

# EMBC-3000 USER

Intel® Core™ i7/i5/i3 SoC (Whiskey Lake) 3.5" Single Board Computer  
2 GigE LAN, 4 10G USB, 4 COM, 2 Mini PCIe, SUMIT A, B, TPM, Ignition Control

# Manual

## Record of Revision

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# Order Information

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Part Number	Description
EMBC-3000E-8665U	EMBC-3000 Intel® Core™ i7-8665UE Processor (Whiskey Lake) 3.5" Embedded Single Board Computer, 2 GigE LAN, 4 10G USB 3.1 Gen 2, 4 COM, 2 Mini PCIe, SUMIT A, B, 16 GPIO, 9V to 48V, Ignition Control
EMBC-3000-8665U	EMBC-3000 Intel® Core™ i7-8665UE Processor (Whiskey Lake) 3.5" Embedded Single Board Computer, 2 GigE LAN, 4 10G USB 3.1 Gen 2, 4 COM, 2 Mini PCIe, 16 GPIO, 9V to 48V, Ignition Control
EMBC-3000-8365U	EMBC-3000 Intel® Core™ i5-8365UE Processor (Whiskey Lake) 3.5" Embedded Single Board Computer, 2 GigE LAN, 4 10G USB 3.1 Gen 2, 4 COM, 2 Mini PCIe, 16 GPIO, 9V to 48V, Ignition Control
EMBC-3000-8145U	EMBC-3000 Intel® Core™ i3-8145UE Processor (Whiskey Lake) 3.5" Embedded Single Board Computer, 2 GigE LAN, 4 10G USB 3.1 Gen 2, 4 COM, 2 Mini PCIe, 16 GPIO, 9V to 48V, Ignition Control
EMBC-3000-4305U	EMBC-3000 Intel® Celeron® Processor 4305UE (Whiskey Lake) 3.5" Embedded Single Board Computer, 2 GigE LAN, 4 10G USB 3.1 Gen 2, 4 COM, 2 Mini PCIe, 16 GPIO, 9V to 48V, Ignition Control

## Optional Accessories

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Part Number	Description
DDR4 32G	Certified DDR4 32GB 2666MHz RAM
DDR4 16G	Certified DDR4 16GB 2400MHz RAM
DDR4 8G	Certified DDR4 8GB 2400MHz RAM
DDR4 4G	Certified DDR4 4GB 2400MHz RAM
61-13Q1009-0DA	COM Port Cable
61-13I0707-0DA	SATA Data Cable
61-13P0430-08A	SATA Power Cable
75-VI7HSK4-S10	Heat Sink for EMBC-3000 Series
75-VI7HS94-S10	Heat Spreader for EMBC-3000 Series
61-13T10LM-3CG	Audio Cable
61-193102U-156	USB 2.0 Cable

# Table of Contents

<b>CHAPTER 1</b>	<b>GENERAL INTRODUCTION</b>	<b>1</b>
1.1	Overview	1
1.2	Features	2
1.3	Product Specification	3
1.3.1	Specifications of EMBC-3000E-8665U	3
1.3.2	Specifications of EMBC-3000-8665U	5
1.3.3	Specifications of EMBC-3000-8365U	7
1.3.4	Specifications of EMBC-3000-8145U	9
1.3.5	Specifications of EMBC-3000-4305U	11
1.4	Supported CPU List	13
1.5	Mechanical Dimension	14
1.5.1	Dimensions of EMBC-3000E-8665U	14
1.5.2	Dimensions of Heat Spreader	14
1.5.3	Dimensions of Heat Sink	15
1.5.4	Dimensions of MB+Heat Spreader	15
1.5.5	Dimensions of MB+Heat Sink	16
<b>CHAPTER 2</b>	<b>GETTING TO KNOW YOUR EMBC-3000</b>	<b>17</b>
2.1	Packing List	17
2.2	Connector/Jumper Locations	18
2.3	Jumper Settings	35
2.4	Ignition Control	38
<b>CHAPTER 3</b>	<b>SYSTEM SETUP</b>	<b>41</b>
3.1	Installing Heat Spreader	41
3.2	Installing Heat Sink	42
3.3	Installing DDR4 SO-DIMM Modules	43
3.4	Installing Mini PCIe Card	44
3.5	Installing SIM Card	45

<b>CHAPTER 4</b>	<b>BIOS SETUP</b>	<b>46</b>
4.1	BIOS Settings	46
4.2	Main	47
4.3	Advanced Functions	47
4.4	Chipset Functions	59
4.5	Security	64
4.6	Boot	66
4.7	Save & Exit	67
<b>APPENDIX A</b>	<b>: GPIO GUIDE</b>	<b>68</b>
<b>APPENDIX B</b>	<b>: Software Functions</b>	<b>71</b>
<b>APPENDIX C</b>	<b>: RAID Functions</b>	<b>73</b>
<b>APPENDIX D</b>	<b>: Power Consumption</b>	<b>77</b>
<b>APPENDIX E</b>	<b>: Supported Memory &amp; Storage List</b>	<b>81</b>
<b>APPENDIX F</b>	<b>: Install Win11 (BIOS TPM Setting)</b>	<b>83</b>

# 1

## GENERAL INTRODUCTION

### 1.1 Overview

Vecow EMBC-3000 is a new generation smart and power-efficient compact embedded engine. Powered by quad core Intel® Core™ i7/i5/i3 U-series processor (Whiskey Lake) running with up to 32GB DDR4 memory, Vecow EMBC-3000 enables more than 40% power productivity greater than former 7th Generation Intel® Kaby Lake U-series SoC; advanced Intel® UHD Graphics 620 supporting DirectX 12, OpenGL 4.5, OpenCL 2.1 API, and up to Ultra HD 4K resolution; Multiple 10G SuperSpeed USB 3.1 Gen 2 (10Gbps), PCIe 3.0 (8GT/s), SATA III (6Gbps), USB 3.1 (5Gbps), GigE LAN (1Gbps) and wireless connection make high-speed data conveying possible. With outstanding performance, small-form-factor compact design, leading power protection, flexible expansion functions, and industrial-grade reliability, Vecow EMBC-3000 3.5" SBC is your smart computing engines for any AIoT/Industry 4.0 applications in harsh environments.

Fanless design supporting -40°C to 85°C extended operating temperature, DisplayPort, DVI-D and dual channel 24-bit LVDS display interfaces support triple independent displays and up to 4K resolution; 4 USB 3.1 Gen 2 ports support up to 10Gbps SuperSpeed data delivery; 2 GigE LAN, 4 COM RS-232/422/485, 2 SATA III, 16 GPIO; SIM socket for WiFi, 4G, 3G, LTE, GPRS or UMTS wireless data transfer; 2 Mini PCIe for PCIe, USB, SIM Card or optional mSATA; optional full function SUMIT A, B expansion supports multiple SIM sockets, 10GigE RJ45 or 10G SPF+ Fiber connections; 9V to 48V wide range DC power input; Ignition Power Control for in-vehicle computing; iAMT 12.0, TPM 2.0, Wake on LAN and PXE smart manageability, Vecow EMBC-3000 Series 3.5" SBC serves compact & flexible solutions to meet your project requirements.

High performance Intel® Core™ i7/i5/i3 U-series SoC (Whiskey Lake), excellent power productivity with outstanding performance, small-form-factor compact design, leading power protection, easy to customize, system-oriented integrated functions, and industrial-grade reliability, Vecow EMBC-3000 Series 3.5" Embedded Single Board Computer is your smart computing engine for Machine Vision, Factory Automation, Intelligent Transportation Systems (ITS), Gaming, In-vehicle Computing, and any Industrial 4.0/AIoT applications.



## 1.2 Features

- 8th Generation Intel® Core™ i7/i5/i3 U-series processor (Whiskey Lake) supports up to 40% greater productivity than former generation solution
- Fanless -40°C to 85°C Operating Temperature
- DDR4 2400MHz memory, up to 32GB
- Multiple DisplayPort, DVI and dual channel 24-bit LVDS display interfaces support triple independent displays
- 4-port USB 3.1 Gen 2 supports up to 10Gbps data transfer
- 2 Independent GigE LAN, iAMT 12.0 supported
- SIM Socket for WiFi/4G/3G/LTE/GPRS/UMTS
- 4 COM RS-232/422/485, 2 SATA III, 1 mSATA
- Supports full function SUMIT A, B expansion
- 9V to 48V DC wide range Power Input
- Ignition Power Control, TPM 2.0
- Easy to customize for low-profile system applications
- One-stop SUMIT Expansion Design and Manufacturing Services

## 1.3 Product Specification

### 1.3.1 Specifications of EMBC-3000E-8665U

<b>System</b>	
Processor	Intel® Core™ i7-8665UE Processor (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	<ul style="list-style-type: none"> <li>• 1 DDR4 2400MHz</li> <li>• Up to 32GB</li> <li>• 1 260-pin SO-DIMM Socket</li> </ul>
<b>Graphics</b>	
Graphics Processor	Intel® UHD Graphics 620
Interface	3 display interfaces : <ul style="list-style-type: none"> <li>• DVI-D : Up to 1920 x 1200 @60Hz</li> <li>• DisplayPort : Up to 4096 x 2304 @60Hz</li> <li>• LVDS : Dual channel 24-bit, up to 1920 x 1200</li> </ul>
<b>Ethernet</b>	
LAN1	Intel® I219LM GigE LAN supports iAMT 12.0
LAN2	Intel® I210 GigE LAN
<b>Audio</b>	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
<b>Storage</b>	
SATA	2 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)
<b>I/O Interface</b>	
Front I/O	<ul style="list-style-type: none"> <li>• 1 DVI-D Connector</li> <li>• 1 DisplayPort Connector</li> <li>• 4 USB 3.1 Connector</li> <li>• 2 RJ45 Connector</li> <li>• 1 Mic-in</li> <li>• 1 Line-out</li> <li>• 1 Power Button</li> <li>• 1 Reset Button</li> <li>• 1 HDD LED</li> <li>• 1 Power LED</li> </ul>

Internal I/O	<ul style="list-style-type: none"> <li>• 1 ATX 4-pin Power Connector</li> <li>• 1 SUMIT A Connector</li> <li>• 1 SUMIT B Connector</li> <li>• 4 COM RS-232/422/485 Connector</li> <li>• 2 Mini PCIe Socket</li> <li>• 1 SIM Card Socket</li> <li>• 1 DDR4 SO-DIMM Socket</li> <li>• 1 LVDS Connector</li> <li>• 1 LVDS Backlight Connector</li> <li>• 2 SATA Data Connector</li> <li>• 1 SATA Power Connector</li> <li>• 1 GPIO Header</li> <li>• 1 Fan Connector</li> <li>• 1 Power On/Off Header</li> </ul>
<b>Expansion</b>	
SUMIT	<ul style="list-style-type: none"> <li>• 1 SUMIT A Connector</li> <li>• 1 SUMIT B Connector</li> </ul>
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> <li>• 1 Mini PCIe for PCIe/USB/SIM Card</li> <li>• 1 Mini PCIe for PCIe/USB/Optional mSATA</li> </ul>
<b>Power</b>	
Power Input	9V to 48V DC-in
Power Interface	ATX Power Connector
Ignition Control	16 Mode (Internal)
<b>Others</b>	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
<b>Software Support</b>	
OS	Windows 10, Linux
<b>Mechanical</b>	
Dimension (W x L)	146mm x 102mm (5.75" x 4.02")
Weight	351 g (0.77 lb)
<b>Environment</b>	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% humidity, non-condensing
Relative Humidity	95% at 85°C
EMC	CE, FCC

### 1.3.2 Specifications of EMBC-3000-8665U

<b>System</b>	
Processor	Intel® Core™ i7-8665UE Processor (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	<ul style="list-style-type: none"> <li>• 1 DDR4 2400MHz</li> <li>• Up to 32GB</li> <li>• 1 260-pin SO-DIMM Socket</li> </ul>
<b>Graphics</b>	
Graphics Processor	Intel® UHD Graphics 620
Interface	3 display interfaces : <ul style="list-style-type: none"> <li>• DVI-D : Up to 1920 x 1200 @60Hz</li> <li>• DisplayPort : Up to 4096 x 2304 @60Hz</li> <li>• LVDS : Dual channel 24-bit, up to 1920 x 1200</li> </ul>
<b>Ethernet</b>	
LAN1	Intel® I219LM GigE LAN supports iAMT 12.0
LAN2	Intel® I210 GigE LAN
<b>Audio</b>	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
<b>Storage</b>	
SATA	2 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)
<b>I/O Interface</b>	
Front I/O	<ul style="list-style-type: none"> <li>• 1 DVI-D Connector</li> <li>• 1 DisplayPort Connector</li> <li>• 4 USB 3.1 Connector</li> <li>• 2 RJ45 Connector</li> <li>• 1 Mic-in</li> <li>• 1 Line-out</li> <li>• 1 Power Button</li> <li>• 1 Reset Button</li> <li>• 1 HDD LED</li> <li>• 1 Power LED</li> </ul>

Internal I/O	<ul style="list-style-type: none"> <li>• 1 ATX 4-pin Power Connector</li> <li>• 4 COM RS-232/422/485 Connector</li> <li>• 2 Mini PCIe Socket</li> <li>• 1 SIM Card Socket</li> <li>• 1 DDR4 SO-DIMM Socket</li> <li>• 1 LVDS Connector</li> <li>• 1 LVDS Backlight Connector</li> <li>• 2 SATA Data Connector</li> <li>• 1 SATA Power Connector</li> <li>• 1 GPIO Header</li> <li>• 1 Fan Connector</li> <li>• 2 USB 2.0 Wafer with 4 ports</li> <li>• 1 Power On/Off Header</li> </ul>
<b>Expansion</b>	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> <li>• 1 Mini PCIe for PCIe/USB/SIM Card</li> <li>• 1 Mini PCIe for PCIe/USB/Optional mSATA</li> </ul>
<b>Power</b>	
Power Input	9V to 48V DC-in
Power Interface	ATX Power Connector
Ignition Control	16 Mode (Internal)
<b>Others</b>	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
<b>Software Support</b>	
OS	Windows 10, Linux
<b>Mechanical</b>	
Dimension (W x L)	146mm x 102mm (5.75" x 4.02")
Weight	351 g (0.77 lb)
<b>Environment</b>	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% humidity, non-condensing
Relative Humidity	95% at 85°C
EMC	CE, FCC

### 1.3.3 Specifications of EMBC-3000-8365U

<b>System</b>	
Processor	Intel® Core™ i5-8365UE Processor (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	<ul style="list-style-type: none"> <li>• 1 DDR4 2400MHz</li> <li>• Up to 32GB</li> <li>• 1 260-pin SO-DIMM Socket</li> </ul>
<b>Graphics</b>	
Graphics Processor	Intel® UHD Graphics 620
Interface	3 display interfaces : <ul style="list-style-type: none"> <li>• DVI-D : Up to 1920 x 1200 @60Hz</li> <li>• DisplayPort : Up to 4096 x 2304 @60Hz</li> <li>• LVDS : Dual channel 24-bit, up to 1920 x 1200</li> </ul>
<b>Ethernet</b>	
LAN1	Intel® I219LM GigE LAN supports iAMT 12.0
LAN2	Intel® I210 GigE LAN
<b>Audio</b>	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
<b>Storage</b>	
SATA	2 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)
<b>I/O Interface</b>	
Front I/O	<ul style="list-style-type: none"> <li>• 1 DVI-D Connector</li> <li>• 1 DisplayPort Connector</li> <li>• 4 USB 3.1 Connector</li> <li>• 2 RJ45 Connector</li> <li>• 1 Mic-in</li> <li>• 1 Line-out</li> <li>• 1 Power Button</li> <li>• 1 Reset Button</li> <li>• 1 HDD LED</li> <li>• 1 Power LED</li> </ul>

Internal I/O	<ul style="list-style-type: none"> <li>• 1 ATX 4-pin Power Connector</li> <li>• 4 COM RS-232/422/485 Connector</li> <li>• 2 Mini PCIe Socket</li> <li>• 1 SIM Card Socket</li> <li>• 1 DDR4 SO-DIMM Socket</li> <li>• 1 LVDS Connector</li> <li>• 1 LVDS Backlight Connector</li> <li>• 2 SATA Data Connector</li> <li>• 1 SATA Power Connector</li> <li>• 1 GPIO Header</li> <li>• 1 Fan Connector</li> <li>• 2 USB 2.0 Wafer with 4 ports</li> <li>• 1 Power On/Off Header</li> </ul>
<b>Expansion</b>	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> <li>• 1 Mini PCIe for PCIe/USB/SIM Card</li> <li>• 1 Mini PCIe for PCIe/USB/Optional mSATA</li> </ul>
<b>Power</b>	
Power Input	9V to 48V DC-in
Power Interface	ATX Power Connector
Ignition Control	16 Mode (Internal)
<b>Others</b>	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
<b>Software Support</b>	
OS	Windows 10, Linux
<b>Mechanical</b>	
Dimension (W x L)	146mm x 102mm (5.75" x 4.02")
Weight	351 g (0.77 lb)
<b>Environment</b>	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% humidity, non-condensing
Relative Humidity	95% at 85°C
EMC	CE, FCC

### 1.3.4 Specifications of EMBC-3000-8145U

<b>System</b>	
Processor	Intel® Core™ i3-8145UE Processor (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	<ul style="list-style-type: none"> <li>• 1 DDR4 2400MHz</li> <li>• Up to 32GB</li> <li>• 1 260-pin SO-DIMM Socket</li> </ul>
<b>Graphics</b>	
Graphics Processor	Intel® UHD Graphics 620
Interface	3 display interfaces : <ul style="list-style-type: none"> <li>• DVI-D : Up to 1920 x 1200 @60Hz</li> <li>• DisplayPort : Up to 4096 x 2304 @60Hz</li> <li>• LVDS : Dual channel 24-bit, up to 1920 x 1200</li> </ul>
<b>Ethernet</b>	
LAN1	Intel® I219LM GigE LAN supports iAMT 12.0
LAN2	Intel® I210 GigE LAN
<b>Audio</b>	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
<b>Storage</b>	
SATA	2 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)
<b>I/O Interface</b>	
Front I/O	<ul style="list-style-type: none"> <li>• 1 DVI-D Connector</li> <li>• 1 DisplayPort Connector</li> <li>• 4 USB 3.1 Connector</li> <li>• 2 RJ45 Connector</li> <li>• 1 Mic-in</li> <li>• 1 Line-out</li> <li>• 1 Power Button</li> <li>• 1 Reset Button</li> <li>• 1 HDD LED</li> <li>• 1 Power LED</li> </ul>



Internal I/O	<ul style="list-style-type: none"> <li>• 1 ATX 4-pin Power Connector</li> <li>• 4 COM RS-232/422/485 Connector</li> <li>• 2 Mini PCIe Socket</li> <li>• 1 SIM Card Socket</li> <li>• 1 DDR4 SO-DIMM Socket</li> <li>• 1 LVDS Connector</li> <li>• 1 LVDS Backlight Connector</li> <li>• 2 SATA Data Connector</li> <li>• 1 SATA Power Connector</li> <li>• 1 GPIO Header</li> <li>• 1 Fan Connector</li> <li>• 2 USB 2.0 Wafer with 4 ports</li> <li>• 1 Power On/Off Header</li> </ul>
<b>Expansion</b>	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> <li>• 1 Mini PCIe for PCIe/USB/SIM Card</li> <li>• 1 Mini PCIe for PCIe/USB/Optional mSATA</li> </ul>
<b>Power</b>	
Power Input	9V to 48V DC-in
Power Interface	ATX Power Connector
Ignition Control	16 Mode (Internal)
<b>Others</b>	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
<b>Software Support</b>	
OS	Windows 10, Linux
<b>Mechanical</b>	
Dimension (W x L)	146mm x 102mm (5.75" x 4.02")
Weight	351 g (0.77 lb)
<b>Environment</b>	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% humidity, non-condensing
Relative Humidity	95% at 85°C
EMC	CE, FCC

### 1.3.5 Specifications of EMBC-3000-4305U

<b>System</b>	
Processor	Intel® Celeron® Processor 4305UE (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	<ul style="list-style-type: none"> <li>• 1 DDR4 2400MHz</li> <li>• Up to 32GB</li> <li>• 1 260-pin SO-DIMM Socket</li> </ul>
<b>Graphics</b>	
Graphics Processor	Intel® UHD Graphics 620
Interface	3 display interfaces : <ul style="list-style-type: none"> <li>• DVI-D : Up to 1920 x 1200 @60Hz</li> <li>• DisplayPort : Up to 4096 x 2304 @60Hz</li> <li>• LVDS : Dual channel 24-bit, up to 1920 x 1200</li> </ul>
<b>Ethernet</b>	
LAN1	Intel® I219LM GigE LAN supports iAMT 12.0
LAN2	Intel® I210 GigE LAN
<b>Audio</b>	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
<b>Storage</b>	
SATA	2 SATA III (6Gbps)
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)
<b>I/O Interface</b>	
Front I/O	<ul style="list-style-type: none"> <li>• 1 DVI-D Connector</li> <li>• 1 DisplayPort Connector</li> <li>• 4 USB 3.1 Connector</li> <li>• 2 RJ45 Connector</li> <li>• 1 Mic-in</li> <li>• 1 Line-out</li> <li>• 1 Power Button</li> <li>• 1 Reset Button</li> <li>• 1 HDD LED</li> <li>• 1 Power LED</li> </ul>

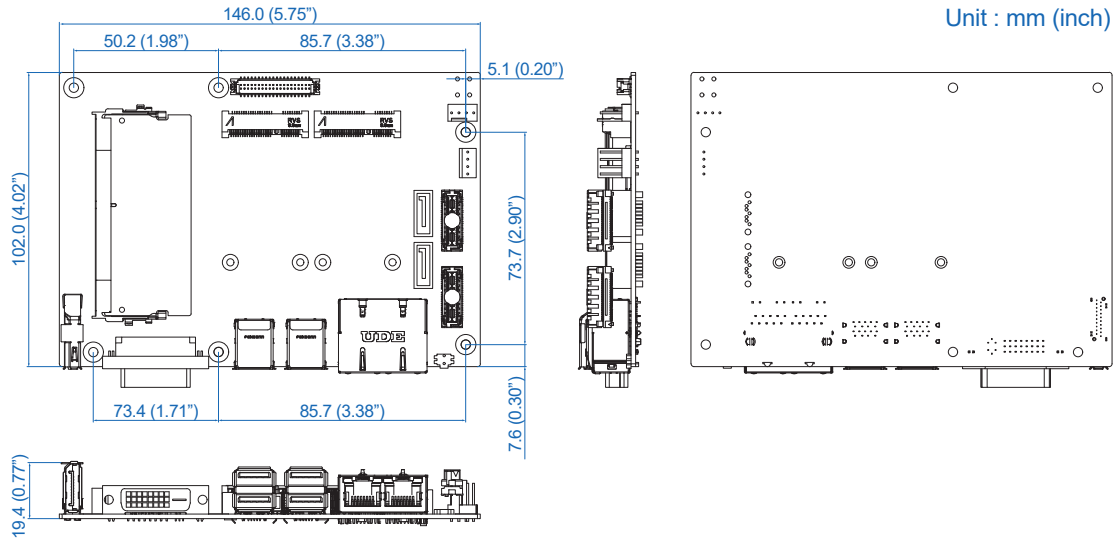
Internal I/O	<ul style="list-style-type: none"> <li>• 1 ATX 4-pin Power Connector</li> <li>• 4 COM RS-232/422/485 Connector</li> <li>• 2 Mini PCIe Socket</li> <li>• 1 SIM Card Socket</li> <li>• 1 DDR4 SO-DIMM Socket</li> <li>• 1 LVDS Connector</li> <li>• 1 LVDS Backlight Connector</li> <li>• 2 SATA Data Connector</li> <li>• 1 SATA Power Connector</li> <li>• 1 GPIO Header</li> <li>• 1 Fan Connector</li> <li>• 2 USB 2.0 Wafer with 4 ports</li> <li>• 1 Power On/Off Header</li> </ul>
<b>Expansion</b>	
Mini PCIe	2 Mini PCIe sockets : <ul style="list-style-type: none"> <li>• 1 Mini PCIe for PCIe/USB/SIM Card</li> <li>• 1 Mini PCIe for PCIe/USB/Optional mSATA</li> </ul>
<b>Power</b>	
Power Input	9V to 48V DC-in
Power Interface	ATX Power Connector
Ignition Control	16 Mode (Internal)
<b>Others</b>	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
<b>Software Support</b>	
OS	Windows 10, Linux
<b>Mechanical</b>	
Dimension (W x L)	146mm x 102mm (5.75" x 4.02")
Weight	351 g (0.77 lb)
<b>Environment</b>	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% humidity, non-condensing

## 1.4 Supported CPU List

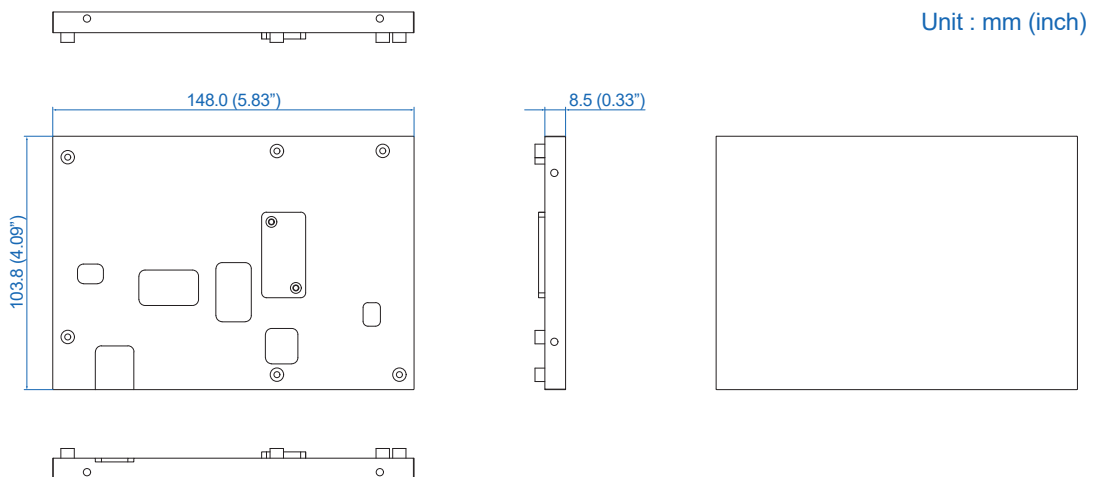
Processor No.	Cores	TDP	Cache	Max. Frequency	ECC Memory
Intel® Core™ i7-8665UE	4	15W	8M	Up to 4.4GHz	N
Intel® Core™ i5-8365UE	4	15W	6M	Up to 4.1GHz	N
Intel® Core™ i3-8145UE	2	15W	4M	Up to 3.9GHz	N
Intel® Celeron 4305UE	2	15W	2M	Up to 2.0GHz	N

# 1.5 Mechanical Dimension

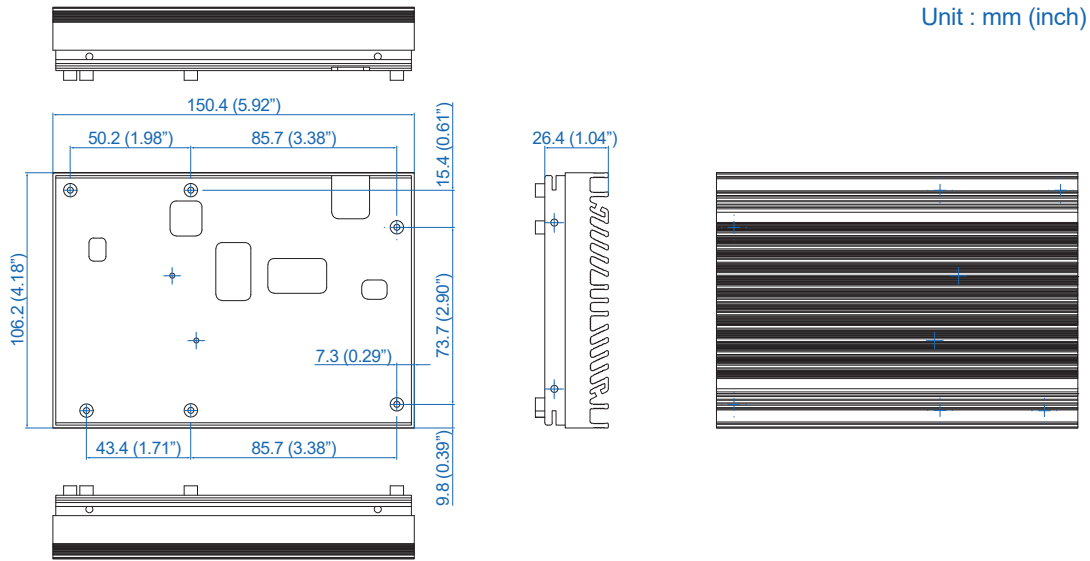
## 1.5.1 Dimensions of EMBC-3000E-8665U



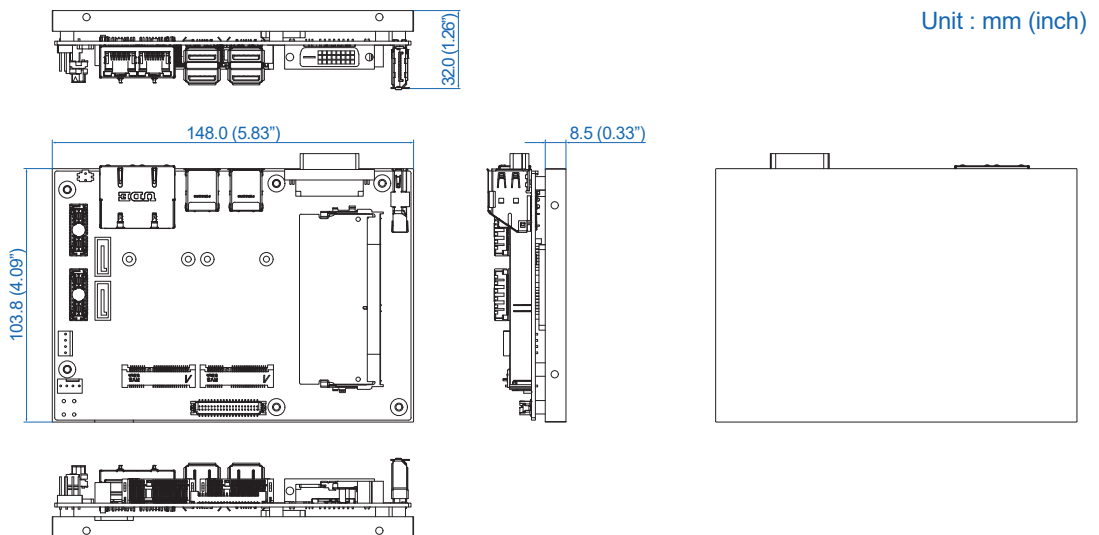
## 1.5.2 Dimensions of Heat Spreader



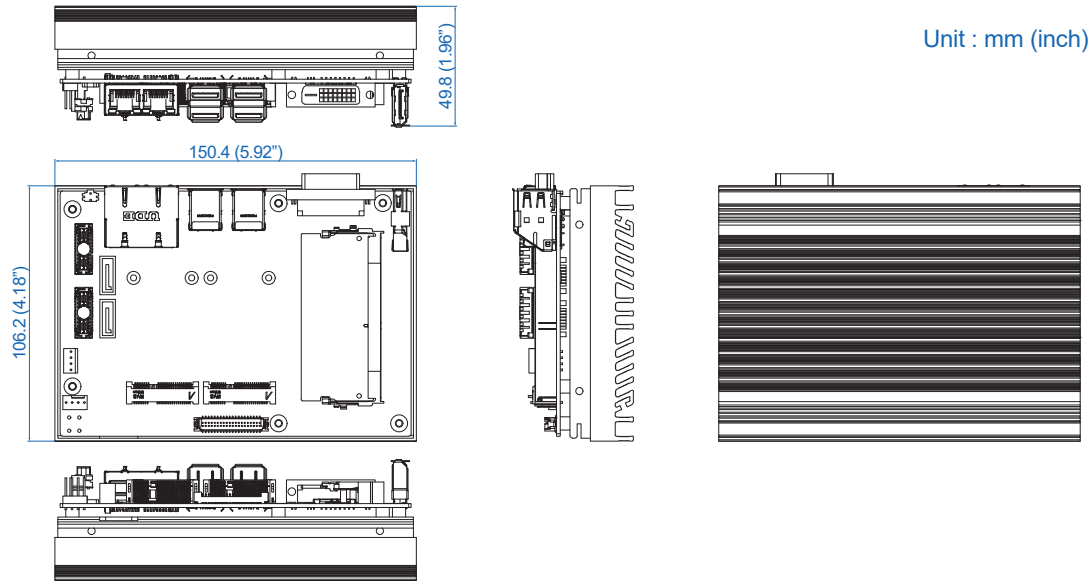
### 1.5.3 Dimensions of Heat Sink



### 1.5.4 Dimensions of MB+Heat Spreader



## 1.5.5 Dimensions of MB+Heat Sink



# 2

## GETTING TO KNOW YOUR EMBC-3000

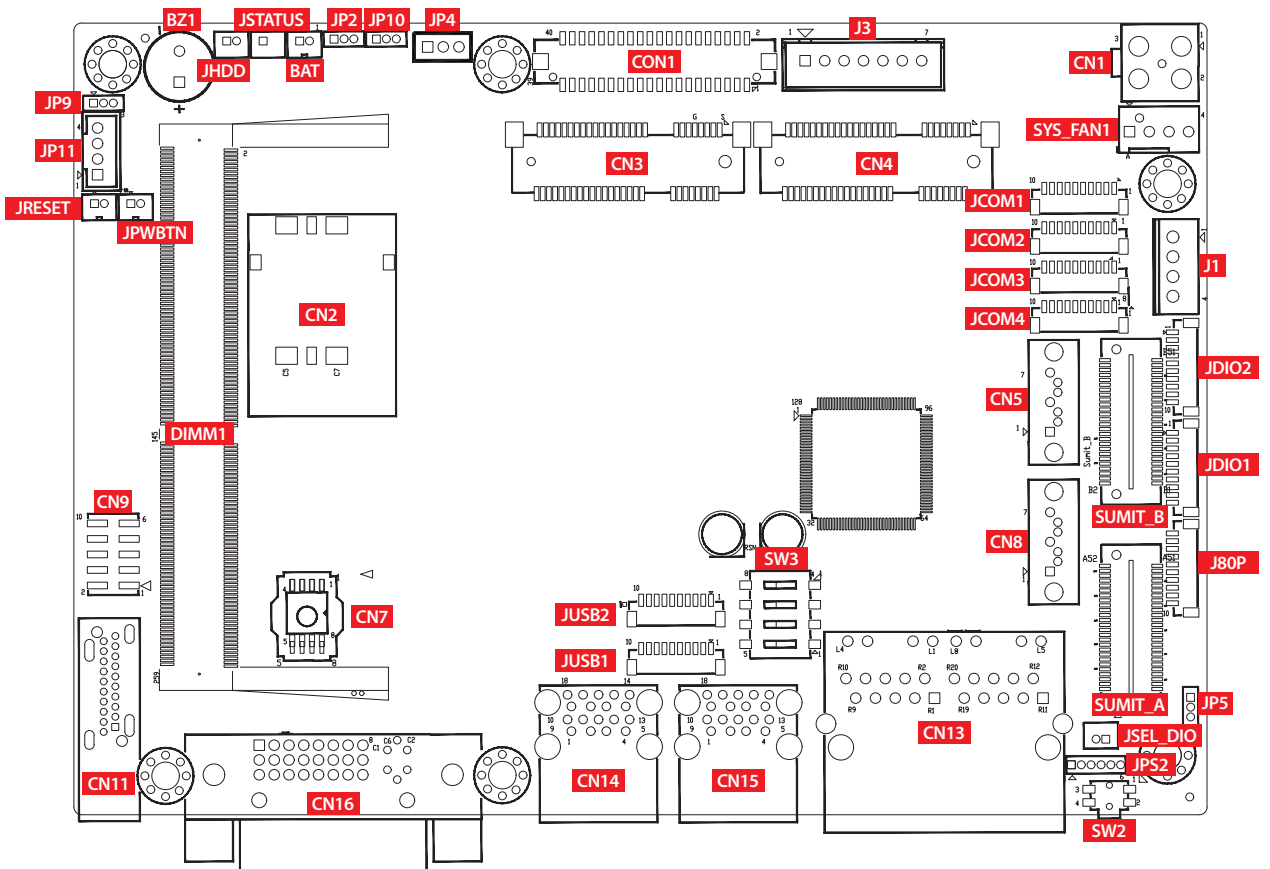
### 2.1 Packing List

Item	Description	Qty
1	EMBC-3000 3.5 Embedded Single Board Computer	1
2	Cable Kit <ul style="list-style-type: none"><li>• COM Port Cable</li><li>• COM Screw#4-40, L=5mm</li><li>• SATA Data Cable</li><li>• SATA Power Cable</li><li>• USB 2.0 Cable</li><li>• USB Screw PH-M3, L=6mm</li><li>• Audio Cable</li><li>• Audio Ring</li></ul>	2 8 1 1 1 4 1 2

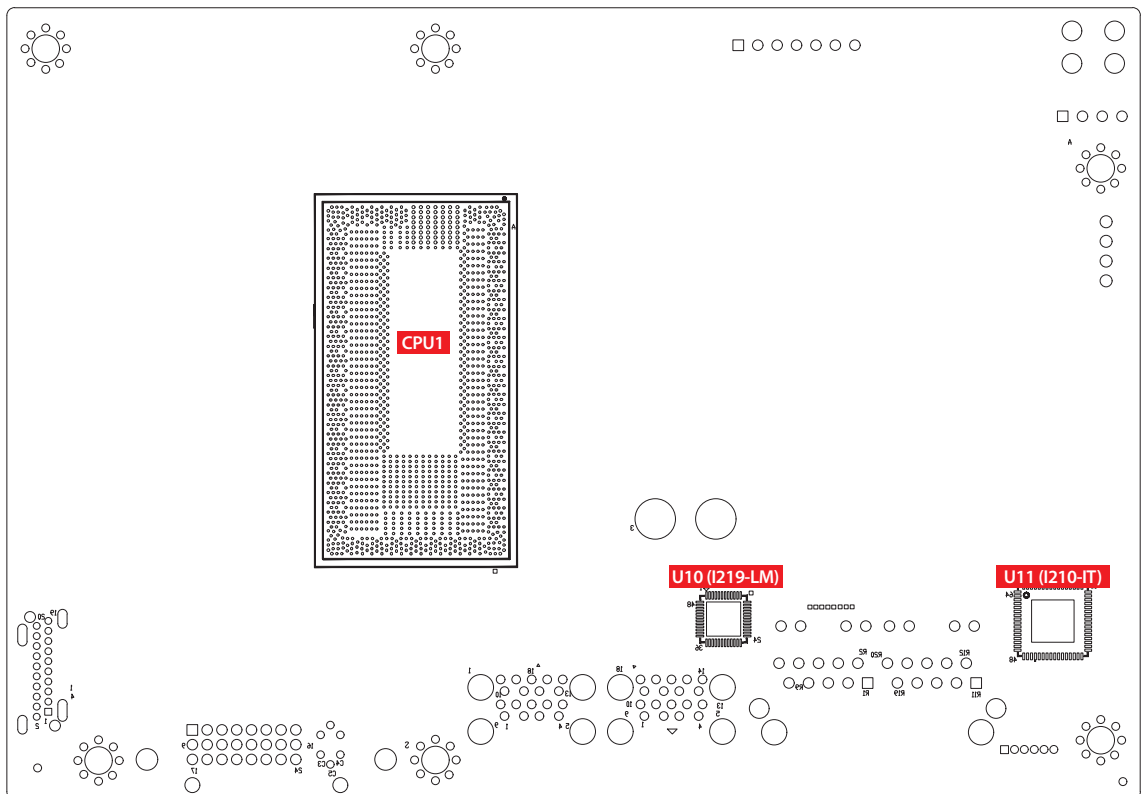


## 2.2 Connector/Jumper Locations

### 2.2.1 Top Side

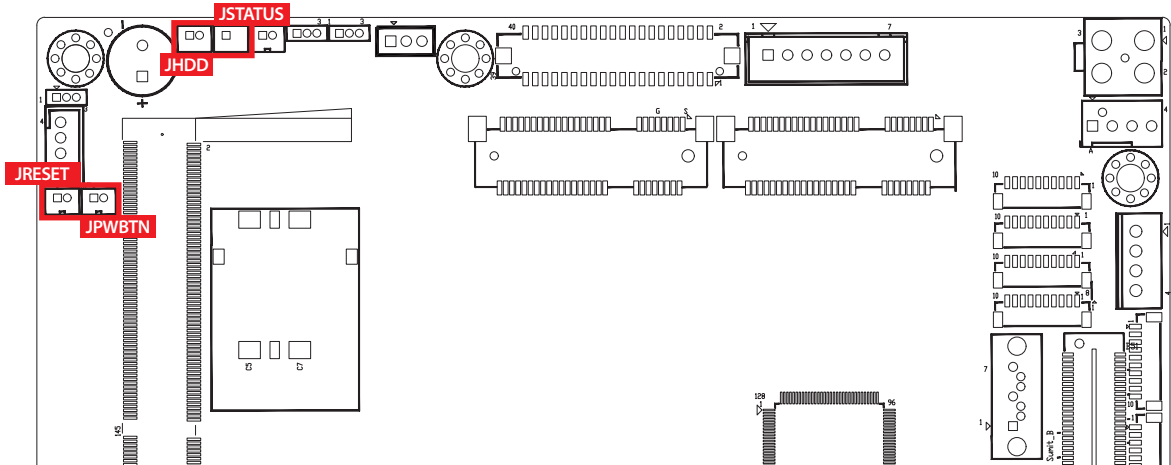


### 2.2.2 Bottom Side



### 2.2.3 JPWBTN, JRESET, JSTATUS, JHDD : Miscellaneous Pin Header

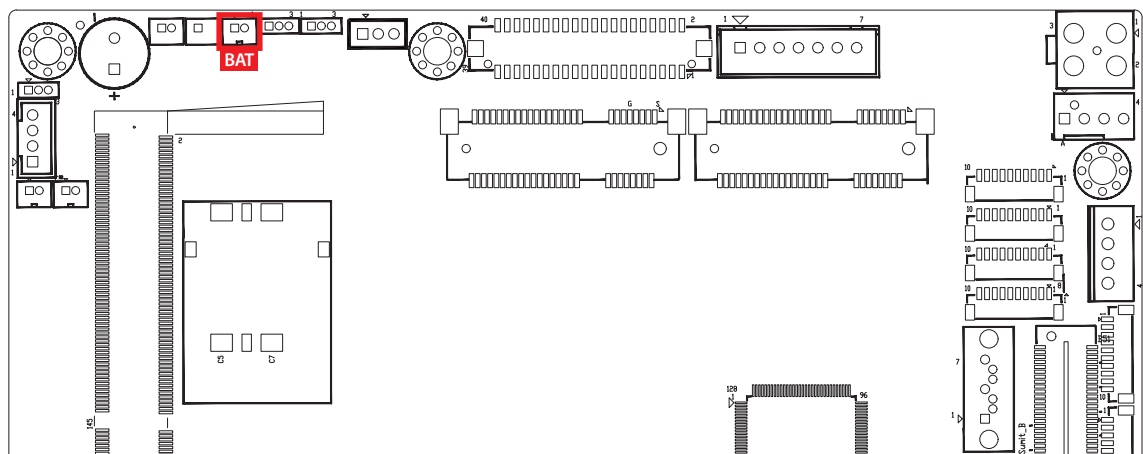
These pin headers can be used as a backup for the following functions : hard drive, LED indicator, reset button, power LED indicator, and power on/off buttons, which already can be accessed by front panel and top panel. The pinouts of Miscellaneous port are listed in following table :



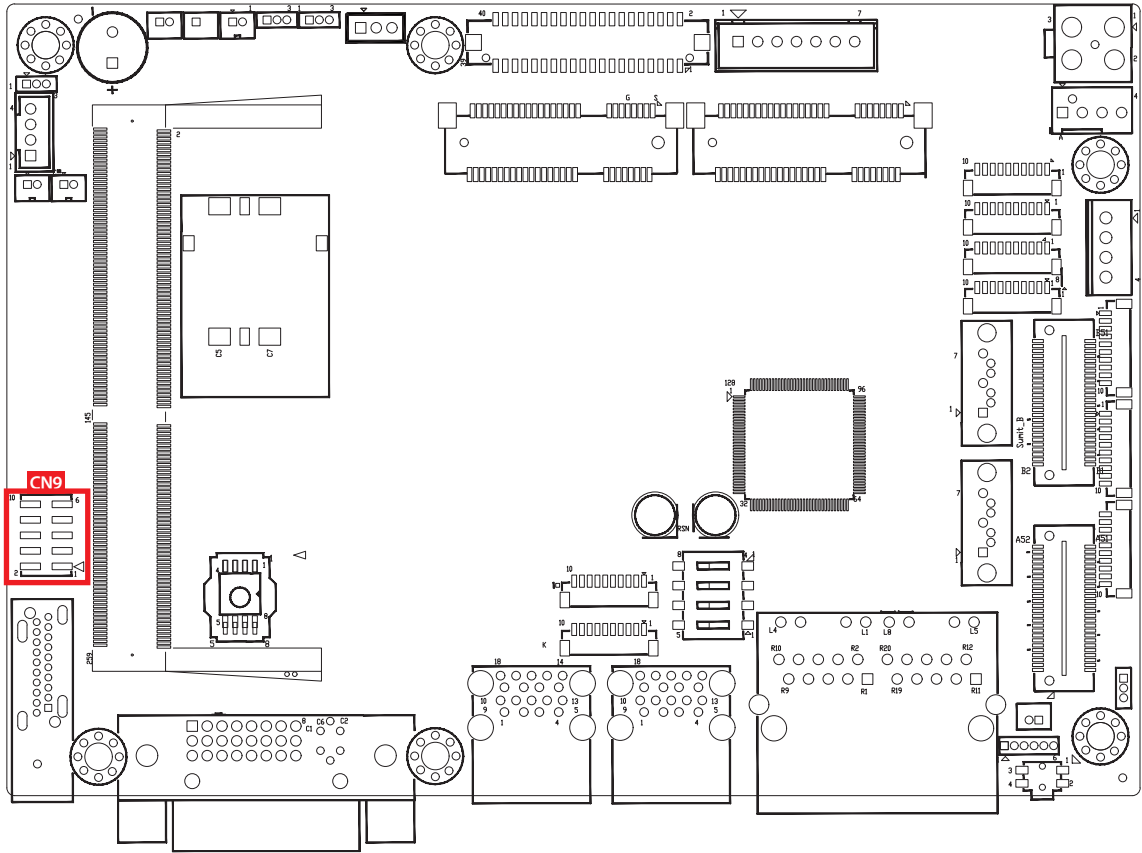
	Group	Pin No.	Description
	JPWBTN	1	GND
		2	FP_PWR_BTN_IN
	JRESET	1	GND
		2	FP_RST_BTN_N
	JSTATUS	1	PWR_LED_N
		2	PWR_LED_P
	JHDD	1	HDD_LED_N
		2	HDD_LED_P

### 2.2.4 BAT : Battery

The EMBC-3000's real-time clock is powered by a lithium battery. It is equipped with Panasonic BR2032 190mAh lithium battery. It is recommended that you not replace the lithium battery on your own, but if the battery needs to be changed, please contact the Vecow RMA service team.



## 2.2.5 CN9 : Audio Connector



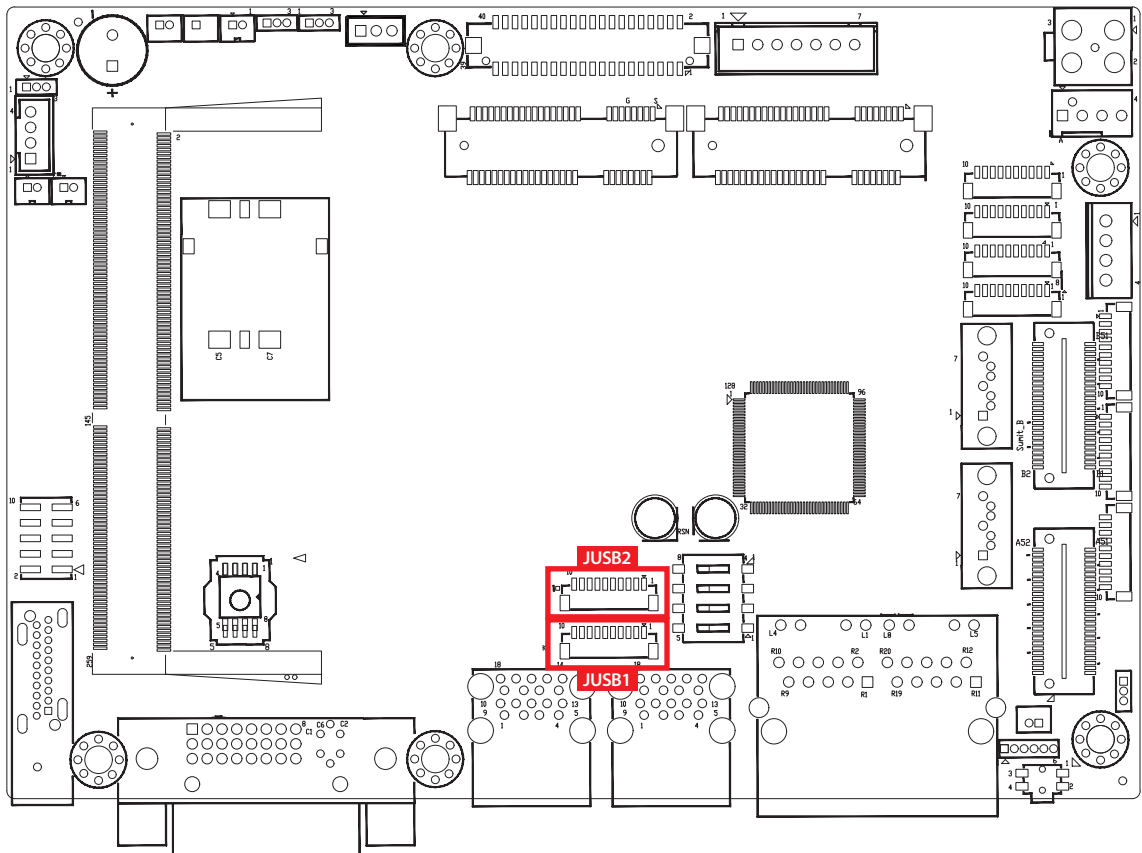
There are three audio connectors, mic-in, line-in, and line-out, in the top side of EMBC-3000. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel® High Definition Audio (Azalia) specifications.

To utilize the audio function in Windows platform, you need to install corresponding drivers for both Intel® Whiskey Lake-U chipset and Realtek ALC888S-VD codec. Please refer to Chapter 4 for more details of driver installation.

The pinouts of Audio port are listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	A_z_MIC1-L	2	GND_A
	3	A_z_MIC1-R	4	GND_EARTH
	5	A_z_LINEO-R	6	A_z_LINEI-R
	7	F_IO_SENSE	8	GND_EARTH
	9	A_z_LINEO-L	10	A_z_LINEI-L

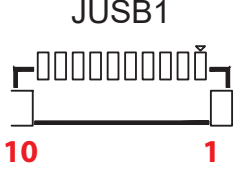
## 2.2.6 JUSB1, JUSB2 : Internal USB 2.0 Connector

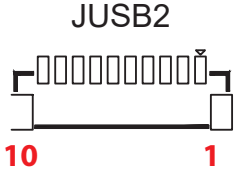


The EMBC-3000 main board provides maxima eight expansion USB ports. The USB interface supports 480Mbps transfer rate which comply with high speed USB specification Rev. 2.0.

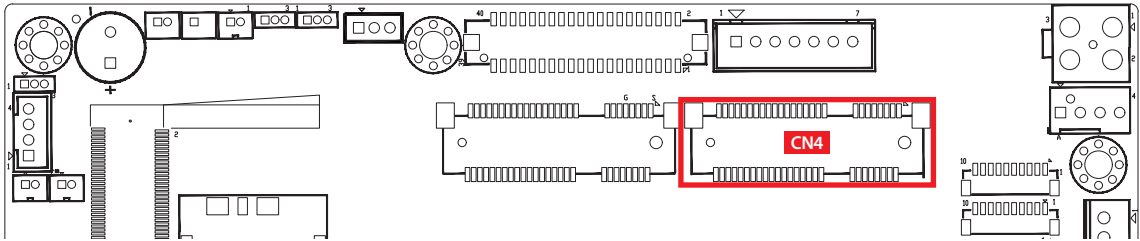
The USB interface is accessed through one 10-pin JST 1.0mm connector. You will need an adapter cable if you use a standard USB connector. The adapter cable has a 10-pin connector on one end and a USB connector on the other.

The pin assignments of JUSB1 and JUSB2 are listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	USB_VCC	2	USB_VCC
	3	USB_VCC	4	USB_D_4N
	5	USB_D_4P	6	USB_D_5N
	7	USB_D_5P	8	GND
	9	GND	10	GND

	Pin No.	Definition	Pin No.	Definition
	1	USB_VCC	2	USB_VCC
	3	USB_VCC	4	USB_D_6N
	5	USB_D_6P	6	USB_D_7N
	7	USB_D_7P	8	GND
	9	GND	10	GND

## 2.2.7 CN4 : Mini PCIe, mSATA



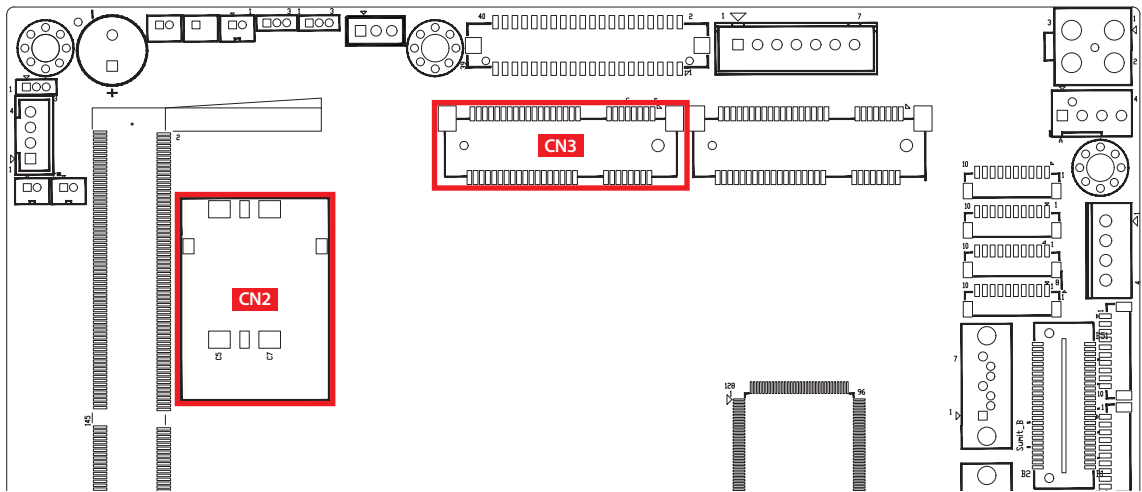
Both mSATA and Mini PCIe share the same form factor and similar electrical pinout assignments on their connectors. There was no clear mechanism to distinguish if a mSATA drive or a Mini PCIe device is plugged into the socket until recently that SATA I/O issued an ECN change (ECN #045) to redefine pin43 on mSATA connector as "no connect" instead of "return current path" (or GND).

When an mSATA drive is inserted, its pin-43 is "no connect", and the respective pin on the socket is being pulled-up to logic 1. When a Mini PCIe device is inserted, its pin-43 forces the respective pin on the socket to ground, or logic 0.

The pin assignments of CN4 are listed in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	SATA_PCIE_SEL	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
Mechanical Key			
15	GND	16	Reserved
13	REFCLK+	14	Reserved
11	REFCLK-	12	Reserved
9	GND	10	Reserved
7	CLKREQ#	8	Reserved
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

## 2.2.8 CN3 : Mini PCIe, Micro-SIM

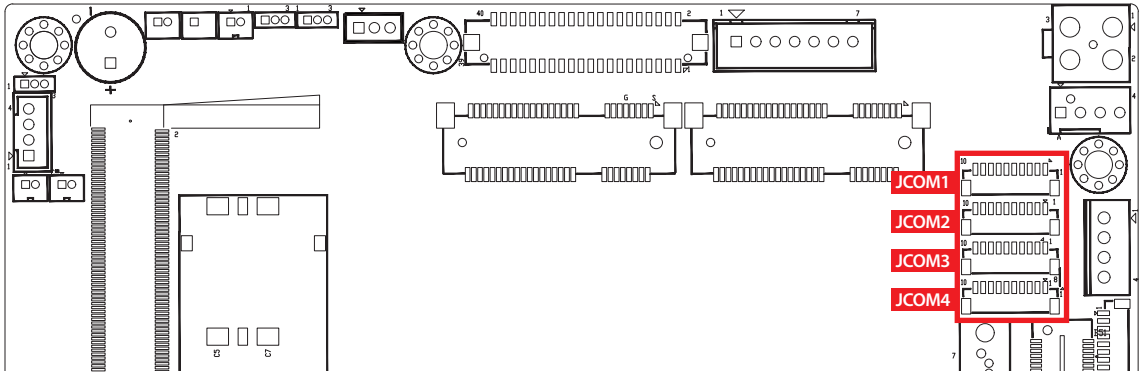


Note : The SIM card socket(CN2) do not support hot-plug. Please make sure to unplug the system power before inserting the SIM card.

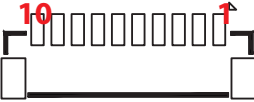
The pin assignments of CN3 are listed in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	GND	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
Mechanical Key			
15	GND	16	UIM_VPP
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

## 2.2.9 JCOM1, JCOM2, JCOM3, JCOM4 : Serial Port



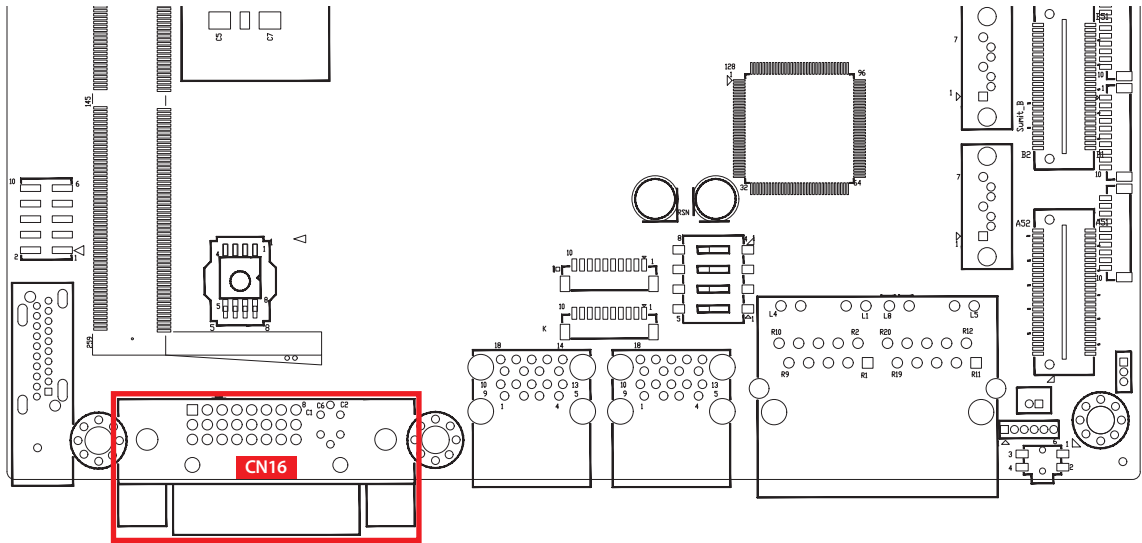
Serial port 1 to 4 (JCOM 1 to 4) can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition of COM 1 to 4 is RS-232, if you want to change to RS-422 or RS-485, you can find the setting in BIOS.

	BIOS Setting	Function	
	COM 1 (JCOM1) COM 2 (JCOM2) COM 3 (JCOM3) COM 4 (JCOM4)		RS-232
			RS-422 (5-wire)
			RS-422 (9-wire)
			RS-485
		RS-485 w/z auto-flow control	

The pin assignments are listed in the following table :

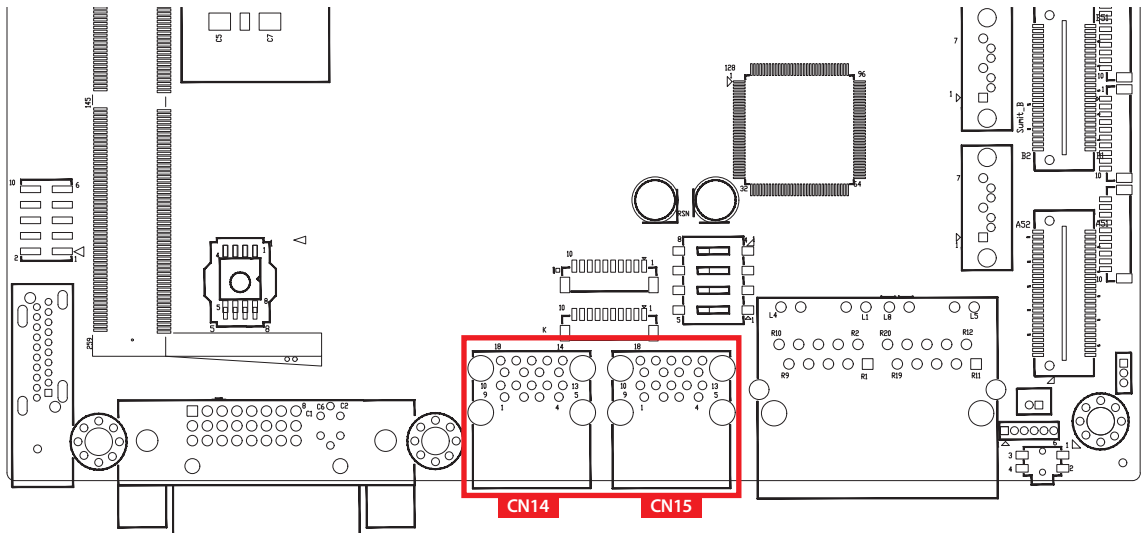
Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
1, 2 3, 4	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH
	2	GND	GND	GND	GND
	3	RI	-----	CTS-	RI
	4	DTR	RXD-	RXD-	-----
	5	CTS	-----	CTS+	-----
	6	TXD	RXD+	RXD+	-----
	7	RTS	-----	RTS+	-----
	8	RXD	TXD+	TXD+	DATA+
	9	DSR	-----	RTS-	-----
	10	DCD	TXD-	TXD-	DATA-

## 2.2.10 CN16 : DVI-D Connector



The DVI-D connector on the front panel supports DVI display modes. The DVI output mode supports up to 1920 x 1080 resolutions.

## 2.2.11 CN14, CN15 : External USB 3.1 Connector



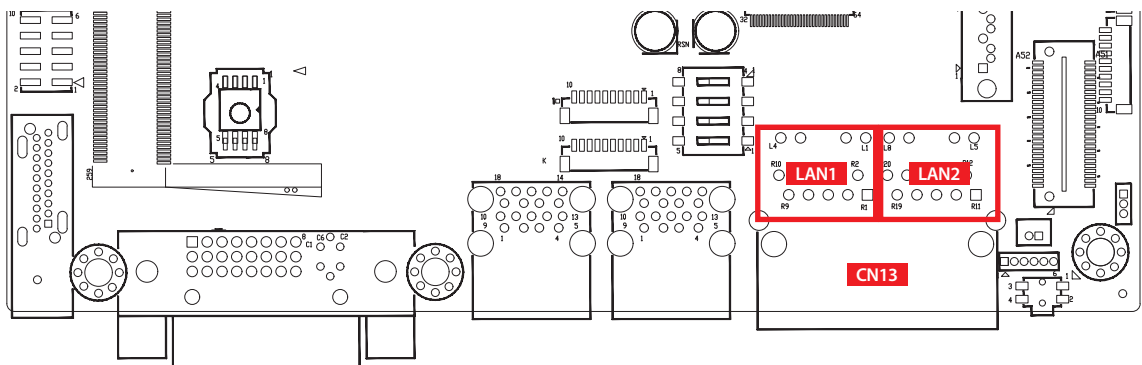
There are 4 USB 3.1 Gen2 connections available supporting up to 10GB per second data rate in the top side of EMBC-3000. They are also compliant with the requirements of SuperSpeed (SS), high speed (HS), full speed (FS) and low speed (LS).



## 2.2.12 CN13 : LAN1 + LAN2

There are two 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections in the front side of EMBC-3000. LAN1 is powered by Intel® I219-LM Ethernet engine; LAN2 is powered by Intel® I210-IT Ethernet engine. When both LAN1 and LAN2 work in normal status, basic iAMT function is enabled.

Using suitable RJ-45 cable, you can connect EMBC-3000 system to a computer or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both LAN1 and LAN2 supports Wake on LAN and Pre-boot functions. The pinouts of LAN1 and LAN2 are listed as follow :

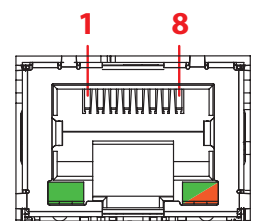


Pin No.	10/100 Mbps	1000Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	-----	MDI2_P
5	-----	MDI2_N
6	E_RX-	MDI1_N
7	-----	MDI3_P
8	-----	MDI3_N

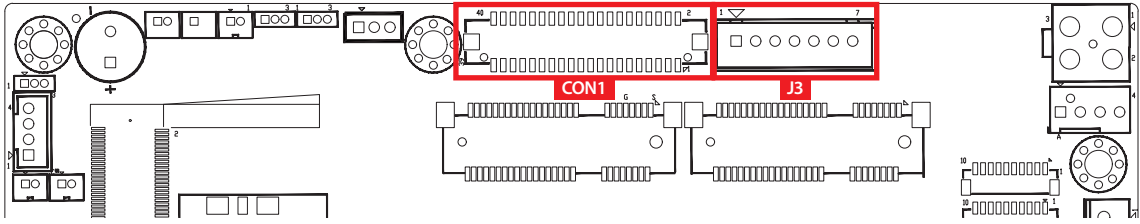
Each LAN port is supported by standard RJ-45 connector with LED indicators to present Active/Link/Speed status of the connection.

The LED indicator on the right bottom corner lightens in solid green when the cable is properly connected to a 100Mbps Ethernet network; The LED indicator on the right bottom corner lightens in solid orange when the cable is properly connected to a 1000 Mbps Ethernet network; The left LED will keep twinkling/off when Ethernet data packets are being transmitted/received.

LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/ Orange	Off	Solid Green	Solid Orange
Left	Green	Twinkling Green	Twinkling Green	Twinkling Green



### 2.2.13 CON1, J3 : LVDS



EMBC-3000 supports dual-channel 24-bit LVDS display and up to 4096 x 2304 pixels resolution.

The pin assignments of LVDS are listed in the following table :

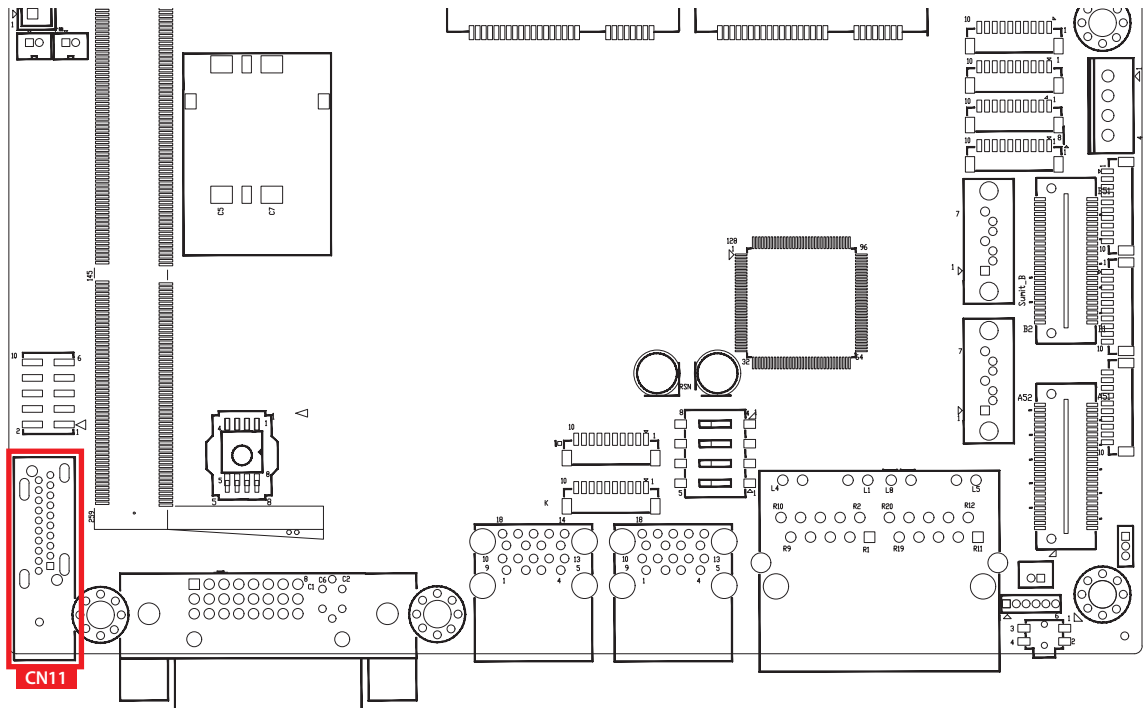
Pin No.	Definition	Pin No.	Definition
1	PANEL_VDD	2	TXO0-
3	PANEL_VDD	4	TXO0+
5	PANEL_VDD	6	TXO1-
7	GND	8	TXO1+
9	GND	10	TXO2-
11	GND	12	TXO2+
13	GND	14	TXOC-
15	GND	16	TXOC+
17	GND	18	TXO3-
19	GND	20	TXO3+
21	GND	22	TXE0-
23	GND	24	TXE0+
25	GND	26	TXE1-
27	GND	28	TXE1+
29	GND	30	TXE2-
31	GND	32	TXE2+
33	GND	34	TXEC-
35	GND	36	TXEC+
37	GND	38	TXE3-
39	LVDS_DET#	40	TXE3+

The LCD inverter is connected to J3 via a JST 7-pin, 2.5mm connector providing +5V/+12V power to LCD display. The pin assignments are listed in the following table :

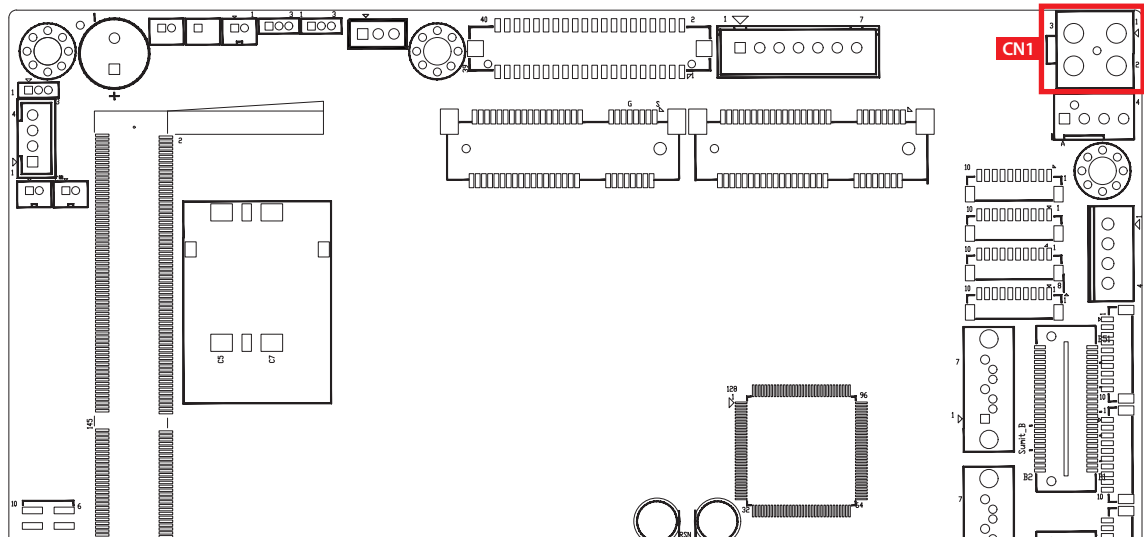
Pin No.	Definition	Pin No.	Definition
1	+5V	2	+12V
3	+12V	4	LBKLT_CTL
5	GND	6	GND
7	LBKLT_EN		

### 2.2.14 CN11 : DP Connector

EMBC-3000 supports single Display Port and up to 4096 x 2304 pixels resolution.



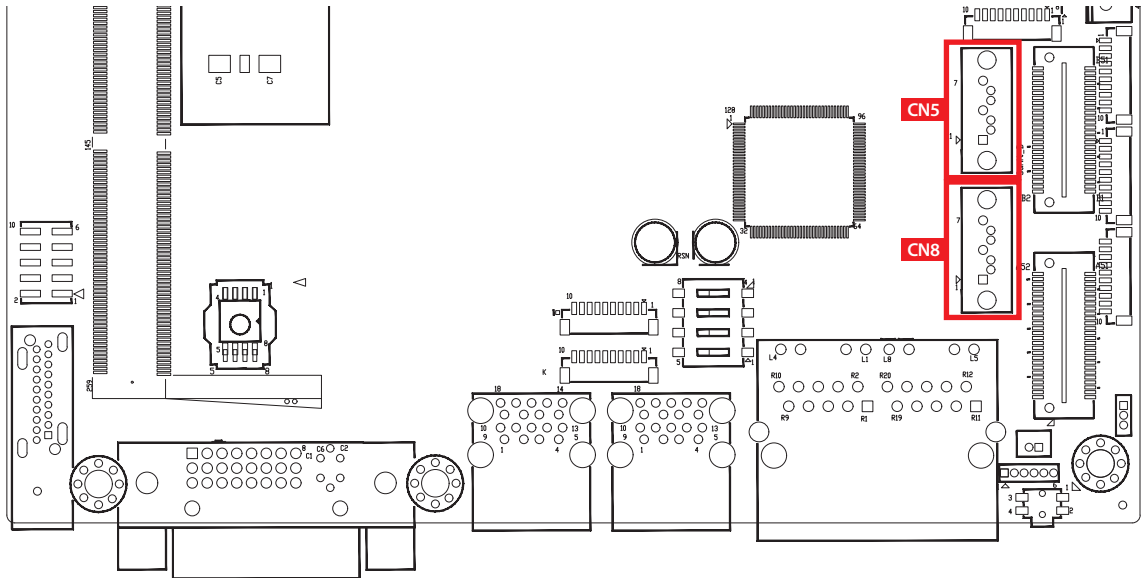
### 2.2.15 CN1 : DC Power input



EMBC-3000 supports 9V to 48V DC power input by wire-to-board connector in the top side.

	Pin No.	Definition	Pin No.	Definition
	1	V-	2	V-
	3	V+	4	V+

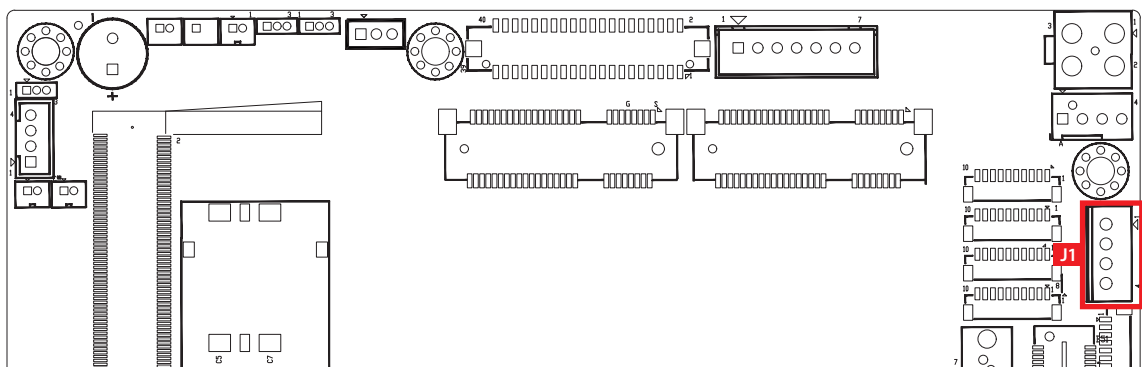
## 2.2.16 CN5, CN8 : SATA III Connector



There are two high performance Serial ATA III (SATA III) on the EMBC-3000. They support higher storage capacity with less cabling effort and smaller required space. The pin assignments of CN5 and CN8 are listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	GND	2	TXP
	3	TXN	4	GND
	5	RXN	6	RXP
	7	GND		

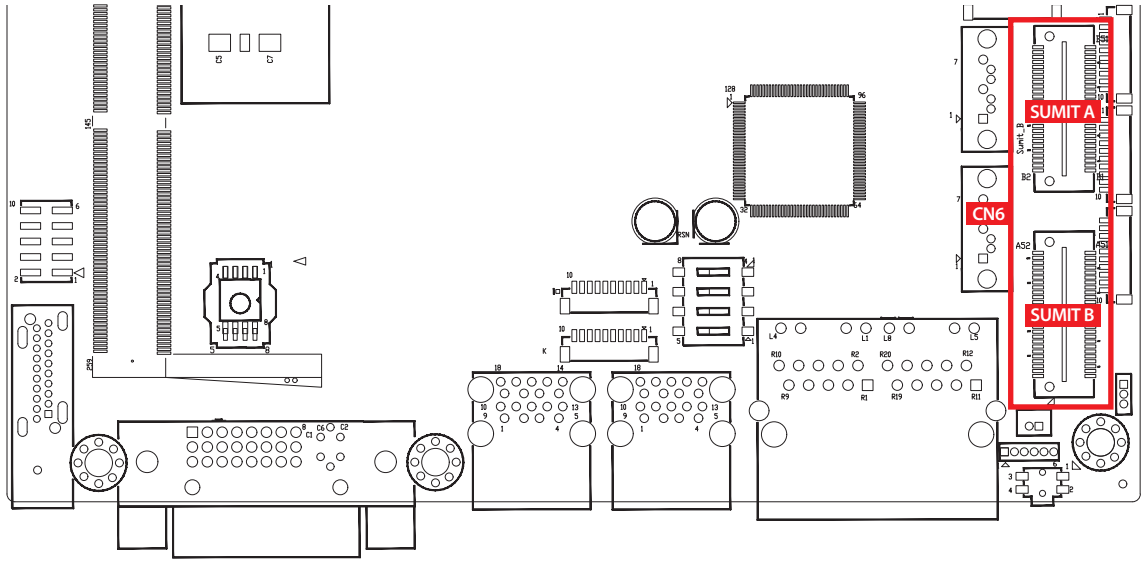
## 2.2.17 J1 : SATA Power Connector



The EMBC-3000 is also equipped with one SATA power connector. It supports 5V (Up to 2A) and 12V (Up to 2A) currents to the hard drive or SSD. The pin assignments of J1 is listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	+12V	2	GND
	3	GND	4	+5V

## 2.2.18 CN6 : SUMIT A+B Connector



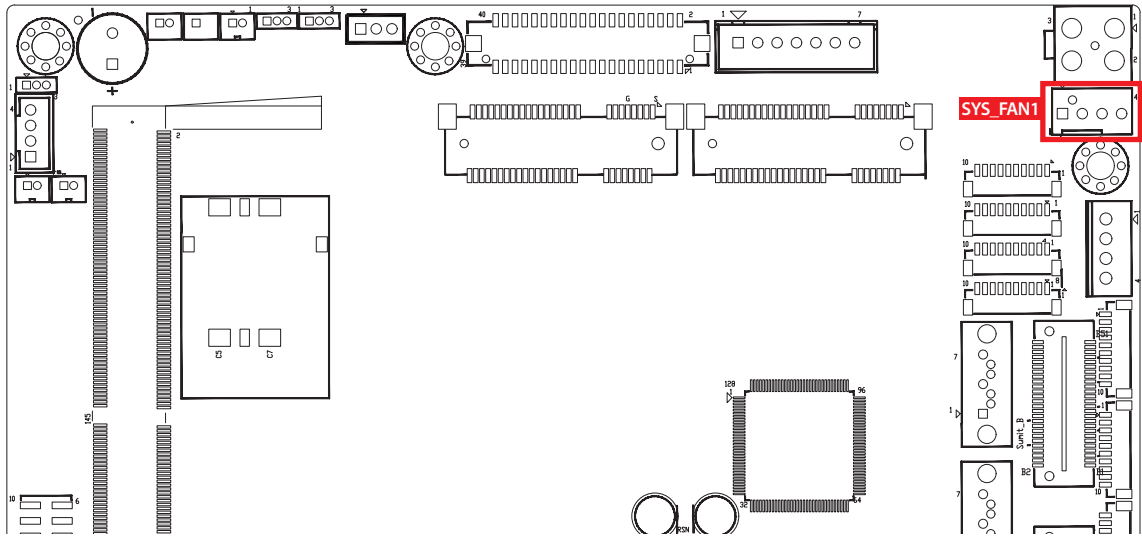
SUMIT-A Connector Pin Out

Pin No.	Definition	Pin No.	Definition
1	+5V_AUX	2	+12V
3	+3.3V	4	SMB_DATA
5	+3.3V	6	SMB_CLK
7	Reserved	8	Reserved
9	Reserved	10	Reserved
11	USB_OC#	12	Reserved
13	Reserved	14	Reserved
15	+5V	16	Reserved
17	USB_3+	18	Reserved
19	USB_3-	20	Reserved
21	+5V	22	Reserved
23	USB_2+	24	LPC_AD0
25	USB_2-	26	LPC_AD1
27	+5V	28	LPC_AD2
29	USB_1+	30	LPC_AD3
31	USB_1-	32	LPC_FRAME#
33	+5V	34	SERIRQ#
35	USB_0+	36	Reserved
37	USB_0-	38	CLK_33MHz
39	GND	40	GND
41	A_PET_P0	42	A_PER_P0
43	A_PET_N0	44	A_PER_N0
45	GND	46	GND
47	PERST#	48	A_CLKP
49	WAKE#	50	A_CLKN
51	+5V	52	GND

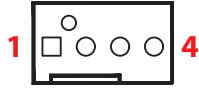
## SUMIT-B Connector Pin Out

Pin No.	Definition	Pin No.	Definition
1	GND	2	GND
3	B_PET_P0	4	B_PER_P0
5	B_PET_N0	6	B_PER_N0
7	GND	8	GND
9	C_CLKP	10	B_CLKP
11	C_CLKN	12	B_CLKN
13	CPRSNT#/C_PE_CLKREQ#	14	GND
15	C_PET_P0	16	C_PER_P0
17	C_PET_N0	18	C_PER_N0
19	GND	20	GND
21	C_PET_P1	22	C_PER_P1
23	C_PET_N1	24	C_PER_N1
25	GND	26	GND
27	C_PET_P2	28	C_PER_P2
29	C_PET_N2	30	C_PER_N2
31	GND	32	GND
33	C_PET_P3	34	C_PER_P3
35	C_PET_N3	36	C_PER_N3
37	GND	38	GND
39	PERST#	40	WAKE#
41	Reserves	42	Reserves
43	+5V	44	Reserves
45	+5V	46	+3.3V
47	+5V	48	+3.3V
49	+5V	50	+3.3V
51	+5V	52	+5V_AUX

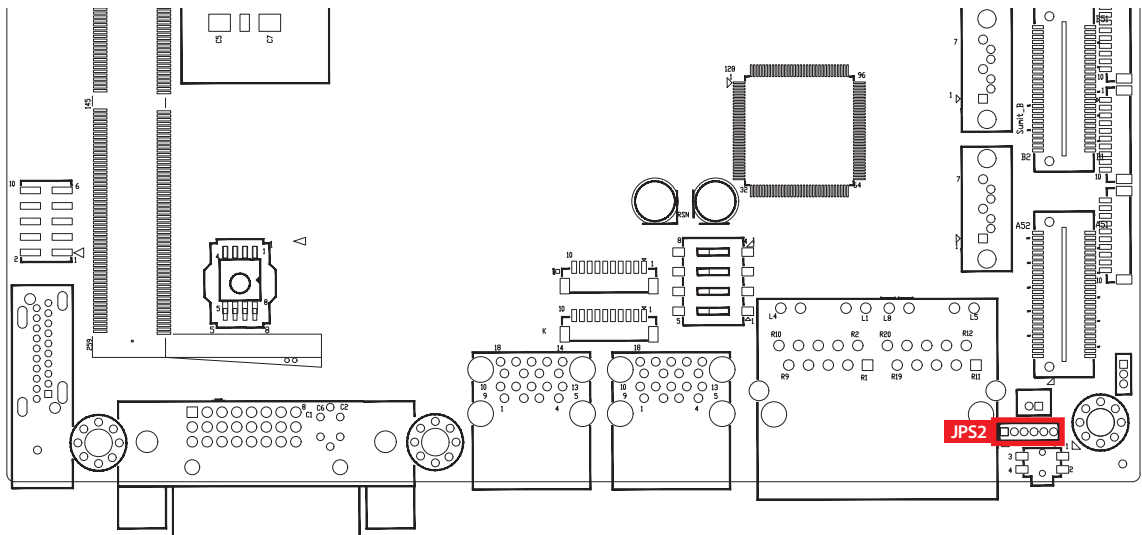
## 2.2.19 SYS\_FAN1




Fan power connector supports higher thermal requirements

	Pin No.	Definition	Pin No.	Definition
	1	1	GND	2
4	3	Fan speed sensor	4	Fan PWM

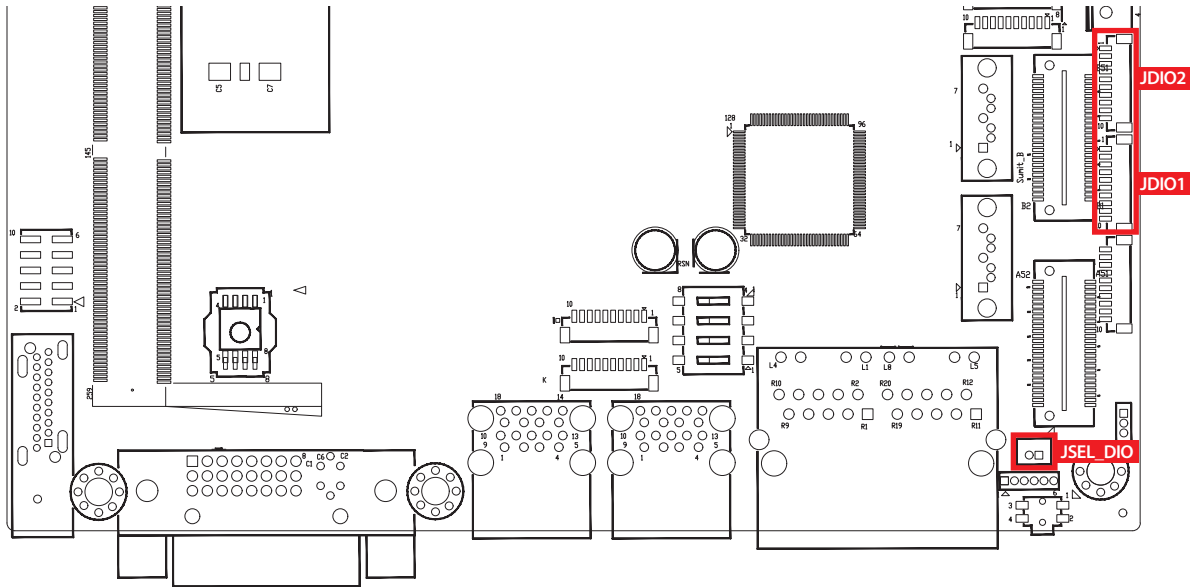
## 2.2.20 JPS2 : PS/2 Keyboard and Mouse



JPS2 Keyboard and mouse pin assignment as the following table :

	Pin No.	Definition	Pin No.	Definition
	1	1	SIO_MCLK	2
6	3	GND	4	SIO_KCLK
	5	SIO_KDAT	6	VCC5_KBMS

## 2.2.21 JDIO1, JDIO2 : GPIO from Super I/O



There is a 16-bit GPIO connector in the Top side. Each GPIO channel can be configuration GPI or GPO.

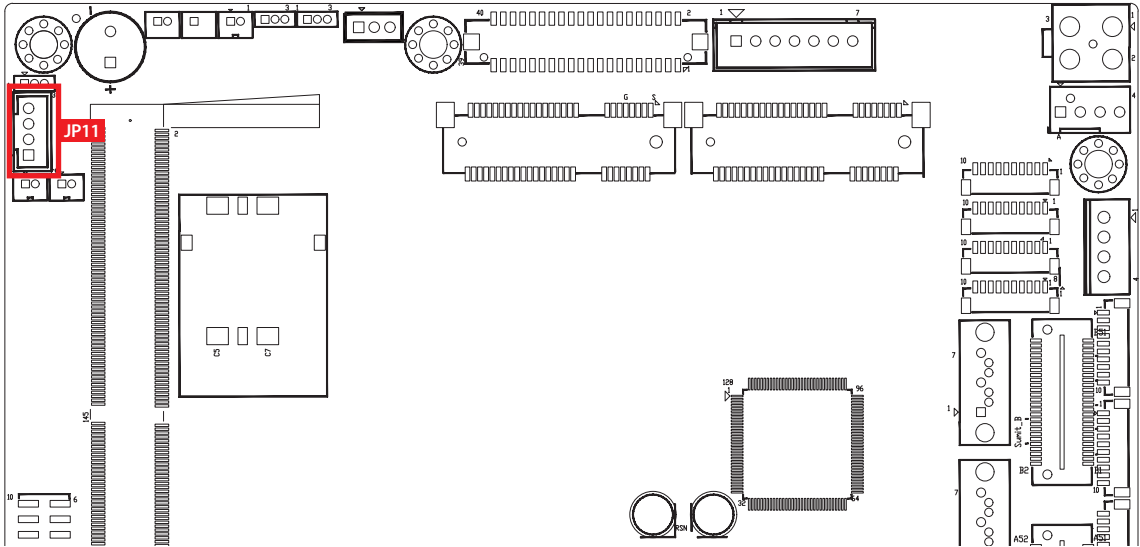
JSEL\_DIO header is for SINK/SOURCE mode selection on ISO\_DIO board (DMX-100-E)

JDIO1 and JDIO2 pins are defined in the following table :


	Pin No.	JDIO1 Definition	JDIO2 Definition
	1	SIO_GPI80	SIO_GPO70
	2	SIO_GPI81	SIO_GPO71
	3	SIO_GPI82	SIO_GPO72
	4	SIO_GPI83	SIO_GPO73
	5	SIO_GPI84	SIO_GPO74
	6	SIO_GPI85	SIO_GPO75
	7	SIO_GPI86	SIO_GPO76
	8	SIO_GPI87	SIO_GPO77
	9	+3.3V	+3.3V
	10	GND	GND



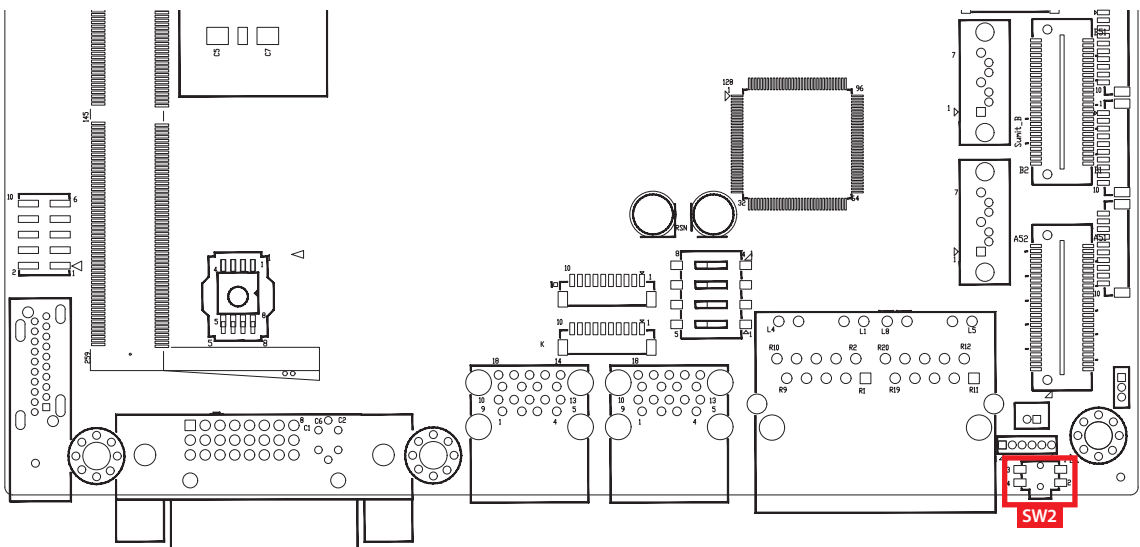
## 2.2.22 JP11 : IGNITION Control and Remote Power on switch



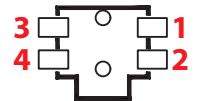
Pin assignment as the following table:

	Pin No.	Definition	Pin No.	Definition
	1	2	FP_PWR_BTN_P	2
3	4	IGNITION	4	GND

## 2.2.23 SW2 : RESET Button



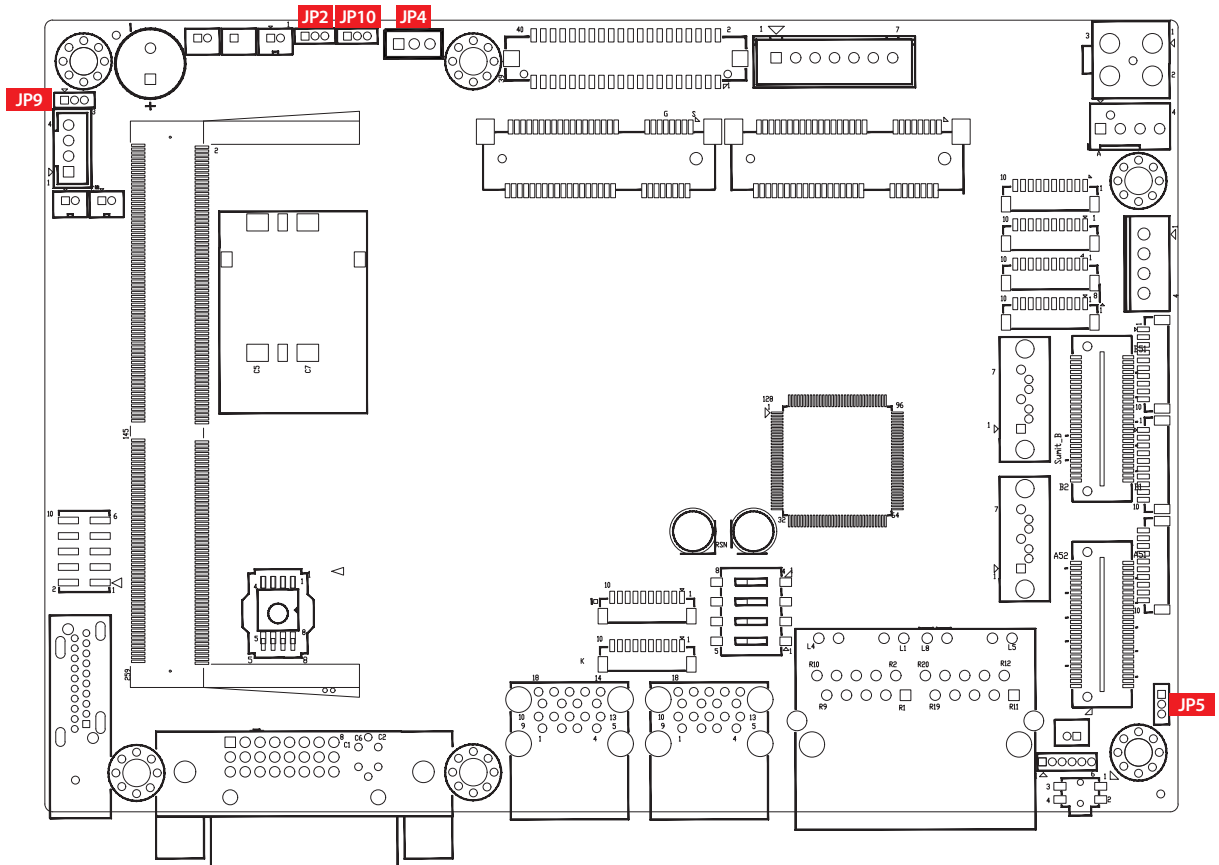
Pin assignment as the following table:

	Pin No.	Definition	Pin No.	Definition
	1	2	FP_RST_BTN_N	2
3	4	FP_RST_BTN_N	4	GND

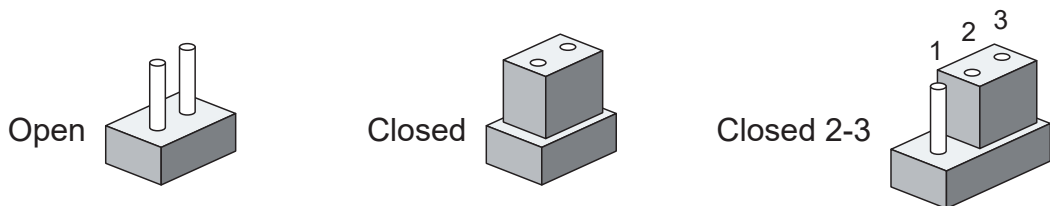
## 2.3 Jumper Settings

### 2.3.1 Front View of EMBC-3000 Main Board with Jumper Location

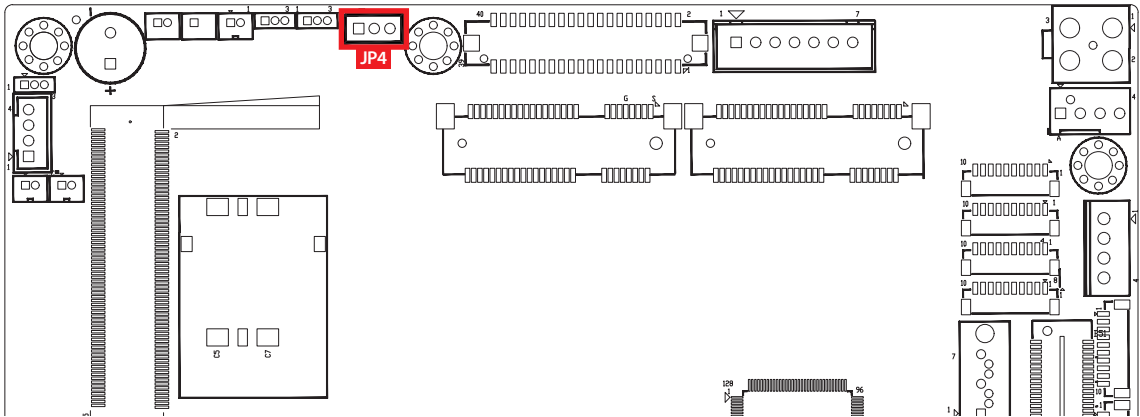
The figure below is the top view of the EMBC-3000 main board. It shows the location of the jumpers.



You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper, you connect the pins with the clip. To "open" a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



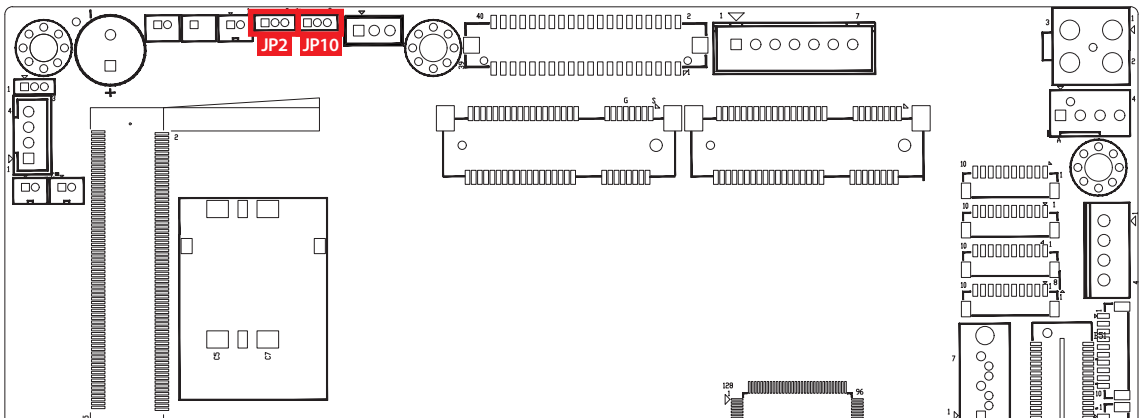
### 2.3.2 JP4 : Power Selection for LVDS Module



JP4 provides LVDS voltage selection function, Closing Pin 1 and Pin 2 is for 3.3V LVDS power input; closing Pin 2 and Pin 3 is for 5V LVDS power input.

	Pin No.	Definition
	1-2	+3.3V (Default)
	2-3	+5V

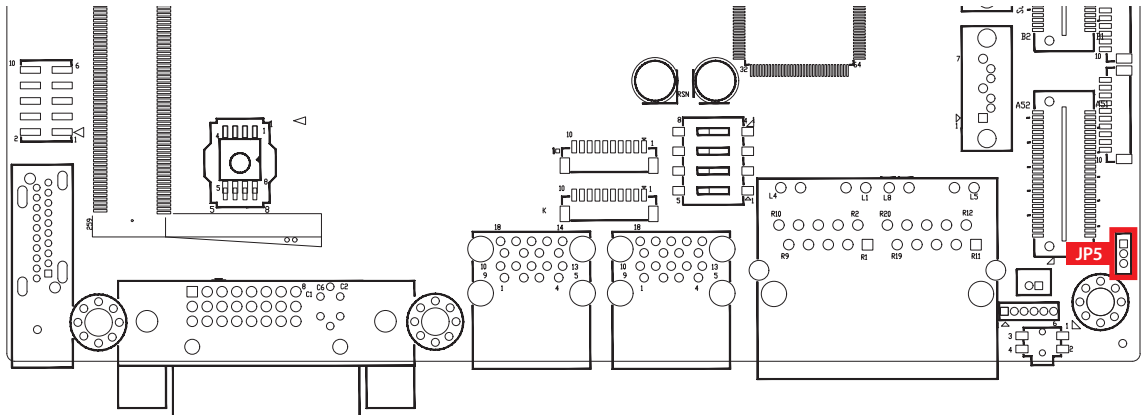
### 2.3.3 JP2 : Clear CMOS, JP10 : Clear ME



	Pin No.	Definition
	1-2	Normal
	2-3	Clear CMOS

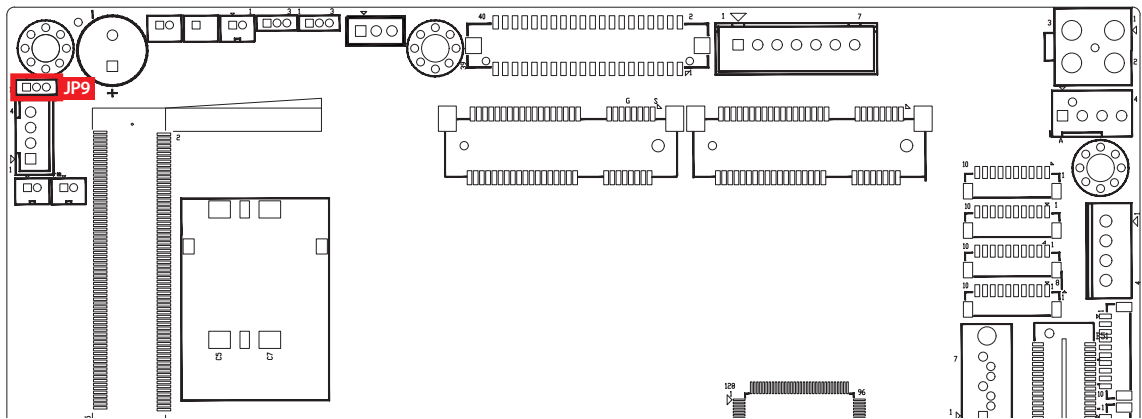
	Pin No.	Definition
	1-2	Normal
	2-3	Clear ME

### 2.3.4 JP5 : Power Selection for EXT and INT USB 3.1 Gen2/USB 2.0 Ports



	Pin No.	Power
	1-2	+5V Standby Power
	2-3	+5V System Power

### 2.3.5 JP9 : Backlight Control Level Selection



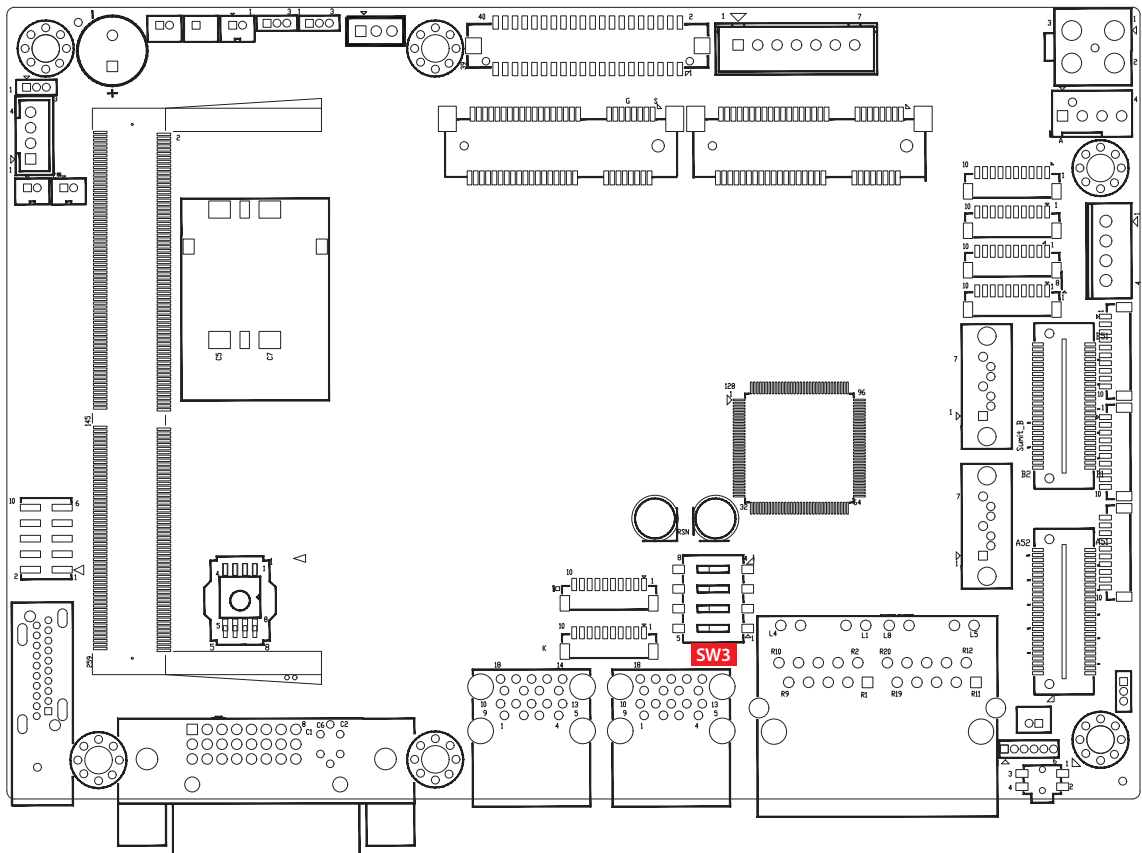
	Pin No.	Power
	1-2	3.3V
	2-3	5V

## 2.4 Ignition Control

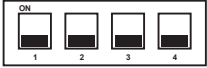

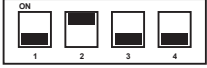
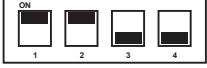
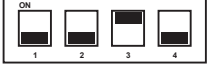
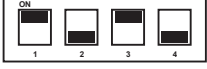
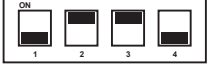
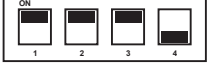
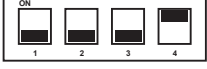
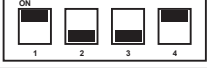
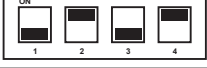


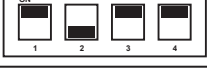
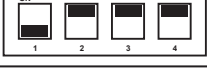
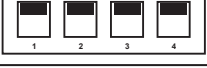
EMBC-3000 series provides ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.

### 2.4.1 Adjust Ignition Control Modes

EMBC-3000 series provides 16 modes of different power on/off delay periods adjustable via SW3 switch. The default rotary switch is set to 0 in ATX/AT power mode.



The modes are listed in the following table :

Deep Switch Position	Power on delay	Power off delay	Switch Position
0	ATX/AT mode (Default)		
1	No delay	No delay	
2	No delay	5 seconds	
3	No delay	10 seconds	
4	No delay	20 seconds	
5	5 seconds	30 seconds	
6	5 seconds	60 seconds	
7	5 seconds	90 seconds	
8	5 seconds	30 minutes	
9	5 seconds	1 hour	
A	10 seconds	2 hours	
B	10 seconds	4 hours	
C	10 seconds	6 hours	
D	10 seconds	8 hours	
E	10 seconds	12 hours	
F	10 seconds	24 hours	

## 2.4.2 Ignition Control Wiring

To activate ignition control, you need to provide IGN signal via the 3-pin pluggable terminal block locates in the back panel. Please find below the general wiring configuration

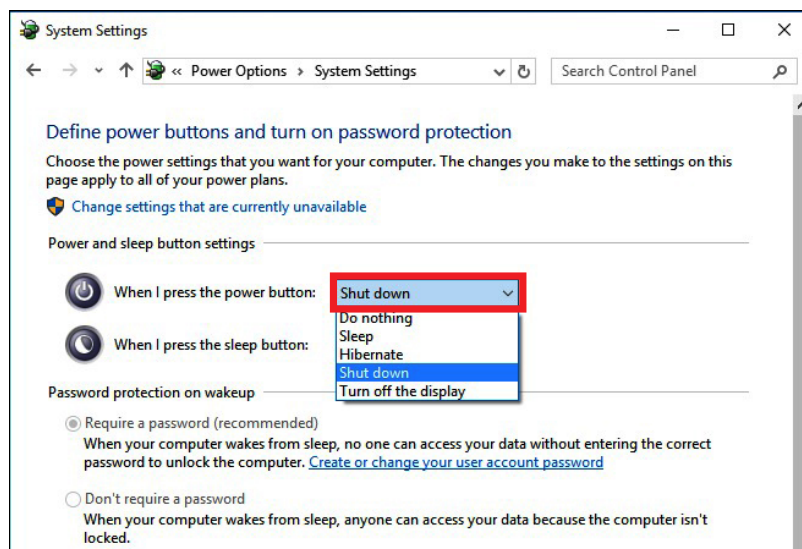


Pin No.	Definition
1	Ignition (IGN)
2	SW+
3	SW-

For testing purpose, you can refer to the picture blow to simulate ignition signal input controlled by a latching switch.

Note :

1. DC power source and IGN share the same ground.
2. EMBC-3000 supports 9V to 48V wide range DC power input in ATX/AT mode. In Ignition mode, the input voltage is fixed to 12V/24V for car battery scenario.
3. For proper ignition control, the power button setting should be "Power Down" mode.



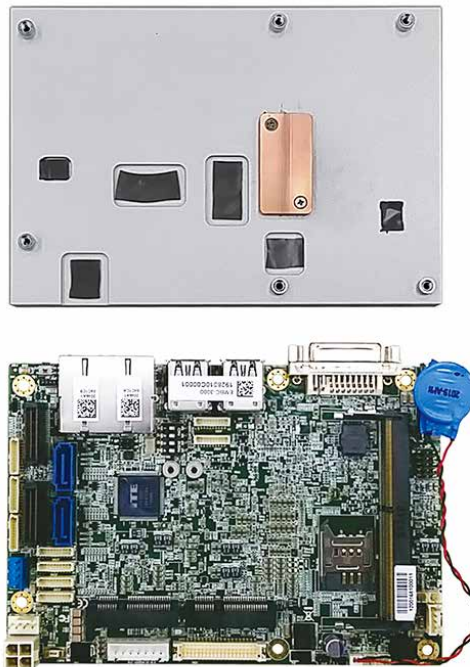
In Windows for example, you need to set "When I press the power button" to Shut down.

# 3

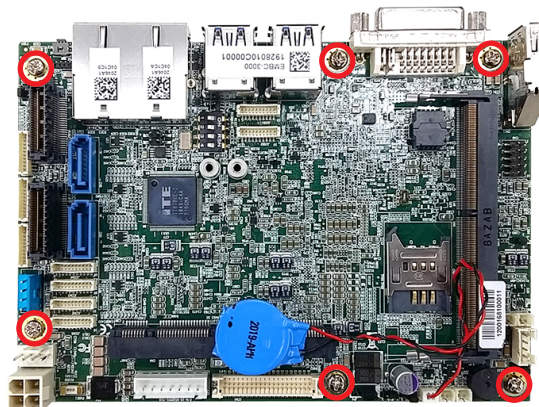
## SYSTEM SETUP

### 3.1 Installing Heat Spreader

**Step 1** Place the motherboard and heat sink in position.



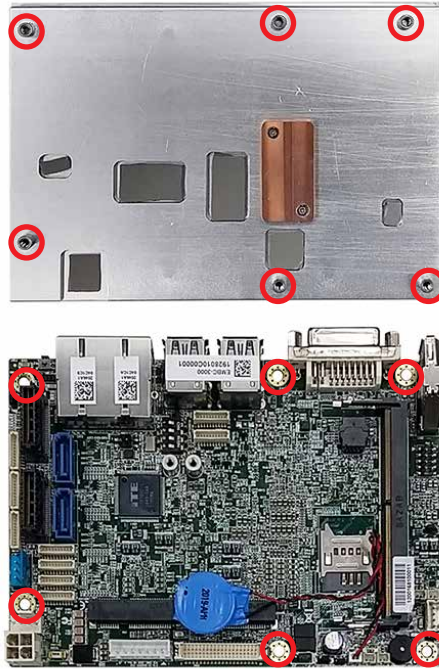
**Step 2** Fasten five PH-M3x6 screws (circled in red).



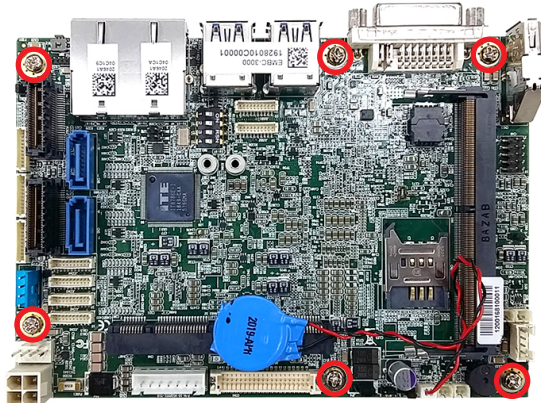


## 3.2 Installing Heat Sink

**Step 1** Ensure the screw locations on EMBC-3000 fit the ones on the heat sink.

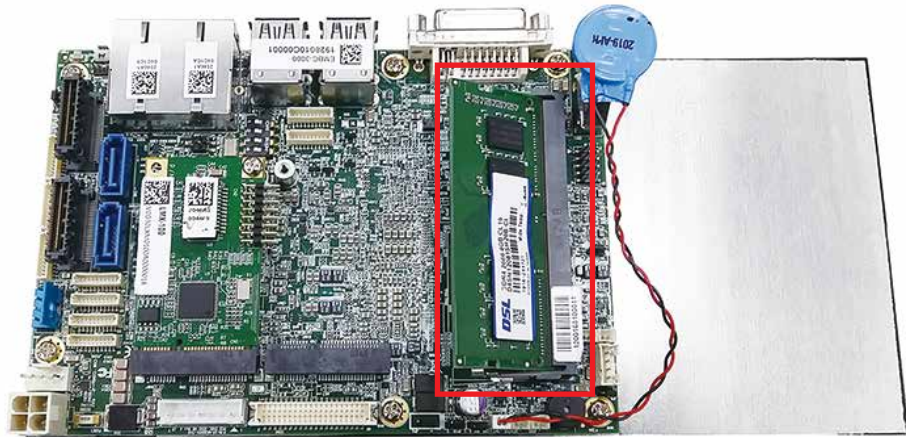


**Step 2** Fasten five PH-M3x6 screws (circled in red).

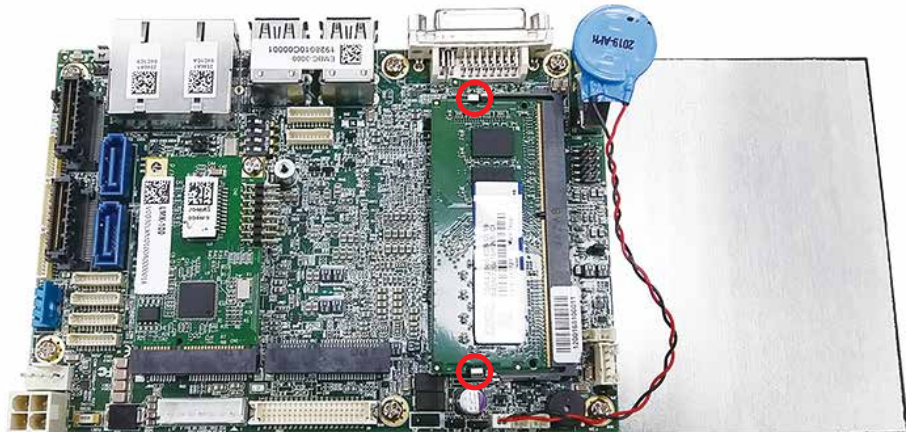


### 3.3 Installing DDR4 SO-DIMM Modules

**Step 1** Install DDR4 RAM module into SO-DIMM slot.

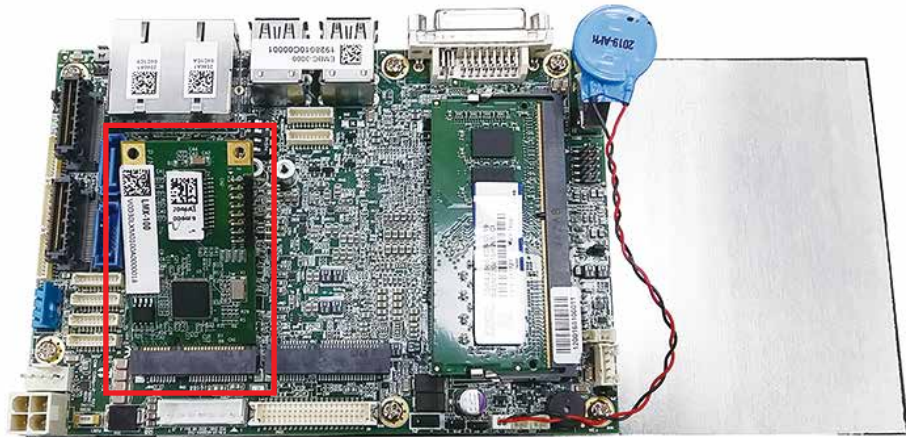


**Step 2** Make sure the RAM module is locked by the memory slot.

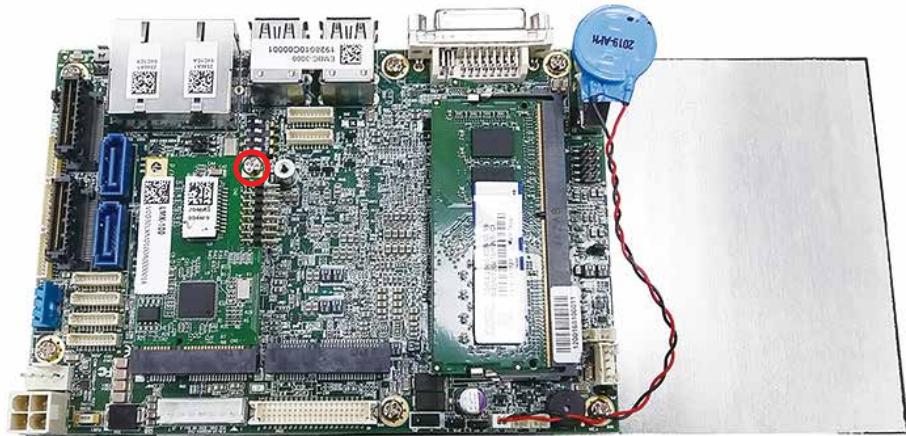


### 3.4 Installing Mini PCIe Card

**Step 1** Install Mini PCIe card into the Mini PCIe slot.

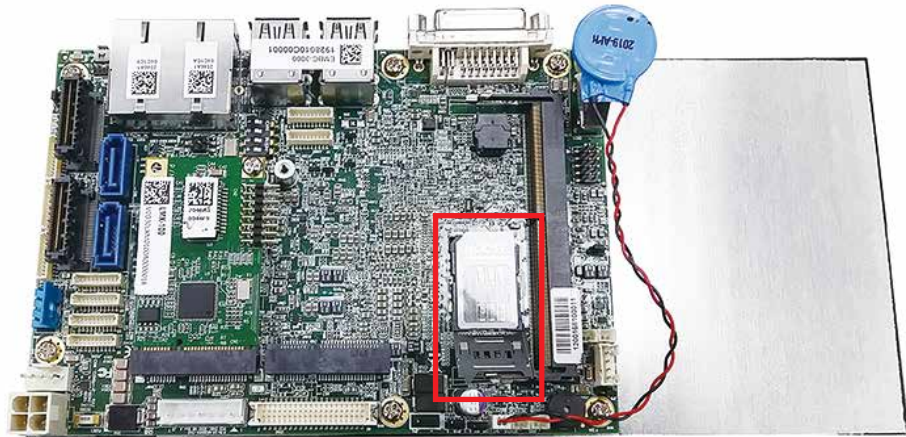


**Step 2** Fasten one M2.5 screw.

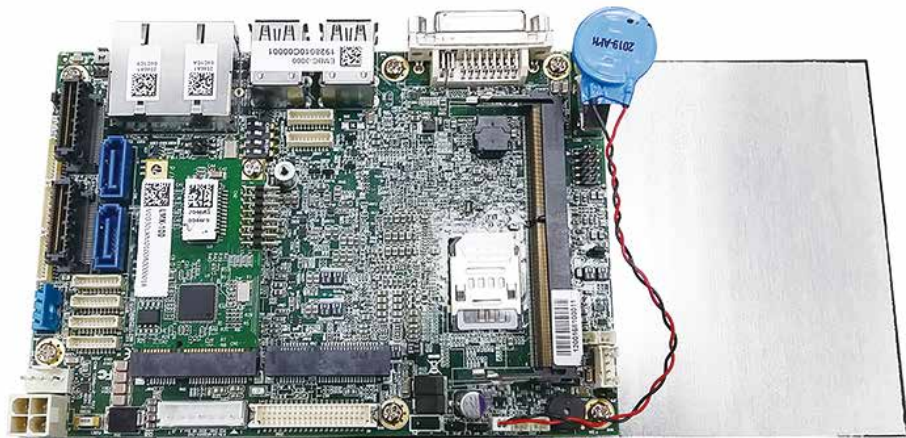


## 3.5 Installing SIM Card

**Step 1** Open the SIM card cover.



**Step 2** Install SIM card into the SIM card slot and then close and lock the SIM card cover.



# 4

## BIOS SETUP

### 4.1 BIOS Settings

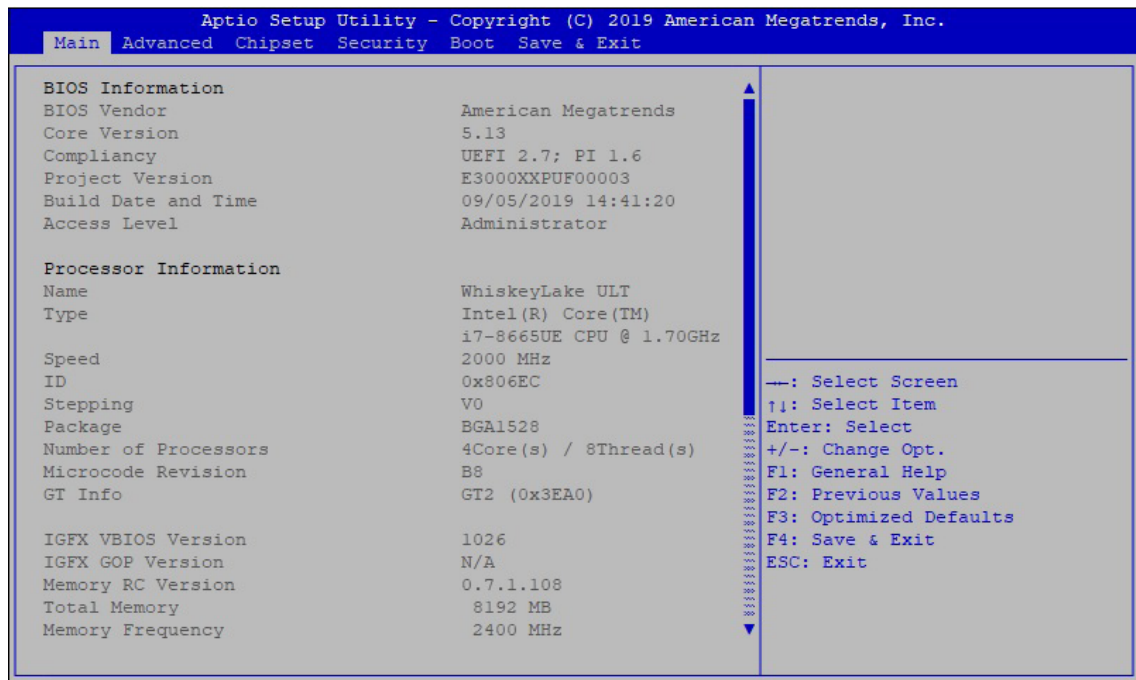


Figure 4-1 : Entering Setup Screen

BIOS provides an interface for users to check and change system configuration. The BIOS setup program is accessed by pressing the <Del> key when POST display output is shown.

## 4.2 Main

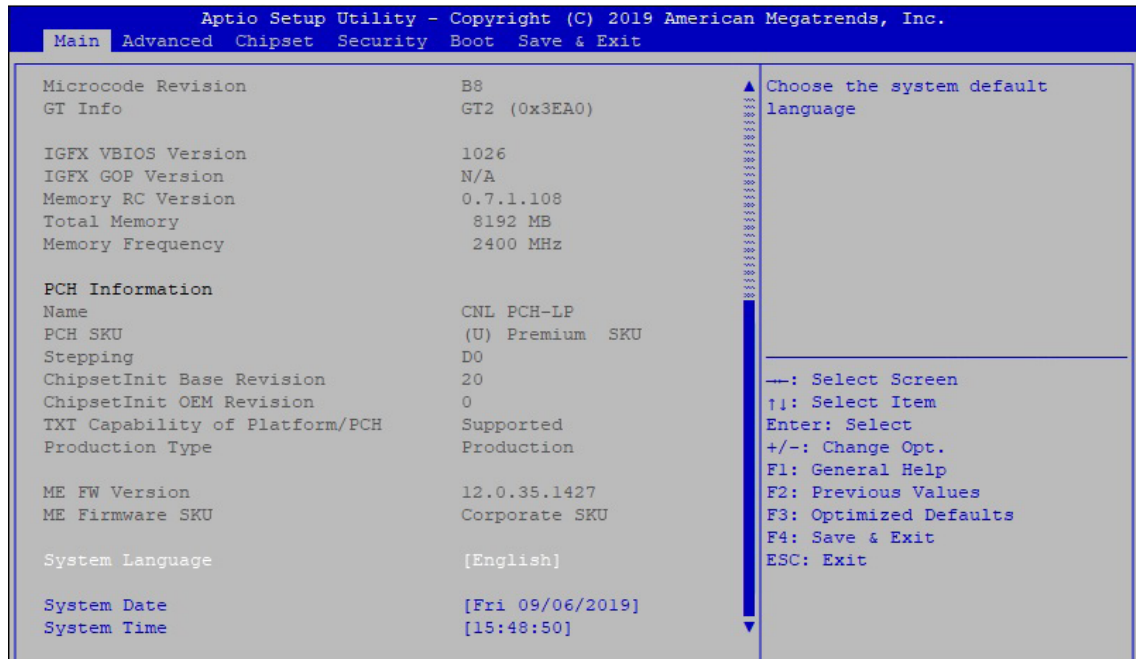


Figure 4-2 : BIOS Main Menu

The main menu displays BIOS version and system information. There are two options on the main menu, system date and system time.

### System Date

Set the date. Use tab to switch between date elements.

### System Time

Set the time. Use tab to switch between time elements.

## 4.3 Advanced Functions

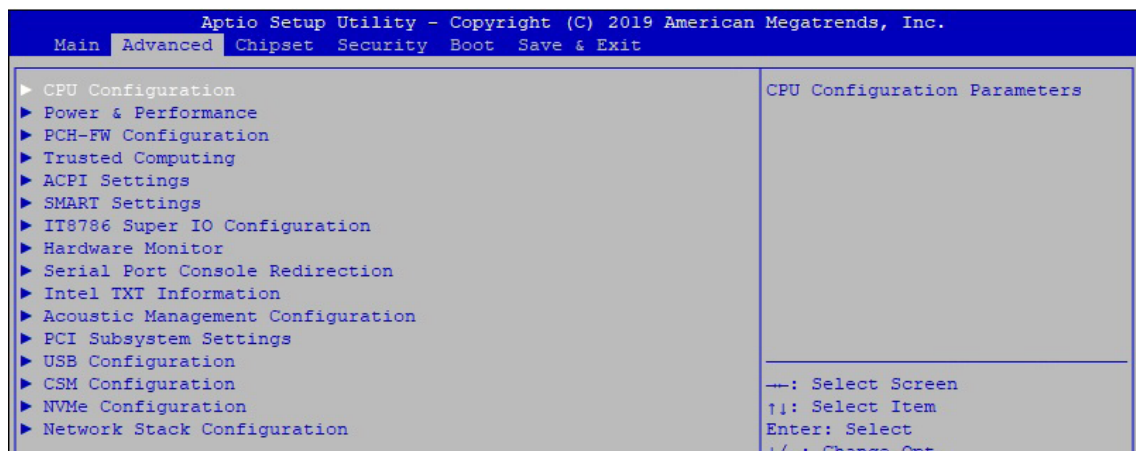


Figure 4-3 : BIOS Advanced Menu

Select advanced tab to enter advanced BIOS setup options such as CPU configuration, SATA configuration, and USB configuration.

### 4.3.1 CPU Configuration

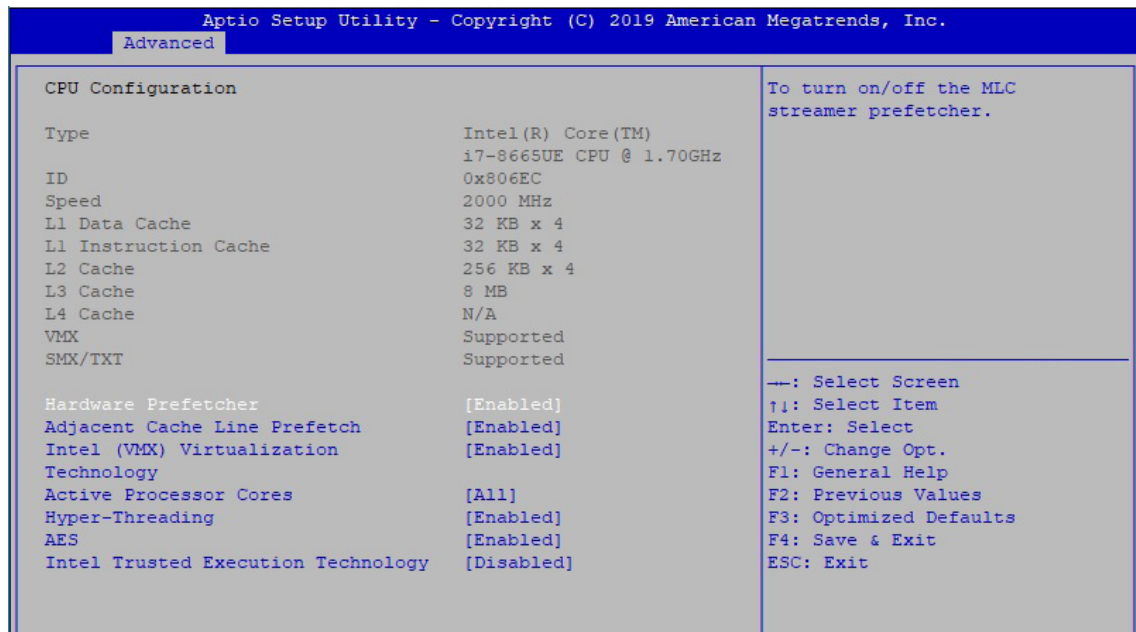


Figure 4-3-1 : CPU Configuration

#### Hardware Prefetcher

To turn on/off the MLC streamer prefetcher.

#### Adjacent Cache Line Prefetch

To turn on/off prefetching of adjacent cache lines.

#### 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.

#### Hyper-threading

Enabled or Disabled Hyper-Threading Technology.

#### AES

Enable/disable AES (Advanced Encryption Standard)

#### Intel Trusted Execution Technology

Enables utilization of additional hardware capabilities provided by Intel Trusted Execution Technology.

Changed require a full power cycle to take effect.

## 4.3.2 Power & Performance



Figure 4-3-2 : Power & Performance

### 4.3.2.1 CPU – Power Management Control

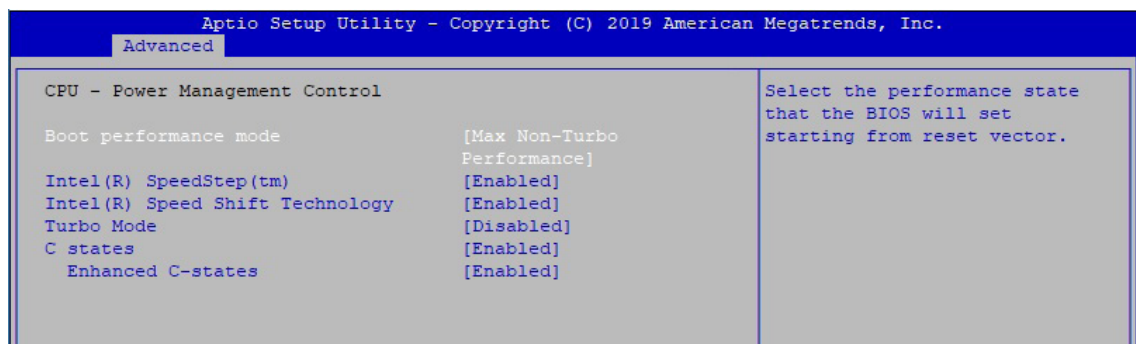


Figure 4-3-2-1 : CPU – Power Management Control

#### Boot performance mode

Select the performance state that the BIOS will set starting from reset vector.

#### Intel® SpeedStep™

Allows more than two frequency ranges to be supported.

#### Intel® Speed shift Technology

Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPCv2 interface to allow for hardware controlled P-states.

#### Turbo Mode

Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).

#### C states

Enable or disable CPU Power Management. Allows CPU to go to C states when it's no 100% utilized.

#### Enhanced C-states

Enable/disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.



### 4.3.2.2 GT – Power Management Control

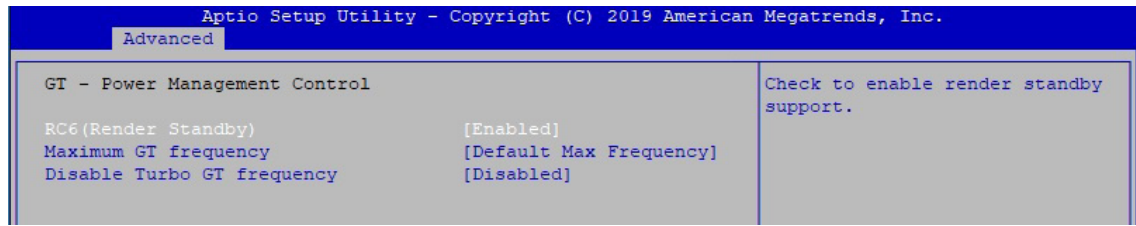


Figure 4-3-2-2 : GT – Power Management Control

#### RC6 (Render Standby)

Check to enable render standby support.

#### Maximum GT frequency

Maximum GT frequency limited by the user. Choose between 300MHz (RPN) and 1150MHz (RP0). Value beyond the range will be clipped to min/max supported by SKU.

#### Disable Turbo GT frequency

Enabled : Disables Turbo GT frequency. Disabled : GT frequency is not limited.

### 4.3.3 PCH-FW Configuration

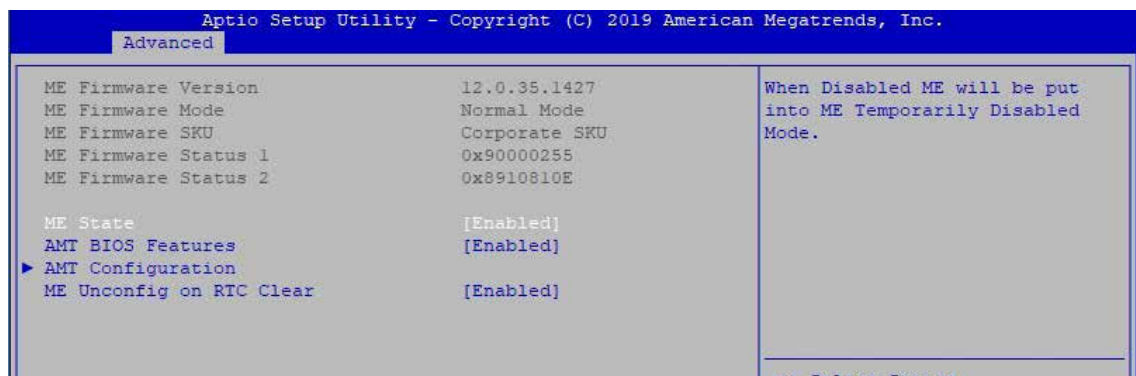


Figure 4-3-3 : PCH-FW Settings

#### ME State

When Disabled ME will be put into ME Temporarily Disabled Mode.

#### AMT BIOS Features

When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup. Note : This option does not disable Manageability Features in FW.

#### AMT Configuration

Configure Intel Active Management Technology Parameters.

#### ME Unconfig on RTC Clear

Disabling this option will cause ME not be unconfigured on RTC clear.

### 4.3.4 Trusted Computing

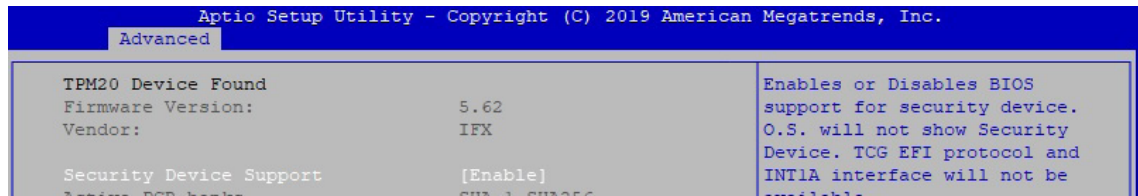


Figure 4-3-4 : Trusted Computing

Control the TPM device status and display related information if TPM chip is present.

### 4.3.5 ACPI Settings

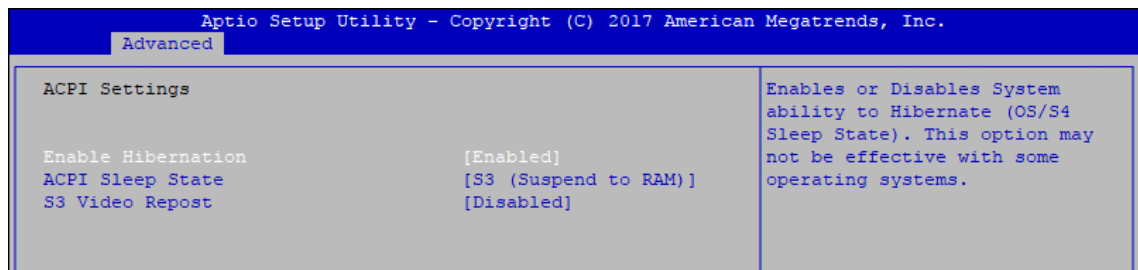


Figure 4-3-5 : ACPI Settings

#### 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.

#### S3 Video Repost

Enable or disable S3 Video Repost.

### 4.3.6 SMART Settings

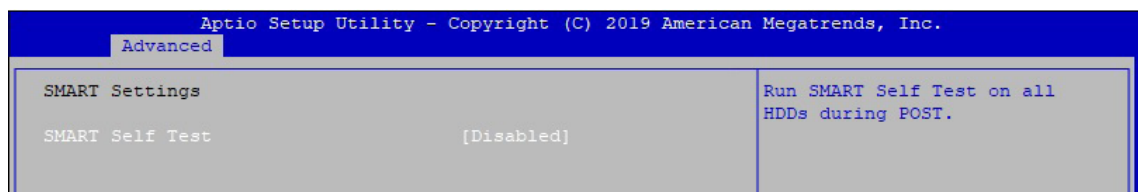


Figure 4-3-6 : SMART Settings

#### SMART Self Test

Run SMART self-test on all HDDs during POST.

## 4.3.7 IT8786 Super IO Configuration



Figure 4-3-7 : Super IO Settings

### Serial Port 1 Configuration

Set parameters of serial port 1 (COM1).

### Serial Port 2 Configuration

Set parameters of serial port 2 (COM2).

### Serial Port 3 Configuration

Set parameters of serial port 3 (COM3).

### Serial Port 4 Configuration

Set parameters of serial port 4 (COM4).

## 4.3.8 Hardware Monitor

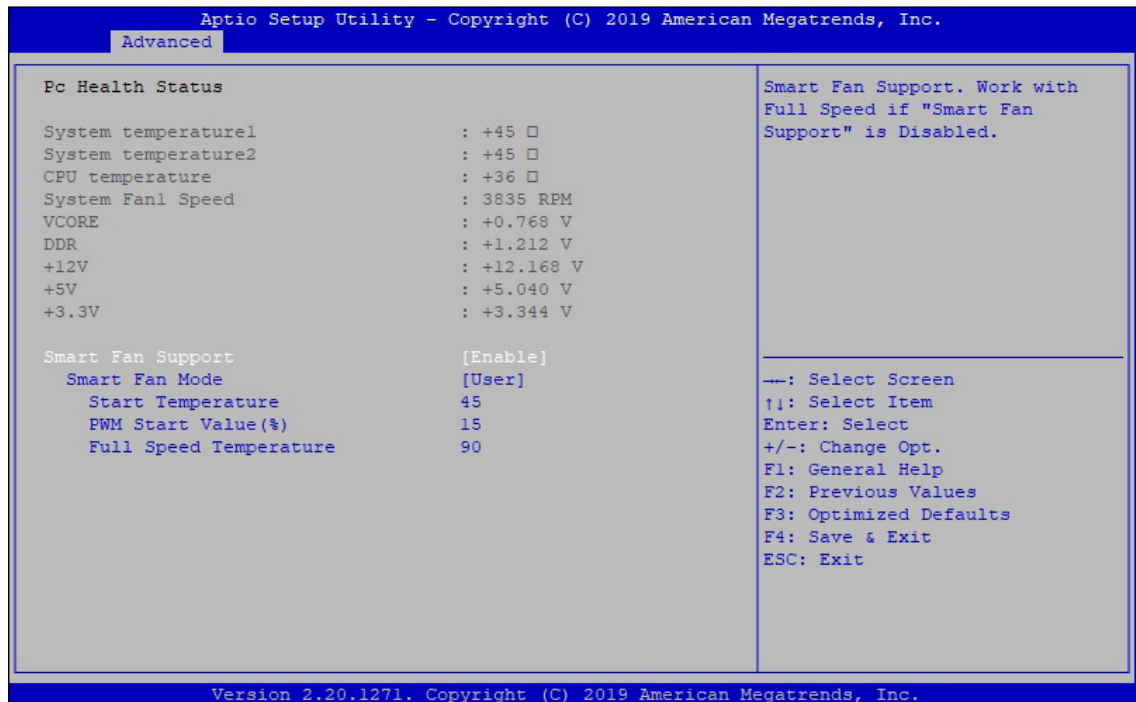


Figure 4-3-8 : Hardware Monitor and Settings

The IT8786 SIO features an enhanced hardware monitor providing thermal, fan speed, and system voltages' status monitoring.

### Smart Fan Support

Smart Fan Support. Work with Full Speed if "Smart Fan Support" is Disabled.

### Smart Fan Mode

Default : Using the default smart fan table.

User : Setting parameters by user.

### Start Temperature

Temperature Limit value of Fan Start (Degree C).

(Range : 10-80)

### PWM Start Value (%)

Default PWM Value of Fan.

(Range : 15%-100%)

### Full Speed Temperature

Temperature Limit value of Fan Full Speed (Degree C).

(Range : 50-90)

### 4.3.9 Serial Port Console Redirection

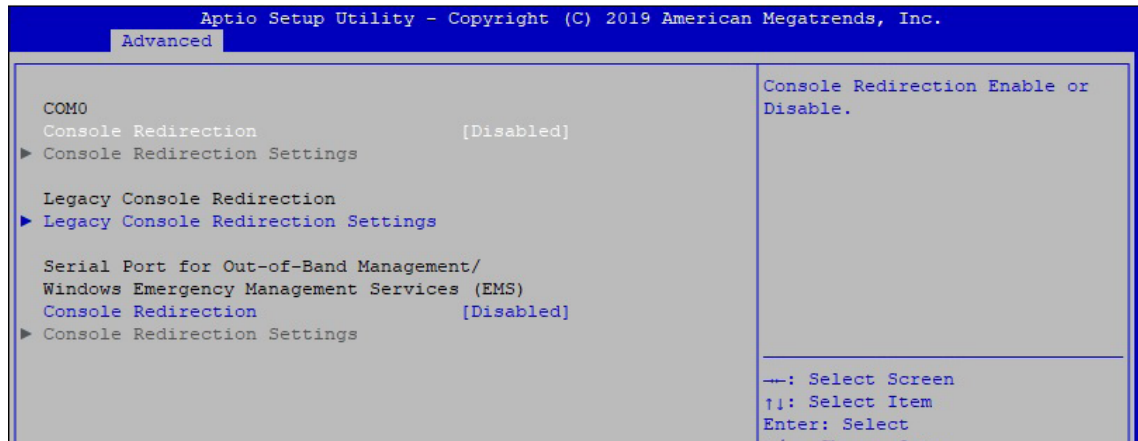


Figure 4-3-9 : Serial Port Console Redirection Settings

#### 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.

#### Legacy Console Redirection Settings

Legacy Console Redirection Settings.

#### Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS)

Console Redirection Enable or Disable.

### 4.3.10 Intel TXT Information

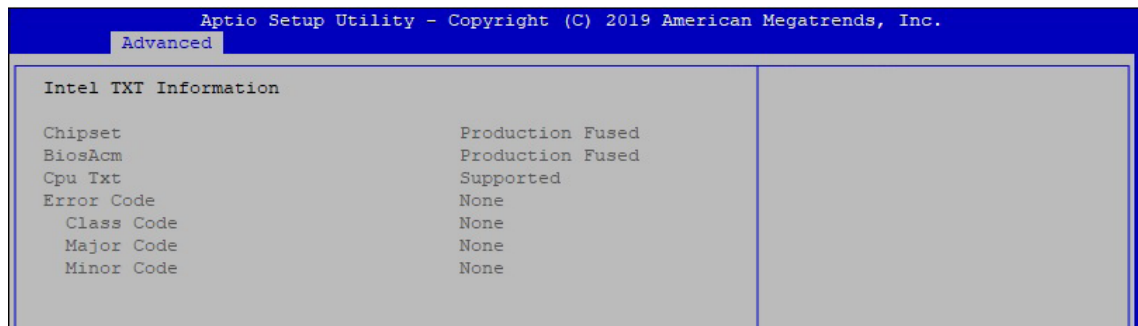


Figure 4-3-10 : Intel TXT Information

Display Intel TXT information.

### 4.3.11 Acoustic Management Configuration

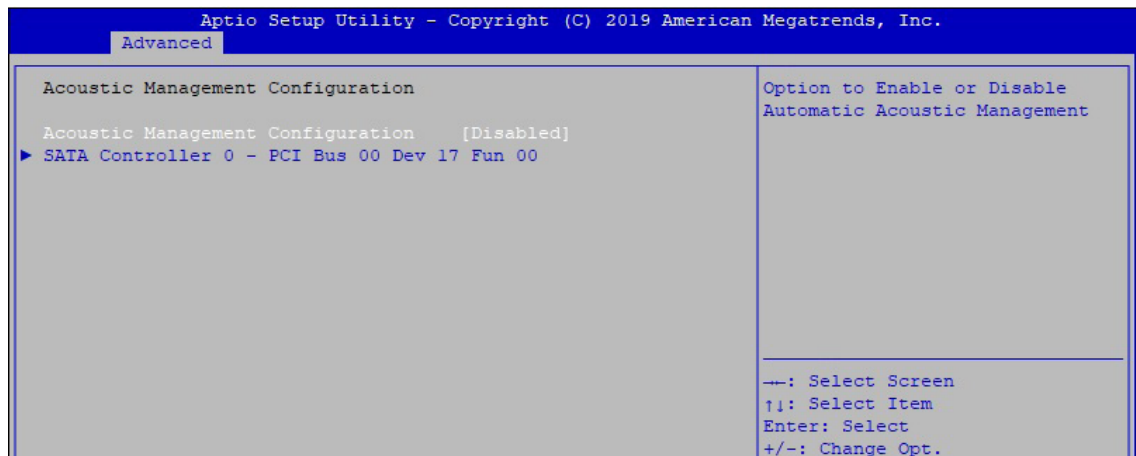


Figure 4-3-11 : Acoustic Management Settings

### Acoustic Management Configuration

Option to enable or disable automatic acoustic management.

### 4.3.12 PCI Subsystem Settings

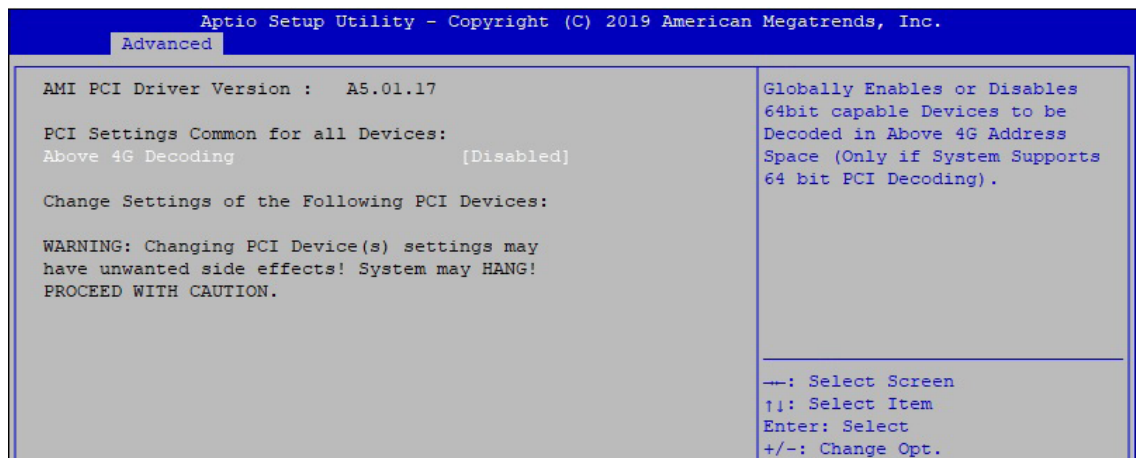


Figure 4-3-12 : PCI Subsystem Settings

### Above 4G Decoding

Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

### 4.3.13 USB Configuration

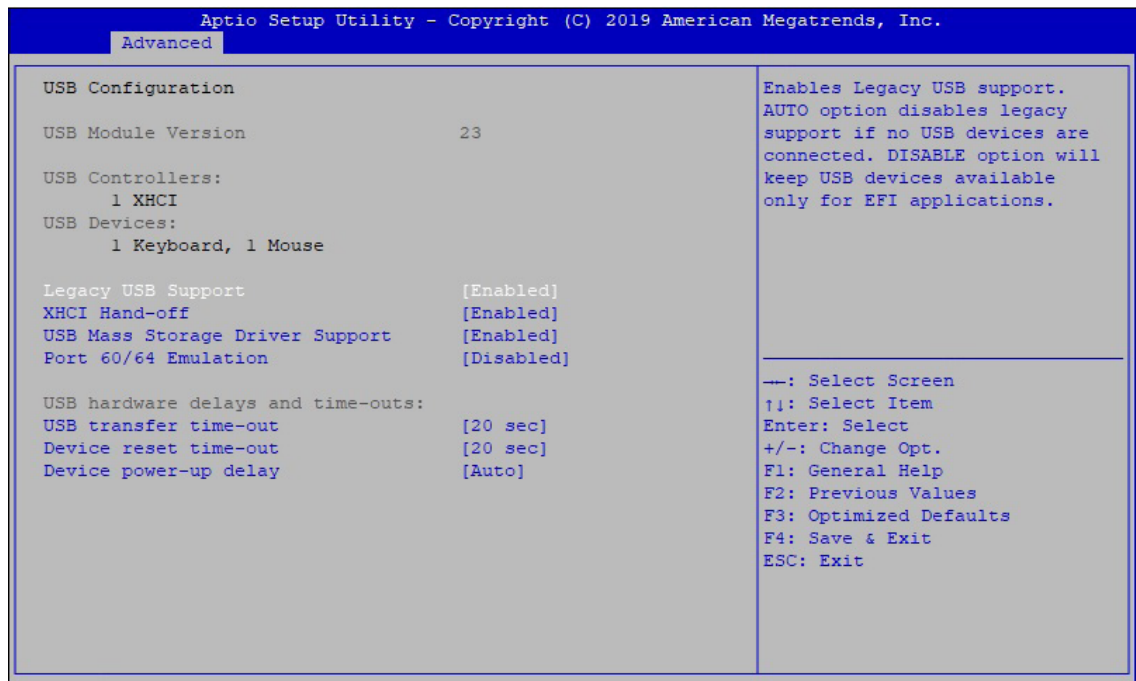


Figure 4-3-13 : USB Settings

#### 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 OSES 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.

#### Port 60/64 Emulation

Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OS's.

#### 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 100ms, for a hub port the delay is taken from hub descriptor.

### 4.3.14 CSM Configuration

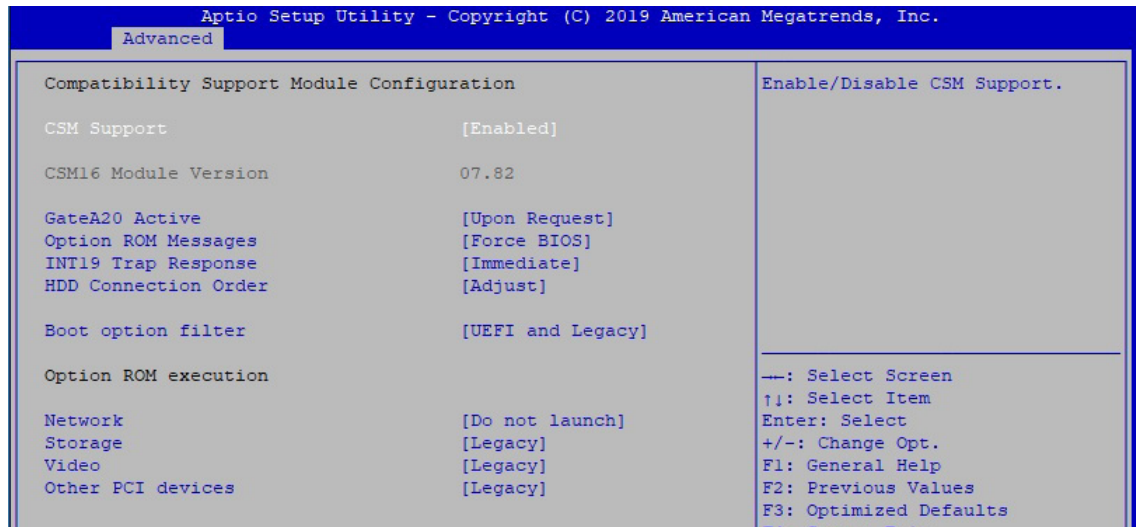


Figure 4-3-14 : CSM Settings

#### CSM Support

Enable/disable CSM support.

#### GateA20 Active

UPON REQUEST-GA20 can be disabled using BIOS services.

ALWAYS-do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

#### Option ROM Messages

Set display mode for option ROM.

#### INT19 Trap Response

BIOS reaction on INT19 trapping by option ROM :

IMMEDIATE - execute the trap right away;

POSTPONED - execute the trap during legacy boot.

#### HDD Connection Order

Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h.

#### Boot option filter

This option controls Legacy/UEFI ROM's 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.



### 4.3.15 NVMe Configuration

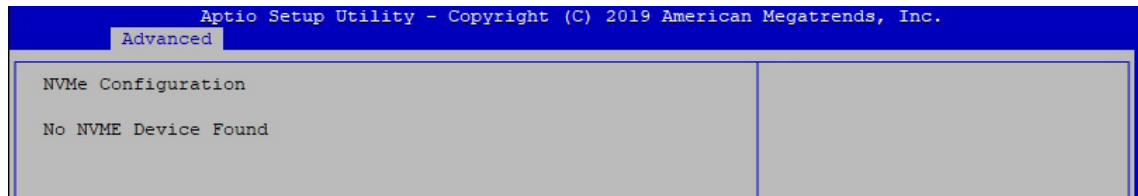


Figure 4-3-15 : NVMe Configuration

Display NVMe Controller and Drive information.

### 4.3.16 Network Stack Configuration

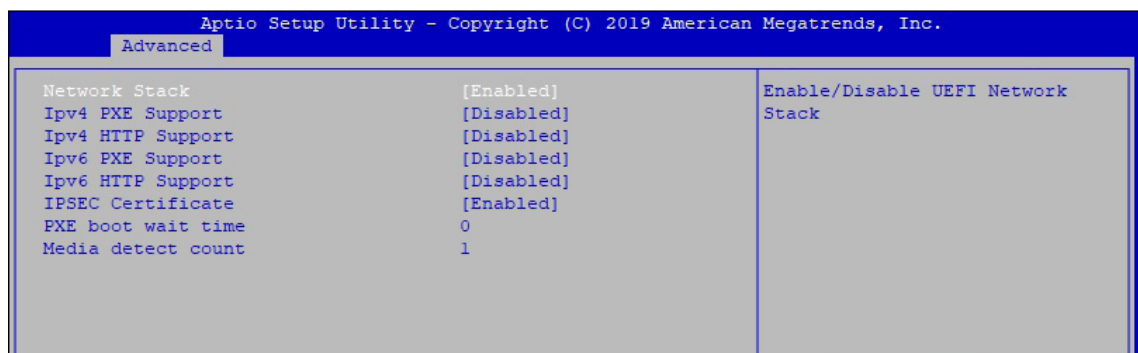


Figure 4-3-16 : Network Stack Configuration

#### Network Stack

Enable/disable UEFI Network Stack.

#### Ipv4 PXE Support

Enable/disable IPv4 PXE boot support.

#### Ipv4 HTTP Support

Enable/disable IPv4 HTTP boot support.

#### Ipv6 PXE Support

Enable/disable IPv6 PXE boot support.

#### Ipv6 HTTP Support

Enable/disable IPv6 HTTP boot support.

#### IPSEC Certificate

Support to Enable/disable IPSEC certificate for Ikev.

#### PXE boot wait time

Wait time to press EEEEEESC key to abort the PXE boot.

#### Media detect count

Number of times presence of media will be checked.

## 4.4 Chipset Functions

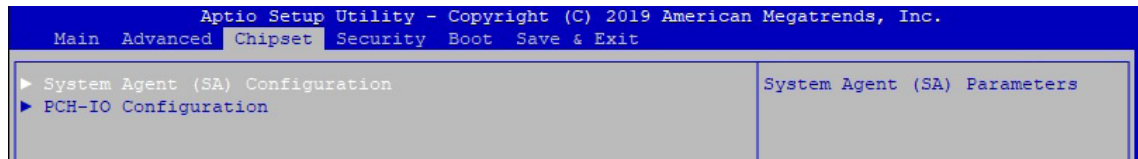


Figure 4-4 : BIOS Chipset Menu

### System Agent (SA) Configuration

System agent (SA) parameters.

### PCH-IO Configuration

PCH parameters.

#### 4.4.1 System Agent (SA) Configuration



Figure 4-4-1 : System Agent Settings

#### VT-d

VT-d capability.

#### Above 4GB MMIO BIOS assignment

Enable/disable above 4GB MemoryMappedIO BIOS assignment. This is disabled automatically when aperture size is set to 2048MB.

#### 4.4.1.1 Memory Configuration

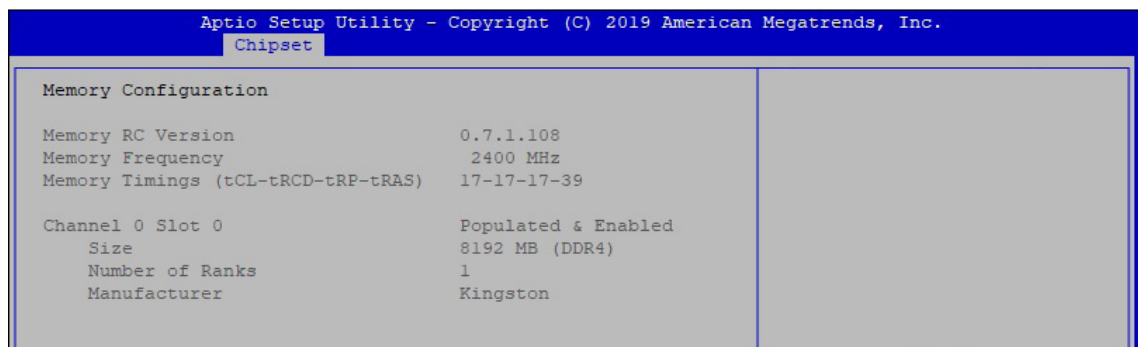


Figure 4-4-1-1 : Memory Information

Display memory information.

## 4.4.1.2 Graphics Configuration

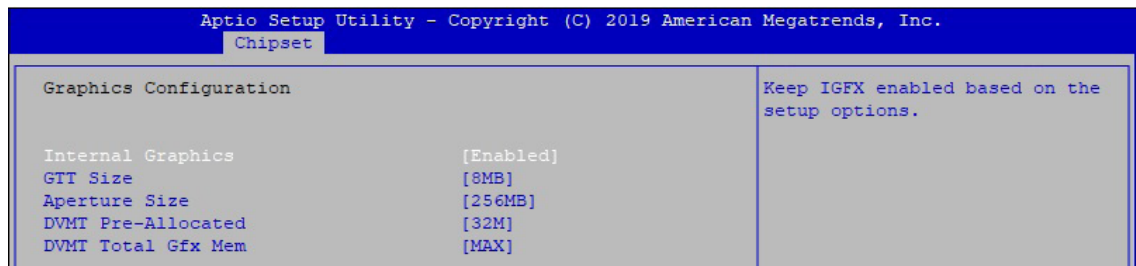


Figure 4-4-1-2 : Graphics Settings

### Internal Graphics

Keep IGFX enabled based on the setup options.

### GTT Size

Select the GTT size.

### Aperture Size

Select the aperture size.

Note : Above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support.

### DVMT Pre-Allocated

Select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device.

### DVMT Total Gfx Mem

Select DVMT5.0 total graphic memory size used by the internal graphics device.

## 4.4.2 PCH-IO Configuration

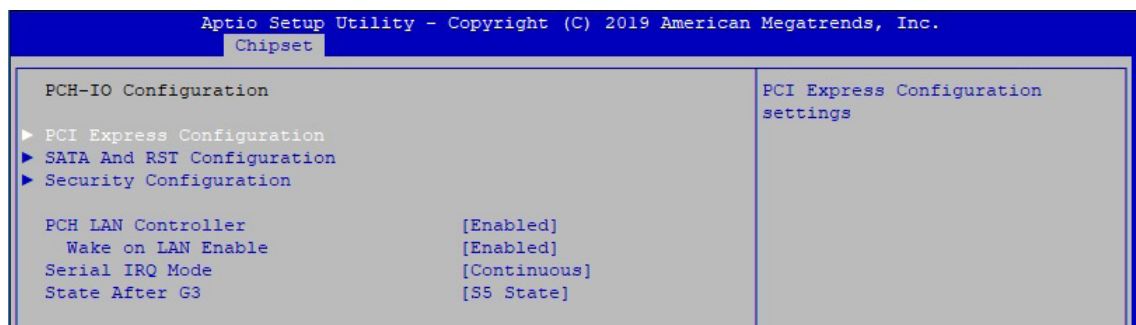


Figure 4-4-2 : PCH-IO Settings

### PCH LAN Controller

Enable or disable onboard NIC.

### Wake on LAN Enable

Enable or disable integrated LAN to wake the system.

### Serial IRQ Mode

Configure serial IRQ mode.

### State After G3

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

## 4.4.2.1 PCI Express Configuration

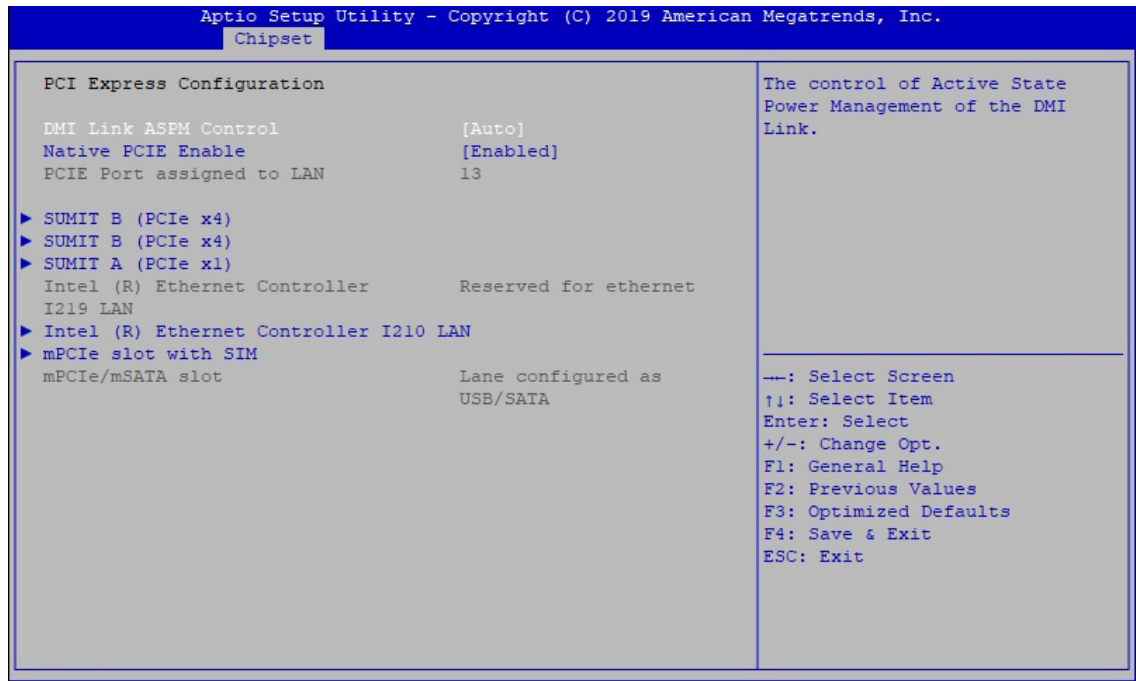


Figure 4-4-2-1 : PCI Express Configuration

### DMI Link ASPM Control

The control of Active State Power Management of the DMI Link.

### Native PCIE Enable

PCI Express Native Support Enable/Disable. This feature is available in vista and beyond Windows OS.

### PCI Express device settings

BIOS options for PCI Express device setting.

## 4.4.2.2 SATA And RST Configuration

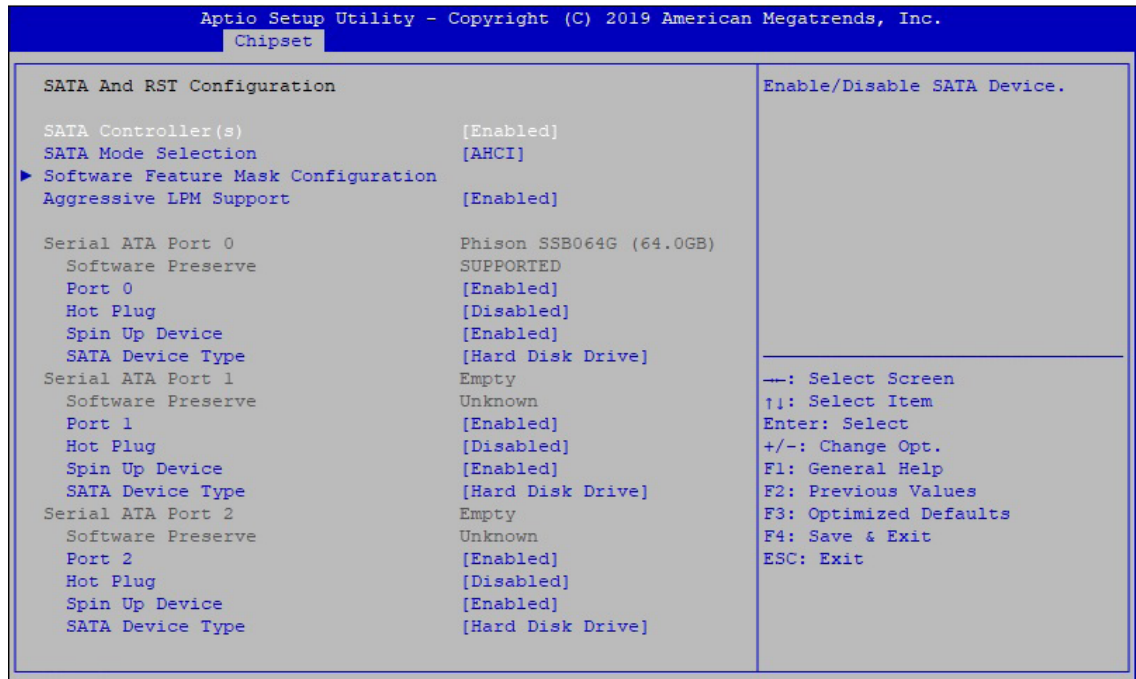


Figure 4-4-2-2 : SATA Devices Settings

### SATA Controller(s)

Enable or disable SATA Device.

### SATA Mode Selection

Determines how SATA controllers operate.

### Software Feature Mask Configuration

RST Legacy OPROM/RST UEFI driver will refer to the SWFM configuration to enable/disable the storage features.

### Aggressive LPM Support

Enable PCH to aggressively enter link power state.

### Options for each SATA port.

#### Port n

Enable or disable SATA port.

#### Hot Plug

Designates this port as Hot Pluggable.

#### Spin Up Device

On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.

#### SATA Device Type

Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

### 4.4.2.3 BIOS Security Configuration of PCH-IO

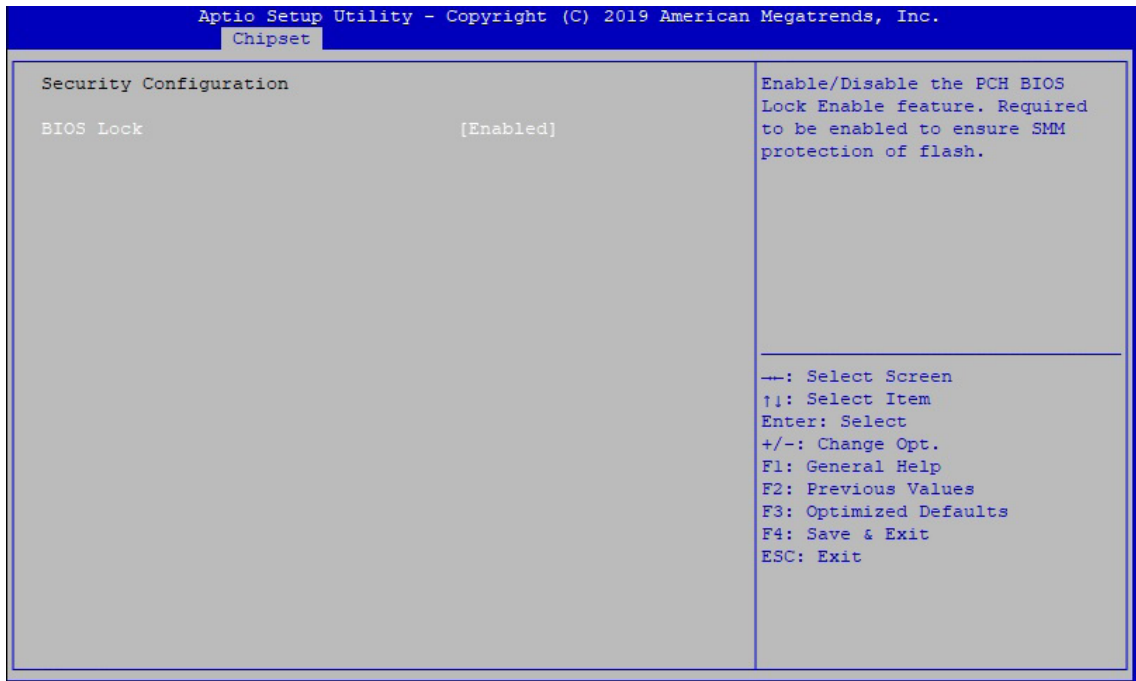


Figure 4-4-2-3 : BIOS Security Settings

#### BIOS Lock

Enable/disable the PCH BIOS lock enable (BLE bit) feature.

## 4.5 Security

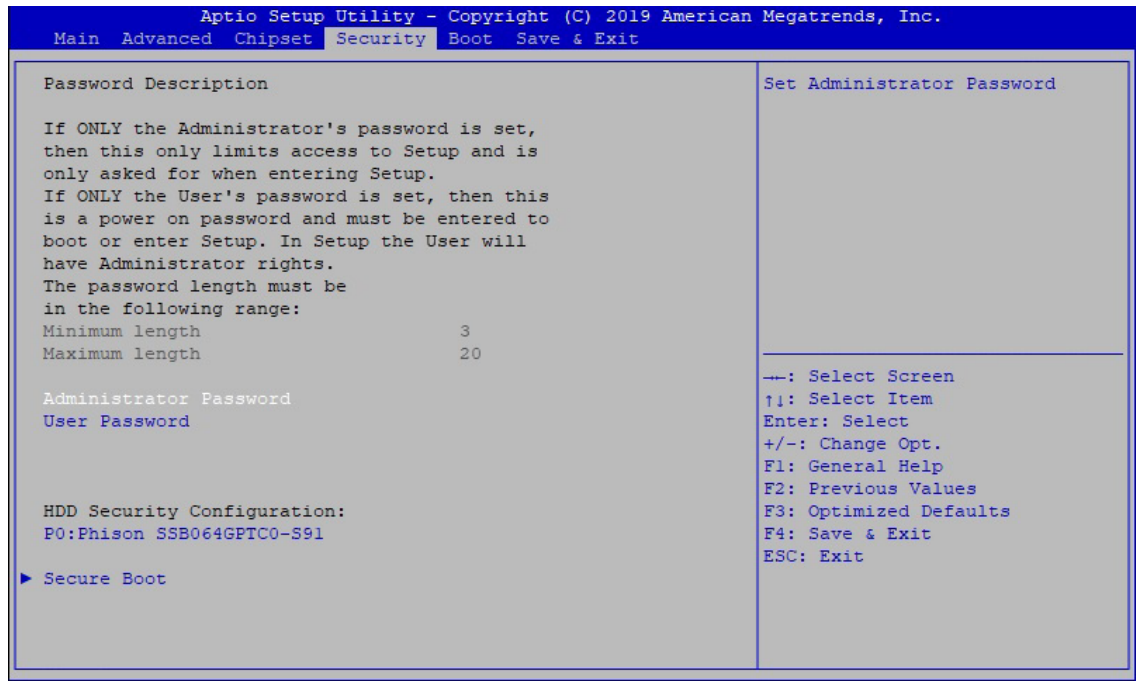


Figure 4-5 : BIOS Security Menu

### Administrator Password

Set administrator password.

### User Password

Set user password.

### Secure Boot

Secure Boot configuration.

## 4.5.1 HDD Security Configuration

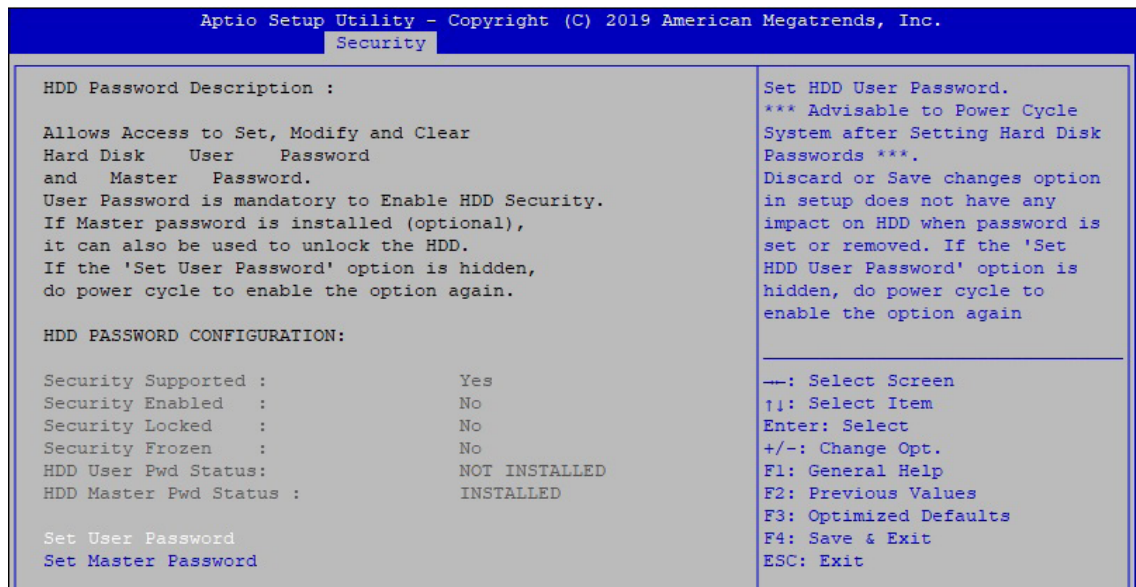


Figure 4-5-1 : HDD Security Settings

### Set User Password

Set HDD user password.

\*\*\* Advisable to power cycle system after setting hard disk passwords \*\*\*.

Discard or save changes option in setup does not have any impact on HDD when password is set or removed. If the 'Set HDD User Password' option is gray, do power cycle to enable the option again.

## 4.5.2 Security Boot



Figure 4-5-2 : Security Boot Settings

### 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.

### Key Management

Enables expert users to modify Secure Boot Policy variables without full authentication.



## 4.6 Boot

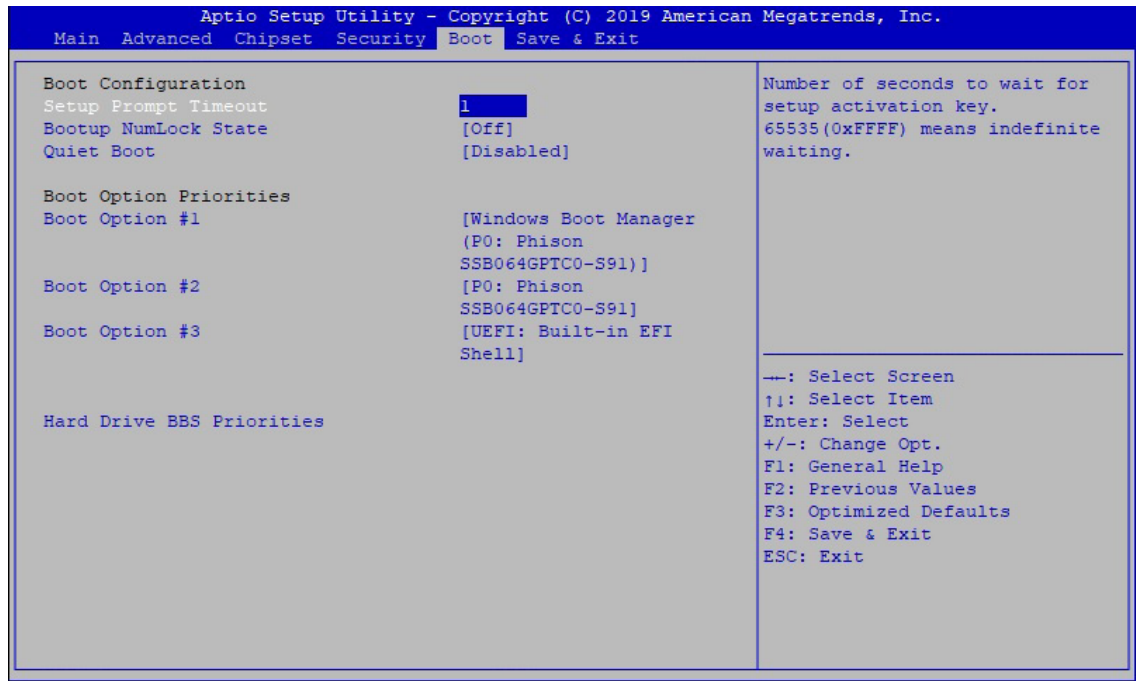


Figure 4-6 : BIOS Boot Menu

### 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 #x

Sets the system boot order.

### Hard Drive BBS Priorities

Set the order of the legacy devices in this group.

## 4.7 Save & Exit

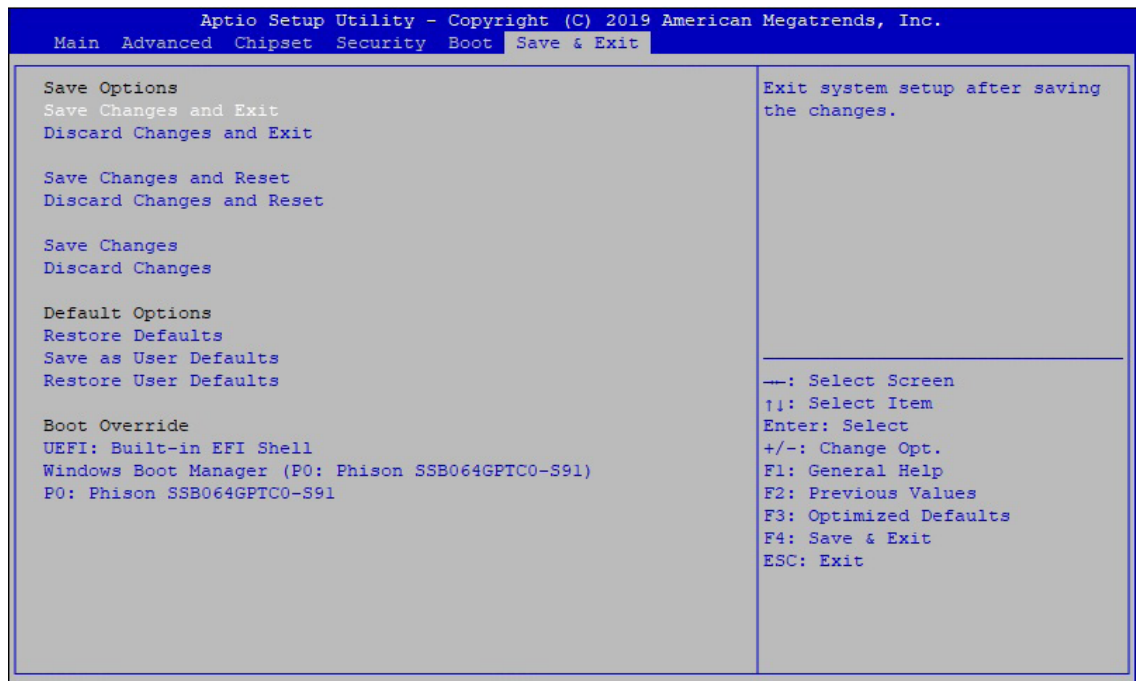


Figure 4-7 : Save & Exit Menu

### 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.

### Default 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.

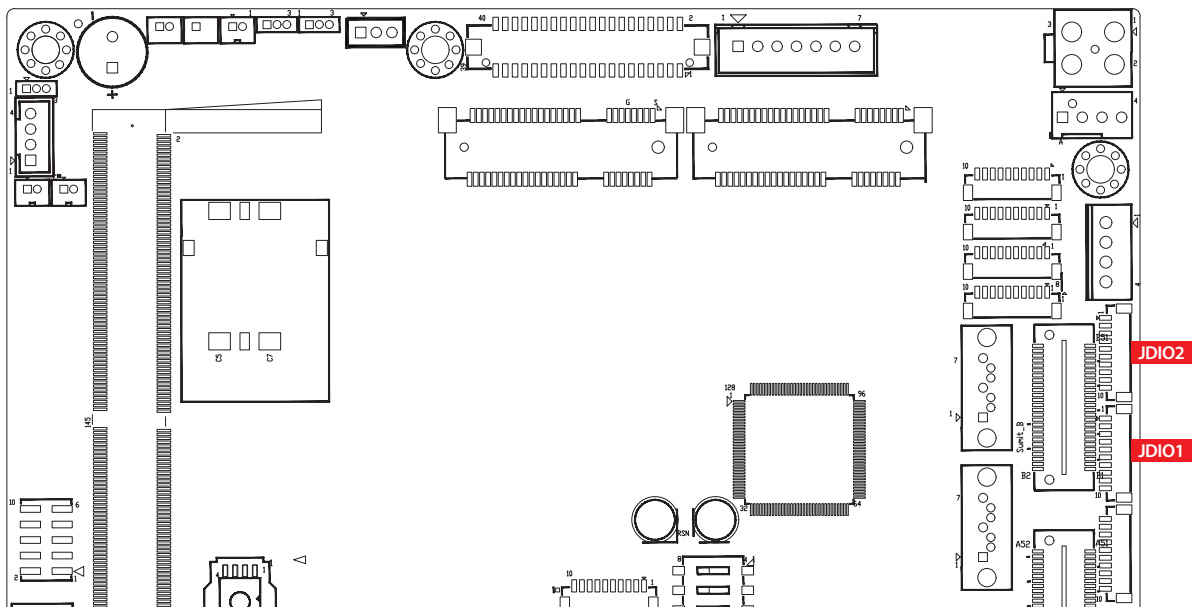
# A

## APPENDIX A : GPIO GUIDE

### A.1 Function Description

The EMBC-3000 offers a 16-bit GPIO a pair of 10-bit internal connector, and a watchdog timer.

GPIO definition is shown below :



Pin No.	JDIO1 Definition	JDIO2 Definition
1	SIO_GPI80	SIO_GPO70
2	SIO_GPI81	SIO_GPO71
3	SIO_GPI82	SIO_GPO72
4	SIO_GPI83	SIO_GPO73
5	SIO_GPI84	SIO_GPO74
6	SIO_GPI85	SIO_GPO75
7	SIO_GPI86	SIO_GPO76
8	SIO_GPI87	SIO_GPO77
9	+3.3V	+3.3V
10	GND	GND

## A.2 Software Package Contain

Distribution folder include x32 and x64 versions, use batch file for installation.

There are included as followed :

Win7\_32.bat :

Installation for 32-bit driver

Win7\_64.bat :

Windows update package which driver required (need to restart), and Installation for 64-bit driver

Win8\_32.bat, Win8\_64.bat :

Installation for driver, and guideline to Framework 3.5 distribution for sample

Win10\_32.bat, and Win10\_64.bat :

Installation for driver, and installation to Framework 3.5 distribution for sample

Uninstall\_32.bat, and Uninstall\_64.bat :

Uninstallation for driver

Run batch file as Administrator.

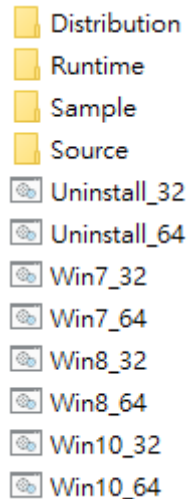
Support Windows 7 above.

Make sure Windows version before installation.

Runtime folder include head file for software developer or System Integration.

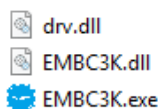
Sample folder include sample program, driver library, and API library.

Source folder include sample program source code that compile on Visual Studio 2008.

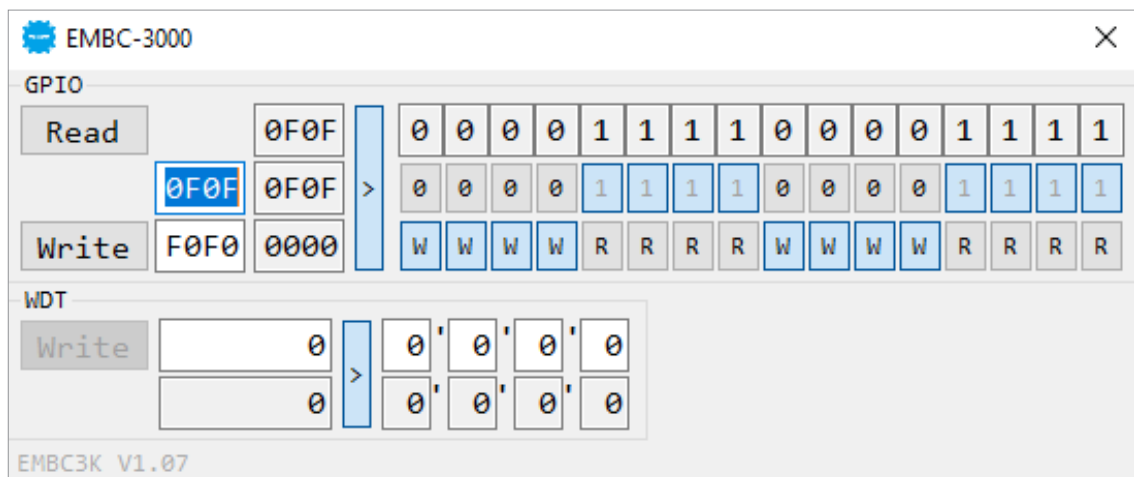


## A.3 Sample

Execute DIO demo tool (EMBC3K.exe)



Sample EMBC3K.exe, as shown below :



## **GPIO group :**

Read button :

Set GPIO configuration to get GPIO state.

Write button :

Set GPIO configuration to set GPIO state.

GPIO output text :

User setting, GPIO output state by hexadecimal bitmask - High/Low.

Use for Write button activate.

GPIO writable text :

User setting, GPIO writable of GPIO configuration by hexadecimal bitmask - yes/no.

Use for Read/Write button activate.

GPIO input text (read only) :

GPIO input state by hexadecimal bitmask - High/Low.

Use for Read button activate.

GPIO text (read only) :

GPIO output state with input state and configuration.

Use for Write button activate.

GPIO output text (read only) :

GPIO output state with configuration.

Use for Write button activate.

GPIO input pin text (read only, pin 18 ~ pin 11, pin 8 ~ pin 1) :

GPIO input pin state

Use for Read button activate.

GPIO output pin check button (pin 18 ~ pin 11, pin 8 ~ pin 1) :

User setting, GPIO output pin state

Use for Write button activate.

GPIO pin writable check button (pin 18 ~ pin 11, pin 8 ~ pin 1) :

User setting, GPIO pin writable of GPIO configuration.

Use for Read/Write button activate.

## **WDT group :**

Write button :

Set WDT when WDT setup text is valid.

Stop button :

Cancel WDT and counting.

Use after Write button action.

WDT setup text :

User setting, WDT value, unit : second.

Use for Write button activate.

WDT counting text (read only) :

WDT counting by program timer after set WDT.

Shown after Write button action.

WDT setup day format texts (user setting) :

User setting, WDT value, format : day'hour'minute'second.

WDT counting day format text (read only) :

WDT counting, format : day'hour'minute'second.

# B

## APPENDIX B : Software Functions

### B.1 Driver API Guide

In Runtime folder, on EMBC3K.h :

  \_DLL\_IMPORT\_ definition is used on LoadLibrary API for EMBC3K.dll.  
  EMBC3K\_EXPORTS definition is used on EMBC3K.dll building.

#### **BOOL Initial()**

Initial machine for GPIO, and watchdog timer

Return :

  TRUE (1) : Success;

  FALSE (0) : Fail (Driver not exists, or initial error (version is too old, or machine not match))

#### **BOOL GetGPIOConfig(WORD \*Mask)**

Get GPIO configuration (by variable)

  Mask ([15:0]) : In/Out, pin setting by hexadecimal bitmask

    1 : Output;

    0 : Input

Return :

  TRUE (1) : Success;

  FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

#### **BOOL SetGPIOConfig(WORD Mask)**

Set GPIO configuration

  Mask ([15:0]) : In/Out, pin setting by hexadecimal bitmask

    1 : Output;

    0 : Input

Return :

  TRUE (1) : Success;

  FALSE (0) : Fail (Initial error, or hardware problem)

#### **BOOL GetGPIO(WORD \*DI)**

Get GPIO input

  DI ([15:0]) : Input state, pin setting by hexadecimal bitmask

    1 : High;

    0 : Low

Return :

  TRUE (1) : Success;

  FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

**BOOL SetGPIO(WORD DO)**

Set GPIO output

DO ([15:0]) : output state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)

**BOOL GetWDT(DWORD \*WDT)**

Get watchdog timer setup

WDT : watchdog timer setup

Unit : second. (Range : 0 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

**BOOL SetWDT(DWORD WDT)**

Set watchdog timer setup

WDT : watchdog timer setup

Unit : second. (Range : 1 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or setup 0 error, or hardware problem)

**BOOL CancelWDT()**

Cancel watchdog timer

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)

# C

## APPENDIX C : RAID Functions

### C.1 SATA Mode for RAID

Please select SATA Device to RAID mode on BIOS menu.

Advanced → SATA Configuration → SATA Mode Selection

Main	Advanced	Chipset	Boot	Security	Save & Exit
SATA Controller(s) [Enabled]					Item Specific Help
SATA Model Selection [AHCI]					

### C.2 OS Installation

The system is featured with 4 SATA, include two internal SATA, two mSATA

You can select one of SATA ports for OS installation

We used internal SATA for Windows 10 OS installation as an example.

### C.3 To Install All Device Drivers of the System

The instructions are as follows :

1. To install Chipset driver
2. To install VGA driver
3. To install ME driver (if available)
4. To install Network driver
5. To install Audio driver



## C.4 To Install "Intel Rapid Storage Technology" Software

You can get the software from the driver CD.

Also, you can find latest information and software directly from Intel website.

[http://www.intel.com/p/en\\_US/support/highlights/chpsts/imsm](http://www.intel.com/p/en_US/support/highlights/chpsts/imsm)

The RAID environment has been done if you completed the steps above.

## C.5 To Insert SATA HDD for RAID 1

Please notice, you can use seven SATA ports for SATA storage devices.

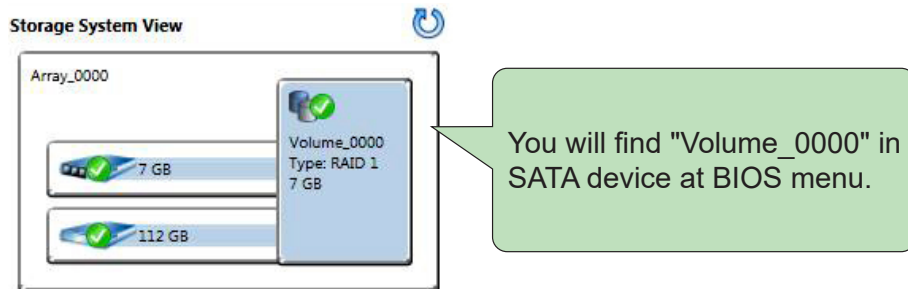
## C.6 To Create RAID Volume on "Rapid Storage Technology" Software

The system is featured with two SATA HDD's for RAID volume, so there are two options to choose on this page. Let's take RAID 1 as an example, select "RAID 1".



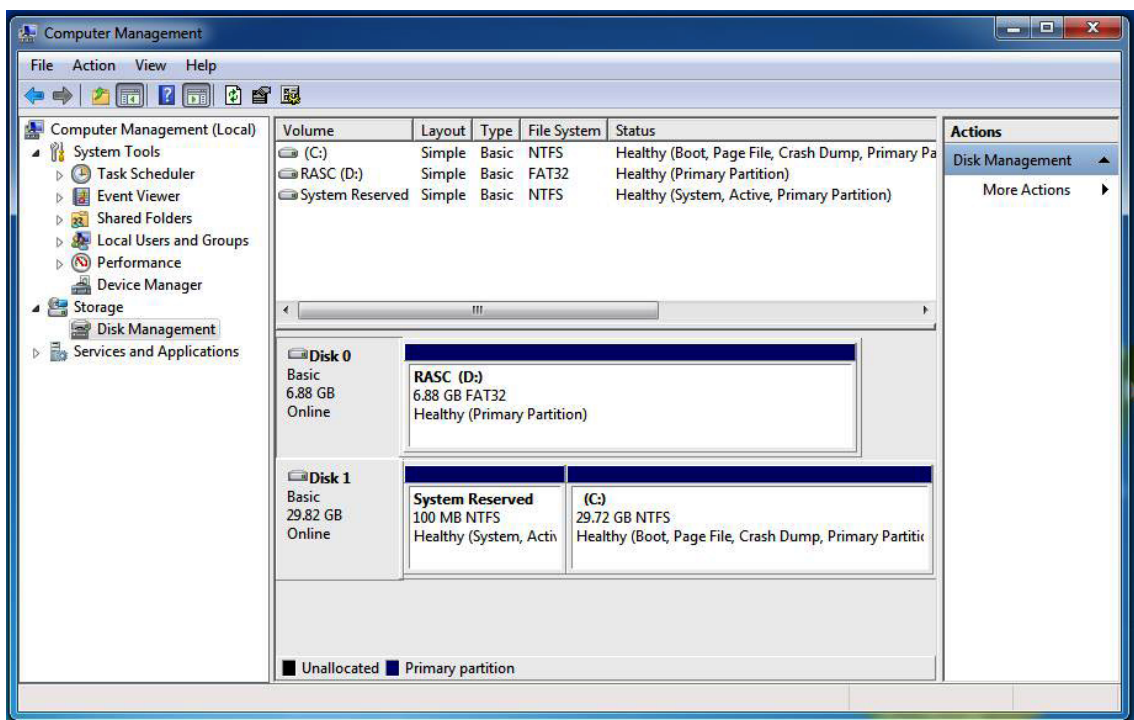
## C.7 Disk Management : Partition the Disk

After RAID 1 volume created, you can see the figure of SATA device allocation.



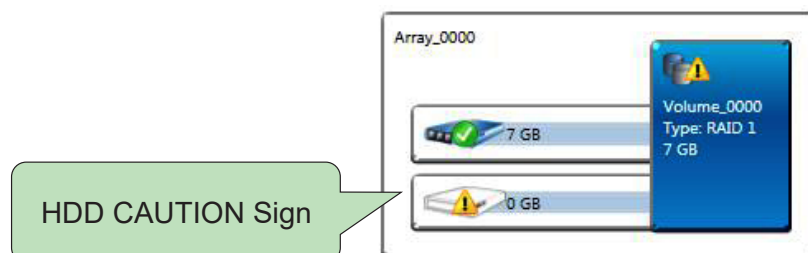
To start Disk Management tool and select "Initialize Disk".

Then add "Logical Device" for Windows access.

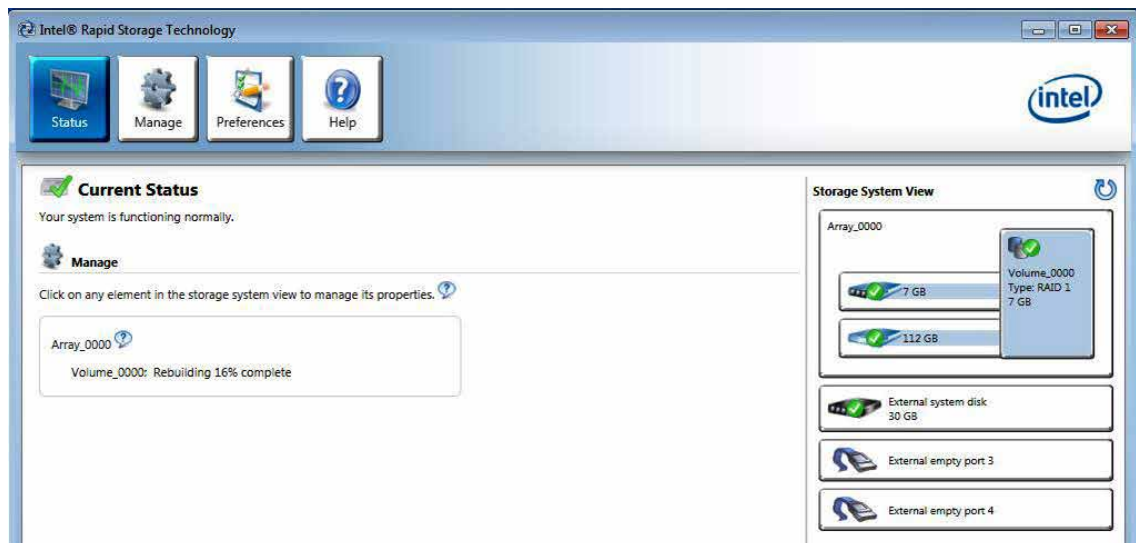


## C.8 If One SATA HDD on RAID Volume is Out-of-use

After RAID 1 volume created, you can see the figure of SATA device allocation.



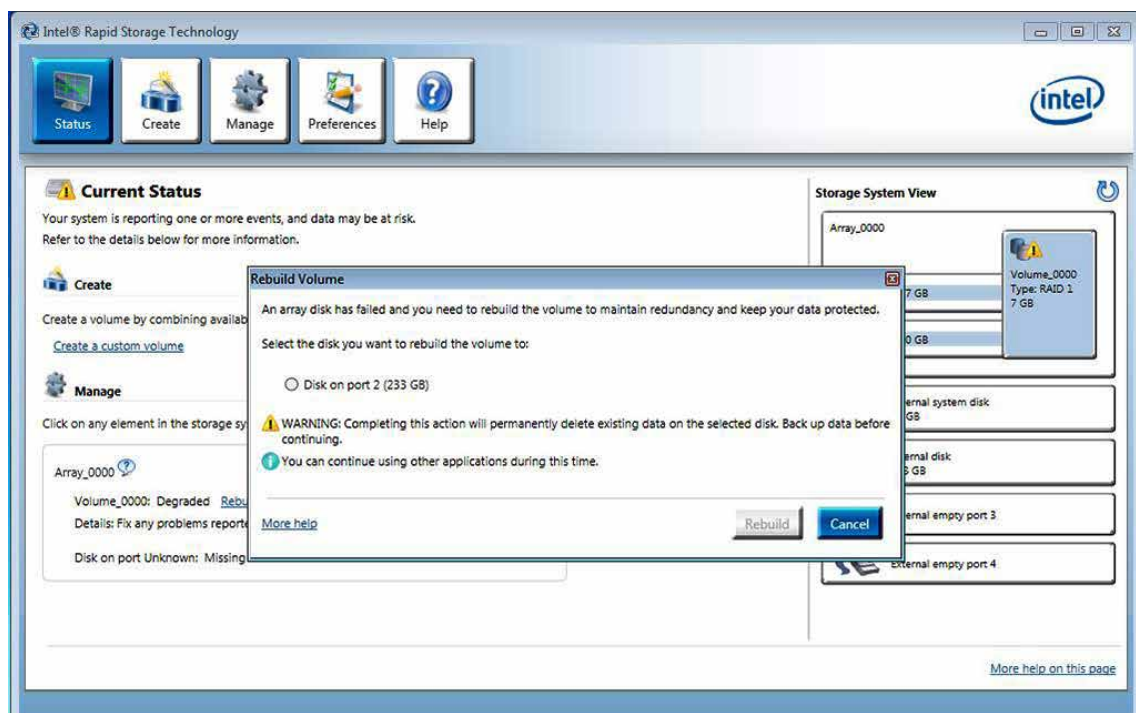
## C.9 Recovery and Auto Re-build When Use the SAME RAID HDD



## C.10 Recovery and Auto Re-build When Use DIFFERENT RAID HDD

There is a warning will pop-up to ask you if the disk is not a member of original RAID volume.

If you press "Rebuild", it will replace the broken SATA HDD to the last one SATA HDD of RAID volume.



# D

## APPENDIX D : Power Consumption

Testing Board	EMBC-3000
RAM	8GB * 1
USB-1 (USB 3.0)	USB 3.0 Loopback Plug
USB-2 (USB 3.0)	USB 3.0 Loopback Plug
USB-3 (USB 3.0)	USB 3.0 Loopback Plug
USB-4 (USB 3.0)	USB 3.0 Loopback Plug
USB-5 (USB 2.0)	USB Mouse HP G1K28AA
USB-6 (USB 2.0)	USB Keyboard AOPEN CMS-730
USB-7 (USB 2.0)	Transcend JetFlash V60 USB 2.0 4GB
USB-8 (USB 2.0)	Kingston DataTraveler SE9 USB 2.0 8GB
SATA 0	Innodisk 3MG2-P DGS25-64GD81BC1QC 64GB
SATA 1	Transcend SSD370 TS64GSSD370 64GB
mPCIe 1	UMX-100
mPCIe 2	UMX-100
FAN	SUNON PF40281B1-Q000-S99
LAN1 (i219)	1.0 Gbps
LAN2 (i210)	1.0 Gbps
Graphics Output	DVI
Power Plan	Balance (Windows10 Power plan)
Power Source	Chroma 62006P-100-25

## D.1 Intel® Core™ i7-8665UE 1.70GHz (8M Cache, up to 4.40GHz)

CPU	Power Input	Standby Mode		Power on and boot to Win 10 (64-bit)			
		Max Current	Max Consumption	Sleep Mode		idle status CPU usage less 3%	
				Max Current	Max Consumption	Max Current	Max Consumption
Core™ i7-8665UE	9V	0.425A	03.83W	0.497A	04.47W	1.382A	12.43W
	12V	0.325A	03.90W	0.378A	04.53W	1.155A	13.86W
	24V	0.189A	04.53W	0.215A	05.16W	0.522A	12.52W
	48V	0.122A	05.85W	0.132A	06.33W	0.324A	15.53W

CPU	Power Input	Power on and boot to Win10 (64-bit)			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Core™ i7-8665UE	9V	2.240A	20.16W	4.270A	38.43W
	12V	1.678A	20.13W	3.300A	39.60W
	24V	0.836A	20.07W	1.645A	39.48W
	48V	0.455A	21.85W	0.847A	40.64W

## D.2 Intel® Core™ i5-8365UE 1.60GHz (6M Cache, up to 4.10GHz)

CPU	Power Input	Standby Mode		Power on and boot to Win 10 (64-bit)			
				Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i5-8365UE	9V	0.415A	03.73W	0.485A	04.37W	1.465A	13.19W
	12V	0.318A	03.81W	0.370A	04.44W	1.082A	12.98W
	24V	0.188A	04.51W	0.214A	05.14W	0.577A	13.84W
	48V	0.121A	05.82W	0.134A	06.45W	0.306A	14.70W

CPU	Power Input	Power on and boot to Win10 (64-bit)			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Core™ i5-8365UE	9V	2.137A	19.23W	3.744A	33.70W
	12V	1.646A	19.76W	2.832A	33.99W
	24V	0.802A	19.24W	1.395A	33.49W
	48V	0.436A	20.93W	0.725A	34.81W

### D.3 Intel® Core™ i3-8145UE 2.20GHz (4M Cache, up to 3.90GHz)

CPU	Power Input	Standby Mode		Power on and boot to Win 10 (64-bit)			
				Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i3-8145UE	9V	0.416A	03.74W	0.485A	04.37W	1.429A	12.86W
	12V	0.317A	03.80W	0.368A	04.42W	1.054A	12.65W
	24V	0.185A	04.44W	0.211A	05.05W	0.543A	13.03W
	48V	0.120A	05.76W	0.133A	06.37W	0.334A	16.05W

CPU	Power Input	Power on and boot to Win10 (64-bit)			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Core™ i3-8145UE	9V	2.040A	18.36W	3.601A	32.41W
	12V	1.578A	18.93W	2.666A	31.99W
	24V	0.787A	18.88W	1.348A	32.35W
	48V	0.414A	19.86W	0.698A	33.49W

# E

## APPENDIX E : Supported Memory & Storage List

### E.1 Test Item

Testing Board	EMBC-3000
Memory Test	MemTest86 V8.2
BurnIn Test	BurnInTest Pro V8.1 (build 1025)

Channel	Memory Test	Burn-in Test	Flash BIOS	Remove Battery	Sleep	Hibernate	Reset	CPU-Z
*1(DIMM 1)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

### E.2 Supported Non-ECC Memory List

Brand	Info	Test Temp.(Celsius)
innodisk 4GB DDR4-2400 SODIMM	M4S0-4GSSN5SJ-H03	25°C
innodisk 16GB DDR4-2400 SODIMM	M4S0-AGS1OCSJ-H03	25°C
innodisk 4GB DDR4-2666 SODIMM	M4S0-4GSSNCIK-H03	25°C
innodisk 4GB DDR4-2666 SODIMM	M4S0-4GSSN5IK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GS1N5IK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GS1NCIK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GSSOCIK-H03	25°C
innodisk 16GB DDR4-2666 SODIMM	M4S0-AGS1OCIK-H03	25°C
innodisk 16GB DDR4-2666 SODIMM	M4S0-AGS1O5IK-H03	25°C
SL-Link 16GB DDR4-2666 SODIMM	J4AGSH1G8QHFC	25°C
SL-Link 32GB DDR4-2666 SODIMM	J4BGSS2G8QHXI	25°C



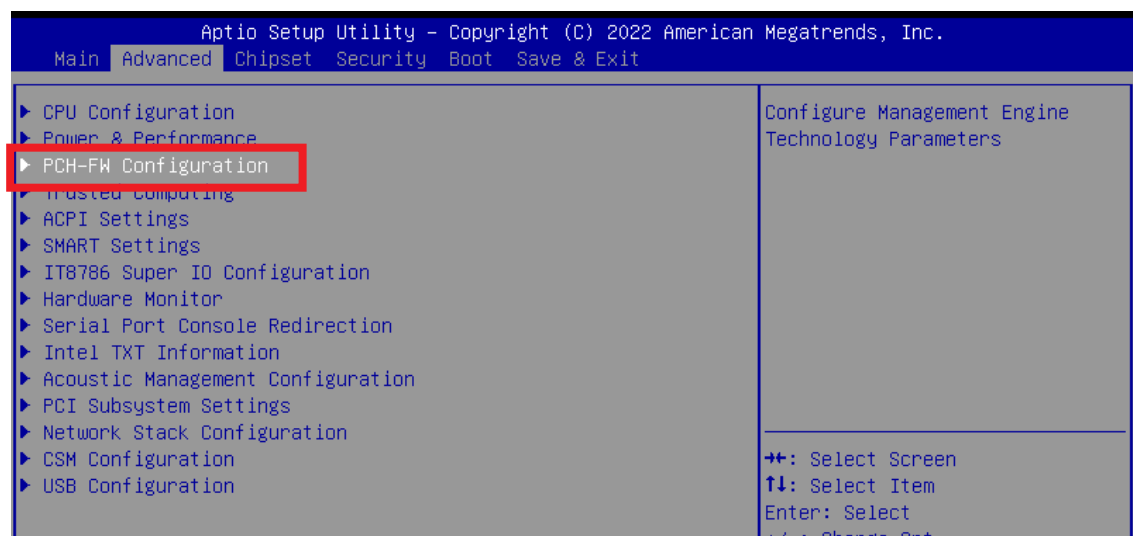
## E.3 Supported Storage List

Type	Brand	Model	Capacity
mSATA	Intel	Intel-310 SSDMAEMC080G2	80GB
	Kingston	SUV500MS	120GB
SATA SSD	Transcend	SSD370 TS64GSSD370	64GB
	innodisk	3MG2-P DGS25-64GD81BC1QC	64GB
	Kingston	SA400S371120G	120GB
	Intel	SSD E 5400s SSDSC2KR120H6	120GB
	MEMXPRO	M3A MI3MA1212802WN	128GB
	FORESEE	S903S128G	128GB
	FORESEE	S903S256G	256GB
	LITE-ON	K8-L1256	256GB
	LITE-ON	K8-L1512	512GB

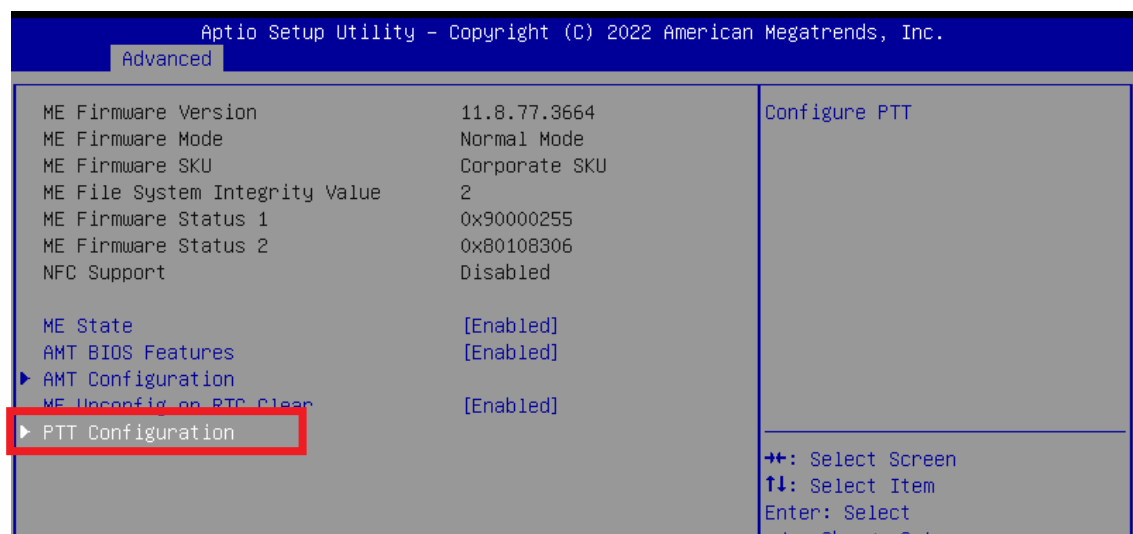
# F

## APPENDIX F : Install Win11 (BIOS TPM Setting)

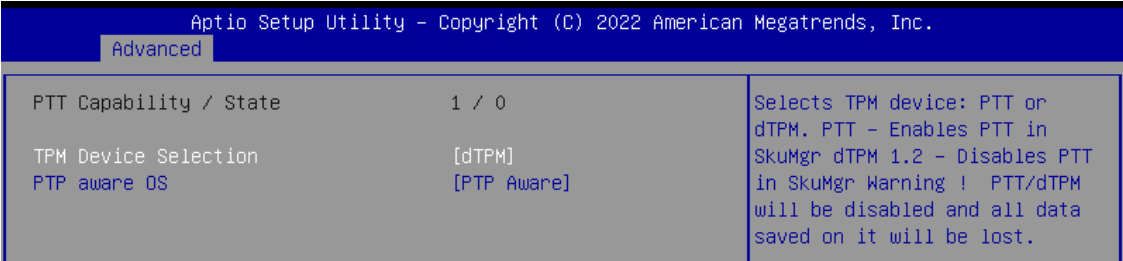
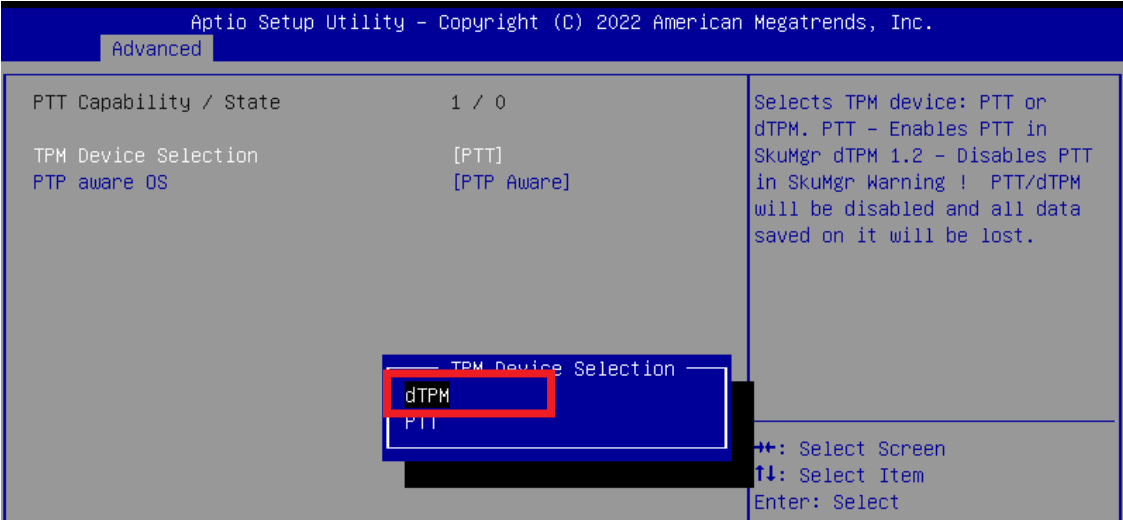
**Step 1** Click on “Advanced”, then click on “PCH-FW Configuration”



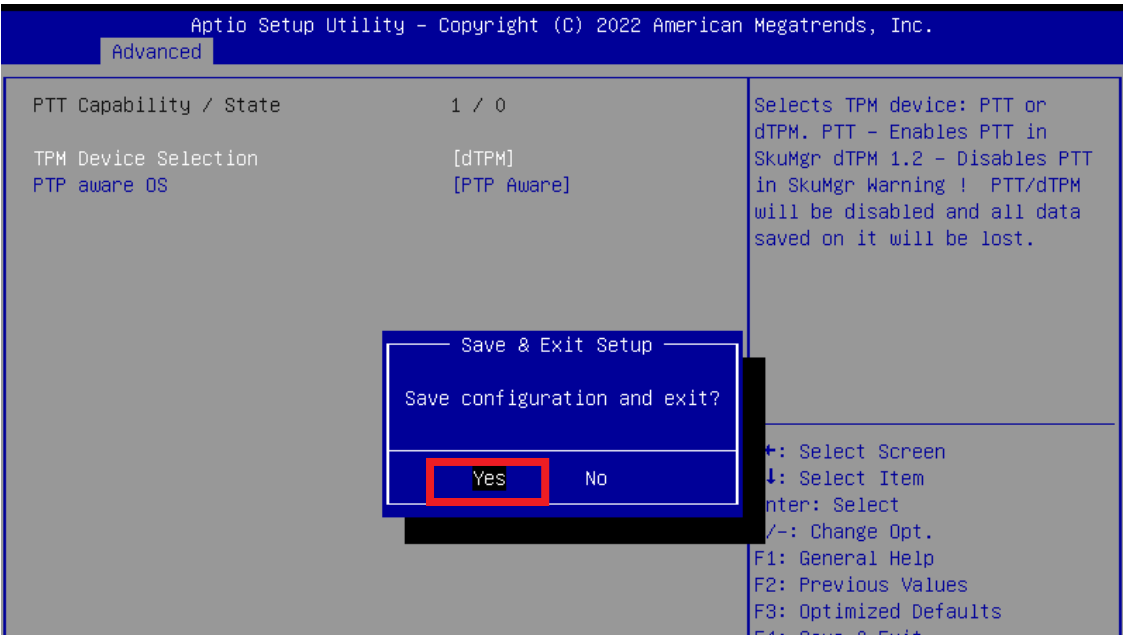
**Step 2** Click on “PTT Configuration”



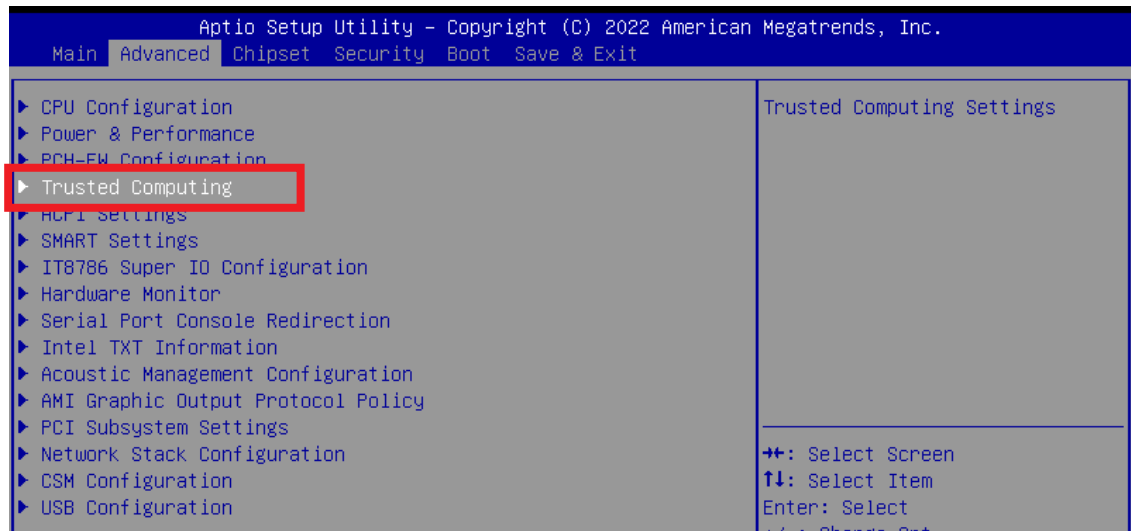
**Step 3** Click on “dTPM” (TPM Device Selection)



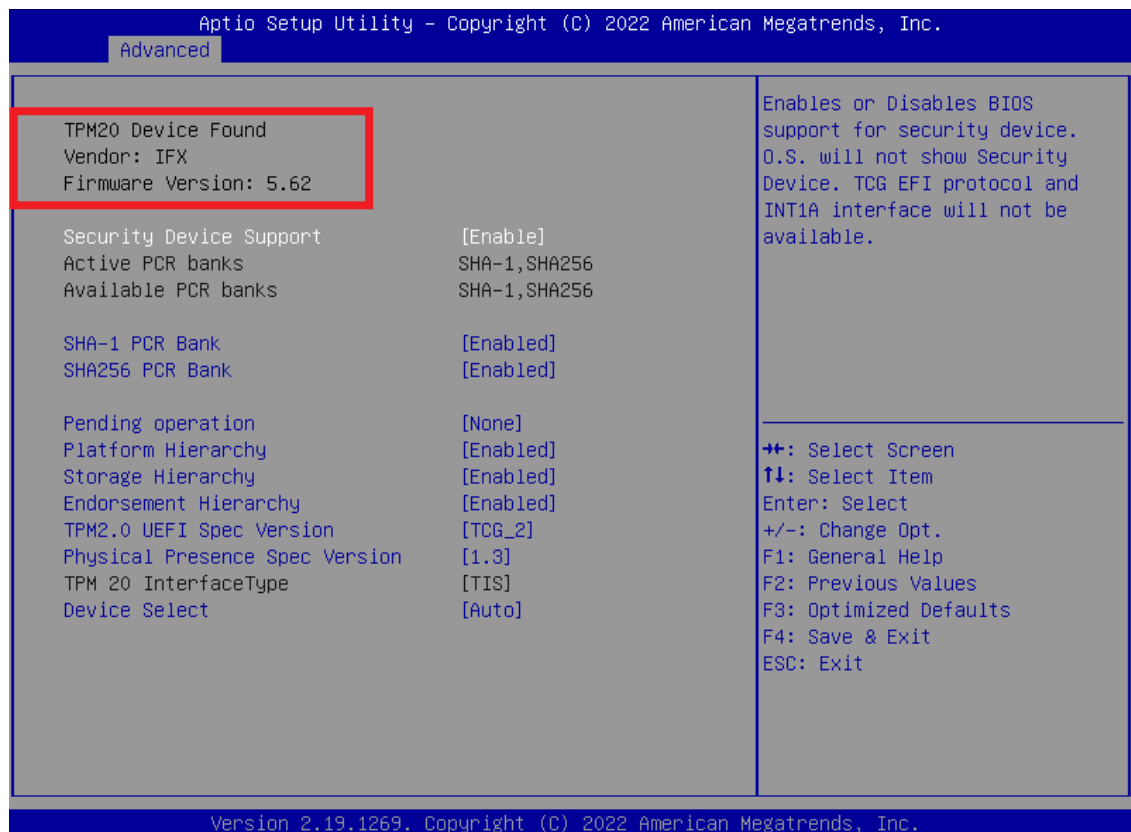
**Step 4** Please save the BIOS settings by pressing F4. Please press Enter when the pop-up window which asks “Save configuration and exit?” appears. The computer will then restart.



**Step 5** Click on “Trusted Computing”



**Step 6** If the window shows “TPM2.0 Device Found Firmware Version:5.62”, then the setting is completed.



\*\* If more help is needed, please contact Vecow technical support \*\*



For further support information, please visit [www.vecow.com](http://www.vecow.com)

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