

uCOM-IMX8P

SMARC Module

User's Manual 1st Ed

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Packing List

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● uCOM-IMX8P	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

About this Document

This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page on AAEON.com for the latest version of this document.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
7. Always disconnect this device from any AC supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.

17. If any of the following situations arises, please the contact our service personnel:
 - i. Damaged power cord or plug
 - ii. Liquid intrusion to the device
 - iii. Exposure to moisture
 - iv. Device is not working as expected or in a manner as described in this manual
 - v. The device is dropped or damaged
 - vi. Any obvious signs of damage displayed on the device
18. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -40°C (-40°F) OR ABOVE 85°C (185°F) TO PREVENT DAMAGE.**

FCC Statement

Warning!



This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON 主板/子板/背板

QQ4-381 Rev.A2

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板 及其电子组件	×	○	○	○	○	○
外部信号 连接器及线材	×	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。 ○：表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572标准规定的限量要求以下。 ×：表示该有害物质的某一均质材料超出了GB/T 26572的限量要求，然而该部件仍符合欧盟指令2011/65/EU 的规范。 环保使用期限(EFUP (Environmental Friendly Use Period)) : 10年 备注：此产品所标示之环保使用期限，系指在一般正常使用状况下。						

China RoHS Requirement (EN)

Name and content of hazardous substances in product

AAEON Main Board/Daughter Board/Backplane

QO4-381 Rev.A2

Part Name	Hazardous Substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCB Assemblies	×	○	○	○	○	○
Connector and Cable	×	○	○	○	○	○
The table is prepared in accordance with the provisions of SJ/T 11364. ○: Indicates that said hazardous substance contained in all of the homogenous materials for this product is below the limit requirement of GB/T 26572. ×: Indicates that said hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement of GB/T 26572. But this product still be compliance with 2011/65/EU Directive (allowed with 2011/65/EU Annex III of RoHS exemption with number 6(c),7(a),7(c)-1). EFUP (Environment Friendly Use Period) value: 10 years Notes: This product defined period of use is under normal condition.						

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Chapter 1

Product Specifications

1.1 Specifications

System

Form Factor	SMARC 2.1 Compliant
CPU	NXP i.MX 8M Plus – Quad-Core Arm® Cortex® -A53 Processor, 1.6GHz (Default w/NPU, optional w/o NPU)
Chipset	-
Memory	Onboard LPDDR4, up to 4GB
Storage	eMMC 5.1, 16GB/32GB (Optional: 64GB/128 GB)
BIOS	-
MTBF (Hours)	3,780,780
Wake on LAN	-
Watchdog Timer	Yes
Real Time Clock	RTC x 1
Boot Select	Carrier SD Card Module eMMC Flash
Security	TPM 2.0 (optional)

Display

Graphics Controller	2D: Vivante GC520L 3D: Vivante GC7000UL
Video Output	HDMI 2.0a x 1 LVDS (2 CH, 4 Lane) x 1 MIPI-DSI 4 Lane x 1 (by request)

I/O

Ethernet	Gigabit Ethernet x 2 (TSN x 1)
USB	USB 3.0 Gen 1 + USB 2.0 x 2 (Host) USB 2.0 x 2 (Host) USB 2.0 x 1 (OTG)
Serial Port	UART x 4 (2-wire x 2, one for debug port, 4-wire x 2)
Audio	I2S x 1
PCIe	PCIe Gen 3 x 1
CANBus	CAN 2.0 FD x 2 (1.8V)
MIPI-CSI	MIPI CSI 2 Lane x 1 MIPI CSI 4 Lane x 1
GPIO	14-bit (one for PWM)
Other Interfaces	SPI x 2 (SPI x 1, QSPI x 1) I2C x 5 (Power Management x 1, Camera x 2, LCD Display x 1, General Purpose x 1)

Power

Power Requirement	DC 3.3V ~ 5.25V
Power Consumption	3.45 W (Full Loading)

Environmental

Dimensions	3.23" x 1.97" (82mm x 50mm)
Weight	0.03 lb. (0.013kg)
Operating Temperature	-40°F ~ 185°F (-40°C ~ 85°C) Optional: 32°F ~ 140°F (0°C ~ 60°C)
Storage Temperature	-40°F ~ 185°F (-40°C ~ 85°C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
Certification	CE/FCC Class A

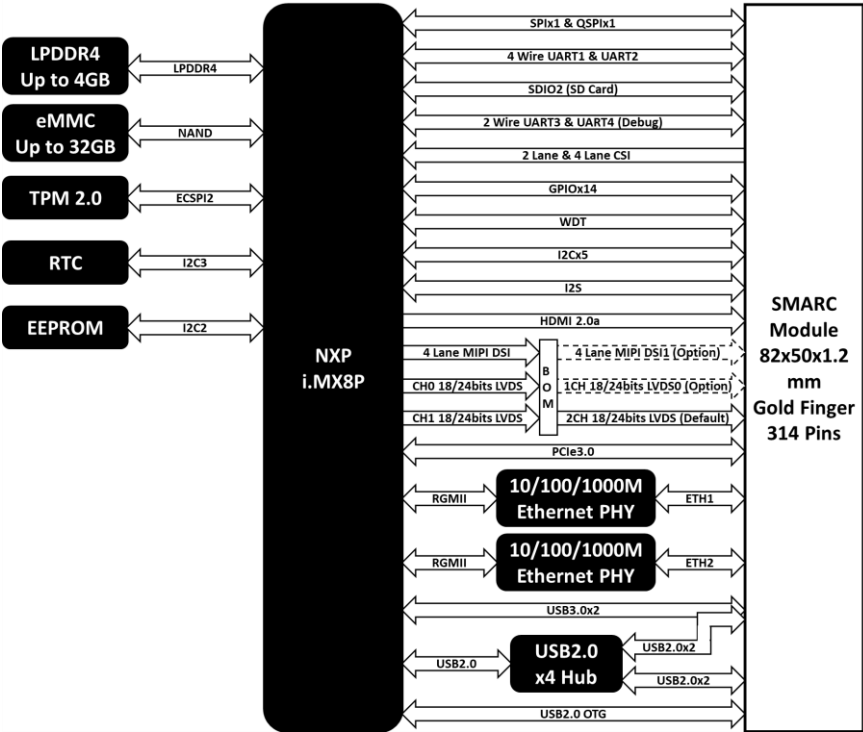
Environmental

OS Support	Debian 12 (Default)
	Windows 10 IoT (by request)
	Yocto (by request)
Support Protocol	Modbus, MQTT, OPC UA

1.2 Function Block Diagram

SMARC Module

uCOM-iMX8P

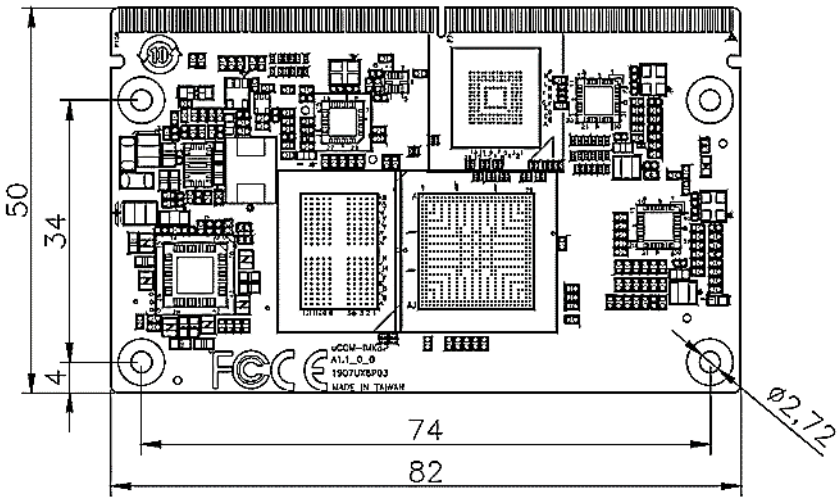


Chapter 2

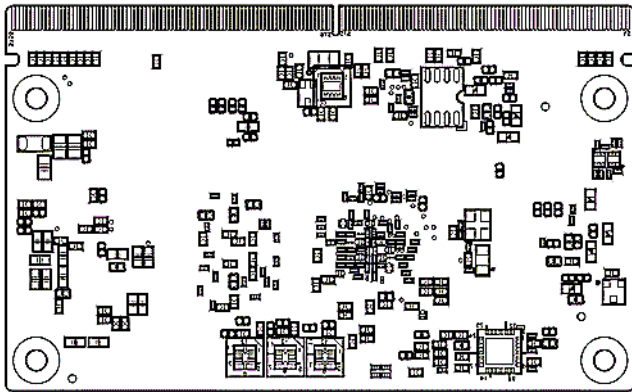
Hardware Information

2.1 Dimensions

Top

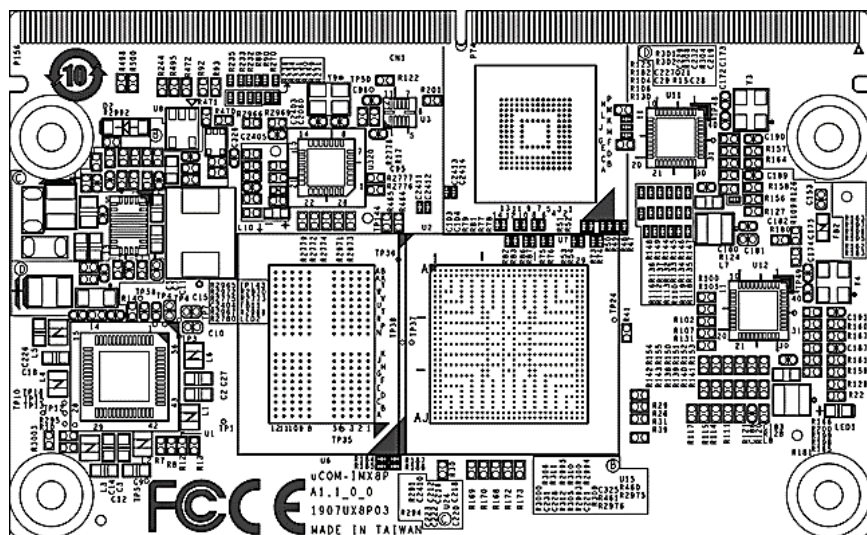


Bottom

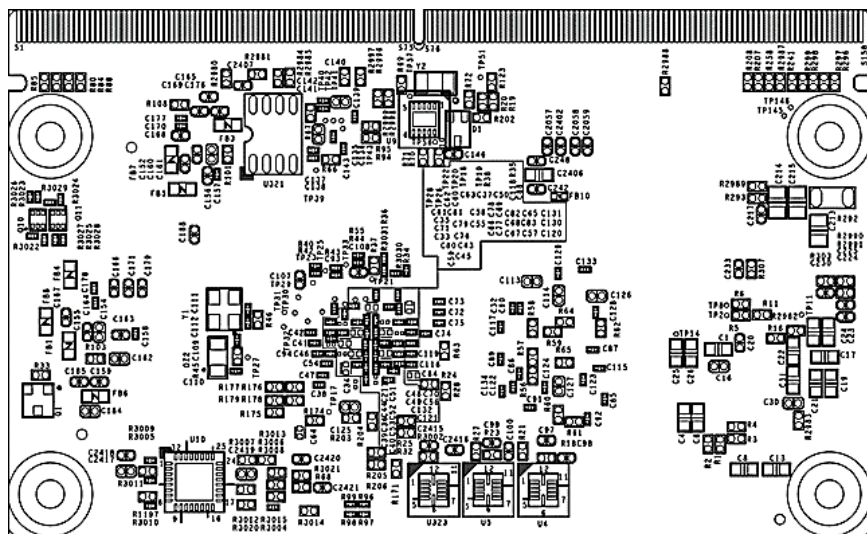


2.2 Jumpers and Connectors

Top Side



Bottom Side



2.3 MXM Gold Finger (CN1)

Pin	Pin Name	Pin	Pin Name
P1	NC	S1	I2C_CAM1_CK
P2	GND	S2	I2C_CAM1_DAT
P3	CSI1_CK+	S3	GND
P4	CSI1_CK-	S4	NC
P5	GBE1_SDP	S5	I2C_CAM0_CK
P6	GBE0_SDP	S6	CAM_MCK
P7	CSI1_RX0+	S7	I2C_CAM0_DAT
P8	CSI1_RX0-	S8	CSI0_CK+
P9	GND	S9	CSI0_CK-
P10	CSI1_RX1+	S10	GND
P11	CSI1_RX1-	S11	CSI0_RX0+
P12	GND	S12	CSI0_RX0-
P13	CSI1_RX2+	S13	GND
P14	CSI1_RX2-	S14	CSI0_RX1+
P15	GND	S15	CSI0_RX1-
P16	CSI1_RX3+	S16	GND
P17	CSI1_RX3-	S17	GBE1_MDI0+
P18	GND	S18	GBE1_MDI0-
P19	GBE0_MDI3-	S19	GBE1_LINK100#
P20	GBE0_MDI3+	S20	GBE1_MDI1+
P21	GBE0_LINK100#	S21	GBE1_MDI1-
P22	GBE0_LINK1000#	S22	GBE1_LINK1000#
P23	GBE0_MDI2-	S23	GBE1_MDI2+
P24	GBE0_MDI2+	S24	GBE1_MDI2-
P25	GBE0_LINK_ACT#	S25	GND
P26	GBE0_MDI1-	S26	GBE1_MDI3+
P27	GBE0_MDI1+	S27	GBE1_MDI3-
P28	NC	S28	NC
P29	GBE0_MDI0-	S29	NC
P30	GBE0_MDI0+	S30	NC
P31	SPI0_CS1#	S31	GBE1_LINK_ACT#
P32	GND	S32	NC
P33	SDIO_WP	S33	NC
P34	SDIO_CMD	S34	GND
P35	SDIO_CD#	S35	USB4+
P36	SDIO_CK	S36	USB4-

Pin	Pin Name	Pin	Pin Name
P37	SDIO_PWR_EN	S37	USB3_VBUS_DET
P38	GND	S38	AUDIO_MCK
P39	SDIO_D0	S39	I2S0_LRCK
P40	SDIO_D1	S40	I2S0_SDOUT
P41	SDIO_D2	S41	I2S0_SDIN
P42	SDIO_D3	S42	I2S0_CK
P43	SPI0_CS0#	S43	NC
P44	SPI0_CK	S44	NC
P45	SPI0_DIN	S45	NC
P46	SPI0_DO	S46	NC
P47	GND	S47	GND
P48	NC	S48	I2C_GP_CK
P49	NC	S49	I2C_GP_DAT
P50	GND	S50	NC
P51	NC	S51	NC
P52	NC	S52	NC
P53	GND	S53	NC
P54	QSPI_CS0#	S54	NC
P55	NC	S55	NC
P56	QSPI_CK	S56	QSPI_IO_2
P57	QSPI_IO_1	S57	QSPI_IO_3
P58	QSPI_IO_0	S58	NC
P59	GND	S59	NC
P60	USB0+	S60	NC
P61	USB0-	S61	GND
P62	USB0_EN_OC#	S62	USB3_SSTX+
P63	USB0_VBUS_DET	S63	USB3_SSTX-
P64	USB0_OTG_ID	S64	GND
P65	USB1+	S65	USB3_SSRX+
P66	USB1-	S66	USB3_SSRX-
P67	USB1_EN_OC#	S67	GND
P68	GND	S68	USB3+
P69	USB2+	S69	USB3-
P70	USB2-	S70	GND
P71	USB2_EN_OC#	S71	USB2_SSTX+
P72	NC	S72	USB2_SSTX-
P73	NC	S73	GND
P74	USB3_EN_OC#	S74	USB2_SSRX+
P75	PCIE_A_RST#	S75	USB2_SSRX-

Pin	Pin Name	Pin	Pin Name
P76	USB4_EN_OC#	S76	NC
P77	NC	S77	NC
P78	PCIE_A_CKREQ#	S78	NC
P79	GND	S79	NC
P80	NC	S80	GND
P81	NC	S81	NC
P82	GND	S82	NC
P83	PCIE_A_REFCK+	S83	GND
P84	PCIE_A_REFCK-	S84	NC
P85	GND	S85	NC
P86	PCIE_A_RX+	S86	GND
P87	PCIE_A_RX-	S87	NC
P88	GND	S88	NC
P89	PCIE_A_TX+	S89	GND
P90	PCIE_A_TX-	S90	NC
P91	GND	S91	NC
P92	HDMI_D2+	S92	GND
P93	HDMI_D2-	S93	NC
P94	GND	S94	NC
P95	HDMI_D1+	S95	NC
P96	HDMI_D1-	S96	NC
P97	GND	S97	NC
P98	HDMI_D0+	S98	NC
P99	HDMI_D0-	S99	NC
P100	GND	S100	NC
P101	HDMI_CK+	S101	GND
P102	HDMI_CK-	S102	NC
P103	GND	S103	NC
P104	HDMI_HPD	S104	USB3_OTG_ID
P105	HDMI_CTRL_CK	S105	NC
P106	HDMI_CTRL_DAT	S106	NC
P107	HDMI_CEC	S107	LCD1_BKLT_EN
P108	GPIO0/CAM0_PWR#	S108	LVDS1_CK+/DSI1_CLK+
P109	GPIO1/CAM1_PWR#	S109	LVDS1_CK-/DSI1_CLK-
P110	GPIO2/CAM0_RST#	S110	GND
P111	GPIO3/CAM1_RST#	S111	LVDS1_0+/DSI1_D0+
P112	GPIO4/HDA_RST#	S112	LVDS1_0-/DSI1_D0-
P113	GPIO5/PWM_OUT	S113	NC
P114	GPIO6/TACHIN	S114	LVDS1_1+/DSI1_D1+

Pin	Pin Name	Pin	Pin Name
P115	GPIO7	S115	LVDS1_1-/DSI1_D1-
P116	GPIO8	S116	LCD1_VDD_EN
P117	GPIO9	S117	LVDS1_2+/DSI1_D2+
P118	GPIO10	S118	LVDS1_2-/DSI1_D2-
P119	GPIO11	S119	GND
P120	GND	S120	LVDS1_3+/DSI1_D3+
P121	I2C_PM_CK	S121	LVDS1_3-/DSI1_D3-
P122	I2C_PM_DAT	S122	LCD1_BKLT_PWM
P123	BOOT_SEL0#	S123	GPIO13
P124	BOOT_SEL1#	S124	GND
P125	BOOT_SEL2#	S125	LVDS0_0+
P126	RESET_OUT#	S126	LVDS0_0-
P127	RESET_IN#	S127	LCD0_BKLT_EN
P128	POWER_BTN#	S128	LVDS0_1+
P129	SER0_TX	S129	LVDS0_1-
P130	SER0_RX	S130	GND
P131	SER0_RTS#	S131	LVDS0_2+
P132	SER0_CTS#	S132	LVDS0_2-
P133	GND	S133	LCD0_VDD_EN
P134	SER1_TX	S134	LVDS0_CK+
P135	SER1_RX	S135	LVDS0_CK-
P136	SER2_TX	S136	GND
P137	SER2_RX	S137	LVDS0_3+
P138	SER2_RTS#	S138	LVDS0_3-
P139	SER2_CTS#	S139	I2C_LCD_CK
P140	SER3_TX	S140	I2C_LCD_DAT
P141	SER3_RX	S141	LCD0_BKLT_PWM
P142	GND	S142	GPIO12
P143	CAN0_TX	S143	GND
P144	CAN0_RX	S144	DSI0_TE
P145	CAN1_TX	S145	WDT_TIME_OUT#
P146	CAN1_RX	S146	PCIE_WAKE#
P147	VDD_IN	S147	VDD_RTC
P148	VDD_IN	S148	NC
P149	VDD_IN	S149	SLEEP#
P150	VDD_IN	S150	VIN_PWR_BAD#
P151	VDD_IN	S151	NC
P152	VDD_IN	S152	NC
P153	VDD_IN	S153	CARRIER_STBY#

Pin	Pin Name	Pin	Pin Name
P154	VDD_IN	S154	CARRIER_PWR_ON
P155	VDD_IN	S155	FORCE_RECOV#
P156	VDD_IN	S156	NC
		S157	NC
		S158	GND

Note: The selection between LVDS1 and DSI1 is determined by 0Ω (0ohm) jumpers. The specific resistor configurations are as follows:

LVDS1: R47, R48, R49, R50, R51, R52, R53, R54, R73, R74

DSI1: R75, R76, R77, R78, R79, R81, R82, R83, R86, R87

Chapter 3

Product Setup and Configuration

3.1 System Account Management

3.1.1 Boot Mode Selection

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P123	BOOT_SEL0#
P124	BOOT_SEL1#
P125	BOOT_SEL2#

Boot Mode	BOOT_SEL0#	BOOT_SEL1#	BOOT_SEL2#
EMMC	Low	High	Low
SD Card	High	Low	Low
Serial Download	High	Low	High

On ECB-960T SMARC Carrier Board, please refer to section 2.3.13 Boot Select (SW5).

Boot Mode	Pin 1	Pin 2	Pin 3
EMMC	ON	OFF	ON
SD Card	OFF	ON	ON
Serial Download	OFF	ON	OFF

3.1.2 Debug Console

There are two ways to access debug console:

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P140	SER3_TX
P141	SER3_RX

On ECB-960T SMARC Carrier Board, please refer to section 2.4.44 UART Lane 3 (TX3/RX3) UART 3) with the following pin configuration:

Pin	Pin Name	Signal Type	Signal Level
1	VCC_3V3_L	PWR	+3.3V
2	SER3_TX_3V_R	O	3.3V or 1.8V
3	SER3_RX_3V_R	I	3.3V or 1.8V
4	GND	GND	

3.1.3 Log In

Log into the system using the below credentials.

Username	Password	Login
root	Pw#12345	Serial Console
aaeon	Pw#12345	Desktop GUI/Serial Console

3.2 I/O Control Command and Examples

3.2.1 CANBus

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P143	CAN0_TX
P144	CAN0_RX
P145	CAN1_TX
P146	CAN1_RX

On ECB-960T SMARC Carrier Board, please refer to CN25 (CAN0) and CN18 (CAN1).

Pin 1	Pin 2	Pin 3	Pin 4
CANH	GND	CANL	NA

Step 1: Connect CN25 pin 1 to CN18 pin 1 on the ECB-960T.

Step 2: Set up CAN0 and CAN1.

```
root@uCOM-IMX8P:~# ip link set can0 type can bitrate 1000000 dbitrate
4000000 fd on
root@uCOM-IMX8P:~# ifconfig can0 up
root@uCOM-IMX8P:~# ip link set can1 type can bitrate 1000000 dbitrate
4000000 fd on
root@uCOM-IMX8P:~# ifconfig can1 up
```

Step 3: candump CAN0.

```
root@uCOM-IMX8P:~# candump can0 &
```

Step 4: cansend CAN1.

```
root@uCOM-IMX8P:~# cansend can1 5A1#11.2233.44556677.88
can0 5A1 [8] 11 22 33 44 55 66 77 88
```

3.2.2 DIO

There are two ways to access the DIO.

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P108	GPIO0/CAM0_PWR#
P109	GPIO1/CAM1_PWR#
P110	GPIO2/CAM0_RST#
P111	GPIO3/CAM1_RST#
P112	GPIO4/HDA_RST#
P113	GPIO5/PWM_OUT
P114	GPIO6/TACHIN
P115	GPIO7
P116	GPIO8
P117	GPIO9
P118	GPIO10
P119	GPIO11
S142	GPIO12
S123	GPIO13

Output Mode

Configure the GPIO pins for output using the following commands:

Name	Commands
GPIO0/CAM0_PWR#	gpioset 0 9=0 gpioset 0 9=1
GPIO1/CAM1_PWR#	gpioset 0 10=0 gpioset 0 10=1
GPIO2/CAM0_RST#	gpioset 0 1=0 gpioset 0 1=1
GPIO3/CAM1_RST#	gpioset 0 12=0 gpioset 0 12=1
GPIO4/HDA_RST#	gpioset 0 13=0 gpioset 0 13=1
GPIO5/PWM_OUT	gpioset 0 14=0 gpioset 0 14=1
GPIO6/TACHIN	gpioset 0 15=0 gpioset 0 15=1
GPIO7	gpioset 4 5=0 gpioset 4 5=1
GPIO8	gpioset 1 5=0 gpioset 1 5=1
GPIO9	gpioset 1 4=0 gpioset 1 4=1
GPIO10	gpioset 1 3=0 gpioset 1 3=1
GPIO11	gpioset 1 2=0 gpioset 1 2=1
GPIO12	gpioset 3 22=0 gpioset 3 22=1
GPIO13	gpioset 3 0=0 gpioset 3 0=1

Input Mode

To read the state of GPIO pins:

Name	Commands
GPIO0/CAM0_PWR#	gpioget 0 9
GPIO1/CAM1_PWR#	gpioget 0 10
GPIO2/CAM0_RST#	gpioget 0 1

Name	Commands
GPIO3/CAM1_RST#	gpioget 0 12
GPIO4/HDA_RST#	gpioget 0 13
GPIO5/PWM_OUT	gpioget 0 14
GPIO6/TACHIN	gpioget 0 15
GPIO7	gpioget 4 5
GPIO8	gpioget 1 5
GPIO9	gpioget 1 4
GPIO10	gpioget 1 3
GPIO11	gpioget 1 2
GPIO12	gpioget 3 22
GPIO13	gpioget 3 0

On ECB-960T SMARC Carrier Board, please refer to section 2.4.27 (CN30).

Output Mode

Configure the GPIO pins for output using the following commands:

CN30	Name	Commands
Pin 1	GPIO 7	gpioset 4 5=0 gpioset 4 5=1
Pin 2	GPIO 8	gpioset 1 5=0 gpioset 1 5=1
Pin 3	GPIO 9	gpioset 1 4=0 gpioset 1 4=1
Pin 4	GPIO 10	gpioset 1 3=0 gpioset 1 3=1
Pin 5	GPIO 11	gpioset 1 2=0 gpioset 1 2=1
Pin 6	GPIO 12	gpioset 3 22=0 gpioset 3 22=1
Pin 7	GPIO 13	gpioset 3 0=0 gpioset 3 0=1

Input Mode

To read the state of GPIO pins:

CN30	Name	Commands
Pin 1	GPIO 7	gpioget 4 5
Pin 2	GPIO 8	gpioget 1 5
Pin 3	GPIO 9	gpioget 1 4
Pin 4	GPIO 10	gpioget 1 3
Pin 5	GPIO 11	gpioget 1 2
Pin 6	GPIO 12	gpioget 3 22
Pin 7	GPIO 13	gpioget 3 0

3.2.3 Ethernet

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P6	GBE0_SDP
S17	GBE1_MDI0+
S18	GBE1_MDI0-
P27	GBE0_MDI1+
P26	GBE0_MDI1-
P24	GBE0_MDI2+
P23	GBE0_MDI2-
P20	GBE0_MDI3+
P19	GBE0_MDI3-
P21	GBE0_LINK100#
P22	GBE0_LINK1000#
P25	GBE0_LINK_ACT#
P5	GBE1_SDP
S20	GBE1_MDI1+
S21	GBE1_MDI1-
S23	GBE1_MDI2+

Pin	Pin Name
S24	GBE1_MDI2-
S26	GBE1_MDI3+
S27	GBE1_MDI3-
S19	GBE1_LINK100#
S22	GBE1_LINK1000#
S31	GBE1_LINK_ACT#

On ECB-960T SMARC Carrier Board, please refer to section 2.4.32 (CN40).

Step 1: Check the Ethernet interface

```

root@uCOM-IMX8P:~# ifconfig

eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.16.17.124 netmask 255.255.255.0 broadcast 172.16.17.255
    inet6 fe80::f5f1:f0cf:b70a:cc2f prefixlen 64 scopeid 0x20<link>
    ether e4:5f:01:8a:61:b3 txqueuelen 1000 (Ethernet)
    RX packets 7457 bytes 1000406 (976.9 KiB)
    RX errors 0 dropped 1612 overruns 0 frame 0
    TX packets 27 bytes 3635 (3.5 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.16.17.95 netmask 255.255.255.0 broadcast 172.16.17.255
    inet6 fe80::af58:5b1c:b960:f55d prefixlen 64 scopeid 0x20<link>
    ether 00:07:32:00:00:01 txqueuelen 1000 (Ethernet)
    RX packets 9638 bytes 1206495 (1.1 MiB)
    RX errors 0 dropped 1613 overruns 0 frame 0
    TX packets 1895 bytes 272939 (266.5 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device memory 0x600000000-60007ffff

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 19 bytes 2141 (2.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 19 bytes 2141 (2.0 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

Step 2: Perform a Ping Test

```
root@uCOM-IMX8P:~# ping google.com -I eth0 -c 1
```

```
PING google.com (172.217.160.110) from 172.16.17.124 eth0: 56(84) bytes of data.  
64 bytes from tsa03s06-in-f14.1e100.net (172.217.160.110): icmp_seq=1 ttl=115  
time=3.33 ms
```

```
--- google.com ping statistics ---  
1 packets transmitted, 1 received, 0% packet loss, time 0ms  
rtt min/avg/max/mdev = 3.326/3.326/3.326/0.000 ms
```

```
root@uCOM-IMX8P:~# ping google.com -I eth1 -c 1  
PING google.com (172.217.160.110) from 172.16.17.95 eth1: 56(84) bytes of data.  
64 bytes from tsa03s06-in-f14.1e100.net (172.217.160.110): icmp_seq=1 ttl=115 time=3.91  
ms
```

```
--- google.com ping statistics ---  
1 packets transmitted, 1 received, 0% packet loss, time 0ms  
rtt min/avg/max/mdev = 3.911/3.911/3.911/0.000 ms
```

3.2.4 PCIe

To check PCIe devices on SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P75	PCIE_A_RST#
P78	PCIE_A_CKREQ#
P83	PCIE_A_REFCK+
P84	PCIE_A_REFCK-
P86	PCIE_A_RX+
P87	PCIE_A_RX-
P89	PCIE_A_TX+
P90	PCIE_A_TX-

To check PCIe devices on ECB-960T SMARC Carrier Board, please refer to section 2.4.13 (CN14).

```
root@uCOM-IMX8P:~# lspci
00:00.0 PCI bridge: Synopsys, Inc. DWC_usb3 / PCIe bridge (rev 01)
01:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev 03)
```

3.2.5 RTC

Command:

```
root@uCOM-IMX8P:~# hwclock -r
```

Output:

2024-07-15 07:58:27.053610+00:00

Synchronize the System Time to the RTC:

```
root@uCOM-IMX8P:~# date 040310422024 && hwclock -w && date
```

Output:

Wed Apr 3 10:42:00 UTC 2024
Wed Apr 3 10:42:01 UTC 2024

3.2.6 Serial

3.2.6.1 Pin Definition

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

UART 0	
Pin	Pin Name
P129	SER0_TX
P130	SER0_RX
P131	SER0_RTS#

UART 0	
Pin	Pin Name
P132	SER0_CTS#

UART 1	
Pin	Pin Name
P134	SER1_TX
P135	SER1_RX

UART 2	
Pin	Pin Name
P136	SER2_TX
P137	SER2_RX
P138	SER2_RTS#
P139	SER2_CTS#

On ECB-960T SMARC Carrier Board, please refer to the below table.

UART	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
0	RTS	TX	RX	CTS	GND
1	3.3V	TX	RX	GND	GND
2	RTS	TX	RX	CTX	GND
3 (Debug Console)	3.3V	TX	RX	GND	GND

3.2.6.2 Device Name

UART	Device Name
0	/dev/ttymx1
1	/dev/ttymx2
2	/dev/ttymx0
3 (Debug Console)	/dev/ttymx3

3.2.6.3 UART 0 (/dev/ttymxcl)

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P129	SER0_TX
P130	SER0_RX

On ECB-960T SMARC Carrier Board, please refer to the below.

Connect UART 0 pin 2 to pin 3.

Configure UART 0:

```
root@uCOM-IMX8P:~# stty -F /dev/ttymxcl -echo
```

Start reading from UART 0:

```
root@uCOM-IMX8P:~# cat /dev/ttymxcl &  
[1] 1460
```

Send a message through UART 0:

```
root@uCOM-IMX8P:~# echo "aaeon" > /dev/ttymxcl
```

Verify the received message:

```
root@uCOM-IMX8P:~# aaeon
```

3.2.6.4 UART 1

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P134	SER1_TX
P135	SER1_RX

On ECB-960T SMARC Carrier Board, please refer to the below.

Connect UART 1 pin 2 to pin 3.

Configure UART 1:

```
root@uCOM-IMX8P:~# stty -F /dev/ttymx2 -echo
```

Start reading from UART 1:

```
root@uCOM-IMX8P:~# cat /dev/ttymx2 &
[1] 1508
```

Send a message through UART 1:

```
root@uCOM-IMX8P:~# echo "aaeon" > /dev/ttymx2
```

Verify the received message:

```
root@uCOM-IMX8P:~# aaeon
```

3.2.6.5 UART 2

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P136	SER2_TX
P137	SER2_RX

On ECB-960T SMARC Carrier Board, please refer to the below.

Connect UART 2 pin 2 to pin 3.

Configure UART 2:

```
root@uCOM-IMX8P:~# stty -F /dev/ttymx0 -echo
```

Start reading from UART 2:

```
root@uCOM-IMX8P:~# cat /dev/ttymx0 &
[1] 1578
```

Send a message through UART 2:

```
root@uCOM-IMX8P:~# echo "aaeon" > /dev/ttymx0
```

Verify the received message:

```
root@uCOM-IMX8P:~# aaeon
```

3.2.7 TPM

Step 1: Install the tpm2-tools package:

```
apt install -y tpm2-tools
```

Step 2: Retrieve the NV indices using tpm2_getcap:

```
root@ uCOM-IMX8P:~# tpm2_getcap handles-nv-index
```

Output:

- 0x1C00002
- 0x1C0000A

3.2.8 USB

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P64	USB0_OTG_ID
P60	USB0+
P61	USB0-
P62	USB0_EN_OC#
P63	USB0_VBUS_DET
P65	USB1+
P66	USB1-
P67	USB1_EN_OC#
P69	USB2+
P70	USB2-
S71	USB2_SSTX+
S72	USB2_SSTX-
S73	GND
S74	USB2_SSRX+
S75	USB2_SSRX-
P71	USB2_EN_OC#
S68	USB3+

Pin	Pin Name
S69	USB3-
S62	USB3_SSTX+
S63	USB3_SSTX-
S65	USB3_SSRX+
S66	USB3_SSRX-
P74	USB3_EN_OC#
S37	USB3_VBUS_DET
S35	USB4+
S36	USB4-
P76	USB4_EN_OC#

On ECB-960T SMARC Carrier Board, please refer to sections 2.4.7 (CN8), 2.4.8 (CN9), 2.4.32 (CN40), and 2.4.15 (CN16).

Note: The top-left USB connector is not available (NA).

List USB devices and their hierarchy using `lsusb -t`:

```
root@uCOM-IMX8P:~# lsusb -t
```

Output:

```
/: Bus 04.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
/: Bus 03.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
   |__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
/: Bus 02.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
/: Bus 01.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
   |__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
       |__ Port 1: Dev 3, If 0, Class=Human Interface Device, Driver=usbhid, 1.5M
       |__ Port 1: Dev 3, If 1, Class=Human Interface Device, Driver=usbhid, 1.5M
       |__ Port 3: Dev 4, If 0, Class=Human Interface Device, Driver=usbhid, 1.5M
```

3.2.9 Watchdog Timer

Step 1: Save the following content to the file `wdt.c`:

```
#include <stdio.h>
#include <errno.h>
#include <fcntl.h>
#include <linux/watchdog.h>
#include <sys/ioctl.h>
#include <unistd.h>
#include <stdlib.h>

int main(int argc, char *argv[])
{
    int fd, timeout;
    // open watchdog
    fd = open("/dev/watchdog", O_RDWR);
    // set timeout seconds
    timeout = 3;
    // enable watchdog
    ioctl(fd, WDIOC_SETTIMEOUT, &timeout);
    printf("Watchdog start. System will reboot after %d seconds\n", timeout);
    while(1) {
#if 0
        // clear watchdog
        printf("Clear watchdog\n");
        ioctl(fd, WDIOC_KEEPAIVE, 0);
#endif
        sleep(1);
        system("date");
    }
    close(fd);
    return 0;
}
```

Step 2: Compile the `wdt.c` program using the gcc compiler:

```
root@uCOM-IMX8P:~# gcc wdt.c -o wdt
```

Step 3: Run the Watchdog Timer program:

```
root@uCOM-IMX8P:~# ./wdt
```

Output: The system will reboot after 3 seconds.

3.2.10 Audio

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
S39	I2S0_LRCK
S40	I2S0_SDOUT
S41	I2S0_SDIN
S42	I2S0_CK

On ECB-960T SMARC Carrier Board, please refer to I2S connector.

Step 1: Connect the audio cable (PN:170X000156) to the "I2S" connector. Plug the audio signals and devices into the appropriate connectors: LINE-IN, LINE-OUT, and MIC.

Step 2: Run the following command to test the audio setup:

```
root@uCOM-IMX8P:~# arecord -Dhw:0,0 -r 48000 -c 2 --period-size=64 -f S16_LE | aplay -Dhw:0,0
```

3.2.11 SD Card

Device name `"/dev/mmcblk1"`

Command:

```
root@uCOM-IMX8P:~# lsblk |grep mmcblk1
```

Output:

```
mmcblk1      179:96    0    15G    0 disk
|-mmcblk1p1   179:97    0   208M    0 part
`--mmcblk1p2  179:98    0    7.1G    0 part /
```

3.2.12 eMMC

Device name `"/dev/mmcblk2"`

Command:

```
root@uCOM-IMX8P:~# lsblk |grep mmcblk2
```

Output:

```
mmcblk2          179:0      0 14.7G    0 disk
mmcblk2boot0     179:32      0    4M    1 disk
mmcblk2boot1     179:64      0    4M    1 disk
```

3.2.13 I2C

Command:

```
root@uCOM-IMX8P:~# i2cdetect -l
```

Output:

```
i2c-0  i2c          30a20000.i2c      I2C adapter
i2c-1  i2c          30a30000.i2c      I2C adapter
i2c-2  i2c          30a40000.i2c      I2C adapter
i2c-6  i2c          DesignWare HDMI  I2C adapter
```

3.2.14 EEPROM

Command:

```
root@uCOM-IMX8P:~# i2cdetect -r -y 1
```

Output:

```
root@IMX8PL:/usr/sbin# i2cdetect -r -y 1
    0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:                -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- UU -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- UU -- --
40: -- -- -- -- -- -- -- -- -- -- UU -- -- --
50: UU -- -- -- -- -- -- 58 -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

3.2.15 SPI

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
P31	SPI0_CS1#
P43	SPI0_CS0#
P44	SPI0_CK
P45	SPI0_DIN
P46	SPI0_DO

On ECB-960T SMARC Carrier Board, please refer to U104.

- Read the **MANUFACTURER & Device ID** of W25Q80

```
root@uCOM-IMX8P:~# printf '\x90\x00\x00\x00\xff\xff' | spi-pipe -d /dev/spidev1.0  
-s 50000 -b 6 -n 1 | hexdump -C
```

W25Q80 returns ef 13

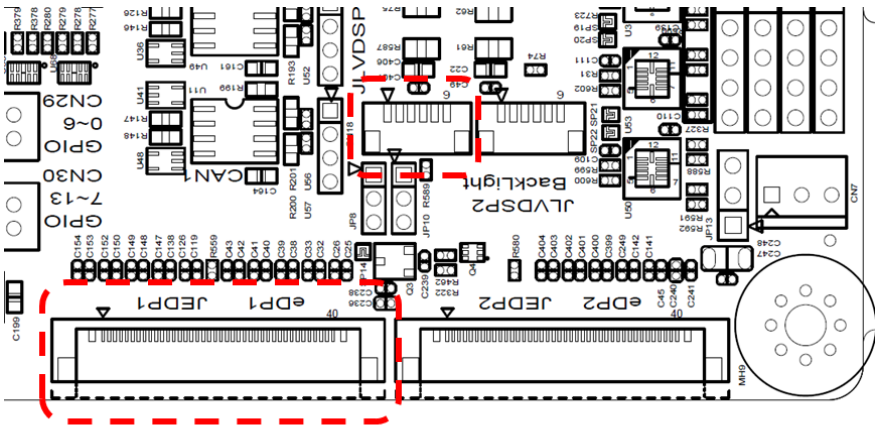


3.2.16 LVDS

On SMARC module, please refer to section 2.3 MXM Gold Finger (CN1).

Pin	Pin Name
S125	LVDS0_0+
S126	LVDS0_0-
S127	LCD0_BKLT_EN
S128	LVDS0_1+
S129	LVDS0_1-
S131	LVDS0_2+
S132	LVDS0_2-
S133	LCD0_VDD_EN
S134	LVDS0_CK+
S135	LVDS0_CK-
S137	LVDS0_3+
S138	LVDS0_3-
S141	LCD0_BKLT_PWM

On ECB-960T SMARC Carrier Board, please refer to JLVDS1 & DP1



- Configure the login session

Press Ctrl + Alt + F2 to the text login mode & login,

open /var/lib/gdm3/.config/monitors.xml, change the position of

<primary>yes</primary>

1. Login session on HDMI


```
<monitors version="2">
  <configuration>
    <logicalmonitor>
      ...
      <primary>yes</primary>
    <monitor>
      <monitorspec>
        <connector>HDMI-1</connector>
      </monitorspec>
    ...
  </monitor>
</logicalmonitor>
<logicalmonitor>
  ...
  <monitor>
    <monitorspec>
      <connector>LVDS-1</connector>
```

```

        <vendor>unknown</vendor>
        <product>unknown</product>
        <serial>unknown</serial>
    </monitorspec>
    ...
</monitor>
</logicalmonitor>
</logicalmonitor>
</configuration>
</monitors>
2. Login session on LVDS
<monitors version="2">
    <configuration>
        <logicalmonitor>
            ...
            <monitor>
                <monitorspec>
                    <connector>HDMI-1</connector>
                    ...
                </monitorspec>
                ...
            </monitor>
        </logicalmonitor>
        <logicalmonitor>
            ...
            <primary>yes</primary>
            <monitor>
                <monitorspec>
                    <connector>LVDS-1</connector>
                    <vendor>unknown</vendor>
                    <product>unknown</product>
                    <serial>unknown</serial>
                </monitorspec>
                ...
            </monitor>
        </logicalmonitor>
    </logicalmonitor>
</configuration>
</monitors>

```


3.3 OS Installation

3.3.1 Flash SD Card to eMMC

Command:

```
root@uCOM-IMX8P:~# imx8_plus_emmc_flasher.sh
```

3.3.2 Check Version

Command:

```
root@uCOM-IMX8P:~# cat /etc/os-release
```

Output:

```
PRETTY_NAME="Debian GNU/Linux 12 (bookworm)"
NAME="Debian GNU/Linux"
VERSION_ID="12"
VERSION="12 (bookworm)"
VERSION_CODENAME=bookworm
ID=debian
HOME_URL="https://www.debian.org/"
SUPPORT_URL="https://www.debian.org/support"
BUG_REPORT_URL="https://bugs.debian.org/"
PROJECT="uCOM-IMX8P"
IMAGE_VERSION="ucom_imx8p_4_2_16_0601_debian12_v_0_9_0.img"
HW_INFO="2G RAM MT53D512M32D2DS"
CREATE_DATE="2024/8/1"
```