

***Amber4X/Amber4Xc/ Amber4Xd/Amber4Xe***  
***G-Series***  
**PowerGEM® Module**  
**(for use with AGIGARAM® DDR4 NVDIMM-N)**

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**AGIGA9834-003JCA/033JCA/103JCA/203JCA**

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**(for release under NDA only)**

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## Revision History

Document Control No.	Revision Date	Description of Changes
01	11/12/19	Initial Release
02	03/20/19	Added Note about V <sub>CAP</sub> voltage when V <sub>IN</sub> is out of spec
03	09/15/20	Updated logo to IFX version Added Note to Max Charge Time parameter
04	05/26/21	Updated logo to Unigen version Update company information to Unigen Clarified lifetime spec is estimated
05	8/26/2021	Added new product images to title page Minor content updates to sections 1 and 4 Updated key features in section 3, added "UKCA" Added Figure 6 to section 9 Added alternative 6-pin cable drawing to Figure 7 in section 10 Updated section 11, added "ordering part number" column to table and added note [3]

# 1. Product Overview

The Amber4X G-Series PowerGEM® family are advanced power modules intended for use with one or more Agiga Tech DDR4 NVDIMM-N modules. Amber4X/Amber4Xd/ Amber4Xe PowerGEMs are configured to with multiple ports to support up to four NVDIMMs. All utilize an ultrathin hybrid supercapacitor enabling a small form factor design while also providing the same long-term reliability as the EDLC Ultracapacitor-based PowerGEM families.

A single 6-pin connector (master port) connects via a cable to a supported DDR4 NVDIMM-N. Three additional 6-pin connectors (shared ports) are available on Amber4X/Amber4Xd/Amber4Xe G-Series which allow support for up to four total DDR4 NVDIMM-Ns. The Amber4X/Amber4Xd /Amber4Xe PowerGEMs takes 12 volts in through the Master and/or the Shared ports (provided over the NVDIMM-N edge connector) and supplies a regulated output voltage to the NVDIMMs during power fail operations. No other external system connections are required.

Amber4Xc PowerGEM supports a Central Power Mode, enabling power delivery back to the host system. In this mode, the host system is responsible for communication and management of the PowerGEM through the SMBus connected on a dedicated 10-pin Central Power port. Power is provided back to the system through this port and can then be routed to multiple DIMM sockets to provide power during the NVDIMM Save operation.

A simple block diagram is shown below depicting both use cases. Additional details can be found in the Universal PowerGEM System Specification.

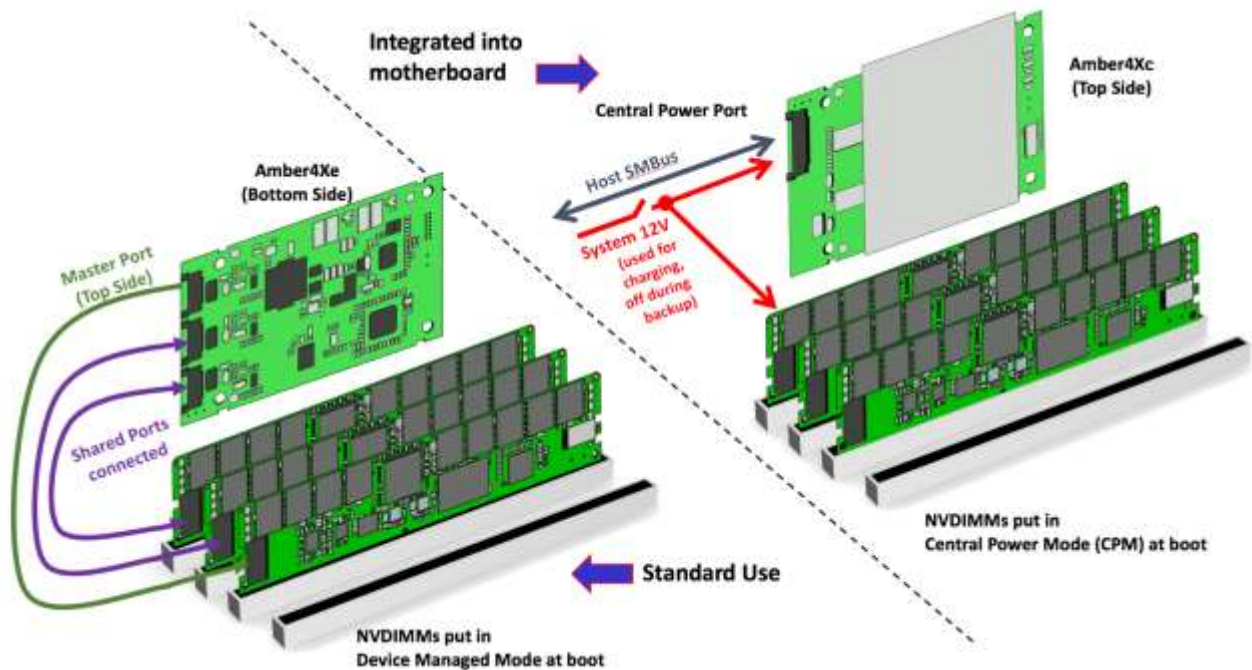


Figure 1. Standard and Central Power Mode

## 2. System Block Diagram

The Amber4X/Amber4Xd/Amber4Xe G-Series PowerGEM architecture is shown in Figure 2 below.

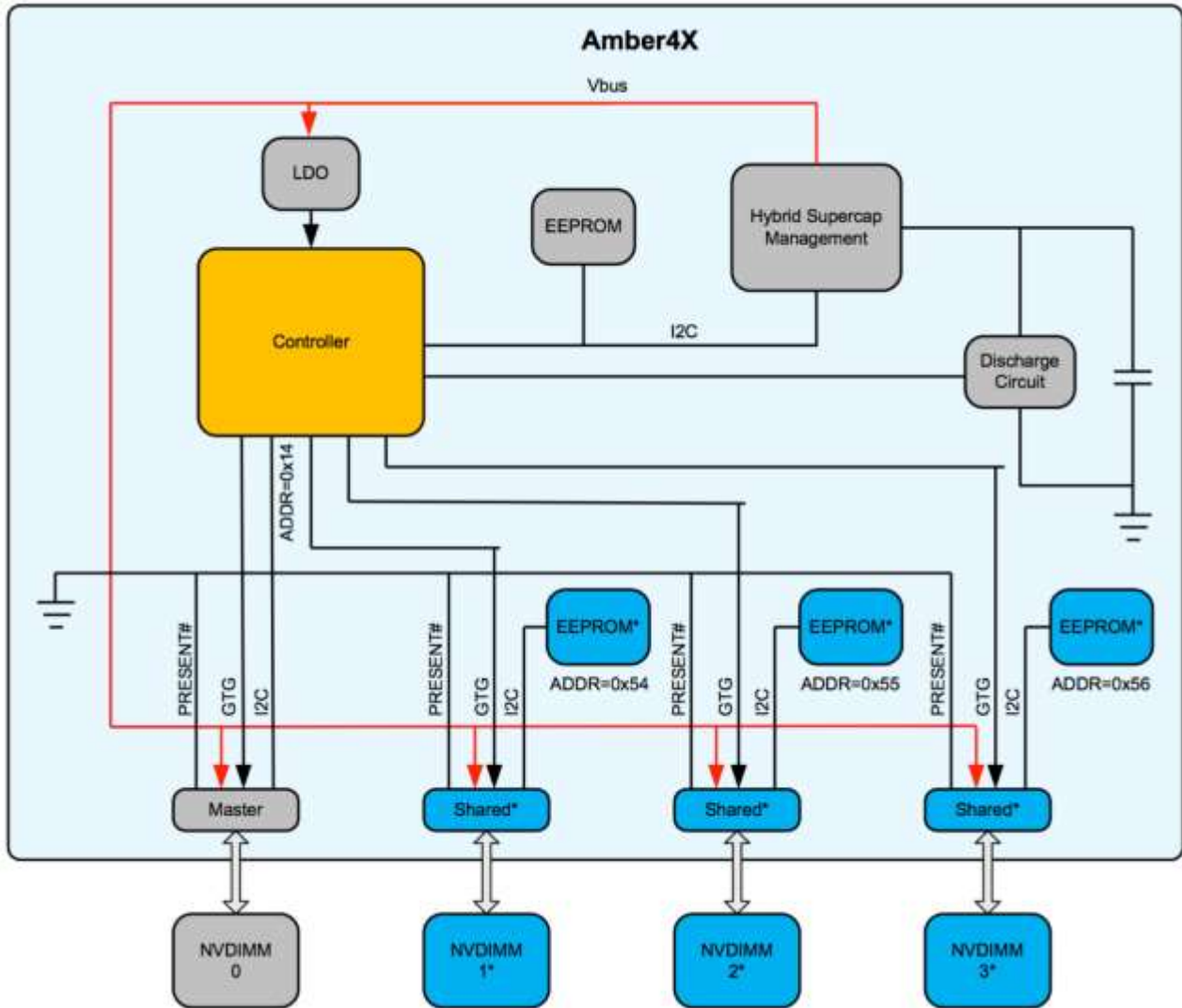


Figure 2. Simplified Amber4X/Amber4Xd/Amber4Xe G-Series PowerGEM Diagram

### 3. Key Features

- Hybrid supercapacitor module
- Provides power to DDR4 NVDIMM-N during SAVE operation in the event of system power loss
- Compatible with AgigA Tech DDR4 NVDIMM-N
  - Recommended for use with Komodo1 16GB and 32GB (AGIGA8811-016/032)
- Supports up to 4x 16GB or 2x 32GB NVDIMMs
- Multiple form factors available: no bracket, 2.5” drive, HHHH PCIe card
- Real-time health monitoring and logging
- Safe online hybrid supercapacitor measurement (never taken offline during normal operation for state of health or learn cycles)
- Hybrid supercapacitor charged from 12V over DIMM edge connector (no other external connections required)
- Max charge current up to 6A to minimize charge time
- Supports Central Power Mode (Amber4Xc)
- Energy Rating@ 25°C: 2600 Joules
- Estimated Operating Life: up to 5 years @ 50°C \*
- Minimum Operating Temp: 10°C
- Product Weight:
  - AGIGA9834-003JCA 57g
  - AGIGA9834-103JCA 128g
  - AGIGA9834-033JCA 57g
  - AGIGA9834-203JCA 89g
- RoHS and REACH compliant
- UL/cUL/CB/CE/UKCA compliant
- Halogen free compliant
- Cable is only included with AGIGA9834-033JCA, cables must be ordered separately for all other options

\*Typical rating, can be tailored to system requirements

### 4. Reference Documents

The Amber4X G-Series PowerGEMs are compatible with AgigA Tech DDR4 NVDIMM-Ns such as the Komodo1 16GB and 32GB. Komodo1 datasheets and the Universal PowerGEM System Spec can be made available upon request.

## 5. Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>INPUT CHARACTERISTICS</b>						
Input Voltage Range <sup>[1]</sup>	$V_{IN}$	Over input range	10.2	12	13.8	V
Input Supply Current	$I_S(V_{IN})$	$V_{IN} = 12V$	-	-	1	A
<b>OUTPUT CHARACTERISTICS</b>						
Output voltage range	$V_{OUT}$	$V_{IN} = 0V$ . Amber4X/Amber4Xd/Amber4Xe G-Series supply power for NVDIMM backup.	4.75	5.0	5.25	V
		$V_{IN} = 0V$ . Amber4Xc provides power for Central Power Mode configuration.	6.75	7.0	7.25	V
Maximum Output Current per port	$I_{OUT-MAX}$	$V_{IN} = 0V$ . Amber4X/Amber4Xd/Amber4Xe G-Series supply power for NVDIMM backup.	-	-	1	A
Maximum Output Current per port	$I_{OUT-MAX}$	$V_{IN} = 0V$ . Amber4Xc G-Series supply power for Central Power Mode configuration.	-	-	4	A
<b>CAPACITOR/ENERGY CHARACTERISTICS</b>						
Capacitor Voltage	$V_{CAP}$	$V_{IN} = 12V$ : Max $V_{CAP}$ after fully charged state <sup>[2]</sup> $V_{IN} = 0V$ : Cap Voltage will drop to 2.5V and then shutoff to protect the cell (FW may shutoff before it drops down to 2.5V if it detects that there is no save operation triggered)	2.5	-	3.7	V
Capacitor Charge Current	$I_{CAP}$	Charge current is adjusted to meet max Input Supply Current and minimize charge time	-	-	6	A
Initial Effective Capacitance	$C_{INIT}$	This value is the result of a capacitance measurement commanded over I <sup>2</sup> C at time of manufacture at RT.	See specific product below for values			F
End of Life Effective Capacitance	$C_{EOL}$	This value is 70% of Initial Effective Capacitance at RT.	See specific product below for values			F
End of Life Joules	$J_{EOL-USEABLE}$	Based on CEOL after 5 years at rated temp of 10°C and 25°C	See specific product below for values			J
Charge Time	$T_{CHG}$	Charge $V_{CAP}$ from 2.5V to 3.6V	See specific product below for values			S

[1]  $V_{CAP}$  may exceed max rating if  $V_{IN}$  falls to within +50mV of  $V_{OUT}$ . This has only been observed in testing and is not an issue under normal operating conditions.

[2] Max  $V_{CAP}$  after fully charged state, during health check, the capacitor voltage is raised for a short duration above the nominal operating voltage. This patented feature is to ensure that there is sufficient energy to complete a backup even when a capacitance measurement is in progress.

Product	$C_{INIT}$	$C_{EOL}$	$J_{EOL-USEABLE}$ @10°C	$J_{EOL-USEABLE}$ @25°C	Typical $T_{CHG}$	Max $T_{CHG}$
AGIGA9834-003JCA/103JCA/203JCA/033JCA	1000 F	700 F	1600 J	1800 J	10 minutes	25 minutes

Note: The max charge time occurs under worst case conditions when the cap is fully discharged to 2.5V and the ambient temperature is at the minimum of 10°C. The typical charge time is more common at room temperature.

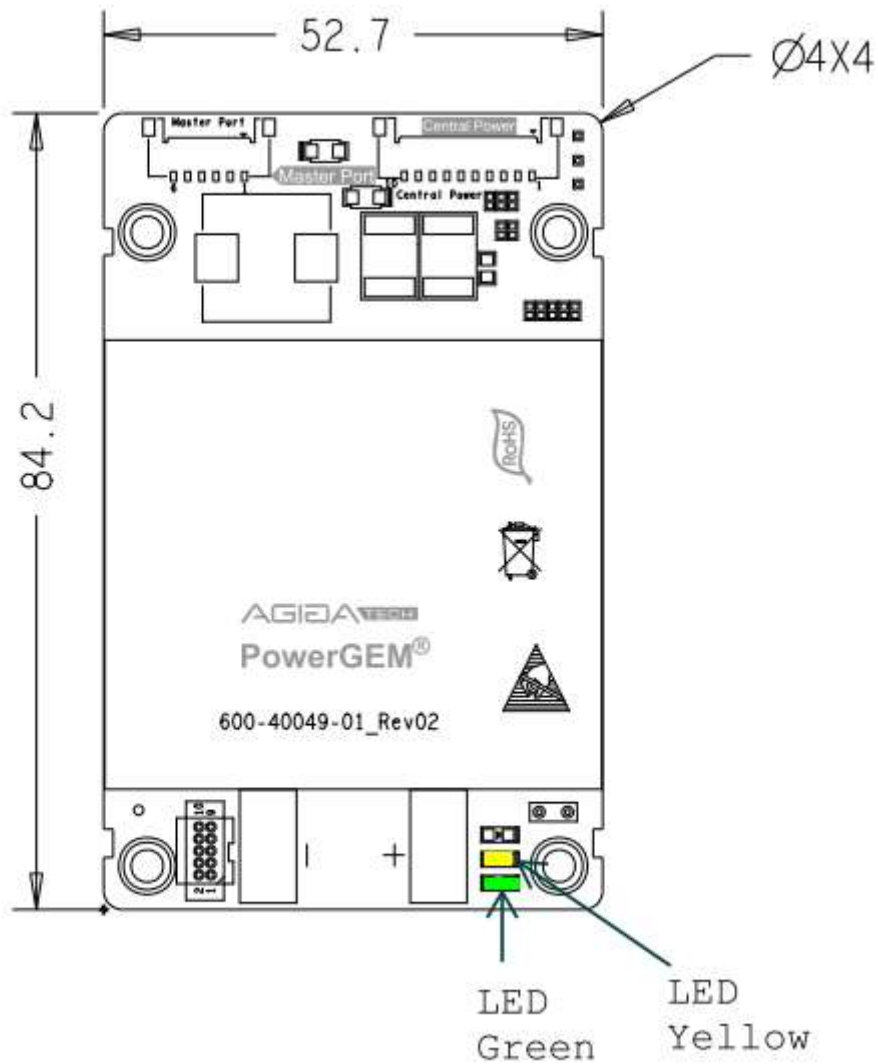
	MIN	TYP	MAX	Notes
Operating Temperature	10°C	25°C	50°C	
Storage Temperature	-25°C		+65°C	1, 2

[1] After 1000 hours storage, at 65°C without load, the PowerGEM shall meet the specified lifetime requirements. To minimize degradation, AgigA Tech suggests that the PowerGEM modules be stored in a temperature and humidity-controlled environment with the following conditions: - Temperature: 20°C~40°C, Humidity: <RH75%

[2] If storage temp is held at 20°C, it is recommended that the PowerGEM is recharged to the operating voltage after 2 years; If storage temp is held at 40°C or above, it is recommended that the PowerGEM is recharged to the operating voltage after 0.5 years.



## 6. LED Functional Description



**Figure 3. LED Locations**

LED	Behavior	Description
LED Green	Quick blinking	Caps are charging
	Slow blinking	Caps are discharging
	On	Caps are fully charged
LED Yellow	On	Indicates Failure



## 7. Pin Layout

Pinout for the 6-pin Master/Shared Port connector and the 10-pin Central Power connector:

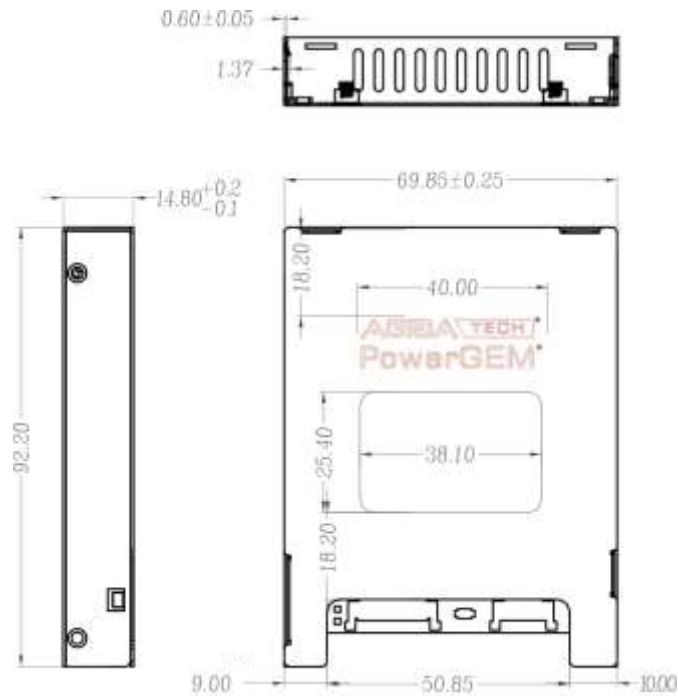
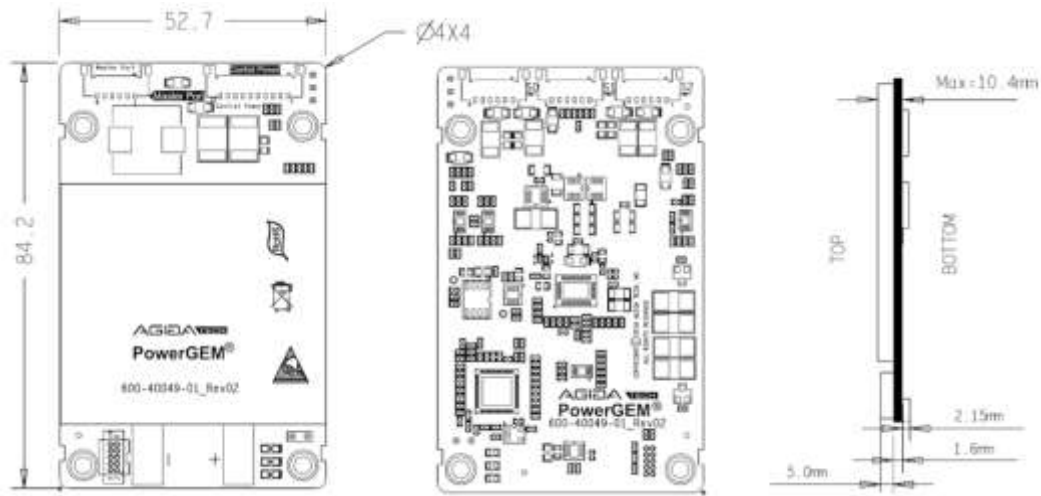
Pin	Signal
1	NVDIMM_IIC_SCL
2	NVDIMM_IIC_SDA
3	PRESENT#
4	GTG
5	GND
6	VBUS

Pin	Signal
1	NVDIMM_IIC_SCL
2	NVDIMM_IIC_SDA
3	PRESENT#
4	GTG
5,6,7	GND
8,9,10	VBUS

## 8. Pin Description

Signal Name	Signal Type	Pin Number	Pin Description
NVDIMM_IIC_SCL	Input	1	NVDIMM I2C slave interface, clock
NVDIMM_IIC_SDA	Input / Output	2	NVDIMM I2C slave interface, data I/O
PRESENT#	Output	3	The AGIGARAM can read this signal to determine if the PowerGEM is present; Reading a low voltage level, means PowerGEM is connected, and reading a high voltage level means PowerGEM is not connected.
GTG	Output	4	Active High signal indicating that PowerGEM is operational, fully charged and ready to supply power to NVDIMM for a save operation during a Power failure.
GND	Power	5	Ground
VBUS	Power	6	This is a multifunction pin that provides 12V power from the host to the PowerGEM during normal operation and provides capacitor output voltage from the hybrid supercapacitor to the NVDIMM when there is a power loss scenario.

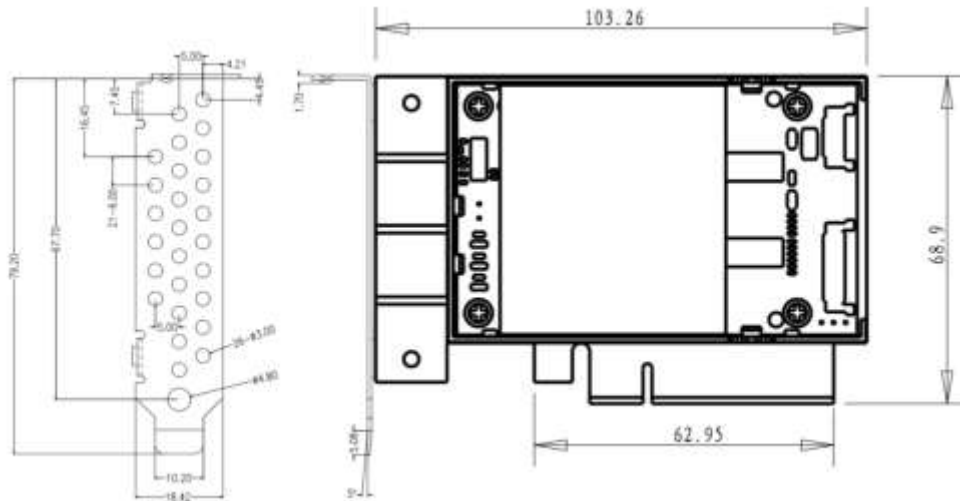
## 9. Mechanical



Dimensions are in mm with below tolerance unless otherwise stated.

>0-5 +/- 0.10	>120-200 +/- 0.50
>5-30 +/- 0.15	>200-300 +/- 0.80
>30-70 +/- 0.20	>300-400 +/- 0.95
>70-120 +/- 0.30	>400-900 +/- 1.10

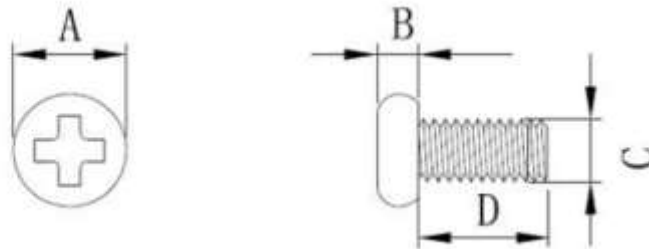
**Figure 4. Mechanical Dimensions**



Dimensions are in mm with below tolerance unless otherwise stated.

- >0-5 +/- 0.10
- >5-30 +/- 0.15
- >30-70 +/- 0.20
- >70-120 +/- 0.30
- >120-200 +/- 0.50
- >200-300 +/- 0.80
- >300-400 +/- 0.95
- >400-900 +/- 1.10

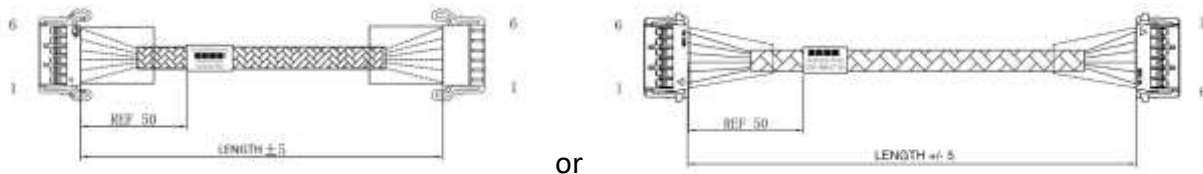
**Figure 5. PCIe Bracket Dimensions**



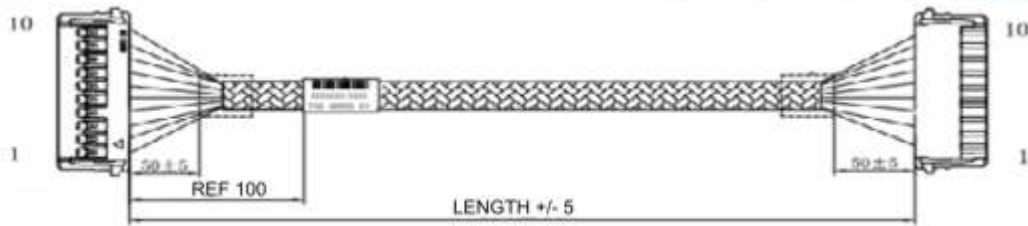
Item	A	B	C	D	Head
Dimension	5.2~5.4mm	1.8~2.0mm	2.8~3.0mm	5.7~6.0mm	Cross recessed pan head

**Figure 6. Screw Spec (for AGIGA9834-003JCA-INS only)**

## 10. Cable Spec



**Figure 7. 6-pin Cable Drawing (for Master and Shared port connections)**



**Figure 8. 10-pin Cable Drawing (for Central Power operation)**

Length = See table below

Current rating 2.5A

Voltage rating 50V DC

## 11. Ordering Part Numbers

Ordering PART NUMBER	PART NUMBER	# of Ports	Description	Operating Conditions/ Estimated Lifetime	Cable Length(s)	DDR4 NVDIMM-N Support <sup>[1]</sup>
AGIGA9834-003JCA	AGIGA9834-003JCA (Amber4X G-Series)	1 Master, 3 Shared	1000 F cell, no bracket, no cables	10° to 50°C, 5 years	None <sup>[2]</sup>	Up to 4x 16GB or Up to 2x 32GB
AGIGA9834-003JCA-INS <sup>[3]</sup>						
AGIGA9834-033JCA	AGIGA9834-033JCA (Amber4Xc G-Series)	1 Central Power	1000 F cell, no bracket, central power cable	10° to 50°C, 5 years	Central Power Cable 190mm	Up to 4x 16GB or Up to 2x 32GB
AGIGA9834-103JCA	AGIGA9834-103JCA (Amber4Xd G-Series)	1 Master, 3 Shared	1000 F cell, 2.5" drive case, no cables	10° to 50°C, 5 years	None <sup>[2]</sup>	Up to 4x 16GB or Up to 2x 32GB
AGIGA9834-203JCA	AGIGA9834-203JCA (Amber4Xe G-Series)	1 Master, 3 Shared	1000 F cell, half-height, half-length PCIe bracket, no cables	10° to 50°C, 5 years	None <sup>[2]</sup>	Up to 4x 16GB or Up to 2x 32GB

[1] Assumes Agiga Tech Komodo1 DDR4 NVDIMM-Ns.

[2] Cables can be ordered individually. Please contact us for available length options.

[3] Includes 4 screws as shown in Figure 6.