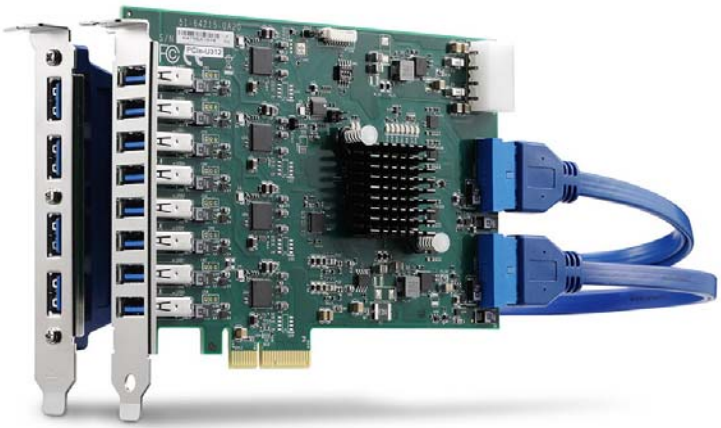
PCIe-U300 Series

4/8/12-ch PCI Express® x4 Gen2
USB3 Vision Top Performing Frame Grabbers

User's Manual



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Part No: 50M-00064-1020

Leading **EDGE COMPUTING**

Revision History

Revision	Release Date	Description of Change(s)
1.00	2019-10-22	Initial release
1.1	2020-12-11	Add PCIe-U312 version; rename to PCIe-U300 Series; update PCIe-U304/U308 to "A2" PCB revision (refer to user's manual Rev. 1.00 for "A1" PCB revision info)
1.2	2022-01-24	Correct PCIe Gen2 specification

Preface

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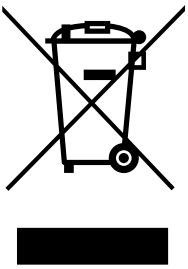

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WARNING: This product can expose you to chemicals including acrylamide, arsenic, benzene, cadmium, Tris(1,3-dichloro-2-propyl)phosphate (TDCPP), 1,4-Dioxane, formaldehyde, lead, DEHP, styrene, DINP, BBP, PVC, and vinyl materials, which are known to the State of California to cause cancer, and acrylamide, benzene, cadmium, lead, mercury, phthalates, toluene, DEHP, DIDP, DnHP, DBP, BBP, PVC, and vinyl materials, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov**.**

Trademarks

Product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.

Additional information, aids, and tips that help users perform tasks.

Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.

Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

1.1 Overview

ADLINK's PCIe-U300 Series is a PCI Express® x4 lane Gen2 USB3 Vision frame grabber supporting 4, 8 or 12 Type-A USB 3.1 Gen 1 ports (the same as USB 3.0) for multiple USB3 Vision® device connections with data transfer speeds up to 5 Gb/s per port.

- PCIe-U304 - 4 USB ports (dedicated bandwidth)
- PCIe-U308 - 8 USB ports (shared bandwidth)
- PCIe-U312 - 12 USB ports (shared bandwidth)

The PCIe-U300 Series delivers 5V and up to 1500mA per port for external USB3 Vision® industrial cameras. To ensure industrial-grade high-bandwidth performance for each port, the card uses four independent Fresco FL1100 USB 3.1 Gen 1 Host Controllers with a 4 lane PCI Express Gen2 interface enabling every USB port to deliver up to 5 Gbps bandwidth when operating multiple ports simultaneously. It supports software programmable per-port power on/off control for fault recovery operations.

ADLINK's PCIe-U300 Series conveniently interfaces with USB3 Vision devices for machine vision, factory automation, and quality assurance applications.

1.2 Features

- PCI Express x4 Gen2 interface
- 4 Independent Fresco FL1100 USB 3.1 Gen 1 Host Controllers
- Data Transfer Rates: SuperSpeed (5.0 Gbps), High Speed (480.0 Mbps), Full Speed (12.0 Mbps) and Low Speed (1.5 Mbps)
- 4/8/12 USB 3.0 Type-A connectors
- 5V, up to 1500mA per port
- Up to 20/60W power supply from PCIe bus / 4-pin Molex connector
- Multiple cards and cameras on a single system
- Voltage, current overload and short circuit protection
- Easy-to-use API provided for software-programmable per-port power on/off
- Host OS Support: Windows® 7/10, Linux

1.3 Applications

The PCIe-U300 Series is ideally suited for frame grabbing in a wide variety of applications including:

- Machine Vision Inspection systems
- Factory Automation
- Quality Assurance

The PCIe-U300 Series Function Library Reference and driver can be downloaded from http://www.adlinktech.com

- AVS-SDK driver for USB power management
- FLUSB3.0-x.x driver for USB3 controller

For the development host PC, make certain to install Microsoft's Kernel-Mode Driver Framework v1.11. This is not natively supported on Windows 7 unless the KB3033929 hotfix is installed manually or via Windows Update.

If the total USB load exceeds 20W, a 4-pin Molex Power Connector connection is required to avoid system damage. See “4-pin 12V Power Connector (CN10)” on page 19.

1.4 Specifications

		PCIe-U304	PCIe-U308	PCIe-U312
PCI Express				
PCI Express		4-lane PCI Express Gen 2.1 (5 GT/s)		
Differential Output Peak to Peak Voltage		+0.8 V to +1.2 V		
Differential Input Peak to Peak Voltage		+0.175 V to +1.2 V		
Input voltage for PERST#, WAKE#, SMBus		-0.75 V to +4.05 V		
USB Ports				
USB Ports (on bracket)		4	8	12 (4 via extension)
USB Connector		USB Type-A Connector		
USB Host Controller		4 x Fresco FL1100 Host Controllers		
		Compliant with USB 3.0 Specification and Intel® xHCI Specification, Revision 1.0		
Data Transfer Rates		SuperSpeed (5.0 Gbps), High Speed (480.0 Mbps), Full Speed (12.0 Mbps), Low Speed (1.5 Mbps)		
USB Power				
Output Voltage (at PSE)		5V ±5%		5V at 4-pin connectors on cable, less 0.25V
Current Limit Range (per Port)		1700 mA ±7%		Ports 1-8: 1700 mA ±7% Ports 9-12: 1100 mA ±7%
USB Power Management		Software-programmable per-port power on/off		
		Voltage, current overload and short circuit protection		
PCBA Max. Power Req't w/o USB Power Delivery		+3.3V 2A, +12V @ 0.1A		
USB Power Delivery Capacity (at PSE)	PCIe Slot only w/o 4-pin Molex Connector	Max. 20W USB Power		4-pin Molex connector req'd for extension ports
	PCIe Slot w/ 4-pin Molex Connector	Max. 30W USB Power	Max. 60W USB Power	Max. 78W USB Power

Table 1-1: PCIe-U300 Series Specifications

	PCIe-U304	PCIe-U308	PCIe-U312
Physical			
Dimensions (W x L)	167.65 mm x 111.15 mm (6.59" x 4.37")		
Operating Temperature	0°C to 60°C (32° to 140°F)		
Humidity	5% to 90% RHNC		
Storage Temperature	-40°C to 85°C (-40°F to 185°F)		
Safety Compliance	CE/FCC, Class A		

Table 1-1: PCIe-U300 Series Specifications

1.5 USB Power

The PCIe-U300 Series provides a choice of 4, 8 or 12 USB 3.0 ports supporting Type-A USB3.0 connections on the front panel, with 5V at 1500mA per port and extension port with 5V at 900mA per port. It supports software programmable per-port power on/off control for fault recovery operations.

1.5.1 Overcurrent Protection

If the USB connection exceeds a rated ICUT value due to overload, short circuit, or ground fault, the system protects the circuit by shutting down the connection to PD in order to avoid an excessive or dangerous temperature rise in the conductors. The recommend recovery procedure is to reboot the PC.

- Ports 1-8
  - USB port ICUT: 1700 mA ±7%
- Ports 9-12
  - USB port ICUT: 1100 mA ± 7%

1.5.2 Software-programmable USB Power On/Off

The AVS SDK for USB power management is ready to use with the PCIe-U300 Series with no additional licensing required. Applications are easily created with the SDK, requiring only a few lines of code.

1.6 PCB Layout and Dimensions

NOTE:

All dimensions areshown in mm.

1.6.1 PCIe-U304 Layout

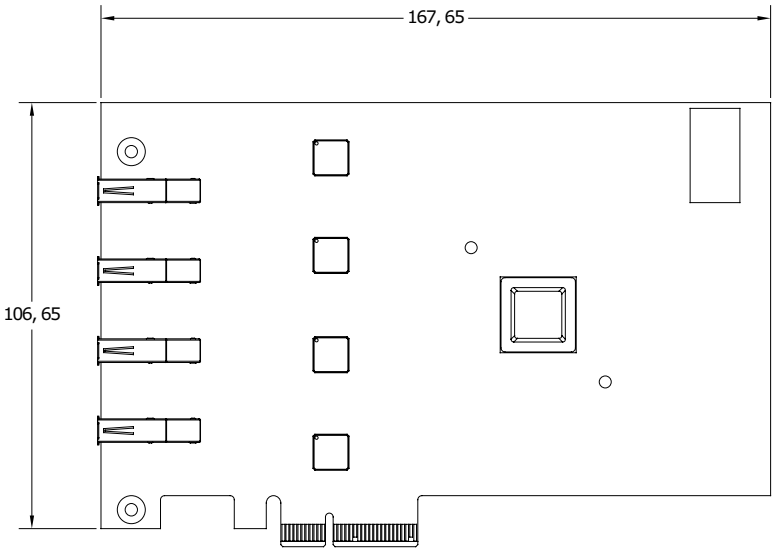


Figure 1-1: PCIe-U304 Top View Dimensions

Figure 1-2: PCIe-U304 Side View

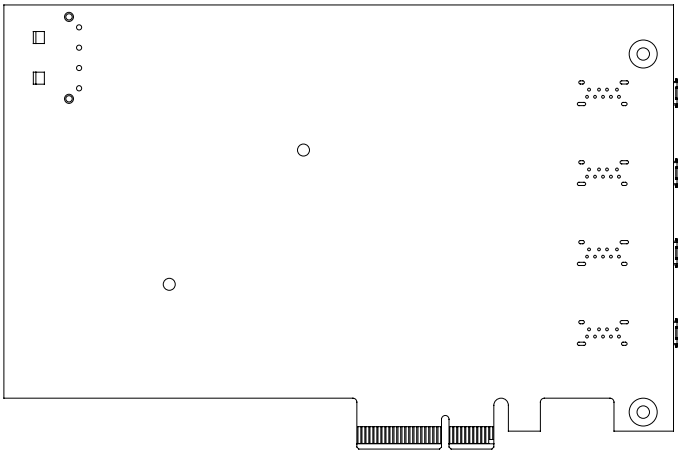


Figure 1-3: PCIe-U304 Bottom View

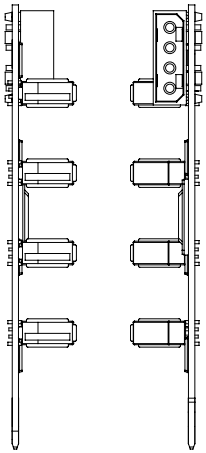


Figure 1-4: PCIe-U304 Front and Rear View

1.6.2 PCIe-U308 Layout

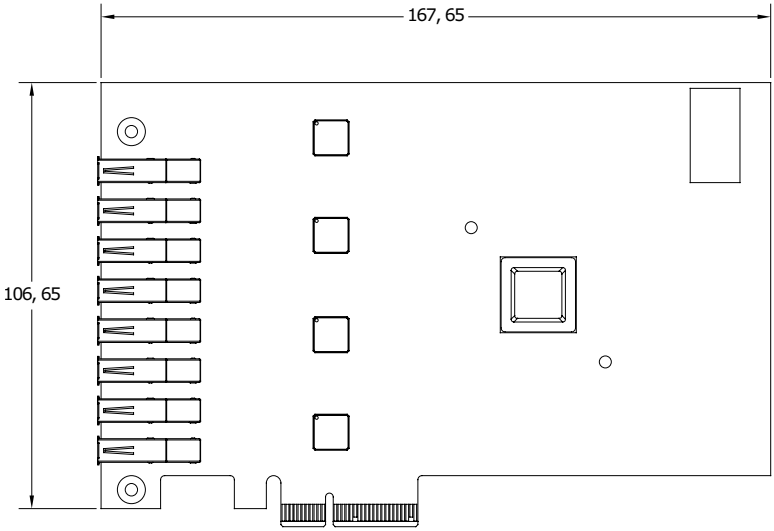


Figure 1-5: PCIe-U308 Top View Dimensions

Figure 1-6: PCIe-U308 Side View

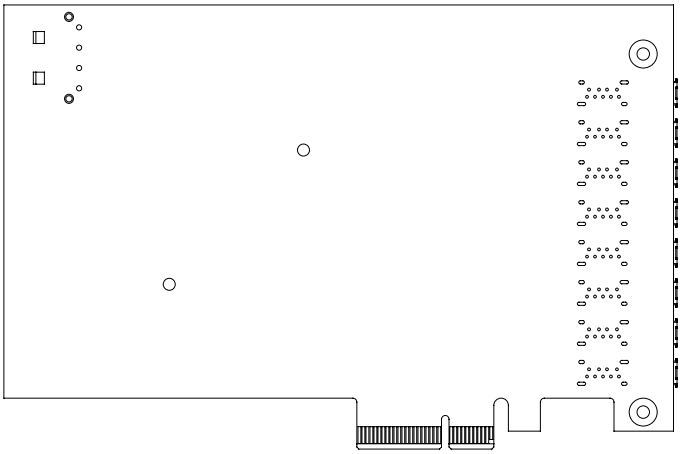


Figure 1-7: PCIe-U308 Bottom View

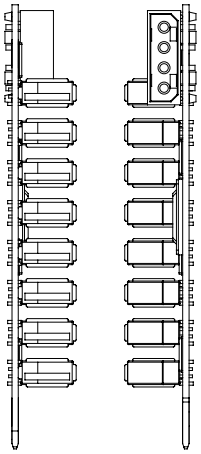


Figure 1-8: PCIe-U308 Front and Rear View

1.6.3 PCIe-U312 Layout

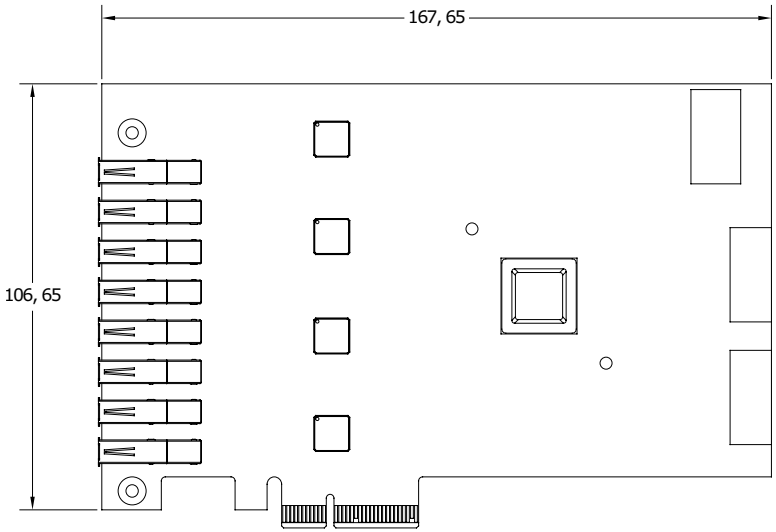


Figure 1-9: PCIe-U312 Top View Dimensions

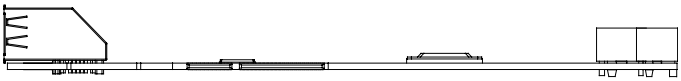


Figure 1-10: PCIe-U312 Side View

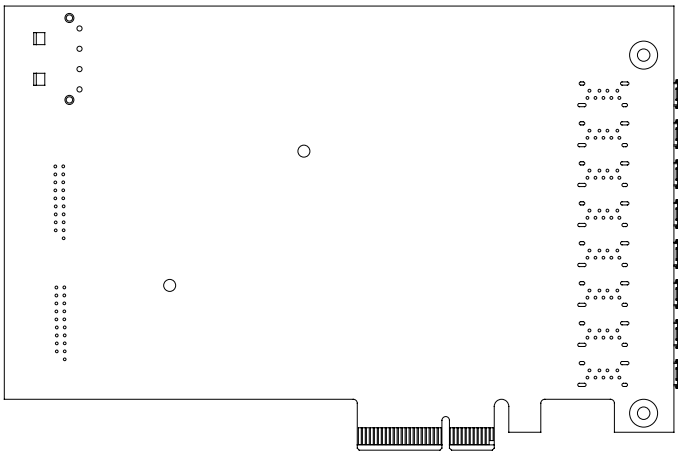


Figure 1-11: PCIe-U312 Bottom View

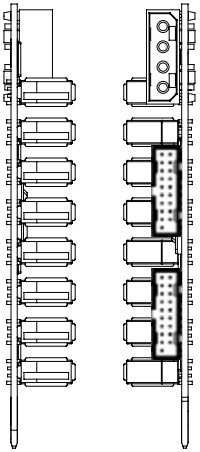


Figure 1-12: PCIe-U312 Front and Rear View

2 Board Interfaces

2.1 PCIe-U304 Interface Layout

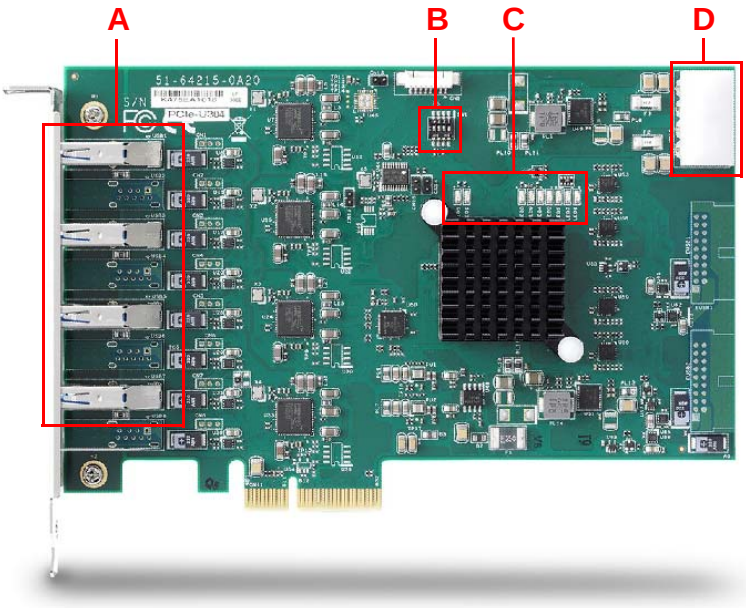


Figure 2-1: PCIe-U304 Connector, Jumper and LED Locations

A	USB Type-A connectors
B	Card ID Switch (SW1)
C	LED Status Indicators
D	4-pin 12V Connector

Table 2-1: PCIe-U304 Connector, Jumper and LED Legend

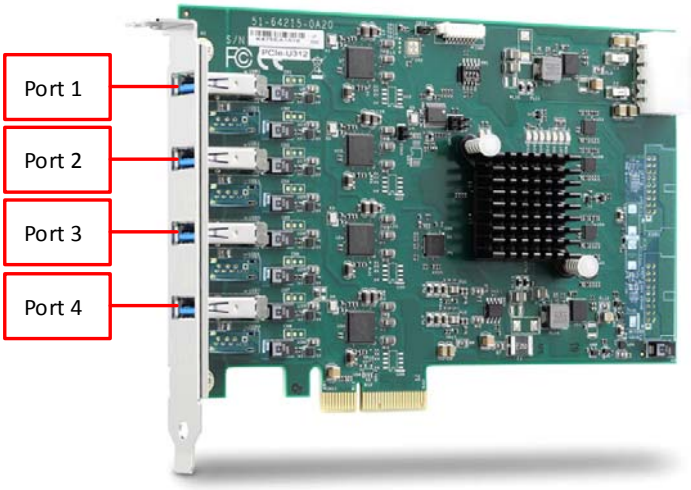


Figure 2-2: PCIe-U304 USB Port Assignment

2.2 PCIe-U308 Interface Layout

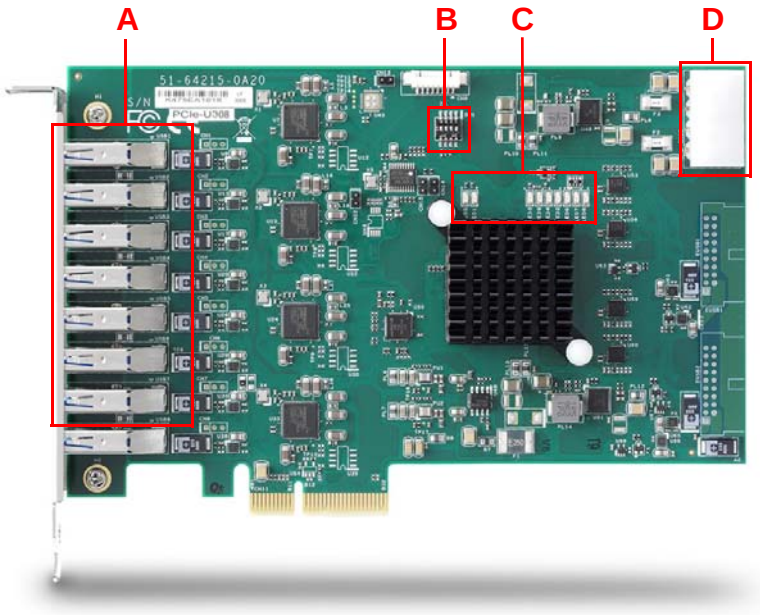


Figure 2-3: PCIe-U308 Connector, Jumper and LED Locations

A	USB Type-A connectors
B	Card ID Switch (SW1)
C	Status LEDs
D	4-pin 12V Connector

Table 2-2: PCIe-U308 Connector, Jumper and LED Legend

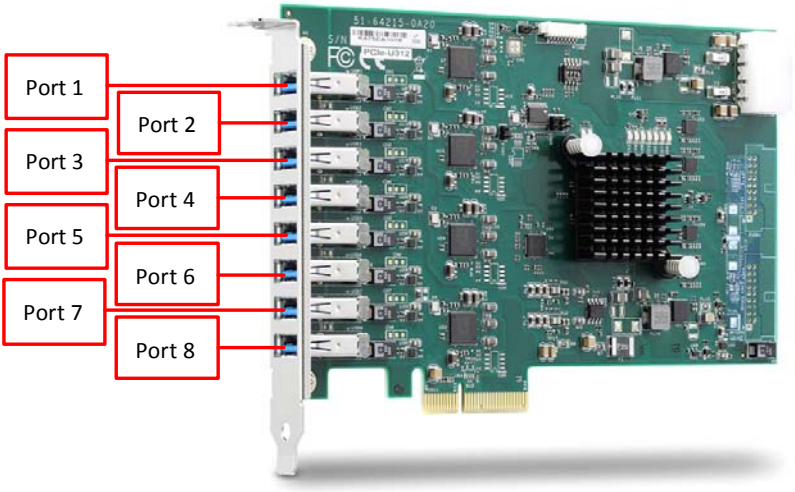


Figure 2-4: PCIe-U308 USB Port Assignment

2.3 PCIe-U312 Interface Layout

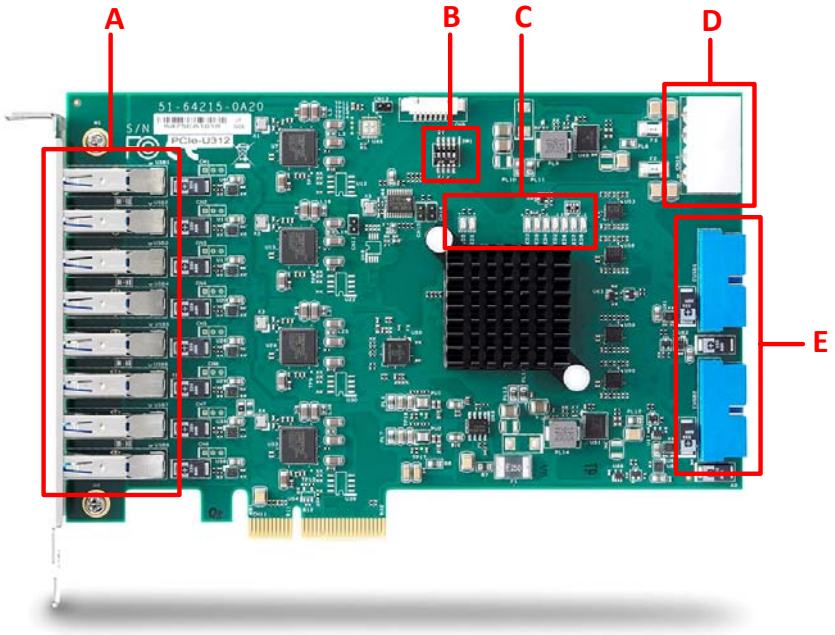


Figure 2-5: PCIe-U312 Connector, Jumper and LED Locations

A	USB Type-A connectors
B	Card ID Switch (SW1)
C	Status LEDs
D	4-pin 12V connector
E	Internal 20-pin header for USB 3.0 Ports 9-12 Extension

Table 2-3: PCIe-U312 Connector, Jumper and LED Legend

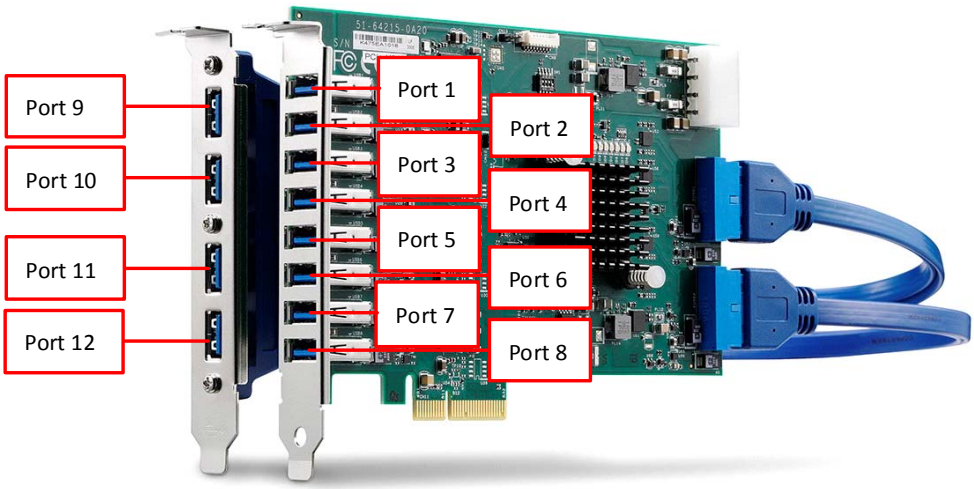
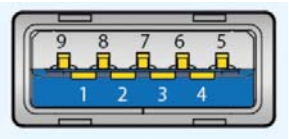


Figure 2-6: PCIe-U312 USB Port Assignment

2.4 Connector, Jumper and LED Definitions

2.4.1 USB Ports



Pin	Signal	Pin	Signal
1	VBUS	5	SSRX-
2	D-	6	SSRX+
3	D+	7	GND_DRAIN
4	GND	8	SSTX-
		9	SSTX+

Table 2-4: USB 3.0 Type-A Port Pin Assignment

2.4.2 4-pin 12V Power Connector (CN10)

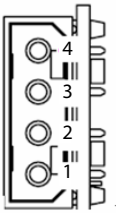


Figure 2-7: 4-pin 12V Power Connector

Pin	Signal
1	+12V
2	GND
3	GND
4	+5

Table 2-5: 4-pin 12V Power Connector Pin Assignment

2.4.3 Card ID Switch (SW1)

Figure 2-8: Card ID Switch

Setting	Definition
ON	1 (Default)
OFF	0

Table 2-6: Card ID Switch Settings

The Card ID default setting is at 15 (0x1111).

Card ID	1	2	3	4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Table 2-7: Card ID Switch Legend

2.4.4 Status LEDs

The status LEDs on the top side of the PCIe-U300 indicate the status of the data stream for each PCIe bridge port and USB controller.

Figure 2-9: PCIe-U300 Series Status LEDs

LED	Activity	Status
1/3/4/5	Off	Abnormal: PCIe switch upstream function (to USB 3.0 controller) is disabled
	On (default)	Normal
2/6/7/8	Off	Abnormal: PCIe switch upstream function (to PCIe slot) is disabled
	On (default)	PCIe x4 Gen2
	Blinking	Insufficient bandwidth
9	Off (default)	Normal
	On	Abnormal: PCIe switch has experienced an unexpected error

Table 2-8: PCIe-U300 Series Status LED Legend

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3 Getting Started

3.1 Unpacking Checklist

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK. Ensure that the following items are included in the package.

- PCIe-U300 Series Frame Grabber card

NOTE:

OEM versions with non-standard configuration, functionality, or packaging may vary according to individual requirements.

3.2 Installation

The following describes installation of the PCIe-U300 Series card on a PCI Express bus.

1. Remove the computer cover according to the computer manual.

NOTE:

A vacant PCI Express slot is required for installation of the card; if none is available, remove a PCI Express card and note the slot number.

2. Remove the slot cover (if any).
3. Carefully position the card in the selected PCI Express slot. If installing in a desktop computer, align the card with the PCI Express slot.
4. Press the card firmly but carefully into the connector.
5. Secure the card with the screw.

6. *PCIe-U312 only:* Connect the cables of the USB extension bracket to the connectors on the rear of the card as shown below, and secure the USB extension bracket to an available slot with a screw.

7. Connect devices to the card using the USB connectors.
8. Power up the computer.

NOTE: PCIe-U300 Series cards can be installed in a PCI Express x4, x8, or x16 slot. Please download the driver from ADLINK (www.adlinktech.com)

NOTE: PCIe-U300 Series cards may not fit some consumer PC cases with non-standard PCIe slots. It is not recommended to install PCIe-U300 Series cards into a PC with a PCIe slot width less than 13.25mm (0.512").

Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil , pour éviter des blessures ou des dommages.

- Read these safety instructions carefully.
- Keep the User's Manual for future reference.
- Read the Specifications section of this manual for detailed information on the recommended operating environment.
- The device can be operated at an ambient temperature of 60ºC.
- When installing/mounting or uninstalling/removing device, or when removal of a chassis cover is required for user servicing (See "Getting Started" on page 23.):
  - Turn off power and unplug any power cords/cables.
  - Reinstall all chassis covers before restoring power.
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources.
  - Keep device away from high heat or humidity.
  - Keep device properly ventilated (do not block or cover ventilation openings).
  - Always use recommended voltage and power source settings.
  - Always install and operate device near an easily accessible electrical outlet.
  - Secure the power cord (do not place any object on/over the power cord).
  - Only install/attach and operate device on stable surfaces and/or recommended mountings.
- If the device will not be used for long periods of time, turn off and unplug it from its power source
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools

- A Lithium-type battery may be provided for uninterrupted backup or emergency power.

Risk of explosion if battery is replaced with one of an incorrect type; please dispose of used batteries appropriately.
Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.

- The device must be serviced by authorized technicians when:
  - The power cord or plug is damaged.
  - Liquid has entered the device interior.
  - The device has been exposed to high humidity and/or moisture.
  - The device is not functioning or does not function according to the User's Manual.
  - The device has been dropped and/or damaged and/or shows obvious signs of breakage.
- Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up.
- It is recommended that the device be installed only in a server room or computer room where access is:
  - Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefor, and any precautions required.
  - Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location.

	BURN HAZARD Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching. ***RISQUE DE BRÛLURES*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures.* *Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

Getting Service

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