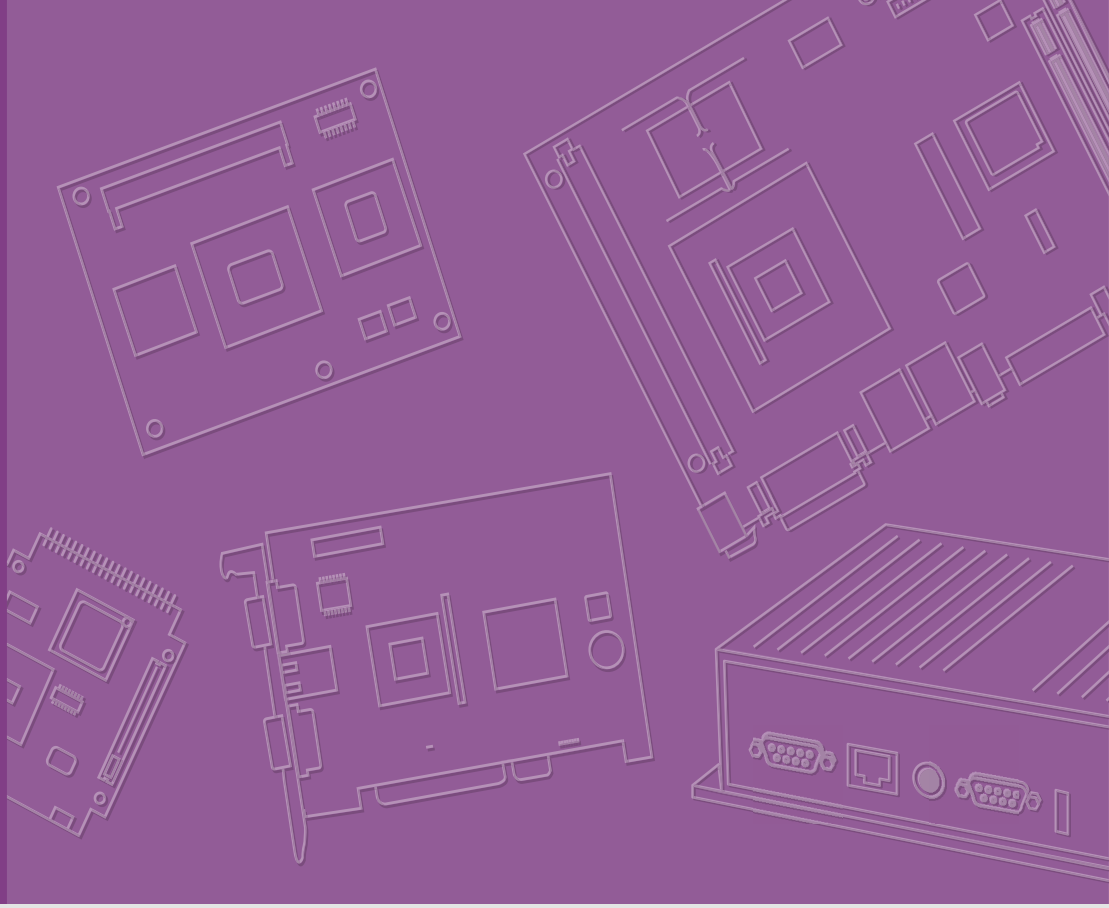

User Manual

ROM-6881

Rockchip RK3588 Cortex-A76 + A55 SMARC 2.1 Full-Size Computer-on-Module

ADVANTECH

Enabling an Intelligent Planet

Copyright

Acknowledgements

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All other product names or trademarks are properties of their respective owners.

Product Warranty (2 Years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product is defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Part No. 2006M68800 Edition 1

Printed in China January 2024

Declaration of Conformity

FCC Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - 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

Packing List

Before installation, please ensure the following items have been shipped.

- 1 x ROM-6881
- 7 x Screws
- 1 x China ROHS

Optional Accessories

Part No.	Description
1701200220	Debug port cable for ROM-6881
1970005826N001	Heat spreader
1970005845T001	Heat sink for 0~60°C
1930004835	Screws for the heat spreader and semi heat sink
96PSA-A36W12W7-5	ADP A/D 100-240V 36W 12V C6 LOCK DC JACK 62368
1700001524	Power cord 3P UL 10A 125V 180cm
170203183C	Power cord 3P Europe (WS-010+WS-083) 183cm
1700008921	Power cord 3P PSE 183cm
170203180A	Power cord 3P UK 2.5A/3A 250V 1.83M
AIW-154BN	Wi-Fi 802.11ac + BT5.0 NXP 88W8997 M.2 2230 PCIe + UART
1750008671-01	Dipole Ant.SMA/M-R 2.4/5G 2.5/4dBi BLK 109mm
1750007965-01	Antenna cable, SMA (M) to MHF4, 300mm
968AD00479*	4G module LTE Cat 4 for China
1750007990-01	Antenna 4G/LTE full band L=11cm 50 Ohm
1750006009	Antenna Cable SMA (F) to MHF 1.32 25cm

*Please contact us for a suitable cellular module for your region.

Ordering Information

Part No.	Description
ROM-6881CO-SFA1	SMARC2.1 RK3588 2.4GHz, 4GB DDR, 32GB eMMC, 0~60°C
ROM-6881WO-SFA1	SMARC2.1 RK3588J 2.2GHz, 4GB DDR, 32GB eMMC, -40~85°C
SOM-DB2510-R0A1	SMARC R2.1 Develop. Board Rev. A1 for RISC Module

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, 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 manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution – Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Contents

Chapter 1 Introduction.....1

1.1 Introduction 2
1.2 Product Features..... 2
Table 1.1: Specifications 2
1.3 Mechanical Specifications..... 3
1.4 Electrical Specifications 4
1.5 Environmental Specifications 4

Chapter 2 H/W Installation.....5

2.1 Connector Locations 6
2.1.1 Connector List..... 6
Table 2.1: Connector and Switch List..... 6
2.1.2 Connector Pin Definitions 6
Table 2.2: SW1: AT/ATX Mode Selection 6
Table 2.3: CN1: CSI2 Connector..... 7
Table 2.4: CN2: CSI3 Connector..... 8
2.2 Block Diagram..... 9
Figure 2.1 Block Diagram 9
2.3 Pin Definition 10
Table 2.5: P-Pin..... 10
Table 2.6: S-Pin..... 13
2.4 Quick Start Guide..... 17
2.4.1 Debug Port Connection..... 17
Table 2.7: Debug Port Connection 17
2.4.2 Debug Port Settings..... 18
2.4.3 ROM-6881 on SOM-DB2510 Jumper, Switch Settings 18
Table 2.8: ROM-6881 on SOM-DB2510 Jumper/Switch List 18
Figure 2.2 SOM-DB2510 Jumpers (1)..... 19
Figure 2.3 SOM-DB2510 Jumpers (2)..... 19
Figure 2.4 SOM-DB2510 Switch..... 20
Table 2.9: CN9 GPIO Headers..... 20
Table 2.10: GPIO_0 GPIO0 Selection..... 20
Table 2.11: GPIO_1 GPIO1 Selection..... 21
Table 2.12: GPIO_2 GPIO2 Selection..... 21
Table 2.13: GPIO_3 GPIO3 Selection..... 21
Table 2.14: GPIO_4 GPIO4 Selection..... 21
Table 2.15: GPIO_5 GPIO5 Selection..... 21
Table 2.16: GPIO_6 GPIO6 Selection..... 22
Table 2.17: CN14 CAN0 Terminal Resistor Selection..... 22
Table 2.18: CN15 CAN1 Terminal Resistor Selection..... 22
Table 2.19: J7, J8 LVDS0 Power Selection..... 22
Table 2.20: J9 LVDS0 Inverter Power Selection 22
Table 2.21: J11, J12 LVDS1 Power Selection..... 23
Table 2.22: J13 LVDS1 Inverter Power Selection 23
Table 2.23: SPI0 Jumper Setting..... 23
Table 2.24: SDIO Jumper Setting..... 24
Table 2.25: SW1 COM0 Setting 24
Table 2.26: SW2 COM2 Setting 24
Table 2.27: SW3 I2S0_MCK Setting 25
Table 2.28: SW4 Setting..... 25

Chapter 3 Software Functionality 27

3.1 Function Test 28
3.2 Command Introduction 28
3.2.1 Uboot 28
3.2.2 Kernel 28
3.3 Debian Desktop Operating System 28
3.3.1 User and Password 28
3.3.2 Find Application 29
3.4 HDMI/DP Screen 30
3.4.1 Configure Resolution for HDMI/DP Screen 30
3.5 Multi-Display 30
Table 3.1: Display Combinations 30
Table 3.2: Supported Panel List 30
3.5.1 Enter U-boot Interrupt Mode 31
3.5.2 Single Display 31
3.5.3 Dual Display 32
3.5.4 Triple Display 34
3.5.5 Quadruple Display 35
3.6 Audio 36
3.6.1 Audio Settings 36
3.6.2 Audio Test 36
3.7 4G 37
3.7.1 Configure 4G 37
3.7.2 4G Test 39
3.8 Wi-Fi/BT 40
3.8.1 Configure Wi-Fi 40
3.8.2 Wi-Fi Test 41
3.8.3 BT 41
3.9 Ethernet 43
3.9.1 Configure to Static IP 43
3.9.2 Configure to DHCP 44
3.9.3 Ethernet Test 45
3.10 UART 45
Table 3.3: UART 45
3.11 GPIO 46
Table 3.4: GPIO 46
3.11.1 GPIO Test 46
3.12 RTC 47
3.13 Watchdog 47
3.14 CAN 48
3.15 SATA 48
3.16 PCIe 48
3.17 I2C PIN Header 49
Table 3.5: I2C PIN Header 49
3.18 Camera 49
Table 3.6: Camera 49
3.19 SPI 49
3.20 More Technical Support and Assistance 50

Chapter 4 System Recovery 51

4.1 Create “update.img” 52
4.2 Using SDDiskTool to Create an Upgrade SD Card 52
4.3 Upgrade or Recover ROM-6881 53

Chapter 5 Advantech Services 55

5.1 RISC Design-In Services 56
5.2 Contact Information 59
Table 5.1: Contact Information 59
5.3 Global Service Policy 60
5.3.1 Warranty Policy 60
5.3.2 Repair Process 60

Chapter 1

Introduction

This chapter gives background information on the ROM-6881.

Sections include:

- Introduction
- Specifications

1.1 Introduction

The Advantech ROM-6881 SMARC 2.1 Computer-on-Module is powered by a Rockchip RK3588 SoC which includes Quad Arm Cortex-A76 and Quad Cortex-A55 processors, 6Tops NPU, and a high-performance Arm Mali-G610 3D graphics engine. ROM-6881 supports 8K @60fps H.265/VP9 video decoding, and 8K @30fps H.265/H.264 video encoding. It also provides a rich display interface supported with HDMI, DP, eDP, and LVDS/MIPI-DSI to meet different display requirements. ROM-6881 offers various high-speed interfaces, including 2 x USB 3.0, 4 x PCIe 3.0, SATA 3.0, Gigabit Ethernet, CAN, and MIPI-CSI. These interfaces can meet a variety of high-rate transmission applications, Wi-Fi 6, and wireless 5G connectivity targeted at big data and other industrial applications.

The ROM-6881 is paired with the Advantech SOM-DB2510 SMARC2.1 development board for faster end-product peripheral integration and time-to-market. The reference schematics and layout checklist documentation for carrier board development will be provided along with the open-source Linux BSP, test utilities, hardware design utilities, and reference drivers.

1.2 Product Features

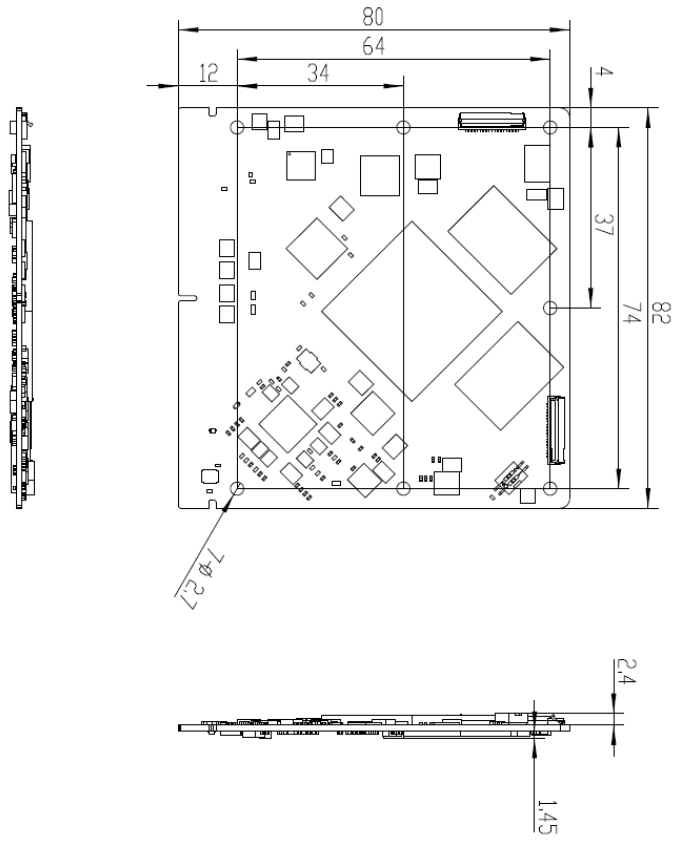
Table 1.1: Specifications

Form Factor		**SMARC 2.1 via MXM 3.0 Connector**
Processor System	CPU	Rockchip RK3588 Arm Quad Cortex-A76 2.4GHz and Quad Cortex-A55 1.8GHz
	NPU	Up to 6.0 Tops Support: TensorFlow, Caffe, Tflite, Pytorch, Onnx NN, Android NN, etc.
Memory	Capacity	Onboard LPDDR4 up to 4/8GB
	Flash	32/64 GB eMMC NAND Flash for OS
Graphics	Graphics Engine	Arm Mali-G610 MP4 GPU, High performance OpenGL ES 1.1, 2.0 and 3.2, OpenCL 2.2, Vulkan1.2 etc.
	H/W Video Codec	Decoder: H.265/VP9 8K@60fps, H.264 8K@30fps, H.263,VC-1,VP8,MVC,AV1, MPEG-4/2/1 Encoder: H.265/H.264 8K@30fps, Multi-channel encoder in parallel for less resolution
Display	Display out	1 x Single channel LVDS (default) or 1 x dual channel LVDS, up to 1920 x 1200 (BOM option) 1 x HDMI 2.1 1 x DP 1.4 1 x eDP 1 x MIPI-DSI (BOM Option, shared with LVDS0)
Ethernet	Chipset & Speed	2 x RTL8211FS 10/100/1000 Mbps
RTC	RTC	Yes
Watch Dog Timer	Watch Dog Timer	HW watch dog by MCU. 1~6527s, default 60s, power on/off 1s

Table 1.1: Specifications		
I/O	PCIe	4 x PCIe 3.0 1 lane
	SATA	1 x SATA 3.0
	USB	2 x USB 3.0 signal, 3 x USB 2.0, 1 x USB 2.0 OTG
	Audio	1 x I2S
	SDIO	1
	UART	1 x 2-wire UART for debugging 1 x 2-wire UART 2 x 4-wire UART
	SPI	2
	CAN	2 x CAN 2.0
	GPIO	12
	I2C	5
	Camera Input	2 x MIPI CSI (1 x 2Lane, 1 x 4Lane) 2 x MIPI CSI by FCC CONN on board (4 Lane)
Power	Power Supply Voltage	5V+-5% DC-in
Environment	Operational Temperature	0 ~ 60°C / -40 ~ 85°C
Mechanical	Dimensions (W x D)	82 x 80 mm
Certifications		CE/FCC Class B
Operation System		Linux Debian11

1.3 Mechanical Specifications

- **Dimension:** SMARC form factor size: (D x W) 82 x 80 mm / 3.22 x 3.15 inch
- **Height on Top:** 2.4 mm
- **Height on Bottom:** 1.45 mm



1.4 Electrical Specifications

- **Power supply Voltage:** DC-in 5V+-5%
- **Power Supply Current:**

Model	Kernel idle	Maximum mode
ROM-6881	1.34W	8.32W

Test Conditions:

1. Test temperature: room temperature
2. Test voltage: rated voltage AC 220V/60Hz
3. Test loading:
   - Maximum load mode: Running programs
   - Idle mode: DUT power management off and no running any program
4. OS: Debian11
5. Test software: qa.sh (heavy loading for CPU+NPU+GPU+VPU)

1.5 Environmental Specifications

- **Operating Temperature:** 0 ~ 60°C / -40 ~ 85°C (32 ~ 140°F / -40 ~ 185°F)
- **Operating Humidity:** 5 ~ 95% relative humidity, non-condensing
- **Storage Temperature:** -40 ~ 85°C (-40 ~ 185°F)
- **Storage Humidity:** 95% @60°C (140°F)

Chapter 2

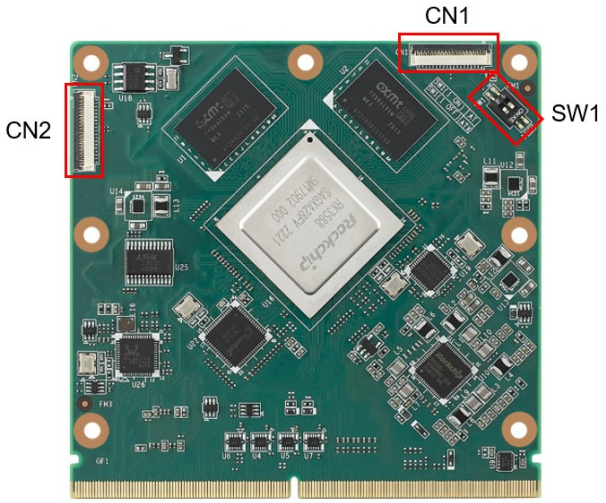
H/W Installation

This chapter gives mechanical and connector information on the ROM-6881.

Sections include:

- Jumper Information
- Connector Information
- Block Diagram
- Pin Definitions
- Quick Start Guide

2.1 Connector Locations



2.1.1 Connector List

Table 2.1: Connector and Switch List

Position	Description
SW1	AT & ATX Mode Switch
CN1	MIPI-CSI2 Connector
CN2	MIPI-CSI3 Connector

2.1.2 Connector Pin Definitions

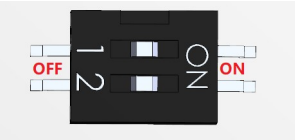
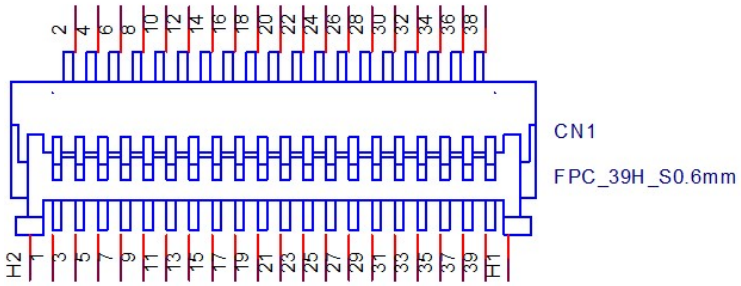


Table 2.2: SW1: AT/ATX Mode Selection

Setting	Function
1 ON	AT Mode (Default)
1 OFF	ATX Mode
2 ON	No Function
2 OFF	No Function



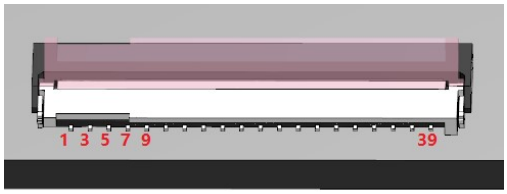


Table 2.3: CN1: CSI2 Connector	
Part Number	1654013526-01
Manufacturer	IRISO Electronics Co.,Ltd.
MPN	IMSA-9671S-39Y912
Pin	**Pin Name**
1	+V3_CAM2
2	+V3_CAM2
3	MIPI_CSI2_RX_D0P
4	MIPI_CSI2_RX_D0N
5	GND
6	MIPI_CSI2_RX_D1P
7	MIPI_CSI2_RX_D1N
8	GND
9	MIPI_CSI2_RX_D2P
10	MIPI_CSI2_RX_D2N
11	CAM2_RST#
12	MIPI_CSI2_RX_D3P
13	MIPI_CSI2_RX_D3N
14	GND
15	MIPI_CSI2_RX_CLK0P
16	MIPI_CSI2_RX_CLK0N
17	GND
18	I2C5_SCL_M2
19	I2C5_SDA_M2
20	CAM2_PWR#
21	CAM2_MCK
22	NC
23	NC
24	NC
25	GND
26	NC
27	NC
28	GND
29	NC

Table 2.3: CN1: CSI2 Connector	
30	NC
31	NC
32	NC
33	NC
34	GND
35	NC
36	NC
37	NC
38	NC
39	NC

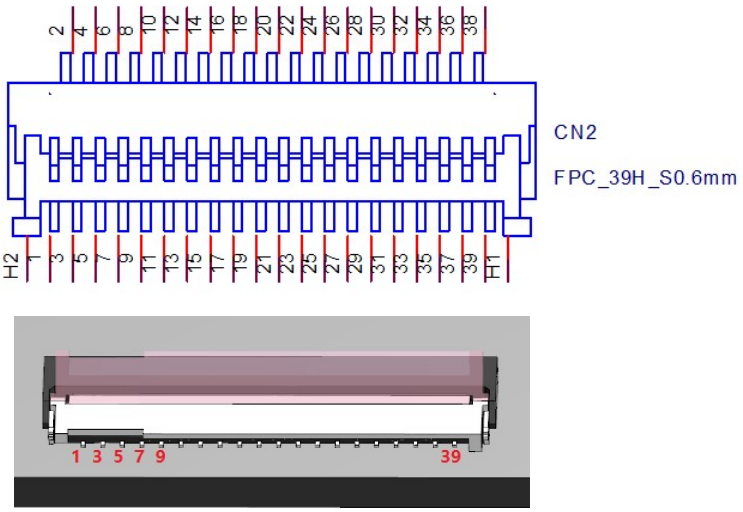


Table 2.4: CN2: CSI3 Connector	
Part Number	1654013526-01
Manufacturer	IRISO Electronics Co.,Ltd.
MPN	IMSA-9671S-39Y912
Pin	**Pin Name**
1	+V3_CAM3
2	+V3_CAM3
3	MIPI_CSI3_RX_D0P
4	MIPI_CSI3_RX_D0N
5	GND
6	MIPI_CSI3_RX_D1P
7	MIPI_CSI3_RX_D1N
8	GND
9	MIPI_CSI3_RX_D2P
10	MIPI_CSI3_RX_D2N
11	CAM3_RST#
12	MIPI_CSI3_RX_D3P
13	MIPI_CSI3_RX_D3N
14	GND
15	MIPI_CSI3_RX_CLK0P
16	MIPI_CSI3_RX_CLK0N
17	GND

Table 2.4: CN2: CSI3 Connector	
18	I2C8_SCL_M2
19	I2C8_SDA_M2
20	CAM3_PWR#
21	CAM3_MCK
22	NC
23	NC
24	NC
25	GND
26	NC
27	NC
28	GND
29	NC
30	NC
31	NC
32	NC
33	NC
34	GND
35	NC
36	NC
37	NC
38	NC
39	NC

2.2 Block Diagram

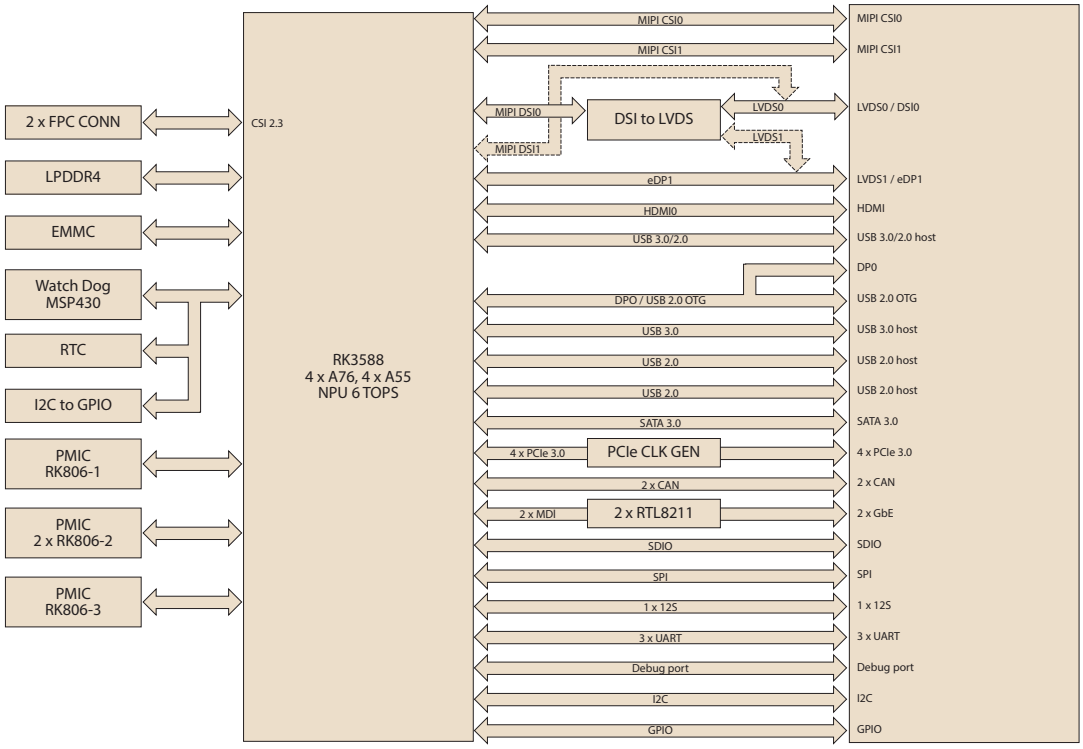


Figure 2.1 Block Diagram

2.3 Pin Definition

Please refer to the 314 Pin MXM golden finger following SMARC 2.1 standard pin definitions as detailed below:

Table 2.5: P-Pin

P-Pin	SMARC2.1	I/F	ROM-6881 Pin Out
P1	SMB_ALERT_1V8#	SMB	SMB_ALERT_1V8#
P2	GND	POWER	GND
P3	CSI1_CK+	SCAM	MIPI_CSI1_RX_CLK0P
P4	CSI1_CK-	SCAM	MIPI_CSI1_RX_CLK0N
P5	GBE1_SDP	GBE	N/A
P6	GBE0_SDP	GBE	N/A
P7	CSI1_D0+	SCAM	MIPI_CSI1_RX_D0P
P8	CSI1_D0-	SCAM	MIPI_CSI1_RX_D0N
P9	GND	POWER	GND
P10	CSI1_D1+	SCAM	MIPI_CSI1_RX_D1P
P11	CSI1_D1-	SCAM	MIPI_CSI1_RX_D1N
P12	GND	POWER	GND
P13	CSI1_D2+	SCAM	MIPI_CSI1_RX_D2P
P14	CSI1_D2-	SCAM	MIPI_CSI1_RX_D2N
P15	GND	POWER	GND
P16	CSI1_D3+	SCAM	MIPI_CSI1_RX_D3P
P17	CSI1_D3-	SCAM	MIPI_CSI1_RX_D3N
P18	GND	POWER	GND
P19	GBE0_MDI3-	GBE	GBE0_MDI3-
P20	GBE0_MDI3+	GBE	GBE0_MDI3+
P21	GBE0_LINK100#	GBE	GBE0_LINK100#
P22	GBE0_LINK1000#	GBE	GBE0_LINK1000#
P23	GBE0_MDI2-	GBE	GBE0_MDI2-
P24	GBE0_MDI2+	GBE	GBE0_MDI2+
P25	GBE0_LINK_ACT#	GBE	GBE0_LINK_ACT#
P26	GBE0_MDI1-	GBE	GBE0_MDI1-
P27	GBE0_MDI1+	GBE	GBE0_MDI1+
P28	GBE0_CTREF	GBE	N/A
P29	GBE0_MDI0-	GBE	GBE0_MDI0-
P30	GBE0_MDI0+	GBE	GBE0_MDI0+
P31	SPI0_CS1#	SPI	N/A
P32	GND	POWER	GND
P33	SDIO_WP	SDIO	N/A
P34	SDIO_CMD	SDIO	SDIO_CMD
P35	SDIO_CD#	SDIO	SDIO_CD#
P36	SDIO_CK	SDIO	SDIO_CK
P37	SDIO_PWR_EN	SDIO	SDIO_PWR_EN
P38	GND	POWER	GND
P39	SDIO_D0	SDIO	SDIO_D0
P40	SDIO_D1	SDIO	SDIO_D1
P41	SDIO_D2	SDIO	SDIO_D2

Table 2.5: P-Pin			
P42	SDIO_D3	SDIO	SDIO_D3
P43	SPI0_CS0#	SPI	SPI1_CS0_M2
P44	SPI0_CK	SPI	SPI1_CLK_M2
P45	SPI0_DIN	SPI	SPI1_MISO_M2
P46	SPI0_DO	SPI	SPI1_MOSI_M2
P47	GND	POWER	GND
P48	SATA_TX+	SATA	SATA_TX+
P49	SATA_TX-	SATA	SATA_TX-
P50	GND	POWER	GND
P51	SATA_RX+	SATA	SATA_RX+
P52	SATA_RX-	SATA	SATA_RX-
P53	GND	POWER	GND
P54	ESPI_CS0# / SPI1_CS0#	SPI	SPI3_CS0_M3
P55	ESPI_CS1# / SPI1_CS1#	SPI	N/A
P56	ESPI_CK / SPI1_CK	SPI	SPI3_CLK_M3
P57	ESPI_IO_1 / SPI1_DIN / QSPI_IO_1	SPI	SPI3_MISO_M3
P58	ESPI_IO_0 / SPI1_DO / QSPI_IO_0	SPI	SPI3_MOSI_M3
P59	GND	POWER	GND
P60	USB0+	USB	USB0+
P61	USB0-	USB	USB0-
P62	USB0_EN_OC#	USB	USB0_EN_OC#
P63	USB0_VBUS_DET	USB	USB0_VBUS_DET
P64	USB0_OTG_ID	USB	USB0_OTG_ID
P65	USB1+	USB	USB1+
P66	USB1-	USB	USB1-
P67	USB1_EN_OC#	USB	USB1_EN_OC#
P68	GND	POWER	GND
P69	USB2+	USB	USB2+
P70	USB2-	USB	USB2-
P71	USB2_EN_OC#	USB	USB2_EN_OC#
P72	RSVD	RSVD	N/A
P73	RSVD	RSVD	N/A
P74	USB3_EN_OC#	USB	USB3_EN_OC#
		<Key>	
P75	PCIE_A_RST#	PCIe	PCIE_A_RST#
P76	USB4_EN_OC#	USB	N/A
P77	PCIE_B_CKREQ#	PCIe	PCIE_B_CKREQ#
P78	PCIE_A_CKREQ#	PCIe	PCIE_A_CKREQ#
P79	GND	POWER	GND
P80	PCIE_C_REFCK+	PCIe	PCIE_C_REFCK+
P81	PCIE_C_REFCK-	PCIe	PCIE_C_REFCK-
P82	GND	POWER	GND
P83	PCIE_A_REFCK+	PCIe	PCIE_A_REFCK+
P84	PCIE_A_REFCK-	PCIe	PCIE_A_REFCK-
P85	GND	POWER	GND

Table 2.5: P-Pin			
P86	PCIE_A_RX+	PCIe	PCIE_A_RX+
P87	PCIE_A_RX-	PCIe	PCIE_A_RX-
P88	GND	POWER	GND
P89	PCIE_A_TX+	PCIe	PCIE_A_TX+
P90	PCIE_A_TX-	PCIe	PCIE_A_TX-
P91	GND	POWER	GND
P92	HDMI_D2+ / DP1_LANE0+	HDMI/DP	HDMI_D2+
P93	HDMI_D2- / DP1_LANE0-	HDMI/DP	HDMI_D2-
P94	GND	POWER	GND
P95	HDMI_D1+ / DP1_LANE1+	HDMI/DP	HDMI_D1+
P96	HDMI_D1- / DP1_LANE1-	HDMI/DP	HDMI_D1-
P97	GND	POWER	GND
P98	HDMI_D0+ / DP1_LANE2+	HDMI/DP	HDMI_D0+
P99	HDMI_D0- / DP1_LANE2-	HDMI/DP	HDMI_D0-
P100	GND	POWER	GND
P101	HDMI_CK+ / DP1_LANE3+	HDMI/DP	HDMI_CK+
P102	HDMI_CK- / DP1_LANE3-	HDMI/DP	HDMI_CK-
P103	GND	POWER	GND
P104	HDMI_HPD / DP1_HPD	HDMI/DP	HDMITX0_HPDIN_M0
P105	HDMI_CTRL_CK / DP1_AUX+	HDMI/DP	HDMI_TX0_SCL_M0
P106	HDMI_CTRL_DAT / DP1_AUX-	HDMI/DP	HDMI_TX0_SDA_M0
P107	DP1_AUX_SEL	DP	N/A
P108	GPIO0 / CAM0_PWR#	GPIO/SCAM	GPIO0
P109	GPIO1 / CAM1_PWR#	GPIO/SCAM	GPIO1
P110	GPIO2 / CAM0_RST#	GPIO/SCAM	GPIO2
P111	GPIO3 / CAM1_RST#	GPIO/SCAM	GPIO3
P112	GPIO4 / HDA_RST#	GPIO/HDA	GPIO4
P113	GPIO5 / PWM_OUT	GPIO/FAN	GPIO5
P114	GPIO6 / TACHIN	GPIO/FAN	GPIO6
P115	GPIO7	GPIO	GPIO7
P116	GPIO8	GPIO	GPIO8
P117	GPIO9	GPIO	GPIO9
P118	GPIO10	GPIO	GPIO10
P119	GPIO11	GPIO	GPIO11
P120	GND	POWER	GND
P121	I2C_PM_CK	PSM	I2C8_SCL_M2
P122	I2C_PM_DAT	PSM	I2C8_SDA_M2
P123	BOOT_SEL0#	MISC	N/A
P124	BOOT_SEL1#	MISC	N/A
P125	BOOT_SEL2#	MISC	N/A
P126	RESET_OUT#	PSM	RESET_OUT#
P127	RESET_IN#	PSM	RESET_IN#
P128	POWER_BTN#	PSM	POWER_BTN#
P129	SER0_TX	SER	UART6_TX_M1
P130	SER0_RX	SER	UART6_RX_M1

Table 2.5: P-Pin			
P131	SER0_RTS#	SER	UART6_RTSN_M1
P132	SER0_CTS#	SER	UART6_CTSN_M1
P133	GND		GND
P134	SER1_TX	SER	UART0_TX_M2
P135	SER1_RX	SER	UART0_RX_M2
P136	SER2_TX	SER	UART9_TX_M2
P137	SER2_RX	SER	UART9_RX_M2
P138	SER2_RTS#	SER	UART9_RTSN_M2
P139	SER2_CTS#	SER	UART9_CTSN_M2
P140	SER3_TX	SER	UART2_TX_M0_DEBUG (Default Console)
P141	SER3_RX	SER	UART2_RX_M0_DEBUG (Default Console)
P142	GND	POWER	GND
P143	CAN0_TX	CAN	CAN1_TX_M1
P144	CAN0_RX	CAN	CAN1_RX_M1
P145	CAN1_TX	CAN	CAN2_TX_M1
P146	CAN1_RX	CAN	CAN2_RX_M1
P147	VDD_IN	POWER	+VDD_IN_MXM
P148	VDD_IN	POWER	+VDD_IN_MXM
P149	VDD_IN	POWER	+VDD_IN_MXM
P150	VDD_IN	POWER	+VDD_IN_MXM
P151	VDD_IN	POWER	+VDD_IN_MXM
P152	VDD_IN	POWER	+VDD_IN_MXM
P153	VDD_IN	POWER	+VDD_IN_MXM
P154	VDD_IN	POWER	+VDD_IN_MXM
P155	VDD_IN	POWER	+VDD_IN_MXM
P156	VDD_IN	POWER	+VDD_IN_MXM

Table 2.6: S-Pin			
S-Pin	**SMARC2.1**	**I/F**	**ROM-6881 Pin Out**
S1	CSI1_TX+ / I2C_CAM1_CK	SCAM	I2C3_SCL_M0
S2	CSI1_TX- / I2C_CAM1_DAT	SCAM	I2C3_SDA_M0
S3	GND	POWER	GND
S4	RSVD	RSVD	N/A
S5	CSI0_TX+ / I2C_CAM0_CK	SCAM	I2C4_SCL_M1
S6	CAM_MCK	SCAM	CAM_MCK
S7	CSI0_TX- / I2C_CAM0_DAT	SCAM	I2C4_SDA_M1
S8	CSI0_CK+	SCAM	MIPI_CSI0_RX_CLK0P
S9	CSI0_CK-	SCAM	MIPI_CSI0_RX_CLK0N
S10	GND	POWER	GND
S11	CSI0_D0+	SCAM	MIPI_CSI0_RX_D0P
S12	CSI0_D0-	SCAM	MIPI_CSI0_RX_D0N
S13	GND	POWER	GND
S14	CSI0_D1+	SCAM	MIPI_CSI0_RX_D1P
S15	CSI0_D1-	SCAM	MIPI_CSI0_RX_D1N
S16	GND	POWER	GND

Table 2.6: S-Pin			
S17	GBE1_MDI0+	GBE	GBE1_MDI0+
S18	GBE1_MDI0-	GBE	GBE1_MDI0-
S19	GBE1_LINK100#	GBE	GBE1_LINK100#
S20	GBE1_MDI1+	GBE	GBE1_MDI1+
S21	GBE1_MDI1-	GBE	GBE1_MDI1-
S22	GBE1_LINK1000#	GBE	GBE1_LINK1000#
S23	GBE1_MDI2+	GBE	GBE1_MDI2+
S24	GBE1_MDI2-	GBE	GBE1_MDI2-
S25	GND	POWER	GND
S26	GBE1_MDI3+	GBE	GBE1_MDI3+
S27	GBE1_MDI3-	GBE	GBE1_MDI3-
S28	GBE1_CTREF	GBE	N/A
S29	PCIE_D_TX+ / SER-DES_0_TX+	GBE	PCIE_D_TX+
S30	PCIE_D_TX- / SER-DES_0_TX-	GBE	PCIE_D_TX-
S31	GBE1_LINK_ACT#	GBE	GBE1_LINK_ACT#
S32	PCIE_D_RX+ / SER-DES_0_RX+	PCIe	PCIE_D_RX+
S33	PCIE_D_RX- / SER-DES_0_RX-	PCIe	PCIE_D_RX-
S34	GND	POWER	GND
S35	USB4+	USB	N/A
S36	USB4-	USB	N/A
S37	USB3_VBUS_DET	USB	N/A
S38	AUDIO_MCK	I2S	I2S0_MCLK
S39	I2S0_LRCK	I2S	I2S0_LRCK
S40	I2S0_SDOUT	I2S	I2S0_SDO0
S41	I2S0_SDIN	I2S	I2S0_SDI0
S42	I2S0_CK	I2S	I2S0_SCLK
S43	ESPI_ALERT0#	SPI	N/A
S44	ESPI_ALERT1#	SPI	N/A
S45	MDIO_CLK	RSVD	N/A
S46	MDIO_DAT	RSVD	N/A
S47	GND	POWER	GND
S48	I2C_GP_CK	I2C	I2C5_SCL_M2
S49	I2C_GP_DAT	I2C	I2C5_SDA_M2
S50	HDA_SYNC / I2S2_LRCK	I2S	I2S1_LRCK_M0
S51	HDA_SDO / I2S2_SDOUT	I2S	I2S1_SDO0_M0
S52	HDA_SDI / I2S2_SDIN	I2S	I2S1_SDI0_M0
S53	HDA_CK / I2S2_CK	I2S	I2S1_SCLK_M0
S54	SATA_ACT#	SATA	SATA_ACT#
S55	USB5_EN_OC#	USB	N/A
S56	ESPI_IO_2	SPI	N/A
S57	ESPI_IO_3	SPI	N/A
S58	ESPI_RESET#	SPI	N/A
S59	USB5+	USB	N/A
S60	USB5-	USB	N/A

Table 2.6: S-Pin			
S61	GND	POWER	GND
S62	USB3_SSTX+	USB	USB3_SSTX+
S63	USB3_SSTX-	USB	USB3_SSTX-
S64	GND	POWER	GND
S65	USB3_SSRX+	USB	USB3_SSRX+
S66	USB3_SSRX-	USB	USB3_SSRX-
S67	GND	POWER	GND
S68	USB3+	USB	USB3+
S69	USB3-	USB	USB3-
S70	GND	POWER	GND
S71	USB2_SSTX+	USB	USB2_SSTX+
S72	USB2_SSTX-	USB	USB2_SSTX-
S73	GND	POWER	GND
S74	USB2_SSRX+	USB	USB2_SSRX+
S75	USB2_SSRX-	USB	USB2_SSRX-
		<Key>	
S76	PCIE_B_RST#	PCIe	PCIE_B_RST#
S77	PCIE_C_RST#	PCIe	PCIE_C_RST#
S78	PCIE_C_RX+	PCIe	PCIE_C_RX+
S79	PCIE_C_RX-	PCIe	PCIE_C_RX-
S80	GND	POWER	GND
S81	PCIE_C_TX+	PCIe	PCIE_C_TX+
S82	PCIE_C_TX-	PCIe	PCIE_C_TX-
S83	GND	POWER	GND
S84	PCIE_B_REFCK+	PCIe	PCIE_B_REFCK+
S85	PCIE_B_REFCK-	PCIe	PCIE_B_REFCK-
S86	GND	POWER	GND
S87	PCIE_B_RX+	PCIe	PCIE_B_RX+
S88	PCIE_B_RX-	PCIe	PCIE_B_RX-
S89	GND	POWER	GND
S90	PCIE_B_TX+	PCIe	PCIE_B_TX+
S91	PCIE_B_TX-	PCIe	PCIE_B_TX-
S92	GND	POWER	GND
S93	DP0_LANE0+	DP	DP0_LANE0+
S94	DP0_LANE0-	DP	DP0_LANE0-
S95	DP0_AUX_SEL	DP	N/A
S96	DP0_LANE1+	DP	DP0_LANE1+
S97	DP0_LANE1-	DP	DP0_LANE1-
S98	DP0_HPD	DP	DP0_HPDIN_M1
S99	DP0_LANE2+	DP	DP0_LANE2+
S100	DP0_LANE2-	DP	DP0_LANE2-
S101	GND	POWER	GND
S102	DP0_LANE3+	DP	DP0_LANE3+
S103	DP0_LANE3-	DP	DP0_LANE3-
S104	USB3_OTG_ID	USB	N/A
S105	DP0_AUX+	DP	DP0_AUX+
S106	DP0_AUX-	DP	DP0_AUX-

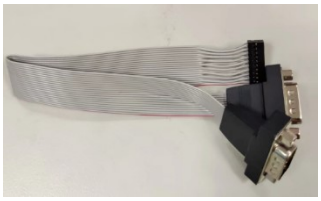
Table 2.6: S-Pin			
S107	LCD1_BKLT_EN	LVDS	LCD1_BKLT_EN
S108	LVDS1_CK+ / EDP1_AUX+ / DSI1_CLK+	LVDS/eDP/ DSI	eDP1_AUX+
S109	LVDS1_CK- / EDP1_AUX- / DSI1_CLK-	LVDS/eDP/ DSI	eDP1_AUX-
S110	GND	POWER	GND
S111	LVDS1_0+ / EDP1_TX0+ / DSI1_D0+	LVDS/eDP/ DSI	eDP1_TX0+
S112	LVDS1_0- / EDP1_TX0- / DSI1_D0-	LVDS/eDP/ DSI	eDP1_TX0-
S113	EDP1_HPD / DSI1_TE	eDP/DSI	eDP1_HPD
S114	LVDS1_1+ / EDP1_TX1+ / DSI1_D+	LVDS/eDP/ DSI	eDP1_TX1+
S115	LVDS1_1- / EDP1_TX1- / DSI1_D1-	LVDS/eDP/ DSI	eDP1_TX1-
S116	LCD1_VDD_EN	LCD	LCD1_VDD_EN
S117	LVDS1_2+ / EDP1_TX2+ / DSI1_D2+	LVDS/eDP/ DSI	eDP1_TX2+
S118	LVDS1_2- / EDP1_TX2- / DSI1_D2-	LVDS/eDP/ DSI	eDP1_TX2-
S119	GND	POWER	GND
S120	LVDS1_3+ / EDP1_TX3+ / DSI1_D3+	LVDS/eDP/ DSI	eDP1_TX3+
S121	LVDS1_3- / EDP1_TX3- / DSI1_D3-	LVDS/eDP/ DSI	eDP1_TX3-
S122	LCD1_BKLT_PWM	LCD	LCD1_BKLT_PWM
S123	GPIO13	GPIO	N/A
S124	GND	POWER	GND
S125	LVDS0_0+ / EDP0_TX0+ / DSI0_D0+	LVDS/eDP/ DSI	LVDS0_0+
S126	LVDS0_0- / EDP0_TX0- / DSI0_D0-	LVDS/eDP/ DSI	LVDS0_0-
S127	LCD0_BKLT_EN	LCD	LCD0_BKLT_EN
S128	LVDS0_1+ / EDP0_TX1+ / DSI0_D1+	LVDS/eDP/ DSI	LVDS0_1+
S129	LVDS0_1- / EDP0_TX1- / DSI0_D1-	LVDS/eDP/ DSI	LVDS0_1-
S130	GND	POWER	GND
S131	LVDS0_2+ / EDP0_TX2+ / DSI0_D2+	LVDS/eDP/ DSI	LVDS0_2+
S132	LVDS0_2- / EDP0_TX2- / DSI0_D2-	LVDS/eDP/ DSI	LVDS0_2-
S133	LCD0_VDD_EN	LCD	LCD0_VDD_EN
S134	LVDS0_CK+ / EDP0_AUX+ / DSI0_CLK+	LVDS/eDP/ DSI	LVDS0_CK+
S135	LVDS0_CK- / EDP0_AUX- / DSI0_CLK-	LVDS/eDP/ DSI	LVDS0_CK-
S136	GND	POWER	GND
S137	LVDS0_3+ / EDP0_TX3+ / DSI0_D3+	LVDS/eDP/ DSI	LVDS0_3+

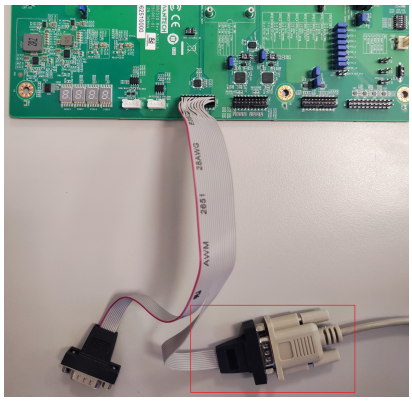
Table 2.6: S-Pin			
S138	LVDS0_3- / EDP0_TX3- / DSI0_D3-	LVDS/eDP/ DSI	LVDS0_3-
S139	I2C_LCD_CK	LCD	I2C3_SCL_M0
S140	I2C_LCD_DAT	LCD	I2C3_SDA_M0
S141	LCD0_BKLT_PWM	LCD	LCD0_BKLT_PWM
S142	GPIO12	GPIO	N/A
S143	GND	POWER	GND
S144	eDP0_HPD / DSI0_TE	eDP/DSI	DSI0_TE
S145	WDT_TIME_OUT#	WDT	WDT_TIME_OUT#
S146	PCIE_WAKE#	PCIe	PCIE_WAKE#
S147	VDD_RTC	POWER	VDD_RTC
S148	LID#	PSM	LID#
S149	SLEEP#	PSM	SLEEP#
S150	VIN_PWR_BAD#	PSM	VIN_PWR_BAD#
S151	CHARGING#	PSM	CHARGING#
S152	CHARGER_PRSNT#	PSM	CHARGER_PRSNT#
S153	CARRIER_STBY#	PSM	CARRIER_STBY#
S154	CARRIER_PWR_ON	PSM	CARRIER_PWR_ON
S155	FORCE_RECOV#	MISC	FORCE_RECOV#
S156	BATLOW#	PSM	BATLOW#
S157	TEST#	PSM	TEST#
S158	GND	POWER	GND

2.4 Quick Start Guide

2.4.1 Debug Port Connection

1. Connect the debug port cable (1701200220) to COM2_4 on SOM-DB2510.
2. Connect it to your PC with a USB to UART Cable.

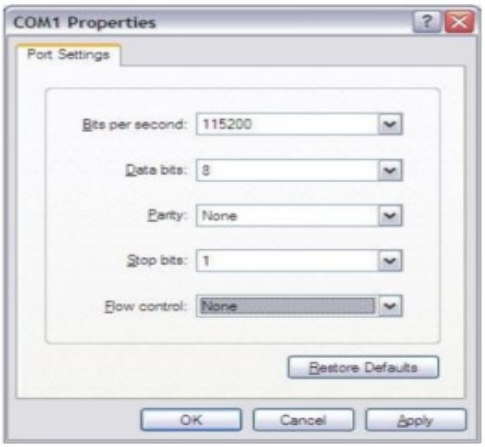
Table 2.7: Debug Port Connection		
Item	**P/N**	**Picture**
Debug Port Cable	1701200220	



2.4.2 Debug Port Settings

ROM-6881 can communicate with a host server using serial cables. Common serial communication programs such as HyperTerminal, Tera Term, or PuTTY can be used in this case. The example below describes the serial terminal setup using HyperTerminal on a Windows host:

1. Connect ROM-6881 with your PC using a serial cable.
2. Open HyperTerminal on your Windows PC, and select the settings demonstrated in the photo below.
3. Insert a power adapter into the DC jack and power up the board. The Debug console log will be displayed on the terminal screen.



2.4.3 ROM-6881 on SOM-DB2510 Jumper, Switch Settings

When using ROM-6881 with the carrier board SOM-DB2510, please follow the below jumper and switch settings.

Table 2.8: ROM-6881 on SOM-DB2510 Jumper/Switch List

Connector/Jumper/Switch	Function
CN9	Header for GPIO Test
GPIO_0 ~ GPIO_10	GPIO Selection
CN14	For CAN Bus port0 Terminal Resistor
CN15	For CAN Bus port1 Terminal Resistor
J7/J8	LVDS0 Power Selection Header
J9	LVDS0 Inverter Power Selection Header
J11/J12	LVDS1 Power Selection Header
J13	LVDS1 Inverter Power Selection Header
J14	EDP1/LVDS1 Hot-Plug Detect Selection Header
J24/J46/J47/J48/J49	SPI Selection
J15/J16/J17/J18/J19/J20/J21	SDIO Selection
SW1/2	COM0,COM2 mode setting
SW3	I2S0_MCK setting
SW4	Mode setting

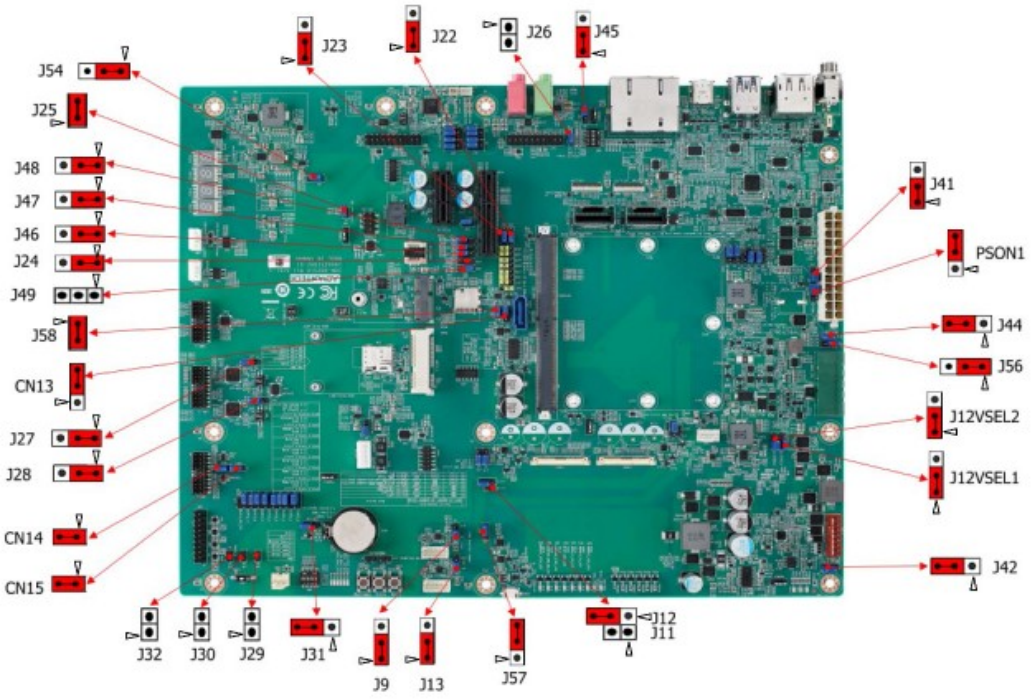


Figure 2.2 SOM-DB2510 Jumpers (1)

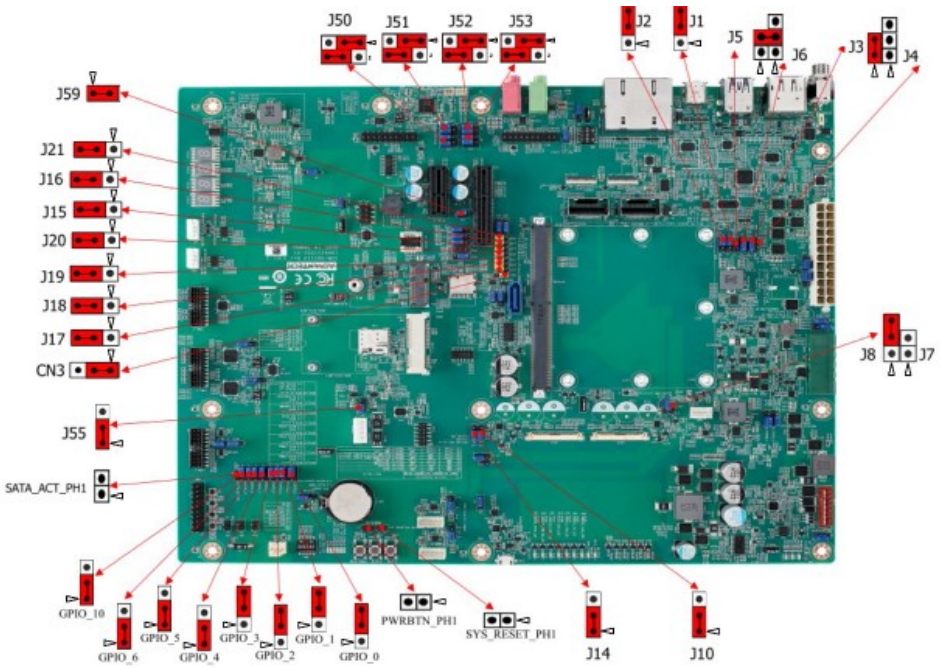


Figure 2.3 SOM-DB2510 Jumpers (2)

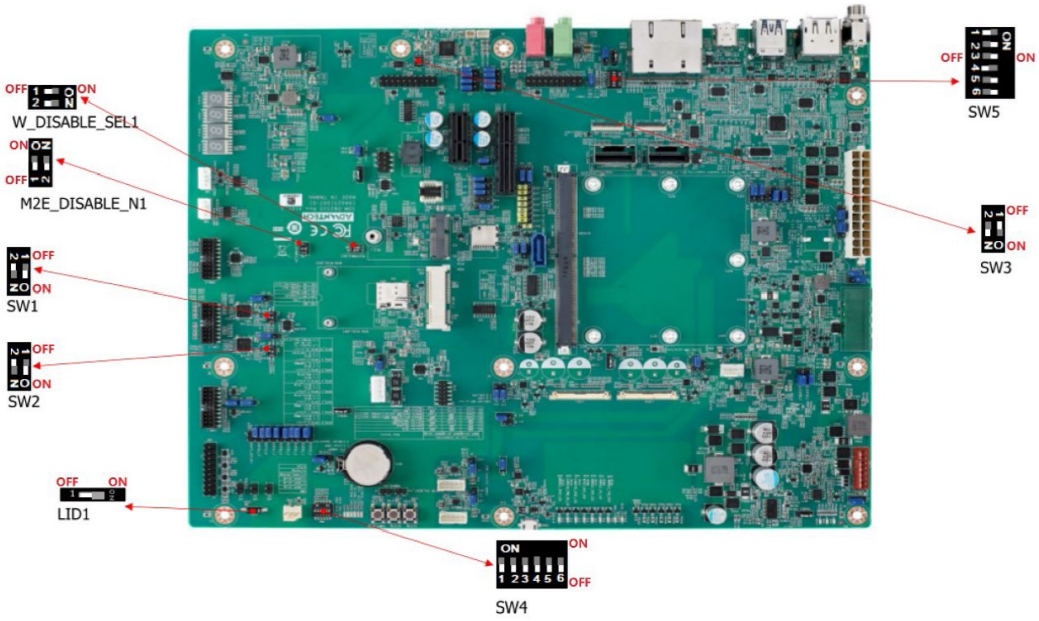


Figure 2.4 SOM-DB2510 Switch

2.4.3.1 GPIO Header and Selection

Table 2.9: CN9 GPIO Headers

Pin	Signal	Pin	Signal
1	+V3.3	2	+V3.3
3	GPIO0_3V3	4	GPIO1_3V3
5	GPIO2_3V3	6	GPIO3_3V3
7	GPIO4_3V3	8	GPIO5_3V3
9	GPIO6_3V3	10	GPIO7_3V3
11	GPIO8_3V3	12	GPIO9_3V3
13	GPIO10_3V3	14	GPIO11_3V3
15	GPIO12_3V3	16	GPIO13_3V3
17	NC	18	NC
19	GND	20	GND

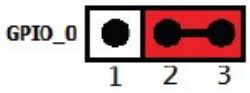


Table 2.10: GPIO_0 GPIO0 Selection

Pin	Function
1-2	Enable GPIO0
2-3	For CAM0_PWR# use (Default)

Table 2.11: GPIO_1 GPIO1 Selection

Pin	Function
1-2	Enable GPIO1
2-3	For CAM1_PWR# use (Default)

Table 2.12: GPIO_2 GPIO2 Selection

Pin	Function
1-2	Enable GPIO2
2-3	For CAM0_RST# use (Default)

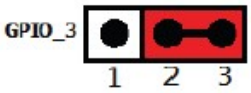


Table 2.13: GPIO_3 GPIO3 Selection

Pin	Function
1-2	Enable GPIO3
2-3	For CAM1_RST# use (Default)

Table 2.14: GPIO_4 GPIO4 Selection

Pin	Function
1-2	Enable GPIO4
2-3	For HDA_RST# use (Default)

Table 2.15: GPIO_5 GPIO5 Selection

Pin	Function
1-2	Enable GPIO5
2-3	For PWM_OUT use (Default)

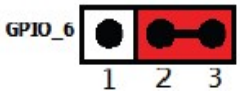


Table 2.16: GPIO_6 GPIO6 Selection	
Pin	**Function**
1-2	Enable GPIO6
2-3	For TACHIN use (Default)

2.4.3.2 CN14, CN15 CAN Terminal Resistor Selection

Table 2.17: CN14 CAN0 Terminal Resistor Selection	
Pin	**Function**
1-2	Mount CAN0 Terminal Resistor (Default)
1-x	NC for CAN0 Terminal Resistor

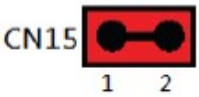


Table 2.18: CN15 CAN1 Terminal Resistor Selection	
Pin	**Function**
1-2	Mount CAN1 Terminal Resistor (Default)
1-x	NC for CAN0 Terminal Resistor

2.4.3.3 J7, J8 LVDS0 Power Selection

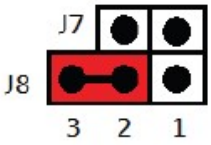


Table 2.19: J7, J8 LVDS0 Power Selection	
Pin	**Function**
J8 2-3	LVDS_PWR is +V3.3 (Default)
J8 1-2	LVDS_PWR is +V5
J7 2-J8 2	LVDS_PWR is +V12

2.4.3.4 J9 LVDS0 Inverter Power Selection

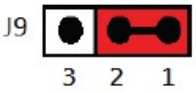


Table 2.20: J9 LVDS0 Inverter Power Selection	
Pin	Function
1-2	LVDS Inverter PWR is +V5 (Default)
2-3	LVDS Inverter PWR is +V12

2.4.3.5 J11, J12 LVDS1 Power Selection

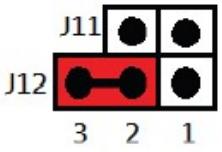


Table 2.21: J11, J12 LVDS1 Power Selection

Pin	Function
J12 2-3	LVDS_PWR is +V3.3 (Default)
J12 1-2	LVDS_PWR is +V5
J11 2-J12 2	LVDS_PWR is +V12

2.4.3.6 J13 LVDS1 Inverter Power Selection

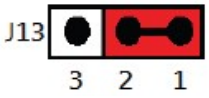


Table 2.22: J13 LVDS1 Inverter Power Selection

Pin	Function
1-2	LVDS Inverter PWR is +V5 (Default)
2-3	LVDS Inverter PWR is +V12

2.4.3.7 SPI0 Jumper Setting

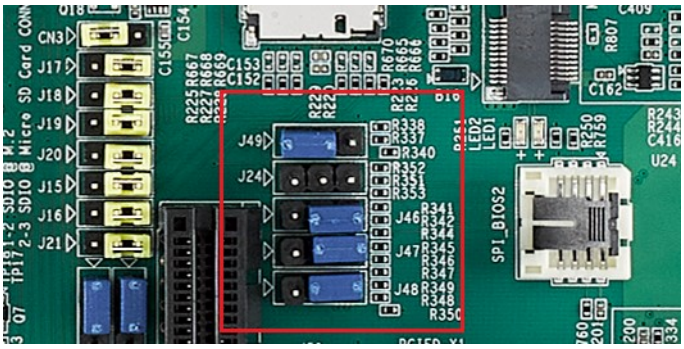


Table 2.23: SPI0 Jumper Setting

Pin	Function
J24/J46/J47/48(1-2)(default)	SPI0 to SPI_BIOS1
J46/J47/J48/J49(2-3)	SPI0 to SPI_BIOS2
J24/J46/J47/J48/J49(2-X)	SPI0 to SPI_CN1

2.4.3.8 SDIO Jumper Setting

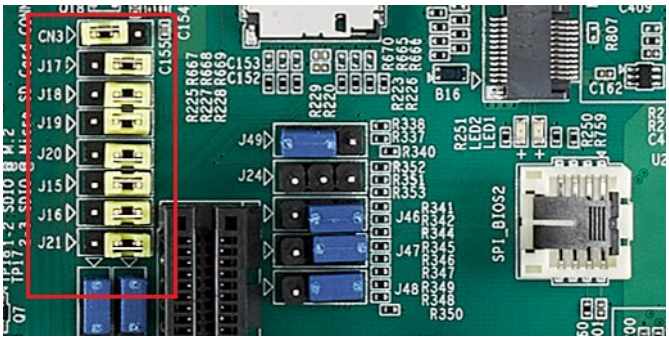


Table 2.24: SDIO Jumper Setting

Pin	Function
J15/J16/J17/J18/J19/J20/J21(1-2)(default)	SDIO to SD Slot
J15/J16/J17/J18/J19/J20/J21(2-3)	SDIO to M.2 Slot

2.4.3.9 SW1 COM0 Setting

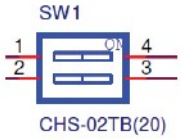


Table 2.25: SW1 COM0 Setting

Dip Switch	1-4	2-3	Function
SW1	OFF	OFF	LOOPBACK Mode
	ON	OFF	RS232 (Default)
	OFF	ON	RS485
	ON	ON	RS422

2.4.3.10 SW2 COM2 Setting

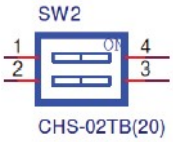


Table 2.26: SW2 COM2 Setting

Dip Switch	1-4	2-3	Function
SW2	OFF	OFF	LOOPBACK Mode
	ON	OFF	RS232 (Default)
	OFF	ON	RS485
	ON	ON	RS422

2.4.3.11 SW3 I2S0_MCK Setting

Table 2.27: SW3 I2S0_MCK Setting

Pin	Function
1 On 2 Off	AUDIO_MCK 24MHz is provided by the carrier board: ROM-DB2510.
1 Off 2 On (Default)	AUDIO_MCK is provided by the ROM-6881.

2.4.3.12 SW4 Setting

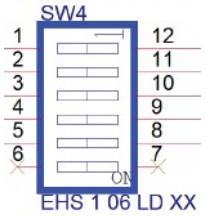


Table 2.28: SW4 Setting

Switch	Function
1-12/2-11/3-10/4-9/6-7	No function for ROM-6881 + SOM-DB2510
5-8(Default Off)	When the eMMC has an OS, ROM-6881 can start up and enter the OS normally. When there is no OS in the eMMC of the ROM-6881, it enters MASKROM mode. You can burn the OS into the eMMC through the Micro USB of the SOM-DB2510. Switch to ON; regardless of whether there is an OS in the eMMC of the ROM-6881, the board will enter MASKROM mode. You have to switch it to off, and then burn the OS into the eMMC through the Micro USB of the SOM-DB2510.

Chapter 3

Software Functionality

This chapter details the software programs on the ROM-6881 platform.

3.1 Function Test

All test tools must be verified using the ROM-6881 evaluation kit. Please prepare the required test fixtures before verifying each specified I/O. If you have any problems during testing, please contact Advantech for help.

3.2 Command Introduction

3.2.1 Uboot

1. Commands start with “=>”.

```
=> command
```

3.2.2 Kernel

1. Commands in a single line start with “#”.

```
# command
```

Copy and run commands without “#”.

2. Commands in multi-lines :

First line starts with “# ” and ends with “ \”.

Next line starts with “ ” and ends with “ \”.

Last line starts with “ ” and ends with “ ”.

```
# command1 \
command2 \
command3 \
command4
```

Copy and run multi-line commands without “#” simultaneously.

3. Annotations in a single line start with “# #---- ” and end with “ ----# #”:

```
# #---- annotations ----# #
```

3.3 Debian Desktop Operating System

ROM-6881 is pre-loaded with the Debian Desktop operating system. It can be easily used right away.

3.3.1 User and Password

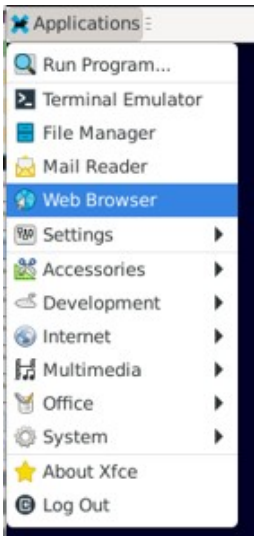
ROM-6881 has two users: root and linaro. Both passwords are “123456”.

After the Debian Desktop system boots up, it will automatically log into the “linaro” user profile.

If there is a debugging serial port connected, the serial terminal automatically logs into the “root” user profile.

3.3.2 Find Application

1. You can find an application in “Applications”.



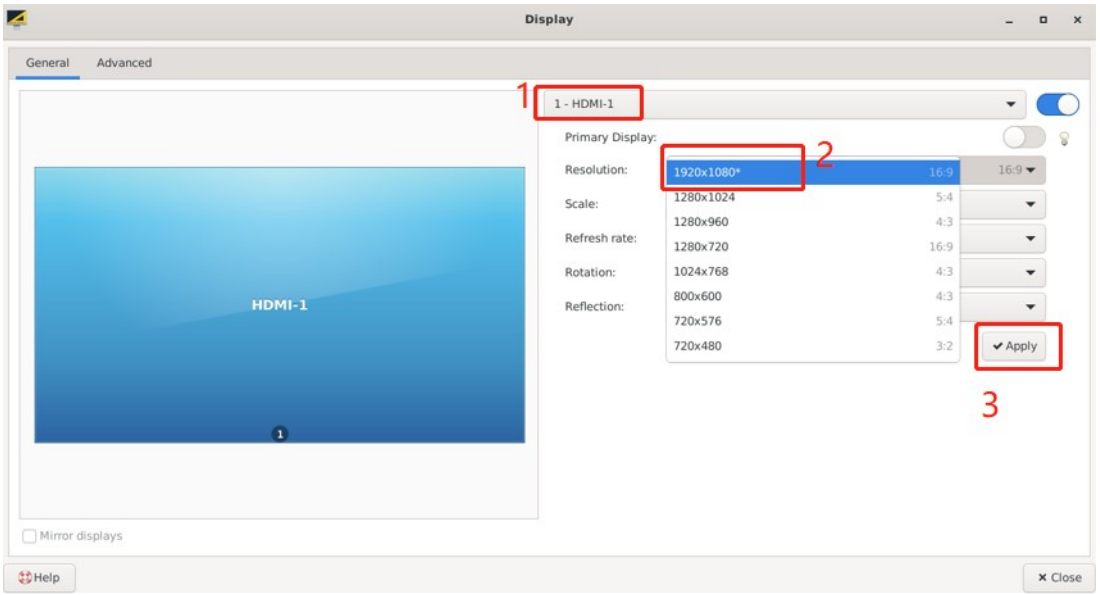
2. Alternatively, you can search for it in the list of “All Applications” in “Application Finder”.

3.4 HDMI/DP Screen

HDMI and DP support multiple resolutions. They can be configured in the GUI.

3.4.1 Configure Resolution for HDMI/DP Screen

1. Click “Applications” -> “Settings” -> “Display”.
2. Choose “HDMI-1” or “DP-1”, then choose “Resolution”.
3. Click “Apply”.



3.5 Multi-Display

The ROM-6881 supports up to four independent displays as shown in the table below:

Table 3.1: Display Combinations

Config	Display1		Display2		Display3		Display4	
	Interface	Test Resolution	Interface	Test Resolution	Interface	Test Resolution	Interface	Test Resolution
Default	Single channel LVDS	800 x 480	eDP	1920 x 1200	HDMI	3840×2160	DP	3840×2160
Option	MIPI-DSI	1920 x 1200	eDP	1920 x 1200	HDMI	3840×2160	DP	3840×2160
Option	Dual Channel LVDS (Test resolution: 1920 x 1080)				HDMI	3840×2160	DP	3840×2160

Note!

1. *MIPI-DSI and LVDS are alternatives.*
2. *Dual-Channel LVDS and eDP are alternatives.*

Table 3.2: Supported Panel List

Panel	Manufacturer Model	Resolution
LVDS	G070VW01 V0	800x480
	G215HVN01	1920x1080
MIPI-DSI	G101UAN02.0	1920x1200
eDP	B156XTN07.1	1366 x 768
	G101UAN01.0	1920x1200

3.5.1 Enter U-boot Interrupt Mode

Connect to the device through the debug port, and open the debug console.

Press “Ctrl + c” before activating the device. Wait until you see the following information on the debug console:

```
Hit any key to stop autoboot: 0
=> <INTERRUPT>
=>
```

Afterwards, you can input the following command to configure Multi-Display settings.

3.5.2 Single Display

1. For HDMI screen only, please set it up in u-boot as follows:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2
=> setenv display3
=> saveenv
=> reset
```

2. For DP screen only, please set it up in u-boot as follows:

```
=> setenv display0
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3
=> saveenv
=> reset
```

3. For eDP screen only, please set it up in u-boot as follows:

```
=> setenv display0
=> setenv display1 edp1-1366x768
=> setenv display2
=> setenv display3
=> saveenv
=> reset
```

4. For LVDS screen only, please set it up in u-boot as follows:

```
=> setenv display0
=> setenv display1
=> setenv display2
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

5. For MIPI-DSI screen only, please set it up in u-boot as follows:

```
=> setenv display0
=> setenv display1
=> setenv display2
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

3.5.3 Dual Display

1. For HDMI + DP, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3
=> saveenv
=> reset
```

2. For HDMI + eDP, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-1366x768
=> setenv display2
=> setenv display3
=> saveenv
=> reset
```

3. For HDMI + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

4. For HDMI + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

5. For DP + eDP, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1 edp1-1366x768
=> setenv display2 dp0-default
=> setenv display3
=> saveenv
=> reset
```

6. For DP + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

7. For DP + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

8. For eDP + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1 edp1-default
=> setenv display2
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

9. For eDP + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1 edp1-default
=> setenv display2
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

3.5.4 Triple Display

1. For HDMI + DP + eDP, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-default
=> setenv display2 dp0-default
=> setenv display3
=> saveenv
=> reset
```

2. For HDMI + DP + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3 lvds0-g215hvn01
=> saveenv
=> reset
```

3. For HDMI + DP + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1
=> setenv display2 dp0-default
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

4. For HDMI + eDP + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-default
=> setenv display2
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

5. For HDMI + eDP + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-default
=> setenv display2
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

6. For DP + eDP + LVDS, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1 edp1-default
=> setenv display2 dp0-default
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

7. For DP + eDP + MIPI, please set it up in u-boot as demonstrated below:

```
=> setenv display0
=> setenv display1 edp1-default
=> setenv display2 dp0-default
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

3.5.5 Quadruple Display

1. For HDMI + DP + LVDS + eDP, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-1366x768
=> setenv display2 dp0-default
=> setenv display3 lvds0-g070vw01
=> saveenv
=> reset
```

2. For HDMI + DP + MIPI + eDP, please set it up in u-boot as demonstrated below:

```
=> setenv display0 hdmi0-default
=> setenv display1 edp1-1366x768
=> setenv display2 dp0-default
=> setenv display3 mipi1-gl0uan
=> saveenv
=> reset
```

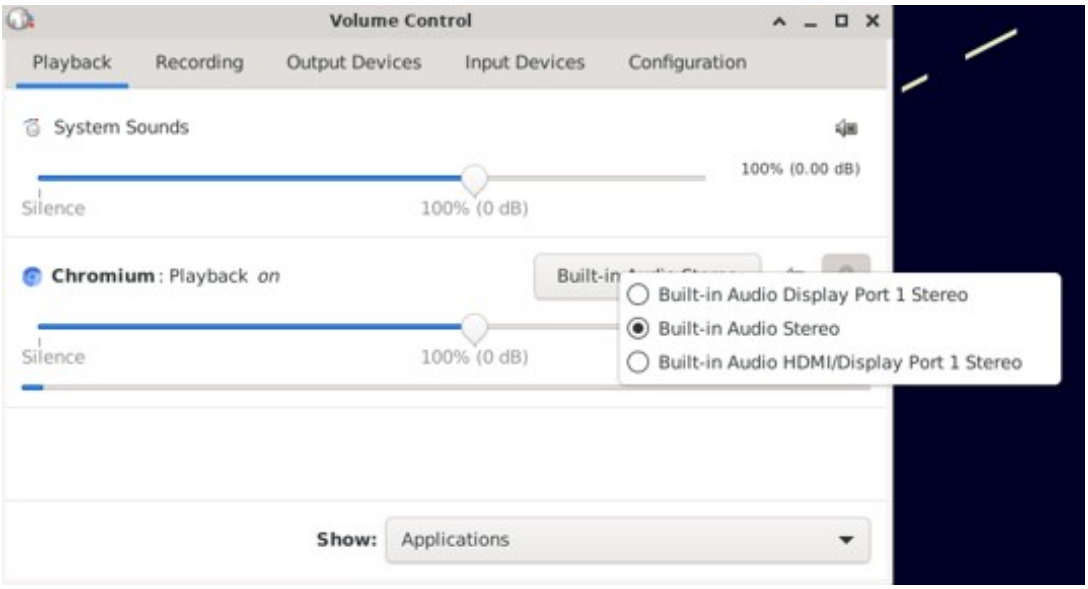
3.6 Audio

ROM-6881 supports three kinds of sound cards:
“0 rt5640-codec” (Advantech ROM-EG57 audio board)
“1 hdmi”,
“2 dp0”.

3.6.1 Audio Settings

Set the default audio output when playing media files.

1. Click “Applications” -> “Multimedia” -> “Pulse Audio Volume Control”.
2. Select “Built-in Audio stereo” for rt5640-codec output,
   or select “Built-in Audio HDMI/Display port 1 Stereo …” for HDMI output,
   or select “Built-in Audio Display Port 1 Stereo” for DP output.



3.6.2 Audio Test

1. Get the Audio board ID

```
# cat /proc/asound/cards
 0 [rockchiprt5640c]: rockchip_rt5640 - rockchip,rt5640-codec
                      rockchip,rt5640-codec
 1 [rockchiphdmi0  ]: rockchip-hdmi0 - rockchip-hdmi0
                      rockchip-hdmi0
 2 [rockchipdp0    ]: rockchip-dp0 - rockchip-dp0
                      rockchip-dp0
```

2. Record
   Take Card ID 0 as an example:

```
# arecord -Dplughw:0,0 -f S16_LE -r 16000 -d 10 -t wav test.wav
```

3. Playback
   Take Card ID 0 for example:

```
# aplay -Dplughw:0,0 -t wav test.wav
```

3.7 4G

3.7.1 Configure 4G

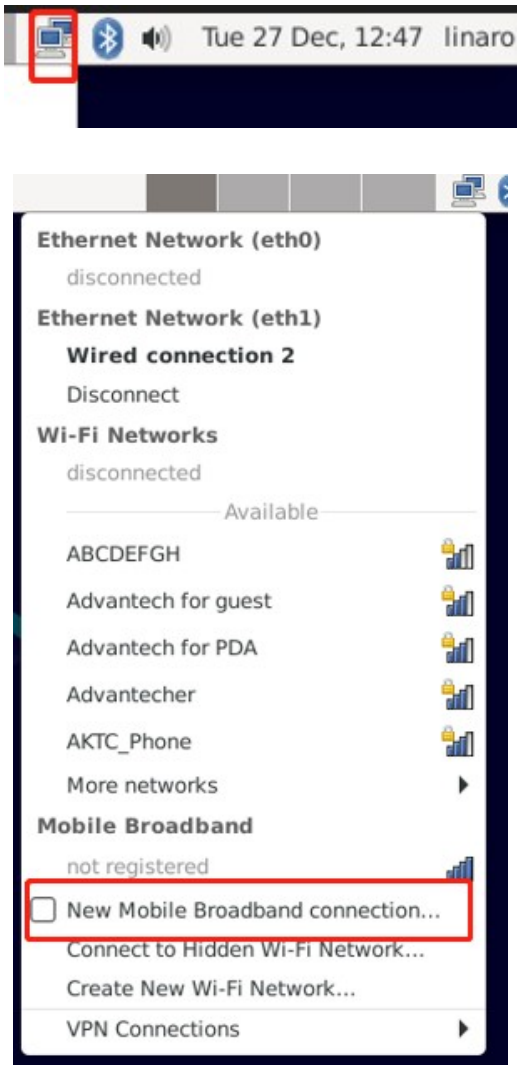
STEP 1: Power off the device, then insert the 4G module and SIM card.

Default supported 4G module:

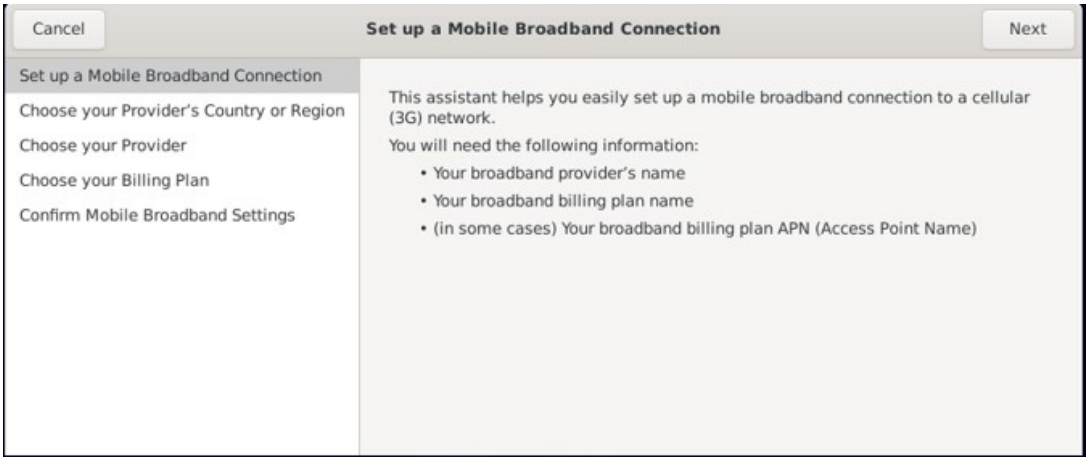
EC20CEFRG-MINIPCIE (Advantech PN: 968AD00479)

Note! *Make sure the device is powered off before inserting the 4G module and SIM card; otherwise, the device, 4G module, and/or SIM card may be damaged.*

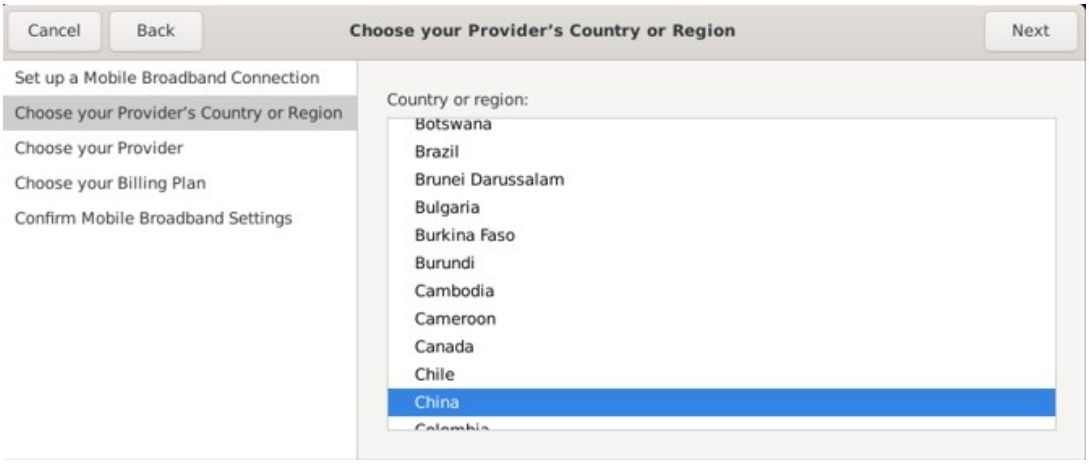
STEP 2: Power on the device. Click the network connection icon, then choose “New Mobile Broadband connection”.



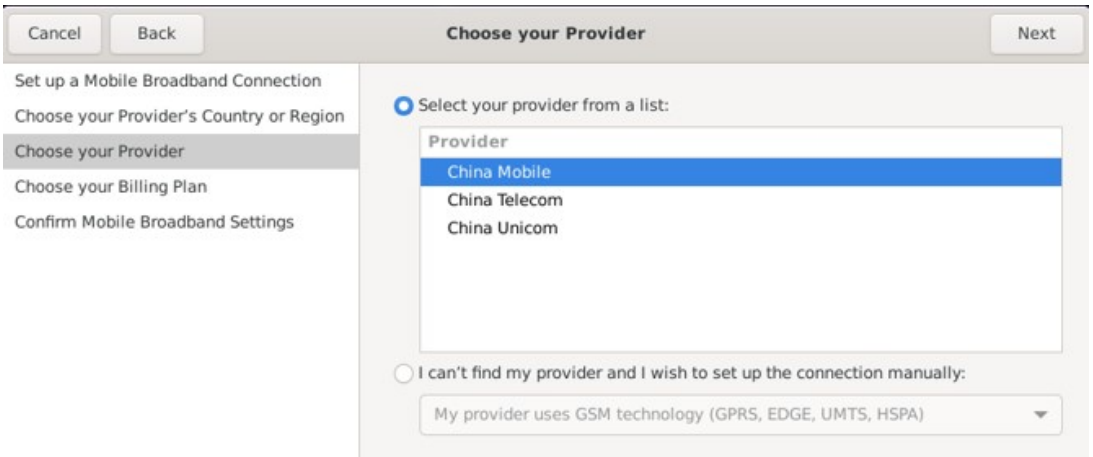
Then you will see the following window. Click the “Next” button to go to the next step.



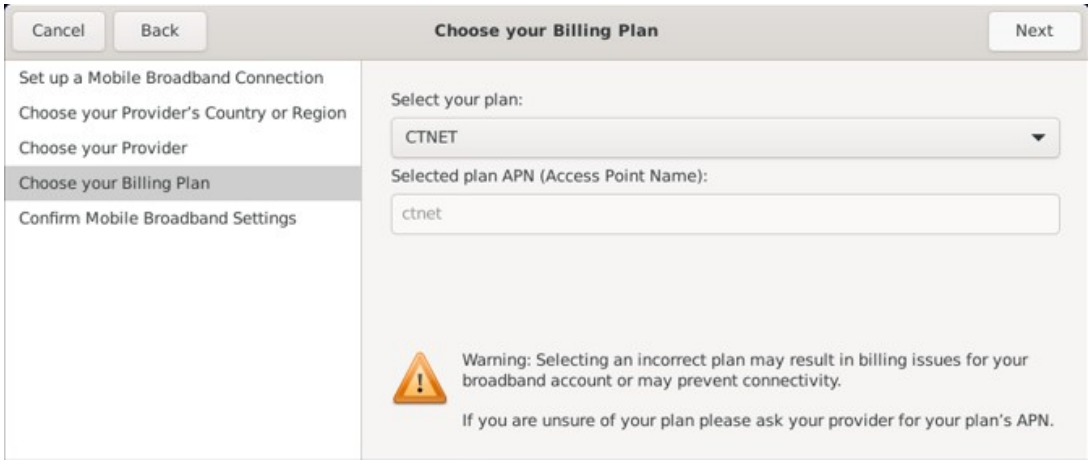
STEP 3: Choose your provider's country or region for the SIM card you inserted in STEP 0.



STEP 4: Choose or set the provider's name.



STEP 5: Choose or Set the APN.



STEP 6: Confirm your configuration and finish.

3.7.2 4G Test

After connection, 4G will create a net point “wwan0”.

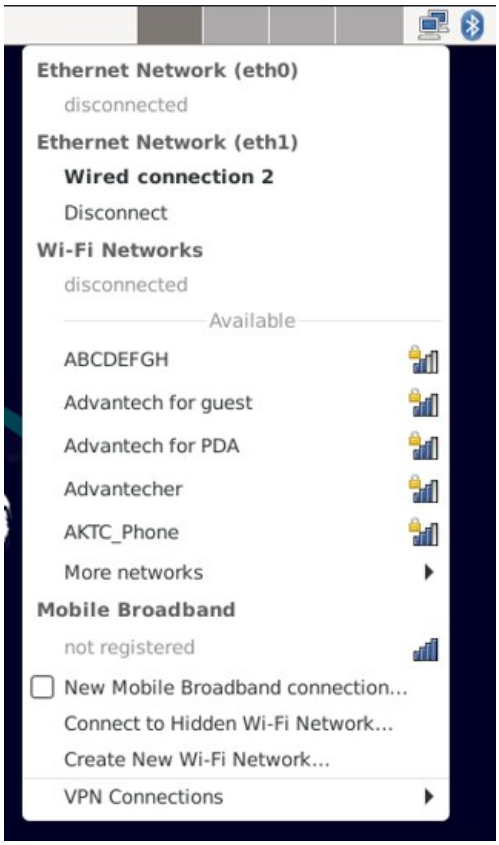
```
# ping -I wwan0 www.advantech.com
```

3.8 Wi-Fi/BT

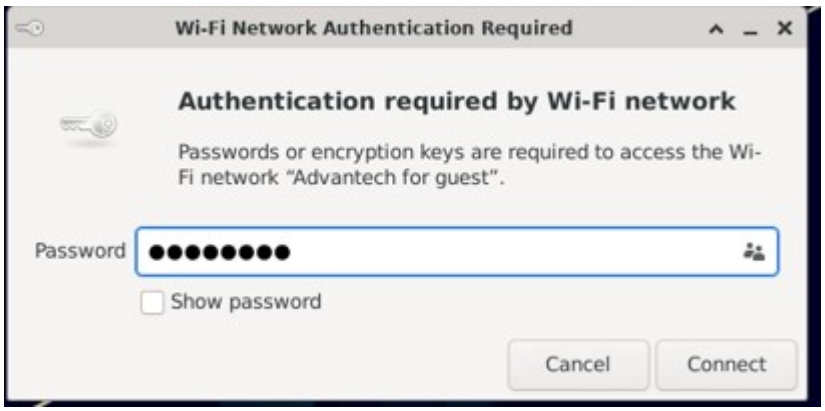
3.8.1 Configure Wi-Fi

Default supported ADVANTECH Wi-Fi5 module: AIW-154BN

1. Click the Wi-Fi icon in the top right corner of the screen and select a Wi-Fi connection (for example, Advantech for guest).



2. Enter the Wi-Fi password to connect to the device.



3. If the password is correct, the device will connect quickly.

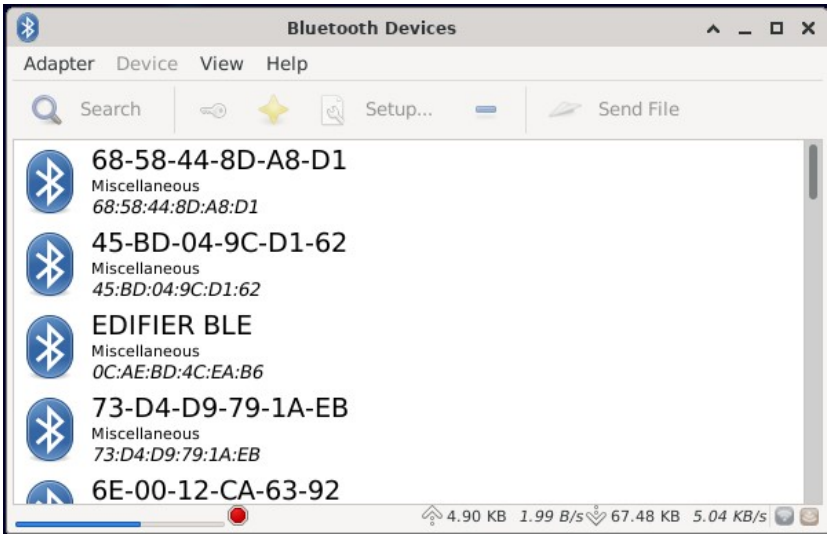
3.8.2 Wi-Fi Test

After connection, Wi-Fi will create a net point “wlan0”.

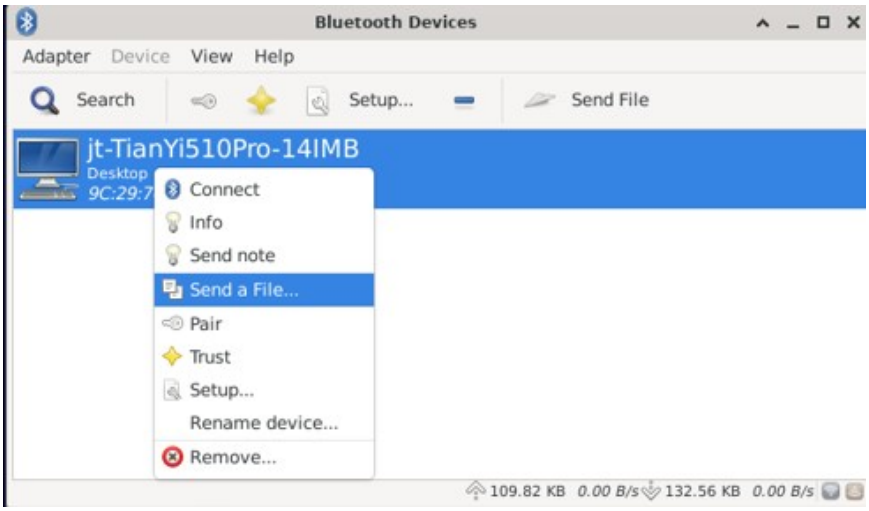
```
# ping -I wlan0 www.advantech.com
```

3.8.3 BT

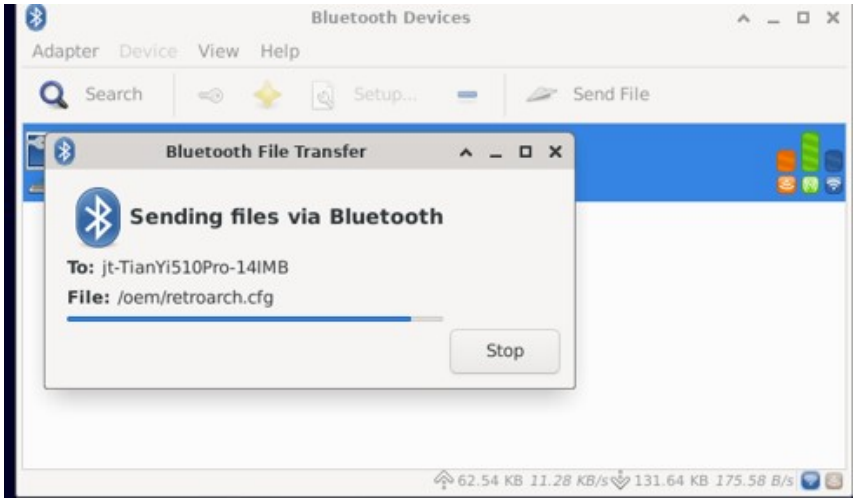
1. Click “Applications” -> “Settings” -> “Bluetooth Manager”.
   Click the “Search” button to search for Bluetooth Devices.



2. Right-click to select a device, such as “jt-TianYi510Pro-14IMB”, and send a file.



3. ROM-6881 will start sending files when the receiver device, such as “jt-TianYi510Pro-14IMB”, confirms Bluetooth reception.

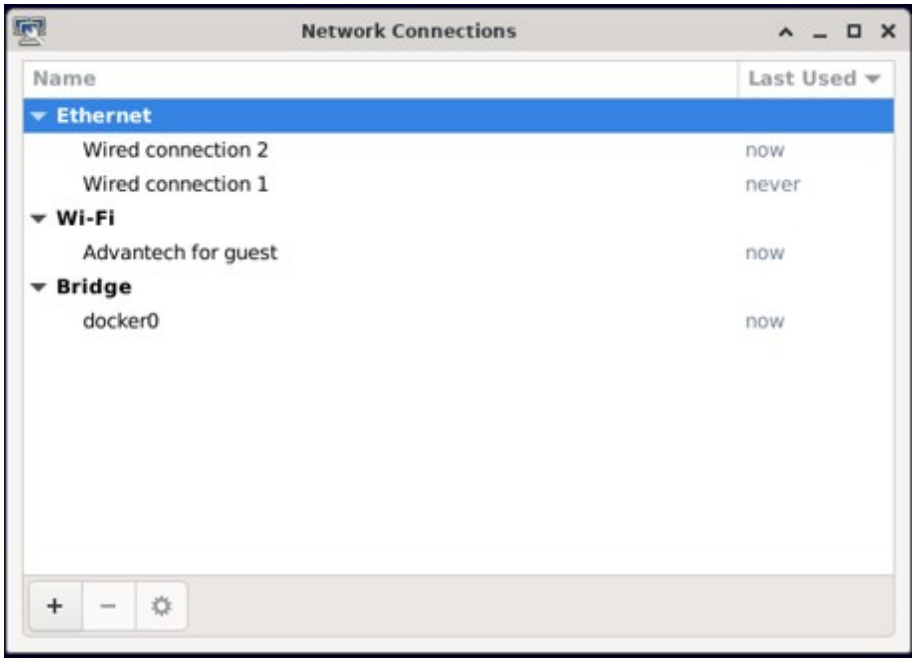


3.9 Ethernet

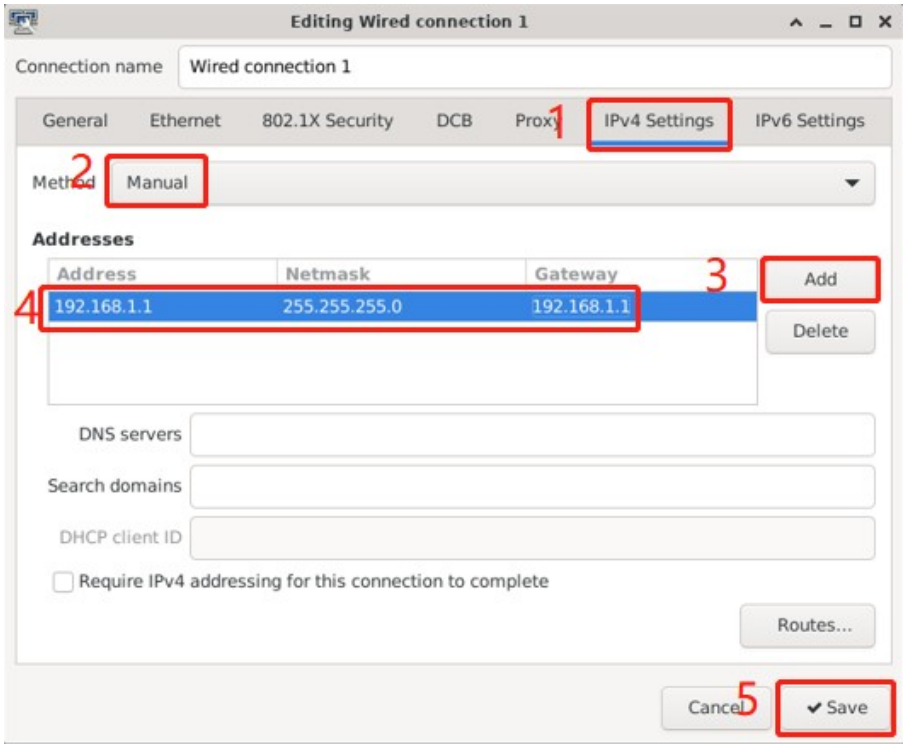
ROM-6881 supports two Ethernet ports: eth0 and eth1. Both ports use “DHCP” mode by default. The following configurations and tests are taking eth0 as an example.

3.9.1 Configure to Static IP

1. Click “Applications” -> “Settings” -> “Advanced Network Configuration”.

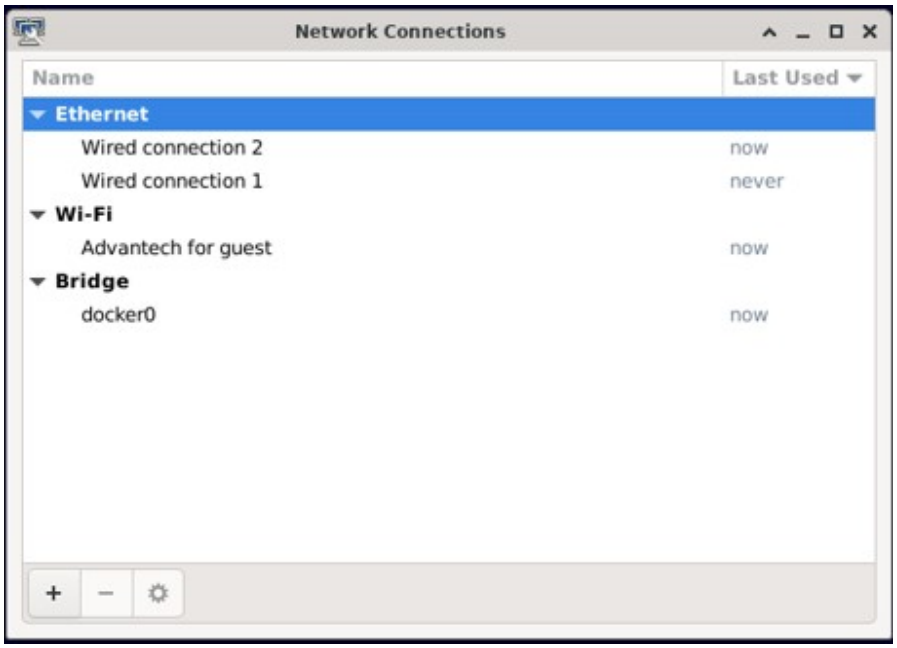


2. Double-click “Wired Connection 1” to configure it.

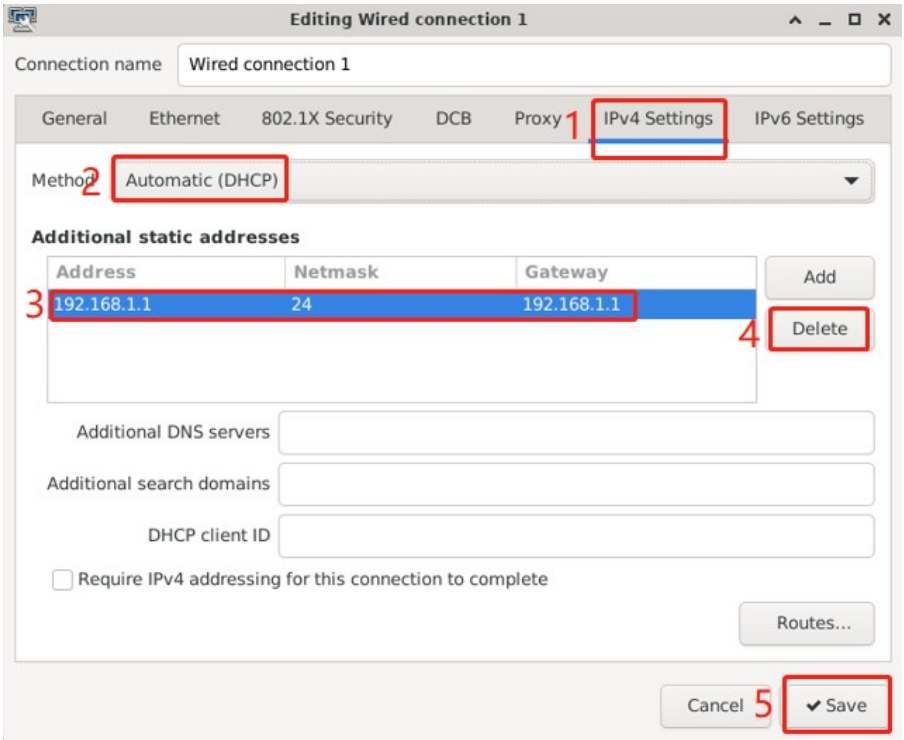


3.9.2 Configure to DHCP

1. Click “Applications” -> “Settings -> “Advanced Network Configuration”.



2. Double-click “Wired Connection 1” to configure it.



3.9.3 Ethernet Test

After connection, Ethernet will create a net point “eth0” and “eth1”.

```
# #---- Test eth0 ----# #
# ping -I eth0 www.advantech.com

# #---- Test eth1 ----# #
# ping -I eth1 www.advantech.com
```

3.10 UART

User Debian/Linux UART/serial port access is through tty-devices. The tty- devices have different names depending on UART drivers for different boards. The default value is RS232.

Table 3.3: UART

Device Node	ROM-6881	SOM-DB2510 COM Port Name
/dev/ttyS0	UART0 (Pin134,Pin135) (RS232 2-wire)	COM2_4 COM2 (RS-232 2-wire)
/dev/ttyS6	UART6 (Pin129~ Pin132) (RS232 4-wire)	COM1_3 COM1 (RS-232 4-wire)
/dev/ttyS9	UART9 (Pin136~Pin139) (RS232 4-wire)	COM1_3 COM3 (RS-232 4-wire)

1. 4-wire (Take UART6 for example)

```
# /tools/test/adv/uart/rs232_4_wire_test.sh /dev/ttyS6
```

2. 2-wire (Take UART0 for example)

```
# /tools/test/adv/uart/rs232_2_wire_test.sh /dev/ttyS0
```

3.11 GPIO

The RK3588 bank/bit notation for GPIOs must be formed as "GPIO<GPIO_bank>_<gpio_bit>"
The numeric value of GPIO is calculated as follows:
32 x (gpio_bank) + gpio_bit
gpio_bit: A0~A7 0-7 B0~B7 8-15 C0~C7 16-23 D0~D7 24-31
E.g. GPIO3_A0 becomes 96

Table 3.4: GPIO

GPIO Number	GPIO Formed	Numeric Representation
GPIO0	Ext-GPIO0 P00	493
GPIO1	Ext-GPIO0 P01	494
GPIO2	Ext-GPIO0 P02	495
GPIO3	Ext-GPIO0 P03	496
GPIO4	Ext-GPIO0 P04	497
GPIO5	GPIO4_B5	141
GPIO6	Ext-GPIO0 P05	498
GPIO7	Ext-GPIO0 P06	499
GPIO8	Ext-GPIO0 P07	500
GPIO9	GPIO4_A0	128
GPIO10	GPIO3_C0	112
GPIO11	GPIO3_C1	113

Export GPIO, then you can use control GPIO from user space through sysfs.

- Export GPIO

```
# echo 493 > /sys/class/gpio/export
```

- Set GPIO direction to in/out

```
# echo "out" > /sys/class/gpio/gpio493/direction
```

- Set GPIO value 0/1 if GPIO pin define as output

```
# echo 1 > /sys/class/gpio/gpio493/value
```

- Unexport GPIO

```
# echo 493 > /sys/class/gpio/unexport
```

3.11.1 GPIO Test

GPIO0 and GPIO1 are taken as examples: Connect GPIO0 and GPIO1

- **Export GPIO0 and GPIO1**

```
# echo 493 > /sys/class/gpio/export
# echo 494 > /sys/class/gpio/export
```

- **Set GPIO0 to output and GPIO1 to input**

```
# echo "out" > /sys/class/gpio/gpio493/direction
# echo "in" > /sys/class/gpio/gpio494/direction
```

- **Change GPIO0 to 1 and read GPIO1 value**

```
# echo 1 > /sys/class/gpio/gpio493/value
# cat /sys/class/gpio/gpio494/value
1
```

- **Change GPIO0 to 0 and read GPIO1 value**

```
# echo 0 > /sys/class/gpio/gpio493/value
# cat /sys/class/gpio/gpio494/value
0
```

3.12 RTC

Set the system to the current time, then set the RTC.

```
# date 021710452016 && hwclock -w && date
Wed Feb 17 10:45:00 UTC 2016
Wed Feb 17 10:45:01 UTC 2016
```

Set one incorrect time, then read RTC to verify.

```
# date 010100002000 && hwclock -r && date
Sat Jan  1 00:00:00 UTC 2000
2016-02-17 10:49:08.417688+00:00
Sat Jan  1 00:00:00 UTC 2000
```

Restore the RTC time to system time.

```
# hwclock -s && date
Wed Feb 17 10:46:58 UTC 2016
```

3.13 Watchdog

The tool “wdt” enables the watchdog, eat it 100 times then let it alone.
Run the following command, check whether ROM-6881 will reboot after 20 seconds.

```
# /tools/test/adv/watchdog/wdt /dev/watchdog 20
```

3.14 CAN

ROM-6881 has two CANs. The following commands set one CAN as sender and the other as receiver. Then send "123#55" from the sender and check whether the receiver gets the same data.

Preparation:

- **Connect CAN0's CAN_L (PIN2 DB9) to CAN1's CAN_L (PIN2 DB9).**
- **Connect CAN0's CAN_H (PIN7 DB9) to CAN1's CAN_H (PIN7 DB9).**

```
# /tools/test/adv/can/can_test.sh can0 can1
```

If there is no error, can0 will receive as follows:

```
can-test can0 can1 Test Pass
```

3.15 SATA

Test scripts automatically copy a file in eMMC to the SATA disk. Check whether the file is different in eMMC and the SATA disk.

Preparation:

- Insert the SATA disk.
- Remove all USB disks.

Note!

- *Make sure the device is powered off before inserting the SATA disk; otherwise, the device and/or SATA disk may be damaged.*
- *Make sure the SATA disk is partitioned and formatted.*

Taking sda1 as an example, confirm that SATA has been mounted in the/run/media path.

```
# /tools/test/adv/storage/storage_test.sh sda1
```

3.16 PCIe

ROM-6881 supports four PCIe ports. Use a PCIe disk (SQF-CM3V1-512G-EDE) to test the PCIe interface. The following cards are needed:

- PCIe disk: SQF-CM3V1-512G-EDE
- M.2 to Mini-PCIe board: EXM-CMPF1(19A6MPF100-01)
- Mini-PCIe to standard PCIe board

Test scripts automatically copy a file in eMMC to a PCIe disk. Check whether the file is different in eMMC and the PCIe disk.

Preparation:

- Insert a PCIe disk.

Note!

- *Make sure the device is powered off before insert the PCIe disk; otherwise, the device and/or PCIe disk may be damaged.*
- *Make sure the PCIe disk is partitioned and formatted.*

```
# /tools/test/adv/storage/storage_test.sh nvme0n1p1
```

3.17 I2C PIN Header

ROM-6881 has two I2C-PIN-Header channels.

Table 3.5: I2C PIN Header

I2c Num	BUS Num	address
I2C1	5	0x51
I2C2	8	0x51

Use the ROM-EG70 Test Board to read I2C flash. Use I2C2 as an example:

```
# /tools/test/adv/i2c/iic_pin_test.sh 8 0x51
```

3.18 Camera

ROM-6881 supports four MIPI-CSI ports.

Table 3.6: Camera

Camera Number	Video Port	Notes
Camera 1	44	(I2C 4) 2 Lane
Camera 2	62	(I2C 3) 4 Lane
Camera 3	53	CN1 (I2C 5) 4 Lane
Camera 4	71	CN2 (I2C 8) 4 Lane

Using “Camera 1” as an example.

```
# /tools/test/adv/camera/camera_rkaiq_test.sh 44
```

3.19 SPI

The ROM-6881 supports two SPIs.
Use the ROM-EG70 Test board to read SPI flash.

Test one SPI:

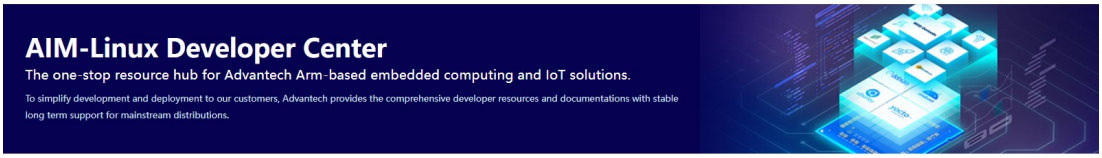
```
# /tools/test/adv/spi/spi_test.sh mtd0
```

Test two SPI ports at the same time:

```
# /tools/test/adv/spi/spi_test.sh mtd1
```

3.20 More Technical Support and Assistance

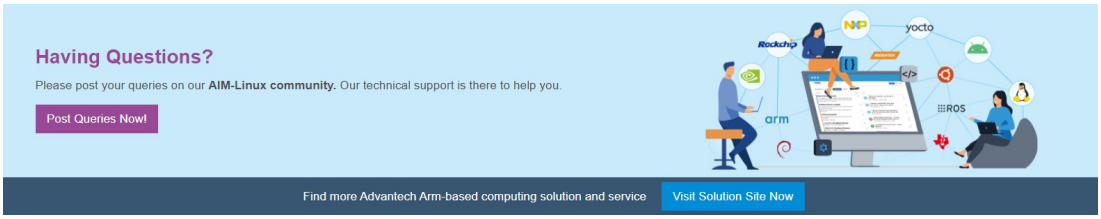
Click on the screenshot or link below to get more information about Advantech Arm computing products.



ESS-WIKI (advantech.com.tw)

http://ess-wiki.advantech.com.tw/view/RISC

Also, you can post your questions or queries on our AIM-Linux community.
Click on the screenshot or link below to join us now.



Advantech AIM-Linux Community - Welcome to the Advantech AIM-Linux Community!

https://forum.aim-linux.advantech.com

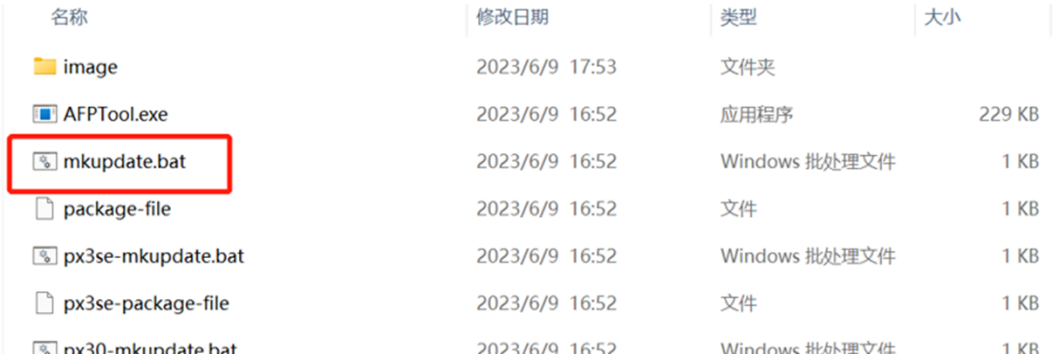
Chapter 4

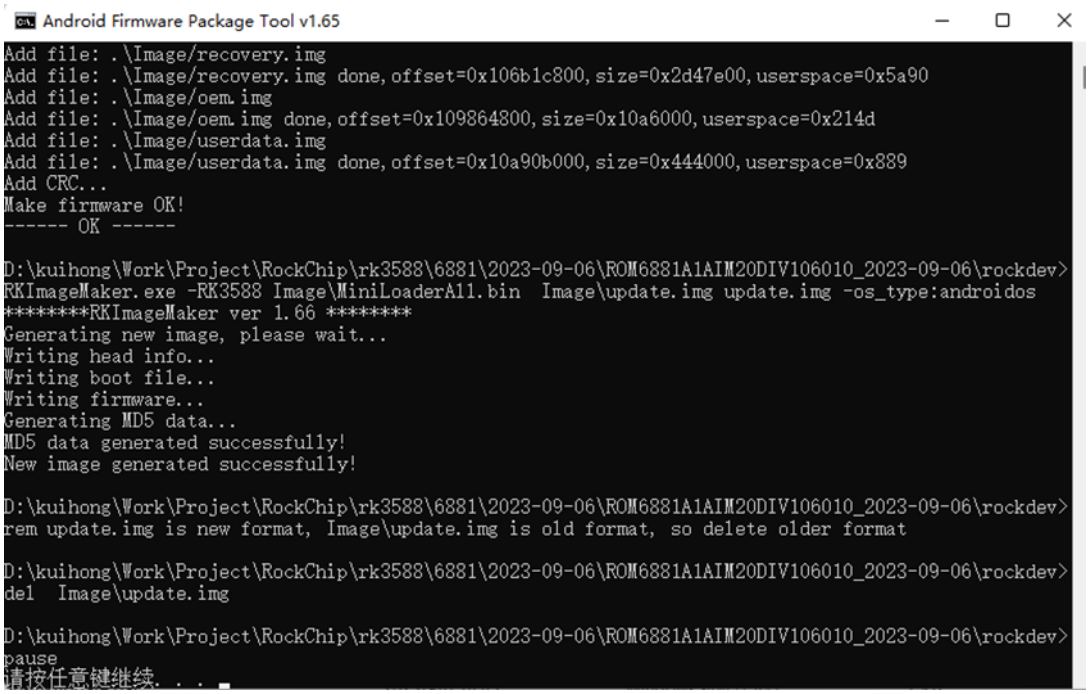
System Recovery

This chapter introduces how to recover the Linux operating system if it is damaged accidentally.

4.1 Create “update.img”

1. Download the Release Image to the PC (Windows OS).
2. Decompress the Image, and double-click mkupdate.bat in the folder “rockdev”.

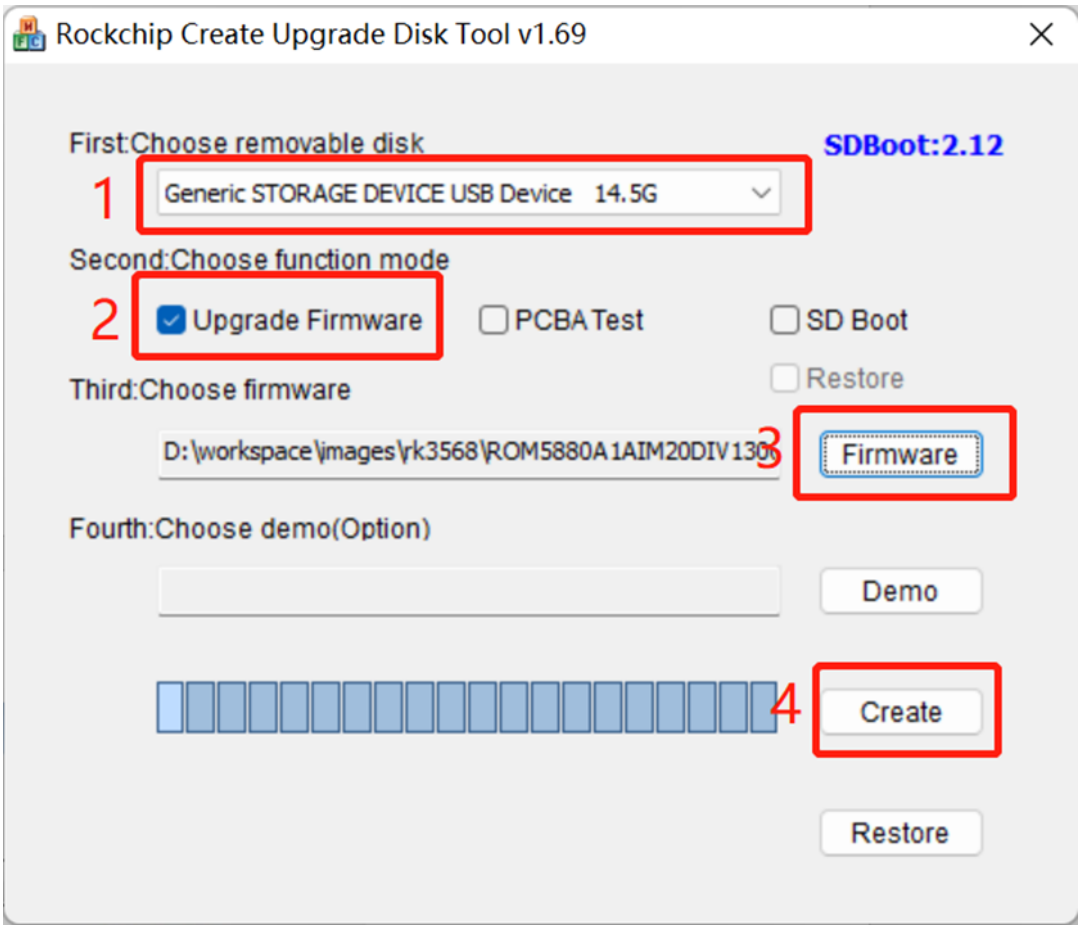




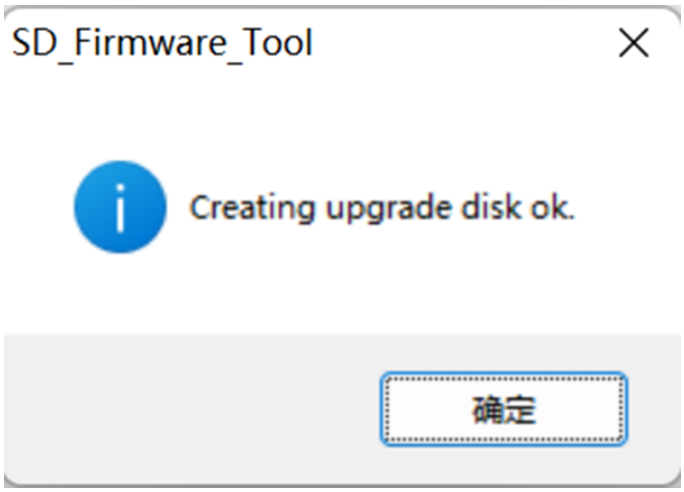
Then you can find “update.img” in the folder “rockdev”.

4.2 Using SDDiskTool to Create an Upgrade SD Card

1. Insert an SD Card into the PC (Windows OS).
2. Decompress SDDiskTool, and double-click SD_Firmware_Tool.exe
3. Create an upgrade SD card:
   a. Choose the SD device.
   b. Choose the "Upgrade firmware"
   c. Choose the update.img path.
   d. Create the update SD.



5. Receive confirmation that the upgrade SD card was created successfully.



4.3 Upgrade or Recover ROM-6881

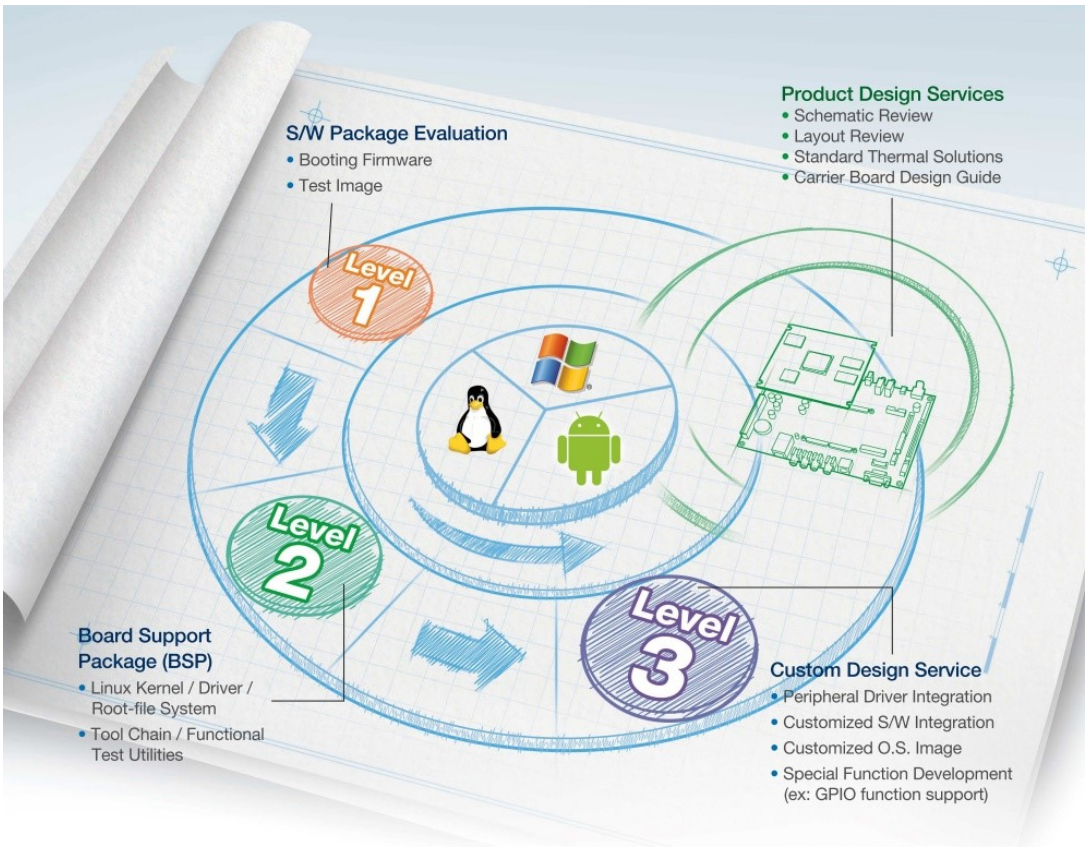
1. Power off ROM-6881.
2. Insert the upgrade SD card into ROM-6881.
3. Power on ROM-6881. It will automatically enter recovery mode to upgrade the system.
4. If the upgrade is successful, you will get the message “Please remove the SD CARD!!!, wait for reboot” on the screen and debug console.
5. Remove the SD card.

Chapter 5

Advantech Services

This chapter introduces Advantech design-in services, technical support, and the warranty policy for the ROM-6881 evaluation kit.

5.1 RISC Design-In Services



Advantech RISC Design-in Services help customers reduce the time and work involved with designing new carrier boards. We handle the complexities of technical research and greatly minimize the development risk associated with carrier boards.

Easy Development

Advantech has support firmware, a root file system, BSP, and other development tools for customers. These tools help customers easily get the most out of their carrier boards and differentiate their embedded products and applications.

- Full Range of RISC Product Offerings
- Comprehensive Document Support

Design Assistance Service

Advantech provides a checklist for engineers to perform an easy check of their schematics and we also provide a review service based on customer carrier board schematics. Those services are preventative, and help catch design errors before they happen. It helps save a lot of time and cost with regard to developing carrier boards.

- Schematic Review
- Placement and Layout Review
- Debugging Assistance Services
- General/Special Reference Design Database

Thermal Solution Services

In order to provide quicker and more flexible solutions for customers' thermal designs, Advantech provides thermal solution services including modularized and customized thermal solutions.

- Standard Thermal Solutions
- Customized Thermal Solutions

Embedded Software Services

Advantech provides drivers, software integration, customized firmware, root file-systems, and Linux images. This allows customers to save lot of time and focus on their core development.

- Embedded Linux/ Android OS
- Advantech boot loader customization

With the spread of industrial computing, a whole range of new applications have been developed, resulting in a fundamental change in the IPC industry. In the past, System Integrators (SI) were used to completing projects without outside assistance, but now, we have moved on. Due to diverse market demands and intense competition, cooperation for (both upstream and downstream) vertical integration has become a much more effective way to create competitive advantages. As a result, ARM-based CPU modules were born out of this trend. Concentrating all necessary components on the CPU module and placing other parts on the carrier board in response to market requirements for specialization provides greater flexibility while retaining low power consumption credentials.

Advantech has been involved in the industrial computer industry for many years and has found that customers usually have the following issues when implementing modular designs.

General I/O design capability

Although customers possess the ability for vertical integration and have enough know-how and core competitiveness in the professional application field, the lack of expertise and experience in general power and I/O design brings many challenges, especially when integrating CPU modules into their carrier boards.

The acquisition of information

Even if an individual client is able to obtain sufficient information to make the right decision for a specialized vertical application, some customers encounter difficult problems dealing with platform design in general and communicating with CPU or chipset manufacturers. This increases carrier board design difficulties, adds risk, seriously impacts time-to-market, and may result in lost market opportunities.

Software development and modification

Compared to x86 architectures, RISC architectures use simpler instruction sets. Therefore, software support for x86 platforms cannot be used on RISC platforms. System integrators need to develop software for their systems and configure the hardware and software integration themselves. Unlike x86 platforms, RISC platforms have less support for Board Support Packages (BSP) and drivers. Even though driver support is provided, SIs still have to make a lot of effort to integrate their systems. Moreover, the BSP provided by CPU manufacturers are usually for carrier board design, so it's difficult for SIs to have an environment for software development.

In view of this, Advantech proposed the concept of Streamlined Design-in Support Services for RISC-based Computer-on-Modules (COM). With a dedicated professional design-in services team, Advantech actively participates in carrier board design and problem solving. Our services not only enable customers to effectively distribute their resources but also reduce R&D manpower cost and hardware investment.

By virtue of a close interactive relationship with leading original manufacturers of CPUs and chipsets such as ARM, TI, and Freescale, Advantech helps solve communication and technical support difficulties, reducing the uncertainties of product development. Advantech's professional software team also focuses on providing a complete Board Support Package and assists customers to build up a software development environment for their RISC platforms.

Advantech RISC design-in services help customers overcome their problems to achieve the most important goal of faster time-to-market through streamlined RISC Design-in services.

Along with our multi-stage development process which includes planning, design, integration, and validation, Advantech's RISC design-in services provide comprehensive support to the different phases described in the following sections.

Planning stage

Before deciding to adopt Advantech RISC COM, customers must go through a complete survey process, covering product features, specifications, and compatibility testing with software. Advantech offers a RISC Customer Solution Board (CSB) as an evaluation tool for carrier boards which are simultaneously designed when developing RISC COMs. In the planning stage, customers can use this evaluation board to assess RISC modules and test peripheral hardware. What's more, Advantech provides standard software Board Support.

Advantech provides a package (BSP) for RISC COM so that customers can define their products' specifications as well as verify I/O and performance at the same time. We offer hardware planning and technology consulting as well as software evaluation and peripheral module recommendations (such as Wi-Fi, 3G, and BT). Resolving customer concerns is Advantech's main objective at this stage. Since we all know that product evaluation is the key task during the planning period, especially for performance and specifications, we help our customers conduct all the necessary tests for their RISC COM.

Design stage

When a product moves into the design stage, Advantech will supply a design guide for the carrier board for reference. The carrier board design guide provides pin definitions for the COM connector with limitations and recommendations for carrier board design. This is so customers can have clear guidelines to follow during carrier board development. According to different form factors, Advantech offers a complete pinout checklist for form factors such as Q7, ULP, and RTX2.0 so that customers can examine the carrier board signals and layout design accordingly. In addition, our team assists customers in reviewing the placement/layout and schematics to ensure the carrier board design meets their full requirements. For software development, the Advantech RISC software team assists customers in establishing an environment for software development and evaluating the amount of time and resources needed. If customers outsource software development to a 3rd party, Advantech can also cooperate with the 3rd party and provide top-notch consulting services. With Advantech's professional support, the design process becomes much easier and product quality will be heightened to meet targets.

Integration stage

This phase comprises of HW/SW integration, application development, and peripheral module implementation. Due to a lack of knowledge and experience with platforms, customers may need to spend a certain amount of time analyzing integration issues. In addition, peripheral module implementation has a lot to do with driver designs on carrier boards and RISC platforms usually have less support for ready-made drivers on the carrier board. Therefore, the customer has to learn from trial and error to finally arrive at the best solution with the least effort. The Advantech team has years of experience in customer support and HW/SW development. Consequently, we can support customers by providing professional advice and information as well as shortening development times and enabling more effective product integration.

Validation stage

After a customer's ES sample is completed, the next step is a series of verification procedures. In addition to verifying a product's functionality, the related test of the product's efficiency is also an important part at this stage, especially for RISC platforms.

In a supportive role, Advantech primarily helps customers solve their problems in the testing process, and will give suggestions and tips. Through an efficient verification process backed by our technical support, customers are able to optimize their applications with minimal fuss. Furthermore, Advantech's team can provide professional consulting services regarding further testing and equipment usage. This way, customers can find the right tools to efficiently identify and solve problems to further enhance the quality and performance of their products.

5.2 Contact Information

Below is the contact information for Advantech customer service.

Table 5.1: Contact Information

Region/Country	Contact Information
America	1-888-576-9688
Brazil	0800-770-5355
Mexico	01-800-467-2415
Europe (Toll-Free)	00800-2426-8080
Singapore & SAP	65-64421000
Malaysia	1800-88-1809
Australia (Toll-Free)	1300-308-531
China (Toll-Free)	800-810-0345 800-810-8389 Sales@advantech.com.cn
India (Toll-Free)	1-800-425-5071
Japan (Toll-Free)	0800-500-1055
Korea (Toll-Free)	080-363-9494 080-363-9495
Taiwan (Toll-Free)	0800-777-111
Russia (Toll-Free)	8-800-555-01-50

On the other hand, you can reach our service team through the below website. Our technical support engineers will provide a quick response once the form is filled out:

http://www.advantech.com.tw/contact/default.aspx?page=contact_form2&subject=Technical+Support

5.3 Global Service Policy

5.3.1 Warranty Policy

Below is the warranty policy for Advantech products:

5.3.1.1 Warranty Period

Advantech-branded off-the-shelf products and 3rd-party off-the-shelf products used to assemble Advantech Configure-to-Order products are entitled to a 2-year complete and prompt global warranty service. Product defects in design, materials, and workmanship are covered from the date of shipment.

All customized products will by default carry a 15-month regional warranty service. The actual product warranty terms and conditions may vary based on sales contract.

All 3rd-party products purchased separately will be covered by the original manufacturer's warranty and time period, and shall not exceed one year of coverage through Advantech.

5.3.1.2 Repairs under Warranty

It is possible to obtain a replacement (cross-shipment) during the first 30 days of the purchase, through your original ADVANTECH supplier to arrange DOA replacement if the products were purchased directly from ADVANTECH and the product is DOA (Dead-on-Arrival). The DOA cross-shipment excludes any shipping damage, and customized and/or build-to-order products.

For those products which are not DOA, the return fee to an authorized ADVANTECH repair facility will be at the customer’s expense. The shipping fee for reconstructed products from ADVANTECH back to customers' sites will be at ADVANTECH's expense.

5.3.1.3 Exclusions from Warranty

The product is excluded from warranty if:

- the product has been found to be defective after expiry of the warranty period;
- the warranty has been voided by removal or alteration of the product or part identification labels;
- the product has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or there is failure caused for which ADVANTECH is not responsible whether by accident or other cause. Such conditions will be determined by ADVANTECH at its sole unfettered discretion;
- the product is damaged beyond repair due to a natural disaster such as a lighting strike, flood, earthquake, etc;
- there are product updates/upgrades and tests done upon the request of customers who are without warranty.

5.3.2 Repair Process

5.3.2.1 Obtaining an RMA Number

All returns from customers must be authorized with an ADVANTECH RMA (Return Merchandise Authorization) number. Any returns of defective units or parts without valid RMA numbers will not be accepted; they will be returned to the customer at the customer's cost without prior notice.

An RMA number is only an authorization for returning a product; it is not an approval for repair or replacement. When requesting an RMA number, please access ADVAN-

TECH's RMA website: http://erma.ADVANTECH.com.tw with an authorized user ID and password.

You must fill out basic product and customer information and describe the problems encountered in detail in "Problem Description". Vague entries such as "does not work" and "failure" are not acceptable.

If you are uncertain about the cause of the problem, please contact ADVANTECH's Application Engineers (AE). They may be able to find a solution that does not require sending the product for repair.

The serial number of the whole set is required if only a key defective part is returned for repair. Otherwise, the case will be regarded as out-of-warranty.

5.3.2.2 Returning the Product for Repair

It's possible customers can save time and meet end-user requirements by returning defective products to an authorized ADVANTECH repair facility without an extra cross-region charge. It is required to contact the local repair center before offering global repair service.

It is recommended to send cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as CPU, DRAM, or CF Cards. If you send all these parts back (because you believe they may be part of the problem), please note clearly that they are included. Otherwise, ADVANTECH is not responsible for any items not listed. Make sure the "Problem Description" is enclosed.

European Customers that are located outside the European Community are requested to use UPS as the forwarding company. We strongly recommend adding a packing list to all shipments. Please prepare a shipment invoice according to the following guidelines to decrease the clearance time of goods:

1. Give a low value to the product on the invoice, or additional charges will be levied by customs that will be borne by the sender.
2. Add the information "Invoice for customs purposes only with no commercial value" on the shipment invoice.
3. Show RMA numbers, product serial numbers, and warranty status on the shipment invoice.
4. Add information about country of origin of the goods.

In addition, please attach an invoice with the RMA number on the package, then write the RMA number on the outside of the package and attach the packing slip to save handling time. Please also address the parts directly to the Service Department and mark the package "Attn. RMA Service Department".

All products must be returned in properly packed ESD material or anti-static bags. ADVANTECH reserves the right to return unrepaired items at the customer's cost if inappropriately packed.

Besides that, "Door-to-Door" transportation such as speed post is recommended for delivery; otherwise, the sender should bear additional charges such as clearance fees if air cargo is adopted.

Should a product be DOA, ADVANTECH will take full responsibility for the product and transportation charges. If the items are not DOA, but fail within warranty, the sender will bear the freight charges. For out-of-warranty cases, customers must cover the cost and take care of both outward and inward transportation.

5.3.2.3 Service Charges

The product is excluded from warranty if:

- the product is repaired after expiry of the warranty period;
- the product is tested or calibrated after expiry of the warranty period, and a No Problem Found (NPF) result is obtained;
- the product, though repaired within the warranty period, has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused for which ADVANTECH is not responsible whether by accident or other cause. Such conditions will be determined by ADVANTECH at its sole unfettered discretion;
- the product is damaged beyond repair due to a natural disaster such as a lighting strike, flood, earthquake, etc.;
- there are product updates and tests upon the request of customers who are without warranty.

If a product has been repaired by ADVANTECH, and within three months after such a repair the product requires another repair for the same problem, ADVANTECH will do this repair free of charge. However, such free repairs do not apply to products which have been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or there is failure caused for which ADVANTECH is not responsible whether by accident or other cause.

Please contact your nearest regional service center for a detailed service quotation.

Before we start out-of-warranty repairs, we will send you a pro forma invoice (P/I) with the repair charges. When you remit the funds, please reference the P/I number listed under "Our Ref". ADVANTECH reserves the right to deny repair services to customers that do not return the DOA unit or sign the P/I. Meanwhile, ADVANTECH will scrap defective products without prior notice if customers do not return the signed P/I within 3 months.

5.3.2.4 Repair Report

ADVANTECH returns each product with a "Repair Report" which shows the result of the repair. A "Repair Analysis Report" is also provided to customers upon request. If the defect is not caused by ADVANTECH design or manufacturing, customers will be charged US$60 or US$120 for in-warranty or out-of-warranty repair analysis reports respectively.

5.3.2.5 Custody of Products Submitted for Repair

ADVANTECH will retain custody of a product submitted for repair for one month while it is waiting for return of a signed P/I or payment (A/R). If the customer fails to respond within such period, ADVANTECH will close the case automatically. ADVANTECH will take reasonable measures to stay in proper contact with the customer during this one-month period.

5.3.2.6 Shipping Back to the Customer

The forwarding company for RMA returns from ADVANTECH to customers is selected by ADVANTECH. Per customer requirement, other express services can be adopted, such as UPS, FedEx, etc. The customer must bear the extra costs of such alternative shipments. If you require any special arrangements, please indicate this when shipping the product to us.

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Please verify specifications before quoting. This guide is intended for reference purposes only.