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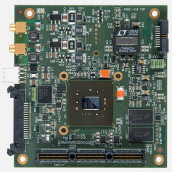
NEW

Coaxlink Duo PCIe/104-MIL

Two-connection military-grade CoaXPress frame grabber



At a Glance

- Ruggedized COTS board for military applications
- Small stackable PCIe/104 form factor
- Extended temperature range: -40 to +85°C / -40 to +185°F
- MIL-STD-810G method 514.6 (vibration) and method 516.6 (shock)
- 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

Benefits

Ruggedized CoaXPress Frame Grabber

- Compliant with the PCIe/104 form factor.
- Extended operating temperature range.
- Withstand high levels of shock and vibration.
- Two CoaXPress CXP-6 (6 Gbit/s) camera connections.
- PCIe 2.0 (Gen 2) x4 bus.

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

CoaXPress for Defense and Surveillance

CoaXPress outdoor cameras are available with characteristics that meet the most demanding applications in defense and high-end surveillance.

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 following optional accessories are available:

- 3300 HD26F I/O module for Coaxlink Duo PCIe/104: A remote module that can be installed at a convenient location on the enclosure.
- 3301 Thermal drain (Model 1) for Coaxlink Duo PCIe/104
- 3302 DIN1.0/2.3 Coaxial cable for Coaxlink Duo PCIe/104

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.

Direct GPU transfer

- Sample programs for AMD DirectGMA and NVIDIA (CUDA) available.
- Direct GPU transfer eliminates unnecessary system memory copies, dramatically lowers CPU overhead, and reduces latency, resulting in significant performance improvements in data transfer times for applications.
- Direct capture of image data to GPU memory is available using AMD's DirectGMA. Compatible with AMD FirePro W5x00 and above and 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.

Line-scan triggering capabilities

Coaxlink supports continuous web scanning (to inspect infinite, continuously moving surfaces without losing a single line) and discrete object scanning (to acquire the image of objects moving in front of the camera).

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the board's I/O lines. Software triggers come from the application.
- After it is started, the acquisition either:
  - Continues indefinitely (for web inspection applications)
  - Continues for a programmable number of lines (to acquire the image of objects of a known length)
  - Continues until an end trigger is received (to acquire the image of objects of a variable length)
- An optional trigger delay is available to postpone the beginning of the acquisition for a programmable number of lines.

Line-scan triggering capabilities

- The Coaxlink frame grabber controls the camera scanning rate based on the signals received from a motion encoder. When the parts move faster, the acquisition line rate of the camera increases. When the parts move slower, the acquisition line rate of the camera decreases.
- The Coaxlink boards interpret A/B signals from quadrature motion encoders to know in which direction (forward or backward) the part is moving.
- Optionally, the Coaxlink can be instructed to acquire lines only when the object is moving forward or only when the object is moving backward.
- A feature called Backward Motion Cancellation stops the acquisition when a backward motion is detected. The line acquisition automatically resumes when the motion is again in the forward direction, at the exact place where the acquisition was interrupted.
- A Rate Converter allows the camera to acquire lines at any programmable resolution lower or higher than the resolution of the motion encoder. This gives the designer incredible freedom and flexibility during the development of the application.
- A Rate Divider allows the camera to acquire lines at a resolution lower than the resolution of the motion encoder. It divides the frequency of the incoming encoder signal by a programmable integer.

Flexible line-scan camera operation with the rate converter.

- The rate converter is a smart, programmable frequency multiplier/divider.
- Used with motion encoders and line-scan cameras, it allows the user to choose the aspect ratio of the pixels in the image.
- It provides a way to calibrate the acquisition chain to easily reach square (1:1 aspect ratio) pixels.

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

- Including support for the AArch64 64-bit ARM architecture for Linux

Applications

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.

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.

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	• 'CAMERA POWER INPUT' – 4-pin 0.1-in Molex KK 7478 male connector • 'C2C-Link' – 6-pin 2-row 0.1-in header • 'I/O' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional) – 26-pin 3-row high-density female sub-D connector – GPIO lines and power output • 'A', 'B' on '3302 DIN1.0/2.3 Coaxial cable for Coaxlink Duo PCIe/104' (optional) – DIN 1.0/2.3 female connectors – CoaXPress host interface
Lamp indicators	• 'A', 'B' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional) – 2x bi-color red/green LEDs – CoaXPress Host connector indicator lamps • 'FPGA STATUS LAMP' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional) – Bi-color red/green LED • 'BOARD STATUS LAMP' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional) – 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
Weight	75 g, 2.65 oz without accessories

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 • One 1- or 2-connection line-scan camera
Line-scan cameras supported	Yes
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 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 CAMERA 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 • Line-scan cameras: – Gray-scale 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

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	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 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
Input LUT (Lookup Table)	• Available for monochrome cameras – 8 to 8 bits – 10 to 8, 10 or 16 bits – 12 to 8, 12 or 16 bits

General Purpose Inputs and Outputs

Number of lines	10 I/O lines on '3300 HD26F I/O module for Coaxlink Duo PCIe/104': • 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	On '3300 HD26F I/O Module for Coaxlink Duo PCIe/104': 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	Firmware-dependent I/O toolbox composition: • 1-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS • 2-camera: 8 LIN, 1 QDC, 1 DIV, 1 UAS • 1-camera, line-scan: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS

C2C-Link

Description	• Allows to accurately synchronize the trigger and start-of-exposure of multiple grabber-controlled area-scan and line-scan cameras. • C2C-Link is able to synchronize cameras connected – to the same Coaxlink 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)
Specification	• Maximum distance: 60 cm • Maximum trigger rate: 2.5 MHz • Trigger propagation delay from master to slave devices: Less than 10 ns

Software

Host PC Operating System	• Microsoft Windows 10, 8.1, 8, 7 for x86 (32-bit) and x86-64 (64-bit) processor architectures • Linux kernel versions 3.10 to 4.10, compatible with a wide range of distributions, tested with CentOS 7, Ubuntu 14.04 and Ubunto 17.04, for x86 (32-bit) and x86-64 (64-bit) processor architectures • Linux kernel version 3.10.96-tegra, tested with Ubuntu 16.04 LTS, for aarch64 (64-bit) processor architecture
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 • aarch64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of aarch64 applications
Memento	Compatible with Memento Event Logging tool

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	Half-sine and terminal peak shocks • 40 g/11 ms Random vibrations, 5 to 2000 Hz • 5 Hz: 0.005 g^2/Hz • 15Hz: 0.1 g^2/Hz • 2000 Hz: 0.1 g^2/Hz

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 61000-4-5 • EN 61000-4-6
Shock and vibration	• MIL-STD-810G method 514.6 (vibration) • MIL-STD-810G method 516.6 (shock)
Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2011/65/EU (ROHS2)
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	• 1634 - Coaxlink Duo PCIe/104-MIL
Optional accessories	• 3300 - HD26F I/O module for Coaxlink Duo PCIe/104 • 3301 - Thermal drain (Model 1) for Coaxlink Duo PCIe/104 • 3302 - DIN1.0/2.3 Coaxial cable for Coaxlink Duo PCIe/104

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