KAYA INSTRUMENTS

Premium Vision Solutions

**Key Features:**

- 4 x SFP+ channels at 10 Gbps each
- 1 x QSFP+ channel at 40 Gbps
- PCIe Gen3 x8 Half-length card
- Up to 144 Gb of DDR3 memory
- On-board 16 Gb DDR3 64bit wide
- DDR3 SODDIMM of up to 128 Gb
- Flexible machine I/O:
- 4 TTL configurable I/Os
- 4 LVCMOS configurable I/Os
- 2 LVDS inputs
- 2 LVDS outputs
- 4 opto-isolated outputs
- 4 opto-isolated inputs
- 2 quadrature rotary encoders
- Integrated strobe controller
- Transfer Rate of up to 50 Gbps through PCIe
- Transfer Rate of up to 80 Gbps through optical interfaces
- CWDM support
- QSFP+ can be expanded to 4x 10G interfaces
- Authentication device for design security
- Temperature control
- Fan control
- 4 indication LEDs
- 0°C to 50°C operating environment temperature

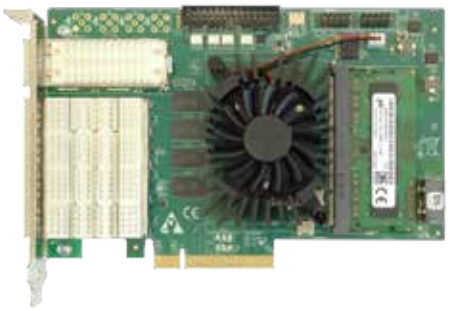
# Komodo Fiber Frame Grabber

## Innovative Approach

Komodo-Fiber is high-performance yet low-cost FPGA card supporting four SFP+ 10GigE transceivers and a single QSFP+ 40GigE optical interface. The card is based on powerful FPGA, a flexible DDR3 memory system with up to 144 Gb of memory and 128 Gbps throughput. A high speed 8 lane Gen 3.0 PCI express interface allows fast data transfers between optical links and computer memory while a versatile GPIO with multi-standard support enables connection to external devices. The QSFP+ and SFP+ interfaces are connected directly to FPGA device transceiver channels to minimize latency.

## Intelligent Design

All of these features combine make the Komodo-Fiber ideal for a wide range of applications, including network processing and security, compute and storage, instrumentation, broadcast, defense and aerospace.



| | |
|---|---|
| Product Name | Komodo™ Fiber Frame Grabber |
| 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 | 4x SFP+ connectors<br>1x QSFP+ connector<br>Internal I/O conenctor (with expansion bracket)<br>26-pin 2-row 0.1" pitch pin header with shrouding for I/O lines |
| Dimensions | L 167.65 mm x H 111.15 mm<br>L 6.6 in x H 4.38 in |
| 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>• Phisical 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) | KAYA Vision interface (Optional CLHS, 10GiGE Vision) |
| Status LEDs | 1 Host connection status per connector<br>4 System status LEDs |
| Number of cameras | Up to 8 |
| Number of links, per single camera | Up to 8 |
| Syncronisation between cameras | Yes |
| Line-scan cameras supported, | Yes |
| Maximum aggregated camera data transfer rate | 50 Gbit/s |

| | |
|---|---|
| Camera types | • Area-scan cameras:<br>  • Gray-scale and color (RGB and Bayer CFA)<br>  • Single-tap (1X-1Y) progressive-scan<br>• Line-scan cameras:,<br>  • Gray-scale and color RGB |
| Camera 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>• YUV411_8, YUV411_10, YUV411_12, YUV411_14, YUV411_16<br>• YUV422_8, YUV422_10, YUV422_12, YUV422_14, YUV422_16<br>• YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16<br>• YCbCr601_411_8, YCbCr601_411_10, YCbCr601_411_12, YCbCr601_411_14, YCbCr601_411_16<br>• YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16<br>• YCbCr601_444_8, YCbCr601_444_10, YCbCr601_444_12, YCbCr601_444_14, YCbCr601_444_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. |
| Strobe | Accurate control of the strobe position for strobe light sources.<br>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.<br>Support of external hardware trigger, with optional delay and filtering.<br>Support of trigerrring 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. |
| **On-board processing** | |
| On-board memory | • 2 GB<br>• Up to 16GByte SODIMM |
| Bayer De-Mosaic | Full 16bit resulution<br>• Bilinear 3x3<br>• Bilinear 3x2 for linescan with gradient correction |
| Color Transformation | Full 16bit resolution 18bit coefficiens table<br>• Color space conversion<br>• Gain and Offset |
| Decimation | Line skip |
| Additional features | Unpacking of 10-/12-/14-bit to 16-bit with justification to LSb |
| Frame Timestamp | 64bit with 8ns precision |
| Data stream statistics | Measurement of:<br>• Frame/Line rate<br>• CRC Errors<br>• Dropped frames<br>• Received packets<br>• Test packets |
| Event signaling and counting | The application software can be notified of the occurrence of various events:<br>• Newly aquired 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>2 differential inputs<br>2 differential outputs<br>4 singled-ended TTL inputs/outputs<br>4 singled-ended LVCTTL 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 backeward counting<br>Position trigger support<br>Noise filtering |
| Timers | 8 general purpose timers<br>Configurable delay and duration<br>32bit accomulator |
| 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 |
| **Frame grabber syncronisation** | |
| Syncronisation | Precise area and linscan cameras syncronisation across different frame grabbers |
| **Software** | |
| Host PC Operating System | Microsoft Windows 7/10 32- and 64-bit versions, Linux open source driver compatible with a wide range of distributions, tested and precompiled for Ubuntu 14.04 , RedHat 6.5 , CentOS 7 32- and 64-bit versions |
| Buffer management | Circular buffer support<br>Accomulation of several frames/lines to single buffer to reduce CPU load<br>DMA Buffer filling directly to system memory |
| GUI | Supported for Windows and Linux OS<br>Multicamera display and configuration<br>Flexible buffer queuing<br>Image/video recording and playback |
| Debuging capabilityes | Event logging<br>Statistics counters |
| GeniCam | Support of genicam up to 2.4<br>Full camera and frame grabber parameters configuration |
| **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-FGF |
| **Optional accessories** | • GPIO Expansion bracket<br>• DDR3 Extra memory SODIMM 2GB, 4GB, 8GB or 16GB<br>• SFP+ optical modules<br>• QSFP+ optical modules<br>• Fiber cables |

## Compatibility

Supported vision standart

10GiGE VISION

GEN<i>CAM TRANSPORT LAYER

GENTL

Supported operating systems

Windows

Linux

Supported vision libraries

HALCON a product of MVTec

OpenCV

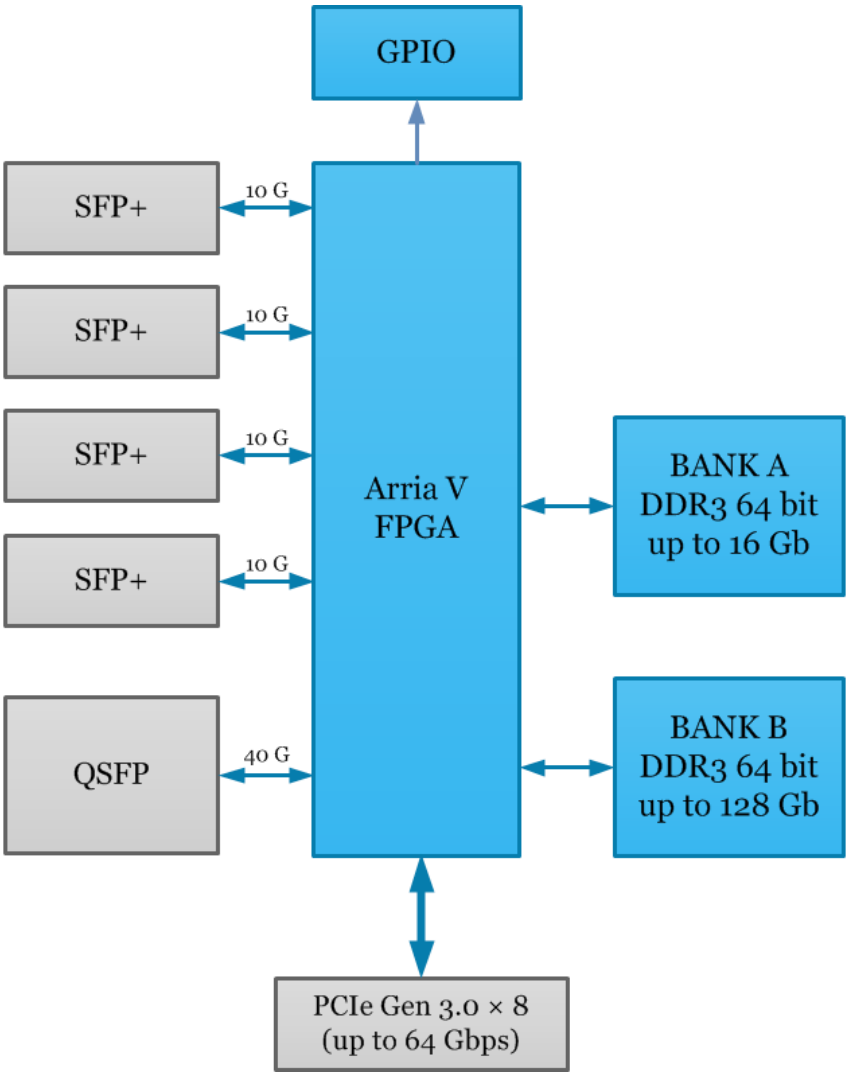
LabVIEW

MATLAB

Compatible with more than 30 popular machine vision libraries

KAYA Instrument strives to create and maintain 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**. Please check our KAYA website for an up-to-date list of other supported libraries and software packages.

## Komodo Fiber Frame Grabber HW Block Diagram




## Contact

Please visit **www.kayainstruments.com** for complete product information.
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We will be glad to assist and consult you regarding our products.


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The information provided herein is subject to change without notice

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