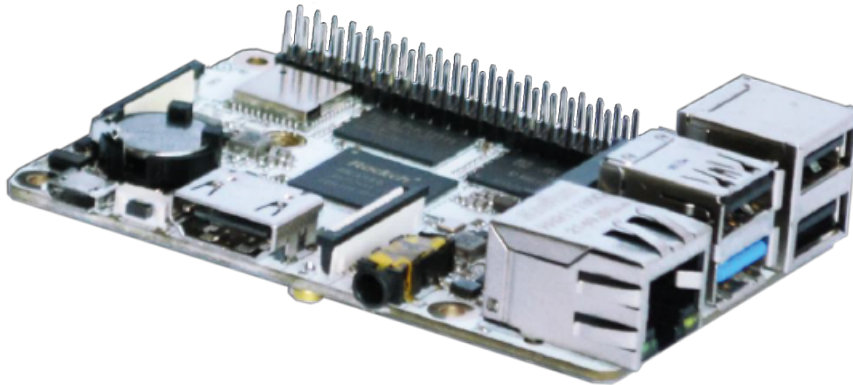


URVE

URVE Board PI

User Manual



www.urveboard.com

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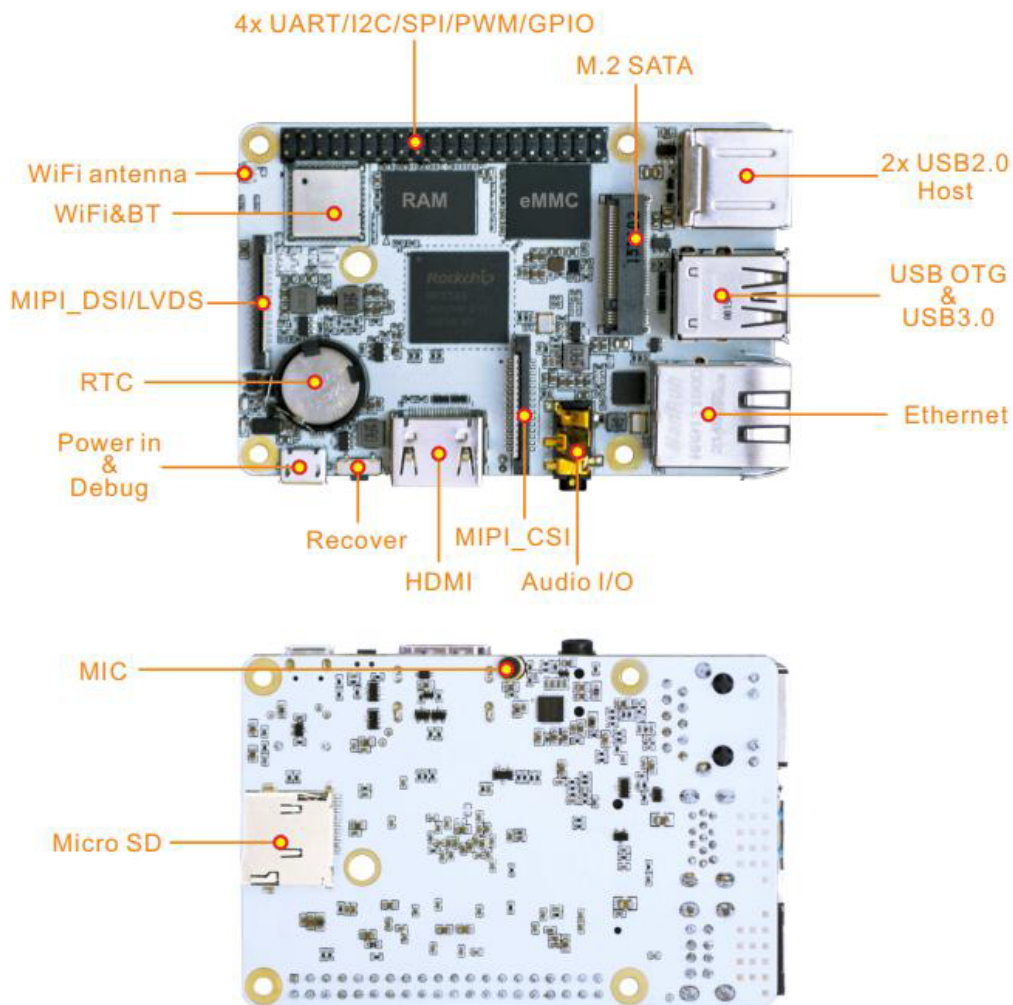
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Quick Start

1. URVE Board PI Introduction

URVE Board PI is a credit card-sized single board computer (SBC) based on the Rockchip RK3566 Quad-core Cortex-A55 processor designed for IoT devices, such as home security system, Face Recognizing Robot, drones and HMI.

The small computing platform has a high-performance and low power processor with USB ports, Gigabit Ethernet, 2.4G/5G WiFi, M.2, micro-SD card slot, MIPI CSI camera connector, MIPI DSI (or LVDS) and HDMI port that support 4K monitors.



Specifications	
CPU	Rockchip RK3566 Quad-core Cortex-A55, 1.8 GHz
GPU	ARM Mali-G52 2EE GPU with support for OpenGL ES 1.1/2.0/3.2. OpenCL 2.0. Vulkan 1.1
NPU	0.8 TOPS
Memory	2/4/8GB LPDDR4 or LPDDR4X RAM

Storage	8/16/32/64/128GB eMMC flash M.2 PCIe 2.0 socket NVMe SSD MicroSD card slot
Power Supply	5V/2A via Micro USB
USB	1x USB2.0 OTG (USB-A/F) 2x USB2.0 Host 1x USB 3.0
Networking	Gigabit Ethernet RJ45 port via Realtek RTL8211F-CG controller 2.4G/5G WiFi(802.11 a/b/g/n/ac) with Bluetooth 4.2
Debugging	Micro USB
Display	MIPI DSI/LVDS, HDMI2.0 output
Audio	ES8388 audio codec. 1x 3.5mm audio I/O jack, 1x differential MIC
Camera (optional)	MIPI CSI Camera, 15-pin FPC connector.
Expansion	4x UART, SPI, I2C, PWM, SPDIF_TX and GPIO via 40-pin header
Misc	1x Recover button, 2x LED, RTC
Dimension	85 x 56mm (Raspberry Pi 3-like form factor)

2.Quick Setup

- Connect the board and monitor with a HDMI cable.
- Connect the Micro USB cable and power on the board.
- On your host PC, start a terminal emulation program (such as SecureCRT) with the following serial port settings:

Baud Rate	Data Bits	Stop Bits	Parity	Flow Control
1500000	8	1	none	none

3.Shipping list (for reference only)

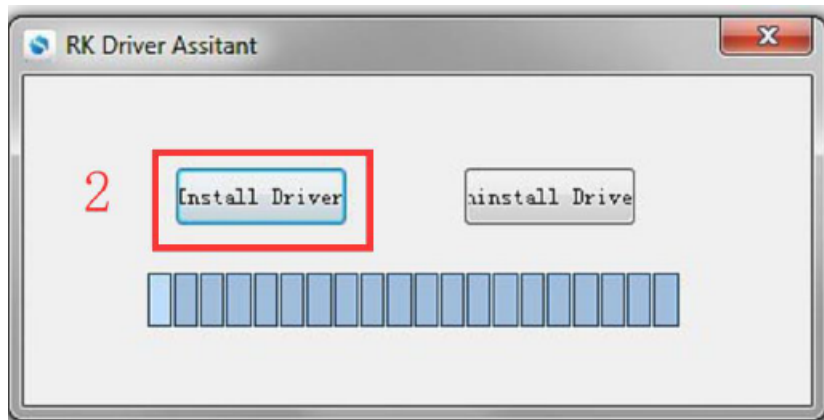
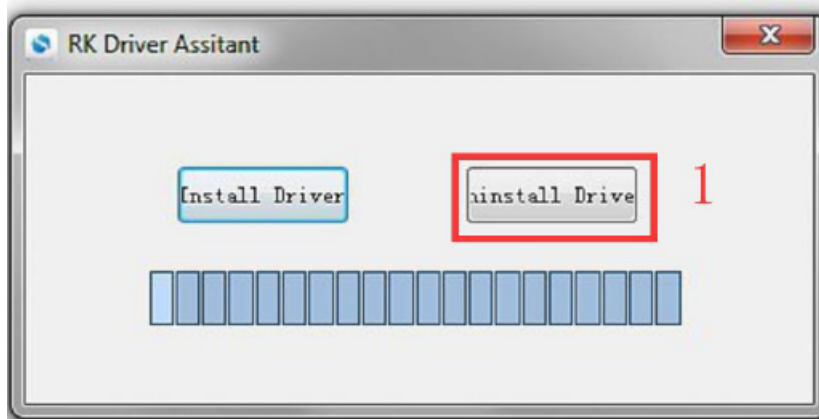
- 1 x URVE Board PI
- 1 x Micro USB cable
- 1 x USB cable
- 1 x Ethernet cable
- 1 x WIFI Antenna
- 1 x SD card

Install Debug Tools

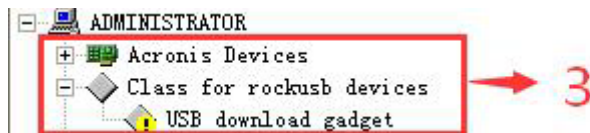
1. Install Rockchip Driver Assistant

If it is the first time to download firmware in WINDOWS, you need to install Rockchip Driver.

Path: *DriverAssitant_v5.1.1/DriverInstall.exe*

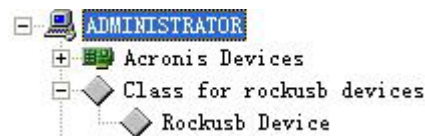


After the installation is complete, connect the board and PC with Type_C USB cable and press the “Recover” key and hold then power the board, in *Computer Management* can see the following information:



The WINDOW will pop up found New Hardware Wizard dialog box, choose to install from the specified location, and then select *\\DriverAssitant_v5.11\\DriverAssitant_v5.1.1\\ADBDriver*.

After the installation is complete in *Computer Management* can see the following information:

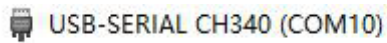


2. Install CH340 Driver

If you are doing system development and testing, the USB to serial TTL adapter is very useful for checking the system startup log and functional test results, especially when there is no graphical desktop display. The following shows how to use USB serial adapter CH340.

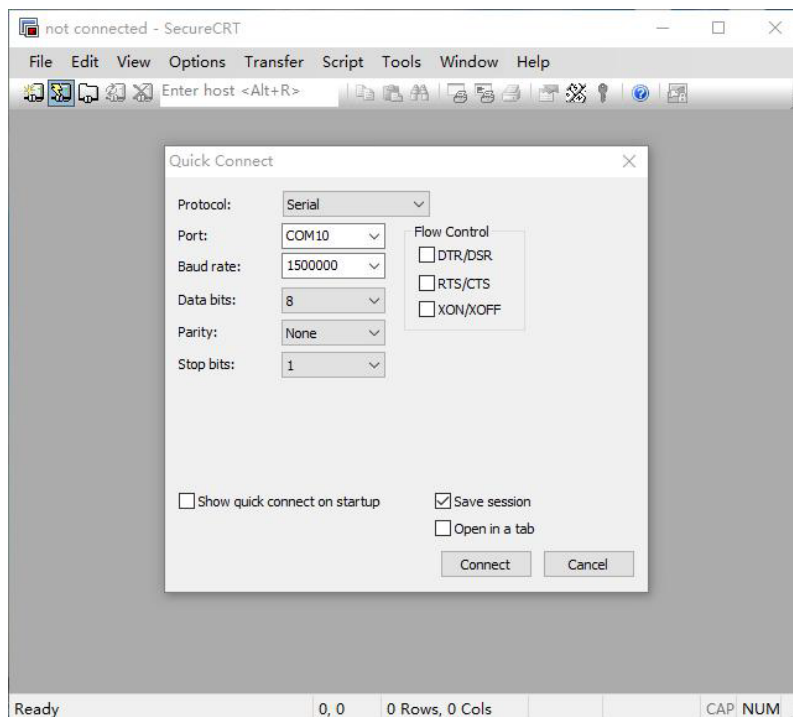
Plug the Micro USB cable to the PC, unzip CH341SER.zip on Windows, then click CH341SER.EXE to install.

Now the device will be listed under **Device Manager -> PORTS** with unique serial port assigned.



3. Serial Terminal Tool

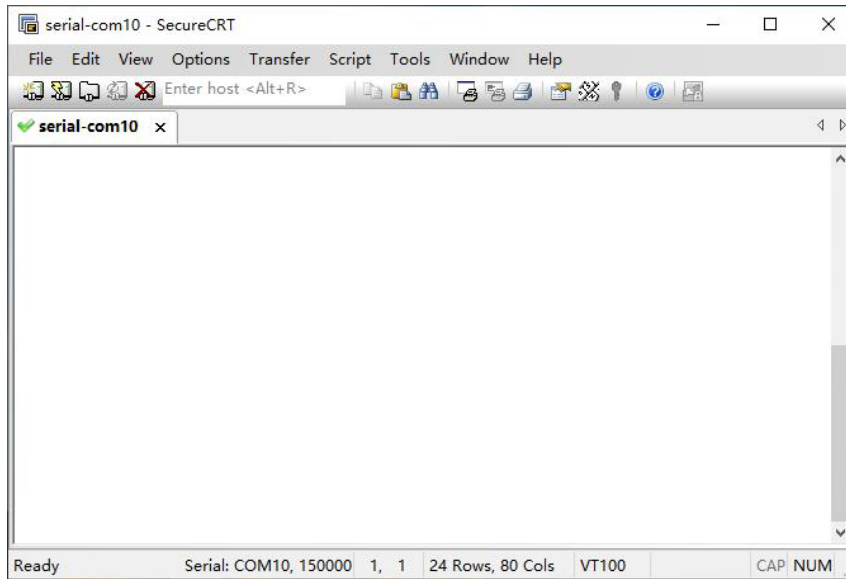
The Micro USB cable of URVE Board PI is both the power cable and the serial port debugging cable



Configuration parameters:

Protocol	Serial
Port	To be specified by user PC
Baud rate	1500000
Data bits	8
Parity	None
Stop bits	1
Please check XON/XOFF and RTS/CTS not selected	

After all, Check **Save session** and click **connect**.



Illusion: If open more than one serial terminal tools, and they use the same serial port, there will be reported the port is busy.

Solution: Turn off the serial tool that unnecessary.

Upgrade Firmware

1.Upgrade Mode

URVE Board PI supports two modes: Normal mode and upgrade mode.

Normal mode	Upgrade mode
eMMC Interface/SDMMC Interface	<ol style="list-style-type: none"> 1. MASKROM mode 2. Loader mode 3. SD card mode

1.1 MASKROM mode

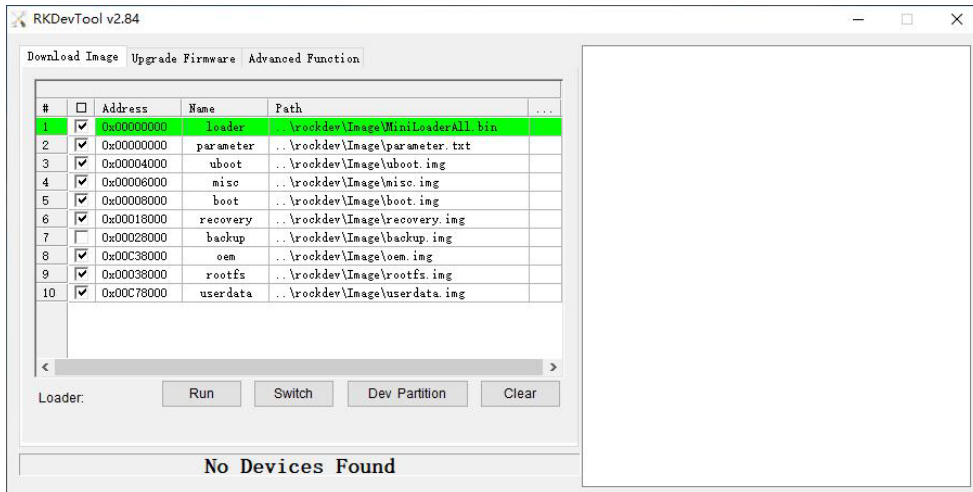
When the eMMC is empty, the board automatically enters the MASKROM mode when it is powered on.

In general, there is no need to enter MASKROM Mode. Only when the bootloader verification fails (the IDB block cannot be read, or the bootloader is damaged), the BootRom code will enter this mode. At this time, the BootRom code waits for the host to transmit the bootloader code through the USB interface, load and run it. When the board becomes bricked and cannot start or upgrade the program normally need enter MASKROM Mode.

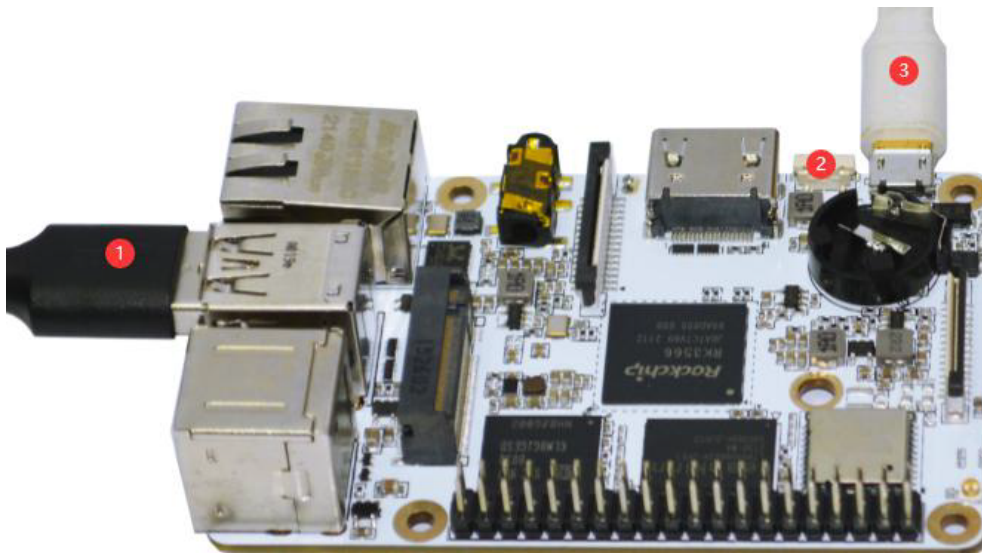
1.1.1 Software method

Step 1, unzip **RKDevTool.rar** on Windows.

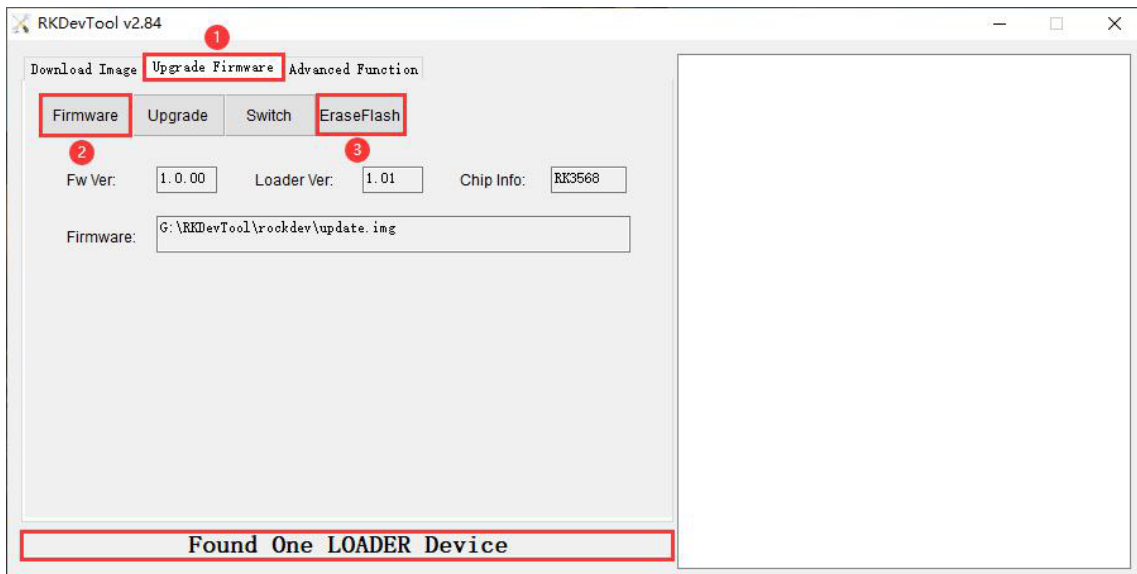
Step 2, open **RKDevTool.exe** (Path:\RKDevTool\RKDevTool_Release\RKDevTool.exe).



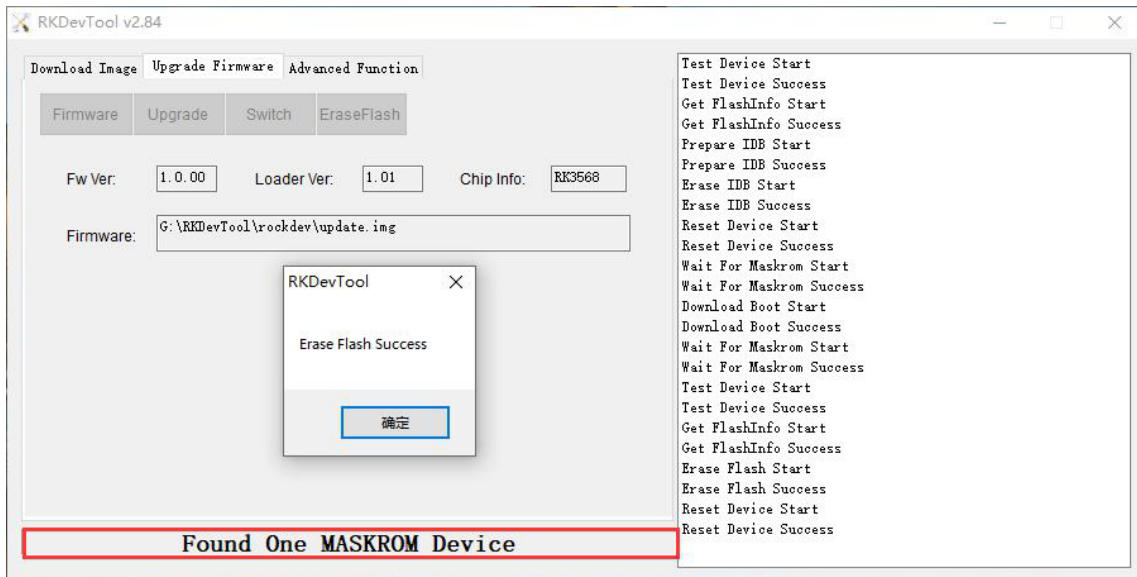
Step 3, connect PC and development board with OTG USB cable, keep pressing the **RECOVER** Key and power the board (connect Micro USB cable) until the windows PC shows **Found One LOADER Device**.



Step 4, click **Upgrade Firmware -> Firmware**, select **update.img**. Click **“EraseFlash”** to erase flash.



Step 5, after erase flash will enter MASKROM mode.



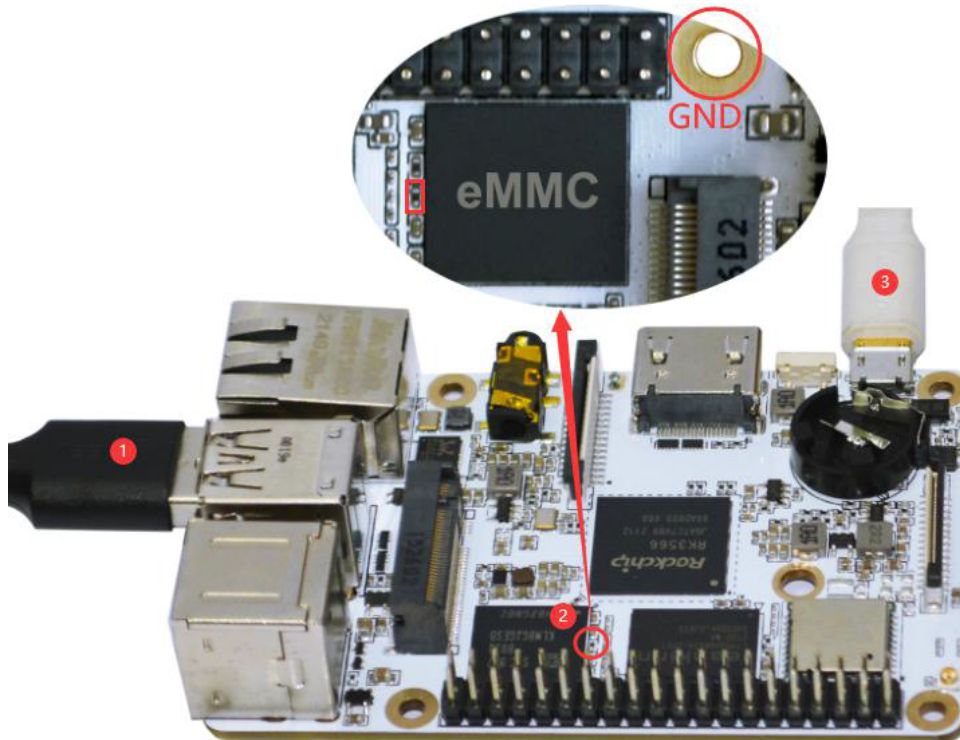
1.1.2 Hardware method

Please read and operate carefully! The operation steps are as follows:

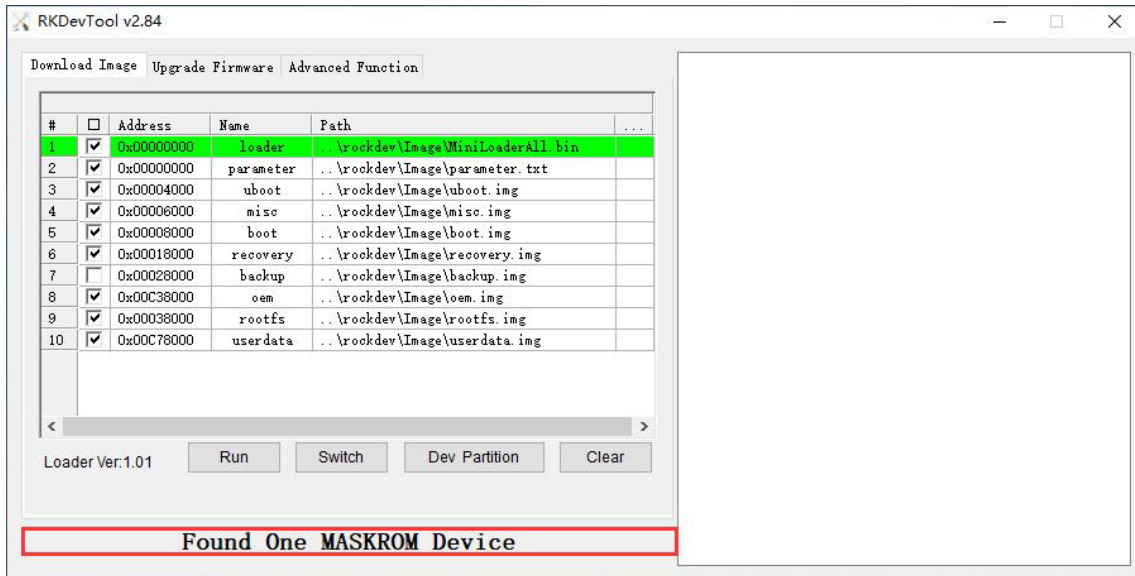
Step 1, connect PC and development board with USB OTG cable

Step 2, short the test point near eMMC to GND.

Step 3, connect PC and development board with Micro USB cable (power the board).



Step 4, at this time, the device should go into MASKROM mode.



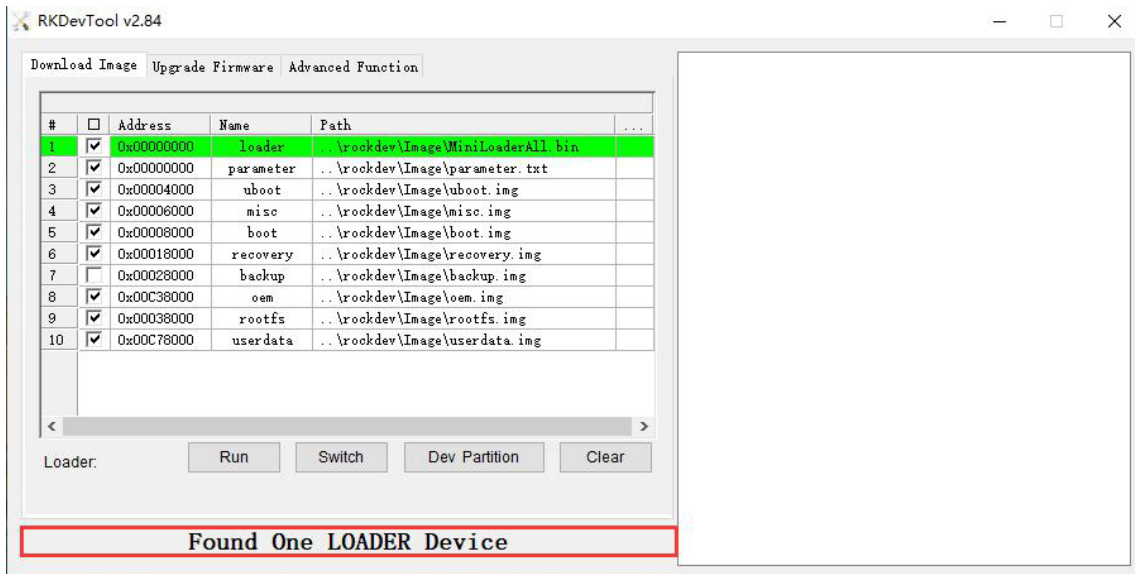
1.2 Loader mode

In Loader mode, the bootloader will waiting for host commands for firmware upgrades. To enter this mode, the USB is connected and the bootloader must detect a **RECOVERY** key press at startup.

Step 1, connect PC and development board USB OTG cable.

Step 2, keep press the **RECOVERY** key.

Step 3, connect PC and development board with Micro USB cable (power the board) until the windows PC shows **Found One LOADER Device** then release the **RECOVERY** key.



2.SD boot card

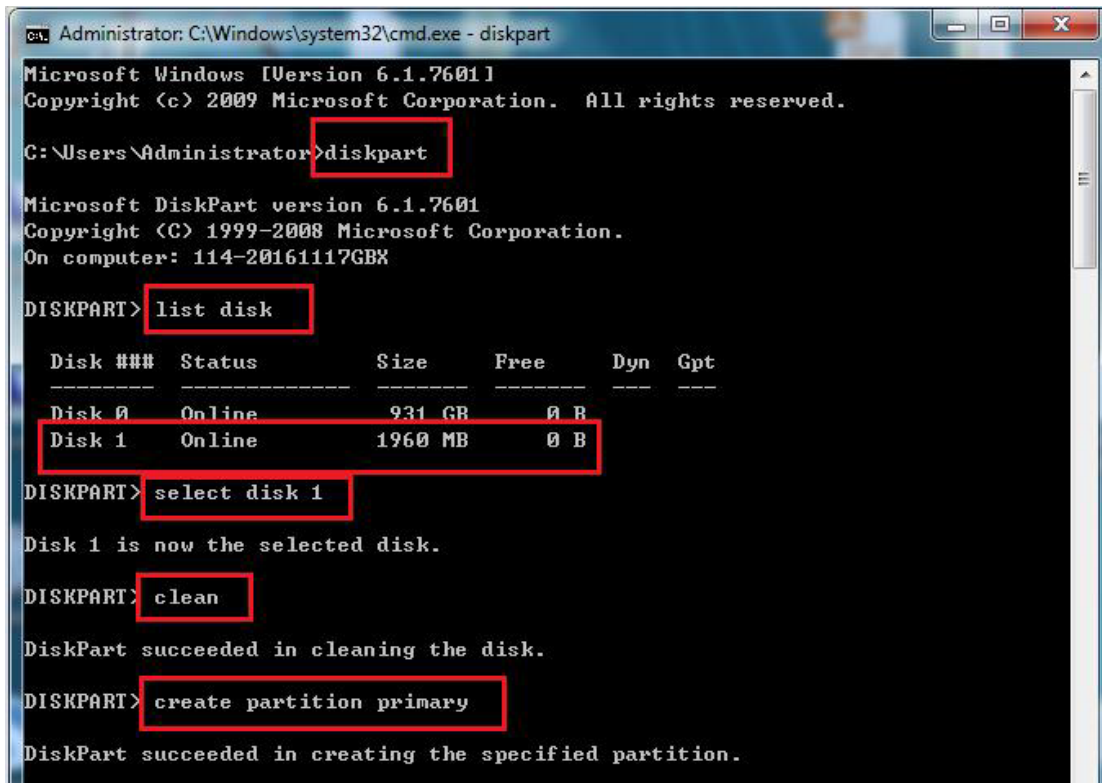
The image is stored in the sd card, and the system boots directly from the sd card. **The SD card must be formatted before make SD upgrade card,and make sure that the SD card has only one partition, otherwise it may cause the board to fail to boot.**

2.1 Format sdcard

If your sdcard has only one partition, just format it as FAT32 in WINDOWS



If your sdcard has multiple partitions, you need to delete the partitions in CMD of WINDOWS as follow:



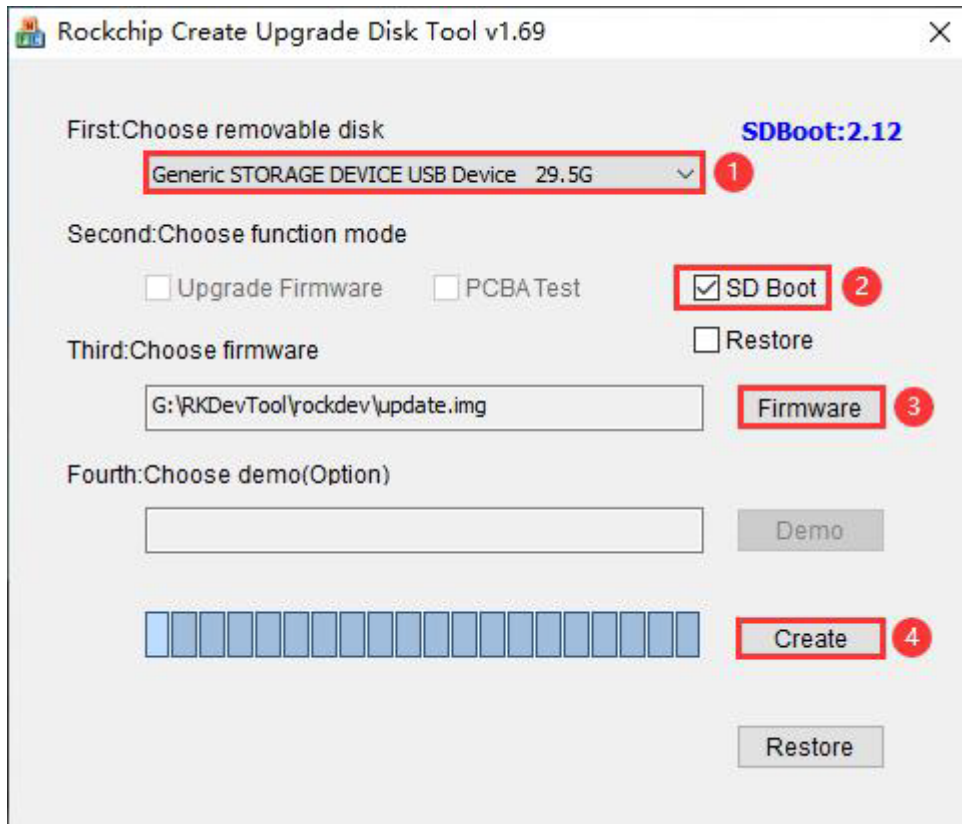
And then format it as FAT32.

2.2 make SD boot card

Step 1, unzip **SDDiskTool_v1.69.zip** on Windows.

Step 2, open **RKDevTool.exe** (Path:SDDiskTool_v1.69\SD_Firmware_Tool.exe).

Step 3, as shown in the figure, make SD upgrade card.



Parameter Description:

1	Select an SD card or USB flash drive from the drop-down list .
2	Select " SD Boot ".
3	Click Select " Firmware " and select update.img to upgrade the firmware.
4	lick " Create " to start creation.

Step 4, Insert the SD card into the card slot, power on and booting.

Debian10

1. Compiler Environment

It is recommended to use Ubuntu 18.04. If you encounter an error during compilation, you can check the error message and install the corresponding software packages accordingly. Other Linux versions may need to adjust the software package accordingly. In addition to the system requirements, there are other hardware and software requirements.

Hardware requirements	Software requirements
64-bit system, hard disk space should be greater than 40G. If you do	Ubuntu 18.04 system

multiple builds, you will need more hard drive space.	
---	--

2. Install Tools

PC OS: ubuntu18.04 system

Network: online

Permission: root

```
# sudo apt-get install repo git ssh make gcc libssl-dev liblz4-tool \
    expect g++ patchelf chrpath gawk texinfo chrpath diffstat binfmt-support \
    qemu-user-static live-build bison flex fakeroot cmake gcc-multilib g++-multilib unzip \
# sudo apt-get install device-tree-compiler
# sudo apt-get install python-pip
# sudo apt-get install ncurses-dev
```

3. Compile Source

Step 1, unzip the source

```
$ tar xvf rk3566_linux_source-20220708.tar.bz2
$ cd rk3566_linux_source
```

Step 2, set the compile board

```
$ ./build.sh -h (view the build command)
$ ./build.sh device/rockchip/rk356x/BoardConfig-rk3566-evb2-lp4x-v10.mk
```

Or use :

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

```
root@em-virtual-machine:/home/EM1126/rk3566_linux_source# ./build.sh lunch
```

processing option: lunch

You're building on Linux

Lunch menu...pick a combo:

0. default BoardConfig.mk
1. BoardConfig-rk3566-evb2-lp4x-v10-32bit.mk
2. BoardConfig-rk3566-evb2-lp4x-v10.mk
3. BoardConfig-rk3568-evb1-ddr4-v10-32bit.mk
4. BoardConfig-rk3568-evb1-ddr4-v10-spi-nor-64M.mk
5. BoardConfig-rk3568-evb1-ddr4-v10.mk
6. BoardConfig-rk3568-nvr-spi-nand.mk
7. BoardConfig-rk3568-nvr.mk
8. BoardConfig-rk3568-uvc-evb1-ddr4-v10.mk
9. BoardConfig.mk

Which would you like? [0]: 2 (BoardConfig-rk3566-evb2-lp4x-v10.mk)

switching to board:

```
/home/EM1126/rk3566_linux_source/device/rockchip/rk356x/BoardConfig-rk3566-evb2-lp4x-v10.mk
```

Step 3, compile uboot

`$./build.sh uboot`

Step 4, compile kernel

`$./build.sh kernel`

Note: it will pop out configuration the IO Domain Map power window when first time compile kernel, you need to accord to below form to configure it:

IO Power Domain Map

Refer to the actual design!

IO Domain	Pin Num	Support IO Voltage		Assignment IO Domain Voltage		Voltage	Notes
		3.3V	1.8V	Supply Power Net Name	Power Source		
PMUIO1	1P16	YES	NO	VCC3V3_PMU	VCC3V3_PMU	3.3V	
PMUIO2	1N15	YES	YES	VCCA1V8_PMU	VCCA1V8_PMU	3.3V	
VCCIO1	1D13	YES	YES	VCCIO_ACODEC	VCCIO_ACODEC	3.3V	
VCCIO2	1C13	YES	YES	VCCIO_FLASH	VCC_1V8	1.8V	FLASH_VOL_SEL = 1 --> VCCIO_FLASH = 1.8V
VCCIO3	1F17	YES	YES	VCCIO_SD	VCCIO_SD	3.3V	
VCCIO4	1E16	YES	YES	VCCIO_WL	VCC_1V8	1.8V	
VCCIO5	1N5 1N6	YES	YES	VCCIO5	VCC_1V8	3.3V	
VCCIO6	1L4 1L5	YES	YES	VCCIO6	VCC_1V8	1.8V	
VCCIO7	1N8	YES	YES	VCCIO7	VCC_3V3	3.3V	

Boardcon Confidential

kernel.img, resource.img and boot.img are generated in rk3566_linux_source\kernel directory.

If want to configure the kernel, execute follow command:

`$ cd kernel`

`$ make ARCH=arm64 menuconfig`

Kernel default use config file is: kernel\arch\arm64\configs\rockchip_linux_defconfig. After reconfigure the kernel, please use kernel\.config file to replace rockchip_linux_defconfig.

Step 5, compile recovery

`$./build.sh recovery`

Step 6, compile debian

`# sudo tar xvf debian.tar.bz2`

`# sudo ./build.sh debian`

After compile, will get the rootfs.img image in the debian directory, the file rootfs.img is finally we use to burn to board.

Step 7, Generated image file

`$./mkfirmware.sh`

`$ cd rockdev`

`$ cp ../debian/rootfs.img ./`

`$ ls`

Images are generated in current directory.

After compilation, execute the follow command to clean the build if need:

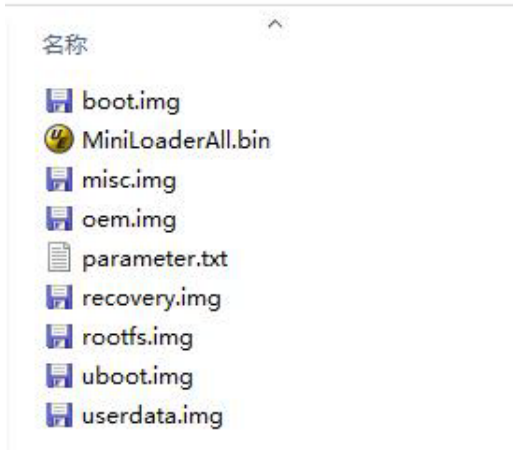
`# sudo ./build.sh cleanall`

4. Images Operation

4.1 Pack Image

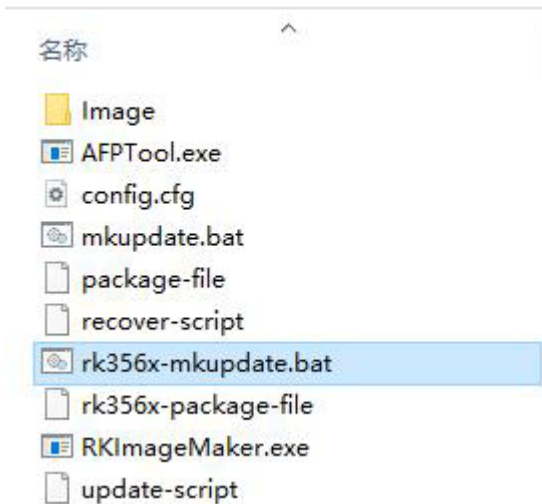
Step 1, copy all the files in debian directory **rockdev** to the windows **RKDevTool/rockdev/Image**.

RKDevTool > rockdev > Image



Step 2, enter **RKDevTool/rockdev/**, double-click to run **rk356x-mkupdate.bat**.

RKDevTool > rockdev >



```

Android Firmware Package Tool v1.65
G:\RKDevTool\rockdev>Afptool -pack ./ Image\update.img
Android Firmware Package Tool v1.65
----- PACKAGE -----
Add file: .\package-file
Add file: .\package-file done, offset=0x800, size=0x331, userspace=0x1
Add file: .\Image\MiniLoaderAll.bin
Add file: .\Image\MiniLoaderAll.bin done, offset=0x1000, size=0x6f1c0, userspace=0xdf
Add file: .\Image\parameter.txt
Add file: .\Image\parameter.txt done, offset=0x70800, size=0x1f4, userspace=0x1
Add file: .\Image\uboot.img
Add file: .\Image\uboot.img done, offset=0x71000, size=0x400000, userspace=0x801
Add file: .\Image\misc.img
Add file: .\Image\misc.img done, offset=0x471800, size=0xc000, userspace=0x19
Add file: .\Image\boot.img
Add file: .\Image\boot.img done, offset=0x47e000, size=0x1539600, userspace=0x2a73
Add file: .\Image\rootfs.img
Add file: .\Image\rootfs.img done, offset=0x19b7800, size=0xfa00000, userspace=0x1f4001
Add file: .\Image\recovery.img
Add file: .\Image\recovery.img done, offset=0xfb9b8000, size=0x1bcea00, userspace=0x379e
Add file: .\Image\oem.img
Add file: .\Image\oem.img done, offset=0xfd587000, size=0x1100000, userspace=0x2201
Add file: .\Image\userdata.img
Add file: .\Image\userdata.img done, offset=0xfe687800, size=0x500000, userspace=0xa01
Add CRC...
Make firmware OK!
----- OK -----

G:\RKDevTool\rockdev>RKImageMaker.exe -RK3568 Image\MiniLoaderAll.bin Image\update.img update.img
*****RKImageMaker ver 1.66 *****
Generating new image, please wait...
Writing head info...
Writing boot file...
Writing firmware...
Generating MD5 data...
MD5 data generated successfully!
New image generated successfully!

G:\RKDevTool\rockdev>rem update.img is new format, Image\update.img is old format, so delete older
G:\RKDevTool\rockdev>del Image\update.img

G:\RKDevTool\rockdev>pause
请按任意键继续. . .

```

Step 3, the **update.img** will be generated in **rockdev** directory.

RKDevTool > rockdev

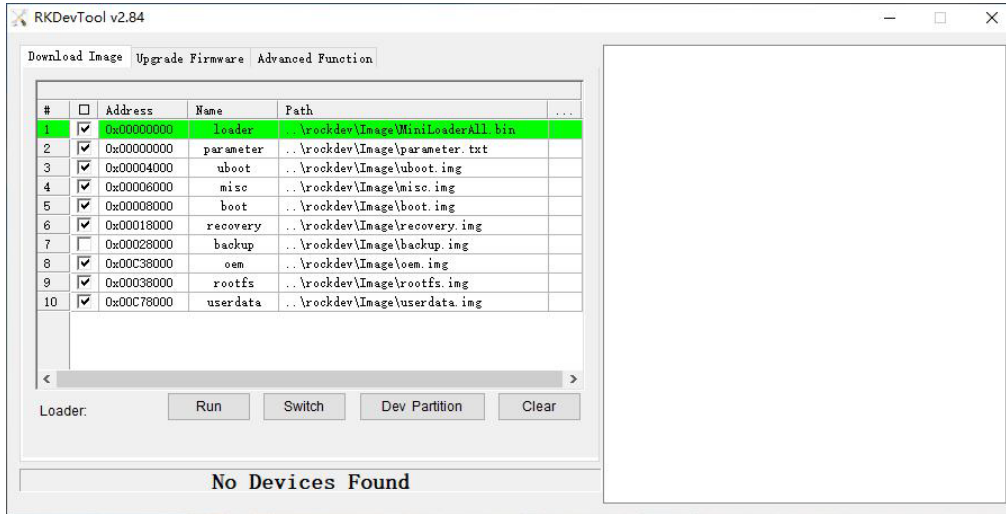
名称

- Image
- AFPTool.exe
- config.cfg
- mkupdate.bat
- package-file
- recover-script
- rk356x-mkupdate.bat
- rk356x-package-file
- RKImageMaker.exe
- update.img**
- update-script

4.2 Unzip Firmware

Unzip Firmware in windows.

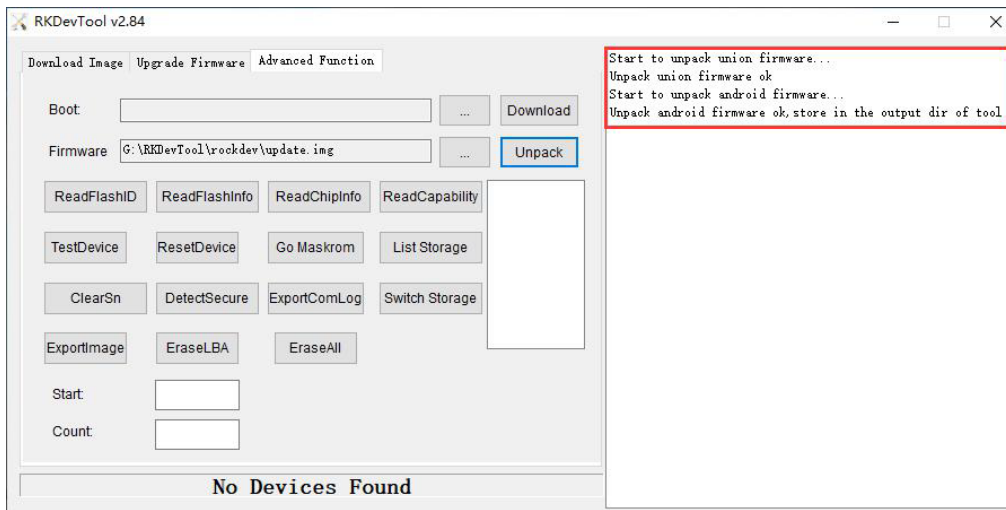
Step 1, open **RKDevTool.exe** (Path:RKDevTool\RKDevTool_Release\RKDevTool.exe).



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

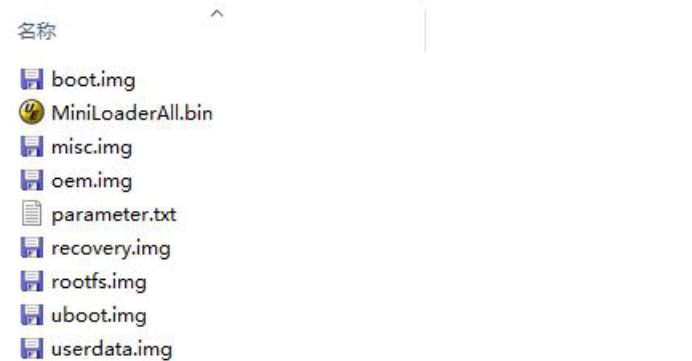


Step 3, unpack finish as follow:



The unzip files will be generated in `\RKDevTool\RKDevTool_Release\Output\Android\Image` directory.

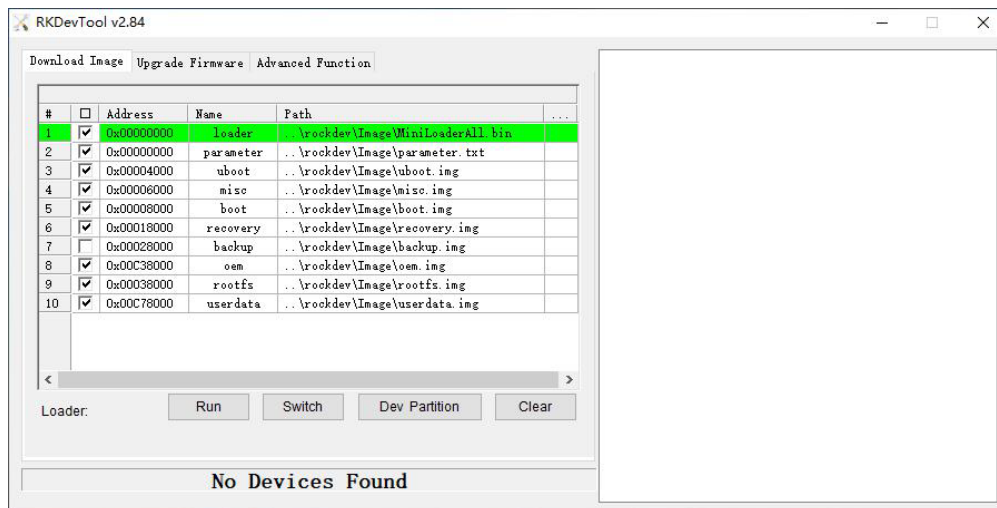
RKDevTool > RKDevTool_Release > Output > Android > Image



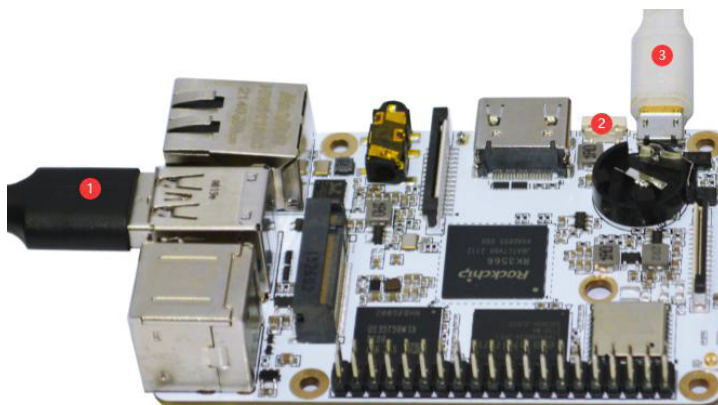
5. Burn Images

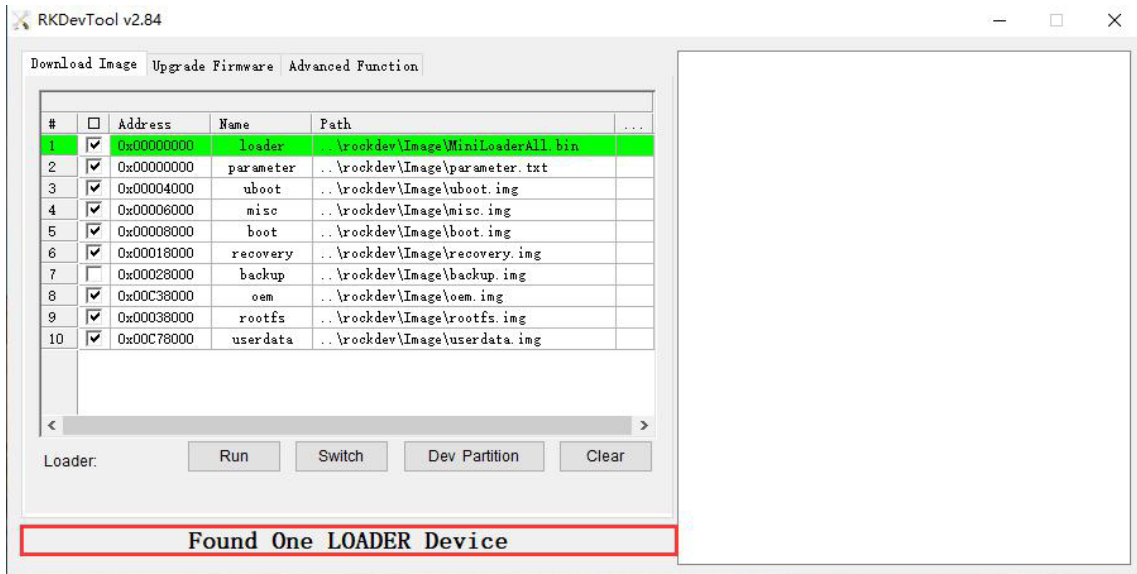
Step 1, unzip **RKDevTool.rar** on Windows.

Step 2, open **RKDevTool.exe** (Path: `RKDevTool\RKDevTool_Release\RKDevTool.exe`).

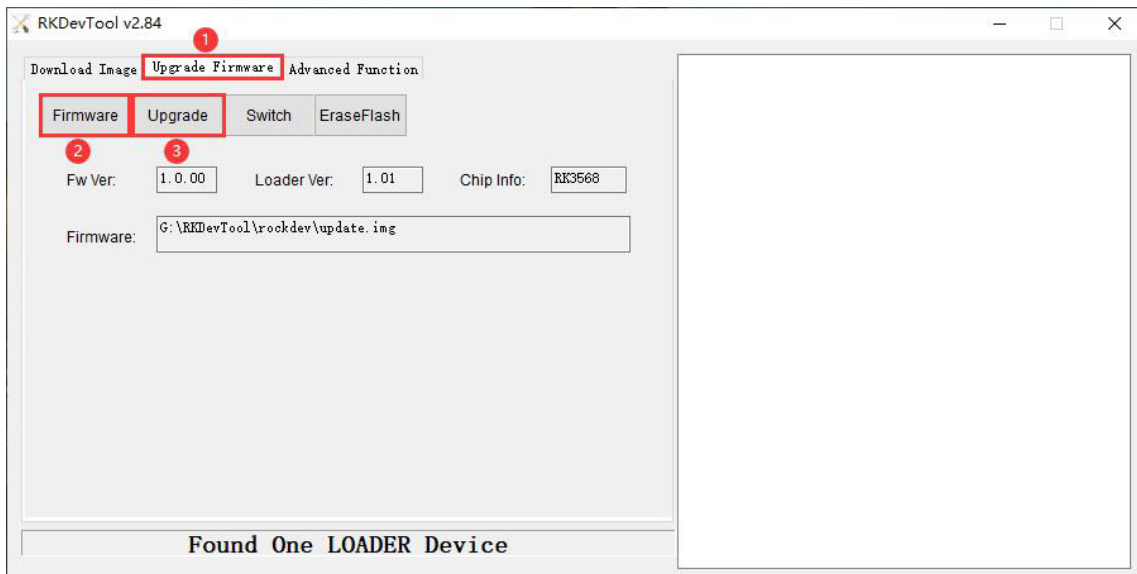


Step 3, connect PC and development board with USB OTG cable, keep pressing the **RECOVERY** Key and power the board (connect Micro USB cable) until the windows PC shows **Found One LOADER Device**.

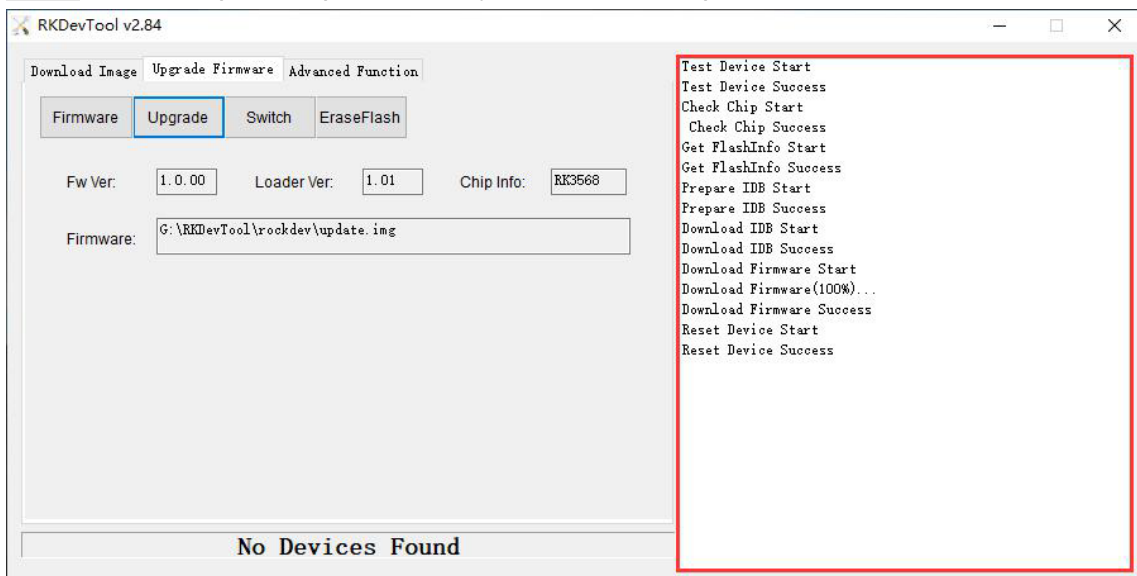




Step 4, click **Upgrade Firmware** -> **Firmware**, select **update.img**. Click **Upgrade** to flash.



Step 4, after burning the image successfully, as shown in the figure.

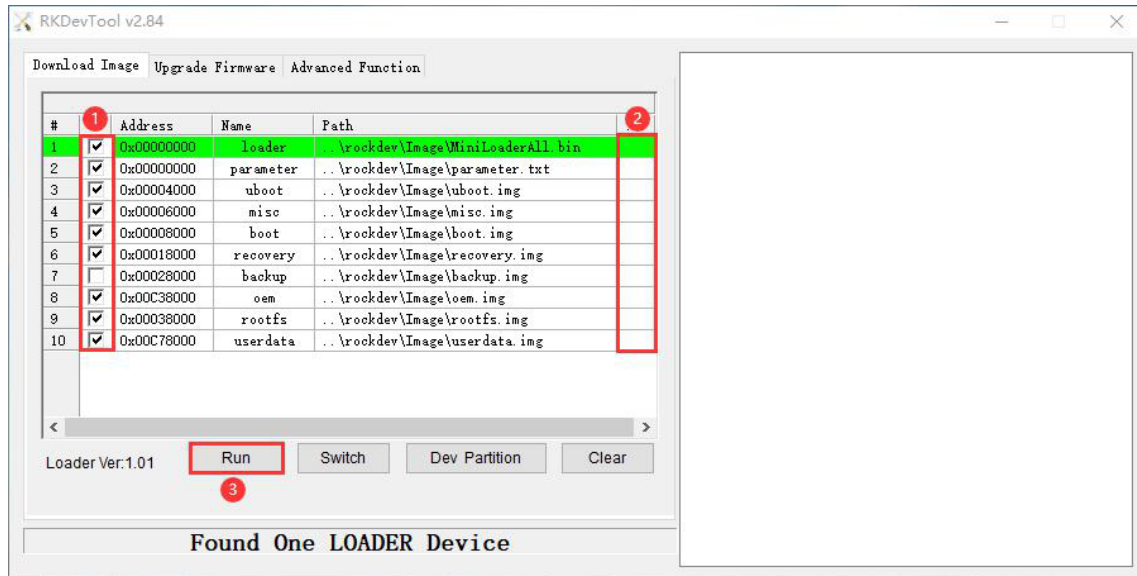


User can also update the firmware separately.

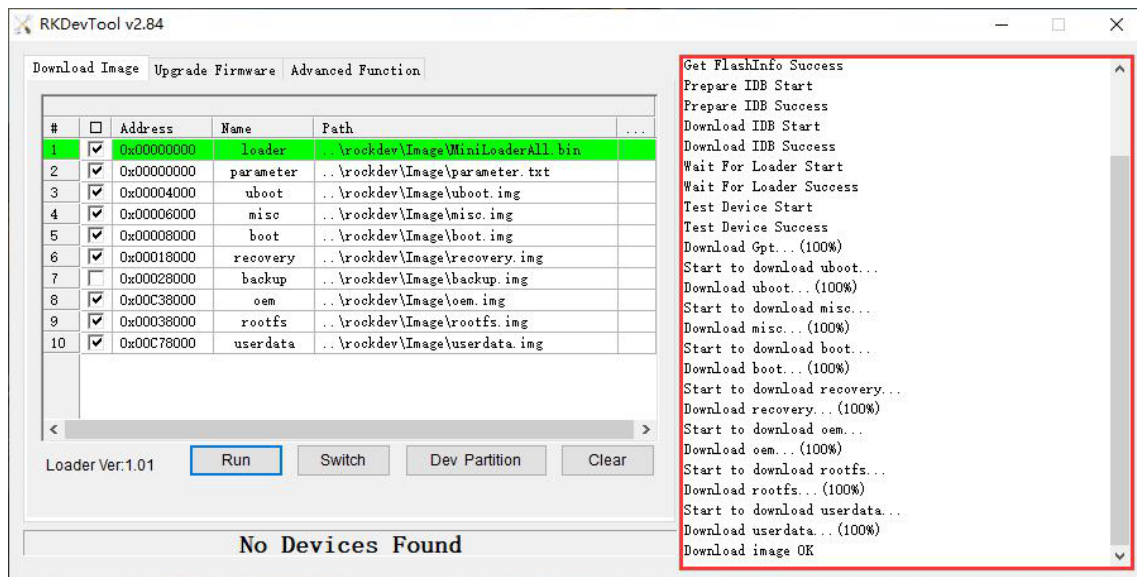
Step 1, select the checkbox on the left.

Step 2, click the column on the right side for the path of the file want to flash.

Step 3, click "run" to flash the image.



Step 4, after burning the image successfully, as shown in the figure.



6. Debian10 Application

6.1 Display

6.1.2 LVDS Display

After connecting the lvds screen(1280x800), power on.



6.1.2 HDMI Display

Connect the board and monitor with a HDMI I cable, then start up.



NOTE: The board default support HDMI display. If use lvds need to flash the boot-lvds.img separately.

6.2 Audio I/O

`aplay -l` (View sound card devices)

```

root@linaro-alip:~# aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: rockchipes8388c [rockchip,es8388-codec], device 0: fe410000.i2s-es8328-hifi-analog es8328-hi
fi-analog-0 [fe410000.i2s-es8328-hifi-analog es8328-hifi-analog-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: ROCKCHIPSPDIF [ROCKCHIP,SPDIF], device 0: fe460000.spdif-dit-hifi dit-hifi-0 [fe460000.spdif
-dit-hifi dit-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
root@linaro-alip:~#
    
```

Record audio file, when the headset is not connected, the microphone on the board is used, and the input recording command will output `hw det_value = 0`; when the headset is plugged in, the microphone on the headset is used, and the recording command will output `hw det_value = 1`.

`arecord -Dhw:0,0 -f cd test.wav` (sound card 0, device 0)

```

root@linaro-alip:~# arecord -Dhw:0,0 -f cd test.wav
Recording WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
[ 52.480804] es8328_hw_params
[ 52.482925] hw det_value = 0
c^CAborted by signal Interrupt...
root@linaro-alip:~#
    
```

play audio file:

`aplay -D plughw:0,0 test.wav` (sound card 0, device 0)

```

root@linaro-alip:~# aplay -D plughw:0,0 test.wav
Playing WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
[ 313.444563] es8328_hw_params
[ 313.446718] hw det_value = 0
    
```

6.3 Ethernet

Connect the Board and router with an Ethernet cable (default DHCP=Yes). User can ping URL/IP at terminal. or open the browser to test Network.

`ifconfig`

```

serial-com5 (1) - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt>
serial-com5 (1) x
root@linaro-alip:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.125 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::c18c:6e84:ccfe:f83d prefixlen 64 scopeid 0x20<link>
    ether 92:dc:d7:c3:cd:80 txqueuelen 1000 (Ethernet)
    RX packets 2395 bytes 156726 (153.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 188 bytes 15908 (15.5 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 42

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 45 bytes 3496 (3.4 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45 bytes 3496 (3.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

p2p0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 62:fb:00:36:d2:f5 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@linaro-alip:~#
root@linaro-alip:~# █

Ready Serial: COM5, 1500000 29, 21 29 Rows, 77 Cols VT100

```

ping www.urveboard.com

```

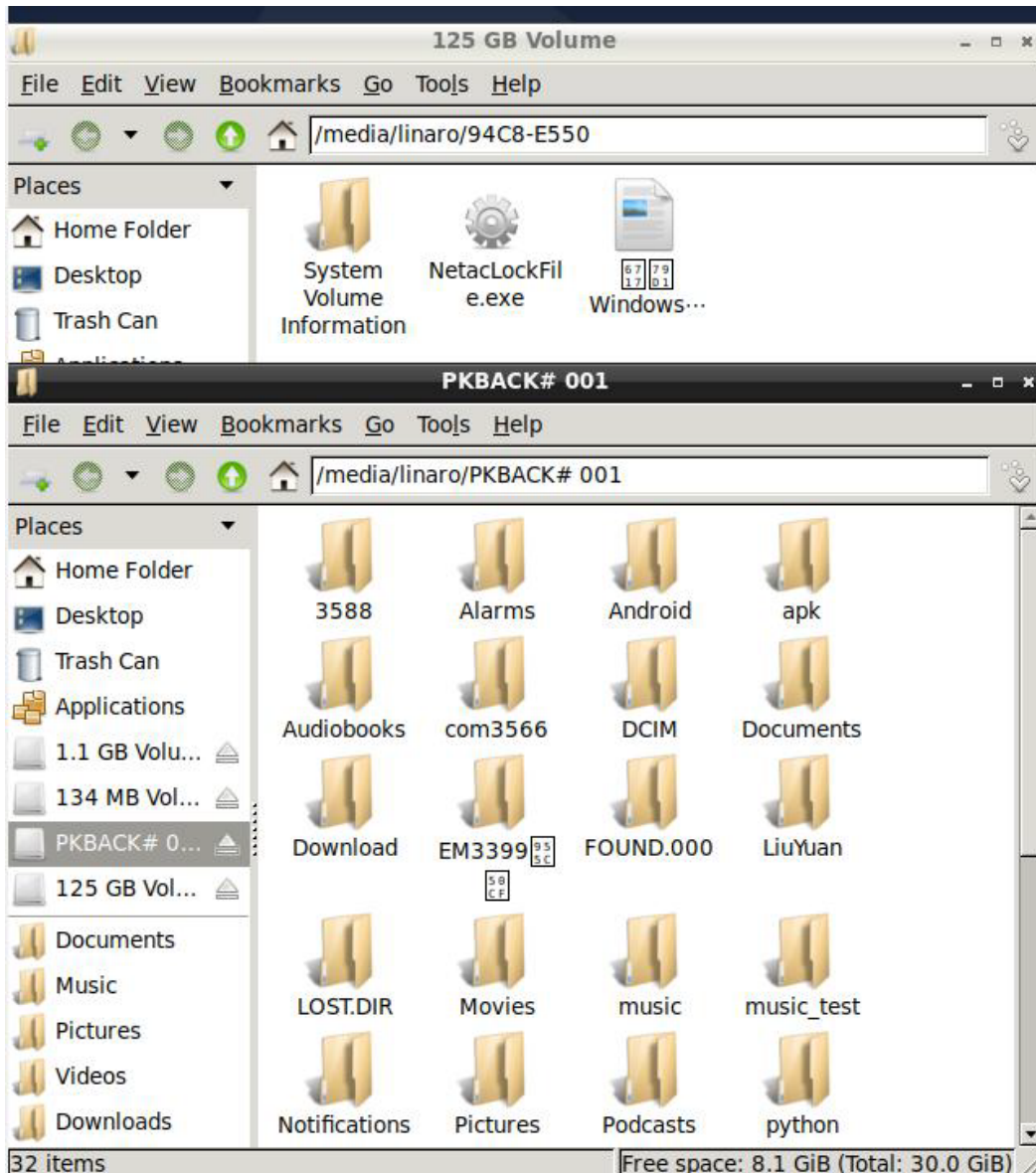
serial-com5 (1) - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt>
serial-com5 (1) x
root@linaro-alip:~#
root@linaro-alip:~# ping www.boardcon.com
PING www.boardcon.com (67.222.54.196) 56(84) bytes of data.
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=47 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=47 time=196 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=47 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=10 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=11 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=12 ttl=47 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=13 ttl=47 time=200 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=14 ttl=47 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=15 ttl=47 time=199 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=16 ttl=47 time=201 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=17 ttl=47 time=200 ms
█

Ready Serial: COM5, 1500000 21, 1 21 Rows, 93 Cols VT100 CAP NUM

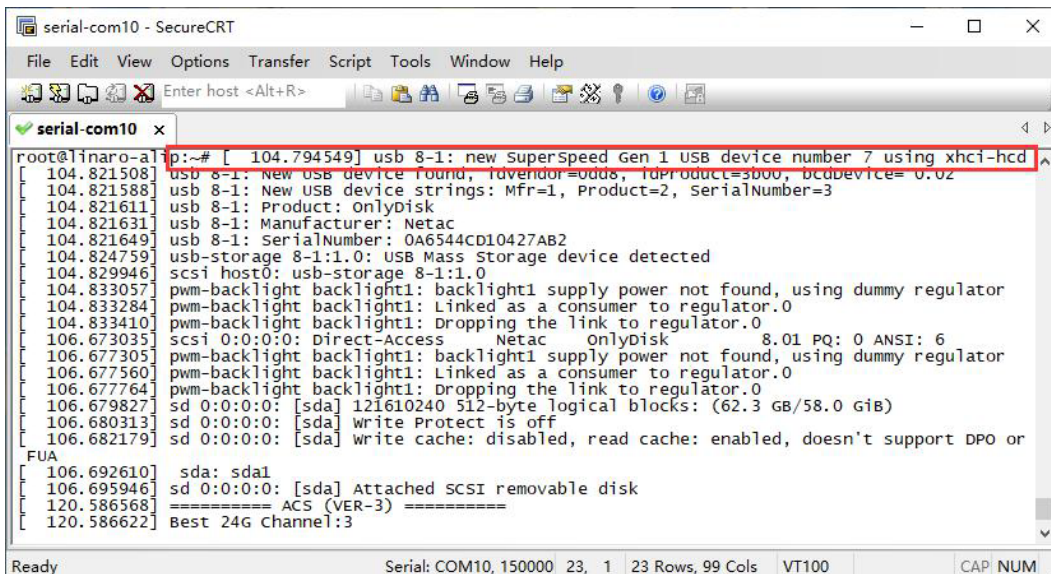
```

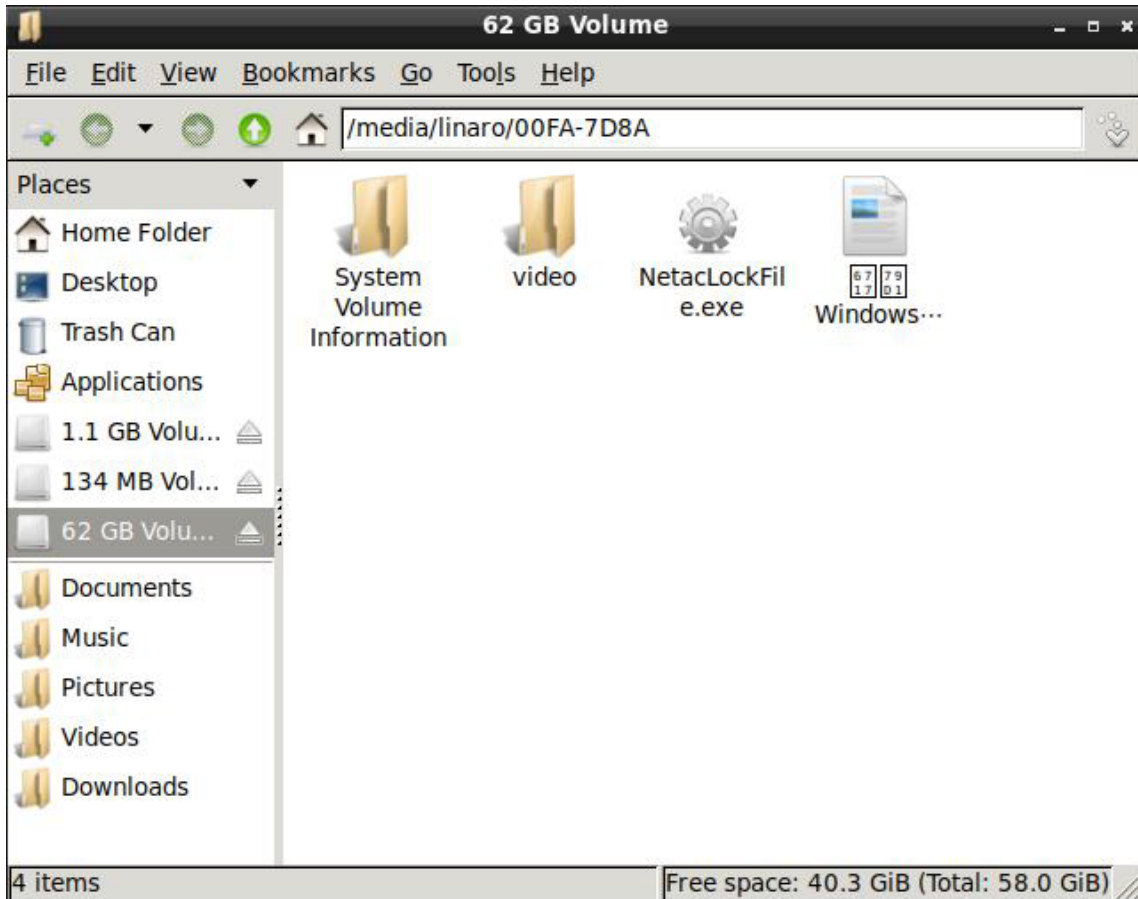
6.4 USB Host

6.4.1 USB2.0x3:(USB OTG use for host)



6.4.2 USB3.0:





6.5 M.2 SSD

Connect the SSD to the development board before power on. Then execute follow command to erase SSD and mount.

`ls /dev` (View SSD device name)

```

root@linaro-alip:~#
root@linaro-alip:~# ls /dev
block                mmcblk0boot1      tty14   tty52             vcs1
bus                  mmcblk0p1         tty15   tty53             vcs2
char                 mmcblk0p2         tty16   tty54             vcs3
console              mmcblk0p3         tty17   tty55             vcs4
cpu_dma_latency     mmcblk0p4         tty18   tty56             vcs5
disk                 mmcblk0p5         tty19   tty57             vcs6
dri                  mmcblk0p6         tty2    tty58             vcs7
fb0                  mmcblk0p7         tty20   tty59             vcsa
fd                   mmcblk0p8         tty21   tty6              vcsa1
full                 mmcblk0rpmb       tty22   tty60             vcsa2
fuse                 mpp_service       tty23   tty61             vcsa3
gpiochip0            network_latency   tty24   tty62             vcsa4
gpiochip1            network_throughput tty25   tty63             vcsa5
gpiochip2            null              tty26   tty7              vcsa6
gpiochip3            nvme0             tty27   tty8              vcsa7
gpiochip4            nvme0n1          tty28   tty9              vcsu
hidraw0              port              tty29   ttyFIQ0           vcsu1
hidraw1              ppp               tty3    ttyGS0            vcsu2
hwrng                ptmx              tty30   ttys1             vcsu3
i2c-0                ptp0              tty31   ttys3             vcsu4
i2c-1                pts               tty32   ttys4             vcsu5
i2c-4                ram0              tty33   ttys5             vcsu6
iio:device0          random            tty34   ubi_ctrl          vcsu7
initctl              rfskill          tty35   uhid              vendor_storage
input                rga               tty36   uinput            vhci
kmsg                 rtc               tty37   urandom           video-dec0
log                  rtc0              tty38   usb               video-enc0
loop-control         shm               tty39   usb-ffs           video0
loop0                snd               tty4    usbmon0           video1
loop1                spidev0.0        tty40   usbmon1           video2
loop2                stderr            tty41   usbmon2           video3
loop3                stdin            tty42   usbmon3           video4
loop4                stdout            tty43   usbmon4           video5
loop5                tee0              tty44   usbmon5           video6
loop6                teeprivo         tty45   usbmon6           video7
loop7                tty               tty46   usbmon7           video8
mali0                tty0              tty47   usbmon8           watchdog
media0               tty1              tty48   v4l               watchdog0
mem                  tty10            tty49   v4l-subdev0      zero
memory_bandwidth     tty11            tty5    v4l-subdev1      zram0
mmcblk0              tty12            tty50   v4l-subdev2
mmcblk0boot0         tty13            tty51   vcs
root@linaro-alip:~#

```

- # mke2fs -t ext4 /dev/nvme0n1 (If SSD is not ext4 format, format it to ext4 file system)
- # mkdir /mnt/ssd (Create a new directory file)
- # mount -t ext4 /dev/nvme0n1 /mnt/ssd (Mount SSD to the new directory)
- # ls /mnt/ssd (View the contents of the ssd)


```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~#
root@linaro-alip:~# mke2fs -t ext4 /dev/nvme0n1
mke2fs 1.44.5 (15-Dec-2018)
/dev/nvme0n1 contains a ext4 file system
    last mounted on Thu Feb 14 10:14:48 2019
Proceed anyway? (y,N) y
Discarding device blocks: done
Creating filesystem with 31258710 4k blocks and 7815168 inodes
Filesystem UUID: d3b7479c-2a0b-406a-9bf9-f90ea20c41ec
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872

Allocating group tables: done
writing inode tables: done
Creating journal (131072 blocks): done
writing superblocks and filesystem accounting information: done

root@linaro-alip:~# mkdir /mnt/ssd
root@linaro-alip:~#
root@linaro-alip:~# mount -t ext4 /dev/nvme0n1 /mnt/ssd
root@linaro-alip:~#
root@linaro-alip:~# ls /mnt/ssd
lost+found
root@linaro-alip:~# █
Ready          Serial: COM10, 150000 25, 21 25 Rows, 79 Cols  VT100  CAP NUM

```

6.6 UART

Connect the UART RX and TX with the test line. Execute the follow command to test.

com /dev/ttyS3 115200 8 0 1 (CON3 PIN3&PIN5)

```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# com /dev/ttyS3 115200 8 0 1
port = /dev/ttyS3
baudrate = 115200
cs = 8
parity = 0
stopb = 1
1111111
RECV: 1111111
uuuuuuu
RECV: uuuuuuu
█
Ready          Serial: COM10, 150000 11, 1 11 Rows, 73 Cols  VT100  CAP I

```

com /dev/ttyS4 115200 8 0 1 (CON3 PIN11&PIN12)

The screenshot shows a SecureCRT terminal window titled 'serial-com10'. The terminal output is as follows:

```

root@linaro-alip:/# com /dev/ttyS4 115200 8 0 1
port = /dev/ttyS4
baudrate = 115200
cs = 8
parity = 0
stopb = 1
5555555
RECV: 5555555
yyyyyyy
RECV: yyyyyyy
    
```

The status bar at the bottom indicates 'Ready', 'Serial: COM10, 150000', '11, 1', '11 Rows, 73 Cols', 'VT100', and 'CAP | ...'.

com /dev/ttyS5 115200 8 0 1 (CON3 PIN8&PIN10)

The screenshot shows a SecureCRT terminal window titled 'serial-com10'. The terminal output is as follows:

```

root@linaro-alip:/# com /dev/ttyS5 115200 8 0 1
port = /dev/ttyS5
baudrate = 115200
cs = 8
parity = 0
stopb = 1
6666666
RECV: 6666666
kkkkkk
RECV: kkkkkk
    
```

The status bar at the bottom indicates 'Ready', 'Serial: COM10, 150000', '11, 1', '11 Rows, 73 Cols', 'VT100', and 'CAP | ...'.

6.7 SPI

Execute the following command after short-circuiting the signal pin(CON3 PIN19&PIN21), you can see the value change.

spidev0.0_test


```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:/# spidev0.0_test
spi mode: 0
bits per word: 8
max speed: 500000 Hz (500 KHz)

FF FF FF FF FF FF
FF FF FF FF FF FF
FF FF FF FF FF FF
FF FF FF FF FF FF
FF FF FF FF FF FF
FF FF FF FF FF FF
FF FF
root@linaro-alip:/# spidev0.0_test
spi mode: 0
bits per word: 8
max speed: 500000 Hz (500 KHz)

FF FF FF FF FF FF
40 00 00 00 00 95
FF FF FF FF FF FF
FF FF FF FF FF FF
DE AD BE EF BA AD
F0 0D
root@linaro-alip:/# █
Ready Serial: COM10, 150000 26, 21 26 Rows, 77 Cols VT100 CAP NUM

```

6.8 IR

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

```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~#
root@linaro-alip:~# echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print
root@linaro-alip:~# [ 52.017436] USERCODE=0xff00
[ 52.044010] RMC_GETDATA=f7
[ 52.370997] USERCODE=0xff00
[ 52.397559] RMC_GETDATA=f7
[ 52.655490] USERCODE=0xff00
[ 52.682077] RMC_GETDATA=f7
[ 52.925002] USERCODE=0xff00
[ 52.951592] RMC_GETDATA=f7
[ 53.160267] USERCODE=0xff00
[ 53.186823] RMC_GETDATA=f7
[ 53.404357] USERCODE=0xff00
[ 53.430918] RMC_GETDATA=f7
[ 53.621313] USERCODE=0xff00
[ 53.647950] RMC_GETDATA=f7
[ 53.850188] USERCODE=0xff00
[ 53.876744] RMC_GETDATA=f7
[ 54.189738] USERCODE=0xff00
[ 54.216335] RMC_GETDATA=f7
[ 54.722484] USERCODE=0xff00
[ 54.749081] RMC_GETDATA=f7
[ 55.565846] USERCODE=0xff00
[ 55.592441] RMC_GETDATA=f7
█
Ready Serial: COM10, 150000 25, 1 25 Rows, 88 Cols VT100 CAP NUM

```

6.9 WIFI

Connect the WiFi antenna, then click the network icon in the lower right corner of the UI interface, select the SSID from the list of available networks and enter the password. After connected, can ping the URL/IP at the terminal.

ifconfig

```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# ifconfig
eth0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 92:dc:d7:c3:cd:80 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 42

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 32 bytes 2144 (2.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 32 bytes 2144 (2.0 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

p2p0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 62:fb:00:36:d2:f5 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.2.15 netmask 255.255.255.0 broadcast 192.168.2.255
    inet6 fe80::baad:212:248b:d7bd prefixlen 64 scopeid 0x20<link>
    ether 60:fb:00:36:d2:f5 txqueuelen 1000 (Ethernet)
    RX packets 450 bytes 120119 (117.3 KiB)
    RX errors 0 dropped 6 overruns 0 frame 0
    TX packets 17 bytes 23112 (22.5 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@linaro-alip:~#
Ready Serial: COM10, 150000 36, 21 36 Rows, 81 Cols VT100 CAP NUM

```

ping www.urveboard.com

```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# ping www.boardcon.com
PING www.boardcon.com (67.222.54.196) 56(84) bytes of data:
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=1 ttl=46 time=203 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=2 ttl=46 time=203 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=3 ttl=46 time=203 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=4 ttl=46 time=203 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=5 ttl=46 time=216 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=6 ttl=46 time=203 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=7 ttl=46 time=304 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=8 ttl=46 time=214 ms
64 bytes from 67-222-54-196.unifiedlayer.com (67.222.54.196): icmp_seq=9 ttl=46 time=245 ms
█
Ready Serial: COM10, 150000 13, 1 16 Rows, 92 Cols VT100 CAP NUM

```

6.10 Bluetooth

Step 1, execute the following command to turn on bluetooth.

`# bt_load_rtk_firmware`

```

serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# bt_load_rtk_firmware
rtk_hciattach: no process found
[ 84.641052] [BT_RFKILL]: bt shut off power
[ 86.675353] [BT_RFKILL]: rfkill_rk_set_power: set bt wake_host high!
[ 86.728718] [BT_RFKILL]: ENABLE UART_RTS
[ 86.835246] [BT_RFKILL]: DISABLE UART_RTS
[ 86.835404] [BT_RFKILL]: bt turn on power
[ 86.835512] [BT_RFKILL]: Request irq for bt wakeup host
[ 86.835640] [BT_RFKILL]: ** disable irq
[ 88.878082] hci_uart: loading out-of-tree module taints kernel.
[ 88.882839] Bluetooth: HCI UART driver ver 2.2.74e8f89.20210423-153941
[ 88.882926] Bluetooth: HCI H4 protocol initialized
[ 88.882941] Bluetooth: HCI Realtek H5 protocol initialized
[ 88.882954] rtk_btcoex: rtk_btcoex_init: version: 1.2
[ 88.882964] rtk_btcoex: create workqueue
[ 88.884604] rtk_btcoex: alloc buffers 1792, 2432 for ev and l2
[ 88.895524] of_dma_request_slave_channel: dma-names property of node '/serial@fe650000' missing or empty
[ 88.895595] ttyS1 - failed to request DMA, use interrupt Can't get device info: No such device
Realtek Bluetooth:Realtek Bluetooth init uart with init speed:115200, type:dHCI UART H5
3.1.dced3af.20210423-153942 ciattach version

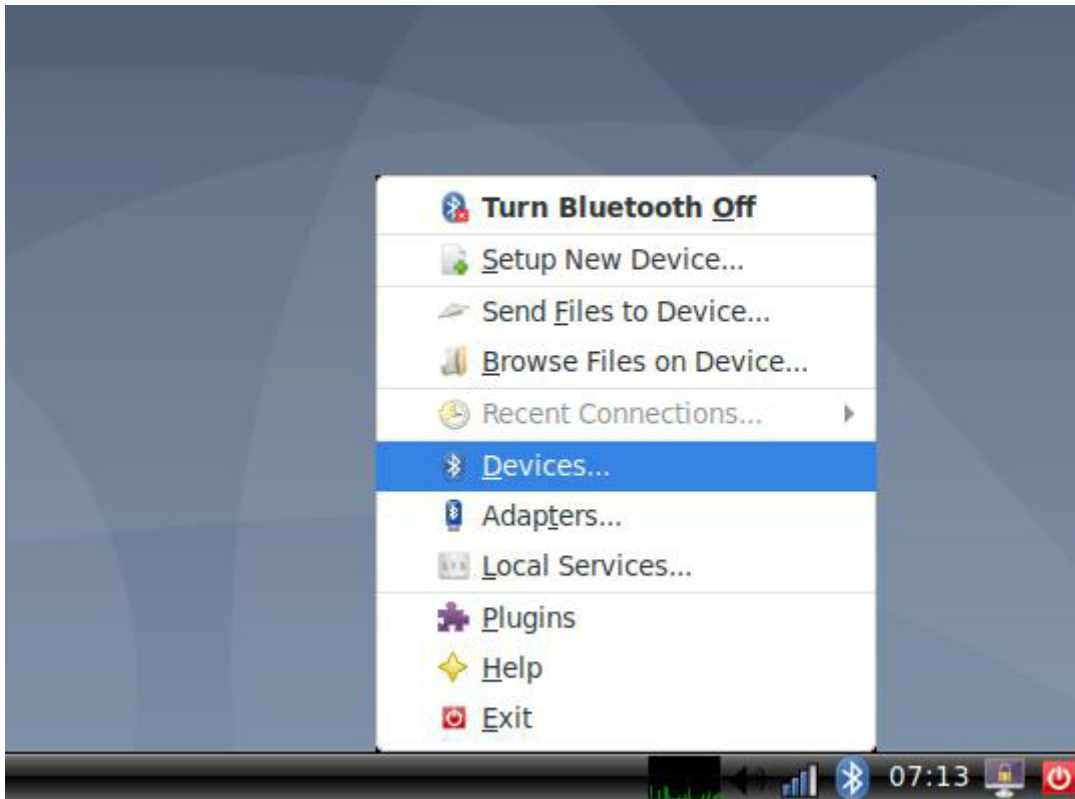
Realtek Bluetooth :Use epoll
root@linaro-alip:~# Realtek Bluetooth :[SYNC] Get SYNC Resp Pkt
Realtek Bluetooth :[CONFIG] Get SYNC pkt
Realtek Bluetooth :[CONFIG] Get CONFIG pkt
Realtek Bluetooth :[CONFIG] Get CONFIG resp pkt
Realtek Bluetooth :dic is 1, cfg field 0x14
Realtek Bluetooth :H5 init finished

Realtek Bluetooth :Realtek H5 IC
Realtek Bluetooth :Receive cmd complete event of command: 1001
Realtek Bluetooth :HCI Version 0x08
Realtek Bluetooth :HCI Revision 0x000c
Realtek Bluetooth :LMP Subversion 0x8821
Realtek Bluetooth :Receive cmd complete event of command: fc6d
Realtek Bluetooth :Read ROM version 01
Realtek Bluetooth :LMP Subversion 0x8821
Realtek Bluetooth :EVersion 1
Realtek Bluetooth :IC: RTL8821CS
Realtek Bluetooth :Firmware/config: rtl8821c_fw, rtl8821c_config
Realtek Bluetooth :Couldnt open extra config /opt/rtk_btconfig.txt, No such file or directory

Ready Serial: COM10, 150000, 42, 1 | 42 Rows, 110 Cols | VT100 CAP NUM

```

Step 2, click the Bluetooth icon in the lower right corner of the desktop and select the “Devices...” option.



Step 3, click the “Search” button to start searching and select the available device in the list to pair.



Step 4, after pairing, devices can connect with each other automatically.

6.11 RTC

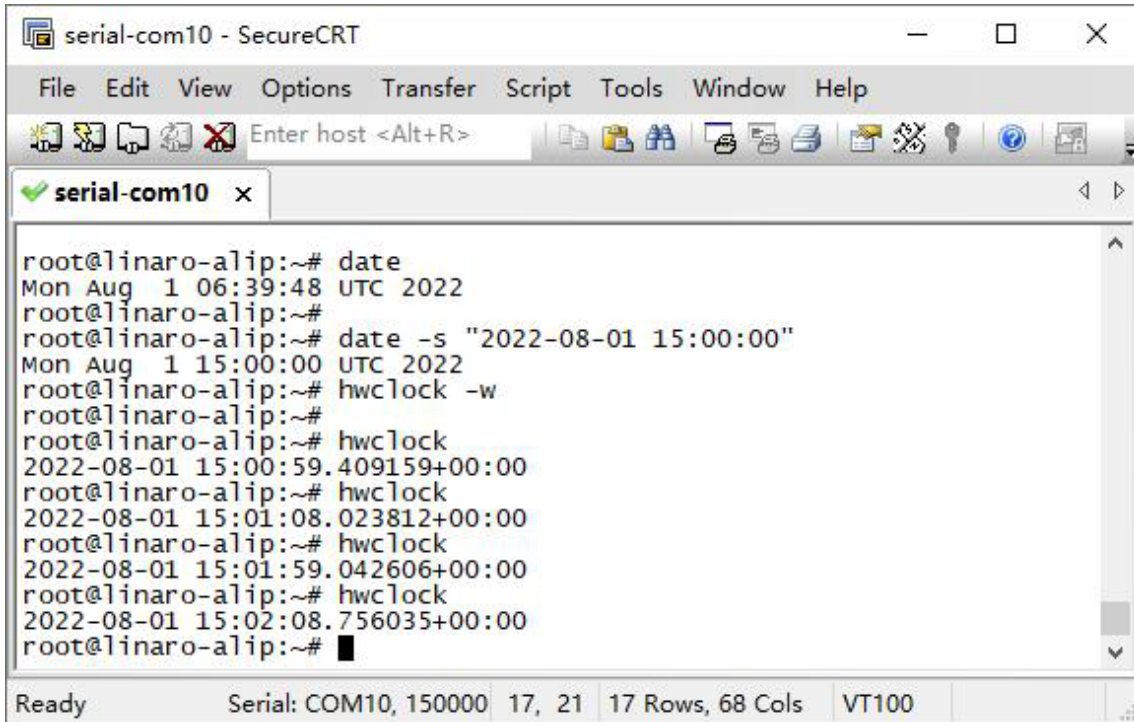
Execute the follow command to set the RTC time.

```
# date -s "2022-08-01 15:00:00"
```

```
# hwclock -w
```

Wait a minute then run hwclock again, it can be seen the time has changed.

```
# hwclock
```



```
serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# date
Mon Aug 1 06:39:48 UTC 2022
root@linaro-alip:~#
root@linaro-alip:~# date -s "2022-08-01 15:00:00"
Mon Aug 1 15:00:00 UTC 2022
root@linaro-alip:~# hwclock -w
root@linaro-alip:~#
root@linaro-alip:~# hwclock
2022-08-01 15:00:59.409159+00:00
root@linaro-alip:~# hwclock
2022-08-01 15:01:08.023812+00:00
root@linaro-alip:~# hwclock
2022-08-01 15:01:59.042606+00:00
root@linaro-alip:~# hwclock
2022-08-01 15:02:08.756035+00:00
root@linaro-alip:~# █
Ready Serial: COM10, 150000 17, 21 17 Rows, 68 Cols VT100
```

After the board is turned off, the RTC supports battery power supply, and RTC clock to be saved.

6.12 SD

URVE Board PI supports SD Hot-plug.



6.13 Video Player

Copy the video file to sdcard/udisk and plug it into the board. After the system starts, open sdcard/udisk and execute the following command to play.

Test 1920x1080

```
# gst-play-1.0 --flags=3 --videosink=xvimagesink
/media/linaro/6A2A-09F0/video/AVC/1080P60-test1.mp4
```

The screenshot shows a terminal window titled "serial-com10 - SecureCRT". The terminal output is as follows:

```
root@linaro-alip:~#
root@linaro-alip:~#
root@linaro-alip:~# gst-play-1.0 --flags=3 --videosink=xvimagesink /media/linaro/6A2A-09F0/video/AVC/1080
P60-test1.mp4
Press 'k' to see a list of keyboard shortcuts.
Now playing /media/linaro/6A2A-09F0/video/AVC/1080P60-test1.mp4
mpp[2722]: mpp_rt: NOT found ion allocator
mpp[2722]: mpp_rt: found drm allocator
mpp[2722]: mpp_info: mpp version: f0ad7e40 author: Caesar wang 2021-12-25 HACK: use afbc
mpp[2722]: hal_h264d_vdpu34x: control info: fmt 7, w 1920, h 1080
mpp[2722]: mpp_buf_slot: set frame info: w 1920 h 1080 hor 1920 ver 1088
mpp[2722]: mpp_dec: setting default w 1920 h 1080 h_str 1920 v_str 1088
mpp[2722]: h264d_api: is_avcc=1
WARNING No volume control found
WARNING debug information: gstplaysink.c(2883): gen_audio_chain(): /GstPlayBin:playbin/GstPlaysink:plays
ink:
volume/mute is not available
[ 3212.567814] es8328_hw_params
[ 3212.569524] hw det_value = 0
Redistribute latency...
[ 3260.463852] ===== ACS (VER-3) =====
[ 3260.463890] Best 24G channel:4
[ 3260.463897] Best 5G channel:52
[ 3260.463897]
0:01:00.8 / 0:04:46.7
```

The terminal status bar at the bottom shows "Ready", "Serial: COM10, 150000", "25, 1", "25 Rows, 105 Cols", "VT100", and "CAP NUM".

Test 4K(max-fps to 50fps)


```
# echo performance | tee $(find /sys/devices -name *governor)
# echo 40000000 > /sys/kernel/debug/clk/aclk_rkvdec/clk_rate
# export GST_DEBUG=fpsdisplaysink:10
# export KMSSINK_DISABLE_VSYNC=1
# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
#GST_DEBUG=fpsdisplaysink:5 gst-play-1.0
/media/linaro/6A2A-09F0/video/HEVC/I.O.I-Dream.Girl.2160p.UHDTV.H265.ts --flags=3
--use-playbin3 --videosink="fpsdisplaysink text-overlay=false video-sink="kmssink plane-id=87"
sync=false"
```

```
serial-com10 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com10 x
root@linaro-alip:~# echo performance | tee $(find /sys/devices -name *governor)
performance
root@linaro-alip:~# echo 40000000 > /sys/kernel/debug/clk/aclk_rkvdec/clk_rate
root@linaro-alip:~# export GST_DEBUG=fpsdisplaysink:10
root@linaro-alip:~# export KMSSINK_DISABLE_VSYNC=1
root@linaro-alip:~# export GST_MPP_VIDEODEC_DEFAULT_ARM_AFBC=1
root@linaro-alip:~# GST_DEBUG=fpsdisplaysink:5 gst-play-1.0 /media/linaro/6A2A-09F0/video/HEVC/I.O.I-Drea
m.Girl.2160p.UHDTV.H265.ts --flags=3 --use-playbin3 --videosink="fpsdisplaysink text-overlay=false video
-sink="kmssink plane-id=87" sync=false
Press 'k' to see a list of keyboard shortcuts.
Now playing /media/linaro/6A2A-09F0/video/HEVC/I.O.I-Dream.Girl.2160p.UHDTV.H265.ts
0:00:00.068767765 2896 0x55712ee270 DEBUG fpsdisplaysink fpsdisplaysink.c:440:fps_display_sink
_start:<fpsdisplaysink0> Use text-overlay? 0
mpp[2896]: mpp_rt: NOT found ion allocator
mpp[2896]: mpp_rt: found drm allocator
mpp[2896]: mpp_info: mpp version: f0ad7e40 author: Caesar wang 2021-12-25 HACK: use afbc
WARNING No volume control found
WARNING debug information: gstplaysink.c(2883): gen_audio_chain (): /GstPlayBin3:playbin/gstplaysink:play
sink:
Volume/mute is not available
mpp[2896]: mpp_buf_slot: set frame info: w 3840 h 2160 hor 3840 ver 2160
mpp[2896]: mpp_dec: setting default w 3840 h 2160 h_str 3840 v_str 2160
mpp[2896]: H265D_PARSER: extradata is encoded as hvcc format
mpp[2896]: H265_PARSER_REF: could not find ref with POC -28
Redistribute latency...
0:00:02.161368029 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:372:display_current_
fps:<fpsdisplaysink0> Updated max-fps to 77.030271 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:02.162370446 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 77.030271 fpsdisplaysink fpsdisplaysink.c:372:display_current_
0:00:02.661922734 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated max-fps to 111.877123 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:03.671383948 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 69.706679 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:04.191302748 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 61.547486 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:04.700305209 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 58.942087 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:06.769927311 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 53.601859 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:09.324553263 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
fps:<fpsdisplaysink0> Updated min-fps to 53.542494 fpsdisplaysink fpsdisplaysink.c:376:display_current_
0:00:17.035151158 2896 0x7f94058770 DEBUG fpsdisplaysink fpsdisplaysink.c:376:display_current_
ps:<fpsdisplaysink0> Updated min-fps to 51.543752 fpsdisplaysink fpsdisplaysink.c:376:display_current_f
0:01:28.1 / 0:04:45.6
Ready Serial: COM10, 150000 49, 1 49 Rows, 106 Cols VT100 CAP NUM
```