

# MS-CF03

**Industrial Computer Board** 

User Guide

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# **Regulatory Notices**

## **CE Conformity**

This product has been tested and found to comply with the harmonized standards for Information Technology Equipment published under Directives of Official Journal of the European Union.



## **FCC-B Radio Frequency Interference Statement**

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 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

#### Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

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.

#### WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2012/19/EU, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.



#### **Chemical Substances Information**

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:

https://csr.msi.com/global/index

## **Battery Information**

Please take special precautions if this product comes with a battery.

- Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- Avoid disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, which can result in an explosion.
- Avoid leaving a battery in an extremely high temperature or extremely low air pressure environment that can result in an explosion or the leakage of flammable liquid or gas.
- Do not ingest battery. If the coin/button cell battery is swallowed, it can cause severe internal burns and can lead to death. Keep new and used batteries away from children.

#### **European Union:**



Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

#### BSMI:



#### 廢電池請回收

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

#### California, USA:



The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

http://www.dtsc.ca.gov/hazardouswaste/perchlorate/

## **Environmental Policy**

- The product has been designed to enable proper reuse of parts and recycling and should not be thrown away at its end of life.
- Users should contact the local authorized point of collection for recycling and disposing of their end-of-life products.



- Visit the MSI website and locate a nearby distributor for further recycling information.
- Users may also reach us at gpcontdev@msi.com for information regarding proper disposal, take-back, recycling, and disassembly of MSI products.
- Please visit < <a href="https://us.msi.com/page/recycling">https://us.msi.com/page/recycling</a> for information regarding the recycling of your product in the US.

## **Copyright and Trademarks Notice**







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The terms HDMI™. HDMI™ High-Definition Multimedia Interface. HDMI™ Trade dress and the HDMI™ Logos are trademarks or registered trademarks of HDMI™ Licensing Administrator, Inc.

## **Technical Support**

If a problem arises with your product and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please visit https://www.msi.com/support/ for further guidance.

# **Safety Information**

Please read and follow these safety instructions carefully before installing, operating or performing maintenance on the equipment.

### **General Safety Instructions**

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment in a dry, humidity-free environment.
- Ensure that all components are securely connected to prevent issues during operation.
- Do not cover the air openings to prevent overheating.
- Avoid spilling liquids into the equipment to prevent damage or electrical shock.
- Do not leave the equipment in an unconditioned environment. Storage temperatures above 60°C (140°F) may cause damage.

#### **Electrostatic Discharge (ESD) Precautions**

The components included in this package are sensitive to electrostatic discharge. Follow these guidelines to prevent ESD-related damage:

- Hold the motherboard by the edges to avoid touching sensitive components.
- Wear an ESD wrist strap. If not available, discharge static electricity by touching a metal object before handling.
- When not installed, store the motherboard in an electrostatic shielding container or place it on an anti-static pad.

### **Power Safety**

- Always turn off the power supply and unplug the power cord from the outlet before installing or removing any component.
- Ensure the electrical outlet provides the same voltage as indicated on the PSU before connecting.
- Arrange the power cord to avoid tripping hazards or damage. Do not place objects over the power cord.

#### Installation Instructions

- Lay the equipment on a stable, flat surface before setting it up.
- Before turning on the system, ensure there are no loose screws or metal components on the motherboard or within the system case.
- Do not boot the computer before completing all installations. Premature booting can cause permanent damage to components and pose safety risks.

#### When to Contact Service Personnel

Immediately consult service personnel if any of the following situations arise:

- The power cord or plug is damaged.
- Liquid has entered the equipment.
- The equipment has been exposed to moisture.
- The equipment does not function as described in the User Guide.
- The equipment has been dropped or physically damaged.
- The equipment shows visible signs of breakage.

# **Specifications**

Model	MS-CF03
Processor	<ul> <li>Intel® Alder Lake-N Processor</li> <li>N97, QC, 12W</li> <li>N200, QC, 6W</li> <li>Intel® Alder Lake-N Core i3</li> <li>N305, OC, 9W up to 15W</li> <li>Intel® Alder Lake-N Atom</li> <li>x7425E, QC, 12W</li> <li>Intel® Twin Lake-N Processor</li> <li>N150, QC, 6W</li> <li>Intel® Twin Lake-N Core 3</li> <li>N355, OC, 9W up to 15W</li> </ul>
Chipset	Within processor
Memory	<ul> <li>1 x DDR5 SO-DIMM slot (262-pin)</li> <li>Single Channel DDR5, Non-ECC</li> <li>Up to 4800 MT/s</li> <li>Up to 16GB</li> </ul>
Network	2 x Intel® i226-V 2.5GbE LAN
Expansion Slots	<ul> <li>1 x M.2 E Key slot (2230)</li> <li>Supports PCle x1 &amp; USB 2.0 signal</li> <li>Supports Intel® AX210 Wi-Fi 6E &amp; BT-5.2</li> <li>1 x M.2 B Key slot (2242/ 2280/ 3042)*</li> <li>Supports PCle x1 signal</li> <li>Supports B+M Key PCle x1 module</li> </ul>
Storage	1 x SATA 3.0 6Gb/s port     Support AHCI mode     1 x M.2 B Key slot (2242/ 2280/ 3042)*     Supports SATA 3.0 signal     Supports B+M Key SATA 3.0 SSD    Dealto
Audio	Realtek® ALC897 High Definition Audio Codec

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<sup>\*</sup>There is only "one" M.2 B Key Slot on board, which is marked as M2\_B1.

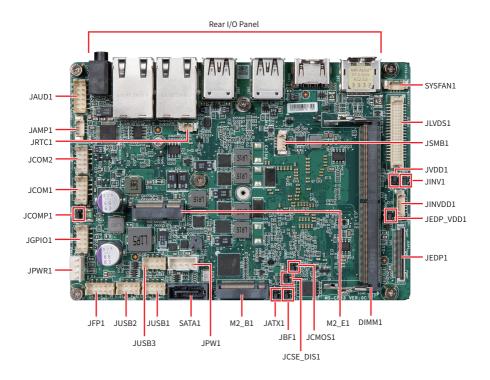
Model	MS-CF03					
	● 1 x DP 1.4a up to 4096×2304 @60Hz					
	1 x HDMI <sup>™</sup> 1.4b up to 3840x2160 @30Hz					
	• 1 x LVDS up to 1920x1200 @60Hz					
Graphics	- 18/24-bit dual channel					
	• 1 x eDP 1.4b up to 1920×1080 @60 Hz (supports up to 4K60, only with Alder Lake-N N97 & Twin Lake Series)					
	3 independent display supported in OS     DP/ HDMI™/ LVDS /eDP					
Power	1 x 9V~36V DC-in power connector*					
	• 1 x Line-out jack					
	• 2 x 2.5 GbE RJ-45 LAN ports					
	• 2 x Dual Stacked USB 3.2 Type-A ports					
Rear I/O	- 2 x USB 10Gbps Type-A ports (Bottom layer)					
	- 2 x USB 5Gbps Type-A ports (Top layer)					
	• 1 x DisplayPort (1.4a)					
	1 x HDMI <sup>™</sup> connector (1.4b)					
	• 1 x DC-in power connector (4-pin)					
	• 1 x SATA power connector (4-pin, 5V/ 12V)					
	• 1 x Front audio header (Headphone, Mic-in, Line-in)					
	• 1 x Audio amplifier header					
	• 1 x LVDS Inverter box header					
	• 1 x LVDS wafer connector					
Onboard	• 1 x eDP connector					
Connector	• 1 x PWM system fan box header					
	• 1 x Front panel connector (Power switch, Reset switch, Power LED, HDD LED for M.2 B key)					
	• 2 x COM port box headers					
	• 1 x GPIO (DIO) connector					
	• 1 x SMBus box header					
	• 3 x USB 2.0 box headers (480 Mbps)					
	• 1 x CMOS battery header					

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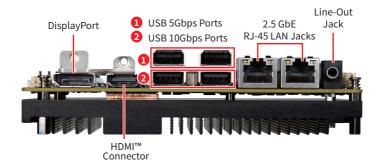
<sup>\*</sup>The **power adapter** you use should provide at least **90W**.

Model	MS-CF03			
	• 1 x COM1 power select jumper (0V/ 5V/ 12V)			
	• 1 x Clear CMOS jumper			
	• 1 x CSE jumper			
Onboard Jumper	• 1 x AT/ ATX mode select jumper			
oumpe.	• 1 x LVDS power select jumper (3V/ 5V)			
	• 1 x eDP power select jumper (3V/ 5V)			
	• 1 x LVDS Inverter power select jumper (5V/ 12V)			
Form factor	• 3.5" SBC (Single Board Computer)			
FOITH IACTOR	- 146mm(L) x 102mm(W)			
	• Windows 10 IoT Enterprise 21H2 LTSC (64-Bit, only for Alder Lake-N Series)			
OS Support	Windows 11 IoT Enterprise LTSC 24H2 (64-Bit)			
	• Linux (supports by request)			
Certification	CE, FCC Class B, BSMI, VCCI, RCM, UKCA, IC			
	Operating Temperature: -10 ~ 60°C			
	• Storage Temperature: -20 ~ 80°C			
Environment	• Operating Humidity: 10 ~ 90%, non-condensing			
	• Storage Humidity: 10 ~ 90%, non-condensing			

## **Motherboard Overview**



## Rear I/O Panel



## **DisplayPort**

DisplayPort is a digital display interface standard. This connector is used to connect a monitor with DisplayPort inputs.

## HDMI™ Connector H⊃mI™

HDMI<sup>™</sup> is an all-digital interface for uncompressed audio/video streams, supporting standard, enhanced, or high-definition video, and multi-channel digital audio on a single cable.

## **USB 10Gbps Ports**

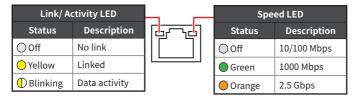
This connector delivers high-speed data transfer for various devices, such as storage devices, hard drives, video cameras, etc.It supports data transfer rates up to 10 Gbps.

## **USB 5 Gbps Ports**

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboards, mouse, or other USB-compatible devices. It supports data transfer rates up to **5 Gbps**.

### 2.5 GbE RJ-45 LAN Jack

The standard single RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.



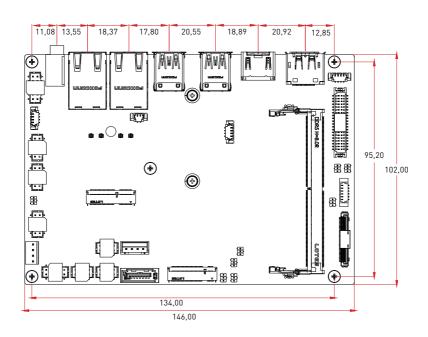
## Line-Out Jack

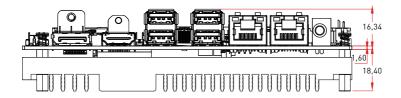
This connector is provided for headphones or speakers.

## **ME Overview**

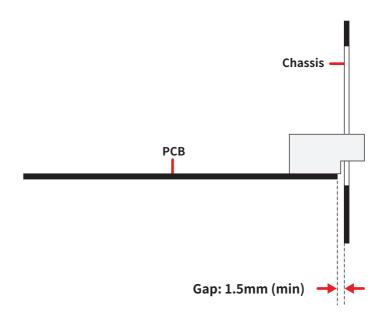
## **Board Dimension**

Unit of measurement: mm





# **Suggested Chassis I/O Gap Dimension**



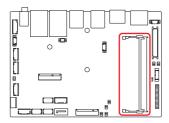
# **Component Contents**

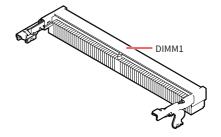
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## **Memory**

#### DIMM1: DDR5 SO DIMM Slot

The SO-DIMM slots is intended for memory modules.





## **Installing DDR5 Memory**

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



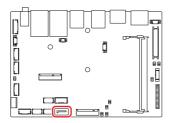
## **Important**

- You can barely see the golden finger if the DIMM is properly inserted in the DIMM
- To ensure system stability for Dual channel mode, memory modules must be of the same type, number and density.

# **Storage**

### SATA1: SATA 3.0 6Gb/s Port

This connector is SATA 6Gb/s interface port, it can connect to one SATA device.





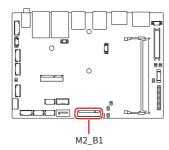


## Important

- This SATA port supports hot plug.
- Please do not fold the SATA cable at a 90-degree angle. Data loss may result during transmission otherwise.
- SATA cables have identical plugs on either sides of the cable. However, it is recommended that the flat connector be connected to the motherboard for space saving purposes.

## M2\_B1: M.2 Slot (B Key, 2242, 3042, 2280)

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



#### **Feature**

- Supports SATA 3.0 signal.
- Supports B+M Key SATA 3.0 SSD.



## **Video Demonstration**

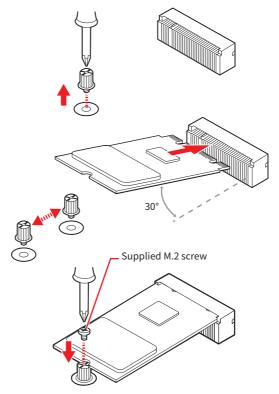
Watch the video to learn how to Install M.2 SSD.



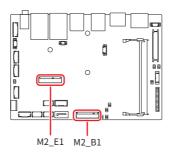
## **Installing M.2 SSD**

1. Loosen the M.2 riser screw from the motherboard.

- 2. Set the M.2 riser screw at the appropriate location based on the length of your M.2 SSD.
- 3. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.
- 4. Secure the M.2 SSD in place with the supplied M.2 screw.

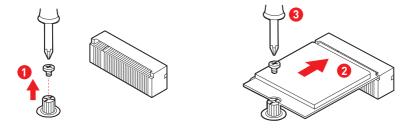


# **Expansion Slots**



M2\_B1: M.2 Slot (B Key, 2242, 3042, 2280)

Please install the module card into the M.2 slot as shown below.

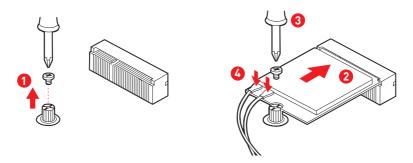


#### **Feature**

- Supports PCIe x1 signal.
- Supports B+M key PCIe x1 module.

## M2\_E1: M.2 Slot (E Key, 2230)

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



#### **Feature**

- Supports PCIe x1 & USB 2.0 signal.
- Supports Intel® Wi-Fi 6E AX210 + BT 5.2 wireless card.

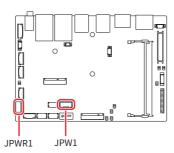


## Important

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.

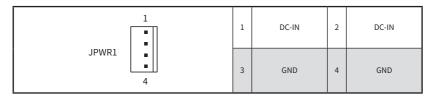
## **Connectors**

#### **Power Connectors**



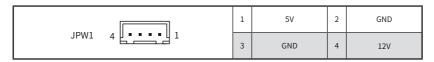
#### JPWR1: 4-Pin DC-In Main Power Connector

This connector allows you to connect an power supply.



## JPW1: 4-Pin SATA Power Connector

This connector is used to provide power to SATA devices.

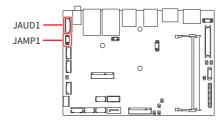




## **Important**

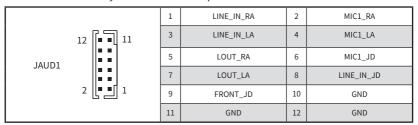
Make sure that all the power cables are securely connected to a proper power supply to ensure stable operation of the system.

## **Audio Connectors**



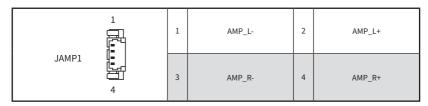
#### **JAUD1: Front Audio Header**

This connector allows you to connect front panel audio.

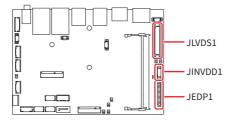


## JAMP1: Audio Amplifier Header

The connector is used to connect audio amplifiers to enhance audio performance.



## **Graphics Connectors**



#### **JLVDS1: LVDS Wafer Connector**

This connector is designed for use with LVDS interface flat panels. When connecting your flat panel to this connector, be sure to check the panel datasheet to ensure that you set the LVDS power select jumper (JVDD1) to the appropriate power voltage.

	1	12V	2	12V
	3	LCD_VDD	4	12V
	5	LCD_VDD	6	LCD_VDD
	7	DDC_CLK	8	DDC_DATA
JLVDS1	9	L_BKLT_CTRL#	10	LCDEN
	11	INV_ON	12	LVDS_DETECT#_C
	13	LVDSA_DATA1	14	LVDSA_DATA0
2   1	15	LVDSA_DATA#1	16	LVDSA_DATA#0
	17	GND	18	GND
	19	LVDSA_DATA3	20	LVDSA_DATA2
	21	LVDSA_DATA#3	22	LVDSA_DATA#2
	23	GND	24	GND
	25	LVDSB_DATA1	26	LVDSB_DATA0
	27	LVDSB_DATA#1	28	LVDSB_DATA#0
40 39	29	GND	30	GND
	31	LVDSB_DATA3	32	LVDSB_DATA2
	33	LVDSB_DATA#3	34	LVDSB_DATA#2
	35	GND	36	GND
	37	LVDSB_CLK	38	LVDSA_CLK
	39	LVDSB_CLK#	40	LVDSA_CLK#



#### **Important**

Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

#### JINVDD1: LVDS Inverter Box Header

The connector is provided for LCD backlight options, be sure to check the panel datasheet to ensure that you set the LVDS Inverter Power Select Jumper (JINV1) to the appropriate power voltage (5V/12V).

1	1	5V/12V	2	5V/12V
JINVDD1	3	BKLT_EN	4	BKLT_CTRL
6	5	GND	6	GND

#### JEDP1: eDP Connector

This connector is designed for use with eDP interface flat panels. When connecting your flat panel to this connector, be sure to check the panel datasheet to ensure that you set the **eDP power select jumper (JEDP\_VDD1)** to the appropriate power voltage.

		1	LCD_VDD1	2	LCD_VDD1
		3	LCD_VDD1	4	LCD_VDD1
		5	LCD_VDD1	6	VCC3
		7	SMB_CLK	8	SMB_DATA
		9	GND	10	HPD
		11	N/C	12	N/C
		13	GND	14	DPC_LINE3_DN
		15	DPC_LINE3_DP	16	GND
		17	DPC_LINE2_DN	18	DPC_LINE2_DP
JEDP1		19	GND	20	DPC_LINE1_DN
		21	DPC_LINE1_DP	22	GND
40	23	DPC_LINE0_DN	24	DPC_LINE0_DP	
	25	GND	26	DSP_DDPC_AUXP	
	27	DSP_DDPC_AUXN	28	GND	
		29	VCC3	30	GND
	31	+12V	32	GND	
		33	GND	34	VCC5
		35	GND	36	BKLTCTL
		37	BKLT_EN	38	+12V
		39	VCC3	40	GND

#### Other Connectors

### SYSFAN1: PWM System Fan Box Header

The fan power connector supports system cooling fans with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND.

	4	1 510	1	GND	2	FAN POWER
SYSFAN1			3	FAN SENSE	4	FAN_PWM

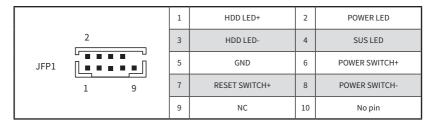


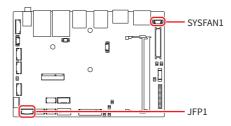
#### **Important**

Please refer to the recommended CPU fans at processor's official website or consult the vendors for proper CPU cooling fan.

#### JFP1: Front Panel Connector

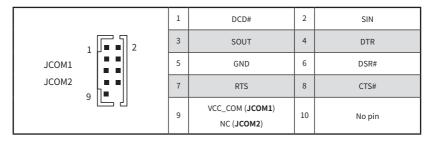
This front-panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.

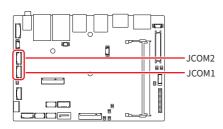




## JCOM1, JCOM2: COM Port Box Headers

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach a serial device to it.





#### • JCOM1

- Supports RS-232/422/485
- With 0V/5V/12V

#### • JCOM2

- Supports RS-232

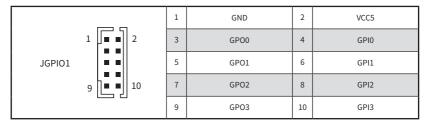
	RS232						
PIN	SIGNAL	DESCRIPTION					
1 2 3 4 5 6 7 8 9	NDCD NSIN NSOUT NDTR GND NDSR NRTS NCTS VCC_COM/ NC NO Pin	Data Carrier Detect Signal In Signal Out Data Terminal Ready Signal Ground Data Set Ready Request To Send Clear To Send VCC_COM/ No Connection No Pin					

	RS422
SIGNAL	DESCRIPTION
422 TXD-	Transmit Data, Negative
422 TXD+	Transmit Data, Positive
422 RXD+	Receive Data, Positive
422 RXD-	Receive Data, Negative
GND	Signal Ground
NC	No Connection
	422 TXD- 422 TXD+ 422 RXD+ 422 RXD- GND NC NC NC NC

RS485				
PIN	SIGNAL	DESCRIPTION		
1 2	D- D+	Data, Negative Data, Positive		
3	NC	No Connection		
4 5	NC GND	No Connection Signal Ground		
6	NC NC	No Connection No Connection		
8	NC NC	No Connection No Connection		
10	NC NC	No Connection		

## JGPIO1: GPIO (DIO) Box Header

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



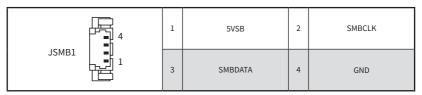
#### JUSB1~3: USB 2.0 Box Headers

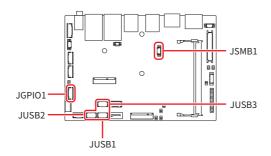
These connectors are ideal for connecting USB devices such as keyboard, mouse, or other USB-compatible devices.

2 8	1	5V	2	GND
JUSB1 JUSB2 1 1	3	USB_0-	4	USB_1+
JUSB3	5	USB_0+	6	USB_1-
1 7	7	GND	8	5V

#### JSMB1: SMBus Box Header

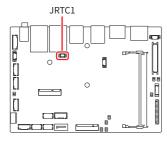
This connector, known as I2C, is for users to connect System Management Bus (SMBus) interface.





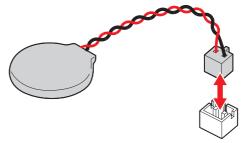
### **JRTC1: CMOS Battery Header**

If the CMOS battery is out of charge, the time in the BIOS will be reset and the data of system configuration will be lost. In this case, you need to replace the CMOS battery.



## **Replacing CMOS battery**

- 1. Unplug the battery wire from the JRTC1 connector and remove the battery.
- 2. Connect the new CR2032 battery with wire to the JRTC1 connector.





#### WARNING

#### **KEEP OUT OF REACH OF CHILDREN**



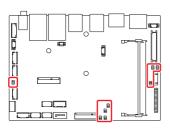
- Swallowing can lead to chemical burns, perforation of soft tissue, and even death.
- Severe burns can occur within 2 hours of ingestion.
- If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

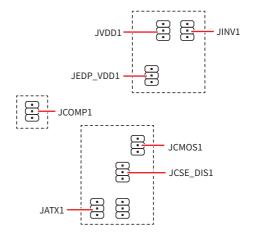
# **Jumpers**



# 1mportant

Avoid adjusting jumpers when the system is on; it will damage the motherboard.





Jumper Name	Default Setting	Description
	1	COM Power Select Jumper
JCOMP1		1-2: 5V Power (Default)
		2-3: 12V Power
	1	Clear CMOS Jumper
JCMOS1		1-2: Normal (Default)
		2-3: Clear CMOS
	1	CSE Jumper
JCSE_DIS1		1-2: Normal (Default)
		2-3: ME disable
		AT/ ATX Mode Select Jumper
JATX1		1-2: ATX (Default)
	1 ( )	2-3: AT
	1	LVDS Power Select Jumper
JVDD1		1-2: 3V (Default)
		2-3: 5V

Continued on next column

Jumper Name	Default Setting	Description
	1	LVDS Inverter Power Select Jumper
JINV1		1-2: 5V (Default)
		2-3: 12V
	1	eDP Power Select Jumper
JEDP_VDD1		1-2: 5V
		2-3: 3V (Default)

## **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 Setup program when:

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



## Important

- 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 below appears on the screen, press <DEL> or <F2> key to enter Setup, <F11> key to Boot Menu, <F12> key to PXE Boot.

Press <DEL> or <F2> 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.



### Important

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**

$\leftarrow \rightarrow$	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Value
Esc	Exit
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Reset*
F12	Screenshot capture
<k></k>	Scroll help area upwards
<m>&gt;</m>	Scroll help area downwards

<sup>\*</sup> When you press <F10>, a confirmation window appears and it provides the modification information. Select between Yes or No to confirm your choice.

## **Getting Help**

Upon entering setup, you will see 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** ( $\uparrow\downarrow$ ) 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.

## 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 on-board chipsets.

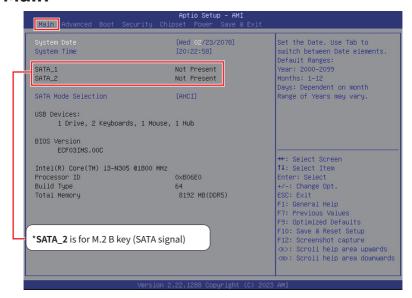
#### ► Power

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.

## Main



#### ► System Date

This setting allows you to set the system date. Use <Tab> key to switch between date elements.

Format: <Day> <Month> <Date> <Year>.

#### ► System Time

This setting allows you to set the system time. Use <Tab> key to switch between time elements.

Format: <Hour> <Minute> <Second>.

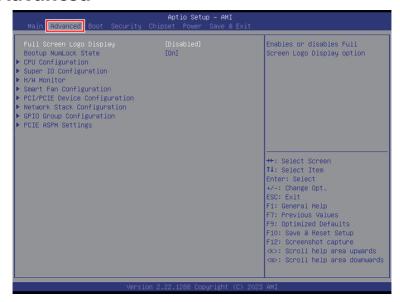
#### ► SATA Mode Selection

This setting specifies SATA controller mode.

[AHCI]

AHCI (Advanced Host Controller Interface), is a technical standard for an interface that allows the software to communicate with Serial ATA (SATA) devices. It offers advanced SATA features such as Native Command Queuing (NCQ) and hot-plugging.

## **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.

[Enabled] BIOS will display the full-screen logo during the boot-up sequence,

hiding normal POST messages.

BIOS will display the normal POST messages, instead of the full-[Disabled]

screen logo.

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

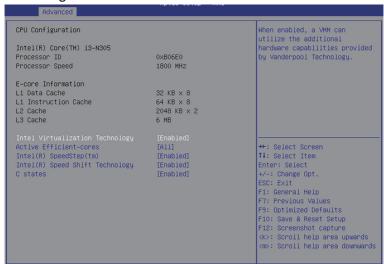
#### ► Bootup NumLock State

This setting is to set the state of the Num Lock key on the keyboard when the system is powered on.

[On] Turn on the Num Lock key when the system is powered on.

[Off] Allow users to use the arrow keys on the numeric keypad.

# ► CPU Configuration



#### ► Intel Virtualization Technology

Enables or disables Intel Virtualization technology.

[Enabled] Enables Intel Virtualization technology and allows a platform to

run multiple operating systems in independent partitions. The system can function as multiple systems virtually.

[Disabled] Disables this function.

#### Active Efficient-cores

Select the number of active Efficient-cores (E-cores).

#### ▶ Intel(R) SpeedStep(TM)

Enhanced Intel SpeedStep® Technology enables the OS to control and activate performance states (P-States) of the processor.

[Enabled] When enabled, Intel SpeedStep® technology is activated.

> This technology allows the processor to manage its power consumption via performance state (P-State) transitions.

[Disabled] Disables this function.

### ► Intel(R) Speed Shift Technology

Intel® Speed Shift Technology is an energy-efficient method that allows frequency control by hardware rather than the OS.

When enabled, Intel® Speed Shift Technology is activated. [Enabled]

The technology enables the management of processor power consumption via hardware performance state (P-State) transitions.

[Disabled] Disable this function.

#### ▶ C States

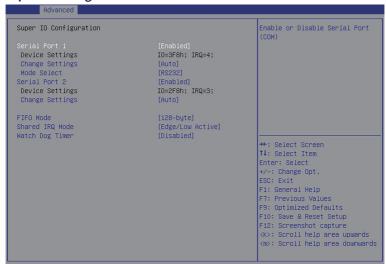
This setting controls the C-States (CPU Power states).

[Enabled] Detects the idle state of system and reduce CPU power

consumption accordingly.

[Disabled] Disable this function.

# ► Super IO Configuration



#### ► Serial Port 1/2

This setting enables or 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 Serial Port 1/2.

#### ► FIFO Mode

This setting controls the FIFO (First In First Out) data transfer mode.

#### ► Shared IRQ Mode

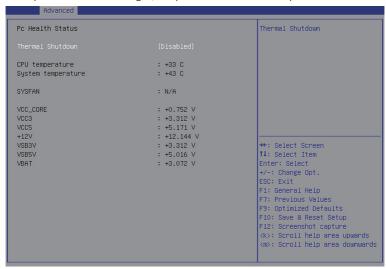
This setting provides the system with the ability to share interrupts among its serial ports.

#### ► Watch Dog Timer

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

# ► H/W Monitor (PC Health Status)

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



#### ► Thermal Shutdown

This setting determines the behavior of the system when the CPU temperature reaches a predefined threshold.

[Enabled] Initiate an automatic shutdown of the system to protect from

potential damage due to overheating.

[Disabled] Disable this function.

# ► Smart Fan Configuration



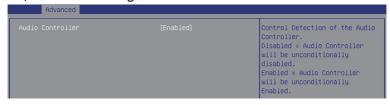
#### ► SYSFAN

This setting enables or disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the system fan speed automatically depending on the current system temperature, avoiding the overheating to damage your system. The following items will display when **SYSFAN** is enabled.

#### » Min. Speed (%)

The beginning speed of the System fan.

## ► PCI/PCIE Device Configuration



#### ► Audio Controller

This setting enables or disables the detection of the onboard audio controller.

# ► Network Stack Configuration

This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS.



#### ► Network Stack

This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS. The following items will display when Network Stak is enabled.

#### » IPV4 PXE Support

Enables or disables IPv4 PXE boot support.

#### » IPV4 HTTP Support

Enables or disables Ipv4 HTTP Support.

#### » IPV6 PXE Support

Enables or disables Ipv6 PXE Support.

#### » IPV6 HTTP Support

Enables or disables Ipv6 HTTP Support.

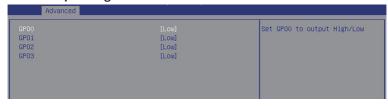
#### » PXE boot wait time

Use this option to specify the wait time to press the ESC key to abort the PXE boot. Press "+" or "-" on your keyboard to change the value. The default setting is 0.

#### » Media detect count

Use this option to specify the number of times media will be checked. Press "+" or "-" on your keyboard to change the value. The default setting is 1.

# ► GPIO Group Configuration



#### ► GPO0 ~ GPO3

These settings control the operation mode of the specified GPIO.

# ► PCIE ASPM settings

This menu provide settings for PCIe ASPM (Active State Power Management) level for different installed devices.



#### ► M2 B1/ M2 E1

[L1]

Sets PCI Express ASPM (Active State Power Management) state for power saving.

Initiate an automatic shutdown of the system to protect from [L0s] potential damage due to overheating.

Higher latency, lower power "standby" state (optional).

[L0sL1] Activate both L0s and L1 support.

[Disabled] Disable this function.

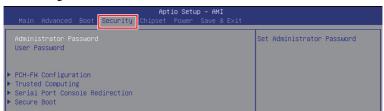
# **Boot**



# ► Boot Option #1-2

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

# **Security**



## ► Administrator Password

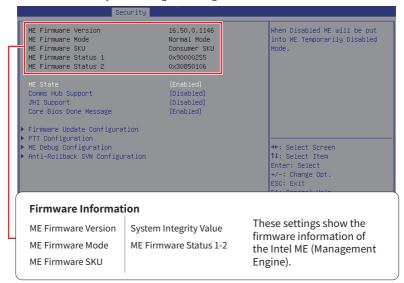
Administrator Password controls access to the BIOS Setup utility.

#### ► User Password

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

## ► PCH-FW Configuration

This menu allows you to configure settings related to the PCH firmware.



#### ▶ ME State

This menu controls the Intel® Management Engine State (ME state) parameters, which provides various management and security capabilities. The following items will display when ME State is enabled.

#### ► Comms Hub Support

Enables or disables the communications hub support.

#### ▶ JHI Support

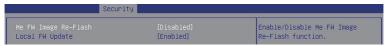
Enables or disables JHI Support. JHI stands for Intel® Dynamic Application Loader Host Interface Service (Intel® DAL HIS) and is the engineering name for this feature. Enabling JHI Support in the BIOS settings allows the system to utilize this interface for communication between trusted applications and host-based applications.

#### ► Core BIOS Done Message

Enables or disables Core BIOS Done Message sent to ME.

### ► Firmware Update Configuration

This menu will display when ME State is enabled.



#### » ME FW Image Re-Flash

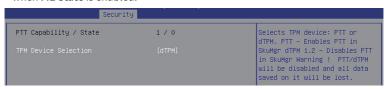
Enables or disables the ME Firmware Image Re-flashing.

#### » Local FW Update

Enables or disables the capability to perform a firmware update of the ME locally.

#### ► PTT Configuration

Intel® Platform Trust Technology (PTT) is a platform functionality for credential storage and key management used by Microsoft Windows. This menu will display when ME State is enabled.



#### » TPM Device Selection

Select TPM (Trusted Platform Module) devices from PTT or dTPM (Discrete TPM).

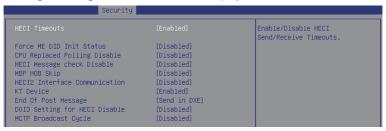
[PTT] Enables PTT in SkuMgr.

[dTPM] Disables PTT in SkuMgr. Warning! PTT/ dTPM will be disabled

and all data saved on it will be lost.

#### ► ME Debug Configuration

This menu allows you to configure debug-related options for the Intel® Management Engine (ME). This menu will display when ME State is enabled.



#### » HECI Timeouts

This setting enables/ disables the HECI (Host Embedded Controller Interface) send/ receive timeouts.

#### » Force ME DID Init Status

Forces the ME Device ID (DID) initialization status value.

#### » CPU Replaced Polling Disable

Setting this option disables the CPU replacement polling loop.

#### » HECI Message Check Disable

This setting disables message check for BIOS boot path when sending messages.

### » MBP HOB Skip

Setting this option will skip ME's Memory-Based Protection (MBP) H0B region.

#### » HECI2 Interface Communication

This setting Adds/ Removes HECI2 device from PCI space.

#### » KT Device

Enables or disables Key Transfer (KT) Device.

#### » End of Post Message

Enables or disables End of Post Message sent to ME.

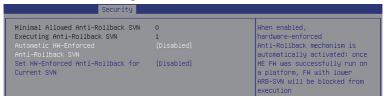
### » DOI3 Setting for HECI Disable

Setting this option disables setting DOI3 bit for all HECI devices.

### » MCTP Broadcast Cycle

Enables or disables Management Component Transport Protocol (MCTP) Broadcast Cycle.

## ► Anti-Rollback SVN Configuration



#### » Automatic HW-Enforced Anti-Rollback SVN

Setting this item enables will automatically activate the hardware-enforced antirollback protection based on the Secure Version Number (SVN). Once enabled, the hardware will enforce that only firmware updates with an SVN equal to or higher than the current SVN can be installed.

#### » Set HW-Enforced Anti-Rollback for Current SVN

Fnable HW FRB mechanism for current ARB SVN value, FW with lower ARB-SVN will be blocked from execution. The value will be restored to disable after the command is sent. This item will display when Automatic HW-Enforced Anti-Rollback SVN is enabled.

### Trusted Computing



#### ► Security Device Support

This item enables or disables BIOS support for security device. When set to [Disable], the OS will not show security device.

#### ► SHA256/ SHA384 PCR Bank

These settings enables or disables the SHA256 PCR Bank and SHA384 PCR Bank.

### ► Pending Operation

When **Security Device Support** is set to [Enable], **Pending Operation** will appear. It is advised that users should routinely back up their TPM secured data.

[TPM Clear] Clear all data secured by TPM.

Discard the selection. [None]

#### ► Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy

These settings enables or disables the Platform Hierarchy, Storage Hierarchy and Endorsement Hierarchy.

### Physical Presence Spec Version

This settings show the Physical Presence Spec Version.

#### ► TPM 2.0 Interface Type

This setting shows the TPM 2.0 Interface Type.

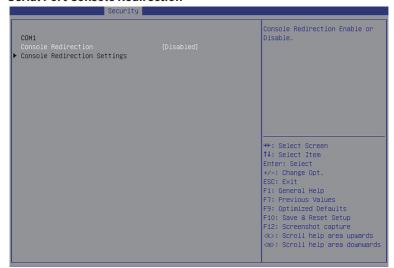
#### ▶ PH Randomization

Enables or disables Platform Hierarchy (PH) Randomization.

#### ▶ Device Select

Select your TPM device through this setting.

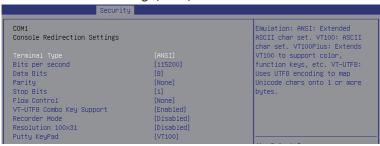
#### ► Serial Port Console Redirection



#### ► Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables or 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 (COM1)



#### » 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). You can select emulation for the terminal from this setting.

[ANSI] Extended ASCII character set.

[VT100] ASCII character set.

[VT100Plus] Extends VT100 to support color, function keys, etc.

[VT-UTF8] Uses UTF8 encoding to map Unicode characters onto one or

more bytes.

#### » Bits per second, Data Bits, Parity, Stop Bits

These 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's 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 or disables the VT-UTF8 combination key support for ANSI/ VT100 terminals.

#### » Recorder Mode, Resolution 100x31

These settings enables or disables the recorder mode and the resolution 100x31.

#### » Putty KeyPad

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

#### ► Secure Boot



#### ► Secure Boot

Secure Boot function can be enabled only when the Platform Key (PK) is enrolled and running accordingly.

#### ▶ Secure Boot Mode

Selects the secure boot mode. This item appears when **Secure Boot** is enabled.

The system will automatically load the secure keys from BIOS. [Standard]

[Custom] Allows user to configure the secure boot settings and manually load the secure keys.

#### ► Restore Factory Keys

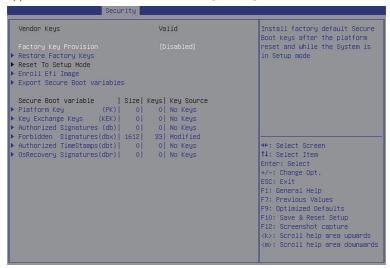
Allows you to restore all factory default keys. The settings will be applied after reboot or at the next reboot. This item appears when "Secure Boot Mode" sets to [Custom].

#### ► Reset to setup Mode

Allows you to delete all the Secure Boot keys (PK,KEK,db,dbt,dbx). The settings will be applied after reboot or at the next reboot. This item appears when "Secure Boot Mode" sets to [Custom].

#### Key Management

Press Enter key to enter the sub-menu. Manage the secure boot keys. This item appears when "Secure Boot Mode" sets to [Custom].



#### » Platform Key (PK):

The Platform Key (PK) can protect the firmware from any un-authenticated changes. The system will verify the PK before your system enters the OS. Platform Key (PK) is used for updating KEK.

#### » Set New Key

Sets a new PK to your system.

#### » Delete Kev

Deletes the PK from your system.

#### » Key Exchange Keys (KEK):

Key Exchange Key (KEK) is used for updating DB or DBX.

#### » Set New Key

Sets a new KEK to your system.

#### » Append Key

Loads an additional KEK from storage devices to your system.

#### » Delete Key

Deletes the KEK from your system.

#### » Authorized Signatures (db):

Authorized Signatures (db) lists the signatures that can be loaded.

#### » Set New Key

Sets a new db to your system.

#### » Append Key

Loads an additional db from storage devices to your system.

#### » Delete Key

Deletes the db from your system.

### » Forbidden Signatures (dbx):

Forbidden Signatures (dbx) lists the forbidden signatures that are not trusted and cannot be loaded.

#### » Set New Key

Sets a new dbx to your system.

## » Append Key

Loads an additional dbx from storage devices to your system.

#### » Delete Key

Deletes the dbx from your system.

### » Authorized TimeStamps (dbt):

Authorized TimeStamps (dbt) lists the authentication signatures with authorization time stamps.

#### » Set New Key

Sets a new DBT to your system.

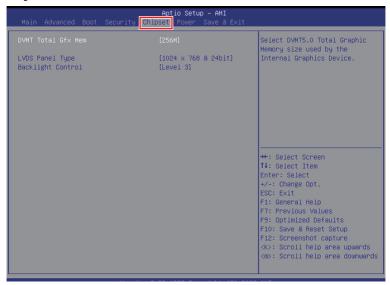
#### » Append Key

Loads an additional DBT from storage devices to your system.

#### » OsRecovery Singnatures (dbr):

Lists the available signatures for OS recovery.

# Chipset



#### ► DVMT Total Gfx Mem

This setting specifies the total graphics memory size for Dynamic Video Memory Technology (DVMT).

# ► LVDS Panel Type

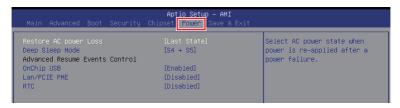
This setting specifies the LVDS Panel's resolution and distribution formats.

# ► Backlight Control

This setting controls the intensity of the LED's backlight output. When lighting conditions are brighter, set it high for a clearer image and low when it is darker.

LED's backlight output					
[Level 1]	20%				
[Level 2]	40%				
[Level 3]	60%				
[Level 4]	80%				
[Level 5]	100%				

# **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 or 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.

# ► OnChip USB

The item allows the activity of the OnChip USB device to wake up the system from S4/S5 sleep state.

#### ► LAN/ PCIE PME

Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel LAN device and onboard PCIE PME is detected.

#### ► RTC

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

# 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.

# **Audio Driver Setup**

# Installing the Intel® SST Audio Driver

The Intel® Smart Sound Technology (Intel® SST) driver enables high-quality audio processing, voice interactions, and microphone functionality on your device. This section guides you through installing the Intel® SST driver and the associated audio codec driver on a Windows operating system.



# Important

To enable the Realtek audio codec to function under the Intel® Smart Sound Technology (Intel® SST) framework on your PC, the Intel® SST driver **must be installed** before the Realtek audio driver.

# **Prerequisites**

- Operating System: Windows 10 or Windows 11 (64-bit).
- Administrative Privileges: Administrator access to the PC.
- Internet Connection: Required for driver downloads.

#### **Key Reminder**

Install the Intel® SST driver before the Realtek audio driver. The Intel® SST driver provides the necessary framework to prevent errors.

# **Installation Steps**

- 1. Download the Intel® SST Driver:
  - Visit the MSI Support Page for your IPC model.
  - Download the Intel® SST driver (.zip) and save it to a known location.
- 2. Locate and Extract the Driver File:
  - Right-click and select Extract All to a folder.
- 3. Sort and Identify the .inf File:
  - Open the extracted folder and sort contents by **Type** to group .inf files.
  - Locate the Intel<sup>®</sup> SST .inf file.
- 4. Install the Driver:
  - Right-click all the .inf file and select Install.
  - If prompted by User Account Control (UAC) window, click "Yes" to allow changes.
  - On Windows 10, click "OK" when "The operation completed successfully" appears.
- 5. Restart your PC to apply the driver.
- 6. Verify Intel® SST Installation:
  - Open **Device Manager** (Windows + X > Device Manager).
  - Expand Sound, Video, and Game Controllers and confirm that Intel® Smart Sound Technology (Intel® SST) Audio Controller is listed without a yellow exclamation mark.



• Note: After completing Intel® SST installation, the "Intel High Definition Audio" item will be shown at "Other devices" of Device Manager. Please install the audio codec driver for this.

# **GPIO WDT BKL SMBus Access Programming**

This chapter provides GPIO (General Purpose Input/Output), WDT (Watch Dog Timer), LVDS Backlight and SMBus Access programming guide.

# **Abstract**

In this section, code examples based on C programming language provided for customer interest. Inportb, Outportb, Inportl and Outportl are basic functions used for access IO ports and defined as following.

**Inportb:** Read a single 8-bit I/O port.

Outportb: Write a single byte to an 8-bit port.

**Inportl:** Reads a single 32-bit I/O port.

Outportl: Write a single long to a 32-bit port.

# **General Purpose IO**

## 1. General Purposed IO - GPIO/DIO

The GPIO port configuration addresses are listed in the following table:

Name	IO Port	IO address	Name	IO Port	IO address
N_GPI0	0xA10	Bit 0	N_GPO0	0xA10	Bit 4
N_GPI1	0xA10	Bit 1	N_GPO1	0xA10	Bit 5
N_GPI2	0xA10	Bit 2	N_GPO2	0xA10	Bit 6
N_GPI3	0xA10	Bit 3	N_GPO3	0xA10	Bit 7

#### 1.1 Set output value of GPO

- 1. Read the value from GPO port.
- 2. Set the value of GPO address.
- 3. Write the value back to GPO port.

```
Example: Set N GPO0 output "high"
```

```
val = Inportb (0xA10);
                                       // Read value from N GPO0 port.
    val = val | (1<<4);
                                       // Set N_GPOO address (bit 4) to 1 (output "high").
    Outportb (0xA10, val);
                                       // Write back to N_GPO0 port.
Example: Set N GPO1 output "low"
    val = Inportb (0xA10);
                                       // Read value from N_GPO1 port.
    val = val & (^{(1 << 5)});
                                       // Set N_GPO1 address (bit 5) to 0 (output "low").
```

// Write back to N GPO1 port.

#### 1.2 Read input value from GPI

Outportb (0xA10, val);

- 1. Read the value from GPI port.
- Get the value of GPI address. 2.

#### Example: Get N\_GPI2 input value.

```
val = Inportb (0xA10);
                                    // Read value from N_GPI2 port.
val = val & (1<<2);
                                    // Read N_GPI2 address (bit 2).
if (val)
         printf ("Input of N_GPI2 is High");
else
           printf ("Input of N_GPI2 is Low");
```

# **Watchdog Timer**

# 2. Watchdog Timer - WDT

The base address (WDT\_BASE) of WDT configuration registers is 0xA10.

#### 2.1 Set WDT Time Unit

```
val = Inportb (WDT BASE + 0x05);
                                        // Read current WDT setting
val = val \mid 0x08;
                                        // minute mode. val = val & 0xF7 if second mode
Outportb (WDT_BASE + 0x05, val);
                                       // Write back WDT setting
```

#### 2.2 Set WDT Time

```
Outportb (WDT BASE + 0x06, Time); // Write WDT time, value 1 to 255.
```

#### **Enable WDT** 2.3

```
val = Inportb (WDT_BASE + 0x0A);
                                        // Read current WDT_PME setting
                                        // Enable WDT OUT: WDOUT_EN (bit 0) set to 1.
val = val \mid 0x01;
Outportb (WDT BASE + 0x0A, val);
                                        // Write back WDT setting.
val = Inportb (WDT BASE + 0x05);
                                        // Read current WDT setting
val = val \mid 0x20;
                                        // Enable WDT by set WD EN (bit 5) to 1.
Outportb (WDT BASE + 0x05, val);
                                        // Write back WDT setting.
```

#### 2.4 Disable WDT

```
val = Inportb (WDT_BASE + 0x05);
                                        // Read current WDT setting
val = val & 0xDF;
                                        // Disable WDT by set WD_EN (bit 5) to 0.
Outportb (WDT_BASE + 0x05, val);
                                        // Write back WDT setting.
```

#### 2.5 **Check WDT Reset Flag**

If the system has been reset by WDT function, this flag will set to 1.

```
val = Inportb (WDT_BASE + 0x05);
                                 // Read current WDT setting.
val = val & 0x40;
                                       // Check WDTMOUT STS (bit 6).
if (val)
         printf ("timeout event occurred");
else
         printf ("timeout event not occurred");
```

#### 2.6 **Clear WDT Reset Flag**

```
val = Inportb (WDT_BASE + 0x05);
                                     // Read current WDT setting
val = val | 0x40;
                                      // Set 1 to WDTMOUT_STS (bit 6);
Outportb (WDT_BASE + 0x05, val);
                                     // Write back WDT setting
```

# LVDS Backlight Control

## 3. LVDS Backlight Control - BKL

The controller support LVDS backlight level control from 0(0%) to 255(100%), the default backlight level is 100%. It must be controlled by SMBus access. The details of SMBus access (SMBus ReadByte, SMBus WriteByte) are provided in this document.

#### Set the Level of LVDS Backlight 3.1

- 1. Write 0x0D into address 0x00 on SMBus device 0x42.
- 2. Write desired backlight level from 0(0%) to 255(100%) into address 0x35 on SMBus device 0x42.

# Example 3: Set LVDS backlight level to "100%" SMBus WriteByte (0x42, 0x00, 0x0D) SMBus\_WriteByte (0x42, 0x35, 0xFF)

#### 3.2 Read the Level of LVDS Backlight

- 4. Write **0x0D** into address **0x00** on SMBus device 0x42.
- 5. Read current backlight level from address 0x35 on SMBus device 0x42.

#### Example 4: Get LVDS backlight level

```
SMBus_WriteByte(0x42, 0x00, 0x0D);
BKL_Value = SMBus_ReadByte(0x42, 0x35);
```

# **SMBus Access**

#### 4. SMBus Access

The base address of SMBus must know before access. The relevant bus and device information are as following.

```
#define IO SC
                    0xCF8
#define IO DA
                   0xCFC
#define PCIBASEADDRESS 0x80000000
#define PCI_BUS_NUM 0
#define PCI DEV NUM 31
#define PCI_FUN_NUM 4
```

#### Get SMBus Base Address 4.1

```
int SMBUS BASE;
int DATA ADDR = PCIBASEADDRESS + (PCI BUS NUM<<16) +
                                 (PCI DEV NUM<<11) +
                                 (PCI FUN NUM << 8);
Outportl (DATA_ADDR + 0x20, IO_SC);
SMBUS BASE = Inportl (IO DA) & 0xfffffff0;
```

#### 4.2 SMBus ReadByte (char DEVID, char offset)

Read the value of OFFSET from SMBus device DEVID.

```
Outportb (LOWORD (SMBUS BASE), 0xFE);
Outportb (LOWORD (SMBUS BASE) + 0x04, DEVID + 1); //out Base + 04, (DEVID + 1)
Outportb (LOWORD (SMBUS BASE) + 0x03, OFFSET); //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS BASE) + 0x02, 0x48); //out Base + 02, 48H
mdelay (20);
                                                //delay 20ms to let data ready
while ((Inportl (SMBUS BASE) & 0x01) != 0);
                                                //wait SMBus ready
SMB_DATA = Inportb (LOWORD (SMBUS_BASE) + 0x05); //input Base + 05
```

#### 4.3 SMBus\_WriteByte (char DEVID, char offset, char DATA)

Write <u>DATA</u> to <u>OFFSET</u> on SMBus device <u>DEVID</u>.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS BASE) + 0x04, DEVID); //out Base + 04, (DEVID)
Outportb (LOWORD (SMBUS BASE) + 0x03, OFFSET); //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x05, DATA);
                                               //out Base + 05, DATA
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);
                                               //out Base + 02, 48H
mdelay (20);
                                               //wait 20ms
```