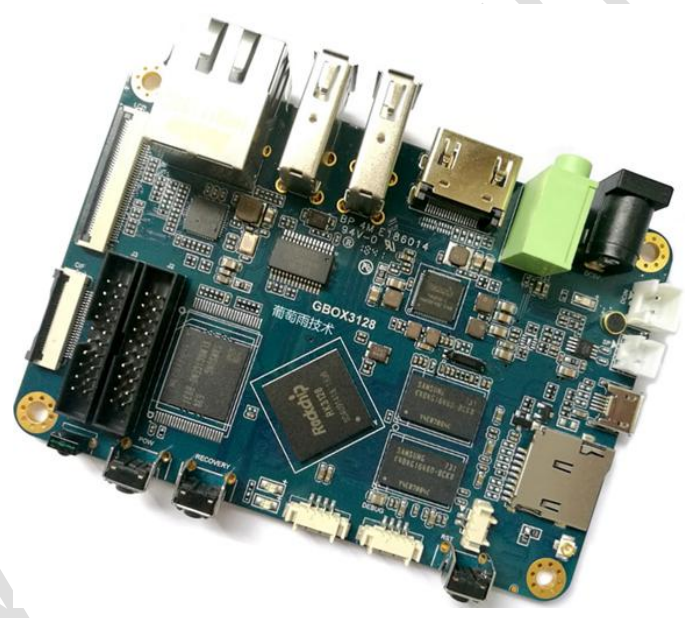


G3128

Single Board Computer

Development Manual



Shenzhen Graperain Technology Co., Ltd.

www.graperain.com/

Copyright Statement

Copyrights of this manual belong to Shenzhen Graperain Technology Co., Ltd. and all rights are reserved. Any companies or individuals are not allowed to extract part or all of this manual, and violators will be prosecuted under law.

Attention:

The manuals of development platform on sell will be updated from time to time, please download the latest manual from website www.graperain.com or contact our company sales representative, there would be no further notice.

www.graperain.com

Release Notes

Version	Release Date	Author	Description
Rev.01	2018-8-20	David	Revision

www.graperain.com

Technical Support

Any questions about the manuals, you can call our landline or email us.

Website: <http://www.graperain.com>

Landline: +86 755 23025312

E-mail: supports@graperain.com

Sales and Service Network

Shenzhen Graperain Technology Co., Ltd.

Website: <http://www.graperain.com>

Landline: +86 755 23025312

E-mail: sales@graperain.com

Address: Building A, Huafeng Tech. & Innov. Park Baoan Wisdom Valley, Xixiang, Baoan
Dist. Shenzhen, Guangdong. Post code 518101.

www.graperain.com

Catalogue

Copyright Statement.....	2
Chapter 1 Setting up Android Platform Development Environment.....	7
1.1 Install Ubuntu OS by U-disk.....	7
1.2 Install Dependent Package of Android Source Code.....	8
1.3 Install Cross-compiler Tool.....	10
1.4 Specify GCC Cross-compiler.....	10
Chapter2 Compiling Android Source Code Package.....	12
2.1 Install Android Source Code Package.....	12
2.2 Analysis Compiled Script.....	12
2.3 Compiling Source Code.....	13
2.3.1 Checking Compiling Assistance.....	13
2.3.2 Compiling Uboot.....	13
2.3.3 Compiling Kernel.....	13
2.3.4 Compiling Android File System.....	13
2.4 Configuring Kernel.....	13
Chapter 3 Compiling Linux QT Source Code.....	15
3.1 Install Linux Source Code Package.....	15
3.2 Compiling Script Analysis.....	15
3.3 Compiling Source Code.....	15
3.3.1 Check compiling assistant out.....	15
3.3.2 Compiling Uboot.....	16
3.3.3 Compiling Kernel.....	16
3.3.4 Compiling Linux File System.....	16
3.3.5 Generate System Update Package.....	16
3.4 Configuring Kernel.....	16
3.5 Configuration File System.....	17
Chapter 4 Programming Android Image Files.....	18
4.1 Upgrade Firmware in Ubuntu Environment.....	18
4.2 Upgrade Firmware in Windows.....	18
4.2.1 Install RK USB Drive.....	18
4.2.2 Connect Device.....	19
4.2.3 Take AndroidTool to Upgrade Firmware.....	21
4.3 Update Firmware by TF Card When Off-line.....	22
Chapter 5 Programme Linux-qt Image File.....	26
5.1 Update Firmware in Ubuntu Environment.....	26
5.2 Update Firmware in Windows Environment.....	26
5.2.1 Install RK USB Drive.....	26

- 5.2.2 Connect Device..... 27
- 5.2.3 Take AndroidTool Update Firmware..... 28
- 5.3 Update Firmware When Off-line..... 31
- Chapter 6 Product Portfolio..... 34
 - 6.1 System on Module Series..... 34
 - 6.2 Development Board Series..... 34
 - 6.3 Single Board Computer (SBC) Series..... 34

Graperaïin

Chapter 1 Setting up Android Platform Development Environment

Please install Linux operating system in PC which could fully play PC performance as compiling Android source could ask for high requirements in PC hardware. We use Ubuntu14.04 64bit system in this chapter. Please keep the same as our version.

1.1 Install Ubuntu OS by U-disk

Tool :

One U-disk bigger than 2GB

Software: Linuxlive usb creator, Download link : <http://www.linuxliveusb.com/>

Operating System:

Ubuntu14.04, Download link : <http://www.ubuntu.com/download/desktop/>

Installation Method :

Step1: Download Ubuntu ISO file and linuxlive usb creator, and done installation.

Step2: Insert U-disk, and open usb creator file, and done setting as hints, at first, please take installation and tell U-disk, second, find downloaded file ubuntu image file, third default, and check hide files and FAT32 format U-disk, last click lightning icon and done installation.-



- Step3: Re-start computer, and enter into BIOS setting menu, and take U-disk launch. Generally, the desktop computer press DEL key, and notebook computer F2, or F10 enter into BIOS. Done setting, save and quit.
- Step4: Re-start it one more time, and Ubuntu installation interface will be, please check your language and go on;
- Step5: Check install, and go on;
- Step6: Check your language, and go on;
- Step7: Netconfig, installation or not both ok, or installation it after system done;
- Step8: Check something else, and Go on; separate two zones for Ubuntu, “一个 /” and “一个 /home” . Zones can be re-buit or format. It depends on requirements.
- Step9: Setup area, take yours;
- Step10: Select Keyboard;
- Step11: Login user name and password, and done setup. Go on and install it directly. Restart when done installation, and enter into Ubuntu operating system.

1.2 Install Dependent Package of Android Source Code

Dependent software package and 64bit System patches:

GIT

JDK 8

JDK 7

git-core , gnupg , flex , bison , gperf , libsdl-dev , libesd0-dev , libwxgtk2.6-dev ,
libwxgtk2.8-dev , build-essential , zip , curl , libncurses5-dev , zlib1g-dev , libxml2-utils ,
genromfs , lsb-core , libc6-dev-i386 , g++-multilib , lib32z1-dev , lib32ncurses5-dev ,
u-boot-tools,
android-tools-fastboot, Texinfo, lib32readline-gplv2-dev, gcc-multilib, libswitch-perl,
gcc-arm-linux-gnueabi

All software package needed:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

```
sudo apt-get install git-core gnupg flex bison gperf libsdl-dev libesd0-dev  
libwxgtk2.6-dev libwxgtk2.8-dev build-essential zip curl libncurses5-dev zlib1g-dev  
libxml2-utils genromfs lsb-core libc6-dev-i386 g++-multilib lib32z1-dev lib32ncurses5-dev  
u-boot-tools android-tools-fastboot Texinfo lib32readline-gplv2-dev  
gcc-multilib, libswitch-perl gcc-arm-linux-gnueabi
```

Install above software packages one by one, and then failing ones will be found.

Install manually JDK8:

Step details in Ubuntu os:

Step1: Execute following order:

```
sudo add-apt-repository ppa:openjdk-r/ppa
```

```
sudo apt-get update
```

```
sudo apt-get install openjdk-8-jdk
```

Step2: Re-start the system

Check Java version:

```
root@david:/usr/lib/jvm# java -version
```

Till now, done JDK8 installation.

Install manually DK7:

Install manually jdk1.7 in Ubuntu:

Step1: Execute following order:

```
sudo add-apt-repository ppa:webupd8team/java
```

```
sudo apt-get update
```

```
sudo apt-get install oracle-java7-set-default
```

Step2: Re-start the system

Step3: Check Java version:

```
root@david:/usr/lib/jvm# java -version
```

Till now, done jdk7 installation.

1.3 Install Cross-compiler Tool

The cross-compiler tool has been integrated into source code package yet, no need manual installation. Its path:(Android source code)
prebuilts/gcc/linux-x86/arm

1.4 Specify GCC Cross-compiler

When install latest GCC cross-compiler in Ubuntu system, the version is exceed 4.4. Check GG version with the following command:

```
gcc --version
```

Maybe shows following information:

```
david@ubuntu-server:~$ gcc --version
```

```
gcc (Ubuntu/Linaro 4.6.3-1ubuntu5) 4.8.3
```

Copyright © 2011 Free Software Foundation, Inc.

Above information shows version is 4.8, it will be error hint. That caused by new GCC version error, you could find solution in internet. If you do not want to modify those error, just downgrading your version into 4.4 will be ok.

Solution :

Install 4.4 version

```
sudo apt-get install gcc-4.4 g++-4.4 g++-4.4-multilib
```

Done installation, and downgrading version gcc

```
cd /usr/bin  
sudo mv gcc gcc.bk  
sudo ln -s gcc-4.4 gcc  
sudo mv g++ g++.bk  
sudo ln -s g++-4.4 g++
```

Check version and done downgrading:

```
david@david-work:~$ gcc -version  
gcc: unrecognized option '-version'  
gcc: no input files  
david@david-work:~$ gcc --version  
gcc (Ubuntu/Linaro 4.4.7-8ubuntu1) 4.4.7  
Copyright (C) 2010 Free Software Foundation, Inc.
```

Chapter2 Compiling Android Source Code Package

G3128 single board computer is of eMMC memory as fault.

State: Take ordinary permissions when compiling image. Done compiling, following images happen: **uboot.img , kernel.img , resource.img , boot.img , recovery.img , misc.img , system.img , update.img.**

uboot.img: bootloader, which used to guide kernel

kernel.img : kernal image

resource.img: source files image

system.img: android file system image

update.img: all android system upgrading, which includes all images compiled

2.1 Install Android Source Code Package

Copy Android 5.1 source code package from cloud storage into user catalogue.

Notice: do not save this file into root catalogue of system file, if you do, there will be administration authority problem.

For example: Do following command in user' s authority :

```
cp yourcdromdir/source/g3128-android-v51-xxx.tar.bz2 ~/
cd
tar -xjvf g3128-android-v51-xxx.tar.bz2
```

Now all Android file saved in the extracted directory. Till here all Android source code package installation done well.

State: Source code names could be different as its data issued, subject to cloud storage.

2.2 Analysis Compiled Script

State: Kinds of source code version is different but principle same. And its script details subject to its relevant source code package, here it used to be analysis realizing mechanism.

2.3 Compiling Source Code

2.3.1 Checking Compiling Assistance

Do following command to checking usage of mk script

```
./mk.sh -h
```

2.3.2 Compiling Uboot

Do following command and compiling uboot. Save uboot.img file into out/release catalogue when compiling done.

```
./mk.sh -u -j=4
```

2.3.3 Compiling Kernel

Do following command to compiling Android kernel in Android source code catalogue:

```
./mk.sh -k -j=4
```

Done compiling, new image happens: kernel.img and resource.img, save them into out/release

2.3.4 Compiling Android File System

First, check "out catalogue" in Android root catalogue. Cancel full out catalogue at the first compiling, and take following command as following to compiling Android image files :

```
./mk.sh -s -j=4
```

Done compiling and save images into out/release, which includes: system.img , boot.img , misc.img , recovery.img., parameter.txt, and all system firmware package update.img.

2.4 Configuring Kernel

Kernel configuration file:kernel/arch/arm/configs/g3128_defconfig, and its steps are:

1) cp kernel/arch/arm/configs/g3128_defconfig kernel/.config (copy it)

- 2) make menuconfig ARCH=arm (Manual configuration, and save it.)
- 3) cp kernel/.config kernel/arch/arm/configs/g3128_defconfig (Updating configuration files.)
- 4) ./mk.sh -k (Compiling kernel one more time.)

Graperaïin

Chapter 3 Compiling Linux QT Source Code

G3128 single board computer is of standard eMMC.

State: Take ordinary permissions when compiling image. Done compiling, following images will be happend: **uboot.img** , **kernel.img** , **resource.img** , **linux_system.img** , **update_linux.img**.

uboot.img: bootloader, which used to be guide kernel.

kernel.img: which is kernel image.

resource.img: which is source files image.

linux_system.img: which is file system image.

update_linux.img: which includes all Linux qt system updating images.

3.1 Install Linux Source Code Package

Copy Linux QT source code package into user catalogue. Notice not save into root catalogue, or administrative authority issue happens:

For example: Do following command in user' authority:

```
cp yourcdromdir/source/g3128-linux-xxx.tar.bz2 ~/
cd
tar -xjvf g3128-linux-xxx.tar.bz2
```

Save all Linux files system into current zip catalogue. And till now, Linux source code package installation done.

State: The name of source code package maybe different name as date, please reference its real name in disk.

3.2 Compiling Script Analysis

State: Different version source code script are different, but principle same.

3.3 Compiling Source Code

3.3.1 Check compiling assistant out.

Do following command to check mk script details out:

```
./mk.sh -h
```

3.3.2 Compiling Uboot

Do following command to compiling uboot in Linux source code catalogue and then save the image uboog.img into out/release:

```
./mk.sh -u -j=4
```

3.3.3 Compiling Kernel

Do following command to compiling kernel in Linux source code catalogue:

```
./mk.sh -k -j=4
```

Done compiling and save all images kernel.img and resource.img into out/release.

3.3.4 Compiling Linux File System

Do following command to compiling Linux file system in Linux source code catalogue:

```
./mk.sh -r -j=4
```

Done compiling and save image linux_system.img into out/release.

3.3.5 Generate System Update Package

Do following command to generate system update package in Linux source code catalogue :

```
./mk.sh -l -j=4
```

Done compiling and save image update_linux.img into out/release.

3.4 Configuring Kernel

All configuration files saved in kernel/arch/arm/configs/g3128_defconfig, and configuration steps as following;

- 1) cp kernel/arch/arm/configs/g3128_defconfig kernel/.config (copy files)

2) make menuconfig ARCH=arm (Manual configuration and save it when done configuration)

3) cp kernel/.config kernel/arch/arm/configs/g3128_defconfig (Update configuration files)

4) ./mk.sh -k (Compiling kernel again)

3.5 Configuration File System

The name of configuration file is rootfs/buildroot/configs/rk3128_rootfs_defconfig, and configuration process is:

1) cp configs/rk3128_rootfs_defconfig .config (Copy it)

2) make menuconfig (Manual configuration in rootfs/buildroot, and save it after done.)

3) cp .config configs/rk3128_rootfs_defconfig (Update configuration files)

4) ./mk.sh -r (Compiling it again in Linux source code catalogue)

Chapter 4 Programming Android Image Files

4.1 Upgrade Firmware in Ubuntu Environment

In Ubuntu Environment to upgrade firmware.

Preparation :

Insert power charger with G3128 single board computer, and connect OTG cable with PC, and connect serial cable with PC, and open serial terminal and command terminal;

Power on, and press Update key, meanwhile press Reset key, and upgrade automatically.

Then, take following operation in PC command line:

```
sudo ./upgrade_tool uf update.img (Upgrade full Android upgrade image)
```

Or upgrade them separately: uboot , kernel and resource firmware files :

```
sudo ./upgrade_tool di uboot uboot.img
sudo ./upgrade_tool di -k kernel.img
sudo ./upgrade_tool di resource resource.img
sudo ./upgrade_tool di -b boot.img
sudo ./upgrade_tool di -r recovery.img
sudo ./upgrade_tool di -m misc.img
sudo ./upgrade_tool di -p paramater.txt
sudo ./upgrade_tool di -s system.img
```

Comment:

All images and download tool are in out/release.

4.2 Upgrade Firmware in Windows

4.2.1 Install RK USB Drive

Steps :

Step1, Run DriverAssitant_v4.4 in DriverInstall.exe, and done installation;



Notice:

- 1) Support xp,win7_32,win7_64,win8_32,win8_64 OS.
- 2) Done installation of XP OS, still hint find new device, please take automount “自动安装”
- 3) Click quit drive and install drive then if old drive version found before installation.

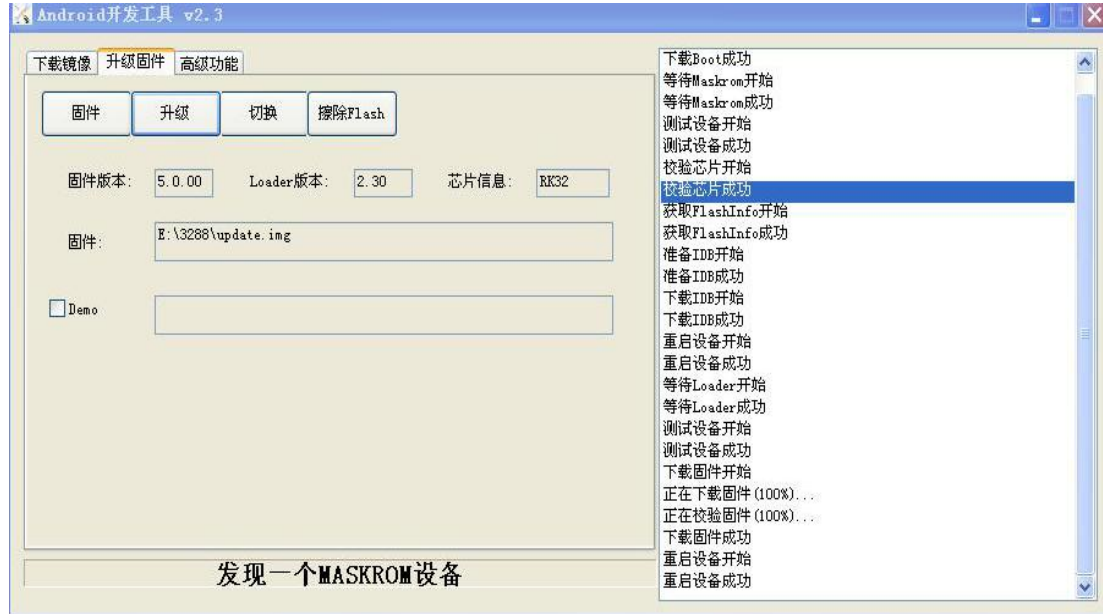
4.2.2 Connect Device

Run AnroidTool.exe tool in AndroidTool, and find following interface:



- 1) When eMMC have not programmed any firmware before.

Press Update key, and connect G3128 single board computer with PC through OTG cable. Done connection, take off Update key will be ok. And the board will enter into MASKROM, and waiting for programming to upgrade.



2) When the G3128 single board computer have been programmed firmware before:

Power the board, and connect the board with PC through OTC, press Update key, and meanwhile press Reset key, re-start the board, take off Update key will be ok. And then the board will enter into LOADER, and waiting for upgrading. And its interfaces like following picture:



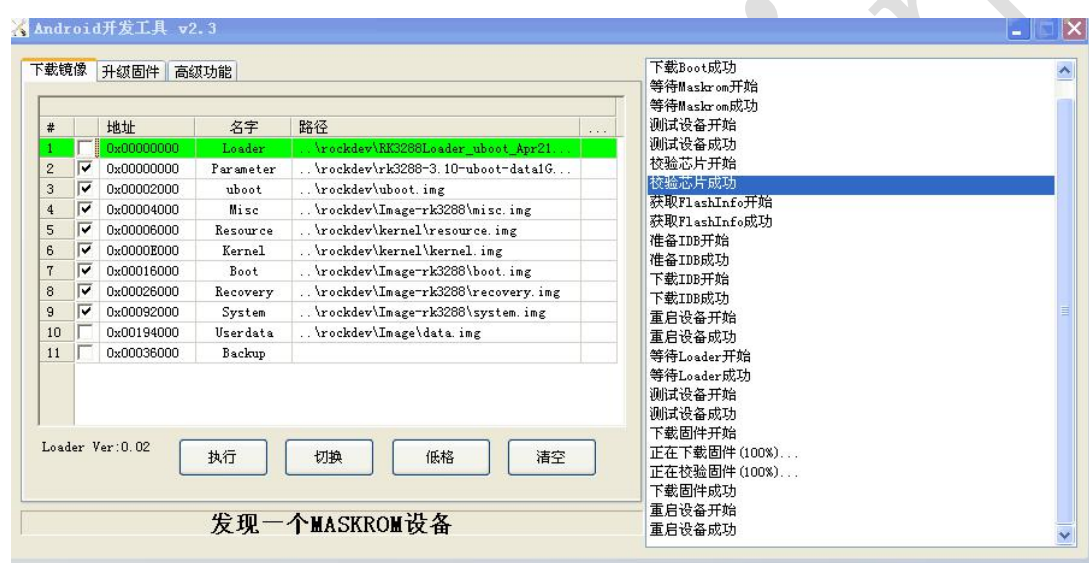
4.2.3 Take AndroidTool to Upgrade Firmware

In last sections described how to install RK USB drive and how to connect with PC. No matter blank board or upgraded board, once done upgraded and connect well, just upgrade its firmware will be ok: Or upgrade uboot, kernel and resource firmwares one by one, or upgrade its firmware update.img.

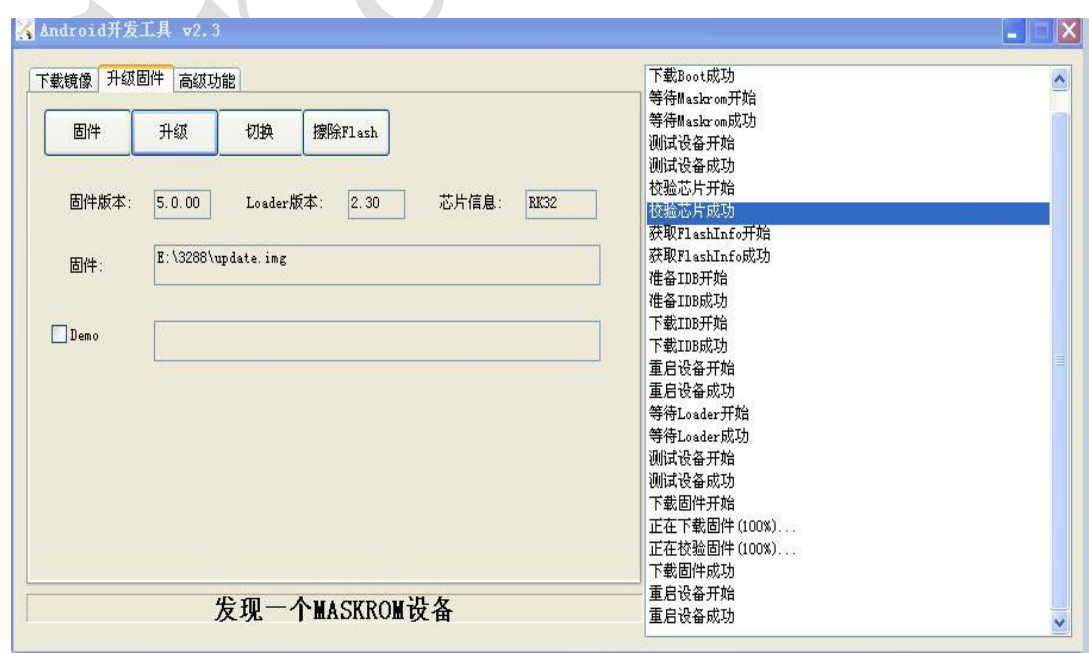
Run AndroidTool.exe in AndroidTool

MASKROM mode:

Upgrade every firmware: click the firmware which need to be upgraded, and click do “执行”



Or upgrade unit firmware update.img, and take update.img, click ‘升级’



LOADER mode:

Update every firmware, and check the firmware which need to be upgraded, and click '执行'



Or upgrade unit firmware update.img, check update.img, and click '升级'



4.3 Update Firmware by TF Card When Off-line.

When board power on, the CPU will boot from SD card boot preferentially, and then guide. There are two functions of SD Card Boot: Upgrade and Run. Here is SD card upgrade

function:

Tool : SD_Firmware_Tool.exe

Steps :

Step1, Run SD_Firmware_Tool.exe in PC, and like following picture:



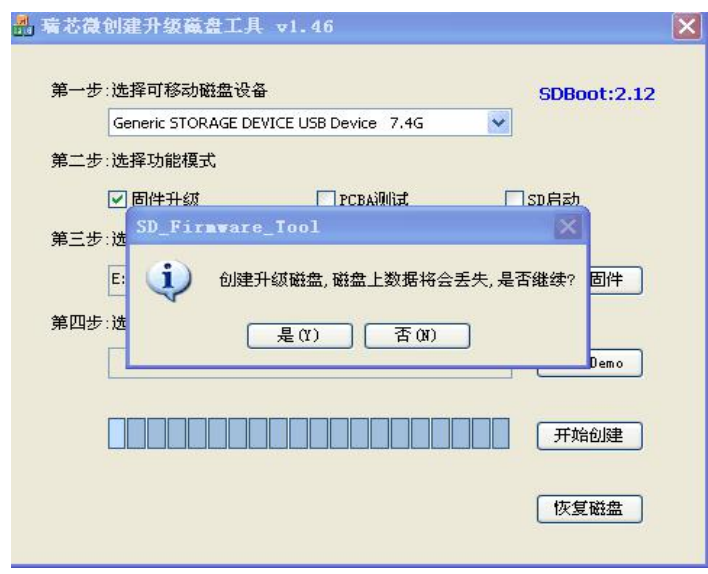
Step2, Insert TF into PC, and software tool will find TF card, like:



Step3, In function mode, check “固件升级” , “选择升级固件” (which means zipped firmware update-android.img in Android)

Step4, Click “开始创建” , and upgrade, and click “开始创建” , following picture will shows,

and check format TF or not, yes, and upgrade then.



Upgrading :



Step 5, Done upgrade.



Step6, Pull out TF card, and insert it into the board, and power, and it upgrade automate.
Done upgrade, following printing information shows:

```
[ 85.661371] ret = 0  
[ 86.507524] ret = 0
```

```
librkupdate_ INFO:Start to download uboot,offset=0x2000,size=4194304
```

```
librkupdate_ INFO:Start to download misc,offset=0x6000,size=49152
```

```
librkupdate_ INFO:Start to download resource,offset=0x8000,size=3768320
```

```
librkupdate_ INFO:Start to download kernel,offset=0x10000,size=20463636
```

```
librkupdate_ INFO:Start to download boot,offset=0x1c000,size=1991896
```

```
librkupdate_ INFO:Start to download recovery,offset=0x2c000,size=28082176
```

```
librkupdate_ INFO:Start to download system,offset=0xb4000,size=1610612736
```

```
librkupdate_Finish to upgrade firmware.
```

```
SD upgrade ok.
```

```
Doing Actions succeeded.please remove the sdcard.....
```

Step7, Power off, and pull out TF card, and power on the board, and check out upgrade done.

Chapter 5 Programme Linux-qt Image File

5.1 Update Firmware in Ubuntu Environment

Update firmware in Ubuntu environment means, PC in Ubuntu OS, and done update G3128 sbc in corresponding commands.

Preparation :

Power on G3128 sbc, connect the board with PC through OTG cable, and serial ports too. Visit serial terminal and command terminal in PC.

Then, press Update key, and meanwhile press Reset key, and enter into upgrade mode.

Next, do following operation in PC command terminal:

```
sudo ./upgrade_tool uf update_linux.img (Update full Linux image)
```

Or Update uboot, kernel and resource firmwares separately:

```
sudo ./upgrade_tool di uboot uboot.img
```

```
sudo ./upgrade_tool di -k kernel.img
```

```
sudo ./upgrade_tool di resource resource.img
```

Comment:

All images and upgrade tools saved in out/release.

5.2 Update Firmware in Windows Environment

5.2.1 Install RK USB Drive

Steps :

Step1, Run DriverInstall.exe in DriverAssitant_4.4 file. And one drive installation first.


Notes:

- Support XP, Win7_32, Win_64, Win8_32, Win8_64 OS.
- Please take automate installation when XP done installation, but the system still hint find new device.
- Click quit drive and then install drive if old version drive found before installation.

5.2.2 Connect Device

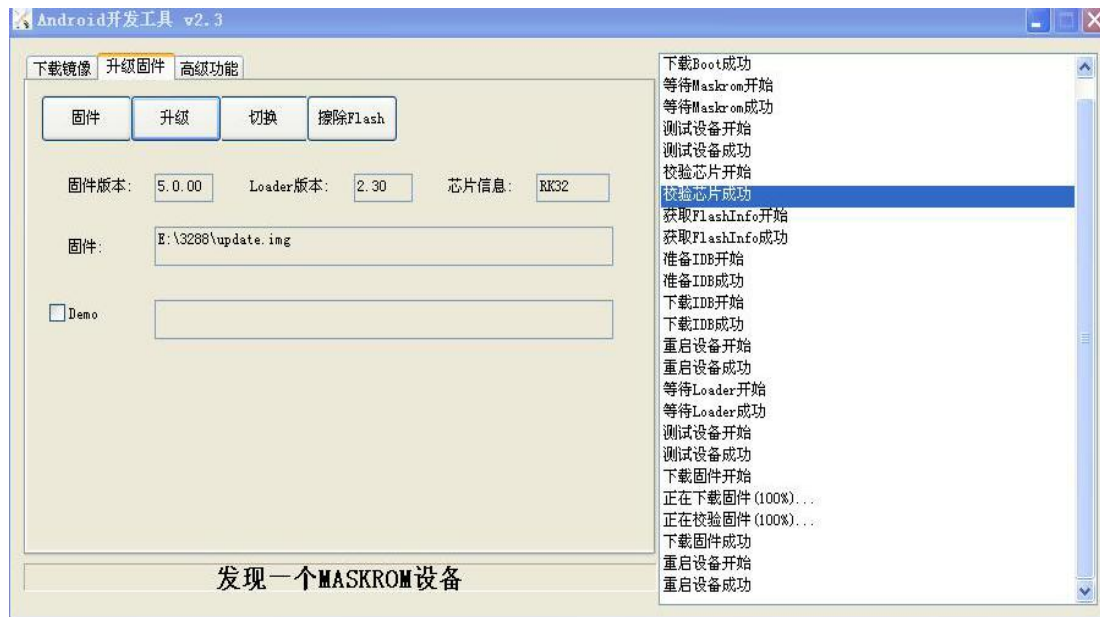
Run AndroidTool.exe in AndroidTool file, and its interface likes:



3) For blank board, which means eMMC no firmware or image.

Press Update key, and connect the board with PC (Windows os) through OTG cable. Done the connection, take off Update key will be ok. And the board will enter into MASKROM mode,

and waiting for programme.



4) For the board which have been programmed firmware before.

Power on, connect the board with PC through OTG cable, press Update key, and meanwhile press Reset key, and re-start the board. Pull off Update key will be ok. And then the board will enter into LOADER mode, and waiting for programme, and interface likes:



5.2.3 Take AndroidTool Update Firmware

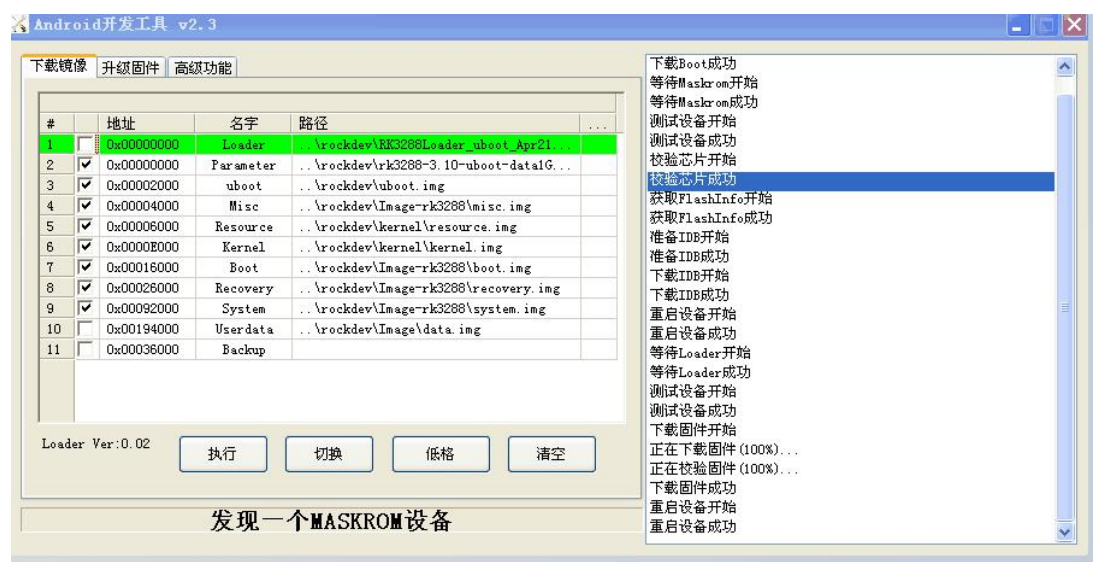
In last sections described how to install RK USB drive and how to connect board with PC. Both blank board or programmed board, could be update firmware as needed when connection done. Update uboot, kernel and resource firmware files separately or update unit

firmware in one time.

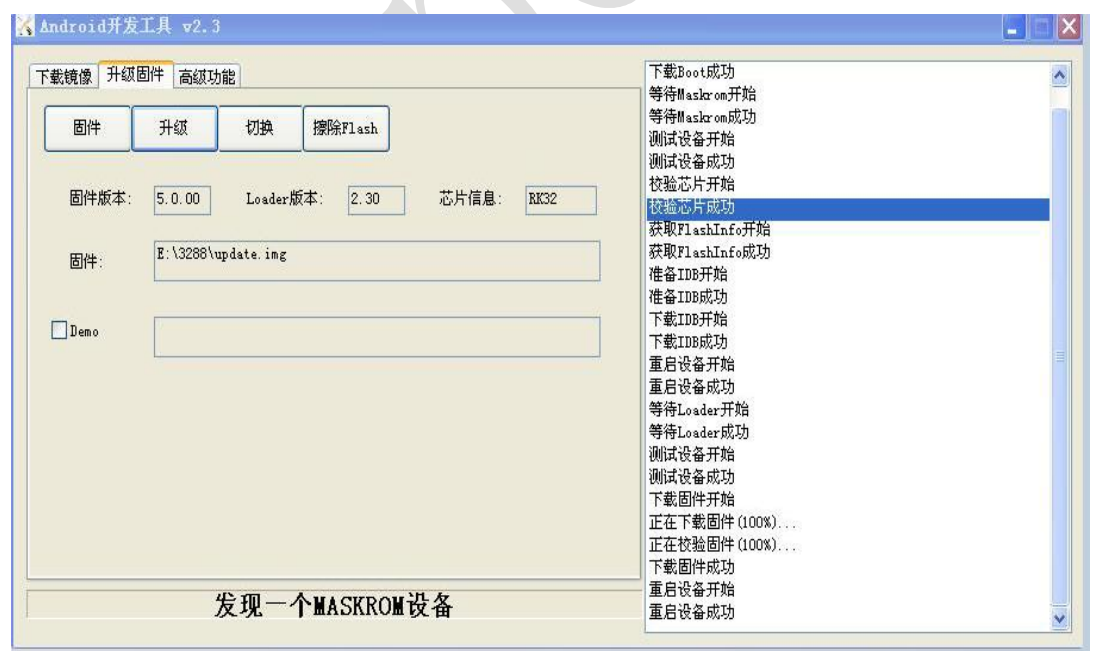
Run AndroidTool.exe tool in AndroidTool file.

MASKROMM mode updating:

Update every firmwares separately: click wanted firmware, and click '执行' ;



Or update unit firmware update_linux.img: Check update_linux.img, and click '升级'



LOADER mode updating:

Update every firmwares separately: Check firmware and click '执行'



Or update unit firmware update_linux.img: Check firmware update_linux.img, and click ‘升级’



5.3 Update Firmware When Off-line

When board power on, the CPU will boot from SD card boot preferentially, and then guide. There are two functions of SD Card Boot: Upgrade and Run. Here is SD card upgrade function:

Tool : SD_Firmware_Tool.exe

Details :

Step1, Run SD_Firmware_Tool.exe in PC (Here is SD_Firmware_Tool_v1.46), likes:

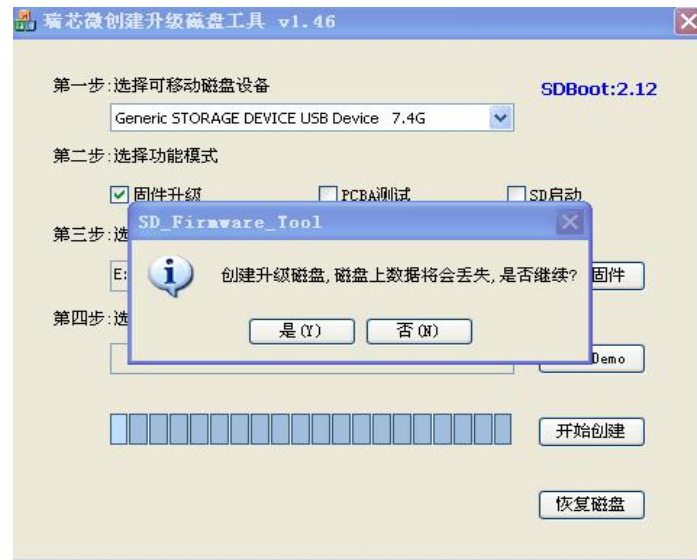


Step2, Insert TF card into PC, and software will find TF, likes:



Check “固件升级” , and check the firmwares (here means update-android.img in Android) which need to be updated .

Click “开始创建” , and updating. One dialog box pops up when click “开始创建” , hints format or not, yes “是” , and start updating.



Updating :



Done update.



Pull out TF card, and insert it into G3128 board, power on, and it will upgrade automatically.
Done upgrade, and its printing information goes as:

```
[ 85.661371] ret = 0  
[ 86.507524] ret = 0
```

```
librkupdate_ INFO:Start to download uboot,offset=0x2000,size=4194304
```

```
librkupdate_ INFO:Start to download misc,offset=0x6000,size=49152
```

```
librkupdate_ INFO:Start to download resource,offset=0x8000,size=3768320
```

```
librkupdate_ INFO:Start to download kernel,offset=0x10000,size=20463636
```

```
librkupdate_ INFO:Start to download boot,offset=0x1c000,size=1991896
```

```
librkupdate_ INFO:Start to download recovery,offset=0x2c000,size=28082176
```

```
librkupdate_ INFO:Start to download system,offset=0xb4000,size=1610612736
```

```
librkupdate_Finish to upgrade firmware.
```

```
SD upgrade ok.
```

```
Doing Actions succeeded.please remove the sdcard.....
```

Power off, pull out TF card, and power on one more time, and check upgrade done.

Chapter 6 Product Portfolio

6.1 System on Module Series

G4418 SOM (Samsung S5P4418)
G6818 SOM (Samsung S5P 6818)
G3288 SOM (Rockchip RK3288 stamp hole)
GR3288 SOM (Rockchip RK3288 Immersion Gold MXM)
G3128 SOM (Rockchip RK3128 Immersion Gold MXM)
G3399 SOM (Rockchip RK3399 stamp hole)
GR3399 SOM (Rockchip RK3399 Immersion Gold MXM)
M9 SOM (Qualcomm 8916)

6.2 Development Board Series

G4418 development board (Samsung S5P4418)
G6818 development board (Samsung S5P 6818)
G3288 development board (Rockchip RK3288 stamp hole)
GR3288 development board (Rockchip RK3288 Immersion Gold MXM)
G3399 development board (Rockchip RK3399 stamp hole)
GR3399 development board (Rockchip RK3399 Immersion Gold MXM)

6.3 Single Board Computer (SBC) Series

G4418 single board computer (Samsung S5P4418)
G6818 single board computer (Samsung S5P 6818)
G3128 single board computer (Rockchip RK3128)
G3288 single board computer (Rockchip RK3288)
GR3399 single board computer (Rockchip RK3399)

Instructions: More information of specifications and other products, please pay attention to website and contact us directly.

www.graperain.com