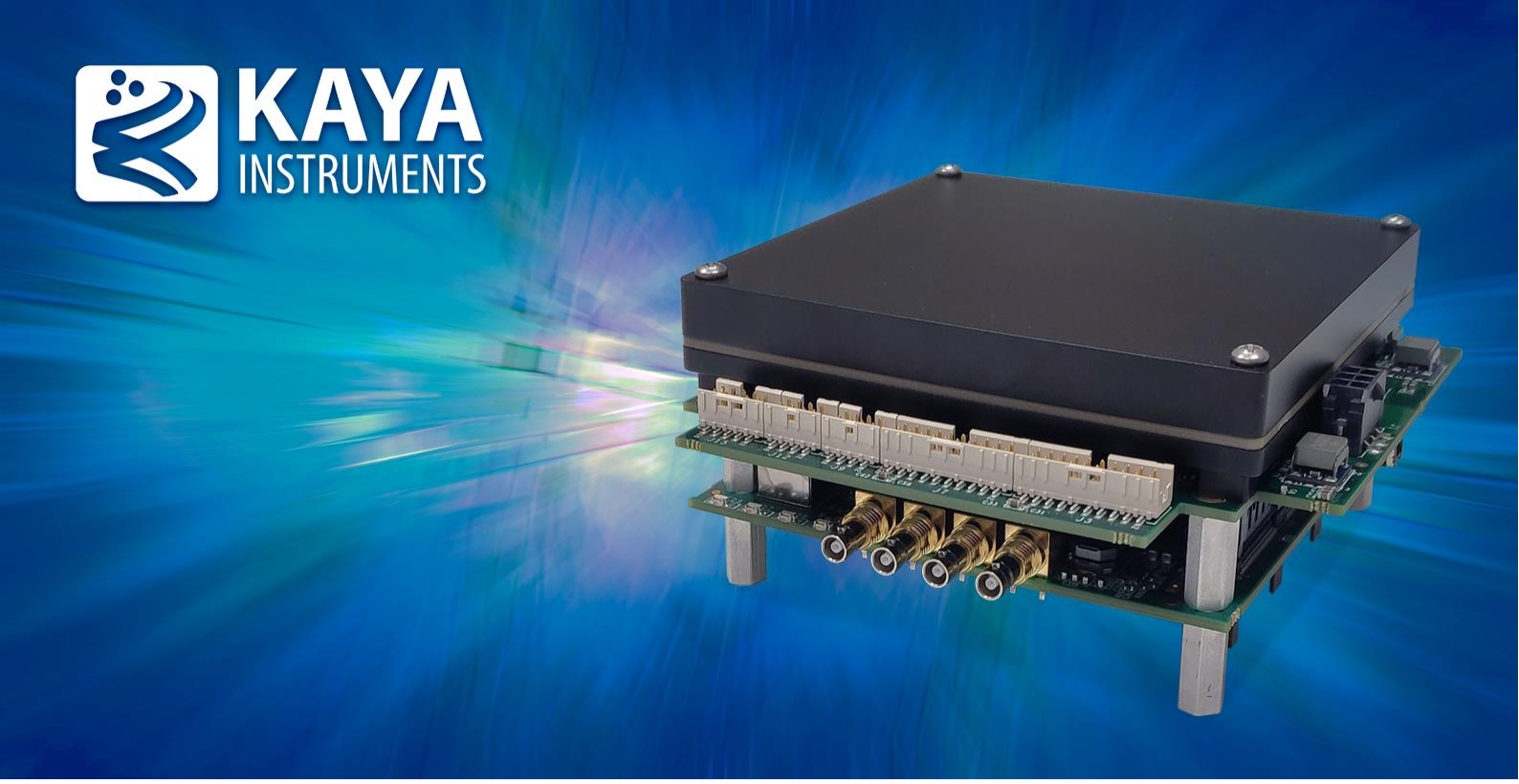
KAYA INSTRUMENTS



RPU104
Vision System

The **RPU104** is a complete system consisting of Nvidia's Jetson AGX Xavier, KAYA's world class Frame Grabber, supporting the CoaXPress 2.0 standard and a proprietary carrier board binding them together to create an independent system that is rugged, reliable and particularly resistant to shock and vibrations at a wide temperature range.

Connectivity will never be an issue with a D-Sub connector, Auxiliary power input, 2 HDMI outputs, USB 2 and 3 connectors (2 of each), 2 serial RS232 (or RS422), 4 MIPI-CSI, a single M.2 NVME module slot, PCIe/104 stack down connector, an audio interface as well as a M.2 E slot for WIFI & BT sloth.

All these features makes the **RPU104** ideally suited for industrial, defense and aerospace Machine Vision Systems and applications.

Key Features:

- High Performance NVIDIA AI
- Rugged design
- Camera controls and triggers
- Large variety of IO interfaces
- CoaXPress 2.0 compliant
- Power over CoaXPress with 13W per link
- Multiple camera synchronization
- Multiple Frame Grabbers synchronization
- Micro-BNC connectors for CoaXPress links
- GUI Interface
- Supporting Windows and Linux OS
- API for custom application development
- Gen<i>Cam compliant
- GenTL support

International Distributors

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System Technical Data

General Information

Feature	
Cooling method	Conduction cooling and passive heat dissipation
Connectors	▪ Ports 0 through 3 via x4 extended Micro-BNC female connectors cables ▪ x1 External 26pin I/O connector ▪ 2x HDMI outputs ▪ 2x USB 3 interfaces ▪ 2x Serial RS232/RS422 (selectable) interfaces ▪ 4x MIPI-CSI 4-Lane interfaces ▪ 1x Gigabit Ethernet interface ▪ 1x M.2 E for WIFI & Bluetooth module slot ▪ 1x M.2 NVME module slot ▪ PCIe/104 stack down connector ▪ 1x Audio interface ▪ Micro SD card
Dimensions	L 115.6 mm x W 111.6 mm x H 53.4 mm L 4.55 in x W 4.39 in x H 2.1 in
Weight	560gr
Power consumption	45W @ full performance

Environmental Conditions	
Operating ambient air temperature	-40°C to TBD°C / -40°F to TBD°F
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-60°C to TBD°C / -76°F to TBD°F
Storage ambient air humidity	10% to 90% RH non-condensing
Shock/Vibration	MIL-STD-810G

Certifications	
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

Ordering Information	**KY-RPU104**

Jetson AGX Xavier

JETSON AGX XAVIER	
GPU	512-core Volta GPU with Tensor Cores
CPU	8-core ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3
Memory	32GB 256-Bit LPDDR4x | 137GB/s
Storage	32GB eMMC 5.1
DL accelerator	(2x) NVDLA Engines
Vision accelerator	7-way VLIW Vision Processor
Encoder/decoder	(2x) 4Kp60 | HEVC/(2x) 4Kp60 | 12-Bit Support

Komodo II CoaXPress PCIe/104

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) ▪ 5.0 GT/s (PCIe 2.0) with reduced performance
Maximum payload size	512 bytes
DMA	▪ 32- and 64-bit ▪ Scatter gather support ▪ 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	TBD

Camera / Video Inputs		
Interface standard(s)	CoaXPress 2.0 (CoaXPress 1.1 backward compatible)	
Status LEDs	1 bicolor status LED per connector 4 System status LEDs	
Number of cameras	Up to 4	
Number of links per Single camera	Up to 4	
Synchronization between cameras	Yes	
Line-scan cameras supported	Yes	
MAX aggregated camera data transfer rate	50 Gbit/s	
Supported CXP down-connection speeds	▪ 1.25 GT/s (CXP-1) ▪ 2.5 GT/s (CXP-2) ▪ 3.125 GT/s (CXP-3) ▪ 5 GT/s (CXP-5)	▪ 6.25 GT/s (CXP-6) ▪ 10 GT/s (CXP-10) ▪ 12.5 GT/s (CXP-12)
Number of data streams (per camera)	1 data stream per camera	
Maximum stream packet size	8.192 bytes	
PoCXP (power over CoaXPress)	▪ PoCXP Safe Power ▪ 13 W of 24V DC regulated power per CoaXPress connector ▪ PoCXP Device detection and automatic power-on ▪ Overload and short-circuit protections ▪ On-board 12V to 24V DC/DC converter	
Camera types	▪ Area-scan cameras: - Gray-scale and color (RGB and Bayer CFA) - Single-tap (1X-1Y) progressive-scan ▪ Line-scan cameras: - Gray-scale and color RGB	

Camera pixel formats supported	Raw, Monochrome, Bayer, RGB, YUV, YCbCr and RGBA (PFNC names): - Raw - Mono8, Mono10, Mono12, Mono14, Mono16 - BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 where XX = GR, RG, GB, or BG - RGB8, RGB10, RGB12, RGB14, RGB16 - RGBA8, RGBA10, RGBA12, RGBA14, RGBA16 - YUV411_8, YUV411_10, YUV411_12, YUV411_14, YUV411_16 - YUV422_8, YUV422_10, YUV422_12, YUV422_14, YUV422_16 - YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16 - YCbCr601_411_8, YCbCr601_411_10, YCbCr601_411_12, YCbCr601_411_14, YCbCr601_411_16 - YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16 - 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. ▪ Support of camera exposure/readout overlap. ▪ Support of triggering from encoder or timer. ▪ Support of external hardware trigger, with optional delay, filtering and trigger decimation.
Strobe	Accurate control of the strobe position for strobe light sources. 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. ▪ Support of external hardware trigger, with optional delay and filtering. ▪ Support of triggering from encoder. ▪ 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	2GByte DDR4
Bayer De-Mosaic	▪ Full 16bit resolution ▪ Bilinear 3x3 ▪ Bilinear 3x2 for linescan with gradient correction
Color transformation	Full 16bit resolution 18bit coefficients table: - Color space conversion - 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: - Frame/Line rate - CRC Errors - Dropped frames - Received packets - Test packets

Event signaling and counting	The application software can be notified of the occurrence of various events: - Newly acquired buffers - Camera and Illumination control events - I/O events - Timer events - Encoder events

General Purpose Inputs and Outputs	
Number of lines	▪ 20 I/O lines: - 2 differential inputs - 2 differential outputs - 4 singled-ended TTL inputs/outputs - 4 singled-ended LVTTL inputs/outputs - 4 opto-isolated inputs - 4 opto-isolated outputs
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 ▪ LVTTL lines: 3.3V LVTTL 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 µs - for IN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs
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	▪ 4 general purpose timers ▪ Configurable delay and duration ▪ 32bit accumulator
Event reporting	▪ 64-bit system timestamp event reporting ▪ Each I/O line can generate event on configurable edge ▪ Each Timer can generate event ▪ Each encoder can generate event

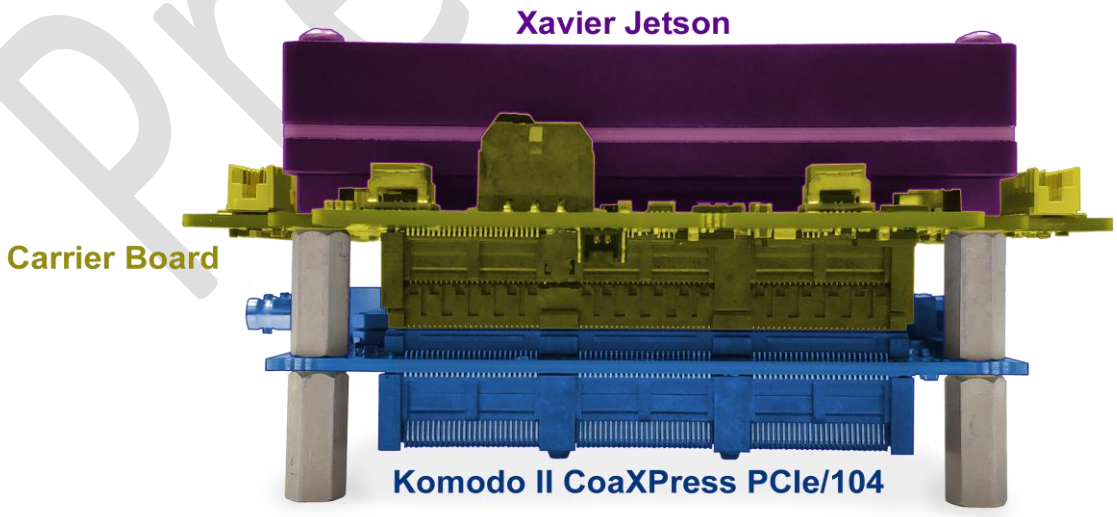
Frame Grabber Synchronization	
Synchronization	Precise area and line-scan cameras synchronization across different frame grabbers

Software	
Gen<i>Cam	▪ Support of Gen<i>Cam 2.4 and 3.0 ▪ Full camera and Frame Grabber parameters configuration
Buffer management	▪ Circular buffer support ▪ Accumulation of several frames/lines to single buffer to reduce CPU load ▪ CPU load ▪ DMA Buffer filling directly to system memory

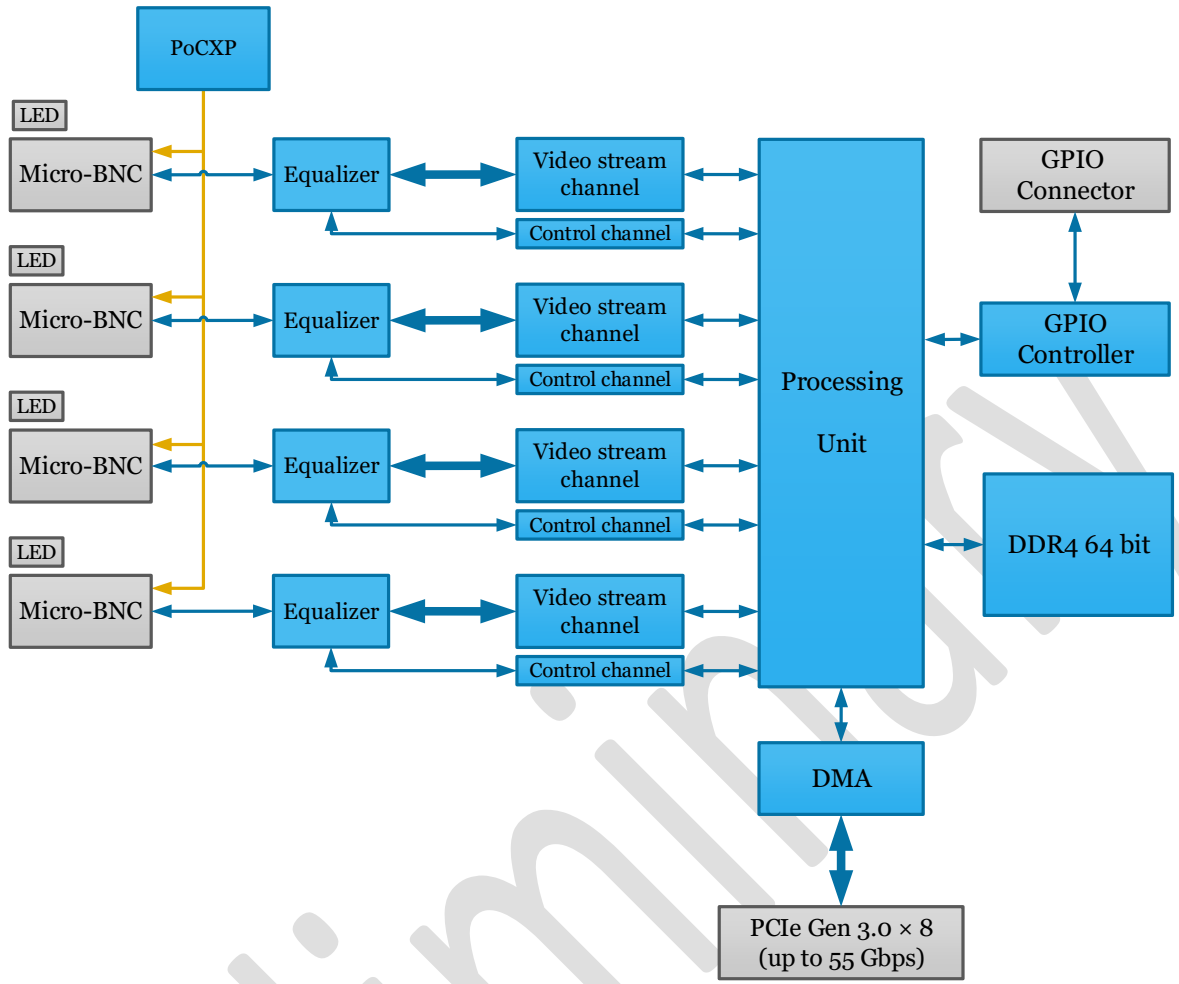
GUI	▪ Supported for Windows and Linux OS ▪ Multi camera display and configuration ▪ Flexible buffer queuing ▪ Image/video recording and playback
Debugging capabilities	▪ Event logging ▪ Statistics counters
APIs	▪ Gen<i>Cam, GenTL producer libraries, C/C++, Python and NET bindings ▪ Compilers: - x86 and 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

System HW Block Diagram & Description

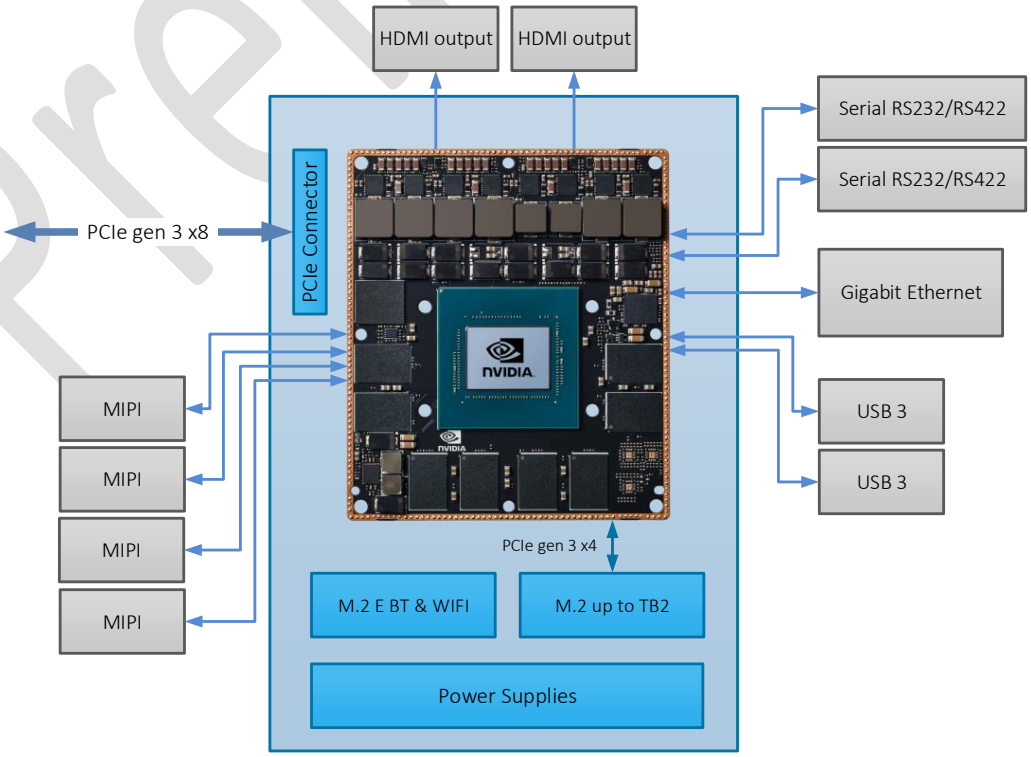
System Construction



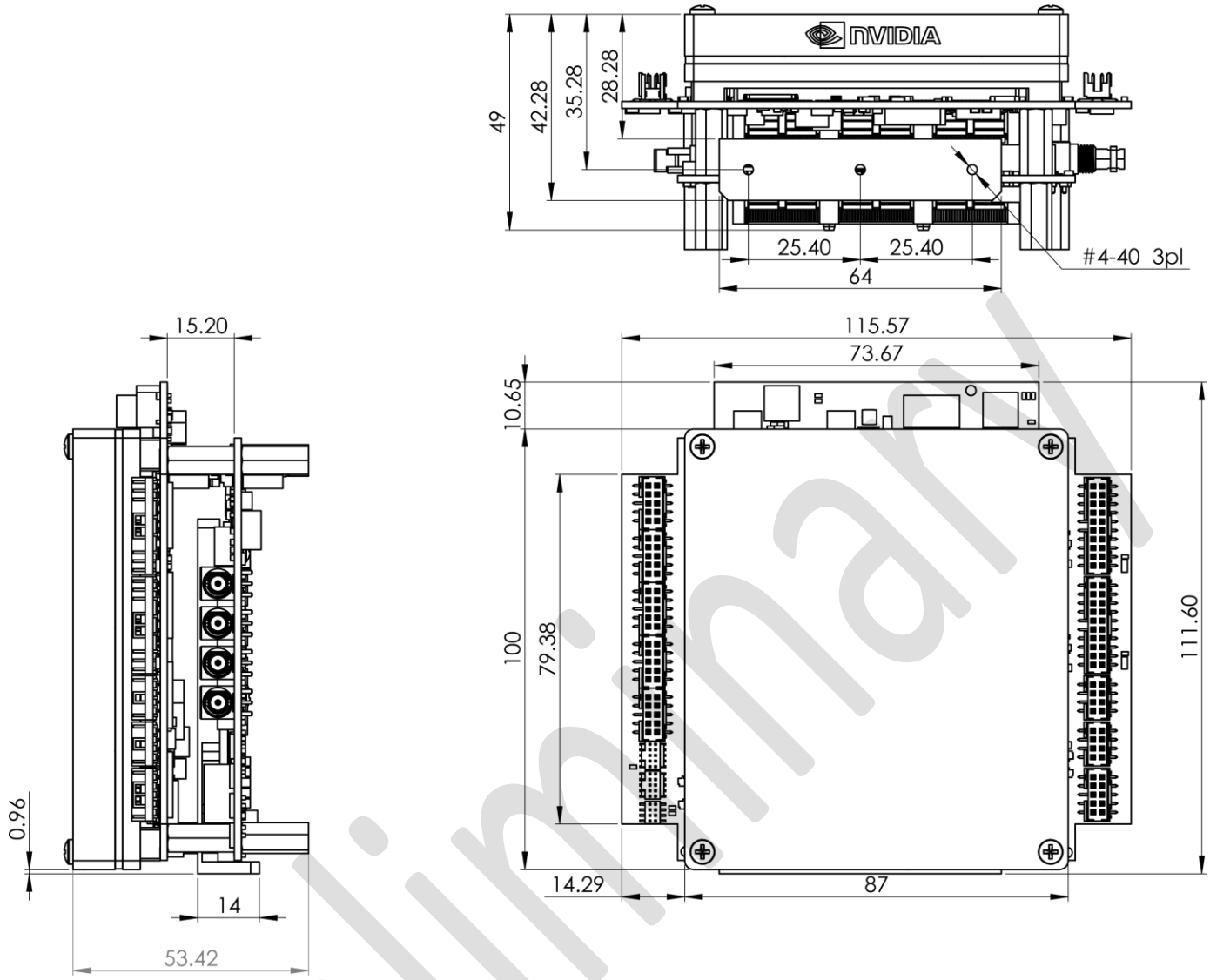
Komodo II CoaXPress 12G PCI/e104 Frame Grabber HW Block Diagram



Xavier PC104 HW Block Diagram



Mechanical Drawings



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@skyblue.de** – we will be happy to provide assistance and consultation.

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