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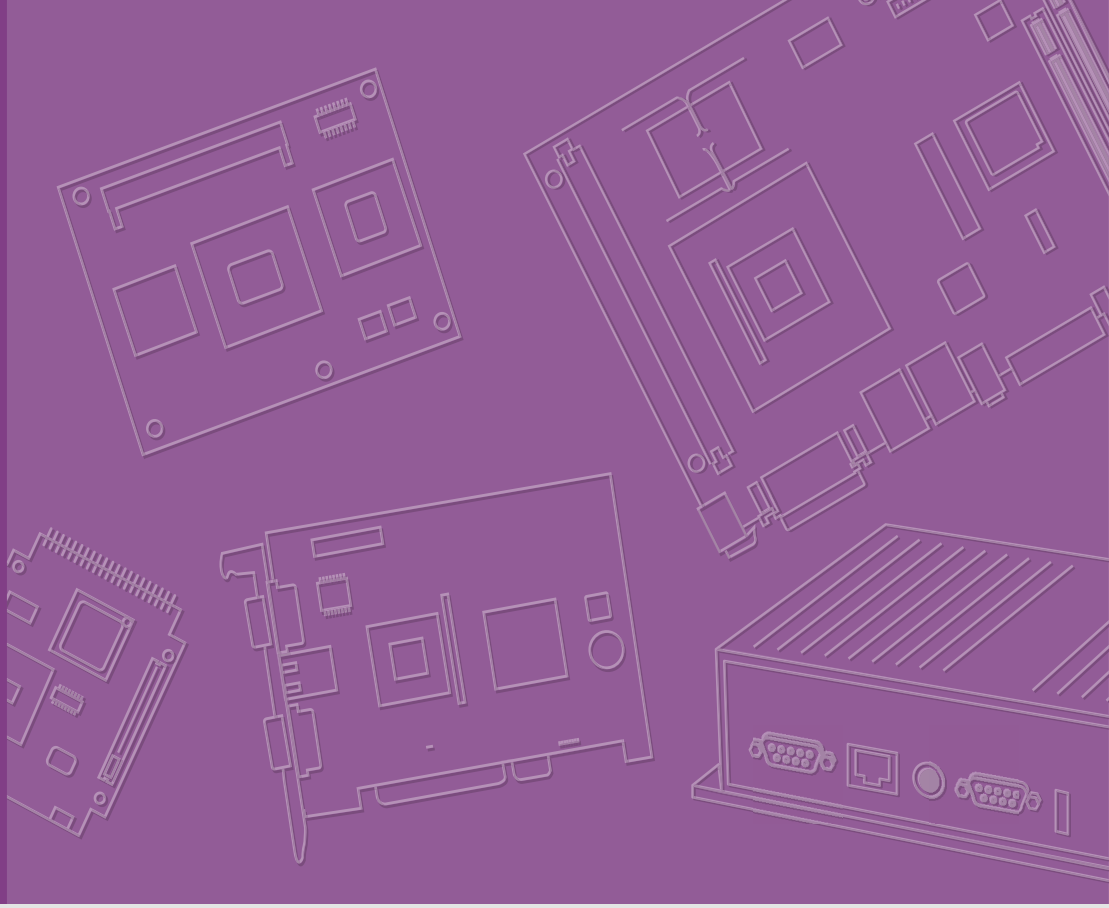


User Manual

# RSB-3720

## NXP i.MX8M Plus Cortex®-A53 2.5" SBC with UIO40-Express

# Copyright



# Acknowledgments



# 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 to be 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 merchandize 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. 2006372000 Edition 1

Printed in China July 2021

# 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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In such cases, users are required to correct the interference at their own expense.

# Packing List

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

- RSB-3720 SBC with Heat Sink (1970004819T001)

# Safety Precautions – Static Electricity

Follow this simple precaution to protect yourself from harm and the products from damage:

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards when the PC is powered on.

# Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment 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. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. 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 from transient overvoltage.
12. Never pour 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 any of the following occurs, have the equipment checked by qualified service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

# Ordering Information

| Part No. | Description |
|---|---|
| RSB-3720CD-BCA1E | 2.5" UIO SBC NXP i.MX8M Plus Dual, 4GB, 0 ~ 60 °C (32 ~ 140 °F) |
| RSB-3720WD-BCA1E | 2.5" UIO SBC NXP i.MX8M Plus Dual, 4GB, -40 ~ 85 °C (-40 ~ 158 °F) |
| RSB-3720CQ-ACA1E | 2.5" UIO SBC NXP i.MX8M Plus Quad, 6GB, 0 ~ 60 °C (32 ~ 140 °F) |
| RSB-3720WQ-ACA1E | 2.5" UIO SBC NXP i.MX8M Plus Quad, 6GB, -40 ~ 85 °C (-40 ~ 158 °F) |

# Optional Accessories

| Part Number | Description |
|---|---|
| 96PSA-A36W12W7-5 | ADP A/D 100-240V 36W 12V C6 LOCK DC JACK 62368 |
| 1700001524 | Power Cord 3P UL 10A 125V 180cm |
| 170203183C | Power Cord 3P Europe (WS-010+WS-083) 183 cm (72 in) |
| 170203180A | Power Cord 3P UK 2.5A/3A 250V 1.83 m (72 in) |
| 1700008921 | Power Cord 3P PSE 183 cm (72 in) |
| 1700100250 | Debug cable 10P-2.0/D-SUB 9P(M) 25 cm (9.8 in) |
| 1700019474 | D-SUB 9P(F)/D-SUB 9P(F) RS232/RS485 100c |
| 1700031429-01 | Line out cable |
| 1700026878-01 | Mic in cable |
| 96LEDK-A070WV40NB1 | LVDS 7" Panel G070VW01 V0 (VDD: 3.3V, Backlight Power: 12V) |
| 1700021883-01 | LVDS Cable |
| 1700032155-01 | LVDS BKLT Cable |
| EWM-W163M201E | 802.11 a/b/g/n/ac,QCA6174A,2T2R,w/BT4.1,M.2 2230 |
| 1750008717-01 | Dipole Ant. D.B 2.4/5G Wi-Fi 3dBi SMA/M-R BLK |
| 1750007965-01 | Antenna Cable R/P SMA (M) to MHF4, 300 mm (11.8 in) |
| EWM-C117FL06E* | LTE 4G,3G WCDMA/DC-HSPA+, 2G module, MPCI-L280H |
| 1750007990-01 | Antenna 4G/LTE full band L=11 cm 50 Ohm |
| 1750006009 | Antenna Cable SMA (F) to MHF 1.32 25 cm (9.8 in) |

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

# Contents

# Chapter 1

## General Introduction

**This chapter details background information on the RSB-3720.**

- Introduction
- Specification

## 1.1 Introduction

Advantech's RSB-3720 is powered by NXP's i.MX 8M Plus Processor — the first Cortex®-A53 based SoC integrated with NPU (Neural Processing Unit). It is capable of providing outstanding Edge AI inference at 2.3 TOPS and delivers excellent performance to Object Detection and Image Segmentation applications. RSB-3720 is a compact 2.5" Single Board Computer that provides advanced I/O and Extension capabilities using UIO40-Express.

### 1.1.1 Product Features

| | | |
|---|---|---|
| Model Name | | RSB-3720 |
| Form Factor | | 2.5" UIO40-Express SBC |
| Processor System | CPU | NXP i.MX8M Plus Cortex-A53 Dual / Quad core (up to 1.8GHz) |
| Memory | Technology | LPDDR4 4000MT/s |
| | Capacity | On-board 4 GB / 6 GB |
| | Flash | 16 GB eMMC Flash for O.S. and 8 MB QSPI NOR Flash for board information |
| NPU | | 2.3 TOPS Neural Network performance |
| Graphics | HDMI | 1 x HDMI 2.0a, up to 3840 x 2160 at 30Hz |
| | LVDS | 1 x Single Channel or 1 Dual Channel 24 Bit LVDS, Backlight Power: 5V/12V, Max. 1A |
| | MIPI-DSI | 1 x 4-Lane MIPI-DSI (shared with LVDS connector by BOM option) |
| | 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: 1080p60 HEVC/H.265 Main, VP9 Profile 0/2, VP8, AVC/H.264 Baseline/Main/High Encoder: 1080p60 AVC/H.264, HEVC/H.265 |
| Ethernet | Chipset | NXP i.MX8M Plus integrated RGMII |
| | Speed | 2 x 10/100/1000 Mbps |
| WatchDog Timer | WatchDog Timer | 1~6553s, power on/off 4s |
| TPM | | TPM 2.0 (ST33HTPH2E32AHB8) |
| RTC | RTC | RTC Battery by 2pin type connector |
| Reset | | 1 x Reset Button |
| I/O | USB | 1 x USB 3.2 Gen 1 By 1 Host, 1 USB 2.0 Host |
| | Audio | 1 x Mic-in / 1 Line-Out by pin header |
| | CAN | 1 x CANBus for RSB-3720CD/CQ or 1 CAN-FD for RSB-3720WD/WQ by COM1 pin header* |
| | Serial Port | 1 x 4 wires RS-232/422/485 by pin header* (default configured as debug console) |
| | Camera Input | 2 x 4-Lane MIPI-CSI2 |
| Rear I/O | UIO40-Express | 1 x USB 3.2 Gen1 By 1, 3 x USB 2.0, 10 x GPIO, 2 x UART, 1 x CANBus, and 1 x I2C |
| Indicator | LED | 1 x Green Power LED |
| | | 1 x Blue Programmable LED |

| | | |
|---|---|---|
| Expansion | Mini PCIe | 1 x Full Size MiniPCIe Slot (USB Signal Only) |
| | M.2 | 1 x M.2 2230 Key E Slot (USB/PCIe/SDIO/UART/I2S) |
| | SD Socket | 1 x Micro SD Socket |
| | SIM Slot | 1 x Nano SIM Slot |
| Power | Power Supply Voltage | 12V DC-IN by lockable DC Jack (or 2pin type connector by BOM option) |
| | Power Consumption | 7.13W |
| Environment | Operational Temperature | 0 ~ 60/-40 ~ 85 °C (0 ~ 140/ -40 ~ 185 °F) |
| | Operating Humidity | 5 ~ 95% Relative Humidity, noncondensing |
| Mechanical | Dimensions (W x D x H) | 100 x 72 x 19 mm (3.93 x 2.83 x 74 in) |
| | Weight | 0.05 kg/.11 lb (0.25 kg/.55 lb with Heat Sink) |
| Operating System | | Yocto 3.0 Linux & Android 10 |
| Certifications | | CE/FCC Class B |

### 1.1.2 Mechanical Specifications

- Dimensions: 100 x 72 mm (3.93 x 2.83 in)
- Height: 19 mm (.74 in)
- Reference Weight: 0.05 kg /.11 lb (0.25 kg/.55 lb with Heat Sink)

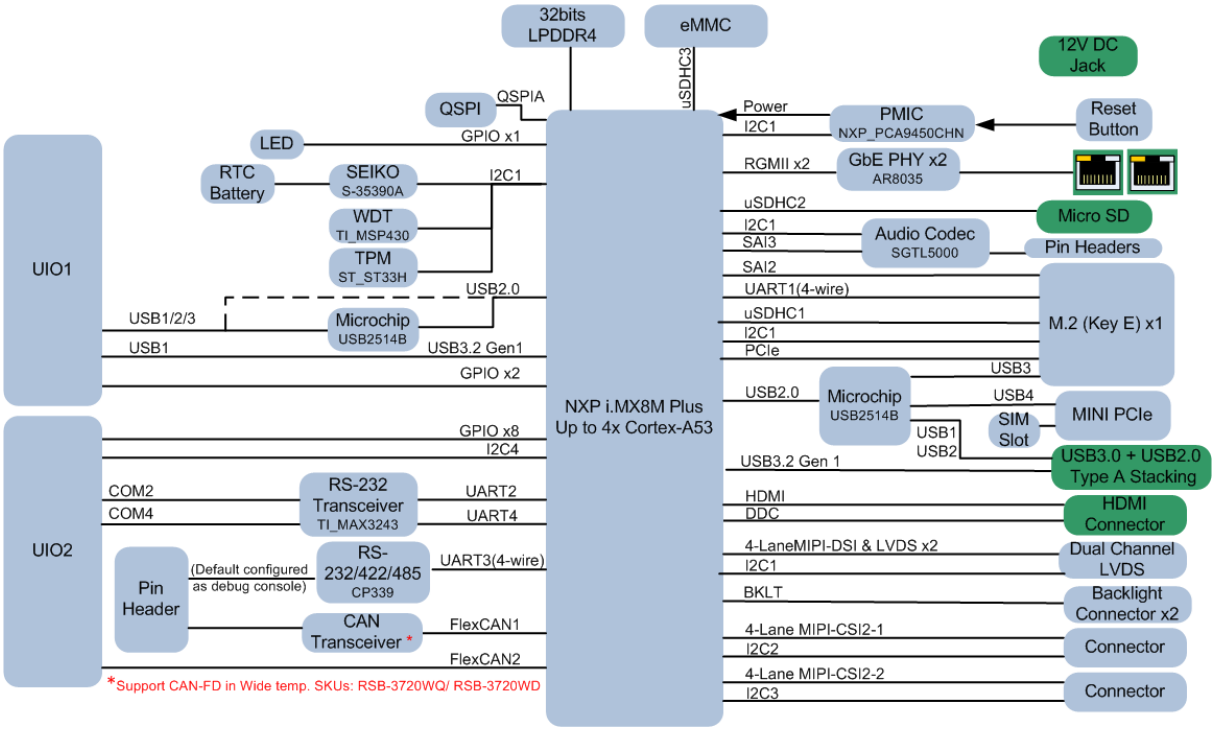
### 1.1.3 Electrical Specifications

- Power Supply Type: DC-in 12V
- RTC Battery:
  - Typical voltage: 3V
  - Normal discharge capacity: 210mAH

### 1.1.4 Environmental Specifications

- Operating Temperature: 0 ~ 60 °C/32 ~ 140 °F; -40 ~ 85 °C/-40 ~ 185 °F
- 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

## 1.1.5 Block Diagram



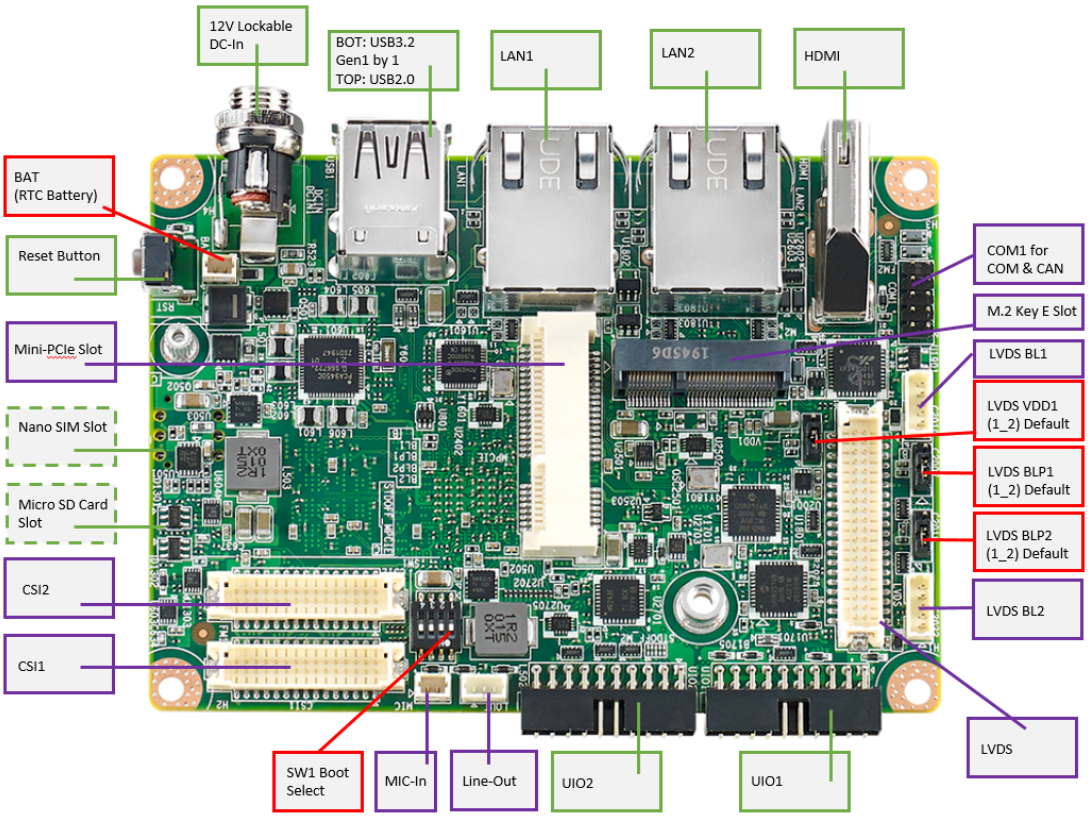
# Chapter 2

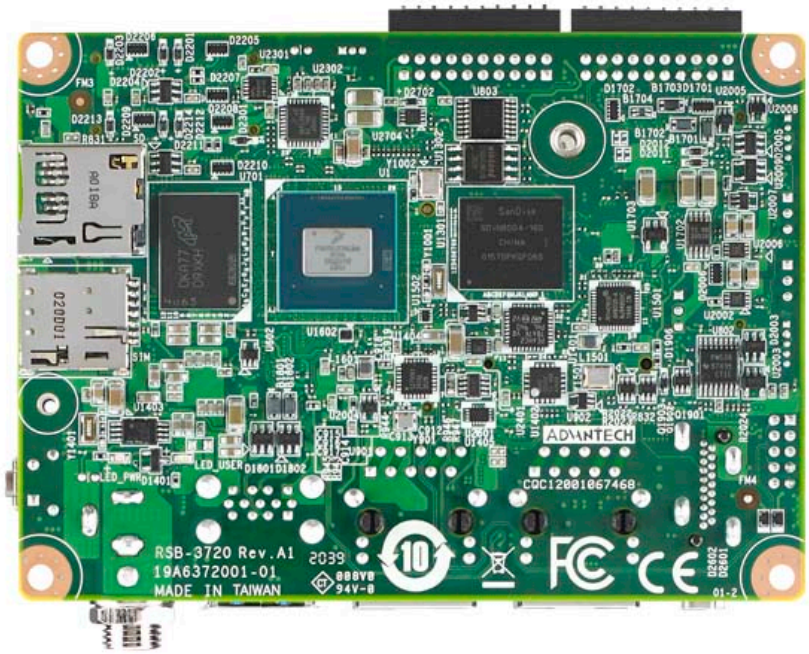
## Hardware Installation

This chapter details mechanical and connector information.

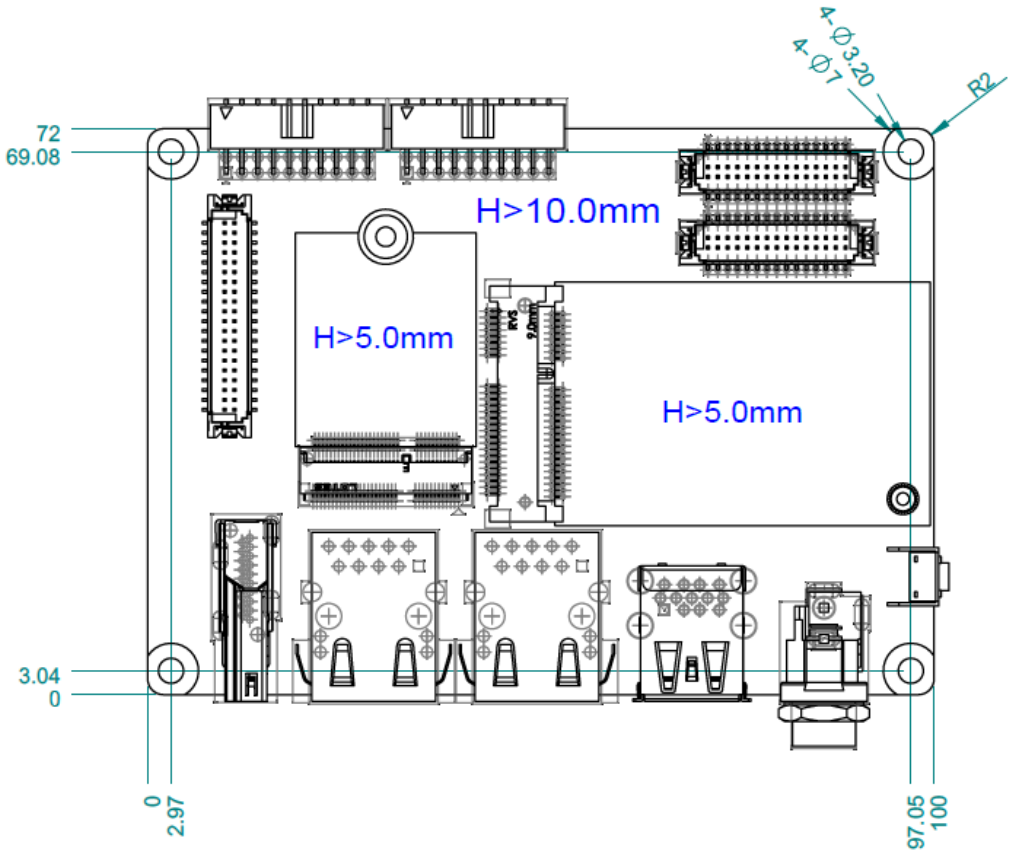
- Jumper Information
- Connector Information
- Mechanical Drawing
- Quick Start Guide

## 2.1 Jumper and Connector Locations



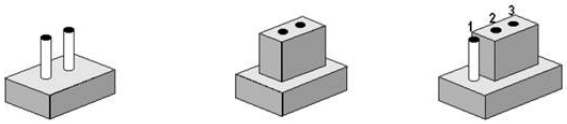
## 2.2 Board Dimensions



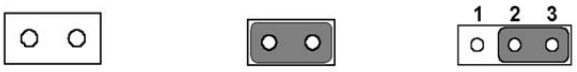

## 2.3 Jumpers

### 2.3.1 Jumper Description

Cards can be configured by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To close a jumper, connect the pins with the clip. To open a jumper, remove the clip. Sometimes a jumper will have three pins labeled 1, 2, and 3. In such cases, connect either pins 1 and 2 or pins 2 and 3.



The jumper settings are schematically depicted in this manual as follows:



A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before making any changes. Generally, only a standard cable is required to make most connections.

***Warning!*** *To avoid damaging the computer, always turn off the power supply before setting jumpers.*

## 2.3.2 Jumper List

| Table 2.1: Jumper List | |
|---|---|
| BLP1 | Backlight Power Select for LVDS0 (Default 5V) |
| BLP2 | Backlight Power Select for LVDS1 (Default 5V) |
| VDD1 | LVDS VDD (Default 3.3V) |
| SW1 | Boot Mode Select (Default boot from eMMC) |

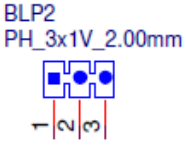
## 2.3.3 Jumper Settings

### 2.3.3.1 BLP1

| **BLP1** | **Backlight Power Select for LVDS0** |
|---|---|
| Part Number | 1653003101 |
| Description | PIN HEADER 3x1P 2.0mm 180D(M) DIP 2000-13 WS |
| **Setting** | **Function** |
| (1_2) | 5V (Default) |
| (2_3) | 12V |

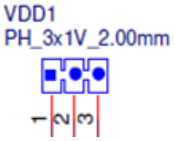

### 2.3.3.2 BLP2

| **BLP2** | **Backlight Power Select for LVDS1** |
|---|---|
| Part Number | 1653003101 |
| Description | PIN HEADER 3x1P 2.0mm 180D(M) DIP 2000-13 WS |
| **Setting** | **Function** |
| (1_2) | 5V (Default) |
| (2_3) | 12V |



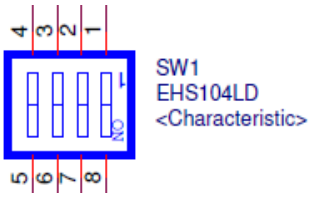
### 2.3.3.3 VDD1

| VDD1 | LVDS VDD |
|---|---|
| Part Number | 1653003101 |
| Description | PIN HEADER 3x1P 2.0mm 180D(M) DIP 2000-13 WS |
| **Setting** | **Function** |
| (1_2) | 3.3V (Default) |
| (2_3) | 5V |




### 2.3.3.4 SW1

| SW1 | | Boot Mode Select | | |
|---|---|---|---|---|
| Part Number | | 1600000097 | | |
| Description | | DIP SW SMD 4P P=1.27mm WO/Pb EHS104LD ECE | | |
| **1** | **2** | **3** | **4** | **Feature** |
| OFF | ON | OFF | OFF | eMMC Boot (Default) |
| ON | ON | OFF | OFF | SD Boot |
| OFF | ON | ON | OFF | QSPI Boot |
| ON | OFF | OFF | OFF | USB Serial Download |
| | | | | (USB OTG Port is reserved only, please contact us for a Serial Download Mode Solution) |



# 2.4 Connectors

## 2.4.1 Connector List

| Table 2.2: Connectors | |
|---|---|
| BAT | RTC Battery CONN. |
| BL1 | LVDS Backlight 1 |
| BL2 | LVDS Backlight 2 |
| COM1 | COM + CAN Pin Header (default as debug console) |
| CSI1 | MIPI-CSI Camera Input 1 |
| CSI2 | MIPI-CSI Camera Input 2 |
| DCIN/DCIN1 | 12V DC Power Input by DC Jack/ by Pin Header |
| HDMI | HDMI CONN. |
| LAN1 | Ethernet 1 |
| LAN2 | Ethernet 2 |
| LOUT | Line Out Pin Header |
| LVDS | LVDS CONN. |
| M2 | M.2 Key E CONN. |
| MIC | MIC In Pin Header |
| MPCIE | Mini-PCIe CONN. |
| RST | Reset Button |
| SD | SD Slot |
| SIM | SIM Slot |
| UIO1 | UIO40-Express Pin Header 1 |
| UIO2 | UIO40-Express Pin Header 2 |
| USB1 | USB CONN. (USB 3.2 Gen 1 on TOP + USB 2.0 on BOT) |

## 2.4.2 Connector Settings

### 2.4.2.1 BAT (RTC Battery CONN.)

RSB-3720 supports one 2-pin type connector for the RTC Battery.

The connector pins are defined below.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +COIN_RTC | 2 | GND |

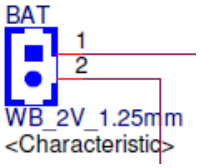



**Figure 2.1 BAT (RTC Battery CONN.)**

#### 2.4.2.2 BL1 (LVDS Backlight 1)

RSB-3720 supports 1 LVDS Backlight CONN. for each channel. The pin definition for the 1st channel is demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +12V | 2 | GND |
| 3 | LCD_BKLT0_EN | 4 | LCD_BKLT0_PWM |
| 5 | +5V | - | - |

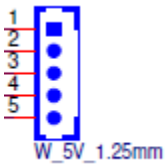



**Figure 2.2 BL1 (LVDS Backlight 1)**

#### 2.4.2.3 BL2 (LVDS Backlight 2)

RSB-3720 supports 1 LVDS Backlight CONN. for each channel. The pin definition for the 2nd channel is demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +12V | 2 | GND |
| 3 | LCD_BKLT1_EN | 4 | LCD_BKLT1_PWM |
| 5 | +5V | - | - |

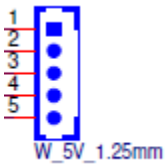



**Figure 2.3 BL2 (LVDS Backlight 2)**

#### 2.4.2.4 COM1 (COM + CAN Pin Header): (default as debug console)

RSB-3720 supports COM1 Pin Header for 1 x 4-wires COM port (Can be defined as RS-232/RS-422/RS-485 by S/W setting). Its default setting is RS-232 debug console + 1 CANBus (Supports CAN-FD with industrial temp. SKU: RSB-3720WQ/RSB-3720WD) pin definition as below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | COM_DCD | 2 | CAN1_H |
| 3 | COM_RXD | 4 | COM_RTS |
| 5 | COM_TXD | 6 | COM_CTS |
| 7 | COM_DTR | 8 | CAN1_L |
| 9 | GND | 10 | GND |

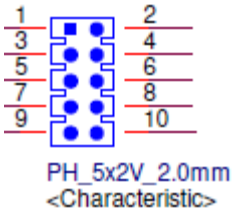



**Figure 2.4 COM1 (COM + CAN Pin Header)**

COM1 connects with 1700100250 cable, DB9 Pin definition will become the following:

| Pin | RS-232 (Default used as Debug Console) | RS-422 | RS-485 | CAN-FD |
|---|---|---|---|---|
| 1 | COM_DCD | RS-422_TXD- | RS-485_D- | - |
| 2 | COM_RXD | RS-422_TXD+ | RS_485_D+ | - |
| 3 | COM_TXD | RS-422_RXD+ | - | - |
| 4 | COM_DTR | RS-422_RXD- | - | - |
| 5 | GND | GND | GND | - |
| 6 | - | - | - | CAN1_H |
| 7 | COM_RTS | - | - | - |
| 8 | COM_CTS | - | - | - |
| 9 | - | - | - | CAN1_L |

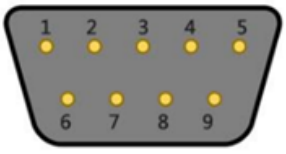



**Figure 2.5 DB9 of 1700100259 Cable**

### 2.4.2.5 CSI1 (MIPI-CSI Camera Input 1)

RSB-3720 supports 2 x 4-Lane MIPI-CSI Camera Input CONNs, CSI1 is for MIPI-CSI1. Their pin definitions are demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | GND | 2 | GND |
| 3 | MIPI_CSI1_D0- | 4 | MIPI_CSI1_CLK- |
| 5 | MIPI_CSI1_D0+ | 6 | MIPI_CSI1_CLK+ |
| 7 | GND | 8 | GND |
| 9 | MIPI_CSI1_D1- | 10 | I2C2_CSI1_SCL |
| 11 | MIPI_CSI1_D1+ | 12 | I2C2_CSI1_SDA |
| 13 | GND | 14 | +V1.8 |
| 15 | CLKO1 | 16 | +V1.8 |
| 17 | GND | 18 | CSI1_PWR_EN# |
| 19 | MIPI_CSI1_D2- | 20 | CSI1_RST# |
| 21 | MIPI_CSI1_D2+ | 22 | +V3.3 |
| 23 | GND | 24 | +V3.3 |
| 25 | MIPI_CSI1_D3- | 26 | CSI1_SYNC |
| 27 | MIPI_CSI1_D3+ | 28 | +5V |
| 29 | GND | 30 | +5V |

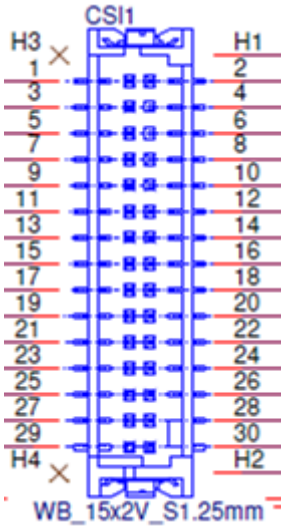



**Figure 2.6 CSI1 (MIPI-CSI Camera Input 1)**

### 2.4.2.6 CSI2 (MIPI-CSI Camera Input 2)

RSB-3720 supports 2 x 4-Lane MIPI-CSI Camera Input CONNs, CSI2 is for MIPI-CSI2. The pin definitions are demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | GND | 2 | GND |
| 3 | MIPI_CSI2_D0- | 4 | MIPI_CSI2_CLK- |
| 5 | MIPI_CSI2_D0+ | 6 | MIPI_CSI2_CLK+ |
| 7 | GND | 8 | GND |
| 9 | MIPI_CSI2_D1- | 10 | I2C3_CSI2_SCL |
| 11 | MIPI_CSI2_D1+ | 12 | I2C3_CSI2_SDA |
| 13 | GND | 14 | +V1.8 |
| 15 | CLKO2 | 16 | +V1.8 |
| 17 | GND | 18 | CSI2_PWR_EN# |
| 19 | MIPI_CSI2_D2- | 20 | CSI2_RST# |
| 21 | MIPI_CSI2_D2+ | 22 | +V3.3 |
| 23 | GND | 24 | +V3.3 |
| 25 | MIPI_CSI2_D3- | 26 | CSI2_SYNC |
| 27 | MIPI_CSI2_D3+ | 28 | +5V |
| 29 | GND | 30 | +5V |

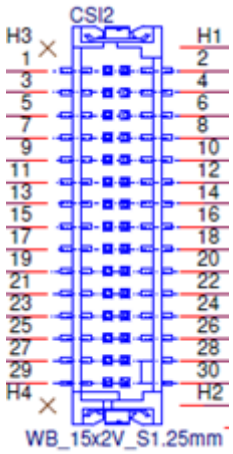



**Figure 2.7 CSI2 (MIPI-CSI Camera Input 2)**

### 2.4.2.7 DCIN/ DCIN1 (12V DC Power Input by DC Jack/ by Pin Header)

The power input for RSB-3720 is 12V. We designed the DC Jack and 2 x pin type Pin Header co-layout. The default SKU is a lockable DC Jack.

DCIN (Default):

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +12V | 2 | GND |
| 3 | GND | - | - |

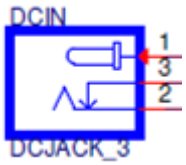



**Figure 2.8 DCIN (12V DC Jack)**

DCIN1 (By BOM Option):

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +12V | 2 | GND |

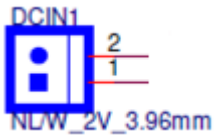



**Figure 2.9 DCIN1 (12V DC-IN Pin Header)**

### 2.4.2.8 HDMI (HDMI CONN.)

RSB-3720 supports 1 x HDMI 2.0 CONN. along its coast line.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | HDMI_TD2+ | 2 | GND |
| 3 | HDMI_TD2- | 4 | HDMI_TD1+ |
| 5 | GND | 6 | HDMI_TD1- |
| 7 | HDMI_TD0+ | 8 | GND |
| 9 | HDMI_TD0- | 10 | HDMI_CLK+ |
| 11 | GND | 12 | HDMI_CLK- |
| 13 | HDMI_CEC | 14 | HDMI_Utility/ eARC+ |
| 15 | HDMI_DDC_SCL | 16 | HDMI_DDC_SDA |
| 17 | GND | 18 | +5V |
| 19 | HDMI_HPD/ eARC- | - | - |

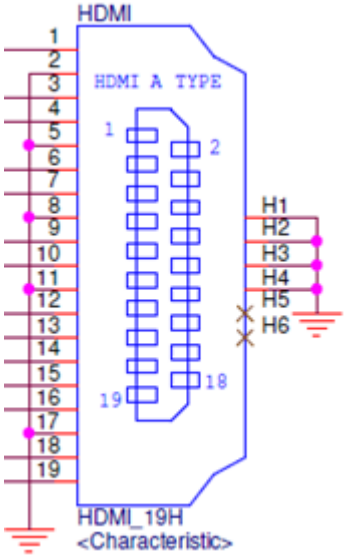



**Figure 2.10 HDMI (HDMI CONN.)**

#### 2.4.2.9 LAN1 (Ethernet eth0)

LAN1 supports 10M/100M/1G.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | LAN1_MDI0+ | 2 | LAN1_MDI0- |
| 3 | LAN1_MDI1+ | 4 | LAN1_MDI1- |
| 5 | GND | 6 | GND |
| 7 | LAN1_MDI2+ | 8 | LAN1_MDI2- |
| 9 | LAN1_MDI3+ | 10 | LAN1_MDI3- |
| 11 | LAN1_ACT# | 12 | +2.5V_VDDH1 |
| 13 | LAN1_LED_1000# | 14 | LAN1_LED_10_100# |

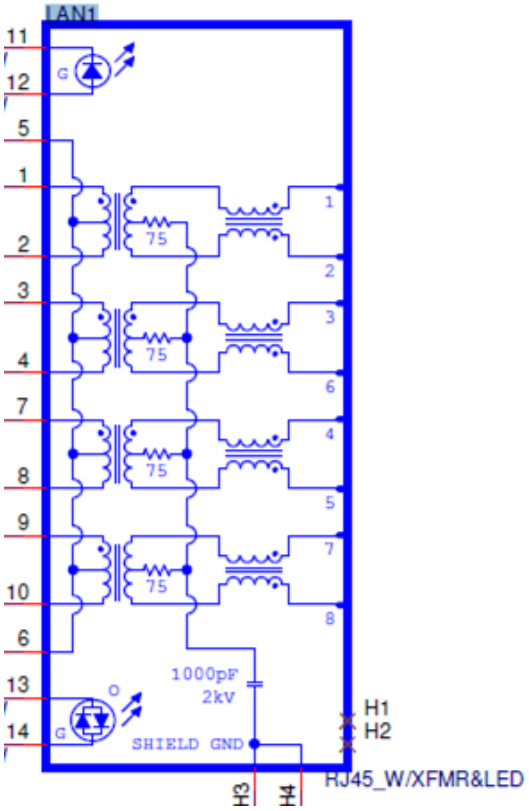



**Figure 2.11 LAN1 (Ethernet eth0)**

### 2.4.2.10 LAN2 (Ethernet eth1)

LAN2 supports 10M/100M/1G.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | LAN0_MDI0+ | 2 | LAN0_MDI0- |
| 3 | LAN0_MDI1+ | 4 | LAN0_MDI1- |
| 5 | GND | 6 | GND |
| 7 | LAN0_MDI2+ | 8 | LAN0_MDI2- |
| 9 | LAN0_MDI3+ | 10 | LAN0_MDI3- |
| 11 | LAN0_ACT# | 12 | +2.5V_VDDH0 |
| 13 | LAN0_LED_1000# | 14 | LAN0_LED_10_100# |

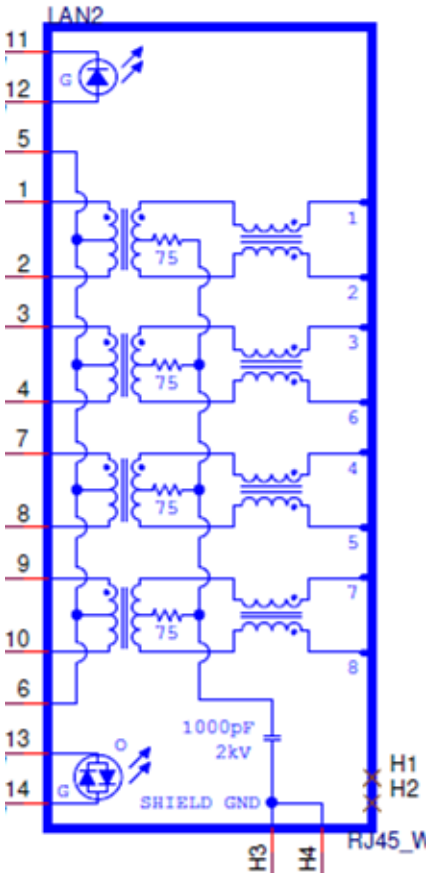



**Figure 2.12 LAN2 (Ethernet eth1)**

### 2.4.2.11 LOUT (Line Out Pin Header)

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | LINEOUT_L | 2 | LINEOUT_R |
| 3 | GND | - | - |

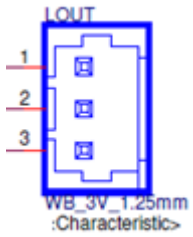



**Figure 2.13 LOUT (Line Out Pin Header)**

### 2.4.2.12 LVDS (LVDS CONN.)

RSB-3720 supports one single channel LVDS @LVDS0, one 4-Lane MIPI-DSI @LVDS1, and can be configured as 1 dual channel LVDS.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +VDD_LVDS | 2 | +VDD_LVDS |
| 3 | GND | 4 | GND |
| 5 | +VDD_LVDS | 6 | +VDD_LVDS |
| 7 | LVDS0_D0- | 8 | DSI/LVDS1_D0- |
| 9 | LVDS0_D0+ | 10 | DSI/LVDS1_D0+ |
| 11 | GND | 12 | GND |
| 13 | LVDS0_D1- | 14 | DSI/LVDS1_D1- |
| 15 | LVDS0_D1+ | 16 | DSI/LVDS1_D1+ |
| 17 | GND | 18 | GND |
| 19 | LVDS0_D2- | 20 | DSI/LVDS1_D2- |
| 21 | LVDS0_D2+ | 22 | DSI/LVDS1_D2+ |
| 23 | GND | 24 | GND |
| 25 | LVDS0_CLK- | 26 | DSI/LVDS1_CLK- |
| 27 | LVDS0_CLK+ | 28 | DSI/LVDS1_CLK+ |
| 29 | GND | 30 | GND |
| 31 | I2C1_SCL_LVDS | 32 | I2C1_SDA_LVDS |
| 33 | GND | 34 | GND |
| 35 | LVDS0_D3- | 36 | DSI/LVDS1_D3- |
| 37 | LVDS0_D3+ | 38 | DSI/LVDS1_D3+ |
| 39 | GND | 40 | LVDS_CTRL |
| 41 | - | 42 | - |
| 43 | GND | 44 | GND |

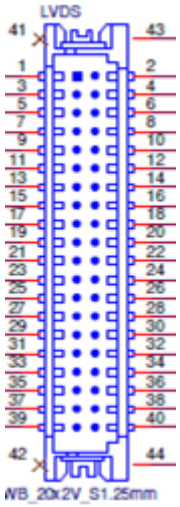



**Figure 2.14 LVDS (LVDS CONN.)**

### 2.4.2.13 M2 (M.2 Key E CONN.)

RSB-3720 supports 1 x M.2 Key E CONN. for extension. It has the following interfaces: USB/PCIe/SDIO/UART/I2S.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | GND | 2 | +3.3V |
| 3 | USB_M2_0+ | 4 | +3.3V |
| 5 | USB_M2_0- | 6 | - |
| 7 | GND | 8 | SAI2_TXC |
| 9 | SD1_CLK | 10 | SAI2_TXFS |
| 11 | SD1_CMD | 12 | SAI2_RXD0 |
| 13 | SD1_DATA0 | 14 | SAI2_TXD0 |
| 15 | SD1_DATA1 | 16 | - |
| 17 | SD1_DATA2 | 18 | GND |
| 19 | SD1_DATA3 | 20 | UART1_WAKE#_3V3 |
| 21 | SD1_WAKE# | 22 | UART1_RXD |
| 23 | SD1_RESET# | - | - |
| | | Key | |
| 33 | GND | 32 | UART1_TXD |
| 35 | PCIE_TX+ | 34 | UART1_CTS# |
| 37 | PCIE_TX- | 36 | UART1_RTS# |
| 39 | GND | 38 | - |
| 41 | PCIE_RX+ | 40 | - |
| 43 | PCIE_RX- | 42 | - |
| 45 | GND | 44 | - |
| 47 | PCIE_REF_CLK_OUT+ | 46 | - |
| 49 | PCIE_REF_CLK_OUT- | 48 | - |
| 51 | GND | 50 | M2_SYSCLK_3V3 |
| 53 | PCIE_CLKREQ# | 52 | M2_RESET#_3V3 |
| 55 | +3.3V | 54 | M2_W_DIS2#_3V3 |
| 57 | GND | 56 | M2_W_DIS1#_3V3 |
| 59 | - | 58 | I2C1_SDA |

| | | | |
|---|---|---|---|
| 61 | - | 60 | I2C1_SCL |
| 63 | GND | 62 | M2_IRQ# |
| 65 | - | 64 | - |
| 67 | - | 66 | - |
| 69 | GND | 68 | - |
| 71 | - | 70 | - |
| 73 | - | 72 | +3.3V |
| 75 | GND | 74 | +3.3V |

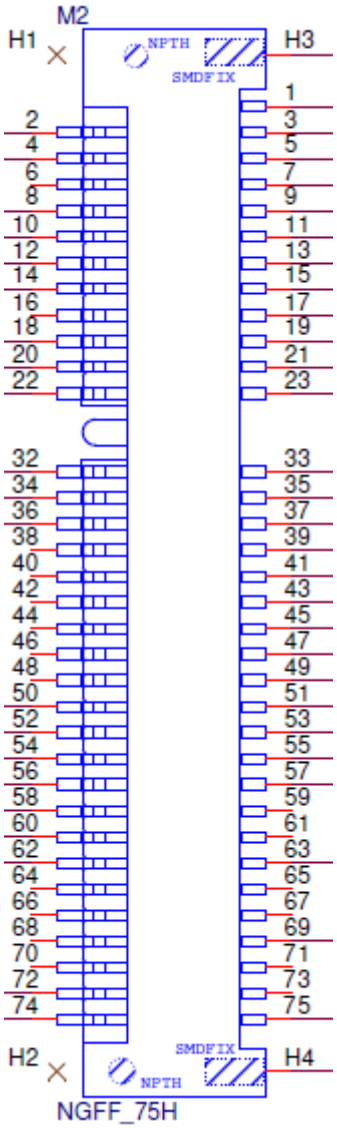



**Figure 2.15 M2 (M.2 Key E CONN.)**

### 2.4.2.14 MIC (MIC In Pin Header)

| Pin | Description | Pin | Description |
|---|---|---|---|
| 1 | MIC_IN | 2 | GND |

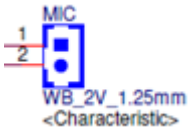



**Figure 2.16 MIC (MIC In Pin Header)**

### 2.4.2.15 MPCIE (Mini-PCIe CONN.)

RSB-3720 supports 1 x full size Mini-PCIe CONN. for extension via USB interface.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | - | 2 | GND |
| 3 | - | 4 | MINICARD_DET#_3V3 |
| 5 | - | 6 | - |
| 7 | - | 8 | UIM_VCC |
| 9 | GND | 10 | UIM_DATA |
| 11 | - | 12 | UIM_CLK |
| 13 | - | 14 | UIM_RESET |
| 15 | GND | 16 | - |
| | | Key | |
| 17 | - | 18 | GND |
| 19 | - | 20 | MICICARD_W_DIS#_3V3 |
| 21 | GND | 22 | MINICARD_RESET#_3V3 |
| 23 | - | 24 | +3.3V |
| 25 | - | 26 | GND |
| 27 | GND | 28 | - |
| 29 | GND | 30 | - |
| 31 | - | 32 | - |
| 33 | - | 34 | GND |
| 35 | GND | 36 | USB_MINICARD- |
| 37 | GND | 38 | USB_MINICARD+ |
| 39 | +3.3V | 40 | GND |
| 41 | +3.3V | 42 | - |
| 43 | GND | 44 | - |
| 45 | - | 46 | - |
| 47 | - | 48 | - |
| 49 | - | 50 | GND |
| 51 | - | 52 | +3.3V |

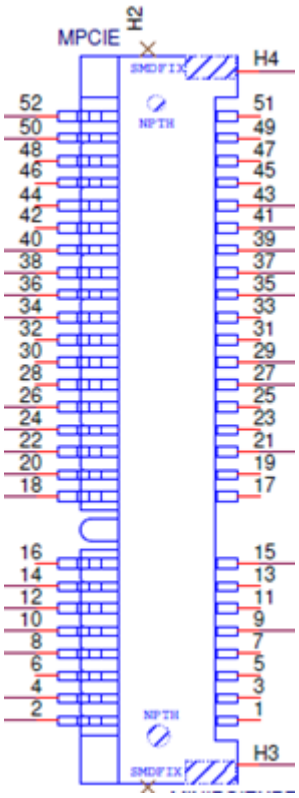



**Figure 2.17 MPCIE (Mini-PCIe CONN.)**

### 2.4.2.16 RST (Reset Button)

| Pin | Description | Pin | Description |
|---|---|---|---|
| 1 | RESET_IN# | 2 | GND |
| 3 | GND | 4 | GND |

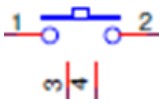



**Figure 2.18 RST (Reset Button)**

### 2.4.2.17 SD (SD Slot)

RSB-3720 supports 1 x Micro SD Slot.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | SDCARD_DAT2 | 2 | SDCARD_DAT3 |
| 3 | SDCARD_CMD | 4 | +3.3V |
| 5 | SDCARD_CLK | 6 | GND |
| 7 | SDCARD_DAT0 | 8 | SDCARD_DAT1 |
| H1 | GND | H2 | +VDD_SD2 |
| H3 | GND | H4 | GND |

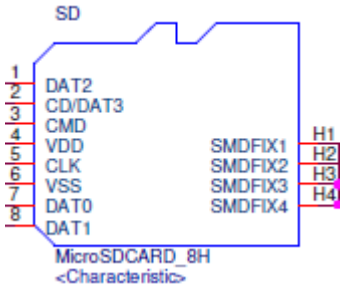



**Figure 2.19 SD (SD Slot)**

### 2.4.2.18 SIM (SIM Slot)

RSB-3720 supports 1 x Nano SIM Slot.

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| C1 | UIM_PWR | C2 | UIM_RESET |
| C3 | UIM_CLK | - | - |
| C5 | GND | C6 | - |
| C7 | UIM_DATA | CD | - |

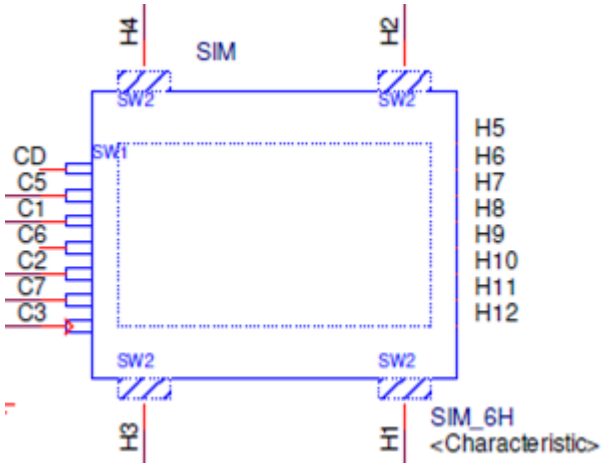



**Figure 2.20 SIM (SIM Slot)**

### 2.4.2.19 UIO1 (UIO40-Express Pin Header 1)

RSB-3720 supports I/O extension via UIO40-Express standard. The UIO1 connector pinout is demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | 5V_USB1 | 2 | GND |
| 3 | USB1_D- | 4 | USB2_D+ |
| 5 | USB1_D+ | 6 | USB2_D- |
| 7 | GND | 8 | 5V_USB2 |
| 9 | USB3_SSTX- | 10 | GPIO2 |
| 11 | USB3_SSTX+ | 12 | GPIO4 |
| 13 | 5V_USB3 | 14 | GND |
| 15 | USB3_D- | 16 | USB3_SSRX+ |
| 17 | USB3_D+ | 18 | USB3_SSRX- |
| 19 | GND | 20 | 5V_USB3 |

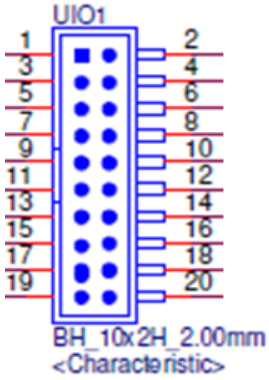



**Figure 2.21 UIO1 (UIO40-Express Pin Header 1)**

### 2.4.2.20 UIO2 (UIO40-Express Pin Header 2)

RSB-3720 supports I/O extension via UIO40-Express standards. The UIO2 connector pinout is demonstrated below:

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | 5V | 2 | GND |
| 3 | COM2_TXD | 4 | COM4_TXD |
| 5 | COM2_RXD | 6 | COM4_RXD |
| 7 | GPIO5 | 8 | GPIO6 |
| 9 | GPIO7 | 10 | GPIO8 |
| 11 | GPIO9 | 12 | GPIO10 |
| 13 | GPIO11 | 14 | GPIO12 |
| 15 | CAN2_TXD | 16 | I2C4_SDA |
| 17 | CAN2_RXD | 18 | I2C4_SCL |
| 19 | 3.3V | 20 | GND |

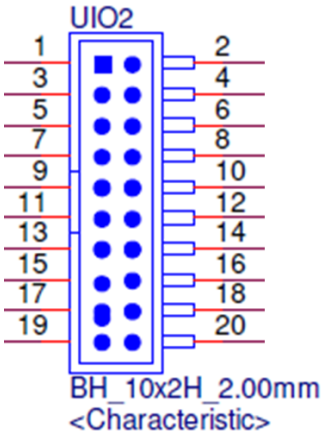



**Figure 2.22 UIO2 (UIO40-Express Pin Header 2)**

#### 2.4.2.21 USB 1 (USB 3.2 Gen 1 on TOP + USB 2.0 on BOT)

| Pin | Pin Name | Pin | Pin Name |
|---|---|---|---|
| 1 | +VBUS_USB5 | 2 | USB5_D- |
| 3 | USB5_D+ | 4 | GND |
| 5 | USB5_SSRX- | 6 | USB5_SSRX+ |
| 7 | GND | 8 | USB5_SSTX- |
| 9 | USB5_SSTX+ | 10 | +VBUS_USB6 |
| 11 | USB6_D- | 12 | USB6_D+ |
| 13 | GND | - | - |
| H1 | GND | H2 | GND |
| H3 | GND | H4 | GND |

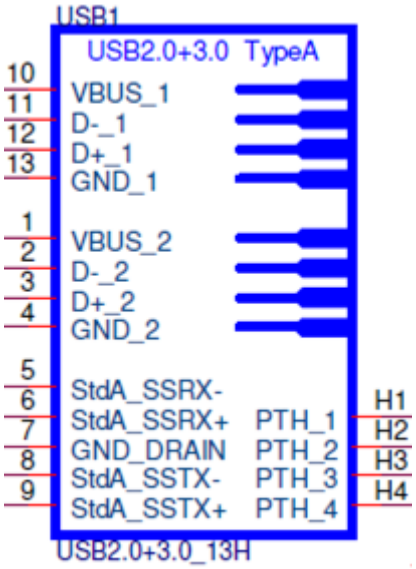



**Figure 2.23 USB 1 (USB 3.2 Gen 1 on TOP + USB 2.0 on BOT)**

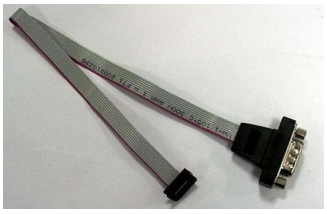
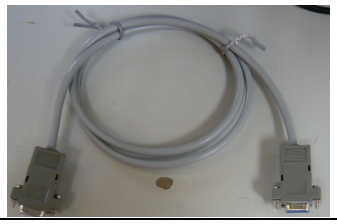
## 2.5 LED

| Name | Description | Function |
|---|---|---|
| LED_PWR | LED GREEN SMD 0603 2P LTST-C191KGKT | Show Power Status |
| LED_USER | LED BLUE SMD 0603 19-215SUBC/S280/TR8 | Software Programmable:<br>Method will be provided in Chapter 3. |

## 2.6 Quick Start Guide

### 2.6.1 Debug Port Connection and Setting

1. RSB-3720 debug port is shared with COM1. Please connect the debug console cable 1700100250 & 1700019474. 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 |
|---|---|---|
| 1700100250 | 10P-2.0/D-SUB 9P(M) 25CM |  |
| 1700019474 | RS-232 Cable DB9 female to DB9 female |  |

2. RSB-3720 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 2.23.

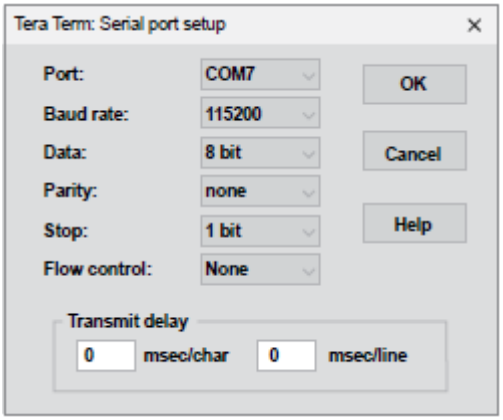



**Figure 2.24**

3. Connect a Display:
RSB-3720's default display interface is HDMI. When you use HDMI display as an example, please connect the HDMI display cable to RSB-3720's HDMI connector as shown in Figure 2.24.

**Figure 2.25**

4. Connect the Power Source:
RSB-3720'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.

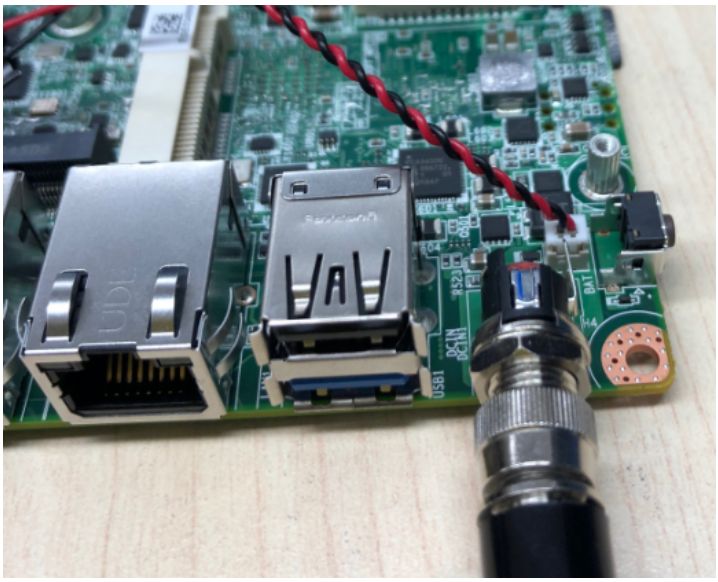


**Figure 2.26**

5. When switching on the power, the green LED indicator (location LED_PWR) on BOT side of the board will light up to indicate that the board has booted up normally. (Figure 2.26)

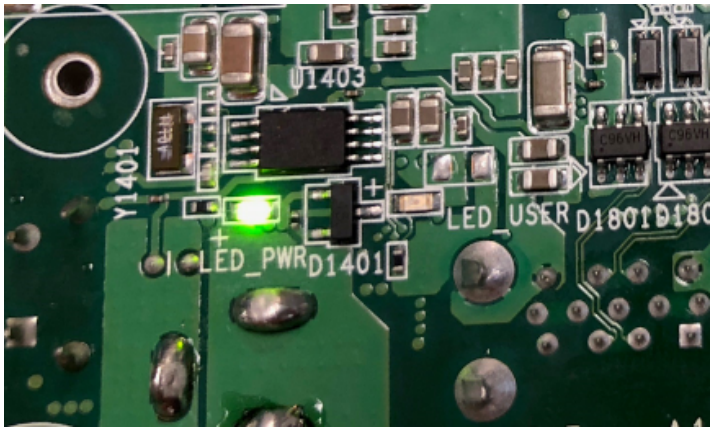



**Figure 2.27**

6. After booting, the display boot screen is shown in Figure 2.27. The debug window is shown in Figure 2.28.

**Figure 2.28**

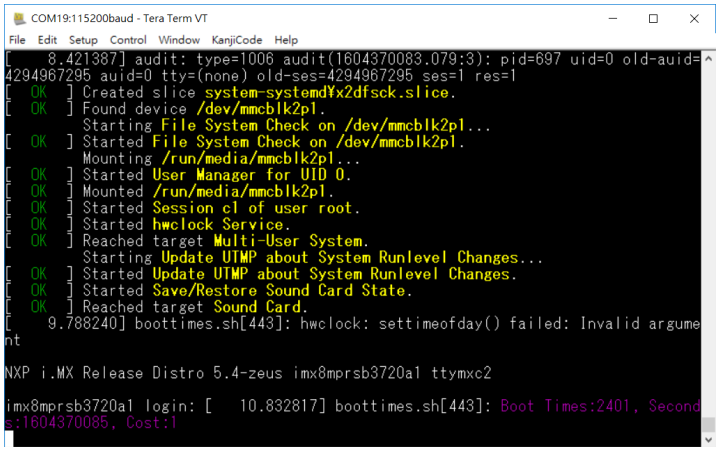



**Figure 2.29**

# Chapter 3

## Software Functionality

This chapter details software functions on the RSB-3720.

# 3.1 Display

## 3.1.1 HDMI

When the HDMI Cable is connected, the default Weston UI(1920x1080) will be displayed on the screen.

### 3.1.1.1 Test Different Resolutions:

Step 1: Disable Weston UI

```
# killall -9 weston UI
```

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

```
# modetest -c
```

```
id      encoder status          name            size (mm)       modes   encoders
46      45      connected       HDMI-A-1        510x290         8       45
  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 46:1920x1080-60
```

## 3.1.2 LVDS

### 3.1.2.1 Single Channel LVDS (Single LVDS0 or Single LVDS1)

**LVDS0- Panel: G070VW01V0 (VDD: 3.3V, Backlight Power: 12V)**

Step 1: Connect 96LEDK-A070WV40NB1 LVDS panel with LVDS cable (1700021883-01). Connect this to the LVDS and the Backlight cable (1700032155-01) to BL1.

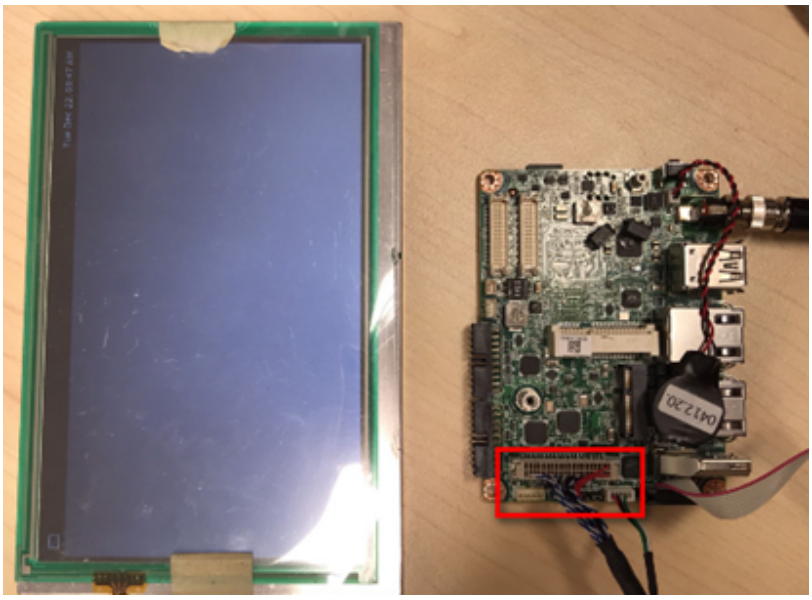
Step 2: Change VDD1 jumper to (1-2 short), BLP1 jumper to (2-3 short).

Step 3: Power on.

Step 4: Press enter after boot. The system will stop at u-boot as below, enter the command in red and press enter.

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rsb3720-a1-lvds0-auo.dtb; boot
```

Step 5: Weston UI will be displayed on the screen.



**LVDS1- Panel: G070VW01V0 (VDD: 3.3V, Backlight Power: 12V)**

Step 1: Connect 96LEDK-A070WV40NB1 LVDS panel to the LVDS cable (1700021883-01). Then connect this to the LVDS and the Backlight cable (1700032155-01) to BL2.

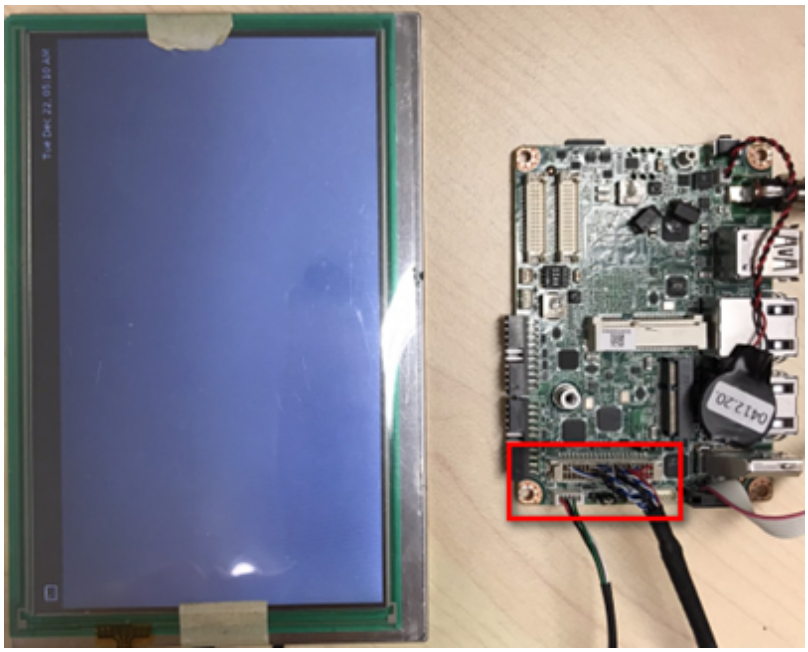
Step 2: Change VDD1 jumper to (1-2 short), BLP2 jumper to (2-3 short).

Step 3: Power on.

Step 4: Press enter after boot. The system will stop at u-boot as demonstrated below, enter the command in red and press enter.

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rsb3720-a1-lvds1-auo.dtb; boot
```

Step 5: Weston UI will be displayed on screen.



**Dual Channel LVDS Panel: G215HVN0 (VDD: 5V, Backlight Power: 12V)**

Step 1: Connect 96LEDK-A215FH30NF2 LVDS panel with the LVDS cable. Connect this to the LVDS. Connect the Backlight cable to BL1.

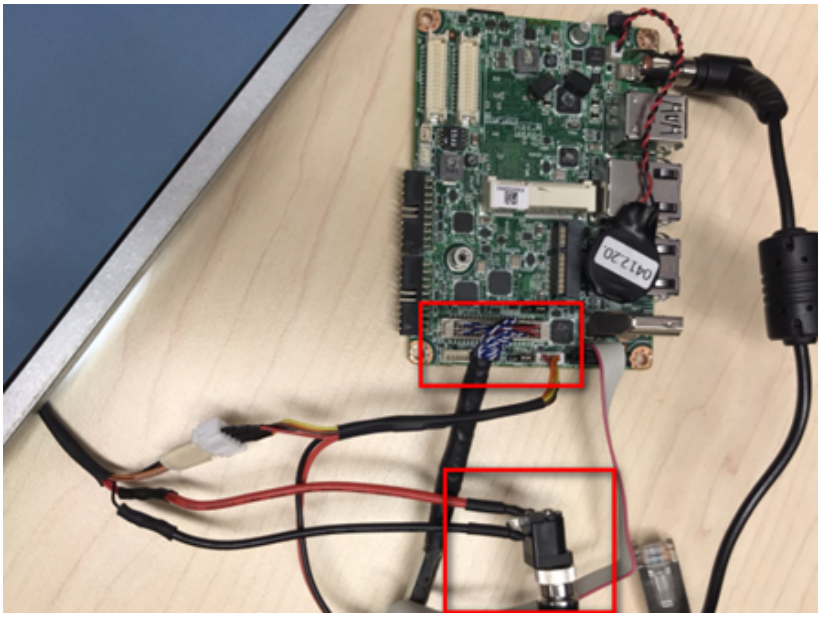
Step 2: Change VDD1 jumper to (2-3 short), BLP1 jumper to (2-3 short).

Step 3: Connect another 12V adapter to the DC-Jack on the backlight cable.

Step 4: Power on RSB-3720 and the extra 12V adapter.

Step 5: Press enter after boot. The system will stop at u-boot as demonstrated below, enter the command in red and press enter.

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rsb3720-a1-lvds-dual.dtb; boot
```



## 3.2 Audio

Step 1: Check audio codec

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

Step 2: Audio codec (sgtl5000):

1. 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%]
```

2. Record and playback:

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

## 3.3 Mini-PCIE

Test 3G/4G with EWM-C117FL06E Module

Step 1: Connect the PCIE card to the Mini PCIE slot.


Step 2: Execute the pppd command to connect to 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 &
```

## 3.4 M.2

### 3.4.1 Test Wi-Fi with EWM-W163M201E Module (PCIe Interface)

```
# 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
```

### 3.4.2 Test Bluetooth with EWM-W163M201E Module (USB Interface)

```
$ 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
```

## 3.5 Serial Port

For COM1 serial port pin definition, please refer to previous chapter 2.4.2.4 for more information.

### 3.5.1 RS-232 Loopback Test (eg. ttymxc1)

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

### 3.5.2 RS-422 Test

Step 1: First change the debug console port to UART2 (UIO-4032 COM_3), or use telnet to login to the system console to issue the command for the com port test.

```
u-boot=>
u-boot=> editenv console
edit: ttymxc1,115200
```

Step 2: Set both GPIO#496, GPIO#497, set as 1, 1 for RS-422.

```
# echo 496 > /sys/class/gpio/export
# echo 497 > /sys/class/gpio/export
# echo out > /sys/class/gpio/gpio1/direction
# echo out > /sys/class/gpio/gpio2/direction
# echo 1 > /sys/class/gpio/gpio1/value
# echo 1 > /sys/class/gpio/gpio2/value
```

Step 3: Test RS-422 with Adam-4520. Connect Adam-4520 with COM1 with 1700100250 DB9 as the following:

Adam-4520 RX- <--> DB9 Pin 1, Adam-4520 RX+ <-->DB9 Pin 2, Adam-4520 TX- <-->DB9 Pin 4, Adam-4520 TX+ <--> DB9 Pin 3

```
# stty -F /dev/ttymxc2 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
# cat /dev/ttymxc2 &
# echo "Serial Test" > /dev/ttymxc2
```

### 3.5.3 RS-485 Test

Step 1: Set GPIO#496, GPIO#497 Set to 0,1

Step 2: Test RS-485 with Adam-4520. Connect Adam-4520 with COM1 with 1700100250 DB9 as the following:

Adam-4520 Pin 1: Data- connect to DB9 Pin 1: COM_DCD. Adam-4520 Pin 2: Data+ connect to DB9 Pin 3: COM_RXD..

```
#./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
```

## 3.6 I²C

Step 1: Check i²c device (audio codec : 0-000a)

```
root@imx8mprsb3720a1:~# i2cdetect -y 0
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- UU -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- UU -- -- -- 29 -- -- -- -- UU --
30: UU UU UU UU UU UU UU UU -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: UU UU -- -- -- -- -- --
```

Step 2: I²c set and get

```
root@imx8mprsb3720a1:~# i2cset -f -y 0 0x0a 0 0xff00 w
root@imx8mprsb3720a1:~# i2cget -f -y 0 0x0a 0 w
0x11a0
```

## 3.7 USB

USB disk test (USB 2.0/ USB 3.2 Gen 1 By 1 port)

Step 1: Issue the following command (lsusb -t) after inserting a USB disk into the USB 2.0 port or USB 3.2 Gen 1 port to check if the USB device is listed.

```
root@imx8mprsb3720a1:~# lsusb -t
/:  Bus 04.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 5000M
/:  Bus 03.Port 1: Dev 1, Class=root_hub, Driver=xhci-hcd/1p, 480M
    |__ Port 1: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
        |__ Port 2: Dev 3, If 0, Class=Mass Storage, Driver=usb-storage, 480M
/:  Bus 02.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 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
```

Step 2: 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
```

## 3.8 RTC

Step 1: Disable RTC sync service

```
root@imx8mprsb3720a1:~# systemctl disable ntpd.service
Removed /etc/systemd/system/multi-user.target.wants/ntpd.service.
root@imx8mprsb3720a1:~# systemctl stop systemd-timesyncd
root@imx8mprsb3720a1:~# systemctl stop ntpdate.service
```

Step 2: Set system time to current, then write to RTC

```
root@imx8mprsb3720a1:~# date 021710452016 && hwclock -w && date
Wed Feb 17 10:45:00 UTC 2016
Wed Feb 17 10:45:01 UTC 2016
```

Step 3: Set one incorrect time, then read time from RTC to verify

```
root@imx8mprsb3720a1:~# 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
```

Step 4: Restore the RTC time to system time

```
root@imx8mprsb3720a1:~# hwclock -s && date
Wed Feb 17 10:45:13 UTC 2016
```

## 3.9 eMMC/SD/SPI flash

### 3.9.1 Device Routes

eMMC: /dev/mmcblk2

SD: /dev/mmcblk1

QSPI1: /dev/mtd0

#### 3.9.1.1 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
```

## 3.10 Ethernet

Step 1: Check the Ethernet device

```
root@imx8mprsb3720a1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr de:35:e3:67:5c:4d
          inet addr:172.22.28.49  Bcast:172.22.31.255  Mask:255.255.252.0
          inet6 addr: fe80::dc35:e3ff:fe67:5c4d/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:90 errors:0 dropped:10 overruns:0 frame:0
          TX packets:51 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:9589 (9.3 KiB)  TX bytes:9475 (9.2 KiB)

eth0:0    Link encap:Ethernet  HWaddr de:35:e3:67:5c:4d
          inet addr:192.168.0.1  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

eth1      Link encap:Ethernet  HWaddr de:35:e3:67:5c:4e
          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:46

eth1:0    Link encap:Ethernet  HWaddr de:35:e3:67:5c:4e
          inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          Interrupt:46
```

Step 2: Connect the cable and ping test (eg. Eth0)

```
root@imx8mprsb3720a1:~# 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=115 time=3.42 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=3.44 ms
^C
--- 8.8.8.8 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 3.419/3.431/3.443/0.012 ms
root@imx8mprsb3720a1:~#
```

# 3.11 GPIO

## 3.11.1 GPIO Pins

**Table 3.1: UIO Extension 1 (UIO1)**

| Pin | Numbers |
|---|---|
| GPIO2 | 501 |
| GPIO4 | 503 |

**Table 3.2: UIO Extension 2 (UIO2)**

| Pin | Numbers |
|---|---|
| GPIO5 | 504 |
| GPIO6 | 505 |
| GPIO7 | 506 |
| GPIO8 | 507 |
| GPIO9 | 508 |
| GPIO10 | 509 |
| GPIO11 | 139 |
| GPIO12 | 138 |

## 3.11.2 GPIO Loopback Test (Using GPIO2 and GPIO4 as examples)

Step 1: Connect GPIO2 and GPIO4

Step 2: Export GPIO interface

```
root@imx8mprsb3720a1:~# echo 501 > /sys/class/gpio/export
root@imx8mprsb3720a1:~# echo 503 > /sys/class/gpio/export
```

Step 3: Set GPIO direction

```
root@imx8mprsb3720a1:~# echo out > /sys/class/gpio/gpio1/direction
root@imx8mprsb3720a1:~# echo in > /sys/class/gpio/gpio2/direction
```

Step 4: Read value and set output value than check

```
root@imx8mprsb3720a1:~# cat /sys/class/gpio/gpio2/value
0
root@imx8mprsb3720a1:~# echo 1 > /sys/class/gpio/gpio1/value
root@imx8mprsb3720a1:~# cat /sys/class/gpio/gpio2/value
1
```

## 3.12 Watchdog

### 3.12.1 System will reboot after 1 sec

```
root@imx8mprsb3720a1:~# /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 2020.04-3720A1AIM30LIVA0070+g121029b89f (Dec 01 2020 - 08:46:32
+0000)
```

## 3.13 Camera (Default MIPI-CSI0 and MIPI-CSI1 are for OV5640)

### 3.13.1 MIPI-CSI0 (Tested with OV5640 + mini-SAS to MIPI-CSI Cable)

#### 3.13.1.1 Preview

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

#### 3.13.1.2 Capture

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

### 3.13.2 MIPI-CSI1 (Tested with OV5640 + mini-SAS to MIPI-CSI Cable)

#### 3.13.2.1 Preview

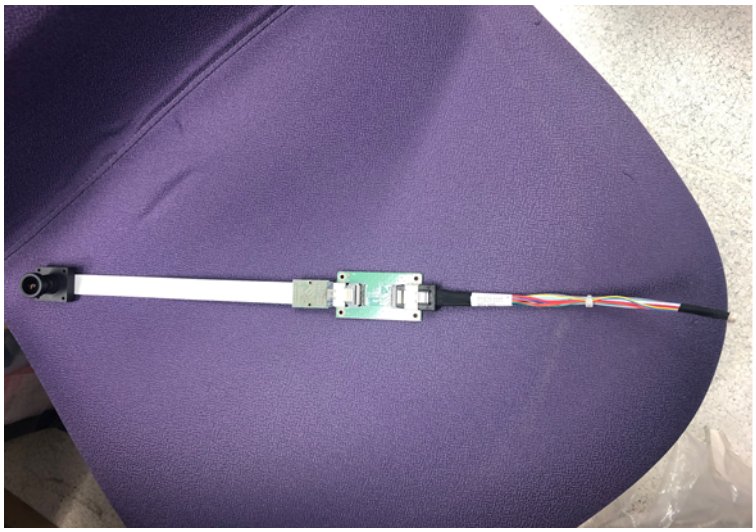
```
# gst-launch-1.0 v4l2src device=/dev/video1 ! video/x-raw,width=640,height=480 ! wayland-
sink
```

#### 3.13.2.2 Capture

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

### 3.13.3 MIPI-CSI0 (Tested with Basler daA3840-30mc Camera)

Step 1: Connect the Basler camera to the mini-SAS. Then connect this to the MIPI-CSI Cable. Then connect the mini-SAS cable to the ROM-EG55 board. Finally, connect the other side to the Basler daA3840-30mc Camera.

Step 2: Connect the ROM-EG56 (DSI to HDMI Converter board).

Step 3: Press enter after boot, system will stop at the u-boot demonstrated below:

```
Normal Boot
Hit any key to stop autoboot:  0
u-boot=>
u-boot=> setenv fdt_file imx8mp-rsb3720-a1-basler.dtb; boot
```

#### 3.13.3.1 Preview

```
# gst-launch-1.0 -v v4l2src device=/dev/video0 ! "video/x-raw,for-
mat=YUY2,width=1920,height=1080" ! queue ! imxvideoconvert_g2d !  waylandsink
```

#### 3.13.3.2 Capture

```
# gst-launch-1.0 v4l2src num-buffers=1 device=/dev/video0 ! video/x-
raw,width=1920,height=1080 ! jpegenc ! filesink location=sample.jpeg
```

## 3.14 CANBus or CAN-FD

(Please note that the CAN function on RSB-3720 COM1 Pin Header is CANBus only with RSB-3720CQ & RSB-3720CD, RSB-3720 COM1 Pin Header is CANB-FD only with RSB-3720WQ & RSB-3720WD)

Step 1: Connect the UIO-4034 A101-2 CANbus port Pin 2 and Pin 7 to RSB-3720 COM1 with 1700100250 cable, pin 9 and Pin 6 of the DB9.

Step 2: Set CAN0 and CAN1 up.

```
root@imx8mprsb3720a1:~#  ip link set can0 up type can bitrate 125000
[ 1362.935162] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
root@imx8mprsb3720a1:~# ifconfig can0 up
root@imx8mprsb3720a1:~#  ip link set can1 up type can bitrate 125000
[ 1381.546624] IPv6: ADDRCONF(NETDEV_CHANGE): can1: link becomes ready
root@imx8mprsb3720a1:~# ifconfig can1 up
```

Step 3: candump CAN0

```
root@imx8mprsb3720a1:~# candump can0 &
[1] 965
```

Step 4: candump CAN1

```
root@imx8mprsb3720a1:~# cansend can1 1F334455#1122334455667788
root@imx8mprsb3720a1:~#   can0  1F334455   [8]  11 22 33 44 55 66 77 88
```

## 3.15 TPM

Please use tpm_test.bin to test.

```
root@imx8mprsb3720a1:~# cp /run/media/sda1/tpm_test.bin .
root@imx8mprsb3720a1:~# ls
tpm_test.bin
root@imx8mprsb3720a1:~# ./tpm_test.bin
[TPM Command]
80010000000C000001440000
[TPM Response]
80010000000A00000100

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

[TPM Command]
8001000000160000017A0000000600000010500000001
[TPM Response]
80010000001B000000000100000006000000010000010553544D20

[TPM Command]
8001000000160000017A00000060000010B00000002
[TPM Response]
8001000000230000000001000000060000000200000010B004900410000010C44A01A17
```

## 3.16 LED

### 3.16.1 LED ON/OFF test

```
# echo 255 > /sys/class/leds/user/brightness
# echo 0 > /sys/class/leds/user/brightness
```

## 3.17 EEPROM

```
# 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
```

## 3.18 UIO Extension Boards

### 3.18.1 UIO-4030

| | | | |
|---|---|---|---|
| 1 | UART | 2-wire RS-232 (UIO Extension_UIO2: COM2)<br>UIO-4030 COM_3<br>/dev/ttymxc1 | |
| 2 | GPIO | 4 DI & 4 DO Pins (UIO Extension_UIO2) | |
| | | input pin#5: gpio 504<br>output pin#6: gpio 505<br>input pin#7: gpio 506<br>output pin#8: gpio 507 | input pin#9: gpio 508<br>output pin#10: gpio 509<br>input pin#11: gpio 139<br>output pin#12: gpio 138 |
| 3 | RS-485 | 1. Test RS-485 with Adam-4520. Adam-4520 Pin Data- and Pin Data+ connect to UIO-4030 COM_4 Pin 1 and Pin 2.<br># stty -F /dev/ttyUSB0 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke<br># cat /dev/ttyUSB0 &<br># echo "Serial Test" > /dev/ttyUSB0 | |
| 4 | EEPROM | # echo -n $'\x06\x05\x04\x03\x02\x01' > test<br># dd if=test of=/sys/bus/i2c/devices/3-0050/eeprom<br># hexdump -C /sys/bus/i2c/devices/3-0050/eeprom -n 64 | |

### 3.18.2 UIO-4032

| | | |
|---|---|---|
| 1 | UART | 2-wire RS-232 (UIO Extension_UIO2: COM2)<br>UIO-4032 COM_3<br>/dev/ttymxc1 |
| | | 2-wire RS-232 (UIO Extension_UIO2: COM4)<br>UIO-4032 COM_4<br>/dev/ttymxc3<br># stty -F /dev/ttymxc3 -echo -onlcr 115200<br># cat /dev/ttymxc3 &<br># echo "Serial Port Test" > /dev/ttymxc3<br><br>Can also be used as M7_Debug Port:<br>M7_Debug:<br>(1) emmc boot:<br>U-Boot > fatload mmc 2:1 0x48000000 imx8mp_m7_TC-M_hello_world.bin;cp.b 0x48000000 0x7e0000 20000;<br>U-Boot > bootaux 0x7e0000<br>(2) sd card boot:<br>U-Boot > fatload mmc 1:1 0x48000000 imx8mp_m7_TC-M_hello_world.bin;cp.b 0x48000000 0x7e0000 20000;<br>U-Boot > bootaux 0x7e0000 |
| 2 | USB | TOP: USB1 |
| | | BOT: USB2 |
| 3 | Ethernet | 1. Check IP & DHCP<br>2. Throughput<br># iperf3 -c 192.168.0.2 -t 60 -i 10 |
| 4 | EEPROM | # echo -n $'\x06\x05\x04\x03\x02\x01' > test<br># dd if=test of=/sys/bus/i2c/devices/3-0050/eeprom<br># hexdump -C /sys/bus/i2c/devices/3-0050/eeprom -n 64 |

### 3.18.3 UIO-4034

| | | |
|---|---|---|
| 1 | UART | 2-wire RS-232 (UIO Extension_UIO2: COM2)<br>Same as UIO-4032 COM_3 |
| | | 2-wire RS-232 (UIO Extension_UIO2: COM4)<br>Same as UIO-4032 COM_4 |
| 2 | CAN Bus | Connect the UIO-4034 A101-2 CANbus port Pin 2 and Pin 7 to RSB-3720<br>COM1 with 1700100250 cable, pin 9 and Pin 6 of the DB9.<br># ip link set can0 up type can bitrate 125000<br># ifconfig can0 up<br># ip link set can1 up type can bitrate 125000<br># ifconfig can1 up<br><br># candump can0 &<br># cansend can1 1F334455#1122334455667788 |
| 3 | EEPROM | # echo -n $'\x06\x05\x04\x03\x02\x01' > test<br># dd if=test of=/sys/bus/i2c/devices/3-0050/eeprom<br># hexdump -C /sys/bus/i2c/devices/3-0050/eeprom -n 64 |

### 3.18.4 UIO-4036

| | | |
|---|---|---|
| 1 | Lan Switch | 1. Check IP & DHCP<br>2. Ping IP<br>3. Throughput<br># iperf3 -c 192.168.0.2 -t 60 -i 10 |
| 2 | EEPROM | # echo -n $'\x06\x05\x04\x03\x02\x01' > test<br># dd if=test of=/sys/bus/i2c/devices/3-0050/eeprom<br># hexdump -C /sys/bus/i2c/devices/3-0050/eeprom -n 64 |

## 3.19 PyeIQ Test

The i.MX 8M Plus family focuses on neural processing units (NPU) and vision system as well as advance multimedia, delivering highly reliable industrial automation.

The Neural Processing Unit (NPU) operating at up to 2.3 TOPS

- Keyword detection, noise reduction, and beamforming
- Speech recognition (i.e. Deep Speech 2)
- Image recognition (i.e. ResNet-50)

eIQ - A Python Framework for eIQ on i.MX Processors

PyeIQ is written on top of eIQ™ ML Software Development Environment and provides a set of Python classes allowing the user to run Machine Learning applications in a simplified and efficient way without spending time on cross-compilations, deployments, or reading extensive guides.

For more examples and how to run PyeIQ demos on RSB-3720, please refer to the below page:

http://ess-wiki.advantech.com.tw/view/AIMLinux/AddOn/Edge_AI

### 3.19.1 Run Applications and Demos

#### 3.19.1.1 Applications

| Application Name | Framework | i.MX Board | BSP Release | Inference Core | Status |
|---|---|---|---|---|---|
| Switch Classification Image | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | CPU, GPU, NPU | PASS |
| Switch Detection Video | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | CPU, GPU, NPU | PASS |

#### 3.19.1.2 Demos

| Demo Name | Framework | i.MX Board | BSP Release | Inference Core | Status |
|---|---|---|---|---|---|
| Object Classification | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Object Detection SSD | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Object Detection YOLOv3 | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Object Detection DNN | OpenCV:4.2.0 | RSB-3720 | 5.4.24_2.1.0 | CPU | PASS |
| Facial Expression Detection | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Fire Classification | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Fire Classification | ArmNN:19.08 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Pose Detection | TFLite:2.1.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |
| Face/Eyes Detection | OpenCV:4.2.0 | RSB-3720 | 5.4.24_2.1.0 | GPU, NPU | PASS |

# Chapter 4

## Embedded O.S

This chapter details instructions for building Linux systems

# 4.1 Introduction

Advantech's RSB-3720 platform comes preloaded with Yocto 3.0 based embedded O.S. (Linux kernel starting from 5.4.24 to 5.4.70). It contains all the system-required shell commands and drivers needed to operate the platform. We do not offer IDE developing environment on RSB-3720 BSP. Users can evaluate and develop their device using the Ubuntu 16.04 LTS environment.

This chapter introduces the software configuration and development of RSB-3720. It enables users to develop their application(s) efficiently.

For detailed operation, please refer to the Yocto Linux BSP Version A User Guide. The following link directs you to the iMX8 series Wikipedia page: http://ess-wiki.advantech.com.tw/view/IoTGateway/BSP/Linux/iMX8/Yocto_LBVA_User_Guide

## 4.1.1 Device Tree Source File Select for RSB-3720

### 4.1.1.1 Display

A. HDMI (Default)

imx8mp-rsb3720-a1.dtb

B. LVDS

1. g070vw01(LVDS0) + HDMI
   imx8mp-rsb3720-a1-lvds0-auo.dtb
2. g070vw01(LVDS1) + HDMI
   imx8mp-rsb3720-a1-lvds1-auo.dtb
3. g215hvn01(DUAL LVDS) + HDMI
   imx8mp-rsb3720-a1-lvds-dual.dtb

C. MIPI-DSI

1. ROM-EG56 (DSI to HDMI Converter Board) + HDMI
   imx8mp-rsb3720-a1-adv7535.dtb
2. auog101uan02(DSI) + HDMI
   imx8mp-rsb3720-a1-auog101uan02.dtb

### 4.1.1.2 Camera

1. OV5640 (default)
   imx8mp-rsb3720-a1.dtb
2. Basler daA3840-30mc Camera
   imx8mp-rsb3720-a1-basler.dtb

# Chapter 5

## System Recovery

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

## 5.1 System Recovery

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

### 5.1.1 Recovery by SD Card

1. Copy 3720A1AIM30LIVA0070_iMX8MP_flash_tool.tgz package to your desktop.
2. Insert the SD card into the PC.
3. Make a bootable SD card.

```
# tar zxvf 3720A1AIM30LIVA0070_iMX8MP_flash_tool.tgz
# cd 3720A1AIM30LIVA0070_iMX8MP_flash_tool/mk_inand/
# sudo ./mksd-linux.sh /dev/sdg
```

4. Insert the SD card and copy the 3720A1AIM30LIVA0070_iMX8MP_flash_tool to a USB disk.
5. Insert the USB disk and SD card then boot the whole system from the SD card by changing SW1 to 1-2 ON, 3-4 OFF.
6. Enter USB disk folder and make a bootable emmc.

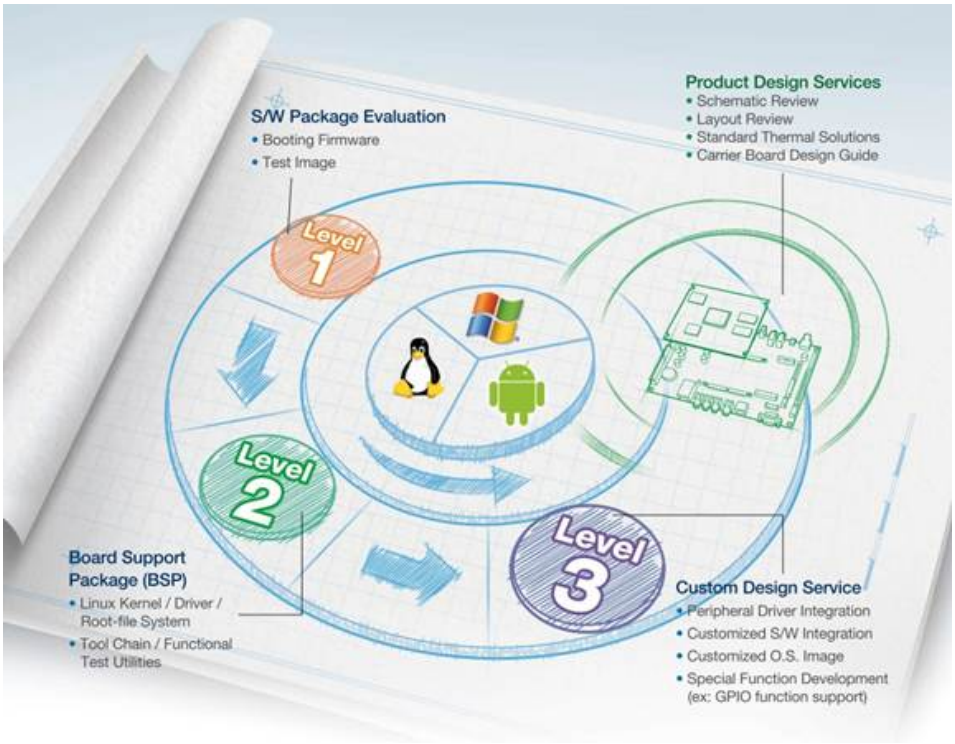
```
# cd /run/media/sda1/
# cd 3720A1AIM30LIVA0070_iMX8MP_flash_tool/mk_inand/
# sudo ./mksd-linux.sh /dev/mmcblk2
```

# Chapter 6

## Advantech Services

**This chapter outlines Advantech's Design-In services, technical support, and warranty policy for RSB-3720.**

## 6.1 RISC Design-In Services




Advantech's RISC Design-In Services help customers reduce the time and work required to design new carrier boards. We handle the complexities of technical research, greatly minimizing the development risks associated with carrier boards.

**Easy Development**

Advantech offers support firmware, root file systems, board support packages, and other development tools that help customers easily develop unique carrier boards and differentiate their embedded products and applications.

- Full range of RISC-based product offerings
- Comprehensive document support

**Design Assistance Service**

Advantech provides engineers with a schematic checklist and review services based on customer carrier board specifications. These services prevent design errors before they occur. This saves time and reduces the costs associated with developing carrier boards.

- Schematic review
- Placement and layout review
- Debugging assistance services
- General/special reference design database

### Thermal Solution Services

Advantech provides thermal solution services — including modularized and/or customized thermal solutions — that quickly accommodate customers' designs.

- Standard thermal solutions
- Customized thermal solutions

### Embedded Software Services

This service provides support drivers, software integration/customized firmware, root file-system, and Linux image — enabling users to 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.

### General I/O Design Capability

Users can typically perform vertical integration. However, lack of expertise and experience in general power and I/O design can cause challenges; especially when integrating CPU modules into carrier boards.

### 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 Wi-Fi, 3G, and 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 RTX 2.0, 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 third parties 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 time 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

## 6.2 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<br>800-810-8389<br>Sales@advantech.com.cn |
| India (toll free) | 1-800-425-5071 |
| Japan (toll free) | 0800-500-1055 |
| Korea (toll free) | 080-363-9494<br>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 Global Service Policy

### 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 lighting 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 the Product 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” on the shipment invoice.
3. List RMA numbers, product serial numbers, and warranty status on the shipment invoice.
4. Add information about the country of origin of the goods

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 lighting 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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www.advantech.com

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

All product specifications are subject to change without notice.