IAC-RK3568-Kit Debian & Android User Manual

Ver. No.: V2.0
2022.08

Version Record

Version	Hardware Platform	Description	Date	Revisor
1.0	IAC-RK3568-MB-V1.00	Initial Version	2022-06	wwx
2.0	IAC-RK3568-MB-V1.00		2022-08	

Catalogue

Notice: This manual mainly introduces IAC-RK3568-Kit development board.

I. Preface

Company Profile

Zhejiang Qiyang Intelligent Technology Co., Ltd. was founded in Hangzhou in 2007, is a national high-tech enterprise focusing on the development, production and sales of ARM embedded products. 10 years of accumulation and precipitation, successfully built a product development to mass production service chain.

As the core of the company, Qiyang R&D team consists of more than 30 embedded engineers, dedicated to providing users with easy-to-use embedded hardware, software tools and customized product solutions. It has been widely used in industrial control, Internet of Things, new retail, medical, electric power, environmental monitoring, charging pile and other fields.

The production base in Zhuji provides a strong guarantee for Qiyang, covering an area of 5,000 square meters, with 2 SMT production lines, through and strictly follow the ISO9001 quality management system certification to guide production. Relying on the strong production strength, the annual production capacity can reach 1 million sets to ensure the delivery time of users and solve the worries.

Qiyang has a perfect sales and marketing network, professional sales and after-sales team to provide users with a full range of technical support and services. Business has spread to more than 120 countries and regions, successfully helping more than 2000 users to bring their products to market

quickly and efficiently.

The combination and extension of R&D, production capacity and market has laid a solid foundation for Qiyang Intelligence to become a professional and global supplier of embedded software and hardware.

We offer:

- **Multi-platform software/hardware products**

NXP, Rockchip, MTK, Renesas, TI, Atmel, Cirrus Logic and other multi-platform ARM development boards/core boards/industrial control boards and peripheral hardware products, as well as supporting tools and software resources to support rapid secondary development of users.

- **Customized Services**

We fully utilize our accumulated technology on ARM platform and Linux, Android, Ubuntu and Debian operating systems to provide customized embedded product services (OEM/ODM).

Thank you for using Qiyang's products, we will do our best to provide you with technical assistance! Wish you good luck in your work!

Ⅱ. Tutorial

2.1. Guideline

The IAC-RK3568-Kit development board includes the following accessories.

No.	List		Qty
1	Core Board	Core Board :IAC-RK3568-CM	1
2	Carrier Board	Carrier Board IAC-RK3568-MB	1
3	Crossed serial cable	Crossed serial cable (Both Female Type)	1
4	Serial Cable	3PIN 2.0mm pitch serial cable with socket	3
5	USB cable	Type-c USB data download cable	1
7	Power adapter	Power supply DC 12V/2.5A	1

Additionally, you can also purchase the paired 7- inch touch screen. Furthermore, while developing, you may need below accessories:

Network Device:100M/1000M LAN cable, and wired router.

Display Device: Displayer with HDMI connector and HDMI cable;

Others: USB Flash Disk, USB Mouse, TF Card, etc.

IAC-RK3568-Kit supports eMMc boot in default, the development board has flashed firmware before leaving factory, it could be tested directly.

Other: U disk, USB mouse, TF card and other devices.

The connectors' details, please refer to ***IAC-RK3568-KIT Hardware Manual.pdf.***

2.2. UART Debugging

UART debugging is necessary for the pre-test or kernel development, it is very useful for checking the system booting log file when it is without a graphical user interface.

Hardware Connection:

General desktop owns an RS232 port, if the desktop is without UART or if you are using a laptop, you need to prepare a USB To RS232 serial cable.

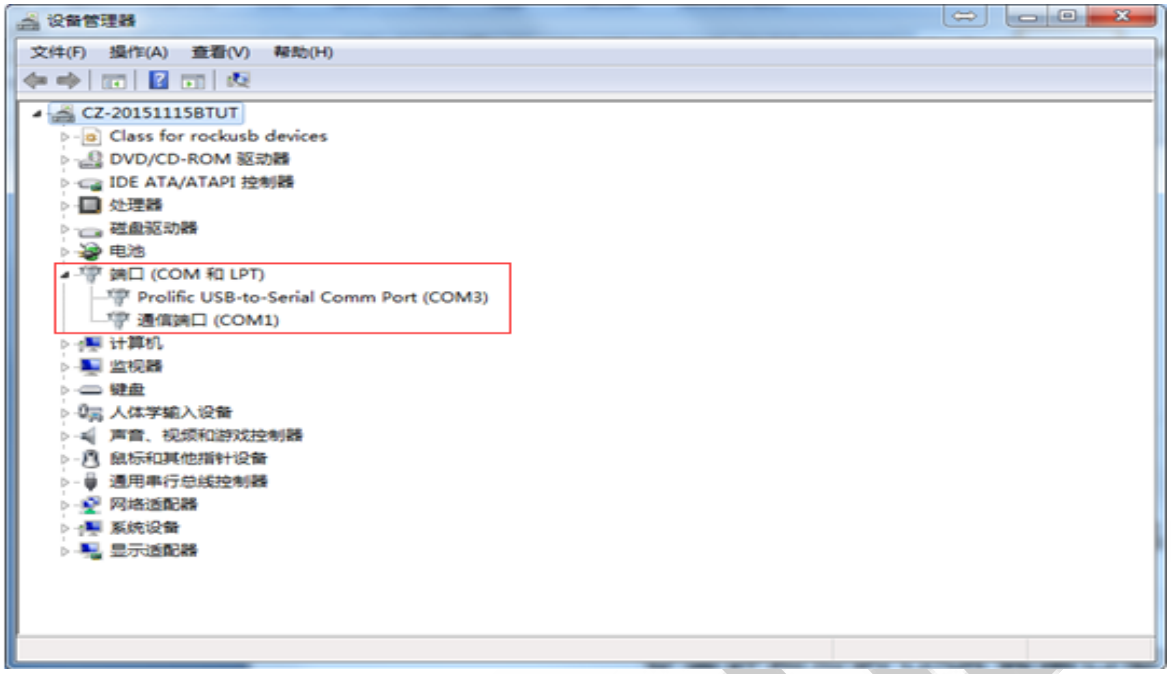
Remark: You can buy a USB To RS232 serial cable from the online shop, chipset solutions: CH340, PL2303, CP2104;

Serial Connection: By using 3Pin serial cable and crossed serial cable to connect DEBUG(J12) on development kit with computer's UART.

Driver Installation:

If you are using USB To RS232 serial cable, you should install the driver related to the specific model no.

After the driver is installed, inserting USB To RS232 serial cable, the system will hint new hardware and initialization, then you could find out the corresponding COM port, as below picture shown:



As the above picture shown, COM1 is the serial port that the computer owns, and COM3 is USB To UART.

Using Serial Port to Debug in Windows:

Normally, Putty, SecureCRT or other UART terminal software is a common tool. It is easy to operate.

Here, we take an example of SecureCRT.

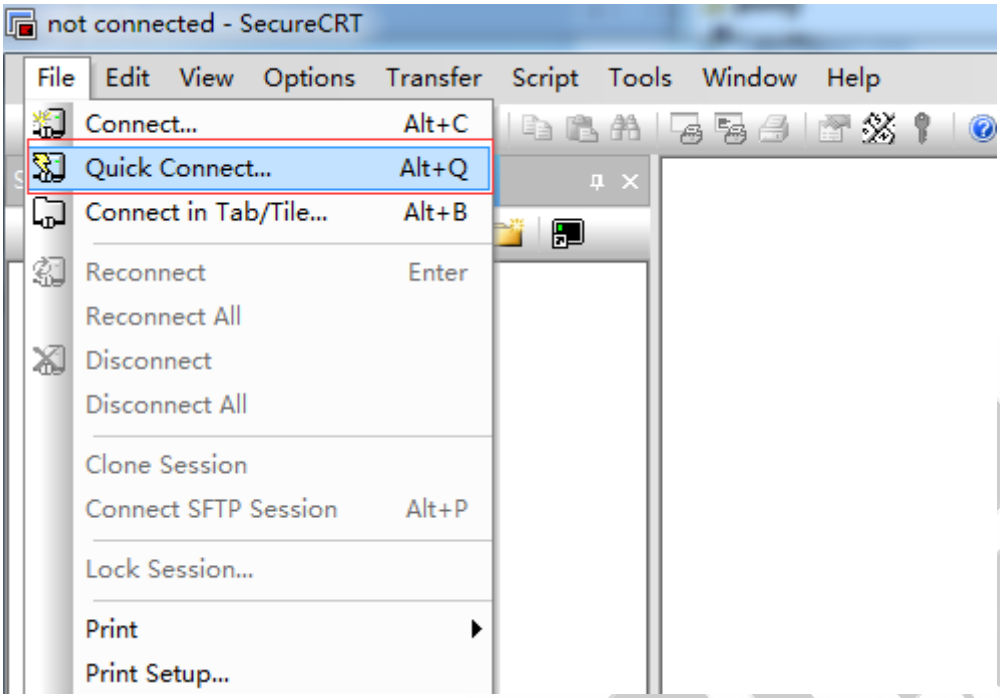
1. Open File-Quick Connect;

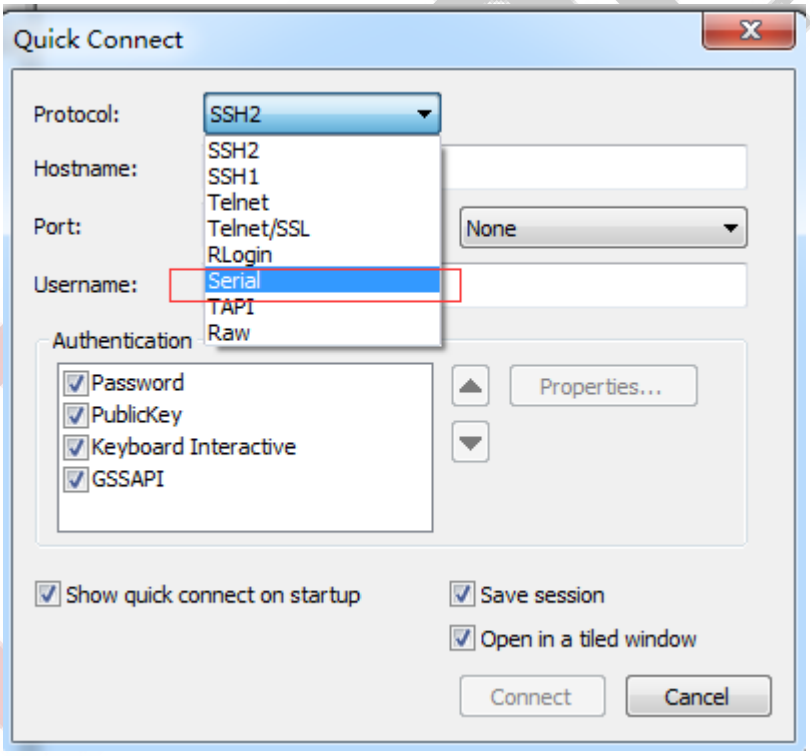
2. Select Protocol as Serial;

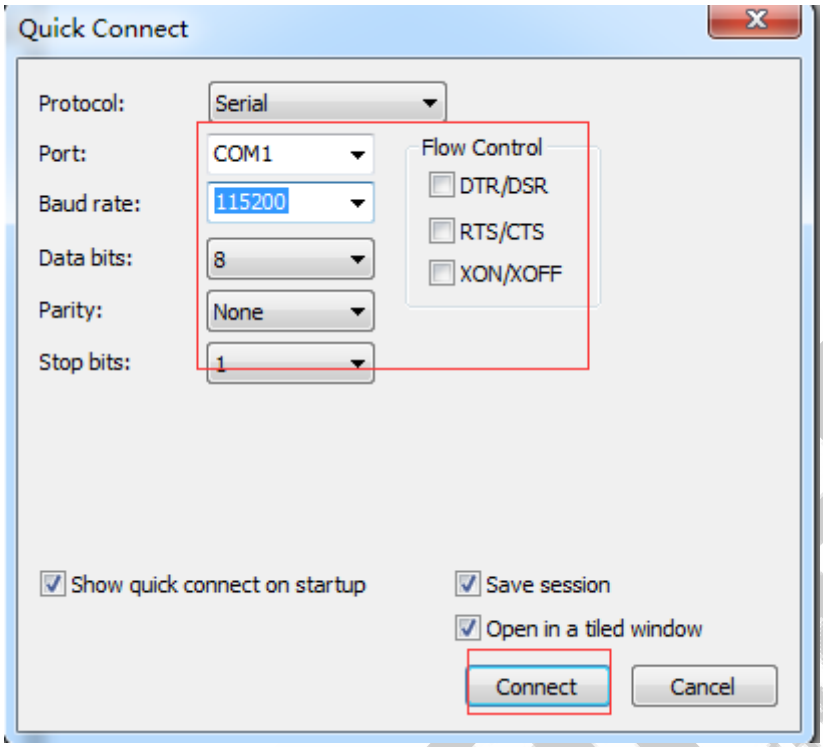
3. Modify the port to the COM which is found in the device manager.

4.Baud Rate:115200; Data Bits:8; Stop Bits: 1; Parity: None; Flow Control: None.

5. Click [Connect] button.








```
         Starting Advanced IEEE 802_/WPA/WPA2/EAP Authenticator...
[FAILED] Failed to start Advanced I_1X/WPA/WPA2/EAP Authenticator.
See 'systemctl status hostapd.service' for details.
         Starting Bluetooth service...
[  OK  ] Started Bluetooth service.
[   11.626449] ttyFIQ ttyFIQ0: tty_port_close_start: tty->count = 1 port count = 2

Debian GNU/Linux 10 linaro-alip ttyFIQ0

linaro-alip login: root (automatic login)

Last login: Wed Aug 24 08:19:43 UTC 2022 on ttyFIQ0
Linux linaro-alip 4.19.219 #207 SMP Wed Aug 24 10:13:56 CST 2022 aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
root@linaro-alip:~# [   13.102317] EXT4-fs (mmcblk0p8): mounting ext2 file system using t
he ext4 subsystem
[   13.104008] EXT4-fs (mmcblk0p8): warning: mounting unchecked fs, running e2fsck is rec
ommended
[   13.104751] EXT4-fs (mmcblk0p8): mounted filesystem without journal. Opts: (null)
[   13.281045] EXT4-fs (mmcblk0p7): mounting ext2 file system using the ext4 subsystem
[   13.283373] EXT4-fs (mmcblk0p7): warning: mounting unchecked fs, running e2fsck is rec
ommended
[   13.284119] EXT4-fs (mmcblk0p7): mounted filesystem without journal. Opts: (null)

root@linaro-alip:~#
```

Using serial port to debug in Ubuntu

Normally, using minicom, picocom, or other serial terminal software in Ubuntu.For the specific method, please Google it.

III. Flash image file (Firmware Flashing)

3.1. OS Version Introduction

Supported OS version:

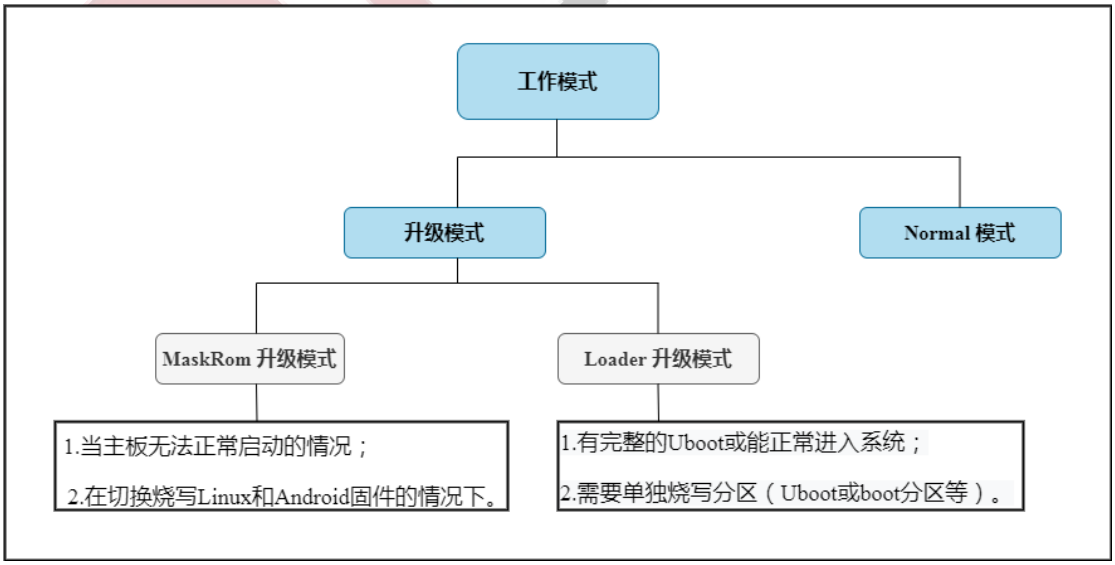
OS Version	Kernel Version	Support or Not
Debian 10	Linux4.19	Major Support
Android11.0	Linux4.19	Major Support

3.2. Working Method

The IAC-RK3568-Kit mainboard has two working modes, Normal mode and Upgrade mode.

Under normal circumstances, the system directly run into Normal. If you need to upgrade the motherboard system, you can select the appropriate upgrade mode for firmware upgrade according to the situation.

Note: The firmware has been loaded to the mainboard as order requirements.



Normal Mode:

Normal mode is the normal boot process, where each component is loaded in turn and the system is entered normally.

Upgrade mode:

The upgrade mode includes MaskRom mode, Loader mode, and SD card mode; the SD card mode will not be clarified here.

MaskRom Mode:

MaskRom mode is used for system recovery when the bootloader is damaged. Generally, it is not necessary to enter the MaskRom mode. Only when the bootloader verification fails (the IDR block cannot be read, or the bootloader is damaged), the BootRom code will enter the MaskRom mode. At this time, the BootRom code waits for the host to transmit the bootloader code through the USB interface, load and run it.

Loader Mode:

In Loader mode, the bootloader will be in upgrade status, waiting for the commands from the host machine, to do firmware upgrade, etc.

To enter Loader mode, the bootloader must detect that the RECOVERY key is pressed and the USB is connected during startup:

1. Make sure the device is connected to the power adapter and powered on;

2. Connect the mainboard with the host machine by a USB OTG cable;

3. Press and hold the RECOVERY (Recovery-SW4) key on the device;

4. Short press the RESET (reset-SW1) button;

5. About 2 seconds later, release the RECOVERY (SW4) key.

Note: If the device is still not found after pressing the RESET button, please press and hold the POWERON (SW2) button while keeping the RECOVERY button pressed, and then release the RECOVERY button.

3.3. Firmware Description

There are two types of firmware:

1. Single unified firmware: update.img, which packs the boot parameter loader, parameters and all partition images together for firmware release.

By default, a unified upgrade firmware image is provided, which can be obtained in the network disk link image folder.

2. Multiple partition images: such as kernel.img, boot.img, recovery.img and other files, generated during the development stage.

3.4. Firmware Flashing

The firmware of the IAC-RK3568-Kit Mainboard has been loaded by default before leaving the factory.

Preparation:

1. IAC-RK3568-Kit development kit;

2. USB Type-c data cable;

3. Image file and firmware: can be obtained through a network disk link;

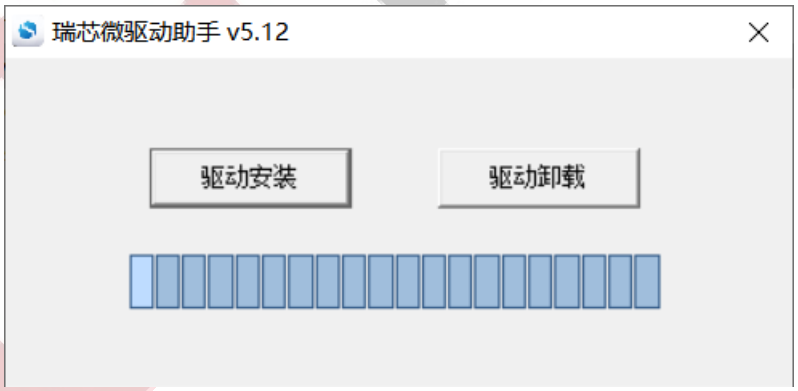
4. Computer host: support Windows7 (32/64 bit), Windows10 (32/64 bit).

To flash the firmware ,you need to use the RKDevTool_Release_vx.xx(Version No.), please install RK USB driver before using mfgtool. If the driver is installed ,please skip this step.

Install RK USB driver:

The Rockchip_DriverAssitant_v5.12 driver file can be obtained from the network disk link .

Copy the Rockchip_DriverAssitant_v5.12 driver compression package to the computer , unzip it, and then run the DriverInstall.exe. In order to use the updated driver for all devices, please select "Driver Uninstall", and then select "Driver Install", as below picture shown:



1. Make sure the device is connected to the power adapter and powered on.

2. Connect the device and the host machine by a USB Type-C cable.

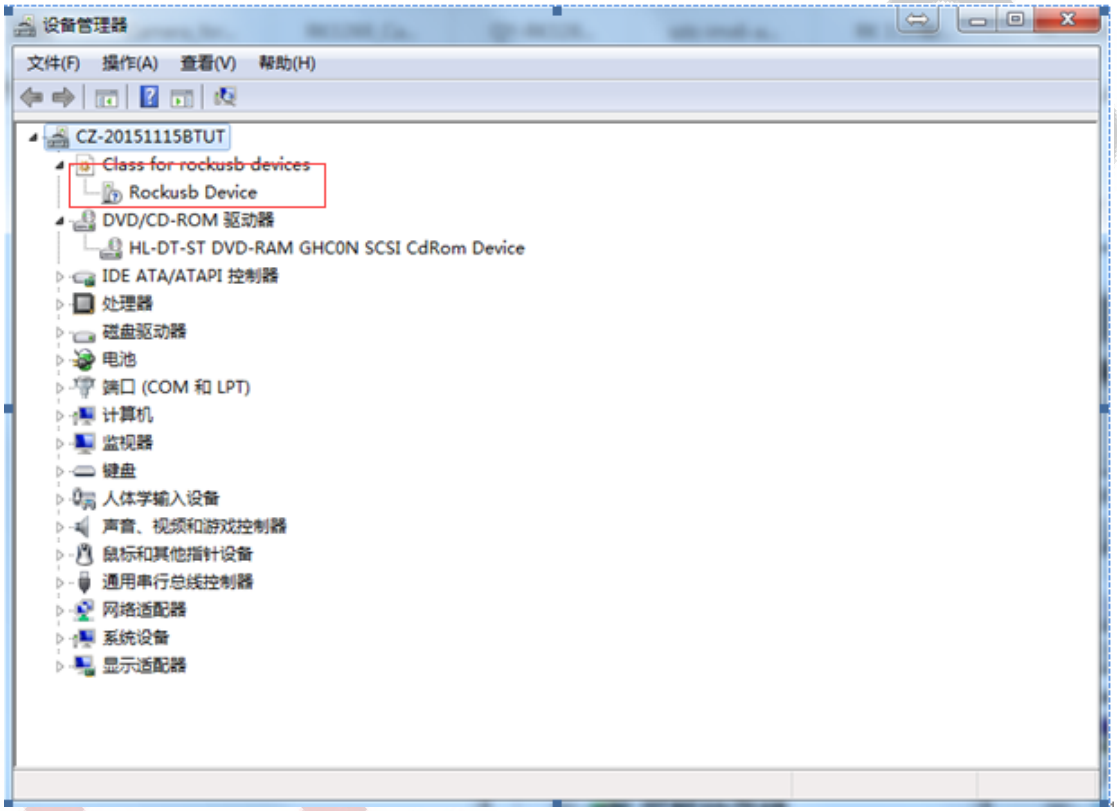
3. Press and hold the RECOVERY (SW8) key on the device.

4. Short press the RESET (SW1) key.

5. About two seconds later, release the RECOVERY key.

Note: If the device is still not found after pressing the RESET button, please press and hold the RECOVERY button while pressing the POWERON (SW2) button, and then release the RECOVERY button.

Till now, the computer should prompt that new hardware has been found and the configuration is finished. Open device manager, you will see the new device "Rockusb Device" appears, as the below picture shown:

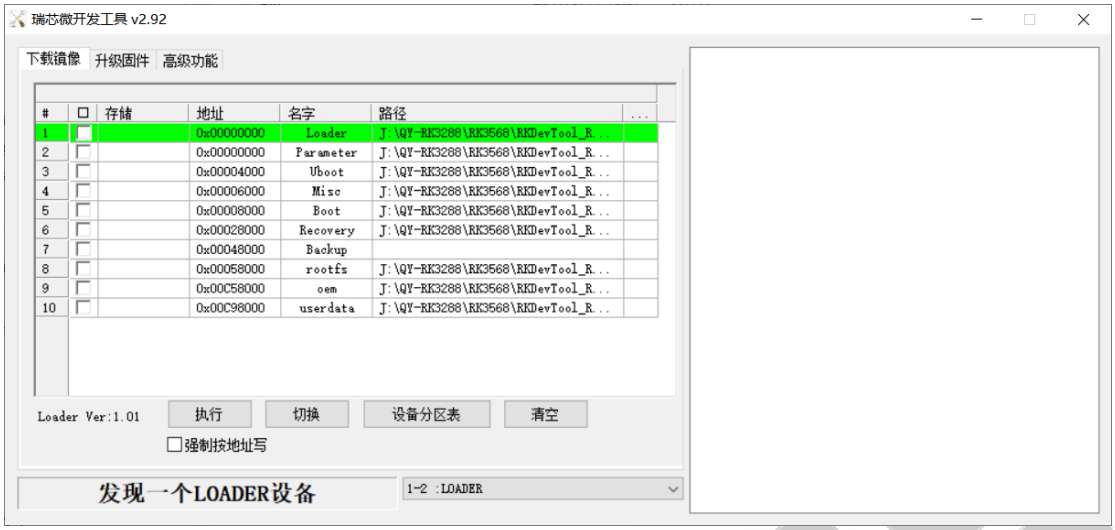


If not, please go back to the previous step to reinstall the RK USB driver.

Flash Firmware:

Open Mfgtool RKDevTool_Release_v2.92, which can be obtained from network disk lin. Or higher version tool.

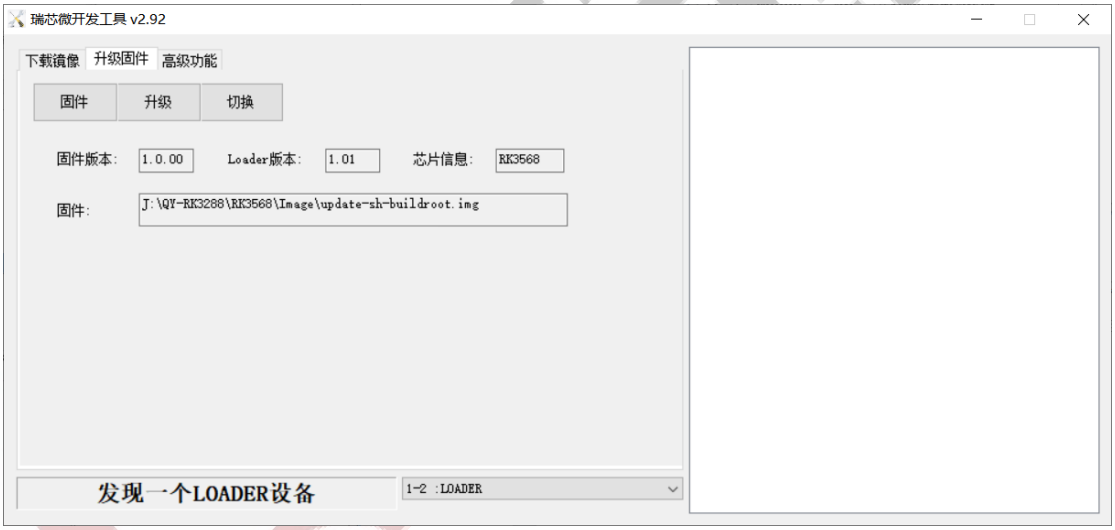
Open RKDevTool_Release_v2.92, run RKDevTool.exe in the directory, and click Execute, as the below picture shown:



As the above picture shown: a LOADER device is found, which can be used for image flashing.

Flash unified firmware:

1. Switch to the "Upgrade Firmware" page, as the below picture shown



2. Press ***Firmware*** button to open the firmware file which need to upgraded (Available from network disk). The upgrade tool will show the detailed firmware information.

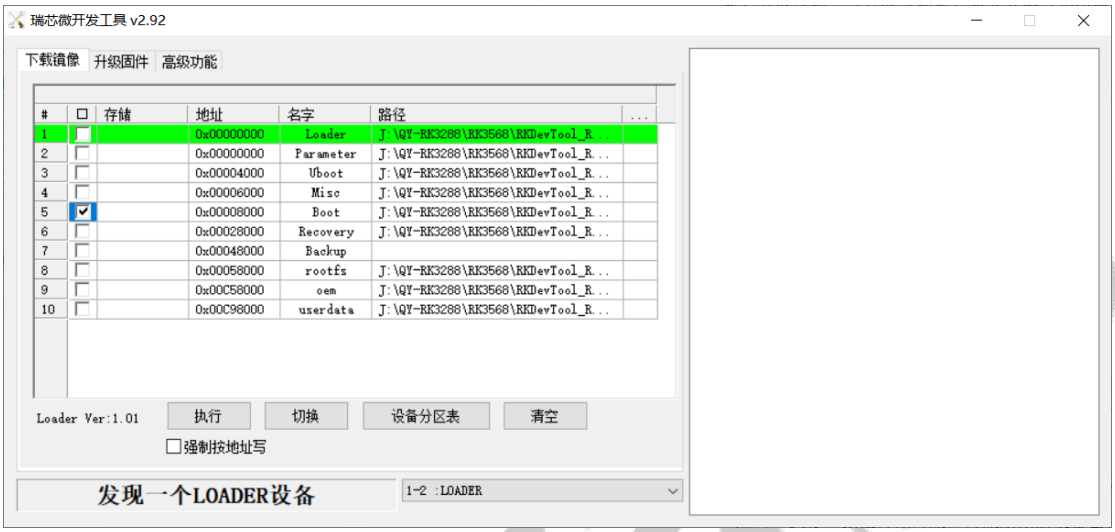
3. Press the ***Upgrade*** button to start the upgrade.

4. If upgrade fails, you can try "Erase Flash" button in the advanced function to erase the Flash, and then upgrade.

Note: If the firmware loader version you flashed is inconsistent with the original machine, please perform "erase Flash" before upgrading the firmware.

Flash partition image: (Partition image flashing can be used in the development process)

1. Switch to the "Download Image" page, as the below picture shown:



2. Check the partitions that need to be flashed, and you can choose multiple.

3. Make sure the path of the image file is correct. If necessary, click the blank table cell on right to re-select.

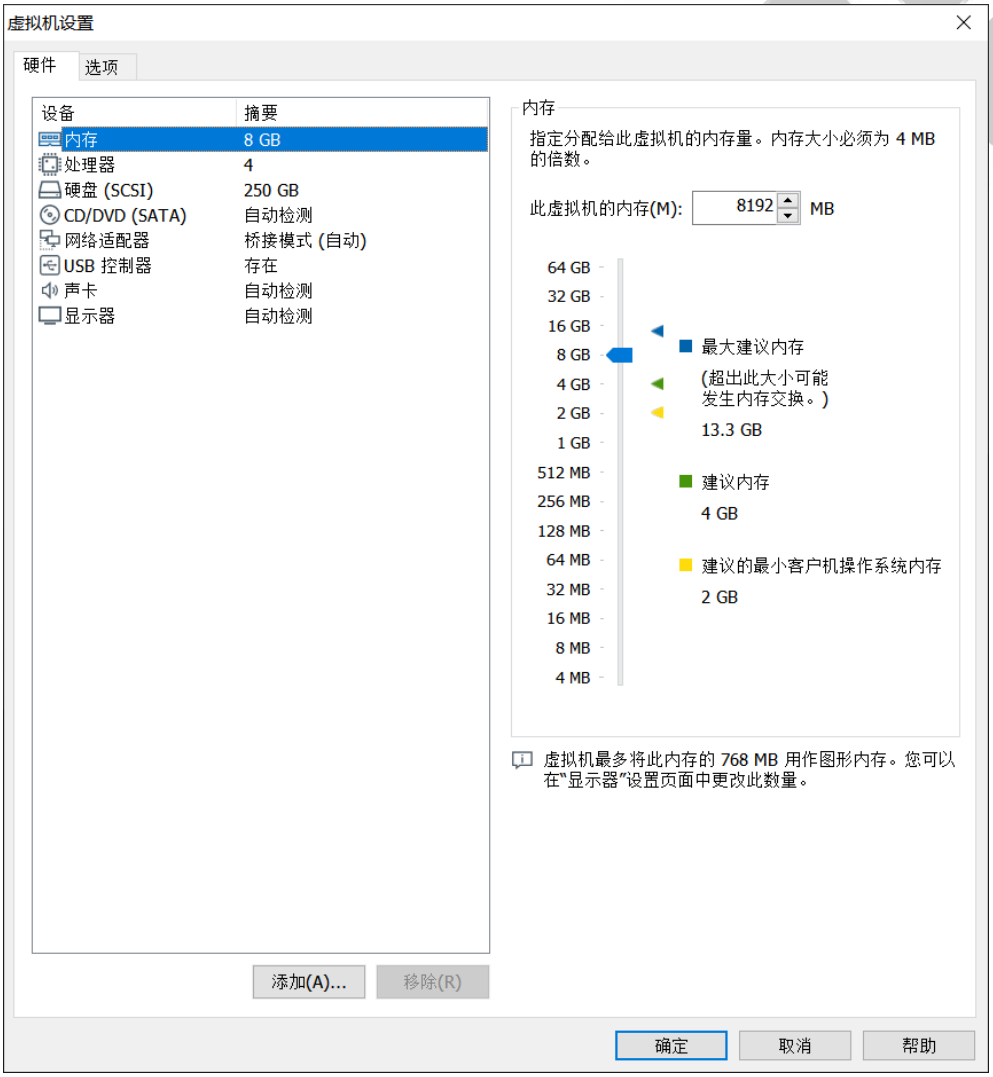
4. Click the "Execute" button to start the upgrade, and the device will automatically restart after the upgrade is finished.

Ⅳ.Linux Development

4.1. Build Compilation Environment

4.1.1 Host Machine Configuration:

The PC environment is required to be ubuntu20.04 or above. Here is the author's virtual machine configuration information, which can be allocated according to the needs of the host.



4.1.2 Install the necessary libraries

Before compiling, you need to install some necessary libraries. The relevant libraries are as follows:

***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 ***

***device-tree-compiler python-pip ncurses-dev pyelftools ***

Note: Above libraries is just a small part, please install the missing libraries while the compilation reports error.

4.1.3 SDK compiler introduction

The sdk directory contains ***u-boot kernel*** compiler and the ***buildroot*** compiler.

The two are compiled by different compilers. In fact, the ***u-boot kernel*** uses the same compiler path as below :

follows:prebuilts/gcc/linux-x86/aarch64/gcc-linaro-6.3.1-2017.05-x86_64_aarch64-linux- gnu/bin/aarch64-linux-gnu-

buildroot uses the compiler which is generated by buildroot, so it will be generated after buildroot is compiled. The path is as follows:

buildroot/output/rockchip_rk356x/host/bin/aarch64-buildroot-linux-gnu-

4.1.4 sdk overall compilation (To compile buildroot by default)

Execute ***./build.sh*** directly in the top-level directory of the sdk (do not use root authority), and the relevant configuration options will pop up. By default, ***BoardConfig-IAC-RK3568-MB-BETA-LVDS.mk*** is selected, as shown in the figure:

```
0. default BoardConfig.mk
1. BoardConfig-GATEWAY-RK3568-MB-V1_00.mk
2. BoardConfig-IAC-RK3568-MB-BETA-EDP.mk
3. BoardConfig-IAC-RK3568-MB-BETA-LVDS.mk
4. BoardConfig-IAC-RK3568-MB-BETA-MIPI.mk
5. BoardConfig-IAC-RK3568-MB-BETA-V1_00-sdsc.mk
6. BoardConfig-IAC-RK3568-MB-BETA-V1_00.mk
7. BoardConfig-rk3566-evb2-lp4x-v10-32bit.mk
8. BoardConfig-rk3566-evb2-lp4x-v10.mk
9. BoardConfig-rk3568-evb1-ddr4-v10-32bit.mk
10. BoardConfig-rk3568-evb1-ddr4-v10-spi-nor-64M.mk
11. BoardConfig-rk3568-evb1-ddr4-v10.mk
12. BoardConfig-rk3568-nvr-spi-nand.mk
13. BoardConfig-rk3568-nvr.mk
14. BoardConfig-rk3568-uvc-evb1-ddr4-v10.mk
15. BoardConfig.mk
Which would you like? [0]:
```

After the normal compilation is completed, the ***rockdev*** folder will be created in the top directory of the ***sdk***, and the ***.img*** image file will be generated as shown in the figure below:

```
ylook@ubuntu:~/IAC-RK3568-MB-BETA_CUSTOMER/rockdev$ ls
boot.img  MiniLoaderAll.bin  misc.img  oem.img  parameter.txt  recovery.img  rootfs.ext4  rootfs.img  uboot.img  update.img  userdata.img
```

In addition, a screenshot of the successful compilation is attached, the repo error will not affect the final results:

```
Images in /home/qiyang/Rk3568/rockdev are ready!
Running build_firmware succeeded.
Make update.img
start to make update.img...
Android Firmware Package Tool v2.0
------ PACKAGE ------
Add file: ./package-file
package-file,Add file: ./package-file done,offset=0x800,size=0x28b,userspace=0x1
Add file: ./Image/MiniLoaderAll.bin
bootloader,Add file: ./Image/MiniLoaderAll.bin done,offset=0x1000,size=0x719c0,userspace=0xe4
Add file: ./Image/parameter.txt
parameter,Add file: ./Image/parameter.txt done,offset=0x73000,size=0x1f4,userspace=0x1
Add file: ./Image/uboot.img
uboot,Add file: ./Image/uboot.img done,offset=0x73800,size=0x400000,userspace=0x800
Add file: ./Image/misc.img
misc,Add file: ./Image/misc.img done,offset=0x473800,size=0xc000,userspace=0x18
Add file: ./Image/boot.img
boot,Add file: ./Image/boot.img done,offset=0x47f800,size=0x15ef600,userspace=0x2bdf
Add file: ./Image/recovery.img
recovery,Add file: ./Image/recovery.img done,offset=0x1a6f000,size=0x1ea6600,userspace=0x3d4d
Add file: ./Image/rootfs.img
rootfs,Add file: ./Image/rootfs.img done,offset=0x3915800,size=0x4586e000,userspace=0x8b0dc
Add file: ./Image/oem.img
oem,Add file: ./Image/oem.img done,offset=0x49183800,size=0x10a6000,userspace=0x214c
Add file: ./Image/userdata.img
userdata,Add file: ./Image/userdata.img done,offset=0x4a229800,size=0x444000,userspace=0x888
Add CRC...
Make firmware OK!
------ OK ------
********rkImageMaker ver 2.0********
Generating new image, please wait...
Writing head info...
Writing boot file...
Writing firmware...
Generating MD5 data...
MD5 data generated successfully!
New image generated successfully!
Making ./Image/update.img OK.
Running build_updateimg succeeded.
./build.sh: line 1172: .repo/repo/repo: No such file or directory
ERROR: Running build_save failed!
ERROR: exit code 127 from line 1172:
    .repo/repo/repo forall -c "$TOP_DIR/device/rockchip/common/gen_patches_body.sh"
```

Note: If the compilation fails and the reason cannot be found, you can ask our FAE for a fully compiled virtual machine. The virtual machine is about 200G, and it is transferred with Onedrive. Please ask for it if required.

4.2. Compile Debian firmware

4.2.1 Compiling Debian firmware is not a compiling strictly, it adds some special packages of RK to Debian basic package, so generally there will be no

error reporting. The compilation steps are as follows:

Firstly, to compile the Debian basic package:

RELEASE=butser TARGET=desktop ARCH=arm64 ./mk-base-debian.sh

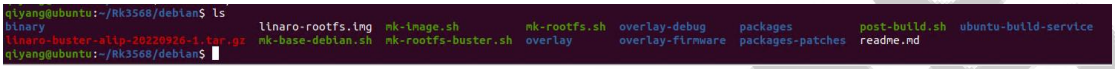
Secondly, to compile RK additional package:

VERSION=debug ARCH=arm64 ./mk-rootfs-buster.sh

Thirdly, to pack it as image file

./mk-image.sh

Finally, the following files are generated:



Amongst, ***linaro-rootfs.img*** is the debian image that we flashed to the board.

Ⅴ. Android Development

5.1. Use ADB

IAC-RK3568 use adb to debug as default, it could use usb-otg to do adb debugging; If the adb can't recognize , please make sure the driver is installed correctly, if PC could recognize usb device normally, and check theJ5 jumper if it is connected well at right lower side.

5.2. Build Compilation Environment

Take ubuntu20.04 as an example, here, we listed some common libraries, some libraries can't be found or not existed as the version upgrade, you could Google or install the similar libraries.

If the subsequent compiling lacks of some libraries, you could install it by refer to the error information.

sudo apt-get install git gnupg flex bison gperf libsdl1.2-dev \libesd-java libwxgtk3.0-dev squashfs-tools build-essential zip curl \libncurses5-dev zlib1g-dev pngcrush schedtool libxml2 libxml2-utils \xsltproc lzop libc6-dev schedtool g++-multilib lib32z1-dev lib32ncurses5-dev \lib32readline-dev gcc-multilib libswitch-perl libssl-dev unzip zip device-tree-compiler \liblz4-tool python-pyelftools python3-pyelftools

5.3. Compile Android 11.0 Firmware

Android source code is big, it has been separated in several parts, you can compile it after decompression, the compilation steps are as below:

Blocked Compilation:

Uboot: ***./make.sh rk3568***

Kernel:

make ARCH=arm64 rockchip_defconfig rk356x_evb.config android-11.config && make ARCH=arm64 BOOT_IMG=../rockdev/Image-rk3568_r/boot.img rk3568-ddr4-qiyang.img -j16

Android: 1、source build/envsetup.sh 2、lunch rk3568_r-userdebug 3、make -j16

Package Command: ***./mkimage.sh***

Whole Compiling:

1.source build/envsetup.sh 2、lunch rk3568_r-userdebug 3、./build.sh -UKAu

5.4. Flash Android Image

The steps is same as firmware flashing, the only difference is partition files, the mainboard has to enter into ***maskrom*** mode while flashing Linux and Android OS.

Ⅵ. FAQ

Zhejiang Qiyang Intelligent Technology Co,.Ltd.

Tel: 0571-87858811 / 87858822

Fax: 0571-89935912

Technical support: 0571-87858811 ext. 805

E-MAIL:supports@qiyangtech.com

Website: http://www.qiytech.com

ADD: 3rd Floor, Building A, WSCG Building, NO.6 Xiyuan 8th Road, Sandun Town, Xihu District, Hangzhou City, Zhejiang ,PRC

Post code: 310030