



FET3588-C OK3588-C

Embedded Development Platform

Linux5.10.209+ Qt5.15.10 User's Manual

Rev.1.0

Safety Instructions & Maintenance



- DO NOT plug&unplug the SoM and peripheral modules with power.
- Read and follow all the safety instructions and warnings marked on the products.
- Keep the product dry. If a fault occurs(liquid penetration or splashing), disconnect the power and dry it.
- Maintain sufficient ventilation to avoid component damage caused by excessive heat.
- DO NOT store and use the product in a dusty, dirty environment.
- DO NOT use the product in a harsh thermal alternating environment. Failure to do this may result in component damage.
- DO NOT drop the product and expose it to knock or sever shock. Failure to do this may result in circuits.
- DO NOT use organic solvents or corrosive liquid to clean the product.
- DO NOT attempt to repair or disassemble the product. If a fault occurs, please consult us in time for repair.
- DO NOT attempt to modify or use unauthorized accessories. Failure to do this may result in the product.

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- 1.2 Problems encountered during the software and hardware manuals usage;
- 1.3 ODM after-sales technical support ;
- 1.4 Fault evaluation and after-sales maintenance.

2. Technical Service to Be Discussed

- 2.1 Modification of source code and understanding;
- 2.2 Operating system porting methods;
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Revision History

Date	Manual Version	SoM Version	Carrier Board Version	Revision History
25/11/2024	V1.0	V1.1	V1.3 and Above	OK3588-C Linux5.10.209 Software Manual Initial Version

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Overview

This manual is designed to help users quickly familiarize themselves with the product, and understand the interface functions and testing methods. It primarily covers the testing of interface functions on the development board, the methods for flashing images, and troubleshooting procedures for common issues encountered in use. In the process of testing, some commands are annotated to facilitate the user's understanding, mainly for practical use. For kernel compilation, related application compilation methods, development environment setup, etc., please refer to "OK3588-C Linux User's Compilation Manual" provided by Forlinx.

- There are total six parts:
 - Chapter 1. provides an overview of the product, briefly introducing the interface resources of the development board, the relevant driver paths in the kernel source code, supported flashing and booting methods, as well as explanations of key sections in the documentation; Chapter 2. is the fast boot/startup of the product, which can adopt two ways of serial port login and network login;
 - Chapter 3. provides function test of product desktop and QT interface; Chapter 4. is the command line operation of the product for functional testing;
 - Chapter 5. is the multimedia test of the product, including the playback test of the camera and the video hardware codec test;
 - Chapter 6. is the image update of the product, which mainly describes the method of updating the image to the storage device. Users can choose the corresponding flashing mode according to the actual situation.
- A description of some of the symbols and formats associated with this manual:

Format	Meaning
	Note or information that requires special attention, be sure to read carefully
	Relevant notes on the test chapter.
	Indicates the related path.
Blue on gray	Refers to commands entered at the command line(Manual input required).
Black font on gray background	Serial port output message after entering a command
Black font on gray background	Key information in the serial port output message
//	Interpretation of input instructions or output information
Username@Hostname	forlinx @ ubuntu: Development environment ubuntu account information. The user can use this information to determine the environment, in which the function operates.

After packaging the file system, you can use the "ls" command to view the generated files.

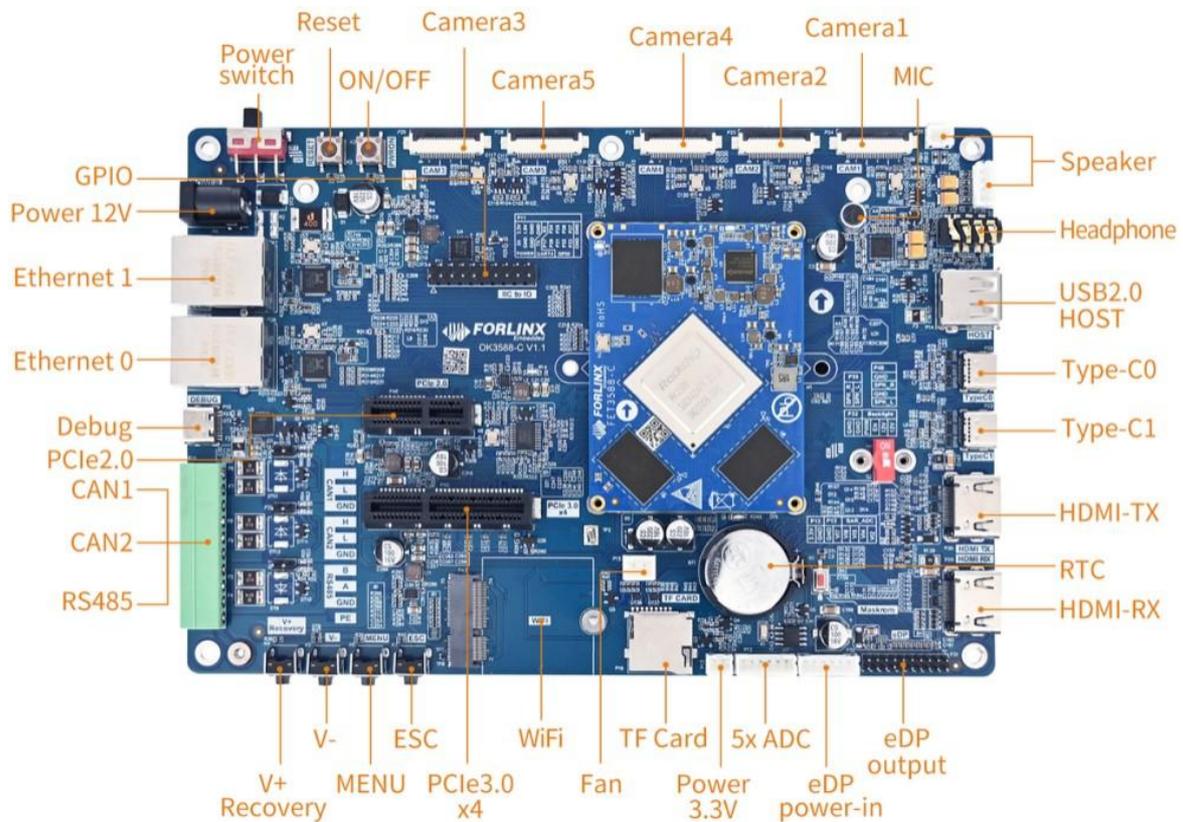
```
forlinx@ubuntu:~/3588$ ls //List the files in  
OK3588-linux-source OK3588-linux- this directory
```

- forlinx@ubuntu: the username is forlinx and the hostname is ubuntu, indicating that the operation is performed in the development environment ubuntu.
- //: Explanation of the instruction, no input required.
- ls: Blue font, indicating the relevant commands that need to be manually entered. OK3588-linux-source: Black font is the output information after entering the command; bold font is the key information; here is the packaged file system.

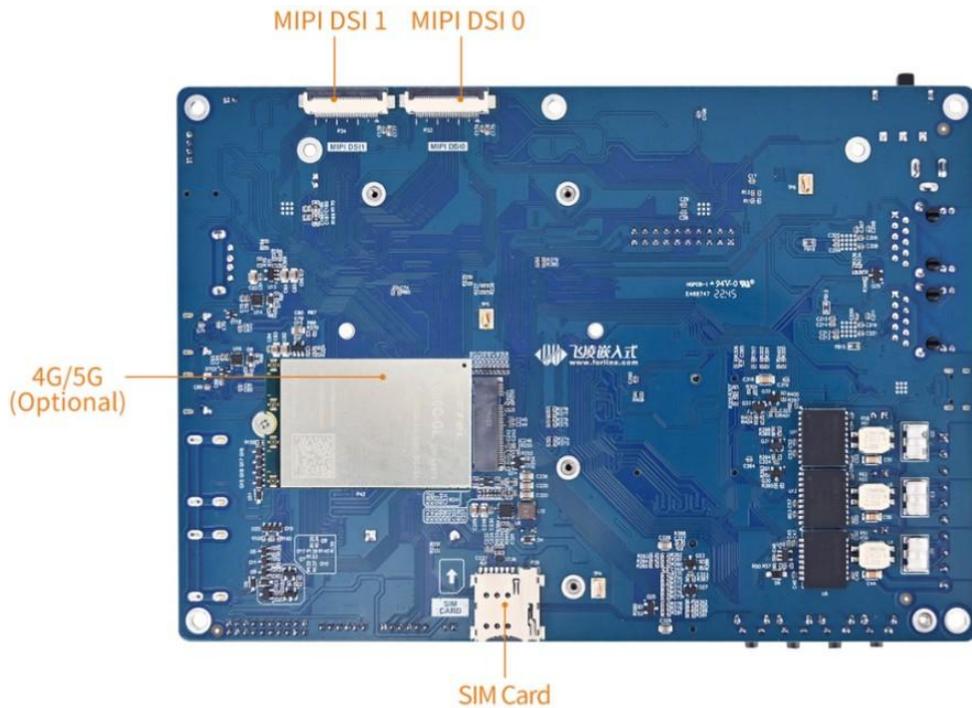
Chapter 1. OK3588 Development Board Description

RK3588 is a low-power, high-performance processor based on ARM64 architecture, which includes 4-core Cortex-A55 and 4-core Cortex-A76 as well as independent NEON processor and neural network processor NPU, and it can be applied to computers, cell phones, personal mobile Internet, and digital multimedia devices.

The connection of OK3588 SoM and the carrier board is board-to-board, and the main interfaces are as follows:



Front



Back

Note:

Hardware parameters are not described in this software manual. Please read "OK3588-C

Hardware Manual" under the "Hardware Information/User's Manual" path before developing the software by referring to this manual to understand the product naming rules and the hardware configuration information of the product you are using.

1.1 CPU/GPU/NPU Frequency Description

RK3588J industrial grade SoM frequencies are described below:

Note: Starting from version R4, the industrial-grade RK3588J SoM defaults to overclocking mode in the user guide to assist in testing maximum performance. However, for stable operation, it's recommended to switch to normal mode unless specific performance requirements exist.

Refer to "Rockchip RK3588J Data Sheet V1.1-03/08/2023.pdf" Table 3-2 Recommended operating conditions

Maximum CPU A76 frequency, normal mode ①	1.6 GHz
Maximum CPU A76 frequency, overclocking mode ②	2.0GHz
Maximum CPU A55 frequency, normal mode ①	1.3GHz
Maximum CPU A55 frequency, overclocking mode ②	1.7GHz
Maximum GPU frequency, normal mode ①	700MHz

Maximum CPU A76 frequency, normal mode ①	1.6 GHz
Maximum GPU frequency, overclocking mode ②	850MHz
Maximum NPU frequency, normal mode ①	800MHz
Maximum NPU frequency, overclocking mode ②	950MHz

1. Normal mode indicates that the chip is operating at a safe voltage and frequency. For industrial environments, it is highly recommended to keep it in normal mode to reasonably ensure longevity.
2. Overclocking mode will bring higher frequency, and the corresponding voltage will also increase. When running in overclocking mode for a long time, the life of the chip may be shortened, especially in high temperature conditions .
3. To switch to "normal mode", you need to add the following to the reference in the kernel device tree #include "rk3588j.dtsi", path: OK3588_Linux_fs/kernel/arch/arm64/boot/dts/rockchip/OK3588-C-common.dtsi

```
#include "dt-bindings/usb/pd.h"
#include <dt-bindings/gpio/gpio.h>
#include <dt-bindings/pwm/pwm.h>
#include <dt-bindings/pinctrl/rockchip.h>
#include <dt-bindings/input/rk-input.h>
#include <dt-bindings/display/drm_mipi_dsi.h>
#include <dt-bindings/display/rockchip_vop.h>
#include <dt-bindings/sensor-dev.h>

#include "rk3588.dtsi"
#include "rk3588j.dtsi"
#include "FET3588-C.dtsi"
#include "rk3588-rk806-single.dtsi"
#include "OK3588-C-Camera.dtsi"
/ {
    forlinx-control {
        /**
         * hdmi0 and edp0 share same port, only one can be used.
         * hdmi1 and edp1 share same port, only one can be used.
         * only four VPs internally, so up to four interfaces can be activated
         * hdmi edp dp can only be displayed on VP0 or VP1 or VP2.
         * dsi0 dsi1 can only be displayed on VP2 or VP3.
         * rgb can only be displayed on VP3.
         */
        /**/
        /*** if "disabled" , display is controlled by uboot ***/
        status = "disabled";

        HDMI0 = "VP0";
        HDMI1 = "OFF";
        EDP0 = "OFF";
        EDP1 = "VP1";
        DP0 = "OFF";
        DP1 = "OFF";
        MIPI0 = "VP2";
        MIPI1 = "VP3";
        RGB = "OFF";
        primary_display = "MIPI0";
        primary_display_resolution = "1920x1080p60";
        disp_type = "sync";
    };
};
```

RK3588 commercial grade SoM frequencies are described below:

Refer to "Rockchip RK3588 Datasheet V1.7-17/11/2023.pdf" Table 3-2 Recommended operating conditions

Maximum CPU A76 frequency	2.2-2.4 GHz
Maximum CPU A55 frequency	1.8GHz
Maximum GPU frequency	1GHz
Maximum CPU A76 frequency	2.2-2.4 GHz
Maximum NPU frequency	1GHz

1.2 Introduction to Linux 5.10.209 System Software Resources

Device	Location of driver source code in the kernel	Device Name
LCD Backlight Driver	drivers/video/backlight/pwm_bl.c	/sys/class/backlight
USB Port	drivers/usb/storage/	
USB Mouse	drivers/hid/usbhid/	/dev/input/mice
Ethernet	drivers/net/ethernet/stmicro/stmmac	
SD/micro TF card driver	drivers/mmc/host/dw_mmc-rockchip.c	/dev/mmcblk1pX
EMMC Driver	drivers/mmc/host/dw_mmc-rockchip.c	/dev/mmcblk0pX
OV13850	drivers/media/i2c/ov13850.c	/dev/videoX
LCD Controller	drivers/gpu/drm/rockchip/rockchip_drm_vop.c	
MIPI CSI	drivers/phy/rockchip/phy-rockchip-mipi-rx.c	
MIPI DSI	drivers/phy/rockchip/phy-rockchip-inno-mipi-dphy.c	
LCD Touch Driver	drivers/input/touchscreen/goodix.c drivers/input/touchscreen/edt-ft5x06.c	/dev/input/eventX
RTC Real Time Clock Driver	drivers rtc/rx8010.c drivers/rtc/rtc-pcf8563.c	/dev/rtc0
serial port	drivers/tty/serial/8250/8250_dw.c	/dev/ttySX
Key Driver	drivers/input/keyboard/adc-keys.c	/dev/input/eventX
LED	drivers/leds/leds-gpio.c	
I2S	sound/soc/rockchip/rockchip_i2s.c	
Audio Driver	sound/soc/codecs/nau8822.c	/dev/snd/
PMIC	drivers/mfd/rk806.c drivers/regulator/rk860x-regulator.c	
PCIE	drivers/pci/controller/pcie-rockchip.c	
Watchdog	drivers/watchdog/dw_wdt.c	
SPI	drivers/spi/spi-rockchip.c	
Device	Location of driver source code in the kernel	Device Name
PWM	drivers/video/backlight/pwm_bl.c	

1.3 eMMC Memory Partition Table

The following table shows the eMMC memory partition information for the Linux operating system (calculated with a block size of 512bit):

Partition Index	Name	Offset / block	Size/block	content
N/A	security	0x00000000	0x00004000	MiniLoaderAll.bin
1	uboot	0x00004000	0x00004000	uboot.img
2	misc	0x00006000	0x00002000	misc.img
3	boot	0x00008000	0x00020000	boot.img
4	recovery	0x00028000	0x00050000	recovery.img
5	oem	0x01c78000	0x00040000	oem.img
6	rootfs	0x00078000	0x01c00000	rootfs.img
7	userdata	0x01cb8000		userdata.img

Chapter 2. Preparation Before Startup

OK3588 development board has two system login methods, serial and network login. We need to make hardware preparation before system startup:

- 12V3A DC Power Cable
- Debugging Serial Cable (Serial Login Use)

The debug serial port on the development board is a Type-C USB jack, so users can use a USB to Type-C cable to connect the development board to a PC and then check the board's status.

- Network cable (for network login)
- According to the development board interface to connect the screen (Based on display needs).



2.1 Debugging Serial Driver Installation

OK3588-C platform debugging serial port using Type-C interface, on-board USB to UART chip; users don't need to use USB to serial debugging tools (Easy operation).

To install the driver, please use the driver package CP210x _ VCP _ Windows _ XP _ Vista. Zip provided in the \ Linux \ Tools \ directory of the user profile.

Run CP210xVCPInstaller_x64.exe directly after unzipping is complete, to ensure the latest driver is installed, please click driver uninstall first, then driver install.

2.2 Serial Login

2.2.1 Serial Port Connection Settings

Description:

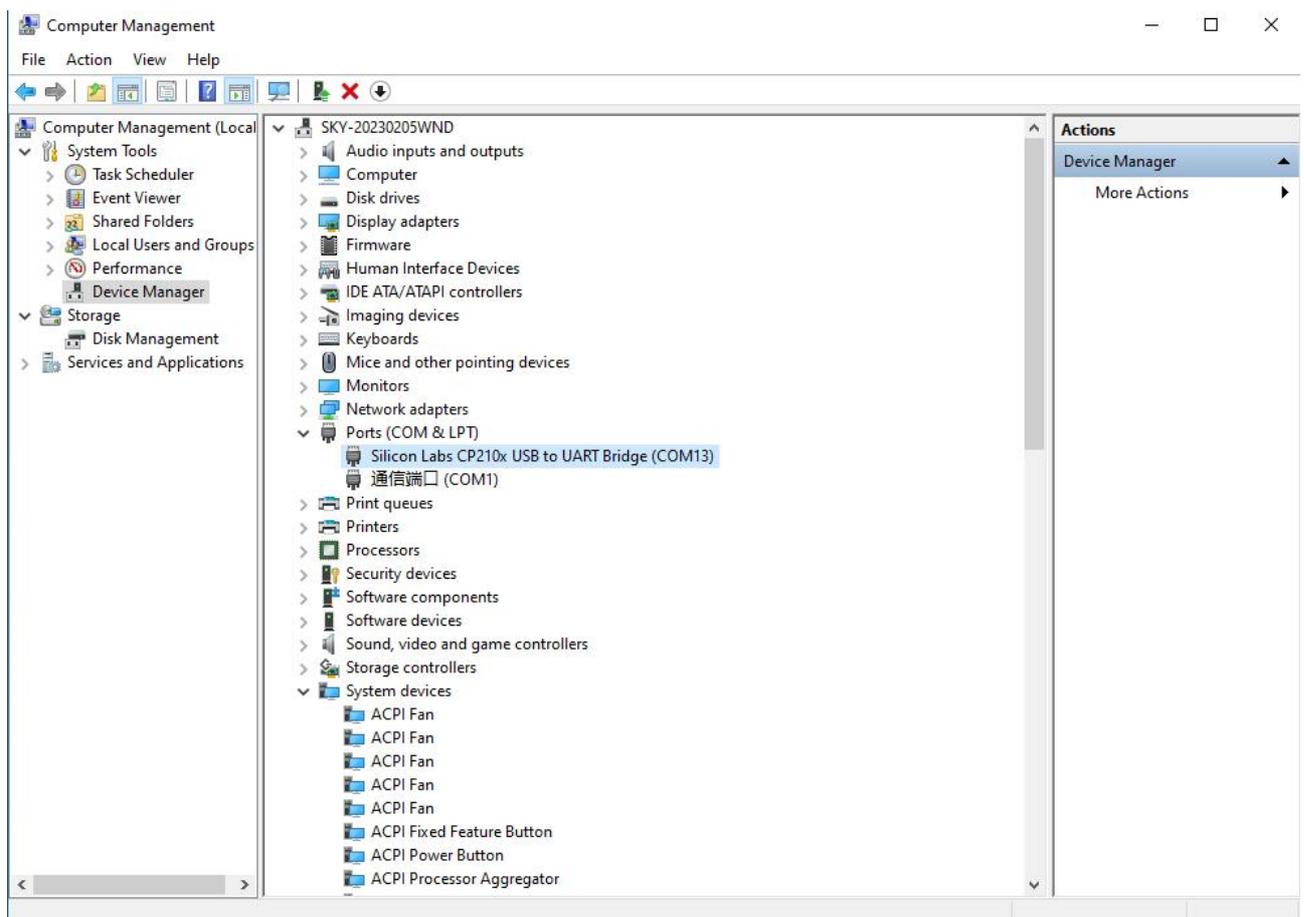
Serial port settings: baud rate 115200, data bit 8, stop bit 1, no parity bit, no flow control

Serial terminal login: User name: forlinx Password: forlinx

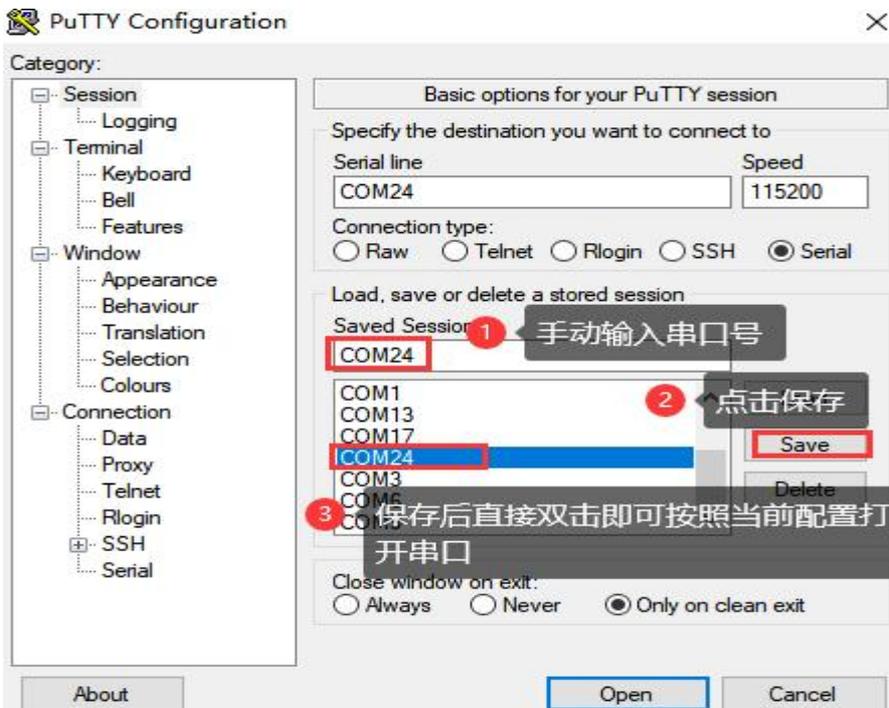
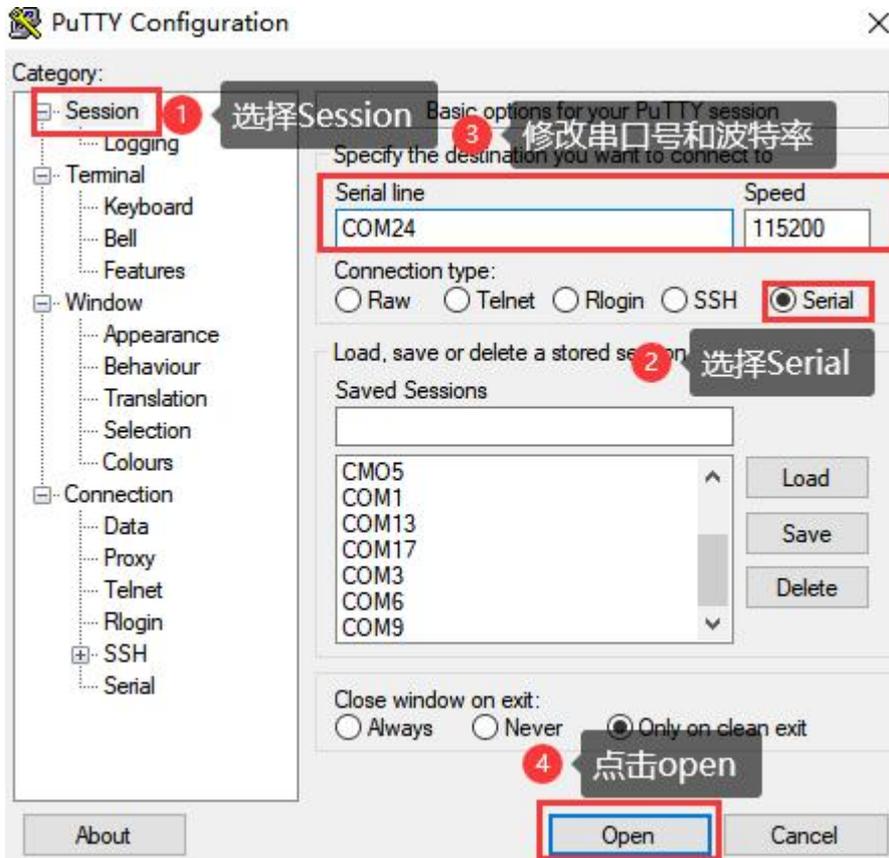
Software requirements: PC Windows system needs to install the super terminal software. Because the terminal software has many types, users can choose their familiar one.

In the following, we take the putty terminal software as an example to introduce the serial port login method:

Step 1: Connect the serial port number of the computer---check the serial port number from the device manager (Based on the port actually recognized by the computer).



Step 2: Open and set up putty, then set the line according to the COM port of the computer used, baud rate 115200



Step 3: After the setting, input the COM port used by the computer in Saved Sessions. The following figure takes COM24 as an example, save the settings, open the serial port again later, and click on the saved port number.

Step 4: Turn on the power switch of the development board, then there will be a print message output from the serial port (no need to login).

```
libpng warning: iCCP: known incorrect sRGB profile
```

2.2.2 Serial Login Common Problems

If the computer does not have a serial port, we can use the USB to serial cable to connect with the development board. (Using a USB to serial cable connection requires the matching driver).

It is better to use a good quality cable to avoid error codes.

2.3 Network Login Methods

2.3.1 Network Connection Test

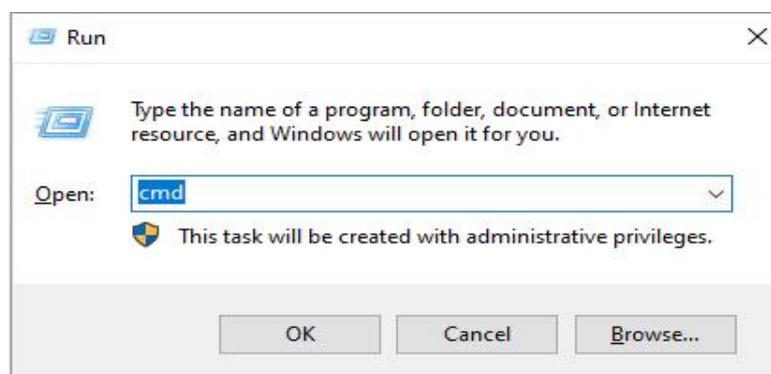
Description:

The factory default configuration of the card is static IP; the IP address is 192.168.0.232. Please refer to "Ethernet Configuration" chapter for the static IP changing method.

The computer and board should be on the same network segment for testing.

Before login, we should ensure the network connection between the computer and the development board is normal, and we can use the ping command to test the connection status. The specific method of operation is as follows:

1. Connect the development board's eth0 interface to the computer using an Ethernet cable. Power on the board and boot the kernel. Confirm the blue heartbeat LED is blinking. Check the network card connection, ensuring its LED flashes rapidly. Once confirmed, proceed with testing the network connection.
2. Close the computer firewall (General computer operations, not described here in detail), then open the computer's run command.
3. Use cmd to open the administrator interface , and use the ping command to test the network connection status of the computer and the development board.



```
C:\Users\Administrator>ping 192.168.0.232

Pinging 192.168.0.232 with 32 bytes of data:
Reply from 192.168.0.232: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.232:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

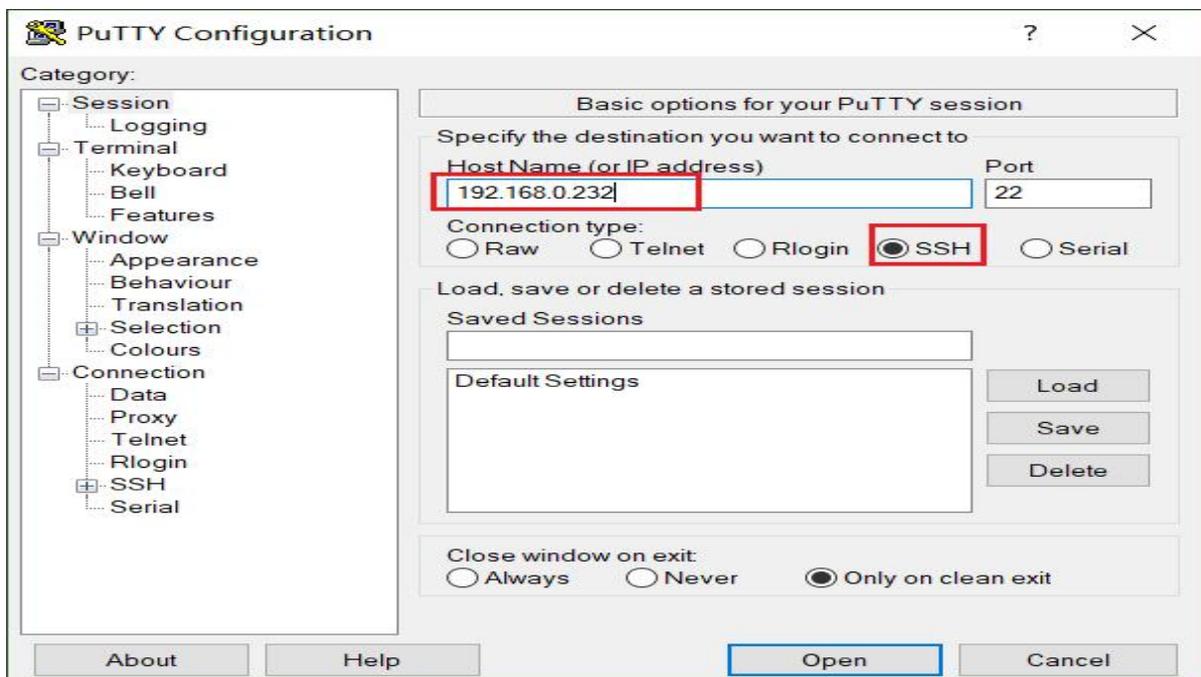
C:\Users\Administrator>
```

A data return indicates a normal network connection.

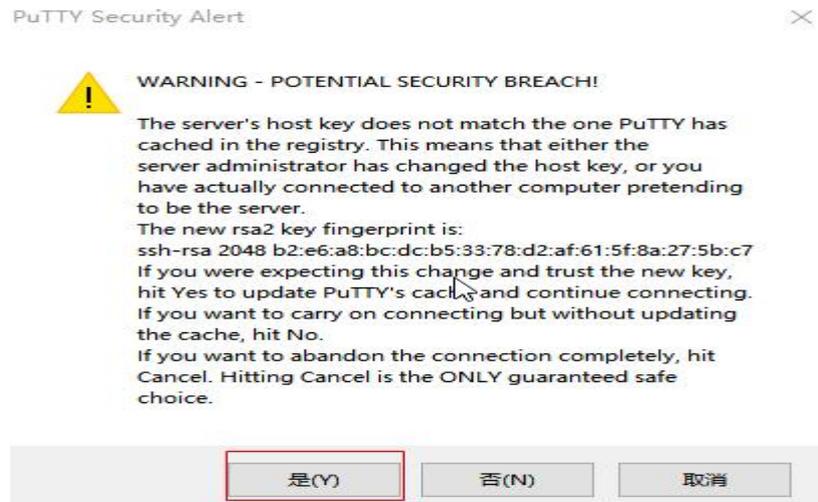
2.3.2 SSH Server

Description:

- The factory default configuration of the card is static IP, and the IP address is 192.168.0.232. Please refer to "Ethernet Configuration" chapter for the static IP changing method.
 - Users: forlinx; password:forlinx
 - If using root login, we need to change the password before using ssh login and scp for file transfer.
1. Use ssh to log in the development board



Click "Open", the following dialog box will appear, click "Yes" to enter the login screen.



```

Login as: forlinx
root@192.168.0.232's password: //Enter as prompt account : forlinx
root@ok3588-buildroot:~# password forlinx
    
```

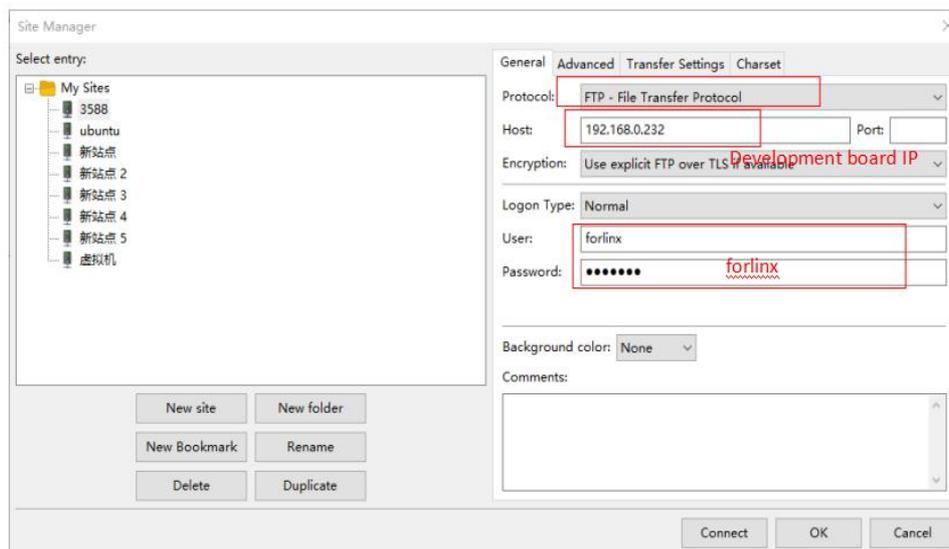
2.3.3 SFTP

Path: OK3588-C (Linux) user profile\tool\FileZilla*

The OK3588 development board supports SFTP service and it is automatically enabled at startup, so it can be used as an SFTP server after setting the IP address. The following describes how to utilize the FTP tool for file transfer.

Install the filezilla utility on windows and follow the steps shown below to set it up, with the username and password forlinx.

Open the filezilla tool, click on File and select Site Manager.



After successful login, you can upload and download.

2.4 Screen Switching

OK3588 supports a variety of screen interfaces such as MIPI DSI, HDMI, eDP, DP, RGB, etc., and can perform simultaneous co-display and heterodyne display of four screens simultaneously. Currently there are three screen switching methods: uboot menu dynamic control; kernel device tree designation; DisplayHwConfig application control.

OK3588 contains 4 display controllers, i.e. 4 VP. Supports up to 4 screens simultaneously. The maximum resolution of VP0 is 7680x4320; the maximum resolution of VP1 is 4096x4320; the maximum resolution of VP2 is 4096x4320; the maximum resolution of VP3 is 2048x1080.

2.4.1 Uboot Menu Dynamic Control

2.4.1.1 Display Type Settings

This method allows switching without recompiling and flash-in of existing supported screens.

During the uboot self-boot process, press the space bar at the serial terminal to bring up the control options:

```
Hit key to stop autoboot('Spacebar'): 0
```

```
0:Exit to console  
1:Reboot  
2:Display type
```

Enter 2 at the terminal to access the Screen Control sub-menu:

```
hdmi0 and edp0 share same port, only one can be used.  
hdmi1 and edp1 share same port, only one can be used.  
  
only four VPs internally, so up to four interfaces can be activated  
hdmi edp dp can only be displayed on VP0 or VP1 or VP2.
```

```
dsi0 dsi1 can only be displayed on VP2 or VP3.  
rgb can only be displayed on VP3.
```

```
Select display  
0:Exit  
  
1: hdmi0 => VP0  
2: hdmi1 =>  
3: edp0 =>  
4: edp1 =>  
5: dp0 =>  
6: dp1 =>  
7: mipi0 =>  
8: mipi1 =>  
9: rgb =>  
  
a: primary display => HDMI0  
b: primary display resolution => 1920x1080p50  
c: display type => sync
```

Note: It is better not to set HDMI as the main screen. When the system starts, hot plug HDMI will cause QT application to exit.

According to the content of the comments in the uboot menu, we can get the uboot display menu setting rules:

1. hdmi0 and edp0 use the same port, and only one of the two can be used at the same time.
2. Hdmi1 and edp1 use the same port, and only one of the two can be used at the same time.
3. There are only four VP inside, so up to four interfaces can be activated.
4. hdmi, edp, dp can only be displayed on VP0 or VP1 or VP2.
5. dsi0 and dsi1 can only be displayed on VP2 or VP3.
6. rgb can only be displayed on VP3.

When setting up the display, enter the serial number corresponding to the display interface and VP will be assigned to the corresponding interface. Upon re-input, the available VP for the port will be switched sequentially, or the VP assigned to the port will be turned off.

2.4.2 Kernel Device Tree Specification

This method does not require the connection of a serial terminal, and the system image defaults to the desired configuration selection, which is suitable for mass production. However, we need to manually modify the device tree and regenerate the system image once again

Note: This method has higher priority than the uboot screen selection, and the uboot selection will not take effect after the device tree is modified.

The device tree path :kernel/arch/arm64/boot/dts/rockchip/OK3588-C-common.dtsi In the kernel source code, open the device dtsi file and find the following node:

```
forlinx-control {
    /**
     * hdmi0 and edp0 share same port, only one can be used.
     * hdmi1 and edp1 share same port, only one can be used.
     * only four VPs internally, so up to four interfaces can be activated
     * hdmi edp dp can only be displayed on VP0 or VP1 or VP2.
     * dsi0 dsi1 can only be displayed on VP2 or VP3.
     * rgb can only be displayed on VP3.
     */
    /**
     * if "disabled", display is controlled by uboot */
    status = "disabled";

    HDMI0 = "VP0";
    // HDMI1 = "OFF";
    // EDP0 = "OFF";
    // EDP1 = "VP1";
    // DP0 = "OFF";
    // DP1 = "OFF";
    MIPI0 = "VP2";
    // MIPI1 = "VP3";
    // RGB = "OFF";
    primary_display = "MIPI0";
    primary_display_resolution = "1920x1080p60";
    disp_type = "sync";
};
```

The node has a default disabled state and needs to be changed to an okay enabled node. Change according to screen requirements.

Parameter Description:

Parameter	Meaning
status	Describe the node state: disabled is for off, okay is for on
HDMI0	Specify the VP assigned to HDMI0
HDMI1	Specifies the VP assigned to HDMI1
EDP0	Specifies the VP assigned to EDP0
EDP1	Specifies the VP assigned to EDP1
DP0	Specifies the VP assigned to DP0
DP1	Specifies the VP assigned to DP1
MIPI0	Specifies the VP assigned to MIPI0
MIPI1	Specifies the VP assigned to MIPI1
RGB	Specify the VP assigned to RGB
primary_display	Specify the main screen display
primary_display_resolution	Specify the resolution to be used for the main screen with HDMI
disp_type	Note: Please specify the same and different displays, the default is the same display.

The user changes the setup parameters as needed, and after saving, the image needs to be recompiled to generate the image.

An annotated description of the node:

1. hdmi0 and edp0 use the same port, and both can only use one of them at the same time.
2. Hdmi1 and edp1 use the same port, and both can only use one of them at the same time.
3. There are only four VP inside, so maximum four interfaces can be activated.
4. hdmi, edp, dp can only be displayed on VP0 or VP1 or VP2.
5. dsi0 and dsi1 can only be displayed on VP2 or VP3.
6. rgb can only be displayed on VP3.

So the optional parameters for HDMI0/1, EDP0/1, DP0/1 are: "VP0", "VP", "VP2", "OFF"; DP0/1 optional parameters are: "VP2", "VP3";

The RGB optional parameter is: "VP3".

The primary_display parameter depends on the actual display interface assigned to get the VP. The optional parameters for disp_type are "sync" and "async".

Note: When modifying the device tree, you need to follow the annotation rules to avoid using conflicts. The driver does not detect whether the forlinx-control configuration conforms to the rules. An error in the setting will cause an exception to be displayed.

For the display interface set to "OFF", blocking, deleting, or retaining is possible. It's not necessary to set all four VP.

Setup Examples:

Assign VP0 to HDMI0, VP1 to HDMI1, VP2 unused, and VP3 for RGB use. Set the main screen to HDMI0

```
forlinx-control {
    /**
     * hdmi0 and edp0 share same port, only one can be used.
     * hdmi1 and edp1 share same port, only one can be used.
     * only four VPs internally, so up to four interfaces can be activated
     * hdmi edp dp can only be displayed on VP0 or VP1 or VP2.
     * dsi0 dsi1 can only be displayed on VP2 or VP3.
     * rgb can only be displayed on VP3.
     *
     */
    /**/

    /*** if "disabled" , display is controlled by uboot ***/
    status = "okay";

    HDMI0    = "VP0";
    HDMI1    = "VP1";
    // EDP0    = "OFF";
    // EDP1    = "VP1";
    // DP0     = "OFF";
    // DP1     = "OFF";
    // MIPI0   = "VP2";
    // MIPI1   = "VP3";
    RGB      = "VP3";
    primary_display = "HDMI0";
    primary_display_resolution = "1920x1080p60";
    disp_type = "sync";
};
```

After saving, recompile to generate the image.

2.5 System Shutdown

In general, the power can be turned off directly, if there is data storage, function use and other operations, do not arbitrarily disconnect the power during the operation, in order to prevent irreversible damage to the file, you can only re-flash the firmware. To ensure that data is not completely written, enter the sync command to complete data synchronization before turning off the power.

Note: For products designed based on the SoM, if there are scenarios where accidental power loss causes the system to shut down unexpectedly, measures such as adding power-loss protection can be incorporated into the design.

Chapter 3. Introduction to Interface Function

OK3588 platform has excellent support for Qt, especially for multimedia-related classes, such as video decoding and playback, camera, video recording, etc. can all be combined with hardware codecs and OpenGL to achieve the best results.

The desktop is displayed as follows after the board booting:



3.1 Hardware Decoding Experience

Click the desktop icon to open the video player.



Application Icons



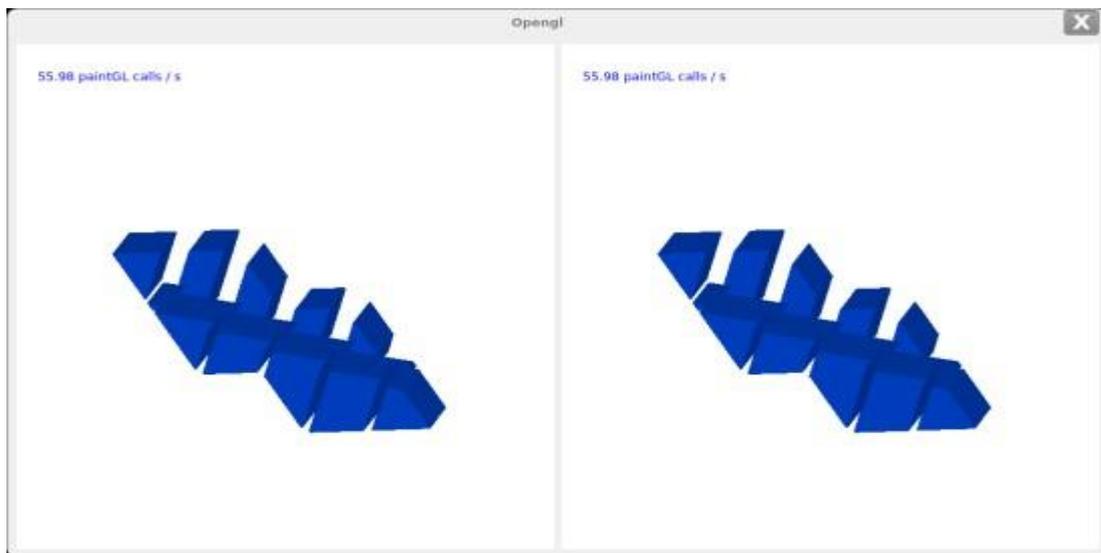
Note: The test video file is located in the directory: /userdata/me*.mp4 Please test 8K video playback with only one display turned on.

3.2 OpenGL Test

OK3588 supports OpenGL ES3.2, click the desktop icon for OpenGL test.

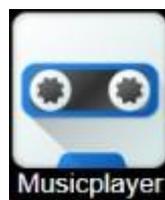


Application Icons



3.3 Music Play Test

"music player" is a simple audio test application that can be used to test the function of the sound card or as a simple audio player.



Application Icons

Application Interfaces

Click the button in the lower left corner and select test audio /userdata/media/test.mp3

Note: The default sound card output is nau8822. If using HDMI output, please use the command on the serial port:



```
root@ok3588:/# gst-play-1.0 /userdata/media/test.mp3 --audiosink="alsasink  
device= plughw:3,0"
```

3.4 4G/5G Test

This test requires an Internet-capable SIM card, a description of which can be found in the Command Line Functional Tests 5G section of this manual.

The "4G/5G" test program is used to test the OK3588 external 5G module (RM500U). Before testing, please power off the development board, access the 5G module, insert the SIM card, start the development board, and open the test application.

Meanwhile, the test supports the 4G module (EM05-CE), inserts the 4G module and SIM card in the case of power failure, and opens the test application after powering up the system to start.



Application Icons

Application Interfaces

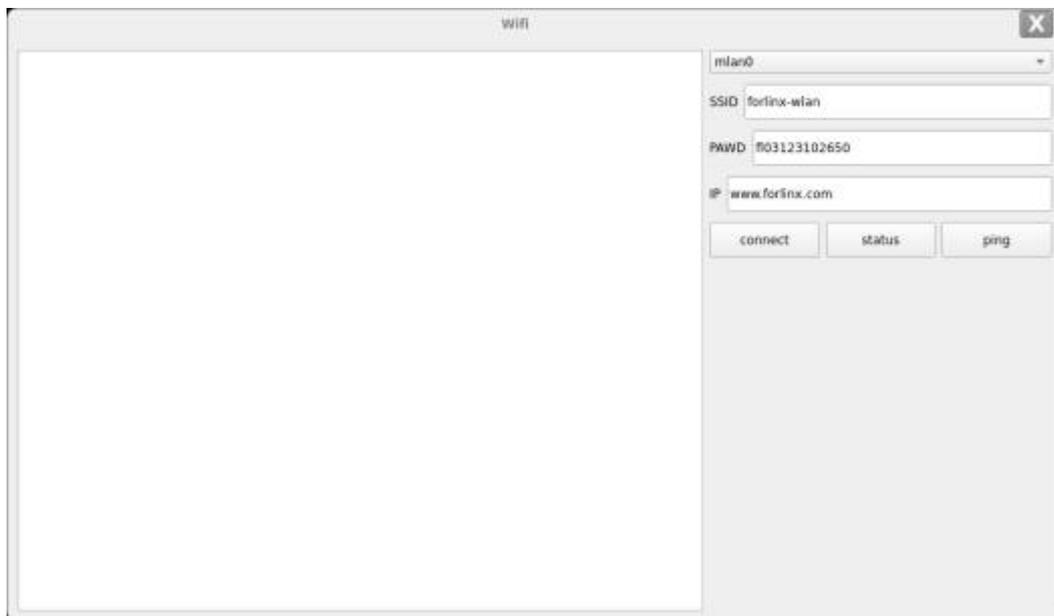
Click the connect button, the program will automatically enter the dialing process and get the IP settings, DNS, etc. wait patiently for a few seconds, and then click the ping button to test.

3.5 WIFI Test

"WIFI" is a tool to configure wifi. The OK3588 platform has the AW-XM458 module on board by default. The wifi module exists in the system as a mean node, and this test corresponds to wlan0 (other corresponding nodes are used for multiple devices):



Application Icons



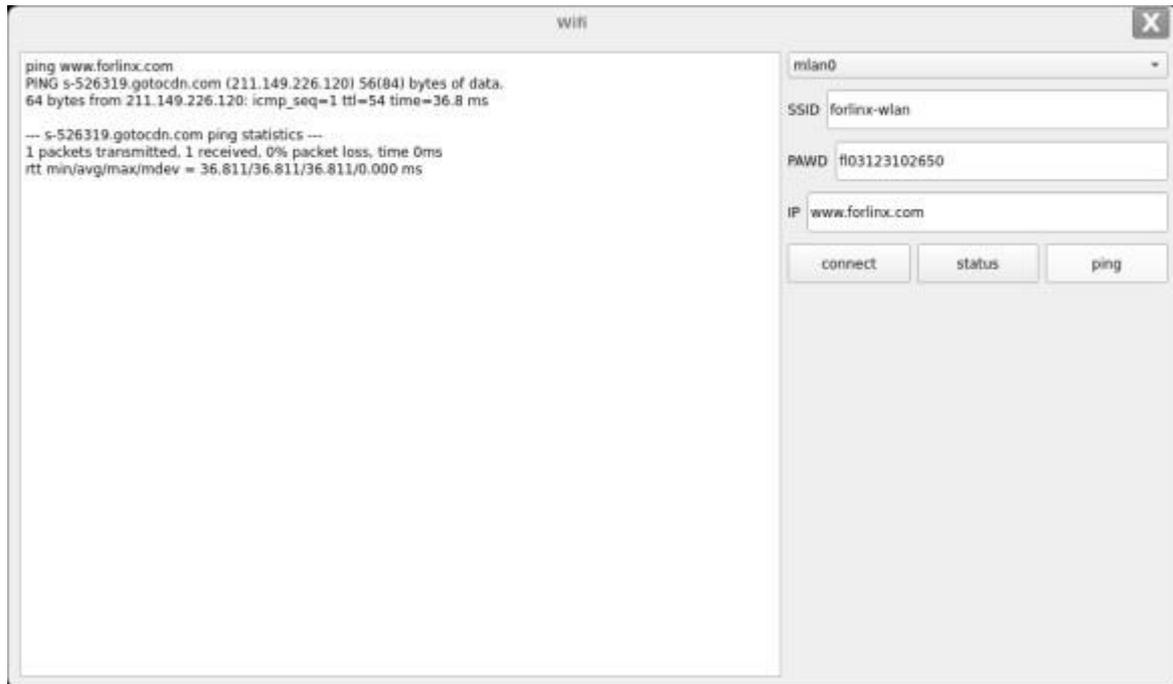
Application Interfaces

Select wlan0, enter the router name(the one connected to wifi) in the SSID column, enter the router password in the PAWD column, click CONNECT to the router via wifi, enter a valid ip in the IP column, and then click ping to see if the currently used wifi network is smooth.

The following is an example test of the AW-XM458 module.

Open the Wifi test app, enter the correct network name and password, click CONNECT, wait 5 seconds, and click STATUS to view the connection ledge.

After the connection is successful, click ping to test the network.



3.6 Network Configuration Test

When the OK3588 starts up, the default setting of the NIC is dhcp. The two modes of dhcp and static can be selected through the "Network" configuration application, and the static mode can be configured with ip address, subnet mask, gateway, and DNS.

Application Icons

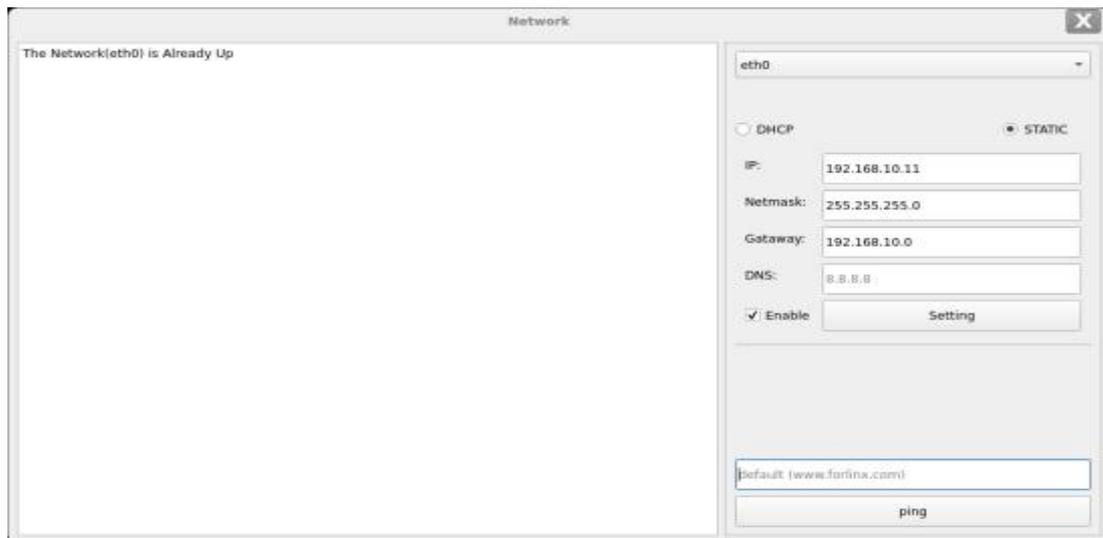


The DHCP mode interface is as follows:



Check DHCP, select the NIC device needing to be configured, and click Apply and Restart Network at the bottom of the interface to restart the network and get the ip automatically.

The static mode interface is as follows:



Select the NIC device to be configured in the interface, and enter the ip to be set in the ip field, enter the subnet mask in the netmask field, the gateway in the gateway field, and DNS in the dns field.

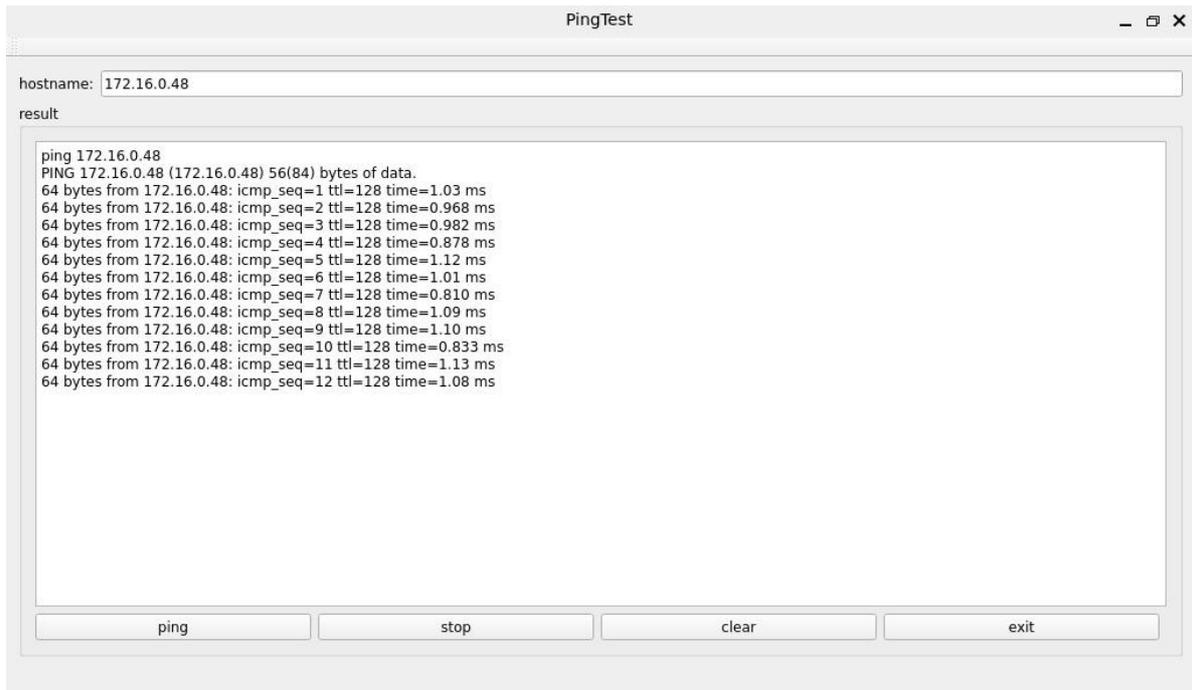
Note: Information such as ip set in STATIC mode is saved to the relevant configuration file of the system so each reboot will use the network information set this time; network information configured in DHCP mode, on the other hand, does not need to care about this; ip addresses are dynamically assigned every reboot.

3.7 Ping Test

"Ping" is an interface application of the common network testing command ping.



Application Icons



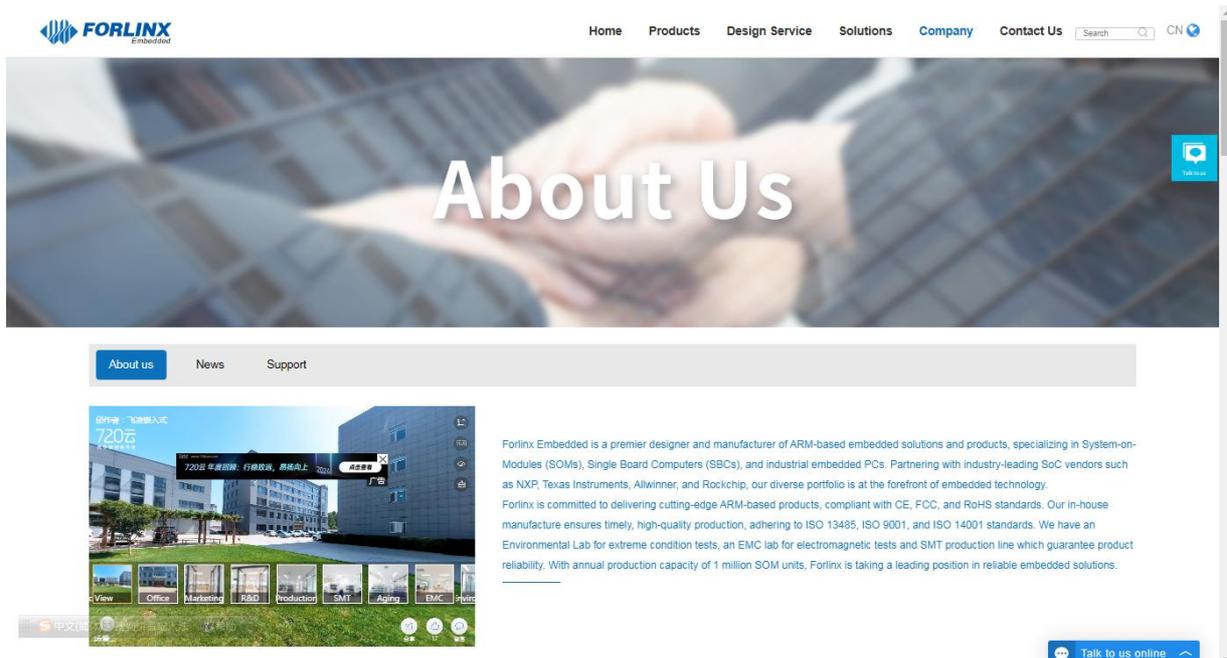
Application Interfaces

Write the target ip needing ping in the hostname field; after clicking the ping button, the RESULT column will indicate the result, click stop to end the ping test and clear to clean the information in the result.

3.8 Browser Test

"DemoBrowser" is a simple and practical web browser. When using it, please make sure that the network is smooth, and make sure that the dns is available before accessing the external network; when the browser starts, it will visit the official website of Forlinx Embedded by default, and the interface is as follows:

Note: If the development board time is abnormal, it will cause certificate problems. Do not shut down the power immediately after using the browser or the sync command at the command line. Otherwise, it may cause the browser to exit abnormally and not work properly, and can only be solved by re-flashing.



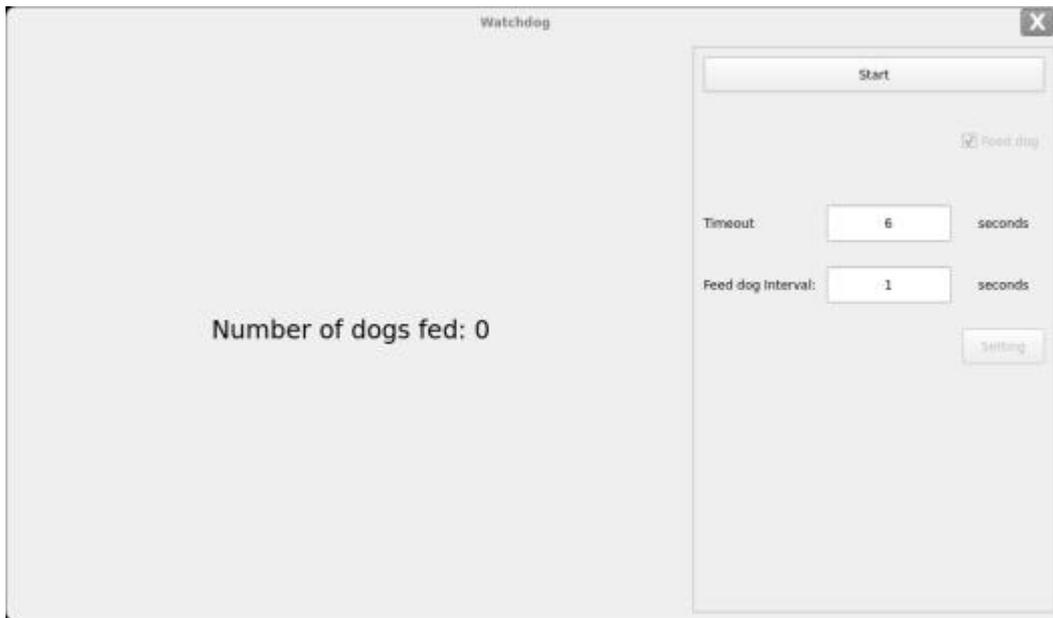
Exit this browser via the upper navigation bar File->Quit.

3.9 Watchdog Test

"WatchDog" is an application used to test the watchdog status.



Application Icons



Application Interfaces

Check feed dog and click the open watchdog key, then the watchdog will be activated, the program will carry out the feeding operation, and the system will not reboot under normal circumstances; when unchecking feed dog and clicking open watchdog key, the watchdog function will be activated, the program will not carry out the feeding operation, and the system. Enter into a reboot after the watchdog is activated for about 10s, which indicates that the watchdog function is normal.

3.10 Key Test

The "Keypad" is used to test whether the platform's own keys are available:



Application Icons



Application Interfaces

By default, the OK3588 platform configures the four physical buttons V+, V-, Home, and ESC as the Volume + and Volume - keys, Home, and Return keys, respectively. The corresponding key in the test application will turn blue when pressing the key, indicating that the key is in normal status.

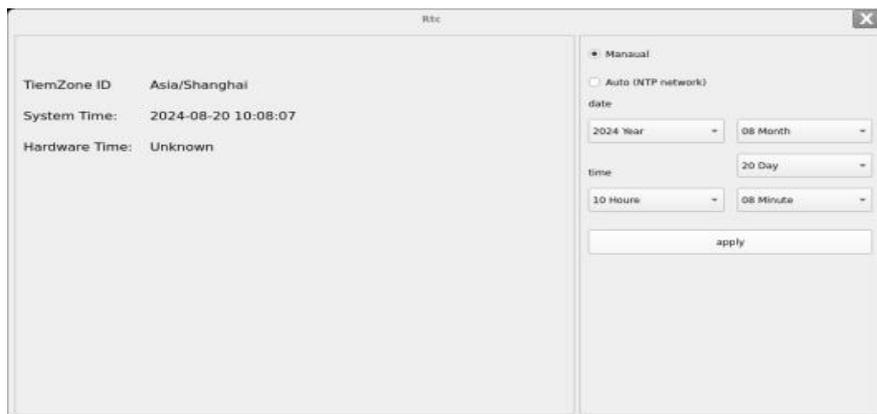
"Exit" the current routine and returns to the system desktop.

3.11 RTC Test

The "RTC" application allows you to view and set the current system time:



Application Icons



Application Interfaces

After SET, users can set the time and click Save to finish the setting.

With the RTC backup battery installed, power down and restart the development board to confirm that the RTC clock is set successfully.

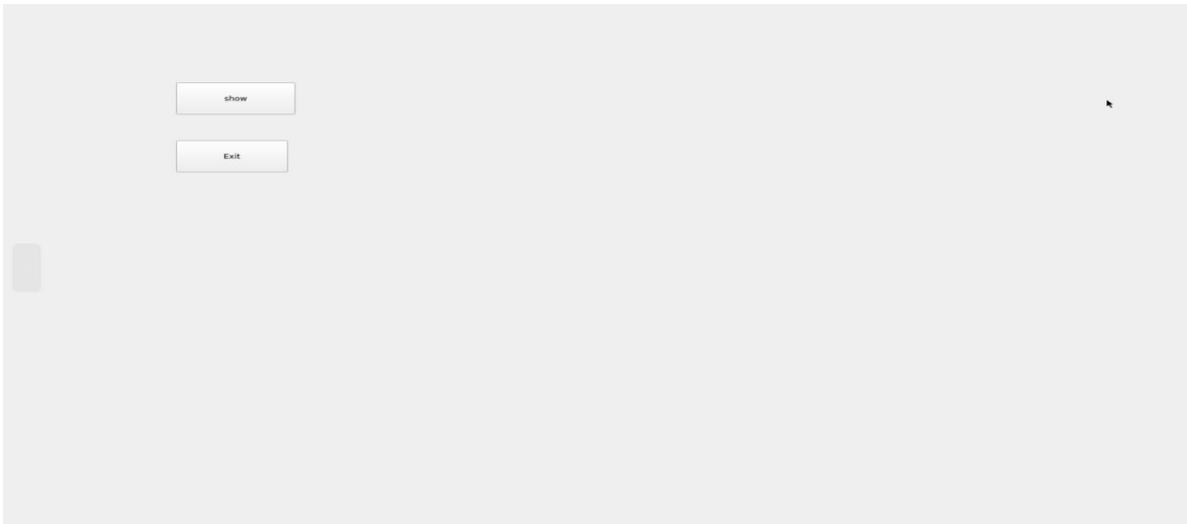
3.12 Same-screen & Multi-screen

Note:

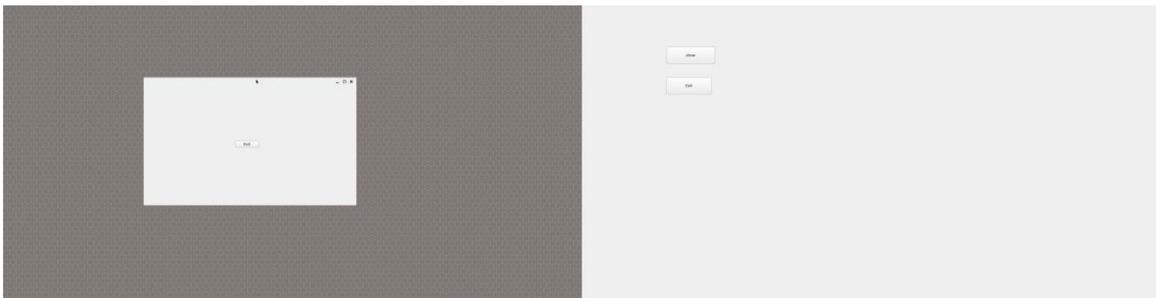
1. The default setting is simultaneous display; for extended display configuration, the `disp_type` property in the UBOOT menu needs to be changed to `async`.
2. In the case of a heterodyne display, if the configuration is a multi-screen display without connecting a monitor, the QT display will show on the neighboring screens, which needs to check if the screens are connected in QT.

Click on the desktop icon QtMultiScreen to test Multi Screen.

Open multiple screens according to the UBOOT menu configuration section to configure HDMI as the main screen.



After clicking the "show" button, a window will pop up on the other screen, and the QT window can be moved on the other screen with the mouse.



3.13 UART Test

Click on the desktop icon to use it to test the OK3588 on-board UART interface.



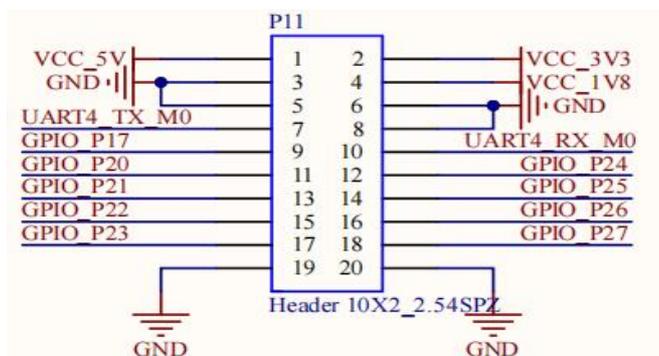
Application Icons

UART2, UART4, UART6, UART9, a total of four serial ports led from the OK3588 carrier board, including UART2 for debugging serial port, UART6 for Bluetooth serial port, and UART9 for 485 serial port. The default device names of UART4 and UART9 in the development board are ttyS4 and ttyS9 respectively.

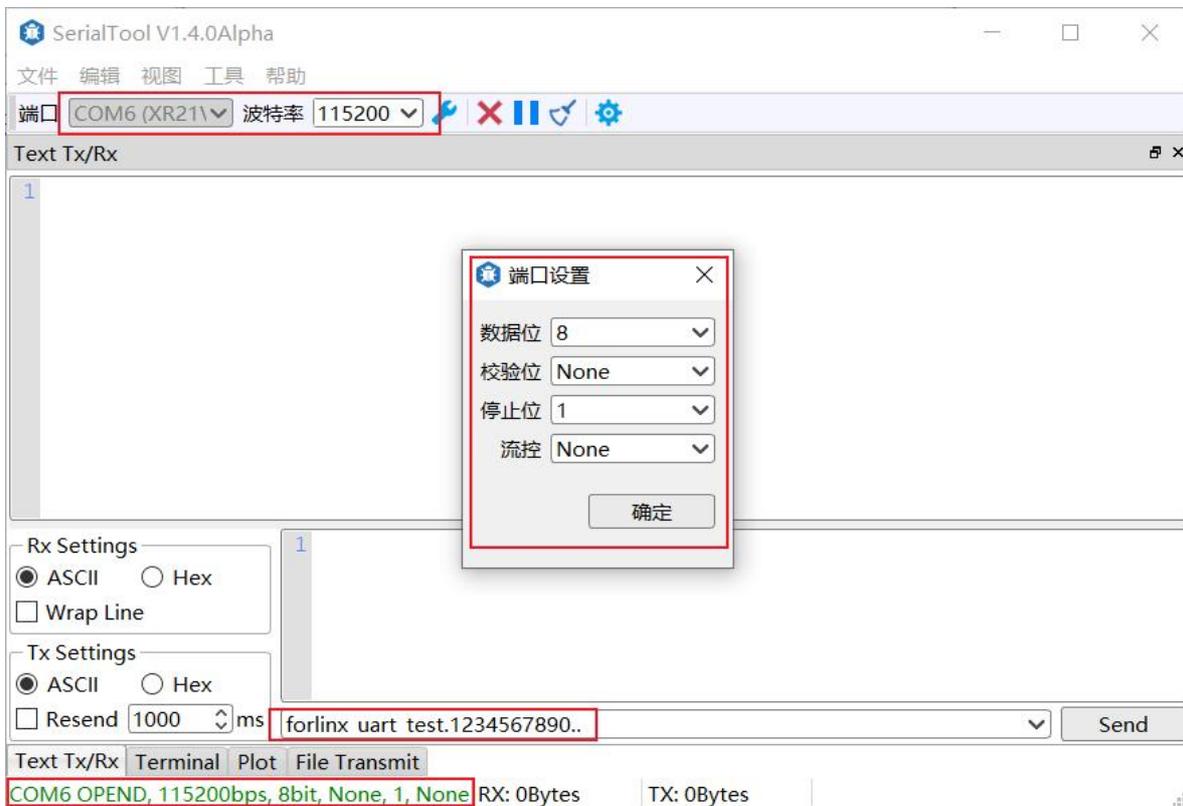
UART	Device Nodes	Description
UART2	/dev/ttyS2	Debugging serial port cannot be used directly for this test.
UART4	/dev/ttyS4	TTL level, pinned-put from P11, can be used for test.
UART6	/dev/ttyS6	It is used for Bluetooth and is not separately cited, so it cannot be used directly for this test.
UART9	/dev/ttyS9	RS485

Use the command `fltest_qt_terminal` to open the uart's qt test program (refer to Setup at the beginning of this section for qt test method). This test uses UART4 (ttyS4) to perform serial port test by sending and receiving data between the development board's UART and the computer's serial port tool software.

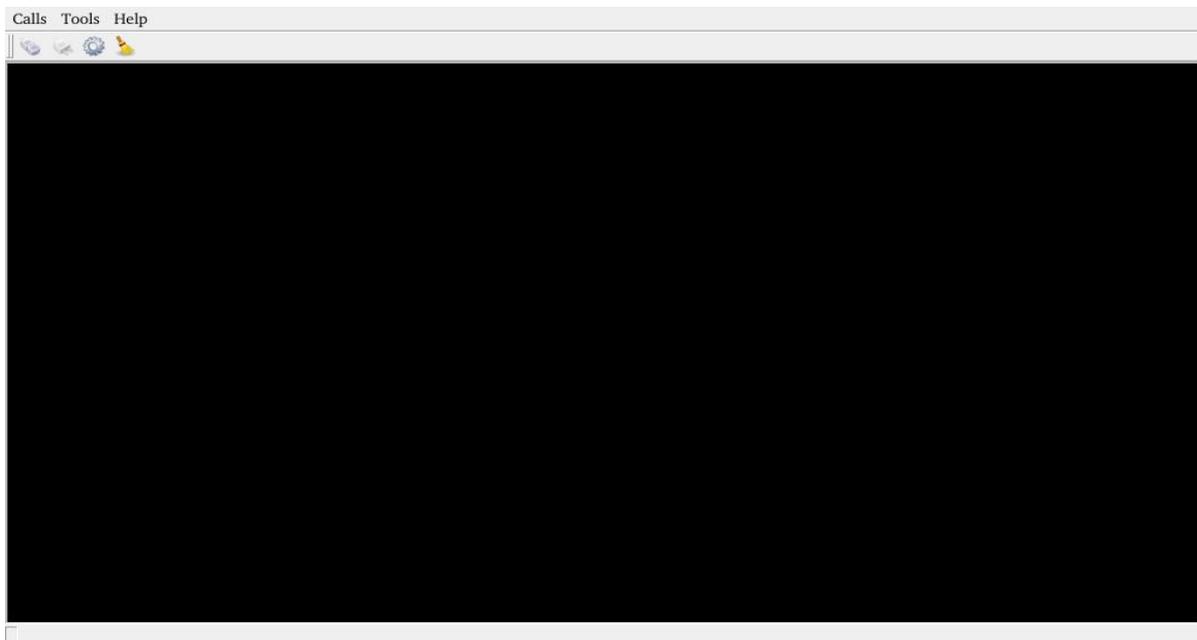
1. First, connect the development board and computer with the TTL to the USB module, then power up the development board and check in the computer's device manager recognized as COM4 (users set the parameters with their actual recognized COM port).



- Open the computer serial port tool, set the serial port parameters: baud rate 115200, 8 data bits, 1 stop bit, no parity, no flow control, and open the serial port.

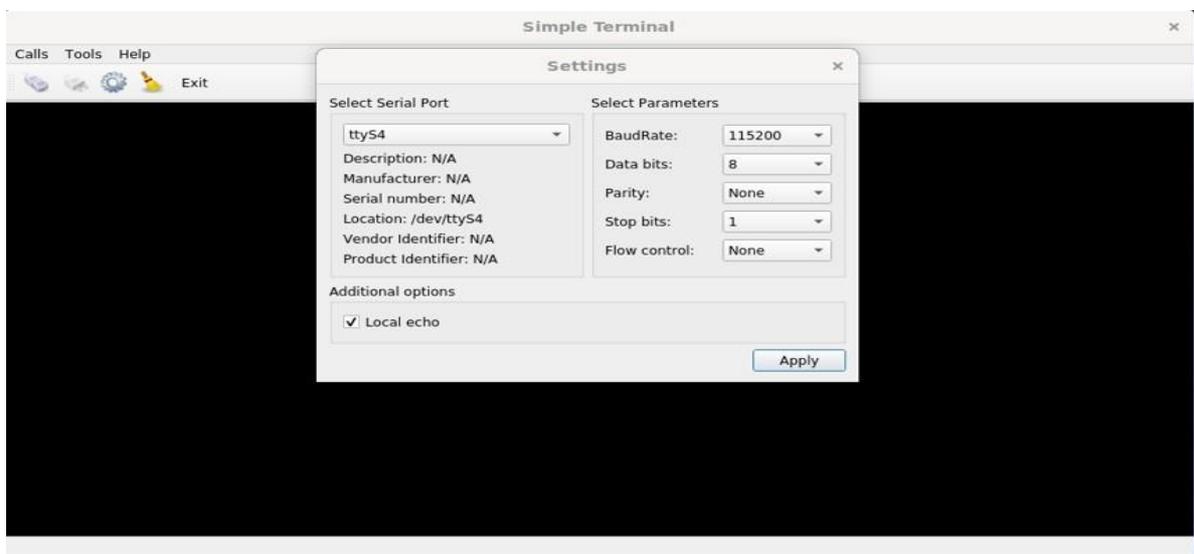


- Click the UART test icon to enter the following interface to set the serial port parameters:



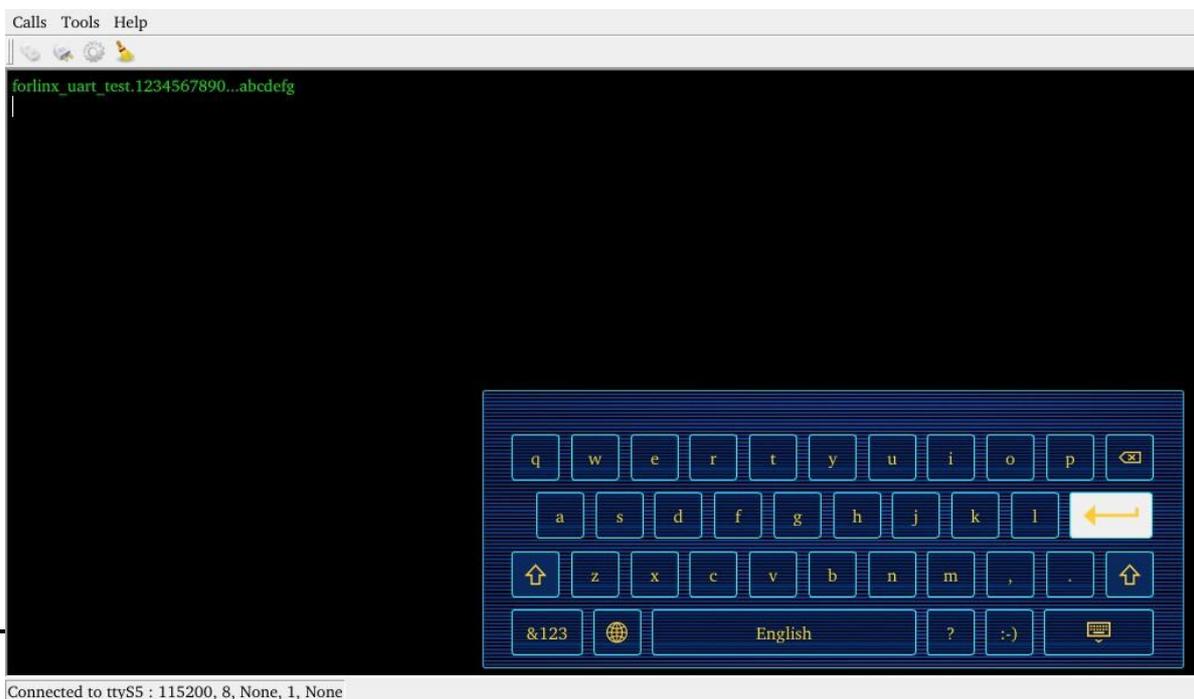
Click the Setup button in the upper left corner  to set the serial port parameters to be consistent with the parameters of the serial port tool on the computer side, as shown below:

Relevant Parameter	Meaning
Select Serial Port	Setting the serial port (select UART5, i.e. ttyS5)
BaudRate	Set baud rate (115200)
Data bits	Set data bits (8 bits)
Parity	Set parity bit (no parity)
Stop bits	Set stop bit (1 bit)
Flow control	Set flow control (no flow control)

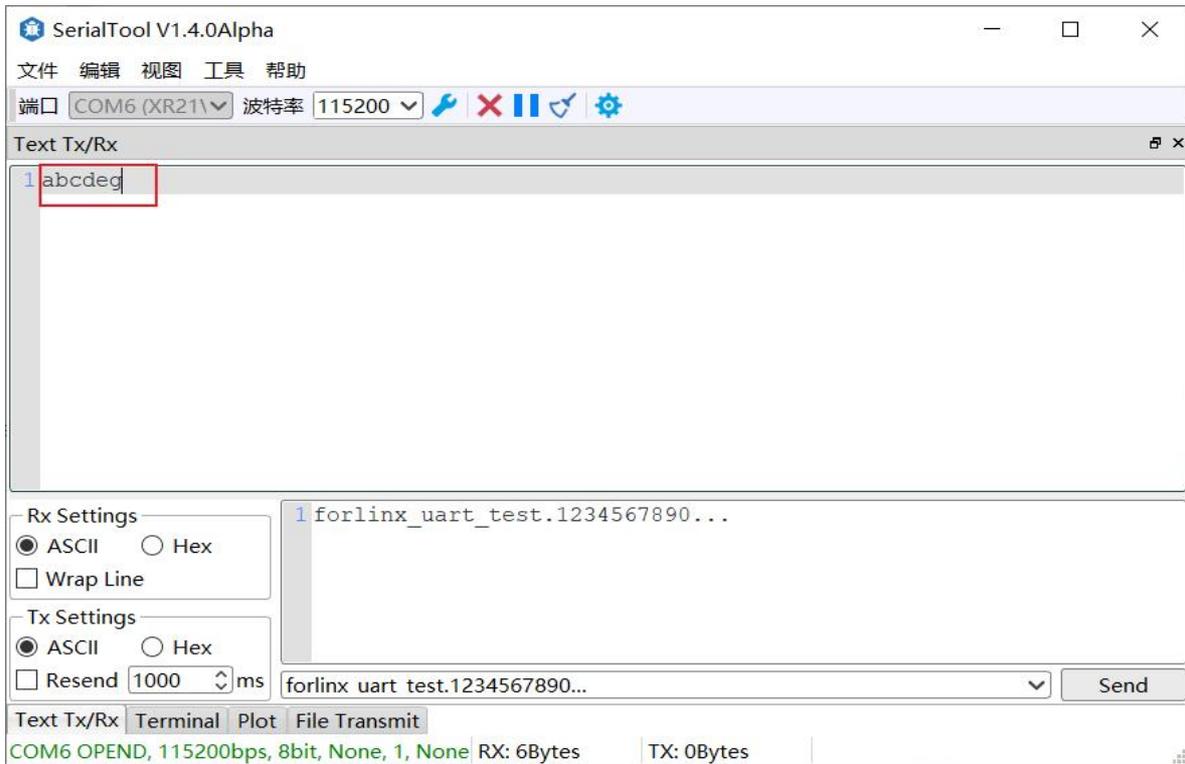


4. The serial port tool of the computer sends: "forlinx_uart_test.1234567890...", the test interface will receive the data:

Click on the test interface will pop up the soft keyboard, enter "abcdefg", press enter on the soft keyboard to send data to the serial port tool on the computer:

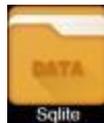


The data received by the serial port tool on the computer side:

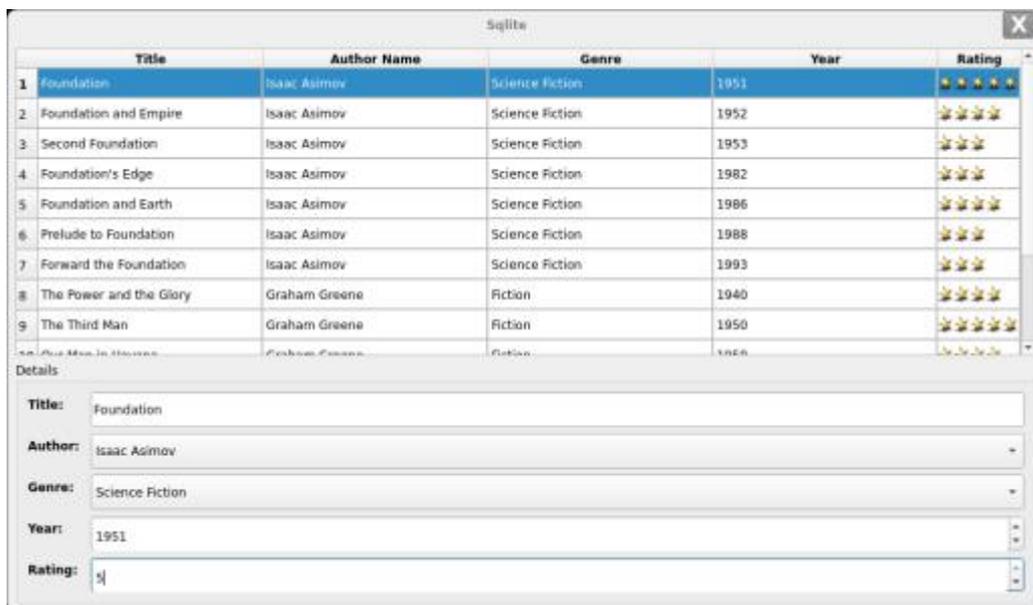


3.14 Database Test

After clicking the desktop icon, the Sqlite test database will be ready.



Application Icons

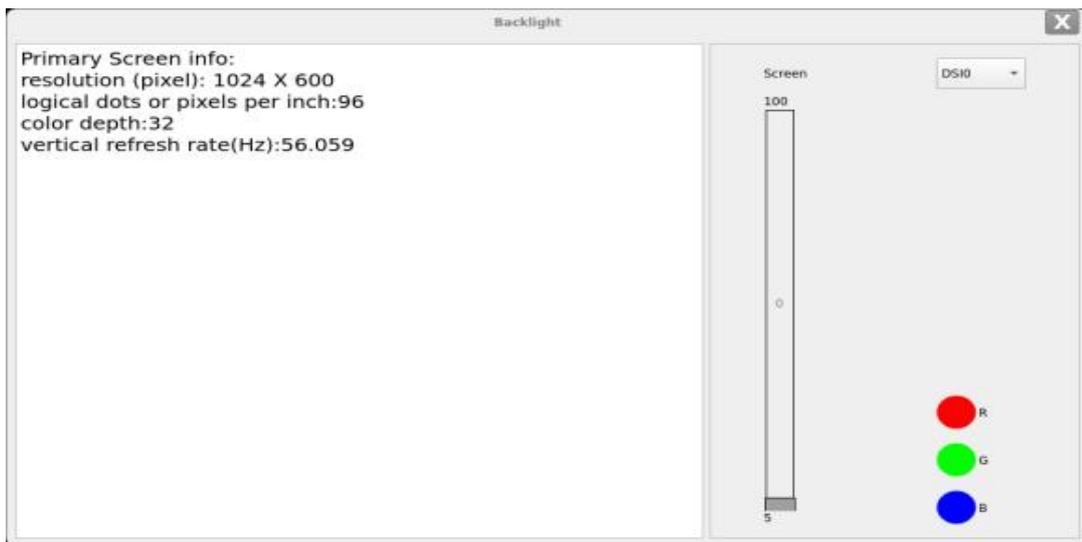


3.15 Backlight Test

"BackLight" is the lcd backlight adjustment application:



Application Icons



Drag the slider in the interface to set the Lcd backlight brightness, level 0 is no backlight, level 255 is the highest level.

3.15 Uboot Menu



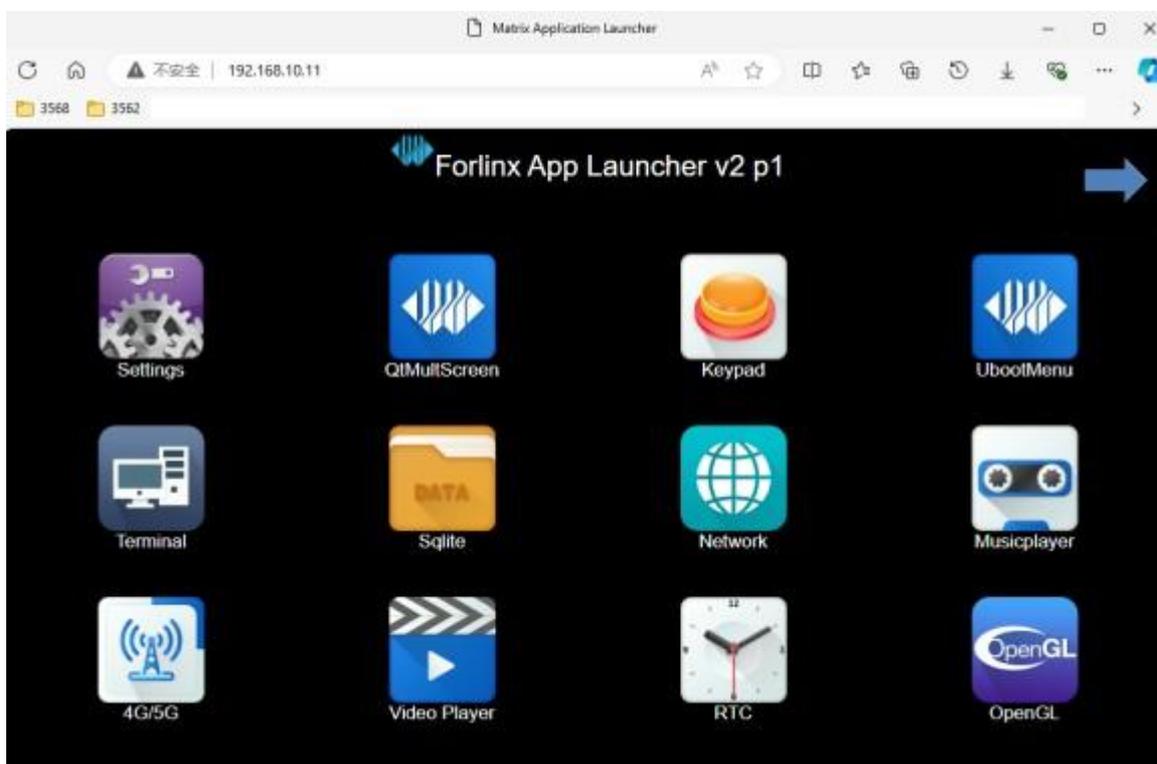
Click on the desktop icon to configure the Uboot menu.



After the configuration is complete, reboot the development board to take effect.

3.16 Web Services

OK3588 development board comes with the lighttpd web server pre-installed, and the lighttpd service has been automatically started at system startup. Enter the IP address of the board into the PC browser to view the web pages in the board's webserver, as shown in the following figure:



Note: To use this function properly, the network IP of the development board needs to be the same network segment as the network IP of the PC, or the PC is under the subnet of the network where the development board is located.

3.17 Abnormal Touch

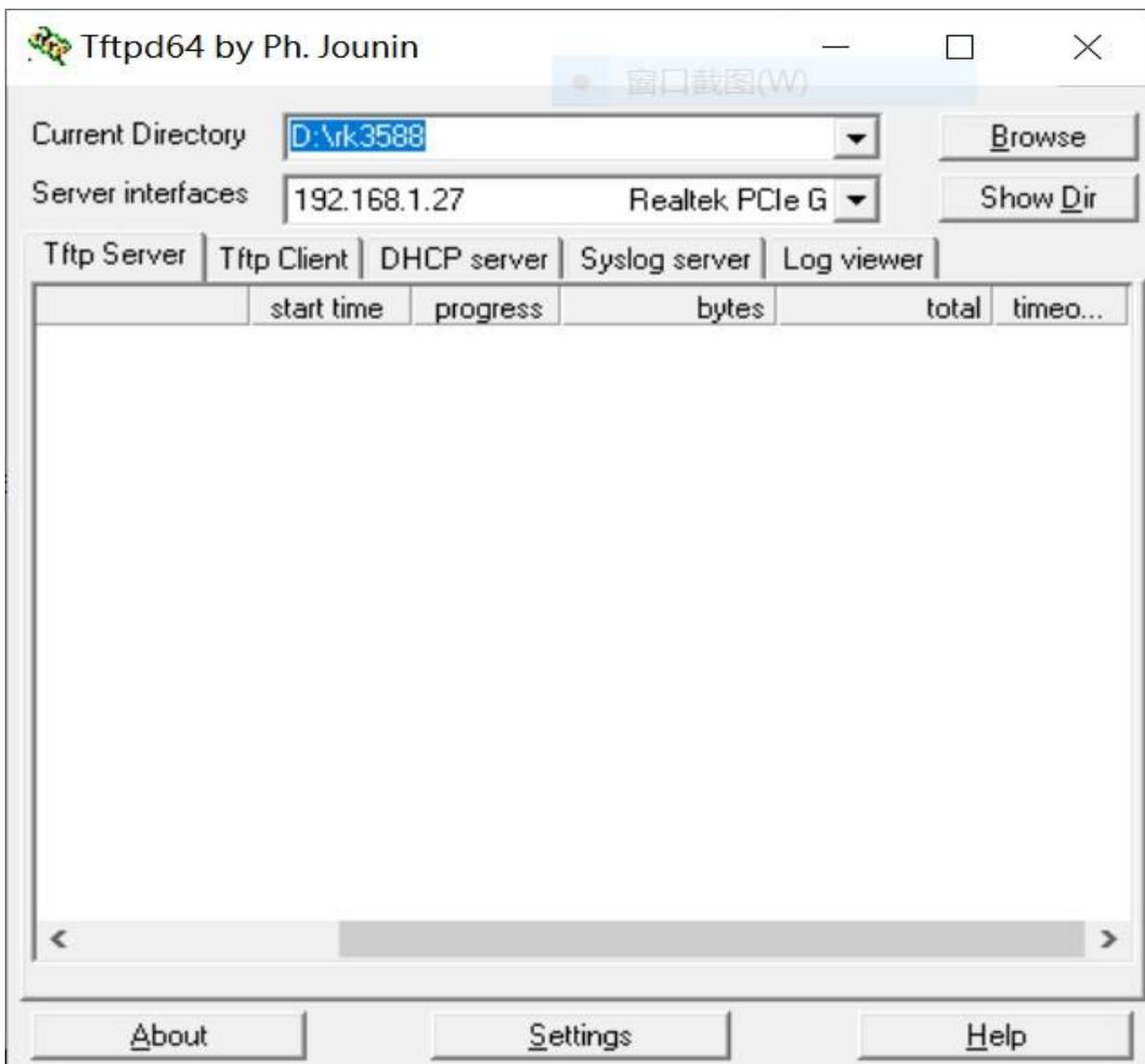
Configure OK3588 to different display mode, connect two MIPI display screens, and touch each MIPI screen respectively without affecting each other.

3.18 Tftp Upgrading System

Note: The current version upgrade rootfs.img file cannot be larger than 1.6G. Use tftp udp to transfer on port 69. Install the tftp server tool Tftpd64.4.64.exe

Path: OK3588-C-Linux User Profile/Tools/Tftpd64.4.64.exe

1. Install Tftpd64.4.64.exe
2. Open Tftpd64.4.64.exe and run the test



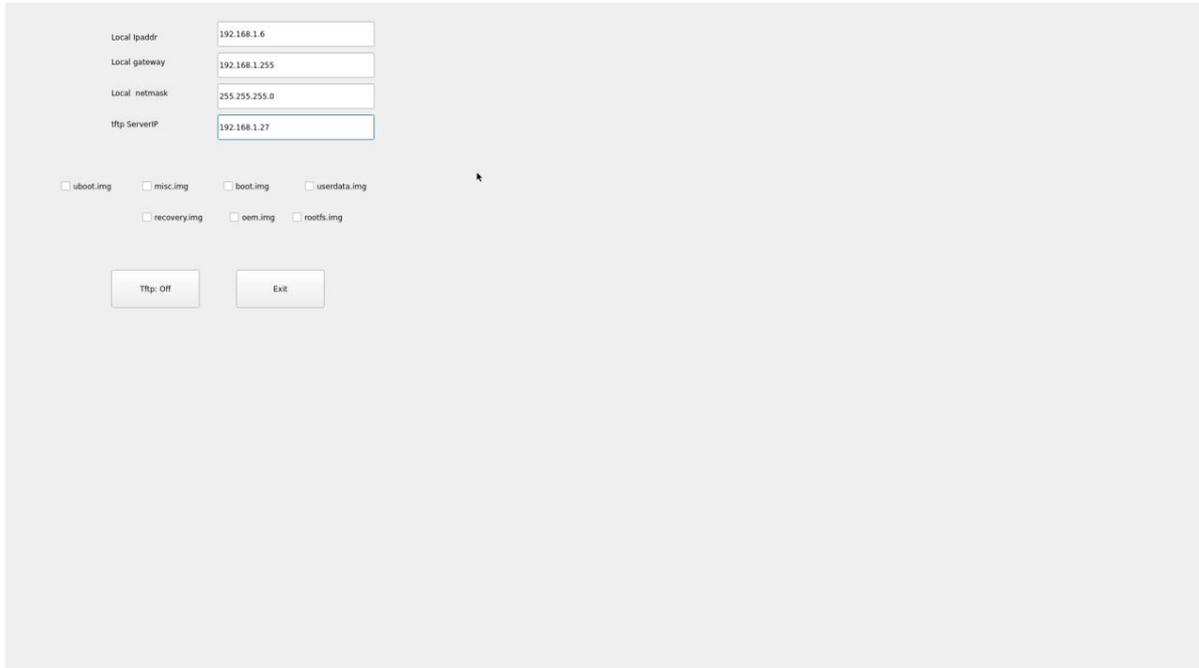
CurrentDirectory: Select the OK3588-C partition firmware storage path. Server interfaces: Select the local IP address.

Note: Please close the window firewall and verify the tftp download file test by yourself.

1. Open the desktop Tftp Update icon



Application Icon



Please fill in the form according to the actual situation. Select the firmware to update. Click Tftp: Off to become Tftp: On; reboot the board.

The serial port prints the following information:

```

COM13 - PuTTY
aclk_center_root 702000 KHz
pclk_center_root 100000 KHz
hclk_center_root 396000 KHz
aclk_center_low_root 500000 KHz
aclk_top_root 750000 KHz
pclk_top_root 100000 KHz
aclk_low_top_root 396000 KHz
Net: eth0: ethernet@felb0000, eth1: ethernet@felc0000
ethernet@felb0000 Waiting for PHY auto negotiation to complete. done
Using ethernet@felb0000 device
host 192.168.1.27 is alive
Using ethernet@felb0000 device
TFTP from server 192.168.1.27; our IP address is 192.168.1.6
Filename 'uboot.img'.
Load address: 0x20000000
Loading: ##
         4.2 MiB/s
done
Bytes transferred = 4194304 (400000 hex)
## TFTP flash uboot.img to partititon 'uboot' size 0x400000 ... OK
Using ethernet@felb0000 device
TFTP from server 192.168.1.27; our IP address is 192.168.1.6
Filename 'boot.img'.
Load address: 0x20000000
Loading: #####
         7.3 MiB/s
done
Bytes transferred = 32835072 (1f50600 hex)

```

3.19 CPU Frequency Configuration Test

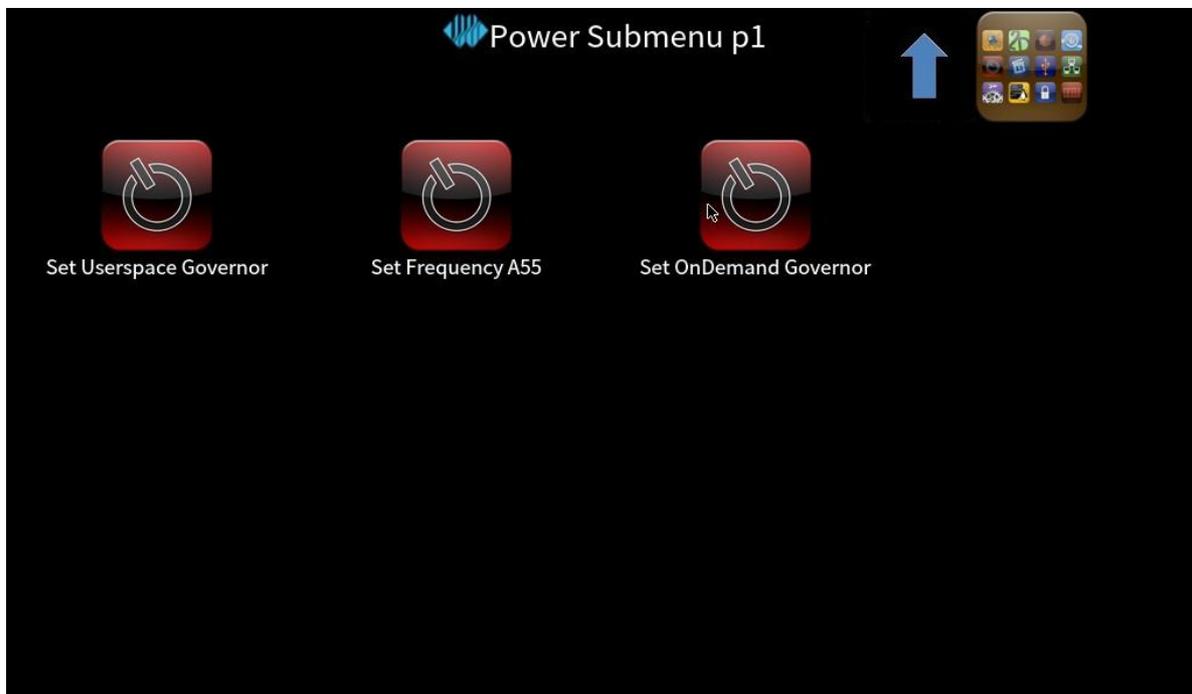
Note: The current interface only configures A55 core, not A76 core FM. For A76 core FM, please refer to the FM test chapter.

Click the desktop icon to enter the next menu:



Application Icons

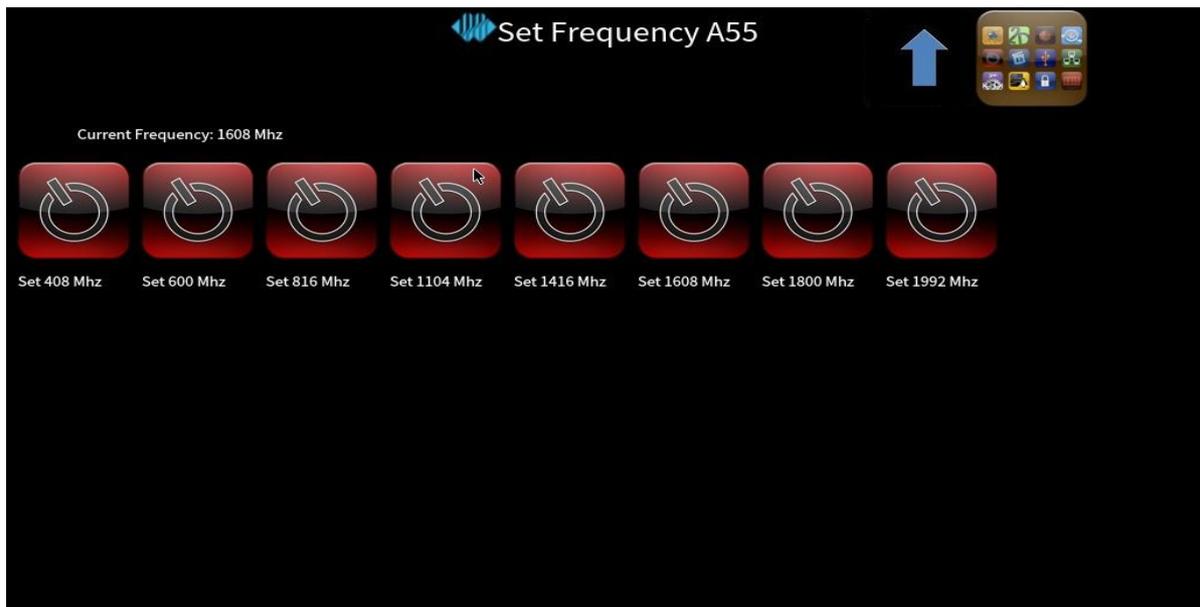
OK3588 CPU main frequency up to 1.8Ghz, by default, the CPU will dynamically adjust the main frequency according to the load, you can also fix the CPU main frequency through the settings. Click the desktop Power icon to enter the CPU main frequency setting page:



Set Userspace Governor: Set the main frequency in the user mode

Set Frequency A55: Set the main frequency.

Take setting the main frequency as an example, if you need to set a fixed frequency, please click Set Userspace Governor first, click run, then return to the above operation interface and click Set Frequency A55 to set.



Select the corresponding frequency for setting according to the requirements.

Chapter 4. OK3588 Command Line Function Test

OK3588 platform has various built-in command line tools available to users.

4.1 System Information Query

To view kernel and cpu information, enter the following command

```
root@ok3588-buildroot:~# uname -a
Linux ok3588-buildroot 5.10.209 #1 SMP Sun Aug 18 19:07:38 CST 2024 aarch64
GNU/Linux
```

View operating system information:

```
root@ok3588-buildroot:~# cat /etc/issue
welcome to Forlinx OK3588 Board
```

View environment variable information:

```
root@ok3588-buildroot:~# env
SHELL=/bin/sh
GST_V4L2_PREFERRED_FOURCC=NV12:YU12:NV16:YUY2
GST_VIDEO_CONVERT_PREFERRED_FORMAT=NV12:NV16:I420:YUY2
CHROMIUM_FLAGS=--enable-wayland-ime
GST_V4L2_USE_LIBV4L2=1
GST_INSPECT_NO_COLORS=1
PULSE_HOME=/userdata/.pulse
EDITOR=/bin/vi
GST_DEBUG_NO_COLOR=1
PWD=/
HOME=/
LANG=en_US.UTF-8
WESTON_DRM_PRIMARY=DSI-1
ADB_TCP_PORT=5555
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:
su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;
31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01
;31:*.zip=01;31:*.z=01;31:*.Z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zs
t=01;31:*.tzt=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.taz=01;31:*.deb=01;31:*.rpm=01;31:*.ja
r=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7
z=01;31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.swm=01;31:*.dwm=01;31:*.esd=01;31:*.jpg=01;35:*.jpeg=01;35:*.mj
pg=01;35:*.mjpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.
xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35
:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01
;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;
35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.emf=01;35
:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;3
6:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;
36:
```

```
WAYLANDSINK_FORCE_DMABUF=1
GST_V4L2SRC_DEFAULT_DEVICE=/dev/video-camera0
QT_QPA_PLATFORM=wayland
USB_FW_VERSION=0x0310
TERM=xterm-color
USER=root
AUTOAUDIOSINK_PREFERRED=pulsesink
ADB_SHELL=/bin/bash
GST_V4L2SRC_RK_DEVICES=_mainpath:_selfpath:_bypass:_scale
WESTON_DRM_MIRROR=1
SHLVL=1
USB_FUNCS=adb
WESTON_DISABLE_ATOMIC=1
USB_MANUFACTURER=Rockchip
USB_PRODUCT=rk3xxx
XDG_RUNTIME_DIR=/var/run
USB_VENDOR_ID=0x2207
PLAYBIN2_PREFERRED_AUDIOSINK=pulsesink
PATH=/usr/bin:/usr/sbin
storagemedia=emmc
GST_V4L2SRC_MAX_RESOLUTION=3840x2160
GST_VIDEO_DECODER_QOS=0
_=/usr/bin/env
```

4.1 Frequency Test

Note: Quad-core A55 is `cpu0`, `cpu1`, `cpu2`, `cpu3`; Quad-core A76 is `cpu5`, `cpu6`, `cpu7`, `cpu8`. This process takes `cpu0` as an example: the actual process of `cpu1`, `cpu2`, `cpu3` will be changed at the same time; `cpu4`, `cpu5`, `cpu6`, `cpu7` will not affect each other when operated individually.

1. All `cpufreq` governor types supported in the current kernel:

```
root@ok3588-buildroot:/# cat
/sys/devices/system/cpu/cpu0/cpufreq/scaling_available_governors
conservative ondemand userspace powersave performance schedutil
```

The userspace indicates user mode, in which other users' programs can adjust the CPU frequency.

2. View the current CPU supported frequency level.

```
root@ok3588-buildroot:~# cat
/sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies
408000 600000 816000 1008000 1200000 1416000 1608000 1800000
```

3. Set to user mode and modify the frequency to 1800000:

```
root@ok3588-buildroot:/# echo userspace >
/sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
root@ok3588-buildroot:/# echo 1800000 >
/sys/devices/system/cpu/cpu0/cpufreq/scaling_setspeed
```

View the modified current frequency:

```
root@ok3588-buildroot:/# cat
/sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq
1800000
```

4.2 Temperature Test

View the temperature value:

```
root@ok3588-buildroot:~# cat /sys/class/thermal/thermal_zone0/temp
45307
```

The temperature value is 45.3°C.

4.3 DDR Test

```
root@ok3588-buildroot:/# fltest_memory_bandwidth.sh
L1 cache bandwidth rd test with # process
0.008192 34377.39
0.008192 33984.75
0.008192 55061.17
0.008192 55036.10
0.008192 31220.66
L2 cache bandwidth rd test
0.131072 43651.06
0.131072 43698.59
0.131072 43608.40
0.131072 43682.74
0.131072 37935.10
Main mem bandwidth rd test
52.43 18157.16
52.43 18066.44
52.43 18711.21
52.43 18293.37
52.43 17823.83
L1 cache bandwidth wr test with # process
0.008192 71583.65
0.008192 50513.15
0.008192 71591.09
0.008192 71590.31
0.008192 71535.33
L2 cache bandwidth wr test
0.131072 43075.72
0.131072 45764.77
0.131072 41351.95
0.131072 46124.97
0.131072 44245.42
Main mem bandwidth wr test
```

```
52.43 7342.97
52.43 7310.21
52.43 7357.40
52.43 7352.24
52.43 7330.65
L1 cache bandwidth rdwr test with # process
0.008192 36026.35
0.008192 36037.05
0.008192 36048.68
0.008192 36036.17
0.008192 36024.58
L2 cache bandwidth rdwr test
0.131072 25015.92
0.131072 25010.29
0.131072 25017.20
0.131072 25020.46
0.131072 13448.39
Main mem bandwidth rdwr test
52.43 10359.38
52.43 10580.99
52.43 10595.96
52.43 10304.40
52.43 10792.26
L1 cache bandwidth cp test with # process
0.008192 28217.79
0.008192 36032.60
0.008192 36036.75
0.008192 36038.84
0.008192 36041.82
```

```
L2 cache bandwidth cp test
0.131072 22356.68
0.131072 22555.37
0.131072 22625.67
0.131072 22519.82
0.131072 22364.80
Main mem bandwidth cp test
52.43 6197.99
52.43 6141.36
52.43 6114.86
52.43 6138.48
52.43 6102.76
L1 cache bandwidth frd test with # process
0.008192 10891.45
0.008192 10895.39
0.008192 10898.38
0.008192 10893.92
0.008192 10895.88
L2 cache bandwidth frd test
0.131072 10815.70
0.131072 10811.78
0.131072 10819.62
0.131072 10816.62
0.131072 10778.87
Main mem bandwidth frd test
52.43 9245.07
52.43 9048.81
52.43 9310.74
52.43 9365.63
52.43 9180.32
```

```
L1 cache bandwidth fwr test with # process
```

```
0.008192 15780.22  
0.008192 15145.62  
0.008192 30524.19  
0.008192 30891.70  
0.008192 31170.71
```

```
L2 cache bandwidth fwr test
```

```
0.131072 27427.59  
0.131072 22163.22  
0.131072 27451.38  
0.131072 24936.65  
0.131072 27422.61
```

```
Main mem bandwidth fwr test
```

```
52.43 3328.81  
52.43 3343.89  
52.43 3326.91  
52.43 3335.38  
52.43 3321.01
```

```
L1 cache bandwidth fcp test with # process
```

```
0.008192 9104.37  
0.008192 9051.73  
0.008192 5531.40  
0.008192 9056.83  
0.008192 6320.95
```

```
L2 cache bandwidth fcp test
```

```
0.131072 8971.34  
0.131072 4788.34  
0.131072 8972.33  
0.131072 4779.16  
0.131072 6890.70
```

```
Main mem bandwidth fcp test
```

```
52.43 8565.40  
52.43 8787.93  
52.43 8732.31  
52.43 8564.00  
52.43 8559.80
```

```
L1 cache bandwidth bzero test with # process
```

```
0.008192 70325.47  
0.008192 61005.11  
0.008192 70226.90  
0.008192 70151.61  
0.008192 70173.32
```

```
L2 cache bandwidth bzero test
```

```
0.131072 60200.58  
0.131072 59218.33  
0.131072 47963.00  
0.131072 43743.43  
0.131072 54540.03
```

```
Main mem bandwidth bzero test
```

```
52.43 27843.23  
52.43 27449.63  
52.43 27216.89  
52.43 27569.92  
52.43 27608.64
```

```
L1 cache bandwidth bcopy test with # process
```

```
0.008192 35515.04  
0.008192 35475.39  
0.008192 35526.89  
0.008192 35551.67  
0.008192 35482.84
```

```
L2 cache bandwidth bcopy test
0.131072 32708.53
0.131072 32761.49
0.131072 16620.35
0.131072 28515.39
0.131072 32714.54
Main mem bandwidth bcopy test
52.43 11990.58
52.43 11997.44
52.43 11856.35
52.43 11929.19
52.43 11706.78
```

4.2 Watchdog Test

Watchdog is a function often used in embedded systems. The device node of watchdog in OK3588 is `/dev/watchdog`. This test provides two test procedures, and the user selects one test according to the actual situation.

Start the watchdog, set the reset time to 10s, and kick the dog regularly.

If using `fltest_watchdog`, it turns on the watchdog and kick it, so the system does not reboot.

```
root@ok3588-buildroot:~# fltest_watchdog
Watchdog Ticking Away!
```

When using `ctrl+c` to end the test program, kicking the dog is stopped, the watchdog is on, and the system is reset after 10s.

```
root@ok3588-buildroot:~# fltest_watchdog -d //Close watchdog
```

If you do not want to reset, enter the shutdown watchdog command within 10s after finishing the program:

Start watchdog, set reset time 10s, do not kick the watchdog.

Execute the command `fltest_watchdogrestart`, this command will turn on the watchdog but will not kick the watchdog and the system will reboot after 10s.

```
root@ok3588-buildroot:~# fltest_watchdogrestart
```

4.3 RTC Function Test

Note: Ensure that button cell batteries are installed on the board and the battery voltage is normal.

RTC test: The main way to set the software and hardware time is by using the `date` and `hwclock` utilities. When performing the board power-down and power-up test, the software clock reads whether the RTC clock is synchronized or not.

Time setting

```
root@ok3588-buildroot:~# date -s "2022-12-12 17:23:00" //Set software
Mon Dec 12 17:23:00 CST 2022 time
root@ok3588-buildroot:~# hwclock -wu
root@ok3588-buildroot:~# hwclock -r //Synchronize software
Mon Dec 12 17:23:06 CST 2022 time to hardware time
//Displays the hardware
time
```

Then power down and power up the board, enter the system, and read the system time. After that, we can see that the time has synchronized.

```
root@ok3588-buildroot:~# date
Mon Dec 12 17:23:20 CST 2022
```

4.4 Key Test

Use the `fltest_keytest` command line tool to test the keys. `fltest_keytest` currently supports the test of four keys on the carrier board, VOL+, VOL-, MENU, and ESC, with key codes 115, 114, 139, and 158, respectively.

Execute the following command:

```
|
| plain root@ok3588-buildroot:~# fltest_keytest
|-----
```

At this point, press the lift button in sequence, and the following can be output on the terminal:

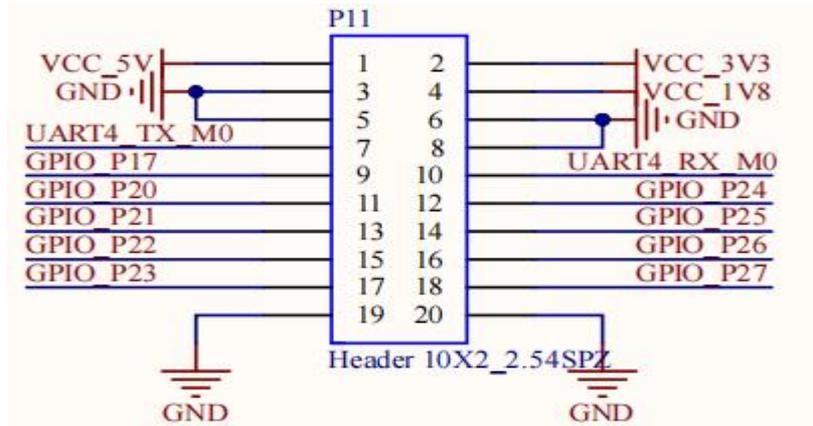
```
key115 Presse // VOL+press
key115 Released // VOL+release
key114 Presse // VOL-press
key114 Released // VOL-release
key139 Presse // MENU press
key139 Released // MENU release
key158 Presse // ESC press
key158 Released // ESC release
```

4.5 UART Test

UART2, UART4, UART6, UART9, a total of four serial ports led from the OK3588 carrier board, including UART2 for debugging serial port, UART6 for Bluetooth serial port, and UART9 for 485 serial port. The default device names of UART4 and UART9 in the development board are `ttyS4` and `ttyS9` respectively.

UART	Device Nodes	Description
UART2	/dev/ttyS2	Debugging serial port cannot be used directly for this test.
UART4	/dev/ttyS4	TTL level, pinned-out from P11, can be used for this test.
UART6	/dev/ttyS6	It is used for Bluetooth and is not separately cited, so it cannot be used directly for this test.
UART9	/dev/ttyS9	RS485

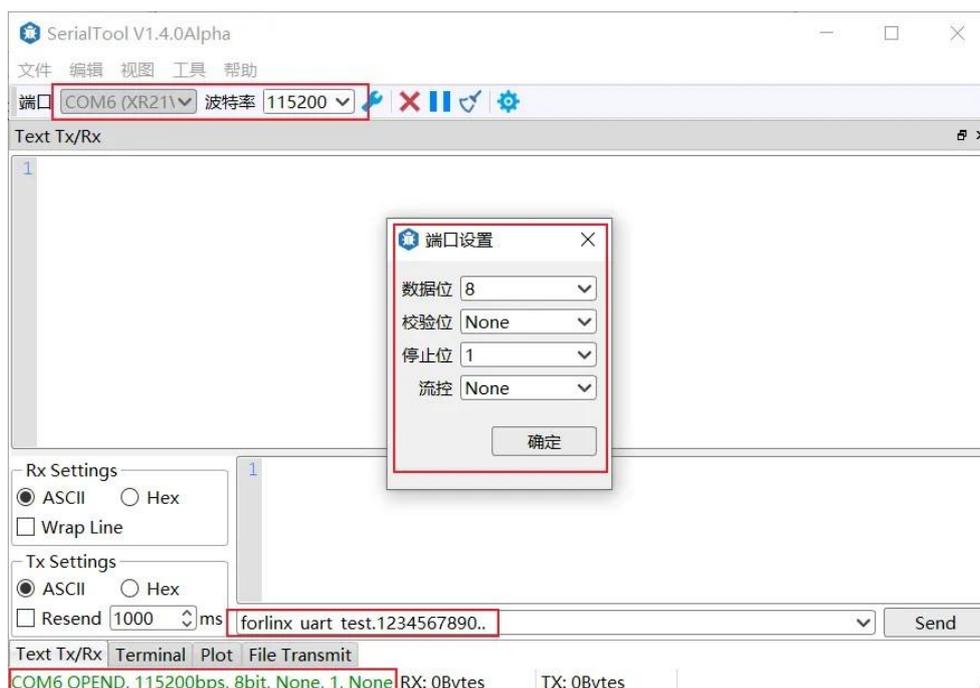
This test uses UART4 (`ttyS4`), according to the development board schematic short UART4 transceiver pins corresponding to PIN7 and PIN10. Serial port testing is performed by sending and receiving data between the development board's UART and the computer's serial port tool software.



1. First, connect the development board and computer with the TTL to the USB module, then power up the development board and check in the computer's device manager recognized as COM4 (users set the parameters with their actual recognized COM port).



2. Open the computer serial port tool, set the serial port parameters: baud rate 115200, 8 data bits, 1 stop bit, no parity, no flow control, and open the serial port.



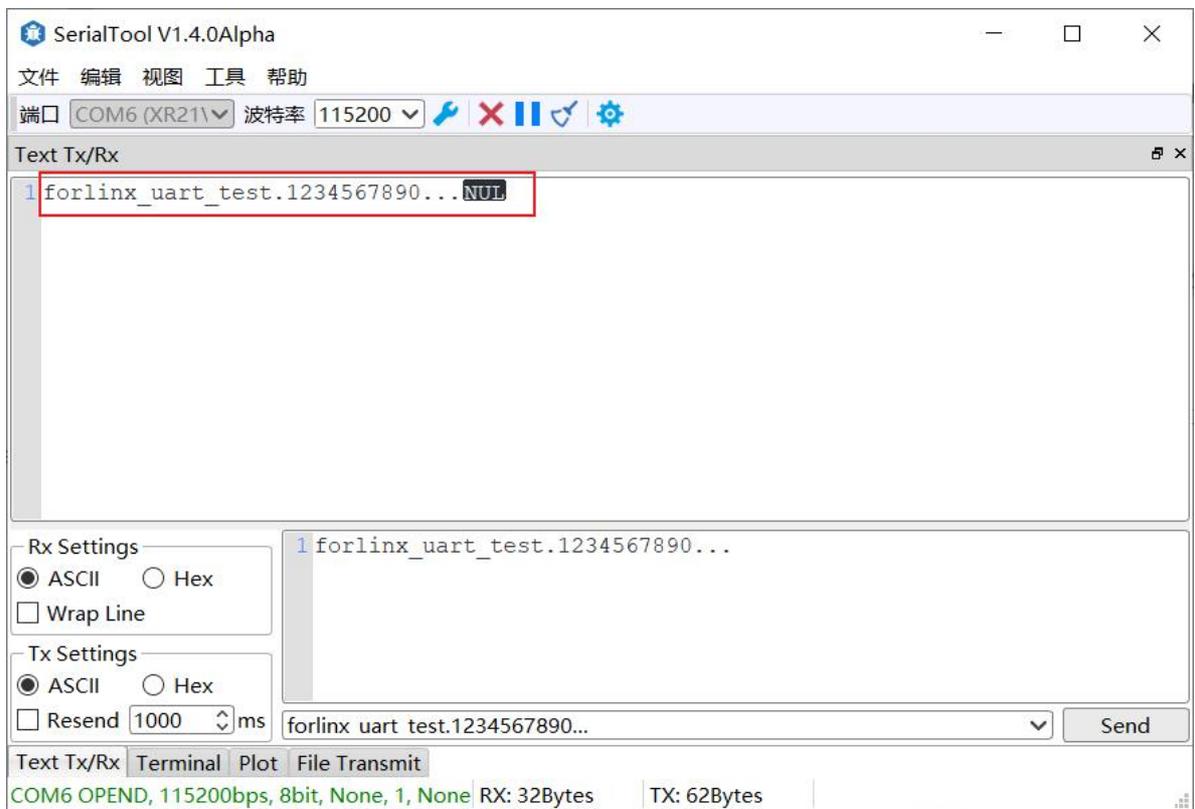
Enter the following command into the serial port of the development board (the test program has a fixed baud rate of 115200):

```
root@ok3588-buildroot:~# fltest_uarttest -d /dev/ttyS4
```

Printing information is as follows:

```
welcome to uart test
send test data:
forlinux_uart_test.1234567890...// Data sent
```

The test program automatically se"forlinux_uart_test.1234567890...". The message is received when the serial aide is viewed:



PC serial tool sends "forlinux_uart_test.1234567890...". At this point, the development board receives the message and the related printout is as follows:

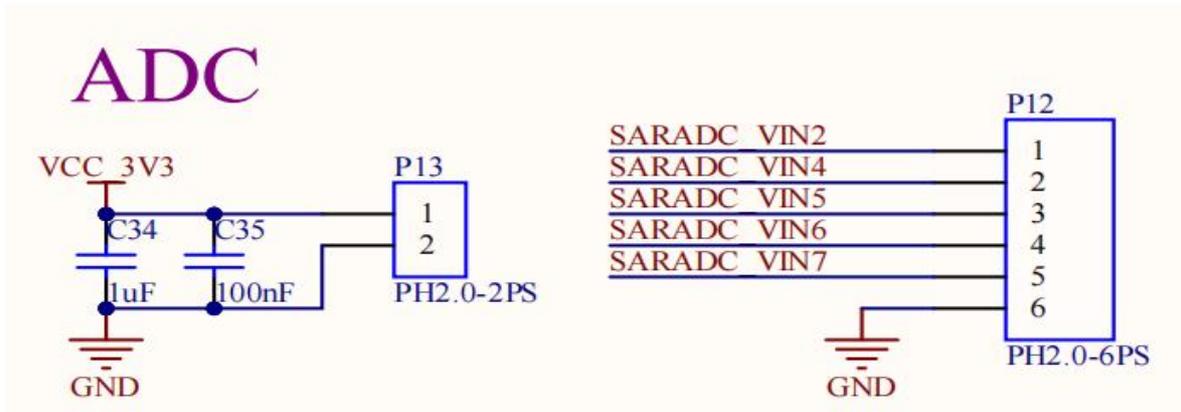
```
welcome to uart test
Send test data:

forlinux_uart_test.1234567890...
Read Test Data finished,Read:
forlinux_uart_test.1234567890...

//Receive data
```

4.6 ADC Test

OK3588-C development board provides an internal 8-channel ADC. An adjustable resistor connects to the saradc2, saradc4, saradc5, saradc6, and saradc7 channels, and saradc2 is selected for testing. The ADC pin hardware diagram is shown below, and the voltage is inputted at pin 1 of P12. The current chip uses a 1.8V reference voltage corresponding to a 12-bit ADC maximum of 4096.



Test adjustable resistance value.

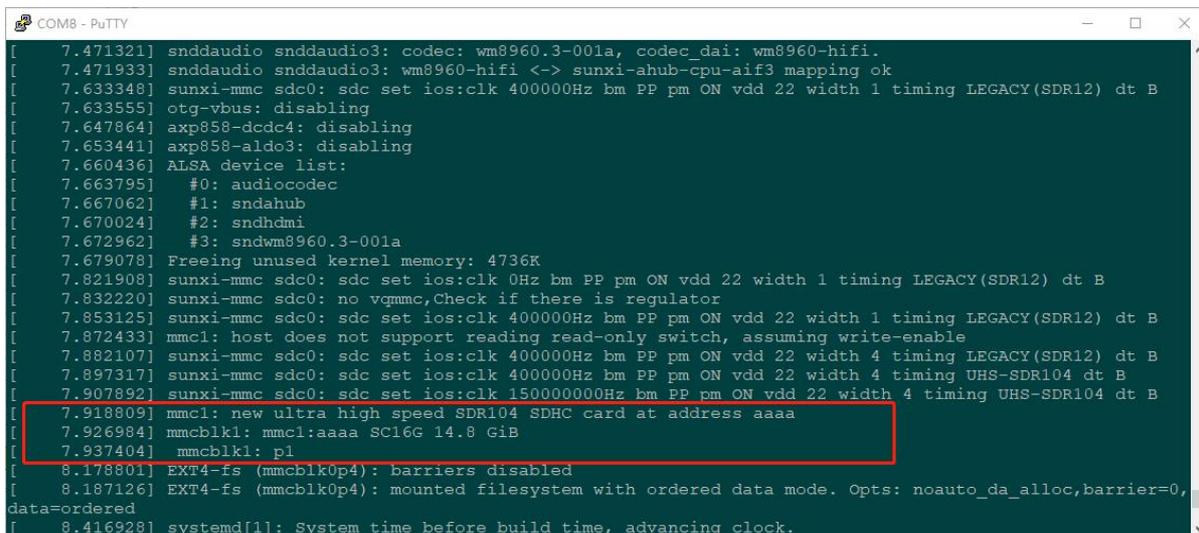
```
root@ok3588-buildroot:~# cd /sys/bus/iio/devices/iio:device0
root@ok3588:/sys/bus/iio/devices/iio:device0# cat in_voltage2_raw
3516
```

4.6 TF Card Test

Description:

The SD card mount directory is /run/media/ and supports hot-swapping.

1. Insert the TF card into the TF card slot on the carrier board before power-up. Then power up and start, run the command `dmesg`, and the terminal will have the following printed information:



```
COM8 - PuTTY
[ 7.471321] snddaudio snddaudio3: codec: wm8960.3-001a, codec_dai: wm8960-hifi.
[ 7.471933] snddaudio snddaudio3: wm8960-hifi <-> sunxi-ahub-cpu-aif3 mapping ok
[ 7.633348] sunxi-mmc sdc0: sdc set ios:clk 400000Hz bm PP pm ON vdd 22 width 1 timing LEGACY(SDR12) dt B
[ 7.633555] otg-vbus: disabling
[ 7.647864] axp858-dcdc4: disabling
[ 7.653441] axp858-aldo3: disabling
[ 7.660436] ALSA device list:
[ 7.663795] #0: audiocodec
[ 7.667062] #1: sndahub
[ 7.670024] #2: sndhdmi
[ 7.672962] #3: sndwm8960.3-001a
[ 7.679078] Freeing unused kernel memory: 4736K
[ 7.821908] sunxi-mmc sdc0: sdc set ios:clk 0Hz bm PP pm ON vdd 22 width 1 timing LEGACY(SDR12) dt B
[ 7.832200] sunxi-mmc sdc0: no vgmnc,Check if there is regulator
[ 7.853125] sunxi-mmc sdc0: sdc set ios:clk 400000Hz bm PP pm ON vdd 22 width 1 timing LEGACY(SDR12) dt B
[ 7.872433] mmc1: host does not support reading read-only switch, assuming write-enable
[ 7.882107] sunxi-mmc sdc0: sdc set ios:clk 400000Hz bm PP pm ON vdd 22 width 4 timing LEGACY(SDR12) dt B
[ 7.897317] sunxi-mmc sdc0: sdc set ios:clk 400000Hz bm PP pm ON vdd 22 width 4 timing UHS-SDR104 dt B
[ 7.907892] sunxi-mmc sdc0: sdc set ios:clk 150000000Hz bm PP pm ON vdd 22 width 4 timing UHS-SDR104 dt B
[ 7.918809] mmc1: new ultra high speed SDR104 SDHC card at address aaaa
[ 7.926984] mmcblk1: mmc1:aaaa SC16G 14.8 GiB
[ 7.937404] mmcblk1: p1
[ 8.178801] EXT4-fs (mmcblkUp4): barriers disabled
[ 8.187126] EXT4-fs (mmcblkUp4): mounted filesystem with ordered data mode. Opts: noauto_da_alloc,barrier=0,
data=ordered
[ 8.416928] systemd[1]: System time before build time, advancing clock.
```

2. Check the mount directory:

```
root@ok3588-buildroot:~# mount | grep "mmcblk1p1"
/dev/mmcblk1p1 on /run/media/mmcblk1p1 type vfat
(rw,relatime,fmask=0022,dmask=0022,codepage=936,ioccharset=utf8,shortname=mixed,errors=remount-ro)
```

3. Write test:

```
root@ok3588-buildroot:~# dd if=/dev/zero of=/run/media/mmcblk1p1/test bs=1M
count=500 conv=fsync

500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 13.5747 s, 38.6 MB/s
```

4. Read the test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@ok3588-buildroot:~# dd if=/run/media/mmcblk1p1/test of=/dev/null bs=1M
500+0 records in

500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 9.60899 s, 54.6 MB/s
```

5. After using the TF card, uninstall it with umount before ejecting it.

```
root@ok3588-buildroot:~# umount /run/media/mmcblk1p1
```

Note: Plug and unplug the TF card after exiting the TF card mounting path.

4.7 eMMC Test

OK3588 platform eMMC runs in HS200 mode 200MHz clock by default. The following is a simple eMMC read/write speed test: taking the read/write ext4 file system as an example.

Write test:

```
root@ok3588-buildroot:~# dd if=/dev/zero of=/test bs=1M count=500 conv=fsync
500+0 records in

500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 3.29881 s, 159 MB/s
```

Read test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@ok3588-buildroot:/# dd if=/test of=/dev/null bs=1M
500+0 records in

500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 2.57102 s, 204 MB/s
```

4.8 USB Mouse Test

Connect the USB mouse to the USB interface of the OK3588 platform and use the `dmesg` command, the serial terminal prints the following information:

```
[ 4548.850548] usb 3-1: new low-speed USB device number 2 using ohci-platform
[ 4549.076070] usb 3-1: New USB device found, idVendor=09da, idProduct=8736, bcdDevice= 1.01
[ 4549.076086] usb 3-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[ 4549.076095] usb 3-1: Product: USB Mouse
[ 4549.076103] usb 3-1: Manufacturer: SIGMACHIP
[ 4549.083863] input: SIGMACHIP USB Mouse as /devices/platform/fc840000.usb/usb3/3-1/3-1:1.0/0003:09DA:8736.0001/input/input8
[ 4549.140890] hid-generic 0003:09DA:8736.0001: input,hidraw0: USB HID v1.10 Mouse [SIGMACHIP USB Mouse] on usb-fc840000.usb-1/input0
```

At this time, the arrow cursor appears on the screen, the mouse can work normally.

4.9 USB2.0

OK3588 supports 1 x USB 2.0 interface. Users can connect a USB mouse, USB keyboard, USB flash drive, and other devices on any of the on-board USB HOST ports, and it supports hot-swapping of the above devices. Demonstration with a mounting USB flash drive, the current USB flash drive test support up to 32G, but no test for 32G or above.

The terminal prints information about the USB flash drive, and since many types of USB flash drives exist, the information displayed may vary:

1. After the development board booting, connect the USB interface disk to the USB host interface of the development board. The default log print information is low, so there will be no print information. Use the `dmesg` command to view and get information about the USB flash drive.

```
[ 4918.530468] usb 1-1: new high-speed USB device number 3 using ehci-platform
[ 4918.679715] usb 1-1: New USB device found, idVendor=0781, idProduct=5591, bcdDevice= 1.00
[ 4918.679731] usb 1-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 4918.679740] usb 1-1: Product: SanDisk 3.2Gen1
[ 4918.679748] usb 1-1: Manufacturer: USB
[ 4918.679756] usb 1-1: SerialNumber: 050104f747e0b9702e943a7e9ad6562604d20c3ecf1cd2a176a7f3cbbb86bbfbee0400000000000000000000004017c75600001810915581071d2eeab7
[ 4918.680942] usb-storage 1-1:1.0: USB Mass Storage device detected
[ 4918.684276] scsi host0: usb-storage 1-1:1.0
[ 4919.688778] scsi 0:0:0:0: Direct-Access          USB          SanDisk 3.2Gen1 1.00 PQ: 0 ANSI: 6
[ 4919.690416] sd 0:0:0:0: [sda] 60088320 512-byte logical blocks: (30.8 GB/28.7 GiB)
[ 4919.691870] sd 0:0:0:0: [sda] Write Protect is off
[ 4919.691877] sd 0:0:0:0: [sda] Mode Sense: 43 00 00 00
[ 4919.693242] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 4919.786514] sda: sda1
[ 4919.796524] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 4920.341605] FAT-fs (sda): utf8 is not a recommended IO charset for FAT filesystems, filesystem will be case sensitive!
```

2. View the mount directory:

```
root@ok3588-buildroot:/# mount | grep "sda1"
/dev/sda1 on /run/media/sda1 type vfat
(rw,relatime,fmask=0022,dmask=0022,codepage=936,iocharset=utf8,shortname=mixed,errors=remount-ro)
```

We can see the USB mount directory: /run/media/sda1

3. View the contents of the U disk (sda1 is based on the actual USB flash drive partition name).

```
root@ok3588-buildroot:/# ls -l /run/media/sda1/
total 8
drwxrwx--- 2 root disk 8192 Sep 23  2021 'System Volume Information'
-rwxrwx--- 1 root disk   0 Apr 25 09:25 test
```

4. Write test: Write speeds are limited by the specific storage device:

```
root@ok3588-buildroot:/# dd if=/dev/zero of=/run/media/sda1/test bs=1M count=500
conv=fsync

500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 74.533 s, 7.0 MB/s
```

5. Read the test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@ok3588-buildroot:/# dd if=/run/media/sda1/test of=/dev/null bs=1M
iflag=direct

500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 25.2193 s, 20.8 MB/s
```

6. After using a USB flash drive, before removing the USB flash drive, you need to use the "umount" command to unmount it.

```
root@ok3588-buildroot:/# umount /run/media/sda1
```

Note: Exit the USB flash drive mount path before plugging and unplugging the USB flash drive.

4.10 TYPE-C Test

OK3588-C includes 2 x TYPE-C. The HOST/DEVICE mode of TYPE-C0 is automatically detected, while TYPE-C1 only supports HOST mode. Device mode can flash, transfer ADB file, debug, and Host mode can plug in a normal USB device.

Device Mode:



Host Mode:

View the insertion information via demsg.

```
[ 5448.472251] dwc3 fc000000.usb: request 000000006d9656a9 was not queued to ep0out
[ 5448.472317] android_work: did not send uevent (0 0 0000000000000000)
[ 5448.580944] xhci-hcd xhci-hcd.11.auto: xHCI Host Controller
[ 5448.581529] xhci-hcd xhci-hcd.11.auto: new USB bus registered, assigned bus number 9
[ 5448.581715] xhci-hcd xhci-hcd.11.auto: hcc params 0x0220fe64 hci version 0x110 quirks 0x0
000802002010010
[ 5448.581754] xhci-hcd xhci-hcd.11.auto: irq 163, io mem 0xfc000000
[ 5448.581911] xhci-hcd xhci-hcd.11.auto: xHCI Host Controller
[ 5448.582315] xhci-hcd xhci-hcd.11.auto: new USB bus registered, assigned bus number 10
[ 5448.582333] xhci-hcd xhci-hcd.11.auto: Host supports USB 3.0 SuperSpeed
[ 5448.582544] usb usb9: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice= 5.1
0
[ 5448.582555] usb usb9: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 5448.582563] usb usb9: Product: xHCI Host Controller
[ 5448.582571] usb usb9: Manufacturer: Linux 5.10.209 xhci-hcd
[ 5448.582579] usb usb9: SerialNumber: xhci-hcd.11.auto
[ 5448.583400] hub 9-0:1.0: USB hub found
[ 5448.583442] hub 9-0:1.0: 1 port detected
[ 5448.583982] usb usb10: We don't know the algorithms for LPM for this host, disabling LPM.
[ 5448.584106] usb usb10: New USB device found, idVendor=1d6b, idProduct=0003, bcdDevice= 5.
10
[ 5448.584116] usb usb10: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 5448.584123] usb usb10: Product: xHCI Host Controller
[ 5448.584130] usb usb10: Manufacturer: Linux 5.10.209 xhci-hcd
[ 5448.584138] usb usb10: SerialNumber: xhci-hcd.11.auto
[ 5448.585044] hub 10-0:1.0: USB hub found
[ 5448.585085] hub 10-0:1.0: 1 port detected
[ 5449.117131] usb 10-1: new SuperSpeed Gen 1 USB device number 2 using xhci-hcd
[ 5449.136375] usb 10-1: New USB device found, idVendor=0781, idProduct=5591, bcdDevice= 1.0
0
[ 5449.136390] usb 10-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 5449.136399] usb 10-1: Product: SanDisk 3.2Gen1
[ 5449.136407] usb 10-1: Manufacturer: USB
[ 5449.136416] usb 10-1: SerialNumber: 050104f747e0b9702e943a7e9ad6562604d20c3ecf1cd2a176a7f
3cbbb86bbf8e040000000000000000000004017c75600001810915581071d2eeab7
[ 5449.138490] usb-storage 10-1:1.0: USB Mass Storage device detected
[ 5449.139411] scsi host0: usb-storage 10-1:1.0
[ 5450.142516] scsi 0:0:0:0: Direct-Access          USB          SanDisk 3.2Gen1 1.00 PQ: 0 ANSI: 6
[ 5450.151439] sd 0:0:0:0: [sda] 60088320 512-byte logical blocks: (30.8 GB/28.7 GiB)
[ 5450.152253] sd 0:0:0:0: [sda] Write Protect is off
[ 5450.152263] sd 0:0:0:0: [sda] Mode Sense: 43 00 00 00
[ 5450.153002] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support
DPO or FUA
[ 5450.299652] sda: sda1
[ 5450.309248] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 5450.454427] FAT-fs (sda): utf8 is not a recommended IO charset for FAT filesystems, files
ystem will be case sensitive!
[ 5451.144263] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT filesystems, file
system will be case sensitive!
```

4.11 Ethernet Configuration

OK3588-C has two Gigabit NICs on board, which are configured as dynamic IPs by factory default (with a network connection).

Create an eth0 configuration file. The path to the configuration file is /etc/network/interfaces. Set the dynamic ip configuration file content as follows:

```
auto eth0
iface eth0 inet dhcp
```

Set the static configuration IP. Take eth0 set ip to 192.168.0.232 as an example:

```
auto eth0
iface eth0 inet static
address 192.168.0.232
netmask 255.255.255.0
gateway 192.168.0.1
```

Parameter	Meaning
iface	Used to specify a network card that requires a fixed IP
address	Used to specify an IP address that needs to be fixed
netmask	Used to set the subnet mask
gateway	Used to specify a gateway

After setting up, use the sync file synchronization command to reboot the development board or restart the service for the configuration to take effect.

```
root@ok3588-buildroot:/# ifdown -a
root@ok3588-buildroot:/# ifup -a
```

4.12 WIFI Test

Description:

The network environment is different, so please set it according to the actual situation when you do this experiment.

OK3588 platform supports two types of WIFI Bluetooth 2-in-1 modules; AW9098 and AW8997.

STA Mode

This mode means that it acts as a station and connects to the wireless network. In the following test, the router uses WPA encryption, the connected wifi hotspot name is: H3C_708_5G and the password is: 123456785. Due to the different network environments, users should set up according to the actual situation when conducting this test:

1. Take AW-XM458 module as an example, enter the following commands in the development board terminal:

```
root@ok3588-buildroot:/# fltest_wifi.sh -i wlan0 -s H3C_708_5G -p 12345678
```

The meanings of the related parameters in the command are as follows:

Parameter	Meaning
-i	Different wifi modules use different parameters, and specify the WIFI device name.
-s	Actual wifi hotspot connected
-p	-p: followed by the parameter Password refers to the password of the actual wifi hotspot to be connected. If the current hotspot does not have a password, the parameter after -p is NONE.

The serial port prints as follows:

```
wifi wlan0
ssid H3C_708_5G
pasw 123456785.

[ 480.732219] wlan: Received disassociation request on wlan0, reason: 3
[ 480.732260] wlan: REASON: (Deauth) Sending STA is leaving (or has left) IBSS
or ESS

waiting...
[ 483.053122] wlan: wlan0 START SCAN
try to connect again...
[ 487.590894] wlan: Connected to bssid 14:XX:XX:XX:fc:87 successfully
[ 487.600365] woa1_cfg80211_set_rekey_data return: gtk_rekey_offload is DISABLE
RTNETLINK answers: File exists
```

1. Check whether it can ping the external network and enter the following command in the terminal:

```
root@ok3588-buildroot:/# ping www.forlinx.com -c 3
PING s-526319.gotocdn.com (211.149.226.120) 56(84) bytes of data.
64 bytes from 211.149.226.120 (211.149.226.120): icmp_seq=1 ttl=49 time=201 ms
64 bytes from 211.149.226.120 (211.149.226.120): icmp_seq=2 ttl=49 time=226 ms
64 bytes from 211.149.226.120 (211.149.226.120): icmp_seq=3 ttl=49 time=253 ms

--- s-526319.gotocdn.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
```

AP Mode

Description:

Ensure that the Gigabit LAN card is eth0 connected to the network and that the network works well before performing this test.

1. Check the driver loading status, take AW-XM458 module for example

```
root@ok3588-buildroot:/# lsmod //View Loaded Module
Module          Size      Used by    Tainted: G
moal            573440    1
m1an            454656    1 moal
```

2. Configuration Hotspot

WiFi Hotspot Name: OK3588_WIFI_2.4G_AP Password: 12345678

Check by hotspot name, password and /etc/hostapd-2.4g.conf.

```
root@ok3588-buildroot:/# sudo fltest_hostapd.sh
[ 705.365653] wlan: Received disassociation request on m1an0, reason: 3
[ 705.365693] wlan: REASON: (Deauth) Sending STA is leaving (or has left) IBSS
or ESS

hostapd: no process found
Stopping dnsmasq (via systemctl): dnsmasq.service.
Configuration file: /etc/hostapd-2.4g.conf
[ 706.760789] uap0: Skip change virtual intf on uap: type=3

Using interface uap0 with hwaddr 14:13:33:63:f0:73 and ssid
"OK3588_WIFI_2.4G_AP"

uap0: interface state UNINITIALIZED->ENABLEDuap0: AP-ENABLED
Starting dnsmasq (via systemctl): dnsmasq.service.
```

4.13 Bluetooth Test

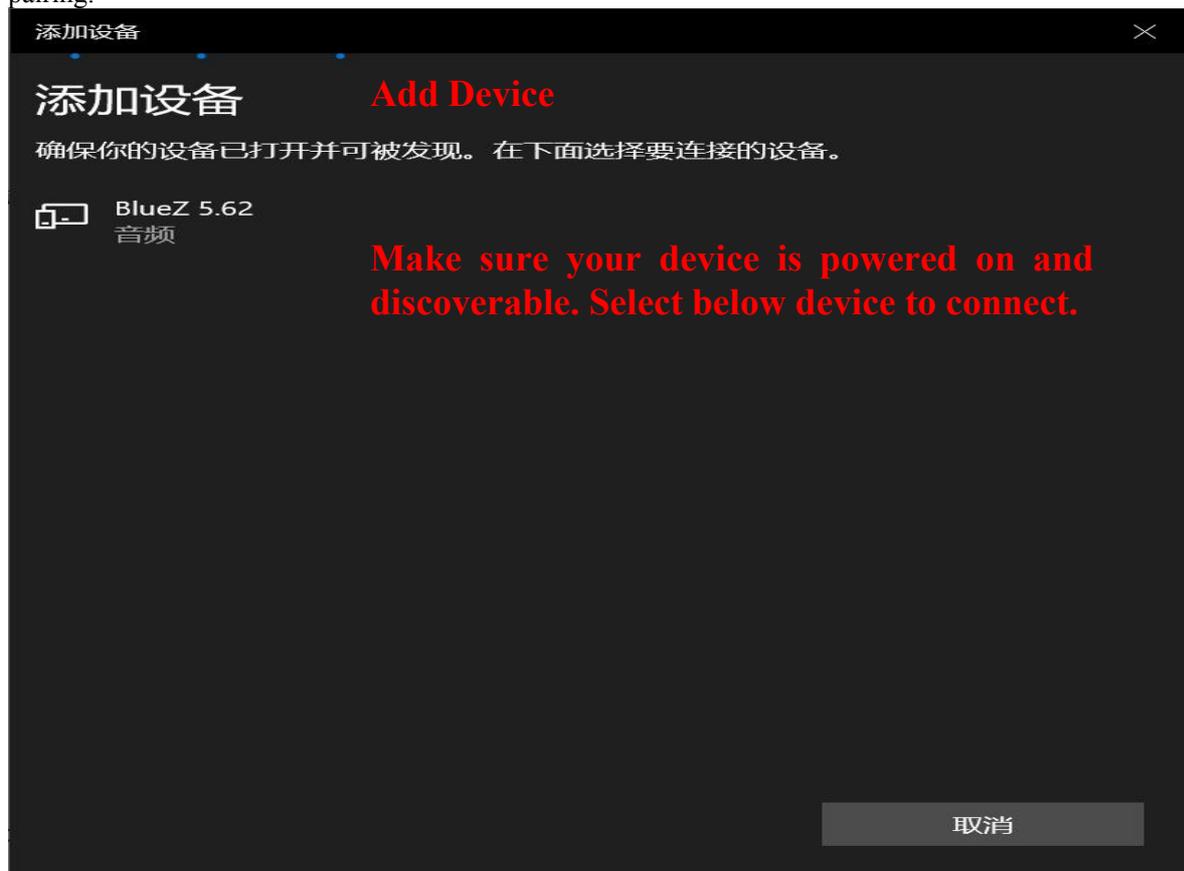
The AW-XM458 module on the OK3588 carrier board integrates Bluetooth. This section demonstrates data transfer via Bluetooth between a cell phone and the development board. It can support Bluetooth up to 5.0.

1. Bluetooth Configuration

```
root@ok3588-buildroot:/# bluetoothctl //Open the bluez Bluetooth tool
[NEW] Controller B8:4D:43:12:43:6F forlinx [default]
Agent registered
[bluetooth]# power on //Start the Bluetooth device
Changing power on succeeded
[bluetooth]# pairable on //Set to pairing mode
Changing pairable on succeeded
[bluetooth]# discoverable on //Set to discoverable mode
[bluetooth]# [ 1547.589820] Bluetooth: hu fffffffc066059c00 retransmitting 1 pkts
Changing discoverable on succeeded
[CHG] Controller B8:4D:43:12:43:6F Discoverable: yes
[bluetooth]# agent on //Start the agent
Agent is already registered
[bluetooth]# default-agent //Set the current agent as the default
Default agent request successful
```

2. Development Board Passive Pairing

At this point, open the PC Bluetooth search, then a "BlueZ 5.72" device will appear, and select the pairing.



At the same time the printing message displays on the development board as follows, enter "Yes".

```
[bluetooth]#
Default agent request successful
[NEW] Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F
Request confirmation
[agent] Confirm passkey 678054 (yes/no): yes
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110e-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 Modalias: bluetooth:v0006p0001d0A00
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001000-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110a-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110b-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110e-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001115-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000111e-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000111f-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001200-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: c7f94713-891e-496a-a0e7-983a0946126e
[CHG] Device 2C:DB:07:C7:4F:F6 ServicesResolved: yes
[CHG] Device 2C:DB:07:C7:4F:F6 Paired: yes
Authorize service
[agent] Authorize service 0000110e-0000-1000-8000-00805f9b34fb (yes/no): yes

Authorize service
[agent] Authorize service 0000110d-0000-1000-8000-00805f9b34fb (yes/no): yes
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001000-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110a-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110b-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110d-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000110e-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001115-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000111e-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 0000111f-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: 00001200-0000-1000-8000-00805f9b34fb
[CHG] Device 2C:DB:07:C7:4F:F6 UUIs: c7f94713-891e-496a-a0e7-983a0946126e
```

View and remove connected devices:

```
[bluetooth]# devices //View connected Bluetooth device
Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F
[bluetooth]# remove 2C:DB:07:C7:4F:F6 //Remove the device
```

3. Development board active pairing

In addition to passive pairing, it is also possible to send an active pairing request from the development board terminal.

```
[bluetooth]# scan on //Search for discoverable Bluetooth
Discovery started

[CHG] Controller 14:13:33:63:EF:72 Discovering: yes
[NEW] Device FC:E8:00:CF:42:E3 EDIFIER BLE

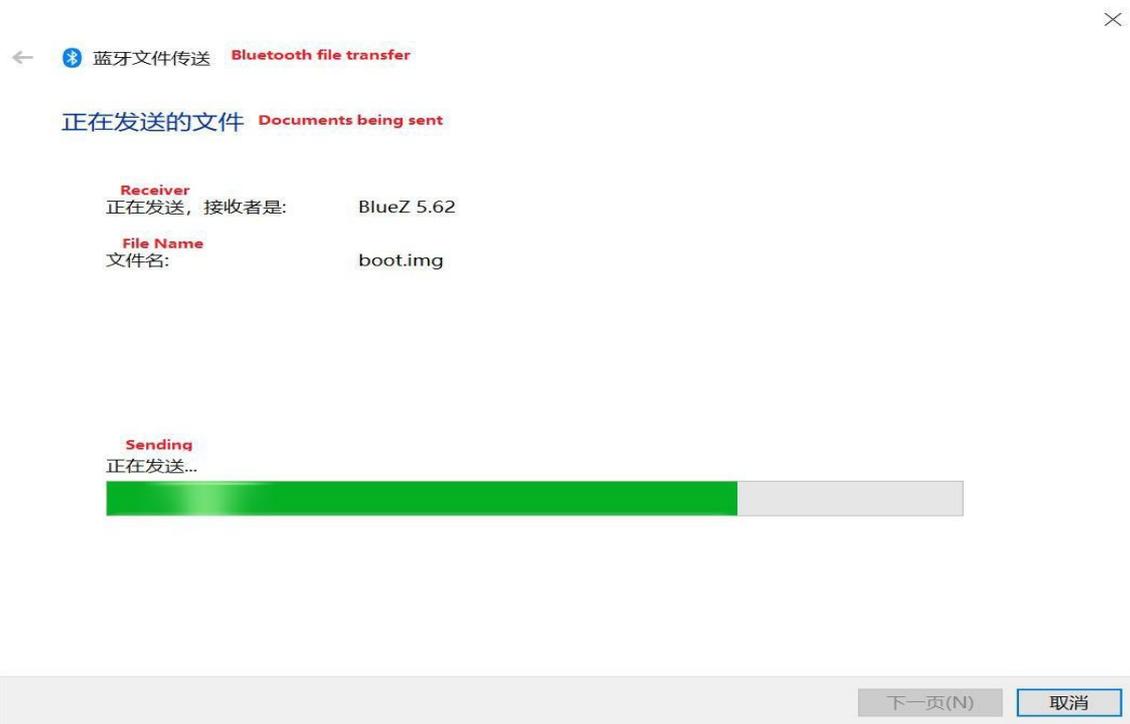
[NEW] Device 5C:50:51:B5:85:4B 5C-50-51-B5-85-4B
[CHG] Device FC:E8:00:CF:42:E3 RSSI: -92

[bluetooth]# scan off //Stop searching
[bluetooth]# pair 2C:DB:07:C7:4F:F6 //Pair Bluetooth
Attempting to pair with 2C:DB:07:C7:4F:F6
[CHG] Device 2C:DB:07:C7:4F:F6 Connected: yes
Request confirmation

[agent] Confirm passkey 745068 (yes/no): yes
```

4. Development board to receive documents

After successful pairing, on the PC side, Bluetooth can send files to the OK3568-C.



Received files are saved in the /tmp directory.

5. The development board to send files

Similarly, the OK3588-C can send files to a cell phone, test is as follows:

6. OK3588-C development board to send files to the cell phone, the test method is as follows:

```
root@ok3588-buildroot:/# fltest_obexctl.sh //Open obexctl
[NEW] Client /org/bluez/obex

[obex]# connect 2C:DB:07:C7:4F:F6 //Connect to the Bluetooth
Attempting to connect to 2C:DB:07:C7:4F:F6

[NEW] Session /org/bluez/obex/client/session1 [default][NEW]
ObjectPush /org/bluez/obex/client/session1 Connection successful

[C4:E1:A1:BA:A4:9E]# send /userdata/media/audio/test.mp3 //Send files
```



The phone will receive the incoming file request, click Accept to transfer the file.

4.18 4G/5G

Description:

- When using the IoT card to test, the module firmware version needs to be confirmed, the low firmware version is not supported, and EC05 needs to be upgraded.
- Some IoT cards require a dedicated account number and password when dialing, and users adjust the commands according to the situation.
- The `quectelCM --help` command allows you to see the meaning of the relevant parameters.

OK3588 supports 4G module EM05 and 5G RM500U RM500Q; before the development board startup, access the 4G/5G m, insert the SIM card, and start the development board.

1. After connecting the module and powering up the board and module, check the USB status through the `lsusb` command.

```
root@ok3588-buildroot:/# lsusb
Bus 006 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 005 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 003: ID 2c7c:0125 //EC05 VID and PID
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

View device node status under /dev

```
root@ok3588-buildroot:/# ls /dev/ttyUSB*
/dev/ttyUSB0 /dev/ttyUSB1 /dev/ttyUSB2 /dev/ttyUSB3
```

2. After the equipment is successfully identified, the dial-up Internet access test can be conducted. `fltest_quectel.sh` calls `quectelCM`, see `/usr/bin/fltest_quectel.sh` for specific commands.

```
root@ok3588-buildroot:/# fltest_quectel.sh &
```

Printing information is as follows:

```
[01-01_08:00:45:041] Quectel_QConnectManager_Linux_v1.6.0.24
[01-01_08:00:45:042] Find /sys/bus/usb/devices/2-1 idVendor=0x2c7c idProduct=0x125, bus=0x002, dev=0x002
[01-01_08:00:45:043] Auto find qmichannel = /dev/qcqmio
[01-01_08:00:45:043] Auto find usbnet_adapter = usb0
[01-01_08:00:45:043] netcard driver = GobiNet, driver version = V1.6.2.14
[01-01_08:00:45:043] Modem works in QMI mode
[01-01_08:00:45:133] Get clientWDS = 7
[01-01_08:00:45:201] Get clientDMS = 8
[01-01_08:00:45:230] Get clientNAS = 9
[01-01_08:00:45:261] Get clientUIM = 10
[01-01_08:00:45:347] Get clientWDA = 11
[01-01_08:00:45:391] requestBaseBandVersion EM05CEFCR06A04M1G_ND
[01-01_08:00:45:663] requestGetSIMStatus SIMStatus: SIM_READY
[01-01_08:00:45:710] requestGetProfile[1] cmnet///1
[01-01_08:00:45:743] requestRegistrationState2 MCC: 460, MNC: 0, PS: Attached, DataCap: LTE
[01-01_08:00:45:804] requestQueryDataCall IPv4ConnectionStatus: DISCONNECTED
[01-01_08:00:45:851] ifconfig usb0 0.0.0.0
[01-01_08:00:45:859] ifconfig usb0 down
[01-01_08:00:45:934] requestSetupDataCall wdsConnectionIPv4Handle: 0x86d6ed00
[01-01_08:00:46:158] ifconfig usb0 up
[01-01_08:00:46:233] busybox udhcpc -f -n -q -t 5 -i usb0
udhcpc: started, v1.36.1
udhcpc: broadcasting discover
udhcpc: broadcasting select for 10.78.208.225, server 10.78.208.226
udhcpc: lease of 10.78.208.225 obtained from 10.78.208.226, lease time 7200
[01-01_08:00:50:588] deleting routers
[01-01_08:00:50:610] adding dns 111.11.1.3
[01-01_08:00:50:610] adding dns 111.11.11.3
```

3. Before testing, check the relevant configuration

View Gateway Configuration

```
root@ok3588-buildroot:/# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 10.78.208.226 0.0.0.0 UG 0 0 0 usb0
10.78.208.224 * 255.255.255.252 U 0 0 0 usb0
```

Viewing DNS Configuration

```
root@ok3588-buildroot:/# cat /etc/resolv.conf
nameserver 111.11.1.3 # usb0
nameserver 111.11.11.3 # usb0
```

4. After setting up DNS and routing, we can ping the domain name.

```
root@ok3588-buildroot:/# ping -I usb0 www.baidu.com -c 3 //Specify the
ping3times usb0 NIC
PING www.a.shifen.com (39.156.66.14) from 10.78.208.225 usb0: 56(84) bytes of
data.
64 bytes from 39.156.66.14 (39.156.66.14): icmp_seq=1 ttl=50 time=39.9 ms
64 bytes from 39.156.66.14 (39.156.66.14): icmp_seq=2 ttl=50 time=88.0 ms
64 bytes from 39.156.66.14 (39.156.66.14): icmp_seq=3 ttl=50 time=105 ms
--- www.a.shifen.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2112ms
rtt min/avg/max/mdev = 39.938/77.690/105.133/27.596 ms
```

4.19 Play/Record Test

OK3588 provides the NAU88C22YG chip, 1 x standard 3.5mm audio jack, 1 x XH2.0-2P white socket P25 lead-out, and 1 x PH2.0-4P white socket P48 lead-out. It can drive an 8Ω speaker with a maximum output power of 1W. Before conducting playback tests, please connect the prepared headphones to the headphone jack or insert the speaker into the corresponding slot on the carrier board for testing.

4.19.1 HDMI Play Sound

```
root@ok3588-buildroot:/# aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: rockchipdp1 [rockchip,dp1], device 0: rockchip,dp1 spdif-hifi-0
[rockchip,dp1 spdif-hifi-0]

  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: rockchipnau8822 [rockchip-nau8822], device 0: dailink-multicodecs
nau8822-hifi-0 [dailink-multicodecs nau8822-hifi-0]

  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 3: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-0
[rockchip-hdmi0 i2s-hifi-0]

  Subdevices: 1/1
  Subdevice #0: subdevice #0
root@ok3588-buildroot:/# gst-play-1.0 /userdata/media/audio/test.mp3 --
audiosink="alsasink device=plughw:3,0"
```

4.19.2 SPKOUT for Sound Play

```
root@ok3588-buildroot:/# amixer -c rockchipnau8822 //Query audio parameters
root@ok3588-buildroot:/# amixer -c rockchipnau8822 sset "PCM" 255 //Set PCM parameters
root@ok3588-buildroot:/# amixer -c rockchipnau8822 sset "Speaker" on //Open Speaker
root@ok3588-buildroot:/# amixer -c rockchipnau8822 sset "Speaker" 63 //Set the volume
root@ok3588-buildroot:/# gst-play-1.0 /userdata/media/test.mp3 --audiosink="alsasink device=plughw:2,0"
```

Plug the headphones into the SPKOUT connector to hear the sound.

4.19.3 MIC Input

```
root@ok3588-buildroot:/# arecord -l
**** List of CAPTURE Hardware Devices ****
card 1: rockchiphdmiin [rockchip,hdmiin], device 0: rockchip,hdmiin i2s-hifi-0
[rockchip,hdmiin i2s-hifi-0]

  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: rockchipnau8822 [rockchip-nau8822], device 0: dailink-multicodecs
nau8822-hifi-0 [dailink-multicodecs nau8822-hifi-0]

  Subdevices: 1/1
  Subdevice #0: subdevice #0
root@ok3588-buildroot:/# arecord -D hw:rockchipnau8822,0 -d 3 -f cd -t wav
test1.wav

//Collect sound for 3 seconds and save in WAV format
root@ok3588-buildroot:/# aplay -D plughw:3,0 test1.wav //Use HDMI to play the
acquired sound
```

4.19.4 HDMI IN Audio Test

Insert the HDMI cable of the PC into the HDMI RX interface, and the PC plays the sound. The following test is conducted in a loopback manner.

```
root@ok3588-buildroot:/# arecord -D plughw:1,0 -f cd -t wav test1.wav
root@ok3588-buildroot:/# aplay -D plughw:3,0 -f cd test1.wav

root@ok3588-buildroot:/# arecord -D plughw:1,0 -f cd | aplay -D plughw:3,0 -f cd
//HDMI IN playback sound is output via HDMI
```

4.20 LCD Backlight Adjustment

Backlight level range (0--255), maximum level 255, 0 indicating turn off. After connecting the mipi screen on the mipi dsi0, power up and start. Enter the system and enter the following command in the terminal to perform the backlight test.

1. View supported backlight models

```
root@ok3588-buildroot:/# ls /sys/class/backlight
backlight-dsi0 backlight-dsi1 backlight-edp1 Display the currently supported
screen backlight model
```

The following is an example of dsi0

2. View the current screen backlight value:

```
root@ok3588-buildroot:/# cat /sys/class/backlight/backlight-dsi0/brightness
150 //Backlight value is 200
```

3. Backlight is off:

```
root@ok3588-buildroot:/# echo 0 > /sys/class/backlight/backlight-dsi0/brightness
```

4. LCD backlight is on:

```
root@ok3588-buildroot:/# echo 125 > /sys/class/backlight/backlight-
dsi0/brightness
```

4.21 Sleep & Wake-up Test

Note: Sleep-wake test without type-C 4G module plugged in.

OK3588 platform supports sleep wake-up.

Short press the power button, the effect is as follows:

```

INFO:      IRQ_EN: 292
INFO:      IRQ_EN: 321
INFO:      IRQ_EN: 365

01INFO:    pmu_power_domains_suspend 1203 pd_st=0x24dffff repair_st=0xfa900001 i
dle_st=0xbffff qst=0x28000
2abcINFO:  pvtm_32k_config:pvtm:
con0=0x23, con1=0x200
st0=0x1, st1=0x208
pvtm_freq: 24375khz, div = 761
real_freq: 31khz
de3456789aINFO:    PMU1_PWR_CON(0x1) PMU1_CRU_PWR_CON(0x2f) PMU1_WAKEUP_INT_CON(0
x100)
PMU2_BUS_IDLE_ST(0x27ffff 0x0) PMU2_BUS_IDLE_ACK(0x27ffff 0x0) PMU2_PWR_GATE_ST
(0x67ffff 0x0)
PMU2_BUS_IDLE_CON(0x0 0xfd80 0xf007) PMU2_BIU_AUTO_CON(0xffff 0xffff 0x7)
PMU2_PWR_GATE_CON(0x0 0x9000 0x3)
PMU2_VOL_GATE_CON(0x7 0x0 0x3)
PMU2_QCHANNEL_PWR_CON(0x0) PMU2_QCHANNEL_STATUS(0xfe0007f)
PMU1_DDR_PWR_CON(0x747 0x747 0x747 0x747)
PMU1_DDR_PWR_SFTCON(0x900 0x900 0x900 0x900)
PMU1_PLLPD_CON(0xffff 0x3)
PMU2_PWR_CON1(0xfe)
PMU2_DSU_PWR_CON(0x3)
PMU2_CORE_PWR_CON0(0x1 0x1)
PMU2_CORE_AUTO_PWR_CON0(0x0 0x0)
PMU2_CLUSTER_IDLE_CON(0x75)
INFO:    PMU0_PWR_CON(0x0) PMU0_WAKEUP_INT_CON(0x0)
PMU0_DDR_RET_CON(0x0 0x0)
PMU1_GRF_SOC_CON2(0x7777) PMU0_GRF_OS_REGS9(0xcb6ded09)
9aS

```

Short press the power button here to wake up:

```

9aS01234INFO:    wake up status: 0x100
INFO:    the wake up information:
INFO:    GPIO0 interrupt wakeup
INFO:    GPIO0: 0x80

a9876543edcba2INFO:  pmu_power_domains_resume 1295 pd_st=0xfffff9 repair_st=0xf
f800001 idle_st=0x23ffff qst=0xfe4007f
INFO:    pmu_power_domains_resume 1368 pd_st=0x24dffff repair_st=0xfa900001 idle
_st=0xbffff qst=0x28000
10INFO:      IRQ_EN: 282
INFO:      IRQ_EN: 272
INFO:      IRQ_EN: 313
INFO:      IRQ_EN: 312
INFO:      IRQ_EN: 311
INFO:      IRQ_EN: 310
INFO:      IRQ_EN: 309
INFO:      IRQ_EN: 292
INFO:      IRQ_EN: 321
INFO:      IRQ_EN: 365
INFO:      IRQ_PED: 309
INFO:      IRQ_PED: 392
INFO:      gpio_a7

I/TC: Secondary CPU 1 initializing
I/TC: Secondary CPU 1 switching to normal world boot
I/TC: Secondary CPU 2 initializing
I/TC: Secondary CPU 2 switching to normal world boot
I/TC: Secondary CPU 3 initializing
I/TC: Secondary CPU 3 switching to normal world boot
I/TC: Secondary CPU 4 initializing
I/TC: Secondary CPU 4 switching to normal world boot
I/TC: Secondary CPU 5 initializing
I/TC: Secondary CPU 5 switching to normal world boot
I/TC: Secondary CPU 6 initializing
I/TC: Secondary CPU 6 switching to normal world boot
I/TC: Secondary CPU 7 initializing
I/TC: Secondary CPU 7 switching to normal world boot

root@ok3588-buildroot:/#

```

4.22 PCIE Test

OK3588-C board has 1×PCIE 2.0 and 1×PCIE 3.0 x4 interface.

Before powering up the system, insert the PCIE module into the PCIE card slot on the carrier board. After powering up and booting, from lspci we can see that the corresponding device enumeration is successful.

Due to the many types of pcie devices, it may not be supported by the kernel by default, so you need to add the corresponding driver for the compiled device by yourself.

```
root@ok3588-buildroot:/#  
root@ok3588-buildroot:/# lspci  
01:00.0 Class 0200: 1d6a:07b1  
00:00.0 Class 0604: 1d87:3588  
root@ok3588-buildroot:/#
```

Take the TL-NT521 Gigabit network card as an example, the Linux kernel already contains the driver by default. After plugging in the NIC, powering up, and booting, we can see the enumeration information with the Ethernet interface.

```
root@ok3588-buildroot:/# ifconfig eth2  
eth2      Link encap:Ethernet  HWaddr EC:60:73:50:EF:1C  
          inet addr:192.168.1.16  Bcast:192.168.1.255  Mask:255.255.255.0  
          inet6 addr: fe80::ee60:73ff:fe50:ef1c/64  Scope:Link  
          UP BROADCAST MULTICAST  MTU:1500  Metric:1  
          RX packets:1095057  errors:0  dropped:0  overruns:0  frame:0  
          TX packets:218610306  errors:0  dropped:0  overruns:0  carrier:0  
          collisions:0  txqueuelen:1000  
          RX bytes:72299605 (68.9 MiB)  TX bytes:330733410858 (308.0 GiB)
```

Set the 3588 to performance mode:

```
root@ok3588-buildroot:/# echo performance > /sys/devices/system/cpu/cpufreq/policy0/scaling_governor  
root@ok3588-buildroot:/# echo performance > /sys/devices/system/cpu/cpufreq/policy4/scaling_governor  
root@ok3588-buildroot:/# echo performance > /sys/devices/system/cpu/cpufreq/policy6/scaling_governor
```

Test bandwidth with iperf3

```
root@ok3588-buildroot:/#  
root@ok3588-buildroot:/# iperf3 -s  
-----  
Server listening on 5201 (test #1)  
-----  
Accepted connection from 192.168.1.16, port 44690  
[ 5] local 192.168.1.17 port 5201 connected to 192.168.1.16 port 44700  
[ ID] Interval      Transfer      Bitrate  
[ 5]  0.00-1.00    sec    853 MBytes    7.15 Gbits/sec  
[ 5]  1.00-2.00    sec    857 MBytes    7.18 Gbits/sec  
[ 5]  2.00-3.00    sec    860 MBytes    7.22 Gbits/sec  
[ 5]  3.00-4.00    sec    864 MBytes    7.25 Gbits/sec  
[ 5]  4.00-5.00    sec    871 MBytes    7.30 Gbits/sec  
[ 5]  5.00-6.00    sec    884 MBytes    7.41 Gbits/sec  
[ 5]  6.00-7.00    sec    899 MBytes    7.54 Gbits/sec  
[ 5]  7.00-8.00    sec    898 MBytes    7.54 Gbits/sec  
[ 5]  8.00-9.00    sec    891 MBytes    7.47 Gbits/sec  
[ 5]  9.00-10.00   sec    892 MBytes    7.48 Gbits/sec  
[ 5] 10.00-10.00   sec    128 KBytes    5.12 Gbits/sec  
-----  
[ ID] Interval      Transfer      Bitrate  
[ 5]  0.00-10.00   sec    8.56 GBytes    7.35 Gbits/sec  
-----  
Server listening on 5201 (test #2)
```

```

root@ok3588-buildroot:/#
root@ok3588-buildroot:/# iperf3 -c 192.168.1.17
Connecting to host 192.168.1.17, port 5201
[ 5] local 192.168.1.16 port 44700 connected to 192.168.1.17 port 5201
[ ID] Interval          Transfer          Bitrate          Retr  Cwnd
[ 5]  0.00-1.00    sec    860 MBytes    7.21 Gbits/sec     0  1.23 MBytes
[ 5]  1.00-2.00    sec    856 MBytes    7.18 Gbits/sec    58   938 KBytes
[ 5]  2.00-3.00    sec    860 MBytes    7.22 Gbits/sec     1   748 KBytes
[ 5]  3.00-4.00    sec    864 MBytes    7.24 Gbits/sec     0   854 KBytes
[ 5]  4.00-5.00    sec    871 MBytes    7.31 Gbits/sec    35   782 KBytes
[ 5]  5.00-6.00    sec    882 MBytes    7.40 Gbits/sec    10   764 KBytes
[ 5]  6.00-7.00    sec    899 MBytes    7.54 Gbits/sec    23   789 KBytes
[ 5]  7.00-8.00    sec    899 MBytes    7.54 Gbits/sec    80   813 KBytes
[ 5]  8.00-9.00    sec    890 MBytes    7.47 Gbits/sec    27   766 KBytes
[ 5]  9.00-10.00   sec    892 MBytes    7.48 Gbits/sec    15   812 KBytes
-----
[ ID] Interval          Transfer          Bitrate          Retr
[ 5]  0.00-10.00   sec    8.57 GBytes    7.36 Gbits/sec   249
[ 5]  0.00-10.00   sec    8.56 GBytes    7.35 Gbits/sec
iperf Done.

```

4.22 RKNPU Test

There is an example of rknpu2 in the Linux file system. The following is an example of mobilenet_v1.rknn for testing:

```

root@ok3588-buildroot:/# /usr/bin/rknn_common_test /usr/share/model/RK3588/mobilenet_v1.rknn
/usr/share/model/dog_224x224.jpg
rknn_api/rknnrt version: 2.0.0b0 (35a6907d79@2024-03-24T10:31:14), driver version: 0.9.6
model input num: 1, output num: 1
input tensors:
  index=0, name=input, n_dims=4, dims=[1, 224, 224, 3], n_elems=150528, size=150528, fmt=NHWC, type=INT8,
  qnt_type=AFFINE, zp=0, scale=0.007812
output tensors:
  index=0, name=MobilenetV1/Predictions/Reshape_1, n_dims=2, dims=[1, 1001, 0, 0], n_elems=1001, size=2002,
  fmt=UNDEFINED, type=FP16, qnt_type=AFFINE, zp=0, scale=1.000000
custom string:
Begin perf ...
  0: Elapse Time = 2.44ms, FPS = 409.67
---- Top5 ----
0.884766 - 156
0.054016 - 155
0.003677 - 205
0.002974 - 284
0.000189 - 285

```

4.23 SQLite3 Test

SQLite3 is a lightweight database management system that adheres to ACID principles, making it a resource-efficient relational database management system. The OK3588-C development board is ported with version 3.21.0 of sqlite3.

```

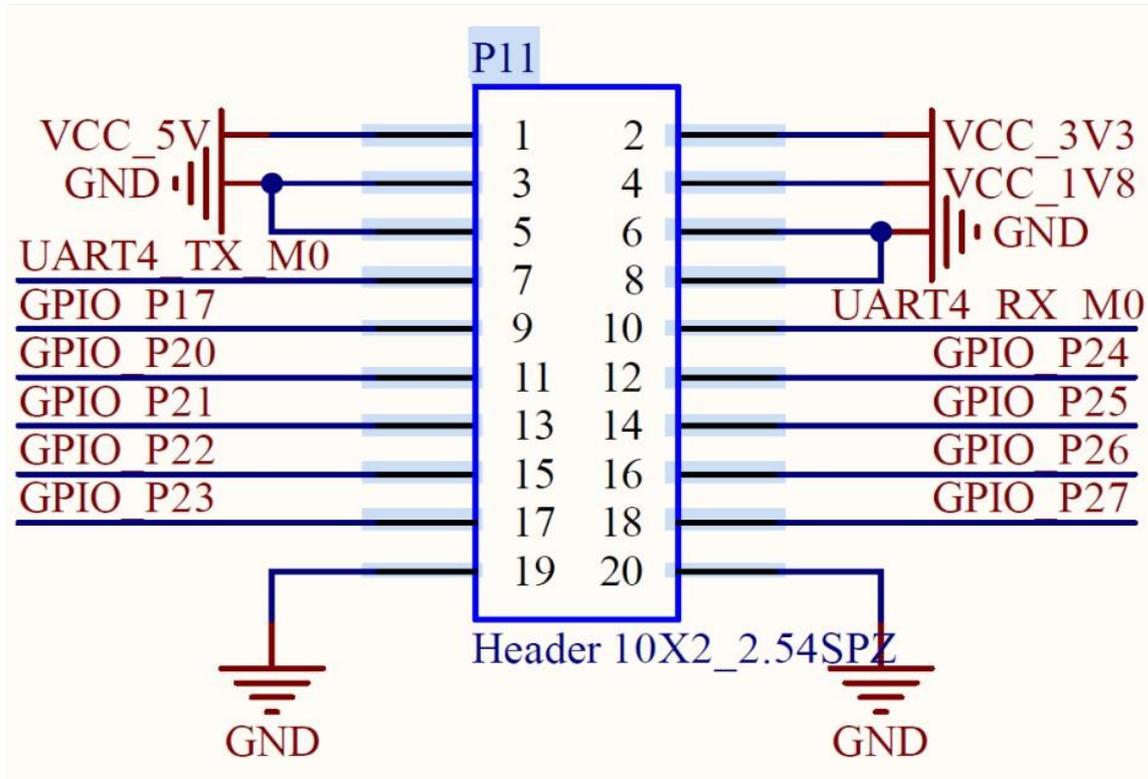
root@ok3588-buildroot:/# sqlite3
SQLite version 3.36.0 2021-06-18 18:36:39
Enter ".help" for usage hints.
Connected to a transient in-memory database.
Use ".open FILENAME" to reopen on a persistent database.
sqlite> create table tbl1 (one varchar(10), two smallint); //Create the table tbl1
sqlite> insert into tbl1 values('hello!',10); //Insert data in tbl1 table
sqlite> insert into tbl1 values('goodbye', 20); //tbl1 table insert data goodbye|20
sqlite> select * from tbl1; //Query the contents of table tbl1
hello!|10
goodbye|20
sqlite> delete from tbl1 where one = 'hello!'; //Delete data
sqlite> select * from tbl1; //Query the contents of table tbl1
goodbye|20
sqlite> .quit //Exit the database (or use the.exit command)
root@ok3588-buildroot:/#

```

4.24 GPIO Test

OK3588 carrier board schematic exports the extended IO pin, located at P11 on the carrier board.

Take GPIO_P17 PIN as an example for test.



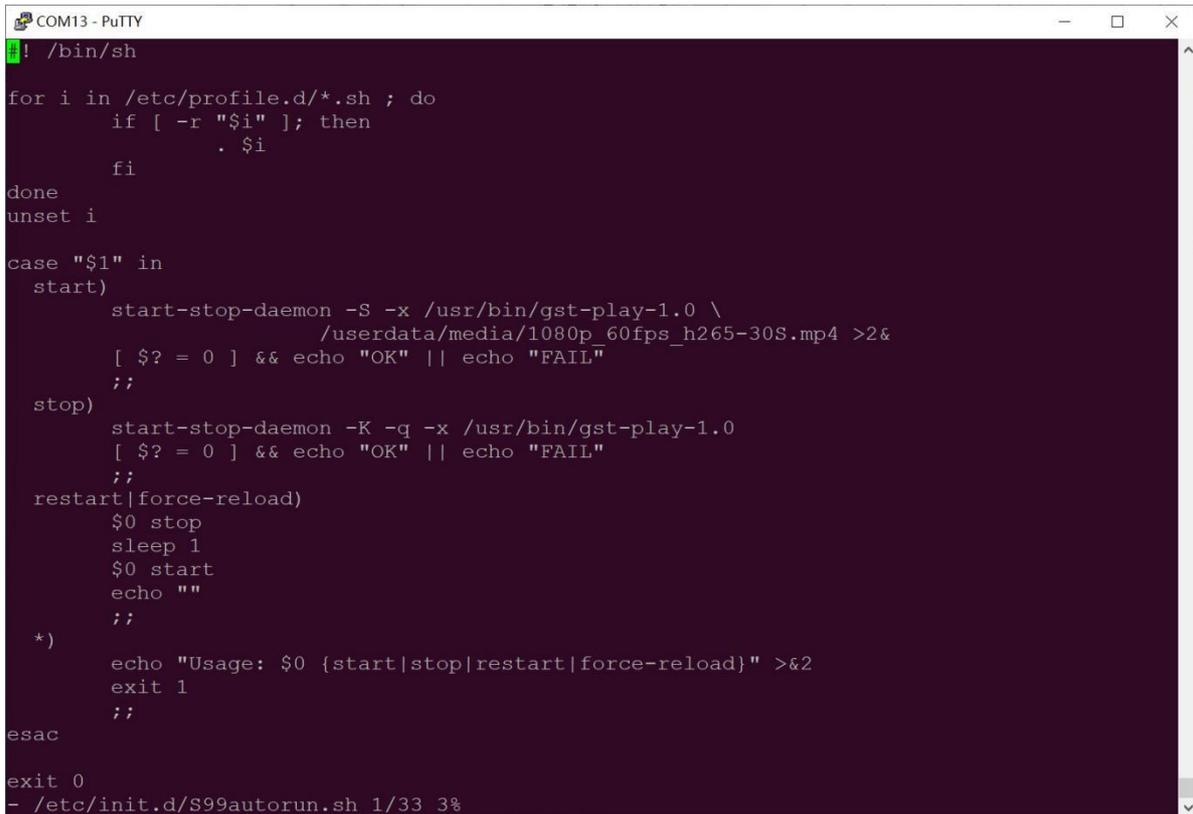
Note: fltest_extgpio.sh can only test IO extended chip pins, OK3588 soc GPIO pins should be tested using the fltest_gpio.sh script.

4.25 Adding Boot Scripts

Temporarily adding a self-starting script

1. Create a self-startup script in the /etc/init.d/ directory

```
root@ok3588-buildroot:/# vi /etc/init.d/S99autorun.sh
```



```
COM13 - PuTTY
! /bin/sh

for i in /etc/profile.d/*.sh ; do
    if [ -r "$i" ]; then
        . $i
    fi
done
unset i

case "$1" in
    start)
        start-stop-daemon -S -x /usr/bin/gst-play-1.0 \
            /userdata/media/1080p_60fps_h265-30S.mp4 >2&
        [ $? = 0 ] && echo "OK" || echo "FAIL"
        ;;
    stop)
        start-stop-daemon -K -q -x /usr/bin/gst-play-1.0
        [ $? = 0 ] && echo "OK" || echo "FAIL"
        ;;
    restart|force-reload)
        $0 stop
        sleep 1
        $0 start
        echo ""
        ;;
    *)
        echo "Usage: $0 {start|stop|restart|force-reload}" >&2
        exit 1
        ;;
esac

exit 0
- /etc/init.d/S99autorun.sh 1/33 3%
```

Save and Exit

2. Add execution privileges

```
[root@ok3588:/]# chmod +x /etc/init.d/S99autorun.sh
```

3. Reboot the board to verify

Add the boot self-start script to the flash image:

Copy the above S99autorun.sh script to the OK3588-linux-source package
buildroot/board/forlinx/ok3588/fs-overlay/etc/init.d/ directory and add execute privileges.

```
root@ok3588-buildroot:/# cp S99autorun.sh buildroot/board/forlinx/ok3588/fs-
overlay/etc/init.d/

root@ok3588-buildroot:/# chmod +x buildroot/board/forlinx/ok3588/fs-
overlay/etc/init.d/S99autorun.sh
```

Recompile the package and flash the image. Some application layer software for audio and video on the OK3588 platform uses Gstreamer, which supports hardware codecs. All examples in this section based on the GStreamer command line form. If users need a player with an interface, they can also use qt's multimedia classes, which also support codecs, see the Qt Tests chapter.

OK3588 platform has an internal video processing unit, the VPU, which supports hard codecs for video in the following formats:

Video Decoding: H264, H265, VP8, VP9, etc., max support 4Kx2K@60fps Video Encoding: H264, H.265, maximum support 8k@30fps

Table of hardware codec parameters for the OK3588 platform:

Video Decoder	Format	Profile	Resolution	Frame rate
	H.265	main 10	7680x4320	60 fps
	H.264	main 10	7680x4320	30 fps
	VP9	Profile 0/2	7680x4320	60 fps
	VP8	version2	1920x1080	60 fps
	VC1		1920x1080	60 fps
	MPEG-2		1920x1080	60 fps
	MPEG-1		1920x1080	60 fps
	H.263		720x576	60 fps
Video Encoder	H.264	BP/MP/HP@level4.2	7680x4320	30 fps
	H.265	MP@level4.1	7680x4320	30 fps

Chapter 5. OK3588 Platform Multi-media Function Test

5.1 Audio and Video Playback

5.1.1 Playing Audio and Video With gst-play

Gplay is an audio/video player based on GStreamer that can automatically select the right plugin for audio/video play according to the hardware, and it is easy to run.

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/1080p_60fps_h265-30S.mp4 !
qtdemux ! queue ! h265parse ! mppvideodec ! waylandsink
//Play video only
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:01.0 / 0:00:30.0 (3.6 %)
```

5.1.2 Playing Video With gst-launch

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/audio/test.mp3 ! id3demux !
mpegaudioparse ! mpg123audiodec ! alsasink device=plughw:2,0
//Play audio only, test with headphones, use HDMI to play sound, remove device = plughw: 2,0
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstAudioSinkClock
handling interrupt.
Interrupt: Stopping pipeline ...
Execution ended after 0:00:02.665159268
Setting pipeline to PAUSED ...
Setting pipeline to READY ...
Setting pipeline to NULL ...
Freeing pipeline ...
```

5.1.3 Playing Audio With gst-launch

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/audio/test.mp3 ! id3demux !
mpegaudioparse ! mpg123audiodec ! alsasink device=plughw:2,0
//Play audio only, test with headphones, use HDMI to play sound, remove device = plughw: 2,0
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstAudioSinkClock
handling interrupt.
Interrupt: Stopping pipeline ...
Execution ended after 0:00:02.665159268
Setting pipeline to PAUSED ...
Setting pipeline to READY ...
Setting pipeline to NULL ...
Freeing pipeline ...
```

5.1.4 Playing Video & Audio With gst-launch

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location= /userdata/media/video/1080p_60fps_h265-30S.mp4 !
qtdemux name=dec dec. ! queue ! h265parse ! mppvideodec ! waylandsink dec. ! queue ! decodebin ! alsasink
device=plughw:2,0
////Play the video file with sound, and test the sound played by the earphone
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstAudioSinkClock
^Chandling interrupt. (2.6 %)
```

5.2 Video Hardware Encoding

OK3588 supports up to 8K @ 60fps/H.265 and 8K @ 60fps/H.264 video encoding

5.2.1 H.264 Video Hardware Encoding

```
root@ok3588-buildroot:/# gst-launch-1.0 videotestsrc num-buffers=600 ! video/x-
raw,framerate=30/1,width=7680,height=4320 ! mpph264enc ! h264parse ! mp4mux !
filesink location=test.mp4

Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...

Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
Redistribute latency...

New clock: GstSystemClock
0:00:18.2 / 0:00:20.0 (91.0 %)
```

5.2.2 H.265 Video Hardware Encoding

```
root@ok3588-buildroot:/# gst-launch-1.0 videotestsrc num-buffers=600 ! video/x-
raw,framerate=30/1,width=7680,height=4320 ! mpph265enc ! h265parse ! mp4mux !
filesink location=test.mp4

Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...

Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...

Redistribute latency...
New clock: GstSystemClock

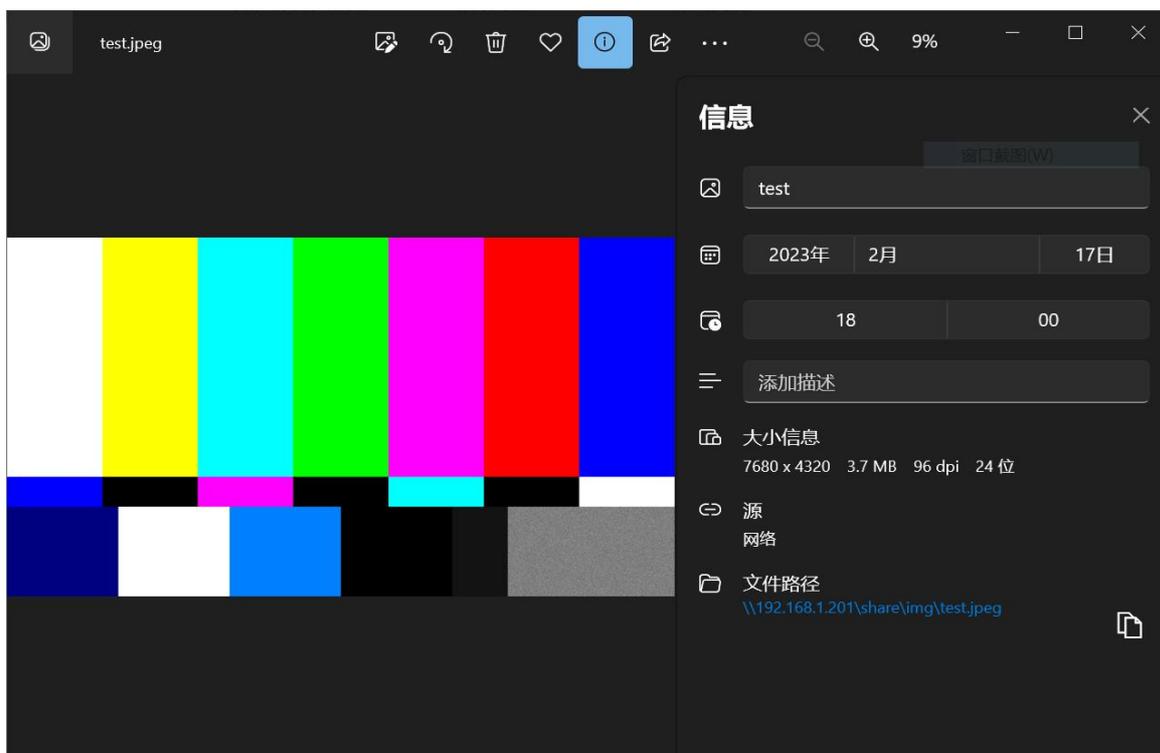
0:00:05.0 / 0:00:20.0 (25.2 %)
```

5.2.3 JPEG Hardware Encoding

```

root@ok3588-buildroot:/# gst-launch-1.0 videotestsrc num-buffers=1 ! video/x-
raw,framerate=1/1,width=7680,height=4320 ! mppjpegenc ! jpegparse ! queue ! filesink location=test.jpeg
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
Got EOS from element "pipeline0".
Execution ended after 0:00:00.029266878
Setting pipeline to NULL ...
Freeing pipeline ...

```



5.3 Video Hardware Decoding

OK3588 supports H264, H265, VP8, VP9 video hard decoding, H264 decoder supports 8K@30fps, H265 decoder supports 8K@60fps.

OK3588 uses the mppvideodec component for video hard decoding, and its output formats are: NV12, I420, YV12.

5.2.1 Decoding & Playing H264 Video

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc
location=/userdata/media/video/1080p_60fps_h264-30s.mp4 ! qtdemux ! h264parse !
mppvideodec ! waylandsink

Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...

Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...

Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...

New clock: GstSystemClock
0:00:05.9 / 0:00:30.0 (19.8 %)
```

5.2.2 Decoding & Playing H264 Video With Audio

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc
location=/userdata/media/video/1080p_60fps_h264-30s.mp4 ! qtdemux name=demux
demux.video_0 ! queue ! h264parse ! mppvideodec ! waylandsink demux.audio_0 !
queue ! aacparse ! faad ! alsasink

Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...

Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...

Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...

Redistribute latency...

New clock: GstAudioSinkClock
0:00:04.5 / 0:00:30.0 (15.0 %)
```

5.2.3 Decoding & Playing H265 Video

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/4k_60fps_h265-30S.mp4 !
qtdemux ! h265parse ! mppvideodec ! waylandsink
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:06.4 / 0:00:30.0 (21.4 %)
```

5.2.4 Decoding & Playing H265 Video With Audio

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/4k_60fps_h265-30S.mp4 !
qtdemux name=demux demux.video_0 ! queue ! h265parse ! mppvideodec ! waylandsink demux.audio_0 ! queue !
aacparse ! faad ! alsasink
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstAudioSinkClock
0:00:03.4 / 0:00:30.0 (11.3 %)
```

5.3.5 Decoding & Playing VP9 Video

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/1080p_60fps_vp9-30S.mp4 !
qtdemux ! vp9parse ! mppvideodec ! waylandsink
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:02.5 / 0:00:30.0 (8.7 %)
```

5.3.6 Decoding & Playing VP9 Video With Audio

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/1080p_60fps_vp9-30S.mp4 !
qtdemux name=demux demux.video_0 ! queue ! vp9parse ! mppvideodec ! waylandsink demux.audio_0 ! queue !
aacparse ! faad ! alsasink device=plughw:2,0
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstAudioSinkClock
0:00:03.2 / 0:00:30.0 (10.7 %)
```

5.3.7 Decoding & Playing VP8 Video

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/1080p_30fps_vp8.mp4 !
matroskademux ! queue ! mppvideodec ! waylandsink
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:09.2 / 0:00:30.1 (30.7 %)
```

5.3.8 Decoding & Playing VP8 Video With Audio

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=/userdata/media/video/1080p_30fps_vp8.mp4
typefind=true ! video/webm ! matroskademux name=dec dec. ! queue ! mppvideodec ! waylandsink dec. ! queue !
decodebin ! audioconvert ! audioresample ! alsasink device=plughw:2,0
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstAudioSinkClock
0:00:02.4 / 0:00:30.1 (8.3 %)
```

5.4 Camera Test

OK3588 supports the OV13850 MIPI camera as well as the UVC camera. First to test the UVC camera, here to Logitech C270 process test, the USB camera will be inserted into the development board, will automatically install uvc driver.

5.4.1 UVC Camera Test

5.4.1.1 Camera Recognition Detection and Format Support Queries

Camera Recognition Detection

```
root@ok3588-buildroot:/# v4l2-ctl --list-devices //View the device nodes, and see that/dev/video9 & 10 are
USB camera nodes.
rk_hdmirx (fdee0000.hdmirx-controller):
    /dev/video73

rkisp-statistics (platform: rkisp):
    /dev/video62
    /dev/video63
    /dev/video71
    /dev/video72

rkcif-mipi-lvds (platform:rkcif):
    /dev/media0
    /dev/media1
    /dev/media2
    /dev/media3
    /dev/media4

rkCIF (platform:rkCIF-mipi-lvds1):
    /dev/video11
    /dev/video12
    /dev/video13
    /dev/video14
    /dev/video15
    /dev/video16
    /dev/video17
    /dev/video18
    /dev/video19
    /dev/video20
    /dev/video21
```

```
rkisp_mainpath (platform:rkisp0-vir0):
  /dev/video55
  /dev/video56
  /dev/video57
  /dev/video58
  /dev/video59
  /dev/video60
  /dev/video61
  /dev/media5

rkisp_mainpath (platform:rkisp0-vir1):
  /dev/video64
  /dev/video65
  /dev/video66
  /dev/video67
  /dev/video68
  /dev/video69
  /dev/video70
  /dev/media6

Rmoncam HD 720P: Rmoncam HD 720 (usb-fc800000.usb-1):
  /dev/video74
  /dev/video75
  /dev/media7

Failed to open /dev/video0: No such device
```

Format Support Queries

```
root@ok3588-buildroot:/# v4l2-ctl --list-formats-ext -d /dev/video74 //View formats supported by the camera
ioctl: VIDIOC_ENUM_FMT
  Type: Video Capture

  [0]: 'MJPG' (Motion-JPEG, compressed)
    Size: Discrete 1280x720
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 160x120
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 320x240
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 352x288
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 640x480
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 800x600
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 848x480
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 960x540
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 1024x768
      Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 1280x800
      Interval: Discrete 0.033s (30.000 fps)
```

```
[1]: 'YUYV' (YUYV 4:2:2)
    Size: Discrete 1280x720
        Interval: Discrete 0.100s (10.000 fps)
    Size: Discrete 640x480
        Interval: Discrete 0.033s (30.000 fps)
    Size: Discrete 800x600
        Interval: Discrete 0.050s (20.000 fps)
    Size: Discrete 848x480
        Interval: Discrete 0.050s (20.000 fps)
    Size: Discrete 960x540
        Interval: Discrete 0.050s (20.000 fps)
    Size: Discrete 1024x768
        Interval: Discrete 0.100s (10.000 fps)
    Size: Discrete 1280x800
        Interval: Discrete 0.100s (10.000 fps)
```

5.4.1.2 Camera Capture Format Queries and Modifications

Camera Capture Format Queries

```
root@ok3588-buildroot:/# v4l2ctl -V -d /dev/video74
Format Video Capture:
  Width/Height       : 1280/720
  Pixel Format        : 'MJPG' (Motion-JPEG)
  Field               : None
  Bytes per Line     : 0
  Size Image         : 1843200
  Colourspace        : sRGB
  Transfer Function  : Rec. 709
  YCbCr/HSV Encoding: ITU-R 601
  Quantization       : Default (maps to Full Range)
  Flags               :
```

5.4.1.3 Camera Image Preview and Taking Pictures

Camera Image Preview

```
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video74 ! videoconvert ! video/x-
raw,format=NV12,width=640,height=480 ! waylandsink
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
0:00:19.7 / 99:99:99.
```

Camera to take pictures.

```
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video74 num-buffers=1 ! videoconvert ! video/x-
raw,format=NV12,width=640,height=480 ! mppjpegenc ! filesink location=pic.jpg
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
Got EOS from element "pipeline0".
Execution ended after 0:00:00.310412782
Setting pipeline to NULL ...
Freeing pipeline ...
//After the execution, view the pic. JPG file generated under the root directory
```

// Check the pic.jpg file generated in the root directory after execution is complete.

5.4.2 OV13855 Test

For raw sensors such as OV13855, each sensor corresponds to 5 device nodes:

```

root@ok3588-buildroot:/# grep ' /sys/class/video4linux/video*/name
/sys/class/video4linux/video0/name:stream_cif_mipi_id0
/sys/class/video4linux/video1/name:stream_cif_mipi_id1
/sys/class/video4linux/video10/name:rkcif_tools_id2
/sys/class/video4linux/video11/name:stream_cif_mipi_id0
/sys/class/video4linux/video12/name:stream_cif_mipi_id1
/sys/class/video4linux/video13/name:stream_cif_mipi_id2
/sys/class/video4linux/video14/name:stream_cif_mipi_id3
/sys/class/video4linux/video15/name:rkcif_scale_ch0
/sys/class/video4linux/video16/name:rkcif_scale_ch1
/sys/class/video4linux/video17/name:rkcif_scale_ch2
/sys/class/video4linux/video18/name:rkcif_scale_ch3
/sys/class/video4linux/video19/name:rkcif_tools_id0
/sys/class/video4linux/video2/name:stream_cif_mipi_id2
/sys/class/video4linux/video20/name:rkcif_tools_id1
/sys/class/video4linux/video21/name:rkcif_tools_id2
/sys/class/video4linux/video22/name:stream_cif_mipi_id0
/sys/class/video4linux/video23/name:stream_cif_mipi_id1
/sys/class/video4linux/video24/name:stream_cif_mipi_id2
/sys/class/video4linux/video25/name:stream_cif_mipi_id3

```

Main path, refers to an output node of Rockchip ISP, which can output full-resolution images, generally used to take photos and capture Raw images.

Self Path, refers to an output node of Rockchip ISP, which can only output up to 1080p resolution and is usually used for preview.

Statistics 3A

Input-params 3A parameter setting

The test methods for the OV13855 are essentially the same as those for the UVC Camera. This section takes OV13855 as an example for testing

CAM1: platform:rkisp0-vir0

CAM2: platform:rkisp0-vir1

5.4.2.1 Camera Recognition Detection and Format Support Queries

```

root@ok3588-buildroot:/# v4l2-ctl --list-devices
rk_hdmirx (fdee0000.hdmirx-controller):
    /dev/video73

rkisp-statistics (platform: rkisp):
    /dev/video62
    /dev/video63
    /dev/video71
    /dev/video72

rkcif-mipi-lvds (platform:rkcif):
    /dev/media0
    /dev/media1
    /dev/media2
    /dev/media3
    /dev/media4

rkcif (platform:rkcif-mipi-lvds1):
    /dev/video11
    /dev/video12
    /dev/video13
    /dev/video14
    /dev/video15
    /dev/video16
    /dev/video17
    /dev/video18
    /dev/video19
    /dev/video20
    /dev/video21

```

```
rkisp_mainpath (platform:rkisp0-vir0):
```

```
  /dev/video55  
  /dev/video56  
  /dev/video57  
  /dev/video58  
  /dev/video59  
  /dev/video60  
  /dev/video61  
  /dev/media5
```

```
rkisp_mainpath (platform:rkisp0-vir1):
```

```
  /dev/video64  
  /dev/video65  
  /dev/video66  
  /dev/video67  
  /dev/video68  
  /dev/video69  
  /dev/video70  
  /dev/media6
```

```
Failed to open /dev/video0: No such device
```

5.4.2.2 Camera Preview

```
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video55 ! videoconvert ! video/x-  
raw,format=NV12,width=1920,height=1080 ! autovideosink sync=false  
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  
Redistribute latency...  
0:00:06.9 / 99:99:99.
```

5.4.2.3 Camera to Take Pictures

```
//Camera to take pictures (front)  
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video64 num-buffers=1 ! video/x-  
raw,format=NV12,width=640,height=480 ! mppjpegenc ! filesink location=pic.jpg  
Setting pipeline to PAUSED ...  
Using mplane plugin for capture  
Pipeline is live and does not need PREROLL ...  
Pipeline is PREROLLED ...  
Setting pipeline to PLAYING ...  
New clock: GstSystemClock  
Redistribute latency...  
Got EOS from element "pipeline0".  
Execution ended after 0:00:00.267194152  
Setting pipeline to NULL ...  
Freeing pipeline ...  
//Check whether the pic. JPG is generated, which can be copied to PC for viewing
```

5.4.2.4 Recording H264 Format Video

```
//H264 encoding for camera preview
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video64 num-buffers=100 ! video/x-
raw,format=NV12,width=640,height=480 ! tee name=t ! queue ! mpph264enc ! queue ! h264parse ! qtmux !
filesink location=13855_h264.mp4 t. ! queue ! waylandsink
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
Redistribute latency...
Redistribute latency...
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
```

```
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
WARNING: from element /GstPipeline:pipeline0/GstWaylandSink:waylandsink0: A lot of buffers are being
dropped.
Additional debug info:
../libs/gst/base/gstbasesink.c(3143): gst_base_sink_is_too_late ():
/GstPipeline:pipeline0/GstWaylandSink:waylandsink0:
There may be a timestamping problem, or this computer is too slow.
Got EOS from element "pipeline0".
Execution ended after 0:00:06.843200646
Setting pipeline to NULL ...
Freeing pipeline ...
root@ok3588-buildroot:/# ls
//Check if H264 files are generated
```

5.4.2.5 Playing H264 Format Video

```
root@ok3588-buildroot:/# gst-launch-1.0 filesrc location=13855_h264.mp4 ! qtdemux ! queue ! h264parse !
mppvideodec ! waylandsink
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Prerolled, waiting for async message to finish...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
Got EOS from element "pipeline0".
Execution ended after 0:00:06.619988206
Setting pipeline to NULL ...
Freeing pipeline ...
```

5.4.3 OV5645 Test

Camera Corresponding Node

CAM3 : rkCIF-mipi-lvds2

CAM4 : rkCIF-mipi-lvds4

CAM5 : rkCIF-mipi-lvds5

Take testing CAM5 as an example.

5.4.3.1 Camera Recognition Detection

```
root@ok3588-buildroot:/# v4l2-ctl --list-devices
//Check device node
rkCIF (platform:rkCIF-mipi-lvds2):
    /dev/video22
    /dev/video23
    /dev/video24
    /dev/video25
    /dev/video26
    /dev/video27
    /dev/video28
    /dev/video29
    /dev/video30
    /dev/video31
    /dev/video32
```

5.4.3.2 Supported Formats View

```
root@ok3588-buildroot:/# v4l2-ctl --list-formats-ext -d /dev/video22
ioctl: VIDIOC_ENUM_FMT
    Type: Video Capture Multiplanar

    [0]: 'NV16' (Y/CbCr 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [1]: 'NV61' (Y/CrCb 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [2]: 'NV12' (Y/CbCr 4:2:0)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [3]: 'NV21' (Y/CrCb 4:2:0)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [4]: 'YUYV' (YUYV 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [5]: 'YVYU' (YVYU 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [6]: 'UYVY' (UYVY 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
    [7]: 'VYUY' (VYUY 4:2:2)
        Size: Stepwise 64x64 - 1920x1080 with step 8/8
```

5.3.3.3 Camera Previews

```
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video22 ! video/x-raw, format=NV12,
width=1920,height=1080, framerate=30/1 ! waylandsink
Setting pipeline to PAUSED ...
Using mplane plugin for capture
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
0:00:32.4 / 99:99:99.
```

5.4.4 HDMI IN Test

5.4.4.1 HDMIIN Format Support Queries

Camera Recognition Detection

```
root@ok3588-buildroot:/# v4l2-ctl --list-devices // You can see that /dev/video73 is the HDMI IN node.
rk_hdmirx (fdee0000.hdmirx-controller):
    /dev/video73

rkisp-statistics (platform: rkisp):
    /dev/video62
    /dev/video63
    /dev/video71
    /dev/video72

rkcif-mipi-lvds (platform: rkCIF):
    /dev/media0
    /dev/media1
    /dev/media2
    /dev/media3
    /dev/media4
```

Format Supported Queries

```
root@ok3588-buildroot:/# v4l2-ctl --list-formats-ext -d /dev/video73//View supported formats for HDMI RX
ioctl: VIDIOC_ENUM_FMT
    Type: Video Capture Multiplanar

    [0]: 'BGR3' (24-bit BGR 8-8-8)
    [1]: 'NV24' (Y/CbCr 4:4:4)
    [2]: 'NV16' (Y/CbCr 4:2:2)
    [3]: 'NV12' (Y/CbCr 4:2:0)
```

5.4.4.2 Camera Capture Format Queries and Modifications

Camera Capture Format Queries

```
root@ok3588-buildroot:/# v4l2-ctl -v -d /dev/video73
Format Video Capture Multiplanar:
    Width/Height      : 1920/1080
    Pixel Format       : 'BGR3' (24-bit BGR 8-8-8)
    Field             : None
    Number of planes  : 1
    Flags             : premultiplied-alpha, set-csc, 0x000000fc
    Colorspace        : sRGB
    Transfer Function : Default
    YCbCr/HSV Encoding: Unknown (0x000000ff)
    Quantization      : Limited Range
    Plane 0           :
        Bytes per Line : 5760
        Size Image     : 6220800
```

5.4.4.3 Camera Image Preview

```
root@ok3588-buildroot:/# gst-launch-1.0 v4l2src device=/dev/video73 ! videoconvert ! kmssink
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
Redistribute latency...
0:00:22.1 / 99:99:99.
```

Note: Please do not use the waylandsink display in the current version. And using gst-launch-1.0 encoding may have delay.

Chapter 6. OTG Flashing System

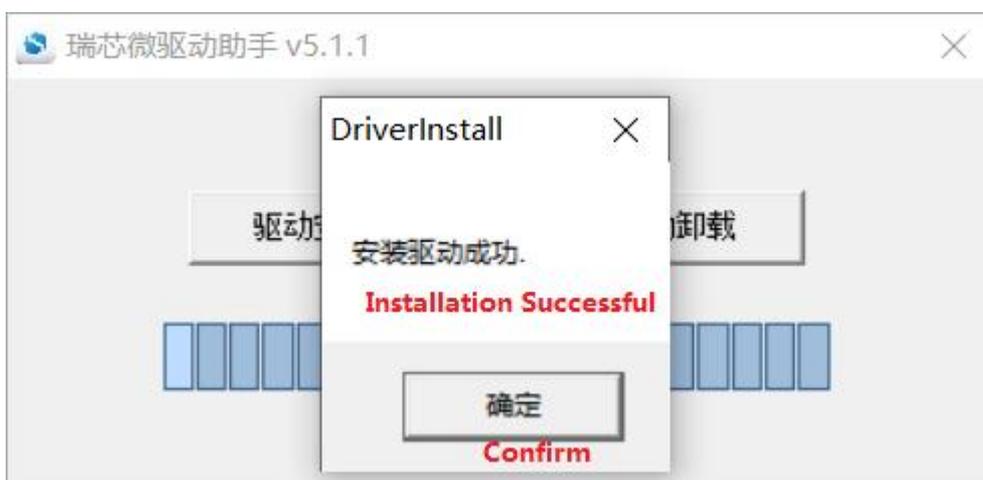
OK3588-C development board currently supports both OTG and TF card programming. The corresponding flashing tool is provided in the user information, and the user can choose anyone to flash the image.

6.1 OTG Driver Installation

Path: OK3588-C (Linux) user information\Linux\toolDriverAssitant_v5.11.zip Extract the above path file to any directory and run it with administrator privileges Open DriverInstall.exe



Click "Driver Installation"



6.1.1 OTG Full Flashing Test

6.1.1.1 RKDevTool Flashing Test

Path: OK3588-C (Linux) user information\Linux\toolRKDevTool_Release_v2.84.zip

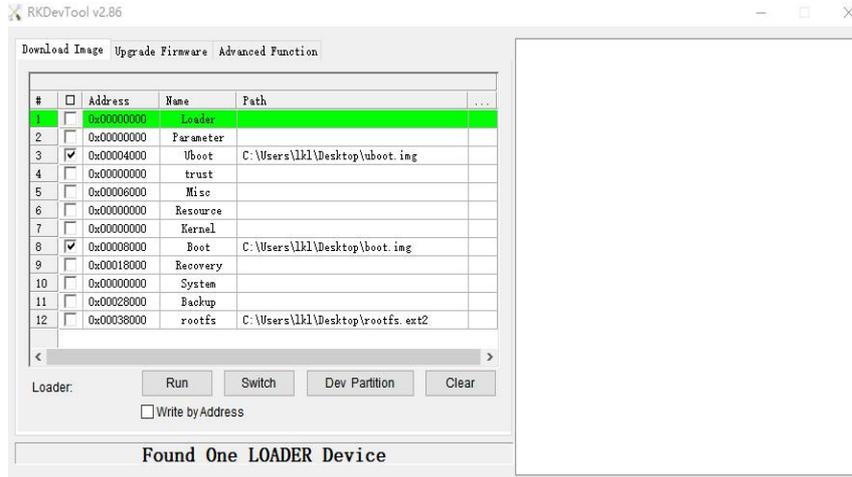
It is a development tool provided by Rockchip Micro. Unzip it to a full English path before use, connect the TYPE-C0 port of the development board and the host computer with a Type-C cable, press and hold the recovery key of the development board and don't release it, then press the reset key to reset the system, and release the recovery key after about two seconds. There will be prompts on the Rockchip development tool : loader device found

Note:

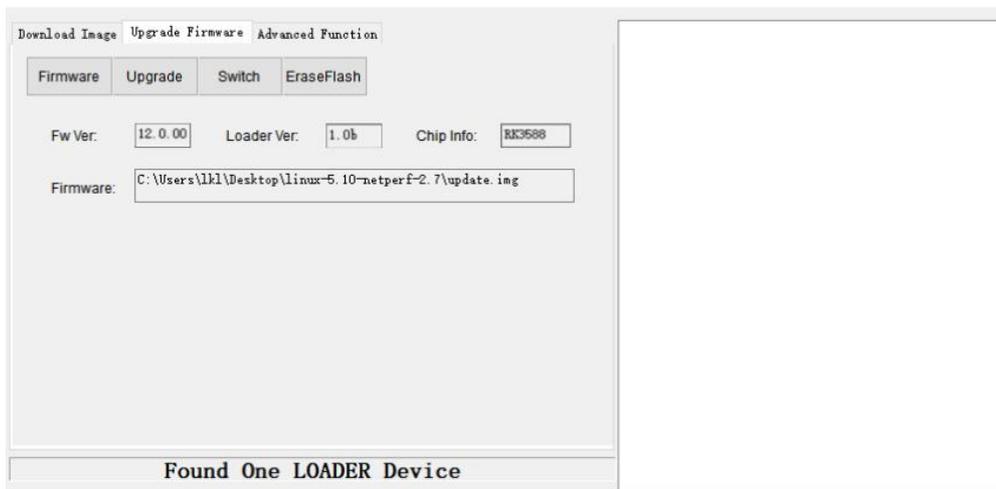
The condition for recognition is that the development board is powered up and the RECOVER key is in the pressed state.

Theoretically, Rockchip development tools have no requirements for the unzip directory. However, some users have feedback that the unzip directory should be in full English. If the tool doesn't match the following figure, please consider unzipping it in an English directory.

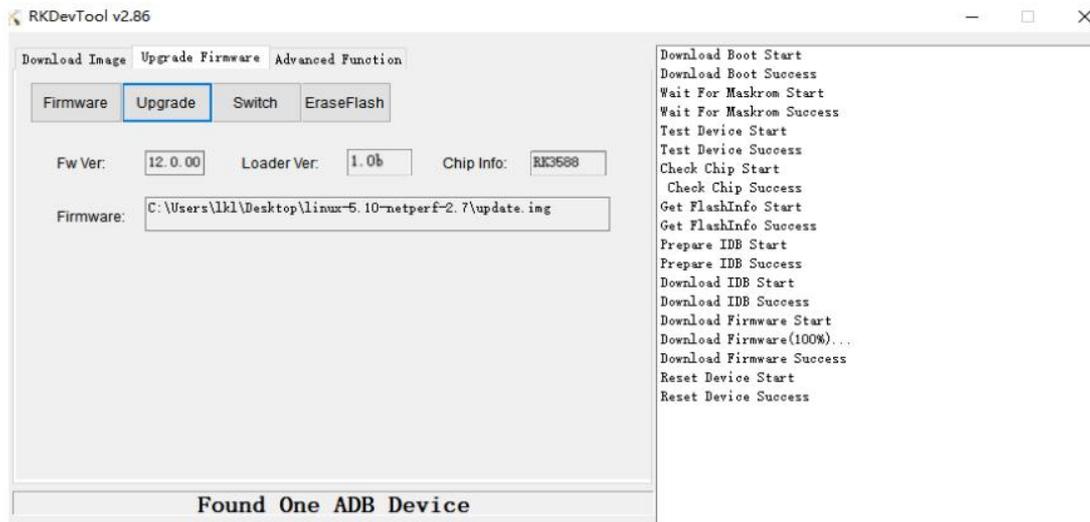
Open the Rockchip development tool:



Click the "Upgrade Firmware" tab, click the "Firmware" button to select the full upgrade image update.img. The program will be parsing the firmware, so wait a while.



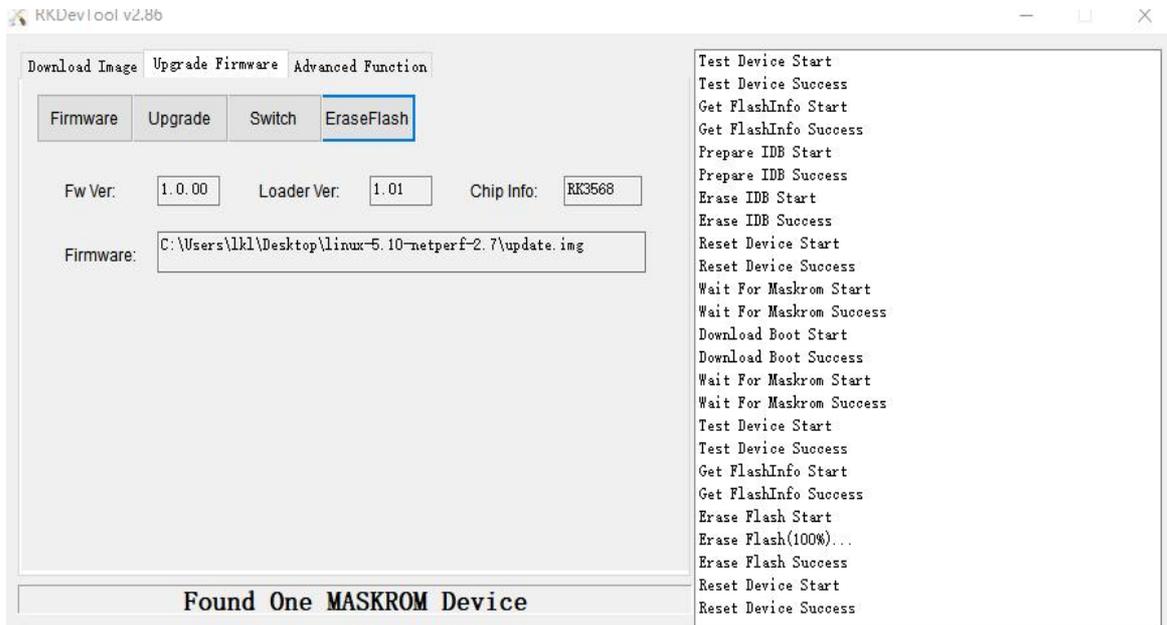
Click "Switch" and wait for a while to enter the LOADER device, then click "Erase Flash" to erase. Then click the "Upgrade" button to upgrade.



Introduction to MASKROM mode

If the loader is damaged and cannot enter the Loader mode, press and hold the red Maskrom key and then press the reset key to enter the maskrom mode for flashing.

At this time, the system will prompt the discovery of a maskrom device. The flashing process is consistent with the loader mode, so it is best to use an update.img flashing.



Note: Don't click "Device Partition Table" in maskrom mode, it is invalid.

A separate flash in maskrom mode will not clear the UBOOT environment variables.

6.1.1.2 Factory Tool Flashing Test

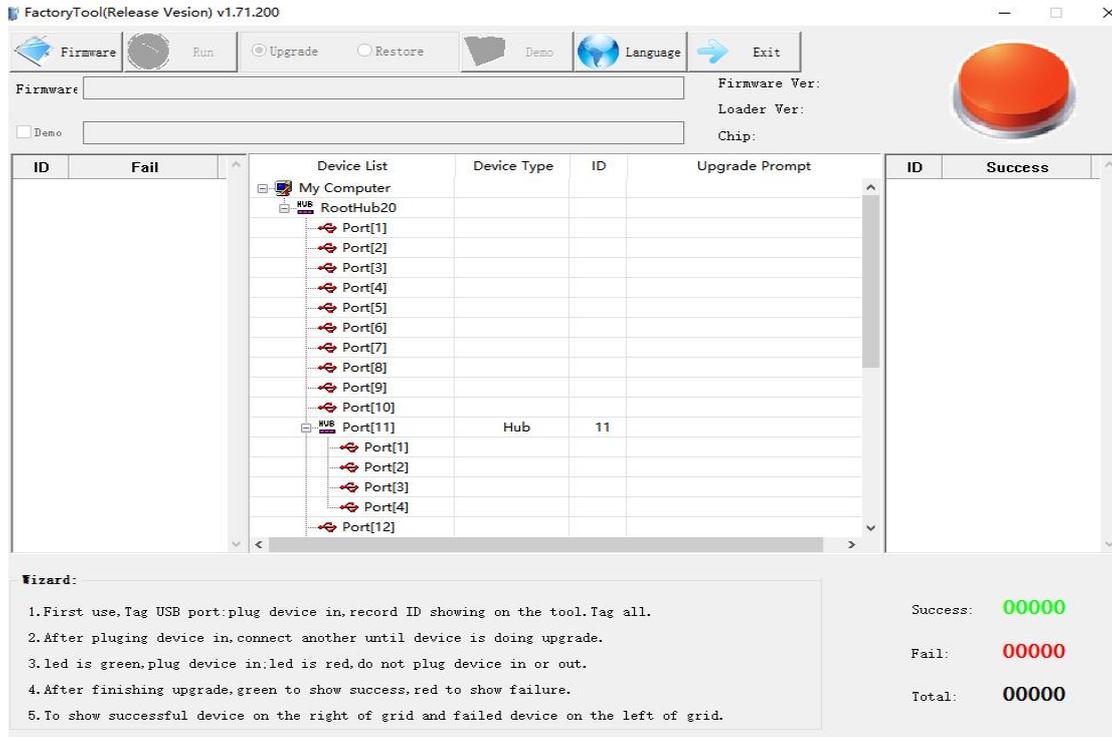
FactoryTool is a factory batch OTG flashing tool. It does not need to read the image and can do batch flashing. In addition, it can flash some larger image files. If RKDevTool compatibility is not satisfied, you can try this method. Before using it, unzip it to a full English path, connect the development board and host computer with a Type-C cable, press and hold the recover button of the development board and don't release it, then press the reset button to reset the system, and release the recover button after about two seconds. There will be prompts on the Rockchip development tool : loader device found

Note:

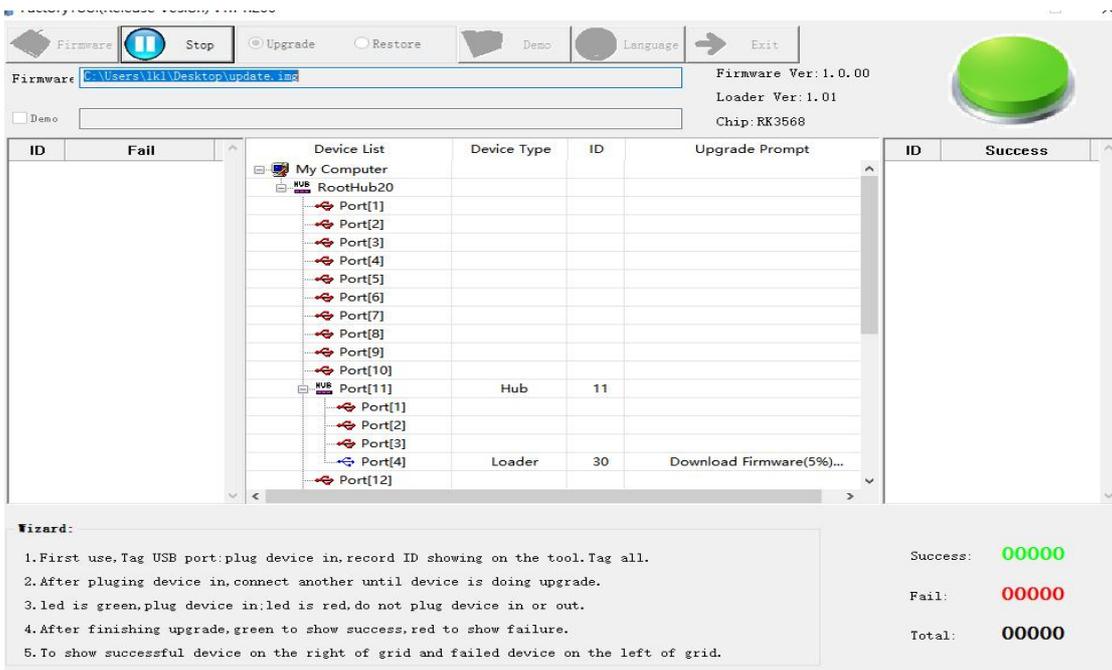
The condition for recognition is that the development board is powered up and the RECOVER key is in the pressed state.

Theoretically, Rockchip development tools have no requirements for the unzip directory. However, some users have feedback that the unzip directory should be in full English. If the tool doesn't match the following figure, please consider unzipping it in an English directory.

Open the Rockchip development tool:



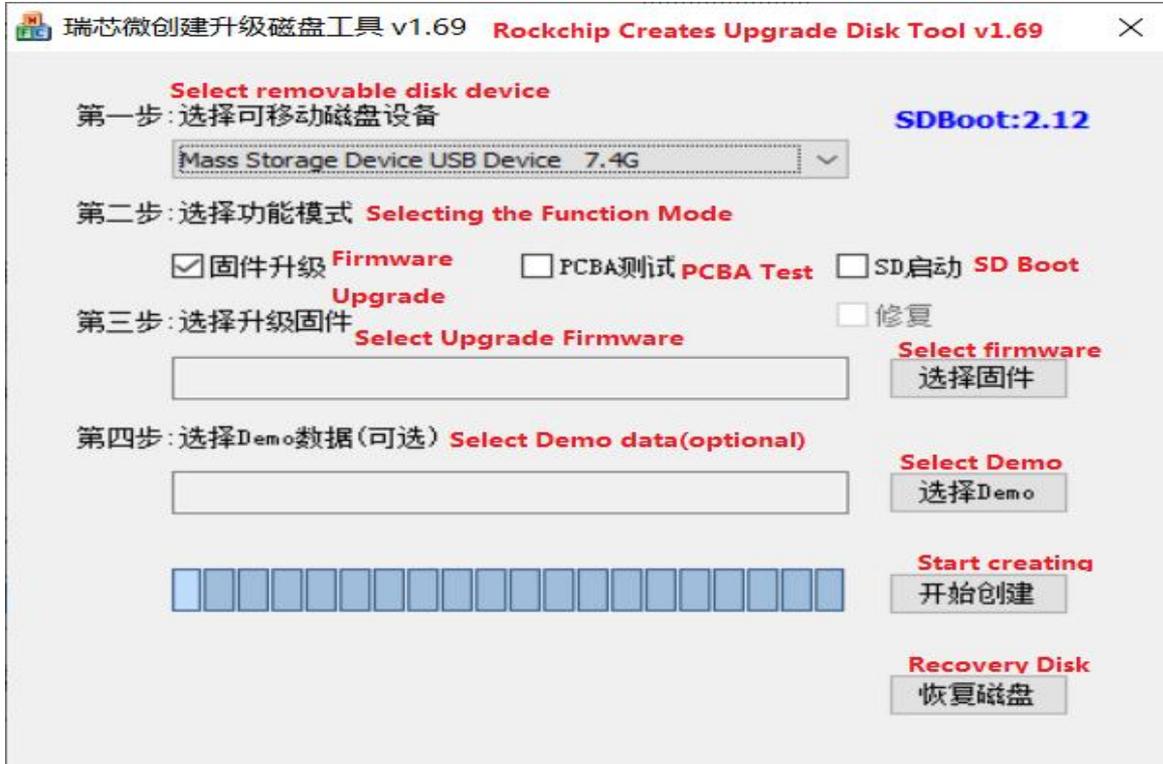
Click to select the firmware, and click to start. At this time to recognize the loader device will automatically start flashing.



6.2 TF Card Flashing

TF card furning and testing.

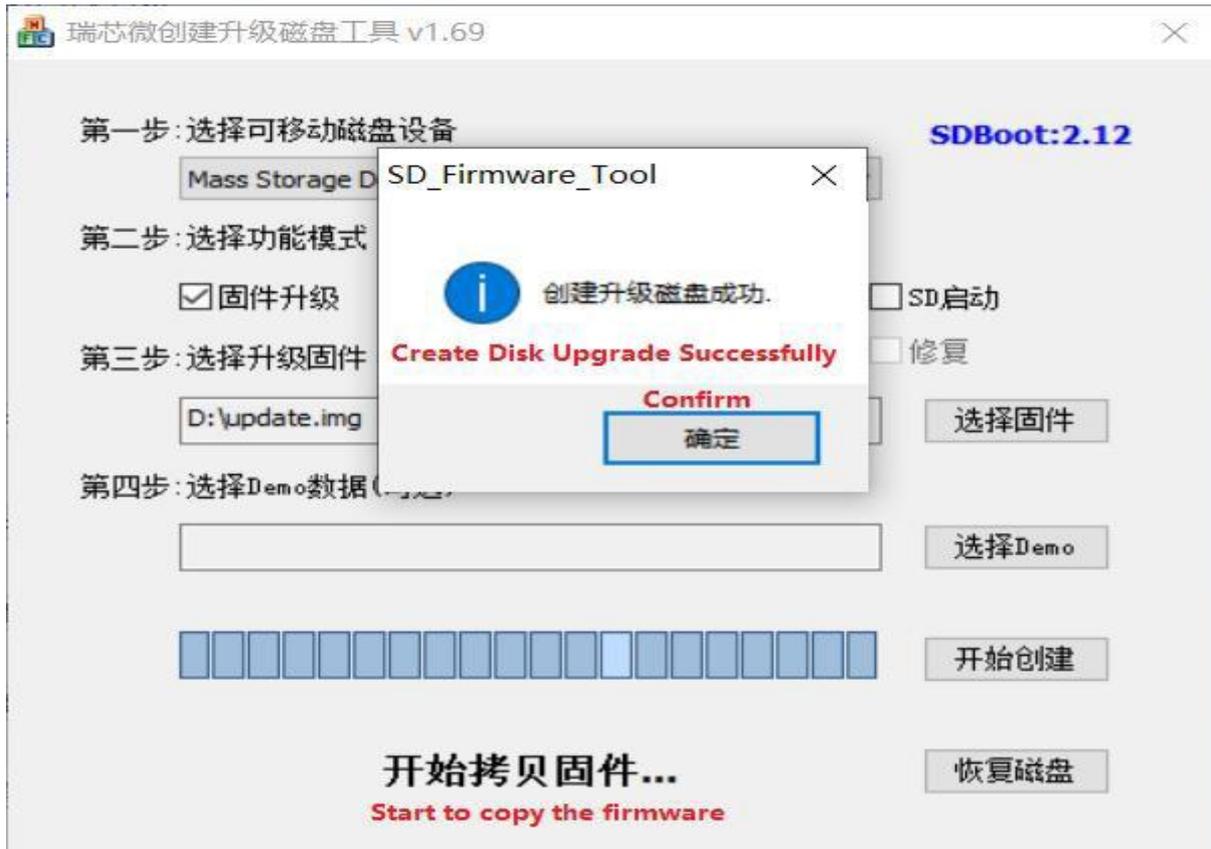
Note: The maximum capacity of the test TF card is 32G, using a TF card above 32G may fail to flash.



Copy SDDiskTool_v1.69.zip from the user profile tools directory to any directory on windows. Run SD_Firmware_Tool.exe with administrator privileges.

Select the disk device, check "Firmware Upgrade" and select update.img. Click Start Creating.





Insert the TF card into the development board and start, the system will automatically enter the flashing process. When the flashing is complete, both the screen and the serial port will prompt:

Please remove SD CARD!!!, wait for reboot.

At this time, pull out the TF card, the system automatically restarts (please do not power down directly).

During mass production, check the flashing status by SoM heartbeat light. Heartbeat light modes are as follows:

- (1) Kernel startup phase: Heartbeat light mode, regular intermittent flashes.
- (2) Flashing preparation phase: EMMC indicator light, off.
- (3) Flashing in progress phase: EMMC indicator light, on.

Flashing completion phase: Heartbeat light mode, regular intermittent flashes. Serial port information during the flashing process:

```
Starting input-event-daemon: LOG_ERROR: unknown volume for path [/userdata/recovery/command]
LOG_ERROR: Can't mount /userdata/recovery/command
LOG_INFO: Now is SD.
LOG_INFO: no found mtd.
done
root@ok3588-recovery:/# LOG_INFO:
Please remove SD CARD!!!, wait for reboot.
LOG_INFO: finish_recovery Enter.....
LOG_INFO: Now is SD.
LOG_INFO: no found mtd.
LOG_INFO: recovery usage time:58534 ms
LOG_INFO: Reboot...
[ 69.243763] reboot: Restarting system
```

If the automatic restart does not occur after removing the TF card, a manual restart can also complete the flashing. Please be patient during the flashing process.