

# FIREBIRD COAXPRESS OVER FIBER

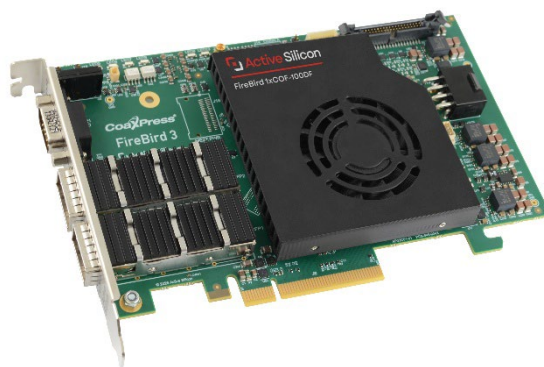
## 1xCOF100G-DF Frame Grabber

- CoaXPress-over-Fiber Frame Grabber
- Supports CoaXPress-over-Fiber speeds up to 4x 25.7Gbps
- RISC based ActiveDMA engine technology
- PCI Express 4.0 8-lane interface
- Data Forwarding capability



### FEATURES

- High-speed data and camera control over a single cable.
- QSFP28 port allows up to 100 Gbps of data.
- Second QSFP28 port for data forwarding.
- Fast PCI Express 4.0 8-lane interface.
- ActiveDMA engine – acquisition with zero CPU usage.
- Comprehensive I/O including end-bracket I/O.
- ActiveFlex-IO functionality.
- Very long cable lengths supported.
- Standard half-length PCIe form-factor.
- Full GenICam support (including GenTL Producer).
- Supported by the proven ActiveSDK.



### OVERVIEW

The **FireBird CoaXPress over Fiber 1xCOF100G-4PE8-DF** frame grabber is a brand-new member of Active Silicon's state-of-the-art FireBird frame grabber family.

The board features a QSFP28 port that supports data rates up to 100 Gbps across four 25 Gbps lanes. Its PCI Express 4.0 x8 interface enables real-time transfer of high-resolution image data to the host system. The board will be fully compliant with CoaXPress v3.0 (released later this year) and delivers a significant increase in bandwidth and performance compared to the previous generation.

A second QSFP28 port handles data forwarding and distributes image data from a single camera to another processing node; if this node also has a data forwarding card data can be daisy-chained. Multiple PCs can either run different algorithms on the same image stream or acquire only selected portions of the image data, all synchronized by trigger information from the master frame grabber. This enables e.g. scalable imaging systems without changing the camera setup and allows innovative system architectures like fail-safe vision systems while keeping processing performance aligned with modern camera data rates.

**FireBird** is designed for ultimate performance using Active Silicon's proprietary DMA Engine technology, "ActiveDMA". This technical innovation applies RISC based processor techniques, ensuring high-speed, extremely low-latency image data transfers and zero CPU intervention.



The **FireBird 1xCOF100G-DF** features up to 8GB onboard buffer memory and comprehensive I/O, including a selection of signals available directly on the end bracket. Additional flexibility is provided through ActiveFlex-IO, enabling sophisticated trigger and output sequencing schemes.

CoaXPress over Fiber is an extension bridge protocol of the CoaXPress v2.1 Machine Vision standard for high-speed imaging in professional and industrial applications. CoaXPress over Fiber allows the CoaXPress protocol to run over a fiber optic cable. The fiber optic cables and connectors needed for transmission are sourced from mainstream Ethernet technology (100 Gigabit Ethernet), this keeps their costs to a minimum and availability plentiful. Using fiber optics for communications has significant benefits where long cable runs are required, or cameras are placed in harsh electrical environments. With the correct choice of optical transceiver module, cameras can be placed multiple kilometers from the grabber.

Active Silicon was one of the primary authors of the international CoaXPress standard, which is hosted by the JIIA (Japan Industrial Imaging Association).

**FireBird** is supported by Active Silicon's software development kit, ActiveSDK. This is available as a separate item and allows rapid system development and integration. It provides comprehensive example applications and optimized libraries and supports a variety of operating systems via a common API, including Windows and Linux (x86 and ARM, including NVIDIA Jetson). Drivers for third party applications are also available such as Cognex VisionPro, HALCON, Common Vision Blox, StreamPix, LabVIEW, MATLAB etc.

Full GenICam support is provided with the frame grabber drivers, which include a GenTL Producer for data streaming as well as register accesses. Additional to functions that control the hardware, the libraries include general purpose functions for the manipulation and display of images. A separate datasheet describes ActiveSDK in detail.

## SPECIFICATION SUMMARY

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>CoaXPress over Fiber Interface:</i> | Two QSFP28 transceiver cages. The <b>FireBird 1xCOF100G-DF</b> frame grabber supports: <ul style="list-style-type: none"><li>• Direct Attach Copper (DAC) cables (up to 1m in length)</li><li>• 100GBASE-SR4 Optical Transceiver Modules – coupled with MTP/MPO connectors and OM3 optical cable; the maximum cable length is 100m.</li><li>• 100GBASE-SR4 Optical Transceiver Modules – coupled with MTP/MPO connectors and OM4 optical cable; the maximum cable length is 150m.</li><li>• 100GBASE-SR Active Optical Cable; the maximum cable length is 100m.</li><li>• 100GBASE-LR Optical Transceiver Modules and a suitable LC-Duplex optical cable; the maximum cable length is &gt;2km.</li><li>• (to be characterized) the 1xCOF100G-DF frame grabber is designed to support one prime 100GBASE-ER ≤4.5W optical transceiver giving up to 40km reach and one SR4 ≤2.5W transceiver for data forwarding).</li></ul> <p>LEDs on the end bracket show the link status according to the CoaXPress over Fiber specification.</p> |
| <i>Buffer Memory:</i>                  | Up to 8GBytes of DDR4 memory is fitted for buffering between the CoaXPress over Fiber interface and the PCI Express bus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <i>PCI Express:</i>                    | The PCI Express 4.0 8-lane interface to supports up to 15.7 Gbytes/sec transfer from <b>FireBird</b> to the PC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <b>I/O:</b> | <p>The following I/O lines are available for triggers, optical shaft encoders, exposure control and general I/O:</p> <ul style="list-style-type: none"><li>• 2 opto-isolated inputs.</li><li>• 3 TTL I/O, 5V logic.</li><li>• 2 RS-422 inputs.</li><li>• 1 RS-422 output.</li></ul> <p>All these I/O signals are provided on a 15-way D-Type connector located on the end bracket.</p> <p>Additionally available:</p> <ul style="list-style-type: none"><li>• 3 TTL I/O, 5V logic.</li><li>• 20 TTL I/O 3V3 Logic, 5V tolerant</li></ul> <p>All these I/O signals are provided on a 40-way header on the <b>FireBird</b> board. This can be coupled to extension end panels for a variety of I/O or custom I/O expansion boards. These signals are all ActiveFlex-IO and are supported by the ActiveFlex-IO control engine for the ultimate in IO flexibility.</p> <p>Please contact your local Active Silicon sales representative for more information.</p> |
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## CONFORMANCE

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                   |    |                                                                                                                       |  |                                                 |     |                  |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------|-----|------------------|
| <b>PCI Express Interface:</b> | <p>PCI Express Bus 4.0 8-lane interface with a max payload size of 512 bytes.</p> <p><b>FireBird 1xCOF100G-DF</b> supports both Short (32-bit) and Long (64-bit) Address packets. It also generates Posted Writes for image data, thus achieving transfer rates up to 13.6 Gbytes/sec, subject to host performance.</p>                                                                                           |    |                                                                                                                       |  |                                                 |     |                  |
| <b>CoaXPress:</b>             | <p><b>FireBird 1xCOF100G-DF</b> conforms to v2.1 of the CoaXPress specification, and CoaXPress over Fiber Bridge Protocol 1.0.</p> <p>Support for CoaXPress v3.0 will be added when the specification is ratified.</p>                                                                                                                                                                                            |    |                                                                                                                       |  |                                                 |     |                  |
| <b>Approvals:</b>             | <table><tr><td>EU</td><td>CE mark for compliance with EMC EN 55032:2015 (class A) and EN 55035:2017 in accordance with EU directive 2014/30/EU.</td></tr><tr><td></td><td>RoHS compliance to RoHS3 directive 2015/863/EU.</td></tr><tr><td>USA</td><td>EMC FCC Class A.</td></tr></table> <p>The printed circuit board is manufactured by UL recognized manufacturers and has a flammability rating of 94V-0.</p> | EU | CE mark for compliance with EMC EN 55032:2015 (class A) and EN 55035:2017 in accordance with EU directive 2014/30/EU. |  | RoHS compliance to RoHS3 directive 2015/863/EU. | USA | EMC FCC Class A. |
| EU                            | CE mark for compliance with EMC EN 55032:2015 (class A) and EN 55035:2017 in accordance with EU directive 2014/30/EU.                                                                                                                                                                                                                                                                                             |    |                                                                                                                       |  |                                                 |     |                  |
|                               | RoHS compliance to RoHS3 directive 2015/863/EU.                                                                                                                                                                                                                                                                                                                                                                   |    |                                                                                                                       |  |                                                 |     |                  |
| USA                           | EMC FCC Class A.                                                                                                                                                                                                                                                                                                                                                                                                  |    |                                                                                                                       |  |                                                 |     |                  |

## PHYSICAL AND ENVIRONMENTAL DETAILS

|                                                                         |                                                    |
|-------------------------------------------------------------------------|----------------------------------------------------|
| <b>Dimensions:</b>                                                      | PCB: 168mm by 69mm.                                |
|                                                                         | Overall: 181mm by 69mm.                            |
| <b>Approximate weight:</b>                                              | 248g.                                              |
| <b>Power consumption (typical):</b>                                     | +3.3 V +12 V                                       |
| (measured while acquiring from QSFP connection with 100GBase-SR optics) | xxmA xxmA power figures will be updated shortly    |
| <b>Storage Temperature:</b>                                             | -15°C to +85°C.                                    |
| <b>Operating Temperature:</b>                                           | 0°C to +60°C (ambient environment).                |
| <b>Relative Humidity:</b>                                               | 10% to 90% non-condensing (operating and storage). |



## ORDERING INFORMATION

| PART NUMBER                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AS-FBD-1XCOF100G-4PE8-DF</b> | <b>FireBird 1xCOF100G-DF</b> CoaXPress over Fiber frame grabber with a QSFP28 interface and PCIe 4.0 (Gen4) 8-lane interface, supporting up to 100 Gbits per second line rate.<br><br>With an additional second QSFP28 connector for data forwarding (Aurora, CoaXPress over Fiber formats) for daisy-chained data-processing applications. |
| <b>AS-FBD-1XCOF100G-4PE8</b>    | <b>FireBird 1xCOF100G</b> CoaXPress over Fiber frame grabber with one QSFP28 interface and PCIe 4.0 (Gen4) 8-lane interface, supporting up to 100 Gbits per second line rate.                                                                                                                                                               |
| <b>AS-ACTIVESDK-WIN</b>         | Software Development Kit for <i>Windows</i> operating system.                                                                                                                                                                                                                                                                               |
| <b>AS-ACTIVESDK-LIN</b>         | Software Development Kit for <i>Linux</i> operating system (x86 and Arm).                                                                                                                                                                                                                                                                   |
| <b>Cable Solutions</b>          | Fiber optic cable solutions are available (please contact sales).                                                                                                                                                                                                                                                                           |

## THE FIREBIRD RANGE

The following products are also available in the range:

- New Generation CoaXPress over Fiber 1xCOF100G and 1xCOF100G-DF.
- High-performance CoaXPress CXP-12 frame grabbers in single, dual, quad and octal configurations.
- High-performance CoaXPress over Fiber 4xCOF-12 (40Gbps) and Dual 4xCOF-12 frame grabbers.
- Camera Link frame grabbers in Base, Medium, Full and 80-bit (Deca) configurations.

## THE ONCILLA RANGE

Oncilla Machine Vision Computers are rugged industrial PCs with integrated frame grabber to provide a full vision solution for CoaXPress systems.

- Oncilla Machine Vision Computer – CoaXPress (4xCXP-3PE8)
- Oncilla Machine Vision Computer – CoaXPress over Fiber (4xCOF-3PE8)
- Oncilla Machine Vision Computer – Camera Link (1xCLD-2PE4)



## CONTACT DETAILS

### Head Office:

Active Silicon Ltd  
1 Waterside Court, Waterside Drive,  
Langley, Berks, SL3 6EZ, UK.

Tel: +44 (0)1753 650600  
Email: [info@activesilicon.com](mailto:info@activesilicon.com)  
Website: [www.activesilicon.com](http://www.activesilicon.com)

### North America Office:

Active Silicon, Inc.  
479 Jumpers Hole Road, Suite 301,  
Severna Park, MD 21146, USA.

Tel: +1 410-696-7642  
Email: [sales.us@activesilicon.com](mailto:sales.us@activesilicon.com)  
Website: [www.activesilicon.com](http://www.activesilicon.com)