EM3399 Android6.0 User Manual

V3.0

Date: 2017-06-08

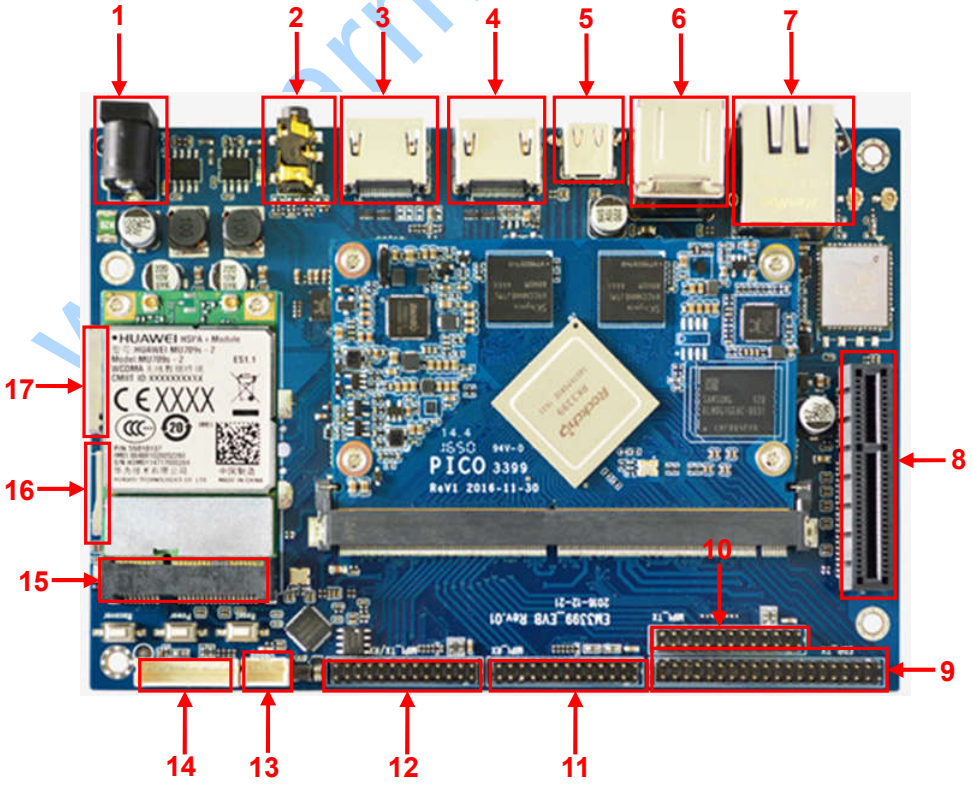
Colophon

Ver	Author	Description	Date
V1.0	Weixianya	Initial version android6.0.	2017-03-01
V2.0	Aojuncheng	Add section 6 Android Application Guidance.	2017-03-31
V3.0	Zhou Lijun	Add HDMI IN test	2017-06-8

Contents

1. Hardware Introduction

- **Processor:** Rock chip RK3399, Dual 64-bit Cortex-A72 + Quad Cortex-A53 @ 2.0GHz
- **RAM:** 4GB LPDDR3
- **eMMC Flash:** 8GB
- **Interface:** (1) DC12V power port x 1
  (2) Headphone x1,
  (3) HDMI-IN(Optional) x1
  (4) HDMI-OUT x1
  (5) Type – C x1
  (6) USB2.0 Host x2
  (7) Ethernet x1
  (8) PCI-E(Optional) x1
  (9) eDP (Optional) for LCD panel x1
  (10) MIPI_TX (Optional) for LCD panel x1
  (11) MIPI_RX(Optional) for Camera x1
  (12) MIPI_TX/RX(Optional)
  (13) 3.3V TTLSerial port for Serial terminal x1
  (14) Key board interface x1
  (15) mini PCI-E(Optional) for 3G/4G/SSD x1
  (16) SD card socket (optional low/high speed) x1
  (17)SIM card socket for 3G/4G
- **WIFI/BT Module:** AP6354
- **Operating system:** Android6.0.1
- **Board size:** 100 x 145mm



2. Compiler Environment

2.1 Vmware7.0+ubuntu12.04

Install Vmware7.0 in windows OS , and then install ubuntu12.04 in VMware to compile. You can see the installing steps in the initial version.

Note: Android6.0 should be complied by ubuntu 64bit OS.

2.2 Install JDK

Install openjdk-7-jdk：

```
# sudo apt-get install openjdk-7-jdk
```

For example the installation path is /usr/lib/jvm/java-7-openjdk-amd64.
You can configure the environment variable at the terminal by executing the following command.

```
# export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64
# export PATH=$JAVA_HOME/bin:$PATH
# export CLASSPATH=.:$JAVA_HOME/lib:$JAVA_HOME/lib/tools.jar
```

Execute the following command to check if the jdk has been installed successfully and check the revised version:

```
# java -version
        java version "1.7.0_121"
        OpenJDK Runtime Environment (IcedTea 2.6.8) (7u121-2.6.8-1ubuntu0.14.04.1)
        OpenJDK 64-Bit Server VM (build 24.121-b00, mixed mode)
```

2.3 Install other necessary tools

```
# sudo apt-get install build-essential
# sudo apt-get install zlib1g-dev
# sudo apt-get install flex
# sudo apt-get install libx11-dev
# sudo apt-get install gperf
# sudo apt-get install libncurses5-dev
# sudo apt-get install bison
# sudo apt-get install lsb-core
# sudo apt-get install lib32z1-dev
# sudo apt-get install g++-multilib
# sudo apt-get install lib32ncurses5-dev
# sudo apt-get install uboot-mkimage
# sudo apt-get install g++-4.4-multilib
```

3. Compile the Source

Step 1, unzip the source.

#tar xvfj em3399_mid.tar.bz2

3.1 compile uboot

cd em3399_mid/u-boot$

make rk3399_defconfig

make ARCHV=aarch64

RK3399MiniLoaderAll_V1.05.bin、 **trust.img**、 and **uboot.img** are generated in current directory.

3.2 compile kernel

cd em3399_mid/kernel

make ARCH=arm64 boardcon_defconfig

make ARCH=arm64 boardcon-rk3399.img

kernel.img and **resource.img** are generated in current directory.

3.3 compile Android

cd em3399_mid/

source build/envsetup.sh

lunch

Choice rk3399_mid-userdebug

make -j4

Generated image file

#./mkimage.sh

#cd rockdev/Image-rk3399_mid

#ls

Images are generated in current directory.

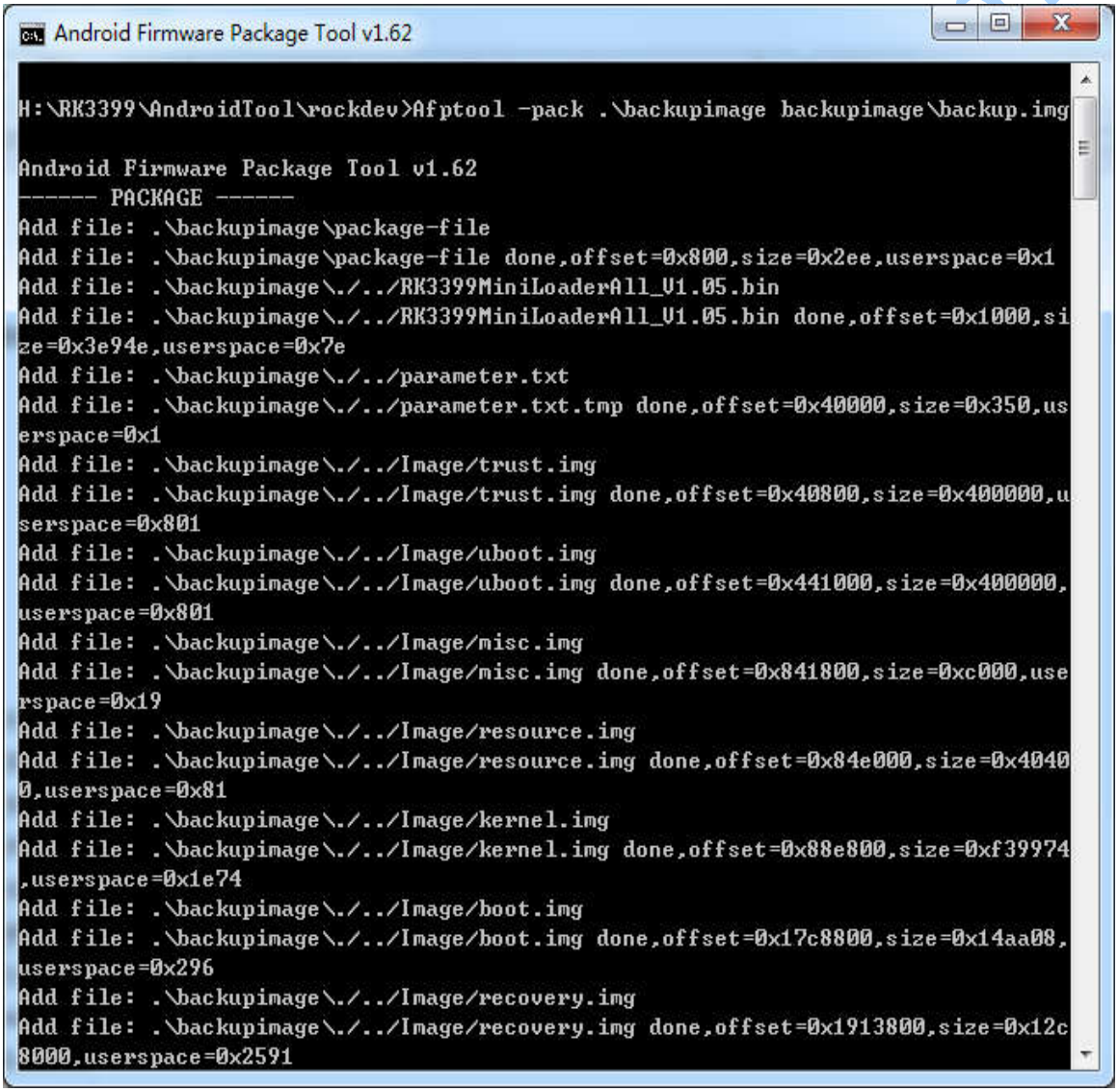
4. Images operation

4.1 Pack to update.img

Step 1, using winRAR unzip **AndroidTool_Release_v2.38.rar** in windows.

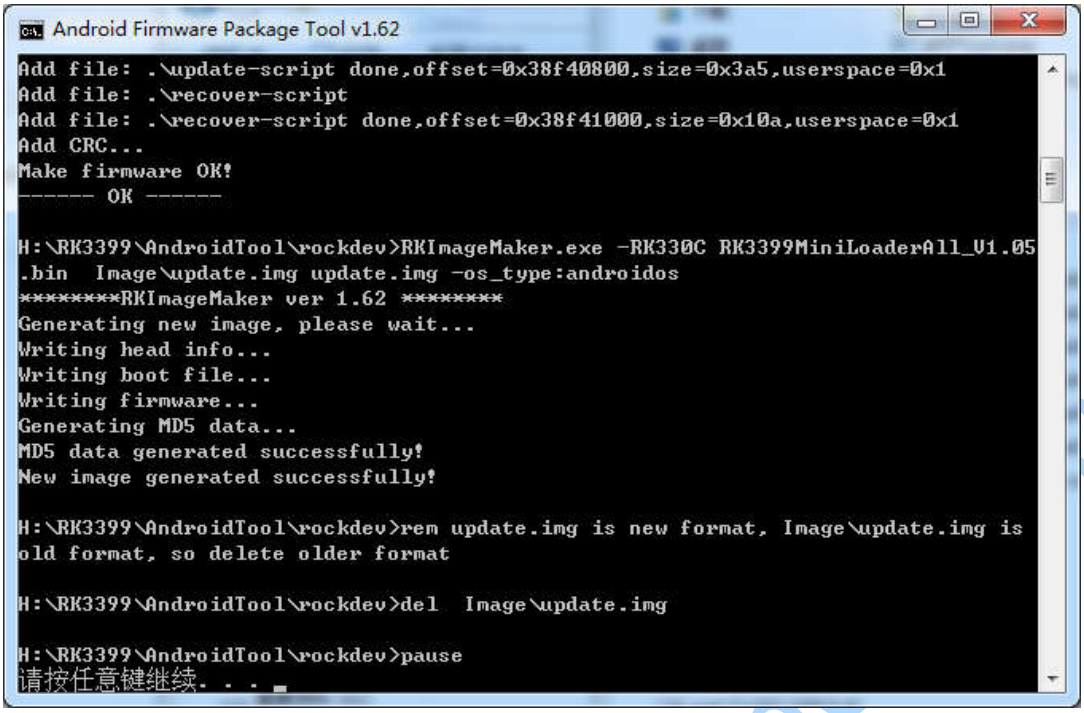
Step 2, copy all the files in the Android root directory **rockdev/Image-rk3399_mid** to the development tools **rockdev/Image** directory.

Step 3, enter the directory **AndroidTool_Release_v2.38/rockdev/Image**, and then double-click to run **mkupdate.bat.**



Step 5, after that **update.img** will be generated in **rockdev** directory.

Note: If an error occurs, it may be in the script is not the same bootloader version, follow the prompts to modify the file **mkupdate.bat** and **package-file** the same version of the current directory.

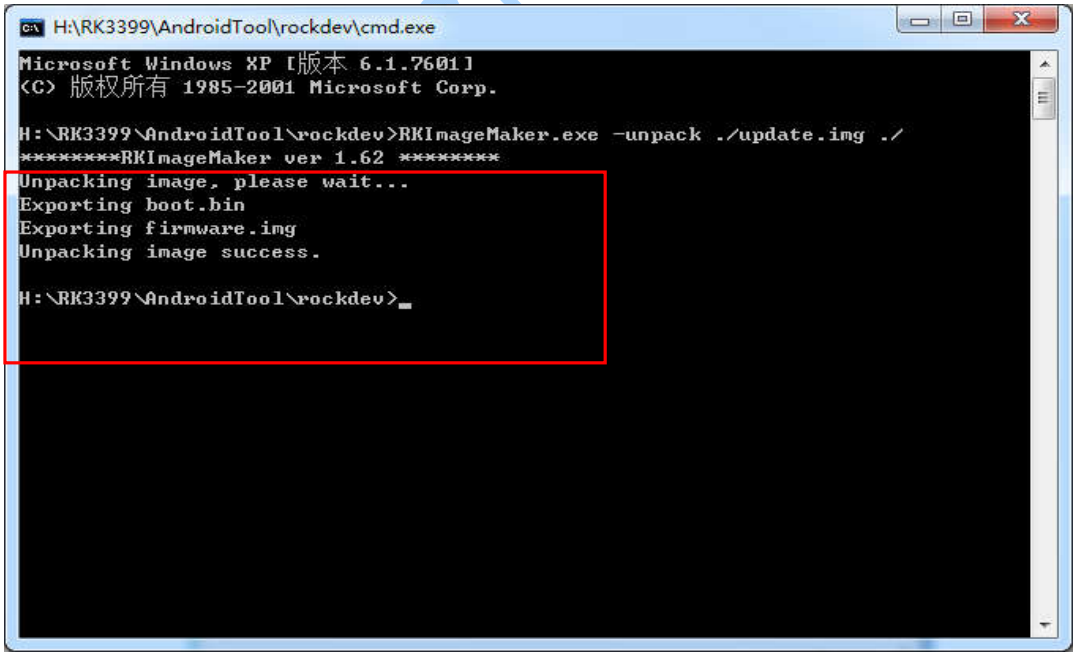


4.2 Unzip the firmware upgrade

Step 1, in CMD enters the **AndroidTool_Release_v2.38\rockdev** directory, unzip **update.img**. Enter the following command:

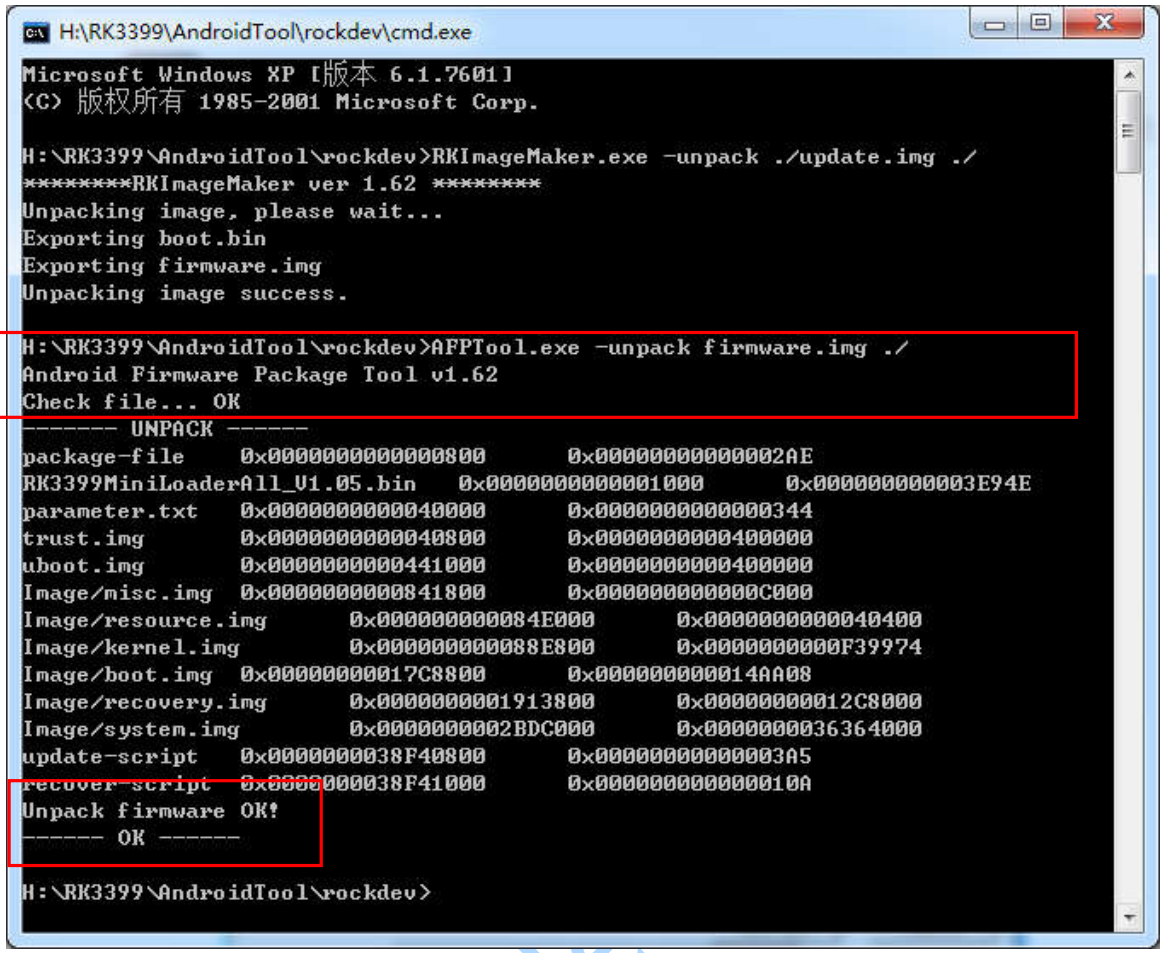
RKImageMaker.exe -unpack ./update.img ./

Then unzip the file to get boot.bin and firmware.img two files.



Step 2, unzip **firmware.img.** Enter the following command:

AFPTool.exe -unpack firmware.img ./



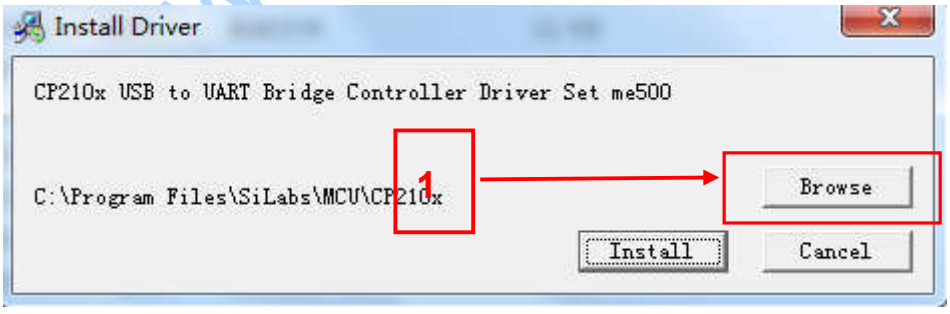
The unzip files will be generated in **AndroidTool_Release_v2.38\rockdev\Image** directory.

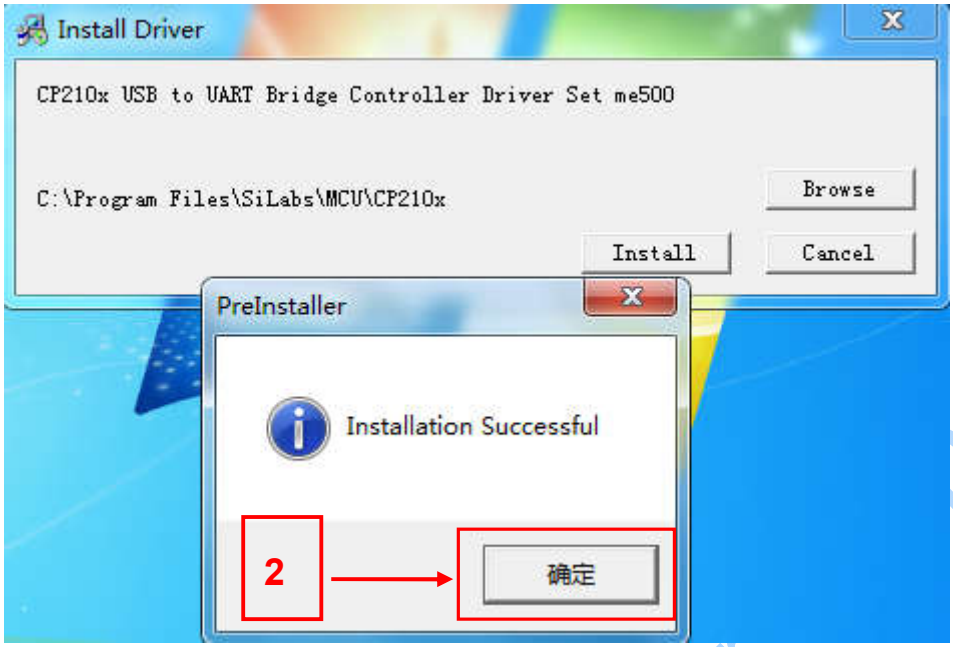
5. Burn images

5.1 Install debug OTG driver

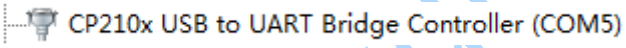
Step 1, install CP2102 driver

Unzip **CP2102WIN7.rar** to the windows, double click **preInstaller.exe**



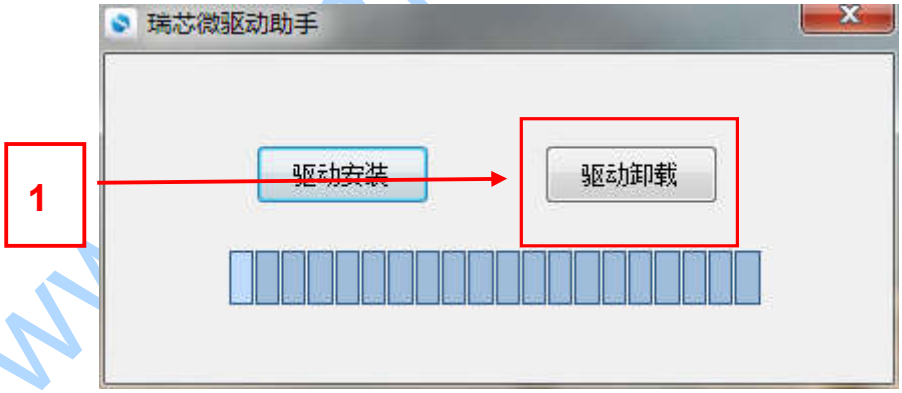


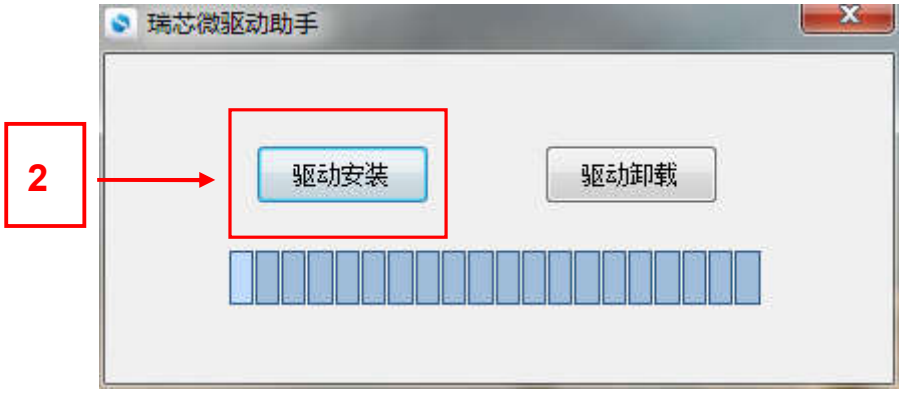
You can check”Computer—>Right mouse button—>Device manager—>Port”, As shown in Figure



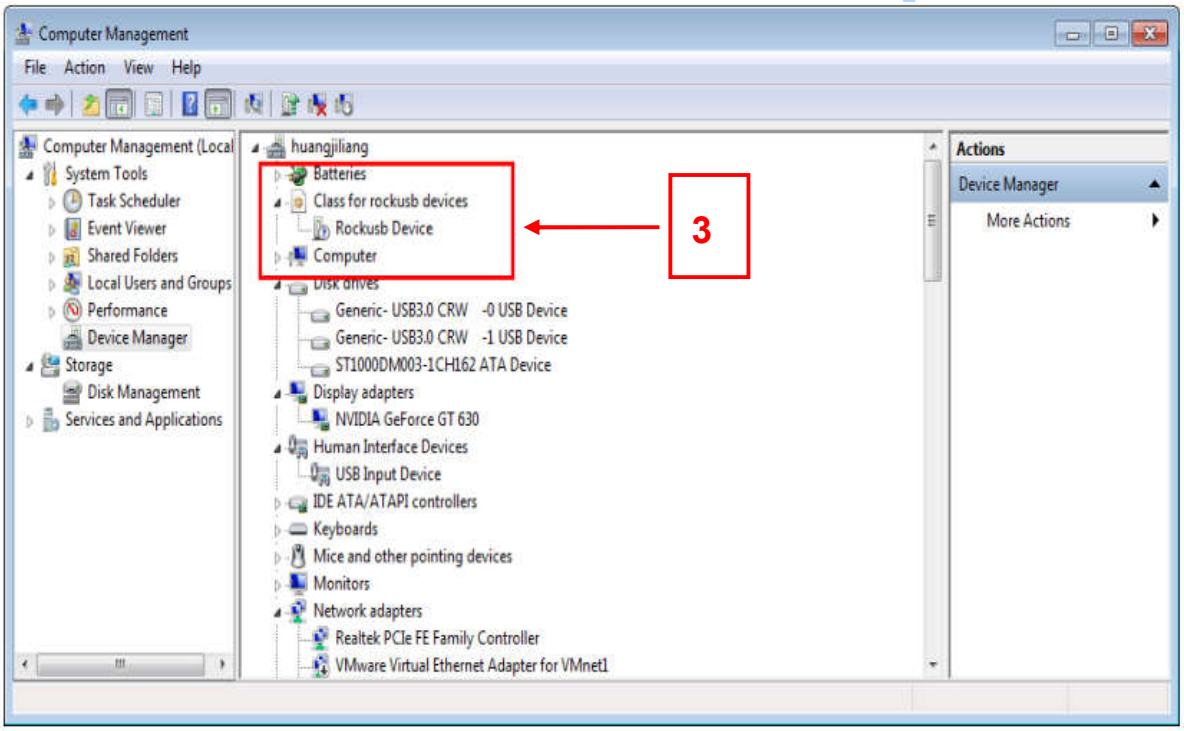
5.2 Install driver

Step 1, install Rockchip driver assistant（ **Release_DriverAssitant/DriverInstall.exe**）.





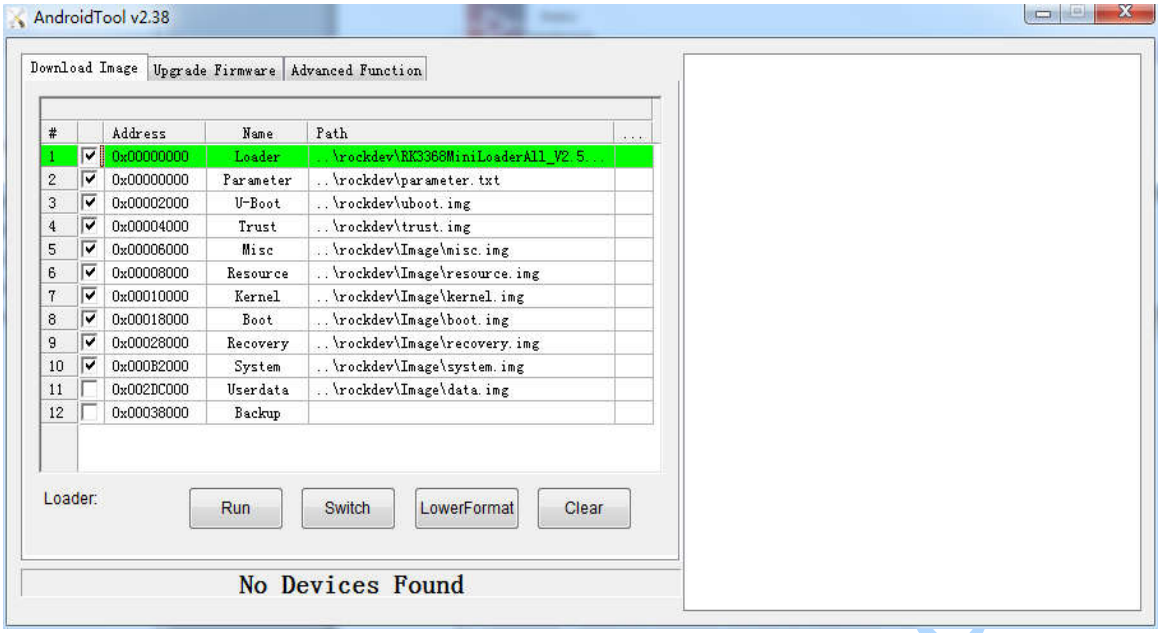
Step2, after successful installation, plug in the power and connecting OTG cable, in the computer hardware management interface can see the following information.



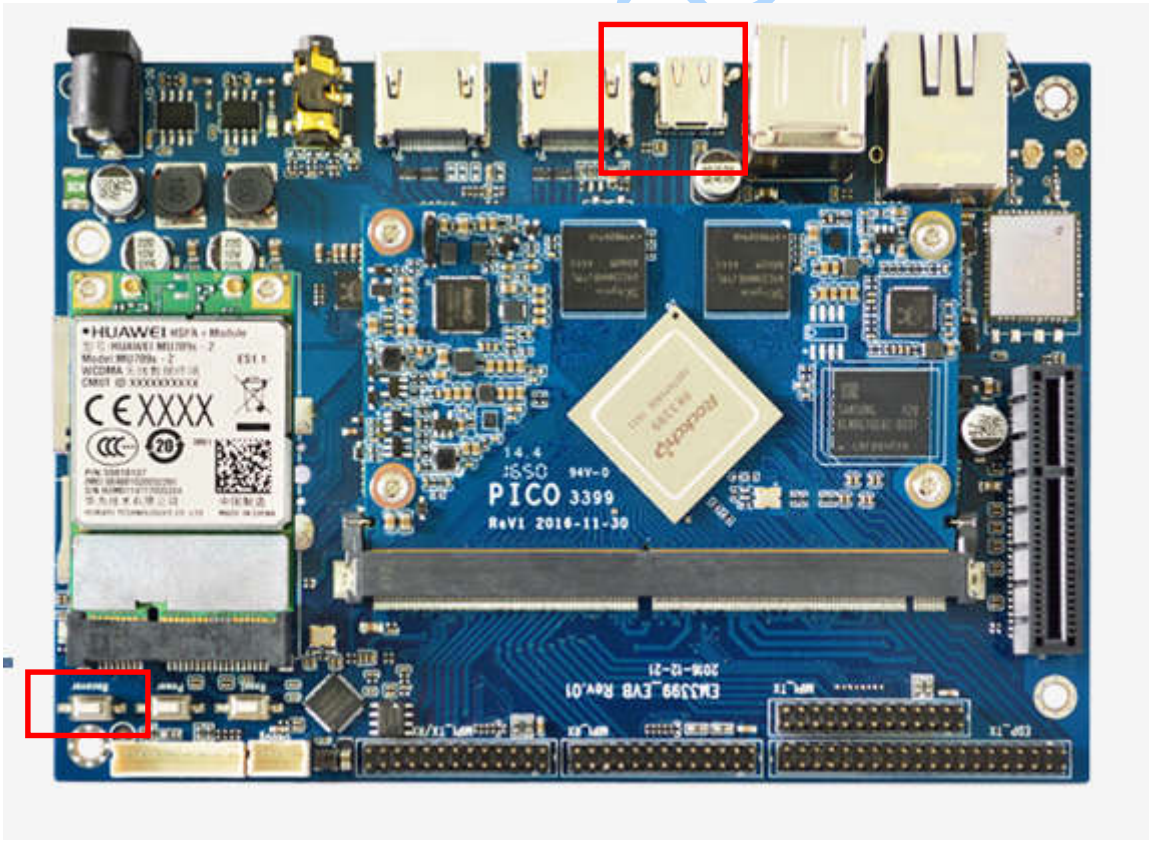
5.3 Upgrade Uniform firmware

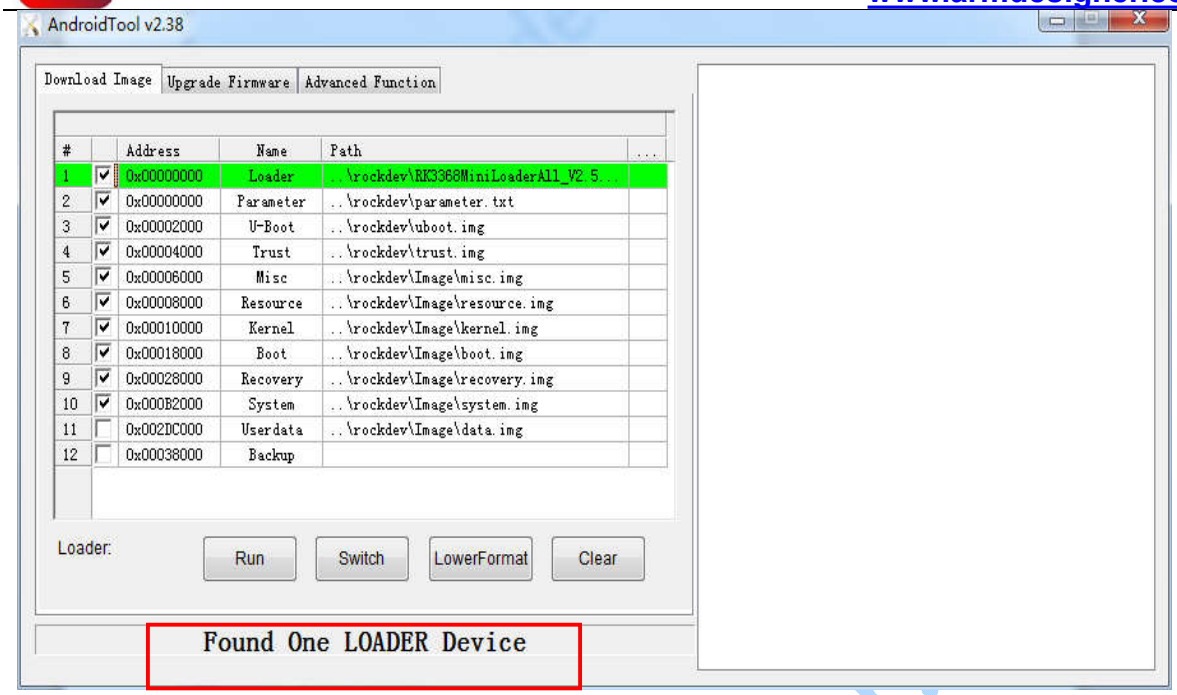
Step 1, Unzip **AndroidTool_Release_v2.38 tools** to the windows.

Step 2, open **AndroidTool_Release_v2.38\AndroidTool_Release_v2.38\AndroidTool.exe,** interface is shown below:

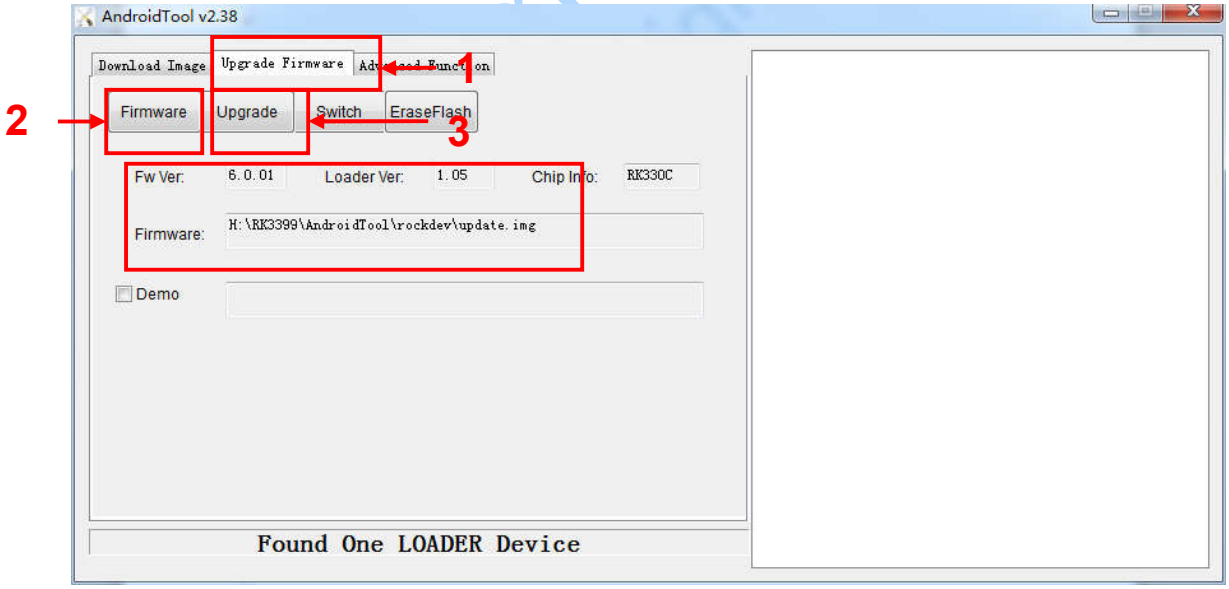


Step 2, first disconnect the power, **open AndroidTool.exe**, connect between Computer USB interface and development board's OTG port, press the button **Recover Key** and hold, as shown below, and then plug in the power, until the windows PC discovery of **Found one LOADER Device.**



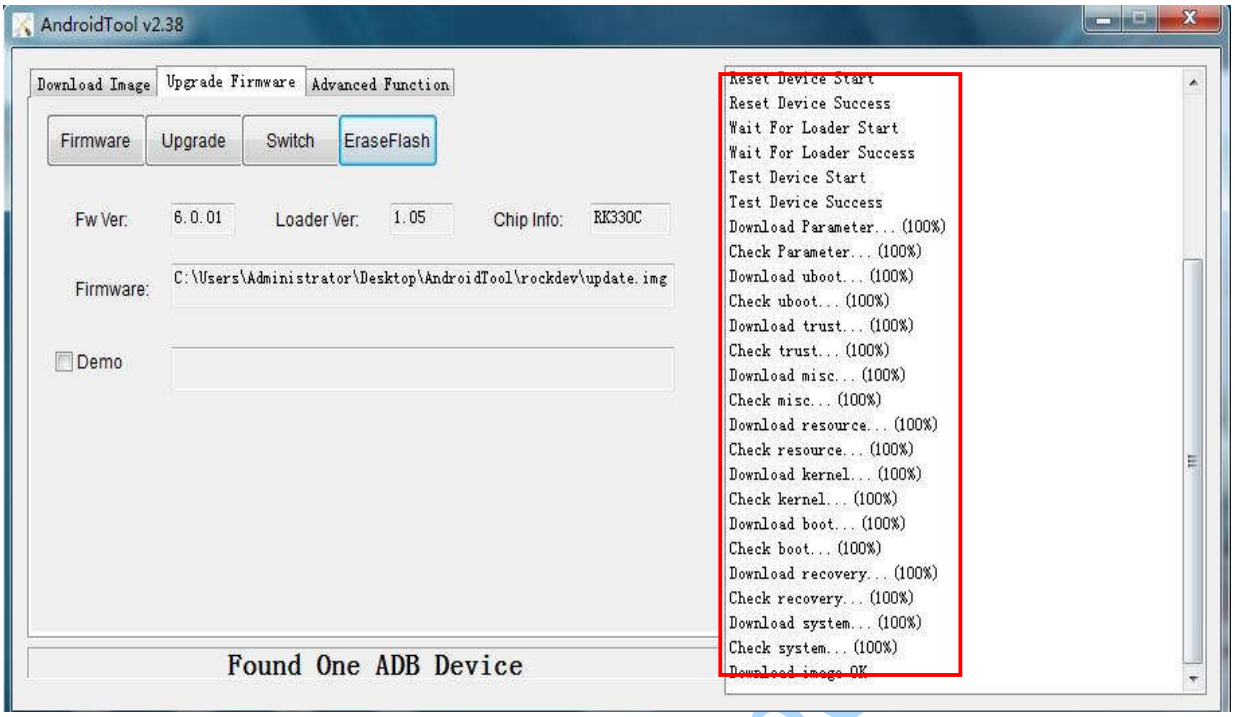


Step 3, select **Firmware** under the **Upgrade Firmware**, and Select the downloaded firmware. Click **Upgrade** start updating firmware.

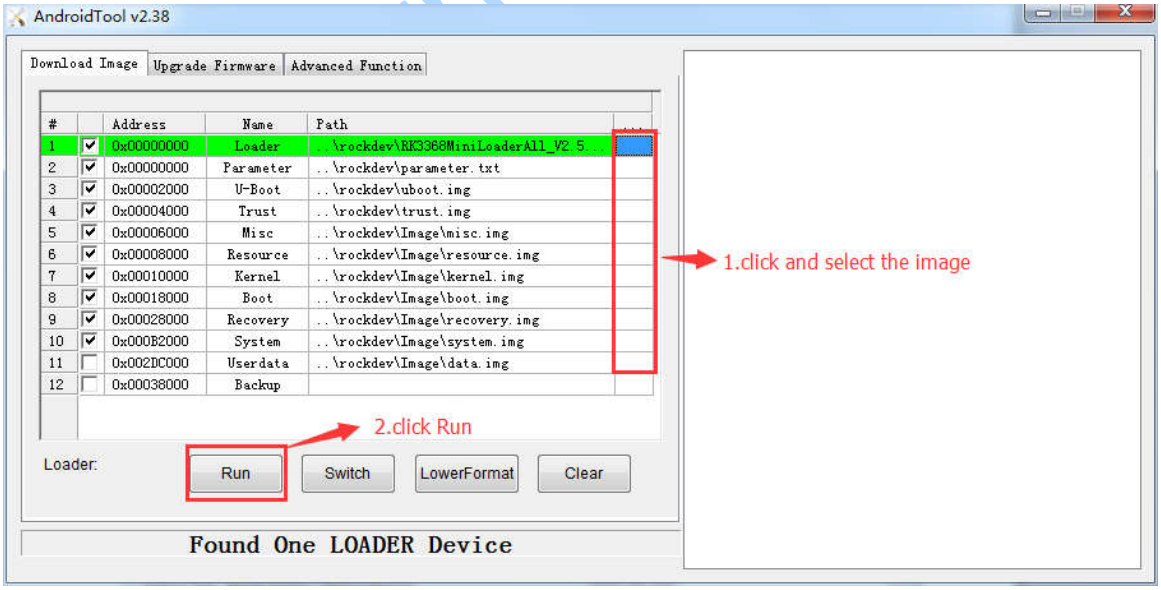


Note: Downloading firmware takes a long time, so please be patient.

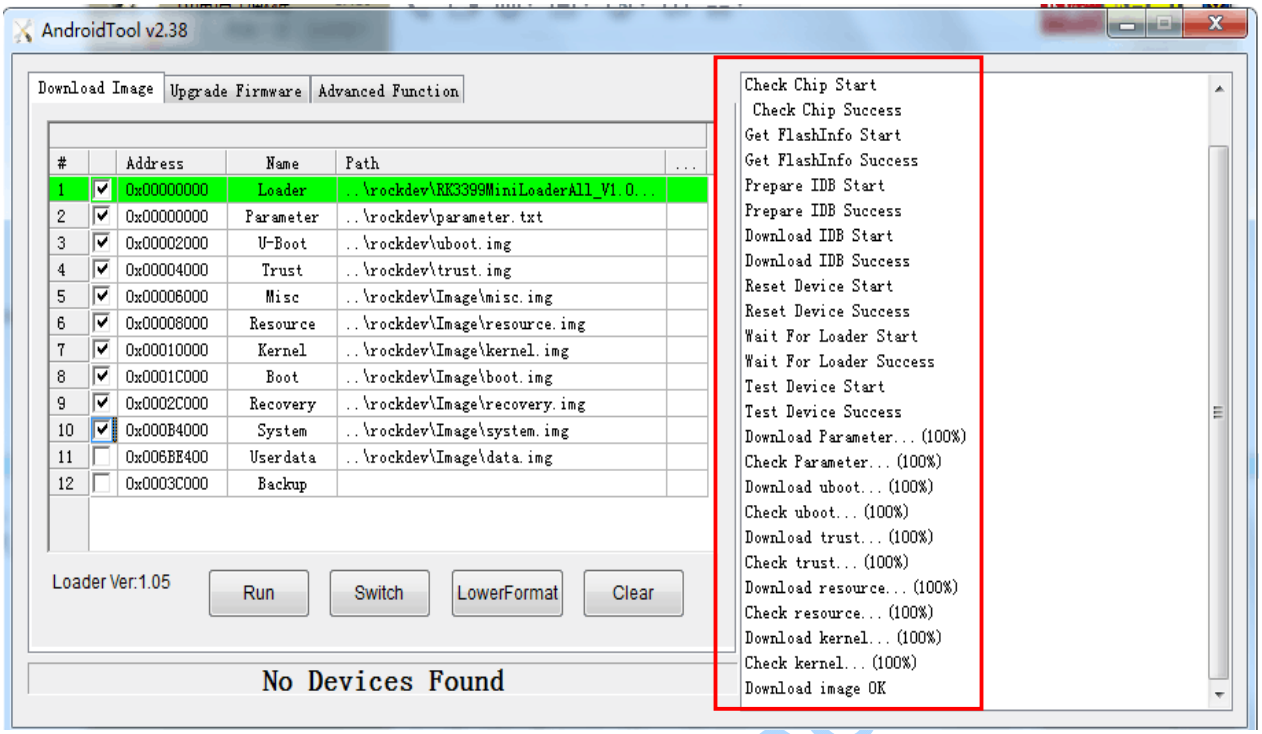
Step 4, When the following message is displayed, indicating that the download is complete.



If necessary, you can choose to update the firmware separating.



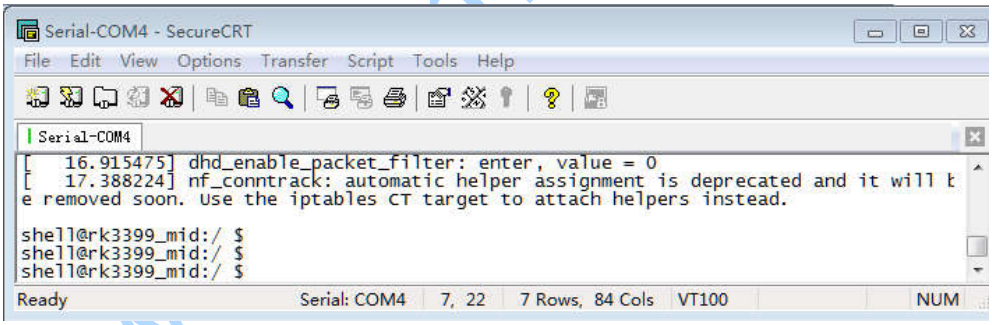
When the following message is displayed, indicating that the download is complete.



6. Android Application Guidance

6.1 Serial terminal

Connect the Serial port to the development board, it will enter android Serial terminal automatically as below.



6.2 HDMI Display

Connect HDMI-OUT interface with HDMI monitor by a HDMI cable, then start up board. After

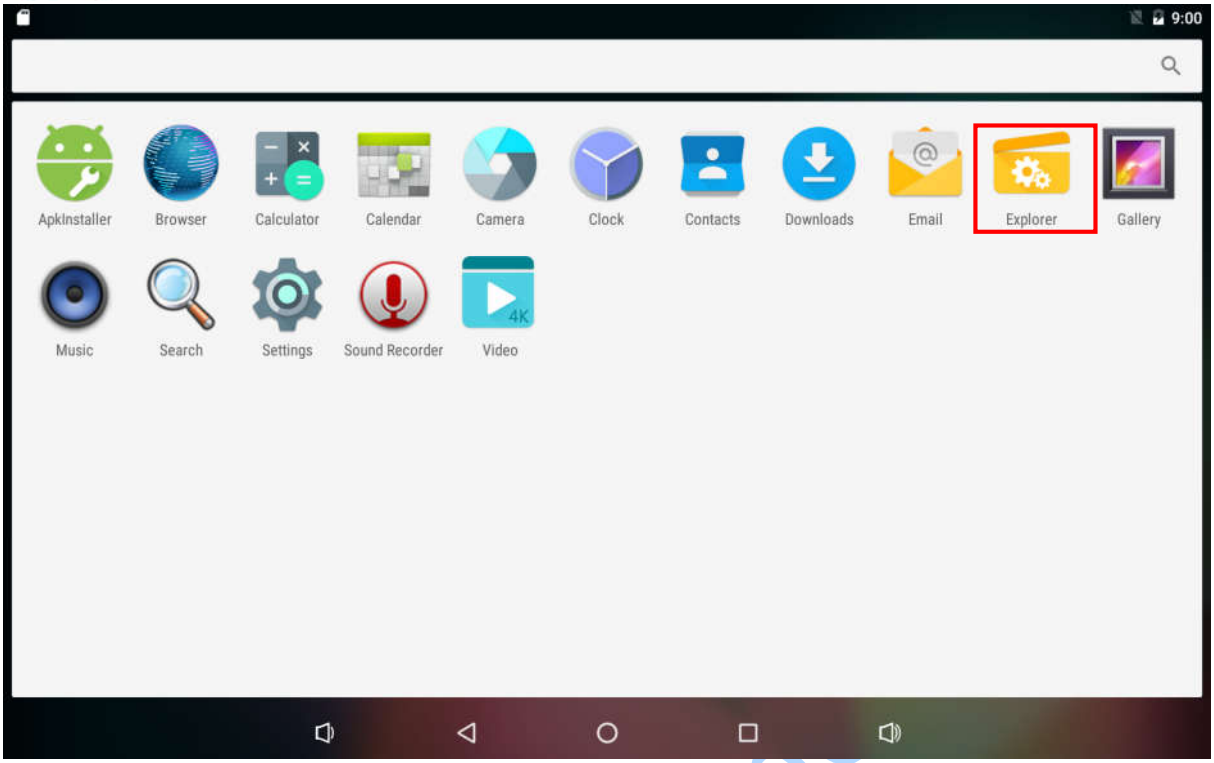
the board boot into android, HDMI monitor will show as below.

6.3 USB Keyboard and USB Mouse

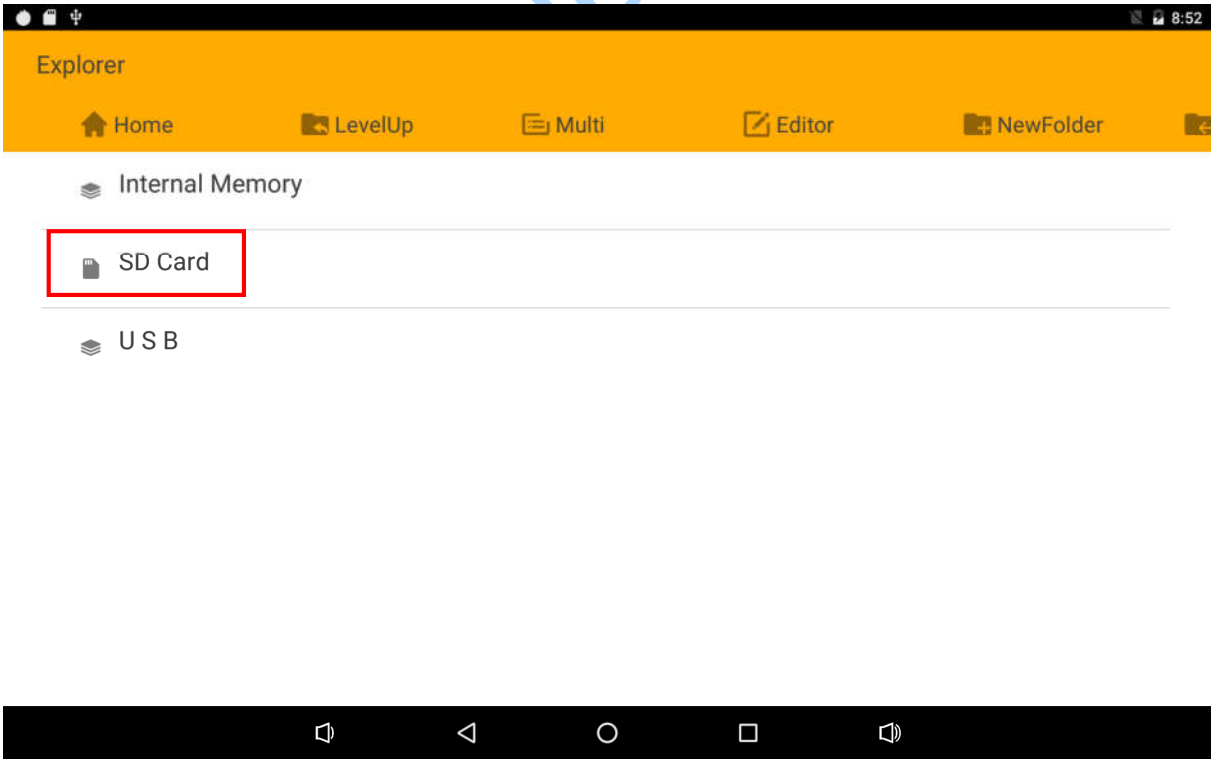
Starts the development board, Insert the USB Mouse or USB keyboard to the usb host port, you can use them in android interface.

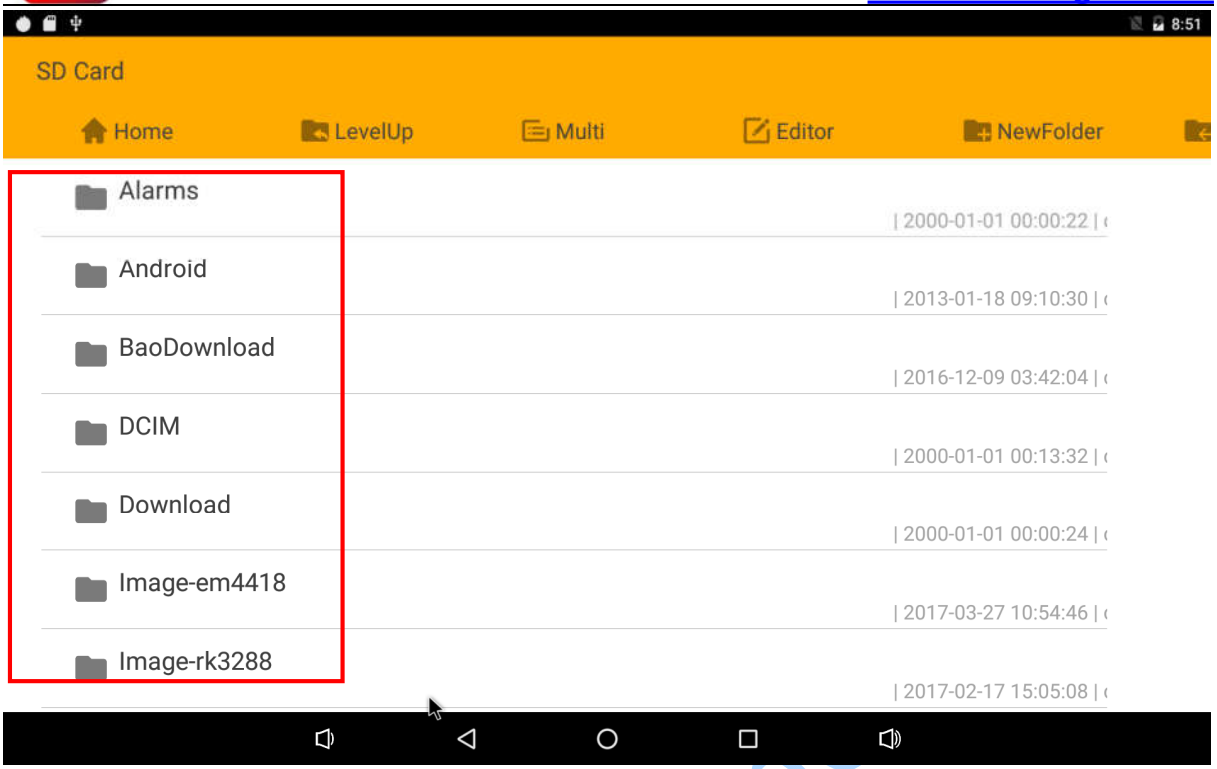
6.4 SD Card

Insert SD card into SD card interface when system is running, system will automatically mount the SD card. You can view pictures in the SD card through picture browser. Play video in the SD card through video player, or view the files in SD card through **Explorer** as follow:



Click “SD Card”:

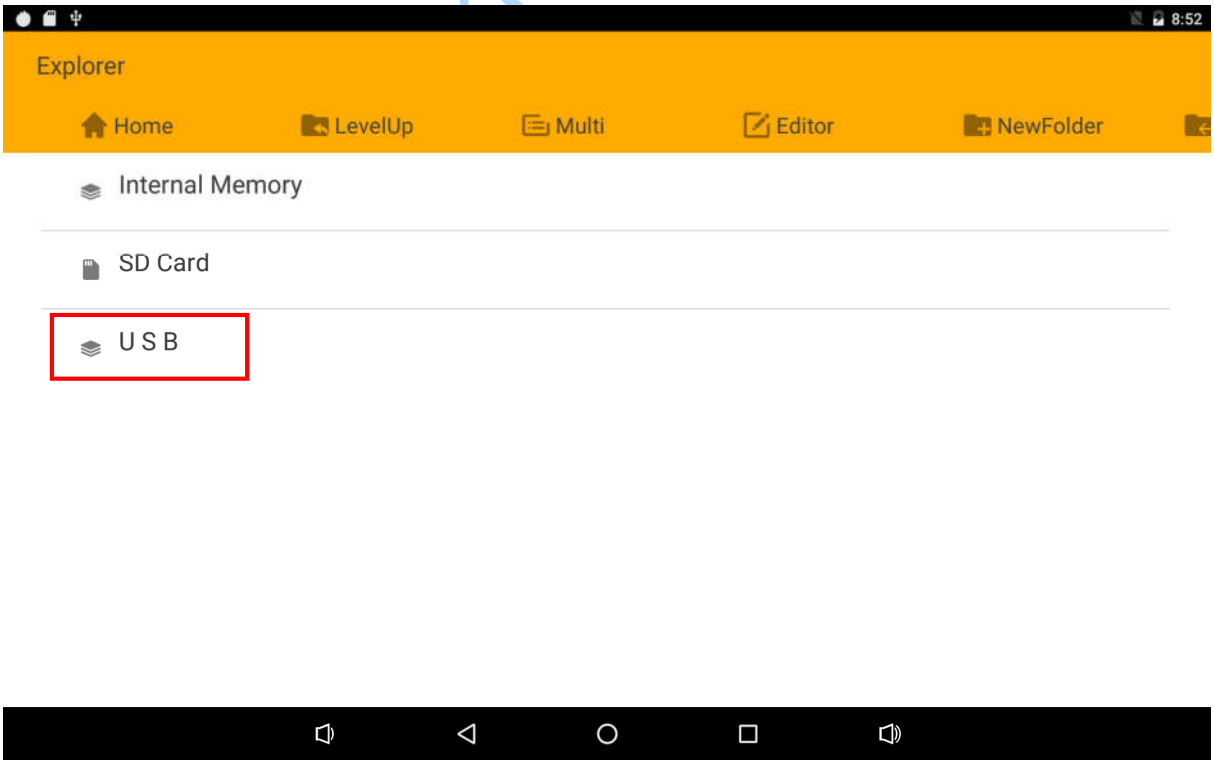




NOTICE: when the board is running, don't pull out the SD card, which may not recognize the SD card.

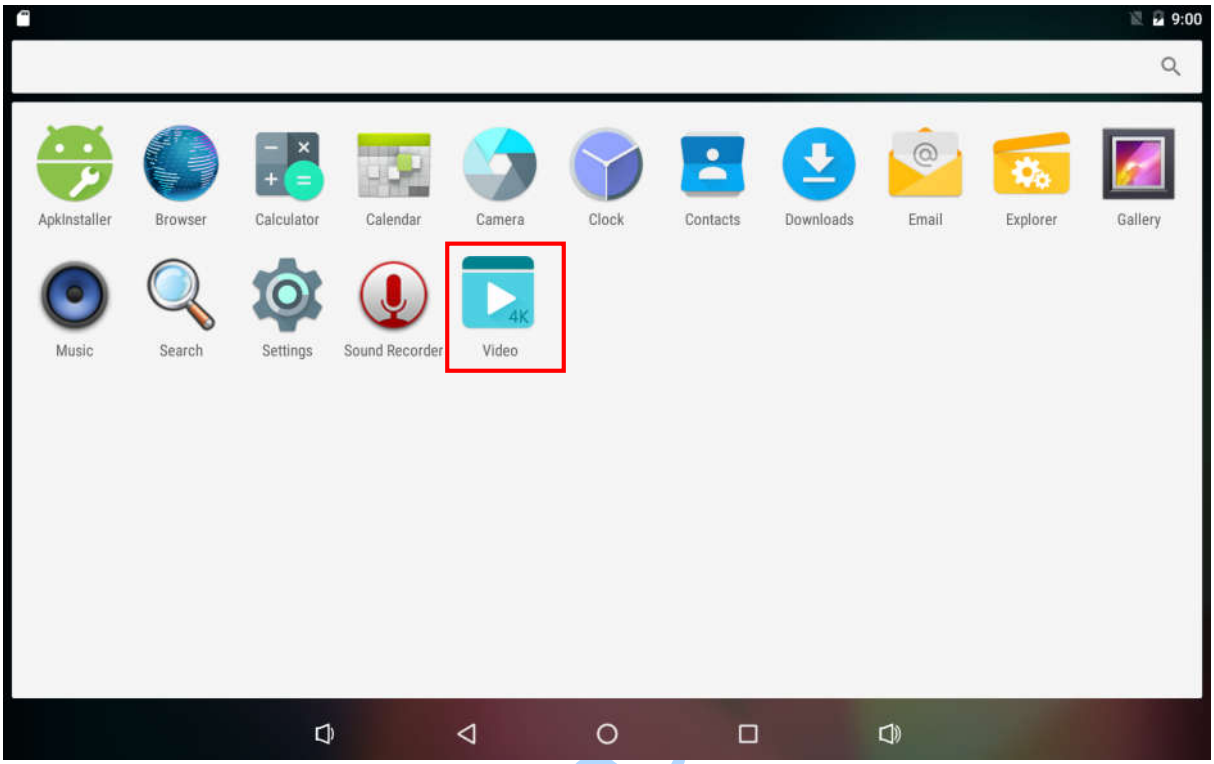
6.5 USB mass Storage

Insert USB mass storage device (e.g. U disk) to USB interface，then use it like SD.



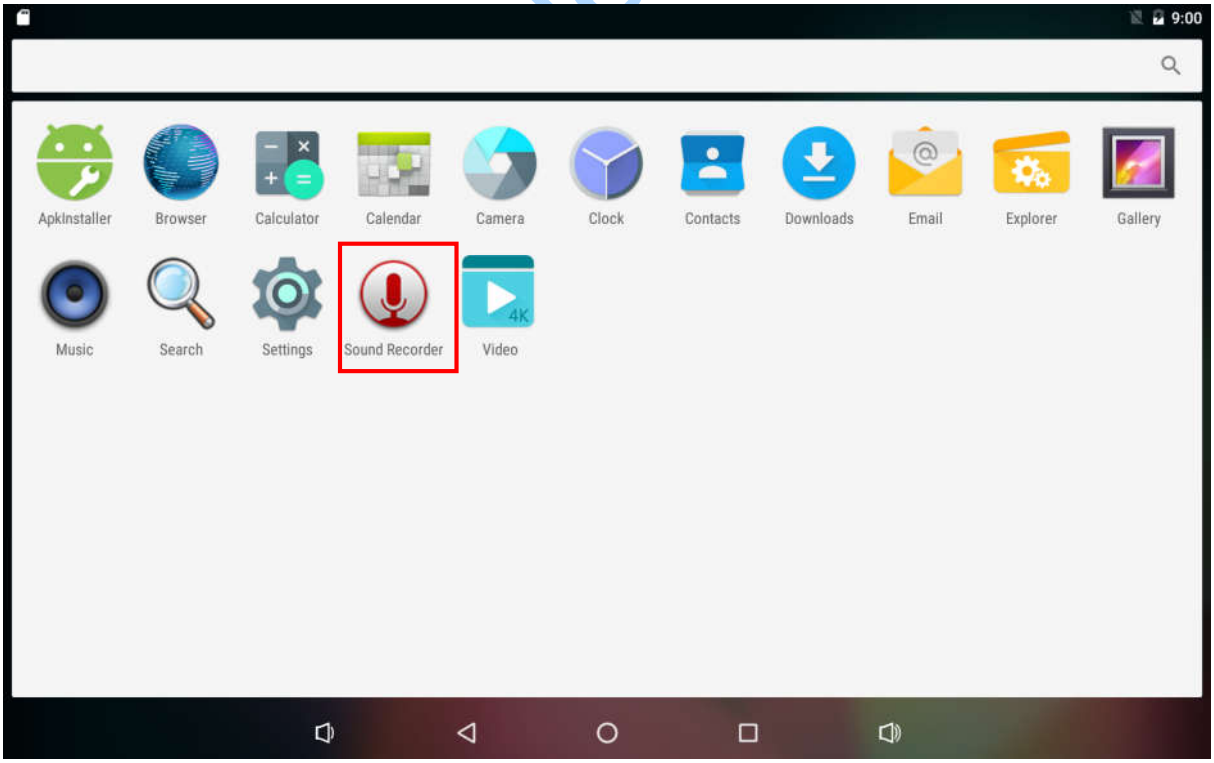
6.6 Video player

Put some MP4 files to the SD card and insert the SD card to the development board. Star up the board and run video, and click the video file, then the speaker will appear player, as the follow chart:



6.7 Record

Inserted the headset and use the APP Recorder as below.



6.8 RTC

Step 1, at the terminal of the board, run **hwclock**.

```
# su
# hwclock
```

Step 2, Wait a minute then run **hwclock** again, you can see the latest time.

```
# hwclock
shell@rk3399_mid:/ $ su
root@rk3399_mid:/ # hwclock
Fri Jan 18 08:50:33 2013  0.000000 seconds
root@rk3399_mid:/ # hwclock
Fri Jan 18 08:51:01 2013  0.000000 seconds
root@rk3399_mid:/ #
```

6.9 Ethernet

By default, The Ethernet is enabled. The IP mode is dhcp, it will automatically connect to the Internet. You can **ping** at terminal to test the network or go on the Internet.

```
# su
# ping www.baidu.com
```

6.10 WiFi

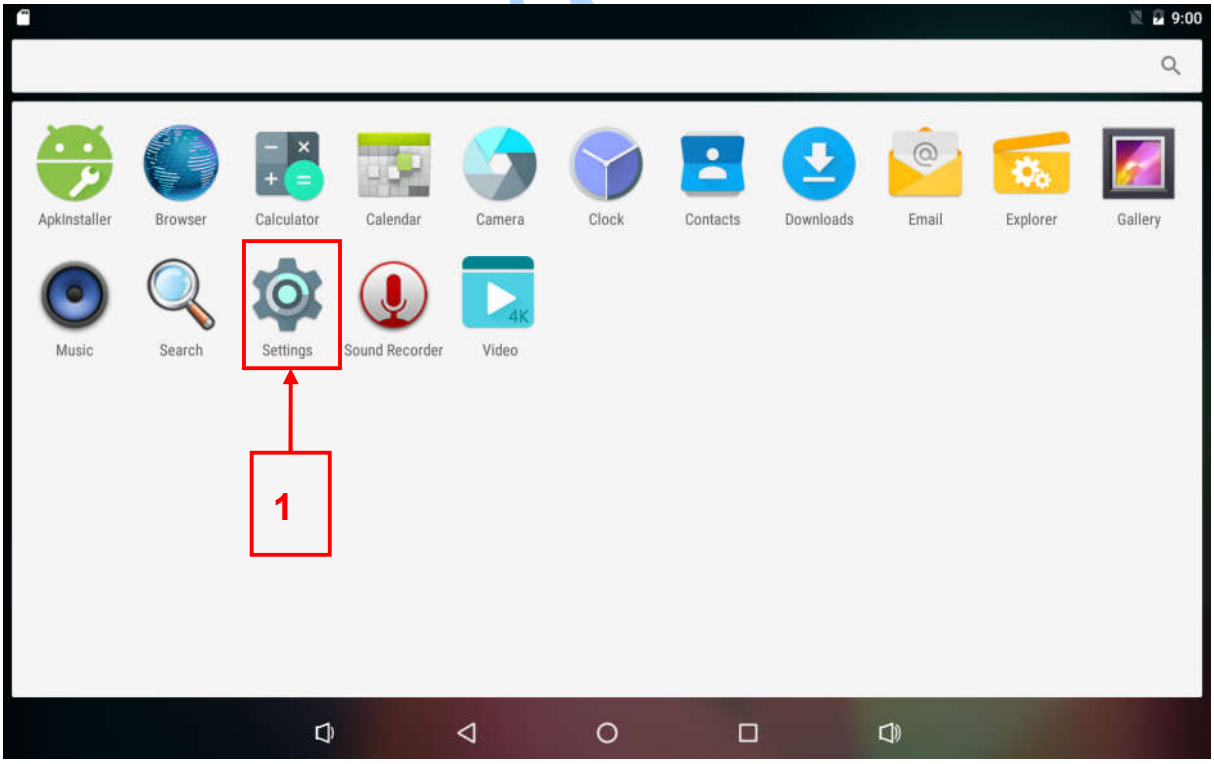
Step 1, Connect WiFi antenna.

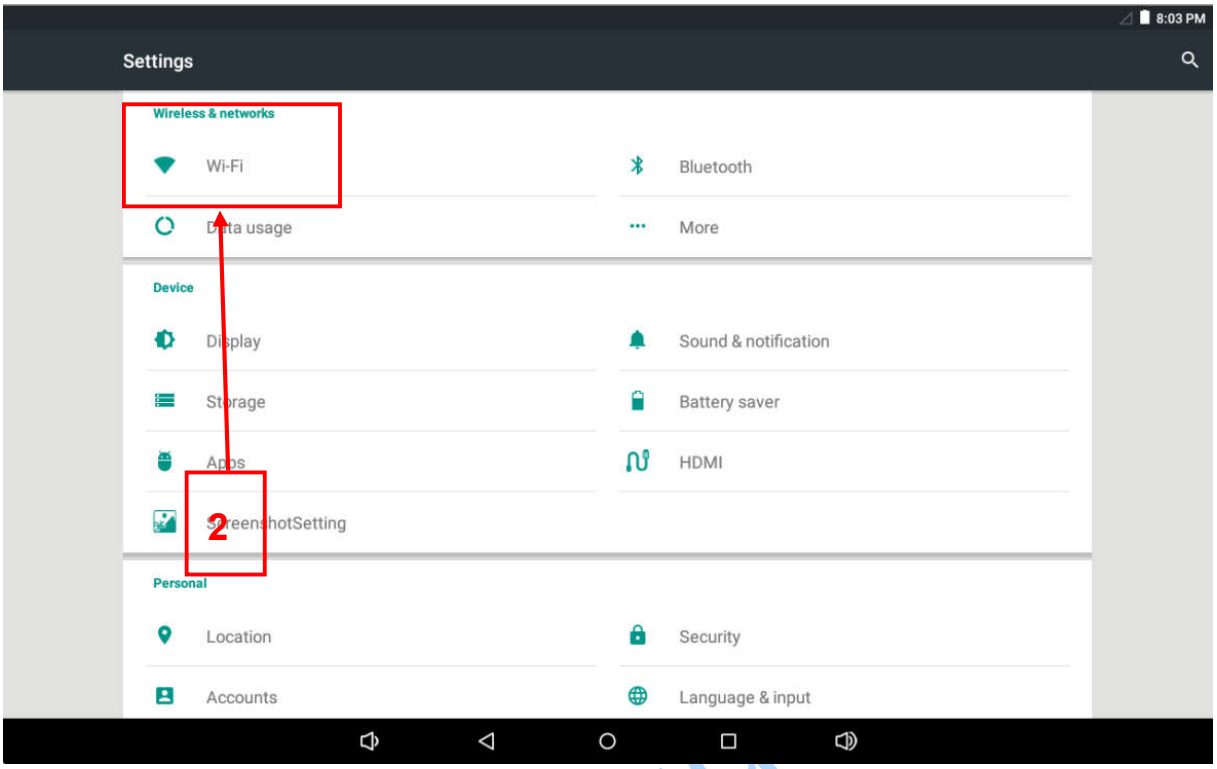
Step 2, Make sure menu option Settings->WIRELESS&NETWORK->Wi-Fi… was on.

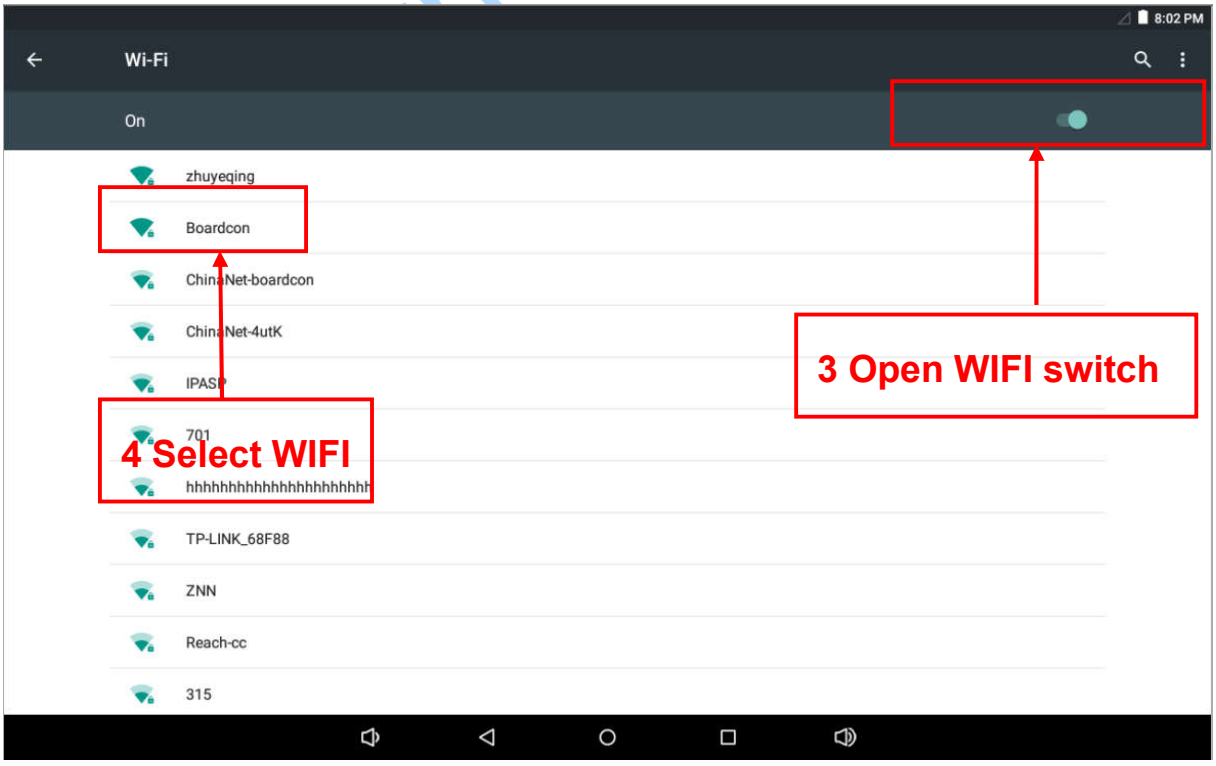
Step 3, Enter WIFI and it will scan AP automatically.

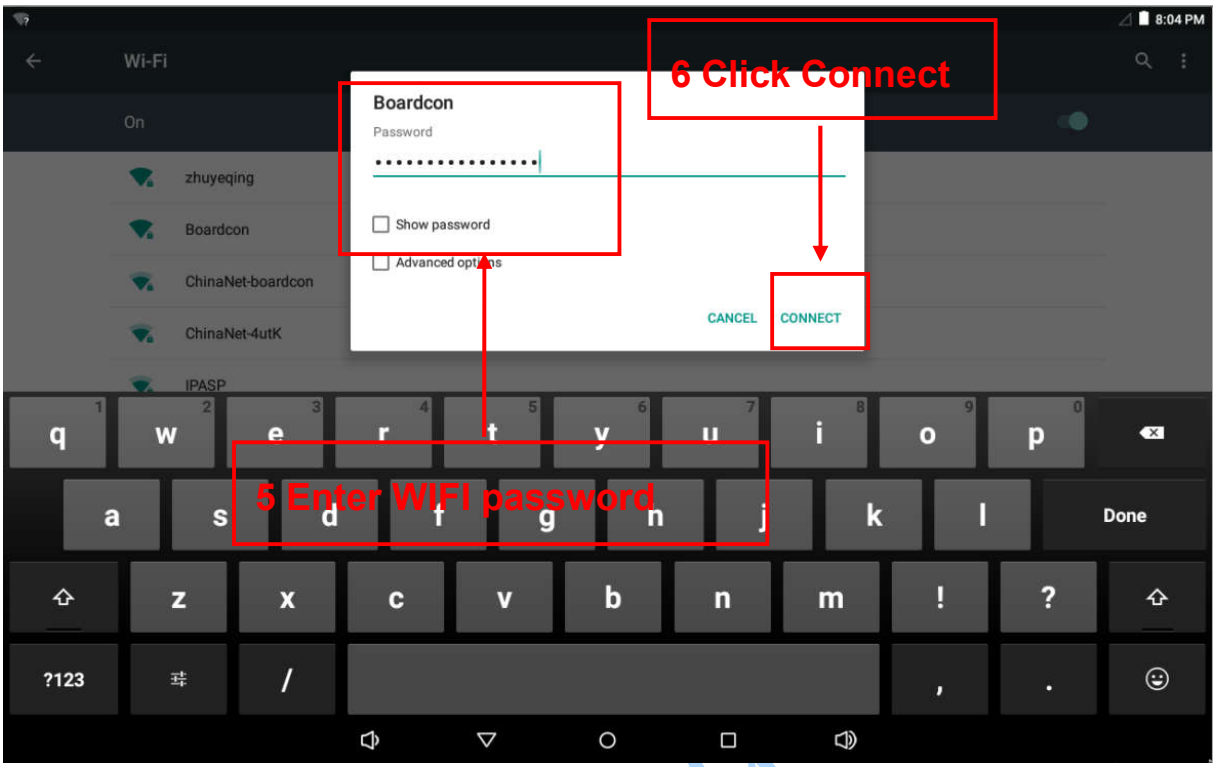
Step 4, Select AP and type password. There is Wi-Fi icon in the status bar if connected.

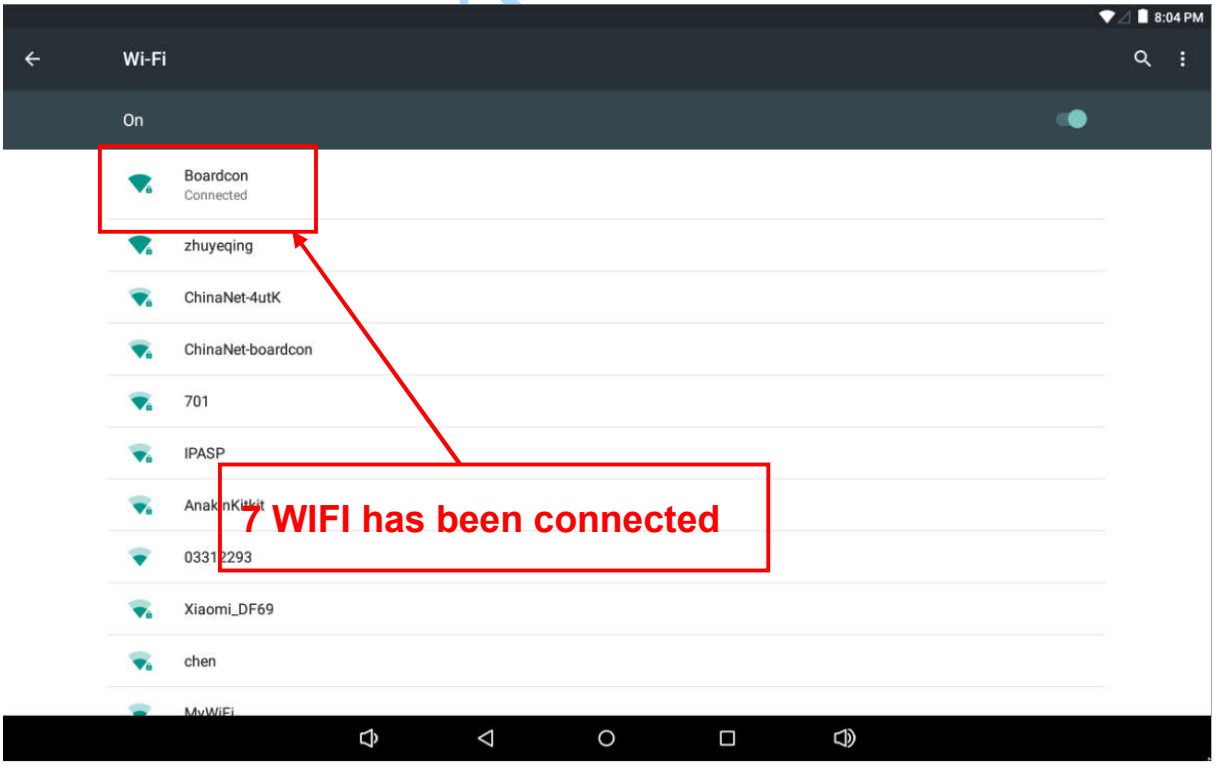
Step 5, Open Internet Browser to browse the Web

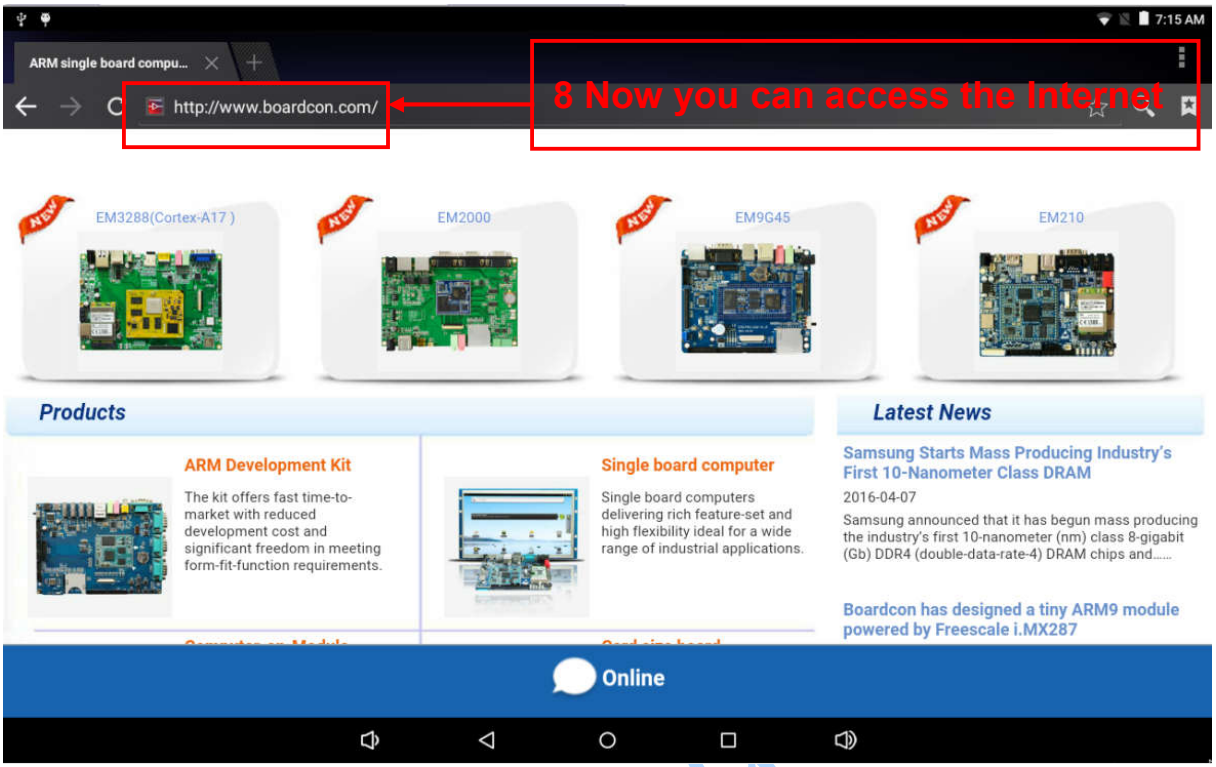



8:03 PM
Settings
Wireless & networks
Wi-Fi
Bluetooth
Data usage
More
Device
Display
Sound & notification
Storage
Battery saver
Apps
HDMI
ScreenshotSetting
2
Personal
Location
Security
Accounts
Language & input

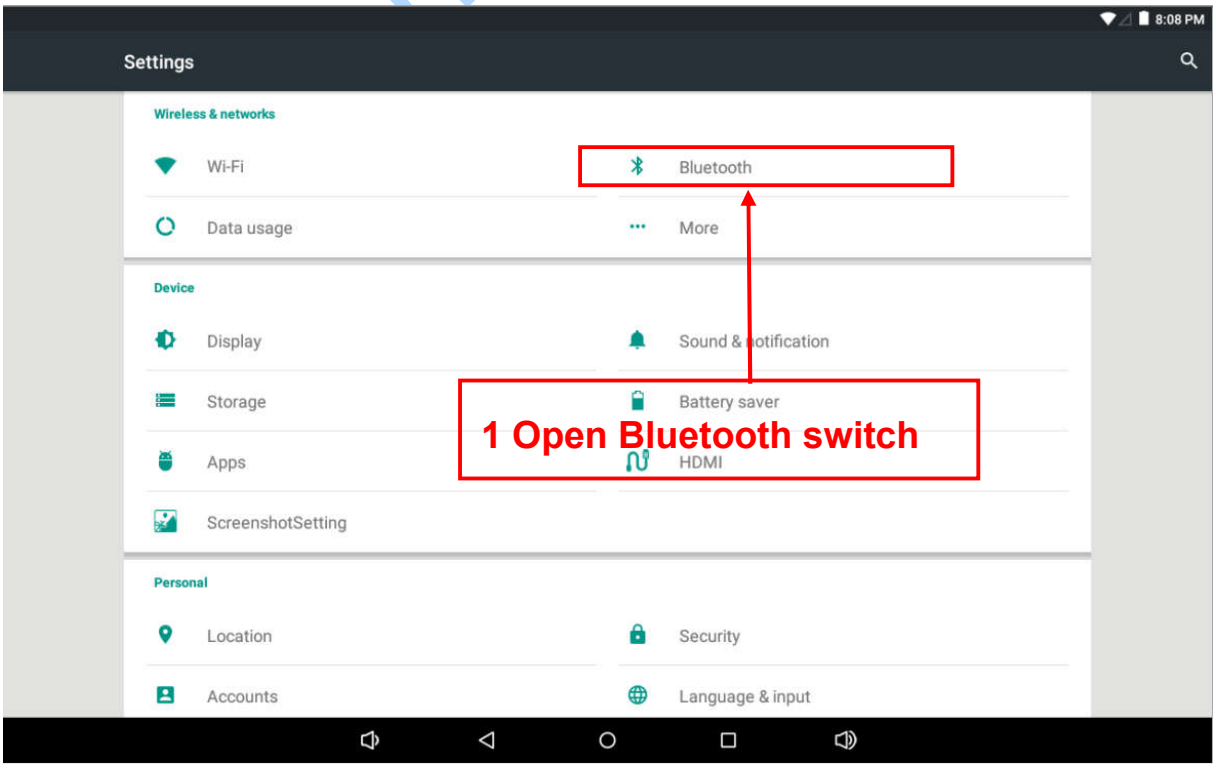

8:02 PM
Wi-Fi
On
zhuyeqing
Boardcon
ChinaNet-boardcon
ChinaNet-4utK
IPASS
701
TP-LINK_68F88
ZNN
Reach-cc
315
3 Open WIFI switch
4 Select WIFI

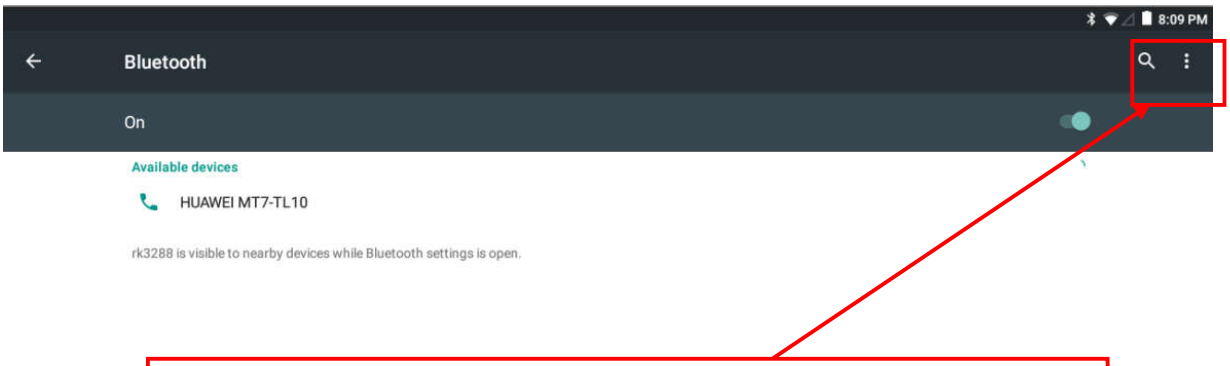

8:04 PM
Wi-Fi
On
zhuyeqing
Boardcon
ChinaNet-boardcon
ChinaNet-4utK
IPASP
Boardcon
Password
Show password
Advanced options
CANCEL
CONNECT
6 Click Connect
5 Enter WIFI password
Done


8:04 PM
Wi-Fi
On
Boardcon
Connected
zhuyeqing
ChinaNet-4utK
ChinaNet-boardcon
701
IPASP
03312293
Xiaomi_DF69
chen
7 WIFI has been connected

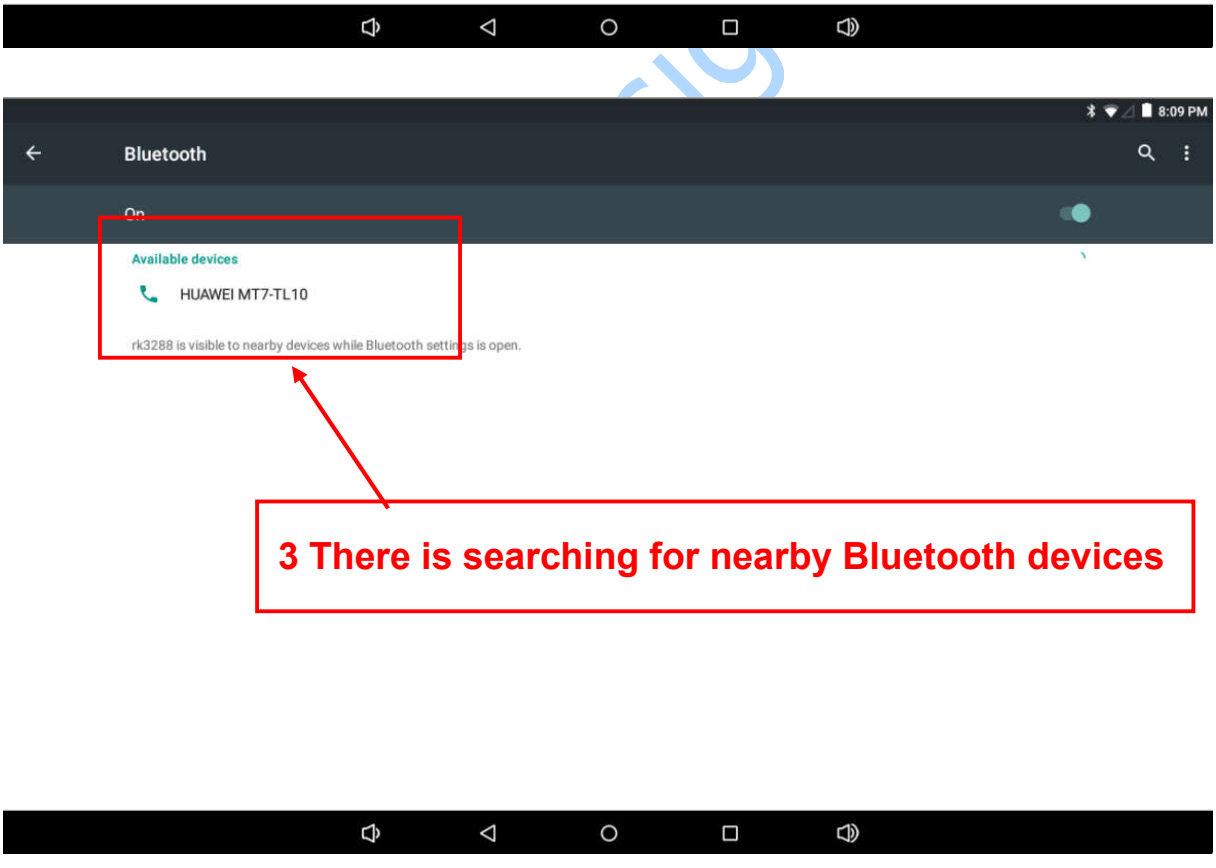


6.11 Bluetooth

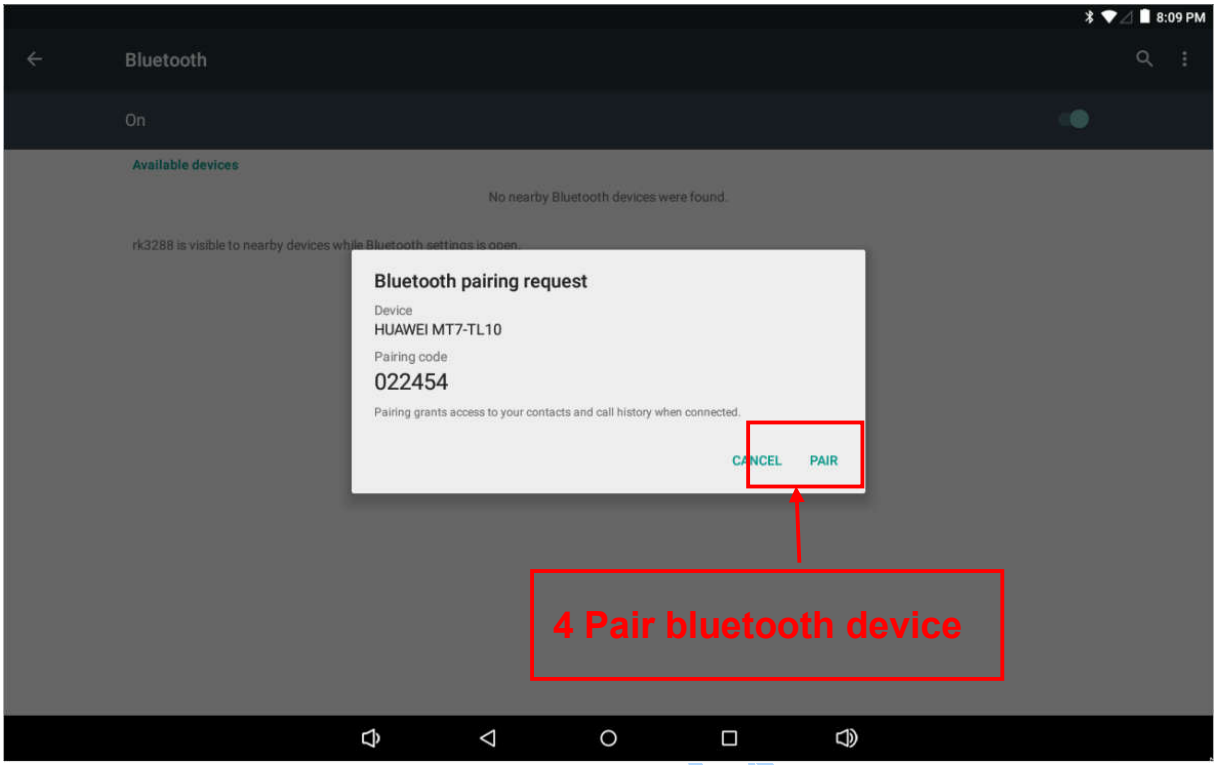




2 Click here refresh to scan the Bluetooth device

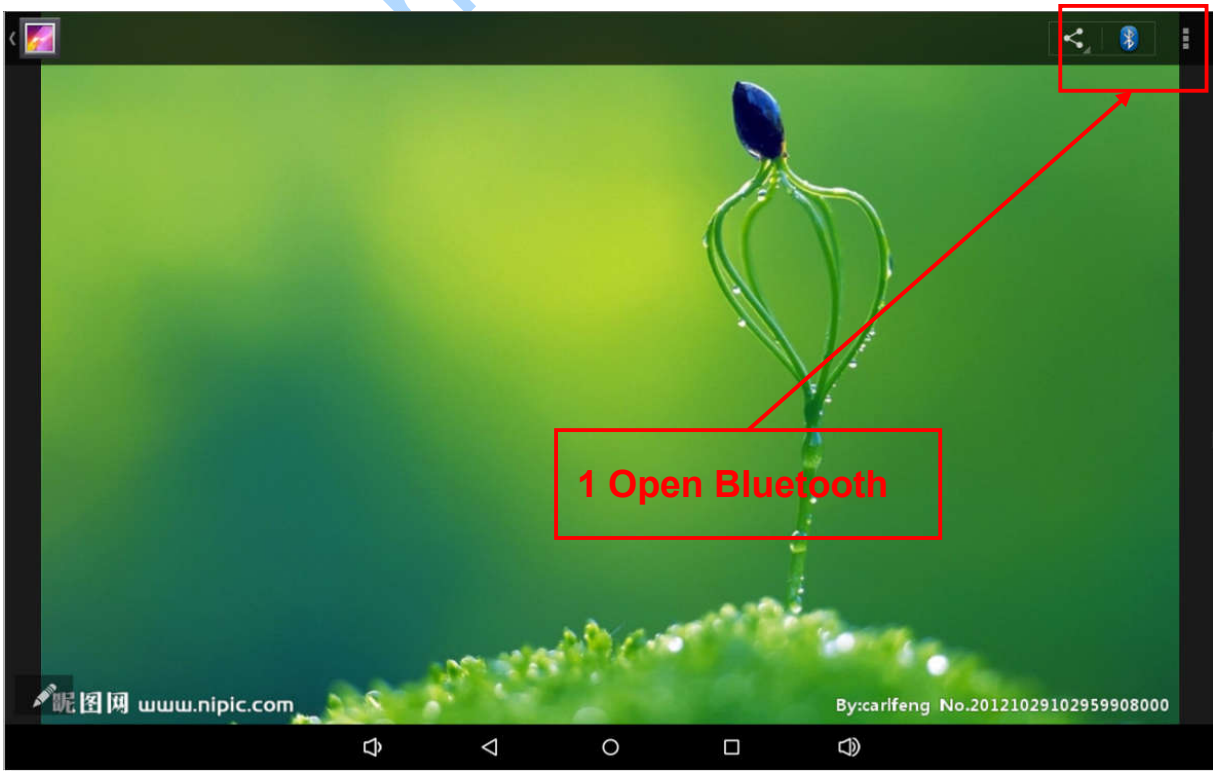


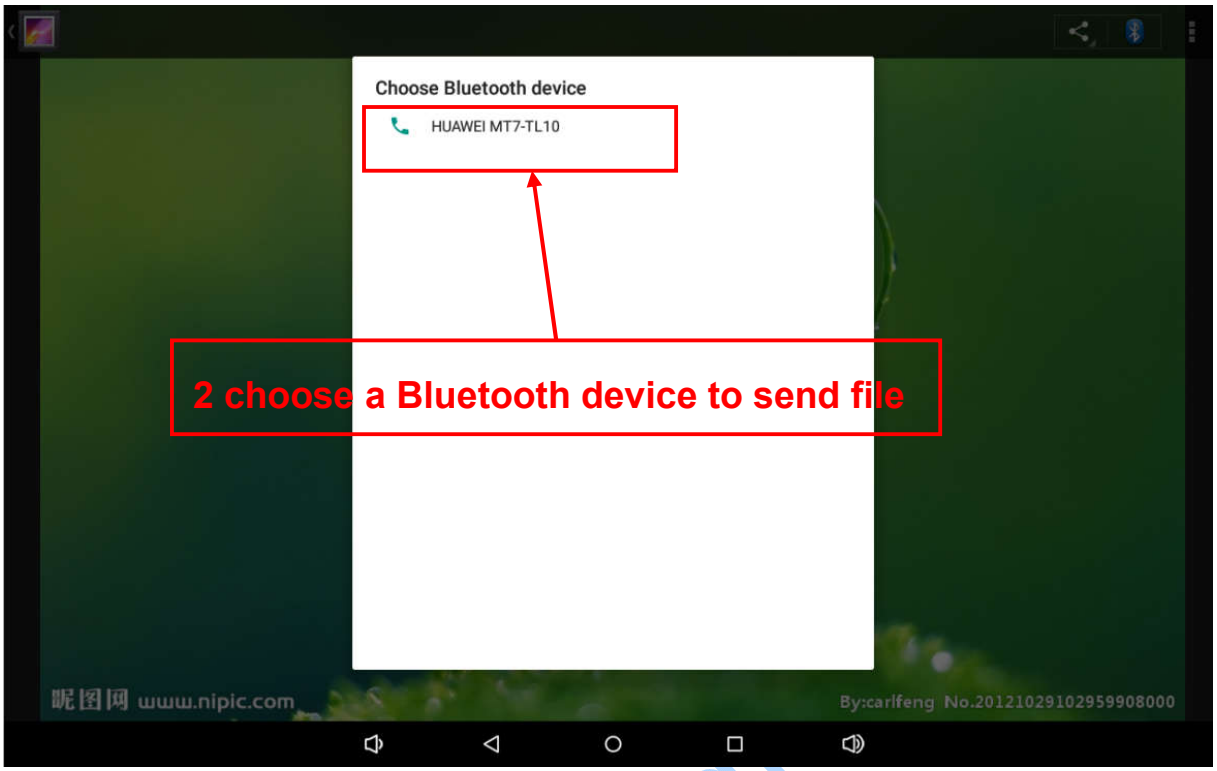
3 There is searching for nearby Bluetooth devices

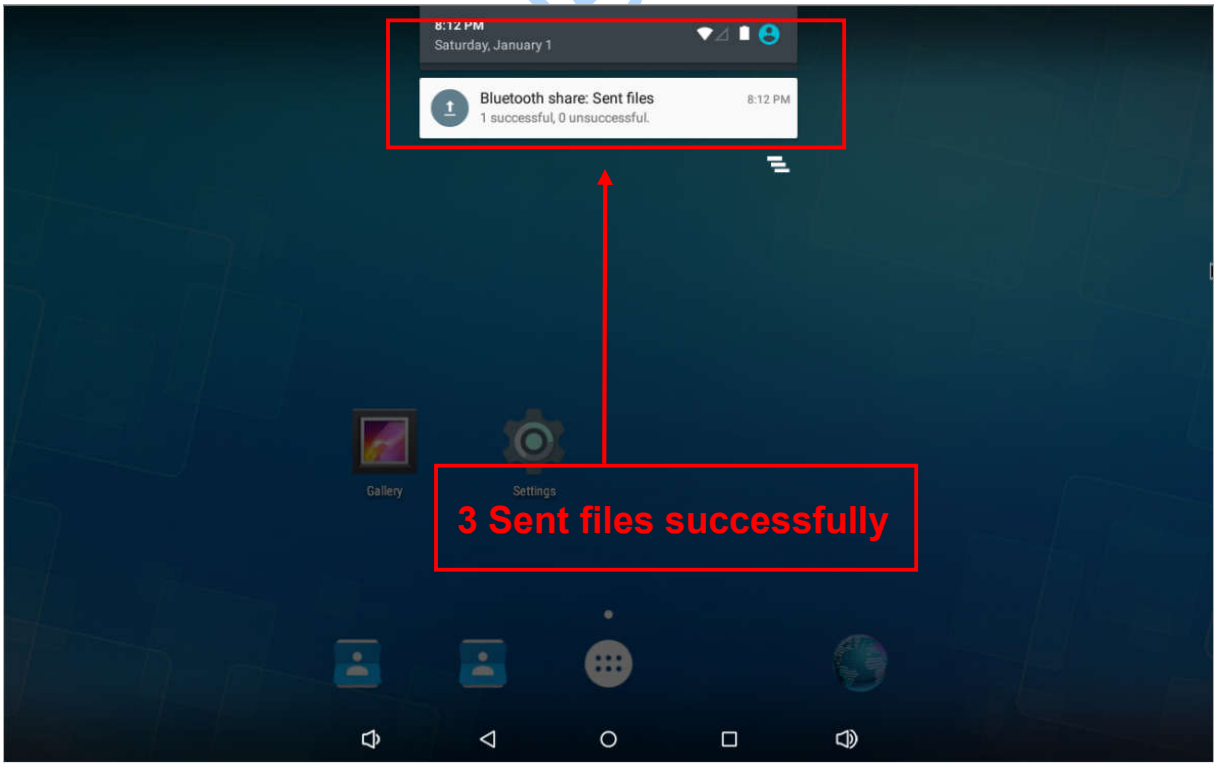


1. Send file to receive device via Bluetooth.

Send a picture for example：

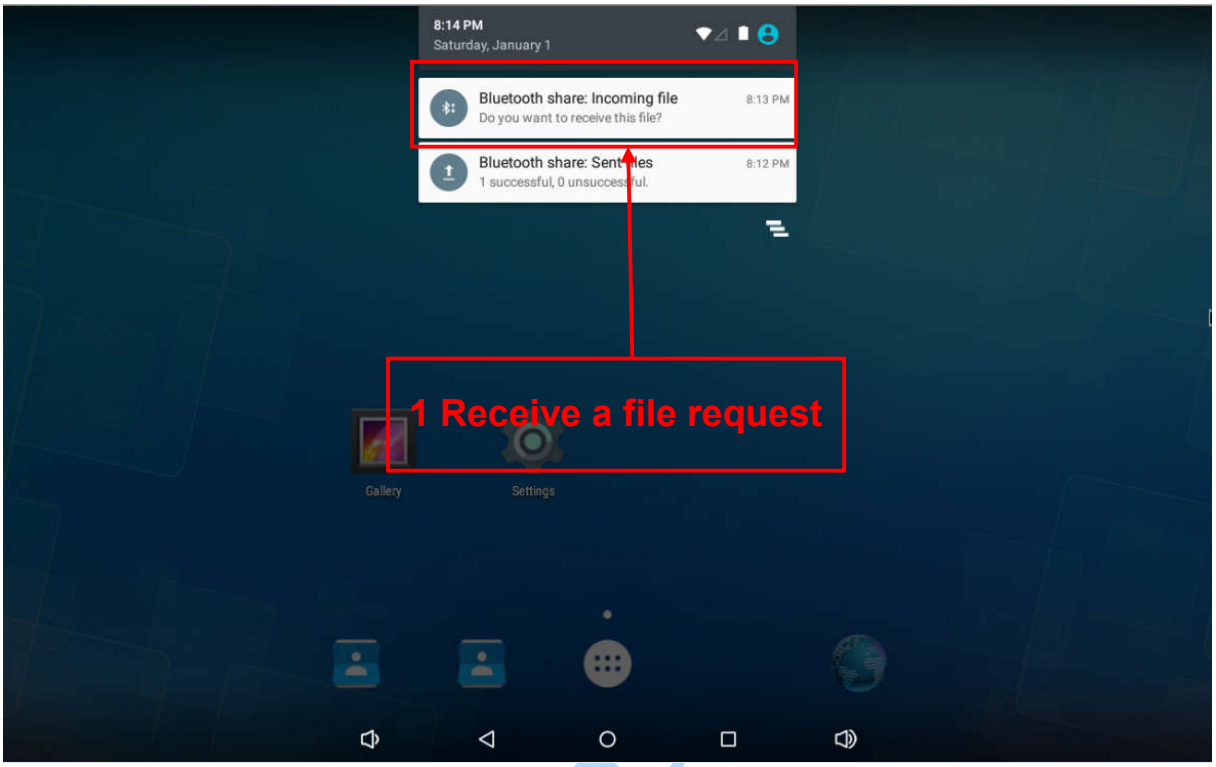


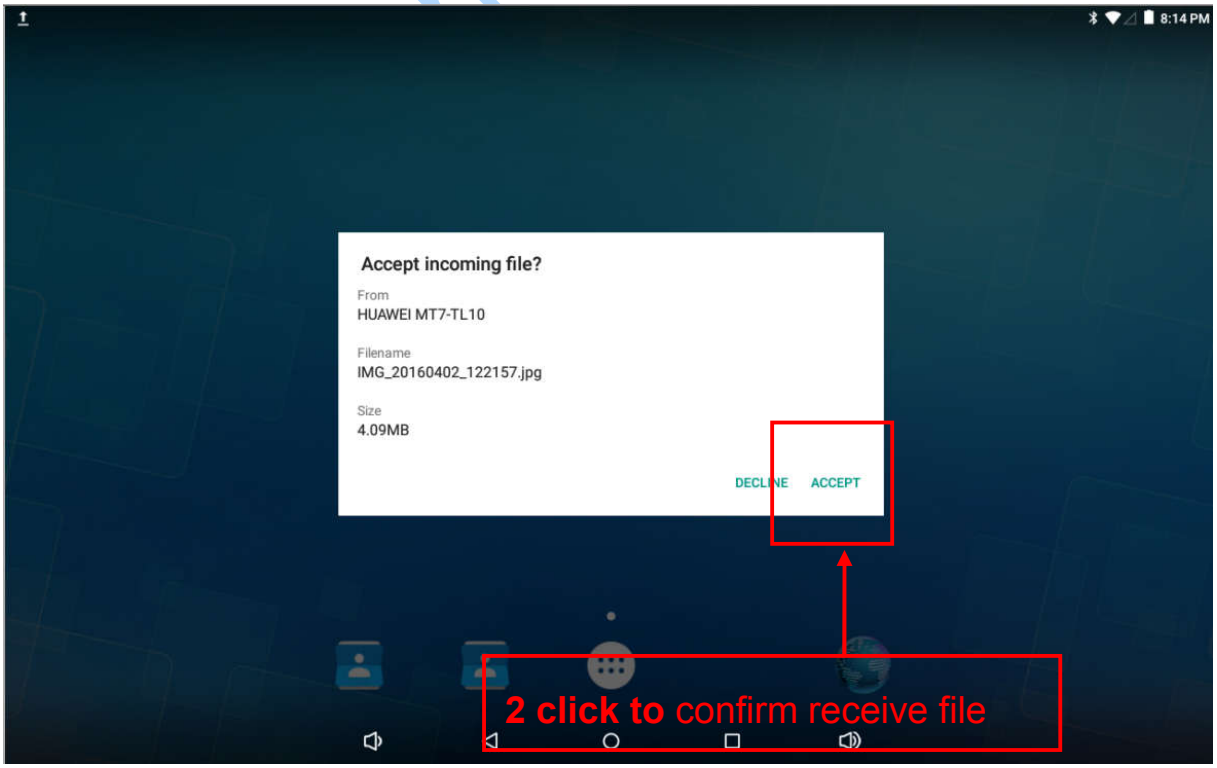

Choose Bluetooth device
HUAWEI MT7-TL10
2 choose a Bluetooth device to send file
昵图网 www.nipic.com
By:carlfeng No.20121029102959908000

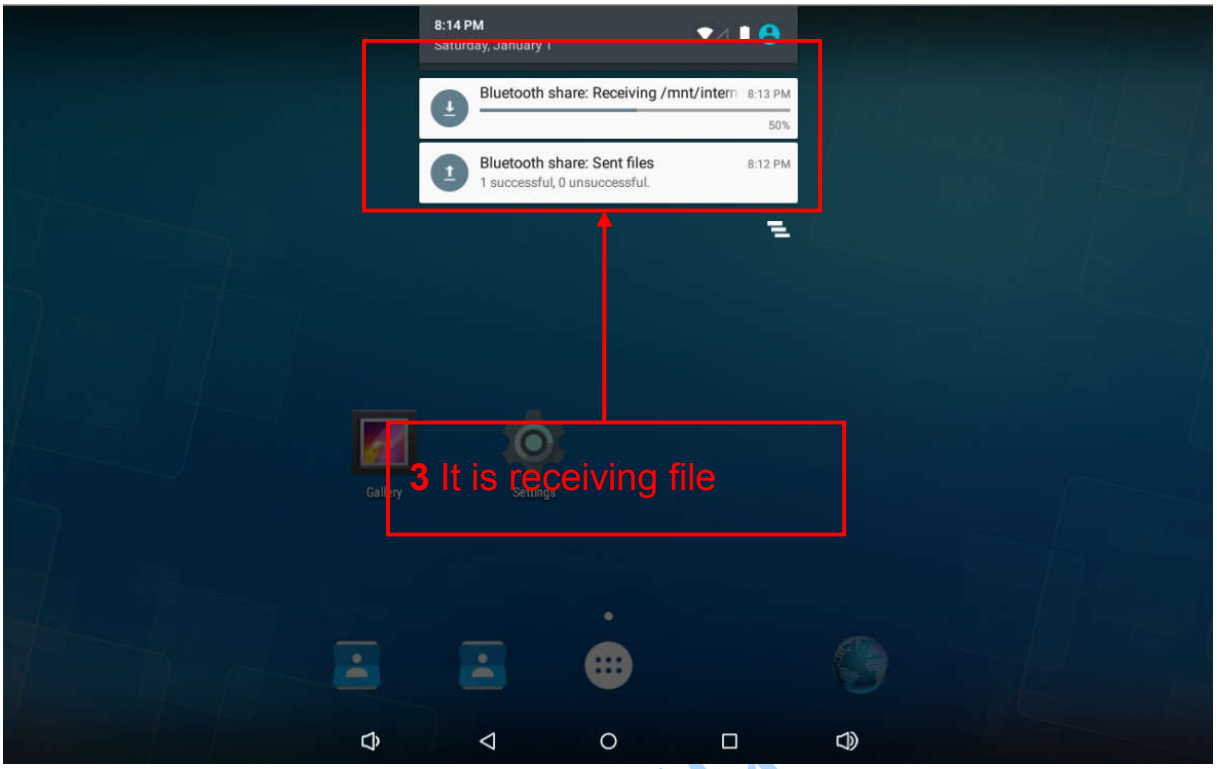

8:12 PM
Saturday, January 1
Bluetooth share: Sent files
1 successful, 0 unsuccessful.
8:12 PM
Gallery
Settings
3 Sent files successfully

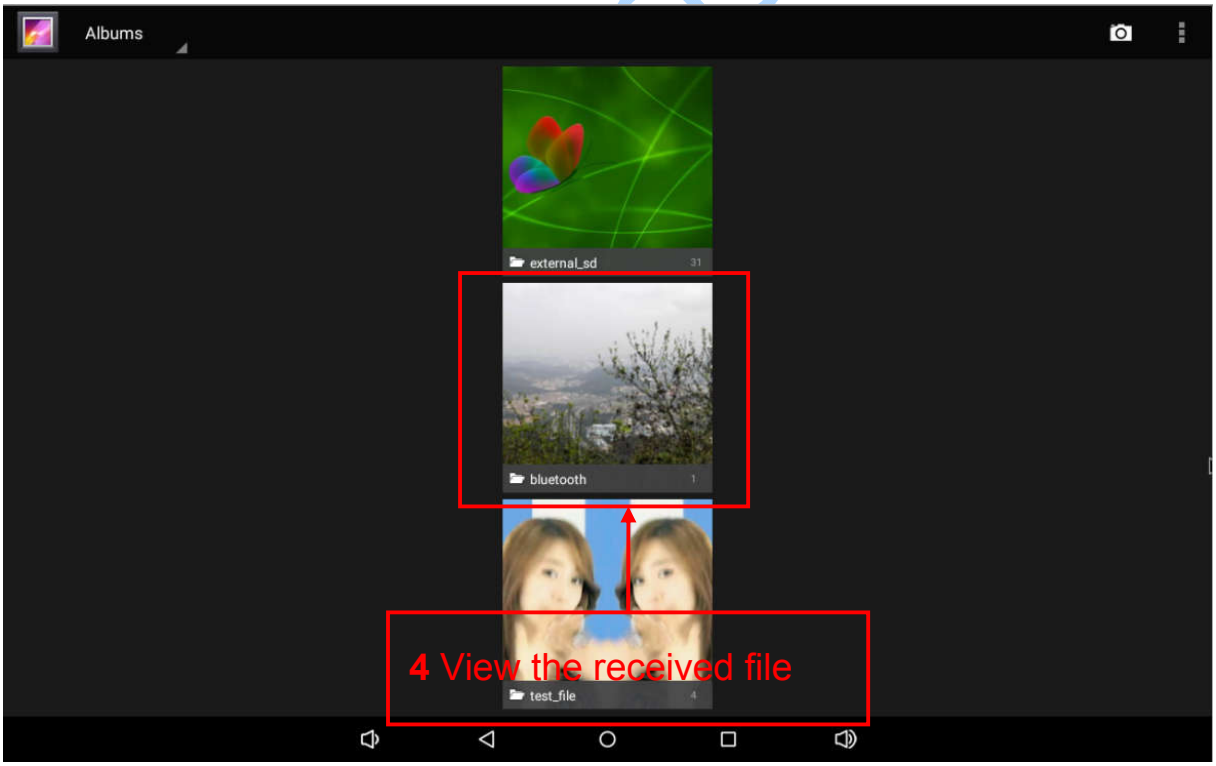
2. Receive file from send device via Bluetooth.

Receive a picture for example：









6.12 Type c to RJ45

Connect the TYPE-C Multi-function LAN Adapter to the development board, Serial terminal will send message as below.

```
shell@rk3399_mid:/ $
shell@rk3399_mid:/ $ [   44.769170] fusb302 1-0022: cc connected in 0 as DFP
[   47.034487] fusb302 1-0022: PD disabled
[   47.040490] cdn-dp-fb fec00000.dp-fb: dp lanes is 0, and same with last time
[   47.067806] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   47.067915] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 7
[   47.069203] xhci-hcd xhci-hcd.2.auto: hcc params 0x0220fe64 hci version 0x110 quirks 0x00030010
[   47.069274] xhci-hcd xhci-hcd.2.auto: irq 227, io mem 0xfe800000
[   47.069700] usb usb7: New USB device found, idVendor=1d6b, idProduct=0002
[   47.069747] usb usb7: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   47.069777] usb usb7: Product: xHCI Host Controller
[   47.069805] usb usb7: Manufacturer: Linux 4.4.36 xhci-hcd
[   47.069829] usb usb7: SerialNumber: xhci-hcd.2.auto
[   47.071068] type=1400 audit(1358499048.386:25): avc: denied { create } for pid=37 comm="kdevtmpfs" name="007" scontext=u:r:kernel
:s0 tcontext=u:object_r:device:s0 tclass=dir permissive=1
[   47.075714] hub 7-0:1.0: USB hub found
[   47.075838] hub 7-0:1.0: 1 port detected
[   47.076710] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   47.076769] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 8
[   47.076963] usb usb8: We don't know the algorithms for LPM for this host, disabling LPM.
[   47.077234] usb usb8: New USB device found, idVendor=1d6b, idProduct=0003
[   47.077269] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   47.077299] usb usb8: Product: xHCI Host Controller
[   47.077325] usb usb8: Manufacturer: Linux 4.4.36 xhci-hcd
[   47.077351] usb usb8: SerialNumber: xhci-hcd.2.auto
[   47.080480] hub 8-0:1.0: USB hub found
[   47.080606] hub 8-0:1.0: 1 port detected
[   47.081384] rockchip-dwc3 usb@fe800000: USB HOST connected
[   47.379937] usb 7-1: new high-speed USB device number 2 using xhci-hcd
[   47.387722] usb 8-1: new SuperSpeed USB device number 2 using xhci-hcd
[   47.405645] usb 8-1: New USB device found, idVendor=05e3, idProduct=0612
[   47.405753] usb 8-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[   47.405787] usb 8-1: Product: USB3.0 Hub
[   47.405812] usb 8-1: Manufacturer: GenesysLogic
[   47.414427] hub 8-1:1.0: USB hub found
[   47.415905] hub 8-1:1.0: 4 ports detected
[   47.512069] usb 7-1: New USB device found, idVendor=05e3, idProduct=0610
[   47.512113] usb 7-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[   47.512129] usb 7-1: Product: USB2.0 Hub
[   47.512141] usb 7-1: Manufacturer: GenesysLogic
[   47.526685] hub 7-1:1.0: USB hub found
[   47.528197] hub 7-1:1.0: 4 ports detected
[   47.829934] usb 7-1.4: new high-speed USB device number 3 using xhci-hcd
[   47.912415] usb 7-1.4: New USB device found, idVendor=0bda, idProduct=8152
[   47.912513] usb 7-1.4: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[   47.912546] usb 7-1.4: Product: USB 10/100 LAN
[   47.912572] usb 7-1.4: Manufacturer: Realtek
[   47.912597] usb 7-1.4: SerialNumber: 00E04C361167
[   48.101089] usb 7-1.4: reset high-speed USB device number 3 using xhci-hcd
[   48.234331] r8152 7-1.4:1.0 eth1: v1.08.2
```

This means the connection is ok,you can test type-c to RJ45 with the commands as below.

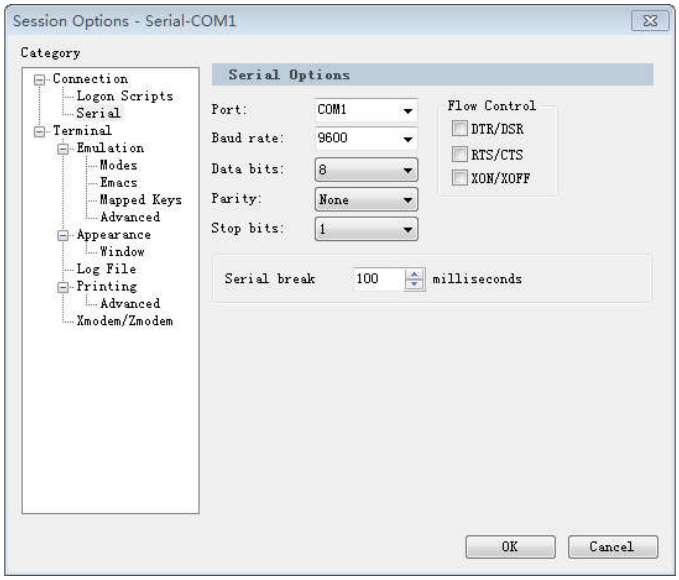
```
# su
# ifconfig eth0 down
# ifconfig eth1 192.168.0.189 up
# route add default gw 192.168.0.2 dev eth1
# ping 192.168.0.2
```

6.13 Type c to RS232

Connect the TYPE-C to RS232 Adapter to the development board, Serial terminal will send message as below.

```
shell@rk3399_mid:/ $
shell@rk3399_mid:/ $ [   44.374305] fusb302 1-0022: cc connected in 0 as DFP
[   46.645422] fusb302 1-0022: PD disabled
[   46.650921] cdn-dp-fb fec00000.dp-fb: dp lanes is 0, and same with last time
[   46.683856] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   46.683953] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 7
[   46.685332] xhci-hcd xhci-hcd.2.auto: hcc params 0x0220fe64 hci version 0x110 quirks 0x00030010
[   46.685403] xhci-hcd xhci-hcd.2.auto: irq 227, io mem 0xfe800000
[   46.685957] usb usb7: New USB device found, idVendor=1d6b, idProduct=0002
[   46.686006] usb usb7: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   46.686050] usb usb7: Product: xHCI Host Controller
[   46.686094] usb usb7: Manufacturer: Linux 4.4.36 xhci-hcd
[   46.686119] usb usb7: SerialNumber: xhci-hcd.2.auto
[   46.692003] hub 7-0:1.0: USB hub found
[   46.692113] hub 7-0:1.0: 1 port detected
[   46.693005] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   46.693059] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 8
[   46.693229] usb usb8: We don't know the algorithms for LPM for this host, disabling LPM.
[   46.694294] usb usb8: New USB device found, idVendor=1d6b, idProduct=0003
[   46.694331] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   46.694360] usb usb8: Product: xHCI Host Controller
[   46.694386] usb usb8: Manufacturer: Linux 4.4.36 xhci-hcd
[   46.694412] usb usb8: SerialNumber: xhci-hcd.2.auto
[   46.707223] hub 8-0:1.0: USB hub found
[   46.707278] hub 8-0:1.0: 1 port detected
[   46.707608] rockchip-dwc3 usb@fe800000: USB HOST connected
[   46.995928] usb 7-1: new full-speed USB device number 2 using xhci-hcd
[   47.118463] usb 7-1: New USB device found, idVendor=067b, idProduct=2303
[   47.118570] usb 7-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[   47.118601] usb 7-1: Product: USB-Serial Controller D
[   47.118627] usb 7-1: Manufacturer: Prolific Technology Inc.
[   47.128897] pl2303 7-1:1.0: pl2303 converter detected
[   47.134039] usb 7-1: pl2303 converter now attached to ttyUSB0
```

This means the connection is ok, then choose the port you actual use and set the baud rate to 9600.



Test type-c to RS232 with the commands as below.

Send data:

su

echo 1893489048 > /dev/ ttyUSB0 (1893489048 is the data we want to send)

Receive data:

#cat /dev/ttyUSB0

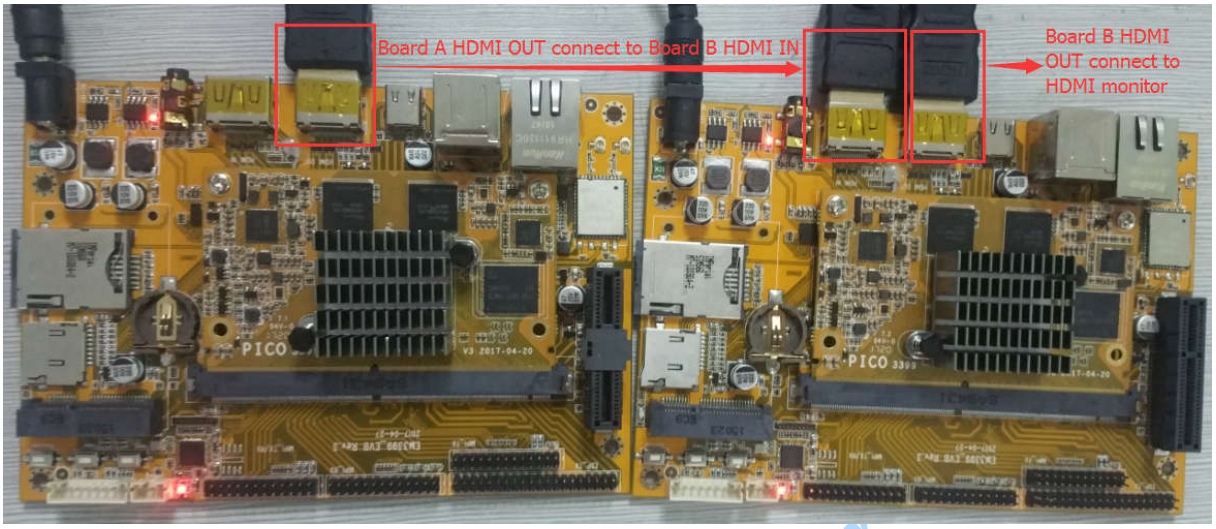
6.14 Type c to HDMI-OUT

Connect the TYPE-C to HDMI Adapter to the development board, Serial terminal will send message as below. This means the connection is ok, now you can see the monitor displays the android interface.

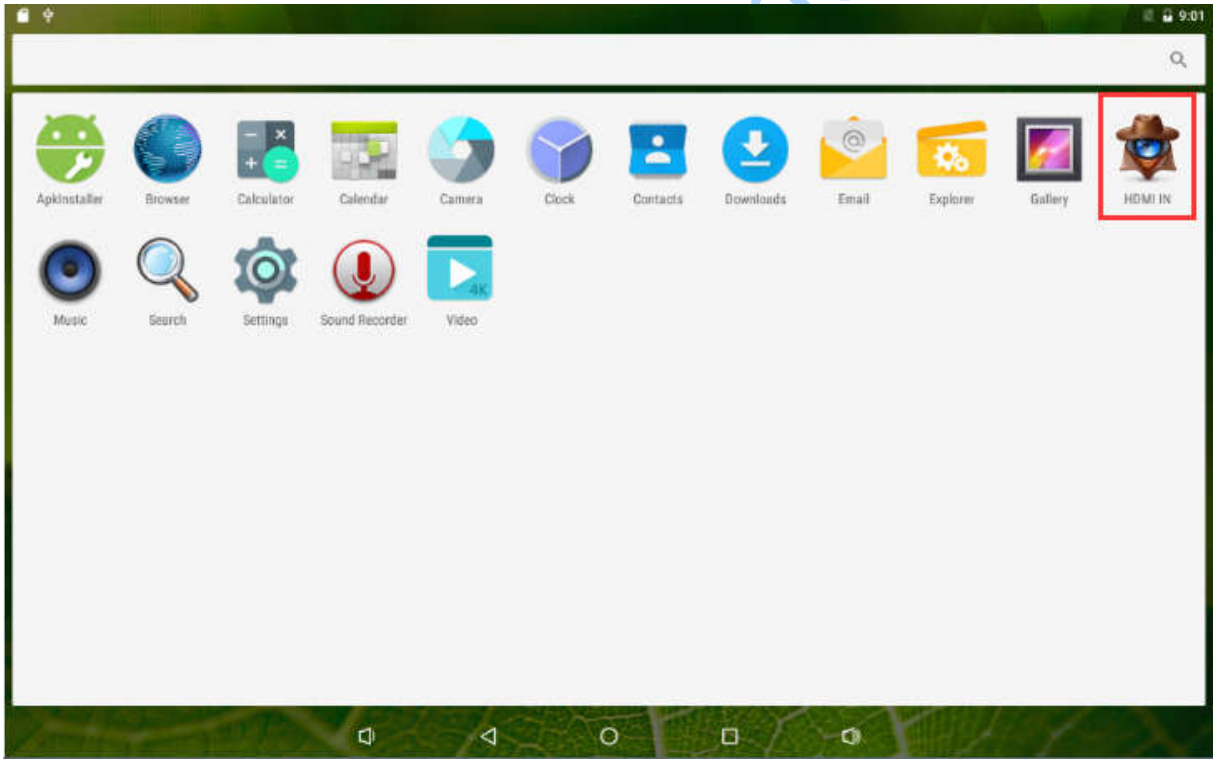
```
shell@rk3399_mid:/ $ [   46.470601] fusb302 1-0022: connection has disconnected
[   46.657370] fusb302 1-0022: CC connected in 1 as DFP
[   47.224754] fusb302 1-0022: PD connected as DFP, supporting 5V
[   47.336604] fusb302 1-0022: DP config successful, pin_assignment 0x4
[   47.386525] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   47.386632] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 7
[   47.388523] xhci-hcd xhci-hcd.2.auto: hcc params 0x0220fe64 hci version 0x110 quirks 0x00030010
[   47.388598] xhci-hcd xhci-hcd.2.auto: irq 227, io mem 0xfe800000
[   47.388969] usb usb7: New USB device found, idVendor=1d6b, idProduct=0002
[   47.389117] usb usb7: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   47.389150] usb usb7: Product: xHCI Host Controller
[   47.389189] usb usb7: Manufacturer: Linux 4.4.36 xhci-hcd
[   47.389227] usb usb7: SerialNumber: xhci-hcd.2.auto
[   47.392773] type=1400 audit(1358499049.676:24): avc: denied { create } for pid=37 comm="kdevtmpfs" name="007" scontext=u:r:kernel
:s0 tcontext=u:object_r:device:s0 tclass=dir permissive=1
[   47.394980] hub 7-0:1.0: USB hub found
[   47.395106] hub 7-0:1.0: 1 port detected
[   47.395957] xhci-hcd xhci-hcd.2.auto: xHCI Host Controller
[   47.396015] xhci-hcd xhci-hcd.2.auto: new USB bus registered, assigned bus number 8
[   47.396191] usb usb8: We don't know the algorithms for LPM for this host, disabling LPM.
[   47.396494] usb usb8: New USB device found, idVendor=1d6b, idProduct=0003
[   47.396528] usb usb8: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[   47.396563] usb usb8: Product: xHCI Host Controller
[   47.396596] usb usb8: Manufacturer: Linux 4.4.36 xhci-hcd
[   47.396622] usb usb8: SerialNumber: xhci-hcd.2.auto
[   47.398780] hub 8-0:1.0: USB hub found
[   47.398887] hub 8-0:1.0: config failed, hub doesn't have any ports! (err -19)
[   47.400105] rockchip-dwc3 usb@fe800000: USB HOST connected
[   47.617656] hdmi output corlor mode is 1
[   47.617699] hdmi connect to lcdc1
[   47.617708] switch:en=1,lcdc_id=1,screen type=6,cur type=0
[   47.617714] data space: 0, color mode: 0
[   47.827385] rk322x-lcdc vop1: failed to get clk source
[   47.827425] rk322x-lcdc vop1: failed to get clk source
[   47.829984] rk322x-lcdc vop1: lcdc1: dclk:148500000>>fps:60
[   47.830009] rk322x-lcdc vop1: dsp lut table is null
[   47.830017] rk322x-lcdc vop1: cabc lut table is null
[   47.830026] rk322x-lcdc vop1: wakeup from standby!
[   47.830036] rk322x-lcdc vop1: wake up from standby!
[   47.851176] cdn-dp-fb fec00000.dp-fb: rate:10, lanes:4
[   47.852226] fusb302 1-0022: attention, dp_status 9a
[   47.856679] cdn-dp-fb fec00000.dp-fb: hpd interrupt is triggered when dp has been already connected
[   47.863457] rk_iommu ff8f3f00.vop1-mmu: rockchip_iommu_attach_device: Attached new IOMMU with pgtable 0xe899c000
[   48.347541] fusb302 1-0022: attention, dp_status 9a
[   48.350110] cdn-dp-fb fec00000.dp-fb: hpd interrupt is triggered when dp has been already connected
[   48.846312] fusb302 1-0022: attention, dp_status 9a
[   48.851645] cdn-dp-fb fec00000.dp-fb: hpd interrupt is triggered when dp has been already connected
```

6.15 HDMI IN

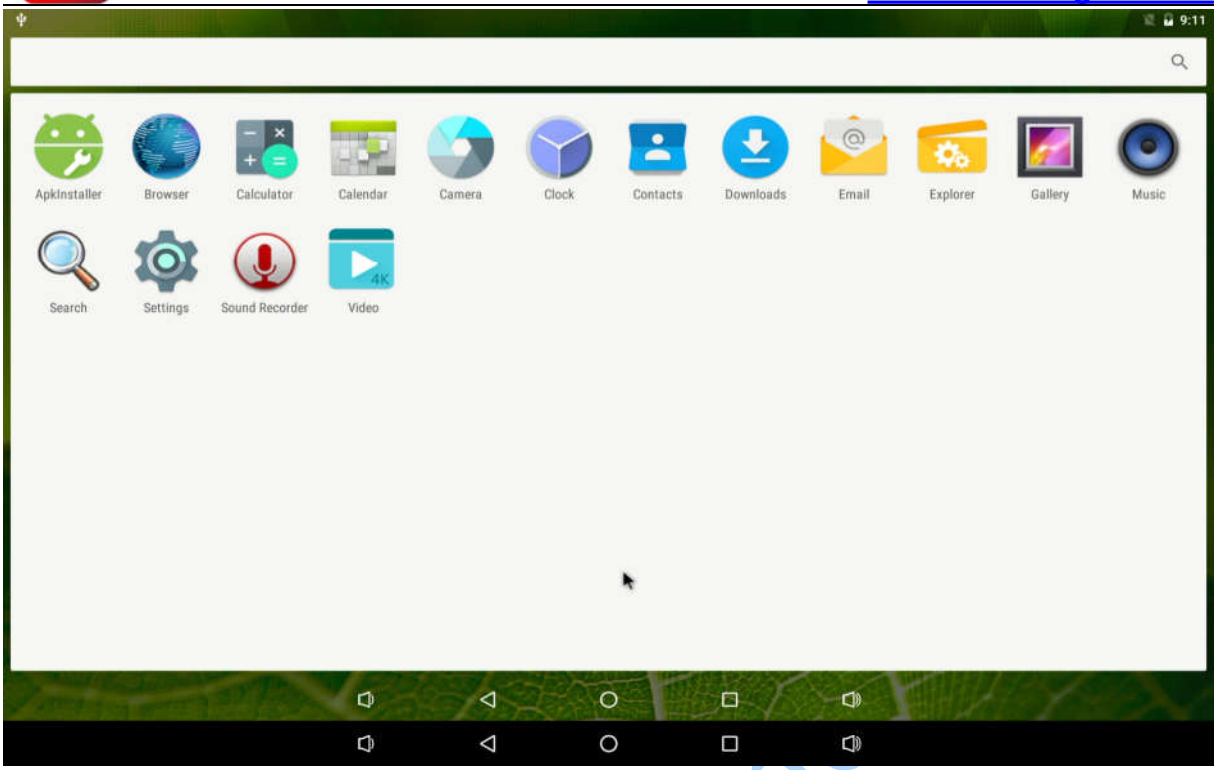
Connect the two EM3399 board with the HDMI test line.



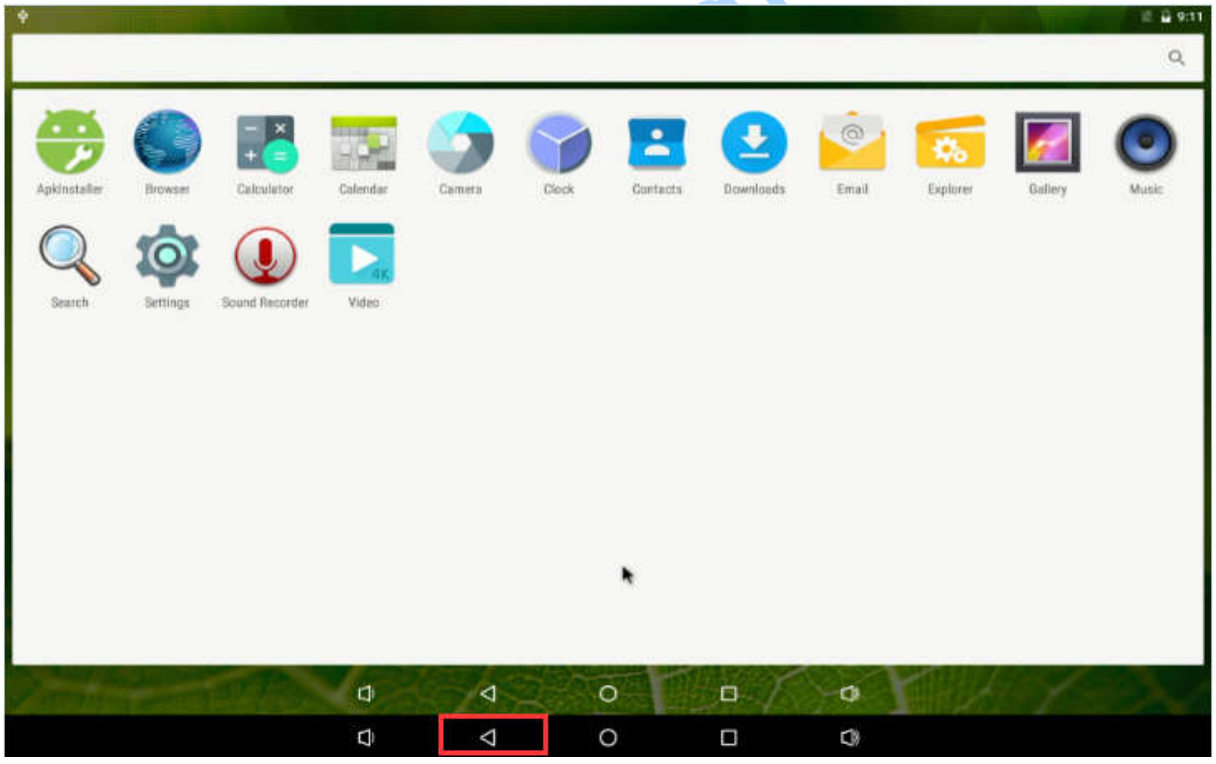
Then power to the board. In Board B open “HDMI IN” application. If your board no “HDMI IN” application need install it. The file in CD/Test/HDMI IN

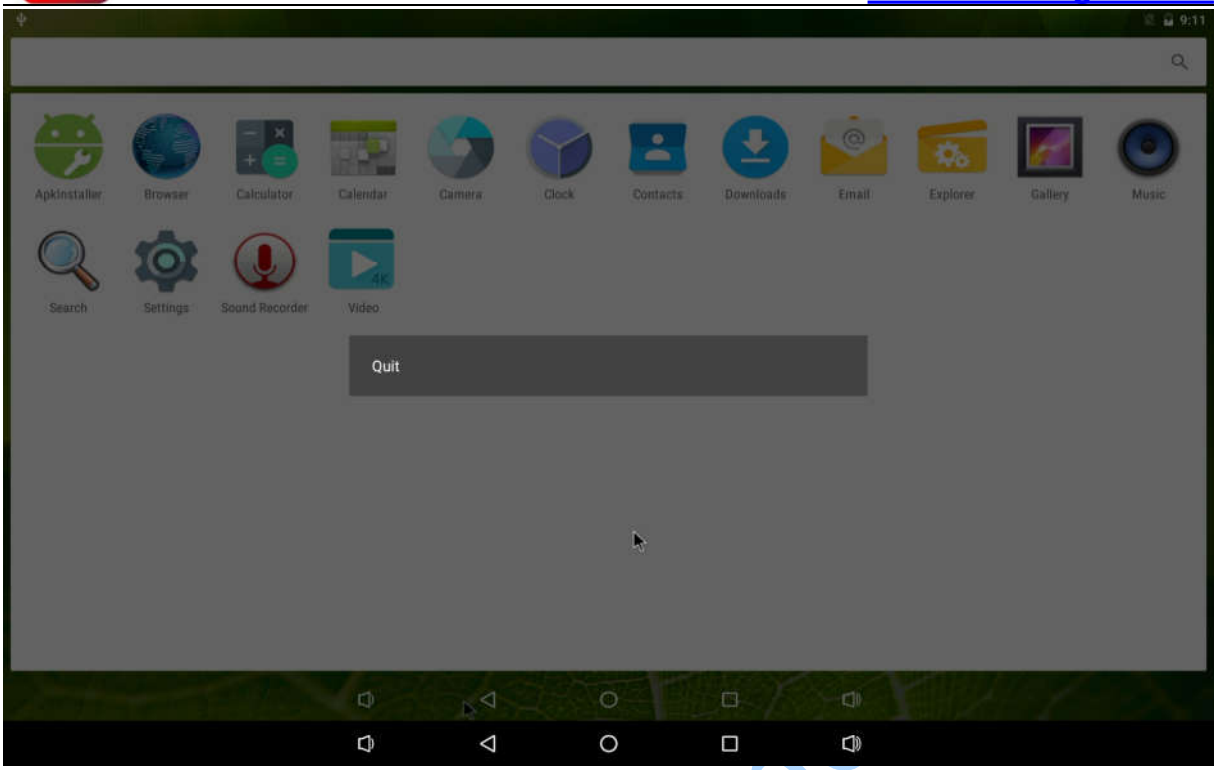


And will show as follow:



Click the follow “return key” to quit the HDMI IN.





Click “Quit” will quit the HDMI IN. If HDMI IN does not exit normally, it will cause the HDMI IN function can’t turn on again.