User Manual

SOM-7532

CPU Computer on Module

ADVANTECH

Enabling an Intelligent Planet

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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.

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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.

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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 1.1: Acronyms	
Term	**Define**
AC'97	Audio CODEC (Coder-Decoder)
ACPI	Advanced Configuration Power Interface – standard to implement power saving modes in PC-AT systems
BIOS	Basic Input Output System – firmware in PC-AT system that is used to initialize system components before handing control over to the operating system
CAN	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
DDI	Digital Display Interface – containing DisplayPort, HDMI/DVI, and SDVO

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
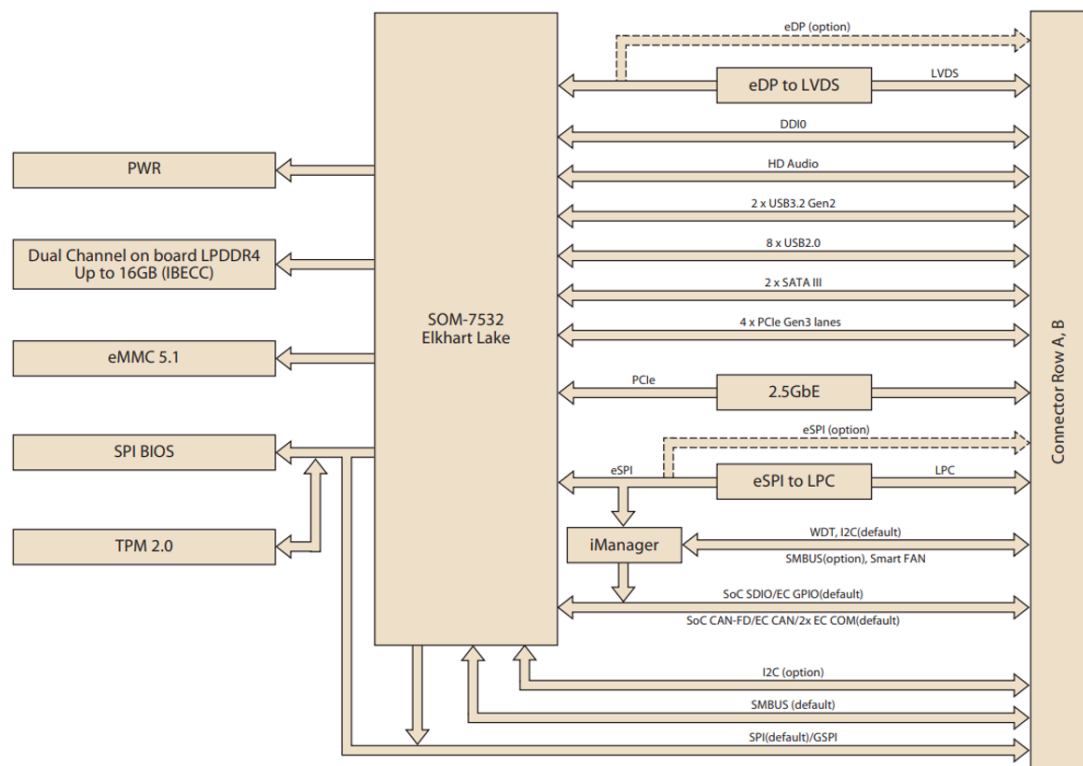
1.3 Product Specifications

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

1.3.3 Processor System

Table 1.3: Processor System					
CPU	Std. Freq.	Max. Turbo Freq.	Core	Cache (MB)	TDP(W)
Pentium J6426	2.0 GHz	3.0 GHz	4	4	10W
Pentium N6415	1.2 GHz	3.0 GHz	4	4	6.5W
Atom x6211E	1.3 GHz	3.0 GHz	2	4	6W
Atom x6425RE	1.9 GHz	-	4	4	12W
Atom x6425E	2.0 GHz	3.0 GHz	4	4	12W
Atom x6413E	1.5 GHz	3.0 GHz	4	4	9W

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 1.4: Graphics/Audio			
CPU	Graphic Core	Base Freq.	Max Freq.
Pentium J6426	Gen10 UHD Graphic	400	850
Pentium N6415	Gen10 UHD Graphic	350	800
Atom x6211E	Gen10 UHD Graphic	350	750
Atom x6425RE	Gen10 UHD Graphic	400	-
Atom x6425E	Gen10 UHD Graphic	500	750
Atom x6413E	Gen10 UHD Graphic	500	750

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 1.5: PCIe x1					
Type 10		Row A,B			
		P0	P1	P2	P3
Default	Config	X1	X1	X1	X1
Option 1		X4			

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 1.6: USB3.2		
Type 10	P0	P1
SoC	P0	P1
Type 10	OC_01	
SoC USB_OC#	OC_0	

1.3.8.5 USB2.0

Table 1.7: USB2.0							
Type 10	P0	P1	P2	P3	P4	P5	P6	P7
SoC	P0	P1	P2	P3	P4	P5	P6	P7
Type 10	OC_01		OC_23		OC_45		OC_67	
SoC USB_OC#	OC_0		OC_2		OC_3		OC_1	

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 1.8: BIOS		
BIOS_DIS#0	**BIOS_DIS#1**	**Boot up destination/function**
Open	Open	Boot from Module's SPI BIOS
Open	GND	SPI_CS0# to Carrier Board, SPI_CS1# to Module
GND	GND	SPI_CS0# to Module, SPI_CS1# to Carrier Board

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:

SCN1(1653008552-01)
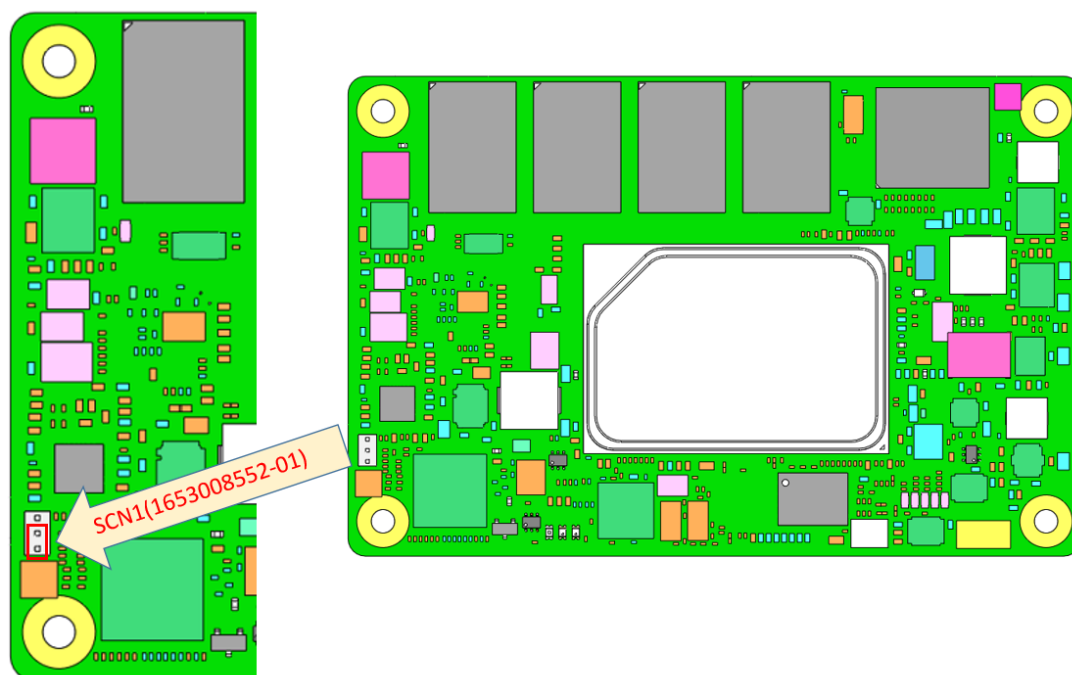
1. Remove the coin battery.
2. Put jumper on SCN1 pin1-2.
3. Turn on power supply.
4. System will boot up a few times.
5. BIOS will be load default setting successfully.

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

Please refer Advantech SOM-7532 Refresh Series Reliability Prediction report on the website: Link: http://com.advantech.com

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 1.9: Power Consumption Table (Watt.)						
VCC=12V, VSB=5V	Active Power Domain			Suspend Power Domain		Mechanical off
Power State	S0 Max. Load	S0 Burn-in	S0 Idle	S5	S5 Deep Sleep	RTC (uA)
SOM-7532DCCX-U0A1	23.141W	16.770W	4.297W	1.026W	0.237W	4.36uA

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

Part No.	CPU	Core	Graphics	Base Freq.	Max. Boost Freq.	GFX HFM	GFX Burst Mode	CPU TDP	Onboard Memory	eMMC	IBECC	Thermal solution	Operating Temp.
Table 1.10: Selection Guide w/ P/N													
SOM-7532DNCC-U0A1	Pentium J6426	4	32EU	2.0GHz	3.0GHz	400MHz	850MHz	10W	16G	64GB	No	Passive	0~60°C
SOM-7532CNBC-S2A1	Pentium N6415	4	16EU	1.2GHz	3.0GHz	350MHz	800MHz	6.5W	8G	32GB	No	Passive	0~60°C
SOM-7532ACBC-S3A1	Atom x6211E	2	16EU	1.3GHz	3.0GHz	350MHz	750MHz	6W	2G	32GB	Yes	Passive	0~60°C
SOM-7532CCBX-S9A1	Atom x6425RE	4	32EU	1.9GHz	N/A	400MHz	N/A	12W	8G	32GB	Yes	Passive	-40~85°C
SOM-7532DCCX-U0A1	Atom x6425E	4	32EU	2.0GHz	3.0GHz	500MHz	750MHz	12W	16G	64GB	Yes	Passive	-40~85°C
SOM-7532CCBX-S5A1	Atom x6413E	4	16EU	1.5GHz	3.0GHz	500MHz	750MHz	9W	8G	32GB	Yes	Passive	-40~85°C
SOM-7532BCBX-S3A1	Atom x6211E	2	16EU	1.3GHz	3.0GHz	350MHz	750MHz	6W	4G	32GB	Yes	Passive	-40~85°C

1.3.16 Packing list

Part No.	Description	Quantity
Table 1.11: Packing List		
-	SOM-7532 COM module	1
1970005552T001/1970005552T011	Heatspreader IHS/Heatspreader NON-I	1

1.3.17 Development Board

Part No.	Description
Table 1.12: Development Board	
SOM-DB5830-00A2	COMe Devel. Board COMe R3.0 Type6 pin-out (LVDS) 0 ~ 60 °C
SOM-DB5830A-00A2	COMe Devel. Board COMe R3.0 Type6 pin-out (eDP) 0 ~ 60 °C
SOM-DB5830X-00A2	COMe Devel. Board COMe R3.0 Type6 pin-out (LVDS) -40 ~ 85 °C

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

Part No.	Description
Table 1.13: Optional Accessory	
1970005554T001	Semi-Heatsink

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 constrains 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.
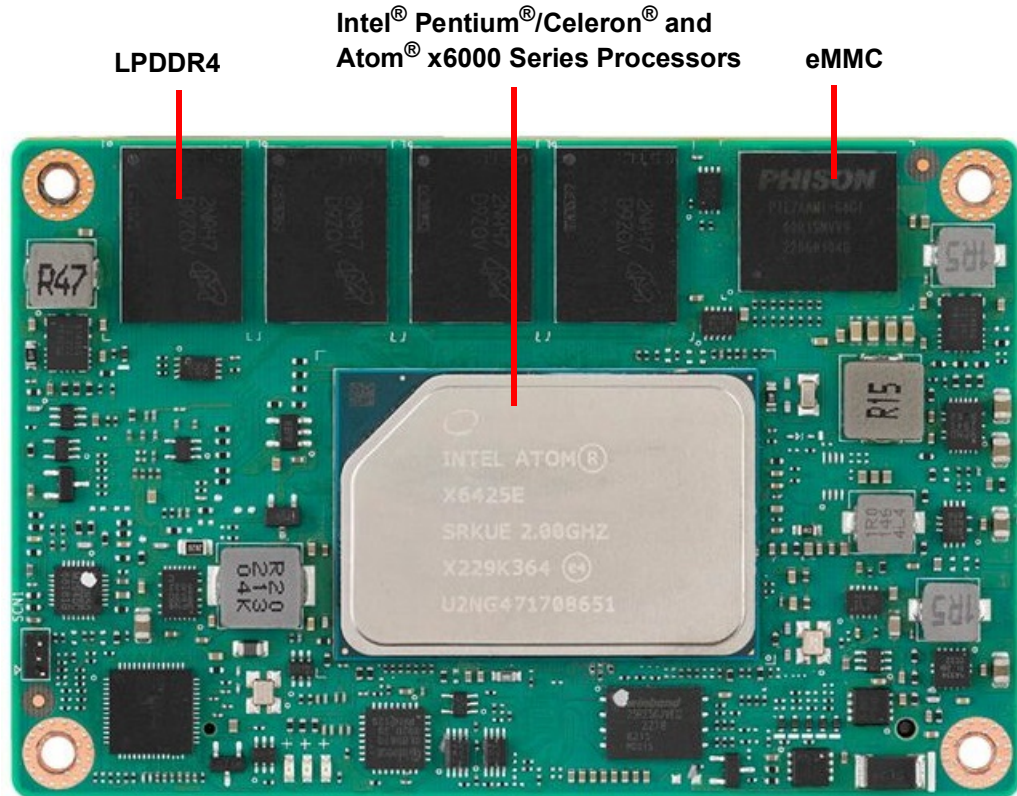
Figure 2.1 Board Chips ID – Front
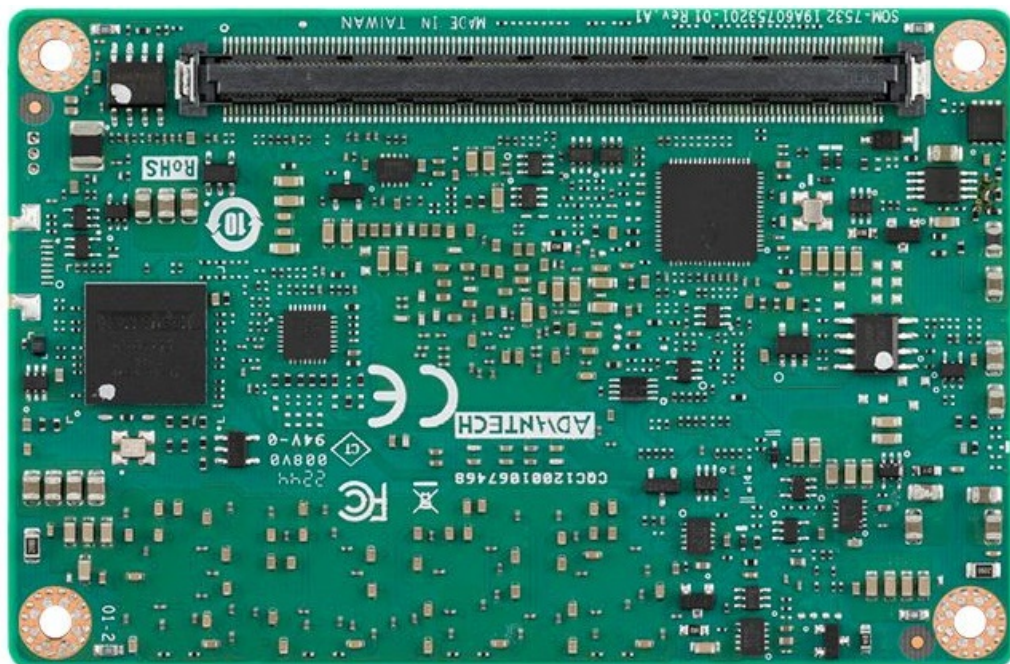
Figure 2.2 Board Chips ID – Rear

2.2 Mechanical Diagram

For more detail about 2D/3D models, please find on Advantech COM support service website http://com.advantech.com.
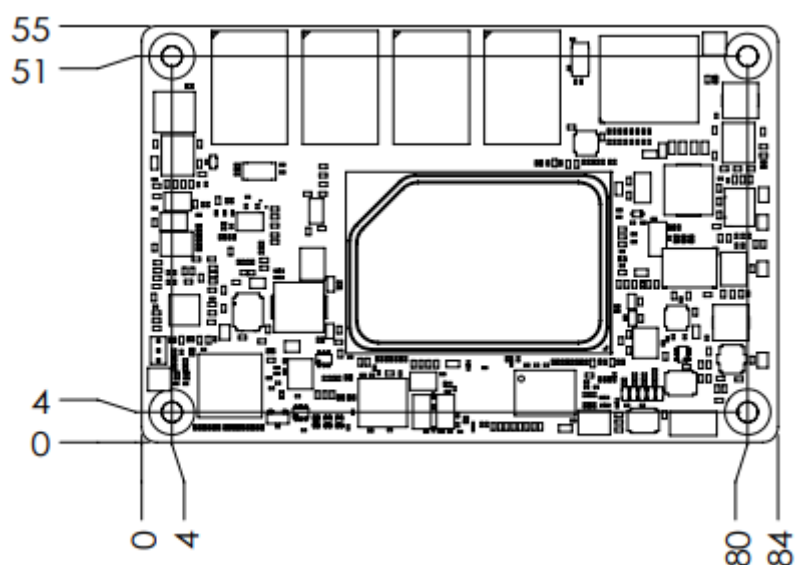
Figure 2.3 Atom Series Board Mechanical Diagram – Front
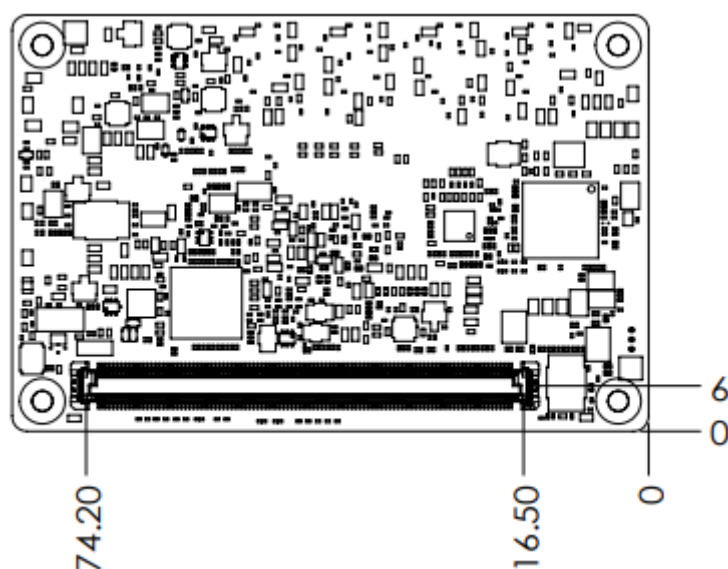
Figure 2.4 Atom Series Board Mechanical Diagram – Rear

Figure 2.5 Atom Series Board Mechanical Diagram – Side
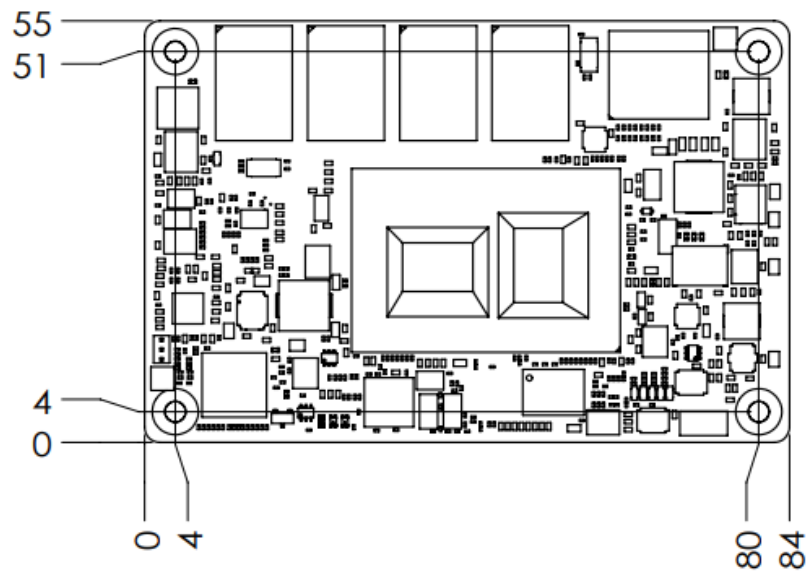
Figure 2.6 Pentium Series Board Mechanical Diagram – Front
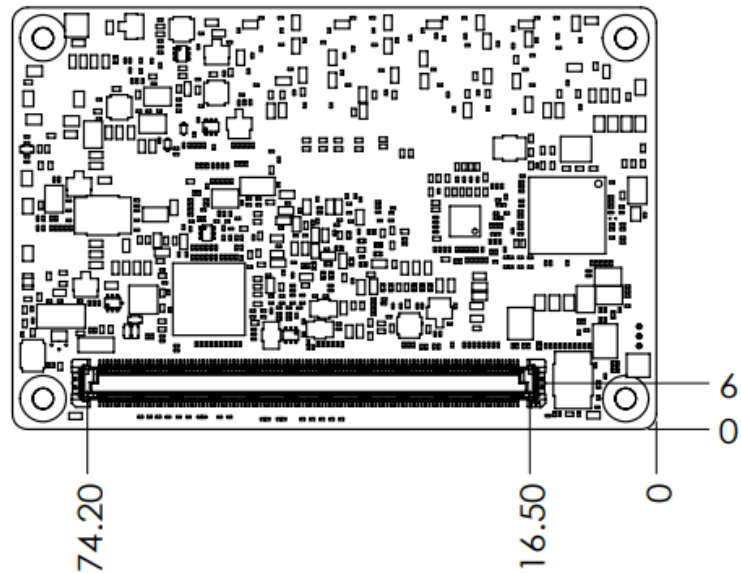
Figure 2.7 Pentium Series Board Mechanical Diagram – Rear

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.

Semi Heat-Sink

Heat Spreader

SOM-7532

SOM-EA00

SOM-DB5830
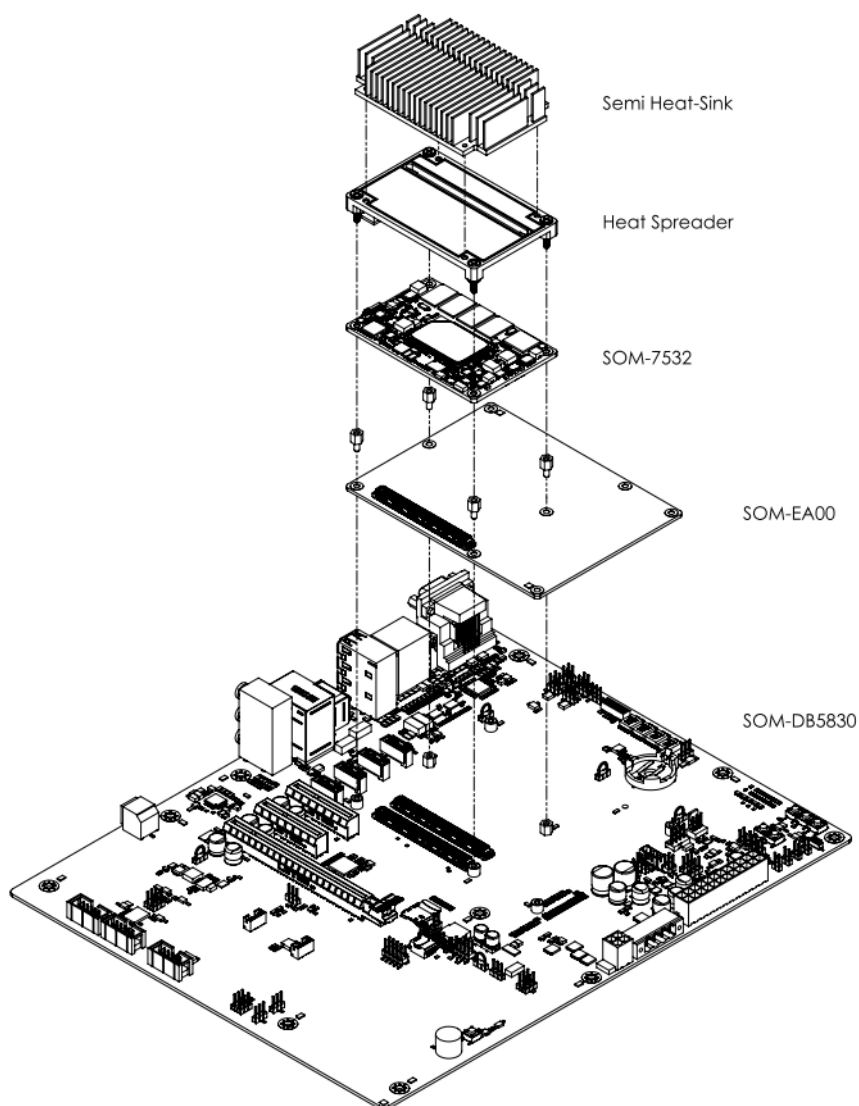
Figure 2.9 Assembly Diagram

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.
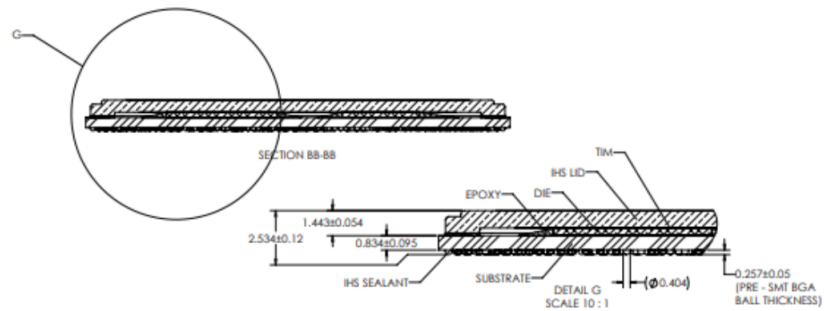
Intel Atom® Processor Series

Figure 2.10 CPU Height and Tolerance
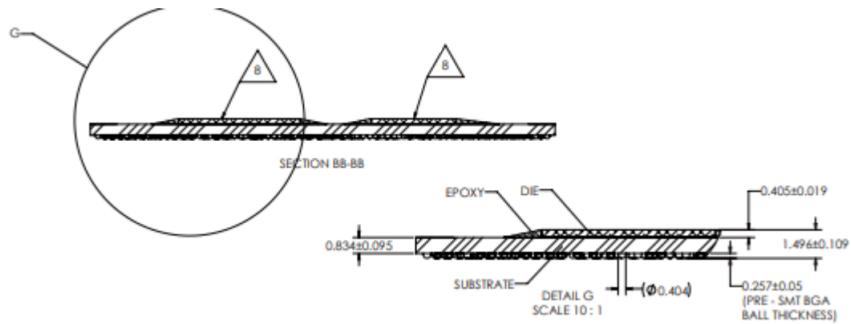
Intel® Pentium and Celeron N and J Series Processors

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.

```
                        Aptio Setup - AMI
  Main  Advanced  Chipset  Security  Boot  Save & Exit

  BIOS Information                                              Choose the system default
  BIOS Vendor                  American Megatrends              language
  Core Version                 5.0.1.9   0.16 x64
  Compliancy                   UEFI 2.7.0; PI 1.6
  Project Version              75320000060X005
  Build Date and Time          09/07/2022 18:28:32
  Access Level                 Administrator

  Memory Information
  Total Memory                 16384 MB
  Memory Frequency              3200 MT/s


  System Language              [English]                        →←: Select Screen
                                                                ↑↓: Select Item
  System Date                  [Fri 01/08/2021]                 Enter: Select
  System Time                  [22:49:22]                       +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F3: Optimized Defaults
                                                                F4: Save & Exit
                                                                ESC: Exit



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```

Figure 3.1 Setup Program Initial Screen

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.

```
                         Aptio Setup - AMI
      Main  Advanced  Chipset  Security  Boot  Save & Exit

   BIOS Information                              Choose the system default
   BIOS Vendor            American Megatrends    language
   Core Version           5.0.1.9   0.16 x64
   Compliancy             UEFI 2.7.0; PI 1.6
   Project Version        75320000060X005
   Build Date and Time    09/07/2022 18:28:32
   Access Level           Administrator

   Memory Information
   Total Memory           16384 MB
   Memory Frequency        3200 MT/s


   System Language        [English]              →←: Select Screen
                                                 ↑↓: Select Item
   System Date            [Fri 01/08/2021]       Enter: Select
   System Time            [22:49:22]             +/-: Change Opt.
                                                 F1: General Help
                                                 F2: Previous Values
                                                 F3: Optimized Defaults
                                                 F4: Save & Exit
                                                 ESC: Exit




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```

Figure 3.2 Main setup screen

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.

```
                        Aptio Setup - AMI
      Main  Advanced  Chipset  Security  Boot  Save & Exit

   ▶ CPU Configuration                           CPU Configuration Parameters
   ▶ Power & Performance
   ▶ PCH-FW Configuration
   ▶ Trusted Computing
   ▶ ACPI Settings
   ▶ Embedded Controller
   ▶ Serial Port Console Redirection
   ▶ USB Configuration
   ▶ Network Stack Configuration
   ▶ NVMe Configuration
   ▶ SDIO Configuration

   ▶ Tls Auth Configuration
   ▶ Intel(R) Ethernet Controller (3) I225-IT - 00:19:0F:17:95:C2    ←→: Select Screen
   ▶ VLAN Configuration (MAC:00190F1795C2)       ↑↓: Select Item
   ▶ MAC:00190F1795C2-IPv4 Network Configuration  Enter: Select
   ▶ MAC:00190F1795C2-IPv6 Network Configuration  +/-: Change Opt.
                                                 F1: General Help
                                                 F2: Previous Values
                                                 F3: Optimized Defaults
                                                 F4: Save & Exit
                                                 ESC: Exit


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```

Figure 3.3 Advanced BIOS features setup screen

- ■ **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.

■ **SDIO Configuration**
SDIO Configuration Parameters.

3.4.1 CPU Configuration

```
                              Aptio Setup - AMI
     Advanced

    CPU Configuration                                    When enabled, a VMM can
                                                         utilize the additional
    Type                     Intel Atom(R) x6425E        hardware capabilities provided
                             Processor @ 2.00GHz         by Vanderpool Technology.
    ID                       0x90661
    Speed                    2000 MHz
    L1 Data Cache            32 KB x 4
    L1 Instruction Cache     32 KB x 4
    L2 Cache                 1536 KB x 4
    L3 Cache                 4 MB
    VMX                      Supported

    Intel (VMX) Virtualization   [Enabled]
    Technology                                           →←: Select Screen
    Active Processor Cores       [All]                   ↑↓: Select Item
    AES                          [Enabled]               Enter: Select
    MonitorMWait                 [Enabled]               +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit



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```

Figure 3.4 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

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

```
                        Aptio Setup - AMI
      Advanced

CPU - Power Management Control                    Select the performance state
                                                  that the BIOS will set
Boot performance mode           [Max Non-Turbo    starting from reset vector.
                                Performance]
Intel(R) SpeedStep(tm)          [Enabled]
Intel(R) Speed Shift Technology [Enabled]
  Turbo Mode                    [Enabled]
C states                        [Enabled]


                                                  →←: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                                                  F2: Previous Values
                                                  F3: Optimized Defaults
                                                  F4: Save & Exit
                                                  ESC: Exit



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```

Figure 3.6 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.

3.4.2.2 GT - Power Management Control
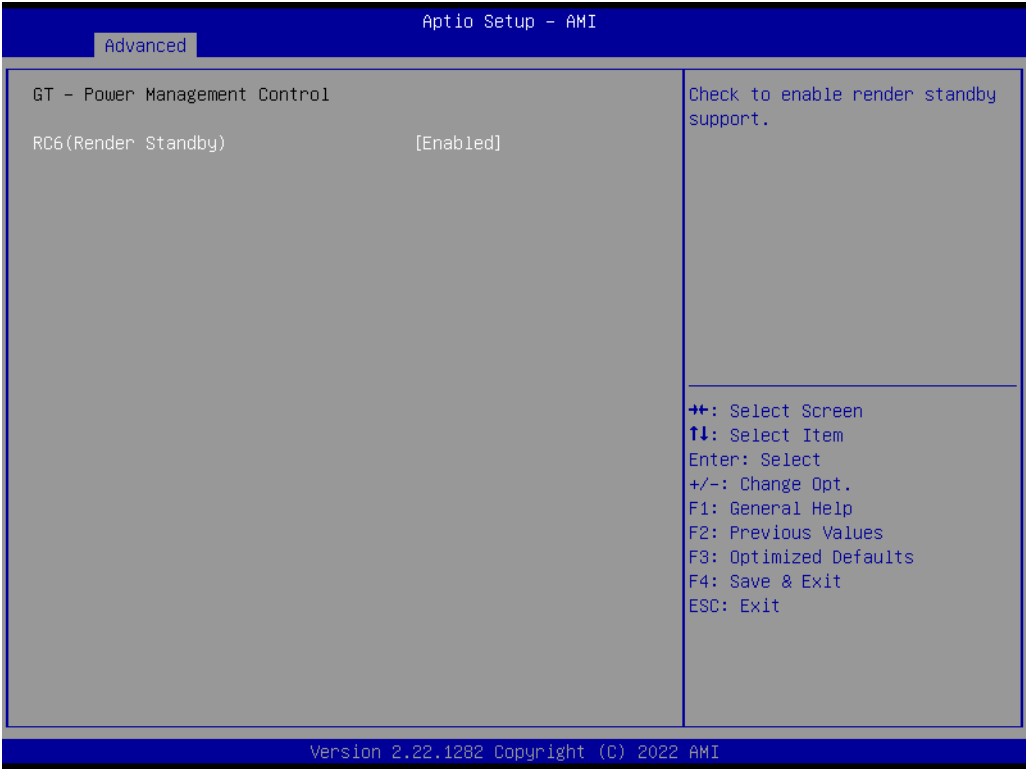
Figure 3.7 GT - Power Management Control

■ **RC6(Render Standby)**
Check to enable render standby support.

3.4.3 PCH-FW Configuration

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
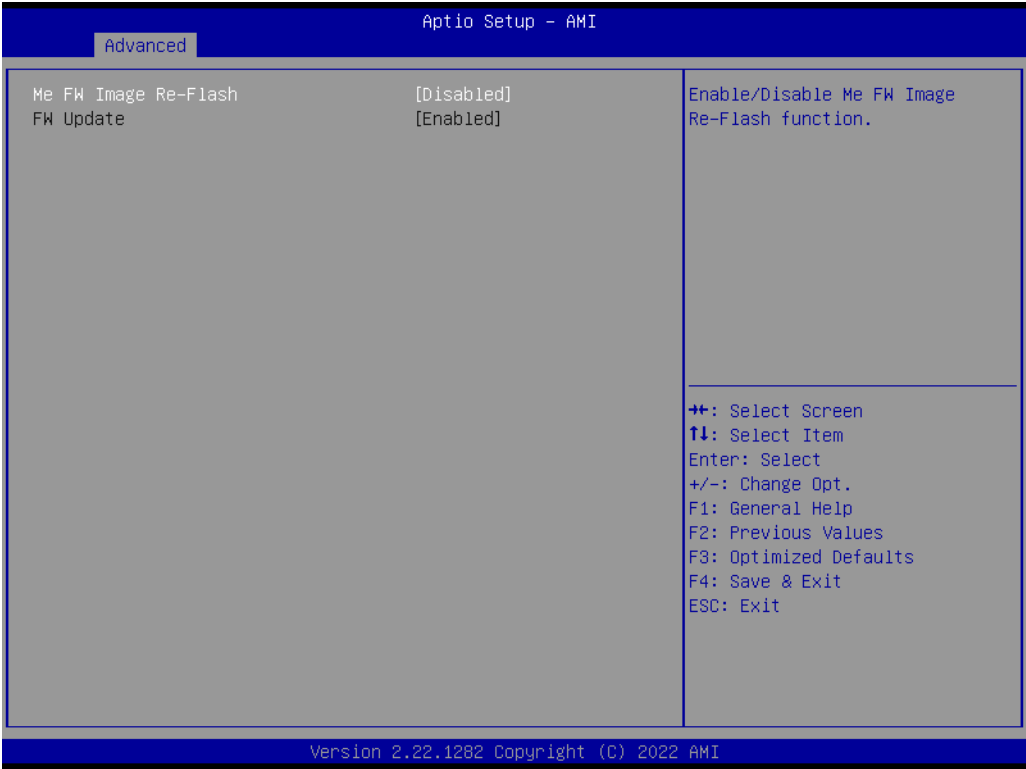
Figure 3.9 Firmware Update Configuration

- **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

```
                              Aptio Setup – AMI
        Advanced

  TPM 2.0 Device Found                              Enables or Disables BIOS
  Firmware Version:            13.11                support for security device.
  Vendor:                      IFX                  O.S. will not show Security
                                                    Device. TCG EFI protocol and
  Security Device Support      [Enable]             INT1A interface will not be
  Active PCR banks             SHA256               available.
  Available PCR banks          SHA256

  SHA256 PCR Bank              [Enabled]

  Pending operation            [None]
  Platform Hierarchy           [Enabled]
  Storage Hierarchy            [Enabled]
  Endorsement Hierarchy        [Enabled]            ↔: Select Screen
  Physical Presence Spec Version [1.3]              ↑↓: Select Item
  TPM 2.0 InterfaceType        [TIS]                Enter: Select
  Device Select                [Auto]               +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```

Figure 3.10 Trusted Computing

- ■ **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.

3.4.5 ACPI Settings
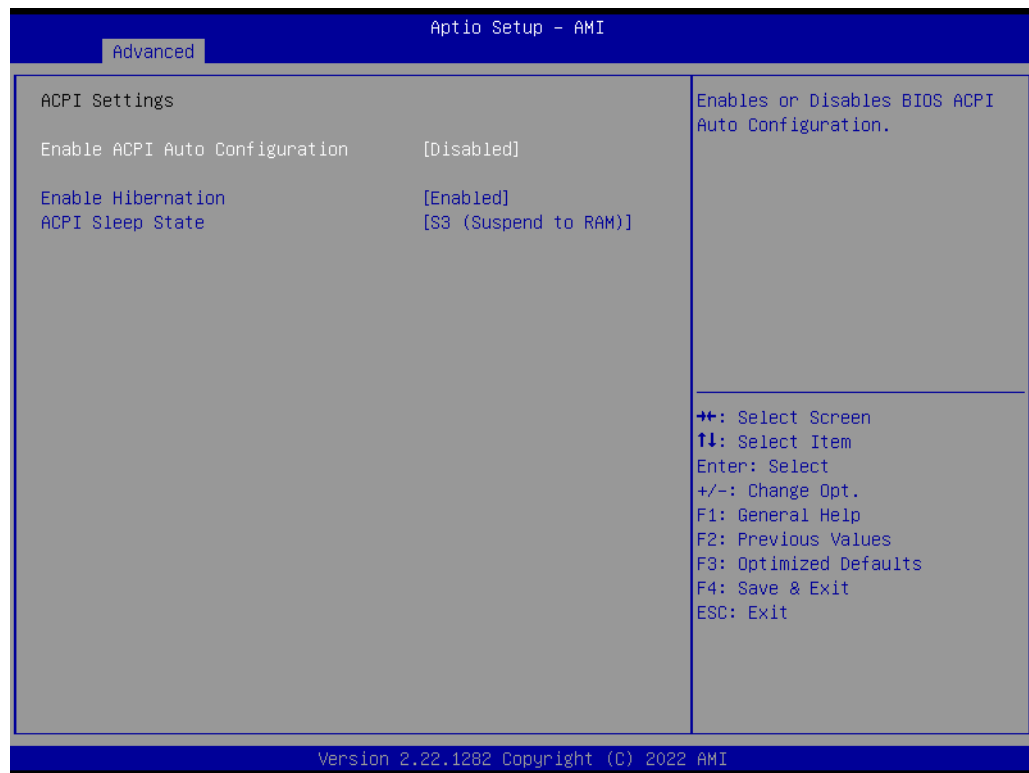
Figure 3.11 ACPI Settings

■ **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

Figure 3.12 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

```
                              Aptio Setup – AMI
        Advanced

 Serial Port 1 Configuration                          Enable or Disable Serial Port
                                                       (COM)
 Serial Port                       [Enabled]
 Device Settings                   IO=3F8h; IRQ=4;

 Change Settings                   [Auto]



                                                       ↔: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit



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```
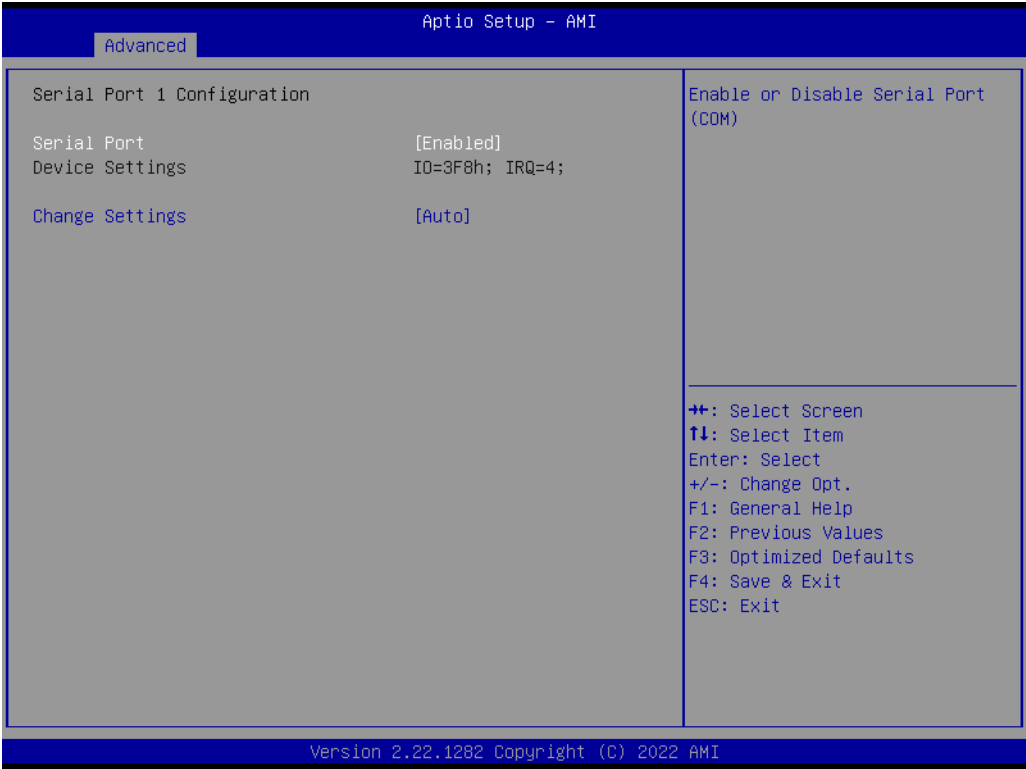
Figure 3.13 Serial Port 1 Configuration

■ **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
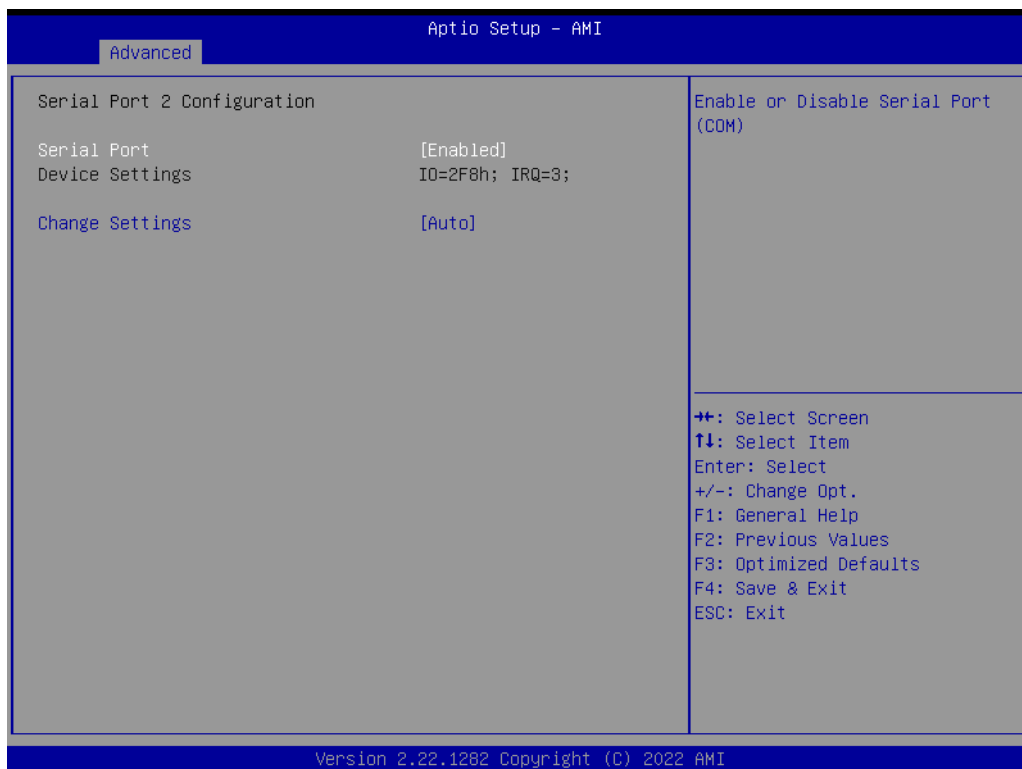
Figure 3.14 Serial Port 2 Configuration

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

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

3.4.6.3 Hardware Monitor

```
                              Aptio Setup - AMI
   Advanced

   PC Health Status

   CPU Temperature                    : + 33.9°C/ +93.0°F

   Carrier Board FAN                  :  6915 RPM

   +12V                               : +12.26 V
   + 5V                               : +5.08 V
   VBAT                               : +3.03 V

                                                     ↔: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit

                    Version 2.22.1282 Copyright (C) 2022 AMI
```
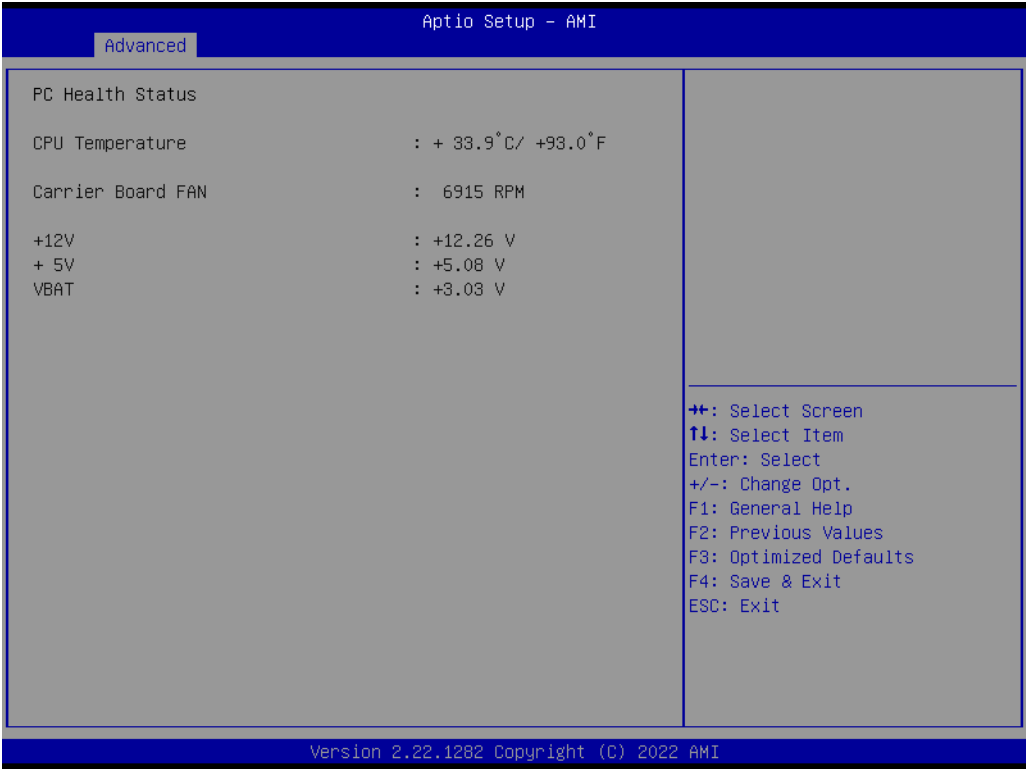
Figure 3.15 Hardware Monitor

3.4.7 Serial Port Console Redirection


```
                              Aptio Setup - AMI
        Advanced

                                                      Console Redirection Enable or
        COM1                                          Disable.
        Console Redirection              [Disabled]
      ▶ Console Redirection Settings

        COM2 (Disabled)
        Console Redirection              Port Is Disabled

        Serial Port for Out-of-Band Management/
        Windows Emergency Management Services (EMS)
        Console Redirection EMS          [Disabled]
      ▶ Console Redirection Settings

                                                      ↔: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit



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```

Figure 3.16 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

```
                              Aptio Setup - AMI
         Advanced

    USB Configuration                                        Enables Legacy USB support.
                                                             AUTO option disables legacy
    USB Module Version              25                       support if no USB devices are
                                                             connected. DISABLE option will
    USB Controllers:                                         keep USB devices available
        1 XHCI                                               only for EFI applications.
    USB Devices:
        1 Drive, 1 Keyboard, 1 Mouse, 1 Hub

    Legacy USB Support             [Enabled]
    XHCI Hand-off                  [Enabled]
    USB Mass Storage Driver Support [Enabled]

    USB hardware delays and time-outs:
    USB transfer time-out          [20 sec]                  →←: Select Screen
    Device reset time-out          [20 sec]                  ↑↓: Select Item
    Device power-up delay          [Auto]                    Enter: Select
                                                             +/-: Change Opt.
    Mass Storage Devices:                                    F1: General Help
    SKYMEDI USB Drive              [Auto]                    F2: Previous Values
                                                             F3: Optimized Defaults
                                                             F4: Save & Exit
                                                             ESC: Exit


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```

Figure 3.17 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

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

```
                          Aptio Setup - AMI
      Advanced
 ┌─────────────────────────────────────────┬──────────────────────────────┐
 │ NVMe Configuration                       │                              │
 │                                          │                              │
 │ No NVME Device Found                     │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │                              │
 │                                          │ →←: Select Screen            │
 │                                          │ ↑↓: Select Item              │
 │                                          │ Enter: Select                │
 │                                          │ +/-: Change Opt.             │
 │                                          │ F1: General Help             │
 │                                          │ F2: Previous Values          │
 │                                          │ F3: Optimized Defaults       │
 │                                          │ F4: Save & Exit              │
 │                                          │ ESC: Exit                    │
 │                                          │                              │
 │                                          │                              │
 └─────────────────────────────────────────┴──────────────────────────────┘
              Version 2.22.1282 Copyright (C) 2022 AMI
```
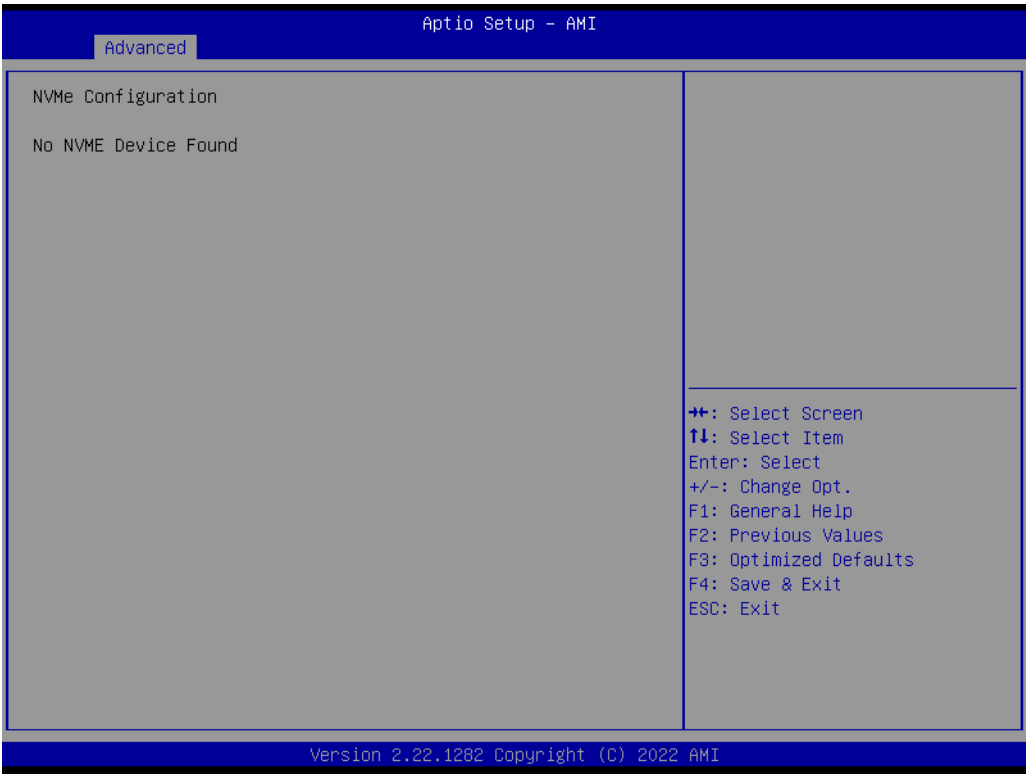
Figure 3.19 NVME Configuration

3.4.11 SDIO Configuration


```
                           Aptio Setup – AMI
      Advanced

 SDIO Configuration                                    ▲ Auto Option: Access SD device
                                                         in DMA mode if controller
 SDIO Access Mode                    [Auto]              supports it,otherwise in PIO
                                                         mode.DMA Option: Access SD
 Mass Storage Devices:                                   device in DMA mode.PIO Option:
                                                         Access SD device in PIO mode.

 Bus 0 Dev 1A Func 0
  eMMC MMC32G(31.2GB)                [Auto]


                                                       ←→: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit



                                                     ▼

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```

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

Figure 3.21 Chipset Setup

- ■ **System Agent (SA) Configuration**
  System Agent Parameters.
- ■ **PCH-I0 Configuration**
  PCH parameters.

3.5.1 System Agent (SA) Configuration

```
                              Aptio Setup - AMI
                  Chipset

System Agent (SA) Configuration                           Memory Configuration Parameters

VT-d                              Supported

▶ Memory Configuration
▶ Graphics Configuration
  VT-d                            [Enabled]
  Above 4GB MMIO BIOS assignment  [Enabled]



                                                          ↔: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit




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```

Figure 3.22 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

```
                           Aptio Setup - AMI
          Chipset

 Memory Configuration                                    Maximum Value of TOLUD.
                                                         Dynamic assignment would
 Memory RC Version            0.0.4.104                  adjust TOLUD automatically
 Memory Frequency              3200 MT/s                 based on largest MMIO length
                                                         of installed graphic controller
 Channel 0 Slot 0            Populated & Enabled
    Size                     8192 MB
    Number of Ranks          1
    Manufacturer             Micron Technology
 Channel 1 Slot 0            Populated & Enabled
    Size                     8192 MB
    Number of Ranks          1
    Manufacturer             Micron Technology

 Max TOLUD                   [Dynamic]                   →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit




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```

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


```
                              Aptio Setup - AMI
       Chipset

  Graphics Configuration                                    Keep IGFX enabled based on the
                                                            setup options.
  Internal Graphics                 [Auto]
  GTT Size                          [8MB]
  Aperture Size                     [256MB]
  DVMT Pre-Allocated                [60M]
  DVMT Total Gfx Mem                [256M]
▶ LCD Control

                                                            ↔: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F3: Optimized Defaults
                                                            F4: Save & Exit
                                                            ESC: Exit

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```

Figure 3.24 Graphics Configuration

- ■ **Internal Graphics**
  Keep IGFX enabled base 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**

■ **LCD Control**
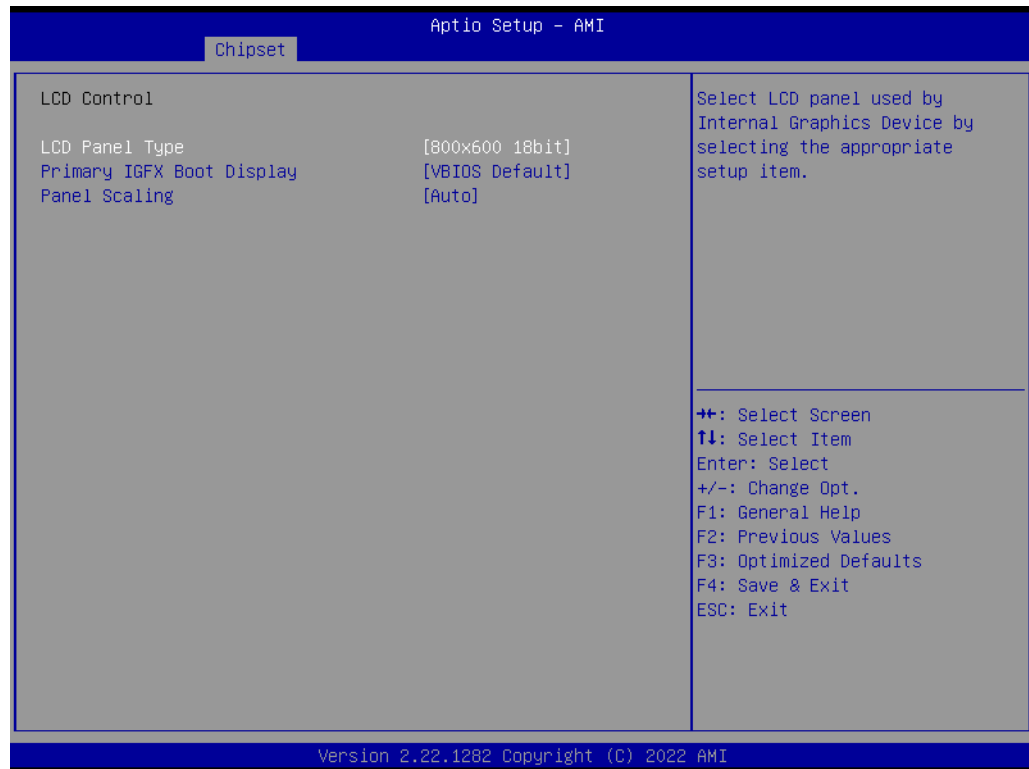
Figure 3.25 LCD Control

– **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

```
                          Aptio Setup - AMI
            Chipset

 PCH-IO Configuration                               PCI Express Configuration
                                                    settings
▶ PCI Express Configuration
▶ SATA Configuration
▶ USB Configuration
▶ Security Configuration
▶ HD Audio Configuration
▶ SerialIo Configuration
▶ SCS Configuration
▶ GBE Configuration

  State After G3                  [S5 State]
  Pcie Ref Pll SSC                [Auto]
  Flash Protection Range Registers [Enabled]
  (FPRR)                                            ←→: Select Screen
  SPD Write Disable               [TRUE]            ↑↓: Select Item
  PinCntrl Driver GPIO Scheme     [Disabled]        Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```

Figure 3.26 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.

3.5.2.1 PCI Express Configuration

```
                          Aptio Setup - AMI
            Chipset

   PCI Express Configuration                              The control of Active State
                                                          Power Management of the DMI
   DMI Link ASPM Control           [Disabled]             Link.
   Compliance Test Mode            [Disabled]

 ▶ 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

                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit


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```

Figure 3.27 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**

■ **PCI Express Root Port 1**

```
                         Aptio Setup - AMI
        Chipset

 PCI Express Root Port 1          [Enabled]            Control the PCI Express Root
 ASPM                             [Disabled]           Port.
   Hot Plug                       [Disabled]
 PCIe Speed                       [Gen3]




                                                       ++: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit



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```

Figure 3.28 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**

```
                            Aptio Setup - AMI
            Chipset

PCI Express Root Port 2         [Enabled]           Control the PCI Express Root
ASPM                            [Disabled]          Port.
  Hot Plug                      [Disabled]
PCIe Speed                      [Gen3]




                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit




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```

Figure 3.29 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.
– **PCIe Speed**
  Configure PCIe Speed.

■ **PCI Express Root Port 3**

```
                           Aptio Setup - AMI
       Chipset

PCI Express Root Port 3        [Enabled]          Control the PCI Express Root
ASPM                           [Disabled]         Port.
  Hot Plug                     [Disabled]
PCIe Speed                     [Gen3]




                                                 →←: Select Screen
                                                 ↑↓: Select Item
                                                 Enter: Select
                                                 +/-: Change Opt.
                                                 F1: General Help
                                                 F2: Previous Values
                                                 F3: Optimized Defaults
                                                 F4: Save & Exit
                                                 ESC: Exit



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```

Figure 3.30 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.

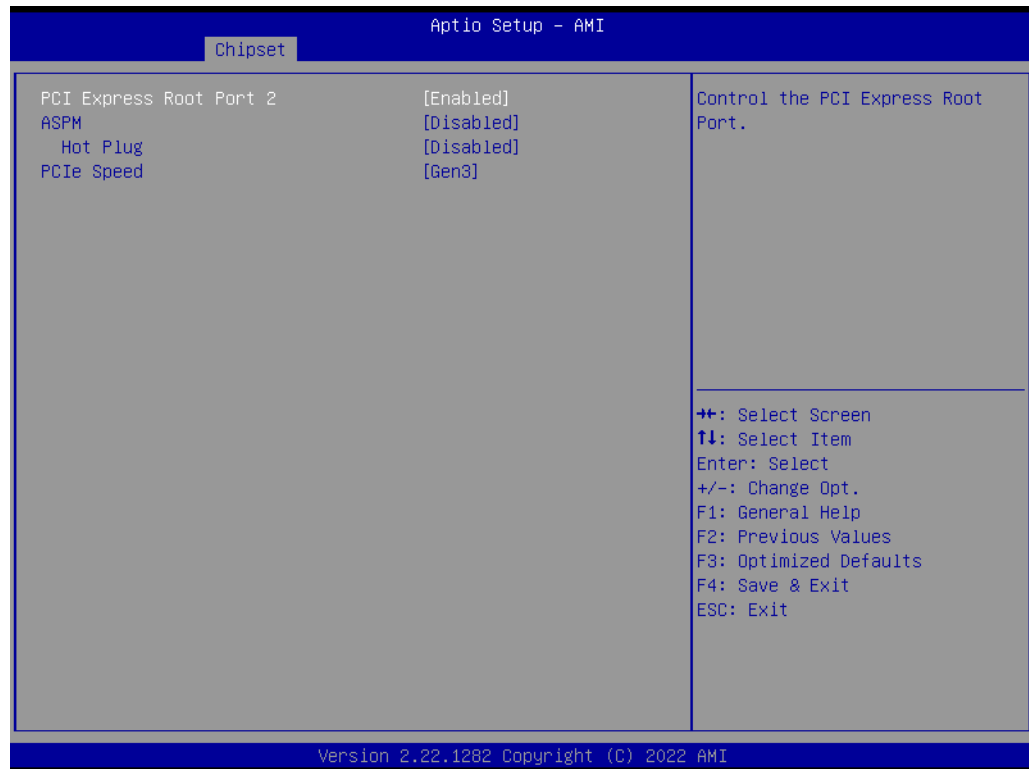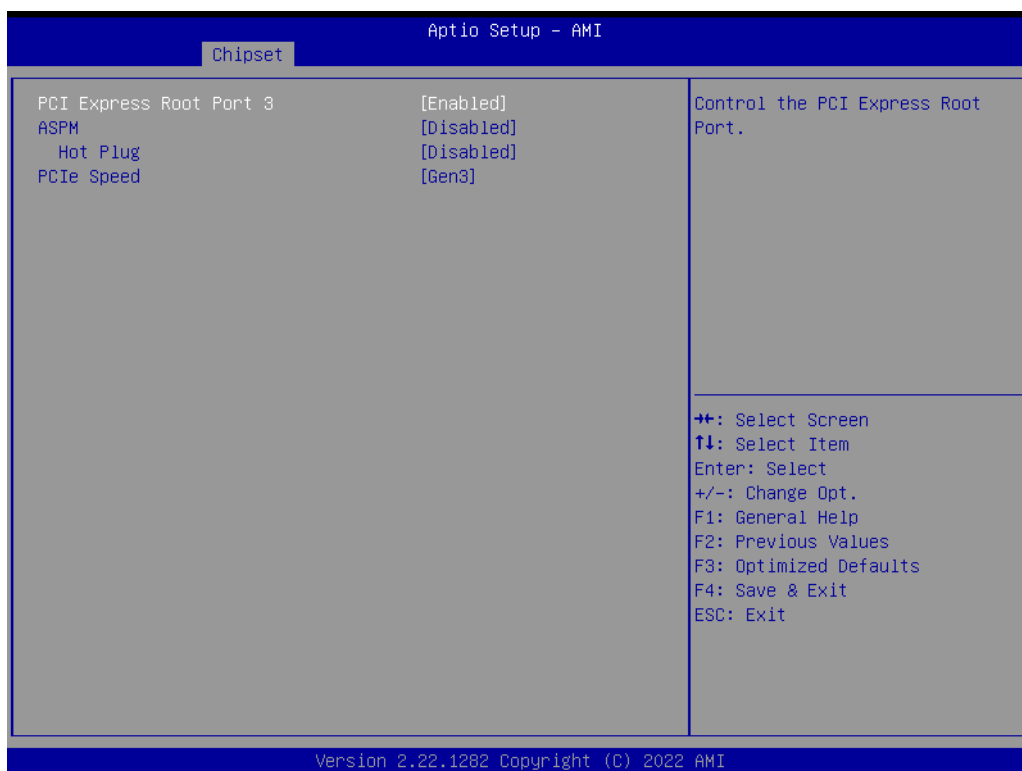■ **PCI Express Root Port 4**

```
                           Aptio Setup – AMI
         Chipset

PCI Express Root Port 4          [Enabled]          Control the PCI Express Root
ASPM                             [Disabled]         Port.
  Hot Plug                       [Disabled]
PCIe Speed                       [Gen3]






                                                    ↔: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/–: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit




              Version 2.22.1282 Copyright (C) 2022 AMI
```
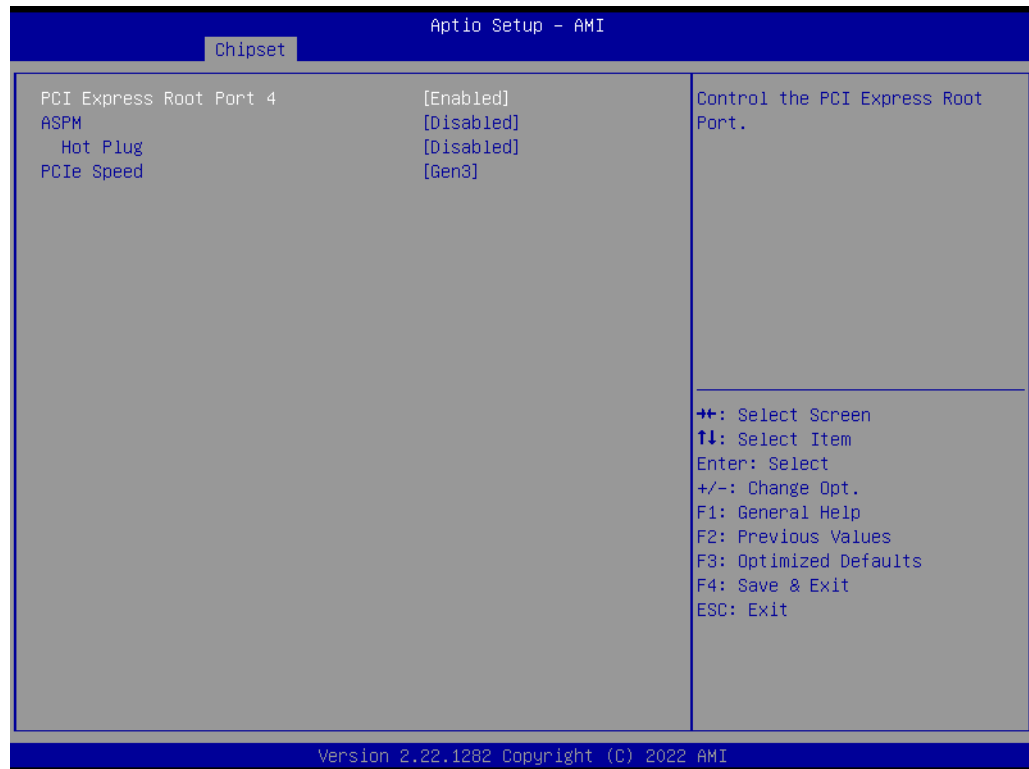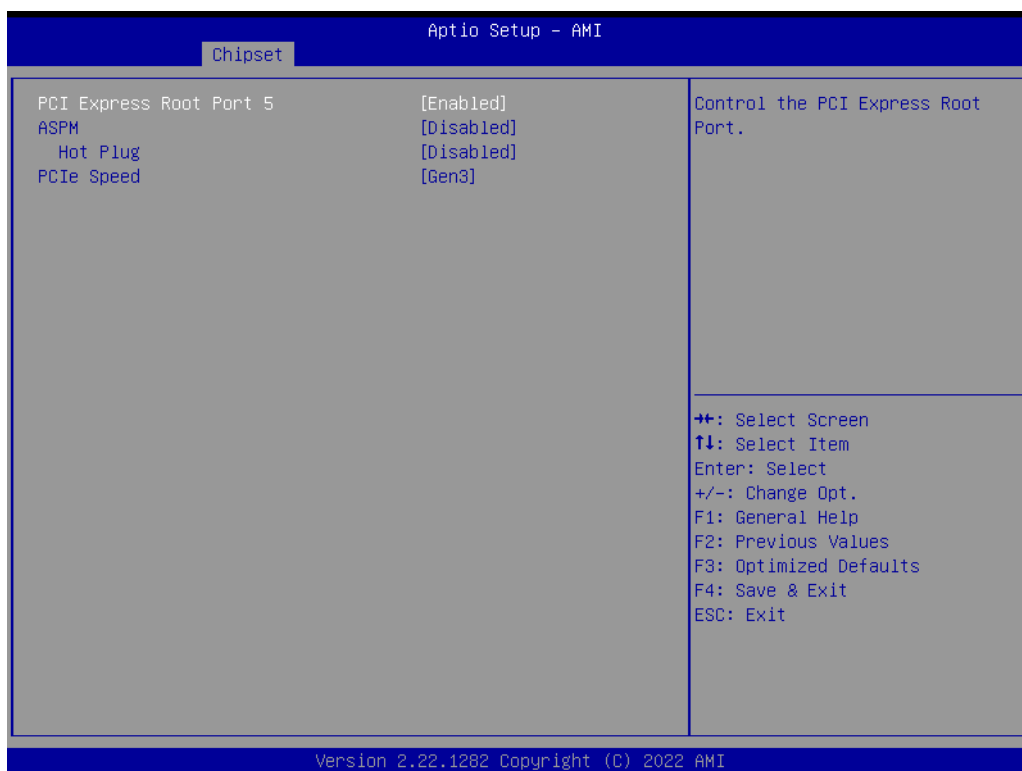
Figure 3.31 PCI Express Root Port 4

– **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**

```
                        Aptio Setup - AMI
        Chipset

PCI Express Root Port 5        [Enabled]            Control the PCI Express Root
ASPM                           [Disabled]           Port.
  Hot Plug                     [Disabled]
PCIe Speed                     [Gen3]




                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```

Figure 3.32 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**
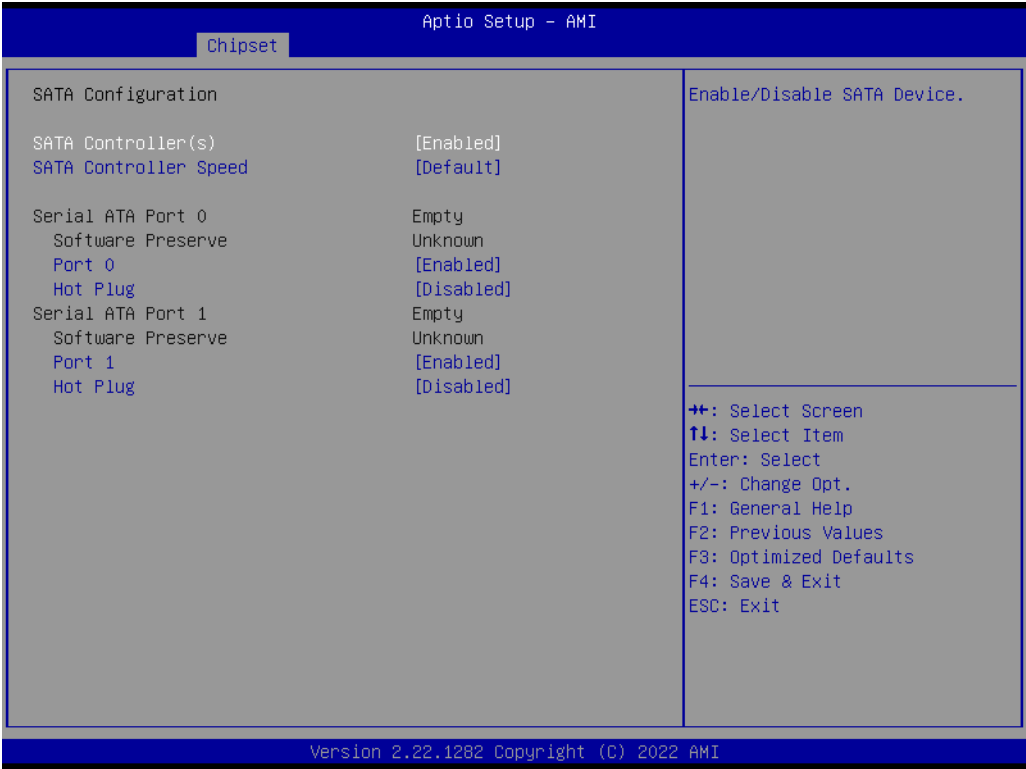 Configure PCIe Speed.

3.5.2.2 SATA Configuration

```
                         Aptio Setup - AMI
        Chipset

SATA Configuration                                    Enable/Disable SATA Device.

SATA Controller(s)            [Enabled]
SATA Controller Speed         [Default]

Serial ATA Port 0             Empty
  Software Preserve           Unknown
  Port 0                      [Enabled]
  Hot Plug                    [Disabled]
Serial ATA Port 1             Empty
  Software Preserve           Unknown
  Port 1                      [Enabled]
  Hot Plug                    [Disabled]
                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit



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```

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.

3.5.2.3 USB Configuration

```
                              Aptio Setup - AMI
      Chipset

 USB Configuration                                      Option to enable Compliance
                                                        Mode. Default is to disable
 XHCI Compliance Mode              [Disabled]           Compliance Mode. Change to
                                                        enabled for Compliance Mode
                                                        testing.




                                                        ++: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F3: Optimized Defaults
                                                        F4: Save & Exit
                                                        ESC: Exit




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```
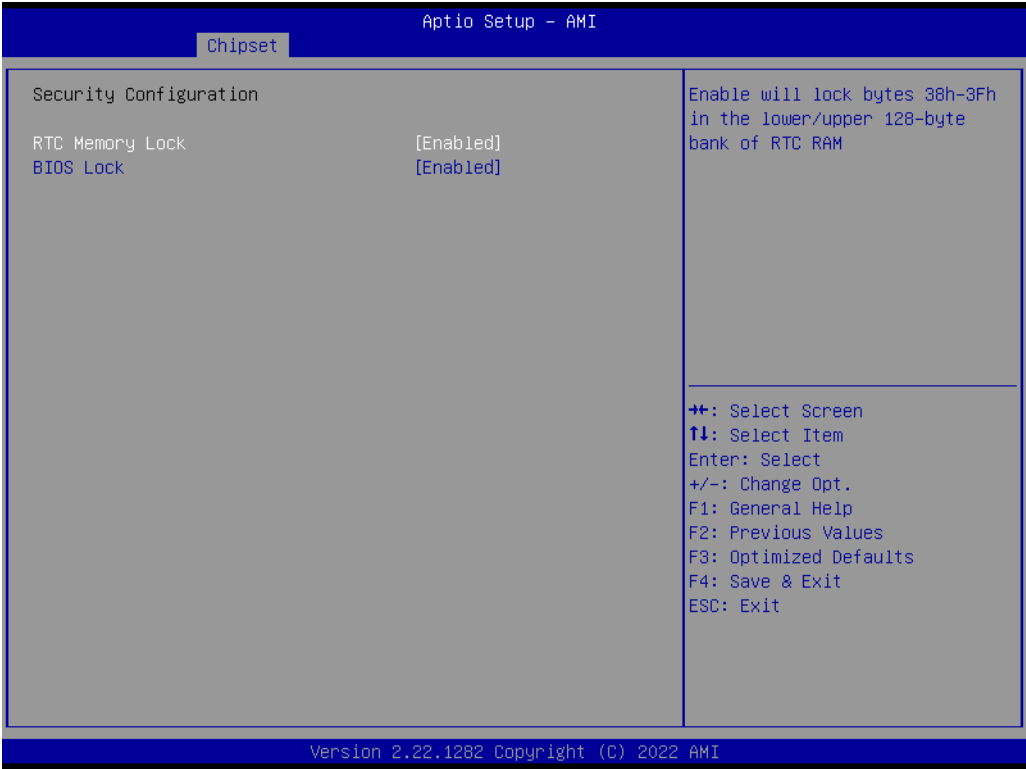
Figure 3.34 USB Configuration

■ **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

```
                           Aptio Setup – AMI
       Chipset

  Security Configuration                            Enable will lock bytes 38h-3Fh
                                                    in the lower/upper 128-byte
  RTC Memory Lock              [Enabled]            bank of RTC RAM
  BIOS Lock                    [Enabled]




                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```

Figure 3.35 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.

3.5.2.5 HD Audio Subsystem Configuration Settings

```
                          Aptio Setup - AMI
         Chipset

HD Audio Subsystem Configuration Settings         Control Detection of the
                                                  HD-Audio device.
HD Audio                        [Enabled]         Disabled = HDA will be
                                                  unconditionally disabled
                                                  Enabled = HDA will be
                                                  unconditionally enabled.



                                                  ↔: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                                                  F2: Previous Values
                                                  F3: Optimized Defaults
                                                  F4: Save & Exit
                                                  ESC: Exit



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```

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.

3.5.2.6 SerialIo Configuration
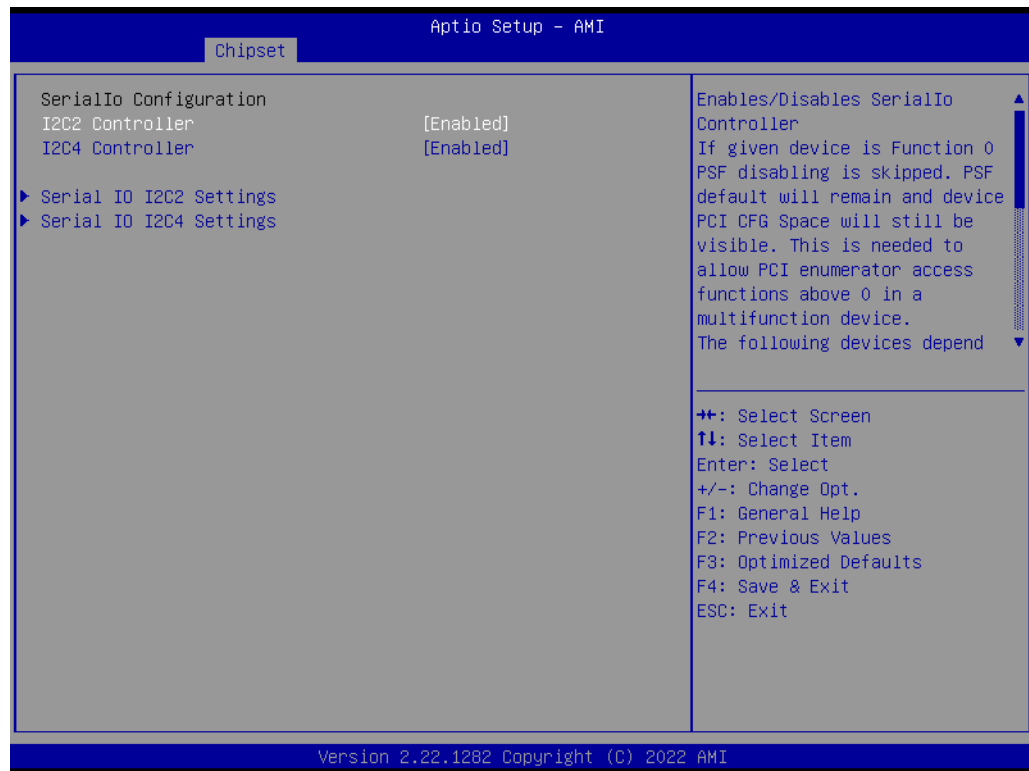
Figure 3.37 SerialIo Configuration

- **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 I2C4 Settings**

■   **Serial IO I2C2 Settings**

```
                          Aptio Setup – AMI
              Chipset

     Serial IO I2C2 Settings                              Indicates what type of I2C
                                                          Touch Panel is connected to
  ▶  Serial IO Touch Panel Settings                       this SerialIo controller

     Set Serial IO I2C #2 Speed        [Fast Mode]
     Timing parameters
     StandardSpeed SCL High            429
     StandardSpeed SCL Low             495
     StandardSpeed SDA Hold            30
     FastSpeed SCL High                81
     FastSpeed SCL Low                 153
     FastSpeed SDA Hold                30
     FastSpeedPlus SCL High            9
     FastSpeedPlus SCL Low             16
     FastSpeedPlus SDA Hold            11              ──────────────────────────
     HighSpeed SCL High                8              ↔: Select Screen
     HighSpeed SCL Low                 16             ↑↓: Select Item
     HighSpeed SDA Hold                8              Enter: Select
     D0->D3 idle timeout (screen off)  200            +/-: Change Opt.
     D0->D3 idle timeout (screen on)   2000           F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit


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```

Figure 3.38 Serial IO I2C2 Settings

– **Serial IO Touch Pad Settings**
  Indicates what type of I2C Touch Pad is connected to this SerialIo 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 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 I2C4 Settings**

```
                          Aptio Setup - AMI
           Chipset

 Serial IO I2C4 Settings                            Select Serial IO I2C #4 Speed
 Set Serial IO I2C #4 Speed        [Fast Mode]
 Timing parameters
 StandardSpeed SCL High             429
 StandardSpeed SCL Low              495
 StandardSpeed SDA Hold             30
 FastSpeed SCL High                 81
 FastSpeed SCL Low                  153
 FastSpeed SDA Hold                 30
 FastSpeedPlus SCL High             9
 FastSpeedPlus SCL Low              16
 FastSpeedPlus SDA Hold             11
 HighSpeed SCL High                 8
 HighSpeed SCL Low                  16           ↔: Select Screen
 HighSpeed SDA Hold                 8            ↑↓: Select Item
 D0->D3 idle timeout (screen off)   200          Enter: Select
 D0->D3 idle timeout (screen on)    2000         +/-: Change Opt.
                                                 F1: General Help
                                                 F2: Previous Values
                                                 F3: Optimized Defaults
                                                 F4: Save & Exit
                                                 ESC: Exit



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```

Figure 3.39 Serial IO I2C4 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 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
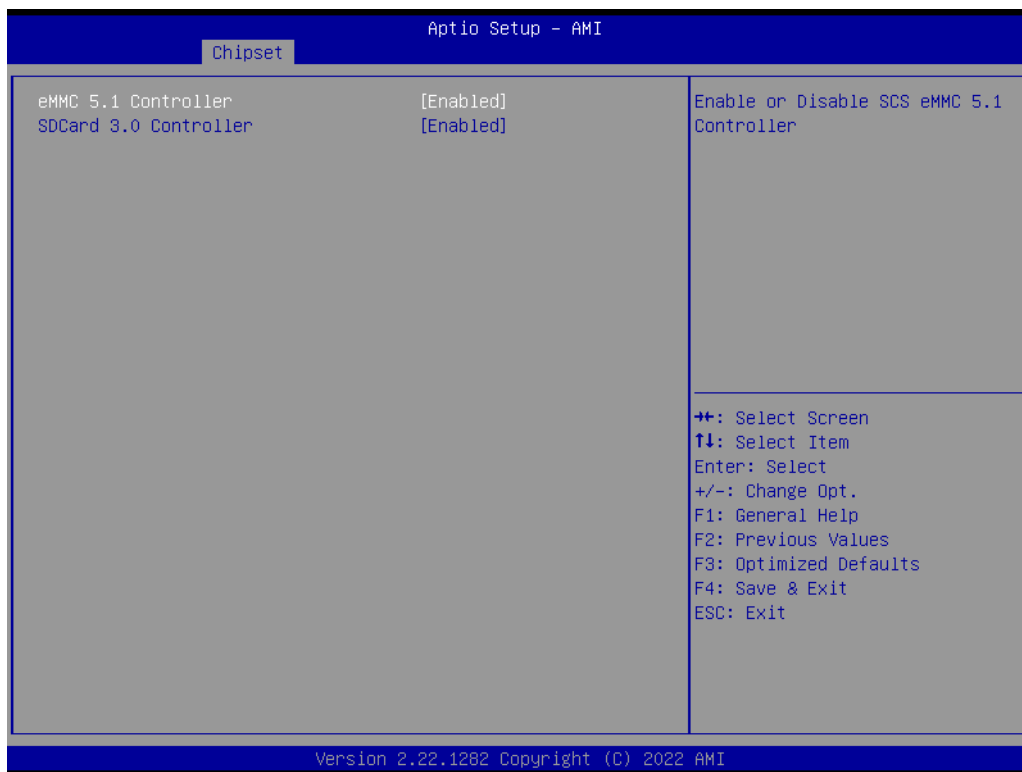
Figure 3.40 SCS Configuration

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

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

3.6 Security Chipset
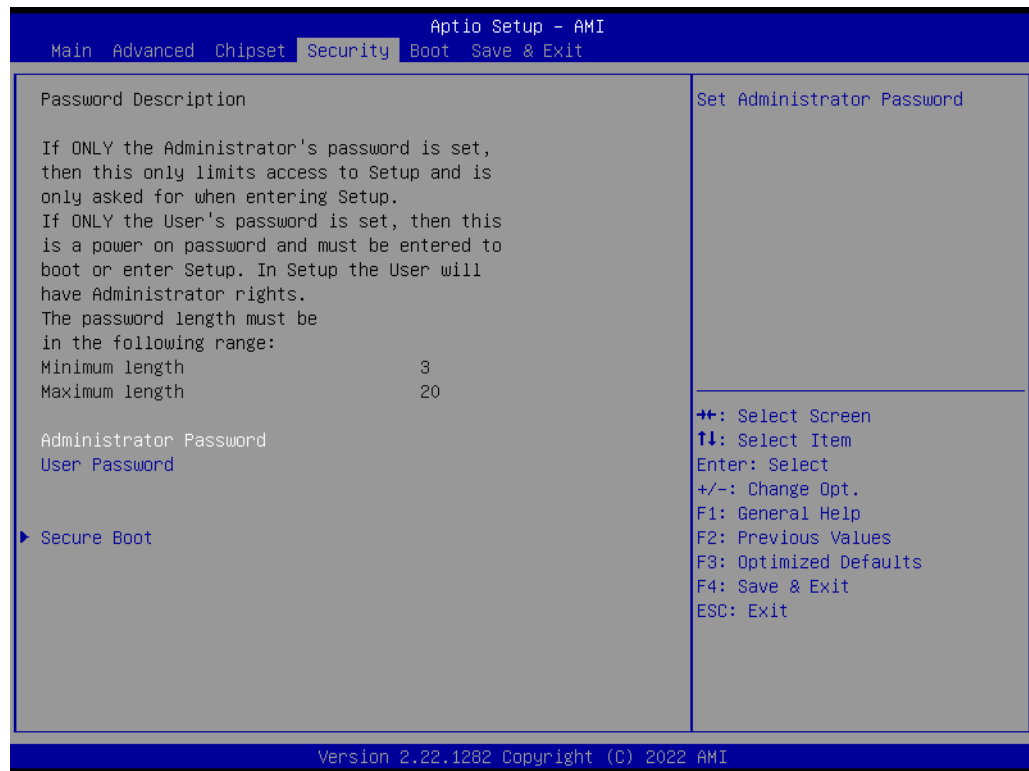
Figure 3.41 Security Chipset

- ■ **Administrator Password**
  Set Setup Administrator Password.
- ■ **User Password**
  Set User Password.
- ■ **Secure Boot**
  Secure Boot Configuration.

3.6.1 Secure Boot

Figure 3.42 Secure Boot

■ **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**
Secure Boot mode options:
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
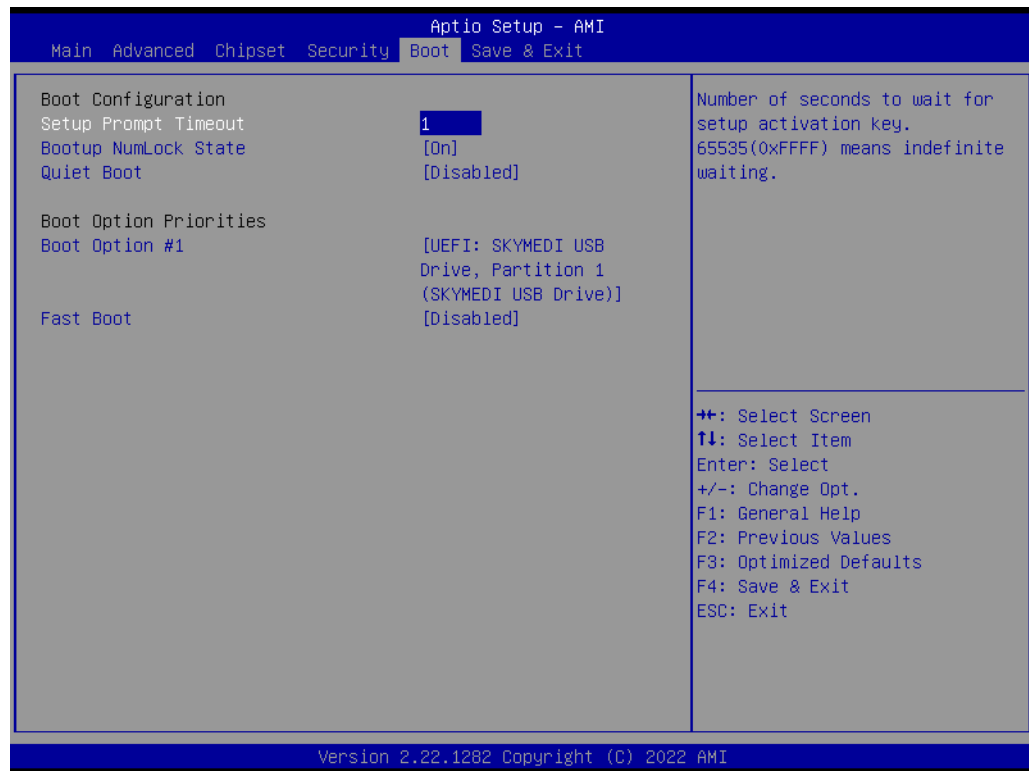
Figure 3.43 Boot Setup

- **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.

3.8 Save & Exit

```
                        Aptio Setup - AMI
  Main  Advanced  Chipset  Security  Boot  Save & Exit

Save Options                                Exit system setup after saving
Save Changes and Exit                       the changes.
Discard Changes and Exit

Save Changes and Reset
Discard Changes and Reset

Save Changes
Discard Changes

Default Options
Restore Defaults
Save as User Defaults
Restore User Defaults                       →←: Select Screen
                                            ↑↓: Select Item
Boot Override                               Enter: Select
UEFI: SKYMEDI USB Drive, Partition 1 (SKYMEDI USB Drive)  +/-: Change Opt.
                                            F1: General Help
                                            F2: Previous Values
                                            F3: Optimized Defaults
                                            F4: Save & Exit
                                            ESC: Exit



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```

Figure 3.44 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**

SOM-7532 User Manual

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 define 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 flexible parallel 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 allows developers to dynamically set the GPIO input or output status.

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

I²C
I²C is a bi-directional two wire bus that was developed by Philips for use in their televisions in the 1980s. The I²C API allows a developer to interface with an embedded system environment and transfer serial messages using the I²C protocols, allowing multiple simultaneous device control.

Display

Brightness Control
The Brightness Control API allows a developer to interface with an embedded device to easily control brightness.

Backlight
The Backlight API allows a developer to control the backlight (screen) on/off in an embedded device.

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 watchdog timer can be programmed to perform a warm boot (restarting the system) after a certain number of seconds.

Hardware Monitor
The Hardware Monitor (HWM) API is a system health supervision API that inspects certain condition indexes, such as fan speed, temperature and voltage.

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

Power Saving

CPU Speed
Make use of Intel SpeedStep technology to reduce power 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 COME 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.

SOM-7532 Row A,B

A1	GND (FIXED)	B1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#
A3	GBE0_MDI3+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MDI2-	B6	LPC_AD2
A7	GBE0_MDI2+	B7	LPC_AD3
A8	GBE0_LINK#	B8	N/A
A9	GBE0_MDI1-	B9	N/A
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	N/A	B14	SMB_DAT
A15	SUS_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_S4#	B18	N/A
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND (FIXED)	B21	GND (FIXED)
A22	USB_SSRX0-	B22	USB_SSTX0-
A23	USB_SSRX0+	B23	USB_SSTX0+
A24	SUS_S5#	B24	PWR_OK
A25	USB_SSRX1-	B25	USB_SSTX1-
A26	USB_SSRX1+	B26	USB_SSTX1+
A27	BATLOW#	B27	WDT
A28	(S)ATA_ACT#	B28	N/A
A29	HDA_SYNC	B29	HDA_SDIN1
A30	HDA_RST#	B30	HDA_SDIN0
A31	GND (FIXED)	B31	GND (FIXED)
A32	HDA_BITCLK	B32	SPKR
A33	HDA_SDOUT	B33	I2C_CK
A34	BIOS_DIS0#	B34	I2C_DAT
A35	THRMTRIP#	B35	THRM#
A36	USB6-	B36	USB7-
A37	USB6+	B37	USB7+
A38	USB_6_7_OC#	B38	USB_4_5_OC#
A39	USB4-	B39	USB5-
A40	USB4+	B40	USB5+

A41	GND (FIXED)	B41	GND (FIXED)
A42	USB2-	B42	USB3-
A43	USB2+	B43	USB3+
A44	USB_2_3_OC#	B44	USB_0_1_OC#
A45	USB0-	B45	USB1-
A46	USB0+	B46	USB1+
A47	VCC_RTC	B47	ESPI_EN#
A48	RSVD	B48	N/A
A49	GBE0_SDP	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#
A51	GND (FIXED)	B51	GND (FIXED)
A52	RSVD	B52	RSVD
A53	RSVD	B53	RSVD
A54	GPI0	B54	GPO1
A55	RSVD	B55	RSVD
A56	RSVD	B56	RSVD
A57	GND	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+
A59	PCIE_TX3-	B59	PCIE_RX3-
A60	GND (FIXED)	B60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+
A62	PCIE_TX2-	B62	PCIE_RX2-
A63	GPI1	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND	B66	WAKE0#
A67	GPI2	B67	WAKE1#
A68	PCIE_TX0+	B68	PCIE_RX0+
A69	PCIE_TX0-	B69	PCIE_RX0-
A70	GND (FIXED)	B70	GND (FIXED)
A71	LVDS_A0+	B71	DDI0_PAIR0+
A72	LVDS_A0-	B72	DDI0_PAIR0-
A73	LVDS_A1+	B73	DDI0_PAIR1+
A74	LVDS_A1-	B74	DDI0_PAIR1-
A75	LVDS_A2+	B75	DDI0_PAIR2+
A76	LVDS_A2-	B76	DDI0_PAIR2-
A77	LVDS_VDD_EN	B77	N/A
A78	LVDS_A3+	B78	N/A
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	LVDS_A_CK+	B81	DDI0_PAIR3+
A82	LVDS_A_CK-	B82	DDI0_PAIR3-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY
A86	RSVD	B86	VCC_5V_SBY
A87	eDP_HPD	B87	VCC_5V_SBY
A88	PCIE_CLK_REF+	B88	BIOS_DIS1#

A89	PCIE_CLK_REF-	B89	DDI0_HPD
A90	GND (FIXED)	B90	GND (FIXED)
A91	SPI_POWER	B91	N/A
A92	SPI_MISO	B92	N/A
A93	GPO0	B93	N/A
A94	SPI_CLK	B94	N/A
A95	SPI_MOSI	B95	DDI0_DDC_AUX_SEL
A96	TPM_PP	B96	N/A
A97	TYPE10#	B97	SPI_CS#
A98	SER0_TX	B98	DDI0_CTRLCLK_AUX+
A99	SER0_RX	B99	DDI0_CTRLDATA_AUX-
A100	GND (FIXED)	B100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT
A102	SER1_RX	B102	FAN_TACHIN
A103	LID#	B103	SLEEP#
A104	VCC_12V	B104	VCC_12V
A105	VCC_12V	B105	VCC_12V
A106	VCC_12V	B106	VCC_12V
A107	VCC_12V	B107	VCC_12V
A108	VCC_12V	B108	VCC_12V
A109	VCC_12V	B109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)

*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

Trigger Event	Note
IRQ	(BIOS setting default disable)**
NMI	N/A
SCI	Power button event
Power Off	Support
H/W Restart	Support
WDT Pin Activate	Support

** 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

Programming GPIO

This Appendix illustrates the General Purpose Input and Output pin settings.

Sections include:

■ **GPIO Register**

C.1 GPIO Register

GPIO Byte Mapping	H/W Pin Name
BIT0	GPI0
BIT1	GPI1
BIT2	GPI2
BIT3	GPI3
BIT4	GPO0
BIT5	GPO1
BIT6	GPO2
BIT7	GPO4

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 D.1: Table D.1: System I/O ports	
Addr.Range(Hex)	**Device**
0x00000299-0x0000029A	Motherboard resources
0x000002C0-0x000002DF	Motherboard resources
0x000002A0-0x000002BF	Motherboard resources
0x000002A0-0x000002BF	Motherboard resources
0x00000290-0x0000029F	Motherboard resources
0x0000029E-0x000002AD	Motherboard resources
0x00000060-0x0000006F	Motherboard resources
0x00000200-0x0000027F	Motherboard resources
0x00000300-0x0000037F	Motherboard resources
0x00000280-0x0000028F	Motherboard resources
0x00000280-0x0000028F	Motherboard resources
0x000002F0-0x000002F7	Motherboard resources
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000070-0x00000070	Motherboard resources
0x00000080-0x00000080	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources
0x0000164E-0x0000164F	Motherboard resources
0x00000062-0x00000062	Microsoft ACPI-Compliant Embedded Controller
0x00000066-0x00000066	Microsoft ACPI-Compliant Embedded Controller
0x0000EFA0-0x0000EFBF	Intel(R) SMBus - 43A3
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x00001800-0x000018FE	Motherboard resources
0x00003090-0x00003097	Standard SATA AHCI Controller
0x00003080-0x00003083	Standard SATA AHCI Controller
0x00003060-0x0000307F	Standard SATA AHCI Controller
0x00000000-0x00000CF7	PCI Express Root Complex
0x00000D00-0x0000FFFF	PCI Express Root Complex
0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller

Table D.1: Table D.1: System I/O ports	
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x000004D0-0x000004D1	Programmable interrupt controller
0x00002000-0x000020FE	Motherboard resources
0x000000F0-0x000000F0	Numeric data processor
0x0000FFF8-0x0000FFFF	Intel(R) Active Management Technology - SOL (COM3)
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer
0x00003000-0x0000303F	Intel(R) UHD Graphics
0x00001854-0x00001857	Motherboard resources

D.2 Interrupt Assignments

Table D.2: Table D.2: Interrupt Assignments	
Interrupt#	Interrupt Source
IRQ0	System timer
IRQ 27	Intel(R) Serial IO I2C Host Controller - 43E8
IRQ 4294967294	Intel(R) PCI Express Root Port #5 - 43BC
IRQ 4	Communications Port (COM1)
IRQ 3	Communications Port (COM2)
IRQ 14	Intel(R) Serial IO GPIO Host Controller - INT34C6
IRQ 6	Motherboard resources
IRQ 4294967293	Standard SATA AHCI Controller
IRQ54-68	Microsoft ACPI-Compliant System
IRQ69	Trusted Platform Module 2.0
IRQ70-511	Microsoft ACPI-Compliant System
IRQ13	Numeric data processor
IRQ 19	Intel(R) Active Management Technology - SOL (COM3)
IRQ 16	High Definition Audio Controller
IRQ 4294967281	Intel(R) Ethernet Controller (3) I225-LM
IRQ 4294967291	Intel(R) UHD Graphics
IRQ 4294967280	Intel(R) Management Engine Interface #1

D.3 1st MB Memory Map

Table D.3: 1st MB Memory Map	
Addr. Range (Hex)	**Device**
0xFFEFA000-0xFFEFAFFF	Intel(R) Serial IO I2C Host Controller - 43E8
0xFEDC0000-0xFEDC7FFF	Motherboard resources
0xFEDA0000-0xFEDA0FFF	Motherboard resources
0xFEDA1000-0xFEDA1FFF	Motherboard resources
0xC0000000-0xCFFFFFFF	Motherboard resources
0xFED20000-0xFED7FFFF	Motherboard resources
0xFED90000-0xFED93FFF	Motherboard resources
0xFED45000-0xFED8FFFF	Motherboard resources
0xFEE00000-0xFEEFFFFF	Motherboard resources
0x50400000-0x506FFFFF	Intel(R) PCI Express Root Port #5 - 43BC
0x50400000-0x506FFFFF	PCI Express Root Complex
0x1128000-0x11280FF	Intel(R) SMBus - 43A3
0xFED00000-0xFED003FF	High precision event timer
0xFE000000-0xFE01FFFF	Motherboard resources
0xFE04C000-0xFE04FFFF	Motherboard resources
0xFE050000-0xFE0AFFFF	Motherboard resources
0xFE0D0000-0xFE0FFFFF	Motherboard resources
0xFE200000-0xFE7FFFFF	Motherboard resources
0xFF000000-0xFFFFFFFF	Motherboard resources
0xFD000000-0xFD68FFFF	Motherboard resources
0xFD6C0000-0xFD6CFFFF	Motherboard resources
0xFD6F0000-0xFDFFFFFF	Motherboard resources
0xFD6E0000-0xFD6EFFFF	Intel(R) Serial IO GPIO Host Controller - INT34C6
0xFD6D0000-0xFD6DFFFF	Intel(R) Serial IO GPIO Host Controller - INT34C6
0xFD6B0000-0xFD6BFFFF	Intel(R) Serial IO GPIO Host Controller - INT34C6
0xFD6A0000-0xFD6AFFFF	Intel(R) Serial IO GPIO Host Controller - INT34C6
0xFD690000-0xFD69FFFF	Intel(R) Serial IO GPIO Host Controller - INT34C6
0x50700000-0x50701FFF	Standard SATA AHCI Controller
0x50703000-0x507030FF	Standard SATA AHCI Controller
0x50702000-0x507027FF	Standard SATA AHCI Controller
0xA0000-0xBFFFF	PCI Express Root Complex
0xE0000-0xE3FFF	PCI Express Root Complex
0xE4000-0xE7FFF	PCI Express Root Complex
0xE8000-0xEBFFF	PCI Express Root Complex
0xEC000-0xEFFFF	PCI Express Root Complex
0xF0000-0xFFFFF	PCI Express Root Complex
0x1100000-0x110FFFF	Intel(R) USB 3.20 eXtensible Host Controller - 1.20 (Microsoft)
0xFED40000-0xFED44FFF	Trusted Platform Module 2.0
0xFE010000-0xFE010FFF	Intel(R) SPI (flash) Controller - 43A4
0xBFFFF000-0xBFFFFFFF	Intel(R) Active Management Technology - SOL (COM3)
0xFFEFC000-0xFFEFFFFF	High Definition Audio Controller
0xFFF00000-0xFFFFFFFF	High Definition Audio Controller
0x1110000-0x111FFFF	Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft)

Table D.3: 1st MB Memory Map	
0x50500000-0x505FFFFF	Intel(R) Ethernet Controller (3) I225-LM
0x50600000-0x50603FFF	Intel(R) Ethernet Controller (3) I225-LM
0x0000-0xFFFFFF	Intel(R) UHD Graphics
0x0000-0xFFFFFFFF	Intel(R) UHD Graphics
0xFFEFB000-0xFFEFBFFF	Intel(R) Management Engine Interface #1
0xFFEFA000-0xFFEFAFFF	Intel(R) Serial IO I2C Host Controller - 43E8

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