Anchor Lab BlackBox VX Lite User Guide

Version: V1.0（2023-09）

Complied by: Polyhex Technology Company Limited（http://www.polyhex.net/）

BPC-iMX8MP-06 Industrial Computer is a ruggedized and protected computer. It is composed of a DEBIX SOM A (core board), a custom carrier board and a steel and aluminum enclosure. It combines various types of harsh environment resistance features, including ruggedness, dustproof, anti-vibration, shock resistance, wide temperature, portability and other indicators.

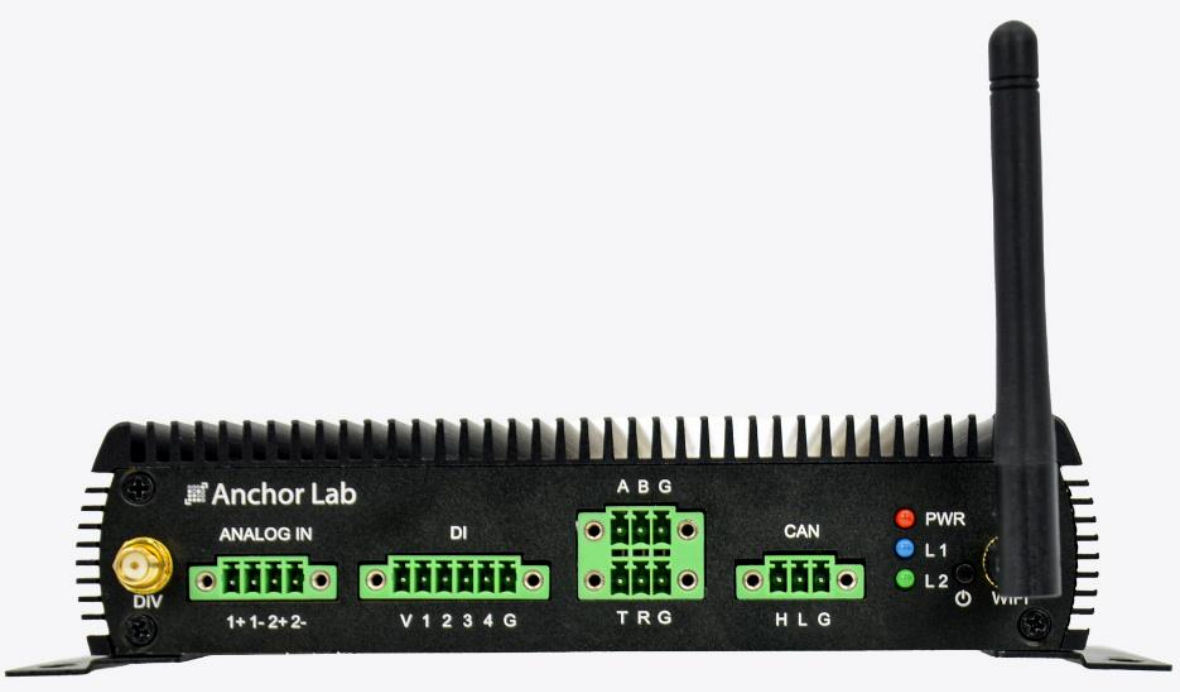

Figure 1 BPC-iMX8MP-06

REVISION HISTORY		
Rev.	**Date**	**Description**
1.0	2023.09.15	First edition

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1. Applicable objects

All personnel who come into contact with BPC-iMX8MP-06 device, including but not limited to developers, maintenance technician, installation, repair, etc.

All users must read and fully understand contents of the manual.

2. Security

2.1. Safety Precaution

This document inform how to make each cable connection. In most cases, you will simply need to connect a standard cable.

Table 1 Terms and conventions

Symbol	Meaning
Warning!	Always disconnect the power cord from the chassis whenever there is no workload required on it. Do not connect the power cable while the power is on. A sudden rush of power can damage sensitive electronic components. Only experienced electricians should open the chassis.
Caution!	Always ground yourself to remove any static electric charge before touching *BPC-iMX8MP-06* product. Modern electronic devices are very sensitive to electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag.

2.2. Safety Instruction

To avoid malfunction or damage to this product please observe the following:

1. Disconnect the device from the DC power supply before cleaning. Use a damp cloth. Do not use liquid detergents or spray-on detergents.

2. Keep the device away from moisture.

3．During installation, set the device down on a reliable surface. Drops and bumps will lead to damage.

4．Before connecting the power supply, ensure that the voltage is in the required range, and the way of wiring is correct.

5．Carefully put the power cable in place to avoid stepping on it.

6．If the device is not used for a long time, power it off to avoid damage caused by sudden overvoltage.

7．Do not pour liquid into the venting holes of the enclosure, as this could cause fire or electric shock.

8．For safety reasons, the device can only be disassembled by professional personnel.

9．If one of the following situations occur, get the equipment checked by service personnel:

- The terminal block is damaged.
- Liquid has penetrated into the equipment.
- The equipment has been exposed to moisture.
- The equipment does not work well, or you cannot get it to work according to the user's manual.
- The equipment has been dropped and damaged.
- The equipment has obvious signs of breakage.

10．Do not place the device in a place where the ambient temperature is below -40°C (-40°F) or above 85°C (185°F). This will damage the machine. It needs to be kept in an environment at controlled temperature.

DISCLAIMER: Polyhex disclaims all responsibility for the accuracy of any statement of this instructional document.

2.3. Technical Support

1. Visit DEBIX website https://www.debix.io/ where you can find the latest information about the product.
2. Contact your distributor, sales representative or Polyhex's customer service center for technical support if you need additional assistance. Please have the following info ready before you call:
   - Product name and memory size
   - Description of your peripheral attachments
   - Description of your software(operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Discord Community (recommended): https://discord.com/invite/adaHHaDkH2

Email: *info@polyhex.net*

3. Overview

BPC-iMX8MP-06 is a compact and lightweight security computer designed for industrial applications with waterproof, dustproof and shockproof properties.

3.1. Overview

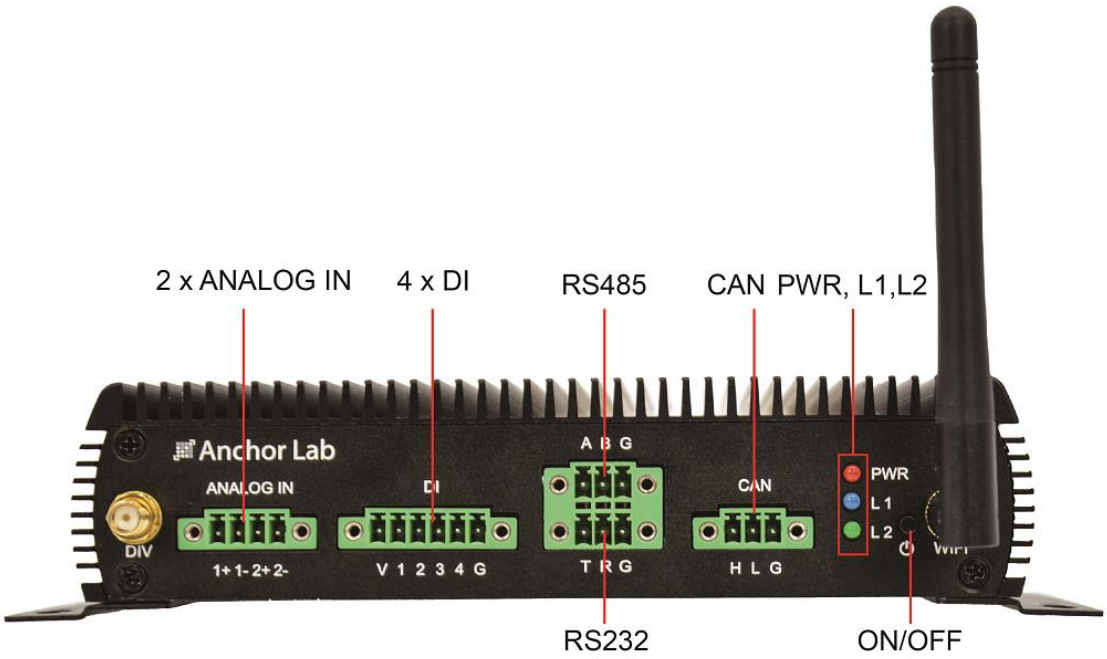


Figure 2 External Interface

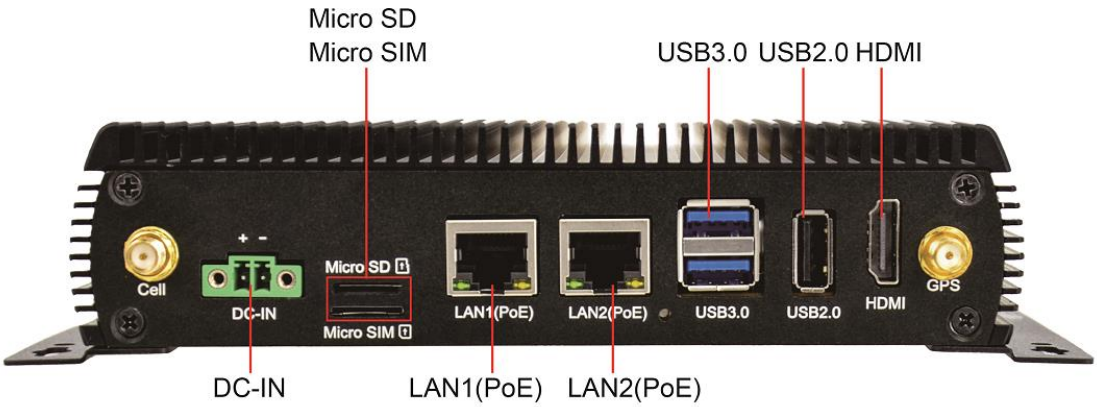


Figure 3 External Interface

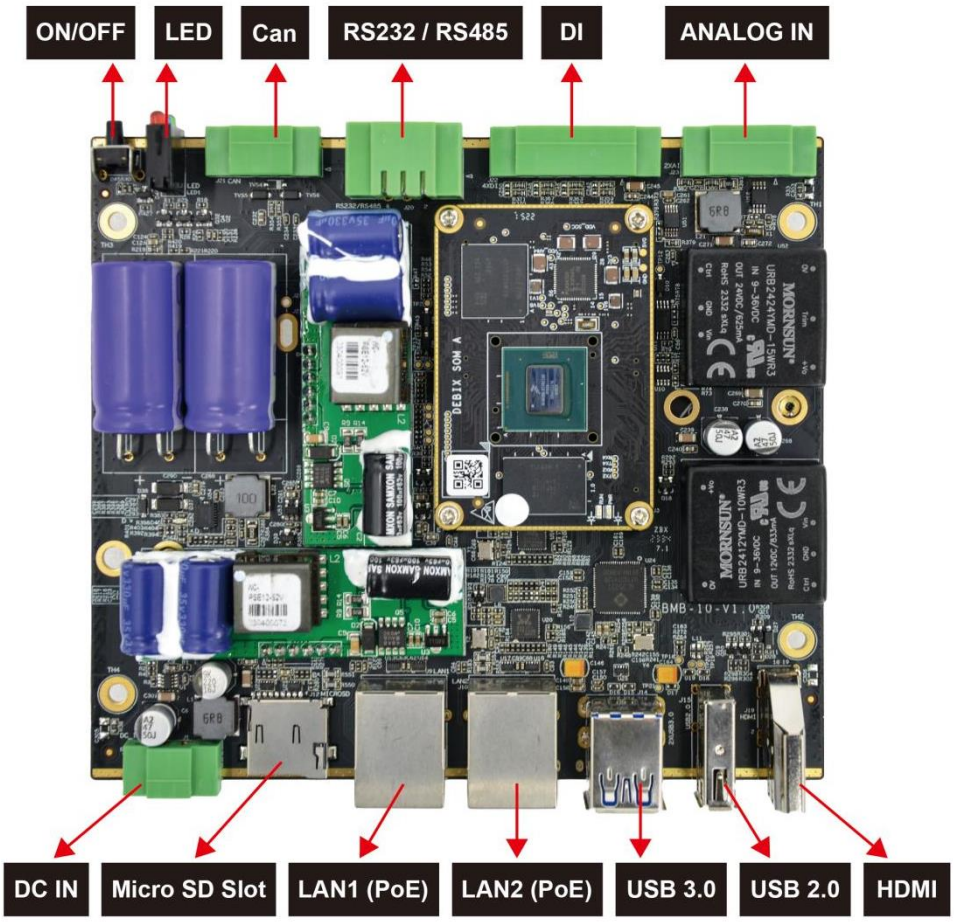


Figure 4 Internal Interface (Front)

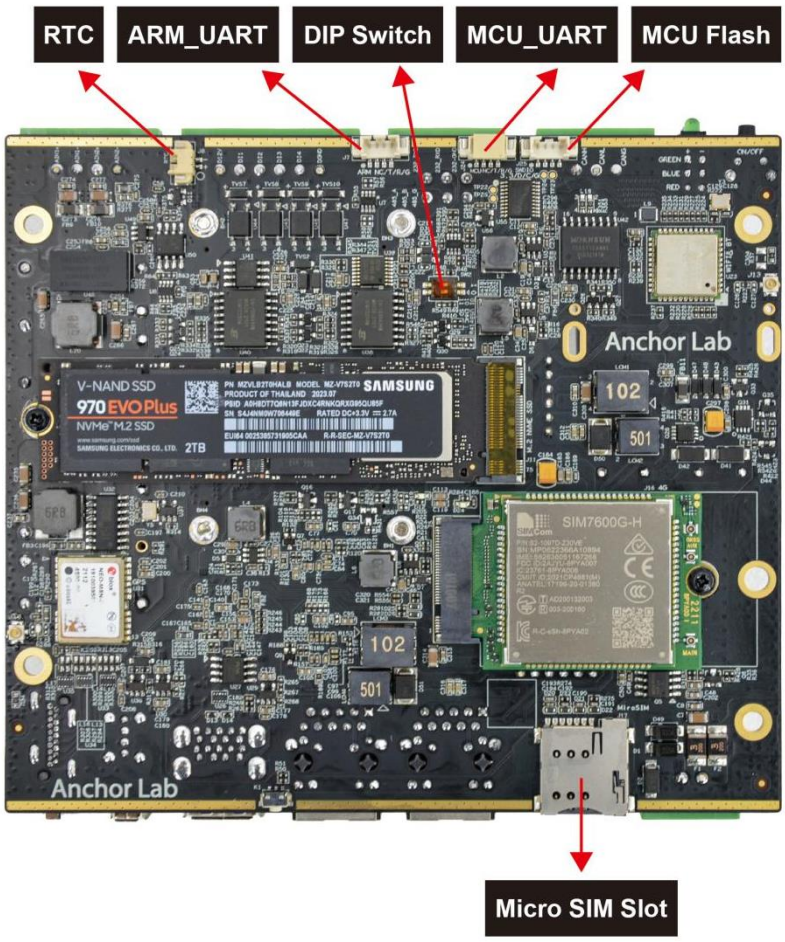


Figure 5 Internal Interface (Back)

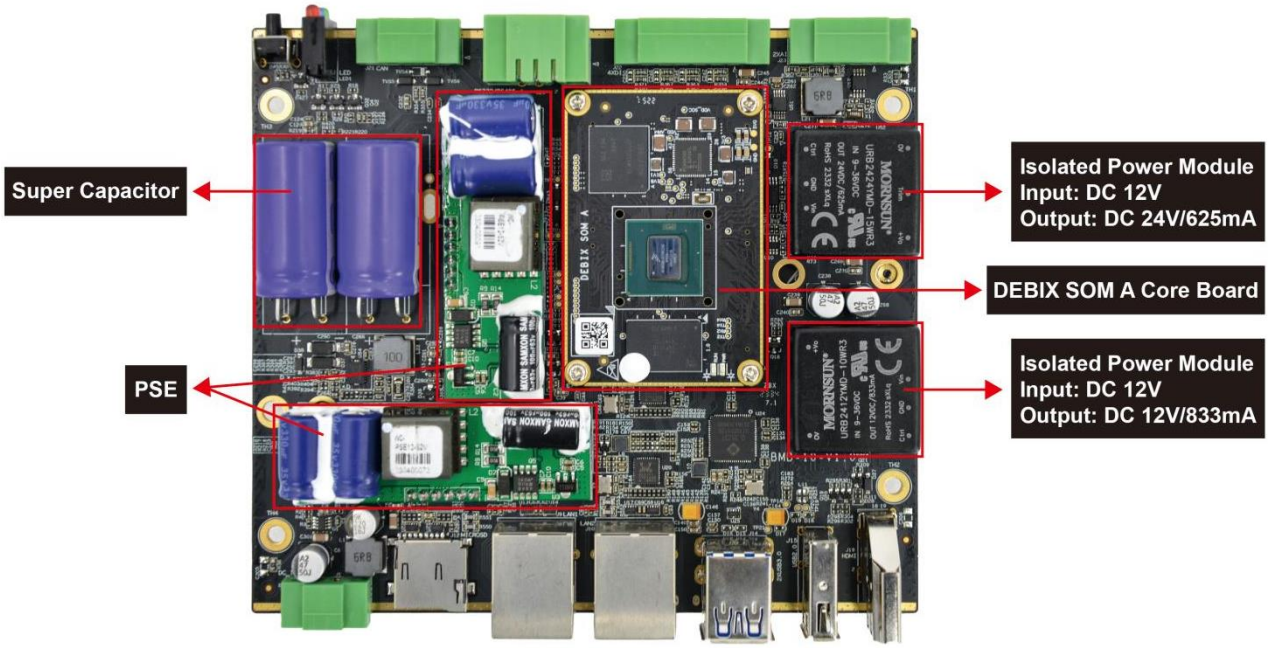


Figure 6 Internal Circuit (Front)

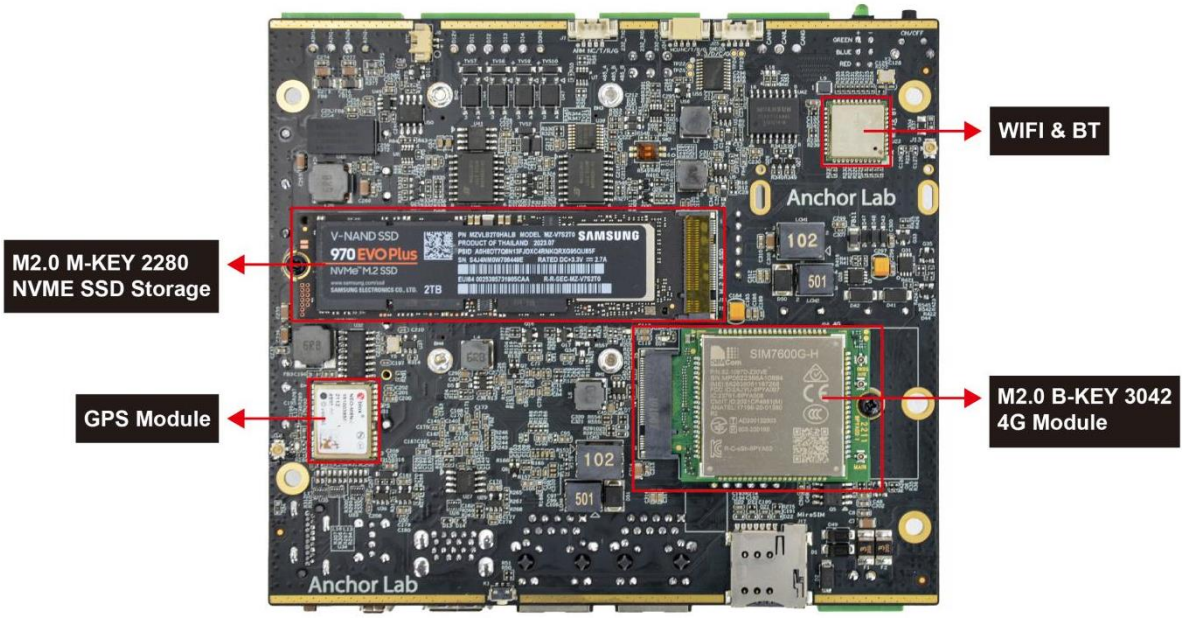


Figure 7 Internal Circuit (Back)

BPC-iMX8MP-06 utilizes DEBIX SOM A and a custom Carrier Board as the main board, which supports dual Gigabit Ethernet, WiFi, Bluetooth, 4G, GPS, etc. It is dustproof, waterproof, shock resistant, vibration resistant, etc. The specific specifications are as follows:

Table 2 BPC-iMX8MP-6 specification

System	
Main Board	DEBIX SOM A + custom Carrier Board
Memory	4GB LPDDR4
Storage	64GB eMMC
OS	Ubuntu, Yocto -L5.10.72_2.0.0
Boot Mode	1) Support eMMC boot (default) 2) Support Micro SD card boot
Communication	
Gigabit Network	2 x Independent MAC RJ45 Gigabit Ethernet ports, both support IEEE 802.3af POE external power supply
Wi-Fi & BT	2.4GHz & 5GHz dual-band Wi-Fi, Bluetooth 5.0, external SMA Wi-Fi antenna connector

Cell	1 x 4G/5G network module, external SMA Cell antenna connector
GPS	1 x GPS module, external GPS antenna connector
Video	
HDMI	1 x HDMI output, the connector is Type A HDMI female
External I/O Interface	
Power socket	1 x 2Pin/3.5mm Pitch Phoenix Terminal
USB	1) 2 x USB 3.0 Host, the connector is double layer Type-A interface 2) 1 x USB 2.0 Host, the connector is Type-A interface
Serial Ports	1) 1 x isolated RS232 2) 1 x isolated RS485
CAN	1 x isolated CAN
DI	4 x isolated DI, support wet nodes
Analog IN	2 x isolated Analog IN
Slot	1) 1 x Micro SIM slot 2) 1 x Micro SDslot
LED & Key	1) 1 x Power indicator (PWR) 2) 1 x L1 indicator 3) 1 x L2 indicator 4) 1 x ON/OFF Key
Power Supply	
Power Input	Default DC 12V power input, support DC 12V~36V wide voltage input
Temperature	
Temperature	-40°C~85°C (SSD card inserted, the temperature is 0~70°C)
Mechanical & Environmental	
Enclosure Material	Aluminium alloy
Size (L x W x H)	169.6mm x 143.6mm x 39.0mm

Weight	851g

3.2. Interface

3.2.1. Power Interface

BPC-iMX8MP-06 has 1 power connector with a 1 x 2Pin/3.5mm pitch Phoenix terminal, and default DC 12V input. As shown in the figure below:

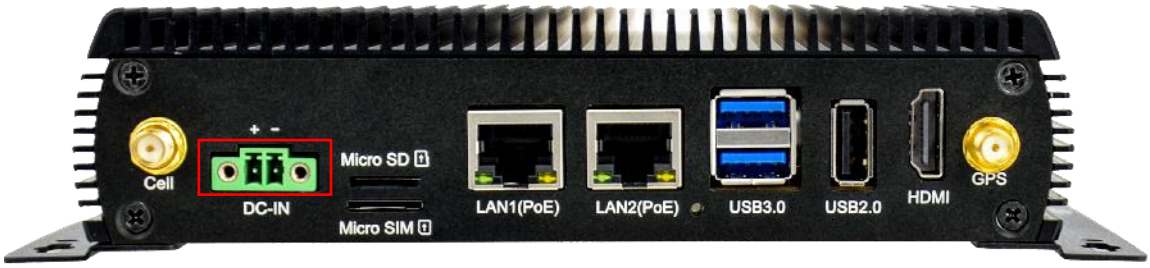


Figure 8 DC IN interface

3.2.2. Ethernet Interface

Two independent MAC RJ45 Gigabit Ethernet ports on board (ETH1: LAN1(PoE), ETH2: LAN2(PoE)), both support IEEE 802.3af POE power supply; connect device to the network through the network cable of the RJ45 connector, and there is also a set of status indicators below the interface to display the signal, one is Link and the other is Active.

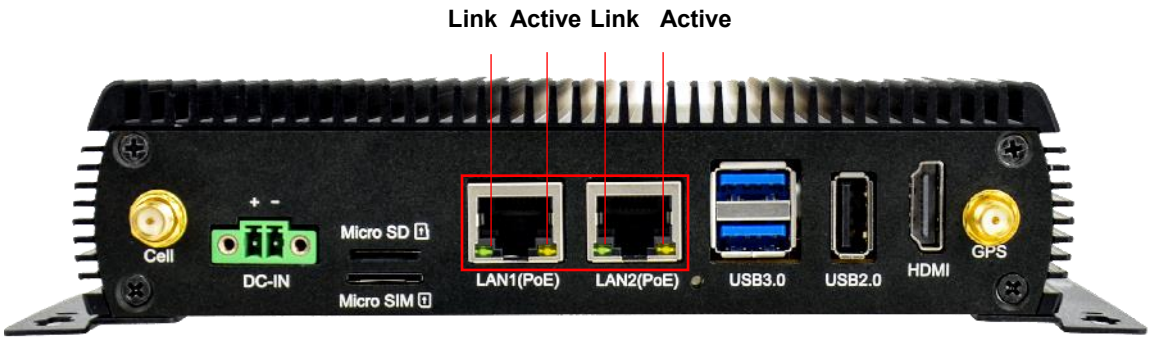


Figure 9 Ethernet interface

Table 3 Description of RJ45 Port Status Indicator

LED	Color	Description
Link	Green	Light, the network cable is plugged in, network connection status is good
Active	Yellow	Blinking, network data is being transmitted

3.2.3. USB Interface

BPC-iMX8MP-06 has two USB controllers and PHY, supports USB 3.0 and 2.0.

- Two USB 3.0 interface with a double layer Type-A connector;
- One USB 2.0 interface with a Type-A connector.

As shown in the figure below:

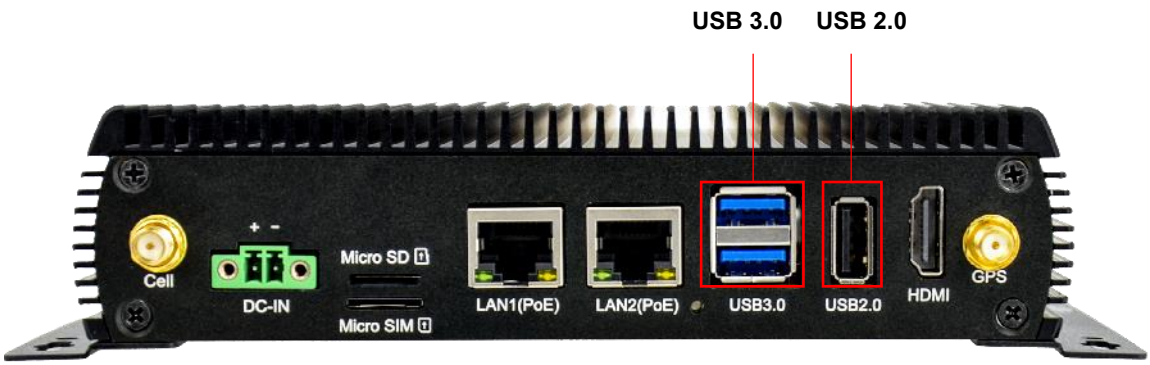


Figure 10 USB interface

3.2.4. HDMI

BPC-iMX8MP-06 has an HDMI interface, and the connector is an A-type HDMI female socket, which is used to connect a monitor, TV or projector. HDMI resolution up to 3840x2160p30. Audio supports 32 channel audio output and supports 1 S/PDIF audio eARC input.

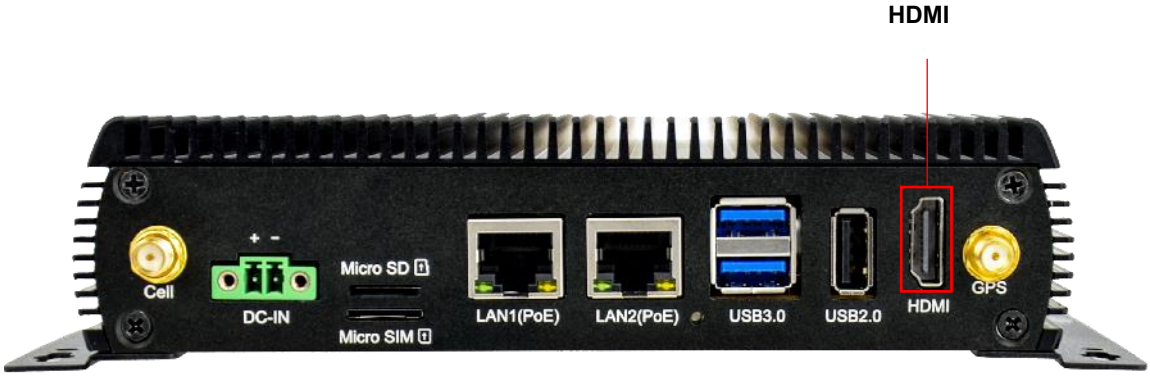


Figure 11 HDMI

3.2.5. Analog IN Interface

BPC-iMX8MP-06 has a set of 4pin Analog IN interface with physical isolation. As shown in the figure below:

Figure 12 Analog IN interface

The pin sequence is as shown in the figure:

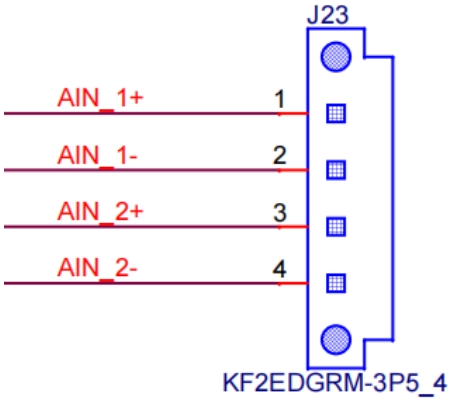


Figure 13 Pin sequence of Analog IN

The interface is defined as follows:

Table 4 Pin definition of Analog IN

Function	Pin	Definition	Description	Channel Node
Analog IN	1+	AIN1+	Analog IN channel 1 voltage DC24V+ output, external power supply capacity of 200mA, power supply to external Sensor	voltage0
	1-	AIN1-	Analog IN channel 1 current input, current collection range 4mA-20mA	
	2+	AIN2+	Analog IN channel 2 voltage DC24V+ output, external power supply capacity of 200mA, power supply to external Sensor	voltage1
	2-	AIN2-	Analog IN channel 2 current input, current collection range 4mA-20mA	

3.2.6. DI Interface

There is a 4 x DI interface with physical isolation, a digital isolated DI that supports wet node input. As shown in the figure below:

DI electrical parameters:

- Wet contact:
  - The signal input voltage range is 0~30V DC;
  - When the signal input voltage is 0~3V DC, the corresponding SOM A signal is low level;
  - When the signal input voltage is 5~30V DC, the corresponding SOM A signal is high level;

Figure 14 DI interface

The interface is defined as follows:

Table 5 Pin definition of DI

Function	Pin	Definition	Description	Device Node
DI	V	ISO-DI_VDD12V	Digital isolated power supply 12V output	
	1	DI-1	Digital isolation input 1	DIN1
	2	DI-2	Digital isolation input 2	DIN2
	3	DI-3	Digital isolation input 3	DIN3
	4	DI-4	Digital isolation input 4	DIN4
	G	DI-GND	Digital isolation input Ground	

3.2.7. CAN Interface

There is a 1 x CAN interface with physical isolation, as shown in the figure below:

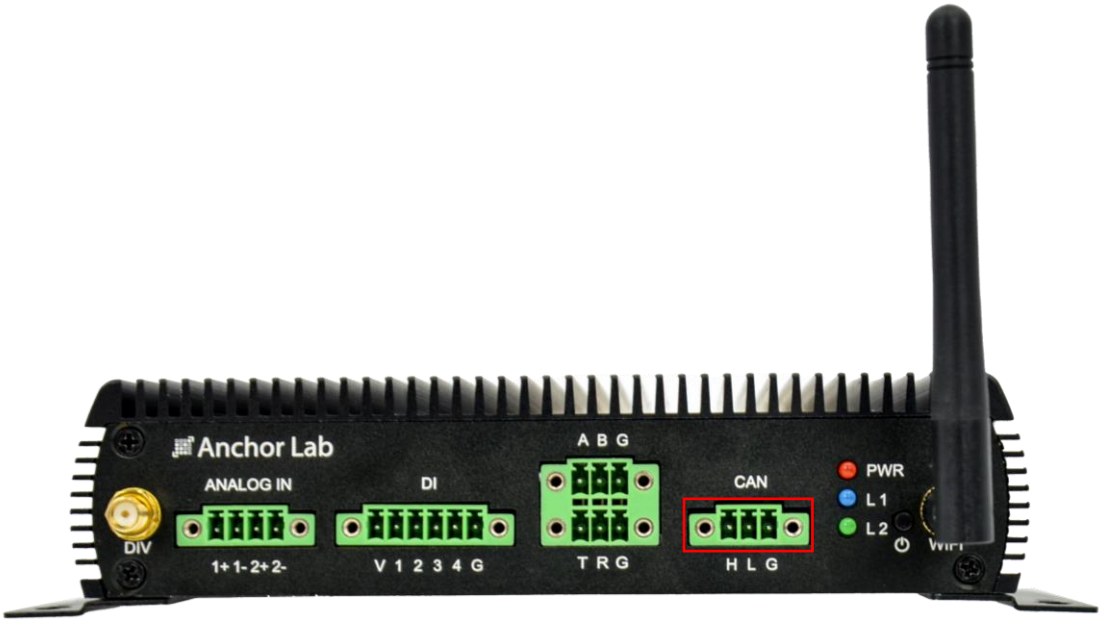


Figure 15 CAN interface

The interface is defined as follows:

Table 6 Pin definition of CAN

Function	Pin	Definition	Description	Device Node
CAN	H	CANH	HIGH-level CAN bus line	can0
	L	CANL	LOW-level CAN bus line	
	G	CANG	CAN bus Ground for reserved	

3.2.8. RS485 & RS232 Interface

There is a 1 x RS485 & 1 x RS232 interface with physical isolation, as shown in the figure below:

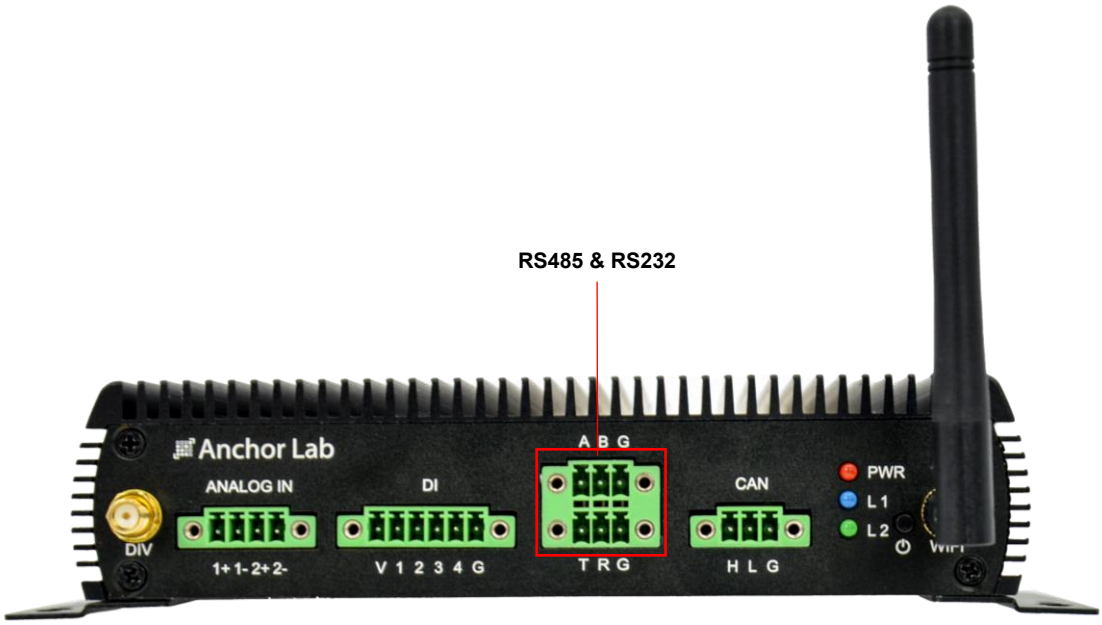


Figure 16 RS485 & RS232 interface

The interface is defined as follows:

Table 7 Pin definition of RS485 & RS232

Function	Pin	Definition	Description	Device Node
RS485	A	RS485_AH	Noninverting RS485 bus line	/dev/ttyWCH0
	B	RS485_BL	Inverting RS485 bus line	
	G	ISO_RS485_GND	RS485 bus Ground for reserved	
RS232	T	RS232_TXD	Transmitter output RS232 bus line	/dev/ttyWCH2
	R	RS232_RXD	Receiver input RS232 bus line	
	G	ISO_RS232_GND	RS232 bus Ground	

3.2.9. Slot

BPC-iMX8MP-06 has two slots：

- One Micro SD card slot to insert a Micro SD Card, the Micro SD Card can be used as a system boot card or as a standard memory card to save user data.
- One Micro SIM card slot to insert a Micro SIM Card, the Micro SIM Card provides network

connection and data transmission for the 4G module.

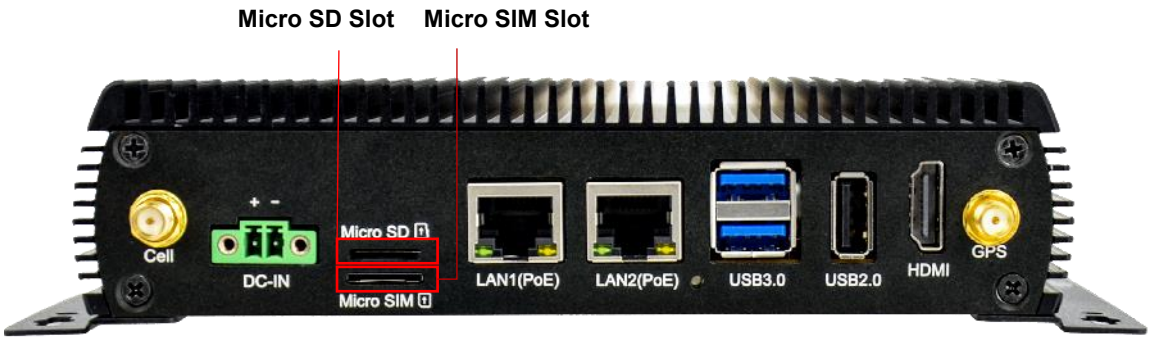


Figure 17 Slot

3.2.10. LED & Key

BPC-iMX8MP-06 has three LED and one Power Key, as shown in the figure below:

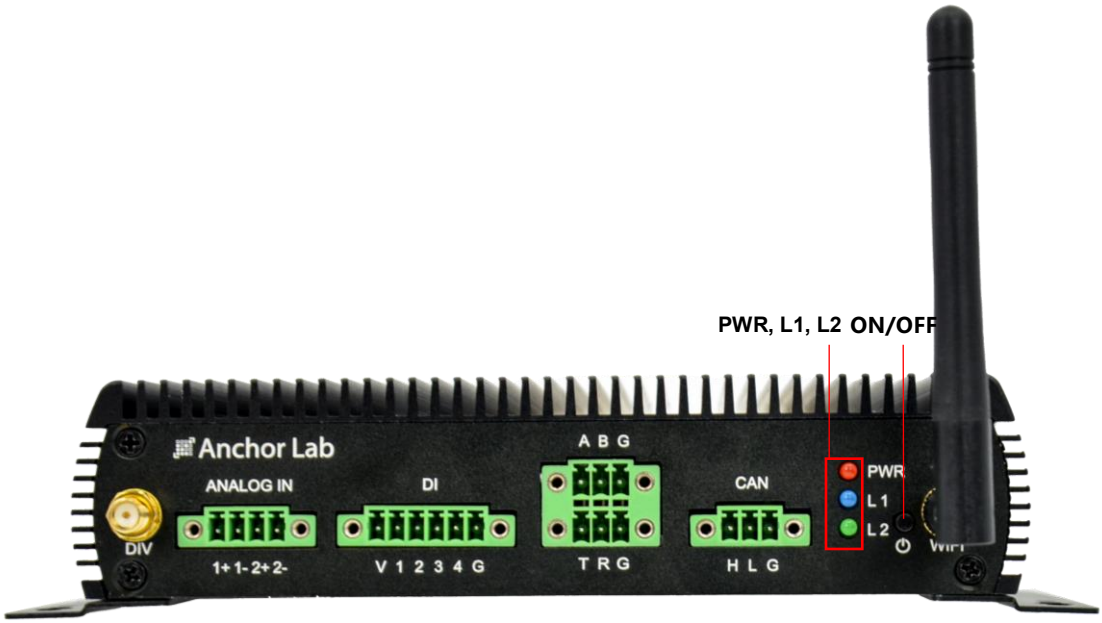


Figure 18 LED & Key

Table 8 Description of LED & Key

LED&Key	Status	Description
PWR（Red）	light	Power on
	off	Power off

L1 (Blue) / L2 (Green)	Blinking	System upgrade starts (on for 0.1s, off for 0.1s)
	Jump blinking	System upgrade successful (on for 0.1s, off for 0.1s, on for 0.1s, off for 2s)
	light	System upgrade failure
ON/OFF Key	Short press	Sleep/wake up
	Long press	Power on/shut down

3.2.11. DIP Switch

There is a dip-switch combination, which is used to determine the BOOT startup mode. There are two switches in total, and each switch has the two states of ON/OFF. By default, the switch is turned ON. Four BOOT startup modes as follows:

- 01-USB burning mode
- 10-DEBIX SOM A On-board eMMC Boot
- 11-Micro SD Card Boot

Warning

In order to protect the DIP switch, the following guidelines need to be observed:

1. The yellow tape on the DIP switch needs to be torn off;
2. It is not allowed to use sharp objects to toggle the DIP switch.

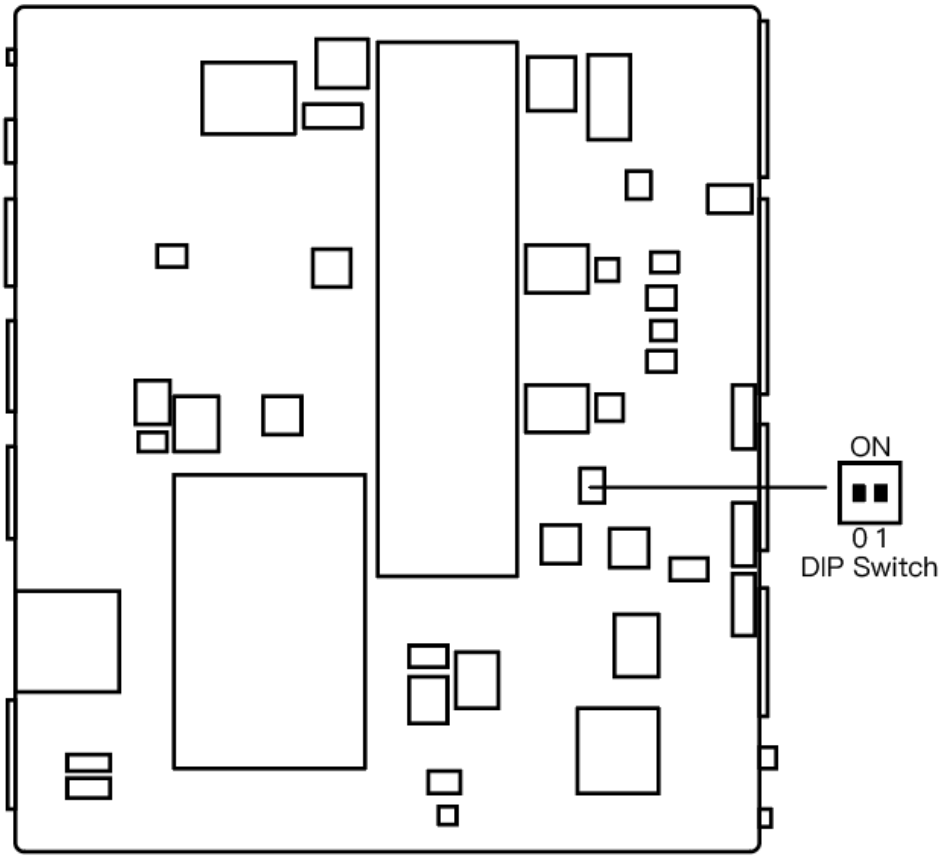
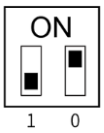
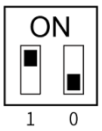
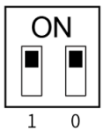


Figure 19 DIP Switch

Switch the switches to the corresponding state, the selected boot mode is shown in the table below:

Table 9 DIP switch set boot mode

Mode / Switch	USB	eMMC	Micro SD
SW state setting			
Note: The switch is facing up, it is ON state, the switch is facing down, it is OFF state.			

3.3. Packing List

- ✓ 1 x WiFi antenna
- ✓ 4 x M3-5 black screws
- ✓ 2 x Wall Mount Brackets
- ✓ 1 x BPC-iMX8MP-06 box
- ✓ 1 x 2Pin/3.5mm pitch Phoenix terminal for power connector
- ✓ 1 x 3Pin/3.5mm pitch Phoenix terminal for CAN interface
- ✓ 2 x 3Pin/3.5mm pitch Phoenix terminal for RS232/RS485 interface
- ✓ 1 x 4Pin/3.5mm pitch Phoenix terminal for Analog IN interface
- ✓ 1 x 6Pin/3.5mm pitch Phoenix terminal for DI interface

4. Installation Guide

4.1. Software Installation

Note

BPC-iMX8MP-06 is shipped with the latest Ubuntu 20.04 system burned into eMMC, and the system will boot from eMMC. Connect the monitor and power on, and it will start up and work normally.

BPC-iMX8MP-06 has two boot modes: eMMC (default), Micro SD card.

When users install the system by themselves, they need to download the system installation package image of the device (provided by Polyhex) first.

4.1.1. Boot from Micro SD

- **Component Preparation**

✓ BPC-iMX8MP-06

✓ Micro SD card, and card reader

✓ DC 12V/3A power adapter

✓ PC (windows 10/11)

- **Micro SD Card Installation Boot from Micro SD Card Image**

1. Install and open the Etcher tool on your PC, insert the Micro SD card, select the img file to be installed and the disk partition corresponding to the Micro SD card;

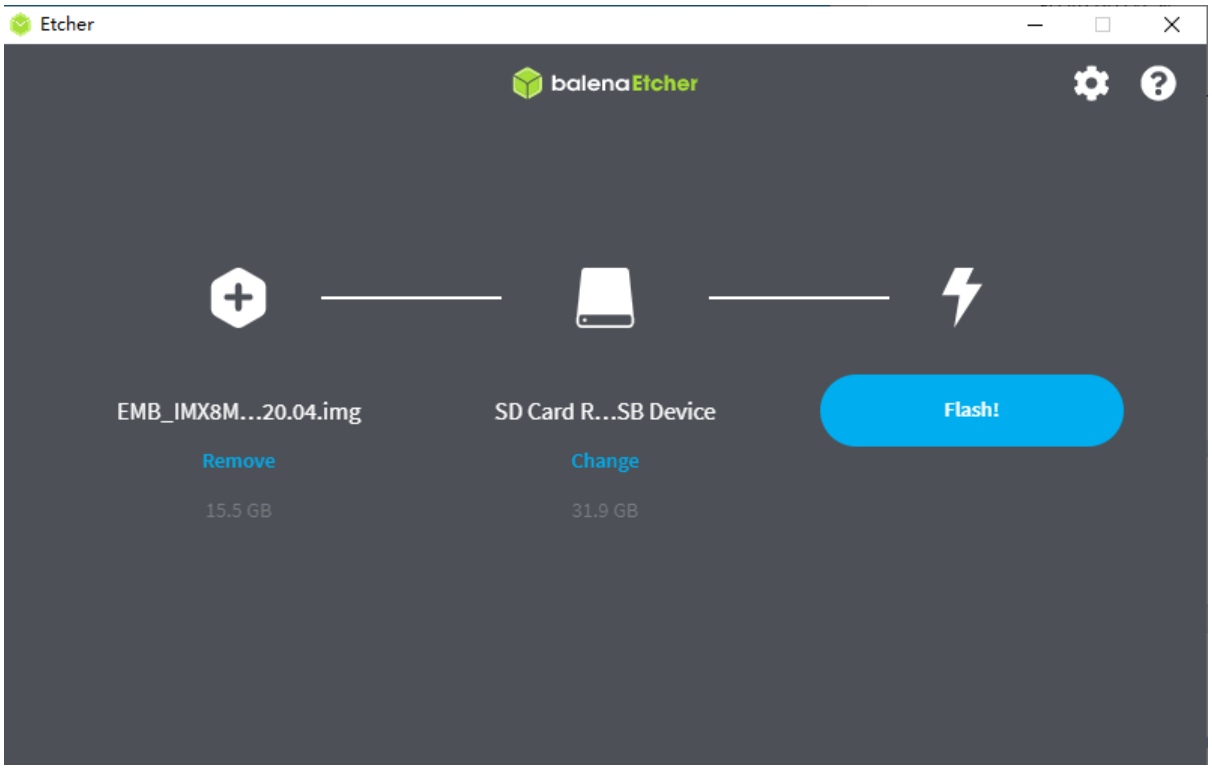


Figure 20

2. Click **Flash!** Wait patiently and the program will write the system to the Micro SD card;

NOTE

The system may prompt you that the disk is unavailable and needs to be formatted, please ignore it, it is not an error!

3. When **Flash Complete!** appears, it means the system has been successfully programmed to the Micro SD card;

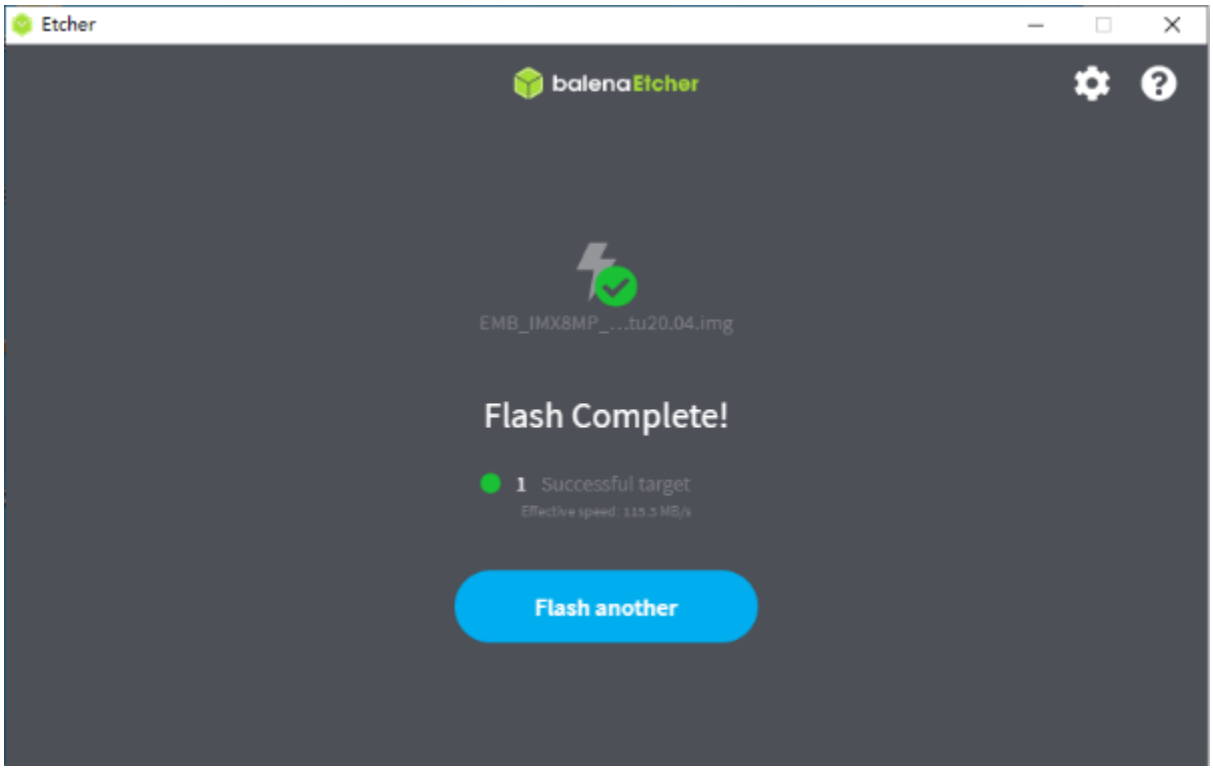


Figure 21

4. Set the DIP switch to "11" (boot from the Micro SD card), please refer to Setting BOOT Mode by DIP Switch for Micro SD card boot mode.
5. Insert the Micro SD card into the slot, connect the display and power on, then you can see the boot screen.

4.1.2. Boot from eMMC (default)

- **Component Preparation**

✓ BPC-iMX8MP-06

✓ Micro SD card above 16GB, and card reader

✓ DC 12V/3A power adapter

✓ PC (windows 10/11)

- **Micro SD Card Installation Boot from eMMC Image**

Write the downloaded system image to the Micro SD card, and set the DIP switch to Micro SD card boot mode according to the steps 1-4 operation of “Boot from Micro SD Card”. Then burn

it to eMMC with the following steps:

1. Insert the Micro SD card into the slot, and power on. The system will automatically write to eMMC through the Micro SD card, this burn process will not be displayed on screen. When burning, the green LED on the motherboard will flash quickly, please wait. When the green LED of DEBIX SOM A core board changes from fast flash to slow flash, that is, the programming is complete.

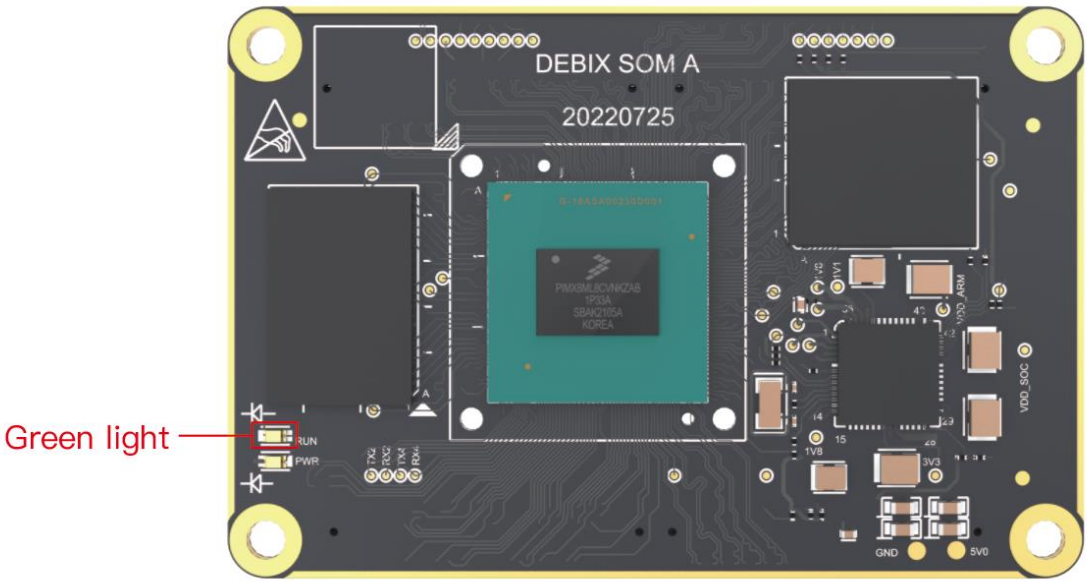


Figure 22

IMPORTANT

If the system with the same version as the Micro SD card has been burned to eMMC, the system will not be burned again, and the indicator light will not flash quickly.

If you need to flash the eMMC system again, you need to format the eMMC first. Proceed as follows:

1) Connect the motherboard to the keyboard, mouse and HDMI display, set the DIP switch to "11" to start the system from the Micro SD card, and power on.
2) In the Terminal, enter the default username “debix” and password "debix" to enter the command line, and run the following commands (as shown in the figure below):

   #sudo su (password: debix)

   #fdisk /dev/mmcblk2

   d

   d

   w
3) Repeat step 2 to burn the system to eMMC again.

```
root@imx8mpevk:/home/debix# fdisk /dev/mmcblk2
mmcblk2       mmcblk2boot1  mmcblk2p2
mmcblk2boot0  mmcblk2p1     mmcblk2rpmb
root@imx8mpevk:/home/debix# fdisk /dev/mmcblk2p
mmcblk2p1  mmcblk2p2
root@imx8mpevk:/home/debix# fdisk /dev/mmcblk2

Welcome to fdisk (util-linux 2.34).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): p
Disk /dev/mmcblk2: 14.58 GiB, 15636365312 bytes, 30539776 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xc84cc398

Device         Boot   Start      End  Sectors  Size Id Type
/dev/mmcblk2p1        20480  1024000  1003521  490M 83 Linux
/dev/mmcblk2p2      1228800 30539775 29310976   14G 83 Linux

Command (m for help): d
Partition number (1,2, default 2):

Partition 2 has been deleted.

Command (m for help): d
Selected partition 1
Partition 1 has been deleted.

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

root@imx8mpevk:/home/debix#
```

2. Disconnect the power supply, and set the DIP switch to "10", the system will boot from eMMC, connect to HDMI and power on, then you can see the boot screen.

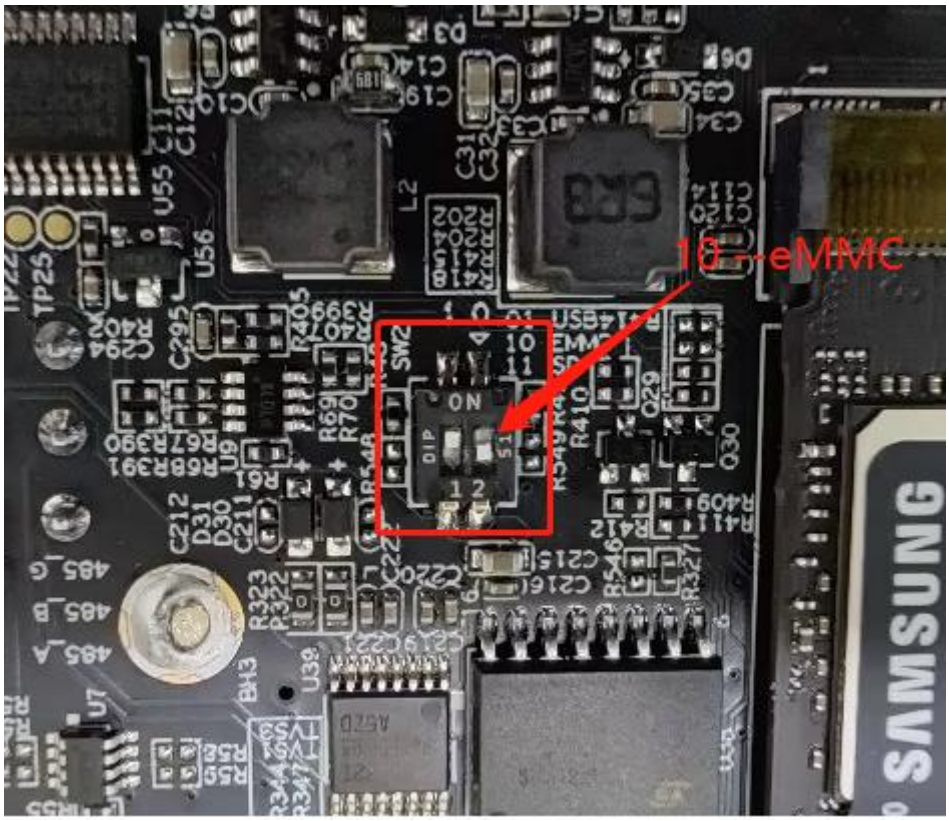


Figure 23 DIP switch to eMMC mode "10"

4.2. Hardware Installation

Note

The factory default boot mode of BPC-iMX8MP-06 Industrial Computer is eMCC boot.

If you need to change to other boot modes, please contact our engineer for modification before leaving the factory, and do not disassemble the machine by yourself.

After receiving the product, install the accessories as follows.

1. If you need to hang the device on the wall, use 4 black screws to fix 2 wall brackets on the enclosure, and then fix the device on the wall.
2. Install the WiFi external antenna to the WiFi antenna connection port, Cell antenna and GPS antenna to the Cell antenna connector and GPS antenna connector respectively, as shown in the following picture:

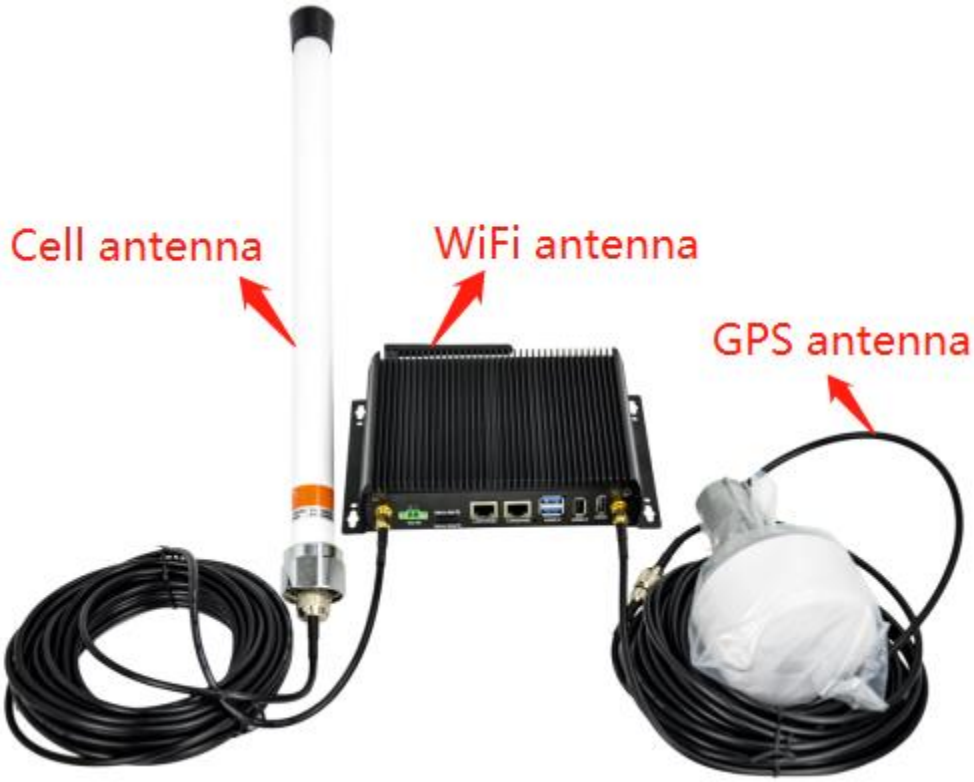


Figure 24

3. Connect the power adapter to the DC connector of enclosure. When the PWR LED is on, it proves that the Industrial Computer is powered on.

5. Operation Instructions

5.1. View version

Check hardware version, system version, MCU version, System version, LAN MAC address, WiFi MAC address, Bluetooth MAC address, kernel version, memory size and CPU frequency via the DebixVersion command, as shown below:

```
debix@imx8mpevk:~$ DebixVersion
=====================================================
================ Debix Information =================
=====================================================
***HW Version       : V1.0
***Mcu Version      : V003
***system Version   : Ubuntu 20.04.3 LTS (V0.1 20230914)
***Lan1  mac        : e2:a8:5f:40:73:23
***Lan2  mac        : ce:0f:f5:71:88:79
***wifi mac         : ac:6a:a3:2a:7c:09
***bt   mac         : AC:6A:A3:2A:7C:0A
***kernel           : 5.10.72 #20 SMP PREEMPT Fri Sep 15 13:00:08 UTC 2023
***memory           : 4 GB
***cpu              : 1.6 GHz
```

5.2. Heartbeat Packet Switch

Through software to switch heartbeat packet on/off, the system will send signals to MCU at regular intervals, indicating that the system is working normally. If MCU does not receive signals at specific intervals, MCU will actively power off and restart the i.MX8MPlus system.

- Off command:

```
echo 0 >
/sys/devices/platform/soc\@0/30800000.bus/30a40000.i2c/i2c-2/2-003e/stm32_heartbeat
_onoff
```

- On command:

```
echo 1 >
/sys/devices/platform/soc\@0/30800000.bus/30a40000.i2c/i2c-2/2-003e/stm32_heartbeat
_onoff
```

5.3. MCU Shutdown Command

Send the shutdown command to MCU, after 8s, the MCU will pull down power of ARM, ARM shuts down.

```
echo 0 >
/sys/devices/platform/soc\@0/30800000.bus/30a40000.i2c/i2c-2/2-003e/stm32_poweroff
```

5.4. Usage of Ethernet

1. Query ip command.

ip a

```
debix@imx8mpevk:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens34: <NO-CARRIER,BROADCAST,MULTICAST,DYNAMIC,UP> mtu 1500 qdisc mq state DO
WN group default qlen 1000
    link/ether 10:07:23:6d:da:96 brd ff:ff:ff:ff:ff:ff
3: ens33: <BROADCAST,MULTICAST,DYNAMIC,UP,LOWER_UP> mtu 1500 qdisc mq state UP g
roup default qlen 1000
    link/ether 10:07:23:6d:da:93 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.18/24 brd 192.168.1.255 scope global dynamic ens33
       valid_lft 78101sec preferred_lft 78101sec
    inet6 240e:36d:df5:2b00:404c:2d31:25d7:c18c/64 scope global temporary dynami
c
       valid_lft 223060sec preferred_lft 77756sec
    inet6 240e:36d:df5:2b00:5d2a:4da2:a828:f1a3/64 scope global dynamic mngtmpad
dr noprefixroute
       valid_lft 223060sec preferred_lft 136660sec
    inet6 fe80::fd5e:df65:73dc:d698/64 scope link noprefixroute
```

As shown above: eth33 network card corresponds to the network port of the device silkscreen "LAN1(PoE)";

eth34 network card corresponds to the network port of the device silkscreen "LAN2(PoE)".

2. Apply ping command.

ping 192.168.1.18

```
debix@imx8mpevk:~$ ping 192.168.1.18
PING 192.168.1.18 (192.168.1.18) 56(84) bytes of data.
64 bytes from 192.168.1.18: icmp_seq=1 ttl=64 time=0.073 ms
64 bytes from 192.168.1.18: icmp_seq=2 ttl=64 time=0.077 ms
64 bytes from 192.168.1.18: icmp_seq=3 ttl=64 time=0.081 ms
64 bytes from 192.168.1.18: icmp_seq=4 ttl=64 time=0.079 ms
64 bytes from 192.168.1.18: icmp_seq=5 ttl=64 time=0.079 ms
64 bytes from 192.168.1.18: icmp_seq=6 ttl=64 time=0.075 ms
64 bytes from 192.168.1.18: icmp_seq=7 ttl=64 time=0.071 ms
64 bytes from 192.168.1.18: icmp_seq=8 ttl=64 time=0.075 ms
64 bytes from 192.168.1.18: icmp_seq=9 ttl=64 time=0.078 ms
64 bytes from 192.168.1.18: icmp_seq=10 ttl=64 time=0.077 ms
```

3. Query the speed of the network port.

sudo ethtool ens33

```
debix@imx8mpevk:~$ sudo ethtool ens33
Settings for ens33:
        Supported ports: [ TP MII ]
        Supported link modes:   10baseT/Half 10baseT/Full
                                100baseT/Half 100baseT/Full
                                1000baseT/Full
        Supported pause frame use: Symmetric Receive-only
        Supports auto-negotiation: Yes
        Supported FEC modes: Not reported
        Advertised link modes:  10baseT/Half 10baseT/Full
                                100baseT/Half 100baseT/Full
                                1000baseT/Full
        Advertised pause frame use: Symmetric Receive-only
        Advertised auto-negotiation: Yes
        Advertised FEC modes: Not reported
        Link partner advertised link modes:  10baseT/Half 10baseT/Full
                                             100baseT/Half 100baseT/Full
                                             1000baseT/Full
        Link partner advertised pause frame use: Symmetric
        Link partner advertised auto-negotiation: Yes
        Link partner advertised FEC modes: Not reported
        Speed: 1000Mb/s
        Duplex: Full
        Port: Twisted Pair
```

5.5. Usage of WiFi

- Unplug the network cable, device connect WiFi (polyhex_mi), query the WiFi network port:

```
ifconfig wlan0
```

```
debix@imx8mpevk:~$ ifconfig wlan0
wlan0: flags=-28605<UP,BROADCAST,RUNNING,MULTICAST,DYNAMIC>  mtu 1500
        inet 192.168.1.21  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::48dd:f5:95c:e1a3  prefixlen 64  scopeid 0x20<link>
        inet6 240e:36d:df5:2b00:3656:9509:ddfb:e51c  prefixlen 64  scopeid 0x0<g
lobal>
        inet6 240e:36d:df5:2b00:fb79:bb47:ef3f:f209  prefixlen 64  scopeid 0x0<g
lobal>
        ether ac:6a:a3:1f:b4:a7  txqueuelen 1000  (Ethernet)
        RX packets 7459  bytes 3793417 (3.7 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 8909  bytes 1261738 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

- Apply ping command to check the network connection status.

```
ping 192.168.1.1
```

```
debix@imx8mpevk:~$ ping 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_seq=1 ttl=63 time=4.65 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=63 time=4.66 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=63 time=4.45 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=63 time=4.53 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=63 time=18.6 ms
64 bytes from 192.168.1.1: icmp_seq=6 ttl=63 time=5.30 ms
64 bytes from 192.168.1.1: icmp_seq=7 ttl=63 time=4.82 ms
64 bytes from 192.168.1.1: icmp_seq=8 ttl=63 time=4.57 ms
64 bytes from 192.168.1.1: icmp_seq=9 ttl=63 time=4.47 ms
64 bytes from 192.168.1.1: icmp_seq=10 ttl=63 time=4.58 ms
64 bytes from 192.168.1.1: icmp_seq=11 ttl=63 time=5.12 ms
```

Reconnect to the new WiFi network (ChinaNet-polyhex), use the ping command, and the same screen appears as above.

5.6. Usage of BT

1. Enter the system desktop, open the Terminal and query Bluetooth device:

```
hciconfig
```

```
debix@imx8mpevk:~$ hciconfig
hci0:   Type: Primary  Bus: UART
        BD Address: AC:6A:A3:1F:B4:A8  ACL MTU: 1021:8  SCO MTU: 64:1
        UP RUNNING PSCAN ISCAN
        RX bytes:669864 acl:167 sco:0 events:16682 errors:0
        TX bytes:11426 acl:156 sco:0 commands:464 errors:0
```

2. Switch to root user:

```
sudo su
```

```
debix@imx8mpevk:~$ sudo su
root@imx8mpevk:/home/debix#
```

3. Start bluetooth and match bluetooth.

```
hciconfig hci0 up
bluetoothctl
power on
agent on
default-agent
scan on
pair yourDeviceMAC          #Match the Bluetooth MAC address
```

5.7. Usage of USB

1. Switch to root user.

```
debix@imx8mpevk:~$ sudo su
root@imx8mpevk:/home/debix#
```

2. Access the U disk in FAT32 format, the system will automatically mount it to the /mnt path.

```
df -h
```

```
root@imx8mpevk:/home/debix# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        29G  3.6G   24G  14% /
devtmpfs        494M     0  494M   0% /dev
tmpfs           975M   39M  937M   4% /dev/shm
tmpfs           195M  2.1M  193M   2% /run
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           975M     0  975M   0% /sys/fs/cgroup
/dev/mmcblk1p1  500M   31M  470M   7% /boot
tmpfs           195M   44K  195M   1% /run/user/1000
/dev/sda1       253M   31M  222M  12% /media/debix/boot
/dev/sda2        15G  3.6G   11G  26% /media/debix/rootfs
```

- If the U disk is not mounted, you can mount the U disk with the following command:
  - Query the U disk letter:

```
fdisk -l
```

```
root@imx8mpevk:/home/debix# fdisk -l
Disk /dev/mtdblock0: 8 MiB, 8388608 bytes, 16384 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes


Disk /dev/mmcblk2: 14.57 GiB, 15634268160 bytes, 30535680 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xfc26a6dc

Device         Boot   Start      End  Sectors  Size Id Type
/dev/mmcblk2p1         20480  1024000  1003521  490M 83 Linux
/dev/mmcblk2p2       1228800 30535679 29306880   14G 83 Linux


Disk /dev/mmcblk1: 29.74 GiB, 31914983424 bytes, 62333952 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
```

```
Disk identifier: 0x000dba0b

Device         Boot   Start      End  Sectors  Size Id Type
/dev/mmcblk1p1         20480  1044479  1024000  500M  c W95 FAT32 (LBA)
/dev/mmcblk1p2       1228800 62333951 61105152 29.1G 83 Linux


Disk /dev/sda: 14.86 GiB, 15931539456 bytes, 31116288 sectors
Disk model: STORAGE DEVICE
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x994d7a7d

Device     Boot  Start      End  Sectors  Size Id Type
/dev/sda1         8192   532479   524288  256M  c W95 FAT32 (LBA)
/dev/sda2       532480 31116287 30583808 14.6G 83 Linux
```

- Mounting the U disk:

```
mount /dev/sda1 /mnt
```

3. Enter the U disk directory:

```
cd /mnt
```

```
root@imx8mpevk:/home/debix# cd /mnt
root@imx8mpevk:/mnt# ls
 COPYING.linux                bcm2711-rpi-cm4s.dtb   issue.txt
 LICENCE.broadcom             bootcode.bin           kernel8.img
'System Volume Information'   cmdline.txt            overlays
 bcm2710-rpi-2-b.dtb          config.txt             start.elf
 bcm2710-rpi-3-b-plus.dtb     fixup.dat              start4.elf
 bcm2710-rpi-3-b.dtb          fixup4.dat             start4cd.elf
 bcm2710-rpi-cm3.dtb          fixup4cd.dat           start4db.elf
 bcm2710-rpi-zero-2-w.dtb     fixup4db.dat           start4x.elf
 bcm2710-rpi-zero-2.dtb       fixup4x.dat            start_cd.elf
 bcm2711-rpi-4-b.dtb          fixup_cd.dat           start_db.elf
 bcm2711-rpi-400.dtb          fixup_db.dat           start_x.elf
 bcm2711-rpi-cm4.dtb          fixup_x.dat
```

4. Clear the cache, run before each read and write test command.

```
sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
```

```
root@imx8mpevk:/home/debix# mount /dev/sda1 /mnt/
root@imx8mpevk:/home/debix# cd /mnt/
root@imx8mpevk:/mnt# sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
```

5. Write speed test.

```
sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"     # clear cache

dd if=/dev/zero of=./test_write count=1 bs=1G
```

```
root@imx8mpevk:/mnt# dd if=/dev/zero of=./test_write count=1 bs=1G
1+0 records in
1+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 26.6288 s, 40.3 MB/s
root@imx8mpevk:/mnt# sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
```

6. Reading speed test.

```
sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"     # clear cache

dd if=./test_write of=/dev/null count=1 bs=1G
```

```
root@imx8mpevk:/mnt# sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
root@imx8mpevk:/mnt# dd if=./test_write of=/dev/null count=1 bs=1G
1+0 records in
1+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 43.7707 s, 24.5 MB/s
```

5.8. Analog IN verification

Analog input current range is 4mA~20mA.

- ADC collects channel 1 current

```
cat /sys/bus/i2c/drivers/ads1015/1-0048/iio:device0/in_voltage0_raw
```

- ADC collects channel 2 current

```
cat /sys/bus/i2c/drivers/ads1015/1-0048/iio:device0/in_voltage1_raw
```

- ADC collects channel 3 current

```
cat /sys/bus/i2c/drivers/ads1015/1-0048/iio:device0/in_voltage2_raw
```

- ADC collects channel 4 current

```
cat /sys/bus/i2c/drivers/ads1015/1-0048/iio:device0/in_voltage3_raw
```

5.9. LED & Key

1. LED

- PWR is the power status indicator：
  - After power on, this indicator is on;
  - After power off, this indicator is off.
- L1 and L2 are the system upgrade indicators,
  - When the system upgrade starts, this indicator is blinking;
  - The system upgrade is completed, this indicator is jumps blinking;
  - When the system upgrade failed, this indicator is always on.

2. Key

BPC-iMX8MP-06 Industrial Computer is automatically turned on when power is applied.

- Short press
  - PWR green light is off, the system enters into sleep.
  - Short press again, PWR green light is on to wake up the system.
- Long press
  - Press and hold until the green light turns off to shut down.
  - Press and hold again until the green light turns on to boot the system.

FCC Warnning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection againstharmful interference in a residential installation. This equipment generates, uses and can radiateradio frequency energy and, if not installed and used in accordance with the instructions, maycause harmful interference to radio communications. However, there is no guarantee thatinterference will not occur in a particular installation. If this equipment does cause harmfulinterference to radio or television reception, which can be determined by turning the equipmentoff and on, the user is encouraged to try to correct the interference by one or more of thefollowing measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This devices contains LTE transmitter module FCC ID: 2AJYU-8PYA007.