DEBIX Model S User Guide

Version: V1.0 (2024-06)

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

DEBIX Model S is the first DEBIX single board computer to feature the NXP i.MX 6ULL, a low-power processor rating up to 792MHz with only 0.53 watt of power at full load consumption.

Designed to provide a more energy-efficient and cost-effective solution for smart edge computing, DEBIX Model S mainly provides 2 x 100Mbps Ethernet ports, 2.4GHz WiFi, BT5.1, 2 x USB 2.0, 1 x 24bit RGB Display Output, 1 x 8bit DVP Parallel CSI Camera, and 40Pin Expansion Port for IoT Edge, Non-contact HMI, smart home, building control and industrial applications.

Figure 1 DEBIX Model S

REVISION HISTORY		
Rev.	**Date**	**Description**
1.0	2023.06.20	First edition

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Chapter 1 Security

1.1. Safety Precaution

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

Table 1 Terms and conventions

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

1.2. Safety Instruction

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

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

2．Keep the device away from moisture.

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

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

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

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

overvoltage.

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

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

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

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

10. Do not place the device 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 met the following certifications:

Table 2 Compliance Certification

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

	This equipment has passed UKCA certified.
	This equipment has passed PSE 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 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@debix.io*

Chapter 2 DEBIX Model S Introduction

DEBIX Model S is single board computer based on NXP i.MX 6ULL, which can be widely used in smart home, industrial applications, edge computation, non-contact HMI, security monitoring etc..

Main features:

- Low-power processor with NXP i.MX 6ULL/MCIMX6Y2CVM08AB, 512MB DDR3/DDR3L, and 8GB eMMC onboard, consuming only 0.53 watts at full load (Extended Industrial grade, Industrial grade and Commercial grade processor optional).
- Feature an advanced implementation of a single Arm® Cortex®-A7 core, which operates at speeds up to 792 MHz.
- High security with support for secure encryption, tamper-proof monitoring, secure boot, and more.
- Rich and extensible interfaces: 4 x USB 2.0 Host, 1 x 24bit RGB, 1 x 8bit DVP CSI, 40Pin dual-row headers etc. to enhance scalability.
- Compatible with DEBIX PoE module and DEBIX 5" LCD monitor.
- Support Yocto, OpenWRT.

2.1. Overview

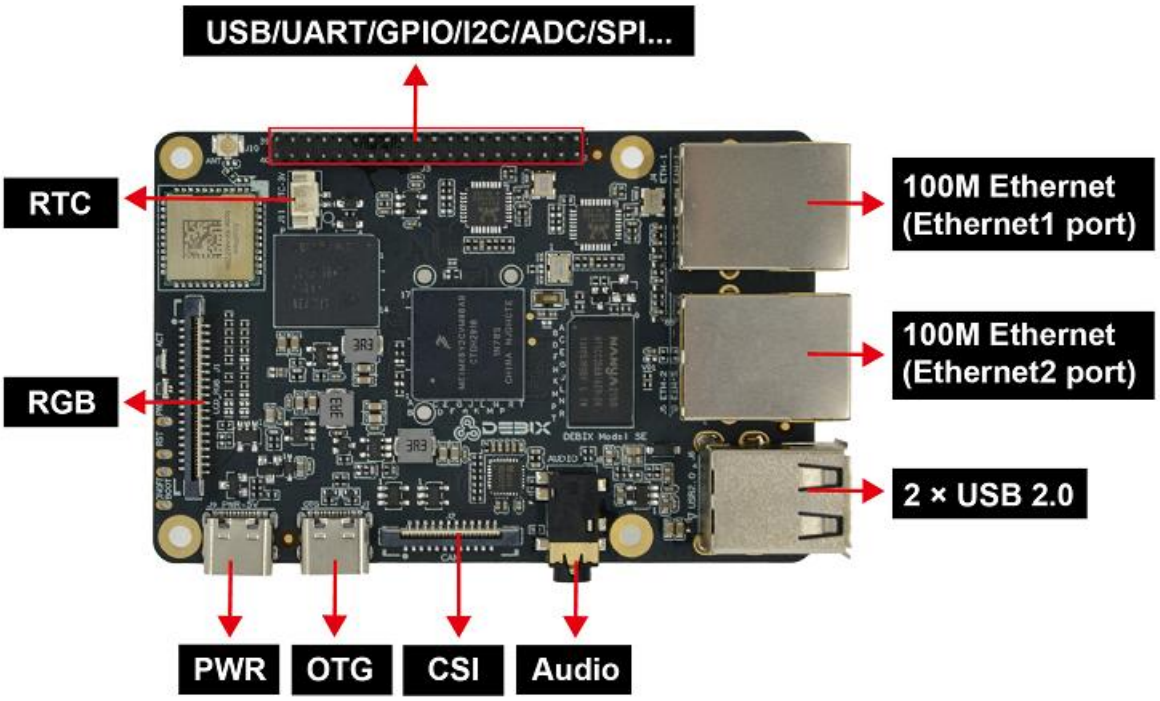


Figure 2 DEBIX Model S Front

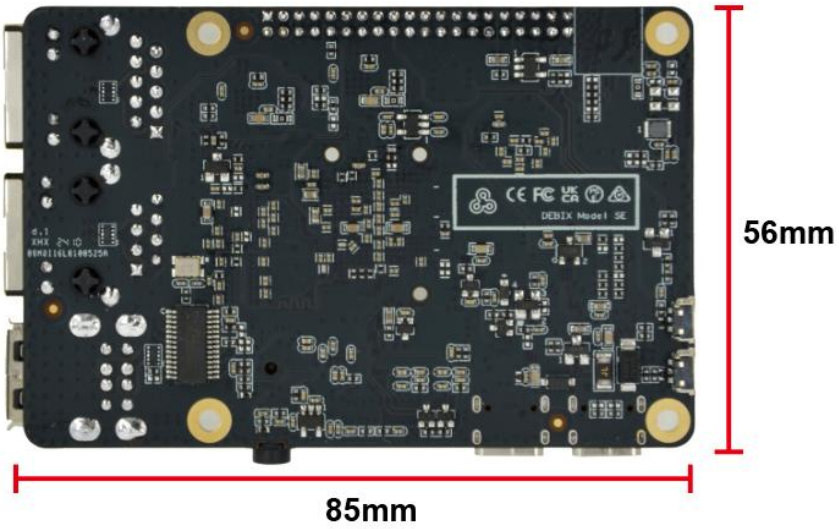


Figure 3 DEBIX Model S Back

DEBIX Model S uses NXP i.MX 6ULL based Soc, supports 100Mb Ethernet, wireless network and Bluetooth 5.1, etc. The data specifications are as below:

Table 3 DEBIX Model S Specification

System	
CPU	NXP i.MX 6ULL/MCIMX6Y2CVM08AB ● 1 x Arm® Cortex®-A7 @792MHz ● i.MX 6ULL series CPU optional, commercial grade up to 900MHz
Memory	512MB DDR3/DDR3L (128MB/256MB optional)
Storage	Onboard 8GB eMMC (16GB/32GB/64GB/128GB/256GB optional)
OS	Yocto, OpenWRT
Boot Mode	Boot from eMMC
Communication	
Network	● 2 x 10/100M Ethernet interfaces ■ 1 x Ethernet port, support POE power supply (need POE power supply module) ■ 1 x Ethernet port (POE power supply not supported)
WiFi & BT	2.4GHz WiFi IEEE 802.11b/g/n, BT 5.1, external WiFi & BT SMA antenna(IPEX-1) connector; customizable 2.4GHz+5GHz dual-band Wi-Fi & BT
Video & Audio	
RGB Display	1 x 24bit RGB, the connector is 40Pin 0.5mm Pitch FPC socket
CSI	1 x 8bit DVP Parallel CSI, the connector is 24Pin 0.5mm Pitch FPC socket
Audio	1 x 3.5mm headphone and microphone combo port
External I/O Interface	
USB	● 2 x USB 2.0 Host Type-A ● 1 x USB OTG Type-C
40-Pin Double-Row Headers	● 2 x USB 2.0 Host, 1 x UART Debug ● Default: 12 x GPIO, which can be configured to up to 3 x UART, 6 x ADC, 1 x SPI, 2 x I2C, 1 x CAN, 3 x PWM via software ● 5V power input/output, 1.8V/3.3V@300mA power output, system

	reset, ON/OFF
RTC	1 x RTC, the connector is 2Pin header
LED & KEY	● 1 x ACT LED (Green) ● 1 x Power LED (Red and Blue) ● 1 x ON/OFF (USB upgrade key for eMMC img) ● 1 x Reset
Power Supply	
Power Input	DC 5V/2A
Mechanical & Environmental	
Size (L x W)	85.0mm x 56.0mm (±0.5mm)
Weight	43g (±0.5g)
Operating Temp.	● Industrial grade: -20°C~70°C ● Industrial grade: -40°C~85°C

2.2. Composition

DEBIX Model S consists of a range of different computer components, including the central processing unit (CPU) located at the center of the motherboard, as well as Random Memory (RAM), eMMC, WiFi Bluetooth module that contains the wireless communication components, and Audio Codec ES8316, as shown in the following figure:

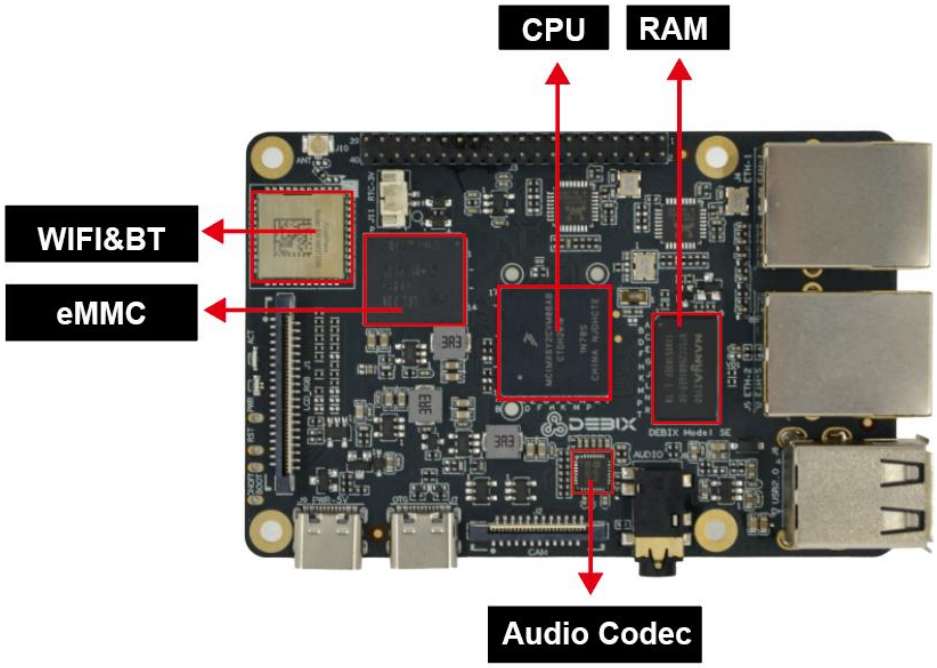


Figure 4 DEBIX Model S Board

2.3. Interface

2.3.1. Power Interface

DEBIX Mode SE provides a USB Type-C power interface (J9) with default DC 5V/2A power input.

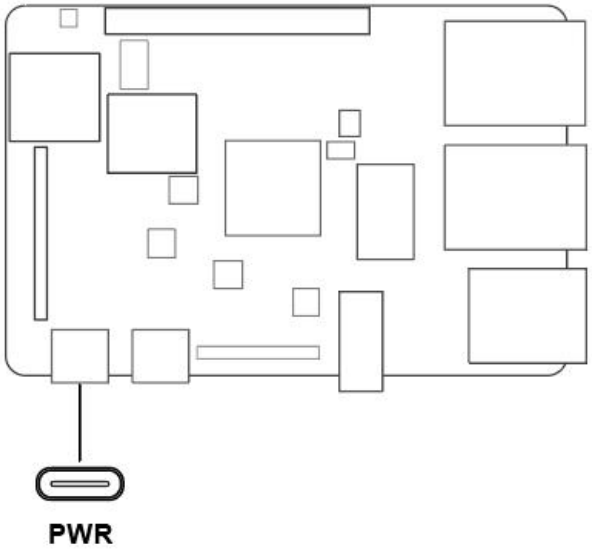


Figure 5 Power interface

2.3.2. USB Interface

DEBIX Model S has five USB interfaces:

- 2 x USB 2.0 Host with double layer Type-A interface (J6),
- 2 x USB 2.0 Host with header in pin31-pin38 of GPIO interface (J3),
- 1 x USB OTG Type-C interface (J7).

Figure 6 USB interface

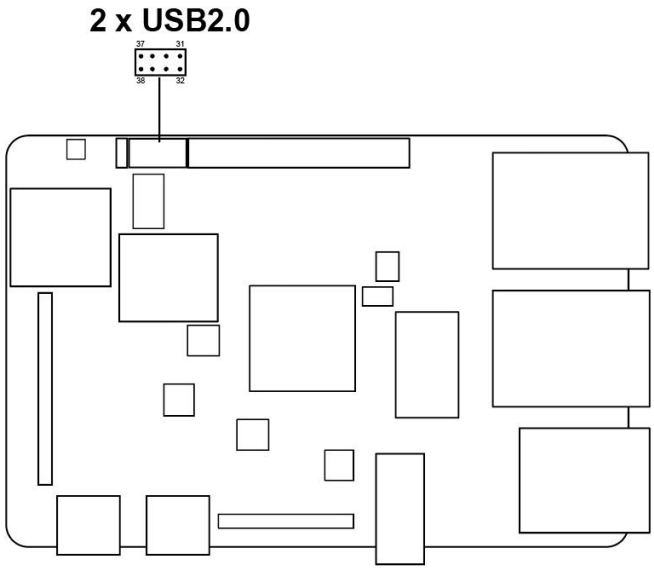


Figure 7 USB interface

2.3.3. Ethernet Interface

DEBIX Model S provides two 100Mb Ethernet interfaces, both are independent MAC Ethernet network port.

- One independent MAC Ethernet port is ETH-1 (J4) , support POE power supply (need POE power supply module).
- One independent MAC Ethernet port is ETH-2 (J5).

Connect DEBIX Model S to the network through the network cable of the RJ45 connector, and

a set of status indicators below the interface to display the status signal, the green is Link and the yellow is Active.

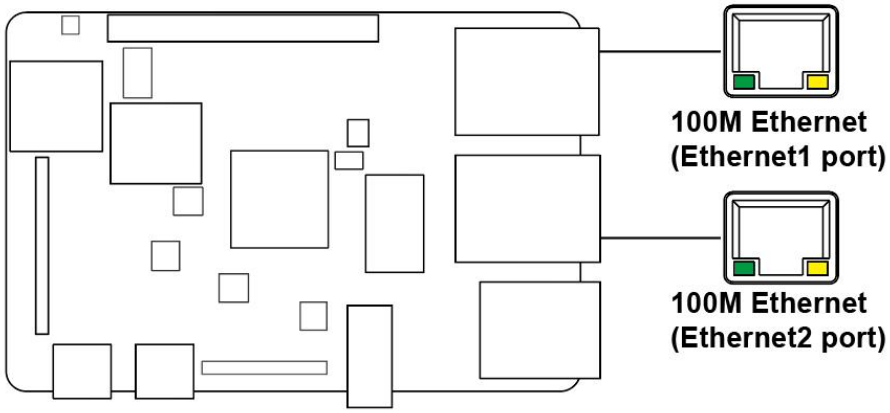


Figure 8 Ethernet interface

Table 4 Description of Ethernet Port Status Indicator

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

2.3.4. WiFi & BT antenna Interface

DEBIX Model S provides a WiFi&BT antenna interface (J10) for connecting WiFi&BT antenna.

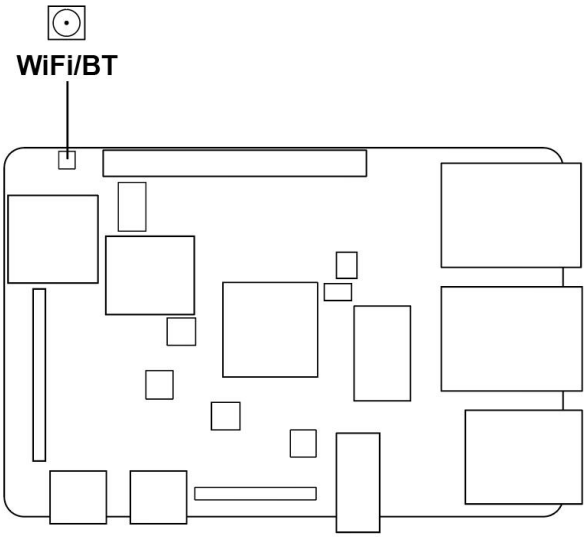


Figure 9 WiFi & BT interface

2.3.5. RGB Display Interface

DEBIX Model S has an 24-bit RGB interface (J1), with a 40Pin/0.5mm Pitch FPC socket, which is used to connect a monitor, TV or projector. Supports RGB888 24-bit, each of the data consist of 8-bit Red, 8-bit Green, and 8-bit Blue data. RGB resolution up to 1366x768.

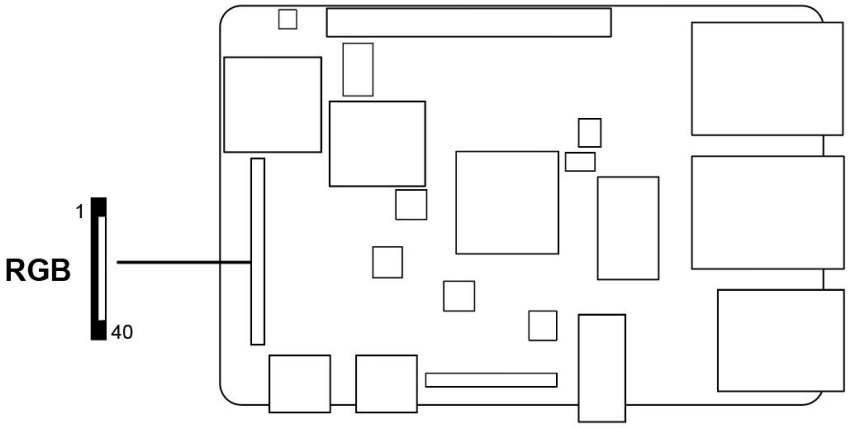


Figure 10 RGB interface

The pin sequence is as shown in the figure:

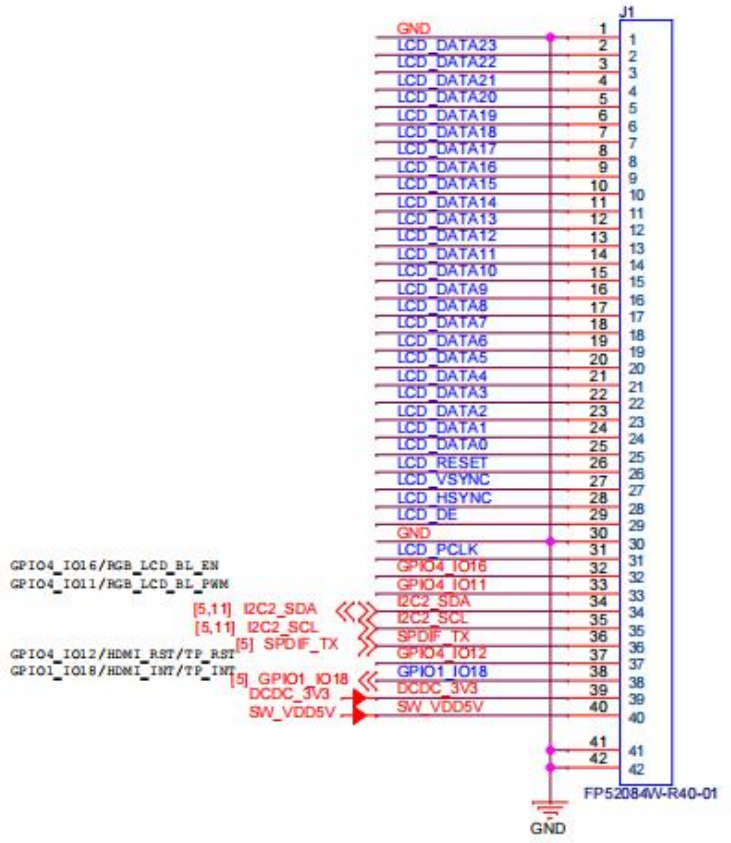


Figure 11 Pin sequence of RGB

The RGB interface is defined as follows:

Table 5 Pin definition of RGB

Pin	Definition	Pin	Definition
1	GND	2	LCD_DATA23
3	LCD_DATA22	4	LCD_DATA21
5	LCD_DATA20	6	LCD_DATA19
7	LCD_DATA18	8	LCD_DATA17
9	LCD_DATA16	10	LCD_DATA15
11	LCD_DATA14	12	LCD_DATA13
13	LCD_DATA12	14	LCD_DATA11
15	LCD_DATA10	16	LCD_DATA9
17	LCD_DATA8	18	LCD_DATA7
19	LCD_DATA6	20	LCD_DATA5
21	LCD_DATA4	22	LCD_DATA3
23	LCD_DATA2	24	LCD_DATA1
25	LCD_DATA0	26	LCD_RESET
27	LCD_VSYNC	28	LCD_HSYNC
29	LCD_DE	30	GND
31	LCD_PCLK	32	GPIO4_IO16
33	GPIO4_IO11	34	I2C2_SDA
35	I2C2_SCL	36	SPDIF_TX
37	GPIO4_IO12	38	GPIO1_IO18
39	DCDC_3V3	40	SW_VDD5V

2.3.6. CSI Interface

There is one 8-bit DVP Parallel CSI interface (J2) on board, with a 24Pin/0.5mm Pitch FPC socket for connecting the camera module. Supports up to 5MP, and currently compatible with

OV5640 sensor.

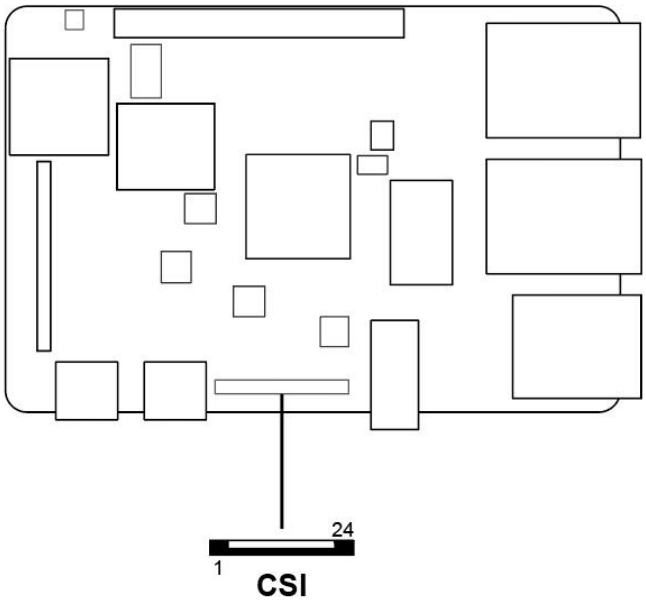


Figure 12 MIPI CSI

The pin sequence is shown in the figure:

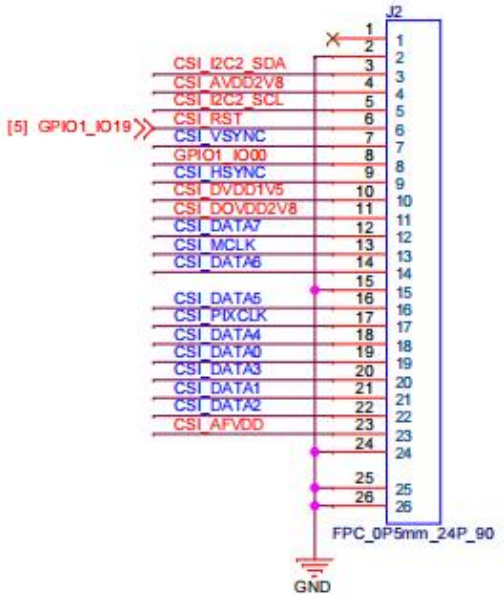


Figure 13 Pin sequence of CSI

The CSI interface is defined as follows:

Table 6 Pin definition of CSI

Pin	Definition	Pin	Definition
1	Not used	2	GND

3	CSI_I2C2_SDA	4	CSI_AVDD2V8
5	CSI_I2C2_SCL	6	CSI_RST
7	CSI_VSYNC	8	GPIO1_IO00
9	CSI_HSYNC	10	CSI_DVDD1V5
11	CSI_DOVDD2V8	12	CSI_DATA7
13	CSI_MCLK	14	CSI_DATA6
15	GND	16	CSI_DATA5
17	CSI_PIXCLK	18	CSI_DATA4
19	CSI_DATA0	20	CSI_DATA3
21	CSI_DATA1	22	CSI_DATA2
23	CSI_AFVDD	24	GND

2.3.7. Audio Interface

DEBIX Model S provides a combined headphone and microphone input interface (J8), the connector is 3.5mm socket, with audio in/out function.

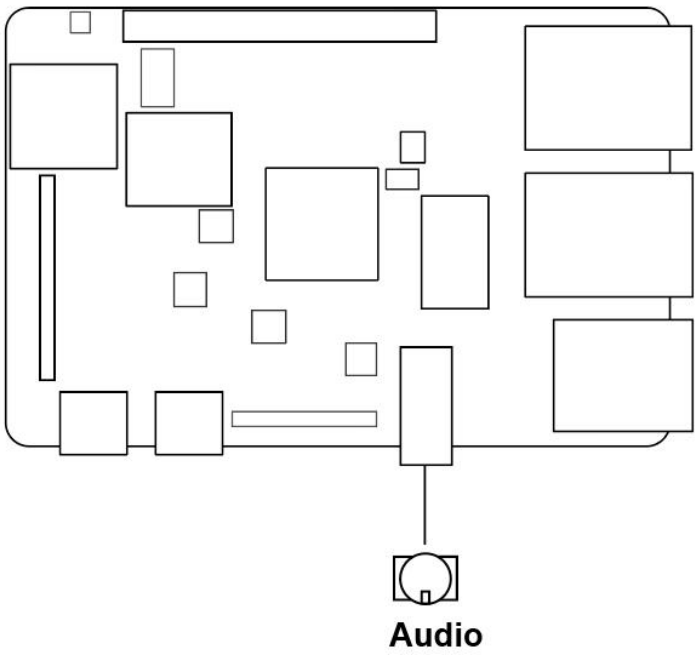


Figure 14 Audio interface

NOTE

DEBIX Model S 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 audio interface according to the GND and MIC connection lines for normal use.

Figure 15 Definition of four-segment headphones

2.3.8. GPIO

DEBIX Model S has a set of 2*20Pin/2.0mm Pitch GPIO interface (J3), 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 S or peripherals.

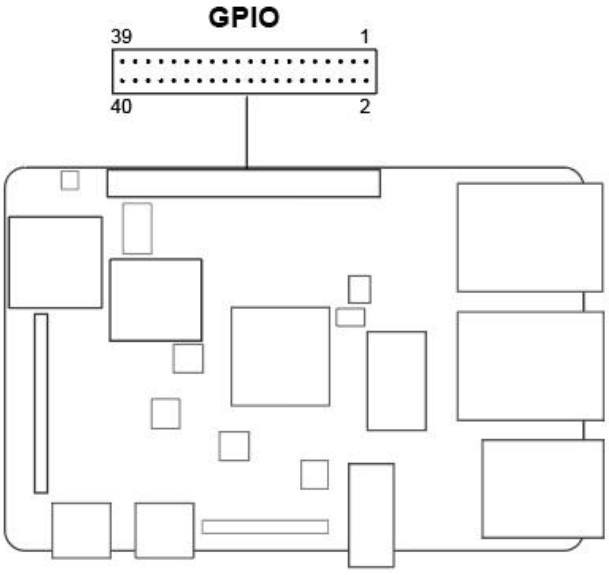


Figure 16 GPIO

The pin sequence is shown in the figure:

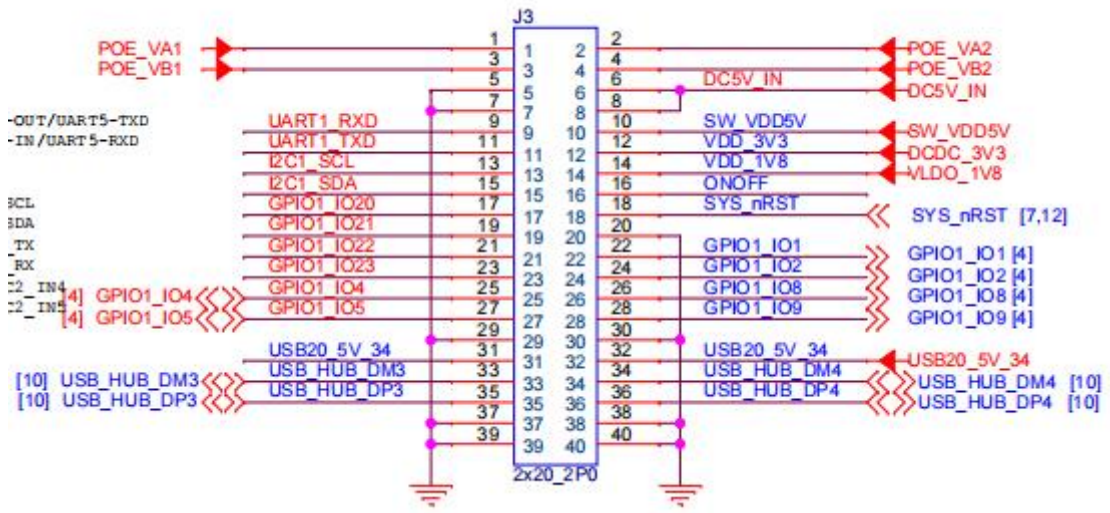


Figure 17 Pin sequence of GPIO

The GPIO interface pins are defined in the table below:

Table 7 Pin definition of GPIO

Pin	Definition	Pin	Definition
1	POE_VA1	2	POE_VA2
3	POE_VB1	4	POE_VB2
5	GND	6	DC5V_IN
7	GND	8	DC5V_IN
9	UART1_RXD	10	SW_VDD5V
11	UART1_TXD	12	VDD_3V3
13	I2C1_SCL	14	VDD_1V8
15	I2C1_SDA	16	ONOFF
17	GPIO1_IO20	18	SYS_nRST
19	GPIO1_IO21	20	GND
21	GPIO1_IO22	22	ADC1_IN1
23	GPIO1_IO23	24	ADC1_IN2
25	GPIO1_IO4	26	ADC2_IN8
27	GPIO1_IO5	28	ADC2_IN9

29	GND	30	GND
31	USB20_5V_34	32	USB20_5V_34
33	USB_HUB_DM3	34	USB_HUB_DM4
35	USB_HUB_DP3	36	USB_HUB_DP4
37	GND	38	GND
39	GND	40	GND

For detailed GPIO function MUX, please refer to "DEBIX Model S Reduced GPIO Function List".

2.3.9. LED & KEY

DEBIX Model S has two LED indicators and two Keys.

- LED
  - 1 x ACT LED (Green)
  - 1 x Power LED (Red and Blue)
- Key
  - 1 x ON/OFF Key (USB upgrade key for eMMC img)
  - 1 x Reset Key

The specific states are described in the following table:

Table 8 Description of LED & Key

Function Name		Status	Description
LED	Power LED	Lighting	Power is on, and red & blue light
		off	Power is off, and red & blue change to red, until off
	ACT LED	Blinking	System is normal
		off	System fault
Key	ON/OFF Key	Short press	Wake
		Long press	Power off/on, the device enter USB burning mode
	RESET Key	Press	System reset

2.3.10. RTC

DEBIX Model S provides an RTC interface (J11) with a 1*2Pin/1.25mm Pitch header for connecting RTC battery, responsible for maintaining system time and date information. The voltage of RTC battery is the same as the operating voltage of CPU internal clock, both are 3V.

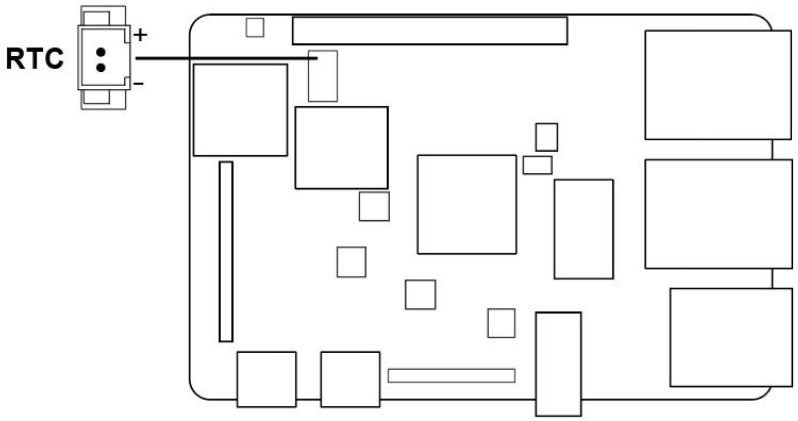


Figure 18 RTC

2.4. Packing List

- 1 x DEBIX Model S
- 1 x Foam bag
- 1 x Packing box

Chapter 3 Getting started

3.1. Software Installation

3.1.1.Download Image

1. Download the latest system image from the software download page of DEBIX official website;
2. If the downloaded image file is a zip file, you need to decompress it, and use .wic file for the system file; if you only flash uboot, you need to use u-boot.imx.

3.1.2.System Boot

DEBIX Model S only boot from eMMC onboard.

- **Component Preparation**

✓ DEBIX Model S board

✓ USB Type-C data cable

✓ DC 5V/2A power adapter

✓ PC (windows 10/11)

- **Burning to eMMC via USB**

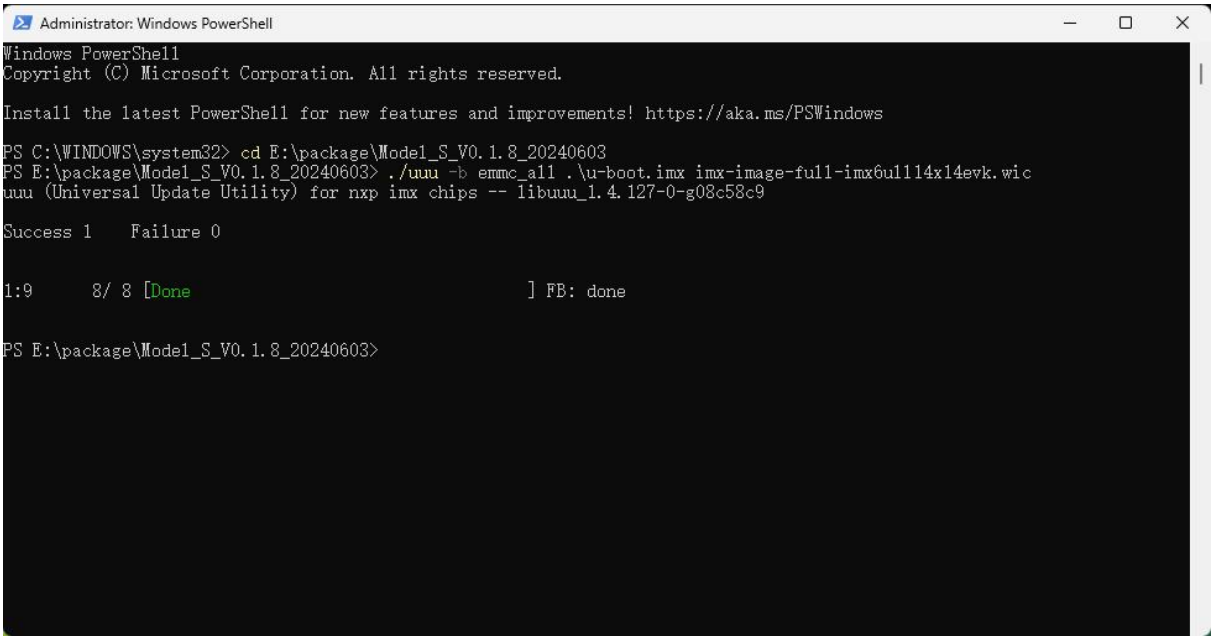
1. Download the system installation package we provided to DEBIX Model S, check the MD5 match after downloading, and then unzip it to PC;
2. Use USB cable to connect the OTG port of the device to the USB port of PC, **press and hold the ON/OFF key of the device, then connect the power supply**, the system 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 E:\package\Model_S_V0.1.8_20240603
```

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

```
./uuu -b emmc_all .\u-boot.imx imx-image-full-imx6ull14x14evk.wic
```

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



7. After burning, disconnect the power supply and OTG USB cable, make sure the device 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. **Connect the RGB monitor**
2. **Connect the keyboard**
3. **Connect the mouse**
4. **Connect the network cable**
5. **Connect the power adapter:** Plug in the power supply, DEBIX Model S will power on,

and the red & blue indicator light will be on, the green indicator light will be blinking (if the boot fails, the green indicator light will be off).

Chapter 4 Software Application Examples

4.1. System Version

Get the system version of DEBIX Model S via DebixVersion command:

```
root@DebixModelS:~# DebixVersion
==================================================
================ Debix Information ================
==================================================
***Board  Name         : Debix_Model_S
***HW     version      : V1.0
***system version      : (V0.1.8_20240603)
***ETH-1  MAC Address  : 4e:e6:f2:55:ae:4d
***ETH-2  MAC Address  : 36:a5:8b:d4:fa:71
***wifi   MAC Address  : 48:9e:9d:ea:5b:d1
***bt     MAC Address  : 48:9E:9D:EA:5B:D2
***kernel              : Linux version 6.1.22 (Debix Model S V0.1.8)
***memory          : 512 MB
```

4.2. Usage of Ethernet

1. Query ip command.

```
ip a
```

```
root@DebixModelS:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth2: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc pfifo_fast state DOW
N group default qlen 1000
    link/ether 36:a5:8b:d4:fa:71 brd ff:ff:ff:ff:ff:ff
3: eth1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc pfifo_fast state DOW
N group default qlen 1000
    link/ether 4e:e6:f2:55:ae:4d brd ff:ff:ff:ff:ff:ff
4: sit0@NONE: <NOARP> mtu 1480 qdisc noop state DOWN group default qlen 1000
    link/sit 0.0.0.0 brd 0.0.0.0
5: mlan0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qle
n 1000
    link/ether 48:9e:9d:ea:5b:d1 brd ff:ff:ff:ff:ff:ff
6: uap0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen
 1000
    link/ether 4a:9e:9d:ea:5c:d1 brd ff:ff:ff:ff:ff:ff
7: wfd0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen
 1000
    link/ether 4a:9e:9d:ea:5b:d1 brd ff:ff:ff:ff:ff:ff
```

As shown above: eth1 network card corresponds to the network port of the device silkscreen "ETH-1";

eth2 network card corresponds to the network port of the device silkscreen "ETH-2".

2. Apply ping command.

```
ping -i eth1 192.168.1.14
```

```
root@DebixModelS:~# ping -i eth1 192.168.1.14
ping: option argument contains garbage: eth1
ping: this will become fatal error in the future
PING 192.168.1.14 (192.168.1.14) 56(84) bytes of data.
64 bytes from 192.168.1.14: icmp_seq=1 ttl=128 time=2.28 ms
64 bytes from 192.168.1.14: icmp_seq=2 ttl=128 time=1.15 ms
64 bytes from 192.168.1.14: icmp_seq=3 ttl=128 time=1.12 ms
64 bytes from 192.168.1.14: icmp_seq=4 ttl=128 time=1.11 ms
64 bytes from 192.168.1.14: icmp_seq=5 ttl=128 time=1.12 ms
64 bytes from 192.168.1.14: icmp_seq=6 ttl=128 time=1.11 ms
64 bytes from 192.168.1.14: icmp_seq=7 ttl=128 time=1.10 ms
64 bytes from 192.168.1.14: icmp_seq=8 ttl=128 time=1.11 ms
64 bytes from 192.168.1.14: icmp_seq=9 ttl=128 time=1.14 ms
64 bytes from 192.168.1.14: icmp_seq=10 ttl=128 time=1.12 ms
64 bytes from 192.168.1.14: icmp_seq=11 ttl=128 time=1.22 ms
64 bytes from 192.168.1.14: icmp_seq=12 ttl=128 time=1.14 ms
64 bytes from 192.168.1.14: icmp_seq=13 ttl=128 time=1.15 ms
64 bytes from 192.168.1.14: icmp_seq=14 ttl=128 time=1.13 ms
64 bytes from 192.168.1.14: icmp_seq=15 ttl=128 time=1.13 ms
64 bytes from 192.168.1.14: icmp_seq=16 ttl=128 time=1.15 ms
64 bytes from 192.168.1.14: icmp_seq=17 ttl=128 time=1.13 ms
64 bytes from 192.168.1.14: icmp_seq=18 ttl=128 time=1.12 ms
64 bytes from 192.168.1.14: icmp_seq=19 ttl=128 time=1.15 ms
64 bytes from 192.168.1.14: icmp_seq=20 ttl=128 time=1.14 ms
```

4.3. Usage of WiFi

- Edit the configuration file and set the "SSID" and connection password of the connected router.

```
vi /etc/wpa_supplicant.conf
```

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1

network={
        #key_mgmt=NONE
        ssid="polyhex_mi1"
        psk="bohai2021"
}
```


- Initializing the configuration file.

```
wpa_supplicant -Dnl80211 -iwfd0 -c/etc/wpa_supplicant.conf &
```

```
root@DebixModelS:~# wpa_supplicant -Dnl80211 -iwfd0 -c/etc/wpa_supplicant.conf &
[11] 24323
[9]   Done                    wpa_supplicant -Dnl80211 -iwfd0 -c/etc/wpa_supplic
ant.conf
root@DebixModelS:~# Successfully initialized wpa_supplicant
rfkill: Cannot open RFKILL control device
wfd0: SME: Trying to authenticate with 5c:02:14:b6:a2:46 (SSID='polyhex_mi1' fre
q=2452 MHz)
wfd0: CTRL-EVENT-REGDOM-CHANGE init=BEACON_HINT type=UNKNOWN
wfd0: CTRL-EVENT-REGDOM-CHANGE init=BEACON_HINT type=UNKNOWN
wfd0: CTRL-EVENT-REGDOM-CHANGE init=BEACON_HINT type=UNKNOWN
wfd0: Trying to associate with 5c:02:14:b6:a2:46 (SSID='polyhex_mi1' freq=2452 M
Hz)
wfd0: Associated with 5c:02:14:b6:a2:46
wfd0: CTRL-EVENT-SUBNET-STATUS-UPDATE status=0
wfd0: CTRL-EVENT-REGDOM-CHANGE init=COUNTRY_IE type=COUNTRY alpha2=CN
wfd0: WPA: Key negotiation comple[11549.536610] IPv6: ADDRCONF(NETDEV_CHANGE): w
fd0: link becomes ready
ted with 5c:02:14:b6:a2:46 [PTK=CCMP GTK=CCMP]
wfd0: CTRL-EVENT-CONNECTED - Connection to 5c:02:14:b6:a2:46 completed [id=0 id_
```

- Obtain the IP address assigned by the router.

```
udhcpc -i wfd0 –n
```

```
root@DebixModelS:~# udhcpc -i wfd0 –n
udhcpc: started, v1.36.0
Dropped protocol specifier '.udhcpc' from 'wfd0.udhcpc'. Using 'wfd0' (ifindex=7
).
udhcpc: broadcasting discover
udhcpc: broadcasting select for 192.168.31.100, server 192.168.31.1
udhcpc: lease of 192.168.31.100 obtained from 192.168.31.1, lease time 43200
/etc/udhcpc.d/50default: Adding DNS 114.114.114.114
/etc/udhcpc.d/50default: Adding DNS 8.8.8.8
Dropped protocol specifier '.udhcpc' from 'wfd0.udhcpc'. Using 'wfd0' (ifindex=7
).
root@DebixModelS:~#
```

- Remove other network and apply ping command.

```
ping 192.168.1.14
```

```
root@DebixModelS:~# ping 192.168.1.14
PING 192.168.1.14 (192.168.1.14) 56(84) bytes of data.
64 bytes from 192.168.1.14: icmp_seq=1 ttl=127 time=12.0 ms
64 bytes from 192.168.1.14: icmp_seq=2 ttl=127 time=38.1 ms
64 bytes from 192.168.1.14: icmp_seq=3 ttl=127 time=7.35 ms
64 bytes from 192.168.1.14: icmp_seq=4 ttl=127 time=3.98 ms
64 bytes from 192.168.1.14: icmp_seq=5 ttl=127 time=3.92 ms
64 bytes from 192.168.1.14: icmp_seq=6 ttl=127 time=6.52 ms
64 bytes from 192.168.1.14: icmp_seq=7 ttl=127 time=3.71 ms
64 bytes from 192.168.1.14: icmp_seq=8 ttl=127 time=4.00 ms
64 bytes from 192.168.1.14: icmp_seq=9 ttl=127 time=3.61 ms
64 bytes from 192.168.1.14: icmp_seq=10 ttl=127 time=6.74 ms
```

4.4. Usage of Bluetooth

- Query the Bluetooth device via hciconfig command.

```
root@DebixModelS:~# hciconfig
hci0:   Type: Primary  Bus: UART
        BD Address: 48:9E:9D:EA:5B:B4  ACL MTU: 1021:7  SCO MTU: 120:6
        UP RUNNING PSCAN
        RX bytes:13054 acl:32 sco:0 events:346 errors:0
        TX bytes:3129 acl:32 sco:0 commands:133 errors:0

root@DebixModelS:~#
```

- Start bluetooth and match bluetooth:

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

```
root@DebixModelS:~# hciconfig hci0 up
root@DebixModelS:~# bluetoothctl
Agent registered
[CHG] Controller 48:9E:9D:EA:5B:D2 Pairable: yes
[bluetooth]# power on
Changing power on succeeded
[bluetooth]# agent on
Agent is already registered
[bluetooth]# default-agent
Default agent request successful
[bluetooth]# scan on
Discovery started
[CHG] Controller 48:9E:9D:EA:5B:D2 Discovering: yes
[NEW] Device 88:12:AC:7C:B7:B5 88-12-AC-7C-B7-B5
[NEW] Device 72:B6:41:C4:FE:02 72-B6-41-C4-FE-02
```

```
[bluetooth]# pair B4:85:E1:5B:E6:D8
Attempting to pair with B4:85:E1:5B:E6:D8
[CHG] Device B4:85:E1:5B:E6:D8 Connected: yes
Request confirmation
[agent] Confirm passkey 279814 (yes/no): yes
[CHG] Device B4:85:E1:5B:E6:D8 Bonded: yes
[CHG] Device B4:85:E1:5B:E6:D8 Modalias: bluetooth:v004Cp7410d1150
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00000000-deca-fade-deca-deafdecacafe
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00001000-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 0000110a-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 0000110c-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 0000110e-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00001116-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 0000111f-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 0000112f-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00001132-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00001200-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 00001801-0000-1000-8000-00805f9b34fb
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 02030302-1d19-415f-86f2-22a2106a0a77
[CHG] Device B4:85:E1:5B:E6:D8 UUIDs: 1ff31936-572e-4b36-a2bf-b2409b1aa6f4
[CHG] Device B4:85:E1:5B:E6:D8 ServicesResolved: yes
[CHG] Device B4:85:E1:5B:E6:D8 Paired: yes
Pairing successful
```

4.5. Usage of USB

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

```
df -h
```

```
root@DebixModelS:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       7.0G  1.6G  5.1G  25% /
devtmpfs        163M  4.0K  163M   1% /dev
tmpfs           244M     0  244M   0% /dev/shm
tmpfs            98M  9.6M   88M  10% /run
tmpfs           4.0M     0  4.0M   0% /sys/fs/cgroup
tmpfs           244M  8.0K  244M   1% /tmp
tmpfs           244M  152K  244M   1% /var/volatile
/dev/mmcblk1p1   27M   11M   16M  39% /boot
tmpfs            49M  4.0K   49M   1% /run/user/0
/dev/sda1       500M  434M   67M  87% /run/media/sda1
/dev/sda2        29G  3.4G   25G  13% /run/media/sda2
root@DebixModelS:~#
```

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

```
fdisk -l
```

```
Disk /dev/sda: 29.72 GiB, 31914983424 bytes, 62333952 sectors
Disk model: STORAGE DEVICE
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xda3661a8

Device     Boot   Start      End  Sectors  Size Id Type
/dev/sda1          20480  1044479  1024000  500M  c W95 FAT32 (LBA)
/dev/sda2        1228800 62333951 61105152 29.1G 83 Linux
root@DebixModelS:~#
```

  - Mounting the U disk:

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

```
root@DebixModelS:~# mount /dev/sda1 /mnt
root@DebixModelS:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       7.0G  1.6G  5.1G  25% /
devtmpfs        163M  4.0K  163M   1% /dev
tmpfs           244M     0  244M   0% /dev/shm
tmpfs            98M  9.6M   88M  10% /run
tmpfs           4.0M     0  4.0M   0% /sys/fs/cgroup
tmpfs           244M  8.0K  244M   1% /tmp
tmpfs           244M  152K  244M   1% /var/volatile
/dev/mmcblk1p1   27M   11M   16M  39% /boot
tmpfs            49M  4.0K   49M   1% /run/user/0
/dev/sda1       500M  434M   67M  87% /mnt
/dev/sda2        29G  3.4G   25G  13% /run/media/sda2
root@DebixModelS:~#
```

2. Enter the U disk directory:

```
cd /mnt
ls
```

```
root@DebixModelS:~# cd /mnt
root@DebixModelS:/mnt# ls
 Image
'System Volume Information'
 cc
```

3. Clear the cache: run before each read and write test command.

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

4. Test write speed.

```
sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"    #Clear the cache
dd if=/dev/zero of=/mnt/test_file bs=1M count=1024
```

5. Test read speed.

```
sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"     #Clear the cache
dd if=/mnt/test_file of=/dev/null bs=1M count=1024
```

```
root@DebixModelS:~# sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
root@DebixModelS:~# dd if=/dev/zero of=/mnt/test_file bs=1M count=1024
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 44.7802 s, 24.0 MB/s
root@DebixModelS:~# sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
root@DebixModelS:~# dd if=/mnt/test_file of=/dev/null bs=1M count=1024
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 44.2226 s, 24.3 MB/s
root@DebixModelS:~#
```

4.6. Usage of Display

Component Preparation: 5-inch RGB screen, DEBIX Model S, display adopter board, 40Pin FPC cable, as shown in the figure below:

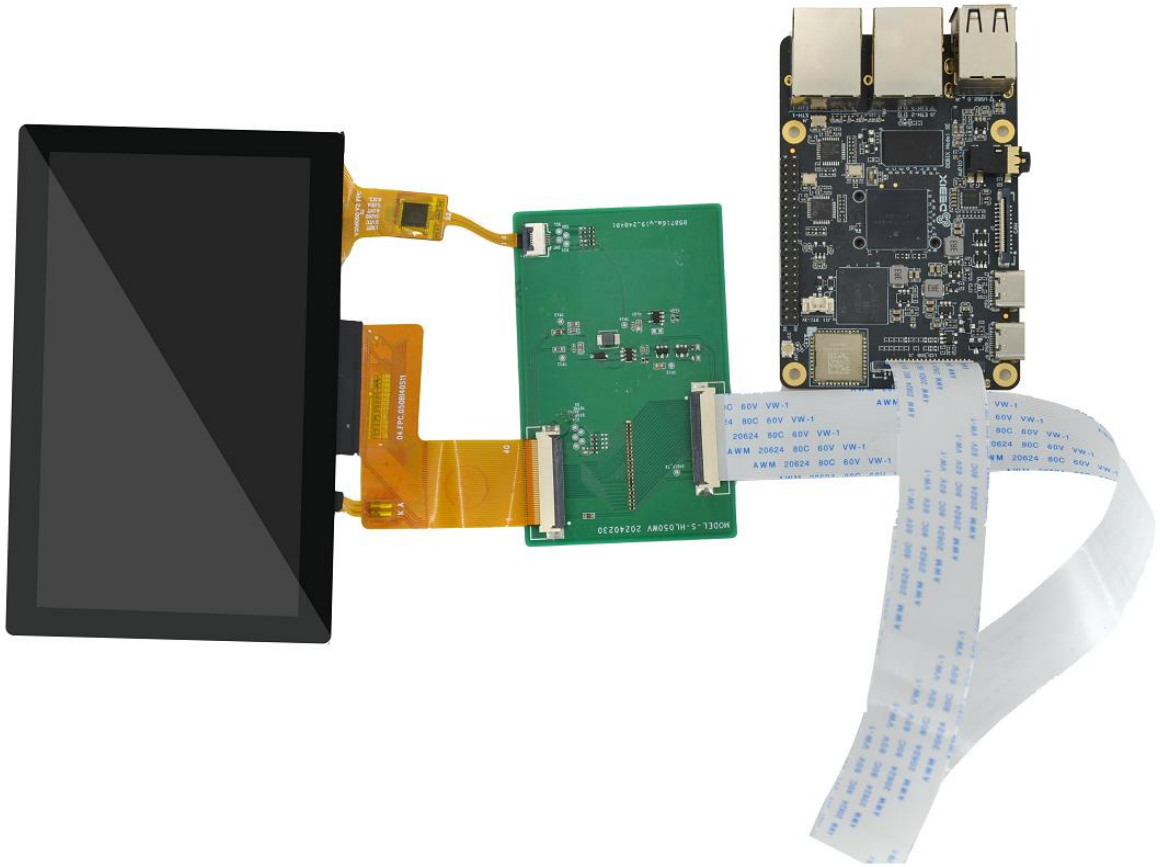


Figure 19

1. Pull up the black rubber snap of the RGB dispaly interface (J1) of DEBIX Model S, insert

same-direction 40pin FPC cable (note the direction of the gold finger, gold finger facing CPU), and press the snap.

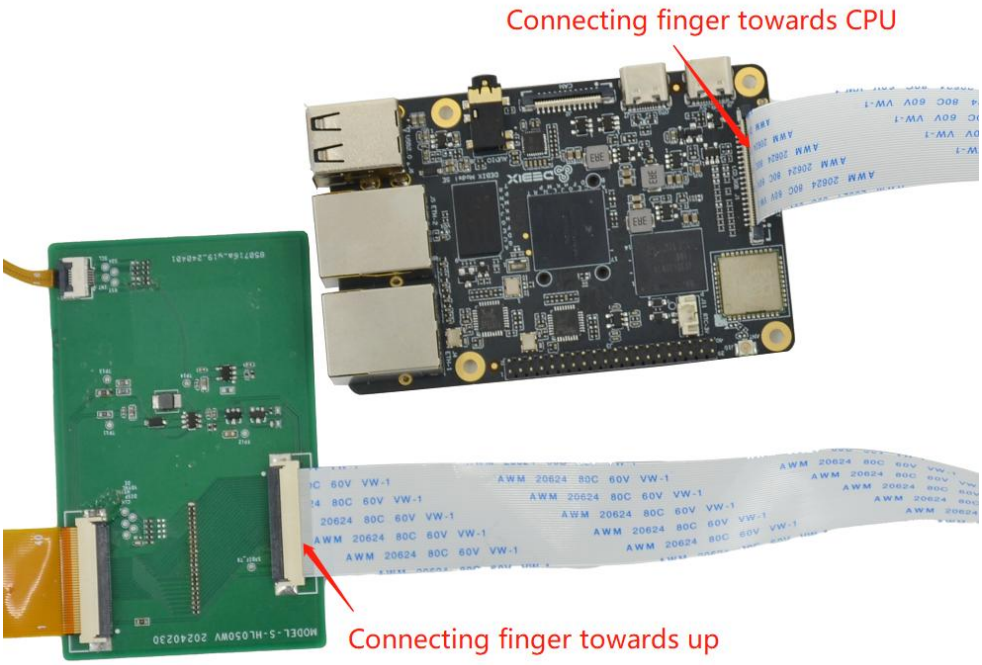


Figure 20

2. Insert the other end of the FPC cable into the 40pin interface of the display adapter board.
3. Insert the screen cable of the 5-inch RGB display into the display adapter board, and the connection is completed as shown in the following figure:

Figure 21

4.7. Usage of Camera

NOTE

The OV5640 camera sensor is only used as a demonstration camera for DEBIX Model S. Currently, DEBIX Model S is compatible with the OV5640 camera sensor. If need other camera sensors, please select the corresponding camera sensor when ordering.

1. Pull up the black rubber snap of the CSI interface (J2) of DEBIX Model S, insert the FPC cable of OV5640 camera sensor (note the direction of the gold finger, gold finger facing CPU), and press the snap.

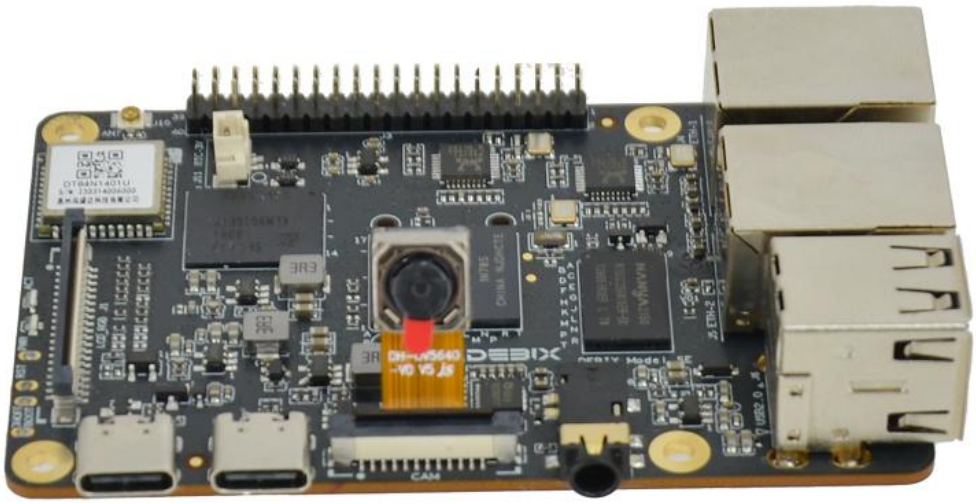


Figure 22

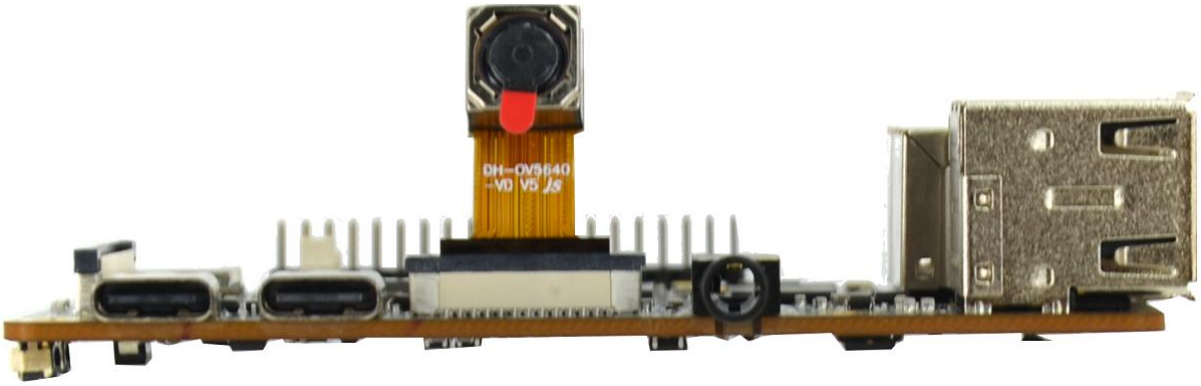


Figure 23

2. Connect the power supply to the DEBIX Model S and use the camera via the following

command:

```
gst-launch-1.0 imxv4l2src device=/dev/video1 ! autovideosink
DebixCsiTest.sh
```

Depending on the model, the camera may come with a small piece of translucent blue plastic film covering the lens. This is only present to protect the lens while it is being mailed to you, and needs to be removed by gently peeling it off after installation.

4.8. Verification of RTC

- Connect the RTC button battery, power on.
- Read the RTC time.

```
hwclock --systohc
hwclock --show
```

```
root@DebixModelS:~# hwclock --systohc
root@DebixModelS:~# hwclock --show
2024-06-12 10:02:47.321937+00:00
```

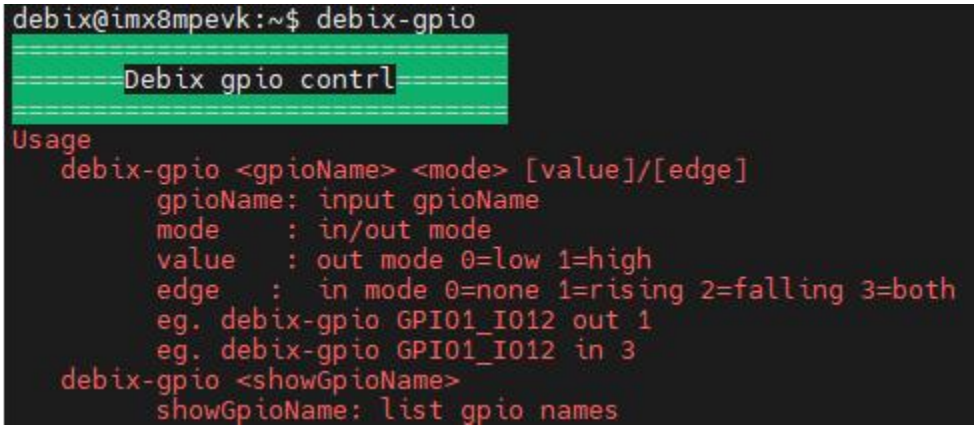
4.9. Usage of GPIO

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

IMPORTANT

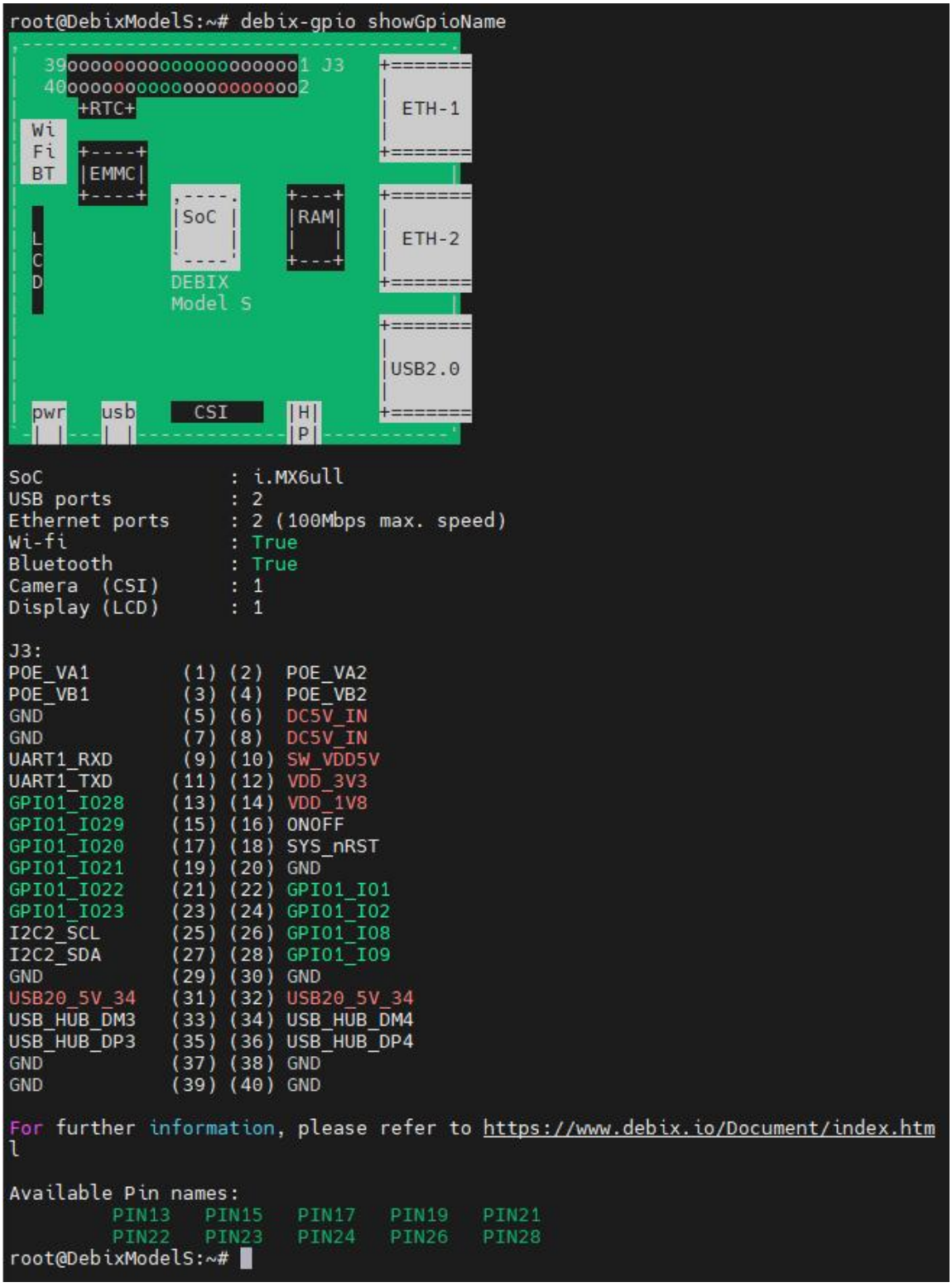
> The GPIO voltage input of DEBIX Model S only supports 3.3V. If the input is higher than 3.3V, it may cause damage to the GPIO interface and CPU.

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



- 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:



3. Example: Set GPIO1_IO28 to output high, type command `debix-gpio PIN13 out 1`, GPIO1_IO8 will output 3.3V.
4. Example: Set GPIO1_IO28 to input rising edge, type command `debix-gpio PIN13 in 1`, if

Pin13 (GPIO1_IO28) detects power, the message INFO:PIN13 value=1; if the power is disconnected, the message INFO:PIN13 value=0.

4.10. Heat Dissipation

When a DEBIX Model S 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, it is recommended to use CPU aluminum alloy heatsink: paste aluminum alloy heatsink directly above the CPU for heat dissipation, as shown below:

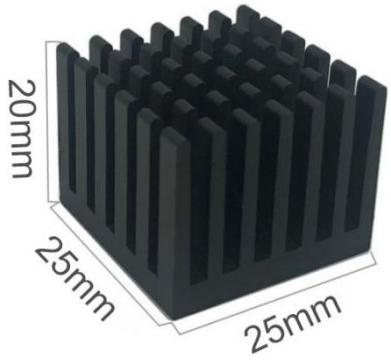


Figure 24 Aluminum alloy heatsink