Copyright

The documentation and the software included with this product are copyrighted 2023 by Advantech Co., Ltd. All rights are reserved. Advantech Co., Ltd. reserves the right to make improvements in the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated, or transmitted in any form or by any means without the prior written permission of Advantech Co., Ltd. The information provided in this manual is intended to be accurate and reliable. However, Advantech Co., Ltd. assumes no responsibility for its use, nor for any infringements of the rights of third parties that may result from its use.

Acknowledgments

AMD are trademarks of AMD Corporation.
Microsoft Windows and MS-DOS are registered trademarks of Microsoft Corp.
All other product names or trademarks are properties of their respective owners.

Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.
This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.
Because of Advantech’s high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.
If you believe your product 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 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.
Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

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 instruction manual, 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.

FM

This equipment has passed FM certification. According to the National Fire Protection Association, work sites are categorized into different classes, divisions, and groups based on hazard considerations. This equipment is compliant with the specifications for Class I, Division 2, Groups A, B, C, and D indoor hazards.

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
Warnings, Cautions, and Notes

**Warning!** Warnings indicate conditions that could cause personal injury if not observed!

**Caution!** Cautions are included to help prevent hardware damage and data loss. For example,

“Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer’s instructions.”

**Note!** Notes provide additional and/or optional information.

Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all feedback in writing to support@advantech.com.

Safety Precautions - 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 the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.
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 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.
15. Do not leave the equipment in an environment with a storage temperature of below -20 °C (-4 °F) or above 60 °C (140 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer’s instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator’s position does not exceed 70 dB (A).

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

### Chapter 1 General Information ............................1

1.1 Introduction ............................................................... 2
  Table 1.1: Acronyms.......................................................... 3

1.2 Functional Block Diagram ........................................... 4

1.3 Product Specifications.................................................. 5
  1.3.1 Compliance................................................................. 5
  1.3.2 Feature List................................................................. 5
  Table 1.2: Feature List......................................................... 5
  1.3.3 Processor System....................................................... 6
  Table 1.3: Processor System ............................................. 6
  1.3.4 Memory..................................................................... 6
  1.3.5 Graphics/Audio ......................................................... 6
  Table 1.4: Graphics/Audio.................................................. 6
  1.3.6 Expansion Interface.................................................. 6
  Table 1.5: PCIe x1.............................................................. 6
  1.3.7 Serial Bus................................................................. 7
  1.3.8 I/O ........................................................................... 7
  Table 1.6: USB3.2.............................................................. 7
  Table 1.7: USB2.0.............................................................. 7
  Table 1.8: BIOS................................................................. 8
  1.3.9 Power Management.................................................. 9
  1.3.10 Environment............................................................ 10
  1.3.11 MTBF ................................................................. 10
  1.3.12 OS Support............................................................... 10
  1.3.13 Advantech iManager ............................................. 11
  1.3.14 Power Consumption.............................................. 11
  Table 1.9: Power Consumption Table (Watt.) ................... 11
  1.3.15 Selection Guide w/ P/N........................................... 12
  Table 1.10:Selection Guide w/ P/N................................... 12
  1.3.16 Packing list............................................................. 12
  Table 1.11:Packing List ................................................... 12
  1.3.17 Development Board .............................................. 12
  Table 1.12:Development Board................................. 12
  1.3.18 Optional Accessory............................................... 12
  Table 1.13:Optional Accessory....................................... 12
  1.3.19 Pin Description....................................................... 13

### Chapter 2 Mechanical Information ....................15

2.1 Board Information....................................................... 16
  Figure 2.1 Board Chips ID – Front.................................. 16
  Figure 2.2 Board Chips ID – Rear .................................. 16

2.2 Mechanical Diagram .................................................. 17
  Figure 2.3 Atom Series Board Mechanical Diagram – Front .. 17
  Figure 2.4 Atom Series Board Mechanical Diagram – Rear .. 17
  Figure 2.5 Atom Series Board Mechanical Diagram – Side ... 17
  Figure 2.6 Pentium Series Board Mechanical Diagram – Front 18
  Figure 2.7 Pentium Series Board Mechanical Diagram – Rear 18
  Figure 2.8 Pentium Series Board Mechanical Diagram – Side .. 18

2.3 Assembly Diagram ..................................................... 19
  Figure 2.9 Assembly Diagram ......................................... 19

2.4 Assembly Diagram ..................................................... 20
  Figure 2.10CPU Height and Tolerance............................ 20
  Figure 2.11CPU Height and Tolerance......................... 20
Chapter 3

AMI BIOS

3.1 Introduction ............................................................................................. 22
Figure 3.1 Setup Program Initial Screen ................................... 22
3.2 Entering Setup ........................................................................................ 22
3.3 Main Setup.............................................................................................. 23
Figure 3.2 Main setup screen.................................................... 23
3.4 Advanced BIOS Features Setup............................................................. 24
Figure 3.3 Advanced BIOS features setup screen ............................ 24
3.4.1 CPU Configuration................................................................. 25
Figure 3.4 CPU Configuration ................................................... 25
3.4.2 Power & Performance................................................................. 26
Figure 3.5 Power & Performance .................................................. 26
Figure 3.6 CPU - Power Management Control ................................... 27
Figure 3.7 GT - Power Management Control .................................... 28
3.4.3 PCH-FW Configuration.............................................................. 29
Figure 3.8 PCH-FW Configuration .............................................. 29
Figure 3.9 Firmware Update Configuration ..................................... 30
3.4.4 Trusted Computing.............................................................. 31
Figure 3.10 Trusted Computing ................................................... 31
3.4.5 ACPI Settings ............................................................................. 32
Figure 3.11 ACPI Settings ........................................................... 32
3.4.6 Embedded Controller............................................................... 33
Figure 3.12 Embedded Controller ............................................... 33
Figure 3.13 Serial Port 1 Configuration ....................................... 34
Figure 3.14 Serial Port 2 Configuration ....................................... 35
Figure 3.15 Hardware Monitor..................................................... 36
3.4.7 Serial Port Console Redirection.................................................. 37
Figure 3.16 Serial Port console Redirection ................................ 37
3.4.8 USB Configuration...................................................................... 38
Figure 3.17 USB Configuration.................................................... 38
3.4.9 Network Stack Configuration ...................................................... 39
Figure 3.18 Network Stack Configuration .................................... 39
3.4.10 NVME Configuration................................................................... 40
Figure 3.19 NVME Configuration ................................................. 40
3.4.11 SDIO Configuration..................................................................... 41
Figure 3.20 SDIO Configuration .................................................. 41
3.5 Chipset Setup ......................................................................................... 42
Figure 3.21 Chipset Setup .................................................................... 42
3.5.1 System Agent (SA) Configuration................................................... 43
Figure 3.22 System Agent (SA) Configuration ............................ 43
Figure 3.23 Memory Configuration.............................................. 44
Figure 3.24 Graphics Configuration............................................. 45
Figure 3.25 LCD Control.............................................................. 46
3.5.2 PCH-IO Configuration................................................................. 47
Figure 3.26 PCH-IO Configuration ................................................... 47
Figure 3.27 PCI Express Configuration ........................................... 48
Figure 3.28 PCI Express Root Port 1 .............................................. 49
Figure 3.29 PCI Express Root Port 2 .............................................. 50
Figure 3.30 PCI Express Root Port 3 .............................................. 51
Figure 3.31 PCI Express Root Port 4 .............................................. 52
Figure 3.32 PCI Express Root Port 5 .............................................. 53
Figure 3.33 SATA Configuration.................................................. 54
Figure 3.34 USB Configuration.................................................... 55
Figure 3.35 Security Configuration.................................................. 56
Figure 3.36 HD Audio Subsystem Configuration Settings ............... 57
Figure 3.37 Serial IO I2C2 Configuration ......................................... 58
Figure 3.38 Serial IO I2C2 Settings .............................................. 59
Figure 3.39 Serial IO I2C4 Settings ................................................... 60
Figure 3.40 SCS Configuration..................................................... 61
Chapter 4 S/W Introduction and Installation ....67

4.1 S/W Introduction .............................................................. 68
4.2 Driver Installation ............................................................ 68
   4.2.1 Windows Driver Setup ................................................. 68
   4.2.2 Other OS .................................................................... 68
4.3 Advantech iManager ........................................................... 69

Appendix A Pin Assignment ................................................. 71
   A.1 SOM-7532 Pin Assignment ............................................. 72

Appendix B Watchdog Timer ................................................. 77
   B.1 Programming the Watchdog Timer ................................. 78

Appendix C Programming GPIO ............................................. 79
   C.1 GPIO Register ............................................................... 80

Appendix D System Assignments ......................................... 81
   D.1 System I/O Ports ............................................................ 82
       Table D.1: Table D.1: System I/O ports ............................. 82
   D.2 Interrupt Assignments ................................................... 83
       Table D.2: Table D.2: Interrupt Assignments ..................... 83
   D.3 1st MB Memory Map ..................................................... 84
       Table D.3: 1st MB Memory Map ....................................... 84
Chapter 1

General Information

This chapter gives background information on the SOM-7532 CPU Computer on Module. Sections include:

- Introduction
- Functional Block Diagram
- Product Specification
1.1 Introduction

SOM-7532 is a COM Express Compact module with type 10 pin-out that fully complies with the PICMG (PCI Industrial Computer Manufactures Group) COM R3.0 specification. The CPU module is Intel® Pentium®/Celeron® and Atom® x6000 Series Processors (formally called Elkhart Lake) in a mini size 55x84mm COM Express form factor, features a 12watt thermal design power (TDP) rating.

Compare with previous platforms, SOM-7532 has a better 1.7X CPU performance, and 2X graphics performance enhancements. SOM-7532 supports up to 16GB dual channel LPDDR4 3200MT/s memory, with higher memory bandwidth for better performance. In addition, there are numerous high speed I/O interfaces included, such as PCIe Gen3 (8.0GT/s) and 2.5Gbase-T, USB3.2 Gen2 (10Gbps) and CAN-FD, for better system expansion. Moreover, it could be developed with double independent displays up to 4K, picked from DisplayPort 1.4/HDMI 2.0 and one optional eDP or LVDS. With optional eMMC, TPM2.0 on-board design, 4.75~20V power input feature, and -40 to 85°C operating temperature. SOM-7532 is a reliable and suitable solution for industrial & automation requirements.

Advantech iManager (SUSI 4) is invented to satisfy a lot of embedded application requirements such as multi-level watchdog timer, voltage and temperature monitoring, thermal protection and mitigation through processor throttling, LCD backlight on/off and brightness control, embedded storage for customized information, etc. Combining Advantech WISE-PaaS/RMM, it can remote monitoring and controlling devices through internet for easy maintain. All Advantech modules integrate iManager and WISE-PaaS/RMM to be an add-on value for customer’s applications.

Capable of performance under extreme conditions, and featuring embedded platform power consumption and multiple expansion I/O interfaces, SOM-7532 is a product that is computing centric, thermal sensitive, graphics/media insensitive, and appropriate for demanding I/O applications.
<table>
<thead>
<tr>
<th>Term</th>
<th>Define</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC’97</td>
<td>Audio CODEC (Coder-Decoder)</td>
</tr>
<tr>
<td>ACPI</td>
<td>Advanced Configuration Power Interface – standard to implement power saving modes in PC-AT systems</td>
</tr>
<tr>
<td>BIOS</td>
<td>Basic Input Output System – firmware in PC-AT system that is used to initialize system components before handing control over to the operating system</td>
</tr>
<tr>
<td>CAN</td>
<td>Controller-area network (CAN or CAN-bus) is a vehicle bus standard designed to allow microcontrollers to communicate with each other within a vehicle without a host computer</td>
</tr>
<tr>
<td>DDI</td>
<td>Digital Display Interface – containing DisplayPort, HDMI/DVI, and SDVO</td>
</tr>
</tbody>
</table>
| EAPI | Embedded Application Programmable Interface Software interface for COM Express® specific industrial function:
- System information
- Watchdog timer
- I2C Bus
- Flat-panel brightness control
- User storage area
- GPIO |
| GbE | Gigabit Ethernet |
| GPIO | General purpose input output |
| HDA | Intel High Definition Audio (HD Audio) refers to the specification released by Intel in 2004 for delivering high definition audio that is capable of playing back more channels at higher quality than AC’97 |
| I2C | Inter Integrated Circuit – 2 wire (clock and data) signaling scheme allowing communication between integrated circuit, primarily used to read and load register values |
| ME | Management Engine |
| PC-AT | “Personal Computer – Advanced Technology” – an IBM trademark term used to refer to Intel based personal computer in 1990s |
| PEG | PCI Express Graphics |
| RTC | Real Time Clock – battery backed circuit in PC-AT systems that keeps system time and date as well as certain system setup parameters |
| SPD | Serial Presence Detect – refers to serial EEPROM on DRAMs that has DRAM Module configuration information |
| TPM | Trusted Platform Module, chip to enhance the security features of a computer system |
| UEFI | Unified Extensible Firmware Interface |
| WDT | Watch Dog Timer |
1.2 Functional Block Diagram
1.3 Product Specifications

1.3.1 Compliance

- PICMG COM.0 (COM Express) Revision 3.0
- Mini Size - 55 x 84mm
- Pin-out Type 10 compatible

1.3.2 Feature List

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Connector Row</th>
<th>Feature</th>
<th>Type 10 Define</th>
<th>SOM-7532</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>A-B</td>
<td>LVDS Channel A (18/24-bit)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>eDP (muxed on LVDS Channel A)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Expansion</td>
<td>A-B</td>
<td>PCI Express x1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>LPC</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Serial</td>
<td>A-B</td>
<td>SMBus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>I2C Bus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Serial Port</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>CAN BUS (muxed on SER1)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>I/O</td>
<td>A-B</td>
<td>LAN Port 0 (Gigabit Ethernet)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>SATA</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>USB 2.0</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>USB Client</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>HD Audio</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>SPI Bus</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>General Purpose I/O (GPIO)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>SDIO (muxed on GPIO)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Watchdog Timer Output</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Speaker Out</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>External BIOS ROM Support</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Power Button Support</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Power Good</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>VCC_5V_SBY Contacts</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Sleep</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Thermal Protection</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Lid Input</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Battery Low Alarm</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Suspend/Wake Signals</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Fan PWM / Tachometer</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>Trusted Platform Modules</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>A-B</td>
<td>USB 3.0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
1.3.3 Processor System

<table>
<thead>
<tr>
<th>Table 1.3: Processor System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
</tr>
<tr>
<td>Pentium J6426</td>
</tr>
<tr>
<td>Pentium N6415</td>
</tr>
<tr>
<td>Atom x6211E</td>
</tr>
<tr>
<td>Atom x6425RE</td>
</tr>
<tr>
<td>Atom x6425E</td>
</tr>
<tr>
<td>Atom x6413E</td>
</tr>
</tbody>
</table>

1.3.4 Memory
Dual channels onboard LPDDR4 3200MT/s up to 16GB, up to 4267MT/s by specific SPU SKUs. (non-ECC)

1.3.5 Graphics/Audio
Graphics Core: Intel® Gen10 UHD/P630 Graphic supports DX12, OGL5.0, OCL2.1, and MPEG2, HEVC/H265, VC1/WMV9 HW decode/encode/transcode acceleration.

<table>
<thead>
<tr>
<th>Table 1.4: Graphics/Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
</tr>
<tr>
<td>Pentium J6426</td>
</tr>
<tr>
<td>Pentium N6415</td>
</tr>
<tr>
<td>Atom x6211E</td>
</tr>
<tr>
<td>Atom x6425RE</td>
</tr>
<tr>
<td>Atom x6425E</td>
</tr>
<tr>
<td>Atom x6413E</td>
</tr>
</tbody>
</table>

1.3.6 Expansion Interface

1.3.6.1 PCIe x1
PCI Express x1: Supports default 4 ports PCIe x1 compliant to PCIe Gen3 (8.0 GT/s) specifications, configurable to PCIe x4 or PCIe x2. Several configurable combinations may need BIOS modification. Please contact the Advantech sales or FAE for more details.

<table>
<thead>
<tr>
<th>Table 1.5: PCIe x1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 10</strong></td>
</tr>
<tr>
<td>Default</td>
</tr>
<tr>
<td>Option 1</td>
</tr>
</tbody>
</table>

1.3.6.2 LPC
Supports Low Pin Count (LPC) 1.1 specification, without DMA or bus mastering. Enables connection to Super I/O, embedded controller, or TPM. 24MHz LPC clock.
1.3.7 Serial Bus

1.3.7.1 SMBus
Support SMBus 2.0 specification.

1.3.7.2 I²C Bus
Supports I²C bus 7-bit and 10-bit address modes. Support standard mode up to 100 Kb/s, fast mode up to 400 Kb/s.

1.3.8 I/O

1.3.8.1 Gigabit Ethernet
Ethernet: Intel I225 Gigabit LAN supports 10/100/1000 Mbps & 2.5 Gbps Speed.

1.3.8.2 SATA
Supports 2 ports SATA Gen3 (6.0 Gb/s), backward compliant to SATA Gen2 (3.0 Gb/s) and Gen1 (1.5 Gb/s). The maximum data rate is 600 MB/s. Supports AHCI 1.3.1 mode (does not support IDE mode).

1.3.8.3 USB3.2/USB2.0
SOM-7532 supports 2 x ports USB 3.2 Gen2 (10 Gbps) and 8 x ports USB 2.0 (480 Mbps) which are reverse compatible to USB1.x. For USB 3.2, product supports LPM (U0, U1, U2, and U3) for power efficiency.
Notice: To meet USB 3.2 Gen2 performance, Advantech strongly recommends using a certificated cable.

1.3.8.4 USB3.2

<table>
<thead>
<tr>
<th>Table 1.6: USB3.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 10</td>
</tr>
<tr>
<td>SoC</td>
</tr>
<tr>
<td>Type 10</td>
</tr>
<tr>
<td>SoC USB_OC#</td>
</tr>
</tbody>
</table>

1.3.8.5 USB2.0

<table>
<thead>
<tr>
<th>Table 1.7: USB2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 10</td>
</tr>
<tr>
<td>SoC</td>
</tr>
<tr>
<td>Type 10</td>
</tr>
<tr>
<td>SoC USB_OC#</td>
</tr>
</tbody>
</table>

1.3.8.6 SPI Bus
Supports BIOS flash only. SPI clock can be 20MHz, with capacity up to 256Mb.

1.3.8.7 GPIO
8 programmable general purpose input or output (GPIO).
1.3.8.8 **Watchdog Timer**  
Supports multi-level watchdog time-out output. Provides 1-65535 level, from a 100ms to 109.22 minute intervals.

1.3.8.9 **Serial Port**  
2 x 2-wire serial port (Tx/Rx) supports 16550 UART compliance.  
- Programmable FIFO or character mode  
- 16-byte FIFO buffer on transmitter and receiver in FIFO mode  
- Programmable serial-interface characteristics: 5, 6, 7, or 8-bit character  
- Even, odd, or no parity bit selectable  
- 1, 1.5, or 2 stop bit selectable  
- Baud rate up to 115.2K

1.3.8.10 **TPM**  
Supports TPM 2.0 module by option.

1.3.8.11 **Smart Fan**  
Supports 1 Fan PWM control signals and 1 tachometer input for fan speed detection. Provides 1 on carrier board following PICMG COM Express R3.0 specifications.

1.3.8.12 **BIOS**  
The BIOS chip is on module by default. Users can place BIOS chip on the carrier board with appropriate design and jumper setting in BIOS_DIS#[1:0].

<table>
<thead>
<tr>
<th>BIOS_DIS#0</th>
<th>BIOS_DIS#1</th>
<th>Boot up destination/function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Open</td>
<td>Boot from Module’s SPI BIOS</td>
</tr>
<tr>
<td>Open</td>
<td>GND</td>
<td>SPI_CS0# to Carrier Board, SPI_CS1# to Module</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
<td>SPI_CS0# to Module, SPI_CS1# to Carrier Board</td>
</tr>
</tbody>
</table>

**Note:** If system COMS is cleared, Advantech strongly suggests going to the BIOS setup menu and loading default settings on the first boot up.
The standard module has no jumper at SCN1, so BIOS settings is kept without a RTC coin battery. If you need to restore to BIOS default settings follow the steps below:

1. Remove the coin battery.
2. Put jumper on SCN1 pin1-2.
3. Turn on power supply.
4. System will boot up a few times.
5. BIOS will be load default setting successfully.

1.3.9 **Power Management**

1.3.9.1 **Power Supply**

Supports both ATX and AT power modes. VSB is for suspended power and can be optional if not required by standby (suspend-to-RAM) support. RTC battery may be optional if date/timekeeping is not required.

- VCC: 4.75V (5V-5%) – 20V (19V+5%)
- VSB: 5V ± 5% (Suspend power)
- RTC Battery Power: 2.0V – 3.3V

1.3.9.2 **PWROK**

Power-good from the main power supply. A high value indicates the power level is good. This signal can be used to postpone module startup allowing Carrier-based FPGAs or other configurable devices time to be programmed.

1.3.9.3 **Power Sequence**

According to PICMG COM Express R 3.0 specification.
1.3.9.4 **Wake Event**
Various wake event support allows users to apply different scenarios.

- Wake-on-LAN (WOL): Wake to S0 from S3/S4/S5
- USB Wake: Wake to S0 from S3
- PCIe Device Wake: depends on user inquiry and may need customized BIOS
- LPC Wake: depends on user inquiry and may need customized BIOS

1.3.9.5 **Advantech S5 ECO Mode (Deep Sleep Mode)**
Advantech iManager provides additional features allowing the system to enter a very low suspended power mode – S5 ECO mode. In this mode, the module will cut all power, including suspended and active power to the chipset, and keep an on-module controller active. Only power under 50MW will be consumed, meaning user battery packs can last longer. While this mode is enabled in the BIOS, the system (or module) only allows power button boot instead of other methods such as WOL.

1.3.10 **Environment**

1.3.10.1 **Temperature**

- **Operating:** 0 ~ 60° C (32 ~ 140° F)
- **Storage:** -40 ~ 85° C (-40 ~ 185° F)

1.3.10.2 **Humidity**

- **Operating:** 40°C @ 95% relative humidity, non-condensing
- **Storage:** 60°C @ 95% relative humidity, non-condensing

1.3.10.3 **Vibrations**

IEC60068-2-64: Random vibration test under operation mode, 3.5 Grms.

1.3.10.4 **Drop Test (Shock)**
Federal Standard 101 Method 5007 test procedure with standard packing.

1.3.10.5 **EMC**
CE EN55022 Class B and FCC Certifications: validated with standard development boards in Advantech chassis.

1.3.11 **MTBF**

1.3.12 **OS Support**
The mission of Advantech Embedded Software Services is to "Enhance quality of life with Advantech platforms and Microsoft Windows Embedded technology." We enable Windows Embedded software products on Advantech platforms to more effectively support the embedded computing community. Customers are freed from the hassle of dealing with multiple vendors (hardware suppliers, system integrators, embedded OS distributors) for projects. Our goal is to make Windows Embedded software solutions easily and widely available to the embedded computing community.
To install drivers, please connect to the website http://support.advantech.com.tw to download the setup file.
1.3.13 **Advantech iManager**

Supports APIs for GPIO, smart fan control, multi-stage watchdog timer, temperature sensor, and hardware monitoring. Follows PICMG EAPI 1.0 specifications with backward compatibility.

1.3.14 **Power Consumption**

<table>
<thead>
<tr>
<th>Power State</th>
<th>Active Power Domain</th>
<th>Suspend Power Domain</th>
<th>Mechanical off</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM-7532DCCX-U0A1</td>
<td>23.141W</td>
<td>16.770W</td>
<td>4.297W</td>
</tr>
<tr>
<td>S0 Max. Load</td>
<td>S0 Burn-in</td>
<td>S0 Idle</td>
<td>S5</td>
</tr>
<tr>
<td>S5 Deep Sleep</td>
<td>RTC (uA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hardware Configurations:**
1. MB: SOM-7532DCCX-U0A1
2. DRAM: 16GB LPDDR4 3200MT/s
3. Carrier board: SOM-DB5830-00A2

**Test Condition:**
1. Test temperature: room temperature (about 25°C)
2. Test voltage: rated voltage DC +12.0V
3. Test loading:
   - Maximum load mode: According to Intel thermal/power test tools.
   - Burn-in mode: Burn-in test V8.1 Pro (1023) for 64 bit Windows. (CPU, RAM, 2D&3D Graphics and Disk with 100%)
   - Idle mode: DUT power management off and not running any program.
4. OS: Windows 10 Enterprise

1.3.14.1 **Performance**

To compare performance or benchmark data with other modules, please refer to “Advantech COM Performance & Power Consumption Table.”
1.3.15 Selection Guide w/ P/N

**Table 1.10: Selection Guide w/ P/N**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM-7532DNC C-U0A1</td>
<td>Pentium J6426</td>
<td>4</td>
<td>32EU</td>
<td>2.0GHz</td>
<td>3.0GHz</td>
<td>400MHz</td>
<td>850MHz</td>
<td>10W</td>
<td>16G</td>
<td>64GB</td>
<td>No</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532CNB C-S2A1</td>
<td>Pentium N6415</td>
<td>4</td>
<td>16EU</td>
<td>1.2GHz</td>
<td>3.0GHz</td>
<td>350MHz</td>
<td>800MHz</td>
<td>6.5W</td>
<td>8G</td>
<td>32GB</td>
<td>No</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532ACB C-S3A1</td>
<td>Atom x6211E</td>
<td>2</td>
<td>16EU</td>
<td>1.3GHz</td>
<td>3.0GHz</td>
<td>350MHz</td>
<td>750MHz</td>
<td>6W</td>
<td>2G</td>
<td>32GB</td>
<td>Yes</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532CCB X-S9A1</td>
<td>Atom x6425R</td>
<td>4</td>
<td>32EU</td>
<td>1.9GHz</td>
<td>N/A</td>
<td>400MHz</td>
<td>N/A</td>
<td>12W</td>
<td>8G</td>
<td>32GB</td>
<td>Yes</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532DCC X-U0A1</td>
<td>Atom x6425E</td>
<td>4</td>
<td>32EU</td>
<td>2.0GHz</td>
<td>3.0GHz</td>
<td>500MHz</td>
<td>750MHz</td>
<td>12W</td>
<td>16G</td>
<td>64GB</td>
<td>Yes</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532CCB X-S5A1</td>
<td>Atom x6413E</td>
<td>4</td>
<td>16EU</td>
<td>1.5GHz</td>
<td>3.0GHz</td>
<td>500MHz</td>
<td>750MHz</td>
<td>9W</td>
<td>8G</td>
<td>32GB</td>
<td>Yes</td>
<td>Passive</td>
</tr>
<tr>
<td>SOM-7532BCB X-S3A1</td>
<td>Atom x6211E</td>
<td>2</td>
<td>16EU</td>
<td>1.3GHz</td>
<td>3.0GHz</td>
<td>350MHz</td>
<td>750MHz</td>
<td>6W</td>
<td>4G</td>
<td>32GB</td>
<td>Yes</td>
<td>Passive</td>
</tr>
</tbody>
</table>

1.3.16 Packing list

**Table 1.11: Packing List**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>SOM-7532 COM module</td>
<td>1</td>
</tr>
<tr>
<td>1970005552T001/1970005552T011</td>
<td>Heatspreader IHS/Heatspreader NON-I</td>
<td>1</td>
</tr>
</tbody>
</table>

1.3.17 Development Board

**Table 1.12: Development Board**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM-DB5830-00A2</td>
<td>COMe Devel. Board COMe R3.0 Type6 pin-out (LVDS) 0 ~ 60 °C</td>
</tr>
<tr>
<td>SOM-DB5830A-00A2</td>
<td>COMe Devel. Board COMe R3.0 Type6 pin-out (eDP) 0 ~ 60 °C</td>
</tr>
<tr>
<td>SOM-DB5830X-00A2</td>
<td>COMe Devel. Board COMe R3.0 Type6 pin-out (LVDS) -40 ~ 85 °C</td>
</tr>
</tbody>
</table>

Note: SOM-7532 need to assembly middle board EA00, then pin out will mapping to type 10 with SOM-DB5830.

1.3.18 Optional Accessory

**Table 1.13: Optional Accessory**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970005554T001</td>
<td>Semi-Heatsink</td>
</tr>
</tbody>
</table>
1.3.19 Pin Description

Advantech provides useful checklists for schematic design and layout routing. In schematic checklist, it will specify detail about each pin electrical properties and how to connect for different user scenes. In layout checklist, it will specify the layout constraints and recommendations for trace length, impedance, and other necessary information during design.

Please contact your nearest Advantech branch office or call for getting the design documents and further advance supports.
Chapter 2

Mechanical Information

This chapter gives mechanical information on the SOM-7532 CPU Computer on Module. Sections include:

- Board Information
- Mechanical Drawing
- Assembly Drawing
2.1 Board Information

The figures below indicate the main chips on SOM-7532 Computer-on-Module. Please aware on these positions while design customer’s own carrier board to avoid mechanical violence and thermal solutions contacts for best thermal dispassion performance.

![Figure 2.1 Board Chips ID – Front](image1)

![Figure 2.2 Board Chips ID – Rear](image2)
2.2 Mechanical Diagram

For more detail about 2D/3D models, please find on Advantech COM support service website http://com.advantech.com.

Figure 2.3 Atom Series Board Mechanical Diagram – Front

Figure 2.4 Atom Series Board Mechanical Diagram – Rear

Figure 2.5 Atom Series Board Mechanical Diagram – Side
Figure 2.6 Pentium Series Board Mechanical Diagram – Front

Figure 2.7 Pentium Series Board Mechanical Diagram – Rear

Figure 2.8 Pentium Series Board Mechanical Diagram – Side
2.3 **Assembly Diagram**

These figures demonstrate the order of assembly for attaching the thermal module and COM module to carrier board.

![Assembly Diagram](image)

**Figure 2.9 Assembly Diagram**

There are 4 x reserved screw holes that enable SOM-7532 to be assembled with the heat spreader.
2.4 Assembly Diagram

Please consider the CPU and chip height tolerance when designing your thermal solution.

![Figure 2.10 CPU Height and Tolerance](image1)

Intel Atom® Processor Series

Figure 2.10 CPU Height and Tolerance

![Figure 2.11 CPU Height and Tolerance](image2)

Intel® Pentium and Celeron N and J Series Processors

Figure 2.11 CPU Height and Tolerance
Chapter 3

AMI BIOS

This chapter gives BIOS setup information for the SOM-7532 CPU computer-on module.

Sections include:
- Introduction
- Entering Setup
- Hot/Operation Key
- Exit BIOS Setup Utility
3.1 Introduction

AMI BIOS has been integrated into many motherboards for over a decade. With the AMI BIOS Setup Utility, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the BIOS Setup Utility.

![Figure 3.1 Setup Program Initial Screen](image)

AMI's BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This information is stored in flash ROM so it retains the Setup information when the power is turned off.

3.2 Entering Setup

Turn on the computer and then press <DEL> or <ESC> to enter the Setup menu.
3.3 Main Setup

When users first enter the BIOS Setup Utility, users will enter the Main setup screen. Users can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.

![Main setup screen](image)

The Main BIOS setup screen has two main frames. The left frame displays all the options that can be configured. Grayed-out options cannot be configured; options in blue can. The right frame displays the key legend.

Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

- **System time/System date**
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time must be entered in HH:MM:SS format.
3.4 Advanced BIOS Features Setup

Select the Advanced tab from the SOM-7532 setup screen to enter the Advanced BIOS Setup screen. Users can select any item in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. Users can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screens are shown below. The sub menus are described on the following pages.

- **CPU Configuration**
  - CPU Configuration Parameters.

- **Power & Performance**
  - Power & Performance Options.

- **PCH-FW Configuration**
  - Configure Management Engine Technology Parameters.

- **Trusted Computing**
  - Trusted Computing Settings.

- **ACPI Settings**
  - ACPI Sleep State.

- **Embedded Controller**
  - Embedded Controller Parameters.

- **Serial Port Console Redirection**
  - Console Redirection Settings.

- **USB Configuration**
  - USB Configuration Parameters.

- **Network Stack Configuration**
  - Network Stack Settings.

- **NVMe Configuration**
  - NVMe controller and Drive information.
3.4.1 CPU Configuration

- **Intel (VMX) Virtualization Technology**
  When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

- **Active Processor Cores**
  Number of cores to enable in each processor package.

- **AES**
  Enable/Disable AES (Advanced Encryption Standard)

- **MonitorMwait**
  Enable/Disable Monitor Mwait.
## 3.4.2 Power & Performance

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU - Power Management Control</td>
<td>Options</td>
</tr>
<tr>
<td>GT - Power Management Control</td>
<td>Options</td>
</tr>
</tbody>
</table>

### Figure 3.5 Power & Performance

- **CPU - Power Management Control**
  - CPU - Power Management Control Options
- **GT - Power Management Control**
  - GT - Power Management Control Options
3.4.2.1 CPU - Power Management Control

- **Boot performance mode**
  Select the performance state that the BIOS will set starting from reset vector.

- **Intel(R) SpeedStep(tm)**
  Allows more than two frequency ranges to be supported.

- **Intel(R) Speed Shift Technology**
  Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

- **Turbo Mode**
  Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.

- **C states**
  Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
### GT - Power Management Control

**RC6(Render Standby)**
Check to enable render standby support.
### 3.4.3 PCH-FW Configuration

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ME Firmware Version</strong></td>
<td>15.40.26.2619</td>
</tr>
<tr>
<td><strong>ME Firmware Mode</strong></td>
<td>Normal Mode</td>
</tr>
<tr>
<td><strong>ME Firmware SKU</strong></td>
<td>Consumer SKU</td>
</tr>
<tr>
<td><strong>ME State</strong></td>
<td>[Enabled]</td>
</tr>
<tr>
<td><strong>ME Unconfig on RTC Clear</strong></td>
<td>[Enabled]</td>
</tr>
<tr>
<td><strong>Firmware Update Configuration</strong></td>
<td>Configure Management Engine Technology Parameters.</td>
</tr>
<tr>
<td><strong>OEM Key Revocation Configuration</strong></td>
<td>When enabled, BIOS will automatically send HECI command to revoke OEM keys.</td>
</tr>
</tbody>
</table>

Figure 3.8 PCH-FW Configuration

- **ME Unconfig on RTC Clear**
  When Disabled ME will nor unconfigured on RTC clear.

- **Firmware Update Configuration**
  Configure Management Engine Technology Parameters.

- **OEM Key Revocation Configuration**
  When enabled, BIOS will automatically send HECI command to revoke OEM keys.
3.4.3.1 Firmware Update Configuration

**Figure 3.9 Firmware Update Configuration**

- **Me FW Image Re-Flash**
  Enable/Disable Me FW Image Re-Flash function.

- **FW Update**
  Enable/Disable ME FW Update function.
3.4.4 Trusted Computing

![Table of Trusted Computing Settings]

- **Security Device Support**
  Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

- **SHA256 PCR Bank**
  Enable or Disable SHA256 PCR Bank.

- **Pending operation**
  Pending operation

- **Platform Hierarchy**
  Enable or Disable Platform Hierarchy.

- **Storage Hierarchy**
  Enable or Disable Storage Hierarchy.

- **Endorsement Hierarchy**
  Enable or Disable Endorsement Hierarchy.

- **Physical Presence Spec Version**
  Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.

- **Device Select**
  TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated.

---

**Figure 3.10 Trusted Computing**
### 3.4.5 ACPI Settings

<table>
<thead>
<tr>
<th>ACPI Settings</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable ACPI Auto Configuration</td>
<td>[Disabled]</td>
</tr>
<tr>
<td>Enable Hibernation</td>
<td>[Enabled]</td>
</tr>
<tr>
<td>ACPI Sleep State</td>
<td>[S3 (Suspend to RAM)]</td>
</tr>
</tbody>
</table>

*Enables or Disables BIOS ACPI Auto Configuration.*

*Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.*

*Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.*

#### Figure 3.11 ACPI Settings

- **Enable ACPI Auto Configuration**
  Enables or Disables BIOS ACPI Auto Configuration.

- **Enable Hibernation**
  Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

- **ACPI Sleep State**
  Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.
3.4.6 Embedded Controller

- **CPU Shutdown Temperature**
  CPU Shutdown Temperature.

- **Smart Fan - Carrier Board**
  Control Carrier Board Smart FAN function. Get value from EC and only set value when Save Changes.

- **Backlight Enable Polarity**
  Switch Backlight Enable Polarity for Native or Invert.

- **Backlight Mode Selection**
  Switch Backlight Control to PWM or DC mode.

- **Brightness PWM Polarity**
  Backlight Control Brightness PWM Polarity for Native or Invert.

- **Power Saving Mode**
  Select Power Saving Mode.

- **Serial Port 1 Configuration**
  Set Parameters of Serial Port 1 (COMA).

- **Serial Port 2 Configuration**
  Set Parameters of Serial Port 2 (COMB).

- **Hardware Monitor**
  Monitor hardware status

- **ACPI Report Method Configuration**
  Select ACPI Reporting Method for EC Devices.

- **CAN0 Control**
  Enable/Disable CAN0 controller on RDC EIO-211.

- **I2C0 Control**
  Enable/Disable I2C0 controller on RDC EIO-211.

- **SMBus0 Control**
  Enable/Disable SMBus0 controller on RDC EIO-211.
### 3.4.6.1 Serial Port 1 Configuration

- **Serial Port**
  Enable or Disable Serial Port (COM).

- **Change Settings**
  Select an optimal settings for Super IO Device.
3.4.6.2 Serial Port 2 Configuration

- **Serial Port**
  Enable or Disable Serial Port (COM).

- **Change Settings**
  Select an optimal settings for Super IO Device.

Figure 3.14 Serial Port 2 Configuration
3.4.6.3 Hardware Monitor

Figure 3.15 Hardware Monitor
3.4.7 Serial Port Console Redirection

- **COM1 Console Redirection**
  Console Redirection Enable or Disable.

- **Console Redirection Settings**
The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

- **COM2 Console Redirection**
  Console Redirection Enable or Disable.

- **Console Redirection EMS**
  Console Redirection Enable or Disable.

- **Console Redirection Settings**
The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.
3.4.8 USB Configuration

- **Legacy USB Support**
  Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.

- **XHCI Hand-off**
  This is a workaround for OS without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

- **USB Mass Storage Driver Support**
  Enable/Disable USB Mass Storage Driver Support.

- **USB transfer time-out**
  The time-out value for Control, Bulk, and Interrupt transfers.

- **Device reset time-out**
  USB mass storage device Start Unit command time-out.

- **Device power-up delay**
  Maximum time the device will take before it properly reports itself to the Host Controller. "Auto" uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.
### 3.4.9 Network Stack Configuration

<table>
<thead>
<tr>
<th>Feature</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4 PXE Support</td>
<td>[Disabled]</td>
<td>Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.</td>
</tr>
<tr>
<td>IPv4 HTTP Support</td>
<td>[Disabled]</td>
<td>Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.</td>
</tr>
<tr>
<td>IPv6 PXE Support</td>
<td>[Disabled]</td>
<td>Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.</td>
</tr>
<tr>
<td>IPv6 HTTP Support</td>
<td>[Disabled]</td>
<td>Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.</td>
</tr>
<tr>
<td>PXE boot wait time</td>
<td>0</td>
<td>Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.</td>
</tr>
<tr>
<td>Media detect count</td>
<td>1</td>
<td>Number of times presence of media will be checked. Use either +/- or numeric keys to set the value.</td>
</tr>
</tbody>
</table>

**Figure 3.18 Network Stack Configuration**

- **Network Stack**
  Enable/Disable UEFI Network Stack.

- **IPv4 PXE support**
  Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

- **IPv4 HTTP Support**
  Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.

- **IPv6 PXE Support**
  Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

- **IPv6 HTTP Support**
  Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.

- **PXE boot wait time**
  Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

- **Media detect count**
  Number of times presence of media will be checked. Use either +/- or numeric keys to set the value.
3.4.10 NVME Configuration

Figure 3.19 NVME Configuration
3.4.11 SDIO Configuration

**Figure 3.20 SDIO Configuration**

- **SDIO Access Mode**
  - **Auto Option**: Access SD device in DMA mode if controller supports it, otherwise in PIO mode.
  - **DMA Option**: Access SD device in DMA mode.
  - **PIO Option**: Access SD device in PIO mode.
3.5 Chipset Setup

- **System Agent (SA) Configuration**
  System Agent Parameters.

- **PCH-I0 Configuration**
  PCH parameters.

![Chipset Setup Diagram](image-url)
3.5.1 System Agent (SA) Configuration

- Memory Configuration
  Memory Configuration Parameters.
- Graphic Configuration
- VT-d
  VT-d capability.
- Above 4GB MMIO BIOS assignment
  Enable/Disable above 4GB memory mapped IO BIOS assignment. This is enabled automatically when aperture size is set to 2048MB.
### 3.5.1.1 Memory Configuration

#### Figure 3.23 Memory Configuration

- **Max TOLUD**
  Maximum value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on the largest MMIO length of installed graphic controller.
3.5.1.2 Graphics Configuration

- **Internal Graphics**
  Keep IGFX enabled based on the setup options.

- **GTT Size**
  Select the GTT size.

- **Aperture Size**
  Select the aperture size. Note: Above 4GB MMIO BIOS assignment is atomically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support.

- **DVMT Pre-Allocated**
  Select DVMT5.0 pre-allocated (fixed) Graphics Memory size is used by the internal graphics device.

- **DVMT Total Gfx Mem**
  Select DVMT5.0 total graphic memory size is used by the internal graphic device.

- **LCD Control**

---

**Figure 3.24 Graphics Configuration**
## LCD Control

<table>
<thead>
<tr>
<th>LCD Control</th>
<th>[800x600] [Exit]</th>
<th>Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCD Panel Type</td>
<td>[W8310s Default]</td>
<td></td>
</tr>
<tr>
<td>Primary IGFX Boot Display</td>
<td>[Auto]</td>
<td></td>
</tr>
<tr>
<td>Panel Scaling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 3.25 LCD Control

- **LCD Panel Type**
  Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.

- **Primary IGFX Boot Display**
  Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.

- **Panel Scaling**
  Select the LCD panel scaling option used by the Internal Graphics Device.
3.5.2 PCH-IO Configuration

- **PCI Express Configuration**
  - PCI Express Configuration settings.

- **SATA Configuration**
  - SATA device option settings.

- **USB Configuration**
  - USB Configuration settings.

- **Security Configuration**
  - Security Configuration settings.

- **HD Audio Configuration**
  - HD audio subsystem configuration settings.

- **SerialIo Configuration**
  - SerialIo configuration settings.

- **SCS Configuration**
  - Storage and Communication Subsystem (SCS) Configuration.

- **GBE Configuration**
  - Time Sensitive Network GBE Configuration.

- **State After G3**
  - Specify what state to go to when power is re-applied after a power failure (G3 state).

- **Pcie Ref Pll SSC**
  - Pcie Ref Pll SSC Percentatge. AUTO - Keep hw default, no BIOS override. Range is 0.0%-0.5%.

- **Flash Protection Range Registers (FPRR)**
  - Enable Flash Protection Range Registers.

- **SPD Write Disable**
  - Enable/Disable setting SPD Write Disable. For security recommendations, SPD write disable bit must be set.

**Figure 3.26 PCH-IO Configuration**
3.5.2.1 PCI Express Configuration

- **DMI Link ASPM Control**
  The control of Active State Power Management of the DMI Link.

- **Compliance Test Mode**
  Enable when using Compliance Load Board.

- **PEG PCIe Port Config**
  Config PEG PCIe Lane 0~15 setting.

- **PCI Express Root Port 1**

- **PCI Express Root Port 2**

- **PCI Express Root Port 3**

- **PCI Express Root Port 4**

- **PCI Express Root Port 5**

**Figure 3.27 PCI Express Configuration**
PCI Express Root Port 1

- **PCI Express Root Port 1**
  Control the PCI Express Root Port.

- **ASPM**
  PCI Express Active State Power Management settings.

- **Hot Plug**
  PCI Express Hot Plug Enable/Disable.

- **PCIe Speed**
  Configure PCIe Speed.
PCI Express Root Port 2

- **PCI Express Root Port 2**
  Control the PCI Express Root Port.
- **ASPM**
  PCI Express Active State Power Management settings.
- **Hot Plug**
  PCI Express Hot Plug Enable/Disable.
- **PCle Speed**
  Configure PCle Speed.

Figure 3.29 PCI Express Root Port 2
PCI Express Root Port 3

- **PCI Express Root Port 3**
  Control the PCI Express Root Port.

- **ASPM**
  PCI Express Active State Power Management settings.

- **Hot Plug**
  PCI Express Hot Plug Enable/Disable.

- **PCIe Speed**
  Configure PCIe Speed.
PCI Express Root Port 4

- **PCI Express Root Port 4**
  Control the PCI Express Root Port.

- **ASPM**
  PCI Express Active State Power Management settings.

- **Hot Plug**
  PCI Express Hot Plug Enable/Disable.

- **PCIe Speed**
  Configure PCIe Speed.
### PCI Express Root Port 5

- **PCI Express Root Port 5**
  Control the PCI Express Root Port.

- **ASPM**
  PCI Express Active State Power Management settings.

- **Hot Plug**
  PCI Express Hot Plug Enable/Disable.

- **PCIe Speed**
  Configure PCIe Speed.

<table>
<thead>
<tr>
<th>Chipset</th>
<th>Aoptio Setup - AMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Express Root Port 5</td>
<td>[Enabled]</td>
</tr>
<tr>
<td>ASPM</td>
<td>[Disabled]</td>
</tr>
<tr>
<td>Hot Plug</td>
<td>[Disabled]</td>
</tr>
<tr>
<td>PCIe Speed</td>
<td>[Gen3]</td>
</tr>
</tbody>
</table>

Control the PCI Express Root Port.

---

**Figure 3.32 PCI Express Root Port 5**
### 3.5.2.2 SATA Configuration

**Figure 3.33 SATA Configuration**

- **SATA Controller(s)**
  Enable/Disable SATA Device.

- **SATA Controller Speed**
  Indicates the maximum speed the SATA controller can support.

- **Port 0**
  Enable or Disable SATA Port.

- **Port 1**
  Enable or Disable SATA Port.

<table>
<thead>
<tr>
<th>SATA Configuration</th>
<th></th>
<th>Enable/Disable SATA Device.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATA Controller(s)</td>
<td></td>
<td>[Enabled] [default]</td>
</tr>
<tr>
<td>SATA Controller Speed</td>
<td></td>
<td>[default] Empty Unknown [Enabled] [Disabled] Empty Unknown [Enabled] [Disabled]</td>
</tr>
<tr>
<td>Serial ATA Port 0</td>
<td></td>
<td>Port 0</td>
</tr>
<tr>
<td>Software Preserve</td>
<td></td>
<td>Port 1</td>
</tr>
<tr>
<td>Hot Plug</td>
<td></td>
<td>Port 1</td>
</tr>
<tr>
<td>Serial ATA Port 1</td>
<td></td>
<td>Port 1</td>
</tr>
<tr>
<td>Software Preserve</td>
<td></td>
<td>Port 1</td>
</tr>
<tr>
<td>Hot Plug</td>
<td></td>
<td>Port 1</td>
</tr>
</tbody>
</table>

**Chips**

**Version 2.23.18E Copyright (C) 2022 AMI**
3.5.2.3 USB Configuration

- **XHCI Compliance Mode**
  Option to enable Compliance Mode. Default is to disable Compliance Mode. Change to enabled for Compliance Mode testing.

---

**Figure 3.34 USB Configuration**

- **XHCI Compliance Mode**
  Option to enable Compliance Mode. Default is to disable Compliance Mode. Change to enabled for Compliance Mode testing.
3.5.2.4 Security Configuration

- **RTC Memory Lock**
  Enable will lock bytes 38h-3Fh in the lower/upper 126-byte bank of RTC RAM.

- **BIOS Lock**
  Enable/Disable the PCH BIOS lock enable feature. Required to be enabled to ensure SMM protection of flash.

Figure 3.35 Security Configuration
### HD Audio Subsystem Configuration Settings

<table>
<thead>
<tr>
<th>HD Audio Subsystem Configuration Settings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HD Audio</td>
<td>[Enabled]</td>
</tr>
</tbody>
</table>

Control Detection of the HD-Audio device. **Disabled**=HDA will be unconditionally disabled. **Enabled**=HDA will be unconditionally enabled.

**Figure 3.36 HD Audio Subsystem Configuration Settings**

- **HD Audio**
  Control Detection of the HD-Audio device. **Disabled**=HDA will be unconditionally disabled. **Enabled**=HDA will be unconditionally enabled.
### SerialIo Configuration

#### I2C2 Controller
Enables/Disables SerialIo Controller
If given device is Function 0 PSF disabling is skipped. PSF default will remain and device PCI CFG Space will still be visible. This is needed to allow PCI enumerator access functions above 0 in a multifunction device.

The following devices depend on each other:
- I2C0 and I2C1,2,3
- UART0 and UART1, SPI0,1
- UART2 and I2C4,5

UART 0 (00:30:00) cannot be disabled when:
1. Child device is enabled like CNVi Bluetooth (SB.PC00.UA00.BTH0)

UART 0 (00:30:00) cannot be enabled when:
1. I2S Audio codec is enabled (SB.PC00.I2C0.HDAC)

#### I2C4 Controller
Enables/Disables SerialIo Controller
If given device is Function 0 PSF disabling is skipped. PSF default will remain and device PCI CFG Space will still be visible. This is needed to allow PCI enumerator access functions above 0 in a multifunction device.

The following devices depend on each other:
- I2C0 and I2C1,2,3
- UART0 and UART1, SPI0,1
- UART2 and I2C4,5

UART 0 (00:30:00) cannot be disabled when:
1. Child device is enabled like CNVi Bluetooth (SB.PC00.UA00.BTH0)

UART 0 (00:30:00) cannot be enabled when:
1. I2S Audio codec is enabled (SB.PC00.I2C0.HDAC)
Serial IO I2C2 Settings

- Serial IO Touch Pad Settings
  Indicates what type of I2C Touch Pad is connected to this Serial IO controller.
- Set Serial IO I2C #2 Speed
  Select Serial IO I2C #2 Speed.
- StandardSpeed SCL High
- StandardSpeed SCL Low
- StandardSpeed SDA Hold
- FastSpeed SCL High
- FastSpeed SCL Low
- FastSpeed SDA Hold
- FastSpeedPlus SCL High
- FastSpeedPlus SCL Low
- FastSpeedPlus SDA Hold
- HighSpeed SCL High
- HighSpeed SCL Low
- HighSpeed SDA Hold
- D0->D3 idle timeout (screen off)
- D0->D3 idle timeout (screen on)
Serial IO I2C #4 Settings

- **Set Serial IO I2C #4 Speed**
  - Select Serial IO I2C #4 Speed.
- **StandardSpeed SCL High**
- **StandardSpeed SCL Low**
- **StandardSpeed SDA Hold**
- **FastSpeed SCL High**
- **FastSpeed SCL Low**
- **FastSpeed SDA Hold**
- **FastSpeedPlus SCL High**
- **FastSpeedPlus SCL Low**
- **FastSpeedPlus SDA Hold**
- **HighSpeed SCL High**
- **HighSpeed SCL Low**
- **HighSpeed SDA Hold**
- **D0->D3 idle timeout (screen off)**
- **D0->D3 idle timeout (screen on)**
**3.5.2.7 SCS Configuration**

- **eMMC 5.1 Controller**
  Enable or Disable SCS eMMC 5.1 Controller.

- **SDCard 3.0 Controller**
  Enable or Disable SCS SDHC 3.0 Controller.

*Figure 3.40 SCS Configuration*
3.6 Security Chipset

Administrator Password
Set Setup Administrator Password.

User Password
Set User Password.

Secure Boot
Secure Boot Configuration.
3.6.1 Secure Boot

Secure Boot feature is Active if Secure Boot is Enabled, Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset.

Secure Boot Mode
- Standard or Custom.
- In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.
3.7 Boot Setup

- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

- **Bootup NumLock State**
  Select the keyboard NumLock state.

- **Quiet Boot**
  Enables or disables Quiet Boot option.

- **Boot Option #1**
  Sets the system boot order.

- **Fast Boot**
  Enable or Disable FastBoot features. Most probes are skipped to reduce time cost during boot.

---

**Figure 3.43 Boot Setup**
3.8 Save & Exit

- **Save Changes and Exit**
  Exit system setup after saving the changes.

- **Discard Changes and Exit**
  Exit system setup without saving any changes.

- **Save Changes and Reset**
  Reset the system after saving the changes.

- **Discard Changes and Reset**
  Reset system setup without saving any changes.

- **Save Changes**
  Save Changes done so far to any of the setup options.

- **Discard Changes**
  Discard Changes done so far to any of the setup options.

- **Restore Defaults**
  Restore/Load Default values for all the setup options.

- **Save as User Defaults**
  Save the changes done so far as User Defaults.

- **Restore User Defaults**
  Restore the User Defaults to all the setup options.

- **Boot Override**
Chapter 4

S/W Introduction and Installation

- S/W Introduction
- Driver Installation
- Advantech iManager
4.1 S/W Introduction

The mission of Advantech Embedded Software Services is to "Enhance quality of life with Advantech platforms and Microsoft Windows embedded technology." We enable Windows Embedded software products on Advantech platforms to more effectively support the embedded computing community. Customers are freed from the hassle of dealing with multiple vendors (Hardware suppliers, System integrators, Embedded OS distributor) for projects. Our goal is to make Windows Embedded Software solutions easily and widely available to the embedded computing community.

4.2 Driver Installation

The Intel Chipset Software Installation (CSI) utility installs the Windows INF files that outline to the operating system how the chipset components will be configured.

4.2.1 Windows Driver Setup

To install the drivers on a windows-based operation system, please connect to internet and browse the website http://support.advantech.com.tw and download the drivers that you want to install and follow Driver Setup instructions to complete the installation.

4.2.2 Other OS

Linux Ubuntu & Yocto
4.3 Advantech iManager

Advantech’s platforms come equipped with iManager, a micro controller that provides embedded features for system integrators. Embedded features have been moved from the OS/BIOS level to the board level, to increase reliability and simplify integration. iManager runs whether the operating system is running or not; it can count the boot times and running hours of the device, monitor device health, and provide an advanced watchdog to handle errors just as they happen. iManager also comes with a secure & encrypted EEPROM for storing important security key or other customer defined information. All the embedded functions are configured through API and provide corresponding utilities to demonstrate. These APIs comply with PICMG EAPI (Embedded Application Programmable Interface) specification and unify in the same structures. It makes these embedded features easier to integrate, speed up developing schedule, and provide the customer’s software continuity while upgrade hardware. More detail of how to use the APIs and utilities, please refer to Advantech iManager2.0 Software API User Manual.

Control

- **GPIO:** General Purpose Input/Output is a two-pin dedicated interface that allows a variety of custom connections. It allows users to monitor the level of signal input or set the output status to switch on/off a device. Our API also provides Programmable GPIO, which automatically changes the GPIO input or output status.

- **SMBus:** The System Management Bus defined by Intel® Corporation in 1995. It is used in personal computers and servers for low-level system management communication. The SMBus API allows a developer to interface with a standard system environment and transfer serial messages using the SMBus protocols, allowing multiple simultaneous device control.

Monitor

- **Watchdog:** A watchdog timer (WDT) is a device that performs a specific operation after a certain period of time if something goes wrong and the system does not recover on its own. A WDT can be programmed to perform a warm boot (resetting the system) after a certain number of seconds.

- **Hardware Monitor:** The Hardware Monitor (HWM) API is a system health supervision API that monitors common conditions indexes, such as fan speed, temperature, and voltage.

- **Hardware Control:** The Hardware Control API allows developers to set the PWM (Pulse Width Modulation) value or adjust the boost or other devices; it can also be used to adjust the LCD brightness.

Display

- **Brightness Control:** The Brightness Control API allows a developer to control the overall brightness of the screen in an embedded device.

Power Saving

- **CPU Speed:** Make use of Intel SpeedStep technology to reduce power consumption. The system will automatically adjust the CPU speed depending on system loading.

- **System Throttling:** Refers to a series of methods for reducing power consumption in computers by lowering the clock frequency. These APIs allow the user to lower the clock from 87.5% to 12.5%.
Appendix A

Pin Assignment

This appendix gives you the information about the hardware pin assignment of the SOM-7532 CPU System on Module.
Sections include:
- SOM-7532 Type 10 Pin Assignment
A.1 SOM-7532 Pin Assignment

This section gives SOM-7532 pin assignment on COM Express connector which compliant with COM Express R3.0 Type 10 pin-out definitions. More details about how to use these pins and get design reference, please contact to Advantech for design guide, checklist, reference schematic, and other hardware/software supports.

<table>
<thead>
<tr>
<th>SOM-7532 Row A,B</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>GND (FIXED)</td>
<td>B1</td>
</tr>
<tr>
<td>A2</td>
<td>GBE0_MDI3-</td>
<td>B2</td>
</tr>
<tr>
<td>A3</td>
<td>GBE0_MDI3+</td>
<td>B3</td>
</tr>
<tr>
<td>A4</td>
<td>GBE0_LINK100#</td>
<td>B4</td>
</tr>
<tr>
<td>A5</td>
<td>GBE0_LINK1000#</td>
<td>B5</td>
</tr>
<tr>
<td>A6</td>
<td>GBE0_MDI2-</td>
<td>B6</td>
</tr>
<tr>
<td>A7</td>
<td>GBE0_MDI2+</td>
<td>B7</td>
</tr>
<tr>
<td>A8</td>
<td>GBE0_LINK#</td>
<td>B8</td>
</tr>
<tr>
<td>A9</td>
<td>GBE0_MDI1-</td>
<td>B9</td>
</tr>
<tr>
<td>A10</td>
<td>GBE0_MDI1+</td>
<td>B10</td>
</tr>
<tr>
<td>A11</td>
<td>GND (FIXED)</td>
<td>B11</td>
</tr>
<tr>
<td>A12</td>
<td>GBE0_MDI0-</td>
<td>B12</td>
</tr>
<tr>
<td>A13</td>
<td>GBE0_MDI0+</td>
<td>B13</td>
</tr>
<tr>
<td>A14</td>
<td>N/A</td>
<td>B14</td>
</tr>
<tr>
<td>A15</td>
<td>SUS_S3#</td>
<td>B15</td>
</tr>
<tr>
<td>A16</td>
<td>SATA0_TX+</td>
<td>B16</td>
</tr>
<tr>
<td>A17</td>
<td>SATA0_TX-</td>
<td>B17</td>
</tr>
<tr>
<td>A18</td>
<td>SUS_S4#</td>
<td>B18</td>
</tr>
<tr>
<td>A19</td>
<td>SATA0_RX+</td>
<td>B19</td>
</tr>
<tr>
<td>A20</td>
<td>SATA0_RX-</td>
<td>B20</td>
</tr>
<tr>
<td>A21</td>
<td>GND (FIXED)</td>
<td>B21</td>
</tr>
<tr>
<td>A22</td>
<td>USB_SSRX0-</td>
<td>B22</td>
</tr>
<tr>
<td>A23</td>
<td>USB_SSRX0+</td>
<td>B23</td>
</tr>
<tr>
<td>A24</td>
<td>SUS_S5#</td>
<td>B24</td>
</tr>
<tr>
<td>A25</td>
<td>USB_SSRX1-</td>
<td>B25</td>
</tr>
<tr>
<td>A26</td>
<td>USB_SSRX1+</td>
<td>B26</td>
</tr>
<tr>
<td>A27</td>
<td>BATLOW#</td>
<td>B27</td>
</tr>
<tr>
<td>A28</td>
<td>(S)ATA_ACT#</td>
<td>B28</td>
</tr>
<tr>
<td>A29</td>
<td>HDA_SYNC</td>
<td>B29</td>
</tr>
<tr>
<td>A30</td>
<td>HDA_RST#</td>
<td>B30</td>
</tr>
<tr>
<td>A31</td>
<td>GND (FIXED)</td>
<td>B31</td>
</tr>
<tr>
<td>A32</td>
<td>HDA_BITCLK</td>
<td>B32</td>
</tr>
<tr>
<td>A33</td>
<td>HDA_SDOUT</td>
<td>B33</td>
</tr>
<tr>
<td>A34</td>
<td>BIOS_DIS0#</td>
<td>B34</td>
</tr>
<tr>
<td>A35</td>
<td>THRMTTRIP#</td>
<td>B35</td>
</tr>
<tr>
<td>A36</td>
<td>USB6-</td>
<td>B36</td>
</tr>
<tr>
<td>A37</td>
<td>USB6+</td>
<td>B37</td>
</tr>
<tr>
<td>A38</td>
<td>USB_6_7_OC#</td>
<td>B38</td>
</tr>
<tr>
<td>A39</td>
<td>USB4-</td>
<td>B39</td>
</tr>
<tr>
<td>A40</td>
<td>USB4+</td>
<td>B40</td>
</tr>
<tr>
<td>Pin</td>
<td>Description</td>
<td>Pin</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>-----</td>
</tr>
<tr>
<td>A41</td>
<td>GND (FIXED)</td>
<td>B41</td>
</tr>
<tr>
<td>A42</td>
<td>USB2-</td>
<td>B42</td>
</tr>
<tr>
<td>A43</td>
<td>USB2+</td>
<td>B43</td>
</tr>
<tr>
<td>A44</td>
<td>USB_2_3_OC#</td>
<td>B44</td>
</tr>
<tr>
<td>A45</td>
<td>USB0-</td>
<td>B45</td>
</tr>
<tr>
<td>A46</td>
<td>USB0+</td>
<td>B46</td>
</tr>
<tr>
<td>A47</td>
<td>VCC_RTC</td>
<td>B47</td>
</tr>
<tr>
<td>A48</td>
<td>SVD</td>
<td>B48</td>
</tr>
<tr>
<td>A49</td>
<td>GBE0_SDG</td>
<td>B49</td>
</tr>
<tr>
<td>A50</td>
<td>LPC_SERIRQ</td>
<td>B50</td>
</tr>
<tr>
<td>A51</td>
<td>GND (FIXED)</td>
<td>B51</td>
</tr>
<tr>
<td>A52</td>
<td>SVD</td>
<td>B52</td>
</tr>
<tr>
<td>A53</td>
<td>SVD</td>
<td>B53</td>
</tr>
<tr>
<td>A54</td>
<td>GPI0</td>
<td>B54</td>
</tr>
<tr>
<td>A55</td>
<td>SVD</td>
<td>B55</td>
</tr>
<tr>
<td>A56</td>
<td>SVD</td>
<td>B56</td>
</tr>
<tr>
<td>A57</td>
<td>GND</td>
<td>B57</td>
</tr>
<tr>
<td>A58</td>
<td>PCIE_TX3+</td>
<td>B58</td>
</tr>
<tr>
<td>A59</td>
<td>PCIE_TX3-</td>
<td>B59</td>
</tr>
<tr>
<td>A60</td>
<td>GND (FIXED)</td>
<td>B60</td>
</tr>
<tr>
<td>A61</td>
<td>PCIE_TX2+</td>
<td>B61</td>
</tr>
<tr>
<td>A62</td>
<td>PCIE_TX2-</td>
<td>B62</td>
</tr>
<tr>
<td>A63</td>
<td>GPI1</td>
<td>B63</td>
</tr>
<tr>
<td>A64</td>
<td>PCIE_TX1+</td>
<td>B64</td>
</tr>
<tr>
<td>A65</td>
<td>PCIE_TX1-</td>
<td>B65</td>
</tr>
<tr>
<td>A66</td>
<td>GND</td>
<td>B66</td>
</tr>
<tr>
<td>A67</td>
<td>GPI2</td>
<td>B67</td>
</tr>
<tr>
<td>A68</td>
<td>PCIE_TX0+</td>
<td>B68</td>
</tr>
<tr>
<td>A69</td>
<td>PCIE_TX0-</td>
<td>B69</td>
</tr>
<tr>
<td>A70</td>
<td>GND (FIXED)</td>
<td>B70</td>
</tr>
<tr>
<td>A71</td>
<td>LVDS_A0+</td>
<td>B71</td>
</tr>
<tr>
<td>A72</td>
<td>LVDS_A0-</td>
<td>B72</td>
</tr>
<tr>
<td>A73</td>
<td>LVDS_A1+</td>
<td>B73</td>
</tr>
<tr>
<td>A74</td>
<td>LVDS_A1-</td>
<td>B74</td>
</tr>
<tr>
<td>A75</td>
<td>LVDS_A2+</td>
<td>B75</td>
</tr>
<tr>
<td>A76</td>
<td>LVDS_A2-</td>
<td>B76</td>
</tr>
<tr>
<td>A77</td>
<td>LVDS_VDD_EN</td>
<td>B77</td>
</tr>
<tr>
<td>A78</td>
<td>LVDS_A3+</td>
<td>B78</td>
</tr>
<tr>
<td>A79</td>
<td>LVDS_A3-</td>
<td>B79</td>
</tr>
<tr>
<td>A80</td>
<td>GND (FIXED)</td>
<td>B80</td>
</tr>
<tr>
<td>A81</td>
<td>LVDS_A_CK+</td>
<td>B81</td>
</tr>
<tr>
<td>A82</td>
<td>LVDS_A_CK-</td>
<td>B82</td>
</tr>
<tr>
<td>A83</td>
<td>LVDS_I2C_CK</td>
<td>B83</td>
</tr>
<tr>
<td>A84</td>
<td>LVDS_I2C_DAT</td>
<td>B84</td>
</tr>
<tr>
<td>A85</td>
<td>GPI3</td>
<td>B85</td>
</tr>
<tr>
<td>A86</td>
<td>SVD</td>
<td>B86</td>
</tr>
<tr>
<td>A87</td>
<td>eDP_HPD</td>
<td>B87</td>
</tr>
<tr>
<td>A88</td>
<td>PCIE_CLK_REF+</td>
<td>B88</td>
</tr>
</tbody>
</table>
*Note:
1. A50 could be an optional pin reserved for ESPI_CS1#. Please contact FAE for details.
2. A52 could be an optional pin reserved for PMC_PROCHOT#. Please contact FAE for details.
3. A53 could be an optional pin reserved for FUSA_ISA_ALERT#. Please contact FAE for details.
4. A54 could be an optional pin reserved for SD_SDIO_D0. Please contact FAE for details.
5. A55 could be an optional pin reserved for FUSA_ISI_OK. Please contact FAE for details.
6. A56 could be an optional pin reserved for FUSA_ISI_NOK. Please contact FAE for details.
7. A63 could be an optional pin reserved for SD_SDIO_D1. Please contact FAE for details.
8. A67 could be an optional pin reserved for SD_SDIO_D2. Please contact FAE for details.
9. A71 could be an optional pin reserved for ESPI_CS1#. Please contact FAE for details.
10. A72 could be an optional pin reserved for eDP_TX2+. Please contact FAE for details.
11. A73 could be an optional pin reserved for eDP_TX2-. Please contact FAE for details.
12. A74 could be an optional pin reserved for eDP_TX1+. Please contact FAE for details.
13. A75 could be an optional pin reserved for eDP_TX1-. Please contact FAE for details.
14. A76 could be an optional pin reserved for eDP_TX0+. Please contact FAE for details.
15. A77 could be an optional pin reserved for eDP_TX0-. Please contact FAE for details.
16. A85 could be an optional pin reserved for SD_SDIO_D3. Please contact FAE for details.
17. A86 could be an optional pin reserved for SD_PWR_EN. Please contact FAE for details.
18. A92 could be an optional pin reserved for GSPI_MISO. Please contact FAE for details.
19. A93 could be an optional pin reserved for SD_SDIO_CLK. Please contact FAE for details.
20. A94 could be an optional pin reserved for GSPI_CLK. Please contact FAE for details.
21. A95 could be an optional pin reserved for GSPI_MOSI. Please contact FAE for details.
22. A101 could be an optional pin reserved for PSE_CAN0_TX. Please contact FAE for details.
23. A102 could be an optional pin reserved for PSE_CAN0_RX. Please contact FAE for details.
24. A101 could be an optional pin reserved for EC CAN0_TX. Please contact FAE for details.
25. A102 could be an optional pin reserved for EC CAN0_TX. Please contact FAE for details.
26. B3 could be an optional pin reserved for ESPI_CS0#. Please contact FAE for details.
27. B4 could be an optional pin reserved for ESPI_IO_0. Please contact FAE for details.
28. B5 could be an optional pin reserved for ESPI_IO_1. Please contact FAE for details.
29. B6 could be an optional pin reserved for ESPI_IO_2. Please contact FAE for details.
30. B7 could be an optional pin reserved for ESPI_IO_3. Please contact FAE for details.
31. B8 could be an optional pin reserved for ESPI_ALERT0#. Please contact FAE for details.
32. B9 could be an optional pin reserved for ESPI_ALERT1#. Please contact FAE for details.
33. B10 could be an optional pin reserved for ESPI_CLK. Please contact FAE for details.
34. B18 could be an optional pin reserved for ESPI_RESET#. Please contact FAE for details.
35. B52 could be an optional pin reserved for FUSA_ISI_CS. Please contact FAE for details.
36. B53 could be an optional pin reserved for FUSA_ISI_CLK. Please contact FAE for details.
37. B54 could be an optional pin reserved for SD_SDIO_CMD. Please contact FAE for details.
38. B55 could be an optional pin reserved for FUSA_ISI_MOSI. Please contact FAE for details.
39. B56 could be an optional pin reserved for FUSA_ISI_MISO. Please contact FAE for details.
40. B57 could be an optional pin reserved for SD_SDIO_WP. Please contact FAE for details.
41. B63 could be an optional pin reserved for SD_SDIO_CD. Please contact FAE for details.
42. B79 could be an optional pin reserved for eDP_BKLT_EN. Please contact FAE for details.
43. B83 could be an optional pin reserved for eDP_BKLT_CTRL. Please contact FAE for details.
44. B97 could be an optional pin reserved for GSPI_CS#. Please contact FAE for details.
Appendix B

Watchdog Timer

This appendix gives you the information about the watchdog timer programming on the SOM-7532 CPU System on Module.

Sections include:
- Watchdog Timer Programming
B.1 Programming the Watchdog Timer

<table>
<thead>
<tr>
<th>Trigger Event</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRQ</td>
<td>(BIOS setting default disable)**</td>
</tr>
<tr>
<td>NMI</td>
<td>N/A</td>
</tr>
<tr>
<td>SCI</td>
<td>Power button event</td>
</tr>
<tr>
<td>Power Off</td>
<td>Support</td>
</tr>
<tr>
<td>H/W Restart</td>
<td>Support</td>
</tr>
<tr>
<td>WDT Pin Activate</td>
<td>Support</td>
</tr>
</tbody>
</table>

** WDT new driver support automatically select available IRQ number from BIOS, and then set to EC. Only Win10 support it. In other OS, it will still use IRQ number from BIOS setting as usual. For details, please refer to iManager & Software API User Manual.
Appendix C

C Programming GPIO

This Appendix illustrates the General Purpose Input and Output pin settings.
Sections include:
- GPIO Register
## C.1 GPIO Register

<table>
<thead>
<tr>
<th>GPIO Byte Mapping</th>
<th>H/W Pin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIT0</td>
<td>GPI0</td>
</tr>
<tr>
<td>BIT1</td>
<td>GPI1</td>
</tr>
<tr>
<td>BIT2</td>
<td>GPI2</td>
</tr>
<tr>
<td>BIT3</td>
<td>GPI3</td>
</tr>
<tr>
<td>BIT4</td>
<td>GPO0</td>
</tr>
<tr>
<td>BIT5</td>
<td>GPO1</td>
</tr>
<tr>
<td>BIT6</td>
<td>GPO2</td>
</tr>
<tr>
<td>BIT7</td>
<td>GPO4</td>
</tr>
</tbody>
</table>

For details, please refer to the iManager and Software API User Manual.
Appendix D

System Assignments

This appendix gives you the information about the system resource allocation on the SOM-7532 CPU System on Module.

Sections include:
- System I/O ports
- DMA Channel Assignments
- Interrupt Assignments
- 1st MB Memory Map
## D.1 System I/O Ports

<table>
<thead>
<tr>
<th>Addr.Range(Hex)</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x000000299-0x0000029A</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x0000002C0-0x000002DF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x0000002A0-0x000002BF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000000290-0x0000029F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x0000029E-0x000002AD</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000060-0x0000006F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000000220-0x00000227</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000000300-0x00000037F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000280-0x0000028F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000280-0x0000028F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000002A0-0x000002BF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000280-0x0000028F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x0000022E-0x0000002F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x0000004E-0x0000004F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000061-0x00000061</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000063-0x00000063</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000065-0x00000065</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000067-0x00000067</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000070-0x00000070</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000080-0x00000080</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000092-0x00000092</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000000B2-0x000000B3</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x000000680-0x00000069F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000164E-0x00000164F</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00000062-0x00000062</td>
<td>Microsoft ACPI-Compliant Embedded Controller</td>
</tr>
<tr>
<td>0x00000066-0x00000066</td>
<td>Microsoft ACPI-Compliant Embedded Controller</td>
</tr>
<tr>
<td>0x0000EFA0-0x0000EFBF</td>
<td>Intel(R) SMBus - 43A3</td>
</tr>
<tr>
<td>0x0000003F8-0x0000003FF</td>
<td>Communications Port (COM1)</td>
</tr>
<tr>
<td>0x0000002F8-0x0000002FF</td>
<td>Communications Port (COM2)</td>
</tr>
<tr>
<td>0x00001800-0x000018FE</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x00003090-0x00003097</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0x00003080-0x00003083</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0x00003060-0x0000307F</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0x00000000-0x000000CF7</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0x00000D00-0x0000FFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0x00000020-0x00000021</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x00000024-0x00000025</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x00000028-0x00000029</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x0000002C-0x0000002D</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x00000030-0x00000031</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x00000034-0x00000035</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x00000038-0x00000039</td>
<td>Programmable interrupt controller</td>
</tr>
<tr>
<td>0x0000003C-0x0000003D</td>
<td>Programmable interrupt controller</td>
</tr>
</tbody>
</table>
Appendix D System Assignments

D.2 Interrupt Assignments

<table>
<thead>
<tr>
<th>Table D.2: Table D.2: Interrupt Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interrupt#</strong></td>
</tr>
<tr>
<td>IRQ0</td>
</tr>
<tr>
<td>IRQ 27</td>
</tr>
<tr>
<td>IRQ 4294967294</td>
</tr>
<tr>
<td>IRQ 4</td>
</tr>
<tr>
<td>IRQ 3</td>
</tr>
<tr>
<td>IRQ 14</td>
</tr>
<tr>
<td>IRQ 6</td>
</tr>
<tr>
<td>IRQ 4294967293</td>
</tr>
<tr>
<td>IRQ54-68</td>
</tr>
<tr>
<td>IRQ69</td>
</tr>
<tr>
<td>IRQ70-511</td>
</tr>
<tr>
<td>IRQ13</td>
</tr>
<tr>
<td>IRQ 19</td>
</tr>
<tr>
<td>IRQ 16</td>
</tr>
<tr>
<td>IRQ 4294967281</td>
</tr>
<tr>
<td>IRQ 4294967291</td>
</tr>
<tr>
<td>IRQ 4294967280</td>
</tr>
</tbody>
</table>
# D.3 1st MB Memory Map

<table>
<thead>
<tr>
<th>Addr. Range (Hex)</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>0xFFEFA000-0xFFEFAFFF</td>
<td>Intel(R) Serial IO I2C Host Controller - 43E8</td>
</tr>
<tr>
<td>0xFEDC0000-0xFEDC7FFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFEDA0000-0xFEDA0FFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFEDA1000-0xFEDA1FFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xC000000-0xCFFFFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFED20000-0xFED7FFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFED90000-0xFED93FFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFED45000-0xFED8FFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFEE00000-0xFEEFFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0x50400000-0x506FFFFF</td>
<td>Intel(R) PCI Express Root Port #5 - 43BC</td>
</tr>
<tr>
<td>0x50400000-0x505FFFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0x11280000-0x11280FF</td>
<td>Intel(R) SMBus - 43A3</td>
</tr>
<tr>
<td>0xFED00000-0xFE01FFFF</td>
<td>High precision event timer</td>
</tr>
<tr>
<td>0xFE000000-0xFE04FFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFE04C000-0xFE04FFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFE050000-0xFE0AFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFE0D0000-0xFE0FFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFE200000-0xFE7FFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFF000000-0xFFFFFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFD000000-0xFD68FFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFD6C0000-0xFD6CFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFD6F0000-0xFD6FFFFFF</td>
<td>Motherboard resources</td>
</tr>
<tr>
<td>0xFD6E0000-0xFD68FFFF</td>
<td>Intel(R) Serial IO GPIO Host Controller - INT34C6</td>
</tr>
<tr>
<td>0xFD6D0000-0xFD6DFFFF</td>
<td>Intel(R) Serial IO GPIO Host Controller - INT34C6</td>
</tr>
<tr>
<td>0xFD6B0000-0xFD6BFFFF</td>
<td>Intel(R) Serial IO GPIO Host Controller - INT34C6</td>
</tr>
<tr>
<td>0xFD6A0000-0xFD6AFFFF</td>
<td>Intel(R) Serial IO GPIO Host Controller - INT34C6</td>
</tr>
<tr>
<td>0xFD690000-0xFD69FFFF</td>
<td>Intel(R) Serial IO GPIO Host Controller - INT34C6</td>
</tr>
<tr>
<td>0x50700000-0x50701FFF</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0x50703000-0x507030FF</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0x50702000-0x507027FF</td>
<td>Standard SATA AHCI Controller</td>
</tr>
<tr>
<td>0xA0000-0xBFFFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0xE0000-0xE3FFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0xE4000-0xE7FFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0xE8000-0xEBFFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0xEC000-0xEFFFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0xF0000-0xFFFFFF</td>
<td>PCI Express Root Complex</td>
</tr>
<tr>
<td>0x1100000-0x110FFFF</td>
<td>Intel(R) USB 3.20 eXtensible Host Controller - 1.20 (Microsoft)</td>
</tr>
<tr>
<td>0xFED40000-0xFED44FFF</td>
<td>Trusted Platform Module 2.0</td>
</tr>
<tr>
<td>0xFE010000-0xFE010FFF</td>
<td>Intel(R) SPI (flash) Controller - 43A4</td>
</tr>
<tr>
<td>0xBFFFF000-0xBFFFFFFF</td>
<td>Intel(R) Active Management Technology - SOL (COM3)</td>
</tr>
<tr>
<td>0xFFFFC000-0xFFFFFFFFFF</td>
<td>High Definition Audio Controller</td>
</tr>
<tr>
<td>0xFFFF0000-0xFFFFFFFFFF</td>
<td>High Definition Audio Controller</td>
</tr>
<tr>
<td>0x11100000-0x111FFFFFF</td>
<td>Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft)</td>
</tr>
<tr>
<td>Memory Address</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>0x50500000-0x505FFFFF</td>
<td>Intel(R) Ethernet Controller (3) I225-LM</td>
</tr>
<tr>
<td>0x50600000-0x50603FFF</td>
<td>Intel(R) Ethernet Controller (3) I225-LM</td>
</tr>
<tr>
<td>0x0000-0xFFFFFFFF</td>
<td>Intel(R) UHD Graphics</td>
</tr>
<tr>
<td>0x0000-0xFFFFFFFF</td>
<td>Intel(R) UHD Graphics</td>
</tr>
<tr>
<td>0xFFEFB000-0xFFEFBFFF</td>
<td>Intel(R) Management Engine Interface #1</td>
</tr>
<tr>
<td>0xFFEFA000-0xFFEFAFFF</td>
<td>Intel(R) Serial IO I2C Host Controller - 43E8</td>
</tr>
</tbody>
</table>