ITX-i89H0

Mini-ITX Industrial Motherboard

User's Manual

Version 1.1

2018.06

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Revision History

Version	Release Time	Description
1.0	May, 2016	Initial release
1.1	June, 2018	Corrected DCIN1 pin assignment in page 22.

Copyright Notice

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

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

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

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

Warning

Single Board Computers and their components contain very delicate Integrated Circuits (IC). To protect the Single Board Computer and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your Single Board Computer from the power source when you want to work on the inside.
2. Hold the board by the edges and try not to touch the IC chips, leads or circuitry.
3. Use a grounded wrist strap when handling computer components.
4. Place components on a grounded antistatic pad or on the bag that comes with the Single Board Computer, whenever components are separated from the system.

Replacing Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash-can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have any technical difficulties, please do not hesitate to contact us at:

https://www.arbor-technology.com

Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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Chapter 1

Introduction

1.1. Product Highlights

- Soldered onboard 6th Generation Intel® Core™/Xeon® Processor
- Integrated Gigabit Ethernet
- ECC memory support
- Dual DisplayPorts and one HDMI support
- Extended operating temp: -20~70ºC

1.2. About this Manual

This manual is intended for experienced users and integrators with hardware knowledge of computers. If you are not sure about the description in this manual, consult your vendor before further handling.

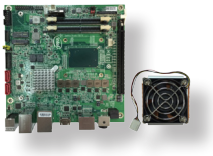
We recommend that you keep one copy of this manual for the quick reference for any necessary maintenance in the future. Thank you for choosing ARBOR products.

1.3. Specifications

Form Factor	Mini-ITX industrial motherboard
Processor	Soldered onboard Intel® Core™ i3-6100E Dual-core 2.7GHz (Base)
	Intel® Xeon® Processor E3-1505L V5 Quad-core 2.0GHz (Base) / 2.8GHz (Trubo)
	Intel® Xeon® Processor E3-1515M V5 Quad-core 2.8GHz (Base) / 3.7GHz (Trubo)(Optional)
Chipset	Intel® CM236
Memory	2 x DDR4 SO-DIMM sockets W/ECC, supporting up to 32GB SDRAM
BIOS	AMI BIOS
Super I/O	Nuvoton NCT6776D
Serial Port	1 x UART Connector
Keyboard & Mouse	USB interface Keyboard/ Mouse
USB 2.0	4 x USB 2.0 ports
USB 3.0/2.0	6 x USB 3.0/2.0 ports
Expansion	1 x PCIe x16 Gen 3.0 slot
	1 x NGFF M.2 E-Key socket for Wireless
	1 x LPC interface
Storage	2 x Serial ATA ports with 600MB/s HDD transfer rate
	1 x NGFF M.2 M-Key socket for SSD
Ethernet Chipset	1 x Intel® i219LM GbE PHY
Audio Interface	Realtek® ALC662 5.1 Channel HD Audio CODEC, Mic-in/Line-out
Graphic Chipset	Integrated Intel® HD Graphics
Graphic Interface	1 x HDMI port 2 x DisplayPort ports
OS Support	Windows 8.1 64-bit Windows 10 64-bit
Power Input	DC 12V DC jack
Power Consumption	4.17A@12V (w/ E3-1505L)
Operating Temp.	-20 ~ 70ºC (-4 ~ 158ºF)
Operating Humidity	10 ~ 95% @ 70ºC (non-condensing)
Dimension (L x W)	170 x 170 mm (6.7” x 6.7”)

1.4. Inside the Package

Before starting to install the single board, make sure the following items are shipped:

	1 x ITX-i89H0 Mini-ITX industrial motherboard
	1 x Cooler
	1 x Driver CD
	1 x Quick Installation Guide

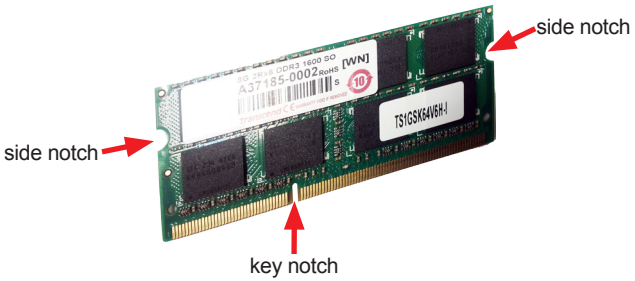
If any of the aforelisted items is damaged or missing, contact your vendor immediately.

1.5. Ordering Information

ITX-i89H0-A-6100E	Intel® Core™ Processor i3-6100E/CM236 PCH Mini-ITX motherboard
ITX-i89H0 (BTO)	Intel® Xeon® Processor E3-1505L/CM236 PCH Mini-ITX motherboard
CBK-06-89H0	2 x SATA cables 1 x SATA Power cable 1 x COM cable 1 x USB cable 1 x USB 3.0 cable

1.6. RAM Installation

The main board has one memory module (SO-DIMM) sockets. Load the computer with a memory module of higher capacity to make programs run faster. The memory module for the computer's SO-DIMM socket should be a DDR3L with a "key notch" off the centre among the pins, which enables the memory module for particular applications. There are another two notches at each left and right side of the memory module to help fix the module in the socket.



To install the memory module:

1. Find the SO-DIMM socket on the board as marked in the illustration below. The SO-DIMM socket is horizontal type, and it has two spring-loaded locks to fix the memory module.

2. Confront the memory module's edge connector with the SO-DIMM slot connector. Align the memory module's key notch at the break on the SO-DIMM slot connector.

3. Fully plug the memory module until it gets auto-locked in place.

To uninstall the memory module:

1. Pull back the locks from both sides of the SO-DIMM socket.
   The memory module will be auto-released from the socket.
2. Remove the memory module.

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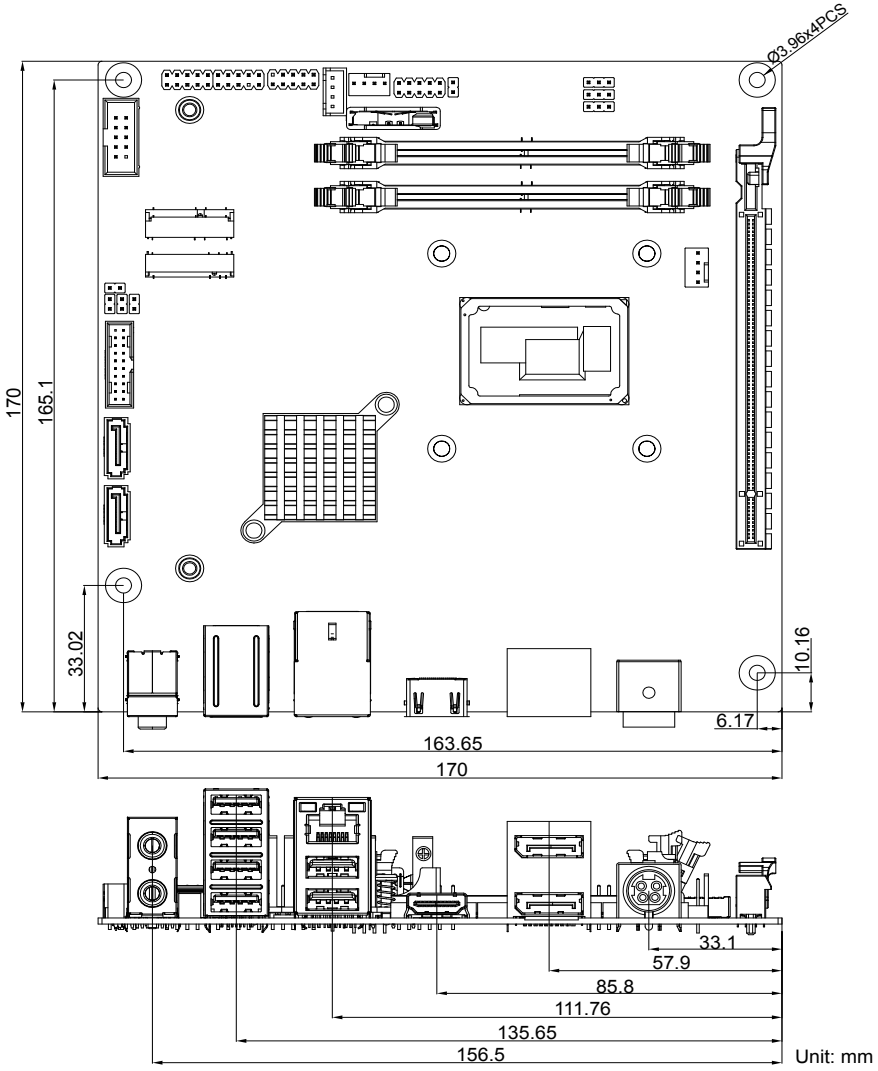
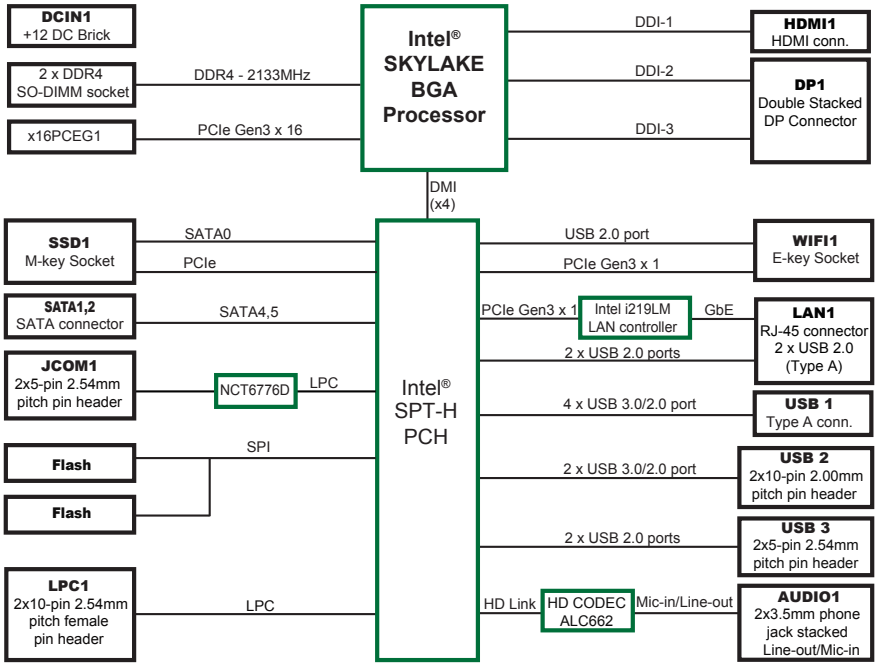
Chapter 2

Getting Started

2.1. Board Dimensions



2.2. Block Diagram

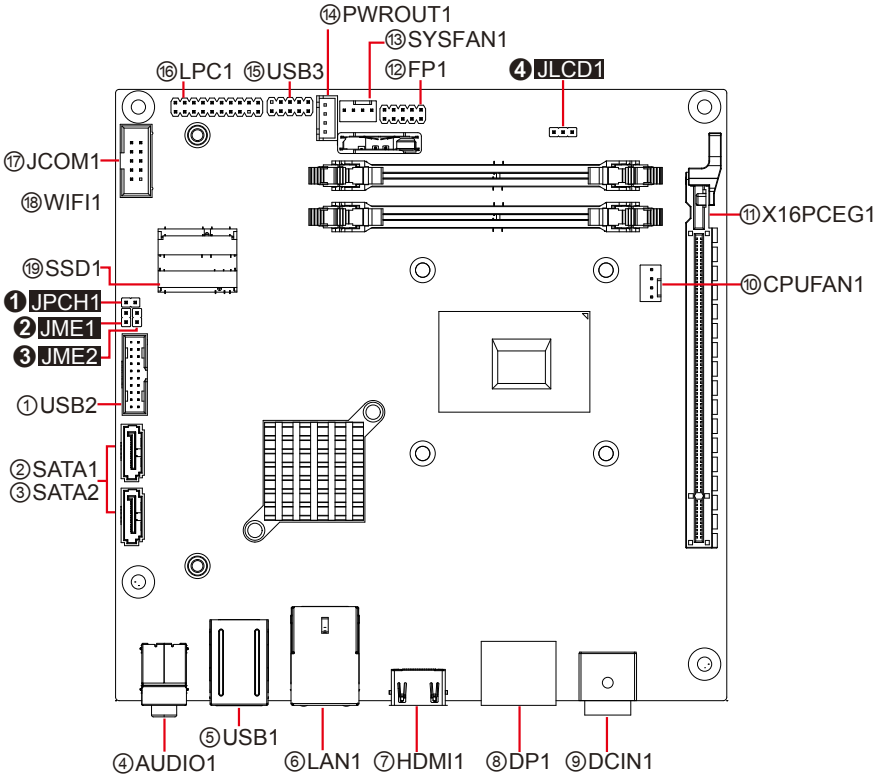


2.3. Jumpers & Connectors

The board comes with some connectors to join some devices and also some jumpers to alter the hardware configuration. The following in this chapter will explicate each of these components one-by-one.

2.3.1. Layout

This section will provide an overview of this board.



2.3.2. Jumpers

❶JPCH1

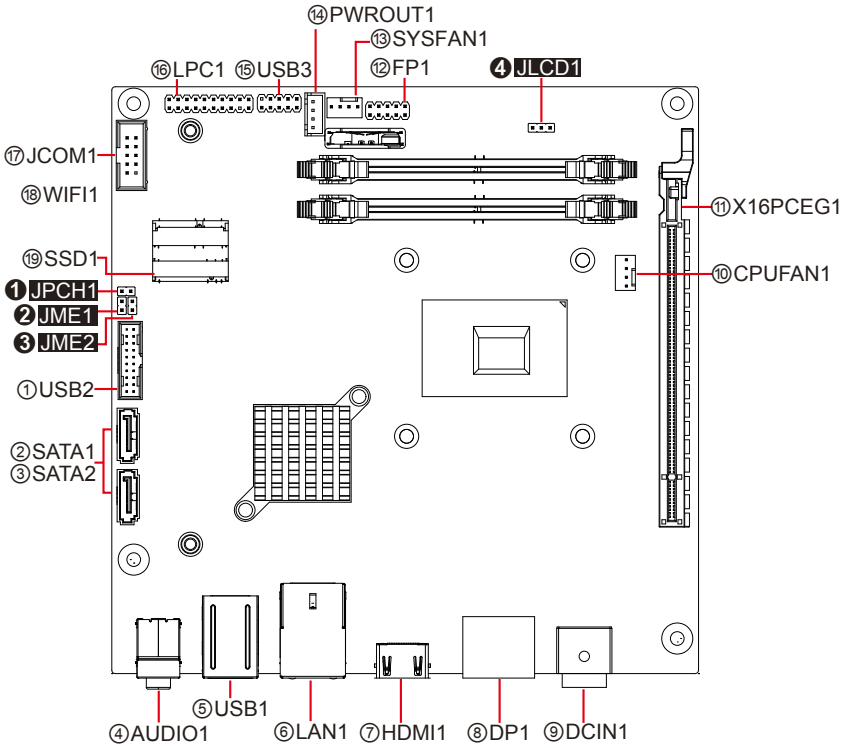
Function: Clear CMOS Selection

Jumper Type: 2.54mm pitch 1x2-pin headers

Setting:

Pin	Mode	
Short	Clear CMOS	
Open	Keep CMOS (default)	

Board Top



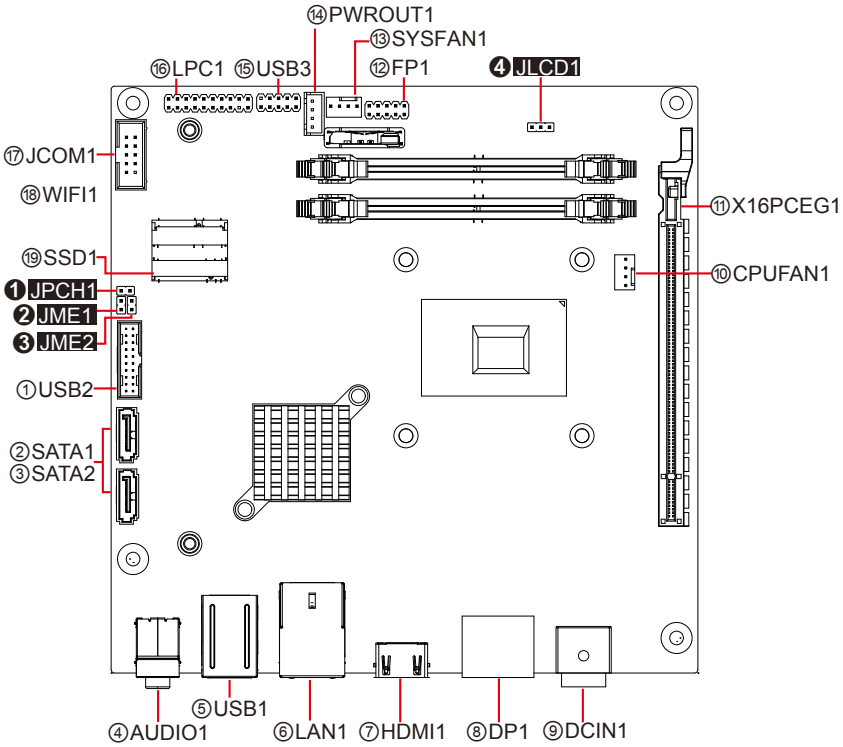
❷JME1

Function:	ME Selection
Jumper Type:	2.54mm pitch 1×2-pin headers

Setting:

Pin	Mode	
Short	ME Disable	
Open	ME Enable (default)	

Board Top



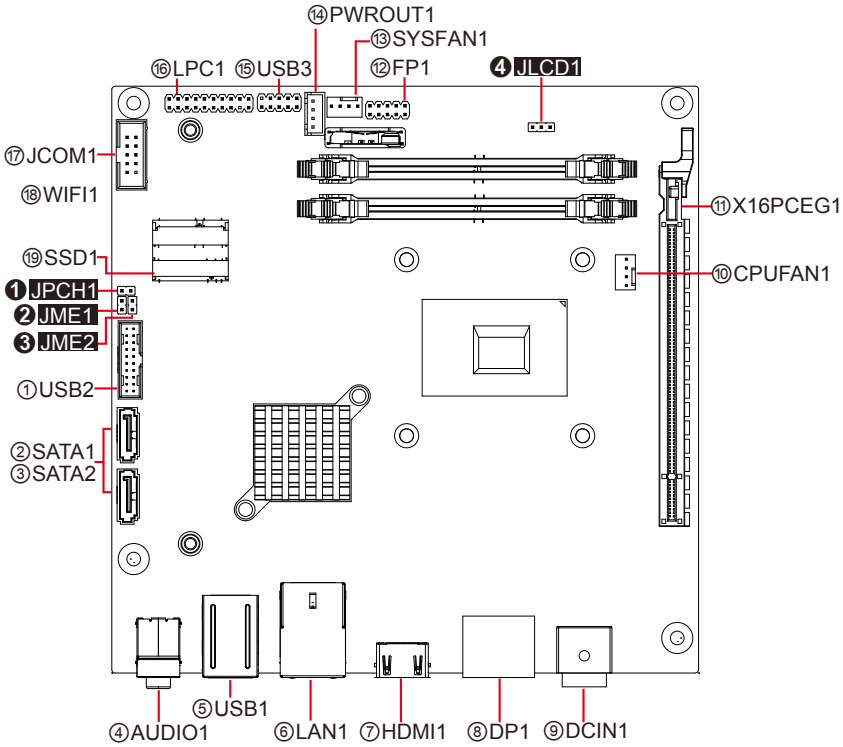
❸JME2

Function:	SRTC Reset Selection
Jumper Type:	2.54mm pitch 1x2-pin headers

Setting:

Pin	Mode	
Short	Clear ME RTC	1 2
Open	Normal (default)	1 2

Board Top



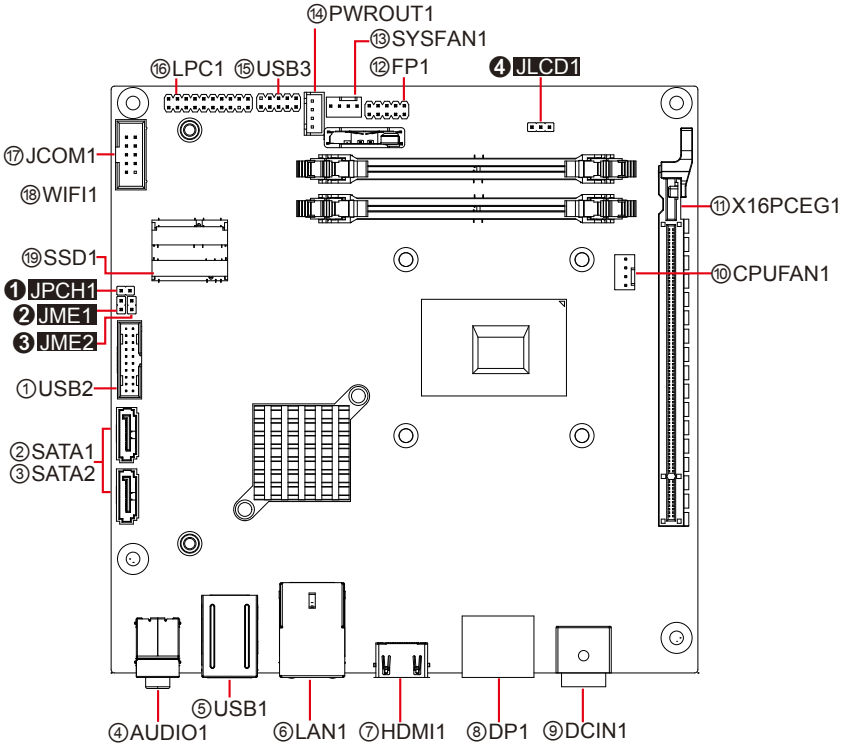
❹JLCD1

Function:	LCD Panel Voltage Selection
Jumper Type:	2.54mm pitch 1x3-pin headers

Setting:

Pin	Mode	
1-2	+5V	
2-3	+3.3V (Default)	

Board Top



2.3.3. Connectors

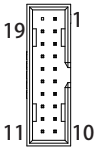
①USB2: USB3.0/2.0 Connector

Function: USB3.0/2.0 Connector

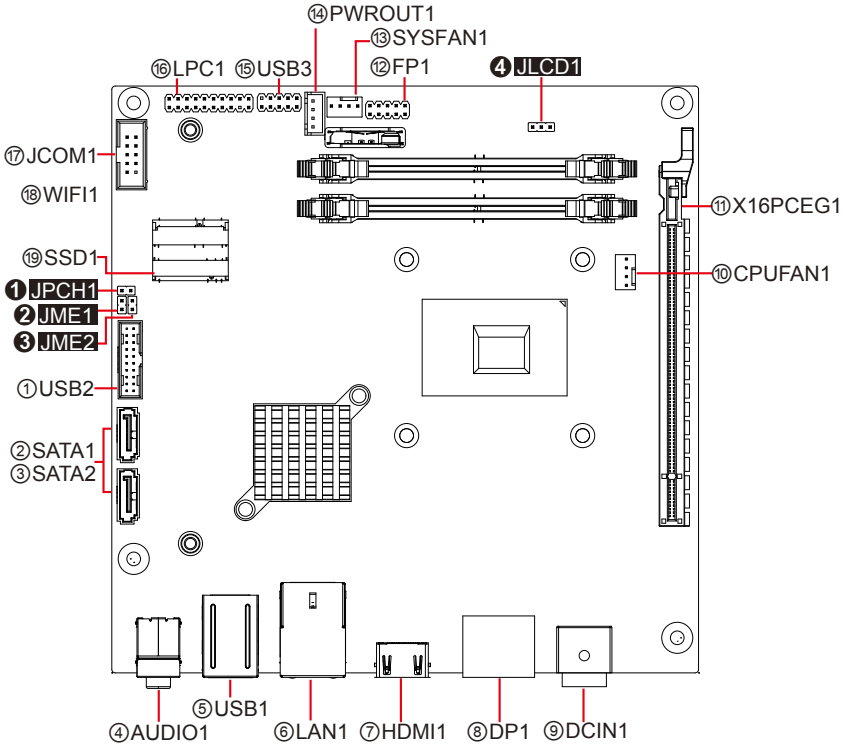
Connector Type: 2x10 pin box header

Pin Assignment:

Pin	Desc.	Pin	Desc.
20	N/C	1	+V5S
19	+V5S	2	USB3_RXN5_C
18	USB3_RXN6_C	3	USB3_RXP5_C
17	USB3_RXP6_C	4	GND
16	GND	5	USB3_TXN5_C
15	USB3_TXN6_C	6	USB3_TXP5_C
14	USB3_TXP6_C	7	GND
13	GND	8	USBP5N
12	USBP6N	9	USBP5P
11	USBP6P	10	N/C



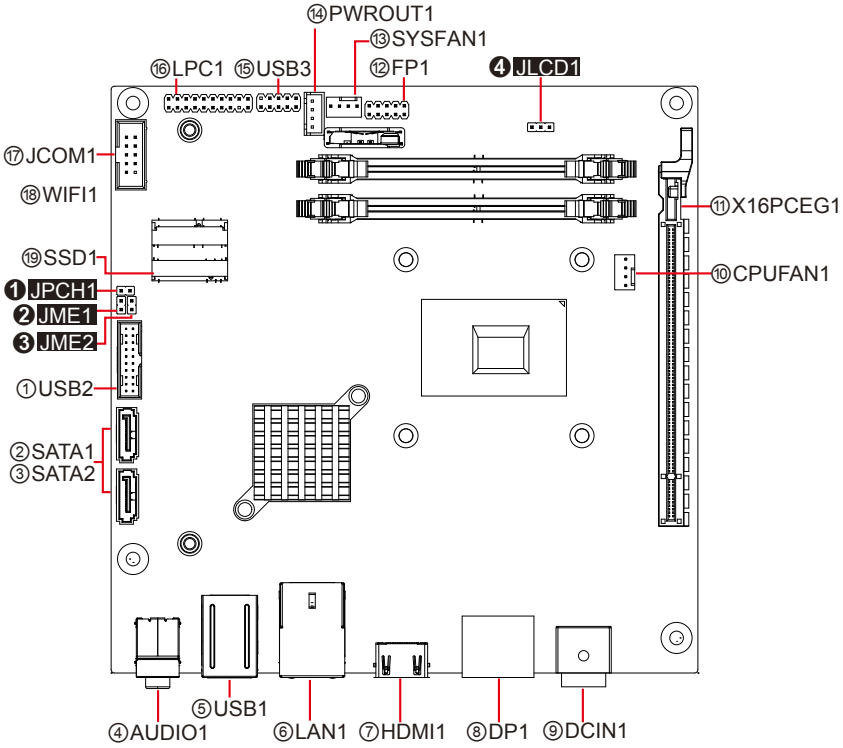
Board Top



②③SATA1~2

Function:	Serial ATA Connector	**Pin Assignment:**
Connector Type:	Serial ATA Connector	The pin assignments conform to the industry standard.

Board Top

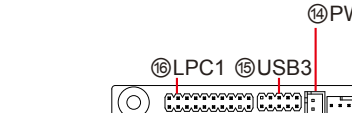


④AUDIO1

Function:	Audio connector
Connector Type:	Double-stacked ø3.5mm stereo audio jacks

Pin Assignment:

Description	
Line-out	Line out
Mic-in	Mic



Board Top

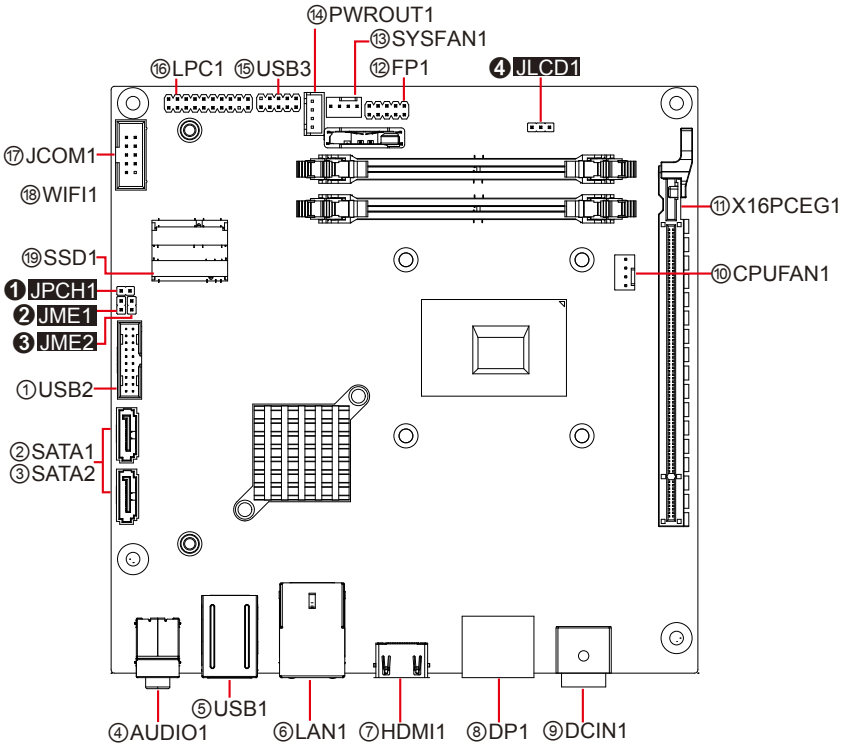
⑤USB1

Function:	USB 3.0/2.0 Stack Connectors
Connector Type:	Quadruple-stacked USB connectors

Pin Assignment:

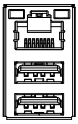
The pin assignments conform to the industry standard.

Board Top

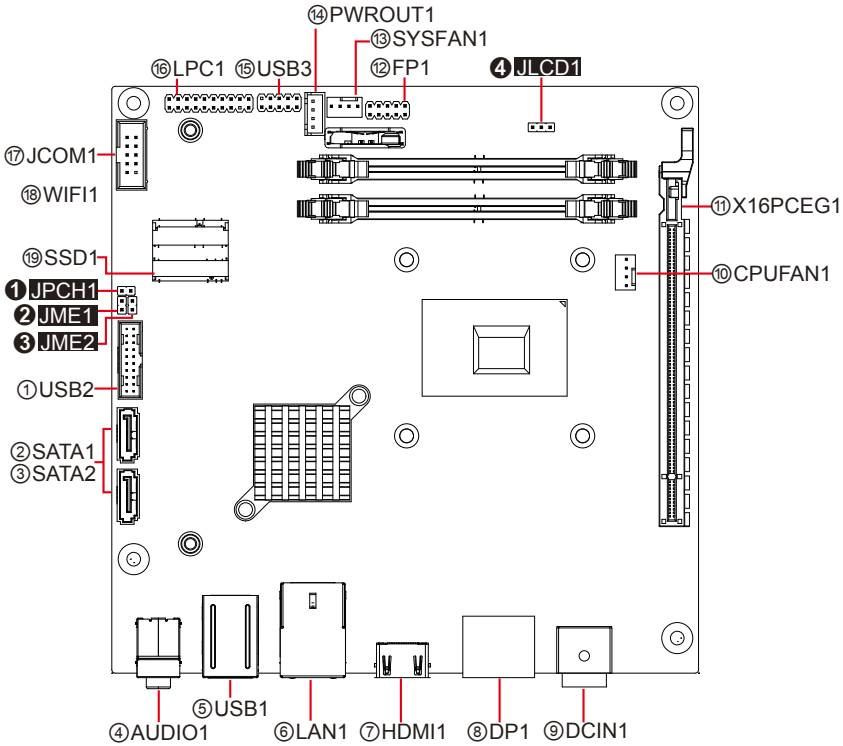


⑥LAN1

Function:	RJ-45 LAN and USB 2.0 Stack Connectors	**Pin Assignment:**
Connector Type:	RJ-45 and double-stacked USB connectors	The pin assignments conform to the industry standard.



Board Top



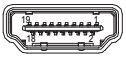
⑦HDMI1

Function: HDMI Connector

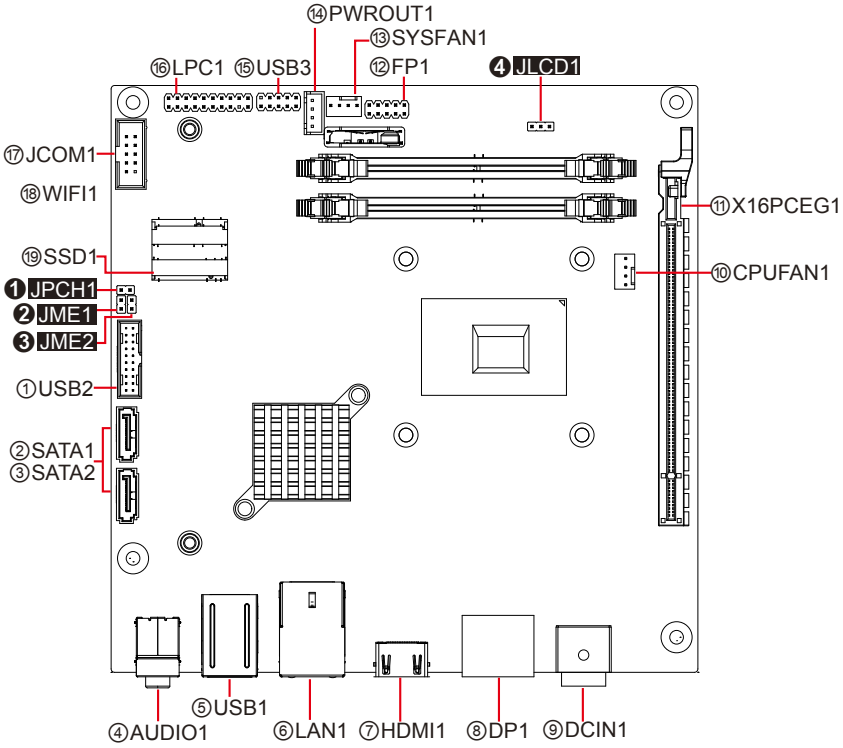
Connector Type: 19-pin HDMI connector

Pin Assignment:

The pin assignments conform to the industry standard.



Board Top



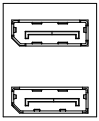
⑧DP1

Function: DisplayPort Stack Connectors

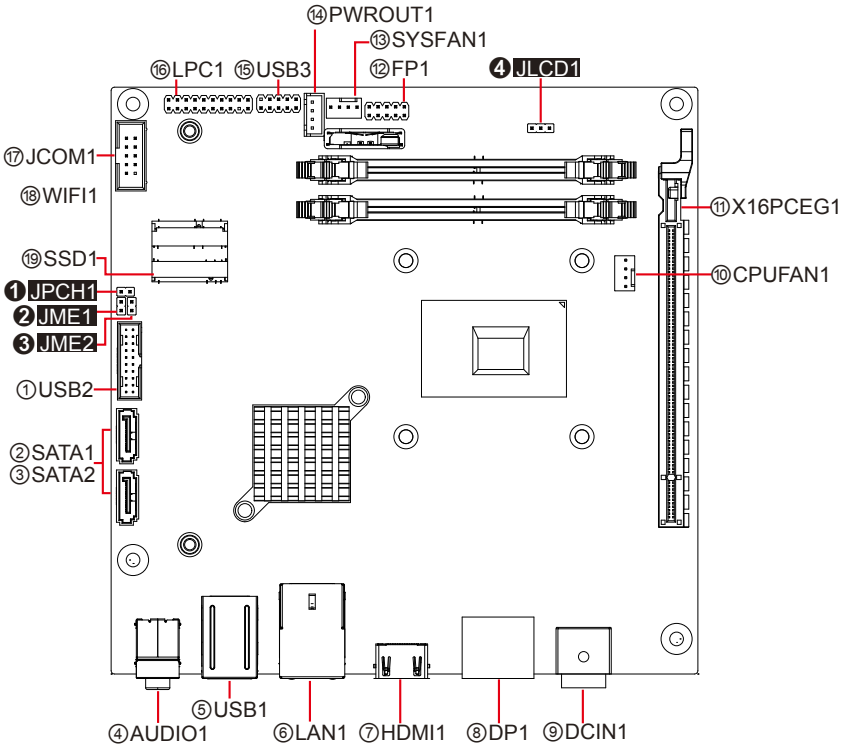
Connector Type: Double-stacked DisplayPort connectors

Pin Assignment:

The pin assignments conform to the industry standard.



Board Top



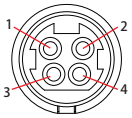
⑨DCIN1

Function: DC IN Jack

Connector Type: 4-pin DC in Jack

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	GND1	2	VCC1
3	GND2	4	VCC2



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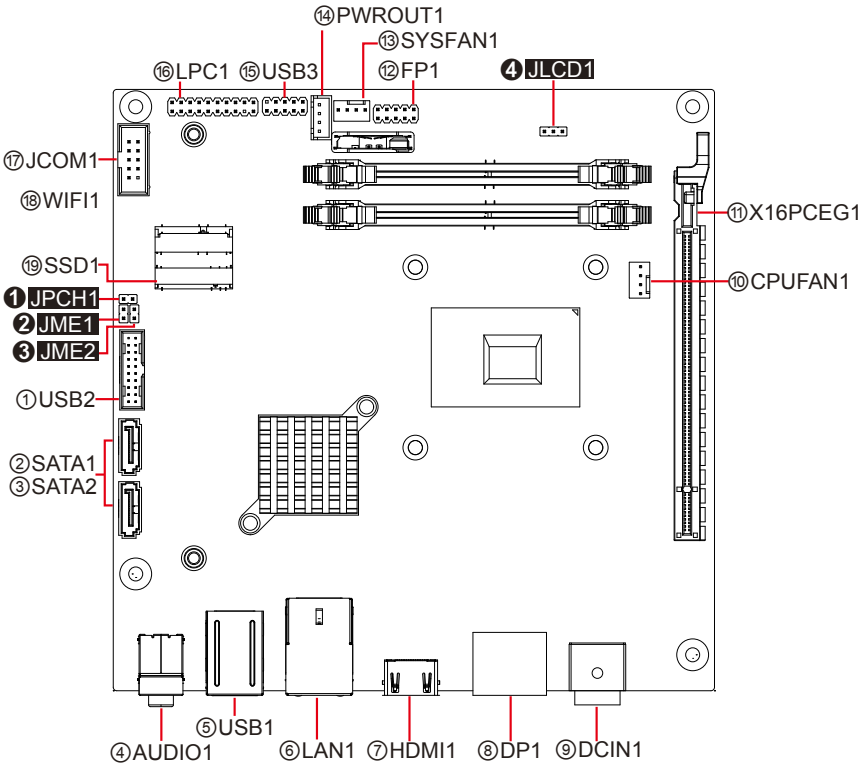


⑩⑬CPUFAN1&SYSFAN1

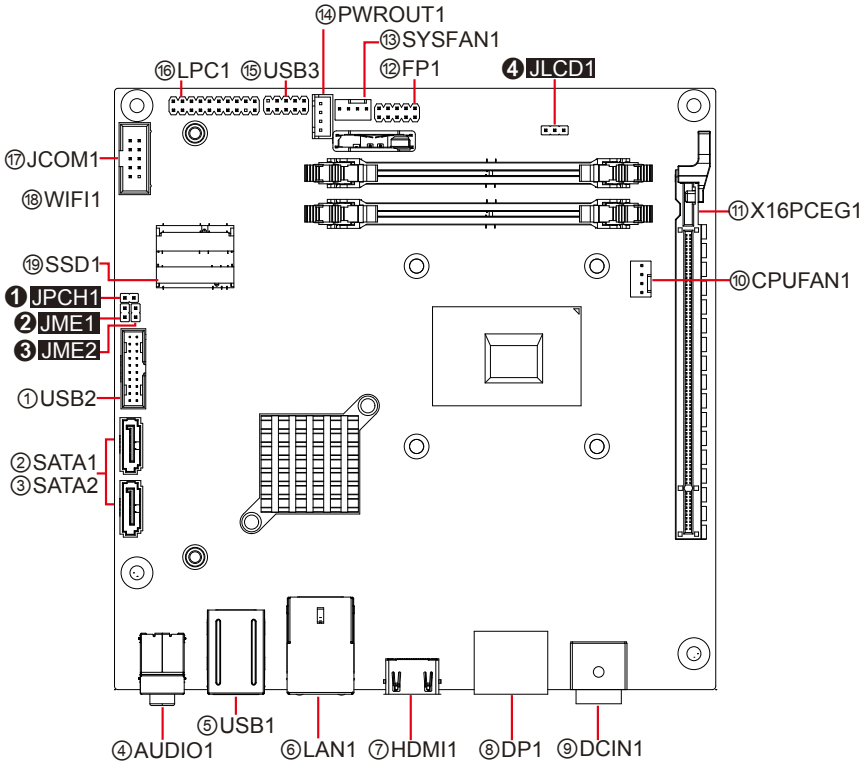
Function: Fan Power Connector

Connector Type: 2.54mm pitch 1x4-pin one-wall connector

Pin Assignment:

Pin	Description
1	GND
2	+12V
3	RPM
4	Control

Board Top



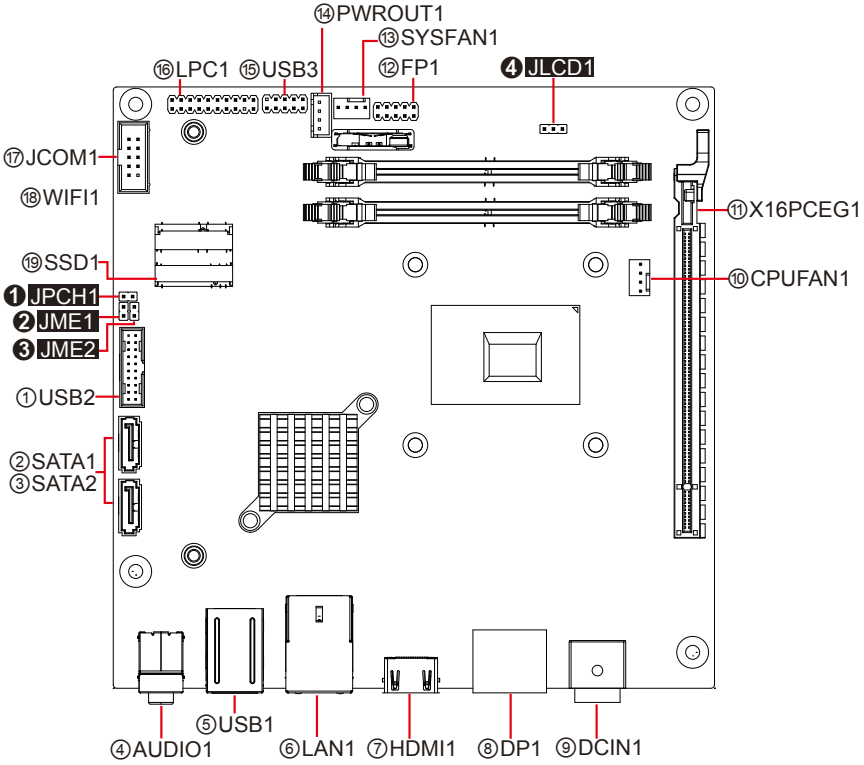
⑪X16PCEG1

Function: PCIex16 Gen 3.0 slot

Pin Assignment:

The pin assignments conform to the industry standard.

Board Top



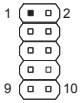
⑫FP1

Function: Front panel LED & audio header

Connector Type: 2.54mm pitch 2x5-pin headers

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	HLED+	2	PLED+
3	HLED-	4	PLED-
5	RESET+	6	PSON+
7	RESET-	8	PSON-
9	+5V	10	N/C



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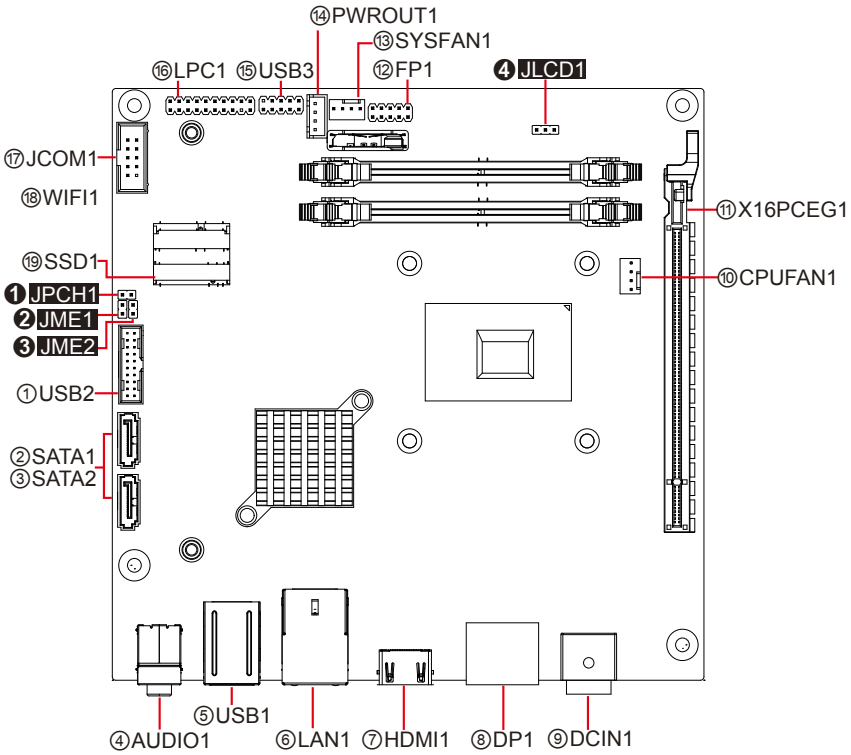


⑭PWROUT1

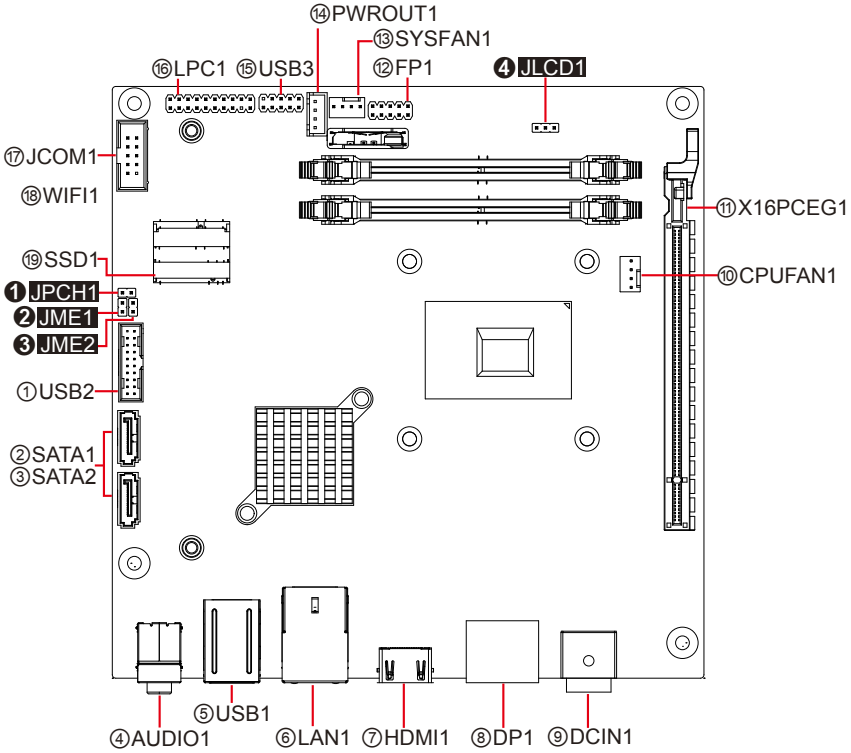
Function: SATA Power Connector

Connector Type: Onboard 4-pin box connector

Pin Assignment:

Pin	Desc.
1	5V
2	GND
3	GND
4	12V

Board Top



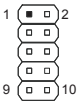
⑮USB3

Function: USB 2.0 Connector

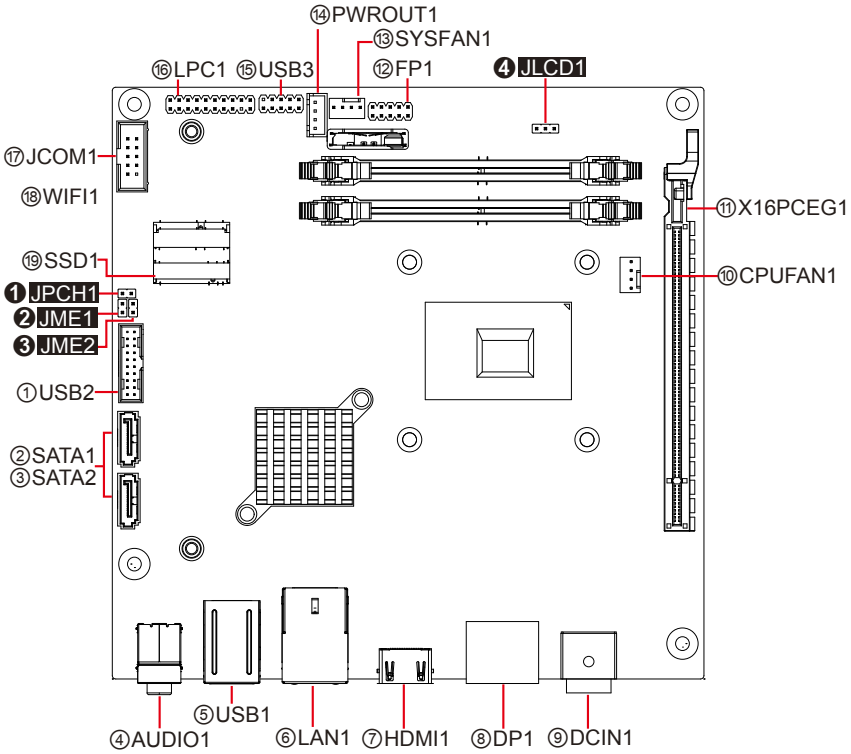
Connector Type: 2.54mm pitch 2x5-pin headers

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	+5VS	2	+5VS
3	USBP7N	4	USBP8N
5	USBP7P	6	USBP8P
7	GND	8	GND
9	N/C	10	GND



Board Top



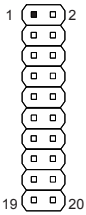
⑯LPC1

Function: Low Pin Count Connector

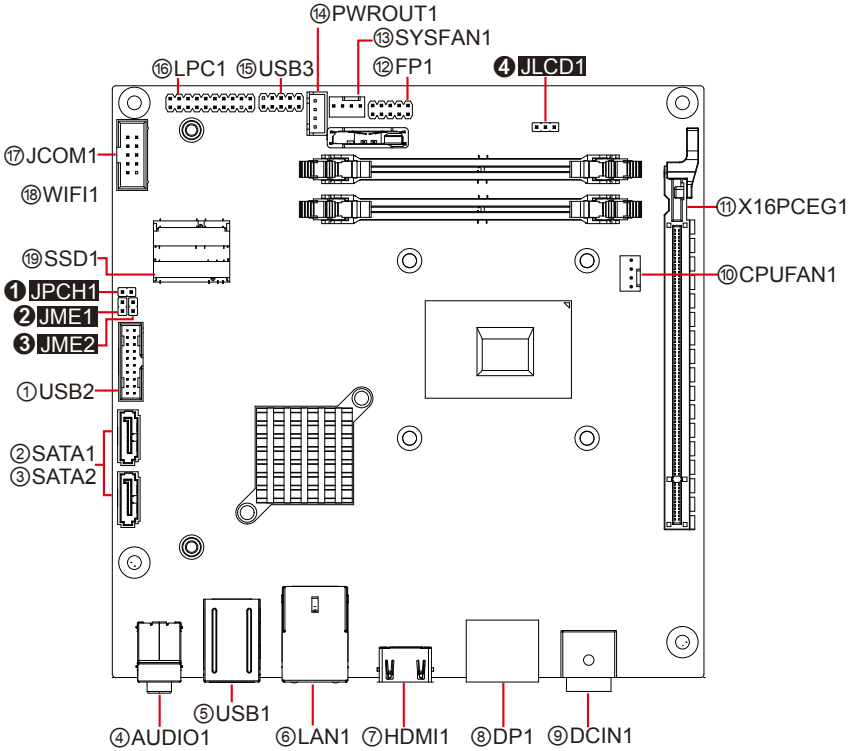
Connector Type: 2x10-pin 2.54mm pitch male pin header

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	CLK_PC_24M	2	GND
3	L_FRAME#	4	N/C
5	PLTRST#	6	+V5S
7	L_AD3	8	L_AD2
9	+V3.3S	10	L_AD1
11	L_AD0	12	GND
13	SMBCLK_M	14	SMBDATA_M
15	+V3.3A	16	SER_IRQ
17	GND	18	TPM_CLKRUN#
19	LPCPD#_LPC	20	L_DRQ_N



Board Top



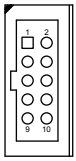
⑰JCOM1

Function: UART Connector

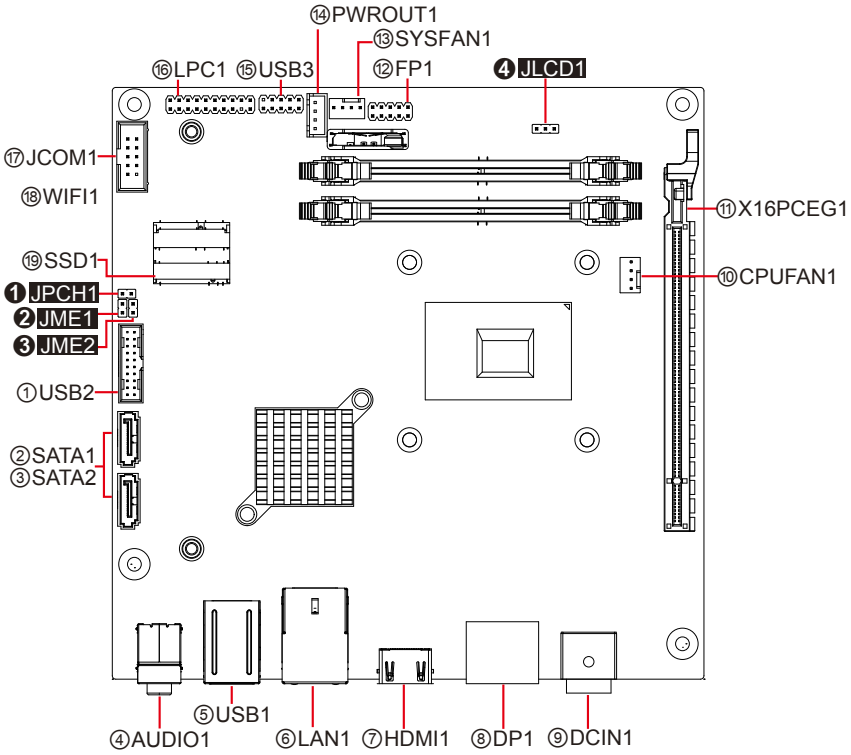
Connector Type: 2.54mm pitch 2x5 pin box header

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	N/C	6	N/C
2	RXD	7	RTS
3	TXD	8	CTS
4	N/C	9	N/C
5	GND	10	N/C



Board Top

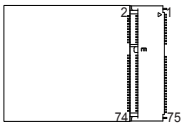


⑱WIFI1

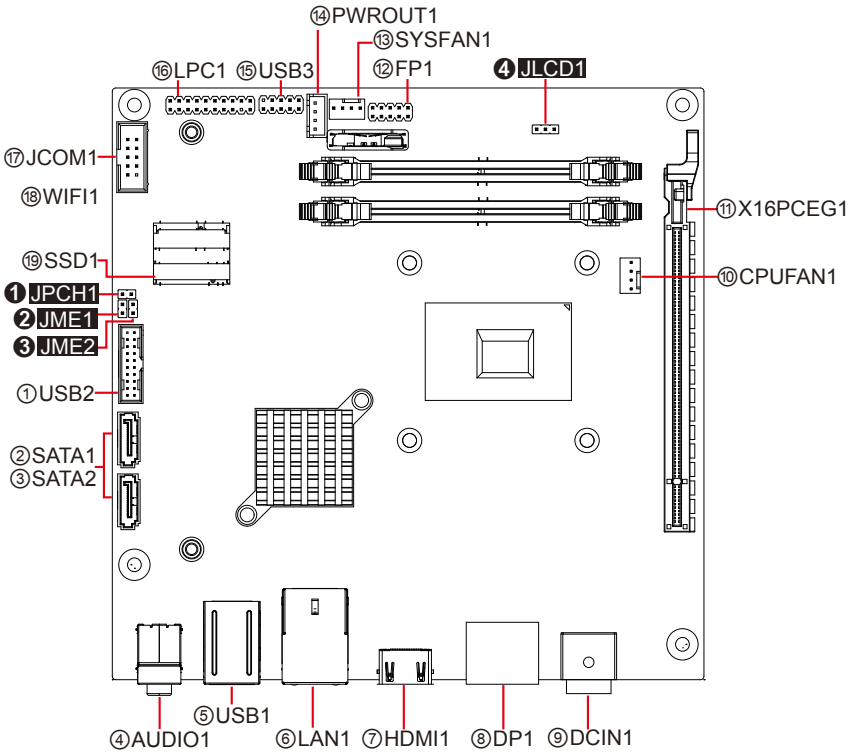
Function: NGFF M.2 E-Key Socket for WIFI

Pin Assignment:

The pin assignments conform to the industry standard.



Board Top



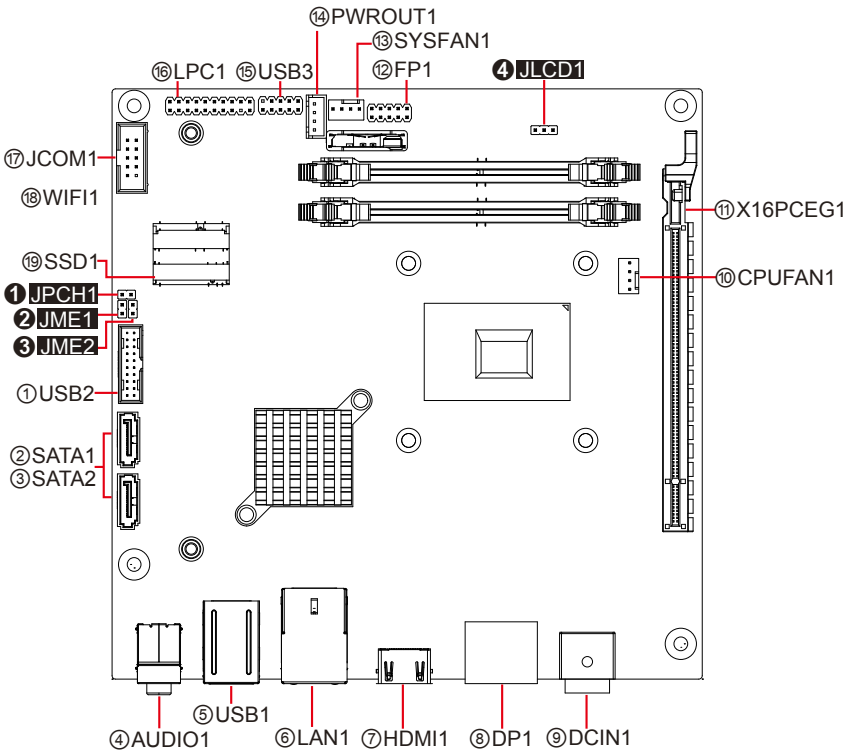
⑲SSD1

Function: NGFF M.2 M-Key Socket for SSD

Pin Assignment:

The pin assignments conform to the industry standard.

Board Top



2.4. Driver Installation Notes

The board supports Windows 8.1 and Windows 10. Find the necessary drivers on the CD that comes with your purchase. For different OS, the driver/utility installation may vary slightly, but generally they are similar. Find the drivers on CD by the following paths:

Windows 8.1 & 10 (64-bit)

Driver	Path
CHIPSET	\i89X\Chipset\Chipset_10.1.1.13_Public
GRAPHIC	\i89X\Graphic\IntelR Graphics Driver Production Version 15.40.16.64.4364
ETHERNET	\i89X\Ethernet
AUDIO	\i89X\Audio\7687_PG436_Win10_Win8.1_Win8_Win7_WHQLx64
ME	\i89X\ME\Intel(R)_ME_11.0_Corporate_11.0.0.1202
USB3.0	\i89X\USB3.0\win8.1 64bit\Intel_USB_3.0_xHC_Adaptation_Driver_MR1_Release_1.0.1.45_PV
RAID	\i89X\RAID\Intel Rapid Storage Technology Driver 14.8.0.1042

Chapter 3

BIOS

The BIOS Setup utility is featured by AMI BIOS to configure the system settings stored in the system's BIOS ROM. AMI BIOS is activated once the computer powers on.

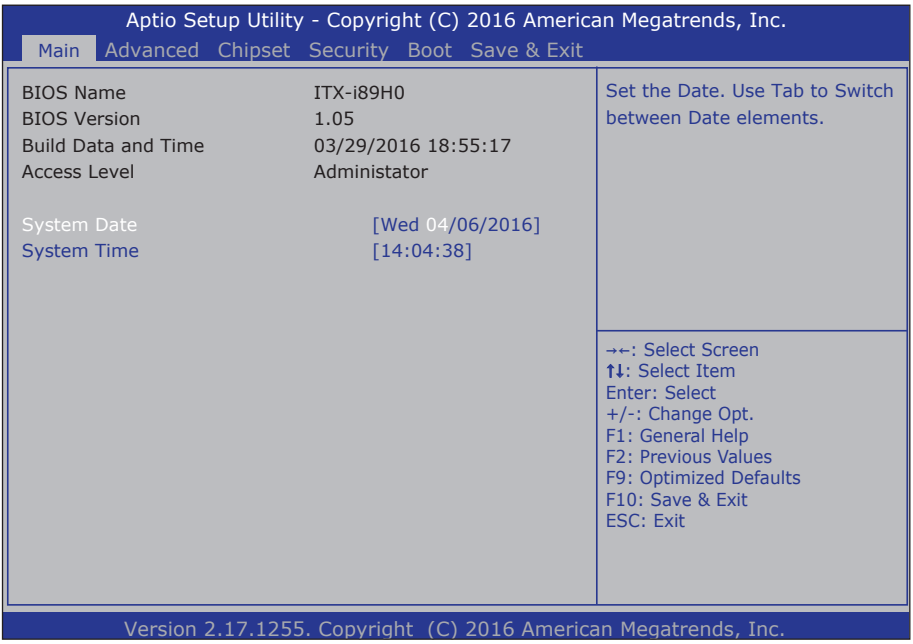
After entering the utility, use the left/right arrow keys to navigate between the top menus and use the down arrow key to access one.

Menu	Description
Main	See 3.1. Main on page 35.
Advanced	See 3.2. Advanced on page 36.
Chipset	See 3.3. Chipset on page 47.
Boot	See 3.5. Boot on page 35.
Security	See 3.3.5 PCI Express Configuration on page 53.
Exit	See 3.6. Save & Exit on page 54.

NOTE: For system stability and performance, this BIOS utility is constantly improved. The screenshots demonstrated and descriptions hereinafter are for reference only and may not exactly meet what is presented onscreen.

3.1. Main

The **Main** menu displays some BIOS info and features the settings of **System Date** and **System Time**.



The BIOS info displayed is:

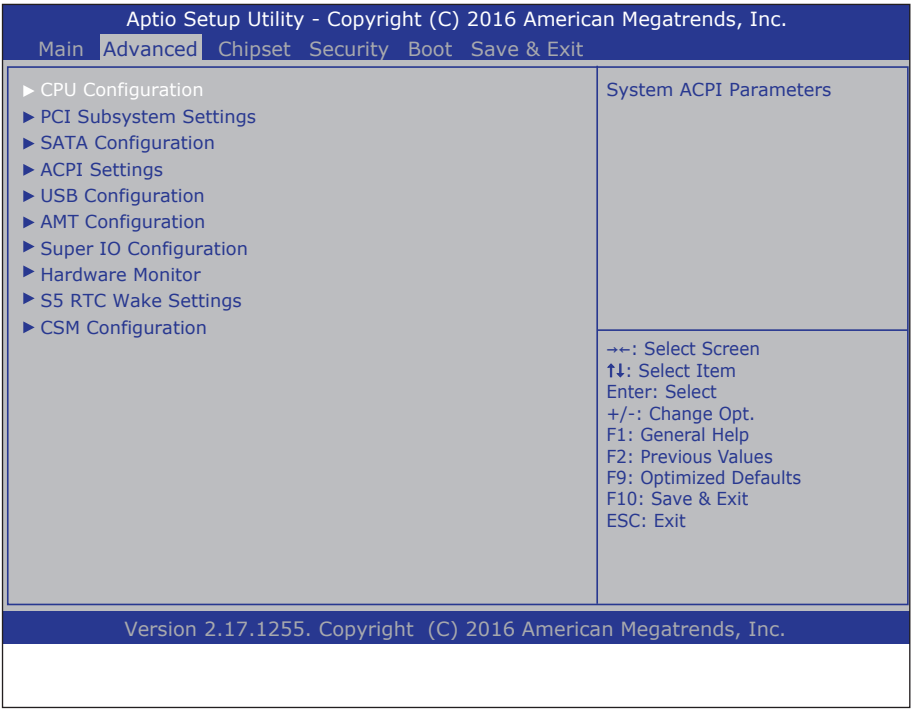
Info Item	Description
BIOS Name	Delivers the name of the project
BIOS Version	Delivers the computer's BIOS version
Build Date and Time	Delivers the date and time when the BIOS Setup utility was created/ updated
Access Level	Shows user's access level

The featured settings are:

Setting	Description
System Time	Sets system time.
System Date	Sets system date.

3.2. Advanced

The **Advanced** menu controls the system's CPU, ACP I, Super IO, SATA and USB, etc... It also helps users monitor hardware health.

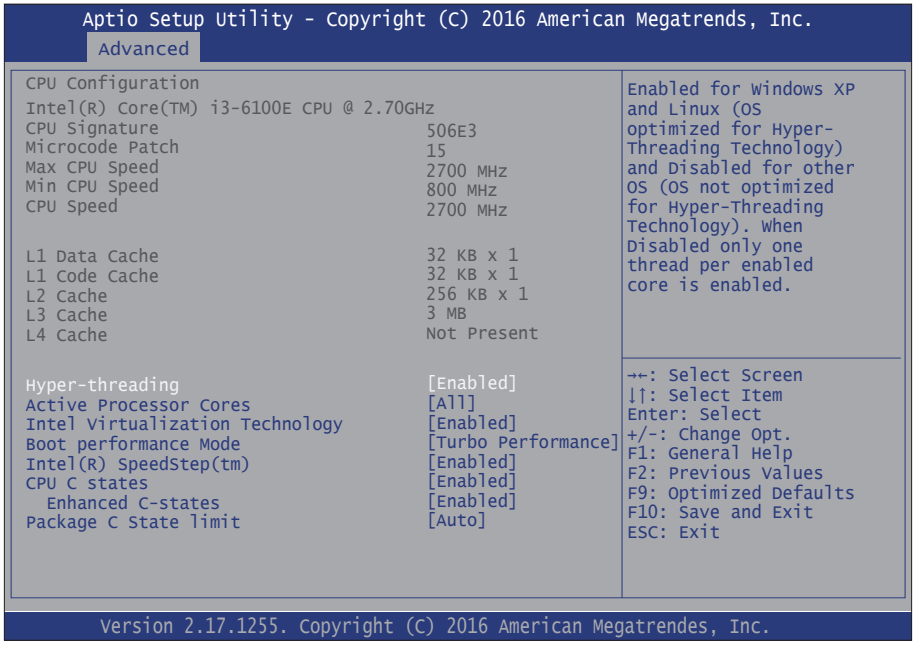


The featured submenus are:

Submenu	Description
CPU Configuration	See 3.2.1. CPU Configuration on page 37.
PCI Subsystem Settings	See 3.2.2. PCI Subsystem Settings page 38.
SATA Configuration	See 3.2.3. SATA Configuration on page 39.
ACPI Settings	See 3.2.4. ACPI Settings on page 40.
USB Configuration	See 3.2.5. USB Configuration on page 41.
AMT Configuration	See 3.2.6. AMT Configuration on page 42.
Super IO Configuration	See 3.2.7. Super IO Configuration on page 43.
Hardware Monitor	See 3.2.8. Hardware Monitor on page 44.
S5 RTC Wake Settings	See 3.2.9. S5 RTC Wake Settings on page 45.
CSM Configuration	See 3.2.10. CSM Configuration on page 46.

3.2.1. CPU Configuration

Access this submenu to setup the CPU Configuration.



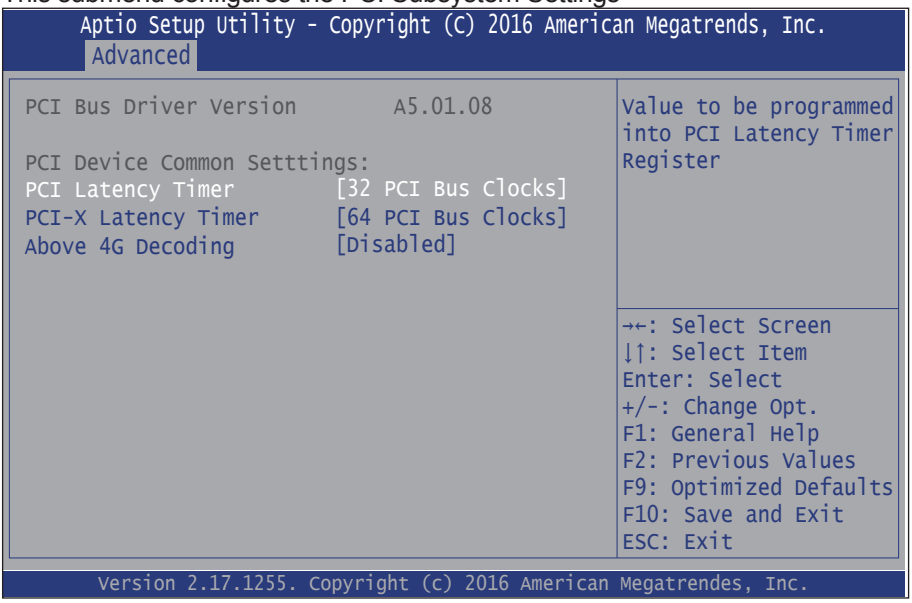
The featured submenus are:

Setting	Description
Intel(R) Core(TM) i3-6100E CPU @ 2.70GHz	Display the CPU info installed in your computer.
Hyper-threading	Enables/disables the **Hyper-threading**. ▸ **Enabled** is the default.
Active Processor Cores	Sets the number of Active Processor Cores. ▸ **All** is the default.
Intel Virtualization Technology	Enables/disables the Intel Virtualization Technology. When enabled, a VMM can utilize the additional hardware capabilities provided by Vandor Pool Technology. ▸ **Enabled** is the default.
Boot Performance mode	Set the performance state that BIOS will set before OS handoff. Options available are: ▸ **Max Battery, Max Non-turbo performance, and Turbo Performance**(default).

Intel(R) SpeedStep(tm)	Enables/disables the **SpeedStep**. ▸ **Enabled** is the default.
CPU C states	Enables/disables the **CPU C states**. ▸ **Enabled** is the default.
Enhanced C-states	Enables/disables the **Enhanced C-states**. ▸ **Enabled** is the default.
Package C State limit	Sets the package C state limit. ▸ **AUTO** is the default.

3.2.2. PCI Subsystem Settings

This submenu configures the PCI Subsystem Settings

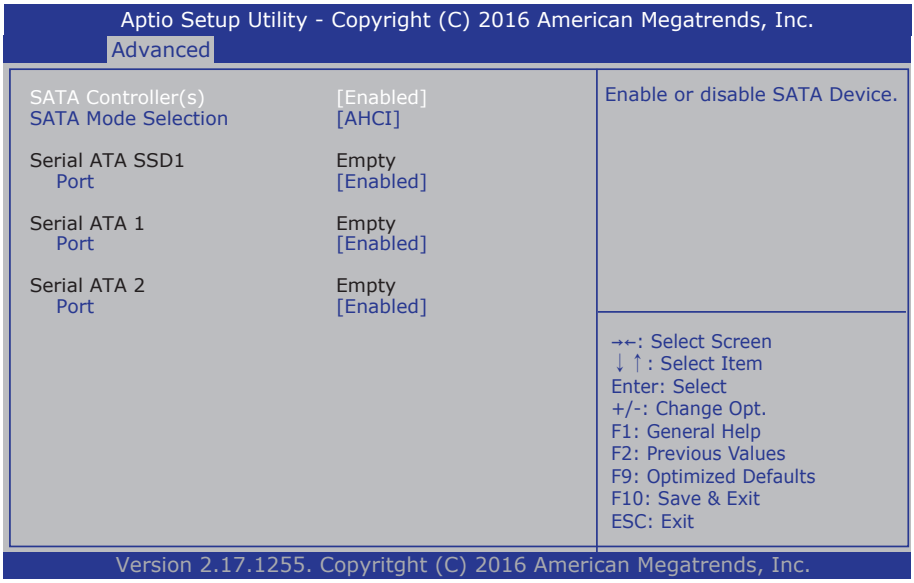


The featured submenus are:

Setting	Description
PCI Latency Timer	Value to be programmed into PCI Latency Timer Register. ▸ Options: **32 (default)/64/96/128/160/192/224/248 PCI Bus Clocks**.
PCI-X Latency Timer	Value to be programmed into PCI-X Latency Timer Register. ▸ Options: **32/64(default)/96/128/160/192/224/248 PCI Bus Clocks**.
Above 4G Decoding	Enable or Disable 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding). ▸ **Disabled** is the default.

3.2.3. SATA Configuration

SATA Configuration manages the system's SATA configuration and also delivers its status.

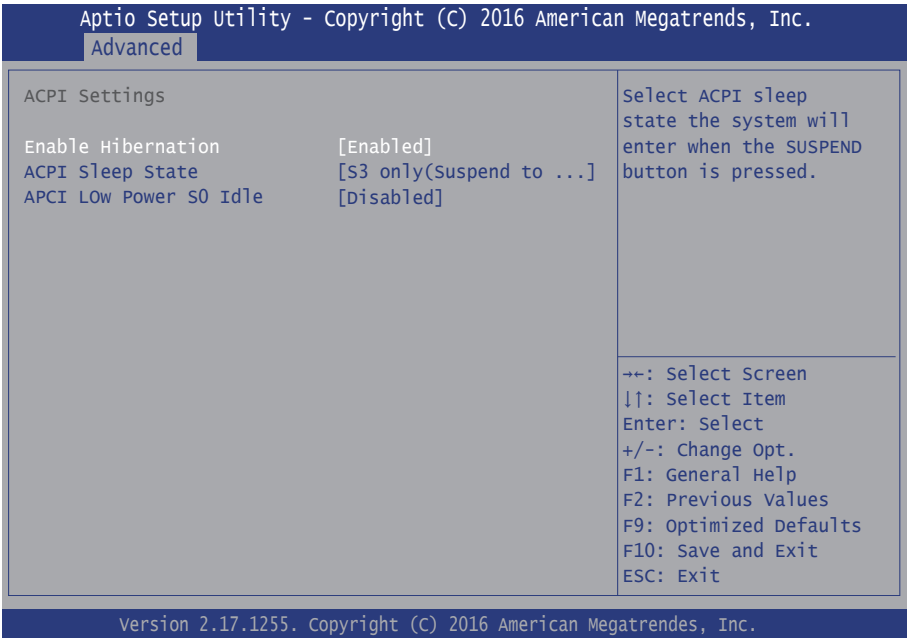


The featured submenus are:

Setting	Description
SATA Controller	Enables/disables SATA device. ► **Enabled** is the default.
SATA Mode Selection	Configures the maximum speed of SATA controller. ► Options available are **Gen1, Gen2** and **Gen3(default)**.
Serial ATA SDD1 **Serial ATA 1** **Serial ATA 2**	**Port 0** Enables/disables SATA Port 0. ► **Enabled** is the default.

3.2.4. ACPI Settings

USB Configuration displays the status of USB connection and configures USB parameters.

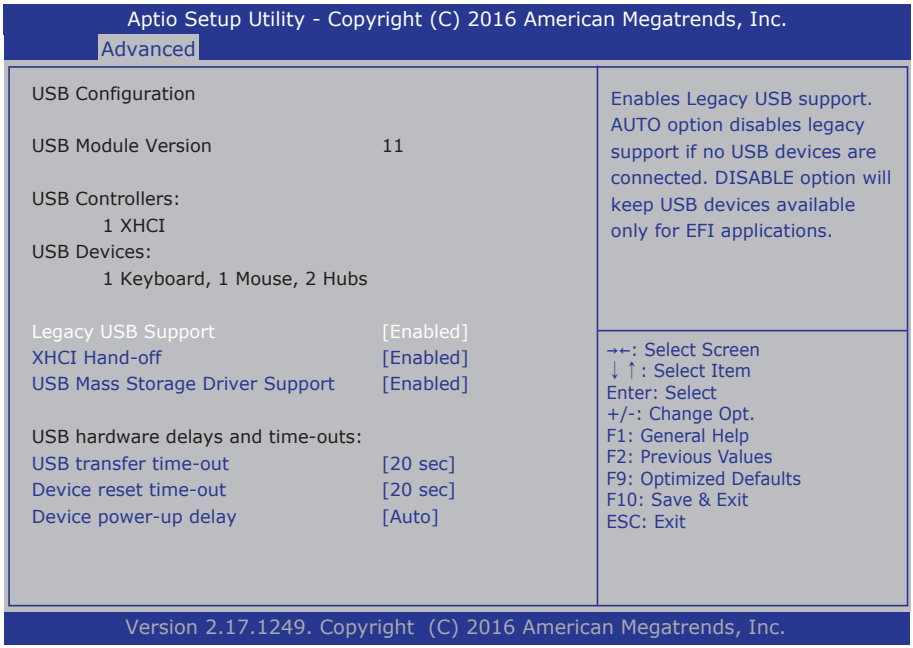


The featured submenus are:

Setting	Description
Enable Hibernation	**Enables** (default) or **Disables** System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Select ACPI sleep state the system will enter when the SUSPEND button is pressed. ► Options: **Suspend Disabled**, **S1 only(CPU Stop Clock)**, **S3 only(Suspend to RAM)** (default), **Both S1 and S3 available for OS to choose from**
ACPI Low Power S0 Idle	Enables/disables ACPI Low Power S0 Idle Support ► **Disabled** is the default.

3.2.5. USB Configuration

USB Configuration displays the status of USB connection and configures USB parameters.

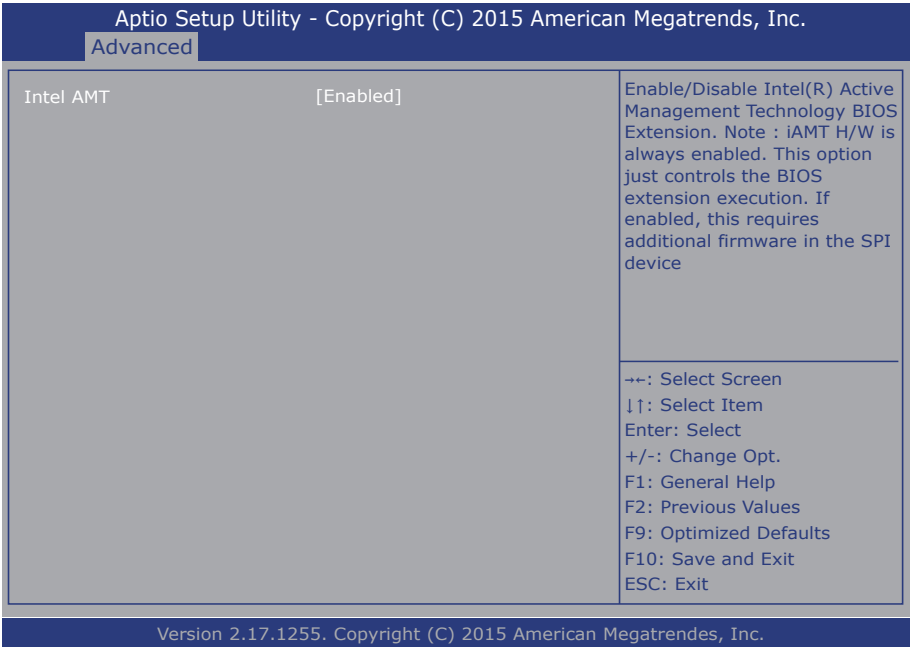


The featured submenus are:

Setting	Description
Legacy USB Support	**Enables** (default) 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. ► **Enabled** is the default.
USB Mass Storage Driver Support	Enables/disables USB Mass Storage Driver Support ► Options: **Disabled** (default), **Enabled**
Port 60/64 Emulation	Enables I/O port 60/64h emulation support. ► **Disabled** is the default.
USB transfer time-out	Configures the USB transfer timeout value for control, bulk and interrupt transfers. ► Options: **20 sec** (default), **10 sec, 5 sec** and **1 sec**.
Device reset time-out	Configures the timeout value for the USB mass storage device Start Unit command. ► Options: **40 sec**, **30 sec**, **20 sec** (default) and **10 sec**.

3.2.6. AMT Configuration

Access this submenu to setup the AMT Configuration

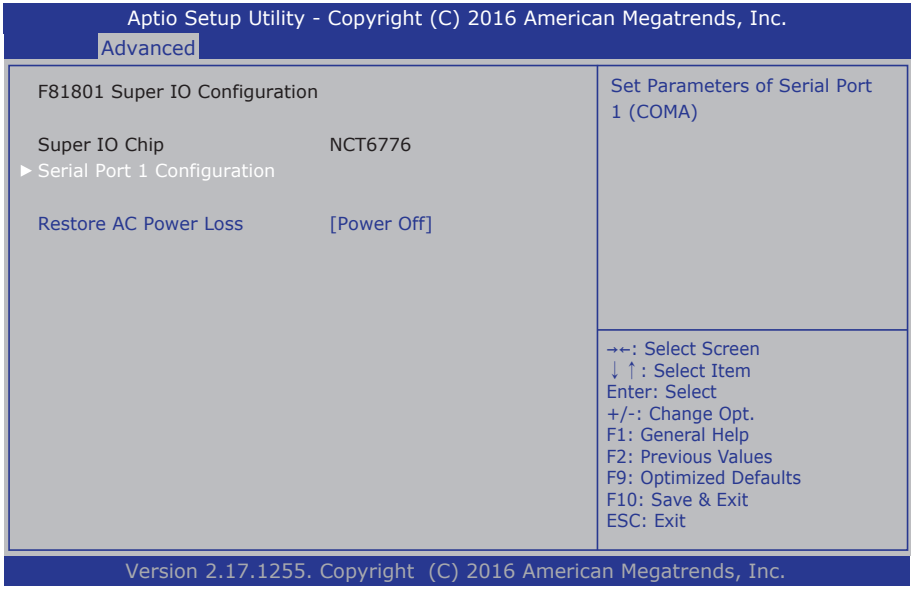


The featured submenus are:

Setting	Description
Intel AMT	Enable (default)/Disable Intel(R) Active Management Technology BIOS Extension. Note : iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device.

3.2.7. Super IO Configuration

Access this submenu to setup the Super IO Configuration

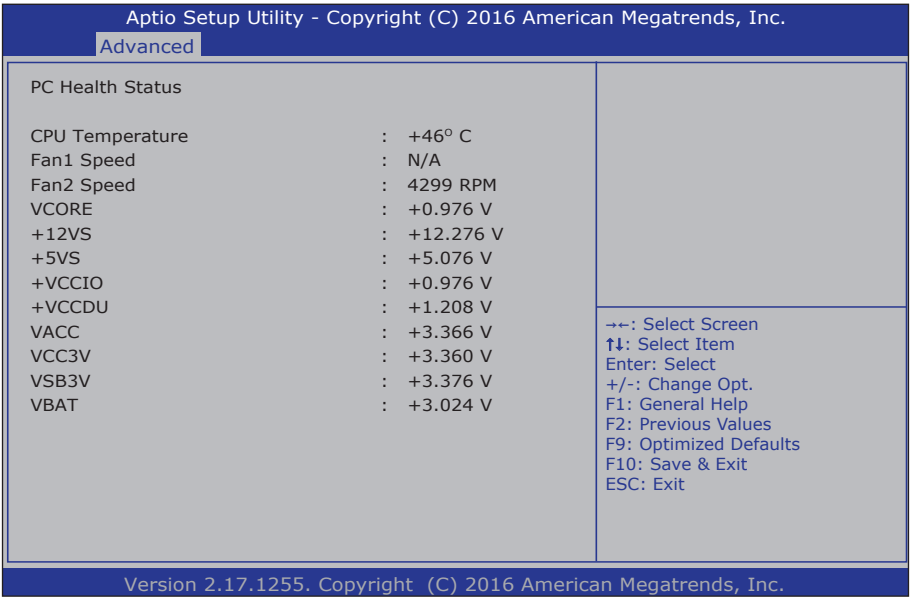


The featured submenus are:

Setting	Description	
Serial Port 1 Configuration	Set the Parameters of Serial Port 1 (COM1).	
	Serial Port	Enable or disable Serial Port (COM). ► **Enabled** is the default.
	Change Setting	Select an optimal setting for Super IO device.
Restore AC Power Loss	Specify what state to go to when power is re-applied after a power failure. ► Options: **Last State**, **Power On** and **Power Off** (default)	

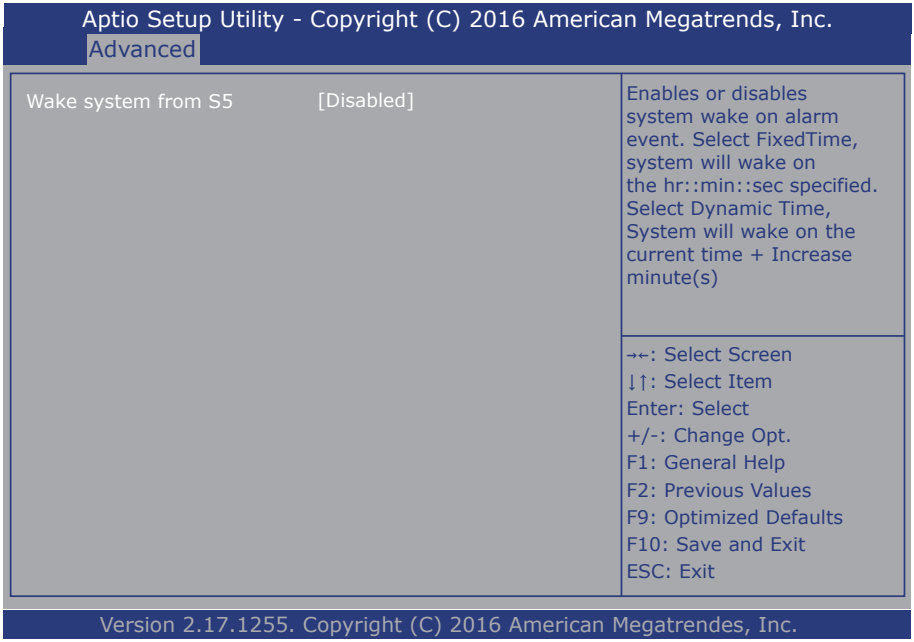
3.2.8. Hardware Monitor

Access this submenu to monitor of the overall inboard hardware health events, such as System temperature, CPU voltage, CPU & System fan speed... etc.



3.2.9. S5 RTC Wake Settings

Access this submenu to setup S5 RTC Wake Setting

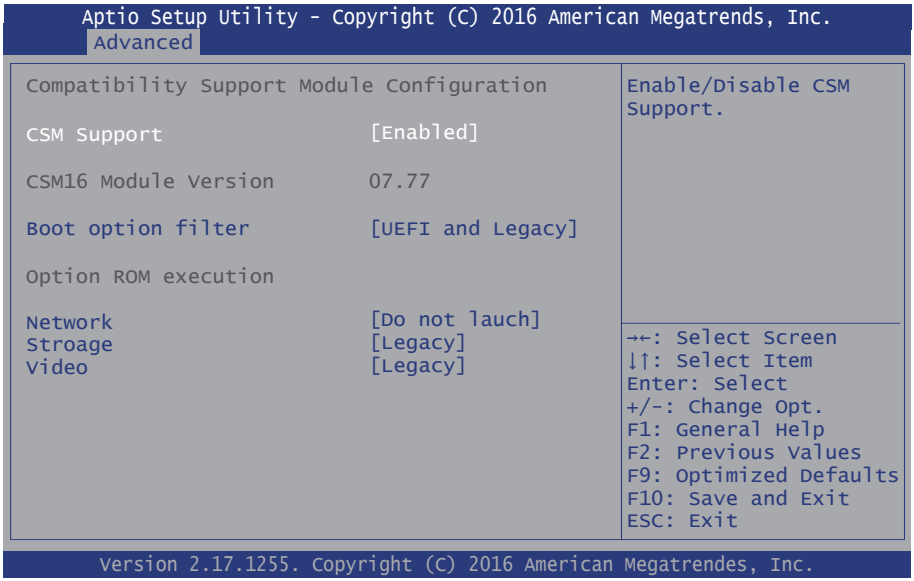


The featured submenus are:

Setting	Description
Wake system from S5	Select System wake on alarm Event ► Options: **Disabled(default)/Fixed Time/Dynamic Time**
Wake System with Fixed Time	Sets if to awake the system at a defined moment.
Wake up hour	Defines the (hour) time to awake the system. ► 0 to 23 configurable.
Wake up Minute	Defines the (minute) time to awake the system. ► 0 to 23 configurable.
Wake up second	Defines the (second) time to awake the system. ► 0 to 59 configurable.
Wake System with Dynamic Time	Sets if to awake the system some time in the future.
Wake up minute increase	Defines how long from now to awake the system. ► 1 to 5 minutes configurable.

3.2.10. CSM Configuration

Access this submenu to setup CSM Configuration

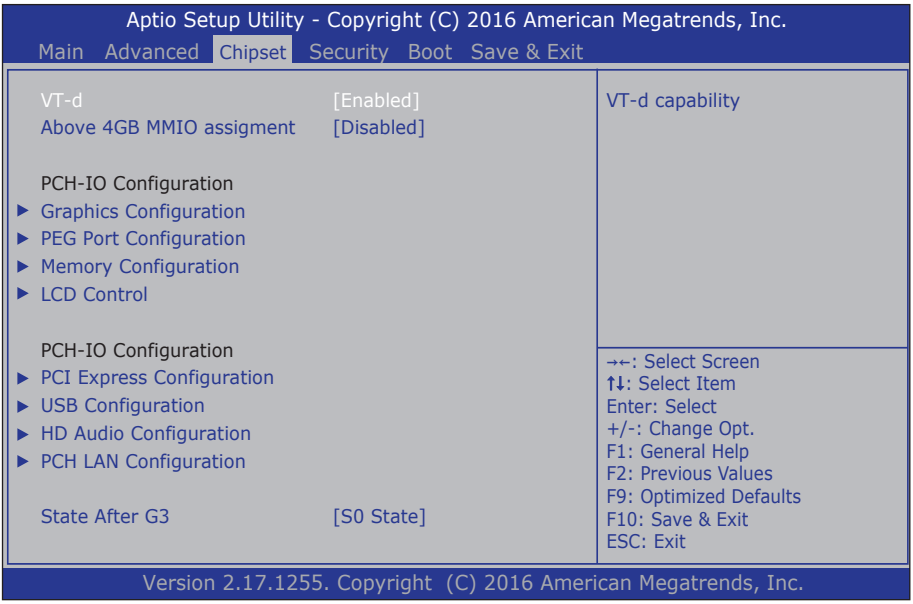


The featured submenus are:

Setting	Description
CSM Support	Enable and Disable CSM Support ► **Enabled** is the default.
Boot option filter	Control the Legacy/UEFI ROMs priority. ► Options: **UEFI and Legacy, Legacy only, and UEFI only.**
Network	Control the execution of UEFI and Legacy PXE OpROM. ► Options: **Do not launch, UEFI and Legacy.**
Storage	Control the execution of UEFI and Legacy Storage OpROM. ► Options: **Do not launch, UEFI and Legacy.**
Video	Control the execution of UEFI and Legacy Video OpROM. ► Options: **Do not launch, UEFI and Legacy.**

3.3. Chipset

Access this **Chipset** menu to configure the system's chipset.



Setting	Description
VT-d	**Enable** (default) or **Disable** VT-d function
Above 4GB MMIO BIOS assignment	**Enable** or **Disable** (default) Above 4GB MMIO BIOS assignment
System Agent (SA) Configuration	
Graphics Configuration	See Section 3.3.1. Graphics Configuration
PEG Port Configuration	See Section 3.3.2. PEG Port Configuration
Memory Configuration	See Section 3.3.3 Memory Configuration
LCD Control	See Section 3.3.4. LCD Control
PCI-IO Configuration	
PCI Express Configuration	See Section 3.3.5 PCI Express Configuration
USB Configuration	See Section 3.3.6 USB Configuration
HD Audio Configuration	See Section 3.3.7 HD Audio Configuration
PCH LAN Configuration	See Section 3.3.8 PCH LAN Configuration
State After G3	Specify what state to go to when power is re-applied after a power failure (G3 state). Options: **S0 State** and **S5 State**

3.3.1. Graphics Configuration

Access this submenu to configure Graphics Configuration.

The featured settings are:

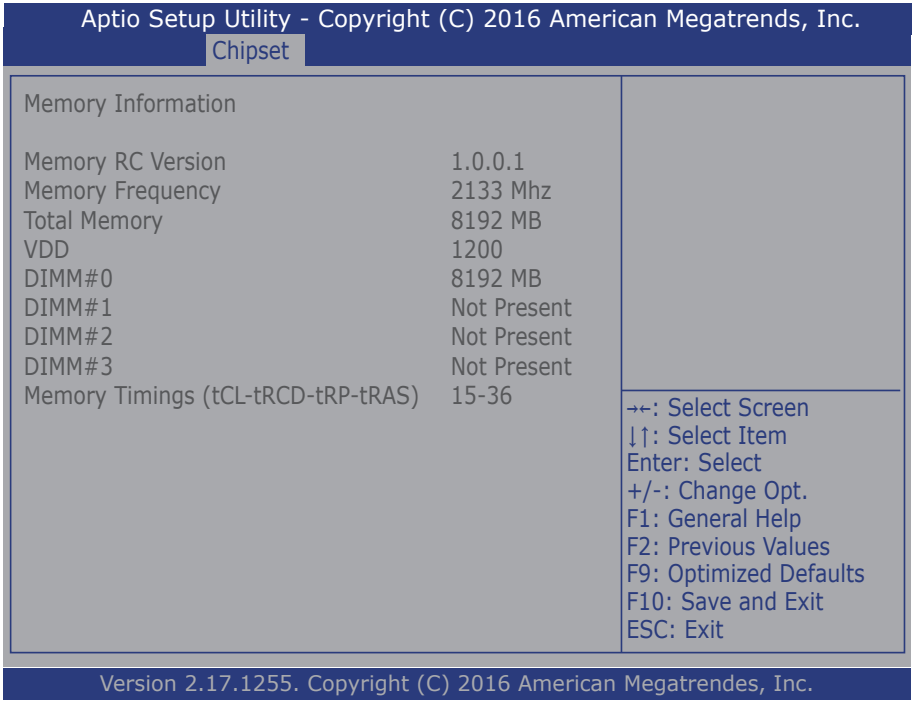
Setting	Description
Graphics Turbo IMON Current	Sets the graphics turbo IMON current values. ► Options available are **14** to **31**(default).
Primary Display	Set IGD or PCI graphic device as the Primary Display. ► Options: **IGD, PCie,** and **Auto**(default).
Primary PEG	Set the Primary PEG device. ► Options: **Auto**(default)**, PEG11,** and **PEG12**.
Internal Graphics	Keep IGD enabled based on the setup options. ► Options: **Auto**(default)**, Disabled** and **Enabled**.
GTT Size	Select the GTT Size. ► Options: **4MB**(default)**, 2MB** and **8MB.**
Apeture Size	Select the Apeture Size. ► Options: **256MB**(default)**, 128MB** and **512MB.**
DVMT Pre-Allocated	Select the DVMT 5.0 Pre-allocated (Fixed) Graphic Memory size used by the Internal Graphic Device. ► Options: 32M is the default.
DVMT total Gfx Mem	Select the DVMT 5.0 Total Graphic Memory size used by the Internal Graphic Device. ► Options: **256MB**(default)**, 128MB** and **Max.**

3.3.2. PEG Port Configuration

Access this submenu to configure Intel IGD Configuration.

Setting	Description
Enable Root Port	Enable and Disable the root port ► **Auto** is the default.
Max Link Speed	Set the PEG 0:1:0 Max Speed. ► Options: **Auto**(default)**, Gen1**, **Gen2** and **Gen3**.

3.3.3 Memory Configuration



3.3.4. LCD Control

Access this submenu to configure LCD Control.

The featured settings are:

Setting	Description
Active LFP	Configures LFP usage ► Options: **eDp Port-A**(default), and **No LVDS**.

3.3.5 PCI Express Configuration

Access this submenu to configure WIFI Configuration.

<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>WIFI1</td><td>WIFI Port Settings
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>WIFI 1</td><td>Enable and Disable WIFI Port
► Enabled is the default.</td></tr>
<tr><td>ASPM Support</td><td>Set the ASPM Level
► Option: Disabled(default), L0s, L1, L0sL1, Auto.</td></tr>
<tr><td>PCIe Speed</td><td>Set PCI Express port speed.
► Option: Auto (default), Gen1, Gen2, Gen3</td></tr>
</table></td></tr>
</table>

3.3.6 USB Configuration

Access this submenu to configure USB Configuration.

Setting	Description
USB Precondition	Enable and Disable USB Precondition ► **Disabled** is the default.
xDCI Support	Enable and Disable xDCI Support ► **Enabled** is the default.
USB Port Disable Override	Enable and Disable USB Port Disable Override ► **Disabled** is the default.

3.3.7 HD Audio Configuration

Access this submenu to configure HD Audio Configuration.

Setting	Description
HD Audio	Set the option of HD Audio. ► **Enabled** is the default.

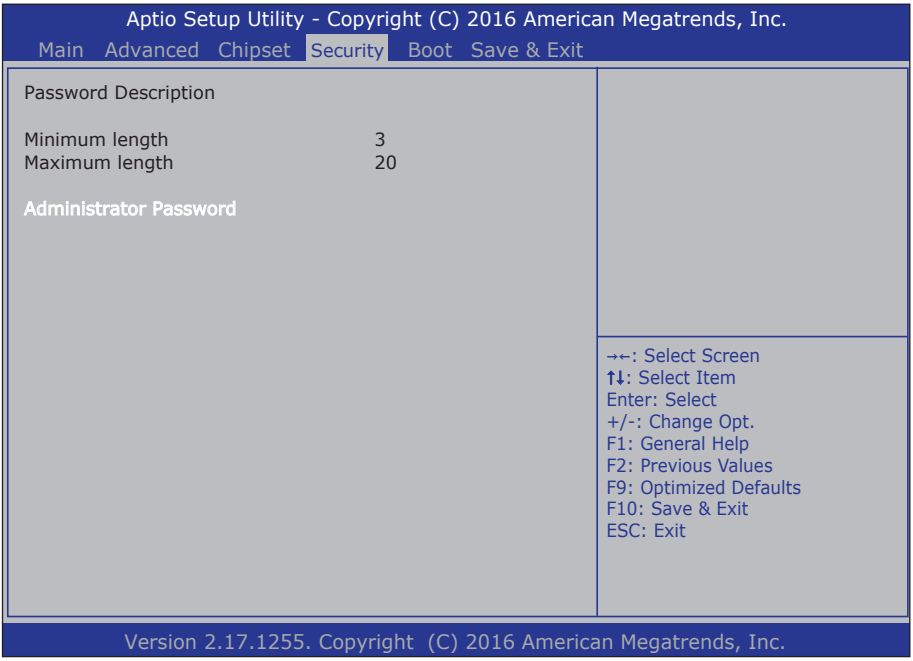
3.3.8 PCH LAN Configuration

Access this submenu to configure PCH LAN Configuration.

Setting	Description
PCH LAN Controller	Enable and Disable onboard NIC ► **Enabled** is the default.
Wake on LAN	Enable and Disable Wake on LAN ► **Enabled** is the default.

3.4. Security

The **Security** menu sets up the administrator password. Once an administrator password is set up, this BIOS Setup utility is limited to access and will ask for the password each time any access is attempted.

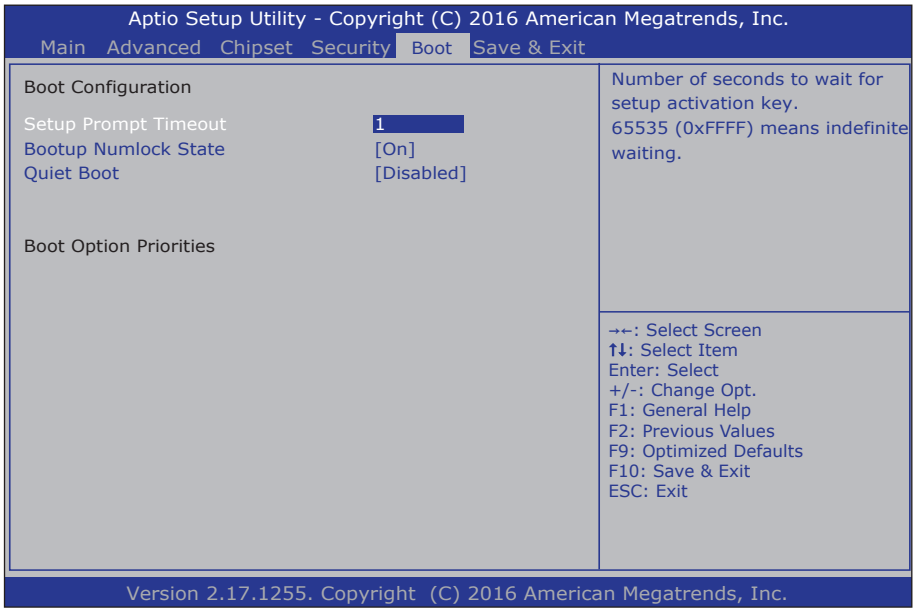


The featured settings are:

Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. A **Create New Password** dialog then pops up onscreen. 2. Enter your desired password that is no less than 3 characters and no more than 20 characters. 3. Hit [Enter] key to submit.

3.5. Boot

Access this menu to change system boot settings.

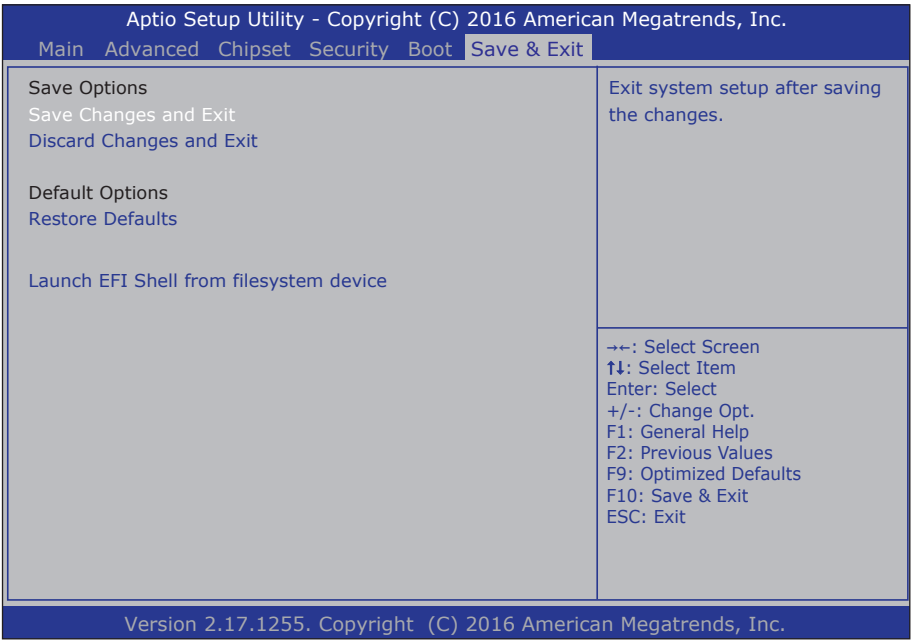


The featured submenu is:

Setting	Description
Setup Prompt Timeout	Configures the seconds allowed to stay in BIOS setup prompt screen. ▸ Options available are **1** (default) and **??**.
Bootup NumLock State	Sets whether to enable or disable the keyboard's NumLock state when the system starts up. ▸ Options available are **On** (default) and **Off**.
Quiet Boot	Enables or Disables Quiet Boot option. ▸ **Disabled** is the default.
Boot Option #1 /2 /3 /4 /5 /6	Sets boot priority for all boot devices. Options are: **USB Flash, CD/DVD, Hard Disk: Windows..., USB CD/DVD, USB Hard Disk, Network**

3.6. Save & Exit

The **Exit** menu features a handful of commands to launch actions from the BIOS Setup utility regarding saving changes, quitting the utility and recovering defaults.



The featured settings are:

Setting	Description
Save Changes and Exit	Saves the changes and quits the BIOS Setup utility. ▸ This is a command to launch an action from the BIOS Setup utility. ▸ When prompted for confirmation, select **OK** to save the changes and quit the BIOS Setup, or select **Cancel** to return to BIOS Setup.
Discard Changes and Exit	Discards the changes and quits the BIOS Setup utility. ▸ This is a command to launch an action from the BIOS Setup utility. ▸ When prompted for confirmation, select **OK** to quit BIOS Setup without saving the change(s), or select **Cancel** to return to the BIOS setup.
Restore Defaults	Loads the defaults to all settings. ▸ This is a command to launch an action from the BIOS Setup utility. ▸ When prompted for confirmation, select **OK** to load the defaults, or select **Cancel** to return to the BIOS setup.

Appendices

Appendix A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device.
The following table lists the I/O port addresses used.

Address	Device Description
0x0000F080-0x0000F087	Microsoft Basic Display Adapter
0x000003B0-0x000003BB	Microsoft Basic Display Adapter
0x000003C0-0x000003DF	Microsoft Basic Display Adapter
0x00000A00-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	Motherboard resources
0x00000A30-0x00000A3F	Motherboard resources
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000070-0x00000070	Motherboard resources
0x00000080-0x0000008F	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources
0x00000400-0x0000047F	Motherboard resources
0x00000500-0x000005FE	Motherboard resources
0x00000600-0x0000061F	Motherboard resources
0x00000000-0x0000006F	PCI Express Root Complex
0x00000078-0x00000CF7	PCI Express Root Complex
0x00000D00-0x0000FFFF	PCI Express Root Complex
0x0000E000-0x0000E0FF	PCI standard PCI-to-PCI bridge
0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller

Address	Device Description
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x000004D0-0x000004D1	Programmable interrupt controller
0x0000E000-0x0000E0FF	Realtek PCIe GBE Family Controller
0x0000F000-0x0000F01F	SM Bus Controller
0x0000F070-0x0000F077	Standard SATA AHCI Controller
0x0000F060-0x0000F063	Standard SATA AHCI Controller
0x0000F050-0x0000F057	Standard SATA AHCI Controller
0x0000F040-0x0000F043	Standard SATA AHCI Controller
0x0000F020-0x0000F03F	Standard SATA AHCI Controller
0x00000070-0x00000070	System CMOS/real time clock
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer

Appendix B. Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ0	System timer
IRQ4	SM Bus Controller
IRQ8	High Precision Event Timer
IRQ16	PCI standard PCI-to-PCI bridge
IRQ18	Realtek PCIe GBE Family Controller
IRQ18	PCI standard PCI-to-PCI bridge
IRQ19	Standard SATA AHCI Controller
IRQ19	PCI standard PCI-to-PCI bridge
IRQ22	High Definition Audio Controller
IRQ81~IRQ511	Microsoft ACPI-Compliant System
IRQ4294967294	Intel(R) USB 3.0 eXtensible Host Controller - 0100 (Microsoft)

Appendix C. BIOS Memory Map

Address	Device Description
0xD0716000-0xD07167FF	Standard SATA AHCI Controller
0xE0000000-0xEFFFFFFF	Motherboard resources
0xFED01000-0xFED01FFF	Motherboard resources
0xFED03000-0xFED03FFF	Motherboard resources
0xFED04000-0xFED04FFF	Motherboard resources
0xFED0C000-0xFED0FFFF	Motherboard resources
0xFED08000-0xFED08FFF	Motherboard resources
0xFED1C000-0xFED1CFFF	Motherboard resources
0xFEE00000-0xFEEFFFFF	Motherboard resources
0xFEF00000-0xFEFFFFFF	Motherboard resources
0xD0000000-0xD03FFFFF	Microsoft Basic Display Adapter
0xC0000000-0xCFFFFFFF	Microsoft Basic Display Adapter
0xA0000-0xBFFFF	Microsoft Basic Display Adapter
0xA0000-0xBFFFF	PCI Express Root Complex
0xFED00000-0xFED003FF	High Precision Event Timer
0xFF000000-0xFFFFFFFF	Intel(R) 82802 Firmware Hub Device
0xC0000-0xDFFFF	PCI Express Root Complex
0xE0000-0xFFFFF	PCI Express Root Complex
0x80000000-0xD0716FFF	PCI Express Root Complex
0xD0700000-0xD070FFFF	Intel(R) USB 3.0 eXtensible Host Controller - 0100 (Microsoft)
0xD0500000-0xD05FFFFF	PCI Encryption/Decryption Controller
0xD0400000-0xD04FFFFF	PCI Encryption/Decryption Controller
0xD0710000-0xD0713FFF	High Definition Audio Controller
0xD0604000-0xD0604FFF	Realtek PCIe GBE Family Controller
0xD0600000-0xD0603FFF	Realtek PCIe GBE Family Controller
0xD0600000-0xD0603FFF	PCI standard PCI-to-PCI bridge
0xD0714000-0xD071401F	SM Bus Controller

Appendix D: Watchdog Timer (WDT) Setting

WDT is widely used for industry application to monitor the activity of CPU. Application software depends on its requirement to trigger WDT with adequate timer setting. Before WDT time out, the functional normal system will reload the WDT. The WDT never time out for a normal system. The WDT will not be reloaded by an abnormal system, then WDT will time out and reset the system automatically to avoid abnormal operation.

This board supports 255 levels watchdog timer by software programming I/O ports. Below are the source codes written in C, please take them as WDT application example.

```
#include "math.h"
#include "stdio.h"
#include "dos.h"

#define   DELAY_TIME                          10

#define _SMBBA                                0xF040          /* SMBus Base Address
*/
#define _SMBSA                                0x6E            /*    SMBus    Slave
Address , 75111R's Add = 6Eh or 9Ch */

unsigned char DIO_Set(unsigned char oMode, unsigned char oData);
unsigned char SMB_Byte_READ(int SMPORT, int DeviceID, int iREG_INDEX);
void SMB_Byte_WRITE(int SMPORT, int DeviceID, int oREG_INDEX, int oREG_DATA);

void main()
{
        WDT_Start(10);

        while(1)
        {
                iCount = WDT_Count();
                printf("\r Counts : %d ",iCount);

                delay(1000);
        }
}

void WDT_Start(int iCount)
{
        int iData;

        /* Configuration and function select Register - Enable WDTOUT2# output */
        iData = SMB_Byte_READ(SMB_PORT_AD,SMB_DEVICE_ADD,0x03);
        iData = iData | 0x03;
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x03,iData);
    delay(DELAY_TIME);

        /* Watchdog Timer Range Register */
        SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x37,iCount);
```

```
    delay(DELAY_TIME);

    /* Watchdog Timer Control Register */
    SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x36,0x72);
}

int WDT_Count(void)
{
    int iData;

    /* Watchdog Timer Range Register */
         iData = SMB_Byte_READ(SMB_PORT_AD,SMB_DEVICE_ADD,0x37);

    return iData;
}

void WDT_Clear(int iCount)
{
         /* Watchdog Timer Range Register */
         SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x37,iCount);
}

void WDT_Stop(void)
{
         /* Watchdog Timer Control Register */
         SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x36,0x52);
}
```