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SPECIFICATIONS
NI 6612

Français Deutsch 日本語 한국어 简体中文
ni.com/manuals

This document lists the specifications of the NI PCIe/PXIe-6612. Unless otherwise noted, the following specifications are typical at 25 °C and are valid after a 15 minute warm-up time.

Digital I/O/PFI

Physical Characteristics

Number of channels ..... 40 total, Port 0 (P0.<0..31>), Port 1 (P1.<0..7); or PFI <0..39>
Ground reference ..... GND
Direction control ..... Each terminal individually programmable as input or output
Pull-down resistor ..... 51 kΩ, pulled down to ground
Input voltage protection[1] ..... -3 V to 8 V
Output impedence ..... 75 Ω

Waveform DIO Functionality

Terminals used ..... Port 0 (P0.<0..31>)
Port/sample size ..... Up to 32 bits
Waveform generation (DO) FIFO ..... 2,047 samples
Waveform generation (DI) FIFO ..... 255 samples
DI Sample Clock frequency ..... 0 to 10 MHz, system and bus activity dependent
DO Sample Clock frequency
  Regenerate from FIFO ..... 0 to 10 MHz
  Streaming from memory ..... 0 to 10 MHz, system and bus activity dependent
Data transfers ..... DMA (scatter-gather), programmed I/O
Digital line filter settings ..... 160 ns, 10.24 µs, 5.12 ms, disable

[1] Stresses beyond those listed under *Input voltage protection* may cause permanent damage to the device.

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Timing I/O (PFI) Functionality

Terminals used ..... PFI <0..39>

Functionality ..... Static digital input, static digital output, timing input, timing output

Timing output sources ..... Many counter, DI, and DO timing signals

Debounce filter settings ..... 90 ns, 5.12 µs, 2.56 ms, customer interval, disable; programmable high and low transitions; selectable per input

Recommended Operation Conditions

Level	Minimum	Maximum
Input High voltage, V_{IH}	2 V	5.25 V
Input Low voltage, V_{IL}	0 V	0.8 V
Output High current, I_{OH}	—	-6 mA
Output Low current, I_{OL}	—	6 mA

Electrical Characteristics

Level	Minimum	Maximum
Positive-going threshold, VT+	—	2.0 V
Negative-going threshold, VT-	0.8 V	—
Delta VT hysteresis, VT+ - VT-	0.5 V	—
I_{IL} input low current (V_{in} = 0 V)	—	-10 µA
I_{IH} input high current (V_{in} = 5 V)	—	200 µA

Digital I/O Characteristics

Figure 1. PFI <0..39>/P0/P1: I_{OH} versus V_{OH}

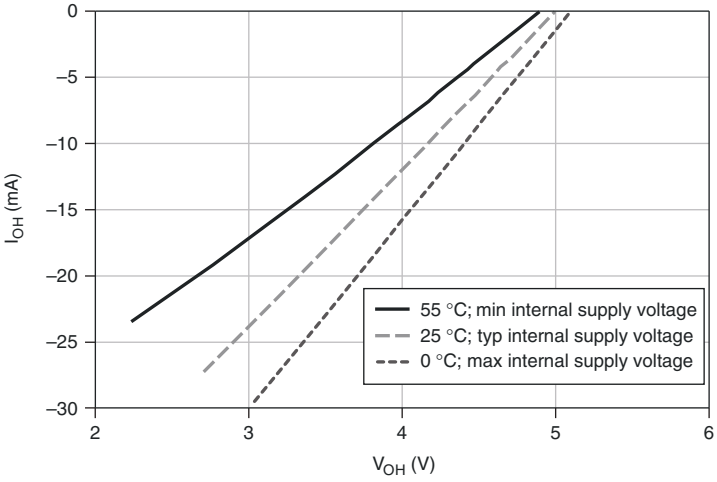
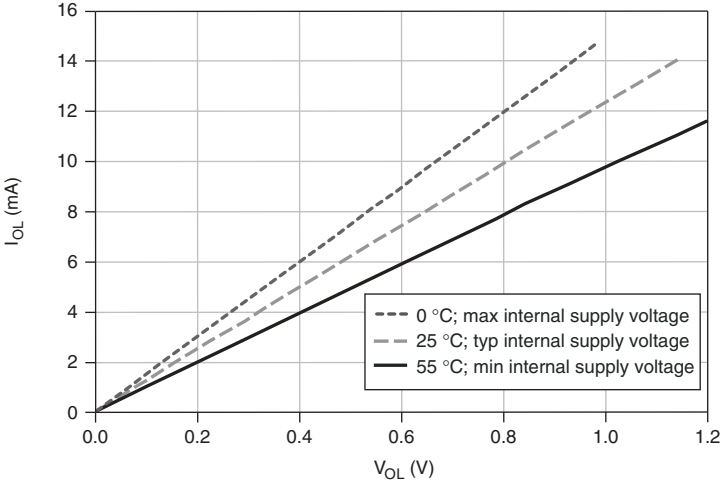


Figure 2. PFI <0..39>/P0/P1: I_{OL} versus V_{OL}



Counters/Timers

Number of counters/timers 8

Resolution ..... 32 bits

Counter Measurements

Measurements supported ..... Frequency, edge counting, pulse, pulse-width, semi-period, period, two-edge separation

Table 1. Maximum Source Frequency

Applications	Default Source PFI Lines*,†	Other PFI Lines*	RTSI Lines	PXI Trigger	PXI Star	PXI_DSTAR <A/B>
Frequency measurement (MHz)	80	50	20	20	80	100
Edge counting without prescaling (MHz)	25	25	20	20	25	25
Edge counting with 2x prescaling (MHz)	50	50	20	20	50	50
Edge counting with 8x prescaling (MHz)	80	50	20	20	80	100

* The maximum source frequency is dependent on the external source used to drive the PFI lines as well as any cables and accessories used to connect the source to the NI 6612. Refer to the *NI 6612 User Manual* at `nicom/manuals` for more information.

† Default source PFI lines are PFI 11, PFI 15, PFI 19, PFI 23, PFI 27, PFI 31,PFI 35, and PFI 39.

Table 2. Minimum Pulse Width

Applications	Default Source PFI Lines	Other PFI Lines	RTSI Lines	PXI Trigger	PXI Star	PXI_DSTAR <A/B>
Frequency measurement (ns)	6.25	10	25	25	6.25	5
Pulse, pulse width, semi-period, period, two-edge separation (ns)	20	20	25	25	20	20
Edge counting without prescaling (ns)	20	20	25	25	20	20
Edge counting with 2x prescaling (ns)	10	10	25	25	10	10
Edge counting with 8x prescaling (ns)	6.25	10	25	25	6.25	5

Position measurement ..... x1, x2, x 4 quadrature encoding with Channel Z reloading; two-pulse encoding

Output applications ..... Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling

Internal timebases ..... 100 kHz, 20 MHz, 100 MHz

External timebases

- NI PCIe-6612 ..... 0 MHz to 25 MHz
- NI PXIe-6612 ..... 0 MHz to 25 MHz; 0 MHz to 100 MHz on PXIe-DSTAR<A,B>

Base clock accuracy ..... ±50 ppm (aging, temperature, and power supply drift)

Inputs ..... Gate, Source, HW_Arm, AUX, A, B, Z, Up_Down, Sample Clock

Routing options for inputs

- NI PCIe-6612 ..... Any PFI, RTSI, many internal signals
- NI PXIe-6612 ..... Any PFI, PXIe-DSTAR<A,B>, PXI_TRIG, PXI_STAR, many internal signals

FIFO ..... 127 samples per counter

Data transfers ..... Dedicated scatter-gather, DMA controller for each counter/timer

Frequency Generator

Number of channels 1

Base clocks ..... 100 kHz, 10 MHz, 20 MHz

Base clock accuracy ..... Refer to the *Counter Measurements* section

Routing options for outputs

- NI PCIe-6612 ..... Any PFI, RTSI, many internal signals
- NI PXIe-6612 ..... Any PFI, PXI_TRIG, PXIe-DSTARC

Phase-Lock Loop (PLL)

Number of PLLs 1

Reference clock locking frequencies

Reference Signal	Locking Input Frequency (MHz)	
	NI PCIe-6612	NI PXIe-6612
PXIe_DSTAR<A,B>	—	10, 20, 100
PXI_STAR	—	10, 20
PXIe_CLK100	—	100
PXI_TRIG<0..7>	—	10, 20
RTSI<0..7>	10, 20	—
PFI<0..39>	10, 20	10, 20

Output of PLL ..... 100 MHz timebase; other signals derived from 100 MHz timebase including 20 MHz and 100 kHz timebases

External Digital Triggers

Source

- NI PCIe-6612 ..... Any PFI, RTSI
- NI PXIe-6612 ..... Any PFI, PXIe-DSTAR <A,B>, PXI_TRIG, PXI_STAR

Polarity ..... Software-selectable for most signals

Counter/timer function ..... Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down, Sample Clock

Digital waveform generation (DO) function .... Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase

Digital waveform acquisition (DI) function ..... Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase

Device-to-Device Trigger Bus

Input source

- NI PCIe-6612 ..... RTSI <0..7>[1]
- NI PXIe-6612 ..... PXI_TRIG <0..7>, PXI_STAR, PXIe-DSTAR<A,B>

Output destination

- NI PCIe-6612 ..... RTSI <0..7>[1]
- NI PXIe-6612 ..... PXI_TRIG <0..7>, PXIe_DSTAR<C>

Output selections ..... 10 MHz Clock; frequency generator output; many internal signals

Debounce filter settings ..... 90 ns, 5.12 µs, 2.56 ms, custom interval, disable; programmable high and low transitions; selectable per input

Bus Interface

Form factor

- NI PCIe-6612 ..... x1 PCI Express Standard Height, Half Length, PCI Express Card Electromechanical Specification Revision 1.1
- NI PXIe-6612 ..... x1 PXI Express, single slot, PXI Express Hardware Specification Revision 1.0 ECN-1 compliant

Slot compatibility

- NI PCIe-6612 ..... x1, x4, x8, x16 PCI Express slot compatibility.
- NI PXIe-6612 ..... x1 and x4 PXI Express, PXI Express hybrid, or PXI Express System Timing Slot

Power Requirements

+3.3 V

- NI PCIe-6612 ..... 4.3 W maximum
- NI PXIe-6612 ..... 6.1 W maximum

+12 V

- NI PCIe-6612 ..... 6.0 W maximum
- NI PXIe-6612 ..... 10.1 W maximum

[1] In other sections of this document, *RTSI* refers to RTSI <0..7> for NI PCIe-6612 or PXI_TRIG <0..7> for NI PXIe-6612.

Physical Requirements

Weight

NI PCIe-6612.....110 g

NI PXIe-6612.....175 g

Caution The protection provided by the NI 6612 can be impaired if it is used in a manner not described in this document.

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.

Current Limits

Caution Exceeding the current limits may cause unpredictable behavior by the device and/or chassis.

+5 V Terminal (at Pin 1 of Figure 3) .....+4.25 V to +5.10 V, 1 A maximum

(NI PCIe-6612 only) On the NI PCIe-6612, the +5 V supply and the PFI/DIO lines share the same power source. Consequently, power available at the +5 V terminal is reduced by certain DIO/PFI use cases.

DIO/PFI Output Condition	Current Reduction (per Terminal)
DIO/PFI output toggling at 25 MHz*	17.5 mA
DIO/PFO output driving logic 1 into 6 mA load	6 mA
* Using a 2 m cable driving a high-impedance load	

For example, if you have an NI PCIe-6612 with 18 DIO/PFI lines configured as outputs toggling at 25 MHz and 22 DIO/PFI lines driving logic 1 into 6 mA loads, you would calculate power available at the +5 V terminal as follows:

18 × 17.5 mA = 315 mA

22 × 6 mA = 132 mA

1 A (max) - 315 mA -132 mA = 553 mA max available at +5 V power connector

Environmental

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only.

Operating Environment

Ambient temperature range ..... 0 to 55 °C
(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 ..... -40 to 71 °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 (NI PXIe-6612 Only)

Operational 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 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.)

Safety

This product meets the requirements of the following standards of safety for electrical equipment 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
- 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 generates 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:

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

Online Product Certification

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

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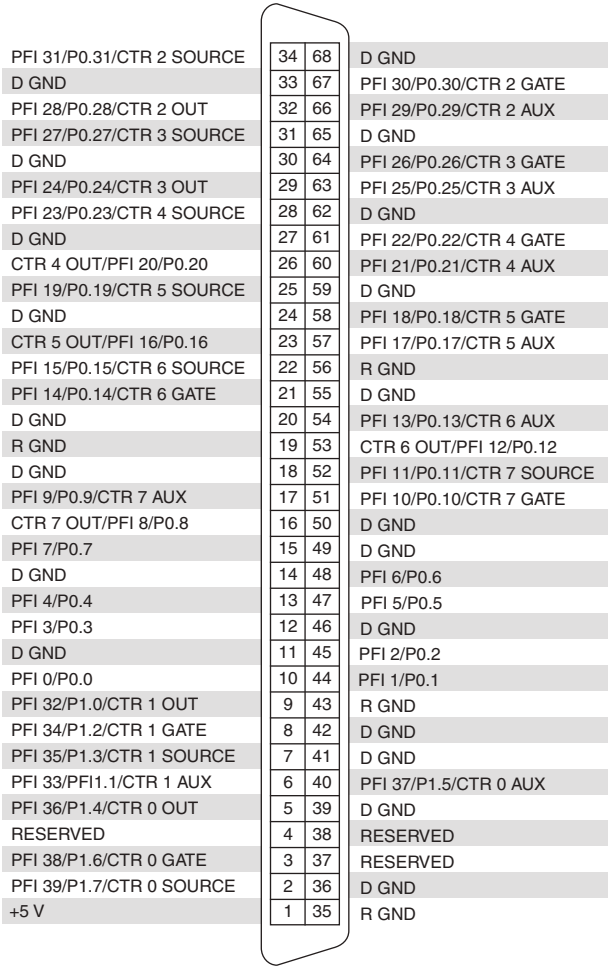
Pinout Diagram

Figure 3. NI 6612 Pinout



PFI 31/P0.31/CTR 2 SOURCE	34	68	D GND
D GND	33	67	PFI 30/P0.30/CTR 2 GATE
PFI 28/P0.28/CTR 2 OUT	32	66	PFI 29/P0.29/CTR 2 AUX
PFI 27/P0.27/CTR 3 SOURCE	31	65	D GND
D GND	30	64	PFI 26/P0.26/CTR 3 GATE
PFI 24/P0.24/CTR 3 OUT	29	63	PFI 25/P0.25/CTR 3 AUX
PFI 23/P0.23/CTR 4 SOURCE	28	62	D GND
D GND	27	61	PFI 22/P0.22/CTR 4 GATE
CTR 4 OUT/PFI 20/P0.20	26	60	PFI 21/P0.21/CTR 4 AUX
PFI 19/P0.19/CTR 5 SOURCE	25	59	D GND
D GND	24	58	PFI 18/P0.18/CTR 5 GATE
CTR 5 OUT/PFI 16/P0.16	23	57	PFI 17/P0.17/CTR 5 AUX
PFI 15/P0.15/CTR 6 SOURCE	22	56	R GND
PFI 14/P0.14/CTR 6 GATE	21	55	D GND
D GND	20	54	PFI 13/P0.13/CTR 6 AUX
R GND	19	53	CTR 6 OUT/PFI 12/P0.12
D GND	18	52	PFI 11/P0.11/CTR 7 SOURCE
PFI 9/P0.9/CTR 7 AUX	17	51	PFI 10/P0.10/CTR 7 GATE
CTR 7 OUT/PFI 8/P0.8	16	50	D GND
PFI 7/P0.7	15	49	D GND
D GND	14	48	PFI 6/P0.6
PFI 4/P0.4	13	47	PFI 5/P0.5
PFI 3/P0.3	12	46	D GND
D GND	11	45	PFI 2/P0.2
PFI 0/P0.0	10	44	PFI 1/P0.1
PFI 32/P1.0/CTR 1 OUT	9	43	R GND
PFI 34/P1.2/CTR 1 GATE	8	42	D GND
PFI 35/P1.3/CTR 1 SOURCE	7	41	D GND
PFI 33/PFI1.1/CTR 1 AUX	6	40	PFI 37/P1.5/CTR 0 AUX
PFI 36/P1.4/CTR 0 OUT	5	39	D GND
RESERVED	4	38	RESERVED
PFI 38/P1.6/CTR 0 GATE	3	37	RESERVED
PFI 39/P1.7/CTR 0 SOURCE	2	36	D GND
+5 V	1	35	R GND

R GND: Pins are not connected to Ground if using an SH68-68-D1 shielded cable; Pins are connected to D GND if using an R6868 ribbon cable.

RESERVED: Should not be used as these pins are weakly pulled down to D GND.

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