

User Manual

SOM-6868

ADVANTECH

Enabling an Intelligent Planet

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This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

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

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FM

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

Technical Support and Assistance

1. Visit the Advantech website at <http://support.advantech.com> where you can find the latest information about the product.
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 you call:
 - 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, which if not observed, can cause personal injury!



Caution! Cautions are included to help you avoid damaging hardware or losing data. e.g.



There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Note! Notes provide optional additional information.



Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such comments in writing to: support@advantech.com

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- 1 x SOM-6868 CPU module
- 1 x Heat spreader (1960075199N001)

Selection Guide w/ P/N

Part No.	CPU	Frequency Base/Burst	CPU TDP	Core	DDR3L Memory	LVDS	VGA	DDI	Giga Lan	HD Audio	PCIe x1	USB 2.0	USB 3.0	SATA III	LPC	Power	Thermal Solution	Operating Temp.
SOM-6868PC-S6A1E	Pentium® N3710	1.6/2.56 GHz	6 W	4	DDR3-L 1600 MHz	18/ 24-bit	1	2	1	Yes	5	8	4	2	Yes	AT/ ATX	Passive	0 ~ 60° C
SOM-6868RC-S6A1E	Celeron® N3160	1.6/2.24 GHz	6 W	4	DDR3-L 1600 MHz	18/ 24-bit	1	2	1	Yes	5	8	4	2	Yes	AT/ ATX	Passive	0 ~ 60° C
SOM-6868RC-S5A1E	Celeron® N3060	1.6/2.48 GHz	6 W	2	DDR3-L 1600 MHz	18/ 24-bit	1	2	1	Yes	5	8	4	2	Yes	AT/ ATX	Passive	0 ~ 60° C
SOM-6868RC-S0A1E	Celeron® N3010	1.04/2.24 GHz	4 W	2	DDR3-L 1600 MHz	18/ 24-bit	1	2	1	Yes	5	8	4	2	Yes	AT/ ATX	Passive	0 ~ 60° C
SOM-6868AC-S0A1E	Atom™ X5-E8000	1.04/2 GHz	5 W	4	DDR3-L 1600 MHz	18/ 24-bit	1	2	1	Yes	5	8	4	2	Yes	AT/ ATX	Passive	0 ~ 60° C

Development Board

Part No.	Description
SOM-DB5800-00A2E	COM Express Development Board A2 Type 6 Pin-out

Accessories

Part No.	Description
1960048815N001	Semi-Heatsink 95 x 95 x 16.25 mm
1960048819N001	Semi-Cooler 95 x 95 x 33 mm

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**

-
16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 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.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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

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Chapter 1

General Information

This chapter gives background information on the SOM-6868 CPU Computer on Module

Sections include:

- Introduction
- Functional Block Diagram
- Product Specification

1.1 Introduction

SOM-6868 is equipped with the new Intel® Pentium® N3710, Celeron® N3160/ N3060/N3010, and Atom™ X5-E8000 single-chip processors, which are built with the latest Intel® 14-nm process technology, providing better performance with lower power consumption. The integrated, new graphics core boasts displays resolutions up to 4K2K and supports state-of-the-art hardware accelerators that perform well beyond previous platforms. So the SOM-6868 is suitable for low-power, yet graphic intense application fields such as medical, digital signage, and portable instruments.

Intel® gen 8 graphics are integrated with up to 16 EUs (execution units) delivering 2x the graphics performance compared with the previous platform. With the new graphics core, this Compact Module provides rich display interfaces such as LVDS, eDP, HDMI, and DisplayPort, and can support three simultaneous and independent display outputs. Up to 3840 x 2160 (4K) resolution satisfies high-quality display requirements. It's also the first low-power platform that supports an H.265/HEVC hardware decoder that accelerates 4K playback.

The SOM-6868 provides advanced features that can satisfy a wide range of applications. This product is designed to support wide-range voltage inputs from 4.75 to 20V; this provides flexible options to fulfill various application user scenarios. SOM-6868 also incorporates a rich array of I/O interfaces including 5 PCIe x1 links that optionally support x4 and x2 configurations, and offers one Intel® i211AT Gigabit Ethernet controller, 2 SATA Gen3, 8 USB 2.0, 4 USB 3.0, 2 COM ports, SMBus, I2C, and HD audio interface functions.

1.2 Specifications

Compliance

- PICMG COM.0 (COM Express) Revision 2.1
- Compact Size – 95 x 95mm
- Pin-out Type 6

Feature List

Feature Type	Connector Row	Feature	Type 6 Define		SOM-6868
			Max.	Min.	
Display	A-B	LVDS Channel A (18/24-bit)	1	0	1
	A-B	LVDS Channel B (18/24-bit)	1	0	1
	A-B	eDP (muxed on LVDS Channel A)	1	0	1
	A-B	VGA	1	0	0
Expansion	A-B	PCI Express x1	6	1	5
	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	0

I/O	A-B	LAN Port 0 (Gigabit Ethernet)	1	1	1
	A-B	SATA	4	1	2
	A-B	USB2.0	8	4	8
	A-B	USB Client	1	0	0
	A-B	HD Audio	1	0	1
	A-B	SPI Bus	2	1	2
	A-B	General Purpose I/O (GPIO)	8	8	8
	A-B	SDIO (muxed on GPIO)	1	0	0
	A-B	Express Card Support	2	1	2
	A-B	Watchdog Timer Output	1	0	1
	A-B	Speaker Out	1	1	1
	A-B	External BIOS ROM Support	2	0	2
	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	2
	A-B	Trusted Platform Modules	1	0	1 Optional
Display	C-D	Digital Display Interfaces 1 - 3	3	0	2
I/O	C-D	PEG (PCI Express x16)	1	0	1
	C-D	PCI Express x1	2	0	0
	C-D	USB3.0	4	0	4

Processor System

CPU	Std. Freq.	Max. Turbo Freq.	Core/Thread	LLC Cache	TDP(W)
Pentium N3710	1.6 GHz	2.56 GHz	4/4	2MB	6W
Celeron N3160	1.6 GHz	2.24 GHz	4/4	2MB	6W
Celeron N3060	1.6GHz	2.48 GHz	2/2	2MB	6W
Celeron N3010	1.04GHz	2.24 GHz	2/2	2MB	4W
Atom X5-E8000	1.04GHz	2.0GHz	4/4	2MB	5W

Memory

- Dual channels 2 sockets support DDR3L-1600 up to 8GB (not supported ECC)
Maximum support 4G + 4G on each socket

Graphics

Intel Gen8 LP graphics supports up to 16 EUs (execution unit).

CPU	Graphics Controller	Base Freq.	Max. Burst Freq.	GFx EUs
Pentium N3710	Intel HD Graphics 405	400 MHz	700 MHz	16
Celeron N3160	Intel HD Graphics 400	320 MHz	640 MHz	12
Celeron N3060	Intel HD Graphics 400	320 MHz	600 MHz	12
Celeron N3010	Intel HD Graphics 400	320 MHz	600 MHz	12
Atom X5-E8000	Intel HD Graphics	320 MHz	320 MHz	12

2D API support

- DirectDraw for windows OS (7/8.1/10), and X Server for Linux

3D API support

- DirectX 12 (Windows 10) ,
- DirectX 11.2 (Windows 8.1),
- DirectX 11 (Windows 7)
- OpenGL 4.2 (Window 10/8.1/7)
- OpenGL ES3.0 (Linux)

Other API support

- OpenCL 1.2

Media Hardware Decoder

- HEVC (H.265) @L5, H.264 @5.1, MVC, MPEG2, VP8, JPEG/MJPEG

Media Hardware Encoder

- H.264@ 5.1, MVC, JPEG

Media Content Protection

- PAVP2.0, HDCP 1.4 (wired) / 2.2 (wireless) and Media Vault DRM

Display Interface

- Supports dual channel 18/24-bit LVDS which can optionally be eDP.
- Supports on Type 6 DDI1 with configurable DisplayPort (DP), HDMI, or DVI.
- Supports on Type 6 DDI2 with HDMI interface, with optional DisplayPort.

	LVDS	eDP	DP	HDMI/DVI
# of Ports	Dual channel 18/24-bit	1 port shared with LVDS	1 port shared with HDMI	2 port shared
Standard	-	eDP1.4	DP1.1a	HDMI1.4b
Max. Resolution	1920x1200@60Hz Option support eDP1.4a :2560x1440@60Hz 24 bpp	2560x1440@60Hz 24bpp	3840x2160@30Hz 2560x1600@60Hz 24bpp	3840x2160@30Hz 2560x1600@60Hz 24bpp
Data Rate	2.7Gb/s (112MHz@24 bpp)	10.8Gb/s	10.8Gb/s	6.6Gb/s

HDCP	N/A	N/A	1.4	1.4
HD Audio	N/A	N/A	Yes	Yes

Multiple-Display

		Single Display	Dual Display		Triple Display	
		LVDS, DDI1, or DDI2	LVDS+DDI1 LVDS+DDI2 DDI1+DDI2	eDP+DDI1 eDP+DDI2 DDI1+DDI2	LVDS+DDI1+ DDI2	eDP+DDI1+D DI2
LVDS	LVDS	1920x1200	1920x1200	-	1920x1200	-
	eDP	2560x1440@60Hz	-	2560x1440 @60Hz	-	2560x1440@ 60Hz
DDI1	DP	3840x2160@30Hz or 2560x1600@60Hz	3840x2160@30Hz or 2560x1600@60Hz		3840x2160@30Hz or 2560x1600@60Hz	
	HDMI					
	DVI	1920 x 1080@60Hz	1920 x 1080@60Hz		1920 x 1080@60Hz	
DDI2	HDMI	3840x2160@30Hz or 2560x1600@60Hz	3840x2160@30Hz or 2560x1600@60Hz		3840x2160@30Hz or 2560x1600@60Hz	
	DVI	1920 x 1080@60Hz	1920 x 1080@60Hz		1920 x 1080@60Hz	

Expansion Interface

- **PCIe x1**
Intel Braswell natively integrates 4 x PCI Express x1 lanes and up to 4 devices. SOM-6868 is aimed at applications needing multiple expansion and is designed with additional PCI Express switches to provide a default 5 PCIe x1 ports with Gigabit Ethernet. It supports PCI Express Gen.2 / 5.0 Gbs and is backwardly compatible with PCI Express Gen.1 2.5 Gb/s.
- Furthermore, SOM-6868 offers alternative configurations to satisfy different applications. Details are listed in the following table. For different configurations, please contact your Advantech sales to learn more about BOM and BIOS support.

Type 6		Row A,B						Row C,D		GbE
		P0	P1	P2	P3	P4	P5	P6	P7	
Default	SoC	V	V							V
	Switch			V	V	V				
	Config.	X1	X1	X1	X1	X1				
		X2		X1	X1	X1				
Option	SoC	V	V	V	V					N.A.
	Config.	X1	X1	X1	X1					
		X2		X2						
		X4								

- **HD Audio Interface**
Supports Intel HD Audio interface integrated in Intel Braswell SoC.
- **LPC**
Supports the Low Pin Count (LPC) 1.1 specification, without DMA or bus mastering. It allows connection to Super I/O, embedded controller, or TPM. The LPC clock is rated at 25MHz.

Serial Bus

- SMBus
Supports SMBus 2.0 specification.
- I2C Bus
Supports I2C bus 8-bit and 10-bit address modes - both 100KHz and 400KHz.


I/O

- Gigabit Ethernet
On-module Intel i211AT supports IEEE802.3 for 1000BASE-T, 100BASE-TX, and 10BASE-T (802.3, 802.3u, and 802.3ab). It supports IPv4, IPv6, TCP/UDP, SCTP, ARP, Neighbor Discovery, and EUI-64.
- SATA
Supports 2 ports SATA Gen3 (6.0 Gb/s) and is backward compatible with SATA Gen2 (3.0 Gb/s) and Gen1 (1.5 Gb/s). Maximum data rate is 600 MB/s. It supports AHCI 1.3.1 mode (not support IDE mode).
- USB3.0/USB2.0
There are 4 USB3.0 ports (5.0 Gbps) and 8 USB2.0 ports (480 Mbps) which are backwardly compatible to USB1.x. For USB3.0, it supports LPM (U0, U1, U2, and U3) manageability to save power.
- USB3.0

Type 6	P0	P1	P2	P3
SoC	P0	P1	P2	P3
Type 6	OC_01		OC_23	
SoC USB_OC#	OC_0		OC_1	

- USB2.0

Type 6	P0	P1	P2	P3	P4	P5	P6	P7
SoC	P0	P1	P2	P3				
HUB					P4	P5	P6	P7
Type 6	OC_01		OC_23		OC_45		OC_67	
SoC USB_OC#	OC_0		OC_1					
USB HUB OC#					OC_12		OC_34	

Note!  OC_23 connects with OC_45 and OC_67 so USB ports 2-7 will have active over current protection. It is defined like this because the Hub-OC will not be shown in the OS and the user won't notice if an overcurrent condition occurs on port 5-7.

- SPI Bus
Supports BIOS flash only. SPI clock can be 50MHz, 33MHz, or 20MHz, capacity up to 16MB.
- GPIO
8 programmable general purpose Input or output (GPIO).
- Watchdog
Supports multi-level watchdog time-out output. Provides 1-65535 level, from 100ms to 109.22 minutes interval.
- Serial port
2 ports 2-wire serial port (Tx/Rx) support 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
- **Express Card**
2 sets of Express Card control signals including card detection and reset following the PICMG COM Express R2.1 specification.
- **TPM**
Module is an optional BOM item to support TPM 1.2 module. If the user wants TPM function, please contact sales to add components on the module board and enable BIOS items.
- **Smart Fan**
Supports two Fan PWM control signals and two tachometer inputs for fan speed detection. Provides one on module with connector and the other to the carrier board following the PICMG COM Express R2.1 specification.
- **BIOS**
A BIOS chip is on the module by default. Also allows the user to place the BIOS chip on the carrier board with the appropriate design and jumper setting on BIOS_DIS#[1:0].

BIOS_DIS0 #	BIOS_DIS# 1	Boot up destination/function
Open	Open	Boot from Module's SPI BIOS
GND	Open	Boot from Carrier Board LPC/FWH 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 are cleared, we suggest you go to BIOS setup menu and load default settings the first time you boot up.



Power Management

- **Power Supply**
Supports both ATX and AT power modes. VSB is for suspend power and can be optional if not requiring standby (suspend-to-RAM) support. RTC Battery may be optional if keeping time/date is not required.
VCC: 4.75V (5V-5%) – 20V (19V+5%)
VSB: 5V +/- 5% (Suspend power)
RTC Battery Power: 2.0V – 3.3V
- **PWROK**
Power check from the main power supply. A high value indicates that the power is good. This signal can be used to hold off the module startup to allow carrier board based FPGAs or other configurable devices time to be programmed.
- **Power Sequence**
According to PICMG COM Express R2.1 specification
- **Wake Event**
Various wake-up event support allows the user to apply to different scenarios.
 - Wake-on-LAN(WOL): Wake to S0 from S3/S4/S5
 - USB Wake: Wake to S0 from S3/S4
 - PCIe Device Wake: depends on user inquiry and may need customized BIOS
 - LPC Wake: depends on user inquiry and may need customized BIOS

- **Advantech S5 ECO Mode (Deep Sleep Mode)**
Advantech iManager provides additional features to allow the system to enter a very low suspend power mode – S5 ECO mode. In this mode, the module will cut all power including suspend and active power into the chipset and keep an on-module controller active. Therefore, only an under 50mW power will consume which means the user battery pack can last a longer time. While this mode is enabled in BIOS, the system (or module) only allows a power button to boot rather than others such as WOL.

Environment

- **Temperature**
 - Operating: 0 ~ 60° C (32 ~ 140° F), with a fanless heatsink under 0.7m/s air flow chamber.
 - Storage: -40 ~ 85° C (-40 ~ 185° F)
- **Humidity**
 - Operating: 40° C @ 95% relative humidity, non-condensing.
 - Storage: 60° C @ 95% relative humidity, non-condensing.
- **Vibrations**
IEC60068-2-64: Random vibration test under operation mode, 3.5Grms.
- **Drop Test (Shock)**
Federal Standard 101 Method 5007 test procedure with standard packing.
- **EMC**
CE EN55022 Class B and FCC Certifications: validate with standard development boards in Advantech chassis.
- **MTBF**
Please refer Advantech SOM-6868 Series Reliability Prediction Report No: 16R214A0.
- **OS Support (see SW chapter 4)**
To install the drivers for Windows, Linux or other OS, please connect to the internet and browse the website <http://support.advantech.com.tw> to download the setup file.
- **Advantech iManager**
Supports APIs for GPIO, smart fan control, multi-stage watchdog timer and output, temperature sensor, hardware monitor, etc. Follows the PICMG EAPI 1.0 specification that provides backward compatibility.

Advantech WISE-PaaS/RMM

IoT device management platform which is:

- **Reliable:**
Remote monitoring and management for all connected devices with access control Integration of 3rd party protection and recovery solution and support for server redundancy for service availability.
- **Scalable:**
Supports up to 1000 IoT device connections and 3 layers of server hierarchy and unlimited sub-servers.
- **Extensible:**
Restful API web service, node-red & WISE Agent framework allows users to do further development, customization, and integration based on their applications.

Power Consumption

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	S3	S5	S5 ECO	RTC (uA)
SOM-6868PC-S6A1E	17.103	8.660	4.507	0.923	0.747	0.191	0.5994
SOM-6868RC-S6A1E	15.826	11.624	4.739	0.918	0.676	0.162	0.5167
SOM-6868RC-S5A1E	14.754	11.185	4.744	0.922	0.681	0.187	0.6020
SOM-6868RC-S0A1E	14.229	8.936	4.555	0.822	0.664	0.202	0.3739
SOM-6868AC-S0A1E	11.414	8.238	4.766	1.002	0.781	0.216	0.4679

Hardware Configuration:

1. MB: SOM-6868PC-S6A1E (PCB_A101-2)
2. DRAM: Kingston 4GB DDR3L 1600MHz *2
3. Carrier board: SOM-DB5800_A201-2

Test Condition:

1. Test temperature: room temperature
2. Test voltage: rated voltage DC +12.0V
3. Test loading:
 - Maximum load mode: According to Intel thermal/power test tools
 - Burn-in mode: Passmark Burn-in Test v8.1 Pro with appropriate load setting
 - Idle mode: DUT power management off and no running any program.
4. OS: Windows 8.1 Pro

Performance

For reference performance or benchmark data that compare with other module, please refer to "Advantech COM Performance & Power Consumption Table".

Pin Description

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

Please contact your nearest Advantech branch office or call for design documents and further advanced support.

1.3 Functional Block Diagram

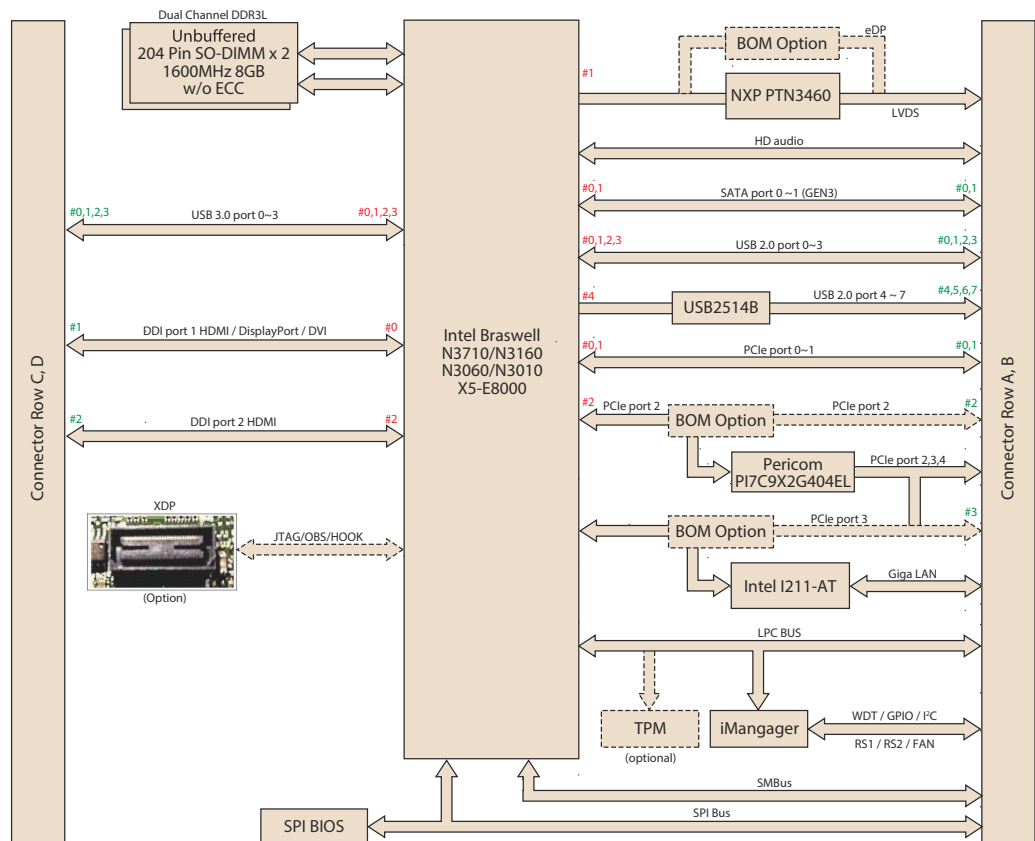


Figure 1.1 Functional Block Diagram

Chapter 2

Mechanical Information

This chapter gives mechanical information on the SOM-6868 CPU Computer on Module

Sections include:

- Board Information
- Mechanical Drawing
- Assembly Drawing

2.1 Board Information

To avoid mechanical problems and get the best thermal dissipation performance, take careful note of all the main components and chips indicated in the figure below..

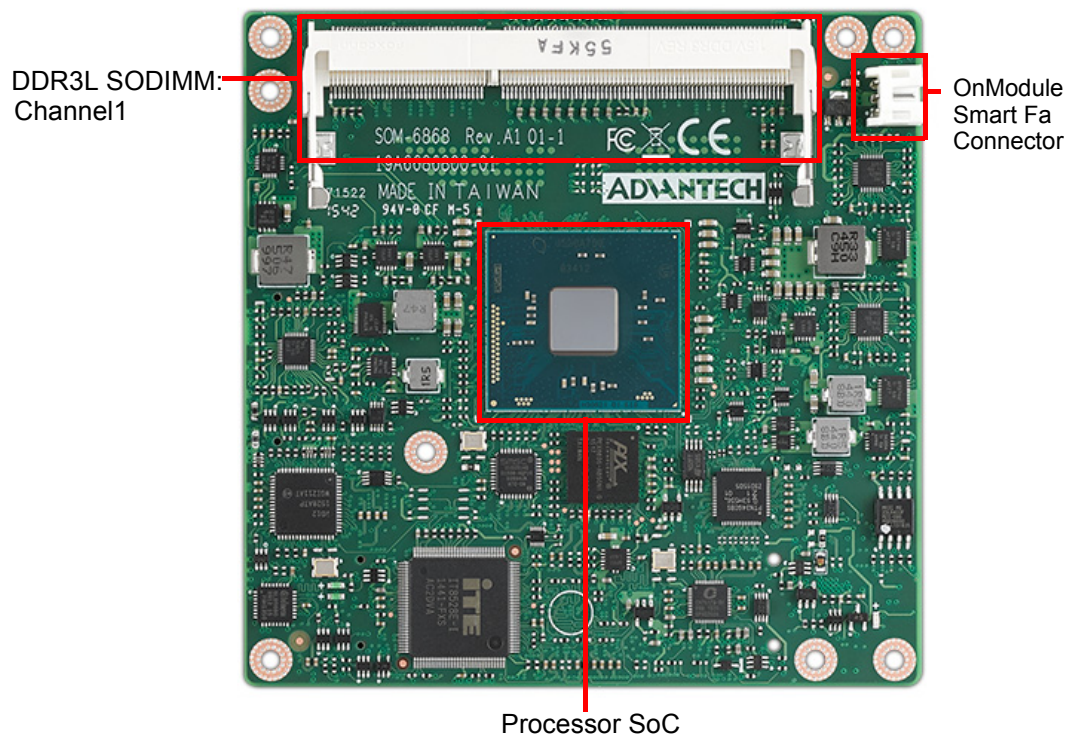


Figure 2.1 Board Chips Identify - Front

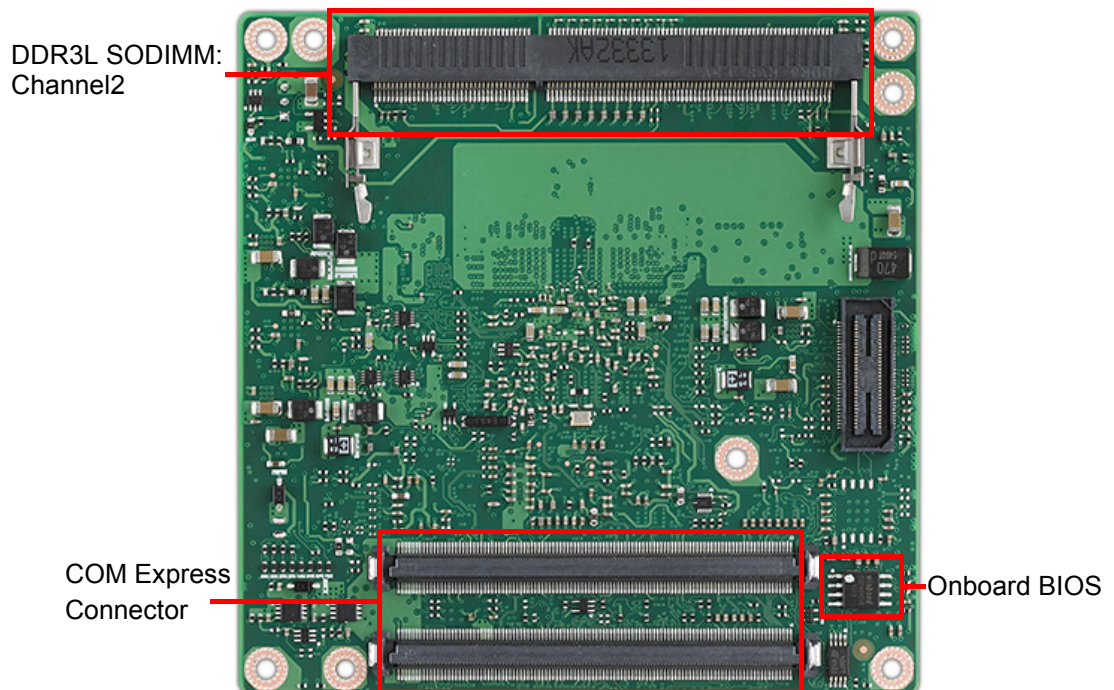
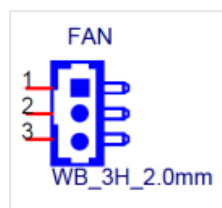


Figure 2.2 Board Chips Identify - Back

2.1.1 Connector List

Table 2.1: FAN1 Fan

FAN1	Fan
Description	Wafer 2.0, 3P 90D(M)DIP 2001-WR-03-LF W/Lock
Pin	Pin Name
1	Fan Tacho-Input
2	Fan Out
3	GND



2.2 Mechanical Drawing

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

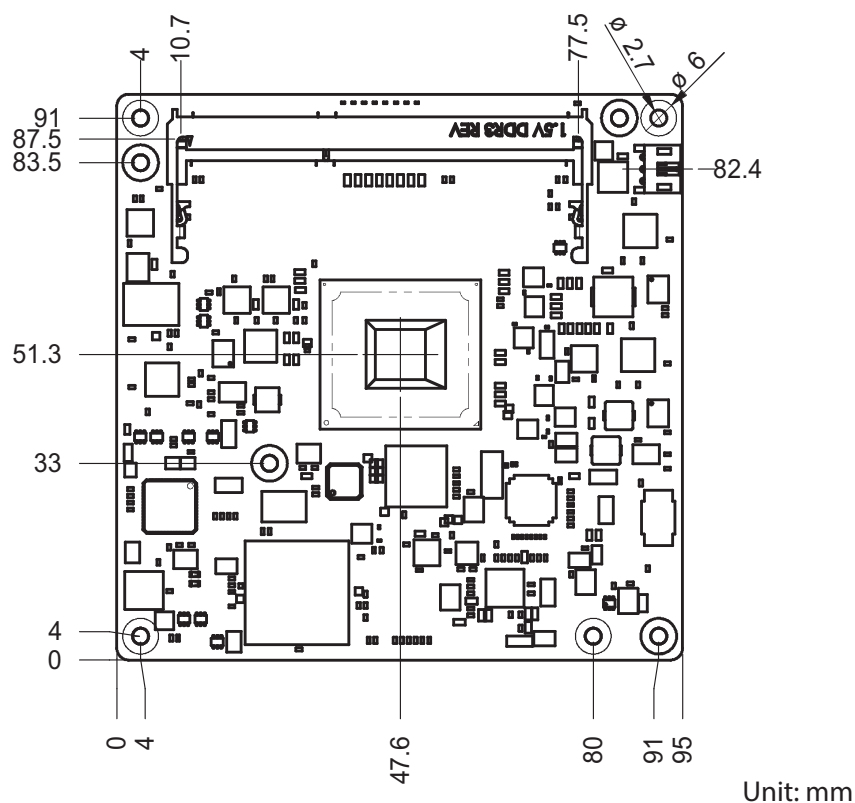


Figure 2.3 Board Mechanical Drawing - Front

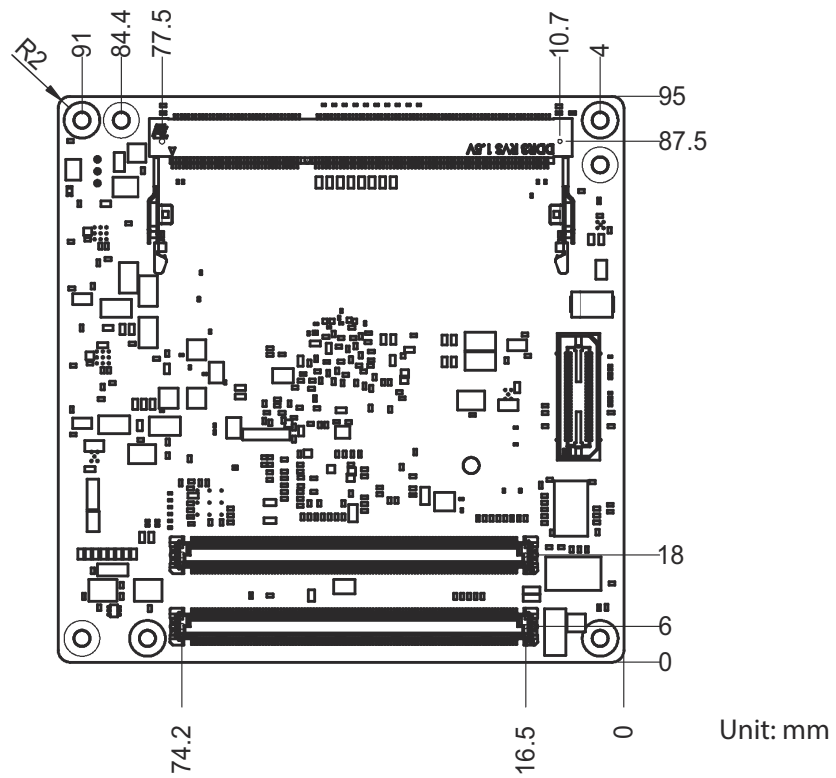
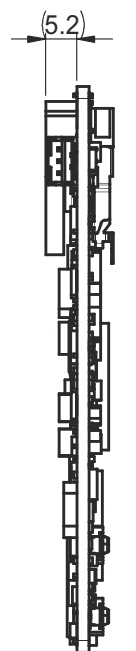


Figure 2.4 Board Mechanical Drawing - Back



Unit: mm

Figure 2.5 Board Mechanical Drawing - Side

2.3 Assembly Drawing

These figures demonstrate the assembly order of the thermal module, COM module to the carrier board.

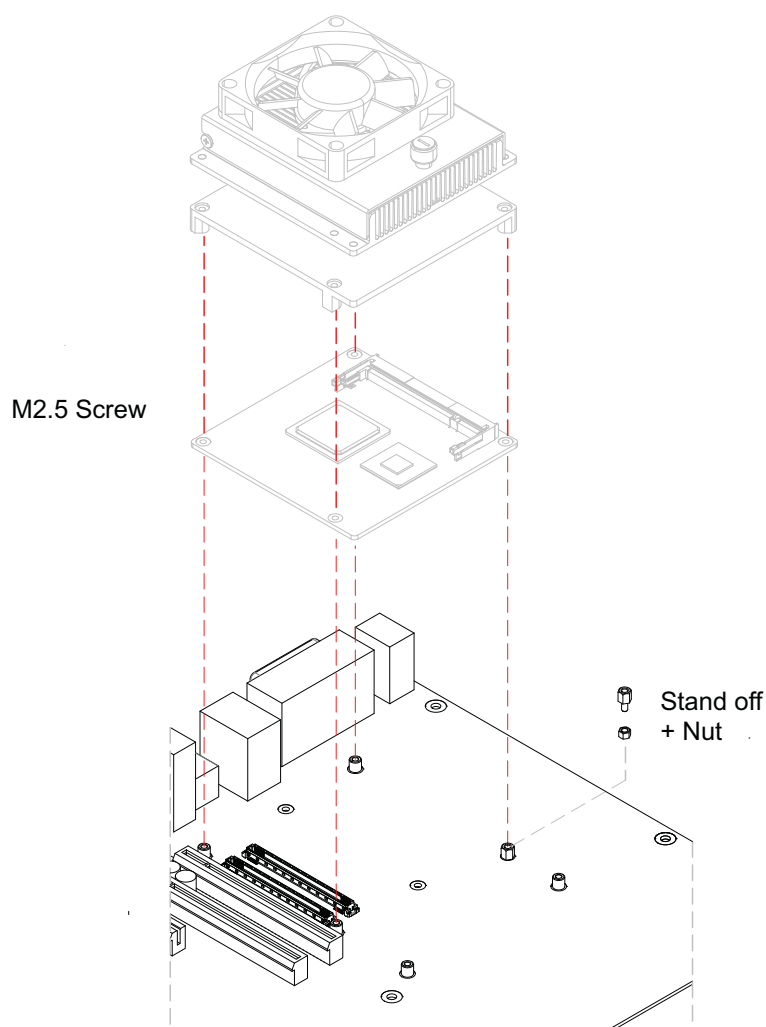
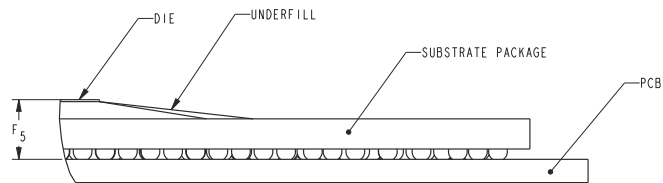
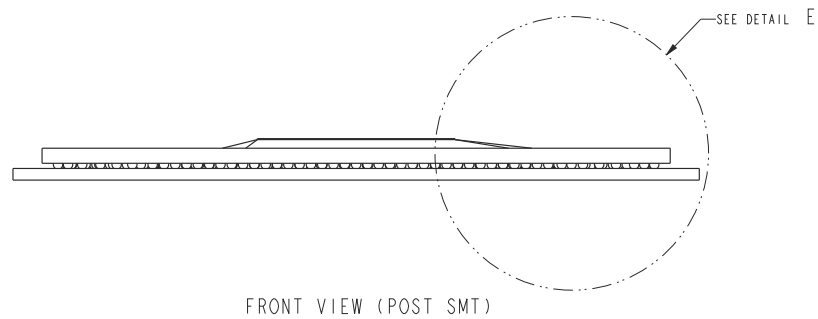


Figure 2.6 Assembly Drawing

There are 4 reserved screw holes for SOM-6868 to be pre-assembled with the heat spreader.

2.4 Assembly Drawing

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



*F₅=NOM : 1.282 TOL:±0.098 (POST SMT STACKUP HEIGHT BASED ON LIMITED DATA FROM INTEL REFERENCE BOARD DESIGN)

Figure 2.7 Main Chip Height and Tolerance

Chapter 3

BIOS

This chapter gives BIOS setup information for the SOM-6868 Computer on Module board

Sections include:

- Introduction
- Entering Setup
- Hot / Operation Key
- Exit BIOS Setup Utility

With the AMI BIOS Setup Utility, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the BIOS Setup Utility.

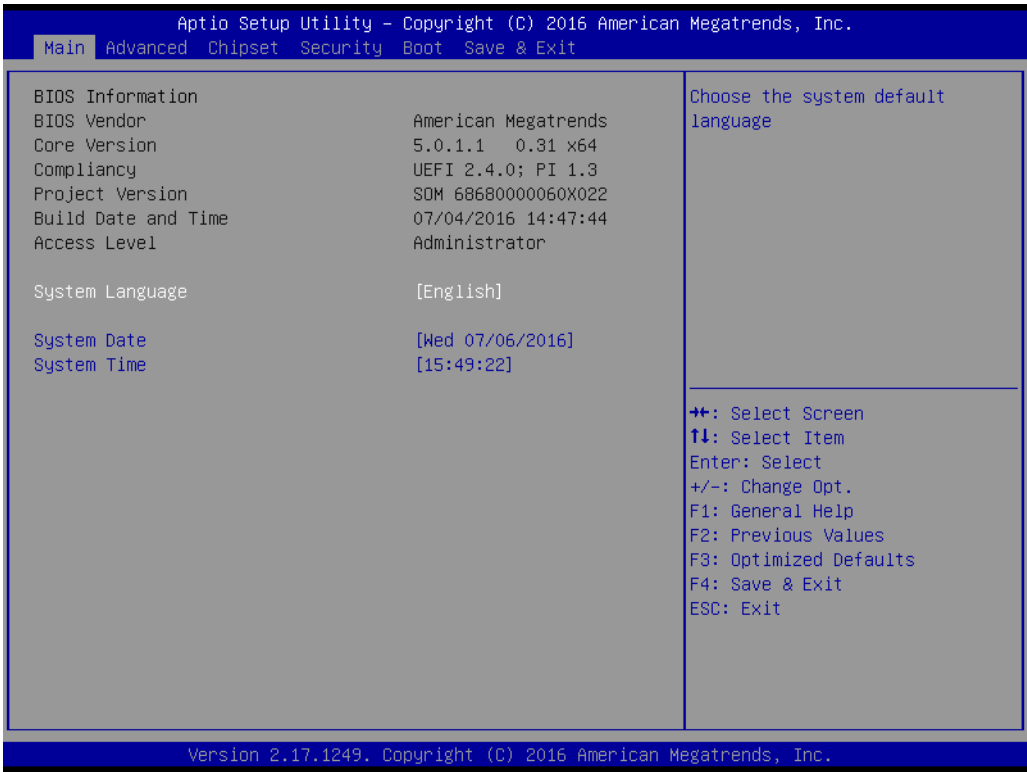


Figure 3.1 Setup program initial screen

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.

3.1 Entering Setup

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

3.2 Main Setup

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



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.

3.3 Advanced BIOS Features Setup

Select the Advanced tab from the SOM-6868 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.

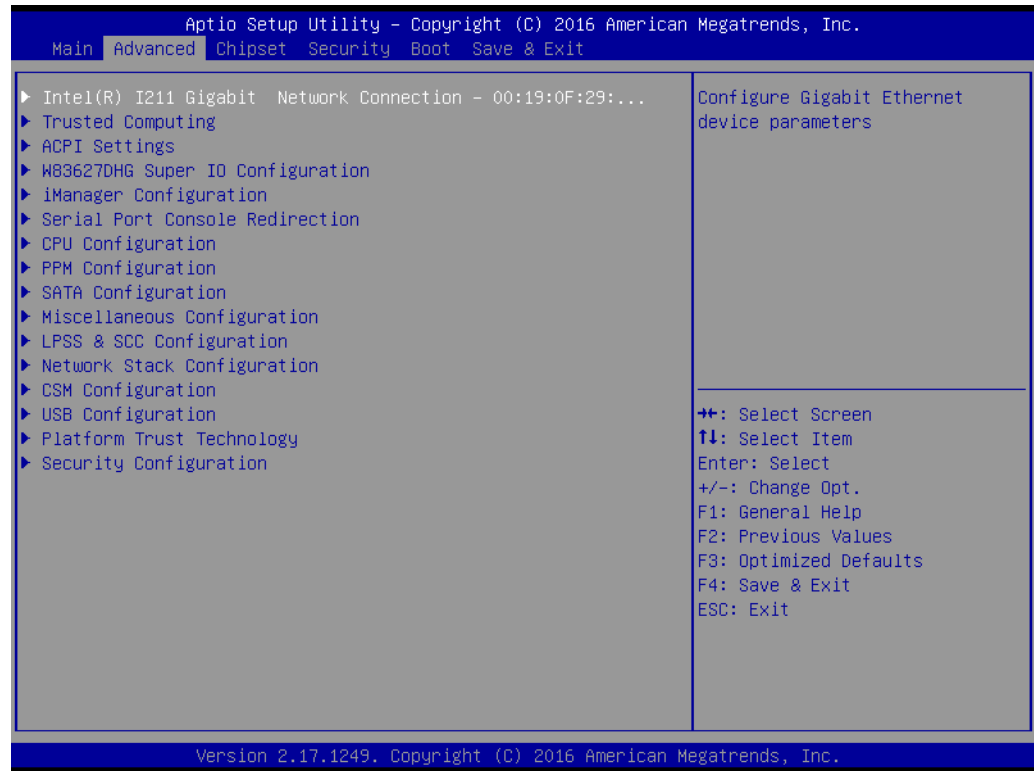


Figure 3.3 Advanced BIOS Features Setup Screen

3.3.1 Intel® I211 Gigabit Network Connection- 00:19:0F:26:....

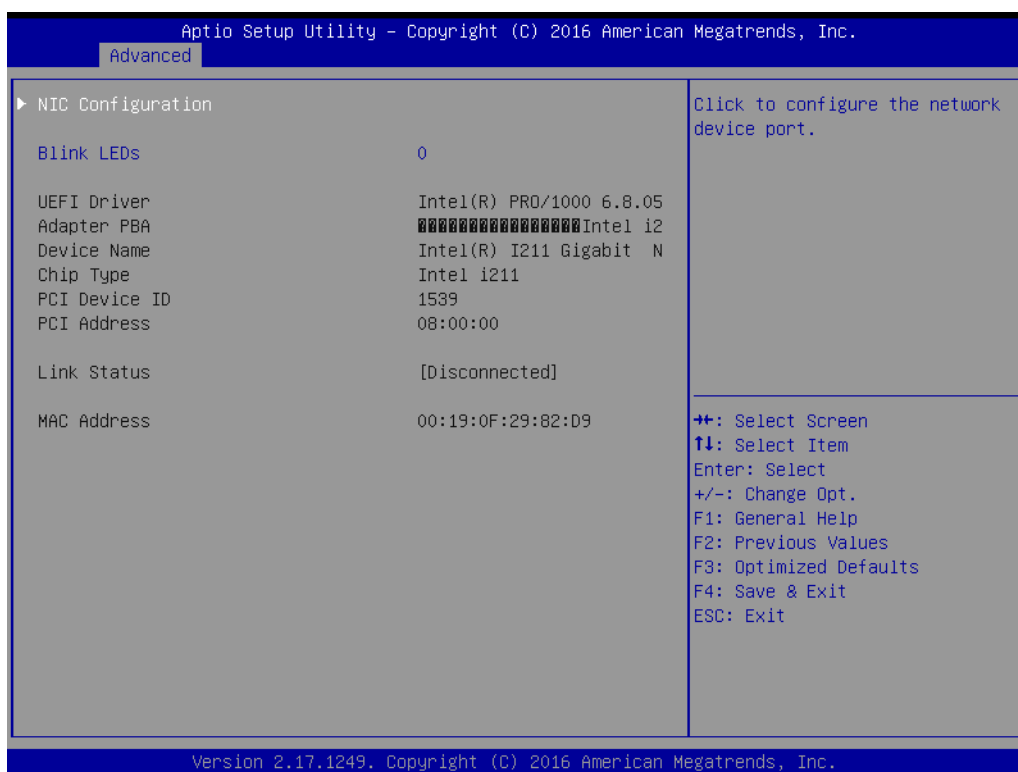


Figure 3.4 Intel® I211 Gigabit Network Connections

- **NIC Configuration**
Set configuration for network device port.
- **Blink LEDs**
Identify the physical network port by blinking the associated LED.

3.3.1.1 NIC Configuration



Figure 3.5 NIC Configuration

- **Link Speed**
Select the boot protocol port speed
- **Wake On LAN**
Enables or Disables the server to be powered on using an in-band magic packet.

3.3.2 Trusted Computing

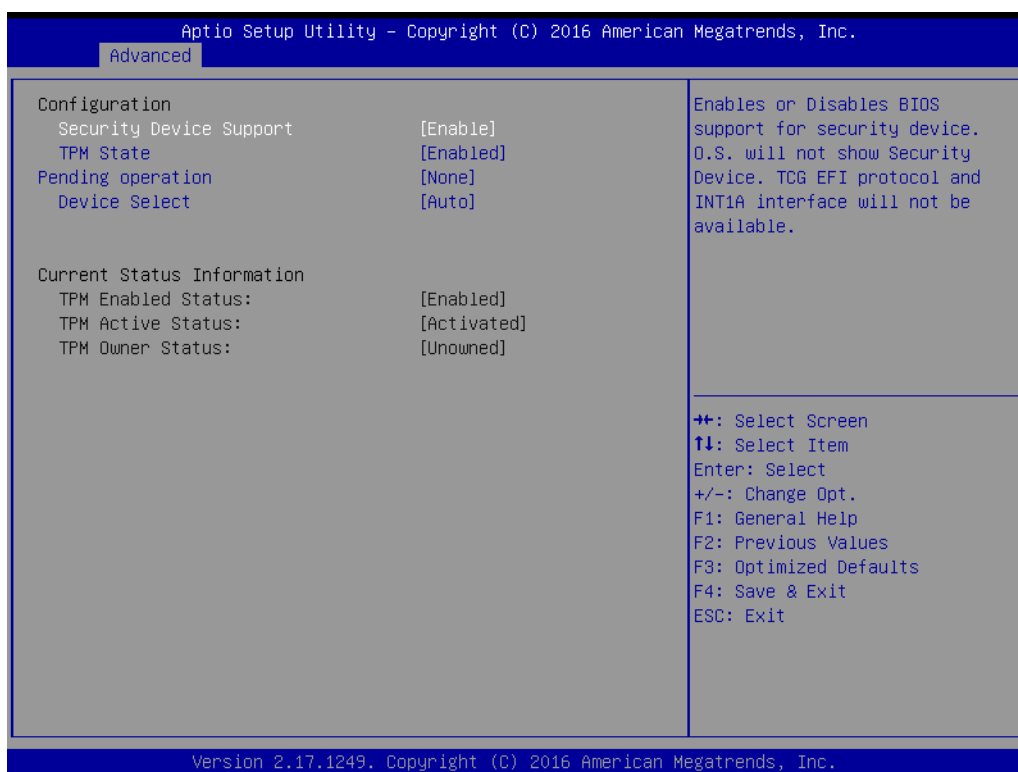


Figure 3.6 Trusted Computing

- **Security Device Support**
Enable or Disables BIOS support for security device. O.S. will not show security Device. TCG EFI protocol and INT1A interface will not be available.
- **Device Select**
Select the device. 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 no found. TPM 1.2 devices will be enumerated.

3.3.3 ACPI Settings



Figure 3.7 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.
- **Lock Legacy Resources**
Enables or Disables Lock of Legacy Resources.

3.3.4 W83627DHG Super IO Configuration



Figure 3.8 W83627DHG Super IO Configuration

- **Serial Port 1 Configuration**
Set Parameters of Serial Port 1 (COMA)
- **Serial Port 2 Configuration**
Set Parameters of Serial Port 2 (COMB)
- **Parallel Port Configuration**
Set Parameters of Parallel Port (LPT/LPTE)

3.3.4.1 Serial Port 1 Configuration

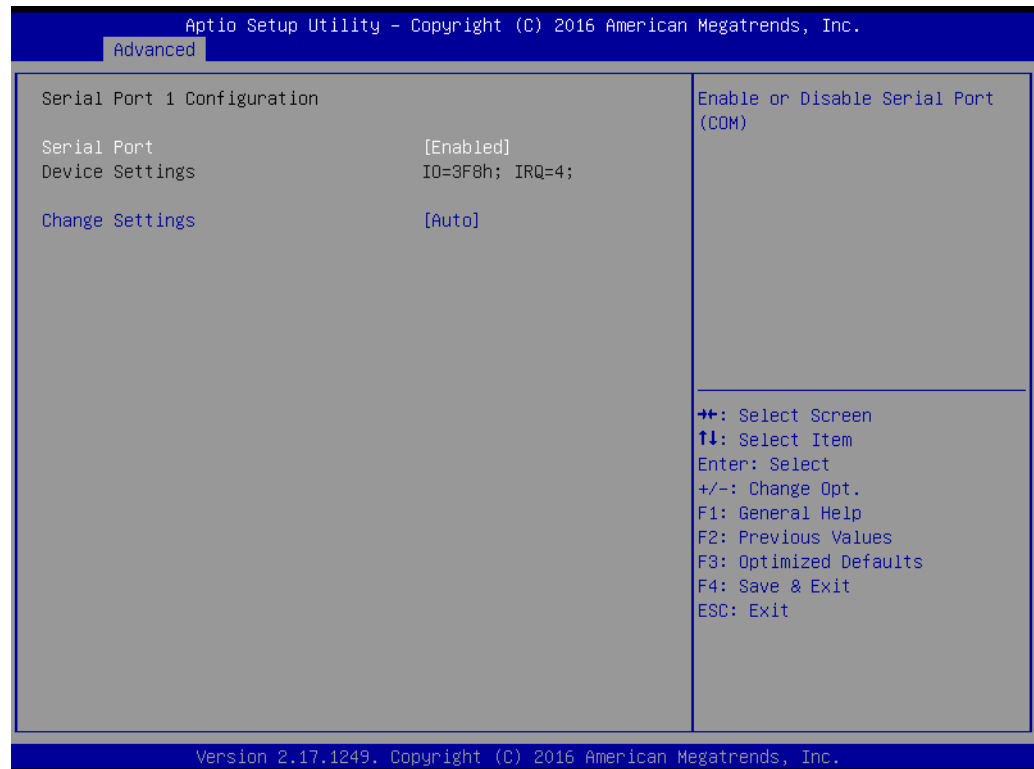


Figure 3.9 Serial Port 1 Configuration

- **Serial Port**
Enable or Disable Serial Port (COM)
- **Change Settings**
Select an optimal setting for Super IO device.

3.3.4.2 Serial Port 2 Configuration

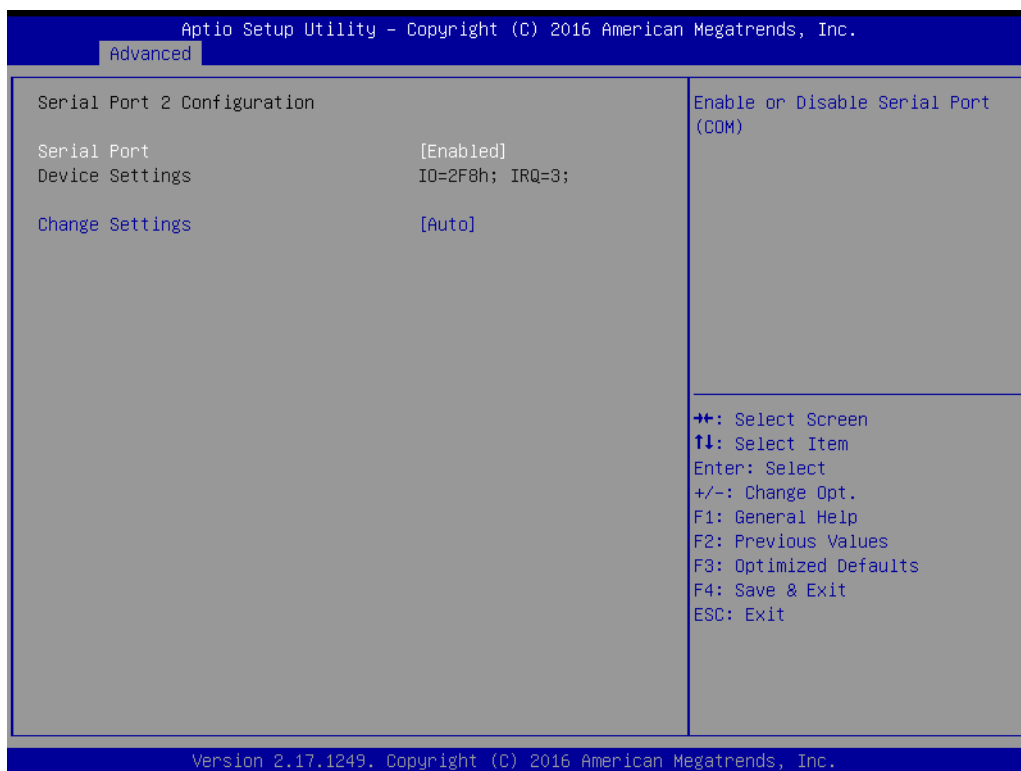


Figure 3.10 Serial Port 2 Configuration

- **Serial Port**
Enable or Disable Serial Port (COM)
- **Change Settings**
Select an optimal setting for the Super IO device.

3.3.4.3 Parallel Port Configuration

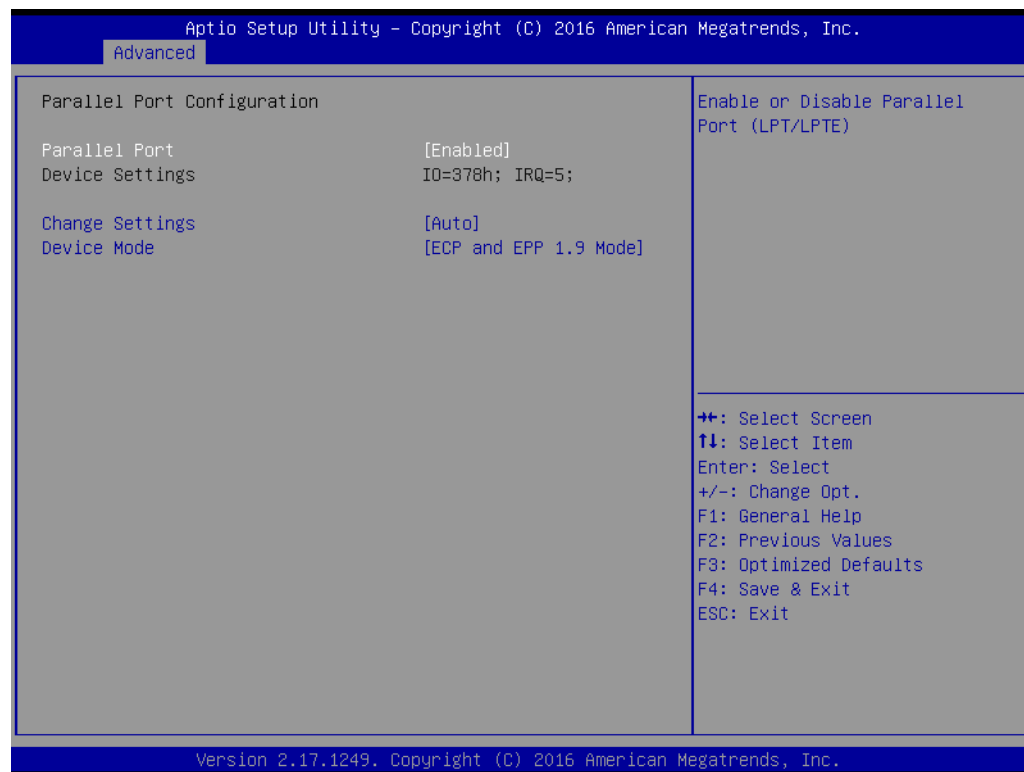


Figure 3.11 Parallel Port Configuration

- **Parallel Port**
Enable or disable Parallel Port (LPT/LPTE).
- **Change Setting**
Select an optimal setting for Super IO device.
- **Device Mode**
Change the printer port mode.

3.3.5 iManager Configuration

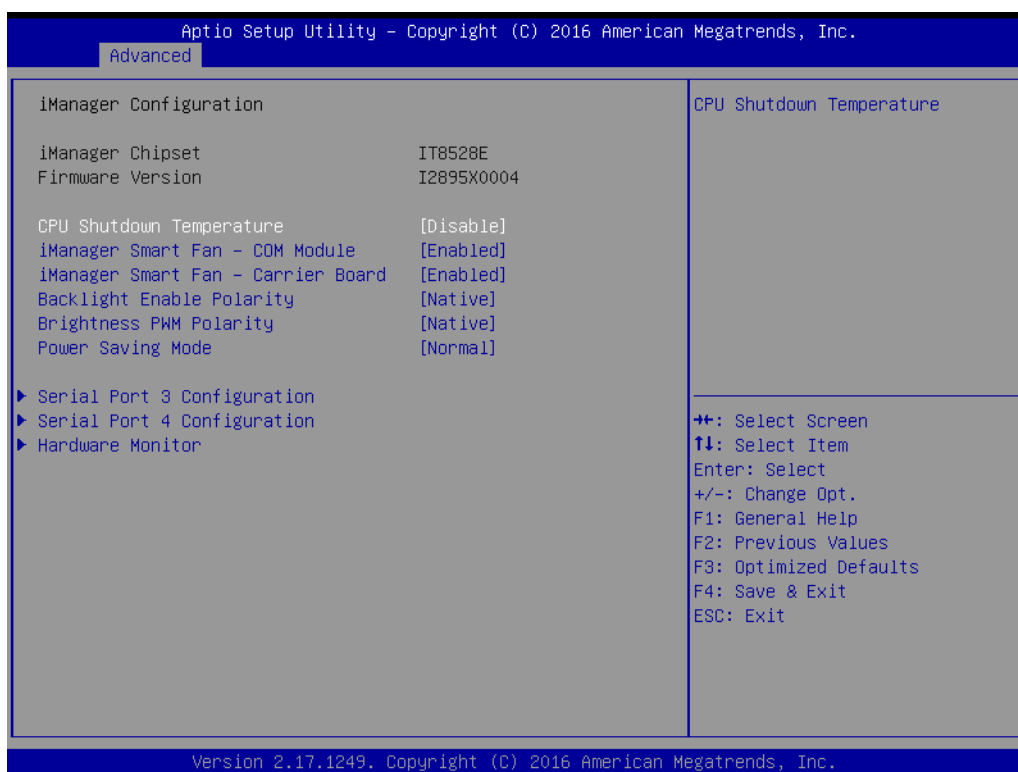


Figure 3.12 iManager Configuration

- **CPU Shutdown Temperature**
Enable/Disable CPU Shutdown Temperature.
- **iManager Smart Fan – Carrier Board**
Control iManager Smart FAN Carrier Board function.
- **Backlight Enable Polarity**
Switch Backlight Enable Polarity - Native or Invert
- **Brightness PWM Polarity**
Switches PWM Polarity backlight control brightness - Native or Invert
- **Power Saving Mode**
Select ITE8528 Power Saving Mode
- **Serial Port 3 Configuration**
Set Parameters of Serial Port 3
- **Serial Port 4 Configuration**
Set Parameters of Serial Port 4
- **Hardware Monitor**
Monitor hardware status

3.3.5.1 Serial Port 3 Configuration

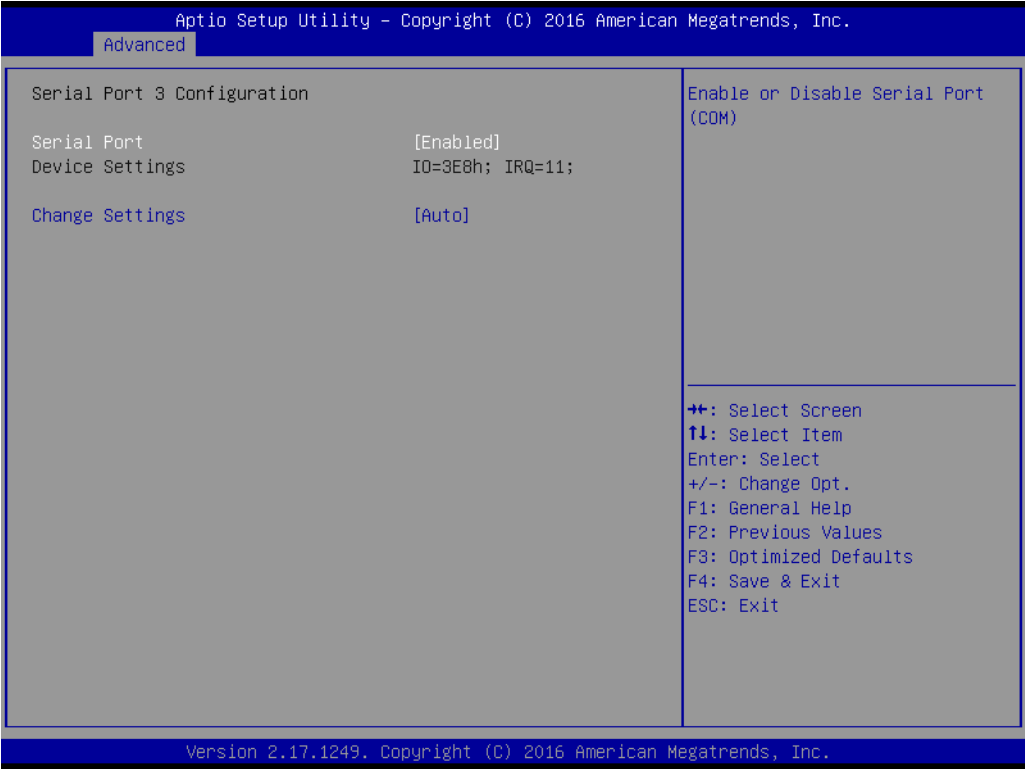


Figure 3.13 Serial Port 3 Configuration

- **Serial Port**
Enable or Disable Serial Port (COM)
- **Change Settings**
Select an optimal setting for Super IO device.

3.3.5.2 Serial Port 4 Configuration



Figure 3.14 Serial Port 4 Configuration

- **Serial Port**
Enable or Disable Serial Port (COM)
- **Change Settings**
Select an optimal setting for the Super IO device.

3.3.5.3 Hardware Monitor

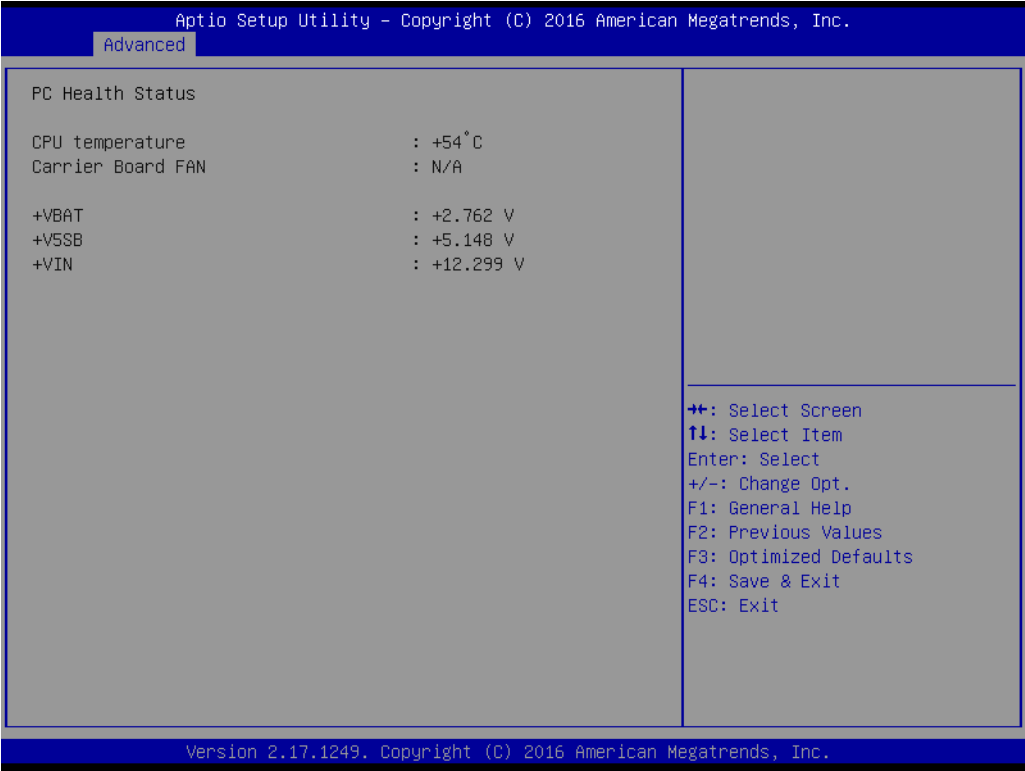


Figure 3.15 Hardware Monitor

- **Hardware Monitor Information**
This item shows hardware information parameters.

3.3.6 Serial Port Console Redirection

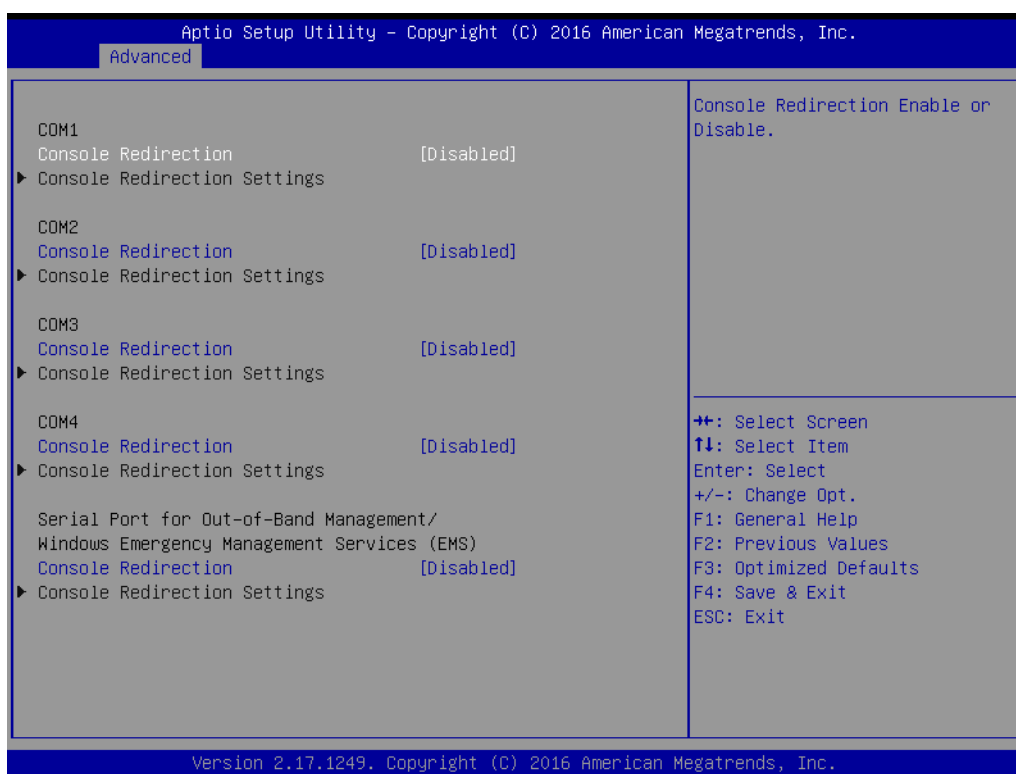


Figure 3.16 Serial Port Console Redirection

- **COM1 Console Redirection**
Console Redirection Enable or Disable
- **COM2 Console Redirection**
Console Redirection Enable or Disable
- **COM3 Console Redirection**
Console Redirection Enable or Disable
- **COM4 Console Redirection**
Console Redirection Enable or Disable
- **Serial Port for Out-of-Band Management / Windows Emergency Management Service (EMS) Console Redirection**
Console Redirection Enable or Disable

3.3.7 CPU Configuration



Figure 3.17 CPU Redirection

- **Socket 0 CPU Configuration**
Socket specific CPU Information
- **Limit CPUID Maximum**
This item is disabled for Windows XP.
- **Intel Virtualization Technology**
When enabled, a VMM can utilize additional hardware capabilities provided by Vanderpool Technology.
- **Power Technology**
Enable power management features.

3.3.7.1 Socket 0 CPU Information

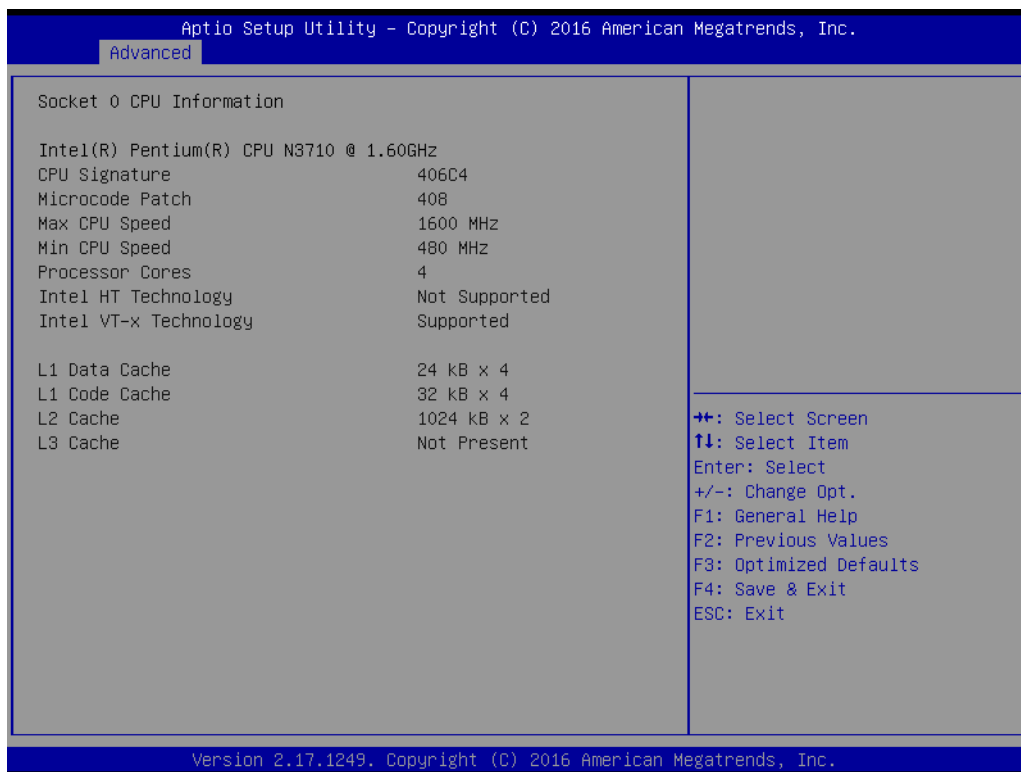


Figure 3.18 Socket 0 CPU Information

- **Socket 0 CPU Information**
Socket specific CPU Information

3.3.8 SATA Configuration

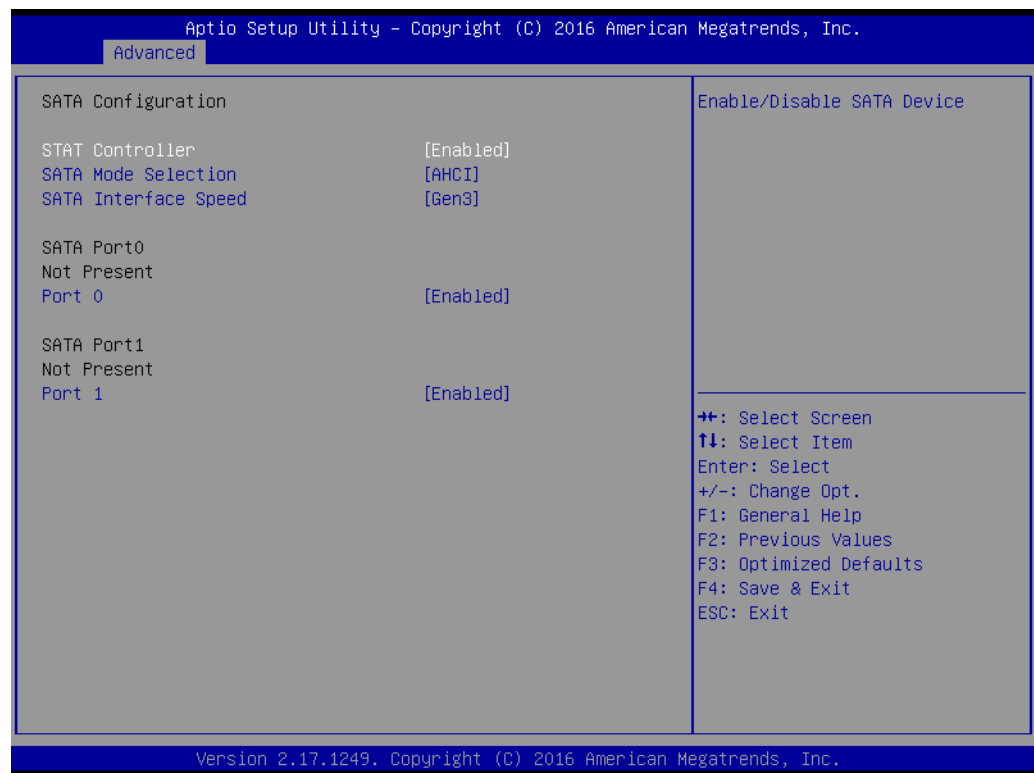


Figure 3.19 SATA Configuration

- **SATA Controller**
Enable or disable SATA Device
- **SATA Mode Selection**
Determines how the SATA controller operates
- **SATA Interface Speed**
Select SATA Interface Speed, CHV A1 always with Gen1 Speed.
- **Port 0**
Enable or Disable SATA Port
- **Port 1**
Enable or Disable SATA Port

3.3.9 Miscellaneous Configuration



Figure 3.20 BOM Config

- **BOM Config**
Select BOM config

3.3.10 LPSS & SCC Configuration

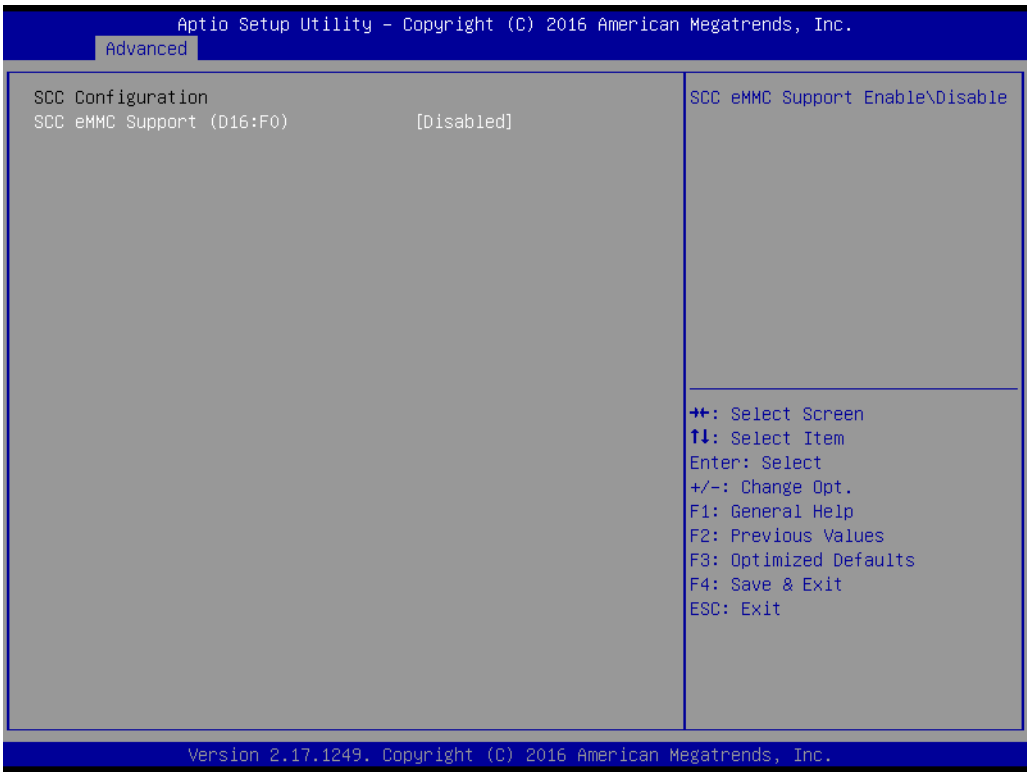


Figure 3.21 LPSS & SCC Configuration

- **SCC eMMC Support (D16:F0)**
Enable or Disable SCC eMMC Support Mode

3.3.11 Network Stack Configuration



Figure 3.22 Network Stack Configuration

- **Network Stack**
Enable or Disable UEFI Network Stack

3.3.12 CSM Configuration

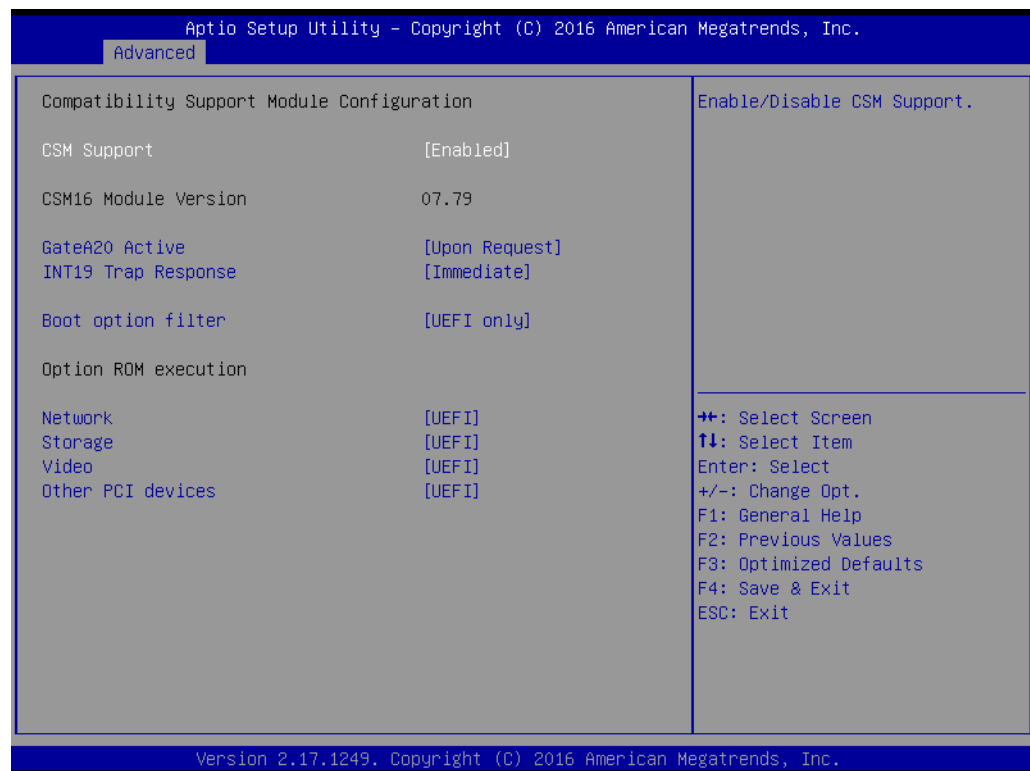


Figure 3.23 CSM Configuration

- **CSM Support**
Enable or Disable CSM Support
- **GateA20 Active**
UPON Request- GA20 can be disabled using BIOS services. Do not disable INT19 Trap Response; this option is useful when any RT code is executed above 1MB.
- **Boot option filter**
This option controls Legacy/UEFI ROMs priority.
- **Network**
Controls the execution of UEFI and Legacy PXE OpROM
- **Storage**
Controls the execution of UEFI and Legacy Storage OpROM
- **Video**
Controls the execution of UEFI and Legacy Video OpROM
- **Other PCI devices**
Determines OpROM execution policy for devices other than Network, Storage, or Video.

3.3.13 USB Configuration

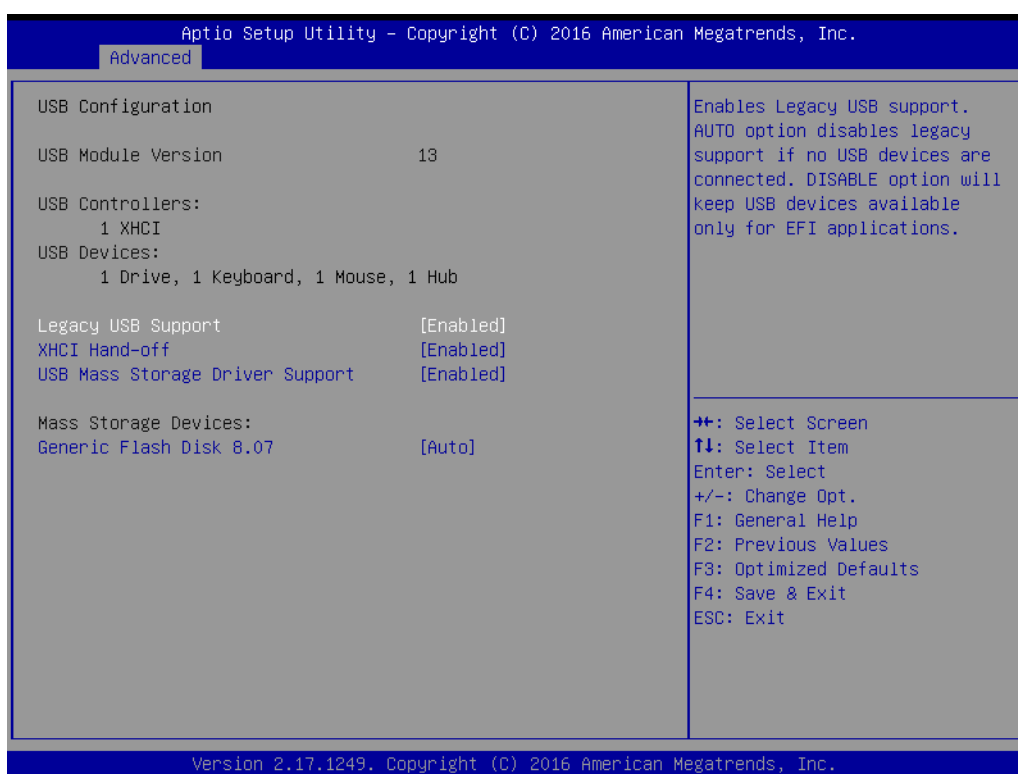


Figure 3.24 USB Configuration

- **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 ownership change should be claimed by XHCI driver.
- **USB Mass Storage Driver Support**
Enable or Disable USB Mass Storage Driver Support.

3.3.14 Platform Trust Technology

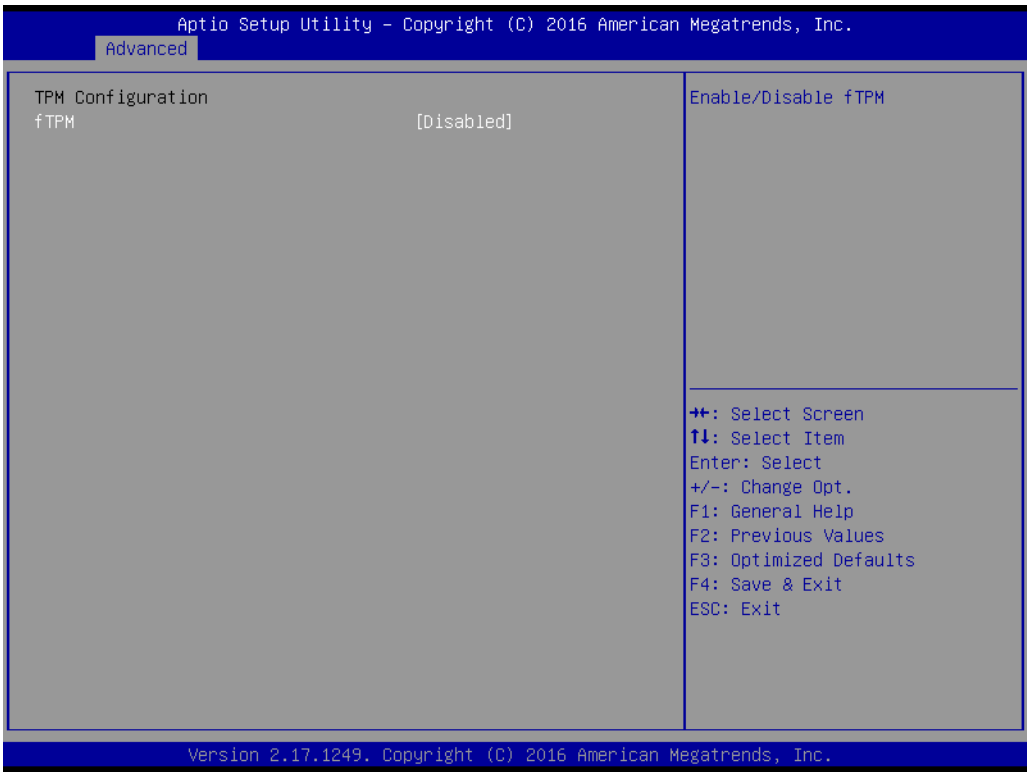


Figure 3.25 Platform Trust Technology

- **fTPM**
Enable or Disable fTPM function

3.3.15 Security Configuration

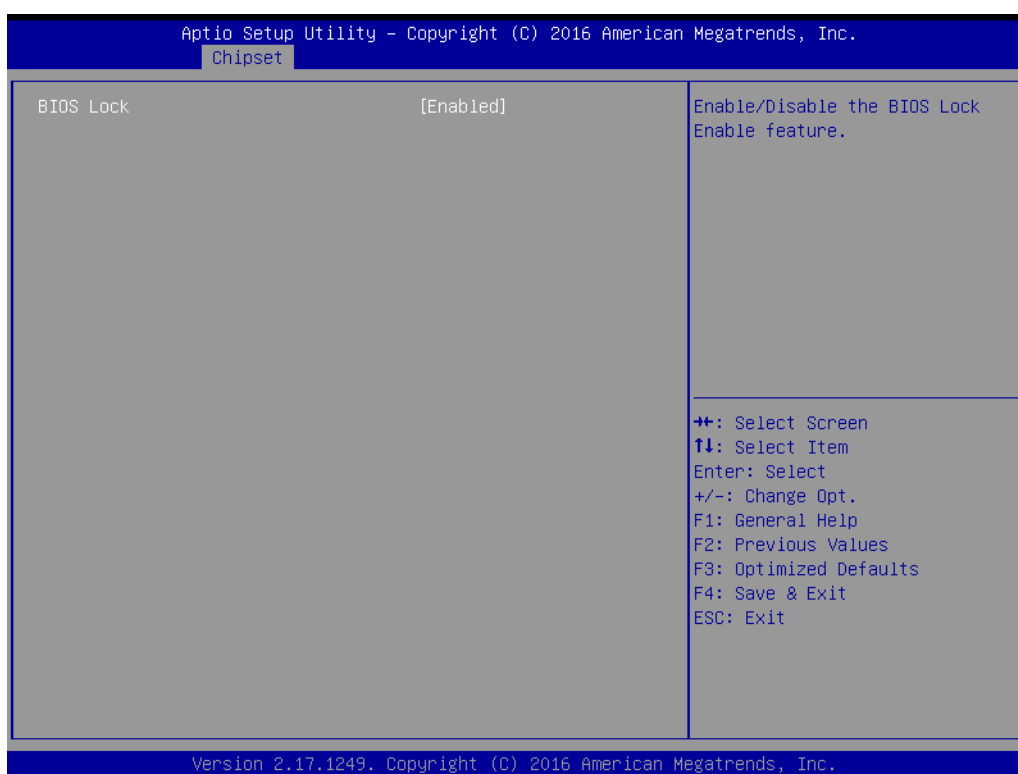


Figure 3.26 Security Configuration

- **TXE HMRFP0**
Enable or Disable TXE HMRFP0 function

3.4 Chipset

Select the Chipset tab from the SOM-6868 setup screen to enter the Chipset BIOS Setup screen. You can display a Chipset BIOS Setup option by highlighting it using the <Arrow> keys. All Plug and Play BIOS Setup options are described in this section. The Plug and Play BIOS Setup screen is shown below.

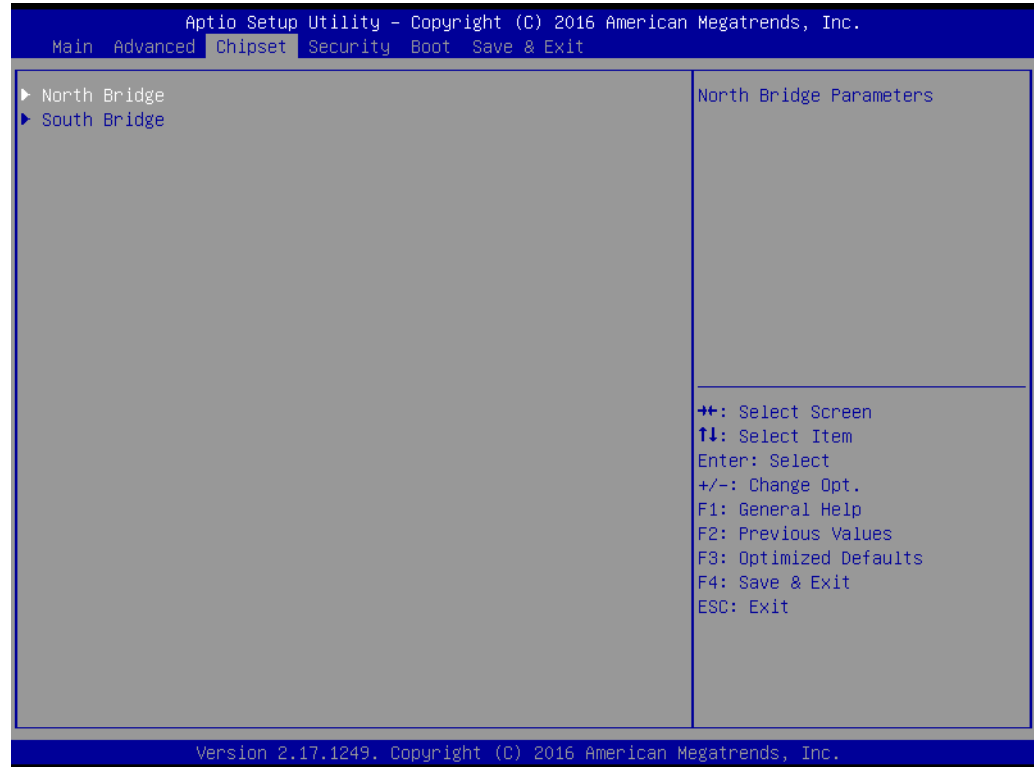


Figure 3.27 Chipset Setup

- **North Bridge**
North Bridge parameters.
- **South Bridge**
South bridge parameters.

3.4.1 North Bridge

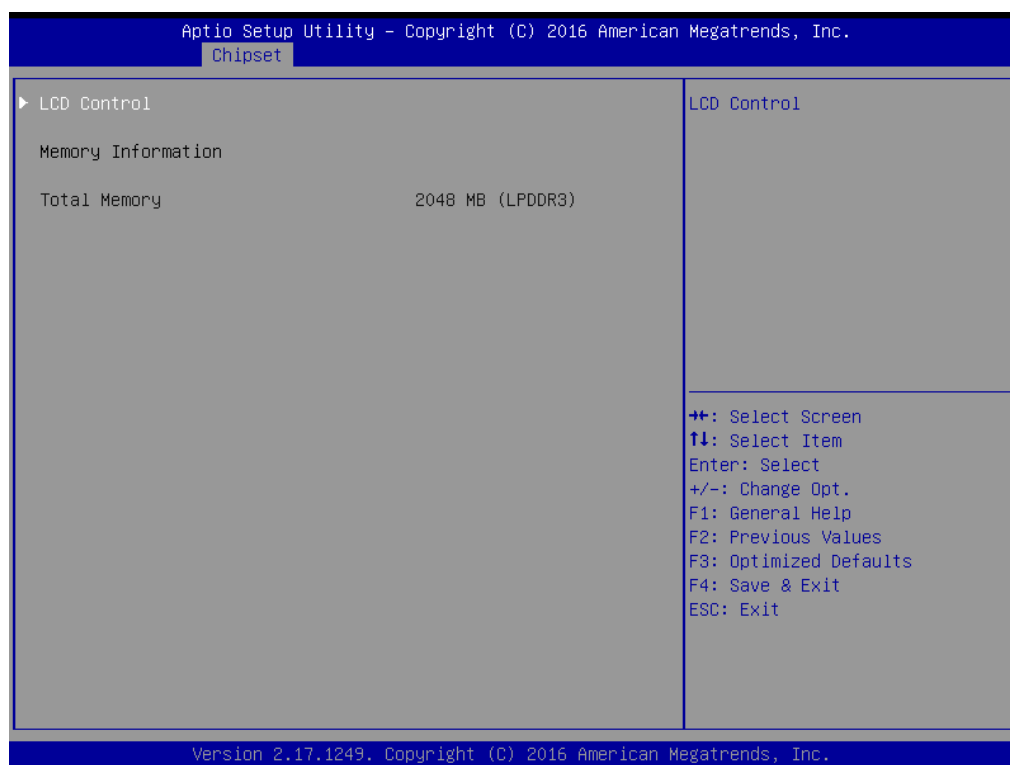


Figure 3.28 North Bridge

- **LCD Control**
LCD control setting.

3.4.1.1 LCD Control

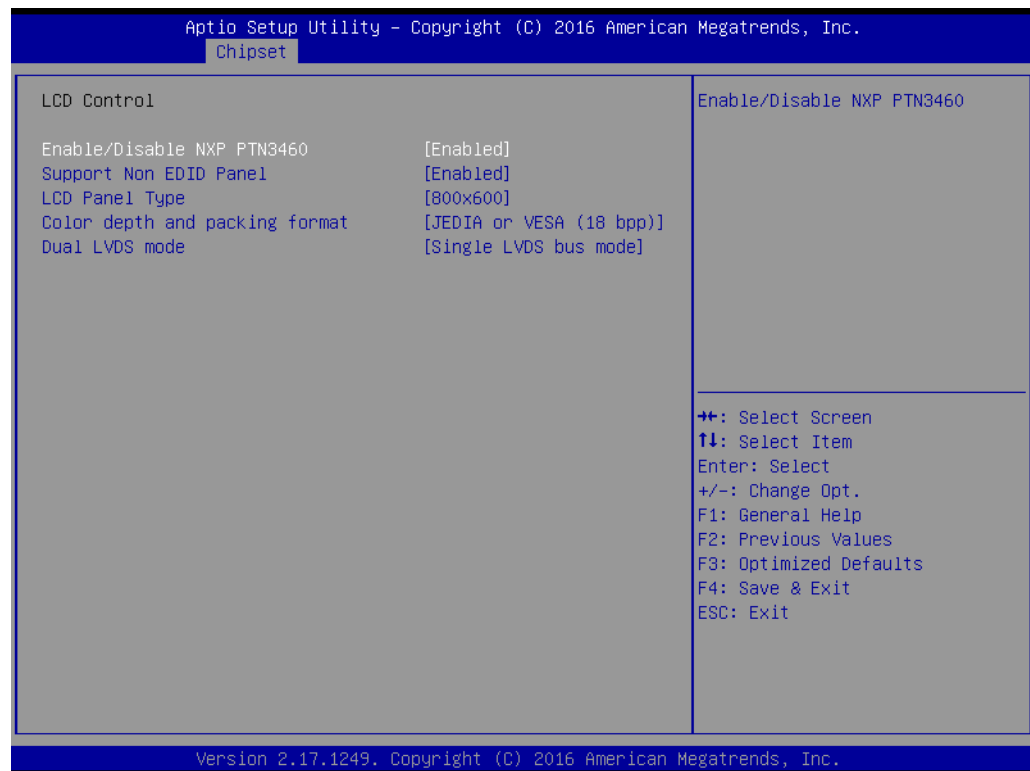


Figure 3.29 LCD Control

- **Enable/Disable NXP PTN3460**
Select the video device which will be activated during POST. This has no effect if external graphics are present.
- **Support Non EDID Panel**
Enable or Disable to choose support for EDID or Non EDID panel.
- **LCD Panel Type**
Select LCD panel resolution used by Internal Graphics Device by selecting the appropriate setup item.
- **Color Depth and packing format**
Choice for support color depth options: 18 bpp, 24 bpp
- **Dual LVDS mode**
Support single or dual LVDS bus mode operation.

3.4.2 South Bridge

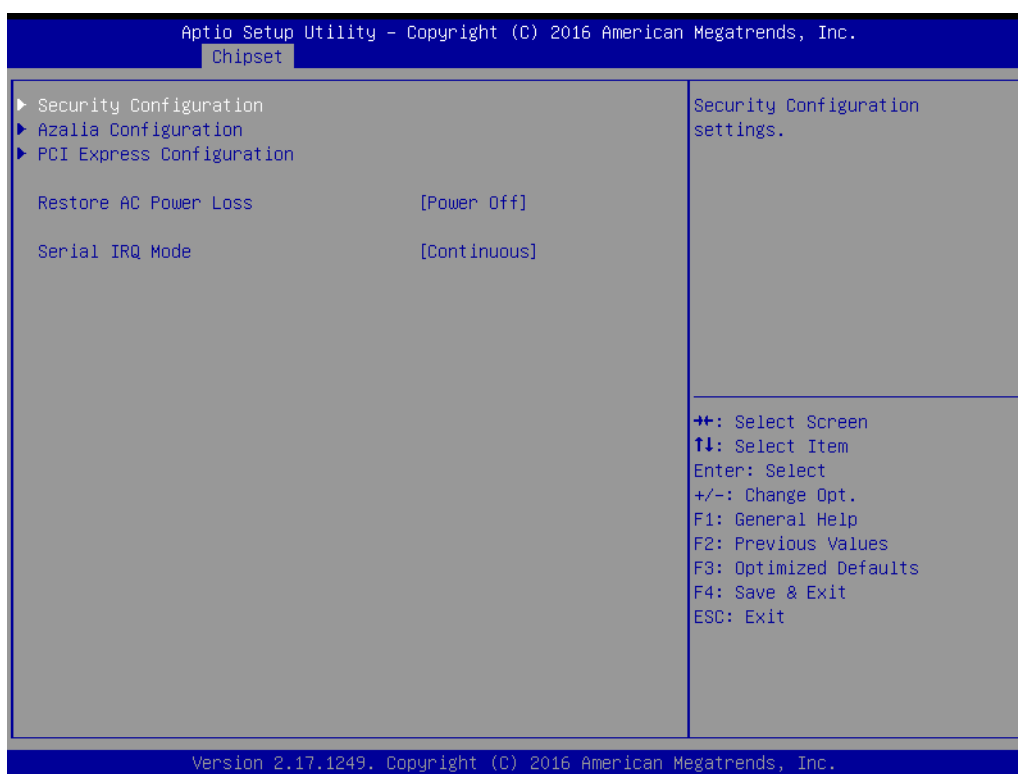


Figure 3.30 South Bridge

- **Security Configuration**
Security configuration settings.
- **Azalia Configuration**
Azalia HD Audio Options
- **USB Configuration**
USB Configuration Settings.
- **PCI Express Configuration**
PCI Express Configuration Settings.
- **Restore AC Power Loss**
Select AC power state when power is re-applied after a power failure.
- **Serial IRQ Mode**
Configure Serial IRQ Mode

3.4.2.1 Security Configuration

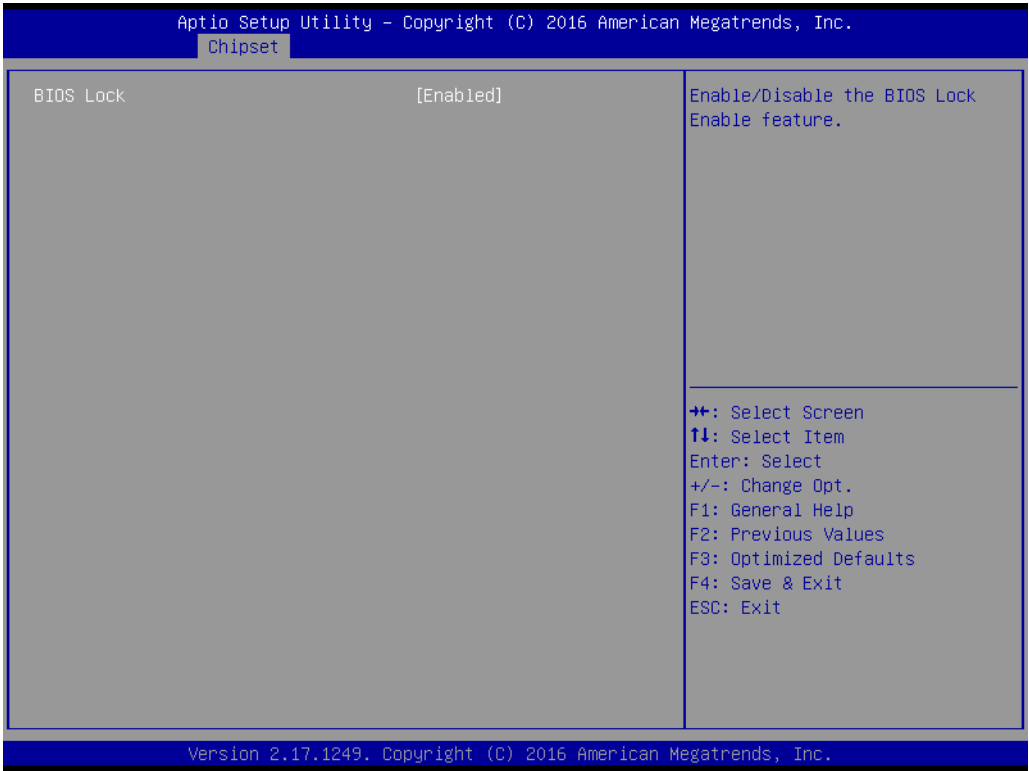


Figure 3.31 Security Configuration

- **BIOS Lock**
Enable or Disable the BIOS Lock Enable feature.

3.4.2.2 Azalia Configuration

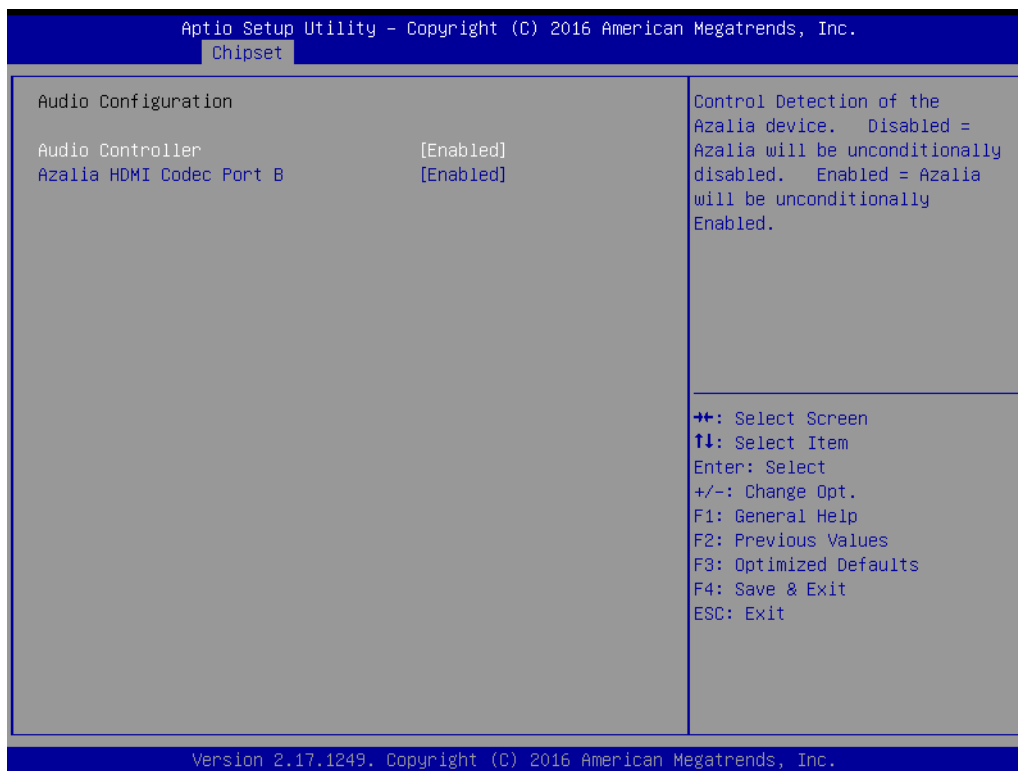


Figure 3.32 Azalia Configuration

- **Audio Controller**
Control detection of the Azalia device.
Disable: Azalia will be unconditionally disabled.
Enable: Azalia will be unconditionally enabled.
- **Audio HDMI Codec Port B**
Enable or Disable internal HDMI Port codec for Azalia

3.4.2.3 PCI Express Configuration



Figure 3.33 PCI Express Configuration

- **PCI Express Root Port 0**
Control the PCI Express Root Port
- **PCI Express Root Port 1**
Control the PCI Express Root Port
- **PCI Express Root Port 2**
Control the PCI Express Root Port
- **PCI Express Root Port 4**
Control the PCI Express Root Port

■ PCI Express Root Port 0 Configuration

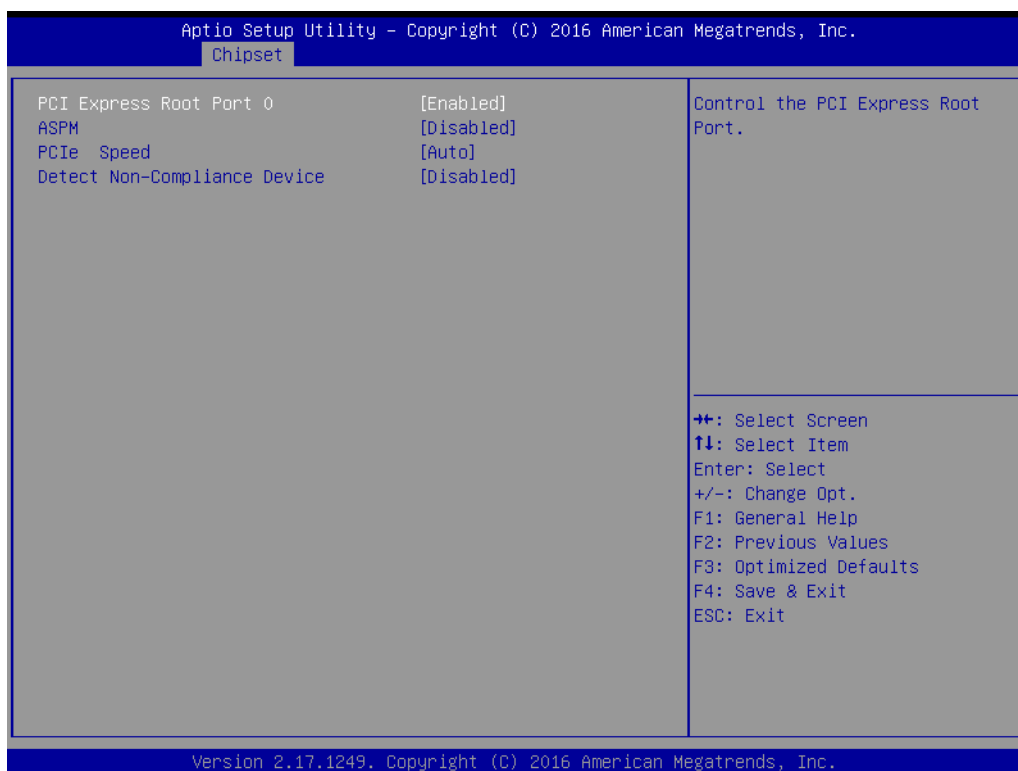


Figure 3.34 PCI Express Root Port 0 Configuration

- **PCI Express Root Port 0**
Control the PCI Express Root Port
- **ASPM**
PCI Express Active State Power Management settings.
- **PCIe Speed**
Configure PCIe Speed. CHV A1 always with Gen1 speed.

■ PCI Express Root Port 1 Configuration

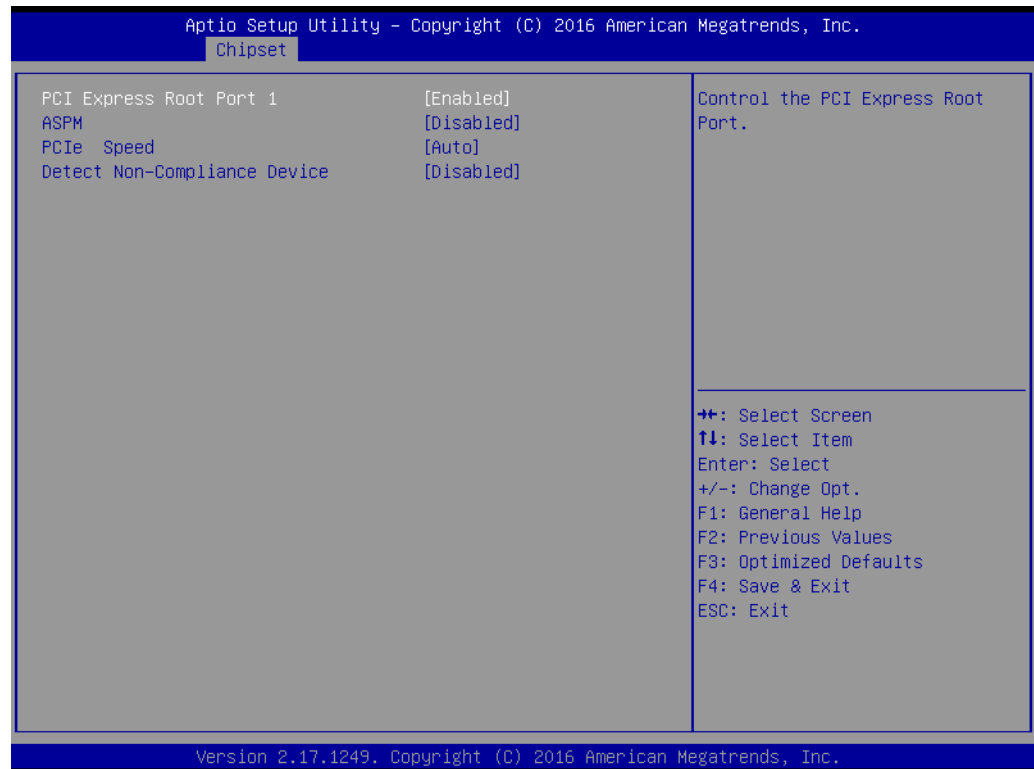


Figure 3.35 PCI Express Root Port 1 Configuration

- **PCI Express Root Port 1**
Control the PCI Express Root Port
- **ASPM**
PCI Express Active State power management settings.
- **PCIe Speed**
Configure PCIe Speed. CHV A1 always with Gen1 speed.

■ PCI Express Root Port 2 Configuration

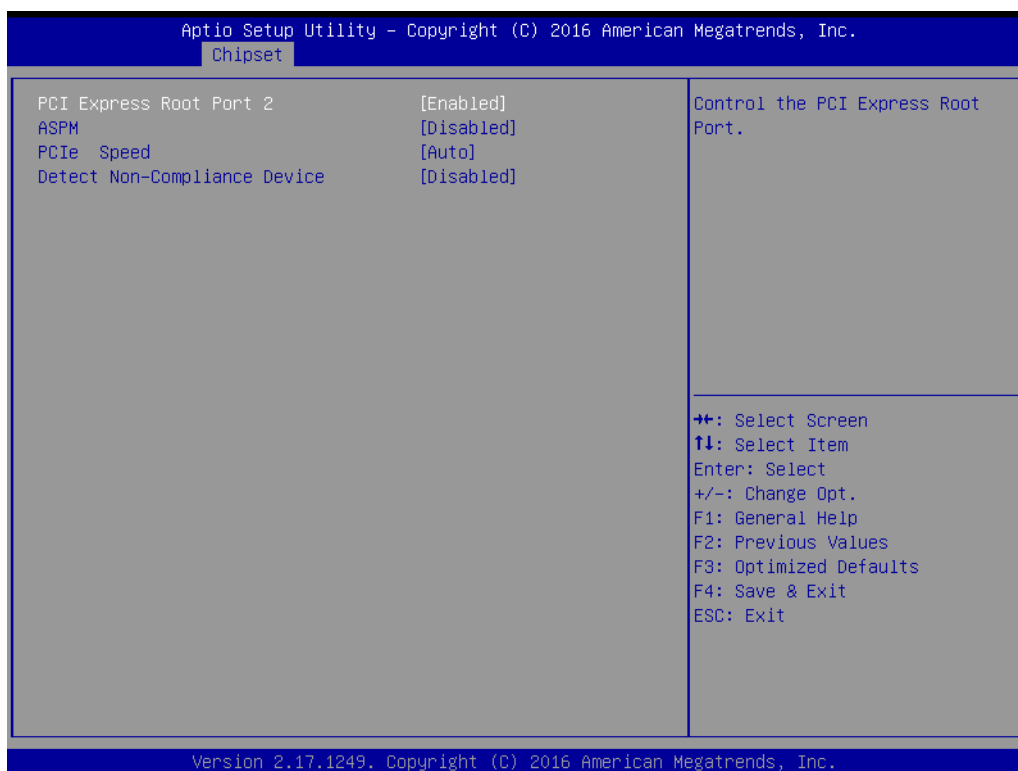


Figure 3.36 PCI Express Root Port 2 Configuration

- **PCI Express Root Port 2**
Control the PCI Express Root Port
- **ASPM**
PCI Express Active State power management settings.
- **PCIe Speed**
Configure PCIe Speed. CHV A1 always with Gen1 speed.

■ PCI Express Root Port 3 Configuration

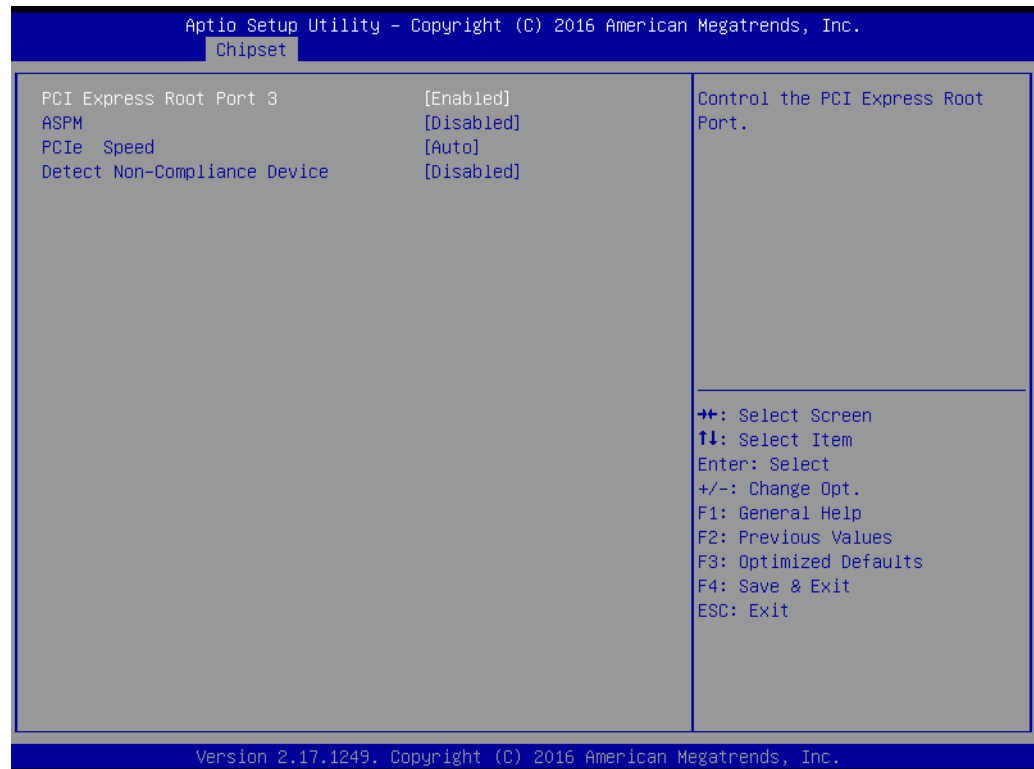


Figure 3.37 PCI Express Root Port 3 Configuration

- **PCI Express Root Port 3**
Control the PCI Express Root Port
- **ASPM**
PCI Express Active State power management settings.
- **PCIe Speed**
Configure PCIe Speed. CHV A1 always with Gen1 speed.

3.5 Security Setting

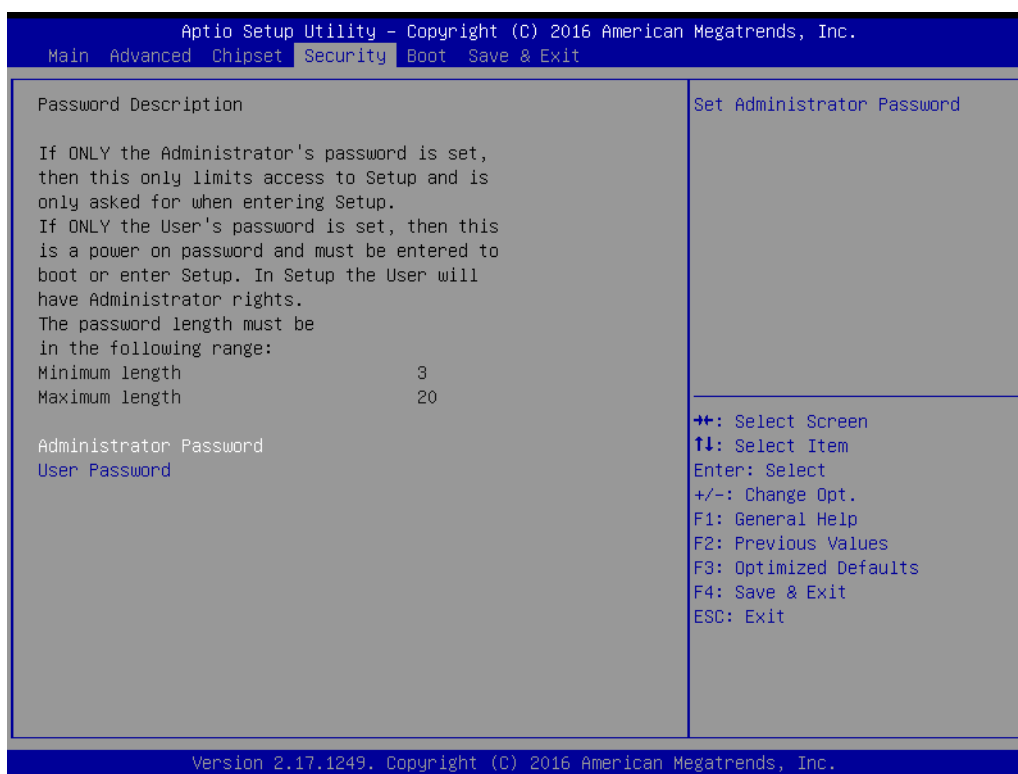


Figure 3.38 Security Setup

Select Security Setup from the SOM-6868 Setup main BIOS setup menu. All Security Setup options, such as password protection is described in this section. To access the sub menu for the following items, select the item and press <Enter>:

- **Change Administrator / User Password:** Select this option and press <ENTER> to access the sub menu, and then type in the password.

3.6 Boot Settings

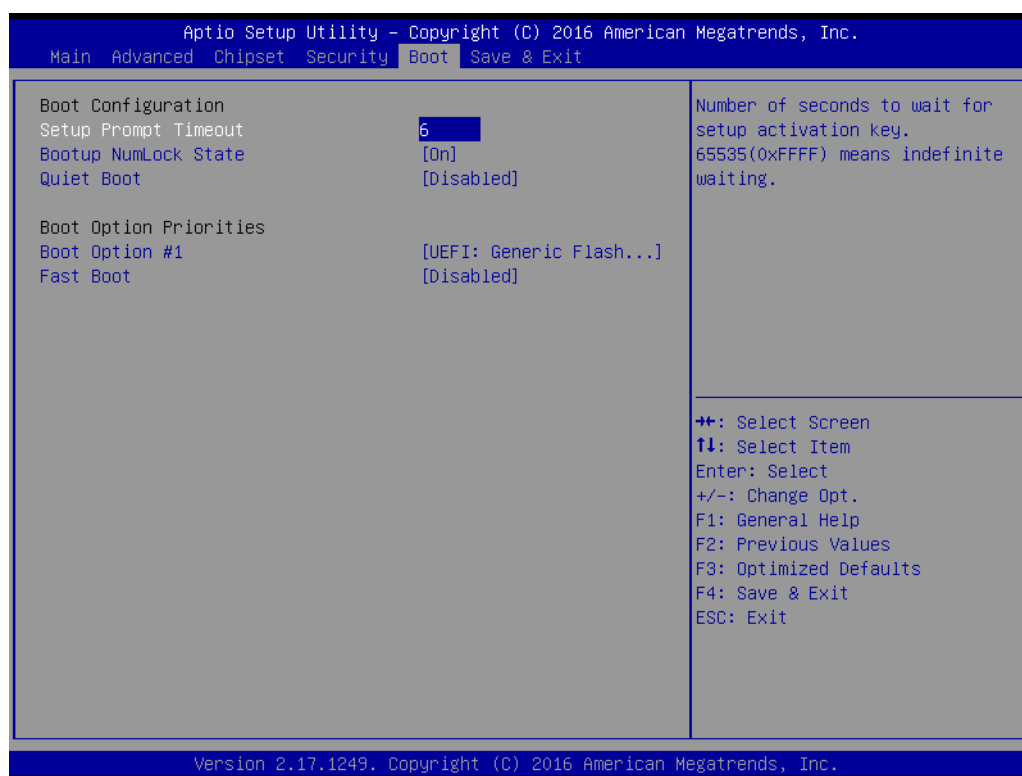


Figure 3.39 Boot Setting

- **Setup Prompt Timeout**
This item allows users to select the number of seconds to wait for setup activation key.
- **Bootup NumLock State**
Select the keyboard NumLock state.
- **Quiet Boot**
This item allows users to enable or disable Quiet Boot option.
- **Fast Boot**
This item allows users to enable or disable boot with initialization of a minimal set of devices required to launch active boot option. It has no effect for BBS boot options.

3.7 Save & Exit



Figure 3.40 Save & Exit

3.7.1 Save Changes and Exit

When users have completed system configuration, select this option to save changes, exit BIOS setup menu and reboot the computer if necessary to take effect all system configuration parameters.

3.7.2 Discard Changes and Exit

Select this option to quit setup without making any permanent changes to the system configuration.

3.7.3 Save Changes and Reset

When users have completed system configuration, select this option to save changes, exit BIOS setup menu and reboot the computer to take effect all system configuration parameters.

3.7.4 Discard Changes and Reset

Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer.

3.7.5 Save Changes

When users have completed system configuration, select this option to save changes without exit BIOS setup menu.

3.7.6 Discard Changes

Select this option to discard any current changes and load previous system configuration.

3.7.7 Restore Defaults

The SOM-6868 automatically configures all setup items to optimal settings when users select this option. Optimal Defaults are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Optimal Defaults if the user's computer is experiencing system configuration problems.

3.7.8 Save as User Defaults

When users have completed system configuration, select this option to save changes as user defaults without exit BIOS setup menu.

3.7.9 Restore User Defaults

The users can select this option to restore user defaults.

3.7.10 Launch EFI Shell from filesystem device

Attempts to Launch EFI Shell application from one of the available file system devices.

Chapter 4

S/W Introduction & Installation

Sections include:

- S/W Introduction
- Driver Installation
- Advantech iManger

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

To install the drivers for Other Windows OS or Linux, please connect to internet and browse the website <http://support.advantech.com.tw> to download the setup file.

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. For more details of how to use the APIs and utilities, please refer to Advantech iManager 2.0 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 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-6868 CPU System on Module

Sections include:

- SOM-6868 Type 6 Pin Assignment

A.1 SOM-6868 Type 6 Pin Assignment

This section gives SOM-6868 pin assignments on COM Express connectors which are compliant with COMR.0 R2.1 Type 6 pin-out definitions. For more details about how to use these pins and getting the design reference, please contact Advantech for design guide, checklist, reference schematic, and other hardware/software support.

SOM-6868 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	SUS_STAT#
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND (FIXED)	B21	GND (FIXED)
A22	N/A	B22	N/A
A23	N/A	B23	N/A
A24	SUS_S4#	B24	PWR_OK
A25	N/A	B25	N/A
A26	N/A	B26	N/A
A27	BATLOW#	B27	WDT
A28	(S)ATA_ACT#	B28	N/A
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0
A31	GND (FIXED)	B31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR
A33	AC/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	EXCD1_PERST#
A48	EXCD0_PERST#	B48	EXCD1_CPPE#
A49	EXCD0_CPPE#	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#
A51	GND (FIXED)	B51	GND (FIXED)
A52	N/A	B52	N/A
A53	N/A	B53	N/A
A54	GPI0	B54	GPO1
A55	PCIE_TX4+	B55	PCIE_RX4+
A56	PCIE_TX4-	B56	PCIE_RX4-
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	LVDS_B0+
A72	LVDS_A0-	B72	LVDS_B0-
A73	LVDS_A1+	B73	LVDS_B1+
A74	LVDS_A1-	B74	LVDS_B1-
A75	LVDS_A2+	B75	LVDS_B2+
A76	LVDS_A2-	B76	LVDS_B2-
A77	LVDS_VDD_EN	B77	LVDS_B3+
A78	LVDS_A3+	B78	LVDS_B3-
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	LVDS_A_CLK+	B81	LVDS_B_CLK+
A82	LVDS_A_CLK-	B82	LVDS_B_CLK-
A83	LVDS_I2C_CLK	B83	LVDS_BKLT_CTRL
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY
A86	N/A	B86	VCC_5V_SBY
A87	eDP_HPD	B87	VCC_5V_SBY
A88	PCIE0_CK_REF+	B88	BIOS_DIS1#

A89	PCIE0_CK_REF-	B89	N/A
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	N/A
A96	TPM_PP	B96	N/A
A97	N/A	B97	SPI_CS#
A98	SER0_TX	B98	N/A
A99	SER0_RX	B99	N/A
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)
SOM-6868 Row C,D			
C1	GND (FIXED)	D1	GND (FIXED)
C2	GND	D2	GND
C3	USB_SSRX0-	D3	USB_SSTX0-
C4	USB_SSRX0+	D4	USB_SSTX0+
C5	GND	D5	GND
C6	USB_SSRX1-	D6	USB_SSTX1-
C7	USB_SSRX1+	D7	USB_SSTX1+
C8	GND	D8	GND
C9	USB_SSRX2-	D9	USB_SSTX2-
C10	USB_SSRX2+	D10	USB_SSTX2+
C11	GND (FIXED)	D11	GND (FIXED)
C12	USB_SSRX3-	D12	USB_SSTX3-
C13	USB_SSRX3+	D13	USB_SSTX3+
C14	GND	D14	GND
C15	N/A	D15	DDI1_CTRLCLK_AUX+
C16	N/A	D16	DDI1_CTRLDATA_AUX-
C17	N/A	D17	N/A
C18	N/A	D18	N/A
C19	N/A	D19	N/A
C20	N/A	D20	N/A
C21	GND (FIXED)	D21	GND (FIXED)
C22	N/A	D22	N/A
C23	N/A	D23	N/A
C24	DDI1_HPD	D24	N/A

C25	N/A	D25	N/A
C26	N/A	D26	DDI1_PAIR0+
C27	N/A	D27	DDI1_PAIR0-
C28	N/A	D28	N/A
C29	N/A	D29	DDI1_PAIR1+
C30	N/A	D30	DDI1_PAIR1-
C31	GND (FIXED)	D31	GND (FIXED)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLCLK_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	N/A	D35	N/A
C36	N/A	D36	DDI1_PAIR3+
C37	N/A	D37	DDI1_PAIR3-
C38	N/A	D38	N/A
C39	N/A	D39	DDI2_PAIR0+
C40	N/A	D40	DDI2_PAIR0-
C41	GND (FIXED)	D41	GND (FIXED)
C42	N/A	D42	DDI2_PAIR1+
C43	N/A	D43	DDI2_PAIR1-
C44	N/A	D44	DDI2_HPD
C45	N/A	D45	N/A
C46	N/A	D46	DDI2_PAIR2+
C47	N/A	D47	DDI2_PAIR2-
C48	N/A	D48	N/A
C49	N/A	D49	DDI2_PAIR3+
C50	N/A	D50	DDI2_PAIR3-
C51	GND (FIXED)	D51	GND (FIXED)

Appendix **B**

Watchdog Timer

This appendix gives you the information about the watchdog timer programming on the SOM-6868 CPU System on Module

Sections include:

- Watchdog Timer Programming

B.1 Programming the Watchdog Timer

Trigger Event	Note
IRQ	IRQ5, 7, 14 (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 Win8.1 and 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 gives the illustration of the General Purpose Input and Output pin setting.

Sections include:

- System I/O ports

C.1 GPIO Register

GPIO Byte Mapping	H/W Pin Name
BIT0	GPO0
BIT1	GPO1
BIT2	GPO2
BIT3	GPO3
BIT4	GPI0
BIT5	GPI1
BIT6	GPI2
BIT7	GPI3

For details, please refer to iManager & Software API User Manual

Appendix **D**

System Assignments

This appendix gives you the information about the system resource allocation on the SOM-6868 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: System I/O ports

Addr.Range(Hex)	Device
0000-006F	PCI Express Root Complex
0020-0021	Programmable interrupt controller
0024-0025	Programmable interrupt controller
0028-0029	Programmable interrupt controller
002C-002D	Programmable interrupt controller
0030-0031	Programmable interrupt controller
0034-0035	Programmable interrupt controller
0038-0039	Programmable interrupt controller
003C-003D	Programmable interrupt controller
0040-0043	System timer
004E-004F	Motherboard resources
0050-0053	System timer
0061-0061	Motherboard resources
0062-0062	Microsoft ACPI-Compliant Embedded Controller
0063-0063	Motherboard resources
0065-0065	Motherboard resources
0066-0066	Microsoft ACPI-Compliant Embedded Controller
0067-0067	Motherboard resources
0070-0070	Motherboard resources
0070-0077	System CMOS/real time clock
0078-0CF7	PCI Express Root Complex
0080-008F	Motherboard resources
0092-0092	Motherboard resources
00A0-00A1	Programmable interrupt controller
00A4-00A5	Programmable interrupt controller
00A8-00A9	Programmable interrupt controller
00AC-00AD	Programmable interrupt controller
00B0-00B1	Programmable interrupt controller
00B2-00B3	Motherboard resources
00B4-00B5	Programmable interrupt controller
00B8-00B9	Programmable interrupt controller
00BC-00BD	Programmable interrupt controller
029C-029D	Motherboard resources
02E8-02EF	Communications Port (COM4)
02F8-02FF	Communications Port (COM2)
0378-037F	Printer Port (LPT1)
03E8-03EF	Communications Port (COM3)
03F8-03FF	Communications Port (COM1)
0400-047F	Motherboard resources
04D0-04D1	Programmable interrupt controller
0500-05FE	Motherboard resources
0680-069F	Motherboard resources
0778-077F	Printer Port (LPT1)

Table D.1: System I/O ports

0A00-0A0F	Motherboard resources
0A10-0A1F	Motherboard resources
0D00-FFFF	PCI Express Root Complex
E000-EFFF	PCI Express standard Root Port
F000-F03F	Intel® HD Graphics
F040-F05F	Intel® Celeron®/Pentium® SM Bus Controller - 2292
F060-F07F	Standard SATA AHCI Controller

D.2 DMA Channel Assignments

Table D.2: DMA channel assignments

Channel	Function
3	Printer Port (LPT1)

D.3 Interrupt Assignments

Table D.3: Interrupt assignments

Interrupt#	Interrupt source
IRQ 0	System Timer
IRQ 3	Communications Port (COM2)
IRQ 4	Communications Port (COM1)
IRQ 6	Communications Port (COM4)
IRQ 10	Intel® Celeron®/Pentium® SM Bus Controller - 2292
IRQ 11	Communications Port (COM3)
IRQ 19	Standard SATA AHCI Controller
IRQ 22	High Definition Audio Controller
IRQ 47	Intel SD Host Controller
IRQ 48~50	Intel Serial IO GPIO Controller
IRQ 81~90	Microsoft ACPI-Compliant System
IRQ 91	Intel Serial IO GPIO Controller
IRQ 91~191	Microsoft ACPI-Compliant System
IRQ 256~511	Microsoft ACPI-Compliant System
IRQ 1024	Intel SD Host Controller
IRQ FFFFFFFEF (-17)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF0 (-16)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF1 (-15)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF2 (-14)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF3 (-13)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF4 (-12)	Intel® I211 Gigabit Network Connection
IRQ FFFFFFFF5 (-11)	Intel® Trusted Execution Engine Interface
IRQ FFFFFFFF6 (-10)	Intel® USB 3.0 Host Controller Adaptation Driver
IRQ FFFFFFFF7 (-9)	Intel® HD Graphics
IRQ FFFFFFFF8 (-8)	PCI Express standard Downstream Switch Port
IRQ FFFFFFFF9 (-7)	PCI Express standard Downstream Switch Port
IRQ FFFFFFFFA (-6)	PCI Express standard Downstream Switch Port

Table D.3: Interrupt assignments

IRQ FFFFFFFB (-5)	PCI Express standard Root Port
IRQ FFFFFFFC (-4)	PCI Express standard Root Port
IRQ FFFFFFFD (-3)	PCI Express standard Root Port
IRQ FFFFFFFE (-2)	PCI Express standard Root Port

D.4 1st MB Memory Map

Table D.4: 1st MB Memory Map

Addr. range (Hex)	Device
0xE0000-0xFFFFF	PCI Express Root Complex
0xC0000-0xDFFFF	PCI Express Root Complex
0xA0000-0xBFFFF	PCI Express Root Complex
0x80000000-0x80FFFFFF	Intel(R) HD Graphics
0x80000000-0xDFFFFFFF	PCI Express Root Complex
0x81000000-0x810FFFFF	Intel(R) Trusted Execution Engine Interface
0x81100000-0x811FFFFF	Intel(R) Trusted Execution Engine Interface
0x81200000-0x8121FFFF	Intel® I211 Gigabit Network Connection
0x81200000-0x8122FFFF	PCI Express standard Root Port
0x81220000-0x81223FFF	Intel® I211 Gigabit Network Connection
0x81300000-0x8130FFFF	Intel® USB 3.0 Host Controller Adaptation Driver
0x81310000-0x81313FFF	High Definition Audio Controller
0x81314000-0x8131401F	Intel® Celeron®/Pentium® SM Bus Controller - 2292
0x81315000-0x813157FF	Standard SATA AHCI Controller
0x81316000-0x81316FFF	Motherboard resources
0x81317000-0x81317FFF	Intel SD Host Controller
0x90000000-0x9FFFFFFF	Intel® HD Graphics
0xE0000000-0xEFFFFFFF	Motherboard resources
0xFE000000-0xFEFFFFFF	Motherboard resources
0xFED01000-0xFED01FFF	Motherboard resources
0xFED03000-0xFED03FFF	Motherboard resources
0xFED06000-0xFED06FFF	Motherboard resources
0xFED08000-0xFED09FFF	Motherboard resources
0xFED1C000-0xFED1CFFF	Motherboard resources
0xFED80000-0xFED87FFF	Intel Serial IO GPIO Controller
0xFED80000-0xFEDBFFFF	Motherboard resources
0xFED88000-0xFED8FFFF	Intel Serial IO GPIO Controller
0xFED90000-0xFED97FFF	Intel Serial IO GPIO Controller
0xFED98000-0xFED9FFFF	Intel Serial IO GPIO Controller
0xFEE00000-0xFEEFFFFF	Motherboard resources
0xFF000000-0xFFFFFFFF	Intel® 82802 Firmware Hub Device



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