KAYA INSTRUMENTS

Chameleon II CoF Standalone
Datasheet

Chameleon II CoF Standalone
Quad CoF Camera Simulator

Innovative Approach

Chameleon II CoF Standalone is the industry's first CoaXPress-over-Fiber (Cof) v2.1 standard camera simulator. Capable of generating video streams and test patterns of up to 4 links in single, dual or quad modes. With each link supports standard CoaXPress-over-Fiber (Cof) v2.1 bitrates of up to 10.3125 Gbps. With a grand total PCI Express transfer rate of up to 3,347 MB/s, the **Chameleon II CoF Standalone** is ideally suited for development of industrial, defense and aerospace Machine Vision systems and applications.

Intelligent Design

The **Chameleon II CoF Standalone** can easily transmit generic test patterns, customers specific pre-processed data or custom video streams on the CoaXPress-over-Fiber (Cof) v2.1 links. A GPIO connector enables machine control signals such as triggers, timers, shaft-encoders, exposure-control and general I/O along with video stream acquisition. Standard SFP+ and headers connector are used as the CoaXPress-over-Fiber (Cof) v2.1 interface and the general purpose I/O, respectively.

Key Features:

- Static and dynamic test patterns
- BMP/RAW/TIFF/JPEG etc. image files
- RAW video files
- Streaming video 3,347 MB/s
- Data rates up to 10.3125 Gbps per link
- Up to 32 Gbyte image buffer
- Multiple pre-recorded video in sequential/loop modes
- Fully programmable image timing
- Fully programmable configuration parameters
- Emulation of Camera controls and triggers
- GUI Interface
- Up to 4 CoaXPress-over-Fiber (Cof) links support
- Frame and line scan formats support
- 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-over-Fiber (Cof) v2.1 compliant
- Gen<i>Cam compliant
- Supporting Windows, Linux OS and Nvidia Jetpack
- API for custom application development
- Plug-in modules for Matlab, HALCON, Cognex and Labview
- SFP+ connectors for CoaXPress-over-Fiber (Cof) links
- External Thunderbolt 3 enclosure
- Per-Link LED indication
- 0℃ to +50℃ operating environment temperatures

TECHNICAL DATA

Mechanical	
Form factor	Thunderbolt 3 enclosure
Format	External Thunderbolt 3 enclosure
Cooling method	Fan cooled
Mounting	Stand Alone
Connectors	• Ports 1 through 4 via x4 SFP+ connectors for CoaXPress-over-Fiber (Cof) v2.1 interface • x1 I/O connector 26-pin 2-row 0.1” pitch pin header with shrouding on board
Dimensions	220 mm x 143 mm x 89 mm (8.7” x 5.6” x 3.5”)
Weight	1500 g (52.9 oz)

Host Bus	
Standard	PCI Express 3.0
Link width	• 4 lanes • 1 or 2 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	3,938 MB/s
Effective (sustained) delivery bandwidth	3,347 MB/s (Host PC dependent)
Power consumption	16.8 W, excluding camera and I/O power output

Camera / Video Simulation	
Interface standard(s)	CoaXPress-over-Fiber (Cof) v2.1
Status LEDs	• 1 bicolor status LED per connector • 4 System status LEDs
Number of Simulated cameras	1
Number of links per single camera	Up to 4
Number of streams per single camera	1
Synchronization between simulators	Yes
Line-scan cameras supported	Yes
Maximum aggregated camera data transfer rate	41.3 Gbit/s
Supported down-connection speeds	• 10.3125 GT/s

Supported up-connection speeds	• 10.3125 GT/s
Maximum stream packet size	8,192 bytes
Power over protocol	
Bandwidth limitations	• 8 bpp, 12 bpp, 14 bpp, 16 bpp - 40 Gbps protocol limited • 10 bpp – 34 Gbps
Image width	16 pixel to 16 Megapixels
Image height	1 pixel to 16 Megapixels
Arbitrary image simulation	Not supported
Link Sharing	Images must be striped prior to loading to API or APP
Camera types	Area-scan cameras: • Gray-scale and color (RGB and Bayer CFA) • Single-tap (1X-1Y) progressive-scan • Multi tap images can be simulated with API and user image segmentation Line-scan cameras: • Gray-scale and color RGB
Camera pixel formats supported	Raw, Monochrome, Bayer, RGB, YUV, YCbCr and RGBA (PFNC names): • Raw (Without headers) • 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 • YUV422_8, YUV422_16 • YUV444_8, YUV444_10, YUV444_12,YUV444_14, YUV444_16 • YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16 • YCbCr709_422_8, YCbCr709_422_10, YCbCr709_422_12, YCbCr709_422_14, YCbCr709_422_16 • YCbCr709_444_8, YCbCr709_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
Additional features	Packing of 16-bit LSB aligned to 10/12/14-bit

Data stream statistics	Measurement of: • Frame rate • CRC Errors • Transmit frames • Transmit 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

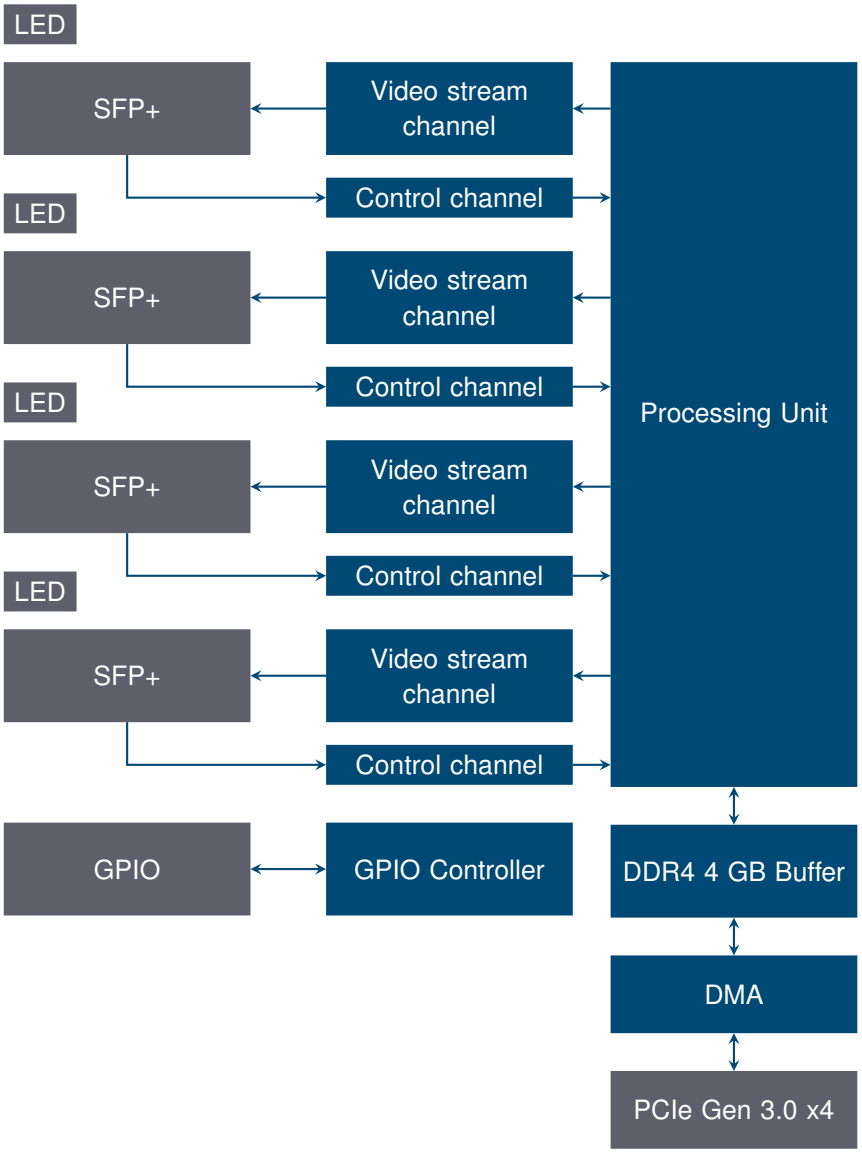
Environmental Conditions	
Operating ambient air temperature	0℃ to +50℃ (32℉ to +122℉)
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-20℃ to +70℃ (-4℉ to +158℉)

Storage ambient air humidity	10% to 90% RH non-condensing
Shock/Vibration	-

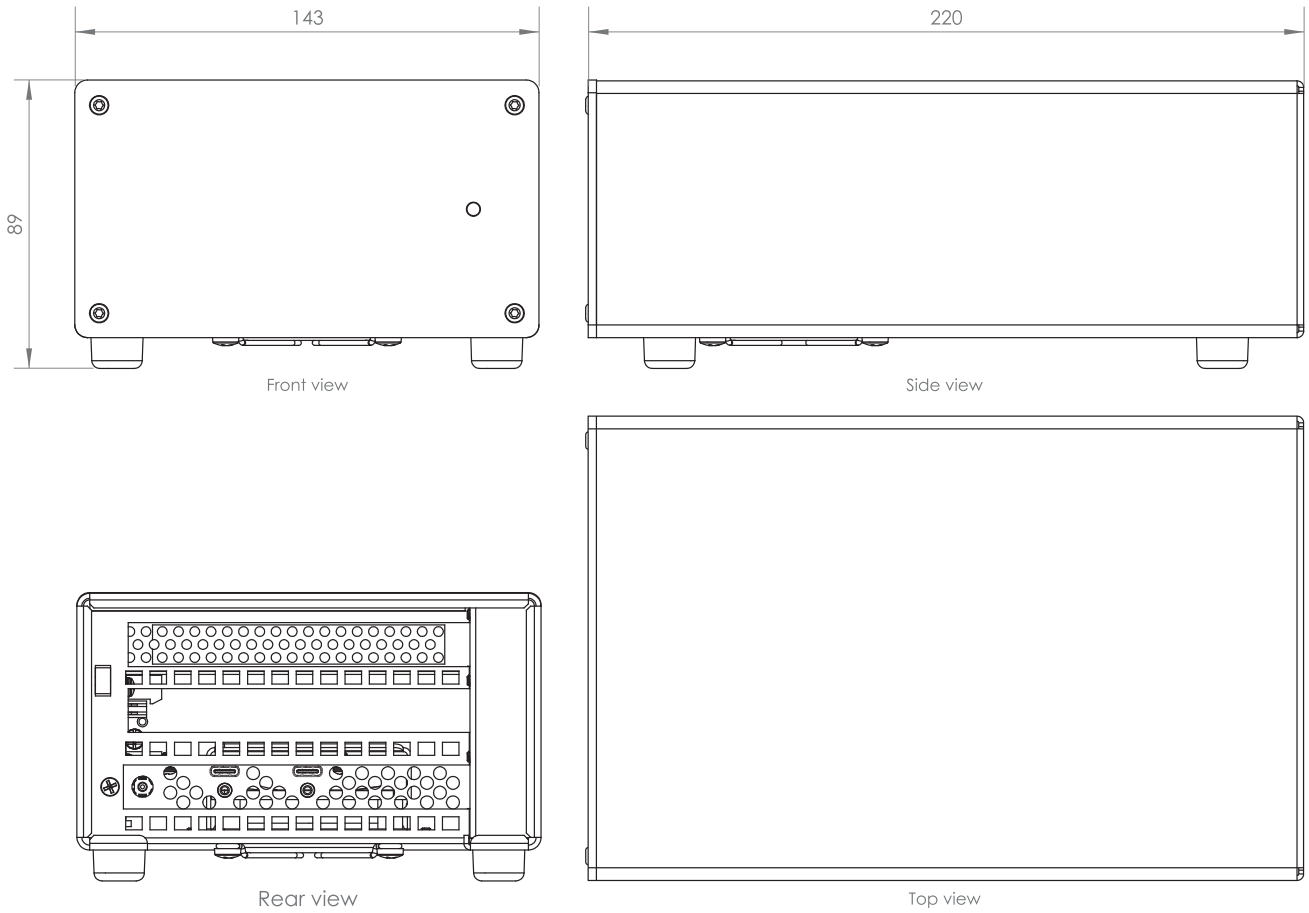
Certifications	
Electromagnetic - EMC standards	• The European Council EMC Directive 2004/108/EC • The Unites States FCC rule 47 CFR 15
EMC - Emission	• EN 55022:2010 Class B • FCC 47 Part 15 Class B
EMC - Immunity	• EN 55024:2010 Class B • EN 61000-4-3 • EN 61000-4-4 • EN 61000-4-6
Flammability	PCB 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-Chameleon-II-COF-SA
Optional accessories	• SFP+ modules • Fiber cables • GPIO expansion bracket

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.

International Distributor

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KAYA Instruments

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