SPECIFICATIONS

# NI PCIe-7820R

## R Series Digital I/O Module for PCI Express, 128 DIO, Kintex-7 160T FPGA

This document contains the specifications for the PCIe-7820R. Specifications are typical at 25 °C unless otherwise noted.

**Caution** Using the PCIe-7820R in a manner not described in this document may impair the protection the PCIe-7820R provides.

## Digital I/O

| | |
|---|---|
| Number of connectors | 4 |
| Number of channels per connector | 32 |
| Maximum frequency | 80 MHz |
| Compatibility | LVTTL, LVCMOS |
| Logic family | Software-selectable |
| Default software setting | 3.3 V |

**Table 1.** Digital Input Logic Levels

| Logic Family | Input Low Voltage ($V_{IL}$) | | Input High Voltage ($V_{IH}$) | |
|---|---|---|---|---|
| | Minimum | Maximum | Minimum | Maximum |
| 1.2 V | -0.3 V | 0.40 V | 0.84 V | 1.5 V |
| 1.5 V | -0.3 V | 0.50 V | 1.05 V | 1.8 V |
| 1.8 V | -0.3 V | 0.60 V | 1.25 V | 2.1 V |
| 2.5 V | -0.3 V | 0.70 V | 1.70 V | 2.8 V |
| 3.3 V | -0.3 V | 0.80 V | 2.00 V | 3.6 V |

| | |
|---|---|
| Input leakage current | ±15 µA maximum |
| Input impedance | 50 kΩ typical, pull-down |

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**Table 2.** Digital Output Logic Levels

| Logic Family | Current | Output Low Voltage ($V_{OL}$) Maximum | Output High Voltage ($V_{OH}$) Minimum |
|---|---|---|---|
| 1.2 V | 100 µA | 0.20 V | 1.00 V |
| 1.5 V | 100 µA | 0.20 V | 1.25 V |
| 1.8 V | 100 µA | 0.20 V | 1.54 V |
| 2.5 V | 100 µA | 0.20 V | 2.22 V |
| 3.3 V | 100 µA | 0.20 V | 3.00 V |
| | 4 mA | 0.40 V | 2.40 V |

| | |
|---|---|
| Maximum DC output current per channel | |
| Source | 4.0 mA |
| Sink | 4.0 mA |
| Output impedance | 50 Ω |
| Power-on state[1] | Programmable, by line |
| Protection[2] | ±20 V, single line |
| Digital I/O voltage selection | Programmable, per connector, and defined at compilation (not run-time configurable) |
| Direction control of digital I/O channels | Per channel |
| Minimum I/O pulse width | 6.25 ns |
| Minimum sampling period | 5 ns |

# External Clock

| | |
|---|---|
| Direction | Input into device |
| Maximum input leakage | ±15 µA |
| Characteristic impedance | 50 Ω |
| Power-on state | Tristated |

[1] Tristate by default

[2] NI recommends minimizing long-term over/under-voltage exposure to the Digital I/O. Prolonged DC voltage stresses that violate the maximum and minimum digital input voltage ratings may reduce device longevity. Over/under-voltage stresses are considered prolonged if the cumulative time in the abnormal condition exceeds 1 year.

| | |
|---|---|
| Minimum input | Inherited from programmed digital voltage selection per connector |
| Maximum input | Inherited from programmed digital voltage selection per connector |
| Logic level | Inherited from programmed digital voltage selection per connector |
| Maximum input frequency | 80 MHz |

# Reconfigurable FPGA

| | |
|---|---|
| FPGA type | Kintex-7 160T |
| Number of flip-flops | 202,800 |
| Number of LUTs | 101,400 |
| Embedded Block RAM | 11,700 kbits |
| Number of DSP48 slices | 600 |
| Timebase | 40 MHz, 80 MHz, 120 MHz, 160 MHz, or 200 MHz |
| Default timebase | 40 MHz |
| Timebase accuracy | ±100 ppm, 250 ps peak-to-peak jitter |
| Data transfers | DMA, interrupts, programmed I/O |

# Synchronization Resources

| | |
|---|---|
| Input/output source | RTSI<0..7> |

# Bus Interface

| | |
|---|---|
| Form factor | x4 PCI Express, specification v1.0 compliant |
| Slot compatibility | x4, x8, and x16 PCI Express slots |
| Data transfers | DMA, interrupts, programmed I/O |
| Number of DMA channels | 16 |

# Maximum Power Requirements

Power requirements are dependent on the digital output loads and configuration of the LabVIEW FPGA VI used in your application.

| | |
|---|---|
| +3.3 V | 3 A |
| +12 V | 2 A |

# Physical Characteristics

**Note** If you need to clean the device, wipe it with a dry, clean towel.

| | |
|---|---|
| Dimensions | 18.1 cm × 12.6 cm × 2.2 cm<br>(7.1 in. × 5.0 in. × 0.9 in.) |
| Weight | 158 g (5.57 oz) |
| I/O connectors | 4 × 68-pin VHDCI |

# Maximum Working Voltage

Maximum working voltage refers to the signal voltage plus the common-mode voltage.

| | |
|---|---|
| Channel-to-earth | ±12 V, Measurement Category I |
| Channel-to-channel | ±24 V, Measurement Category I |

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

**Caution** Do not use the PCIe-7820R for connection to signals in Measurement Categories II, III, or IV.

**Note** Measurement Categories CAT I and CAT O (Other) are equivalent. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

# 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 C22.2 No. 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
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: 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 and certifications, and additional information, refer to the *Online Product Certification* section.

# CE Compliance CE

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

Refer to the manual for the chassis you are using for more information about meeting these specifications.

| | |
|---|---|
| Operating temperature (IEC 60068-2-1, IEC 60068-2-2) | 0 °C to 40 °C |
| Storage temperature (IEC 60068-2-1, IEC 60068-2-2) | - 20 °C to 70 °C |
| Operating humidity (IEC 60068-2-56) | 10% RH to 90% RH, noncondensing |
| Storage humidity (IEC 60068-2-56) | 5% RH to 95% RH, noncondensing |
| Pollution Degree | 2 |
| Maximum altitude | 2,000 m |

Indoor use only.

# 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.)

# Worldwide Support and Services

The NI website is your complete resource for technical support. At *ni.com/support*, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit *ni.com/services* for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting *ni.com/certification*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at *ni.com/support* or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the *Worldwide Offices* section of *ni.com/niglobal* to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

376829A-02 Apr17