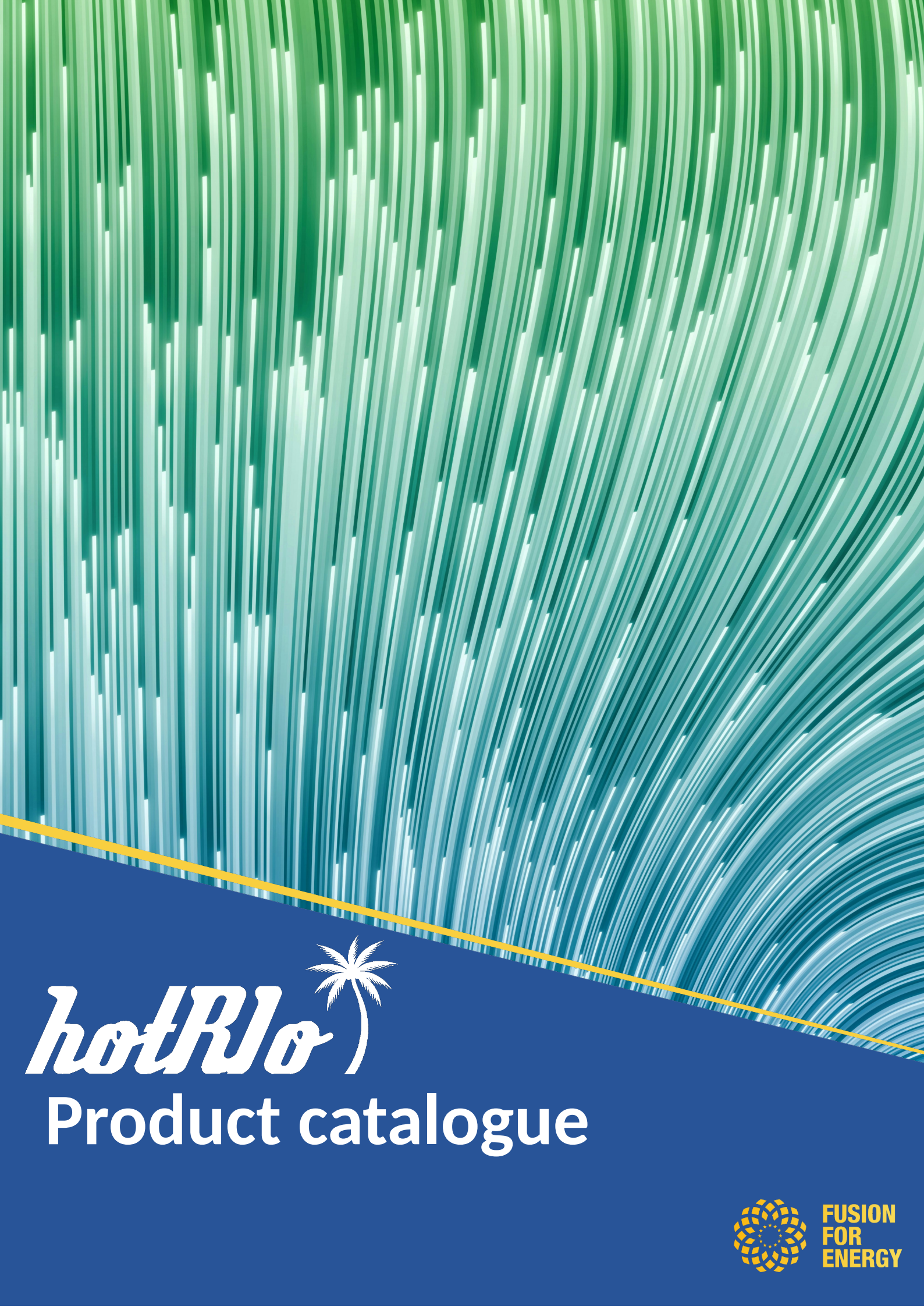


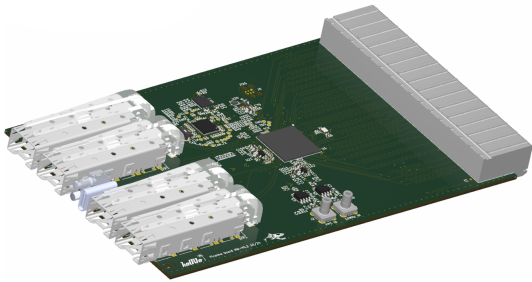


Product catalogue



FUSION
FOR
ENERGY

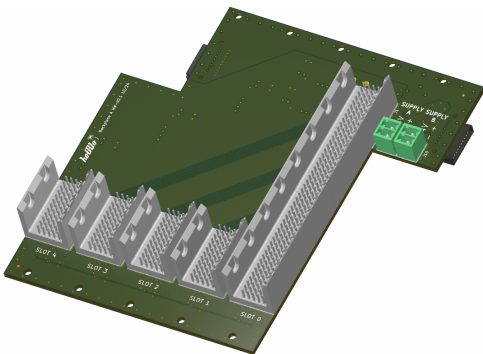
EUROCARD SERIES CONTROLLER BOARDS



F-HEC-PIR

HotRIO Eurocard controller board with 4 SFP fiber optic ports, designed as the main controller hardware for HotRIO Eurocard series systems.

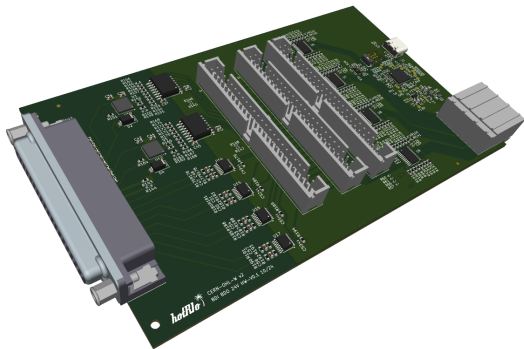
EUROCARD SERIES AGGREGATOR BOARDS



F-HEA-BA4

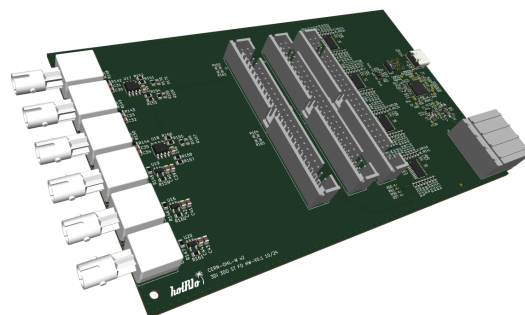
Eurocard backplane for aggregating up to four HotRIO expansion boards and one controller, providing high-speed point-to-point connectivity and integrated CAN bus management.

EUROCARD SERIES EXPANSION BOARDS



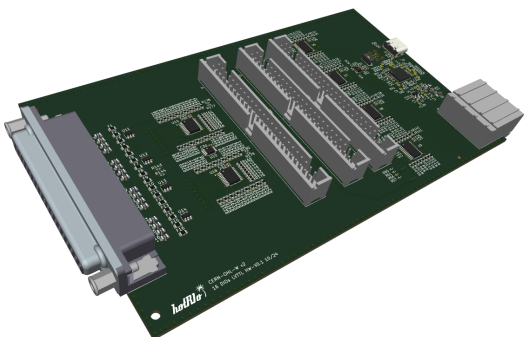
F-HEE-DIO-24V-8I8O

Eurocard expansion board featuring 8 digital inputs and 8 digital outputs, designed for interfacing with 24V nominal copper signals and fully isolated.



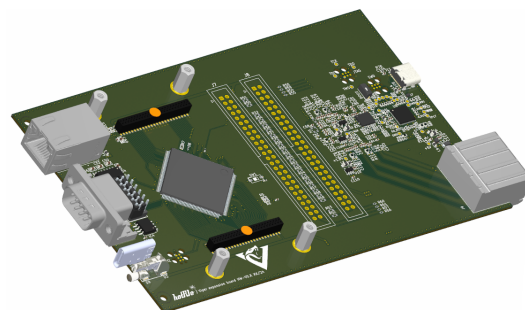
F-HEE-FIO-3I3O

Eurocard-format HotRIO fiber optic I/O expansion board with 3 input and 3 output channels, providing electrical-to-fiber interfacing for controller boards.



F-HEE-DIO-LVTTL-16IO

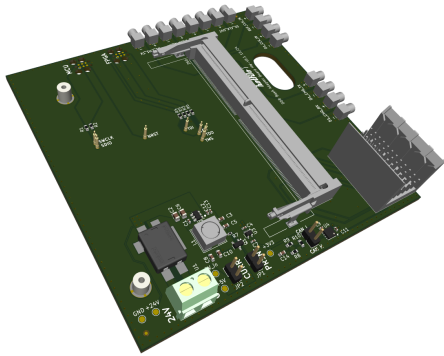
Eurocard expansion board featuring 16 fully isolated LVTTL channels with copper interfaces. Channel direction is configurable in two banks of 8, allowing flexible input/output assignment.



F-HEE-VIP

Eurocard expansion board with STM32H723 coprocessor enabling advanced network protocols and interfaces (Ethernet, RS232/RS-485, USB) for HotRIO Eurocard systems.

EUROCARD SERIES TOOL BOARDS



F-HET-MAC

Development board integrating an F-HSC-DDR Eurocard controller and a single Type A Eurocard chassis slot, enabling prototyping and testing of Eurocard-based solutions.

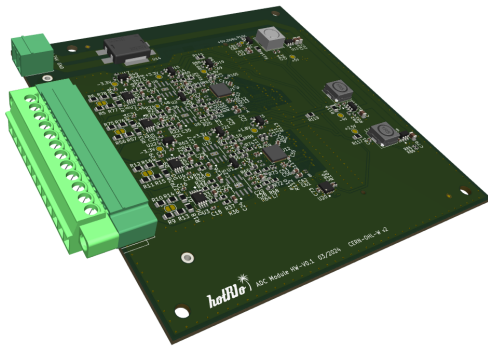
STANDALONE SERIES CONTROLLER BOARDS



F-HSC-DDR

Compact HotRIO controller board with DDR4 SODIMM interface, dual SFP ports, and extensive LVDS connectivity ideal for embedded HotRIO applications and custom electronics.

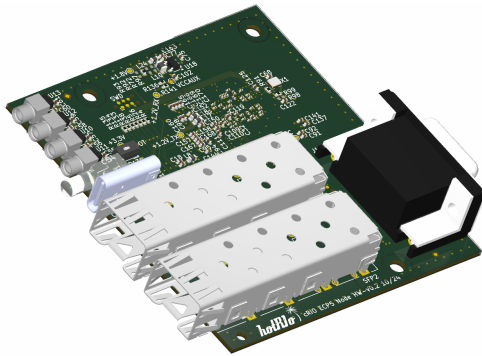
STANDALONE SERIES EXPANSION BOARDS



F-HSE-ADC-DDR

Standalone HotRIO ADC expansion board featuring four high-resolution channels, enabling precise analog signal acquisition with no Eurochassis required.

cRIO SERIES CONTROLLER BOARDS



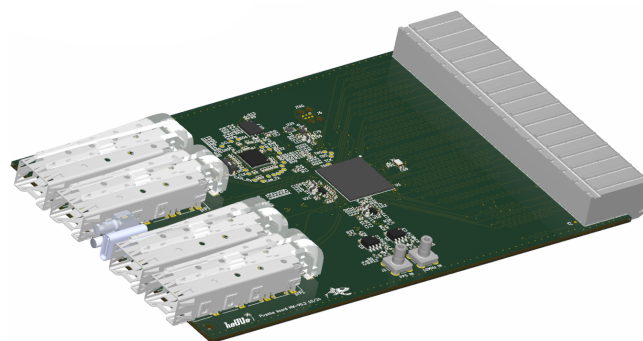
F-HCC-IPA

Protocol gateway board enabling seamless integration between HotRIO networks and National Instruments CompactRIO (cRIO) systems.

F-HEC-PIR

HotRIO Eurocard Controller board

- HotRIO controller board solution for Eurocard-mounted systems.
- HotRIO-node capable hardware.
- Features 4 SFP communication interfaces.
- Dual-role board, may be used as Eurocard-chassis master or expansion-board.



The HotRIO F-HEC-PIR board (codename Piranha) is a HotRIO controller board developed by Fusion for Energy (F4E). It can function either as an independent HotRIO node, communicating with the rest of the system via the HotRIO protocol, or as an expansion board, operating under the control of another HotRIO node.

At its core, the F-HEC-PIR board features a Lattice ECP5 FPGA, which handles all HotRIO protocol communication, manages expansion boards when connected, and performs the necessary signal acquisition and processing. To enable high-speed connectivity, the board includes four 1Gbps SFP fiber optic ports, allowing it to interface with other HotRIO nodes, general-purpose network equipment, or custom communication protocols using standard fiber optic cabling.

Because the board relies solely on high-speed fiber optic communication interfaces, aside from its expansion board connection, it is specifically designed as a communication node. This makes it an ideal solution not only for HotRIO systems but also for external applications requiring high-bandwidth fiber optic data transmission at speeds of up to 1Gbps. For use cases that involve low-speed or non-serialized fiber optic signals, it is recommended to use dedicated fiber optic I/O expansion boards.

Technical Specifications

Form factor	160 x 100 mm Eurocard board
FPGA	LFE5UM5G-85F
Backplane slot	240-pin Type A slot
FPGA interfaces	64 x LVDS pairs, 27 x LVTTTL lines
Communication interfaces	4 x SFP modules (up to 1 Gbps each)
Clock inputs	50 MHz internal oscillator, 10 MHz external clock via SMB
Time sync	1 x external PPS signal via SMB
Power supply	5 V DC through Backplane connector or USB

This board is designed to be used in each HotRIO Eurocard chassis, serving as the chassis master or controller. The mounting solution is optimized to leverage the FPGA on the Piranha board as the main processor of the chassis, handling I/O operations, computation, and communication via the HotRIO protocol, as well as other supported protocols. In this architecture, the Piranha board forms the core of the Eurocard chassis solution.

When used as an expansion board, it enables high-speed I/O via fiber optics through its SFP interfaces, effectively transforming the Piranha base into a high-performance I/O module with onboard processing capabilities.

F-HEA-BA4

HotRIO Eurocard Aggregator board

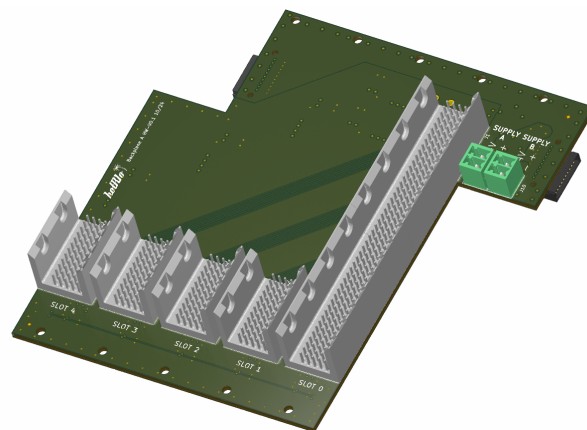
- Aggregates up to four HotRIO expansion boards and one controller in a Eurocard chassis.
- Provides high-speed, low-noise point-to-point LVDS and LVTTL signal connections.
- Integrated CAN bus for board management and configuration with selective slot control.

The F-HEA-BA4 is a HotRIO Eurocard backplane designed to aggregate and interconnect up to four HotRIO expansion boards and one controller board within a Eurocard chassis. Serving as the backbone of the HotRIO Eurocard system, this backplane enables seamless communication, power distribution, and management for all installed boards.

The backplane is equipped with five connectors: four expansion slots and one master (controller) slot. Each expansion slot provides a 60-pin interface supporting 16 LVDS pairs and 6 LVTTL single-ended lines, while the master slot offers a 240-pin interface with 64 LVDS pairs and 24 LVTTL lines. All signal connections between the master and expansion slots are implemented as point-to-point links, ensuring high-speed, low-noise communication across the system.

Integrated into the backplane is a dedicated CAN bus, featuring five transceivers—one per connector. This CAN bus is reserved for board management, status monitoring, and configuration, and is not used for data acquisition. The master slot includes four LVTTL control lines, each connected to the disable pin of a CAN transceiver on the expansion slots. This allows the controller board to selectively inhibit CAN communication on any expansion slot, enabling advanced features such as backplane-wide autonegotiation and coordinated management.

Power distribution is robust and redundant: the backplane accepts 24 V DC input, supplying all connected boards directly. An onboard DC-DC converter provides regulated 5 V power to the slots as needed, eliminating the need for individual board power supplies.



Technical Specifications

Form factor	Eurocard chassis
Number of slots	4 expansion slots, 1 master (controller) slot
Master slot interface	240-pin: 64 LVDS pairs, 24 LVTTL lines
Expansion slot interface	60-pin: 16 LVDS pairs, 6 LVTTL lines per slot
Signal topology	Point-to-point LVDS/LVTTL between master and expansions
CAN bus	Integrated, 5 transceivers (1 per slot), selective control
Power input	24 V DC
Onboard power	DC-DC converter for 5 V supply to slots
Chassis compatibility	Up to 4 backplanes per Eurocard chassis (20 boards total)

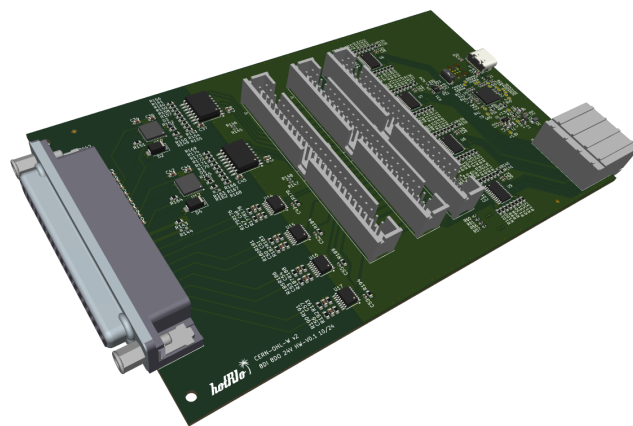
A Eurocard chassis can accommodate up to four F-HEA-BA4 backplanes, supporting a total of 20 HotRIO boards in a single enclosure. While 24 V power is shared across all backplanes, data and CAN bus domains remain isolated within each backplane, ensuring electrical and logical separation between groups of boards.



F-HEE-DIO-24V-8I8O

HotRIO Eurocard Expansion board

- 8 digital inputs and 8 digital outputs, each fully isolated
- Supports 12–36 V (nominal 24 V) copper signal interfacing
- Seamless Eurocard backplane integration with HotRIO controllers
- Galvanic isolation using high-speed digital isolators for robust protection



The F-HEE-DIO-24V-8I8O is a HotRIO Eurocard expansion module designed for seamless integration with a HotRIO controller board via a Eurocard Type A backplane. It features eight digital input channels and eight digital output channels, each with a fixed direction and dedicated function. All channels support copper signal paths operating within a 12–36 V range (nominally 24 V), making the board well-suited for industrial control applications.

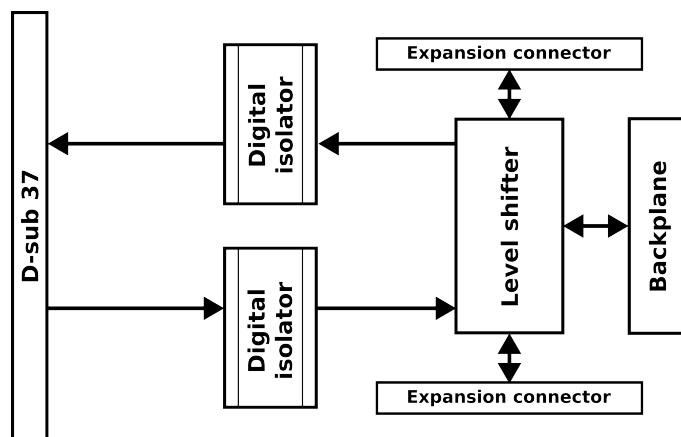
To ensure robust electrical isolation, each input and output channel is fully isolated using high-speed digital isolators. This design enhances safety and reliability by protecting both the controller and connected field devices from transients, ground loops, and electrical noise.

Functionally, the board acts as a transparent signal interface between the front DB-37 connector (field wiring) and the rear backplane connector. The only active components present are for signal conditioning. Signals received from the backplane—originating from the controller board's FPGA—first pass through a voltage level shifter (converting 1.8 V to 3.3 V), followed by digital isolation.

This architecture provides galvanic isolation between the Eurocard chassis and external field devices, ensuring safe and noise-immune communication across system boundaries.

Technical Specifications

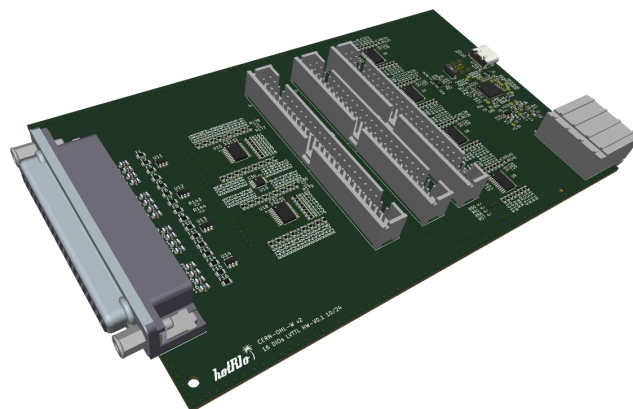
Form factor	100x160 mm (Eurocard)
Mounting	Eurocard chassis
Backplane interface	HotRIO Type A
Digital inputs	8 (12–36 V, nominal 24 V, fully isolated)
Digital outputs	8 (12–36 V, nominal 24 V, fully isolated)
Isolation method	High-speed digital isolators
Input/output connector	DB-37 (front panel)
Power supply	5V DC (from backplane)
Power consumption	TBD W



F-HEE-DIO-LVTTL-16IO

HotRIO Eurocard Expansion board

- 16 LVTTL channels with copper interfaces
- Two banks of 8 channels, each bank independently configurable as input or output
- Supports LVTTL voltage levels for both input and output



The F-HEE-DIO-LVTTL-16IO is a HotRIO Eurocard expansion module designed for flexible digital interfacing with a HotRIO controller board via a Eurocard Type A backplane. It provides sixteen fully isolated LVTTL channels, organized into two banks of eight channels each. Each bank can be independently configured as either input or output, allowing for a mix of input and output channels as required by the application.

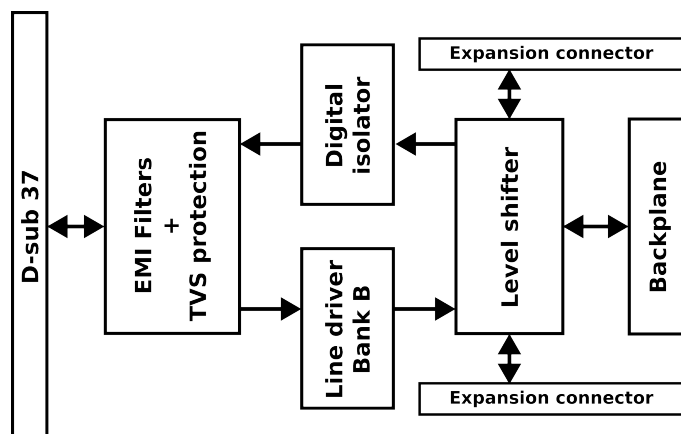
Functionally, the F-HEE-DIO-LVTTL-16IO serves as a robust, transparent digital interface between the field-side DB-37 connector and the system backplane. Signals from the controller board's FPGA enter via the backplane connector and are first conditioned by voltage level shifters (converting 1.8 V logic to 3.3 V LVTTL), followed by line buffers and drivers equipped with Schmitt triggers. This arrangement ensures clean, reliable signal transitions and high noise immunity.

All sixteen channels adhere to the LVTTL voltage standard, supporting low-voltage, high-speed digital signaling. The board's architecture provides full electrical isolation between the backplane and the field wiring, significantly enhancing system safety and reducing susceptibility to electrical noise.

No onboard data processing occurs; instead, the board faithfully transmits signals between the controller and external devices, making it ideal for applications demanding flexible, isolated digital I/O with configurable directionality.

Technical Specifications

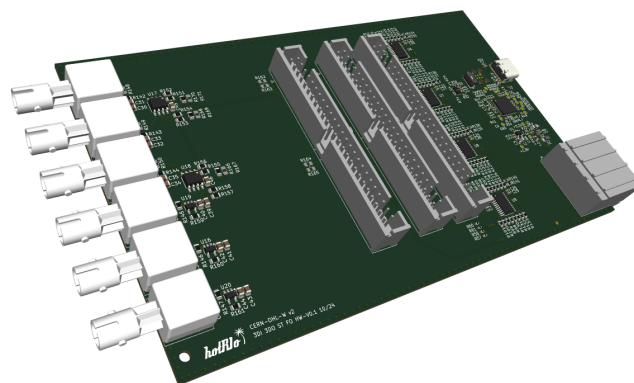
Form factor	100x160 mm (Eurocard)
Mounting	Eurocard chassis
Backplane interface	HotRIO Type A
Digital channels	16 (LVTTL, fully isolated, configurable in 2 banks of 8 as input or output)
Isolation method	Line drivers
Input/output connector	DB-37 (front panel)
Power supply	5V DC (from backplane)
Power consumption	TBD W



F-HEE-FIO-3I3O

HotRIO Eurocard Expansion board

- HotRIO solution for fiber optic interfaces
- Designed for Eurocard mounted solutions
- 3 input and 3 output simultaneous fiber channels
- No onboard processing, only electrical-to-fiber adapter



The HotRIO F-HEE-FIO-3I3O is a fiber optic I/O expansion board in Eurocard format, developed by F4E for the HotRIO system. It is designed to enable any controller board installed in a HotRIO Eurocard chassis to interface with up to three fiber optic input channels and three fiber optic output channels per backplane slot.

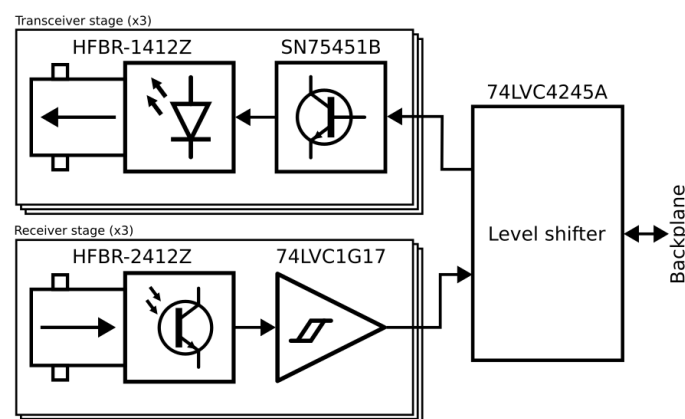
This board integrates three optical transmitters (HFBR-1412Z) and three optical receivers (HFBR-2412Z), supporting ST-type fiber connectors and optimized for use with 850 nm multimode fiber. These components serve as front-end adapters that convert electrical signals to optical signals and vice versa, enabling optical communication lines to be interfaced directly with the system FPGA. All signal processing is performed by the controller board's FPGA—this board solely provides the physical interface for optical connectivity.

The F-HEE-FIO-3I3O connects directly to the HotRIO backplane and is intended for use with controller boards such as the F-HEE-PIR. It does not include any programmable logic devices; instead, it incorporates a management microcontroller used solely for identification and status monitoring via the CAN bus, allowing the board to be properly recognized within the chassis.

Each optical transceiver channel interfaces with the controller board's FPGA via LVTTTL-level digital lines, routed through level shifters to ensure voltage compatibility and signal integrity. Additionally, unused digital pins from the backplane connector are routed—via appropriate level shifting stages—to the footprint of an unpopulated header.

Technical Specifications

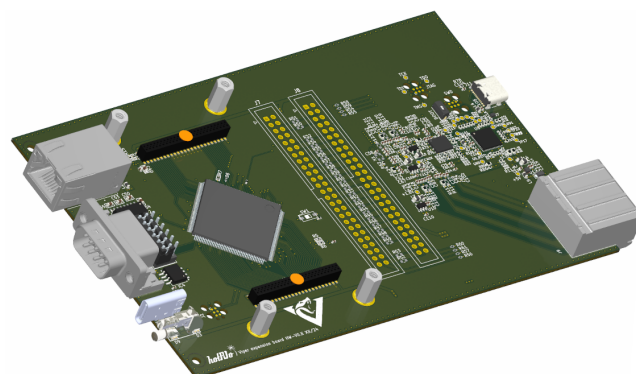
Form factor	100x160 mm (Eurocard)
Mounting	Eurocard chassis
Backplane interface	HotRIO type A
Fiber optic channels	3x input, 3x output
Transceivers	Avago HFBR-1412Z
Receivers	Avago HFBR-2412Z
Optical wavelength	850 nm MMF
Connector type	ST (Straight Tip)
Fiber optic compatibility	50/120 um, 62.5/125 um, 100/140 um or 200 um at 850nm
Optical bandwidth	Up to 160 MBd
Power supply	5V DC (from backplane)
Power consumption	TBD W



F-HEE-VIP

HotRIO Eurocard Expansion board

- HotRIO expansion board solution for complex network and protocol stacks.
- Features an ARM coprocessor to handle complex software tasks.
- Embeds 100T-base Ethernet, RS232/RS-485 and USB host/device interfaces.



The HotRIO F-HEE-VIP is a high-performance Eurocard expansion board designed to significantly extend the communication capabilities of HotRIO controller boards by supporting advanced, high-level network protocols such as TCP/IP, Modbus, OPC UA, and customizable proprietary protocols. This expansion board achieves this by integrating a powerful STM32H723 microcontroller as a dedicated coprocessor, which offloads the complexities of network stack processing from the FPGA, thereby simplifying firmware development and optimizing system performance.

Equipped with a 100 Mbps Fast Ethernet interface that fully supports IEEE 1588 Precision Time Protocol (PTP), the F-HEE-VIP ensures synchronized and deterministic communication critical for industrial automation and other time-sensitive applications. The board also features a versatile serial port configurable for either RS232 or RS485 operation, providing compatibility with legacy systems and robust differential signaling for electrically noisy environments. Additionally, a flexible USB port capable of functioning in host or device mode expands the board's connectivity options, enabling peripheral interfacing, diagnostics, or firmware updates.

The embedded STM32H723 microcontroller runs mature and proven networking software stacks, handling all protocol complexities internally. This approach relieves the controller FPGA from resource-intensive network processing tasks, allowing it to focus exclusively on real-time control and data acquisition.

Technical Specifications

Form factor	160x100 mm Eurocard board
Coprocessor	STM32H723 at up to 550MHz
FPGA	LFE5UM5G-85F
Backplane slot	60-pin type A slot
Communication interfaces	Fast Ethernet, RS-232/RS-485 and USB host/device
Power supply	5V DC

To overcome the microcontroller's inherent limitations in high-speed interface support, the board incorporates a Lattice ECP5 FPGA (non-SERDES variant), which serves as a high-throughput memory bridge between the HotRIO controller FPGA and the microcontroller. This FPGA enables efficient data transfer across the HotRIO backplane and can be programmed to perform pre-processing or data filtering functions, further reducing the computational load on the main controller FPGA and enhancing overall system responsiveness.

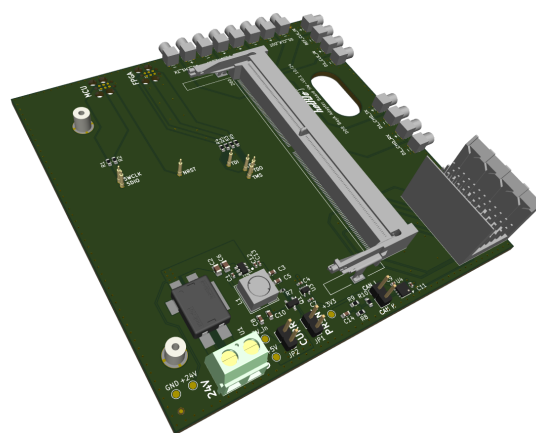
The design also takes full advantage of the STM32H723's extensive I/O capabilities by routing most of its unused GPIO pins to expansion headers on the board. This allows developers to easily interface additional peripherals, sensors, or custom electronics without the need for extensive firmware or hardware development.



F-HET-MAC

HotRIO Eurocard Tool board

- Integrates SO-DIMM DDR4 slot for F-HSC-DDR Eurocard controller module
- Provides a single Eurocard Type A slot for expansion board development and testing
- Direct signal routing between DDR module and Type A slot
- MMCX connectors for probing LVDS pairs from the DDR module



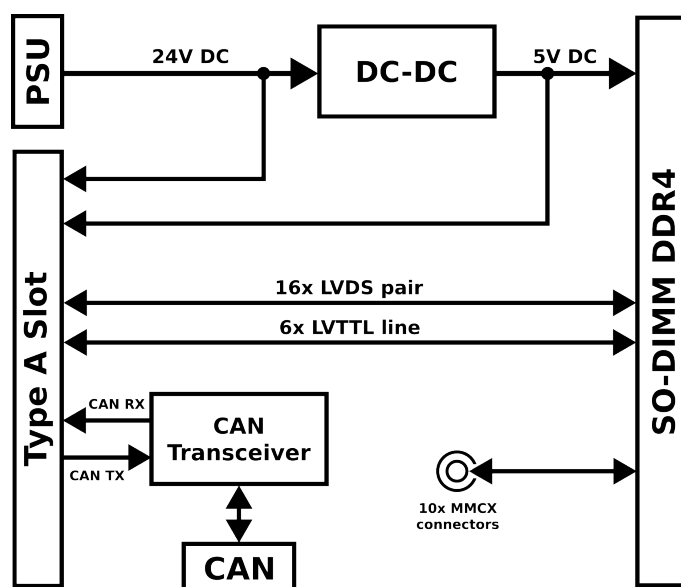
The F-HET-MAC (Macaco) is a HotRIO Eurocard tooling board designed to facilitate firmware development and testing for HotRIO-based products. It integrates a SO-DIMM DDR4 slot for connecting an F-HSC-DDR Eurocard controller module and provides a single Eurocard Type A slot, simulating a minimal Eurocard chassis environment. This allows developers to prototype and test Eurocard expansion boards without assembling a full chassis, streamlining the development process.

The board features direct signal routing between the DDR4 controller module and the Type A slot, with no onboard FPGA or programmable logic. Additional MMCX connectors are provided for probing selected LVDS pairs from the DDR module, supporting advanced debugging and timing analysis. The board also includes a CAN transceiver for the expansion slot, accessible via a dedicated connector for external monitoring. Power is supplied via a dedicated 24V input connector; the board cannot be powered through the backplane.

The DDR module installed in the SO-DIMM DDR4 slot is designed to serve as a direct substitute for a traditional HotRIO controller board within a Eurocard chassis. Instead of using a standard controller, this board allows the DDR module to directly interface with and control an expansion board inserted into the Eurocard Type A backplane slot. This configuration enables streamlined signal routing and control, eliminating the need for onboard FPGA or programmable logic while maintaining compatibility with existing Eurocard-based systems.

Technical Specifications

Form factor	100x100 mm
Controller interface	SO-DIMM DDR4 slot (for F-HSC-DDR module)
Expansion slot	1 x Eurocard Type A slot
Signal probing	MMCX connectors for selected LVDS pairs
CAN interface	CAN transceiver for expansion slot, accessible via dedicated connector
Power supply	24V DC (via dedicated supply connector)
Power from backplane	Not supported



F-HSC-DDR

HotRIO Standalone Controller board

- Compact form factor for custom applications.
- Recommended solution to embed HotRIO-protocol into custom designs.
- Standard DDR4 connector interface the FPGA.
- Two individual SFP interfaces.



The HotRIO DDR Module is a compact HotRIO controller board designed for seamless integration into custom electronics or standalone applications. Supplied in a small form factor, it features a DDR4 SODIMM connector, allowing easy interfacing with bespoke hardware or embedded systems.

At its core, the board is built around a Lattice ECP5 LFE5UM5G-85F FPGA, complemented by a dedicated manager microcontroller for board management and configuration. Two SFP ports provide high-speed optical or copper connectivity, enabling the board to operate as either a master or slave on a HotRIO bus, as well as supporting UDP communication.

This board is functionally analogous to the F-HEC-PIR board (codename Piranha), but is specifically tailored for embedded applications where space is limited or where HotRIO capabilities must be added to an existing system without the need for a bulky Eurocard chassis. The HotRIO DDR Module exposes all LVDS pair outputs (both clock-capable and regular pairs) and several LVTTL pins via the DDR connector, making it ideal for hardware developers seeking a flexible and compact HotRIO solution.

By leveraging the DDR4 SODIMM connector, the HotRIO DDR Module enables straightforward integration of custom hardware into the HotRIO ecosystem. Designers can develop bespoke carrier boards or daughtercards that interface directly with the module's high-speed LVDS pairs and LVTTL signals, allowing for rapid prototyping and deployment of application-specific solutions.

Technical Specifications

Form factor	66 x 73 mm
FPGA	LFE5UM5G-85F
Interface connector	SO-DIMM DDR4
FPGA interfaces	64 x LVDS pairs,
Communication interfaces	2 x SFP modules (up to 1 Gbps each)
Clock inputs	50 MHz internal oscillator, 10 MHz external clock via SMB
Time sync	1 x external PPS signal via SMB
Power supply	5 V DC through USB or SO-DIMM DDR4 connector

Within a HotRIO system, the DDR Module can function as either a master or slave node. As a master, it allows developers to control and communicate with a network of HotRIO-capable devices, integrating remote I/O seamlessly into their system. Alternatively, when configured as a slave, the board acts as a data provider to an existing HotRIO infrastructure.

This flexibility enables developers to embed custom electronics into the HotRIO ecosystem—either as data producers or as gateways for HotRIO protocol integration. For example, if an existing electronic system requires direct access to multiple HotRIO devices, the DDR Module can be interfaced via a standard SO-DIMM connector, much like a network interface card (NIC). This approach allows rapid expansion of system capabilities, providing straightforward connectivity to HotRIO devices without the need for bulky hardware or complex integration steps.



F-HSE-ADC-DDR

HotRIO Standalone Expansion board

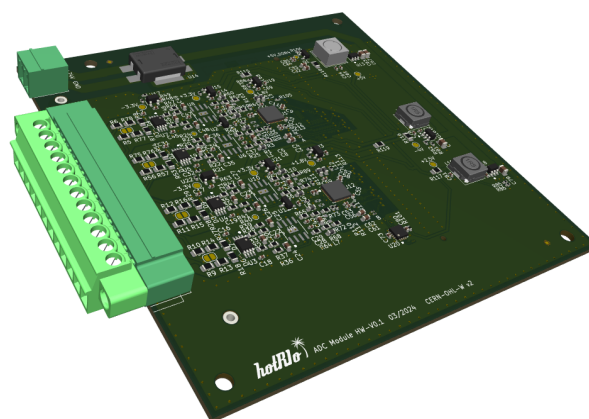
- Four independent 20-bit ADC channels, each supporting up to 2 MHz sampling rate
- Direct interface to HotRIO F-HSC-DDR controller board
- Standalone operation without additional infrastructure
- High-precision analog-to-digital conversion for demanding applications

The HotRIO F-HSE-ADC-DDR is a standalone expansion board with two ADC ICs, each providing two independent channels. Each channel supports sampling rates up to 2 MHz at 20-bit resolution.

The board is designed for integration with the HotRIO F-HSC-DDR standalone controller for analog-to-digital conversion. This solution is ideal for use-cases where standalone ADCs must be provided without any other equipment, allowing deployment of a single HotRIO-compliant node with the ADCs, without the need for additional infrastructure such as a Eurocard chassis.

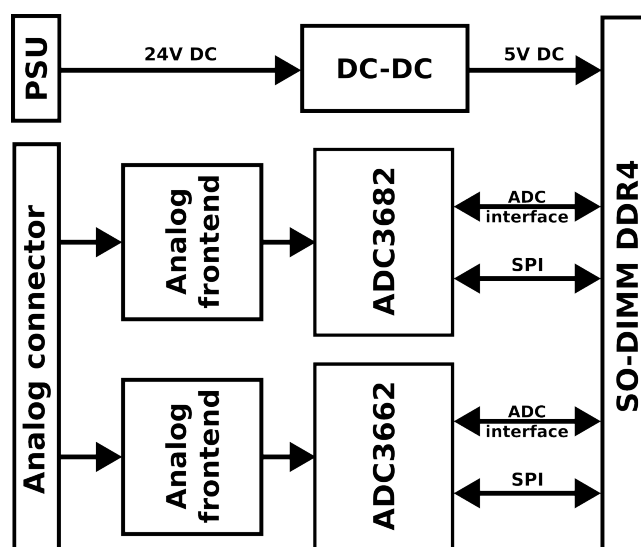
The F-HSE-ADC-DDR board is intended for applications where analog signals must be digitized in close proximity to their source, such as in remote or distributed environments. In scenarios where sensors are deployed in the field, this board enables local analog-to-digital conversion, thereby minimizing the need for extended analog cabling, which can be prone to noise and signal degradation. By performing digitization at the source, only digital data needs to be transmitted, significantly reducing susceptibility to interference.

Unlike the full HotRIO eurocard chassis, which is large and includes a wide range of I/O options, this board is compact and focused. It provides the essential HotRIO functionality for ADC applications without the bulk and complexity of the full chassis, making it ideal for installations where space is limited and only ADC capability is required.



Technical Specifications

Form factor	100 x 100 mm
Interface connector	SO-DIMM DDR4
ADCs	1x ADC3662, 1x ADC3682
Number of channels	4 (2 per ADC)
Sampling rate	Up to 2 MHz per channel
Resolution	Up to 16-bit (ADC3662), up to 20-bit with decimation (ADC3682)
Filters	Digital decimation and FIR filters (ADC3682)
ADC input voltage	±1.6 V
ADC connector	Phoenix Contact MC 1,5/12-GF-3,5
Power supply	24 V DC connector or 5 V DC via SO-DIMM connector

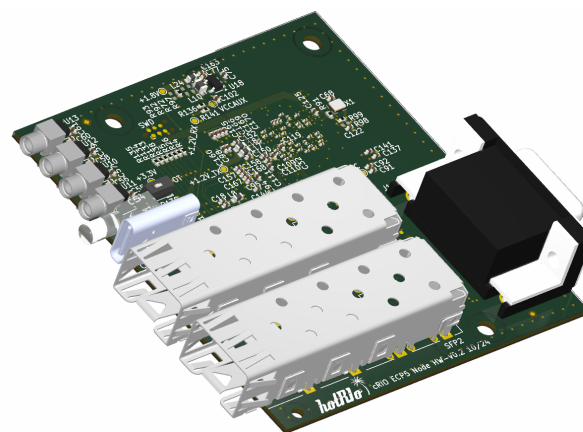




F-HCC-IPA

HotRIO cRIO Controller board

- Compatible controller for NI CompactRIO (cRIO) platforms
- Enables HotRIO-to-cRIO integration as a protocol gateway
- Two SFP ports for high-speed data transfer
- Supports master and slave HotRIO modes



The HotRIO F-HCC-IPA board (codename Ipanema) is a controller board developed by Fusion for Energy (F4E) for seamless integration with National Instruments CompactRIO (cRIO) systems. Designed as an interface between the HotRIO protocol and the cRIO environment, the board operates as a cRIO module, enabling reliable data exchange between HotRIO-based devices and cRIO platforms. This solution allows users to access HotRIO data within NI cRIO systems with minimal modifications and investment, facilitating efficient integration of HotRIO infrastructure into existing cRIO-based applications.

At the heart of the board is a Lattice Semiconductor LFE5UM5G-85F FPGA, which provides robust communication and data-processing capabilities. This FPGA manages the HotRIO protocol, operating as either a master or slave within a HotRIO system, and facilitates seamless data transfer between the SFP communication interfaces and the cRIO interface. By leveraging this architecture, developers can efficiently bridge data between HotRIO-based devices and NI cRIO systems, enabling integration with minimal hardware changes.

Serving as a HotRIO system master, the board allows users to extend the functionality of existing NI cRIO setups by incorporating HotRIO's high-speed, fiber-optic communication—ideal for applications requiring electrical isolation or long-distance data transmission. The board can be installed directly into a cRIO chassis, acting as a protocol gateway that enables cRIO-based applications to interact with a network of HotRIO-capable devices, thus expanding system flexibility and scalability.

Technical Specifications

Form factor	cRIO module (66 x 73 mm)
FPGA	LFE5UM5G-85F
FPGA interfaces	cRIO-compatible interface (D-sub 15 connector)
Communication interfaces	2 x SFP modules (up to 1 Gbps each)
Clocks	50 MHz internal oscillator, 2x MMCX clock inputs, 2x MMCX clock outputs
Power supply	5 V DC through cRIO connector or USB

It is important to note that the F-HCC-IPA board does not provide direct I/O capabilities or support for direct connection to HotRIO expansion boards. Its primary function is to serve as a protocol gateway, facilitating data exchange exclusively between the SFP communication interfaces and the cRIO interface. All data processed by this board must pass through these interfaces; the board itself does not generate or consume user I/O data beyond protocol conversion and data handling between HotRIO and cRIO systems.

This design choice ensures a clear separation of roles within the HotRIO ecosystem, with the F-HCC-IPA board dedicated to protocol translation and system integration tasks. Users seeking direct I/O expansion or additional peripheral connectivity should consider pairing the F-HCC-IPA with other HotRIO modules specifically designed for those purposes. By focusing on reliable protocol bridging, the F-HCC-IPA simplifies the integration of HotRIO networks into cRIO environments, supporting robust and scalable system architectures.

