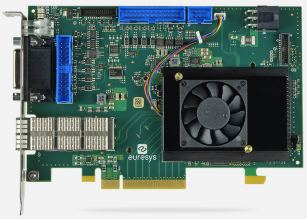
新

Coaxlink QSFP+

四路 CoaXPress-over-Fiber 采集卡



特性一览

- 1 个符合 40 Gbps 光学模块要求的 QSFP+ 端口
- 5,000 MB/s 相机带宽
- PCIe 3.0 (Gen 3) x8 总线：6,700 MB/s 总线带宽
- 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

CoaXPress-over-Fiber 是什么？

CoaXPress-over-Fiber 是对现有 CoaXPress 规范进行的较少但却很重要的扩展，旨在支持光纤传输。

CoaXPress (CXP) 是高带宽计算机视觉应用的实际标准。CoaXPress 2.0 是该规范的最新版本，它指定了 CXP-12 速度，即同轴铜缆上的 12.5 Gbps（千兆位/秒）链路。由于链路聚合在 CoaXPress 中很常见，因此四条 CXP-12 链路可以轻松实现 50 Gbps (12.5 x 4) 的带宽。CoaXPress 规范由 JIIA（日本工业成像协会）主持。

CoaXPress-over-Fiber 是 CoaXPress 2.0 规范的附加部分。它提供了一种通过标准以太网连接（包括光纤）运行未经修改的 CoaXPress 协议的方法。因此，CoaXPress-over-Fiber 虽然使用的是为以太网设计的标准电子设备、连接器和电缆，但所采用的协议既不是以太网，也不是 GigE Vision，而是 CoaXPress。

Read more about CoaXPress-over-Fiber on our technology page.

PCIe 3.0 (Gen 3) x8 总线

- 7,800 MB/s 峰值总线带宽
- 6,700 MB/s 持续总线带宽

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
- 相机到主机 PC 内存的带宽高达 50 Gb/s (5,000 MB/s)

使用光纤有何优缺点？

优点

- 首先，由于光纤连接长度基本不受限制，因此电缆长度不再是问题。
- 光纤提供更高的带宽，如今每条光纤的标准连接速度为 10 Gbps 和 25 Gbps，并且在数据中心得到广泛使用。
- 光纤不受电噪声的影响，对于生产车间和某些医疗应用而言，这是一大重要优势。
- 光纤比同等的铜缆更轻便、小巧，很适合于必须具备这一特点的应用，例如飞机或车辆。

缺点

- 不能“通过光纤传送电能”。由于光纤中的信号通过光传输，因此无法通过光纤传送电能，诸如相机等设备必须单独供电。

CoaXPress-over-Fiber 的电缆选择有哪些？

CoaXPress-over-Fiber 最重要的优势之一，就是众多公司已提供多种连接选择。10 Gbps CoaXPress-over-Fiber 和 Coaxlink QSFP+ 的的初始连接选择有 SFP+ 和 QSFP+（Quad 或四倍 SFP+）模块。
相较于固定接口，使用模块的优势在于可以根据应用要求为端口配备任何合适类型的收发器。由于可以使用的发送器和接收器类型多样，因此用户可以选择合适的收发器，通过多模或单模光纤提供所需的光学范围。

使用 CoaXPress-over-Fiber 有何益处？

- 超高数据/帧率
- 提供多种附件和布线方案，能满足任何长度要求
- CPU 开销低，延迟低，图像采集抖动程度低
- 就 PC 性能而言，支持的相机数量最多
- 极具竞争力的性价比
- 由于 JIIA 和 IEEE 标准化，得到了业界的广泛认可

CoaXPress-over-Fiber 的抖动和延迟是多少？它们与“传统”CoaXPress 相比如何？

CoaXPress-over-Fiber 基于 CoaXPress 协议，在抖动和延迟方面，其性能与 CoaXPress 一样高。另外，CoaXPress-over-Fiber 比 CoaXPress 支持的传输速度更高，因此这些版本中的抖动和延迟将得到进一步改善。

多模光纤的最大电缆长度是多少？

使用标准的 40GBASE-SR4 QSFP+ 光纤收发器模块和用于多模光纤的 MTP/MPO 光纤连接器时，光纤电缆的最大长度可达 150 米。这种解决方案适合于机器视觉应用。

单模光纤的最大电缆长度是多少？

使用标准的 40GBASE-ER4 QSFP+ LC DOM 光纤收发器模块和用于单模光纤的 LC-双工光纤连接器时，光纤电缆的最大长度可达 40 公里。这种解决方案适合于视频传输应用等。

CoaXPress-over-Fiber 标准的状态如何？

As of February 2021

Started in 2018, the development of CoaXPress-over-Fiber by Euresys and Sensor to Image has received in February 2021 the final approval and incorporation into the standard by the CoaXPress Workgroup.

Euresys had anticipated this approval and readily offers CoaXPress-over-Fiber Bridge IP Cores as well as a Four-connection CoaXPress-over-Fiber frame grabber (QSFP+) for evaluation and integration to camera manufacturers / integrators.

The CoaXPress Workgroup includes most major vision machine manufacturers working under the leadership of the Japan Industrial Imaging Association (JIIA).

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

高性能 DMA（直接存储器存取）

- 直接传送到用户分配的内存
- 硬件分散 – 聚集支持

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。

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

符合 Genicam 标准

包括支持

- GenApi
- 标准功能命名约定（SFNC）
- GenTL

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。

规格

Mechanical

Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot

Connectors	• 'QSFP+' on bracket: – Enhanced Quad Small Form-factor Pluggable port – CoaXPress-over-Fiber 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 • 'I/O EXTENSION' on PCB: – 26-pin 2-row 0.05" pitch pin header with shrouding – I/O extension lines and power output • 'AUXILIARY POWER INPUT' on module: – 6-pin PEG power socket – 12 VDC power input for I/O power • 'C2C-LINK' on module: – 6-pin 2-row 0.1" 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
Weight	176 g, 6.21 oz (without transceiver)

Host bus

Standard	PCI Express 3.0
Link width	• 8 lanes • 1 lane, 2 lanes or 4 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	7,800 MB/s
Effective (sustained) delivery bandwidth	6,700 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 16.5 W (3.0 W @ +3.3V, 12.5 W @ +12V), excluding I/O power output and optical transceiver module

Camera / video inputs

Interface standard(s)	CoaXPress 1.0, 1.1, 1.1.1 and 2.0, CoaXPress-over-Fiber
Connectors	• Enhanced Quad Small Form-factor Pluggable (QSFP+) port • Compliant with SFF-8436 (4 x10 Gbit/s Pluggable Transceiver) specification • Compliant with CoaXPress over Fiber • Available power for the module: 3.5 W (SFF-8436 Power Level 4)
Status LEDs	One CoaXPress Host connection status LED per connection
Number of cameras	One 1- or 2- or 4-connection camera
Maximum aggregated camera data transfer rate	5,000 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), 6.25 GT/s (CXP-6), 10.0 GT/s (CXP-10), and 12.5 GT/s (CXP-12)
Supported CXP up-connection speeds	• Low-speed 20.83... Mbps (CXP-1 to CXP-6) • Low-speed 41.6... Mbps (CXP-10, CXP-12) • High-speed (CXP-1 to CXP-12)
Number of CXP data streams (per camera)	1 data stream per camera
Maximum CXP stream packet size	16,384 bytes
Camera types	Area-scan cameras: • Grayscale and color (YCbCr, YUV, RGB and Bayer CFA) • Single-tap (1X-1Y) progressive-scan
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.

On-board processing

On-board memory	4 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
Input LUT (Lookup Table)	Only available for monochrome cameras: • 8 to 8 bits • 10 to 8, 10 or 16 bits • 12 to 8, 12 or 16 bits

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) NOTE: The number of I/O lines can be extended using I/O modules attached to the I/O EXTENSION connector.
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 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	8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 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
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	• 3625 - Coaxlink QSFP+
Optional accessories	• 1625 - DB25F I/O Adapter Cable • 1636 - InterPC C2C-Link Adapter • 3303 - C2C-Link Ribbon Cable • 3304 - HD26F I/O Adapter Cable • 3610 - HD26F I/O Extension Module TTL-RS422 • 3612 - HD26F I/O Extension Module TTL-CMOS5V-RS422

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