BPC-iMX8MP-03 Industrial Computer User Guide

Version: V1.0(2023-03)

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

BPC-iMX8MP-03 Industrial Computer is a ruggedized and protected computer. It is composed of a DEBIX SOM A (core board), a DEBIX SOM A I/O board (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

REVISION HISTORY		
Rev.	**Date**	**Description**
1.0	2023.03.17	First edition

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Chapter 1 Security

1.1. 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-03* 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.

1.2. 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 power cord or plug 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 -20°C (-4°F) or above 70°C (158°F). This will damage the machine. It needs to be kept in an environment at controlled temperature.

11．Due to the sensitive nature of the equipment, it must be stored in a restricted access location, only accessible by qualified engineer.

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

1.3. 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:

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- 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*

Chapter 2 BPC-iMX8MP-03 Industrial Computer Introduction

BPC-iMX8MP-03 Industrial Computer is a compact and secure computer, which designed for industrial applications and can be widely used in machine vision and machine learning, advanced multimedia, smart cities, edge computing and other solutions that require high reliability.

Main features:

- Stainless steel and aluminum enclosure with MTBF>50,000 hours

- It encompasses a DEBIX SOM A and DEBIX SOM A I/O Board

- Support boot from eMCC, Micro SD card and SPI NOR Flash

- Support dual Gigabit Ethernet, 2.4GHz & 5GHz dual-band Wi-Fi, Bluetooth 5.0 and a Mini PCIe 4G module/LoRa module/network card

- Support 4 x USB 3.0, 2 x USB 2.0, physically isolated interfaces: 4 x RS232, 2 x RS485/RS232/CAN, 4 x DI, 4 x DO

- Support for Ubuntu, Android, Yocto, Windows 10 IoT
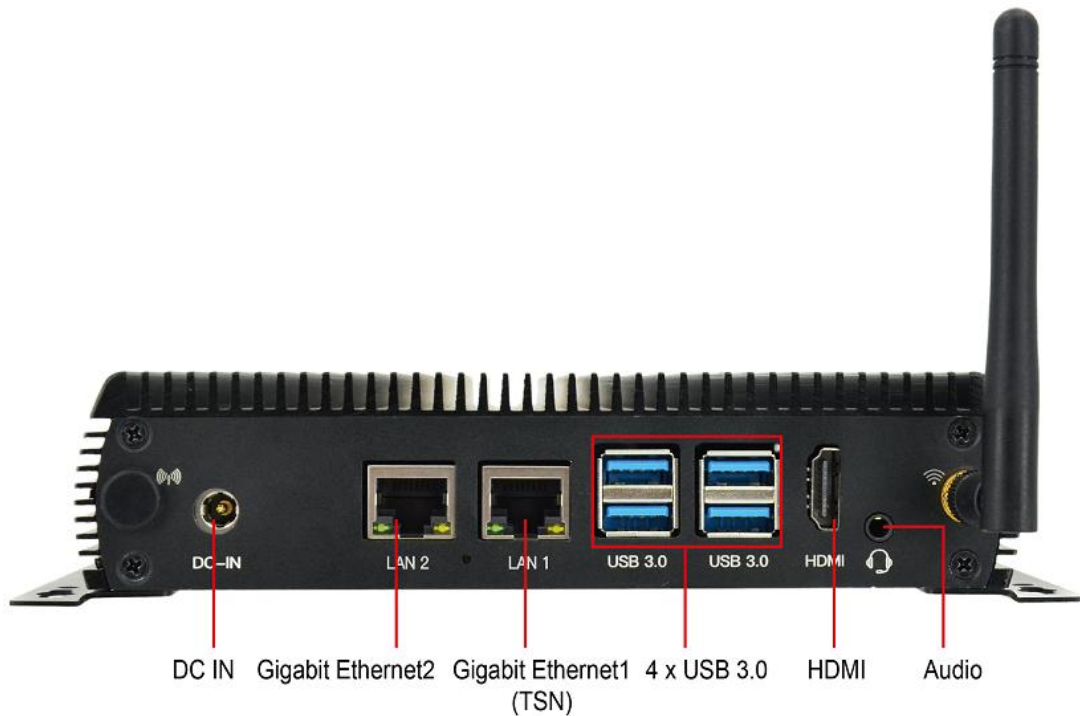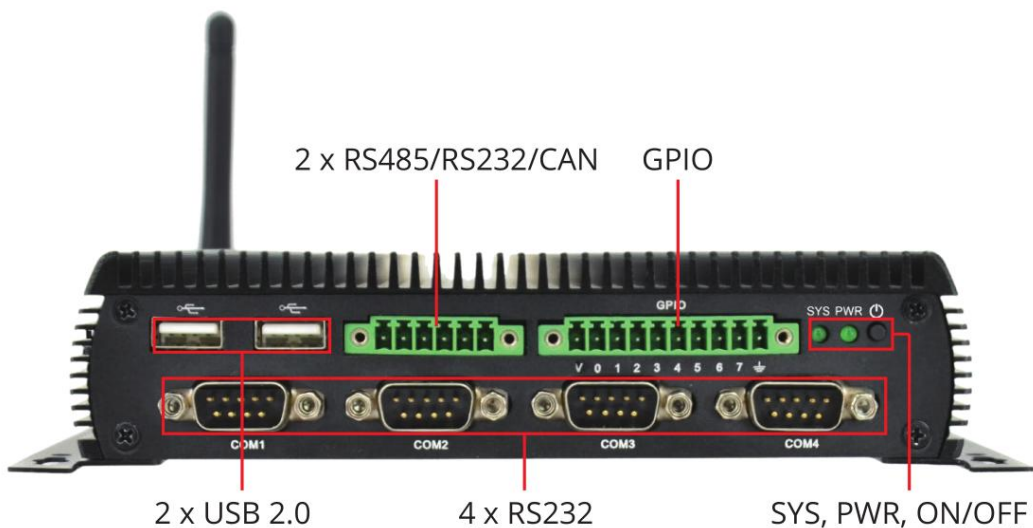
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2.1. Overview

Figure 2

Figure 3

BPC-iMX8MP-03 Industrial Computer uses DEBIX SOM A and DEBIX SOM A I/O Board connection as the main board, which supports dual Gigabit Ethernet, three boot modes, shock and vibration resistance, etc.. The data specifications are as follows.

Table 2 BPC-iMX8MP-03 Industrial Computer specification

System	
Motherboard	DEBIX SOM A + DEBIX SOM A I/O Board
Model	BPC-iMX8MP-03
Memory	2GB LPDDR4 (1GB/4GB/8GB optional)
Storage	Onboard 16GB eMMC (8GB/32GB/64GB/128GB/256GB optional)
OS	Ubuntu 20.04, Android 11, Yocto-L5.10.72_2.2.0, Windows 10 IoT Enterprise
Boot Mode	1) Support DEBIX SOM A board eMCC boot (default) 2) Support DEBIX SOM A I/O Board Micro SD card boot 3) Support DEBIX SOM A I/O Board SPI Nor Flash boot (reserved)
Communication	
Gigabit Network	2 x Independent MAC RJ45 Gigabit Ethernet ports, both support POE power supply (need POE power device module)
Wi-Fi & Bluetooth	2.4GHz & 5GHz dual-band Wi-Fi, Bluetooth 5.0, external Wi-Fi and 4G SMA antenna interface
Video & Audio	
HDMI	1 x HDMI output, connector is Type A HDMI female
Audio	1 x headphone output and microphone input combo interface, the connector is a 3.5mm socket
External I/O Interface	
DC Block	1 x DC socket, supports 5.5mm x 2.1mm plug
USB 3.0	4 x USB 3.0 Host, the connector is double layer Type-A interface
USB 2.0	3 x USB 2.0 Host, the connector is Type-A interface
Serial Ports	1) 4 x physically isolated RS232, compatible with UART TTL 3.3V without physical isolation 2) 2 x physically isolated RS485/RS232/CAN (RS485 by default),

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	compatible with UART TTL 3.3V without physical isolation
GPIO	1) 4 x physically isolated DIs, supporting wet and dry nodes 2) 4 x physically isolated DOs, support wet nodes, compatible with external relay dry nodes
LED & Key	1) 1 x System status indicator 2) 1 x Power status indicator 3) 1 x ON/OFF key
Internal I/O Interface	
Slot	1) 1 x Micro SIM pop-up card slot 2) 1 x Micro SD pop-up card slot
Mini PCIe	1) Support Mini PCIe 4G module, such as Quectel 4G module, built-in SIM card 2) Support Mini PCIe LoRa module 3) Support Mini PCIe expansion modules, such as network card, SATA card, serial port card
Power Supply	
Power Input	Default DC 12V/2A power input, support DC 12V~36V wide voltage input
Mechanical & Environmental	
Enclosure Material	Steel and aluminum alloy
Dimension (W x D x H)	124mm x 169.42mm x 38.9mm
Gross Weight	812g
Heat Dissipation	No fan, heat dissipation through the enclosure
Operating Temp.	-20 °C to 70 °C
Relative Humidity	10%~90%

2.2. Composition

Figure 4

BPC-iMX8MP-03 Industrial Computer assembly consists of these main components: DEBIX SOM A + I/O Board, enclosure and antenna.
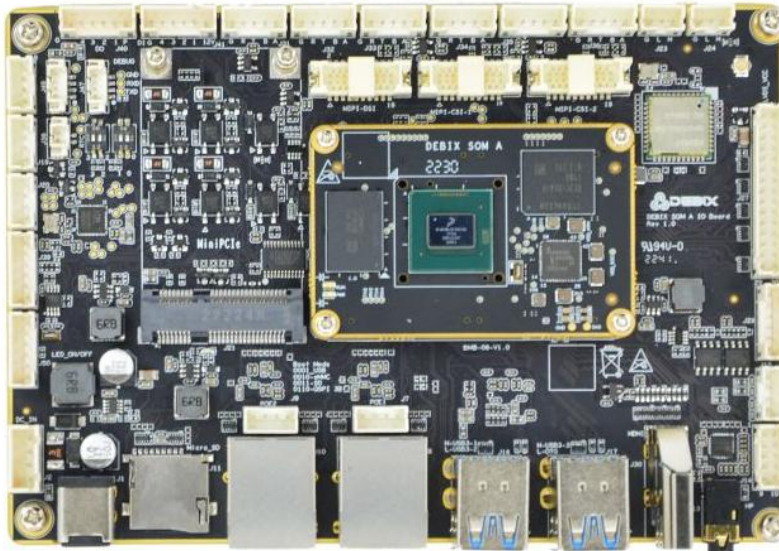

Figure 5 DEBIX SOM A + I/O Board

Figure 6 Enclosure and antenna

2.3. External Interface

2.3.1. Power Interface

BPC-iMX8MP-03 Industrial Computer provides one power connector (DC socket), with default

DC 12V/2A power input. As shown in the figure below.

Figure 7 DC-IN

2.3.2. HDMI Interface

BPC-iMX8MP-03 Industrial Computer provides an HDMI interface, and the connector is an A-type HDMI female socket, which is used to connect a monitor, TV or projector. As shown in the Figure 8.

HDMI resolution up to 3840x2160p30. Audio supports 32 channel audio output and supports 1 S/PDIF audio eARC input.
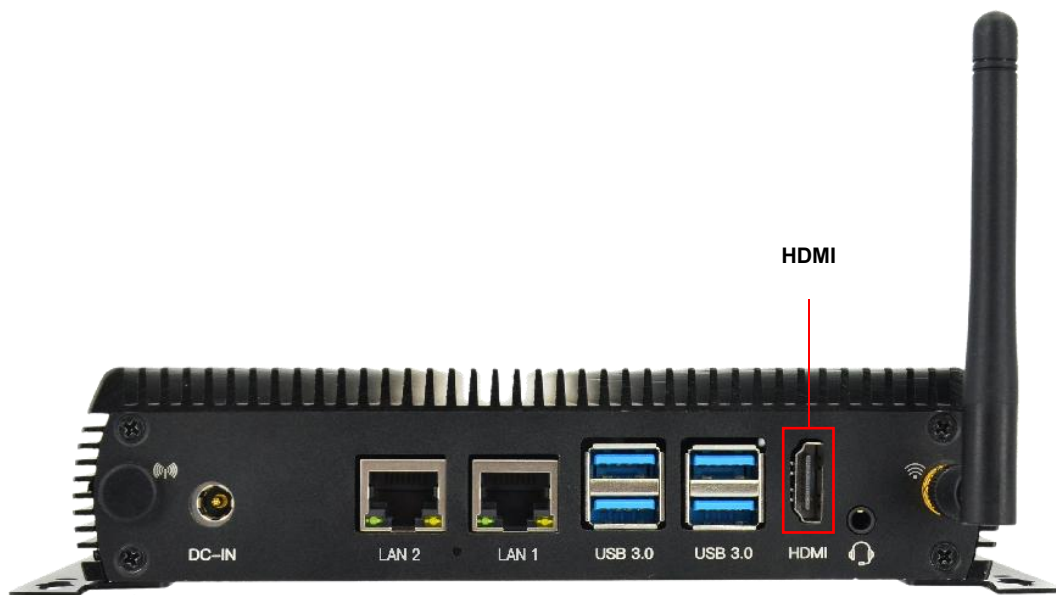
Figure 8 HDMI

2.3.3. Audio Interface

BPC-iMX8MP-03 Industrial Computer provides a combined headphone and microphone input interface. The connector is a 3.5mm socket, compatible with the built-in needle socket design, has audio input/output functions, and supports rated voltage 1.5V MIC audio input. As shown in the Figure 9.
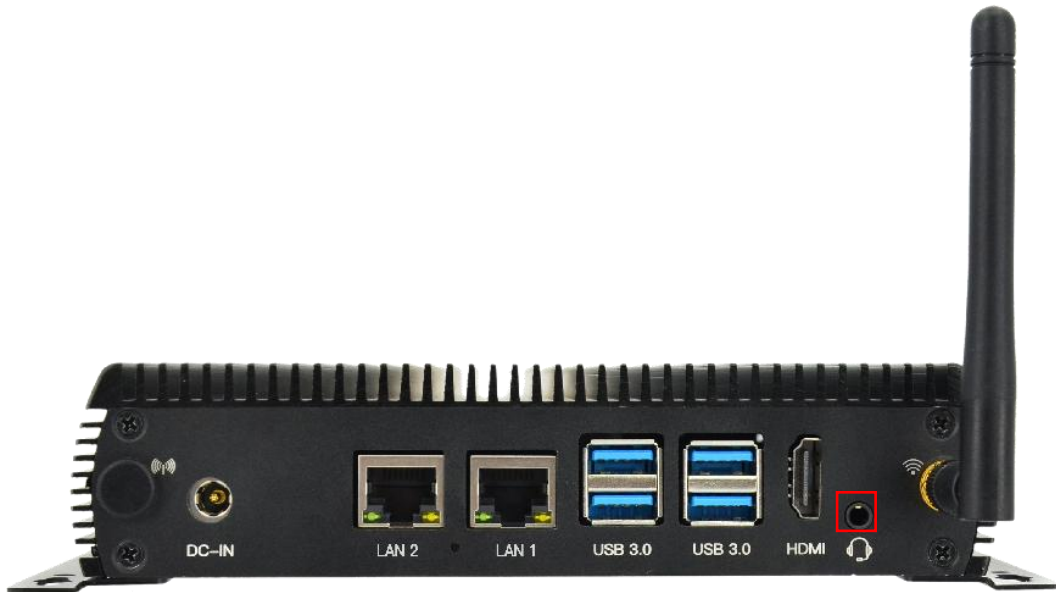
Figure 9 Audio

2.3.4. Ethernet Interface

BPC-iMX8MP-03 Industrial Computer supports two independent MAC RJ45 Gigabit Ethernet ports (Network port 1: LAN1, Network port 2: LAN2), both support POE power supply (Additional POE module is required), connect device to network through the network cable of RJ45 connector; and a set of status indicators below the interface to display the status signal, the green is Link and the yellow is Active.
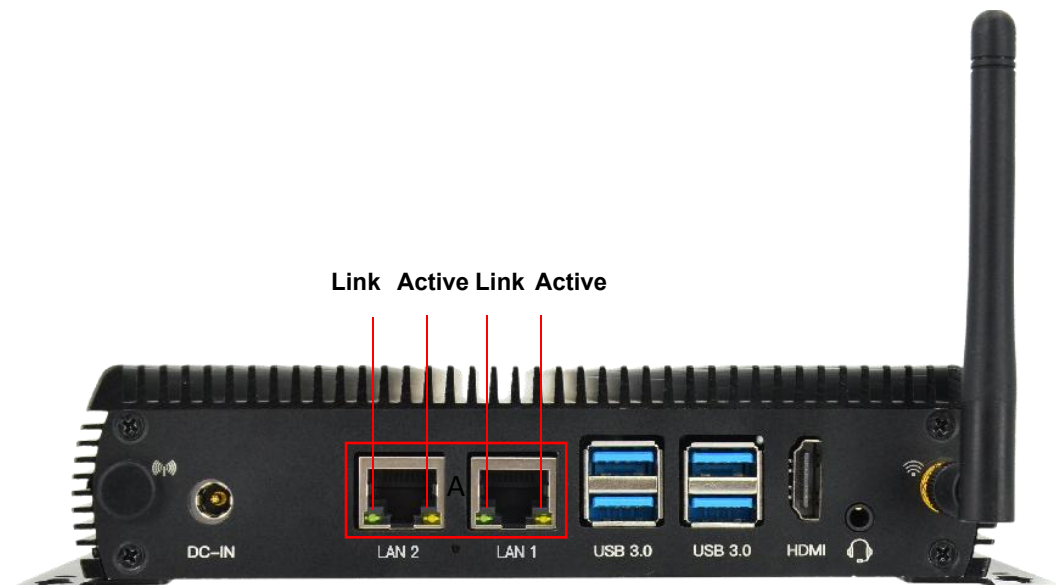
Figure 10 Ethernet

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

2.3.5. USB Interface

BPC-iMX8MP-03 Industrial Computer has two USB controllers and PHY, supports USB 3.0 and 2.0. There are four USB 3.0 interfaces with dual-layer Type-A connectors and another two USB 2.0 interfaces with Type-A connectors. As shown in the figure below.
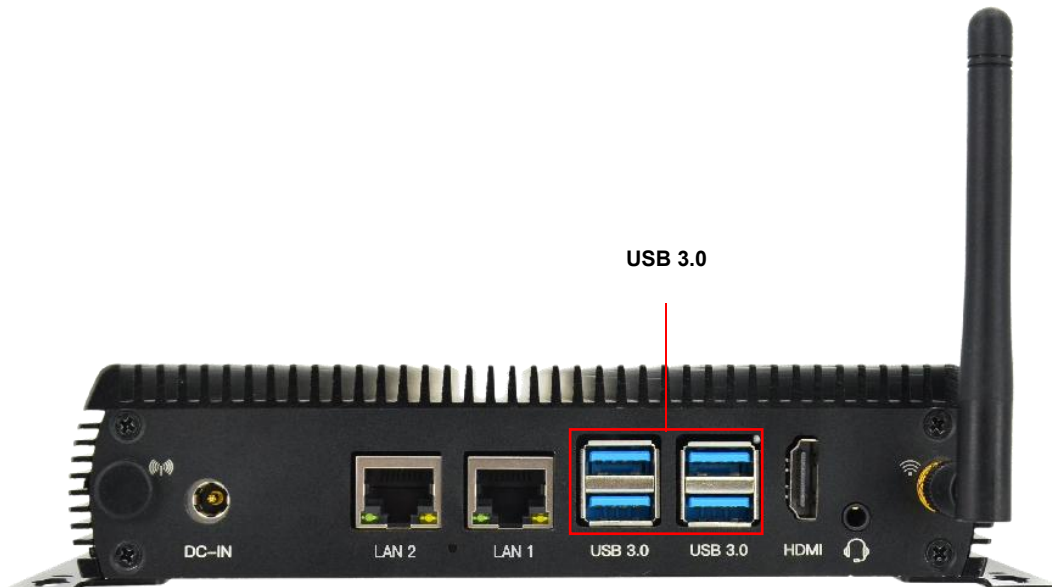
Figure 11 USB 3.0
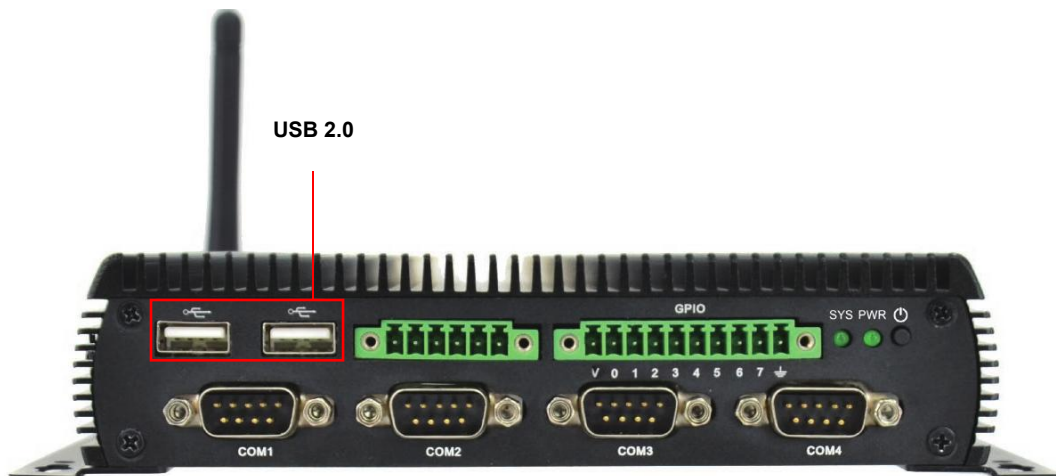
Figure 12 USB 2.0

2.3.6. RS485/RS232/CAN Interface

IMPORTANT

> The default configuration is an RS485 interface. RS485, RS232, and CAN on the same connector, only one can be used at the same time. If RS232 or CAN function is required, internal hardware wiring needs to be adjusted before leaving the factory.

BPC-iMX8MP-03 Industrial Computer provides two types of serial connectors:

● Supports 2 x RS485/RS232/CAN interface, compatible with the UART TTL 3.3V serial port without physical isolation.

● Supports 4 x RS232 interfaces, compatible with UART TTL 3.3V serial ports without physical isolation.
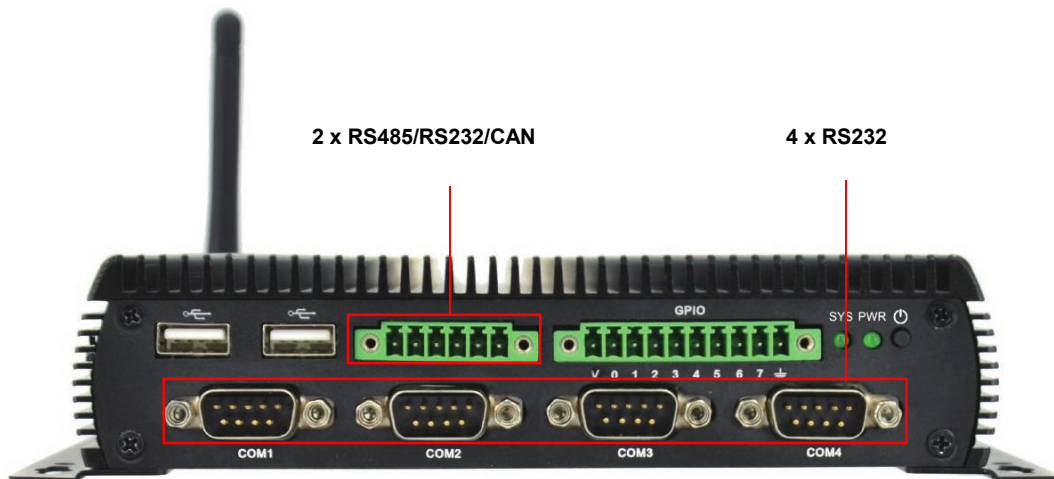
Figure 13 RS485/RS232/CAN

The 2 x RS485/RS232/CAN pin sequence is as shown in the figure:
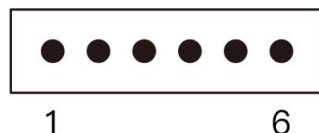
Figure 14

The 2 x RS485/RS232/CAN interface is defined as follows:

Table 4 Pin definition of RS485/RS232/CAN

Pins	Definition	Description	Device node
1	GND	RS485 differential signal line A/ RS232 sender/ CAN1 differential signal line H	/dev/ttyWCH0
2	RS485_B1/RS232_RXD1 /CAN1_L	RS485 differential signal line B/ RS232 receiver/ CAN1 differential signal line L	
3	RS485_A1/RS232_TXD1 /CAN1_H	To ground	
4	GND	To ground	/dev/ttyWCH1
5	RS485_B2/RS232_RXD2 /CAN2_L	RS485 differential signal line B/ RS232 receiver/ CAN2 differential signal line L	
6	RS485_A2/RS232_TXD2 /CAN2_H	RS485 differential signal line A/ RS232 sender/ CAN2 differential signal line H	

The 4 x RS232 pin sequence is as shown in the figure:
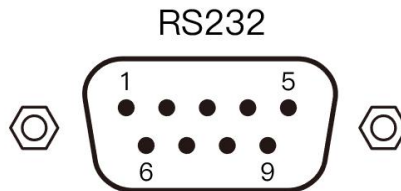
Figure 15

Table 5 Device node of COM

Function Name	IO Name	Description	Device node
COM1	RS232_RXD1	RS232 receiver	/dev/ttymxc3
	RS232_TXD1	RS232 sender	
COM2	RS232_RXD2	RS232 receiver	/dev/ttymxc2
	RS232_TXD2	RS232 sender	
COM3	RS232_RXD3	RS232 receiver	/dev/ttyWCH3

	RS232_TXD3	RS232 sender	
COM4	RS232_RXD4	RS232 receiver	/dev/ttyWCH2
	RS232_TXD4	RS232 sender	

The 4 x RS232 interface is defined as follows:

Table 6 Pin definition of COM

Pins	Definition	Pins	Definition
1	NC	2	RS232_RXD
3	RS232_TXD	4	NC
5	GND	6	NC
7	NC	8	NC
9	NC		

2.3.7. GPIO Interface

BPC-iMX8MP-03 Industrial Computer provides a GPIO interface with isolated type (from left to right, DI interface, DO interface), physically isolated DI, supports dry node input and wet node input; physically isolated DO, supports wet node, and is compatible with external relay dry nodes.
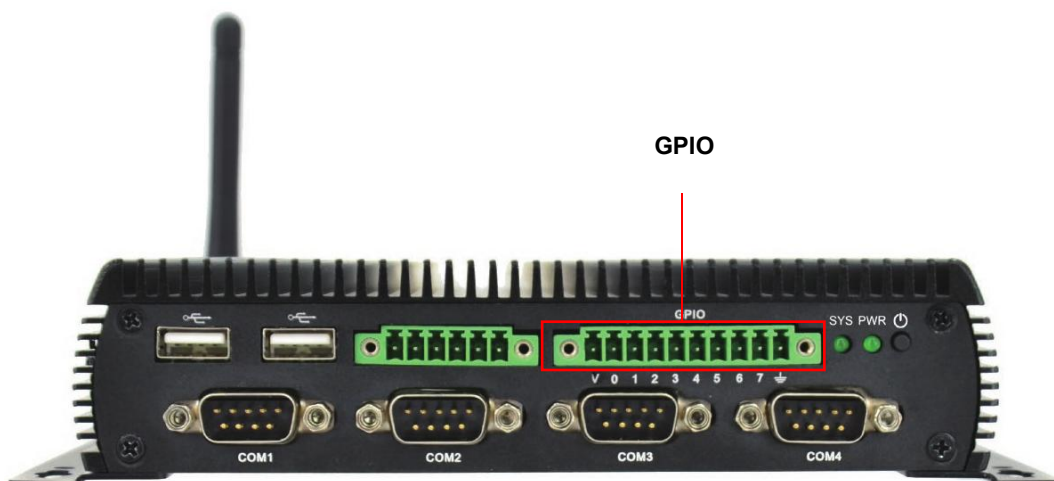
Figure 16 GPIO

The GPIO interface is defined as follows:

Table 7 Pin definition of GPIO

Pins	Definition	Pins	Definition
V	DO_PCOM	0	DI_1
1	DI_2	2	DI_3
3	DI_4	4	DO_1
5	DO_2	6	DO_3
7	DO_4	G	GND

DI electrical parameters:

● Wet contact:

   ■ 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.

● Dry contact:

   ■ Open state: high level

   ■ Short state with GND: low level

DO electrical parameters:

● Node DO-PCOM supports a voltage range of 5~30V DC;

● When the SOM A signal is low, the corresponding DO signal output voltage follows the node DO-PCOM, the higher the node DO-PCOM voltage, the higher the DO signal output voltage (compared with the node DO-PCOM, there is a 1~3V voltage drop);

● When the SOM A signal is high level, the corresponding DO signal output voltage is 0.

2.3.8. LED & Key

There are two LED indicators and a power ON/OFF key, as shown in the figure below.

Figure 17 LED & Key

Table 8 Description of LED & Key

LED & Key	Status	Description
SYS	Lighting	Device works normally
	off	Device works abnormally
PWR	Lighting	Power is on
	off	Power is off
ON/OFF key	Short press	Hibernation/wake up
	Long press	Power off/on

2.4. Package List

BPC-iMX8MP-03 Industrial Computer product list:

- 1 x WiFi antenna

- 4 x M3-5 Black screw

- 2 x Wall bracket

- 1 x BPC-iMX8MP-03 box

Chapter 3 Installation Guide

3.1. Installation

After receiving the product, install the accessories as follows.

1. Install the WiFi antenna to the WiFi antenna connection port as shown in the following figure.
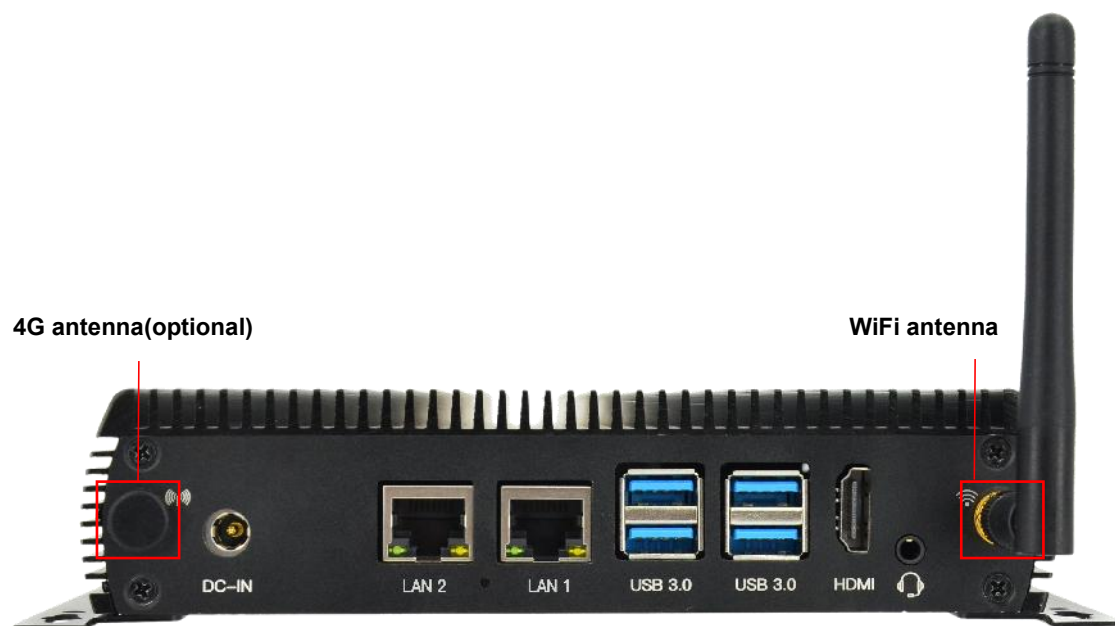
Figure 18

2. Connect the power adapter to the DC connector of enclosure (DC-IN connector as shown above). When the SYS and PWR LED are on, it proves that the Industrial Computer is powered on.

Figure 19 Power adapter

3.2. Power on

NOTE

The factory default boot mode of BPC-iMX8MP-03 Industrial Computer is eMMC boot, and **the RS232/RS485/CAN interface is configured as RS485 by default**.

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

Chapter 4 Software Application Examples

4.1. Use 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" (Figure 10, right side);

eth34 network card corresponds to the network port of the device silkscreen

"LAN2" (Figure 10, left side).

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
```

The desktop settings of the BPC-iMX8MP-03 Industrial Computer Ethernet (Settings >> Network) are as follows.
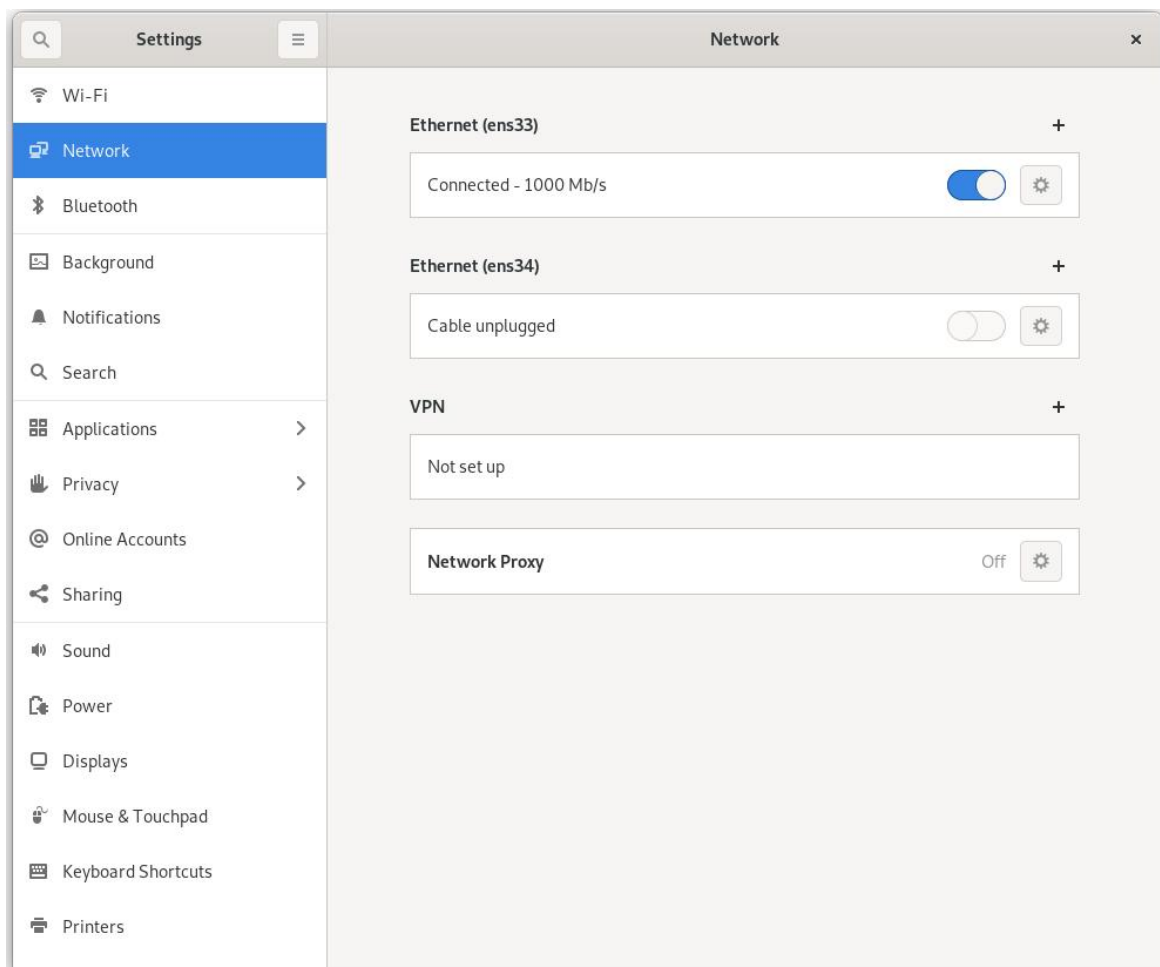
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Figure 20

4.2. Use of WiFi

● Unplug the network cable, device connect WiFi (polyhex_mi), query the WiFi network port via 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.

The desktop settings of the BPC-iMX8MP-03 Industrial Computer WIFI (Settings >> Wi-Fi) are as follows.

● Turn on the Wi-Fi function, as shown in Figure 22.

● Click on the wifi network name, the "Authentication required" dialog box will pop up, enter the wifi network password, as shown in the figure below:
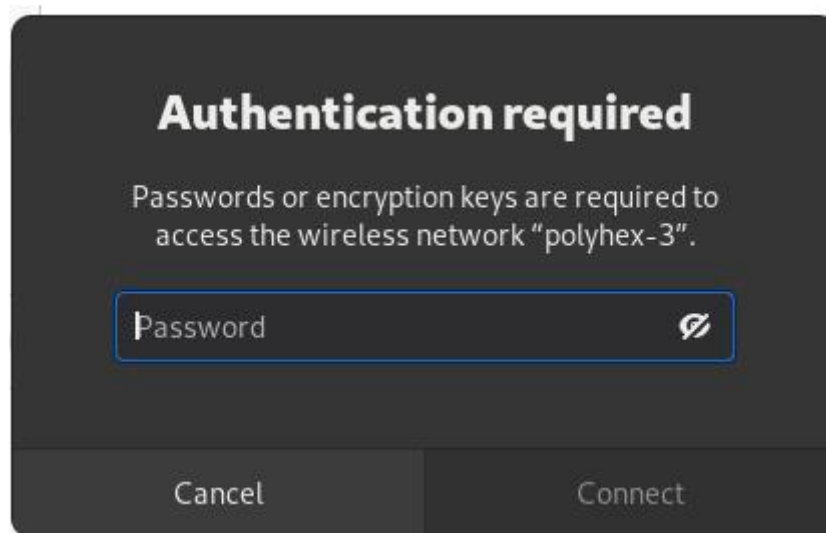
Figure 21

● Wait for a while, when you see the right side of the connected wifi name √, that is, the wifi

connection is successful, as shown in the following figure.
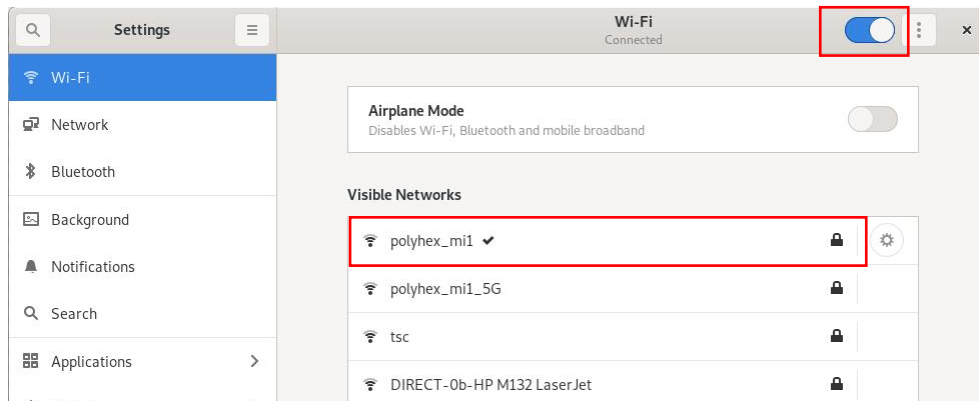
Figure 22

4.3. Use of Bluetooth

● Query Bluetooth devices via the hciconfig command.

● Switch to the root user.

● Start bluetooth and match bluetooth.

```
hciconfig hci0 up

bluetoothctl

power on

agent on

default-agent

scan on

pair yourDeviceMAC          #Match the Bluetooth MAC address
```

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```
root@imx8mpevk:/home/debix# hciconfig hci0 up
root@imx8mpevk:/home/debix# bluetoothctl
Agent registered
```

```
[bluetooth]# power on
[CHG] Device 00:FA:09:93:48:29 RSSI: -89
```

```
Changing power on succeeded
```

```
[bluetooth]# agent on
Agent is already registered
[bluetooth]# default-agent
[bluetooth]# scan on
```

```
Default agent request successful
Discovery started
```

The desktop settings of the BPC-iMX8MP-03 Industrial Computer Bluetooth (Settings >> Bluetooth) are as follows.

Example: Turn on Bluetooth on both the phone and Industrial Computer, the phone Bluetooth can detect the Bluetooth device of Industrial Computer, the Industrial Computer can detect the phone Bluetooth device, click on the Bluetooth device, connect, enter the key for pairing, as shown in the following figure.
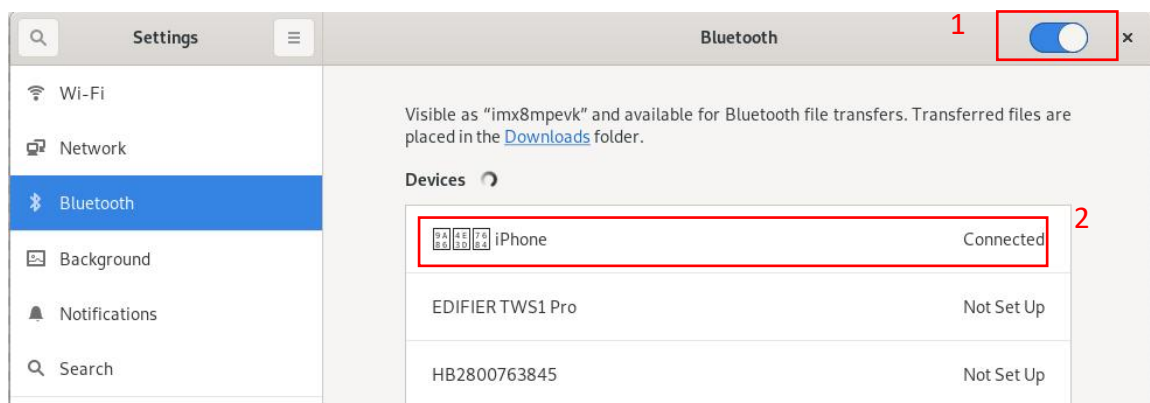

Figure 23

4.4. Use of USB

1. Switch to the 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
```

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
```

4.5. Verification of RS485/RS232/CAN

IMPORTANT

The default configuration is an RS485 interface. RS485, RS232, and CAN on the same connector, only one can be used at the same time. If RS232 or CAN function is required, internal hardware wiring needs to be adjusted before leaving the factory.

1. Install cutecom serial port tool on BPC-iMX8MP-03 Industrial Computer.

```
sudo apt update

sudo apt install cutecom qtwayland5
```

2. The serial port parameters are set as follows.

Table 9 Cutecom parameter settings

Parameter	Value
Baudrate	115200
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None

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4.5.1. RS485 (Default)

Connect Pin2 to Pin5, and connect Pin3 to Pin6 (that is, A to A, and B to B). The wiring is shown in the following figure.

Figure 24

● Run the cutecom tool, set the Device to /dev/ttyWCH0, set other parameters as shown in the table, click Open.

Figure 25

● Open another window of the cutecom tool, set the Device to /dev/ttyWCH1 and click Open.

● Send and receive data via cutecom. Enter the test string in the cutecom input box, press Enter to send, you can see that another cutecom receiving box receives the same message, indicating that the communication is successful, and the result is as follows:
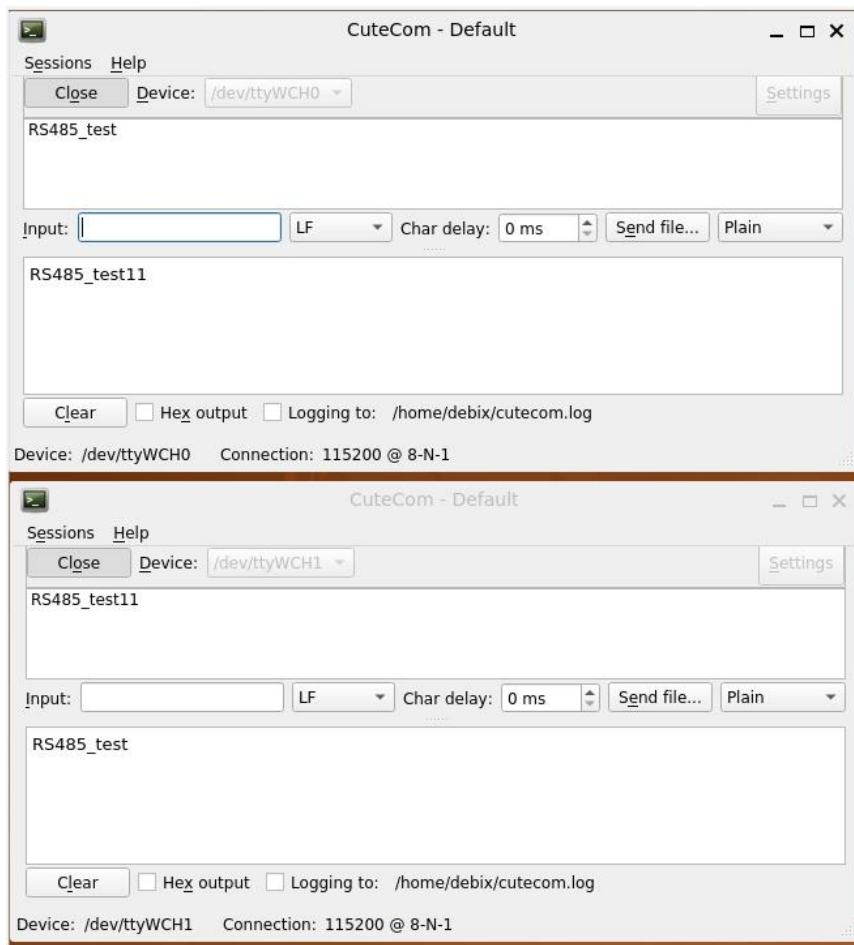
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Figure 26

4.5.2. RS232

Connect Pin2 of RS232 to the sending end of USB-RS232, Pin3 to the receiving end of USB-RS232, and Pin1 to the ground terminal of USB-RS232, USB-RS232 is connected to the onboard USB 3.0 interface. The wiring is shown in the following figure.
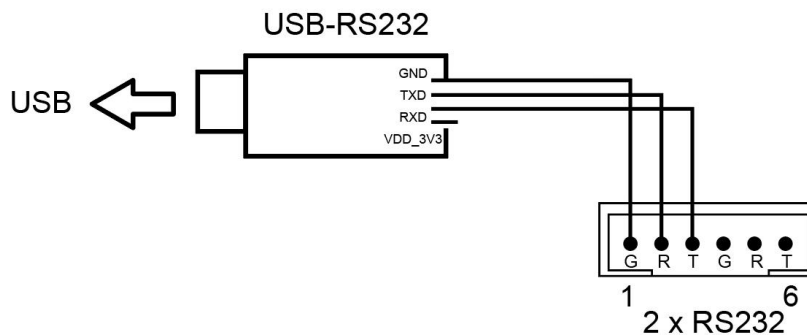

Figure 27

- Set the Device of the cutecom tool to /dev/ttyWCH0, click Open.

- Set the Device of another cutecom tool to /dev/ttyUSB0, set other parameters as below, click Open.

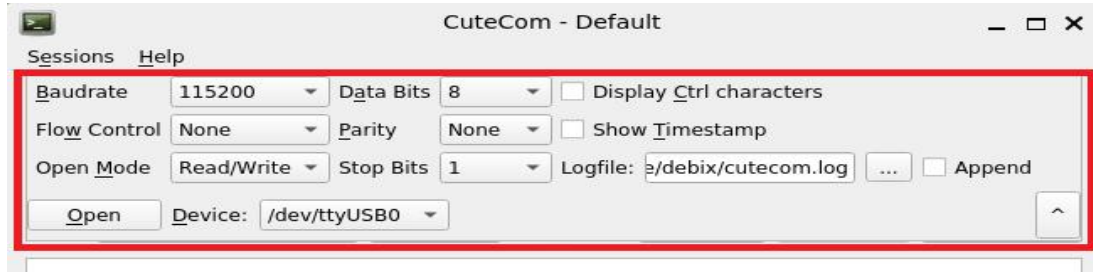Figure 28

- Send and receive data via cutecom. Enter the test string in the cutecom input box, press Enter to send, you can see that another cutecom receiving box receives the same message, indicating that the communication is successful, and the result is as follows:
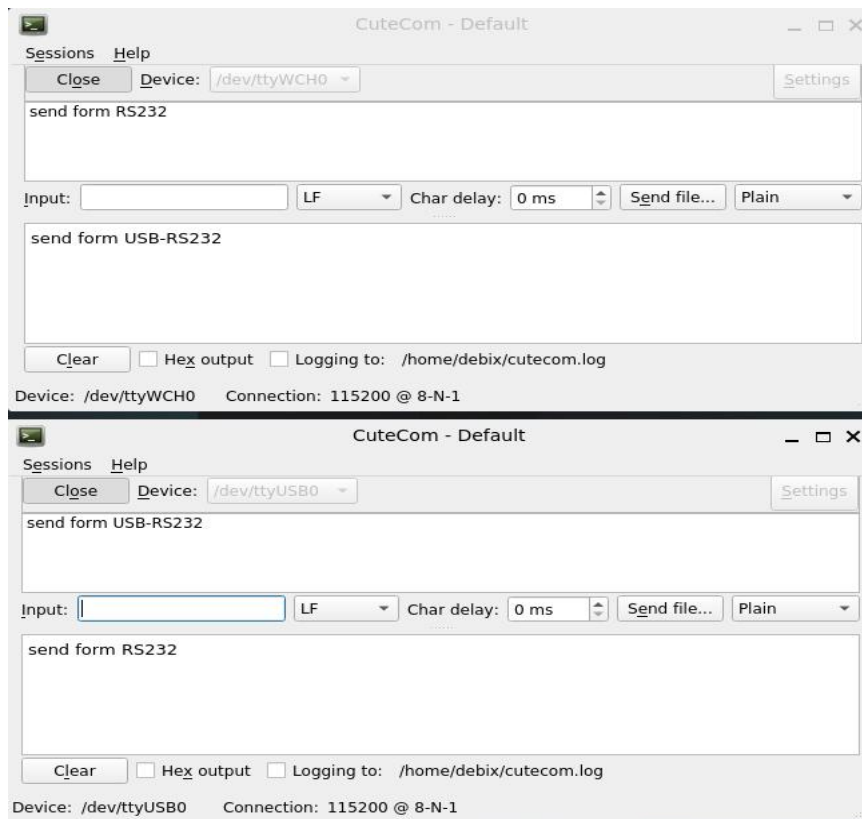

Figure 29

4.5.3. CAN

Connect Pin2 to Pin5, and connect Pin3 to Pin6 (that is, H to H, and L to L). The wiring is shown in the following figure.
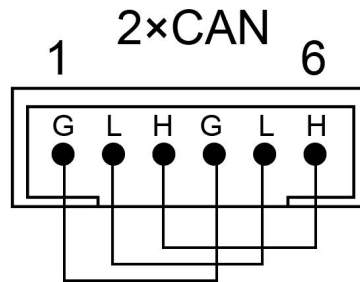

Figure 30

Switch to the root user first.

```
sudo su
```

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

- CAN1 sends data, CAN0 receives data

1. Open a Terminal and configure CAN0 to receive.

```
ifconfig can0 down

ip link set can0 type can bitrate 500000

ifconfig can0 up

candump can0
```

```
root@imx8mpevk: /home/debix
debix@imx8mpevk:~$ sudo su
[sudo] password for debix:
root@imx8mpevk:/home/debix#
root@imx8mpevk:/home/debix# ifconfig can0 down
root@imx8mpevk:/home/debix# ip link set can0 type can bitrate 500000
root@imx8mpevk:/home/debix# ifconfig can0 up
root@imx8mpevk:/home/debix# candump can0
  can0  123   [8]  11 22 33 44 55 66 77 88
```

2. Open another Terminal and configure CAN1 to send.

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```
ifconfig can1 down

ip link set can1 type can bitrate 500000

ifconfig can1 up

cansend can1 123#1122334455667788
```



```
debix@imx8mpevk:~$ sudo su
[sudo] password for debix:
root@imx8mpevk:/home/debix# ifconfig can1 down
root@imx8mpevk:/home/debix# ip link set can1 type can bitrate 500000
root@imx8mpevk:/home/debix# ifconfig can1 up
root@imx8mpevk:/home/debix# cansend can1 123#1122334455667788
```

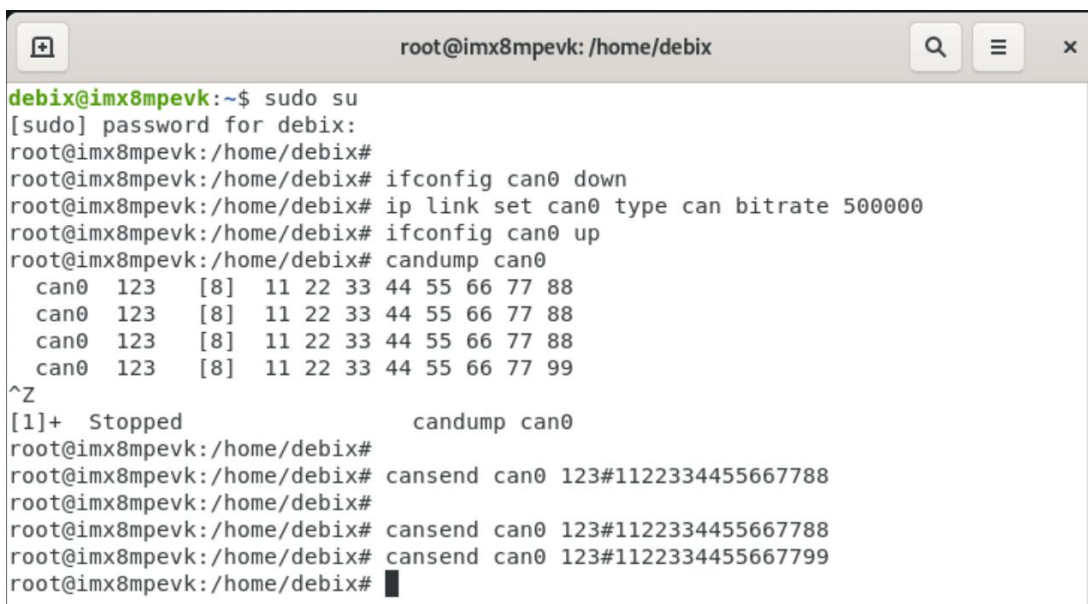- CAN1 receives data, CAN0 sends data

1. In the Terminal sent by CAN1, switch can1 to receiving state.

```
candump can1
```

2. In the Terminal receiving CAN0, press Ctrl+Z to end receiving. And switch can0 to send
   state.

```
cansend can0 123#1122334455667788
```

As shown in the figure below:


```
debix@imx8mpevk:~$ sudo su
[sudo] password for debix:
root@imx8mpevk:/home/debix#
root@imx8mpevk:/home/debix# ifconfig can0 down
root@imx8mpevk:/home/debix# ip link set can0 type can bitrate 500000
root@imx8mpevk:/home/debix# ifconfig can0 up
root@imx8mpevk:/home/debix# candump can0
  can0  123   [8]  11 22 33 44 55 66 77 88
  can0  123   [8]  11 22 33 44 55 66 77 88
  can0  123   [8]  11 22 33 44 55 66 77 88
  can0  123   [8]  11 22 33 44 55 66 77 99
^Z
[1]+  Stopped                 candump can0
root@imx8mpevk:/home/debix#
root@imx8mpevk:/home/debix# cansend can0 123#1122334455667788
root@imx8mpevk:/home/debix#
root@imx8mpevk:/home/debix# cansend can0 123#1122334455667788
root@imx8mpevk:/home/debix# cansend can0 123#1122334455667799
root@imx8mpevk:/home/debix#
```

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```
debix@imx8mpevk:~$ sudo su
[sudo] password for debix:
root@imx8mpevk:/home/debix# ifconfig can1 down
root@imx8mpevk:/home/debix# ip link set can1 type can bitrate 500000
root@imx8mpevk:/home/debix# ifconfig can1 up
root@imx8mpevk:/home/debix# cansend can1 123#1122334455667788
root@imx8mpevk:/home/debix# cansend can1 123#1122334455667788
root@imx8mpevk:/home/debix# cansend can1 123#1122334455667788
root@imx8mpevk:/home/debix# cansend can1 123#1122334455667799
root@imx8mpevk:/home/debix# candump can1
  can1  123  [8]  11 22 33 44 55 66 77 88
  can1  123  [8]  11 22 33 44 55 66 77 88
  can1  123  [8]  11 22 33 44 55 66 77 99
```

4.6. Verification of DI/DO

Switch to the root user first.

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

4.6.1. DI

Take the dry node connection as an example, all ports of DI operate in the same way, here take DI_1 as an example, and connect the DI_1 to ground in series.

1. Enter the GPIO directory.

```
cd /sys/class/gpio
```

```
root@imx8mpevk:~# cd /sys/class/gpio
root@imx8mpevk:/sys/class/gpio# ls
export      gpiochip128  gpiochip480  gpiochip64  unexport
gpiochip0  gpiochip32   gpiochip496  gpiochip96
```

2. Export GPIO. After the export is successful, the gpio5 directory will be automatically generated, as shown below:

```
echo 5 > export
```

```
root@imx8mpevk:/sys/class/gpio# echo 5 > export
root@imx8mpevk:/sys/class/gpio# ls
export  gpiochip0    gpiochip32   gpiochip496  gpiochip96
gpio5   gpiochip128  gpiochip480  gpiochip64   unexport
root@imx8mpevk:/sys/class/gpio#
```

3. Configure GPIO pins.

echo in > gpio5/direction	//Set pin direction to input
echo none > gpio5/edge	//set non-interrupt pin

```
root@imx8mpevk:/sys/class/gpio# echo in > gpio5/direction
root@imx8mpevk:/sys/class/gpio# echo none > gpio5/edge
root@imx8mpevk:/sys/class/gpio# cat gpio5/value
1
root@imx8mpevk:/sys/class/gpio#
```

4.6.2. DO

The current supported by DO port is 500mA, take DO_1 as an example.

1. Enter the DOUT_1 control directory

```
cd /sys/devices/platform/gpio-leds/leds/DOUT_1
```

2. GPIO output is low, DO_1 open-drain output is high configuration, and the relay is turned off.

```
echo 0 > brightness
```

3. GPIO output is high, DO_1 output is low, and the relay is on.

```
echo 1 > brightness
```

The other DO verification methods are the same, the DOUT_1, DOUT_2, DOUT_3, and DOUT_4 files under /sys/devices/platform/gpio-leds/leds/ correspond to DO_1, DO_2, DO_3, and DO_4 ports respectively.

```
root@imx8mpevk:~# cd /sys/devices/platform/gpio-leds/leds/
root@imx8mpevk:/sys/devices/platform/gpio-leds/leds# ls
4G_RESET          DOUT_1      GPIO_LED2       SPDIF_TX        VDD5V_EN
BB_VDD5V_EN       DOUT_2      SOM_VDD1V8_EN   USB20_PWR_EN    yellow:status
BB_VDD5V_EN_1     DOUT_3      SOM_VDD3V3_EN   USB30_OTG_EN
CSI1_VDD1V8_EN    DOUT_4      SPDIF_EXT_CLK   USB30_PWR_EN
CSI1_VDD3V3_EN    GPIO_LED1   SPDIF_RX        USB30_RST
root@imx8mpevk:/sys/devices/platform/gpio-leds/leds#
```

4.7. Verification of LED & Key

1. **LED**

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- SYS is the system status indicator, the indicator is on when the Industrial Computer is running normally; otherwise, the indicator is off.

- PWR is the power status indicator, the indicator is on when power is applied; otherwise, the indicator is off when power is off.

2. Key

BPC-iMX8MP-03 Industrial Computer is automatically turned on when power is applied.

- Short press

    - SYS green light is off, the system enters into sleep.

    - Short press again, SYS 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.

4.8. Verification of RTC

Confirm that the HYM8653S driver module is loaded successfully.

```
dmesg | grep rtc-hym8653
```

The desktop settings of the BPC-iMX8MP-03 Industrial Computer RTC (Settings >> Date&Time) are as follows.

- Unlock "Date & Time" to turn on or off automatic time.
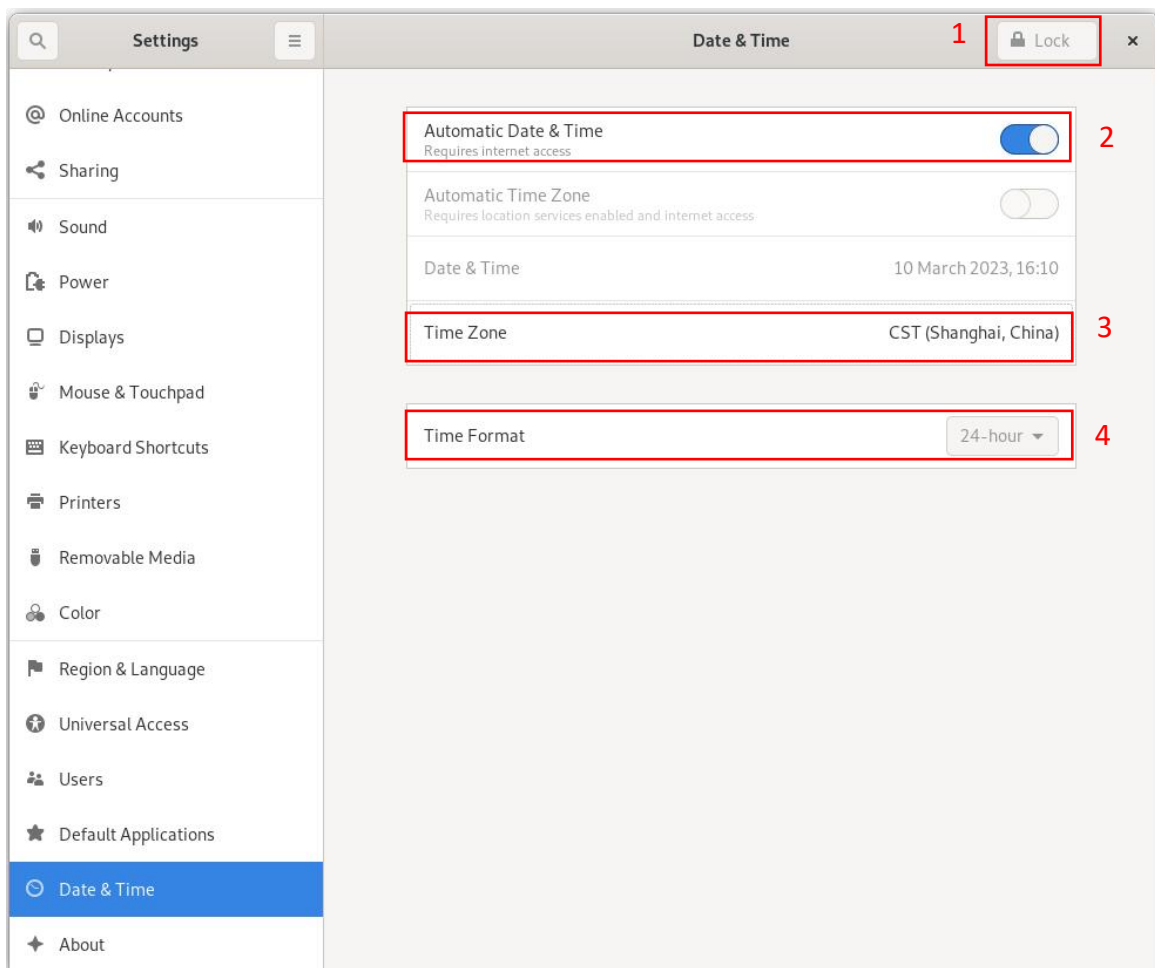- Set "Time Zone" as local zone.
- Set "Time Format" to 24-hour.

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Figure 31

Read the RTC time of the Industrial Computer via hwclock -r command, as shown in the following figure.

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