Rocket 1604L (R1604L)

NVMe Switch AIC User Guide

V1.01 - March 23, 2026

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1. Overview

The R1604L is a member of our PCIe Gen5 NVMe Switch AIC product family.

The R1604L features four independent ports for M.2 NVMe SSDs and supports Out-of-Band (OOB) control for remote monitoring and management. It operates in an x4x4x4x4 PCIe bifurcation mode.

The R1604L features four independent ports for M.2 NVMe SSDs, supporting common SSD form factors including 2242, 2260, and 2280. It operates in an x4x4x4x4 PCIe bifurcation mode, enabling simultaneous connectivity for up to four NVMe drives. Additionally, it supports Out-of-Band (OOB) control via the OOB connector, allowing remote monitoring and management.

Universally compatible with industry-standard x86 platforms, it requires no dedicated drivers —NVMe SSDs are automatically recognized and ready to use with the OS.

1.1. Key Features

- Support four dedicated M.2 NVMe devices
- Host CPU Architect Support (X86)
- FRU Inventory support
- Support communication with the MCU via USB-C (using the HPT Utility)
- Support OOB control
- Support passive PCIe bifurcation (BIOS PCIe bifurcation required).
- Support LED Management
- All the Operating Systems with a native NVMe Driver

1.1.1. FRU

The *Field Replacement Unit (FRU)* ensures smooth operation and efficient maintenance of complex systems. The unit is designed to house and protect vital product data (VPD).

Information fields within a VPD resource type contain a three-byte header and some data. The three-byte header contains a two-byte keyword and a one-byte length. A keyword is a two-character (ASCII) mnemonic that uniquely identifies the information in the field. The last byte of the header is binary and represents the length value (in bytes) of the following data.

In the event of a hardware failure, the *FRU* can be quickly replaced, returning the device to full functionality without extensive diagnostics or data recovery. This reduces downtime and minimizes the possibility of data loss, ensuring that critical operations can continue uninterrupted.

The following table provides details on the VPD.

Table 1: Details and Descriptions of the VPD

Key Word	Details	Descriptions
PN	AIC Part Number	This keyword is an extension to the Device ID (or Subsystem ID) in the Configuration Space header.
EC	Engineering Change Level	The characters are alphanumeric and represent the engineering change level for this add-in card.
MN	Manufacture ID	This keyword is provided as an extension to the Vendor ID (or Subsystem Vendor ID) in the Configuration Space header. This allows vendors to identify an additional level of detail regarding the sourcing of this device.
SN	Serial Number	The characters are alphanumeric and represent the unique add-in card Serial Number.
Vx	Vendor Specific	This is a vendor-specific item, and the characters are alphanumeric. The keyword's second character (x) can be 0 through 9 or A through Z. V0 indicates the Vendor Name V1 indicates the Main Chip

1.1.2. Passive PCIe Bifurcation

This R1604L supports PCIe bifurcation, enabling you to connect up to four NVMe SSDs through a single PCIe x16 slot. Please note that this requires you to manually set the corresponding slot's PCIe bifurcation mode to "x4x4x4x4" in the motherboard BIOS.

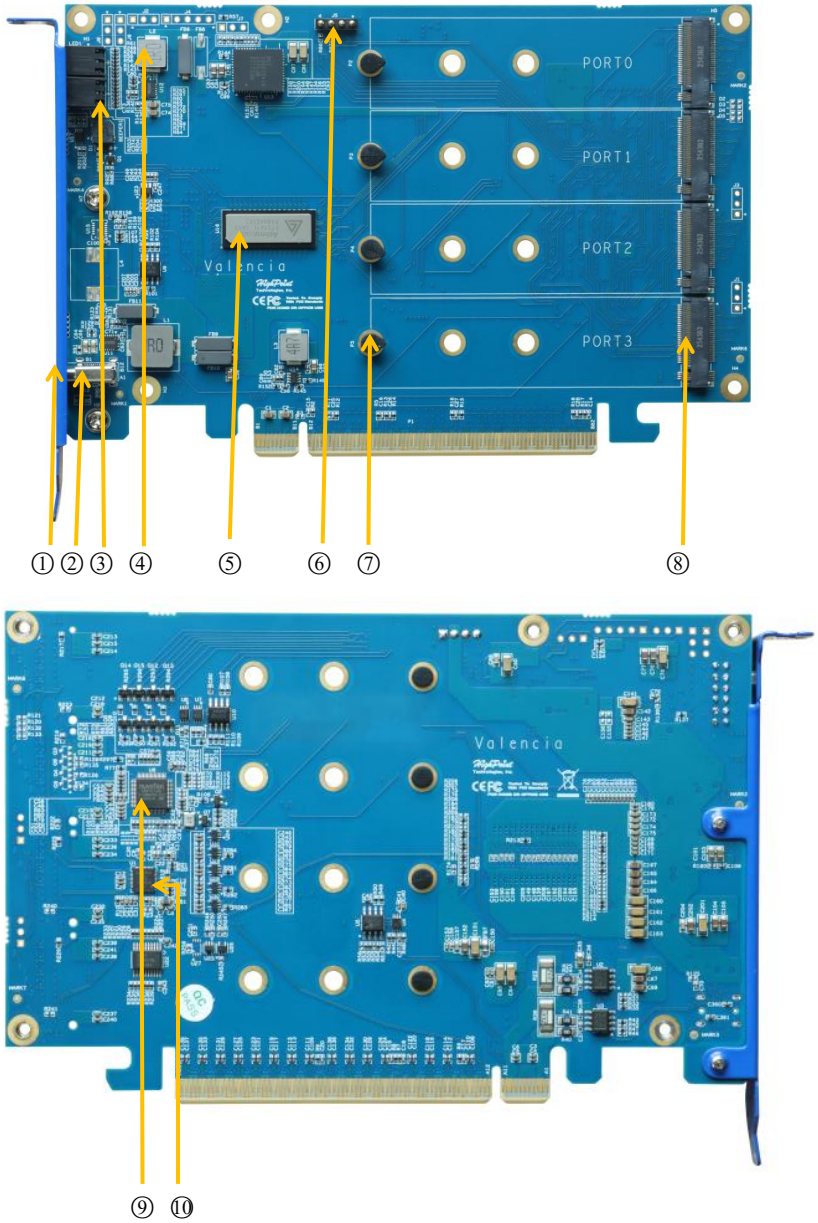
2. R1604L Hardware Description

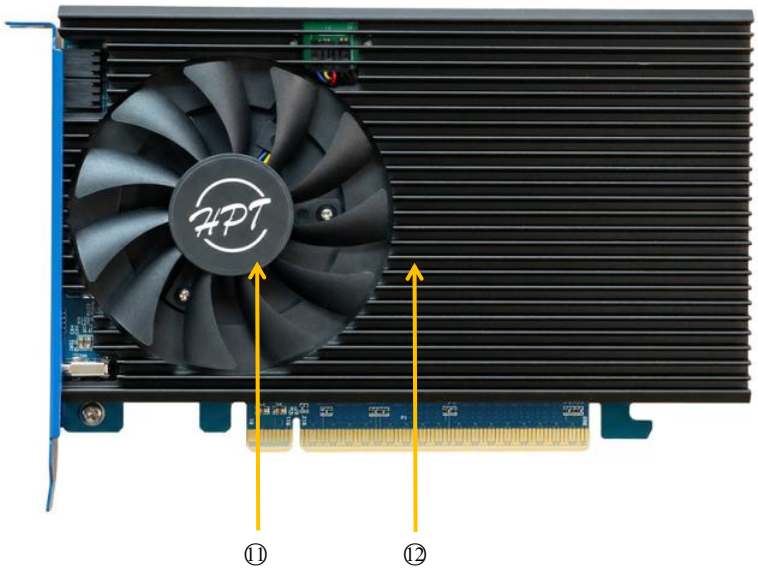
2.1. R1604L Layout

The layout of the R1604L is presented in two parts.

2.1.1. Front View

The following figure shows the key components of the R1604L.





The following table describes the key components of the R1604L.

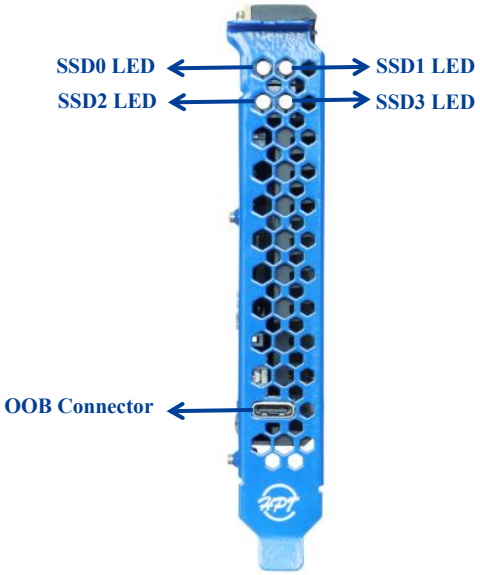
Table 2: Key components of the R1604L

Number	Type	Description
①	Bracket	Full-height bracket The R1604L is secured to the chassis by a bracket.
②	OOB Connector	This interface implements USB-UART functionality. USB-C port (out from the bracket) to do the following OOB Control: ● **Hardware Status Monitoring**: Provides real-time information on Retimer IC temperature, fan speed, and adapter power consumption. ● **NVMe-MI Support**: Manages compatible SSDs via the NVMe Management Interface (optional, not required for initial release). ● **Firmware Management**: Supports firmware updates for both the Retimer IC and the main controller MCU. ● **Retimer Status Diagnostics**: Retrieves and reports key operational parameters of the Retimer IC, such as link state and health status.
③	LED	Four SSD LED. Indicates the state of SSD. See SSD LED for details.
④	Beeper	The beeper will appear in the following 3 beeping statuses: Notes: 1 means alarming, and 0 means not alarming. This setting takes effect temporarily, not permanently.
		1-0-1-0-1-0 — The Fan Speed is < 100 RPM.
		1-0-0-1-0-0 — The Retimer chip temperature is > 100°C.
		1-1-1-1-1-1 — Both "**1-0-1-0-1-0**" and "**1-0-0-1-0-0**" above occur simultaneously.
⑤	Retimer Chipset	Asteralabs PT5161LRS. Main chip for signal enhancement.
⑥	J5	Fan module probe. Used to connect the fan module to the heatsink and to power the fan module.

⑦	Rubber	Four rubbers. Used to secure the retention hole on the end of the NVMe SSD.	
⑧	Storage Interface	Four PCIe 5.0 x4 M.2 connectors. Connect the NVMe SSD to the R1604L. SSD Form Factor: 2242/ 2260/ 2280	
⑨	Microcontroller Unit (MCU)	Serves as the primary controller for core board functions.	
⑩	Clock IC	Provides and manages the system's master clock and timing synchronization.	
⑪	Cooling Fan	Used to dissipate heat from the chipset.	
		Smart Fan Control	**Lower Speed:** The Retimer chip temperature is < 65°C.
			Linear Speed: The Retimer chip temperature is between 65°C and 75°C.
			Full Speed: The Retimer chip temperature is > 75°C.
		Note: The fan speed choice depends on the higher temperature.	
		Manual Fan Control	**0**: Ultra Low Speed (Around 0 RPM)
			1: Low Speed (Duty: 40%, Around 1800 RPM)
			2: Medium Speed (Duty: 60%, Around 2400 RPM)
			3: High Speed (Duty: 80%, Around 2820 RPM)
			4: Full Speed (Around 3180 RPM)
⑫	Heatsink	Dissipates heat by transferring thermal energy from electronic components.	

2.1.2. Diagnostic LED View

The following figure shows the LED Indicators of the R1604L.



The following table describes the SSD LED of the R1604L.

Table 3: Description of LED

LED	Color	Status	Description
SSD LED		**OFF**	The R1604L is powered off, or the SSD is not detected.
		Solid Green	The SSD is detected.
		Fast Flash Green	The LED blinks green at 4 Hz to indicate that the SSD is doing I/O in the PCIe 5.0 x4 status.
		Interval Flash Green	The LED blinks green twice in the first second, then goes out for one second and continues cycling. This indicates that the SSD is operating in PCIe 5.0 x2 or PCIe 4.0 x4 mode.
		Slow Flash Green	The LED blinks green at 1 Hz to indicate that the SSD is doing I/O at a bandwidth not shown above.

2.2. PCIe Host Interface

The R1604L's PCIe 5.0 host interface provides maximum transmission.

Other PCIe host interface features include the following:

- PCI-Express 5.0 x16 Physical Slot, Working Mode is x4x4x4x4
- Up to 64GB/s

2.3. Storage Interface

The R1604L has four M.2 connectors.

Other storage interface features include the following:

- Dedicated PCIe 5.0 x4 per port
- Supports up to four NVMe devices (up to x4 lanes, M.2 media)
- Data transfer at 16 GB/s

2.4. Basic Specifications

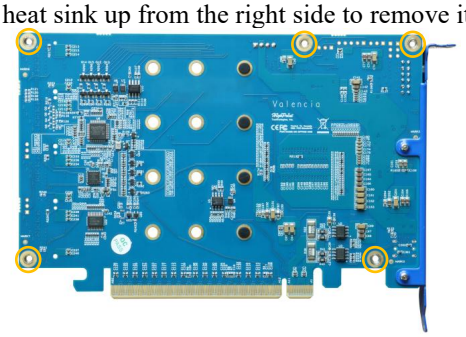
The following table describes the basic specifications of the R1604L.

Table 4: Basic Specifications of R1604L

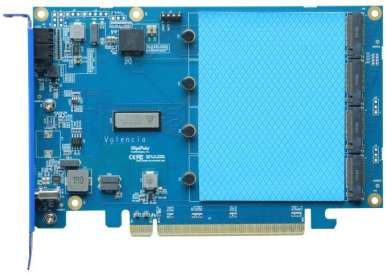
Model		**R1604L**
Form Factor		Full-Height, Single-Width
Weight		360g
Dimension	**Length**	167mm
	Height	110mm
Power consumption		• **Idle mode**: 4.8W • **I/Os mode**: 58.82W Notes: The I/Os mode power consumption is measured with the four Crucial T705 2TB SSDs. Actual power consumption may differ based on system hardware and configuration.
Power supply		PCIe: 12V 3.3V
Work temperature		+5°C ~ + 55°C
Storage temperature		-20°C ~ +80°C
MTBF (Mean Time Before Failure)		920,585 Hours

3. R1604L Installation Instructions

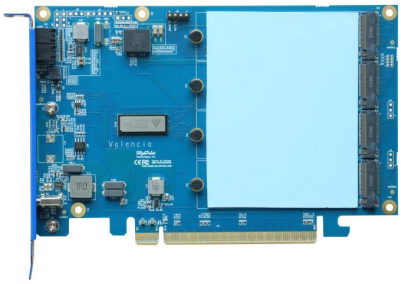
1. Use a wired ESD wrist strap that is properly grounded.
2. Unpack and remove the R1604L and check it for damage. If it appears damaged, please get in touch with HighPoint Technical Support.
3. Remove the five screws on the back of the R1604L that secure the heat sink to the PCB and lift the heat sink up from the right side to remove it.



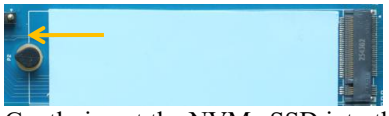
4. Install the thermal pad onto the R1604L PCB.
   Note: Omission of the thermal pad on the R1604L PCB is permissible if your disk exhibits adequate heat dissipation.
   1) Remove the blue film from one side of the thermal pad.
   2) Align the thermal pad with the M.2 port and press gently to ensure a tight fit.



   3) Remove the blue film from the other side of the thermal pad.

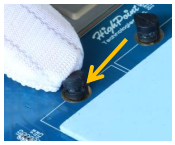


5. Install the NVMe SSDs in the R1604L.
   1) Confirm the direction of the rubber (pointing in the opposite direction of the M.2 port).



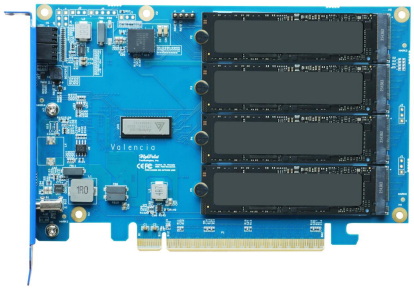
   2) Gently insert the NVMe SSD into the M.2 connector.

   3) Press the side of the rubber to align it and insert it into the retention hole on the end of the NVMe SSD.

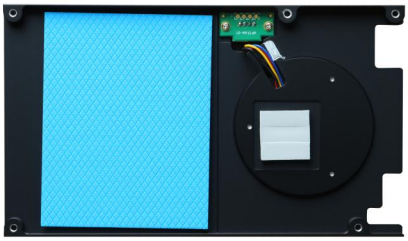


4) Rotate the direction of the rubber so that it points to the M.2 port to secure the NVMe SSD better.

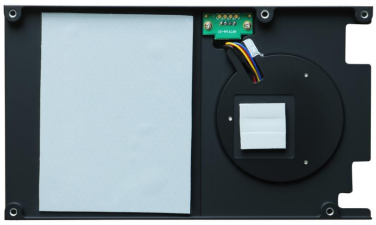
5) Repeat the above steps to install the remaining NVMe SSDs.



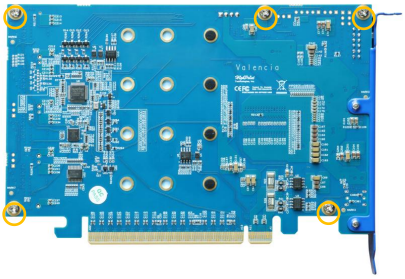
6. Install the heat sink on the R1604L heat sink.
   1) Align the thermal pad and press gently to ensure a tight fit.



   2) Remove the blue film from the thermal pad on the heat sink.



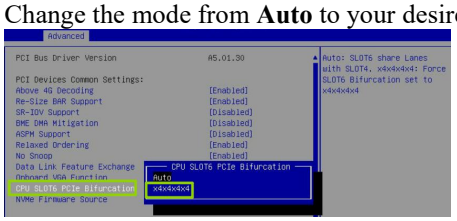
   3) Align the left side of the heat sink with the PCB, then carefully lower the right side to seat it properly.
   4) Re-tighten the five screws removed in step 3.



   Note: If the screws are not tightened, the fan will stall, heat dissipation will be poor, and other issues may arise.

7. Insert the R1604L into an available PCIe slot.
   1) Shut down the system and disconnect the AC power cord.
   2) Align the R1604L to one of the motherboard's available slots. Press down gently but firmly to seat the R1604L correctly in the slot.

8. Set the motherboard's PCIe Bifurcation Configuration.
   Using a Supermicro motherboard as an example:
   1) Enter BIOS Setup by pressing **Del** or **F2** during boot.
   2) Navigate to **Advanced → PCIe/PCI/PnP Configuration → PCIe slot# Configuration**.
   3) Locate the setting for your target PCIe x16 slot.
   4) Change the mode from **Auto** to your desired split (e.g., **x4x4x4x4**).



   5) Save & Exit and reboot.
      Notes:
      PCIe Bifurcation is a BIOS setting. Consult your motherboard manual for support and path, as incorrect settings will prevent device detection.
      Paths vary by motherboard. This is a common, not universal, path. Consult your motherboard manual for the exact location.

4. Revision History

4.1. Version 1.00, March 9, 2026

Initial version.

4.2. Version 1.01, March 23, 2026

Update the images for R1604L