

## 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.

## Datasheet | Komodo™ Fiber Frame Grabber



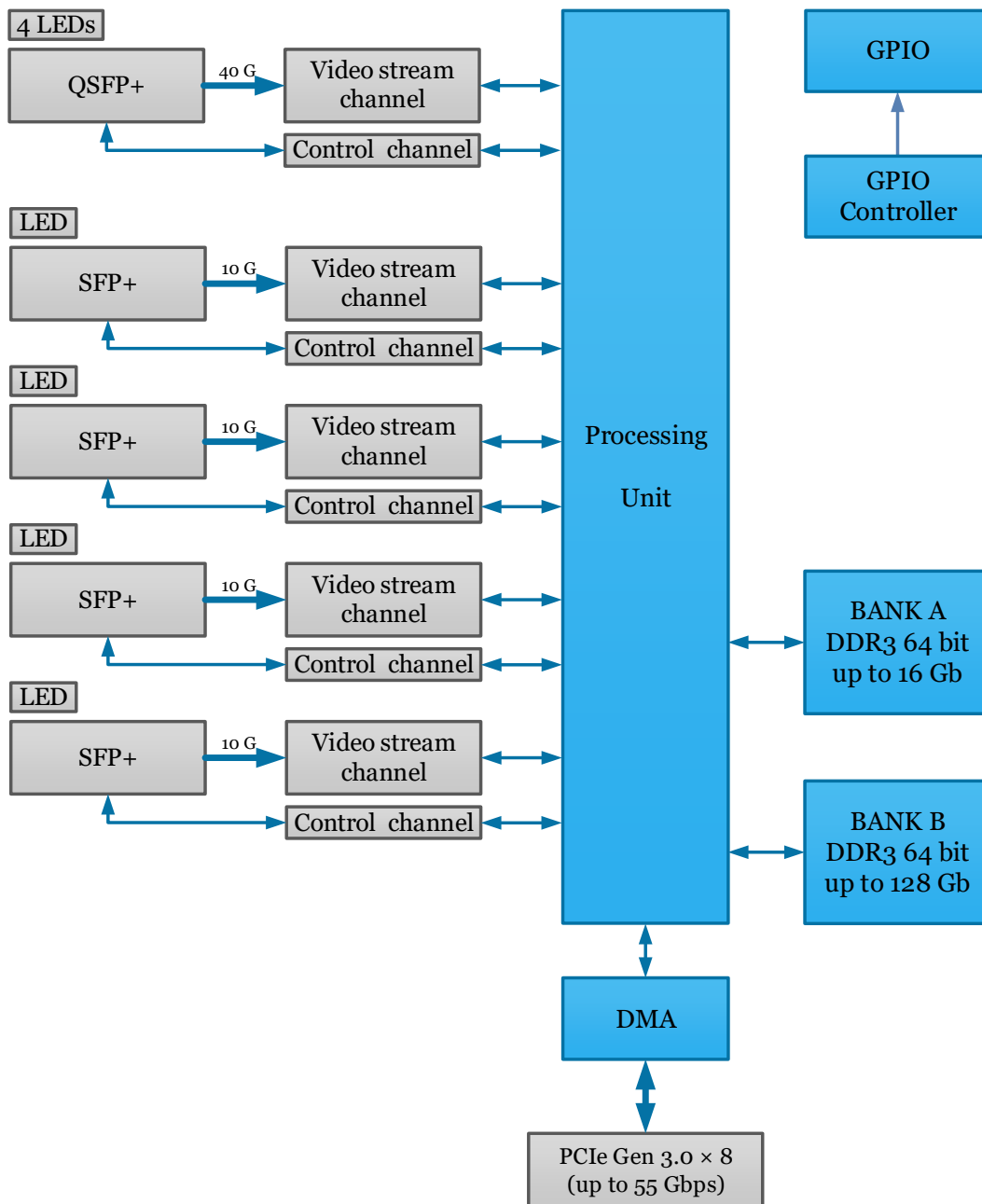
Product Name	Komodo Fiber Frame Grabber
Form Factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink (Optional passive bracket)
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Connectors	4x SFP+ connectors 1x QSFP+ connector Internal I/O connector (with expansion bracket) 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 L 6.6 in x H 4.38 in
Weight	225gr
<b>Hot bus</b>	
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
<b>Camera / video inputs</b>	
Interface standard(s)	KAYA Vision interface (Optional CLHS, 10GiGE Vision)
Status LEDs	1 Host connection status per connector 4 System status LEDs
Number of cameras	Up to 8
Number of links, per single camera	Up to 8
Synchronization between cameras	Yes
Line-scan cameras supported	Yes

Maximum aggregated camera data transfer rate	50 Gbit/s
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> </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</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>• YUV411_8, YUV411_10, YUV411_12, YUV411_14, YUV411_16</li> <li>• YUV422_8, YUV422_10, YUV422_12, YUV422_14, YUV422_16</li> <li>• YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16</li> <li>• YCbCr601_411_8, YCbCr601_411_10, YCbCr601_411_12, YCbCr601_411_14, YCbCr601_411_16</li> <li>• YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16</li> <li>• YCbCr601_444_8, YCbCr601_444_10, YCbCr601_444_12, YCbCr601_444_14, YCbCr601_444_16</li> </ul>
<b>Area-scan camera control</b>	
Trigger	<p>Precise control of asynchronous reset cameras, with exposure control.</p> <p>Support of camera exposure/readout overlap.</p> <p>Support of triggering from encoder or timer.</p> <p>Support of external hardware trigger, with optional delay, filtering and trigger decimation.</p>
Strobe	<p>Accurate control of the strobe position for strobe light sources.</p> <p>Support of early and late strobe pulses.</p>
<b>Line-scan camera control</b>	
Scan/page trigger	<p>Precise control of start-of-scan and end-of-scan triggers.</p> <p>Support of external hardware trigger, with optional delay and filtering.</p> <p>Support of triggering from encoder.</p> <p>Support of infinite acquisition, without missing lines.</p>
Line trigger	<p>Support for quadrature motion encoders, with programmable filters, selection of acquisition direction and backward motion compensation.</p>
Line strobe	<p>Accurate control of the strobe position for strobe light sources.</p>
<b>On-board processing</b>	
On-board memory	<ul style="list-style-type: none"> <li>• 2 GB</li> <li>• Up to 16GByte SODIMM</li> </ul>
Bayer De-Mosaic	<p>Full 16bit resolution</p> <ul style="list-style-type: none"> <li>• Bilinear 3x3</li> <li>• Bilinear 3x2 for linescan with gradient correction</li> </ul>
Color Transformation	<p>Full 16bit resolution 18bit coefficients table</p> <ul style="list-style-type: none"> <li>• Color space conversion</li> <li>• Gain and Offset</li> </ul>
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: <ul style="list-style-type: none"> <li>• Frame/Line rate</li> <li>• CRC Errors</li> <li>• Dropped frames</li> <li>• Received 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>• Camera and Illumination control events</li> <li>• I/O events</li> <li>• Timer events</li> <li>• Encoder events</li> </ul>
<b>General Purpose Inputs and Outputs</b>	
Number of lines	20 I/O lines: <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 LVCTTL inputs/outputs</li> <li>4 opto-isolated inputs</li> <li>4 opto-isolated outputs</li> </ul>
Usage	Any System I/O input lines can be connected to any I/O line Any I/O line can be used to decode A/B and Z signals of a motion encoder Any I/O line can generate any trigger event Any I/O line can trigger a timer
Electrical specifications	Differential lines - LVDS compatible TTL lines - 5V TTL compliant LVTTTL lines - 3.3V LVTTTL compliant Isolated lines - opto isolated lines with voltage range up to 30V
Filter control	Glitch removal filter available on all System I/O input lines Configurable filter time constants for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 $\mu$ s for IIN lines: 500 ns, 1 $\mu$ s, 2 $\mu$ s, 5 $\mu$ s, 10 $\mu$ s
Polarity control	Yes
Encoders	4 quadrature encoders with A/B and Z inputs 32bit position counter Forward and backward counting Position trigger support Noise filtering
Timers	8 general purpose timers Configurable delay and duration 32bit accumulator
Event reporting	64bit system timestamp event reporting Each I/O line can generate event on configurable edge Each Timer can generate event Each encoder can generate event

<b>Frame grabber synchronization</b>	
Synchronization	Precise area and linescan cameras synchronization across different frame grabbers
<b>Software</b>	
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 Accumulation of several frames/lines to single buffer to reduce CPU load DMA Buffer filling directly to system memory
Gen<i>Cam	Support of Gen<i>Cam up to 2.4 Full camera and frame grabber parameters configuration
GUI	Supported for Windows and Linux OS Multicamera display and configuration Flexible buffer queuing Image/video recording and playback
Debugging capabilities	Event logging Statistics counters
<b>Environmental conditions</b>	
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
<b>Certifications</b>	
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
<b>Ordering Information</b>	<b>KY-FGF</b>
<b>Optional accessories</b>	<ul style="list-style-type: none"> <li>• GPIO Expansion bracket</li> <li>• DDR3 Extra memory SODIMM 2GB, 4GB, 8GB or 16GB</li> <li>• SFP+ optical modules</li> <li>• QSFP+ optical modules</li> <li>• Fiber cables</li> </ul>

# Komodo Fiber Frame Grabber HW Block Diagram



## Compatibility

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### Supported vision standard



### Supported operating systems



### Supported vision libraries



### Compatible with most 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 package.

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### International Distributors



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