



Rocket 7608A (R7608A)

NVMe RAID AIC User Guide



V1.00 - June 18, 2024

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1. Overview

The R7608A is the latest member of our PCIe Gen5 NVMe RAID AIC product family.

HighPoint Rocket Series NVMe connectivity AICs address the needs of solution providers and system integrators that cater to vertical marketplaces for high-speed industrial, corporate, and media applications. They were designed for professional applications that demand uncompromised storage performance, scalability, and adaptability in a compact, easy-to-integrate package that is universally compatible with industry-standard x86-64 (Intel/AMD) platforms.

The R7608A's eight independent device ports can support M.2 NVMe SSDs.

All major Windows operating systems and current distributions of Linux natively support the R7608A. You won't need to juggle a series of device drivers, install a complex software suite, or master a specialized management interface. Your NVMe SSDs will be automatically recognized and can be prepped and mounted using the operating system's standard tool set.

1.1. Key Features

- Dedicated PCIe 5.0 x16 host interface
- Support data transfer rate 64GB/s
- Support eight dedicated M.2 NVMe devices
- Synthetic Hierarchy
- Software Secure Boot
- Hardware Secure Boot
- FRU Inventory support
- Support LED Management
- Support the following Operating Systems:
 - Windows 11,10/ Server 2022,2019,2016/ Microsoft Hyper-V
 - RHEL/Debian/Ubuntu/Fedora/Proxmox/Rocky Linux (Linux kernel 3.10 and later)

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 a fully functional state without requiring 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 describes the details and descriptions of 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. Synthetic Hierarchy

A synthetic hierarchy can be created to isolate the host from these physical PCIe topology changes and errors.

1.1.3. Hardware Secure Boot

The secure boot feature permits only authenticated firmware to execute. The switch boots the root of the trusted firmware from the internal boot ROM (IBR) and uses that firmware to authenticate the external firmware stored in the SPI flash and prevent the execution of unauthenticated code.

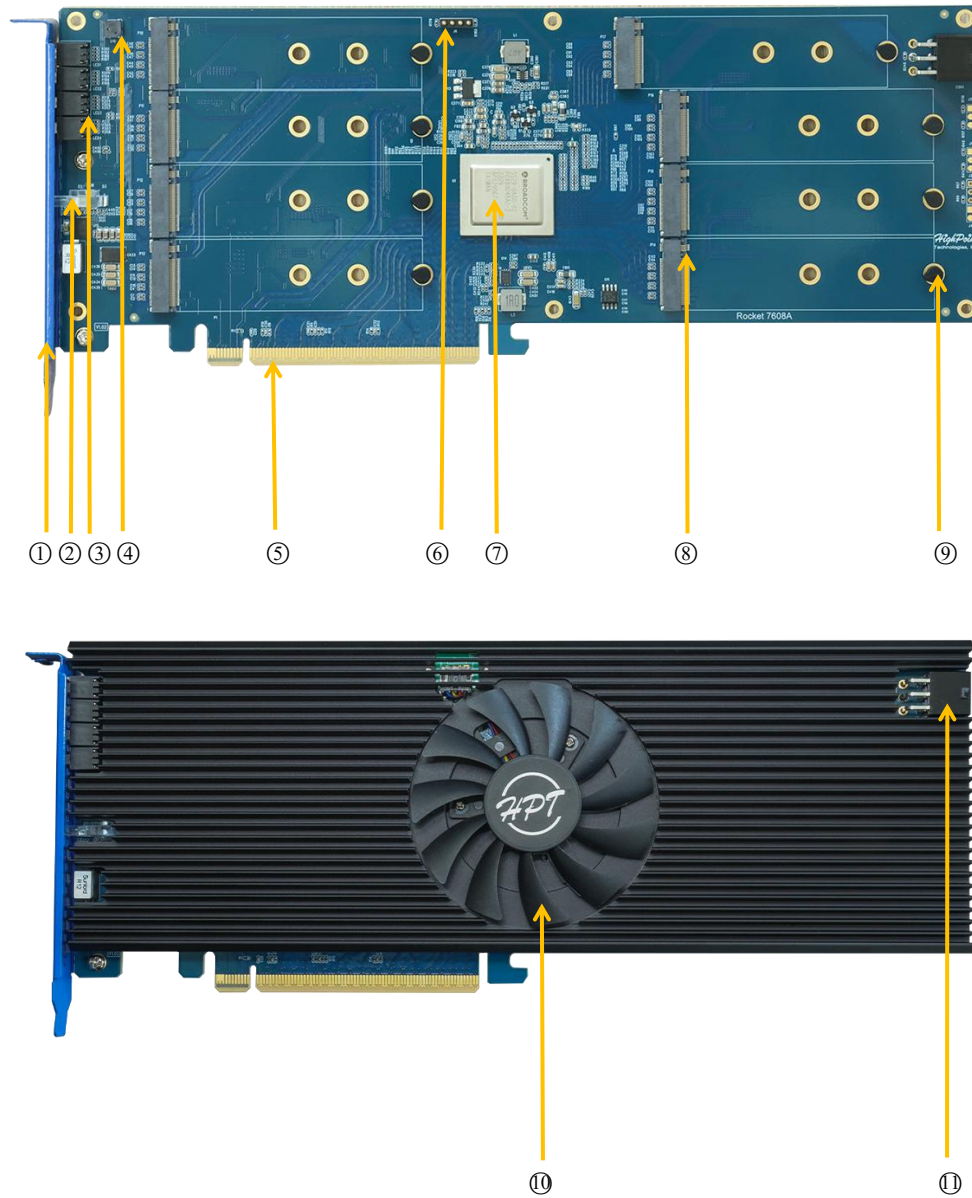
2. R7608A Hardware Description

2.1. R7608A Layout

The layout of the R7608A is presented in two parts.

- **Front View**

The following figure shows the key components of the R7608A.



The following table describes the key components of the R7608A.

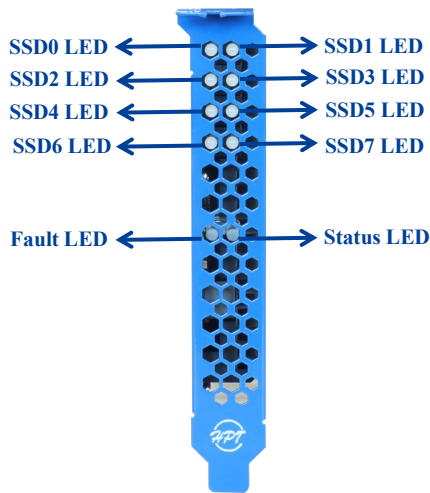
Table 2: Key component of the R7608A

Number	Type	Description	
①	Bracket	Full-height bracket (optional low-profile bracket included) The R7608A is secured to the chassis by a bracket.	
②	RGB	Status LED and Fault LED. <ul style="list-style-type: none"> ● Status LED -- The state of R7608A PCIe bandwidth. ● Fault LED -- The state of the Broadcom chipset temperature, SSD temperature, and fan speed. 	
③	LED	Eight SSD LED. SSD LED indicates the state of SSD.	
④	Beeper	1-0-1-0-1-0	The SSD has failed.
		1-0-0-1-0-0	The beeper will chirp when any of the following conditions are triggered. <ul style="list-style-type: none"> ● The Broadcom chipset temperature is $> 105^{\circ}\text{C}$. ● The SSD temperature is \geq the SSD warning threshold. ● The fan speed is $< 600\text{RPM}$.
		1-1-1-1-1-1	Both “1-0-1-0-1-0” and “1-0-0-1-0-0” above occur simultaneously.
Note: 1 for beeper beeping, 0 for beeper not beeping.			
⑤	PCIe Host Interface	PCIe 5.0 x16 host interface. The interface between the R7608A and the host system. With the PCIe interface, this connector provides power to the board.	
⑥	J6	Fan module probe. Used to connect the fan module on the heatsink. Used to power the fan module.	
⑦	Chip	Broadcom PEX 89048 chip.	
⑧	Storage Interface	Eight PCIe 5.0 x4 M.2 connector. Connect the SSD to the R7608A.	
⑨	Rubber	Eight rubbers. Used to secure the retention hole on the end of the NVMe SSD.	
⑩	Cooling System	Heatsink with a built-in Low-Decibel fan. Used to dissipate heat from electronic components that are prone to heat generation.	
		Smart Fan Control	Low Speed: Situation 1: The SSD temperature is $\leq 30^{\circ}\text{C}$. Situation 2: The Broadcom chipset temperature is $\leq 40^{\circ}\text{C}$.
			Linear Speed: Situation 1: The SSD temperature is between 30°C and 60°C . Situation 2: The Broadcom chipset temperature is between 40°C and 70°C .
			Full Speed: Situation 1: The SSD temperature is $\geq 60^{\circ}\text{C}$. Situation 2: The Broadcom chipset temperature is $\geq 70^{\circ}\text{C}$.

		<p>Note: The fan speed choice depends on the higher temperature of the SSD or Broadcom chipset.</p> <table border="1"> <tr> <td rowspan="5">Manual Fan Control</td> <td>OFF</td> </tr> <tr> <td>Low Speed (ducty cycle: 40%)</td> </tr> <tr> <td>Medium Speed (ducty cycle: 60%)</td> </tr> <tr> <td>High Speed (ducty cycle: 80%)</td> </tr> <tr> <td>Full Speed</td> </tr> </table>	Manual Fan Control	OFF	Low Speed (ducty cycle: 40%)	Medium Speed (ducty cycle: 60%)	High Speed (ducty cycle: 80%)	Full Speed
Manual Fan Control	OFF							
	Low Speed (ducty cycle: 40%)							
	Medium Speed (ducty cycle: 60%)							
	High Speed (ducty cycle: 80%)							
	Full Speed							
①	External power port	The system power supply unit powers the R7608A through this port connected to the external 6-pin PCIe power cable.						




● **LED View**










The following figure shows the LED Indicators of the R7608A.



The following table describes the SSD LED, Status LED, and Fault LED of the R7608A.

Table 3: Description of LED

LED	Color	Status	Description	
SSD LED		OFF	The R7608A 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 to cycle this process. This indicates the SSD is doing I/O in the PCIe 5.0 x2 or PCIe 4.0 x4 status.	
		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.	
			Solid Red	The SSD has failed.
			Fast Flash Red	The LED blinks red at 4 Hz to indicate that the reinserted disk is in the rebuild state.
			Interval Flash Red	The LED blinks red twice in the first second, then goes

			out for one second and continues to cycle this process. This indicates the disk is greater than or equal to the SSD warning threshold.
		Slow Flash Red	The LED blinks red at 1 Hz to indicate the disk's location, which can be accessed through the HighPoint RAID Management Software-- Identify LED function. Identify ON means the LED blinks, and Identify OFF means the LED light is restored to its original state.
Status LED		OFF	The R7608A is powered off.
		Fast Flash Blue	The LED blinks blue at 4 Hz to indicate that the R7608A's bandwidth is PCIe 5.0 x16.
		Fast Flash Green	The LED blinks green at 4 Hz to indicate that the R7608A's bandwidth is PCIe 5.0 x8 or PCIe 4.0 x16.
		Fast Flash Yellow	The LED blinks yellow at 4 Hz to indicate that the R7608A's bandwidth is PCIe 5.0 x4, PCIe 4.0 x8, or PCIe 3.0 x16.
		Fast Flash Cyan	The LED blinks cyan at 4 Hz to indicate that the R7608A's bandwidth is PCIe 4.0 x4 or PCIe 3.0 x8.
		Fast Flash White	The LED blinks white at 4 Hz to indicate that the R7608A's bandwidth is PCIe 3.0 x4.
		Fast Flash Red	The LED blinks red at 4 Hz to indicate that the R7608A's bandwidth does not appear as above.
Fault LED		OFF	The R7608A is powered off or not in error.
		Fast Flash Red	The LED blinks red at 4 Hz to indicate that any of the following have been triggered. <ul style="list-style-type: none"> ● The Broadcom chipset temperature > 105°C. ● The SSD temperature is \geq the SSD warning threshold. ● The fan speed is < 600 RPM.
		Slow Flash Red	The LED blinks red at 1 Hz to indicate that the initialized RAID is not in normal status.
		Solid Red	Both " Fast Flash Red " and " Slow Flash Red " above occur at the same time.

2.2. PCIe Host Interface

The R7608A's PCIe 5.0 host interface provides maximum transmission.

Other PCIe host interface features include the following:

- 16-lane PCIe host interface
- Support of x16 link width
- 16-lane aggregate bandwidth of up to 64GB/s

2.3. Storage Interface

The R7608A has eight M.2 connectors.

Other storage interface features include the following:

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

2.4. Basic Specifications

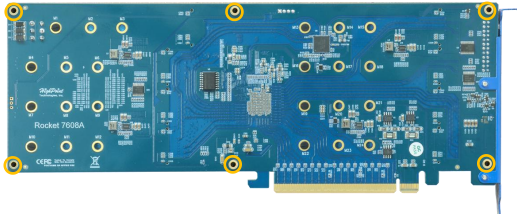
The following table describes the basic specifications of the R7608A.

Table 4: Basic Specifications of R7608A

Model		R7608A
Form Factor		Full-Height, Single-Width
Weight		1.015kg
Dimension	Length	11.18"
	Height	4.33"
Power consumption		82.64W
Power supply		PCIe: 12V(±8%), 3.3V (±8%)
Work temperature		+5°C ~ + 55°C
Storage temperature		-20°C ~ +80°C
MTBF (Mean Time Before Failure)		920,585 Hours

3. R7608A Installation Instructions

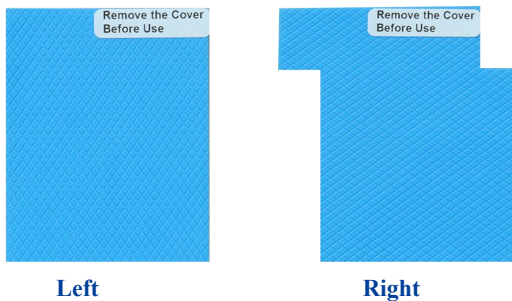
1. Use a wired ESD wrist strap that is properly grounded.
2. Unpack and remove the R7608A and check it for damage. If it appears damaged, please get in touch with HighPoint Technical Support.
3. Remove the six screws on the back of the R7608A that secure the heat sink to the PCB and lift the heat sink up from the right side to remove it.



4. Install the thermal pads onto the R7608A PCB.
 - 1) Determine whether your disk is a single-sided or a double-sided M.2 NVMe SSD.

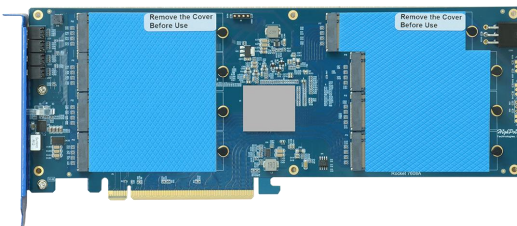
Notes:
 Single-sided M.2 NVMe SSDs only have chips on one side of the PCB.
 Double-sided M.2 NVMe SSDs have chips on both sides of the PCB.
 - 2) Select the thermal pad that corresponds to the NVMe SSD.

PCB	Single-sided	Double-sided
Left	K=3 70mm*90mm*1.5mm	K=8 70mm*90mm*0.75mm
Right	K=3 84mm*90mm*1.5mm	K=8 84mm*90mm*0.75mm

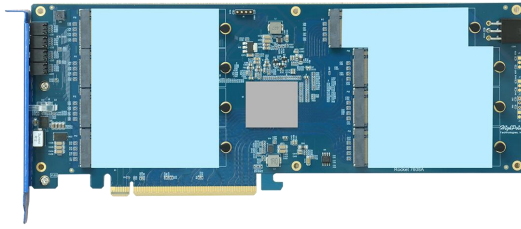


Note: This picture only shows the thermal pads on the left and right positions; please follow the table above for specific thermal pad options.

- 3) Remove the blue film from one side of the thermal pads.
- 4) Align the thermal pad with the M.2 port and press gently to ensure a tight fit.

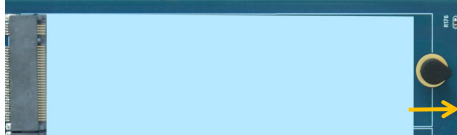


- 5) Remove the blue film from the other side of the thermal pads.

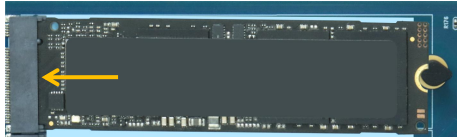


5. Install the NVMe SSDs to the R7608A.

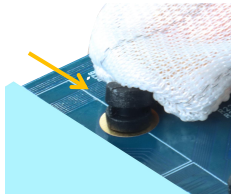
- 1) Confirm the direction of the rubber (pointing in the opposite direction of the M.2 port).



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



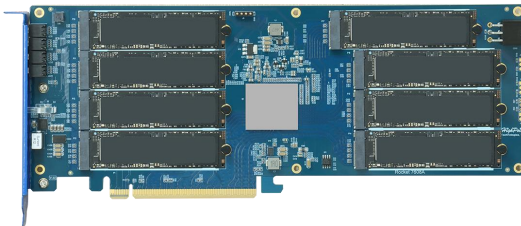
- 3) Press the side of the rubber to align it and insert it into the retention hole on the end of the NVMe SSD.



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

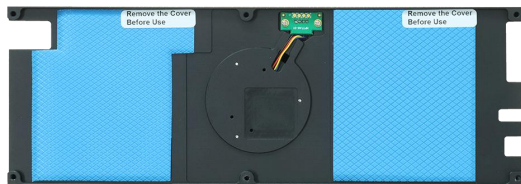


- 5) Repeat the above steps to install the remaining NVMe SSDs.



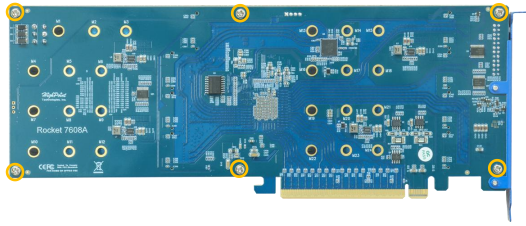
6. Install the heat sink to the R7608A PCB.

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



- 2) Align the left side of the heat sink with the PCB and carefully lower the right side.

- 3) Carefully and properly align the heat sink with the PCB and retighten the six screws that were removed in step 3.



Note: If the screws are not tightened, there will be fan stalling, poor heat dissipation, and other situations.

7. Insert the R7608A into an available PCIe slot.
 - 1) Shut down the system and disconnect the AC power cord.
 - 2) Align the R7608A to one of the motherboard's available slots. Press down gently but firmly to seat the R7608A correctly in the slot.



- 3) Connect the 6-pin PCIe power cable to the external power connector on the right side of the R7608A. Power up the SSD external power supply.



8. Turn on the power to the system.

4. Revision History

Version 1.00, June 18, 2024

Initial version.