# Neousys Technology Inc.

## Nuvo-2822

## User Manual

Revision 1.0

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# Legal Information

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# Declaration of Conformity

| **FCC** | This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense. |
| --- | --- |
| **CE** | The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques. |

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# Safety Precautions

- Read these instructions carefully before you install, operate, or transport the system.

- Install the system or DIN rail associated with, at a sturdy location

- Install the power socket outlet near the system where it is easily accessible

- Secure each system module(s) using its retaining screws

- Place power cords and other connection cables away from foot traffic. Do not place items over power cords and make sure they do not rest against data cables

- Shutdown, disconnect all cables from the system and ground yourself before touching internal modules

- Ensure that the correct power range is being used before powering the device

- Should a module fail, arrange for a replacement as soon as possible to minimize down-time

- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

# Service and Maintenance

- ONLY qualified personnel should service the system

- Shutdown the system, disconnect the power cord and all other connections before servicing the system

- When replacing/ installing additional components (expansion card, memory module, etc.), insert them as gently as possible while assuring proper connector engagement

# ESD Precautions

- Handle add-on module, motherboard by their retention screws or the module's frame/ heat sink. Avoid touching the PCB circuit board or add-on module connector pins

- Use a grounded wrist strap and an anti-static work pad to discharge static electricity when installing or maintaining the system

- Avoid dust, debris, carpets, plastic, vinyl and styrofoam in your work area.

- Do not remove any module or component from its anti-static bag before installation

# About This Manual

This manual introduces Neousys Nuvo-2822 series featuring Intel® Alder Lake N CPU with two PCIe and PCI slots expandability.

The guide also demonstrates the system's installation procedures.

## Revision History

| Version | Date | Description |
|---------|-----------|-----------------|
| 1.0 | Sep. 2024 | Initial release |

# 1 Introduction

Nuvo-2822 is a compact expansion box PC powered by an Intel Alder Lake N CPU featuring two PCIe and two PCI slots. The expansion slots are designed to support various frame grabbers, motion control cards, COM port expansion cards, and data acquisition cards.



With up to five times the performance boost compared to our previous Nuvo-2400 series, the new Nuvo-2822 can efficiently process vast amounts of data acquired from extensive I/O interfaces in real time. It features two Ethernet ports with I210-IT controllers, and two USB 3.2 Gen 2 ports with screw lock mechanisms to connect and secure industrial cameras for machine vision applications. Furthermore, the Nuvo-2822 supports 8-channel isolated DIO and four COM ports to communicate with and control various industrial sensors, indicators, motors, and actuators.

The system also features a unique "Super Power Saving Mode" to minimize energy consumption when the system is in standby (S4/S5) mode, significantly reducing electricity usage without taxing performance. Thanks to its compact dimensions, it can be deployed in restricted spaces or small cabinets. With support for versatile PCIe and PCI expansion cards, it is ideal for industrial control and machine automation applications.

## 1.1 Product Specifications

### 1.1.1 Nuvo-2822 Specifications

| System Core | |
|---|---|
| Processor | Intel® Alder Lake N97 (4C/ 4T, 2.0/ 3.6GHz, 12W TDP) |
| Graphics | Integrated Intel® UHD Graphics with 24EUs |
| Memory | Up to 16 GB DDR5 4800 SDRAM (one SODIMM slot) |
| TPM | Supports dTPM 2.0 |
| **I/O Interface** | |
| Ethernet | 2x Gigabit Ethernet port by Intel® I210-IT (1x WOL) |
| USB | 2x USB 3.2 Gen2 ports with screw-lock<br>2x USB 2.0 ports with screw-lock |
| Video port | 1x DP++, supporting 4096 x 2169 resolution<br>1x HDMI 1.4b, supporting 3840 x 2160 @ 30 Hz |
| Serial Port | 1x software-programmable RS-232/ 422/ 485 ports (COM1)<br>3x 3-wire RS-232 ports (COM3/ COM4/ COM5) |
| Isolate DIO | 4-CH isolated DI and 4-CH isolated DO |
| **Storage Interface** | |
| M.2 M key | 1x M.2 2280 M key expansion slot (SATA signal only) |
| **Expansion Bus** | |
| PCI Express | 1x PCIe x4 slot@Gen3, 4-lanes<br>1x PCIe x4 slot@Gen3, 1-lanes |
| PCI | 2x 33MHz/ 32-bit 5V |
| **Power Supply** | |
| DC Input | 1x 2-pin pluggable terminal block for 12V to 24V DC input |
| Remote ctrl & LED output (optional) | 1x 10-pin (2x5) wafer connector for remote on/ ff control and status LED output |
| **Mechanical** | |
| Dimension | 164.6 mm (W) x 214 mm (D) x 135.6 mm (H) |
| Weight | 2.3 Kg |
| Mounting | Wall-mounting (optional) |
| **Environmental** | |
| Operating temperature | With fan kit<br>-10°C to 70°C [1][2]<br>Without fan kit<br>-10°C to 60°C [1] |

| Storage temperature | -40°C to 85°C |
|---|---|
| Humidity | 10% to 90%, non-condensing |
| Vibration | MIL-STD-810H, Method 514.8, Category 4 |
| Shock | MIL-STD-810H, Method 516.8, Procedure I |
| EMC | CE/ FCC Class A, according to EN 55032 & EN 55035 |

**[1]** For sub-zero and over 60°C operating temperatures, a wide temperature Solid State Disk (SSD) is required.

**[2]** The optional fan kit is recommended for operating at ambient temperatures higher than 60°C.

## 1.2 Nuvo-2822 Dimensions

✎ NOTE

*All measurements are in millimeters (mm).*

### 1.2.1 Nuvo-2822 I/O Panel View
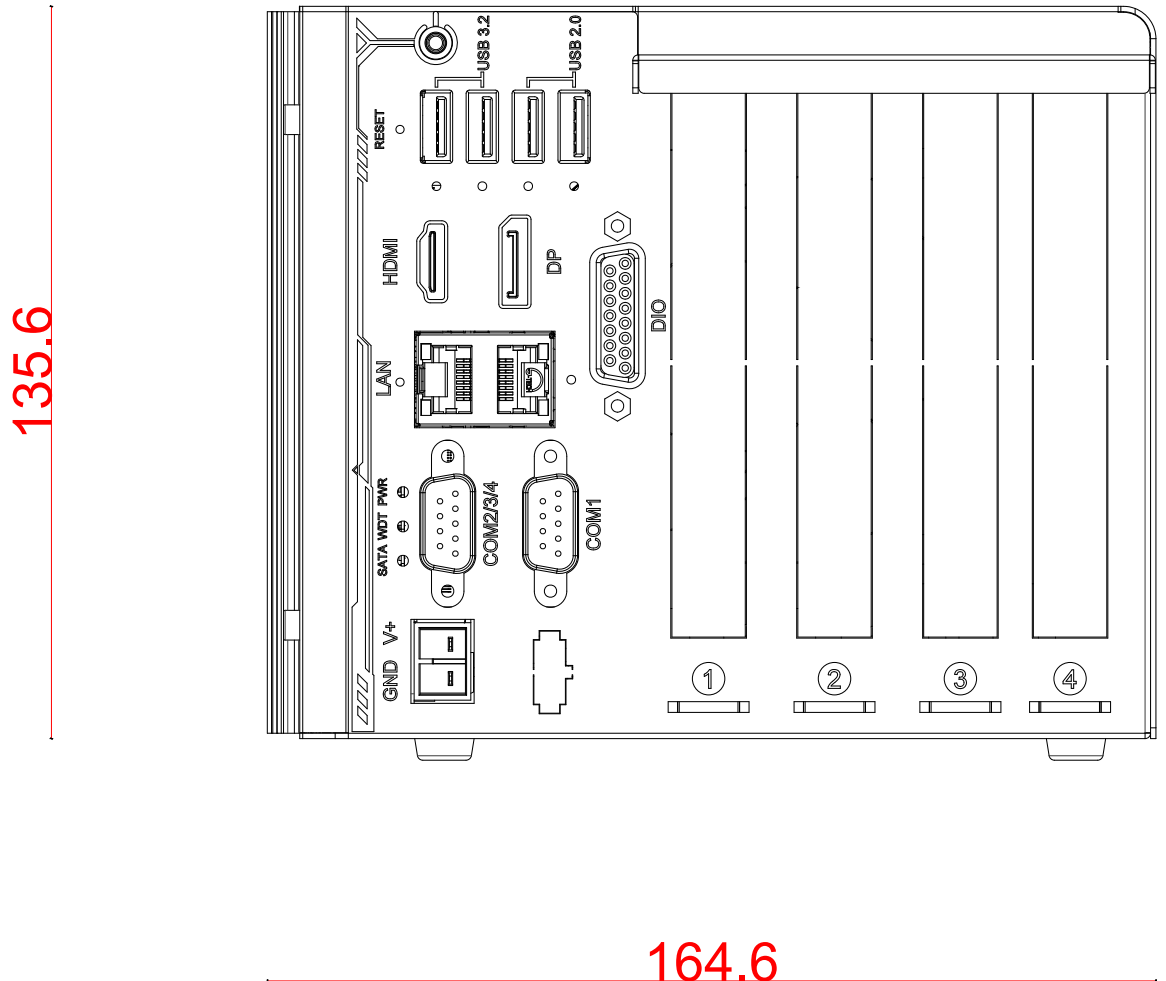
### 1.2.2 Nuvo-2822 Side View
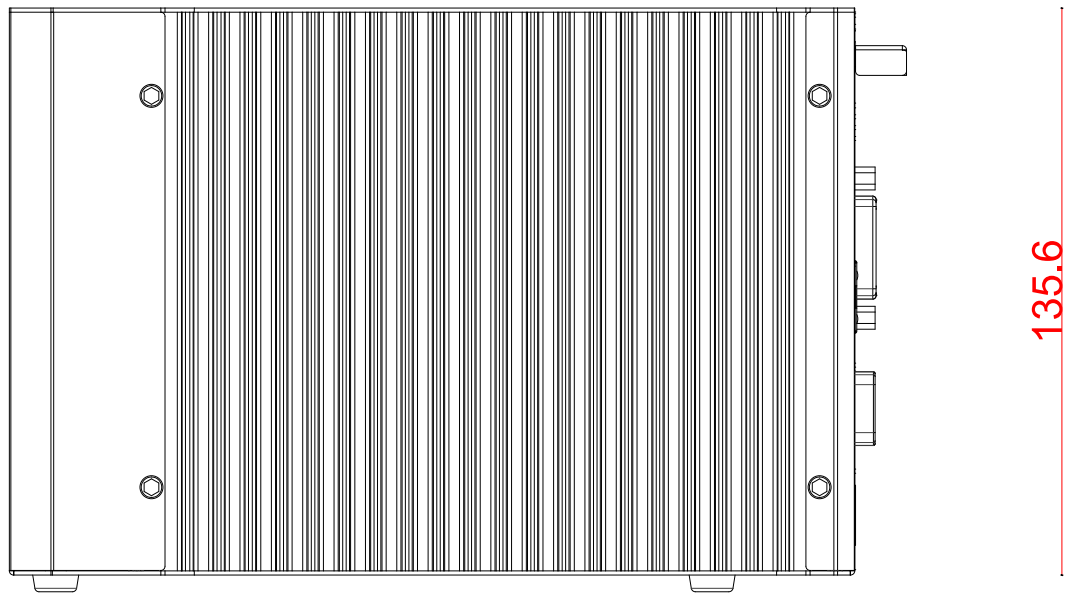


135.6

214.6

### 1.2.3 Nuvo-2822 Bottom View
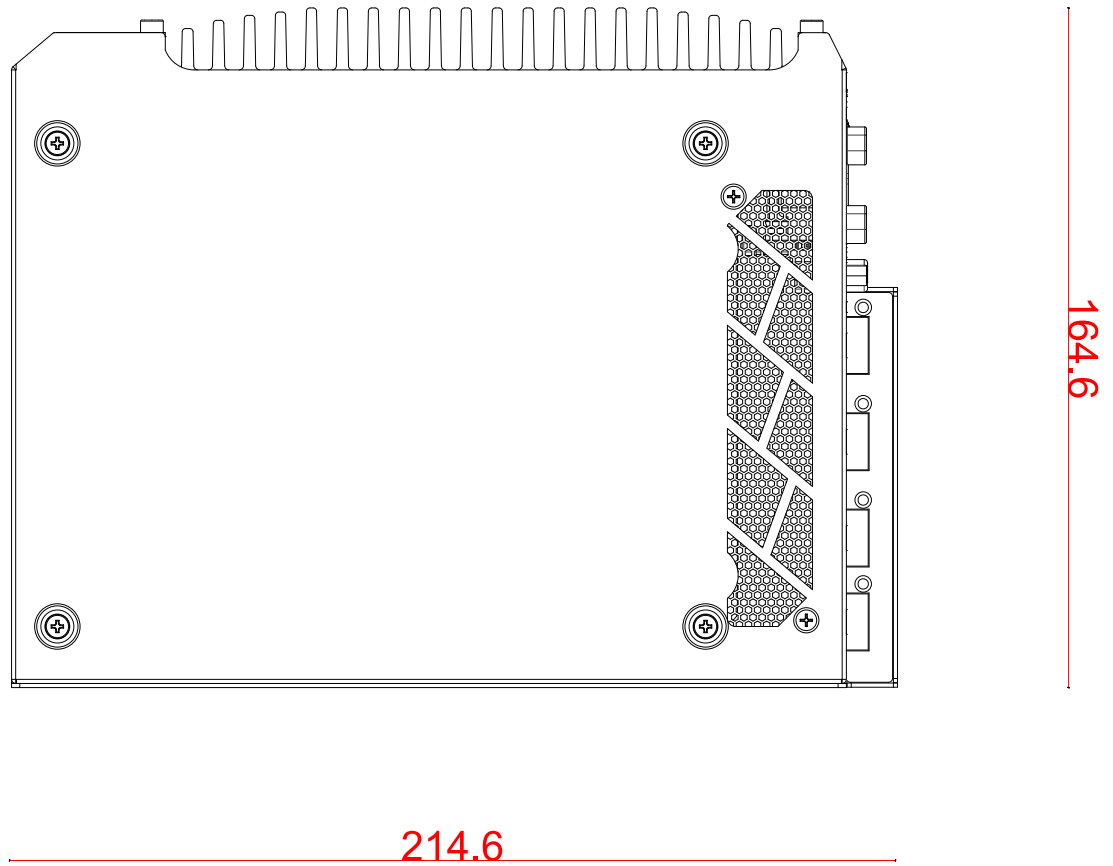
# 2 Overview

Upon receiving and unpacking your Nuvo-2822 system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neousys Technology.

## 2.1 Nuvo-2822 Packing List

| System Pack | Nuvo-2822 series | Qty |
|---|---|---|
| 1 | Nuvo-2822 series system <br> (If you ordered RAM/ HDD, please verify these items) | 1 |
| 2 | Accessory box, which contains <br> ●    2-pin power terminal block | 1 |

## 2.2 Nuvo-2822 Series I/O Panel

The Nuvo-2822 I/O panel features USB3.2, USB2.0, HDMI, DP, Ethernet and COM ports.
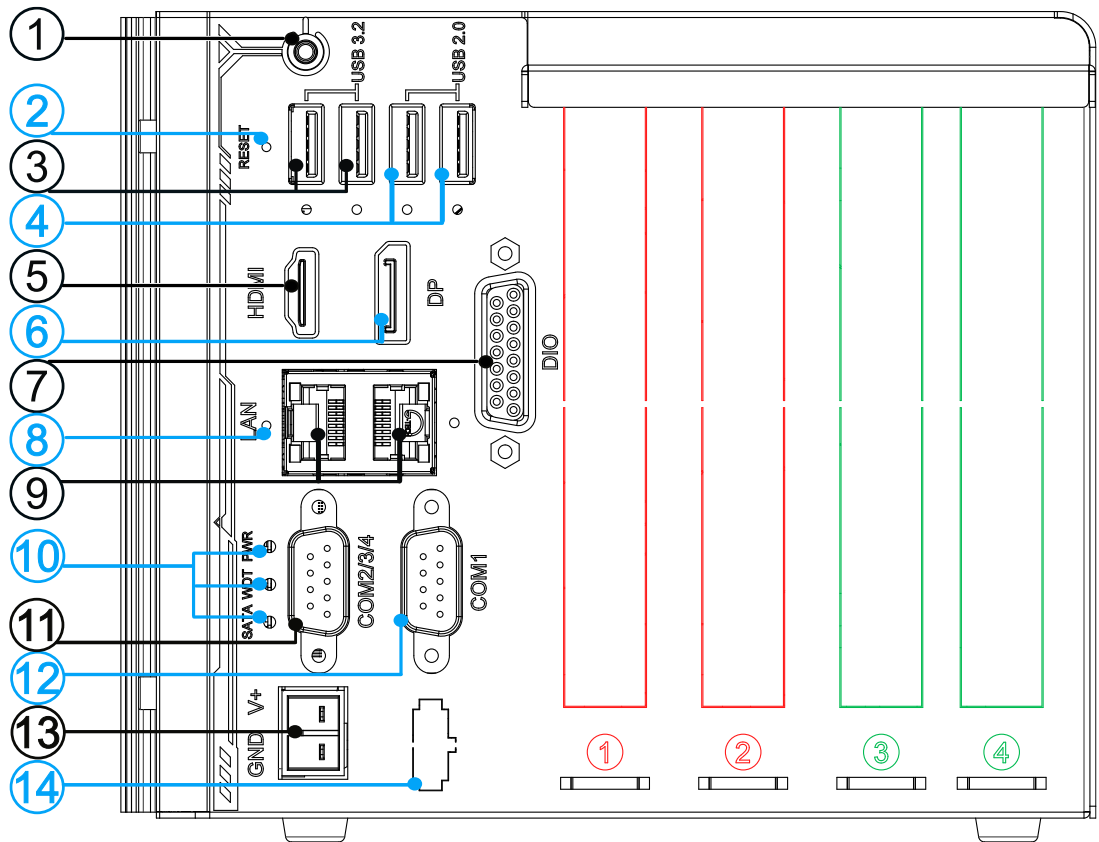


| No. | Item | Description |
|---|---|---|
| 1 | Power button | Use this button to turn on or shutdown the system |
| 2 | Reset button | Use this button to manual reset the system |
| 3 | USB3.2 Gen2 | USB3.2 Gen2 offers up to 10Gbps of data-throughput performance |
| 4 | USB2.0 | USB2.0 offers up to 480Mbits/sec data-throughput performance |
| 5 | HDMI | The HDMI port is a high-resolution graphics/ data port supporting up to 3840 x 2160 @ 30Hz |
| 6 | DisplayPort | Support display resolutions up to 4096 x 2304. Compatible with HDMI/ DVI via respective adapter/ cable (resolution may vary) |
| 7 | Digital input/ output | The DIO port provides 4x digital input and 4x output channels |
| 8 | Clear CMOS | Use this button to manually to reset the CMOS to load default BIOS |
| 9 | Ethernet port | Gigabit Ethernet ports by Intel® I210-IT |
| 10 | Status LED indicator | From top to bottom, the LEDs are PWR (system power), WDT (watchdog timer), SATA (hard disk drive) |
| 11 | COM 2/ 3/ 4 | COM 2 port is a software-selectable RS-422/ 485 port. |

| 12 | COM 1 | COM 1 port is a software-selectable RS-232/ 422/ 485 port. The operation mode can be set in BIOS |
|---|---|---|
| 13 | 2-pin terminal block | The system accepts 12V - 24V DC power input |
| 14 | On/ off control & status LED connector (optional) | Reserved punch-out panel for On/ Off control and status LED extension. Please refer to its installation for details |
| **PCIe slots** | | Indicated in **red** are PCIe slots: <br> Slot (1) is x4 Gen3 <br> Slot (2) is x1 Gen3 |
| **PCI slots** | | Indicated in **green** are PCI 33MHz/ 32-bit 5V PCI slots |

### 2.2.1 Power Button
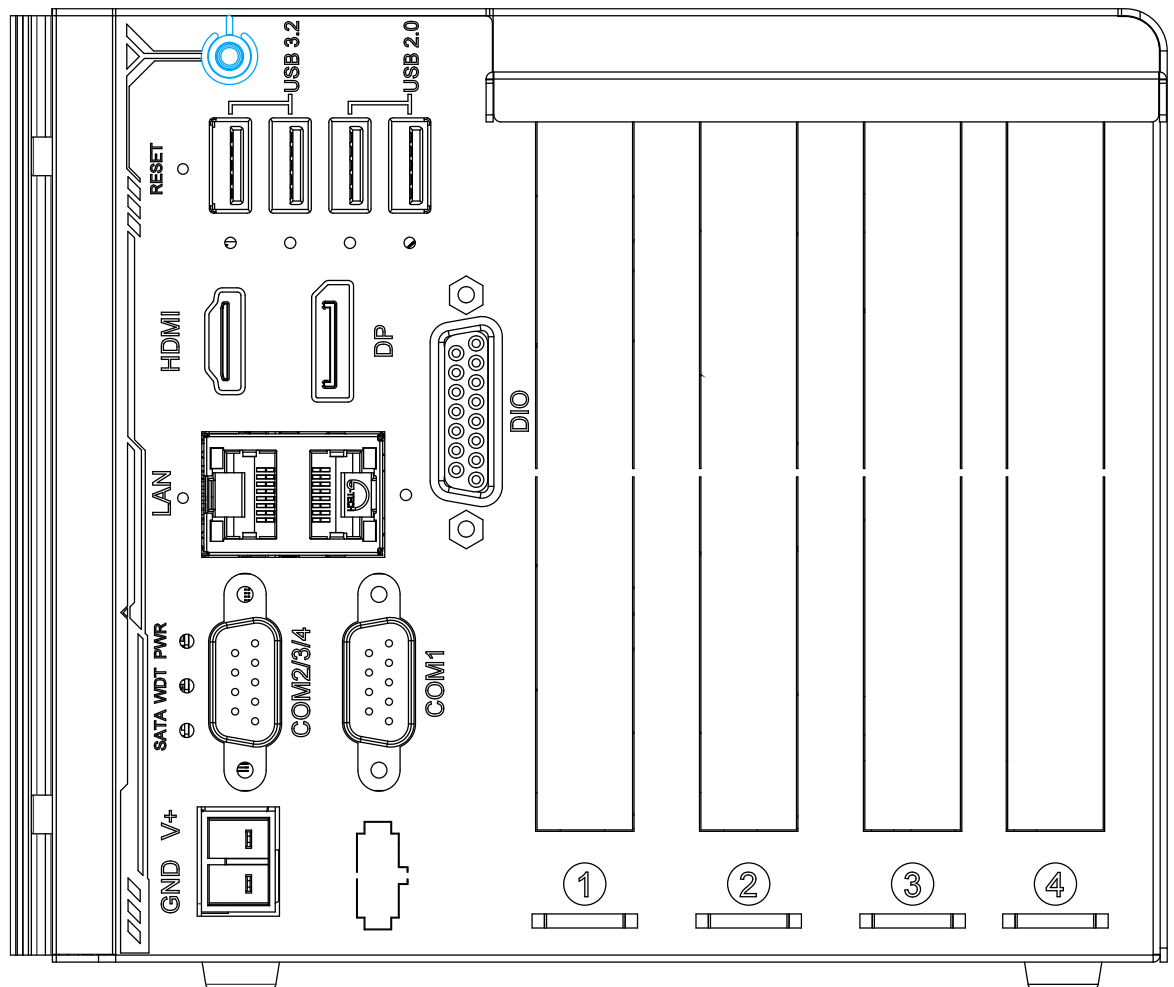


The power button is a non-latched switch for ATX mode on/off operation. To turn on the system, press the power button and the PWR LED should light-up green. To turn off the system, issuing a shutdown command in OS is preferred, or you can simply press the power button. To force shutdown when the system freezes, press and hold the power button for 5 seconds. Please note that there is a 5-second interval between on/off operations (i.e. once the system is turned off, there is a 5-second wait before you can power-on the system).

### 2.2.2 Reset Button
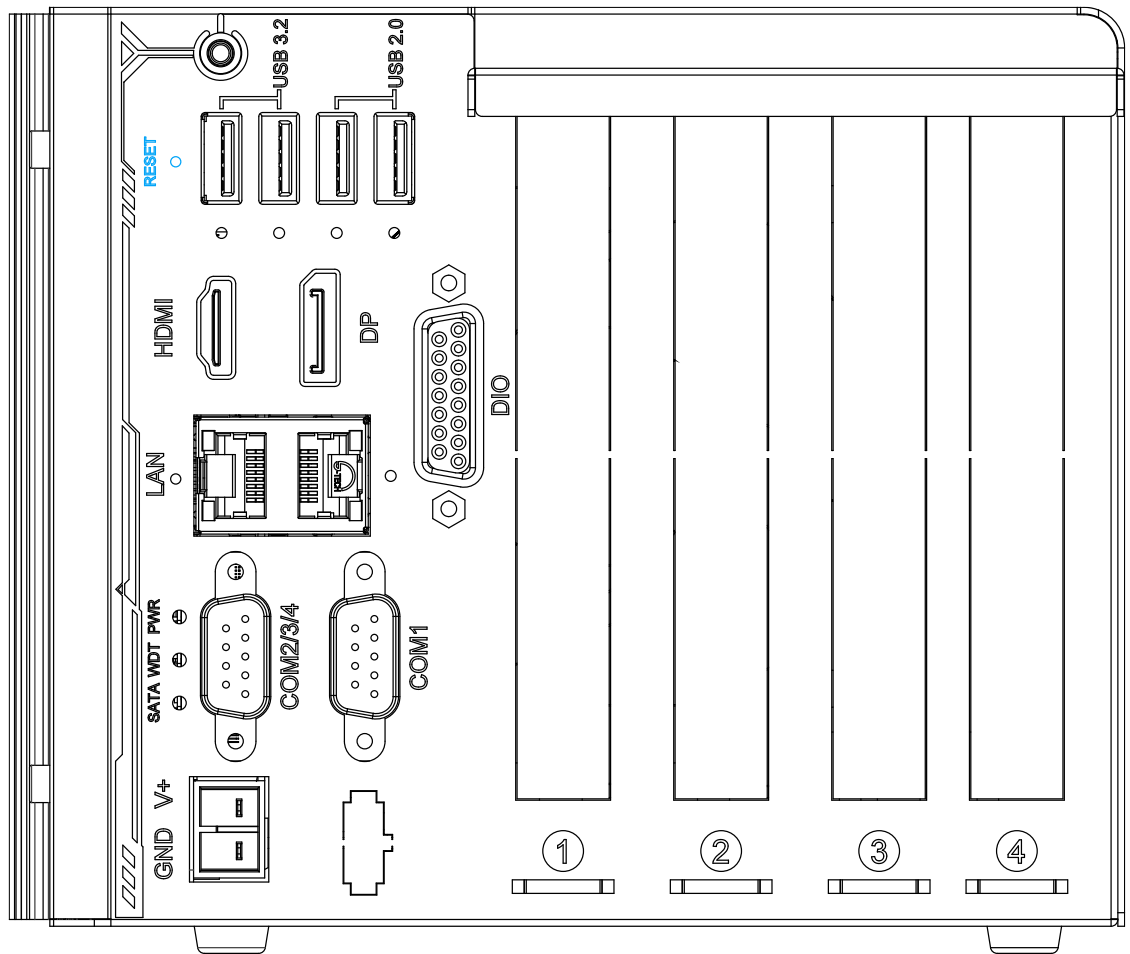


The reset button is used to manually reset the system in case of system halt or malfunction. To avoid unexpected reset, the button is purposely placed behind the panel. To reset, please use a pin-like object (eg. tip of a pen) to access the reset button.

### 2.2.3 USB3.2 Gen2 Ports
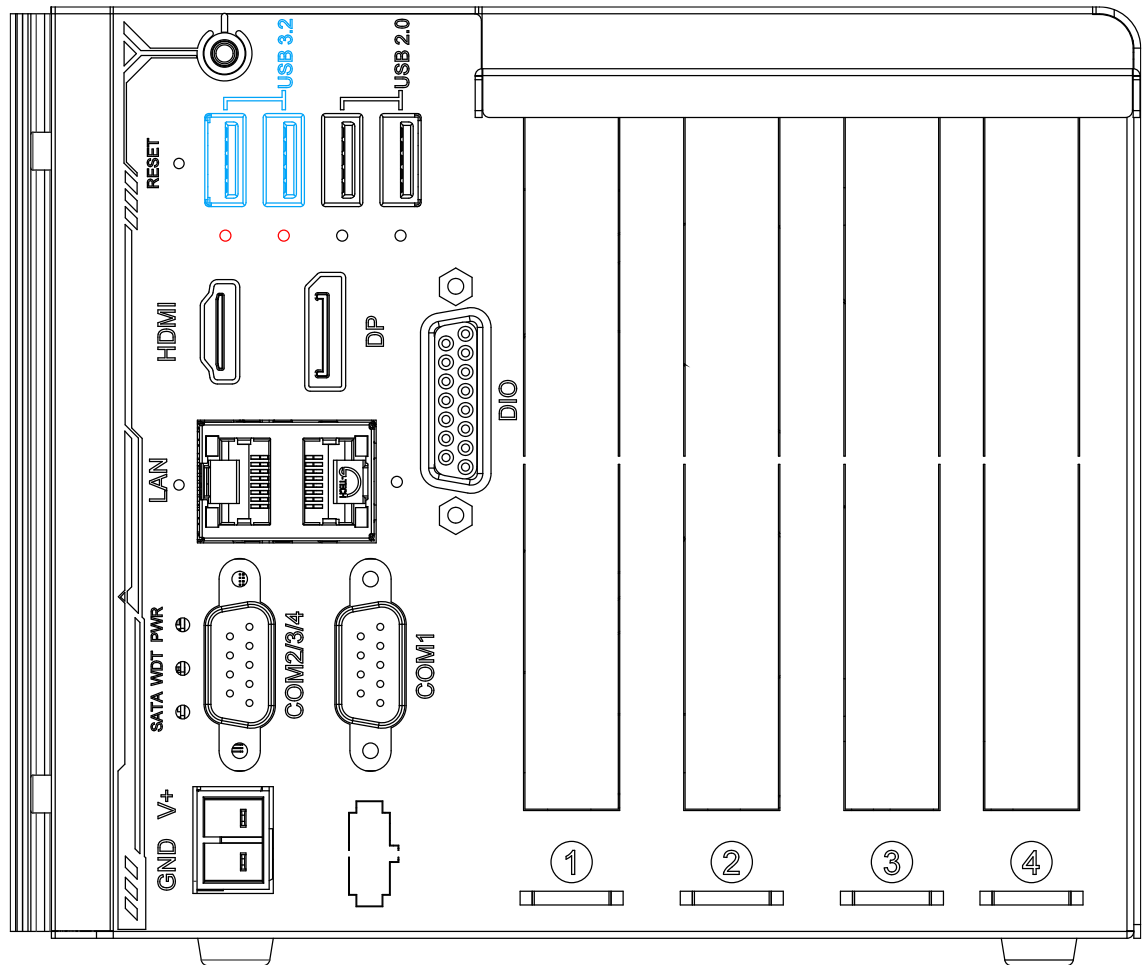


The system offers USB3.2 Gen2 ports with screw-lock mechanism (indicated in **red**). It is backward-compatible with USB 2.0, USB 1.1 and USB 1.0 devices.

### 2.2.4 USB2.0 Ports
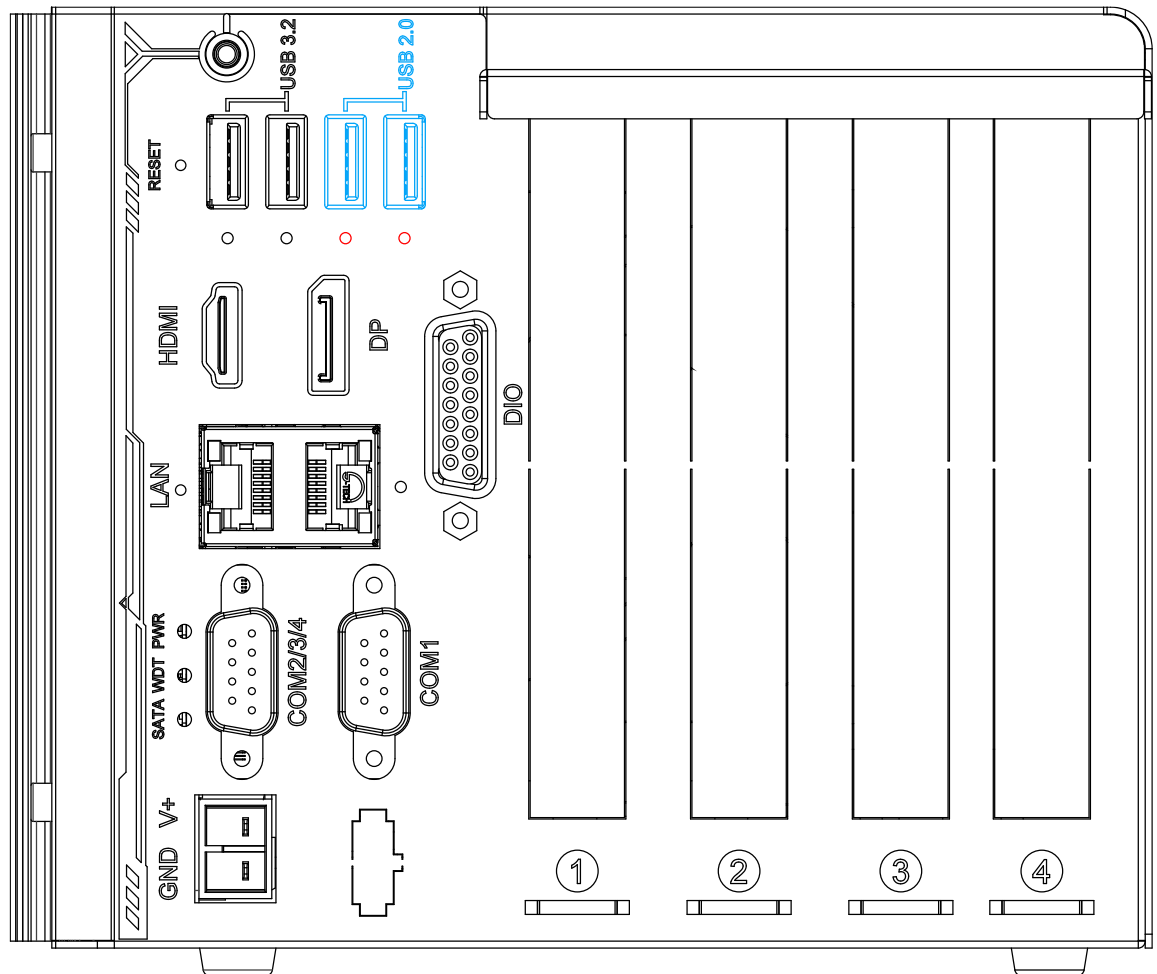


The system offers USB2.0 ports with screw-lock mechanism (indicated in **red**). It is backward-compatible with USB 1.1 and USB 1.0 devices.

### 2.2.5 HDMI Port
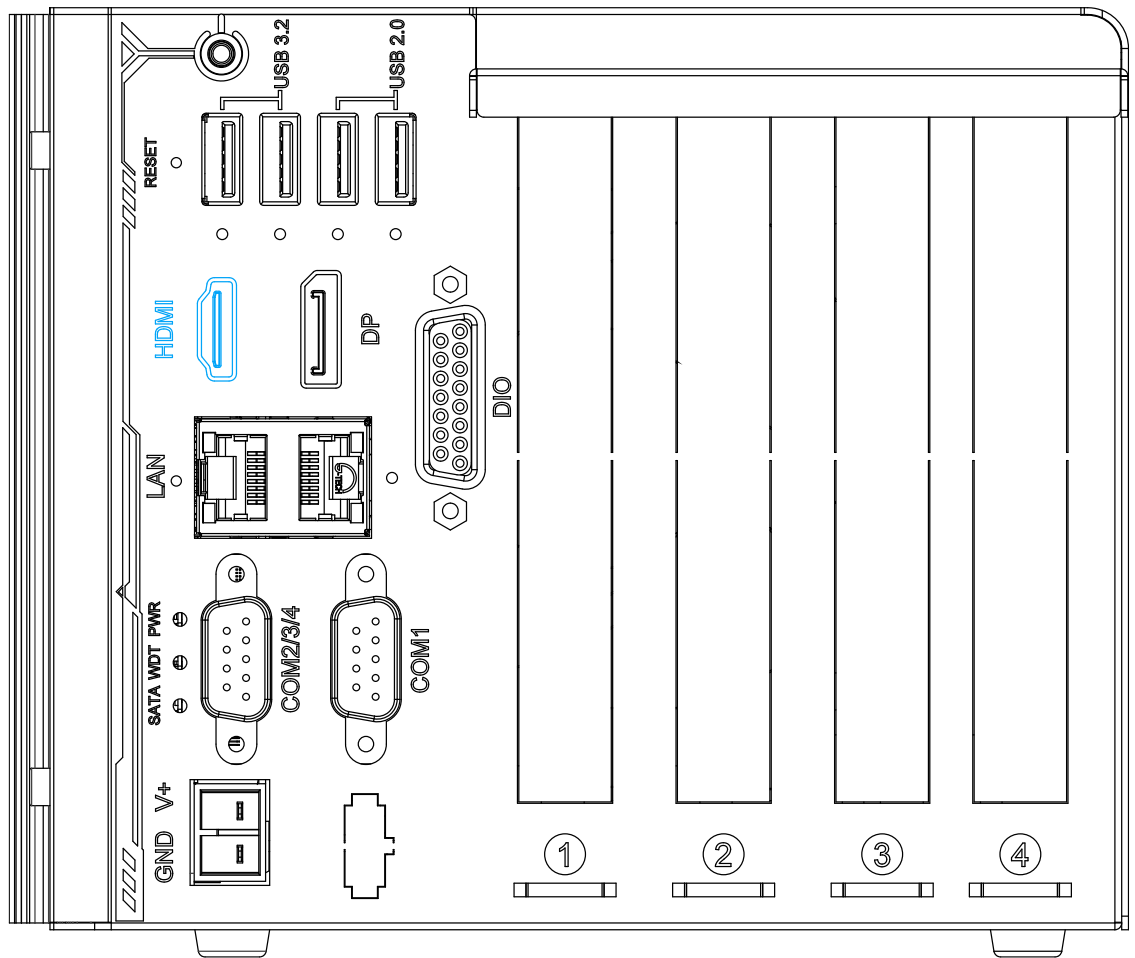


The High-Definition Multimedia Interface (HDMI) port provides uncompressed high-quality digital video and audio transmission between the system and a multimedia display device on a single cable. You can connect to other digital inputs by using a HDMI-to-DVI or HDMI-to-DP cable.

The system supports dual independent display outputs by connecting display devices to HDMI and DisplayPort connection. To support dual display outputs and achieve best DisplayPort output resolution in Windows, you need to install corresponding graphics drivers. Please refer to section OS Support and Driver Installation for details.



**HDMI-to-DP**

## 2.2.6 DisplayPort
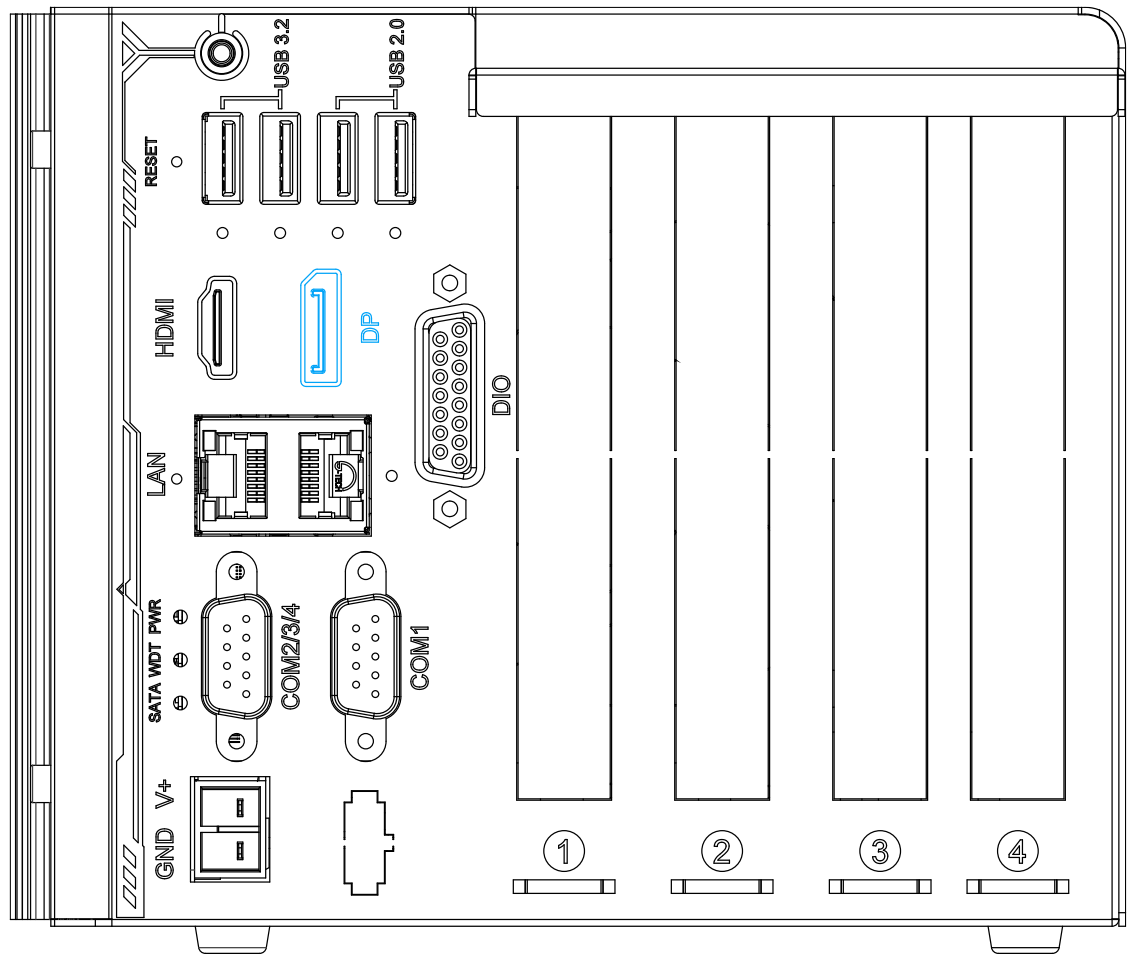


The DisplayPort (DP) output is a digital display interface that mainly connect video source and carry audio to a display device. When connecting a DP, it can deliver up to 4K UHD (4096 x 2304) in resolution. The system is designed to support passive DP adapter/ cable. You can connect to other display devices using DP-to-HDMI cable or DP-to-DVI cable.



**DP-to-HDMI**                                    **DP-to-DVI**

The system supports triple independent display outputs by connecting display devices to VGA, DVI and DisplayPort connection. To support multiple display outputs and achieve best DisplayPort output resolution in Windows, you need to install corresponding graphics drivers. Please refer to section OS Support and Driver Installation for details.

## 2.2.7 Digital Input/ Output
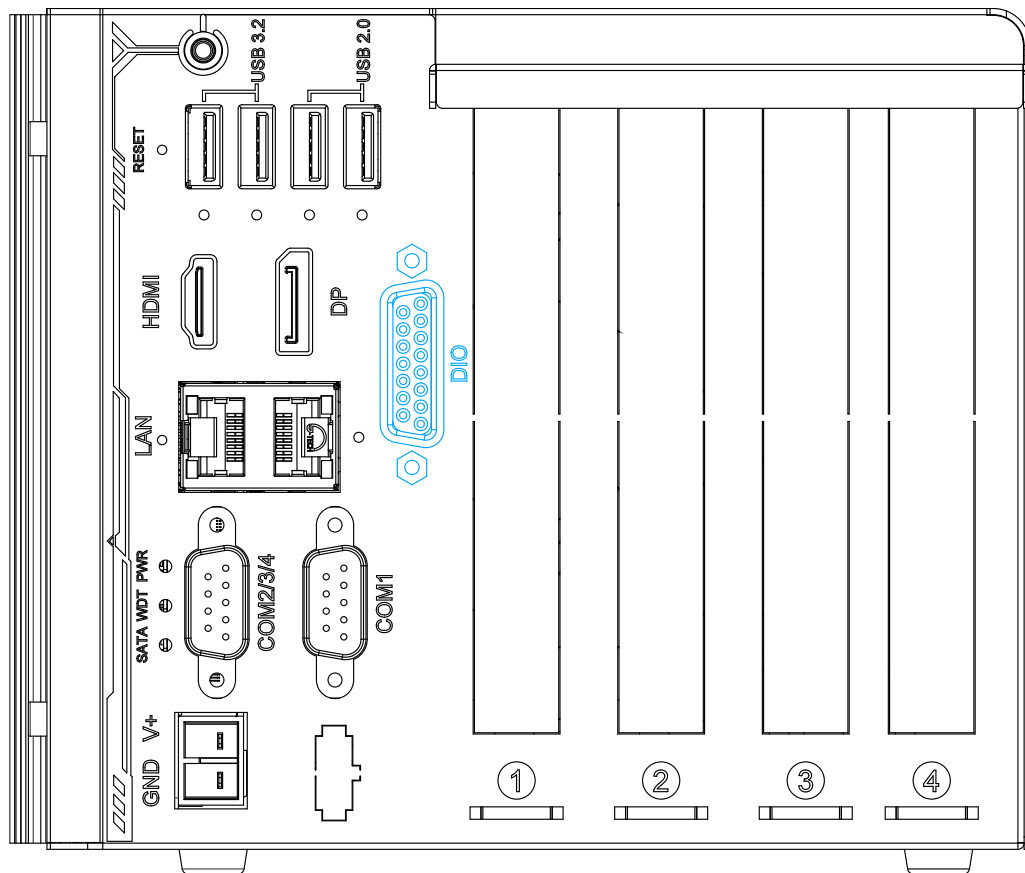


The system provides 4x isolated digital input channels and 4x isolated digital output channels. The DIO functions support polling mode I/O access and DI change-of-state interrupt. Please refer to Watchdog Timer & Isolated DIO for information on wiring and programming the isolated DIO channels.
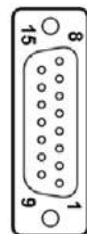


| Pin# | Pin Definition | Pin# | Pin Definition |
|------|----------------|------|----------------|
| 1 | DI_0 | 9 | DI_GND |
| 2 | DI_1 | 10 | DI_2 |
| 3 | DI_GND | 11 | DI_3 |
| 4 | DO_GND | 12 | DO_GND |
| 5 | DO_0 | 13 | DO_2 |
| 6 | DO_1 | 14 | DO_3 |
| 7 | DO_GND | 15 | - |
| 8 | VDD | | |

**Wiring for Digital Input/ Output**

The digital input function is implemented using a photo-coupler with an internally series-connected 1kΩ resistor. You need to provide a voltage to specify the logic high/low state. The input voltage for logic high is 5~24V, and the input voltage for logic low is 0~1.5V.
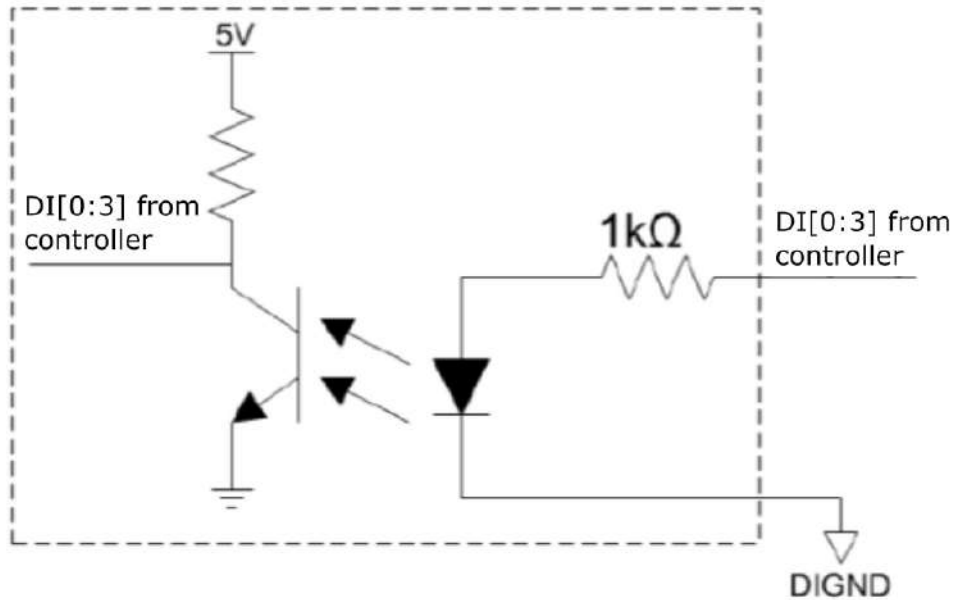


The digital output function is implemented using Power MOSFET + Analog Device iCoupler® component. The DO channels are configured as NO (normally-open) configuration. When you turn on the system, all DO channels have a deterministic state of logic 0 (circuit disconnected from GND return). When logic 1 is specified, MOSFET is activated and GND return path is established. The digital output function on the system supports sinking current connection. The following diagrams are the suggested wiring for DO:
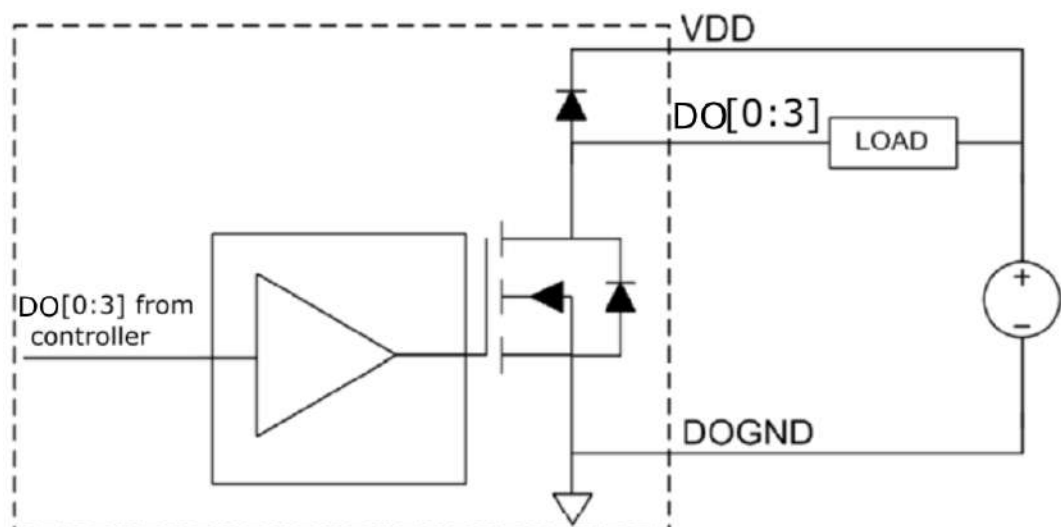
## 2.2.8 Clear CMOS Button
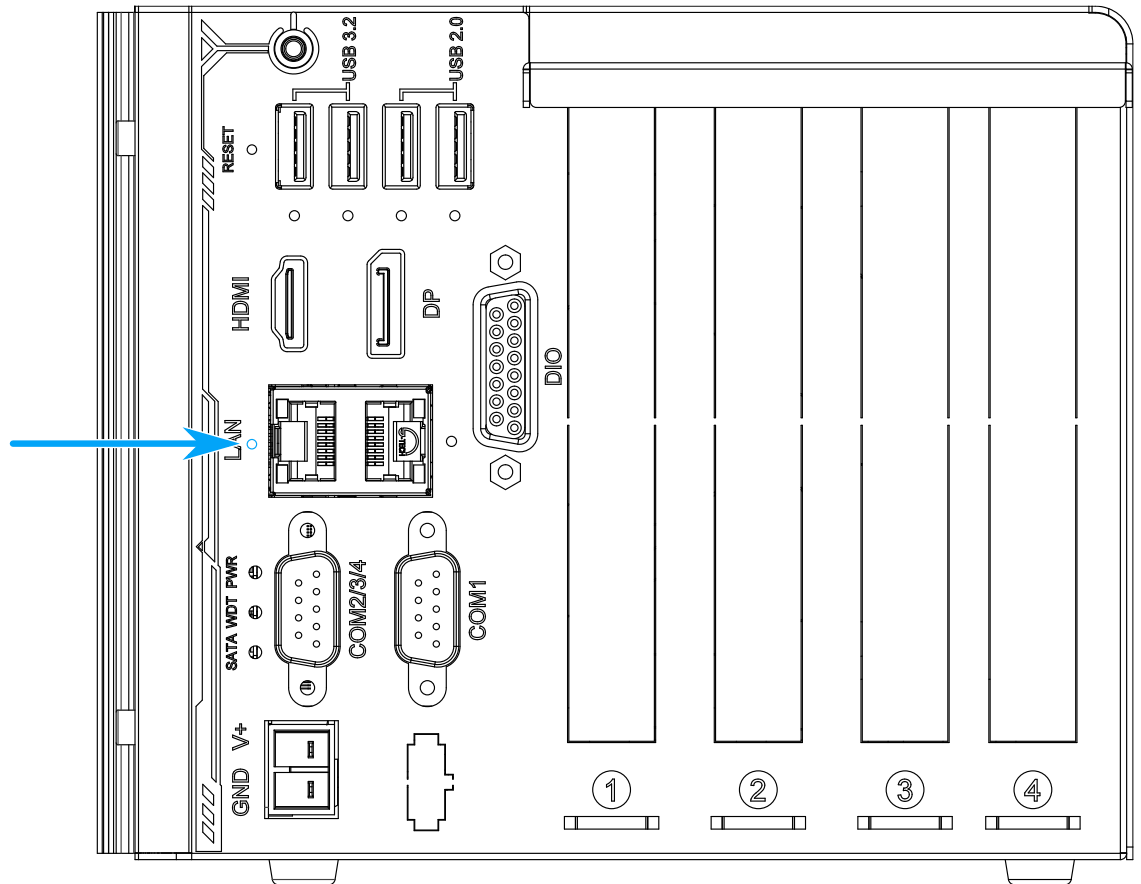


The CMOS Reset button is used to manually reset the motherboard BIOS in case of system halt or malfunction. To avoid unexpected operation, it is purposely placed behind the panel. To reset, disconnect the DC power input, and use the tip of a pen to press and hold for at least 5 seconds to reset the BIOS.

✎ NOTE

*You **MUST** disconnect the DC input from the system before resetting the CMOS.*

⚠ WARNING

*Clearing the CMOS will reset all BIOS settings to default and may result in down time!*

### 2.2.9 Gigabit Ethernet Ports
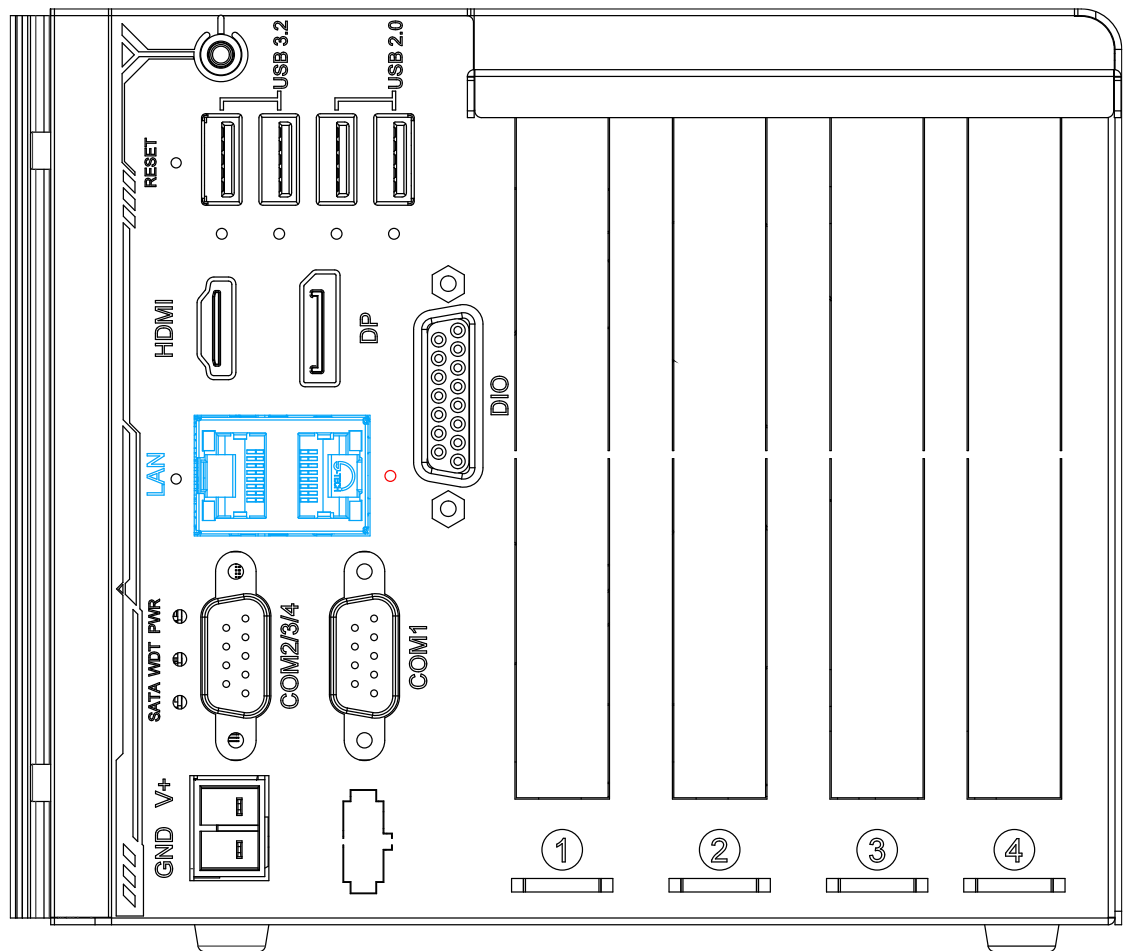


This Gigabit Ethernet port with screw lock mechanism (indicated in **red**) is implemented using Intel® I210-IT controller. The Ethernet port has one dedicated PCI Express link for maximum performance. Please refer to the table below for LED connection statuses.

**Active/Link LED**

| LED Color | Status | Description |
|---|---|---|
| Green | Off | Ethernet port is disconnected |
| | On | Ethernet port is connected and no data transmission |
| | Flashing | Ethernet port is connected and data is transmitting/receiving |

**Speed LED**

| LED Color | Status | Description |
|---|---|---|
| Green or Orange | Off | 10 Mbps |
| | Green | 100 Mbps |
| | Orange | 1000 Mbps |

To utilize the GbE port in Windows, you need to install corresponding driver for Intel®

I210-IT GbE controller.

### 2.2.10 Status LED Indicators
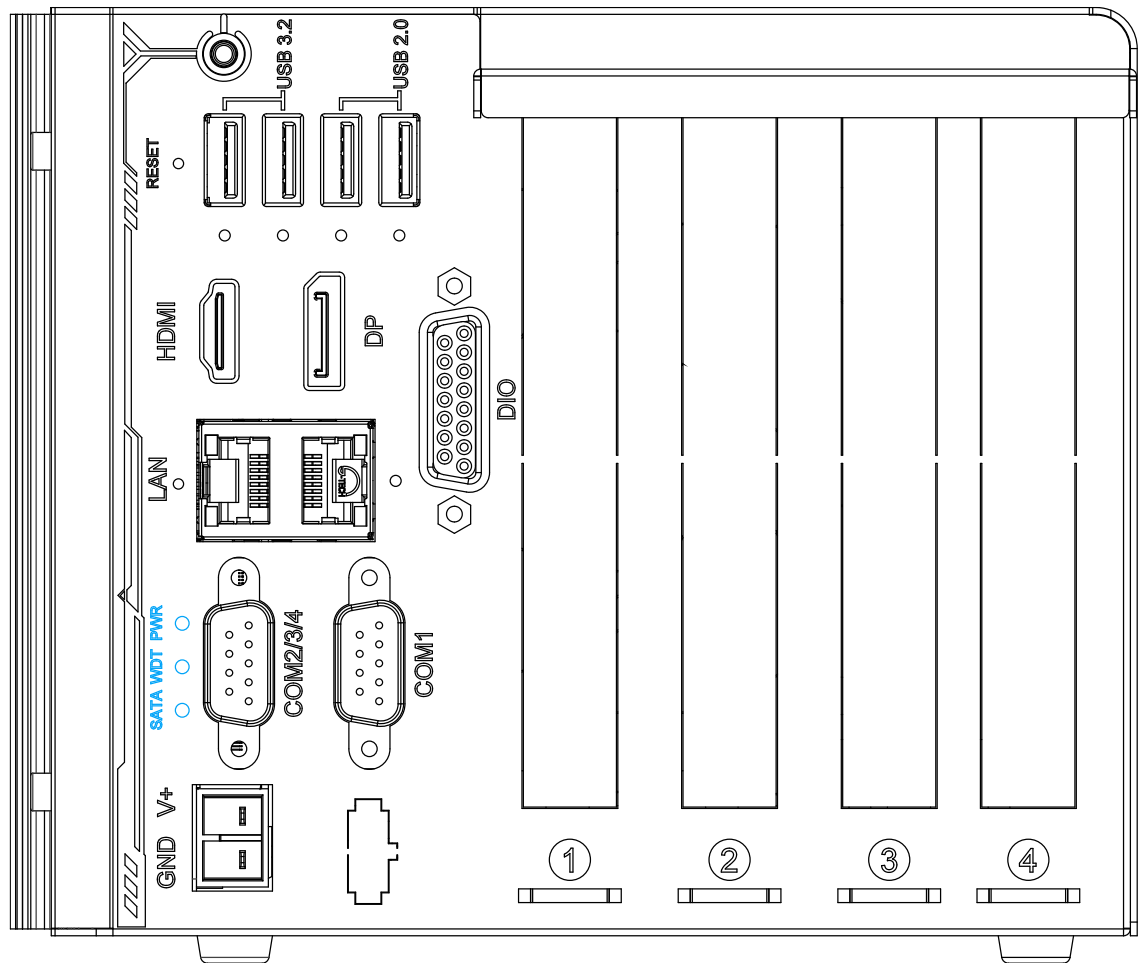


There are three LED indicators on the I/O panel. From top to bottom, they are power (PWR), Watchdog timer (WDT) and hard disk drive activity (SATA).    The descriptions of these three LEDs are listed in the following table.

| Indicator | Color | Description |
|-----------|-------|-------------|
| PWR | Green | Power indictor, lid when system is on. |
| WDT | Yellow | Watchdog timer LED, flashing when WDT is active. |
| SATA | Red | Hard drive indicator, flashing when hard disk drive is active. |

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### 2.2.11 COM2/ 3/ 4 Port
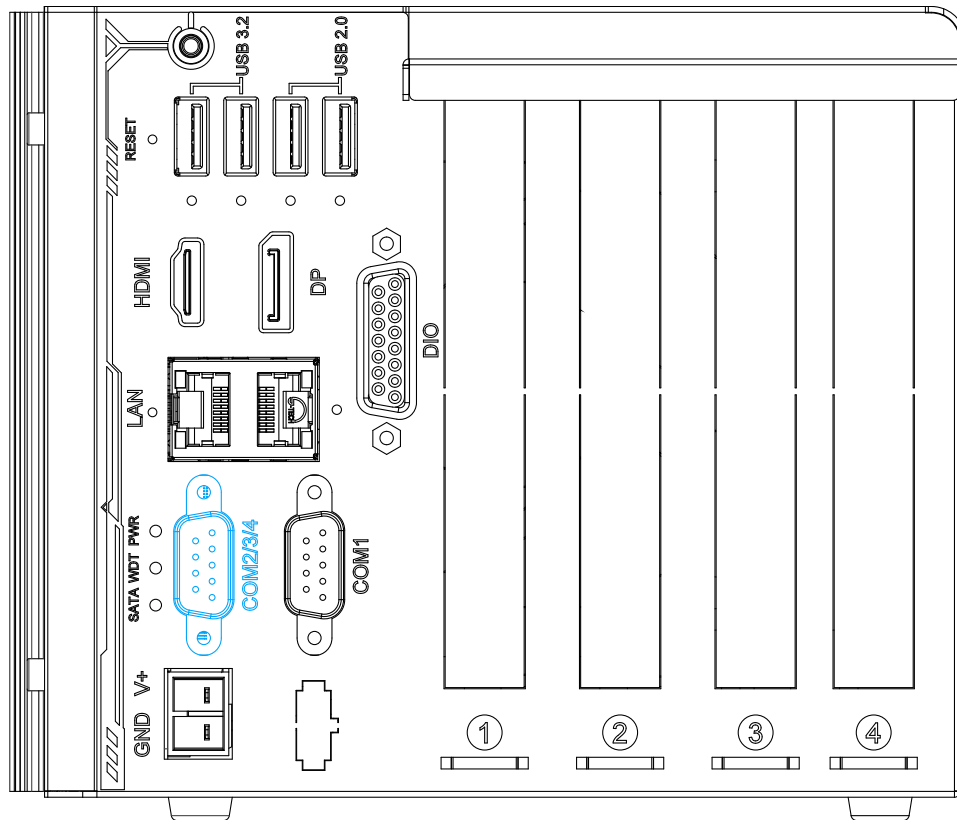


Implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 921600 bps baud rate, the D-Sub male connector (COM2/ 3/ 4) can be configured in the BIOS as three 3-wire RS-232 ports (COM2/COM3/COM4). Please refer to COM2/ 3/ 4 Port Configuration for configuring operation mode. An optional 1-to-3 Y-cable is available to connect three RS-232 devices.
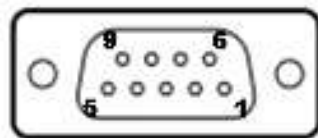


**COM2/ 3/ 4 Pin**



**1-to-3 Y-cable**

The following table describes the pin definition of the COM port

| Pin# | 3-port RS-232 COM2/ 3/ 4 | | |
|------|------|------|------|
|      | COM2 | COM3 | COM4 |
| 1    |      |      |      |
| 2    | RX   |      |      |
| 3    | TX   |      |      |
| 4    |      | TX   |      |
| 5    | GND  | GND  | GND  |
| 6    |      | RX   |      |
| 7    |      |      | TX   |
| 8    |      |      | RX   |
| 9    |      |      |      |

## 2.2.12  COM1 Port
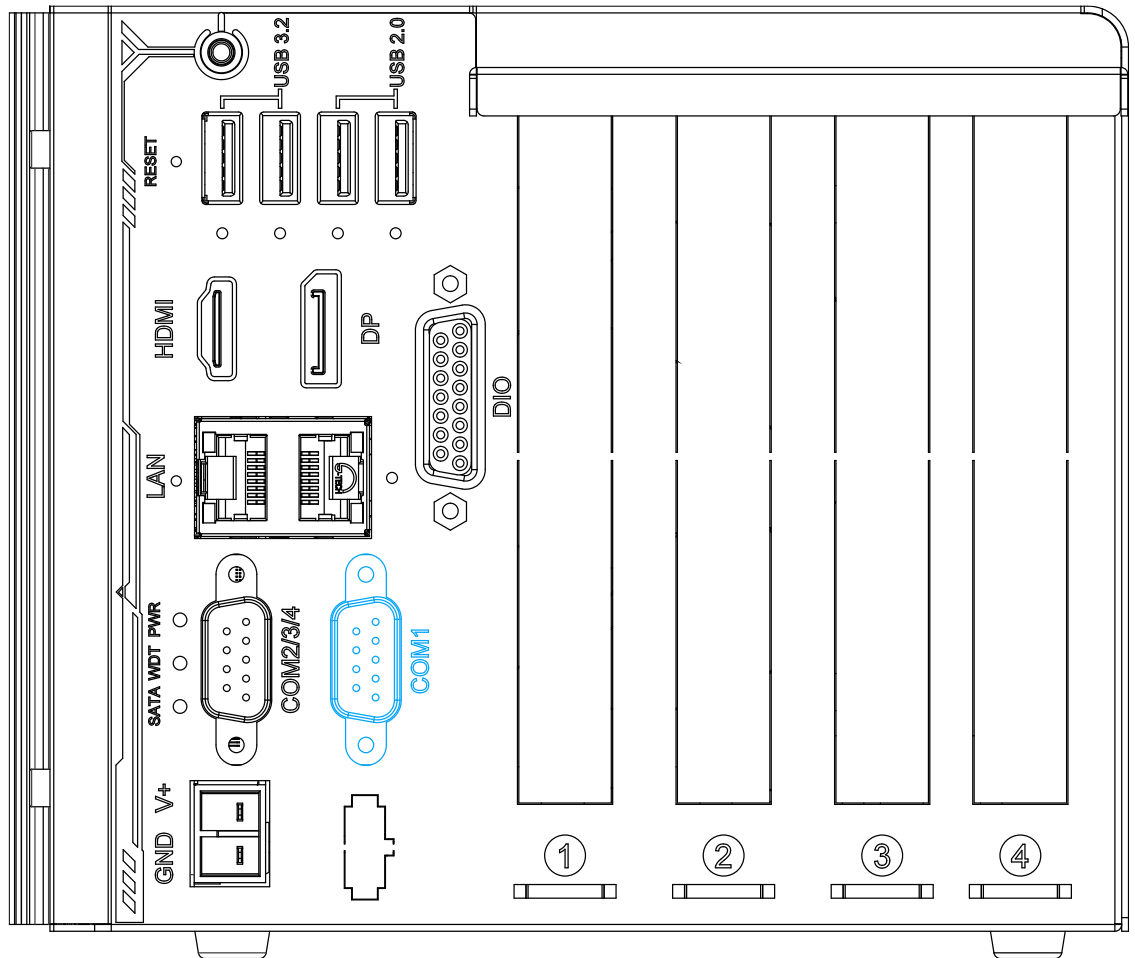


The COM1 port is implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate. It is a software-configurable RS-232/422/485 port. The operation mode of can be set in BIOS setup utility. The following table describes the pin definition of the COM port.

**COM Port Pin Definition**
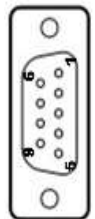


| | COM1 | | |
|---|---|---|---|
| Pin# | RS-232 Mode | RS-422 Mode | RS-485 Mode (Two-wire 485) |
| 1 | DCD | | |
| 2 | RX | 422 TXD+ | 485 TXD+/RXD+ |
| 3 | TX | 422 RXD+ | |
| 4 | DTR | 422 RXD- | |
| 5 | GND | GND | GND |
| 6 | DSR | | |
| 7 | RTS | | |
| 8 | CTS | 422 TXD- | 485 TXD-/RXD- |
| 9 | RI | | |

### 2.2.13  2-Pin Terminal Block for DC Input
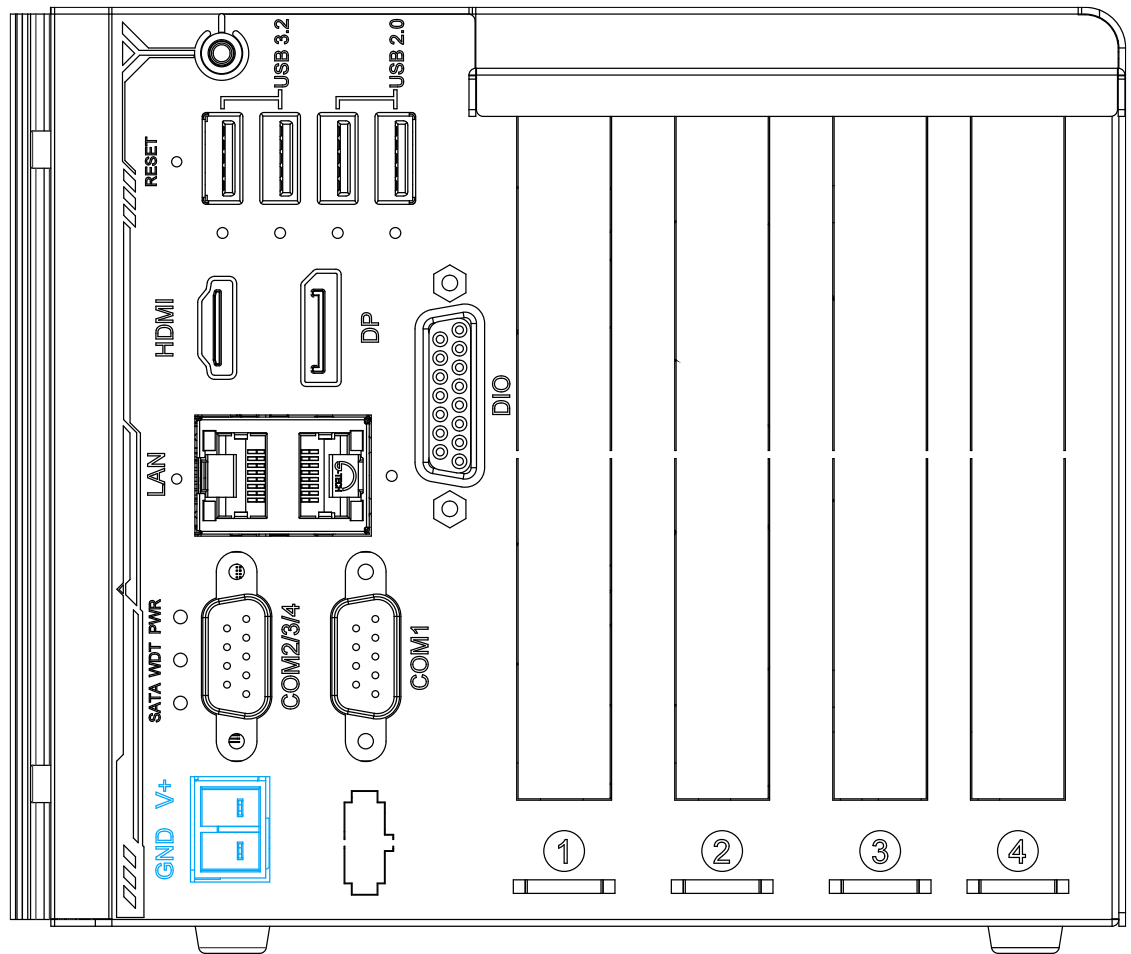


The system accepts a wide range of DC power input from 12V to 24V via 3-pin pluggable terminal block, which is fit for field usage where DC power is provided. And the screw clamping connection of the terminal block gives a very reliable way of wiring DC power.

| Symbol | Description |
|--------|-------------|
| GND | Negative polarity (ground) of DC input |
| V+ | Positive polarity of DC input |

⚠️ **WARNING**

*Please make sure the voltage of DC power is correct before you connect it to the system. Supplying a voltage over 24V will damage the system.*

## 2.2.14  Reserved Panel for On/ Off Ctrl & Status LED Connector (Optional)
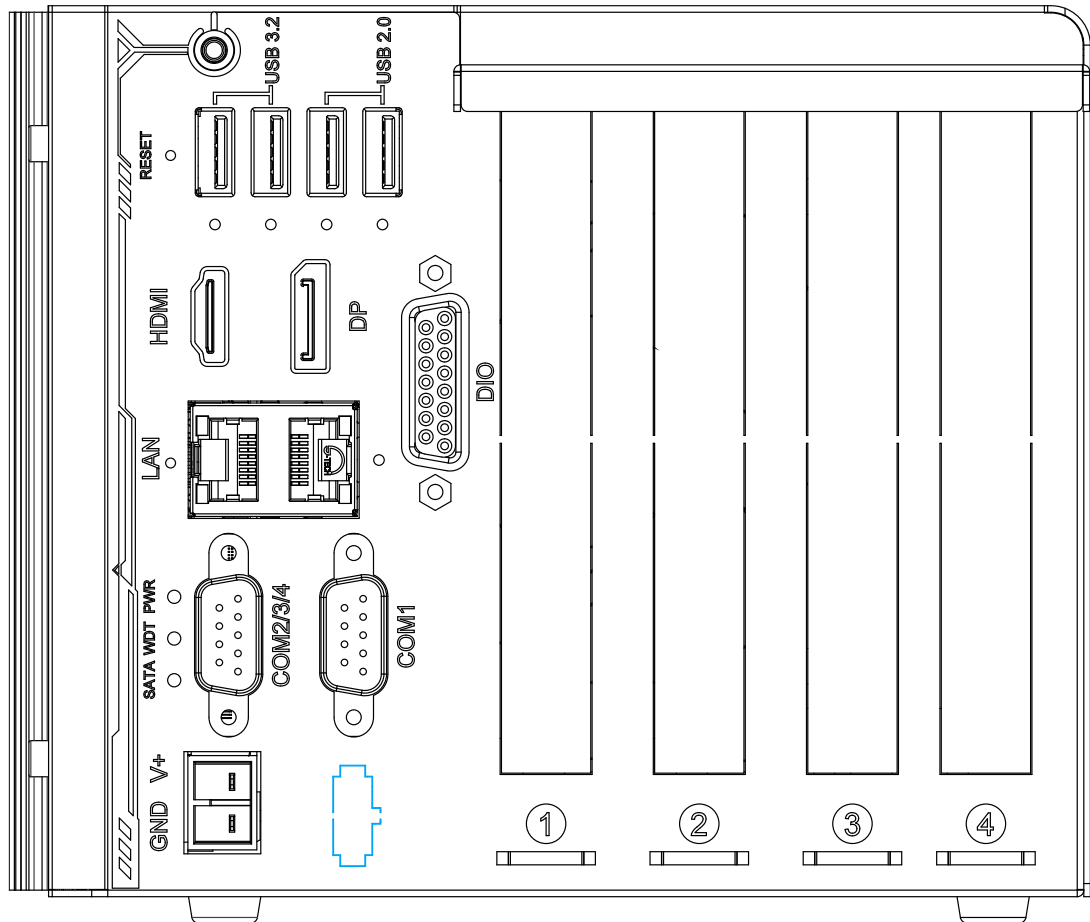


When the system is placed inside a cabinet, it's useful to connect the on/ off controls and the system status to the external panel. The system provides an optional 2x6, 2.0mm pitch pin header to output system status such as power, HDD, watchdog timer, and control system on/off remotely.

## 2.3    Internal I/O Functions

In addition to I/O connectors on the front panel, the system also provides internal on-board connectors, such as M.2 expansion, DRAM, PCIe and PCI slots, etc. In this section, we'll illustrate these internal I/O functions.

### 2.3.1    SODIMM DRAM Slot

The system motherboard supports single module DDR5 4800MHz SODIMM up to 16GB capacity.



✏️ NOTE

*When changes are made to DRAM module(s), such as additionally install or remove and re-install (into the same/ different slot, it will result in an approximately 30 - 60 seconds delay when booting up for the first time after such change(s).*

### 2.3.2 M.2 2280 (M-key) Slot (SATA Signal Only) for SSD

The system has an M.2 2280 slot (SATA signal only) for you to install an M.2 SATA SSD for faster access over traditional hard disk drives.



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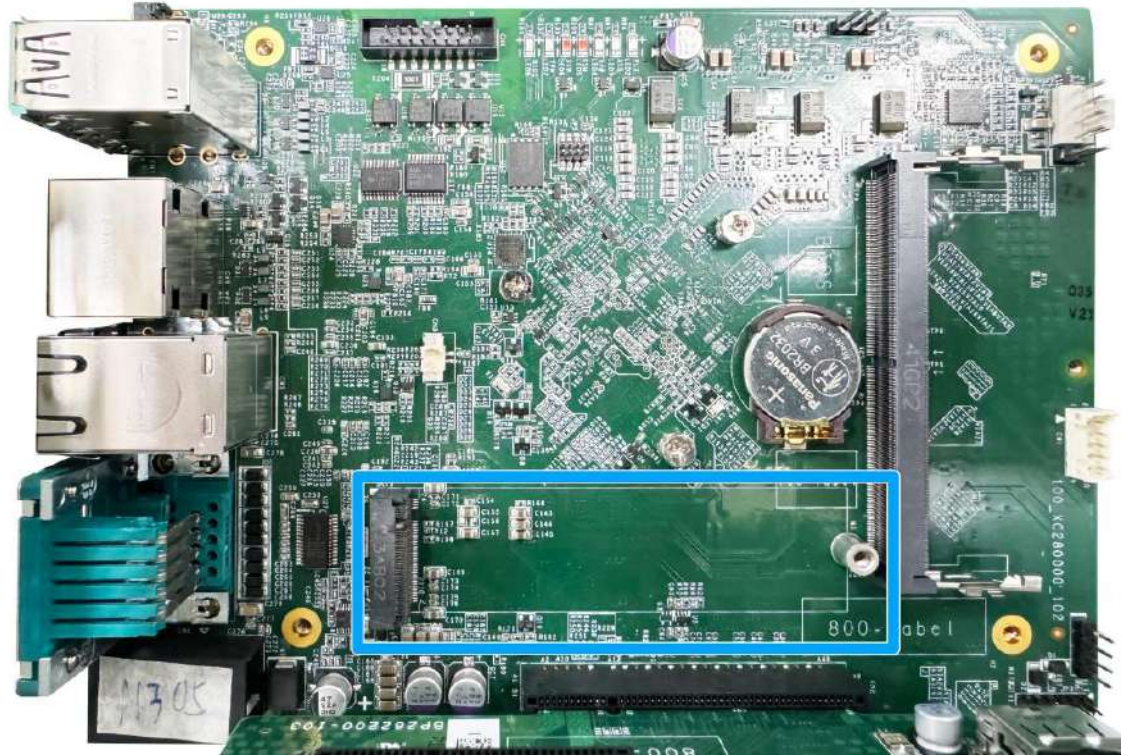
✎ **NOTE**

*The M.2 slot is only compatible with SATA signal M.2 SSD only.*

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### 2.3.3 On/ Off Ctrl & Status Output

For an application which places Nuvo-2822 inside a cabinet, it's useful to output the system status to external LED indicators so that users can check how the system's running. The system provides a 2x6, 2.0mm pitch pin header to output system status such as power, HDD, watchdog timer, and control system on/off remotely. The status LED output has a built-in series-resistor and provides 10mA current to directly drive the external LED indicators. System on/off control is also provided so you can use an external non-latched switch to turn on/off the system exactly the same as the power button on the front panel. The following table describes the pin definition of the status LED output.
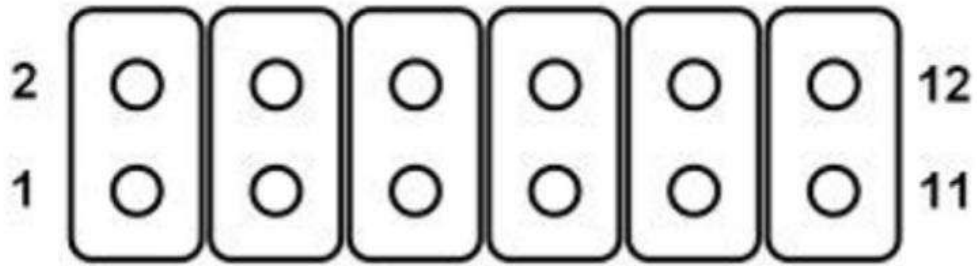
| Pin# | Definition | Description |
|------|------------|-------------|
| 1 | WDT_LED- | [Output] Watchdog timer indicator, flashing when Watchdog timer is active |
| 2 | WDT_LED+ | |
| 3 | UID_LED- | [Output] User defined LED, reserved for future usage |
| 4 | UID_LED+ | |
| 5 | HDD- | [Output] Hard drive indicator, flashing when SATA hard drive is active. |
| 6 | HDD+ | |
| 7 | Power_LED- | [Output] System power indicator, on if system is turned on, off if system is turned off. |
| 8 | Power_LED+ | |
| 9 | Ctrl- | [Input] Remote on/off control, connects to an external switch to turn on/off the system (polarity is negligible). |
| 10 | Ctrl+ | |
| 11 | NA | Un-used pin |
| 12 | NA | |

# 3 System Installation

Before disassembling the system enclosure and installing components and modules, please make sure you have done the following:

- It is recommended that only qualified service personnel should install and service this product to avoid injury or damage to the system.
- Please observe all ESD procedures at all times to avoid damaging the equipment.
- Before disassembling your system, please make sure the system has powered off, all cables and antennae (power, video, data, etc.) are disconnected.
- Place the system on a flat and sturdy surface (remove from mounts or out of server cabinets) before proceeding with the installation/ replacement procedure.

## 3.1 Disassembling the System

To access system internal components, the system needs to be disassembled. To disassemble the system enclosure, you need to remove the screws indicated on the enclosure.

1. One the panel, remove the screws indicated.

2. Remove the screws indicated on the side panel.



3. Remove the screw indicated on the rear panel.
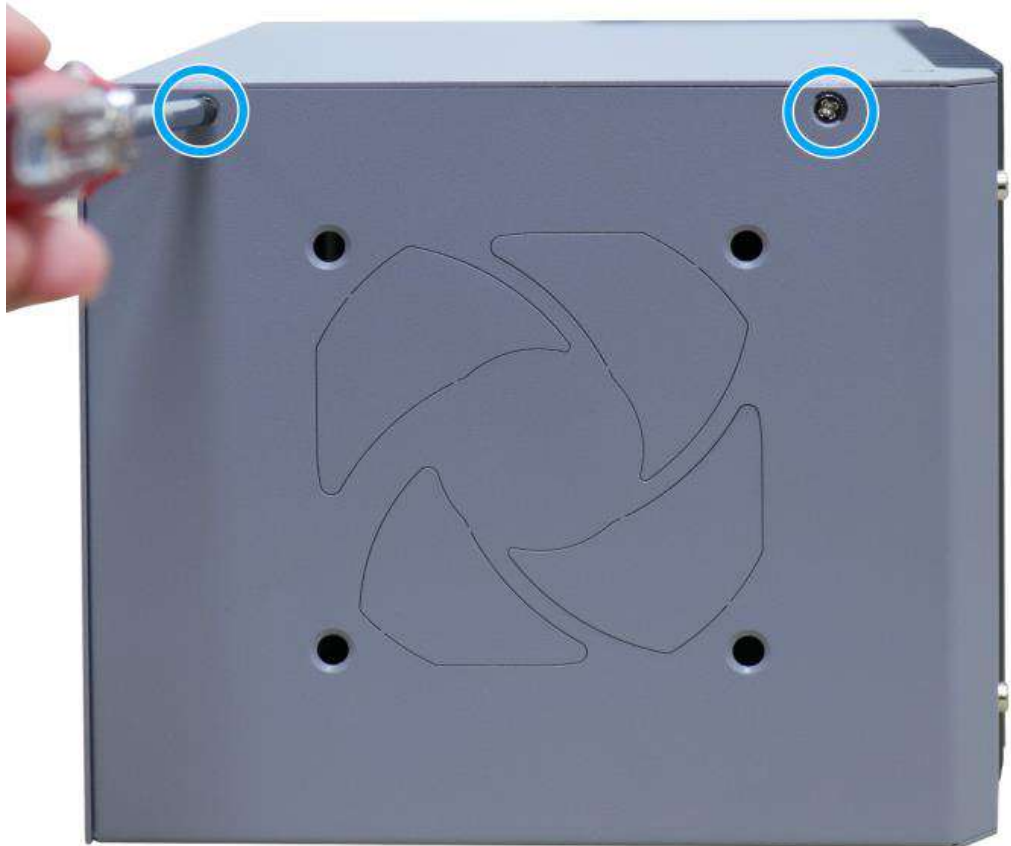
4. Gently lift the L-shape cover panel to separate it from the enclosure.



5. Once the L-shaped panel has been removed, remove the four (4) screws indicated.
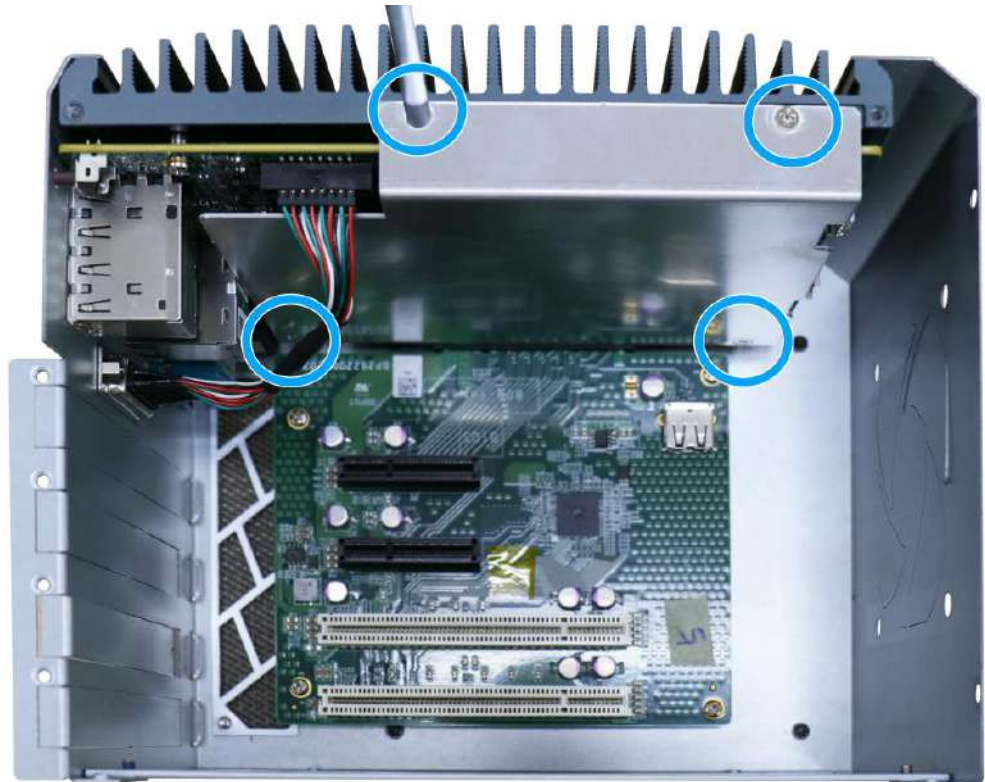
6.  Remove the heatspreader on the motherboard to gain access to all internal expansion slots and components

## 3.2 Installing Internal Components

### 3.2.1 DDR5 SO-DIMM Installation

There is a SO-DIMM memory slot (indicated in **blue**) on the motherboard that supports a total maximum of 16GB non-ECC DDR5-4800. Please follow the procedures below to replace or install the memory modules.

1. Please refer to the section "Disassembling the System".
2. Locate the SODIMM memory module slots on the motherboard.
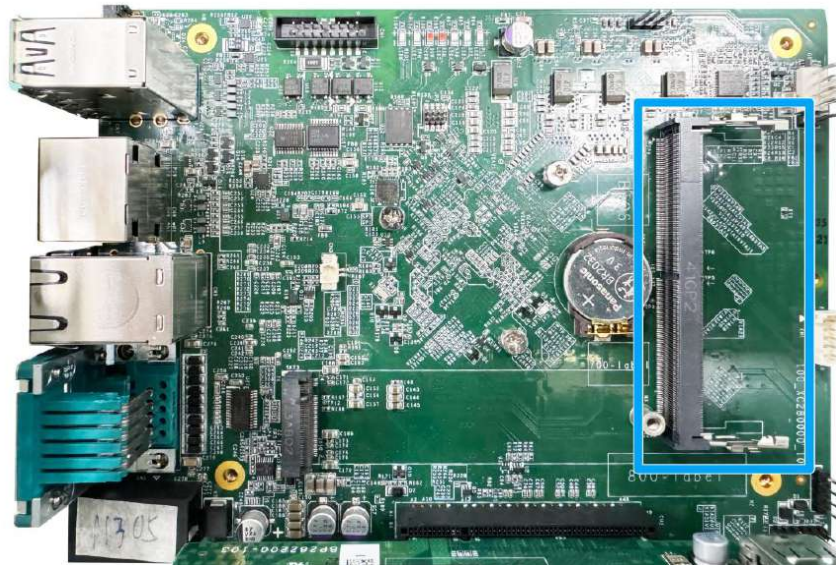


3. To install the memory module, insert gold fingers into the slot at 45-degree angle, push down on the memory module to clip the module into position.
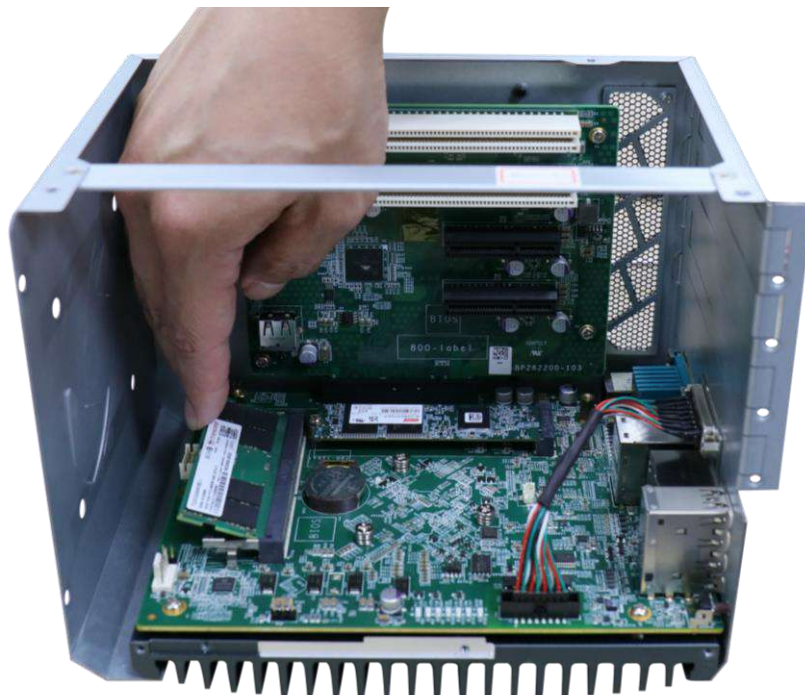
4. Push the memory module down until it is clipped-in, and remove the corresponding protection film off the thermal pad.
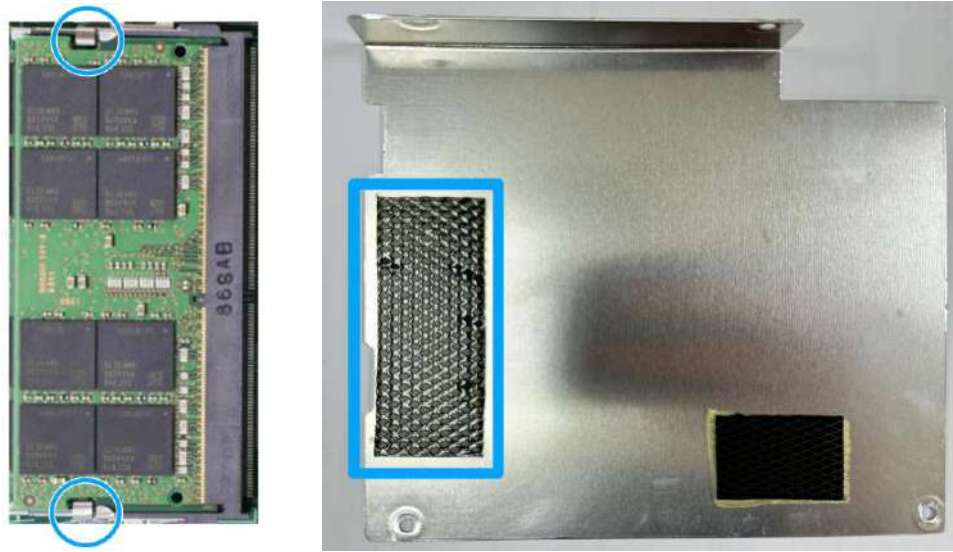


5. Reinstall the heat spreader by securing the screws indicated when done.
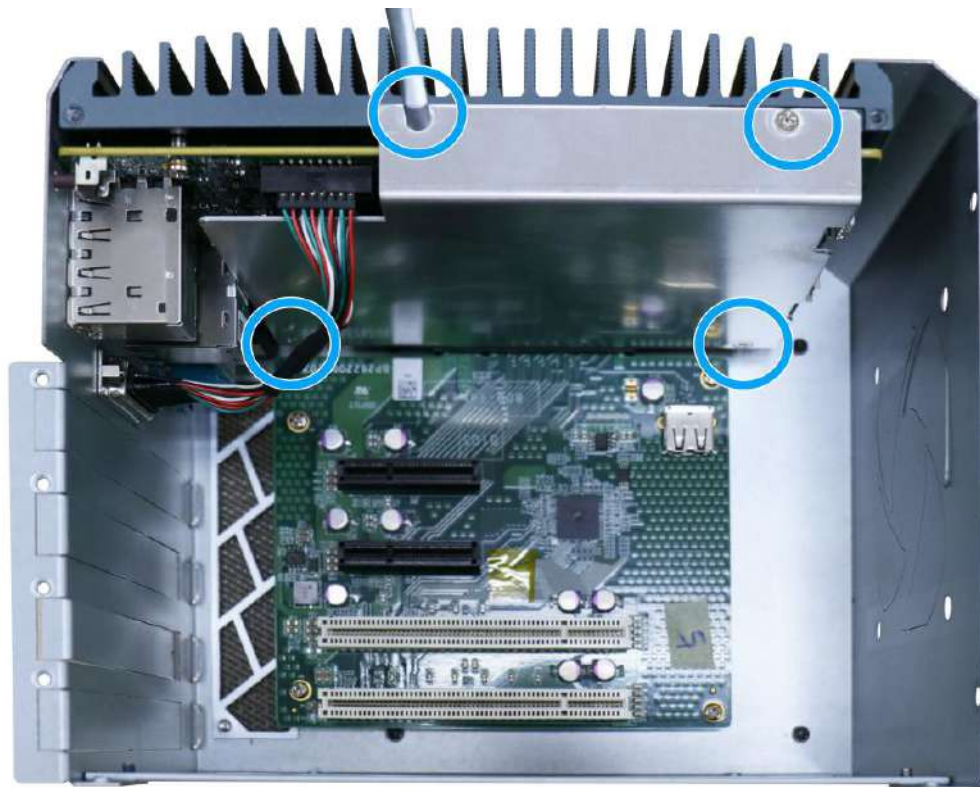


6. Reinstall the system enclosure and panel when done.

7. If you need to install other components, please refer to respective sections.

### 3.2.2 M.2 2280 SSD Installation

The system has a SATA signal M.2 2280 slot for you to install an M.22280 SATA SSD. For installation, please refer to the following instructions.

1. Please refer to the section "Disassembling the System".

2. Locate the M.2 2280 expansion slot.



3. Insert the SSD module on a 45 degree angle into the expansion slot.

4. Secure the module with an M3 P-head screw.
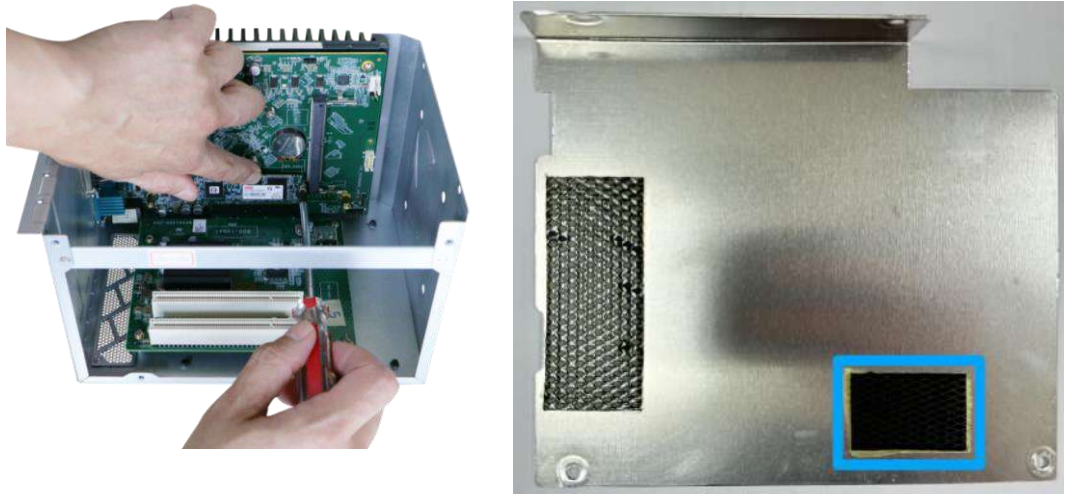


5. Reinstall the heat spreader by securing the screws indicated when done.
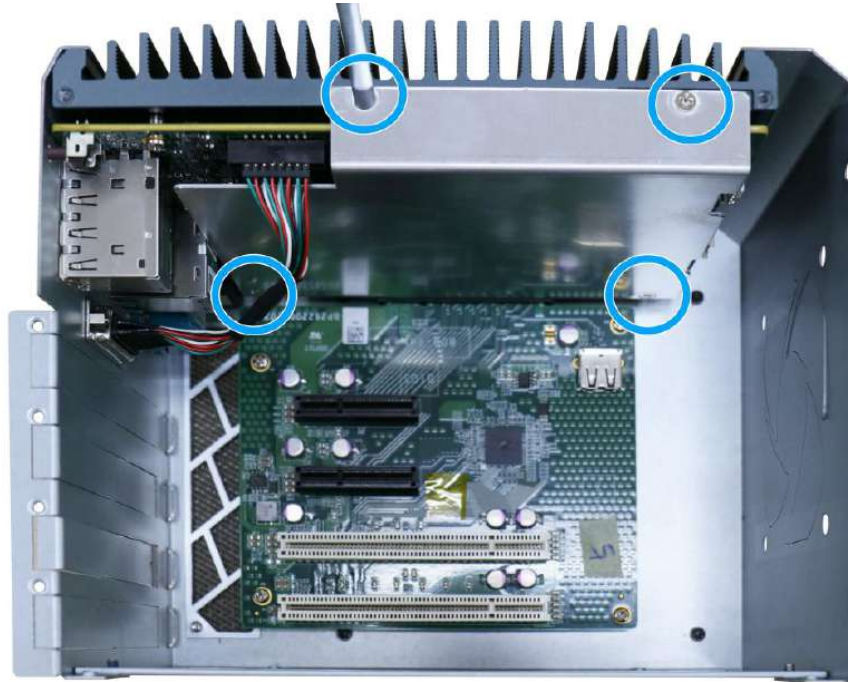


6. Reinstall the system enclosure and panel when done.

7. If you need to install other components, please refer to respective sections.

### 3.2.3 On/ Off Control & Status LED Cable Installation (Optional)

When the system is placed inside a cabinet, it's useful to connect the on/ off controls and the system status to the external panel. The system provides a 2x6, 2.0mm pitch pin header to output system status such as power, HDD, watchdog timer, and control system on/off remotely. To install the optional cable, please refer to the following procedure:

1. Please refer to the section "Disassembling the System".
2. Remove the screws indicated on the PCIe/ PCI expansion board.
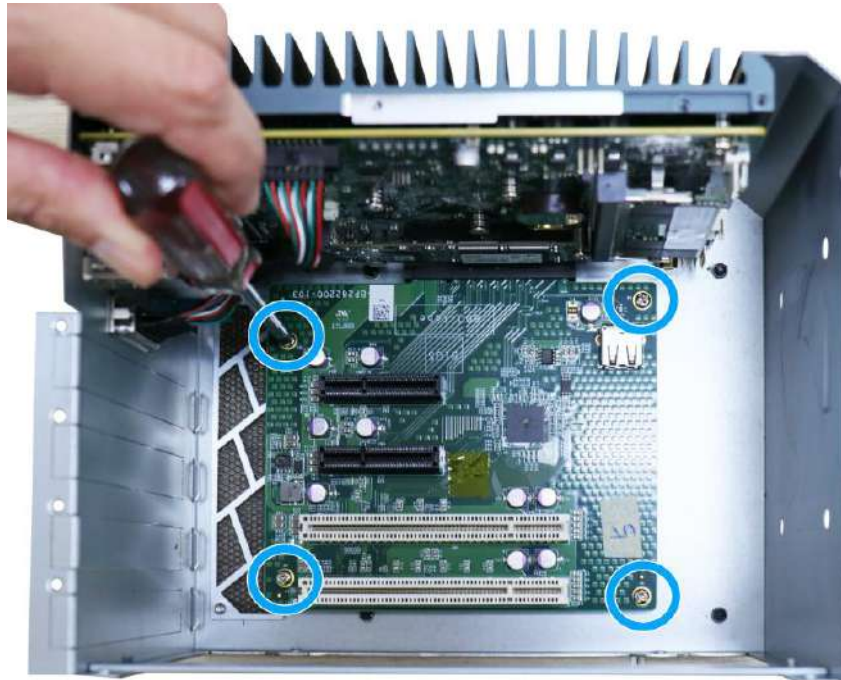


3. Gently disengage the PCIe/ PCI expansion board from the motherboard.
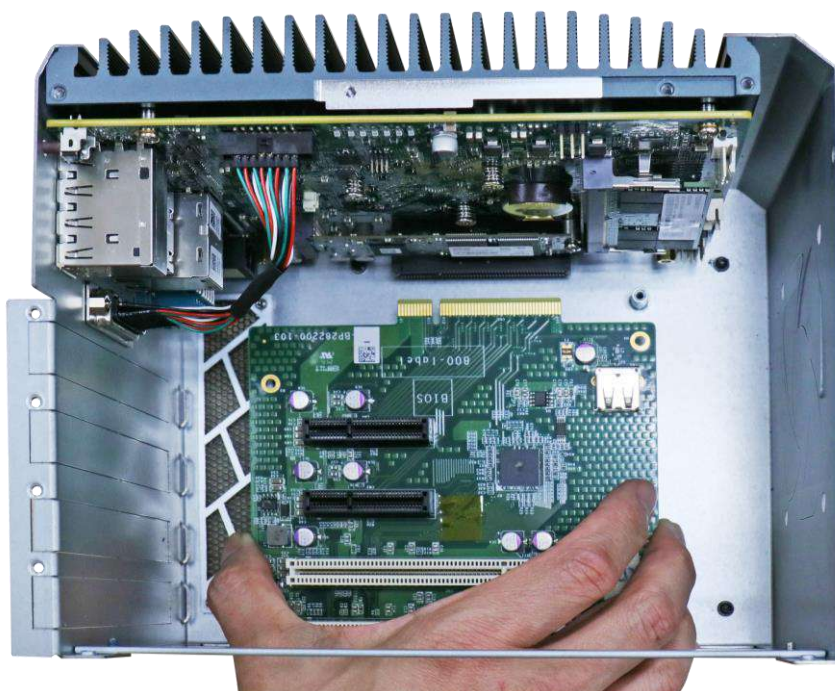
4. Locate the 2x6 pins for On/Off control & status LED output on the bottom right corner of the motherboard.



5. Remove the reserved punch-out panel on the I/O panel.

6. Note the pin order, and make sure Pin 1 on the cable (indicated in **blue**) is plugged into Pin 1 on the motherboard (indicated in **red**).
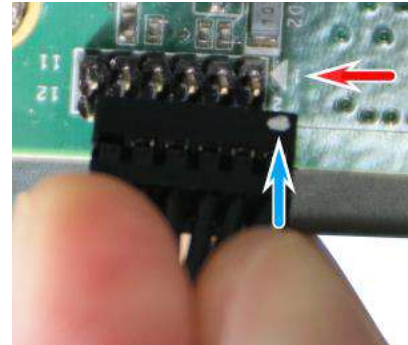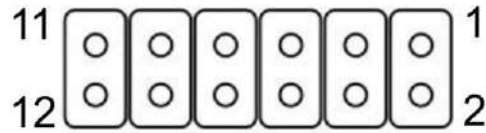


**Pin allocation on motherboard**



**Pin 1 (cable) plugged into Pin 1 (MB)**

7. When inserting the connector to the I/O panel, make sure the orientation of the plug matches the I/O panel. Push the plug inside-out, make sure it is clipped onto the I/O panel to complete the optional cable installation.
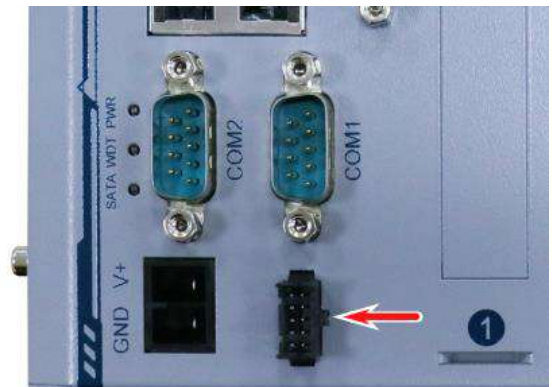




8. The orientation of the plug pins is as below.
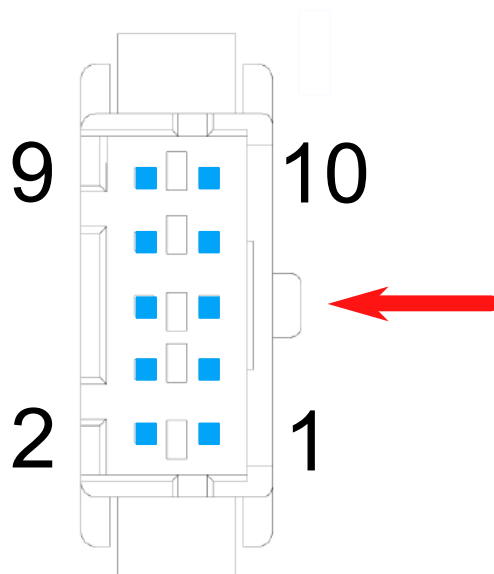
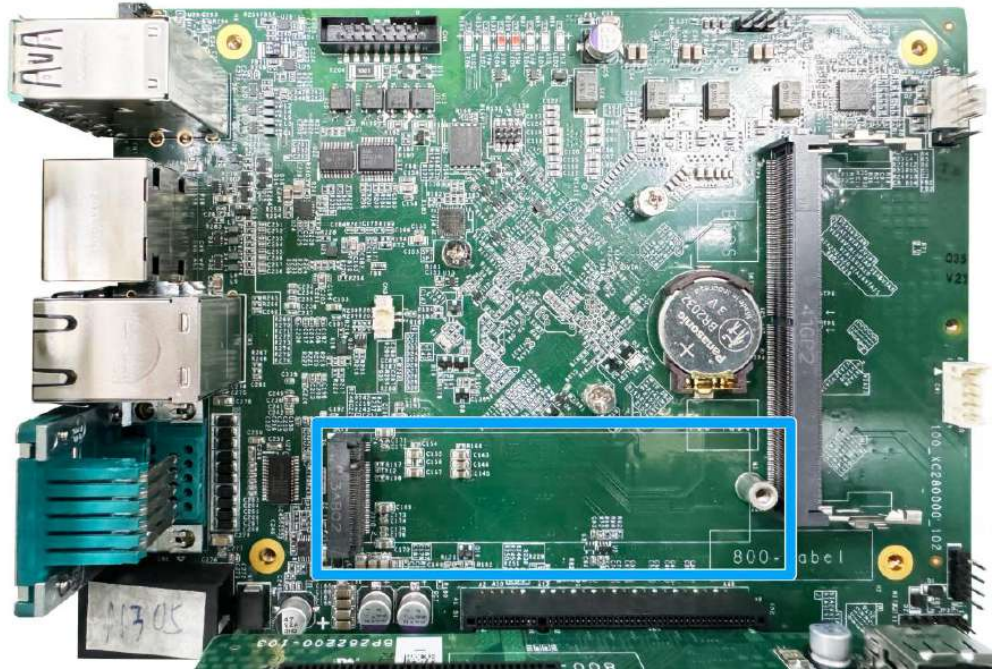9. For pin definition, please refer to this [section](#).

10. [Reinstall the system enclosure](#) and panel when done.

11. If you need to install other components, please refer to respective sections.

### 3.2.4 Fan Installation (Optional)

> ✎ **NOTE**
>
> *The fan kit is recommended if your system is deployed to operate in ambient conditions exceeding 60°C.*

Please refer to the following procedure to installation the optional fan kit.

1. Please refer to the section "<u>Disassembling the System</u>".
2. Remove the reserved punch-out fan panels at the rear.



    **Reserved punch-out panels**         **Punch-out panels removed**
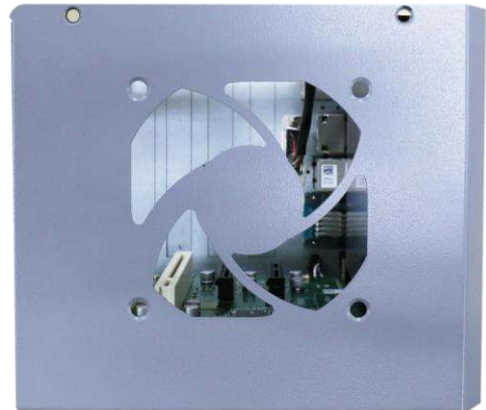
3. Remove the protection film on the fan filter, match the screw-holes and place it on the fan.



    **Remove protection film**         **Place filter on fan while matching screw-holes**
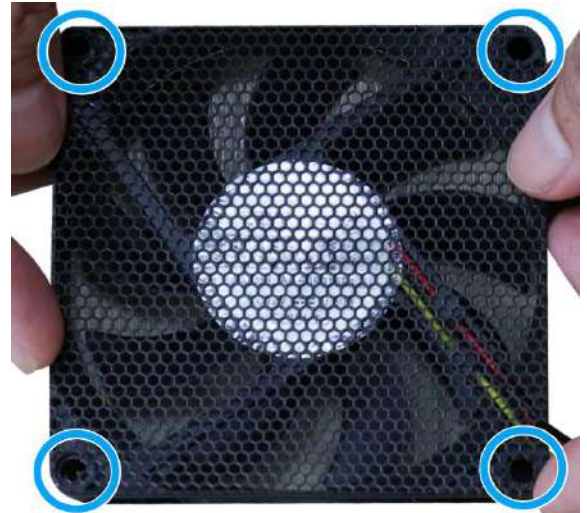
4. Plug the fan's 3-pin cable onto the motherboard fan connector onto the motherboard.



**Motherboard fan connector location**          **Plug onto motherboard**
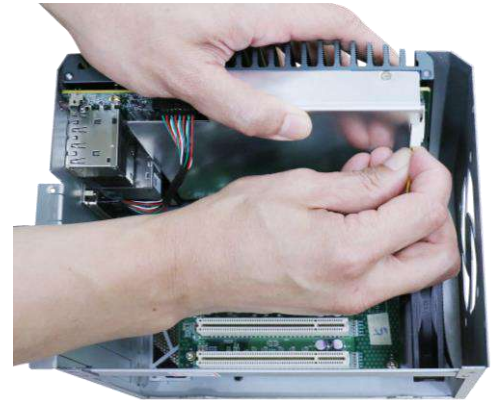
5. Install the fan on the inside, at the rear end of the enclosure.
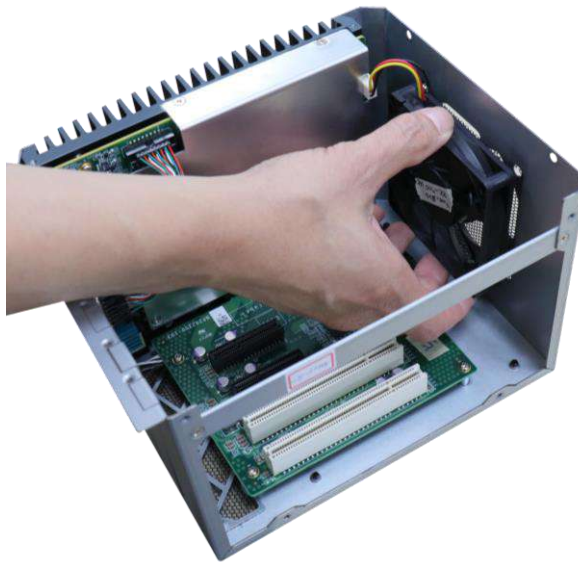


6. Secure with screws to complete the fan installation.
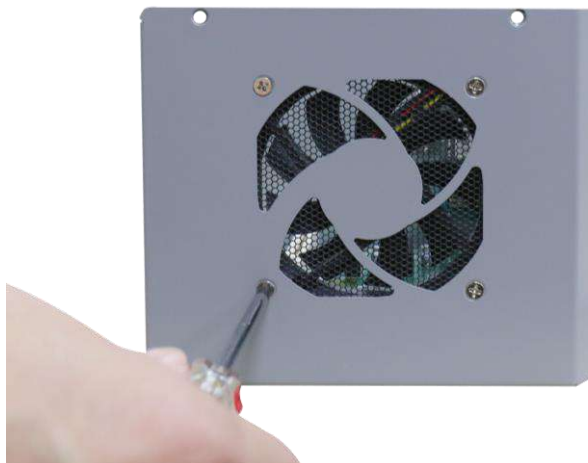


7. Reinstall the system enclosure and panel when done.

8. If you need to install other components, please refer to respective sections.

## 3.3 Installing the System Enclosure

1. To reinstall the system enclosure, place the L-shaped panel back onto the system.



2. Secure the screw indicated top of the system.

3. Secure the screws indicated on the side panel.



4. Secure the screw indicated at the rear to complete the enclosure installation.
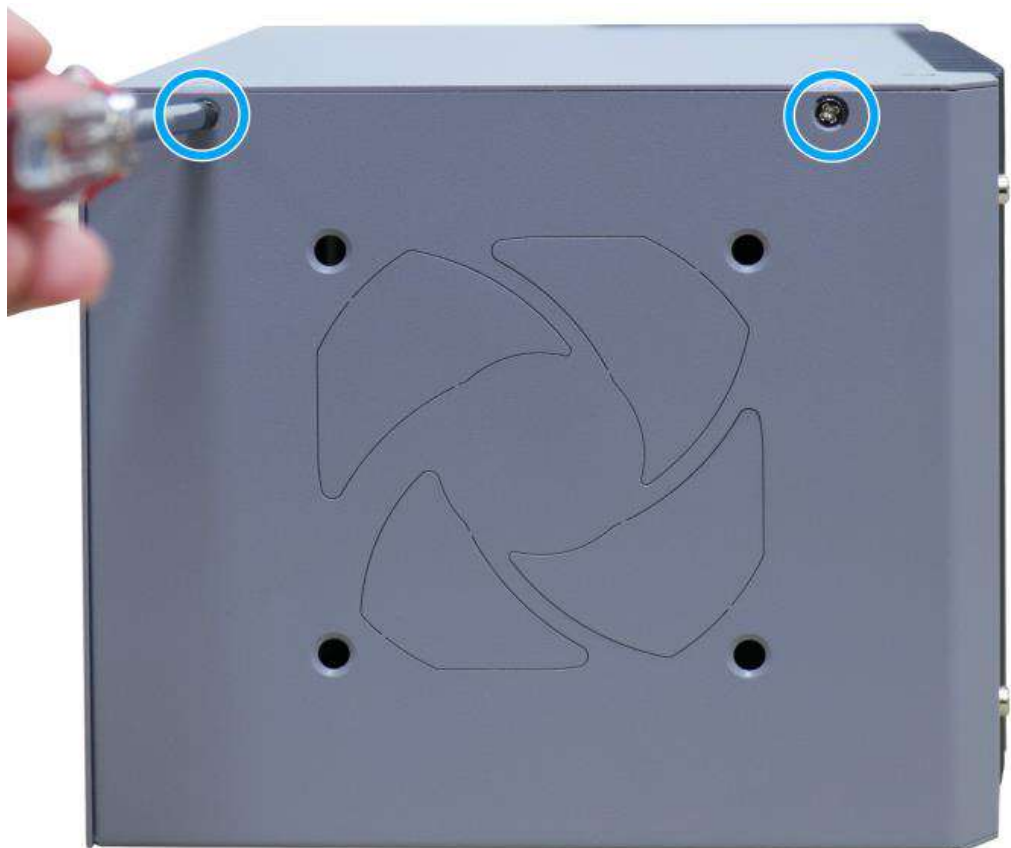
## 3.4 Wall-mount Bracket Installation

To install the wall-mount bracket, please refer to the exploded illustration below on installing the wall-mount bracket. The bracket and screws can be found in the accessory box.

1. Secure the wall-mount bracket (in **blue**) with the supplied M4 screws (in **red**).



Wall-mount bracket (2X)

M4 Screw (4X)
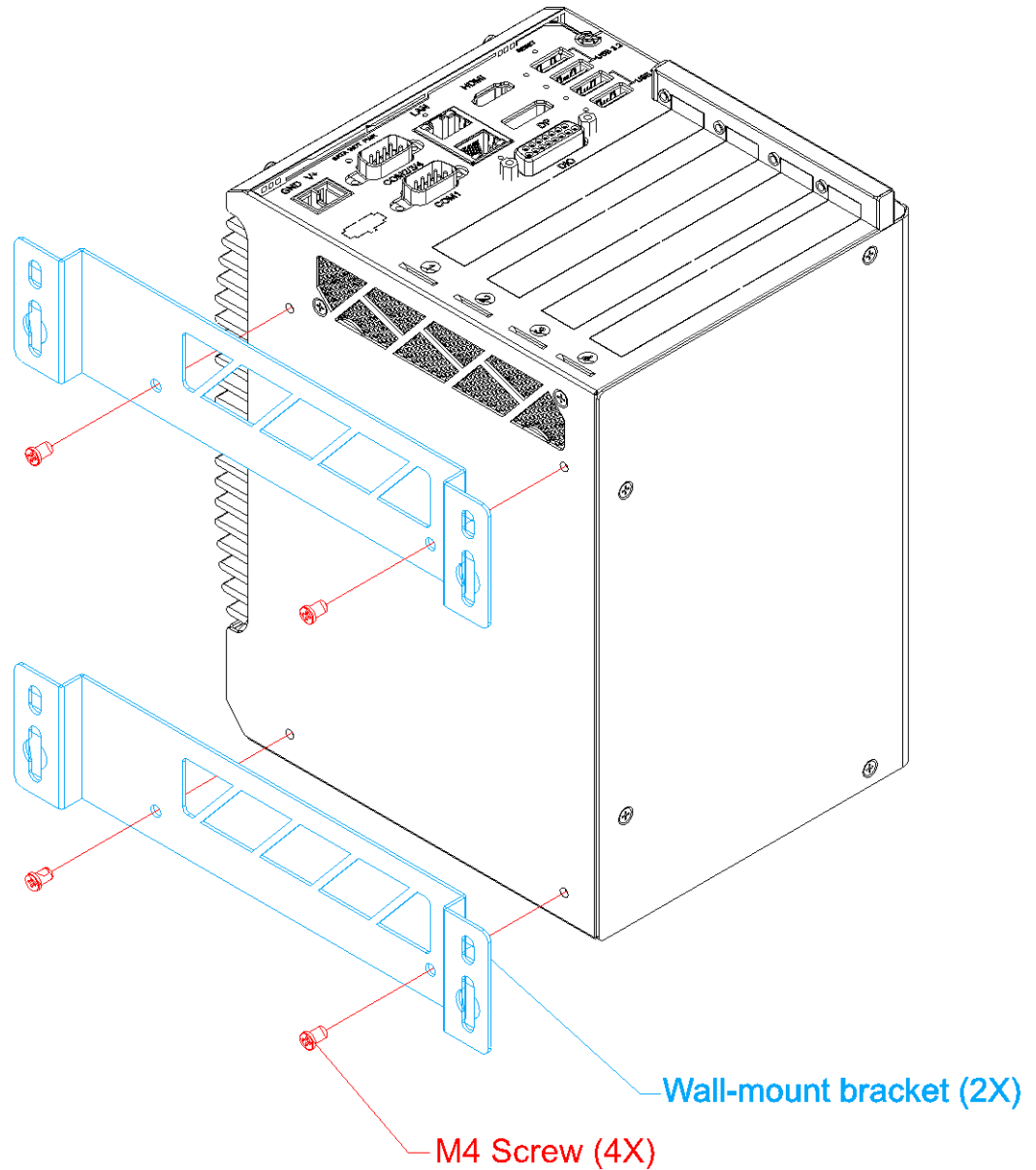
2. Place the system on a flat surface and secure it with screws.

## 3.5 Powering On the System

There are three methods to power on the system

- Pressing the power button

- Sending a LAN packet via Ethernet (Wake-on-LAN)

### 3.5.1 Powering On Using the Power Button

This is the simplest way to turn on your system. The power button is a non-latched switch and behaves as the ATX-mode on/off control. With DC power connected, pushing the power button will turn on the system and the PWR LED indicator will light up. Pushing the button when system is on will turn off the system. If your operating system supports ATX power mode (i.e. Microsoft Windows or Linux), pushing the power button while the system is in operation will result in a pre-defined system behavior, such as shutdown or hibernation.
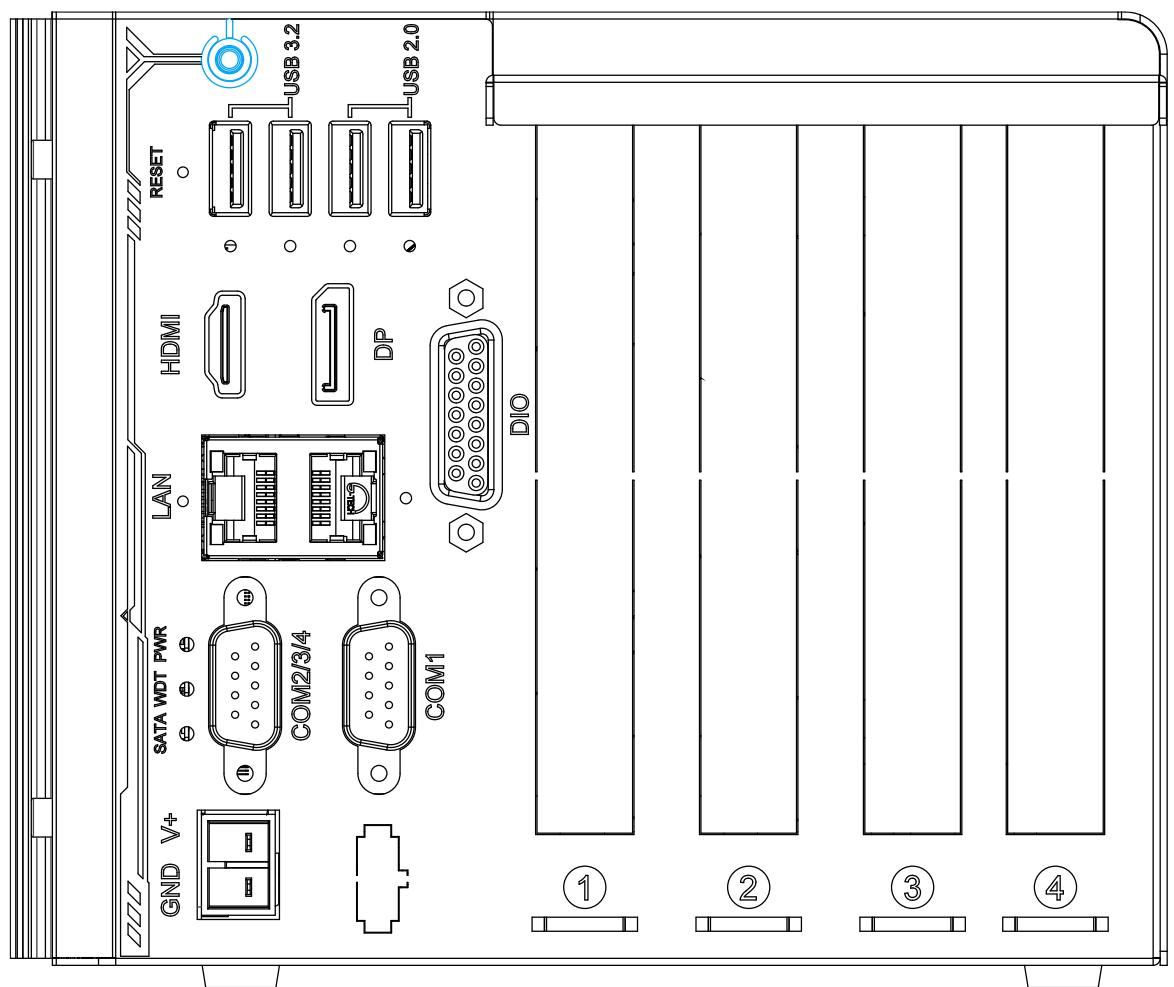
### 3.5.2 Powering On Using Wake-on-LAN

Wake-on-LAN (WOL) is a mechanism to wake up a computer system from a S5 (system off with standby power) state via issuing a magic packet. The system's Wake-on-LAN compatible GbE port is shown below.
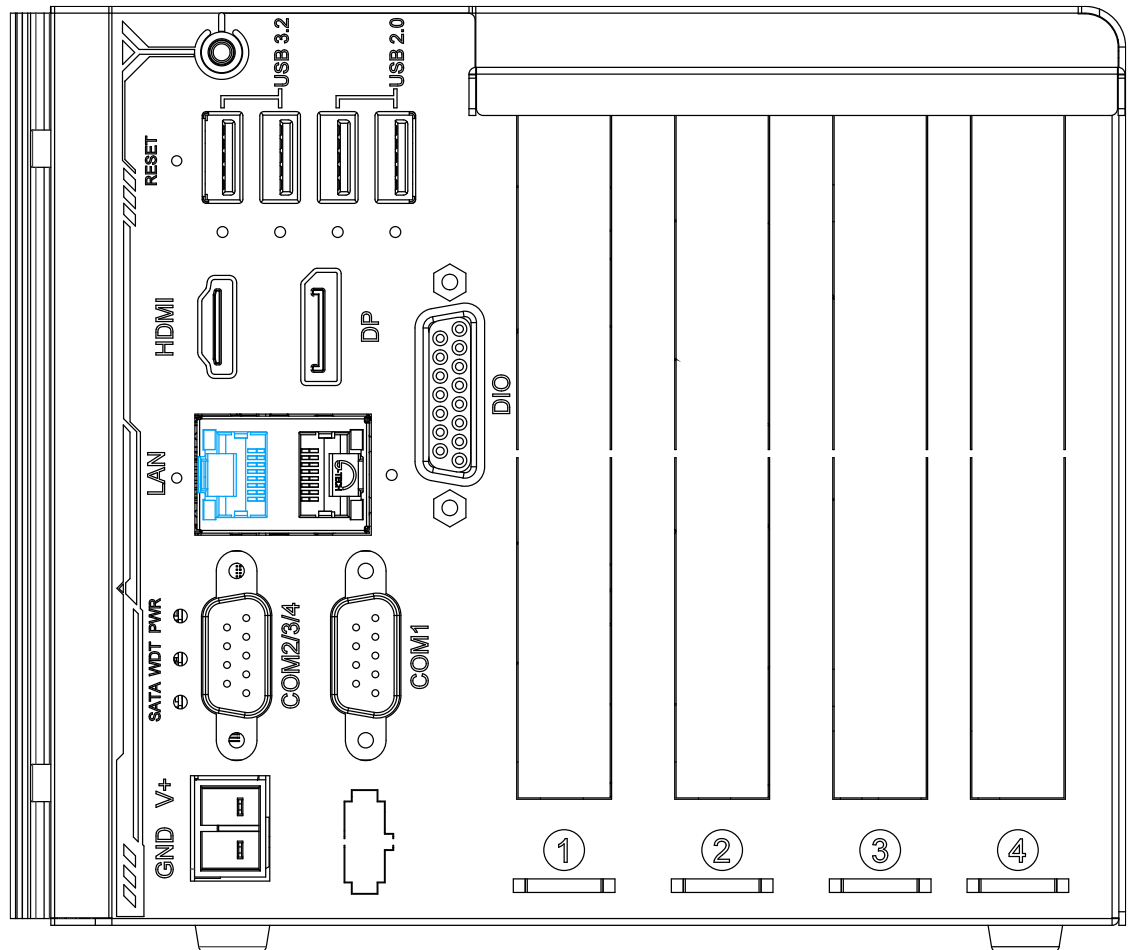


📝 NOTE

*Please ensure that the "Power Saving Mode" in the BIOS has been Disabled.*

*Please make sure the Intel chipset and Ethernet driver has been properly installed prior to setting up WOL function.*

To enable WOL function, please set up WOL settings in the BIOS and in the operating system by follow the steps described below.

1.  When the system boots up, press F2 to enter BIOS setup utility.
2.  Go to the **[Power]**>**[Wake On LAN]** and set it to **[Enabled]**.
3.  Press F10 to "**Save changes and exit BIOS**" and allow the system boot into the operating system.

4. Once booted into the Windows system, press "**Windows key + E**", right-click on "**Network**>**Properties**>**Change adapter settings**". Locate and double-click on the adapter Intel® I219 Gigabit Network Connection, click on **Configure...**

5. Click on the **Power Management** tab and check the following options. Click on OK when done.

**Magic Packet**

The magic packet is a broadcast frame containing anywhere within its payload 6 bytes of all 255 (FF FF FF FF FF FF in hexadecimal), followed by sixteen repetitions of the target computer's 48-bit MAC address.

For example, NIC's 48-bit MAC Address is 78h D0h 04h 0Ah 0Bh 0Ch DESTINATION SOURCE MISC
FF FF FF FF FF FF
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C
MISC       CRC
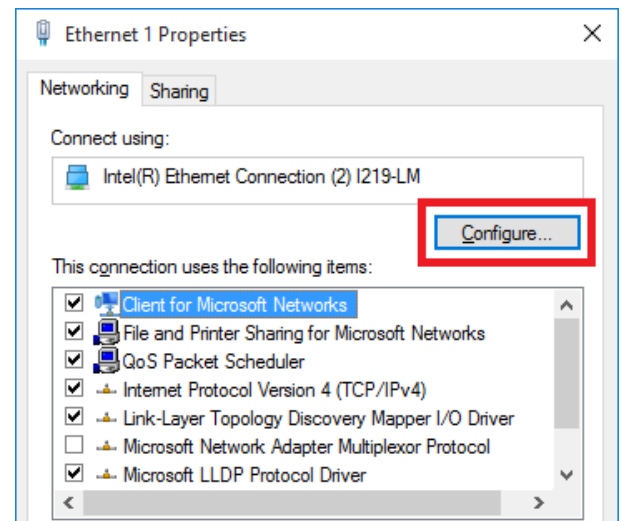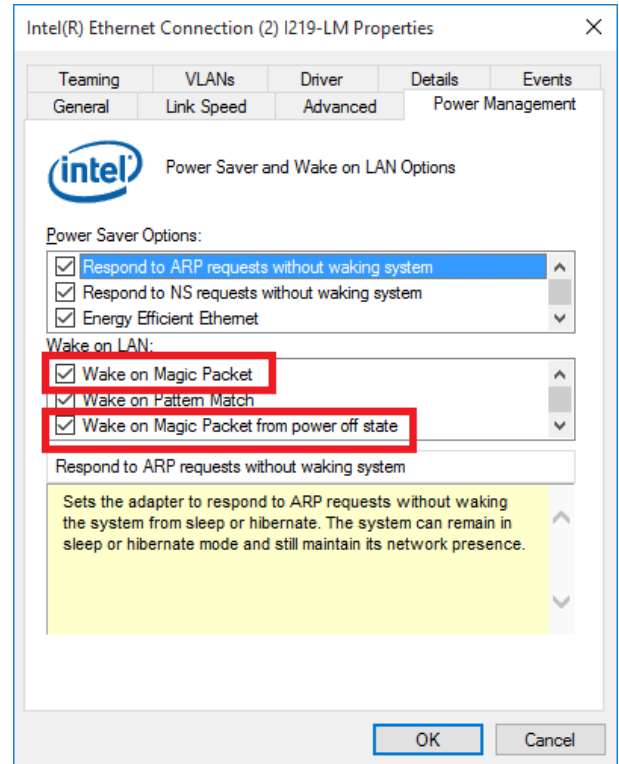
There are some free tools available on Internet that can be used to send a magic packet. Please refer to the following link to understand more about Magic Packet.

### 3.5.3 Configure your Windows system

When applying ignition power control to your system, please make sure you've configured your Windows system to initiate a shutdown process when pressing the power button. By default, Windows 10 goes to sleep (S3) mode when power button is pressed. As sleep (S3) is not a complete shutdown behavior, the ignition control function does not recognize the finish of a normal shut down process and thus users will encounter a system hard-off (power cut-off after 10 minutes). Please configure "When I press the power button" to "Shut down" in your Windows system settings.
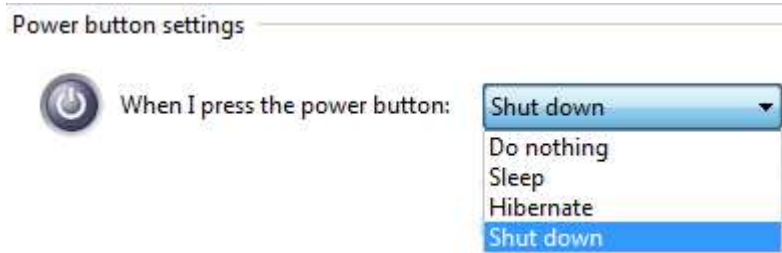
# 4 System Configuration

## 4.1 BIOS Settings

The system is shipped with factory-default BIOS settings meticulously programmed for optimum performance and compatibility. In this section, we'll illustrate some of BIOS settings you may need to modify. Please always make sure you understand the effect of change before you proceed with any modification. If you are unsure of the function you are changing, it is recommended to change one setting at a time to see its effect(s).
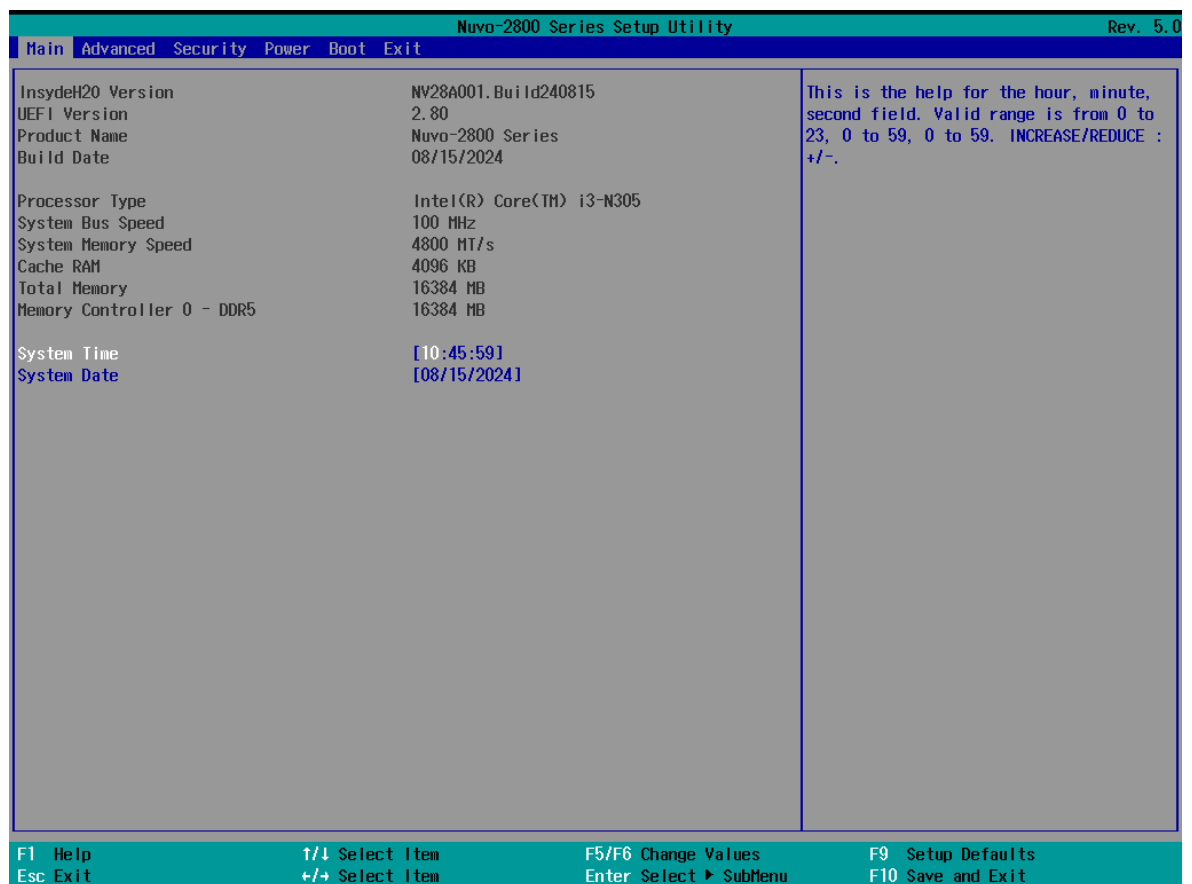


NOTE

*Not all BIOS settings will be discussed in this section. If a particular setting/ function you are after requires specific BIOS settings but is not discussed in this section, please contact Neousys Technical Support staff.*

### 4.1.1 COM Port Configuration

The system's COM1 port supports RS-232 (full-duplex), RS-422 (full-duplex) and RS-485 (half-duplex) mode. You can set the COM1 operating mode via BIOS settings. Another option in BIOS called "*Slew Rate*" defines how sharp the rising/falling edge is for the output signal of COM1. For long-distance RS-422/ 485 transmission, you may set the "*Slew Rate*" option as "High" to improve signal quality. For RS-422/ 485 communication, the "*RS-422/ 485 Termination*" option determines whether to enable/disable internal termination of RS-422/ 485 transceiver according to your wiring configuration (e.g. with or without external termination).
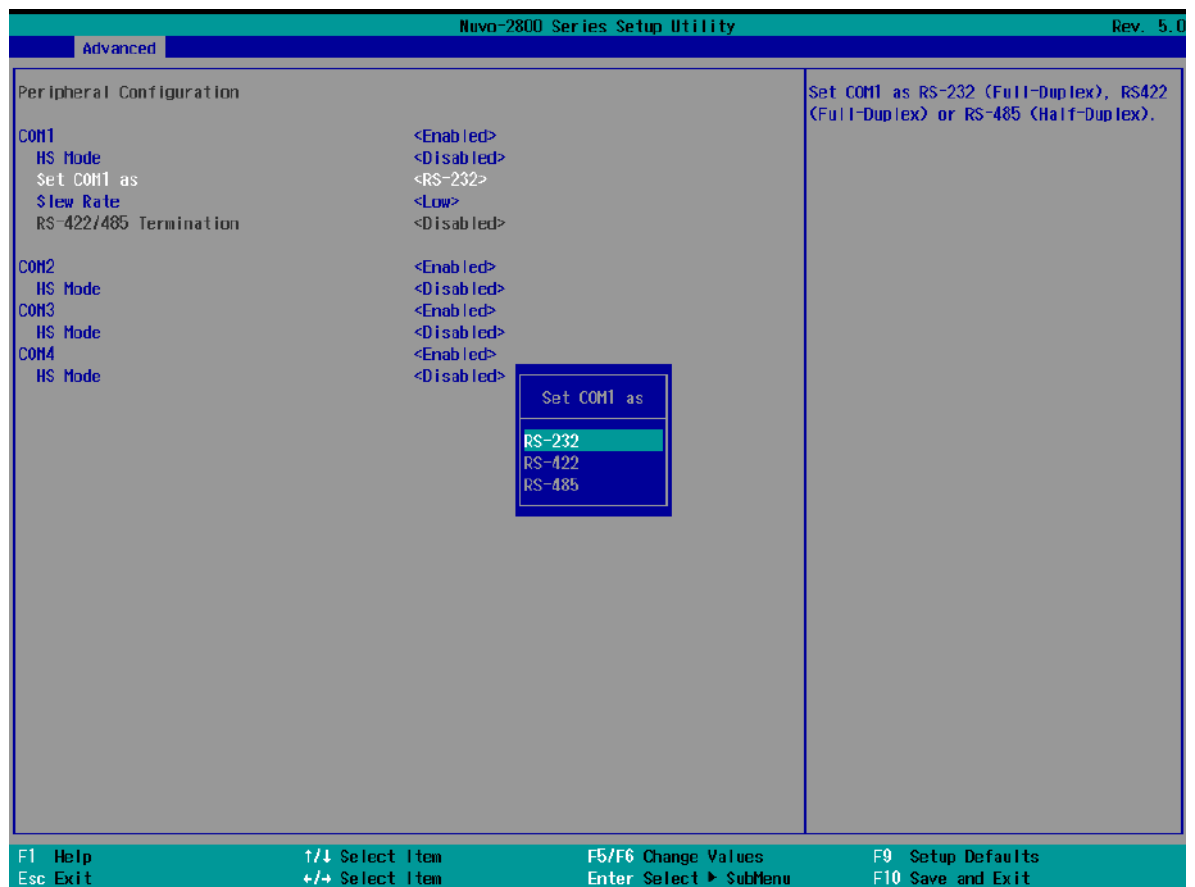


**To set COM port operating mode:**

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced]** → **[Peripheral Configuration]**.
3. Set the **[Set COM1 Mode as]** option to the desired mode.
4. Once set, press **F10** to save setting and exit.

### 4.1.2 COM Port High Speed Mode

The high speed mode of each COM port effectively allows for the port's baud rate generator to operate at 8x the speed with an effective baud rate of 921,600 bps (115,200 x 8). Please refer to the following instructions on how to enable the high speed mode for your COM port (COM1 used as an example).



**To set COM port high speed mode:**

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced] > [Peripheral Configuration]**.
3. Enable or set the **[Set COM1 Mode as]** option to the desired mode.
4. Highlight **[HS Mode]** and press ENTER to bring up options, highlight **[Enable]** and press ENTER.
5. Once set, press **F10** to save setting and exit.

### 4.1.3 Init Delay Before PCIe Reset

This setting offers delay in milliseconds before the PCIe signal is reset. By increasing this value, you can extend the time between PCIe card power-on and PCIe reset.

```
                          Nuvo-2800 Series Setup Utility                            Rev. 5.0
   Advanced

PCI Express Configuration                                      Delay in milli-seconds before PCIe
                                                               reset signal. Increasing this value to
DMI Link ASPM Control                  <Auto>                  extend time between PCIe card power-on
Init Delay Before PCIe Reset           [0]                     and PCIe reset.
Init Delay After PCIe Reset            [100]

▶PCIe Root Port for PCIe x4
▶PCIe Root Port for PCIe x1
▶PCIe Root Port for I210 #1
▶PCIe Root Port for I210 #2

F1  Help            ↑/↓ Select Item      F5/F6 Change Values     F9  Setup Defaults
Esc Exit            ←/→ Select Item      Enter Select ▶ SubMenu  F10 Save and Exit
```

**To set Init delay in milliseconds**:

1.  When system boots up, press F2 to enter BIOS setup utility.

2.  Go to **[Advanced]** > **[PCI Express Configuration]** > **[Init Delay Before PCIe Reset]** and press ENTER.

3.  A small window will appear for you to enter the desired delay values.

4.  When done, press F10 to "Exit Saving Changes"

### 4.1.4 Power On After Power Failure Option

This option defines the behavior of System series when DC power is supplied.
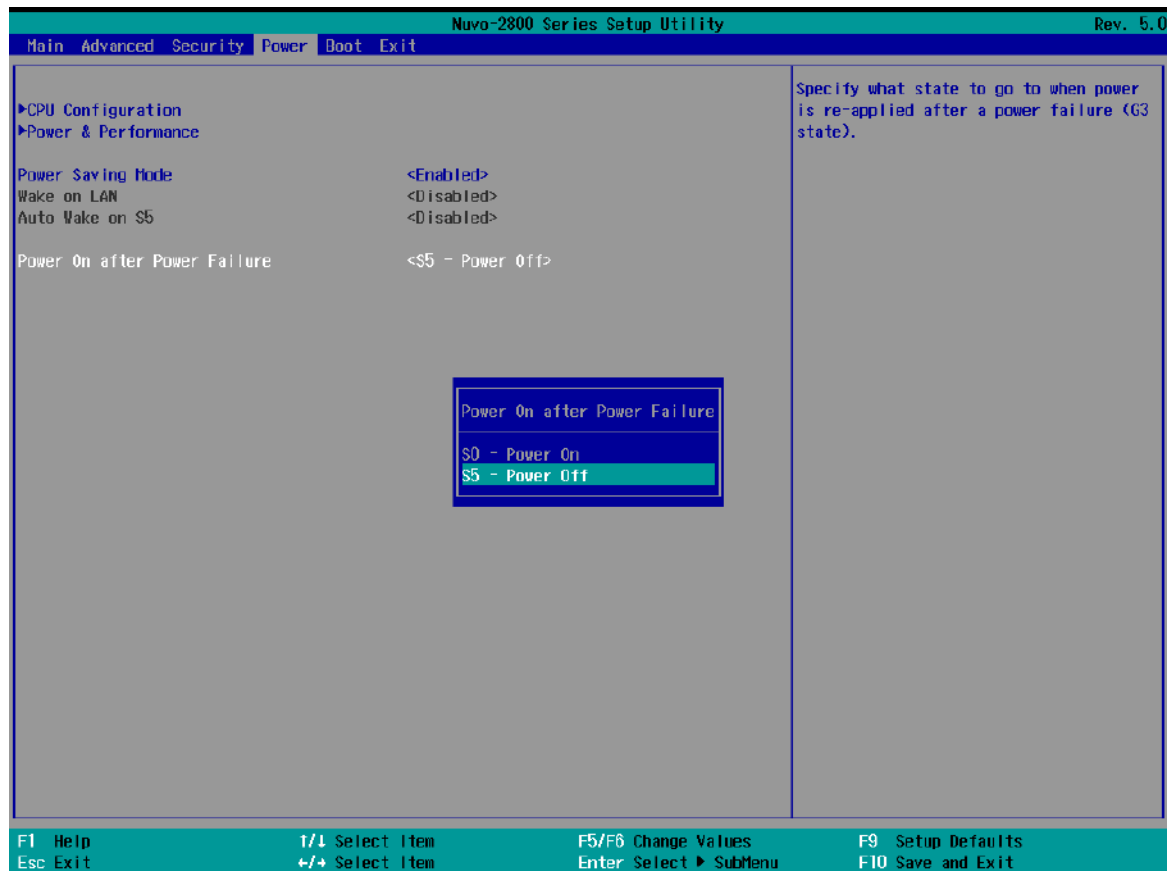


| Value | Description |
|---|---|
| S0 – Power On | System is powered on when DC power is supplied. |
| S5 – Power Off | System is kept in off state when DC power is supplied. |

To set "Power On after Power Failure" option:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Power] > [Power On after Power Failure]**.

3. Scroll down to highlight **[Power On after Power Failure]**, press ENTER to bring up setting options, S0 – Power On or S5 – Power Off, and press ENTER to select the setting.

4. Press F10 to "Exit Saving Changes".

## 4.1.5 Power & Performance

The system supports Intel Alder Lake N97 CPU with a 12W TDP. The platform offers a boot performance mode to maximize efficiency (Max Battery) or performance (Turbo Performance).
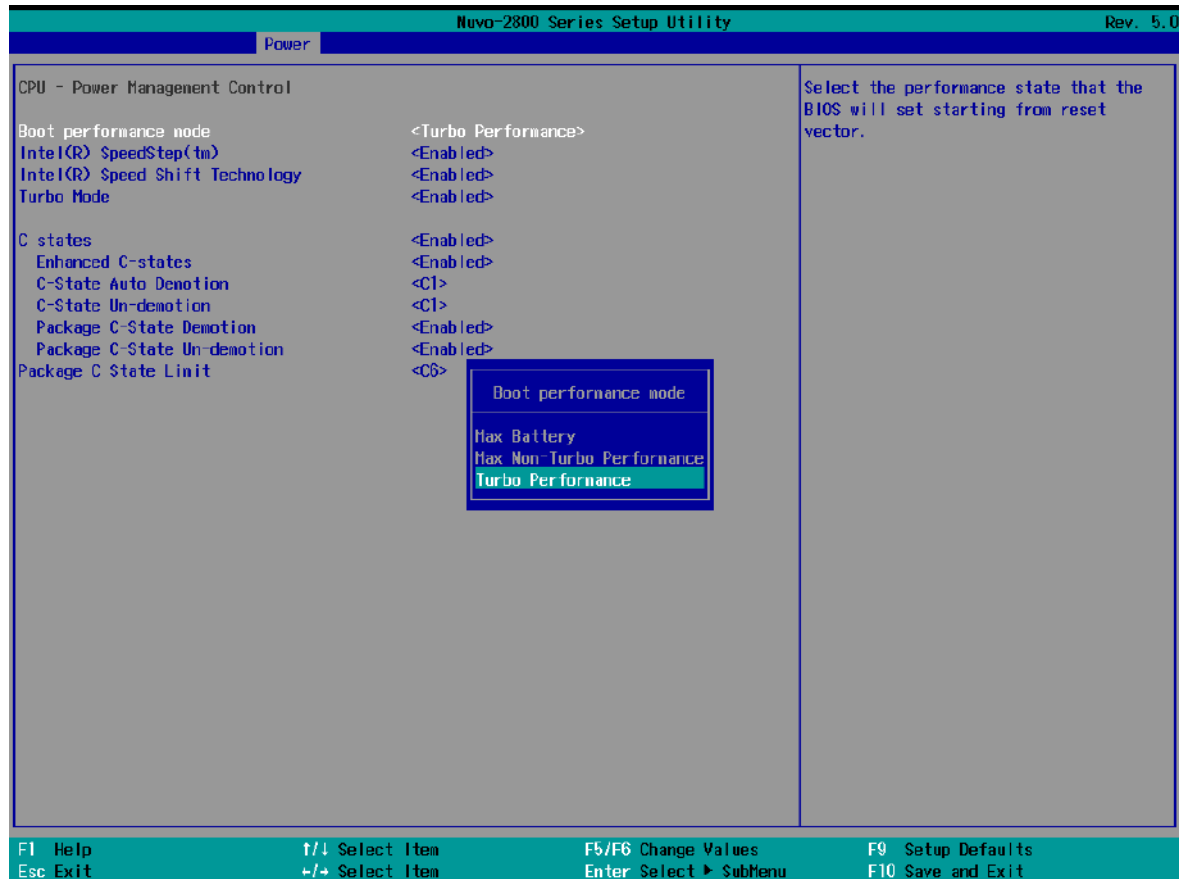


To configure the CPU SKU power limit:

1. When the system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Power]** → **[Power & Performance]** → **[Boot performance mode]**.

3. Select a desired value, and press ENTER to select it.

4. Press F10 to "Exit Saving Changes.

**NOTE**

*The option "Turbo Performance" allows the CPU to operate at maximum performance with the highest power consumption. Make sure you're using a power supply with a rated power output four times that of the CPU TDP to ensure reliable system operations.*

### 4.1.6 Power Saving Mode

> 📝 **NOTE**
>
> *If you are using WOL functions, please set Power Saving Mode to **Disabled**.*

The platform features a power saving mode where when in idle, the system consumes approximately 1.1V of electricity.
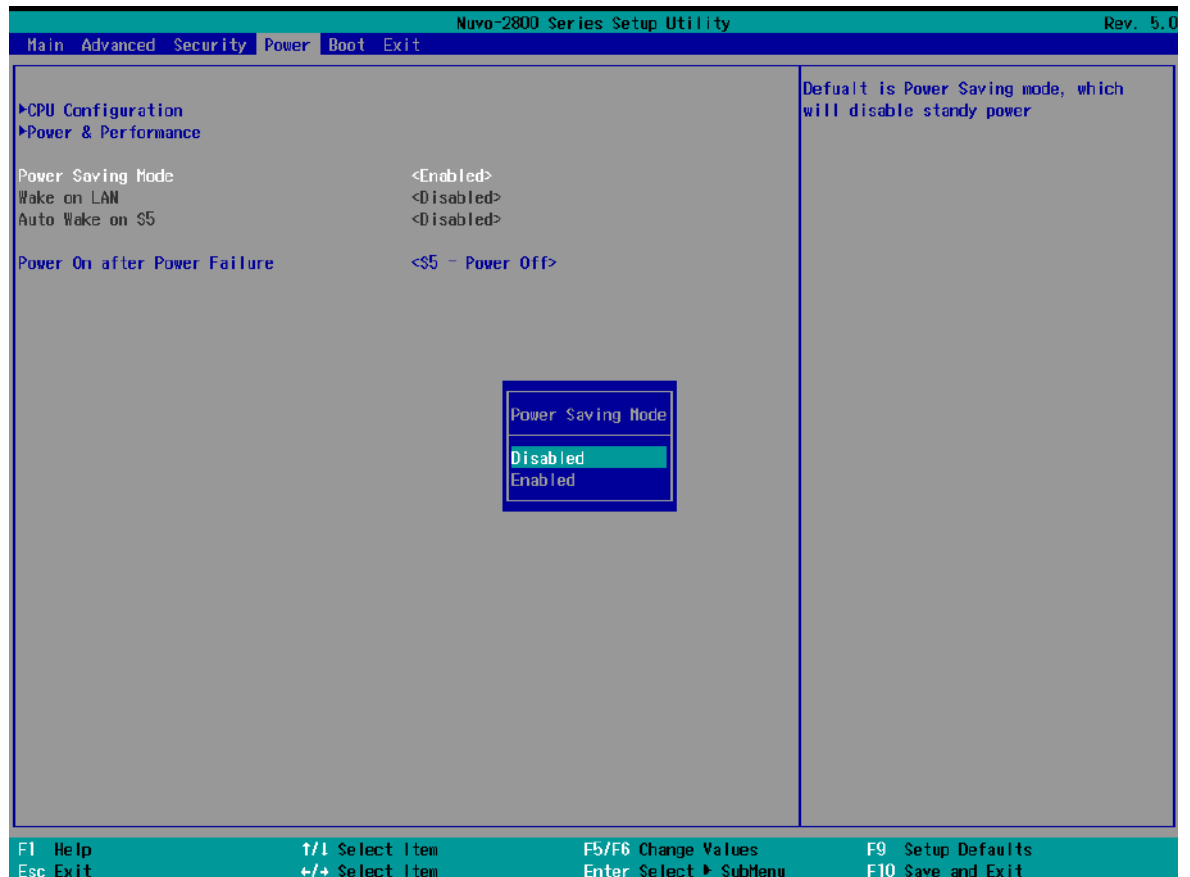


To enable the power saving mode:

1. When the system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Power]** → **[Power Saving Mode]**, and press ENTER.

3. Select Enabled or Disabled, and press ENTER to set it.

4. Press F10 to save and exit.

### 4.1.7 Wake on LAN Option

> ✎ **NOTE**
>
> *Please set Power Saving Mode to **Disabled** if you are using WOL functions.*

Wake-on-LAN (WOL) is a mechanism which allows you to turn on your System series via Ethernet connection. To utilize Wake-on-LAN function, you have to enable this option first in BIOS settings. Please refer "Powering On Using Wake-on-LAN" to set up the system.

```
                             Nuvo-2800 Series Setup Utility                        Rev. 5.0
 Main  Advanced  Security  Power  Boot  Exit

▶CPU Configuration                                      Determines the action taken when the
▶Power & Performance                                    system power is off and a Wake-on-LAN
                                                        event occurs on any of GbE port.
 Power Saving Mode                <Disabled>
 Wake on LAN                      <Disabled>
 Auto Wake on S5                  <Disabled>

 Power On after Power Failure     <S5 - Power Off>



                                         ┌─────────────┐
                                         │ Wake on LAN │
                                         │             │
                                         │ Disabled    │
                                         │ Enabled     │
                                         └─────────────┘




 F1   Help              ↑/↓  Select Item        F5/F6 Change Values        F9   Setup Defaults
 Esc  Exit              ←/→  Select Item        Enter Select ▶ SubMenu     F10  Save and Exit
```

To enable/ disable "Wake on LAN" option:

1.  When system boots up, press F2 to enter BIOS setup utility.

2.  Go to **[Power]> [Wake on LAN]**.

3.  Press ENTER to bring up setting options, scroll to the setting you desire and press ENTER to set.

4.  Press F10 to "Exit Saving Changes.

## 4.1.8 Boot Menu

The Boot menu in BIOS allows you to specify the system's boot characteristics by setting bootable device components (boot media) and method. Or, you may press F12 upon system start up and select a device you wish boot from.
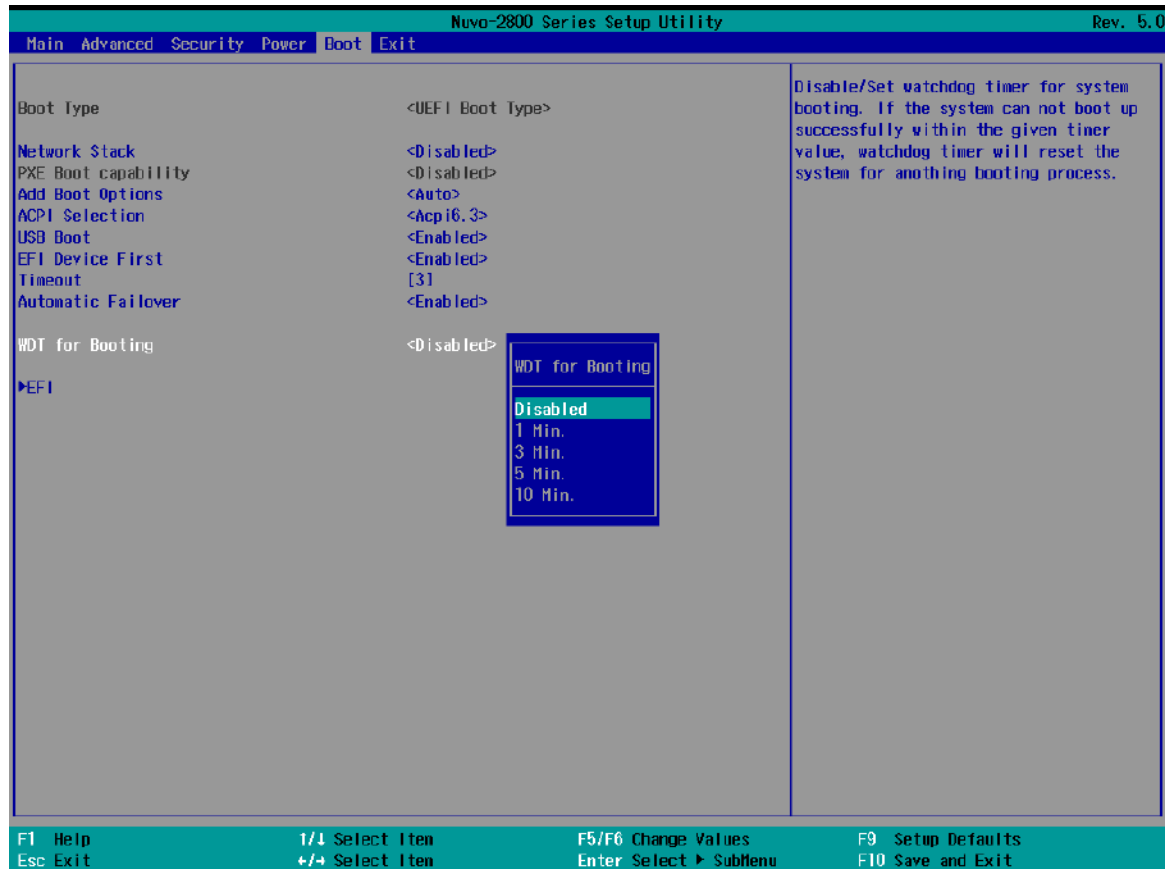


| Value | Option | Description |
|---|---|---|
| Boot Type | UEFI Boot Type | Only legacy boot media listed are approved as boot media. |
| Network Stack | Enabled | The system is available for network access using UEFI. |
| | Disabled | The system is not available for network access using UEFI. |
| PXE Boot capability | Disabled | Only UEFI Network Stack is supported: Preboot eXecution Environment (PXE) is not supported |
| | Enabled | By enabling the PXE boot, one can choose to boot via **I210 Only**. |
| Add Boot Options | First | Newly detected boot media are placed at the top of the boot order. |

| | Last | Newly detected boot media are placed at the bottom of the boot order. |
|---|---|---|
| ACPI Selection | 1.0B/ 3.0/ 4.0/ 5.0/ 6.0 | Advanced Configuration and Power Interface allows the operating system to control system power management |
| USB Boot | Enabled | Allow boot from bootable USB devices. |
| | Disabled | Does not allow boot from bootable USB devices |
| EFI Device First | Enabled | Set to boot bootable EFI media first. |
| | Disabled | Will not boot bootable EFI media first. |
| Timeout | 1, 2, 3, etc (in seconds) | Boot delay time in seconds to give the user time to activate the hotkey to access the BIOS |
| WDT for booting | Disabled, 1, 3, 5, 10 (minutes) | WDT ensures a successful system boot by specifying a timeout value |

### 4.1.9 Position New Boot Device

The "Add Boot Options" allow you to determine whether a newly added device (eg. USB flash disk) is to boot as the first device to boot or the last in the boot sequence.

To set the newly-installed boot device as the first or last boot device:

1. Press **F2** when the system boots up to enter the BIOS setup utility.

2. Go to **[Boot] > [Add Boot Options]** menu.

3. Select **[First]** or **[Last]** for your newly-added boot device and press ENTER.
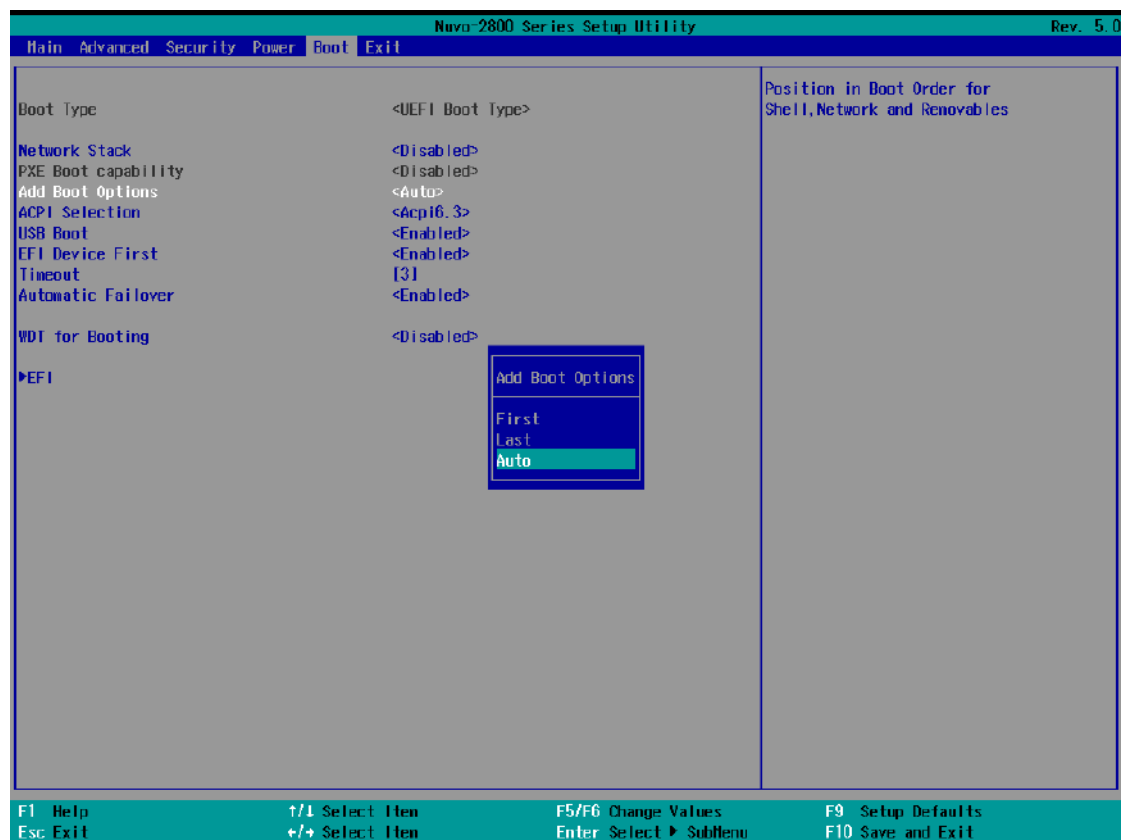


4. Once set, press **F10** to save setting and exit.

### 4.1.10 Watchdog Timer for Booting

The watchdog timer secures the boot process by means of a timer. Once the timer expires, a reset command is issued to initiate another booting process. There are two options in BIOS menu, "*Automatically after POST*" and "*Manually after Entering OS*". When "*Automatically after POST*" is selected, the BIOS automatically stops the watchdog timer after POST (Power-On Self Test) OK. When "*Manually after Entering OS*" is selected, the user must stop the watchdog timer once booted into the OS. This guarantees the system can always boot into the OS, otherwise another booting process will be initiated. For information about programming watchdog timer, please refer to Watchdog Timer & Isolated DIO.
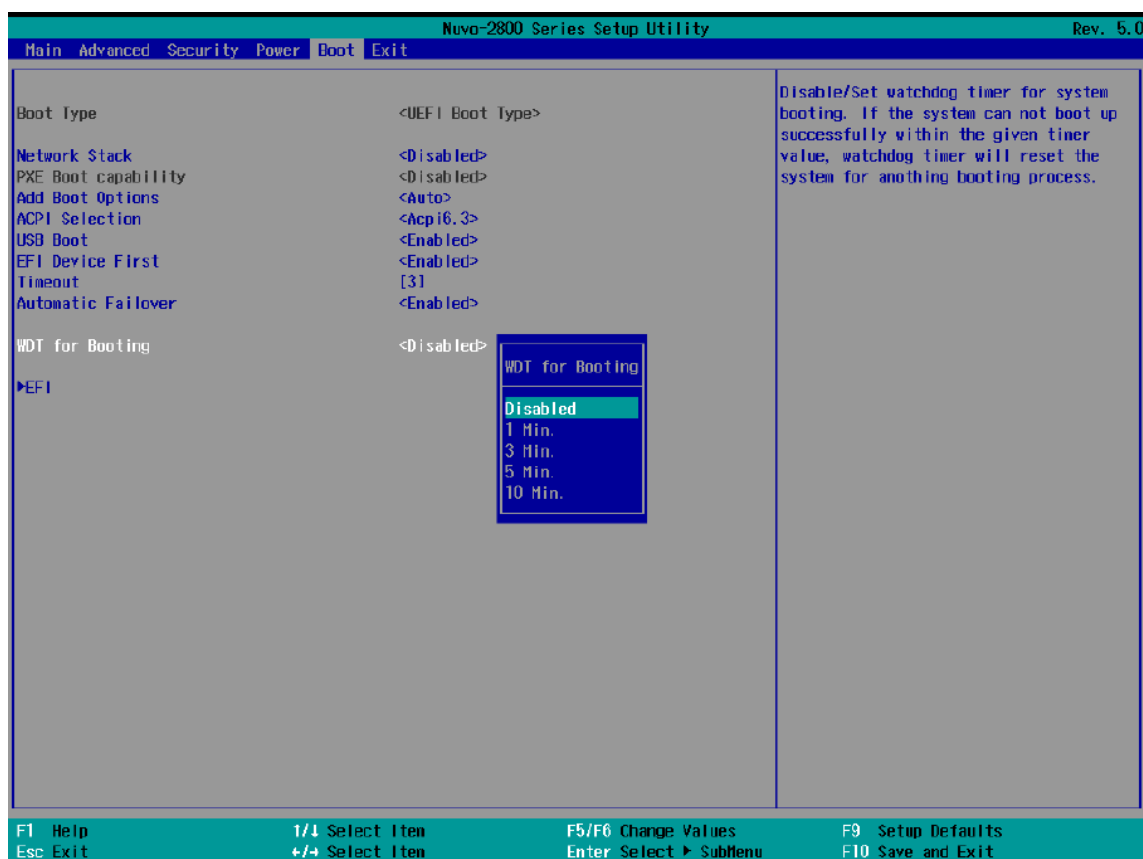


To set the watchdog timer for boot in BIOS:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Boot]** menu.

3. Disable or select timeout value for **[WDT for Booting]** option.

4. Once you give a timeout value, the **[WDT Stop Option]** option appears. You can select "*Automatically after POST*" or "*Manually after Entering OS*".

5. Press F10 to "Exit Saving Changes.

# 5 OS Support and Driver Installation

## 5.1 Operating System Compatibility

The system supports most operating system developed for Intel® x86 architecture. The following list contains the operating systems which have been tested by Neousys Technology.

- Microsoft Windows 10 LTSC 2021 (x64)
- Microsoft Windows 11 IoT Enterprise 22H2 64-bit
- Ubuntu 20.04.2 LTS or other distribution with kernel version ≥ 5.19 */**

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NOTE

*For Linux system, user may need to manually compile and install the driver for Intel graphics or I210 GbE controller if the driver is not embedded in kernel. You can visit Intel website for further information.*

**For distributions, graphics driver function may not be completely implemented in its kernel. You may encounter restrictions when using these features, such as dual independent display. For optimum operation, it is the users' responsibility to manually check for new drivers and upgrades!*

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Neousys may remove or update operating system compatibility without prior notice. Please contact us if your operating system of choice is not on the list.

## 5.2 Driver Installation

The system drivers are available online, please click on this link to download the driver.

## 5.3 Drivers Installation for Watchdog Timer Control

Neousys provides a driver package which contain function APIs for Watchdog Timer control function. You should install the driver package (WDT_DIO_Setup.exe) in prior to use these functions. Please note that you must install WDT_DIO_Setup_v2.4.0.0 or later versions.

Please refer to this link to download WDT_DIO.

# Appendix A Using WDT & DIO

The watchdog timer (WDT) function ensures reliable system operation. The WDT is a hardware mechanism to reset the system if the watchdog timer is expired. Users can start the WDT and keeping resetting the timer to make sure the system or program is running. Otherwise, the system shall be reset.

In this section, we'll illustrate how to use the function library provided by Neousys to program the WDT functions. Currently, WDT driver library supports Windows 10 x64 and WOW64 platform. For other OS support, please contact Neousys Technology for further information.

**Installing WDT_DIO Library**

The WDT_DIO function library is delivered in the form of a setup package named **WDT_DIO_Setup.exe**. In prior to program WDT, you should execute the setup program and install the WDT library. Please use the following WDT_DIO_Setup packages according to your operating systems and application.

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✎ **NOTE**

Please download from Neousys website and install the latest WDT_DIO_Setup.exe file.

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# WDT and DIO Library Installation

To WDT_DIO_Setup.2.4.0.0.exe will be used as an example to demonstrate WDT & DIO Library installation setup process. Please refer to the instructions below.

1. Execute **WDT_DIO_Setup.2.4.0.0.exe**.
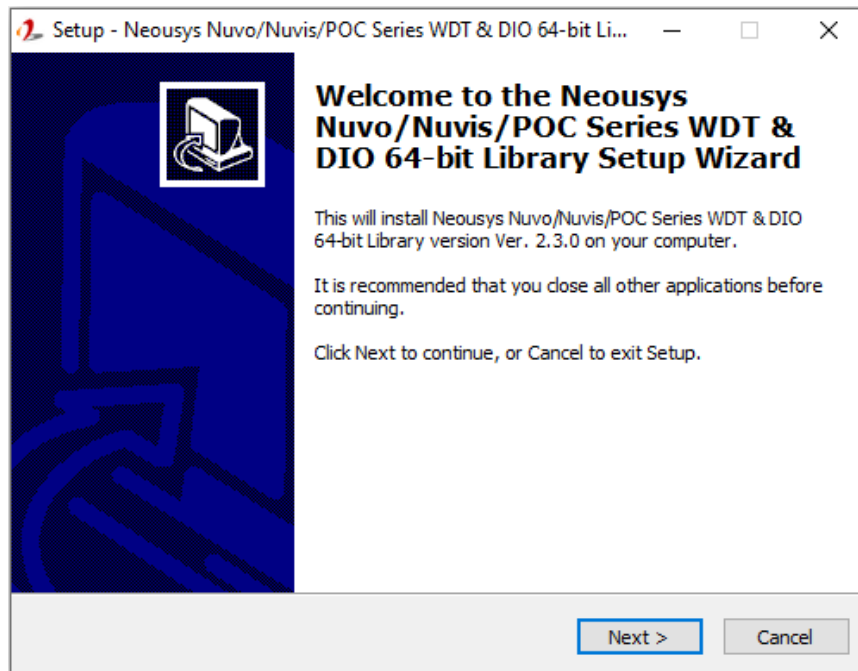


2. Click "Next >" and specify the directory of installing related files. The default directory is *C:\Neousys\WDT_DIO*.
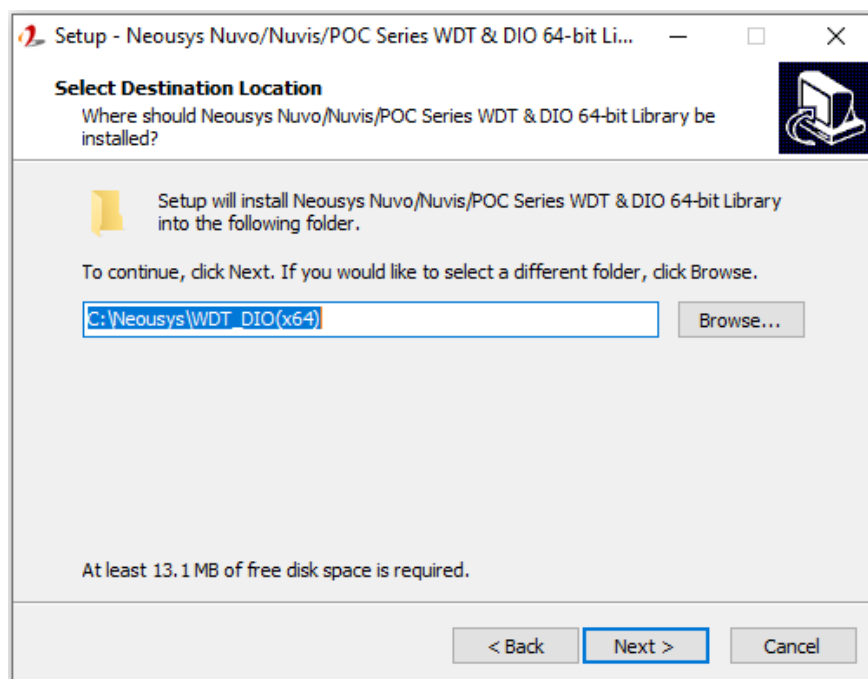
3. Once the installation has finished, a dialog will appear to prompt you to reboot the system. The WDT & DIO library will take effect after the system has rebooted.
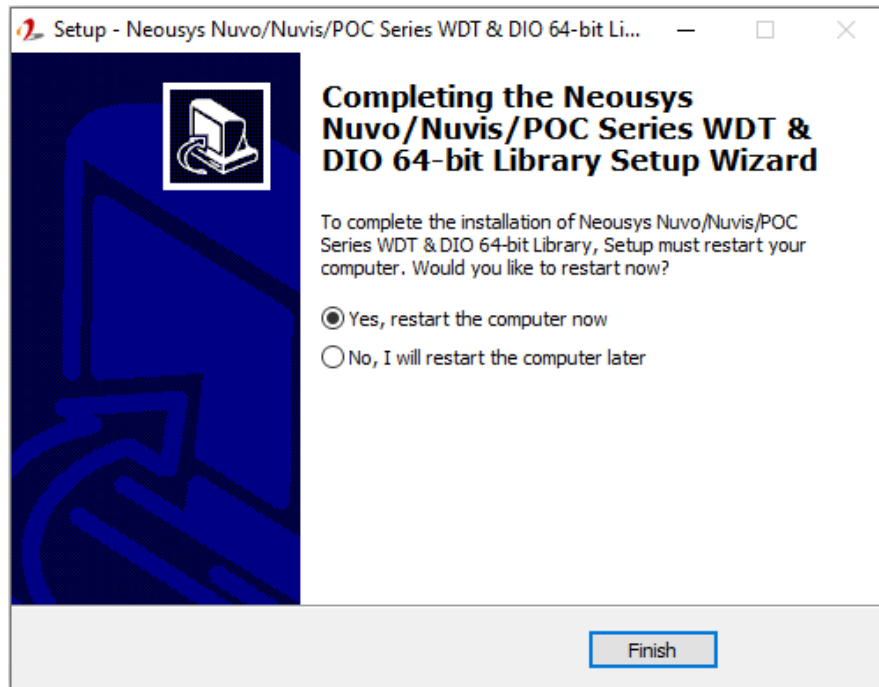


4. When programming your WDT or DIO program, the related files are located in

| Header File: | \Include |
|---|---|
| Library File: | \Lib |
| Function Reference: | \Manual |
| Sample Code: | \Sample\WDT_Demo (Demo for Watchdog Timer) \Sample\DIO_Demo (Demo for isolated DIO Control) \Sample\COS_Demo (Demo for change-of-state DI) |

# WDT Function Reference

## InitWDT

| Syntax | BOOL InitWDT(void); |
| --- | --- |
| **Description:** | Initialize the WDT function. You should always invoke InitWDT() before set or start watchdog timer. |
| **Parameter** | None |
| **Return Value** | **TRUE:** Successfully initialized<br><br>**FALSE:** Failed to initialize |
| **Usage** | BOOL bRet = InitWDT() |

## SetWDT

| Syntax | BOOL SetWDT(WORD tick, BYTE unit); |
| --- | --- |
| **Description** | Set timeout value and unit for watchdog timer. When InitWDT() is invoked, a default timeout value of 255 seconds is assigned. |
| **Parameter** | *tick*<br>    WORD value (1 ~ 65535) to indicate timeout ticks.<br>*unit*<br>    BYTE value (0 or 1) to indicate unit of timeout ticks.<br>    0 : unit is minute<br>    1: unit is second |
| **Return Value** | If value of unit is correct (0 or 1), this function returns TRUE, otherwise FALSE. |
| **Usage** | WORD tick=255;<br>BYTE unit=1; //unit is second.<br>BOOL bRet = SetWDT(tick, unit); //timeout value is 255 seconds |

## StartWDT

| Syntax | BOOL StartWDT(void); |
|---|---|
| Description | Starts WDT countdown. Once started, the WDT LED indicator will begin blinking. If ResetWDT() or StopWDT is not invoked before WDT countdowns to 0, the WDT expires and the system resets. |
| Parameter | None |
| Return Value | If the timeout value is given in correct format (WDT started), this function returns TRUE, otherwise FALSE |
| Usage | BOOL bRet = StartWDT() |

## ResetWDT

| Syntax | BOOL ResetWDT(void); |
|---|---|
| Description | Reset the timeout value to the value given by SetWDT().If ResetWDT() or StopWDT is not invoked before WDT countdowns to 0, the WDT expires and the system resets. |
| Parameter | None |
| Return Value | Always returns TRUE |
| Usage | BOOL bRet = ResetWDT() |

## StopWDT

| Syntax | BOOL StopWDT(void); |
|---|---|
| Description | Stops the countdown of WDT. When WDT has stopped, the WDT LED indicator stops blinking. |
| Parameter | None |
| Return Value | Always returns TRUE |
| Usage | BOOL bRet = StopWDT() |

# DIO Functions

## InitDIO

| | |
|---|---|
| **Syntax** | BOOL InitDIO(void); |
| **Description** | Initialize the DIO function. You should always invoke InitDIO() before write/read any DIO port/channel. |
| **Parameter** | None |
| **Return Value** | Returns TRUE if initialization successes, FALSE if initialization failed. |
| **Usage** | BOOL bRet = InitWDT() |

## DIReadLine

| | |
|---|---|
| **Syntax** | BOOL DIReadLine(BYTE ch); |
| **Description** | Read a single channel of isolated digital input. |
| **Parameter** | *ch* <br> BYTE value specifies the DI channel to be read. C*h* should be a value of 0 ~ 7. |
| **Return Value** | The status (TRUE or FALSE) of the specified DI channel. |
| **Usage** | BYTE ch=3; //DI channel #3 <br><br> BOOL DIChValue = DIReadLine(ch); //read DI channel #3 |

## DIReadPort

| | |
|---|---|
| **Syntax** | WORD DIReadPort(void); |
| **Description** | Read the entire isolated digital input port (8 channels). |
| **Parameter** | None |
| **Return Value** | A WORD value (0~255) indicates the status of DI port (8 DI channels). |
| **Usage** | WORD DIPortValue = DIReadPort (); |

## DOWriteLine

| | |
|---|---|
| **Syntax** | void DOWriteLine(BYTE ch, BOOL value); |
| **Description** | Write a single channel of isolated digital output. |
| **Parameter** | *ch*<br>BYTE value specifies the DO channel to be written. C*h* should be a value of 0 ~ 7.<br>*value*<br>BOOL value (TRUE or FALSE) specifies the status of DO channel. |
| **Return Value** | None |
| **Usage** | BYTE ch=3; //DI channel #3<br>BOOL DOChValue=TRUE;<br><br>DOWriteLine(ch, DOChValue); //write DO channel #3 as TRUE |

## DOWritePort

| | |
|---|---|
| **Syntax** | void DOWritePort(WORD value); |
| **Description** | Write the entire isolated digital output port (8 channels). |
| **Parameter** | *value*<br>WORD value specifies the status of the DO port. V*alue* should be a value of 0~255. |
| **Return Value** | None |
| **Usage** | WORD DOPortValue=0XFF; //11111111b<br>DOWritePort(DOPortValue); //write DO port as 11111111b |