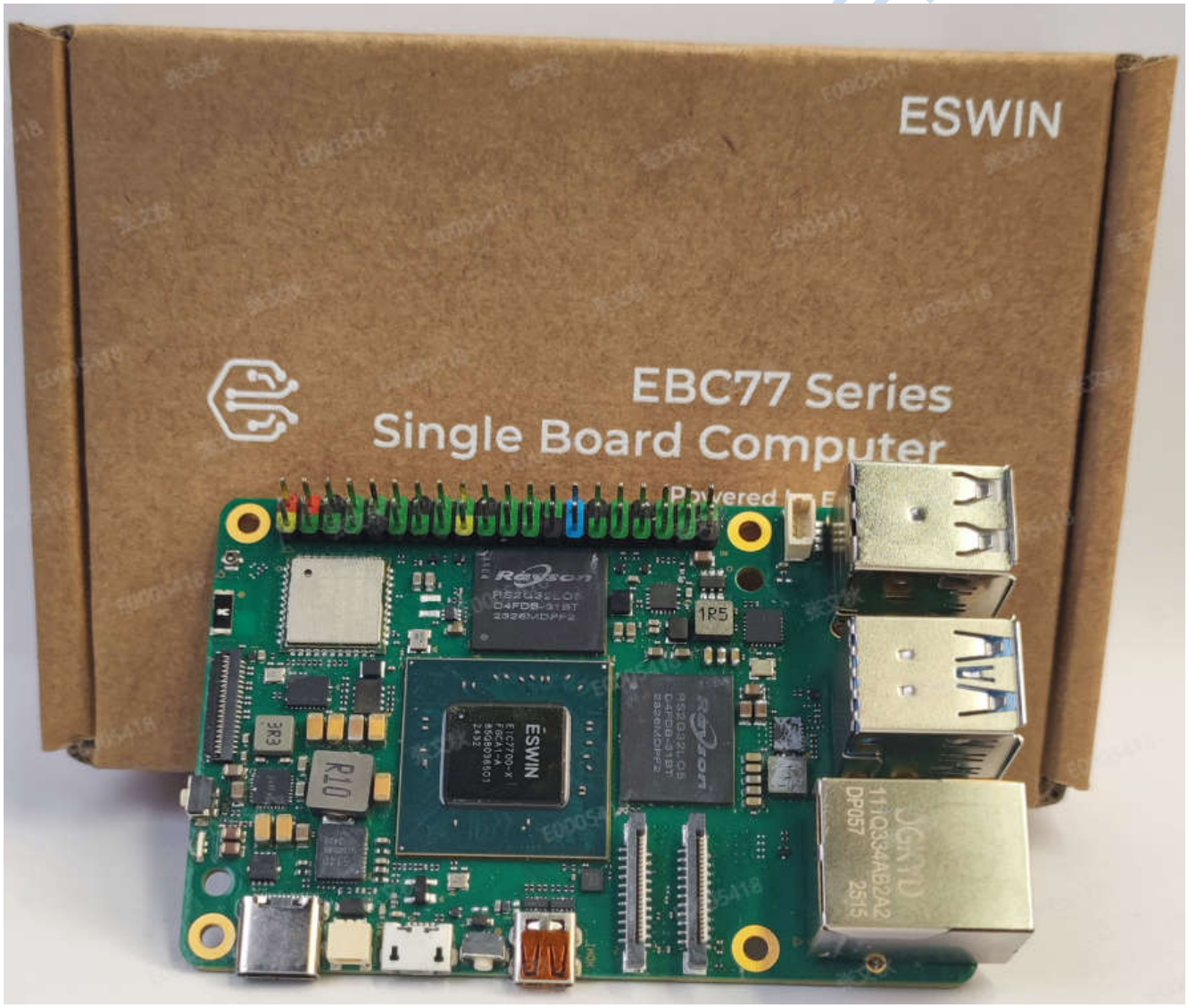
EBC77 Series Single Board Computer User Guide

Version 1.1

July 29, 2025



Notice

Change History

Version	Date	Descriptions
Rev 1.1	July 29, 2025	Add Chapter 6: Burning Program
Rev 1.0	July 24, 2025	Initial Release

Content

Content of Figures

Content of Tables

1 Safety Reminder

1.1 Copyright Statement

ESWIN provides the "EBC77 Series Single Board Computer" (hereinafter referred to as "SBC") for end-user use only and only for end-user testing and evaluation of ESWIN's semiconductor components and software applications ("Intended Use"). No one may resell, redistribute, transfer or otherwise profit from the product.

Please note that the SBC user manual may be revised from time to time, and you can contact ESWIN sales and after-sales for updates.

1.2 Important Safety Information

1.2.1 Warning

- Any power supply used with the SBC must comply with the regulations and standards of your country.
- The SBC must be operated in a well-ventilated environment.
- This product can only be used on a flat, non-conductive surface and must never come into contact with conductors at any time.
- Connecting incompatible devices to the SBC may damage the single board computer.
- All accessories and peripherals used with the SBC must comply with the standards specified in your country and must be labeled accordingly to ensure that safety requirements are met.
- All cables and connecting devices used with the SBC must be properly insulated according to safety standards and requirements.

1.2.2 Safety Instructions

The requirements described below must be followed to avoid malfunction and damage to the SBC.

- Do not allow the SBC to come into contact with water or be exposed to moisture.
- During operation, do not place the SBC on or near the surface of a conductor.
- Do not expose the SBC to high temperatures. As specified in this document, the SBC can only be used at room temperature and in an environment with air circulation.
- Avoid any mechanical or electrical damage to the printed circuit boards, interfaces, and integrated circuits on the SBC.
- Avoid touching, picking up, or moving the SBC when it is powered on.

2 Introduction

The SBC(Single-Board-Computer) board is powered by ESWIN EIC7700X SoC, featuring the 64-bit RISC-V quad-core CPU and self-developed 20TOPS NPU, which supports data format of INT8/INT16/FP16. The product has rich interfaces, strong audio/video processing capabilities, highly adaptable in computer vision(CV) applications.

Other highlights like 64-bit LPDDR5 memory up to 6400Mbps, storage expansion with Micro SD Card, high-speed interconnectors with PCIe Gen3, and external connectors with USB3.2 Gen1, Gigabit Ethernet. Also it has an on-board Wi-Fi module with 802.11ac protocal.

Main function components:

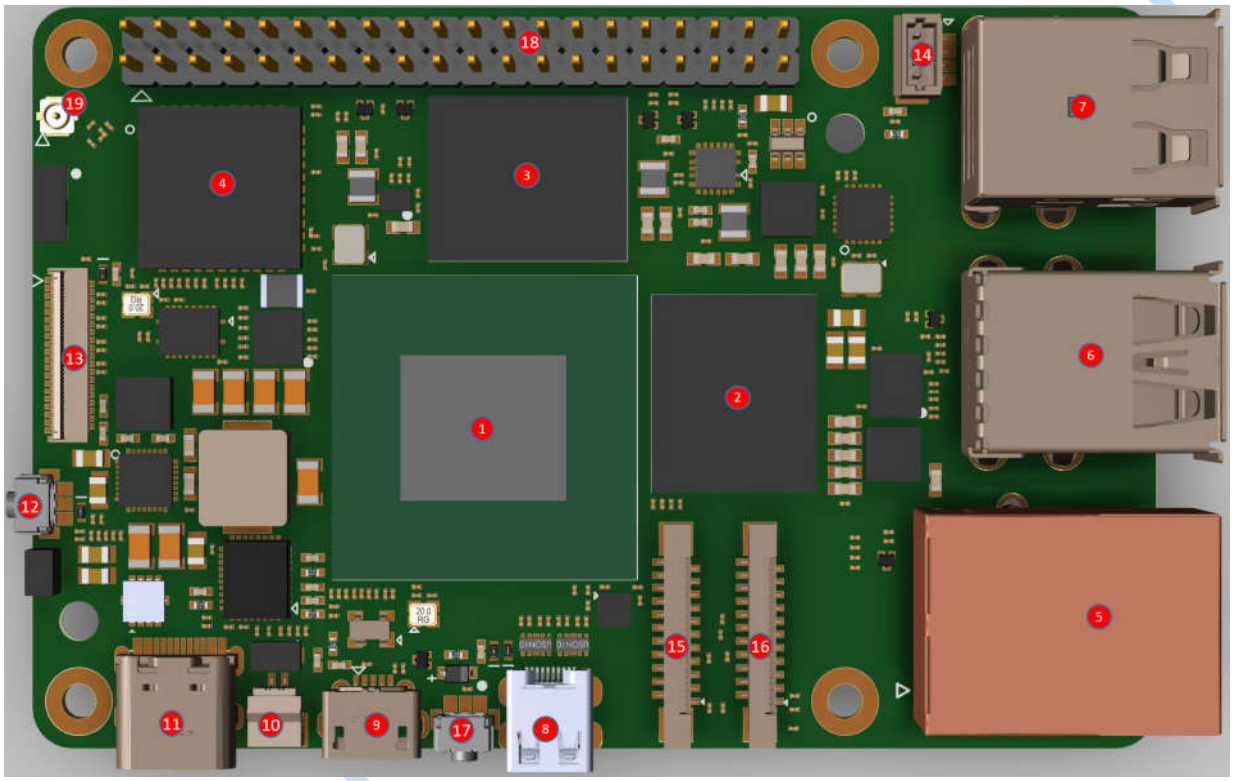


Figure 2-1 SBC TOP Appearence

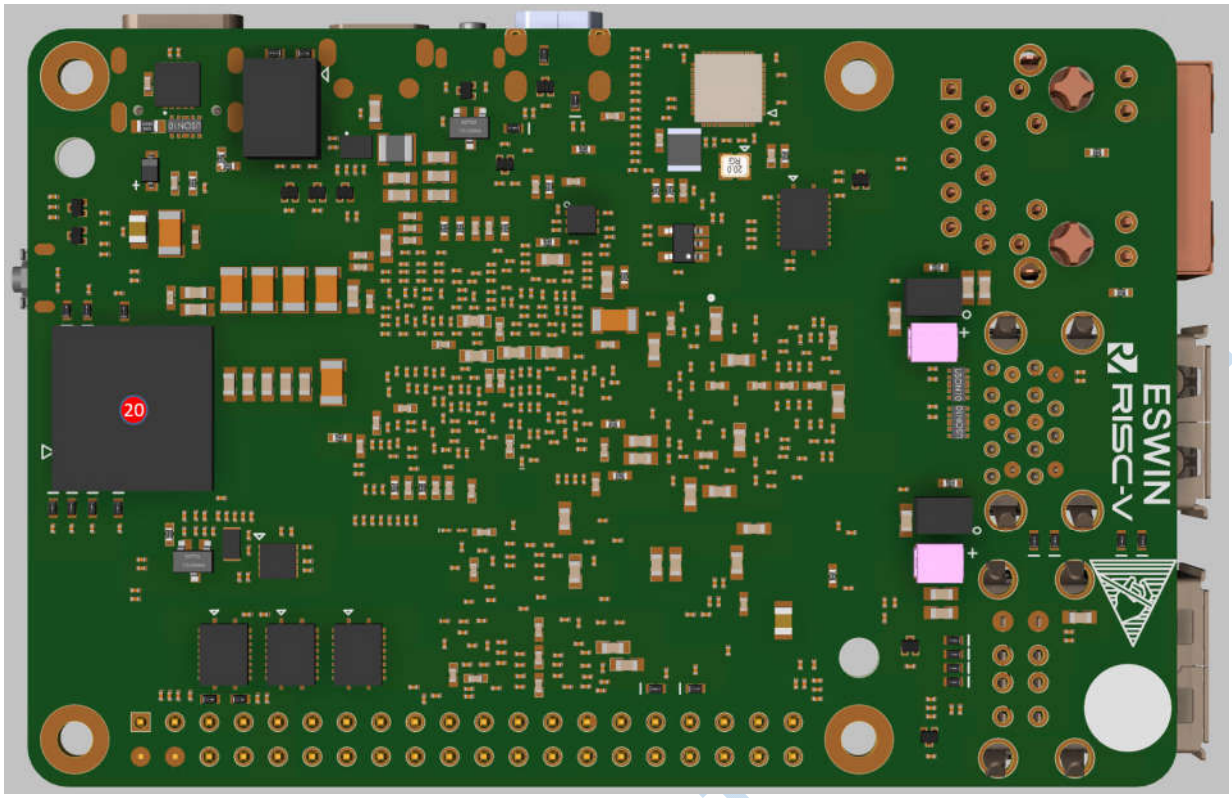


Figure 2-2 SBC BOTTOM Appearence

Table 1 Compnents Description

No.	Component name	No.	Component name
1	EIC7700X SoC	11	TypeC PD
2	LPDDR5 SDRAM	12	Reset Key
3	LPDDR5 SDRAM	13	PCIE3.0 X4 FPC CON
4	WIFI	14	FAN CPM
5	1x Gigabit RJ45	15	MIPI DSI/CSI CON
6	2x USB3.0 TypeA	16	MIPI CSI CON
7	2x USB2.0 TypeA	17	FORCE RECOVERY MODE KEY
8	1x Micro HDMI2.0	18	40PIN IO HEADER
9	1x Micro USB debug Uart0	20	uSD Slot
10	RTC BAT CON		

3 Block Diagram

3.1 System Block Diagram

3.1.1 EIC7700X SoC Architecture

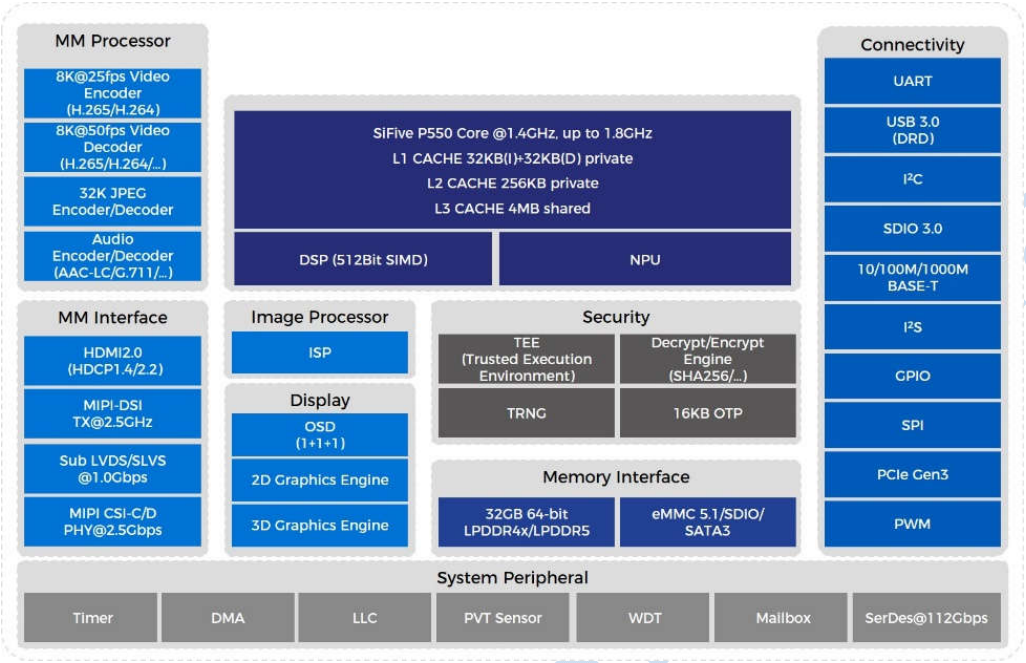


Figure 3-1 EIC7700X SoC Architecture

3.1.2 SBC System Block Diagramm

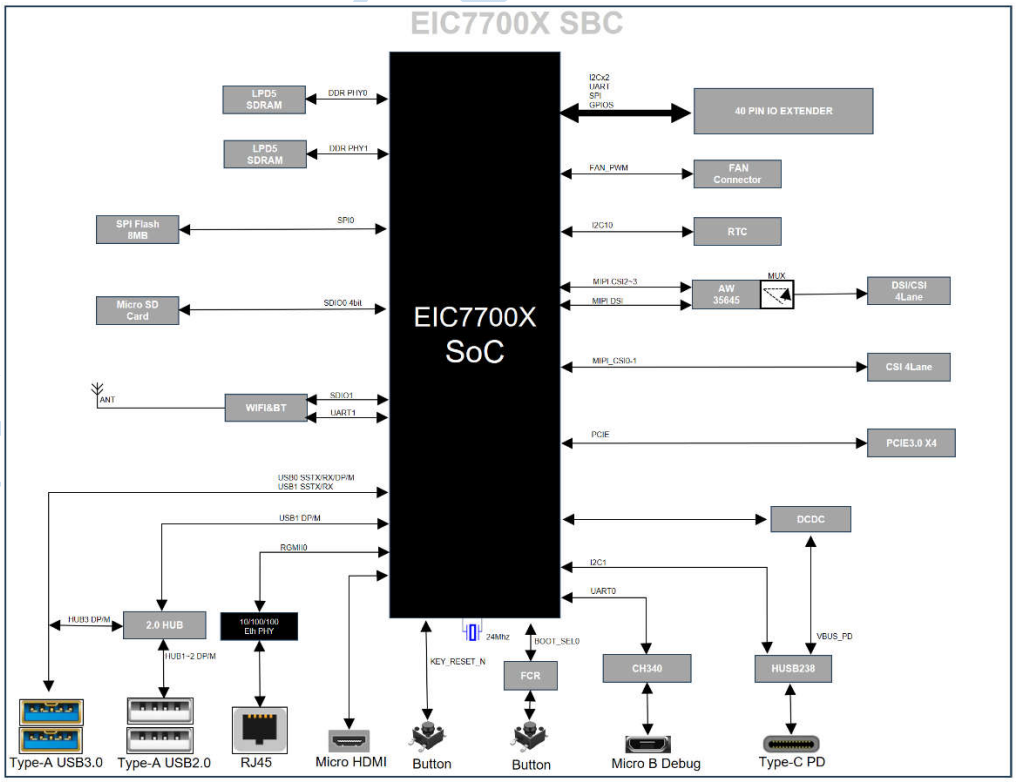


Figure 3-2 SBC System Block Diagramm

3.2 SBC Power Tree

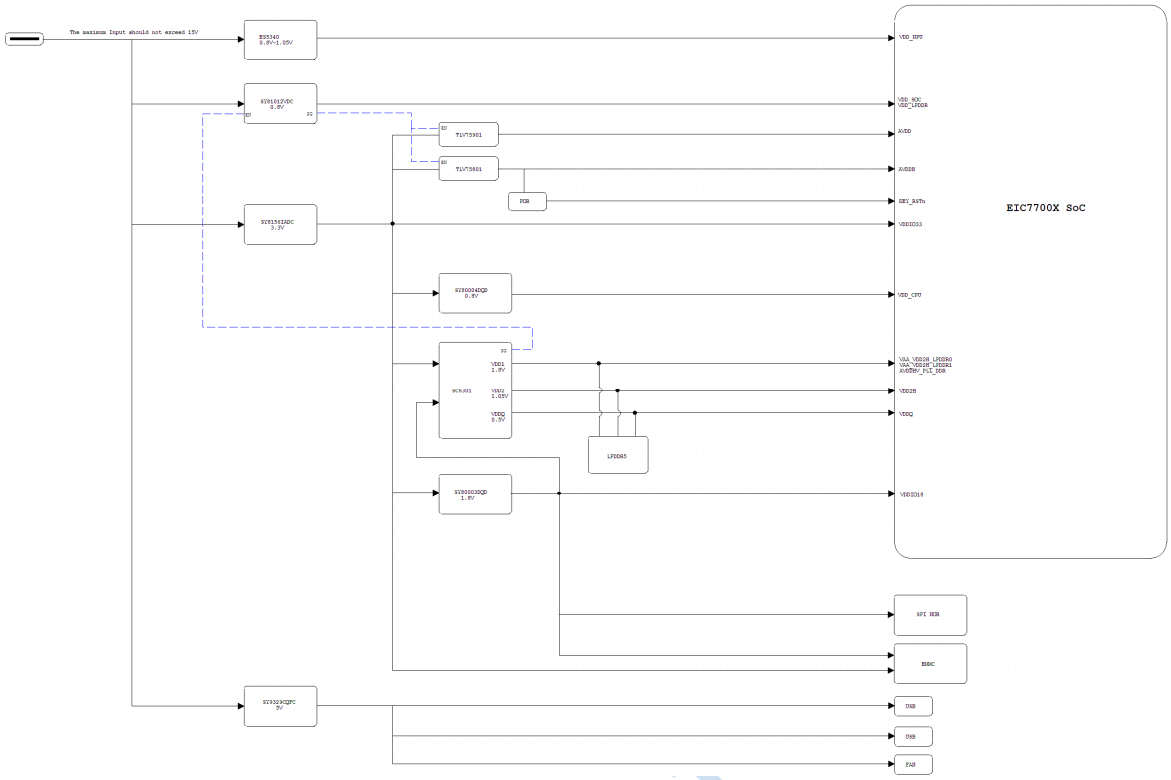


Figure 3-3 SBC Power Tree

3.3 SBC Rendering

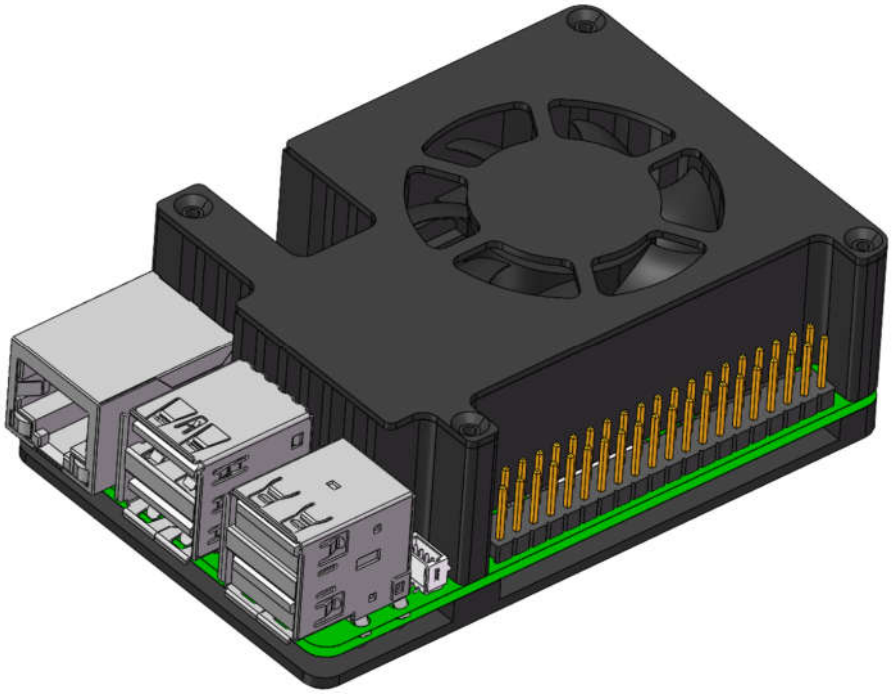


Figure 3-4 SBC PCBA Appearance with cooler

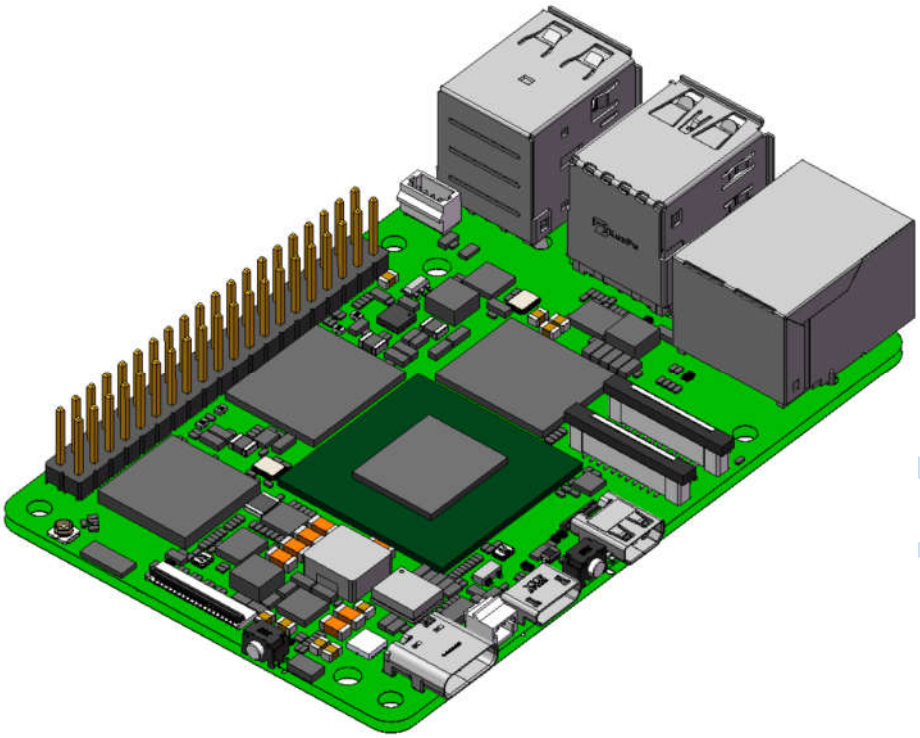


Figure 3-5 SBC PCBA Appearence

3.4 SBC Key Features

Table 2 SBC Key Features

Item	Parameters
CPU	• RISC-V RV64GC Quad-core • Clock frequency running up to 1.8GHz • L1 Cache 32KB(I) + 32KB(D) (private) • L2 Cache 256KB (private) • L3 Cache 4MB (shared) • Support ECC (Support SECDED)
AI Processor	• Up to 20TOPS in INT8, 10 TOPS in INT16, and 10 TFLOPS in FP16
Vision DSP	• Multiple DSPs, support 512INT8MA
Memory	• 64-bit LPDDR5@6400Mbps • Optional Inline ECC(support SECDED)
Flash	• 8MB SPI flash • Micro SD Card slot, SDIO3.0
RAS	• SRAM DDR support parity check and ECC
Video Encoder	Up to 8K@25fps or 16-channel 1080p@25fps H.265 (HEVC): • ITU-T Rec. H.265 (04/2013), ISO/IEC 23008-2 • Main Profile, Level 5.1, High Tier • Main10 profile, Level 5.1, High Tier • Main Still Profile H.264 (AVC): • Spec Version 12:ISO/IEC 14496-10 / ITU-T Rec. H.264 (03/2010)

	• Baseline Profile, levels 1 - 5.2 • Main Profile, levels 1 - 5.2 • High Profile, levels 1 - 5.2 • High 10 Profile, levels 1 - 5.2
Video Decoder	Up to 8K@56fps or 36-channel 1080p@25fps H.265 (HEVC)： • ITU-T Rec. H.265 (04/2013), ISO/IEC 23008-2 • Main Profile, up to Level 5.1, High Tier • Main10 profile, up to Level 5.1, High Tier • Main Profile, Level 6, High Tier • Main10 profile, Level 6, High Tier • Main Still Profile H.264 (AVC)： • Spec Version 12:ISO/IEC 14496-10 / ITU-T Rec. H.264 (03/2010) • Baseline Profile, Levels 1 – 5.2 (up to 4K) • Main Profile, Levels 1 – 5.2 (up to 4K) • High Profile, Levels 1 – 5.2 (up to 4K) • Constrained Baseline, levels 1 – 5.2 (up to 4K) • Progressive High profile, levels 1 – 5.2 (up to 4K) • High 10 profile (progressive only), levels 1 – 5.2 (up to 4K) • High 10 Intra profile (progressive only), levels 1 – 5.2 (up to 4K) • Constrained Baseline, level 6 (up to 8K) • Progressive High profile, level 6 (up to 8K) • High 10 profile (progressive only), level 6 (up to 8K) • High 10 Intra profile (progressive only), level 6 (up to 8K)
JPEG Codec	JPEG ISO/IEC 10918-1, ITU-T T.81. • Up to 32K x 32K • Baseline process (support Huffman coding Interleaved YUV420, YUV422, Monochrome) • Lossless process (support 8-bit with Huffman coding Interleaved YUV420, Monochrome) • MJPEG format (T.81 Annex H) in AVI container
Vision Engine	• HAE (2D Blit, Crop, Resize, Normalization)
GPU	• 3D GPU (OpenGL-ES 3.2、EGL 1.4、OpenCL 1.2/2.1 EP2、Vulkan 1.2、Android NN HAL)
Display	• OSD (3-layer)
LLC	• 4MB (128Bytes cache line，16 ways associativity) • ECC(support SECDED)
Security	• TEE, TRNG, ECDSA, ECC, RSA, AES, SM3/4, SHA256, DES, HMAC, CRC32 • 16KB OTP
40 PIN IO Header	• UART ,SPI ,GPIOS, 2x I2C
USB port	• 2XUSB3.0 • 2XUSB2.0
ETHERNET	• Gigabit Ethernet with RJ45 connector
HDMI	• Micro HDMI，HDMI2.0 • HDCP1.4/2.2
Keys	• System Reset Key • Force Recovery Mode Key
Debug	• Micro USB
Power Supply	• Type-C USB PD
WIFI	• 802.11ac 2.4GHz&5.1GHz&5.8GHz • 2.4GHz with 20MHz bandwidth • 5.1GHz&5.8GHz with 20MHz,40MHz and 80MHz bandwidth
FAN	• 4PIN 1.0mm connector • PWM speed control • Tach meter
CSI	• 2x MIPI CSI 4 lane(1x CSI Shares the physical interface with DSI)

DSI	• 1x MIPI DSI 4 lane(Shares the physical interface with CSI23)
PCIE	• 1x PCIE3.0 X4 FPC connector
RTC	• Integrated RTC IC, with VBAT connector
Power Consumption	• Depends on the application scenario and application load.
Operation Temperature	• 0~40°C
Dimension	• 85x56mm

4 Hardware Guide

4.1 Power Supply

The EBC77 Series Single Board Computer (The following is referred to as SBC) uses PD power supply and supports PD3.0. The system will request the PD adapter to provide 15V/3A power supply. If the PD adapter does not support 15/3A, the next gear supported by the PD adapter will be selected until the negotiation is successful and the power supply is turned on.

With a 15V/3A (45W) power supply, the SBC can run most application scenarios. If the power supply power is lower than 45W, some functions may be limited.

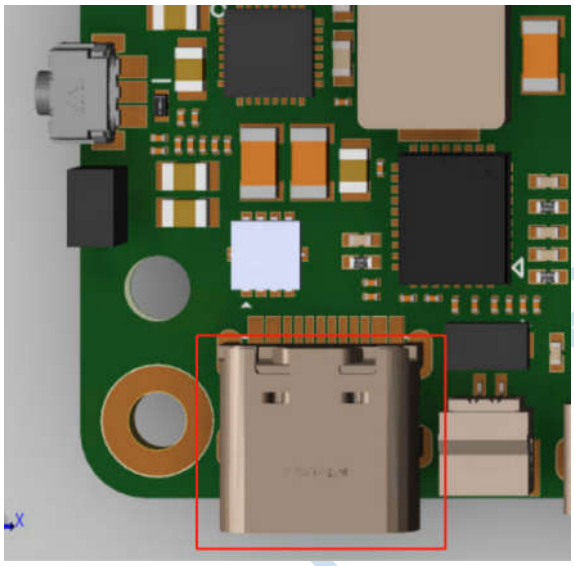


Figure 4-1 PD Port

4.2 USB Ports

SBC integrated 4 USB ports, 2x USB 2.0 and 2x USB 3.2 Gen1.

All of these USB ports support Keyboard, Mouse, and other USB peripheral equipments.

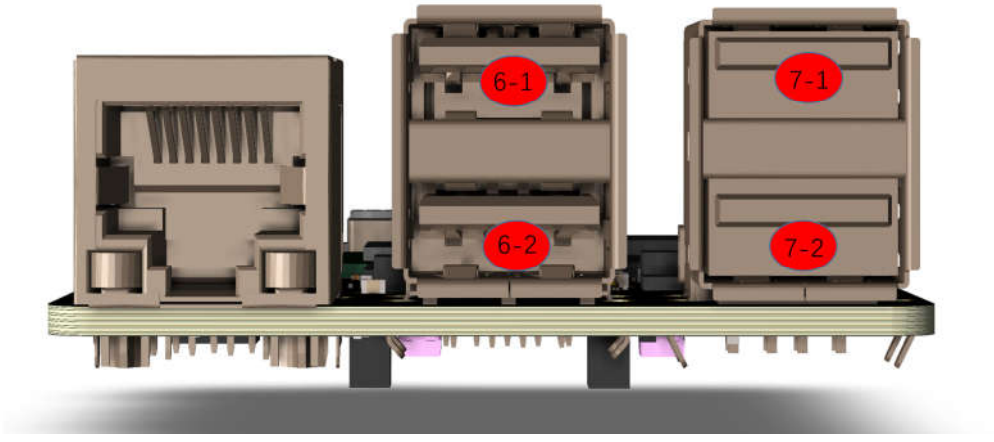


Figure 4-2 USB Ports

Table 3 USB Ports Description

No.	Description	Comments
6-1	USB 3.2 Gen1	Share 2A current with 6-2 port
6-2	USB 3.2 Gen1	1.Use this port as software download interface in foce recovery mode 2.Use this port for fast-boot in Uboot. Share 2A current with 6-1 port
7-1	USB 2.0	Share 1.2A current with 7-2 port
7-2	USB 2.0	Share 1.2A current with 7-1 port

Notes:

1. The No. of 6-2 USB port is configured in device mode.
2. The No. of 6-1 USB port not available in Uboot;

4.3 Display

SBC integrated 1x micro HDMI port, and 1x 4lane DSI FPC connector.

The HDMI port supports HDM2.0/1.4b TX, supports 1080P@120Hz,4Kx2K,3D (340MHz TMDS clock).

4lane mipi DSI TX, resolution up to 1080P@60Hz. (DSI hardware interface please refer to section 4.9)

HDMI and DSI can not work at the same time, this feature determines that the video output interface needs to be adapted and selected in advance at the software level.

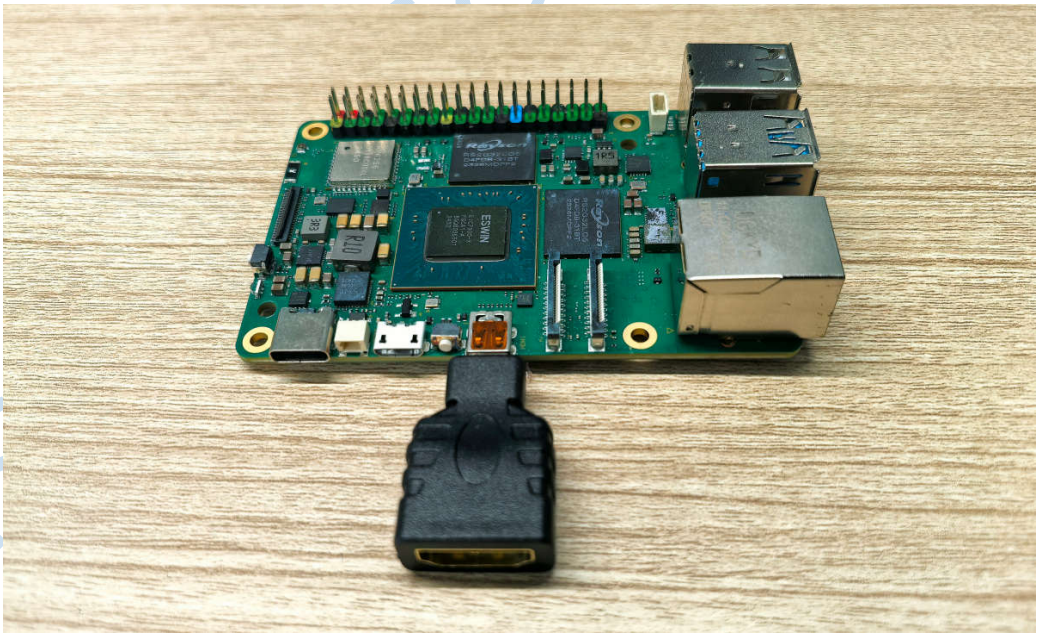


Figure 4-3 SBC micro HDMI

4.4 Button

There are two keys on SBC board, loacation please refer to below picture:

The left one is system hardware reset key, press and release this key, system will reboot immediately.

The bottom one is foce recovery mode key, please refer to section 4.5.

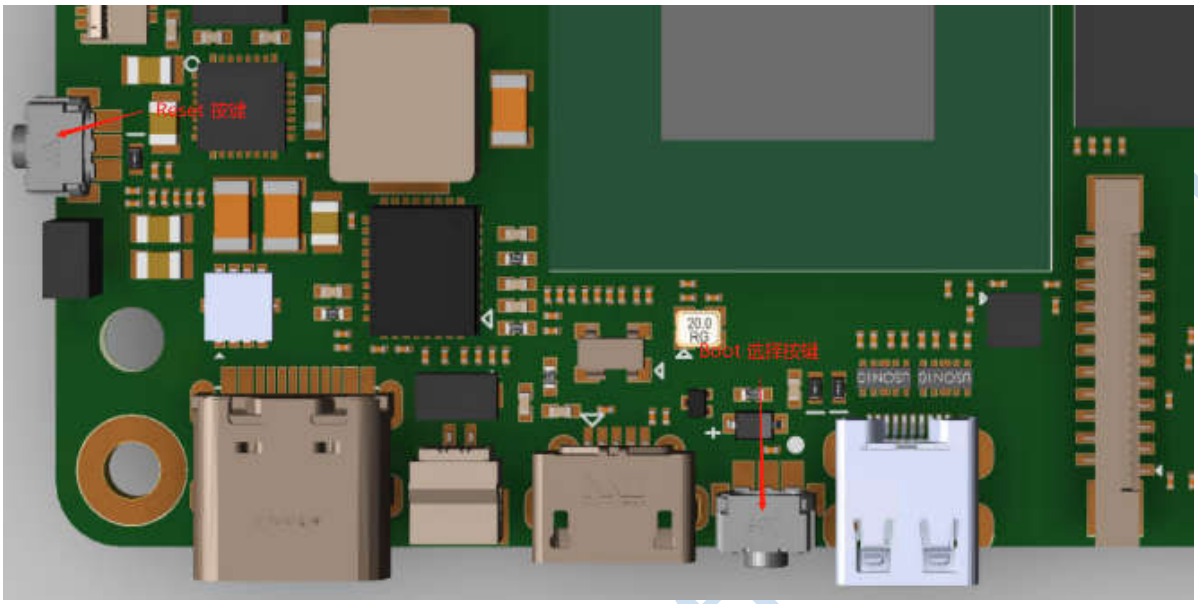


Figure 4-4 SBC Button

4.5 Force Recovery Mode

Boot chain is pre-burned in on-board SPI NOR flash, in normal mode, when power on, system will boot from SPI NOR flash.

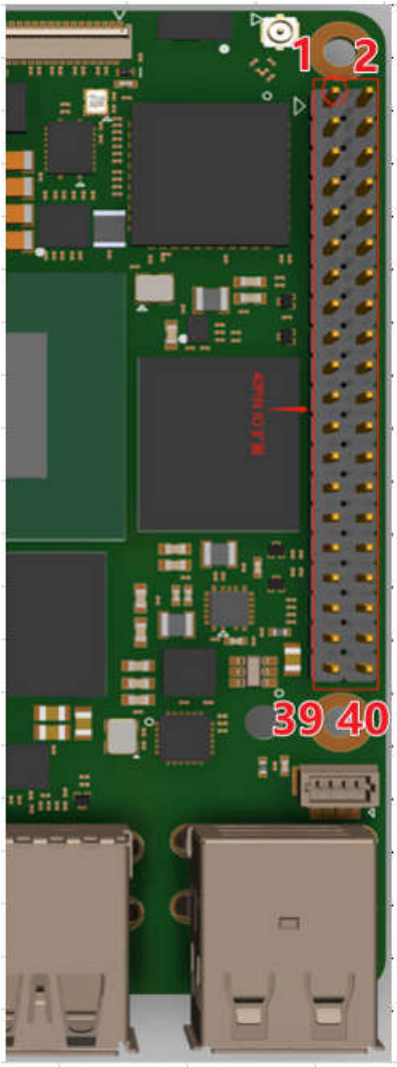
There are two ways to let SBC enter into Force Recovery Mode:

1. Plug in a host device at USB port (refer to section 4.2) before power on or press and release the reset button;
2. Press the force recovery key (refer to section 4.4) and release after power on or press and release the reset button;

After the SBC entered into recovery mode, The SBC is discovered by the host as a USB flash drive, copy recovery bootchain to this USB flash drive, then SBC will boot up automatically.

4.6 40 PIN IO Header

The SBC contains one 40 PIN IO Header, location and pin details please refer to bleow picture and table.



3.3V	1	2	5V
I2C5_SDA	3	4	5V
I2C5_SCL	5	6	GND
GPIO_022	7	8	UART3_TXD
GND	9	10	UART3_RXD
GPIO_009	11	12	GPIO_030
GPIO_001	13	14	GND
GPIO_008	15	16	GPIO_010
3.3V	17	18	GPIO_004
MOSI	19	20	GND
MISO	21	22	GPIO_003
SCLK	23	24	CE0
GND	25	26	CD1
I2C4_SDA	27	28	I2C4_SCL
GPIO_007	29	30	GND
GPIO_062	31	32	GPIO_039
GPIO_063	33	34	GND
GPIO_031	35	36	GPIO_040
GPIO_022	37	38	GPIO_032
GND	39	40	GPIO_033

Figure 4-5 SBC 40PIN IO Header

TYPE Description

I	**Input**
O	**Output**
A	**Analog**
P	**Power supply**
G	**Ground**

Table 4 SBC 40 PIN Description

Pin No.	Name	Type	Voltage	Default function	Description
1	3.3V	P	3.3V		3.3V Power supply
2	5V	P	5.0V		5V Power supply
3	SDA.1	IO	3.3V	I2C data line	I2C5_SDA, IO mux GPIO55
4	5V	P	5.0V		5V Power supply

5	SCL.1	O	3.3V	I2C clock line	I2C5_SCL, IO mux GPIO54
6	GND	G			GND
7	GPIO_022	IO	3.3V	General Purpose I/O	I2S_MCLK, IO mux GPIO22
8	TXD	O	3.3V	UART Transmit Data	UART3_TX, IO mux GPIO92
9	GND	G			GND
10	RXD	I	3.3V	UART Receive Data	UART3_RX, IO mux GPIO93
11	GPIO_009	IO	3.3V	General Purpose I/O	JTAG1_TDI, IO mux GPIO09
12	GPIO_030	IO	3.3V	General Purpose I/O	I2S1_BCLK, IO mux GPIO30
13	GPIO_001	IO	3.3V	General Purpose I/O	JTAG0_TCK, IO mux SPI2_CLK and GPIO1
14	GND	P			GND
15	GPIO_008	IO	3.3V	General Purpose I/O	JTAG1_TMS, IO mux GPIO8
16	GPIO_010	IO	3.3V	General Purpose I/O	JTAG1_TDO, IO mux GPIO10
17	3.3V	P	3.3V		3.3V Power supply
18	GPIO_004	IO	3.3V	General Purpose I/O	JTAG0_TDO, IO mux SPI2_D2 and GPIO4
19	MOSI	O	3.3V	SPI master ouput slave input	SPI1_D0, IO mux GPIO37
20	GND	G			GND
21	MISO	I	3.3V	SPI master input slave output	SPI1_D1, IO mux GPIO38
22	GPIO_003	IO	3.3V	General Purpose I/O	JTAG0_TDI, IO mux SPI2_D1 and GPIO3
23	SCLK	O	3.3V	SPI Clock	SPI1_CLK, IO mux GPIO36
24	CE0	O	3.3V	SPI Chip select 0	SPI1_CS0_N, IO mux GPIO35
25	GND	G			GND
26	CE1	O	3.3V	SPI Chip select 1	SPI1_CS1_N, IO mux GPIO41, PWM2
27	SDA.0	IO	3.3V	I2C data line	I2C4_SDA, IO mux GPIO53
28	SCL.0	O	3.3V	I2C clock line	I2C4_SCL, IO mux GPIO52
29	GPIO_007	IO	3.3V	General Purpose I/O	JTAG1_TCK, IO mux GPIO7
30	GND	G			GND
31	GPIO_062	IO	3.3V	General Purpose I/O	GPIO62

32	GPIO_039	IO	3.3V	General Purpose I/O	SPI1_D2, IO mux GPIO39
33	GPIO_063	IO	3.3V	General Purpose I/O	GPIO63
34	GND	G			GND
35	GPIO_031	IO	3.3V	General Purpose I/O	I2S1_WCLK, IO mux GPIO31
36	GPIO_040	IO	3.3V	General Purpose I/O	SPI1_D3, IO mux GPIO40, PWM1
37	GPIO_002	IO	3.3V	General Purpose I/O	JTAG0_TMS, IO mux SPI2_D0 and GPIO2
38	GPIO_032	IO	3.3V	General Purpose I/O	I2S1_SDI, IO mux GPIO32
39	GND	G			GND
40	GPIO_033	IO	3.3V	General Purpose I/O	I2S1_SDO, IO mux GPIO33

4.7 PCIE

The SBC integrates PCIe with a 0.3mm pitch FPC connector. PCIe 3.0 x4, up to 4GB/s, support RC and EP mode, details please refer to below picture and table.

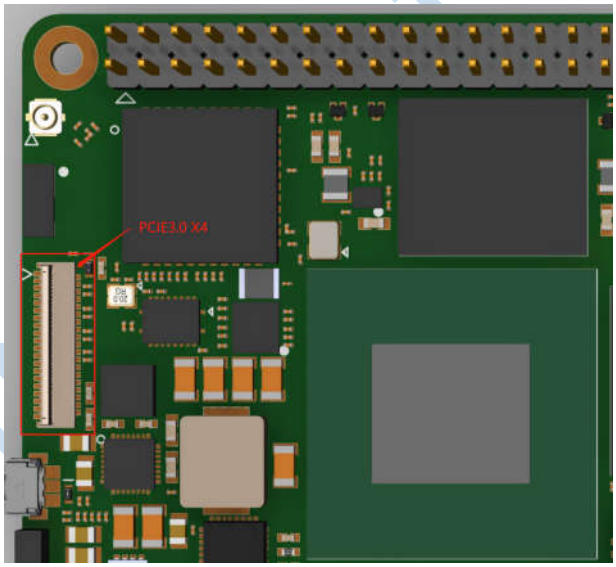


Figure 4-6 SBC PCIE3.0 X4

Table 5 SBC PCIE Singal description

Pin No	Pin name	Pin Description
1	GND	Reference ground
2	PCIE_RX3N	Lane 3 Receive negative
3	PCIE_RX3P	Lane 3 Receive positive
4	GND	Reference ground
5	PCIE_TX3N	Lane 3 Transmit negative
6	PCIE_TX3P	Lane 3 Transmit positive
7	GND	Reference ground

8	PCIE_RX2N	Lane 2 Receive negative
9	PCIE_RX2P	Lane 2 Receive positive
10	GND	Reference ground
11	PCIE_TX2N	Lane 2 Transmit negative
12	PCIE_TX2P	Lane 2 Transmit positive
13	GND	Reference ground
14	PCIE_RX1N	Lane 1 Receive negative
15	PCIE_RX1P	Lane 1 Receive positive
16	GND	Reference ground
17	PCIE_TX1N	Lane 1 Transmit negative
18	PCIE_TX1P	Lane 1 Transmit positive
19	GND	Reference ground
20	PCIE_RX0N	Lane 0 Receive negative
21	PCIE_RX0P	Lane 0 Receive positive
22	GND	Reference ground
23	PCIE_TX0N	Lane 0 Transmit negative
24	PCIE_TX0P	Lane 0 Transmit positive
25	GND	Reference ground
26	PCIE_CLKN	External clock input for SBC, 100MHz HCSL, negative
27	PCIE_CLKP	External clock input for SBC, 100MHz HCSL, positive
28	GND	Reference ground
29	PCIE_FUNC_3V3	GPIO_015, user define function, 3.3V level, pull high on SBC
30	PCIE_PERST_N_3V3	Reset singal, 3.3V level, pull high on SBC
31	PCIE_CLKREQ_N_3V3	Clock request singal, 3.3V level, pull high on SBC
32	PCIE_WAKE_N_3V3	WAKE signal, 3.3V level, pull high on SBC
33	GND	Reference ground
34	5.0V	5.0V power supply from SBC, if EP mode used, do not connect this power
35	5.0V	5.0V power supply from SBC, if EP mode used, do not connect this power
36	5.0V	5.0V power supply from SBC, if EP mode used, do not connect this power
37	5.0V	5.0V power supply from SBC, if EP mode used, do not connect this power
38	GND	Reference ground
39	GND	Reference ground

4.8 MIPI CSI 4lane

The CSI RX interface has two 0.5mm pitch FPC connectors, each with 4 data lanes, supporting 4 Lane and 2 Lane cameras, depending on software configuration.

Connector location and signal details description please refer to below picture and tables.

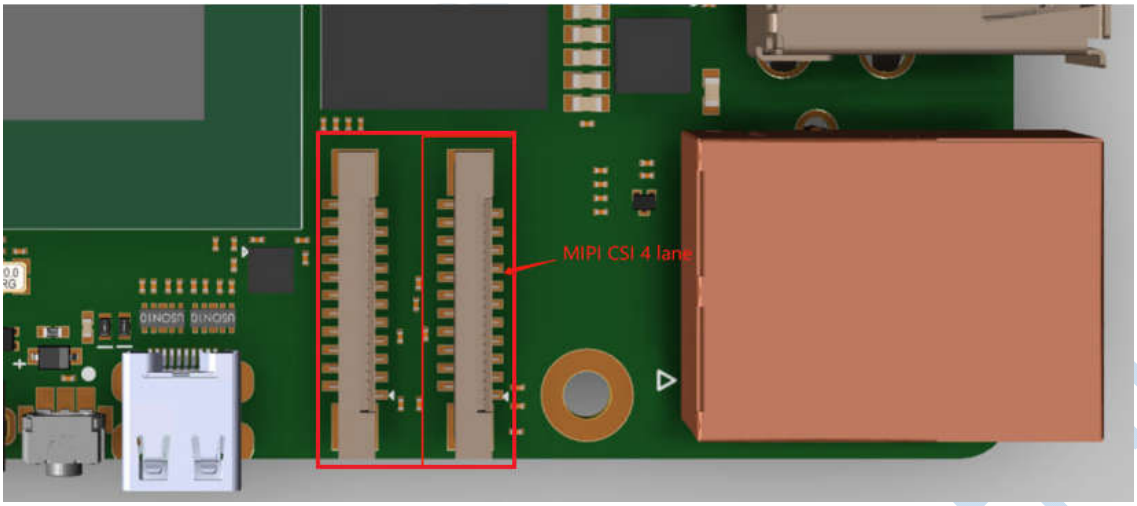


Figure 4-7 SBC MIPI CSI

Table 6 SBC MIPI CSI01 PIN Description

Pin No.	Pin Name	Description
1	GND	Reference ground
2	MIPI_CSI0_D0N	CSI0 data lane 0 Receive negative
3	MIPI_CSI0_D0P	CSI0 data lane 0 Receive positive
4	GND	Reference ground
5	MIPI_CSI0_D1N	CSI0 data lane 1 Receive negative
6	MIPI_CSI0_D1P	CSI0 data lane 1 Receive positive
7	GND	Reference ground
8	MIPI_CSI0_CKN	CSI0 clock lane Receive negative
9	MIPI_CSI0_CKP	CSI0 clock lane Receive positive
10	GND	Reference ground
11	MIPI_CSI1_D0N	CSI1 data lane 0 Receive negative
12	MIPI_CSI1_D0P	CSI1 data lane 0 Receive positive
13	GND	Reference ground
14	MIPI_CSI1_D1N	CSI1 data lane 1 Receive negative
15	MIPI_CSI1_D1P	CSI1 data lane 1 Receive positive
16	GND	Reference ground
17	GPIO_072	General purpose IO, gpio72, internal pull up
18	GPIO_070	General purpose IO, gpio70, internal pull up
19	GND	Reference ground
20	SCL	I2C3 clock, 3.3V level internal pull up
21	SDA	I2C3 data, 3.3V level internal pull up
22	3.3V	3.3V power supply from SBC

Table 7 SBC MIPI CSI23 PIN Description

Pin No.	Pin Name	Description
1	GND	Reference ground
2	MIPI_ D0N	CSI2 data lane 0 Receive negative
3	MIPI_ D0P	CSI2 data lane 0 Receive positive
4	GND	Reference ground
5	MIPI_ D1N	CSI2 data lane 1 Receive negative
6	MIPI_ D1P	CSI2 data lane 1 Receive positive
7	GND	Reference ground
8	MIPI_ CKN	CSI2 clock lane Receive negative
9	MIPI_ CKP	CSI2 clock lane Receive positive
10	GND	Reference ground
11	MIPI_ D2N	CSI3 data lane 0 Receive negative
12	MIPI_ D2P	CSI3 data lane 0 Receive positive
13	GND	Reference ground
14	MIPI_ D2N	CSI3 data lane 1 Receive negative
15	MIPI_ D2P	CSI3 data lane 1 Receive positive
16	GND	Reference ground
17	GPIO_021	General purpose IO, gpio72, internal pull up
18	GPIO_020	General purpose IO, gpio70, internal pull up
19	GND	Reference ground
20	SCL	I2C2 clock, 3.3V level internal pull up
21	SDA	I2C2 data, 3.3V level internal pull up
22	3.3V	3.3V power supply from SBC

Note: The CSI23 signals share the physical interface with DSI, software can change the CSI or DSI configuration.

4.9 MIPI DSI 4lane

The DSI TX interface has one 0.5mm pitch FPC connectors, with 4 data lanes, supporting 4 Lane and 2 Lane screens, depending on software configuration.

Connector location and signal details description please refer to the picture and tables below.

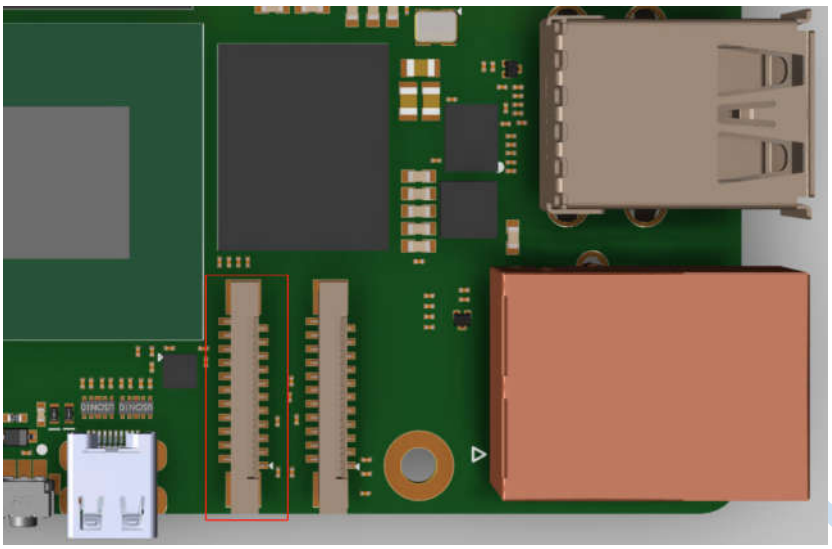


Figure 4-8 SBC MIPI DSI

Table 8 SBC MIPI DSI PIN Description

Pin No.	Pin Name	Description
1	GND	Reference ground
2	MIPI_ D0N	DSI data lane 0 Transmit negative
3	MIPI_ D0P	DSI data lane 0 Transmit positive
4	GND	Reference ground
5	MIPI_ D1N	DSI data lane 1 Transmit negative
6	MIPI_ D1P	DSI data lane 1 Transmit positive
7	GND	Reference ground
8	MIPI_ CKN	DSI clock lane Transmit negative
9	MIPI_ CKP	DSI clock lane Transmit positive
10	GND	Reference ground
11	MIPI_ D2N	DSI data lane 0 Transmit negative
12	MIPI_ D2P	DSI data lane 0 Transmit positive
13	GND	Reference ground
14	MIPI_ D2N	DSI data lane 1 Transmit negative
15	MIPI_ D2P	DSI data lane 1 Transmit positive
16	GND	Reference ground
17	GPIO_021	General purpose IO, gpio72, internal pull up
18	GPIO_020	General purpose IO, gpio70, internal pull up
19	GND	Reference ground
20	SCL	I2C2 clock, 3.3V level internal pull up
21	SDA	I2C2 data, 3.3V level internal pull up
22	3.3V	3.3V power supply from SBC

Note: The DSI singals share the physical interface with CSI23, software can change the CSI or DSI configuration.

4.10 FAN Connector

There is one 1.0mm, 4pin connector for FAN controller, include FAN PWM and speed TACH meter. This connector can drive 5V FAN.

Connector location and signal details description please refer to below picture and tables.

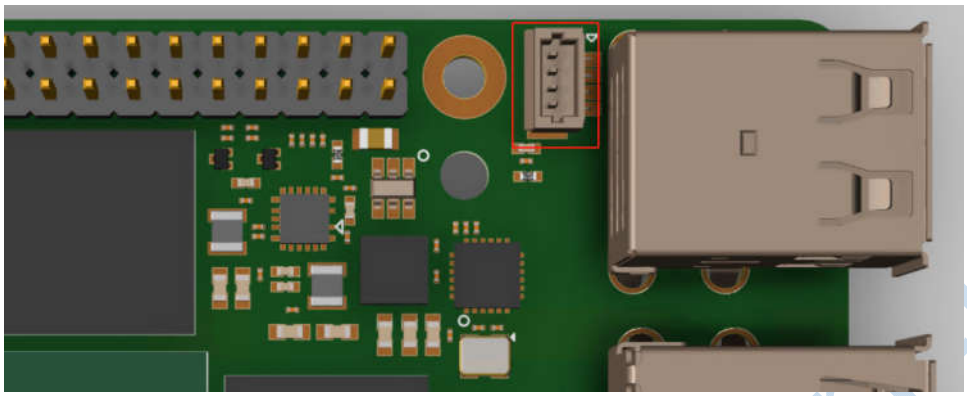


Figure 4-9 SBC FAN Connector

Table 9 SBC FAN Connector PIN Description

Pin No.	Pin Name	Description
1	5.0V	5.0V power supply for FAN
2	PWM	PWM for FAN speed control
3	GND	Reference ground
4	TACH	Speed feedback signal

4.11 RTC Battery Connector

There is one 1.0mm, 2pin connector for RTC battery, the manufacture is XUNPU, MPN is WAFER-SH1.0-2PWB, for more information about this connector, please refer to the datasheet.

Connector location and signal details description please refer to below picture and tables.

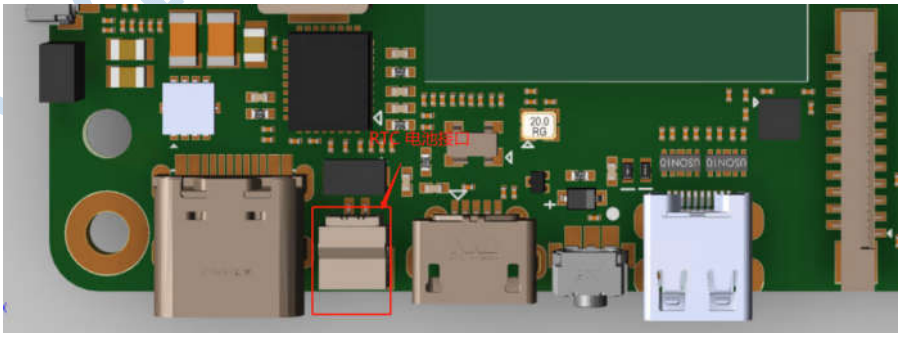


Figure 4-10 SBC RTC Battery Connector

Table 10 SBC RTC Battery Connector PIN Description

Pin No.	Pin Name	Description
1	VCC	Battery positive, 3.6V Max
2	GND	Reference ground

4.12 LED

There is one RGB led indicator for power and system statusrs.

Connector location and RGB details description please refer to below picture and tables.

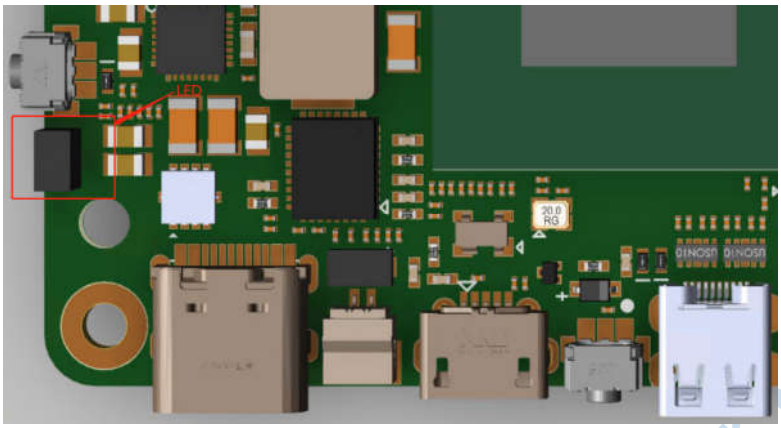


Figure 4-11 SBC RGB LED Location

Table 11 LED Define

LED Define	Description
Green	Power Indicator
Blue	Software Control, user define
Red	Software Control, user define

4.13 Wireless Lan

The SBC integrates a wireless network card with onboard antenna, 2.4G and 5G dual-band, supports IEEE 802.11 a /b/g/n/ac,1T1R SISO. 2.4G support 20MHz bandwidth, 5G support 20MHz,40MHz and 80MHz bandwidth,

The Module used on SBC is a fully Wi-Fi functionalities module with seamless roaming capabilities and advance security, also it could interact with different vendors' 802.11a/b/g/n/ac 1x1 Access Points with SISO standard. Furthermore, this module included SDIO interface for Wi-Fi.

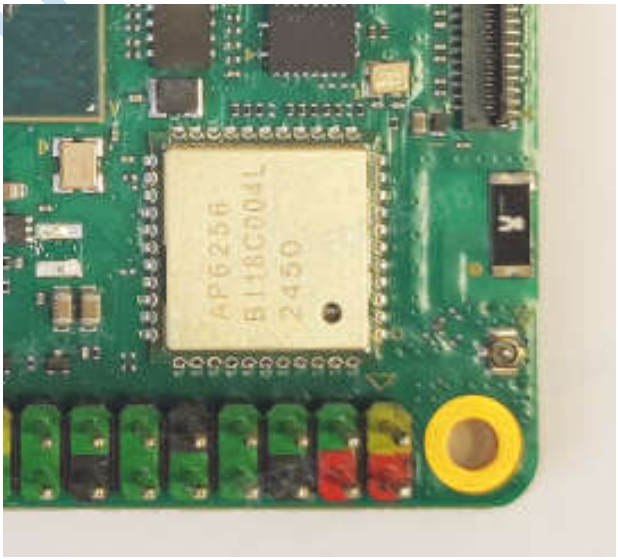


Figure 4-12 WIFI PCB location

5 Software stack usage and board-level image file burning

When users become familiar with the EIC7x software stack using the development board, they can directly use the " Software_Introduction_Guide " to carry out development, compilation and other development work.

6 Burn program

This section covers the installation and upgrade of Bootloader, as well as the burning and upgrade of Ubuntu system images. All the hosts used in this section are Linux development machines.

6.1 Install BOOTLOADER

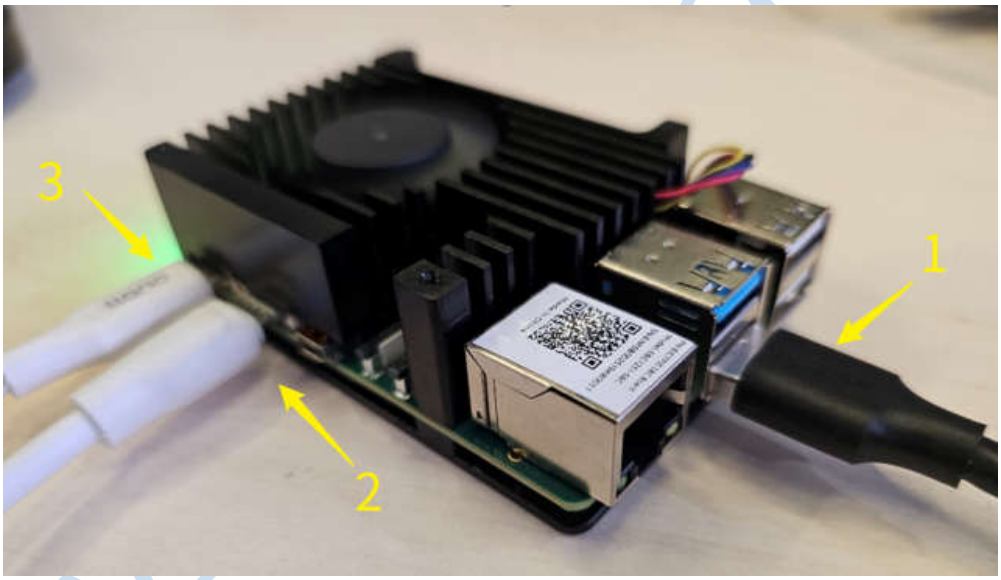
This section is applicable when the bootloader is damaged, causing the system to fail to start normally and requiring the restoration of the bootloader image.

6.1.1 RECOVER BOOTLOADER

ESWIN release package provides the recovery_bootloader_SBC-A1.bin image, which can automatically install the bootloader via USB boot.

1) As shown in the following figure, connect the Debug Uart and USB0 of the development board to the host respectively through the USB male-to-male data cable and the serial port cable. Finally, connect the power cord and power it on. (See below Figure: 1. USB male-to-male data cable; 2. Serial cable; 3. TYPE-C power cord)

Figure 6-1 Recover hardware connection diagram



2) After power-on, the development board will create a usb storage device number (/dev/sd{x}) in the system and run dmesg to obtain the relevant information.

```
[1271223.131467] usb 1-12.3: new high-speed USB device number 125 using xhci_hcd
[1271223.256297] usb 1-12.3: New USB device found, idVendor=0000, idProduct=0000, bcdDevice= 0.00
[1271223.256303] usb 1-12.3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[1271223.256307] usb 1-12.3: Product: Eswin-storage
[1271223.256310] usb 1-12.3: Manufacturer: Eswincomputing.co
[1271223.256313] usb 1-12.3: SerialNumber:
[1271223.258920] usb-storage 1-12.3:1.0: USB Mass Storage device detected
[1271223.259529] scsi host6: usb-storage 1-12.3:1.0
[1271224.280270] scsi 6:0:0:0: Direct-Access     ESWIN    WIN-2030         PQ: 0 ANSI: 2
[1271224.280944] sd 6:0:0:0: Attached scsi generic sg1 type 0
[1271224.281363] sd 6:0:0:0: Power-on or device reset occurred
[1271224.281671] sd 6:0:0:0: [sdb] 8192000 512-byte logical blocks: (4.19 GB/3.91 GiB)
[1271224.281814] sd 6:0:0:0: [sdb] Write Protect is off
[1271224.281818] sd 6:0:0:0: [sdb] Mode Sense: 0c 00 00 08
[1271224.281961] sd 6:0:0:0: [sdb] No Caching mode page found
[1271224.281968] sd 6:0:0:0: [sdb] Assuming drive cache: write through
[1271224.296698]  sdb:
[1271224.320219] sd 6:0:0:0: [sdb] Attached SCSI removable disk
```

Figure 6-2 Board corresponds to the blk device number

3) Mount the usb device and copy the bootloader to the corresponding directory. After the copy is completed, wait for the development board to print: bootloader write OK. This indicates that the bootloader has been

successfully installed.

```
0/bootloader$ sudo mount -o noatime,sync /dev/sdb usb
0/bootloader$ sudo cp recovery_bootloader_SBC_A1.bin usb/
```

Figure 6-3 Copy bootloader image

```
pll config ok
die_num:0,die_ordinal:0
Firmware version:1.5;disable ECC
PHY0 training process:100%
PHY1 training process:100%
DDR type:LPDDR5;Size:16GB,Data Rate:6400MT/s
DDR self test OK

USB: error in submission: ep129 --> -22

USB: bulk_in_complete --> -22, 0/13
                                Build May 28 2025 13:36:14
BOOT_SPI_BASE 51800000 disable flash wp
 ef 60 17 0 0 0
FIRMWARE writing...
Erase progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
SF: 7d4 bytes @ 140000 Erased: OK
Write progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
crc32 check:
SF: 0x7d4 bytes @ 140000 Written: OK
DDR writing...
Erase progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
SF: 42aa8 bytes @ 40000 Erased: OK
Write progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
crc32 check:
SF: 0x42aa8 bytes @ 40000 Written: OK
BOOTLOADER writing...
Erase progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
SF: 3ed1d8 bytes @ 1c0000 Erased: OK
Write progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
crc32 check:
SF: 0x3ed1d8 bytes @ 1c0000 Written: OK
Erase progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
SF: e0 bytes @ 0 Erased: OK
Write progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++
crc32 check:
SF: 0xe0 bytes @ 0 Written: OK
bootloader write OK
```

Figure 6-4 Wait for the bootloader to be installed

6.2 Update BOOTLOADER

This section is applicable when the bootloader can start normally and the bootloader image needs to be updated and upgraded. The bootloader image upgrade can be done through the command line.

6.2.1 Create bootloader burning disc

Both installing and upgrading the image require obtaining the corresponding image file from the USB

drive. Therefore, it is necessary to partition the USB drive in advance and format it as the ext4 file system.

If you have already made a bootable USB drive, you can skip this section.

1) Insert the host and enter "dmesg" in the terminal to obtain the device path.

```
53] usb 2-6: SerialNumber: ABCDEF0123456789AB
91] usb-storage 2-6:1.0: USB Mass Storage device detected
90] scsi host10: usb-storage 2-6:1.0
30] scsi 10:0:0:0: Direct-Access              SD Card Reader   1.00 PQ: 0 ANSI: 6
91] sd 10:0:0:0: Attached scsi generic sg0 type 0
53] sd 10:0:0:0: [sdc] 61074432 512-byte logical blocks: (31.3 GB/29.1 GiB)
99] sd 10:0:0:0: [sdc] Write Protect is off
02] sd 10:0:0:0: [sdc] Mode Sense: 03 00 00 00
45] sd 10:0:0:0: [sdc] No Caching mode page found
55] sd 10:0:0:0: [sdc] Assuming drive cache: write through
74]  sdc: sdc1
75] sd 10:0:0:0: [sdc] Attached SCSI removable disk
```

Figure 6-5 Obtain the path of USB flash drive

2) Format the USB flash drive partition and create a partition table

The input command is as follows:

```
$ sudo fdisk /dev/sdc
Welcome to fdisk (util-linux 2.31.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Command (m for help): g
Created a new GPT disklabel (GUID: 044AD8EA-A200-BE43-B53F-731998FD7092).
The old dos signature will be removed by a write command.
Command (m for help): n
Partition number (1-128, default 1): 1
First sector (2048-61074398, default 2048): 2048
Last sector, +sectors or +size{K,M,G,T,P} (2048-61074398, default 61074398): 61074398
Created a new partition 1 of type 'Linux filesystem' and of size 29.1 GiB.
Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.
```

The output of the host terminal is shown in the following figure:

```
$ sudo fdisk /dev/sdc

Welcome to fdisk (util-linux 2.31.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): g
Created a new GPT disklabel (GUID: 044AD8EA-A200-BE43-B53F-731998FD7092).
The old dos signature will be removed by a write command.

Command (m for help): n
Partition number (1-128, default 1): 1
First sector (2048-61074398, default 2048): 2048
Last sector, +sectors or +size{K,M,G,T,P} (2048-61074398, default 61074398): 61074398

Created a new partition 1 of type 'Linux filesystem' and of size 29.1 GiB.

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

Figure 6-6 Create a partitioned table

3) Check if the partition is successful and format partition num 1 as the ext4 file system

```
$ ls /dev/sdc*
/dev/sdc1
$ sudo mkfs.ext4 /dev/sdc1
Creating filesystem with 7680000 4k blocks and 1921360 inodes
Filesystem UUID: 40cae407-67bd-4474-858d-0ad0c07640c9
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000
Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

4) Copy the image to the USB flash drive

Copy the prepared bootloader (bootloader_SBC-A1.bin) to the USB flash drive. After confirming the copy is complete, uninstall the USB flash drive.

```
buildroot$ sudo cp nsign_bootloader_secboot_ddr.bin /media/usb0/
buildroot$ ls /media/usb0/
oader_secboot_ddr.bin
:buildroot$ sudo umount /media/usb0
```

Figure 6-7 Prepare the bootloader image

6.2.2 Install bootloader image

1) As shown in the following figure, connect the serial port and insert the prepared mirror USB flash drive into the USB2.0 port of the development board.

Figure 6-8 Hardware connection diagram

2) Power on and start up to enter the U-Boot cmd interface.

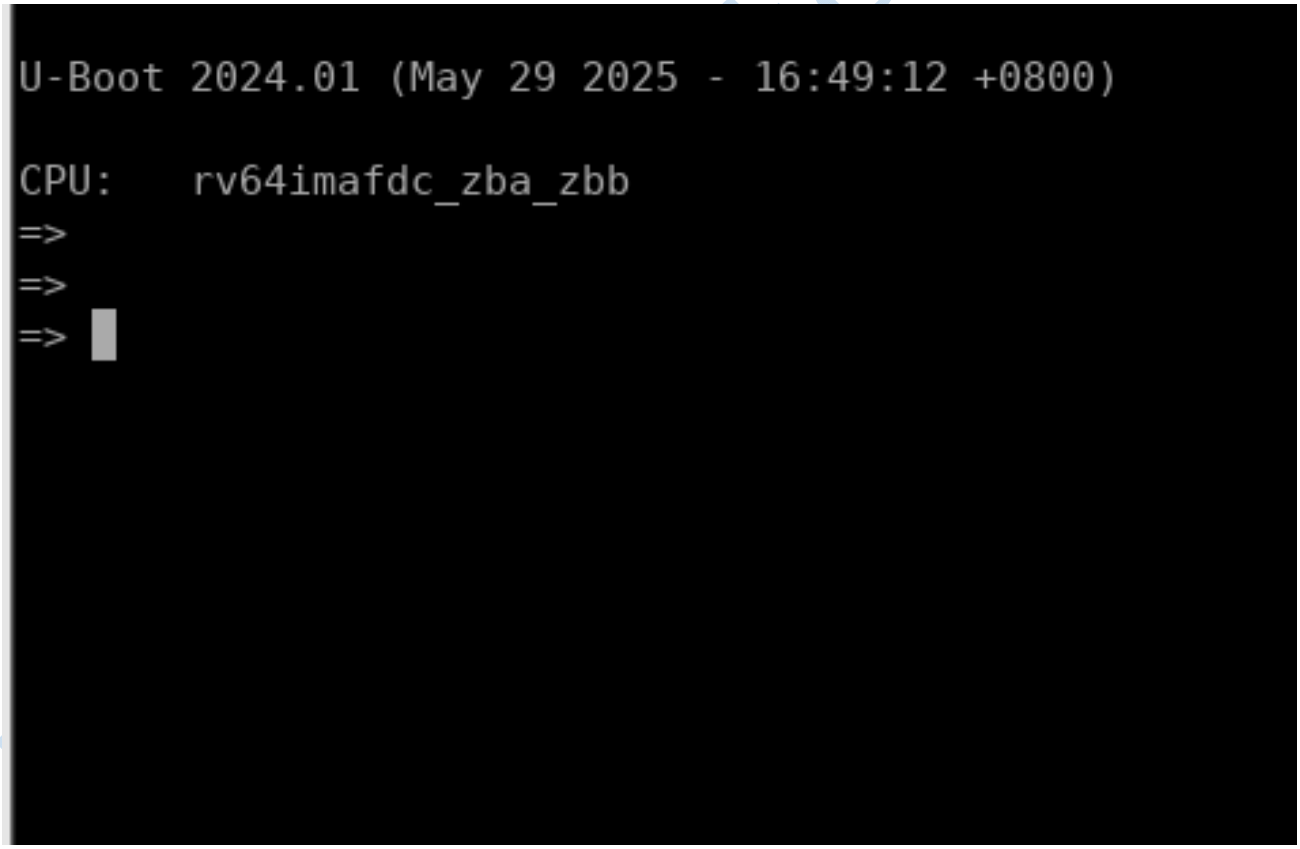


Figure 6-9 Enter the U-Boot cmd interface

3) Mount the USB drive to download the image and install it, then wait for the installation to complete. Effective after reset.

```
=> usb start
starting USB...
Bus usb1@50490000: Register 2000140 NbrPorts 2
Starting the controller
USB XHCI 1.10
scanning bus usb1@50490000 for devices... 4 USB Device(s) found
       scanning usb for storage devices... 1 Storage Device(s) found
=> ls usb 0
  6726232   nsign_bootloader_secboot_ddr.bin

1 file(s), 0 dir(s)

=> fatload usb 0 0x90000000 nsign_bootloader_secboot_ddr.bin
6726232 bytes read in 40 ms (160.4 MiB/s)
=> es_burn write 0x90000000 flash
SF: 224 bytes @ 0x0 Read: OK
FIRMWARE writing...
Bootspi flash write protection disabled
SF: 4096 bytes @ 0x800000 Erased: OK
SF: Erase time 49 ms, Write time 8 ms, 0x776 bytes @ 0x800000 Written: OK
Bootspi flash write protection enabled
write done

DDR writing...
Bootspi flash write protection disabled
SF: 1060864 bytes @ 0x400000 Erased: OK
SF: Erase time 2614 ms, Write time 4407 ms, 0x1026d2 bytes @ 0x400000 Written: OK
Bootspi flash write protection enabled
write done

BOOTLOADER writing...
Bootspi flash write protection disabled
SF: 5668864 bytes @ 0xa00000 Erased: OK
SF: Erase time 13500 ms, Write time 23587 ms, 0x5670f8 bytes @ 0xa00000 Written: OK
Bootspi flash write protection enabled
write done

Bootspi flash write protection disabled
SF: 4096 bytes @ 0x0 Erased: OK
SF: Erase time 48 ms, Write time 1 ms, 0xe0 bytes @ 0x0 Written: OK
Bootspi flash write protection enabled
bootloader wirte OK
=>
```

Figure 6-10 Download and upgrade the bootloader image

6.3 Update Ubuntu system image

This section mainly discusses how to update the Ubuntu system image.

This section is only applicable when the bootloader can start normally and the system image needs to be updated.

Copy the released ubuntu image such as Ubuntu.img to a USB flash drive, and insert the USB flash drive into the USB2.0 port of the development board. The hardware connection is the same as shown in Figure 6-8.

In the U-Boot cmd, execute "usb reset" and "ls usb 0" to query the files on the USB drive. Then, use the command “es_fs write usb 0 ubuntu.img mmc 0" to write the image to the corresponding partition of mmc. After the burning is completed, reset it and it will take effect.

```
=> usb reset
resetting USB...
Bus usb1@50490000: Register 2000140 NbrPorts 2
Starting the controller
USB XHCI 1.10
scanning bus usb1@50490000 for devices... 3 USB Device(s) found
       scanning usb for storage devices... 1 Storage Device(s) found
=> ls usb 0
<DIR>       4096 .
<DIR>       4096 ..
<DIR>      16384 lost+found
     7702584832 nowifi-sbc-ubuntu-24.04-preinstalled-server-riscv64.img
     7700852224 0701-sbc-ubuntu-24.04-preinstalled-server-riscv64.img
     2031164861 sbc-eic7700-image-2025.06.zip
        4510744 bootloader_SBC-A1.bin
     7713570304 sbc-ubuntu-24.04-preinstalled-server-riscv64.img
=> es_fs write usb 0 sbc-ubuntu-24.04-preinstalled-server-riscv64.img mmc 0
Write progress: 100%:++++++++++++++++++++++++++++++++++++++++++++++++++++++++
sbc-ubuntu-24.04-preinstalled-server-riscv64.img has been successfully writen in mmc 0
=>
```

Figure 6-11 Write Image Command

After the Ubuntu image update is completed, the username for entering the system is ubuntu, and the initial password is also ubuntu (the password will be required to be changed during the first login).

6.4 Install Serial port Driver under Windows System

1) When using the board card under the Windows system, it may be necessary to install the serial port driver CH341SER.EXE first.
2) Reconnect the board card to the computer via the serial port cable.
3) Open the serial port using the MobaXterm software.

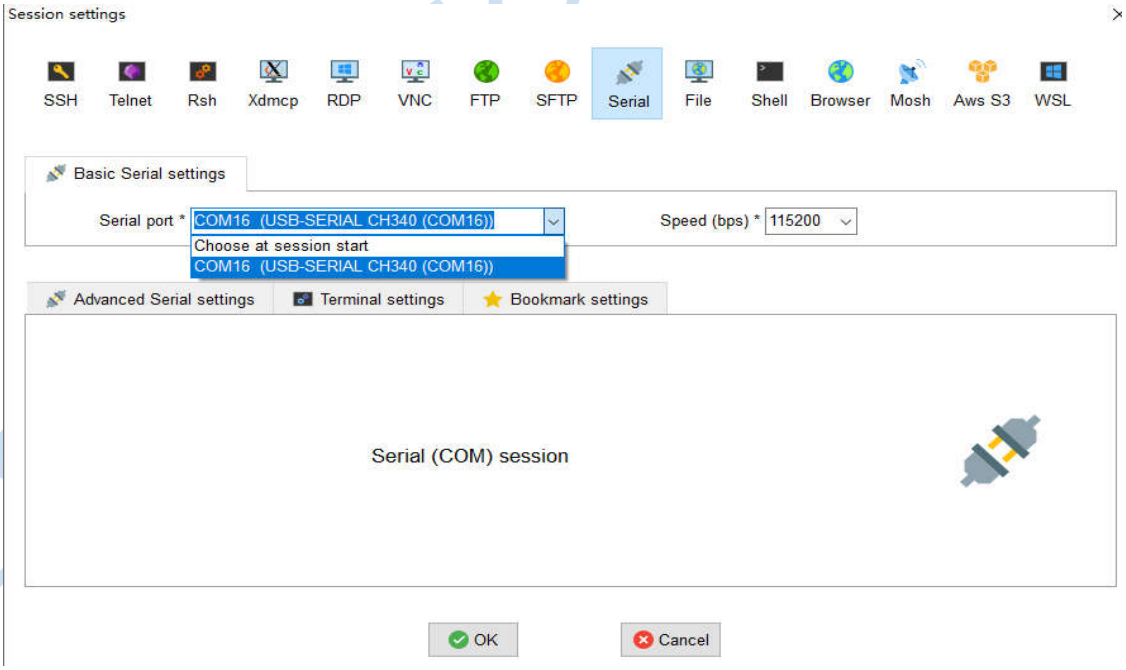


Figure 6-12 Serial Tool configuration

4) After entering the serial port, follow the previous steps to operate and use the board card.

7 Application Introduction

This section mainly provides a brief introduction to some applications in the system.

a) Video playback

Install the mpv player software, sudo apt install mpv, and then execute for example mpv bbb_sunflower_4k.mp4 to play the corresponding video file.

b) Play the supertuxkart game

Install the supertuxkart software. sudo apt install supertuxkart, and then execute supertuxkart to run the game. The Ubuntu system must execute MESA_LOADER_DRIVER_OVERRIDE=zink supertuxkart.

c) Run large models

Install the SDK software, sudo apt install es-sdk-sample-npu-qwen, Then execute /opt/eswin/sample-code/npu_sample/qwen_sample/bin/es_qwen2 config.json. This json file is the model parameter configuration file. For details of this part, please refer to the "ModelZoo User Guide".

8 FQA

Q: How to get familiar with the related functions of U-Boot?

A: The "help" function can be used to query commands related to U-Boot, and each command also has its own detailed help information.

Q: What should I do if the network is not working?

A: Make sure the connected network has the relevant permissions. Secondly, check through print whether there is an ethaddr parameter and whether the mac address has been read. If not, you can set the mac address by env set ethaddr aa:bb:cc:11:22:33 and save it by saveenv.

Q: Serial port pasting can only fix the length, and some characters at the back are lost?

A: Execute “setenv stdout serial". The impact is that the uboot output will not be output to HDMI.

Q: Why does it report an error when starting up after burning?

A: The environment configuration information of the previous version may be left over, which may affect the startup of the new version. After burning the bootloader, reset it and execute “env default –a", clear the old configuration, “saveenv". The current configuration will be maintained.

Q: Burning error, partition not existing, partition too small?

A: “mmc part" view partition information, First, burn the correct bootloader. After reset, “env default-a" clear the old configuration, “saveenv", reset, “run gpt_partition" to repartition.

Q: How to determine if the burning was successful after burning?

A: When uboot starts up, there is a line marked with the compilation time of uboot. At the same time, when the kernel starts up, the compilation time of the kernel is also marked.

Q: Does uboot support hot plugging of devices?

A: After hot-swapping a USB device, usb reset needs to be performed. SD cards do not support hot plugging.

Q: How to switch from HDMI to MIPI DSI output?

A: Follow the steps below

1) First, when the power is disconnected, you need to connect the raspberry 7-inch screen with the MIPI DSI interface. After startup, log in to the ubuntu system.

2) Operate the following command to modify the dtb files that the ubuntu system depends on. After completing the command and restarting, you can use the MIPI DSI interface to output.

```
ubuntu@ubuntu:~$ sudo su
root@ubuntu:/home/ubuntu# cp /lib/firmware/6.6.18-2025-eic7700/device-tree/eswin/eic7700-sbc-a1-mipi.dtb /boot/dtbs/6.6.18-2025-eic7700/eswin/
```

```
root@ubuntu:/home/ubuntu# ln -sf /boot/dtbs/6.6.18-2025-eic7700/eswin/eic7700-sbc-a1-mipi.dtb /boot/dtb-6.6.18-2025-eic7700
root@ubuntu:/home/ubuntu# reboot
```

To switch back to HDMI, the user needs to operate the following command after the ubuntu system starts up and then restart.

```
ubuntu@ubuntu:~$ sudo su
root@ubuntu:/home/ubuntu#  ln -sf /boot/dtbs/6.6.18-2025-eic7700/eswin/eic7700-sbc-a1.dtb /boot/dtb-6.6.18-2025-eic7700
root@ubuntu:/home/ubuntu# reboot
```