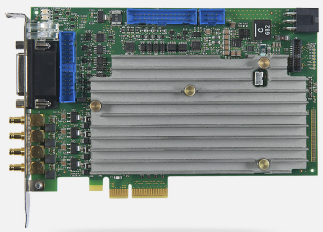
euresys
Empowering Computer Vision

Coaxlink Quad G3 LH

PCIe 3.0 四路 CoaXPress 图像采集卡（无源散热器）



特性一览

- 4路CoaXPress CXP-6 连接：2,500 MB/s 相机带宽
- PCIe 3.0 (Gen 3) x4 总线：3,300 MB/s 总线带宽
- 被动（无风扇）散热器
- 特征丰富的 20 条数字 I/O 线
- 丰富的相机控制功能
- Memento 事件日志工具

优势

PCIe 3.0 (Gen 3) x4 总线

- 3,300 MB/s 持续总线带宽

散热方法

- 被动（无风扇）散热器
- 也可提供风扇冷却型散热器。

连接最快速最高分辨率的相机来采集图像

- 在同行业中最高的数据采集速率
- 25 Gbit/s (2,500 MB/s) 带宽（从相机到主机 PC 内存）

Power over CoaXPress

- Power over CoaXPress : Feed your camera up to 17 W per channel under 24 VDC with automatic device detection, measurement and overload protection.
- Total and per-channel voltage and current measurement is possible, allowing validation and performance deviation monitoring.

长线缆支持

- CXP-6 速度时 40 米（6.25 Gbps）
- CXP-3 速度时 100 米（3 Gbps）

使用标准同轴电缆

- 只需一条并不昂贵的电缆，就可完成数据传输、相机控制、触发器和电源供应
- 顶级的可靠性和灵活性，可在恶劣环境执行

稳健的连接器，确保可靠连接

- Coaxlink CXP-6 使用 DIN 1.0/2.3 连接器，带推/拉闩锁系统

- Coaxlink CXP-12 使用 Micro-BNC (HD-BNC) 连接器提供可靠的推转卡环式正锁，可快速简便的连接和断开连接

最多可连接4个相机到一张Coaxlink卡

Memento 事件日志工具

- Memento 是供 Coaxlink 卡使用的高级开发和调试工具。
- Memento 记录与相机、图像采集卡及其驱动程序以及应用程序相关的所有事件的准确日志。
- 对于包含时间戳的时间，它为开发人员提供精确的时间表，也提供上下文信息和逻辑分析器视图。
- 它可以在应用程序开发和调试，以及机器操作期间提供宝贵的协作。

直接GPU传输

- 可提供用于AMD DirectGMA和NVIDIA (CUDA)的样例程序。
- GPU 直接传输消除了不必要的系统内存副本，降低了 CPU 开销，减少了延迟，从而显著改善了应用程序的数据传输时间。
- 使用AMD的DirectGMA，可直接将图像数据采集到GPU内存。兼容AMD FirePro W5x00和更高版本以及所有AMD FirePro S系列产品。

通用 I/O 线

- 兼容多种传感器和运动编码器。
- 高速差分输入：正交运动编码器，支持高达 5 MHz。
- 隔离式电流感应输入：接受 5V、12V、24V 信号电压，最高 50 kHZ，个别电气隔离高达 250VDC 和 170VAC RMS。
- 隔离触式输出。
- 高速 5V 兼容 TTL 输入/LVTTL 输出。

高性能 DMA（直接存储器存取）

- 直接传输到用户分配的内存和显示 PCI 地址的硬件板
- 硬件分散 – 聚集支持
- 64 位寻址能力

区域扫描触发功能

- 触发器用于在零件就位时启动采集。硬件触发器来自 Coaxlink 的 I/O 线。软件触发器来自于应用程序。
- 可控的延时触发器，用来控制推迟图像采集的时间点。
- 触发抽取功能允许跳过某些触发器。
- 相机曝光控制允许应用来控制相机的曝光时间。
- 当系统开始采集图像时，Coaxlink采集卡会在一个适当的时间点生成信号来控制连接在输出端的照明设备。

线扫描触发能力 1/2

Coaxlink 支持连续滚网扫描（以检查无限、连续移动的表面而不丢失行）和离散的目标扫描（以采集在相机前方移动的目标图像）。

- 触发器用于在零件就位时启动采集。硬件触发器来自主板 I/O 线。软件触发器来自于应用程序。
- 启动以后，采集将：
  - 无限进行下去 (用于滚网式监测应用)
  - 继续进行可编程的行数（以采集已知长度的目标图像）
  - 继续进行直至收到结束触发信号（以采集可变长度的目标图像）
- 可控的延时触发器，用来以可编程的行数推迟开始采集。

线扫描触发能力 2/2

- Coaxlink 图像采集卡根据从运动编码器接收到的信号来控制相机扫描率。如果零件移动速度变快，相机的采集线率将增大。如果零件移动速度变慢，相机的采集线率将减小。
- Coaxlink 板解读来自正交运动编码器的 A/B 信号，了解零件向哪个方向（向前或向后）移动。
- 也可以在对象只向前移动或只向后移动时命令 Coaxlink 卡采集激光线。
- 监测到向后运动时，名为“向后动作取消”的功能即停止采集。当在采集中断位置再次向前运动时，自动恢复行采集。

- 速率转换器能够让相机以任何低于或高于运动编码器分辨率的可编程分辨率来采集行。这就为设计师在应用程序开发过程中提供了惊人的自由度和灵活度。
- 速率分割器允许相机采集的图像分辨率高于或低于运动编码器的分辨率，它实现于利用一个可编程的整数倍来对编码器输入信号进行分割。

通过速率转换器实现灵活的线扫相机操作

- 速率转换器是一个智能的、可编程的倍频器/分频器。
- 用于运动编码器和线扫描相机，允许用户选择该图像中的像素纵横比。
- 它提供了一种方法来校准采集链以轻松达到正方形（1:1 纵横比）像素。

兼容 eGrabber

- eGrabber Studio：eGrabber 新型交互式评估和演示应用程序
- GenICam 浏览器：该应用程序提供对 GenTL Producer 中 GenICam 功能的访问渠道。
- GenTL 控制台：该命令行工具提供对 Euresys GenTL Producer 功能和命令的访问渠道。

符合 Genicam 标准

包括支持

- GenApi
- 标准功能命名约定（SFNC）
- GenTL

Windows、Linux和macOS驱动程序可用

- 包含对英特尔 32 位和 64 位平台以及 ARM 64 位平台的支持

应用

电子制造业的机器视觉

- 用于AOI、3D SPI、3D铅/球检测机的高速图像采集。
- 极高分辨率线扫描图像采集，用于平板显示器检测和太阳能电池检测

一般制造业的机器视觉

- 用于检查机的高帧率图像采集
- 表面检测机的线扫描图像采集
- 用于纺织品检测的线扫描图像采集
- 机器人图像采集

印刷业的机器视觉

- 用于印刷检查机的高速线扫描图像采集

视频采集和录制

- 用于运动分析和记录的高帧速率视频采集

视频监视、监控和安全

- 通过长距离同轴线缆传输和采集高清视频，进行交通监控、监视和控制

规格

Mechanical

Format	Standard profile, half length, 4-lane PCI Express card
Cooling method	Air-cooling, fanless
Mounting	For insertion in a standard height, 4-lane or higher, PCI Express card slot

Connectors	• 'A', 'B', 'C', 'D' on bracket: – 4x DIN 1.0/2.3 female connectors – CoaXPress host interface • 'EXTERNAL I/O' on bracket: – 26-pin 3-row high-density female sub-D connector – I/O lines and power output • 'INTERNAL I/O 1' and 'INTERNAL I/O 2' on PCB: – 2x 26-pin 2-row 0.1" pitch pin header with shrouding – I/O lines and power output • 'AUXILIARY POWER INPUT' on module: – 6-pin PEG power socket – 12 VDC power input for PoCXP camera(s) and I/O power • 'C2C-LINK' on module: – 6-pin 2-row 0.1-in header – Card to card link
LED indicators	• 'A', 'B', 'C', 'D' on bracket: – Bi-color red/green LEDs – CoaXPress Host connector indicator • 'FPGA STATUS LAMP' on PCB: – Bi-color red/green LED – FPGA status indicator • 'BOARD STATUS LAMP' on PCB: – Bi-color red/green LED – Board status indicator
Switches	'RECOVERY' on card PCB: • 3-pin 1-row 0.1" header • Firmware emergency recovery
Dimensions	L 167.65 mm x H 111.15 mm L 6.6 in x H 4.38 in

Host bus

Standard	PCI Express 3.0
Link width	• 4 lanes • 1 lane or 2 lanes with reduced performance
Link speed	• 8.0 GT/s (PCIe 3.0) • 5.0 GT/s (PCIe 2.0) with reduced performance
Maximum payload size	512 bytes
DMA	32- and 64-bit
Peak delivery bandwidth	3,900 MB/s
Effective (sustained) delivery bandwidth	3,350 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 16.8 W (3.8 W @ +3.3V, 13 W @ +12V), excluding camera and I/O power output

Camera / video inputs

Interface standard(s)	CoaXPress 1.0, 1.1 and 1.1.1
Connectors	Four DIN1.0/2.3 75 Ohms CXP-6
Status LEDs	One CoaXPress Host connection status LED per connection

Number of cameras	• Area-scan cameras: – One 1- or 2- or 4-connection camera – One 1- or 2- or 4-connection multi-stream camera (up to 4 data streams) – One or two 1- or 2-connection cameras – One 1- or 2-connection and one or two 1-connection cameras – Up to four 1-connection cameras – One 4-connection sub-link of an 8-connection camera • Line-scan cameras: – One 1- or 2- or 4-connection camera – One or two 1- or 2-connection cameras – Up to four 1-connection cameras
Maximum aggregated camera data transfer rate	25 Gbit/s (2,500 MB/s)
Supported CXP down-connection speeds	1.25 GT/s (CXP-1), 2.5 GT/s (CXP-2), 3.125 GT/s (CXP-3), 5 GT/s (CXP-5), and 6.25 GT/s (CXP-6)
Number of CXP data streams (per camera)	• 4 (1-camera, 4 data-stream firmware variant) • 1 per camera (other firmware variants)
Maximum CXP stream packet size	16,384 bytes
PoCXP (Power over CoaXPress)	• PoCXP Safe Power: – 17 W of 24V DC regulated power per CoaXPress connector – PoCXP Device detection and automatic power-on – Overload and short-circuit protections • On-board 12V to 24V DC/DC converter • A +12V power source must be connected to the AUXILIARY POWER INPUT connector using a 6-pin PEG cable
Camera types	• Area-scan cameras: – Grayscale and color (YCbCr, YUV, RGB and Bayer CFA) – Single-tap (1X-1Y) progressive-scan • Line-scan cameras and contact imaging sensors: – Grayscale and color RGB
Camera pixel formats supported	Raw, Monochrome, Bayer, RGB, and RGBA (PFNC names): • Raw • Mono8, Mono10, Mono12, Mono14, Mono16 • BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 where XX = GR, RG, GB, or BG • RGB8, RGB10, RGB12, RGB14, RGB16 • RGBA8, RGBA10, RGBA12, RGBA14, RGBA16 • YCbCr601_422_8, YCbCr601_422_10 • YCbCr709_422_8, YCbCr709_422_10 • YUV422_8, YUV422_10

Area-scan camera control

Trigger	• Precise control of asynchronous reset cameras, with exposure control. • Support of camera exposure/readout overlap. • Support of external hardware trigger, with optional delay and trigger decimation.
Strobe	• Accurate control of the strobe position for strobed light sources. • Support of early and late strobe pulses.

Line-scan camera control

Scan/page trigger	• Precise control of start-of-scan and end-of-scan triggers. • Support of external hardware trigger, with optional delay. • Support of infinite acquisition, without missing line, for web inspection applications.
Line trigger	• Support for quadrature motion encoders, with programmable noise filters, selection of acquisition direction and backward motion compensation. • Rate Converter tool for fine control of the pixel aspect ratio: Rate Conversion Ratio in the range 0.001 to 1000 with an accuracy better than 0.1%. • Rate Divider tool
Line strobe	• Accurate control of the strobe position for strobed light sources.

On-board processing

On-board memory	1 GB
Image data stream processing	• Unpacking of 10-/12-/14-bit to 16-bit with selectable justification to LSb or MSb • Optional swap of R and B components • Little endian conversion
Flat-field correction	Only available with the '1-camera' and '1-camera, line-scan' firmware variants
Input LUT (Lookup Table)	Only available for monochrome cameras on all the firmware variants but '1-camera, 4-data-stream': • 8 to 8 bits • 10 to 8, 10 or 16 bits • 12 to 8, 12 or 16 bits
Bayer CFA to RGB decoder	• '1-camera' firmware variant: – 3x3 linear interpolation method – 3x3 median-based interpolation method
Data stream statistics	• Measurement of: – Frame rate (Area-scan only) – Line rate – Data rate • Configurable averaging interval
Event signaling and counting	• The application software can be notified of the occurrence of various events: – Standard event: the EVENT_NEW_BUFFER event notifies the application of newly filled buffers – A large set of custom events • Custom events sources: – I/O Toolbox events – Camera and Illumination control events – CoaXPress data stream events – CoaXPress host interface events • Each custom event is associated with a 32-bit counter that counts the number of occurrences • The last three 32-bit context data words of the event context data can be configured with event-specific context data: – Event-specific data – State of all System I/O lines sampled at the event occurrence time – Value of any event counter

General Purpose Inputs and Outputs

Number of lines	20 I/O lines: • 4 differential inputs (DIN) • 4 singled-ended TTL inputs/outputs (TTLIO) • 8 isolated inputs (IIN) • 4 isolated outputs (IOUT)
Usage	• Any I/O input lines can be used by any LIN tool of the I/O Toolbox • Selected pairs of I/O input lines can be used by any QDC tool of the I/O toolbox to decode A/B signals of a motion encoder • The LIN and QDC tools outputs can be further processed by the other tools (DIV, MDV, DEL) of the I/O toolbox to generate any of the following "trigger" events: – The "cycle trigger" of the Camera and Illumination controller – The "cycle sequence trigger" of the Camera and Illumination controller – The "start-of-scan trigger" of the Acquisition Controller (line-scan only) – The "end-of-scan trigger" of the Acquisition Controller (line-scan only)
Electrical specifications	• DIN: High-speed differential inputs compatible with ANSI/EIA/TIA-422/485 differential line drivers and complementary TTL drivers • TTLIO: High-speed 5V-compliant TTL inputs or LVTTL outputs, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers or LVTTL, TTL, 3V CMOS receivers • IIN: Isolated current-sense inputs with wide voltage input range up to 30V, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers, RS-422 differential line drivers, potential free contacts, solid-state relays and opto-couplers • IOUT: Isolated contact outputs compatible with 30V / 100mA loads
Filter control	• Glitch removal filter available on all System I/O input lines • Configurable filter time constants: – for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 µs – for IIN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs
Polarity control	Yes
Power output	Non-isolated, +12V, 1A, with electronic fuse protection
I/O Toolbox tools	The I/O Toolbox is a configurable interconnection of tools that generates events (usually triggers) from input lines. The composition of the toolset is product- and firmware-dependent. • Line Input tool (LIN): Edge detector delivering events on rising or falling edges of any selected input line. • Quadrature Decoder tool (QDC): A composite tool including: – A quadrature edge detector delivering events on selected transitions of selected pairs of input lines. – An optional backward motion compensator for clean line-scan image acquisition when the motion is unstable. – A 32-bit up/down counter for delivering a position value. • Divider tool (DIV): to generate an event every nth input events from any I/O toolbox event source. • Multiplier/divider tool (MDV): to generate m events every d input events from any I/O toolbox event source. • Delay tool (DEL): to delay up to 16 events from one or two I/O toolbox event sources, by a programmable time or number of motion encoder ticks (any QDC events). • User Actions Scheduler tool (UAS): to delegate the execution of User Actions at a scheduled time or encoder position. Possible user actions include setting low/high/toggle any bit of the User Output Register or generation of any User Events.

I/O Toolbox composition	Determined by the selected firmware variant: • 1-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 1-camera, 4-data-stream: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 1-camera, line-scan: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 1-slm-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 1-sls-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 2-camera: 8 LIN, 2 QDC, 2 DIV, 2 MDV, 2 DEL, 1 UAS • 2-camera, line-scan: 8 LIN, 2 QDC, 2 DIV, 2 MDV, 2 DEL, 1 UAS • 3-camera: 8 LIN, 2 QDC, 2 DIV, 2 MDV, 2 DEL, 1 UAS • 4-camera: 8 LIN, 4 QDC, 4 DIV, 4 MDV, 4 DEL, 4 UAS • 4-camera, line-scan: 8 LIN, 4 QDC, 4 DIV, 4 MDV, 4 DEL, 4 UAS

C2C-Link

Description	• Accurate synchronization of the trigger and the start-of-exposure of multiple grabber-controlled area-scan cameras. • Accurate synchronization of the start-of-cycle, start-of-scan and end-of-scan of multiple grabber-controlled line-scan cameras.
Specification	• C2C-Link synchronizes cameras connected to: – the same card – to different cards in the same PC (requires an accessory cable such as the "3303 C2C-Link Ribbon Cable" or a custom-made C2C-Link cable) – to different cards in different PCs (requires one "1636 InterPC C2C-Link Adapter" for each PC and one RJ 45 CAT 5 STP straight LAN cable for each adapter but the last one) • Maximum distance: – 60 cm inside a PC – 1200 m cumulated adapter to adapter cable length • Maximum trigger rate: – 2.5 MHz for configurations using a single PC, or up to 10 PCs and 100 m total C2C-Link cable length – 200 kHz for configurations up to 32 PCs and 1200m total C2C-Link cable length • Trigger propagation delay from master to slave devices: – Less than 10 ns for cameras on the same card or on different cards in the same PC – Less than 265 ns for cameras on different cards in different PCs (3 PCs and 40m total C2C-Link cable length)

Software

Host PC Operating System	• Microsoft Windows 10, 8.1, 7 for x86 (32-bit) and x86-64 (64-bit) processor architectures • Linux for x86 (32-bit), x86-64 (64-bit) and aarch64 (64-bit) processor architectures • macOS for x86-64 (64-bit) processor architecture Refer to release notes for details
APIs	EGrabber class, with C++ and .NET APIs: • .NET assembly designed to be used with development environments compatible with .NET frameworks version 4.0 or higher GenICam GenTL producer libraries compatible with C/C++ compilers: • x86 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86 applications • x86_64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86_64 applications • aarch64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of aarch64 applications

Environmental conditions

Operating ambient air temperature	0 to +55 °C / +32 to +131 °F
Operating ambient air humidity	10 to 90% RH non-condensing
Storage ambient air temperature	-20 to +70 °C/ -4 to +158 °F
Storage ambient air humidity	10% to 90% RH non-condensing

Certifications

Electromagnetic - EMC standards	• European Council EMC Directive 2004/108/EC • United States FCC rule 47 CFR 15
EMC - Emission	• EN 55022:2010 Class B • FCC 47 Part 15 Class B
EMC - Immunity	• EN 55024:2010 Class B • EN 61000-4-3 • EN 61000-4-4 • EN 61000-4-6
KC Certification	Korean Radio Waves Act, Article 58-2, Clause 3
Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2015/863 (ROHS3)
REACH	European Union Regulation 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations

Ordering Information

Product code - Description	• 1633-LH - Coaxlink Quad G3 LH
Optional accessories	• 1625 - DB25F I/O Adapter Cable • 1636 - InterPC C2C-Link Adapter • 3303 - C2C-Link Ribbon Cable • 3304 - HD26F I/O Adapter Cable

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