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NI PCI-7813R

R Series Digital RIO With Virtex-II 3M Gate FPGA

- 160 digital lines configurable as inputs, outputs, counters, or custom logic at rates up to 40 MHz
- Virtex-II 3M gate FPGA programmable with the LabVIEW FPGA Module
- User-defined triggering, timing, and onboard decision making with 25 ns resolution
- High-speed digital pattern generation with 196 KB of onboard memory and DMA data streaming
- Examples for I2C, SPI, S/PDIF, RS232, and other digital communication protocols



Overview

The NI PCI-7813R digital reconfigurable I/O (RIO) board features a user-programmable FPGA chip for onboard processing and flexible I/O operation. You configure all functionality using NI LabVIEW graphical block diagrams and the LabVIEW FPGA Module. Your block diagram executes in the hardware, giving you direct, immediate control over all I/O signals to deliver high-performance capabilities such as the following:

-Complete control over the synchronization and timing of all signals and operations

-Custom onboard decision making that executes with hardware-timed speed and reliability

-160 digital lines individually configurable as inputs, outputs, counter/timers, PWM, flexible encoder inputs, or specialized communication protocols

With R Series digital RIO devices and LabVIEW FPGA, you can configure user-defined hardware for a wide variety of applications, such as custom digital DAQ, high-speed waveform generation, sensor simulation, hardware-in-the-loop (HIL) test, custom digital communications protocols, bit error rate testing, and other applications that require precise timing and control.

Recommended Accessories

The NI SHC68-68-RDIO cable is designed and shielded specifically for the digital I/O (DIO) connectors on R Series digital RIO devices for improved signal integrity when connected to terminal blocks or the NI 9151 R Series expansion chassis.

Specifications

Specifications Documents

- Specifications
- Data Sheet

Specifications Summary

General

Product Family	Digital I / O
Measurement Type	Digital
Form Factor	PCI
Operating System / Target	FPGA Real-Time Windows
RoHS Compliant	No
Analog Input	
Single-Ended Channels	0
Differential Channels	0
Analog Output	
Number of Channels	0
Digital I / O	
Bidirectional Channels	160
Input-Only Channels	0
Output-Only Channels	0
Timing	Hardware
Maximum Clock Rate	40 MHz
Logic Levels	3.3 V 5 V LVTTL TTL
Programmable Input Filters	Yes
Supports Programmable Power-Up States?	Yes
Digital Input	
Input Type	Sinking Sourcing
Maximum Voltage Range	0 V - 5 V
Digital Output	
Output Type	Sinking Sourcing

Current Flow

A sinking device provides a path for the current to ground and is not responsible for powering the device. Terms used to describe sinking devices include NPN, Open Collector, Normally High, and IEC Negative Logic.

A sourcing device provides the power or a positive potential. Sourcing devices "push" the current through the load. Terms used to describe sourcing devices include PNP, Open Emitter, Normally Low, and IEC Positive Logic.

Relays are classified by their number of poles and number of throws. The pole of a relay is the terminal common to every path. Each position that the pole can connect to is called a throw. A relay can be made of n poles and m throws. For example, a single-pole single-throw relay (SPST) has one pole and one throw.

- Form A relays are SPST with a default state of normally open.=
- Form B relays are SPST with a default state of normally closed.
- Form C relays are SPDT and break the connection with one throw before making contact with the other (break-before-make)..

Current Drive Single	5 mA
Current Drive All	800 mA
Maximum Voltage Range	0 V - 3.3 V
Counters / Timers	
Watchdog Timer	Yes

Digital I/O Watchdogs

NI digital I/O watchdogs are an innovative technology that provides protection against a wide variety of fault conditions:

- Computer crash - total OS crash
- Application crash - software application ceases to respond
- Driver crash - device driver ceases to respond
- PCI bus failure - communications cease to respond

With watchdogs, the digital outputs go to a safe state when a fault condition is detected and the watchdog timer expires for safe recovery. Watchdogs are important whenever the module is connected to actuators such as pumps, valves, motors, and relays. The digital I/O module monitors the software application and, if it fails to respond within the time limit, automatically sets the output lines to a user-defined safe state. The module remains in the watchdog state until the watchdog timer is disarmed by the application and new I/O values are written, the device is reset, or the computer is restarted.

Counters	160
Number of DMA Channels	3

Buffered Operations and DMA

The National Instruments counter/timers can capture numerous data points without dead times. These types of measurements, called buffered operations, are valuable in applications that range from statistical analysis on production lines to experiments in molecular chemistry. For instance, when you configure a counter for buffered period measurement, data is moved from the counter into a buffer.

Each edge that initiates a measurement also causes a transfer of the count into the buffer. With buffered operations, data is transferred to the computer memory using DMA or interrupts. DMA offers a considerable performance advantage; if your application requires this performance simultaneously on multiple counter/timers, you must know how many DMA channels are available on a particular counter/timer device. For example, if a device contains three DMA channels and eight counter/timers, you can simultaneously perform three high-speed and five

lower-speed, interrupt-based, buffered operations.

Buffered Operations	Yes
Debouncing / Glitch Removal	Yes
Max Source Frequency	40 MHz
Pulse Generation	Yes
Size	64 bits
Timebase Stability	100 ppm
Logic Levels	3.3 V 5 V LVTTL TTL
Timing / Triggering / Synchronization	
Triggering	Digital
Synchronization Bus(RTSI)	Yes
Physical Specifications	
Length	17 cm
Width	11 cm
I / O Connector	68-pin VHDCI female

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