
EM3188 Android5.1 User Manual

V1.0

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Boardcon Technology Limited

www.armdesigner.com

Change History

Ver	Date	Description	Author
V1.0	2017-07-04	The initial released Version.	Zhao Linhai, Ao Juncheng

Preface

1. About this Manual

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

2. Feedback and Update to this Manual

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website (www.boardcon.com , www.armdesigner.com).

These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new.

When we are prioritizing work on these updated resources, feedback from customers is the number one influence, If you have questions, comments, or concerns about your product or project, please no hesitate to contact us at support@armdesigner.com.

3. Limited Warranty

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon.

This limited warranty does not cover damages resulting from lightning or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit .In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this products.

Repairs make after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.



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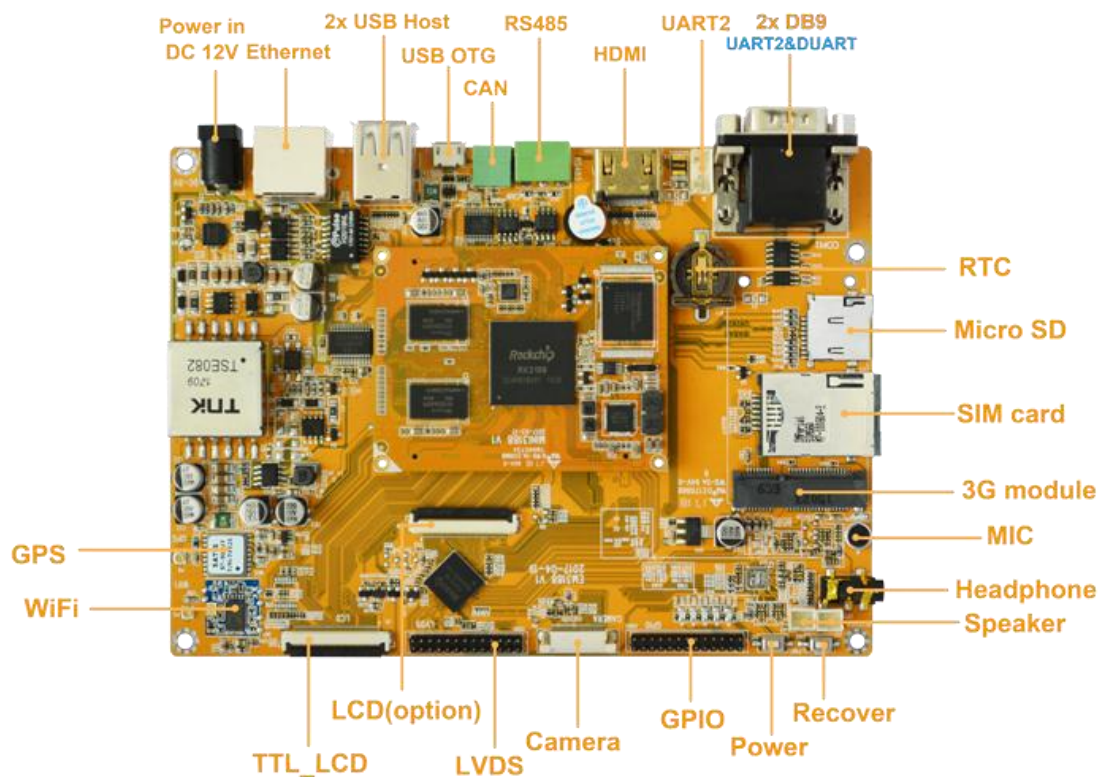
1 Introduction

This document is part of a set of reference documents providing information necessary to operate and program Boardcon EM3188 SBC.

1.1 Overview

The Boardcon EM3188 is a single board computer (SBC) powered by Rochchip RK3188 processor, with 1GB DDR3 RAM, 4GB eMMC flash, supporting WiFi, 3G and GPS module, running at Android5.1 and designed for Tablet, set-top boxes and other digital multimedia applications.

EM3188 comes with Ethernet, CAN, RS485 and other basic ports such as USB2.0 OTG, dual USB2.0 HOST, dual DB9, a 3.5mm audio jack and a microSD card for additional storage. This RK3188 SBC features RK616 chipset (optional) that includes two RGB display input interface with double data rate. With the internal MUX function, it can output 1080P HDMI signal to TV and output RGB/LVDS signal to TFT panel. In this case, EM3188 can support dual panel (TV and TFT) display.



1.2 Hardware Specification

Feature	Specifications
CPU	Rockchip RK3188, Quad-Core ARM Cortex-A9, up to 1.6GHz 28 nm HKMG process
GPU	Quad-Core Mail-400MP4 GPU, support OpenGL ES1.1/2.0 High performance dedicated 2D processor
Memory	1GB DDR3
Flash	4GB eMMC Flash
CPU Board Dimension	67.0 x 51.0mm
Power	12V/2A
Ethernet	10/100M, RJ45 interface
USB	2x USB2.0HOST, 1x USB2.0 OTG
CAN	1x CAN. 2pin connector.
RS485	1x RS485. 3pin connector.
HDMI	HDMI V1.4, support 1080P
UART	2-CH UARTs. <i>DUART: DB9_top/4-pin connector, for debug.</i> <i>UART2: DB9_bottom.</i>
SD card	1x Micro SD card slot
RTC	Real Time Clock, powered by external lithium battery
Audio	Microphone, MIC, Speakers
LCD	2x 40-pin TTL_LCD connector for 4.3-,7-inch Cap-touch panel; 1x 26-pin LVDS for 10.1-inch HD Cap-touch panel.
GPIO	1x 26-pin header
Button	Recover, Power
WiFi(optional)	2.4GHz WiFi, support 802.11 b/g/n
Camera(optional)	24PinFPC connector.OV5640 model,5 Megapixels.
GPS(optional)	ST-97-U7 MODEL, ublox 7 chipset
3G(optional)	PCI-E connector, U20 model.
Baseboard Dimension	161.0 x 116.0 mm

1.3 Software Specification

OS	Item	Feature	Description	
Android5.1	Boot	Bootloader	RK3188Loader(L)_V2.31.bin	
	Kernel	Version	Linux 3.0.101+	
	Drivers	HDMI		Support 1080P resolution
		Audio		RK616/WM860 (optional) chip
		SD card		On-board 1x Micro SD card slot
		USB		2x USB2.0 Host and 1x USB2.0 OTG
		Ethernet		1x 10/100 Mbit/s Ethernet RJ45 connector
		WiFi		Realtek RTL8188EUS,support IEEE802.11n/b/g
		Camera		1x 24Pin FPC connector for OV5640, 5 Mega pixels
		LCD		Support 4.3"/5"/7" RGB-TTL LCD panel (optional). Support 10.1"High-definition LVDS LCD panel. Support LCD panel and HDMI dual display.
		Capacitive touch panel		Match the corresponding 4.3"/5"/7"/10.1" LCD display screen
		3G		UMTS/HSPA+, Multiband optional, 1x MINI PCI-E connector.
		Debug		1x DB-9 (RS232) Debug serial port, Micro OTG USB for ADB
		Buttons		Recover, Power on/off (system)
		Serial Port		1x DB-9 (RS232) serial port for external communication
		CAN		1x CAN port with CAN V2.0 B technical specification
	GPS		Uses ublox 7 chipset which is high performance u-blox 7 multi-GNSS (GPS, GLONASS, QZSS, SBAS – Galileo and Compass ready) position engine delivers exceptional sensitivity and acquisition times	
	RS485		1x RS485 port with ANSI Standards TIA/EIA-485-A	
	GPIOS		1x 26Pin(2.0mm pitch) connector for GPIOS and power	
	Embedded GUI	Android5.1.1		Support file Alarm Clock, Browser, Gallery, Calculator, Camera, Email, ES File Explorer, videoplayer, Music, etc
Cross compiler Environment			VMware V7+ ubuntu-12.04 ,jdk-7u80-linux-x64.tar.gz	
Debug Tools			SecureCRT, AndroidTool.exe, ADB	

1.4 Development Accessories

Accessories	Description
Micro USB cable	Download image
Serial cable	USB for serial communication

U disk	Data storage
Ethernet cable	Network communication
TF card (2G or above)	Data storage
Power adaptor	Power supply

2 Compiler Environment

2.1 Vmware7.0+ubuntu12.04

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

Note: We advise you compile Android5.1 with ubuntu 64bit OS.

2.2 Install JDK

Install steps:

Step 1: Copy the file (Path: Tools\jdk-7u80-linux-x64.tar.gz) to the Ubuntu system, and unzip it:

```
# sudo mkdir /usr/lib/java
```

```
# sudo tar zxvf jdk-7u80-linux-x64.tar.gz -C /usr/lib/java/
```

Step 2: Add the following information in the end of “/etc/profile”:

```
export JAVA_HOME=/usr/lib/java/jdk1.7.0_80
```

```
export JRE_HOME=/usr/lib/java/jdk1.7.0_80/jre
```

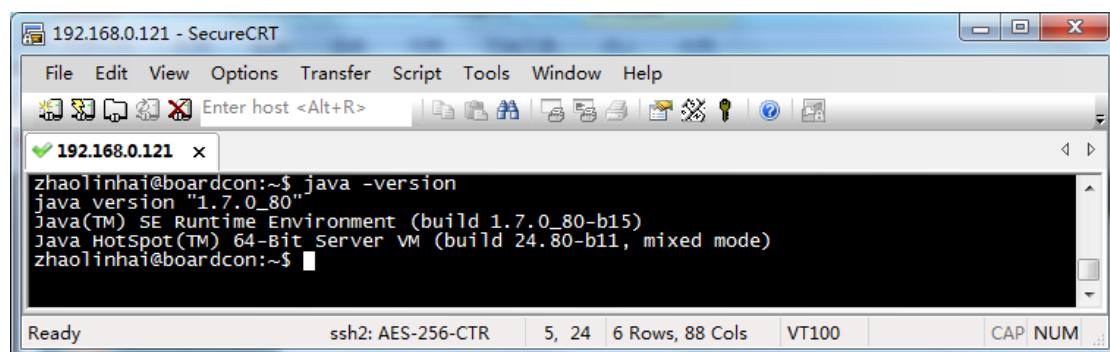
```
export CLASSPATH=.:$JAVA_HOME/lib:$JRE_HOME/jre/lib:$CLASSPATH
```

```
export PATH=$JAVA_HOME/bin:$JRE_HOME/jre/bin:$PATH
```

```
# source /etc/profile
```

Step 3: Enter the following command to check if the JDK has been installed successfully and check the revised version:

```
# java -version
```



```
192.168.0.121 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
192.168.0.121 x
zhaolinhai@boardcon:~$ java -version
java version "1.7.0_80"
Java(TM) SE Runtime Environment (build 1.7.0_80-b15)
Java HotSpot(TM) 64-Bit Server VM (build 24.80-b11, mixed mode)
zhaolinhai@boardcon:~$
```

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

Under the Windows unzip the CD files below.

```
boardcon_3188mid_v2.tar.7z.001
boardcon_3188mid_v2.tar.7z.002
boardcon_3188mid_v2.tar.7z.003
```

You will get the Source: **em3188mid.tar.bz2**, Copy it to the ubuntu system and unzip it.

```
# tar xvf em3188mid.tar.bz2
# cd em3188mid
```

The entire source is in **em3188mid** directory.

3.1 Compile u-boot

No need to compile the u-boot can be used directly.

u-boot path: **AndroidTool_Release_V2.35/rockdev/RK3188Loader(L)_V2.31.bin**

3.2 Compile kernel

Enter the following command to compile the kernel:

```
# cd em3188mid /kernel/
# make rk3188_defconfig
# make kernel.img
```

Kernel.img is generated in **em3188\kernel** directory.

3.3 Compile Android

Enter the follow command to Compile Android:

```
# cd .. (Enter em3188mid directory)
```

```
# source build/envsetup.sh
# make -j4
# ./mkimage.sh          (Generate images files)
```

Images are generated in **em3188\rockdev\Image-rk3188** directory.

3.4 Pack Images to update.img

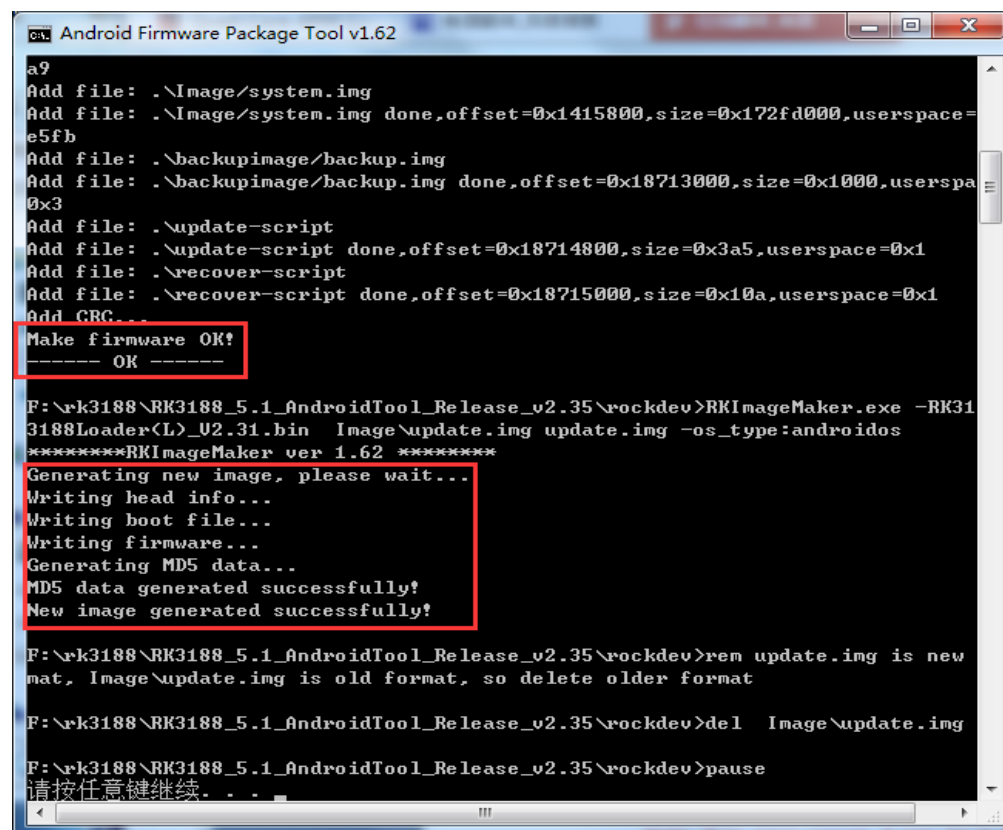
Note. If you need to pack kernel.img, boot.img, misc.img, recovery.img and system.img to update.img, you should do as below, or you needn't.

Step 1, using winRAR unzip **RK3188_5.1_AndroidTool_Release_v2.35.zip** in windows.

Step 2, copy **boot.img, misc.img, recovery.img** and **system.img** in **rockdev/Image-rk3188** of the Android root directory and **kernel/kernel.img** of the Android root directory to the development tools **rockdev/Image** directory.

Step 3, enter **RK3188_5.1_AndroidTool_Release_v2.35\rockdev** directory, then double-click to run **mkupdate.bat**.

After you see the information as below, you will get the **update.img** in **RK3188_5.1_AndroidTool_Release_v2.35\rockdev** directory.



```
Android Firmware Package Tool v1.62
a9
Add file: .\Image\system.img
Add file: .\Image\system.img done,offset=0x1415800,size=0x172fd000,userspace=
e5fb
Add file: .\backupimage\backup.img
Add file: .\backupimage\backup.img done,offset=0x18713000,size=0x1000,userspa
0x3
Add file: .\update-script
Add file: .\update-script done,offset=0x18714800,size=0x3a5,userspace=0x1
Add file: .\recover-script
Add file: .\recover-script done,offset=0x18715000,size=0x10a,userspace=0x1
Add CRC...
Make firmware OK!
----- OK -----

F:\rk3188\RK3188_5.1_AndroidTool_Release_v2.35\rockdev>RKImageMaker.exe -RK31
3188Loader(L)_U2.31.bin Image\update.img -os_type:androidos
*****RKImageMaker ver 1.62 *****
Generating new image, please wait...
Writing head info...
Writing boot file...
Writing firmware...
Generating MD5 data...
MD5 data generated successfully!
New image generated successfully!

F:\rk3188\RK3188_5.1_AndroidTool_Release_v2.35\rockdev>ren update.img is new
mat, Image\update.img is old format, so delete older format

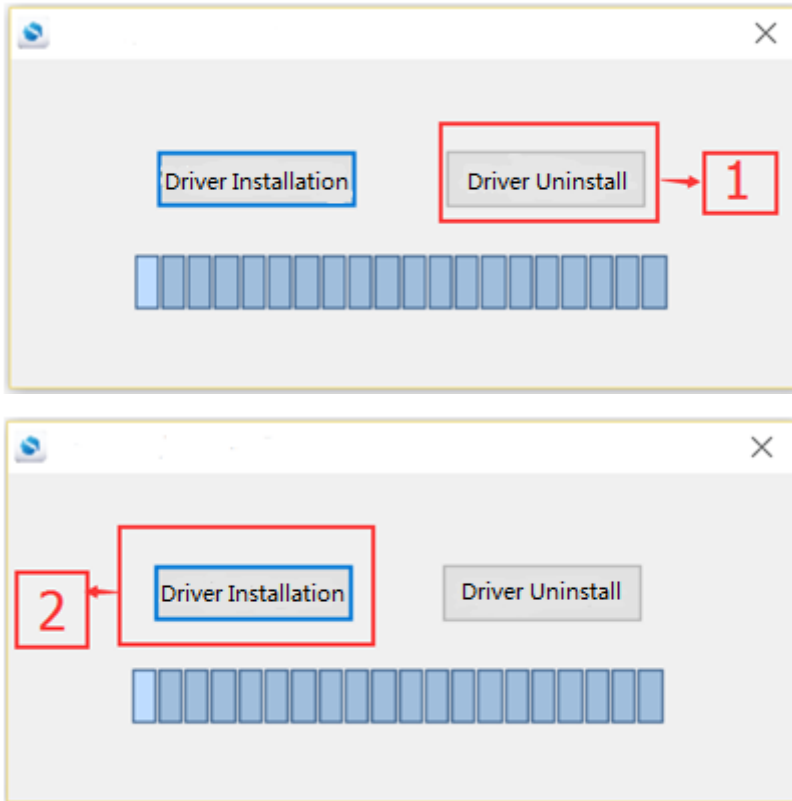
F:\rk3188\RK3188_5.1_AndroidTool_Release_v2.35\rockdev>del Image\update.img

F:\rk3188\RK3188_5.1_AndroidTool_Release_v2.35\rockdev>pause
请按任意键继续. . .
```

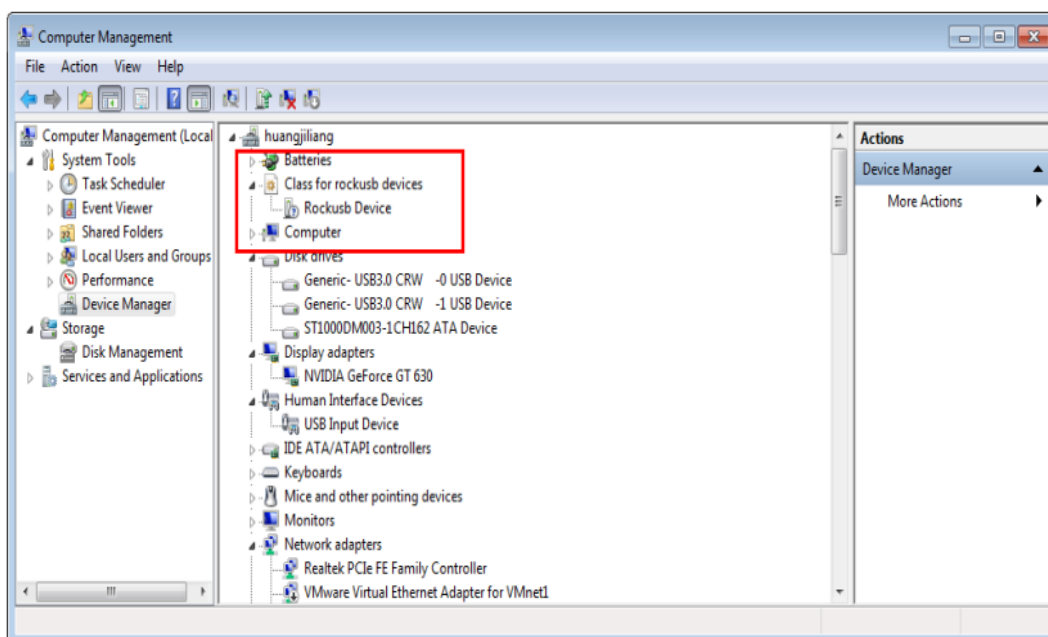
4 Set burn images software environment

4.1 Install Rockchip driver assistant

Double-click AndroidTool_Release/DriverAssitant/DriverInstall.exe.

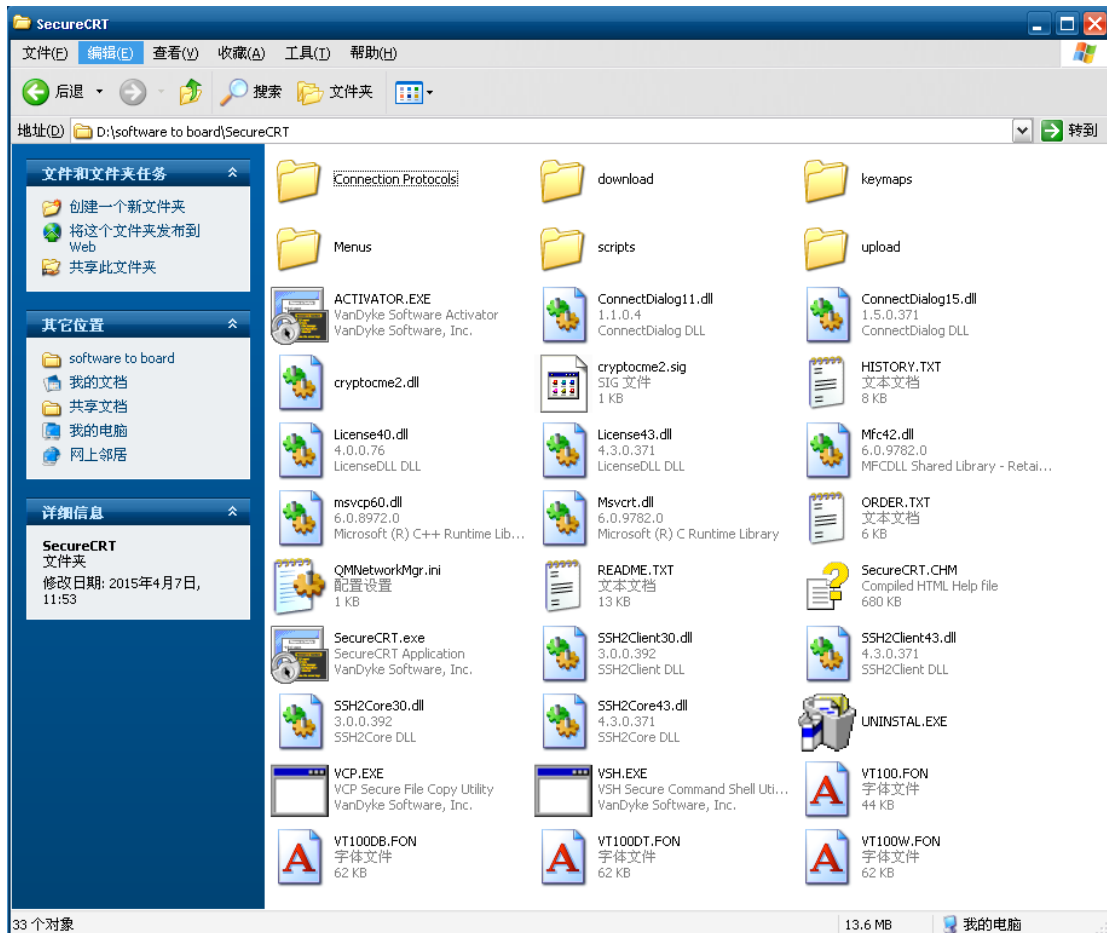


Then power on the board and connect the micro usb connector to the PC with the OTG USB cable, you will see the following information. Now, the USB download driver is ok.

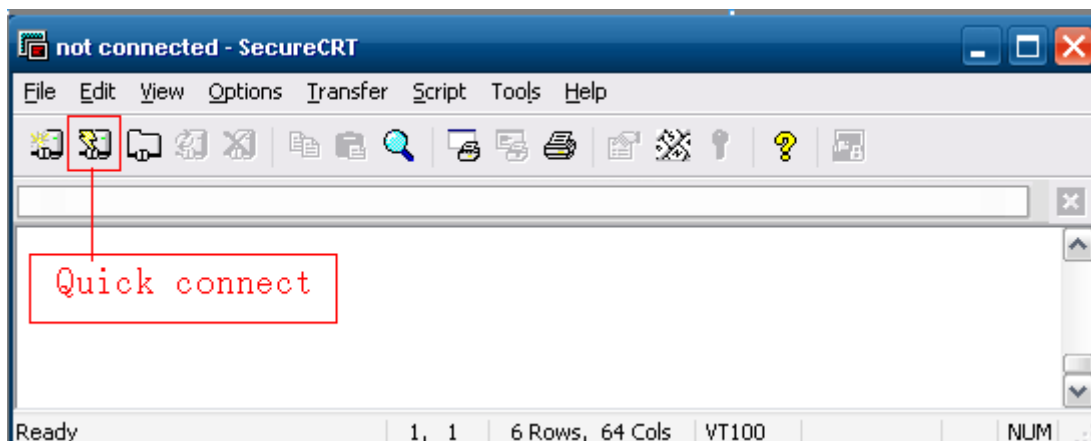


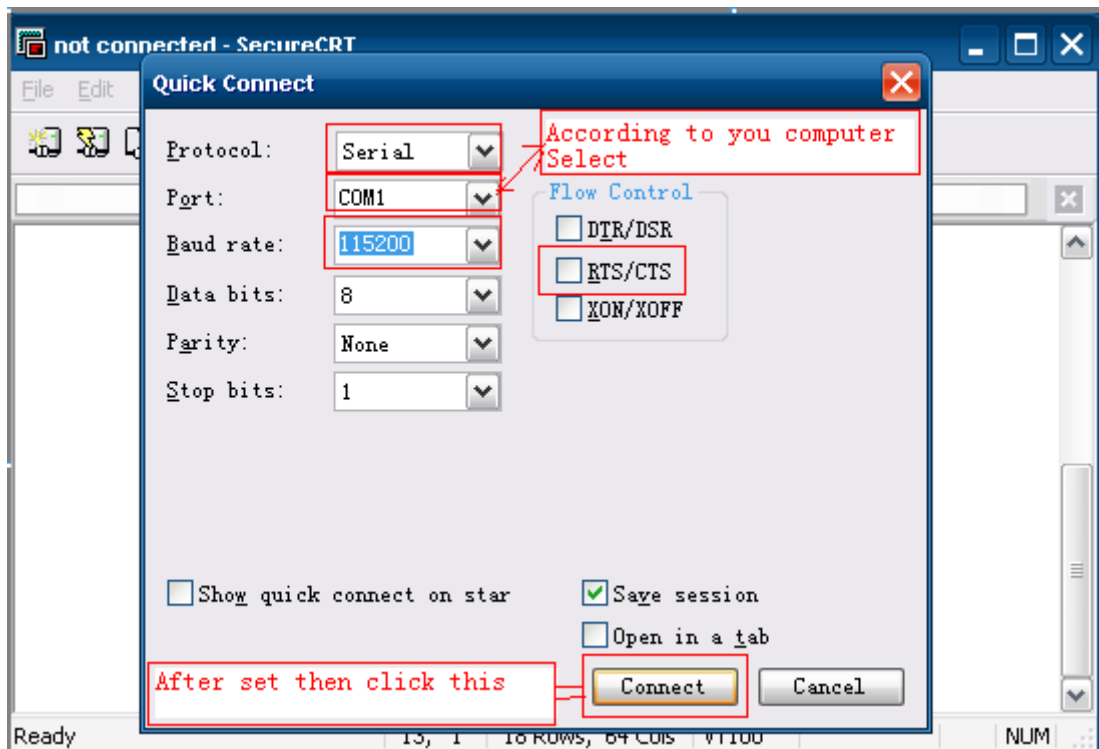
4.2 Install SecureCRT for Serial terminal

Copy **SecureCRT.rar** to your windows and unzip it,then generate the file **SecureCRT**, then go into this directory:



Open **SecureCRT\SecureCRT.exe**, then click **Quick connect**:



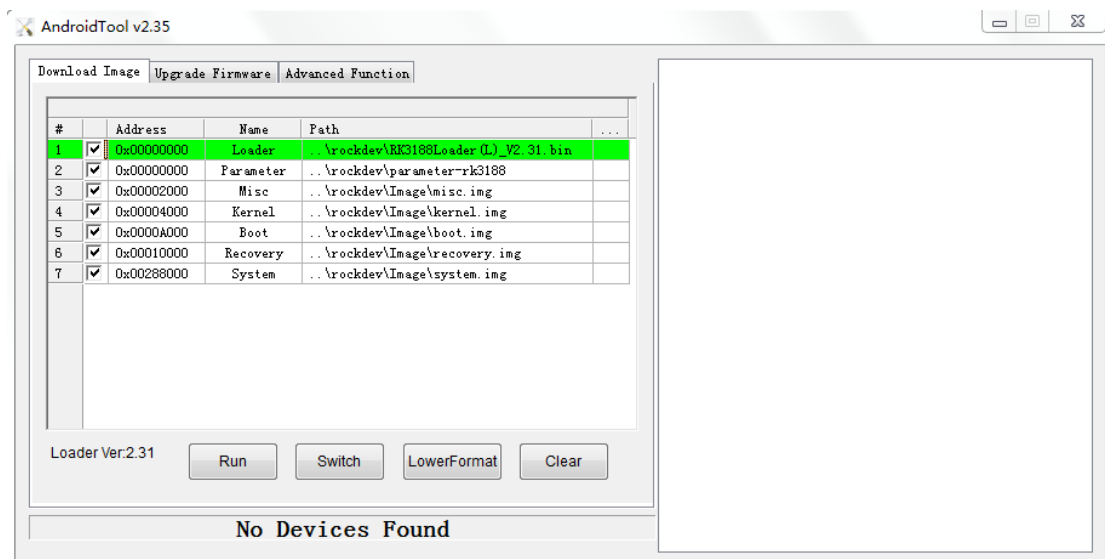


5 Download the images

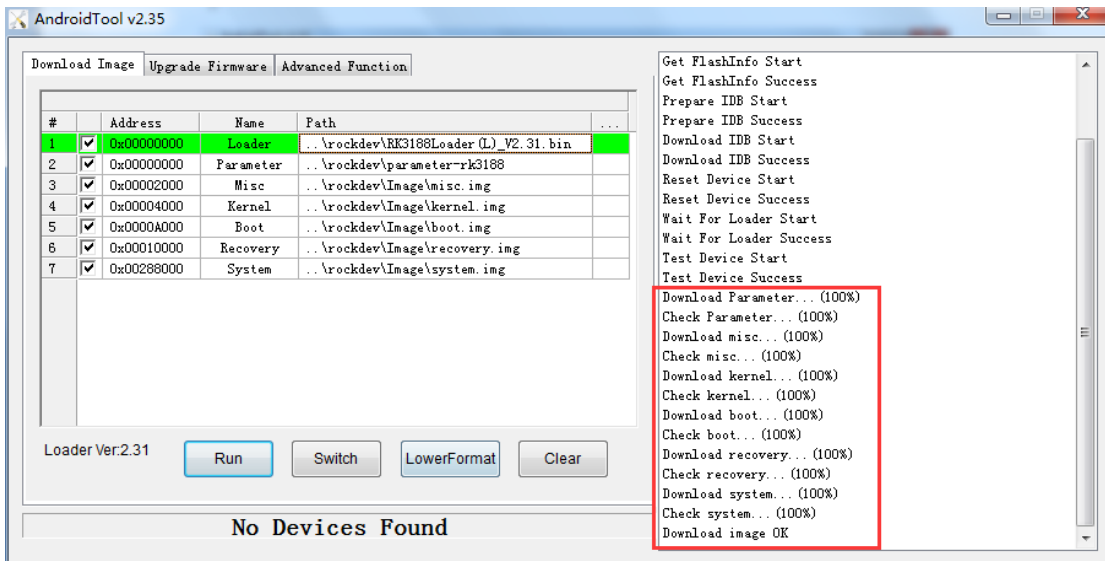
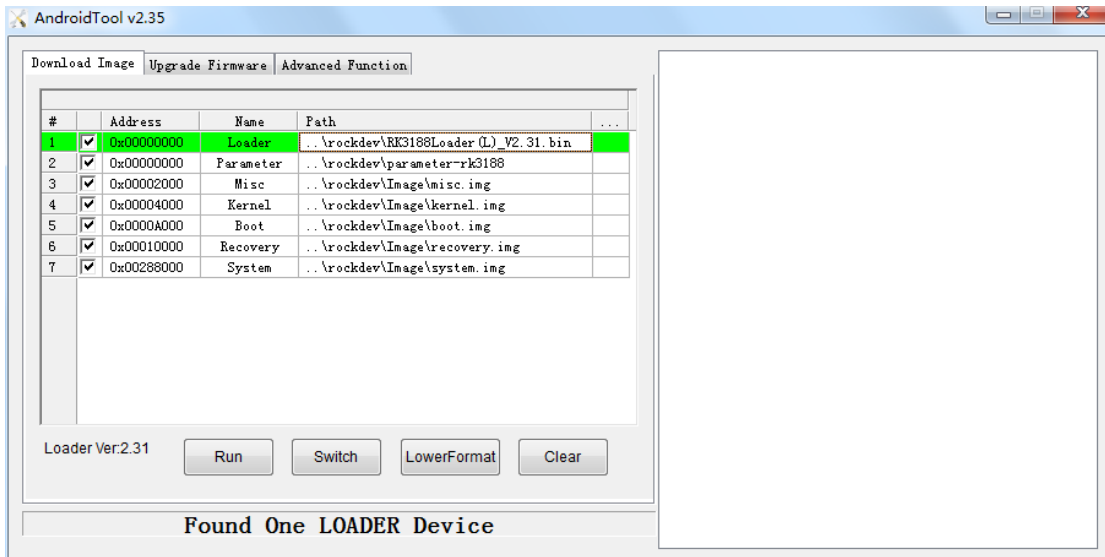
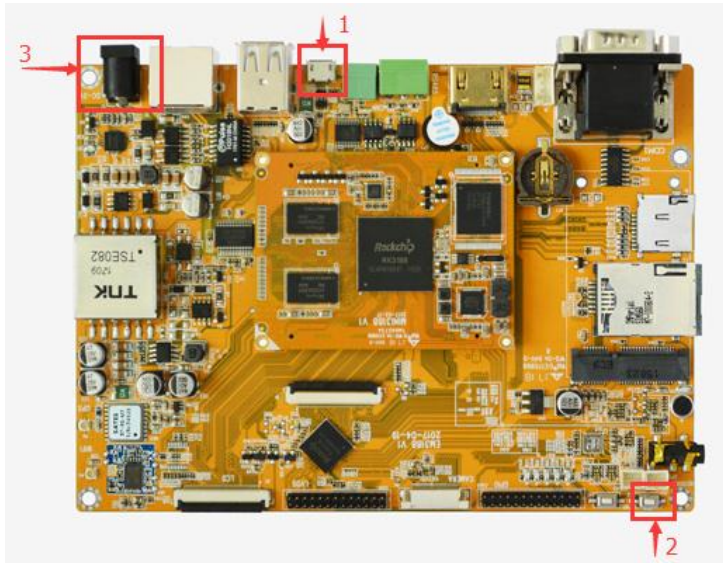
Step 1, unzip **RK3188_5.1_AndroidTool_Release_v2.35.zip** tools to the windows.

Step 2, open **AndroidTool_Release_v2.35/AndroidTool_Release_v2.35/AndroidTool.exe**

Step 3, Copy the **kernel/kernel.img** and Android root directory **rockdev/Image-rk3188/ boot.img, misc.img, recovery.img** and **system.img** to **AndroidTool_Release_v2.35/rockdev/Image/**.



Step 4, connect the EM3188 and PC with the USB OTG cable, press the recover button and power on until the windows shows **Found one LOADER Device**.

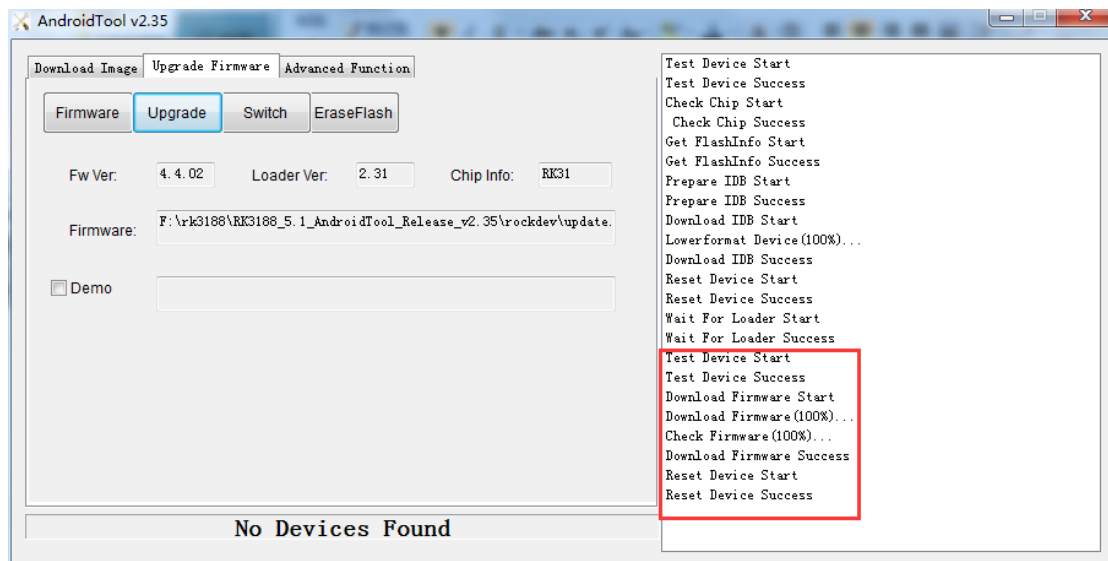
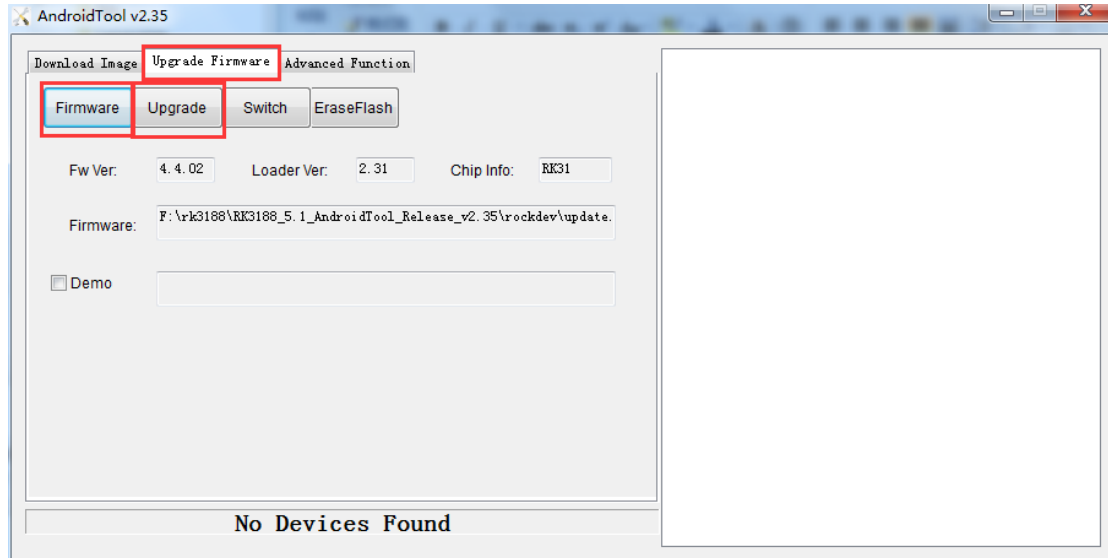


Once the download has finished, the board will reboot automatically.

If you want to download the update.img, you can do as below.

First, click **Upgrade Firmware**, then click **Firmware** to select update.img.

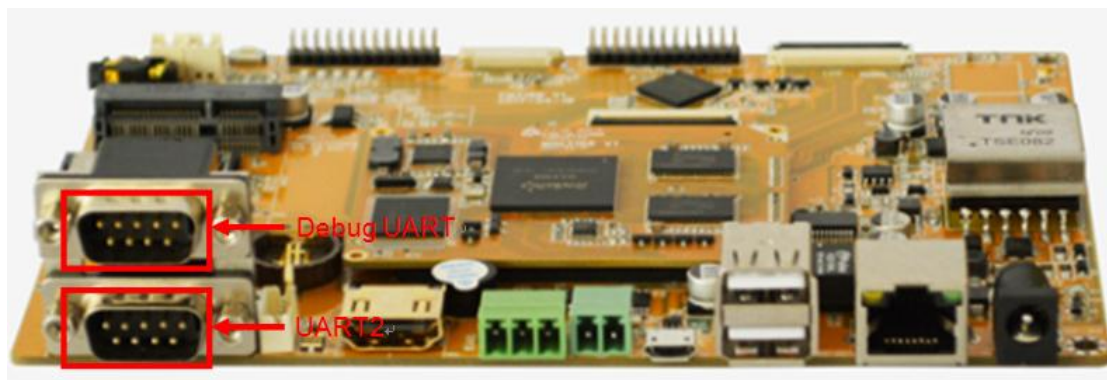
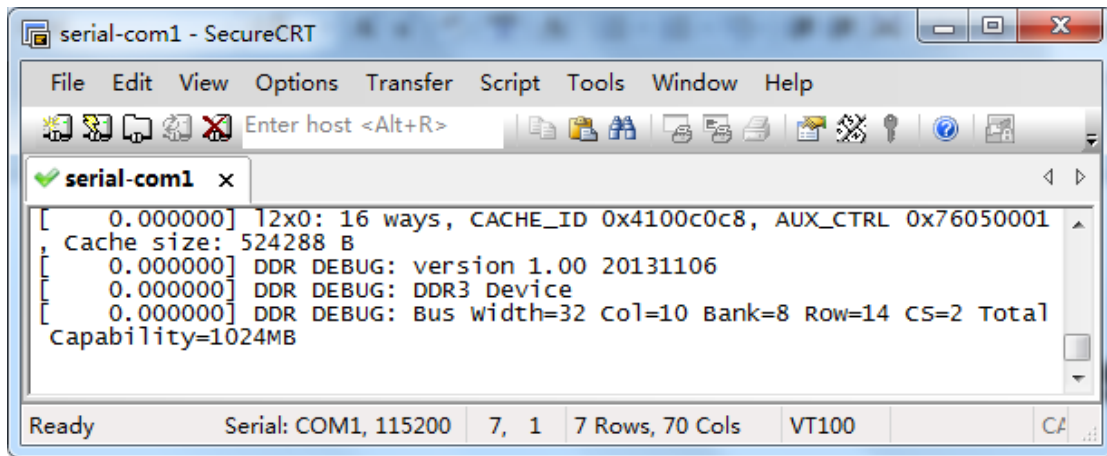
Finally, click **Upgrade** start updating firmware.



6 Android Application Guidance

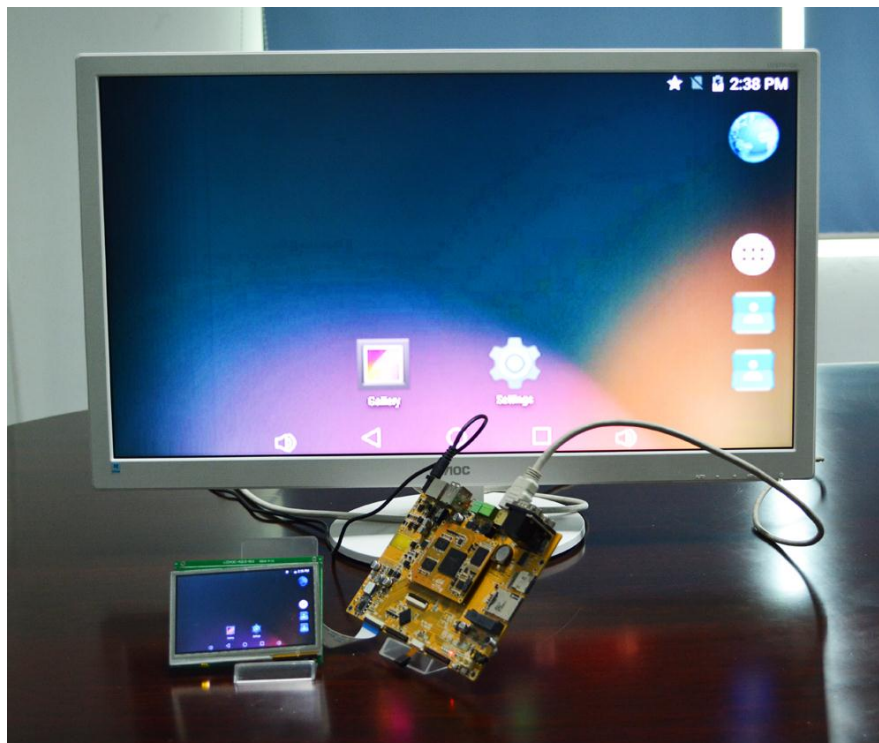
6.1 Debug Serial Terminal

Connect the Debug UART to the PC, the SecureCRT will show you the Serial terminal information as below.



6.2 LCD Panel and HDMI Dual Display

Connect LCD panel and HDMI-OUT as below, then Power on EM3188 board, the LCD panel and HDMI dual display as shown in the following figure.

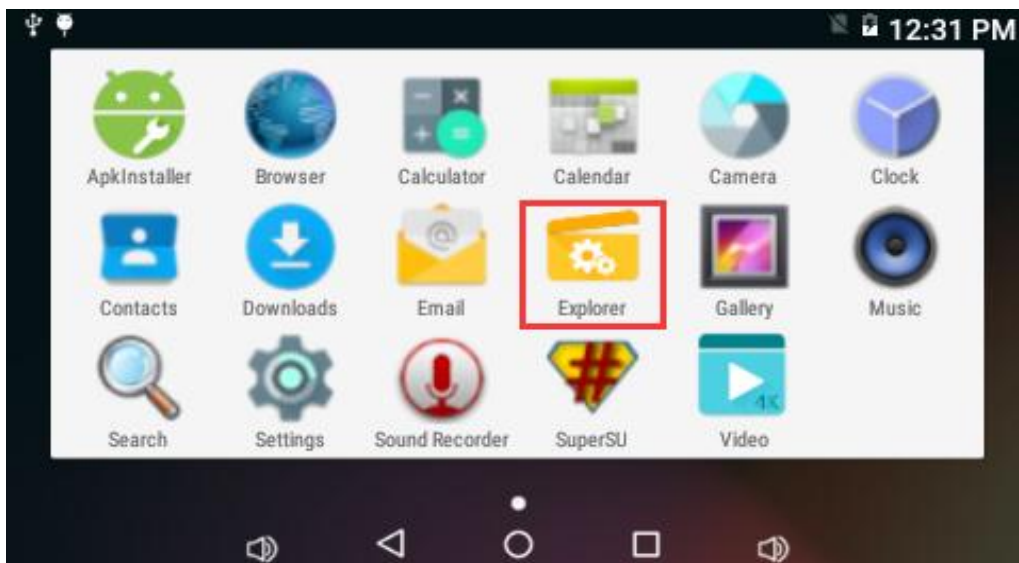


6.3 USB Keyboard and USB Mouse

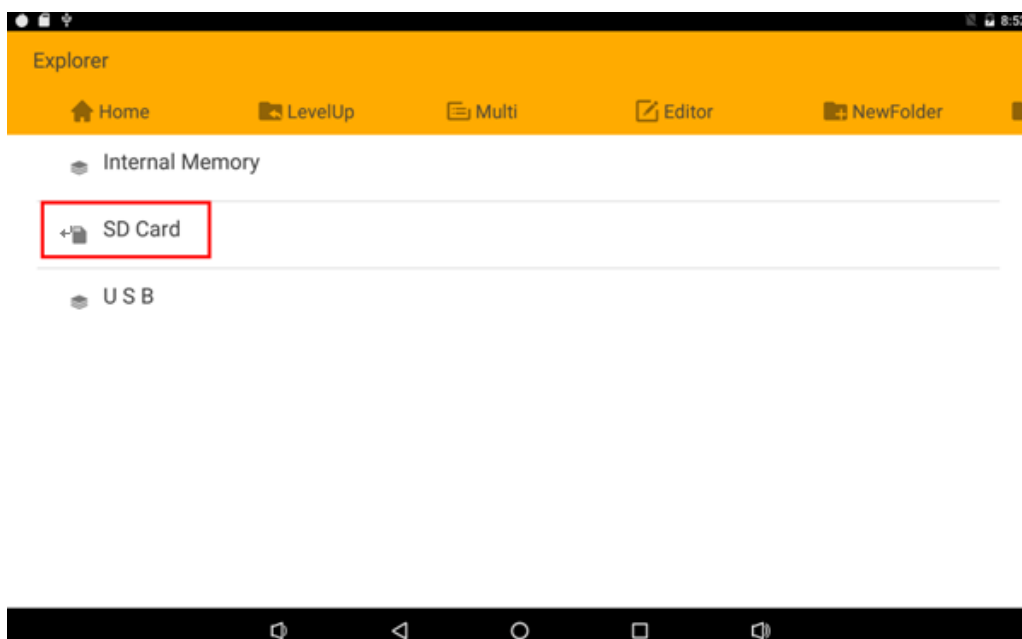
Power on EM3188 board, Insert the USB Mouse or USB keyboard to the usb host port, you can use them in android interface.

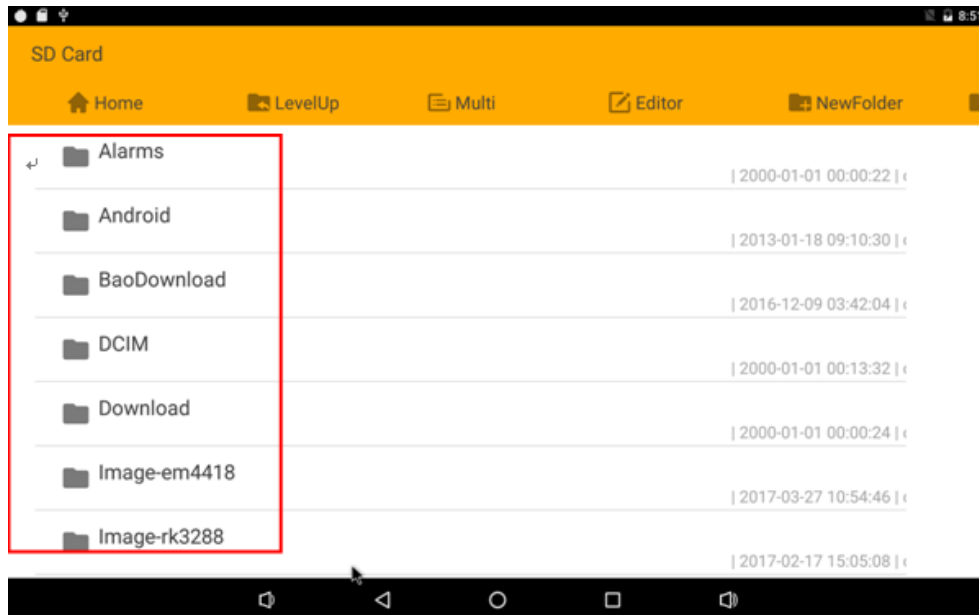
6.4 SD Card

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:



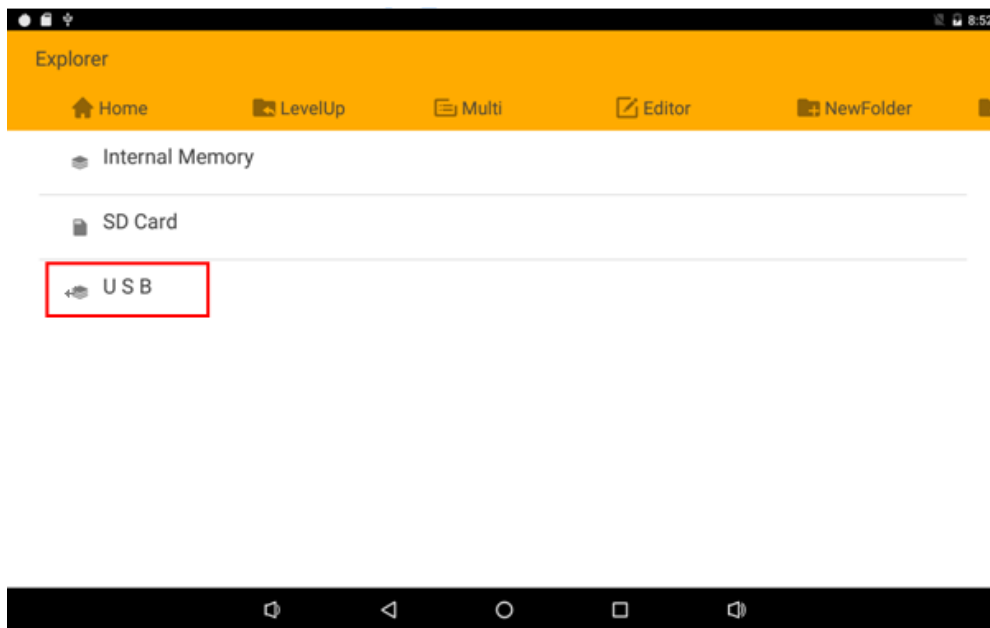
Click “SD Card”:





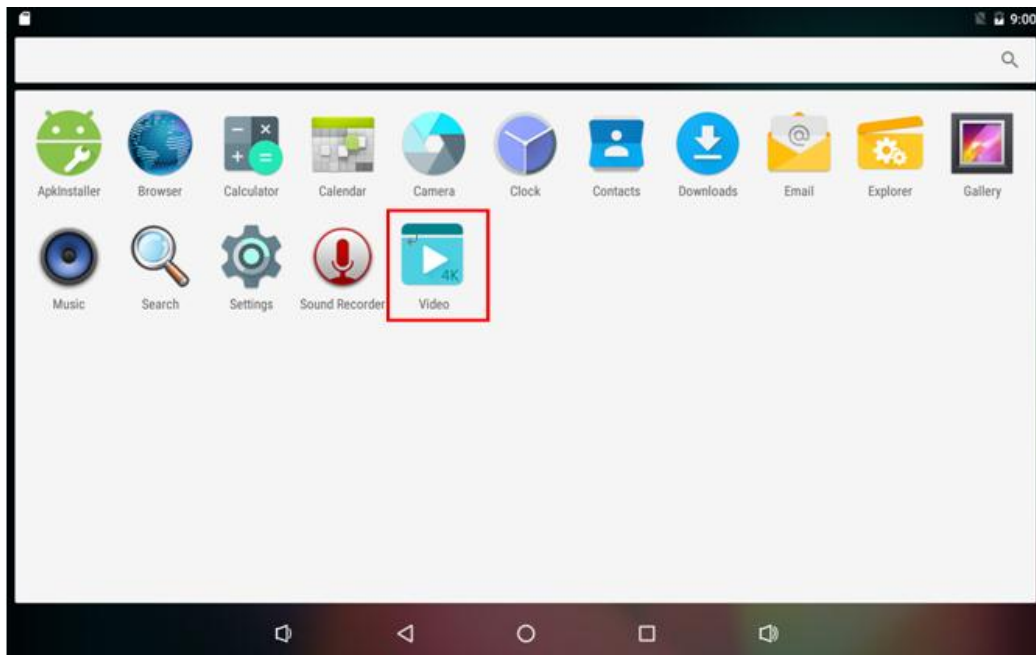
6.5 USB mass Storage

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



6.6 Video Player

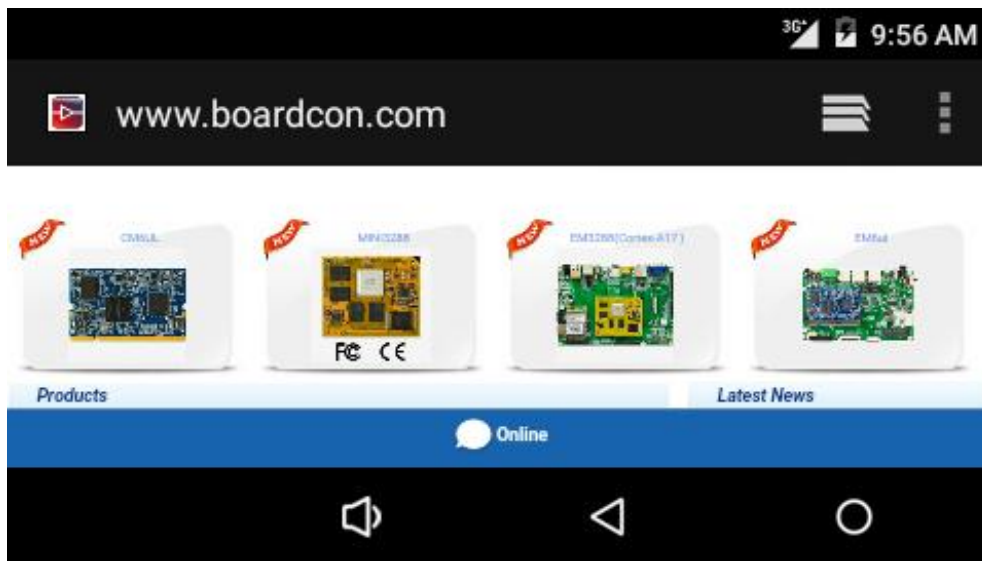
Put some MP4 files to the U disk and insert the U disk to the development board. Star up the board and run Gallery, and click the video file, then the speaker will appear player, as the follow chart:





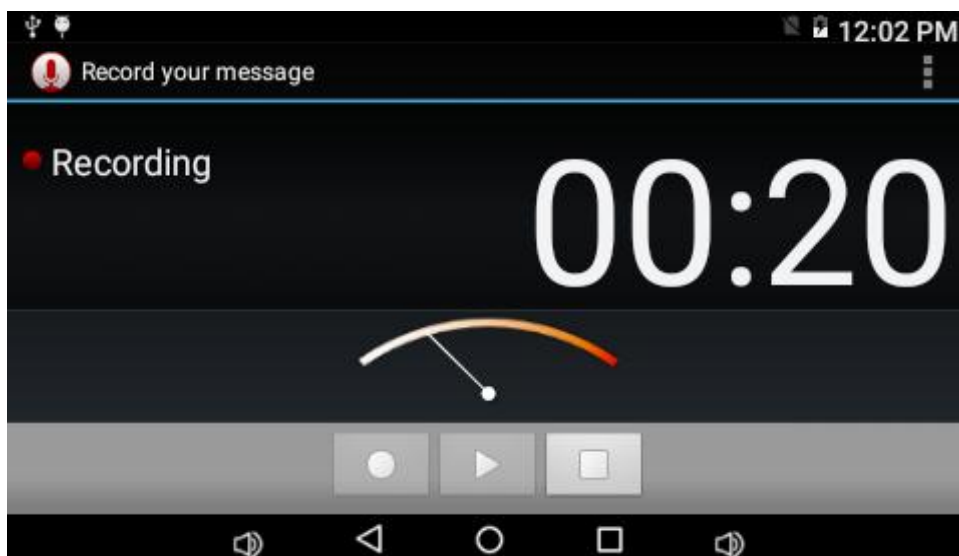
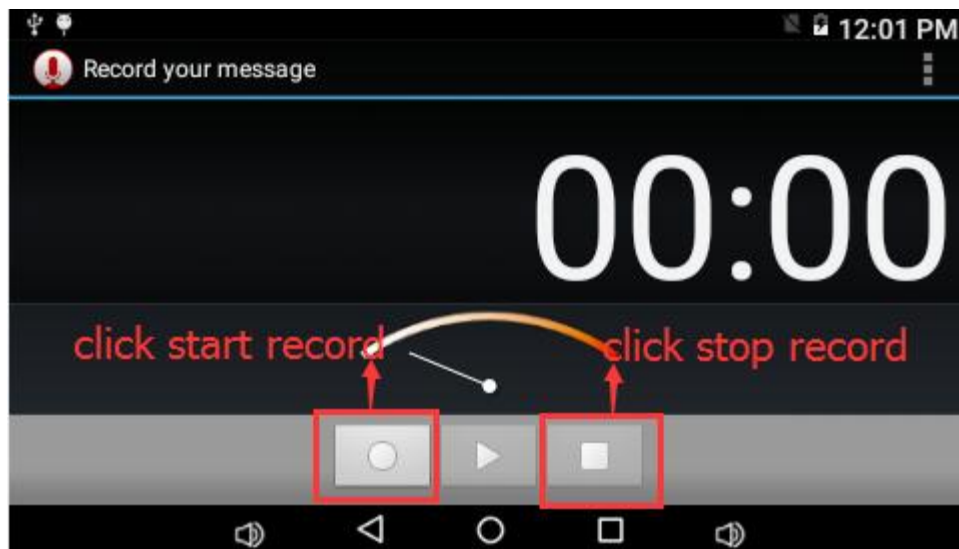
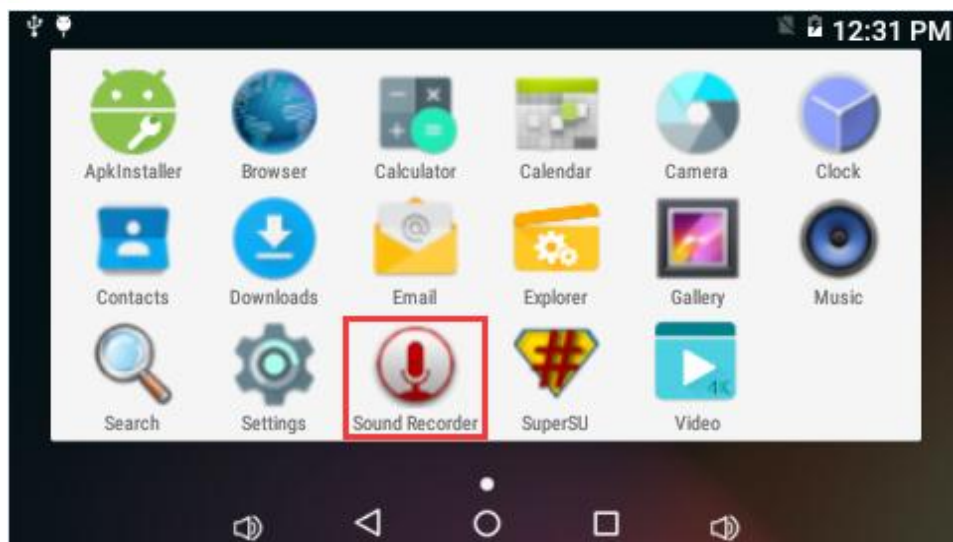
6.7 Ethernet

Plug in an Ethernet cable (RJ45), start the system, and it will automatically connect to the Internet.

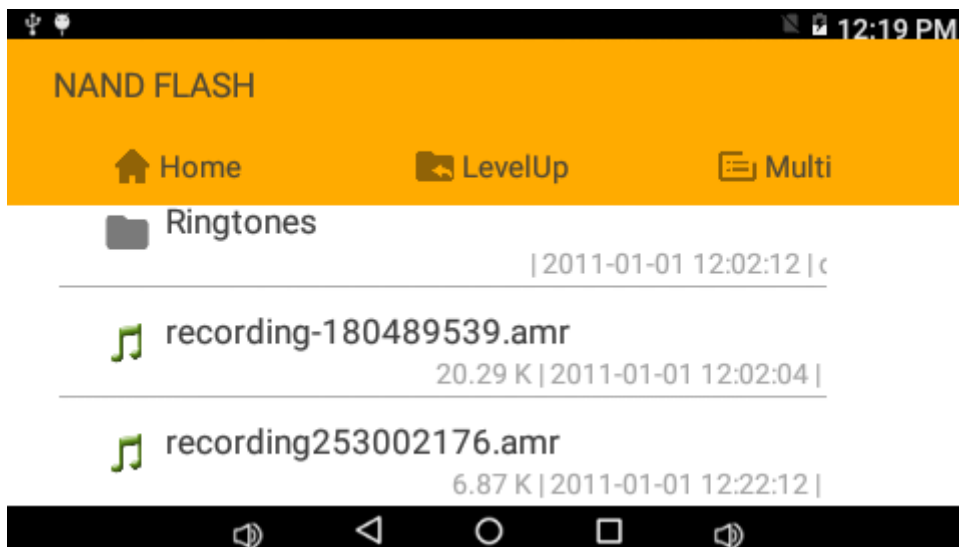
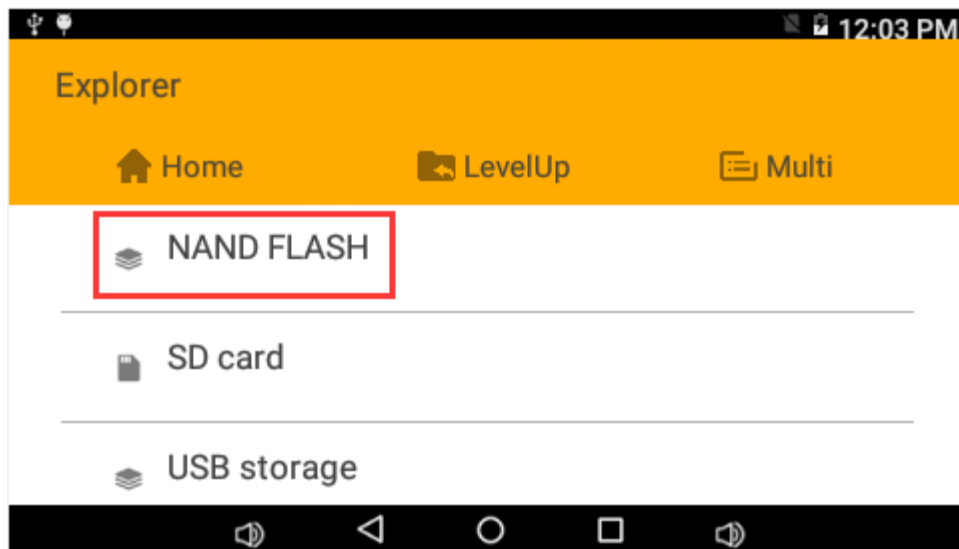


6.8 Record

Open the APP Recorder as below. Speech in front of the mic then it can record.

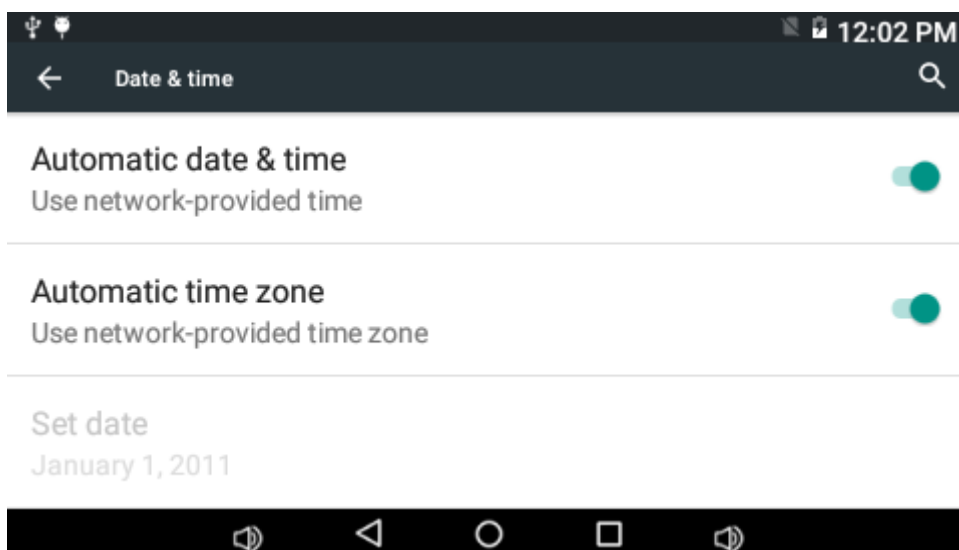
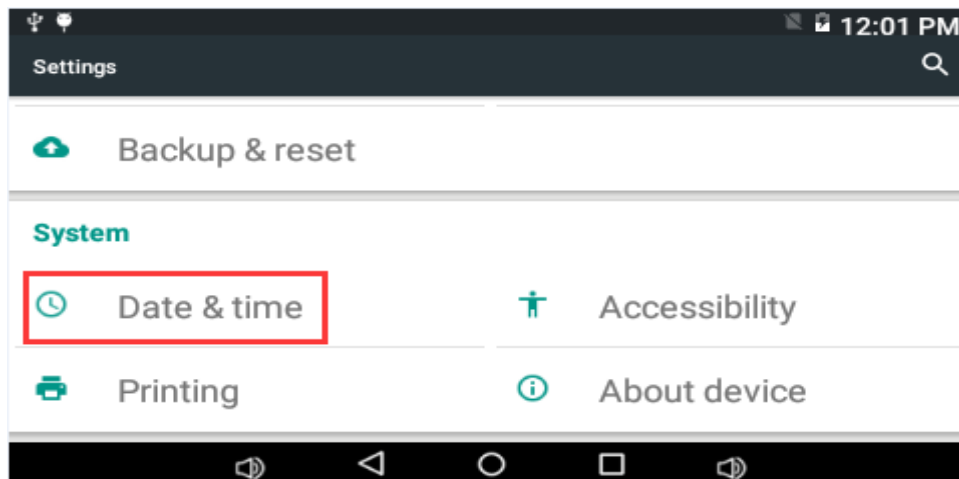


View the record file:



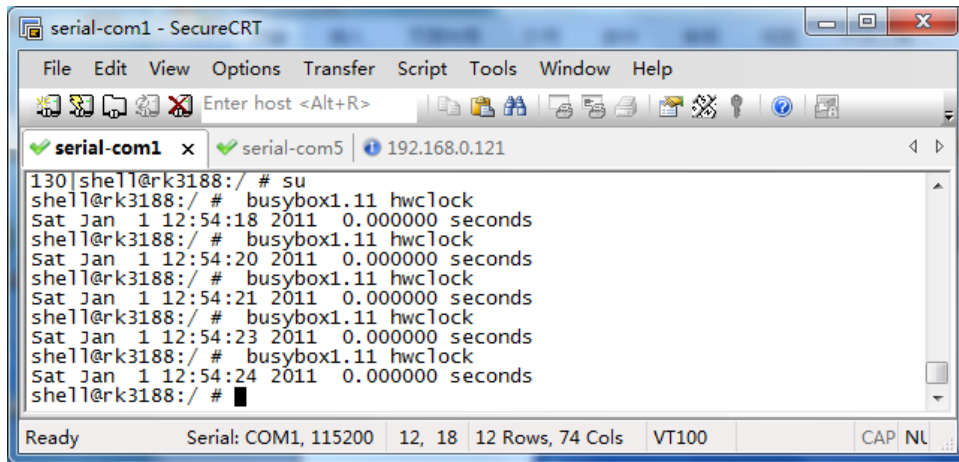
6.9 RTC

The RTC is used to ensure the date and time is still able to work after power off. Can view the time in the upper right corner of the screen as follow:



Also can Enter the following command in command line to view the RTC:

```
# busybox1.11 hwclock
```



```
serial-com1 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com1 x serial-com5 192.168.0.121
130|shell@rk3188:/ # su
shell@rk3188:/ # busybox1.11 hwclock
Sat Jan 1 12:54:18 2011 0.000000 seconds
shell@rk3188:/ # busybox1.11 hwclock
Sat Jan 1 12:54:20 2011 0.000000 seconds
shell@rk3188:/ # busybox1.11 hwclock
Sat Jan 1 12:54:21 2011 0.000000 seconds
shell@rk3188:/ # busybox1.11 hwclock
Sat Jan 1 12:54:23 2011 0.000000 seconds
shell@rk3188:/ # busybox1.11 hwclock
Sat Jan 1 12:54:24 2011 0.000000 seconds
shell@rk3188:/ #
```

6.10 Wi-Fi

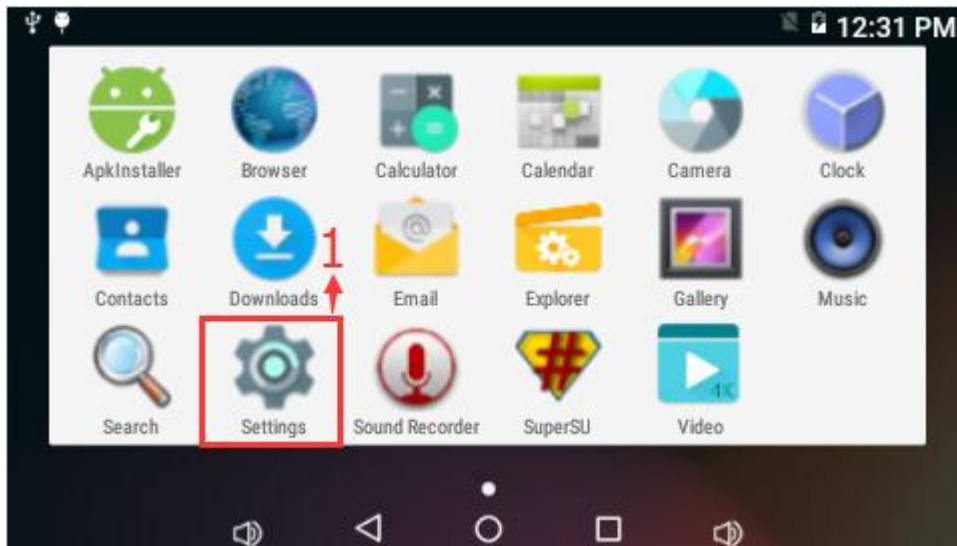
Step 1, Connect WiFi antenna.

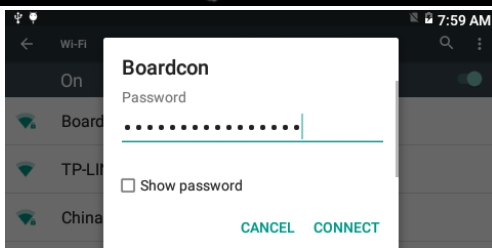
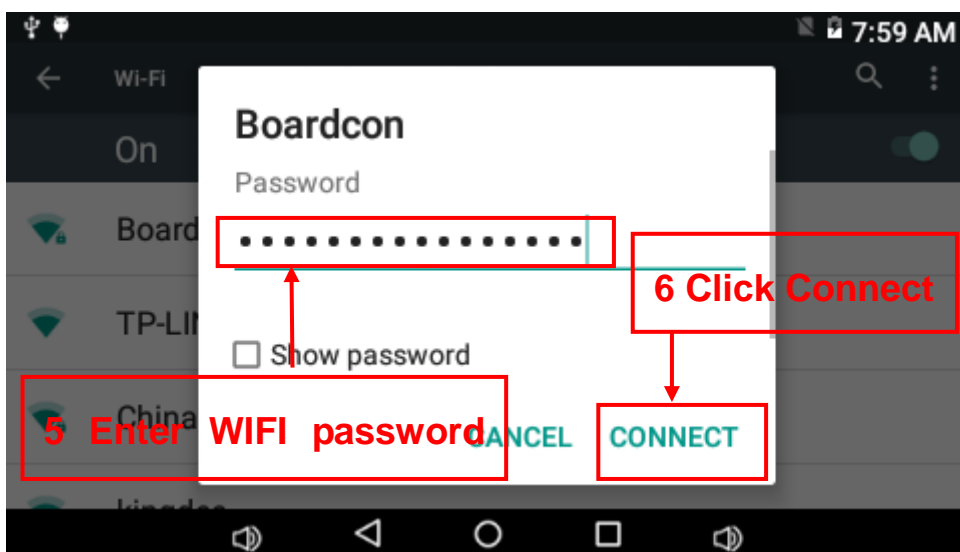
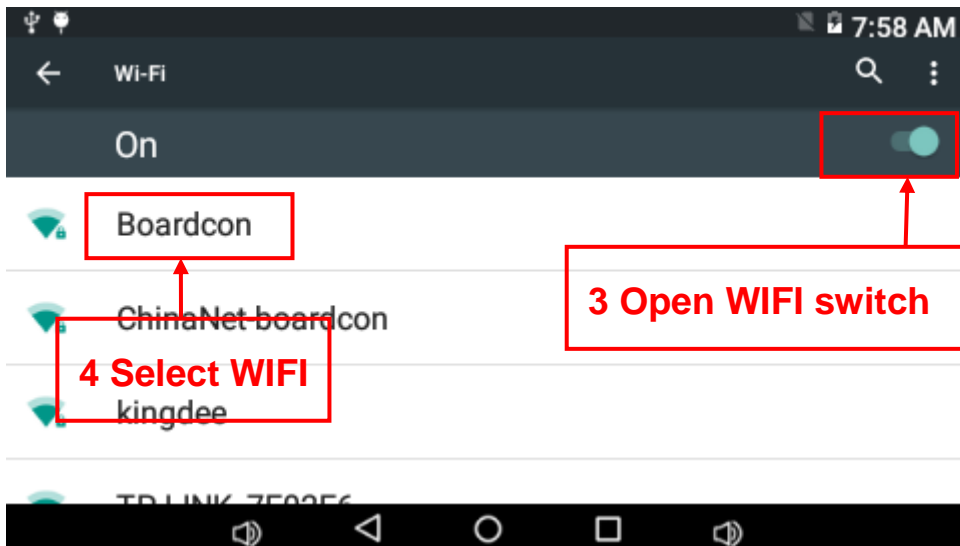
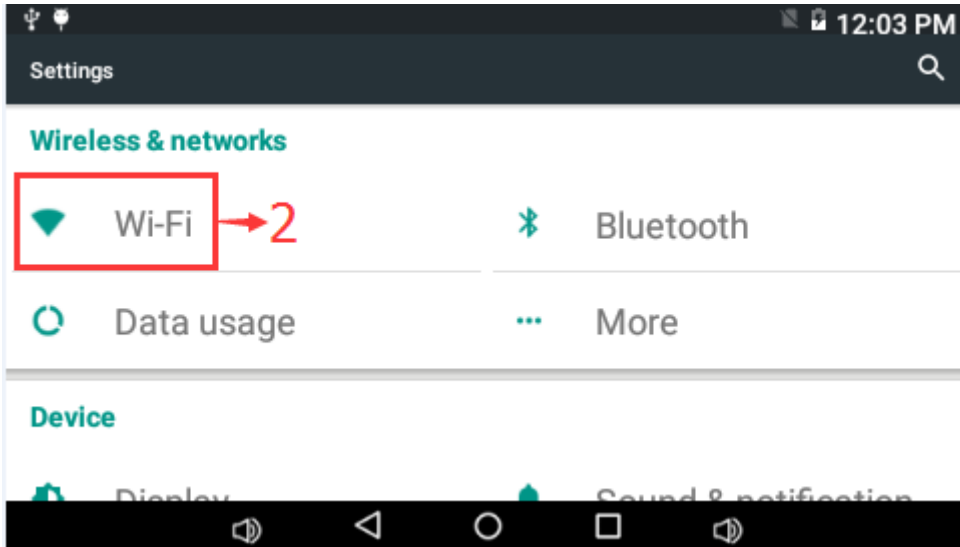
Step 2, Make sure menu option Settings->Wireless&network->Wi-Fi... was on.

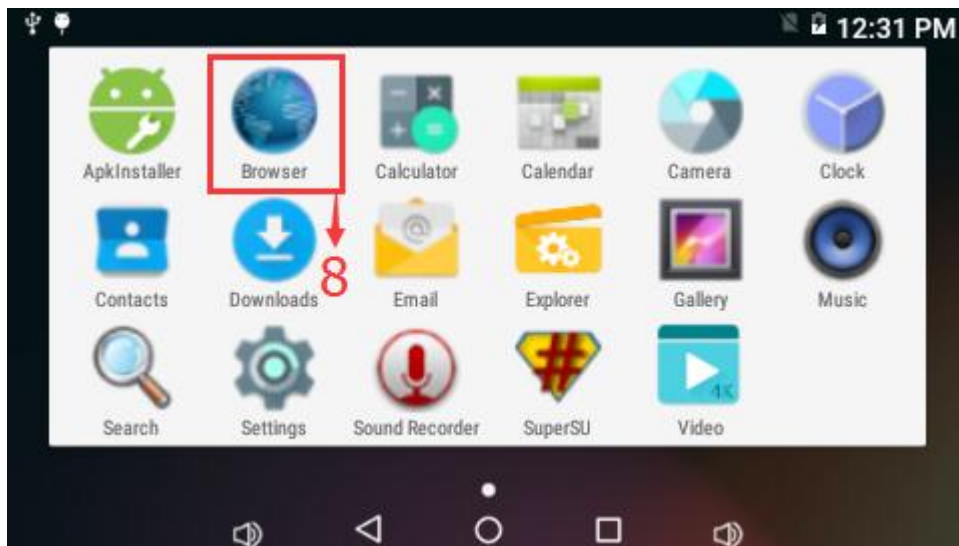
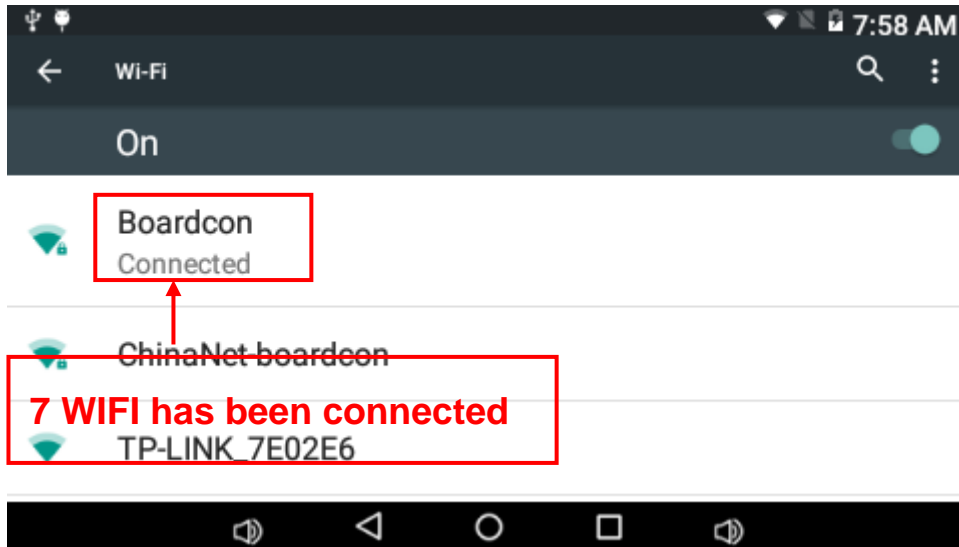
Step 3, Enter WIFI and it will scan AP automatically.

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

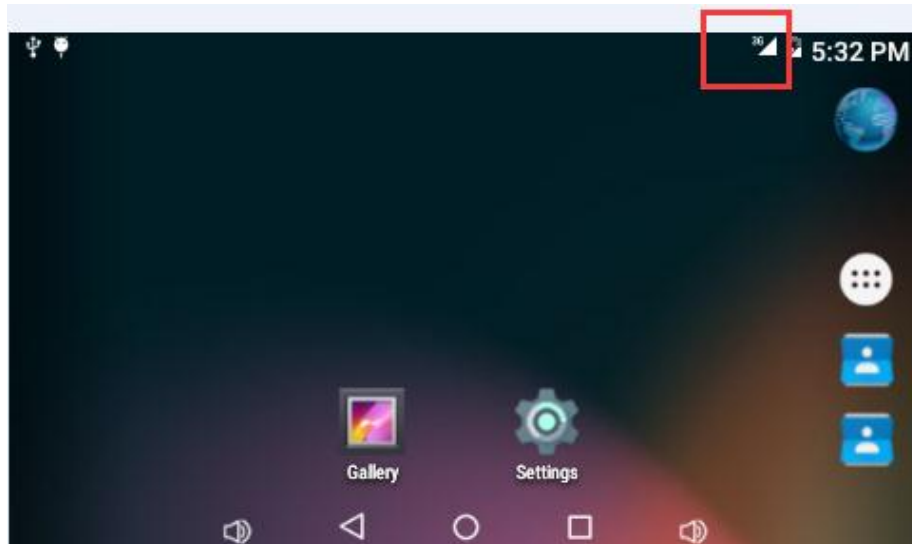






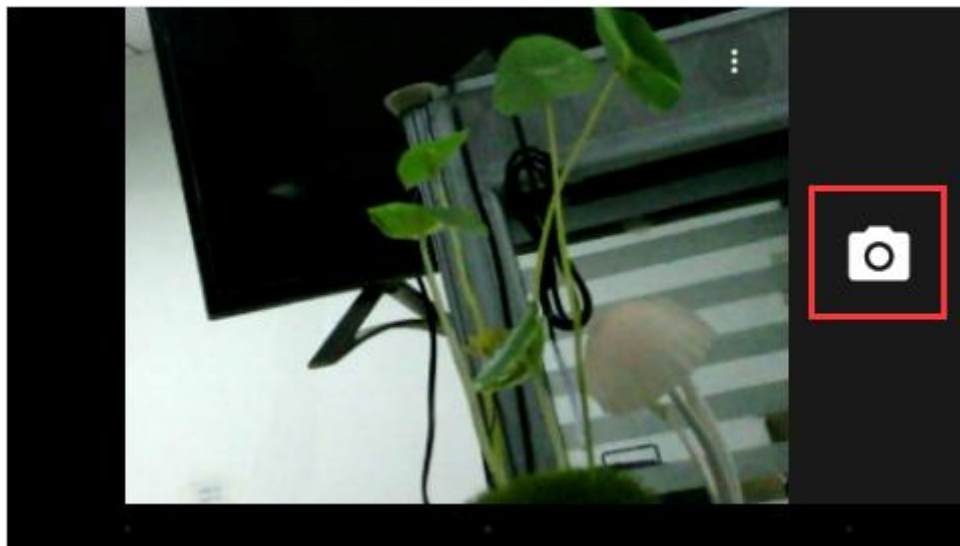
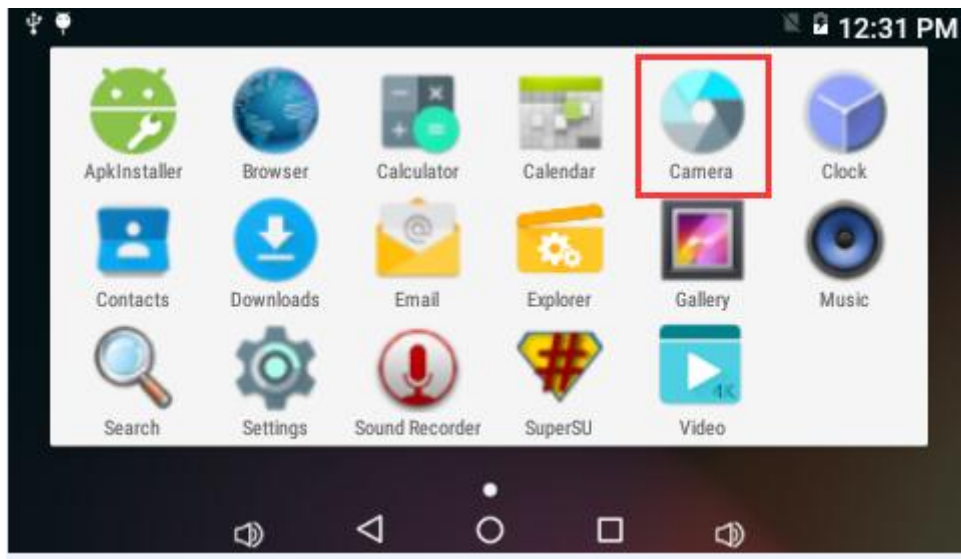
6.11 WCDMA 3G Module (UC20)

- Step 1*, Install 3G module (UC20) on PCI-E slot;
Step 2, Connect antenna and insert SIM card;
Step 3, Power on RK3188 board, start up Android;
Step 4, Open Internet Browser to browse the Web.



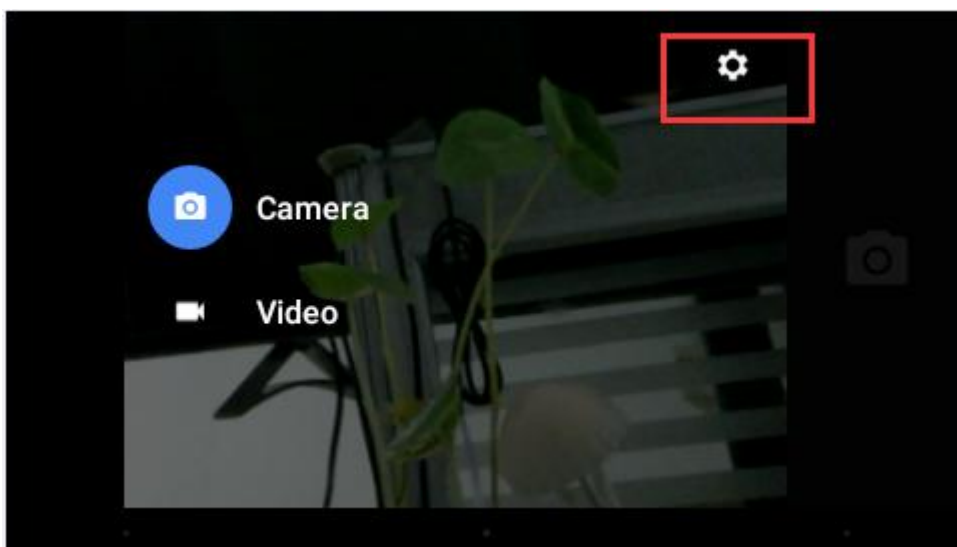
6.12 Camera

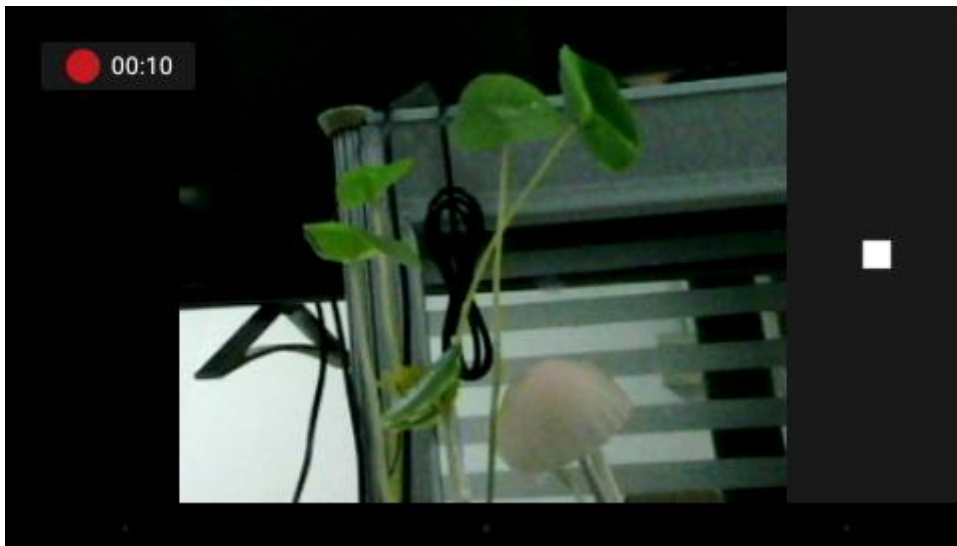
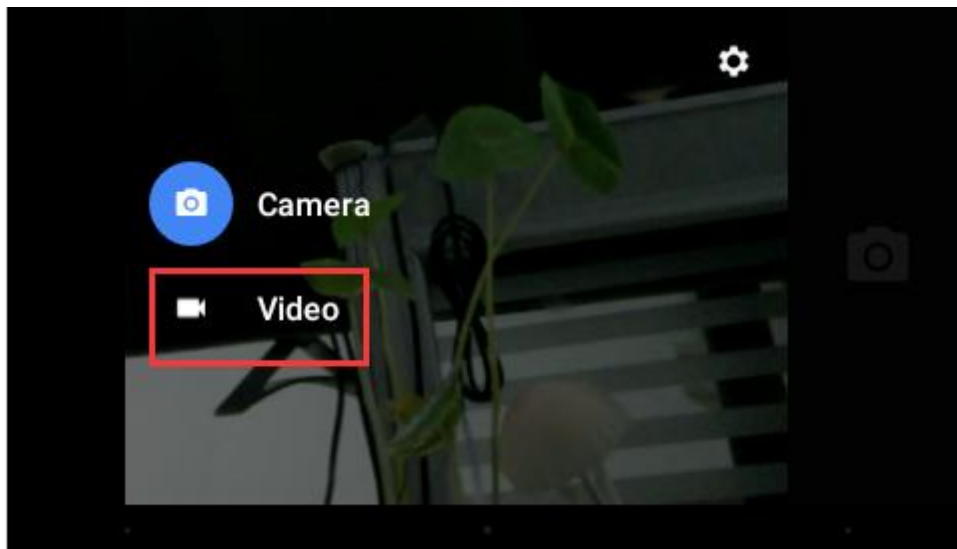
Insert camera module (OV5640) when the development board is de-energized, and then start the system. After the system running, click the Camera icon, then the program will run.



Click the button to take photo.

When take video set the video form is CIF. Click the button to take video.

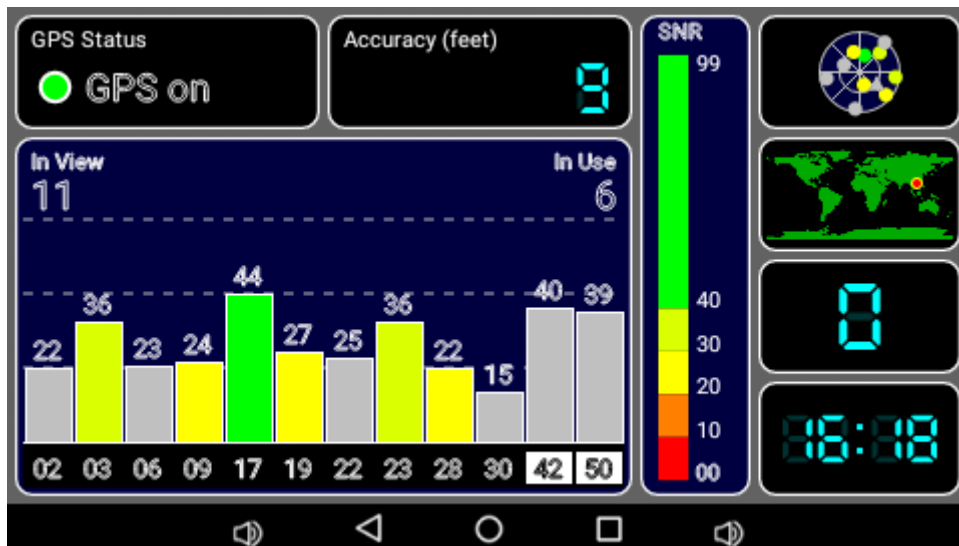




6.13 GPS

First, install the GPS Test Plus to android, then connect GPS antenna to GPS module's antenna interface, and GPS antenna head is must place in the outside areas to good receive signals.

Open GPS-Test in menu option. It will take some time to search star, please wait a moment.



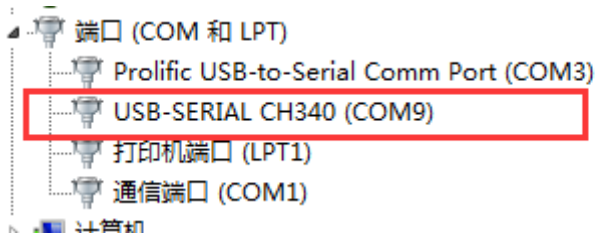
6.14 RS485

Step1. Connect the EM3188 RS485 port and PC with usb-RS485 device(A B reverse connection).



The PC will report that found new hardware if it never install the serial driver (CD\EM3188\tools\CH341SER.zip), install the driver.

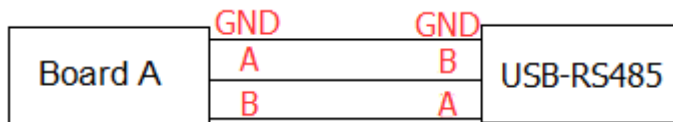
User can check whether the driver is installed successfully (Computer -> Device manager -> Port)



Step2. open another SecureCRT and set the parameters as follow.

Protocol: Serial
Port: USB-RS485
Baud rate: 9600

Step3. Connect Board A and computer with the USB-RS485 and Set the corresponding serial port (COM 9) as below.



Execute the command at Board A serial terminal:

```
# OUT_IO_NUMBER=183
# echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
```

Set the gpio183 as output port:

```
# echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direction
```

Execute the follow command to set Board B as Transmitter.

Then in the PC SecureCRT will receive 12345678.

```
# echo 0 > /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
# echo 12345678 > /dev/ttyS0
```

Execute the follow command to set Board B as receiver.

The Transmitter and receiver can be converted by execute the command

```
# echo 1 > /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
# cat /dev/ttyS0
```

```

serial-com1 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com1 x serial-com9
shell@rk3188:/ # OUT_IO_NUMBER=183
shell@rk3188:/ # echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
1|shell@rk3188:/ # echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/dire
"out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/directio
n
shell@rk3188:/ # echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direct
ion
shell@rk3188:/ #
shell@rk3188:/ # echo 0 > /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
shell@rk3188:/ # echo 12345678 > /dev/ttyS0
U[ 215.710179] rk_serial rk_serial.0: error:lsr=0x99
ART_IER = 0x87
UART_IIR = 0xc4
UART_LSR = 0x41
UART_MSR = 0x0
UART_MCR = 0x3
UART_RFL = 0x1
UART_LCR = 0x13
shell@rk3188:/ # echo 12345678 > /dev/ttyS0
U[ 220.073641] rk_serial rk_serial.0: error:lsr=0x99
ART_IER = 0x85
UART_IIR = 0xc4
UART_LSR = 0x1
UART_MSR = 0x0
UART_MCR = 0x3
UART_RFL = 0x1
UART_LCR = 0x13
shell@rk3188:/ # echo 12345678 > /dev/ttyS0
shell@rk3188:/ # echo 12345678 > /dev/ttyS0
Ready Serial: COM1, 115200 30, 18 30 Rows, 74 Cols VT100 CAP N

```

```

serial-com9 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com1 x serial-com9 x
12345678
12345678
12345678
Ready Serial: COM9, 9600 4, 1 11 Rows, 74 Cols VT100 CAP N

```

6.15 UART2

For an example, we test the communication of EM3188 board's UART2 and PC's com5. The is Baud rate 9600.

Setp1, connect EM3188 board's Debug serial terminal to your PC. **Maybe your PC is not COM1, it is another port, No problem. It is ok).**

Setp2, connect EM3188 board's UART2 to your PC. **Maybe your PC is not COM5, it is another port, No problem. It is ok).**

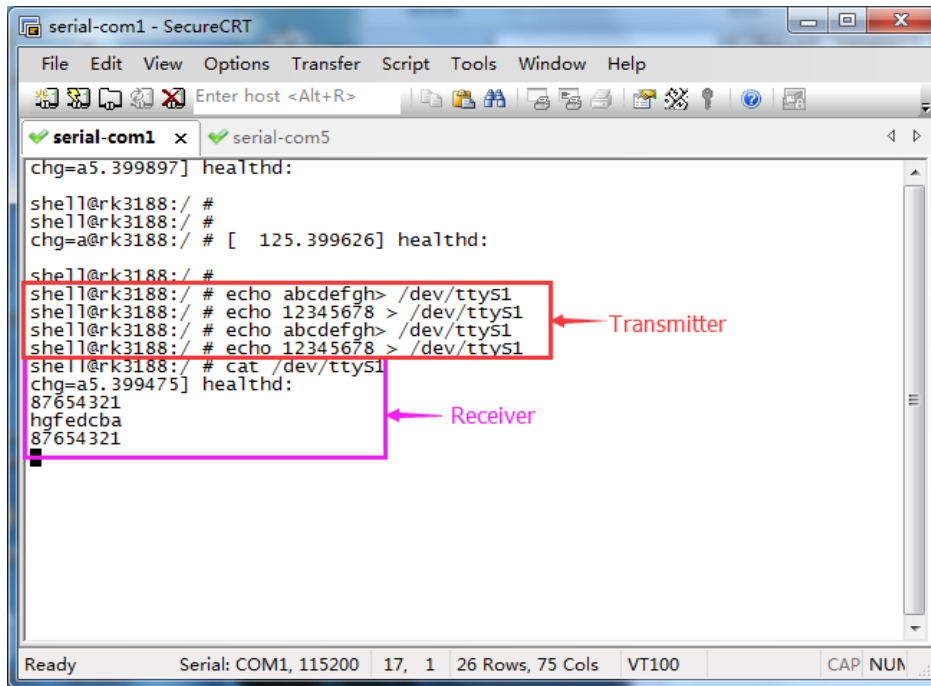
Setp3, execute the command in the Debug serial terminal of EM3188 board

Send data:

echo abcdefgh > /dev/ttyS1

Receive data:

cat /dev/ttyS1

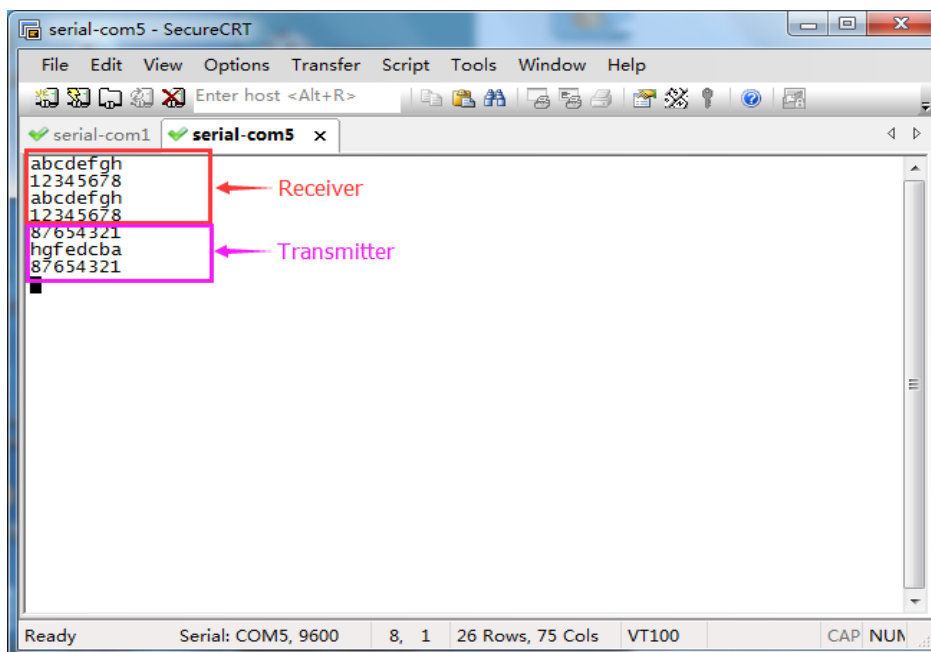


```

serial-com1 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com1 x serial-com5
chg=a5.399897] healthd:
shell@rk3188:/ #
shell@rk3188:/ #
chg=a@rk3188:/ # [ 125.399626] healthd:
shell@rk3188:/ #
shell@rk3188:/ # echo abcdefgh> /dev/ttyS1
shell@rk3188:/ # echo 12345678 > /dev/ttyS1
shell@rk3188:/ # echo abcdefgh> /dev/ttyS1
shell@rk3188:/ # echo 12345678 > /dev/ttyS1
shell@rk3188:/ # cat /dev/ttyS1
chg=a5.399475] healthd:
87654321
hgfedcba
87654321

```

Setp4, you can enter the Send data directly in the COM5 of your PC as below.



```

serial-com5 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com1 x serial-com5 x
abcdefgh
12345678
abcdefgh
12345678
87654321
hgfedcba
87654321

```

6.16 CAN

Install the USB ADB Tool and push the test program can_server and can_client to EM3188 board:

```
# adb root
# adb remount
# adb push can_server /system/bin
# adb push can_client /system/bin
```

```
# adb shell
# cd system
# cd bin
# chmod 777 can_server
# chmod 777 can_client
```

start can0:

```
# ifconfig can0 down
# ip link set can0 type can bitrate 125000
# ifconfig can0 up
```

board A(send data) :

```
# ./can_client
can0 can_ifindex = 4
Send a CAN frame from interface 4
```

board B (receive data) :

```
# ./can_server
can0 can_ifindex = 4
ddReceived a CAN frame from interface 0
frame message
--can_id = 123
--can_dlc = 5
--data = hello
Received a CAN frame from interface 4
```

6.17 Buzzer

Execute the command at EM3188 serial terminal:

```
# OUT_IO_NUMBER=284
# echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
```

Set the gpio284 as output port:

```
# echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direction
```

Execute the follow command to buzzer:

buzzer turn on:

```
# echo 1> /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

buzzer turn off:

```
# echo 0> /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

6.18 Use GPIO as output

For an example, Execute follow commands to control GPIO0_B7 to be a output port. If you want to control other gpio, you only need to modify the OUT_IO_NUMBER.

```
# OUT_IO_NUMBER=175
# echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direction
```

Assign value=1:

```
# echo 1> /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

Assign value= 0:

```
# echo 0> /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

6.19 Use GPIO as input

Base on this example, Execute follow commands to control GPIO0_B7 to be an input port. If you want to control other gpio, you only need to modify the OUT_IO_NUMBER.

```
# OUT_IO_NUMBER=175
# echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
# echo "in" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direction
# cat /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

List of GPIOs

Connector Pin Name	Used GPIO	OUT_IO_NUMBER
BL_EN	GPIO0_A2	162
DC_DET	GPIO0_B2	170
ALRT_N	GPIO0_B1	169
GPIO0_A1	GPIO0_A1	161
GPIO0_A3	GPIO0_A3	163
GPIO0_A5	GPIO0_A5	165
LCD_EN	GPIO0_B0	168
GPIO0_B4	GPIO0_B4	172
GCENSOR_INT	GPIO0_B7	175
CHG_DET	GPIO0_A6	166
SPI0_CLK	GPIO1_A6	198

SPI0_CSN0	GPIO1_A7	199
GPIO0_C3	GPIO0_C3	179
GPIO0_C4	GPIO0_C4	180
GPIO0_C2	GPIO0_C2	178
GPIO0_C6	GPIO0_C6	182
UART3_RTSN	GPIO1_B5	205
UART3_CTSN	GPIO1_B4	204
SDMMC0_RSTN	GPIO3_A0	256
UART0_RTS	GPIO1_A3	195
COMP_INT	GPIO3_D7	287

6.20 LEDs

For an example, Execute follow commands to turn on/off the LED20, If you want to control other LED, you only need to modify the OUT_IO_NUMBER.

```
# OUT_IO_NUMBER=172
# echo ${OUT_IO_NUMBER} > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio${OUT_IO_NUMBER}/direction
```

LED turn on:

```
# echo 1 > /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

LED turn off:

```
# echo 0 > /sys/class/gpio/gpio${OUT_IO_NUMBER}/value
```

List of LEDs

LED NAME	Used GPIO	OUT_IO_NUMBER
LED17	GPIO0_A1	161
LED18	GPIO0_A3	163
LED19	GPIO0_A5	165
LED20	GPIO0_B4	172