DEBIX 4G Board User Guide

Version: V1.0 （2023-07）

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

DEBIX 4G Board is an add-on board for DEBIX Model A and DEBIX Model B SBC, and is compatible with DEBIX Infinity. DEBIX 4G Board is designed to provide 4G network function for DEBIX Model A/B and DEBIX Infinity. In a small size of 57mm x 51.3mm, it has one Mini PCIe slot for 4G module and one Micro SIM slot.
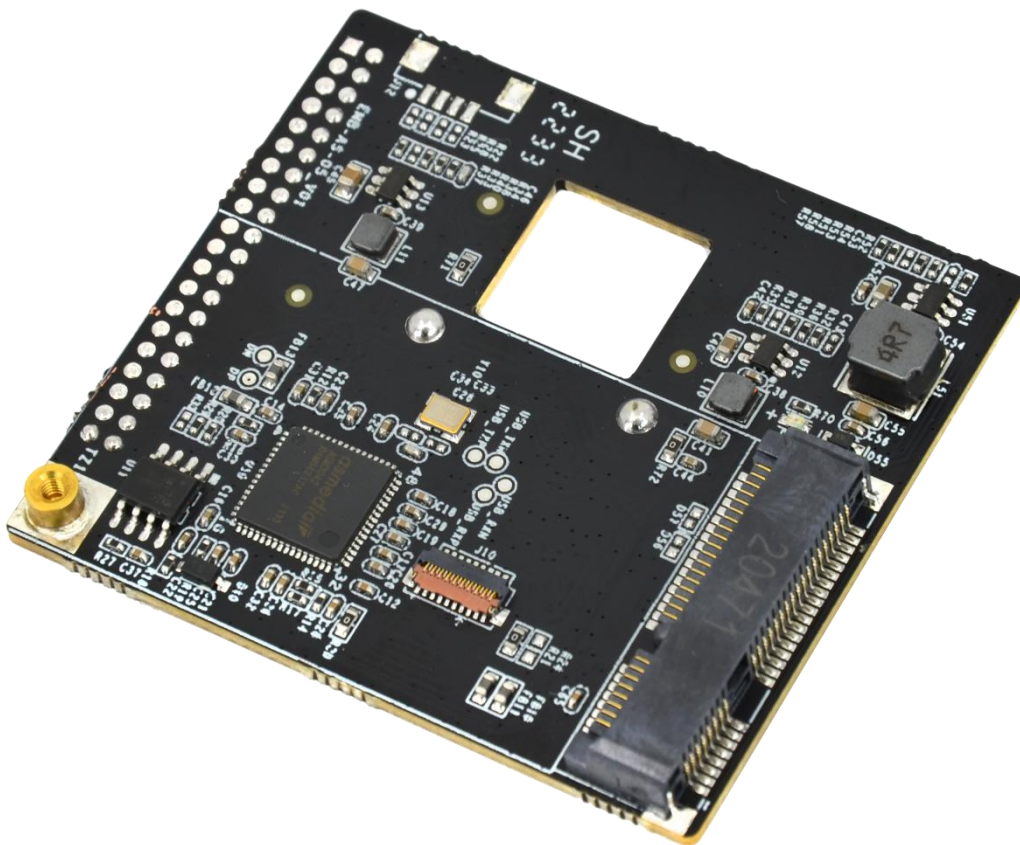

Figure 1 DEBIX 4G Board

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REVISION HISTORY		
Rev.	**Date**	**Description**
1.0	2022.07.25	First edition

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Chapter 1 Security

1.1. Safety Precaution

The following messages 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 *DEBIX* 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

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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 outside the specified ambient temperature range. 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. Declaration of Compliance

This product has passed the following certifications:

Table 2 Compliance Certification

Symbol	Meaning
C E	This equipment has passed CE certified.
RoHS	This equipment is manufactured in compliance with RoHS regulations.

UK CA	This equipment has passed UKCA certified.
FC	This equipment has passed FCC certified.

1.4. 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
- 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@debix.io*

Chapter 2 DEBIX 4G board Introduction

DEBIX 4G board for DEBIX motherboard provides a Mini PCIe interface, Micro SIM card slot, and supports 4G module to realize 4G network function.

Main features:

- Support Mini PCIe 4G module.

- Support 4G network.

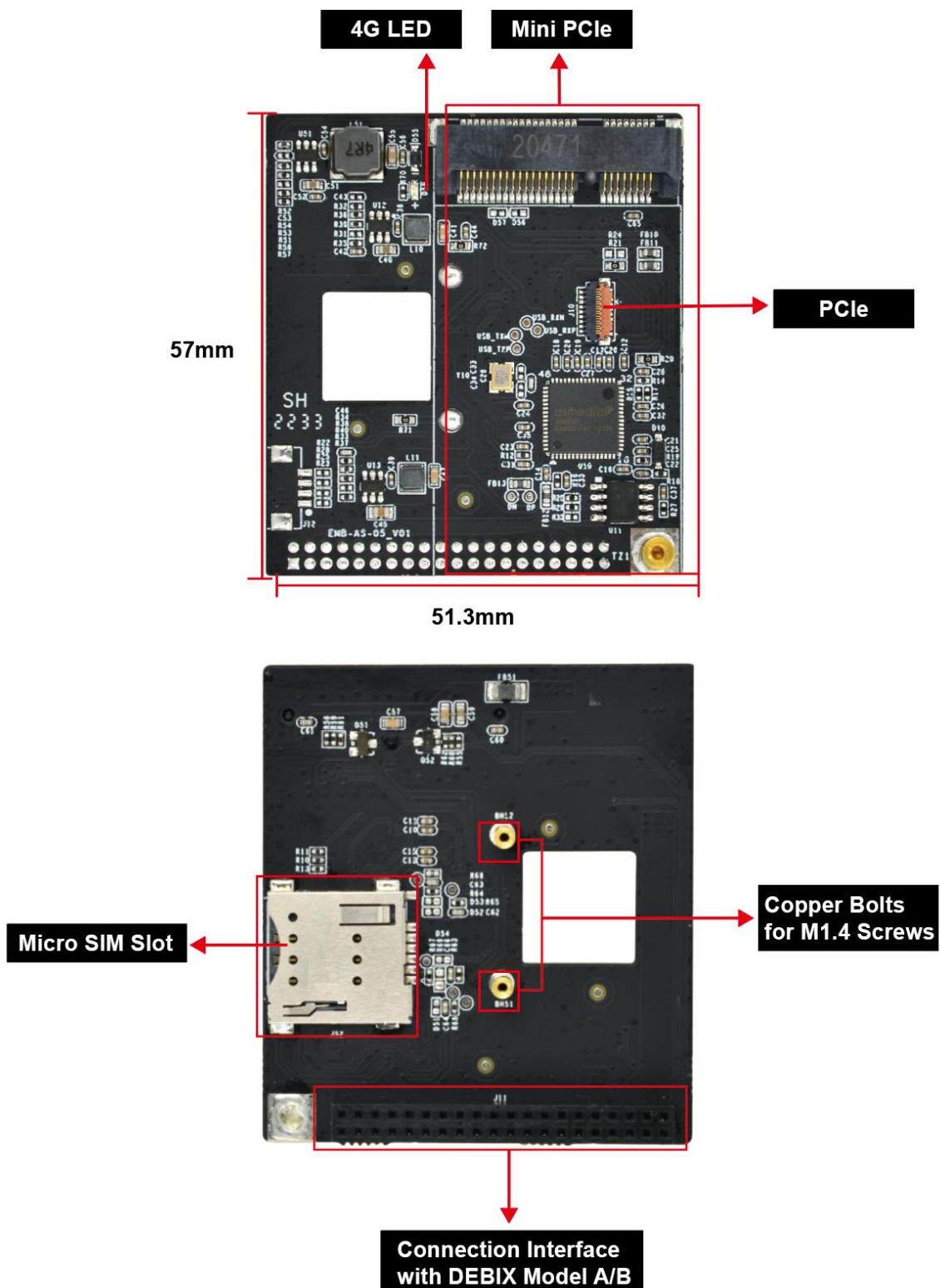- Compatible with the existing DEBIX Aluminum Enclosure.

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2.1. Overview

Figure 2 DEBIX 4G Board

DEBIX 4G board provides 4G network capability for DEBIX motherboard. The data specifications are as below:

Table 3 DEBIX 4G Board specification

I/O Interface	
Mini PCIe	1 x Mini PCIe, support 4G module
LED	1 x 4G Operation LED
Slot	1 x Micro SIM card slot (pop-up)
PCIe	1 x PCIe, the connector is 19Pin 0.3mm Pitch FPC socket (Clamshell)
Power Supply	
Power Input	DC 5V/2A
Mechanical & Environmental	
Size (L x W)	57.0mm x 51.3mm (±0.5mm)
Weight	90g (±0.5g)

2.2. Interface

2.2.1. Mini PCIe

DEBIX 4G board has a PCIE Gen3.0 single lane PCIe controller compatible with the following standards:

● PCI Express Base Specification, Revision 4.0, Version 0.7

● PCI Local Bus Specification, Revision 3.0

● PCI Bus Power Management Specification, Revision 1.2

● PCI Express Card Electromechanical Specification, Revision 1.1

Mini PCIe interface (J53) supports Mini PCIe 4G module with the following supported models:

● Quectel EC20CEHDLG-128-SNNS

● Quectel EC21ECGA-128-SNNS

● Quectel EC25ECGA-128-SNNS

Figure 3 Mini PCIe
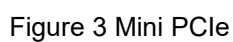
The Mini PCIe interface is defined as follows:

Table 4 Pin definition of Mini PCIe

Pin	Definition	Pin	Definition
1	NC	2	4G_VDD3P3V
3	NC	4	GND
5	NC	6	NC
7	NC	8	USIM_POWER
9	GND	10	USIM_DATA
11	NC	12	USIM_CLK
13	NC	14	USIM_RESET
15	GND	16	USIM_VPP
17	NC	18	GND
19	NC	20	4G-DISABLE
21	GND	22	4G-RESET
23	NC	24	4G_VDD3P3V
25	NC	26	GND
27	GND	28	NC

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29	GND	30	NC
31	NC	32	NC
33	NC	34	GND
35	GND	36	4G_USB_DM
37	GND	38	4G_USB_DP
39	4G_VDD3P3V	40	GND
41	4G_VDD3P3V	42	4G_VDD3P3V
43	GND	44	NC
45	NC	46	NC
47	NC	48	NC
49	NC	50	GND
51	NC	52	4G_VDD3P3V
53	GND	54	GND
55	GND		

2.2.2. PCIe Interface

DEBIX 4G board provides a PCIe interface (J54) with 19Pin/0.3mm FPC socket connector, please refer to "FH26W-19S-0.3SHW(97)" on DEBIX website, which can be used to connect to the PCIe interface of DEBIX motherboard.
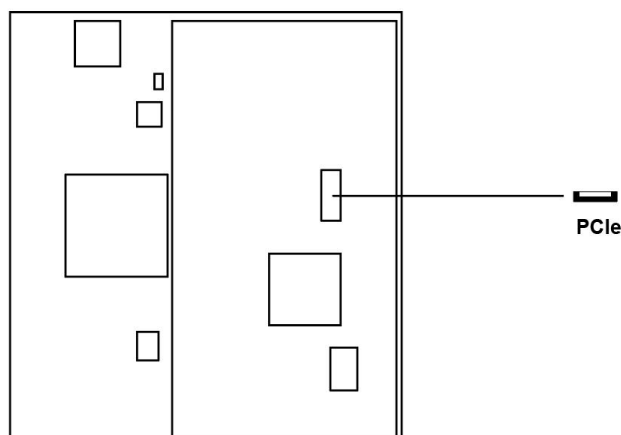
Figure 4 PCIe interface

The PCIe interface is defined as follows:

Table 5 Pin definition of PCIe

Pin	Definition	Pin	Definition
1	GND	2	PCIE_RXP
3	PCIE_RXN	4	GND
5	PCIE_TXN	6	PCIE_TXP
7	GND	8	PCIE_CLKP
9	PCIE_CLKN	10	GND
11	SAI2_RXC	12	SAI2_RXFS
13	SAI2_MCLK	14	GND
15	GND	16	GND
17	VDD_1V8	18	VDD_3V3
19	VDD-5V		

2.2.3. Slot

DEBIX 4G board provides a Micro SIM card slot for inserting a SIM card to provide network connection and data transmission for the 4G module.
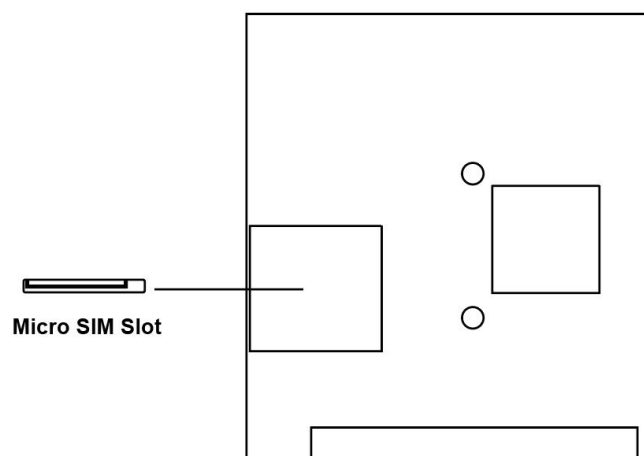
Figure 5 Micro SIM Slot

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2.2.4. LED

DEBIX 4G Board has a 4G operation status indicator as shown below:
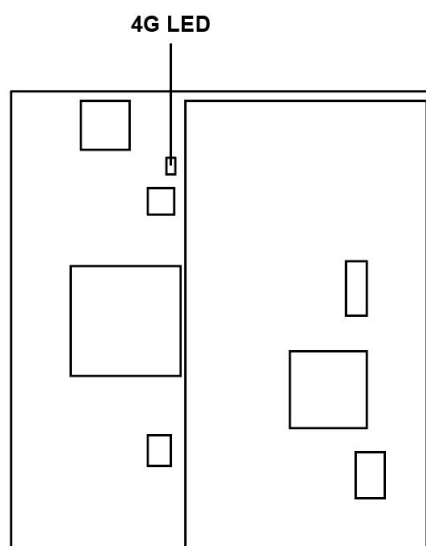
Figure 6 4G LED

Table 6 Description of LED

LED	Status	Description
4G LED	Lighting	4G network connection successful
	off	4G network disconnected

2.3. Packing List

- DEBIX 4G Board

- 4G Module (optional)

- Antenna (optional)

Chapter 3 Getting started

3.1. Hardware connection

● **Component Preparation**

✓ DEBIX 4G board

✓ DEBIX motherboard

✓ 4G Module, 4G antenna

✓ FPC cable (19Pin 0.3mm Pitch)

✓ 2 x lock screw CM2.0X4, lock screw PM1.4X4

✓ Micro SIM card

The connection steps are as follows:

1. Paste the square shape and the round shape Mylar sheet on the front and back of DEBIX motherboard, as shown in the figure below:
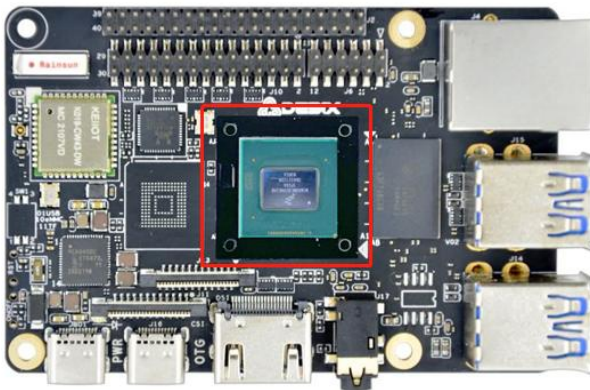
Figure 7 Square shape Mylar sheet   Figure 8 Round shape Mylar sheet
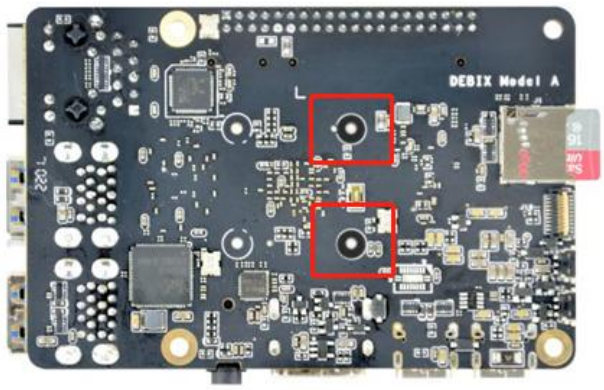
2. Insert the FPC cable into the PCIe interface (J54) of DEBIX 4G board, as shown in the following figure:
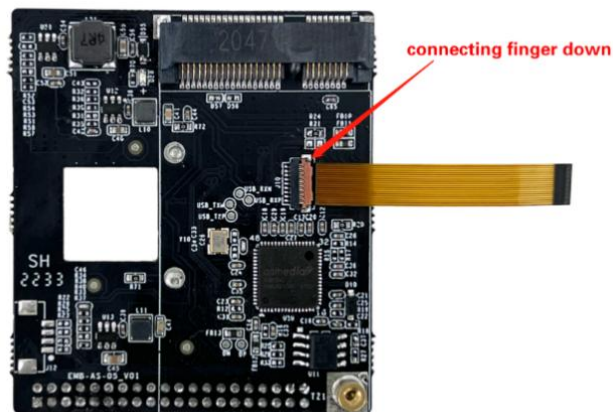
Figure 9 Connect PCIe interface with FPC cable

3. Install the 4G module to DEBIX 4G board and lock screw CM2.0X4 to fix it, as shown in the following figure:
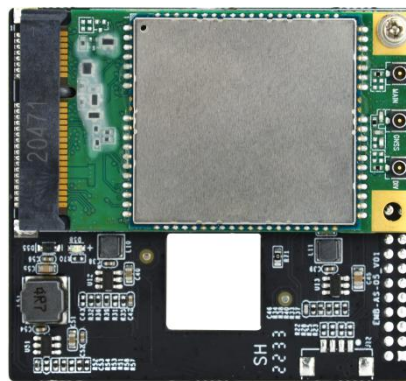
Figure 10 Connect DEBIX 4G board with 4G module

4. Insert the Micro SIM card into the slot of DEBIX 4G board (note the direction of insertion), as shown in the following figure:
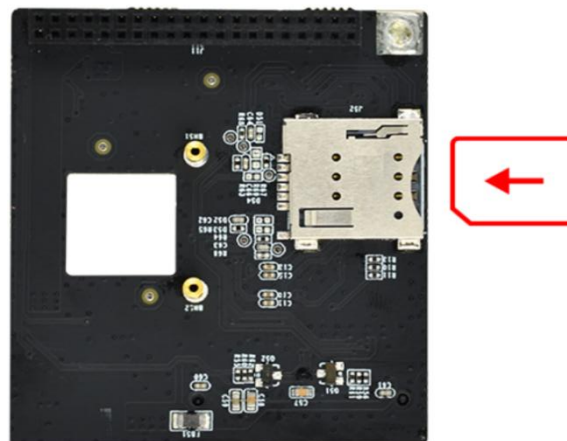
Figure 11 Insert SIM card

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5. Align the female header of DEBIX 4G board with the top pin header of DEBIX motherboard, and press to insert, fix them with locking screws (PM1.4X4), and insert the FPC cable into the PCIe interface (J18) of DEBIX motherboard, as shown in the following figure:

NOTE

It is necessary to confirm that the female header of DEBIX 4G board are aligned one by one with the top pin header on the DEBIX motherboard to avoid damage to the board caused by power on after misalignment.
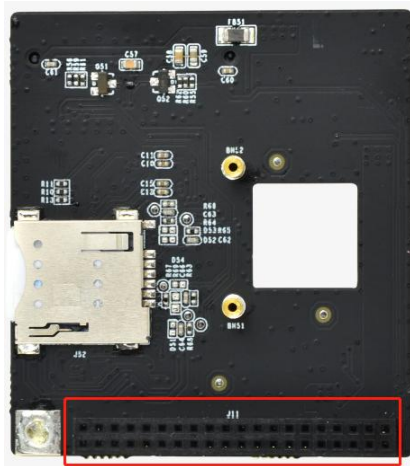
Figure 12 Female header of DEBIX 4G board
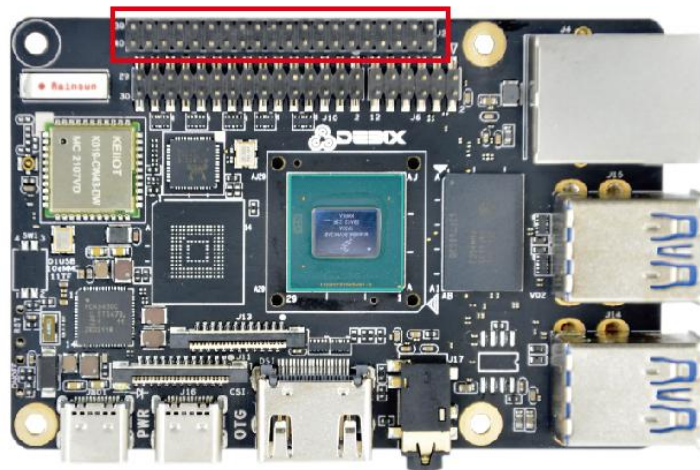
Figure 13 Pin header of DEBIX motherboard
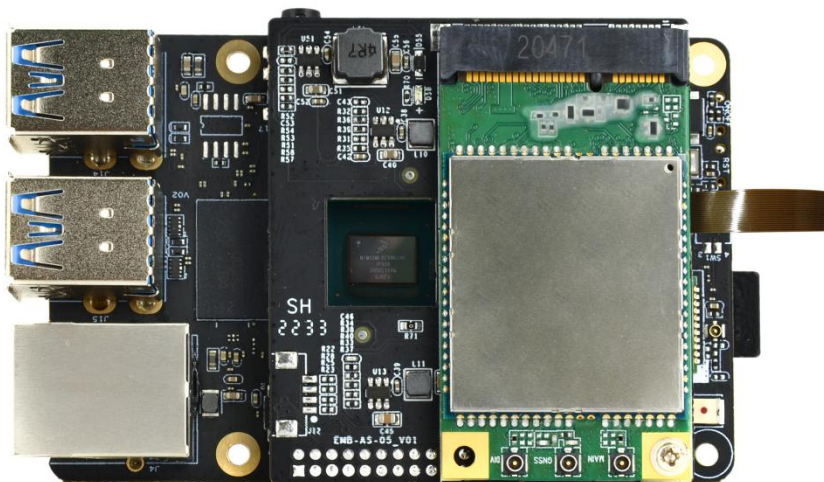
Figure 14 Connect DEBIX with DEBIX 4g board

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6. Connect the 4G antenna to 4G module;

7. Insert the Micro SD card with DEBIX system into the slot of DEBIX motherboard, connect DEBIX peripherals (HDMI monitor, keyboard, mouse, network cable), power up DEBIX, and the DEBIX can be used normally.

Chapter 4 Function Examples

4.1. Usage of 4G network

1. Start DEBIX, click to open the "Add-on Board" application;
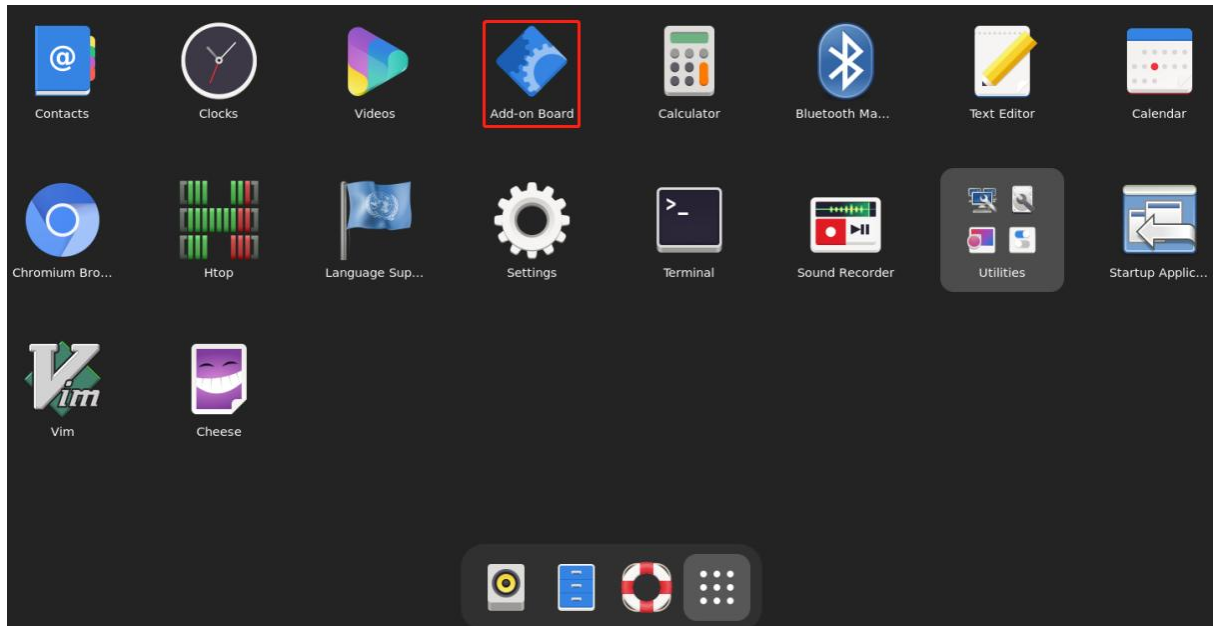
Figure 15 Add-on Board

2. The "DEBIX add-on board dtb file selection" dialog box pops up, select **Debix + 4g board**, and click **OK**.
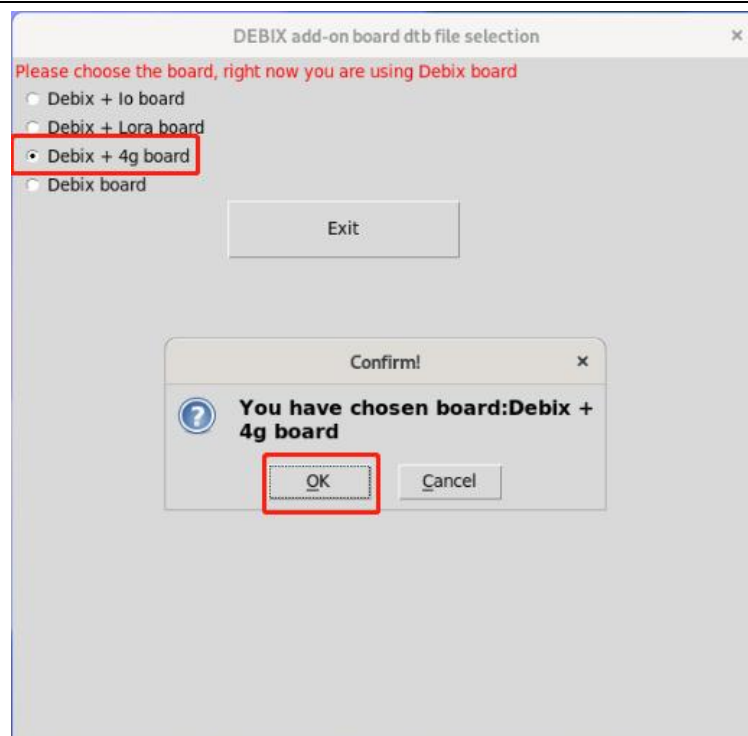
Figure 16

3. Select **None** for Panel and click **OK**.

Figure 17

4. Click **Start**, and click **OK**.

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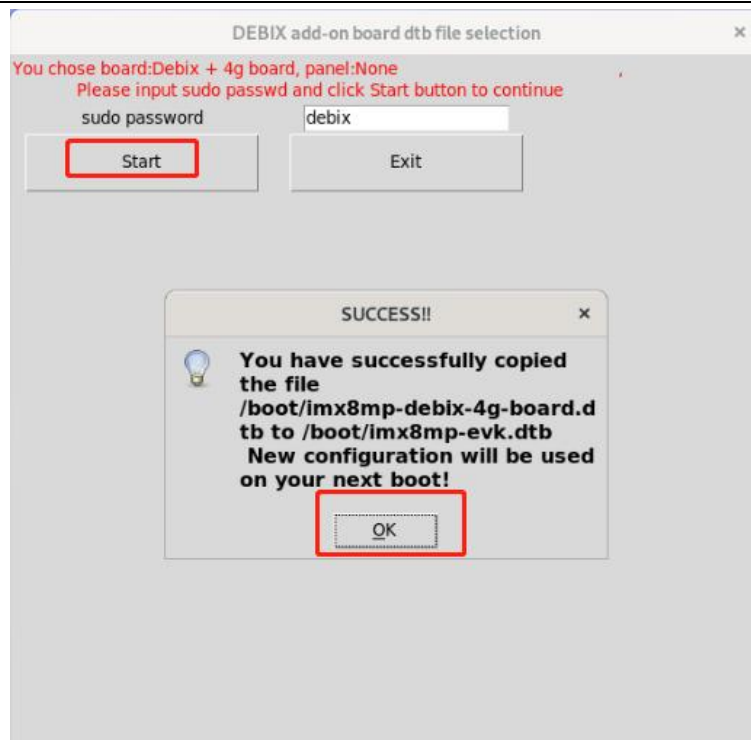
Figure 18

5. Reboot the device to take effect the above settings.

6. **Dial-up:** Click to open "Setting" application, select **Network**, enable "Mobile Broadband", set Network to **Add new connection**, and the "Set up a Mobile Broadband Connection" dialog box pops up, click **Next**.

Figure 19

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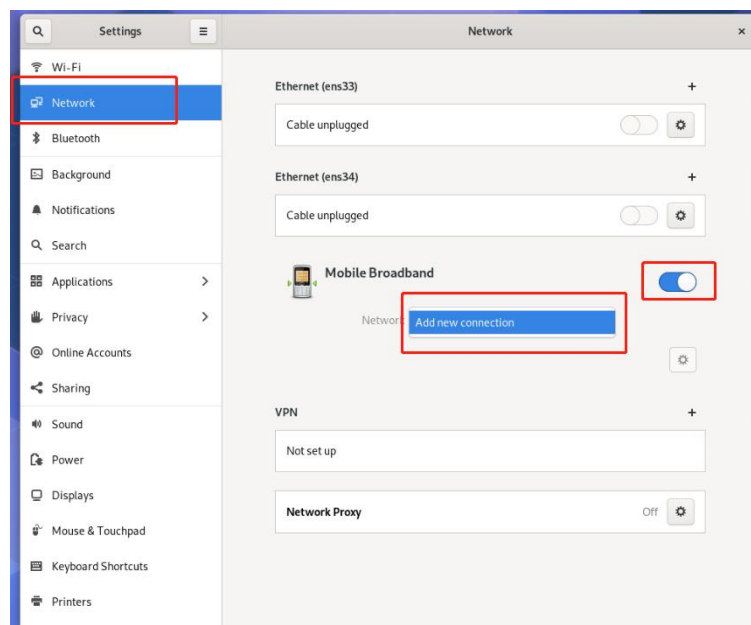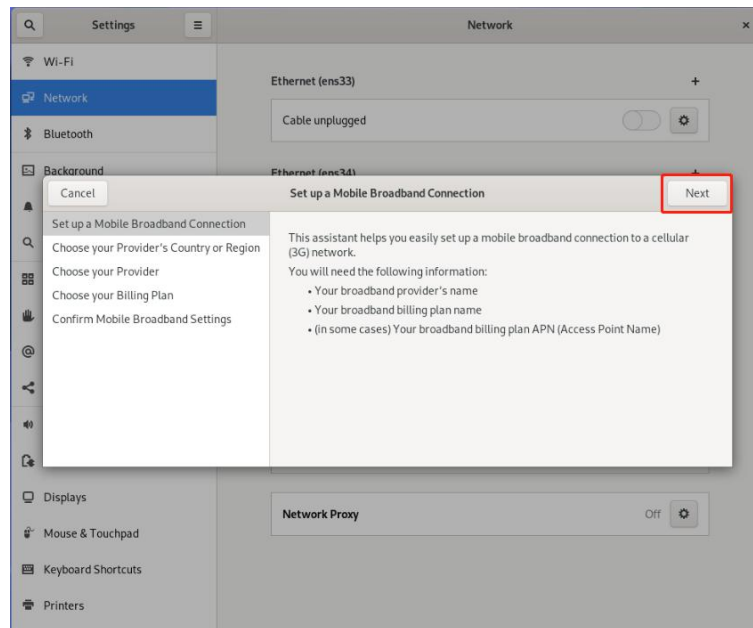
Figure 20

7. In the "Choose your Provider's Country or Region" dialog box, select the country as needed, here "China" was chosen, click **Next**.
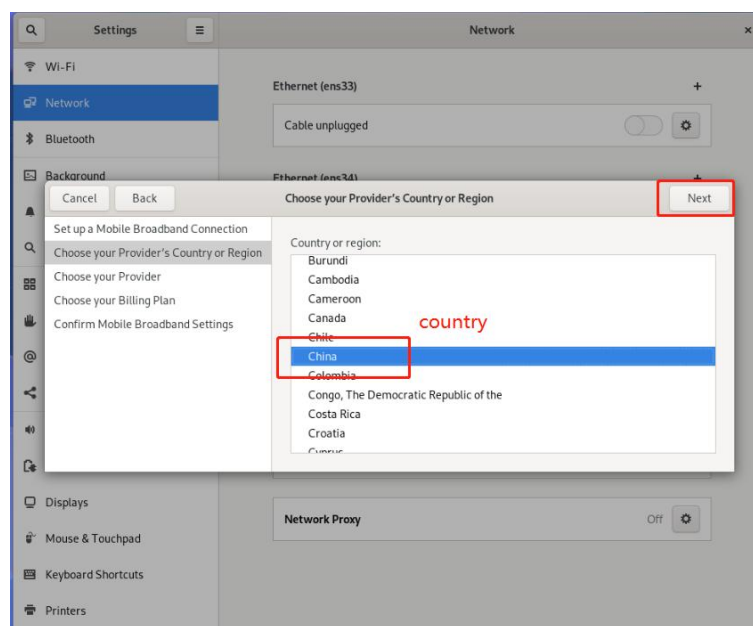
Figure 21

8. In the "Choose your Provider" dialog box, select "China Mobile", click **Next**.
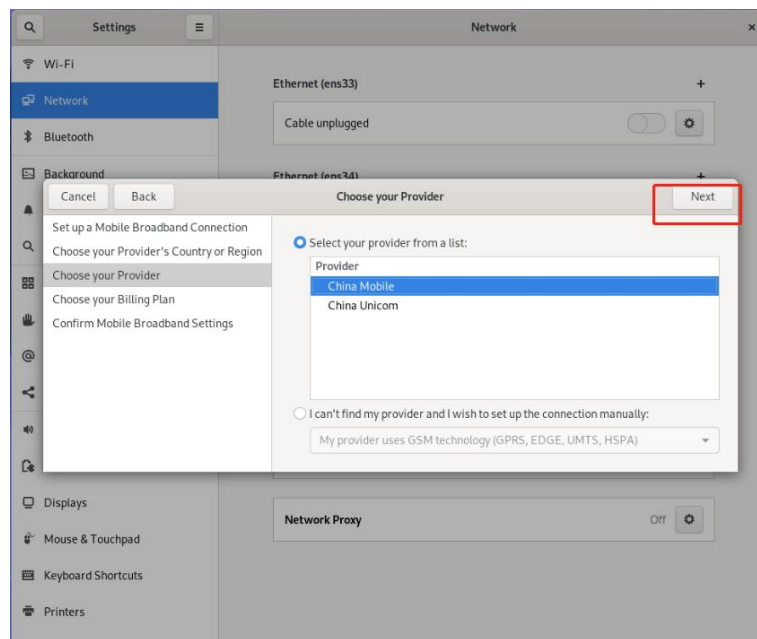
Figure 22

9. In the "Choose your Billing Plan" dialog box, click **Next**.
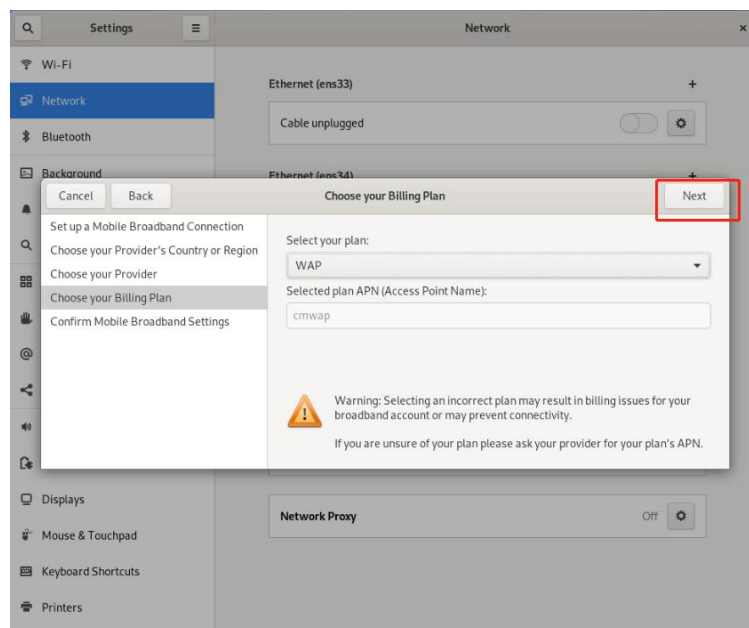
Figure 23

10. In the "Confirm Mobile Broadband Settings" dialog box, make sure the settings are correct, and then click **Apply**.
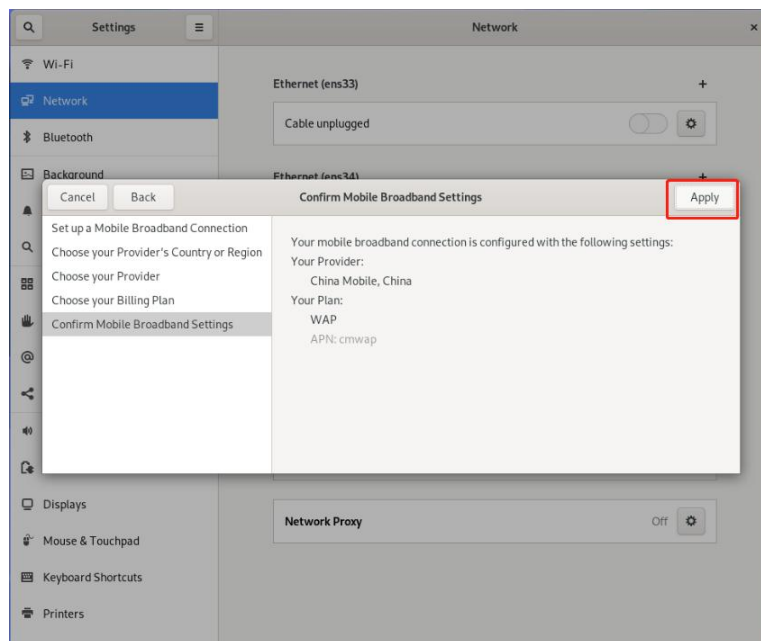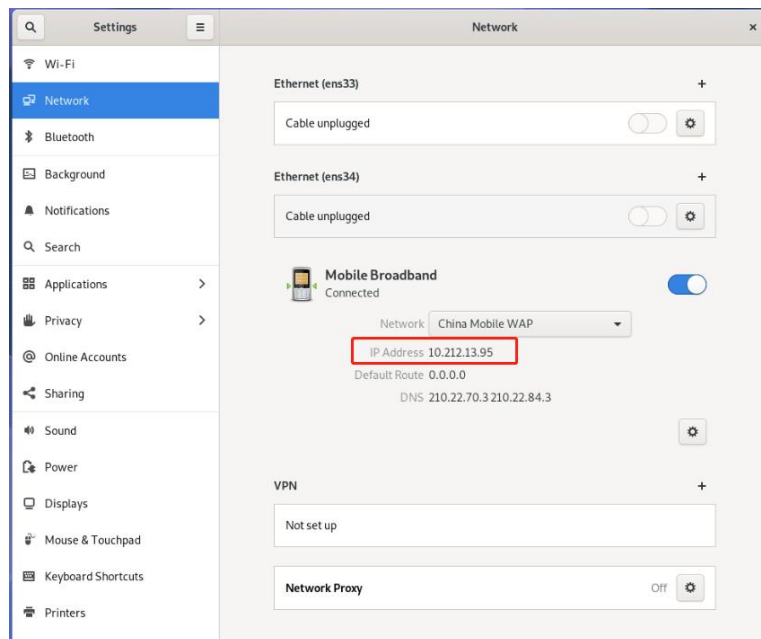
Figure 24

11. Get the dial-up IP address;

Figure 25

12. **4G network test:** Open a Terminal, type `ping -I ppp0 baidu.com` to verify whether the network connection is normal.

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Figure 26

4.2. Common Troubleshooting

● **PCI device query:**

1. Install and query PCI devices with the following commands:

```
sudo apt update

sudo apt install pciutils

lspci
```

2. The output is as follows:

● **4G module verification:**

The 4G module is identified as /dev/ttyUSB2 in DEBIX system:

1. Use the serial port debugging tool and type the following command to verify:

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```
microcom /dev/ttyUSB2

AT+CPIN?

AT+CIMI

AT+CGSN

AT+CSQ
```

2. The output is as follows:

NOTE

AT+CPIN?   #SIM card detection; return "+CPIN:<code>", if <code> is READY, no password is required

AT+CIMI   #Query SIM card CIMI; return International Mobile Subscriber Identity (IMSI) code

AT+CGSN   #Query module IMEI; return international mobile equipment identity code

AT+CSQ   #Query signal strength; the first return value is signal strength, the higher the value within 9~31, the stronger the signal, the second value is channel BER, 99 indicates the position; if it returns 99, 99 indicates that SIM is unavailable and you need to check the antenna.

```
# microcom /dev/ttyUSB2

+CPIN: READY

OK

460065021200496

OK

864394040047898

OK

+CSQ: 23,99

OK
```