APEX WAVES NI 6587 High-Speed Digital I-O Adapter Module User Manual

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INFORMATION

The NI-6587 is an adapter module that provides high-speed digital input and output capabilities to the NI FlexRIO FPGA. The module has multiple channels that support single-ended and LVDS signals. The specifications listed in this document are typical unless otherwise noted.

This document lists specifications for the NI 6587 adapter module. Pair these specifications with the specifications listed in your NI FlexRIO FPGA specifications document. For more information about safety and electromagnetic compatibility, refer to the Read Me **First:** Safety and Electromagnetic Compatibility document included in your hardware kit or available at **ni.com/manuals**.

- **Caution** To avoid permanent damage to the NI 6587, disconnect all signals connected to the NI 6587 before powering down the module, and only connect signals after the module has been powered on by the NI FlexRIO FPGA module.
- **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**.

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**..... 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 1. 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**..... ±18 mA strength
- **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

- **Acquisition** (PFI, CLOCK IN)
- **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 buf**.....fers 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**..... 500 µs latency

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 2. 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 3. 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**……. Si570, Grade B (Silicon Labs) onboard clock
- **Frequency range of adapter module**……. 10 MHz to 810 MHz onboard clock
- **Resolution of adapter onboard clock**…….0.1 Hz, maximum by design
- **Duty cycle of adapter module**……. 45% to 55% onboard clock

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

Byte Address	Size (Bytes)	Field Name
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 6587 to stop functioning.

Power

- **+12 V**…….210 mA, 2.51 W, typical
- **+3.3 V**…….770 mA, 2.53 W, typical
- **VccoA**…….290 mA, 710 mW, typical
- **VccoB**…….0 mA

Physical
Note Clean the device with a soft, non-metallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

- **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 °C1 (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.)

Random vibration

- **Operating**……..5 Hz to 500 Hz, 0.3 grms
- **Nonoperating**……..5 Hz to 500 Hz, 2.4 grms (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
This product meets the essential requirements of applicable European Directives, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

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 products must be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit **ni.com/environment/weee.htm**.

COMPREHENSIVE SERVICES
We offer competitive repair and calibration services, as well as easily accessible documentation and free downloadable resources.

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Documents / Resources

	APEX WAVES NI 6587 High-Speed Digital I-O Adapter Module [pdf] User Manual NI 6587 High-Speed Digital I-O Adapter Module, NI 6587, High-Speed Digital I-O Adapter Module, Digital I-O Adapter Module, I-O Adapter Module, Adapter Module, Module

References

- Engineer Ambitiously - NI
- Product Certifications - NI
- Engineering a Healthy Planet - NI
- Managing Critical Substances - NI
- Product Take-Back Program and Recycling - NI
- Trade Compliance - NI
- Product Documentation - NI
- National Instruments Patents - NI
- NI Trademarks and Logo Guidelines - NI
- Product Certifications - NI
- Engineering a Healthy Planet - NI
- Product Take-Back Program and Recycling - NI
- Product Documentation - NI
- Silicon Labs
- Adaptive Computing Support
- NI-6587 National Instruments Digital I/O Adapter Module for FlexRIO | Apex Waves