KAYA INSTRUMENTS


# Chameleon II CoaXPress

## Camera Simulator with Four Channels

### Innovative Approach

The **Chameleon II** is the industry's first CoaXPress 2.0 standard Camera Simulator. Capable of generating video streams and test patterns of up to 4 CoaXPress links in single, dual or quad modes with each link supporting standard CoaXPress bitrates of up to 12.5 Gbps. With a grand total PCI Express transfer rate of up to 55 Gbps, the Chameleon II is ideally suited for development of industrial, defense and aerospace Machine Vision systems and applications.

### Intelligent Design

The **Chameleon II** Camera Simulator can easily transmit generic test patterns, customers' specific pre-processed data or custom video streams on the **CoaXPress 2.0** links. The Chameleon II Simulator enables PoCXP simulation by connecting an external load.
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 Micro-BNC and headers connector are used as the CoaXPress 2.0 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 (up to 55Gbps)
- Data rates up to 12.5 Gbps per link
- Up to 32Gbyte image buffer
- Multiple pre-recorded video in sequential/loop modes
- Fully programmable image timing and
- Fully programmable configuration parameters
- Emulation of Camera controls and triggers
- GUI Interface
- Up to 4 CoaXPress device links
- Frame and line scan formats support
- 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 inputs and outputs
  - 4 quadrature rotary encoders
  - 4 timers
  - Integrated strobe controller
- CoaXPress V2.0 compliant
- Gen<i>Cam compliant
- Power over CoaXPress Simulation
- Supporting both Windows and Linux OS
- API for custom application development
- Plug-in modules for Matlab HALCON Cognex and Labview
- 4 Micro-BNC connectors for CoaXPress links
- PCIe Gen3 x8 Half-length card
- Per-Link LED indication on card bracket
- 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<br>▪ 1x standard header I/O connector<br>▪ Auxiliary power load (PoCXP) on bracket panel |
| Dimensions | 167.65 mm x 111.15 mm \| 6.6 in. x 4.38 in. (Length x Height) |
| 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)<br>▪ 5.0 GT/s (PCIe 2.0) with reduced performance |
| Maximum payload size | 512 bytes |
| DMA | ▪ 32- and 64-bit<br>▪ Scatter gather support<br>▪ 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<br>4 System status LEDs |
| Number of links, per single host | Up to 4 |
| MAX aggregated data transfer rate | 50 Gbit/s |
| Supported CXP down-connection speeds | ▪ 1.25 GT/s (CXP-1)<br>▪ 2.5 GT/s (CXP-2)<br>▪ 3.125 GT/s (CXP-3)<br>▪ 5 GT/s (CXP-5)<br>▪ 6.25 GT/s (CXP-6)<br>▪ 10 GT/s (CXP-10)<br>▪ 12.5 GT/s (CXP-12) |
| Number of video streams | 1 data stream |
| Number of simulated cameras | 1 |
| Maximum stream packet size | 8.192 bytes |
| PoCXP (Power over CoaXPress) | ▪ PoCXP Safe Power |

| | |
|---|---|
| | ▪ Power over CoaXPress Simulation<br>▪ Power source must be connected to an external load |
| Video types | ▪ Area-scan cameras:<br>- Gray-scale and color (RGB and Bayer CFA)<br>- Single-tap (1X-1Y) progressive-scan<br>- Mlti tap images can be simulated with API and user image segmentation<br>▪ Line-scan cameras:<br>- Gray-scale and color RGB |
| Bandwidth limitations | - 8bpp,12bpp,14bpp , 16bpp - 40Gpbs protocol limited<br>- 10bpp – 34Gbps |
| Image width | - 16pixel to 16mega pixels |
| Image height | - 1pixel to 16mega pixels |
| Arbitrary image simulation | - Not supported |
| Link Sharing | - Images must be striped prior to loading to API or APP |
| Pixel formats supported | Raw, Monochrome, Bayer, RGB, YUV, YCbCr and RGBA (PFNC names):<br>- Raw<br>- Mono8, Mono10, Mono12, Mono14, Mono16<br>- BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 where XX = GR, RG, GB or BG<br>- RGB8, RGB10, RGB12, RGB14, RGB16<br>- RGBA8, RGBA10, RGBA12, RGBA14, RGBA16<br>- YUV422_8, YUV422_16<br>- YCbCr709_422_8, YCbCr709_422_16 |

| **Area-scan camera control** | |
|---|---|
| Trigger | ▪ Precise control of asynchronous reset cameras, with exposure control.<br>▪ Support of camera exposure/readout overlap.<br>▪ Support of triggering from encoder or timer.<br>▪ Support of external hardware trigger, with optional delay, filtering and trigger decimation. |
| Downlink trigger | Not supported |

| **Line-scan camera control** | |
|---|---|
| Scan/page trigger | ▪ Precise control of start-of-scan and end-of-scan triggers.<br>▪ Support of external hardware trigger, with optional delay and filtering.<br>▪ Support of triggering from encoder.<br>▪ 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. |
| | Not supported |

| **On-board processing** | |
|---|---|
| On-board memory | Up to 4GByte DDR4 SODIMM |
| Data stream statistics | Measurement of:<br>- Frame/Line rate<br>- Transmit packets<br>- Test packets |
| Event signaling and counting | The application software can be notified of the occurrence of various events:<br>- Newly generated buffers<br>- Camera and Illumination control events<br>- I/O events<br>- Timer events<br>- Encoder events |

| General Purpose Inputs and Outputs | |
|---|---|
| Number of lines | ▪ 20 I/O lines:<br>▪ 4 differential inputs<br>▪ 4 differential outputs<br>▪ 8 singled-ended TTL inputs/outputs<br>▪ 4 singled-ended LVTTL inputs/outputs<br>▪ 4 opto-isolated inputs<br>▪ 4 opto-isolated outputs |
| Usage | ▪ Any System I/O input lines can be connected to any I/O line<br>▪ Any I/O line can be used to decode A/B and Z signals of a motion encoder<br>▪ Any I/O line can generate any trigger event<br>▪ Any I/O line can trigger a timer |
| Electrical specifications | ▪ Differential lines - LVDS compatible<br>▪ TTL lines - 5V TTL compliant<br>▪ LVTTL lines - 3.3V LVTTL compliant<br>▪ Isolated lines - opto isolated lines with voltage range up to 30V |
| Filter control | ▪ Glitch removal filter available on all System I/O input lines<br>▪ Configurable filter time constants:<br>▪ for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns,1 µs<br>▪ for IIN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs |
| Polarity control | ▪ Yes |
| Encoders | ▪ 4 quadrature encoders with A/B and Z inputs<br>▪ 32bit position counter<br>▪ Forward and backward counting<br>▪ Position trigger support<br>▪ Noise filtering |
| Timers | ▪ 4 general purpose timers<br>▪ Configurable delay and duration<br>▪ 32bit accumulator |
| Event reporting | ▪ 64-bit system timestamp event reporting<br>▪ Each I/O line can generate event on configurable edge<br>▪ Each Timer can generate event<br>▪ Each encoder can generate event |

| Software | |
|---|---|
| Host PC Operating System | ▪ Microsoft Windows 7/10 32- and 64-bit versions<br>▪ Open source kernel driver<br>▪ Tested and precompiled for Ubuntu 16.04/18.04, RedHat 7.x, CentOS 7.x 64-bit versions<br>▪ Nvidia Xavier AGX |
| Gen<i>Cam | ▪ Support of Gen<i>Cam 2.4 and 3.0<br>▪ Full camera parameters configuration |
| Buffer management | ▪ Circular buffer support<br>▪ Accumulation of several frames/lines to single buffer to reduce CPU load<br>▪ DMA Buffer filling directly to system memory<br>▪ Buffer must be 32byte aligned |
| GUI | ▪ Supported for Windows and Linux OS<br>▪ Camera display and configuration<br>▪ Flexible buffer queuing<br>▪ Image/video recording and playback |
| Debugging capabilities | ▪ Event logging<br>▪ Statistics counters |
| APIs | ▪ GenICam GenTL producer libraries C, Python and .NET bindings<br>▪ 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

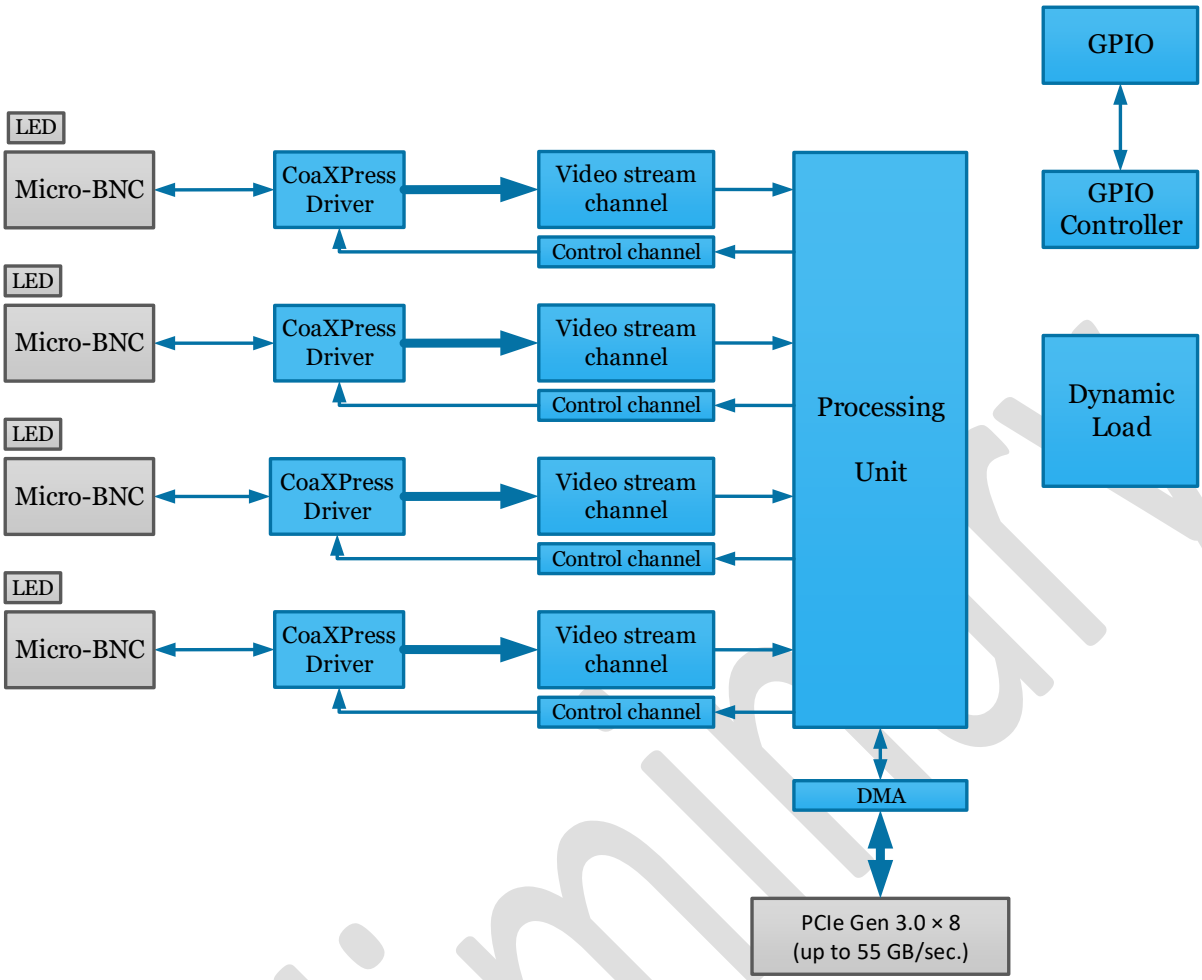
- Plug-in modules for Matlab, HALCON, Cognex and Labview

| 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<br>▪ The Unites States FCC rule 47 CFR 15 |
| EMC - Emission | ▪ EN 55022:2010 Class B<br>▪ FCC 47 Part 15 Class B |
| EMC - Immunity | ▪ EN 55024:2010 Class B<br>▪ EN 61000-4-3<br>▪ EN 61000-4-4<br>▪ 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-Chameleon-II** |
|---|---|
| Optional accessories | CoaXPress cables |

## HW Block Diagram | **Chameleon II CoaXPress**




## 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*

# Contact Us

Please feel free to contact our team with any question or further inquiry at **info@kayainstruments.com** – we will be happy to provide assistance and consultation.

## KAYA Instruments

20 HaMesila St., Nesher 3688520, Israel
POB 25004, Haifa 3125001, Israel

Tel: +972-72-272-3500
Fax: +972-72-272-3511