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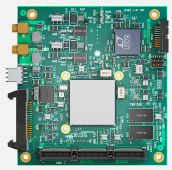
Coaxlink Duo PCIe/104

Two-connection ruggedized CoaXPress frame grabber



At a Glance

- Ruggedized COTS board for industrial and military embedded applications
- Small stackable PCIe/104 form factor
- Extended temperature range: -40 to +85°C / -40 to +185°F with conduction cooling (ambient temperature measured inside the enclosure)
- Sustained shock: 20 g/11ms (all axes - half-sine and saw tooth)
- Optional conformal coating
- Two CoaXPress CXP-6 connections: 1,250 MB/s camera bandwidth
- PCIe 2.0 (Gen 2) x4 bus: 1,700 MB/s delivery bandwidth
- Feature-rich set of 10 digital I/O lines

Benefits

PCIe/104 ruggedized board design

- Compact size: 90 x 96 mm module size - reduced footprint for smaller electronic devices
- Self-stacking: expands without backplanes or card cages
- Rugged, reliable connectors: reliable in harsh environments
- Four-corner mounting holes: resistance to shock and vibration
- Fully PC compatible: reduced development costs and time-to-market
- Backward compatibility with current PC/104 specifications and form factors
- Commercial Off-The-Shelf (COTS) for rapid uptime and low development costs
- Interoperability across manufacturers

Use heavy duty coaxial cables

- A single inexpensive cable for data transfer, camera control, trigger and power supply
- Top reliability and flexibility, performs in the harshest environments

Use robust remote connectors

- Remote DIN 1.0/2.3 connectors (other connector types available on request)
- Remote I/O connectors on separate board
- Connectors can be customized and installed on enclosure at convenient locations

Modular architecture

- The Coaxlink Duo PCIe/104 card is made of a main module with a customized heat sink for conduction cooling.
- The I/O connectors are on separate card that can be installed at a convenient location on the enclosure.
- The two DIN1.0/2.3 CoaXPress connectors are independent form the main card and can be installed at convenient locations.

Long cable support

- 40 meters at CXP-6 speed (6.25 Gbps)
- 100 meters at CXP-3 speed (3 Gbps)

Acquire images from the fastest and highest resolution cameras

- Highest data acquisition rate in the industry
- 12.5 Gbit/s (1,250 MB/s) bandwidth from camera to host PC memory

Memento Event Logging Tool

- Memento is an advanced development and debugging tool available for Coaxlink cards.
- Memento records an accurate log of all the events related to the camera, the frame grabber and its driver as well as the application.
- It provides the developer with a precise timeline of time-stamped events, along with context information.
- It provides valuable assistance during application development and debugging, as well as during machine operation.

AMD's DirectGMA support

- Direct transfer of image data to GPU memory.
- Eliminates unnecessary system memory copies, dramatically lowers CPU overhead, and reduces latency, resulting in significant performance improvements in data transfer times for applications using the AMD FirePro W5x00 and above and for all AMD FirePro S series products.

PCIe 2.0 (Gen 2) x4 universal expansion bus (Type 1 or Type 2)

- 1,700 MB/s sustained bus bandwidth

General purpose I/O lines

- Compatible with a wide range of sensors and motion encoders.
- High-speed differential inputs: Quadrature motion encoder support up to 5 MHz.
- Isolated current-sense inputs: 5V, 12V, 24V signaling voltages accepted, up to 50 kHz, individual galvanic isolation up to 500VAC RMS.
- Isolated contact outputs.
- High-speed 5V-compliant TTL inputs/ LVTTL outputs.

High-performance DMA (Direct Memory Access)

- Direct transfer into user-allocated memory
- Hardware scatter-gather support
- 64-bit addressing capability

Area-scan triggering capabilities

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the Coaxlink's I/O lines. Software triggers come from the application.
- An optional trigger delay is available to postpone the acquisition for a programmable time.
- A trigger decimation function allows to skip some of the triggers.
- Camera exposure control allows the application to control the exposure time of the camera.
- When the acquisition starts, at the appropriate timing, the Coaxlink board generates a signal to control an illumination device connected to one of its output lines.

The Coaxlink driver includes the following tools:

- Genicam Browser: An application giving access to the GenICam features exposed by the GenTL Producer(s) in the system.
- GenTL Console: A command-line tool giving access to the functions and commands exposed by the Euresys GenTL Producer.

Compliant with Genicam

Including support for

- GenApi
- The Standard Feature Naming Convention (SFNC)
- GenTL

Windows and Linux drivers available

Applications

MACHINE VISION FOR THE ELECTRONIC MANUFACTURING INDUSTRY

High speed image acquisition for inspection machines.

The Coaxlink and Grablink cards are dependable industrial frame grabbers that provide robust and stable image acquisition from the fastest digital cameras available. They feature precise camera control and synchronization functions.

- AOI (Automated Optical Inspection) machines
- 3D SPI (Solder Paste Inspection) machines
- 3D lead/ball inspection machines

MACHINE VISION FOR THE GENERAL MANUFACTURING INDUSTRIES

High frame rate image acquisition for inspection machines

Glass inspection: bottles, vials

MACHINE VISION FOR THE PRINTING INDUSTRY

High speed line-scan image acquisition for printing inspection machines

- Printing inspection for packages
- Printing inspection for labels

LIFE SCIENCES & MEDICAL

Scientific research

CoaXPress hyperspectral imagers can be installed in aircrafts or unmanned aerial vehicles for environmental or agriculture monitoring, land analysis or airborne remote sensing.

VIDEO ACQUISITION AND RECORDING

High-frame-rate video acquisition for motion analysis and recording

MILITARY & DEFENSE

Transmission and acquisition of high-definition video over long coaxial cables

CoaXPress is a recent powerful standard providing a high speed interface between the camera and the PC frame grabber. On a highway, high speed cameras can take images in a burst. The sharper images will enhance license plate recognition accuracy.

High frequency real time triggering and exposure time adjustment to the low light situations can be accommodated.

Airborne ISR

Vision systems often integrate high resolution and high speed CoaXPress cameras for airborne Intelligence, surveillance and reconnaissance missions.

Transport, security

Thanks to a high resistance to extreme temperatures, shocks, vibrations and humidity, the Coaxlink Duo PCIe/104 board is particularly well suited for embedded security systems for rail and road transportation, police vehicles equipment or any mobile or outdoor video-surveillance applications.

Camera turrets for airborne surveillance or gun turrets

CoaXPress cameras can easily be integrated in 360°C rotating stations with slip rings to allow continuous panning. High resolution video provides sharper images and a larger viewing area thereby potentially reducing the number of cameras required.

Unmanned applications, vehicle-based video capture

The CoaXPress standard allows video transfer to the PC in a few milliseconds. The very low latency of the system will allow the control of land vehicles or remote control of UAVs.

VIDEO MONITORING, SURVEILLANCE & SECURITY

Transmission and acquisition of high-definition video over long coaxial cables for traffic surveillance, monitoring and control

Specifications

Mechanical

Form Factor	PCIe/104 card
Format	4-lane PCIe/104, stack-down only, universal peripheral module
Cooling method	Conduction cooling
Mounting	For stacking down directly under the Host PC: • 1 or 2 modules on Type 1 and Type 2 Host PC's
Connectors	• 'A', 'B' on module-to-chassis coaxial cables: – 2x DIN 1.0/2.3 female connectors – CoaXpress host interface • 'I/O' on remote I/O card: – 26-pin 3-row high-density female sub-D connector – I/O lines and power output • 'CAMERA POWER INPUT' on module: – 4-pin 0.1-in Molex KK 7478 male connector • 'C2C LINK' on module: – 6-pin 2-row 0.1-in header – Card to card link
Lamp indicators	• 'A', 'B' on remote I/O card: – 2x bi-color red/green LEDs – CoaXPress Host connector indicator lamps • 'FPGA STATUS LAMP' on remote I/O card: – Bi-color red/green LED • 'BOARD STATUS LAMP' on remote I/O card: – Bi-color red/green LED
Switches	'RECOVERY' on card PCB: • 3-pin 1-row 0.1" header • Firmware emergency recovery
Dimensions	96 mm x 90 mm 3.775 in x 3.555 in

Host bus

Standard	PCI Express 2.0
Link width	• 4 lanes • 1 lane or 2 lanes with reduced performance
Link speed	• 5.0 GT/s (PCIe 2.0) • 2.5 GT/s (PCIe 1.0) with reduced performance
Maximum payload size	512 bytes
DMA	32- and 64-bit
Peak delivery bandwidth	2,000 MB/s
Effective (sustained) delivery bandwidth	1,700 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 8.4 W @ +12V excluding I/O power output • +3.3V and +5.0V rails are not used

Camera / video inputs

Interface standard(s)	CoaXPress 1.0 and 1.1
Connectors	2x CXP-6
Status LEDs	1 CoaXPress Host connection status per connector
Number of cameras	• One 1- or 2-connection area-scan camera • Two 1-connection area-scan cameras
Line-scan cameras supported	No
Maximum aggregated camera data transfer rate	12.5 Gbit/s (1,250 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)	1 data stream per camera
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 • A +24V DC power source must be connected to the AUXILIARY POWER INPUT connector on the module
Camera types	• Area-scan cameras: – Gray-scale and color (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

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	512 MB
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
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 on 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 3 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 – Count value of any event counter

General Purpose Inputs and Outputs

Number of lines	10 I/O lines: • 2 differential inputs (DIN) • 2 singled-ended TTL inputs/outputs (TTLIO) • 4 isolated inputs (IIN) • 2 isolated outputs (IOUT)
Usage	• Any System I/O input lines can be used by any LIN tool of the I/O Toolbox • Selected pairs of System 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).
I/O Toolbox composition	Firmware-dependent I/O toolbox composition: • 1-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL • 2-camera: 8 LIN, 1 QDC, 1 DIV

C2C Link

Specification	• Inter-Coaxlink communication link to synchronize image acquisition between cards • Synchronization of area-scan acquisition with advanced flow control

Software

Host PC Operating System	• Microsoft Windows 10, 8.1, 8, 7 • Linux Kernel version 3.13, compatible with a wide range of distributions, tested with Ubuntu 14.04 • 32- and 64-bit versions
APIs	EGrabber class, with C++ and .NET APIs: • .NET assembly designed to be used with development environments compatible with .NET frameworks version 2.0 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
Memento	Compatible with Memento Event Logging tool, version 4.0 and later

Environmental conditions

Operating ambient air temperature	-40 to +85 °C / -40 to +185 °F, with conduction cooling (ambient temperature measured inside the enclosure)
Operating ambient air humidity	0 to 100% RH non-condensing
Storage ambient air temperature	-55 to +100 °C / -67 to +212 °F
Storage ambient air humidity	0 to 100% RH non-condensing
Shock and vibration	• Shock: 20 g/11ms (all axes - half-sine and saw tooth)

Certifications

Electromagnetic - EMC standards	• The European Council EMC Directive 2004/108/EC • The Unites 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 61000-4-5 • EN 61000-4-6
Flammability	PCB compliant with UL 94 V-0
RoHS	Compliant with the European Union Directive 2011/65/EU (ROHS2)
REACH	Compliant with the European Union Regulation No 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	1634 - Coaxlink Duo PCIe/104

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