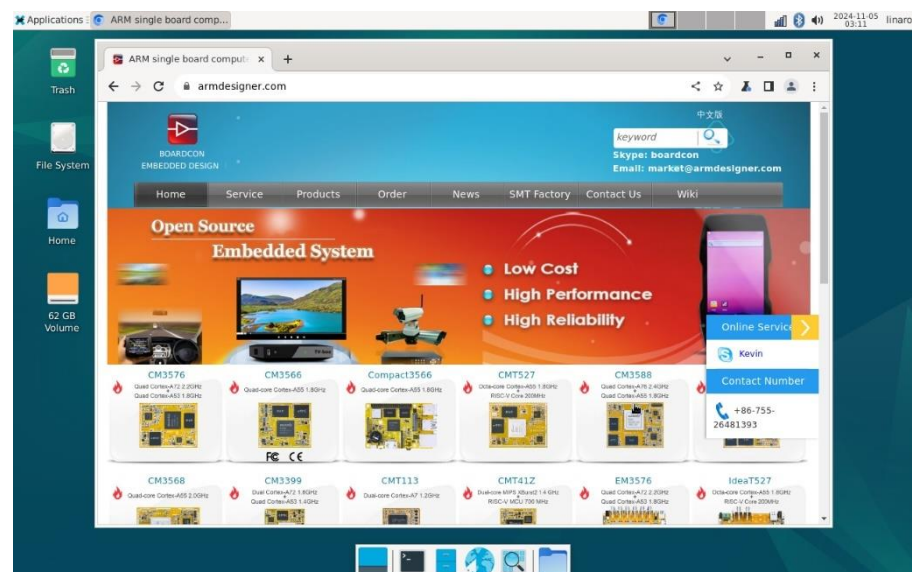
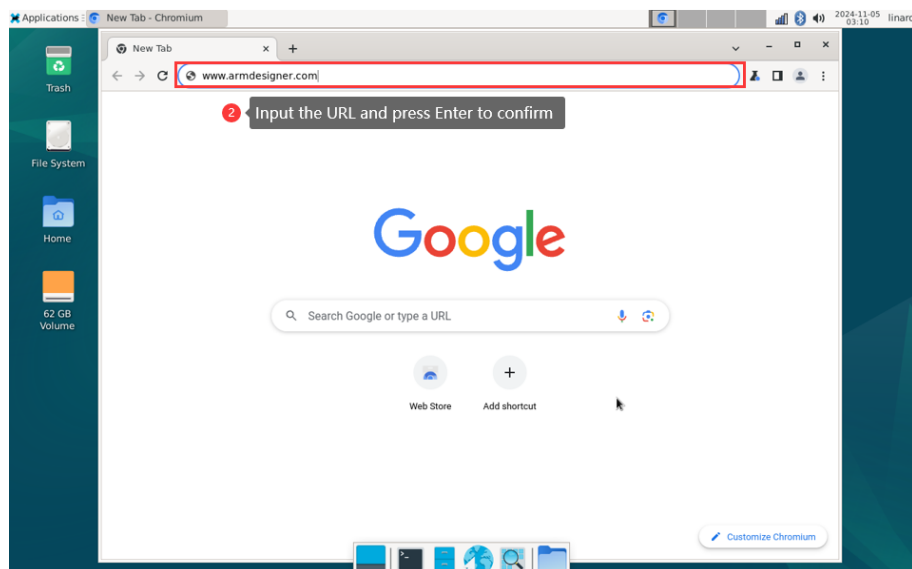
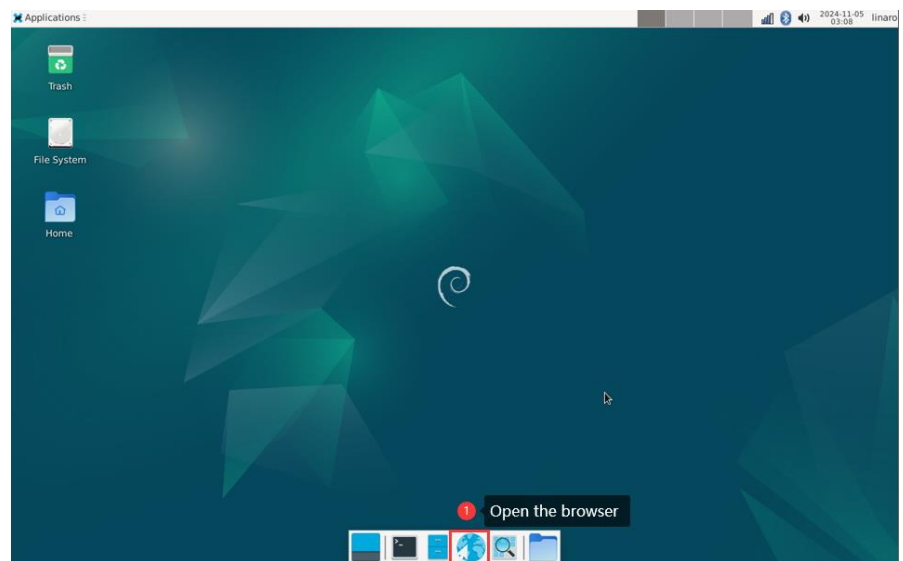
Step 1: Click the network icon in the top right corner of the interface, then select the **"Available Networks"** option to view the list of available hotspots.



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



Step 3: Test the wifi connection.



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

(1) View network interface information.

```
# ifconfig
```

```
root@linaro-alip:/# ifconfig
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.141 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::2970:d932:4830:11bf prefixlen 64 scopeid 0x20<link>
    ether d4:9c:dd:f5:e7:22 txqueuelen 1000 (Ethernet)
    RX packets 89 bytes 8169 (7.9 KiB)
    RX errors 0 dropped 2 overruns 0 frame 0
    TX packets 72 bytes 6243 (6.0 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlan1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether d6:9c:dd:f5:e7:22 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
```

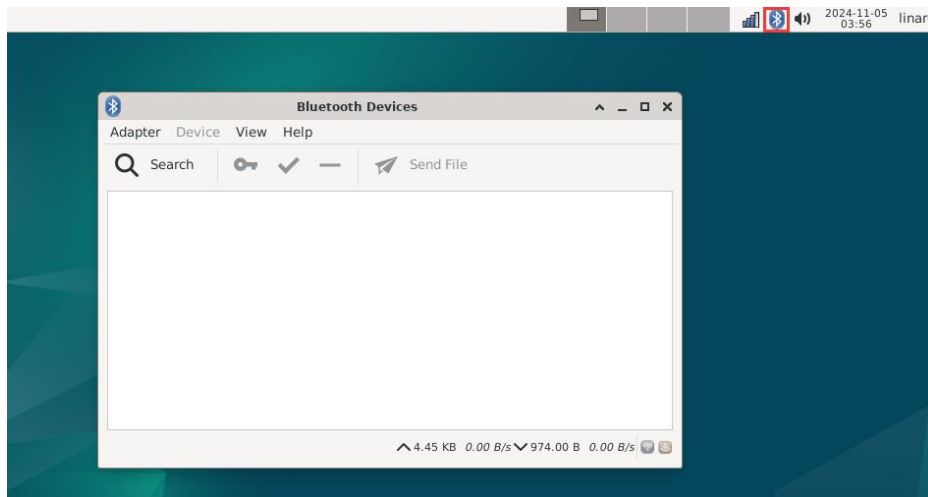
(2) Network connection test.

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

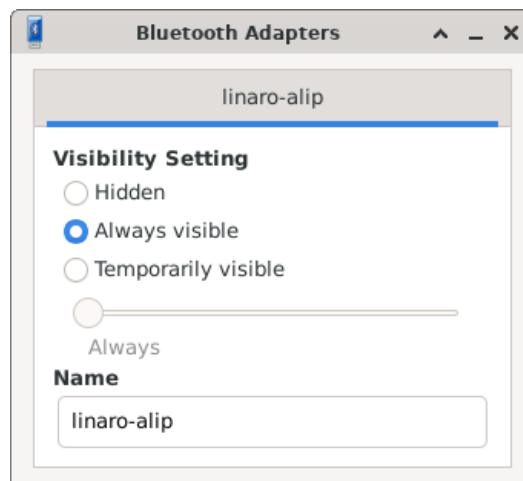
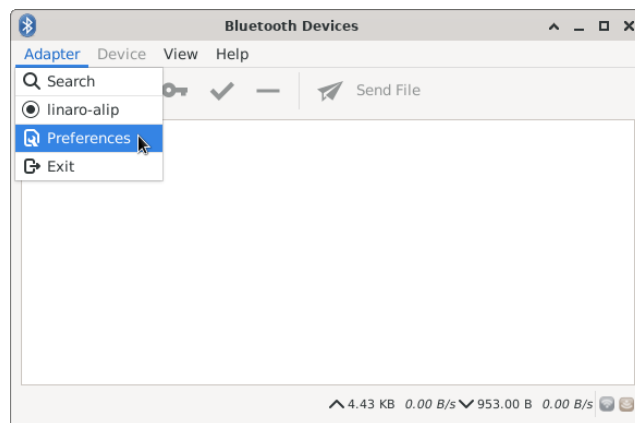
```
root@linaro-alip:/# ping -I wlan0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 192.168.0.141 wlan0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=48 time=342 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=48 time=197 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=48 time=197 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=48 time=197 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=48 time=197 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=48 time=197 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=48 time=198 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=48 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=48 time=216 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=10 ttl=48 time=197 ms
^C
--- www.armdesigner.com ping statistics ---
 10 packets transmitted, 10 received, 0% packet loss, time 1000ms
```

4.6.2 Bluetooth

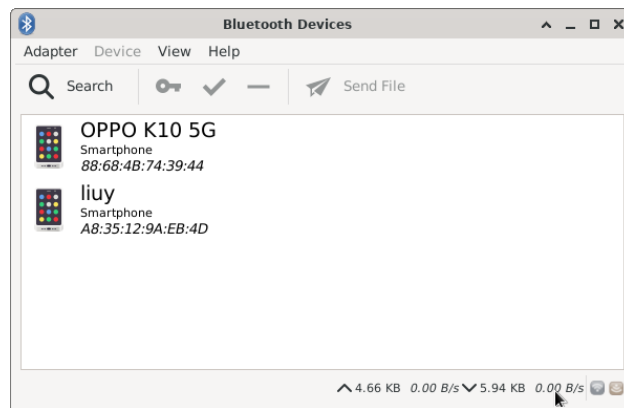
Step 1: Click the Bluetooth icon in the top right corner of the desktop.



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



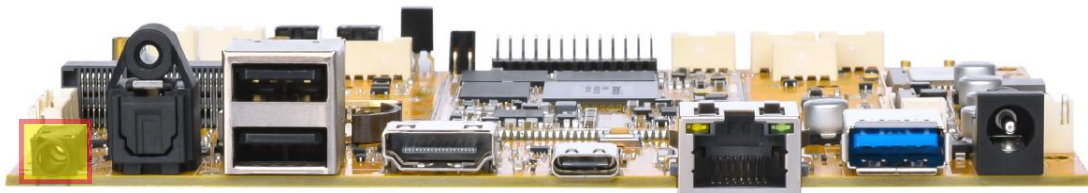
Step 3: Click Search to start searching and select the available device in the list to pair.



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

4.7 Headset

Step 1: Plug the headset into the headset jack.



Headset

Step 2: Verify that the sound card is successfully registered with proc fs.

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

```
root@linaro-alip:/# cat /proc/asound/cards
0 [rockchipdp0 ]: rockchip_dp0 - rockchip_dp0
rockchip_dp0
1 [rockchiphdmi0 ]: rockchip-hdmi0 - rockchip-hdmi0
rockchip-hdmi0
2 [rockchip-es8388 ]: rockchip-es8388 - rockchip-es8388
rockchip-es8388
3 [rockchip-spdif-tx]: simple-card - rockchip-spdif-tx0
rockchip-spdif-tx0
```

Step 3: Headset recording.

```
# arecord -Dhw:2,0 -f cd record.wav
```

```
root@linaro-alip:/# arecord -Dhw:2,0 -f cd record.wav
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

Step 4: Headset play audio.

```
# aplay -Dhw:2,0 record.wav
```

```
root@linaro-alip:/# aplay -Dhw:2,0 record.wav
Playing WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
root@linaro-alip:/#
```

Supplementary instructions on audio output.

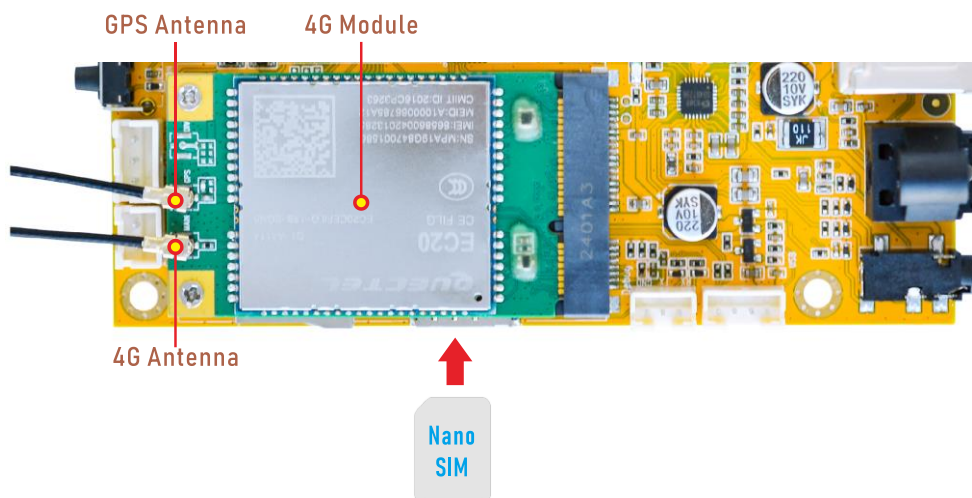
```
# aplay -Dhw:0,0 record.wav // Type-C interface display audio output
# aplay -Dhw:1,0 record.wav // HDMI TX audio output
# aplay -Dhw:2,0 record.wav // Headset audio output
```

4.8 4G & GPS

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

Step 2: Connect antenna and insert SIM card.

Step 3: Power on.



4.8.1 4G Test

Step 1: Execute the following command to start the PPP connection.

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

```
root@linaro-alip:/# pppd call quectel-ppp &
[1] 2773
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 3gpp # (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)
asynmap 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)
noccps        # (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
ATE0^M^M
OK
-- got it

send (ATI;+CSUB;+CSQ;+CPIN?;+COPS?;+CGREG?;&D2^M)
expect (OK)
^M
^M
Quectel^M
EC25^M
Revision: EC25EUXGAR08A17M1G^M
^M
SubEdition: V01^M
^M
+CSQ: 31,99^M
^M
+CPIN: READY^M
^M
+COPS: 0,0,"CHINA MOBILE",7^M
^M
+CGREG: 0,1^M
^M
OK
-- got it

send (AT+CGDCONT=1,"IP","3gnet",,,0,0^M)
expect (OK)
^M
^M
OK
-- got it

send (ATD*99#^M)
expect (CONNECT)
^M
^M
CONNECT
-- got it

Script chat -s -v -f /etc/ppp/peers/quectel-chat-connect finished (pid 2774), status = 0x0
Serial connection established.
using channel 1
Using interface ppp0
Connect: ppp0 <--> /dev/ttyUSB3
sent [LCP ConfReq id=0x1 <asynmap 0x0> <magic 0x6ec93af9> <pcomp> <accomp>]
rcvd [LCP ConfReq id=0x0 <asynmap 0x0> <auth chap MD5> <magic 0x8a34fe6a> <pcomp> <accomp>]
sent [LCP ConfAck id=0x0 <asynmap 0x0> <auth chap MD5> <magic 0x8a34fe6a> <pcomp> <accomp>]
rcvd [LCP ConfAck id=0x1 <asynmap 0x0> <magic 0x6ec93af9> <pcomp> <accomp>]
sent [LCP EchoReq id=0x0 magic=0x6ec93af9]
rcvd [LCP DiscReq id=0x1 magic=0x8a34fe6a]
rcvd [CHAP Challenge id=0x1 <28ed777388576629978d5b483ad34501>, name = "UMTS_CHAP_SVR"]
sent [CHAP Response id=0x1 <6937c2ae3c7f3a917bdf42f39a92226>, name = "test"]
rcvd [LCP EchoRep id=0x0 magic=0x8a34fe6a 6e c9 3a f9]
rcvd [CHAP Success id=0x1 ""]
CHAP authentication succeeded
CHAP authentication succeeded
sent [IPCP ConfReq id=0x1 <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2 0.0.0.0>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::2c3e:1987:14c5:6ee8>]
rcvd [IPCP ConfReq id=0x0]
sent [IPCP ConfNak id=0x0 <addr 0.0.0.0>]
rcvd [IPCP ConfNak id=0x1 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
sent [IPCP ConfReq id=0x2 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
rcvd [IPCP ConfReq id=0x1]
sent [IPCP ConfAck id=0x1]
rcvd [IPCP ConfAck id=0x2 <addr 10.29.47.207> <ms-dns1 120.196.165.7> <ms-dns2 221.179.38.7>]
Could not determine remote IP address: defaulting to 10.64.64.64
Script /etc/ppp/ip-pre-up started (pid 2781)
Script /etc/ppp/ip-pre-up finished (pid 2781), status = 0x0
local IP address 10.29.47.207
remote IP address 10.64.64.64
primary DNS address 120.196.165.7
secondary DNS address 221.179.38.7
Script /etc/ppp/ip-up started (pid 2784)
Script /etc/ppp/ip-up finished (pid 2784), status = 0x0
sent [IPV6CP ConfReq id=0x1 <addr fe80::2c3e:1987:14c5:6ee8>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::2c3e:1987:14c5:6ee8>]
[ 28.077291] dw9714 3-000c: cmd 0x80685600 not supported
sent [IPV6CP ConfReq id=0x1 <addr fe80::2c3e:1987:14c5:6ee8>]
[ 33.246544] vcc3v3_lcd0_n: disabling
sent [IPV6CP ConfReq id=0x1 <addr fe80::2c3e:1987:14c5:6ee8>]
expect (OK)
...
```

Step 2: Check the status of the network interfaces.

```
# ifconfig ppp0
```

```
root@linaro-alip:/# ifconfig ppp0
ppp0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
    inet 10.29.47.207 netmask 255.255.255.255 destination 10.64.64.64
    ppp txqueuelen 3 (Point-to-Point Protocol)
    RX packets 136 bytes 10600 (10.3 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 158 bytes 11052 (10.7 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Step 3: Check the connectivity of the detection network.

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

```
root@linaro-alip:/# ping -I ppp0 www.armdesigner.com
PING www.armdesigner.com (67.222.54.196) from 10.29.47.207 ppp0: 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=43 time=282 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=43 time=281 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=43 time=286 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=43 time=297 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=43 time=300 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=43 time=294 ms
^C
--- www.armdesigner.com ping statistics ---
8 packets transmitted, 6 received, 25% packet loss, time 7055ms
rtt min/avg/max/mdev = 281.022/290.019/299.837/7.287 ms
```

4.8.2 GPS Test

Step 1: Verify whether /dev/ttyUSB3 is currently in use. If it is, please kill the associated process.

```
# lsof /dev/ttyUSB3
# kill -9 <PID>
```

```
root@linaro-alip:/# lsof /dev/ttyUSB3
COMMAND PID USER FD TYPE DEVICE SIZE/OFF NODE NAME
pppd 2773 root 10u CHR 188,3 0t0 668 /dev/ttyUSB3
root@linaro-alip:/# kill -9 2773
root@linaro-alip:/#
[1]+ Killed pppd call quectel-ppp
```

Step 2: Enable GPS functionality.

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

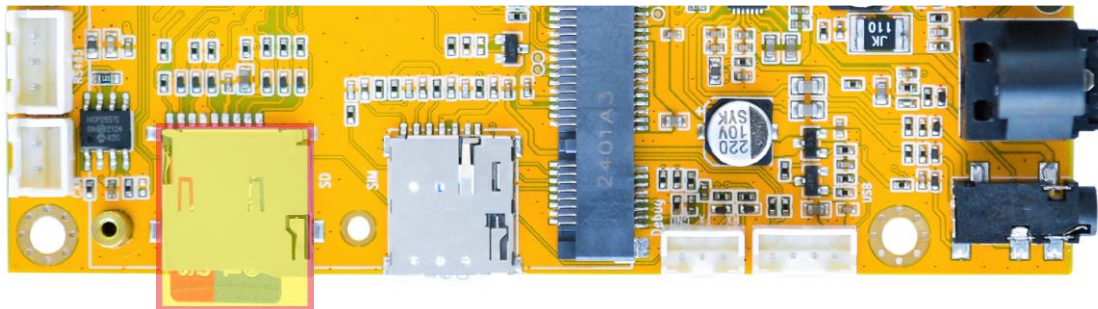
Step 3: Get GPS data.

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

```
root@linaro-alip:/# echo -e "AT+QGPS=1\r\n" > /dev/ttyUSB2
root@linaro-alip:/# cat /dev/ttyUSB1
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
$GPRMC,,V,,,,,,,,,N,V*29
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,*32
$GPGGA,,,,,0,,,,,,,,,*66
```

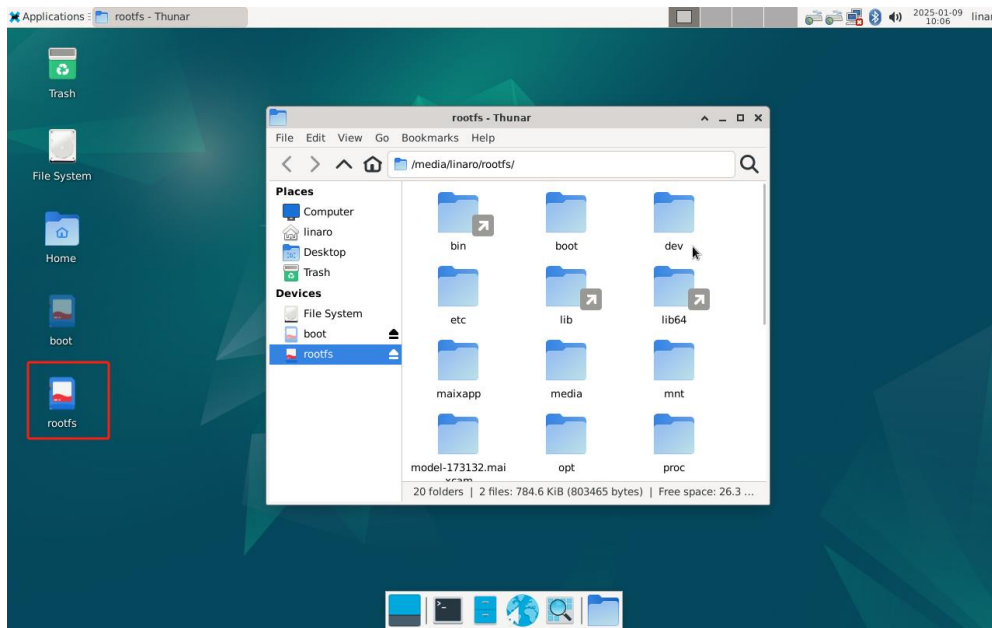
4.9 SD Card

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

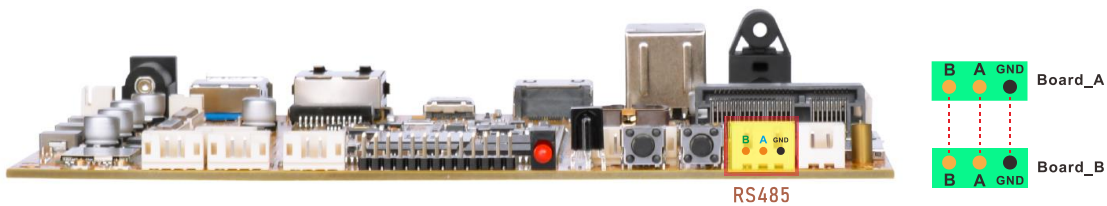


Micro SD

Step 2: After the SD card is inserted, click the desktop icon to mount the SD card device.



4.10 RS485



Step 1: Connect the RS485 ports of board A and board B.

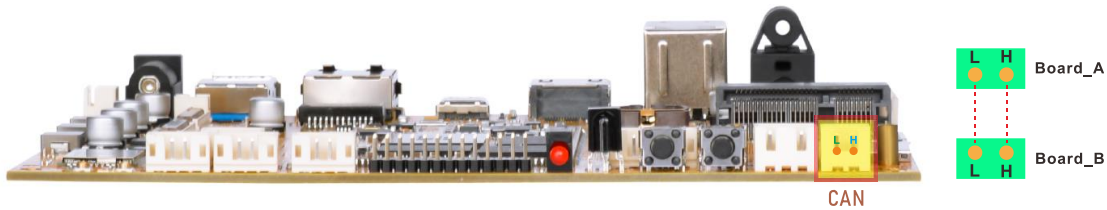
Step 2: Execute command on the terminal serial ports of board A and board B respectively to begin testing.

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

```
root@linaro-alip:/# com /dev/ttyS8 115200 8 0 1
port = /dev/ttyS8
baudrate = 115200
cs = 8
parity = 0
stopb = 1
RECV: 5656565656
RECV: 898989
RECV: 00000222
yuyuyuyu
2313132323
77777777
```

```
root@linaro-alip:/# com /dev/ttyS8 115200 8 0 1
port = /dev/ttyS8
baudrate = 115200
cs = 8
parity = 0
stopb = 1
5656565656
898989
00000222
RECV: yuyuyuyu
RECV: 2313132323
RECV: 77777777
```

4.11 CAN



Step 1: Connect the CAN ports of board A and board B.

Step 2: Execute the following commands on the serial terminal of board A and board B respectively.

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

Step 3: Execute the following command as the receiver.

```
# candump can0
```

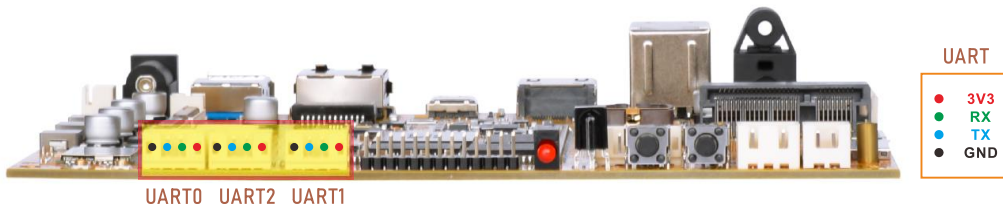
Step 4: Execute the following command as the transmitter.

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

```
root@linaro-alip:/# ip link set can0 down
root@linaro-alip:/# ip link set can0 type can bitrate 500000
root@linaro-alip:/# ip link set can0 up
[17302.549568] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# candump can0
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# ip link set can0 down
root@linaro-alip:/# ip link set can0 type can bitrate 500000
root@linaro-alip:/# ip link set can0 up
[1259.784189] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
root@linaro-alip:/# candump can0
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
can0 123 [4] DE AD BE EF
^Croot@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
root@linaro-alip:/# cansend can0 123#DEADBEEF
```

4.12 UART

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



Step 2: UART0 test.

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

```
root@linaro-alip:/# com /dev/ttyS0 115200 8 0 1
port = /dev/ttyS0
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 87.312051] of_dma_request_slave_channel: dma-names property of node '/serial@fd890000' missing or empty
[ 87.312103] dw-apb-uart fd890000.serial: failed to request DMA, use interrupt mode
1234567890
RECV: 1234567890
abcdefg
RECV: abcdefg
qwertyuiop
RECV: qwertyuiop
```

Step 3: UART1 test.

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

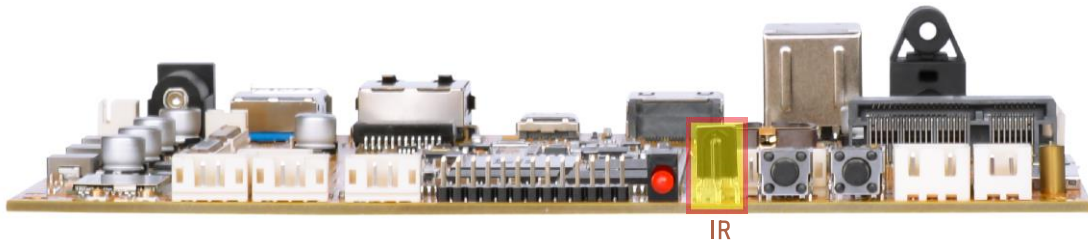
```
root@linaro-alip:/# com /dev/ttyS7 115200 8 0 1
port = /dev/ttyS7
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 117.112553] of_dma_request_slave_channel: dma-names property of node '/serial@feba0000' missing or empty
[ 117.112604] dw-apb-uart feba0000.serial: failed to request DMA, use interrupt mode
1234567890
RECV: 1234567890
qwertyuiop
RECV: qwertyuiop
abcdefg
RECV: abcdefg
```

Step 4: UART2 test.

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

```
root@linaro-alip:/# com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
[ 188.631491] of_dma_request_slave_channel: dma-names property of node '/serial@feb70000' missing or empty
[ 188.631542] dw-apb-uart feb70000.serial: failed to request DMA, use interrupt mode
1234567890
RECV: 1234567890
abcdefg
RECV: abcdefg
qwertyuiop
RECV: qwertyuiop8
```

4.13 IR



Step 1: Enable IR debugging print.

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

Step 2: Change log print level.

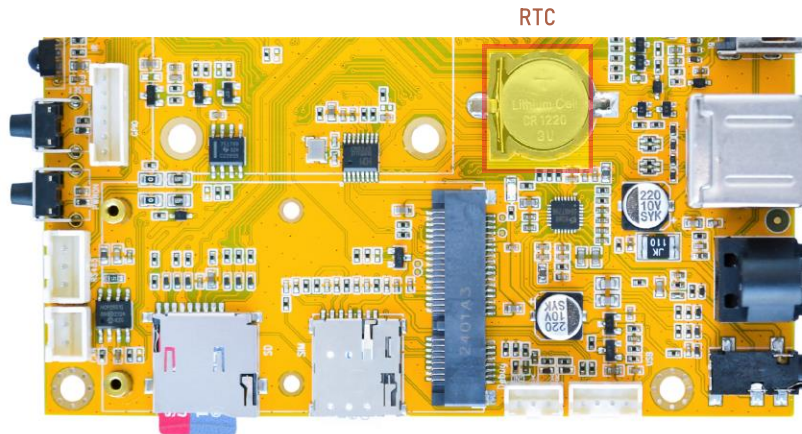
```
# echo 8 > /proc/sys/kernel/printk
```

Step 3: Using the infrared remote control to press a button on the IR receiver will print the key code in the log.

```
root@linaro-alip:/# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
root@linaro-alip:/# echo 8 > /proc/sys/kernel/printk
root@linaro-alip:/# [ 530.233731] USERCODE=0x900
[ 530.256129] RMC_GETDATA=50
[ 530.399415] USERCODE=0x900
[ 530.422943] RMC_GETDATA=70
[ 536.564405] USERCODE=0x53c
[ 536.586796] RMC_GETDATA=50
[ 537.565000] USERCODE=0x43c
[ 537.587401] RMC_GETDATA=50
[ 538.778932] USERCODE=0x8
[ 538.801354] RMC_GETDATA=50
[ 539.383936] USERCODE=0x18
[ 539.406331] RMC_GETDATA=50
[ 540.097322] USERCODE=0x18
[ 540.119699] RMC_GETDATA=50
[ 540.600202] USERCODE=0x18
[ 540.622646] RMC_GETDATA=50
```

4.14 RTC

Step 1: Install the coin cell battery.



Step 2: Set the system time.

```
# date -s "2025-02-26 10:00:00"
```

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

```
# hwclock -w
```

Step 4: Display the current hardware clock time.

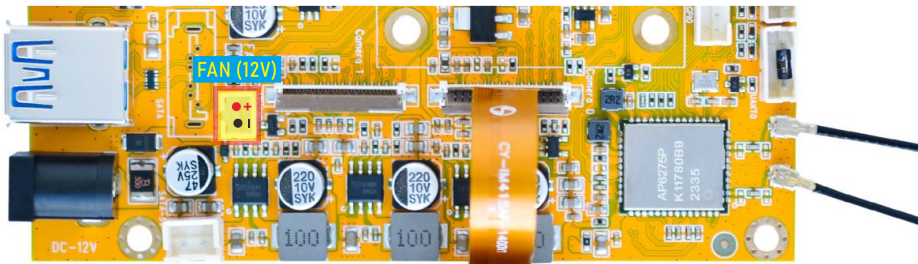
```
# hwclock
```

```
root@linaro-alip:/# date -s "2025-02-26 10:00:00"
Wed Feb 26 10:00:00 UTC 2025
root@linaro-alip:/# hwclock -w
root@linaro-alip:/# hwclock
2025-02-26 10:00:07.524224+00:00
root@linaro-alip:/# hwclock
2025-02-26 10:00:10.257683+00:00
root@linaro-alip:/# hwclock
2025-02-26 10:00:13.250058+00:00
```

Step 5: Turn off the development board, and turn on after a period of time to check whether the time is saved.

```
root@linaro-alip:/# hwclock
2025-02-26 10:01:08.498025+00:00
root@linaro-alip:/# hwclock
2025-02-26 10:01:11.337356+00:00
root@linaro-alip:/# hwclock
2025-02-26 10:01:14.496524+00:00
```

4.15 Fan



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

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

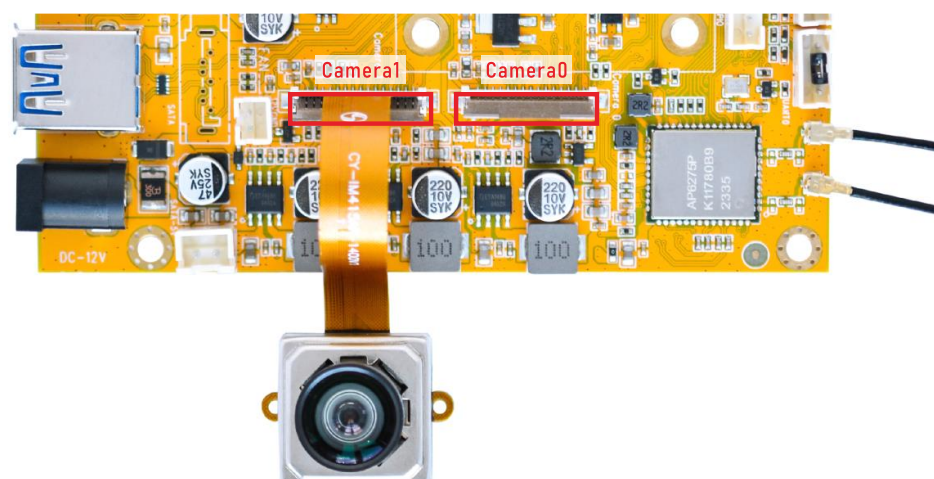
```
root@linaro-alip:/# cat /sys/class/thermal/thermal_zone0/temp
31461
```

When the printed value exceeds 45000, indicating that the temperature has exceeded 45 degrees Celsius, the FAN interface outputs 12V and the fan automatically starts working.

4.16 Camera

4.16.1 Camera1

Idea3588S Debian12 system the camera1 port and imx415 camera are configured by default, as shown in the figure below.



Step 1: Execute the following commands to view the device channel.

```
# grep "" /sys/class/video4linux/v*/name | grep mainpath
# grep "" /sys/class/video4linux/v*/name | grep selfpath
```

```
root@linaro-alip:/# grep "" /sys/class/video4linux/v*/name | grep mainpath
/sys/class/video4linux/video11/name:rkisp_mainpath
root@linaro-alip:/# grep "" /sys/class/video4linux/v*/name | grep selfpath
/sys/class/video4linux/video12/name:rkisp_selfpath
```

Step 2: Preview camera1 in two ways.

(1) Execute the command.

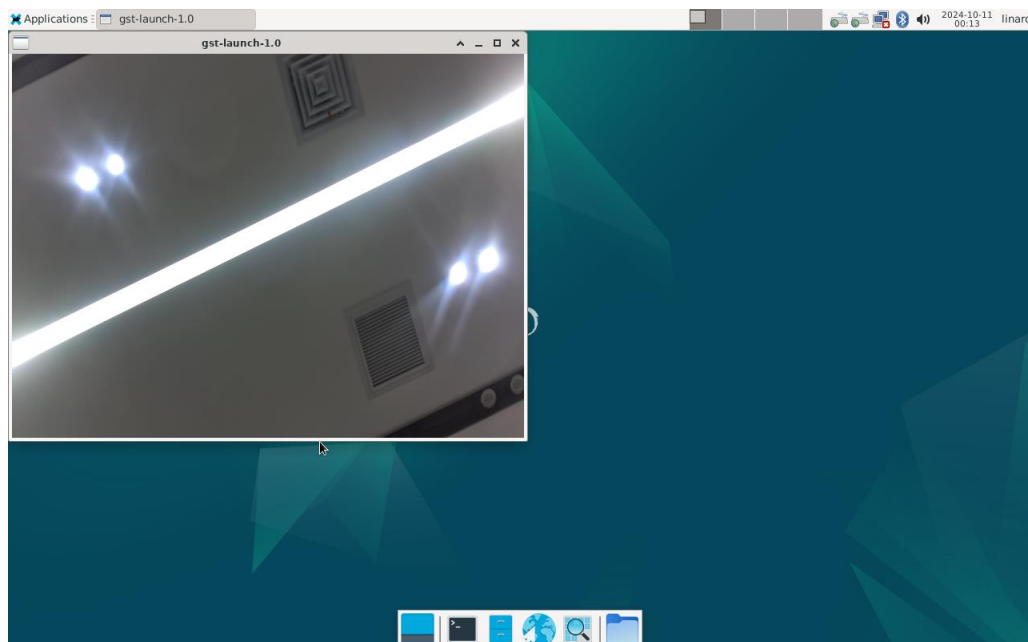
```
# gst-launch-1.0 v4l2src device=/dev/video11 !
video/x-raw,format=NV12,width=1920,height=1080, framerate=30/1 ! xvimagesink
```

(2) Execute the script.

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

```
root@linaro-alip:/#          gst-launch-1.0          v4l2src          device=/dev/video11          !
video/x-raw,format=NV12,width=1920,height=1080, framerate=30/1 ! xvimagesink
[ 890.906551] dw9714 3-000c: cmd 0x80685600 not supported
[ 891.250760] dw9714 3-000c: cmd 0x80685600 not supported
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
[ 199.996556] rockchip-mipi-csi2 mipi1-csi2: stream on, src_sd: 0000000eab33bfd, sd_name:rockchip-csi2-dphy0
[ 199.996582] rockchip-mipi-csi2 mipi1-csi2: stream ON
0:00:20.3 / 99:99:99.
```

Preview camera effect as shown in the figure, support Auto Zoom function.



4.16.2 Camera0

Only one interface of camera1 or camera0 can be used at same time. To use the interface of camera0, modify the device tree in the kernel.

Step 1: Open the board level device tree file.

```
$ vim kernel-6.1/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
```

Step 2: Annotate the camera1 device tree file and open the camera0 file.

```
#include "rk3588s-evb4-imx415-dphy0.dtsi"  
//#include "rk3588s-evb4-imx415-dcphy1.dtsi"
```

```
// SPDX-License-Identifier: (GPL-2.0+ OR MIT)  
/*  
 * Copyright (c) 2021 Rockchip Electronics Co., Ltd.  
 */  
  
#include "dt-bindings/usb/pd.h"  
#include "rk3588s.dtsi"  
#include "rk3588s-evb.dtsi"  
#include "rk3588-rk806-single.dtsi"  
#include "rk3588s-evb4-imx415-dphy0.dtsi"  
//#include "rk3588s-evb4-imx415-dcphy1.dtsi"
```

Step 3: Back to source directory and recompile the kernel , **boot.img** will be generated in the *output/firmware* directory and burned using the RKDevTool.

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

Step 4: Use camera0 in the same way as using camera1.

4.17 Video Playback

Step 1: Execute the following command to switch to performance mode.

```
# echo performance | tee $(find /sys/ -name *governor)
```

```
root@linaro-alip:/# echo performance | tee $(find /sys/ -name *governor)  
tee: /sys/module/cpuidle/parameters/governor: Permission denied  
tee: /sys/module/cpufreq/parameters/default_governor: Permission denied  
performance  
tee: /sys/devices/system/cpu/cpuidle/current_governor: Invalid argument  
root@linaro-alip:/#
```

Step 2: Execute the following command to test the system's built-in video playback, with sound output via Headset.

```
# gst-play-1.0 --videosink=xvimagesink /userdata/test.mp4 --audiosink="alsasink  
device=hw:2"
```

```
root@linaro-alip:/# gst-play-1.0 --videosink=xvimagesink /usr/local/test.mp4 --audiosink="alsasink  
device=hw:3"  
Press 'k' to see a list of keyboard shortcuts.  
Now playing /usr/local/test.mp4  
Redistribute latency...  
0:00:10.0 / 0:00:10.0  
Reached end of play list.
```

Change the output device of the audio, and change the sound card device number at the end of the previous command. The sound card device number can be obtained by using the following command.

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

```
root@linaro-alip:/# cat /proc/asound/cards  
0 [rockchipdp0 ]: rockchip_dp0 - rockchip_dp0  
rockchip_dp0  
1 [rockchiphdmi0]: rockchip-hdmi0 - rockchip-hdmi0  
rockchip-hdmi0  
2 [rockchip-es8388]: rockchip-es8388 - rockchip-es8388  
rockchip-es8388  
3 [rockchip-spdif-tx0]: simple-card - rockchip-spdif-tx0  
rockchip-spdif-tx0
```

For example, change the playback audio device to HDMI.

```
# gst-play-1.0 --videosink=xvimagesink /usr/local/test.mp4 --audiosink="alsasink  
device=hw:1"
```

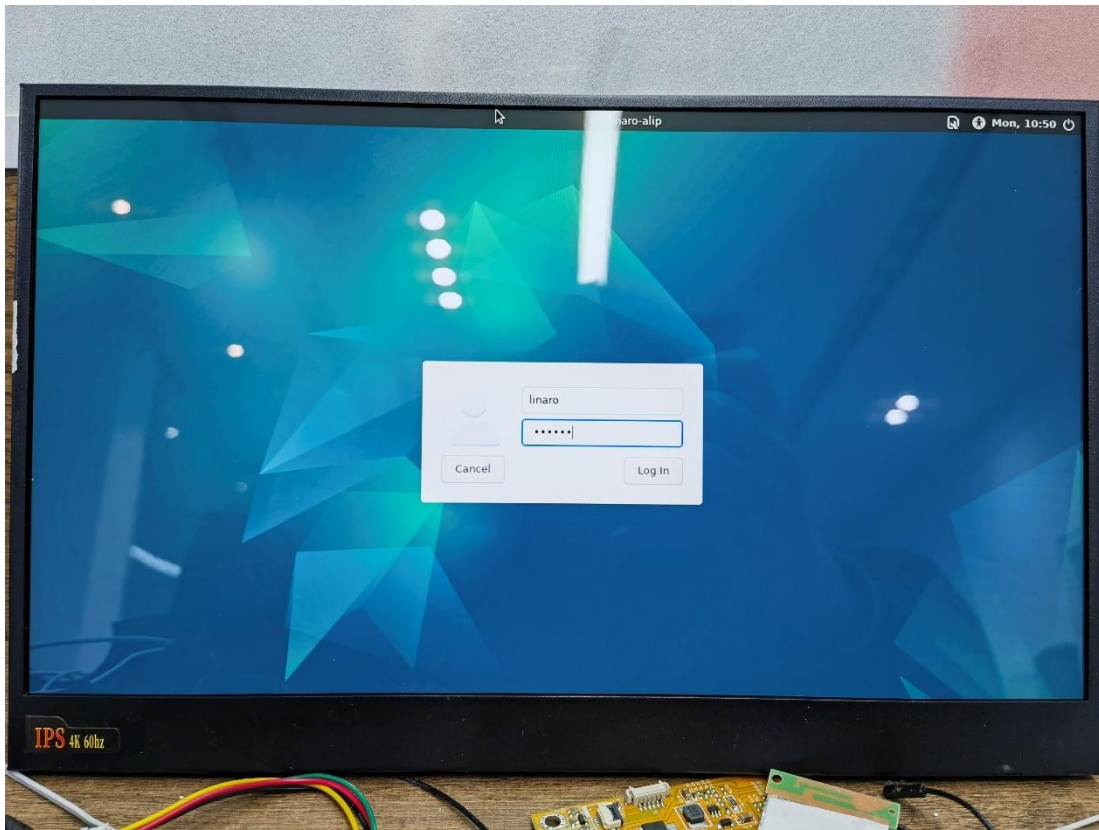
The Idea3588s Debian12 has been tested to decode and play 8K 30fps video content stably, and print the fps in real time.

```
# GST_DEBUG=fpsdisplaysink:7 gst-play-1.0 --flags=3 --videosink="fpsdisplaysink  
video-sink=xvimagesink signal-fps-measurements=true text-overlay=false sync=true"  
/userdata/H265_8KP30.mp4 --audiosink="alsasink device=hw:2"
```

Execute the following command to specify the render range when the video is playing, but the fps cannot be viewed.

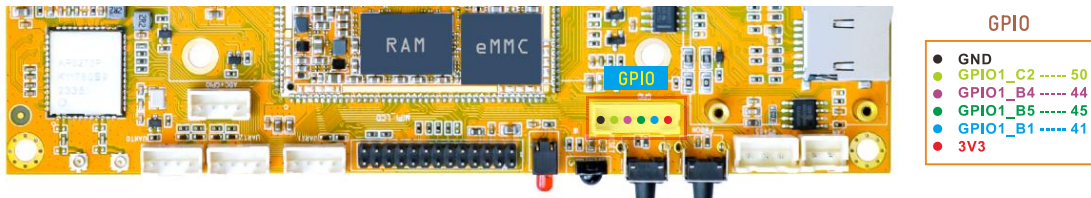
```
root@linaro-alip:/# gst-play-1.0 --videosink="waylandsink render-rectangle=\"<0,0,500,500>\" \"  
/userdata/H265_8KP30.mp4 --audiosink="alsasink device=hw:2,0"  
Press 'k' to see a list of keyboard shortcuts.  
Now playing /userdata/H265_8KP30.mp4  
Redistribute latency...  
Redistribute latency...  
Redistribute latency...  
Redistribute latency...  
Redistribute latency...  
0:00:03.8 / 0:04:57.3
```

When the Power key is pressed, the system goes to sleep. When the key is pressed again, the system wakes up. After waking up, log in to the desktop environment. The user name and password are both “linaro”.



Press and hold the key to force the system to restart.

4.19 GPIO



Execute the following commands to control GPIO1_C2.

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

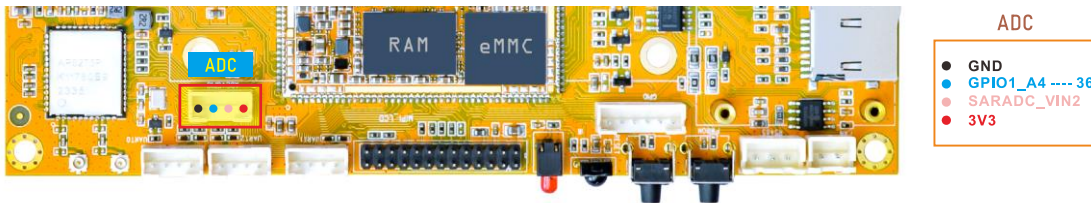
```

root@linaro-alip:/# echo 50 > /sys/class/gpio/export
root@linaro-alip:/# echo out > /sys/class/gpio/gpio50/direction
root@linaro-alip:/# echo 0 > /sys/class/gpio/gpio50/value
root@linaro-alip:/# cat /sys/class/gpio/gpio50/value
0
root@linaro-alip:/# echo 1 > /sys/class/gpio/gpio50/value
root@linaro-alip:/# cat /sys/class/gpio/gpio50/value
1
root@linaro-alip:/# echo 50 > /sys/class/gpio/unexport

```

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

4.20 ADC+GPIO



4.20.1 ADC

Step 1: Connect the SARADC_VIN2 pin to the 3.3V pin or GND pin.

Step 2: Execute the following command to compare the obtained value change.

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

Connect 3.3V pin:

```

root@linaro-alip:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
4095

```

Connect GND pin:

```

root@linaro-alip:/# cat /sys/bus/iio/devices/iio\:device0/in_voltage2_raw
3

```

4.20.2 GPIO

Execute the following commands to control GPIO1_A4.

```

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

```



```
root@linaro-alip:/# echo 36 > /sys/class/gpio/export
root@linaro-alip:/# echo out > /sys/class/gpio/gpio36/direction
root@linaro-alip:/# echo 0 > /sys/class/gpio/gpio36/value
root@linaro-alip:/# cat /sys/class/gpio/gpio36/value
0
root@linaro-alip:/# echo 1 > /sys/class/gpio/gpio36/value
root@linaro-alip:/# cat /sys/class/gpio/gpio36/value
1
root@linaro-alip:/# echo 36 > /sys/class/gpio/unexport
```