Squid PCIe Gen 4 Carrier Board™ for four M.2 SSD modules (SKU-086-44)

Hardware Manual

January 15, 2023
Revision 1.0

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1 About this Document

1.1 Purpose

This document describes hardware installation, features, specification and operation of the *Squid* PCI Express Gen 4 Carrier Board™ for four M.2 SSD modules from Amfeltec Corporation.

1.2 Feedback

AMFELTEC Corp. makes every effort to ensure that the information contained in this document is accurate and complete at the time of release. Please contact Amfeltec if you find any errors, inconsistency or have trouble understanding any part of this document.

To provide your feedback, please send an email to support@amfeltec.com

Your comments or corrections are greatly valued in our effort for excellence and continuous improvement.

1.3 Revision History

Rev. No.	Description	Rev. Date
1.0	Initial Release.	January 15, 2023

2 General Description

2.1 Introduction

The *Squid* PCI Express family is a series of PCIe Carrier Boards designed for desktop computers, servers, embedded appliances or storage expansion. The *Squid* family expands a motherboard's PCIe slot with multiple full/half-size MiniPCI Express or multiple M.2/NGSFF (NF1) PCI Express SSD modules.

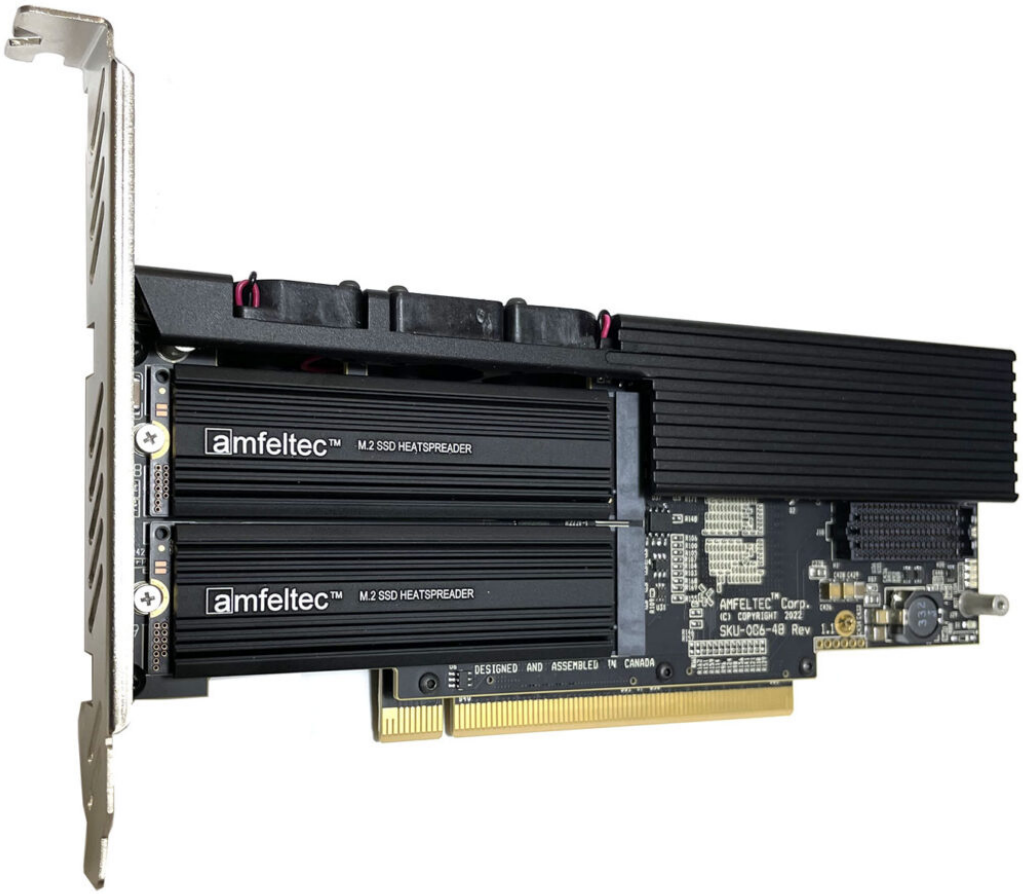
The carrier board is a half-height (2U)/ half-length PCIe board and occupies the space equal to a standard one-slot wide PCIe board, as defined by the PCIe Specification. It is located in the middle of the motherboard's PCIe slot and connects to the motherboard via exchangeable x8 or x16 PCIe upstream adapters. This unique PCI Express structure (US Pat #9,996,495; US Pat. #10,664,431) allows for allocating multiple PCIe M2 modules on the top and bottom sides of the carrier board without violating PCI Express Specification.

This carrier board has four M.2 (M-key) PCI Express Gen 4 circuits. Each circuit supports any M.2 PCI Express Gen 4 (or Gen 3) module with M-key and a length of 80mm (modules 2280). The Carrier board has an optional USB connection to the Host computer for real-time performance and temperature monitoring.

2.2 Package Contents

PCIe Gen 4.0 Carrier Board package includes the following parts:

1. PCIe Gen 4.0 Carrier Board for four M.2 PCIe modules (Figure 1, 2) with x16 or x8 PCIe upstream Adapter
2. Set of Heat sinks for all four of M.2 modules.



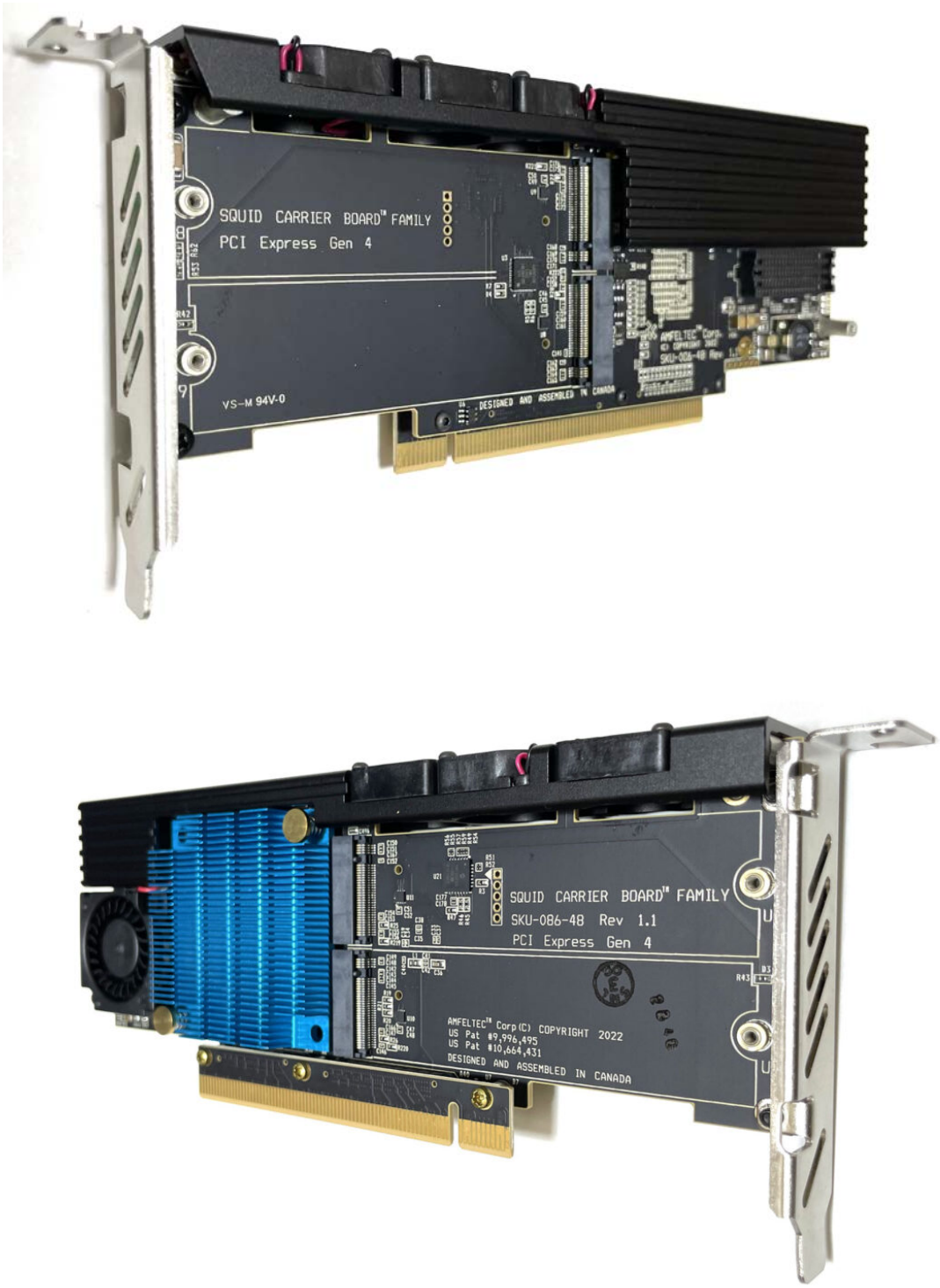


Figure 1: PCIe Gen 4.0 Carrier Board with four M.2 SSD modules (top and bottom sides)

3 Features

3.1 Features

- Easy ‘Plug and Play” installation. No drivers are needed. Transparent to the operation system.
- Compatible with any motherboard.
- Supports up to four M.2 PCI Express SSD modules (M-key)
- Supports any 2280 modules with PCI Express Gen 4 or Gen 3 interface
- x4 PCIe Gen 4.0 (16.0 Gbps) downstream connection to each M.2 circuit.
- x16 or x8 PCIe Gen 4.0 (16.0 Gbps) upstream motherboard connection via exchangeable x16 or x8 PCI Express upstream Adapter.
- Occupies space equal to standard one-slot wide PCIe board defined by PCIe Specification.
- Performance and temperature monitoring during operation; cooling fan speed control
- Real-time transmission of carrier board & modules’ status to host computer via USB connection. (optional)
- Meets PCIe 4.0 and M.2 3.0 Specifications.
- Dimension: 168 mm. x 69 mm.
- RoHS compliant.

3.2 PCI Express Carrier board for four M.2 SSD modules block diagram.

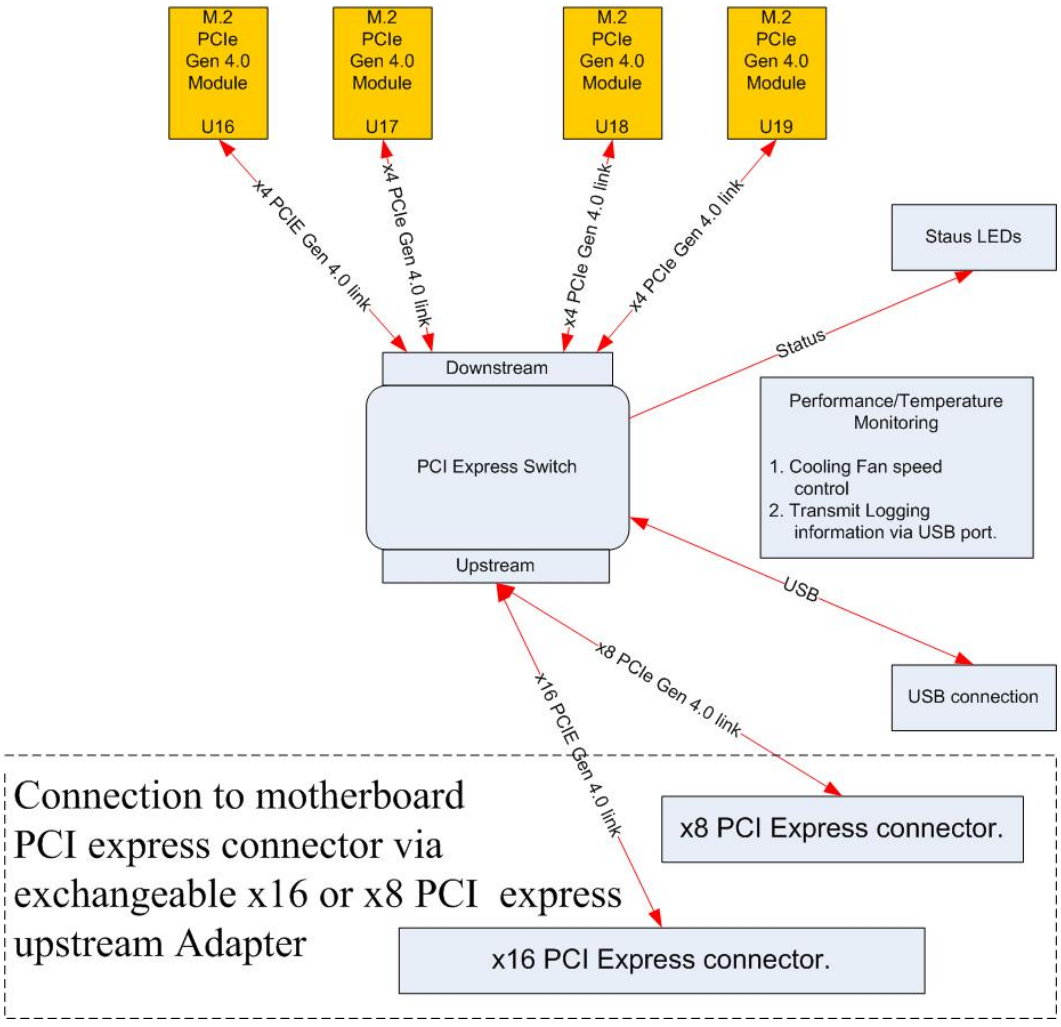


Figure 2: Carrier board internal block diagram.

4 Installation

4.1 Carrier board installation

The following steps provide the exact sequence that needs to be followed in order to properly install the Amfeltec PCIe Carrier Board:

- Turn OFF the computer before installation.
- Remove the chassis cover from the computer.
- Locate an unused PCI express slot and remove the corresponding slot cover from the computer chassis. For maximum performance, it is preferable to use x16 PCI Express Gen 4.0 slot that has a direct connection to CPU.
- Insert the carrier board into the appropriate PCI Express slot and attach its bracket to the computer chassis with a screw.
- Put the chassis cover back on the computer.
- Turn ON the computer.

4.2 Carrier board Power ON

During power ON, the Carrier board runs a self-test that includes the following:

- Upstream and downstream PCI express connection verification
- Checking status LEDs
- Cooling fans operation

After power ON, the operation status test result is shown on D2 (red) and D3 (blue) LEDs:

D2 is solid ON	Power ON Carrier Board verification status
D3 is solid ON	Power ON Carrier Board verification status

5 Hardware Description

5.1 Board Layout

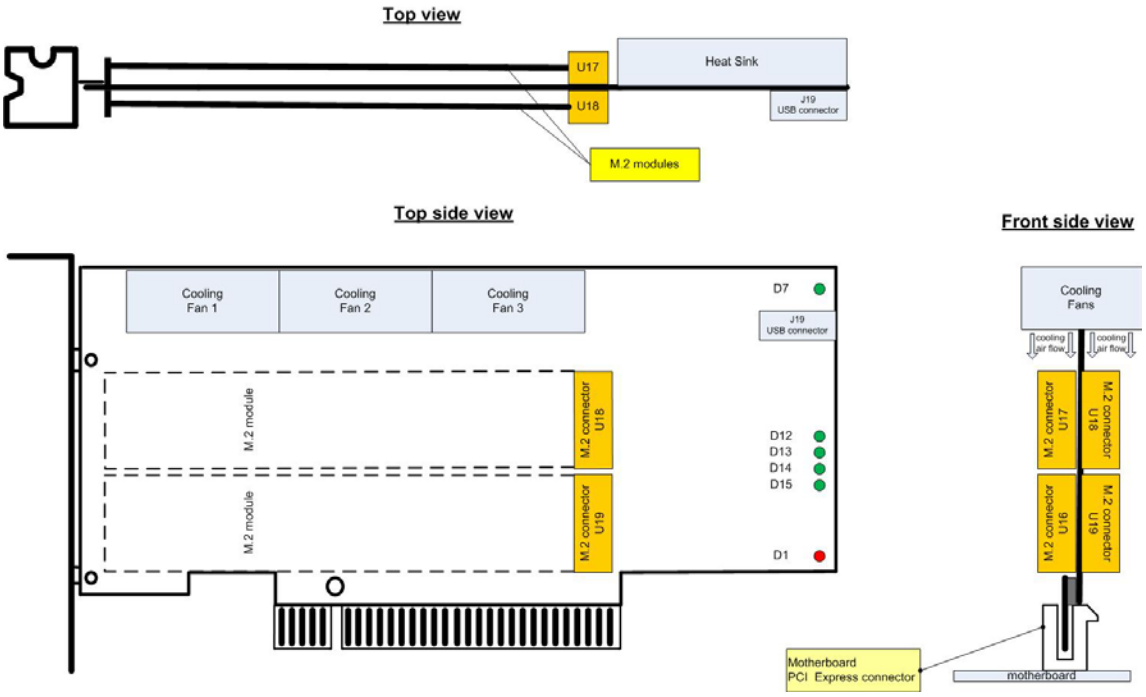


Figure 3: PCIe Gen 4.0 Carrier Board for four M.2 modules - layout

5.2 LEDs

Name	Ref. Des.	Color	Usage
RESET	D1	RED	Global PCI Express RESET signal from motherboard
UPSTREAM	D7	GREEN	Upstream PCIe Link status.
U18 M.2 circuit	D12	GREEN	Downstream x4 PCI Express Gen 4 link status.
U17 M.2 circuit	D13	GREEN	Downstream x4 PCI Express Gen 4 link status.
U19 M.2 circuit	D14	GREEN	Downstream x4 PCI Express Gen 4 link status.
U16 M.2 circuit	D15	GREEN	Downstream x4 PCI Express Gen 4 link status.
(on the bracket)	D2	RED	Board power ON status.
(on the bracket)	D4	GREEN	SSD activity indicator
(on the bracket)	D3	BLUE	Board operation status (currently not used).

Table 1: PCIe Gen 4 Carrier Board for four M.2 modules - LEDs

LEDs D7, D12-D15 will indicate the follow status of the PCIe links:

Solid OFF	PCIe link is down
Solid ON	PCIe link is UP

5.3 Connectors

Ref. Des.	Type	Usage
J8, J9	Connectors	Connection to the x16 or x8 PCI Express Adapter
J19	Connector	USB terminal connection for collecting real-time board operation status information.
U18, U19	M.2 connectors (M-key)	M.2/NGSFF add-in modules connection (top side)
U16, U17	M.2 connectors (M-key)	M.2/NGSFF add-in modules connection (bottom side)

Table 2: PCIe Gen 4.0 Carrier Board for four M.2 modules - Connectors

6 Appendix A: Limited warranty

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