

Rockchip RK3308 Linux5.10 SDK Quick Start

ID: RK-JC-YF-963

Release Version: V1.0.0

Release Date: 2022-09-20

Security Level: ☐Top-Secret ☐Secret ☐Internal ☒Public

DISCLAIMER

THIS DOCUMENT IS PROVIDED "AS IS". ROCKCHIP ELECTRONICS CO., LTD. ("ROCKCHIP") DOES NOT PROVIDE ANY WARRANTY OF ANY KIND, EXPRESSED, IMPLIED OR OTHERWISE, WITH RESPECT TO THE ACCURACY, RELIABILITY, COMPLETENESS, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY REPRESENTATION, INFORMATION AND CONTENT IN THIS DOCUMENT. THIS DOCUMENT IS FOR REFERENCE ONLY. THIS DOCUMENT MAY BE UPDATED OR CHANGED WITHOUT ANY NOTICE AT ANY TIME DUE TO THE UPGRADES OF THE PRODUCT OR ANY OTHER REASONS.

Trademark Statement

"Rockchip", "瑞芯微", "瑞芯" shall be Rockchip's registered trademarks and owned by Rockchip. All the other trademarks or registered trademarks mentioned in this document shall be owned by their respective owners.

All rights reserved. ©2022. Rockchip Electronics Co., Ltd.

Beyond the scope of fair use, neither any entity nor individual shall extract, copy, or distribute this document in any form in whole or in part without the written approval of Rockchip.

Rockchip Electronics Co., Ltd.

No.18 Building, A District, No.89, software Boulevard Fuzhou, Fujian, PRC

Website: www.rock-chips.com

Customer service Tel: +86-4007-700-590

Customer service Fax: +86-591-83951833

Customer service e-Mail: fae@rock-chips.com

Preface

Overview

The document presents the basic usage of Rockchip RK3308 Linux5.10 SDK, aiming to help developers get started with RK3308 Linux5.10 SDK faster.

Intended Audience

This document (this guide) is mainly intended for:

Technical support engineers

Software development engineers

Chipset and System Support

Chip Name	Uboot Version	Kernel Version	Buildroot Version
RK3308B/RK3308H/RK3308B-S/RK3308H-S	2017.9	5.10	2021.11

Revision History

Date	Version	Author	Revision History
2022-09-20	V1.0.0	LinJianHua	Initial version

Contents

Rockchip RK3308 Linux5.10 SDK Quick Start

1. Set up an Development Environment
2. Software Development Guide
 - 2.1 Development Guide
 - 2.2 Software Update History
3. SDK Configuration Framework Introduction
 - 3.1 SDK Project Directory Introduction
 - 3.2 SDK Board Level Configuration
 - 3.3 Compilation Commands
 - 3.4 Automatic Build
 - 3.5 Build and Package Each Module
 - 3.5.1 U-boot Build
 - 3.5.2 Kernel Build
 - 3.5.3 Recovery Build
 - 3.5.4 Buildroot Build
 - 3.5.5 Cross-Compilation
 - 3.5.5.1 SDK Directory Built-in Cross-Compilation
 - 3.5.5.2 Buildroot Built-in Cross-compilation
 - 3.5.6 Firmware Package
4. Upgrade Introdution
 - 4.1 Windows Upgrade Introduction
 - 4.2 Linux Upgrade Instruction
 - 4.3 System Partition Introduction

1. Set up an Development Environment

It is recommended to use Ubuntu 20.04 for compilation. 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: 64-bit system, hard disk space should be greater than 40G. If you do multiple builds, you will need more hard drive space

Software requirements: Ubuntu 20.04 system:

Please install software packages with below commands to setup SDK compiling environment:

```
sudo apt-get install 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 ncurses-dev libgucharmap-2-90-dev \
bzip2 expat gpgv2 cpp-aarch64-linux-gnu g++-aarch64-linux-gnu
```

It is recommended to use Ubuntu 20.04 system or higher version for development. If you encounter an error during compilation, you can check the error message and install the corresponding software packages accordingly.

Considering the time cost of setting up the customer's development environment, we also provide the image mode of cross compiler docker for customer verification, so as to shorten the time-consuming of setting up the compilation environment.

Reference documents [Docker/Rockchip_Developer_Guide_Linux_Docker_Deploy_EN.pdf](#).

The compatibility test results of docker compilation image system are as follows:

OS Vesion	Docker Version	Doading	Image build
ubuntu 21.10	20.10.12	pass	pass
ubuntu 21.04	20.10.7	pass	pass
ubuntu 18.04	20.10.7	pass	pass
fedora35	20.10.12	pass	NR (not run)

2. Software Development Guide

2.1 Development Guide

Aiming to help engineers get started with SDK development and debugging faster, "Rockchip_Developer_Guide_Linux_Software_CN.pdf" is released with the SDK, please refer to the documents under the project's docs/ directory, which will be continuously improved and updated.

2.2 Software Update History

Software release version upgrade history can be checked through project xml file by the following command:

```
.repo/manifests$ realpath rk3308_linux5.10_release.xml
# e.g.:the printed version is v1.0.0 and the update time is 20220920
#<SDK>/.repo/manifests/rk3308_linux/rk3308_linux5.10_release_v1.0.0_20220920.xml
```

3. SDK Configuration Framework Introduction

3.1 SDK Project Directory Introduction

There are buildroot, recovery, app, kernel, u-boot, device, docs, external and other directories in the SDK directory. Each directory or its sub-directories will correspond to a git project, and the commit should be done in the respective directory.

- app: stores application APPs like qcamera/qfm/qplayer/qseting and other applications.
- buildroot: root file system based on Buildroot (2021.11).
- device/rockchip: stores board-level configuration for each chip and some scripts and prepared files for building and packaging firmware.
- docs: stores development guides, platform support lists, tool usage, Linux development guides, and so on.
- IMAGE: stores building time, XML, patch and firmware directory for each building.
- external: stores some third-party libraries, including audio, video, network, recovery and so on.
- kernel: stores kernel5.10 development code.
- prebuilts: stores cross-building toolchain.
- rkbin: stores Rockchip Binary and tools.
- rockdev: stores building output firmware.
- tools: stores some commonly used tools under Linux and Windows system.
- u-boot: store U-Boot code developed based on v2017.09 version.

3.2 SDK Board Level Configuration

Enter the project `<SDK>/device/rockchip/rk3308` directory:

Board Configuration	Description
BoardConfig_rk3308bs_64bit.mk	For RK3308BS EVB V11\V20 development board run 64bits system
BoardConfig_rk3308bs_32bit.mk	For RK3308BS EVB V11\V20 development board run 32bits system
BoardConfig_rk3308hs_32bit.mk	For RK3308HS MODULE V10 development board run 32bits system
BoardConfig_rk3308b_64bit.mk	For RK3308B EVB V10 development board run 64bits system
BoardConfig_rk3308b_32bit.mk	For RK3308B EVB V10 development board run 32bits system
BoardConfig_rk3308h_32bit.mk	For RK3308H MODULE V10 development board run 32bits system

The first way:

Add board configuration file behind `/build.sh`, for example:

Select the board configuration of the **RK3308BS EVB V11\V20 development board**:

```
rk3308$ ./build.sh device/rockchip/rk3308/BoardConfig_rk3308bs_64bit.mk
```

The second way:

```
rk3308$ ./build.sh lunch
processing option: lunch

You're building on Linux
Lunch menu...pick a combo:

0. default BoardConfig.mk
1. BoardConfig.mk
2. BoardConfig_32bit.mk
3. BoardConfig_rk3308b_32bit.mk
4. BoardConfig_rk3308b_64bit.mk
5. BoardConfig_rk3308bs_32bit.mk
6. BoardConfig_rk3308bs_64bit.mk
7. BoardConfig_rk3308h_32bit.mk
8. BoardConfig_rk3308hs_32bit.mk
9. BoardConfig_robot32.mk
10. BoardConfig_robot64.mk
11. BoardConfig_soundai_cmcc.mk
Which would you like? [0]: 6
```

3.3 Compilation Commands

Execute the command in the root directory: `./build.sh -h|help`

```
rk3308$ ./build.sh -h
Usage: build.sh [OPTIONS]
Available options:
BoardConfig*.mk  -switch to specified board config
lunch            -list current SDK boards and switch to specified board config
wifibt           -build wifibt
uboot            -build uboot
uefi             -build uefi
spl              -build spl
loader           -build loader
kernel           -build kernel
modules          -build kernel modules
toolchain        -build toolchain
rootfs           -build default rootfs, currently build buildroot as default
buildroot        -build buildroot rootfs
ramboot          -build ramboot image
multi-npu_boot   -build boot image for multi-npu board
yocto            -build yocto rootfs
debian           -build debian rootfs
pcba             -build pcba
```

recovery	-build recovery
all	-build uboot, kernel, rootfs, recovery image
cleanall	-clean uboot, kernel, rootfs, recovery
firmware	-pack all the image we need to boot up system
updateimg	-pack update image
otapackage	-pack ab update otapackage image (update_ota.img)
sdpackage	-pack update sdcard package image (update_sdcard.img)
save	-save images, patches, commands used to debug
allsave	-build all & firmware & updateimg & save
check	-check the environment of building
info	-see the current board building information
app/<pkg>	-build packages in the dir of app/*
external/<pkg>	-build packages in the dir of external/*

createkeys	-create secureboot root keys
security_rootfs	-build rootfs and some relevant images with security paramter
(just for dm-v)	
security_boot	-build boot with security paramter
security_uboot	-build uboot with security paramter
security_recovery	-build recovery with security paramter
security_check	-check security paramter if it's good

Default option is 'allsave'.

View detailed build commands for some modules, for example: `./build.sh -h kernel`

```
rk3308$ ./build.sh -h kernel
###Current SDK Default [ kernel ] Build Command###
cd kernel
make ARCH=arm64 rk3308_linux_defconfig
make ARCH=arm64 rk3308bs-evb-amic-v11.img -j12
```

The detailed compilation commands should depending on corresponding SDK version, and there may be some differences between configurations. But the build command of build.sh is fixed.

3.4 Automatic Build

Enter root directory of project directory and execute the following commands to automatically complete all build:

```
./build.sh all # Only build module code(u-Boot, kernel, Rootfs, Recovery)
               # Need to execute ./mkfirmware.sh again for firmware package

./build.sh     # Base on ./build.sh all
               # 1. Add firmware package ./mkfirmware.sh
               # 2. update.img package
               # 3. Copy the firmware in the rockdev directory to the
IMAGE/***_RELEASE_TEST/IMAGES directory
               # 4. Save the patches of each module to the
IMAGE/***_RELEASE_TEST/PATCHES directory
               # Note: ./build.sh and ./build.sh allsave command are the same
```


3.5 Build and Package Each Module

3.5.1 U-boot Build

```
### U-Boot build command
./build.sh uboot

### To view the detailed U-Boot build command
./build.sh -h uboot
```

3.5.2 Kernel Build

```
### Kernel build command
./build.sh kernel

### To view the detailed Kernel build command
./build.sh -h kernel
```

3.5.3 Recovery Build

```
### Recovery build command
./build.sh recovery

### To view the detailed Recovery build command
./build.sh -h recovery
```

Note: Recovery is a unnecessary function, some board configuration will not be set

3.5.4 Buildroot Build

Enter project root directory and run the following commands to automatically complete compiling and packaging of Rootfs.

```
./build.sh rootfs
```

After compilations, rootfs.squashfs is generated in Buildroot directory “ output/rockchip_rk3308/images”.

3.5.5 Cross-Compilation

3.5.5.1 SDK Directory Built-in Cross-Compilation

The SDK prebuilts directory built-in cross-compilation are as follows:

Contents	Description
prebuilts/gcc/linux-x86/aarch64/gcc-arm-10.3-2021.07-x86_64-aarch64-none-linux-gnu	gcc arm 10.3.1 64-bit toolchain
prebuilts/gcc/linux-x86/arm/gcc-arm-10.3-2021.07-x86_64-arm-none-linux-gnueabi	gcc arm 10.3.1 32-bit toolchain

3.5.5.2 Buildroot Built-in Cross-compilation

If you need to compile a single module or a third-party application, you need to configure the cross-compilation environment. For example, RK3308, its cross-compilation tool is located in the

`buildroot/output/rockchip_rk3308_bs_release/host/usr` directory, you need to set the `bin/` directory of the tool and the `aarch64-buildroot-linux-gnu/bin/` directory as the environment variable, execute the script that automatically configures environment variables in the top-level directory::

```
source envsetup.sh
```

Enter the command to view:

```
cd buildroot/output/rockchip_rk3308_bs_release/host/usr/bin
./aarch64-linux-gcc --version
```

The following information will be printed:

```
aarch64-linux-gcc.br_real (Buildroot -g900f5662) 11.3.0
```

For example, the rkscript module, commonly used compilation commands are as follows:

- To build rkscript

```
SDK$make rkscript
```

- Rebuild rkscript

```
SDK $ make rkscript-rebuild
```

- Remove rkscript

```
SDK$make rkscript-dirclean
or
SDK$rm -rf buildroot/output/rockchip_rk3308_bs_release/build/rkscript
```

3.5.6 Firmware Package

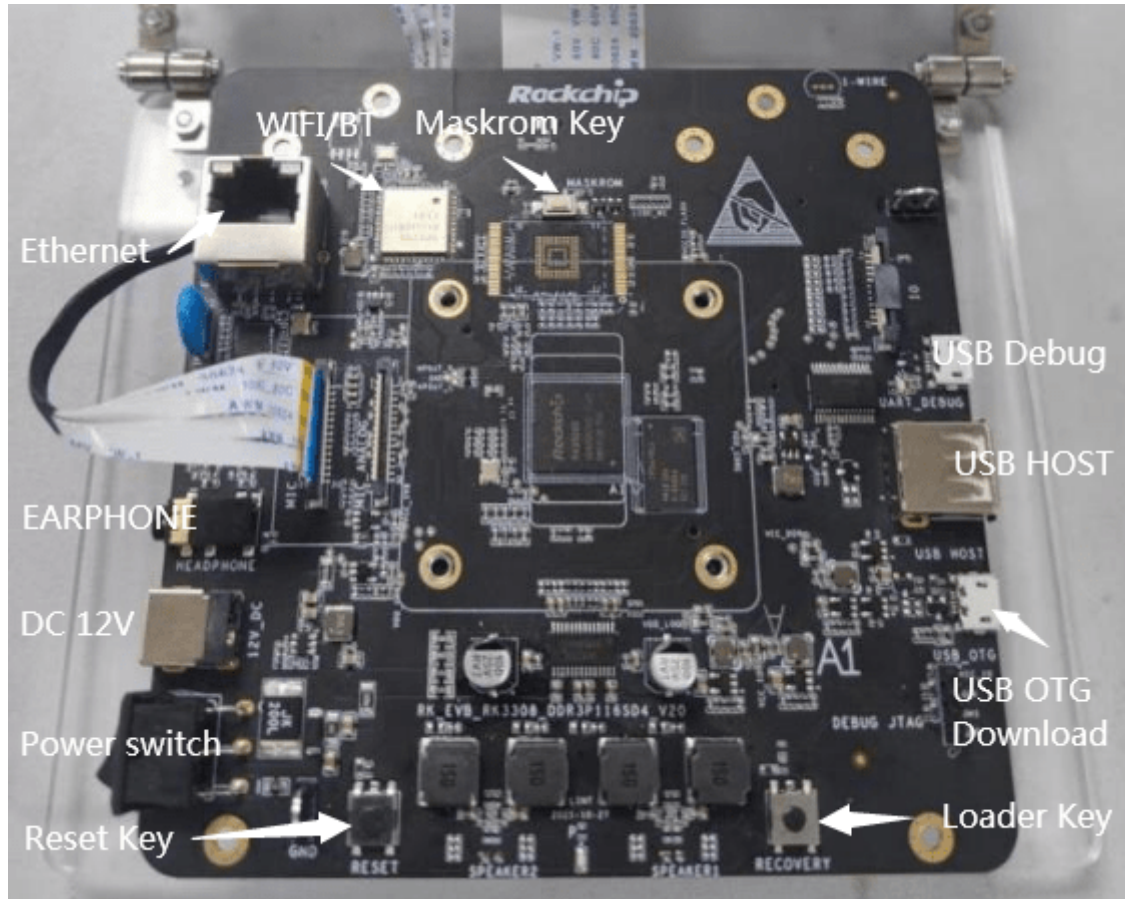
After compiling various parts of Kernel/U-Boot/Recovery/Rootfs above, enter root directory of project directory and run the following command to automatically complete all firmware packaged into rockdev directory:

Firmware generation:

```
./mkfirmware.sh
```

4. Upgrade Introdution

The interface layout diagram of the top surface of RK3308B EVB V20 development board is as follows:

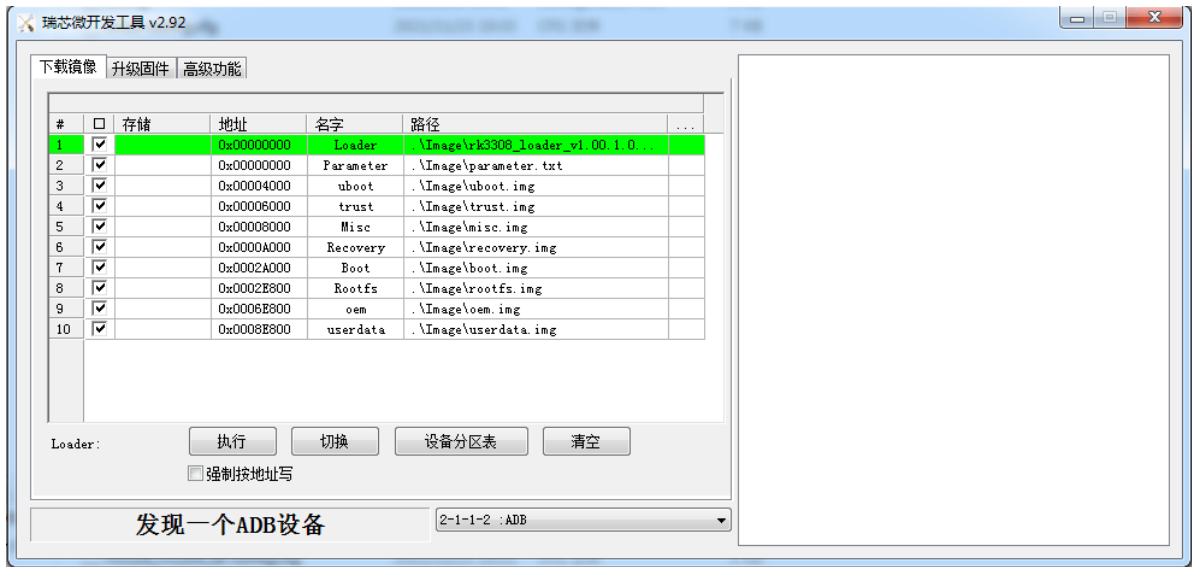


4.1 Windows Upgrade Introduction

SDK provides windows upgrade tool (this tool should be V291 or later version) which is located in project root directory:

```
tools/  
├─ windows/RKDevTool
```

As shown below, after compiling the corresponding firmware, device should enter MASKROM or BootROM mode for update. After connecting USB cable, long press the button “MASKROM” and press reset button “RST” at the same time and then release, device will enter MASKROM Mode. Then you should load the paths of the corresponding images and click “Run” to start upgrade. You can also press the “recovery” button and press reset button “RST” then release to enter loader mode to upgrade. Partition offset and flashing files of MASKROM Mode are shown as follows (Note: Window PC needs to run the tool as an administrator):



Note: Before upgrade, please install the latest USB driver, which is in the below directory:

<SDK>/tools/windows/DriverAssitant_v5.11.zip

4.2 Linux Upgrade Instruction

The Linux upgrade tool (Linux_Upgrade_Tool should be V2.1 or later versions) is located in “tools/linux” directory. Please make sure your board is connected to MASKROM/loader rockusb, if the compiled firmware is in rockdev directory, upgrade commands are as below:

```
sudo ./upgrade_tool ul -noreset rockdev/MiniLoaderAll.bin
sudo ./upgrade_tool di -p rockdev/parameter.txt
sudo ./upgrade_tool di -u rockdev/uboot.img
sudo ./upgrade_tool di -t rockdev/trust.img
sudo ./upgrade_tool di -misc rockdev/misc.img
sudo ./upgrade_tool di -b rockdev/boot.img
sudo ./upgrade_tool di -recovery rockdev/recovery.img
sudo ./upgrade_tool di -oem rockdev/oem.img
sudo ./upgrade_tool di -rootfs rockdev/rootfs.img
sudo ./upgrade_tool di -userdata rockdev/userdata.img
sudo ./upgrade_tool rd
```

Or upgrade the whole update.img in the firmware

```
sudo ./upgrade_tool uf rockdev/update.img
```

Or in root directory, run the following command on the device to upgrade in MASKROM state:

```
./rkflash.sh
```

4.3 System Partition Introduction

Default partition introduction (below is RK3308 EVB reference partition):

- uboot partition: for uboot.img built from uboot.
- trust partition: for trust.img built from uboot.
- misc partition: for misc.img built from recovery.
- boot partition: for boot.img built from kernel.
- recovery partition: for recovery.img built from recovery.
- backup partition: reserved, temporarily useless. Will be used for backup of recovery as in Android in future.
- rootfs partition: store rootfs.img built from buildroot or debian.
- oem partition: used by manufactor to store their APP or data, mounted in /oem directory
- userdata partition: store files temporarily generated by APP or for users, mounted in /userdata directory