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KAYA INSTRUMENTS



Datasheet
Komodo II Quad CoaXPress

Komodo II Quad CoaXPress
Quad CXP-12 Frame Grabber

KAYA Instruments is a global leader in commercial, industrial and rugged cameras and imaging system solutions, providing high-performance products for over 15 years. Founded in 2008 by industry experts, KAYA designs, manufactures and supports both COTS and custom products for high-performance imaging needs.

KAYA Frame Grabbers offer advanced features such as real-time image processing, DMA engine optimization and flexible frame buffer configurations, providing unparalleled flexibility for developers and integrators. Fully compatible with leading software platforms, they also include an intuitive, easy-to-use SDK to simplify integration and accelerate deployment across diverse industries, including industrial automation, medical imaging, and aerospace. Whether designing a cutting-edge vision system or enhancing existing workflows, KAYA Frame Grabbers deliver the performance, scalability, and reliability required for the most demanding imaging tasks.

Key Features:

- Quad CoaXPress links support
- Up to 4 Multi-streams
- PCI Express card
- PCIe 3.0 x8 bus
- 4 GB DDR4 frame buffer
- Camera controls and triggers
- Link Status LED indication
- Flexible GPIO interface:
  - 4 TTL configurable I/Os
  - 4 LVTTL configurable I/Os
  - 2 LVDS inputs
  - 2 LVDS outputs
  - 4 opto-isolated inputs
  - 4 opto-isolated outputs
  - 4 quadrature rotary encoders
  - Integrated strobe controller
  - 4 timers
- CoaXPress v2.1 compliant
- Power over CoaXPress with 13 W per link
- Multiple camera synchronization
- Multiple Frame Grabbers synchronization
- Micro-BNC connectors for CoaXPress links
- GUI Interface
- Supporting Windows, Linux OS and Nvidia Jetpack
- 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 6,695 MB/s
- 0℃ to +50℃ operating environment temperatures

TECHNICAL DATA

Mechanical	
Form factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Passive, requires airflow
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Connectors	• Ports 1 through 4 via x4 Micro-BNC connectors for CoaXPress v2.1 interface • x1 I/O connector HD DB26 D-sub panel mount (26-pin 3-row) on front bracket • Auxiliary 6-pin PEG power socket 12 VDC power input (for PoCXP) on PCB
Dimensions	167.65 mm x 111.15 mm (6.6” x 4.4”)
Weight	296 g (10.4 oz)

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	2,048 bytes
DMA	• 64-bit addressing support • Scatter gather support • Physical address support (GPU transfers)
Peak delivery bandwidth	7,877 MB/s
Effective (sustained) delivery bandwidth	6,695 MB/s (Host PC dependent)
Power consumption	16.8 W, excluding camera and I/O power output

Camera / Video Inputs	
Interface standard(s)	CoaXPress v2.1 (CoaXPress 1.0, 1.1, 1.1.1 and 2.0 backward compatible)
Status LEDs	• 1 bicolor status LED per camera connector • 4 System status LEDs
Number of cameras	Up to 4
Number of links per single camera	Up to 4
Number of streams per single camera	Up to 4
Total number of streams per frame grabber	Up to 4
Synchronization between cameras	Yes

Line-scan cameras supported	Yes
Maximum aggregated camera data transfer rate	50.0 Gbit/s
Supported down-connection speeds	• 1.25 Gbit/s (CXP-1) • 2.5 Gbit/s (CXP-2) • 3.125 Gbit/s (CXP-3) • 5 Gbit/s (CXP-5) • 6.25 Gbit/s (CXP-6) • 10 Gbit/s (CXP-10) • 12.5 Gbit/s (CXP-12)
Supported up-connection speeds	• Low-speed 20.83 Mbps (CXP-1 to CXP-6) • Low-speed 41.66 Mbps (CXP-10, CXP-12)
Maximum stream packet size	8,192 bytes
Power over protocol	• PoCXP Safe Power • 13 W of 24 V DC regulated power per CoaXPress connector • PoCXP Device detection and automatic power-on • Overload and short-circuit protections • On-board 12 V to 24 V DC/DC converter • A +12 V 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 • Single-tap (1X-1Y) interlaced 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

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 output line • Any I/O input line can be used to decode A/B and Z signals of a motion encoder • Any I/O input line can generate any trigger event • Any I/O input line can trigger a timer
Electrical specifications	• Differential lines - LVDS compatible • TTL lines: 5 V TTL compliant • LVTTL lines: 3.3 V LVTTL compliant • Isolated lines: opto-isolated lines with voltage range up to 30 V
Filter control	• Glitch removal filter for Encoders and Triggers • Configurable filter time between 0 µs and 34 ms • Filter time resolution of 8 ns
Polarity control	Yes
Encoders	• 4 quadrature encoders with A/B and Z inputs • 32-bit position counter • Forward and backward counting • Position trigger support • Noise filtering
Timers	• 4 general purpose timers • Configurable delay and duration • 32-bit 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

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	4 GB DDR4
Bayer De-Mosaic	• Full 16-bit resolution • Bilinear 3x3
Color transformation	• Full 16-bit resolution 18-bit coefficients table • Color space conversion • Gain and Offset
Decimation	Line skip
Additional features	Unpacking of 10/12/14-bit to 16-bit LSB aligned
Frame timestamp	64-bit with 8 ns precision
Data stream statistics	Measurement of: • Frame rate • CRC Errors • Received/Dropped frames • Received/Dropped packets • Test packets
Event signaling and counting	The application software can be notified of the occurrence of various events: • Newly acquired buffers • I/O events • Timer events • Encoder events

Software	
Host PC operating system	• Microsoft Windows 10 64-bit version • Microsoft Windows 11 64-bit version • Signed and certified kernel driver supporting Windows 10 and 11 • Source code Linux kernel driver (Automaticlly compiled during installation) • Tested for Ubuntu 18.04, 20.04 and 22.04 versions • Nvidia Xavier AGX (Jetpack 5.1.1 and 4.6.1) • Nvidia Orin AGX (Jetpack 5.1.1)
Gen<i>Cam	• Support of Gen<i>Cam 3.2 • Full camera and Frame Grabber parameters configuration
Buffer management	• Circular buffer support • Accumulation of several frames/lines to single buffer to reduce CPU load • Flexible buffer queuing • DMA Buffer filling directly to system memory
GUI	• Supported for Windows and Linux OS • Multi camera display and configuration • Image/video recording and playback
Debugging capabilities	• Event logging • Statistics counters

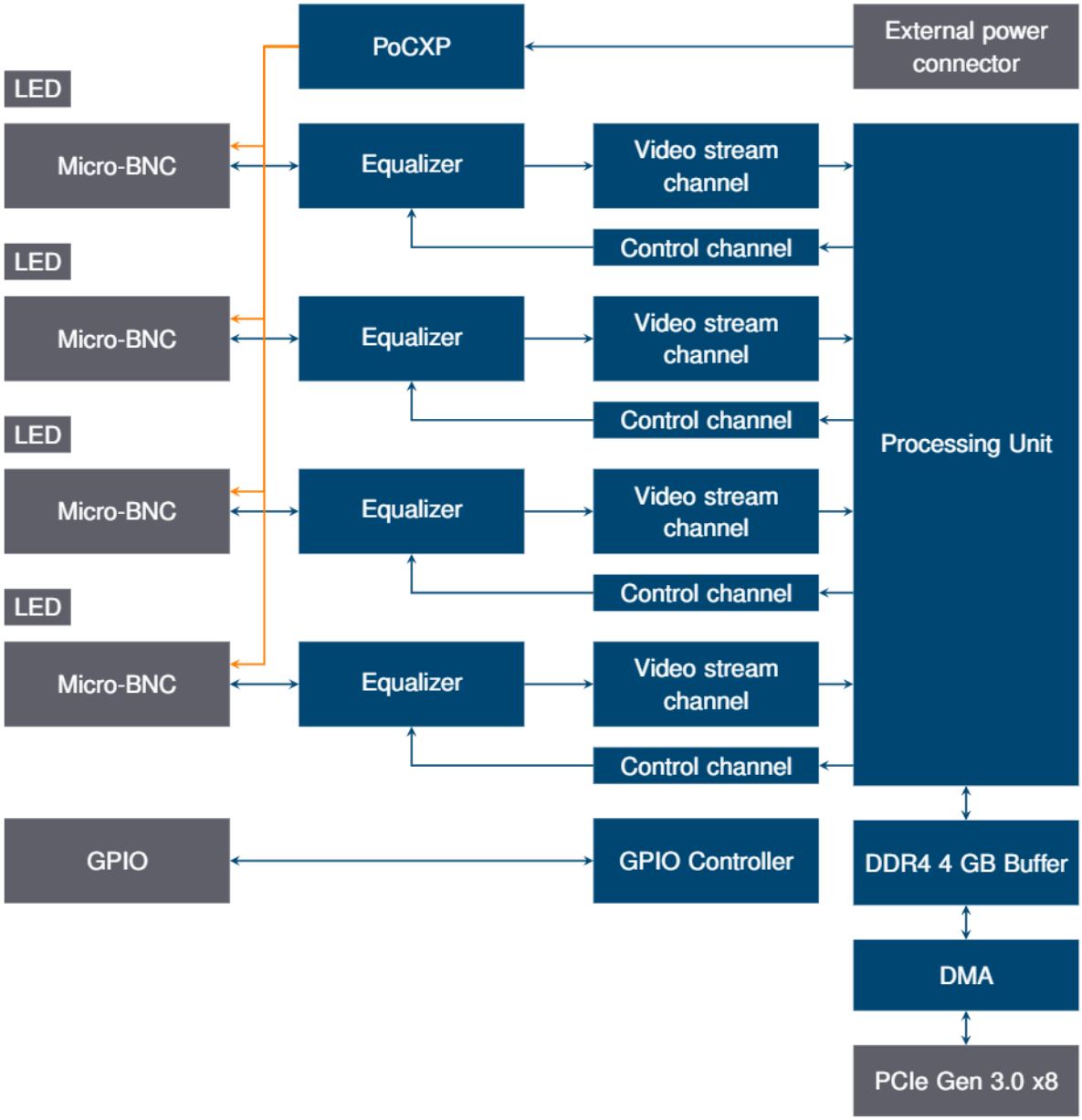
APIs	• Gen<i>Cam, GenTL producer libraries, ANSI C, Python and NET bindings • x86_64 dynamic library designed to be used with ISO-compliant C runtime • Allows for development of x86_64 applications • Plug-in modules for Matlab, HALCON, Cognex and Labview • Export straightforward, unified and easy-to-use API across all Grabber types • Include practical examples based on API functions, for supported language wrappers • Documentation include sample snippets for API usage

Environmental Conditions	
Operating ambient air temperature	0℃ to +50℃ (32℉ to +122℉)
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-20℃ to +70℃ (-4℉ to +158℉)
Storage ambient air humidity	10% to 90% RH non-condensing
Shock/Vibration	-

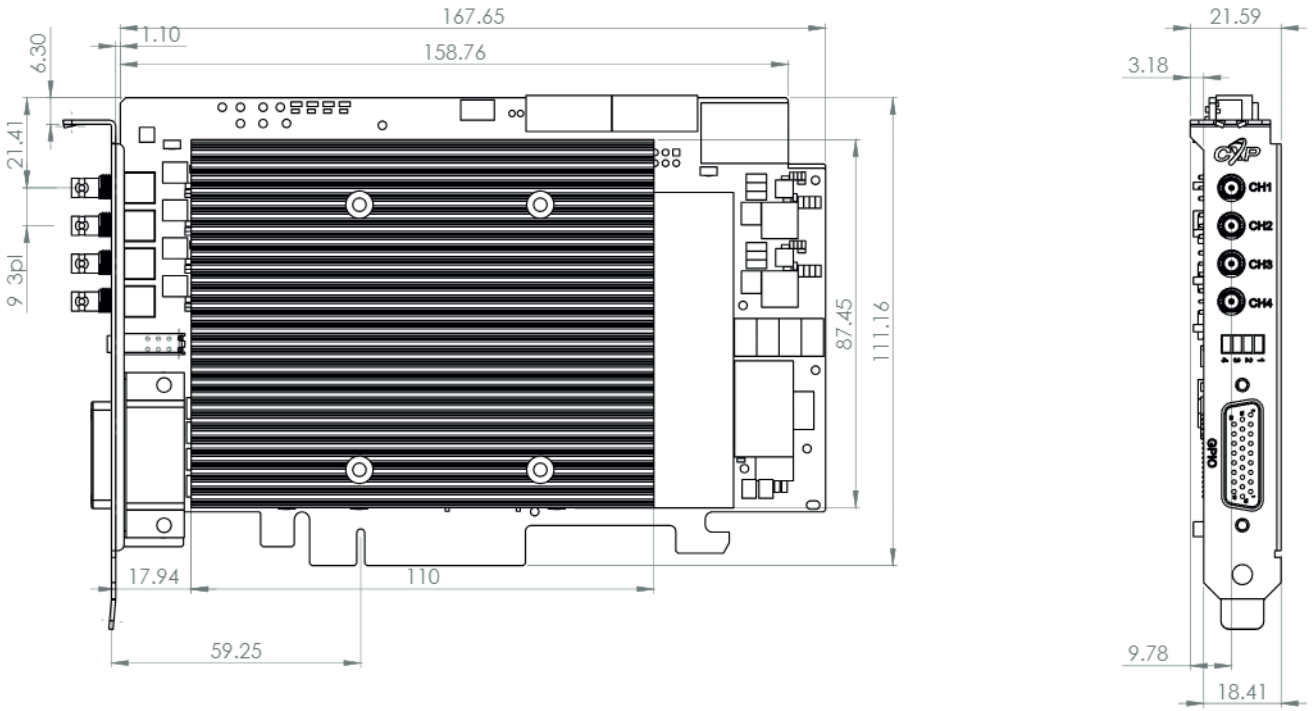
Certifications	
Electromagnetic - EMC standards	• The European Council EMC Directive 2004/108/EC • The Unites States FCC rule 47 CFR 15
EMC - Emission	• EN 55022:2010 Class B • FCC 47 Part 15 Class B
EMC - Immunity	• EN 55024:2010 Class B • EN 61000-4-3 • EN 61000-4-4 • EN 61000-4-6
Flammability	PCB 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	
Part Number	KY-FGK-II-CXP
Optional accessories	• CoaXPress cables
Accessories Included	-

HARDWARE BLOCK DIAGRAM



MECHANICAL DRAWINGS



Dimensions are in millimeters.

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 CoaXPress over-Fiber SMPTE

Supported vision libraries:

HALCON a product of MVTec OpenCV LabVIEW MATLAB COGNEX NORPIX

Supported operating systems:

Windows LINUX NVIDIA JetPack

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

KAYA Instruments

Please feel free to contact our sales team for pricing, availability, documentation or customization at our e-mails – we will be happy to provide assistance and consultation.
Sales Inquiries: info@kayainstruments.com
Technical Support: support@kayainstruments.com

www.KAYAInstruments.com

KAYA Instruments, Inc.
2255 Glades Rd.
Suite 324A
Boca Raton, FL 33431
USA
+1 561 698-2899

KAYA Instruments, Ltd.
20 HaMesila St.
Nesher 3688520
Israel

+972 72 272-3500

KAYA INSTRUMENTS

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