

Neosys Technology Inc.

PCIe-GL26

User Manual

Revision 1.1

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Legal Information

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For questions in regards to hardware/ software compatibility, customers should contact Neosys Technology Inc. sales representative or technical support.

To the extent permitted by applicable laws, Neosys Technology Inc. shall NOT be responsible for any interoperability or compatibility issues that may arise when (1) products, software, or options not certified and supported; (2) configurations not certified and supported are used; (3) parts intended for one system is installed in another system of different make or model.

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FCC This equipment has been tested and found to comply with the limits for a Class A

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

CE Conformity 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.

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 and describes how to setup/ install Neosys Technology PCIe-GL26, an AI-enabled automotive six-port GMSL2 camera frame grabber card. It is a turnkey industrial-grade frame grabber solution that incorporates drivers for selected GMSL2 cameras with video streaming sample codes.

Revision History

Version	Date	Description
1.0	Jan. 2023	Initial release
1.1	Jan, 2024	Updated system installation considerations when installing multiple PCIe cards

1 Introduction

PCIe-GL26 is an AI-enabled automotive six-port GMSL2 camera frame grabber card. It is a turnkey industrial-grade frame grabber solution that incorporates drivers for selected GMSL2 cameras with video streaming sample codes.

PCIe-GL26 aims to provide superior outdoor vision capability with automotive GMSL2 camera connectivity to advanced x86 autonomous vehicle computing platforms. Automotive GMSL2 cameras are ideal for autonomous vehicle applications due to their advanced features, such as IP67 waterproof, high dynamic range (120dB HDR), auto white balance (AWB), and LED flicker mitigation (LFM). It also benefits computer vision applications in outdoor environments where illumination conditions are constantly changing. Powerful x86 computers with PCIe-GL26 can obtain high-quality images with minimal latency regardless of lighting conditions, from bright sunny days to pitch-black nights.

With a half-length, standard height, and single-slot form factor, PCIe-GL26 can be accommodated in most host computers with a PCIe expansion. With pre-built sample codes, a host computer can install up to four PCIe-GL26 cards and support up to 24x GMSL2 camera streams. Featuring a unique synchronization mechanism, it is capable of acquiring images from six GMSL2 cameras simultaneously within microseconds of channel-to-channel skew. It can also accept a GPS PPS signal to align image data with LIDAR or PCIe-GL26 in another host machine.



Powered by Jetson Xavier™ NX, PCIe-GL26 is much more than just a GMSL2 frame grabber card. With 21 TOPS AI performance, 6x GMSL2 camera inputs, 1x GPS PPS input, 1x RS232, and 1x isolated CAN 2.0, PCIe-GL26 is an AI camera sensor hub capable of sensor fusion and data pre-processing for ADAS or autonomous vehicles.

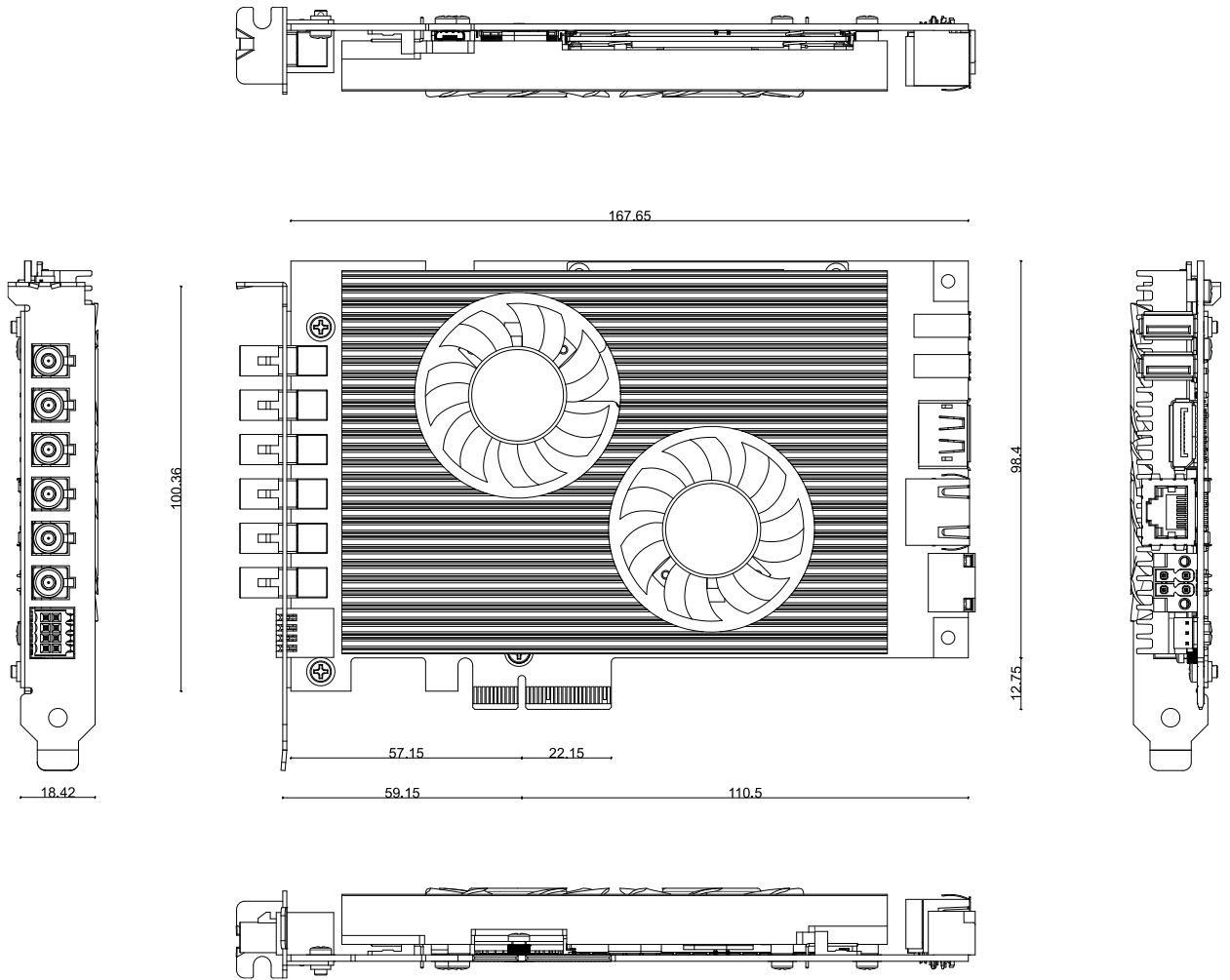
1.1 PCIe-GL26 Specification

System Core	
Processor	NVIDIA® Jetson Xavier™ NX System-on-Module (SOM), comprising of NVIDIA® Volta GPU and Carmel CPU
Memory	8GB/ 16GB LPDDR4x (Xavier NX 8GB/ 16GB) @ 1600/ 1866 MHz (15W/ 20W TDP mode)
eMMC	16GB eMMC 5.1
Deployment I/O Interface	
Bus Interface	x2, Gen3 PCI Express
GMSL2	6x GMSL2 ports (3Gbps) FAKRA Z connectors
CAN bus	1x isolated CAN 2.0 port
Serial Port	1x RS-232 port
Isolated DIO	1x GPS PPS input
Development I/O Interface	
Ethernet port	1x Gigabit Ethernet
USB	2x USB 2.0 ports 1x micro USB (OTG)
Video Port	1x DisplayPort, supporting 3840x2160 at 60Hz
DC Input	12V DC power input (for development only)
Internal I/O Interface	
M.2 NVMe	1x M.2 2242 M key socket (PCIe Gen3 x1) for NVMe SSD
Mechanical	
Dimension	167.7 mm (W) x 111 mm (H)
Weight	0.43Kg
Environmental	

Operating Temperature	-25°C to 60°C with airflow (20W TDP mode) *
Storage Temperature	-40°C to 85°C
Humidity	10% to 90%, non-condensing
EMC	CE Class A, according to EN 55032/55035 (pending) FCC Class A, according to FCC Part 15, Subpart B (pending)

* For sub-zero and over 60°C operating temperature, a wide temperature NVMe is required.

1.2 Dimension



All measurements are in millimeters (mm).

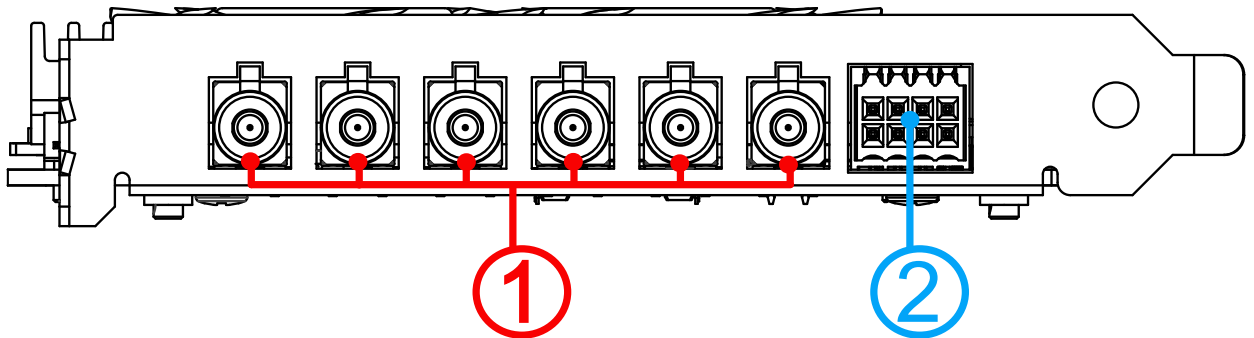
2 Setting Up Your PCIe-GL26

2.1 Unpacking Your PCIe-GL26

Upon receiving the PCIe-GL26, please check immediately if the package contains all the items listed in the following table. If any item is missing or damaged, please contact your local dealer or Neousys Technology.

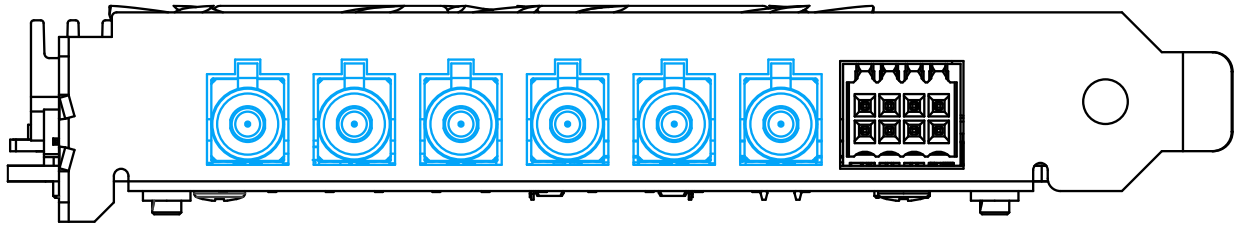
Item	Description	Qty
1	PCIe-GL26	1
2	Screw pack	1
3	Standoff pack	1
4	Poron	4

2.2 Panel Side Connectivity



No.	Item	Description
1.	FAKRA Z connectors	There are six FAKRA Z connectors on the panel side of PCIe-GL26 designed to connect to GMSL2 cameras.
2.	8-pin terminal block	The 8-pin terminal includes isolated signals for GPS PPS input, CAN 2.0, and a RS-232 COM port.

2.2.1 FAKRA Z Connector

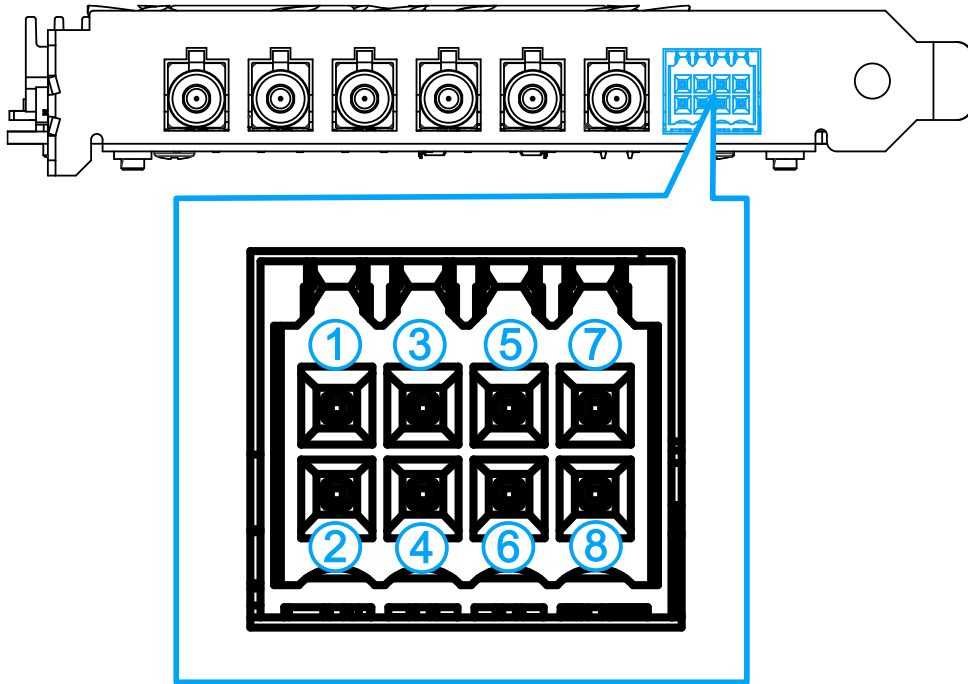


Fachkreis Automobil (FAKRA) connector is a German standard for SubMiniature version B based automotive-grade connectors. There are six FAKRA Z connectors on the panel side of PCIe-GL26 to connect to automotive GMSL2 cameras.

Due to their advanced features such as IP67 waterproof, high dynamic range (120dB HDR), auto white balance (AWB), and LED flicker mitigation (LFM), automotive GMSL2 cameras are ideal for autonomous vehicle applications. due to their advanced features, such as IP67 waterproof, high dynamic range (120dB HDR), auto white balance (AWB), and LED flicker mitigation (LFM).

It also benefits computer vision applications in outdoor environments where illumination conditions are constantly changing. Powerful x86 computers with PCIe-GL26 can obtain high-quality images with minimal latency regardless of lighting conditions, from bright sunny days to pitch-black nights.

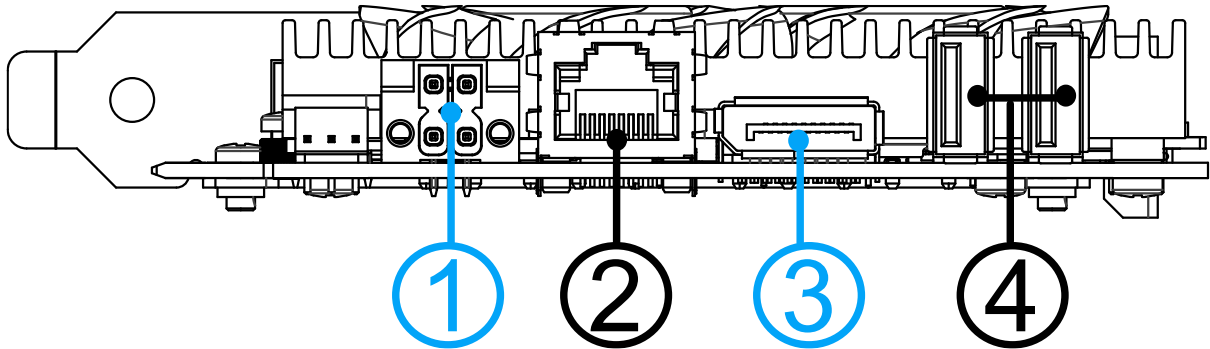
2.2.2 8-pin Terminal Block



The terminal includes isolated signals for GPS PPS input, CAN 2.0, and a RS-232 COM port. For pin definitions, please refer to the following table:

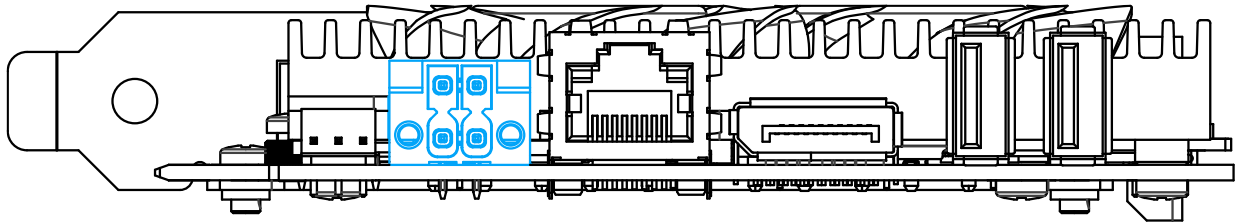
Pin	Description	Pin	Description
1	PPS0_H	5	CAN_L
2	PPS0_L	6	COM_RX
3	CAN_GND	7	CAN_H
4	COM_GND	8	COM_TX

2.3 Onboard Connectivity

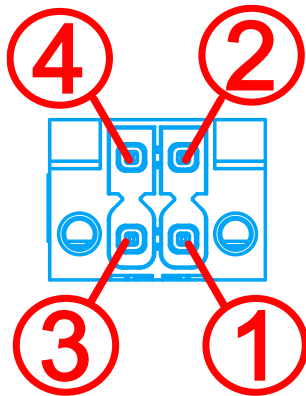


No.	Item	Description
1.	4-pin 12V DC input	When PCIe-GL26 is not installed in a computer (without PCIe supplying power), the 4-pin Supports 12V DC input as power source for independent develop use.
2.	Gigabit Ethernet	The Ethernet ports support 10/ 100/ 1000Mbps network connections.
3	DisplayPort	Support display resolutions up to 3840 x 2160. Compatible with HDMI/ DVI via an active adapter/ cable (support resolution may vary).
4	USB2.0 ports	The USB 2.0 ports are compatible with USB 1.1 / 1.0.

2.3.1 4-pin 12V DC Input



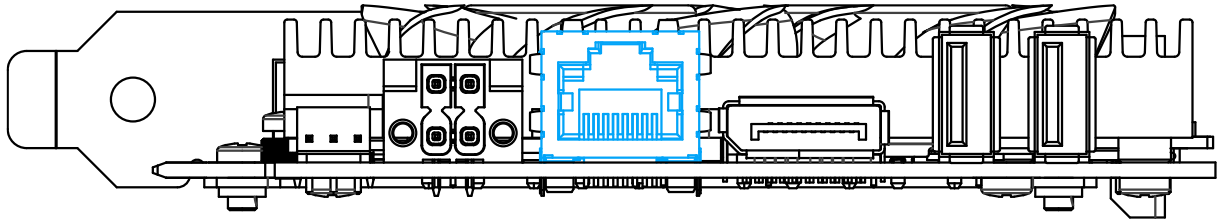
When PCIe-GL26 is not installed in a computer (without the PCIe slot supplying power), the 4-pin plug can support 12V DC input as the power source for independent develop use.



Pin Definition

Pin	Description
1	12V
2	NC
3	Ground
4	NC

2.3.2 Ethernet Port

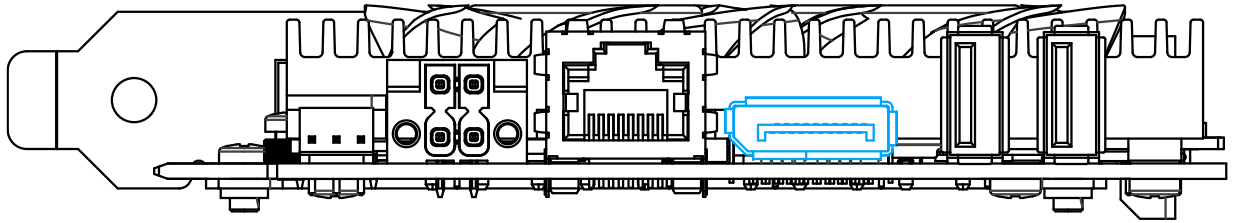


There is a Ethernet port that is compatible with 1000/ 100/ 10 Mbit link speeds. Relevant drivers may need to be installed before you can utilize the port.

Please refer to the table below for LED connection statuses.

LAN Speed	LED	LAN
10 Mbps	Link/Active	Orange (blink)
	Speed	Off
100 Mbps	Link/Active	Orange (blink)
	Speed	Off
1.0 Gbps	Link/Active	Orange (blink)
	Speed	Orange
No Link	Link/Active	Off
	Speed	Off

2.3.3 DisplayPort



The system has a DisplayPort (DP) output which is a digital display interface that mainly connect video source and carry audio to a display device. It can deliver up to 3840 x 2160 in resolution and is designed to support **active** DP adapter/ cable. You can connect to display devices using DP-to-HDMI cable or DP-to-DVI cable.

Relevant drivers may need to be installed before you can utilize the port.

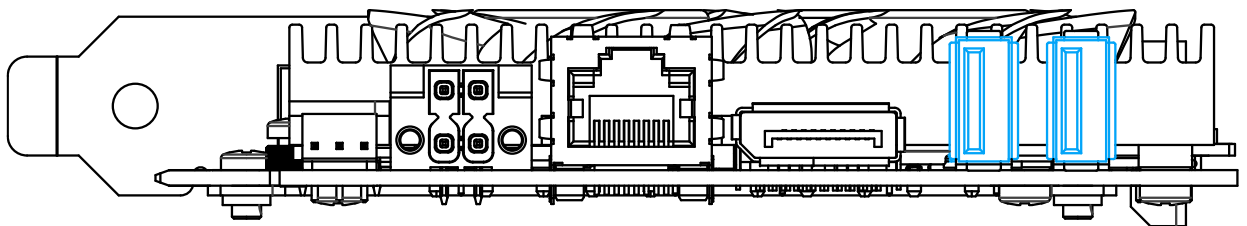


DP-to-HDMI



DP-to-DVI

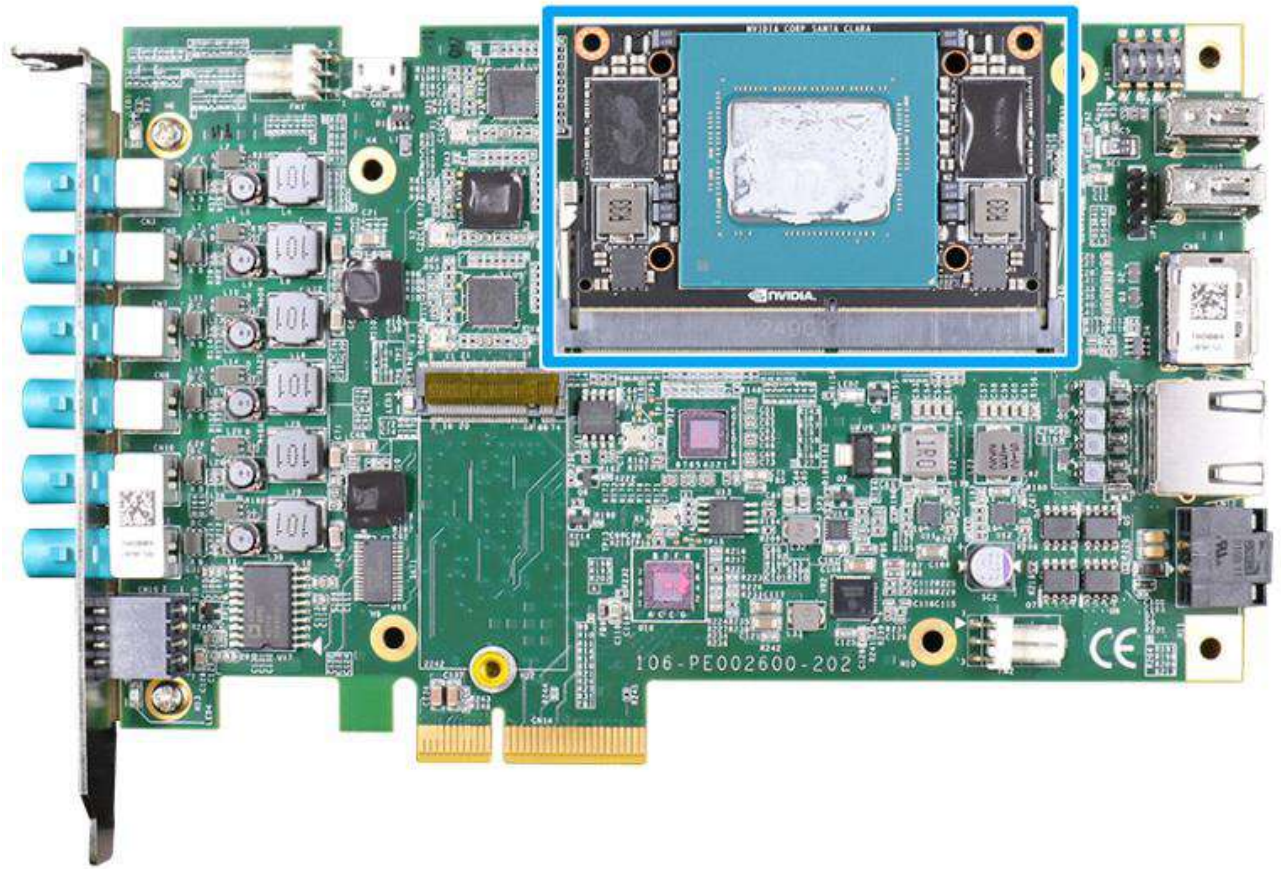
2.3.4 USB2.0 Port



The USB2.0 ports are backward compatible with USB 1.1 and USB 1.0 devices. Legacy USB support is also provided so you can use USB keyboard/mouse in DOS environment.

Relevant drivers may need to be installed before you can utilize the port.

2.4 Onboard NVIDIA Jetson Xavier NX Module

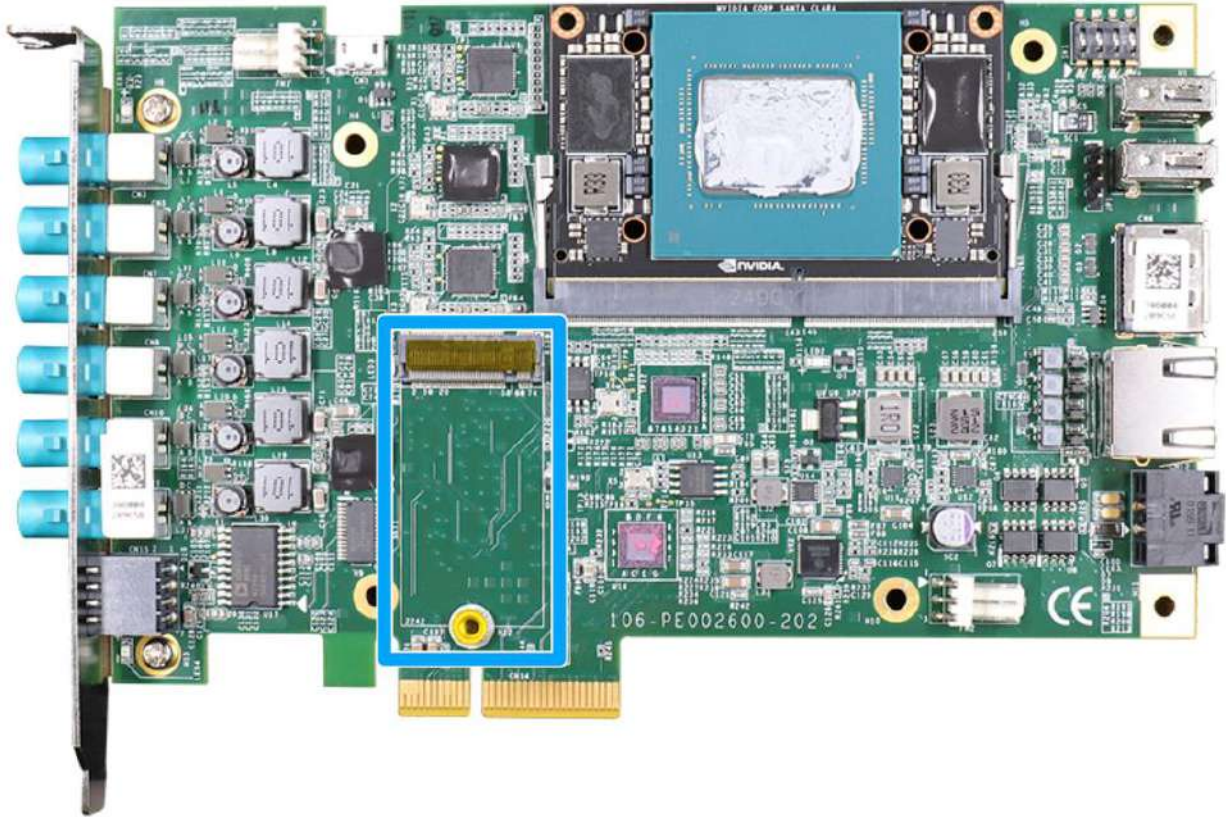


The PCIe-GL26 features a dedicated slot for NVIDIA Jetson Xavier NX module .

 NOTE

If your PCIe-GL26 came with an NVIDIA Jetson Xavier NX preinstalled, the thermal pads (for Xavier NX and NVMe SSD) at the bottom of the heatsink will be removed during the factory installation process.

2.5 Onboard M.2 2242 M Key Slot for NVMe SSD



PCIe-GL26 has a Gen3 x1 PCIe M.2 2242 slot for you to install an NVMe SSD. The M.2 NVMe SSD offers significantly better system performances when compared to a 2.5" SSD.



NOTE

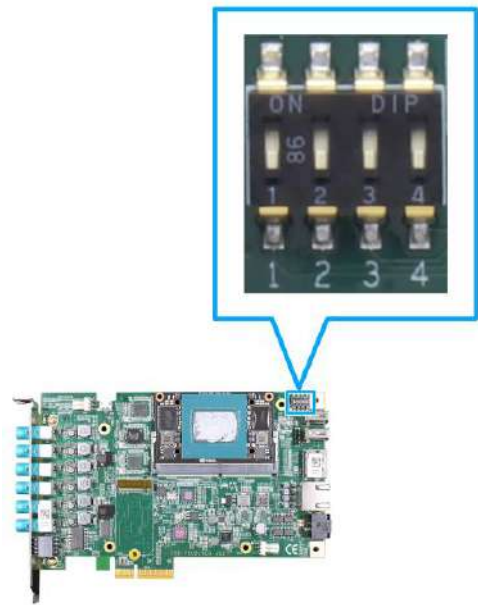
If your PCIe-GL26 came with an NVIDIA Jetson Xavier NX preinstalled, the thermal pads (for Xavier NX and NVMe SSD) at the bottom of the heatsink will be removed during the factory installation process.

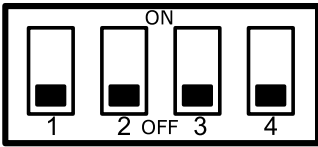
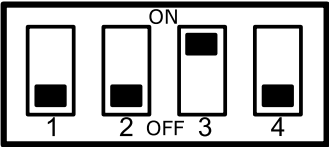
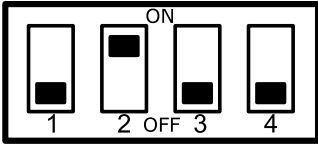
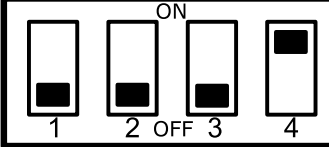
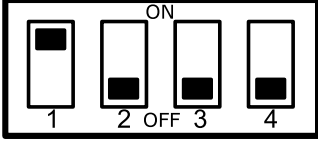
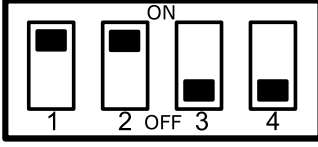
2.6 PCIe-GL26 Board ID DIP Switch

In case you are looking to install multiple cards, there is a set of DIP switches (indicated in blue) for users to configure board ID. The board ID can be used as a parameter in API to specify the card.

Board ID Settings

The following illustrations describe DIP switch board ID settings. When installing multiple cards, please remember to set a different ID for each card.



Function	DIP Switch Position	Function	DIP Switch Position
Board ID 0		Recovery mode	
Board ID 1		12V 4-pin mode	
Board ID 2			
Board ID 3			

3 System Installation

Before you install PCIe-GL26 into the host computer, it is recommended that you setup the onboard ID via the DIP switch, and install the NVMe SSD before installing PCIe-GL26 into the host computer.

Once you have set up the DIP switch ID of your PCIe-GL26 for multi-card installation, and the NVMe SSD, then you are ready to install it into the host computer system. Please refer to the following installation procedures.

Before disassembling the system enclosure and installing the card, please read the following instructions:

- **DO NOT** remove the card out of the anti-static until you are ready to install it into the system.
- 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.

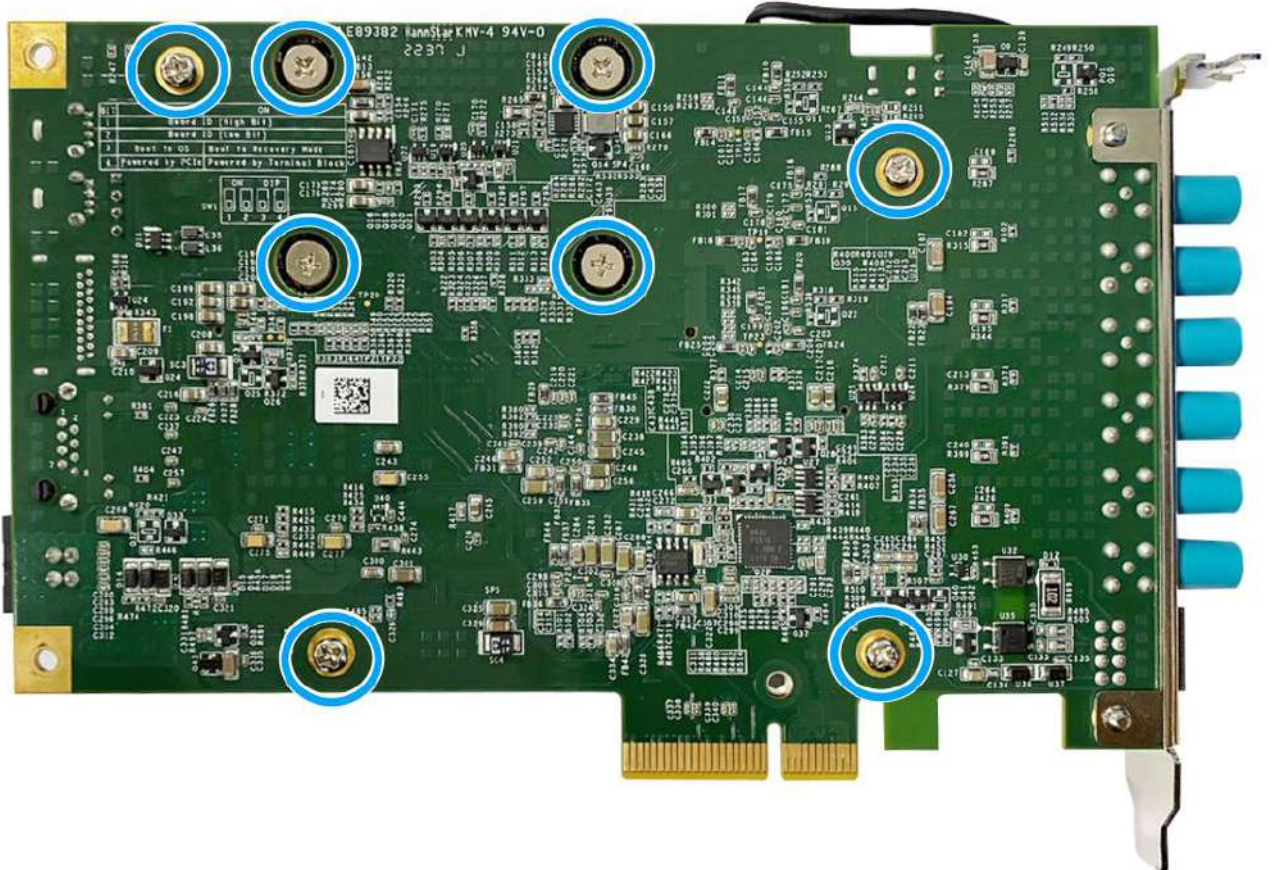


NOTE

Please ensure that the solder side component height of the subsequent PCIe card (on the PCIe-GL26 fan side) must not exceed the PCIe standards of 2.67mm. It is preferable to maintain a height below 2.3mm to avoid making contact with PCIe-GL26's heatsink fan.

3.1 Heatsink Removal

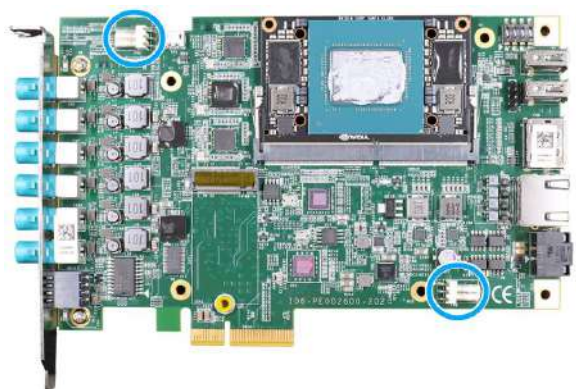
To access the NVME slot, the heatsink and fan must be remove and separated from the PCB. To do so, please remove the screws indicated in the illustration shown below.



Disconnect the 3-pin fan power cable, and gently remove the heatsink.



Disconnect two 3-pin fan plugs

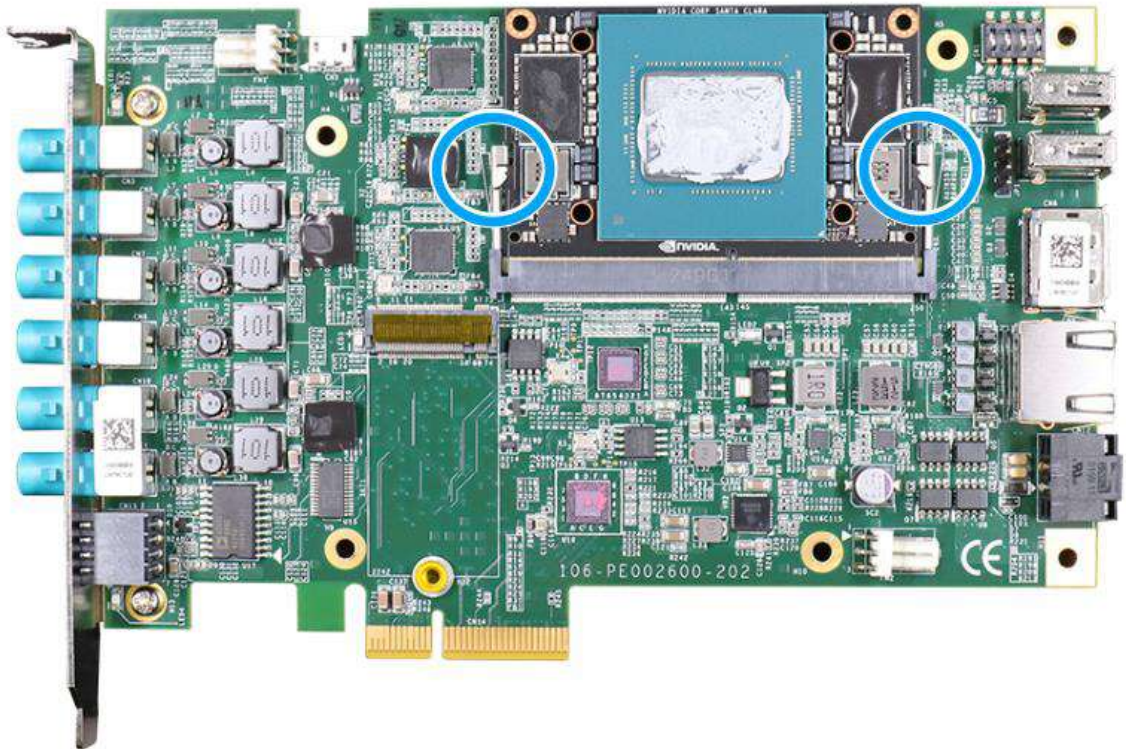


Remove the heatsink, note the position of the two fan 3-pin plugs

3.2 NVIDIA Jetson Xavier NX Installation

To install the NVIDIA Jetson Xavier NX module, please refer to the following instructions:

1. To remove the heatsink, please refer to the this [section](#).
2. Insert the NVIDIA Jetson Xavier NX module on a 45 degree angle into the slot, press down until it clicks in on both sides.

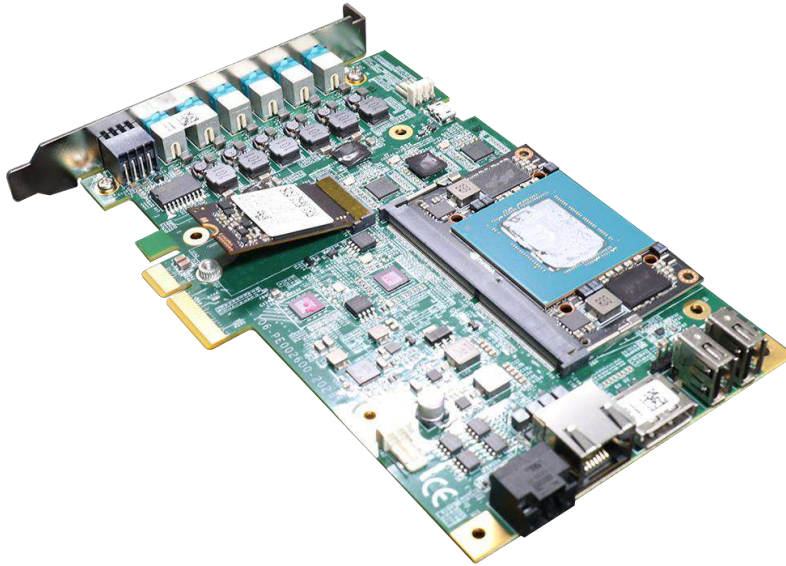


3. Remove the thermal pad protective film at the bottom of the heatsink.
4. [Reinstall the heatsink](#) to complete the NVIDIA Jetson Xavier NX module installation.

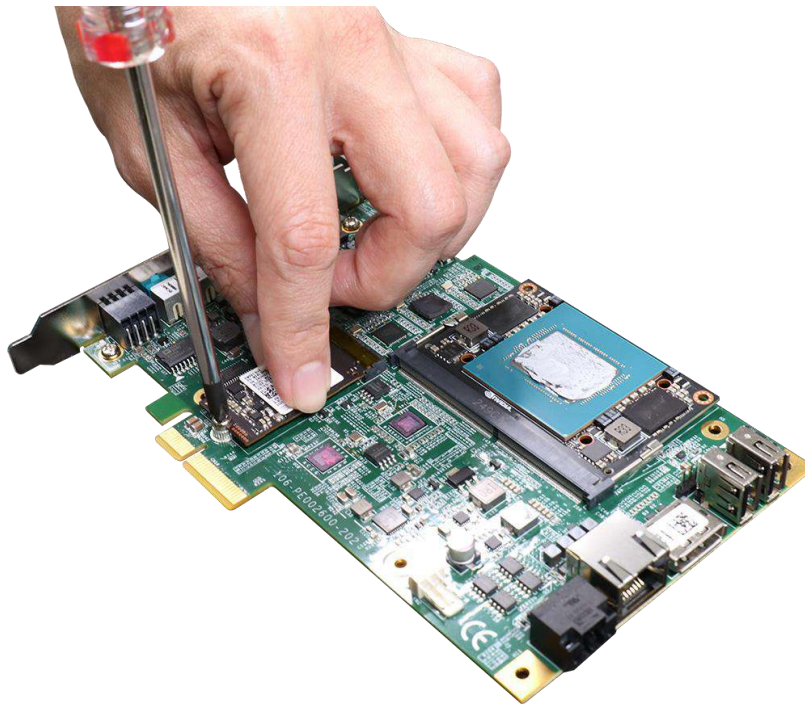
3.3 M.2 2242 M Key NVMe SSD Installation

To install the M.2 2242 M key NVMe SSD, please refer to the following instructions:

1. To remove the heatsink, please refer to this [section](#).
2. Insert the M.2 2242 NVMe SSD on a 45 degree angle into the slot.



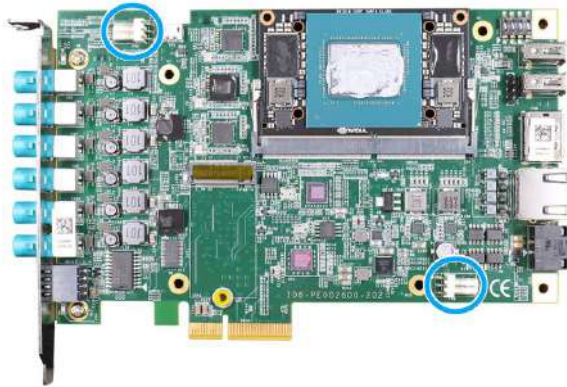
3. Press the SSD down and secure it with a screw.



4. Remove the thermal pad protective film at the bottom of the heatsink.
5. Reinstall the heatsink to complete the NVMe SSD

3.4 Reinstalling the Heatsink

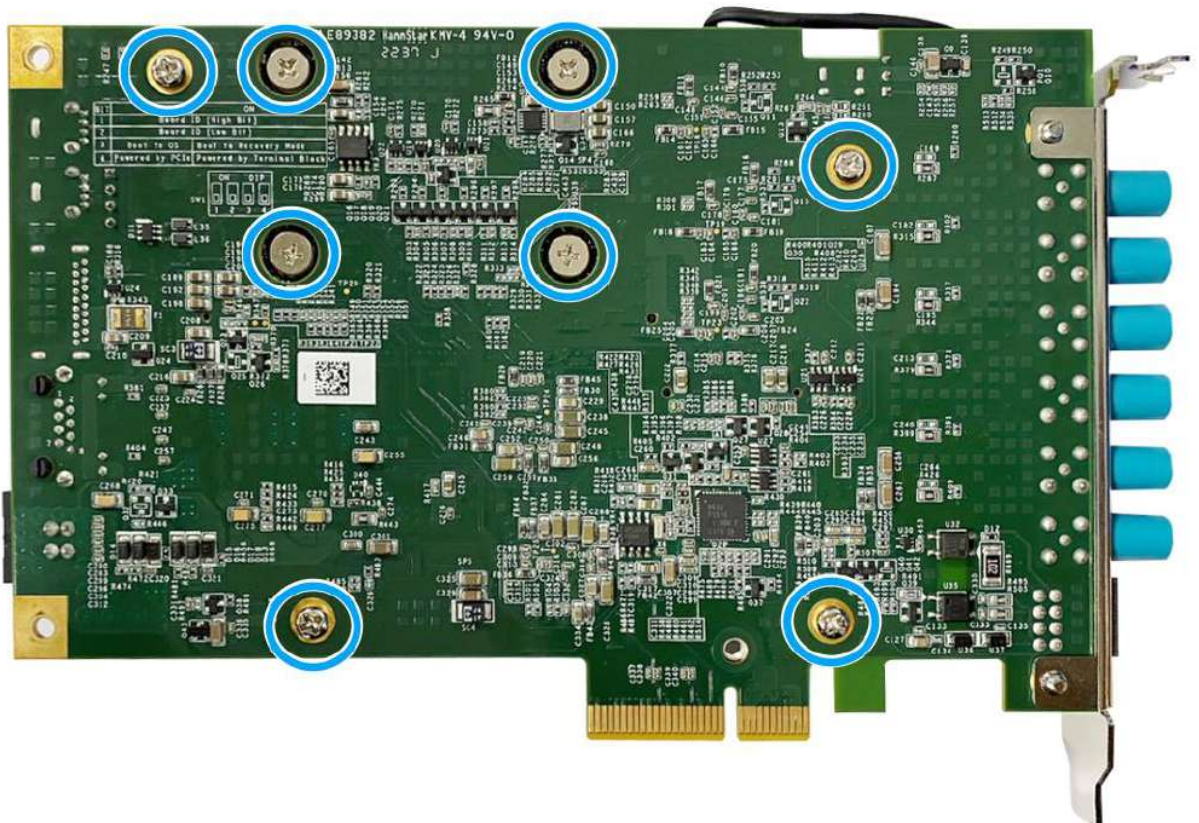
1. To reinstall the heatsink, connect the two 3-pin fan power connectors.



Note the position of the two fan 3-pin plugs

Position the heatsink above PCIe-GL26, connect two 3-pin fan plugs

2. Secure the screws indicated to complete the heatsink installation process.



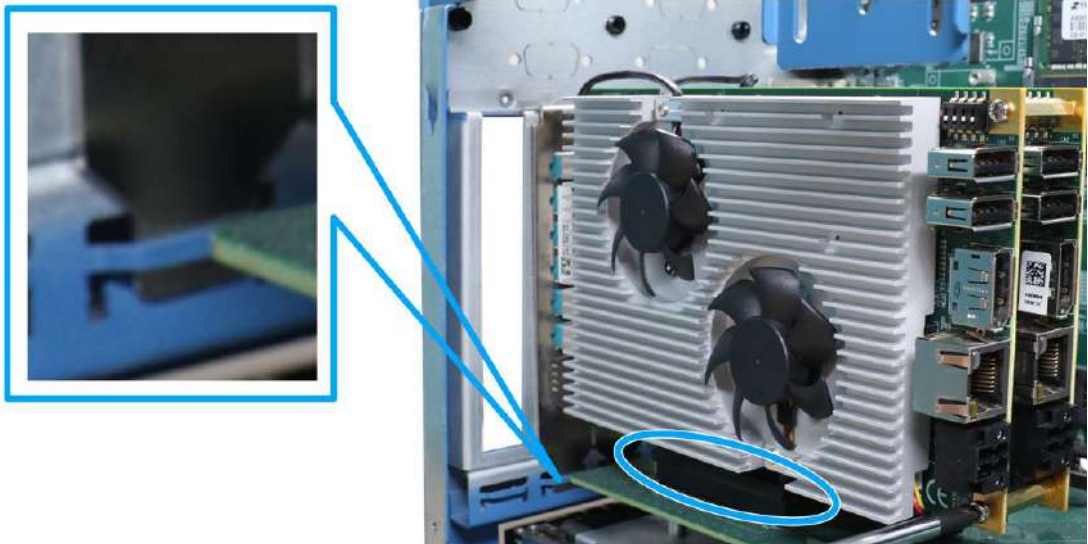
3.5 Installing PCIe-GL26 into the Host Computer

**NOTE**

Please ensure that the solder side component height of the subsequent PCIe card (on the PCIe-GL26 fan side) must not exceed the PCIe standards of 2.67mm. It is preferable to maintain a height below 2.3mm to avoid making contact with PCIe-GL26's heatsink fan.

To install the PCIe-GL26 into the host computer, please refer to the following instructions:

1. Save and close all work in progress on the host computer.
2. Power off and unplug the power cable from the host computer you wish to install to.
3. Open the chassis (side panel) of the host computer you wish to install the PCIe-GL26 into.
4. Locate the x4 PCIe slot or a spare and compatible x16/ x8 PCIe slot.
5. Align and insert PCIe-GL26's gold finger into the PCIe slot.



6. Secure the PCIe-PoE454at to the chassis with a screw.



7. Reinstall the system's chassis (panel) to complete the hardware installation process.

3.6 Installing Multiple PCIe-GL26 into the Host Computer

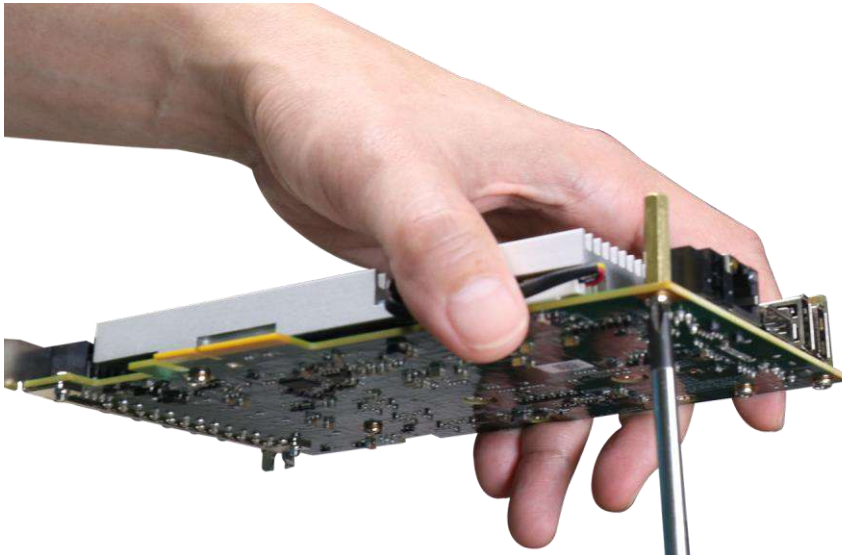


NOTE

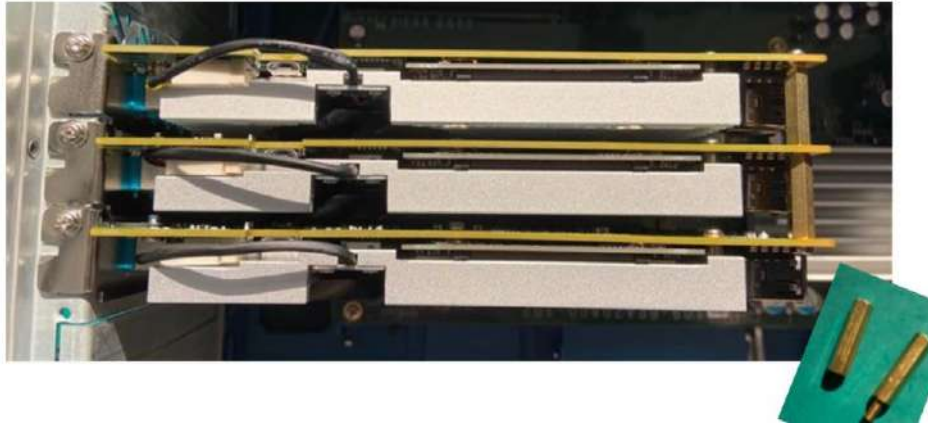
Before setting up and installing multiple PCIe-GL26 cards, please make sure the PCIe slots on your host computer's motherboard can accommodate such configuration, and board ID has been set via the [DIP switches](#).

To install multiple PCIe-GL26 cards, copper stands need to be installed onto the PCB to ensure proper spacing. Please refer to the following instructions:

1. To install two PCIe-GL26 cards, please utilize the female-female 20mm copper stands provided, and secure with a screw.



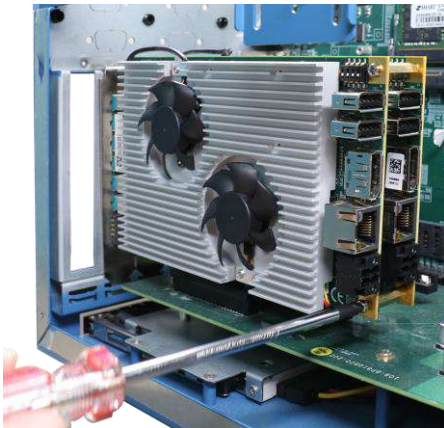
- To install more than two PCIe-GL26 cards, the cards positioned in the middle need to use the male-female copper stands. Please make sure the PCIe slots on the motherboard is positioned to accommodate three PCIe cards.



NOTE

Please ensure that the solder side component height of the subsequent PCIe card (on the PCIe-GL26 fan side) must not exceed the PCIe standards of 2.67mm. It is preferable to maintain a height below 2.3mm to avoid making contact with PCIe-GL26's heatsink fan.

- Once the copper stands have been installed, gently lower the cards into the host computer system's PCIe slots.



Make sure the copper stands are properly secured



Superior view – secure the cards to the host computer with the screws indicated.

- Reinstall the system's chassis (panel) to complete the hardware installation process

4 Reflashing the PCIe-GL26

PCIe-GL26 is shipped with JetPack 4.6.1 installed as a turnkey solution. If you are familiar and experienced with the platform, you can skip this section and start your development.

This section will show you how to reflash the PCIe-GL26 with a pre-built system image by Neosys. Just like Jetson Xavier NX Developer Kit, the PCIe-GL26 series can't install its system by itself. In other words, you will need another computer, **Host Machine**, to reflash the PCIe-GL26 by a micro USB to USB type A cable.

For detailed reflash process procedure, please refer to this [link](#).