# PCIE-U300 SERIES

4/8/12-CH PCI EXPRESS® X4 GEN3 USB3 VISION
TOP PERFORMING FRAME GRABBERS
PRODUCT INTRODUCTION

2019/11/28

# USB3 VISION — One of the Main Machine Vision Interface

**USB3 Vision**, GigE Vision and Camera Link are three major interface standards for industrial cameras accounting for 85% of the machine vision market by revenue.

USB 3.0 combines the benefits of several different interfaces by offering bandwidth that closes the gap between GigE Vision and Camera Link, **plug and play** compatibility, **low CPU load**, and **highly reliable data transfer** speeds for industrial applications.

Accordingly, the USB3 Vision interface will play a significant role in balancing the biggest trade-offs in any project: bandwidth vs. distance, cost, and complexity.

| Interface | Cable length (m) | Bandwidth max. (MB/s) | Multi-camera support | System Cost | Real-time | Plug and Play |
|---|---|---|---|---|---|---|
| USB 2.0 | 5 | 40 | ▲ | ▲ | ✗ | ● |
| FireWire | 4.5 | 64 | ▲ | ▲ | ● | ● |
| GigE VISION | 100 | 115 | ● | ● | ▲ | ▲ |
| USB3 VISION | 8 | 400 | ▲ | ▲ | ● | ● |
| CAMERA Link | 10 | 850 | ✗ | ✗ | ● | ✗ |

Comparison of Camera Interfaces

# USB3 Vision Benefits

- ✓ High bandwidth and low performance overhead
  - Approx. 400 Mbytes/s, roughly ten times the bandwidth of USB 2.0 and five times greater than the bandwidth of IEEE 1394b (FireWire-b)
  - Direct Memory Access (DMA) – is available
- ✓ Easy-to-use plug and play interface
  - leverage widely available USB standard
- ✓ Power and data over the same passive cable up to five meters
- ✓ USB3 Vision & GenICam™ generic programming interface
  - An important lesson was learned when USB 2.0 failed to gain real traction in industrial markets. The USB3 Vision standard, hosted by the Automated Imaging Association (AIA), was established to define the device interface and interoperability. It uses the application programming interface (API) defined by the GenICam™ standard to access and control USB 3.0 compatible cameras.

# USB 3.0 Camera Manufacturers and Distributors

Machine vision developers buy cameras based on their application requirements, then choose frame grabbers based on a selected camera interface. Understanding this approach to USB3 Vision camera manufacturing and distributing is an avenue to developing new business opportunities.

# ADLINK Frame Grabber and Machine Vision Interface

Complete product portfolio to meet customer needs

| Interface | USB3 | GigE | Analog | 1394 | Cameralink/ Coaxpress | HDMI | 3G-SDI |
|---|---|---|---|---|---|---|---|
| Product | **PCIe-U300 Series** | PCIe-GIE72/74 | PCIe-RTV24 | PCIe-FIW62/64 | EURESYS Excellence in vision (AP region only) | PCIe-HDV62/72 | PCIe-2602 |

# What is the ADLINK PCIe-U300 Series?

**A USB3 Vision frame grabber with superior performance, high reliability and the best TCO for a multi-camera capture solution.**
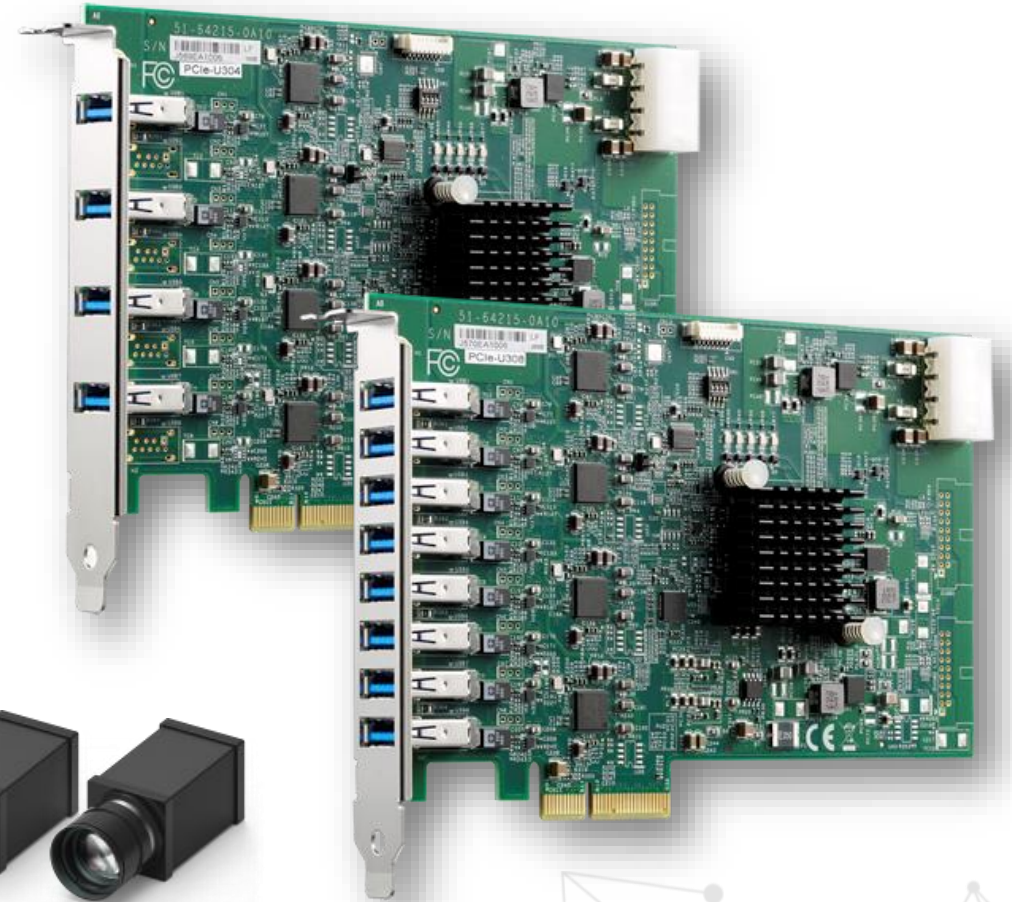
# Why Use the ADLINK PCIe-U300 Series?



## Expert in Machine Vision

✓ ADLINK supplies an optimized and reliable broad portfolio of frame grabbers based on 20-years' experience in machine vision

✓ Over **500K** cameras connected with ADLINK frame grabber

## Superior Performance

✓ 4 x Fresco FL1100 USB 3.1 Gen 1 Controllers adopted

✓ The only USB 3.0 frame grabber on the market so far that uses a **PCI Express x4 Gen3** interface
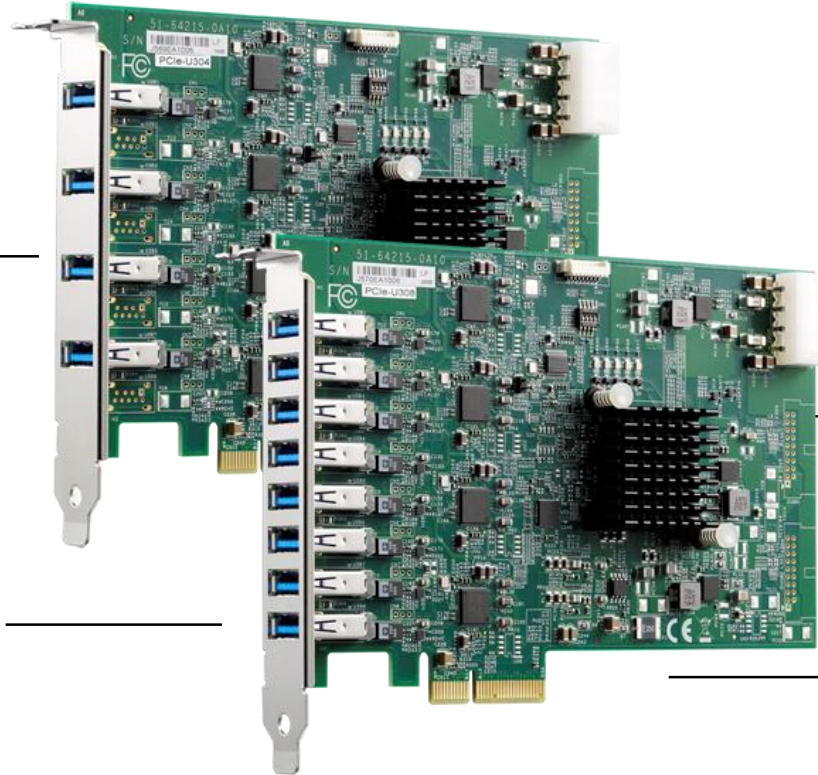
## More Reliable Design

✓ **Power Protection** from overvoltage, overcurrent

✓ **USB Power on/off** for programmable controlling USB power for USB 3.0 camera recovery

✓ USB power capability up to 7.5W per port and **60W** total power (PCIe-U308)

✓ **Operating Temperature** from 0˚C to +60˚C (32˚F to 140˚F)

## Optimized TCO for Multi-Camera Capture Solution

✓ Delivering the best TCO for various multiple cameras applications(PCIe-U308e, up to 12 ports)

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# Comparison of Competitors

| Brand | ADLINK | | Advantech | Neousys | | Vecow | | IOI | | Point Grey | AAEON |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product | PCIe-U304 | PCIe-U308/e | PCIE-1154 | PCIe-USB340 | PCIe-USB380 | UE-1004 | UE-1008 | U3X4-PCIE4XE111 | U3X4-PCIE4XE101 | U3-PCIE2-2P01X | PER-T479 |
| # of Ports | 4 | 8/12 | 4 | 4 | 8 | 4 | 8 | 4 | 4 | 4 | 4 |
| PCIe interface | PCIe x4 Gen3 | | PCIe x4 Gen2 | PCIe x4 Gen2 | | PCIe x4 Gen2 | | PCIe x4 Gen2 | PCIe x4 Gen2 | PCIe x1 Gen2 | PCIe x4 Gen2 |
| USB Controller | Fresco FL1100 | | Fresco FL1100 | Renesas uPD720202 | | Renesas uPD720202 | | Fresco FL1100 | Renesas uPD720202 | Fresco FL1100 | Undocumented |
| # of USB Controllers | 4 | | 4 | 4 | | 4 | | 4 | 4 | 1 | 4 |
| USB Power Control | Software Power on/off | | N/A | Software on/off (no driver download link) | | Software on/off (no driver download link) | | N/A | N/A | N/A | N/A |
| Operating Temperature | 0-60°C | | 0-60°C | 0-60°C | | 0-60°C | | 0-60°C | 0-60°C | 0-45°C | 0-60°C |

# Non-drop Frame Capture

Compatibility Test

| | Test 1 | Test 2 |
|---|---|---|
| PC | ADLINK IMB-M43 | ADLINK MXC-6400 |
| CPU / RAM | 6th Gen Intel® Core™ i7-6700K @ 4.2 GHz / 16G RAM | 6th Gen Intel® Core™ i7-6700K @ 4.2 GHz / 16G RAM |
| OS | Windows 7 64-bit | Windows 10 64-bit |
| Grabbers | PCIe-U304 x3 | PCIe-U304 x1 |
| Cameras | FLIR/ Blackfly BFS-U3-16S2C x5 PCS<br>FLIR/ Blackfly BFS-U3-16S2M x5 PCS<br>FLIR/ Blackfly BFS-U3-51S5M x2 PCS | Basler acA1920-155um x1<br>Basler acA1440-220uc x1<br>Basler acA1440-220uc x2 |
| Cable | 3 meters | 5 meters |
| Settings | Non-drop frame grabs with dual RAM, CPU, PCIe and OS power saving function disabled | |

PASSED

PASSED

# Get More Reliable Asset Protection

Advanced USB Power Protection and Management:

✓ Software-programmable per-port power on/off for USB 3.0 camera recovery

✓ Protection from voltage and current overloads and shorting

- Current limit range (per port): 1700 mA ± 7%

✓ Molex 4P power connector avoids inadequate power from being provided to the camera

- +5V, 1500mA up to 7.5W per port

# Best TCO for Multiple Camera Applications

Support up to 12 ports on multiple cards

Using just one PCIe-U308e to capture 12 cameras can save the TCO of a project and improve performance. The total cost is reduced by:

- Easy installation and simple maintenance
- 1/3 the cost of competitors' solutions
- Higher bandwidth providing more reliable data transfer
- Sufficient power supply providing more stable operation
- Reserves more PCI/PCIe-slots for other use
- Fewer hardware integration issues

**ADLINK 12-camera solution**

**Other brands' 12-camera solution**

**3X Cost**

1x PCIe-U308e

3x USB 3.0 frame grabber

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# Best TCO for Multiple Camera Applications

| | PCIe-U304 | PCIe-U308 | PCIe-U308e (2020 Q2) |
|---|---|---|---|
| Appearance |  |  |  |
| USB Bandwidth | Dedicated Bandwidth | Shared Bandwidth | |
| Multiple Cameras | 4 cameras | 8 cameras | 12 cameras |
| Applications | ✓ Smart phone 5G speed test<br>✓ High resolution printing & webbed materials inspection<br>✓ High speed food inspection | ✓ Low resolution defect inspection<br>✓ Low speed VGR, vision guided robotics<br>✓ Recognition & counting in AI systems<br>✓ Factory automation<br>✓ USB fixture control | |

# Applications



**Defect Inspection**

**AOI**

**Factory Automation**

**Food Inspection**

**Vision Guided Robotics**
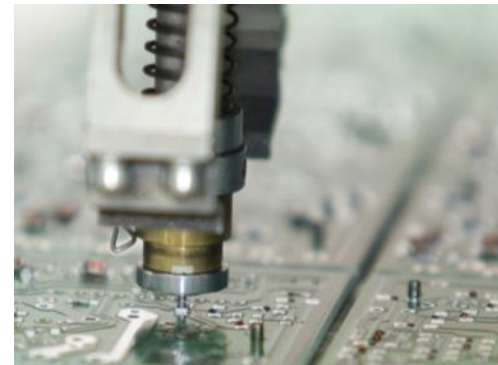
**Machine Tooling**

# Application: Smartphone Camera Module Inspection

## Purpose

- High-resolution cameras used for smartphones are comprised of multiple aspheric lenses, a spectral filter, and a semiconductor image sensor, which are packaged together into a single module with tight geometrical tolerances. Manual inspection was ineffective as defects were not always detected by operators. Automated Optical Inspection (AOI) allowed for a versatile solution that is easy to use and provides consistent, accurate results at high speeds.

## Methods

- Multiple cameras
- Roundness, Diameter, Edge Inspection

## ADLINK Solutions

- PCIe-U308
- IMB-M43
- Euresys eVision
  - EasyImage, EasyObject, EasyGauge
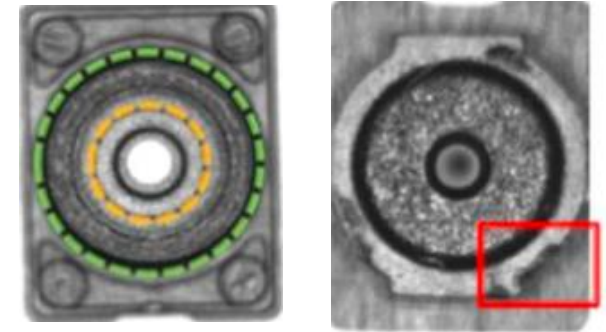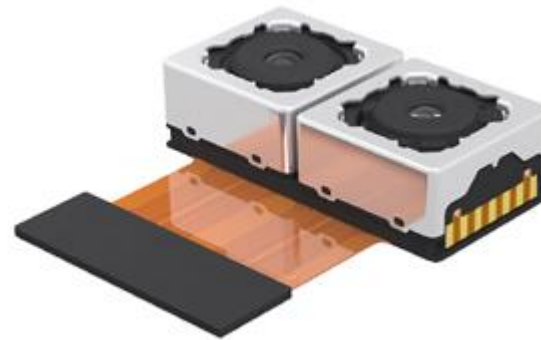
# Application: Electric Components Inspection

## Purpose

- Precise assembly, inspection, and defect detection through the entire manufacturing process, to improve quality control, reduce manufacturing costs, increase yields and throughputs.

## Methods

- Precise, reliable image capturing
- Pick and place

## ADLINK Solutions

- PCIe-U304
- MVP-6100
- Euresys eVision
  – EasyMatch, EasyColor, EasyGauge

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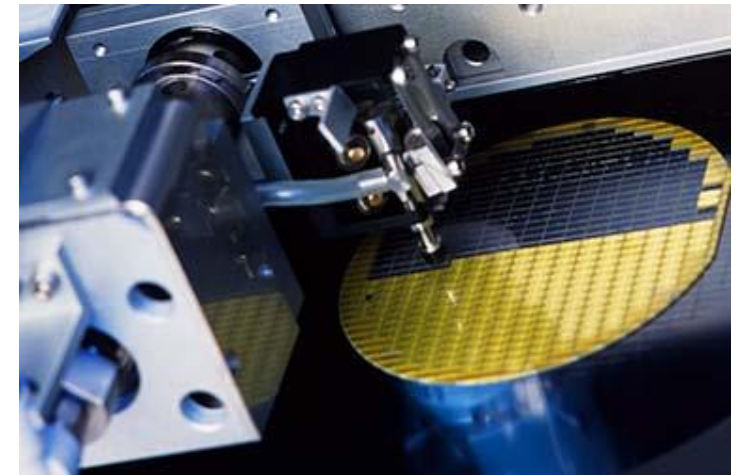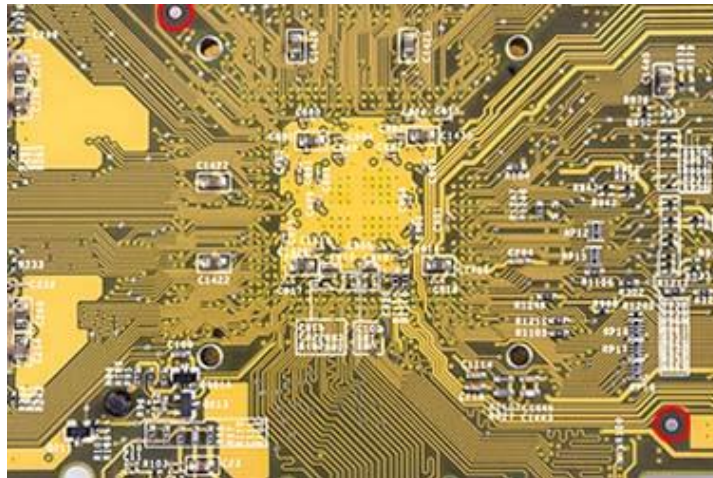
# Product Specification

| | PCIe-U304 | PCIe-U308 | PCIe-U308e (Q2, 2020) |
|---|---|---|---|
| # of Ports | 4 | 8 | 12 |
| PCIe I/F | PCI Express® x4 Gen 3 compliant | | |
| USB Controller I/F | 4x independent Fresco FL1100 Host Controllers | | |
| USB Connector | USB Type-A Connector | | |
| USB Bandwidth | Dedicated | Shared | |
| USB (Voltage) | 5V ± 5% | | |
| Max. USB Power Delivery Capacity (at PSE) | +3.3V 2A, +12V @ max 3.4A Max. 30W USB Power | +3.3V 2A, +12V @ max 6A Max. 60W USB Power | +3.3V 2A, +12V @ max 6A Max. 60W USB Power |
| USB Power Management | 1500mA max. current per port | | 1500mA max. current front port 900mA external port |
| | Easy-to-use API provided for software-programmable per-port power on/off | | |
| OS | Windows® 7/10 32/64-bit | | |
| Operating Temperature | 0 to 60°C , 5% to 90%, RHNC | | |
| Estimated Dimensions | 167.6mm x 106.6mm (W x H) Standard PCIe half-length | | |
| Certificate | CE/FC, Class A | | |
| Application | Machine Vision, Factory Automation, Quality Assurance, Logistics | | |
| Appearance |  |  |  |

# Troubleshooting

**The Camera does not appear in Windows Device Manager**

Ans:

① The camera is not USB3 Vision compliant

   a. The camera must comply with the AIA USB3 Vision Specification version 1.0 or later.

② USB 3.0 controller or camera driver is not installed

   ① The USB 3.0 controller or camera driver must be installed for a USB3 Vision camera.

   ② 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.

③ Inadequate power is being provided to the camera

   a. If the total USB load exceeds 18W, a 4-pin Molex power connector is required to avoid system damage. See "4-pin 12V Power Connector (CN10)" on page 11 in user manual.

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# Troubleshooting

**The Camera cannot acquire images at the advertised frame rate**

Ans:

①     Avoid PC front panel USB ports, red ports branded as "Gaming", "VR Ready" or the USB 2.0 ports

    a.     They may provide less power/bandwidth, through a repeater, share the bandwidth with another port, or make the camera work in USB 2.0 backward-compatible mode, so use an ADLINK PCIe-U300 Series USB 3.0 grabber instead.

②     Remove hubs and extender cables

    ①     Remove any USB hub or extender cable, and plug the USB 3.0 camera directly into a PCIe-U300 Series USB 3.0 grabber.

③     The USB cable length is too long

    ①     We highly recommend the use of machine vision validated USB cables, rather than the cheaper consumer cables.

    ②     For passive cabling, a length of 5 meters or less is recommended. The maximum cable length for USB 3.0 devices is not explicitly specified in the USB 3.0 standard. However, the standard provides a description of the relationship between wire gauge and maximum length in order to prevent too high a voltage drop and attenuation.

④     Disable the CPU, PCIe and OS power saving function

    ①     Skipped images may result from the CPU, PCIe and OS entering a sleep state.