



# **AL053**

## **Embedded SBC 2.5"**

### **User's Manual**

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## Trademarks

Product names or trademarks appearing in this manual are for identification purpose only and are the properties of the respective owners.

## FCC and DOC Statement on Class B

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 when the equipment is operated 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 following measures:

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

### Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

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## Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

## Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



### Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

## Safety Measures

To avoid damage to the system:

- Use the correct AC input voltage range.

To reduce the risk of electric shock:

- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

## About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- One AL053 board
- One Heat spreader (Height: 11mm)

## Optional Items

- USB port cable (Length: 200mm)
- COM port cable (Length: 300mm)
- Power adapter (60W, 12V, DC Jack)
- 2-pole terminal to DC Jack cable
- Audio cable (Length: 160mm)
- Heat sink for E series CPU 0 to 60°C/wide temp (Height: 22.6mm)
- Heat sink for N series CPU 0 to 60°C (Height: 19mm)

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance to the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

## Before Using the System Board

Before using the system board, prepare basic system components.

If you are installing the system board in a new system, you will need at least the following internal components.

- Storage devices such as hard disk drive, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

## Chapter 1 - Introduction

### Specifications

<b>SYSTEM</b>	Processor	Intel Atom® Processor E3900 Series, BGA 1296 Intel Atom® x7-E3950 Processor, Quad Core, 2M Cache, 1.6GHz (2.0GHz), 12W Intel Atom® x5-E3940 Processor, Quad Core, 2M Cache, 1.6GHz (1.8GHz), 9.5W Intel Atom® x5-E3930 Processor, Dual Core, 2M Cache, 1.3GHz (1.8GHz), 6.5W Intel® Pentium® Processor N4200, Quad Core, 2M Cache, 1.1GHz (2.5GHz), 6W Intel® Celeron® Processor N3350, Dual Core, 2M Cache, 1.1GHz (2.4GHz), 6W
	Memory	One 204-pin SODIMM up to 8GB Single Channel DDR3L 1866MHz
	BIOS	Insyde SPI 128Mbit (supports UEFI boot only)
<b>GRAPHICS</b>	Controller	Intel® HD Graphics
	Feature	OpenGL 4.2, Direct X 11.1, OpenCL 1.2, OGL ES 3.0 HW Decode: H.264, MPEG2, VC1, VP8, H.265, MPEG4 HW Encode: H.264, MPEG2, MPEG4
	Display	1 x Mini DP++ 1 x LVDS Mini DP++: resolution up to 4096x2160 @ 60Hz LVDS: dual channel 18/24-bit, resolution up to 1920x1200 @ 60Hz
	Dual Displays	LVDS + Mini DP++
<b>EXPANSION</b>	Interface	1 x Full-size Mini PCIe (PCIe/USB 2.0, optional USB 3.1 Gen1/USB 2.0)
<b>STORAGE</b>	Storage	1 x M.2 B key 2242 (PCIe/USB 2.0/SATA 3.0)
<b>AUDIO</b>	Audio Codec	Realtek ALC262-VC2-GR
<b>ETHERNET</b>	Controller	1 x Intel® I210AT PCIe (10/100/1000Mbps) 1 x Intel® I210IT PCIe (10/100/1000Mbps) (available upon request)
<b>REAR I/O</b>	Ethernet	1 x GbE (RJ-45)
	USB	2 x USB 3.1 Gen1
	Display	1 x Mini DP++
<b>INTERNAL I/O</b>	Serial	1 x RS-232/422/485 (1.27mm pitch)
	USB	2 x USB 2.0 (1.27mm pitch)
	Display	1 x LVDS LCD Panel Connector 1 x LCD/Inverter Power
	Audio	1 x Audio (Line-out/Mic-in)
	DIO	1 x 8-bit DIO
	SMBus	1 x SMBus
<b>WATCHDOG TIMER</b>	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
<b>SECURITY</b>	TPM	ftPM2.0

<b>POWER</b>	Type	9~36V DC
	Connector	2-pin Terminal Block
	Consumption	Typical: E3950:12V @ 0.35A (4.20Watt) Max.: E3950:12V @ 1.90A (22.8Watt)
	RTC Battery	CR2032 Coin Cell
<b>OS SUPPORT (UEFI ONLY)</b>	Microsoft/Linux	Windows 10 IoT Enterprise (64-bit) Ubuntu 16.04
<b>ENVIRONMENT</b>	Temperature	Operating: 0 to 60°C, -20 to 70°C, -40 to 85°C Storage: -40 to 85°C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
	MTBF	715,458 hrs @ 25°C; 482,964 hrs @ 45°C; 335,469 hrs @ 60°C
<b>MECHANICAL</b>	Dimensions	2.5" Pico-ITX Form Factor 100mm (3.94") x 72mm (2.83")
	Height	PCB: 1.6mm Top Side: 15mm, Bottom Side: 8mm
<b>CERTIFICATIONS</b>		CE, FCC, RoHS

## Features

- **Watchdog Timer**

The Watchdog Timer function allows your application to regularly “clear” the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

- **DDR3L**

DDR3L requires less voltage (1.35V) than DDR3 (1.5V). DDR3L SDRAM modules support 1866MHz for DDR modules.

- **Graphics**

The integrated Intel® HD graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications. Supports 1 x Mini DP++ and 1 x LVDS interfaces for dual display outputs.

- **Serial ATA**

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s.

- **Gigabit LAN**

One Intel® I210AT PCI Express Gigabit Ethernet controller or one Intel® I210IT (opt.) PCI Express Gigabit Ethernet controller supports up to 1Gbps data transmission.

- **Audio**

The Realtek ALC262-VC2-GR audio codec provides 4-channel DAC and 6-channel ADC High Definition audio output.

- **Power Failure Recovery**

When power returns after an AC power failure, you may choose to either power-on the system manually or let the system power-on automatically.

- **USB**

The system board supports the USB 3.1 Gen1. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.1 Gen1 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

- **Wake-On-LAN**

This feature allows the network to remotely wake up a Soft Power Down (Soft-Off) PC. It is supported via the onboard LAN port or via a PCI LAN card that uses the PCI PME (Power Management Event) signal. However, if your system is in the Suspend mode, you can power-on the system only through an IRQ or DMA interrupt.

- **Wake-On-USB**

This function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

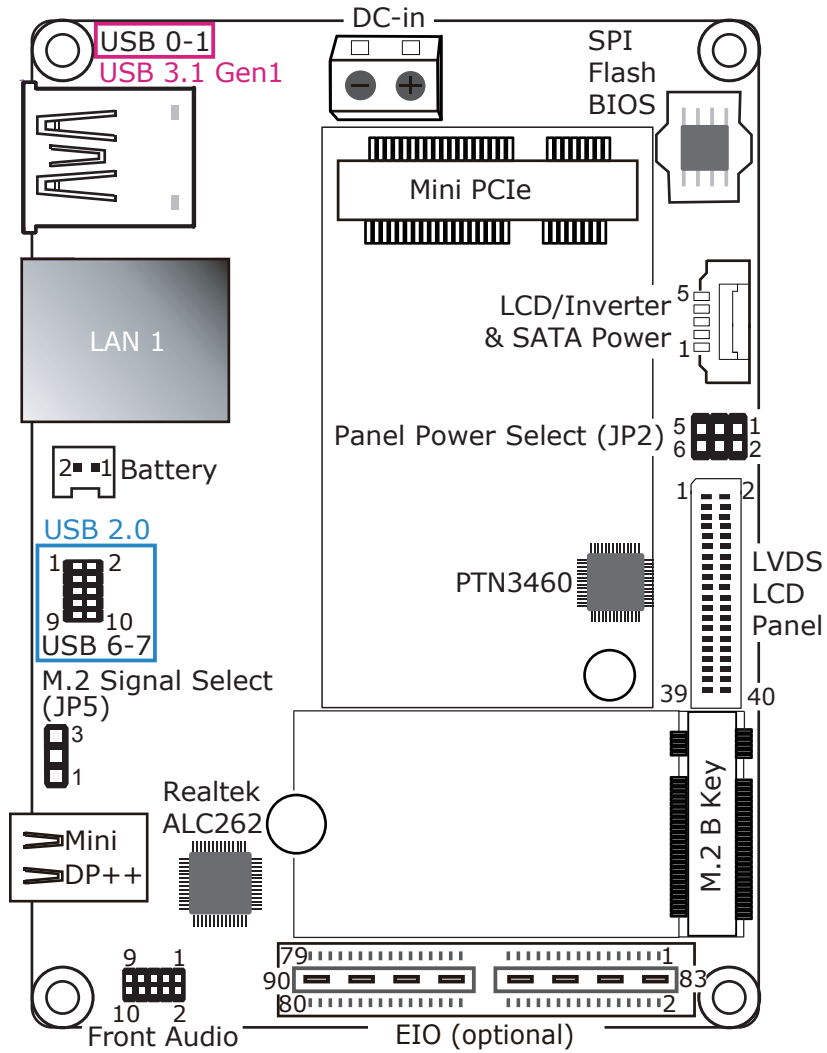
- **ACPI STR**

The system board is designed to meet the ACPI (Advanced Configuration and Power Interface) specification. ACPI has energy saving features that enable PCs to implement power management and plug-and-play with operating systems that support power management features.

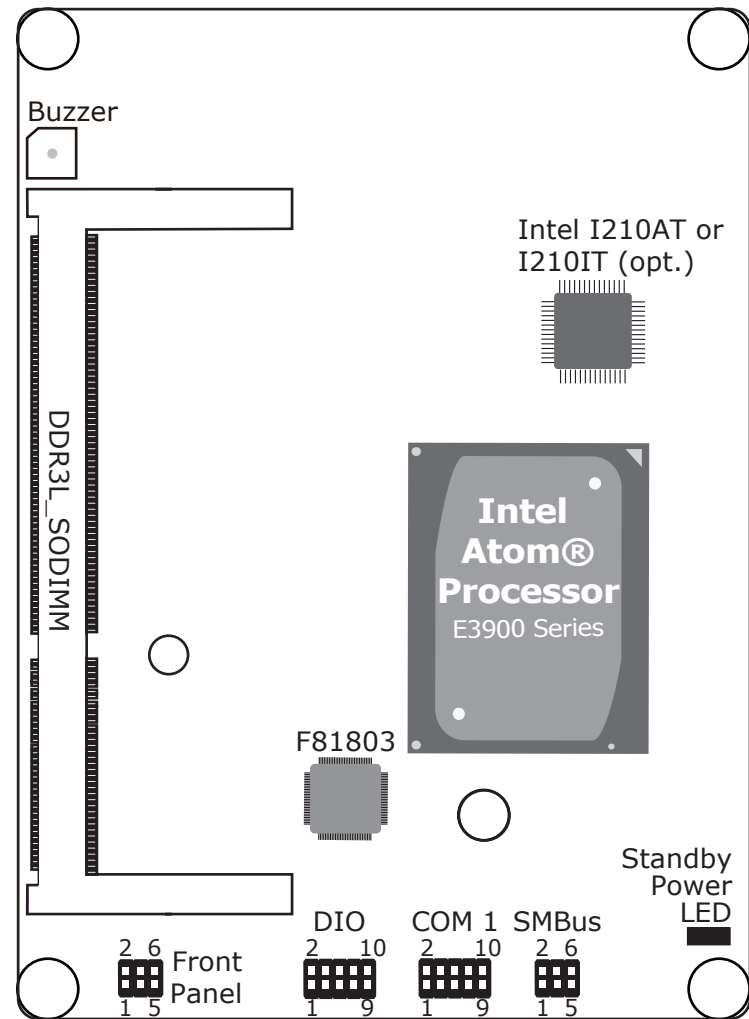
With ACPI, the system can further utilize the Ethernet adapter's wake-on-LAN (WOL) capability that enables remote wake-up if the Ethernet adapter supports such feature.

## Chapter 2 - Hardware Installation

### Board Layout



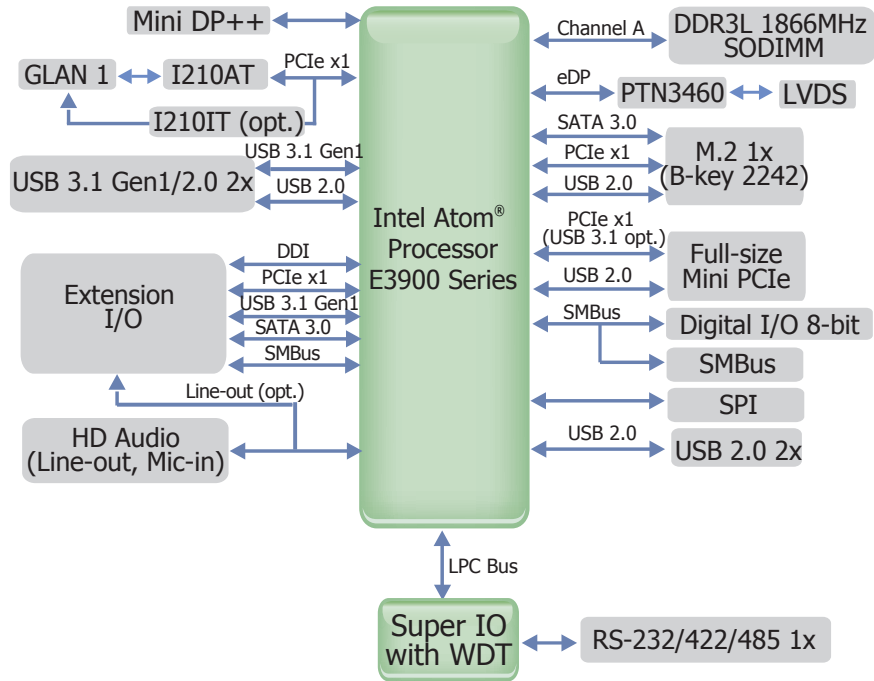
Top View



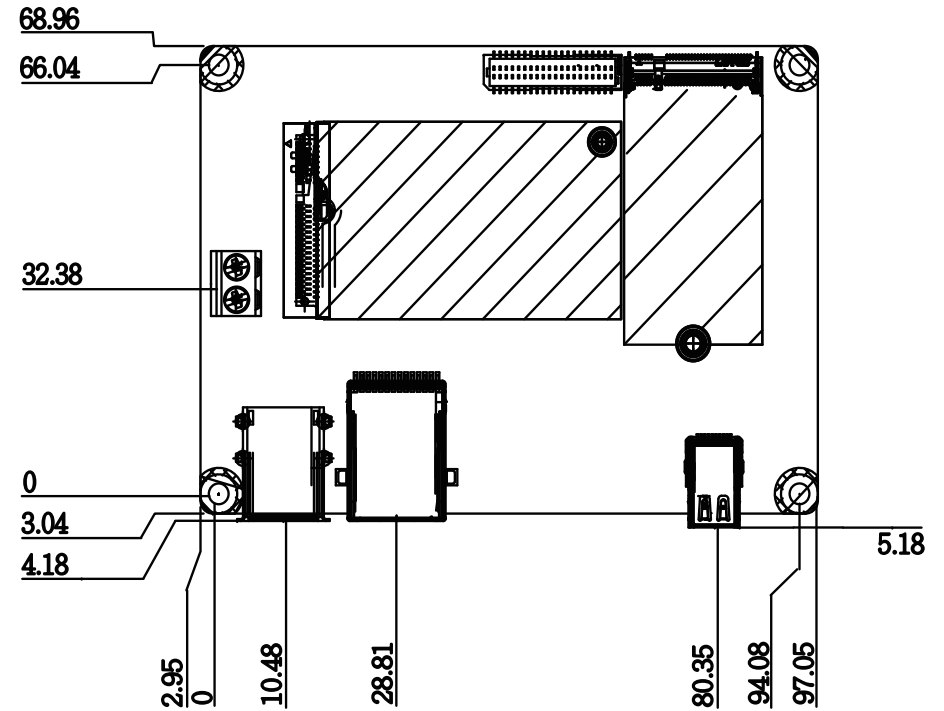
Bottom View



Block Diagram



Mechanical Drawing



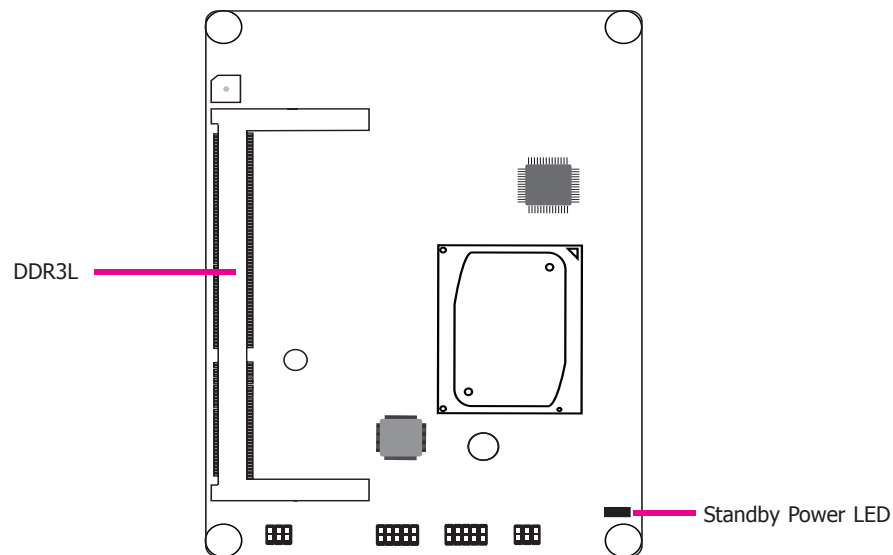
**Important:**

Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

## System Memory

**Important:**

When the Standby Power LED lights red, it indicates that there is power on the system board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.



### Features

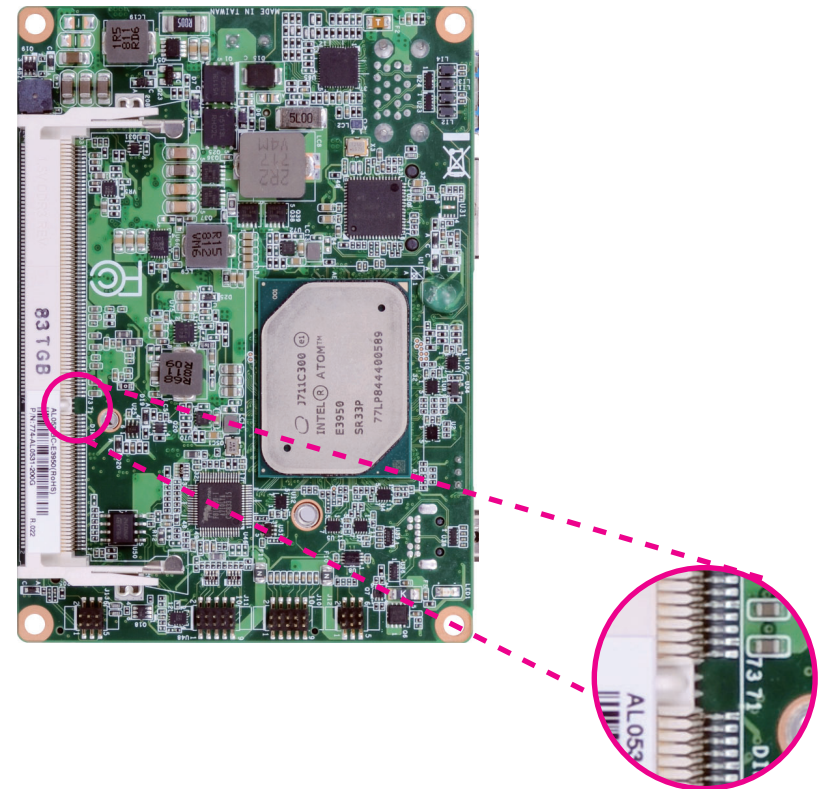
- One 204-pin SODIMM up to 8GB
- Single Channel DDR3L 1866MHz

## Installing the SODIMM Module

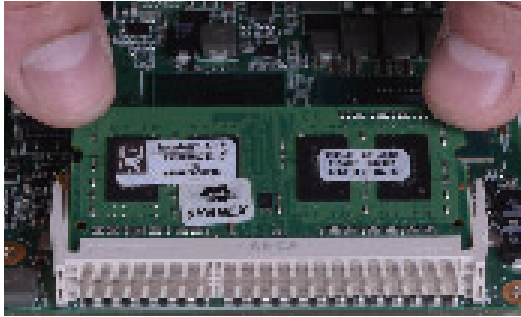
**Note:**

The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the SODIMM socket on the system board.
4. Note the key on the socket. The key ensures the module can be plugged into the socket in only one direction.



- Grasping the module by its edges, align the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.

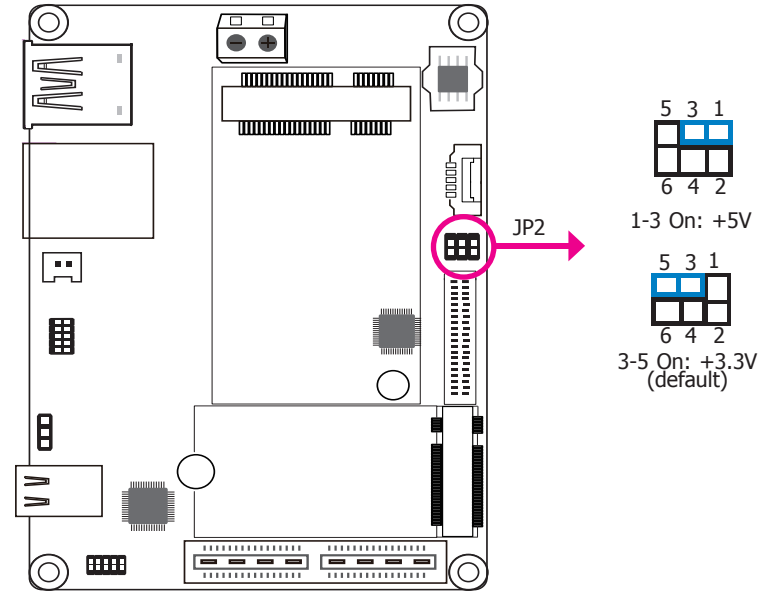


- Push down the module until the clips at each end of the socket lock into position. You will hear a distinctive "click", indicating the module is correctly locked into position.



## Jumper Settings

### Panel Power Select



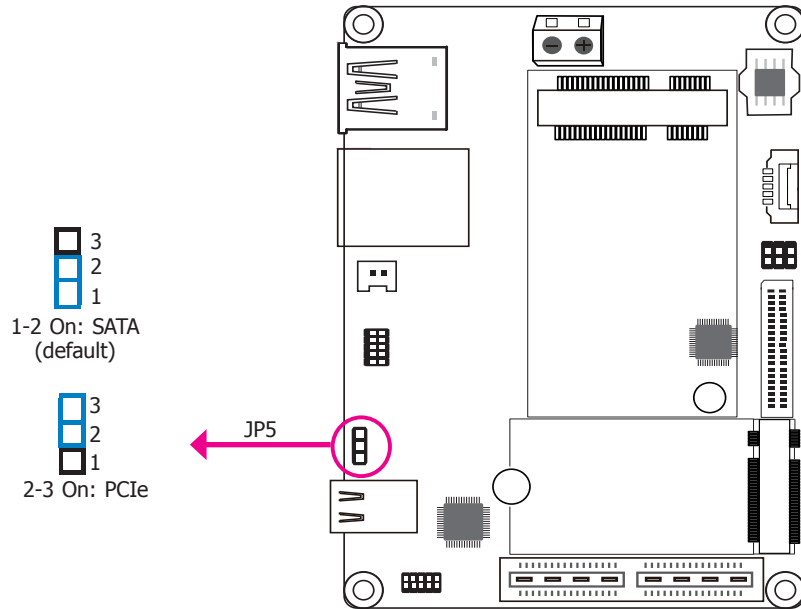
JP2 is used to select the power supplied with the LCD panel.



**Important:**

Before powering-on the system, make sure that the power settings of JP2 match the LCD panel's specification. Selecting the incorrect voltage will seriously damage the LCD panel.

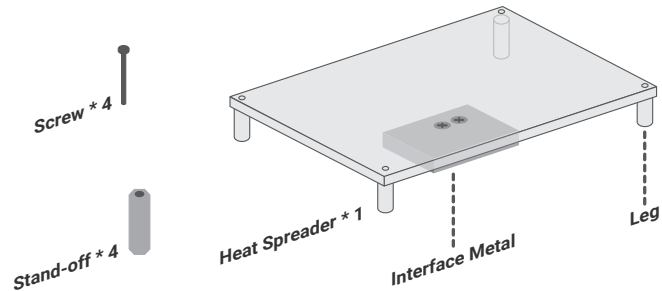
### M.2 Signal Select



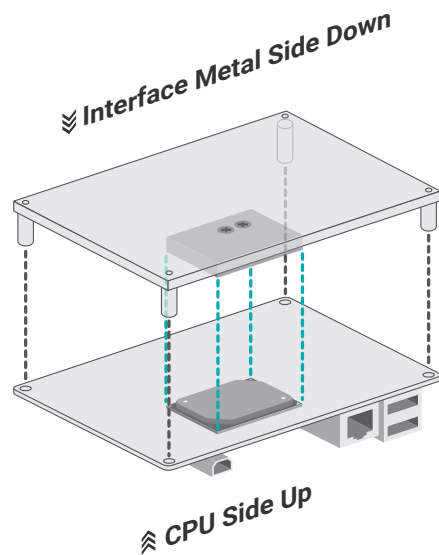
JP5 is used to select the M.2 signal: SATA (default) or PCIe.

## Heat Spreader Assembly

A heat spreader may be included in your standard package. The heat spreader and components required for mounting are illustrated below.



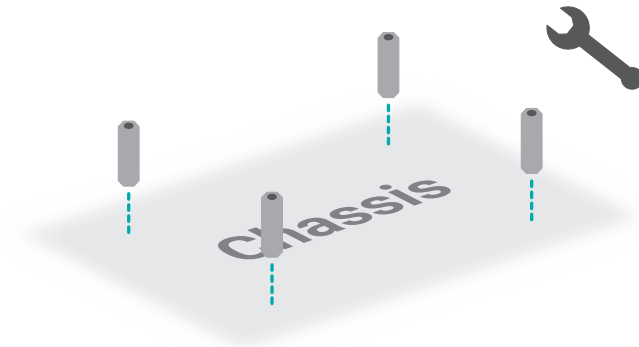
The heat spreader is designed to be mounted onto the module as illustrated below. Please make sure the contacting sides of the heat spreader and the module are correct — the CPU side of the module shall be facing the interface metal side with legs of the heat spreader. Rotate the module horizontally so the interface metal would sit right on top of the CPU.



Please follow the steps to mount the module and heat spreader combo onto your chassis.

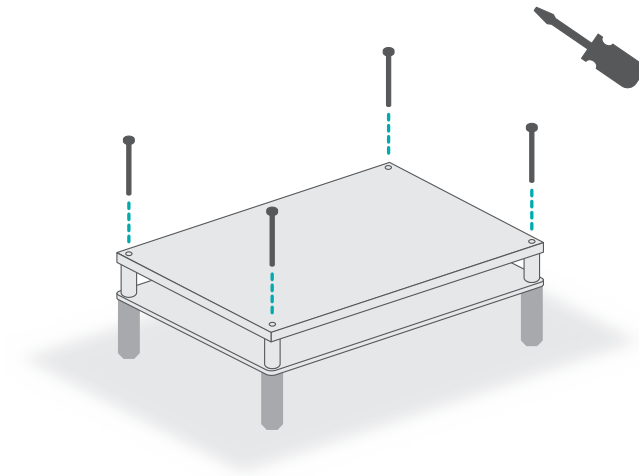
### Step 1:

Locate the mounting holes or screws on your chassis reserved for mounting the stand-offs. The chassis is typically customized, in which case additional screws that conform to the chassis design may be required to secure the stand-offs onto the chassis. Use a wrench to fasten the stand-offs onto the chassis.



### Step 2:

Rotate the module and heat spreader combo so that the I/O is facing the desired side, and place the combo onto the stand-offs. Please make sure the screw holes of the combo align to those of the stand-offs. Place the screws that come with the standard package into the screw holes, and use a screw driver to fasten the screws until the combo is securely fixed onto the chassis.

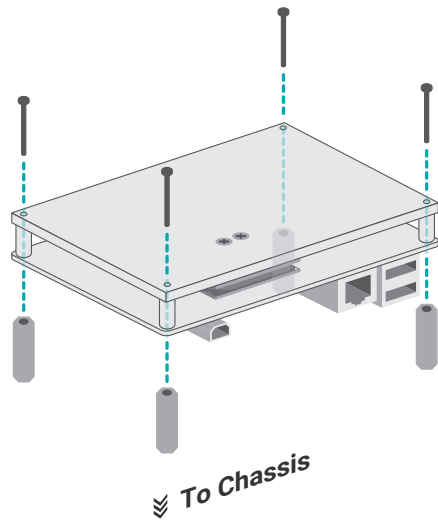


**Note:**

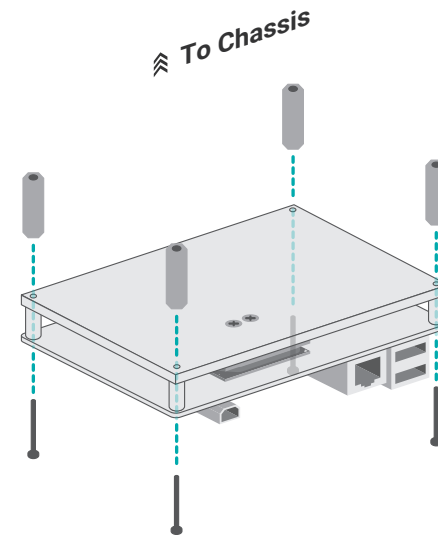
The chassis may come with customized or pre-installed stand-offs and screws. The illustrations here are for reference only.

The combo can be mounted onto the chassis in two manners — 1) module side to the chassis, or 2) heat spreader side to the chassis as illustrated below. This shall depend entirely on the design of the chassis with regard to interior spacing, thermal, and I/O.

1) Module side to the chassis



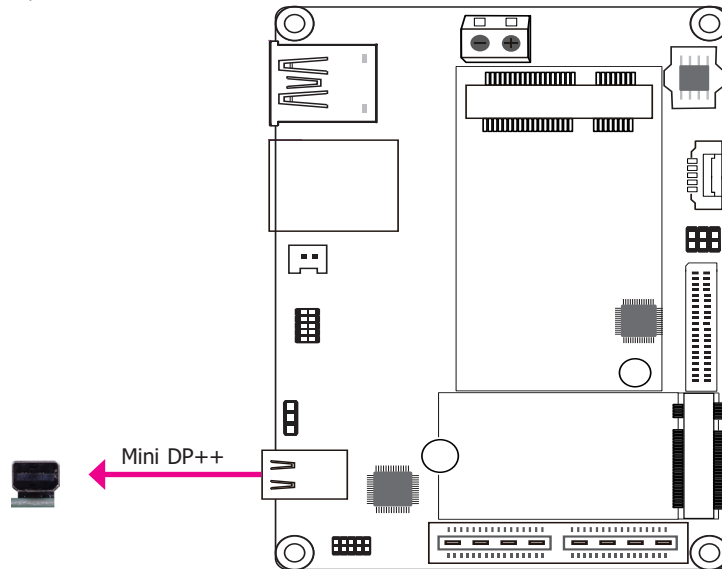
2) Heat spreader side to the chassis



## Graphics Interface

The display port consists of the following:

- 1 Mini DP++ port



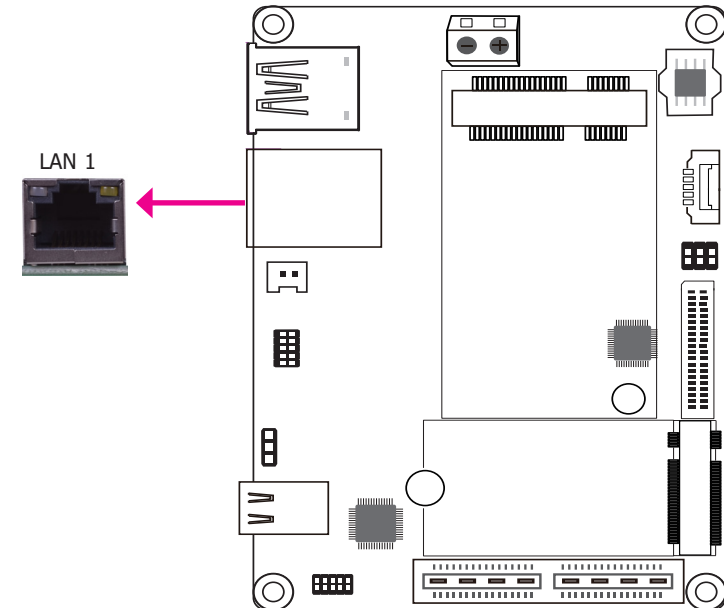
### Mini DP++ Port

The Mini DP++ port is a digital display interface used to connect a display device such as a computer monitor. It is used to transmit audio and video simultaneously. The interface, which is developed by VESA, delivers higher performance features than any other digital interfaces.

### Driver Installation

Install the graphics driver. Refer to Chapter 4 for more information.

## RJ45 LAN Port



### Features

- 1 Intel® I210AT PCI Express Gigabit Ethernet controller or 1 optional Intel® I210IT PCI Ex-press Gigabit Ethernet controller

The LAN port enables the system board to connect to a local area network by means of a network hub.

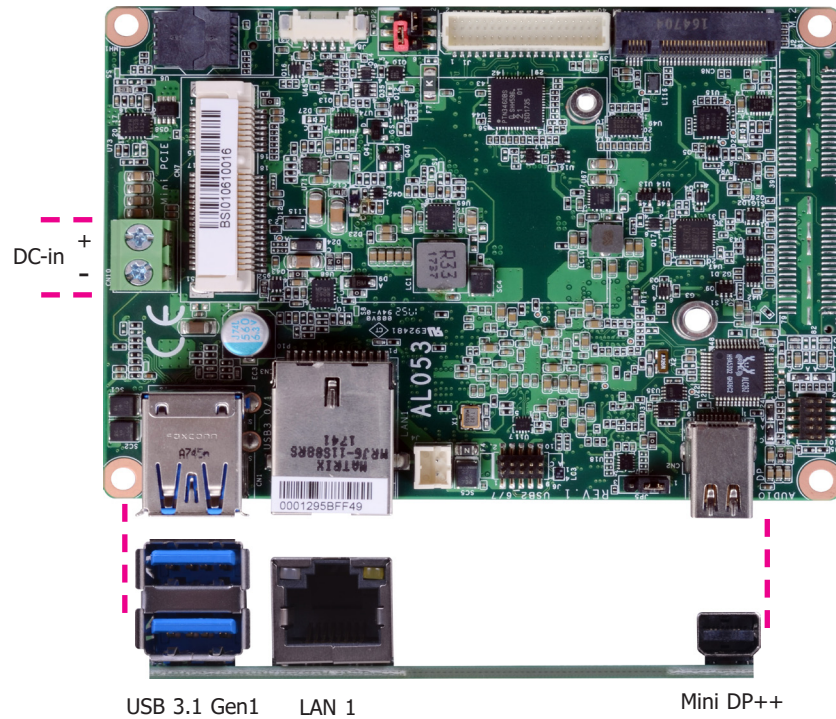
### BIOS Setting

Configure the onboard LAN in the "ACPI Configuration" submenu of the Advanced menu in the BIOS. Refer to Chapter 3 for more information.

### Driver Installation

Install the LAN drivers. Refer to Chapter 4 for more information.

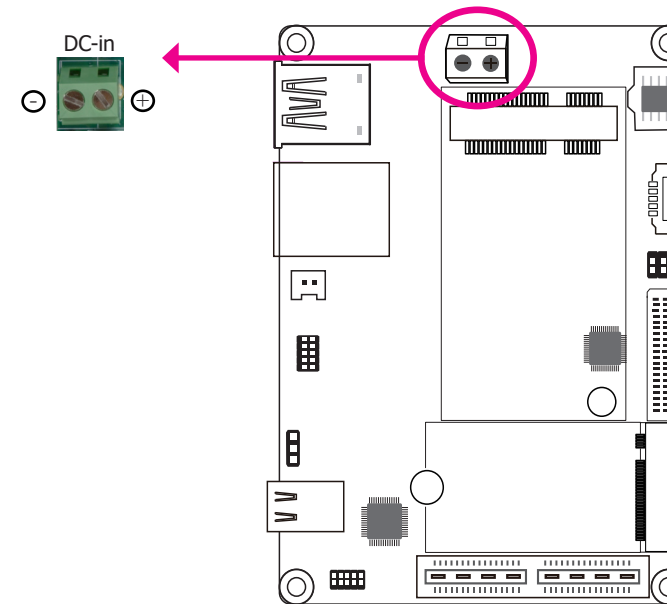
## Rear Panel I/O Ports



The rear panel I/O consists of the following ports:

- 1 9~36V DC-in 2-pin terminal block
- 2 USB 3.1 Gen1 ports
- 1 GbE (RJ-45)
- 1 Mini DP++ port

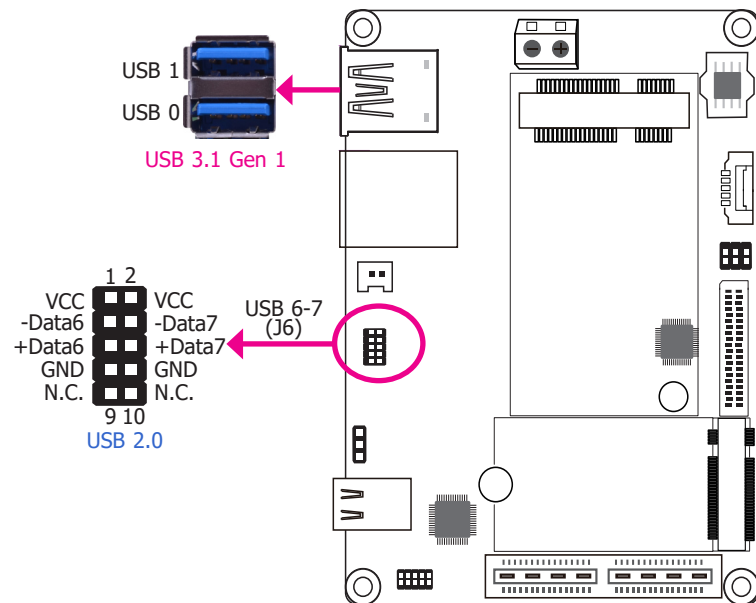
## 9~36V DC-in



This 2-pin terminal block is considered a low power solution. Connect a DC power cord to this terminal block. Using a voltage more than the recommended range may fail to boot the system or cause damage to the system board.



## USB Ports



The USB device allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

The system board is equipped with 2 onboard USB 3.1 Gen1 ports (USB 0-1). The 10-pin connector allows you to connect 2 additional USB 2.0 ports (USB 6-7). The additional USB ports may be mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis and then insert the USB port cables to a connector.

### BIOS Settings

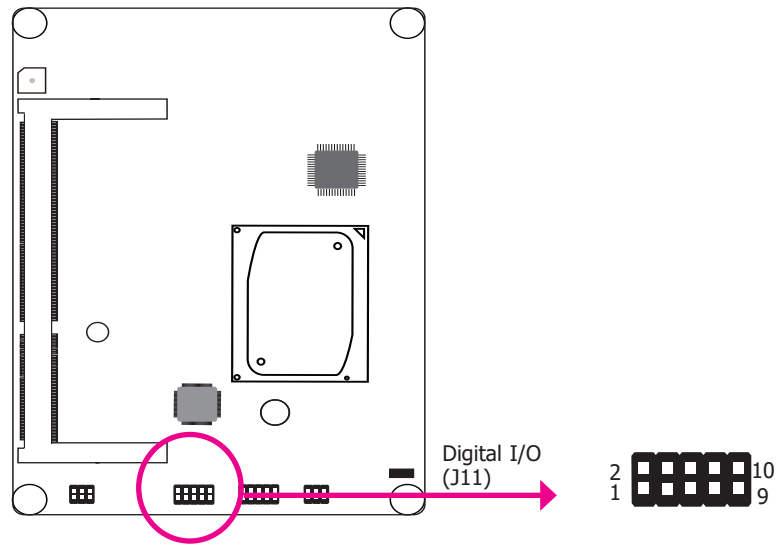
Configure the onboard USB in the "USB Boot" field of the Boot menu in the BIOS. Refer to Chapter 3 for more information.

### Wake-On-USB Keyboard/Mouse

The Wake-On-USB Keyboard/Mouse function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

## I/O Connectors

### Digital I/O Connector

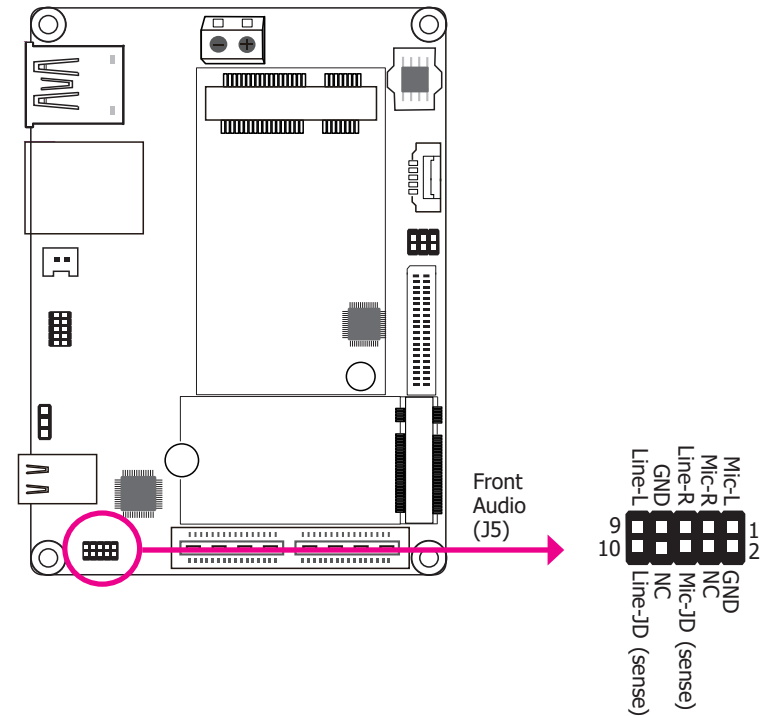


The Digital I/O connector supports 8-bit digital input/output signals to provide the ability of monitoring and controlling the states of the connected external devices.

#### Digital I/O Connector

Pin	Pin Name
1	DIO7
2	DIO6
3	DIO5
4	DIO4
5	DIO3
6	DIO2
7	DIO1
8	DIO0
9	5V
10	GND

### Front Audio Connector



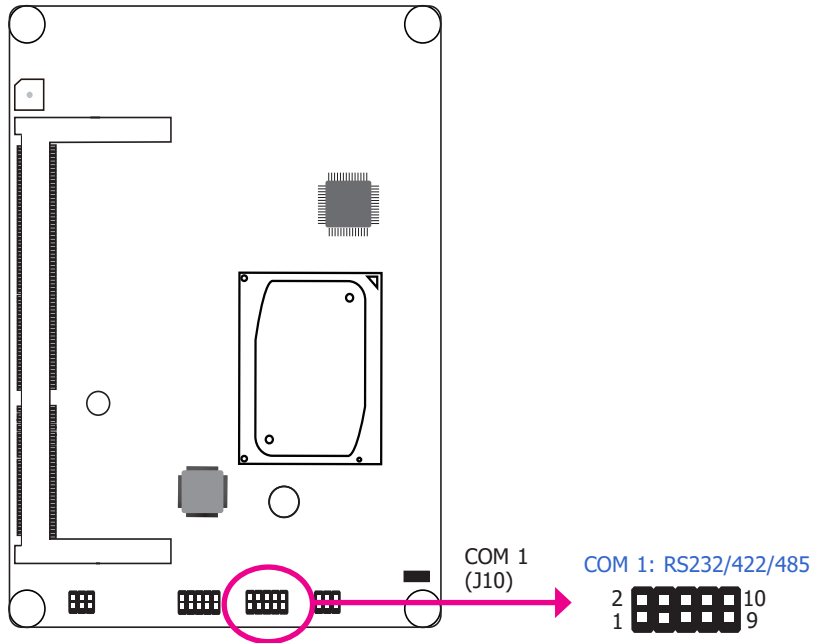
#### Front Audio

The front audio connector allows you to connect to line-out and mic-in jacks that are at the front panel of your system.

#### Driver Installation

Install the audio driver. Refer to Chapter 4 for more information.

## COM (Serial) Port



COM 1 can be selected among RS232, RS422 and RS485 via BIOS setting.

The serial port is asynchronous communication ports with 16C550A-compatible UARTs that can be used with modems, serial printers, remote display terminals, and other serial devices.

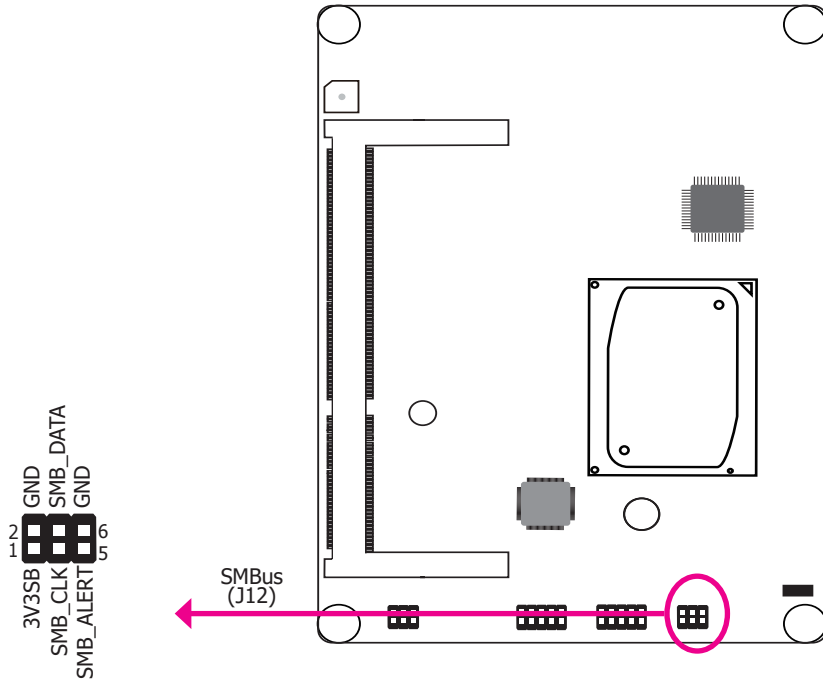
### BIOS Setting

Configure the serial port in the "SIO FINTEK81803" submenu of the Advanced menu in the BIOS. Refer to Chapter 3 for more information.

## COM 1

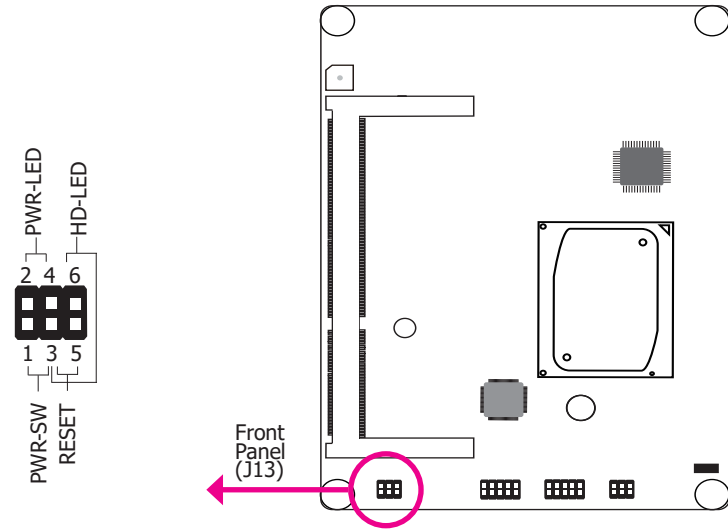
Pin	RS232	RS422 Full Duplex	RS485
1	DCD-	TX-	DATA-
2	RD	TX+	DATA+
3	TD	RX+	N.C.
4	DTR-	RX-	N.C.
5	GND	GND	GND
6	DSR-	N.C.	N.C.
7	RTS-	N.C.	N.C.
8	CTS-	N.C.	N.C.
9	RI-	N.C.	N.C.
10	GND	GND	GND

### SMBus Connector



The System Management Bus (SMBus) connector is used to connect SMBus devices. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

### Front Panel Connector



#### PWR-LED - Power/Standby LED

When the system's power is on, this LED will light. When the system is in the S1 (POS - Power On Suspend) state, it will blink every second. When the system is in the S3 (STR - Suspend To RAM) state, it will blink every 4 seconds.

#### HD-LED - Hard Drive LED

This LED will light when the hard drive is being accessed.

#### PWR-SW - Power Switch

This switch is used to power on or off the system.

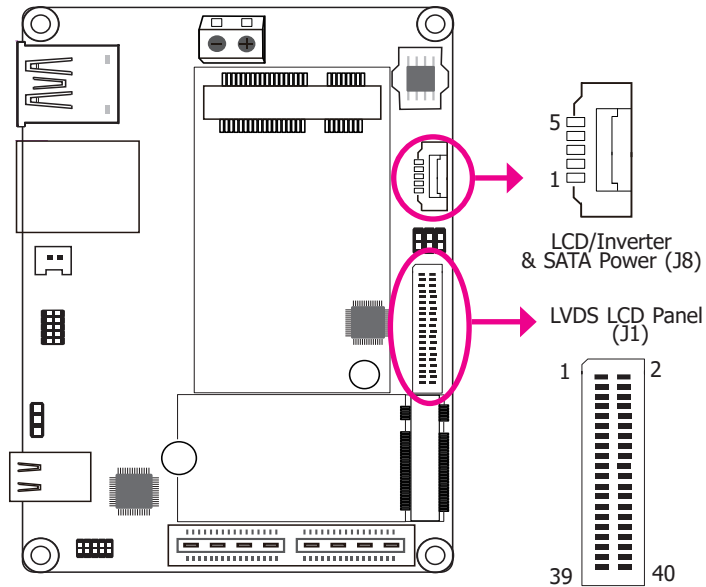
#### RESET - Reset Switch

This switch allows you to reboot without having to power off the system.

	Pin	Pin Name		Pin	Pin Name
PWR-LED	2	LED Power	PWR-SW	1	Signal
	4	Signal		3	GND
HD-LED	3	GND	RESET	3	GND
	6	Signal		5	RST signal

## LVDS LCD Panel Connector

## LCD/Inverter & SATA Power Connector



The system board allows you to connect a LCD Display Panel by means of the LVDS LCD panel connector and the LCD/Inverter power connector. These connectors transmit video signals and power from the system board to the LCD Display Panel.

Refer to the right side for the pin functions of these connectors.

### BIOS Setting

Configure the LCD panel in the "Video Configuration" submenu of the Advanced menu in the BIOS. Refer to Chapter 3 for more information.

## LVDS LCD Panel Connector

Pin	Function	Pin	Function
1	GND	2	GND
3	LVDS_Out3+ (Odd_3+)	4	LVDS_Out7+ (Even_3+)
5	LVDS_Out3- (Odd_3-)	6	LVDS_Out7- (Even_3-)
7	GND	8	GND
9	LVDS_Out2+ (Odd_2+)	10	LVDS_Out6+ (Even_2+)
11	LVDS_Out2- (Odd_2-)	12	LVDS_Out6- (Even_2-)
13	GND	14	GND
15	LVDS_Out1+ (Odd_1+)	16	LVDS_Out5+ (Even_1+)
17	LVDS_Out1- (Odd_1-)	18	LVDS_Out5- (Even_1-)
19	GND	20	GND
21	LVDS_Out0+ (Odd_0+)	22	LVDS_Out4+ (Even_0+)
23	LVDS_Out0- (Odd_0-)	24	LVDS_Out4- (Even_0-)
25	GND	26	GND
27	LVDS_CLK1+ (Odd_CLK+)	28	LVDS_CLK2+ (Even_CLK+)
29	LVDS_CLK1- (Odd_CLK-)	30	LVDS_CLK2- (Even_CLK-)
31	GND	32	GND
33	DDC_CLK	34	N.C.
35	DDC_DATA	36	+3.3V
37	Panel Power	38	Panel Power
39	Panel Power	40	Panel Power

## LCD/Inverter & SATA Power Connector

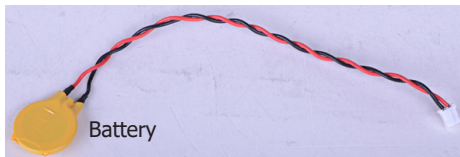
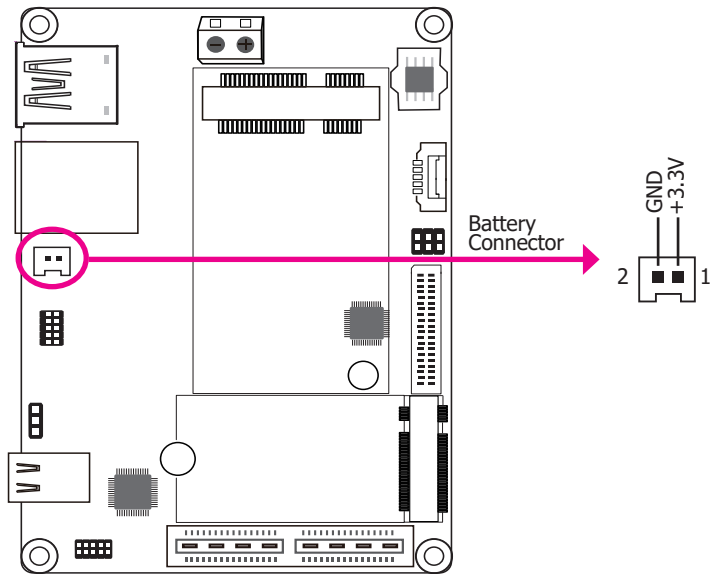
Pin	Pin Name
1	+12V
2	GND
3	Panel Backlight On/Off Control
4	Dimming Control
5	+5V



### Note:

- |   |   |
|---|---|
| 1. DFI board's LVDS LCD panel connector:<br>Manufacturer: V-STAR<br>Part No.: W100V40TP2<br>Description: 2*20pin, 1.0mm, BOX header | 2. DFI board's LCD/Inverter & SATA power connector:<br>Manufacturer: E-call<br>Part No.: 0110-3221050<br>Description: 1*5pin, 1.25mm, Wafer |
|---|---|

### Battery



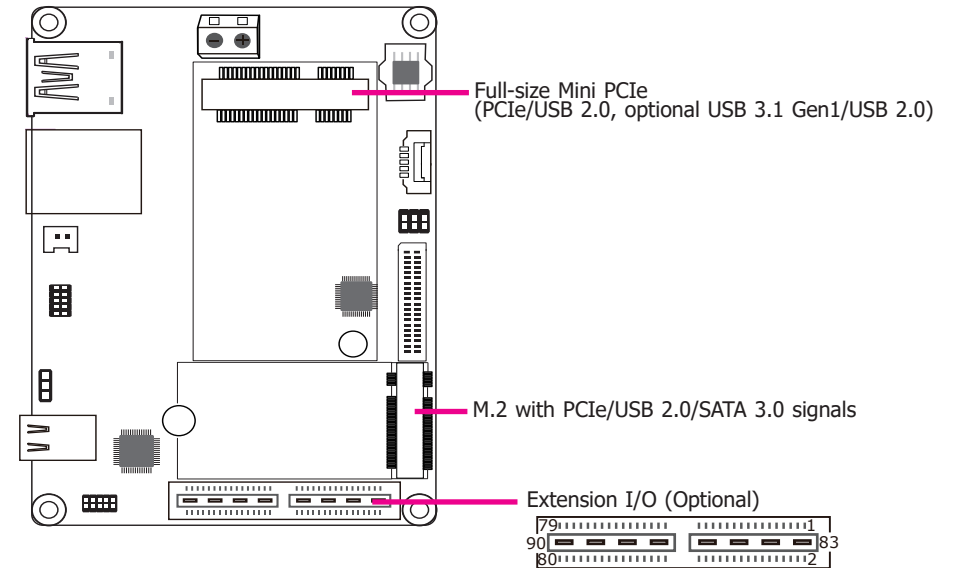
Connect to the battery connector

The lithium ion battery powers the real-time clock and CMOS memory. It is an auxiliary source of power when the main power is shut off.

#### Safety Measures

- Danger of explosion if battery incorrectly replaced.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to local ordinance.

### Expansion Slots



#### Mini PCI Express Slot

The full-size Mini PCIe socket supports PCIe (USB 3.1 Gen1 opt.) and USB 2.0 signals and is used to install a Mini PCIe card.

#### M.2 B Key 2242 Socket

The M.2 B key 2242 socket is the Next Generation Form Factor (NGFF) which is designed to support multiple modules and make the M.2 more suitable in application for solid-state storage.

#### Extension I/O Connector (Optional)

The Extension I/O connector supports a multitude of signals such as PCIe, DDI, USB, LPC, and SMBus. It can expand the system's internal I/O connectivity. Please refer to the following table for pin assignment.

## E I/O Connector

Pin	Pin Name	Pin	Pin Name
1	PCIE_RX0+	2	PCIE_TX0+
3	PCIE_RX0-	4	PCIE_TX0-
5	GND	6	GND
7	PCIE_RX1+	8	PCIE_TX1+
9	PCIE_RX1-	10	PCIE_TX1-
11	GND	12	GND
13	PCIE_CLK+	14	NC
15	PCIE_CLK-	16	NC
17	GND	18	GND
19	USB_SSRX0+	20	NC
21	USB_SSRX0-	22	NC
23	GND	24	GND
25	USB_SSTX0+	26	NC
27	USB_SSTX0-	28	NC
29	GND	30	NC
31	SATA0_RX+	32	NC
33	SATA0_RX-	34	GND
35	GND	36	PCIE_WAKE#
37	SATA0_TX+	38	NC
39	SATA0_TX-	40	NC
41	GND	42	SMB_STB_CK
43	DDIO_CTRLCLK_AUX+	44	SMB_STB_DAT
45	DDIO_CTRLCLK_AUX-	46	GND
47	GND	48	CLK33M
49	DDIO_PAIR0+	50	LPC_AD0

51	DDIO_PAIR0-	52	LPC_AD1
53	GND	54	LPC_AD2
55	DDIO_PAIR1+	56	LPC_AD3
57	DDIO_PAIR1-	58	LPC_SERIRQ
59	GND	60	LPC_FRAME#
61	DDIO_PAIR2+	62	DDIO_HPD
63	DDIO_PAIR2-	64	DDIO_AUX_Detect
65	GND	66	GND
67	DDIO_PAIR3+	68	GPIO_STB (INT)
69	DDIO_PAIR3-	70	PLT_RESET#
71	GND	72	NC
73	3V3SB_1	74	NC
75	3V3SB_2	76	PS_ON
77	AUD_GND	78	LINE_JD
79	LINE1_L	80	LINE1_R
83	GND	84	GND
85	GND	86	GND
87	5VSB	88	5VSB
89	5VSB	90	5VSB

**Note:**

DFI board's E I/O connector:

Manufacturer: Samtec

Part No.: QSE-040-01-L-D-A-K-TR

Description: Board-to-board connector, 2\*40 pin, 0.8mm (pitch), 3.25mm (height), SMD type, 180 degree

## Chapter 3 - BIOS Setup

### Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.

It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.


**Note:**

The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

### Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

### Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.

The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

### Legends

Keys	Function
Right and Left arrows	Moves the highlight left or right to select a menu.
Up and Down arrows	Moves the highlight up or down between submenu or fields.
<Esc>	Exit to the BIOS Setup Utility.
<F5>	Scrolls forward through the values or options of the highlighted field.
<F6>	Scrolls backward through the values or options of the highlighted field.
<F1>	Displays general help
<F9>	Optimized defaults
<F10>	Saves and resets the setup program.
<Enter>	Press <Enter> to enter the highlighted submenu.

### Scroll Bar

When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

### Submenu

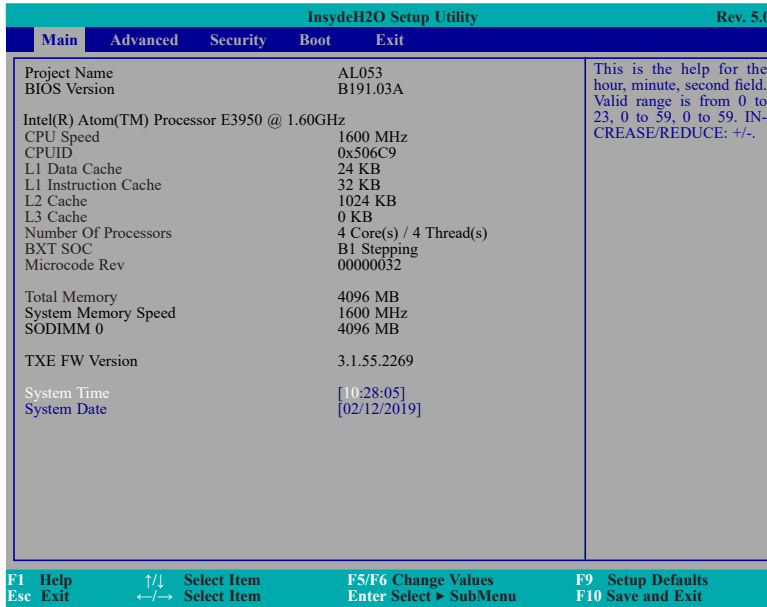
When "►" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.



## Insyde BIOS Setup Utility

### Main

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



### System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

### System Date

The date format is <month>, <date>, <year>. Month displays the month, from 01 to 12. Date displays the date, from 01 to 31. Year displays the year, from 2000 to 2099.

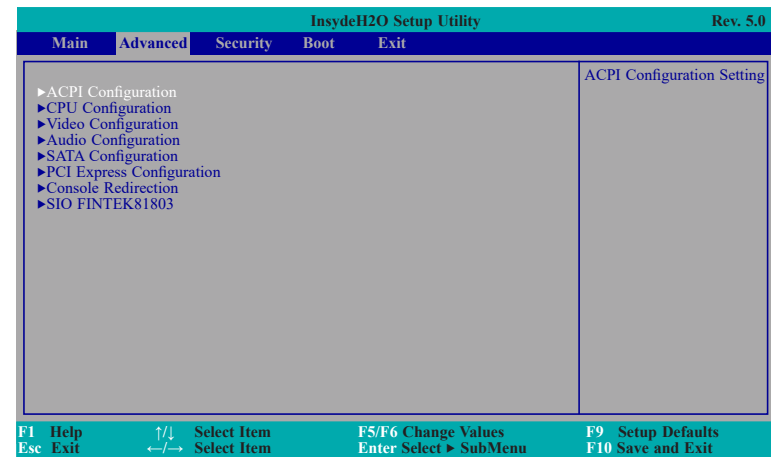
### Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.



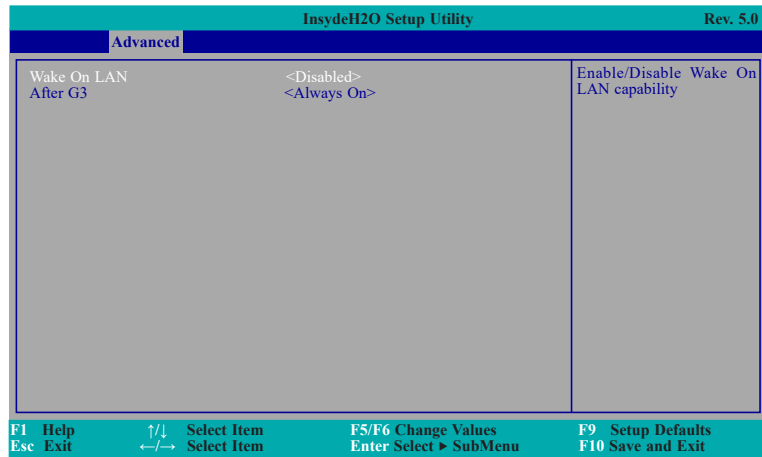
#### Important:

Setting incorrect field values may cause the system to malfunction.



## ACPI Configuration

This section configures the system ACPI parameters.



### Wake On LAN

This field is used to enable or disable the LAN signal to wake up the system.

### After G3

This field is to specify what state the system should be in when power is re-applied after a power failure (G3, the mechanical-off, state).

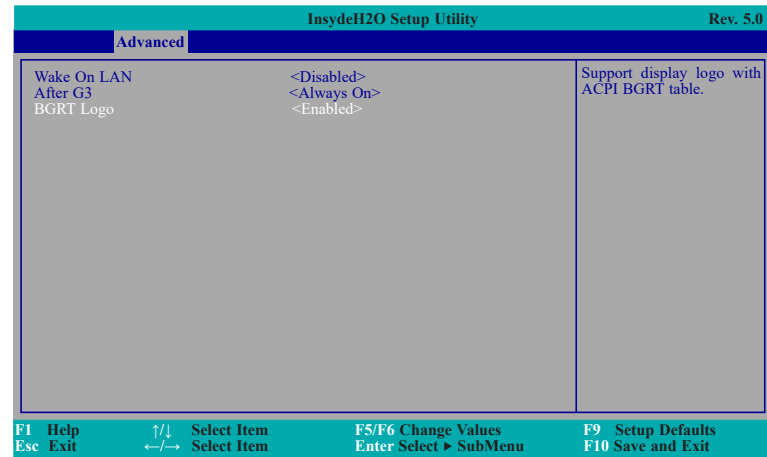
**Always On** The system working state.

**Always Off** Off, except for trickle current to devices such as the power button.



### Note:

If "Quiet Boot" of Boot menu is set to enabled, "BGRT Logo" will appear for configuration. Refer to the Boot menu in this chapter for more information.

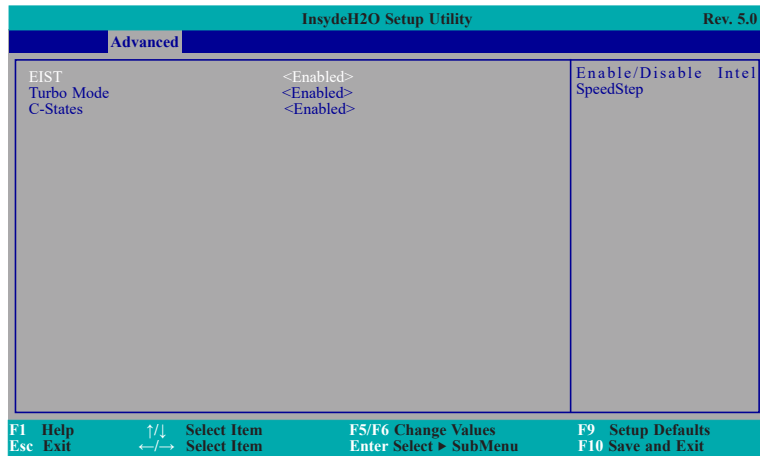


### BGRT Logo

This field is used to enable or disable to support display logo with ACPI BGRT table.

## CPU Configuration

This section is used to configure the CPU.



### EIST

This field is used to enable or disable the Enhanced Intel SpeedStep® Technology, which helps optimize the balance between system's power consumption and performance. After it is enabled in the BIOS, you can enable the EIST feature using the operating system's power management.

### Turbo Mode

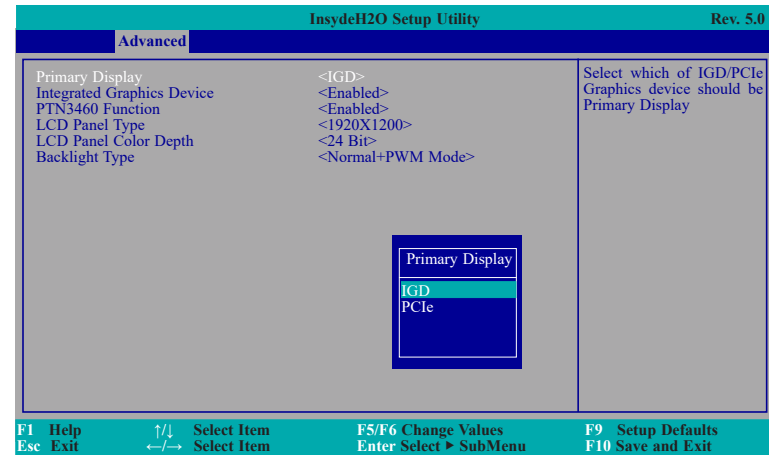
This field is used to enable or disable processor turbo mode (requires that EIST is enabled too), which allows the processor core to automatically run faster than the base frequency when the processor's power, temperature, and specification are within the limits of TDP.

### C-States

Enable or disable CPU Power Management. It allows CPU to go to C States when it's not 100% utilized.

## Video Configuration

This section configures the video settings.



### Primary Display

Select either IGD or PCIe Graphics device to be the primary display.

### Integrated Graphics Device

Keep IGD enabled or disabled based on the setup options.

### PTN3460 Function

Enable or disable PTN3460 LCD features.

### LCD Panel Type

Please check the specifications of your LCD monitor. Select the type of LCD panel connected to the system's LCD connector: 800X480, 800X600, 1024X768, 1366X768, 1280X1024, 1920X1080 or 1920X1200.

### LCD Panel Color Depth

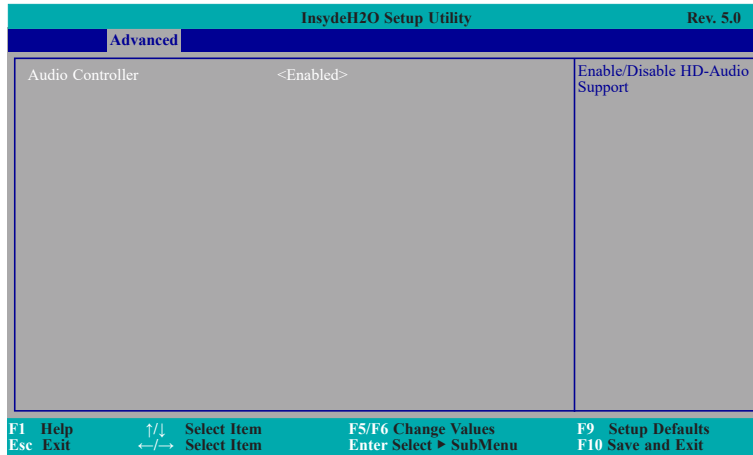
Select the LCD panel color depth: 18 Bit, 24 Bit, 36 Bit or 48 Bit.

### Backlight Type

Set the backlight type: Normal+PWM Mode, Normal+DC Mode, Invert+PWM Mode or Invert+DC Mode.

## Audio Configuration

This section is used to configure the audio settings.



### Audio Controller

Control the support of the high-definition audio device.

#### Disabled

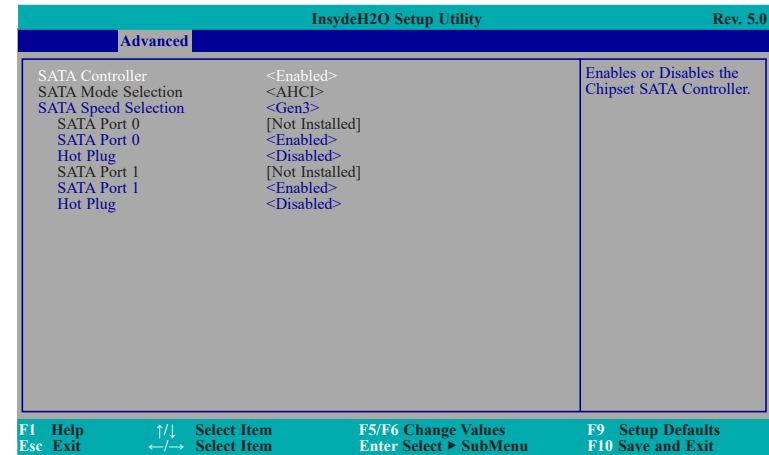
HD Audio will be disabled.

#### Enabled

HD Audio will be enabled.

## SATA Configuration

This section configures the SATA controller.



### SATA Controller

This field is used to enable or disable the Serial ATA controller.

### SATA Mode Selection

The mode selection determines how the SATA controller(s) operates.

#### AHCI

This option allows the Serial ATA devices to use AHCI (Advanced Host Controller Interface).

### SATA Speed Selection

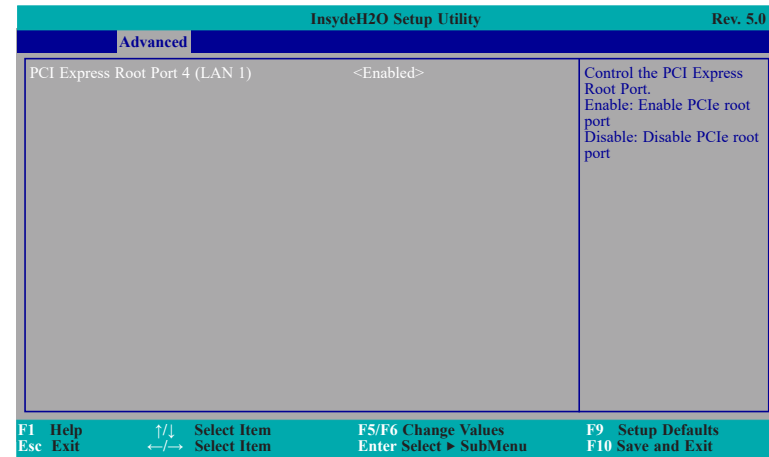
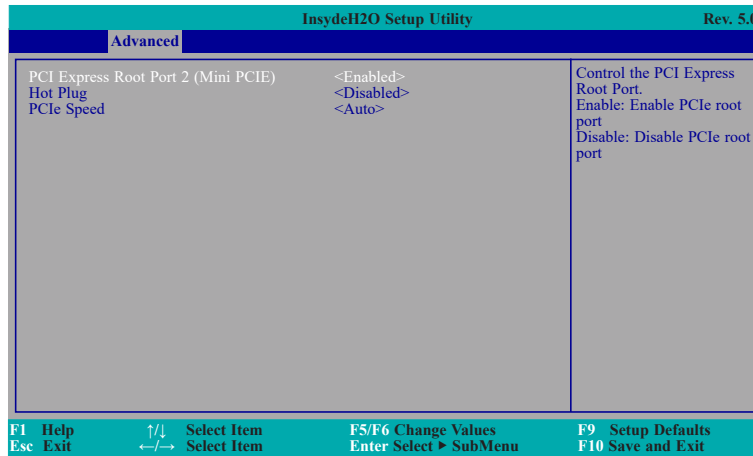
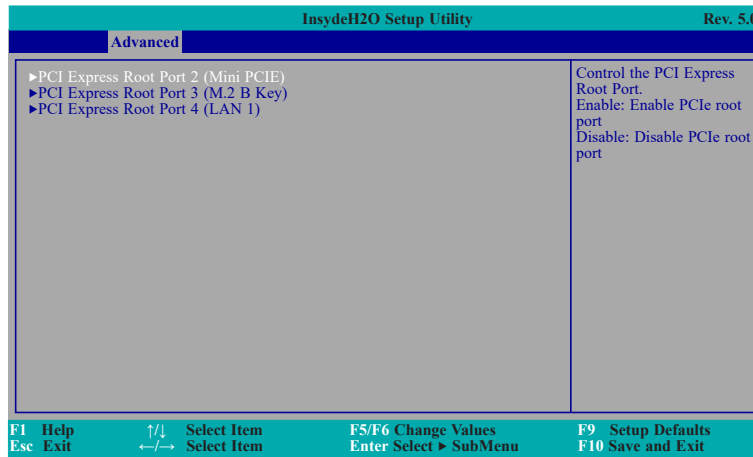
Select Serial ATA controller(s) speed from Gen1 (1.5 Gbit/s), Gen2 (3.0 Gbit/s) or Gen 3 (6.0 Gbit/s).

### Serial ATA Port 0/1 and Hot Plug

These fields are used to enable or disable the serial ATA ports and their hot plug function.

## PCI Express Configuration

This section configures settings relevant to PCI Express root ports.



### PCI Express Root Port 2/3/4

This field is used to enable or disable the PCI Express Root Port.

### Hot Plug

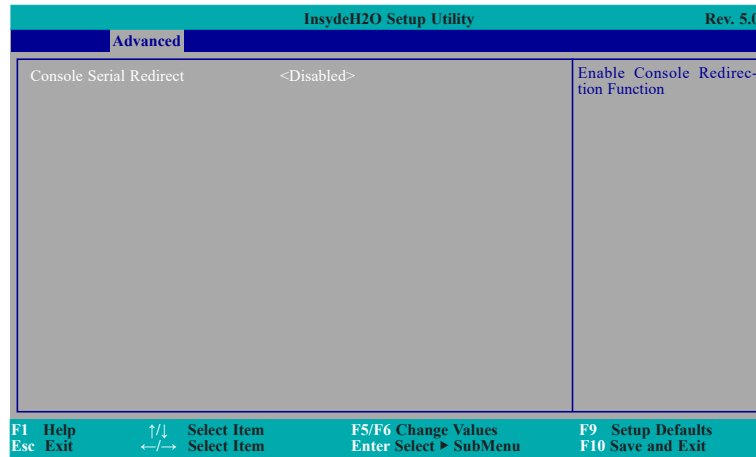
This field is used to enable or disable the PCI Express Hot Plug.

### PCIe Speed

Select the speed of the PCI Express Root Port: Auto, Gen1 or Gen2.

## Console Redirection

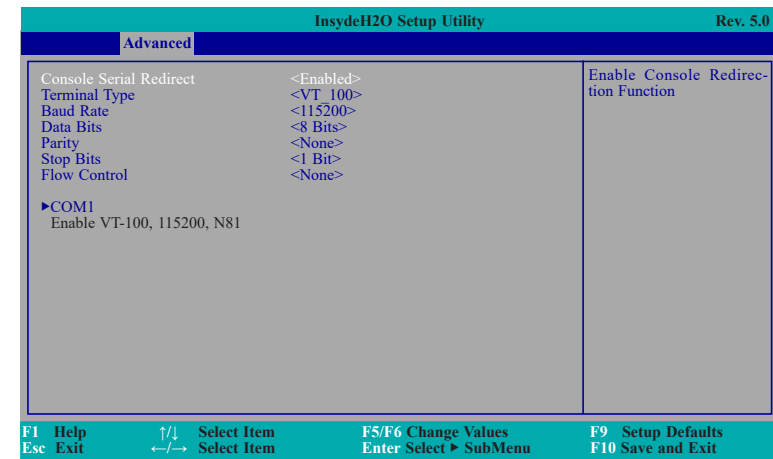
This section configures settings relevant to console redirection.



### Console Serial Redirect

This field is used to enable or disable the console serial redirection function.

When Console Serial Redirect is set to enabled, the screen will appear like below:



### Terminal Type

Select terminal type: VT\_100, VT\_100+, VT\_UTF8 or PC\_ANSI.

### Baud Rate

Select baud rate: 115200, 57600, 38400, 19200 or 9600.

### Data Bits

Select data bits: 7 Bits or 8 Bits.

### Parity

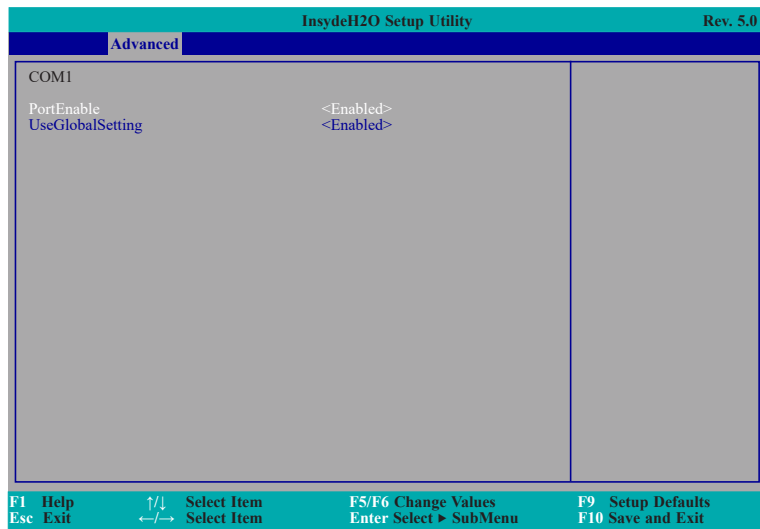
Select parity bits: None, Even or Odd.

### Stop Bits

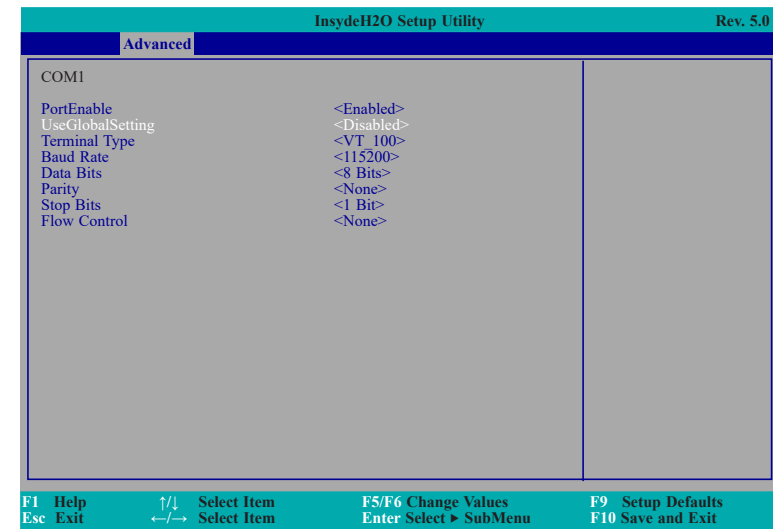
Select stop bits: 1 Bit or 2 Bits.

### Flow Control

Select flow control type: None, RTS/CTS or XON/XOFF.

**COM1**

When UseGlobalSetting is set to disabled, the screen will appear like below:

**PortEnable**

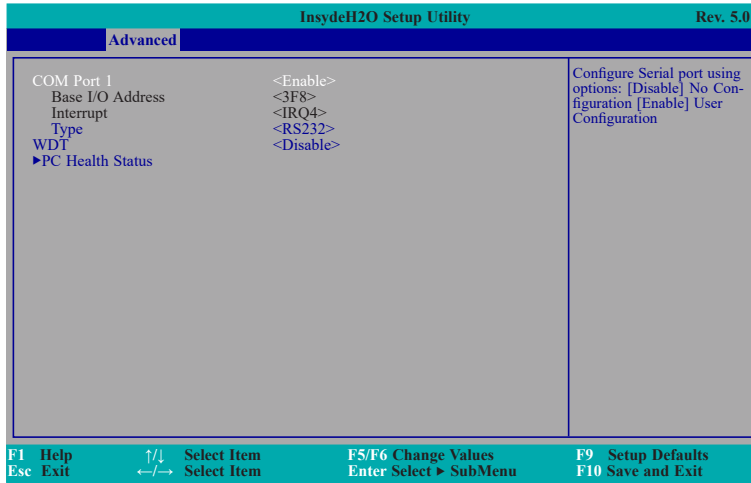
This field is used to enable or disable the COM port to redirect the console.

**UseGlobalSetting**

This field is to enable or disable to use global setting. When enabled the global setting, setting of the COM port will be the same as those in Console Redirection section. When disabled the global setting, setting of the COM port can be configured independently in this section.

## SIO FINTEK81803

This section configures the system super I/O chip parameters.



### COM Port 1

Configure the settings to use the serial port.

**Disable** No configuration

**Enable** User configuration

### Type

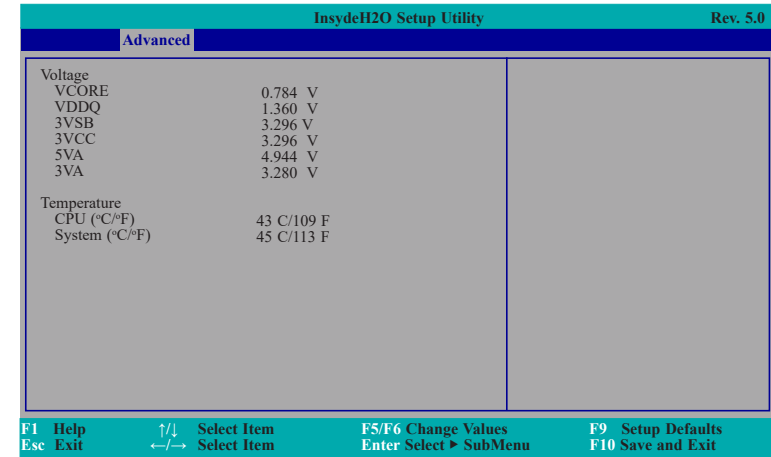
Choose RS232/RS422/RS485 (Peer-to-Peer) for COM type.

### WDT

Enable or disable the watchdog function. A counter will appear if you select to enable WDT. Input any value between 1 to 255 seconds.

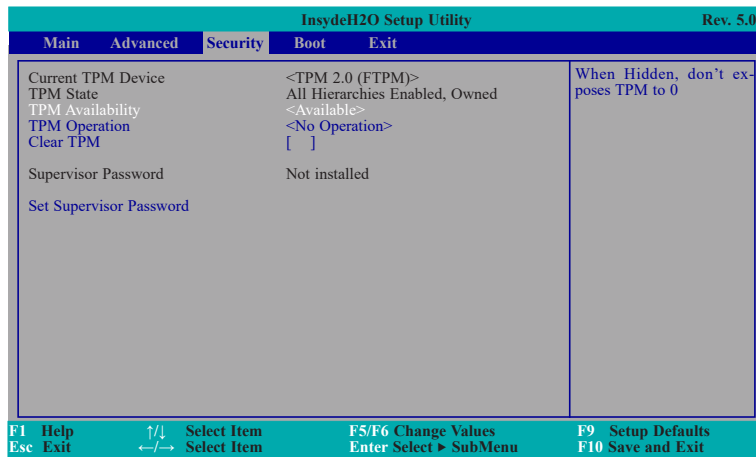
## PC Health Status

This section displays the PC health status.





## Security



### TPM Availability

Show or hide the TPM availability and its configurations.

### TPM Operation

Enable or disable the TPM function. It displays the following options:

**No Operation** No changes to current state.

**Enable** Enable and activate TPM.

**Disable** Disable and activate TPM.

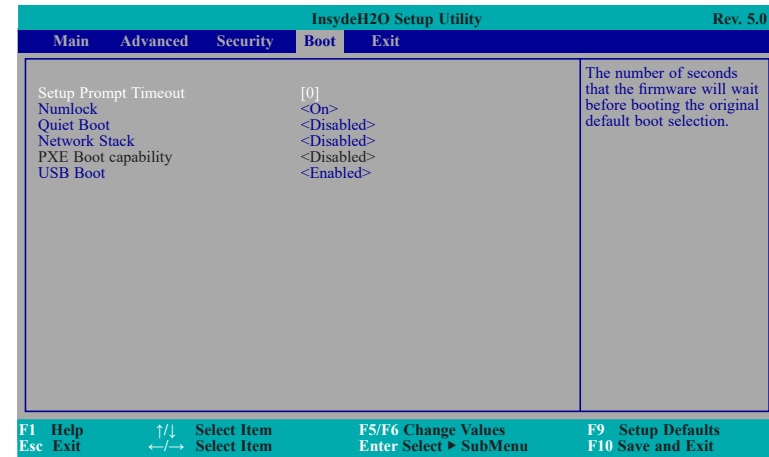
### Clear TPM

Remove all TPM context associated with a specific owner.

### Set Supervisor Password

Set the supervisor's password and the length of the password must be greater than one character.

## Boot



### Setup Prompt Timeout

Setup the number of seconds that the firmware will wait before booting the original default boot selection.

### Numlock

Select the power-on state for numlock.

### Quiet Boot

Enable or disable booting in text mode.

### Network Stack

This field is used to enable or disable network stack.

### PXE Boot capability

**Disabled** Support Network Stack

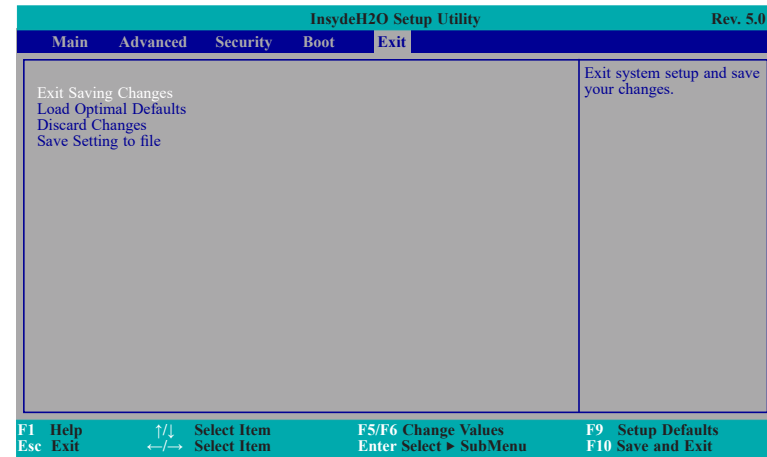
**UEFI** IPv4/IPv6

### USB Boot

Enable or disable booting to USB boot devices.

**Note:**

AL053 only support UEFI boot, no Legacy boot.

**Exit****Exit Saving Changes**

Select Yes and press <Enter> to exit the system setup and save your changes.

**Load Optimal Defaults**

Select YES and press <Enter> to load optimal defaults.

**Discard Changes**

Select YES and press <Enter> to exit the system setup without saving your changes.

**Save Setting to file**

Select this option to save BIOS configuration settings to a USB flash device.

**Restore Setting from file**

This field will appear only when a USB flash device is detected. Select this field to restore setting from the USB flash device.

## Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files. For updating Insyde BIOS in UEFI mode, you may refer to the how-to-video at <https://www.dfi.com/Knowledge/Video/31> .

## Notice: BIOS SPI ROM

1. The Intel® Trusted Execution Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Trusted Execution Engine will not be updated and will cease to be effective.

### Note:



- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

## Chapter 4 - Supported Software

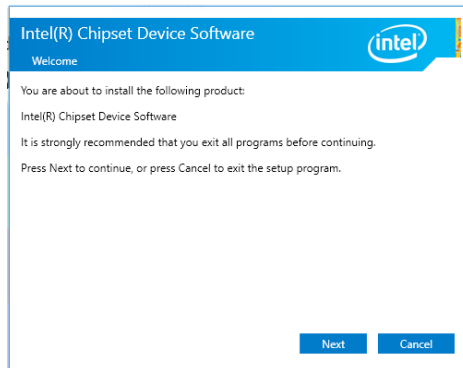
Please download drivers, utilities and software applications required to enhance the performance of AL053 at <https://www.dfi.com/product/index/374#download>.

### Intel Chipset Software Installation Utility

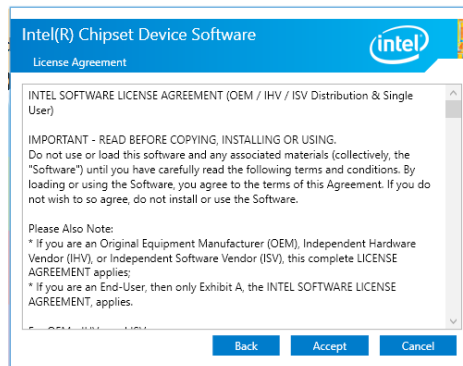
The Intel Chipset Software Installation Utility is used for updating Windows® INF files so that the Intel chipset can be recognized and configured properly in the system.

To install the utility, download "AL053 Chipset Driver" zip file at our website.

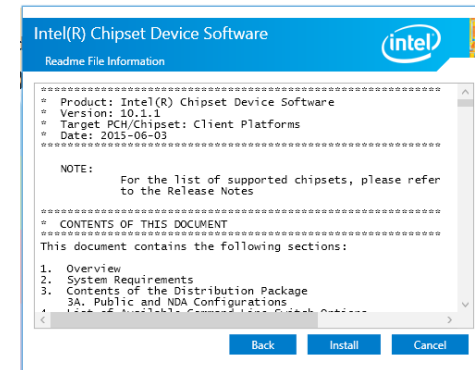
1. Setup is ready to install the utility. Click "Next".



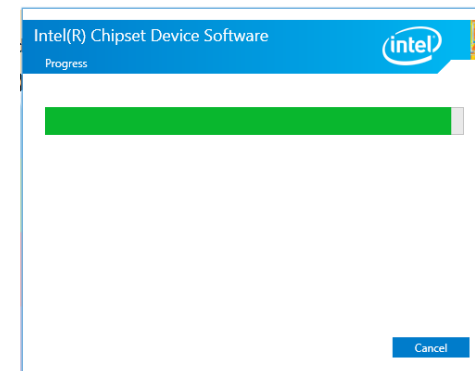
2. Read the license agreement then click "Accept".



3. Go through the readme document for more installation tips then click "Install".

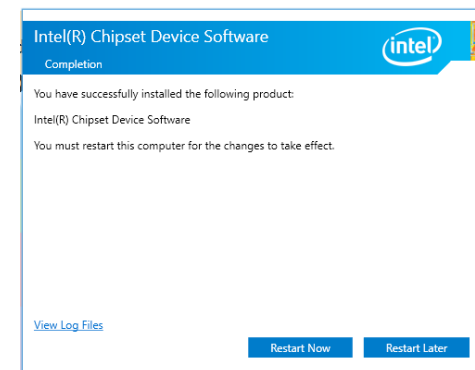


4. The step displays the installing status in the progress.



5. After completing installation, click "Restart Now" to exit setup.

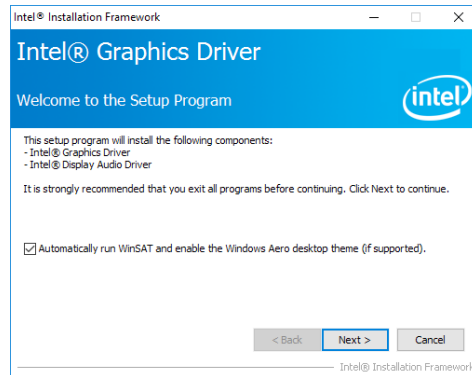
Restarting the system will allow the new software installation to take effect.



## Intel Graphics Driver

To install the driver, download “AL053 Graphics Driver” zip file at our website.

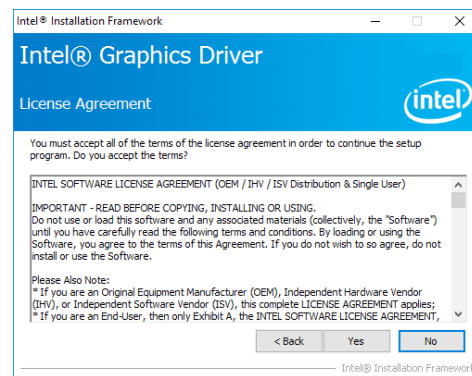
1. Setup is now ready to install the graphics driver. Click “Next”.



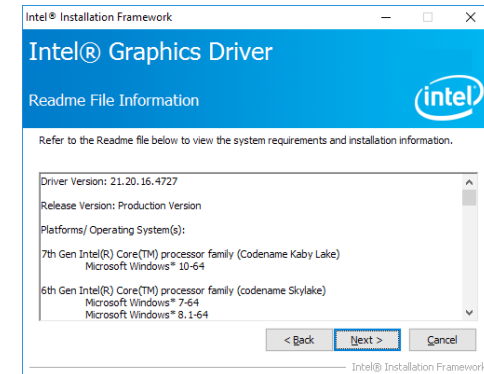
By default, the “Automatically run WinSAT and enable the Windows Aero desktop theme” is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 10 desktop appears. The “blank screen” period is the time Windows is testing the graphics performance.

We recommend that you skip this process by disabling this function then click “Next”.

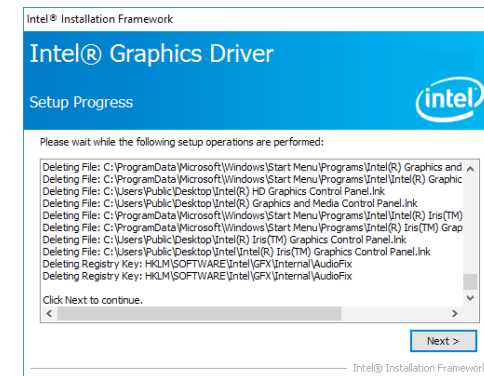
2. Read the license agreement then click “Yes”.



3. Go through the readme document for system requirements and installation tips then click “Next”.

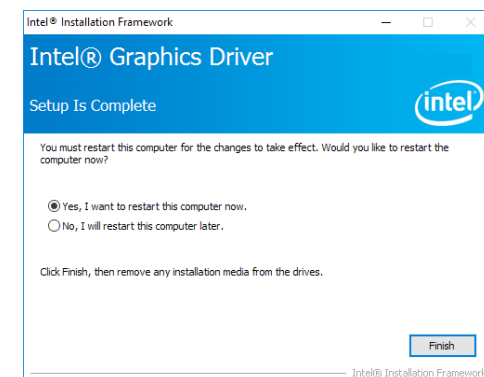


4. Setup is now installing the driver. Click “Next” to continue.



5. Click “Yes, I want to restart this computer now” then click “Finish”.

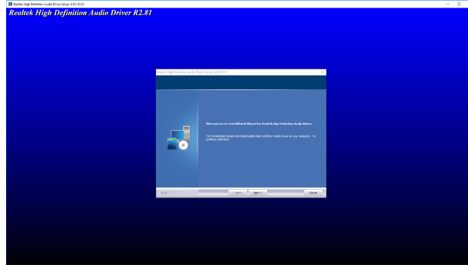
Restarting the system will allow the new software installation to take effect.



## Audio Driver

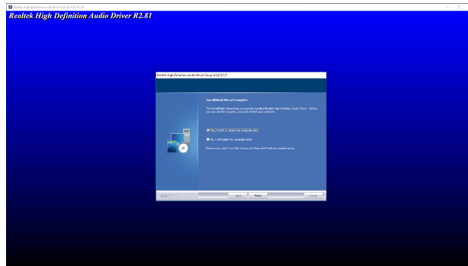
To install the driver, download "AL053 Audio Driver" zip file at our website.

1. Setup is ready to install the driver. Click "Next".



2. Click "Yes, I want to restart my computer now" then click "Finish".

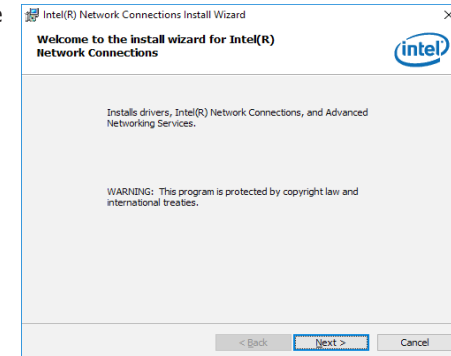
Restarting the system will allow the new software installation to take effect.



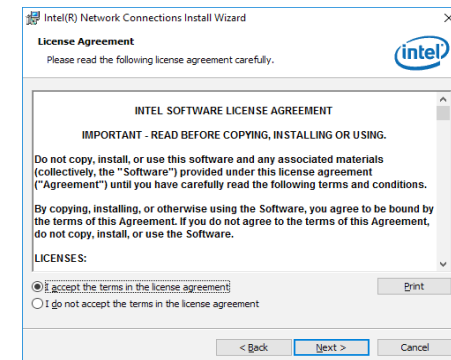
## Intel LAN Driver

To install the driver, download "AL053 LAN Driver" zip file at our website.

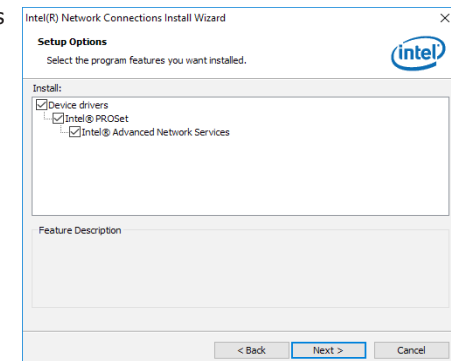
1. Setup is ready to install the driver. Click "Next".



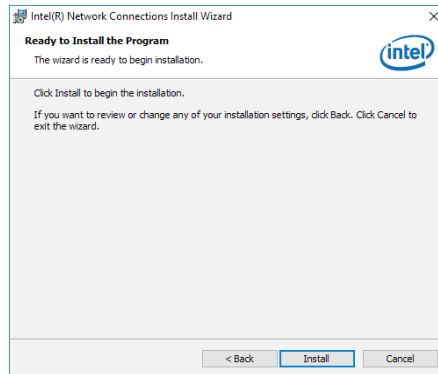
2. Click "I accept the terms in the license agreement" then click "Next".



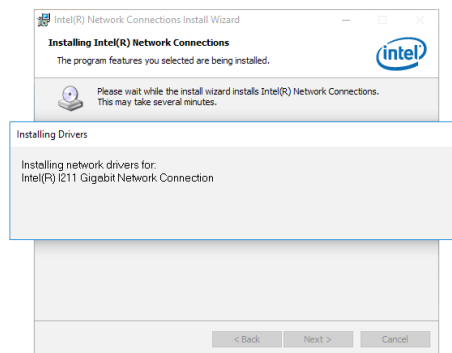
3. Select the program features you want installed then click "Next".



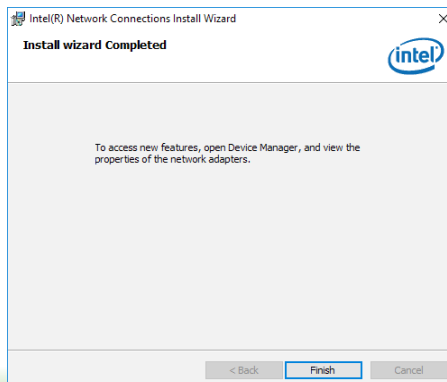
4. Click "Install" to begin the installation.



5. The step displays the installing status in the progress.



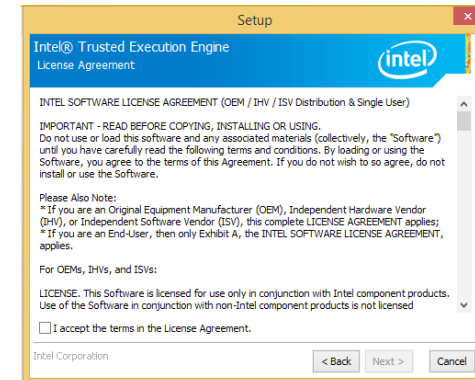
6. After completing installation, click "Finish".



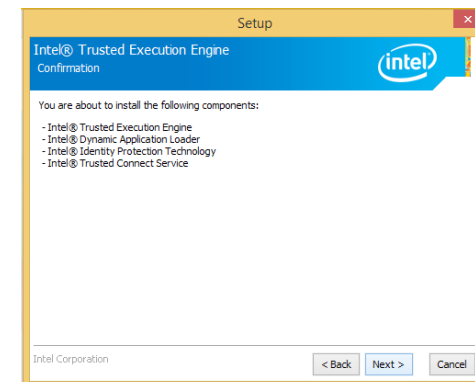
## Intel Trusted Execution Engine Driver

To install the driver, download "AL053 TXE Driver" zip file at our website.

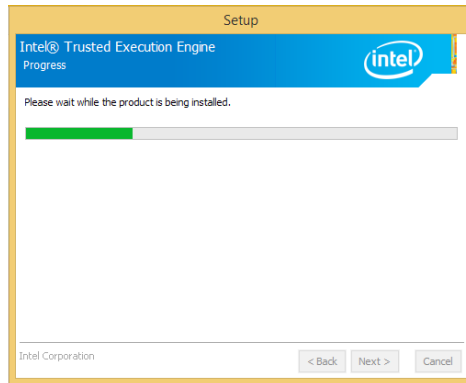
1. Tick "I accept the terms in the License Agreement" and then click "Next."



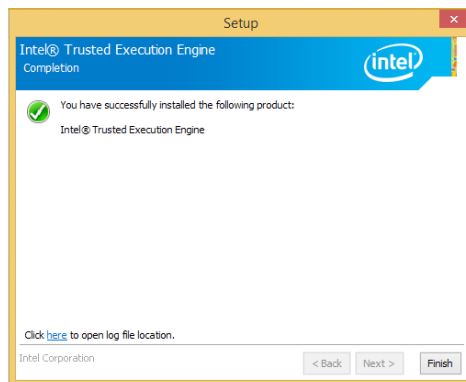
2. The step shows the components which will be installed. Then, Click Next.



3. The step displays the installing status in the progress.



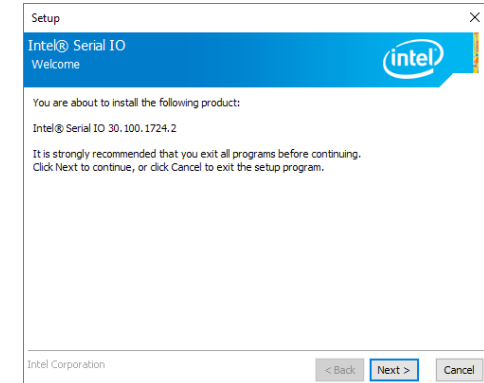
4. Click "Finish" when the installation is complete.



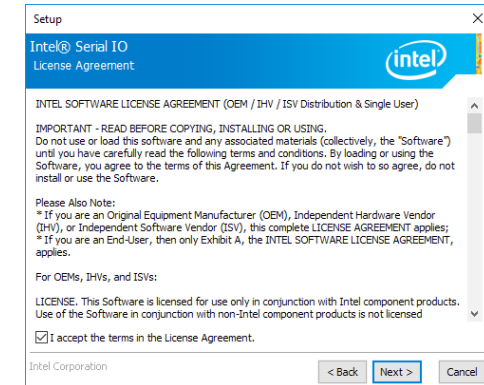
## SIO Driver

To install the driver, download "AL053 SIO Driver" zip file at our website.

1. Setup is ready to install the driver.  
Click "Next".

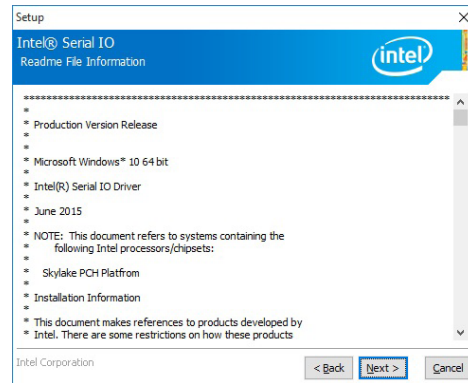


2. Read the license agreement carefully.  
Tick "I accept the terms in the License Agreement" then click "Next".

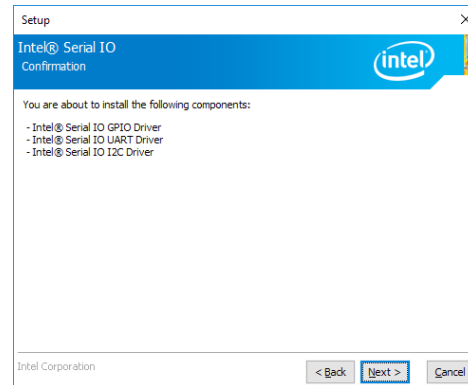




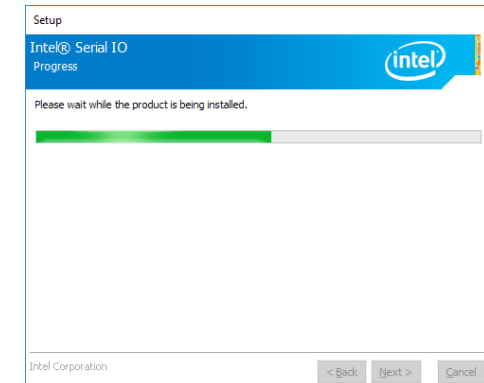
3. Go through the readme document for system requirements and installation tips then click "Next".



4. Setup is ready to install the driver. Click "Next".

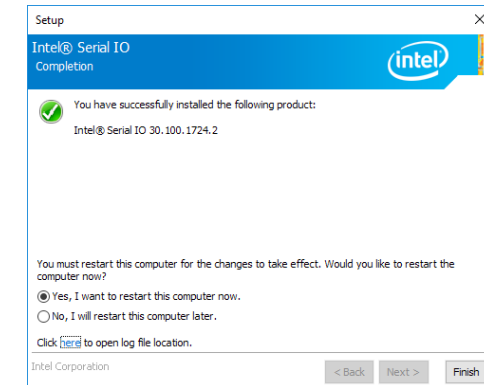


5. Setup is now installing the driver.



6. Click "Yes, I want to restart this computer now" then click "Finish".

Restarting the system will allow the new software installation to take effect.



## Appendix A - List of Connectors

### List of Connectors

Function	Connector	Connector Information	Rate Output
LVDS LCD Panel	J1	V-STAR W100V40TP2: 2*20pin, 1.0mm, BOX HEADER	+3.3V or +5V/1.5A
Front Audio	J5	V-STAR JCL20161228017: 2*5pin, 1.27mm, PIN PLUG, H= 5mm	N/A
USB 6-7	J6	V-STAR JCL20161228017: 2*5pin, 1.27mm, PIN PLUG, H= 5mm	+5V/0.5A (per channel)
LCD/Inverter & SATA Power	J8	E-CALL 0110-3221050: 1*5pin, 1.25mm, WAFER	+12V/1A +5V/1A
COM 1	J10	V-STAR JCL20161228017: 2*5pin, 1.27mm, PIN PLUG, H= 5mm	N/A
Digital I/O	J11	V-STAR JCL20161228017: 2*5pin, 1.27mm, PIN PLUG, H= 5mm	+5V/1A
SMBus	J12	V-STAR SHY-JCL 180806P: 2*3pin, 1.27mm, PIN PLUG, H= 5mm	+3.3VSB/0.5A
Front Panel	J13	V-STAR SHY-JCL 180806P: 2*3pin, 1.27mm, PIN PLUG, H= 5mm	N/A