



# Chameleon II CoaXPress Datasheet

## Chameleon II CoaXPress Quad CXP-12 Camera Simulator

2015年発売のCXP-6対応カメラシミュレータChameleonの後継機種としてCXP-12, CoaXPress2.1, PCIe Gen3x8に対応しています。高価で納期がかかるカメラ入手前のアプリ開発。繰り返し同一データを生成して画像処理アルゴリズムの検証、画像処理装置の検査。外部で収録した画像をLabで再現しての開発。などに重宝します。CoF版 Chameleon IIもあります。お問い合わせは立野電脳（株） sales@dsp-tdi.comへ

### Innovative Approach

**Chameleon II CoaXPress** is the industry's first CoaXPress 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 v2.1 bitrates of up to 12.5 Gbps. With a grand total PCI Express transfer rate of up to 6,695 MB/s, the **Chameleon II CoaXPress** is ideally suited for development of industrial, defense and aerospace Machine Vision systems and applications.

### Intelligent Design

The **Chameleon II CoaXPress** can easily transmit generic test patterns, customers specific pre-processed data or custom video streams on the CoaXPress v2.1 links. The **Chameleon II CoaXPress** 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 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 6,695 MB/s
- Data rates up to 12.5 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 links support
- Frame and line scan formats support
- Flexible GPIO interface:
  - 4 TTL configurable I/Os
  - 4 LVTTTL 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
- Gen<i>Cam compliant
- Power over CoaXPress Simulation
- Supporting Windows, Linux OS and Nvidia Jetpack
- API for custom application development
- Plug-in modules for Matlab, HALCON, Cognex and Labview
- Micro-BNC connectors for CoaXPress links
- Standard profile, half length, 8-lane PCI Express card
- Per-Link LED indication
- 0°C to +50°C operating environment temperatures

## TECHNICAL DATA

Mechanical	
Form factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled 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 1 through 4 via x4 Micro-BNC connectors for CoaXPress v2.1 interface</li> <li>• x1 I/O connector 26-pin 2-row 0.1" pitch pin header with shrouding on board</li> </ul>
Dimensions	167.65 mm x 111.15 mm (6.6" x 4.4")
Weight	293 g (10.3 oz)

Host Bus	
Standard	PCI Express 3.0
Link width	<ul style="list-style-type: none"> <li>• 8 lanes</li> <li>• 1, 2 or 4 lanes with reduced performance</li> </ul>
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	2,048 bytes
DMA	<ul style="list-style-type: none"> <li>• 64-bit addressing support</li> <li>• Scatter gather support</li> <li>• Physical address support (GPU transfers)</li> </ul>
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 Simulation	
Interface standard(s)	CoaXPress v2.1 (CoaXPress 1.0, 1.1, 1.1.1 and 2.0 backward compatible)
Status LEDs	<ul style="list-style-type: none"> <li>• 1 bicolor status LED per connector</li> <li>• 4 System status LEDs</li> </ul>
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	50.0 Gbit/s



Supported 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>
Supported up-connection speeds	<ul style="list-style-type: none"> <li>• Low-speed 20.83 Mbps (CXP-1 to CXP-6)</li> <li>• Low-speed 41.66 Mbps (CXP-10, CXP-12)</li> </ul>
Maximum stream packet size	8,192 bytes
Power over protocol	<ul style="list-style-type: none"> <li>• PoCXP Safe Power</li> <li>• Power over CoaXPress Simulation</li> <li>• Overload and short-circuit protections</li> <li>• Power source must be connected to an external load</li> </ul>
Bandwidth limitations	<ul style="list-style-type: none"> <li>• 8 bpp, 12 bpp, 14 bpp, 16 bpp - 40 Gbps protocol limited</li> <li>• 10 bpp – 34 Gbps</li> </ul>
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	<p>Area-scan cameras:</p> <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>• Multi tap images can be simulated with API and user image segmentation</li> </ul> <p>Line-scan cameras:</p> <ul style="list-style-type: none"> <li>• Gray-scale and color RGB</li> </ul>
Camera pixel formats supported	<p>Raw, Monochrome, Bayer, RGB, YUV, YCbCr and RGBA (PFNC names):</p> <ul style="list-style-type: none"> <li>• Raw (Without headers)</li> <li>• Mono8, Mono10, Mono12, Mono14, Mono16</li> <li>• BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 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>• YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16</li> <li>• YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16</li> <li>• YCbCr709_422_8, YCbCr709_422_10, YCbCr709_422_12, YCbCr709_422_14, YCbCr709_422_16</li> <li>• YCbCr709_444_8, YCbCr709_444_16</li> </ul>

General Purpose Inputs and Outputs	
Number of lines	<p>20 I/O lines:</p> <ul style="list-style-type: none"> <li>• 2 differential inputs</li> <li>• 2 differential outputs</li> <li>• 4 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>

Usage	<ul style="list-style-type: none"> <li>Any System I/O input lines can be connected to any I/O output line</li> <li>Any I/O input line can be used to decode A/B and Z signals of a motion encoder</li> <li>Any I/O input line can generate any trigger event</li> <li>Any I/O input line can trigger a timer</li> </ul>
Electrical specifications	<ul style="list-style-type: none"> <li>Differential lines - LVDS compatible</li> <li>TTL lines: 5 V TTL compliant</li> <li>LVTTL lines: 3.3 V LVTTL compliant</li> <li>Isolated lines: opto-isolated lines with voltage range up to 30 V</li> </ul>
Filter control	<ul style="list-style-type: none"> <li>Glitch removal filter for Encoders and Triggers</li> <li>Configurable filter time between 0 <math>\mu</math>s and 34 ms</li> <li>Filter time resolution of 8 ns</li> </ul>
Polarity control	Yes
Encoders	<ul style="list-style-type: none"> <li>4 quadrature encoders with A/B and Z inputs</li> <li>32-bit 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>32-bit 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>
<b>Frame Grabber Synchronization</b>	
Synchronization	Precise area and line-scan cameras synchronization across different frame grabbers
<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>
Strobe	Accurate control of the strobe position for strobe light sources. Support of early and late strobe pulses
<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

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: <ul style="list-style-type: none"> <li>• Frame rate</li> <li>• CRC Errors</li> <li>• Transmit frames</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 acquired buffers</li> <li>• I/O events</li> <li>• Timer events</li> <li>• Encoder events</li> </ul>
Software	
Host PC operating system	<ul style="list-style-type: none"> <li>• Microsoft Windows 10 64-bit version</li> <li>• Microsoft Windows 11 64-bit version</li> <li>• Signed and certified kernel driver supporting Windows 10 and 11</li> <li>• Source code Linux kernel driver (Automatically compiled during installation)</li> <li>• Tested for Ubuntu 18.04, 20.04 and 22.04 versions</li> <li>• Nvidia Xavier AGX (Jetpack 5.1.1 and 4.6.1)</li> <li>• Nvidia Orin AGX (Jetpack 5.1.1)</li> </ul>
Gen<i>Cam	<ul style="list-style-type: none"> <li>• Support of Gen&lt;i&gt;Cam 3.2</li> <li>• Full camera and Frame Grabber 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>• Flexible buffer queuing</li> <li>• DMA Buffer filling directly to system memory</li> </ul>
GUI	<ul style="list-style-type: none"> <li>• Supported for Windows and Linux OS</li> <li>• Multi camera display and configuration</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>• Gen&lt;i&gt;Cam, GenTL producer libraries, ANSI C, Python and NET bindings</li> <li>• x86_64 dynamic library designed to be used with ISO-compliant C runtime</li> <li>• Allows for development of x86_64 applications</li> <li>• Plug-in modules for Matlab, HALCON, Cognex and Labview</li> <li>• Export straightforward, unified and easy-to-use API across all Grabber types</li> <li>• Include practical examples based on API functions, for supported language wrappers</li> <li>• Documentation include sample snippets for API usage</li> </ul>
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
Shock/Vibration	-

Certifications	
Electromagnetic - EMC standards	<ul style="list-style-type: none"> <li>• The European Council EMC Directive 2004/108/EC</li> <li>• The United 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

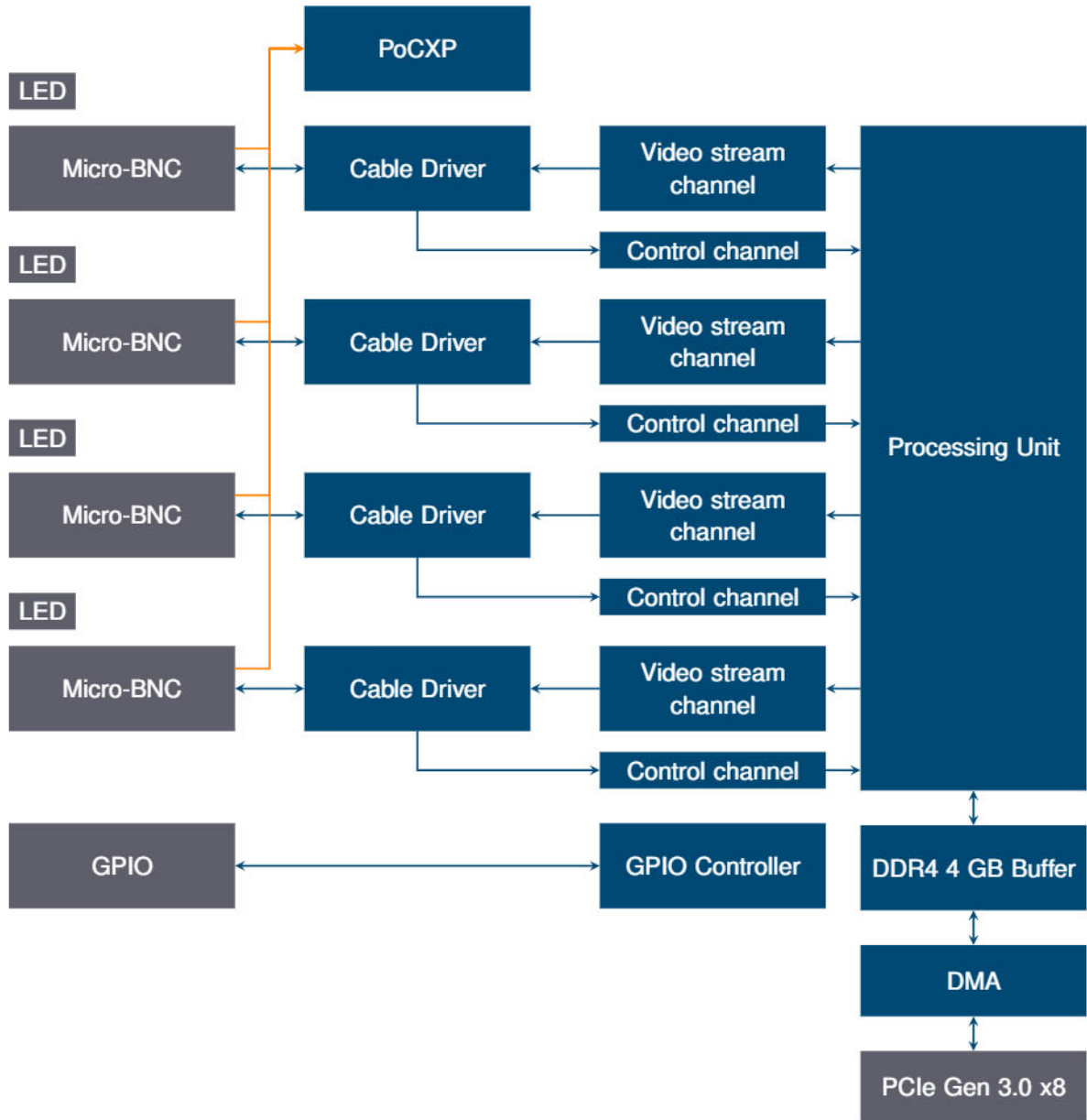
Ordering Information	
Part Number	KY-Chameleon-II
Optional accessories	<ul style="list-style-type: none"> <li>• CoaXPress cables</li> </ul>

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## HARDWARE BLOCK DIAGRAM

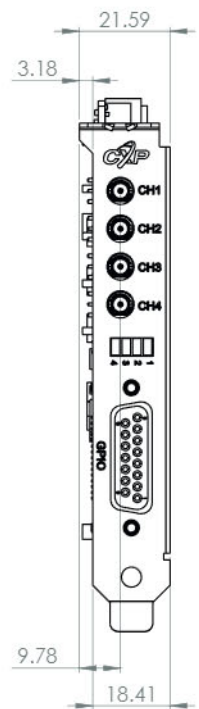
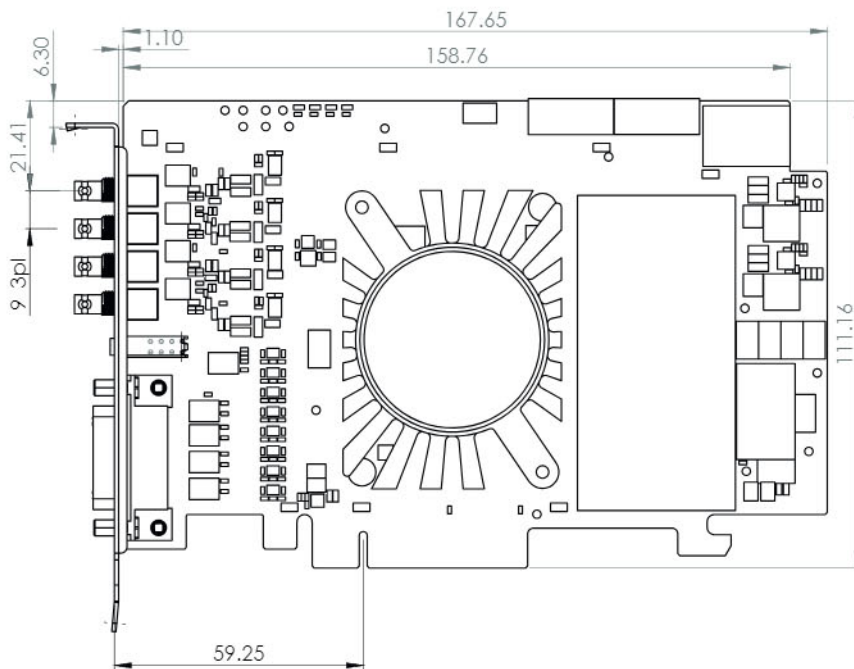


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*Dimensions are in millimeters.*

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## 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.*

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### KAYA Instruments

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