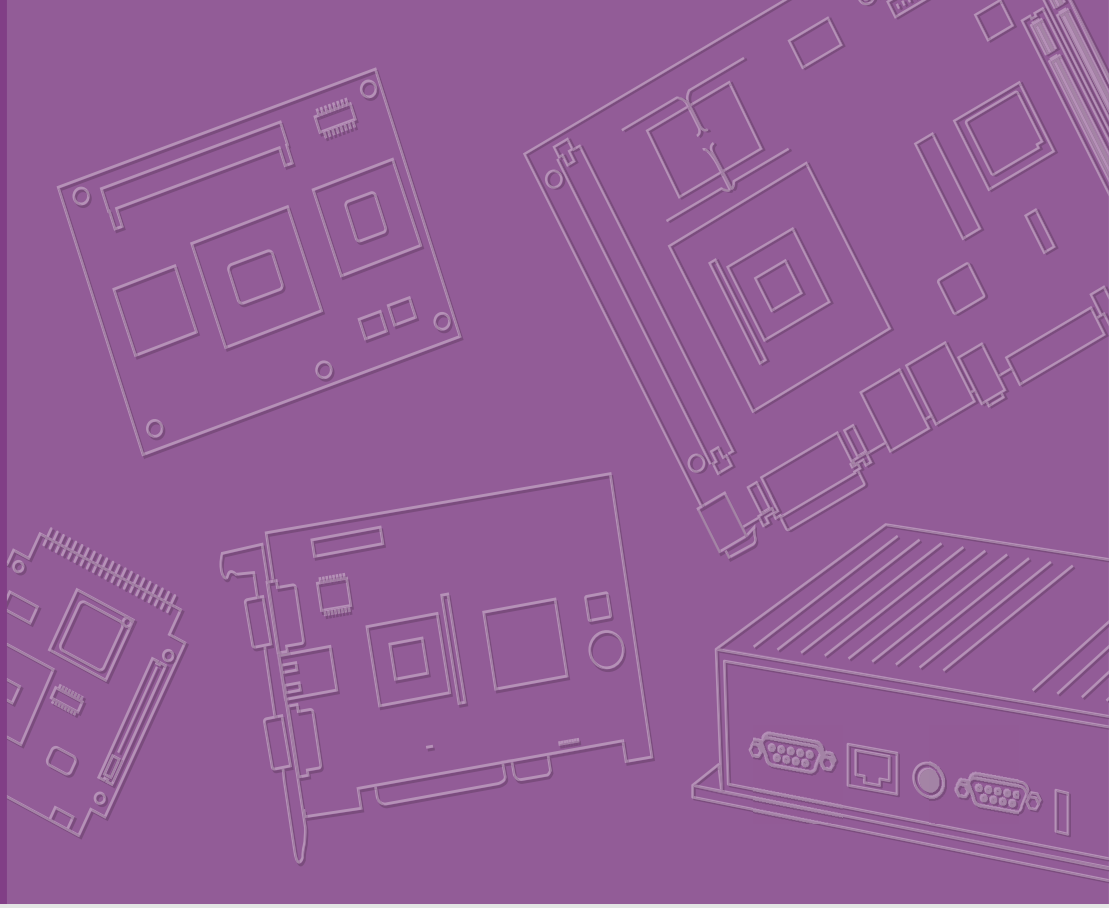

User Manual

ROM-5722

NXP i.MX8M Plus Cortex®-A53 SMARC 2.1 Computer-on-Module

ADVANTECH

Enabling an Intelligent Planet

Copyright

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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. Edition 1

Printed in China October 2023

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-5722
- 1 x china rohs

Optional Accessories

Part No.	Description
96PSA-A36W12R1-3	ADAPTER 100-240V 36W 12V 3A
1700001524	Power cord 3P UL 10A 125 V 180 cm
170203180A	Power Code 3P UK 2.5A/3A 250V 1.83cm
170203183C	Power Code 3P Europe 183cm
1700019146	Power Cord CCC 3P 10A 250V 183cm
SQF-ISDM1-16G-21E	SQ Flash SD card UHS-I MLC 16GB (-40 ~ 85 °C)
SQF-ISDM1-16G-21C	SQ Flash SD card UHS-I MLC 16GB (0 ~ 70 °C)
EWM-C117FL06E*	LTE 4G,3G WCDMA/DC-HSPA+, 2G module, MPCI-L280H
1750008303-01	Antenna AN0727-64SP6BSM
1750006009	Antenna Cable SMA (F) to MHF 1.32 25cm
EWM-W163M201E	802.11 a/b/g/n/ac,QCA6174A,2T2R,w/BT4.1,M.2 2230
1750008949-01	Cable Ant.SMA/F-R-BH MHF4/113 BLK L35
1750008717-01	Dipole Ant. D.B 2.4/5G WIFI 3dBi SMA/M-

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

Ordering Information

Part No.	Description
ROM-5722CQ-REA1E	i.MX8M Plus Quad 1.8GHz, LPDDR4 6GB, 0 ~ 60 °C
ROM-5722WQ-REA1E	i.MX8M Plus Quad 1.8GHz, LPDDR4 6GB, -40 ~ 85 °C

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'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.

Contents

Chapter 1

General Information

This chapter gives background information on the ROM-5722.

Sections include:

- Introduction
- Specification

1.1 Introduction

Advantech ROM-5722 SMARC 2.1 Computer-on-Module is powered by NXP i.MX8M Plus SOC which includes up to 4 Arm Cortex-A53 cores in combination with one Cortex-M7 realtime processor and Vivante GC7000UL graphics engine. It provides USB2.0, USB3.2 Gen1By1, Gigabit Ethernet, MIPI-CSI, PCI Express, Dual channel LVDS shared with MIPIDSI for embedded applications.

ROM-5722 is paired with Advantech SOM-DB2510 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 the open-sourced Linux BSP, test utilities, hardware design utilities and reference drivers.

1.2 Product Features

1.2.1 Specification

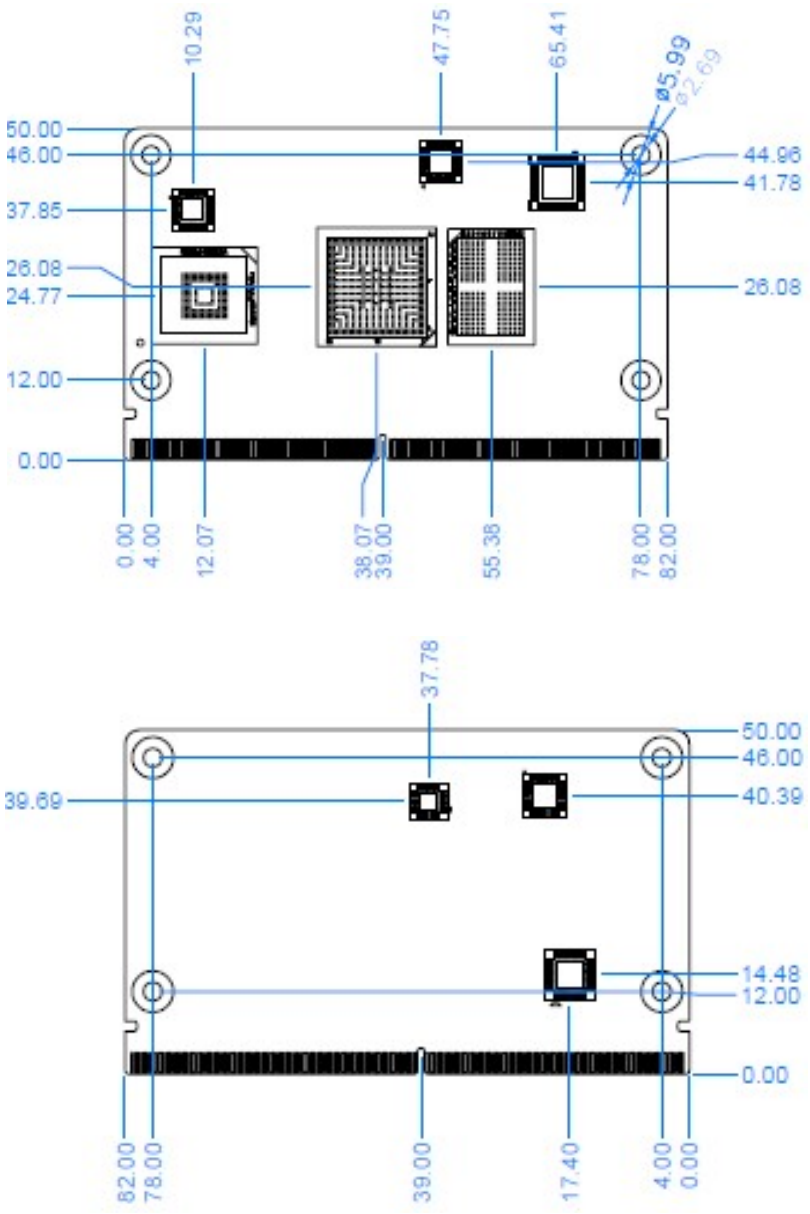
Table 1.1: Specification

Form Factor		SMARC2.0 & SMARC2.1 compliance
Processor System	CPU	NXP i.MX8M Plus Cortex-A53 Quad/Dual core (up to 1.8GHz)
	MCU	1 x Arm Cortex-M7 core
Memory	Technology	LPDDR4 4000MT/s
	Capacity	On-board 4GB/6GB LPDDR4
	Flash	16 GB eMMC NAND Flash for O.S. and 8 MB QSPI NOR Flash for board information
NPU	NPU	2.3 TOP/s Neural Network performance
Graphics	LVDS/MIPI DSI	1 x 4 lane MIPI-DSI & 1 x Single channel LVDS or 1x Dual channel LVDS
	HDMI	1 x HDMI up to 3840 x 2160 at 30Hz
	Parallel RGB	-
	VGA	-
	Graphics Engine	GC7000UL with 2D/3D Graphic Acceleration supporting 1G Pixel/s, OpenVG 1.1, Open GL ES3.1, Vulkan, and Open CL 1.2 FP.
	H/W Video Codec	Decoder: H.265, H.264, VP8/9 1080p Encoder:H.264, VP8 1080p
Ethernet	Chipset	2 x NXP i.MX8M Plus integrated RGMII
	Speed	2 x 10/100/1000 Mbps
RTC	RTC	Yes
WatchDog Timer		Yes (1~6553s, power on/off 4s)
Security		TPM 2.0

Table 1.1: Specification		
I/O	PCIe	1 x PCIe 3.0
	SATA	-
	USB	2 USB3.2 Gen1By1 4 USB 2.0 1 USB 2.0 OTG
	Audio	2 x I2S
	SPDIF	-
	SDIO	1
	Serial Port	2 x 4-wire UART and 2 x 2-wire UART
	SPI	3
	CAN	2 (CANbus for ROM-5722C*, CAN-FD for ROM-5722W*)
	GPIO	14
	I2C	5
	Camera Input	1 x 4-lane MIPI CSI, 1 x 2-lane MIPI CSI
	System Bus	-
	Touch	-
	Keypad	-
Power	Power Supply Voltage	Fixed 5V DC source and allow 3.3 V ~ 5.25 V operates directly from single level Lithium Ion cells
	Power Consumption	4W
Environment	Operating Temperature	0 ~ 60 °C/ -40 ~ 85 °C
	Operating Humidity	5 ~ 95% relative humidity, non-condensing
Mechanical	Dimensions (W x D)	82 x 50 mm
Operation System		Yocto Linux
Certifications		CE/FCC Class B

1.3 Mechanical Specifications

- Dimension: 82 x 50 mm



1.4 Electrical Specifications

- **Power supply Voltage:** 5V
- **Power Supply Current:**

Model	Kemel idle	Maximum mode
ROM-5722	1.91W	3.69W

1.5 Environmental Specifications

- **Operating temperature:** 0~60 °C/-40~85 °C
- **Operating humidity:** 0% ~ 90% relative humidity, non-condensing
- **Storage temperature:** -40~85 °C (-40~185 °F)
- **Storage humidity:** 60 °C @ 95% RH Non-condensing

Chapter 2

H/W Installation

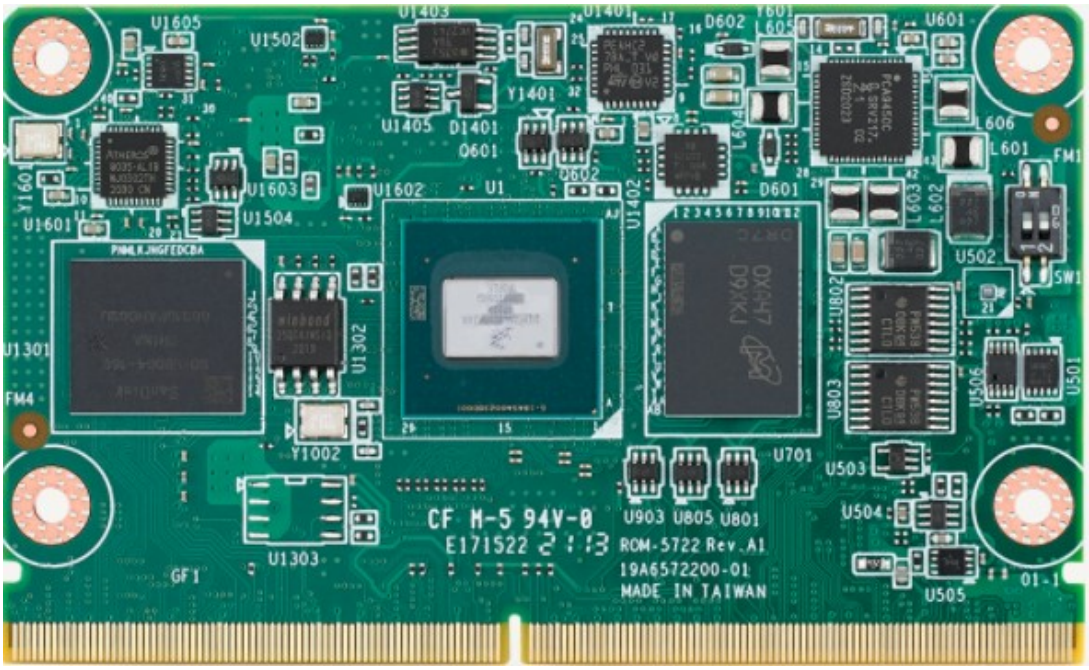
This chapter gives mechanical and connector information on the ROM-5722.

Sections include:

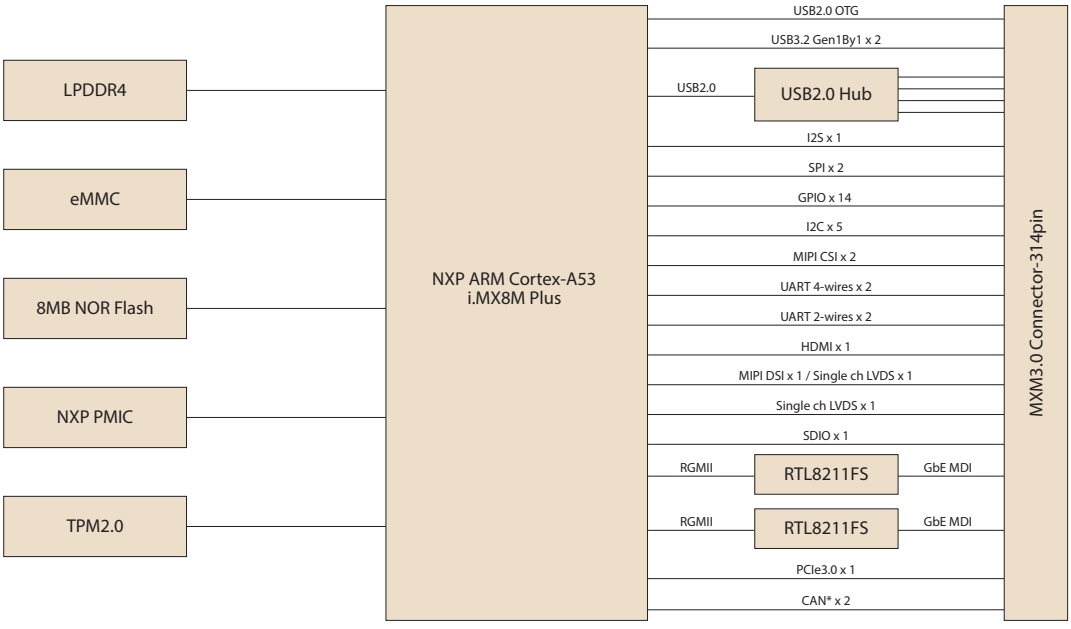
- Connector Information
- Mechanical Drawing
- Quick Start Guide

2.1 Board Connectors

The following sections show the external connectors and pin assignments for applications.



2.2 Block Diagram



Chapter 3

Software Functionality

This chapter details the software programs on the ROM-5722 platform.

3.1 Pin Definition

Table 3.1: P-Pin

P-Pin	SMARC 2.1.1	i.MX 8M Plus
P1	SMB_ALERT#	SMB_ALERT#
P2	GND	GND
P3	CSI1_CK+	MIPI_CSI1_CLK+
P4	CSI1_CK-	MIPI_CSI1_CLK-
P5	GBE1_SDP	GBE1_SDP
P6	GBE0_SDP	GBE0_SDP
P7	CSI1_RX0+	MIPI_CSI1_D0+
P8	CSI1_RX0-	MIPI_CSI1_D0-
P9	GND	GND
P10	CSI1_RX1+	MIPI_CSI1_D1+
P11	CSI1_RX1-	MIPI_CSI1_D1-
P12	GND	GND
P13	CSI1_RX2+	MIPI_CSI1_D2+
P14	CSI1_RX2-	MIPI_CSI1_D2-
P15	GND	GND
P16	CSI1_RX3+	MIPI_CSI1_D3+
P17	CSI1_RX3-	MIPI_CSI1_D3-
P18	GND	GND
P19	GBE0_MDI3-	GBE0_MDI3-
P20	GBE0_MDI3+	GBE0_MDI3+
P21	GBE0_LINK100#	GBE0_LED_10_100#
P22	GBE0_LINK1000#	GBE0_LED_1000#
P23	GBE0_MDI2-	GBE0_MDI2-
P24	GBE0_MDI2+	GBE0_MDI2+
P25	GBE0_LINK_ACT#	GBE0_LED_ACT#
P26	GBE0_MDI1-	GBE0_MDI1-
P27	GBE0_MDI1+	GBE0_MDI1+
P28	GBE0_CTREF	N/A
P29	GBE0_MDI0-	GBE0_MDI0-
P30	GBE0_MDI0+	GBE0_MDI0+
P31	SPI0_CS1#	ECSPI1_SS1#
P32	GND	GND
P33	SDIO_WP	SD2_WP
P34	SDIO_CMD	SD2_CMD
P35	SDIO_CD#	SD2_CD#
P36	SDIO_CK	SD2_CLK
P37	SDIO_PWR_EN	SD2_RESET#
P38	GND	GND
P39	SDIO_D0	SD2_DATA0
P40	SDIO_D1	SD2_DATA1
P41	SDIO_D2	SD2_DATA2
P42	SDIO_D3	SD2_DATA3
P43	SPI0_CS0#	ECSPI1_SS0#

Table 3.1: P-Pin		
P44	SPI0_CK	ECSPI1_SCLK
P45	SPI0_DIN	ECSPI1_MISO
P46	SPI0_DO	ECSPI1_MOSI
P47	GND	GND
P48	SATA_TX+	N/A
P49	SATA_TX-	N/A
P50	GND	GND
P51	SATA_RX+	N/A
P52	SATA_RX-	N/A
P53	GND	GND
P54	SPI1_CS0# / ESPI_CS0# / QSPI_CS0#	ECSPI2_SS0#
P55	SPI1_CS1# / ESPI_CS1# / QSPI_CS1#	ECSPI2_SS1#
P56	SPI1_CK / ESPI_CK / QSPI_CK	ECSPI2_SCLK
P57	SPI1_DIN / ESPI_IO_1 / QSPI_IO_1	ECSPI2_MISO
P58	SPI1_DO / ESPI_IO_0 / QSPI_IO_0	ECSPI2_MOSI
P59	GND	GND
P60	USB0+	USB0+
P61	USB0-	USB0-
P62	USB0_EN_OC#	USB0_EN_OC#
P63	USB0_VBUS_DET	USB0_VBUS_DET
P64	USB0_OTG_ID	USB0_OTG_ID
P65	USB1+	USB1+
P66	USB1-	USB1-
P67	USB1_EN_OC#	USB1_OC#
P68	GND	GND
P69	USB2+	USB2+
P70	USB2-	USB2-
P71	USB2_EN_OC#	USB2_OC#
P72	RSVD	N/A
P73	RSVD	N/A
P74	USB3_EN_OC#	USB3_OC#
<Key>	<Key>	?
P75	PCIE_A_RST#	PCIE_A_RST#
P76	USB4_EN_OC#	USB4_OC#
P77	PCIE_B_CKREQ#	N/A
P78	PCIE_A_CKREQ#	PCIE_CLKREQ#
P79	GND	GND
P80	PCIE_C_REFCK+	N/A
P81	PCIE_C_REFCK-	N/A
P82	GND	GND
P83	PCIE_A_REFCK+	PCIE_REF_CLK_OUT+
P84	PCIE_A_REFCK-	PCIE_REF_CLK_OUT-
P85	GND	GND
P86	PCIE_A_RX+	PCIE_RX+
P87	PCIE_A_RX-	PCIE_RX-
P88	GND	GND
P89	PCIE_A_TX+	PCIE_TX+

Table 3.1: P-Pin		
P90	PCIE_A_TX-	PCIE_TX-
P91	GND	GND
P92	HDMI_D2+ / DP1_LANE0+	HDMI_TX2+
P93	HDMI_D2- / DP1_LANE0-	HDMI_TX2-
P94	GND	GND
P95	HDMI_D1+ / DP1_LANE1+	HDMI_TX1+
P96	HDMI_D1- / DP1_LANE1-	HDMI_TX1-
P97	GND	GND
P98	HDMI_D0+ / DP1_LANE2+	HDMI_TX0+
P99	HDMI_D0- / DP1_LANE2-	HDMI_TX0-
P100	GND	GND
P101	HDMI_CK+ / DP1_LANE3+	HDMI_TXC+
P102	HDMI_CK- / DP1_LANE3-	HDMI_TXC-
P103	GND	GND
P104	HDMI_HPD / DP1_HPD	HDMI_HPD
P105	HDMI_CTRL_CK / DP1_AUX+	HDMI_DDC_SCL
P106	HDMI_CTRL_DAT / DP1_AUX-	HDMI_DDC_SDA
P107	DP1_AUX_SEL	N/A
P108	GPIO0 / CAM0_PWR#	GPIO0
P109	GPIO1 / CAM1_PWR#	GPIO1
P110	GPIO2 / CAM0_RST#	GPIO2
P111	GPIO3 / CAM1_RST#	GPIO3
P112	GPIO4 / HDA_RST#	GPIO4
P113	GPIO5 / PWM_OUT	GPIO5
P114	GPIO6 / TACHIN	GPIO6
P115	GPIO7	GPIO7
P116	GPIO8	GPIO8
P117	GPIO9	GPIO9
P118	GPIO10	GPIO10
P119	GPIO11	GPIO11
P120	GND	GND
P121	I2C_PM_CK	I2C6_SCL
P122	I2C_PM_DAT	I2C6_SDA
P123	BOOT_SEL0#	BOOT_SEL0#
P124	BOOT_SEL1#	BOOT_SEL1#
P125	BOOT_SEL2#	BOOT_SEL2#
P126	RESET_OUT#	RESET_OUT#
P127	RESET_IN#	RESET_IN#
P128	POWER_BTN#	POWER_BTN#
P129	SER0_TX	UART3_TXD
P130	SER0_RX	UART3_RXD
P131	SER0_RTS#	UART3_RTS#
P132	SER0_CTS#	UART3_CTS#
P133	GND	GND
P134	SER1_TX	UART4_TXD
P135	SER1_RX	UART4_RXD
P136	SER2_TX	UART1_TXD

Table 3.1: P-Pin		
P137	SER2_RX	UART1_RXD
P138	SER2_RTS#	UART1_RTS#
P139	SER2_CTS#	UART1_CTS#
P140	SER3_TX	UART2_TXD
P141	SER3_RX	UART2_RXD
P142	GND	GND
P143	CAN0_TX	CAN1_TX
P144	CAN0_RX	CAN1_RX
P145	CAN1_TX	CAN2_TX
P146	CAN1_RX	CAN2_RX
P147	VDD_IN	VDD_IN
P148	VDD_IN	VDD_IN
P149	VDD_IN	VDD_IN
P150	VDD_IN	VDD_IN
P151	VDD_IN	VDD_IN
P152	VDD_IN	VDD_IN
P153	VDD_IN	VDD_IN
P154	VDD_IN	VDD_IN
P155	VDD_IN	VDD_IN
P156	VDD_IN	VDD_IN

Table 3.2: S-Pin		
S-Pin	**SMARC 2.1.1**	**i.MX 8M Plus**
S1	CSI1_TX+ / I2C_CAM1_CK	I2C2_SCL
S2	CSI1_TX- / I2C_CAM1_DAT	I2C2_SDA
S3	GND	GND
S4	RSVD	N/A
S5	I2C_CAM0_CK / CSI0_TX+	I2C3_SCL
S6	CAM_MCK	CLKO1
S7	I2C_CAM0_DAT / CSI0_TX-	I2C3_SDA
S8	CSI0_CK+	MIPI_CSI2_CLK+
S9	CSI0_CK-	MIPI_CSI2_CLK-
S10	GND	GND
S11	CSI0_RX0+	MIPI_CSI2_D0+
S12	CSI0_RX0-	MIPI_CSI2_D0-
S13	GND	GND
S14	CSI0_RX1+	MIPI_CSI2_D1+
S15	CSI0_RX1-	MIPI_CSI2_D1-
S16	GND	GND
S17	GBE1_MDI0+	GBE1_MDI0+
S18	GBE1_MDI0-	GBE1_MDI0-
S19	GBE1_LINK100#	GBE1_LED_10_100#
S20	GBE1_MDI1+	GBE1_MDI1+
S21	GBE1_MDI1-	GBE1_MDI1-
S22	GBE1_LINK1000#	GBE1_LED_1000#
S23	GBE1_MDI2+	GBE1_MDI2+

Table 3.2: S-Pin		
S24	GBE1_MDI2-	GBE1_MDI2-
S25	GND	GND
S26	GBE1_MDI3+	GBE1_MDI3+
S27	GBE1_MDI3-	GBE1_MDI3-
S28	GBE1_CTREF	N/A
S29	PCIE_D_TX+ / SERDES_0_TX+	N/A
S30	PCIE_D_TX- / SERDES_0_TX-	N/A
S31	GBE1_LINK_ACT#	GBE1_LED_ACT#
S32	PCIE_D_RX+ / SERDES_0_RX+	N/A
S33	PCIE_D_RX- / SERDES_0_RX-	N/A
S34	GND	GND
S35	USB4+	USB4+
S36	USB4-	USB4-
S37	USB3_VBUS_DET	N/A
S38	AUDIO_MCK	SAI3_MCLK
S39	I2S0_LRCK	SAI3_TXFS
S40	I2S0_SDOUT	SAI3_TXD0
S41	I2S0_SDIN	SAI3_RXD0
S42	I2S0_CK	SAI3_TXC
S43	ESPI_ALERT0#	N/A
S44	ESPI_ALERT1#	N/A
S45	MDIO_CLK	N/A
S46	MDIO_DAT	N/A
S47	GND	GND
S48	I2C_GP_CK	I2C5_SCL
S49	I2C_GP_DAT	I2C5_SDA
S50	I2S2_LRCK / HDA_SYNC	SAI2_TXFS
S51	I2S2_SDOUT / HDA_SDO	SAI2_TXD0
S52	I2S2_SDIN / HDA_SDI	SAI2_RXD0
S53	I2S2_CK / HDA_CK	SAI2_TXC
S54	SATA_ACT#	N/A
S55	USB5_EN_OC#	N/A
S56	ESPI_IO_2 / QSPI_IO_2	N/A
S57	ESPI_IO_3 / QSPI_IO_3	N/A
S58	ESPI_RESET#	N/A
S59	USB5+	N/A
S60	USB5-	N/A
S61	GND	GND
S62	USB3_SSTX+	USB2_SS_TX+
S63	USB3_SSTX-	USB2_SS_TX-
S64	GND	GND
S65	USB3_SSRX+	USB2_SS_RX+
S66	USB3_SSRX-	USB2_SS_RX-
S67	GND	GND
S68	USB3+	USB3+
S69	USB3-	USB3-
S70	GND	GND

Table 3.2: S-Pin		
S71	USB2_SSTX+	USB1_SS_TX+
S72	USB2_SSTX-	USB1_SS_TX-
S73	GND	GND
S74	USB2_SSRX+	USB1_SS_RX+
S75	USB2_SSRX-	USB1_SS_RX-
<Key>	<Key>	?
S76	PCIE_B_RST#	N/A
S77	PCIE_C_RST#	N/A
S78	PCIE_C_RX+ / SERDES_1_RX+	N/A
S79	PCIE_C_RX- / SERDES_1_RX-	N/A
S80	GND	GND
S81	PCIE_C_TX+ / SERDES_1_TX+	N/A
S82	PCIE_C_TX- / SERDES_1_TX-	N/A
S83	GND	GND
S84	PCIE_B_REFCK+	N/A
S85	PCIE_B_REFCK-	N/A
S86	GND	GND
S87	PCIE_B_RX+	N/A
S88	PCIE_B_RX-	N/A
S89	GND	GND
S90	PCIE_B_TX+	N/A
S91	PCIE_B_TX-	N/A
S92	GND	GND
S93	DP0_LANE0+	N/A
S94	DP0_LANE0-	N/A
S95	DP0_AUX_SEL	N/A
S96	DP0_LANE1+	N/A
S97	DP0_LANE1-	N/A
S98	DP0_HPD	N/A
S99	DP0_LANE2+	N/A
S100	DP0_LANE2-	N/A
S101	GND	GND
S102	DP0_LANE3+	N/A
S103	DP0_LANE3-	N/A
S104	USB3_OTG_ID	N/A
S105	DP0_AUX+	N/A
S106	DP0_AUX-	N/A
S107	LCD1_BKLT_EN	LCD1_BKLT_EN
S108	LVDS1_CK+ / eDP1_AUX+ / DSI1_CLK+	DSI/LVDS1_CLK+
S109	LVDS1_CK- / eDP1_AUX- / DSI1_CLK-	DSI/LVDS1_CLK-
S110	GND	GND
S111	LVDS1_0+ / eDP1_TX0+ / DSI1_D0+	DSI/LVDS1_D0+
S112	LVDS1_0- / eDP1_TX0- / DSI1_D0-	DSI/LVDS1_D0-
S113	eDP1_HPD / DSI1_TE	DSI1_TE
S114	LVDS1_1+ / eDP1_TX1+ / DSI1_D1+	DSI/LVDS1_D1+
S115	LVDS1_1- / eDP1_TX1- / DSI1_D1-	DSI/LVDS1_D1-
S116	LCD1_VDD_EN	LCD1_VDD_EN

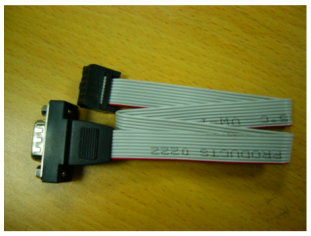
Table 3.2: S-Pin		
S117	LVDS1_2+ / eDP1_TX2+ / DSI1_D2+	DSI/LVDS1_D2+
S118	LVDS1_2- / eDP1_TX2- / DSI1_D2-	DSI/LVDS1_D2-
S119	GND	GND
S120	LVDS1_3+ / eDP1_TX3+ / DSI1_D3+	DSI/LVDS1_D3+
S121	LVDS1_3- / eDP1_TX3- / DSI1_D3-	DSI/LVDS1_D3-
S122	LCD1_BKLT_PWM	PWM3_LCD1_BKLT_PWM
S123	GPIO13	GPIO13
S124	GND	GND
S125	LVDS0_0+ / eDP0_TX0+ / DSI0_D0+	LVDS0_D0+
S126	LVDS0_0- / eDP0_TX0- / DSI0_D0-	LVDS0_D0-
S127	LCD0_BKLT_EN	LCD0_BKLT_EN
S128	LVDS0_1+ / eDP0_TX1+ / DSI0_D1+	LVDS0_D1+
S129	LVDS0_1- / eDP0_TX1- / DSI0_D1-	LVDS0_D1-
S130	GND	GND
S131	LVDS0_2+ / eDP0_TX2+ / DSI0_D2+	LVDS0_D2+
S132	LVDS0_2- / eDP0_TX2- / DSI0_D2-	LVDS0_D2-
S133	LCD0_VDD_EN	LCD0_VDD_EN
S134	LVDS0_CK+ / eDP0_AUX+ / DSI0_CLK+	LVDS0_CLK+
S135	LVDS0_CK- / eDP0_AUX- / DSI0_CLK-	LVDS0_CLK-
S136	GND	GND
S137	LVDS0_3+ / eDP0_TX3+ / DSI0_D3+	LVDS0_D3+
S138	LVDS0_3- / eDP0_TX3- / DSI0_D3-	LVDS0_D3-
S139	I2C_LCD_CK	I2C4_SCL
S140	I2C_LCD_DAT	I2C4_SDA
S141	LCD0_BKLT_PWM	PWM2_LCD0_BKLT_PWM
S142	GPIO12	GPIO12
S143	GND	GND
S144	eDP0_HPD / DSI0_TE	N/A
S145	WDT_TIME_OUT#	WDT_TIME_OUT#
S146	PCIE_WAKE#	PCIE_WAKE#
S147	VDD_RTC	VDD_RTC
S148	LID#	LID#
S149	SLEEP#	SLEEP#
S150	VIN_PWR_BAD#	VIN_PWR_BAD#
S151	CHARGING#	CHARGING#
S152	CHARGER_PRSNT#	CHARGER_PRSNT#
S153	CARRIER_STBY#	CARRIER_STBY#
S154	CARRIER_PWR_ON	CARRIER_PWR_ON
S155	FORCE_RECOV#	FORCE_RECOV#
S156	BATLOW#	BATLOW#
S157	TEST#	TEST#
S158	GND	GND

3.2 Quick Start Guide

3.2.1 Debug Port Connection

1. Connect debug port cable (1701200220) to debug port (COM3) on SOM-DB2510.
2. Connect it to your PC with RS-232 Cable (1700019474).

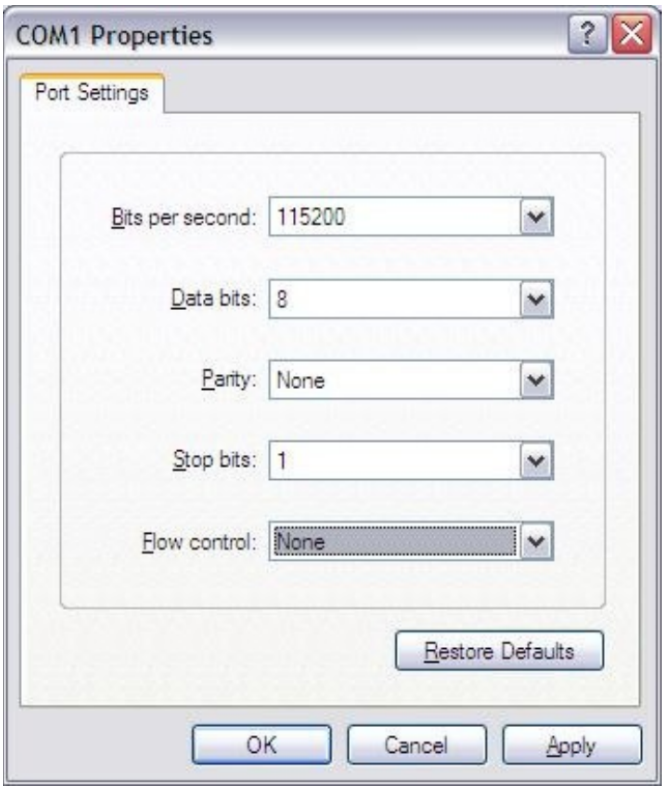
Table 3.3: Debug Port Connection

Item	P/N	Picture
Debug Port Cable	1701200220	
RS-232 Cable	1700019474	

3.2.2 Debug Port Settings

ROM-5722 can communicate with a host server by 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-5722 with your PC by using a serial cable.
2. Open HyperTerminal on your Windows PC, and select the settings as shown in below Photo.



3. Insert power adapter to DC jack and power up the board. The Debug console log will be displayed on the terminal screen.

Chapter 4

Software Functionality

This chapter details the software programs on the ROM-5722 platform.

4.1 Test Tools

All test tools must be verified on the ROM-5620 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.

4.1.1 Display Test

4.1.1.1 HDMI

The default Weston UI will be displayed on the screen.

Step 1: disable weston UI

```
# killall -9 weston
```

Step 2: get “connect ID” and “support resolutions“

```
# modetest -c
```

```
id      encoder status          name            size (mm)       modes   encoders
41      40      connected       HDMI-A-1        510x290         22       40
  modes:
        name refresh (Hz) hdisp hss hse htot vdisp vss vse vtot)
  1920x1080 60 1920 2008 2052 2200 1080 1084 1089 1125 148500 flags: phsync, pvsync; type: pre-
ferred, driver
  1920x1080 50 1920 2448 2492 2640 1080 1084 1089 1125 148500 flags: phsync, pvsync; type: driver
  1280x720 60 1280 1390 1430 1650 720 725 730 750 74250 flags: phsync, pvsync; type: driver
  1280x720 50 1280 1720 1760 1980 720 725 730 750 74250 flags: phsync, pvsync; type: driver
  1440x576 50 1440 1464 1592 1728 576 581 586 625 54000 flags: nhsync, nvsync; type: driver
  1440x480 60 1440 1472 1596 1716 480 489 495 525 54000 flags: nhsync, nvsync; type: driver
  720x576 50 720 732 796 864 576 581 586 625 27000 flags: nhsync, nvsync; type: driver
  720x480 60 720 736 798 858 480 489 495 525 27000 flags: nhsync, nvsync; type: driver
  props:
```

Step 3: play colorbar of the specified resolution on hdmi

```
# modetest -s 41:1920x1080-60
```

4.1.1.2 Single Channel LVDS (Single LVDS0 or Single LVDS1)

The default Weston UI will be displayed on the screen.

- LVDS0 - g070vw01v0(VDD:3.3V, Backlight Power:12V)

Step 1: Connect LVDS VDD and Backlight Power cable

Step 2: power on

Step 3: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=>setenv fdt_file imx8mp-rom5722-a1-lvds0-auo.dtb; boot
```

Step 4: Weston UI will be displayed on the screen.

- LVDS1 - g070vw01v0(VDD:3.3V, Backlight Power:12V)

Step 1: Connect LVDS VDD and Backlight Power cable

Step 2: power on

Step 3: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=>setenv fdt_file imx8mp-rom5722-a1-lvds1-auo.dtb; boot
```

Step 4: Weston UI will be displayed on the screen.

- Dual Channel LVDS - g215hvn0 (VDD:5V, Backlight Power:12V)

Step 1: Connect two LVDS VDD and Backlight Power cable

Step 2: power on

Step 3: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rom5722-a1-lvds-dual.dtb; boot
```

Step 4: Weston UI will be displayed on the screen.

4.1.1.3 MIPI to HDMI test

Step 1: Connect MIPI to HDMI cable to LVDS

Step 2: power on

Step 3: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=>setenv fdt_file imx8mp-rom5722-a1-adv7535.dtb; boot
```

Step 4: Weston UI will be displayed on the screen.

- Display test (MIPI DSI- g101uan02) (VDD:3.3V, Backlight Power:5V)

Step 1: Connect LVDS VDD and Backlight Power cable

Step 2: power on

Step 3: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rom5722-a1-auog101uan02.dtb; boot
```

Step 4: Weston UI will be displayed on the screen.

4.1.2 Audio Test

Check audio codec

```
# cat /proc/asound/cards
 0 [sgtl5000       ]: sgtl5000 - sgtl5000
                      sgtl5000
1 [audiohdmi      ]: audio-hdmi - audio-hd
```

- Audio codec(sgtl5000):

  Set MIC and headphone

```
# amixer set Mic 32%
Simple mixer control 'Mic',0
  Capabilities: volume volume-joined
  Playback channels: Mono
  Capture channels: Mono
  Limits: 0 - 3
  Mono: 1 [33%] [20.00dB]
# amixer set Lineout 100%
Simple mixer control 'Lineout',0
  Capabilities: pvolume
  Playback channels: Front Left - Front Right
  Limits: Playback 0 - 31
  Mono:
  Front Left: Playback 31 [100%] [0.00dB]
  Front Right: Playback 31 [100%] [0.00dB]
# amixer set PCM 100%
Simple mixer control 'PCM',0
  Capabilities: pvolume
  Playback channels: Front Left - Front Right
  Limits: Playback 0 - 192
  Mono:
  Front Left: Playback 192 [100%]
  Front Right: Playback 192 [100%]
```

  Record and playback

```
# arecord -t wav -c 1 -r 44100 -d 5 /tmp/mic.wav
# aplay /tmp/mic.wav
```

4.1.3 PCIE Test

- Test 3G/4G (EWM-W189H02E)

  Connect the PCIE card to PCIE slot.

  Execute the pppd to connect the network.

```
# ppd connect 'chat -v -s -t 10 "" "AT" "" "ATDT*99***4#" "CONNECT"
""' user username password password /dev/ttyACM2 460800 nodetach
crtscts debug usepeerdns defaultroute &
```

4.1.4 M.2 test

- Test Wifi (EWM-W163M201E - PCIE)

```
# killall wpa_supplicant
# ifconfig wlan0 up
# wpa_passphrase "SSID" "PASSWORD" > /tmp/wpa.conf
# wpa_supplicant -BDwext -iwlan0 -c/tmp/wpa.conf
# udhcpc -b -i wlan0
```

Ping network

```
ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=2.10 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=2.10 ms
```

- Test Bluetooth (EWM-W163M201E - USB)

```
$ 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
```

4.1.5 UART Test

- RS-232 test

  Loopback test (eg. ttymxc1)

```
# stty -F /dev/ttymxc1 -echo -onlcr 115200
# cat /dev/ttymxc1 &
# echo "Serial Port Test" > /dev/ttymxc1
```

- RS-485 test

  Set SOM-DB2510 SW1 and SW2 jumper to switch modes. (01: 485, 11: 422)

  Test RS-485 with Adam-4520.

```
#./enable485 /dev/ttymxc2
#stty -F /dev/ttyLP1 speed 115200 ignbrk -brkint -icrnl -imaxbel -
opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -
echoke
#cat /dev/ttymxc2 &
#echo test > /dev/ttymxc2
```

4.1.6 I²C Test

Check i²c device(audio codec: 4-000a)

```
root@imx8mprom5722a1:~# i2cdetect -y 4
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:                         -- -- -- -- -- -- -- UU -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: 20 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- 38 -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- UU -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: UU -- -- -- -- -- -- --
```

I²c set and get

```
root@imx8mprom5722a1:~# i2cset -f -y 4 0x0a 0 0xff00 w
root@imx8mprom5722a1:~# i2cget -f -y 4 0x0a 0 w
0x11a0
```

4.1.7 USB Test

USB disk test(2.0/3.0)

After insert usb disk to 2.0 or 3.0 port

```
root@imx8mprom5722a1:~# lsusb -t
/:  Bus 04.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
    |__ Port 1: Dev 2, If 0, Class=Mass Storage, Driver=usb-storage, 5000M
/:  Bus 03.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
    |__ Port 1: Dev 2, If 0, Class=Mass Storage, Driver=usb-storage, 480M
/:  Bus 02.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
    |__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
        |__ Port 1: Dev 7, If 0, Class=Mass Storage, Driver=usb-storage, 480M
```

Test (eg. if usb disk is /dev/sda)

```
# 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
```

4.1.8 RTC Test

Disable rtc sync service

```
root@imx8mprom5722a1:~# systemctl disable ntpd.service
Removed /etc/systemd/system/multi-user.target.wants/ntpd.service.
root@imx8mprom5722a1:~# systemctl stop systemd-timesyncd
root@imx8mprom5722a1:~# systemctl stop ntpdate.service
```

Set system time to current, then write to RTC

```
root@imx8mprom5722a1:~# 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 time from RTC to verify

```
root@imx8mprom5722a1:~# date 010100002000 && hwclock -r && date
Sat Jan  1 00:00:00 UTC 2000
2016-02-17 10:45:06.361513+00:00
Sat Jan  1 00:00:00 UTC 2000
```

restore the RTC time to system time

```
root@imx8mprom5722a1:~# hwclock -s && date
Wed Feb 17 10:45:13 UTC 2016
```

4.1.9 eMMC/SD/SPI Flash Test

eMMC: /dev/mmcblk2

SD: /dev/mmcblk1

QSPI1: /dev/mtd0

SPI0.0: /dev/mtd1

SPI0.1: /dev/mtd2

SPI1.0: /dev/mtd3

SPI1.1: /dev/mtd4

Test (eg. emmc)

```
# 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
```

4.1.10 Ethernet Test

- Check Ethernet device

```
root@imx8mprom5722a1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 74:fe:48:67:67:cc
          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)

eth0:0    Link encap:Ethernet  HWaddr 74:fe:48:67:67:cc
          inet addr:192.168.0.1  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1

eth1      Link encap:Ethernet  HWaddr 74:fe:48:67:67:cd
          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:50

eth1:0    Link encap:Ethernet  HWaddr 74:fe:48:67:67:cd
          inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          Interrupt:50

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:676 errors:0 dropped:0 overruns:0 frame:0
          TX packets:676 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:42474 (41.4 KiB)  TX bytes:42474 (41.4 KiB)
```

- Connect cable and ping test (eg. Eth0)

```
root@imx8mprom5722a1:~# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=114 time=3.40 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=114 time=3.81 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=114 time=4.92 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=114 time=3.55 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=114 time=3.61 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=114 time=3.49 ms
```

4.1.11 GPIO Test

Table 4.1: GPIO pin

Pin#	Number
GPIO0	114
GPIO1	115
GPIO2	124
GPIO3	125
GPIO4	123
GPIO5	133
GPIO6	154
GPIO7	155
GPIO8	506
GPIO9	507
GPIO10	508
GPIO11	509
GPIO12	510
GPIO13	511

- Loopback test (take GPIO0 and GPIO1 as an example)

  Step 1: connect GPIO0 and GPIO1

  Step 2: export GPIO interface

```
root@imx8mprom5722a1:~# echo 114 > /sys/class/gpio/export
root@imx8mprom5722a1:~# echo 115 > /sys/class/gpio/export
```

  Step 3: set direction

```
root@imx8mprom5722a1:~# echo out > /sys/class/gpio/gpio1/direction
root@imx8mprom5722a1:~# echo in > /sys/class/gpio/gpio2/direction
```

  Step 4: read value and set output value than check

```
root@imx8mprom5722a1:~# cat /sys/class/gpio/gpio2/value
0
root@imx8mprom5722a1:~# echo 1 > /sys/class/gpio/gpio1/value
root@imx8mprom5722a1:~# cat /sys/class/gpio/gpio2/value
1
```

4.1.12 Watchdog Test

System will reboot after 1 sec

```
root@imx8mprom5722a1:~# /unit_tests/Watchdog/wdt_driver_test.out 1 2 0

---- Running < /unit_tests/Watchdog/wdt_driver_test.out > test ----

Starting wdt_driver (timeout: 1, sleep: 2, test: ioctl)
Trying to set timeout value=1 seconds
The actual timeout was set to 10 seconds
Now reading back -- The timeout is 10 seconds

U-Boot SPL 2020.04-5722A1AIM30LIVA0386+ge9fc180545 (Jan 05 2022 - 02:21:38 +0000)
```

4.1.13 Camera Test

Please connect MIPI-CSI2 camera (OV5640) to CN39 FPC connector

Preview

```
# gst-launch-1.0 v4l2src device=/dev/video0 ! video/x-
raw,width=640,height=480 ! waylandsink
```

Capture

```
# gst-launch-1.0 v4l2src num-buffers=1 device=/dev/video0 ! video/x-
raw,width=640,height=480 ! jpegenc ! filesink location=sample.jpeg
```

4.1.14 CANbus Test

- MIPI CSI0 – ov5640

  Preview

```
# gst-launch-1.0 v4l2src device=/dev/video0 ! video/x-
raw,width=640,height=480 ! waylandsink
```

  Capture

```
# gst-launch-1.0 v4l2src num-buffers=1 device=/dev/video0 ! video/x-
raw,width=640,height=480 ! jpegenc ! filesink location=sample.jpeg
```

- MIPI CSI1 – ov5640

  Preview

```
# gst-launch-1.0 v4l2src device=/dev/video1 ! video/x-
raw,width=640,height=480 ! waylandsink
```

  Capture

```
# gst-launch-1.0 v4l2src num-buffers=1 device=/dev/video1 ! video/x-
raw,width=640,height=480 ! jpegenc ! filesink location=sample.jpeg
```

- MIPI CSI0 – Basler Camera

  Step 1: Connect the HDMI.

  Step 2: press enter after boot, system will stop at u-boot as below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rom5722-a1-basler.dtb; boot
```

Preview

```
# gst-launch-1.0 -v v4l2src device=/dev/video0 ! waylandsink
```

Capture

```
# gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=2 ! jpegenc
! multifilesink location=sample0.jpeg max-files=1
```

4.1.15 TPM Test

- Using the tpm_test.bin to test

```
root@imx8mprom5722a1:~# cp /run/media/sda1/tpm_test.bin .
root@imx8mprom5722a1:~# ls
tpm_test.bin
root@imx8mprom5722a1:~# ./tpm_test.bin
[TPM Command]
80010000000C000001440000
[TPM Response]
80010000000A00000100

[TPM Command]
80010000000B0000014301
[TPM Response]
80010000000A00000000

[TPM Command]
8001000000160000017A00000060000010500000001
[TPM Response]
80010000001B00000000010000000600000001000010553544D20

[TPM Command]
8001000000160000017A000000060000010B00000002
[TPM Response]
8001000000230000000001000000060000000200000010B004900410000010C44A01A17

root@imx8mprom5722a1:~#
```

4.1.16 CAN Bus Test

- Step 2: Set can0 and can1 up

```
root@imx8mprom5722a1:~#  ip link set can0 up type can bitrate 125000
[ 1362.935162] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
root@imx8mprom5722a1:~# ifconfig can0 up
root@imx8mprom5722a1:~#  ip link set can1 up type can bitrate 125000
[ 1381.546624] IPv6: ADDRCONF(NETDEV_CHANGE): can1: link becomes ready
root@imx8mprom5722a1:~# ifconfig can1 up
```

- Step 3: candump can0

```
root@imx8mprom5722a1:~# candump can0 &
[1] 965
```

- Step 4: cansend can1

```
root@imx8mprom5722a1:~# cansend can1 1F334455#1122334455667788
root@imx8mprom5722a1:~#   can0  1F334455   [8]  11 22 33 44 55 66 77
88
```

4.1.17 EEPROM Test

```
# echo -n $'\x06\x05\x04\x03\x02\x01' > test
# dd if=test of=/sys/bus/i2c/devices/3-0050/eeprom
# hexdump -C /sys/bus/i2c/devices/3-0050/eeprom -n 64
```

4.1.18 Battery Test

```
# cat /sys/class/power_supply/bms/uevent
```

Chapter 5

Embedded OS

This chapter introduces Linux systems instructions.

5.1 Introduction

ROM-5722 platform is preloaded with the Yocto 2.5 based embedded O.S. (Linux kernel starting from 4.14.98). It contains all system-required shell commands and drivers for the ROM-5722 platform. Advantech does not offer an IDE developing environment.

in ROM-5722 BSP. Users can evaluate and develop environments using Ubuntu 16.04 LTS.

The purpose of this chapter is to introduce users to software configuration for ROM-5620 to enable efficient application(s) development.

"For detailed operation, please refer to Yocto Linux BSP Ver.9 User Guide for iMX8 series form Wiki page:

http://ess-wiki.advantech.com.tw/view/IoTGateway/BSP/Linux/iMX8/Yocto_LBV9_User_Guide

5.1.1 Device Tree Source File Select for ROM-3620

5.1.2 Display

A. LVDS

1. g070vw01

adv-imx8mxp-rom3620-a1.dtb

2. g150xgel05

adv-imx8qxp-rom3620-a1-lvds-chimei.dtb

3. g215hvn01

adv-imx8qxp-rom3620-a1-lvds-dual.dtb

B. DSI to HDMI

adv-imx8qxp-rom3620-a1-hdmi-bridge.dtb

C. DSI

1. auog101uan02

adv-imx8qxp-rom3620-a1-auog101uan02.dtb

Chapter 6

System Recovery

This chapter details system recovery for damaged Linux OS.

6.1 System Recovery

This section provides detail procedures of restoring the eMMC image. If you destroy the onboard flash image by accident, you can recover a system following these steps.

6.1.1 Recovery by SD Card

1. Copy 5722A1AIM30LIVA0386_iMX8MP_6G_flash_tool.tgz package to your desktop.
2. Insert SD card to PC.
3. Make a bootable SD card.

```
# tar zxvf 5722A1AIM30LIVA0386_iMX8MP_6G_flash_tool.tgz
# cd 5722A1AIM30LIVA0386_iMX8MP_6G_flash_tool /mk_inand/
# sudo ./mksd-linux.sh /dev/sdg
```

4. Insert SD card and copy 5722A1AIM30LIVA0386_iMX8MP_6G_flash_tool to USB disk.
5. Insert USB disk and SD card then Boot from SD.
6. Enter USB disk folder, make a bootable emmc.

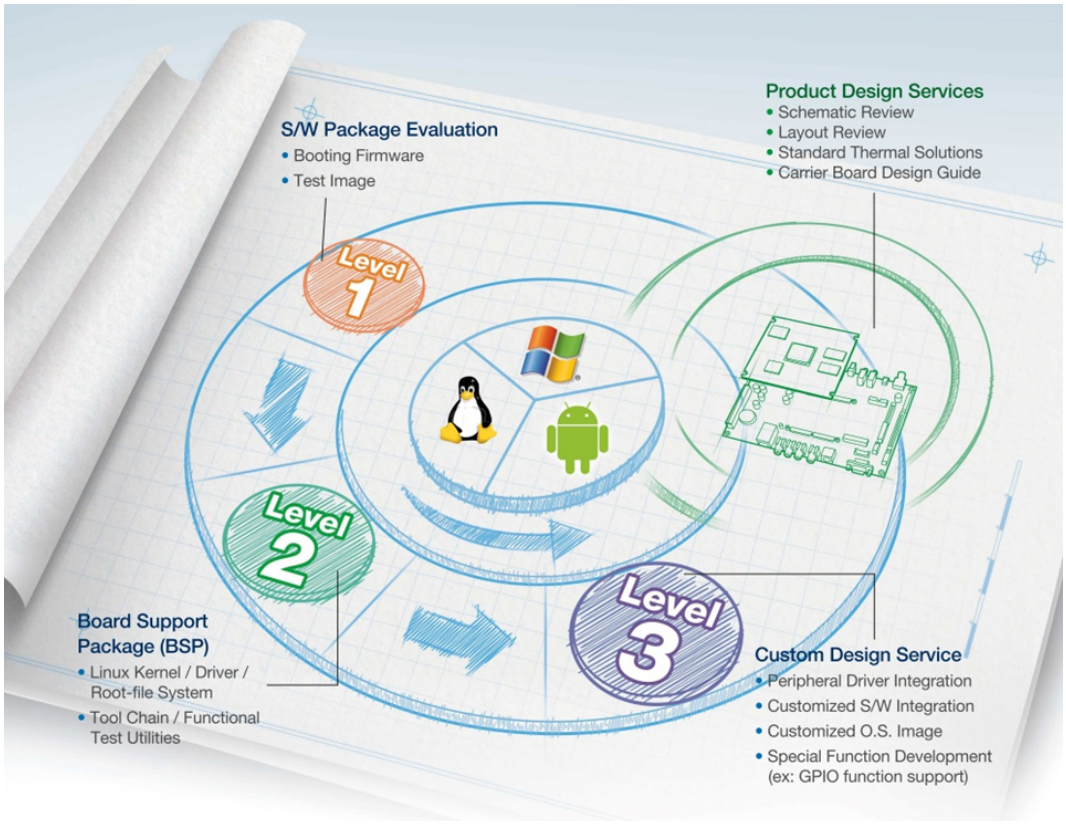
```
# cd /run/media/sda1/
# cd 5722A1AIM30LIVA0386_iMX8MP_6G_flash_tool/mk_inand/
# sudo ./mksd-linux.sh /dev/mmcblk2
```

Chapter 7

Advantech Services

This chapter details Advantech's Design-In serviceability, technical support, and warranty policy for the ROM-5722 evaluation kit.

7.1 RISC Design-in Services



Advantech RISC Design-in Services help customers to 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, root file-system, BSP or other develop tools for customers. It helps customers to easy develop their carrier board and differentiate their embedded products and applications.

- Full Range of RISC Product Offerings
- Comprehensive Document Support

Design Assistance Service

Advantech provides check list for engineer for easy check their schematics and also review service based on customer carrier board schematics. Those services are preventative, and help to catch design errors before they happen. It helps to save a lot of time and costs 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 customer's thermal designs. Advantech provides thermal solution services including modularized thermal solutions and customized thermal solutions.

- Standard Thermal Solutions
- Customized Thermal Solutions

Embedded Software Services

Supports driver, software integration or customized firmware, root file-system and Linux image. Customer can 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 such working models 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 its low power consumption credentials.

Advantech has been involved in the industrial computer industry for many years and found that customers usually have the following questions 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 causes many challenges for them, especially integrating CPU modules into their carrier board.

The acquisition of information

Even if the individual client is able to obtain sufficient information to make the right decision for the specialized vertical application, some customers encounter difficult problems dealing with platform design in general and communicating with CPU or chipset manufacturers, thereby increasing carrier board design difficulties and risk as well as seriously impacting on

Time-to-market and lost market opportunities.

Software development and modification

Compared to x86 architectures, RISC architectures use simpler instruction sets, therefore the software support for x86 platforms cannot be used on RISC platforms. System integrators need to develop software for their system and do the hardware and software integration themselves. Unlike x86 platforms, RISC platforms have less support for Board Support Packages (BSP) and drivers as well. Even though driver support is provided, SIs still have to make a lot of effort to integrate it into the system core. 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, and that can reduce the uncertainties of product development too. 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 helps customers overcome their problems to achieve the most important goal of faster time to market through a streamlined RISC Design-in services.

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

Planning stage

Before deciding to adopt Advantech RISC COM, customers must go through a complete survey process, including product features, specification, and compatibility testing with software. So, 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

Package (BSP) for RISC COM, so that customers can define their product's specifications as well as verifying I/O and performance at the same time. We not only offer hardware planning and technology consulting, but also software evaluation and peripheral module recommendations (such as WiFi, 3G, BT). Resolving customer concerns is Advantech's main target at this stage. Since we all know that product evaluation is the key task in the planning period, especially for performance and specification, so we try to 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 of the carrier board for reference. The carrier board design guide provides pin definitions of the COM connector with limitations and recommendations for carrier board design, so customers can have a clear guideline to follow during their carrier board development. Regarding different form factors, Advantech offers a complete pin-out check list for different 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 is able to assist customers to review the placement/layout and schematics to ensure the carrier board design meets their full requirements. For software development, Advantech RISC software team can assist customers to establish an environment for software development and evaluate 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 proficient consulting services. With Advantech's professional support, the design process becomes much easier and product quality will be improved to meet their targets.

Integration stage

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

Validation stage

After customer's ES sample is completed, the next step is a series of verification steps. 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.

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

7.2 Contact Information

Below is the contact information for Advantech customer service.

Table 7.1: 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 below website, our technical support engineer will provide quick response once the form is filled out:

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

7.3 Global Service Policy

7.3.1 Warranty Policy

Below is the warranty policy of Advantech products:

7.3.1.1 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 years complete and prompt global warranty service. Product defect in design, materials, and workmanship, are covered from the date of shipment.

All customized products will by default carry a 15 months 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.

7.3.1.2 Repairs under Warranty

It is possible to obtain a replacement (Cross-Shipment) during the first 30 days of the purchase, thru 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, 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 customers' expense. The shipping fee for reconstructive products from ADVANTECH back to customers' sites will be at ADVANTECH's expense.

7.3.1.3 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 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 caused 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.
- Product updates/upgrades and tests upon the request of customers who are without warranty.

7.3.2 Repair Process

7.3.2.1 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 web site: 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 D escription". 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.

7.3.2.2 Returning the Product for Repair

It's possible customers can save time and meet end-user requirements by returning defective products to an y 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 s end cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as CPU, DRAM , and CF Card . 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 r responsible for any items not listed. Make sure the "Problem Description" is enclosed.

European Customers that are located outside 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 guide-lines to decrease goods clearance time:

1. Give a low value to the product on the invoice, or additional charges will be lev-ied by customs that will be borne by the sender.
2. Add 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 ship-ment invoice.
4. Add information about Country of origin of goods
   In addition, please attach an invoice with RMA number to the carton, then 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.

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 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.

7.3.2.3 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 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.
- 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 failure caused which ADVANTECH is not responsible whether by accident or other cause.

Please contact your nearest regional service center for detail 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.

7.3.2.4 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.

7.3.2.5 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.

7.3.2.6 Shipping Back to 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 and etc. The customer must bear the extra costs of such alternative shipment. 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.

All product specifications are subject to change without notice.