PCIe-6352 Specifications

2025-07-28

Contents

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These specifications apply to the PCIe-6352.

Revision History

Version	Date changed	Description
379196A-01	July 2025	Initial release.

Looking For Something Else?

For information not found in the specifications for your product, such as operating instructions, browse ***Related Information***.

Related information:

- Software and Driver Downloads
- Dimensional Drawings
- Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- ***Typical*** specifications describe the performance met by a majority of models.
- ***Nominal*** describes an attribute that is based on design, conformance testing, or

supplemental testing.

Specifications are ***Typical*** unless otherwise noted.

Conditions

Specifications are valid at 25 °C unless otherwise noted.

PCIe-6352 Pinout

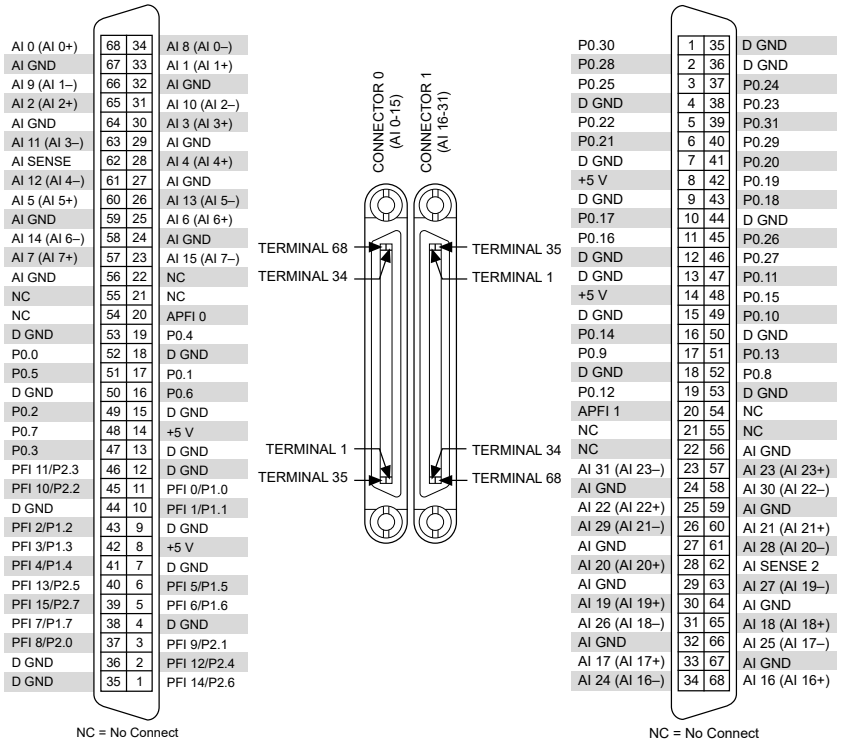


Table 1. Default Counter/Timer Terminals

Counter/Timer Signal	Default PFI Terminal
CTR 0 SRC	PFI 8
CTR 0 GATE	PFI 9
CTR 0 AUX	PFI 10
CTR 0 OUT	PFI 12
CTR 0 A	PFI 8

Counter/Timer Signal	Default PFI Terminal
CTR 0 Z	PFI 9
CTR 0 B	PFI 10
CTR 1 SRC	PFI 3
CTR 1 GATE	PFI 4
CTR 1 AUX	PFI 11
CTR 1 OUT	PFI 13
CTR 1 A	PFI 3
CTR 1 Z	PFI 4
CTR 1 B	PFI 11
CTR 2 SRC	PFI 0
CTR 2 GATE	PFI 1
CTR 2 AUX	PFI 2
CTR 2 OUT	PFI 14
CTR 2 A	PFI 0
CTR 2 Z	PFI 1
CTR 2 B	PFI 2
CTR 3 SRC	PFI 5
CTR 3 GATE	PFI 6
CTR 3 AUX	PFI 7
CTR 3 OUT	PFI 15
CTR 3 A	PFI 5
CTR 3 Z	PFI 6
CTR 3 B	PFI 7
FREQ OUT	PFI 14

Table 2. Signal Descriptions

Signal	Reference	Description
AI GND	—	Analog Input Ground—These terminals are the reference point for single-ended AI measurements in RSE mode and the bias current return point for DIFF measurements. All ground references—AI GND and D GND—are connected on the device. Though AI GND and D GND are connected on the device, they are connected by small traces to reduce crosstalk between subsystems. Each ground has a slight difference in potential.
AI <0..31>	Varies	Analog Input Channels—For single-ended measurements, each signal is an analog input voltage channel. In RSE mode, AI GND is the reference for these signals. In NRSE mode, the reference for each AI signal is an AI SENSE. For differential measurements, AI 0 and AI 8 are the positive and negative inputs of differential analog input channel 0. Similarly, the following signal pairs also form differential input channels: AI <1,9>, AI <2,10>, and so on.
AI SENSE, AI SENSE 2	—	Analog Input Sense—In NRSE mode, the reference for each

Signal	Reference	Description
		AI <0..15> signal is AI SENSE; the reference for each AI <16..31> signal is AI SENSE 2.
D GND	—	Digital Ground—D GND supplies the reference for port 0, port 1, port 2 digital channels, PFI, and +5 V. All ground references—AI GND and D GND—are connected on the device. Though AI GND and D GND are connected on the device, they are connected by small traces to reduce crosstalk between subsystems. Each ground has a slight difference in potential.
P0.<0..31>	D GND	Port 0 Digital I/O Channels—You can configure each signal individually as an input or output.
APFI <0,1>	AO GND or AI GND	Analog Programmable Function Interface Channels—Each APFI signal can be used as an analog trigger input. APFI are referenced to AI GND when they are used as analog trigger inputs.
+5 V	D GND	+5 V Power Source—These terminals provide a fused +5 V power source.

Signal	Reference	Description
PFI <0..7>/P1.<0..7>, PFI <8..15>/P2.<0..7>	D GND	Programmable Function Interface or Digital I/O Channels—Each of these terminals can be individually configured as a PFI terminal or a digital I/O terminal. As an input, each PFI terminal can be used to supply an external source for AI, DI, and DO timing signals or counter/timer inputs. As a PFI output, you can route many different internal AI, DI, or DO timing signals to each PFI terminal. You can also route the counter/timer outputs to each PFI terminal. As a port 1 or port 2 digital I/O signal, you can individually configure each signal as an input or output.
NC	—	No connect—Do not connect signals to this terminal.

Analog Input

Number of channels	32 single ended or 16 differential
ADC resolution	16 bits
DNL	No missing codes guaranteed
INL	Refer to AI Absolute Accuracy.
Sample rate	
Single channel maximum	1.25 MS/s
Multichannel maximum (aggregate)	1.00 MS/s

Minimum	No minimum
Timing resolution	10 ns
Timing accuracy	50 ppm of sample rate
Input coupling	DC
Input range	±0.1 V, ±0.2 V, ±0.5 V, ±1 V, ±2 V, ±5 V, ±10 V
Maximum working voltage for analog inputs (signal + common mode)	±11 V of AI GND
CMRR (DC to 60 Hz)	100 dB
Input impedance	
Device on	
AI+ to AI GND	>10 GΩ in parallel with 100 pF
AI- to AI GND	>10 GΩ in parallel with 100 pF
Device off	
AI+ to AI GND	820 Ω
AI- to AI GND	820 Ω
Input bias current	±100 pA
Crosstalk (at 100 kHz)	
Adjacent channels	-75 dB
Non-adjacent channels	-95 dB
Small signal bandwidth (-3 dB)	1.7 MHz
Input FIFO size	4,095 samples
Scan list memory	4,095 entries
Data transfers	DMA (scatter-gather), programmed I/O
Overvoltage protection for all analog input and sense channels	
Device on	±25 V for up to two AI pins
Device off	±15 V for up to two AI pins
Input current during overvoltage condition	±20 mA maximum/AI pin

Settling Time for Multichannel Measurements

Range	±60 ppm of Step (±4 LSB for Full-Scale Step)	±15 ppm of Step (±1 LSB for Full-Scale Step)
±10 V, ±5 V, ±2 V, ±1 V	1 µs	1.5 µs
±0.5 V	1.5 µs	2 µs
±0.2 V, ±0.1 V	2 µs	8 µs

Typical Performance Graph

Figure 1. Settling Error versus Time for Different Source Impedances

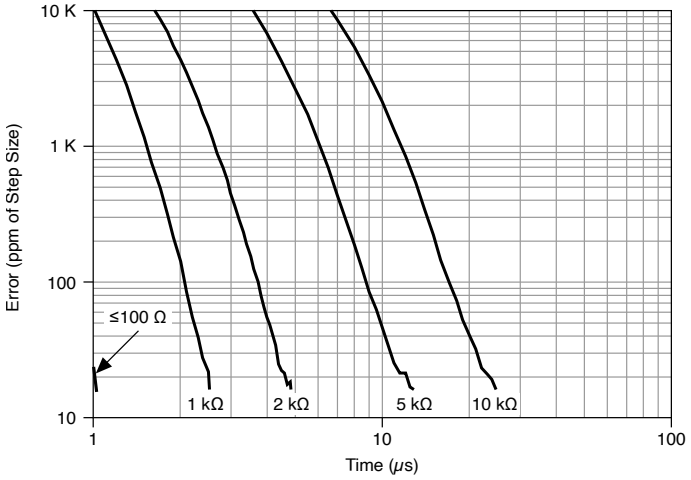


Figure 2. AI <0..31> Small Signal Bandwidth

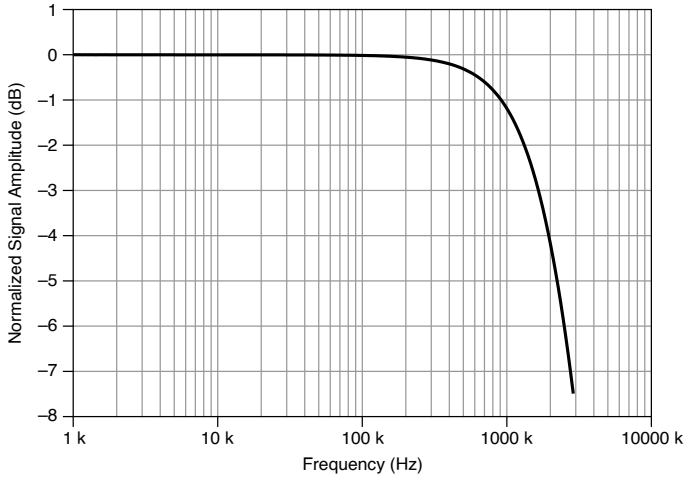
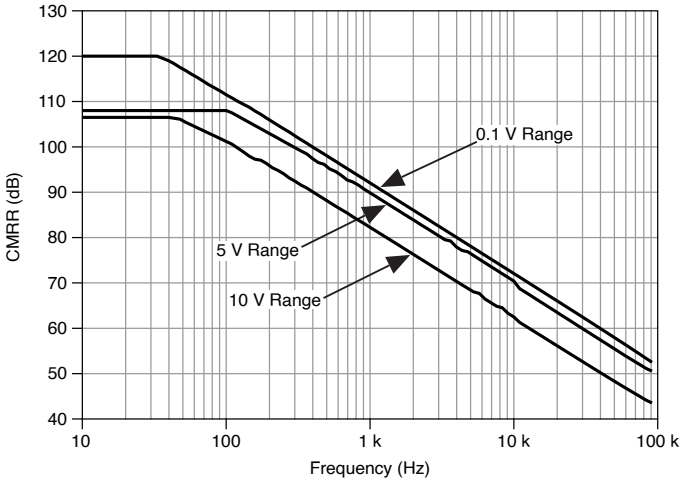


Figure 3. AI <0..31> CMRR



AI Absolute Accuracy (Warranted)

Table 3. AI Absolute Accuracy

Nominal Range Positive Full Scale	Nominal Range Negative Full Scale	Residual Gain Error (ppm of Reading)	Residual Offset Error (ppm of Range)	Offset Tempco (ppm of Range/°C)	Random Noise, σ (µVrms)	Absolute Accuracy at Full Scale (µV)
10	-10	48	13	21	281	1,520
5	-5	55	13	21	137	800
2	-2	55	13	24	56	320
1	-1	65	17	27	35	180
0.5	-0.5	68	17	34	26	95
0.2	-0.2	95	27	55	21	50
0.1	-0.1	108	45	90	16	32

For more information about absolute accuracy at full scale, refer to the ***AI Absolute Accuracy*** section.

Gain tempco	13 ppm/°C
Reference tempco	1 ppm/°C
INL error	46 ppm of range

AI Absolute Accuracy Equation

$$AbsoluteAccuracy = Reading \cdot (GainError) + Range \cdot (OffsetError) + NoiseUncertainity$$

- $GainError = ResidualGainError + GainTempco \cdot (TempChangeFromLastInternalCal) + ReferenceTempco \cdot (TempChangeFromLastExternalCal)$
- $OffsetError = ResidualOffsetError + OffsetTempco \cdot (TempChangeFromLastInternalCal) + INLError$
- $NoiseUncertainty = \frac{\text{Random Noise} \cdot 3}{\sqrt{10,000}}$
  for a coverage factor of 3 σ and averaging 10,000 points.

AI Absolute Accuracy Example

Absolute accuracy at full scale on the analog input channels is determined using the following assumptions:

- TempChangeFromLastExternalCal = 10 °C
- TempChangeFromLastInternalCal = 1 °C
- number_of_readings = 10,000
- CoverageFactor = 3 σ

For example, on the 10 V range, the absolute accuracy at full scale is as follows:

- GainError = 48 ppm + 13 ppm · 1 + 1 ppm · 10 = 71 ppm
- OffsetError = 13 ppm + 21 ppm · 1 + 46 ppm = 80 ppm
- NoiseUncertainty = $\frac{281\ \mu V \cdot 3}{\sqrt{10,000}}$
  = 8.4 µV
- AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty = 1,520 µV

Analog Triggers

Number of triggers	1
Source	AI <0..31>, APFI <0..1>
Functions	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Convert Clock, Sample Clock Timebase
Resolution	16 bits
Modes	Analog edge triggering, analog edge triggering with hysteresis, and analog window triggering
Accuracy	±1% of range

Table 4. Source Level

AI <0..31>	±Full scale
APFI <0..1>	±10 V

Table 5. Bandwidth (-3 db)

AI <0..31>	3.4 MHz
APFI <0..1>	3.9 MHz

Table 6. APFI 0 characteristics

Input impedance	10 kΩ
Coupling	DC
Protection, power on	±30 V
Protection, power off	±15 V

Digital I/O/PFI

Static Characteristics

Number of channels	48 total, 32 (P0.<0..31>), 16 (PFI <0..7>/P1, PFI <8..15>/P2)

Ground reference	D GND
Direction control	Each terminal individually programmable as input or output
Pull-down resistor	50 kΩ typical, 20 kΩ minimum
Input voltage protection	±20 V on up to two pins

Notice Stresses beyond those listed under the ***Input voltage protection*** specification may cause permanent damage to the device.

Waveform Characteristics (Port 0 Only)

Terminals used	Port 0 (P0.<0..31>)
Port/sample size	Up to 32 bits
Waveform generation (DO) FIFO	2,047 samples
Waveform acquisition (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
DO sample clock frequency (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

PFI/Port 1/Port 2 Functionality

Functionality	Static digital input, static digital output, timing input, timing output
Timing output sources	Many AI, counter, DI, DO timing signals
Debounce filter settings	90 ns, 5.12 µs, 2.56 ms, custom interval, disable; programmable high and low transitions; selectable per input

Recommended Operating Conditions

Input high voltage (V_{IH})	
Minimum	2.2 V
Maximum	5.25 V
Input low voltage (V_{IL})	
Minimum	0 V
Maximum	0.8 V
Output high current (I_{OH})	
P0.<0..7>	-24 mA maximum
PFI <0..15>/P1/P2	-16 mA maximum
Output low current (I_{OL})	
P0.<0..7>	24 mA maximum
PFI <0..15>/P1/P2	16 mA maximum

Digital I/O Characteristics

Positive-going threshold (VT+)	2.2 V maximum
Negative-going threshold (VT-)	0.8 V minimum
Delta VT hysteresis (VT+ - VT-)	0.2 V minimum
I_{IL} input low current (V_{IN} = 0 V)	-10 µA maximum
I_{IH} input high current (V_{IN} = 5 V)	250 µA maximum

Figure 4. P0.<0..31>:: I_{OH} versus V_{OH}

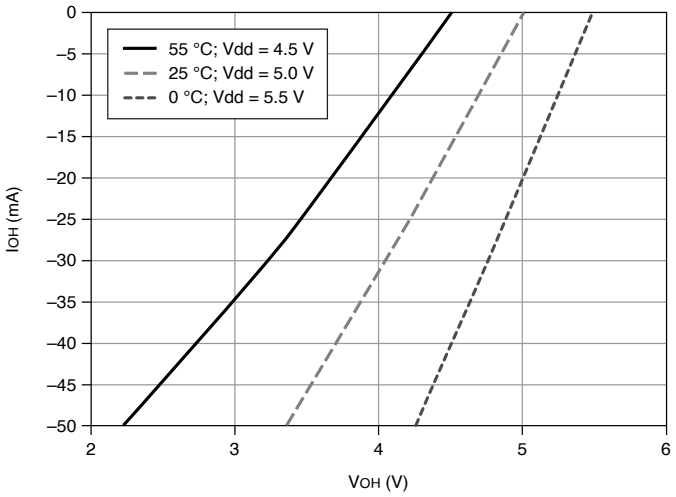


Figure 5. P0.<0..31>: I_{OL} versus V_{OL}

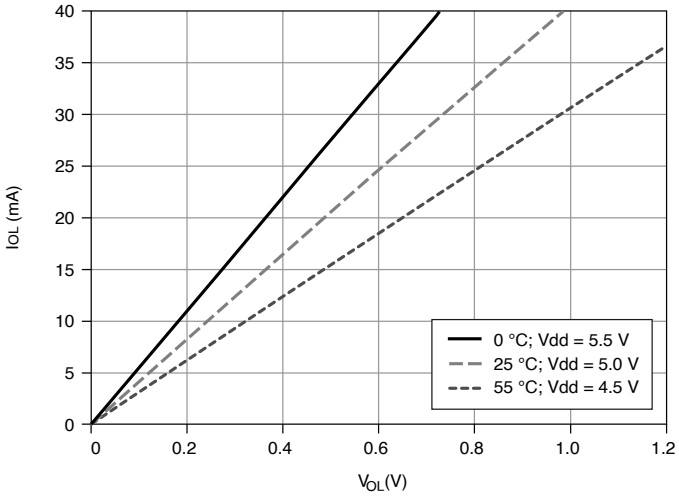


Figure 6. PFI <0..15>/P1/P2: I_{OH} versus V_{OH}

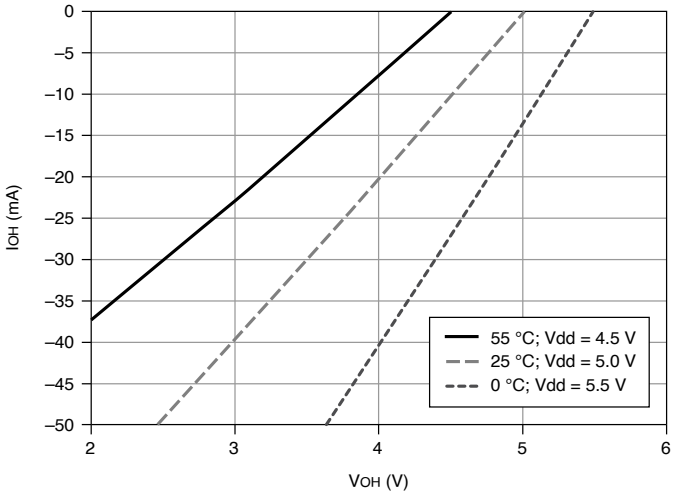
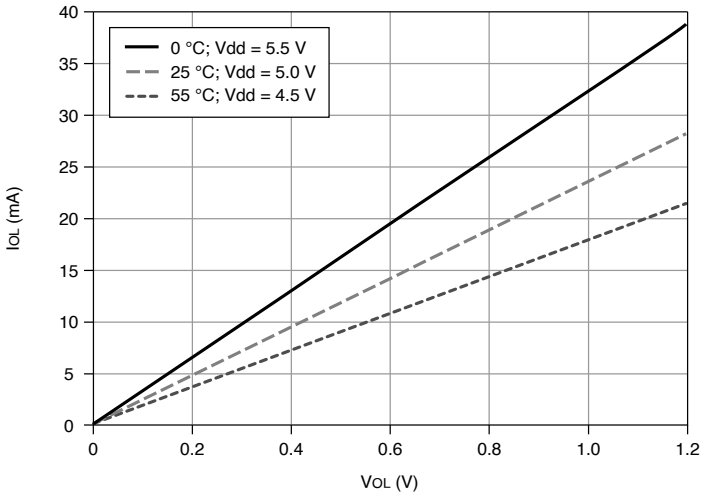


Figure 7. PFI <0..15>/P1/P2: I_{OL} versus V_{OL}



General-Purpose Counters

Number of counter/timers	4
Resolution	32 bits
Counter measurements	Edge counting, pulse, pulse width, semi-period, period, two-edge separation
Position measurements	X1, X2, X4 quadrature encoding with Channel Z reloading; two-pulse encoding
Output applications	Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling
Internal base clocks	100 MHz, 20 MHz, 100 kHz
External base clock frequency	0 MHz to 25 MHz
Base clock accuracy	50 ppm
Inputs	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down, Sample Clock
Routing options for inputs	Any PFI, RTSI, analog trigger, many internal signals
FIFO	127 samples per counter
Data transfers	Dedicated scatter-gather DMA controller for each counter/timer, programmed I/O

Frequency Generator

Number of channels	1
Base clocks	20 MHz, 10 MHz, 100 kHz
Divisors	1 to 16
Base clock accuracy	50 ppm

Output can be available on any PFI or RTSI terminal.

Phased-Locked Loop (PLL)

Number of PLLs	1

Table 7. Reference Clock Locking Frequencies

Reference Signal	Locking Input Frequency (MHz)
RTSI <0..7>	10, 20
PFI <0..15>	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	Any PFI, RTSI
Polarity	Software-selectable for most signals
Analog input function	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Convert Clock, Sample Clock Timebase
Analog output function	Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Counter/timer functions	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	RTSI <0..7>
Output destination	RTSI <0..7>
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

Current Limits

Notice Exceeding the current limits may cause unpredictable behavior by the device and/or PC.

PCIe	
Without disk drive power connector installed	
P0/PFI/P1/P2 and +5 V terminals combined	0.59 A max
With disk drive power connector installed	
+5 V terminal (connector 0)	1 A max[1]
P0/PFI/P1/P2 combined	1 A max

Bus Interface

PCIe

1. Has a self-resetting fuse that opens when current exceeds this specification.

Form factor	x1 PCI Express, specification v1.1 compliant
Slot compatibility	x1, x4, x8, and x16 PCI Express slots [2]
DMA channels	8, analog input, analog output, digital input, digital output, counter/timer 0, counter/timer 1, counter/timer 2, counter/timer 3

Safety Voltages

Table 8. Rated Voltages

AI+ or AI- to GND	±11 V DC
DIO-to-GND	+5 V DC
+5V pin to GND	+5 V DC

Caution Any external sources must be limited to not exceed these maximum rated voltages.

Attention Les sources externes doivent être limitées pour ne pas dépasser ces tensions nominales maximales.

Current Ratings

DIO Maximum continuous current	Per channel	±10 mA
	Sum of all channels	±160 mA

Caution

2. Some motherboards reserve the x16 slot for graphics use.

Any external sources must be limited to not exceed these maximum rated currents.

Attention

Les sources externes doivent être limitées pour ne pas dépasser ces tensions nominales maximales.

Measurement Category

This product is rated for Measurement Category I (or other non-MAINS circuits).

Caution Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV.

Attention Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.

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.

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

Environmental Guidelines

Notice Failure to follow the mounting instructions in the product documentation can cause temperature derating.

Notice This product is intended for use in indoor applications only.

Environmental Characteristics

Temperature	
Operating	0 °C to 50 °C
Storage	-40 °C to 70 °C
Humidity	
Operating	10% to 90% RH, noncondensing
Storage	5% to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m

Indoor use only.

Power Requirements

Table 9. Power Specifications Without Disk Drive Power Connector Installed

PCIe Bus	Voltage/current rating	1.39 A at 3.3 V DC 0.45 A at 12 V DC
	Power rating	10 W

Table 10. Power Specifications With Disk Drive Power Connector Installed

PCIe Bus	Voltage/current rating	0.48 A at 3.3 V DC 0.45 A at 12 V DC 3.0 A at 5 V DC
	Power rating	22 W

Physical Characteristics

Printed circuit board dimensions	9.9 cm × 16.8 cm (3.9 in. × 6.6 in.) (half-length)
Weight	114 g (4.0 oz)
I/O connectors	
Device connector	68-Pos Right Angle Dual Stack PCB-Mount VHDCI (Receptacle)
Cable connector	68-Pos Offset IDC Cable Connector (Plug) (SHC68-*)

Note For more information about the connectors used for DAQ devices, refer to the document, ***NI DAQ Device Custom Cables, Replacement Connectors, and Screws***, by going to ni.com/info and entering the Info Code `rdspmb`.

Disk drive power connector	Standard ATX peripheral connector (not serial ATA)

Calibration

Recommended warm-up time	15 minutes
Calibration interval	2 years