

Alveo UL3422

Installation Guide

UG1643 (v1.0) October 14, 2024

AMD Adaptive Computing is creating an environment where employees, customers, and partners feel welcome and included. To that end, we're removing non-inclusive language from our products and related collateral. We've launched an internal initiative to remove language that could exclude people or reinforce historical biases, including terms embedded in our software and IPs. You may still find examples of non-inclusive language in our older products as we work to make these changes and align with evolving industry standards. Follow this [link](#) for more information.





Table of Contents

- Chapter 1: Introduction..... 3**
- Chapter 2: Accelerator Card Overview..... 4**
 - Card Features.....4
 - Card Interfaces..... 5
 - Minimum System Requirements.....6
 - PCIe AUX Power.....6
 - Qualified Servers..... 7
- Chapter 3: Card Installation Procedure..... 8**
 - Safety Instructions..... 8
 - Before You Begin..... 10
 - Installing the Card..... 10
 - Running lspci..... 11
- Appendix A: Additional Resources and Legal Notices..... 13**
 - Finding Additional Documentation..... 13
 - Support Resources..... 14
 - References..... 14
 - Revision History..... 14
 - Please Read: Important Legal Notices..... 14

Introduction

The AMD Alveo™ UL3422 card, shown below, is designed for ultra low latency applications for the fintech market. It consists of an AMD UltraScale+™ device with ultra-low latency GTF transceivers and DDR memory. There are two QSFP-DD NIC ports supporting 16 GTF TX/RX pairs along with high-speed expansion connectors supporting 16 additional GTF TX/RX pairs.

The UL3422 is a full height, ½ length, single slot PCIe® CEM 4.0 compliant card which supports passive cooling for closed-loop thermal control in the server PCIe expansion slot. It has a PCIe x16 physical connector with the upper eight lanes unconnected.

Figure 1: UL3422 Card



Designs can be developed with the AMD Vivado™ Design Suite where the full resources of the programmable logic device are made available for development.

Accelerator Card Overview

Card Features

The following table lists high-level product details for the UL3422 card.

Table 1: Alveo UL3422 Product Details

Specification	UL3422
Product SKU	A-UL3422-P16G-PQ-G
Total electrical card load	180W
Thermal design power (TDP)	120W
Thermal cooling solution	Passive
Weight	561.5g
Form factor	Full-height, ½ length, single slot
Network interface	Two QSFP-DD
PCIe interface	PCIe Gen4 x8 ¹
Expansion ports	Two ARF6 + one PicoClasp for sideband
DDR4	16 GB 64b + 8b ECC at 2400 MT/s
1 PPS	1PPS IN Port 1PPS OUT Port
Qualified for deployment	Yes
Vivado tools part number	XCVU2P-FSVJ2104-3-E
Card management	External SC MSP432P4011IRGCT
Power management	Power management with power management bus (PMBus) for voltage, current, and temperature monitoring including telemetry for major regulators
External power source (optional)	12V PCIe AUX 2x4
ADK2 Enabled	Yes
Configuration option	2 Gbit QSPI - JTAG over Micro-USB or ADK2
Debug interface	- UARTs over Micro-USB - PMBus, SMBus over ADK2 Debug Connector

Table 1: Alveo UL3422 Product Details (cont'd)

Specification	UL3422
Card security	None

- Notes:**
- The UL3422 is PCIe Gen4 compatible but not compliant. See *UltraScale+ Devices Integrated Block for PCI Express LogiCORE IP Product Guide* (PG213).

Card Interfaces

The AMD Alveo™ UL3422 card is available in a passive cooling configuration and is designed for installation into a data center server where controlled air flow provides direct cooling to the card. The following figure shows the Alveo UL3422 card, highlighting the following interfaces:

- A PCIe card connector
- Two QSFP-DD NIC ports supporting 16 GTF TX/RX lanes
- Two ARF6 connectors supporting 16 GTF TX/RX lanes
- Micro-USB maintenance connector
- ADK2 debug connector
- PCIe AUX power connector

Figure 2: UL3422 Card Interfaces



X28837-041524

CAUTION! Alveo data center accelerator cards are designed to be installed into a data center server, where controlled air flow provides direct cooling. If the cooling enclosure is removed from the card and the card is powered-up, external fan cooling airflow **MUST** be applied to prevent over-temperature shut-down and possible damage to the card electronics. Removing the cooling enclosure voids the board warranty.



ATTENTION! Les cartes Alveo sont conçues pour être installées dans un serveur pour Data Center, où le débit d'air contrôlé assure un refroidissement direct. Si le boîtier de refroidissement est retiré de la carte et que la carte est sous tension, le flux d'air de refroidissement du ventilateur externe DOIT être appliqué pour éviter l'arrêt en cas de surchauffe et d'éventuels dommages des composants électroniques de la carte. Le retrait du boîtier de refroidissement annule la garantie de la carte.



VORSICHT! Alveo-Beschleunigerkarten für Rechenzentren sind für die Installation in einem Rechenzentrumsserver konzipiert, wo ein kontrollierter Luftstrom für eine direkte Kühlung sorgt. Wenn das Kühlgehäuse von der Karte entfernt und die Karte eingeschaltet wird, MUSS ein externer Lüfter zur Kühlung zugeführt werden, um eine Abschaltung bei Übertemperatur und mögliche Schäden an der Kartenelektronik zu verhindern. Durch das Entfernen des Kühlgehäuses erlischt die Garantie der Platine.

For card specifications, dimensions, list of card features, block diagram, and airflow requirements see the Alveo UL3422 Ultra Low Latency Trading Data Sheet ([DS1016](#)).

Minimum System Requirements

The minimum system requirements for running the Alveo UL3422 data center accelerator card are listed in the following table.

Table 2: Minimum System Requirements

Component	Requirement
Motherboard	PCI® Express 4.0-compliant with x16 slot.
System Power Supply	PCIe edge connector and the optional PCIe 12V AUX power connector.

PCIe AUX Power

The card has an 8-pin PCIe auxiliary power connector. The card can operate without AUX power connected, however card power will be reduced, including the QSFP modules which will be limited to 3.5W.

Depending on your server or computer, an additional PCI Express auxiliary power cable or adapter might be needed. Consult your computer documentation for additional information.

Note: This 8-pin connector is not compatible with an ATX12V/EP512V power cable source. Ensure that the appropriate PCIe auxiliary power source is available, not an ATX12V/EP512V power source. For more details see [Answer Record 72298](#).

Qualified Servers

For a list of servers on which Alveo cards are qualified, contact the AMD sales team.

Card Installation Procedure

To reduce the risk of fire, electric shock, or injury, always follow basic safety precautions.



CAUTION! You must always use an ESD strap or other antistatic device when handling hardware.



ATTENTION! Il est fortement recommandé d'utiliser un bracelet ESD ou autres dispositifs antistatiques.



VORSICHT! Beim Umgang mit Hardware müssen sie immer ein Erdungs Armband oder ein anderes antistatisches Gerät verwenden.

Safety Instructions

Safety Information

To ensure your personal safety and the safety of your equipment:

- Keep your work area and the computer/server clean and clear of debris.
- Before opening the computer/system cover, unplug the power cord.

Dispositif de Sécurité

Pour assurer votre sécurité personnelle et la sécurité de votre équipement:

- Maintenez votre zone de travail et l'ordinateur/serveur propre et dégagé de débris.
- Avant d'ouvrir le capot de l'ordinateur/système, débranchez le cordon d'alimentation.

Sicherheitsinformation

Um ihre persönliche Sicherheit und die Sicherheit ihrer Ausrüstung zu gewährleisten:

- Halten sie ihren Arbeitsbereich und den Computer / Server sauber und frei von Ablagerungen.
- Ziehen sie vor dem Öffnen der Computer / Systemabdeckung das Netzkabel ab.

Electrostatic Discharge Caution

Electrostatic discharge (ESD) can damage electronic components when they are improperly handled, and can result in total or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.

To prevent ESD damage:

- Use an ESD wrist or ankle strap and ensure that it makes skin contact. Connect the equipment end of the strap to an unpainted metal surface on the chassis.
- Avoid touching the card against your clothing. The wrist strap protects components from ESD on the body only.
- Handle the card by its bracket or edges only. Avoid touching the printed circuit board or the connectors.
- Put the card down only on an antistatic surface such as the bag supplied in your kit.
- If you are returning the card to AMD Product Support, place it back in its antistatic bag immediately.

Attention aux Décharge Électrostatique (ESD)

L'ESD peut endommager les composants électroniques lorsqu'ils sont mal manipulés, et peut entraîner des défaillances totales ou intermittentes. Suivez toujours les procédures de prévention contre les ESD lors du retrait et remplacement des composants.

Pour prévenir les dommages dus aux ESD:

- Utilisez une sangle de poignet ou de cheville anti-ESD et assurez-vous qu'elle est en contact avec la peau. Branchez l'extrémité du câble de la sangle à une surface métallique non peinte du châssis et à la masse.
- Évitez de mettre en contact la carte de circuit imprimé ou les connecteurs avec vos vêtements. La sangle de poignet protège la carte ou connecteurs contre les ESD du corps seulement.
- Manipulez la carte uniquement par son support ou par ses bords. Évitez de toucher la carte de circuit imprimé ou les connecteurs.
- Ne posez la carte de circuit imprimé ou les connecteurs que sur une surface antistatique telle que le sac anti-statique fourni avec la carte.
- Si vous retournez la carte à Xilinx, remettez-la dans son sac antistatique immédiatement.

Vorsicht Elektrostatische Entladung

Elektrostatische Entladung (ESD) kann elektronische Bauteile beschädigen, wenn sie unsachgemäß behandelt werden, und es kann zu totalen oder zeitweiligen Ausfällen kommen. Befolgen sie beim Entfernen und Austauschen von Komponenten stets die ESD-Schutzmaßnahmen.

So verhindern sie ESD-Schäden:

- Verwenden sie einen ESD-Handgelenk-oder Knöchelriemen und stellen sie sicher, dass er Hautkontakt hat. Verbinden sie das Ende des Riemens mit einer unlackierten Metalloberfläche am Gehäuse.
- Berühren sie die Karte nicht mit ihrer Kleidung. Der Riemen schützt Komponenten nur vor ESD am Körper.
- Fassen sie die Karte nur an der Halterung oder an den Kanten an. Berühren sie nicht die Leiterplatte oder die Anschlüsse.
- Legen sie die Karte nur auf einer antistatischen Oberfläche ab, z.B. dem antistatischen Beutel der mit dem Kit mitgeliefert wurde.
- Wenn sie die Karte an den AMD Product Support zurücksenden, legen Sie sie bitte sofort wieder in den antistatischen Beutel.

Before You Begin

★ **IMPORTANT!** AMD Alveo™ cards are delicate and sensitive electronic devices; equipment is to be installed by a qualified technician only. This equipment is intended for installation in a Restricted Access Location.

★ **IMPORTANT!** Les cartes AMD Alveo™ sont des appareils électronique sensibles et fragiles; l'équipement doit être installé par un technicien certifié seulement. Cet équipement est destiné à être installé dans un lieu d'accès restreint.

★ **WICHTIG!** Die Karten AMD Alveo™ sind sensible und empfindliche elektronische Geräte. Das Gerät darf nur von einem qualifizierten Techniker installiert werden. Dieses Gerät ist für die Installation an einem Ort mit begrenztem Zugang vorgesehen.

- Verify that the minimum card space is available to install your card. Card specifications and dimensions can be found in the Alveo UL3422 Ultra Low Latency Trading Data Sheet ([DS1016](#)).
- Check for card compatibility with the system. Also check for proper system requirements such as power, bus type, and physical dimensions to support the card.
- Ensure that an appropriate PCIe auxiliary power source is available if using the card with PCIe AUX power.

Installing the Card

The following procedure is a guide for the AMD Alveo™ UL3422 data center accelerator card installation. Consult your computer documentation for additional information.

Note: For use with UL Listed Servers or ITE.

1. Shut down the host computer and unplug the power cord.
2. Open your computer by removing the casing.
3. If necessary, remove the adjacent PCIe® slot cover corresponding to the PCIe slot in which you are installing the Alveo card.
4. Plug the Alveo card into the PCIe x16 slot on the motherboard.
5. If using the card with PCIe AUX power, connect the AUX power connector to the Alveo card, ensure the plug is mechanically fixed (with a click).

Note: This 8-pin connector is not compatible with an ATX12V/EPS12V power cable source. Ensure that the appropriate PCIe auxiliary power source is available, not an ATX12V/EPS12V power source. For more details see [Answer Record 72298](#).

6. Re-install the computer casing.
7. Connect the power cord and turn on the computer.



WARNING! Do not power-on a passively cooled card without adequate forced airflow across the card with proper air flow direction, otherwise the card can be damaged. This card can heat up after use in the server. Use caution when handling. For more information, see Alveo UL3422 Ultra Low Latency Trading Data Sheet ([DS1016](#)).



ATTENTION! Ne mettez pas sous tension une carte refroidie passivement sans circulation d'air forcée adéquate sur la carte avec la bonne direction du flux d'air, sinon la carte peut être endommagée. Cette carte peut devenir chaude lors de son utilisation dans le serveur. Soyez prudent lors de la manipulation. Pour plus d'informations, se référer à la fiche technique DS1016 de la carte Alveo UL3422 Ultra Low Latency Trading Data Sheet ([DS1016](#)).



WARNUNG! Schalten Sie eine passiv gekühlte Karte nicht ein, ohne dass ein ausreichender erzwungener Luftstrom über die Karte mit der richtigen Luftstromrichtung erfolgt, da die Karte sonst beschädigt werden kann. Diese Karte kann sich nach Gebrauch im Server erhitzen. Seien Sie vorsichtig bei der Handhabung. Weitere Informationen finden Sie im Datenblatt der Alveo UL3422 Ultra Low Latency Trading Data Sheet ([DS1016](#)).

Running lspci

To verify that the device has been installed correctly, enter the following Linux command in the terminal:

```
$ lspci -vd 10ee:
```

If the card is successfully installed and found by the operating system, you will see a message similar to the following.

```
af:00.0 Processing accelerators: Xilinx Corporation Device 5098
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, NUMA node 1
Memory at e2000000 (64-bit, prefetchable) [size=32M]
Memory at e4000000 (64-bit, prefetchable) [size=256K]
Capabilities: <access denied>
```

Additional Resources and Legal Notices

Finding Additional Documentation

Technical Information Portal

The AMD Technical Information Portal is an online tool that provides robust search and navigation for documentation using your web browser. To access the Technical Information Portal, go to <https://docs.amd.com>.

Documentation Navigator

Documentation Navigator (DocNav) is an installed tool that provides access to AMD Adaptive Computing documents, videos, and support resources, which you can filter and search to find information. To open DocNav:

- From the AMD Vivado™ IDE, select **Help** → **Documentation and Tutorials**.
- On Windows, click the **Start** button and select **Xilinx Design Tools** → **DocNav**.
- At the Linux command prompt, enter `docnav`.

Note: For more information on DocNav, refer to the *Documentation Navigator User Guide* ([UG968](#)).

Design Hubs

AMD Design Hubs provide links to documentation organized by design tasks and other topics, which you can use to learn key concepts and address frequently asked questions. To access the Design Hubs:

- In DocNav, click the **Design Hubs View** tab.
- Go to the [Design Hubs](#) web page.

Support Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see [Support](#).

References

These documents provide supplemental material useful with this guide:

1. *Alveo UL3422 Ultra Low Latency Trading Data Sheet* ([DS1016](#))
 2. *UltraScale+ Devices Integrated Block for PCI Express LogiCORE IP Product Guide* ([PG213](#))
 3. [Answer Record 72298](#)
 4. *Alveo Card Debug Kit User Guide* ([UG1538](#))
-

Revision History

The following table shows the revision history for this document.

Section	Revision Summary
10/14/2024 Version 1.0	
Initial release.	N/A

Please Read: Important Legal Notices

The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions, and typographical errors. The information contained herein is subject to change and may be rendered inaccurate for many reasons, including but not limited to product and roadmap changes, component and motherboard version changes, new model and/or product releases, product differences between differing manufacturers, software changes, BIOS flashes, firmware upgrades, or the like. Any computer system has risks of security vulnerabilities that cannot be completely prevented or mitigated. AMD assumes no obligation to update or otherwise correct or revise this information. However, AMD reserves the right to revise this information and to make changes from time to time to the content hereof without obligation of AMD to notify any person of such revisions or changes. THIS INFORMATION IS PROVIDED "AS IS." AMD MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE CONTENTS HEREOF AND ASSUMES NO RESPONSIBILITY FOR ANY INACCURACIES,

ERRORS, OR OMISSIONS THAT MAY APPEAR IN THIS INFORMATION. AMD SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE. IN NO EVENT WILL AMD BE LIABLE TO ANY PERSON FOR ANY RELIANCE, DIRECT, INDIRECT, SPECIAL, OR OTHER CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF ANY INFORMATION CONTAINED HEREIN, EVEN IF AMD IS EXPRESSLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

AUTOMOTIVE APPLICATIONS DISCLAIMER

AUTOMOTIVE PRODUCTS (IDENTIFIED AS "XA" IN THE PART NUMBER) ARE NOT WARRANTED FOR USE IN THE DEPLOYMENT OF AIRBAGS OR FOR USE IN APPLICATIONS THAT AFFECT CONTROL OF A VEHICLE ("SAFETY APPLICATION") UNLESS THERE IS A SAFETY CONCEPT OR REDUNDANCY FEATURE CONSISTENT WITH THE ISO 26262 AUTOMOTIVE SAFETY STANDARD ("SAFETY DESIGN"). CUSTOMER SHALL, PRIOR TO USING OR DISTRIBUTING ANY SYSTEMS THAT INCORPORATE PRODUCTS, THOROUGHLY TEST SUCH SYSTEMS FOR SAFETY PURPOSES. USE OF PRODUCTS IN A SAFETY APPLICATION WITHOUT A SAFETY DESIGN IS FULLY AT THE RISK OF CUSTOMER, SUBJECT ONLY TO APPLICABLE LAWS AND REGULATIONS GOVERNING LIMITATIONS ON PRODUCT LIABILITY.

Copyright

© Copyright 2024 Advanced Micro Devices, Inc. AMD, the AMD Arrow logo, Alveo, UltraScale+, Versal, Vitis, Vivado and combinations thereof are trademarks of Advanced Micro Devices, Inc. PCI, PCIe, and PCI Express are trademarks of PCI-SIG and used under license. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.