KAYA INSTRUMENTS

Komodo II CoaXPress

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Frame Grabber With 4 Channels

Innovative Approach

Komodo II is the best in class Frame Grabber, supporting the CoaXPress 2.0 standard. It is capable of receiving video streams from up to 4 CoaXPress links in single, dual or quad modes. It can also be used for simultaneous capture from multiple cameras. Each link supports standard CoaXPress bitrates of up to 12.5 Gbps. These features make the Komodo II ideally suited for industrial, defense and aerospace Machine Vision Systems and applications.

Intelligent Design

The Komodo II can easily receive video streams on the CoaXPress links and transmit them to computer memory through the PCIe interface. This product also provides GPIO for machine control signals, such as triggers, timers, shaft encoders, exposure control and general I/O which can be controlled aside video stream acquisition.

The Komodo II uses standard Micro-BNC connectors as a CoaXPress interface to the camera and standard HD DB26 D-sub panel mount connector for general purpose I/O. It utilizes PCIe Gen3 x8 links for communication with Host PC for video uploading and configuration.

Key Features:

- 1 to 4 CoaXPress links support
- PCIe Gen3 x8 Half-length card
- 4GB DDR4 SODIMM
- Camera controls and triggers
- Per-Link LED indication on front card bracket panel
- Flexible GPIO interface on front bracket panel:
  - 4 TTL configurable I/Os
  - 4 LVTTL configurable I/Os
  - 4 LVDS inputs and outputs
  - 4 opto-isolated outputs and inputs
  - 4 quadrature rotary encoders
  - Integrated strobe controller
  - 4 timers
- CoaXPress 2.0 compliant
- Power over CoaXPress with 13W per link
- Multiple camera synchronization
- Multiple Frame Grabbers synchronization
- Micro-BNC connectors for CoaXPress links
- GUI Interface
- Supporting Windows and Linux OS
- API for custom application development
- Plug-in modules for Matlab, HALCON, Cognex and Labview
- Gen<i>Cam compliant
- GenTL support
- Data rates up to 12.5 Gbps per link
- Transfer rates of up to 55 Gbps
- 0°C to 55°C operating environment temperatures

Technical Data

Feature	
Form factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink (optional passive heatsink)
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Connectors	▪ Ports 0 through 3 on bracket for 4x Micro-BNC female connectors CoaXPress host interface ▪ 1x External I/O connector on front bracket panel HD DB26 D-sub panel mount (26-pin 3-row, through hole, right angle) ▪ Auxiliary power input (PoCXP) on PCB 6-pin PEG power socket 12 VDC power input for PoCXP camera(s)
Dimensions	L 167.65 mm x H 111.15 mm L 6.6 in x H 4.38 in
Weight	225gr

Host Bus	
Standard	PCI Express 3.0
Link width	8 lanes, 1, 2 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 ▪ Scatter gather support ▪ Physical address support (GPU transfers)
Peak delivery bandwidth	7,880 MB/s
Effective (sustained) delivery bandwidth	6,710 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 2.0 (CoaXPress 1.1 backward compatible)	
Status LEDs	1 bicolor status LED per connector 4 System status LEDs	
Number of cameras	Up to 4	
Number of links per Single camera	Up to 4	
Synchronization between cameras	Yes	
Line-scan cameras supported	Yes	
MAX aggregated camera data transfer rate	50 Gbit/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 GT/s (CXP-10) ▪ 12.5 GT/s (CXP-12)

Number of data streams (per camera)	1 data stream per camera
Maximum stream packet size	8.192 bytes
PoCXP (power over CoaXPress)	▪ PoCXP Safe Power ▪ 13 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
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, YUV, YCbCr 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 - YUV411_8, YUV411_10, YUV411_12, YUV411_14, YUV411_16 - YUV422_8, YUV422_10, YUV422_12, YUV422_14, YUV422_16 - YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16 - YCbCr601_411_8, YCbCr601_411_10, YCbCr601_411_12, YCbCr601_411_14, YCbCr601_411_16 - YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16 - YCbCr601_444_8, YCbCr601_444_10, YCbCr601_444_12, YCbCr601_444_14, YCbCr601_444_16

Area-Scan Camera Control	
Trigger	▪ Precise control of asynchronous reset cameras, with exposure control. ▪ Support of camera exposure/readout overlap. ▪ Support of triggering from encoder or timer. ▪ Support of external hardware trigger, with optional delay, filtering and trigger decimation.
Strobe	Accurate control of the strobe position for strobe 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 and filtering. ▪ Support of triggering from encoder. ▪ Support of infinite acquisition without missing lines.
Line trigger	Support for quadrature motion encoders, with programmable filters, selection of acquisition direction and backward motion compensation.
Line strobe	Accurate control of the strobe position for strobe light sources.

On-Board Processing	
On-board memory	4GByte DDR4 SODIMM
Bayer De-Mosaic	▪ Full 16bit resolution ▪ Bilinear 3x3 ▪ Bilinear 3x2 for linescan with gradient correction

Color transformation	Full 16bit resolution 18bit coefficients table: - Color space conversion - Gain and Offset
Decimation	Line skip
Additional features	Unpacking of 10-/12-/14-bit to 16-bit with justification to LSB
Frame timestamp	64bit with 8ns precision
Data stream statistics	Measurement of: - Frame/Line rate - CRC Errors - Dropped frames - Received packets - Test packets
Event signaling and counting	The application software can be notified of the occurrence of various events: - Newly acquired buffers - Camera and Illumination control events - I/O events - Timer events - Encoder events

General Purpose Inputs and Outputs	
Number of lines	▪ 20 I/O lines: - 2 differential inputs - 2 differential outputs - 4 singled-ended TTL inputs/outputs - 4 singled-ended LVTTL inputs/outputs - 4 opto-isolated inputs - 4 opto-isolated outputs
Usage	▪ Any System I/O input lines can be connected to any I/O line ▪ Any I/O line can be used to decode A/B and Z signals of a motion encoder ▪ Any I/O line can generate any trigger event ▪ Any I/O line can trigger a timer
Electrical specifications	▪ Differential lines - LVDS compatible ▪ TTL lines: 5V TTL compliant ▪ LVTTL lines: 3.3V LVTTL compliant ▪ Isolated lines: opto-isolated lines with voltage range up to 30V
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 IN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs
Polarity control	Yes
Encoders	▪ 4 quadrature encoders with A/B and Z inputs ▪ 32bit position counter ▪ Forward and backward counting ▪ Position trigger support ▪ Noise filtering
Timers	▪ 4 general purpose timers ▪ Configurable delay and duration ▪ 32bit accumulator
Event reporting	▪ 64-bit system timestamp event reporting ▪ Each I/O line can generate event on configurable edge ▪ Each Timer can generate event ▪ Each encoder can generate event

Frame Grabber Synchronization	
Synchronization	Precise area and line-scan cameras synchronization across different frame grabbers

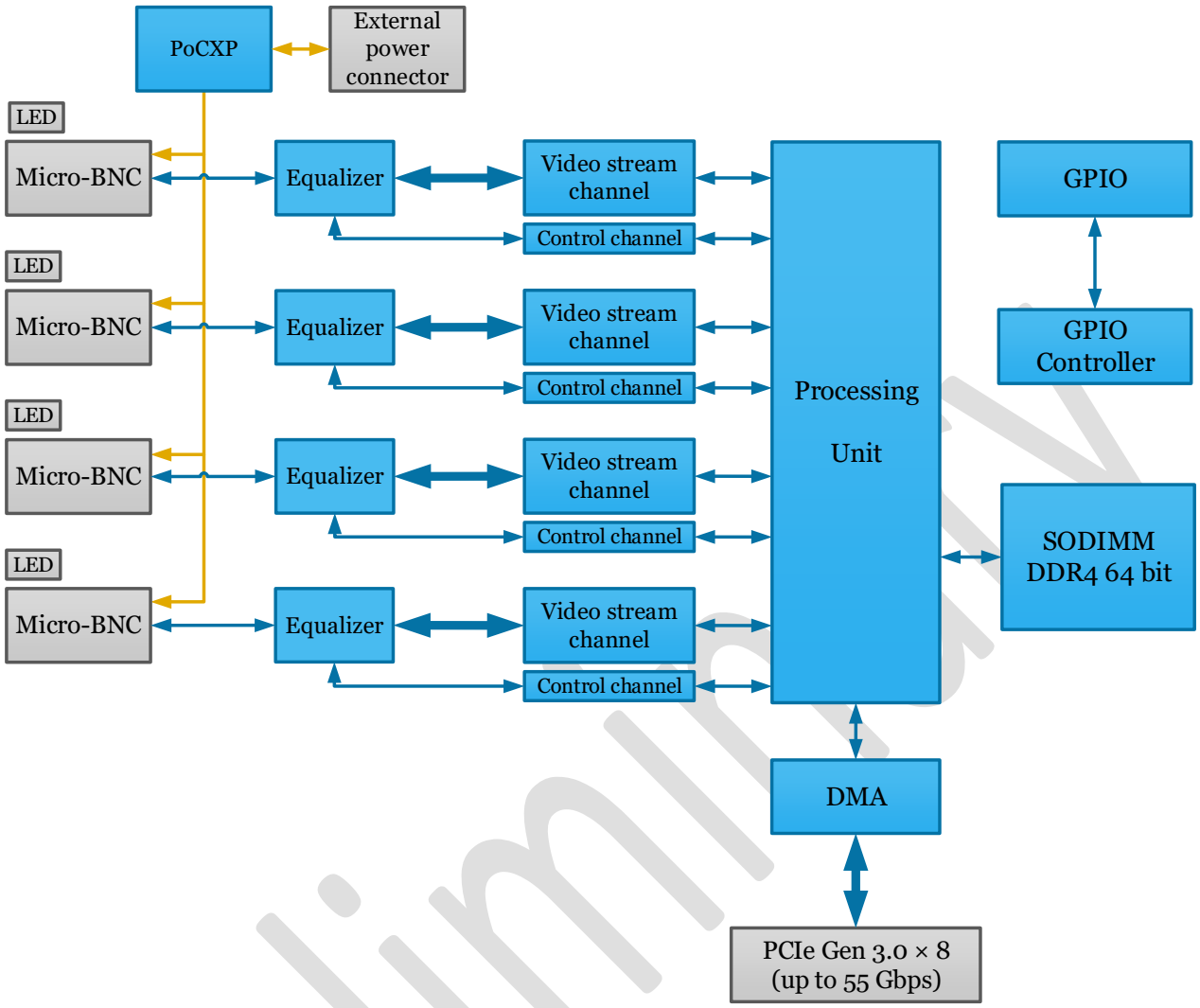
Software	
Host PC operating system	▪ Microsoft Windows 10 32-bit and 64-bit versions ▪ Open source kernel driver ▪ Tested and precompiled for Ubuntu 18.04, RedHat 7.x, CentOS 7.x 64-bit versions ▪ Nvidia Xavier AGX
Gen<i>Cam	▪ Support of Gen<i>Cam 2.4 and 3.0 ▪ Full camera and Frame Grabber parameters configuration
Buffer management	▪ Circular buffer support ▪ Accumulation of several frames/lines to single buffer to reduce CPU load ▪ CPU load ▪ DMA Buffer filling directly to system memory
GUI	▪ Supported for Windows and Linux OS ▪ Multi camera display and configuration ▪ Flexible buffer queuing ▪ Image/video recording and playback
Debugging capabilities	▪ Event logging ▪ Statistics counters
APIs	▪ Gen<i>Cam, GenTL producer libraries, C/C++, Python and NET bindings ▪ Compilers: - x86 and x86_64 dynamic library designed to be used with ISO-compliant C runtime Allows for development of x86 and x86_64 applications ▪ Plug-in modules for Matlab, HALCON, Cognex and Labview

Environmental Conditions	
Operating ambient air temperature	0°C to +50°C / +32°F to +122 °F
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-20°C to +70°C / -4°F to +158°F
Storage ambient air humidity	10% to 90% RH non-condensing

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 61000-4-6
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	**KY-FGK-II**
Optional accessories	CoaXPress cables

Komodo II CoaXPress Frame Grabber HW Block Diagram



Compatibility

KAYA Instruments creates and maintains compatibility and interfaces for the most common and advanced vision image processing libraries and applications. Major support is available for **MVTec Halcon, National Instruments' LabVIEW** and **MathWorks' MATLAB**.

- Supported vision standards:

CoaXPress® GEN<i>CAM TRANSPORT LAYER 10GiGE VISION GEN TL CAMERA Link HS

- Supported vision libraries:

HALCON a product of MVTec OpenCV NATIONAL INSTRUMENTS LabVIEW COGNEX

- Supported operating systems:

Windows Linux

Please check our website for an up-to-date list of other supported libraries and software package

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