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PXIe-6535

#### **SPECIFICATIONS**

# NI PXIe/PCIe-6535/6536/6537 and NI PCIe-6535B/6536B/6537B

10/25/50 MHz Digital I/O Device

このドキュメントには、日本語ページも含まれています。

This document provides specifications for NI PXIe/PCIe-6535/6536/6537 (NI 6535/6536/6537) and NI PCIe-6535B/6536B/6537B (NI 6535B/6536B/6537B) digital I/O devices.

Specifications are subject to change without notice. For the most recent specifications visit ni.com/manuals.



**Caution** All values were obtained using a 1 m cable (SHC68-C68-D4 recommended). Performance specifications are not guaranteed when using longer cables.

*Warranted* specifications are warranted not to exceed these values within certain operating conditions and include the effects of temperature and uncertainty unless otherwise noted.

Typical specifications are unwarranted values that are representative of a majority  $(3\sigma)$  of units within certain operating conditions and include the effects of temperature and uncertainty unless otherwise noted.

*Nominal* specifications are unwarranted values that are relevant to the use of the product and convey the expected performance of the product.

All specifications are *Typical* unless otherwise noted. These specifications are valid within the operating temperature range. All warranted specifications will be specifically denoted as *Warranted* in the comment section of the specification.



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# **Channel Specifications**

| Specification  | Value       | Comments  |
|--|-------------|---|
| Number of data channels  | 32          | _   |
| Direction<br>control of data<br>channels                             | Per channel | _   |
| Number of<br>Programmable<br>Function<br>Interface (PFI)<br>channels | 6           | Refer to the Waveform Specifications section for more information about the PFI channels. |
| Direction<br>control of<br>PFI channels                              | Per channel | _   |

| Specification   | Value   |               | Comments  |
|---|---|---------------|---|
| Number of   | PXI Express PCI Express   |               | PXI_TRIG7 is not  |
| RTSI/PXI<br>trigger channels                            | 10 (PXI_TRIG<07>,<br>PXIe_DSTARB,<br>PXIe_DSTARC)   | 8 (RTSI <07>) | supported as input<br>trigger.  |
| Direction<br>control of<br>RTSI/PXI<br>trigger channels | RTSI <07>/PXI_TRIG<07>: Bidirectional; per channel PXIe_DSTARB: Unidirectional input (PXI Express only) PXIe_DSTARC: Unidirectional output (PXI Express only)                           |               |   |
| Number of<br>Sample clock<br>terminals                  | 3 bidirectional clock terminals (PFI 4, PFI 5, RTSI 7)  1 exported clock terminal (PXIe_DSTARC) (PXI Express only)  2 clock source terminals (PXIe_DSTARA, PXI_STAR) (PXI Express only) |               | Refer to <i>Timing</i> Specifications for more information about clock sources. |

## Generation Channels (Data and PFI <0..5> Channels)

| Specification                                       |                 | Value                                     |            |            |                               |
|---|-----------------|---|------------|------------|-------------------------------|
| Generation<br>voltage<br>families                   | 2.5 V, 3.3 V (5 | 2.5 V, 3.3 V (5 V TTL compatible)         |            |            |                               |
| Generation signal type                              | Single-ended    |   |            |            | _                             |
| Generation  | Low Volta       | ge Levels                                 | High Volta | ige Levels | Warranted.                    |
| voltage levels                                      | Typical         | Maximum                                   | Minimum    | Typical    | Into high impedance           |
| 2.5 V   | 0.0 V           | 0.1 V                                     | 2.4 V      | 2.5 V      | load.                         |
| 3.3 V   | 0.0 V           | 0.1 V                                     | 3.2 V      | 3.3 V      | Production<br>tested for data |
| 5.0 V   | 0.0 V           | 0.1 V                                     | 3.2 V      | 3.3 V      | channels.                     |
| Output impedance                                    | 50 Ω, nominal   | 50 $\Omega$ , nominal                     |            |            | _                             |
| Maximum DC drive strength                           |                 | $\pm 16$ mA at 2.5 V $\pm 32$ mA at 3.3 V |            |            | _                             |
| Data channel<br>driver<br>enable/disable<br>control | Per channel     |   |            |            | Software-<br>selectable.      |

| Specification          | Value   | Comments   |
|------------------------|---|--|
| Channel power-up state | Software programmable (Tristate, 0, or 1 at 2.5 V or 3.3 V)                     | Channel data is<br>typically valid<br>1.5 s after the<br>power-up state<br>is set. |
| Output protection      | The device can indefinitely sustain a short to any voltage between 0 V and 5 V. |  |

## Acquisition Channels (Data and PFI <0..5> Channels)

| Specification                | Value                                    |                                    | Comments   |
|------------------------------|--|------------------------------------|--|
| Acquisition voltage families | 2.5 V, 3.3 V (5 V TTL compatible)        |                                    | _  |
| Acquisition voltage levels   | Low Voltage Thresholds<br>Maximum        | High Voltage Thresholds<br>Minimum | Warranted. Production  |
| 2.5 V                        | 0.75 V                                   | 1.75 V                             | tested for data channels.  |
| 3.3 V                        | 1.00 V                                   | 2.30 V                             |  |
| 5.0 V                        | 1.00 V                                   | 2.30 V                             |  |
| Input impedance              | High-impedance (50 k $\Omega$ to ground) |                                    | _  |
| Input<br>protection          | -1 V to +6 V                             |                                    | Diode clamps<br>in the design<br>may provide<br>additional<br>protection<br>outside this<br>range. |

# **Timing Specifications**

# Sample Clock

| Specification                        | V   | 'alue   | Comments  |
|--------------------------------------|---|---|---|
| Sample clock<br>sources              | <ol> <li>On Board Clock (Sample Clock Timebase with divider)</li> <li>PFI &lt;45&gt;</li> <li>PXI_TRIG7 (PXI backplane)<sup>†</sup>         RTSI 7 (RTSI bus))<sup>‡</sup></li> <li>PXI_STAR (PXI backplane)<sup>†</sup></li> <li>PXI_DSTARA (PXI backplane)<sup>†</sup></li> </ol> |   | Refer to the <i>Clocking</i> diagram in the <i>NI 6535/6536/6537 and NI 6535B/6536B/6537B Help</i> for an illustration of the various clock and timebase sources. |
| Sample clock<br>timebase<br>sources  | 1. 200 MHz Timebase (internal oscillator) 2. PFI <05> 3. PXI_TRIG<06> (PXI backplane)† RTSI <07> (RTSI bus)‡ 4. PXIe_DSTARB (PXI backplane)†  |   |   |
| On Board<br>Clock<br>frequency range | NI 6535/6535B: 48 Hz to 10 MHz<br>Configurable to 200 MHz/N; $20 \le N \le 4,194,307$<br>NI 6536/6536B: 48 Hz to 25 MHz<br>Configurable to 200 MHz/N; $8 \le N \le 4,194,307$<br>NI 6537/6537B: 48 Hz to 50 MHz<br>Configurable to 200 MHz/N; $4 \le N \le 4,194,307$               |   | _   |
| Imported<br>Sample clock             | PFI <45> PXI_TRIG7 <sup>†</sup> PXIe_DSTARA <sup>†</sup> RTSI 7 <sup>‡</sup>  |   | _   |
| frequency range                      | NI 6535/6535B:<br>0 Hz to 10 MHz<br>NI 6536/6536B:<br>0 Hz to 25 MHz<br>NI 6537/6537B:<br>0 Hz to 50 MHz  | NI 6535/6535B:<br>0 Hz to 10 MHz<br>NI 6536/6536B and<br>NI 6537/6537B:<br>0 Hz to 25 MHz |   |

<sup>†</sup> PXI Express only

<sup>‡</sup> PCI Express only

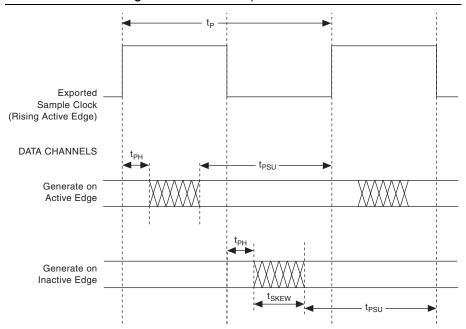
| Specification                             |   | V                             | alue/   |  | Comments  |
|---|---|-------------------------------|---|--|---|
| Minimum<br>detectable                     | PFI <45>  | PXIe_D                        | STARA†  | PXI_TRIG7†<br>RTSI 7‡                        | Positive and negative pulse width at voltage            |
| Sample clock<br>pulse width               | 8 ns  | 15 ns                         | /6535B<br>/6536B:<br>/6537B:                          | 15 ns  | thresholds.   |
| Imported timebase clock                   | PFI <05><br>PXIe_DSTARB <sup>†</sup>  |                               | PXI_TRIG7 <sup>†</sup><br>RTSI 7 <sup>‡</sup>         |  | _   |
| frequency range                           | NI 6535/6535<br>0 Hz to 10 MH<br>NI 6536/6536<br>0 Hz to 25 MH<br>NI 6537/6537<br>0 Hz to 50 MH               | [z] <b>B</b> : [z] <b>B</b> : | NI 6535<br>0 Hz to<br>NI 6536<br>NI 6537<br>0 Hz to 2 | 10 MHz<br>/6536B and<br>/6537B:              |   |
| Minimum<br>detectable                     | PFI <45><br>PXIe_DSTARB <sup>†</sup>  |                               | Р   | XI_TRIG7 <sup>†</sup><br>RTSI 7 <sup>‡</sup> | Positive and negative pulse width at voltage thresholds |
| imported<br>timebase clock<br>pulse width | 6.5 ns  | s 15 ns                       |   |  | thresholds.   |
| Exported                                  | Generation  |                               | Α   | cquisition                                   | _   |
| Sample clock destinations                 | PFI 4     RTSI 7 <sup>†</sup> PXI_TRIG     PXIE_DST   |                               | PFI 5   |  |   |
| Exported<br>Sample clock<br>duty cycle    | Internal Sample clock or divided-down timebase: 33% to 67% Imported Sample clock: Limited by input duty cycle |                               | Nominal.  |  |   |
| † PXI Express onl                         | у   |                               |   |  |   |

<sup>‡</sup> PCI Express only

## Pattern Generation Timing (Data and PFI 4 Channels)

| Specification   | Val  | lue  | Comments   |
|---|--|--|--|
| Maximum data channel toggle rate  | NI 6535/6535B: 5.0 MHz<br>NI 6536/6536B: 12.5 MHz<br>NI 6537/6537B: 25.0 MHz |  | _  |
| Data position   | Data Channels  | PFI Channels                                   | Relative to Sample   |
| modes   | Active edge, Inactive edge   | Active edge                                    | clock; Active edge<br>may be rising or<br>falling.   |
| Minimum   | PXI Express  | PCI Express                                    | t <sub>P</sub> is the Sample clock   |
| provided hold<br>time with<br>respect to PFI 4<br>(t <sub>PH</sub> )              | 750 ps   | 1.1 ns   | interval; values<br>assume the sample is<br>generated and<br>acquired on the               |
| Minimum<br>provided setup<br>time with<br>respect to PFI 4<br>(t <sub>PSU</sub> ) | Sample clock interval (t <sub>P</sub> ) - 5.35 ns                            | Sample clock interval (t <sub>P</sub> ) - 5 ns | same clock edge;<br>includes maximum<br>channel-to-channel<br>skew; valid for all<br>data. |

Figure 1. Provided Setup and Hold Times



 $t_P = \frac{1}{f}$  = Period of Sample Clock

 $t_{PH}$  = Minimum Provided Hold Time

 $t_{\text{PSU}}$  = Minimum Provided Setup Time

 $t_{\rm SKEW}$  = Maximum Channel-to-Channel Skew and Clock Uncertainty

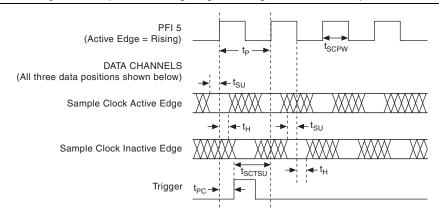


Note Provided setup and hold times include channel-to-channel skew and jitter.

# Pattern Acquisition Timing (Data and PFI 5 Channels)

| Specification   | Value  | Comments  |
|---|--|---|
| Setup time<br>with respect to<br>PFI 5 (t <sub>SU</sub> )                   | NI 6535/6536/6537 Rev C* or later<br>and NI 6535B/6536B/6537B: 2.8 ns<br>NI PCIe-6535/6536/6537 Rev B*: 2.0 ns | Includes maximum data channel-to- channel skew; valid for data and all triggers   |
| Hold time with<br>respect to<br>PFI 5 (t <sub>H</sub> )                     | NI 6535/6536/6537 Rev C* or later<br>and NI 6535B/6536B/6537B: 1.5 ns<br>NI PCIe-6535/6536/6537 Rev B*: 2.0 ns | data and all triggers except the Start trigger when using the Sample Clock sample timing type.  * Refer to assembly number sticker on device for revision information |
| Setup time of<br>triggers with<br>respect to<br>PFI 5 (t <sub>SCTSU</sub> ) | 15 ns  | Nominal.  |
| Trigger delay<br>from PFI 5 to<br>trigger edge<br>(t <sub>PC</sub> )        | 9 ns   | Nominal.  |

Figure 2. Acquisition Timing Diagram Using PFI 5 as the Sample Clock



t<sub>SU</sub> = Setup Time with Respect to PFI 5

t<sub>H</sub> = Hold Time with Respect to PFI 5

 $t_P = \frac{1}{f} = \text{Sample Clock Period}$ 

 $t_{SCPW}$  = Minimum Detectable Sample Clock Pulse Width

t<sub>PC</sub> = Trigger Delay from PFI 5 to Trigger Edge\*

t<sub>SCTSU</sub> = Setup Time of Trigger with Respect to PFI 5\*

\*Sample Clock Sample Timing Type only.

#### Handshaking

| Specification   | Value  | Comments                   |
|---|--|----------------------------|
| Asynchronous<br>handshaking<br>modes  | Handshake (8255) sample timing type                                    | 8255 emulation equivalent. |
| Synchronous<br>handshaking<br>modes   | Burst sample timing type     Pipelined Sample Clock sample timing type | _                          |
| Control line polarity   | Active high     Active low   | _                          |
| Programmable<br>delay<br>resolution for<br>Handshake<br>sample timing<br>type | 20 ns  | _                          |

## **Change Detection**

| Specification                     | Value   | Comments               |
|-----------------------------------|---|------------------------|
| Change<br>detection<br>resolution | Sample clock period   | _                      |
| Sources                           | P0.<07>, P1.<07>, P2.<07>, P3.<07>  | Per data               |
| Valid sample position             | Active edge     Inactive edge   | channel<br>selectable. |
| Valid changes                     | <ol> <li>Don't care</li> <li>Rising edge</li> <li>Falling edge</li> <li>Rising or falling edge</li> </ol> |                        |

# Waveform Specifications

#### Memory

| Specification                     | Value  | Comments  |
|-----------------------------------|--|---|
| Onboard<br>memory size            | 2,048 samples (S)  | First-in<br>first-out based,<br>regardless of<br>port size. |
| Transfer type                     | DMA     Programmed I/O (On Demand sample timing type only) | _   |
| Generation<br>waveform<br>quantum | Waveform size must be an integer multiple of 1 S.          | _   |
| Acquisition minimum buffer size   | 2 S  | _   |

## Triggers

| Specification                 |  | Value  |              | Comments                                   |
|-------------------------------|--|--|--------------|--|
| Supported triggers (by sample | Sample<br>Timing<br>Type   | Acquisition  | Generation   | Generation<br>operations do<br>not support |
| timing type)                  | Sample<br>Clock  | Start, Reference   | Start        | pattern match<br>triggers.                 |
|                               | Pipelined<br>Sample<br>Clock   | Pause, Start, Reference  | Pause, Start |  |
|                               | Burst<br>Handshake   | Pause (not including the pattern match type trigger)   | Pause        |  |
|                               | Handshake  | Handshake  | Handshake    |  |
|                               | Change<br>Detection  | Start  | N/A          |  |
| Sources                       | <ol> <li>PFI &lt;05&gt; (DDC connector)</li> <li>PXI_TRIG&lt;06&gt; (PXI backplane)<sup>†</sup>         RTSI &lt;07&gt; (RTSI bus)<sup>‡</sup></li> <li>PXIe_DSTARB (PXI backplane)<sup>†</sup></li> <li>Pattern match (Acquisition sessions only)</li> <li>Disabled (Do not wait for a trigger)</li> </ol>  |  | _            |  |
| Trigger detection             | <ol> <li>Start Trigger (Edge detection: rising or falling;<br/>Pattern match: match or does not match)</li> <li>Pause Trigger (Level detection: high or low;<br/>Pattern match: match or does not match)</li> <li>Reference Trigger (Edge detection: rising or falling;<br/>Pattern match: match or does not match)</li> <li>Handshaking Trigger (Interlocked: high or low)</li> </ol> |  |              | _  |
| Destinations                  | 2. PXI_TRIG<br>RTSI <07  | (DDC Connector)<br><07> (PXI backplane) <sup>†</sup><br>> (RTSI bus)<br>ARC (PXI backplane) <sup>†</sup> |              | _  |

| Specification                    | Value                             |   |                         | Comments  |
|----------------------------------|-----------------------------------|---|-------------------------|---|
| Delay from                       | Generation                        |   |                         | Use the Data  |
| Pause trigger to<br>Paused state | Minimum                           | Maximum   | Acquisition             | Active event during   |
| (t <sub>P2S</sub> )              | 6 Sample clock cycles<br>+ 6.7 ns | NI PCIe-6535/6536/6537: 7 Sample clock cycles + 15.4 ns NI PXIe-6535/6536/6537: 7 Sample clock cycles + 17 ns NI 6535B/6536B/6537B: 7 Sample clock cycles + 65 ns | Synchronous to the data | generation operations to determine on a sample-by- sample basis when the NI device has entered the Paused state. Pause trigger only supported by Pipelined Sample Clock sample timing type. |

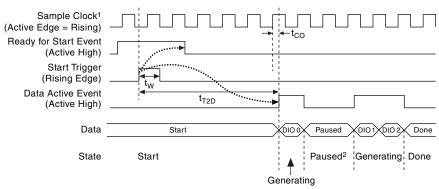
<sup>†</sup> PXI Express only

<sup>‡</sup> PCI Express only

| Delay from  |  | Generation  |   | Nominal.   |
|---|--|---|---|--|
| trigger to digital data output (t <sub>T2D</sub> )                | Minimum  | Maximum   | Acquisition   |  |
|   | 65 ns  | NI 6535/6536/6537:<br>1 Sample clock cycle +<br>130 ns    | N/A   |  |
|   |  | NI 6535B/6536B/6537B:<br>1 Sample clock cycle +<br>150 ns |   |  |
| Minimum<br>detectable<br>trigger pulse<br>width (t <sub>W</sub> ) | Sample Clock Sample Timing Type Triggers and Pipelined Sample Timing Type Generation Start Trigger |   | Burst and Pipelined Sample Timing Type Generation Pause Trigger | Nominal.  Maximum required pulse width to guarantee sampling by an asynchronous clock; |
|   | 10 ns  |   | Sample clock<br>period + 4 ns                                   | synchronous<br>triggers have<br>same setup<br>and hold<br>requirements as<br>data.     |

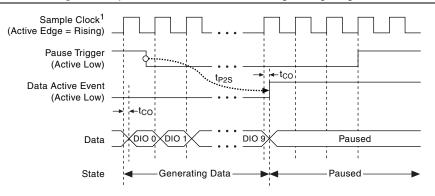
| Specification  | Value  | Comments  |
|--|--|---|
| Maximum<br>required setup<br>and hold of<br>Sample Clock<br>sample timing<br>type triggers<br>with respect to<br>PFI 5 | Refer to the <i>Pattern Acquisition Timing (Data and PFI 5 Channels)</i> section of this document. | _   |
| Maximum<br>required delay<br>from data to<br>Handshake<br>trigger (t <sub>DT</sub> )                                   | 5 ns   | Nominal. Maximum required time between data valid and the Handshake trigger; Handshake sample timing type only.   |
| Maximum<br>required delay<br>from Handshake<br>trigger to data<br>(t <sub>TD</sub> )                                   | 50 ns  | Nominal. Maximum required time between the Handshake Trigger and data invalid; Handshake sample timing type only. |

Figure 3. Pipelined Generation Timing Diagram



<sup>&</sup>lt;sup>1</sup> Must be free-running.

Figure 4. Pipelined Generation Handshaking Timing Diagram



<sup>&</sup>lt;sup>1</sup> Must be free-running.

<sup>&</sup>lt;sup>2</sup> Generation pauses if the DAQmx Underflow property/attribute is set to Pause Until Data Available or Pause Trigger Received.

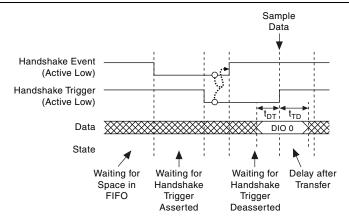
t<sub>W</sub> = Minimum detectable trigger pulse width.

t<sub>CO</sub> = Exported Sample clock offset.

 $t_{T2D}$  = Delay from trigger to digital data out.

t<sub>P2S</sub> = Pause trigger to Paused state.

t<sub>CO</sub> = Exported Sample clock offset.



t<sub>DT</sub> = Maximum required delay from data valid to trigger.

t<sub>TD</sub> = Maximum required delay from trigger to data invalid.

#### **Events**

| Specification              |  | Value                                     |                                 | Comments |
|----------------------------|--|---|---------------------------------|----------|
| Supported events           | Sample<br>Timing Type  | Acquisition                               | Generation                      | _        |
| (by sample<br>timing type) | Sample Clock   | Ready for Start                           | Ready for Start,<br>Data Active |          |
|                            | Pipelined<br>Sample Clock  | Ready for<br>Transfer,<br>Ready for Start | Ready for Start,<br>Data Active |          |
|                            | Burst<br>Handshake   | Ready for<br>Transfer                     | Ready for Transfer              |          |
|                            | Handshake  | Handshake                                 | Handshake                       |          |
|                            | Change<br>Detection  | Change<br>Detection,<br>Ready for Start   | N/A                             |          |
| Destinations               | <ol> <li>PFI &lt;05&gt; (DDC Connector)</li> <li>PXI_TRIG&lt;07&gt; (PXI backplane)<sup>†</sup><br/>RTSI &lt;07&gt; (RTSI bus)<sup>‡</sup></li> <li>PXIe_DSTARC (PXI backplane)<sup>†</sup></li> </ol> |   | Ι                               |          |

| Specification  | Value              |                     | Comments   |
|--|--------------------|---------------------|--|
| Pulse width for<br>the exported<br>Change<br>Detection event | Frequency ≤ 10 MHz | Frequency > 10 MHz* | Software   |
|  | 50 ns              | 15 ns               | determined based<br>on Sample clock<br>frequency.              |
|  |                    |                     | * Frequency<br>>10 MHz does not<br>apply for<br>NI 6535/6535B. |
| † PXI Express only   |                    |                     |  |

<sup>‡</sup> PCI Express only

| Delay from                | Minimum | Maximum  | Nominal.  |
|---------------------------|---------|--|---|
| Change Detect<br>to event | 90 ns   | NI PCIe-6535/6536/6537:<br>1 Sample clock cycle + 100 ns<br>NI PXIe-6535/6536/6537:<br>1 Sample clock cycle + 105 ns | Delay from data at<br>the DDC connector<br>to the event<br>generated on the<br>DDC connector. |
|                           |         | <b>NI 6535B/6536B/6537B</b> :<br>1 Sample clock cycle + 120 ns   |   |

## Nonvolatile Storage

| Specification | Value  | Comments |
|---------------|--|----------|
| Description   | 16 Mbit storage for firmware and power up states | _        |
| Write Cycles  | 75,000 minimum                                   | _        |

#### Power

| Specification | Value             |                      | Comments               |
|---------------|-------------------|----------------------|------------------------|
|               | NI 6535/6536/6537 | NI 6535B/6536B/6537B | Maximum.               |
| +3.3 VDC      | 750 mA            | 1 A                  | Into<br>high-impedance |
| +12 VDC       | 300 mA            | 225 mA               | loads.                 |
| Total power   | 6.1 W             | 6 W                  |                        |

# **Physical Specifications**

| Specification | Value  |  | Comments |
|---------------|--|--|----------|
| Dimensions    | PXI Express  | PCI Express  | _        |
|               | 21.4 cm × 2.0 cm × 13.1 cm<br>(8.42 in. × 0.79 in. × 5.14 in.) | 18.1 cm × 2.2 cm × 12.6 cm<br>(7.13 in. × 0.85 in. × 4.93 in.) |          |
| Weight        | 144.58 g (5.1 oz)  | 107.7 g (3.8 oz)   | _        |

#### Software

| Specification                | Value   | Comments  |
|------------------------------|---|---|
| Driver software  Application | NI 6535: NI-DAQmx driver software version 8.8 or later NI 6536/6537: NI-DAQmx driver software version 8.5 or later NI 6535B/6536B/6537B: NI DAQmx driver software version 9.6.1 or later NI-DAQmx provides programming interfaces for the following | Refer to the  |
| software                     | application development environments (ADEs):  • National Instruments LabVIEW  • National Instruments LabWindows™/CVI™  • Microsoft Visual Studio  | NI-DAQ<br>Readme<br>for more<br>information<br>about<br>supported<br>ADE<br>versions. |
| Test Panel                   | National Instruments Measurement & Automation Explorer (MAX) provides test panels with basic acquisition and generation functionality for the NI 6535/6536/6537 and NI 6535B/6536B/6537B. MAX is included on the NI-DAQmx instrument driver media.  | _   |

#### **Environment**



**Note** The NI 6535/6536/6537 and NI 6535B/6536B/6537B are intended for indoor use only.

| Specification                   | Value   | Comments         |
|---------------------------------|---|------------------|
| Operating temperature           | PCI Express: 0 °C to +45 °C PXI Express: 0 °C to +55 °C   | _                |
| Storage<br>temperature          | -20 °C to +70 °C  | _                |
| Operating relative humidity     | 10% to 90% relative humidity, noncondensing (Meets IEC 60068-2-56.)   | _                |
| Storage<br>relative<br>humidity | 5% to 95% relative humidity, noncondensing (Meets IEC 60068-2-56.)  | _                |
| Operating shock                 | 30 g, half-sine, 11 ms pulse (Meets IEC 60068-2-27. Test profile developed in accordance with MIL PRF-28800F.)              | PXI Express only |
| Storage shock                   | 50 g, half-sine, 11 ms pulse (Meets IEC 60068-2-27. Test profile developed in accordance with MIL PRF-28800F.)              |                  |
| Operating vibration             | 5 Hz to 500 Hz, 0.31 g <sub>rms</sub><br>(Meets IEC 60068-2-64.)  |                  |
| Storage<br>vibration            | 5 Hz to 500 Hz, 2.46 g <sub>rms</sub> (Meets IEC 60068-2-64. Test profile exceeds requirements of MIL PRF-28800F, Class B.) |                  |
| Altitude                        | 0 m to 2,000 m above sea level (at 25 °C ambient temperature)   | _                |
| Pollution<br>Degree             | 2   | _                |

#### Safety, Electromagnetic Compatibility, and CE Compliance



**Caution** The protection provided by this equipment may be impaired if it is used in a manner not described in this document.

| Specification                                   | Value   | Comments                       |
|---|---|--------------------------------|
| Safety  | This product is designed to meet 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   |                                |
| <b>Note</b> : For UL and Certification sect     | d other safety certifications, refer to the product label or the <i>Online I</i> ion.   | Product                        |
| Electromagnetic<br>Compatibility                | This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:   | With use of SHC68-C68-D2 or    |
|   | EN 61326 (IEC 61326): Class A emissions; Basic immunity   | SHC68-C68-D4<br>shielded cable |
|   | EN 55011 (CISPR 11): Group 1, Class A emissions   | snielded cable.                |
|   | AS/NZS CISPR 11: Group 1, Class A emissions   |                                |
|   | FCC 47 CFR Part 15B: Class A emissions  |                                |
|   | ICES-001: Class A emissions   |                                |
| <b>Note</b> : For the sta<br>Certification sect | ndards applied to access the EMC of this product, refer to the <i>Online</i> ion.   | e Product                      |
| <b>Note</b> : For EMC of must be installed.     | compliance, device <i>must</i> be operated with shielded cabling. In additi   | on, filler panels              |
| 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<br>(EMC)   |                                |
| Online Product<br>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. | _                              |

| Specification  | Value  | Comments  |  |
|--|--|---|--|
| Environmental<br>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 <i>Minimize Our Environmental Impact</i> 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<br>Electrical and<br>Electronic<br>Equipment<br>(WEEE) | <b>EU Customers</b> : At the end of the product life cycle, all products WEEE recycling center. For more information about WEEE recyc National Instruments WEEE initiatives and compliance with WEE 2002/96/EC on Waste Electrical and Electronic Equipment, visit nenvironment/weee.  | bout WEEE recycling centers,<br>bliance with WEEE Directive |  |

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