PC1628
Grablink Duo

General

Product name	PC1628 Grablink Duo
Product code	1628
Product status	Released

Mechanical

Form factor	PCI Express card
Format	Standard profile, half length, 4-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink
Mounting	For insertion in a standard height, 4-lane or higher, PCI Express card slot
Connectors	'A' on card bracket: 26-position Shrunk Delta Ribbon (SDR) socket with M2 jack socket screws Camera Link camera A input, PoCL output 'B' on card bracket: 26-position Shrunk Delta Ribbon (SDR) socket with M2 jack socket screws Camera Link camera B input or camera A second cable input, PoCL output 'EXTERNAL I/O' on card bracket: 26-pin 3-row high-density D-Sub female socket with UNC4-40 jack socket screws I/O lines and I/O power output 'INTERNAL I/O 1' on printed circuit board: 26-pin 2-row 0.1" pitch pin header with shrouding I/O lines and I/O power output 'INTERNAL I/O 2' on printed circuit board: 26-pin 2-row 0.1" pitch pin header with shrouding I/O lines and I/O power output 'I/O EXTENSION' on printed circuit board: 26-pin 2-row 0.05" pitch pin header with shrouding I/O extension cable socket

Mechanical

	'C2C-LINK' on printed circuit board: 6-pin 2-row 0.1" pitch pin header with shrouding Card-to-card link 'AUXILIARY POWER INPUT' on printed circuit board: 6-pin PEG power socket 12 V DC power input for PoCL and I/O power output
LED indicators	'A', 'B' on bracket: Bi-color red/green LEDs Camera Link status indicator
Switches	'RECOVERY' on PCB: 3-pin 1-row 0.1" header or 2-way DIP switch Firmware emergency recovery
Dimensions	PCB L x H: 167.65 mm x 111.15 mm [6.6 in x 4.38 in]
Weight	Net weight: 167 g [5.9 oz] Gross weight: 272 g [9.6 oz]

Host Bus

Standard	PCI Express 2.0
Link width	4 lanes 1 lane or 2 lanes with reduced performance
Link speed	5.0 GT/s (PCIe 2.0) 2.5 GT/s (PCIe 1.0) with reduced performance
Maximum payload size	512 bytes
Peak delivery bandwidth	2,000 MB/s
Effective (sustained) delivery bandwidth	1,700 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 7.1 W (2.7 W @ +3.3V, 4.4 W @ +12V), excluding camera and I/O power output

Camera Inputs

Camera interface standard	Camera Link
Interface standard(s)	Camera Link 2.0
Maximum link speed	85 MHz
Camera powering	PoCL
Connectors	Two Shrunk Delta Ribbon (SDR) Miniature Camera Link (MiniCL)

Camera Inputs

ECCO - Extended Camera Link Cable Operation	ECCO
Number of cameras	One 80-bit / 72-bit / Full / Medium / Base configuration camera Or two Base configuration cameras
Maximum number of cameras	2
Line-scan cameras supported	Yes
Maximum aggregated camera data transfer rate	6.8 Gbps (850 MB/s)
Camera Link configuration	Base, Medium, Full, 72-bit, 80-bit
Camera Link clock frequency	From 20 MHz up to 85 MHz
PoCL (Power over Camera Link)	PoCL Safe Power: Two independent controllers PoCL Device detection and automatic power-on Overload and short-circuit protection A +12V power source must be connected to the AUXILIARY POWER INPUT connector using a 6-pin PEG cable
Camera types	Area-scan cameras: Grayscale and color (RGB and Bayer CFA) Line-scan cameras: Grayscale and color RGB
Camera pixel formats supported	Mono8, Mono10, Mono12, Mono14, Mono16 BayerXX8, BayerXX10, BayerXX12, BayerXX16 where XX = GR, RG, GB, or BG RGB8 NOTE: Refer to release notes for availability of BayerXX14, RGB10, RGB12, RGB14 and RGB16 formats

Area Scan Camera Control

Trigger	Precise control of asynchronous reset cameras, with exposure control. Support of camera exposure/readout overlap. Support of external hardware trigger, with optional delay and trigger decimation.
Strobe	Accurate control of the strobe position for strobed 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. Support of infinite acquisition, without missing line, for web inspection applications.
Line trigger	Support for quadrature motion encoders, with programmable noise filters, selection of acquisition direction and backward motion compensation. Rate Converter tool for fine control of the pixel aspect ratio: Rate Conversion Ratio in the range 0.001 to 1000 with an accuracy better than 0.1%. Rate Divider tool
Line strobe	Accurate control of the strobe position for strobed light sources.

On-Board Processing

On-board memory	512 MB
Image data stream processing	Unpacking of 10-/12-/14-bit to 16-bit with selectable justification to LSb or MSb
Input LUT (Lookup Table)	Monochrome 8-bit to 8-bit transformation Monochrome 10-bit to 8-, 10- or 16-bit transformations Monochrome 12-bit to 8-, 12- or 16-bit transformations
Bayer CFA to RGB decoder	Advanced interpolation method using average and median functions on a 3x3 kernel
Data stream statistics	Measurement of: Frame rate (Area-scan only) Line rate Data rate Configurable averaging interval
Event signaling and counting	The application software can be notified of the occurrence of various events: Standard event: the EVENT_NEW_BUFFER event notifies the application of newly filled buffers A large set of custom events Custom events sources: I/O Toolbox events Camera and Illumination control events Each custom event is associated with a 32-bit counter that counts the number of occurrences

On-Board Processing

	The last three 32-bit context data words of the event context data can be configured with event-specific context data: Event-specific data State of all System I/O lines sampled at the event occurrence time Value of any event counter

General Purpose I/O

Number of lines	20 I/O lines: 4 differential inputs (DIN) 4 singled-ended TTL inputs/outputs (TTLIO) 8 isolated inputs (IIN) 4 isolated outputs (IOUT) NOTE: The number of I/O lines can be extended using I/O modules attached to the I/O EXTENSION connector.
Usage	Any I/O input lines can be used by any LIN tool of the I/O Toolbox Selected pairs of I/O input lines can be used by any QDC tool of the I/O toolbox to decode A/B signals of a motion encoder
Electrical specifications	DIN: High-speed differential inputs, up to 5 MHz, compatible with ANSI/EIA/TIA-422/485 differential line drivers and complementary TTL drivers TTLIO: High-speed 5V-compliant TTL inputs or LVTTL outputs, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers or LVTTL, TTL, 3V CMOS receivers IIN: 200 kHz isolated current-sense input with wide voltage input range up to 30V, compatible with totem-pole (push-pull) HTL drivers, 5V TTL/RS-422 differential line drivers, 5V CMOS drivers, potential free contacts, solid-state relays and opto-couplers IOUT: Isolated contact outputs compatible with 30V / 100mA loads NOTE: IIN and IOUT lines provide a functional isolation grade for the circuit technical protection. It does not provide an isolation that can protect a human being from electrical shock!
Filter control	Glitch removal filter available on all System I/O input lines Configurable filter delay: Custom value Fixed values for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 µs Fixed values for IIN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs
Polarity control	Yes

General Purpose I/O

Power output	Non-isolated, +12V, 1A, with electronic fuse protection
I/O Toolbox tools	The I/O Toolbox is a configurable interconnection of tools that generates events (usually triggers): Line Input tool (LIN): edge detector delivering events on rising or falling edges of any selected input line. Quadrature Decoder tool (QDC): a composite tool including: A quadrature edge detector delivering events on selected transitions of selected pairs of input lines. An optional backward motion compensator for clean line-scan image acquisition when the motion is unstable. A 32-bit up/down counter for delivering a position value. User Actions Scheduler tool (UAS): to delegate the execution of 'User Actions' at a scheduled time or encoder position. Possible user actions include setting low/high/toggle any bit of the User Output Register or generation of any User Events. Delay tool (DEL): to delay up to 16 events from one or two I/O toolbox event sources, by a programmable time or number of motion encoder ticks (any QDC events). Divider tool (DIV): to generate an event every nth input events from any I/O toolbox event source. Multiplier/divider tool (MDV): to generate m events every d input events from any I/O toolbox event source. The 'Input Tools' (LIN, QDC and UAS) can be further processed by the 'Event Tools' (DEL, DIV and MDV) to generate any of the following "trigger" events: The "cycle trigger" of the Camera and Illumination controller The "cycle sequence trigger" of the Camera and Illumination controller The "start-of-scan trigger" of the Acquisition Controller (line-scan only) The "end-of-scan trigger" of the Acquisition Controller (line-scan only)
I/O Toolbox composition	Determined by the selected firmware variant: '1-camera': 8 LIN, 1 QDC, 1 UAS, 2 DEL, 1 DIV, 1 MDV, 2 C2C '2-camera': 8 LIN, 2 QDC, 1 UAS, 2 DEL, 2 DIV, 2 MDV, 2 C2C '1-camera, line-scan': 8 LIN, 1 QDC, 1 UAS, 2 DEL, 1 DIV, 1 MDV, 3 C2C '2-camera, line-scan': 8 LIN, 2 QDC, 1 UAS, 2 DEL, 2 DIV, 2 MDV, 3 C2C

C2C Link

Description	Accurate synchronization of the trigger and the start-of-exposure of multiple grabber-controlled area-scan cameras. Accurate synchronization of the start-of-cycle, start-of-scan and end-of-scan of multiple grabber-controlled line-scan cameras.
Specification	C2C-Link synchronizes cameras connected to: the same card to different cards in the same PC (requires an accessory cable such as the "3303 C2C-Link Ribbon Cable" or a custom-made C2C-Link cable) to different cards in different PCs (requires one "1636 InterPC C2C-Link Adapter" for each PC and one RJ 45 CAT 5 STP straight LAN cable for each adapter but the last one) Maximum distance: 120 cm inside a PC 1200 m cumulated adapter to adapter cable length Maximum trigger rate: 2.5 MHz for configurations using a single PC, or up to 10 PCs and 100 m total C2C-Link cable length 200 kHz for configurations up to 32 PCs and 1200m total C2C-Link cable length Trigger propagation delay from master to slave devices: Less than 10 ns for cameras on the same card or on different cards in the same PC Less than 265 ns for cameras on different cards in different PCs (3 PCs and 40m total C2C-Link cable length)

Software

Driver name	eGrabber
First release	eGrabber 23.02
Current release	eGrabber 25.12
Host PC Operating System	Microsoft Windows 11, 10 for x86-64 (64-bit) processor architecture Linux for x86-64 (64-bit) and AArch64 (64-bit) processor architectures macOS for x86-64 (64-bit) and AArch64 (64-bit) processor architectures
APIs	EGrabber class, with C++ and .NET APIs: .NET assembly designed to be used with development environments compatible with .NET frameworks version 4.6 or higher

Software

	GenICam GenTL producer libraries compatible with C/C++ compilers: 'x86_64' dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86-64 (64-bit) applications 'aarch64' dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of AArch64 (64-bit) applications
Memento supported	Yes

Environmental

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

EMC standards	European Council EMC Directive 2014/30/EU United States FCC CFR Title 47 Part 15B
EMC - Emission	EN 55032:2015 / CISPR 32:2012 Class B FCC CFR Title 47 Part 15B Class B
EMC - Immunity	EN 55035:2017 / CISPR 35:2016 EN 61000-6-2:2005 / IEC 61000-6-2:2016 EN 61000-4-2:2009 EN 61000-4-3:2006 EN 61000-4-4:2004 EN 61000-4-6:2014
KC Certification	Korean Radio Waves Act, Article 58-2, Clause 3
Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2015/863 (ROHS3)
REACH	European Union Regulation 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations