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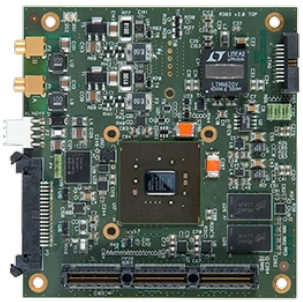
Datasheet

Coaxlink Duo PCIe/104-EMB

Two-connection ruggedized CoaXPress frame grabber



- Ruggedized board for industrial and transportation embedded applications
- Small stackable PCIe/104 form factor
- Extended temperature range: -40 to +85°C / -40 to +185°F
- Sustained shock: 40 g/11ms (all axes - half-sine and saw tooth)
- Optional conformal coating
- Two CoaXPress CXP-6 connections: 1,250 MB/s camera bandwidth
- PCIe 2.0 (Gen 2) x4 bus: 1,700 MB/s delivery bandwidth

Specifications

Mechanical

Form factor

PCIe/104 card

Format

4-lane PCIe/104, stack-down only, universal peripheral module

Cooling method

Conduction cooling

Mounting

1 or 2 modules can be stacked down directly under a Type 1 or a Type 2 Host PC

Connectors

'A B' on printed circuit board:

2 x MCX 75 Ohms coaxial female receptacle

CoaXPress Host Interface

'C2C-LINK' on printed circuit board:

6-pin 2-row 0.1" pitch pin header with shrouding

Card-to-card link

'CAMERA POWER INPUT' on printed circuit board:

4-pin 0.1-in Molex KK 7478 male connector

24 V DC power input for PoCXP

LED indicators

'A', 'B' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional)

2x bi-color red/green LEDs

CoaXPress Host connector indicator

'FPGA STATUS LAMP' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional)

Bi-color red/green LED

'BOARD STATUS LAMP' on '3300 HD26F I/O module for Coaxlink Duo PCIe/104' (optional)

Bi-color red/green LED

Switches

'RECOVERY' on PCB:

3-pin 1-row 0.1" header or 2-way DIP switch

Firmware emergency recovery

Dimensions

PCB L x H: 96 mm x 90 mm [3.775 in x 3.555 in]

Weight

Net weight: 62 g [2.2 oz]

Gross weight: 162 g [5.7 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

DMA

32- and 64-bit

Peak delivery bandwidth

2,000 MB/s

Effective (sustained) delivery bandwidth

1,700 MB/s (Host PC motherboard dependent)

Power consumption

Typ. 8.4 W @ +12V excluding I/O power output

+3.3V and +5.0V rails are not used

Camera / video inputs

Camera interface standard

CoaXPress

Interface standard(s)

CoaXPress 1.0, 1.1, 1.1.1, 2.0 and 2.1

Maximum link speed

CXP-6

Maximum link width

2 connections

Camera powering

PoCXP

Connectors

Two MCX 75 Ohms CXP-6

Status LEDs

One CoaXPress Host connection status LED per connection

Number of cameras

Area-scan cameras:

- One 1- or 2-connection camera
- One or two 1-connection cameras

Line-scan cameras:

- One 1- or 2-connection camera

Maximum number of cameras

2

Line-scan cameras supported

Yes

Maximum aggregated camera data transfer rate

12.5 Gbps (1,250 MB/s)

Supported CXP down-connection speeds

1.25 Gbps (CXP-1), 2.5 Gbps (CXP-2), 3.125 Gbps (CXP-3), 5 Gbps (CXP-5), and 6.25 Gbps (CXP-6)

Number of CXP data streams (per camera)

1 data stream per camera

Maximum CXP stream packet size

16,384 bytes

PoCXP (Power over CoaXPress)

PoCXP Safe Power:

- 17 W of 24V DC power per CoaXPress connector
- PoCXP Device detection and automatic power-on
- Overload and short-circuit protections

A +24V DC power source must be connected to the CAMERA POWER INPUT connector on the module

Camera types

Area-scan cameras:

- Grayscale and color (YCbCr, YUV, RGB and Bayer CFA)
- Single-tap (1X-1Y) progressive-scan

Line-scan cameras and contact imaging sensors:

- Grayscale and color RGB

Camera pixel formats supported

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

YCbCr601_422_8, YCbCr601_422_10

YCbCr709_422_8, YCbCr709_422_10

YUV422_8, YUV422_10

Raw

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

Optional swap of R and B components

Little endian conversion

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

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
- CoaXPress data stream events
- CoaXPress host interface events

Each custom event is associated with a 32-bit counter that counts the number of occurrences

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 Inputs and Outputs

Number of lines

10 I/O lines on '3300 HD26F I/O module for Coaxlink Duo PCIe/104':

2 differential inputs (DIN)

2 singled-ended TTL inputs/outputs (TTLIO)

4 isolated inputs (IIN)

2 isolated outputs (IOUT)

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: Isolated current-sense inputs with wide voltage input range up to 30V, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers, RS-422 differential line 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

Power output

On '3300 HD26F I/O Module for Coaxlink Duo PCIe/104':

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.

Device Link Trigger tool (DLT): delivers an event on reception of a valid high-speed CoaXPress 2.0 connection trigger packet message from the remote device.

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, DLT 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

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

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)

Maximum distance: 60 cm

Maximum trigger rate: 2.5 MHz

Trigger propagation delay from master to slave devices: Less than 10 ns

Software

Driver name

eGrabber

First release

Coaxlink 7.0

Current release

eGrabber 25.05

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

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 conditions

Operating ambient air temperature

-40 °C to +85 °C / -40 °F to +185 °F, with conduction cooling (ambient temperature measured inside the enclosure)

Operating ambient air humidity

0% to 100% RH non-condensing

Storage ambient air temperature

-55 °C to +100 °C / -67 °F to +212 °F

Storage ambient air humidity

0% to 100% RH non-condensing

Certifications

EMC standards

European Council EMC Directive 2014/30/EU

United States FCC rule 47 CFR 15

EMC - Emission

EN 55032:2015 / CISPR 32:2012 Class A

FCC 47 Part 15 Class A

EMC - Immunity

EN 61000-6-2:2005 / IEC 61000-6-2:2016

EN 50121-3-2:2006

EN 61000-4-2:2009

EN 61000-4-3:2006

EN 61000-4-4:2004

EN 61000-4-6:2014

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

Ordering Information

Product status

Not recommended for new designs

Product code - Description

PC1629 Coaxlink Duo PCIe/104-EMB

Related products

PC3300 HD26F I/O module for Coaxlink Duo PCIe/104

PC3301 Thermal drain (Model 1) for Coaxlink Duo PCIe/104

PC3302 DIN1.0/2.3 Coaxial cable for Coaxlink Duo PCIe/104

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