



MX3350N

Intel® Apollo Lake N3350 Mini-ITX Motherboard

Mini-ITX Motherboard

User's Manual

Edition 1.20 – Aug, 2020

FCC Statement

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.

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

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

Notice

This guide is designed for experienced users to setup the system within the shortest time. For detailed information, please always refer to the electronic user's manual.

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1. Collect all the information about the problem encountered. (For example, CPU type and speed, BCM products model name, hardware & BIOS revision number, other hardware and software used, etc.) Note anything abnormal and list any on-screen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information available.
3. If your product is diagnosed as defective, obtain an RMA (return material authorization) number from your dealer. This allows us to process your good return more quickly.
4. Carefully pack the defective product, a complete Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Manual Objectives

This manual describes in detail the BCM MX3350N Main board.

We strongly recommend that you study this manual carefully before attempting to interface with MX3350N or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

If you have any suggestions or find any errors concerning this manual and want to inform us of these, please contact our Customer Service department with the relevant details.

Safety Precautions

Warning!



Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!



Always ground yourself to remove any static charge before touching the mainboard. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

Document Amendment History

Revision	Date	Comment
1 st (0.01)	July, 2017	Initial
2 nd	Oct., 2017	Update backlight control sample code
3 rd	Jan. 2020	Update product information
4 th	Aug. 2020	Correctly HDMI notation error

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Mainboard Specifications

Model	MX3350N
Processor	Intel® Celeron® Processor N3350 Dual Core (up to 2.4GHz)
Chipset	SoC
Memory	2 x DDR3L SO-DIMM slots (204 pin) Dual channel Non-ECC DDR3L 1866/1600 MHz , Up to 8GB
Display	Intel® HD Graphic 3 x independent displays supported <ul style="list-style-type: none"> ■ 1 x LVDS 18/24-Bit Dual Channel <ul style="list-style-type: none"> - Resolution up to 1366x768 @60Hz (18-Bit) - Resolution up to 1920x1200 @60Hz (24-Bit) ■ 1 x DP <ul style="list-style-type: none"> - Resolution up to 4096x2160 @60Hz ■ 2 x HDMI <ul style="list-style-type: none"> - Resolution up to 3840x2160 @30Hz
SATA	1 x SATA III connectors supports Data Transfer rates 6.0Gb/s, 3.0Gb/s and 1.5Gb/s
PCIe	1 x PCIe x1 Slot
M.2	1 x 2230 M.2 slot E Key with PCIe x1 & USB 2.0 signal 1 x 2280 & 2242 M.2 Slot M Key with PCIe x2' & SATA3.0 signal
USB	4 x USB3.0 (4 x Rear I/O with USB2.0 signal) 2 x USB3.0 (2 x Internal I/O with USB2.0 signal) 2 x USB2.0 (2 x Internal I/O)
TPM	Infineon SLB 9665TT2.0 TPM 2.0/FW 5.61 (Optional) 1 x TPM 2.0 Security Device
Super I/O Controller	Fintek® F81867AD-I
Serial Ports	1 x RS232/422/485 COM port connector (COM1) 3 x RS232 COM port connectors (COM2, COM3, COM4)
LPT	1 x LPT header
Watch Dog Timer	1 ~ 255 sec timer
HW Monitor	Yes
Audio	Realtek® ALC887

	HD Audio Codec with auto jack sensing
LAN	Intel® i211AT PCI-E Gigabit LAN
	2 x 10/100/1000 LAN
BIOS	AMI BIOS
	AMI BIOS with 128Mb SPI ROM
Digital IO	8-Bit (4 x GPI, 4 x GPO)
Expansion Slots	
PCIe	1 x PCIe x 1 slot
M.2	1 x 2230 M.2 slot E Key with PCIe x1 & USB 2.0 signal
	1 x 2280 & 2242 M.2 Slot M Key with PCIe x2 & SATA3.0 signal
Internal I/O Headers	
SATA	1 x Std. SATA Connectors
USB 2.0	1 x USB Headers (2 ports on headers)
USB 3.0	1 x USB Headers (2 ports on headers)
COM Port	4 x Headers
LPT	1 x Header
Front Audio	1 x Header (Line-in, Mic)
Amplifier	1 x Header
Front Panel	1 x Header
Fan Header	2 x Headers (4-pins)
Chassis Intrusion Header	1 x Header
LPC (TPM)	1 x Header
Digital IO	1 x Header
LVDS	1 x Header
LVDS Inverter	1 x Header
Internal Jumpers	
COM Port Ring-In/ Power Select	4 x Headers provide selections of “Ring-In”, or “12V” or “5V” on COM ports
Chassis Intrusion	1 x Header
AT/ATX Select	1 x Header
Clear CMOS	1 x Header
TXE F/W Select	1 x Header
Secondary RTC Reset Select	1 x Header
LVDS Backlight Control Select	1 x Header
LVDS Backlight Power Select	1 x Header
Back I/O Panel	

DC-in	1 x DC-in 12V Jack
HDMI	2 x HDMI Connectors
Displayport	1 x DisplayPort Connector
USB3.0	2 x Stack up USB Connectors
LAN	2 x RJ45 Connectors
Audio	2 x Audio Jacks (Line-Out, Mic)
Power & Connector	
	1 x DC-in 12V Jack
	1 x 4 pin DC-in 12V Connector
Form Factor	
	Mini-ITX (6.7-in x 6.7-in)
Certification	
	FCC Class B, CE

-1 M.2 M key support PCIe x2 only, M.2, please check with your vendor to ensure the M.2 SSD use is compatible with PCIe x2.

Chapter 1: System Setup

This chapter describes the mainboard features and the new technologies it supports

1.1 Welcome!

The mainboard delivers a host of new features and latest technologies, making it another line of BCM long life mainboards! Before you start installing the mainboard, and hardware devices on it, check the items in your package with the list below.

If any of the items listed below is damaged or missing, please contact with your vendor.

1.2 Packing Contents

- **Mainboard**

- 1 x MX3350N

- **Cable**

- 1 x Serial ATA Power Cable

- **Accessories**

- 1 x MX3350N STD I/O Shield
- 1 x MX3350N Thin I/O Shield

- **Drivers**

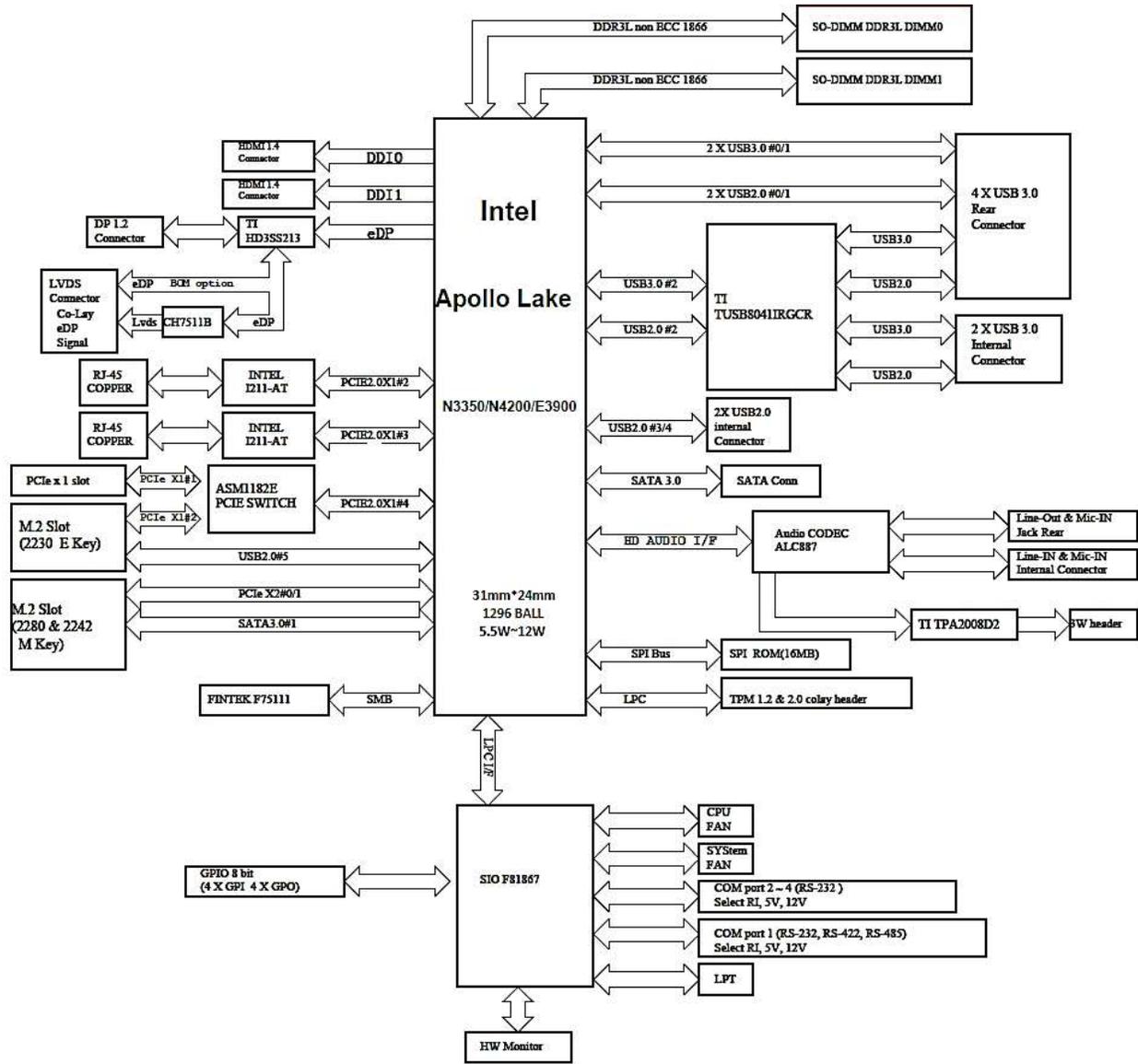
- Drivers is available for download at BCM website at WWW.BCMCOM.COM

- **Documentation**

- Manual is available for download at BCM website at WWW.BCMCOM.COM

1.3 Features

MX3350N block Diagram



1.4 Before you proceed

Take note of the following precautions before you install mainboard components or change any mainboard settings.

- **Unplug the power cord from the wall socket before touching any component inside the system.**
- **Use a grounded wrist strap or touch a safely grounded object or to a metal object, such as the power supply case, before handling components to avoid damaging them due to static electricity.**
- **Hold components by the edges to avoid touching the ICs on them.**
- **Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.**
- **Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power source. Failure to do so may cause severe damage to the mainboard, peripherals, and/or components.**

1.5 Mainboard Overview

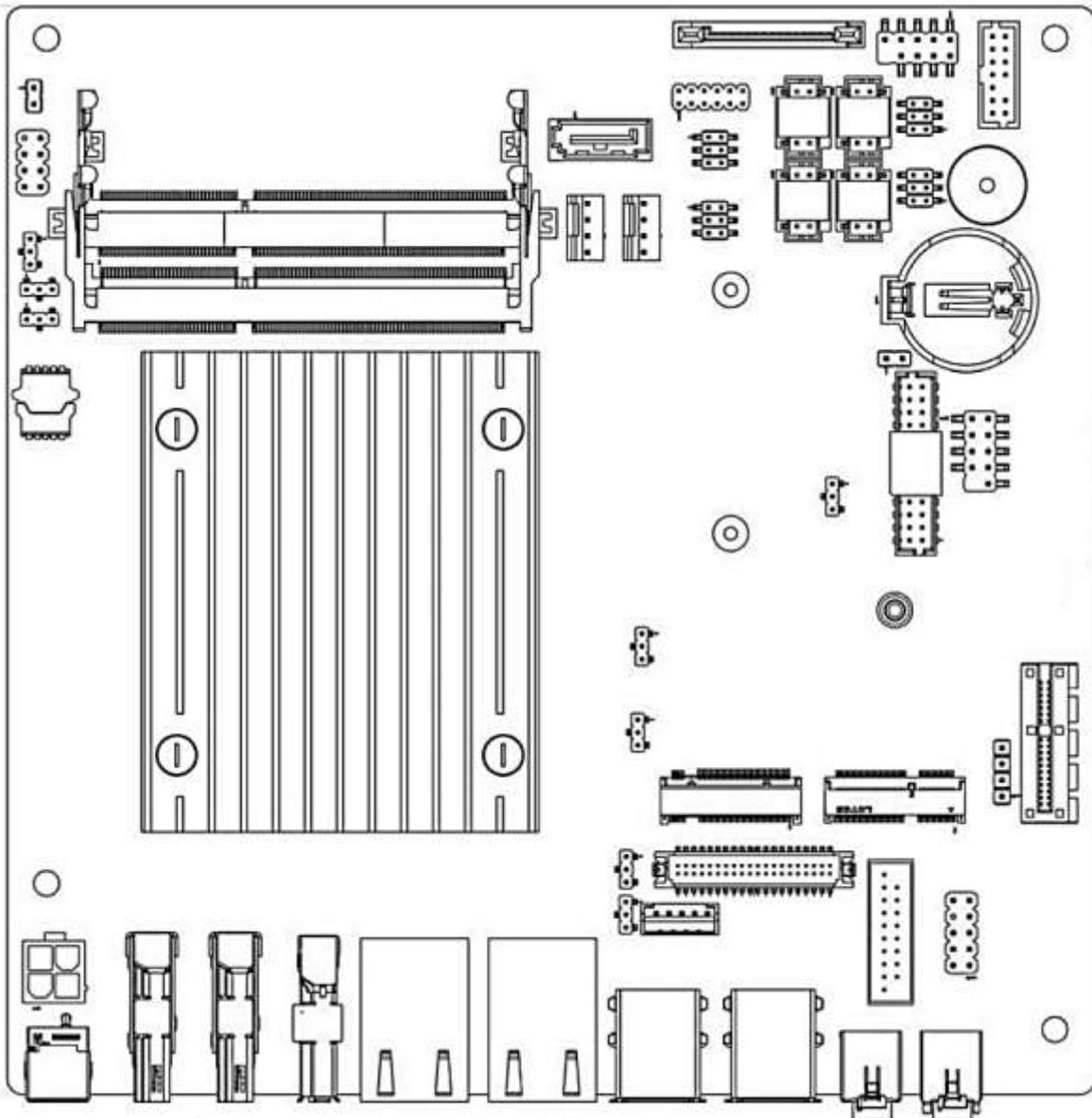
Before you install the mainboard, study the configuration of your chassis to ensure that the mainboard fits into it.



Make sure to unplug the power cord before installing or removing the mainboard. Failure to do so can cause you physical injury and damage mainboard components.

1.5.1 Placement Direction

When installing the mainboard, make sure that you place it into the chassis in the correct orientation. The edge with external port goes to the rear part of the chassis as indicated in the image below.

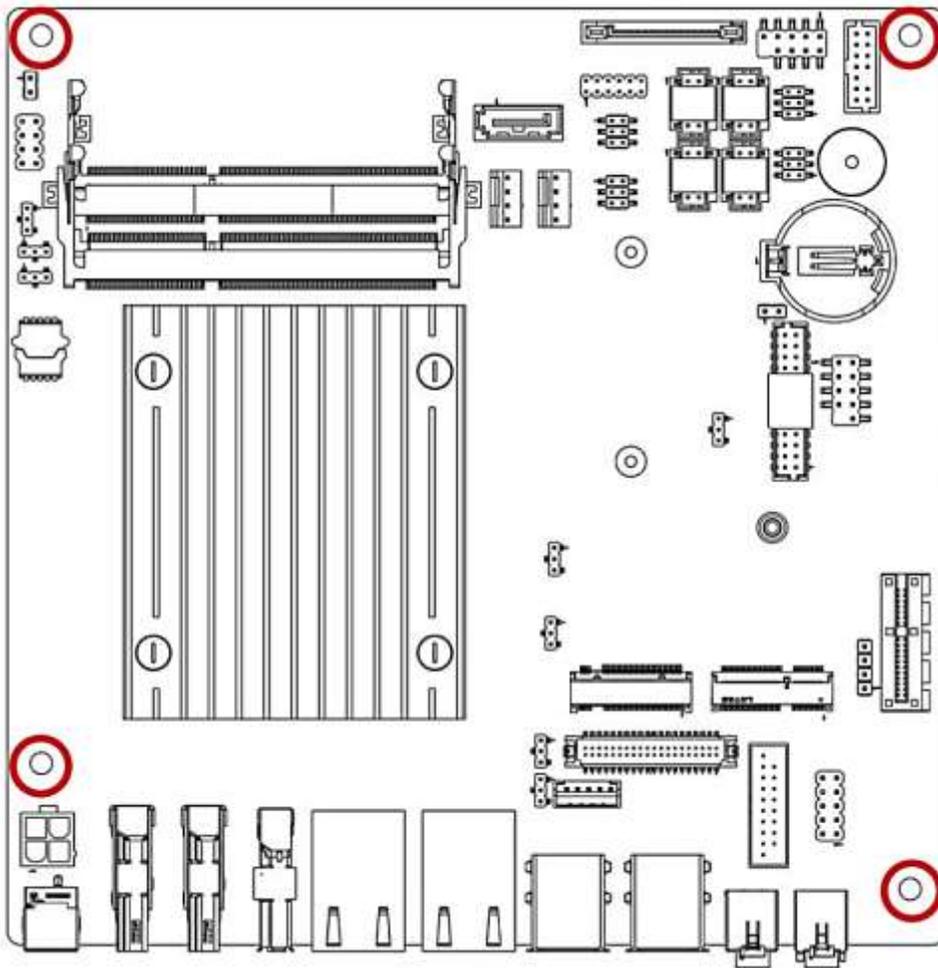


1.5.2 Mounting Holes

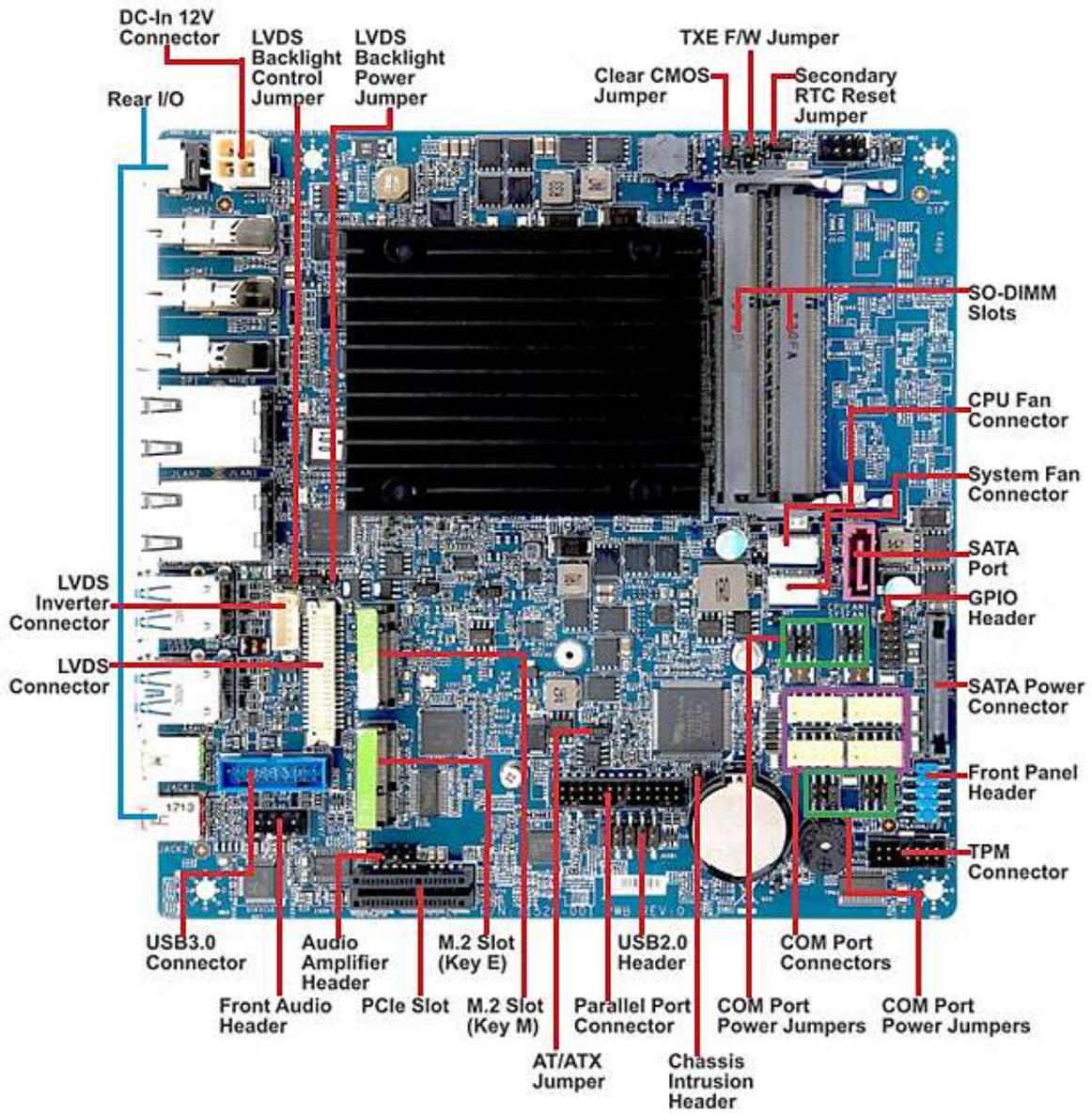
Place the screws into the mounting holes indicated by red squares to secure the mainboard to the chassis.



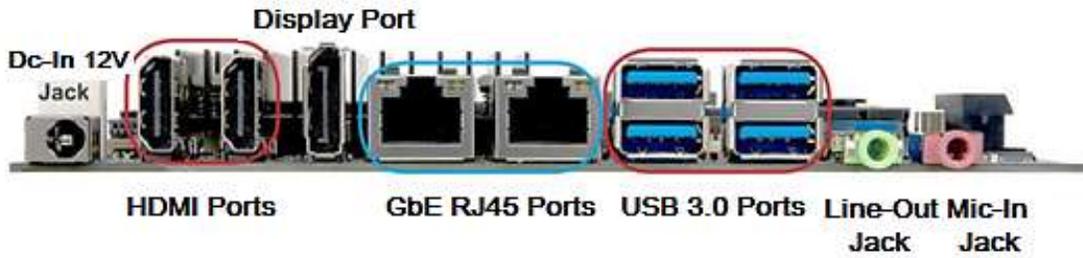
Do not over-tighten the screws! Doing so may damage the mainboard.



1.5.3 Mainboard Layout



• Back Panel:



1.5.4 Layout Content List

1.5.4.1 Slots			
Label	Function	Note	Page
DIMM1	204-pin DIMM slot 1	If there is only one memory module being installed in the system, install it on this slot first.	20
DIMM2	204-pin DIMM slot 2		20
PCI_E1	PCI express x1 slot		38
M2_1	2230 M.2 slot E Key		39
JM1	2280 & 2242 M.2 Slot M Key		38

1.5.4.2 Internal Jumpers			
Label	Function	Note	Page
JCMOS1	Clear CMOS	1 x 3 header, pitch 2.0mm	33
JTXE1	Enable/disable the Intel TXE F/W	1 x 3 header, pitch 2.0mm	35
JBAT1	Secondary RTC Reset Select	1 x 3 header, pitch 2.0mm	35
JLVDS_BKL1	LVDS Backlight Control Select	1 x 3 header, pitch 2.0mm	36
JBKLVOL1	LVDS Backlight Power 3V/5V Select	1 x 3 header, pitch 2.0mm	36
JCOMP1 JCOMP2 JCOMP3 JCOMP4	COM1, COM2, COM3, COM4 RI/+5V/+12V Select	2 x 3 header, pitch 2.0mm	34
JAT1	AT/ATX Power Select	1 x 3 header, pitch 2.0mm	34

1.5.4.3 Internal Headers			
Label	Function	Note	Page
PWR1	DC-in 12V Connector	2 x 2 header	21
SATA1	Serial ATA Connectors	7-pin	24
CPUFAN1	CPU Fan Connector	1 x 4 wafer, pitch 2.54mm	25
SYSFAN1	System Fan Connector	1 x 4 wafer, pitch 2.54mm	25
JGPIO2	Digital I/O header	2 x 6 header, pitch 2.0mm	30

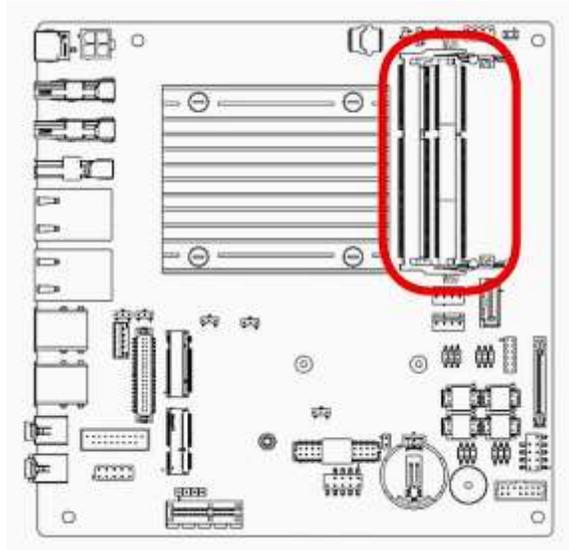
JPSATA1	SATA Power	15-pin	21
JFP1	System Panel Connector	2 x 5 header, pitch 2.54mm	29
COM1 COM2 COM3 COM4	Serial Port Connector 1, 2, 3, 4	2 x 5 wafer, pitch 2.00mm	28
JTPM1	LPC debug port and supports TPM modules	2 x 7 Box header, pitch 2.0mm	32
JCASE1	Chassis Intrusion Connector	1 x 2 header, pitch 2.54mm	26
JLPT1	Parallel Port Connector	2 x 13 Box header, pitch 2.00mm	29
JUSB1	USB 2.0 Connector	2 x 5 header, pitch 2.54mm	27
JAMP1	Amplifier Connector	1 x 4 header, pitch 2.54mm	27
JUSB3	USB 3.0 Connector	2 x 10 Box header, pitch 2.00mm	30
JAUD1	Front Panel Audio Connector	2 x 5 header, pitch 2.54mm	26
JINV1	LVDS Inverter Connector	1 x 5 header, pitch 2.0mm	31
JLVDS1	LVDS Connector	2 x 20 header, pitch 1.25mm	31

1.5.4.4 Back Panel Connectors

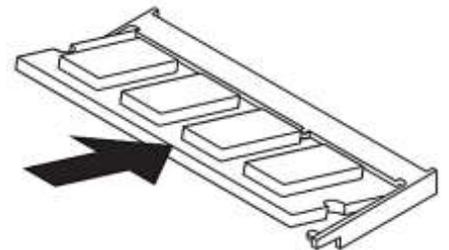
Label	Function	Note	Page
JPWR1	DC-in 12V Jack		22
HDMI1/HDMI2	HDMI x 2		22
DP1	Display Port x 1	1. This DisplayPort Does NOT support Hot Plug and Audio Output	22
JLAN1/ JLAN2	RJ-45 Ethernet Connector x 2		23
USB1/USB2	USB3.0 Connector x 4		23
JACK1/JACK2	Line-out Port, Microphone Port,		23

1.6 Installing DIMM

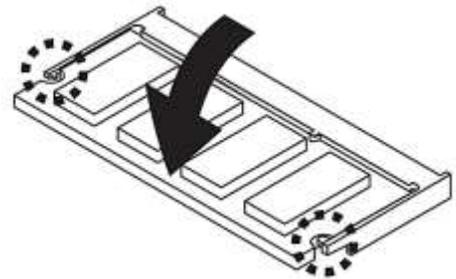
1.6.1 The SO-DIMM slot is intended for memory modules.



1. Locate the SO-DIMM slot. Align the notch on the DIMM with the key on the slot and insert the DIMM into the slot.



2. Push the DIMM gently downwards until the slot levers click and lock the DIMM in place.



3. To uninstall the DIMM, flip the slot levers outwards and the DIMM will be released instantly.

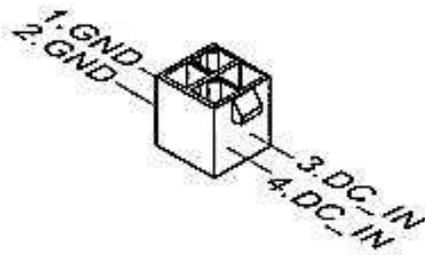
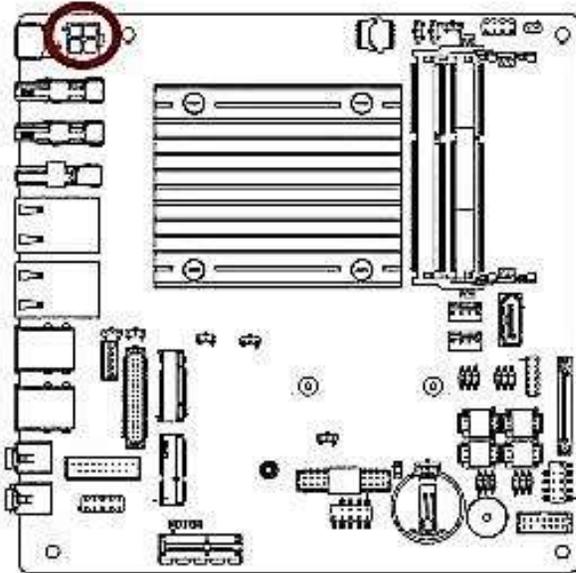


You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.

1.7 Power Supply

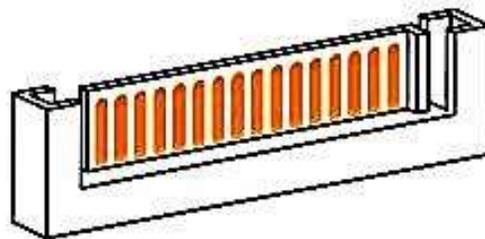
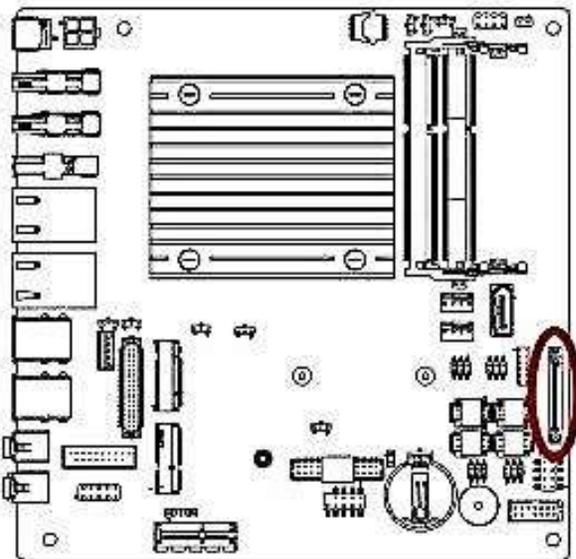
1.7.1 DC-In 12V Connector: PWR1

This connector is used to provide power to the motherboard.



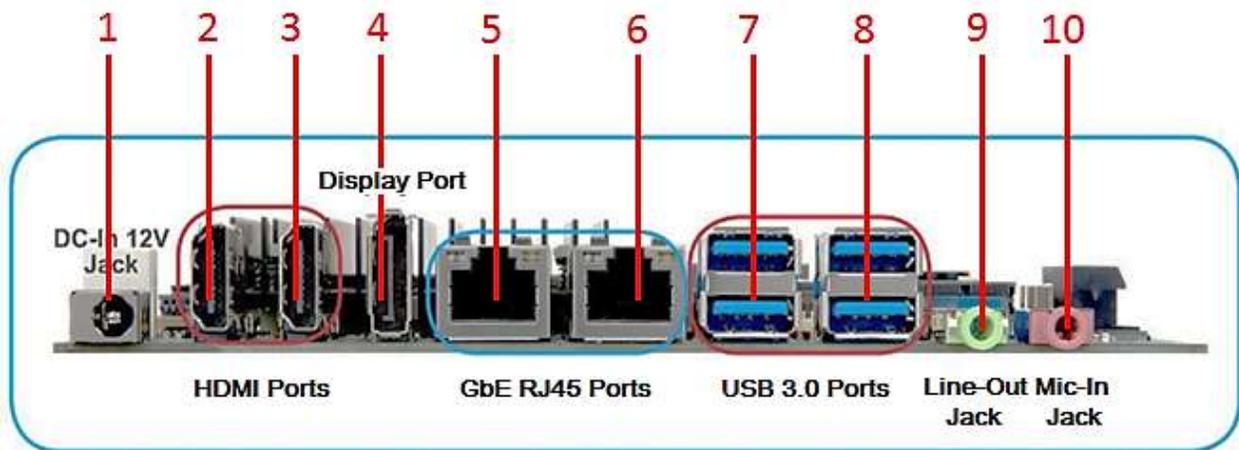
1.7.2 SATA Power Connector: JPSATA1

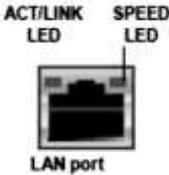
This connector is used to provide power to SATA devices. Please use a SATA power cable connect onboard SATA power connector with SATA device's power connector (for SATA storage only).



1.8 Back Panel

1.8.1 Back Panel Connectors



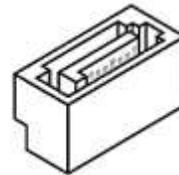
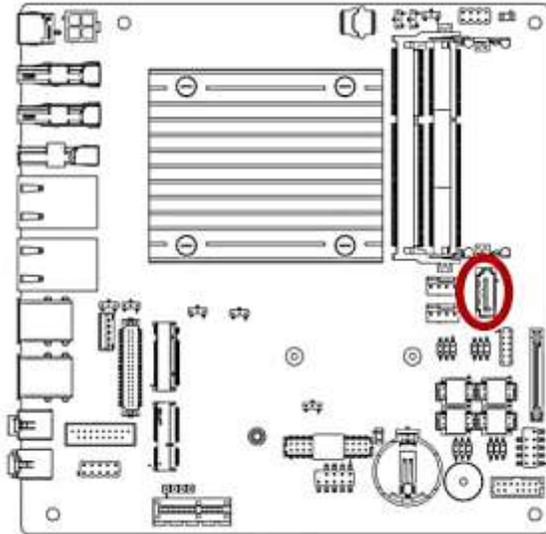
Item	Name	Function	Description																				
1	JPWR1	DC-In 12V Jack	This jack is used to provide power to motherboard.																				
2	HDMI2	HDMI Port 2	The High-Definition Multimedia Interface (HDMI) is an all-digital audio/video interface capable of transmitting uncompressed streams. HDMI supports all TV format, including standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.																				
3	HDMI1	HDMI Port 1																					
4	DP1	Display Port 1	Provides "DisplayPort" type connection to monitor.  This DisplayPort Does NOT support "HotPlug" and "Audio Output".																				
5/6	JLAN1/ JLAN2	Gigabit LAN (RJ-45) Connectors  LAN port	This port allows Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications. <table border="1" data-bbox="750 1524 1357 1864"> <thead> <tr> <th colspan="2">ACT/Link LED</th> <th colspan="2">Speed LED</th> </tr> <tr> <th>Status</th> <th>Description</th> <th>Status</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>No link</td> <td>OFF</td> <td>10Mbps connection</td> </tr> <tr> <td>Orange</td> <td>Linked</td> <td>Orange</td> <td>100Mbps connection</td> </tr> <tr> <td>Blinking</td> <td>Data activity</td> <td>Green</td> <td>1Gbps connection</td> </tr> </tbody> </table>	ACT/Link LED		Speed LED		Status	Description	Status	Description	OFF	No link	OFF	10Mbps connection	Orange	Linked	Orange	100Mbps connection	Blinking	Data activity	Green	1Gbps connection
ACT/Link LED		Speed LED																					
Status	Description	Status	Description																				
OFF	No link	OFF	10Mbps connection																				
Orange	Linked	Orange	100Mbps connection																				
Blinking	Data activity	Green	1Gbps connection																				

7	USB1	USB 3.0 Connectors	These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 3.0/ 2.0 devices.
8	USB2	USB 3.0 Connectors	These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 3.0/ 2.0 devices.
9	JACK1	Line-out port (Lime)	This port connects a headphone or a speaker.
10	JACK2	Microphone port (Pink)	This port connects a microphone.

1.9 Connectors/ Headers

1.9.1 Serial ATA Connectors: SATA1

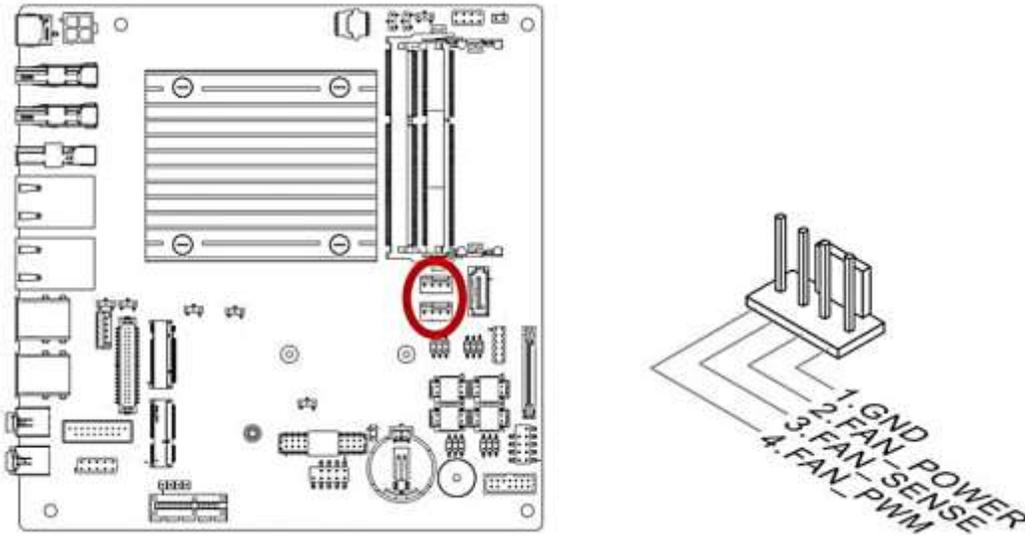
This connector is a high-speed Serial ATA interface port. Each connector can connect to one Serial ATA device. SATA3.0 standard, which is backward compatible with SATA2.0



Please do not fold the Serial ATA cable into 90-degree angle. Otherwise, data loss may occur during data transmission.

1.9.2 Fan Power Connectors: CPUFAN1, SYSFAN1

The fan power connectors support system cooling fan with +12V. When connecting the wire to these fan connectors, please note that the red wire is designated as “Power” and should be connected to “+12V” pin; the black wire is designated as “Ground” and should be connected to “GND”. In order to take the advantage of System Hardware Monitor, be sure to use the fan which is specifically designed with speed sensor.

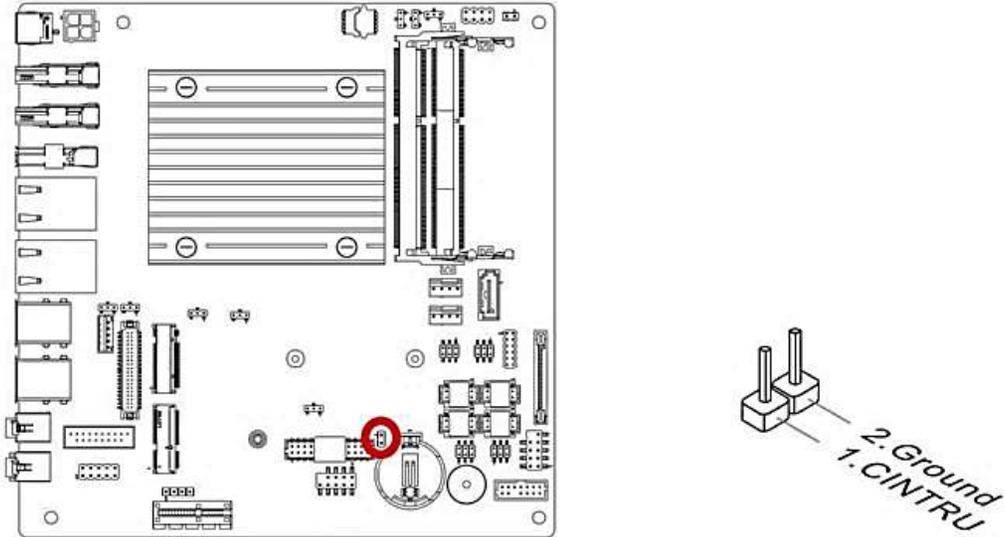


Please refer to the recommended CPU fans at processor’s official website or consult with the vendor for proper CPU cooling fan.

1.9.3 Chassis Intrusion Switch Connector: JCASE1

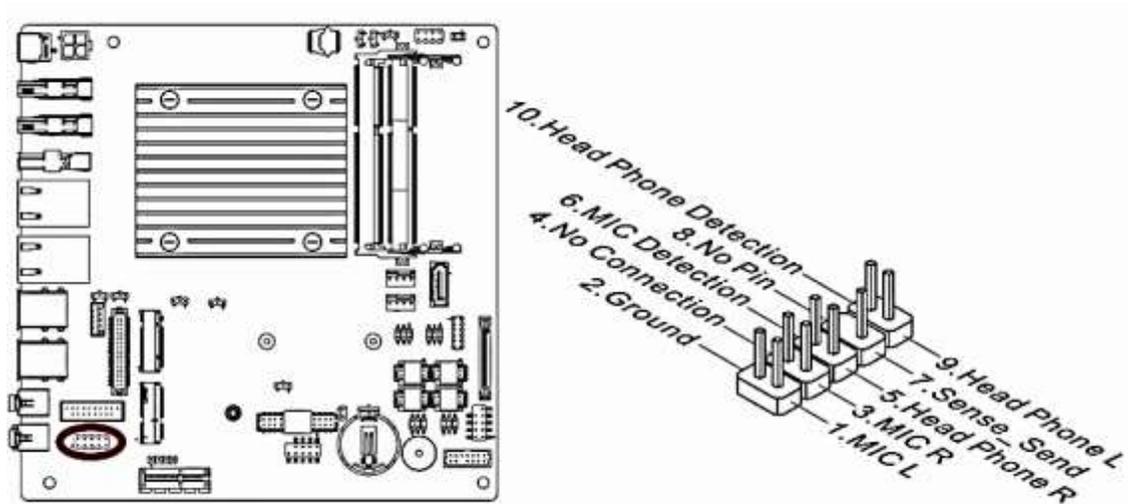
This connector connects to a 2-pin chassis switch. If the chassis is opened, the switch will be short. The system will record this status and show a warning message on the screen.

To clear the warning message, you must enter the BIOS and clear the record.



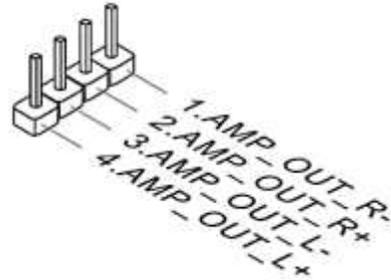
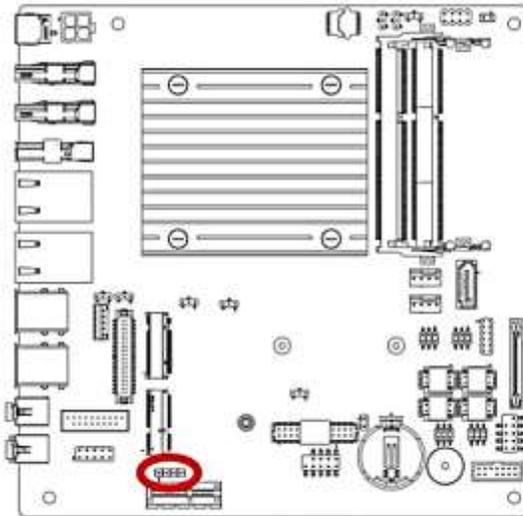
1.9.4 Front Panel Audio Connector: JAUDIO1

This connector allows you to connect the front panel audio and is compliant with Intel® Front Panel I/O Connectivity Design Guide.



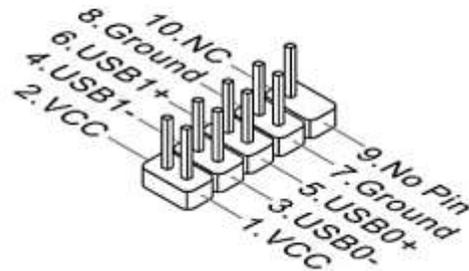
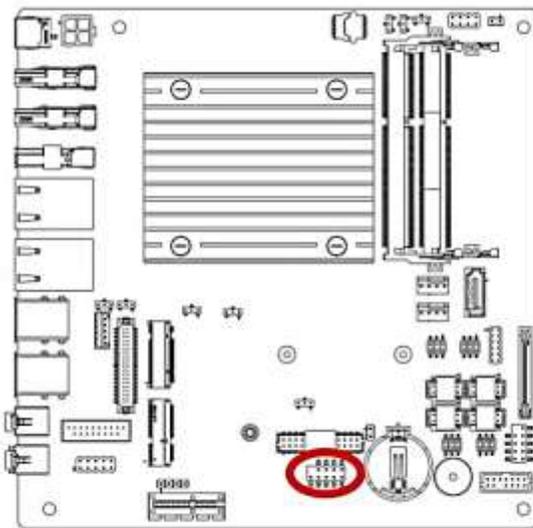
1.9.5 Amplifier Connector: JAMP1

This header provided amplified audio signals to external speakers (2-channels).



1.9.6 Front USB2.0 Headers: JUSB1

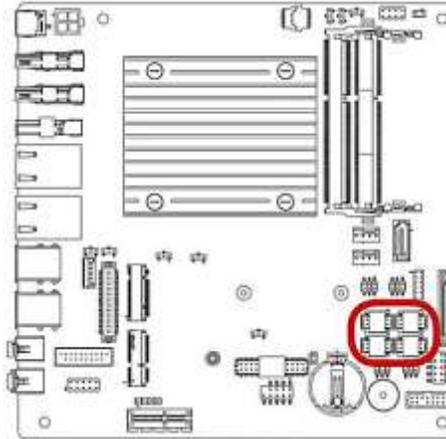
This connector is compliant with Intel® I/O Connectivity Design Guide, which is ideal for connecting high-speed USB peripherals such as USB HDD, USB digital cameras, USB MP3 players, USB printers, etc.



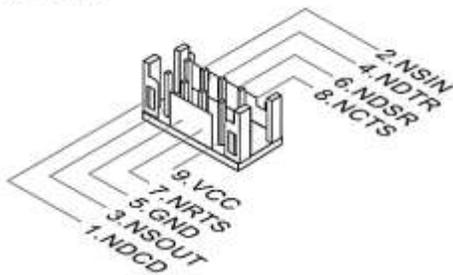
Be sure the pins of VCC and GND is connected to the connector correctly. Otherwise, it may cause damage to the USB port and/or the connected USB device.

1.9.7 Serial Port Connectors: COM1, COM2, COM3, COM4

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach a serial device to it. COM1 supports RS232/422/485. COM2~4 support RS232.

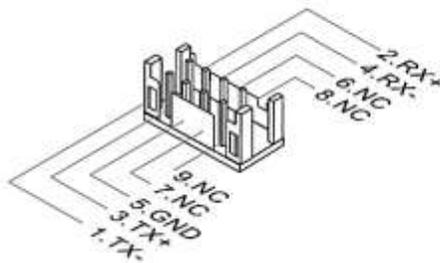


RS232



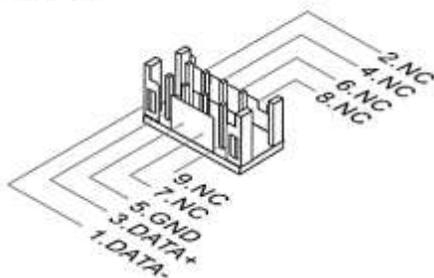
PIN	SIGNAL	DESCRIPTION
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	VCC	5V or 12V selected by jumper
10	NC	No Connection

RS422



PIN	SIGNAL	DESCRIPTION
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection

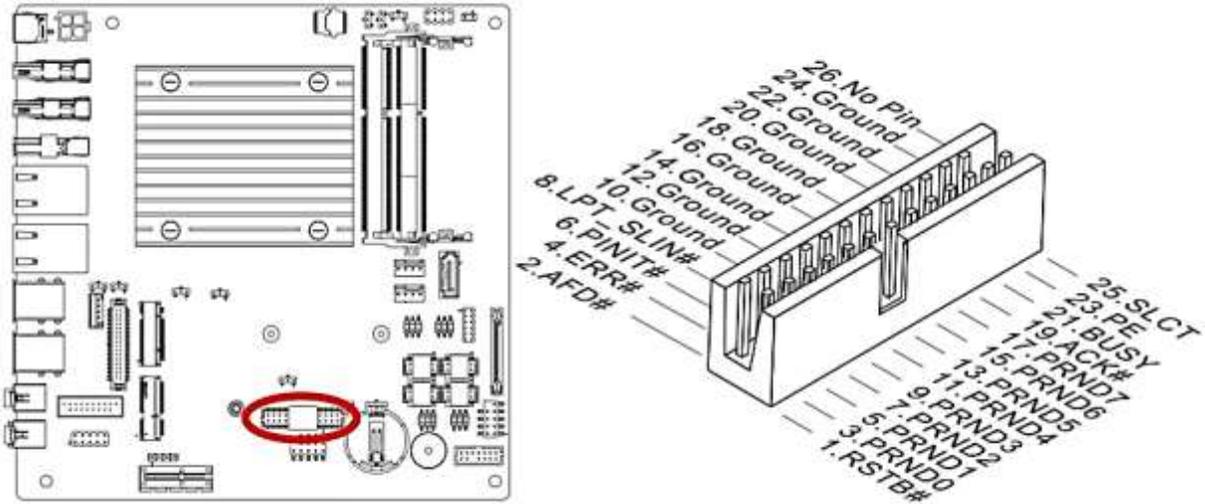
RS485



PIN	SIGNAL	DESCRIPTION
1	485 TXD-	Transmit Data, Negative
2	NC	No Connection
3	485 TXD+	Transmit Data, Positive
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection

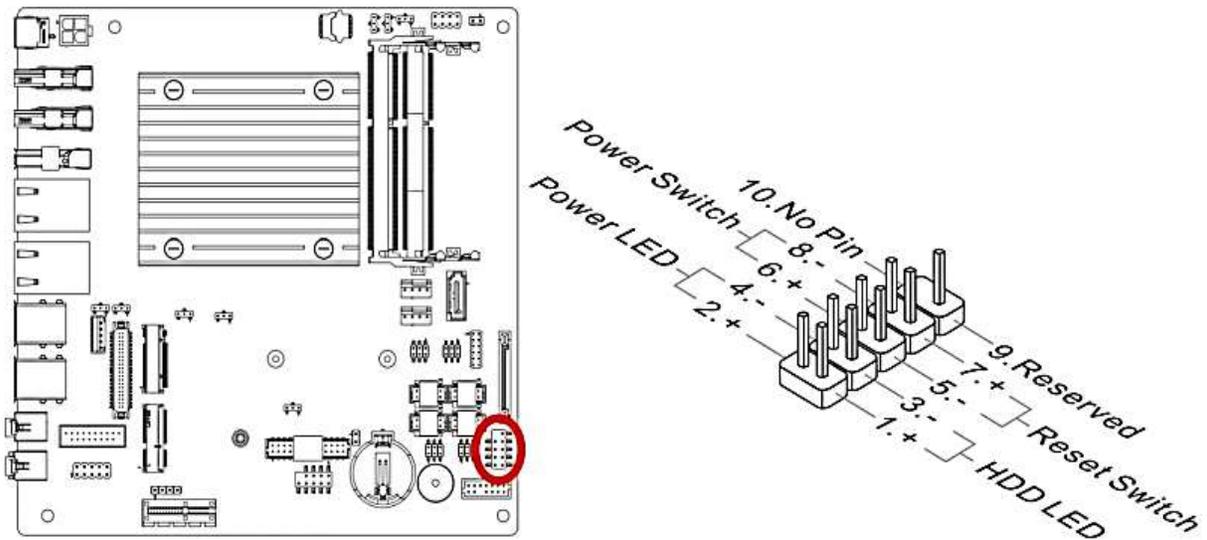
1.9.8 LPT Port Connector: JLPT1

The mainboard provides a 26-pin header for connection to an optional parallel port bracket. The parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.



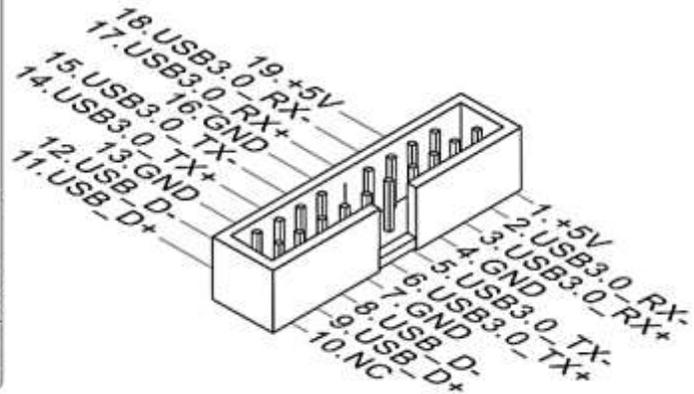
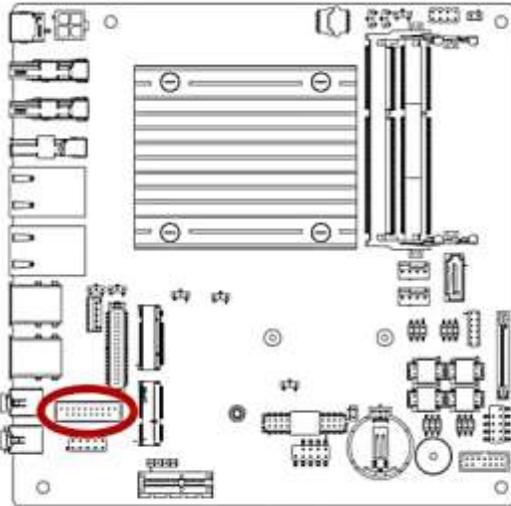
1.9.9 Front Panel Connectors: JFP1

This front panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.



1.9.10 USB3.0 Connector: JUSB3

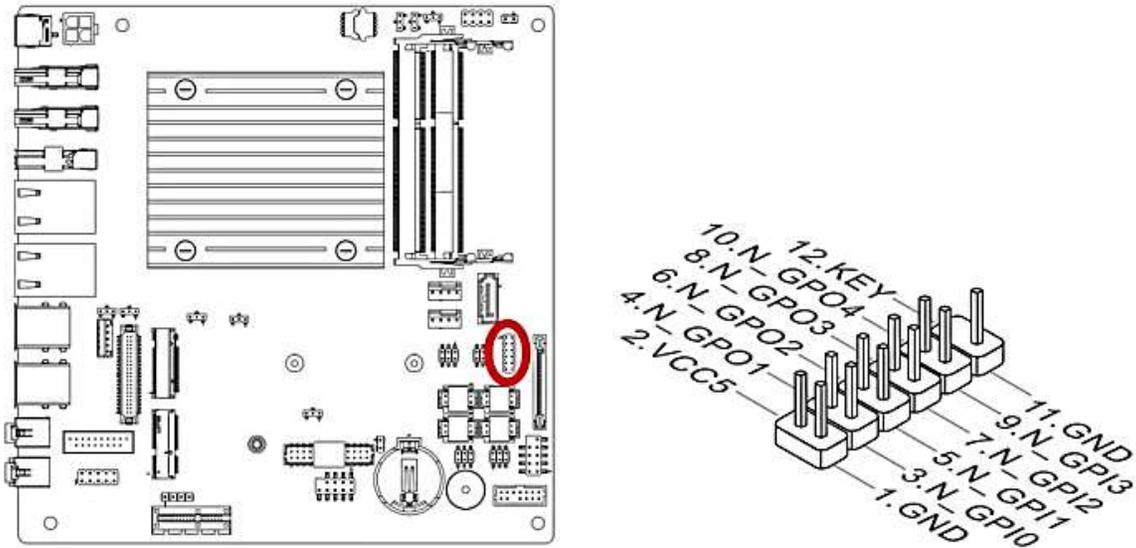
The USB3.0 port is backwards compatible with USB2.0 devices. It supports up to 5 Gbit/s (SuperSpeed) data transfer rate.



1. Note that the pins of VCC and GND must be connected correctly to avoid possible damage.
2. To use a USB3.0 device, you must connect the device to a USB3.0 port through an optional USB3.0 compliant cable.

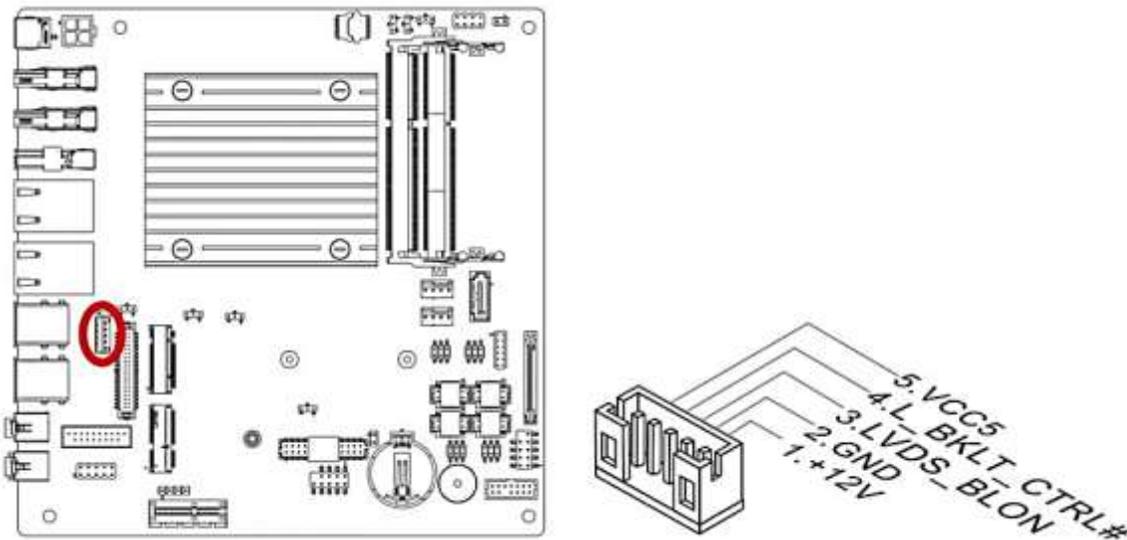
1.9.11 Digital I/O Connector: JGPIO2

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.



1.9.12 LVDS Inverter Connector: JINV1

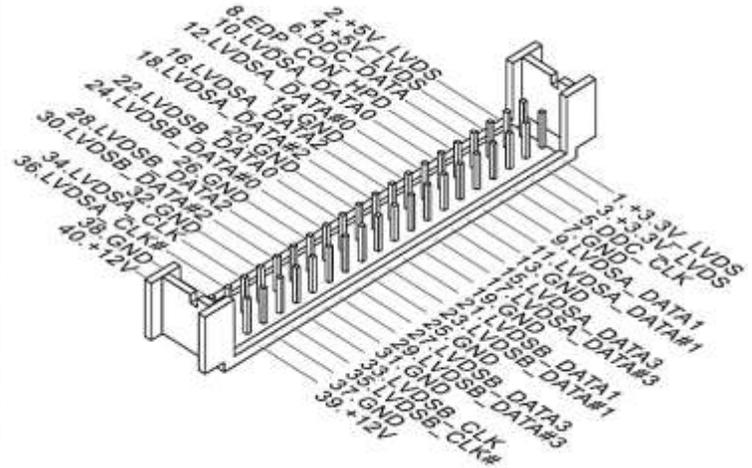
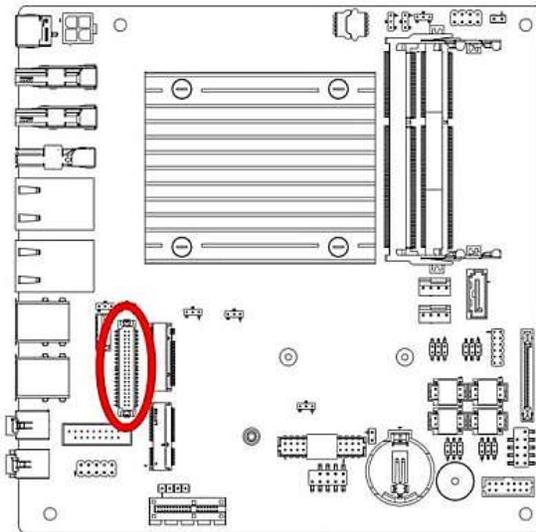
The connector is provided for LCD backlight options.



Pin	Description	Note
5	+5V Backlight	
4	Brightness Control	
3	Backlight Enable	
2	Ground	
1	+12V Backlight	

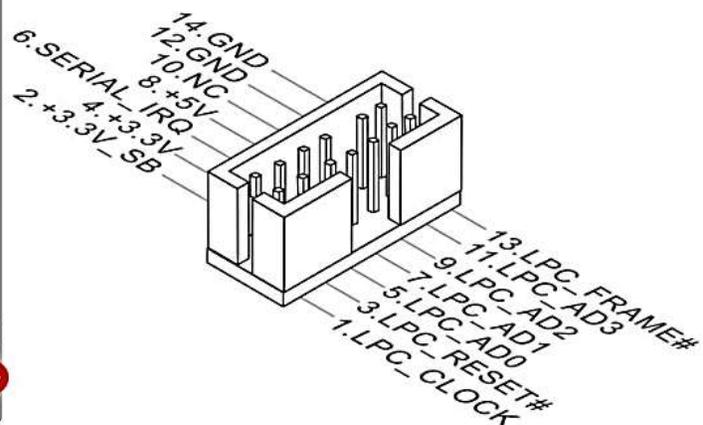
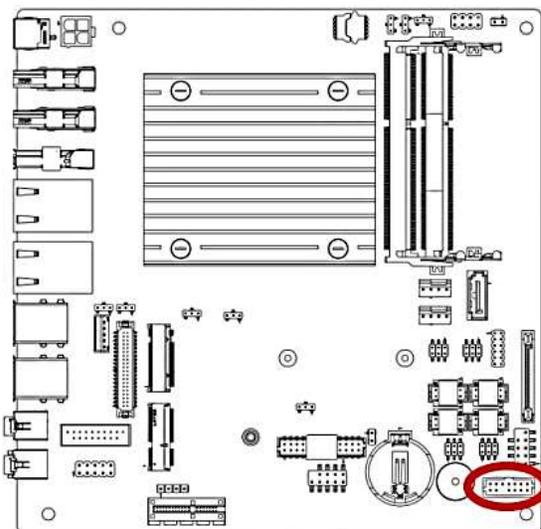
1.9.13 LVDS Connector: JLVDS1

The LVDS (Low Voltage Differential Signal) connector provides a digital interface typically used with flat panels. After connecting an LVDS interface flat panel to the JLVDS1, be sure to check the panel datasheet and set the LVDS jumper to proper power voltage.



1.9.15 Connector: JTPM1 (With TPM Support)

This connector works as LPC debug port and supports TPM modules through an adapter.



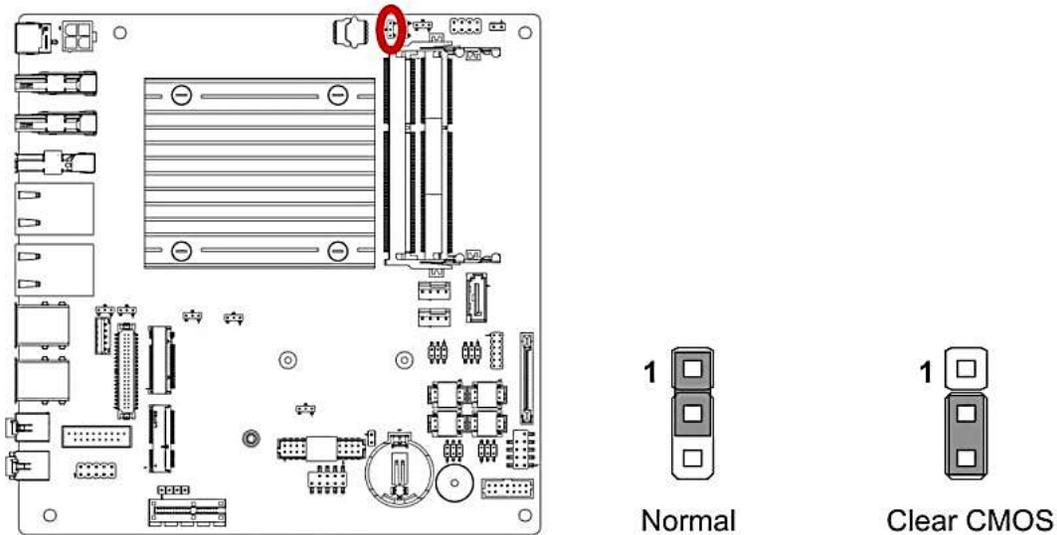
1.10 Jumpers

1.10.1 Clear CMOS Jumper: JCMOS1

There is a CMOS RAM onboard that has a power supply from an external battery to keep the data of system configuration.

For normal state (default), the jumper is set on pin location 1 and 2.

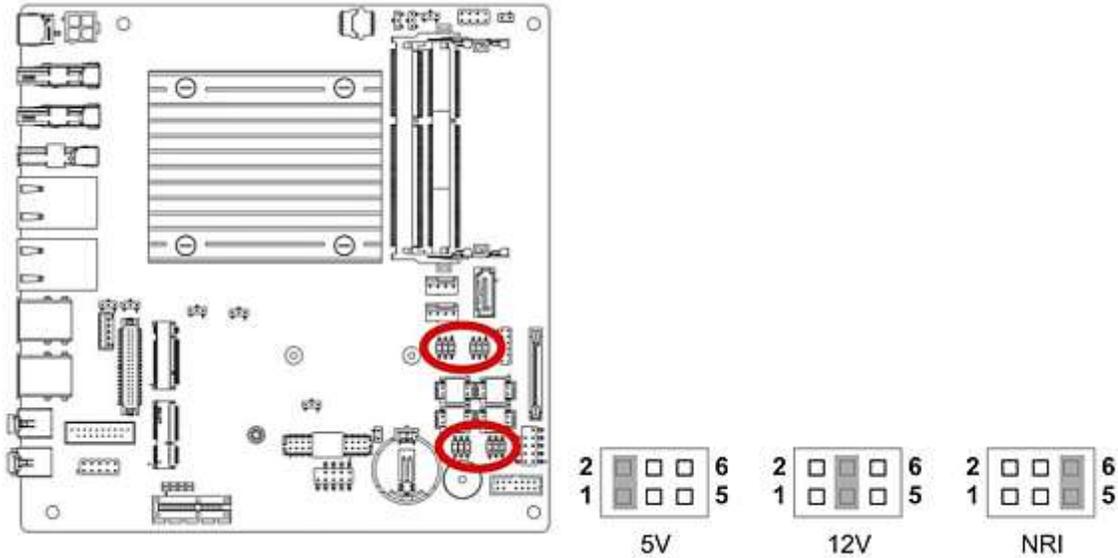
To clear the CMOS, set the jumper to pin location 2 and 3 for at least 30 seconds while the system is off.



1. You can clear CMOS by shorting pin 2-3 for at least 30 seconds (while the system is OFF), then place the jumper back to pin 1-2 for normal operation.
2. Avoid clearing the CMOS while the system is ON; this will damage the mainboard.

1.10.2 COM1, COM2, COM3 and COM4 Ring-in/ +12V/ +5V Power Select: JCOMP1, JCOMP2, JCOMP3, JCOMP4

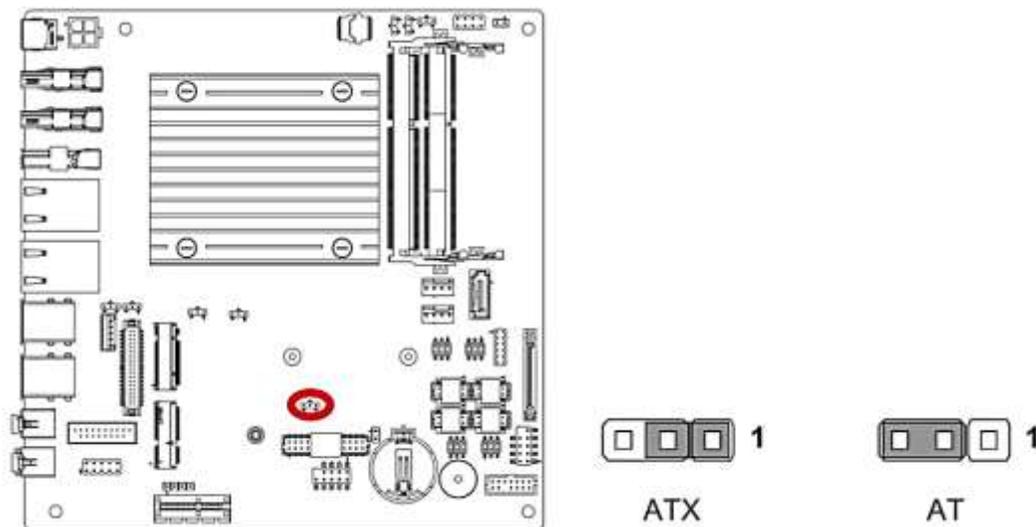
These headers provide ring-in, or 5V, or 12V on the com ports.



1.10.3 ATX/AT Mode Selection: JAT1

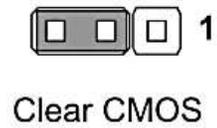
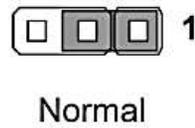
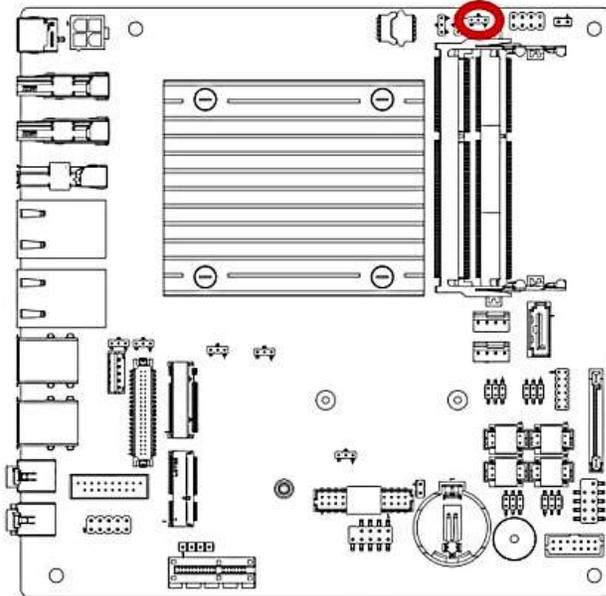
This header provides the option to boot the system in the form of ATX mode (default) or AT mode.

When the system is set in AT mode, the system power on/off will be controlled directly by the power switch on power supply. And some of the power saving modes will not function as ATX mode provided.



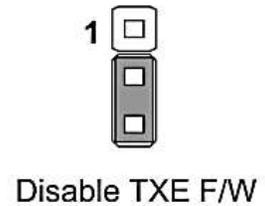
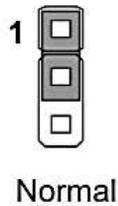
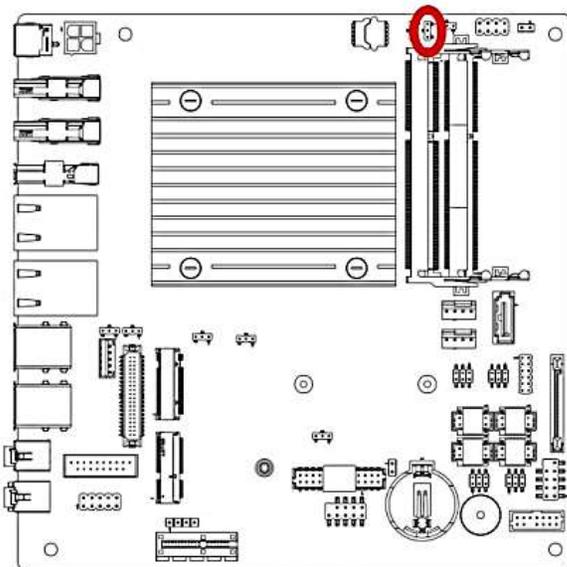
1.10.4 Secondary RTC Reset Jumper: JBAT1

When the RTC battery is removed, this jumper resets the manageability register bits in the RTC.



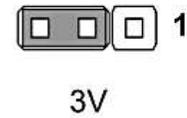
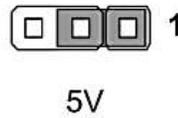
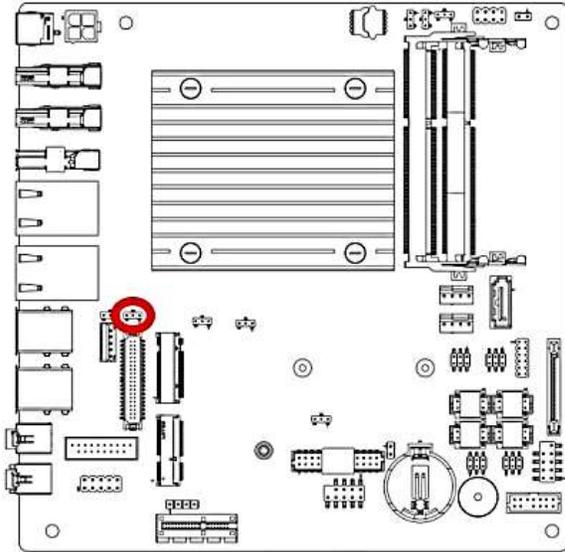
1.10.5 TXE F/W Jumper: JTXE1

This jumper is used to enable/disable the Intel TXE F/W.



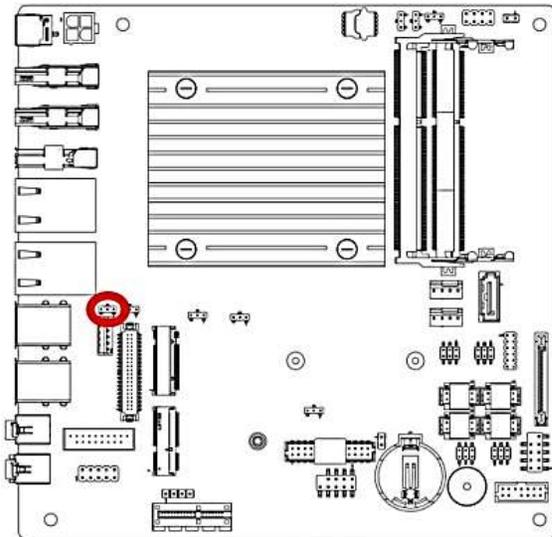
1.10.6 LVDS Backlight Power Jumper: JBKLVOL1

Use this jumper to specify the operation voltage of the LVDS display.



1.10.7 LVDS Backlight Control Jumper: JLVDS_BKL1

Use this jumper to specify the backlight control of the LVDS display.



1.11 The Expansion Slots

In the future, you may need to install expansion cards. The following sub-sections describe the expansion slots and the expansion cards that they support.



Make sure to unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage mainboard components.

1.11.1 Installation of Expansion Card

To install an expansion Card:

1. Before install the expansion card, read the documentation that came with it and make the necessary hardware setting for the card.
2. Remove the chassis cover (if the mainboard is installed in a chassis).
3. Remove the expansion slot bracket from the chassis on the slot that you intend to use. Keep the screw for later use.
4. Align the card connector with the slot and press it firmly until the card is completely seated on the slot.
5. Secure the card to the chassis with the screw that have been removed earlier (in step 3).
6. Place the chassis cover back on.

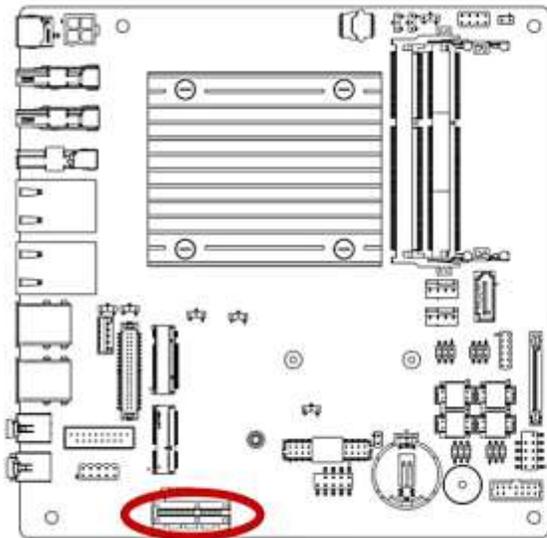
1.11.2 PCI (Peripheral Component Interconnect) Express Slot

The PCI Express slot supports the PCI Express interface expansion card.

- The PCI Express x1 (PCI-E x1) supports up to 250MB/s transfer rate.

1.11.3 PCIe x1 Slot: PCI_E1

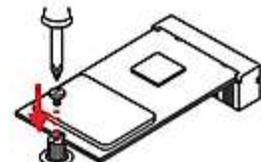
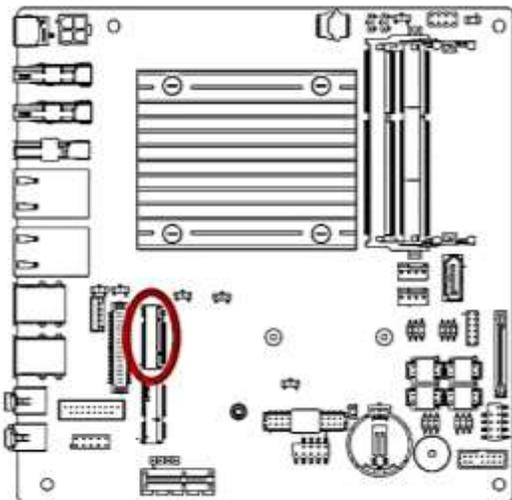
The PCI Express slot supports PCIe interface expansion cards.



PCIe x1 slot

1.11.4 M.2 Slot (Key M, 2280 & 2242): JM1

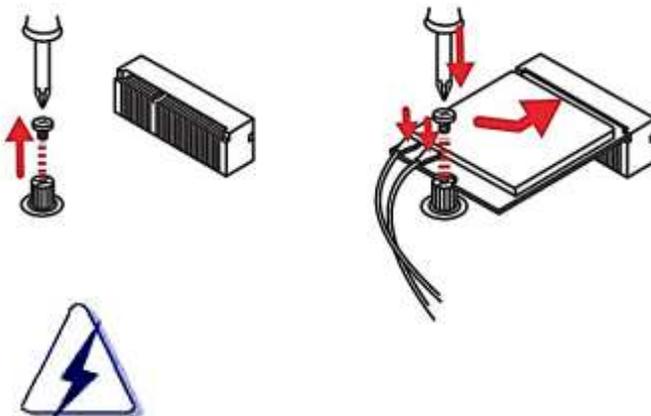
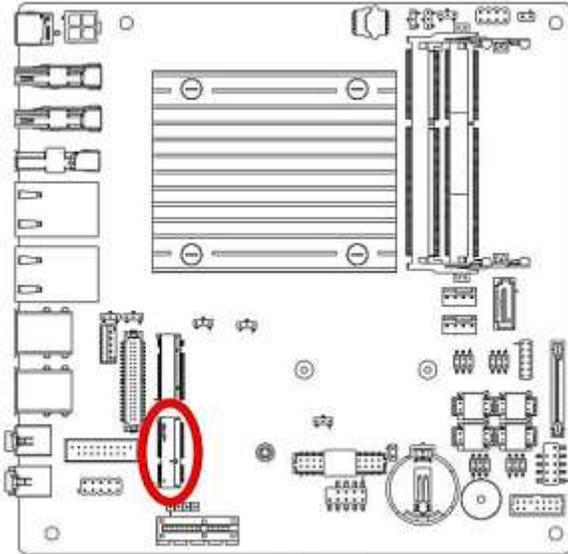
Please install the M.2 solid-state drive (SSD) into the M.2 slot as shown below.



1. When adding or removing expansion cards, make sure the system power is OFF.
2. When install a M.2 SSD, make sure to check with vendor if the M.2 SSD is compatible with PCIe x2
3. Intel® RST only supports PCIe M.2 SSD with UEFI ROM and does not support Legacy ROM.

1.11.5 M.2 Slot (Key E, 2230): M2_1

Please install the Wi-Fi/ Bluetooth card into the M.2 slot as shown below.



When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

Chapter 2: Starting Up the System

2.1 Starting Up Your System

1. After all connections are made, close your computer case cover.
2. Connect the power supply cord into the power supply located on the back of your system case according to your system user's manual.
3. Turn on your peripheral in following order:
 - a. Your monitor.
 - b. Other external peripheral (Printer, Scanner, External Modem etc...)
 - c. Your system power. For ATX power supplies, you need to turn on the power supply and press the ATX power switch on the front side of the case.
4. The power LED on the front panel of the system case will light. The LED on the monitor may light up or switch between orange and green after the system is on. If it complies with green standards or if it has a power standby feature. The system will then run power-on test. While the tests are running, the BIOS will alarm beeps or additional message will appear on the screen.

If you do not see anything within 30 seconds from the time you turn on the power. The system may have failed on power-on test. Recheck your jumper settings and connections or call your retailer for assistance.

5. During power-on, press key to enter BIOS setup. Follow the instructions in BIOS SETUP.
6. If you wish to boot from a different bootable device other than the default arrangement under the BIOS, you may press <F11> key during the system power-on (post); a menu with all detected bootable devices which are attached to the system will be displayed. Then you may select the desired first bootable device from this menu.
7. **Power off your computer:** You must first exit or shut down your operating system before switch off the power switch. For ATX power supply, you can press ATX power switching after exiting or shutting down your operating system. If you use Windows Operating Systems, click **“Start”** button, click **“Shut down”** and then click **“Shut down the computer”** The power supply should turn off after windows shut down.

Chapter 3: BIOS SETUP

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use. Users may need to run the BIOS Setup when:

1. An error message appears on the screen at system startup and requests users to run SETUP.
2. Users want to change the default settings for customized features.



Please note that BIOS update assumes technician-level experience. As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message appears on the screen, press or <F2> key to enter Setup.

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.



The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.

Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Option
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Reset
Esc	Exit

Getting Help

After entering the Setup menu, the first menu you will see is the Main Menu.

Main Menu

The main menu lists the setup functions you can make changes to. You can use the arrow keys (↑↓) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

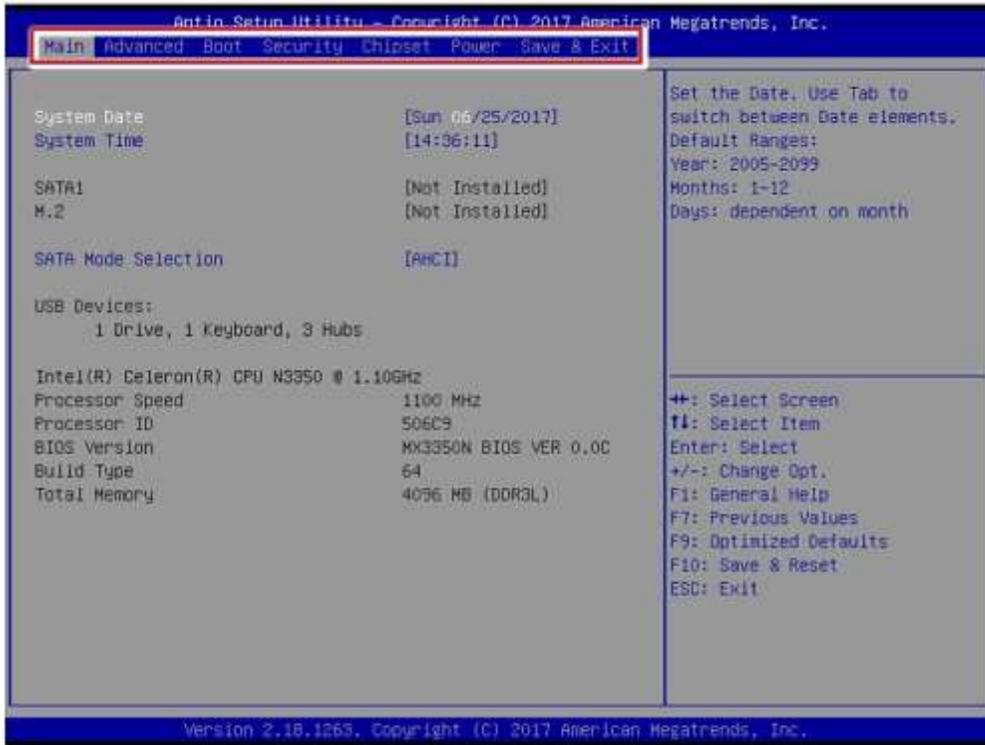
Sub-Menu

If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use arrow keys (↑↓) to highlight the field and press <Enter> to call up the sub-menu. Then you can use the control keys to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the <Esc >.

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing <F1>. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press <Esc> to exit the Help screen.

3.1 The Menu Bar



► Main

Use this menu for basic system configurations, such as time, date, etc.

► Advanced

Use this menu to set up the items of special enhanced features.

► Boot

Use this menu to specify the priority of boot devices.

► Security

Use this menu to set supervisor and user passwords.

► Chipset

This menu controls the advanced features of the onboard chipsets.

► Power

Use this menu to specify your settings for power management.

► Save & Exit

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes

3.2 Main



► System Date

This setting allows you to set the system date. The date format is <Day>, <Month> <Date> <Year>.

► System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

► SATA Mode Selection

This setting specifies the SATA controller mode.

3.3 Advanced



► Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

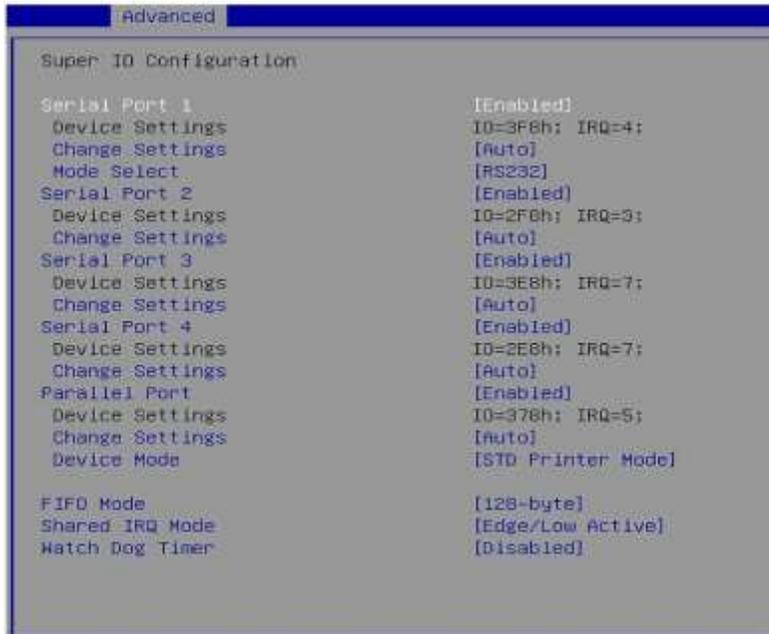
► Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

► Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

► Super IO Configuration



► Serial Port 1/ 2/ 3/ 4

This setting enables/disables the specified serial port.

► Change Settings

This setting is used to change the address & IRQ settings of the specified serial port.

► Mode Select

Select an operation mode for the Serial Port 1.

► Parallel Port

This setting enables/disables the parallel port.

► Change Settings

This setting is used to change the address & IRQ settings of the parallel port.

► Device Mode

Select an operation mode for the parallel port.

► FIFO Mode

This setting controls the FIFO data transfer mode.

► Shared IRQ Mode

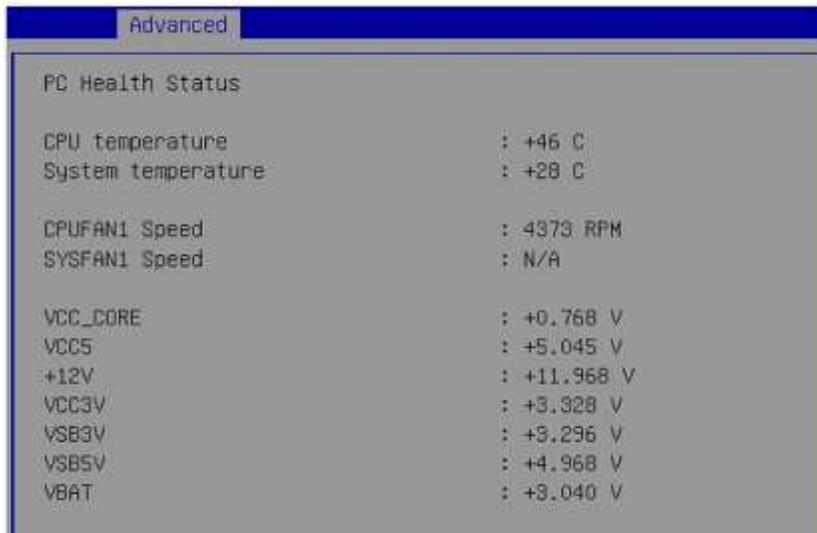
This setting provides the system with the ability to share interrupts among its serial ports.

► Watch Dog Timer

You can enable the system watch-dog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watch dog polls it.

► H/W Monitor

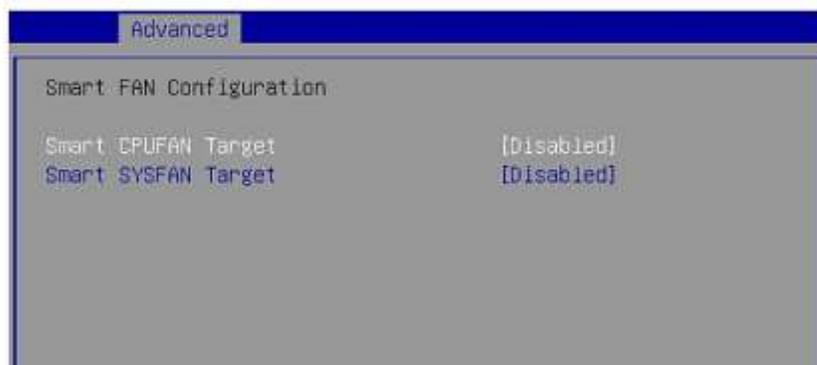
These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



The screenshot shows the 'Advanced' menu with the 'PC Health Status' section. It lists various hardware metrics and their current values.

Item	Value
CPU temperature	: +46 C
System temperature	: +28 C
CPUFAN1 Speed	: 4373 RPM
SYSFAN1 Speed	: N/A
VCC_CORE	: +0.768 V
VCC5	: +5.045 V
+12V	: +11.968 V
VCC3V	: +3.328 V
VSB3V	: +3.296 V
VSB5V	: +4.968 V
VBAT	: +3.040 V

► Smart Fan Configuration



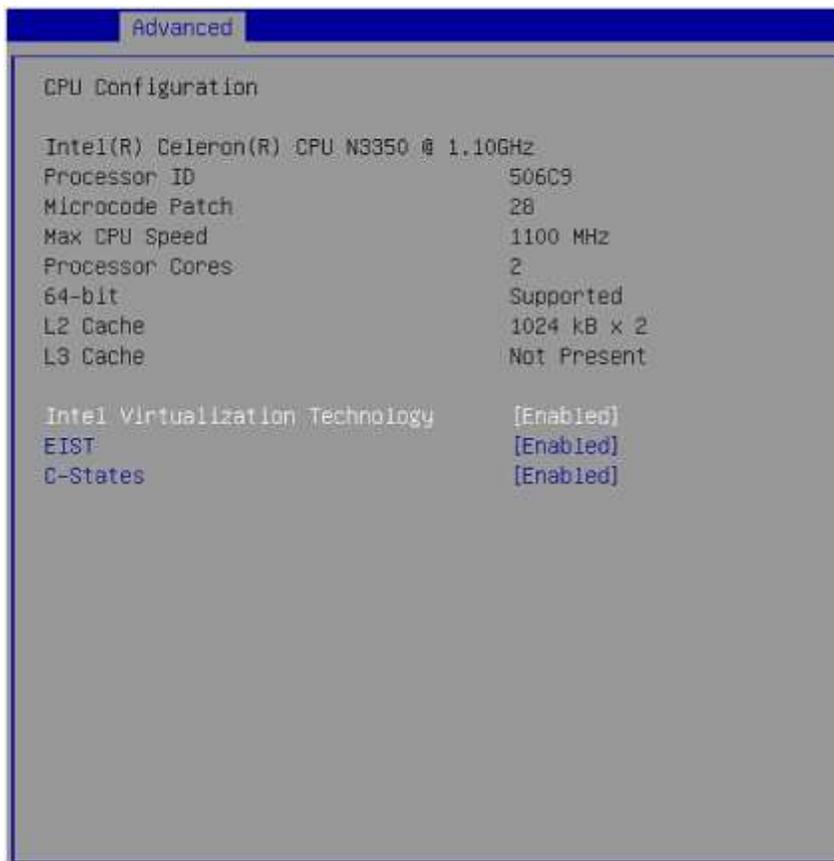
The screenshot shows the 'Advanced' menu with the 'Smart FAN Configuration' section. It lists the status of the Smart Fan function for the CPU and system fans.

Item	Value
Smart CPUFAN Target	[Disabled]
Smart SYSFAN Target	[Disabled]

► Smart CPUFAN Target, Smart SYSFAN Target

The setting enables/disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system.

► CPU Configuration



► Intel Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple "Virtual" systems.

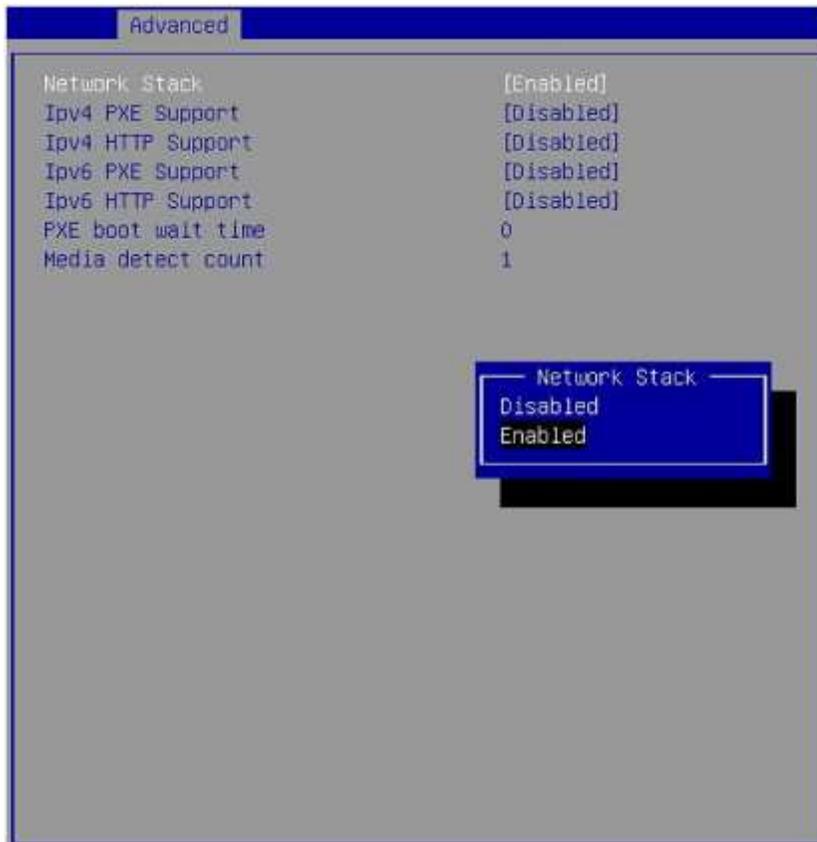
► EIST

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried.

► C-States

C-state performance indicates the ability to run the processor in lower power states when the PC is idle. This setting enables/disables the C-State Configuration for power saving purposes.

► Network Stack Configuration



► Network Stack

The setting enables/disables UEFI Network Stack.

► Ipv4 PXE Support, Ipv4 HTTP Support, Ipv6 PXE Support, Ipv6 HTTP Support

The setting enables/disables Ipv4 PXE Support, Ipv4 HTTP Support, Ipv6 PXE Support and Ipv6 HTTP Support.

► USB Configuration



► Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

► XHCI Hand-off

This setting allows you to enable or disable a workaround for operating systems without eXtensible Host Controller Interface (XHCI) hand-off support. The eXtensible Host Controller Interface (XHCI) is a computer interface specification that defines a register-level description of a Host Controller for Universal Serial bus (USB), which is capable of interfacing to USB 1.0, 2.0, and 3.0 compatible devices. The specification is also referred to as the USB3.0 Host Controller specification.

► USB Mass Storage Driver Support

This setting enables/disables the support for USB mass storage devices.

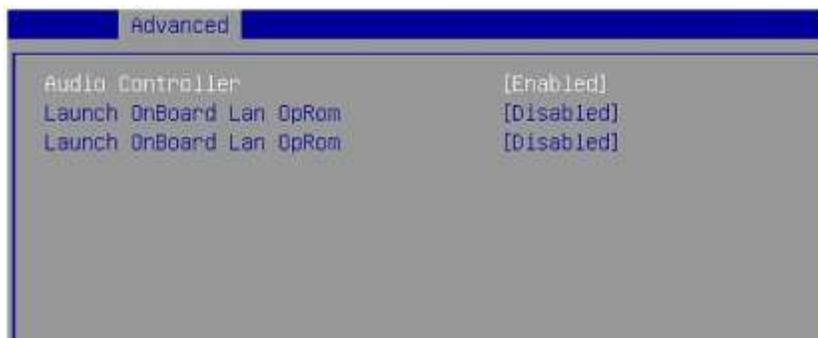
► USB Hardware Delays and Time-outs

These settings control the USB transfer time-out, device reset time-out and device power-up delay.

► Mass Storage Devices

This setting controls the mass storage devices.

► PCI/PCIE Device Configuration



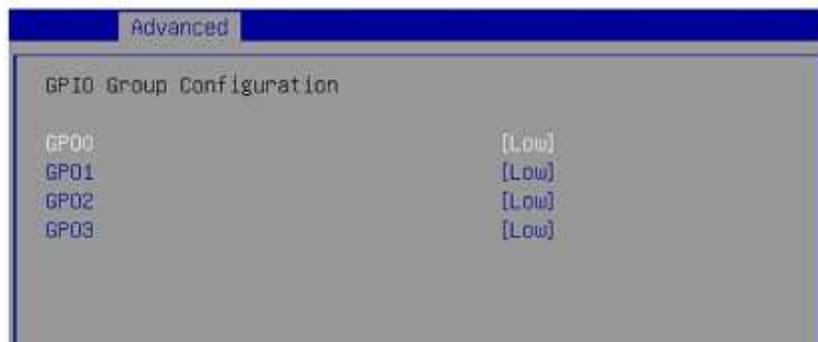
► Audio Controller

This setting enables/disables the onboard audio controller.

► Launch OnBoard LAN OpROM

These settings enable/disable the initialization of the onboard/onchip LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

► GPIO Group Configuration



► GPO0, GPO1, GPO2, GPO3

These settings control the operation mode of the specified GPIO.

3.4 Boot



► CSM Support

This setting enables/disables the support for Compatibility Support Module, a part of the Intel Platform Innovation Framework for EFI providing the capability to support legacy BIOS interfaces.

► OS Selection

This setting allows users to select the Operating System.

► Boot Option Priorities

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

► Hard Drive BBS Priorities

This setting allows users to set the priority of the specified devices. First press <Enter> to enter the sub-menu. Then you may use the arrow keys (↑↓) to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.

3.5 Security



▶ Administrator Password

Administrator Password controls access to the BIOS Setup utility.

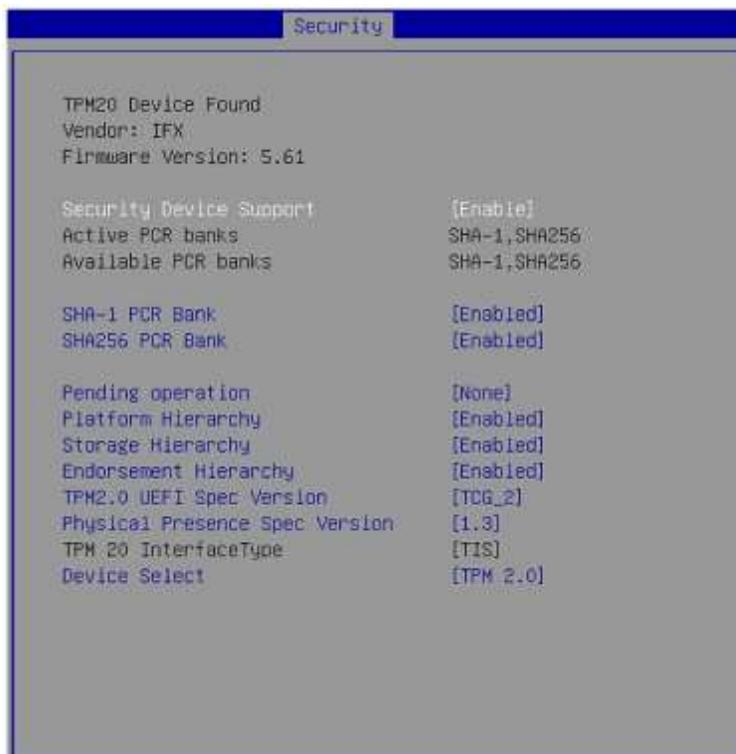
▶ User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

▶ Chassis Intrusion

The field enables or disables the feature of recording the chassis intrusion status and issuing a warning message if the chassis is once opened.

► Trusted Computing



► Security Device Support

This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

► SHA-1 PCR Bank, SHA256 PCR Bank

These settings enable/disable the SHA-1 PCR Bank and SHA256 PCR Bank.

► Pending Operation

This setting shows pending operation.

► Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy

These settings enable/disable the Platform Hierarchy, Storage Hierarchy and Endorsement Hierarchy.

► TPM2.0 UEFI Spec Version, Physical Presence Spec Version

This settings show the TPM2.0 UEFI Spec Version and Physical Presence Spec Version.

► TPM2.0 Interface Type

This setting shows the TPM2.0 Interface Type.

► Device Select

This setting allows users to select the security device.

► Serial Port Console Redirection



► Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

► Console Redirection Settings



► Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

► Bits per second, Data Bits, Parity, Stop Bits

This setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

► Flow Control

Flow control is the process of managing the rate of data transmission between two nodes. It is the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

► VT-UTF8 Combo Key Support

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

► Recorder Mode, Resolution 100x31

These settings enable/disable the recorder mode and the resolution 100x31.

► Legacy OS Redirection Resolution

This setting specifies the redirection resolution of legacy OS.

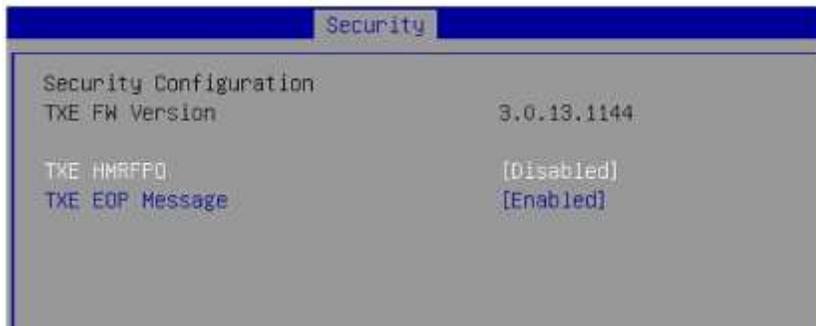
► Putty Keypad

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

► Redirection After BIOS POST

This setting determines whether or not to keep terminals' console redirection running after the BIOS POST has booted.

► Security Configuration



► TXE FW Version

The setting shows the firmware information of the Intel Trusted Execution Engine (TXE).

► TXE HMRFPD

The setting enables/disables TXE HMRFPD (Host ME Region Flash Protection Override).

► TXE EOP Message

This setting determines whether or not to send EOP (Exchange Online Protection) message before entering OS.

3.6 Chipset



► DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is "locked" for video use only and as such, is invisible and unable to be used by the operating system.

► DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

► LVDS

This setting enables/disables the LVDS support.

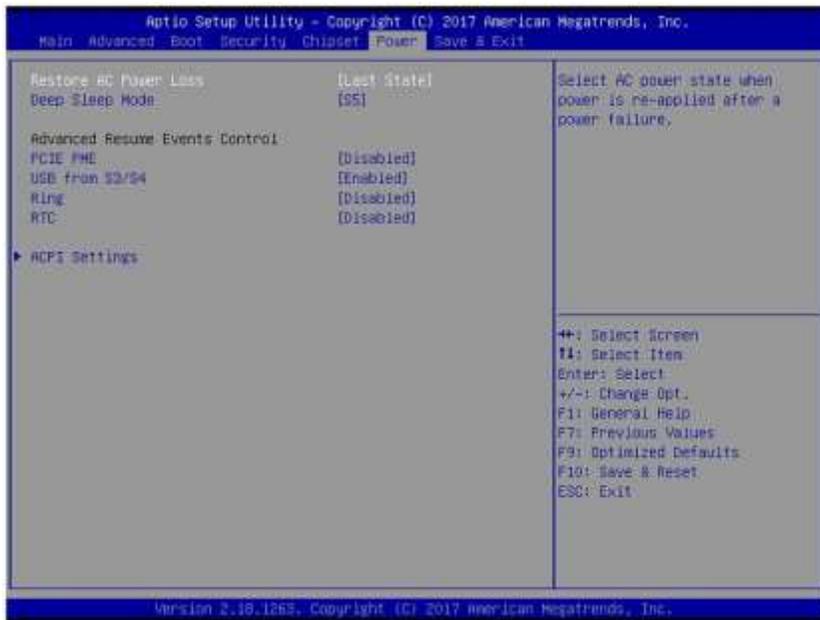
► LCD Panel Type

This setting specifies the LCD panel type.

► LVDS Backlight Control

This setting controls the intensity of the LVDS backlight.

3.7 Power



► Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

► Deep Sleep Mode

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can “wake” on input from the keyboard, clock, modem, LAN, or USB device.

**** Advanced Resume Events Control ****

▶ PCIE PME

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE PME is detected.

▶ USB from S3/S4

The item allows the activity of the USB device to wake up the system from S3/ S4 sleep state.

▶ Ring

An input signal on the serial Ring Indicator (RI) line (in other words, an incoming call on the modem) wakes the system from a soft off state.

▶ RTC

When [Enabled], you can set the date and time at which the RTC (real-time clock) alarm wakes the system from suspend mode.

▶ **ACPI Settings**



▶ Enable ACPI Auto Configuration

This setting activates the ACPI (Advanced Configuration and Power Management Interface) auto configuration.

▶ Enable Hibernation

This setting enables/disables system hibernation.

▶ ACPI Sleep State

This setting specifies the power saving modes for ACPI function.

▶ Lock Legacy Resources

When enabled (locked), this setting prevents the operating system from modifying assignments for legacy resources.

3.8 Save & Exit



► Save Changes and Reset

Save changes to CMOS and reset the system.

► Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

► Discard Changes

Abandon all changes.

► Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

► Save as User Defaults

Save changes as the user's default profile.

► Restore User Defaults

Restore the user's default profile.

► Launch EFI Shell from filesystem device

This setting helps to launch the EFI Shell application from one of the available file system devices.

Chapter 4: WDT&GPIO

4.1 WDT Sample Code

```
SIO_INDEX_Port    equ 04Eh
SIO_DATA_Port     equ 04Fh
SIO_UnLock_Value  equ 087h
SIO_Lock_Value    equ 0AAh
WatchDog_LDN      equ 007h
WDT_UNIT          equ 60h ;60h=second, 68h=minute, 40h=Disabled Watchdog timer
WDT_Timer         equ 30  ;ex. 30 seconds
```

Sample code:

```
;Enable config mode
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_UnLock_Value
    out    dx, al
    jmp    short $+2        ;lo_delay
    jmp    short $+2        ;lo_delay
    out    dx, al

;Change to WDT
    mov    dx, SIO_INDEX_Port
    mov    al, 07h
    out    dx, al
    mov    dx, SIO_DATA_Port
    mov    al, WatchDog_LDN
    out    dx, al

;Active WDT
    mov    dx, SIO_INDEX_Port
    mov    al, 30h
    out    dx, al
    mov    dx, SIO_DATA_Port
    in     al, dx
    or     al, 01h
    out    dx, al
```

```

;set timer
mov  dx, SIO_INDEX_Port
mov  al, 0F6h
out  dx, al
mov  dx, SIO_DATA_Port
mov  al, WDT_Timer
out  dx, al
;set UINT
mov  dx, SIO_INDEX_Port
mov  al, 0F5h
out  dx, al
mov  dx, SIO_DATA_Port
mov  al, WDT_UNIT
out  dx, al
;enable reset
mov  dx, SIO_INDEX_Port
mov  al, 0FAh
out  dx, al
mov  dx, SIO_DATA_Port
in   al, dx
or   al, 01h
out  dx, al
;close config mode
mov  dx, SIO_INDEX_Port
mov  al, SIO_Lock_Value
out  dx, al

```

4.2 GPIO Sample Code

GPI 0 ~ GPI 3

	GPI 0	GPI 1	GPI 2	GPI 3
IO Address				
SIO GPIO Register	92h	92h	92h	92h
Bit	0	1	2	3
Sample code	#1	#1	#1	#1

GPO 0 ~ GPO 3

	GPO 0	GPO 1	GPO 2	GPO 3
IO Address				
SIO GPIO Register	A2h	A2h	A2h	A2h
Bit	3	4	5	6
Sample code	#2	#2	#2	#2

```

SIO_INDEX_Port    equ    04Eh
SIO_DATA_Port     equ    04Fh
SIO_UnLock_Value  equ    087h
SIO_Lock_Value    equ    0AAh
SIO_LDN_GPIO      equ    06h
SIO_GPO_Data      equ    0A1h
SIO_GPO_Status    equ    0A2h
SIO_GPI_Status    equ    092h
GPI_0             equ    0000001b
GPO_0             equ    00010000b
GPO_2             equ    01000000b

```

Sample Code:

#1 : Get GPI 0 status

; Enable config mode

mov dx, SIO_INDEX_Port

mov al, SIO_UnLock_Value

out dx, al

jmp short \$+2 ;lo_delay

jmp short \$+2 ;lo_delay

out dx, al

A-3

; Switch GPIO Configuration for SIO LDN 0x06

mov dx, SIO_INDEX_Port

mov al, 07h

out dx, al

mov dx, SIO_DATA_Port

mov al, SIO_LDN_GPIO

out dx, al

; Get GPI 0 Pin Status Register

mov dx, SIO_INDEX_Port

mov al, SIO_GPI_Status

out dx, al

mov dx, SIO_DATA_Port

in al, dx ;al bit0 = GPI 0 status

; Exit SIO

mov al, SIO_CONFIG_MODE_EXIT_VALUE

out dx, al

#2 : Set GPO 0/GPO 2 to high status

; Enable config mode

mov dx, SIO_INDEX_Port

mov al, SIO_UnLock_Value

out dx, al

```
jmp short $+2 ;lo_delay
jmp short $+2 ;lo_delay
out dx, al
; Switch GPIO Configuration for SIO LDN 0x06
mov dx, SIO_INDEX_Port
mov al, 07h
out dx, al
mov dx, SIO_DATA_Port
mov al, SIO_LDN_GPIO
out dx, al
; Set GPO 0 to high
mov dx, SIO_INDEX_Port
mov al, SIO_GPO_Data
out dx, al
mov dx, SIO_DATA_Port
in al, dx
and al, not GPO_0
or al, GPO_0
out dx, al
; Set GPO 2 to high
mov dx, SIO_INDEX_Port
mov al, SIO_GPO_Data
out dx, al
mov dx, SIO_DATA_Port
in al, dx
and al, not GPO_2
or al, GPO_2
out dx, al
; Exit SIO
mov al, SIO_CONFIG_MODE_EXIT_VALUE
out dx, al
```

4.3 AD5258 Backlight Control Sample Code

```
#define DEFAULT_AD5258_ADDR 0x18

void InitAD5258 (
    IN SETUP_DATA          *SetupData
)
{
    IoWrite32(0xCF8, 0x80000000 | (0x0 << 16) | (0x1F << 11) | (0x4 << 8) | (0x20 & 0xfc)); // Bus 0,
    Device 0x1F, Function 4, offset 0x20 : SMBus Controller IO_Bar
    SmbusBase = IoRead16(0xCFC | (UINT8)(0x20 & 2)) & 0xFFE0;

    IoWrite8(SmbusBase+0x0, 0xFF); // Clear status
    IoWrite8(SmbusBase+0x5, SetupData.AD5258BackLightControl); // Brightness new value.
    IoWrite8(SmbusBase+0x3, 0x00); // Byte 00
    IoWrite8(SmbusBase+0x4, (DEFAULT_AD5258_ADDR<<1)); // Slave Address

    Delay_Loop();
    // Delay Loop, waiting for SMBus ready.
}
```

USB 3.0 cable

Cable

This specification defines only the form, fit, and functions of the cable assembly. Thus, the specific cable construction is up to each connector and cable assembly manufacturer. The following cable requirements and/or guidelines apply: % The maximum cable assembly length shall not exceed 457.2 mm (18"). For most small form factor systems, a 12" is recommended. % To ensure the cable flexibility, the cable shall be able to be bent to a radius less than 25.4 mm (1.0"). % The raw cable impedance should be managed to be within 90+/-7 ohms.