

User Manual

AOM-2721

AOM-DK2721

Qualcomm QCS6490 2.7GHz
Gold Plus 8 cores
OSM 1.1 Computer-on-Module

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty (2 years)

Advantech warrants to you, 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 which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which 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 of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

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 you get 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 an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

FCC Class B

Note: 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 help.

Ordering Information

Part No.	Description
AOM-2721WO-RHA1E	OSM V1.1 w/ QC QCS6490 WT -20~70°C

Packing List

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

- AOM-2721WO-RHA1E

Part No.	Description
ROM-ED92	Carrier board of AOM-2721
96PSA-A36W12R1-3	ADP A/D 100-240V 36W 12V C6 LOCK DC JACK 62368
1700008921	Power Cord 3P PSE 183 cm (72 in)
1700021565-01	Debug cable 1x4P-1.25/D-SUB 9P(F)
ROM-EG51	Audio Codec board
1700031429-01	Line out cable
1700026878-01	Mic in cable
1700023619-01	M cable USB-A 4P(M)/micro USB-B 5P(M) 10
1970005968T001	H.S R2 QC QCS6490 11(SYS)W 59.6x45x18mm SC

Optional Accessories

96LCM-G070WV40L-A0	LED 7" PANEL 400Nits 800X480(G) G070VW01 V12
1700033325-01	LVDS cable of ROM-ED92 for 96LCM-G070WV40L-A0
1700021882-01	Backlight cable of ROM-ED92 for 96LCM-G070WV40L-A0

*Please contact us for suggestions on suitable cellular modules for your region.

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's 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.

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Chapter 1

General Introduction

This chapter details background information on the AOM-2721.

Sections include:

- Introduction
- Specifications

1.1 Introduction

Advantech's AOM-2721 is powered by Qualcomm QCS6490 SoC which includes up to Kryo 8 cores up to 2.7GHz in combination with Andreno GPU 643 and Andreno VPU 633 graphics engine. It provides PCIe, USB 3.2, Giga Ethernet, MIPI-CSI, SPI, GPIO, and HDMI, DP, 2ch. LVDS display for embedded applications.

AOM-2721 is paired with Advantech OSM carrier board for faster end product peripheral integration and time-to-market. The reference schematics and layout checklists documentations for carrier board development will be provided along with Windows 11, Ubuntu, test utilities, hardware design utilities and reference drivers.

1.2 Product Features

Table 1.1: Product Features

Model Name		AOM-2721
Form Factor		OSM1.1
Processor System	CPU	QCS6490 Kryo 8 Cores up to 2.7GHz
	Technology	LPDDR5 up to 6400MT/s
Memory	Capacity	On-board 8GB
	Flash	128 GB eMMC and 128GB UFS for O.S.
Graphics	HDMI	1 x HDMI 1920x1080 @60Hz (Share 2.ch LVDS port)
	LVDS HDMI port)	1 x Dual channel LVDS1920x1080 @60Hz (Share
	DP	1x DP 2lane: 1920x1080 @60Hz
	Graphics Engine	Andreno VPU 633 4K30 encode/Decode Andreno GPU 643, OpenGL ES3.2/OpenCL 2.0
Ethernet	Chipset	1 x QPS615 integrated RGMII and SGMII
	Speed	2 x 10/100/1000 Mbps
RTC	RTC	External RTC
Security		Qualcomm® Trusted Execution Environment (TEE) v5.3
I/O	USB	1 x USB3.2 Gen 1 and 1 x USB2.0
	Serial Port	2 x 4-wire UART, 2 x 2-wire UART, 1 x 2-wire UART for debug console
	SPI	3
	CAN-FD	-
	GPIO	6
	SDIO	1 x Micro SD
	I2C	-
	Camera Input	2 x 4-lane MIPI CSI
	M.2 slots	1x M.2 Key B Type 3042/3052 slot 1x M.2 Key E Type 2230 slot
	Power	Power Supply Voltage
Power Consumption		12.1Watts
Environment	Operational Temperature	-20 ~ 70 °C
	Operating Humidity	5 ~ 95% Relative Humidity, non-condensing
Mechanical	Dimensions (W x D x H)	165 x 115 x 25 mm
Operating System		Windows 11 IoT Enterprise, Ubuntu

Certifications

CE/FCC Class B

1.3 Mechanical Specifications

- **Dimensions:** 165 x 115 x 25 mm
- **Height:** 2.5mm

1.3.1 Electrical Specifications

- **Power Supply:** 12V

1.3.2 Environmental Specifications

- **Operating Temperature:** -20 ~ 70 °C
- **Operating Humidity:** 5 ~ 95% relative humidity, non-condensing
- **Storage Temperature:** -40 ~ 85 °C/-40~185 °F
- **Storage Humidity:** 60 °C/140 °F @ 95% RH non-condensing

Chapter 2

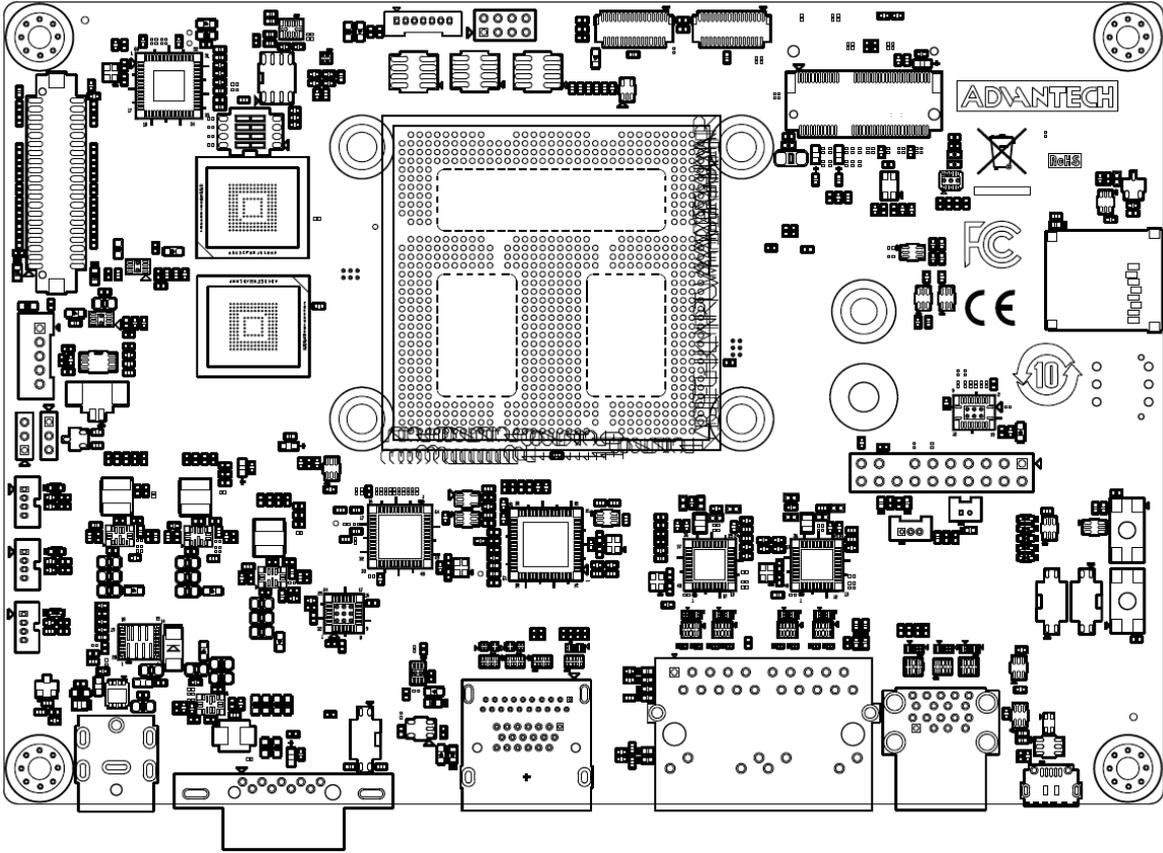
H/W Installation

This chapter details mechanical and connector information.

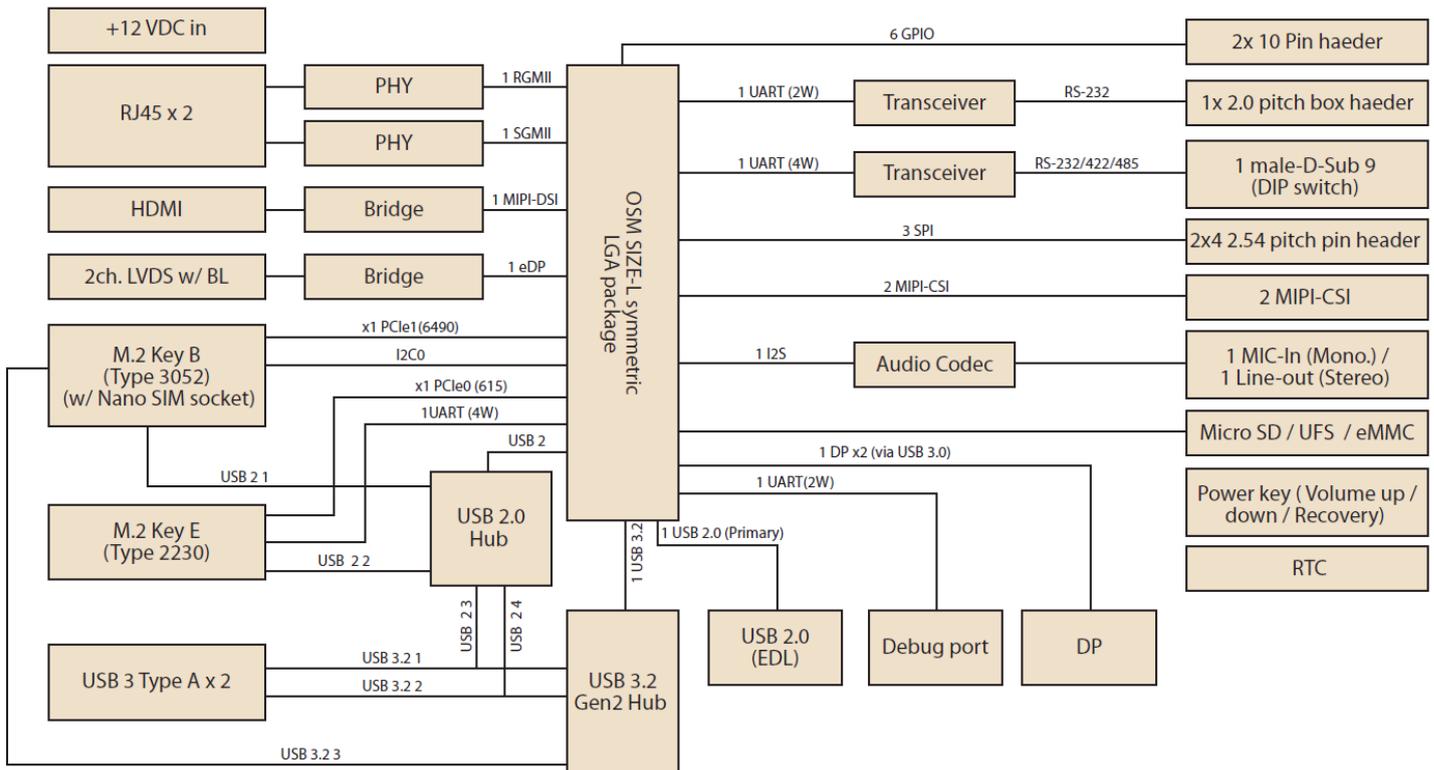
Sections include:

- Mechanical Drawing
- Pin Define
- Quick Start Guide

2.1 AOM-2721 Board Dimensions



2.2 Block Diagram



2.3 Pin Define

Power-GND and Control	Contact Name	Contact Acronym	AOM-2721
	VCC_IN_5V	Y17, Y8, Y9, Y10, Y11, Y25, Y26, Y27, Y28, AE4, AF4, AG4, AH3, AH4, AJ3, AJ4, AK4	+VCC_IN_5V
	GND	D18, E15, E21, F16, F20, J16, J20, L18, M16, M20, P18, R16, R20, V16, V20, Y18, AA14, AA17, AA19, AA22, AB15, AB21, A4, A7, A10, B2, B5, B8, B9, C11, D1, D5, D8, E2, H2, H4, L2, L4, P2, P4, R1, U2, U4, V1, W3, Y2, AA1, A4, AA7, AA8, AA10, AA11, AB3, AB6, AB9, AC4, AC7, AC10, A26, A29, A32, B27, B28, B30, B33, C25, C32, C35, D28, D34, F33, F35, G34, H32, J33, J35, K34, M35, N34, T34, W34, AA25, AA26, AA27, AA28, AA32, AB28, AB31, AB34, AC27, AC30, AC33, AE2, AE34, AF35, AG3, AH2, AH34, AJ35, AK3, AL2, AL34, AM13, AM16, AM19, AM22, AM35, AN3, AN6, AN9, AN11, AN15, AN18, AN21, AN33, AP2, AP5, AP8, AP13, AP16, AP19, AP22, AP25, AP28, AP31, AP34, AR14, AR17, AR20, AR26, AR29, AR32	GND
	SYS_RST#	U17	PM_RESIN#
	CARRIER_PWR_EN	V17	CARRIER_PWR_EN
	RTC_PWR	W17	+RTC_PWR
	BOOT_SELO#	U19	FASTBOOT_SEL_0
	BOOT_SEL1#	R18	FASTBOOT_SEL_1
	VENDOR_DEFINED_1	B22	KYPD_VOL_UP#

PWR_BTN#	AA9	PHONE_ON#
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JTAG	Contact Name	Contact Acronym	AOM-2721
	JTAG_TCK(SWCLK)	N17	QCM_JTAG_TCK
	JTAG_TMS(SWDIO)	N19	QCM_JTAG_TMS
	JTAG_TDI	P17	QCM_JTAG_TDI
	JTAG_TDO(SWO)	R17	QCM_JTAG_TDO
	JTAG_nTRST	R19	QCM_JTAG_TRST#

UART	Contact Name	Contact Acronym	AOM-2721
	UART_A_RX	A14	UART_A_RX
	UART_A_TX	B13	UART_A_TX
	UART_A_RTS	C13	UART_A_RTS#
	UART_A_CTS	C14	UART_A_CTS#
	UART_B_RX	D14	UART_B_RX
	UART_B_TX	D13	UART_B_TX
	UART_B_RTS	D15	UART_B_RTS#
	UART_B_CTS	D16	UART_B_CTS#
	UART_C_RX	A22	UART_C_RX
	UART_C_TX	B23	UART_C_TX
	UART_D_RX	C22	UART_D_RX
	UART_D_TX	C23	UART_D_TX
	UART_CON_RX	D22	UART_CON_RX
	UART_CON_TX	D23	UART_CON_TX

Ethernet / LAN	Contact Name	Contact Acronym	AOM-2721
	ETH_A_(R)(G)MII_CR_S	E16	NC
	ETH_A_(R)(G)MII_CO_L	F15	NC
	ETH_A_(S)(R)(G)MII_TXD0	H15	ETH_A_TX+
	ETH_A_(S)(R)(G)MII_TXD1	G15	ETH_A_TX-
	ETH_A_(S)(R)(G)MII_TXD2	H16	ETH_A_CLK+
	ETH_A_(S)(R)(G)MII_TXD3	G16	ETH_A_CLK-
	ETH_A_(R)(G)MII_TX_EN(_ER)	K16	NC
	ETH_A_(R)(G)MII_TX_CLK	J15	NC
	ETH_A_(S)(R)(G)MII_RXD0	K15	ETH_A_RX+
	ETH_A_(S)(R)(G)MII_RXD1	L15	ETH_A_RX-
	ETH_A_(R)(G)MII_RXD2	N15	NC
	ETH_A_(R)(G)MII_RXD3	P15	NC
	ETH_A_(R)(G)MII_RX_ER	L16	NC
	ETH_A_(R)(G)MII_RX_DV(_ER)	M15	NC
	ETH_A_(R)(G)MII_RX_CLK	R15	NC
	ETH_A_SDP	N16	NC
	ETH_MDIO	T15	ETH_A_MDIO
	ETH_MDC	T16	ETH_A_MDC
	ETH_IOPWR	M17	+VREG_QPS_1P8
	ETH_B_(R)(G)MII_CR_S	D2	NC
	ETH_B_(R)(G)MII_CO_L	E1	NC
	ETH_B_(S)(R)(G)MII_TXD0	G1	ETH_B_TXD0
	ETH_B_(S)(R)(G)MII_TXD1	F1	ETH_B_TXD1
	ETH_B_(S)(R)(G)MII_TXD2	G2	ETH_B_TXD2
	ETH_B_(S)(R)(G)MII_TXD3	F2	ETH_B_TXD3
	ETH_B_(R)(G)MII_TX_EN(_ER)	J2	ETH_B_TX_CTL
	ETH_B_(R)(G)MII_TX_CLK	H1	ETH_B_TXC
	ETH_B_(S)(R)(G)MII_RXD0	J1	ETH_B_RXD0
	ETH_B_(S)(R)(G)MII_RXD1	K1	ETH_B_RXD1
	ETH_B_(R)(G)MII_RXD2	M1	ETH_B_RXD2
	ETH_B_(R)(G)MII_RXD3	N1	ETH_B_RXD3

	ETH_B_(R)(G)MII_RX_ER	K2	NC
	ETH_B_(R)(G)MII_RX_DV(ER)	L1	ETH_B_RX_CTL
	ETH_B_(R)(G)MII_RX_CLK	P1	ETH_B_RXC
	ETH_B_SDP	M2	NC
	ETHB_MDIO	C7	ETH_B_MDIO
	ETHB_MDC	C6	ETH_B_MDC

GPIO	Contact Name	Contact Acronym	AOM-2721
	GPIO_A_0	D17	QCS_GPIO_14
	GPIO_A_1	E17	QCS_GPIO_15
	GPIO_A_2	F17	QCS_GPIO_16
	GPIO_A_3	G17	QCS_GPIO_17
	GPIO_A_4	H17	QCS_GPIO_18
	GPIO_A_5	J17	QCS_GPIO_19
	GPIO_A_6/SPI_A_CS1#	K17	SPIO_CS3#
	GPIO_A_7/SPI_B_CS1#	L17	SPI1_CS3#
	GPIO_B_0	D19	QCS_GPIO_80
	GPIO_B_1	E19	QCS_GPIO_83
	GPIO_B_2	F19	QCS_GPIO_93
	GPIO_B_3	G19	QCS_GPIO_96
	GPIO_B_4	H19	QCS_GPIO_101
	GPIO_B_5	J19	QCS_GPIO_102
	GPIO_B_6	K19	QCS_GPIO_103
	GPIO_B_7	L19	QCS_GPIO_104
	GPIO_C_0	D3	CAM2_PWDN
	GPIO_C_1	D4	CAM2_RESET#
	GPIO_C_2	E3	QCS_GPIO_35
	GPIO_C_3	E4	QCS_GPIO_44
	GPIO_C_4/DISP_VDD_EN	F3	QCS_GPIO_52
	GPIO_C_5/DISP_BL_EN	F4	QCS_GPIO_53
	GPIO_C_6/CAM_PWR	G3	CAM3_PWDN
	GPIO_C_7/CAM_RST#	G4	CAM3_RESET#
	GPIO_D_0	U32	QCS_GPIO_8
	GPIO_D_1	U33	QCS_GPIO_9
	GPIO_D_2	V32	QCS_GPIO_10
	GPIO_D_3	V33	QCS_GPIO_11
	GPIO_D_4	W32	QCS_GPIO_64
	GPIO_D_5	W33	QCS_GPIO_65
	GPIO_D_6	Y32	QCS_GPIO_68
	GPIO_E_0	AF32	QCS_GPIO_109
	GPIO_E_1	AF33	QCS_GPIO_110
	GPIO_E_2	AG32	QCS_GPIO_111
	GPIO_E_3	AG33	QCS_GPIO_112
	GPIO_E_4	AH32	QCS_GPIO_113
	GPIO_E_5	AH33	QCS_GPIO_114
	GPIO_E_6	AJ32	QCS_GPIO_115
	GPIO_E_7	AJ33	QCS_GPIO_116

SDIO	Contact Name	Contact Acronym	AOM-2721
	SDIO_A_CMD	E20	SDC2_CMD
	SDIO_A_CLK	F21	SDC2_CLK
	SDIO_A_D0	G20	SDC2_DATA_0
	SDIO_A_D1	G21	SDC2_DATA_1
	SDIO_A_D2	H20	SDC2_DATA_2
	SDIO_A_D3	H21	SDC2_DATA_3
	SDIO_A_CD#	J21	SD_CARD_DET#
	SDIO_A_WP	D20	SD_WRITE_PROTECT

SDIO	Contact Name	Contact Acronym	AOM-2721
	VENDOR_DEFINED_3	P16	SDC1_RCLK
	SDIO_A_PWR_EN	D21	QCM_RESOUT#
	SDIO_A_IOPWR	C20	+VREG_L6C_2P96

UFS	Contact Name	Contact Acronym	AOM-2721
	UFS_TX0_P	AC28	UFS_L0_TX+
	UFS_TX0_N	AC29	UFS_L0_TX-
	UFS_TX1_P	AB29	UFS_L1_TX+
	UFS_TX1_N	AB30	UFS_L1_TX-
	UFS_RX0_P	AC31	UFS_L0_RX+
	UFS_RX0_N	AC32	UFS_L0_RX-
	UFS_RX1_P	AB32	UFS_L1_RX+
	UFS_RX1_N	AB33	UFS_L1_RX-
	UFS_CLK	AC26	UFS_REF_CLK
	UFS_RESET#	AB27	UFS_RESET#

PWM	Contact Name	Contact Acronym	AOM-2721
	PWM_0	E18	NC
	PWM_1	F18	NC
	PWM_2	G18	NC
	PWM_3	H18	NC
	PWM_4	J18	NC
	PWM_5	K18	NC

SPI_A	Contact Name	Contact Acronym	AOM-2721
	SPI_A_SDI_(IO0)	U15	SPIO_MISO
	SPI_A_SDO_(IO1)	V15	SPIO_MOSI
	SPI_A_/WP_(IO2)	W16	NC
	SPI_A_/HOLD_(IO3)	W15	NC
	SPI_A_CS0#	Y15	SPIO_CS0#
	SPI_A_CS1# / GPIO_A_6	K17	SPIO_CS3#
	SPI_A_SCK	U16	SPIO_SCLK

SPI_B	Contact Name	Contact Acronym	AOM-2721
	SPI_B_SDI	Y22	SPI1_MISO
	SPI_B_SDO	Y23	SPI1_MOSI
	SPI_B_CS0#	AA23	SPI1_CS0#
	SPI_B_CS1# / GPIO_A_7	L17	SPI1_CS3#
	SPI_B_SCK	Y21	SPI1_SCLK

SPI_C	Contact Name	Contact Acronym	AOM-2721
	SPI_C_SDI	C29	SPI2_MISO
	SPI_C_SDO	D30	SPI2_MOSI

SPI_C	Contact Name	Contact Acronym	AOM-2721
	SPI_C_CS0#	C30	SPI2_CS0#
	SPI_C_CS1# / GPIO_D_7	Y33	SPI2_CS1#
	SPI_C_SCK	D29	SPI2_SCLK

I2S	Contact Name	Contact Acronym	AOM-2721
	I2S_A_DATA_IN	V21	LPI_QUA_MI2S_DATA0
	I2S_A_DATA_OUT	W21	LPI_QUA_MI2S_DATA1
	I2S_B_DATA_IN	V19	LPI_QUA_MI2S_DATA2
	I2S_B_DATA_OUT	W19	LPI_QUA_MI2S_DATA3
	I2S_MCLK	V18	I2S_MCLK
	I2S_LRCLK	W18	LPI_QUA_MI2S_WS
	I2S_BITCLK	W20	LPI_QUA_MI2S_SCK

CAN	Contact Name	Contact Acronym	AOM-2721
	CAN_A_TX	AC17	NC
	CAN_A_RX	AB17	NC
	CAN_B_TX	AC19	NC
	CAN_B_RX	AB19	NC

USB	Contact Name	Contact Acronym	AOM-2721
	USB_A_D_N	AB13	USB0_HS_D-
	USB_A_D_P	AC14	USB0_HS_D+
	USB_A_ID	AB14	USB0_ID
	USB_A_OC#	AC15	USB0_OC#
	USB_A_VBUS	AB16	USB0_VBUS_DET
	USB_A_EN	AC16	USB0_EN
	USB_B_D_N	AB23	USB1_HS_D-
	USB_B_D_P	AC22	USB1_HS_D+
	USB_B_ID	AB22	USB1_ID
	USB_B_OC#	AC21	USB1_OC#
	USB_B_VBUS	AB20	USB1_VBUS_DET
	USB_B_EN	AC20	USB1_EN

USB_D_SS	Contact Name	Contact Acronym	AOM-2721
	USB_D_SSTX_N	A28	USB0_SS_TX1-
	USB_D_SSTX_P	A27	USB0_SS_TX1+
	USB_D_SSRX_N	B26	USB0_SS_RX1-
	USB_D_SSTX_P	B25	USB0_SS_RX1+

DP	Contact Name	Contact Acronym	AOM-2721
	USB_C_SSTX_N	A9	USB0_SS_TX0-
	USB_C_SSTX_P	A8	USB0_SS_TX0+

	USB_C_SSRX_N	B11	USB0_SS_RX0-
	USB_C_SSTX_P	B10	USB0_SS_RX0+
	VENDOR_DEFINED_2	C16	DP_HOT_PLUG_DETECT
	VENDOR_DEFINED_5	D7	USB0_DP_AUX_CONN-
	VENDOR_DEFINED_4	D6	USB0_DP_AUX_CONN+

I2C	Contact Name	Contact Acronym	AOM-2721
	I2C_A_SCL	AA15	I2C_A_SCL
	I2C_A_SDA	AA16	I2C_A_SDA
	I2C_B_SCL	AA20	I2C_B_SCL
	I2C_B_SDA	AA21	I2C_B_SDA

eDP	Contact Name	Contact Acronym	AOM-2721
	eDP_A_LANE0_P	A30	EDP0_TX0_FLT+
	eDP_A_LANE0_N	A31	EDP0_TX0_FLT-
	eDP_A_LANE1_P	B31	EDP0_TX1_FLT+
	eDP_A_LANE1_N	B32	EDP0_TX1_FLT-
	eDP_A_LANE2_P	A33	EDP0_TX2_FLT+
	eDP_A_LANE2_N	A34	EDP0_TX2_FLT-
	eDP_A_LANE3_P	B34	EDP0_TX3_FLT+
	eDP_A_LANE3_N	B35	EDP0_TX3_FLT-
	eDP_B_LANE0_P	D35	NC
	eDP_B_LANE0_N	E35	NC
	eDP_B_LANE1_P	E34	NC
	eDP_B_LANE1_N	F34	NC
	eDP_B_LANE2_P	G35	NC
	eDP_B_LANE2_N	H35	NC
	eDP_B_LANE3_P	H34	NC
	eDP_B_LANE3_N	J34	NC
	eDP_A_AUX_P	C33	EDP0_AUX_CONN+
	eDP_A_AUX_N	C34	EDP0_AUX_CONN-
	eDP_A_AUX_SEL	D32	NC
	eDP_A_BL_EN	D31	PMC_GPIO_07_CONN_EDP_BL_EN
	eDP_A_BL_HPD	D33	EDP_HOT_PLUG_DETECT
	eDP_A_BL_PWM	C31	PMC_GPIO_08_CONN_EDP_PWM

MIPI DSI	Contact Name	Contact Acronym	AOM-2721
	DSI_DATA0_N	AB11	DSI0_D0-
	DSI_DATA0_P	AB10	DSI0_D0+
	DSI_DATA1_N	AC9	DSI0_D1-
	DSI_DATA1_P	AC8	DSI0_D1+
	DSI_DATA2_N	AC6	DSI0_D2-
	DSI_DATA2_P	AC5	DSI0_D2+
	DSI_DATA3_N	AB5	DSI0_D3-
	DSI_DATA3_P	AB4	DSI0_D3+
	DSI_CLOCK_N	AB8	DSI0_CLK-
	DSI_CLOCK_P	AB7	DSI0_CLK+
	DSI_TE	AA3	DSI0_TE
	DISP_VDD_EN/GPIO_C_4	F3	QCS_GPIO_52
	DISP_BL_EN/GPIO_C_5	F4	QCS_GPIO_53

MIPI DSI	Contact Name	Contact Acronym	AOM-2721
	DISP_BL_PWM /PWM_0	E18	NC

MIPI CSI3	Contact Name	Contact Acronym	AOM-2721
	CSI_DATA0_N	C1	CSI3_D0-
	CSI_DATA0_P	B1	CSI3_D0+
	CSI_DATA1_N	A2	CSI3_D1-
	CSI_DATA1_P	A3	CSI3_D1+
	CSI_DATA2_N	A5	CSI3_D2-
	CSI_DATA2_P	A6	CSI3_D2+
	CSI_DATA3_N	B6	CSI3_D3-
	CSI_DATA3_P	B7	CSI3_D3+
	CSI_CLOCK_N	B3	CSI3_CLK-
	CSI_CLOCK_P	B4	CSI3_CLK+
	CAM_MCK	C2	CAM_MCLK3
	I2C_CAM_SDA / CSI_TX_N	C3	CCI_I2C3_SDA
	I2C_CAM_SCL / CSI_TX_P	C4	CCI_I2C3_SCL
	CAM_PWR / GPIO_C_6	G3	CAM3_PWDN
	CAM_RST# / GPIO_C_7	G4	CAM3_RESET#

MIPI CSI2	Contact Name	Contact Acronym	AOM-2721
	RESERVED_24	AL3	CSI2_D0-
	RESERVED_34	AM3	CSI2_D0+
	RESERVED_38	AM5	CSI2_D1-
	RESERVED_52	AN5	CSI2_D1+
	RESERVED_53	AN7	CSI2_D2-
	RESERVED_54	AN8	CSI2_D2+
	RESERVED_42	AM9	CSI2_D3-
	RESERVED_26	AM10	CSI2_D3+
	RESERVED_39	AM6	CSI2_CLK-
	RESERVED_40	AM7	CSI2_CLK+
	RESERVED_43	AN2	CAM_MCLK2
	RESERVED_25	AL4	CCI_I2C2_SDA
	RESERVED_37	AM4	CCI_I2C2_SCL
	RESERVED_41	AM8	GND
	GPIO_C_0	D3	CAM2_PWDN
	GPIO_C_1	D4	CAM2_RESET#

PCIe_A	Contact Name	Contact Acronym	AOM-2721
	PCIe_A_HSI0_P	AB1	PCIE0_RX+
	PCIe_A_HSI0_N	AB2	PCIE0_RX-
	PCIe_A_HSO0_P	AC2	PCIE0_TX+
	PCIe_A_HSO0_N	AC3	PCIE0_TX-
	PCIe_CLKREQ#	W2	PCIE0_CLK_REQ#
	PCIe_A_PERST#	V2	PCIE0_RESET#
	PCIe_A_REFCLK_P	W1	PCIE0_REFCLK+
	PCIe_A_REFCLK_N	Y1	PCIE0_REFCLK-
	PCIe_WAKE#	T2	PCIE0_WAKE#
	PCIe_SMDAT	U1	PCIE_SMDAT
	PCIe_SMCLK	T1	PCIE_SMCLK
	PCIe_SM_ALERT#	R2	PCIE_SM_ALERT#

PCIe_B	Contact Name	Contact Acronym	AOM-2721
	PCIe_B_HSI0_P	L34	QPS_DS1_PCIE1_RX0+

PCle_B	Contact Name	Contact Acronym	AOM-2721
	PCle_B_HSI0_N	M34	QPS_DS1_PCIE1_RX0-
	PCle_B_HSO0_P	K35	QPS_DS1_PCIE1_TX0+
	PCle_B_HSO0_N	L35	QPS_DS1_PCIE1_TX0-
	PCle_B_PERST#	L33	QPS_DS1_PCIE1_RESET#
	RESERVED_8	J32	QPS_DS1_PCIE1_REFCLK+
	RESERVED_9	K32	QPS_DS1_PCIE1_REFCLK-
	RESERVED_10	K33	PCIE_B_CLKREQ#

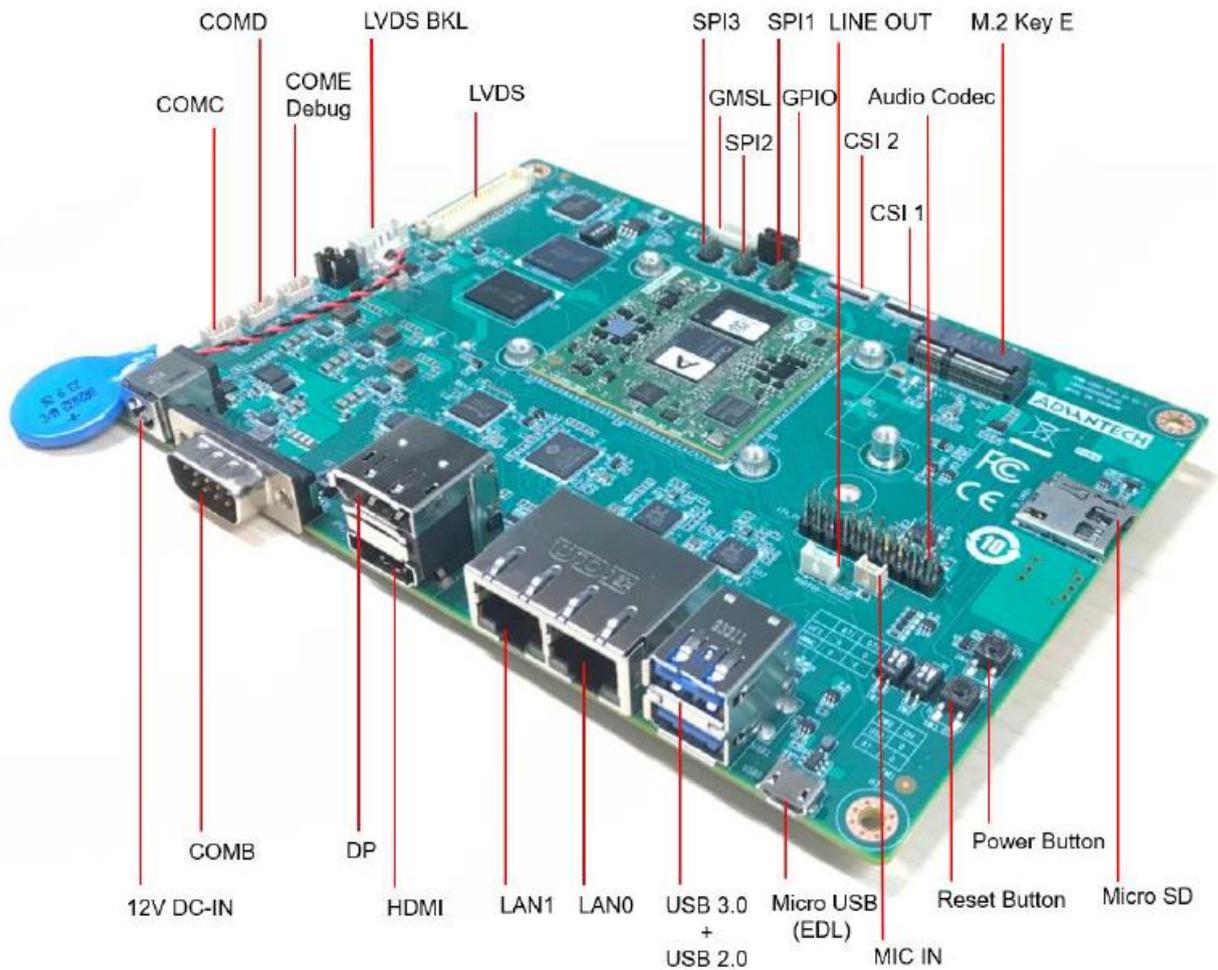
PCle_C	Contact Name	Contact Acronym	AOM-2721
	PCle_C_HSO0_N	AR33	QPS_DS0_PCIE0_TX0-
	PCle_C_HSO0_P	AR34	QPS_DS0_PCIE0_TX0+
	PCle_C_HSO1_N	AN34	QPS_DS0_PCIE0_TX1-
	PCle_C_HSO1_P	AM34	QPS_DS0_PCIE0_TX1+
	PCle_C_HSO2_N	AK34	NC
	PCle_C_HSO2_P	AJ34	NC
	PCle_C_HSO3_N	AG34	NC
	PCle_C_HSO3_P	AF34	NC
	PCle_C_HSI0_N	AP32	QPS_DS0_PCIE0_RX0-
	PCle_C_HSI0_P	AP33	QPS_DS0_PCIE0_RX0+
	PCle_C_HSI1_N	AP35	QPS_DS0_PCIE0_RX1-
	PCle_C_HSI1_P	AN35	QPS_DS0_PCIE0_RX1+
	PCle_C_HSI2_N	AL35	NC
	PCle_C_HSI2_P	AK35	NC
	PCle_C_HSI3_N	AH35	NC
	PCle_C_HSI3_P	AG35	NC
	PCle_C_PERST#	AE33	QPS_DS0_PCIE0_RESET#
	RESERVED_23	AE32	PCIE_C_CLKREQ#
	RESERVED_51	AN31	QPS_DS0_PCIE0_REFCLK-
	RESERVED_50	AN30	QPS_DS0_PCIE0_REFCLK+

2.4 Quick Start Guide

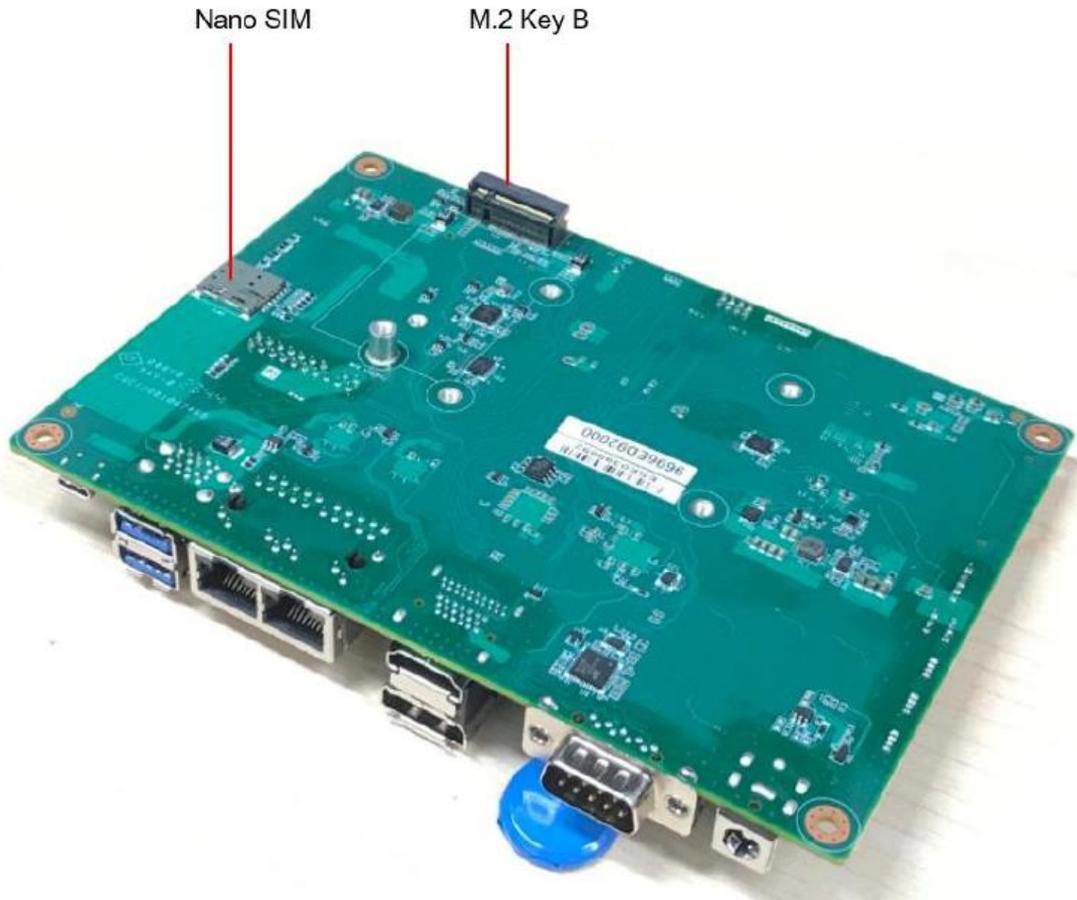
2.4.1 I/O Description of AOM-DK2721

AOM-DK2721 is an evaluation board for AOM-2721. Please see the I/O description of AOM-DK2721 below.

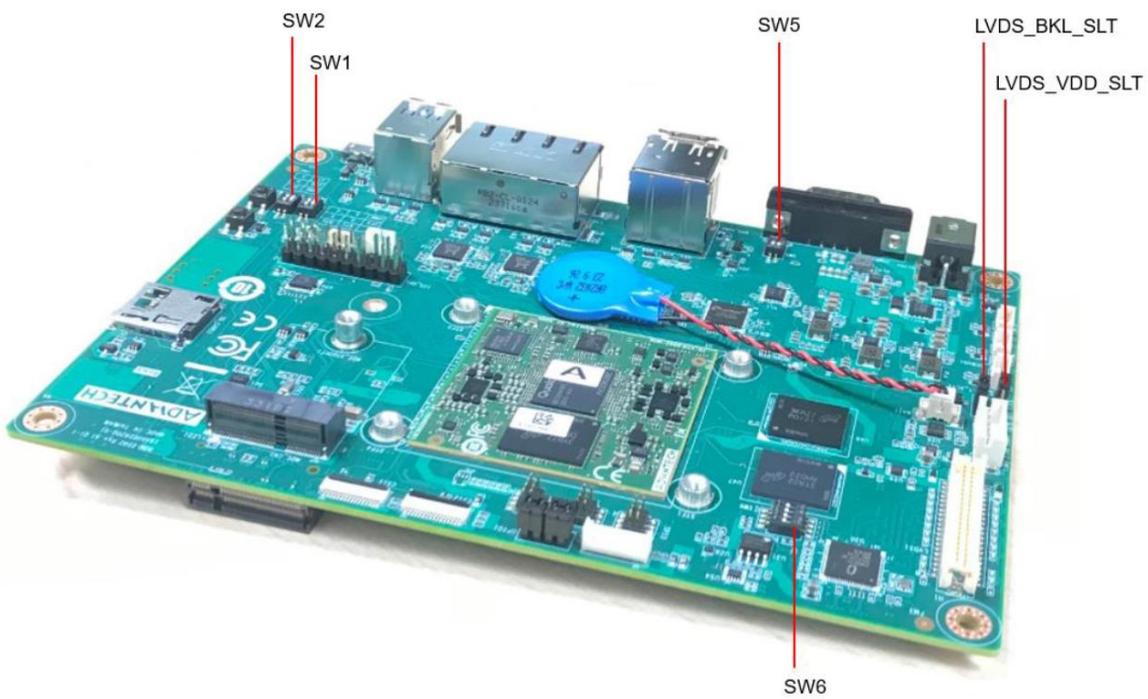
Top



Bottom



2.4.2 Switch Setting for AOM-DK2721



SW1 ↵

- SW1 (1-off, 2-on) : EMMC Boot ↵
- SW1 (1-on, 2-on) : UFS Boot ↵

SW2 ↵

- SW2 (1-on) : Forced Recovery ↵
- SW2 (1-off) : Normal Boot ↵
- SW2 (2-on) : AT Mode ↵
- SW2 (2-off) : ATX Mode ↵

SW6

- LVDS EDID:

	HA	VA	MHz	CH	6/8 bit
0: SW6 (1-on, 2-on, 3-on, 4-on)	800	480	33.25	Single	8 bit
1: SW6 (1-off, 2-on, 3-on, 4-on)	1024	768	65	Single	6 bit
2: SW6 (1-on, 2-off, 3-on, 4-on)	1024	768	65	Single	8 bit
3: SW6 (1-off, 2-off, 3-on, 4-on)	1280	768	79.5	Single	6 bit
4: SW6 (1-on, 2-on, 3-off, 4-on)	1280	800	83.5	Single	6 bit
5: SW6 (1-off, 2-on, 3-off, 4-off)	1280	960	108	Single	6 bit
6: SW6 (1-on, 2-off, 3-off, 4-on)	1280	1024	108	Dual	8 bit
7: SW6 (1-off, 2-off, 3-off, 4-on)	1366	768	85.5	Single	6 bit
8: SW6 (1-on, 2-on, 3-on, 4-off)	1366	768	85.5	Single	8 bit
9: SW6 (1-off, 2-on, 3-on, 4-off)	1440	900	106.5	Dual	8 bit
10: SW6 (1-on, 2-off, 3-on, 4-off)	1400	1050	121.75	Dual	8 bit
11: SW6 (1-off, 2-off, 3-on, 4-off)	1600	900	119	Dual	8 bit
12: SW6 (1-on, 2-on, 4-off, 4-off)	1680	1050	146.25	Dual	8 bit
13: SW6 (1-off, 2-on, 3-off, 4-off)	1600	1200	162	Dual	8 bit
14: SW6 (1-on, 2-off, 3-off, 4-off)	1920	1080	148.5	Dual	8 bit
15: SW6 (1-off, 2-off, 3-off, 4-off)	1920	1200	154	Dual	8 bit

LVDS_BKL_SLT

- LVDS_BKL_SLT (Select 1,2): 5V
- LVDS_BKL_SLT (Select 2,3): 12V

LVDS_VDD_SLT

- LVDS_VDD_SLT (Select 1,2): 3.3V
- LVDS_VDD_SLT (Select 2,3): 5V

2.4.3 Debug Port Connection and Setting

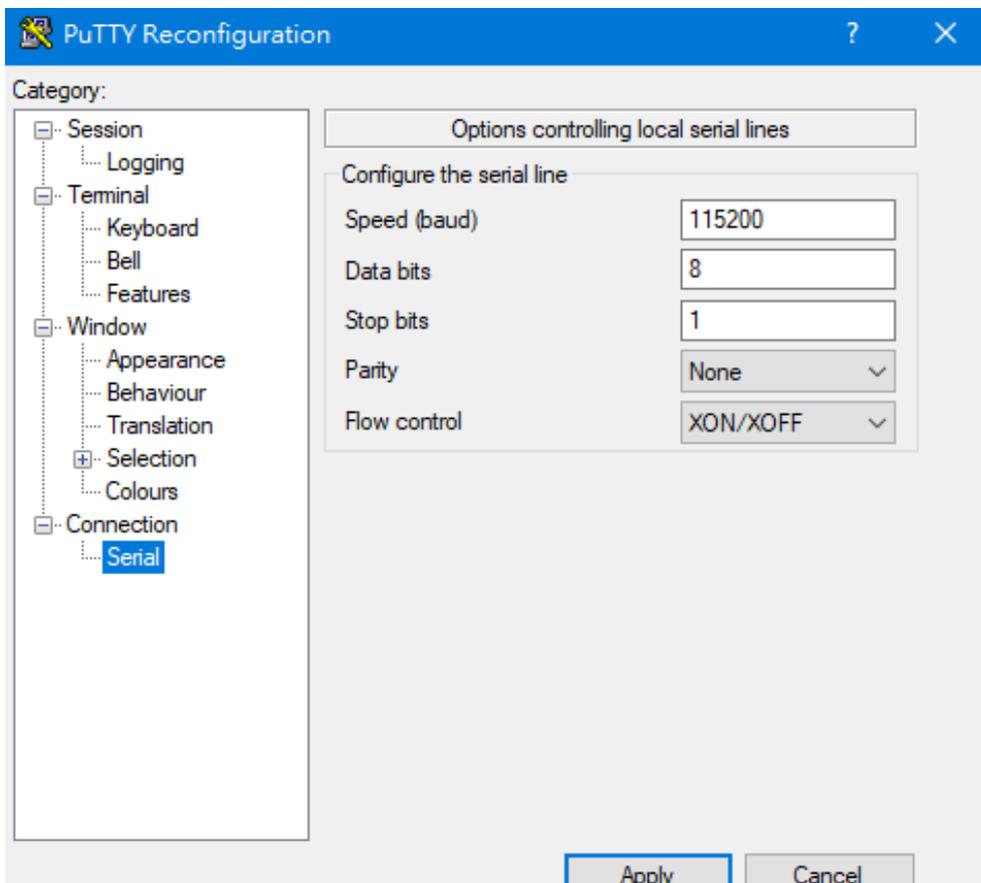
AOM-2721 debug port is shared with A-core Console. Please connect the debug console cable 1700021565-01. Then connect the USB-to-RS232 Cable to your PC terminal. Connect the cable to COM1 pin header to the nearby the HDMI connector.

Note! The debug cable needs to be purchased separately.



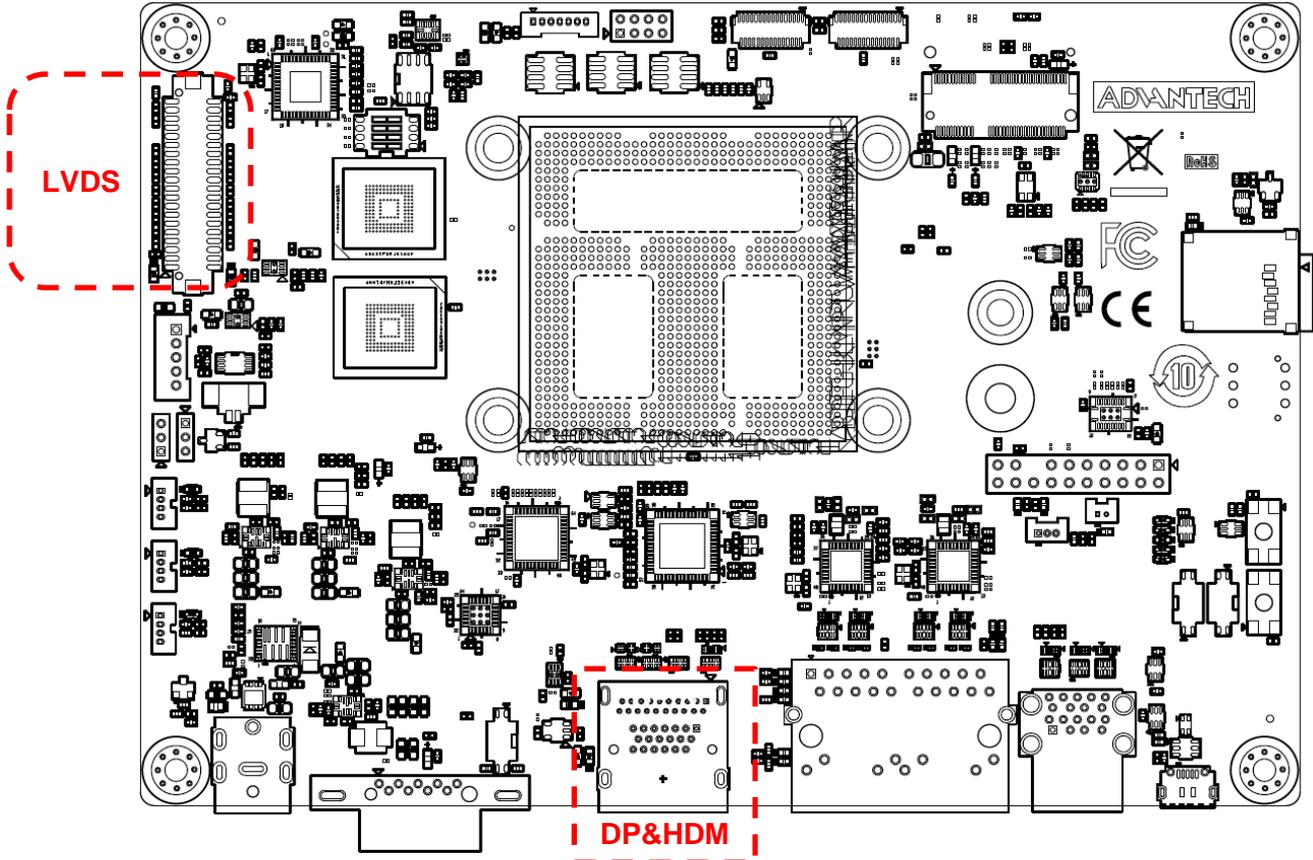
Part Number	Description	Picture
1700021565-01	Debug cable 1x4P-1.25/D-SUB 9P(F)	

1. AOM-2721 can communicate with a host server using serial cables. Common serial communication programs such as HyperTerminal, Tera Term or PuTTY can be used in such applications. The example demonstrated below describes the serial terminal setup using Tera Term on a Windows host: Open Tera Term on your Windows PC, and select the settings as shown in figure.



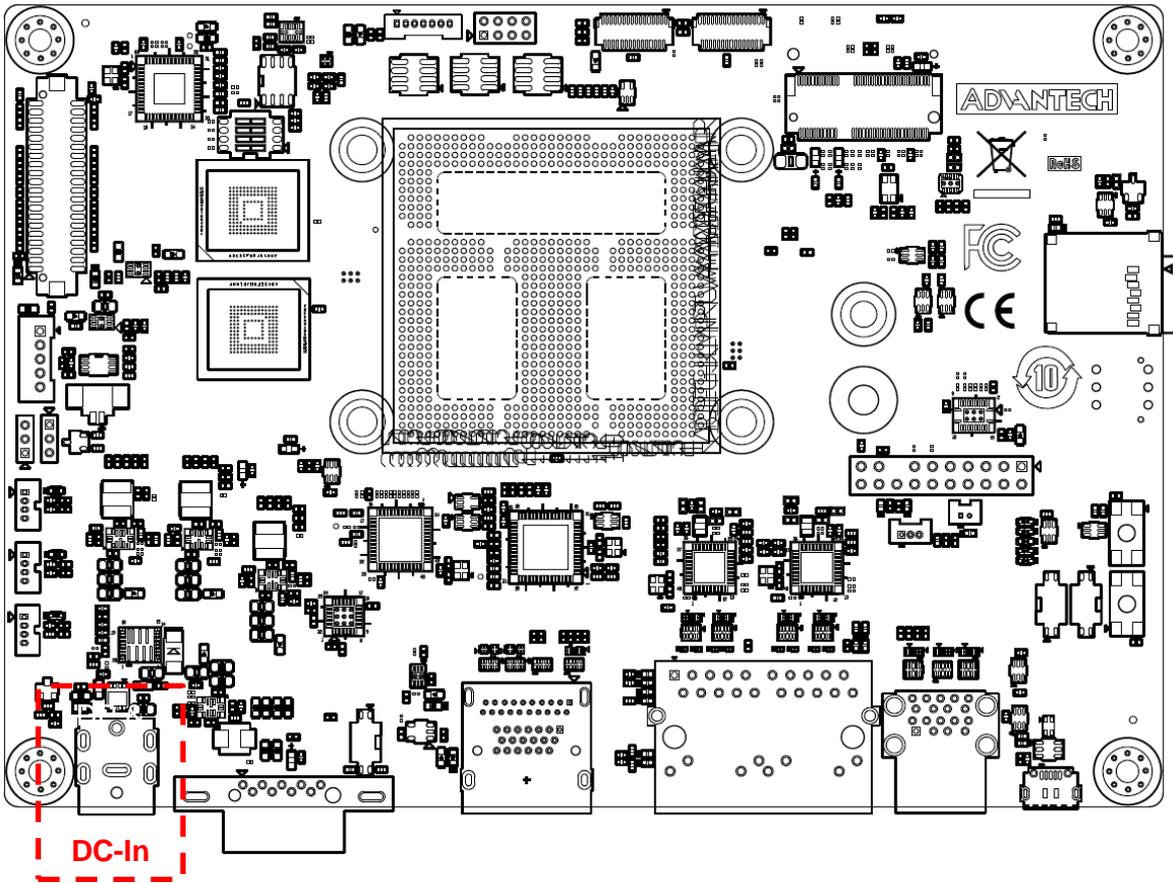
Connect a Display:

AOM-2721 has three display options: one is HDMI, DP and the other is 2 ch. LVDS. The default display is HDMI.

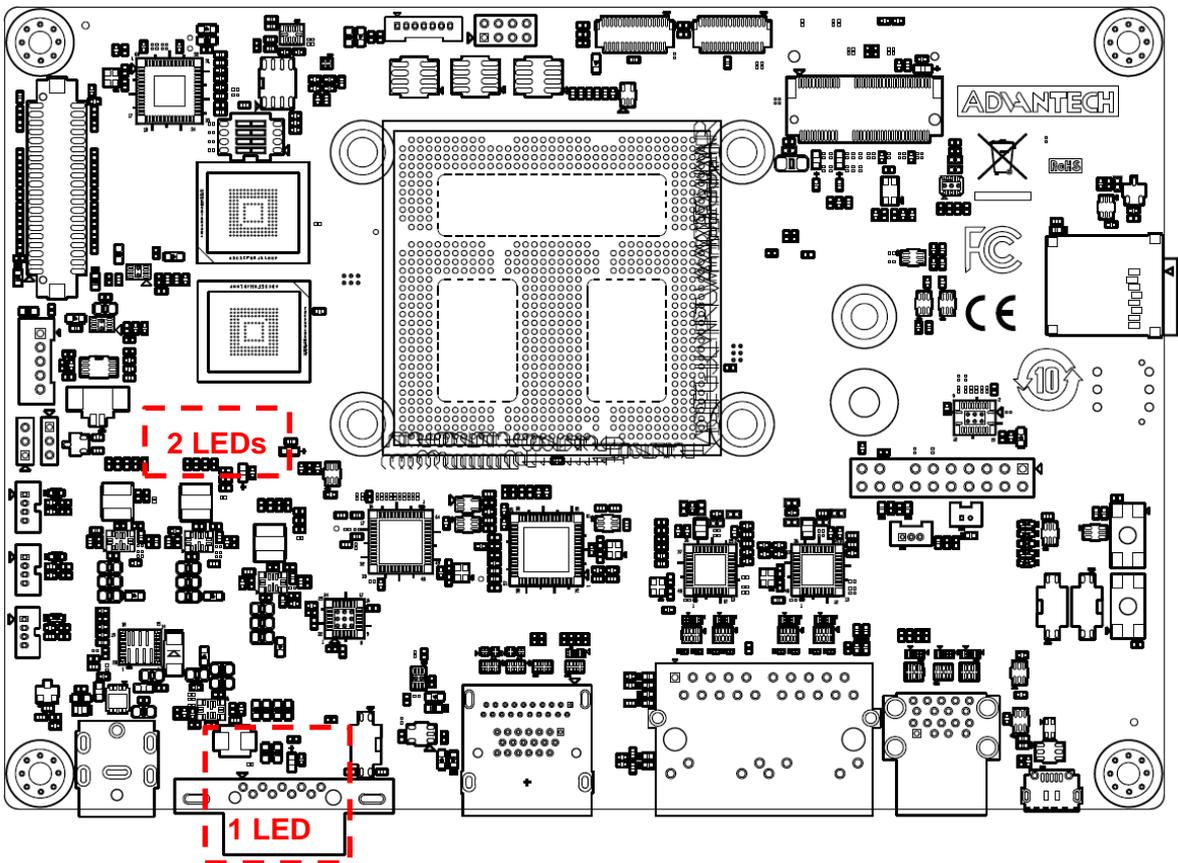


Connect the Power Source:

AOM-2721's power input is 12VDC. The power interface's location is DCIN1. Please choose a suitable adapter and power cord to connect the board (please refer to P/Ns on datasheet and Optional Accessories of this manual) as shown in Figure 2.25.



2. When switching on the power, the green LED indicator on BOT side of the board will light up to indicate that the board has booted up normally.



3. Power on and login

Follow these steps to connect the device to the host machine through UART.

- Connect the debug cable to the "COME Debug" and connect the device to the host machine
- Connect the 12V power adapter to "12V DC-IN"
- **Push the "Power Button" to power on the device**
- Use the serial COM tool, such as PuTTY or Tera Term and set "Speed" to **115200**
- View the serial log dump on your console
- Log in with account and password

Account: **root**

Password: **oelinux123**

Chapter 3

Software Functionality

This chapter details the software functions on the AOM-2721.

3.1 Display

3.1.1 LVDS

If you need the LVDS + DP output, you can use the following tool to change it.

```
# /tools/display/emmcChangeToLVDS.sh
or
# /tools/display/ufsChangeToLVDS.sh
```

It can support the following LVDS panels:

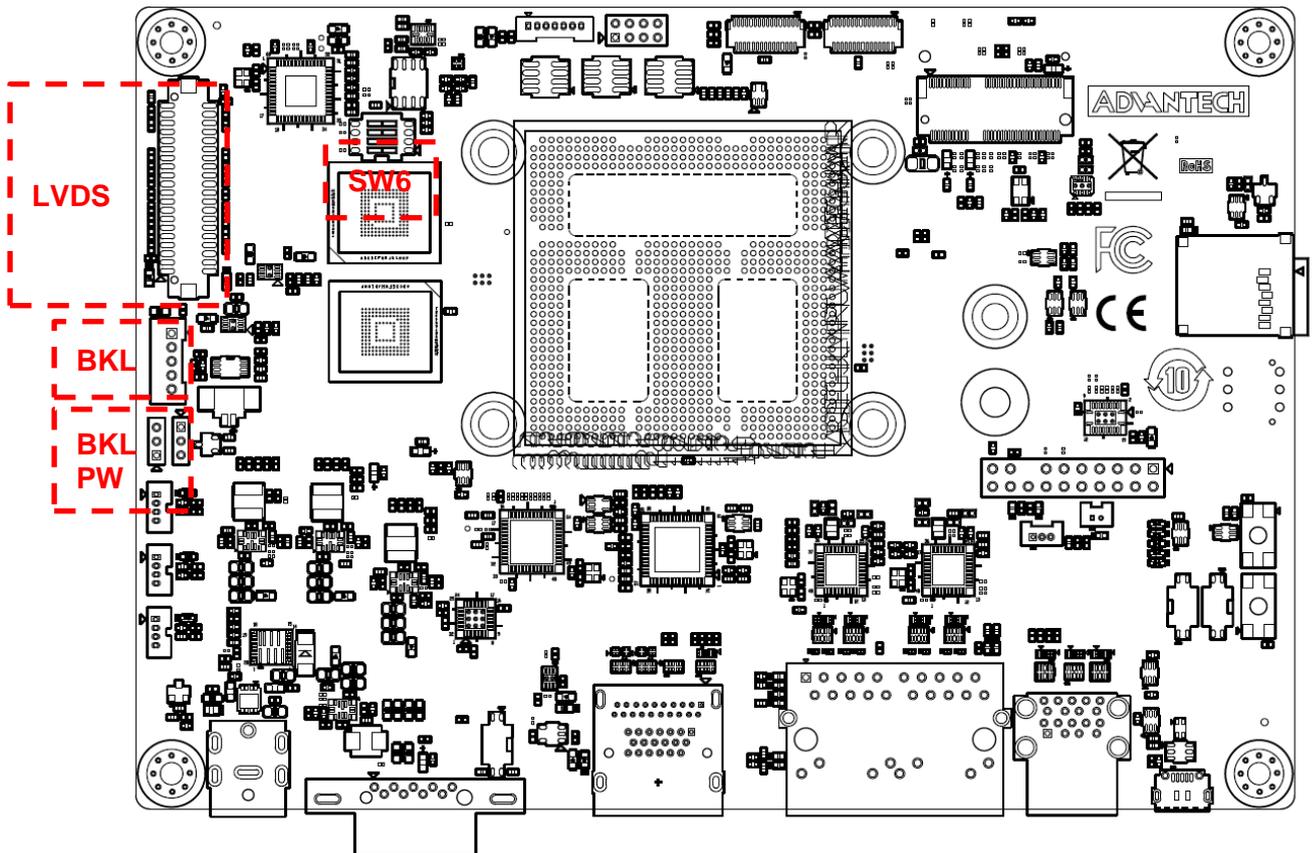
7" AUO G070VW01 V1 single channel (VDD:3.3V, Backlight Power:12V)

- SW6 (1-on, 2-on, 3-on, 4-on)
- LVDS_VDD_SLT (Select 1,2): 3.3V
- LVDS_BKL_SLT (Select 2,3): 12.3V

21.5" AUO G215HVN01.0 dual channel (VDD:5V, Backlight Power:12V)

- SW6 (1-on, 2-off, 3-off, 4-off)
- LVDS_VDD_SLT (Select 2,3): 5V
- LVDS_BKL_SLT (Select 2,3): 12.3V

```
# /tools/display/changeToLVDS.sh
```



3.1.2 HDMI

It can support the 4K@30, 1080P@60, 720P@60 and 480P@60 timing. And it can also support the Dynamic Resolution Switch.

- Manually Switch to 4K@30

```
# echo 3840 2160 30 > /sys/bus/i2c/drivers/lt9611/2-002b/edid_mode
# systemctl restart init display.service
```

- Manually Switch to 1080P@60

```
# echo 1920 1080 60 > /sys/bus/i2c/drivers/lt9611/2-002b/edid_mode
# systemctl restart init display.service
```

- Manually Switch to 720P@60

```
# echo 1280 720 60 > /sys/bus/i2c/drivers/lt9611/2-002b/edid_mode
# systemctl restart init_display.service
```

- Manually Switch to 480P@60

```
# echo 720 480 60 > /sys/bus/i2c/drivers/lt9611/2-002b/edid_mode
# systemctl restart init_display.service
```

3.1.3 DP

It can support the maximum resolution is 4K@30.

3.2 Audio

Connect the ROM-EG51 to the ROM-ED92 I2S_CN1 and boot up the device.
Default audio is hdmi audio. For the SGTL5000, SW need to change the CDT:

```
# /tools/cdt/emmcChangeToHDMIwithSGTL5000AllSPI.sh
or
# /tools/cdt/ufsChangeToHDMIwithSGTL5000AllSPI.sh
```

HDMI

```
# pactl set-sink-port 0 headset
# pactl set-sink-port 1 headset
# paplay /tmp/audio_48k.wav
or
# pactl set-sink-port 0 headset
# pactl set-sink-port 1 headset
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# gst-launch-1.0 -e filesrc location=/tmp/audio_48k.wav ! wavparse !
audioconvert ! pulsesink volume=5
```

Line-Out

```
# pactl set-sink-port 0 speaker
# pactl set-sink-port 1 speaker
# tinymix set "Headphone Playback Volume" "127"
# paplay /tmp/audio_48k.wav
or
# pactl set-sink-port 0 speaker
# pactl set-sink-port 1 speaker
# tinymix set "Headphone Playback Volume" "127"
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# gst-launch-1.0 -e filesrc location=/tmp/audio_48k.wav ! wavparse !
audioconvert ! pulsesink volume=5
```

Mic-In

```
# pactl set-source-port regular2 speaker-mic
# parec -v --rate=48000 --format=s16le --channels=1 --file-format=wav
/tmp/audio_48k.wav --device=regular2
or
# pactl set-source-port regular2 speaker-mic
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# gst-launch-1.0 -v pulsesrc volume=5 ! audioconvert ! wavenc ! filesink
location=/tmp/audio_48k.wav
```

3.3 Storages

3.3.1 EMMC

eMMC: /dev/mmcblk0

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/mmcblk0 of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/mmcblk0 bs=1 seek=4096
# dd if=/dev/mmcblk0 of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/mmcblk0 bs=1 seek=4096
```

3.3.2 SD Card

Connect the Micro SD card to the ROM-ED92 SD_CARD1.

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/mmcblk1 of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/mmcblk1 bs=1 seek=4096
# dd if=/dev/mmcblk1 of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/mmcblk1 bs=1 seek=4096
```

3.3.3 UFS

Need to do the UFS Provision, first.

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/sda of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/sda bs=1 seek=4096
# dd if=/dev/sda of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/sda bs=1 seek=4096
```

3.3.4 SPI Flash

- ROM-ED92: SPI1 CS0 and CS1
- ROM-ED92: SPI2 CS0 and CS1
- ROM-ED92: SPI3 CS0 and CS1

For the ROM-ED92: SPI0 CS1

(1) HW need to rework R419 and R421 of ROM-ED92

(2) SW need to change the cdt:

/tools/cdt/emmcChangeToHDMIwithSGTL5000AllSPI.sh

or

/tools/cdt/ufsChangeToHDMIwithSGTL5000AllSPI.sh

For the ROM-ED92: SPI1 CS1

(1) HW need to rework R420 and R422 of ROM-ED92

(2) SW need to change the cdt:

/tools/cdt/emmcChangeToHDMIwithSGTL5000AllSPI.sh

or

/tools/cdt/ufsChangeToHDMIwithSGTL5000AllSPI.sh

/dev/mtd0

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/mtd0 of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/mtd0 bs=1 seek=4096
# dd if=/dev/mtd0 of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/mtd0 bs=1 seek=4096
```

3.4 Serial ports

3.4.1 RS232 Loopback

- UART 2 (Default RS-232 function): ROM-ED92 COMB1
- UART 3: ROM-ED92 COMC1
- UART 4: ROM-ED92 COMD1

UART 2

```
# stty -F /dev/ttyHS9 -echo -onlcr 115200 raw
# cat /dev/ttyHS9 &
# echo "Serial Port Test" > /dev/ttyHS9
```

UART 3

```
# stty -F /dev/ttyHS10 -echo -onlcr 115200 raw
# cat /dev/ttyHS10 &
# echo "Serial Port Test" > /dev/ttyHS10
```

UART 4

```
# stty -F /dev/ttyHS11 -echo -onlcr 115200 raw
# cat /dev/ttyHS11 &
# echo "Serial Port Test" > /dev/ttyHS11
```

3.4.2 RS-422

- Test RS-422 with Adam-4520:
 - Adam-4520 RX- connect to the DB9 Pin 1 of ROM-ED92 COMB1
 - Adam-4520 RX+ connect to the DB9 Pin 2 of ROM-ED92 COMB1
 - Adam-4520 TX- connect to the DB9 Pin 4 of ROM-ED92 COMB1
 - Adam-4520 TX+ connect to the DB9 Pin 3 of ROM-ED92 COMB1
- Set the GPIO#587,GPIO#588 (UART MODE1,UART MODE0) to 1,1

UART 2

```
# echo 587 > /sys/class/gpio/export (UART MODE1)
# echo 588 > /sys/class/gpio/export (UART MODE0)
# echo out > /sys/class/gpio/gpio587/direction
# echo out > /sys/class/gpio/gpio588/direction
# echo 1 > /sys/class/gpio/gpio587/value
# echo 1 > /sys/class/gpio/gpio588/value
# stty -F /dev/ttyHS2 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr
-isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
# cat /dev/ttyHS2 &
# echo "Serial Test" > /dev/ttyHS2
# echo -e "123456789-123456789-123456789-123456789-123456789-\r" | tee
/dev/ttyHS2
```

3.4.3 RS-485

- Test RS-485 with Adam-4520:
 - Adam-4520 Data- connect to the DB9 Pin 1 of ROM-ED92 COMB1
 - Adam-4520 Data+ connect to the DB9 Pin 2 of ROM-ED92 COMB1
- Set the GPIO#587,GPIO#588 (UART MODE1,UART MODE0) to 1,0
- Set the SW5: 1-on

UART 2

```
# echo 587 > /sys/class/gpio/export (UART MODE1)
# echo 588 > /sys/class/gpio/export (UART MODE0)
# echo out > /sys/class/gpio/gpio587/direction
# echo out > /sys/class/gpio/gpio588/direction
# echo 1 > /sys/class/gpio/gpio587/value
# echo 0 > /sys/class/gpio/gpio588/value
# stty -F /dev/ttyHS2 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr
-isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
# cat /dev/ttyHS2 &
# echo "Serial Test" > /dev/ttyHS2
# echo -e "123456789-123456789-123456789-123456789-123456789-\r" | tee
/dev/ttyHS2
```

3.5 GPIO

- ROM-ED92: GPIO1 (6 pins)
- GPIO_A_0: GPIO#549
- GPIO_A_1: GPIO#550
- GPIO_A_2: GPIO#551
- GPIO_A_3: GPIO#552
- GPIO_A_4: GPIO#553
- GPIO_A_6: GPIO#541

GPIO_A_0 and GPIO_A_1 Loopback Test

1. Connect the GPIO_A_0 and GPIO_A_1
2. Export the GPIO interface

```
# echo 549 > /sys/class/gpio/export
# echo 550 > /sys/class/gpio/export
```

3. Set the GPIO direction

```
# echo out > /sys/class/gpio/gpio350/direction
# echo in > /sys/class/gpio/gpio351/direction
```

4. Set output value and check

```
# cat /sys/class/gpio/gpio550/value
0
# echo 1 > /sys/class/gpio/gpio549/value
# cat /sys/class/gpio/gpio550/value
1
```


3.6 Ethernet

Check Ethernet

```
# ifconfig
enP1p5s0f0 Link encap:Ethernet HWaddr EE:A9:36:72:A7:B9
  inet addr:172.22.12.138 Bcast:172.22.15.255 Mask:255.255.252.0
  inet6 addr: fe80::2009:4a63:5a32:d2ab/64 Scope:Link
  inet6 addr: fe80::eca9:36ff:fe72:a7b9/64 Scope:Link
  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
  RX packets:118 errors:0 dropped:10 overruns:0 frame:0
  TX packets:37 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:27625 (26.9 KiB) TX bytes:6142 (5.9 KiB)
  Interrupt:239

enP1p5s0f1 Link encap:Ethernet HWaddr EE:51:3E:06:D5:3C
  UP BROADCAST MULTICAST MTU:1500 Metric:1
  RX packets:0 errors:0 dropped:0 overruns:0 frame:0
  TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
  Interrupt:244

lo        Link encap:Local Loopback
  inet addr:127.0.0.1 Mask:255.0.0.0
  inet6 addr: ::1/128 Scope:Host
  UP LOOPBACK RUNNING MTU:65536 Metric:1
  RX packets:18 errors:0 dropped:0 overruns:0 frame:0
  TX packets:18 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:2272 (2.2 KiB) TX bytes:2272 (2.2 KiB)
```

Ping Test

```
# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=113 time=5.320 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=113 time=7.445 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=113 time=7.367 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=113 time=7.431 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=113 time=6.394 ms
```

Ethernet LED Lights Test

- Link LED Light
 1. 10M - orange and green light: always off
 2. 100M - orange light: always on
 3. 1000M - green light: always on
- Active LED Light
 1. 10M - green light: flashing on
 2. 100M - green light: flashing on
 3. 1000M - green light: flashing on

10M Speed Setting

```
# ethtool -s enP1p5s0f0 speed 10 duplex full
# ethtool -s enP1p5s0f1 speed 10 duplex full
```

100M Speed Setting

```
# ethtool -s enP1p5s0f0 speed 100 duplex full
```

```
# ethtool -s enP1p5s0f1 speed 100 duplex full
```

1000M Speed Setting

```
# ethtool -s enP1p5s0f0 speed 1000 duplex full  
# ethtool -s enP1p5s0f1 speed 1000 duplex full
```

3.7 USB

- Micro USB: ROM-ED92 USB0
- USB 2.0/3.0 Type A: ROM-ED92 USB1

Micro USB

Micro USB is only for the EDL download. If you need to use the **adb** or **fastboot**, you need to set the Micro USB to **peripheral** mode.

```
# mount -t debugfs none /sys/kernel/debug  
echo "peripheral" > /sys/devices/platform/soc/a600000.ssusb/mode
```

USB 2.0/3.0 Type A

If you want to use the USB 2.0/3.0 Type A, please you don't connect the Micro USB.
Then inserting the USB 2.0/3.0 flash drive to the USB 2.0/3.0 Type A.

Check the USB flash drive

```
# lsusb -t  
/: Bus 05.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M  
|__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 5000M  
|__ Port 2: Dev 3, If 0, Class=Mass Storage, Driver=usb-storage,  
5000M  
/: Bus 04.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M  
/: Bus 03.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/0p, 5000M  
/: Bus 02.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=Mass Storage, Driver=usb-storage,  
480M  
/: Bus 01.Port 1: Dev 1, Class=root_hub, Driver=dummy_hcd/1p, 480M
```

USB Flash Drive Read/Write

```
# dd if=/dev/urandom of=data bs=1 count=1024  
# dd if=/dev/sda of=backup bs=1 count=1024 skip=4096  
# dd if=data of=/dev/sda bs=1 seek=4096  
# dd if=/dev/sda of=data1 bs=1 count=1024 skip=4096  
# diff data data1  
# dd if=backup of=/dev/sda bs=1 seek=4096
```

3.8 I2C

- I2C 0 (QPS615_I2C):
0x77: QPS615
- I2C 1 (APPS_I2C):
0x32 RTC
0x50 EEPROM
0x6D PCIe CLKGEN
- I2C 2 (I2C_A):
0x0A: SGTL5000 (Audio Codec)
0x23: CH7513A-BFI (eDP to LVDS bridge), HW need to rework R132 and R133 of ROM-ED92
0x2B: LT9611UXC (DSI to HDMI bridge)

0x57: EEPROM of CH7513A-BFI (eDP to LVDS bridge)

For the 0x23 and 0x57:

```
• # i2cdetect -y -r 0
•   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
• 00:          -- -- -- -- -- -- -- -- -- -- -- --
• 10: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 20: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 30: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 40: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 50: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 60: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 70: -- -- -- -- -- -- -- UU
•
• # i2cdetect -y -r 1
•   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
• 00:          -- -- -- -- -- -- -- -- -- -- -- --
• 10: -- -- -- -- -- -- -- -- -- -- -- UU -- -- --
• 20: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 30: -- -- UU -- -- -- -- -- -- -- -- -- -- -- --
• 40: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 50: UU -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 60: -- -- -- -- -- -- -- -- -- -- -- 6d -- -- --
• 70: -- -- -- -- -- -- -- -- -- -- -- -- -- --
•
• # i2cdetect -y -r 3
•   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
• 00:          -- -- -- -- -- -- -- -- -- -- -- --
• 10: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 20: -- -- -- -- -- -- -- -- -- -- -- UU -- -- --
• 30: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 40: -- -- -- 44 -- -- -- -- -- -- -- -- -- -- --
• 50: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 60: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 70: -- -- -- -- -- -- -- -- -- -- -- -- -- --
•
• # i2cdetect -y -r 9
•   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
• 00:          -- -- -- -- -- -- -- -- -- -- -- --
• 10: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 20: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 30: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 40: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 50: -- -- -- -- -- -- -- UU -- -- -- -- -- -- --
• 60: -- -- -- -- -- -- -- -- -- -- -- -- -- --
• 70: -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

3.9 External RTC

Set system time to current, then write to RTC

```
# date 032010452024 && hwclock -w && date
Wed Mar 20 10:45:00 UTC 2024
Wed Mar 20 10:45:01 UTC 2024
```

Set one incorrect time, then read time from RTC to verify

```
# date 010100002000 && hwclock -r && date
Sat Jan 1 00:00:00 UTC 2000
2024-03-20 10:47:33.749407+00:00
Sat Jan 1 00:00:00 UTC 2000
```

Restore the RTC time to system time

```
# hwclock -s && date
Wed Mar 20 10:49:03 UTC 2024
```

3.10 Internal Watchdog

The system will enter the ramdump mode after the system crash about 11 seconds by the following command:

```
# echo c > /proc/sysrq-trigger
```

3.11 Camera

MIPI-CSI (IMX577 with ROM-EV50)

MIPI CSI1 (IMX577)

Preview

(1) 3840x2160@30:

```
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=0
name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerate=30/1 !
waylandsink fullscreen=true
```

(2) 1920x2160@30:

```
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=0
name=camsrc ! video/x-raw,format=NV12,width=1920,height=1080,framerate=30/1 !
waylandsink fullscreen=true async=true sync=false
```

MIPI CSI2 (IMX577)

Preview

(1) 3840x2160@30:

```
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=1
name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerate=30/1 !
waylandsink fullscreen=true
```

(2) 1920x2160@30:

```
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=1
name=camsrc ! video/x-raw,format=NV12,width=1920,height=1080,framerate=30/1 !
waylandsink fullscreen=true async=true sync=false
```

MIPI CSI1 and MIPI CSI2 Multi Camera Preview

```
# source /opt/qcom/qirp-sdk/qirp-setup.sh
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=0
name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerate=30/1 !
waylandsink x=0 y=0 &
# export XDG_RUNTIME_DIR=/dev/socket/weston && export
WAYLAND_DISPLAY=wayland-1 && gst-launch-1.0 -e qtiqmmfsrc camera=1
name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerate=30/1 !
waylandsink x=960 y=0 &
```


3.12 M.2 Key E

3.12.1 Wi-Fi / BT (EWM-W170BQ)

WIFI Connection

```
# lspci
0000:00:00.0 PCI bridge: Qualcomm Device 010b
0000:01:00.0 Network controller: Qualcomm QCNFA765 Wireless Network Adapter
(rev 01)

# ifconfig wlp1s0
wlp1s0    Link encap:Ethernet  HWaddr 00:0E:8E:BF:DE:0D
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

# wpa_supplicant -i wlp1s0 -Dnl80211 -c /etc/wpa_supplicant.conf &
# wpa_cli -i wlp1s0 -p /var/run/sockets remove_network all
# wpa_cli -i wlp1s0 -p /var/run/sockets add_network
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 ssid \"SSID\"
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 key_mgmt WPA-PSK
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 proto WPA RSN
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 auth_alg OPEN
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 pairwise TKIP CCMP
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 group TKIP CCMP
# wpa_cli -i wlp1s0 -p /var/run/sockets set_network 0 psk \"PASSWORD\"
# wpa_cli -i wlp1s0 -p /var/run/sockets select_network 0

Sometimes need to use the following command to reconnect
# wpa_cli -i wlp1s0 -p /var/run/sockets reconnect

# ifconfig wlp1s0
wlp1s0    Link encap:Ethernet  HWaddr 00:0E:8E:BF:DE:0D
          inet addr:172.20.10.8  Bcast:172.20.10.15  Mask:255.255.255.240
          inet6 addr: 2401:e180:8880:3d43:16fb:957b:355e:884f/64
Scope:Global
          inet6 addr: fe80::b1eb:b874:c798:be6/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:46 errors:0 dropped:0 overruns:0 frame:0
          TX packets:110 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:5116 (4.9 KiB)  TX bytes:14985 (14.6 KiB)

# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=53 time=61.347 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=53 time=48.723 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=53 time=46.027 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=53 time=59.144 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=53 time=49.458 ms
```

BT Connection

If you want to use the **EWM-170BQ** BT, please you don't connect the Micro USB.

```
# hciconfig
hci0:     Type: Primary  Bus: USB
          BD Address: 00:0E:8E:BC:4A:78  ACL MTU: 1024:7  SCO MTU: 240:8
          DOWN
          RX bytes:857 acl:0 sco:0 events:59 errors:0
```

```
TX bytes:579 acl:0 sco:0 commands:59 errors:0
```

```
# hciconfig hci0 up
# bluetoothctl
# discoverable on
# pairable on
# scan on
[NEW] FC:18:3C:8D:75:F4 myphone
# scan off
# pair FC:18:3C:8D:75:F4
# connect FC:18:3C:8D:75:F4
```

3.13 M.2 Key B

Support **AIW-356** 5G module.
Need to insert the nano SIM card.
Please don't connect the Micro USB

PCIE Checking

Use the AIW-357 to check the pcie function.

```
# lspci
0001:04:00.0 Wireless controller [0d40]: MEDIATEK Corp. Device 4d75 (rev 01)
```

5G Connection

- AIW-356

```
• # lsusb
• Bus 003 Device 003: ID 2cb7:0104 Fibocom Fibocom FM160 Modem_SN:8AF6F50C
(at+gtusbmode=32)
• or
• Bus 003 Device 004: ID 2cb7:0111 Fibocom Fibocom FM160 Modem_SN:8AF6F50C
(at+gtusbmode=30)
•
• # lsusb -t
• /: Bus 03.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
• |__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 5000M
• |__ Port 1: Dev 3, If 0, Class=Mass Storage, Driver=usb-storage,
5000M
• |__ Port 3: Dev 4, If 0, Class=Communications, Driver=cdc_mbim,
5000M
• |__ Port 3: Dev 4, If 1, Class=CDC Data, Driver=cdc_mbim, 5000M
• |__ Port 3: Dev 4, If 2, Class=Vendor Specific Class,
Driver=option, 5000M
• |__ Port 3: Dev 4, If 3, Class=Vendor Specific Class,
Driver=option, 5000M
• |__ Port 3: Dev 4, If 4, Class=Vendor Specific Class,
Driver=option, 5000M
• /: Bus 02.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
• /: 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
•
• # ifconfig | grep wwan0
• wwan0 Link encap:Ethernet HWaddr 36:B7:D9:18:79:41
•
• 1. Change to the MBIM + MODEM + DIAG + AT mode (One-time Prerequisite) for
the AIW-356. Default is the DIAG + MODEM + AT + PIPE + RMNET mode.
```

```

• # microcom -t 15000 -s 115200 /dev/ttyUSB2
• at+gtusbmode=30
•
• 2. Use the MBIM to connect the internet:
• # chmod u+w /sys/bus/usb-serial/drivers/option1/new_id
• # echo "2cb7 0111" > /sys/bus/usb-serial/drivers/option1/new_id
• # mbimcli -d /dev/cdc-wdm0 -p --query-connection-state
• # mbimcli -d /dev/cdc-wdm0 -p --query-subscriber-ready-status
• # mbimcli -d /dev/cdc-wdm0 -p --set-radio-state=on
• // # mbimcli -d /dev/cdc-wdm0 -p --enter-pin=0000 (If needed)
• # mbim-network /dev/cdc-wdm0 start
• # mbimcli -d /dev/cdc-wdm0 -p --query-ip-configuration
• # /tools/modem/mbim-set-ip /dev/cdc-wdm0 wwan0
•
• # ifconfig wwan0
• wwan0      Link encap:Ethernet  HWaddr 36:B7:D9:18:79:41
•           inet addr:10.70.116.33  Bcast:10.70.116.35  Mask:255.255.255.252
•           inet6 addr: fe80::b126:f214:f57c:949/64  Scope:Link
•           inet6 addr: 2001:b400:e352:e30a:a370:edbb:d419:4996/64
Scope:Global
•           UP BROADCAST RUNNING NOARP MULTICAST  MTU:1500  Metric:1
•           RX packets:5 errors:0 dropped:0 overruns:0 frame:0
•           TX packets:56 errors:81 dropped:0 overruns:0 carrier:0
•           collisions:0 txqueuelen:1000
•           RX bytes:1230 (1.2 KiB)  TX bytes:7856 (7.6 KiB)
•
• # ping 8.8.8.8
• PING 8.8.8.8 (8.8.8.8): 56 data bytes
• 64 bytes from 8.8.8.8: icmp_seq=0 ttl=114 time=162.628 ms
• 64 bytes from 8.8.8.8: icmp_seq=1 ttl=114 time=49.067 ms
• 64 bytes from 8.8.8.8: icmp_seq=2 ttl=114 time=47.258 ms
• 64 bytes from 8.8.8.8: icmp_seq=3 ttl=114 time=50.771 ms
• 64 bytes from 8.8.8.8: icmp_seq=4 ttl=114 time=40.334 ms

```

3.14 Power Button

- When the system is in the power off state, it can be power on by short pressing the Power Key.
- When the system is in the power on state, it can be power off by short pressing the Power Key.
- It can force shutdown by pressing and holding the Power Key for 5 seconds.

3.15 Reset Button

The system will reset when pressing the Reset Key.

Chapter 4

Embedded O.S

This chapter details instructions for building Linux systems

4.1 Introduction

Advantech's AOM-2721 comes preloaded with Ubuntu 20.04 based embedded O.S., It contains all the system-required shell commands and drivers needed to operate the platform. We do not offer IDE developing environment on AOM-2721 BSP. Users can evaluate and develop their device using the Ubuntu 20.04 LTS environment. This chapter introduces the software configuration and development of AOM-2721. It enables users to develop their application(s) efficiently.

For detailed operation, please refer to the Ubuntu Version A User Guide.

The following link directs you to the QCS6490 series Wikipedia page: https://ess-wiki.advantech.com.tw/view/AIM-Linux/BSP/Qualcomm/RISC_QCS_Linux_00011.1

Chapter 5

System Recovery

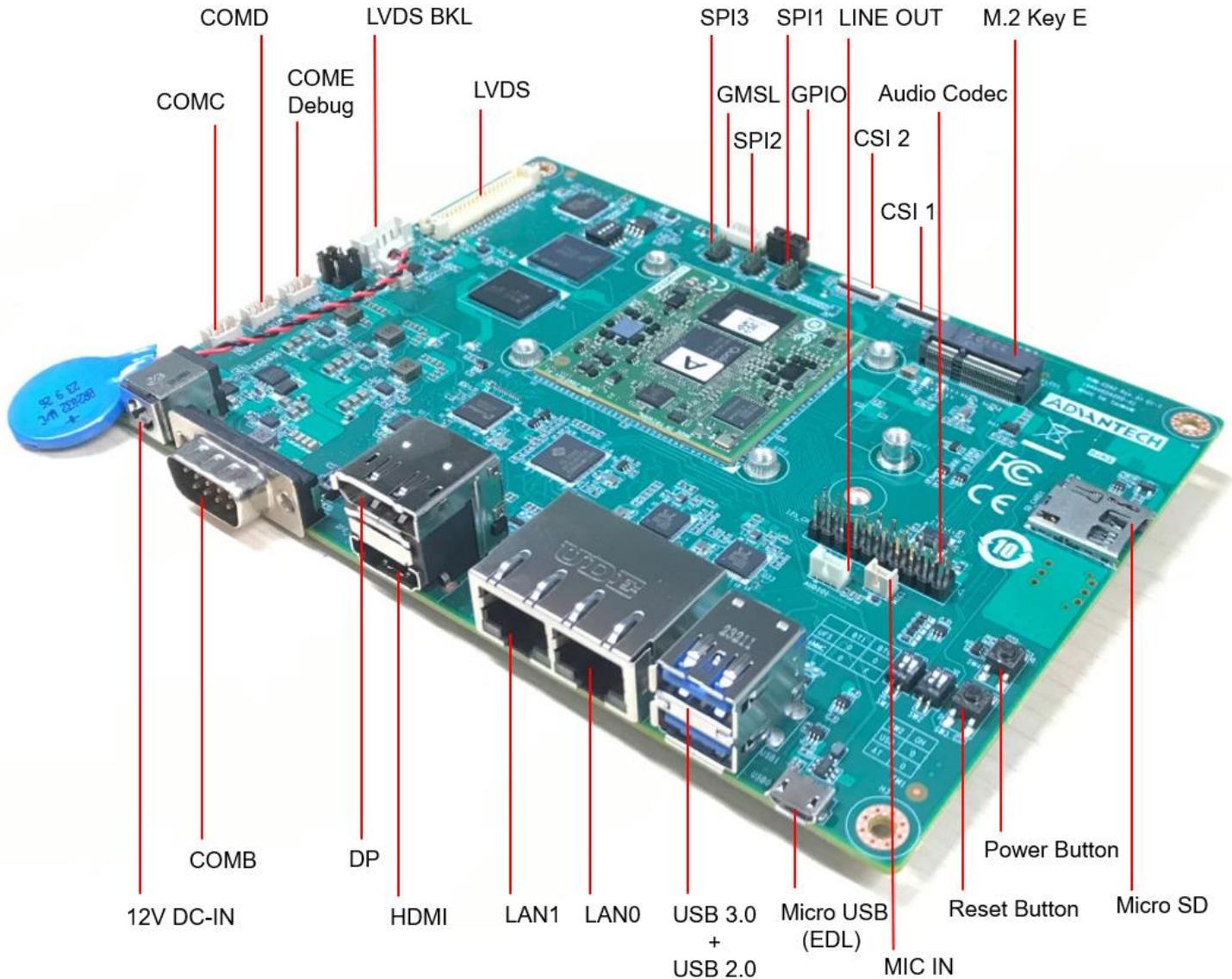
This chapter details system recovery procedures for a damaged Linux OS.

5.1 System Recovery

Using windows PCAT or Qualcomm Download (QDL) tool to flash software images to the device.

Emergency download (EDL) mode

- Connect the **Micro USB (EDL)** to your linux host computer.

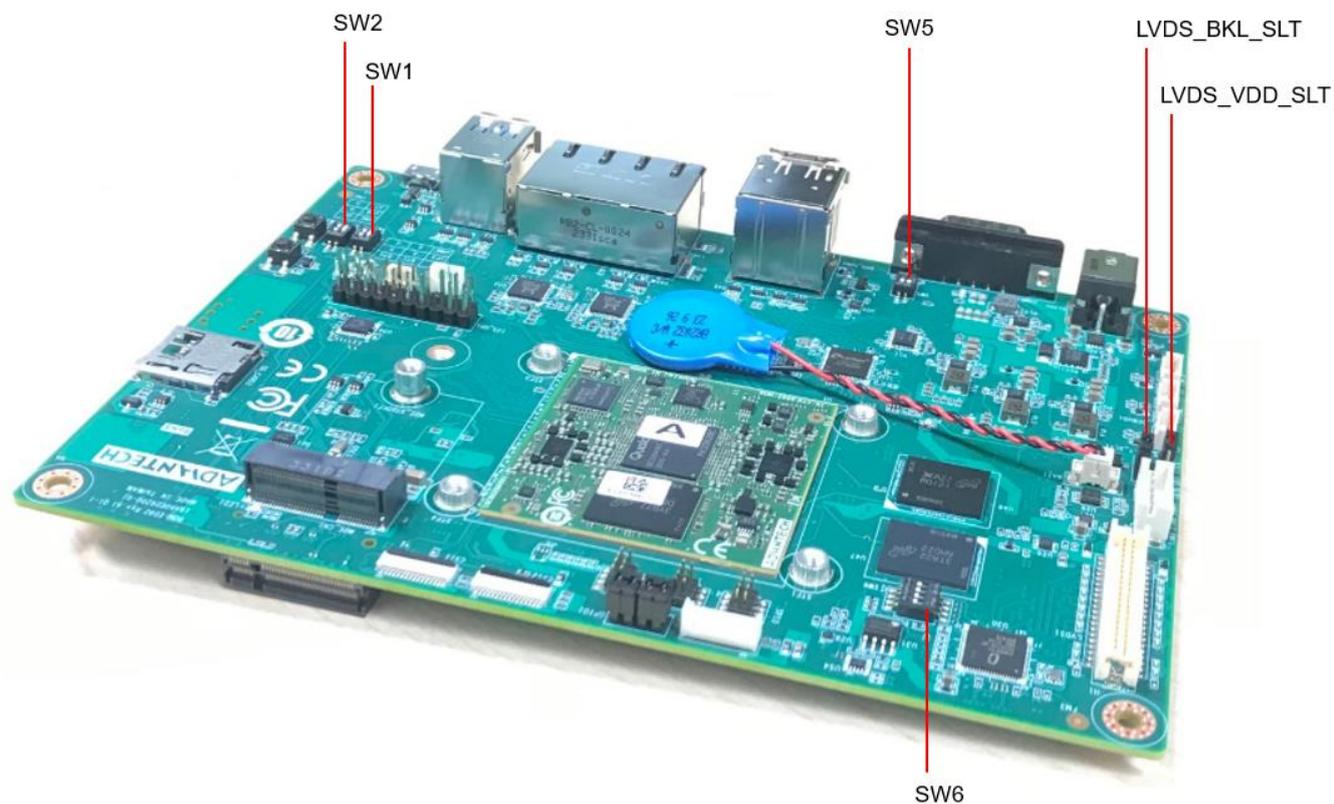


SW1

- SW1 (1-off, 2-on) : EMMC Boot
- SW1 (1-on, 2-on) : UFS Boot

SW2

- SW2 (1-on) : Forced Recovery
- SW2 (2-on) : AT Mode

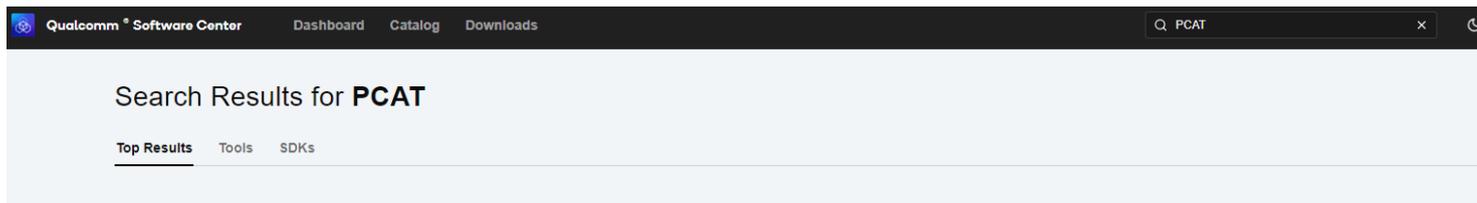


- Connect the adapter and power on the device

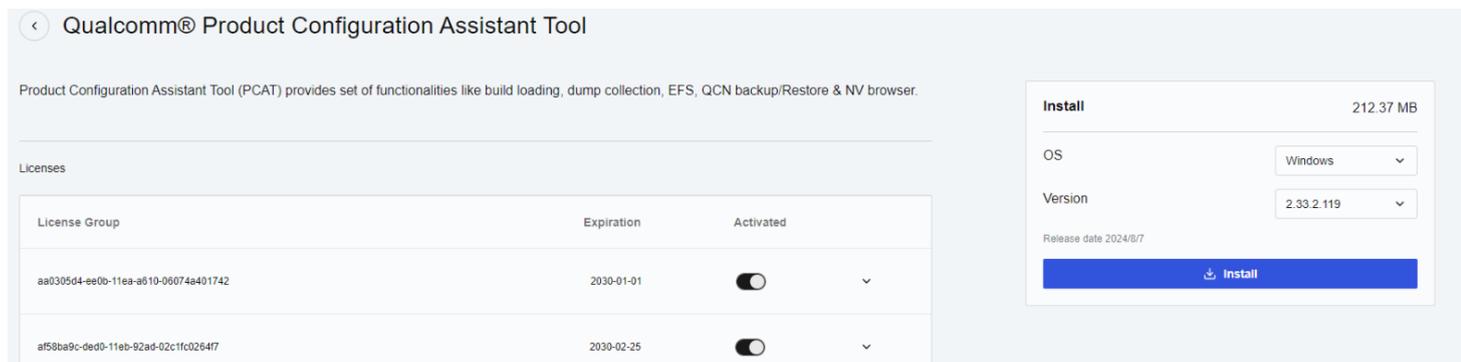
Windows PCAT Tool

Prepare

1. Download the Qualcomm Software Center:
https://softwarecenter.qualcomm.com/#/catalog/item/Qualcomm_Software_Center
2. Open the Qualcomm Software Center
3. Search "PCAT" in the search bar

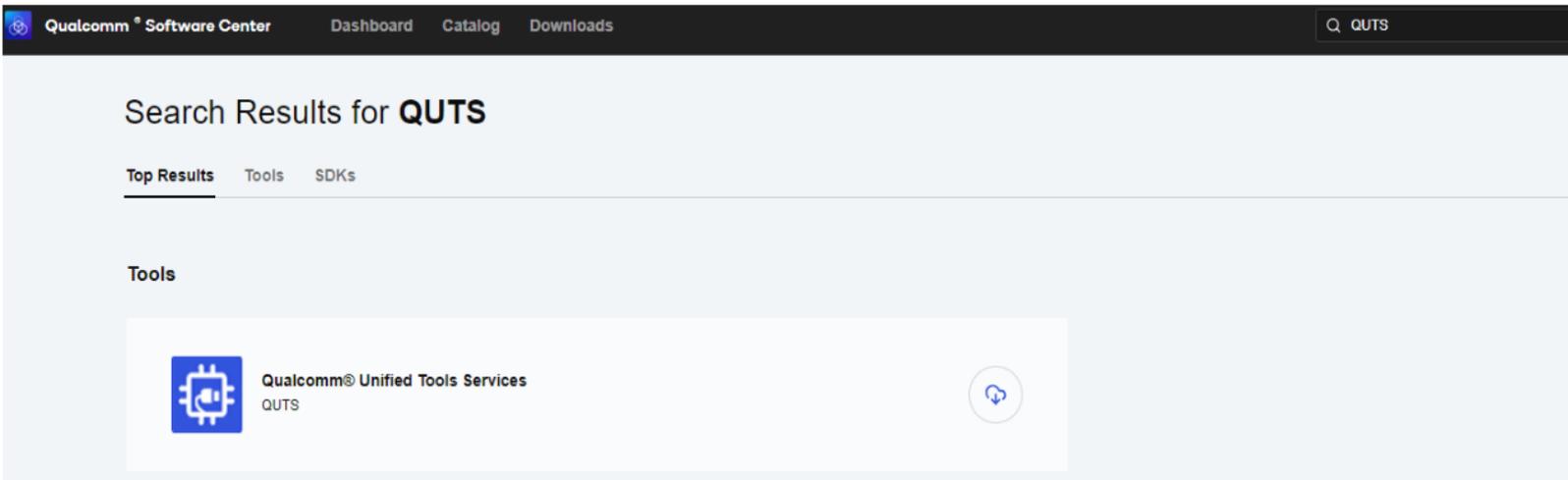


4. Click Qualcomm® Product Configuration Assistant Tool
5. Select Qualcomm® Product Configuration Assistant Tool versio : 2.33.2.119

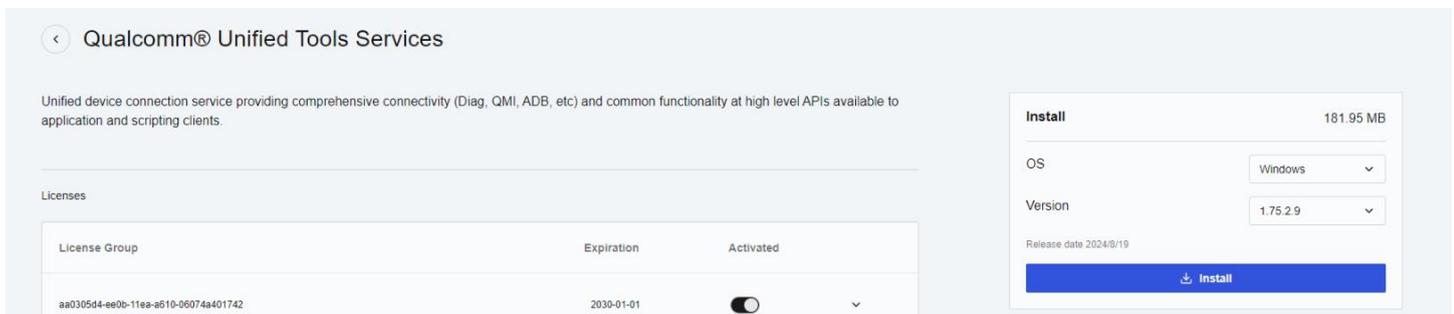


6. Install Qualcomm® Product Configuration Assistant Tool 2.33.2.119

7. Search "QUTS" in the search bar



8. Click the Qualcomm® Unified Tools Services
9. Select Qualcomm® Unified Tools Services version : 1.75.2.9
10. Install Qualcomm® Unified Tools Services 1.75.2.9



11. You will find the new application in your Windows system .



12. Unzip the UFS File and eMMC File

For example :

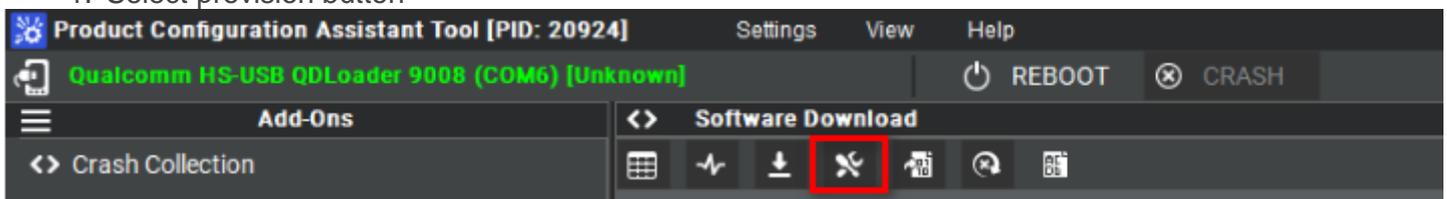
2860A1AIM38LIV11030_2024-11-18_ufs.tgz

2860A1AIM38LIV11030_2024-11-18_emmc.tgz

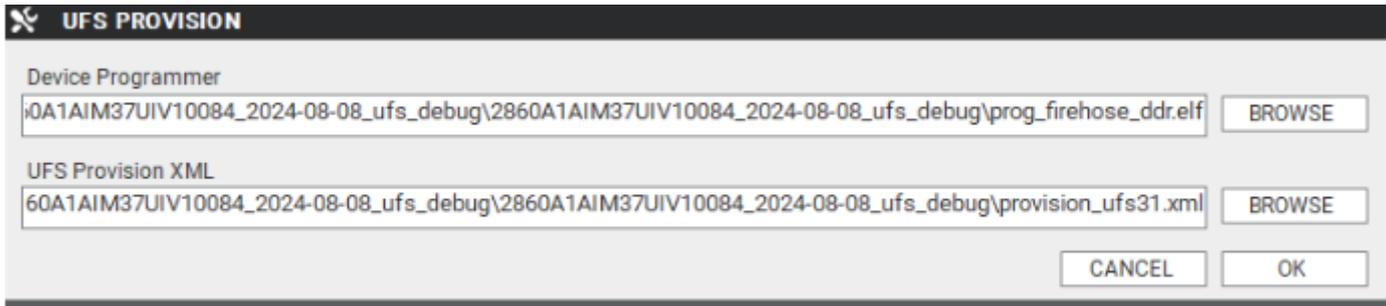
13. Connect your device via Micro USB.

UFS Provision

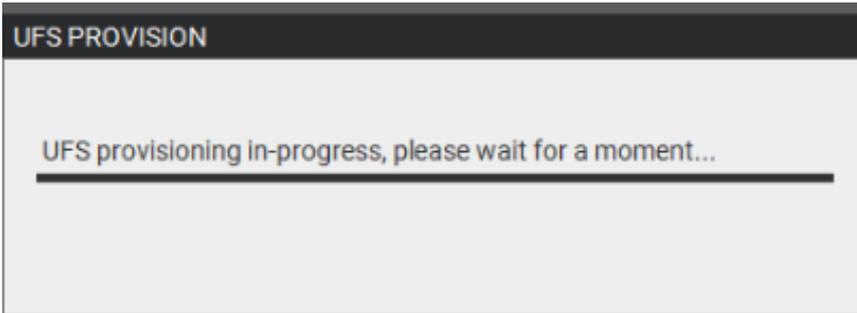
1. Select provision button



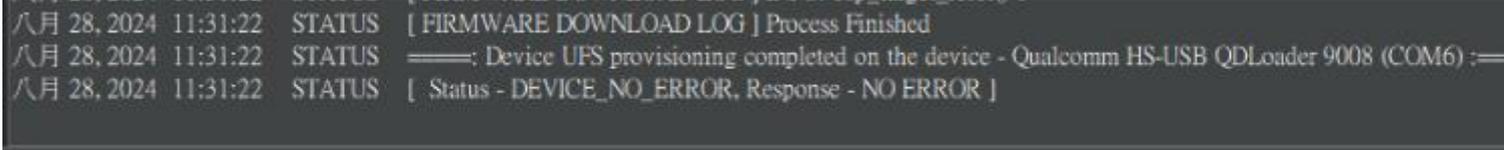
2. Add the prog_firehose_dds.elf and provision_ufs31.xml in UFS folder.



3. Then press "OK" , it will start to do USF Provision.

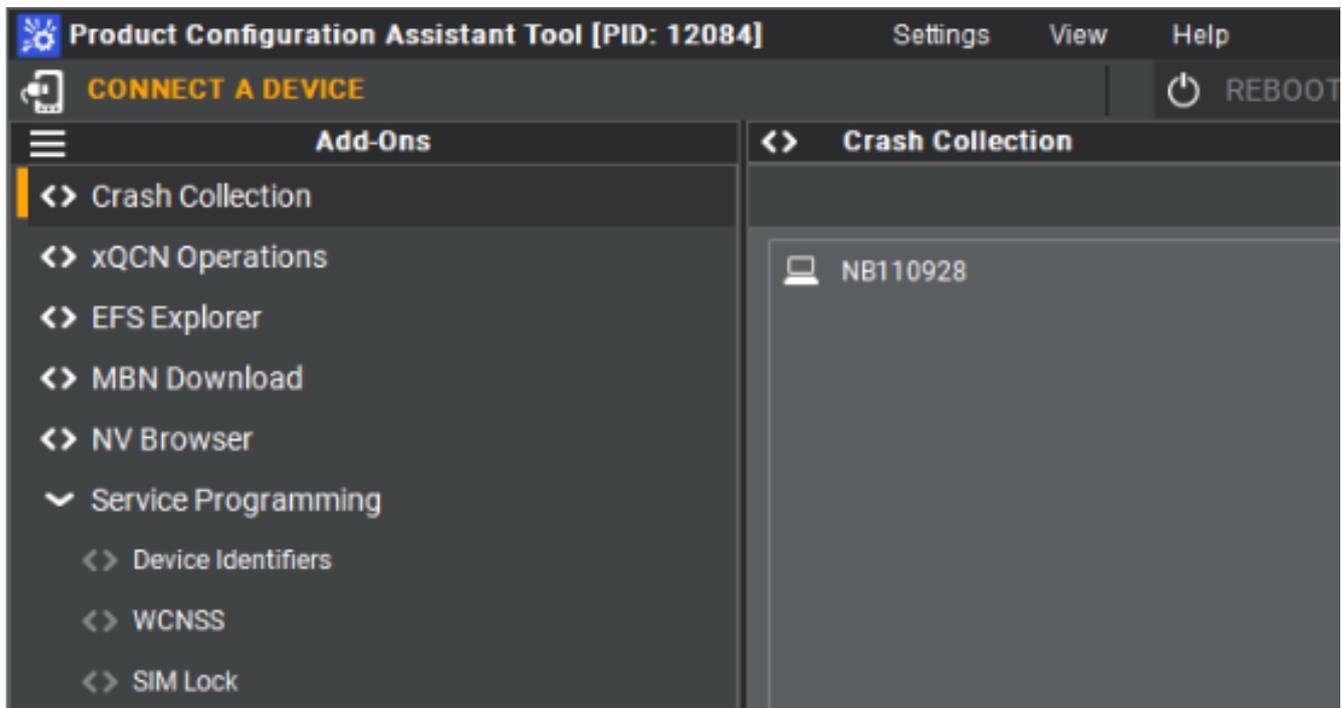


4. When the Provision finished , you can see the result in message window.

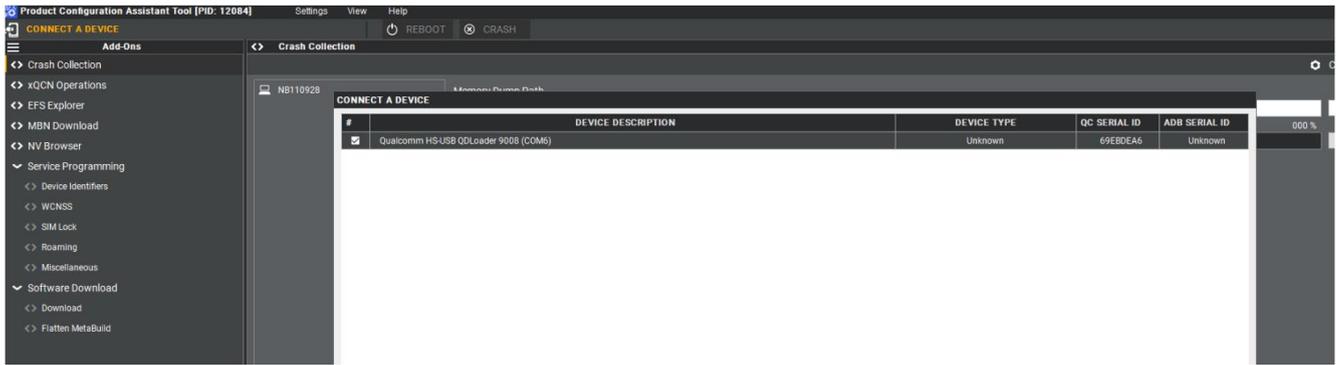


Flash UFS

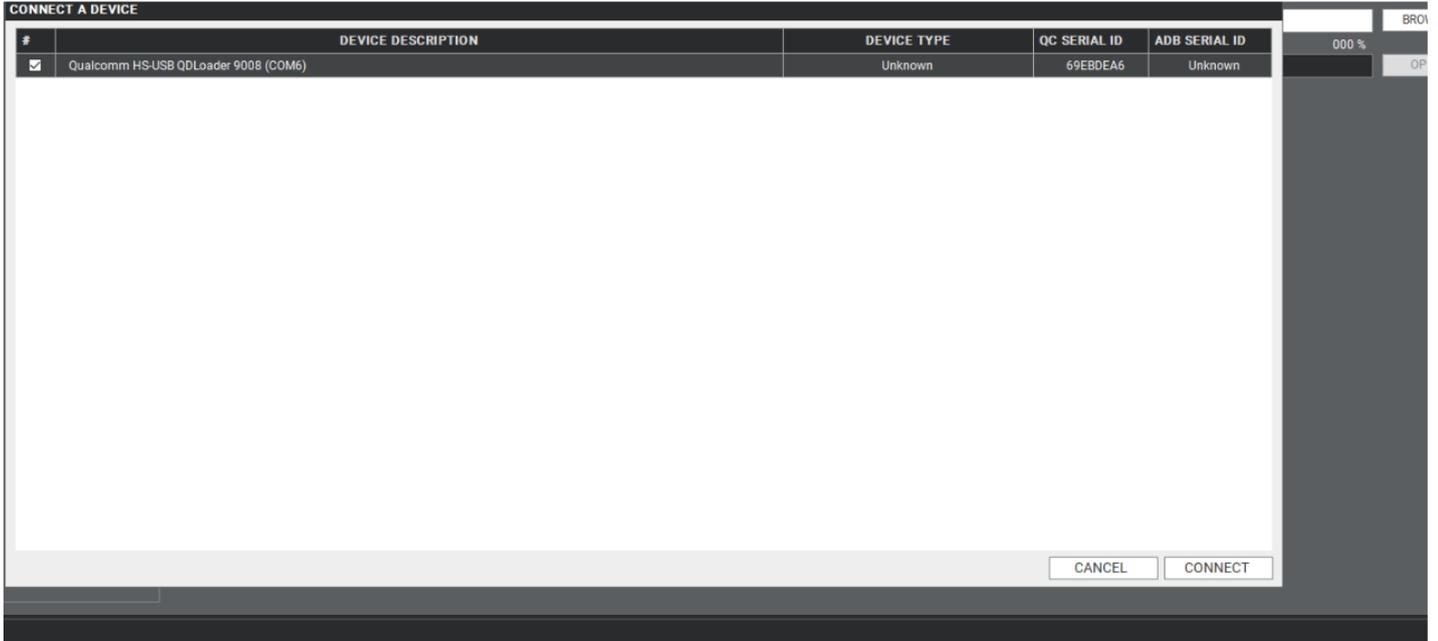
1. Change the SW1 and SW2:
 - o Flash UFS: The SW1 switch to 1-on, 2-on
 - o Forced Recovery: The SW2 switch to 1-on, 2-on
2. Turn on the power
3. Open " PCATApp" Tool
4. Click " Connect A Device"



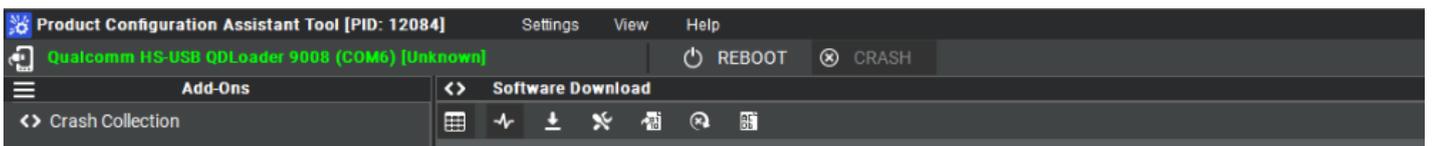
5. Select "Qualcomm HS-USB QDLoader 9008 (COM6)"



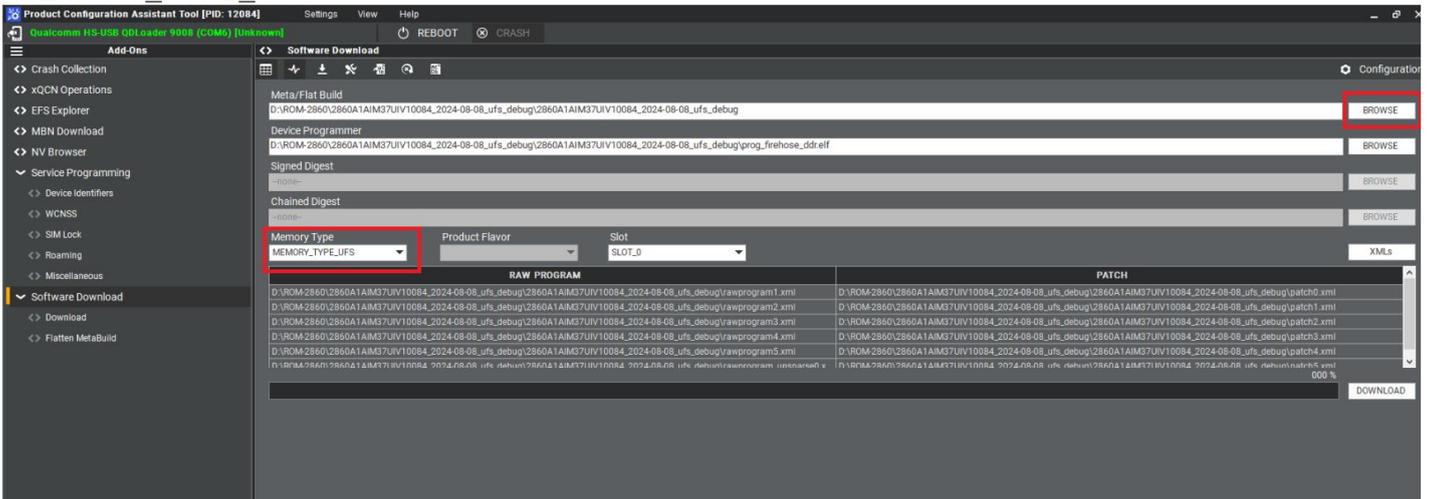
6. Click "Connect" device



7. When you connected successfully, it will show "green word" - Qualcomm HS-USB QDLoader 9008 (COM 6)



8. Select UFS Folder in PCAT Tool, the Tool will help load Files automatically and Select "MEMORY_TYPE_UFS"



lick " Download"

Product Configuration Assistant Tool [PID: 12084] Settings View Help

Qualcomm HS-USB QDLader 9008 (COM6) [Unknown] REBOOT CRASH

Add Ons

- Crash Collection
- xQCX Operations
- EFS Explorer
- MBN Download
- NV Browser
- Service Programming
- Device Identifiers
- WCNSS
- SIM Lock
- Roaming
- Miscellaneous
- Software Download
- Download
- Flatten MetaBuild

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\prog_firehose_ddr.elf

Signed Digest
none

Chained Digest
none

Memory Type: MEMORY_TYPE_UFS Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram1.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram1.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml

FS Download Status

Product Configuration Assistant Tool [PID: 12084] Settings View Help

Qualcomm HS-USB QDLader 9008 (COM6) [Unknown] REBOOT CRASH

Add Ons

- Crash Collection
- xQCX Operations
- EFS Explorer
- MBN Download
- NV Browser
- Service Programming
- Device Identifiers
- WCNSS
- SIM Lock
- Roaming
- Miscellaneous
- Software Download
- Download
- Flatten MetaBuild

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\prog_firehose_ddr.elf

Signed Digest
none

Chained Digest
none

Memory Type: MEMORY_TYPE_UFS Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram_unsparse0.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram_unsparse0.xml



FS Download completed

Product Configuration Assistant Tool [PID: 12084] Settings View Help

Qualcomm HS-USB QDLader 9008 (COM6) [Unknown] REBOOT CRASH

Add Ons

- Crash Collection
- xQCX Operations
- EFS Explorer
- MBN Download
- NV Browser
- Service Programming
- Device Identifiers
- WCNSS
- SIM Lock
- Roaming
- Miscellaneous
- Software Download
- Download
- Flatten MetaBuild

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\prog_firehose_ddr.elf

Signed Digest
none

Chained Digest
none

Memory Type: MEMORY_TYPE_UFS Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram2.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram3.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram4.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram5.xml
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram_unsparse0.xml	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_ufs_debug\2860A1AIM37UIV10084_2024-08-08_ufs_debug\rawprogram_unsparse0.xml



Flash EMMC

Turn off the Power
 Change the SW1 and SW2
 Flash eMMC: The SW1 switch to 1-off, 2-on
 Forced Recovery: The SW2 switch to 1-on, 2-on
 Turn on the power
 Make sure the device connection status.
 If the device disconnect with PCAT Tool, please connect it again.

#	DEVICE DESCRIPTION	DEVICE TYPE	QC SERIAL ID	ADB SERIAL ID
<input checked="" type="checkbox"/>	Qualcomm HS-USB QDLoader 9008 (COM6)	Unknown	69EBDEA6	Unknown

CANCEL

CONNECT

Select EMMC Folder.

Product Configuration Assistant Tool [PID: 20924] Settings View Help

Qualcomm HS-USB QDLoader 9008 (COM6) [Unknown] REBOOT CRASH

Add-Ons

- > Crash Collection
- > xQCN Operations
- > EFS Explorer
- > MBN Download
- > NV Browser
- > Service Programming
 - <> Device Identifiers
 - <> WCNSS
 - <> SIM Lock
 - <> Roaming
 - <> Miscellaneous
- > Software Download
 - <> Download
 - <> Flatten MetaBuild

Software Download

Meta/Flat Build

D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug

Device Programmer

D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\prog_firehose_ddr.elf

Signed Digest

Chained Digest

Memory Type: MEMORY_TYPE_EMMC | Product Flavor: | Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\rawprogram_unspar...	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2...

Activity Log

Make sure the setting, then press " Download " button.

Product Configuration Assistant Tool [PID: 20924] Settings View Help
Qualcomm HS-USB QDL loader 9008 (COM6) [Unknown] REBOOT CRASH

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\prog_firehose_ddr.elf

Signed Digest
--none--

Chained Digest
--none--

Memory Type: MEMORY_TYPE_EMMC Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\rawprogram_unspar...	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\patch...

MMC download status

Product Configuration Assistant Tool [PID: 20924] Settings View Help
Qualcomm HS-USB QDL loader 9008 (COM6) [Unknown] REBOOT CRASH

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\prog_firehose_ddr.elf

Signed Digest
--none--

Chained Digest
--none--

Memory Type: MEMORY_TYPE_EMMC Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\rawprogram_unspar...	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\patch...

Warning: [Yellow and black striped bar]

MMC Download completed

Product Configuration Assistant Tool [PID: 20924] Settings View Help
Qualcomm HS-USB QDL loader 9008 (COM6) [Unknown] REBOOT CRASH

Add-Ons

- Crash Collection
- xQCN Operations
- EFS Explorer
- MBN Download
- NV Browser
- Service Programming
- Device Identifiers
- WCNSS
- SIM Lock
- Roaming
- Miscellaneous
- Software Download
- Download
- Flatten MetaBuild

Software Download

Meta/Flat Build
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug

Device Programmer
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\prog_firehose_ddr.elf

Signed Digest
-none-

Chained Digest
-none-

Memory Type: MEMORY_TYPE_EMMC Product Flavor: Slot: SLOT_0

RAW PROGRAM	PATCH
D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08_emmc_debug\rawprogram_unspar...	D:\ROM-2860\2860A1AIM37UIV10084_2024-08-08_emmc_debug\2860A1AIM37UIV10084_2024-08-08...

Activity Log

TIME	TYPE	MESSAGE
八月 28, 2024 12:14:04	STATUS	[FIRMWARE DOWNLOAD LOG] INFO: Calling handler for power
八月 28, 2024 12:14:04	STATUS	[FIRMWARE DOWNLOAD LOG] INFO: Will issue reset/power off 10000000 useconds, if this hangs check if watchdog is enabled
八月 28, 2024 12:14:04	STATUS	[FIRMWARE DOWNLOAD LOG] INFO: bsp_target_reset() 1
八月 28, 2024 12:14:04	STATUS	[FIRMWARE DOWNLOAD LOG] Overall to target 249.235 seconds (28.67 MBps)
八月 28, 2024 12:14:04	STATUS	[FIRMWARE DOWNLOAD LOG] Process Finished
八月 28, 2024 12:14:04	WARNING	==== Build loading completed on the device - Qualcomm HS-USB QDL loader 9008 (COM6) :====
八月 28, 2024 12:14:04	WARNING	[Status - TRUE, ImgMngt Response - DEVICE_NO_ERROR]
八月 28, 2024 12:14:04	WARNING	[Response - NO_ERROR]
八月 28, 2024 12:14:04	STATUS	==== Build loaded successfully on the device - Qualcomm HS-USB QDL loader 9008 (COM6) :====
八月 28, 2024 12:14:04	STATUS	Device Mode - DEVICE_MODE_SAHARA_DOWNLOAD, Auto Backup and Restore xQCN = FALSE, Read Images - FALSE

Qualcomm Download (QDL) Tool

One-time Prerequisite

To set the udev USB rule with the Qualcomm manufacturing vendor ID 05c6:

```
$ cd /etc/udev/rules.d
$ sudo vi 51-qcom-usb.rules
# add the following
SUBSYSTEMS=="usb", ATTRS{idVendor}=="05c6", ATTRS{idProduct}=="9008", MODE=="0666",
GROUP="plugdev"
$ sudo systemctl restart udev
```

Use the QDL to flash images (UFS only now)

Ensure the QDL mode

```
$ lsusb
Bus 001 Device 028: ID 05c6:9008 Qualcomm, Inc. Gobi Wireless Modem (QDL mode)
```

Ensure ModemManager is not running

It is identified as a Qualcomm modem for some Linux distributions when the device is connected in USB mode.

Check the status of ModemManager:

```
$ sudo systemctl status ModemManager
```

If the ModemManager is enabling, please help to stop it by:

```
$ sudo systemctl stop ModemManager
```

Go to the location of images in the workspace to flash the images:

```
$ cd build-qcom-robotics-ros2-humble/tmp-glibc/deploy/images/qcm6490/qcom-robotics-full-image
$ ./qdl prog_firehose_ddr.elf rawprogram*.xml patch*.xml
HELLO version: 0x2 compatible: 0x1 max len: 1024 mode: 0
```

```
READ64 image: 13 offset: 0x0 length: 0x40
READ64 image: 13 offset: 0x40 length: 0x3f0
READ64 image: 13 offset: 0x1000 length: 0x1000
READ64 image: 13 offset: 0x2000 length: 0x260
READ64 image: 13 offset: 0x3000 length: 0x1000
READ64 image: 13 offset: 0x4000 length: 0x1000
.
.
.
Update Primary Header with CRC of Primary Header.
LOG: INFO: Calling handler for patch
Zero Out Header CRC in Backup Header.
LOG: INFO: Calling handler for patch
Update Backup Header with CRC of Backup Header.
LOG: INFO: Calling handler for patch
LOG: INFO: Calling handler for setbootablestorage drive
LOG: INFO: Using scheme of value= 1
partition 1 is now bootable
LOG: INFO: Calling handler for power
LOG: INFO: Will issue reset/power off 100 useconds, if this hangs check if
watchdog is enabled
LOG: INFO: bsp target reset() 1
```

If you see the "partition 1 is now bootable" in your terminal window, the flash is successful.

Note:

If you get the following issue, please help to download the qdl file

(<https://www.dropbox.com/scl/fi/nv65h778rwkhtul1gnwrr/qdl?rlkey=qzy83yt1x2qhhnqzra9kukhai&st=p4n42eax&dl=0>) or to build the standalone QDL.

```
$ ./qdl prog_firehose_ddr.elf rawprogram*.xml patch*.xml
-bash: ./qdl: No such file or directory
```

How to build the standalone QDL?

```
$ sudo apt-get install libxml2-dev libudev-dev
$ git clone https://git.codelinaro.org/linaro/qcomlt/qdl.git
$ cd qdl
$ make
```

Chapter 6

Advantech Services

This chapter outlines Advantech's Design-In services, technical support, and warranty policy for ROM-2820.

1.1 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 risks associated with carrier boards.

Easy Development

Advantech has support firmware, root file-system, BSP, and other development tools for customers. These help customers develop their carrier board and differentiate their embedded products and applications.

- Full range of RISC products
- Comprehensive document support

Design Assistance Service

Advantech provides a checklist for engineers to check their schematics and review services based on customer carrier board schematics. These services prevent design errors before they occur. This saves time and reduces costs associated with 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 flexible solutions for customer's thermal designs, Advantech provides services including both modularized thermal solutions and customized thermal solutions

- Standard thermal solutions
- Customized thermal solutions

Embedded Software Services

This service provides support drivers, software integration and customized firmware, root file-system, and Linux image. Users can save 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 has been developed, resulting in a fundamental change in the IPC industry. Due to diverse market demands and intense competition, cooperation on vertical integration is an effective way to create competitive advantages. As a result, ARM-based CPU modules have grown in popularity. Concentrating all necessary components on CPU modules and placing other parts on the carrier board provides greater flexibility while retaining low power consumption credentials.

Advantech has identified the following common questions concerning the implementation of modular designs.

Data Acquisition

Despite obtaining sufficient information for making decisions concerning specialized vertical applications, some customers encounter difficulties dealing with platform design, and communicating with the CPU/chipset manufacturers. These challenges in carrier board design can negatively impact time-to-market at the expense of market opportunities.

Software Development and Modification

Compared to x86 architectures, RISC architectures use simpler instruction sets. Software support for x86 platforms cannot be used on RISC platforms. System integrators (SI) need to develop software for their system and integrate it with hardware themselves. Unlike x86 platforms, RISC platforms are not well supported by Board Support Packages (BSP) and drivers. While driver support is provided, system integration still requires a lot of effort. The BSP provided by CPU manufacturers is usually tailored for carrier board design, making system integration for software difficult.

Addressing this, Advantech introduced 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. Advantech's services not only enable customers to effectively distribute their resources, but also reduce R&D costs and hardware investment.

By virtue of a cooperative relationship with leading original manufacturers of CPUs and chipsets - such as ARM, TI, and NXP - Advantech helps solve communication and technical support difficulties. This can reduce the uncertainties in product development. Advantech's professional software team focuses on providing complete Board Support Packages. They also help customers create a software development environment for their RISC platforms.

Advantech RISC design-in services helps customers reduce time to market by overcoming their problems through streamlined services.

Along with our multi-stage development process which includes: planning, design, integration, and validation, Advantech's RISC design-in service provides comprehensive support during the following different phases:

Planning Stage

Before deciding to adopt Advantech RISC COM, customers must go through a complete survey process, detailing 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. Advantech provides standard software Board Support Packages (BSP) for RISC COM, so that customers can define their product's specifications while simultaneously verifying I/O and performance. Advantech also offers software evaluation and peripheral module recommendations (such as WiFi, 3G, BT). At this stage, Advantech seeks to resolve customer concerns. Product evaluation with a focus on performance and specification is vital during the planning period. Therefore, Advantech helps their customers conduct all the necessary tests for their RISC COM.

Design Stage

Advantech will supply a reference carrier board design guide when a product moves into the design stage. The carrier board design guide provides pin definitions for the COM connectors with limitations and recommendations for carrier board design. This design guide gives customers clear guidelines during their carrier board development. Advantech offers a complete pin-out check list for different form factors such as Q7, ULP and RTX2.0, enabling carrier board signals and layout design examination. Advantech's team helps customers review the placement/layout and schematics. This helps carrier board designs fulfill customers' requirements. Advantech's RISC software team assists in establishing an environment for software development while evaluating the time and resources needed. Advantech can also cooperate with a third party to provide proficient consulting services in software development. With Advantech's professional support, the design process is eased and product quality is improved; thus meeting customer targets.

Integration Stage

This phase comprises HW/SW integration, application development, and peripheral module implementation. Due to the lack of knowledge and experience using platforms, customers need to spend a certain amount of time on analyzing integration problems. In addition, peripheral module implementation is relevant to driver designs on carrier boards. RISC platforms usually have less support for ready-made drivers on carrier boards, therefore users need to learn by trial and error to get the best solution with the least effort. Advantech's team has years of experience in customer support and HW/SW development. Advantech supports customers with professional advice and information shortening development time and enabling effective product integration.

Validation stage

After the completion of a customer's ES sample there is a series of verification steps. In addition to verifying a product's functionality, testing a product's efficiency is an important stage for RISC platforms. Through an efficient verification process, backed by Advantech's technical support, customers optimize their applications with ease. Advantech's team can provide professional consulting services regarding further testing and equipment usage. This helps customers find the right tools to efficiently identify and solve problems to enhance product quality and performance.

6.2 Contact Information

The contact information for Advantech customer service is below:

Region/Country	Contact Information
United States of 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

Alternatively, you can contact the Advantech service team via our website.

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

Our technical support engineers will provide a quick response to your queries

6.3 Technical Support and Assistance

6.3.1 Warranty Policy

The warranty policy for Advantech products is provided below.

6.3.1.1 Warranty Period

Advantech branded off-the-shelf products and third-party off-the-shelf products used to assemble Advantech's Configure-to-Order products are entitled to a two-year global warranty. Products defect in design, materials, or workmanship are covered from the date of shipment.

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

All third-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.

6.3.1.2 Repairs under Warranty

It is possible to obtain a replacement product (cross-shipment) within the first 30 days after purchase. Contact your original Advantech supplier to arrange a replacement if the product was purchased directly from Advantech and was DOA (dead-on-arrival). The DOA cross-shipment excludes any shipping damage, customized and/or build-to-order products.

For products that 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 the customer will be at Advantech's expense.

6.3.1.3 Exclusions from Warranty

The product is excluded from warranty if:

- The product has been found to be defective after expiry of the warranty period.
- Warranty has been voided by removal or alternation 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 failure from which Advantech is not responsible whether by accident or other cause. Such conditions will be determined by Advantech at its sole discretion.
- The product is damaged beyond repair due to a natural disaster, such as a lightning strike, flood, earthquake, etc.
- The product is sent for updates, upgrades, or tests at the request of the customer who is without warranty.

6.3.2 Repair Process

6.3.2.1 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. To request an RMA number, visit Advantech's RMA website: <http://erma.advantech.com.tw> and use 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. They may be able to find a solution that does not require sending the product in for repair.

The serial number of the entire product is required even if only a component is returned for repair. Otherwise, the case will be regarded as out-of-warranty.

6.3.2.2 Returning Products for Repair

Customers may be able to save time and meet end-user requirements by returning defective products to any authorized Advantech repair facility without an extra cross-region charge. Customers are required to contact their local repair center before global repair service will be offered.

We recommend sending cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as the CPU, DRAM, and CF card. If you send all these parts back (because you believe they may be part of the problem), please clearly state that they are included. Otherwise, Advantech will not be responsible for any items not listed. Ensure that the Problem Description is enclosed.

European customers who are located outside the European community are requested to use UPS as the shipping company. We strongly recommend adding a packing list to all shipments. Please prepare a shipment invoice according to the following guidelines to minimize goods clearance time:

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 information "Invoice for customs purposes only with no commercial value" to the shipment invoice.
3. Show RMA numbers, product serial numbers, and warranty status on the shipment invoices.
4. Add information about the goods Country of origin.

In addition, attach an invoice with the RMA number to the carton, write the RMA number on the outside of the carton, 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.

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 shipment methods are used.

Should DOA cases fail, 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.

6.3.2.3 Service Charges

The product is excluded from warranty if:

- The product is sent for repair after the warranty period is expired.
- The product is tested or calibrated after the warranty period is expired, and a NPF (no problem found) 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 environment; improperly maintained by the customer; or failure for which Advantech is not responsible whether by accident or other cause. Such conditions will be determined by Advantech at its sole discretion.
- The product is damaged beyond repair due to a natural disaster, such as a lightning strike, flood, earthquake, etc.
- The product is sent for updates, upgrades, or tests at the request of the customer who is 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 conduct the repair free of charge. However, free repairs do not apply to products that have been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable environment; improperly maintained by the customer; or failure for which Advantech is not responsible whether by accident or other cause. Please contact your nearest regional service center for detailed service quotations.

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

6.3.2.4 Repair Report

Advantech returns each product with a repair report that shows the result of the repair. A repair analysis report can also be provided upon request. If the defect is not caused by Advantech's design or manufacturing, customers will be charged US\$60 or US\$120 for in-warranty or out-of-warranty repair analysis reports, respectively.

6.3.2.5 Custody of Products Submitted for Repair

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

6.3.2.6 Shipping Back to Customer

The forwarding company for RMA returns from Advantech to customers is selected by Advantech. Other express services, such as UPS or FedEx, can be used upon request. However, the customer must bear the extra costs of alternative shipment methods. If you require any special arrangements, please specify this when shipping the product to us.

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