



## Chameleon II CoaXPress

# 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 LVTTTL 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
- GenCam 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                                | <ul style="list-style-type: none"> <li>Ports 0 through 3 on bracket for 4x Micro-BNC female connectors CoaXPress host interface</li> <li>1x standard header I/O connector</li> <li>Auxiliary power load (PoCXP) on bracket panel</li> </ul> |
| 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                                | <ul style="list-style-type: none"> <li>8.0 GT/s (PCIe 3.0)</li> <li>5.0 GT/s (PCIe 2.0) with reduced performance</li> </ul>   |
| Maximum payload size                      | 512 bytes   |
| DMA                                       | <ul style="list-style-type: none"> <li>32- and 64-bit</li> <li>Scatter gather support</li> <li>Physical address support (GPU transfers)</li> </ul>  |
| 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      | <ul style="list-style-type: none"> <li>1.25 GT/s (CXP-1)</li> <li>2.5 GT/s (CXP-2)</li> <li>3.125 GT/s (CXP-3)</li> <li>5 GT/s (CXP-5)</li> <li>6.25 GT/s (CXP-6)</li> <li>10 GT/s (CXP-10)</li> <li>12.5 GT/s (CXP-12)</li> </ul>          |
| Number of video streams                   | 1 data stream   |
| Number of simulated cameras               | 1   |
| Maximum stream packet size                | 8,192 bytes   |
| PoCXP (Power over CoaXPress)              | <ul style="list-style-type: none"> <li>PoCXP Safe Power</li> </ul>  |

|                                 |  |
|---------------------------------|--|
|                                 | <ul style="list-style-type: none"> <li>▪ Power over CoaXPress Simulation</li> <li>▪ Power source must be connected to an external load</li> </ul>  |
| Video types                     | <ul style="list-style-type: none"> <li>▪ Area-scan cameras: <ul style="list-style-type: none"> <li>- Gray-scale and color (RGB and Bayer CFA)</li> <li>- Single-tap (1X-1Y) progressive-scan</li> <li>- Mlti tap images can be simulated with API and user image segmentation</li> </ul> </li> <li>▪ Line-scan cameras: <ul style="list-style-type: none"> <li>- Gray-scale and color RGB</li> </ul> </li> </ul>                               |
| Bandwidth limitations           | <ul style="list-style-type: none"> <li>- 8bpp,12bpp,14bpp , 16bpp - 40Gpbs protocol limited</li> <li>- 10bpp – 34Gpbs</li> </ul>   |
| 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): <ul style="list-style-type: none"> <li>- Raw</li> <li>- Mono8, Mono10, Mono12, Mono14, Mono16</li> <li>- BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16<br/>where XX = GR, RG, GB or BG</li> <li>- RGB8, RGB10, RGB12, RGB14, RGB16</li> <li>- RGBA8, RGBA10, RGBA12, RGBA14, RGBA16</li> <li>- YUV422_8, YUV422_16</li> <li>- YCbCr709_422_8, YCbCr709_422_16</li> </ul> |
| <b>Area-scan camera control</b> |  |
| Trigger                         | <ul style="list-style-type: none"> <li>▪ Precise control of asynchronous reset cameras, with exposure control.</li> <li>▪ Support of camera exposure/readout overlap.</li> <li>▪ Support of triggering from encoder or timer.</li> <li>▪ Support of external hardware trigger, with optional delay, filtering and trigger decimation.</li> </ul>   |
| Downlink trigger                | Not supported  |
| <b>Line-scan camera control</b> |  |
| Scan/page trigger               | <ul style="list-style-type: none"> <li>▪ Precise control of start-of-scan and end-of-scan triggers.</li> <li>▪ Support of external hardware trigger, with optional delay and filtering.</li> <li>▪ Support of triggering from encoder.</li> <li>▪ Support of infinite acquisition, without missing lines.</li> </ul>   |
| 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.<br>Not supported   |
| <b>On-board processing</b>      |  |
| On-board memory                 | Up to 4GByte DDR4 SODIMM   |
| Data stream statistics          | Measurement of: <ul style="list-style-type: none"> <li>- Frame/Line rate</li> <li>- Transmit packets</li> <li>- Test packets</li> </ul>  |
| Event signaling and counting    | The application software can be notified of the occurrence of various events: <ul style="list-style-type: none"> <li>- Newly generated buffers</li> <li>- Camera and Illumination control events</li> <li>- I/O events</li> <li>- Timer events</li> <li>- Encoder events</li> </ul>  |

| General Purpose Inputs and Outputs |   |
|------------------------------------|---|
| Number of lines                    | <ul style="list-style-type: none"> <li>20 I/O lines: <ul style="list-style-type: none"> <li>4 differential inputs</li> <li>4 differential outputs</li> <li>8 singled-ended TTL inputs/outputs</li> <li>4 singled-ended LVTTTL inputs/outputs</li> <li>4 opto-isolated inputs</li> <li>4 opto-isolated outputs</li> </ul> </li> </ul>  |
| Usage                              | <ul style="list-style-type: none"> <li>Any System I/O input lines can be connected to any I/O line</li> <li>Any I/O line can be used to decode A/B and Z signals of a motion encoder</li> <li>Any I/O line can generate any trigger event</li> <li>Any I/O line can trigger a timer</li> </ul>  |
| Electrical specifications          | <ul style="list-style-type: none"> <li>Differential lines - LVDS compatible</li> <li>TTL lines - 5V TTL compliant</li> <li>LVTTTL lines - 3.3V LVTTTL compliant</li> <li>Isolated lines - opto isolated lines with voltage range up to 30V</li> </ul>   |
| Filter control                     | <ul style="list-style-type: none"> <li>Glitch removal filter available on all System I/O input lines</li> <li>Configurable filter time constants: <ul style="list-style-type: none"> <li>for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 <math>\mu</math>s</li> <li>for IIN lines: 500 ns, 1 <math>\mu</math>s, 2 <math>\mu</math>s, 5 <math>\mu</math>s, 10 <math>\mu</math>s</li> </ul> </li> </ul> |
| Polarity control                   | <ul style="list-style-type: none"> <li>Yes</li> </ul>   |
| Encoders                           | <ul style="list-style-type: none"> <li>4 quadrature encoders with A/B and Z inputs</li> <li>32bit position counter</li> <li>Forward and backward counting</li> <li>Position trigger support</li> <li>Noise filtering</li> </ul>   |
| Timers                             | <ul style="list-style-type: none"> <li>4 general purpose timers</li> <li>Configurable delay and duration</li> <li>32bit accumulator</li> </ul>  |
| Event reporting                    | <ul style="list-style-type: none"> <li>64-bit system timestamp event reporting</li> <li>Each I/O line can generate event on configurable edge</li> <li>Each Timer can generate event</li> <li>Each encoder can generate event</li> </ul>  |
| Software                           |   |
| Host PC Operating System           | <ul style="list-style-type: none"> <li>Microsoft Windows 7/10 32- and 64-bit versions</li> <li>Open source kernel driver</li> <li>Tested and precompiled for Ubuntu 16.04/18.04, RedHat 7.x, CentOS 7.x 64-bit versions</li> <li>Nvidia Xavier AGX</li> </ul>   |
| Gen<i>Cam                          | <ul style="list-style-type: none"> <li>Support of Gen&lt;i&gt;Cam 2.4 and 3.0</li> <li>Full camera parameters configuration</li> </ul>  |
| Buffer management                  | <ul style="list-style-type: none"> <li>Circular buffer support</li> <li>Accumulation of several frames/lines to single buffer to reduce CPU load</li> <li>DMA Buffer filling directly to system memory</li> <li>Buffer must be 32byte aligned</li> </ul>  |
| GUI                                | <ul style="list-style-type: none"> <li>Supported for Windows and Linux OS</li> <li>Camera display and configuration</li> <li>Flexible buffer queuing</li> <li>Image/video recording and playback</li> </ul>   |
| Debugging capabilities             | <ul style="list-style-type: none"> <li>Event logging</li> <li>Statistics counters</li> </ul>  |
| APIs                               | <ul style="list-style-type: none"> <li>GenICam GenTL producer libraries C, Python and .NET bindings</li> <li>Compilers:</li> </ul>  |

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    |

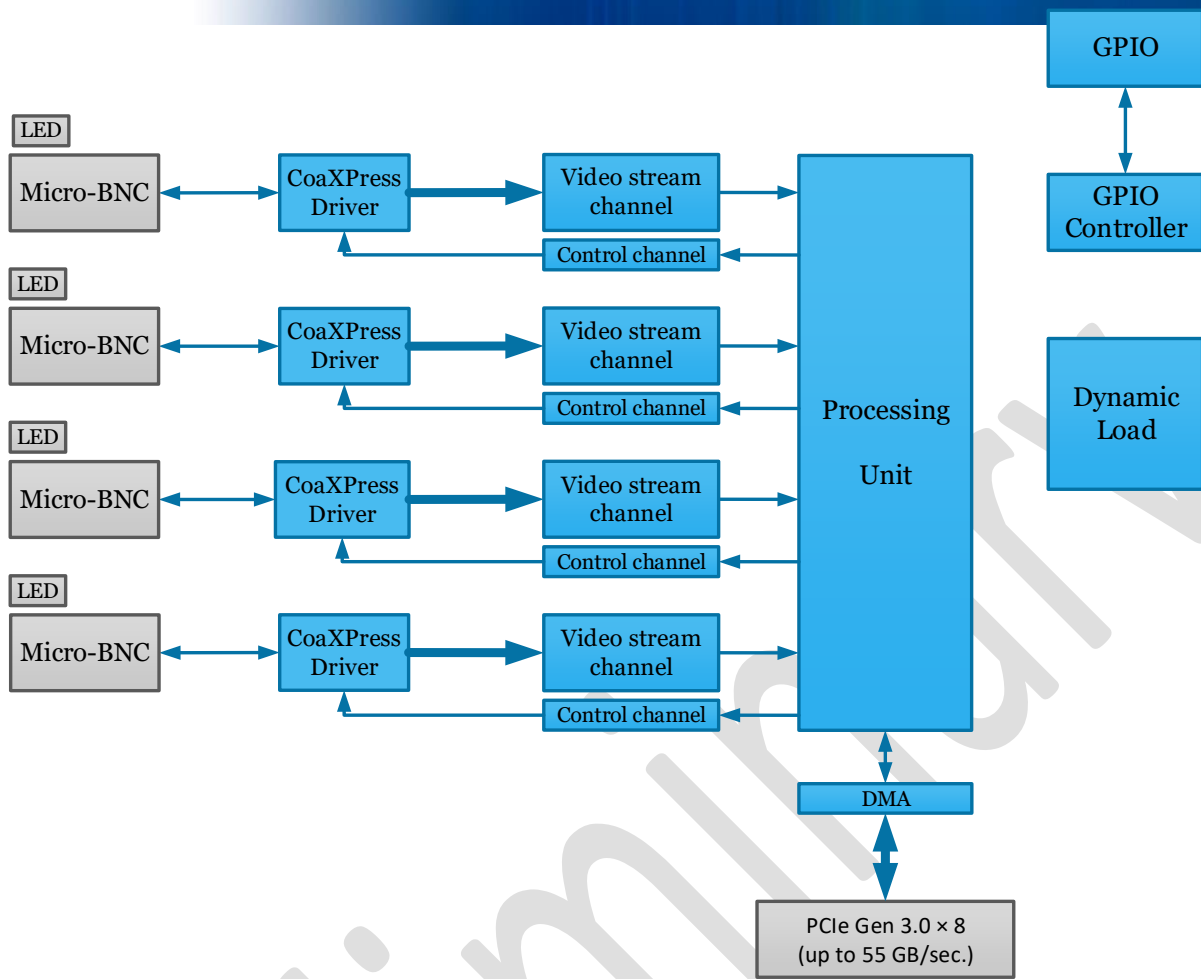
  

| Certifications                  |   |
|---------------------------------|---|
| Electromagnetic - EMC standards | <ul style="list-style-type: none"><li>▪ The European Council EMC Directive 2004/108/EC</li><li>▪ The Unites States FCC rule 47 CFR 15</li></ul> |
| EMC - Emission                  | <ul style="list-style-type: none"><li>▪ EN 55022:2010 Class B</li><li>▪ FCC 47 Part 15 Class B</li></ul>  |
| EMC - Immunity                  | <ul style="list-style-type: none"><li>▪ EN 55024:2010 Class B</li><li>▪ EN 61000-4-3</li><li>▪ EN 61000-4-4</li><li>▪ EN 61000-4-6</li></ul>    |
| 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 |                                     |
|----------------------|-------------------------------------|
| Optional accessories | KY-Chameleon-II<br>CoaXPress cables |

# Chameleon II CoaXPress Camera Simulator 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:



- ❖ Supported vision libraries:



- ❖ Supported operating systems:



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

Preliminary

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