DEVICE SPECIFICATIONS

NI 6589

1 Gbps, 20 Channel, LVDS Digital I/O Adapter Module

This document lists specifications for the NI 6589 adapter module. Pair these specifications with the specifications listed in your FlexRIO FPGA module specifications document or your Controller for FlexRIO specifications document.

⚠ **Caution** The protection provided by the NI 6589 can be impaired if it is used in a manner not described in this document.

⚠ **Caution** To avoid permanent damage to the NI 6589, disconnect all signals connected to the NI 6589 before powering down the module, and only connect signals after the module has been powered on by the FlexRIO FPGA module or the Controller for FlexRIO.

📝 **Note** All numeric specifications are typical unless otherwise noted. All graphs illustrate the performance of a representative module.

⚠ **Caution** To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Specifications are subject to change without notice. For the most recent device specifications, visit *ni.com/manuals*.

Contents

NATIONAL INSTRUMENTS

FlexRIO Documentation

Table 1. FlexRIO Documentation Locations and Descriptions

Document	Location	Description
Getting started guide for your FlexRIO FPGA module or Controller for FlexRIO	Available from the Start menu and at *ni.com/manuals*.	Contains installation instructions for your FlexRIO system.
Specifications document for your FlexRIO FPGA module or Controller for FlexRIO	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your FlexRIO FPGA module or Controller for FlexRIO.
Getting started guide for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains signal information, examples, and CLIP details for your adapter module.
Specifications document for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your adapter module.
LabVIEW FPGA Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about the basic functionality of the LabVIEW FPGA Module.
Real-Time Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about real-time programming concepts, step-by-step instructions for using LabVIEW with the Real-Time Module, reference information about Real-Time Module VIs and functions, and information about LabVIEW features on real-time operating systems.

Table 1. FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
FlexRIO Help	Available from the Start menu and at *ni.com/manuals*.	Contains information about the FPGA module front panel connectors and I/O, controller for FlexRIO front panel connectors and I/O, programming instructions, and adapter module component-level IP (CLIP).
FlexRIO Adapter Module Development Kit User Manual	Available from the Start menu at **Start**»**All Programs**»**National Instruments**»**NI FlexRIO**»**NI FlexRIO Adapter Module Development Kit**»**Documentation**.	Contains information about how to create custom adapter modules for use with FlexRIO FPGA modules.
LabVIEW Examples	Available in NI Example Finder. In LabVIEW, click **Help**»**Find Examples**»**Hardware Input and Output**»**FlexRIO**.	Contains examples of how to run FPGA VIs and Host VIs on your device.
IPNet	Located at *ni.com/ipnet*.	Contains LabVIEW FPGA functions and intellectual property to share.
FlexRIO product page	Located at *ni.com/flexrio*.	Contains product information and data sheets for FlexRIO devices.

Channel Specifications

Number of connectors	2 SMA (PFI 0 and CLOCK IN) and 1 InfiniBand (Digital Data & Control, or DDC)
Number of digital I/O channels	23 total on DDC (16 LVDS data, 4 LVDS PFI, and 3 single-ended PFI)
Direction control of digital I/O channels	Per channel
Number of clock input terminals	2, CLOCK IN (SMA) and STROBE (DDC)
Number of clock output terminals	1, DDC CLK OUT

Single-Ended Channel (PFI, CLOCK IN)

Maximum data rate	100 Mb/s
Minimum required time to tristate	6 ns

Generation (PFI, CLOCK IN)

Table 2. Generation Voltage Levels (100 µA load)

Generation Voltage Levels	Low Voltage Levels		High Voltage Levels	
	Characteristic	Maximum	Characteristic	Minimum
3.3 V	0 V	200 mV	3.3 V	3.1 V

Output impedance	50 Ω, nominal
Maximum per channel DC drive strength	±18 mA
Output protection	Single-ended I/O can indefinitely sustain a short to any voltage between -0.5 V and 3.8 V with a current not exceeding 30 mA.

Acquisition (PFI, CLOCK IN)

Acquisition Voltage Levels	Low Voltage Threshold	High Voltage Theshold
	Minimum	Maximum
3.3 V	0.8 V	2.0 V

Input impedance	50 kΩ, nominal
Input protection	-0.5 V to 4.6 V

📝 **Note** Internal diode clamps may begin conducting outside the 0 V to 3.3 V range.

LVDS Channels (DDC)

Part number of LVDS buffers	SN65LVDT100 (Texas Instruments)
Power-up state	Data direction set to input, 110 Ω differential impedance with 1.62 kΩ to 3.3 V on the inverted pins, and 1.62 kΩ on the noninverted pins.

Maximum data rate	1 Gb/s (per channel)
Minimum required direction change latency	500 μs

> **Note** For more information about using 16 channels in parallel, refer to the Xilinx application note available at the following website: `www.xilinx.com/support/documentation/application_notes/xapp860.pdf`.

Generation (Data, DDC Clock Out)

Table 3. Generation Voltage Levels (100 Ω total load)

Offset Voltage			Differential Voltage		
Minimum	**Typical**	**Maximum**	**Minimum**	**Typical**	**Maximum**
1.125 V	1.2 V	1.375 V	247 mV	340 mV	454 mV

Output protection	Each channel can indefinitely sustain a short to any voltage between 0 V and 4.3 V.

> **Note** Internal diode clamps may begin conducting outside the 0 V and 3.3 V range.

Acquisition (Data, STROBE)

Table 4. Acquisition Voltage Levels

Magnitude of Differential Input Voltage		Input Voltage	
Minimum	**Maximum**	**Minimum**	**Maximum**
0.1 V	0.8 V	0 V	4 V

> **Note** Input Voltage values apply to any combination of common-mode or input signals.

Input impedance	110 Ω differential, nominal
Input protection	Each channel can indefinitely sustain a short to any voltage between 0 V and 4.3 V.

> **Note** Internal diode clamps may begin conducting outside the 0 V to 3.3 V range.

Clocking

Part number of crosspoint switch	DS90CP04 (National Semiconductor)
Part number of adapter module onboard clock	Si570, Grade B (Silicon Labs)
Frequency range of adapter module onboard clock	10 MHz to 810 MHz
Resolution of adapter onboard clock	0.1 Hz, maximum by design
Duty cycle of adapter module onboard clock	45% to 55%

Note For more specifications and information about the Si570 clock chip, refer to the Si570 datasheet available at the Silicon Labs website, `www.silabs.com`.

EEPROM Map

Byte Address	Size (Bytes)	Field Name
0x0	2	Vendor ID
0x2	2	Product ID
0x4	4	Serial Number
0x8	116	Reserved
0x7C	132	User Space

Caution Only write to **User Space**. Writing to any other byte address may cause the NI 6589 to stop functioning.

Power

+12 V	210 mA, 2.51 W, typical
+3.3 V	770 mA, 2.53 W, typical
V_{ccoA}	290 mA, 710 mW, typical
V_{ccoB}	0 mA

Physical

Dimensions	12.9 × 2.0 × 12.5 cm (5.1 × 0.8 × 4.9 in.)
Weight	302 g (10.6 oz)
Front Panel Connectors	2 SMA and one 73-pin InfiniBand connector

Environment

Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C[1] (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Storage Environment

Ambient temperature range	-20 °C to 70 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range	5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

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[1] For PXI/PXI Express chassis configurations that group NI FlexRIO adapter modules in three or more contiguous slots, National Instruments recommends limiting the ambient temperature to less than 50 °C.

Random vibration

Operating	5 Hz to 500 Hz, 0.3 g_{rms}
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Compliance and Certifications

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

> **Note** For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

> **Note** In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

> **Note** Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

> **Note** For EMC declarations, certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance $\large C\,\large\epsilon$

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit *ni.com/certification*, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at *ni.com/environment*. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

电子信息产品污染控制管理办法（中国 **RoHS**）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令（RoHS）。关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。（For information about China RoHS compliance, go to ni.com/environment/rohs_china.）