

DEBIX User Guide

Version: V3.1 (2023-11)

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

In recent years, with the ever-increasing product demand in fields of application such as smart home, smart security, video surveillance and industrial automation, AI chips capable of resolving problems in these fields have also emerged.

Polyhex Technology has responded to this demand with the launch of DEBIX, a development board based on NXP NPU processor i.MX 8M Plus. It focuses on machine learning, vision processing, and industrial IoTs, meeting the application needs of commercial and industrial fields such as education, security monitoring, industrial automation, smart homes and smart cities.

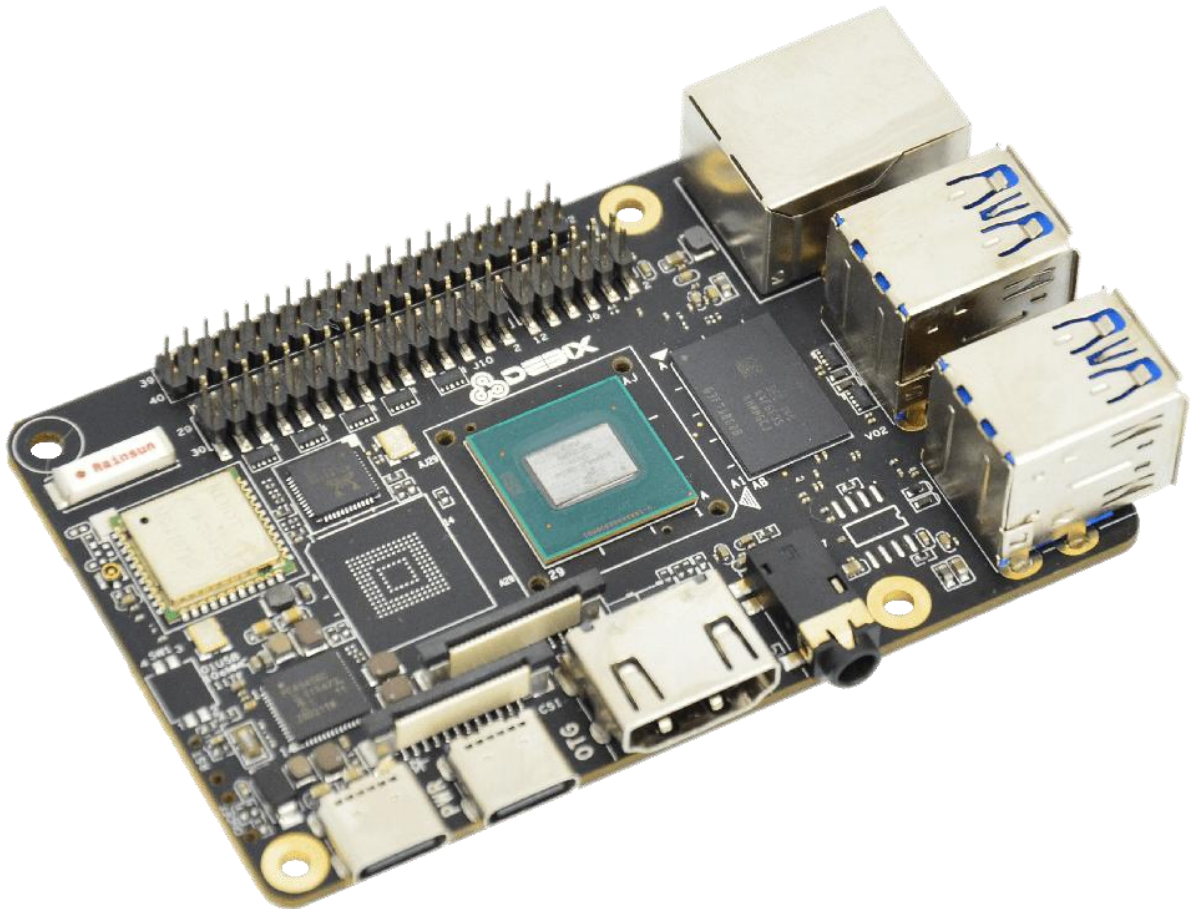


Figure 1 DEBIX

REVISION HISTORY

Rev.	Date	Description
1.0	2022.02.19	First edition
2.0	2023.01.17	Added LVDS/MIPI/HDMI display resolution parameters and GPU introduction.
2.1	2023.02.20	Added boot from eMMC content.
2.2	2023.03.29	Added GPIO usage, 5v Pin supplement.
2.3	2023.05.29	Added the note that DEBIX Model B does not support Windows 10 IoT Enterprise.
3.0	2023.06.19	Overall optimization of documentation, separate user manual for add-on boards.
3.1	2023.11.06	Added heat dissipation methods, and Multi-screen unique display.

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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
<p><i>Warning!</i></p> 	<p>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.</p>
<p><i>Caution!</i></p> 	<p>Always ground yourself to remove any static electric charge before touching <i>DEBIX</i> 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.</p>

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 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
	This equipment has passed CE certified.
	This equipment is manufactured in compliance with RoHS regulations.

	This equipment has passed UKCA certified.
	This equipment has passed FCC certified.
	This equipment has passed KC certified.
	This equipment is manufactured in compliance with MIC/TELEC regulations.
	This equipment has passed C-Tick certified.
	This equipment is manufactured in compliance with RCM regulations.

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 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 DEBIX Introduction

DEBIX is essentially a versatile single board computer, which can be widely used in artificial intelligence, machine learning, industry 4.0, edge computation, gateway, IoT, security monitoring etc..

DEBIX has a clear edge in the area of facial and object recognition applications which combine machine learning and visual processing. Take facial recognition as an example: DEBIX can simultaneously detect and identify the body frames and facial features of multiple people. It can also be used in traffic control to identify vehicle types and information of drivers. Using NPU to perform recognition operations not only increases the recognition speed, but also sees a noticeable reduction to the burden on the CPU.

DEBIX's TSN technology makes it essential for Industrial 4.0 applications, as it meets the needs of industrial enterprises with precision oriented production time control, thus increasing the interconnection speed of the IoT.

Main features:

- Powerful Quad Core Arm ® Cortex ® -A53 CPU with a Neural Processing Unit (NPU) operating at up to 2.3 TOPS.
- The multimedia capabilities include video encode (including h.265) and decode, 3D/2D graphic acceleration, and multiple audio and voice functionalities.
- Real-time control with Cortex-M7. Robust control networks supported by dual CAN FD and dual Gigabit Ethernet with Time Sensitive Networking (TSN).
- High industrial reliability with DRAM inline ECC.
- Designed for severe environmental conditions and industrial grade temperature requirements. The wide CPU temperature range of -40°C to 105°C makes it suitable for extreme operation environments like public transportation and industrial control etc.

- The 2D dimensions of the board is nearly the same with a credit card, while containing multiple extended ports. This allows DEBIX to give full processor performance while being free from application restrictions in physical space aspect.
- Support mainstream operating systems including Android, Ubuntu, Yocto and Windows 10 IoT Enterprise.

2.1. Overview

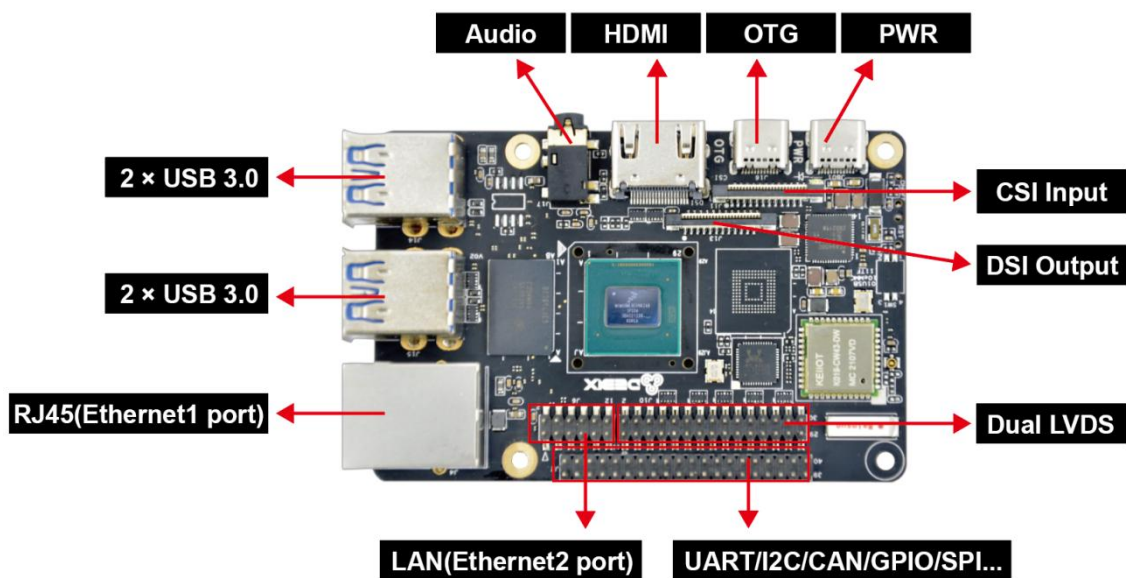


Figure 2 DEBIX Front interface

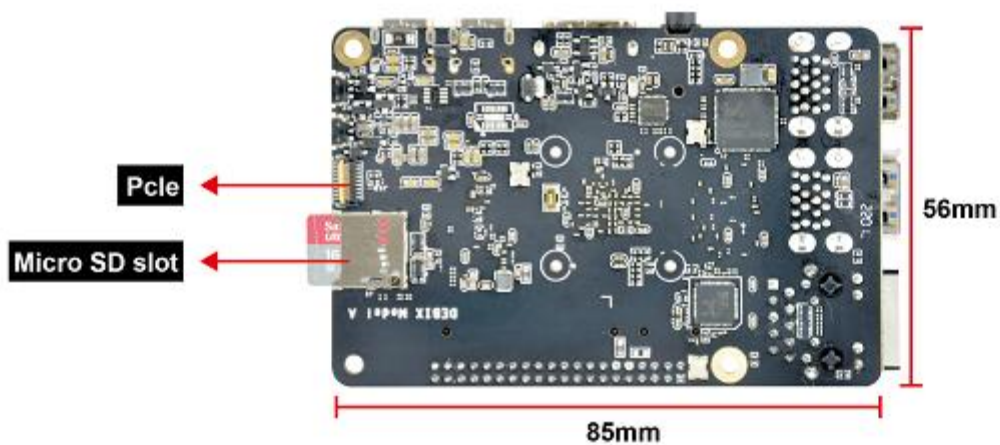


Figure 3 DEBIX Back interface

DEBIX uses NXP i.MX 8M Plus based Soc, supports Gigabit Ethernet, dual-band wireless

network and Bluetooth 5.0, etc. The data specifications are as below:

Table 3 DEBIX Specification

System	
CPU	i.MX 8M Plus, 4 x Cortex-A53 up to 1.8GHz, comes with an integrated neural processing unit (NPU) that delivers up to 2.3 TOPS, and with C520L 3D GPU and GC7000UltraLite 3D GPU
Memory	2GB LPDDR4 (4GB/8GB optional)
Storage	<ul style="list-style-type: none"> ● Micro SD Card (8GB/16GB/32GB/64GB/128GB/256GB optional) ● Onboard eMMC (8GB/16GB/32GB/64GB/128GB/256GB optional)
OS	<p>Android 11, Ubuntu 20.04, Yocto-L5.10.72_2.2.0, Windows 10 IoT Enterprise</p> <p>NOTE</p> <div style="border: 2px solid red; padding: 5px;"> <ul style="list-style-type: none"> ● DEBIX Model A with 4GB LPDDR4 (recommended 8GB LPDDR4) supports Windows 10 IoT Enterprise ● DEBIX Model B with 4GB LPDDR4 supports Windows 10 IoT Enterprise </div>
Boot Mode	<ul style="list-style-type: none"> ● DEBIX Model A: <ul style="list-style-type: none"> ■ Boot from Micro SD Card ● DEBIX Model B: <ul style="list-style-type: none"> ■ Boot from Micro SD Card ■ Boot from eMMC (default)
Communication	
Gigabit Network	<ul style="list-style-type: none"> ● 2 x 10/100/1000M Ethernet interfaces <ul style="list-style-type: none"> ■ 1 x RJ45, support POE power supply (need POE power supply module) ■ 1 x 12pin header (without network transformer)

Wi-Fi & BT	2.4GHz & 5GHz dual-band WIFI, BT 5.0, external Wi-Fi&BT SMA antenna connector
Video & Audio	
HDMI	1 x HDMI output, the connector is Type A HDMI female
LVDS	1 x LVDS output, single & dual channel 8 bit, double-row pin headers
MIPI CSI	1 x MIPI CSI, support 4-lane, 24Pin 0.5mm Pitch FPC socket
MIPI DSI	1 x MIPI DSI, support 4-lane, 24Pin 0.5mm Pitch FPC socket
Audio	1 x 3.5mm headphone and microphone combo port
External I/O Interface	
USB	<ul style="list-style-type: none"> ● 4 x USB 3.0 Host, the connector is double layer Type-A interface ● 1 x USB 2.0 PWR, the connector is Type-C interface for DC 5V power input ● 1 x USB 2.0 OTG, the connector is Type-C interface
PCIe	1 x PCIe, 19Pin 0.3mm Pitch FPC socket
40-Pin Double-Row Headers	<ul style="list-style-type: none"> ● Default: 3 x UART, 2 x SPI, 2 x I2C, 2 x CAN, 6 x GPIO, refer to DEBIX website "DEBIX Model A Reduced GPIO Function List", which can be configured to I2S, PWM, SPDIF, GPIO, etc. via software ● 5V power supply, system reset, ON/OFF
Slot	1 x Micro SD slot
Power Supply	
Power Input	Default DC 5V/3A power input, the connector is Type-C interface
Mechanical & Environmental	
Size (L x W)	85.0mm x 56.0mm
Weight	72g
Operating Temp.	<ul style="list-style-type: none"> ● Industrial grade: -20°C~70°C ● Industrial grade: -40°C~85°C

2.2. Composition

Like any standard computer, DEBIX consists of a range of different computer components. The most important component is the "brain" of the computer, the system-on-chip (SoC) in the center of the motherboard.

The SoC contains most of the components of the computer, often containing both the central processing unit (CPU) and the graphics processing unit (GPU). DEBIX's Random Memory (RAM), eMMC, WiFi Bluetooth module that contains the wireless communication components, and the PMIC (PCA9450c) that manages the power devices of the host machine, as shown in the following figure:

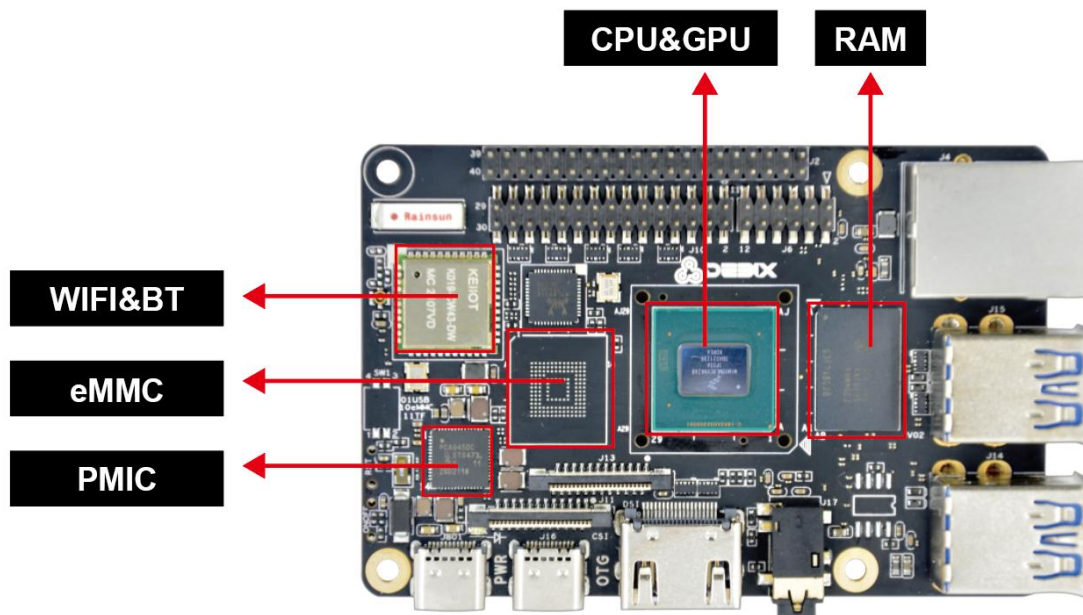


Figure 4 DEBIX Board

2.3. Interface

2.3.1. Power Interface

DEBIX provides a USB Type-C power interface (J801) with default DC 5V voltage.

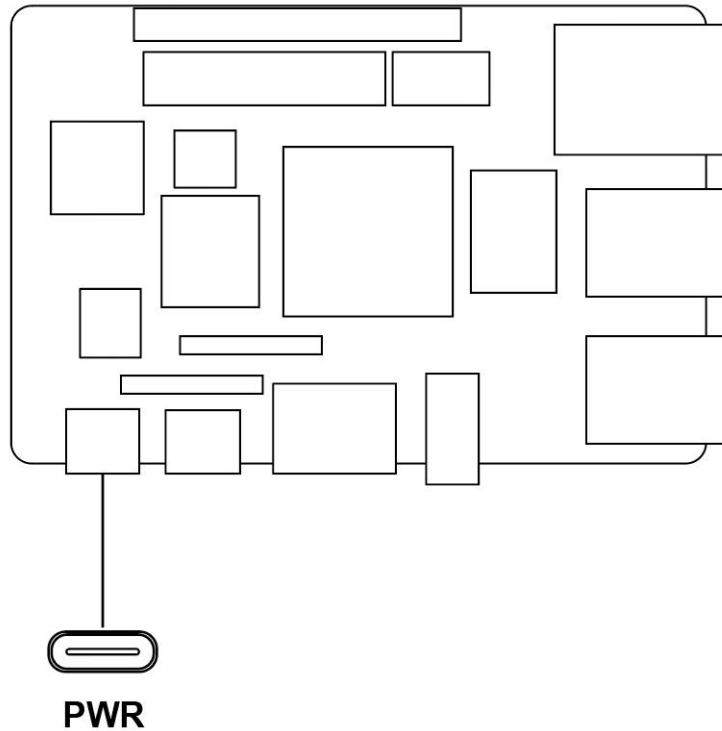


Figure 5 Power interface

2.3.2. USB Interface

DEBIX has two USB controllers and PHY, supports USB 2.0 and USB 3.0.

- 4 x USB 3.0 Host with double layer Type-A interface (J14, J15)
- 2 x USB 2.0 with Type-C interface, one is to DC 5V power input, and one is a OTG interface (J16) which can be used for programming, system updating, or USB drive & hard disk connecting etc.

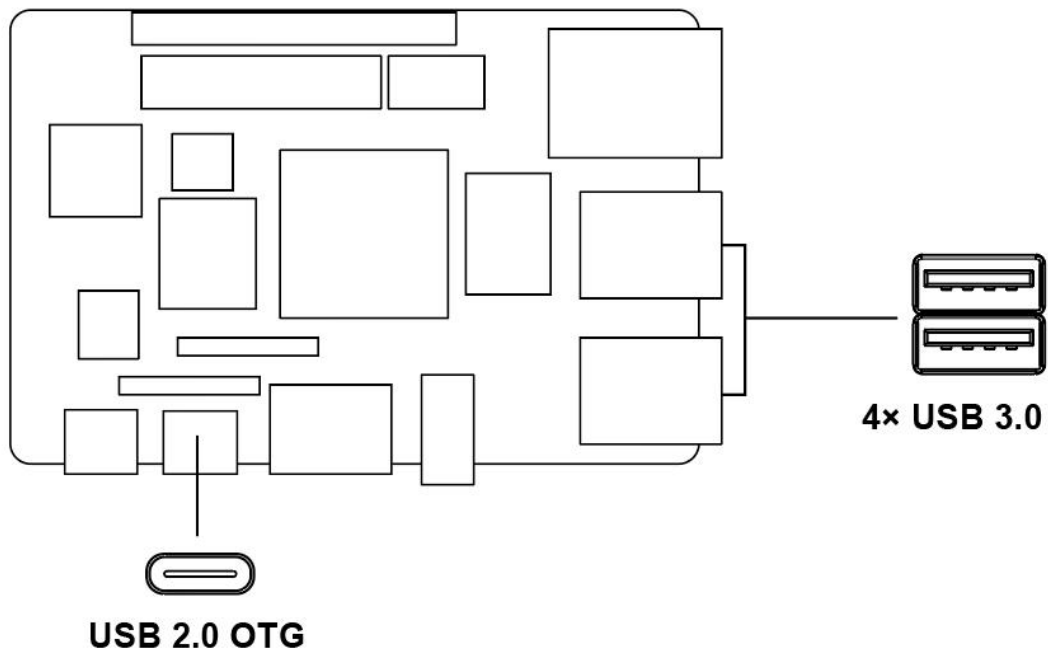


Figure 6 OTG and USB3.0 interface

2.3.3. Ethernet Interface

DEBIX provides two Ethernet interfaces, one is a independent MAC RJ45 network port and one is a 12pin row pin network port.

- One independent MAC RJ45 Ethernet port (J4) , and a set of status indicators below the interface to display the status signal, one is Link, network connection indicator and the other is Active, signal transmission indicator.
- One 2 x 6Pin LAN pins (J6) for connecting to the local network.

Table 4 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

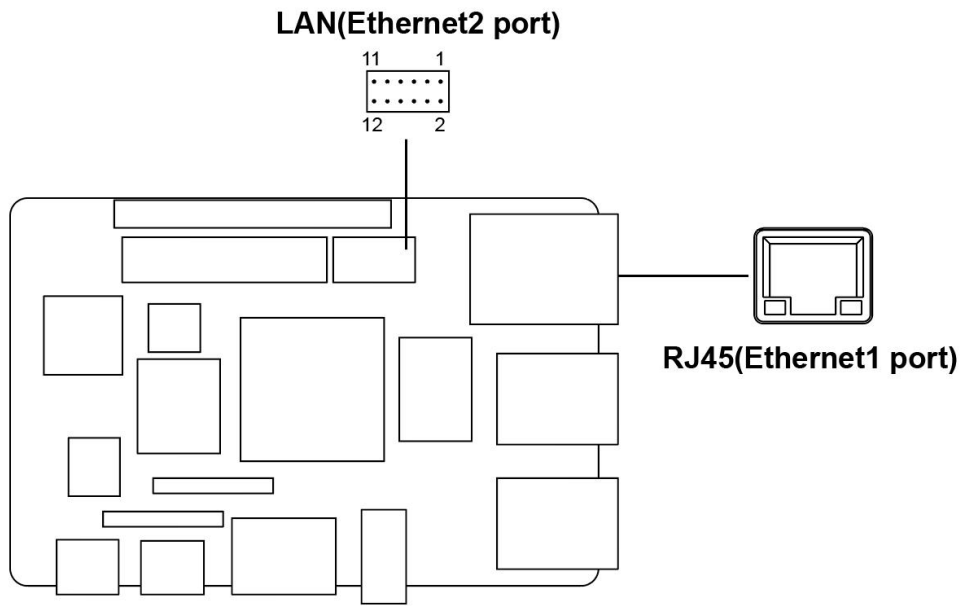


Figure 7 Ethernet interface

The J6 pin sequence is as shown in the figure:

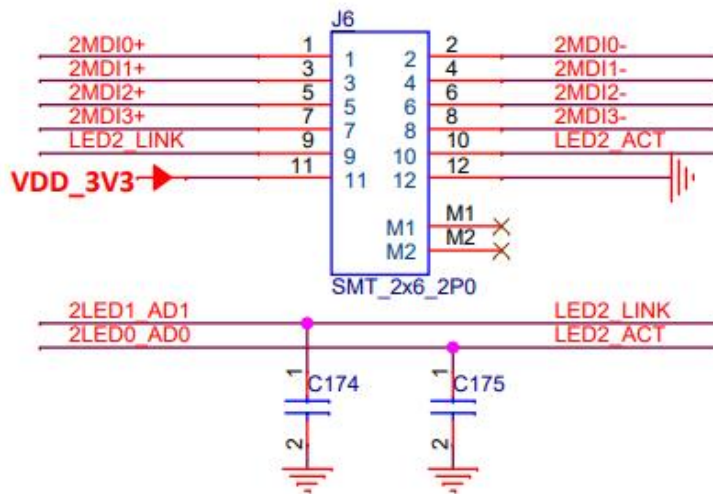


Figure 8 Pin sequence of J6

The J6 interface is defined as follows:

Table 5 Pin definition of J6

Pin	Definition	Description
1	2MDI0+	MDI Differential Signal Channel 0 (+)
2	2MDI0-	MDI Differential Signal channel 0 (-)
3	2MDI1+	MDI Differential Signal Channel 1 (+)

4	2MDI1-	MDI Differential Signal channel 1 (-)
5	2MDI2+	MDI Differential Signal Channel 2 (+)
6	2MDI2-	MDI Differential Signal channel 2 (-)
7	2MDI3+	MDI Differential Signal Channel 3 (+)
8	2MDI3-	MDI Differential Signal channel 3 (-)
9	LED2_LINK	Network connection status signal for LED2
10	LED2_ACT	Data transmission status signal for LED2
11	VDD_3V3	3.3V input
12	GND	To Ground

2.3.4. Display Interface

DEBIX supports three LCDIF Display Controllers:

- One LCDIF driver for MIPI DSI, Up to UWHD and WUXGA
- One LCDIF driver for LVDS Tx, Up to 1920x1080p60
- One LCDIF driver HDMI Tx, 4kp30

When no more than 2 LCD interfaces are used at the same time, each LCD interface supports up to 1920x1200p60 display. When all 3 LCD interfaces are used at the same time, it supports 2 x 1080p60 + HDMI 4kp30.

NOTE

When DEBIX is configured with multiple displays, drag mouse to operate on other displays.

2.3.4.1. HDMI Interface

DEBIX has an HDMI interface (J9), and the connector is an Type-A HDMI female socket, which is used to connect a monitor, TV or projector. HDMI resolution up to 1366x768.

Audio supports 32 channel audio output and supports 1 S/PDIF audio eARC input.

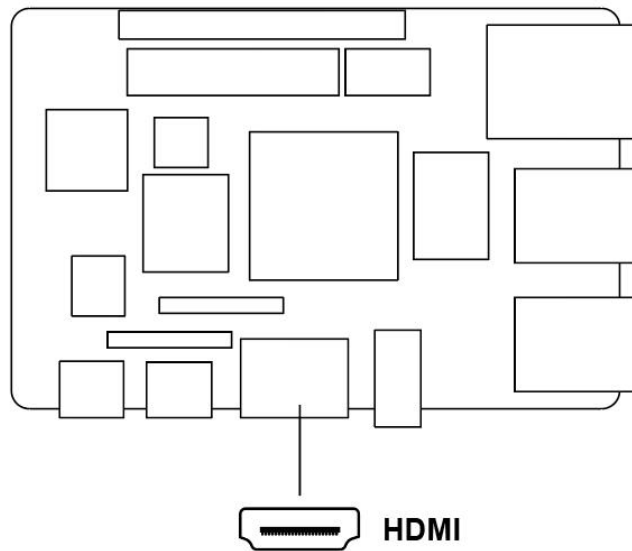


Figure 9 HDMI interface

The pin sequence is as shown in the figure:

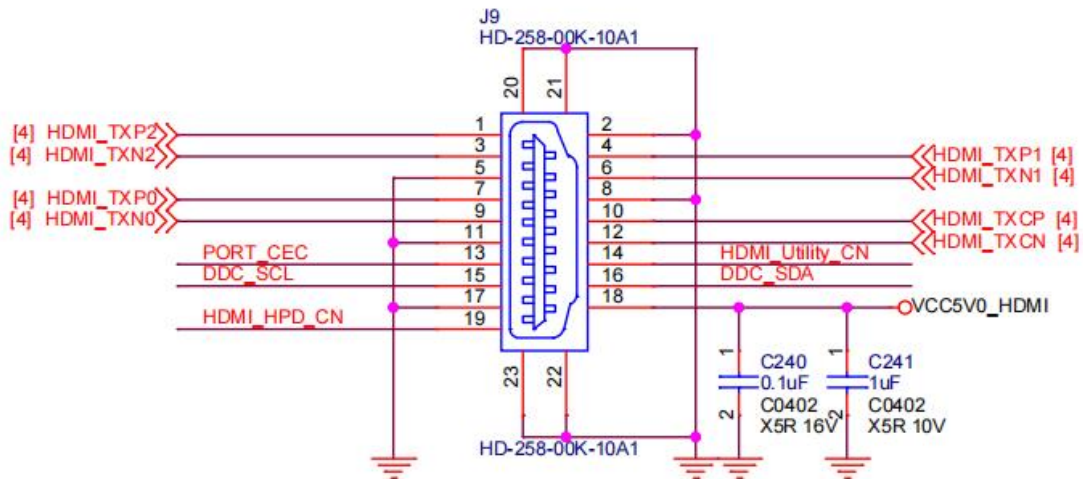


Figure 10 Pin sequence of HDMI

The HDMI interface is defined as follows:

Table 6 Pin definition of HDMI

Pin	Definition	Pin	Definition
1	HDMI-TXP2	2	GND
3	HDMI-TXN2	4	HDMI-TXP1
5	GND	6	HDMI-TXN1
7	HDMI-TXP0	8	GND

9	HDMI-TXN0	10	HDMI-TXCP
11	GND	12	HDMI-TXCN
13	PORT_CEC	14	HDMI_Utility_CN
15	DDC_SCL	16	DDC_SDA
17	GND	18	VDD5V
19	HDMI_HPD_CN	20	GND
21	GND	22	GND
23	GND		

2.3.4.2. LVDS Interface

The LVDS display bridge (LDB) connects the LCDIF inside the CPU with the external LVDS display device. The purpose of the LVDS display bridge (LDB) is to transmit synchronous RGB data to an external display device through the LVDS interface.

DEBIX provides one 2 x 15Pin LVDS display output interface (J10) driven by LDB to support single or dual LVDS display.

- Single channel (4 lanes) 80MHz pixel clock and LVDS clock output. It supports resolutions up to 1366x768p60.
- Asynchronous dual channel (8 data, 2 clocks). This is for a screen with two interfaces, which are transmitted through two channels (odd pixel/even pixel). It supports pixels higher than 1366x768p60 and up to 1080p60.

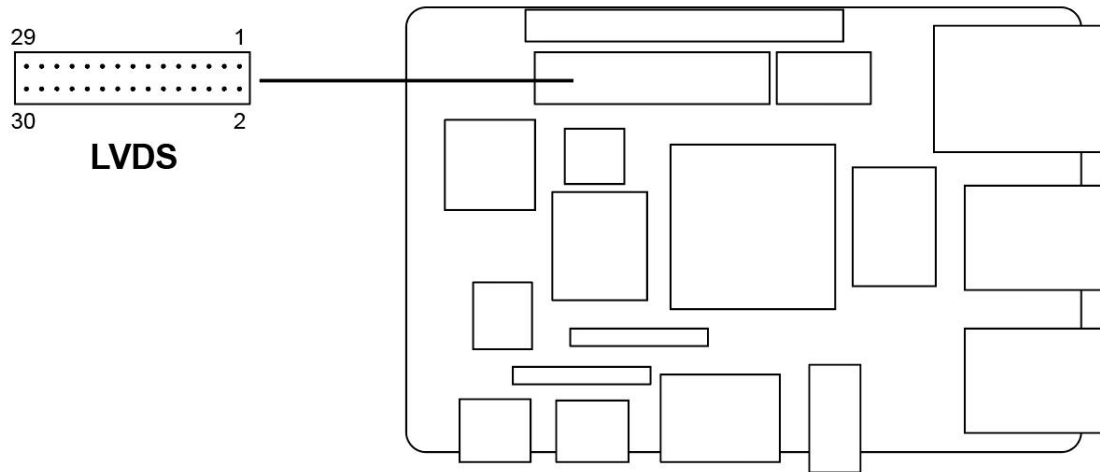


Figure 11 LVDS interface

The pin sequence is shown in the figure:

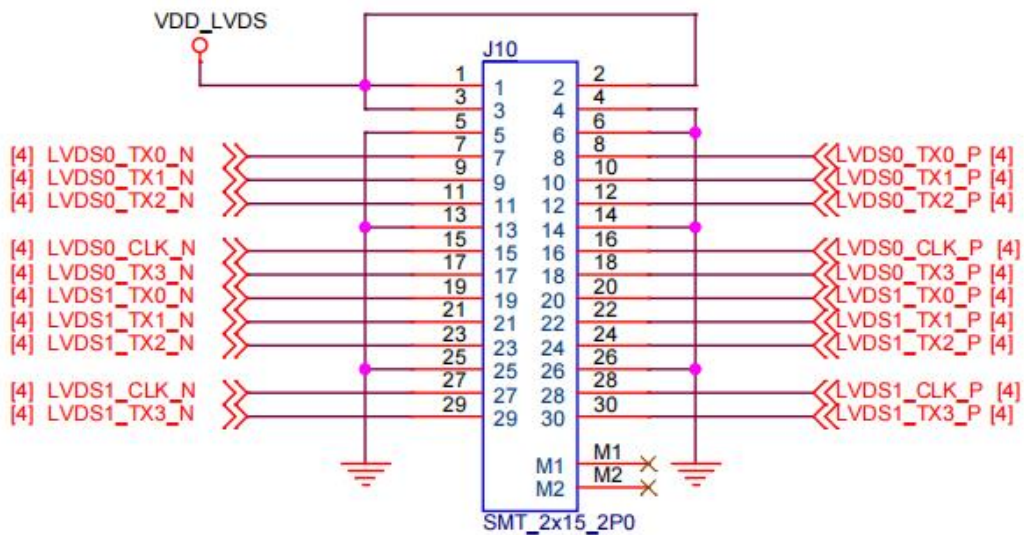


Figure 12 Pin sequence of LVDS

The LVDS interface is defined as follows:

Table 7 Pin definition of LVDS

Pin	Definition	Description
1	VDD_LVDS	Default 5V (3.3V,5V,12-36V optional)
2	VDD_LVDS	Default 5V (3.3V,5V,12-36V optional)
3	VDD_LVDS	Default 5V (3.3V,5V,12-36V optional)
4	GND	To Ground
5	GND	To Ground

6	GND	To Ground
7	LVDS0_TX0_N	LVDS0 Differential data channel 0 (-)
8	LVDS0_TX0_P	LVDS0 Differential data channel 0 (+)
9	LVDS0_TX1_N	LVDS0 Differential data channel 1 (-)
10	LVDS0_TX1_P	LVDS0 Differential data channel 1 (+)
11	LVDS0_TX2_N	LVDS0 Differential data channel 2 (-)
12	LVDS0_TX2_P	LVDS0 Differential data channel 2 (+)
13	GND	To Ground
14	GND	To Ground
15	LVDS0_CLK_N	LVDS0 Clock differential signal path (-)
16	LVDS0_CLK_P	LVDS0 Clock differential signal path (+)
17	LVDS0_TX3_N	LVDS0 Differential data channel 3 (-)
18	LVDS0_TX3_P	LVDS0 Differential data channel 3 (+)
19	LVDS1_TX0_N	LVDS1 Differential data channel 0 (-)
20	LVDS1_TX0_P	LVDS1 Differential data channel 0 (+)
21	LVDS1_TX1_N	LVDS1 Differential data channel 1 (-)
22	LVDS1_TX1_P	LVDS1 Differential data channel 1 (+)
23	LVDS1_TX2_N	LVDS1 Differential data channel 2 (-)
24	LVDS1_TX2_P	LVDS1 Differential data channel 2 (+)
25	GND	To Ground
26	GND	To Ground
27	LVDS1_CLK_N	LVDS1 Clock differential signal path (-)
28	LVDS1_CLK_P	LVDS1 Clock differential signal path (+)
29	LVDS1_TX3_N	LVDS1 Differential data channel 3 (-)
30	LVDS1_TX3_P	LVDS1 Differential data channel 3 (+)

2.3.4.3. MIPI DSI Interface

DEBIX provides one MIPI DSI interface (J13) with a 2*12Pin/0.5mm FPC socket connector, which can be used to connect a MIPI display touch screen.

Key features of MIPI DSI include:

- MIPI DSI compliant with MIPI-DSI standard V1.2, compatible with standard specification V1.01r11
- The commonly used MIPI DSI resolutions are supported as follows:
 - 1080 p60, WUXGA (1920x1200) at 60 Hz, 1920x1440 at 60 Hz, UWHD (2560x1080) at 60 Hz
 - Maximum resolution up to WQHD(2560x1440), it depends on bandwidth between input clock (video clock) and output clock (D-PHY HS clock)
 - Support 1, 2, 3 or 4 data lanes
 - Support pixel format: 16bpp, 18bpp packed, 18bpp loosely packed (3 bytes format), 24bpp.
- Interface
 - Compliant with Protocol-to-PHY Interface (PPI) at 1.0Gbps/1.5Gbps MIPI DPHY
 - Support RGB interface for video image input from general display controller.

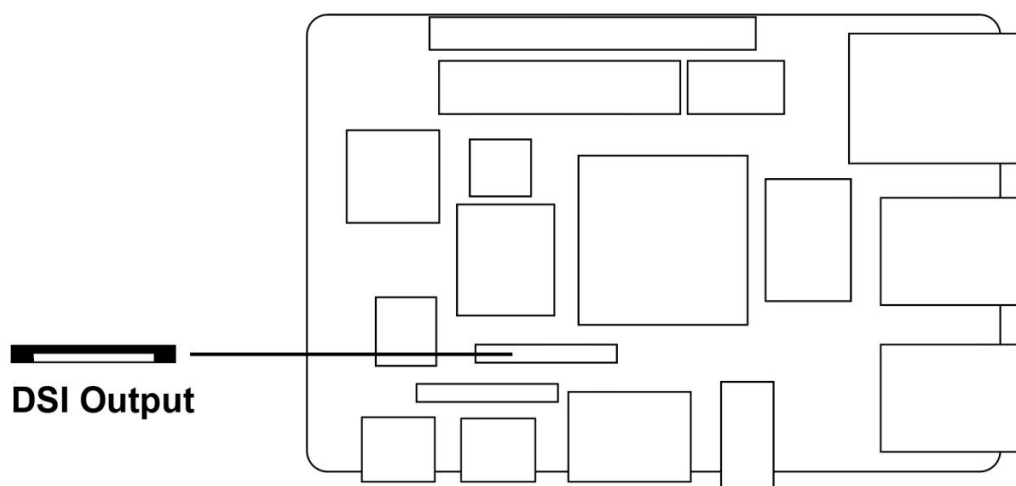


Figure 13 MIPI DSI

The pin sequence is shown in the figure:

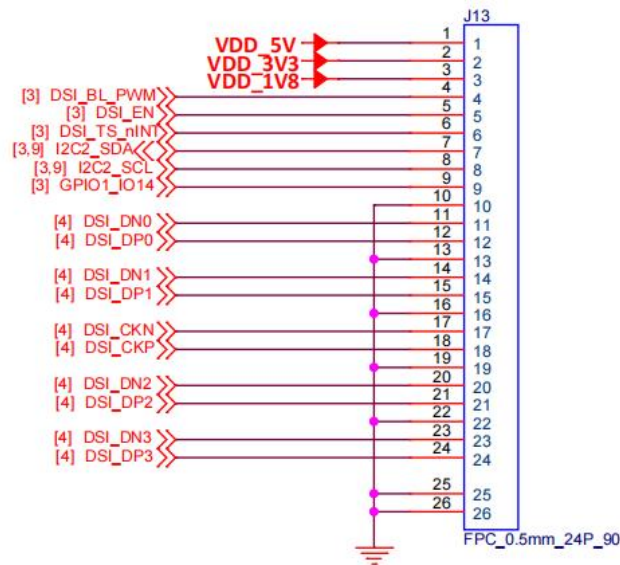


Figure 14 Pin sequence of MIPI DSI

The MIPI DSI interface is defined as follows:

Table 8 Pin definition of MIPI DSI

Pin	Definition	Description
1	VDD_5V	5V output
2	VDD_3V3	3.3V output
3	VDD_1V8	1.8V output
4	DSI_BL_PWM	Backlight control signal
5	DSI_EN	LCD enable signal
6	DSI_TP_nINT	touch interrupt pin
7	DSI_I2C_SDA	Touch the clock terminal of I2C (controlled by I2C2)
8	DSI_I2C_SCL	Touch the clock terminal of I2C (controlled by I2C2)
9	GPIO1_IO14	IO control pin
10	GND	To Ground
11	DSI_DN0	DSI Differential data channel 0 (-)
12	DSI_DP0	DSI Differential data channel 0 (+)
13	GND	To Ground
14	DSI_DN1	DSI Differential data channel 1 (-)

15	DSI_DP1	DSI Differential data channel 1 (+)
16	GND	To Ground
17	DSI_CKN	DSI Differential Clock Channels (-)
18	DSI_CKP	DSI Differential Clock Channels (+)
19	GND	To Ground
20	DSI_DN2	DSI Differential data channel 2 (-)
21	DSI_DP2	DSI Differential data channel 2 (+)
22	GND	To Ground
23	DSI_DN3	DSI Differential data channel 3 (-)
24	DSI_DP3	DSI Differential data channel 3 (+)
25	GND	To Ground
26	GND	To Ground

2.3.5. MIPI CSI Interface

DEBIX has a MIPI CSI-2 Host controller. This controller implements the protocol functions defined in the MIPI CSI-2 specification, allowing camera sensor communication consistent with MIPI CSI-2. The MIPI CSI-2 controller has the following features:

- Supports major and minor image formats
 - YUV420, YUV420(Legacy), YUV420(CSPS), 8-bits and 10-bits YUV422
 - RGB565, RGB666, RGB888
 - RAW6, RAW7, RAW8, RAW10, RAW12, RAW14
- Support D-PHY up to 4 lanes
- Interfaces
 - Image output data bus width: 32 bits
 - Image SRAM storage size is 4KB
 - Pixel clock can be controlled when no PPI data is coming

There is one MIPI CSI interface (J11) on board, with a 2*12Pin/0.5mm FPC socket connector for connecting DEBIX's camera module. Supports up to 12MP @30fps or 4kp45.

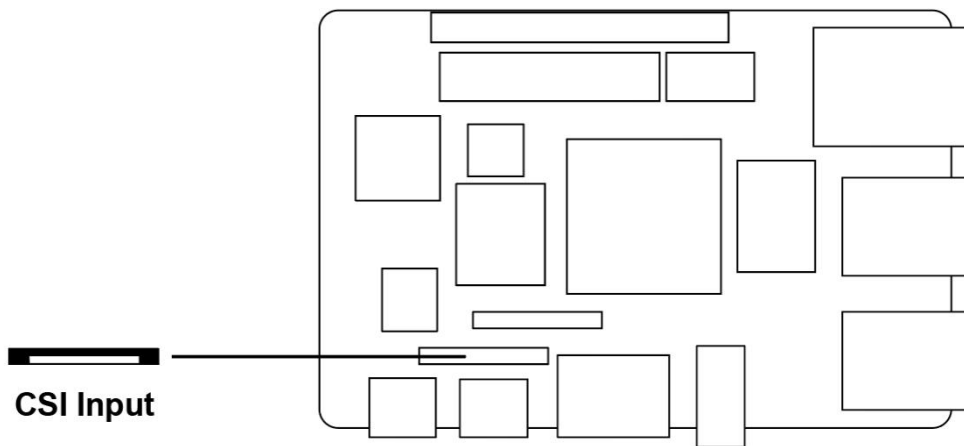


Figure 15 MIPI CSI

The pin sequence is shown in the figure:

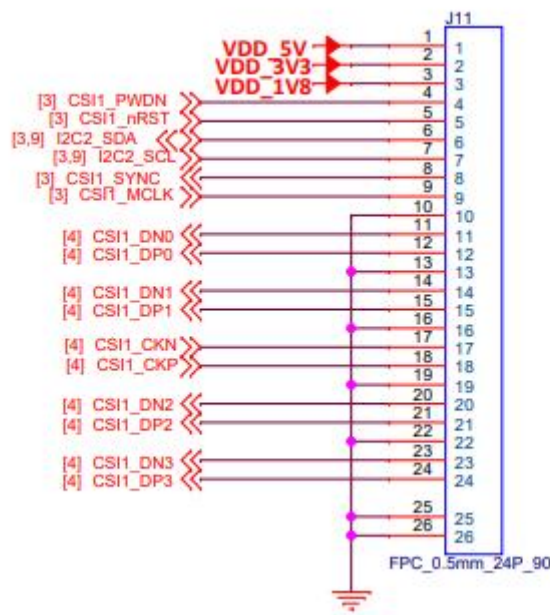


Figure 16 Pin sequence of MIPI CSI

The MIPI CSI interface is defined as follows:

Table 9 Pin definition of MIPI CSI

Pin	Definition	Description
1	VDD_5V	5V output
2	VDD_3V3	3.3V output
3	VDD_1V8	1.8V output

4	CSI1_PWDN	CSI low power mode
5	CSI1_nRST	CSI reset signal
6	I2C2_SDA	I2C data signal
7	I2C2_SCL	I2C clock signal
8	CSI1_SYNC	CSI synchronization signal
9	CSI1_MCLK	CSI external clock input
10	GND	To Ground
11	CSI1_DN0	CSI Differential data channel 0 (-)
12	CSI1_DP0	CSI Differential data channel 0 (+)
13	GND	To Ground
14	CSI1_DN1	CSI Differential data channel 1 (-)
15	CSI1_DP1	CSI Differential data channel 1 (+)
16	GND	To Ground
17	CSI1_CKN	CSI Differential Clock Channels (-)
18	CSI1_CKP	CSI Differential Clock Channels (+)
19	GND	To Ground
20	CSI1_DN2	CSI Differential data channel 2 (-)
21	CSI1_DP2	CSI Differential data channel 2 (+)
22	GND	To Ground
23	CSI1_DN3	CSI Differential data channel 3 (-)
24	CSI1_DP3	CSI Differential data channel 3 (+)
25	GND	To Ground
26	GND	To Ground

2.3.6. Audio Interface

DEBIX provides a combined headphone and microphone input interface (J17), the connector is 3.5mm socket, with audio in/out function, and supports rated voltage 1.5V MIC audio input.

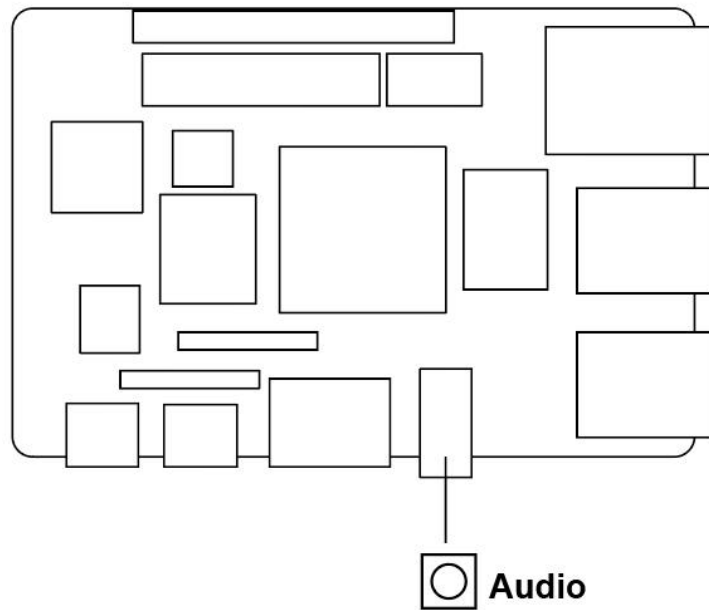


Figure 17 Audio interface

NOTE

DEBIX uses MIC and only supports four-segment headphones. The definition is shown in the following figure, which includes left channel, right channel, GND, and MIC recording. It is necessary to connect to the DEBIX audio interface according to the GND and MIC connection lines for normal use.



Figure 18 Definition of four-segment headphones

2.3.7. PCIe

DEBIX provides a PCIe interface (J18) with 19Pin/0.3mm FPC socket connector, please refer to "FH26W-19S-0.3SHW(97)" on [DEBIX website](http://www.debix.io), which can be used to connect some independent accessories, such as PCIe to USB.

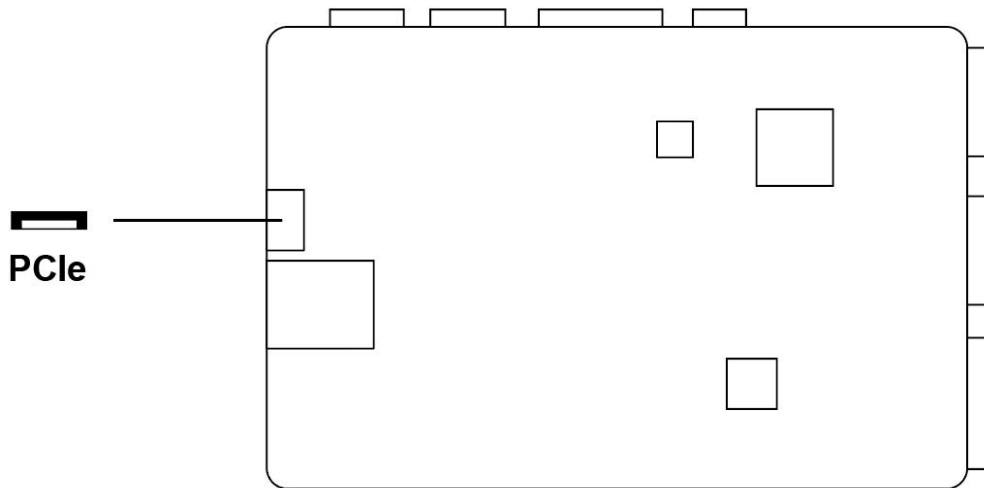


Figure 19 PCIe interface

The pin sequence is shown in the figure:

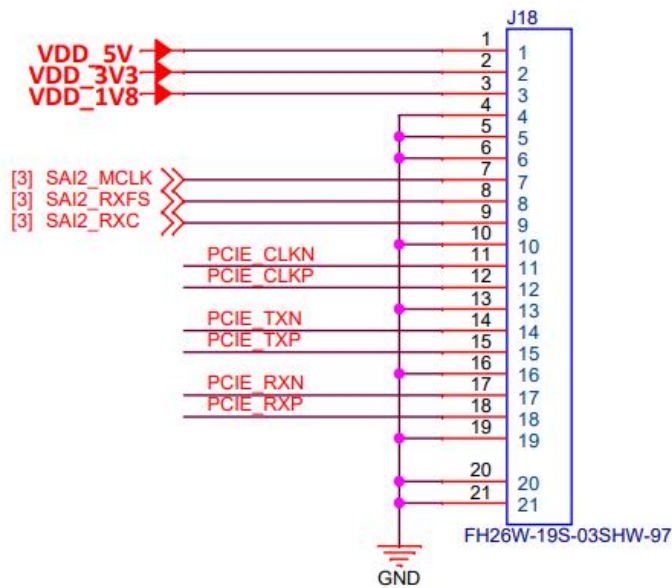


Figure 20 Pin sequence of PCIe

The PCIe interface is defined as follows:

Table 10 Pin definition of PCIe

Pin	Definition	CPU PAD/Pin
1	VDD_3V3	-
2	VDD_5V	-

3	VDD_1V8	-
4	GND	-
5	GND	-
6	GND	-
7	SAI2_MCLK	AJ15
8	SAI2_RXFS	AH17
9	SAI2_RXC	AJ16
10	GND	-
11	PCIE_CLKN	E16
12	PCIE_CLKP	D16
13	GND	-
14	PCIE_TXN	B15
15	PCIE_TXP	A15
16	GND	-
17	PCIE_RXN	B14
18	PCIE_RXP	A14
19	GND	-

2.3.8. Slot

DEBIX provides a Micro SD slot (J1), set the DIP switch to "01" (Micro SD card boot mode), Micro SD card can be used as a system boot card, insert the Micro SD card with the system installed here, and then power on DEBIX to start the system in the Micro SD card.

When the DIP switch is set to other modes and the device is power on, the Micro SD card can be used as a standard memory card to save user data.

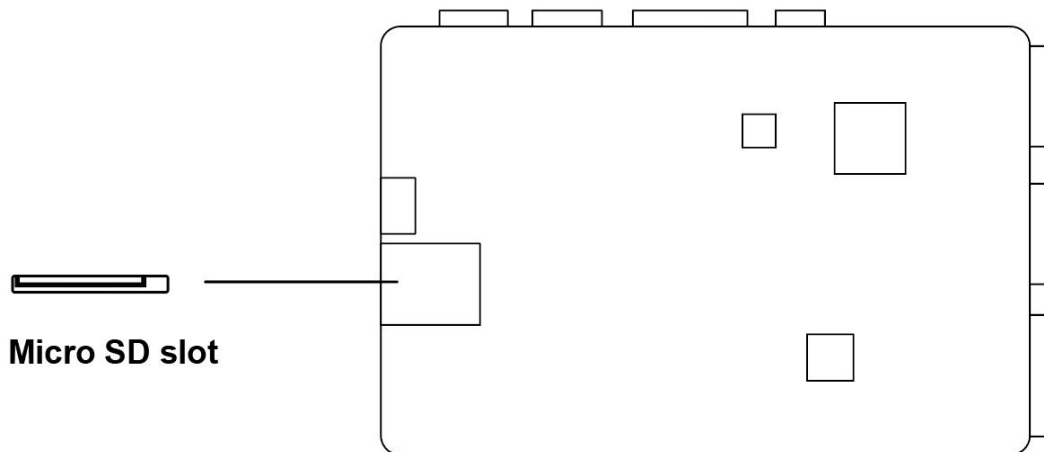


Figure 21 Micro SD slot

2.3.9. GPIO

DEBIX has a set of 2*20Pin/2.0mm GPIO interface (J2), which can be used for external hardware such as LED, button, sensor, function modules, etc.

- The voltage of I2C, UART, CAN, SPI, GPIO pin is 3.3V.
- 5V pins (pin6, pin8) can be used to power to DEBIX Model A/B or peripherals.

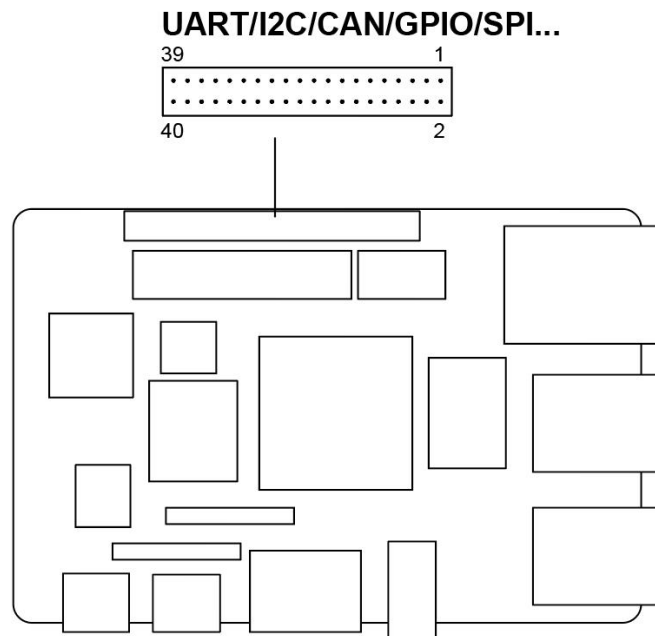


Figure 22 GPIO

The GPIO interface pins are defined in the table below; please refer to “DEBIX Model A Reduced GPIO Function List” on the [DEBIX website](http://www.debix.io) for pin function mapping definitions.

Table 11 Pin definition of GPIO

Pin	Definition	Pin	Definition
1	POE_VA1	2	POE_VA2
3	POE_VB1	4	POE_VB2
5	GND	6	VDD_5V
7	GND	8	VDD_5V
9	UART2_RXD	10	ONOFF
11	UART2_TXD	12	SYS_nRST
13	UART3_RXD	14	ECSPI1_SS0
15	UART3_TXD	16	ECSPI1_MOSI
17	UART4_RXD	18	ECSPI1_MISO
19	UART4_TXD	20	ECSPI1_SCLK
21	I2C4_SCL	22	ECSPI2_SS0
23	I2C4_SDA	24	ECSPI2_MOSI
25	I2C6_SCL	26	ECSPI2_MISO
27	I2C6_SDA	28	ECSPI2_SCLK
29	GPIO1_IO11	30	GPIO1_IO12
31	CAN1_TXD	32	GPIO1_IO13
33	CAN1_RXD	34	GPIO5_IO03
35	CAN2_TXD	36	GPIO5_IO04
37	CAN2_RXD	38	GPIO3_IO21
39	GND	40	GND

2.4. Packing List

- DEBIX Model A (default without eMMC and DIP switch)
- DEBIX Model B (default with eMMC and DIP switch)

Chapter 3 Getting started

DEBIX is designed to maximize the ease of use and convenience for users, as much as possible, while making sure it still works normally like a standard computer. You will need to prepare the following peripherals to make it work:

- **Power adapter:** DC 5V power adapter, at least 3A rated current, equipped with USB Type-C Output.



Figure 23 Power adapter

- **Micro SD card:** DEBIX operating system is installed on it, the minimum capacity requirement is 8GB, 16GB or larger capacity (32GB/64GB/128GB) is recommended.

Warning

If you need to change the Micro SD card of system, please power off the system beforehand.



Figure 24 Micro SD card

- **USB keyboard and mouse:** Any standard USB computer keyboard and mouse will do. They should work normally after being inserted into the USB interfaces.



Figure 25 Keyboard

- **HDMI Cable:** Being used to connect to a TV, projector, or display device that supports HDMI input. If your display device only supports VGA or DVI input, you will also need an adapter. Users can choose to replace HDMI with the LVDS interface or MIPI DSI interface when connecting to a LVDS screen or a MIPI display.

NOTE

We recommend installing a chassis/case for DEBIX before assembling the hardware, which can effectively avoid the short circuit of the motherboard components caused by accidental touch.



Figure 26 HDMI cable

3.1. Software Installation

3.1.1. Download Image

1. Download the latest system image from the [software download page](#) of DEBIX official website;

IMPORTANT

- The memory version of the Ubuntu 20.04 image downloaded depends on the memory size of the DEBIX board and must correspond one to one, e.g., if the board's memory is 4GB, you can only download the image with 4GB DDR Version;
- The boot type of the image downloaded depends on which boot mode image you choose to install, and whether or not the board contains eMMC, etc. For example, if you need to install an image with eMMC boot mode, and the board has an eMMC module, you can choose the image name with (boot from eMMC).

2. If the downloaded image file is a zip file, you need to decompress it into an .img file;
3. Write the .img file into the Micro SD card by [balenaEtcher](#) tool.

3.1.2. System Boot

DEBIX has two boot modes: Micro SD card (default), eMMC.

3.1.2.1. Boot from Micro SD Card

- **Component Preparation**

- ✓ DEBIX board
- ✓ Micro SD card, and card reader
- ✓ DC 5V/3A power adapter
- ✓ PC (windows 10/11)

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

On the DEBIX official website, choose to download Ubuntu 22.04 Boot from SD Card image link: Debix-SD-V3.5-202XXXXXX.img, as shown below.

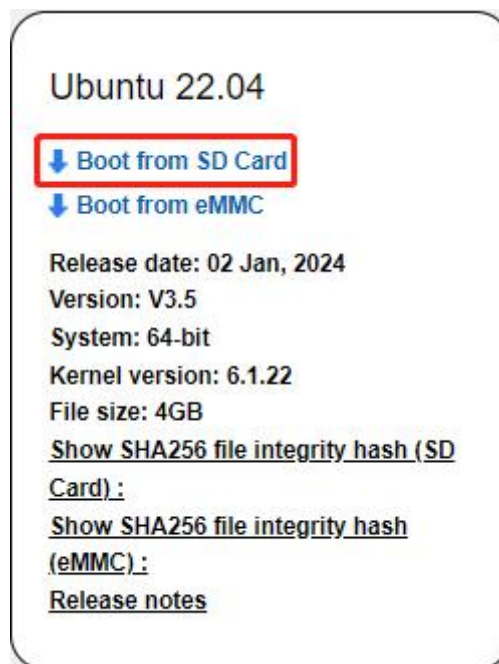


Figure 27

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;

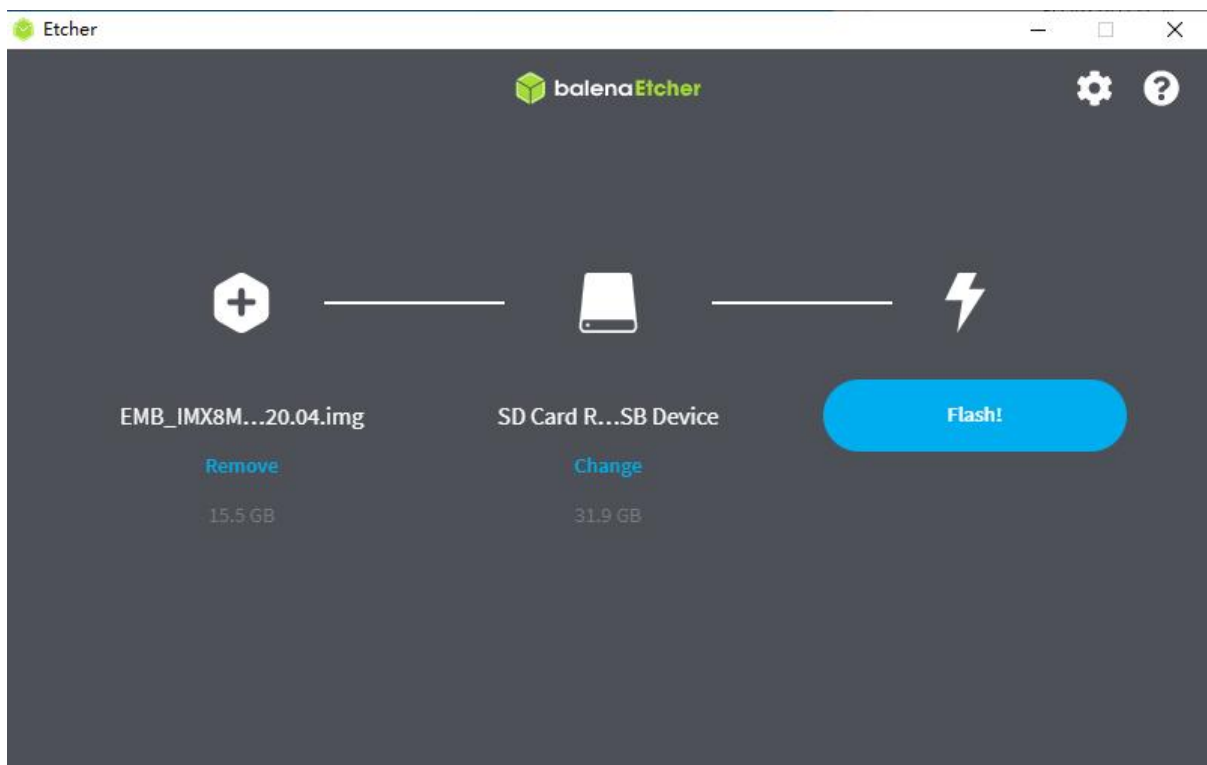


Figure 28

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;

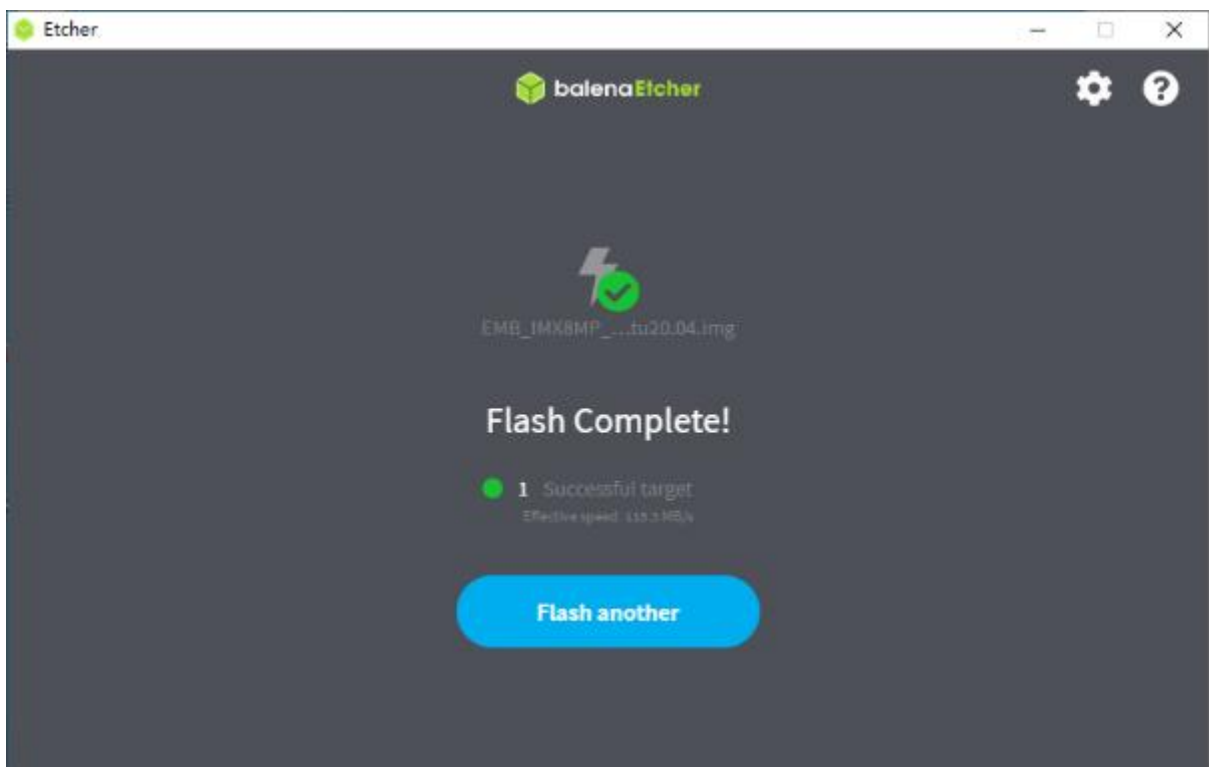


Figure 29

4. Insert the Micro SD card into the slot of DEBIX, connect the display and power on, then you can see the boot screen.

3.1.2.2. Boot from eMMC

- **Component Preparation**

- ✓ DEBIX board
- ✓ Micro SD card above 16GB, and card reader
- ✓ DC 5V/3A power adapter
- ✓ PC (windows 10/11)

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

IMPORTANT

For DEBIX Model A with default configuration, you need to select a set of DIP switch and eMMC module when purchasing.

Choose to download Boot from eMMC: Debix-SD-UPGRADE-EMMC-V3.5-202XXXXX.img, as shown below.

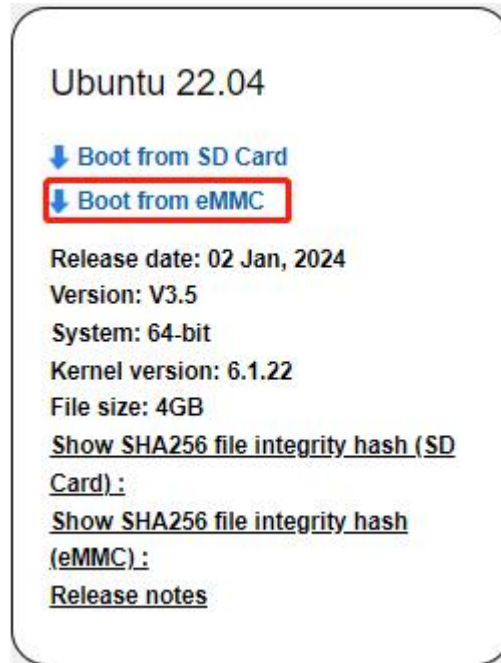


Figure 30

Write the downloaded system image to the Micro SD card according to the steps 1-3 operation of "[Boot from Micro SD Card](#)". Then burn it to eMMC with the following steps:

1. Insert the Micro SD card into DEBIX and set the onboard DIP switch to "11", the system will boot from the Micro SD card, then power on.

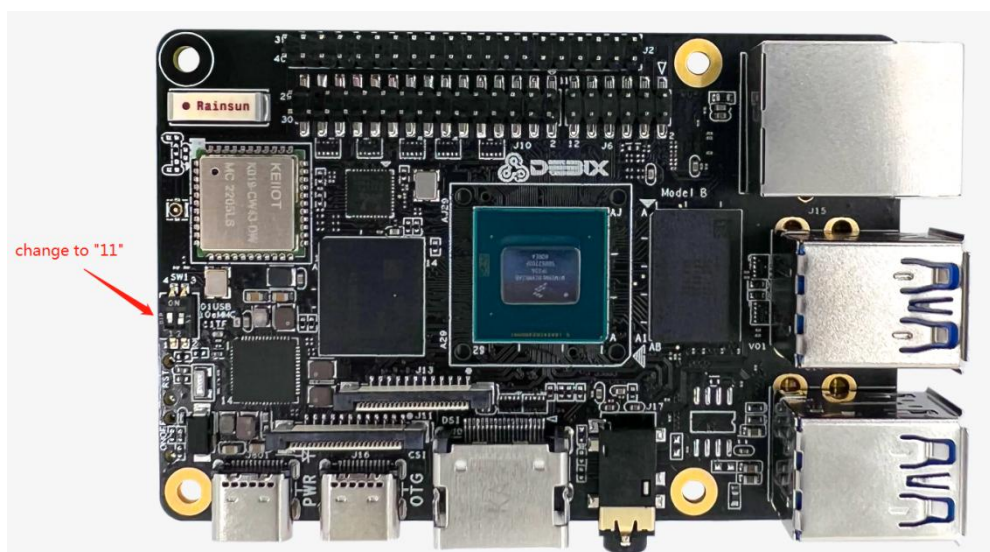


Figure 31

2. After booting, the system will automatically write to eMMC through the Micro SD card, this burn process will not be displayed on screen. When burning, the red LED on the motherboard will flash quickly, please wait. When the red LED changes from fast flash to slow flash, that is, the programming is complete.

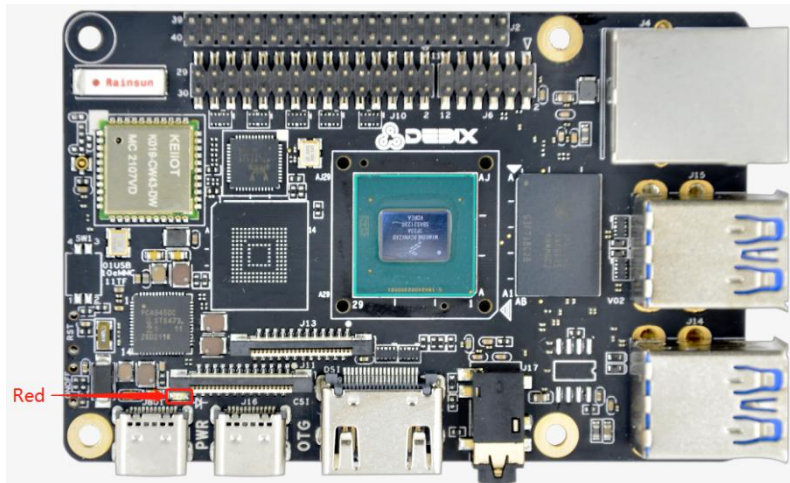


Figure 32

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/mmcbk2
```

```
d
```

```
d
```

```
w
```

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

```
root@imx8mpvck:/home/debix# fdisk /dev/mmcbk2
mmcbk2      mmcbk2boot1  mmcbk2p2
mmcbk2boot0 mmcbk2p1      mmcbk2rpmb
root@imx8mpvck:/home/debix# fdisk /dev/mmcbk2p
mmcbk2p1    mmcbk2p2
root@imx8mpvck:/home/debix# fdisk /dev/mmcbk2

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/mmcbk2: 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/mmcbk2p1  20480    1024000  1003521  490M 83 Linux
/dev/mmcbk2p2 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@imx8mpvck:/home/debix#
```

3. 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.

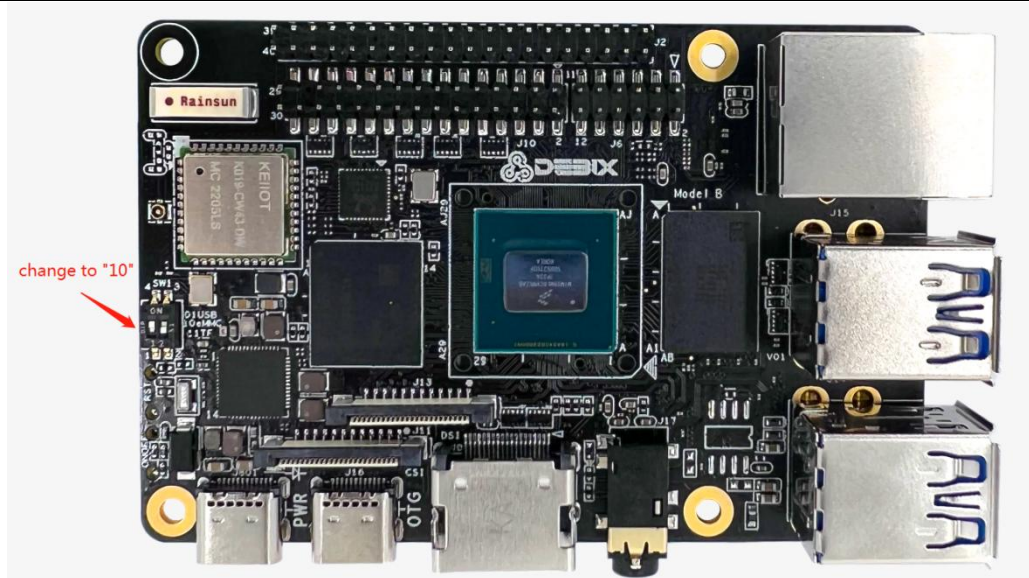


Figure 33

3.1.2.3. USB Flash

- **Component Preparation**

- ✓ DEBIX board
- ✓ USB Type-C data cable
- ✓ DC 5V/3A power adapter
- ✓ PC (windows 10/11)

- **Burning to eMMC via USB**

IMPORTANT

For DEBIX Model A with default configuration, you need to select a set of DIP switch and eMMC module when purchasing.

1. Download the system installation package we provided to DEBIX, check the MD5 match after downloading, and then unzip it to PC;
2. Use USB cable to connect the OTG port of DEBIX to the USB port of PC, set the DIP switch to "01", connect the power supply, the system will enter the **USB burning mode**;
3. Run **Windows PowerShell** as administrator;

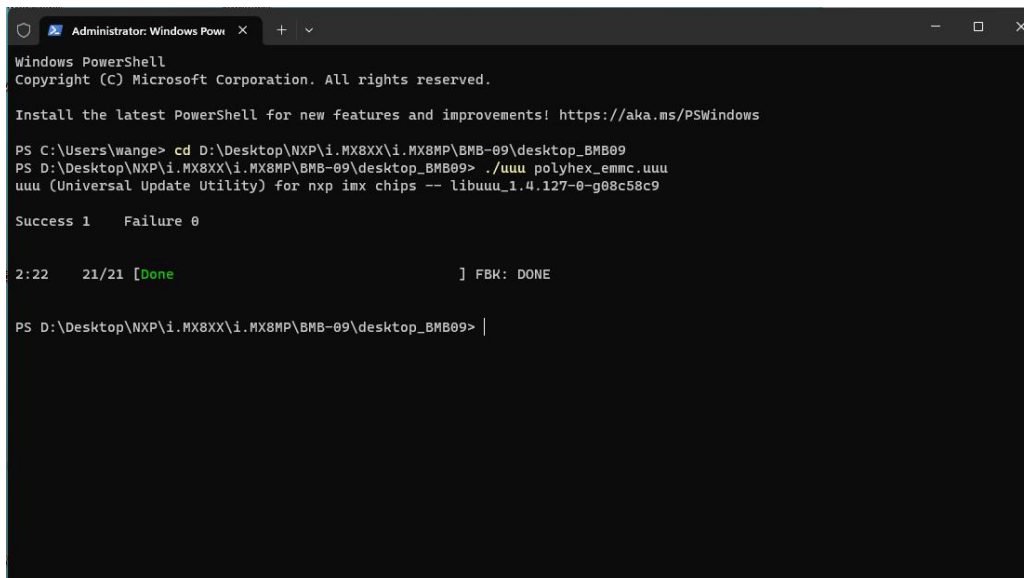
4. Type `cd` command to enter the root directory of the system installation package, for example:

```
cd D:\Desktop\NXP\i.MX8MP\BMB-09\desktop_BMB09
```

5. Run the following command to download the file and start burning the system to eMMC;

```
./uuu polyhex_emmc.uuuu
```

6. Wait for the system burning to finish; when the terminal shows green "Done", it means the burning is finished;



```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\wange> cd D:\Desktop\NXP\i.MX8XX\i.MX8MP\BMB-09\desktop_BMB09
PS D:\Desktop\NXP\i.MX8XX\i.MX8MP\BMB-09\desktop_BMB09> ./uuu polyhex_emmc.uuuu
uuu (Universal Update Utility) for nxp imx chips -- libuuu_1.4.127-0-g08c58c9

Success 1   Failure 0

2:22  21/21 [Done] FBK: DONE

PS D:\Desktop\NXP\i.MX8XX\i.MX8MP\BMB-09\desktop_BMB09> |
```

7. After burning, disconnect the power supply and OTG USB cable, make sure the DEBIX is completely powered off, and then connect the power supply to start.

3.2. Hardware connection

Hardware connections are made as shown in the diagram and the steps are as follows:

1. **Insert the Micro SD card with the system installed:** Insert it into the slot on the back of DEBIX; if you need to remove it, just gently pull out the card after power off.
2. **Connect the HDMI monitor**
3. **Connect the keyboard**

4. **Connect the mouse**
5. **Connect the network cable**
6. **Connect the power adapter:** Plug in the power supply, DEBIX will power on, and the indicator light of DEBIX will be on (if the boot fails, the indicator light will not be on).

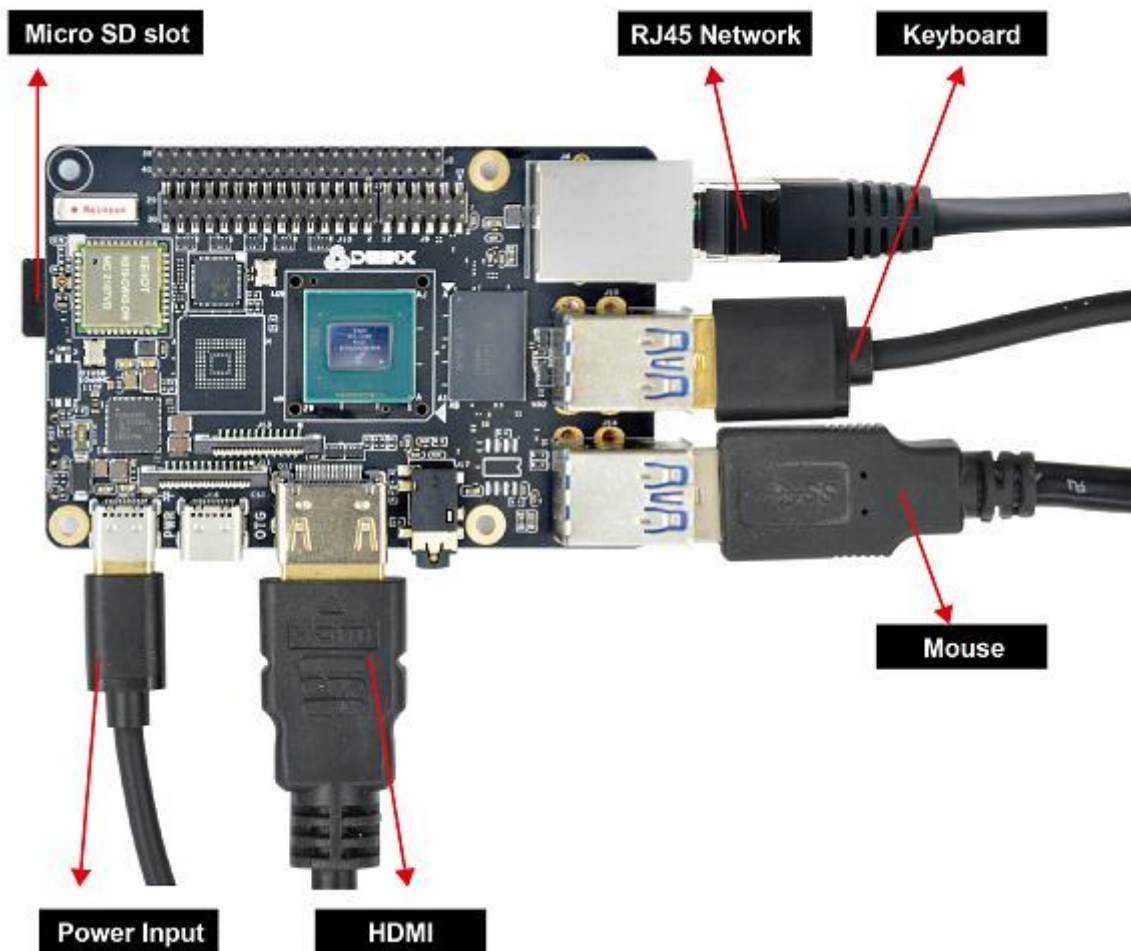


Figure 34

Chapter 4 Software Application Examples

4.1. Desktop Introduction

The default DEBIX system we provide is with Desktop. Here is a brief exhibition. The following picture shows the desktop of DEBIX system:

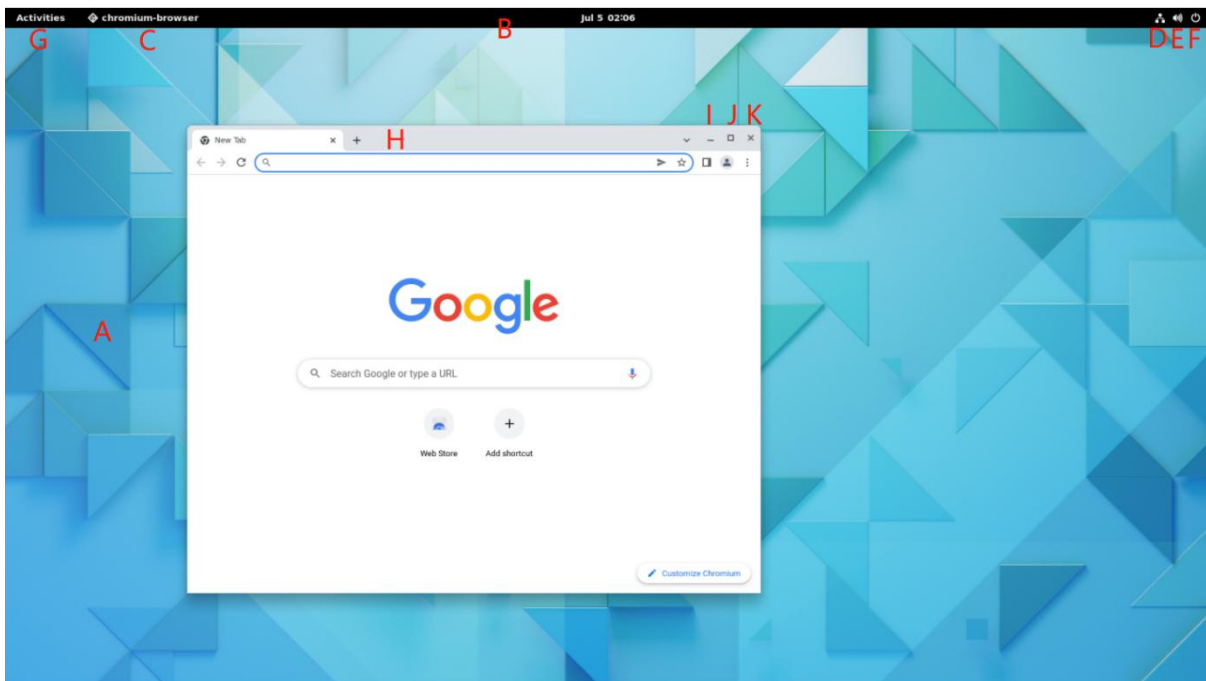


Figure 35 DEBIX Desktop

Table 12 Description of DEBIX Desktop

No	Description	No	Description
A	Wallpaper	B	Taskbar
C	Task	D	Network Identity
E	Sound Volume Icon	F	Power Button
G	Activity Button	H	Window Title Bar
I	Window Minimize Button	J	Window Maximum Button
K	Window Close Button		

4.2. System Browser

DEBIX's desktop system pre-installed the Chromium browser, which has the same function as Google Chrome, and has the same performance of simplicity, speed and security.

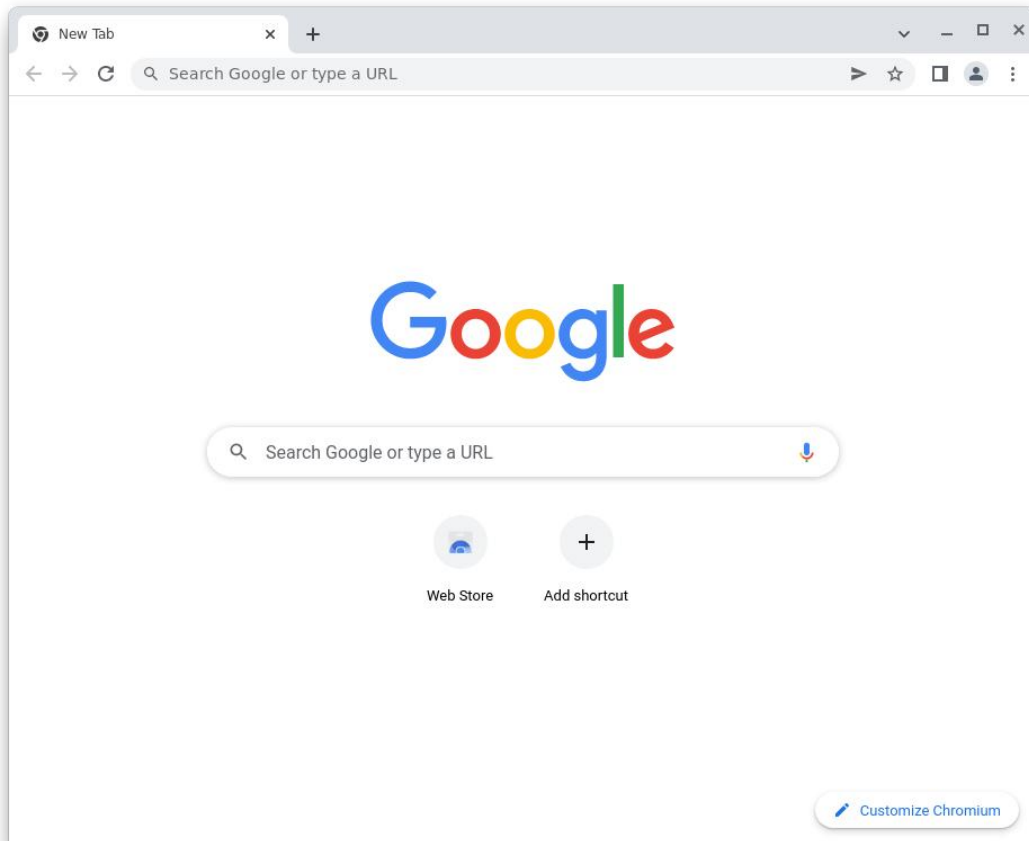


Figure 36 Chromium-browser

4.3. File Management

DEBIX uses Files as the desktop file management tool.

- Files downloaded by browser are stored in the **/Home/Downloads** directory.
- Files for the desktop are stored in the **/Home/Desktop** directory.
- Pictures taken by the camera or Screenshot are stored in the **/Home/Pictures** directory.
- When you insert a removable disk, the name of the disk will be displayed in the file manager, and you can view it by clicking on it.

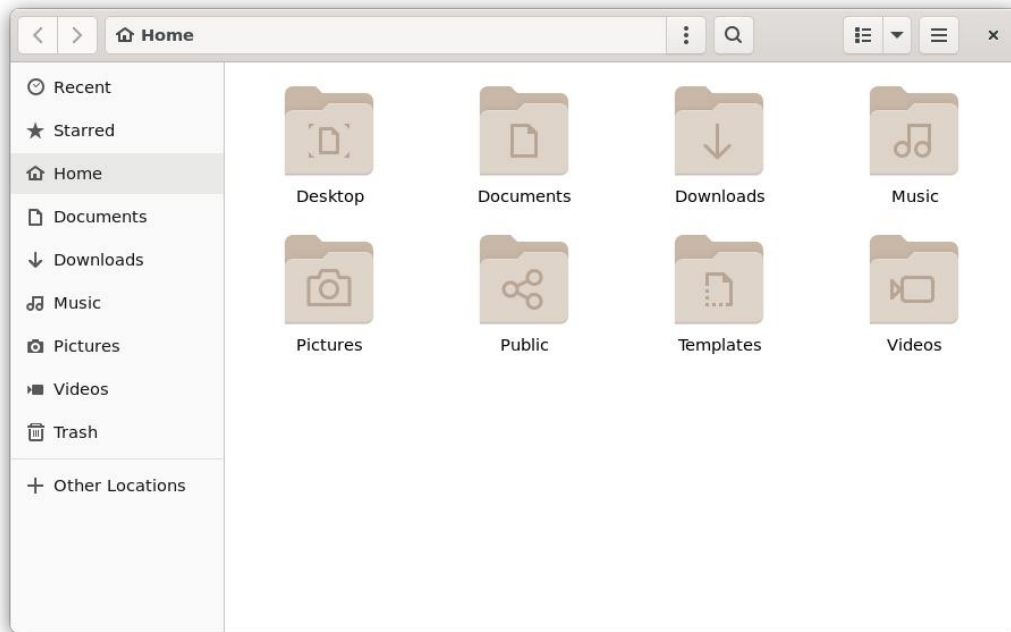



Figure 37 Files

You can set the display of files and folders by the icon  in the upper right corner.

4.4. DEBIX Application Interface

1. Click **Activities** in the upper left corner of the desktop;
2. Click on **Show Applications** icon  to open the all application interface of DEBIX;

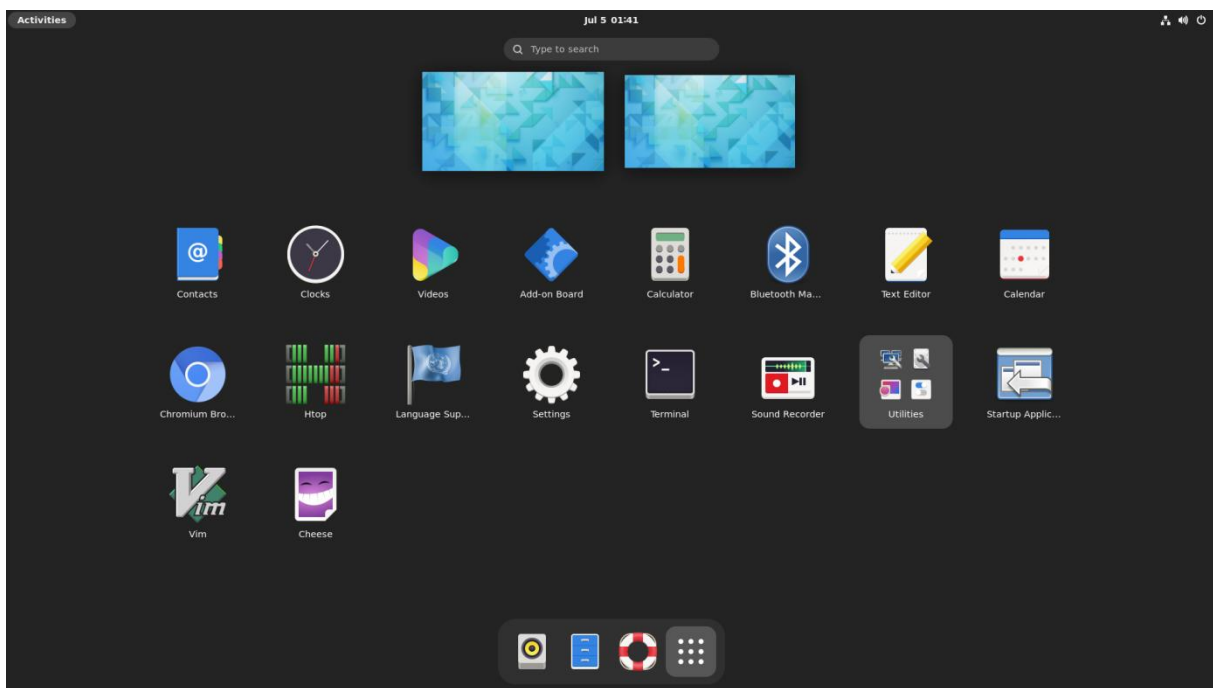


Figure 38 Application of DEBIX Desktop

3. Click any application icon to enter the application interface.
4. For example, click **Settings** application to pop up Settings interface, and on the left side is DEBIX's function menu; you can set DEBIX's Wi-Fi, Bluetooth, displays and other functions.

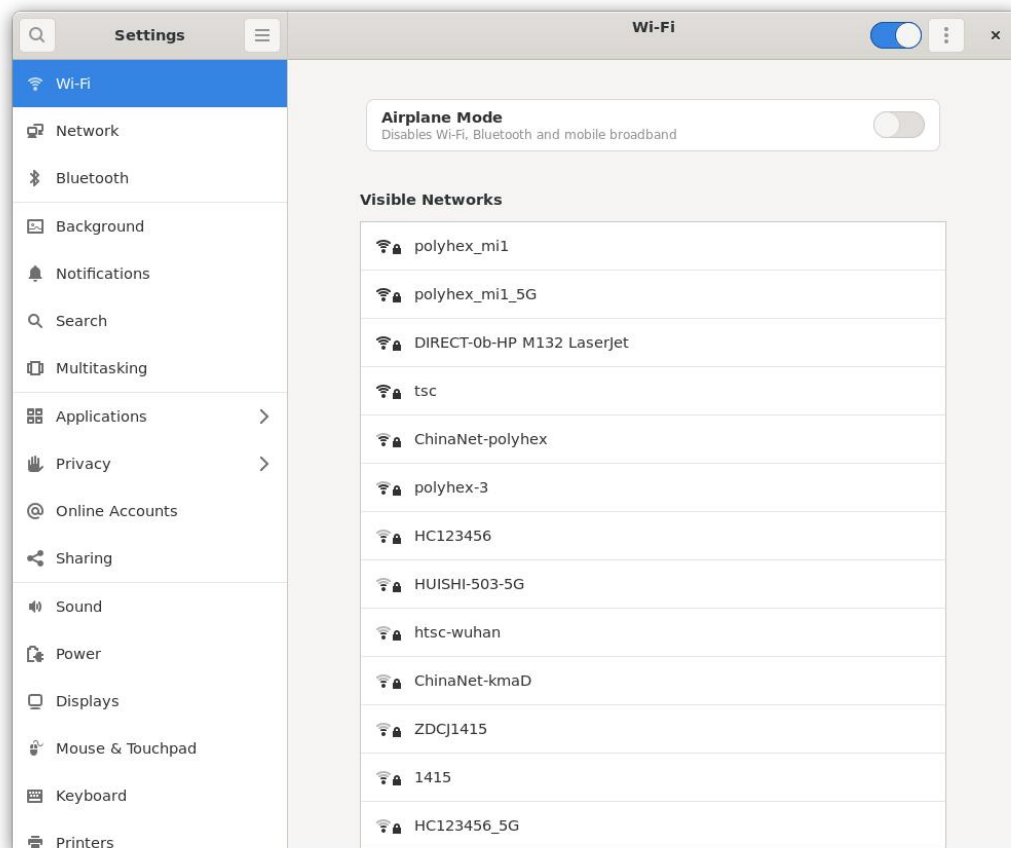


Figure 39 Settings interface

4.5. Change User Password

Location: **Settings -->> Users**

1. Click **Settings** app to open Settings interface;
2. On the left side of the function menu, select **Users** to display user name and password information;

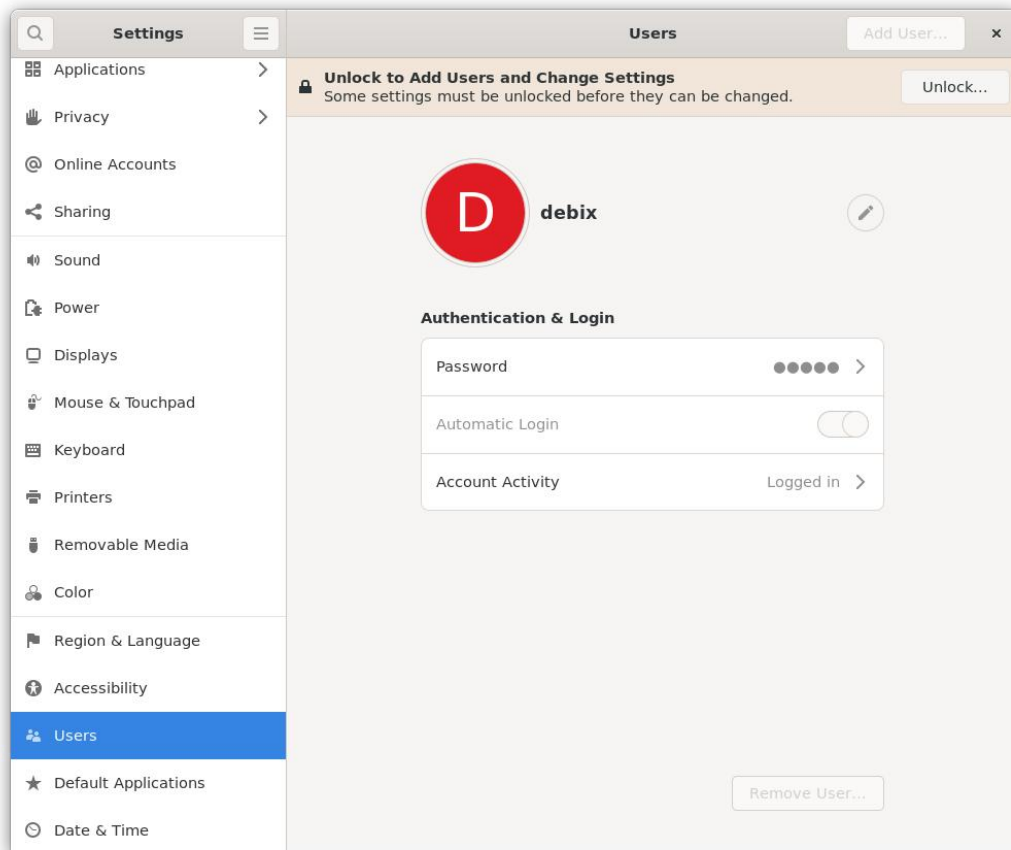


Figure 40 Users interface

3. Click **Unlock** button in the upper right corner to pop up the "Authentication Required" dialog box, type the current user password and click **Authenticate** button to verify;

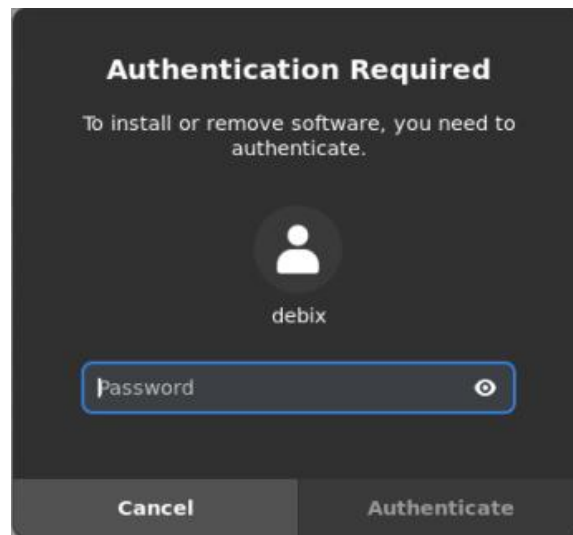


Figure 41 Authenticate dialog box

4. If the authentication passes, click edit icon  in the Users interface's Username

column to modify the username and then press **Enter** to save the username.

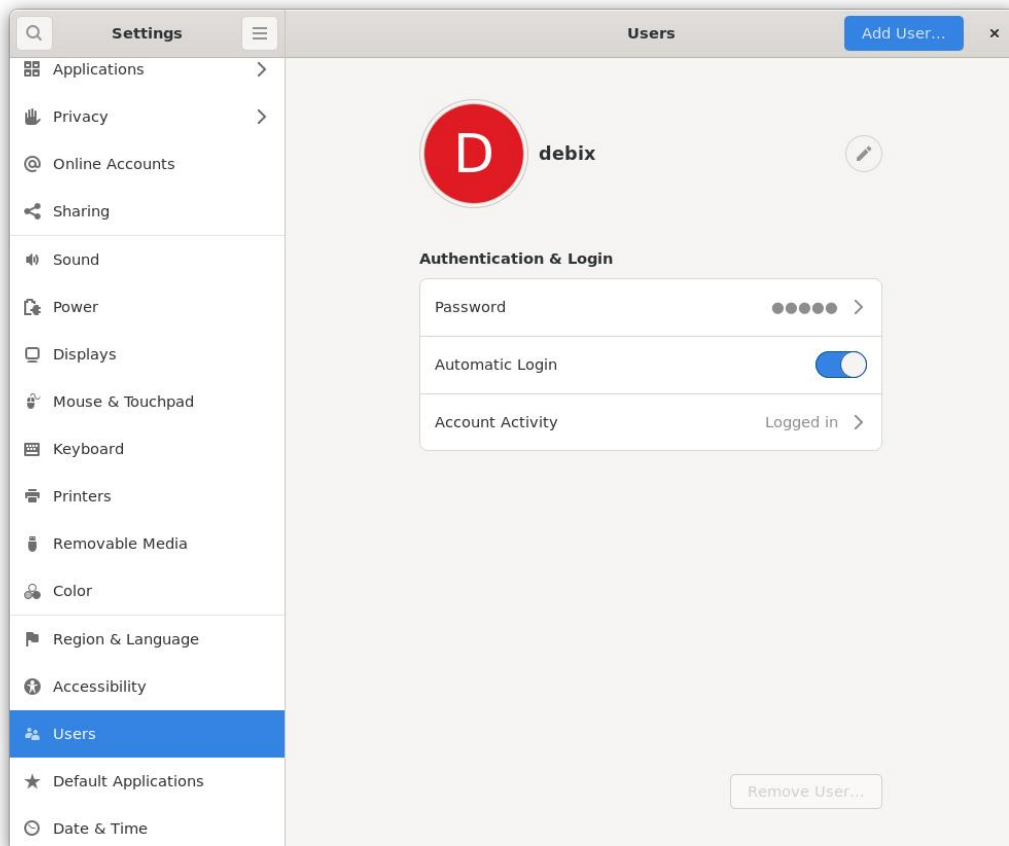


Figure 42

5. Click the Password column in the Users interface, the "Change Password" dialog box pops up to change the password, type "Current Password", "New Password", "Confirm New Password", click **Change** button.

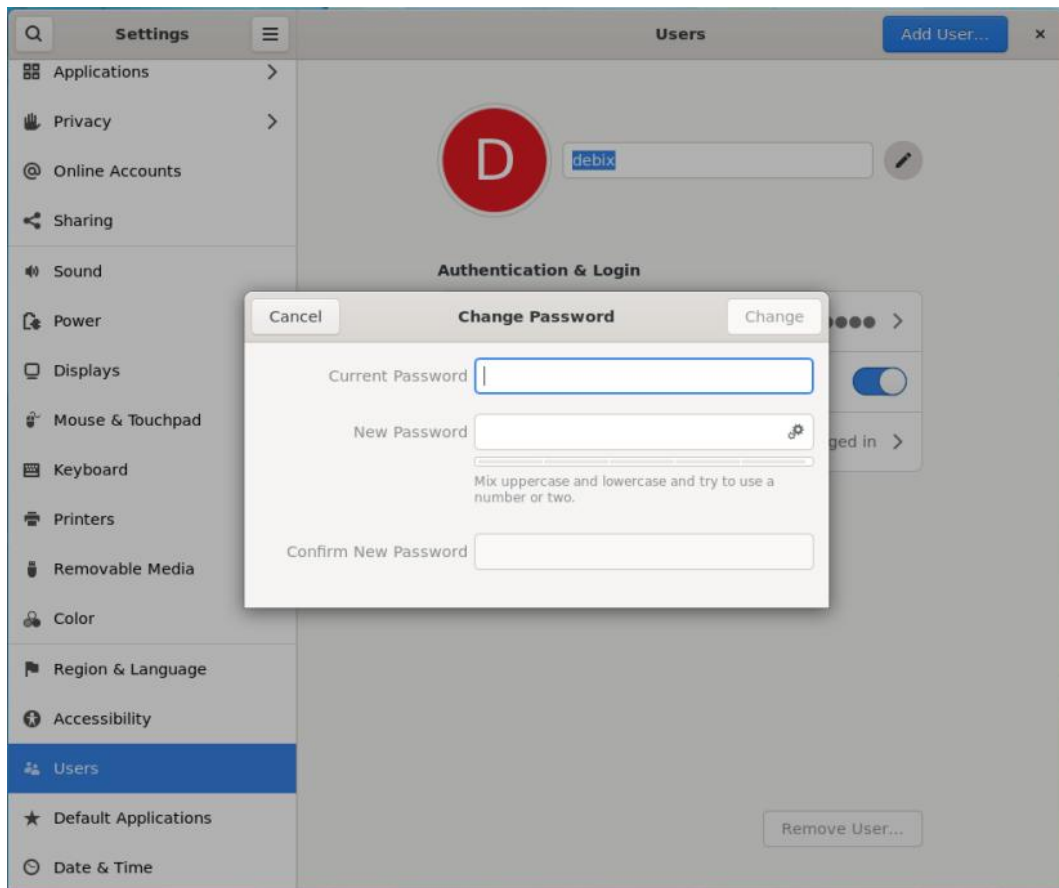


Figure 43 Change Password

NOTE

The value of “New Password” and “Confirm New Password” must be the same.

6. You can also click **Add User** button in the upper right corner to add a new user.

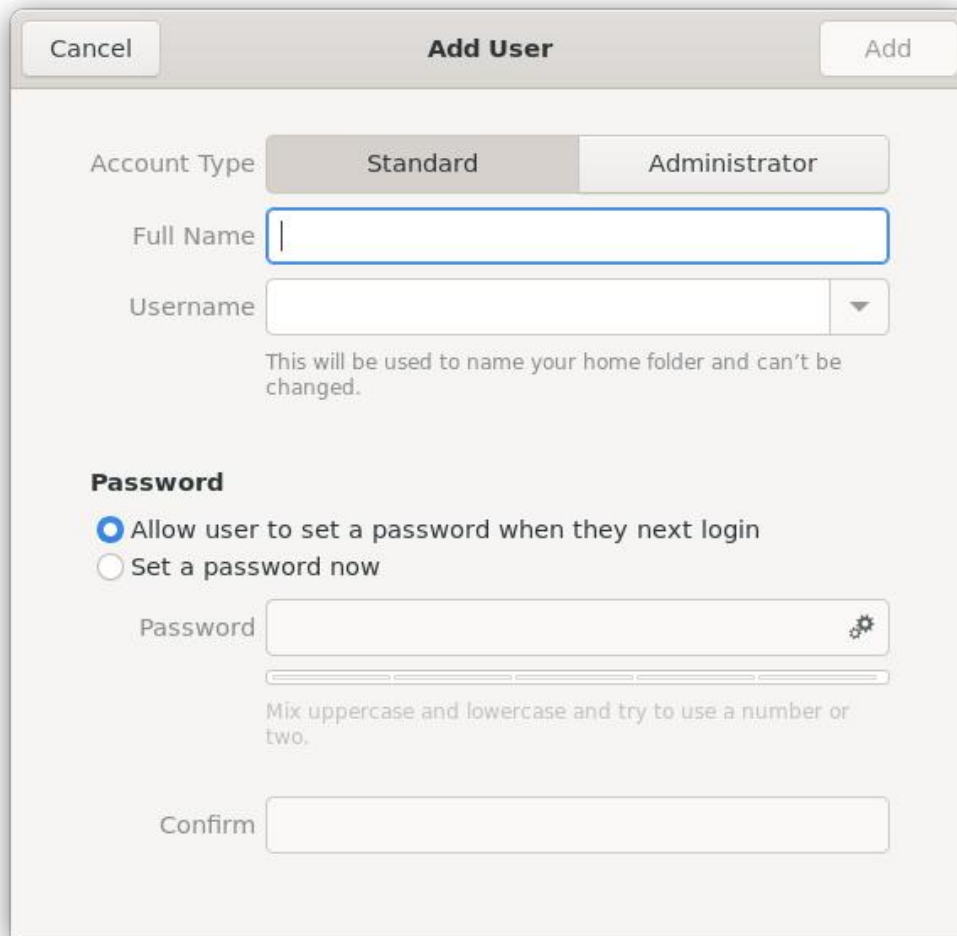



Figure 44 Add User interface

4.6. Setting up WiFi

Location: **Settings -->> Wi-Fi**

1. Click **Settings** app to open Settings interface;
2. On the left side of the function menu, select **Wi-Fi**, click  button in the upper right corner to turn on WiFi network (WiFi network is enabled by default), and the interface will show the available WiFi networks;

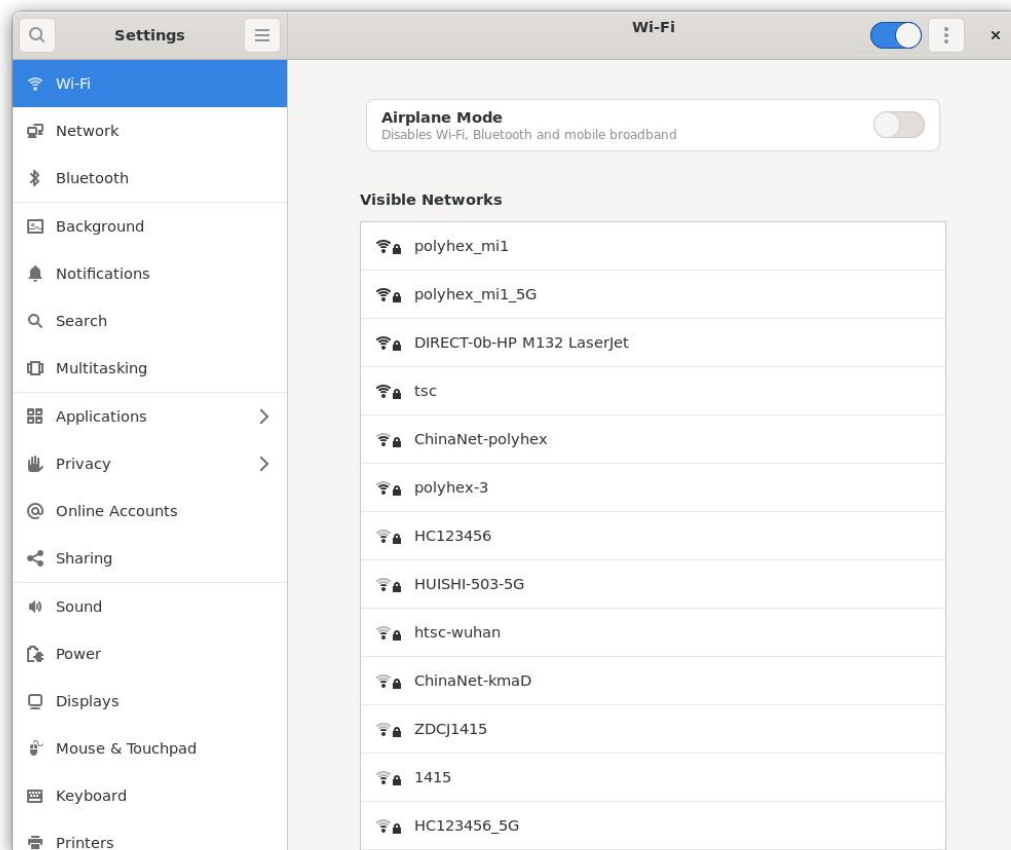


Figure 45 Wi-Fi interface

3. If the name of the connected WiFi is "polyhex_m1", click the WiFi name column, the "Authentication Required" dialog box pops up, and type the WiFi password and click **Connect** button;

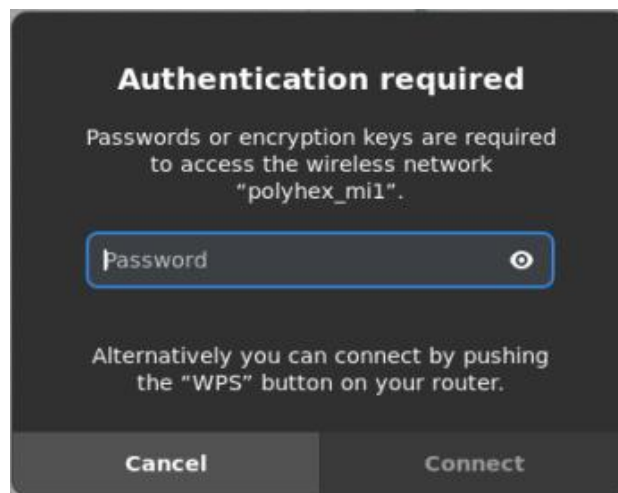



Figure 46 WiFi password verification interface

4. Wait for the connection to be successful.

5. You can also connect to the network by clicking the icon  in the upper right corner and selecting **Connect to Hidden Network**, **Turn On Wi-Fi Hotspot**, or **Known Wi-Fi Networks**.

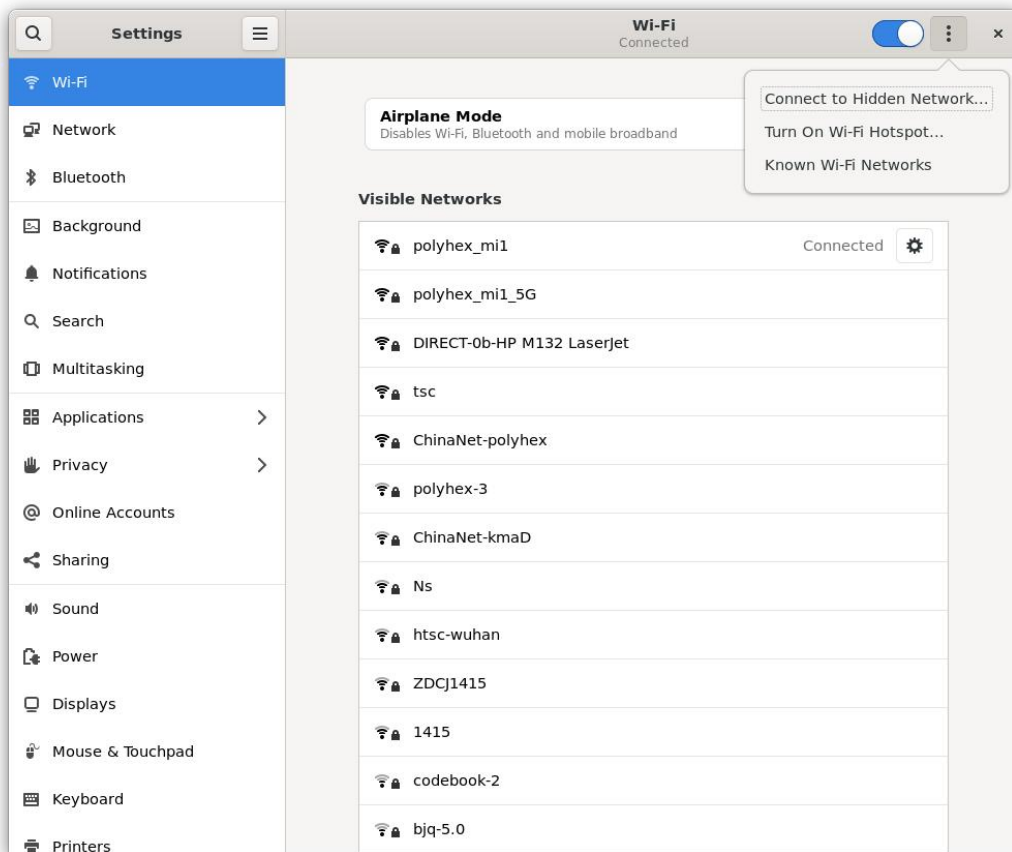


Figure 47

6. Click **Airplane Mode** button to turn on or off the airplane mode.

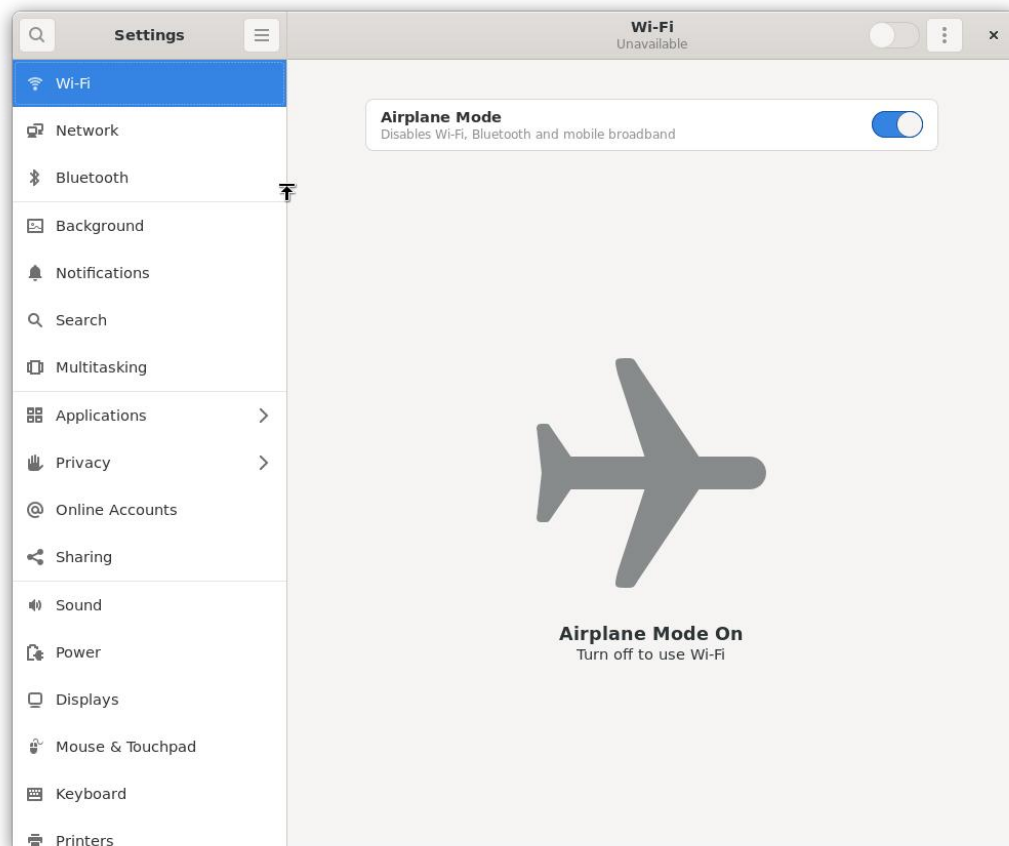


Figure 48 Airplane Mode

4.7. Configure WiFi hotspot

IMPORTANT

- WiFi network needs to be turned on before configuring WiFi Hotspot.
- WiFi network is disconnected after the WiFi Hotspot is turned on.

There are two ways to enable WiFi Hotspot:

- **Command to enable:** `nmcli dev wifi hotspot ifname wlan0 ssid debix_ap password "12345678"`

- Interface to enable: **Settings -->> Wi-Fi -->> "Turn On WiFi Hotspot"**

1. Click **Settings** app to open Settings interface;

2. On the left side of the function menu, select **Wi-Fi**, click the icon  in the upper right

corner and select "Turn On Wi-Fi Hotspot";

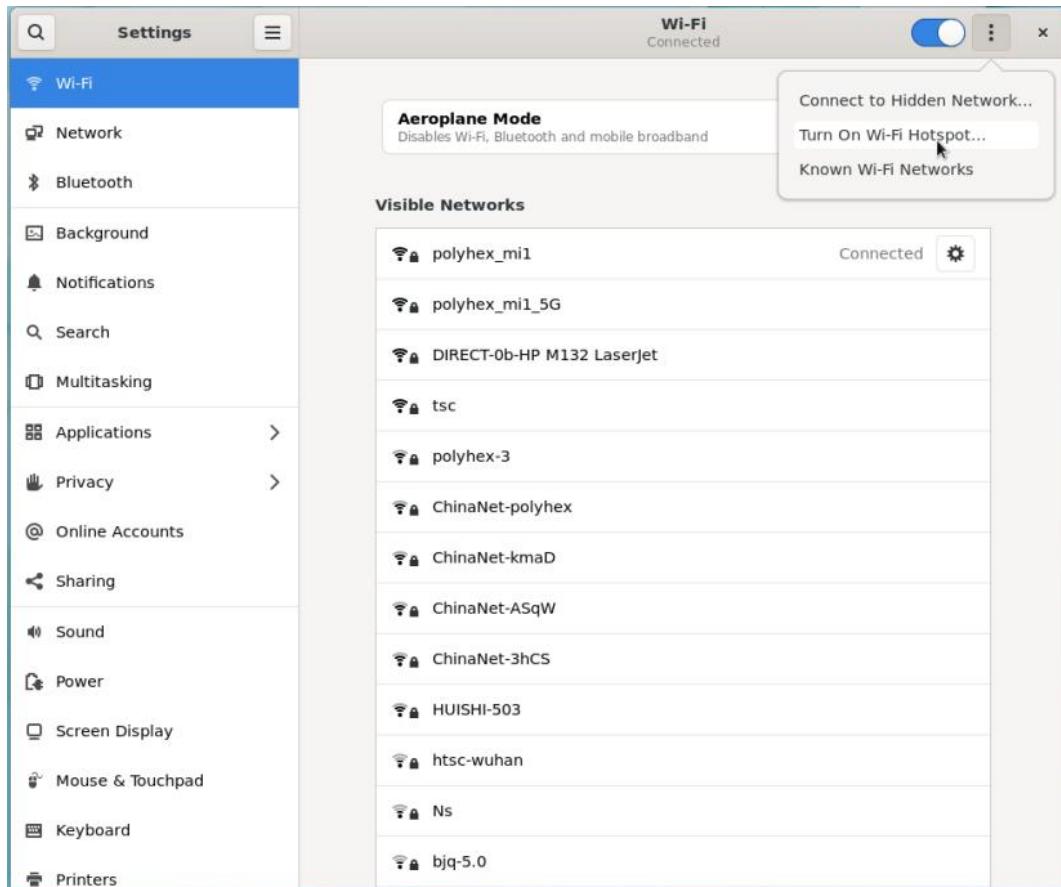


Figure 49 Wi-Fi Hotspot

- When the "Turn on Wi-Fi Hotspot?" interface pops up, type the password of the hotspot network, click **Turn On** to enable the hotspot and display the QR code of the WiFi hotspot.

NOTE

The password of the current hotspot with the network name "imx8mpevk" is imx8mpevk.

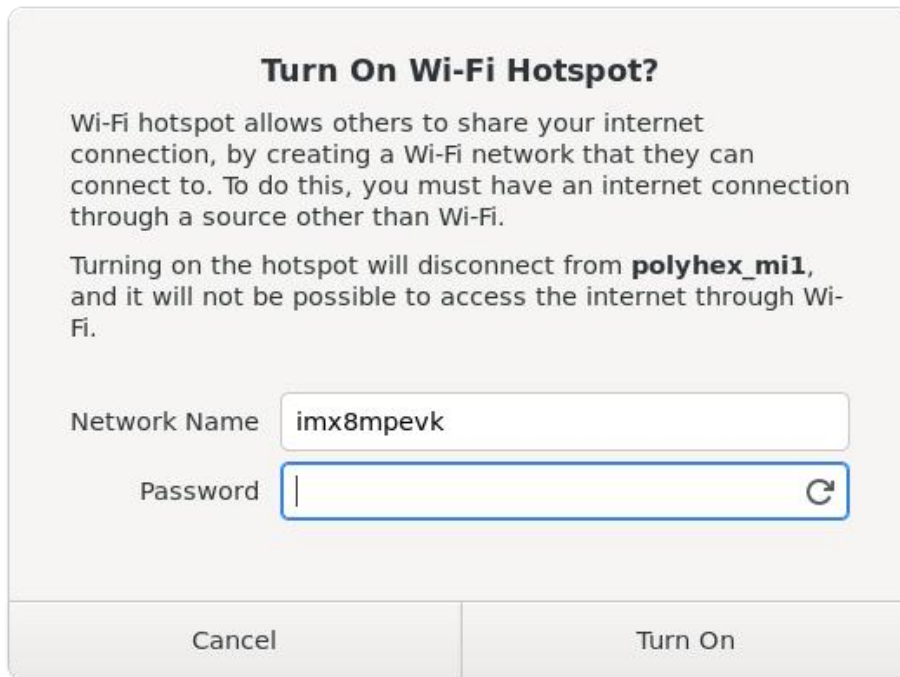


Figure 50 Hotspot Password Verification

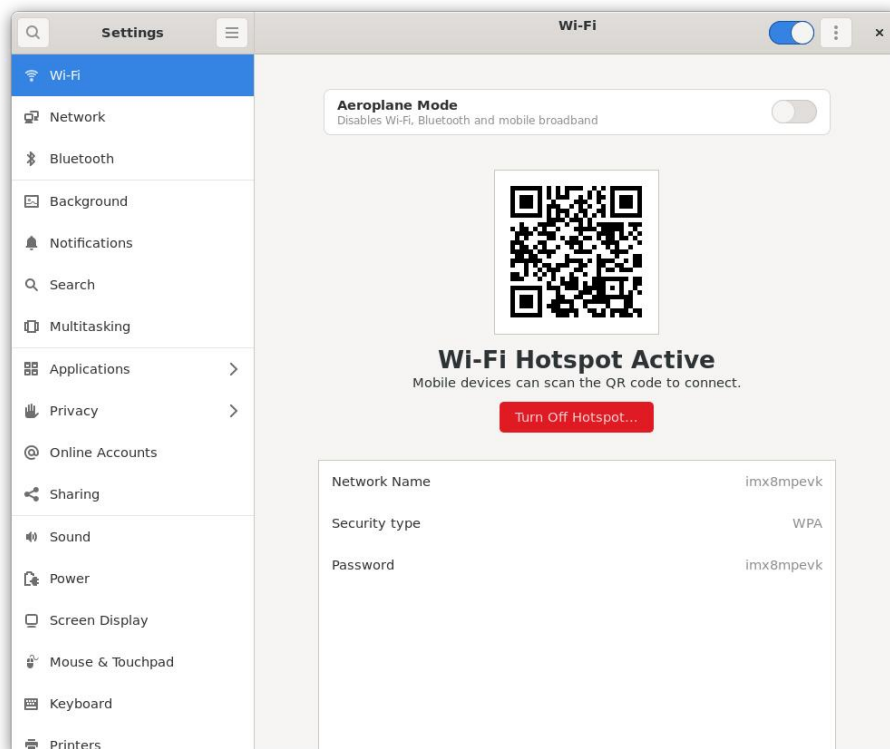


Figure 51 Hotspot active

4. If you need to turn off the WiFi hotspot, you can do it in the following two ways:
 - Click **Turn Off Hotspot**, click **Stop Hotspot** to disconnect the hotspot and connect to the

WiFi network;

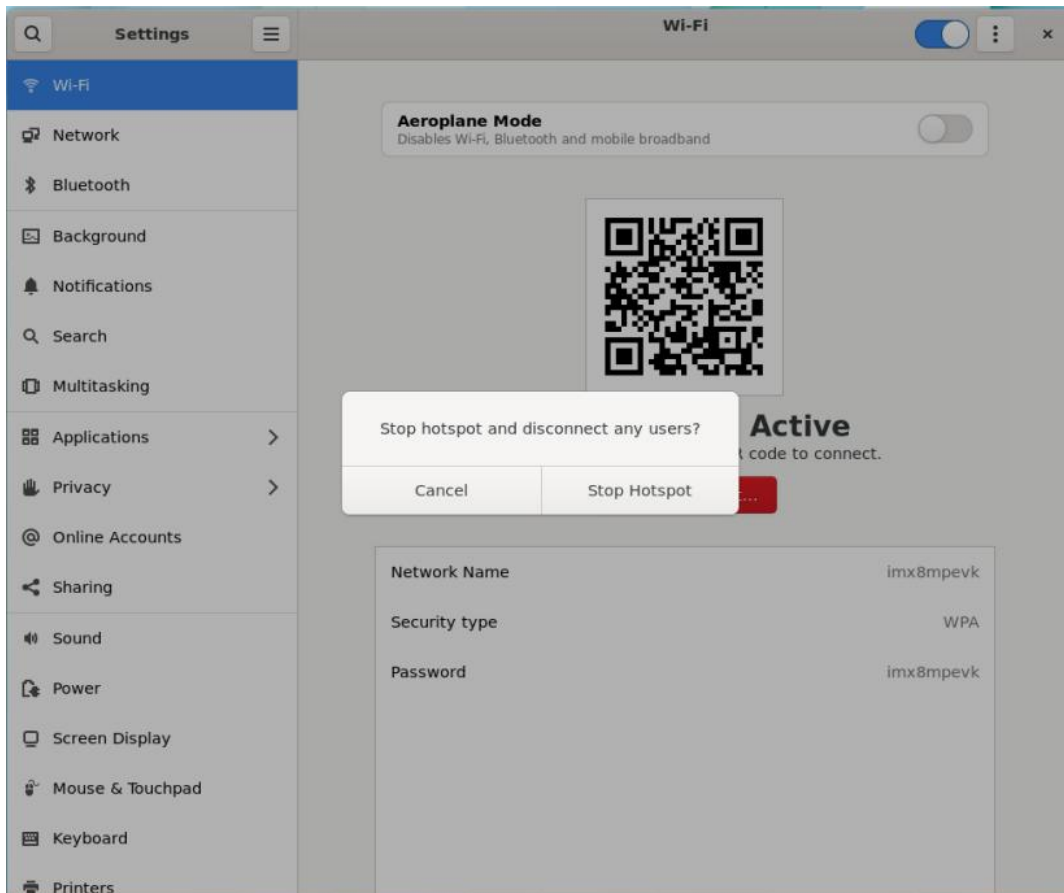



Figure 52

- Or click the top right corner  of DEBIX desktop, select "Wi-Fi Hotspot Active", click **Turn Off** to disconnect the hotspot.

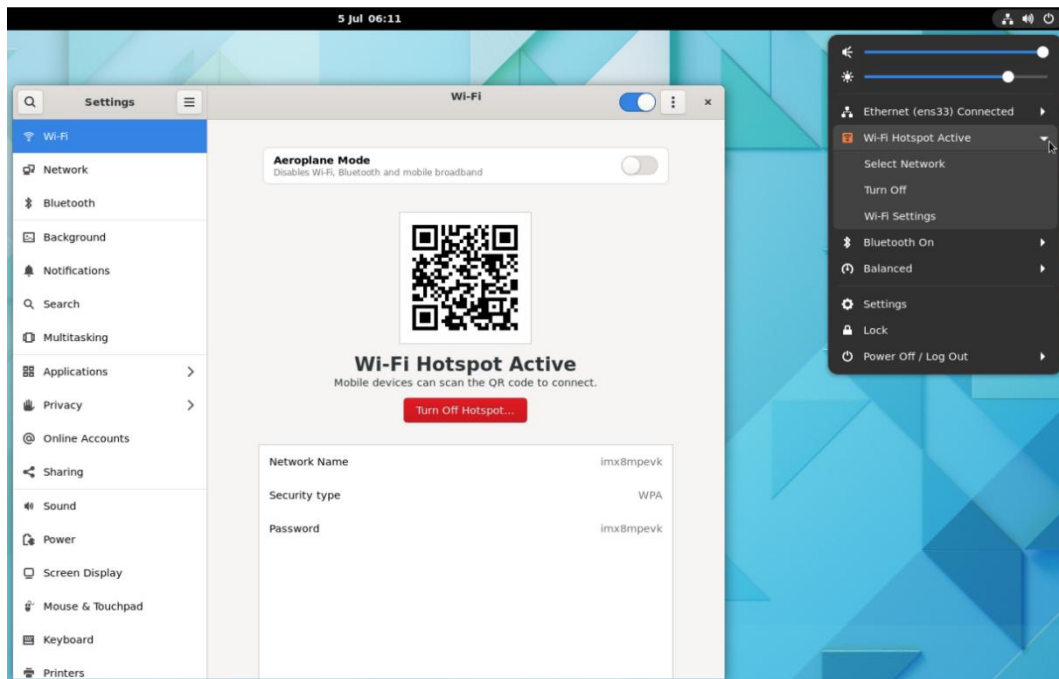


Figure 53

4.8. Change Language

Location: **Settings** --> **Region & Language**

1. Click **Settings** app to open Settings interface;
2. On the left side of the function menu, select **Region & Language**, and in the Region & Language interface, click **Manage Installed Languages** to pop up the "Language Support" dialog box;

NOTE

If the DEBIX system does not have a language package, you need to download the update through network.

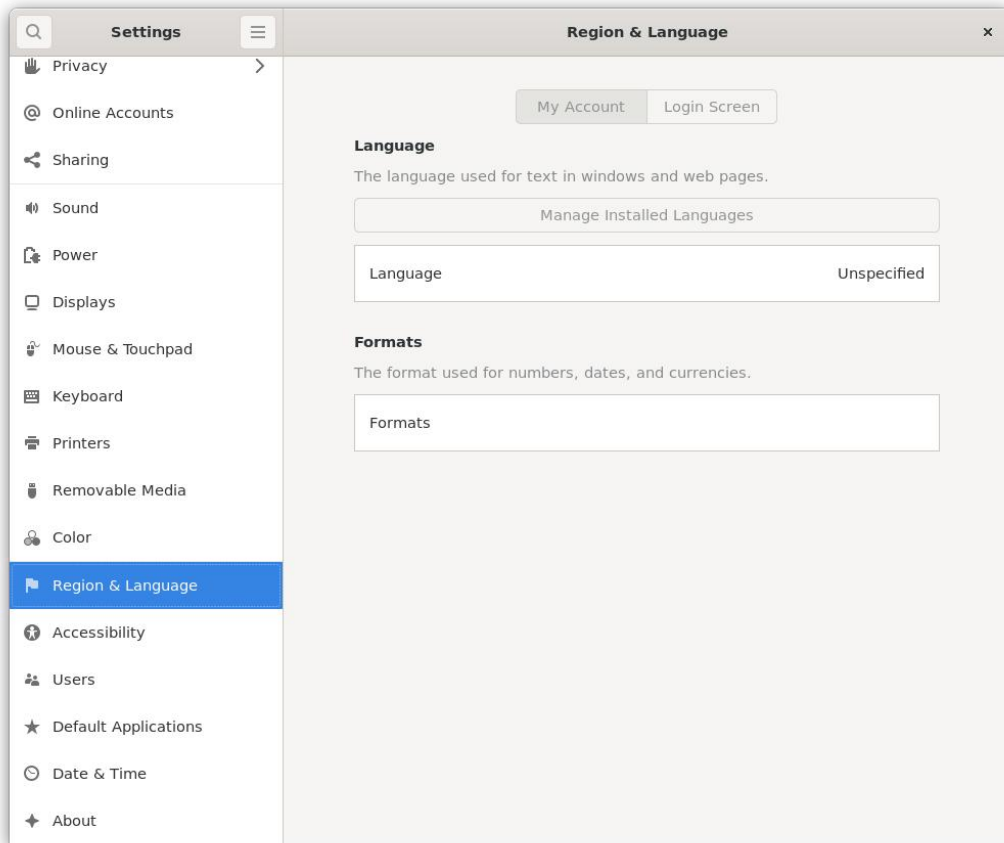


Figure 54 Region & Language interface

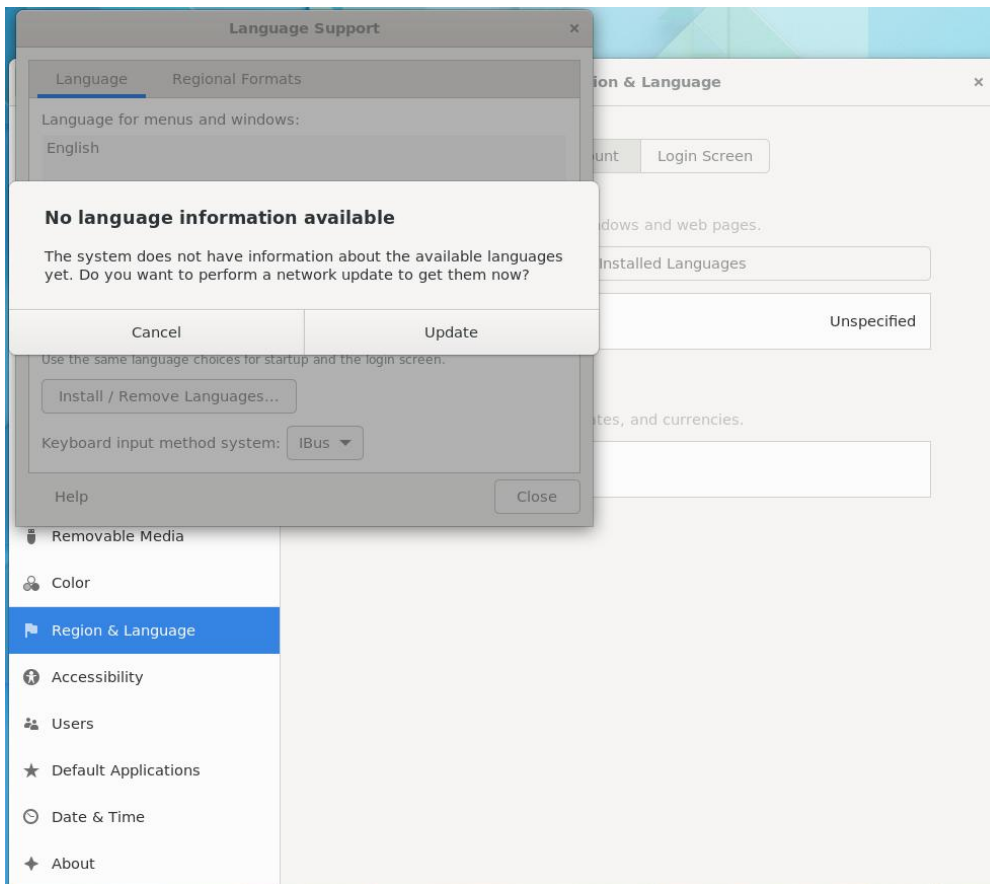


Figure 55 Update language package through network

3. After downloading the updated language package, in the "Language Support" interface, click **Install/Remove Languages** to pop up the "Installed Languages" dialog box, select the languages you need to install, click **Apply** button.

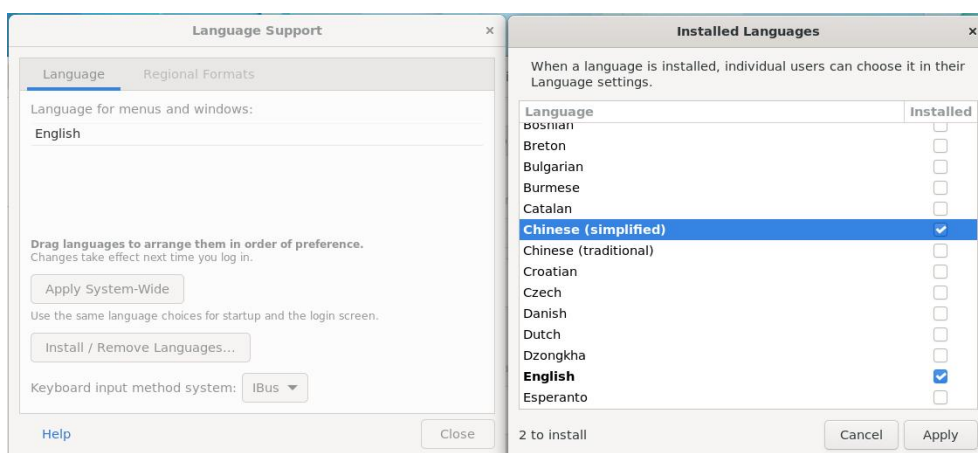


Figure 56 Languages option

4. When the "Authentication Required" dialog box pops up, type the password of the current

user and click **Authenticate** button to install the language package automatically.

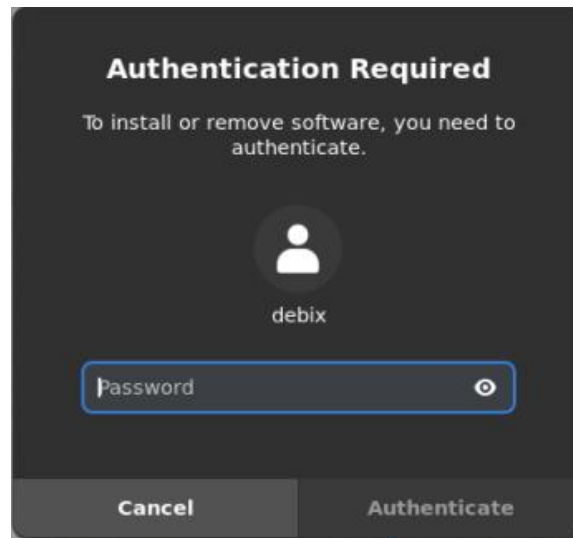


Figure 57

5. After the installation is finished, in the "Language Support" interface, click **Apply System-Wide**; the "Authentication Required" dialog box will pop up, type the current user password. After logging in the system again, go back to the "Language and Region" tab, click on the Language column, select the language you want to set, click **Select**; click **Restart**, then click **Log Out** and restart to take effect.

NOTE

To configure the language for the first time, you need to re-login the system after installing the language package to take effect, and the Language column displays the set language.

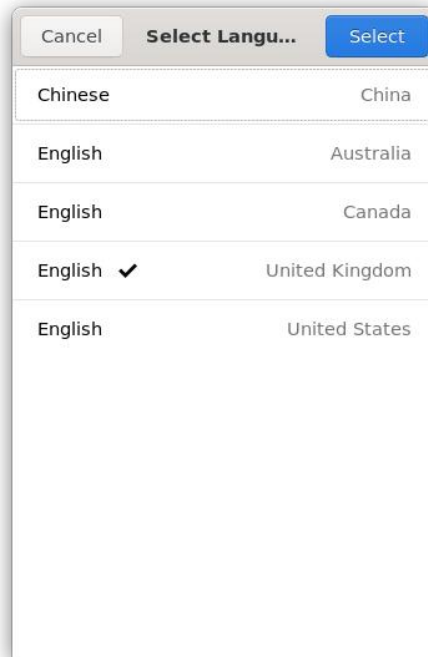


Figure 58 Language settings

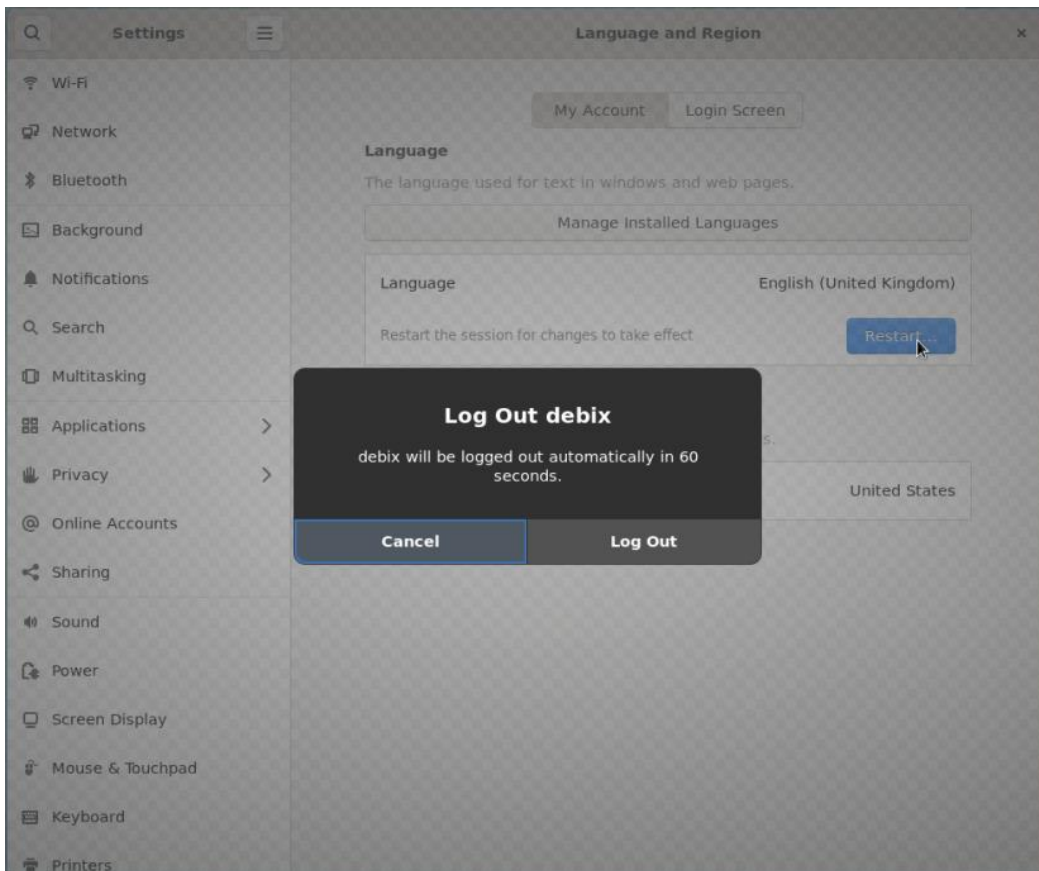


Figure 59 Restart to take effect settings

4.9. Usage of Display Screen

The three screens supported by DEBIX are as follows:

Table 13 Display Screen supported by DEBIX (Touchscreen with USB interface)

No	Screen Type	Specification Address
1	HC080IY28026-D60V.C(MIPI) 800x1280 8-inch MIPI display	https://debix.io/Uploads/Temp/file/20220921/HC080IY28026-D60V.C(800x1280)_Product+Spec.pdf
2	HC050IG40029-D58V.C(LVDS) 800x480 5-inch LVDS display	https://debix.io/Uploads/Temp/file/20220921/HC050IG40029-D58V.C(LVDS)%20800x480_Product%20Spec_220915.pdf
3	HC101IK25050-D59V.C(LVDS) 1024x600 10.1-inch LVDS display	https://debix.io/Uploads/Temp/file/20220921/HC101IK25050-D59V.C(LVDS)%201024x600_Product%20Spec_220915.pdf

1. Usage of HC080IY28026-D60V.C(MIPI) 800x1280 8-inch MIPI screen

- 1) **Component Preparation:** MIPI screen, DEBIX board, FPC cable, as shown in the figure below:

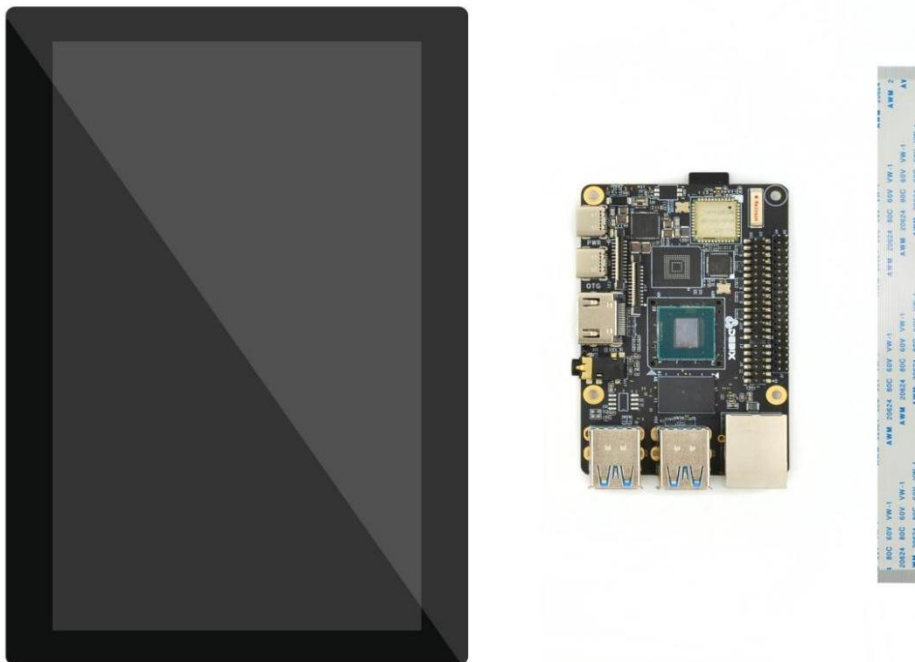


Figure 60

- 2) Use same-direction 24Pin FPC cable to connect to DSI interface (J13) of DEBIX, as

shown below:



Figure 61 Connect FPC cable to MIPI screen



Figure 62 Connect FPC cable to DEBIX



Figure 63 MIPI screen to DEBIX completed

3) DEBIX connected to the power supply, the MIPI screen displays the following figure:



Figure 64

2. Usage of HC050IG40029-D58V.C(LVDS) 800x480 5-inch LVDS screen

- 1) **Component Preparation:** LVDS screen, DEBIX board, LVDS screen cable, as shown in the figure below:

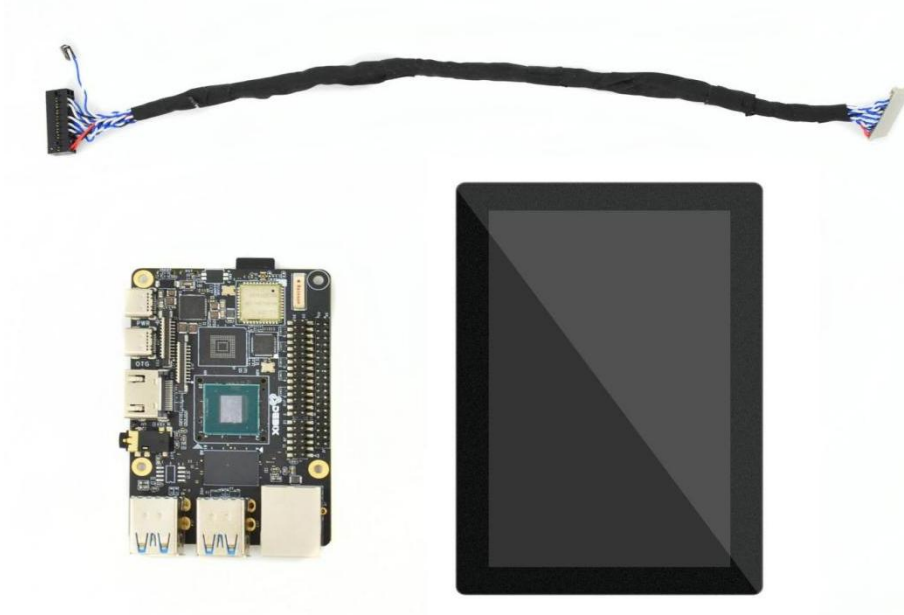


Figure 65

- 2) Plug the double-row female header of LVDS screen cable to LVDS interface (J10) of DEBIX, the red line should be connected to Pin1, Pin2; as for the sole 2Pin blue and white line, the blue line is LVDS VCC Power EN (Active High) connected to Pin36 of GPIO (J2), the white line is Backlight Power EN (Active High) and PWM connected to

Pin38 of GPIO (J2).

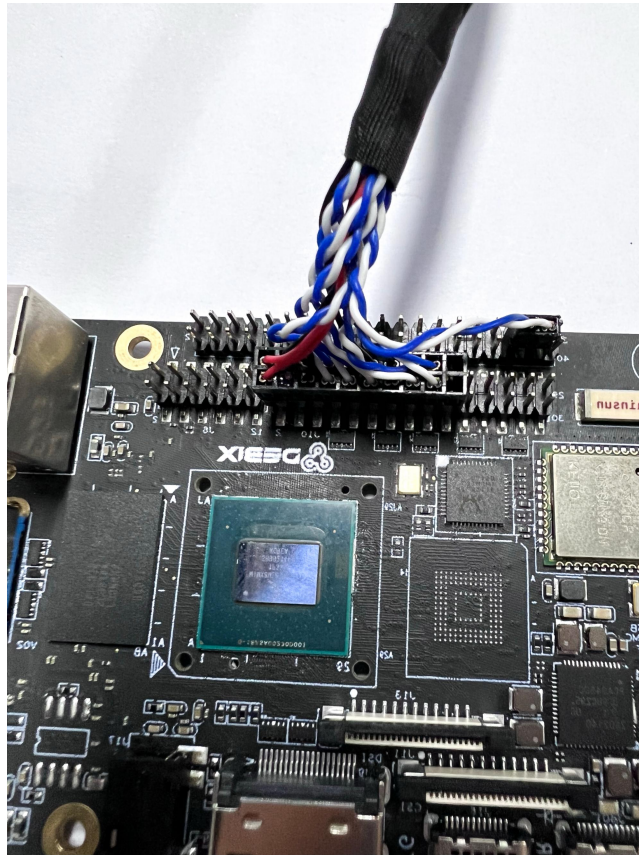


Figure 66 Connect LVDS screen cable to DEBIX



Figure 67 Connect LVDS screen cable to LVDS screen



Figure 68 LVDS screen to DEBIX completed

3) DEBIX connected to the power supply, the LVDS screen displays the following figure:



Figure 69

3. Usage of HC101K25050-D59V.C (LVDS) 1024x600 10.1-inch LVDS screen

- 1) **Component Preparation:** LVDS screen, DEBIX board, LVDS screen cable, as shown in the figure below:



Figure 70

- 2) Plug the double-row female header of LVDS screen cable to LVDS interface (J10) of DEBIX, the red line should be connected to Pin1, Pin2; as for the sole 2Pin blue and white line, the blue line is connected to Pin36 of GPIO (J2), the white line is connected to Pin38 of GPIO (J2).

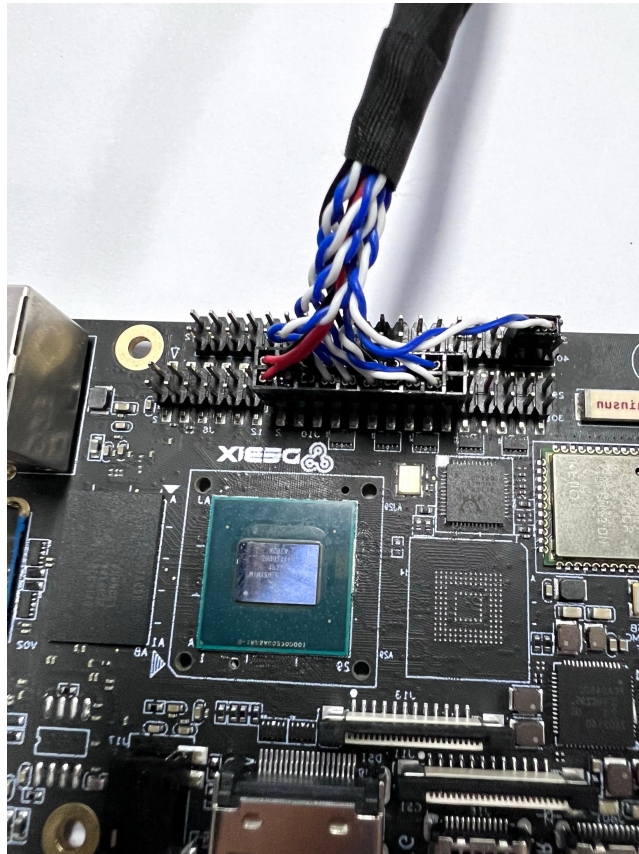


Figure 71 Connect LVDS screen cable to DEBIX



Figure 72 Connect LVDS screen cable to LVDS screen

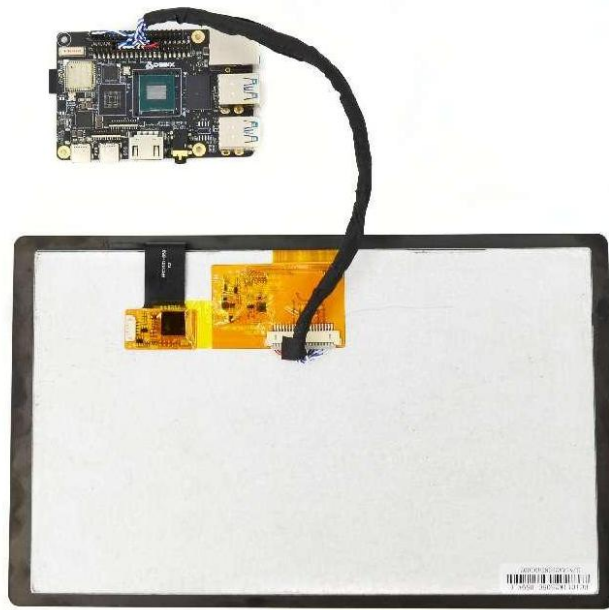


Figure 73 LVDS screen to DEBIX completed

3) DEBIX connected to the power supply, the LVDS screen displays the following figure:



Figure 74

4.10. Usage of Radar Module

Component Preparation

- Radar module, refer to [specification](#) of radar module
- Control board of the Radar module, refer to the [specification](#)
- Standard micro USB data cable
- Lead wire
- DEBIX board

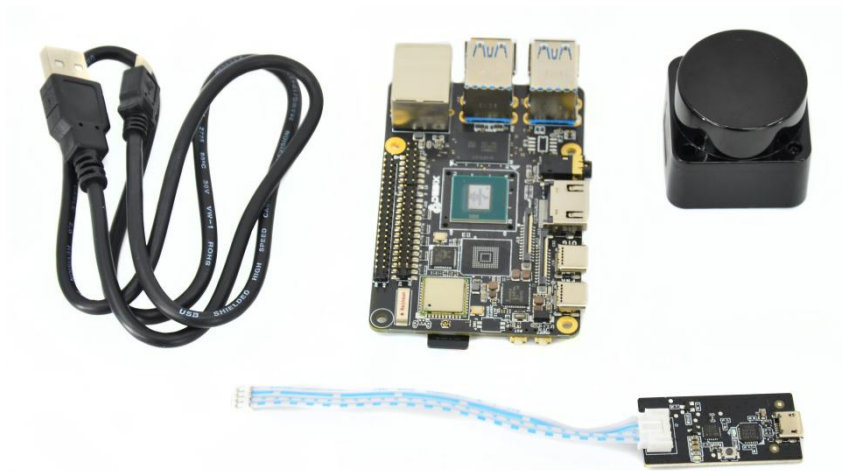


Figure 75



Figure 76 Radar module

1. Connect the Radar module with DEBIX via a micro USB data cable;

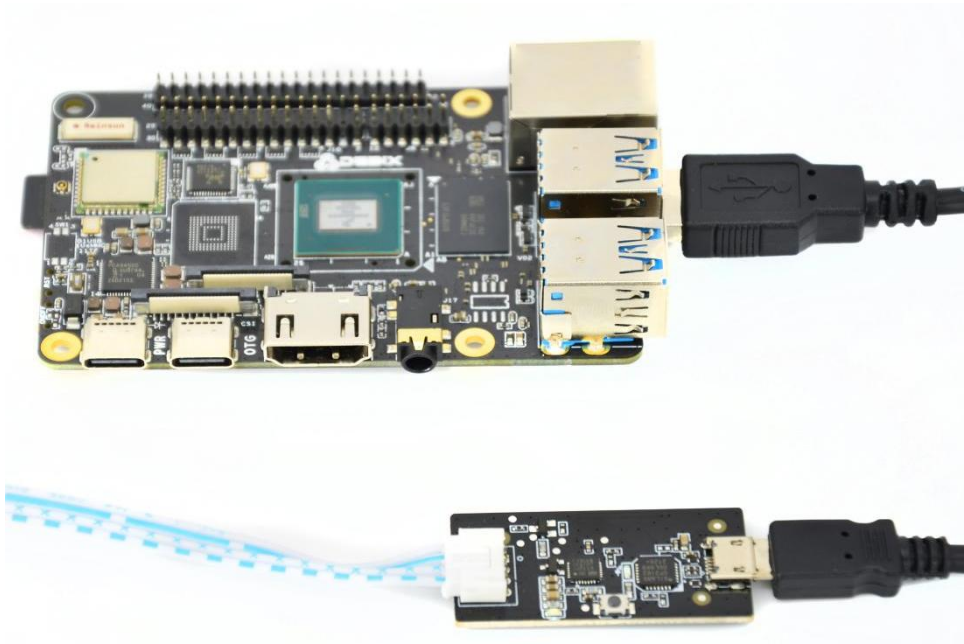


Figure 77

2. Connect the radar module to the radar module control board via Lead wire;



Figure 78

3. Radar module and DEBIX board connection is completed, as shown below:



Figure 79

4. Connect DEBIX with peripherals (keyboard, mouse, display) and insert the Micro SD card with DEBIX system, and power on DEBIX;

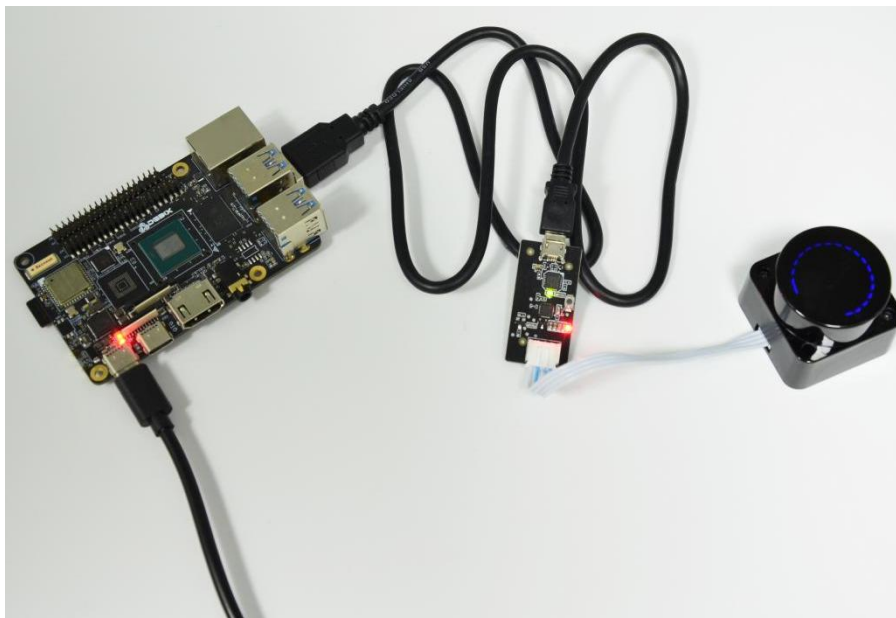


Figure 80

5. Open the Terminal, run the command `ldlidar_stl /dev/ttyUSB0`;
6. Radar begins to work, the above command will output data continuously; when the radar

module is covered, some data will change to 0, as shown below:

```
[ldrobot] angle: 315.51 distance(mm): 0 intensity: 232
[ldrobot] angle: 316.3 distance(mm): 0 intensity: 232
[ldrobot] angle: 317.09 distance(mm): 0 intensity: 231
[ldrobot] angle: 317.88 distance(mm): 0 intensity: 233
[ldrobot] angle: 318.67 distance(mm): 0 intensity: 232
[ldrobot] angle: 319.46 distance(mm): 0 intensity: 233
[ldrobot] angle: 320.25 distance(mm): 0 intensity: 235
[ldrobot] angle: 321.04 distance(mm): 0 intensity: 233
[ldrobot] angle: 321.83 distance(mm): 0 intensity: 232
[ldrobot] angle: 322.62 distance(mm): 0 intensity: 235
[ldrobot] angle: 323.41 distance(mm): 0 intensity: 234
[ldrobot] angle: 324.2 distance(mm): 0 intensity: 233
[ldrobot] angle: 324.99 distance(mm): 0 intensity: 235
[ldrobot] angle: 325.78 distance(mm): 0 intensity: 234
[ldrobot] angle: 326.57 distance(mm): 0 intensity: 235
[ldrobot] angle: 327.36 distance(mm): 0 intensity: 234
[ldrobot] angle: 328.15 distance(mm): 0 intensity: 232
[ldrobot] angle: 328.94 distance(mm): 0 intensity: 232
[ldrobot] angle: 329.73 distance(mm): 0 intensity: 236
[ldrobot] angle: 330.52 distance(mm): 0 intensity: 234
[ldrobot] angle: 331.31 distance(mm): 4 intensity: 234
[ldrobot] angle: 332.1 distance(mm): 0 intensity: 235
[ldrobot] angle: 332.89 distance(mm): 4 intensity: 234
[ldrobot] angle: 333.76 distance(mm): 0 intensity: 235
[ldrobot] angle: 335.69 distance(mm): 0 intensity: 238
[ldrobot] angle: 336.47 distance(mm): 0 intensity: 237
[ldrobot] angle: 337.25 distance(mm): 0 intensity: 238
[ldrobot] angle: 338.03 distance(mm): 0 intensity: 240
[ldrobot] angle: 338.81 distance(mm): 0 intensity: 242
[ldrobot] angle: 339.59 distance(mm): 3 intensity: 241
[ldrobot] angle: 340.37 distance(mm): 0 intensity: 243
[ldrobot] angle: 341.12 distance(mm): 3 intensity: 244
[ldrobot] angle: 341.91 distance(mm): 3 intensity: 247
[ldrobot] angle: 342.7 distance(mm): 3 intensity: 246
[ldrobot] angle: 343.49 distance(mm): 3 intensity: 248
[ldrobot] angle: 344.28 distance(mm): 3 intensity: 249
[ldrobot] angle: 345.07 distance(mm): 3 intensity: 248
[ldrobot] angle: 345.86 distance(mm): 3 intensity: 249
[ldrobot] angle: 346.65 distance(mm): 3 intensity: 247
[ldrobot] angle: 347.44 distance(mm): 3 intensity: 245
[ldrobot] angle: 348.23 distance(mm): 3 intensity: 243
[ldrobot] angle: 349.02 distance(mm): 3 intensity: 239
[ldrobot] angle: 349.81 distance(mm): 3 intensity: 240
[ldrobot] angle: 350.6 distance(mm): 0 intensity: 237
[ldrobot] angle: 351.37 distance(mm): 0 intensity: 237
[ldrobot] angle: 352.14 distance(mm): 0 intensity: 238
[ldrobot] angle: 352.91 distance(mm): 3 intensity: 236
[ldrobot] angle: 353.68 distance(mm): 0 intensity: 236
[ldrobot] angle: 354.45 distance(mm): 0 intensity: 235
[ldrobot] angle: 355.22 distance(mm): 0 intensity: 237
[ldrobot] angle: 355.99 distance(mm): 0 intensity: 234
[ldrobot] angle: 356.76 distance(mm): 0 intensity: 237
[ldrobot] angle: 357.53 distance(mm): 0 intensity: 237
[ldrobot] angle: 358.3 distance(mm): 3 intensity: 236
[ldrobot] angle: 359.07 distance(mm): 0 intensity: 238
[ldrobot] angle: 359.87 distance(mm): 0 intensity: 239
[ldrobot] speed(Hz): 10.0222
```

4.11. Usage of GPIO

DEBIX OS has built-in GPIO interface operation command, you can set GPIO by GPIO command.

IMPORTANT

The GPIO voltage input of DEBIX Mode A/B only supports 3.3V. If the input is higher than 3.3V, it may cause damage to the GPIO interface and CPU.

1. In the terminal window, type command `debix-gpio` to print out the use of GPIO as follows:

```
debix@imx8mpevk:~$ debix-gpio
Debix gpio control
Usage
debix-gpio <gpioName> <mode> [value]/[edge]
gpioName: input gpioName
mode      : in/out mode
value     : out mode 0=low 1=high
edge      : in mode 0=none 1=rising 2=falling 3=both
eg. debix-gpio GPIO1_IO12 out 1
eg. debix-gpio GPIO1_IO12 in 3
debix-gpio <showGpioName>
showGpioName: list gpio names
```

- Command Format: `debix-gpio <gpioName> <mode> [value]/[edge]`
 - `gpioName`: GPIO interface name, for example: `GPIO1_IO11`
 - `mode`: GPIO mode, respectively out (output) and in (input)
 - `value`: When mode is out (output), the value attribute takes effect; the value can be 0 or 1, 0 means output low level, 1 means output high level
 - `Edge`: When mode is in (input), the edge attribute takes effect; there are 4 GPIO states: 0-none, 1-rising, 2-falling, 3-both
- 2. Type command `debix-gpio showGpioName` to print out the definition of the GPIO interface and the location on the board, as follows:

```

debix@imx8mpevk:~$ debix-gpio showGpioName
 39 00000000000000000000000000000001 J2
 40 00000000000000000000000000000002
LVDS 000000000000000000000000000000 LAN
00000000000000000000000000000000
Wi-Fi
DEBIX
SoC
RAM
USB3
USB3
DSI
CSI
pwr otg HDMI H P
SoC      : i.MX 8M Plus
RAM      : 2G
Storage  : MicroSD
USB ports: 4
Ethernet ports : 1 (1000Mbps max. speed)
Wi-fi    : True
Bluetooth: True
Camera ports (CSI) : 1
Display ports (DSI): 1

J2:
POE_VA1 (1) (2) POE_VA2
POE_VB1 (3) (4) POE_VB2
GND     (5) (6) VDD_5V
GND     (7) (8) VDD_5V
UART2_RXD (9) (10) ONOFF
UART2_TXD (11) (12) SYS_nRST
UART3_RXD (13) (14) ECSPi1_SS0
UART3_TXD (15) (16) ECSPi1_MOSI
UART4_RXD (17) (18) ECSPi1_MISO
UART4_TXD (19) (20) ECSPi1_SCLK
I2C4_SCL (21) (22) ECSPi2_SS0
I2C4_SDA (23) (24) ECSPi2_MOSI
I2C6_SCL (25) (26) ECSPi2_MISO
I2C6_SDA (27) (28) ECSPi2_SCLK
GPIO1_I011 (29) (30) GPIO1_I012
CAN1_TXD (31) (32) GPIO1_I013
CAN1_RXD (33) (34) GPIO5_I003
CAN2_TXD (35) (36) GPIO5_I004
CAN2_RXD (37) (38) GPIO3_I021
GND      (39) (40) GND
  
```

3. Example: Set GPIO5_I003 to output high, type command `debix-gpio GPIO5_I003 out 1`, GPIO5_I003 will output 3.3V.
4. Example: Set GPIO5_I003 to input rising edge, type command `debix-gpio GPIO5_I003`

in 1, if Pin34 (GPIO5_IO03) detects power, the message INFO: pin:131 value=1; if the power is disconnected, the message INFO: pin:131 value=0.

```
debix@imx8mpevk:~$ debix-gpio GPIO5_IO03 in 1
Debix gpio contrl
INFO:GPIO_NAME = GPIO5_IO03(131)
INFO:GPIO_MODE = in
INFO:GPIO_FLAG = RISING
INFO:pin:131 value=0
INFO:pin:131 value=1
```

4.12. Usage of UART

DEBIX has three UART serial ports, of which UART2 is used as a UART TTL 3.3V system debug serial port.

Table 14 Pin definition of UART

Function	Interface	Pin	Definition	Device Node
UART	J2	9	UART2_RXD	
		11	UART2_TXD	
		13	UART3_RXD	/dev/ttymx2
		15	UART3_TXD	
		17	UART4_RXD	/dev/ttymx3
		19	UART4_TXD	

UART connection:

Take UART3 as an example, you need to short UART3_RXD and UART3_TXD of the UART interface as shown below:

UART/I2C/CAN/GPIO/SPI...

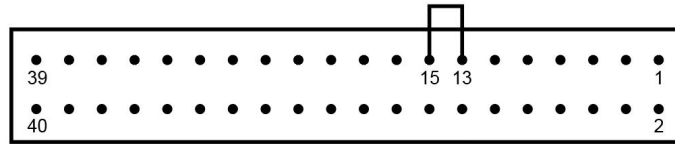


Figure 81 UART3 short jumper

Verify UART3 communication:

1. Open Terminal on DEBIX and run the following command to install the cutecom serial port tool:

```
sudo apt update
sudo apt install cutecom qtwayland5
```

2. Open **cutecom** tool and set the serial port parameters as shown in the following table:

Table 15 Parameter setting of Cutecom

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

3. Set **Device** to `/dev/ttymx2` and click **Open**.

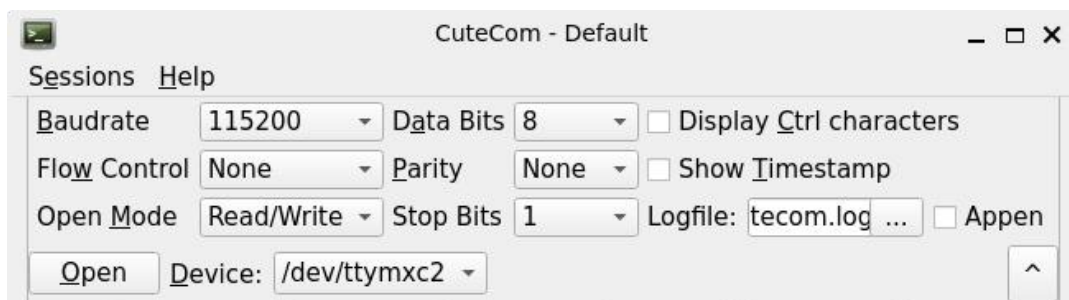


Figure 82 Device node setting

4. **Send and Receive:** Type the test string in the input box of the cutecom window, press **Enter** to send, and you can receive the same message in the receive box, as shown in the following figure:

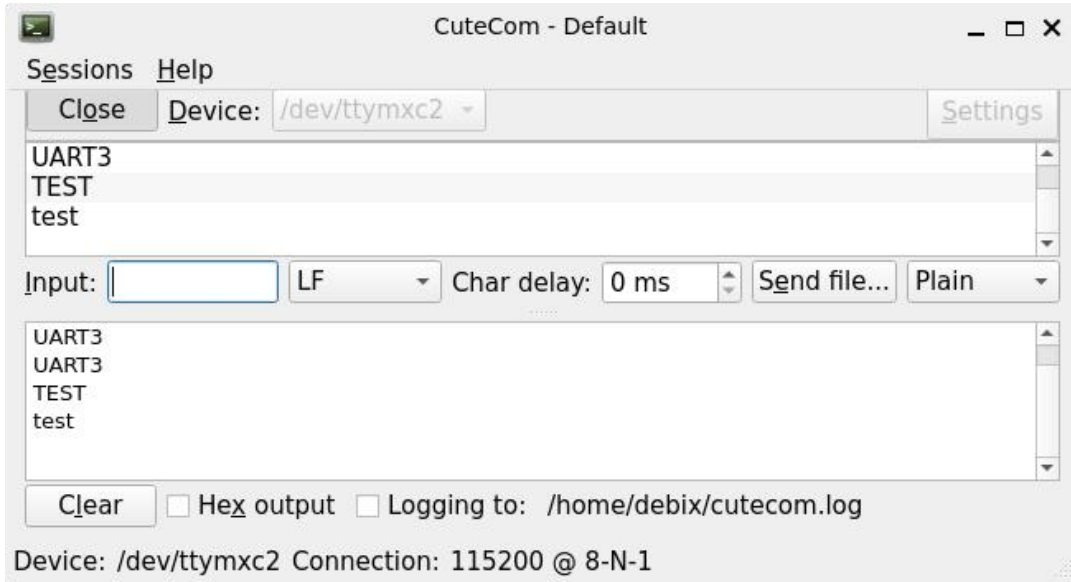


Figure 83 UART self-sending and self-receiving

4.13. Usage of CAN


DEBIX has two CAN communication interfaces. The CAN interface needs to be used in conjunction with a CAN transceiver peripheral for CAN communication, such as DEBIX I/O Board, or other CAN transceiver modules.

Table 16 Pin definition of CAN

Function	Interface	Pin	Definition	Device Node
CAN	J2	31	CAN1_TXD	can0
		33	CAN1_RXD	
		35	CAN2_TXD	can1
		37	CAN2_RXD	

For CAN verification, refer to the CAN verification description of the [DEBIX I/O Board](#).

4.14. DEBIX shutdown

1. Click on Power button  in the upper right corner of the DEBIX desktop to display the Power tab, which allows you to operate the computer by selecting “Log Out”, “Suspend”, “Restart”, or “Power Off”.
 - **Log Out:** Logs out the currently logged in user;
 - **Suspend:** Set the computer to standby, press the power button of DEBIX board without start the system and restore the original state, eliminating the tedious startup process and increase the life of the computer;
 - **Restart:** Restart the computer;
 - **Power Off:** Shut down the computer normally.

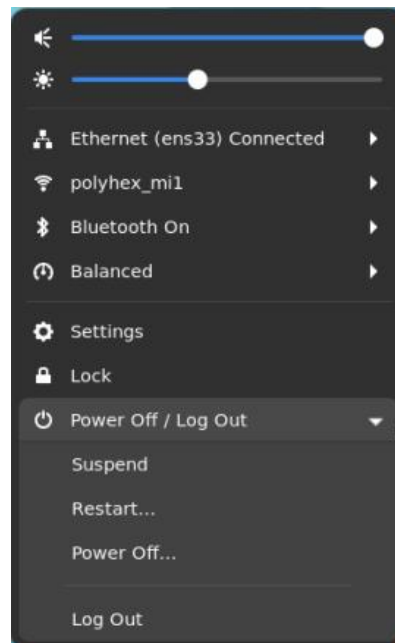


Figure 84

2. **Suspend:** Click **Suspend**, the display will turn black, and the status indicator (red) on DEBIX board will be off.
 - **Another method:** you can set the delay time of Suspend in the **Power** of **Settings** app, and first set "Automatic Suspend" as **On**, as shown below:

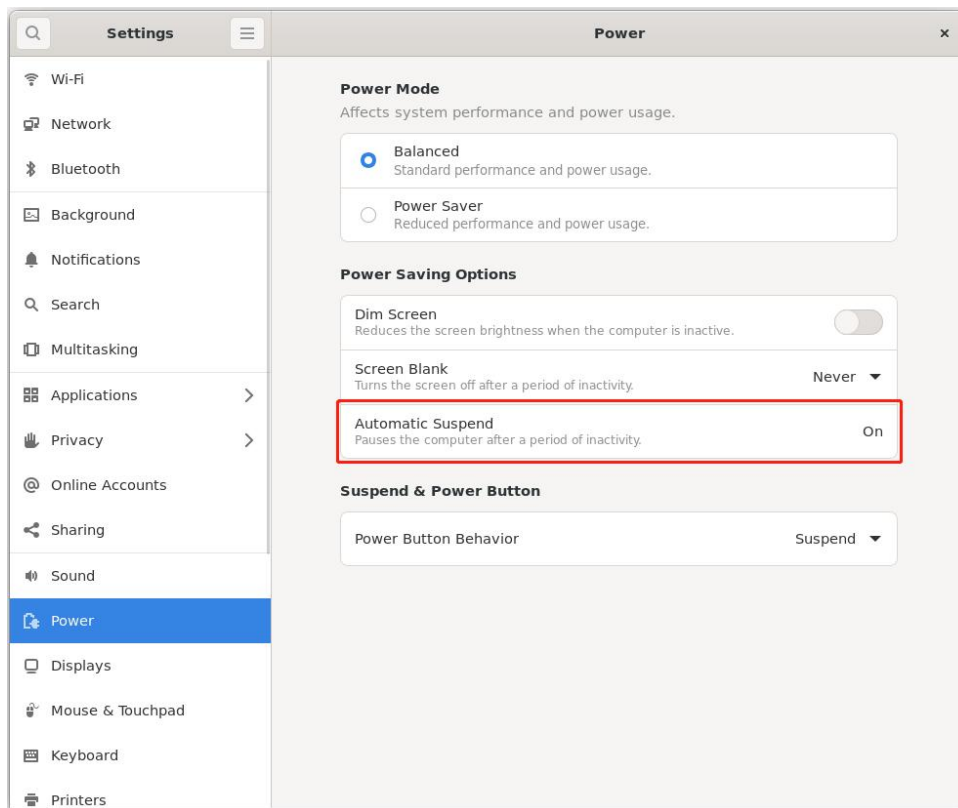


Figure 85 Automatic Suspend

- pop-up "Automatic Suspend" dialog box, set the device idle **Delay** time; before the device Suspend, a reminder message "**Automatic suspend: Suspending soon because of inactivity.**" will be displayed on the top of desktop.



Figure 86 Set "Delay" time

- When the delay time is reached, the device suspends, the display turns black and the status indicator goes off.
3. **Shutdown:** Click **Power Off**, wait for the display to turn black and the status indicator (red) on DEBIX board to off completely, and then finally disconnect the power.

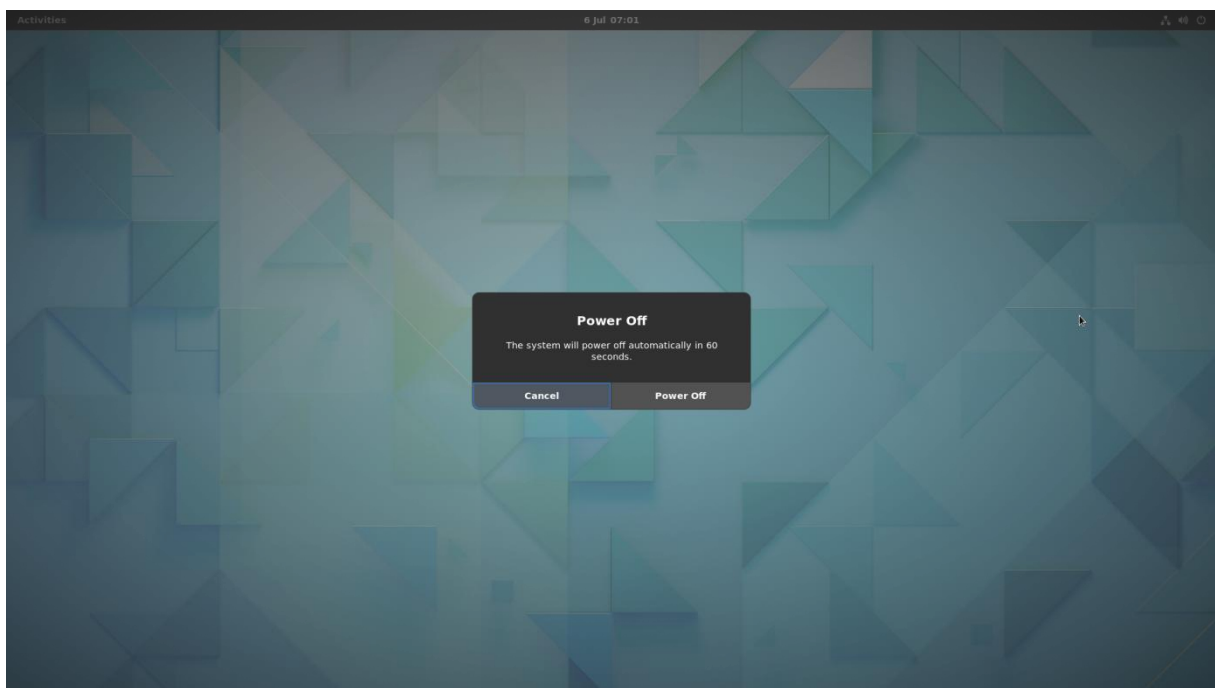


Figure 87

4.15. Heat Dissipation

When a DEBIX single board computer runs for a prolonged period of time, it will result in an increase in its CPU temperature. Therefore, implementations should be considered to cool the CPU and the entire device passively. If the CPU needs to be cooled, the following two methods are recommended:

- Use CPU aluminum alloy heatsink: Paste aluminum alloy heatsink directly above the CPU for heat dissipation, as shown below:

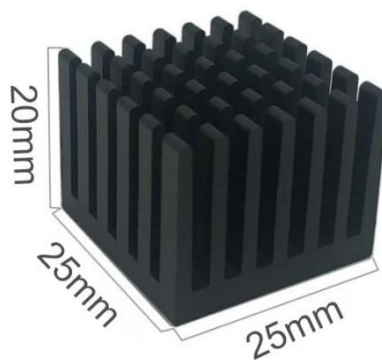


Figure 88 Aluminum alloy heatsink

- Use the official DEBIX Enclosure: Install DEBIX SBC inside the DEBIX Enclosure and dissipate heat through the aluminum alloy material, as shown below:



Figure 89 DEBIX Enclosure

4.16. Multi-screen unique display

NOTE

DEBIX supports multi-screen unique display by default in Ubuntu. When DEBIX is configured with multiple displays, drag mouse to operate on other displays.

When DEBIX is connected to other displays other than HDMI, the device tree needs to be switched. After restarting, the default multi-screen display effect. Take an 8-inch MIPI screen (model: HC080IY28026-D60V.C) as an example:

- **Set multi-screen unique display**
 1. After connecting DEBIX to HDMI display and 8-inch MIPI screen, start DEBIX;
 2. Enter the DEBIX system desktop, select **Add-on Board APP**, and switch to the corresponding device tree;

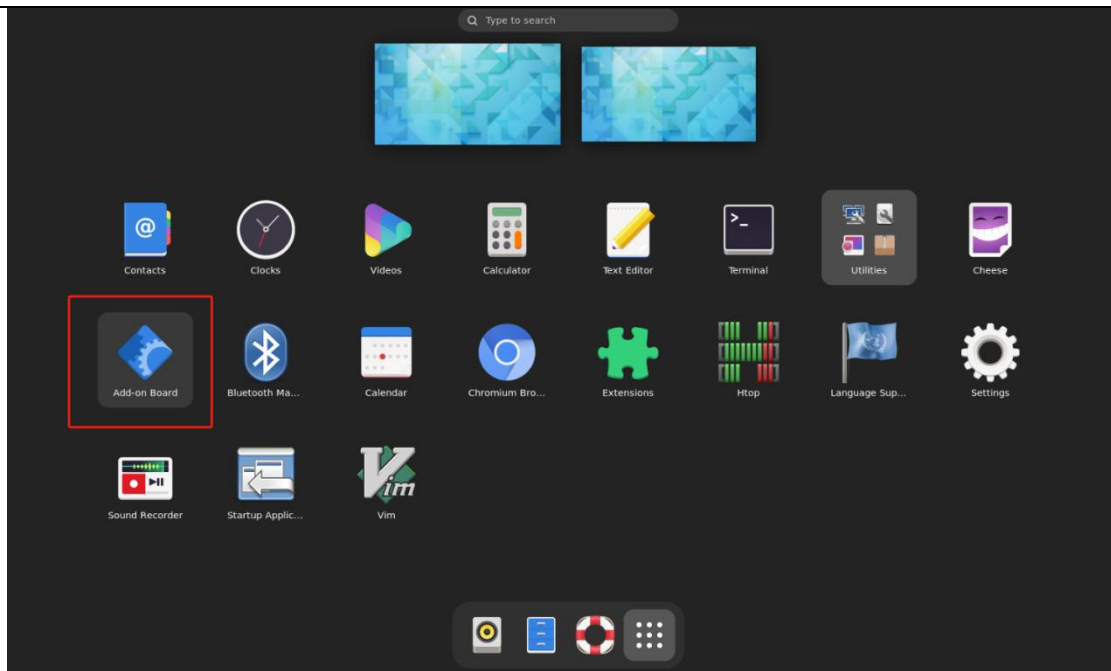


Figure 90

3. In the pop-up "DEBIX add on board dtb file selection" window, select **Debix board** and click **OK**.

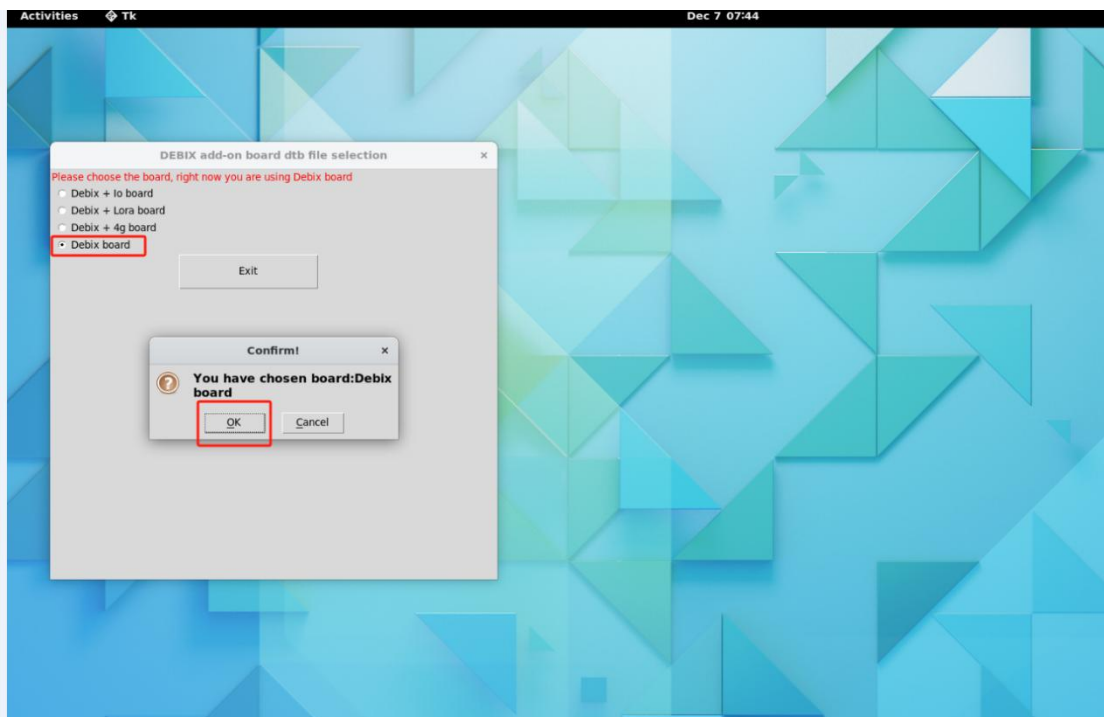


Figure 91

4. Check "Debix 8" HC0801Y28026-D60V.C", click **OK**.

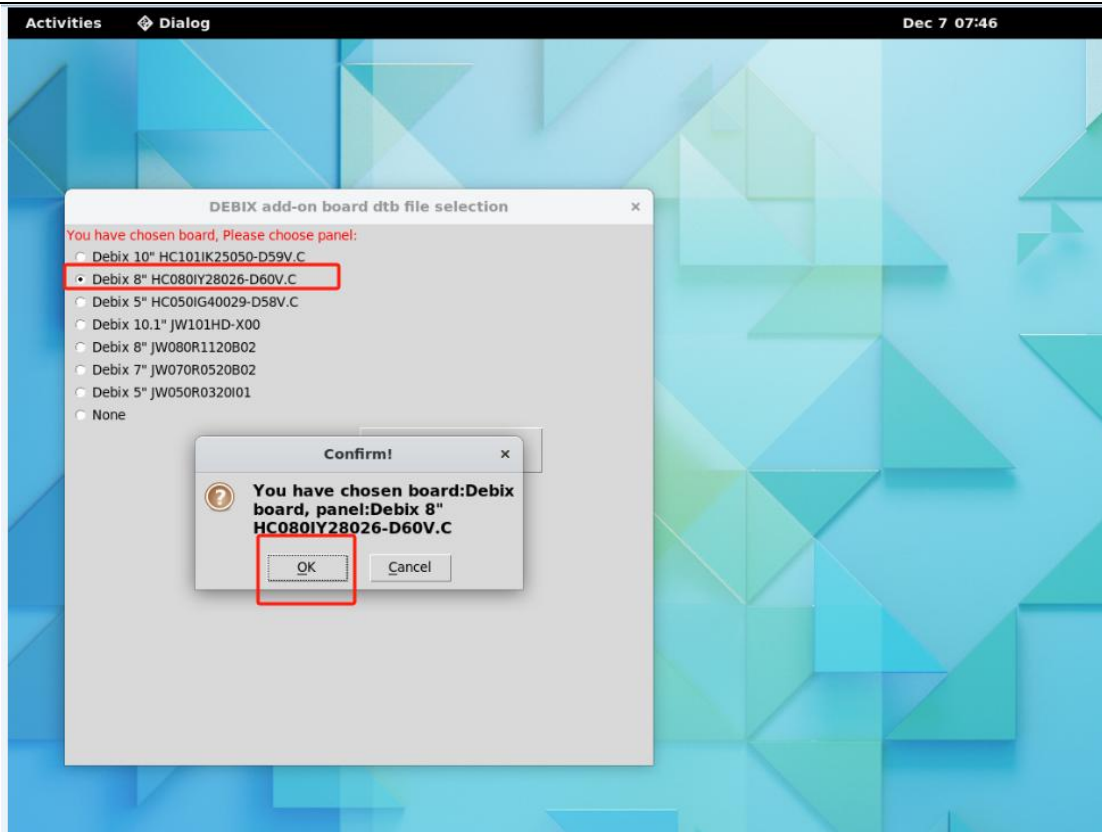


Figure 92

5. Click **Start**, and click **OK** to reboot DEBIX.

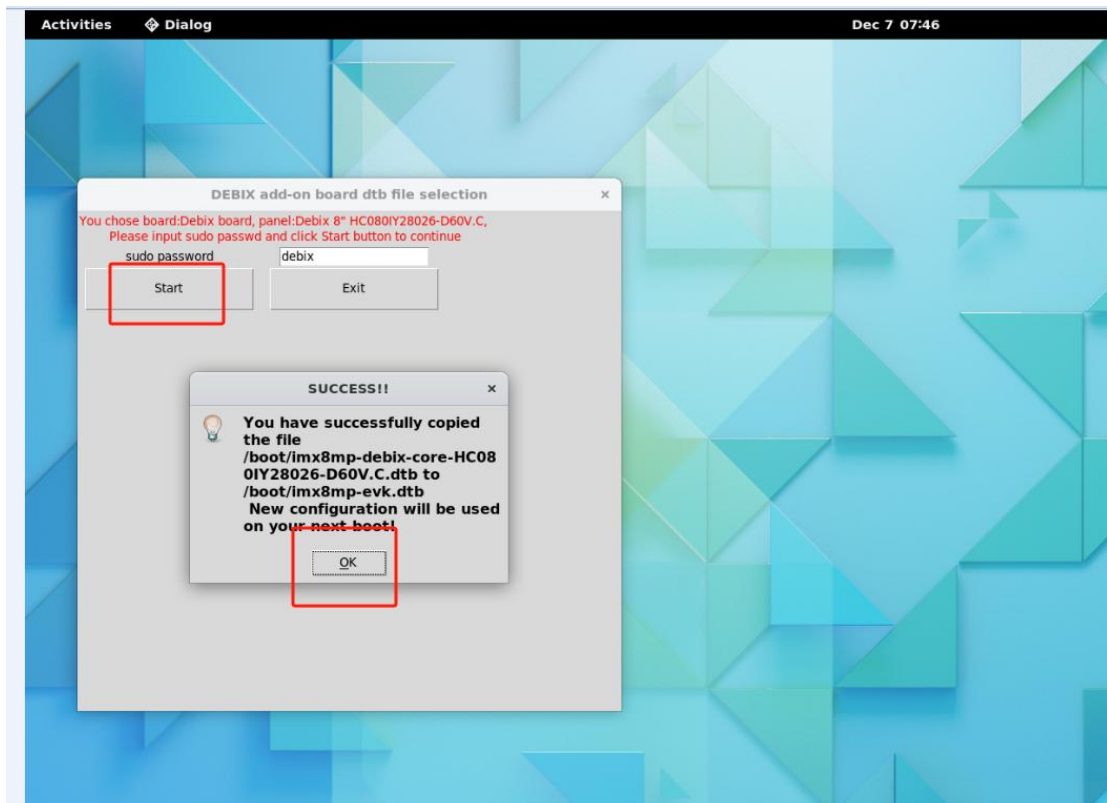


Figure 93

6. After DEBIX restarts, the display setting will be dual screen unique display by default.

● **Set Primary display (take setting HDMI as the primary display as a example)**

1. On the DEBIX system desktop, select **Settings** APP, and select **Displays** function with “Settings” page;
2. **Set HDMI as the primary display:** in the “Displays” window, set “Primary Display” to **AOC 22** (HDMI display model);

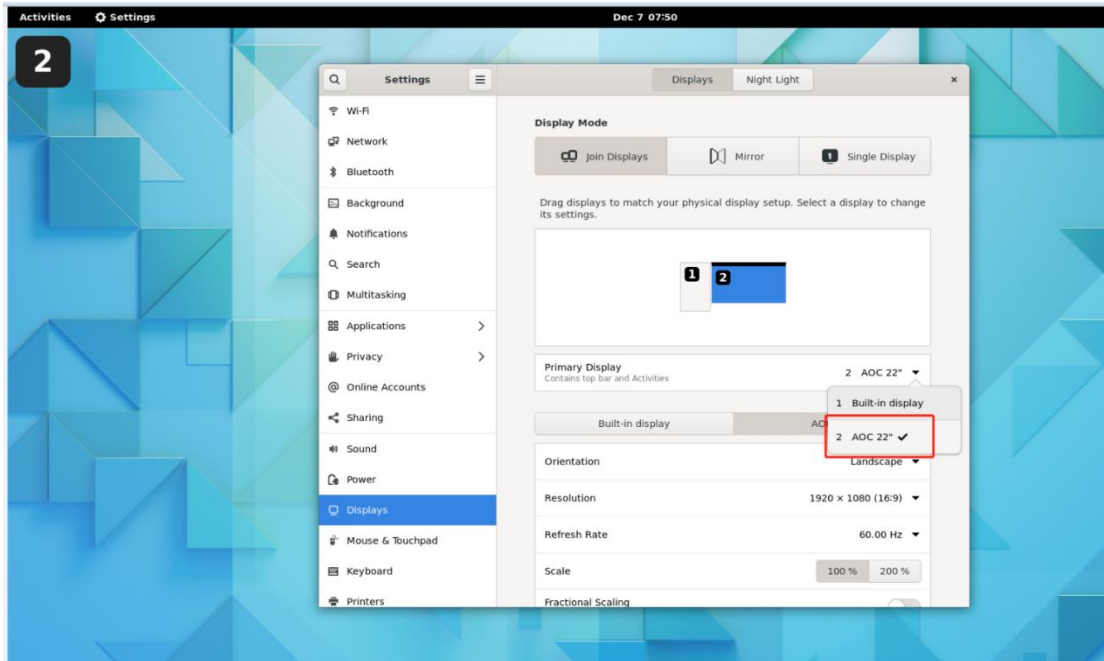


Figure 94

3. Click **Restart** in the upper right corner of the DEBIX desktop to restart DEBIX.
4. After DEBIX restarts, the HDMI display is the primary display and the MIPI display is the secondary display.

Chapter 5 Add-on Boards of DEBIX

5.1. DEBIX I/O Board

DEBIX I/O Board is an add-on board designed for DEBIX Model A and DEBIX Model B SBC. It adds one RJ45 Gigabit network interface and PoE capability to DEBIX Model A/B. It comes with RS232, RS485 and CAN Transceiver to allow connection with more industrial equipment, and its strong expansion ability brings unlimited possibilities.

Please refer to [DEBIX I/O Board User Manual](#) for detailed interface and usage information.

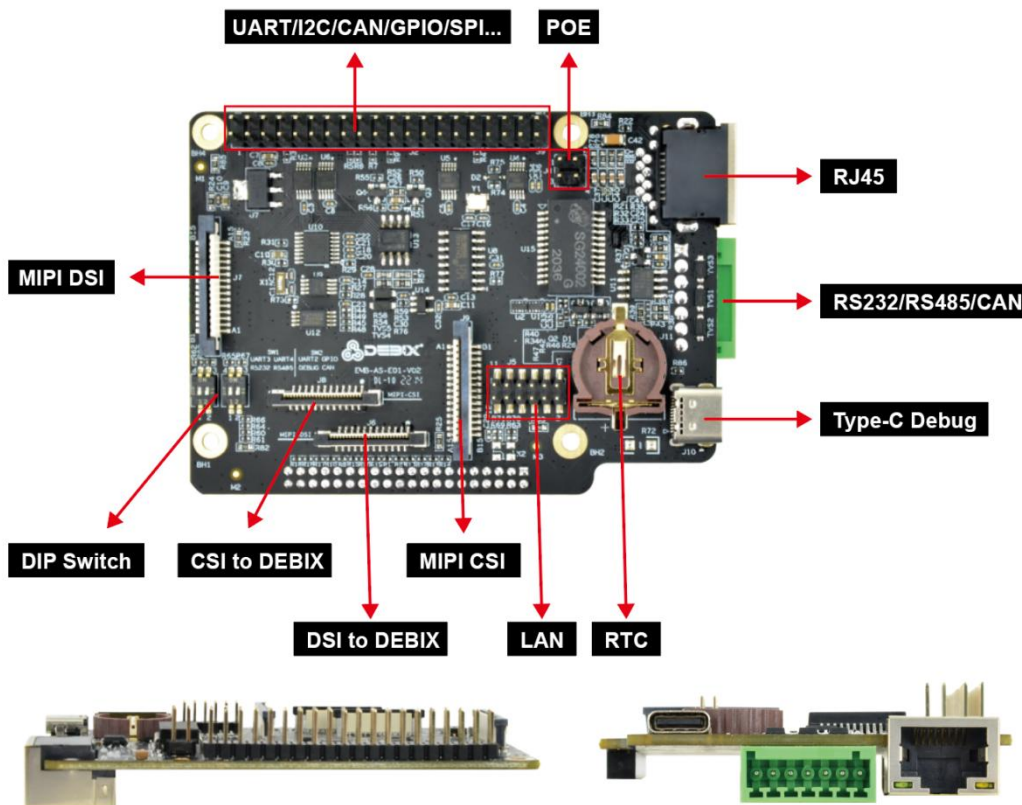


Figure 95 DEBIX I/O Board

5.2. DEBIX LoRa Board

DEBIX LoRa Board is compatible with DEBIX Model A/B and provides a Mini PCIe interface for LoRa Module. LoRa enables long-range transmissions with low power consumption. In

In addition to a LoRa Antenna Connector, it also has a Wifi Antenna Connector and Bluetooth Pairing Button.

Please refer to [DEBIX LoRa Board User Manual](#) for detailed interface and usage information.

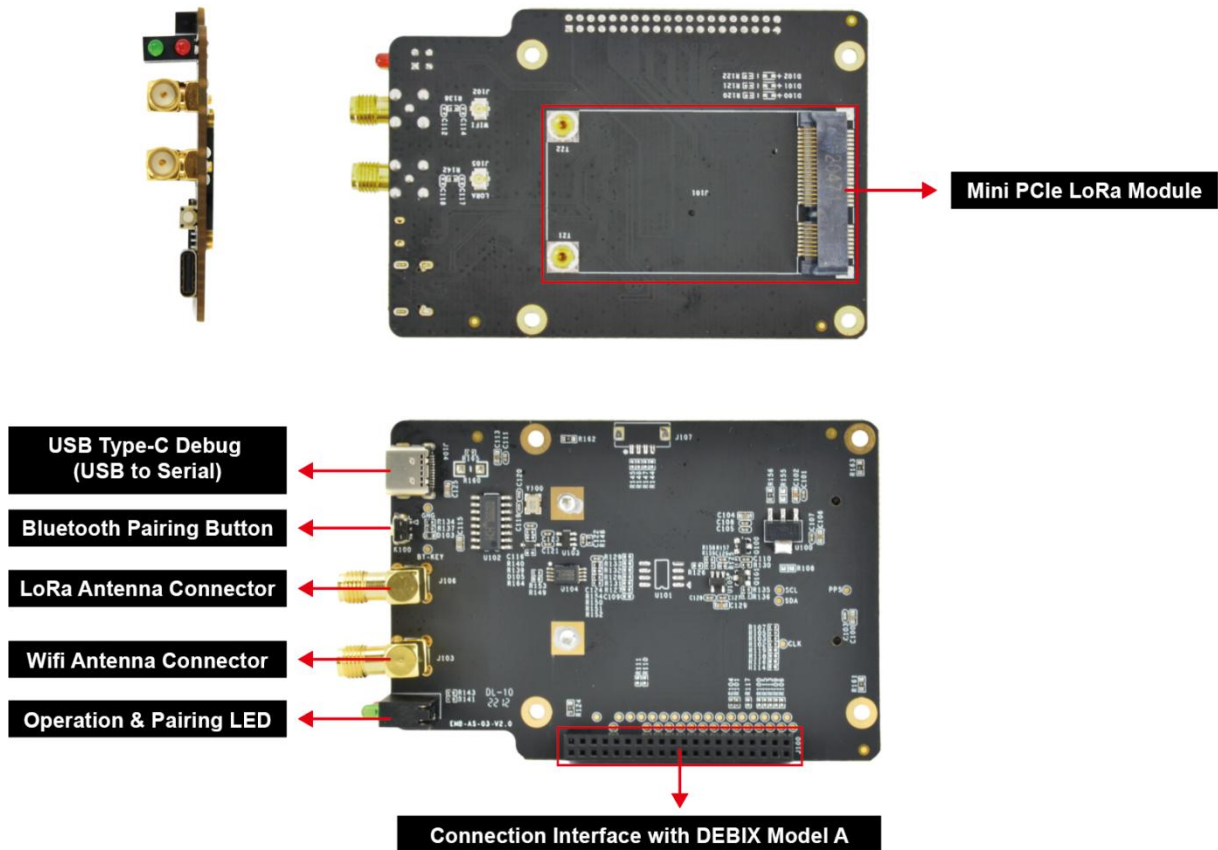


Figure 96 DEBIX LoRa Board

5.3. DEBIX 4G Board

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

Please refer to [DEBIX 4G Board User Manual](#) for detailed interface and usage information.

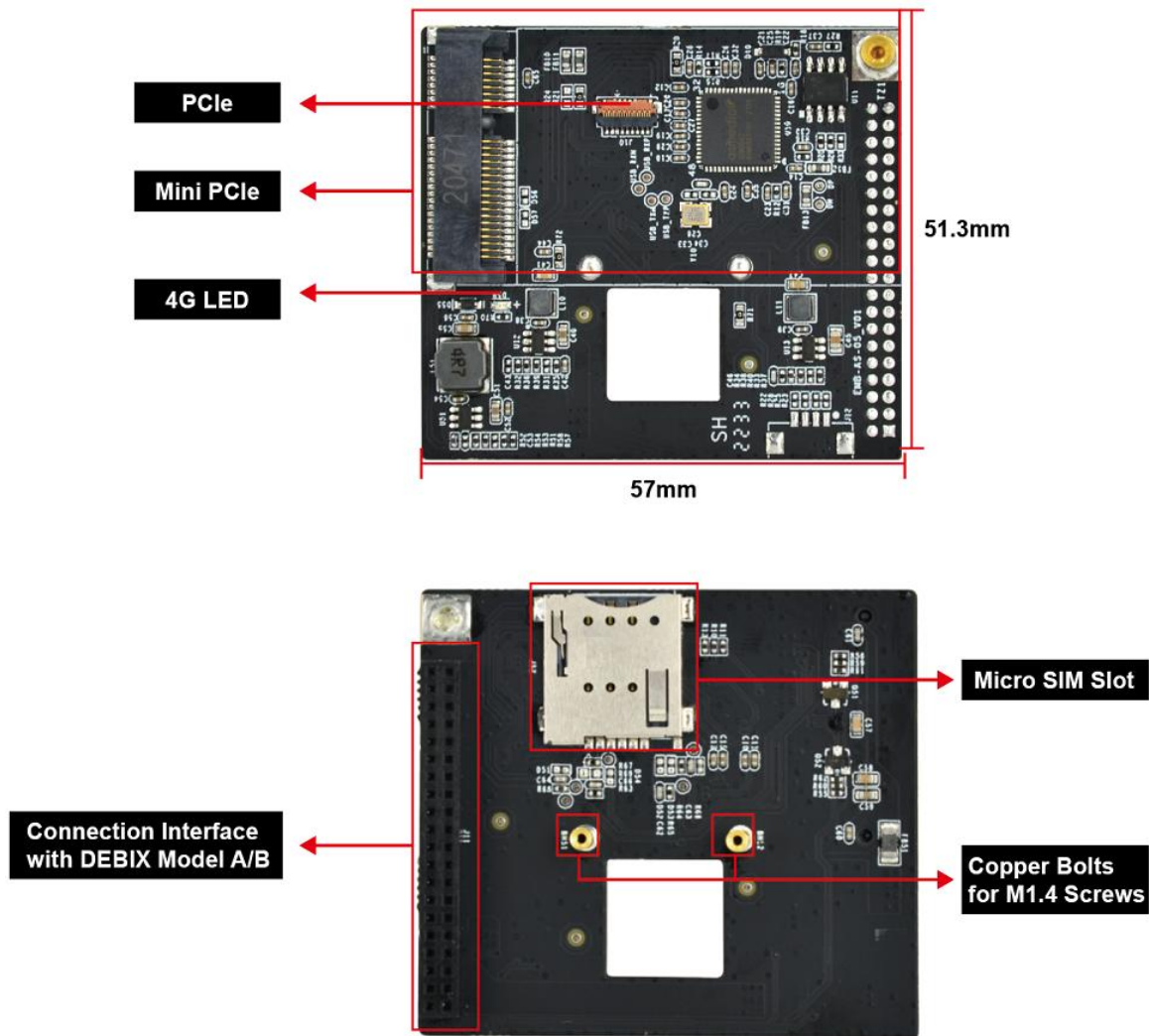


Figure 97 DEBIX 4G Board

5.4. DEBIX POE Module

DEBIX PoE Module is compatible with DEBIX Model A and DEBIX Model B SBC. PoE Module supports DC 5V/4A power output, which provides stable DC power for DEBIX Model A/B SBC and reduces the cost of constructing network infrastructure.

Please refer to [DEBIX POE Module User Manual](#) for detailed interface and usage information.

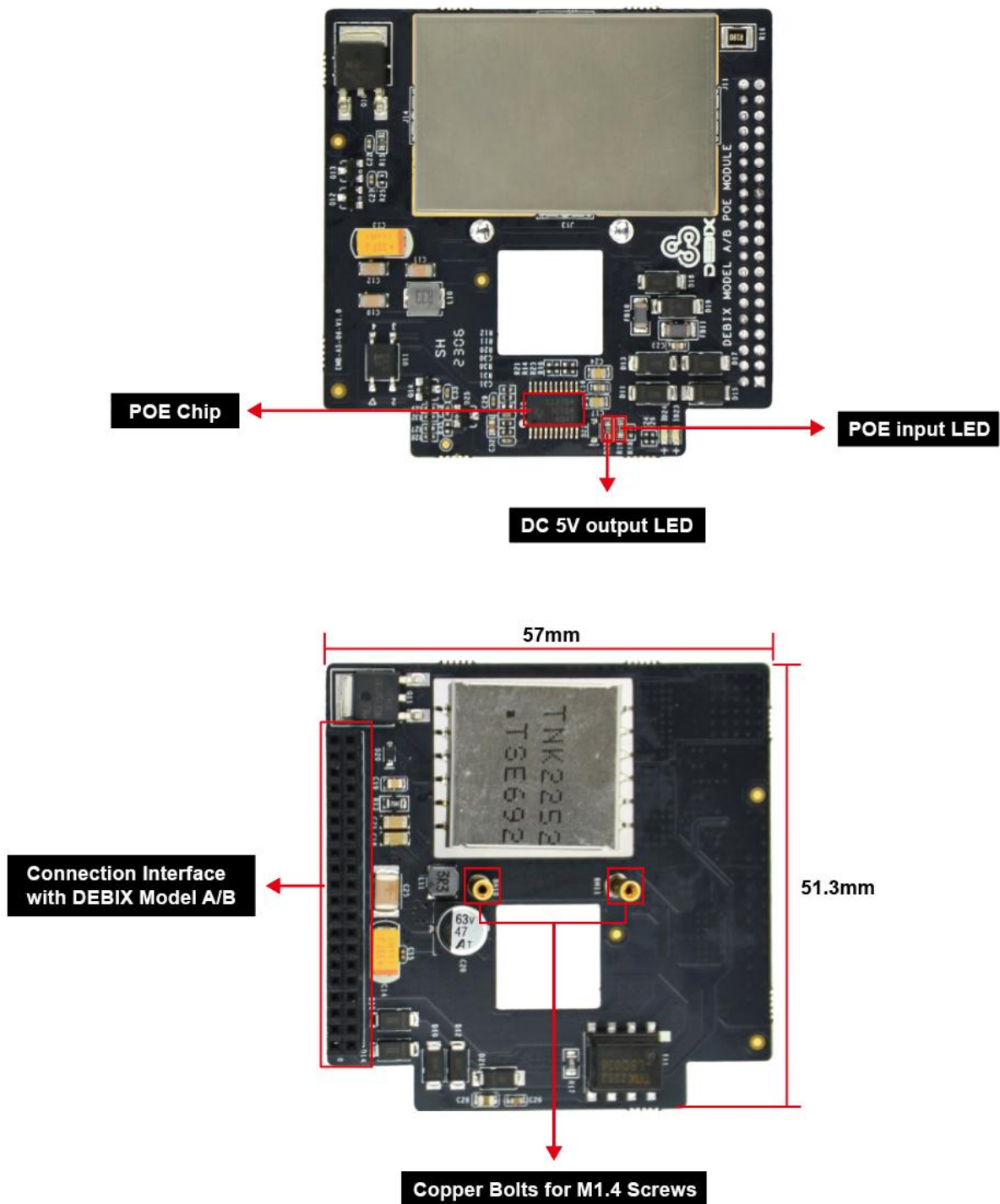


Figure 98 DEBIX POE Module

5.5. DEBIX Camera Module

DEBIX Camera Module is a camera module designed for DEBIX. Currently there are three

types of camera modules: DEBIX Camera 200A Module, DEBIX Camera 500A Module and DEBIX Camera 1300A Module.

- DEBIX Camera 200A Module: a small camera with a GC2145 sensor.
- DEBIX Camera 500A Module: a compact camera with a 5MP OV5640 sensor.
- DEBIX Camera 1300A Module: a small HD camera with a 13 megapixel AR1335 sensor.

Please refer to [DEBIX Camera Module User Manual](#) for detailed interface and usage information.

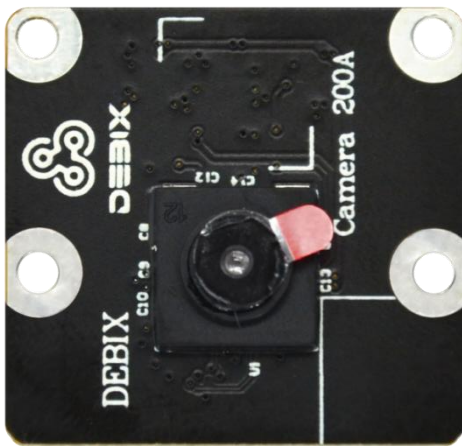


Figure 99 DEBIX Camera 200A Module

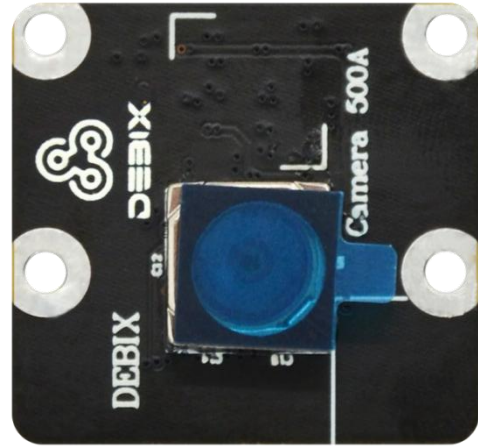


Figure 100 DEBIX Camera 500A Module

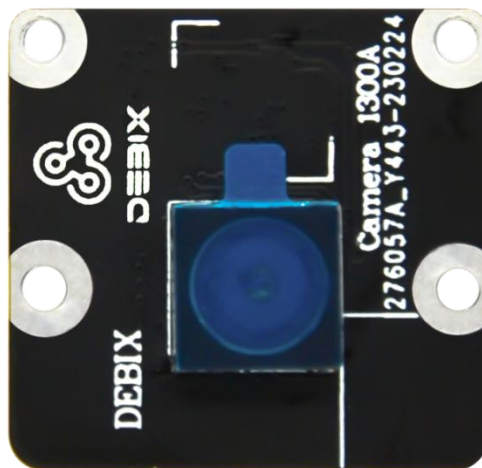


Figure 101 DEBIX Camera 1300A Module