MaaXBoard Mini

Yocto Lite User Manual

V1.1

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Regulatory Compliance:

- MaaXBoard Mini single board computer has passed the CE, FCC & SRRC certification.

Revision History

Rev.	Description	Author	Date
V1.0	Initial version	Sandy	20200903
V1.1	Updated Yocto 3.0	Nick	20210322

Catalog

Chapter 1Introduction

1.1 Package Content

The content of software release package is subject to the actual release sources. For the file structure and instructions, refer to the following table:

Release Folder tree

```
├─01Doc
│   │   MaaXBoard-Mini-Linux-Yocto-ReleaseNote-Vxx.pdf
│   └─EN
│           MaaXBoard-Mini-Hardware_UserManual-Vxx.pdf
│           MaaXBoard-Mini-Linux-Yocto-Development_Guide-Vxx.pdf
│           MaaXBoard-Mini-UUU_Burning_Guide-Vxx.pdf
│           MaaXBoard-Mini-Linux-Yocto-UserManual-Vxx.pdf
└─04Linux Yocto Lite
    ├─01LinuxSourceCode
    │       MaaXBoard-Mini-LinuxSourceCode-Vxx.rar
    ├─02LinuxShipmentImage
    │       MaaXBoard-Mini-LinuxShipmentImage-Yocto-Vxx.rar
    └─03LinuxTools
            MaaXBoard-Mini-LinuxTools-Vxx.rar
```

01Doc	**Description**
MaaXBoard-Mini-Linux-Yocto-ReleaseNote-Vxx.pdf	Release Note
MaaXBoard-Mini-Linux-Yocto-UserManual-Vxx.pdf	User Manual
MaaXBoard-Mini-Linux-Yocto-DevelopmentGuide-Vxx.pdf	Development Guide
01LinuxSourceCode	**Description**

MaaXBoard-Mini-LinuxSourceCode-Vxx.rar	MaaXBoard source code package
02LinuxShipmentImage	**Description**
lite-image-maaxboard-mini-ddr4-2g-sdcard-**.rootfs.sdcard.bz2	Yocto image with firmware, system image file
imx-boot-maaxboard-mini-ddr4-2g-sdcard-sd.bin-flash_ddr4_evk	U-boot image, used to burn eMMC board
03LinuxTools	**Description**
xxx	Other tools

1.2 Feature List

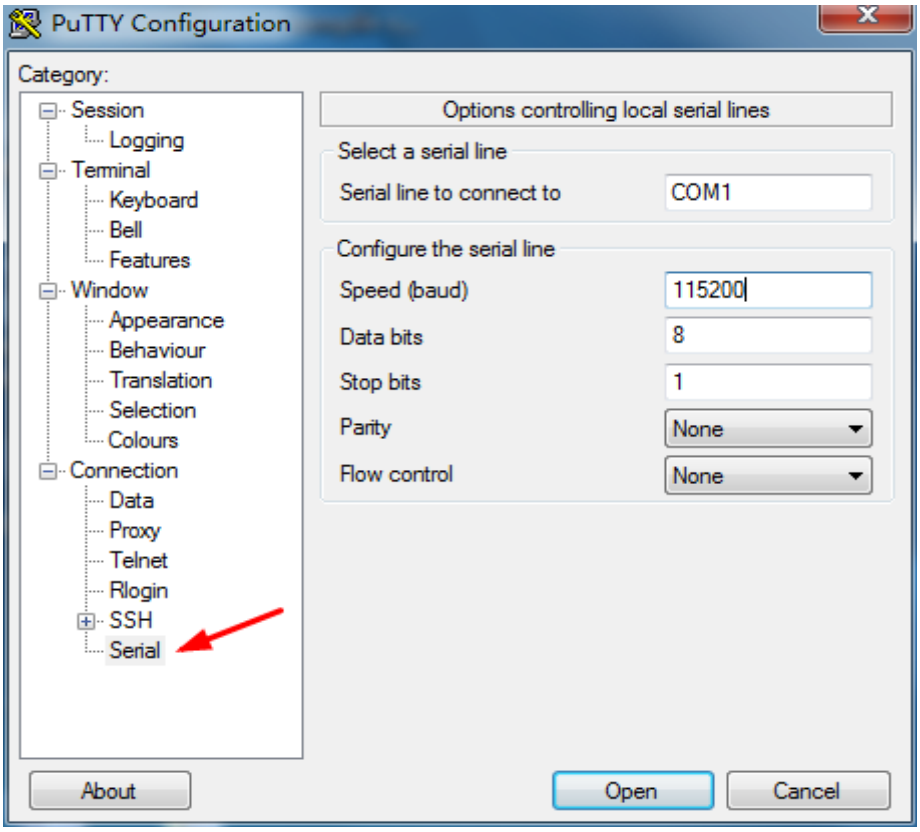
- Yocto version: Zeus (3.0), based on NXP SDK version: imx-5.4.24-2.1.0
- U-Boot version: 2020.04
- Kernel version: 5.4.24
- Evaluation image: Yocto Lite Image
- Development based on NXP i.MX 8M Mini
- Micro SD boot
- 1 Gigabit Ethernet (RJ45)
- 3 x USB 2.0 Host and 1 x USB 2.0 OTG
- 2 UART (TTL) include debug port
- External interfaces(I2C, UART,SPI and GPIO)
- WIFI & BLE 4.2
- MIPI-DSI display
- MIPI camera/USB Camera

Chapter 2Quick Start

The default version of MaaXBoard support boot up from SD Card only. To burn the image to SD Card, refer to Chapter 4 Burn or update the system Image. For the hardware connection and accessories details, please check the QSG.

2.1 Boot from SDCard

- Install the Serial Communication software (e.g. PuTTY), select the corresponding port number, baudrate as 115200, data bits as 8, stop bits as 1, parity as none.



- Connect the debug interface to PC with USB to TTL converter. Pin 6, 8 and 10 of J1 to the GND, RXD and TXD pin of the USB to TTL converter.
- Insert the SD card (with pre-burned image) into the card slot J10.
- Powered the board with a 5V, 2A, Type-C interface power (to J11).
- When the system boot up, the serial terminal will print the following information:

```
NXP i.MX Release Distro 5.4-zeus maaxboard-mini ttymxc0

Maaxboard-mini login:
```

- Enter username as “root”, password as “avnet” to login.

```
Maaxboard-mini login: root
Password:
Last login: Mon Mar 1 04:41:54 UTC 2021 on tty7
root@maaxboard-mini:~#
```

- Users could also connect keyboard and mouse to MaaXBoard Mini to login Yocto system.

2.2 Boot from eMMC

If you are using the eMMC version, the boot process is the same with boot from SD card, just ignore insert SD Card step.

2.3 Login system

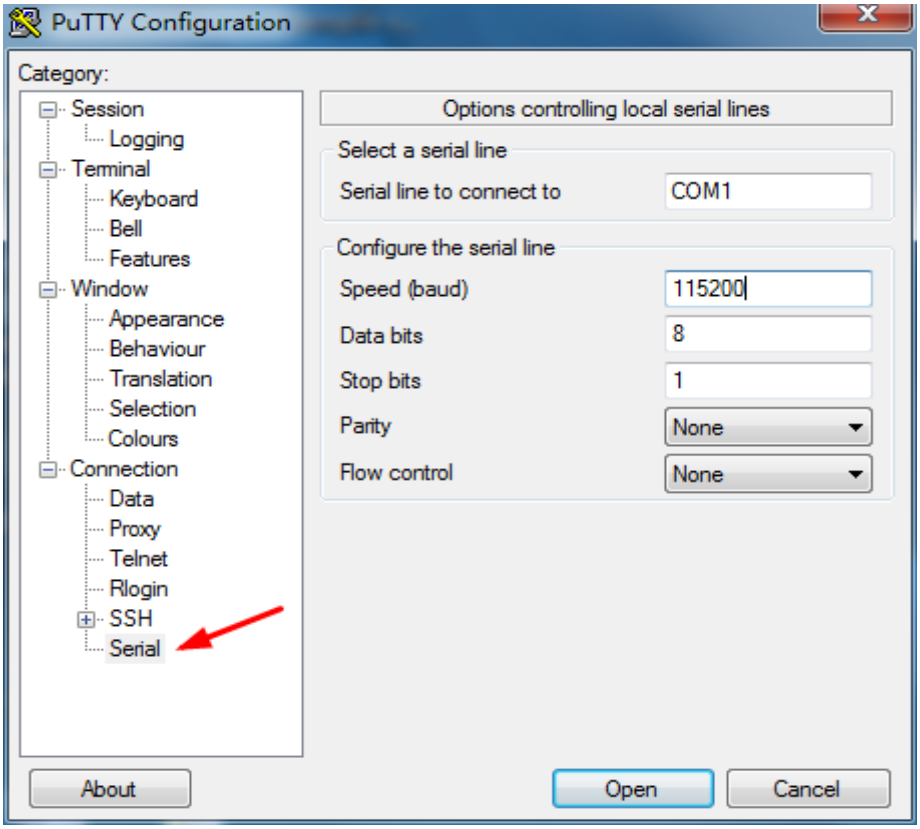
Yocto Lite system support the following login methods: login directly, login from debug serial, login from SSH.

2.3.1 Login Directly

Connect screen and keyboard to MaaXBoard Mini, username as “root”, password as “avnet” to login Yocto system.

2.3.2 Login from Debug Serial

- Install the Serial Communication software (e.g. PUTTY), select the corresponding port number, baudrate as 115200, data bits as 8, stop bits as 1, parity as none.



- Connect the debug interface to PC with USB to TTL converter. Pin 6, 8 and 10 of J1 to the GND, RXD and TXD pin of the USB to TTL converter.
- Enter username as “root”, password as “avnet” to login.

2.3.3 Login from SSH

Yocto OS install and startup SSH service automatically by default. Connect to internet, then login the system using SSH. Use scp to transfer files.

Linux system support ssh in default, in windows OS, you can install ssh by yourself, or use other software which support ssh or scp, such as PuTTY, WinSCP, etc.

2.3.3.1 Preparation

In default situation, users are not allowed to login from SSH as root user, so you need to modify the configuration file or create a common user and login.

Modify methods:

Add following info to the configuration file **/etc/ssh/sshd_config**:

PermitRootLogin yes

Then, check the IP of MaaXBoard: The IP will be used in ssh login.

```
root@maaxboard-mini:~# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 02:ea:0d:13:7f:29
          inet addr:192.168.2.98  Bcast:192.168.2.255  Mask:255.255.255.0
          inet6 addr: fe80::5eca:67bc:7e2e:2d45/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:14 errors:0 dropped:0 overruns:0 frame:0
          TX packets:38 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1903 (1.8 KiB)  TX bytes:7633 (7.4 KiB)
```

2.3.3.2 Login Command line

In this example, the IP of MaaXBoard is 192.168.2.98, enter following command in command line window to connect: **ssh root@192.168.2.98**. Enter **yes** in the first connection, then enter password “avnet” to login, enter **exit** to logout.

```
embest@compiler:~$ ssh root@192.168.2.98
root@192.168.2.98's password:
Last login: Thu Sep  3 02:21:11 2020
root@maaxboard-mini:~#
```

To copy files using scp command, enter the following command and password:
Copy file from computer to MaaXBoard:

```
embest@compiler:~$ scp test.txt root@192.168.2.98:/root/1.txt
```

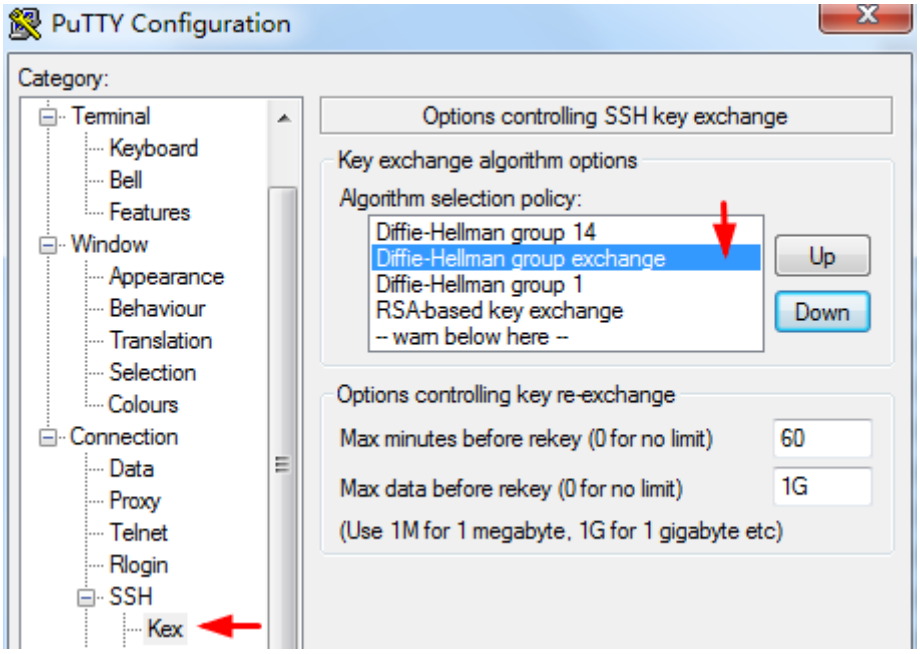
Copy file from MaaXBoard to computer:

```
embest@compiler:~$ scp root@192.168.2.98:/root/1.txt ./1.txt
```

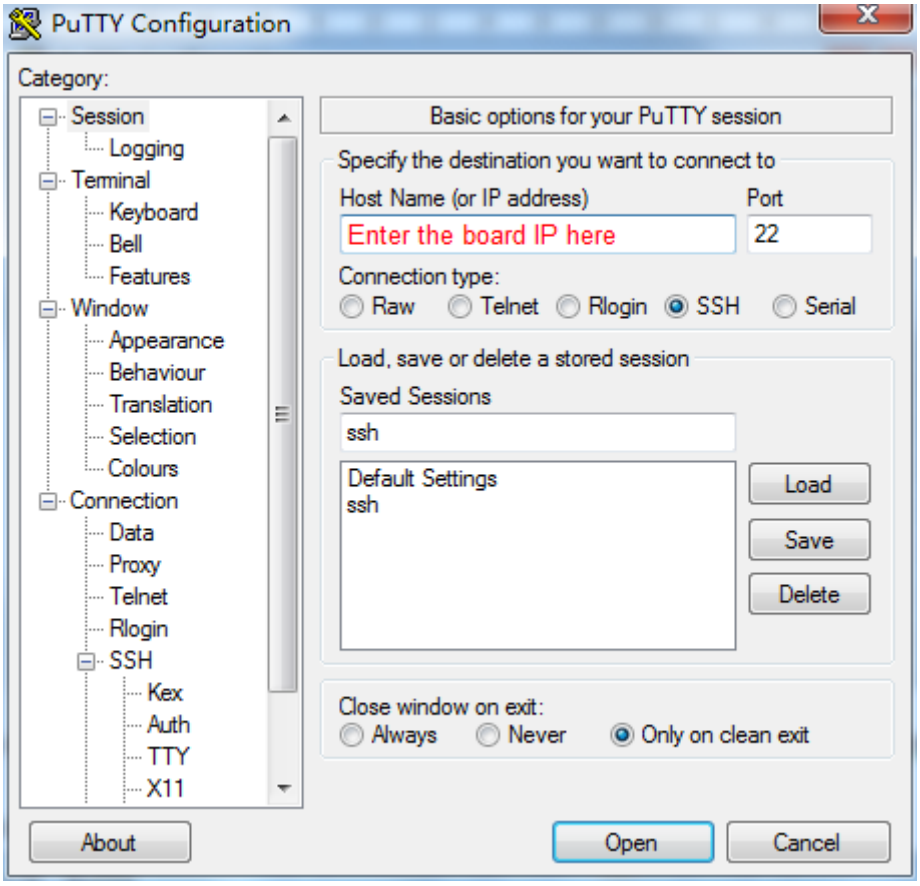
2.3.3.3 PuTTY

PuTTY support SSH, setting method as follows:

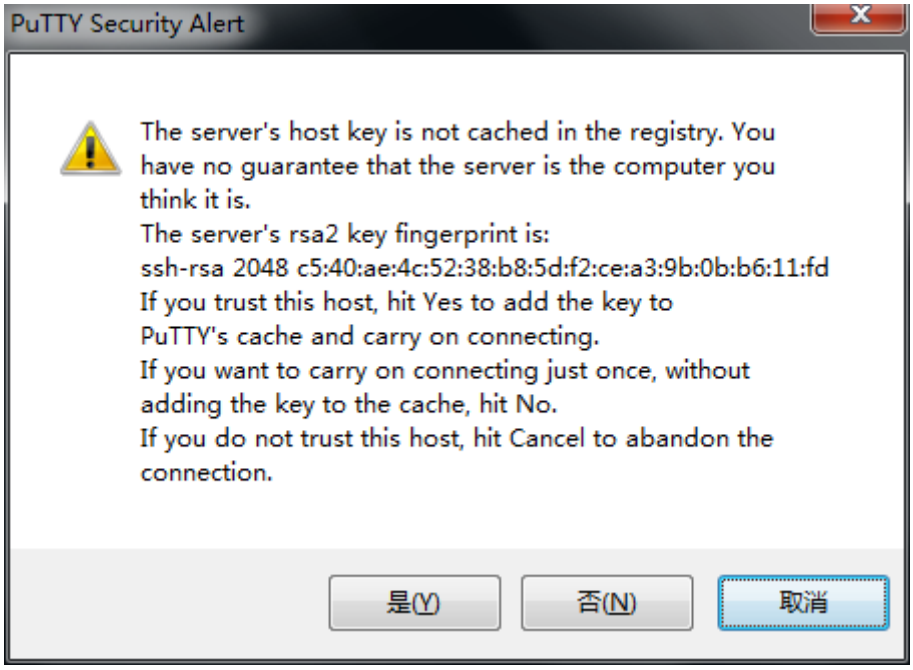
1. Run PUTTY, in Connection->SSH->Kex, change the **sequence** of algorithm.



2. In Session, enter IP address, e.g. 192.168.2.98, port 22, and Connection type SSH, then click Open.



3. In the first connection, click Y in the popout window.



4. Enter username as “root”, password as “avnet” to login, enter **exit** to logout.

```
login as: root
root@192.168.2.98's password:
Last login: Mon Mar 1 04:41:54 UTC 2021 from 192.168.2.72
root@maaxboard-mini:~#
```

Chapter 3Feature Configuration & Introduction

First of all, please refer to the previous chapter and boot up the system. Then configure or use the functions according to the following guidance.

3.1 USER LED

User can control the 2 single color LED indicators, LED0 and LED1 (corresponding to usr_led and sys_led) on MaaXBoard Mini. Execute the following instructions in serial terminal to control them.

Light out LED:

```
root@maaxboard-mini:~# echo 0 | tee /sys/class/leds/usr_led/brightness
root@maaxboard-mini:~# echo 0 | tee /sys/class/leds/sys_led/brightness
```

Light up LED:

```
root@maaxboard-mini:~# echo 1 | tee /sys/class/leds/usr_led/brightness
root@maaxboard-mini:~# echo 1 | tee /sys/class/leds/sys_led/brightness
```

3.2 Button

MaaXBoard Mini support 3 button: BACK, HOME and PWR.

1. Test BACK and HOME button with following instructions:

Enter **evtest** command, then choose the event id for **gpio_keys**

```
root@maaxboard-mini:~# evtest
No device specified, trying to scan all of /dev/input/event*
Available devices:
/dev/input/event0:          30370000.snvs:snvs-powerkey
/dev/input/event1:          fts_ts
/dev/input/event2:          gpio_keys
Select the device event number [0-2]: 2
Input driver version is 1.0.1
Input device ID: bus 0x19 vendor 0x1 product 0x1 version 0x100
Input device name: "gpio_keys"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 158 (KEY_BACK)
```

```
    Event code 172 (KEY_HOMEPAGE)
Properties:
Testing ... (interrupt to exit)
Event: time 1599100203.232960, type 1 (EV_KEY), code 172 (KEY_HOMEPAGE), value 1
Event: time 1599100203.232960, ---------- SYN_REPORT ------------
Event: time 1599100203.454065, type 1 (EV_KEY), code 172 (KEY_HOMEPAGE), value 0
Event: time 1599100203.454065, ---------- SYN_REPORT ------------
Event: time 1599100215.606083, type 1 (EV_KEY), code 158 (KEY_BACK), value 1
Event: time 1599100215.606083, ---------- SYN_REPORT ------------
Event: time 1599100215.852946, type 1 (EV_KEY), code 158 (KEY_BACK), value 0
Event: time 1599100215.852946, ---------- SYN_REPORT ------------
```

2. Press PWR button for 8s, system will enter suspend mode, press PWR again for 1s, the system will reboot.

Users could also test short press PWR button using **evtest** command:

```
root@maaxboard-mini:~# evtest
No device specified, trying to scan all of /dev/input/event*
Available devices:
/dev/input/event0:      30370000.snvs:snvs-powerkey
/dev/input/event1:      gpio_keys
/dev/input/event2:      bd718xx-pwrkey
Select the device event number [0-2]: 0
Input driver version is 1.0.1
Input device ID: bus 0x19 vendor 0x0 product 0x0 version 0x0
Input device name: "30370000.snvs:snvs-powerkey"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 116 (KEY_POWER)
Properties:
Testing ... (interrupt to exit)
Event: time 1596184675.913800, type 1 (EV_KEY), code 116 (KEY_POWER), value 1
Event: time 1596184675.913800, ---------- SYN_REPORT ------------
Event: time 1596184676.169726, type 1 (EV_KEY), code 116 (KEY_POWER), value 0
Event: time 1596184676.169726, ---------- SYN_REPORT ------------
```

3.3 Displayer

MaaXBoard Mini supports MIPI-DSI screen display.

Users can connect the screen to the board before boot up the system according to the following table. When the system boot up, the screen will print the related startup message and login UI. Users can connect keyboard to login the MaaXBoard Mini file system. The default displayer is MIPI-DSI screen.

Screen Type	Screen Resolution	Interface
MIPI-DSI	1280*720	J7

Display device could be chosen by modify the fdt_file value in uEnv.txt.

Modify methods:

Mount the first partition of SD card or eMMC to the system, then use **nano** or **vi** command to modify the uEnv.txt. After the modification, execute **sync** and **reboot** command to make it effect.

```
root@maaxboard-mini:~# mkdir mount
root@maaxboard-mini:~# mount /dev/mmcblk0p1 mount/
root@maaxboard-mini:~# nano mount/uEnv.txt
```

3.3.1 MIPI-DSI Screen

Choose MIPI-DSI screen, the fdt_file value should be:

```
fdt_file=maaxboard-mini-mipi.dtb
```

MIPI-DSI supports backlight brightness adjustment. The backlight brightness has a range from 0 to 9, in which 9 means highest brightness, 0 means lowest.

Execute the following instructions on the serial terminal to implement the backlight test:

```
root@maaxboard-mini:~# echo 7 > /sys/class/backlight/backlight/brightness
```

3.4 Touchscreen

The MIPI-DSI screen support touch screen. Use evtest command to test it.

```
root@maaxboard-mini:~# evtest /dev/input/touchscreen0
Input driver version is 1.0.1
Input device ID: bus 0x18 vendor 0x0 product 0x0 version 0x0
Input device name: "fts_ts"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 102 (KEY_HOME)
    Event code 139 (KEY_MENU)
    Event code 158 (KEY_BACK)
    Event code 330 (BTN_TOUCH)
  Event type 3 (EV_ABS)
    Event code 47 (ABS_MT_SLOT)
      Value      0
      Min        0
      Max        9
    Event code 48 (ABS_MT_TOUCH_MAJOR)
      Value      0
      Min        0
      Max      255
    Event code 53 (ABS_MT_POSITION_X)
      Value      0
      Min        0
      Max      720
    Event code 54 (ABS_MT_POSITION_Y)
```

```
      Value      0
      Min        0
      Max     1280
    Event code 57 (ABS_MT_TRACKING_ID)
      Value      0
      Min        0
      Max    65535
    Event code 58 (ABS_MT_PRESSURE)
      Value      0
      Min        0
      Max      255
Properties:
  Property type 1 (INPUT_PROP_DIRECT)
Testing ... (interrupt to exit)
Event: time 1597392253.449259, type 3 (EV_ABS), code 57 (ABS_MT_TRACKING_ID), value 19
Event: time 1597392253.449259, type 3 (EV_ABS), code 58 (ABS_MT_PRESSURE), value 63
Event: time 1597392253.449259, type 3 (EV_ABS), code 53 (ABS_MT_POSITION_X), value 31
Event: time 1597392253.449259, type 3 (EV_ABS), code 54 (ABS_MT_POSITION_Y), value 1024
Event: time 1597392253.449259, type 1 (EV_KEY), code 330 (BTN_TOUCH), value 1
Event: time 1597392253.449259, ---------- SYN_REPORT ------------
Event: time 1597392253.515228, type 3 (EV_ABS), code 57 (ABS_MT_TRACKING_ID), value -1
Event: time 1597392253.515228, type 3 (EV_ABS), code 58 (ABS_MT_PRESSURE), value 0
Event: time 1597392253.515228, type 1 (EV_KEY), code 330 (BTN_TOUCH), value 0
Event: time 1597392253.515228, ---------- SYN_REPORT ------------
```

3.5 Audio

3.5.1 Play Audio file

```
root@maaxboard-mini:~# aplay audio_sample.wav
root@maaxboard-mini:~# gst-play-1.0 audio_sample.wav
```

Note: aplay command support audio file in wav format, gst-play command support wav, mp3 and aac format.

3.5.2 Supported Devices

MaaXBoard Mini support USB audio device and Bluetooth audio device. If multiple devices are connected simultaneously, the priority is as follows:

USB audio device < Bluetooth audio device

3.5.2.1 USB Audio Device

MaaXBoard Mini could support USB audio device (which do not need specified driver) to play audio. You can play audio from USB audio device.

```
root@maaxboard-mini:~# pulseaudio -D -v
root@maaxboard-mini:~# gst-play-1.0 audio_sample.wav
```

3.5.2.2 Bluetooth Audio

Yocto system also support play audio files via the Bluetooth audio device such as Bluetooth headset. For detail, refer to Bluetooth part:

Pair and connect the Bluetooth device, then execute **pulseaudio -D -v** before play the audio or video files.

```
root@maaxboard-mini:~# pulseaudio -D -v
root@maaxboard-mini:~# gst-play-1.0 embest.mp4
```

Currently we only support part of Bluetooth audio device.

3.6 Video

Yocto system support play video file in mp4 format, the largest support resolution is 4K (use with 4K HDMI Displayer), use the following command:

```
root@maaxboard-mini:~# gst-play-1.0 embest.mp4
```

3.7 Camera

MaaXBoard Mini support USB Camera and MIPI-CSI Camera. This part will introduce how to preview, photograph and record video under Command line.

3.7.1 Check Device ID

```
root@maaxboard-mini:~# ls /dev/video*
/dev/video0   /dev/video1
```

In default, MIPI-CSI camera is /dev/video0, USB Camera is /dev/video1. The device ID will be used in following command.

3.7.2 Preview

Use the following instruction to open Camera and preview the video on the screen.

```
root@maaxboard-mini:~# gst-launch-1.0 v4l2src device=/dev/video0 ! autovideosink
```

Note: Press Ctrl+C to exit, change /dev/video0 to your device ID.

3.7.3 Take Photo

Use the following instruction to take a photo and saved to specific location.

```
gst-launch-1.0 v4l2src device=[video] num-buffers=1 ! jpegenc ! filesink location=[filename]
```

In above command, replace [video] to the camera device ID, filename] to the path and name of saved file. For example:

```
root@maaxboard-mini:~# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=1 ! jpegenc !
filesink location=sample.jpg
```

Copy the photo to other device, such as computer to display it.

3.7.4 Record Video

Use the following instruction to record a video in mp4 format and saved to specific location.

```
root@maaxboard-mini:~# gst-launch-1.0 -e v4l2src device=/dev/video0 num-buffers=100 !
video/x-raw,format=YUY2,framerate=30/1, width=640, height=480 ! videoconvert ! x264enc !
video/x-h264, profile=baseline ! mp4mux ! filesink location=output.mp4
```

In above command, modify the camera device ID, the width and height of the video, the path and name of saved file, etc. The video file can be copy to other device, such as computer to display, or use gst-play-1.0 to display it on the screen directly.

```
root@maaxboard-mini:~# gst-play-1.0 output.mp4
```

3.8 Gigabit Ethernet Interface

Connect the network cable to J8, enter the following instructions to set the IP address:

The below IP address are example, replace it with your real network environment

3.8.1 Network Test

After connecting the network cable, it will automatically obtain the IP by default. You can use the ifconfig command to view the IP information and use the following command to perform the network test:

```
root@maaxboard-mini:~# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 02:ea:0d:13:7f:29
          inet addr:192.168.2.98  Bcast:192.168.2.255  Mask:255.255.255.0
          inet6 addr: fe80::5eca:67bc:7e2e:2d45/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:14 errors:0 dropped:0 overruns:0 frame:0
          TX packets:38 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1903 (1.8 KiB)  TX bytes:7633 (7.4 KiB)
root@maaxboard-mini:~# ping www.baidu.com
```

3.8.2 Set Static IP

If you need to set a static IP, use **nano** command to modify **/etc/dhcpcd.conf**, add following info.

```
interface eth0
static ip_address=192.168.2.100/24
static routers=192.168.2.1
static domain_name_servers=192.168.2.252 8.8.8.8
```

In above command, replace the IP address, router, DNS with your real network environment. Execute **sync** after the modification, then **reboot** the system to make it effect.

3.9 USB 2.0 Interface

MaaXBoard Mini support 4 USB Interfaces, the lower one in J2 is USB0, the upper one in J2 is USB3, the lower one in J4 is USB2, the upper one in J4 is USB1. 4 USB 2.0 interfaces support USB HOST function, only USB0 support USB Device function.

3.9.1 USB Host

Insert a U-disk, serial terminal will display the disk information:

```
[   351.486961] usb 2-1: new SuperSpeed USB device number 2 using xhci-hcd
[   351.555466] usb-storage 2-1:1.0: USB Mass Storage device detected
[   351.565410] scsi host0: usb-storage 2-1:1.0
[   352.580502] scsi 0:0:0:0: Direct-Access     Kingston DataTraveler 3.0    PQ: 0 ANSI: 6
[   352.590313] sd 0:0:0:0: [sda] 30218842 512-byte logical blocks: (15.5 GB/14.4 GiB)
[   352.598479] sd 0:0:0:0: [sda] Write Protect is off
[   352.604317] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[   352.618904]  sda: sda1
[   352.623399] sd 0:0:0:0: [sda] Attached SCSI removable disk
```

Execute the following instructions on the serial terminal:

```
root@maaxboard-mini:~# ls /dev/sd*
/dev/sda  /dev/sda1
```

The storage node for U disk is /dev/sda1, uses could mount the storage device to the file system to read and write data.

MaaXBoard Mini also supports other USB device such as key board, mouse, Camera, etc.

3.9.2 USB Device

USB0 support USB Device function could be used to burn the system image or use as USB Network adapter.

3.9.2.1 BURNING MODE

Connect USB0 and PC before power on the board. The system will not boot normally, it will enter burning mode. Then users could burn the system image to the development board using uuu tools. For the detail information, refer to MaaXBoard Mini UUU Burning Guide.

3.9.2.2 USB NETWORK ADAPTER

To use USB0 as USB slave device: network adapter, users should modify the value of fdt_file in uEnv.txt and reboot the system.

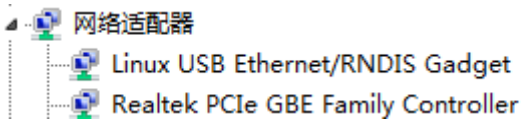
```
fdt_file=maaxboard-mini-device.dtb
```

When choose this value, the displayer is MIPI-DSI screen.

Connect USB0 to PC after the system start up, open the device manager, and check if the following device is recognized:

Please follow the steps listed below to finish USB Device test (Use Windows 7 as example).

1. Install Linux USB Ethernet driver (In release package: LinuxTools), then the device manager will list the Network Adapter: Linux USB Ethernet/RNDIS Gadget



2. Execute the following instructions to set and view the IP address of USB OTG port

The below IP address are example, you can select any other IP, but make sure it is NOT the same network segment as your PC's Ethernet port.

```
root@maaxboard-mini:~# ifconfig usb0 up
root@maaxboard-mini:~# ifconfig usb0 192.168.1.115
root@maaxboard-mini:~# ifconfig usb0
```

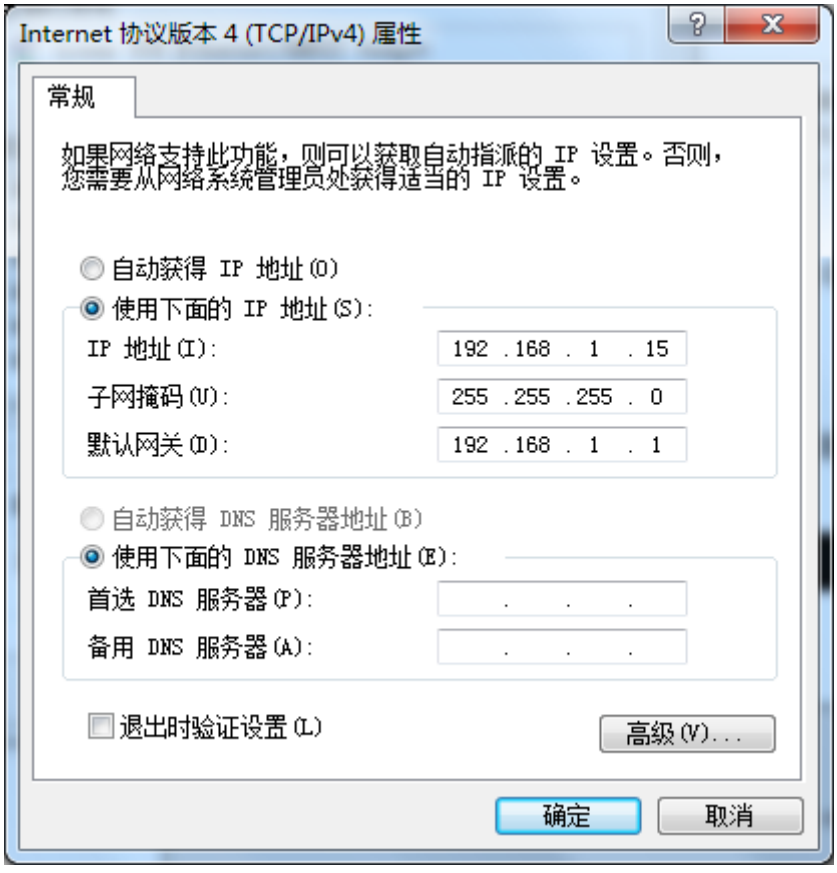
The terminal window will print information as shown below

```
usb0      Link encap:Ethernet  HWaddr 92:a9:b6:be:8b:3f
          inet addr:192.168.1.115  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::90a9:b6ff:febe:8b3f/64 Scope:Link
```

```
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:167 errors:0 dropped:0 overruns:0 frame:0
          TX packets:28 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:12180 (11.8 KiB)  TX bytes:7075 (6.9 KiB)
```

3. Open Control Panel, in the search box, type adapter, and then, under Network and Sharing Center, select View network connections, you will find a new Local Area Connection as shown below

4. Right click the connection “Local Area Connection 5”, select “Properties”-> “Networking” -> “Internet Protocol Version 4 (TCP/IPv4)”, then select Properties to open the following window. Set an IP address that is in the same network segment as the USB OTG port, then click “OK”.



5. Execute the following instruction to verify the network connection;

```
root@maaxboard-mini:~# ping 192.168.1.15
PING 192.168.1.15 (192.168.1.15) 56(84) bytes of data.
64 bytes from 192.168.1.15: icmp_seq=1 ttl=64 time=0.865 ms
```

```
64 bytes from 192.168.1.15: icmp_seq=2 ttl=64 time=0.464 ms
64 bytes from 192.168.1.15: icmp_seq=3 ttl=64 time=0.259 ms
```

The information shown above indicates the network connection is working properly.

3.10 Wi-Fi

The on-board Wi-Fi module support 2.4G/5G network and hotspot.

3.10.1 Connect WIFI

Execute the following instructions on the serial terminal to search Wi-Fi network:

```
root@maaxboard-mini:~# iwlist wlan0 scan
```

It will print the information for all available network.

If you want to search for specific Wi-Fi network, use the following:

```
root@maaxboard-mini:~# iwlist wlan0 scan essid Embest_WiFi
wlan0     Scan completed :
          Cell 01 - Address: 80:81:00:56:2F:88
                    Channel:6
                    Frequency:2.437 GHz (Channel 6)
                    Quality=50/70  Signal level=-60 dBm
                    Encryption key:on
                    ESSID:"Embest_WiFi"
                    Bit Rates:1 Mb/s; 2 Mb/s; 5.5 Mb/s; 11 Mb/s; 6 Mb/s
                              9 Mb/s; 12 Mb/s; 18 Mb/s
                    Bit Rates:24 Mb/s; 36 Mb/s; 48 Mb/s; 54 Mb/s
                    Mode:Master
                    Extra:tsf=0000000000000000
                    Extra: Last beacon: 88ms ago
                    IE: Unknown: 000B456D626573745F57694669
                    IE: Unknown: 010882848B960C121824
                    IE: Unknown: 030106
                    IE: Unknown: 2A0106
                    IE: Unknown: 32043048606C
                    IE: IEEE 802.11i/WPA2 Version 1
                        Group Cipher : TKIP
                        Pairwise Ciphers (2) : CCMP TKIP
                        Authentication Suites (1) : PSK
```

```
                    IE: WPA Version 1
                        Group Cipher : TKIP
                        Pairwise Ciphers (2) : CCMP TKIP
                        Authentication Suites (1) : PSK
```

Connect Wi-Fi network:

```
root@maaxboard-mini:~# nano /etc/wpa_supplicant.conf
```

Add following info into this file:

```
network={
      ssid=" Embest_WiFi "
      psk="12345678"
}
```

Then execute the following command:

```
root@maaxboard-mini:~# wpa_supplicant -B -i wlan0 -c /etc/wpa_supplican
Successfully initialized wpa_supplicant
rfkill: Cannot open RFKILL control device
rfkill: Cannot get wiphy information
```

If the connection succeeds, it will print the following info:

```
IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
```

Test Wi-Fi network with **ping** command:

```
root@maaxboard-mini:~# ping www.baidu.com -I wlan0
PING www.a.shifen.com (103.235.46.39) 56(84) bytes of data.
64 bytes from 103.235.46.39: icmp_seq=1 ttl=50 time=122 ms
```

3.10.2 Auto Connect Wi-Fi Network

To connect Wi-Fi after reboot automatically, use the following method:

Prepare config file

```
mkdir -p /etc/wpa_supplicant
cp /etc/wpa_supplicant.conf /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
```

Note: Add network info to /etc/wpa_supplicant/wpa_supplicant-wlan0.conf, refer to above chapter.

```
systemctl start wpa_supplicant@wlan0
systemctl enable wpa_supplicant@wlan0
```

3.10.3 Wi-Fi Hotspot

To open a Wi-Fi hotspot, disconnect Wi-Fi connection, connect the network cable to J13, and execute the following instructions on the serial terminal:

Download and Install create_ap,

```
root@maaxboard-mini:~# git clone --depth 1 https://github.com/oblique/create_ap.git
root@maaxboard-mini:~# cd create_ap
root@maaxboard-mini:~# make install
```

Enable Wi-Fi hotspot

```
root@maaxboard-mini:~# create_ap wlan0 eth0 MyAccessPoint MyPassPhrase --no-dns &
```

In above instruction: “MyAccessPoint” is the SSID, “MyPassPhrase” is the password. Users could connect the hotspot with Wi-Fi device.

You will see the following info if the Hotspot is created

```
wlan0: Could not connect to kernel driver
Using interface wlan0 with hwaddr d0:c5:d3:f9:5c:1d and ssid "MyAccessPoint"
[79957.558307] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
wlan0: interface state UNINITIALIZED->ENABLED
wlan0: AP-ENABLED
```

Close the Wi-Fi hotspot:

```
root@maaxboard-mini:~# create_ap --stop wlan0
```

3.11 Bluetooth 4.2

3.11.1 Initialize the Bluetooth Module

Execute the following instructions on the serial terminal:

```
root@maaxboard-mini:~# hciattach /dev/ttymxc3 bcm43xx 3000000
bcm43xx_init
Set Controller UART speed to 3000000 bit/s
Flash firmware /etc/firmware/BCM4345C0.1MW.hcd
Set Controller UART speed to 3000000 bit/s
Setting TTY to N_HCI line discipline
Device setup complete
root@maaxboard-mini:~# hciconfig hci0 up
```

3.11.2 Connect Bluetooth Device

Use **bluetoothctl** to connect Bluetooth Device:

```
root@maaxboard-mini:~# pulseaudio -D -v
root@maaxboard-mini:~# bluetoothctl
[bluetooth]# power on
[bluetooth]# pairable on
[bluetooth]# agent on
[bluetooth]# default-agent
[bluetooth]# scan on
[bluetooth]# scan off
[bluetooth]# pair E8:EC:A3:21:57:6C
[bluetooth]# trust E8:EC:A3:21:57:6C
[bluetooth]# connect E8:EC:A3:21:57:6C
[Mi Sports BT Earphones Basic]# quit
```

In above instructions, **E8:EC:A3:21:57:6C** is the address of the Bluetooth device, change it according to your device.

3.11.3 Send Files

Run the OBEXD daemon and connect to the target Bluetooth device

```
root@maaxboard-mini:~# export $(dbus-launch)
root@maaxboard-mini:~# /usr/libexec/bluetooth/obexd -r /home/root -a -d & obexctl
[obex]# connect 94:87:E0:DF:90:2D
[94:87:E0:DF:90:2D]# send /home/root/1.txt
```

In above instructions, 94:87:E0:DF:90:2D is the address of target device, change it according to your device.

3.12 UART

MaaXBoard Mini supports 2 UART interface.

MaaXBoard Mini (CPU)	Interface Type
UART1	UART TTL (Debug Interface)
UART2	UART TTL

3.12.1 UART 2

In the Yocto system, the node for UART2 is /dev/ttymxc1. Users could also write their own applications to control the uart.

3.13 Control 40 Pin Interface

This chapter will provide the Control methods of 40 Pin interface, include GPIO, I2C and SPI.

3.13.1 GPIO

System use /sys/class/gpio to control the GPIO pin, refer to the following table:

Table: GPIO corresponding relation table

GPIO number	PINMUX	Function	PIN	PIN	Function	PINMUX	GPIO number
		3.3V	1	2	5V		
2	GPIO5_IO17	SDA1	3	4	5V		
3	GPIO5_IO16	SCL1	5	6	GND		
4	GPIO1_IO14	GPIO	7	8	UART_TX	GPIO5_IO23	14
		GND	9	10	UART_RX	GPIO5_IO22	15
17	GPIO3_IO17	GPIO	11	12	GPIO/PCM_CLK	GPIO5_IO0	18
27	GPIO3_IO4	GPIO	13	14	GND		
22	GPIO3_IO18	GPIO	15	16	GPIO	GPIO5_IO24	23
		3.3V	17	18	GPIO	GPIO5_IO25	24
10	GPIO5_IO7	MOSI	19	20	GND		
9	GPIO5_IO8	MISO	21	22	GPIO	GPIO5_IO28	25
11	GPIO5_IO6	SCLK	23	24	CE0	GPIO5_IO9	8
		GND	25	26	CE1	GPIO1_IO1	7
0	GPIO5_IO19	SDA0	27	28	SCL0	GPIO5_IO18	1
5	GPIO1_IO15	GPIO/GPCLK	29	30	GND		
6	GPIO4_IO27	GPIO/GPCLK	31	32	GPIO/PWM1	GPIO5_IO5	12

13	GPIO5_IO4	GPIO/PWM2	33	34	GND		
19	GPIO4_IO28	GPIO/PCM_FS	35	36	GPIO	GPIO3_IO16	16
26	GPIO1_IO10	GPIO	37	38	GPIO/PCM_DIN	GPIO4_IO30	20
		GND	39	40	GPIO/PCM_DOUT	GPIO5_IO1	21

Here we use PIN 11 as an example:

1. In above table, find the GPIO Number of PIN11, which is 17.
2. Set the function of Pin11 to be GPIO output.

```
root@maaxboard-mini:~# echo 17 >/sys/class/gpio/export
root@maaxboard-mini:~# echo out >/sys/class/gpio/gpio17/direction
```

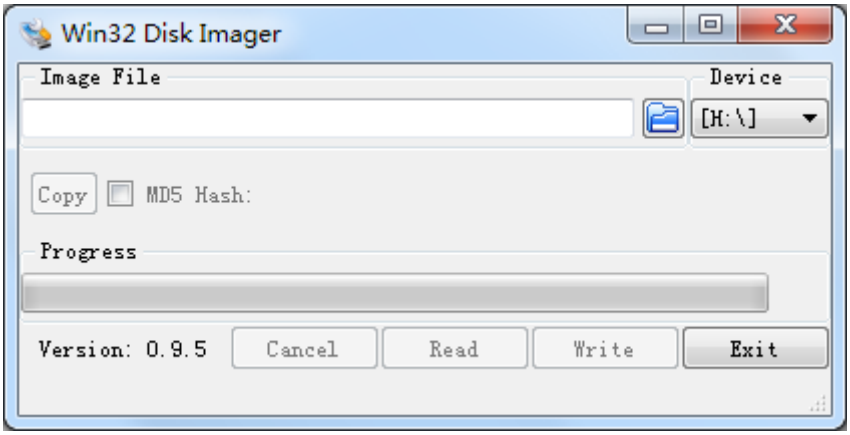
3. Set the level of Pin 11, 0 means low, 1 means high.

```
root@maaxboard-mini:~# echo 1 >/sys/class/gpio/gpio17/value
```

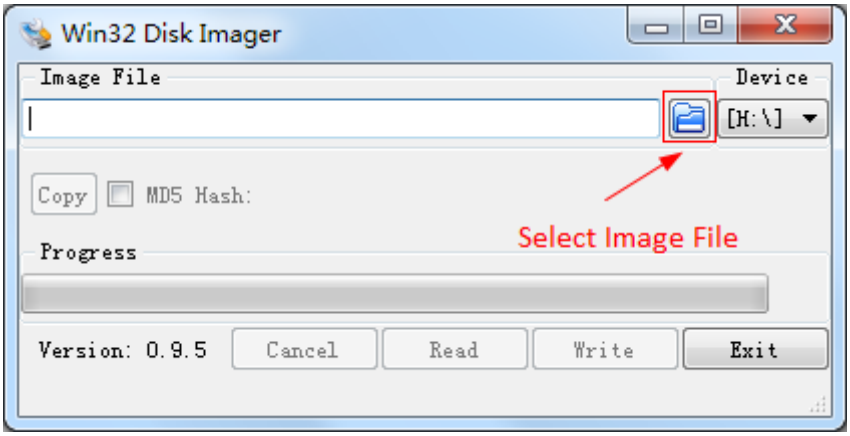
Chapter 4Burn or update the system Image

4.1 Burn the System Image to SD Card under Windows OS

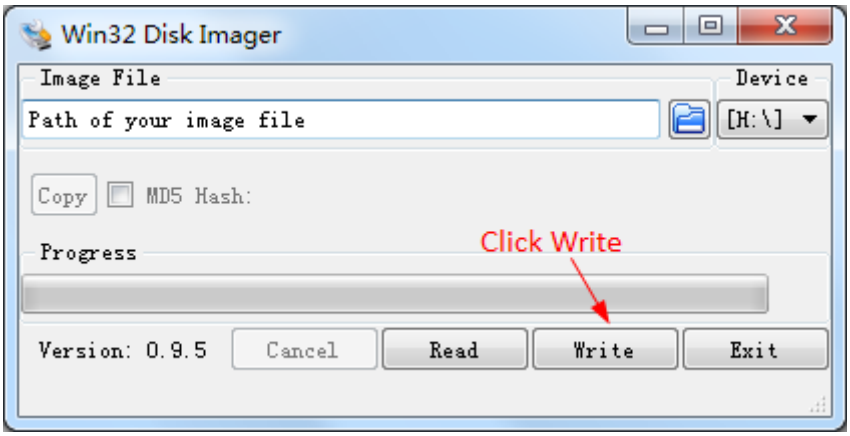
1. Firstly, you should prepare a SD card, which is no less than 8GB.
2. Then, download and install “Win32 Disk Imager” from: https://sourceforge.net/projects/win32diskimager/.



3. Select the system images file:



4. Click “Write” button to burn the images:



4.2 Burn the System Image to SD Card under Linux OS

In Ubuntu or Debian OS, you can use bmap-tool to burn the image to SD Card. Here we use lite-image-maaxboard-mini-ddr4-2g-sdcard-20200810071601.rootfs.sdcard.bz2 as an example:

1. Enter the following instructions in command line to check the SD Card ID, in this example is: sdc

```
$ ls /dev/sd*
/dev/sda    /dev/sda2  /dev/sdb    /dev/sdb2  /dev/sdc    /dev/sdc2
/dev/sda1   /dev/sda5  /dev/sdb1   /dev/sdb5  /dev/sdc1
```

2. If SD Card is mounted automatically, umount it.

```
$ sudo umount /dev/sdc1
$ sudo umount /dev/sdc2
```

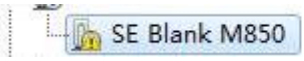
3. Burn the SD card with following instructions:

```
$ bunzip2 lite-image-maaxboard-mini-ddr4-2g-sdcard-*.rootfs.sdcard.bz2
$ sudo dd if= lite-image-maaxboard-mini-ddr4-2g-sdcard-20200810071601.rootfs.sdcard
of=/dev/sdc bs=10M conv=fsync
$ sync
```

4.3 Update System Image in eMMC

USB0 (The lower one in USB interface HUB1) support burning mode. Connect USB0 and PC before power on the board. The system will enter burning mode. Then users could burn the system image to the development board using uuu tools. For the detail information, refer to “MaaXBoard Mini UUU Burning Guide”.

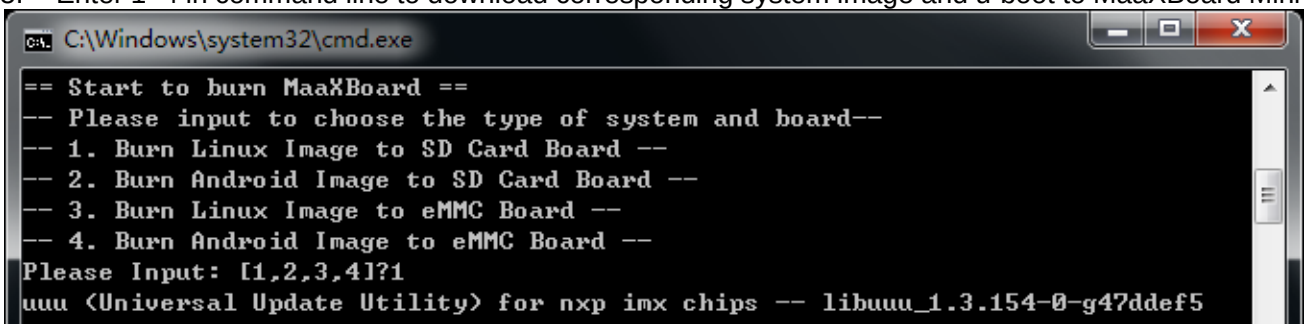
1. Connect USB0 (the lower one in USB 2.0 interface J2) and PC using USB type A cable.
2. Powered the board with a 5V, 2A, Type-C interface power (to J11).
3. In Windows OS, check the device manager to see if need to install driver for following device:



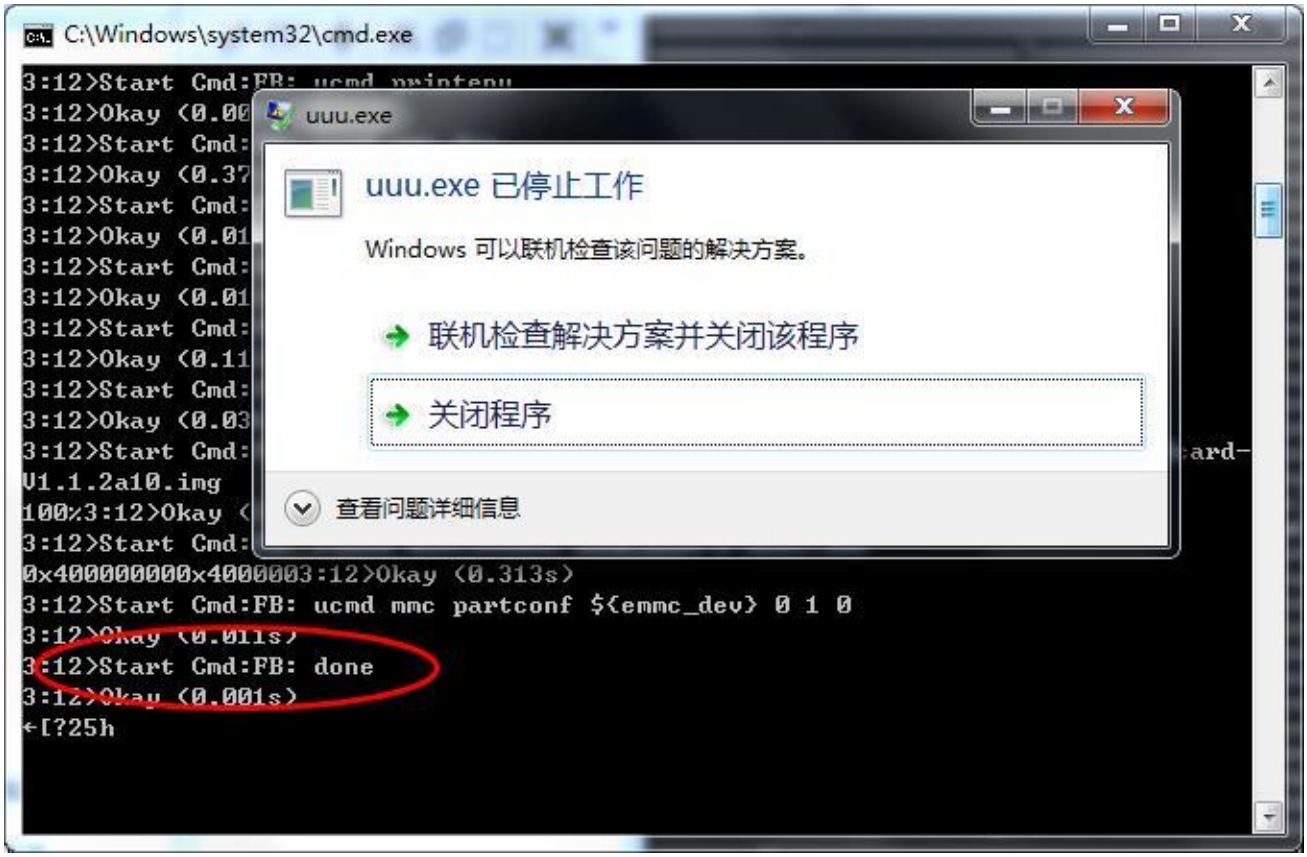
If the driver is installed normally, it will show:

4. Double click uuu-cmd.bat to start burning.

5. Enter 1~4 in command line to download corresponding system image and u-boot to MaaXBoard Mini



6. When burning finished, command line will print following info. If it print Start Cmd:FB: done, it means the burning is successful.



7. Close the pop out message, disconnect the USB connection between USB0 and PC, power down MaaXBoard Mini, power on the board again, then the board will boot with the new system image.
8. If you meet some problem or need help on how to modify the file name and path of system image, refer to MaaXBoard Mini UUU Burning Guide.

Chapter 5 Appendix

5.1 Hardware

For the detail hardware introduction, please refer to MaaXBoard Mini Hardware user manual.

5.2 Software

MaaXBoard Mini support Linux Yocto system and Android system, for the detail software introduction, please refer to related user manual.

- **Linux**
  - MaaXBoard Mini Linux Software Release Note
  - MaaXBoard Mini Linux Software User Manual
  - MaaXBoard Mini Linux Software Development Guide
- **Android**
  - MaaXBoard Mini Android Software Release Note
  - MaaXBoard Mini Android Software User Manual
  - MaaXBoard Mini Android Software Development Guide

5.3 USB Burning

MaaXBoard Mini support burn image through USB port, refer to “MaaXBoard Mini UUU Burning Guide”.

5.4 Verified Device List

Unless otherwise specified, peripherals supported by this software, such as HDMI displays, Wi-Fi devices, etc., are compatible with common types of devices. However, we provide the following list of verified peripheral devices, for customers' reference.

If you meet problems in using other devices, contact the technical support.

- HDMI Displayer: KONKA LED43U5、Philips 224E5Q、Samsung U28E590D
- MIPI LCD: MaaXBoard DISPLAY_MIPI
- MIPI Camera: MaaXBoard Camera
- USB Camera: QQSJ-8810, Logitech C270
- Bluetooth Headphone: QCY-T1, EDIFIER W25BT, Mi Sports BT Earphones Basic
- Wireless Router：HUAWEI WS5200, gee HC5861, TL-WDR5620
- U Disk: SanDisk SDCZ880-128G, Kingston DataTraveler G4, WD WDBYVG0020BBK 2TB

- SD：Raspberry Pi 16G, SanDisk Ultra 16G/64G
- Power Supply: Pisen TypeC, ZMI TypeC

Chapter 6Technical Support and Warranty

6.1 Technical Support

- Avnet Manufacturing Services provides its product with one-year free technical support including:
- Providing software and hardware resources related to the embedded products of Avnet Manufacturing Services;
- Helping customers properly compile and run the source code provided by Avnet Manufacturing Services;
- Providing technical support service if the embedded hardware products do not function properly under the circumstances that customers operate according to the instructions in the documents provided by Avnet Manufacturing Services;
- Helping customers troubleshoot the products.
- The following conditions will not be covered by our technical support service. We will take appropriate measures accordingly:
  - Customers encounter issues related to software or hardware during their development process;
  - Customers encounter issues caused by any unauthorized alter to the embedded operating system;
  - Customers encounter issues related to their own applications;
  - Customers encounter issues caused by any unauthorized alter to the source code provided by Avnet Manufacturing Services.

6.2 Warranty Conditions

- 12-month free warranty on the PCB under normal conditions of use since the sales of the product;
- The following conditions are not covered by free services; Avnet Manufacturing Services will charge accordingly:
  - Customers fail to provide valid purchase vouchers or the product identification tag is damaged, unreadable, altered or inconsistent with the products;
  - Not according to the user's manual operation causes damage to the product;
  - Products are damaged in appearance or function caused by natural disasters (flood, fire, earthquake, lightning strike or typhoon) or natural aging of components or other force majeure;
  - Products are damaged in appearance or function caused by power failure, external forces,

water, animals or foreign materials;

- Products malfunction caused by disassembly or alter of components by customers or, products disassembled or repaired by persons or organizations unauthorized by Avnet Manufacturing Services, or altered in factory specifications, or configured or expanded with the components that are not provided or recognized by Avnet Manufacturing Services and the resulted damage in appearance or function;
- Product failures caused by the software or system installed by customers or inappropriate settings of software or computer viruses;
- Products purchased from unauthorized sales;
- Warranty (including verbal and written) that is not made by Avnet Manufacturing Services and not included in the scope of our warranty should be fulfilled by the party who committed. Avnet Manufacturing Services has no any responsibility.

- Within the period of warranty, the freight for sending products from customers to Avnet Manufacturing Services should be paid by customers; the freight from Avnet Manufacturing Services to customers should be paid by us. The freight in any direction occurs after warranty period should be paid by customers;
- Please contact technical support if there is any repair request.
- **Avnet Manufacturing Services will not take any responsibility on the products sent back without the permission of the company.**

Chapter 7Contact Information

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