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Find the *National Instruments DAQCard-6036E* at our website: *Click HERE*

NI 6034E/6035E/6036E Family Specifications

This document lists the I/O terminal summary and specifications for the devices that make up the NI 6034E/6035E/6036E family of devices. This family includes the following devices:

- NI PCI-6034E
- NI PCI-6035E
- NI DAQCard-6036E
- NI PCI-6036E

I/O Terminal Summary

Note With NI-DAQmx, National Instruments revised its terminal names so they are easier to understand and more consistent among NI hardware and software products. The revised terminal names used in this document are usually similar to the names they replace. For a complete list of Traditional NI-DAQ (Legacy) terminal names and their NI-DAQmx equivalents, refer to *Terminal Name Equivalents* of the *E Series Help*.

Table 1. I/O Terminals

Terminal Name	Terminal Type and Direction	Impedance Input/ Output	Protection (V) On/Off	Source (mA at V)	Sink (mA at V)	Rise Time (ns)	Bias
AI <0..15>	AI	100 GΩ in parallel with 100 pF	25/15	—	—	—	±200 pA
AI SENSE	AI	100 GΩ in parallel with 100 pF	25/15	—	—	—	±200 pA
AI GND	—	—	—	—	—	—	—
AO 0†	AO	0.1 Ω	Short-circuit to ground	5 at 10	5 at –10	—	—
AO 1†	AO	0.1 Ω	Short-circuit to ground	5 at 10	5 at –10	—	—
AO GND	—	—	—	—	—	—	—
D GND	—	—	—	—	—	—	—

NATIONAL INSTRUMENTS

Table 1. I/O Terminals (Continued)

Terminal Name	Terminal Type and Direction	Impedance Input/ Output	Protection (V) On/Off	Source (mA at V)	Sink (mA at V)	Rise Time (ns)	Bias
+5 V	—	0.1 Ω	Short-circuit to ground	1 A fused	—	—	—
P0.<0..7>	DIO	—	V_{CC} + 0.5	13 at (V_{CC} – 0.4)	24 at 0.4	1.1	50 kΩ pu
AI HOLD COMP	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
EXT STROBE*	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 0/ (AI START TRIG)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 1/ (AI REF TRIG)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 2/(AI CONV CLK)*	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 3/ CTR 1 SOURCE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 4/CTR 1 GATE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
CTR 1 OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 5/ (AO SAMP CLK)*	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 6/ (AO START TRIG)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 7/ (AI SAMP CLK)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 8/ CTR 0 SOURCE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 9/ CTR 0 GATE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
CTR 0 OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu

Table 1. I/O Terminals (Continued)

Terminal Name	Terminal Type and Direction	Impedance Input/ Output	Protection (V) On/Off	Source (mA at V)	Sink (mA at V)	Rise Time (ns)	Bias
FREQ OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu

* Indicates active low.

† NI 6035E/6036E only.

AI = Analog Input DIO = Digital Input/Output pu = pull-up
AO = Analog Output DO = Digital Output

Note: The tolerance on the 50 kΩ pull-up resistors is large. Actual value might range between 17 kΩ and 100 kΩ.

Specifications

The following specifications are typical at 25 °C unless otherwise noted.

Analog Input

Input Characteristics

Number of channels ..... 16 single-ended or 8 differential (software-selectable per channel)

Type of A/D converter (ADC) ..... Successive approximation

Resolution ..... 16 bits, 1 in 65,536

Max sampling rate ..... 200 kS/s guaranteed

Input signal ranges

Range (Software-Selectable)	Bipolar Input Range
20 V	±10 V
10 V	±5 V
1 V	±500 mV
100 mV	±50 mV

Input coupling ..... DC

Max working voltage (signal + common mode) ..... Each input should remain within ±11 V of ground

Overvoltage protection

Signal	Powered On (V)	Powered Off (V)
AI <0..15>, AI SENSE	±25	±15

FIFO buffer size

NI DAQCard-6036E ..... 1,024 samples (S)

NI 6034E, NI 6035E, NI PCI-6036E ..... 512 S

DMA (PCI only)

Channels 1

Data sources/destinations ..... Analog input, analog output, counter/timer 0, or counter/timer 1

Data transfers ..... Direct memory access (DMA)[1], interrupts, programmed I/O

DMA[1] modes ..... Scatter-gather (single transfer, demand transfer)

Configuration memory size ..... 512 words

[1] DMA is not available on the NI DAQCard-6036E.

Accuracy Information (NI 6034E, NI 6035E, NI PCI-6036E Only)

Nominal Range at Full Scale (V)	Absolute Accuracy							Relative Accuracy Resolution (μV)	
	% of Reading		Offset (μV)	Noise + Quantization (μV)		Temp Drift (%/°C)	Absolute Accuracy at Full Scale (mV)		
	24 Hours	1 Year		Single Pt.	Averaged			Single Pt.	Averaged
±10	0.0546	0.0588	±1601	±933	±82.4	0.0010	7.56	1,085	108.5
±5	0.0146	0.0188	±811	±467	±41.2	0.0005	1.79	542	52.24
±0.5	0.0546	0.0588	±100	±56.2	±5.04	0.0010	0.399	66.3	6.630
±0.05	0.0546	0.0588	±28.9	±28.2	±2.75	0.0010	0.0611	36.2	3.616

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. NI recommends a one-year calibration interval. The Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 points of averaged data. Go to `ni.com/info` and enter info code `rdspec` for example calculations.

Accuracy Information (NI DAQCard-6036E Only)

Nominal Range at Full Scale (V)		Absolute Accuracy							Relative Accuracy Resolution (μV)	
		% of Reading		Offset (μV)	Noise + Quantization (μV)		Temp Drift (%/°C)	Absolute Accuracy at Full Scale (mV)		
Positive Full Scale	Negative Full Scale	24 Hours	1 Year		Single Pt.	Averaged			Single Pt.	Averaged
+10	–10	0.0549	0.0591	2,602.05	1,500.21	137.329	0.0010	8.653	1,808.17	180.82
+5.0	–5.0	0.0149	0.0191	1,311.53	750.10	68.665	0.0005	2.337	904.08	90.408
+0.5	–0.5	0.0549	0.0591	150.053	84.319	7.782	0.0010	0.454	102.463	10.246
+0.05	–0.05	0.0549	0.0591	33.905	32.779	3.204	0.0010	0.067	42.191	4.219

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. NI recommends a one-year calibration interval. The Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 points of averaged data. Go to `ni.com/info` and enter info code `rdspec` for example calculations.

Transfer Characteristics

Integral nonlinearity (INL)

NI DAQCard-6036E..... ±3 LSB typ, ±6 LSB max

NI 6034E, NI 6035E, NI PCI-6036E..... ±1.5 LSB typ, ±3.0 LSB max

Differential nonlinearity (DNL)

NI DAQCard-6036E..... ±1 LSB typ, +4 LSB, –2 LSB max

NI 6034E, NI 6035E, NI PCI-6036E..... ±0.5 LSB typ, ±1.0 LSB max

No missing codes

NI DAQCard-6036E..... 15 bits

NI 6034E, NI 6035E, NI PCI-6036E..... 16 bits

Offset error

Pregain error after calibration ..... ±1.0 µV max

Pregain error before calibration

NI DAQCard-6036E..... ±3.0 mV max

NI 6034E, NI 6035E, NI PCI-6036E..... ±28.8 mV max

Postgain error after calibration

NI DAQCard-6036E..... ±0.20 mV max

NI 6034E, NI 6035E, NI PCI-6036E..... ±157 µV max

Postgain error before calibration

NI DAQCard-6036E..... ±50.1 mV max

NI 6034E, NI 6035E, NI PCI-6036E..... ±40 mV max

Gain error (relative to calibration reference)

After calibration (gain = 1)

NI DAQCard-6036E..... ±77 ppm of reading max

NI 6034E, NI 6035E, NI PCI-6036E ..... ±74 ppm of reading max

Before calibration

NI DAQCard-6036E..... ±19,800 ppm of reading max

NI 6034E, NI 6035E, NI PCI-6036E ..... ±18,900 ppm of reading max

Gain ≠ 1 with gain error adjusted to 0 at gain = 1 ..... ±200 ppm of reading max

Amplifier Characteristics

Input impedance

Normal powered on ..... 100 GΩ in parallel with 100 pF

Powered off..... 820 Ω

Overload..... 820 Ω

Input bias current

NI DAQCard-6036E..... ±800 pA

NI 6034E, NI 6035E, NI PCI-6036E ..... ±200 pA

Input offset current ..... ±100 pA

Common-mode rejection ratio (CMRR), DC to 60 Hz

Range	Bipolar
20 V	85 dB
10 V	85 dB
1 V	96 dB
100 mV	96 dB

Dynamic Characteristics

Bandwidth

Signal	Bandwidth
Small (–3 dB)	413 kHz
Large (1% THD)	490 kHz

Settling time for full-scale step[1]

NI DAQCard-6036E

Range 100 mV, 1 V, 20 V..... ±4.5 LSB, 5 µs typ

Range 10 V..... ±2 LSB, 5 µs typ

NI 6034E, NI 6035E, NI PCI-6036E

Range 100 mV..... ±4 LSB, 5 µs typ

Range 1 to 20 V..... ±2 LSB, 5 µs max

System noise (LSB_{rms}, including quantization)

NI DAQCard-6036E

Range 10 V, 20 V..... 1.5

Range 1 V..... 1.7

Range 100 mV..... 7.0

[1] Accuracy values are valid for source impedances <1 kΩ. Refer to *Multichannel Scanning Considerations* of the *E Series Help* for more information.

NI 6034E, NI 6035E, NI PCI-6036E
- Range 10 to 20 V 0.8
- Range 1 V 1.0
- Range 100 mV 6.2

Crosstalk ..... DC to 100 kHz

Adjacent channels ..... –75 dB

Other channels ..... –90 dB

Stability

Recommended warm-up time
- NI DAQCard-6036E ..... 30 minutes
- NI 6034E, NI 6035E, NI PCI-6036E ..... 15 minutes

Offset temperature coefficient
- Pregain ..... ±20 µV/°C
- Postgain ..... ±175 µV/°C

Gain temperature coefficient ..... ±20 ppm/°C

Analog Output (NI 6035E/6036E Only)

Output Characteristics

Number of channels ..... 2 voltage

Resolution
- NI DAQCard-6036E, NI PCI-6036E ..... 16 bits, 1 in 65,536
- NI 6035E ..... 12 bits, 1 in 4,096

Max update rate
- DMA[1] ..... 10 kHz, system-dependent
- Interrupts ..... 1 kHz, system-dependent

Type of D/A converter (DAC) ..... Double buffered, multiplying

FIFO buffer size ..... None

Data transfers ..... DMA, interrupts, programmed I/O

DMA modes ..... Scatter-gather (single transfer, demand transfer)

Accuracy Information

Device	Nominal Range at Full Scale (V)	Absolute Accuracy					
		% of Reading			Offset (µV)	Temp Drift (%/°C)	Absolute Accuracy at Full Scale (mV)
		24 Hours	90 Days	1 Year			
NI DAQCard-6036E	±10	0.0091	0.0111	0.0133	1.22	0.0005	2.547
NI 6035E	±10	0.18	0.02	0.022	5.93	0.0005	8.127
NI PCI-6036E	±10	0.009	0.011	0.013	1.1	0.0005	2.417

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. NI recommends a one-year calibration interval. The Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 points of averaged data. Go to `ni.com/info` and enter info code `rdspec` for example calculations.

[1] DMA is not available on the NI DAQCard-6036E.

Transfer Characteristics

INL, after calibration

- NI DAQCard-6036E, NI PCI-6036E: ±2 LSB max
- NI 6035E: ±0.3 LSB typ, ±0.5 LSB max

DNL: ±1.0 LSB max

Monotonicity

- NI DAQCard-6036E, NI PCI-6036E: 16 bits, guaranteed after calibration
- NI 6035E: 12 bits, guaranteed after calibration

Offset error

- After calibration
  - NI DAQCard-6036E, NI PCI-6036E: ±305 µV max
  - NI 6035E: ±1.0 mV max
- Before calibration
  - NI DAQCard-6036E: ±60 mV max
  - NI 6035E: ±200 mV max
  - NI PCI-6036E: ±44 mV max

Gain error (relative to internal reference)

- After calibration
  - NI DAQCard-6036E, NI PCI-6036E: ±30.5 ppm
  - NI 6035E: ±100 ppm
- Before calibration
  - NI DAQCard-6036E, NI PCI-6036E: ±0.50%
  - NI 6035E: ±0.75%

Voltage Output

Range: ±10 V

Output coupling: DC

Output impedance: 0.1 Ω max

Current drive: ±5 mA max

Protection: Short-circuit to ground

Power-on state (steady state)

- NI DAQCard-6036E: ±60 mV
- NI 6035E: ±200 mV
- NI PCI-6036E: ±44 mV

Initial power-up glitch

- Magnitude
  - NI DAQCard-6036E: ±1.6 V
  - NI 6035E: ±1.1 V
  - NI PCI-6036E: ±2.2 V
- Duration
  - NI DAQCard-6036E: 545 ms
  - NI 6035E: 2.0 ms
  - NI PCI-6036E: 42 µs

Power reset glitch

- Magnitude
  - NI DAQCard-6036E: ±1.6 V
  - NI 6035E, NI PCI-6036E: ±2.2 V
- Duration
  - NI DAQCard-6036E: 545 ms
  - NI 6035E: 4.2 µs
  - NI PCI-6036E: 42 µs

Dynamic Characteristics

Settling time for full-scale step

- NI DAQCard-6036E: 5 µs to ±4.5 LSB accuracy
- NI 6035E: 10 µs to ±0.5 LSB accuracy
- NI PCI-6036E: 5 µs to ±1 LSB accuracy

Slew rate

- NI DAQCard-6036E: 5 V/µs
- NI 6035E: 10 V/µs
- NI PCI-6036E: 15 V/µs

Noise

- NI DAQCard-6036E: 160 μV_{rms}, DC to 400 kHz
- NI 6035E: 200 μV_{rms}, DC to 1 MHz
- NI PCI-6036E: 110 μV_{rms}, DC to 400 kHz

Mid-scale transition glitch (NI 6035E and NI PCI-6036E only)

- Magnitude
  - NI 6035E: ±12 mV
  - NI PCI-6036E: ±10 mV
- Duration
  - NI 6035E: 2.0 µs
  - NI PCI-6036E: 1.0 µs

Stability

Offset temperature coefficient

NI DAQCard-6036E.....±150 µV/°C
NI 6035E.....±50 µV/°C
NI PCI-6036E.....±35 µV/°C

Gain temperature coefficient

NI DAQCard-6036E.....±8 ppm/°C
NI 6035E.....±25 ppm/°C
NI PCI-6036E.....±6.5 ppm/°C

Digital I/O

Number of channels.....8 input/output

Compatibility.....5 V TTL/CMOS

Digital logic levels on P0.<0..7>

Level	Min	Max
Input low voltage	0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Input low current (V_{in} = 0 V)	—	–320 µA
Input high current (V_{in} = 5 V)	—	10 µA
Output low voltage (I_{OL} = 24 mA)	—	0.4 V
Output high voltage (I_{OH} = –13 mA)	4.35 V	—

Power-on state.....Input (high-impedance), 50 kΩ pull-up to +5 VDC

Data transfers.....Programmed I/O

Transfer rate (1 word = 8 bits)[1].....50 kwords/s, typ

Constant sustainable rate[1].....1 to 10 kwords/s, typ

Timing I/O

Number of channels

Up/down counter/timers.....2
Frequency scaler.....1

Resolution

Up/down counter/timers.....24 bits
Frequency scaler.....4 bits

Compatibility.....5 V TTL/CMOS

Digital logic levels

Level	Min	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Output low voltage (I_{out} = 5 mA)	—	4.35 V
Output high voltage (I_{out} = –3.5 mA)	0.4 V	—

Base clocks available

Up/down counter/timers.....20 MHz, 100 kHz
Frequency scaler.....10 MHz, 100 kHz

Base clock accuracy.....±0.01%

Max external source frequency up/down counter/timers.....20 MHz

External source selections.....PFI <0..9>, RTSI <0..6> (except DAQCard), analog trigger, software-selectable

External gate selections.....PFI <0..9>, RTSI <0..6> (except DAQCard), analog trigger, software-selectable

Min source pulse duration.....10 ns in edge-detect mode

Min gate pulse duration.....10 ns in edge-detect mode

Data transfers

PCI up/down counter/timer.....DMA[2] (scatter-gather), interrupts, programmed I/O

DAQCard up/down counter/timer.....Interrupts, programmed I/O

Frequency scaler.....Programmed I/O

[1] Not guaranteed on the NI DAQCard-6036E.

[2] DMA is not available on the NI DAQCard-6036E.

Triggers

Digital Trigger

Purpose

- Analog input ..... Start, reference, and pause trigger, sample clock
- Analog output ..... Start and pause trigger, sample clock
- Counter/timers ..... Source, gate

External sources ..... PFI <0..9>, RTSI <0..6> (except DAQCard)

Compatibility ..... 5 V TTL

Response ..... Rising or falling edge

Pulse width ..... 10 ns min

RTSI (PCI Only)

Trigger lines 7

Calibration

Recommended warm-up time

- PCI ..... 15 minutes
- DAQCard ..... 30 minutes

Interval ..... 1 year

External calibration reference ..... Between 6 and 10 V

Onboard calibration reference

- Level ..... 5.000 V (±3.5 mV) (over full operating temperature, actual value stored in EEPROM)
- Temperature coefficient ..... ±5.0 ppm/°C max
- Long-term stability ..... ±15.0 ppm/ $\sqrt{1{,}000\ \text{h}}$

Power Requirement

PCI ..... +5 VDC (±5%) at 0.9 A

DAQCard ..... +5 VDC (±5%) at 0.3 A

Note Excludes power consumed through +5 V available at the I/O connector.

Power available at I/O connector

- PCI ..... +4.65 to +5.25 VDC at 1 A
- DAQCard ..... +4.65 to +5.25 VDC at 0.75 A

Physical

Dimensions

PCI (not including connectors) ..... 17.5 cm × 10.6 cm (6.9 in. × 4.2 in.)

DAQCard ..... Type II PC Card

Weight

- NI DAQCard-6036E ..... 32 g (1.1 oz)
- NI PCI-6034E ..... 152 g (5.3 oz)
- NI PCI-6035E ..... 165 g (5.8 oz)
- NI PCI-6036E ..... 114 g (4.0 oz)

I/O connector

- PCI ..... 68-pin male SCSI-II type
- DAQCard ..... 68-position female VHDCI

Maximum Working Voltage

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

Channel-to-earth ..... ±11 V, Installation Category I

Channel-to-channel ..... ±11 V, Installation Category I

Environmental

Operating temperature ..... 0 to 55 °C

Storage temperature ..... –20 to 70 °C

Relative humidity

- NI DAQCard-6036E ..... 10 to 90%, noncondensing
- NI 6035E, NI PCI-6036E ..... 10 to 90%, noncondensing

Safety

NI PCI-6034E/6035E/6036E

The device 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
- CAN/CSA-C22.2 No. 61010-1

Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

The device meets the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

- IEC 60950, EN 60950
- UL 1950, UL 60950
- CAN/CSA-C22.2 No. 60950

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions.....EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity .....EN 61326:1997 A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, you must operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety).....73/23/EEC

Electromagnetic Compatibility Directive (EMC).....89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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.



Figure 1. NI 6034E Pinout



Figure 2. NI 6035E/6036E Pinout

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