LPC P-cap Panel PC 2VET Series
With Gen 11 Core-i7/i5
User Manual

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Revision : V0.1

Warning!

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Electric Shock Hazard – Do not operate the machine with its back cover removed. There are dangerous high voltages inside.

Disclaimer

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Packing List ®

Accessories (as ticked) included in this package are:

☐ Panel Mounting Kits

☐ 3 Pin Male Terminal Block

☐ Optional Adapter

☐ Other._____(please specify)

Safety Precautions

Follow the messages below to avoid your systems from damage:

◆ Avoid your system from static electricity on all occasions.

◆ Prevent electric shock. Don't touch any components of this card when the card is power-on. Always disconnect power when the system is not in use.

◆ Disconnect power when you change any hardware devices. For instance, when you connect a jumper or install any cards, a surge of power may damage the electronic components or the whole system.

Table of Contents

Chapter 1   Getting Started

1.1   Brief Description of LPC P-cap 2VET Series

The LPC P-cap 2VET series is a power-optimized and delivers robust performance-per-watt for embedded HMI, powered by Intel® Gen 11 Core™ i7/i5 UP3-Series (Tiger Lake UP3) processors. It comes with a Bezel-Free design, up to 32GB DDR4 memory, M.2 slot and a SATA 2.5-inch lockable HDD tray, audio jack, 2 RJ45 Ethernet, DC input, and 4 USB ports. The unit supports Windows 10.

The Elgens fanless touch panel computer is ideal for use as Web Browser, Terminal and HMI at all levels of automation control.

1.2 System Specifications

Model Number	LPC-P150S-2VETx	LPC-P156W-2VETx	LPC-P185W-2VETx	LPC-P190S-2VETx
Max Resolution	1024*768	1920*1080	1920*1080	1280*1024
Color	16.7M	16.2M	16.2M	16.7M
Luminance	300 nits	450 nits	350 nits	350 nits
View Angle	176/176	170/170	178/178	170/160
Contrast Ratio	2500	800	1000	1000
Computing				
Processor	Intel® TGL UP3 Core i7-1185G7E/i5-1145G7E Processor			
System Memory	1 DDR4-3200 SO-DIMM, up to 32GB			
Storage	1 x SATA 6Gb/s ports (1 x lockable HDD tray) 1 M.2 Key B 2260 Socket			
External I/O Port	2 x DisplayPort Connector 4 x USB Connector 2 x RJ45 LAN 4 x COM RS-232/422/485 DB9 Connector 1 x Audio 1 x Power press button 1 x 3-Pin Power Input			
Expansion Slots	1 x M.2 Key E Socket (2230)			
OS support	Windows 10, Linux (by Request)			
Touch Screen				
Type	USB P-cap Touch			
Light Transmission	90%			
Power Supply				
Power Input	■ DC9~55V Wide Range Power Input ■ Input on board fuse ■ Input reverse protection			
Mechanical				
Construction	Metal case with Aluminum Bezel and Heatsink			
IP Rating	Front Panel compliant IP65			
Mounting	Panel/VESA			
Environmental				
Operating/Storage Temperature	-40~70 °C			
Storage Humidity	10~90% @40 °C non-condensing			

Model Naming Rule

Panel PC series

LPC-P 156 WH-2 X-EU

For Internal: Power Adapter Type

Motherboard Model: Please reference MB model list

Chassis Version: Please reference chassis description

Key Feature:

H = High Brightness 1000 nits LED backling	AR = Anti-Reflection
OB = Optical Bonding	V = Vandal Proof Glass
G = Glass without touch	T = Backside Heatsink for Operating Temperature 60˚C
AG = Anti-Glare	
B = Power Board for input on board fuse / Input reverse protection / Over current protection / Output short circuit protection	

TFT-LCD Proportion: S=Square ,W=Wide

TFT-LCD Dimension:
101=10.1" ,104=10.4" ,121=12.1"……..

Touch Type: P=P-cap+Bezel-Less R=Resistive+Bezel-Less

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Order Information	
LPC-Pxxxx-**2VET7**	Bezel-Free P-cap Panel PC with **i7-1185G7,** DC 9~55V Power Input, including a 3-Pin Power Adapter
LPC-Pxxxx-**2VET5**	Bezel-Free P-cap Panel PC with **i5- 1145G7E**, DC 9~55V Power Input, including a 3-Pin Power Adapter

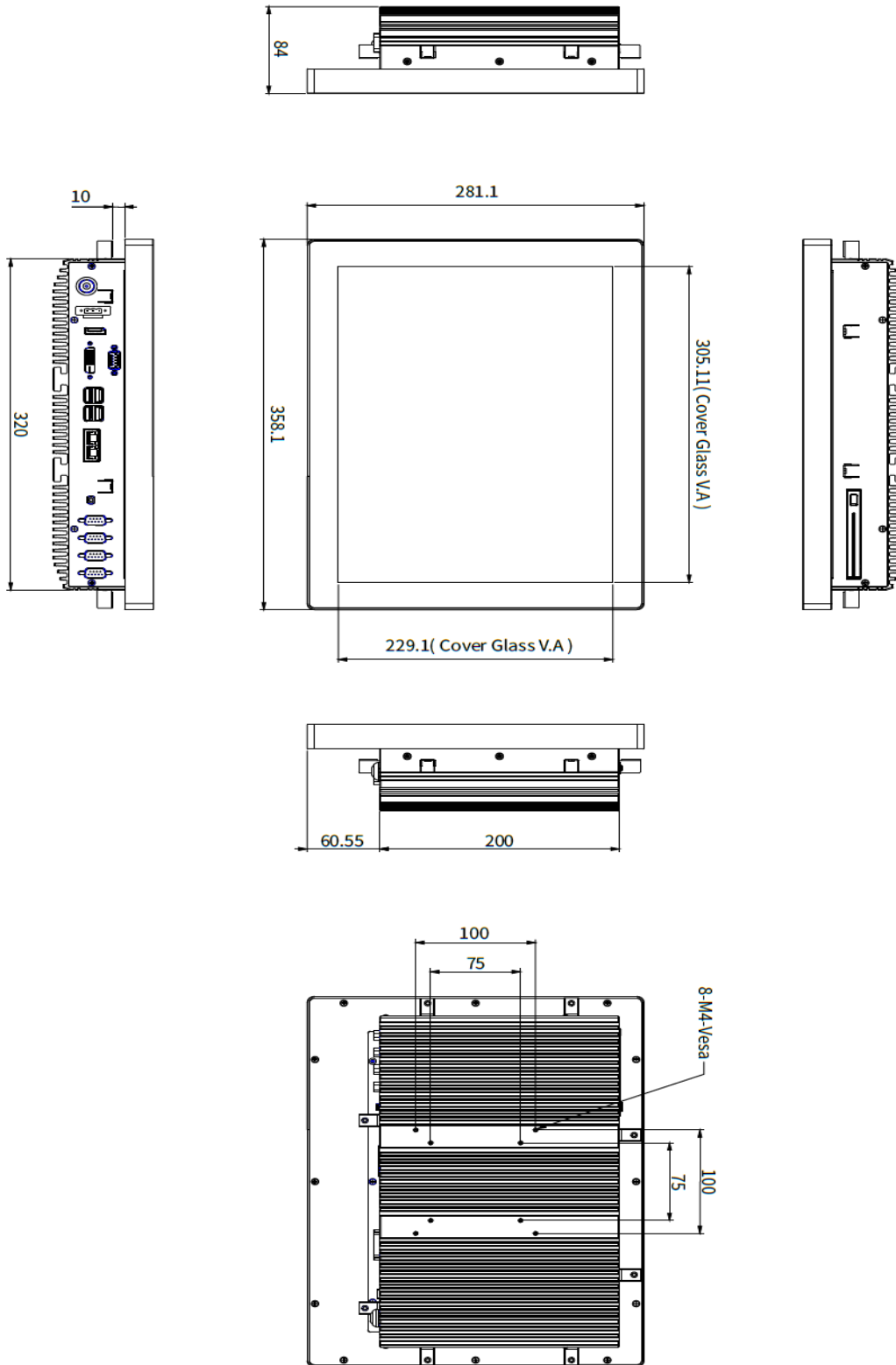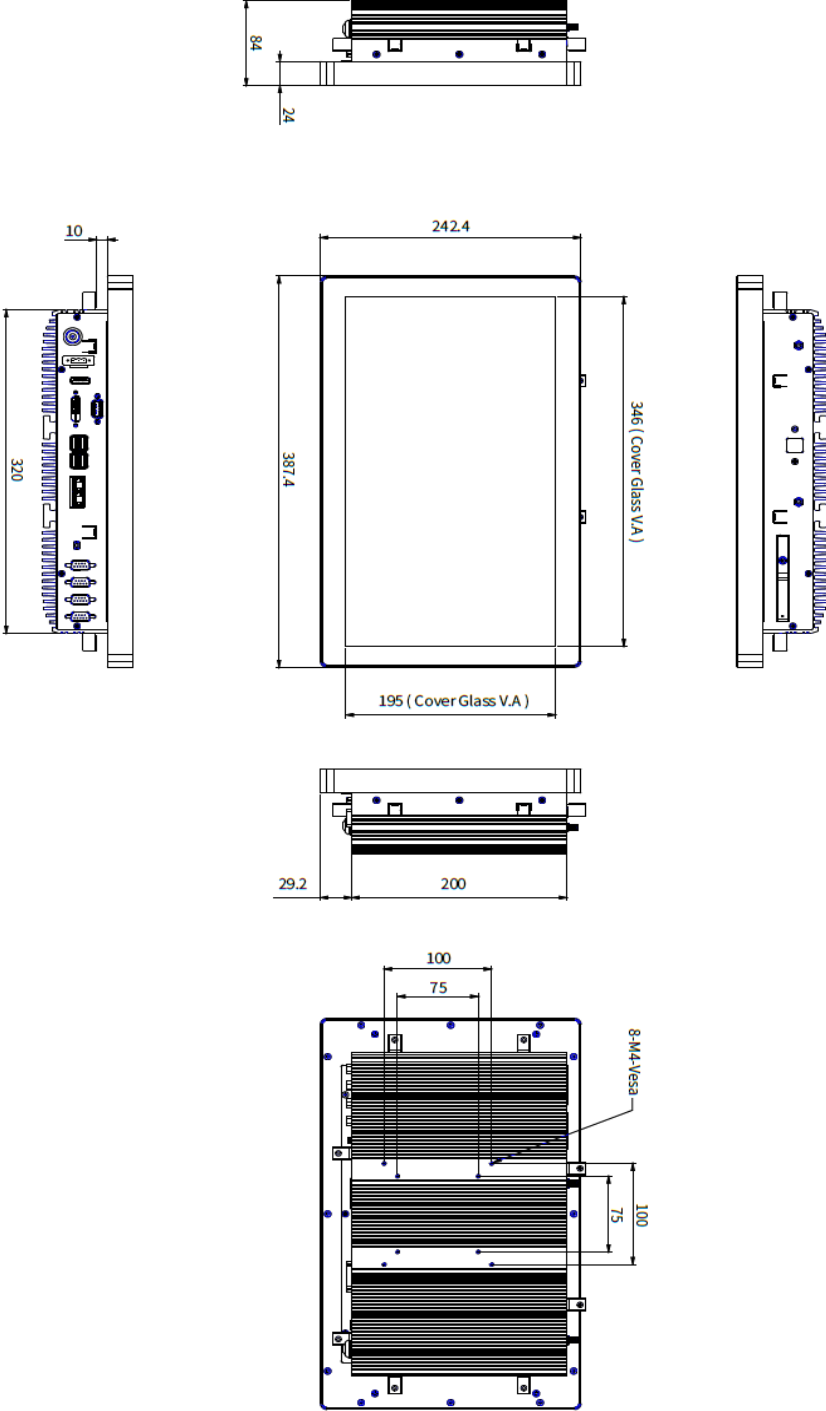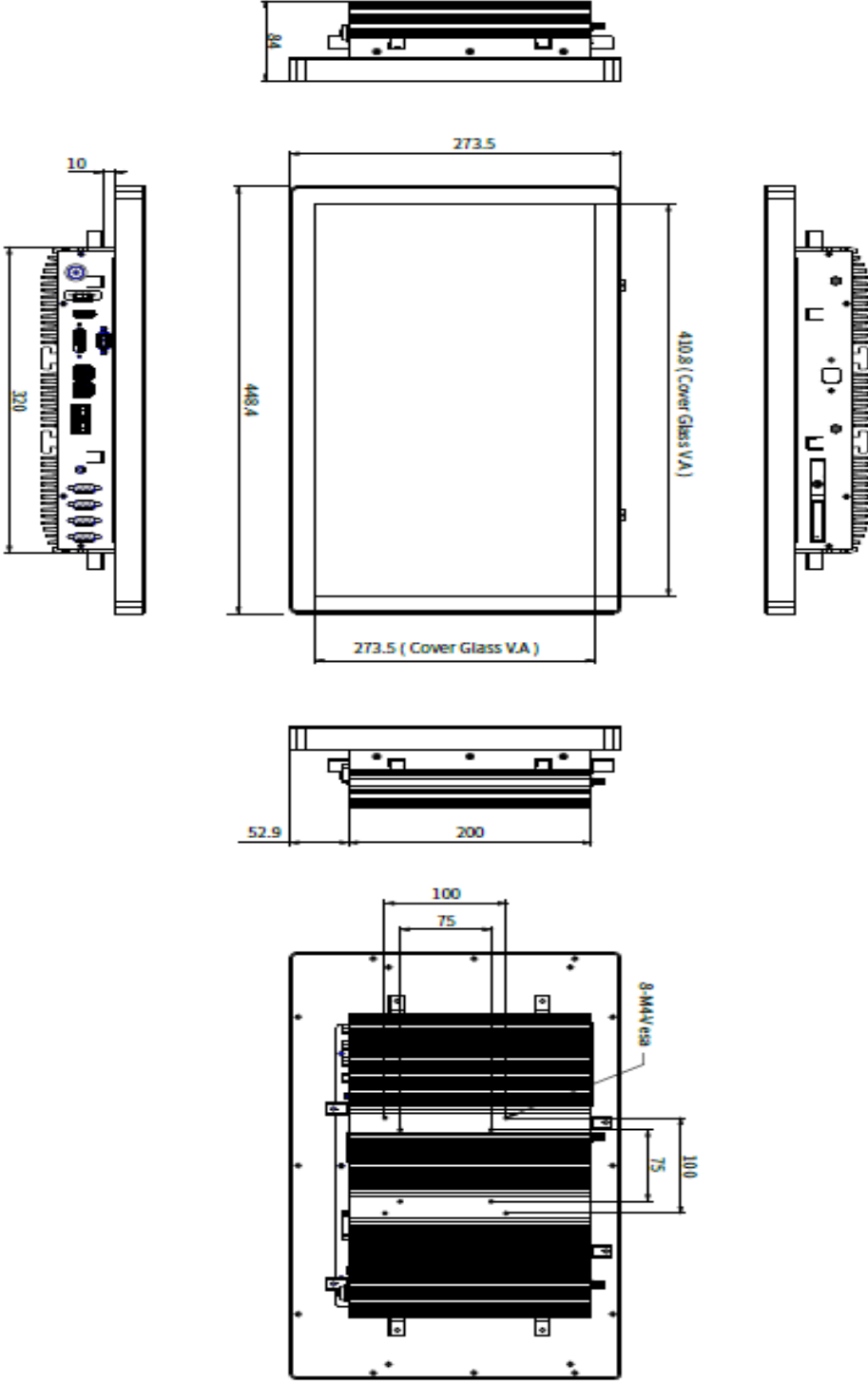| Order Code |
|---|
| **LPC-P**xxx**S/W** -H / -OB / -G / -AG / -AR / -B / -V / -T |
| xxx = size, For example, 10.1" = 101 |
| S = Dimension Ratio Square = 4:3 or 5:4 |
| W= Dimension Ration Wide = 16:9 or 16:10 |
| H = High Brightness 1000 nits LED backlight (Optional to 1600 nits backlight) |
| OB = Optical Bonding |
| G = Glass without touch |
| AG = Anti-Glare |
| AR = Anti-Reflection |
| V = Vandal Proof Glass |
| T = Backside Heatsink for Operating Temperature 60°C |
| Contact Elgens Sales for detail information |

1.3 Dimension
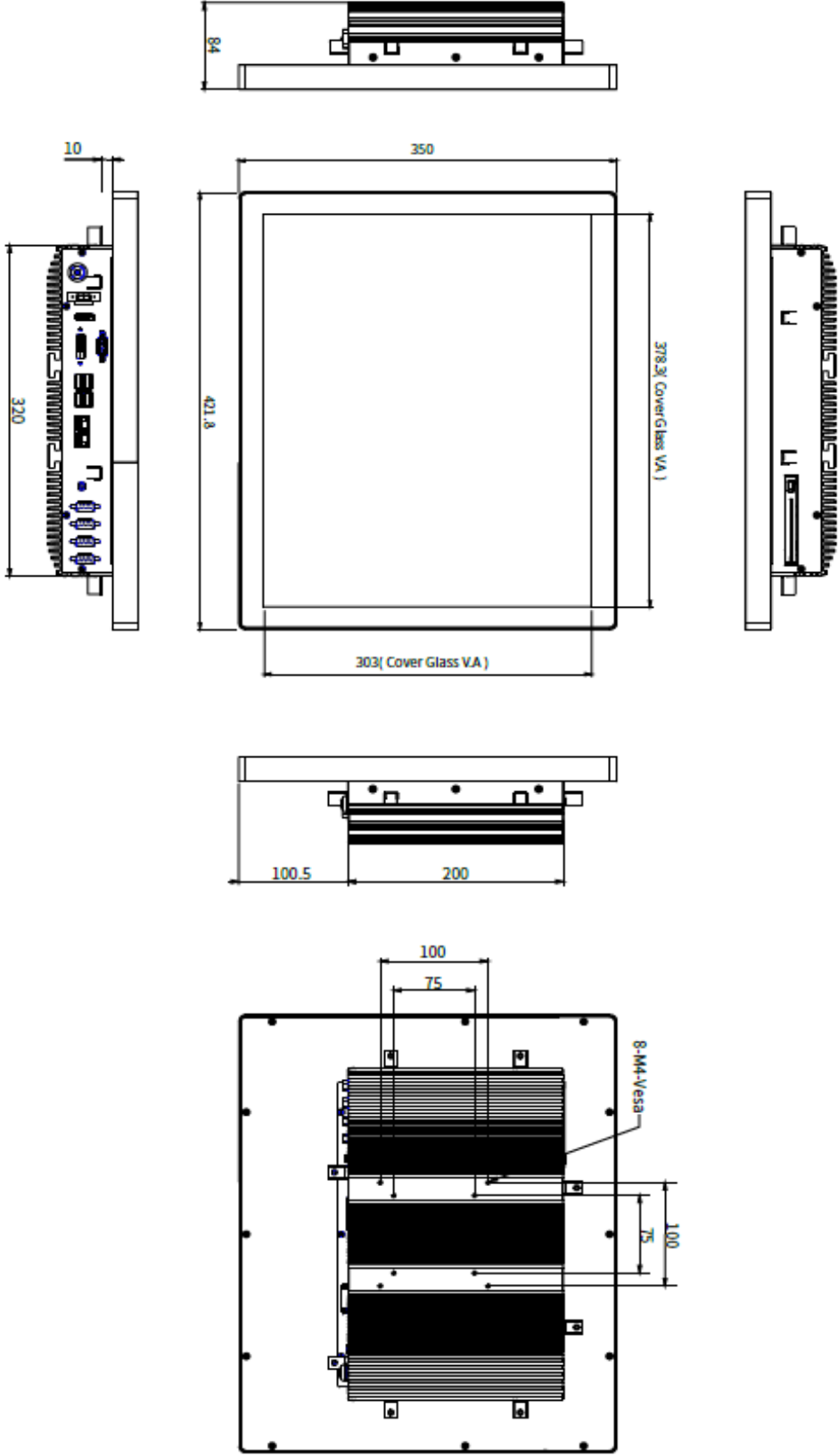### 1.3.1 LPC-P150S-2VETx Drawing

1.3.2 LPC-P156W-2VETx Drawing

1.3.3   LPC-P185W-2VETx Drawing

1.3.4 LPC-P190S-2VETx Drawing

350

84

10

320

421.8

378.3(Cover Glass V.A)

303(Cover Glass V.A)

100.5

200

100

75

75

100

8-M4-Vesa

1.4 General Rear IO Placement
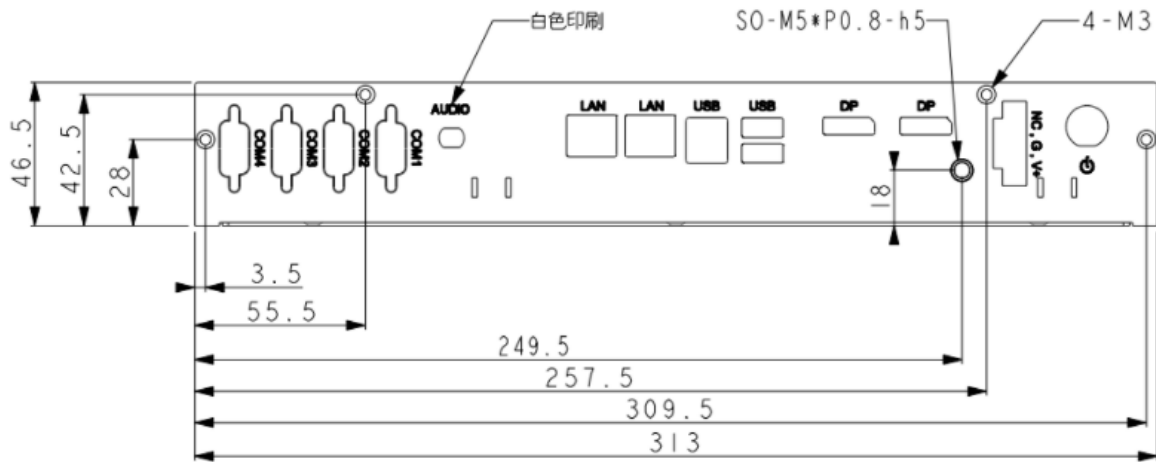
COM 1~4 is RS-232 as default and can be adjustable to RS-422/485 by BIOS.

COM1 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	1	DCD	TXD-	TXD-	DATA-
	2	RXD	TXD+	TXD+	DATA+
	3	TXD	RXD+	RXD+	-----------
	4	DTR	RXD-	RXD-	-----------
	5	GND	GND	GND	GND
	6	DSR	-----------	RTS-	-----------
	7	RTS	-----------	RTS+	-----------
	8	CTS	-----------	CTS+	-----------
	9	RI	-----------	CTS-	-----------
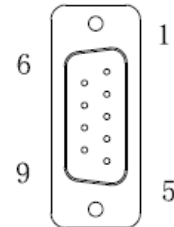
Power input terminal block pin definition is as below.

1.5 Front View of LPC-2VETx Series

1.6 Rear View of LPC-2VETx Series

1.7 Top / Bottom IO View

Chapter 2　System Setup

2.1　Installing of DDR4 SO-DIMM

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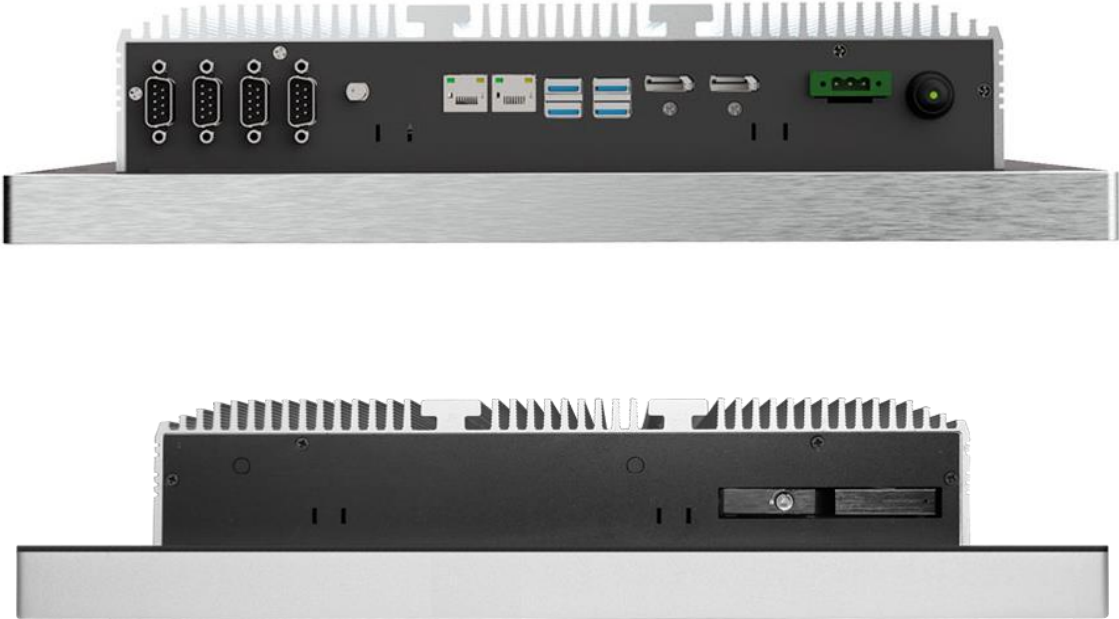

Step 2 Make sure the RAM module is locked by the memory slot.

2.2 Installing of M.2

Step 1 Install M.2 into the M.2 slot.

Step 2 Fasten one PH-M3x4L screw.

2.3 Installing of HDD

Chapter 3　　BIOS Setup

3.1　Entering Setup

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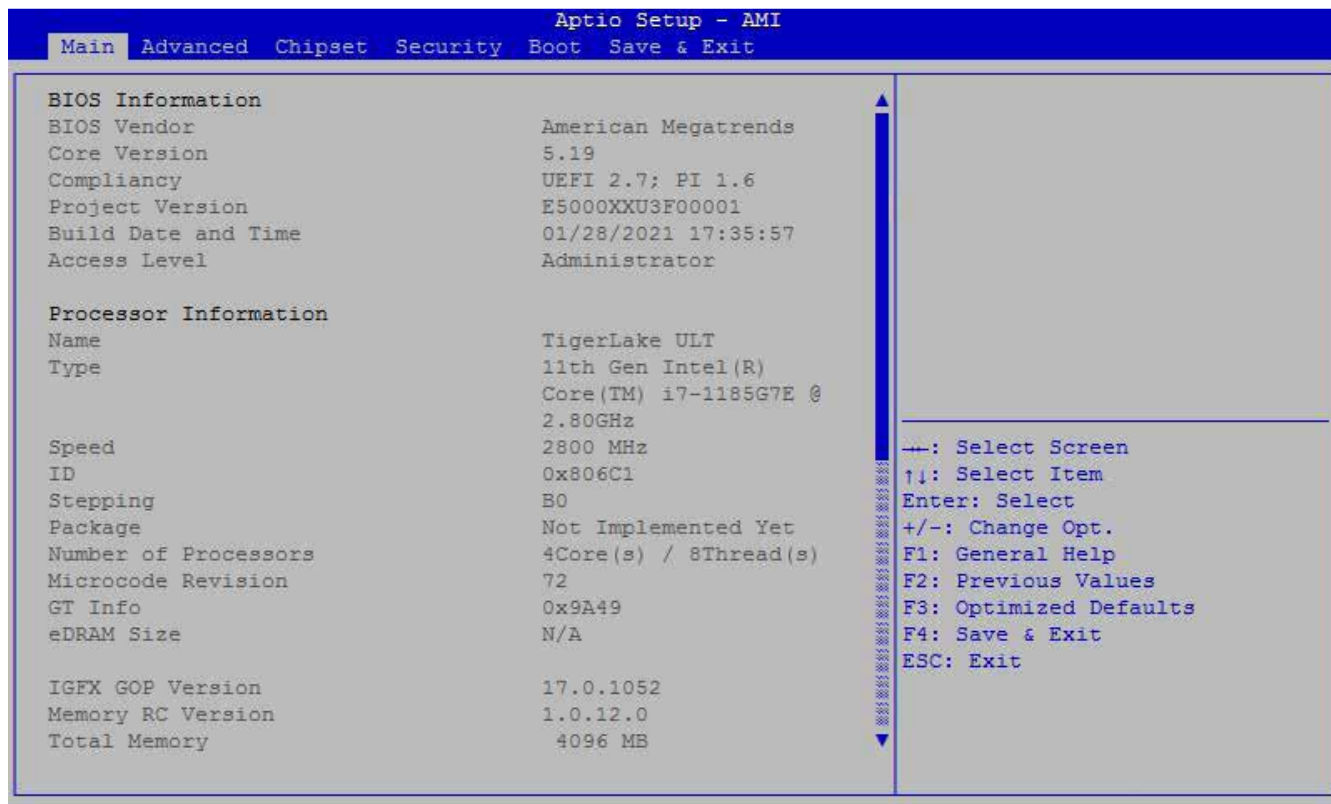
```
                           Aptio Setup - AMI
 Main  Advanced  Chipset  Security  Boot  Save & Exit

 BIOS Information
 BIOS Vendor                   American Megatrends
 Core Version                  5.19
 Compliancy                    UEFI 2.7; PI 1.6
 Project Version               E5000XXU3F00001
 Build Date and Time           01/28/2021 17:35:57
 Access Level                  Administrator

 Processor Information
 Name                          TigerLake ULT
 Type                          11th Gen Intel(R)
                               Core(TM) i7-1185G7E @
                               2.80GHz
 Speed                         2800 MHz
 ID                            0x806C1             →←: Select Screen
 Stepping                      B0                  ↑↓: Select Item
 Package                       Not Implemented Yet Enter: Select
 Number of Processors          4Core(s) / 8Thread(s) +/-: Change Opt.
 Microcode Revision            72                  F1: General Help
 GT Info                       0x9A49              F2: Previous Values
 eDRAM Size                    N/A                 F3: Optimized Defaults
                                                   F4: Save & Exit
 IGFX GOP Version              17.0.1052           ESC: Exit
 Memory RC Version             1.0.12.0
 Total Memory                   4096 MB
```

Figure 2-1 : Entering Setup Screen

3.2 Main Menu

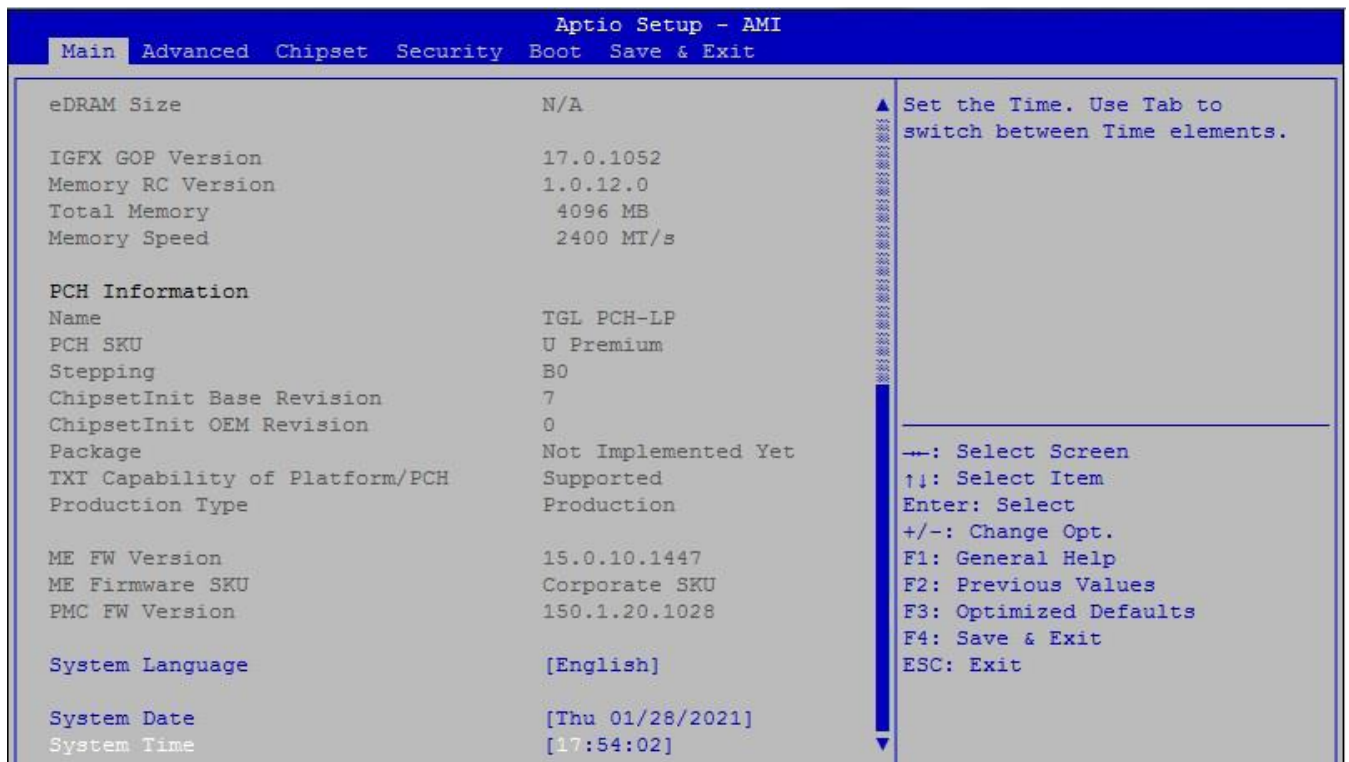The main menu displays BIOS version and system information. There are two options on Main menu.

Figure 2-2 : BIOS Main Menu

System Date
Set the Date. Use Tab to switch between Date elements.

System Time
Set the Time. Use Tab to switch between Time elements.

3.3 Advanced Function

Select Advanced tab to enter advanced BIOS Setup options such as CPU configuration SATA configuration, and USB configuration.
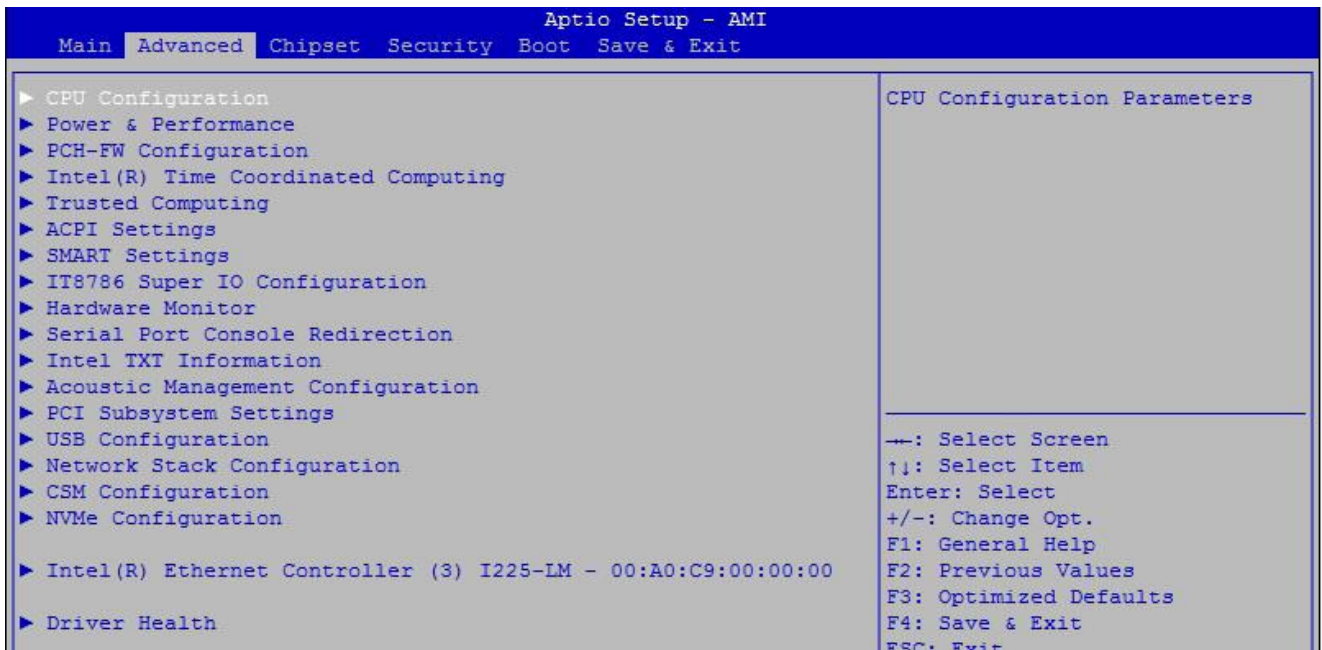
```
                          Aptio Setup - AMI
      Main  Advanced  Chipset  Security  Boot  Save & Exit

 ► CPU Configuration                              CPU Configuration Parameters
 ► Power & Performance
 ► PCH-FW Configuration
 ► Intel(R) Time Coordinated Computing
 ► Trusted Computing
 ► ACPI Settings
 ► SMART Settings
 ► IT8786 Super IO Configuration
 ► Hardware Monitor
 ► Serial Port Console Redirection
 ► Intel TXT Information
 ► Acoustic Management Configuration
 ► PCI Subsystem Settings                         ──────────────────────────────
 ► USB Configuration                              ←→: Select Screen
 ► Network Stack Configuration                    ↑↓: Select Item
 ► CSM Configuration                              Enter: Select
 ► NVMe Configuration                             +/-: Change Opt.
                                                  F1: General Help
 ► Intel(R) Ethernet Controller (3) I225-LM - 00:A0:C9:00:00:00   F2: Previous Values
                                                  F3: Optimized Defaults
 ► Driver Health                                  F4: Save & Exit
                                                  ESC: Exit
```

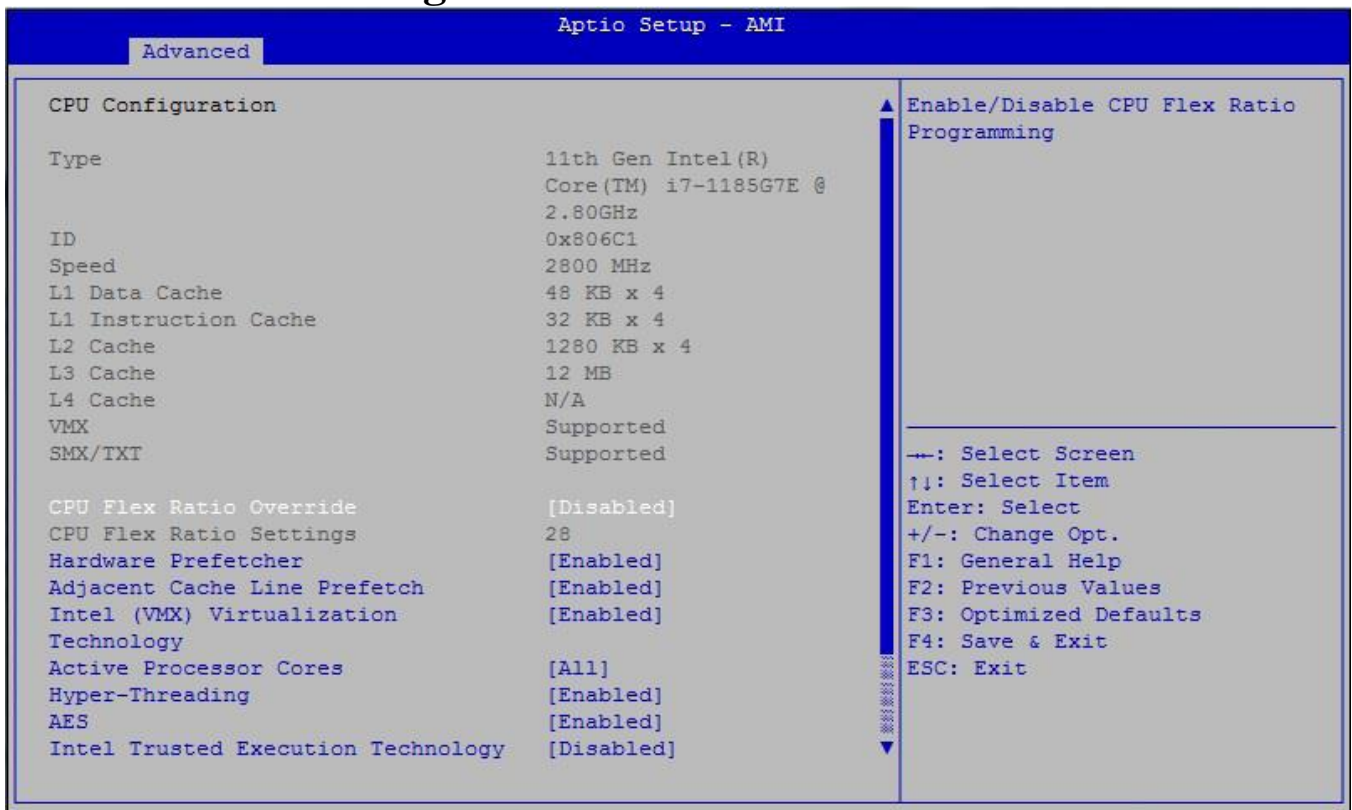Figure 4-3 : BIOS Advanced Menu

3.3.1 CPU Configuration

Figure 2-3-1 : CPU Configurations

CPU Flex Ratio Override
Enable/Disable CPU Flex Ratio Programming.

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.

Total Memory Encryption
Configure Total Memory Encryption (TME) to protect DRAM data from physical attacks. Either the IBECC or the TME can be enabled.
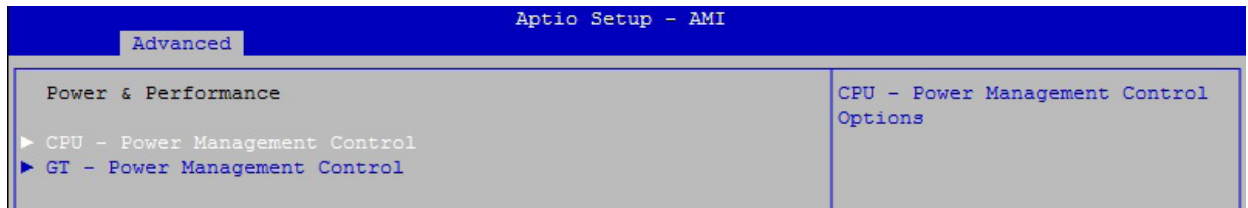
3.3.2   Power & Performance

Figure 2-3-2 : Power & Performance

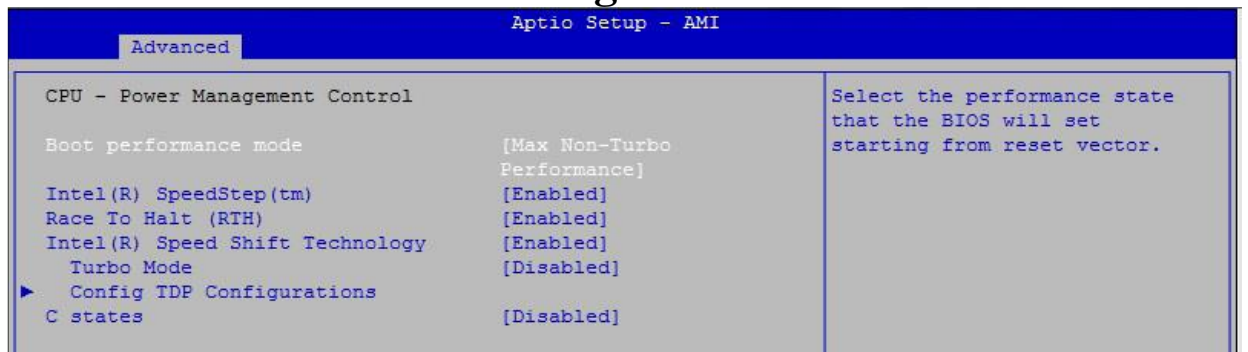## 3.3.2.1   CPU - Power Management Control

Figure 2-3-3 : 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.

Race To Halt (RTH)
Enable/Disable Race To Halt feature. RTH will dynamically increase CPU frequency in order to enter pkg C-State faster to reduce overall power. (RTH is controlled through MSR 1FC bit 20).

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).

Config TDP Configurations
Config TDP Configurations.

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.

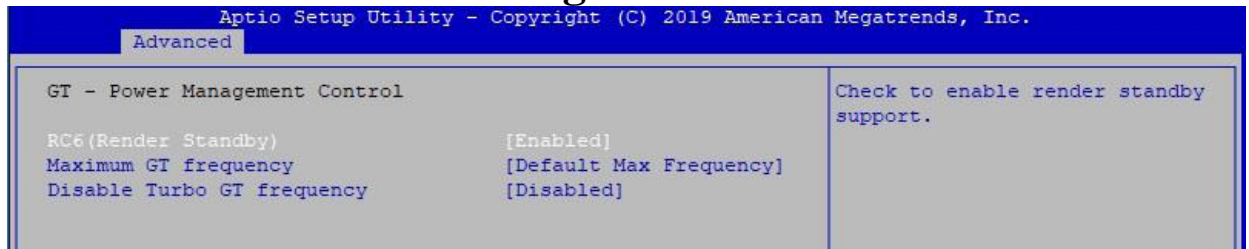## 3.3.2.2   GT - Power Management Control

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
    Advanced

  GT - Power Management Control                              Check to enable render standby
                                                             support.
  RC6(Render Standby)               [Enabled]
  Maximum GT frequency              [Default Max Frequency]
  Disable Turbo GT frequency        [Disabled]
```

Figure 2-3-2-2 : 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 1150 MHz (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.
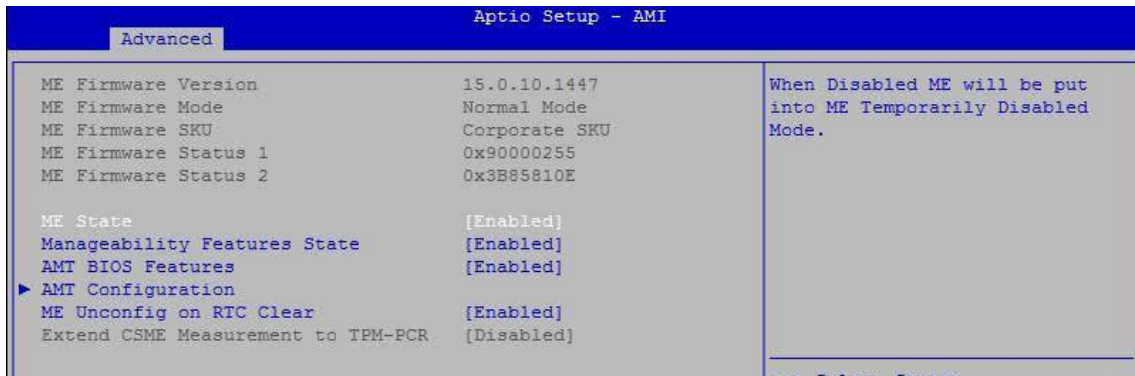
3.3.3   PCH-FW Configuration

```
                          Aptio Setup - AMI
       Advanced

  ME Firmware Version        15.0.10.1447          When Disabled ME will be put
  ME Firmware Mode           Normal Mode           into ME Temporarily Disabled
  ME Firmware SKU            Corporate SKU         Mode.
  ME Firmware Status 1       0x90000255
  ME Firmware Status 2       0x3B85810E

  ME State                           [Enabled]
  Manageability Features State       [Enabled]
  AMT BIOS Features                  [Enabled]
► AMT Configuration
  ME Unconfig on RTC Clear           [Enabled]
  Extend CSME Measurement to TPM-PCR [Disabled]
```

Figure 4-3-1 : PCH-FW Settings

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

Manageability Features State
Enable/Disable Intel(R) Manageability features.
NOTE : This option disables/enables Manageability Features support in FW. To disable support platform must be in an unprovisioned state first.

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.

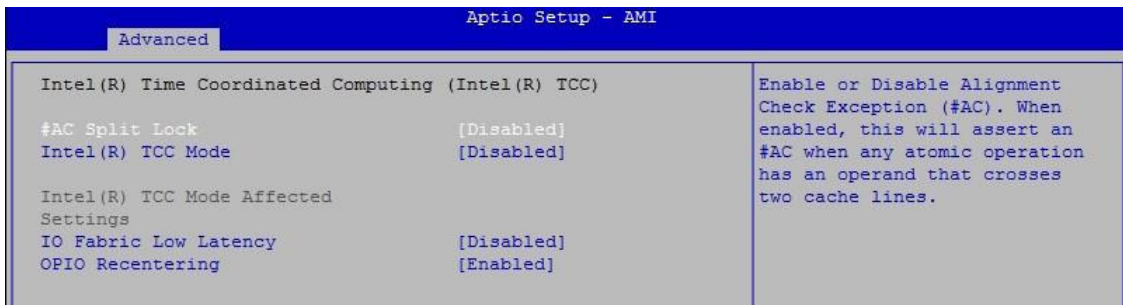## 3.3.4 Intel Time Coordinated Computing

Figure 4-3-5 : Intel TCC

Intel® Time Coordinated Computing options.

#AC Split Lock
Enable or Disable Alignment Check Exception (#AC). When enabled, this will assert an #AC when any atomic operation has an operand that crosses two cache lines.

Intel(R) TCC Mode
Enable or Disable Intel(R) TCC mode. When enabled, this will modify system settings to improve real-time performance. The full list of settings and their current state are displayed below when Intel(R) TCC mode is enabled.

IO Fabric Low Latency
Enable or Disable IO Fabric Low Latency. This will turn off some power management in the PCH IO fabrics. This option provides the most aggressive IO Fabric performance setting. S3 state is NOT supported.

OPIO Recentering
Enable or Disable Opio Recentering to improve Pcie latency.

3.3.5 Trusted Computing
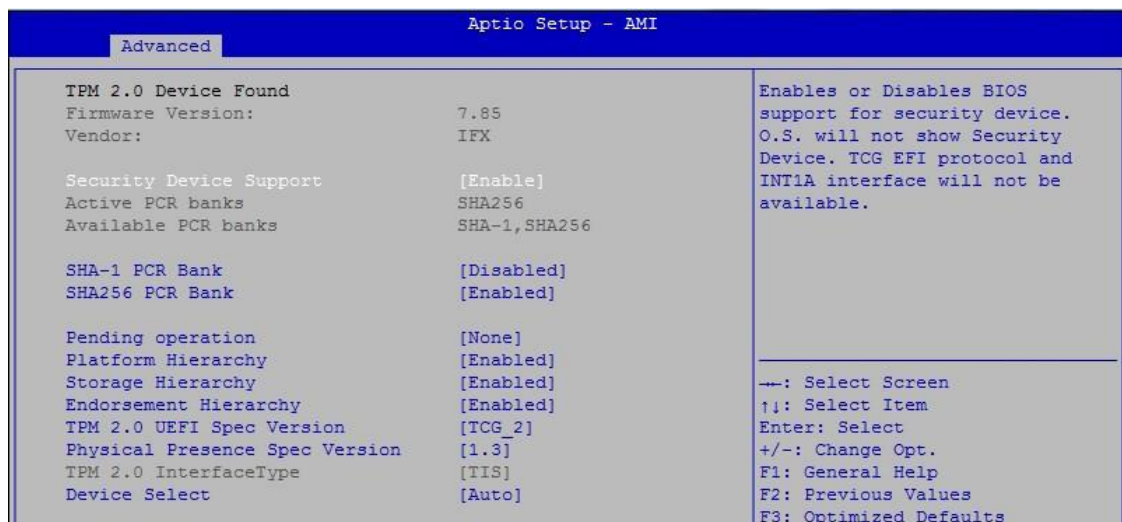
Figure 4-3-5 : Intel TCC

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

3.3.6 ACPI Setting

Figure 4-3-1 : ACPI Settings

Enable Hibernation

Enables or disables system's 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.

ACPI Low Power S0 Idle

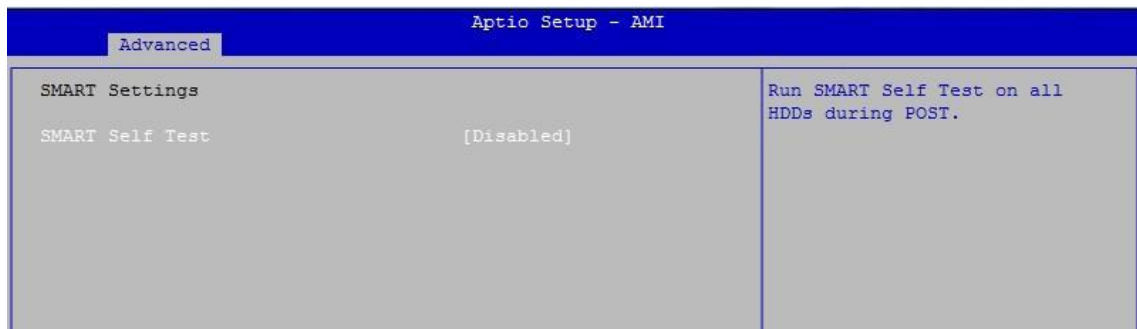Enable or disable ACPI Low Power S0 Idle Support.

3.3.7 SMART Settings

Figure 4-3-5 : Intel TCC

SMART Self Test

Run SMART Self-test on all HDDs during POST.

3.3.8   IT8786 Super IO Configuration

Figure 4-3-5 : Super IO Settings

Serial Port 1 Configuration
Set parameters of serial port 1 (COM 1).

Serial Port 2 Configuration
Set parameters of serial port 2 (COM 2).

Serial Port 3 Configuration
Set parameters of serial port 3 (COM 3).

Serial Port 4 Configuration
Set parameters of serial port 4 (COM 4).

Serial Port 5 Configuration
Set parameters of serial port 5 (COM 5).

3.3.9   Hardware Monitor

The IT8786 SIO features an enhanced hardware monitor providing thermal, fan speed, and system voltages' status monitoring.
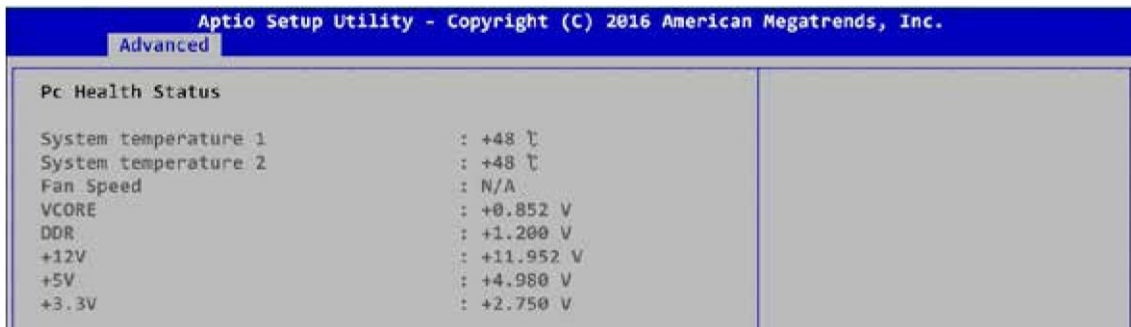
Figure 4-3-6 : Hardware Monitor Settings

3.3.10 Serial Port Console Redirection

Figure 4-3-7 : 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.

3.3.11 Intel TXT information
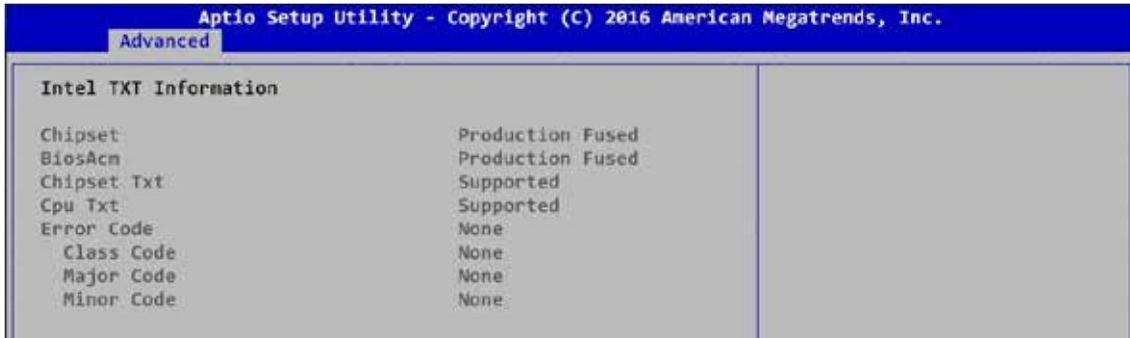
Figure 4-3-9 : Intel TXT Information

Display Intel TXT information.
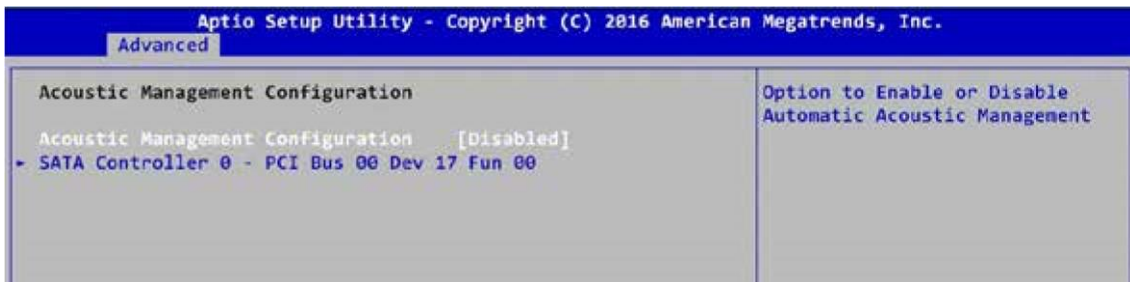
3.3.12 Acoustic Management Configuration

Figure 4-3-11 : Acoustic Management Settings

Acoustic Management Configuration
Option to enable or disable Automatic Acoustic Management.
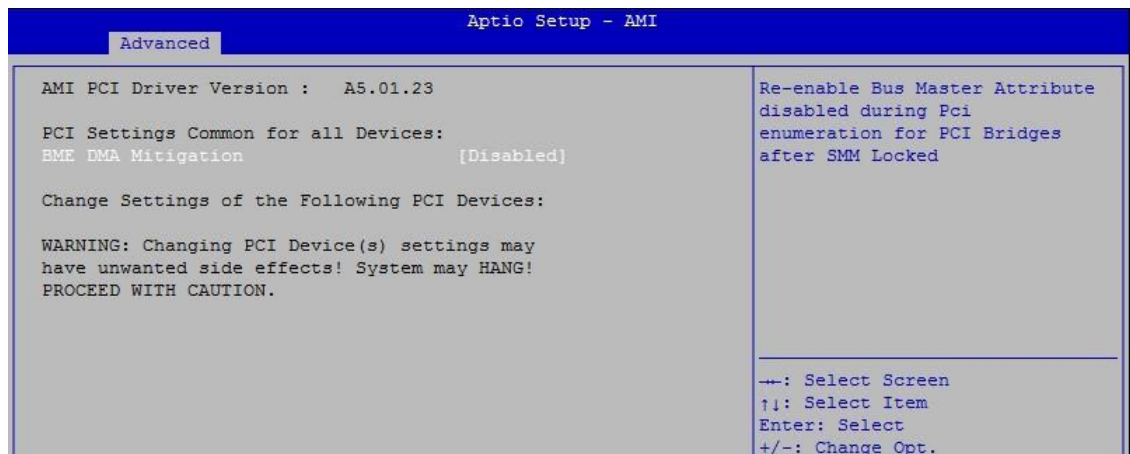
3.3.13 PCI Subsystem Settings

Figure 4-3-7 : PCI Subsystem Settings

BME DMA Mitigation
Re-enable Bus Master Attribute disabled during Pci enumeration for PCI Bridges after SMM Locked.
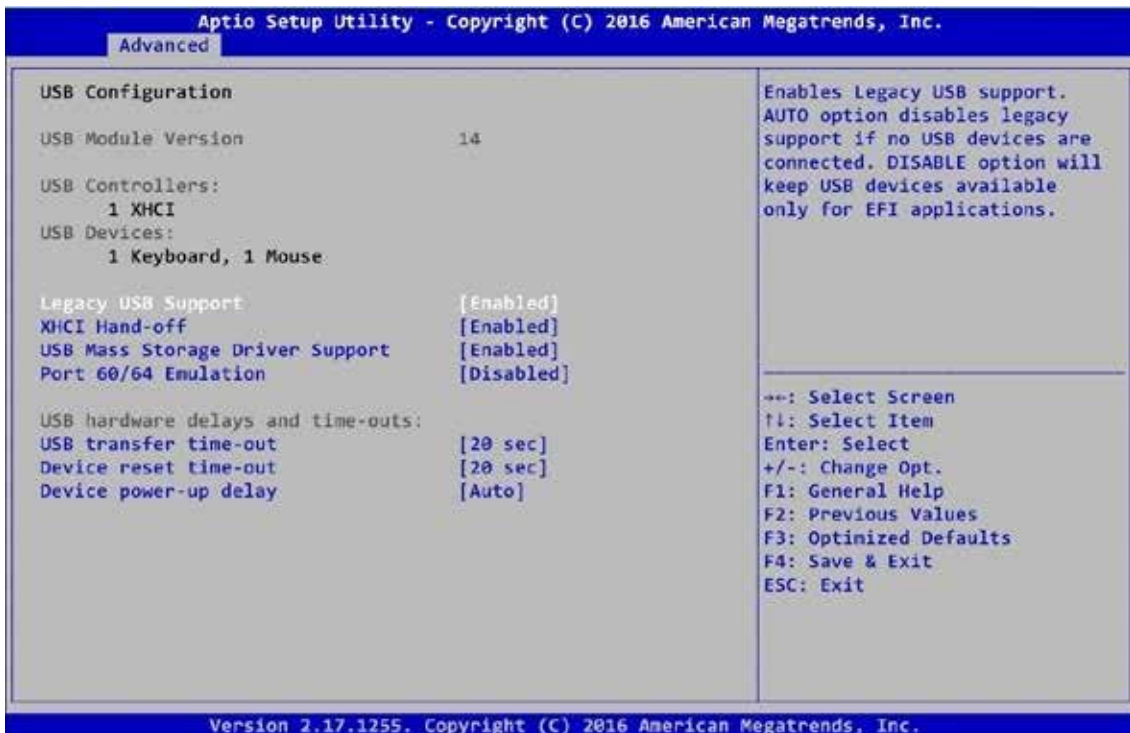
3.3.14 USB Configuration

Figure 4-3-14 : 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 OS-es without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

USB Mass Storage Driver Support
Enable/disable USB Mass Storage Driver Support.

USB transfer time-out
The time-out value for control, bulk, and interrupt transfers.

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

Device power-up delay
Maximum time the device will take before it properly reports itself to the host controller.
'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor.

3.3.15 CSM Configuration

Figure 4-3-13 : CSM Settings

Network Stack
Enable/disable UEFI Network Stack.

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.

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.
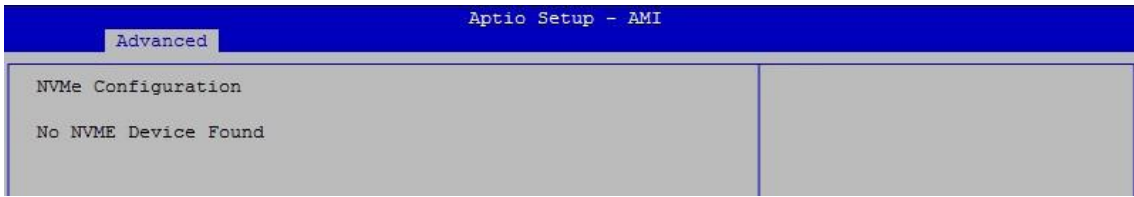
3.3.16 NVME Configuration

Figure 4-3-13 : NVME Settings

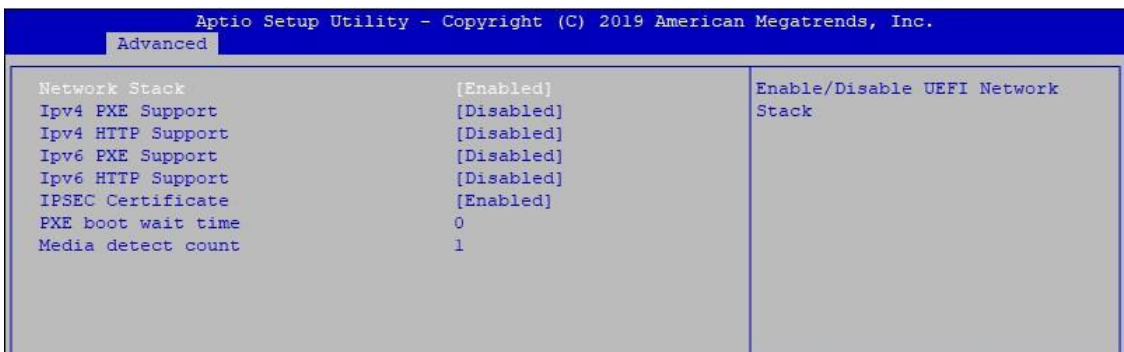Display NVMe Controller and drive information.

3.3.17 Network Stack Configuration

Figure 4-3-12 : Network Stack Settings

Network Stack
Enable/disable UEFI Network Stack.

Ipv4 PXE Support
Enable Ipv4 PXE Boot Support. If disabled IPV4 PXE boot option will not be created.

Ipv4 HTTP Support
Enable/disable IPv4 HTTP boot support

Ipv6 PXE Support
Enable Ipv6 PXE Boot Support. If disabled IPV6 PXE boot option will not be created.

Ipv6 HTTP Support
Enable/disable IPv6 HTTP boot support.

PXE boot wait time
Wait time to press ESC key to abort the PXE boot.

Media detect count
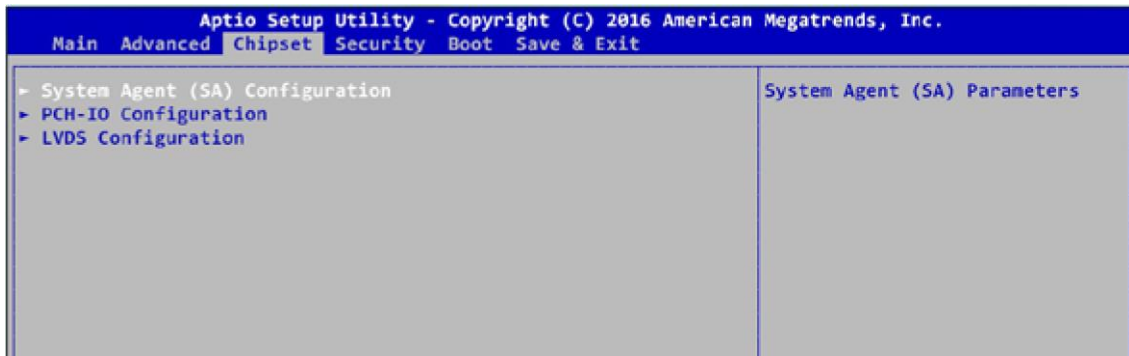Number of times presence of media will be checked.

3.4 Chipset

Figure 4-4 : Chipset Menu

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

PCH-IO Configuration
PCH Parameters.

SW Ignition Configuration
SW Ignition Configuration. Settings Delay Timer and value of Voltage limit.

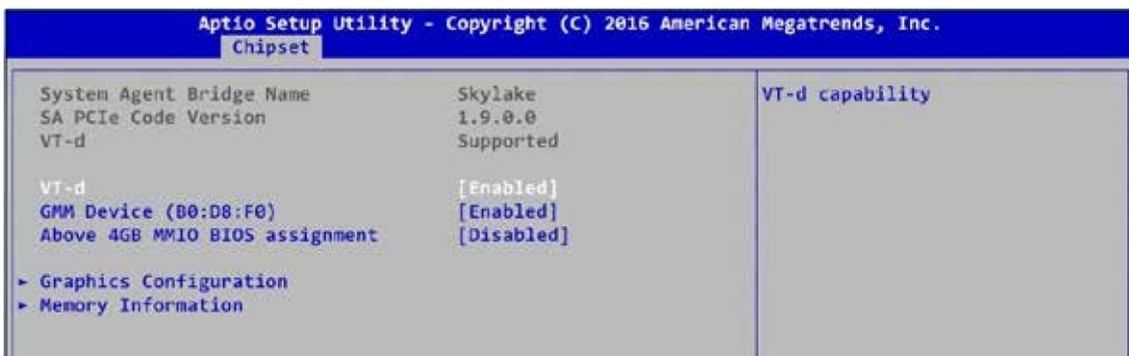## 3.4.1 System Agent (SA) Configuration

Figure 4-4-1 : USB Settings

VT-d
VT-d capability.

Above 4GB MMIO BIOS assignment
Enable/disable above 4GB Memory Mapped IO BIOS assignment. This is disabled automatically when Aperture Size is set to 2048MB.

3.4.1.1 Memory Information of System Agent (SA)

Figure 4-4-3 : Memory Information

Display memory information.

In-Band ECC Support
Enable/Disable In-Band ECC. Either the IBECC or the TME can be enabled.

3.4.1.2 Graphics Configuration

Figure 4-4-4 : Graphics Configuration

PCH LAN Controller
Enable or disable onboard NIC.

Graphics Configuration
Graphics turbo IMON current values supported (14-31).

Skip Scanning of External Gfx Card
If Enable, it will not scan for External Gfx Card on PEG and PCH PCIE ports.

Primary Display
Select which of IGFX/PEG/PCI graphics device should be Primary Display or select HG for Hybrid Gfx.

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.

PSMI SUPPORT
PSMI Enable/Disable.

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.
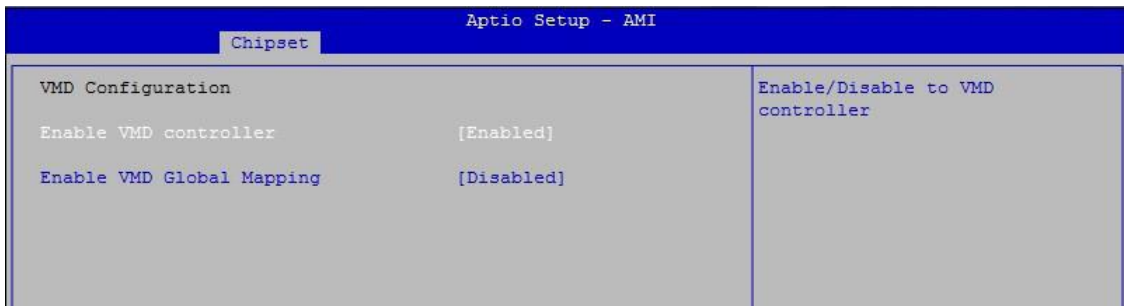
3.4.1.3   VMD Configuration

Figure 4-4-5 : VMD Configuration

Enable VMD controller
Enable/Disable to VMD controller.

Enable VMD Global Mapping
Enable/Disable to VMD Global Mapping.

3.4.1.4   SA PCI Express Configuration

Figure 4-4-5 : SA PCI Express Configuration

PCI Express Clock Gating
PCI Express Clock Gating Enable/Disable for each root port.

PCI Express Power Gating
PCI Express Power Gating Enable/Disable for each root port.

Compliance Test Mode
Enable when using Compliance Load Board.

Enable ClockReq Messaging
Enable or Disable ClockReq Messaging.

SUMIT B (PCIe x4)
BIOS options for PCI Express device setting.

3.4.2   PCH-IO Configuration

```
                          Aptio Setup - AMI
         ┌─────────┐
         │ Chipset │
         └─────────┘

   PCH-IO Configuration                            PCI Express Configuration
                                                   settings
 ► PCI Express Configuration
 ► SATA And RST Configuration
 ► Security Configuration

   PCH LAN Controller            [Enabled]
     Wake on LAN Enable          [Enabled]
   State After G3                [S5 State]



                                                   ⇄: Select Screen
                                                   ↑↓: Select Item
```
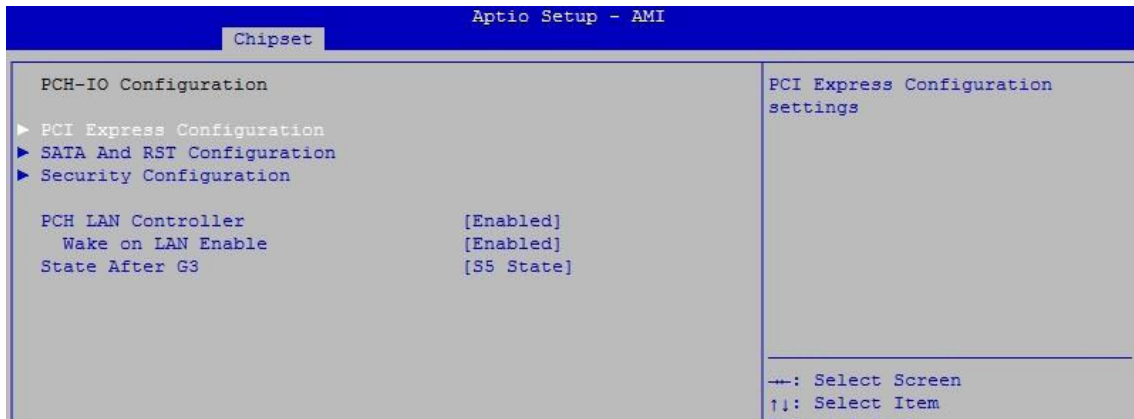
Figure 4-4-6 : PCH-IO Configuration

PCH LAN Controller
Enable or disable onboard NIC.

Wake on LAN
Enable or disable integrated LAN to wake the system.

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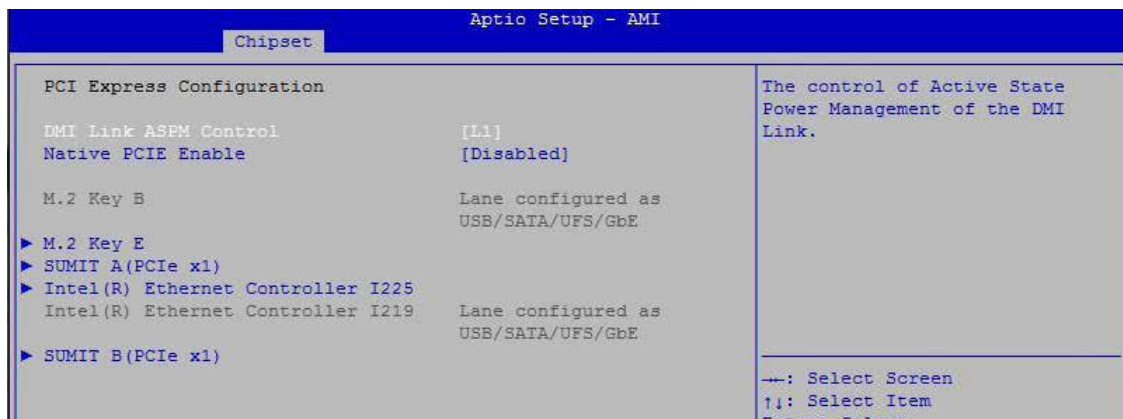
3.4.2.1   PCI Express Configuration

```
                          Aptio Setup - AMI
         ┌─────────┐
         │ Chipset │
         └─────────┘

   PCI Express Configuration                       The control of Active State
                                                   Power Management of the DMI
   DMI Link ASPM Control          [L1]             Link.
   Native PCIE Enable             [Disabled]

   M.2 Key B                      Lane configured as
                                  USB/SATA/UFS/GbE
 ► M.2 Key E
 ► SUMIT A(PCIe x1)
 ► Intel(R) Ethernet Controller I225
   Intel(R) Ethernet Controller I219   Lane configured as
                                        USB/SATA/UFS/GbE
 ► SUMIT B(PCIe x1)
                                                   ⇄: Select Screen
                                                   ↑↓: Select Item
```

Figure 4-4-7 : 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.
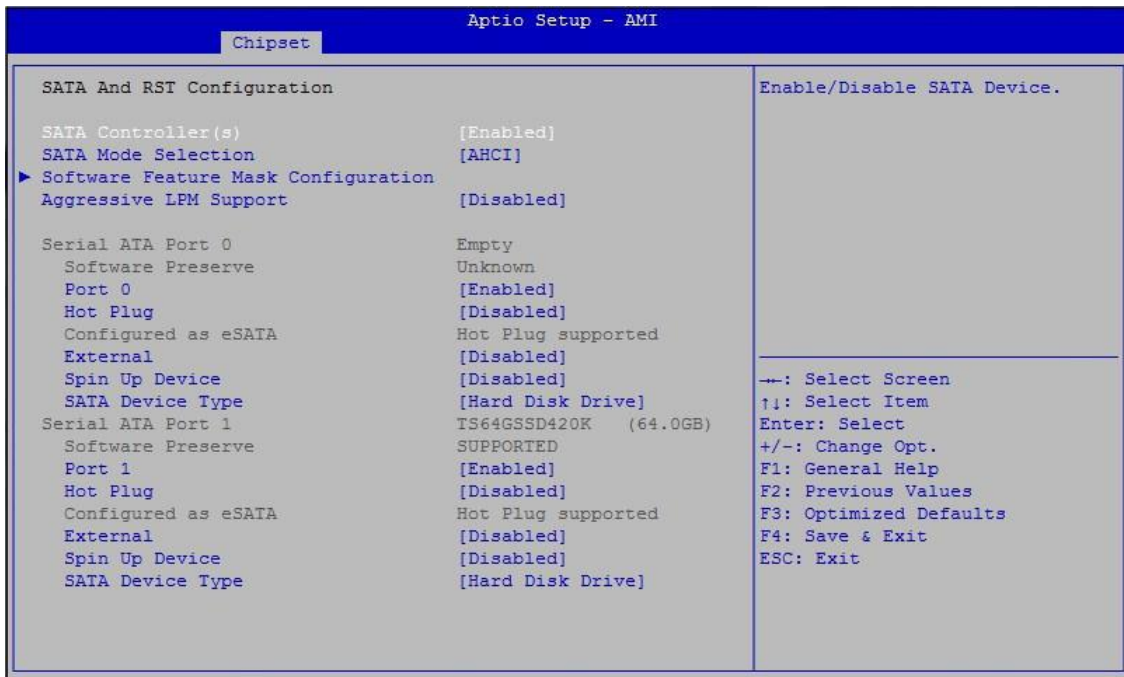
3.4.2.2 SATA & RST Configuration

Figure 4-3-10 : 2.4.2.2　SATA & RST Configurations

SATA Controller(s)
Enable or disable SATA Device.

SATA Mode Selection
Determines how SATA controller(s) operate.

Software Feature Mask Configuration
RAID OROM/RST driver will refer to the SWFM configuration to enable or disable the storage features.

Aggressive LPM Support
Enable PCH to aggressively enter link power state.

Options for each SATA port :

Port n
Enable or disabled 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.

3.4.2.3　BIOS Security Configuration of PCH-IO

Figure 4-4-6 : BIOS Security Settings

Force unlock on all GPIO pads
If Enabled BIOS will force all GPIO pads to be in unlocked state.

BIOS Lock
Enable/disable the PCH BIOS lock enable (BLE bit) feature.
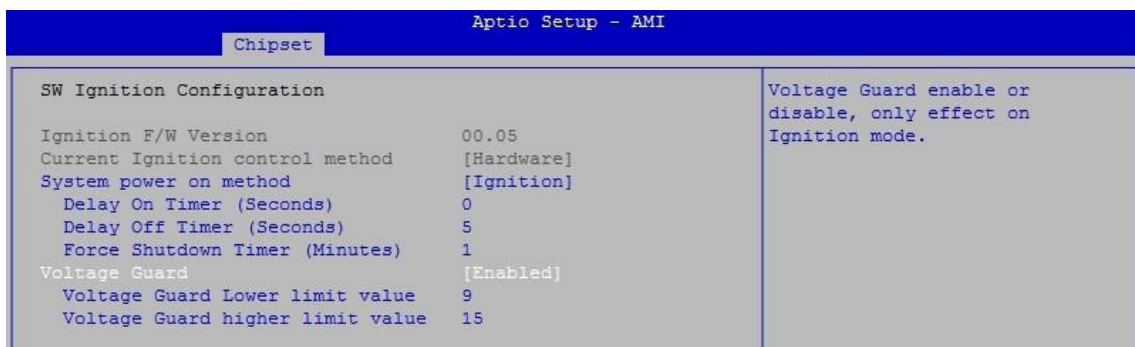
3.4.3　SW Ignition Configuration

Figure 4-4-6 : SW Ignition Configuration

Force unlock on all GPIO pads
If Enabled BIOS will force all GPIO pads to be in unlocked state.

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

System power on method
[Normal] System power on by power button. [Ignition] System power on by ignition pin.

Delay On Timer (Seconds)
The delay time after user trigger ignition on signal (Seconds).

Delay Off Timer (Seconds)
The delay time after user trigger ignition off signal (Seconds).

Force Shutdown Timer (Minutes)
Used to force cut off system power when OS unable gracefully shutdown system successfully.

Voltage Guard
Voltage Guard enable or disable, only effect on Ignition mode.

Voltage Guard Lower limit value
Voltage Guard lower limit value setting. Range : 9v – 40v.

Voltage Guard higher limit value
Voltage Guard Higher limit value setting. Range : 15v – 55v.

3.4.4 LVDS Configuration

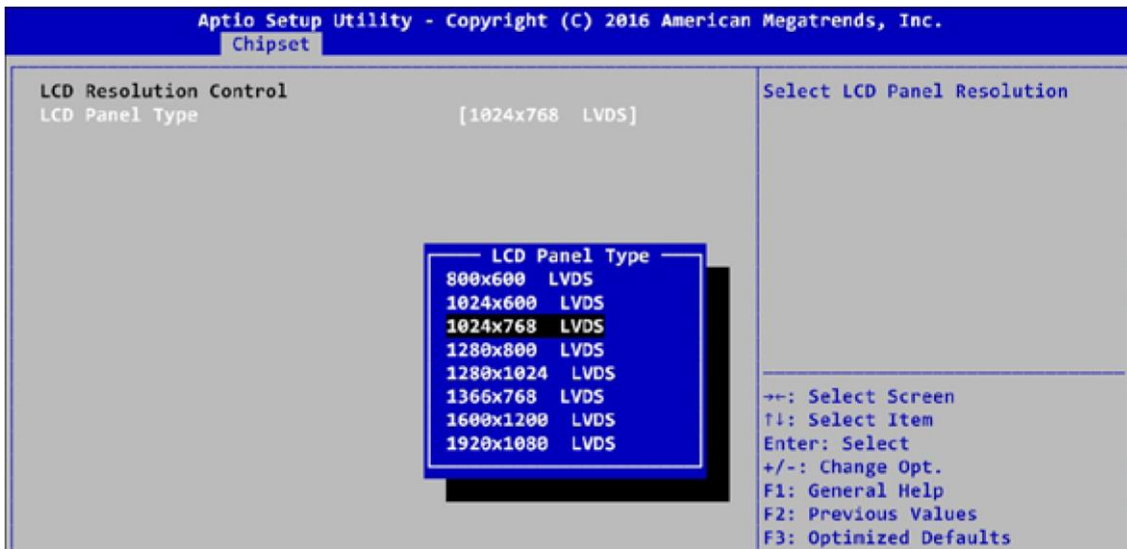The LVDS Configuration option will be present if LVDS panel is connected on system.

Figure 4-4-8 : LVDS Panel Settings

LCD Panel Type
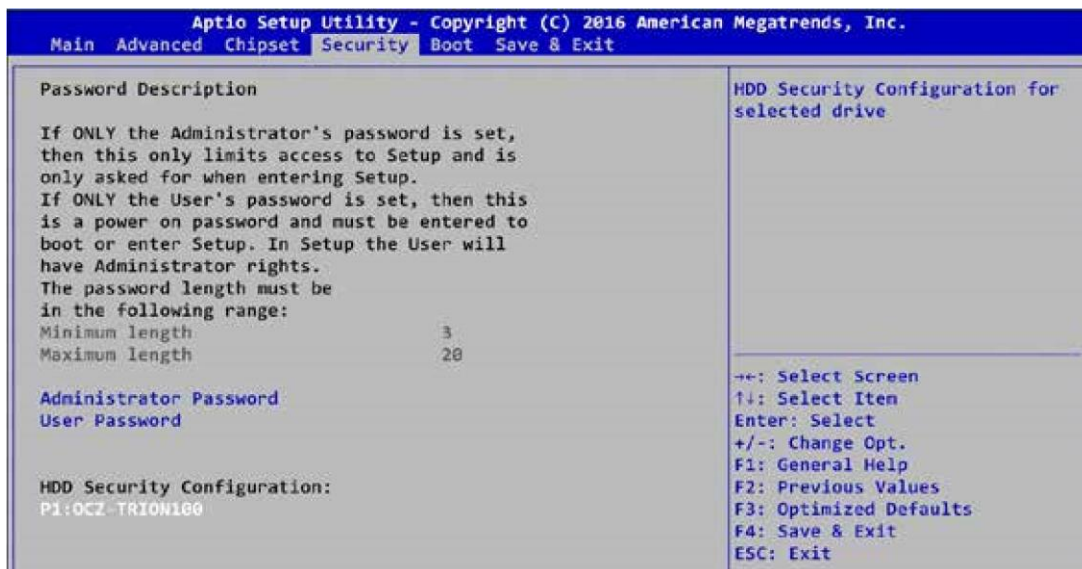Select LCD Panel Resolution.

3.5 Security

Figure 4-5 : BIOS Security Menu

Administrator Password
Set Administrator Password.

User Password
Set User Password.

Secure Boot

Secure Boot configuration.

3.5.1 HDD Security Configuration

```
                          Aptio Setup - AMI
              Security

    HDD Password Description :                        Set HDD User Password.
                                                      *** Advisable to Power Cycle
    Allows Access to Set, Modify and Clear            System after Setting Hard Disk
    Hard Disk   User    Password                      Passwords ***.
    and   Master   Password.                          Discard or Save changes option
    User Password is mandatory to Enable HDD Security. in setup does not have any
    If Master password is installed (optional),       impact on HDD when password is
    it can also be used to unlock the HDD.            set or removed. If the 'Set
    If the 'Set User Password' option is hidden,      HDD User Password' option is
    do power cycle to enable the option again.        hidden, do power cycle to
                                                      enable the option again
    HDD PASSWORD CONFIGURATION:

    Security Supported :          Yes                 →←: Select Screen
    Security Enabled   :          No                  ↑↓: Select Item
    Security Locked    :          No                  Enter: Select
    Security Frozen    :          No                  +/-: Change Opt.
    HDD User Pwd Status:          NOT INSTALLED       F1: General Help
    HDD Master Pwd Status :       NOT INSTALLED       F2: Previous Values
                                                      F3: Optimized Defaults
    Set User Password                                 F4: Save & Exit
    Set Master Password                               ESC: Exit
```
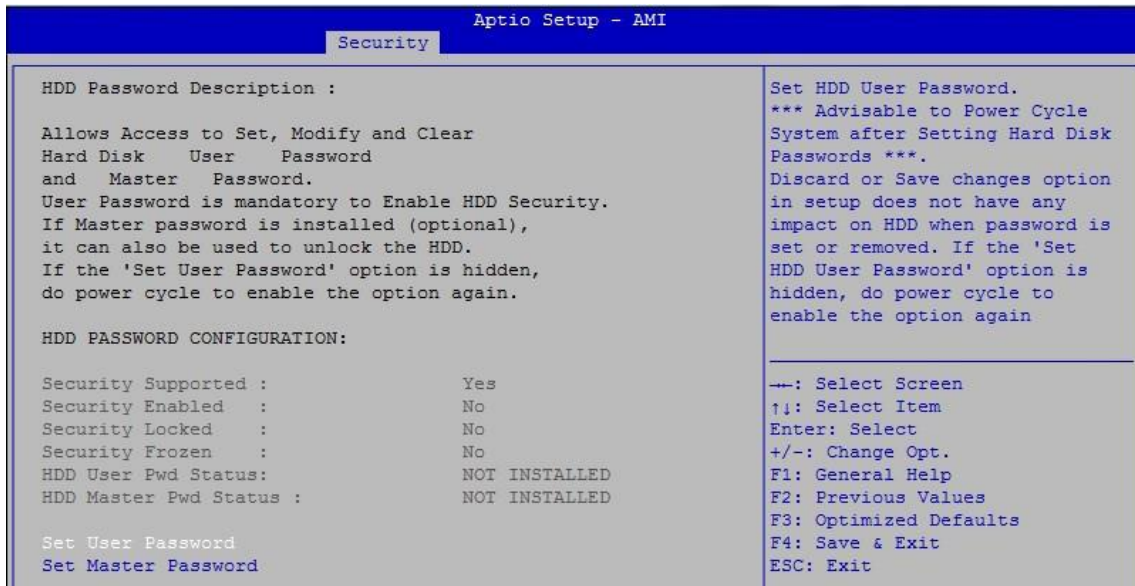
Figure 4-5-1 : HDD Security Settings

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 grayed out, do power cycle to enable the option again.
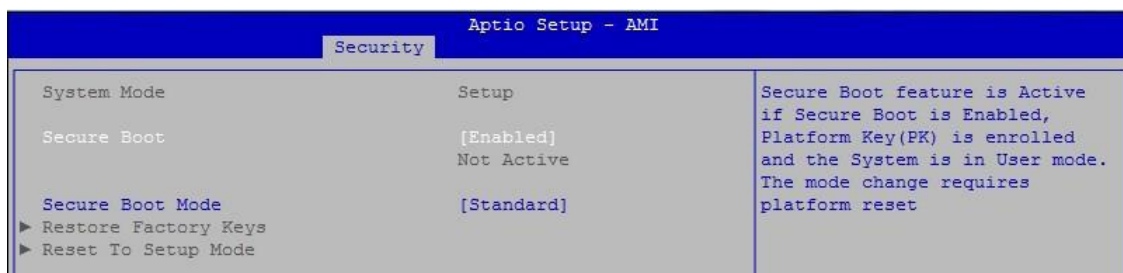
3.5.2 Security Configuration

```
                          Aptio Setup - AMI
                  Security

    System Mode                  Setup              Secure Boot feature is Active
                                                    if Secure Boot is Enabled,
    Secure Boot                  [Enabled]          Platform Key(PK) is enrolled
                                 Not Active         and the System is in User mode.
                                                    The mode change requires
    Secure Boot Mode             [Standard]         platform reset
    ▶ Restore Factory Keys
    ▶ Reset To Setup Mode
```

Figure 4-5-1 : HDD Security 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.
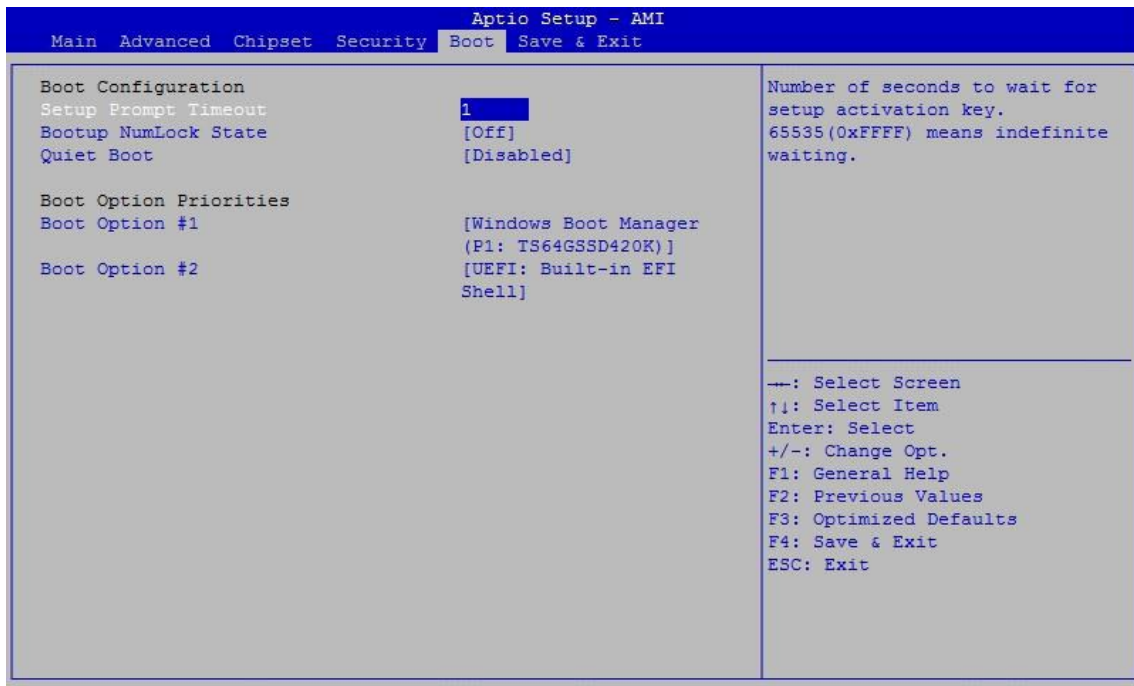
3.6 Boot

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
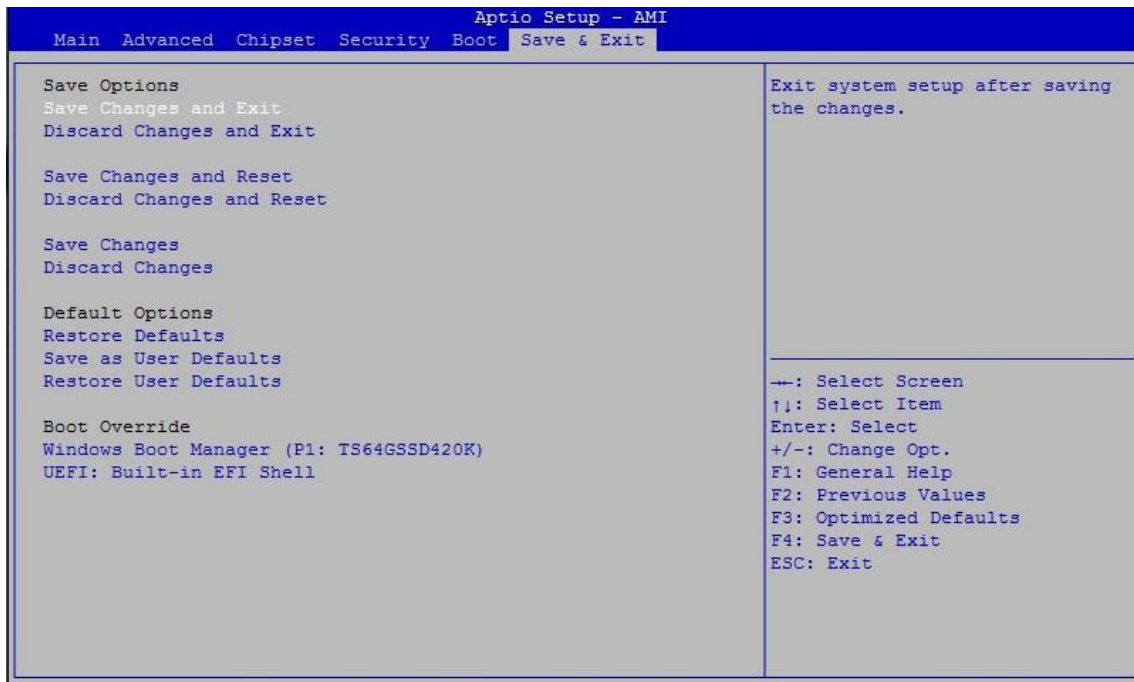
Sets the system boot order.

3.7 Save & Exit

Figure 4-7 : Bios Save and 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.

APPENDIX A : GPIO GUIDE

A.1 Function Description

The EMBC-5000 offers a 16-bit GPIO a pair of 10-bit internal connector, and a watchdog timer.

GPIO definition is shown below :
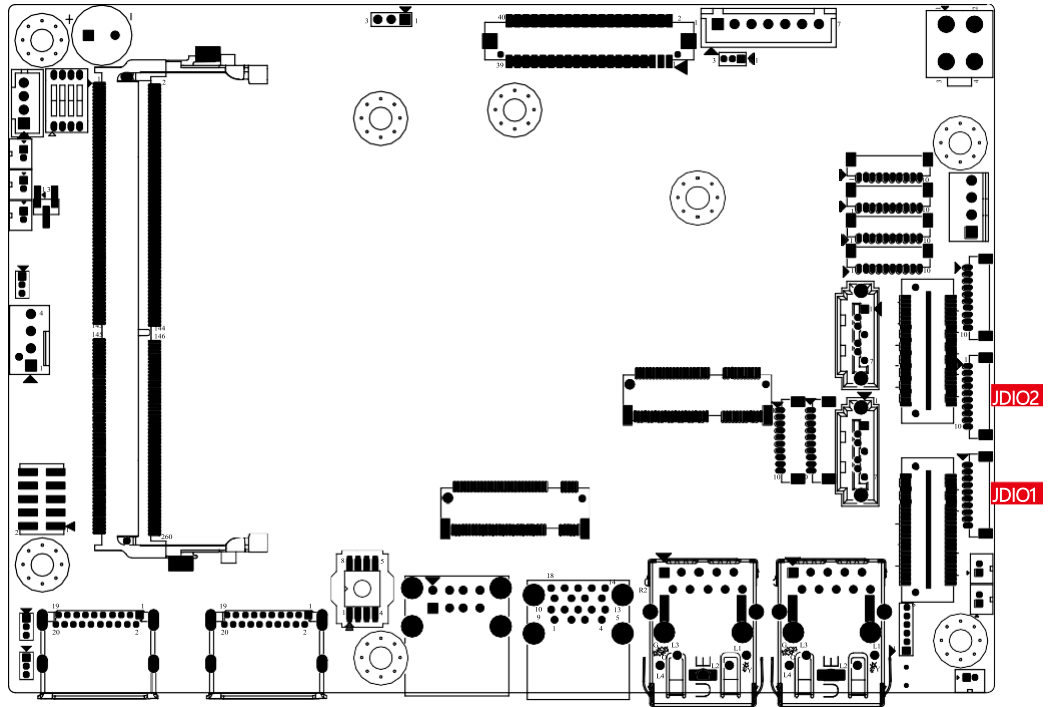
JDIO1		JDIO2	
Pin No.	GPIO Definition	Pin No.	GPIO Definition
1	GPIO 0	1	GPIO 8
2	GPIO 1	2	GPIO 9
3	GPIO 2	3	GPIO 10
4	GPIO 3	4	GPIO 11
5	GPIO 4	5	GPIO 12
6	GPIO 5	6	GPIO 13
7	GPIO 6	7	GPIO 14
8	GPIO 7	8	GPIO 15
9	VDIO	9	VDIO
10	GND	10	GND

A.2 Software Package Contain

Distribution folders include x32 and x64 versions, use the batch file for driver installation.

There are included as fallowed :

Win10_32.bat, and Win10_64.bat :

Installation for driver, and Uninstall_32.bat, and Uninstall_64.bat :

Uninstallation for driver

Run batch file as Administrator.

Make sure Windows version before installation.

Header folders include head file for software developer or System Integration. Manual folders include API description.

Sample folders include sample program, driver library, and API library for Windows/Linux

Source folders include sample program source code that compile on Visual Studio 2008/ ubuntu16.04.

```
Distribution
Header
Manual
Sample
Source
Uninstall_32.bat
Uninstall_64.bat
Win10_32.bat
Win10_64.bat
```
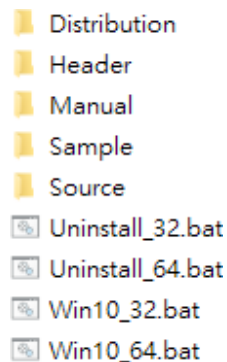
A.3 Sample

Execute demo tool.

Windows
```
IOConfig
drv.dll
Vecow.dll
Vecow_DIO.exe
Vecow_DIO_loopback.exe
Vecow_POE.exe
Vecow_WDT.exe
```

Linux
```
IOConfig
libvecow.so
Vecow_DIO
Vecow_DIO_loopback
Vecow_POE
Vecow_WDT
```
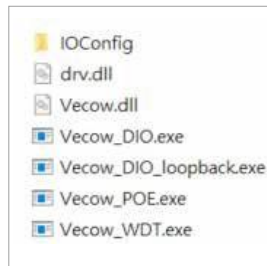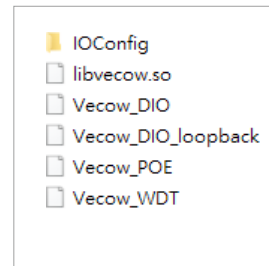
Sample, as shown below :

```
DIO sample version : v1.0.0609.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

Choose IO : (1/2)
```

Vecow_DIO

```
DIO loopback sample version : v1.0.1509.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

How many IO temp_port : (1/2)
```

Vecow_DIO_loopback

```
POE sample version : v1.0.1609.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608

Initial POE success!
Usable slave address ID : 0
Select slave address ID :
```

Vecow_POE

```
WDT sample version : v1.0.0509.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

Set WDT timer seconds (1~3932100) :
```

Vecow_WDT

APPENDIX B : Software Functions

B.1 Driver API Guide

In Header folder, Vecow.h and VecowLinux.h contain usabled API for Windows/Linux.

BOOL initial_SIO(BYTE Isolate_Type, BYTE DIO_NPN)

    Initial machine for IO and watch dogtimer.

      Isolate_Type : DIO type.

        0 : Isolated DIO;

        1 : Non-Isolated DIO (GPIO).

      DIO_NPN : DI/DO type.

        1 : PNP (Source) mode for European rule;

        0 : NPN (Sink) mode for Japanese rule.

    Return :

      TRUE (1) : Success.

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

BOOL get_IO1_configuration(BYTE *Iso, BYTE *DI_mode, BYTE *DO_ mode, WORD *Mask)
BOOL get_IO2_configuration(BYTE *Iso, BYTE *DI_mode, BYTE *DO_ mode, WORD *Mask)

    Get DIO configuration (by variable)

      Isolate_Type : DIO type.

        0 : Isolated DIO;

        1 : Non-Isolated DIO (GPIO).

      DI_mode ([7:0]) : DI type, pin setting by hexadecimal bitmask only for Isolated DIO.

        0xFF : PNP (Source) mode for European rule;

        0 : NPN (Sink) mode for Japanese rule.

      DO_mode : DO type only for Isolated DIO.

        1 : PNP (Source) mode for European rule;

        0 : NPN (Sink) mode for Japanese rule.

      Mask ([15:0]) : In/Out, pin setting by hexadecimal bitmask only for Non- Isolated DIO (GPIO).

        1 : Output;

        0 : Input

    Return :

      TRUE (1) : Success.

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

BOOL set_IO1_configuration(BYTE Iso, BYTE DI_mode, BYTE DO_mode, WORD Mask)
BOOL set_IO2_configuration(BYTE Iso, BYTE DI_mode, BYTE DO_mode, WORD Mask)

    Set DIO configuration.

      Isolate_Type : DIO type.

        1 : Isolated DIO;

        0 : Non-Isolated DIO (GPIO).

      DI_mode ([7:0]) : DI type, pin setting by hexadecimal bitmask only for Isolated DIO.

        0xFF : PNP (Source) mode for European rule;

        0 : NPN (Sink) mode for Japanese rule.

      DO_mode : DO type only for Isolated DIO.

        1 : PNP (Source) mode for European rule;

        0 : NPN (Sink) mode for Japanese rule.

      Mask ([15:0]) : In/Out, pin setting by hexadecimal bitmask only for Non- Isolated DIO (GPIO).

        1 : Output;

        0 : Input

    Return :

      TRUE (1) : Success.

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

BOOL get_DIO1(BYTE *DO_data, BYTE *DI_data)
BOOL get_DIO2(BYTE *DO_data, BYTE *DI_data)

    Get isolated DIO output (DO) and input (DI).

      DI ([7:0]) : Input state, pin setting by hexadecimal bitmask.

        1 : High;

        0 : Low.

      DO ([7:0]) : Output state, pin setting by hexadecimal bitmask.

        1 : High;

        0 : Low.

    Return :

      TRUE (1) : Success.

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

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

BOOL set_DIO1(BYTE DO_data) BOOL set_DIO2(BYTE DO_data)

    Set isolated DIO output(DO).

      DO ([7:0]) : Output state, pin setting by hexadecimal bitmask.

        1 : High;

        0 : Low.

    Return :

      TRUE (1) : Success.

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

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

BOOL get_GPIO1(WORD *GPIO_data)

    Get GPIO.

      GPIO_data ([15:0]) : GPIO state, pin setting by hexadecimal bitmask.

        1 : High;

        0 : Low.

    Return :

      TRUE (1) : Success.

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

BOOL set_GPIO1(WORD GPIO_data)

    Set GPIO.

      GPIO_data ([15:0]) : GPIO state, pin setting by hexadecimal bitmask.

        1 : High;

        0 : Low.

    Return :

      TRUE (1) : Success.

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

BOOL get_WDT(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 set_WDT(DWORD WDT)

    Set 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 setup 0, or hardware problem).

BOOL cancel_WDT()

    Cancel watchdog timer.

    Return :

      TRUE (1) : Success.

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

APPENDIX C : RAID Functions

The 11th Generation Intel processors (Intel Tiger Lake) utilizes the new Intel Volume Management Device technology, which optimizes the storage devices' data processing effectiveness and power consumption.

When you install Windows 10 retail or enterprise version, both need to load the IRST driver so Windows can detect a storage drive.

The steps below are required to set up and configure HW/BIOS supported systems for Intel® RST storage management through Intel® VMD. This is onlya reference for system vendors and expert users. You also can refer to the statement of Intel.

C.1 Access BIOS Settings

1. Boot the system and press the Delete key as soon as you see the AMI BIOSLogo to enter the BIOS setup.

2. Chipset → System Agent (SA) Configuration → VMD setup menu

3. VDM Configuration
   a) Change the setting on "Enable VMD controller" to Enabled
   b) Change the setting on "Enable VMD Global Mapping" to Enabled

4. Save Changes and Reset. When asked if you want to save changes, click "Yes".

5. Access BIOS menu again, select Intel(R) Rapid Storage Technology.
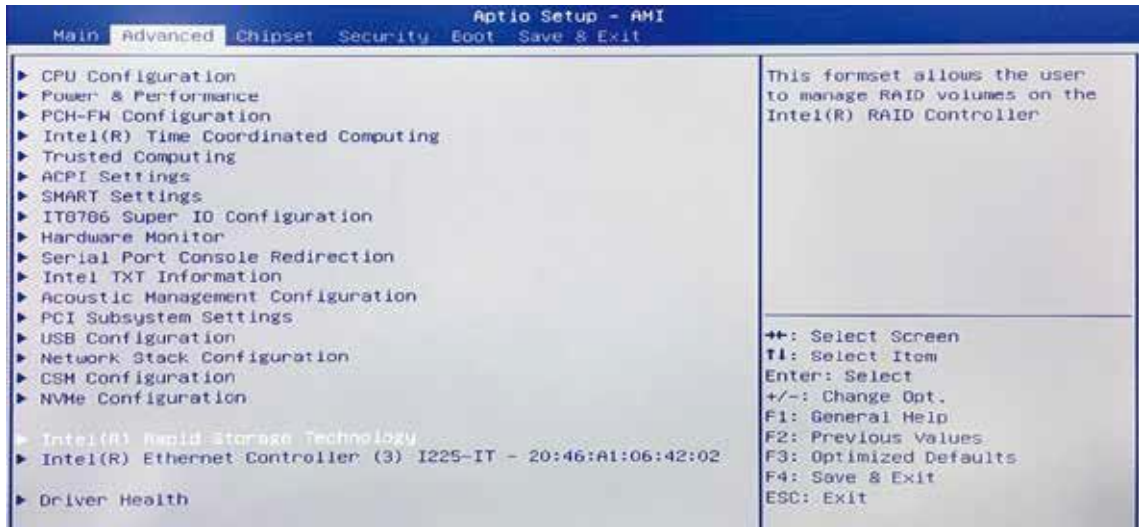
6. Select Create RAID Volume on BIOS menu.
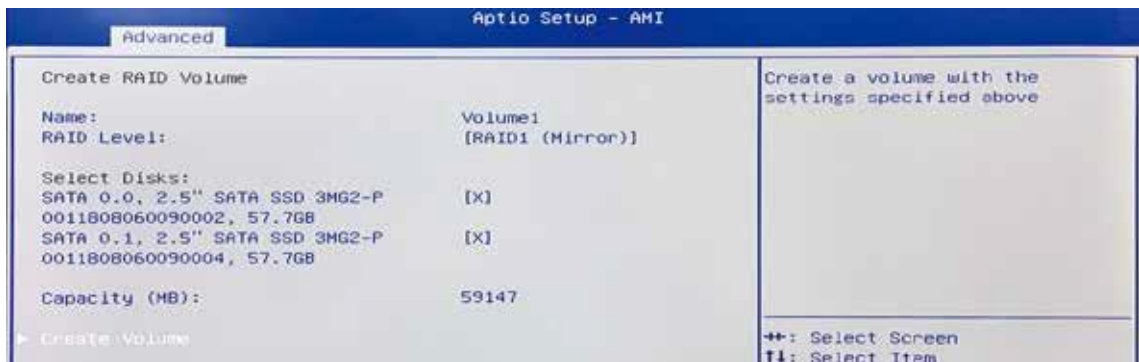
7. Select disks to create RAID Volume then Save Changes and Reset to install OS with UEFI mode.

C.2 OS Installation

The system is featured with three SATA, include two internal SATA, and one M.2Key B (3052) storage.

We take two SATA for Windows 10 OS installation as an example.

1. Please download "Intel Rapid Storage Technology (IRST) driver", DownloadLink from Intel website. Intel® Rapid Storage Technology Driver Installation Software with Intel® Optane™ Memory

2. After downloading the driver, right-click [F6flpy-x64 (Intel® VMD).zip] compressed file and select [Extract All].
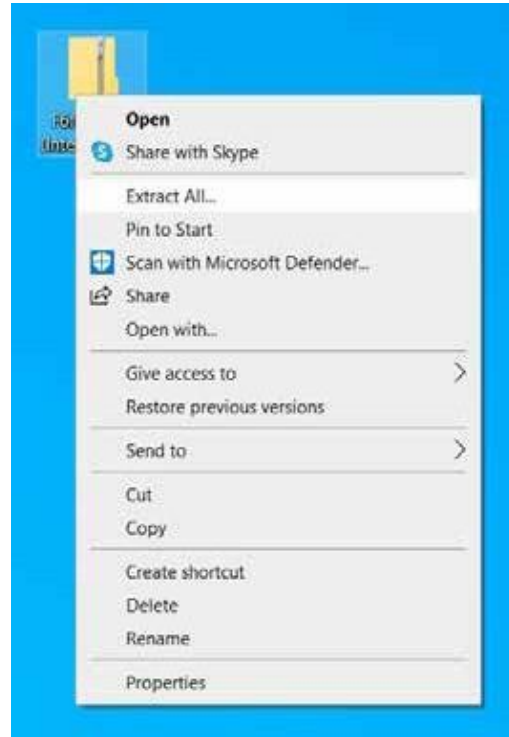
3. Unzip the file you download and save the files to the Windows 10 USB drive you created.
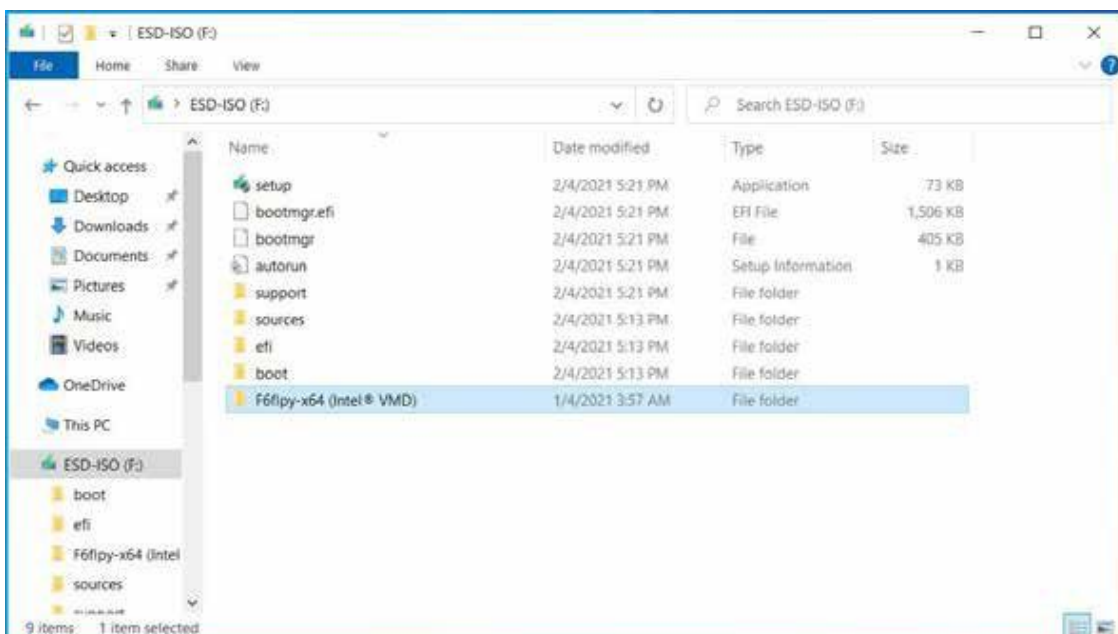
4. After the copying is completed, make sure the folder includes the following files.
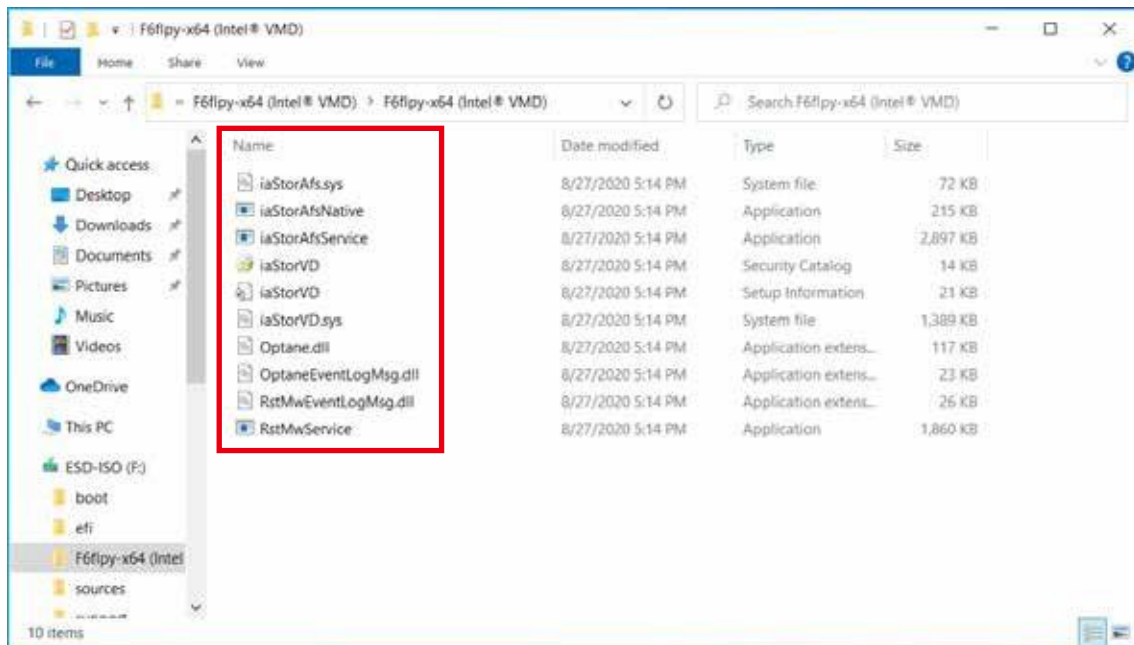
5. Select Windows 10 USB drive to enter Windows 10 setup interface Follow the installation instruction, the system should enter the storage setting interface, the bottom of the screen should display a message "We couldn't find any drives. To get a storage driver, click Load driver."
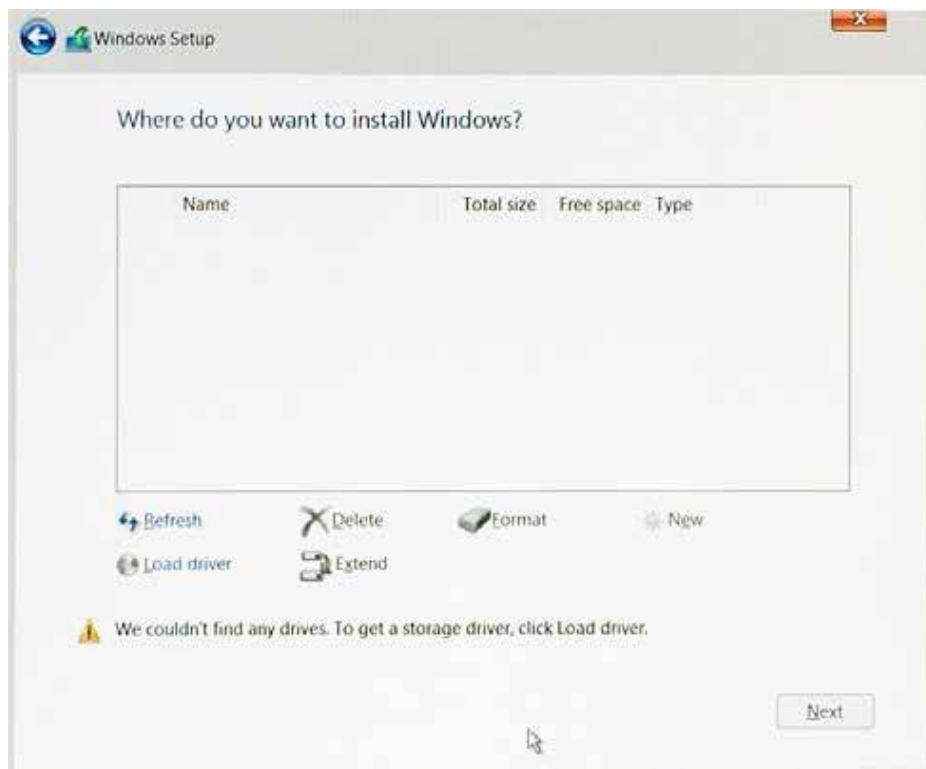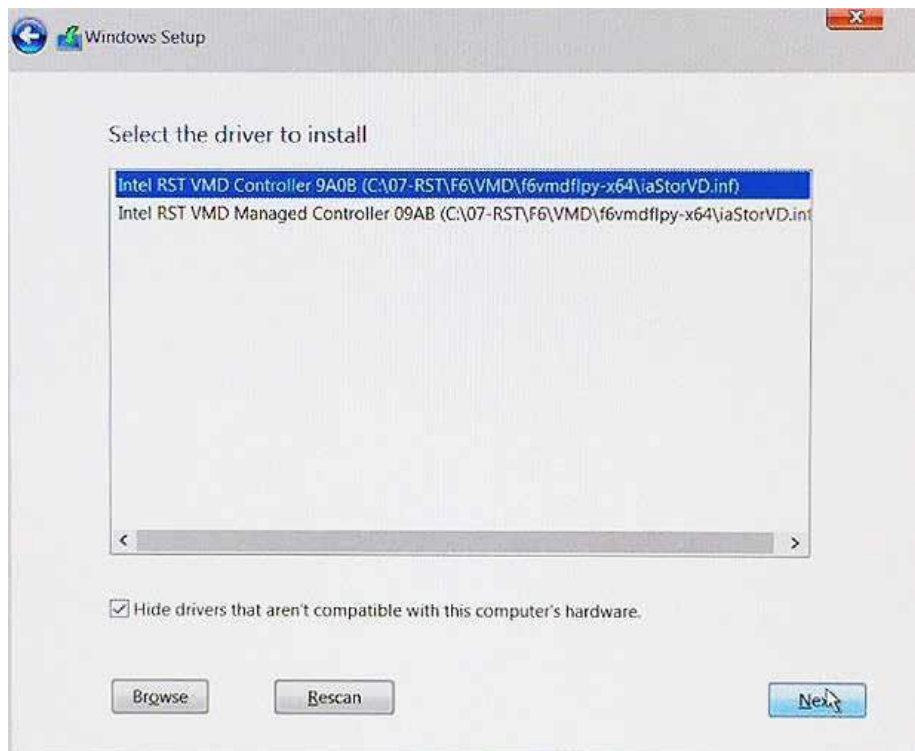
6. Click on Browse icon.
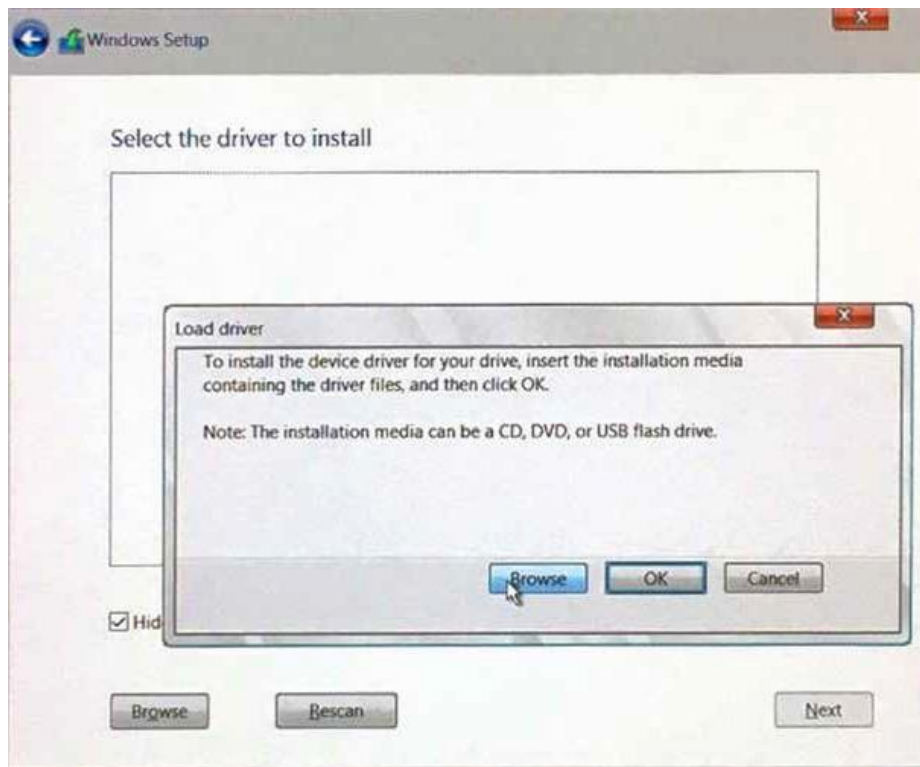
7. Select Intel VMD driver folder which has been saved in, then click on OK to continue
the process.
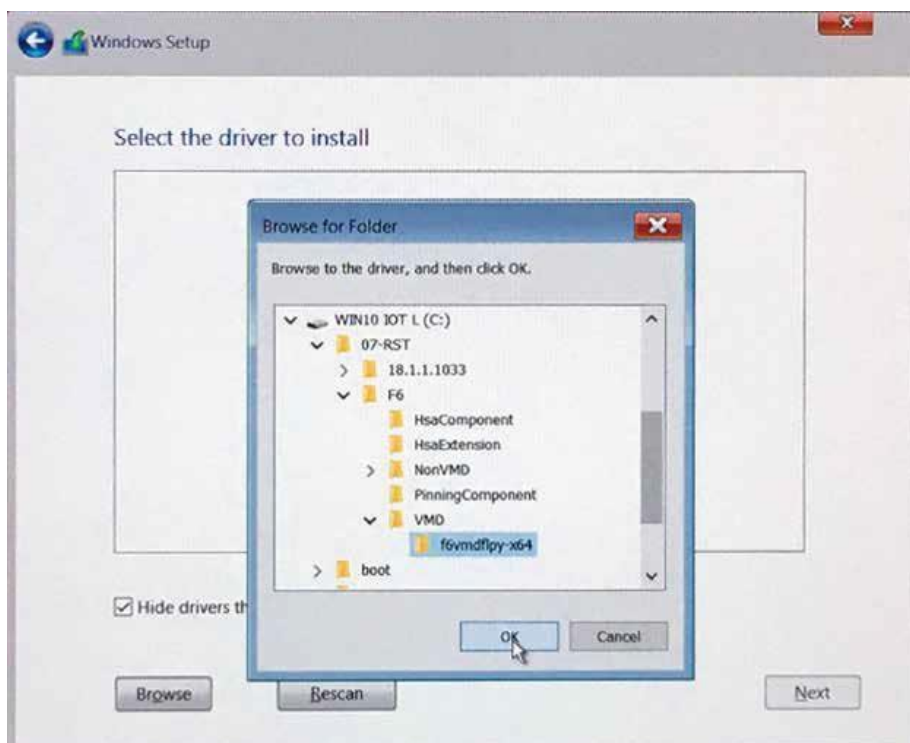
8. Select the top driver, and then click on Next button to continue the process.

9. Windows 10 OS will automatically install the Intel VMD driver, after the process is complete, you will see the list of all drives and partitions on your computer. You can choose to "Refresh", "Format", "Delete" the available drives then click on Next to continue the Windows 10 installation process.

Note : This issue should be resolved in Windows 10 ver. 20H2, which will include the Tiger Lake IRST driver.

C.3 To Install All Device Drivers of the System

The instructions are as follows :

1. To install Chipset driver

2. To install Graphics driver

3. To install ME driver

4. To install SerialIO driver

5. To install Network driver

6. To install Audio driver

7. To install Intel® Rapid Storage Technology Driver Installation Software withIntel® Optane™ Memory driver

C.4 To Install "Intel® Rapid Storage Technology Driver Installation Software with Intel® Optane™ Memory"Software

You can get the software on the driver CD.

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

https://www.intel.com/content/www/us/en/support/products/99745/memory-and-storage/intel-optane-memory.html

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

C.5 To Insert SATA HDD/SSD for RAID 1

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

C.6 To get Intel® Optane™ Memory and Storage Management application

The Intel® Optane™ Memory and Storage Management application/user interface is a Microsoft Store* app. It provides users with monitoring and management capabilities for the Intel® Rapid Storage Technology (Intel® RST) storage subsystem, Download Link.

Note : The Intel® RST Driver is required to be installed before installing the application, read more here.
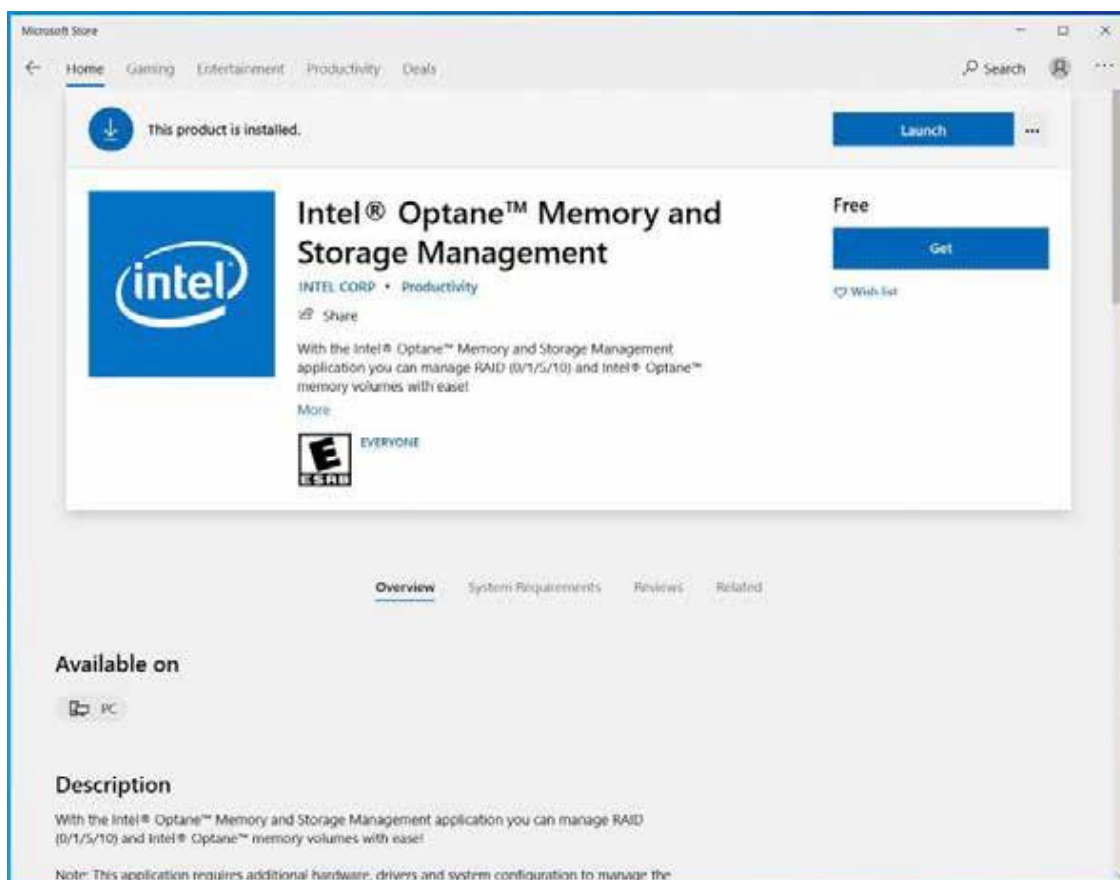
C.7 Intel® Optane™ Memory and Storage Management User Interface

The volume will be shown in the OS-related applications, and it will display Pass-through SATA and PCIe disks, Empty SATA ports, RAID volumes, and Intel® Optane™ memory volumes.
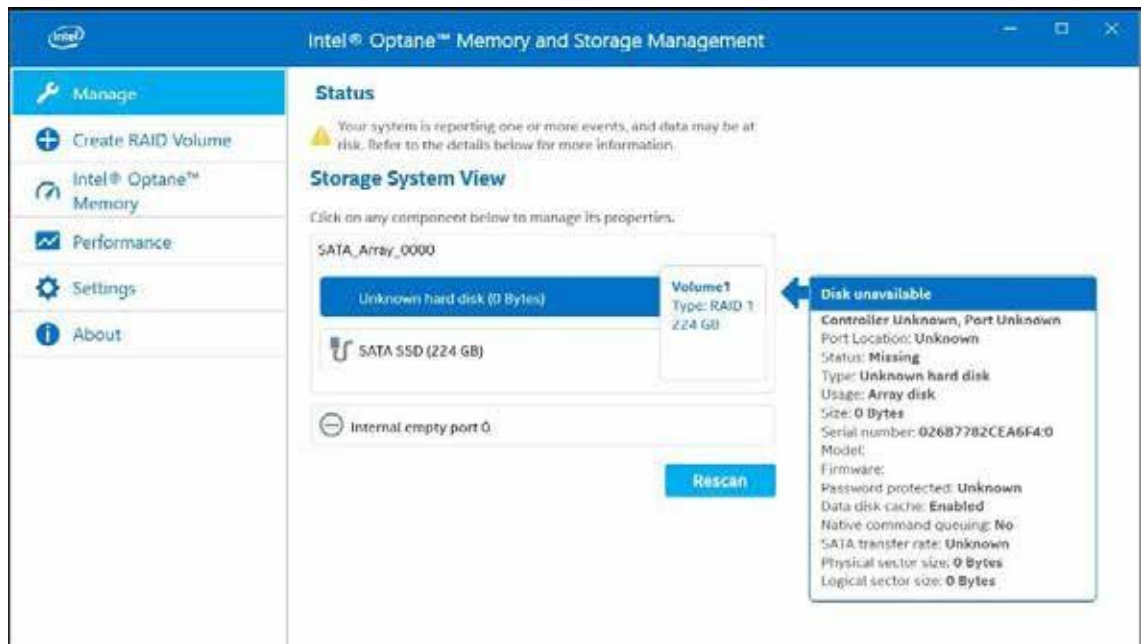
The following guide link can assist you when managing Intel® Optane™ memory devices.

Intel® Optane™ Memory Installation and User Guide
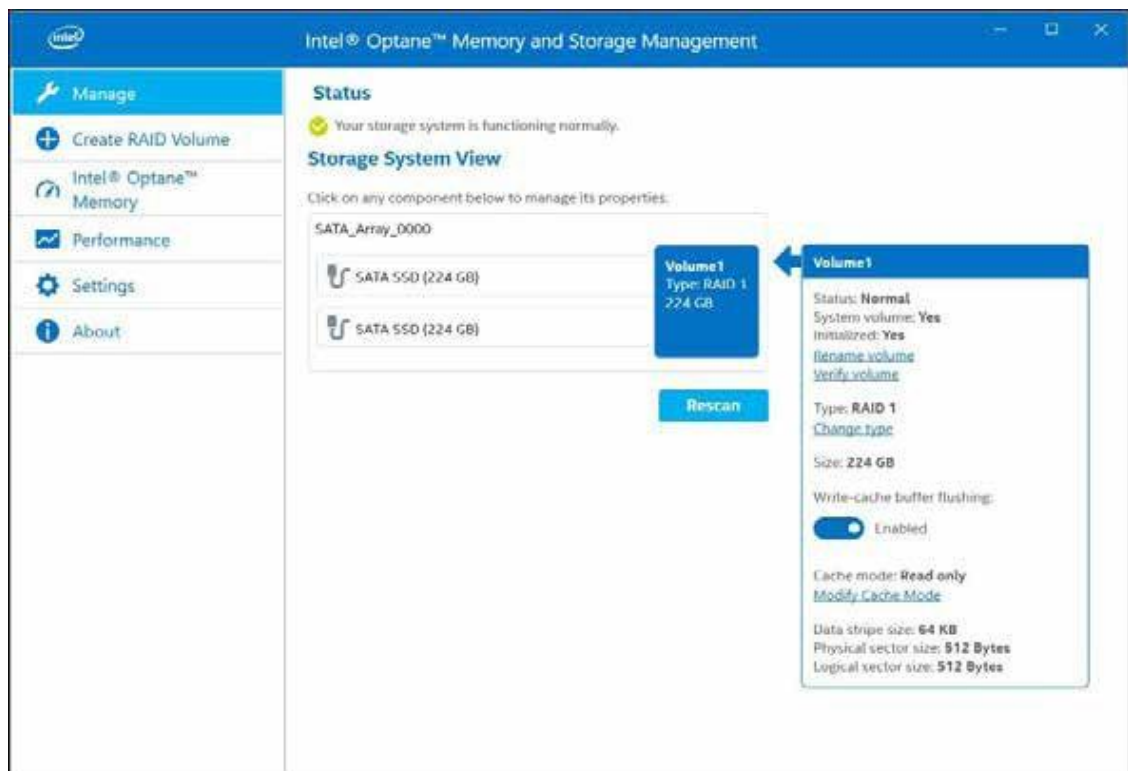
C.8 If one of the hard drives has failed and needs to be replaced

The Intel application will have a screen that indicates the status of the member drives and will let you know which port has the failed drive.

C.9 Recovery and Auto Rebuild When Use the SAME RAID HDD/SSD

Open the Intel® Optane™ Memory and Storage Management User Interface to start will automatically rebuild a RAID volume after replacing the failed hard drive with a new hard drive of equal or larger size. This can take 1 - 3 hours to complete.