

# NI 6030E/6031E/6032E/6033E Family Specifications

This document lists the I/O terminal summary and specifications for the devices that make up the NI 6030E family of devices. This family includes the following devices:

- NI PXI-6030E
- NI PCI-MIO-16XE-10 (NI 6030E)
- NI PCI-6031E
- NI PXI-6031E
- NI PCI-6032E
- NI PCI-6033E

## 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 <16..63> <sup>†</sup>	AI	100 G $\Omega$ in parallel with 100 pF	25/15	—	—	—	$\pm 1$ nA
AI SENSE, AI SENSE 2 <sup>†</sup>	AI	100 G $\Omega$ in parallel with 100 pF	25/15	—	—	—	$\pm 1$ nA
AI GND	—	—	—	—	—	—	—
AO 0 <sup>‡</sup>	AO	0.1 $\Omega$	Short-circuit to ground	5 at 10	5 at -10	5 V/ $\mu$ s	—
AO 1 <sup>‡</sup>	AO	0.1 $\Omega$	Short-circuit to ground	5 at 10	5 at -10	5 V/ $\mu$ s	—
AO GND	—	—	—	—	—	—	—
D GND	—	—	—	—	—	—	—

**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 $\Omega$	Short-circuit to ground	1 A	—	—	—
P0.<0..7>	DIO	—	$V_{CC} + 0.5$	13 at ( $V_{CC} - 0.4$ )	24 at 0.4	1.1	50 k $\Omega$ pu
AI HOLD COMP	DO	—	—	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	50 k $\Omega$ pu
EXT STROBE*	DO	—	—	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	50 k $\Omega$ pu
PFI 0/ (AI START TRIG)	AI/DIO	10 k $\Omega$	$V_{CC} + 0.5/\pm 35$	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	9 k $\Omega$ pu, 10 k $\Omega$ pd
PFI 1/ (AI REF TRIG)	DIO	—	$V_{CC} + 0.5$	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	50 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ pu
CTR 1 OUT	DO	—	—	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	50 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ pu
CTR 0 OUT	DO	—	—	3.5 at ( $V_{CC} - 0.4$ )	5 at 0.4	1.5	50 k $\Omega$ 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 <sub>CC</sub> - 0.4)	5 at 0.4	1.5	50 kΩ pu
<p>* Indicates active low.                      † NI 6031E/6033E only.                      ‡ NI 6030E/6031E only.                      AI = Analog Input      DIO = Digital Input/Output      pd = pull-down                      AO = Analog Output      DO = Digital Output      pu = pull-up                      AI/DIO = Analog Input/Digital Input/Output</p> <p><b>Note:</b> The tolerance on the 50 kΩ pull-up resistors is large. Actual value might range between 17 kΩ and 100 kΩ.</p>							

## Specifications

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

### Analog Input

#### Input Characteristics

Number of channels

NI 6030E, NI 6032E.....	16 single-ended or 8 differential (software-selectable per channel)
NI 6031E, NI 6033E.....	64 single-ended or 32 differential (software-selectable per channel)

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

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

Max sampling rate (single-channel)<sup>1</sup> ..... 100 kS/s guaranteed

Input signal ranges

Range (Software-Selectable)	Input Range	
	Bipolar	Unipolar
20 V	±10 V	—
10 V	±5 V	0 to 10 V
5 V	—	0 to 5 V
4 V	±2 V	—
2 V	±1 V	0 to 2 V
1 V	±500 mV	0 to 1 V
500 mV	—	0 to 500 mV
400 mV	±200 mV	—
200 mV	±100 mV	0 to 200 mV
100 mV	—	0 to 100 mV

<sup>1</sup> Refer to the *Settling time* table in the *Dynamic Characteristics* section for multichannel rates.

Input coupling.....	DC
Max working voltage.....	Each input should remain within $\pm 11$ V of ground.
Overvoltage protection	
Powered on .....	$\pm 25$ V
Powered off.....	$\pm 15$ V
Inputs protected	
NI 6030E, NI 6032E .....	AI <0..15>, AI SENSE
NI 6031E, NI 6033E .....	AI <0..63>, AI SENSE, AI SENSE 2
FIFO buffer size	
NI PCI-6031E OEM .....	1,024 samples (S)
All other devices .....	512 S
DMA	
Channels.....	3
Data sources/destinations.....	Analog input, analog output, counter/timer 0, or counter/timer 1
Data transfers.....	Direct memory access (DMA), interrupts, programmed I/O
DMA modes .....	Scatter-gather (single-transfer, demand-transfer)
Configuration memory size .....	512 words (1 word = 8 bits)

## Accuracy Information

Nominal Range (V)		Absolute Accuracy							Relative Accuracy Resolution ( $\mu\text{V}$ )	
Positive Full Scale	Negative Full Scale	% of Reading		Offset ( $\mu\text{V}$ )	Noise + Quantization ( $\mu\text{V}$ )		Temp Drift ( $\%/\text{C}$ )	Absolute Accuracy at Full Scale (mV)	Single Pt.	Averaged
		24 Hours	1 Year		Single Pt.	Averaged				
+10.0	-10.0	0.0044	0.0061	479.2	634.1	54.9	0.0001	1.147	723.3	72.3
+5.0	-5.0	0.0344	0.0361	243.6	317.1	27.5	0.0006	2.077	361.6	36.2
+2.0	-2.0	0.0344	0.0361	102.2	126.8	11.0	0.0006	0.836	144.7	14.5
+1.0	-1.0	0.0344	0.0361	55.1	63.4	5.5	0.0006	0.422	72.3	7.2
+0.5	-0.5	0.0344	0.0361	31.6	36.8	3.2	0.0006	0.215	42.2	4.2
+0.2	-0.2	0.0394	0.0411	17.4	22.5	2.0	0.0006	0.102	26.5	2.7
+0.1	-0.1	0.0044	0.0461	12.7	19.6	1.8	0.0006	0.061	24.1	2.4
10.0	0.0	0.0044	0.0061	326.6	417.8	36.6	0.0001	0.976	482.2	48.2
5.0	0.0	0.0344	0.0361	167.3	208.9	18.3	0.0006	1.992	241.1	24.1
2.0	0.0	0.0344	0.0361	71.7	83.6	7.3	0.0006	0.802	96.4	9.6
1.0	0.0	0.0344	0.0361	39.9	41.8	3.7	0.0006	0.405	48.2	4.8
0.5	0.0	0.0344	0.0361	23.9	28.1	2.5	0.0006	0.207	33.1	3.3
0.2	0.0	0.0394	0.0411	14.4	19.6	1.8	0.0006	0.098	24.1	2.4
0.1	0.0	0.0444	0.0461	11.2	18.1	1.7	0.0006	0.059	22.9	2.3

**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  $\pm 1\text{ }^{\circ}\text{C}$  of internal calibration temperature and  $\pm 10\text{ }^{\circ}\text{C}$  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  $\pm 10\text{ V}$  range) after one year, assuming 100 points of averaged data. Go to [ni.com/info](http://ni.com/info) and enter info code `rdaspec` for example calculations.

## Transfer Characteristics

Relative accuracy .....	±0.75 LSB typ, ±1 LSB max
Differential nonlinearity (DNL) .....	±0.5 LSB typ, ±1 LSB max
No missing codes.....	16 bits, guaranteed
Offset error	
Pregain error after calibration .....	±3 µV max
Pregain error before calibration .....	±2.2 mV max
Postgain error after calibration .....	±76 µV max
Postgain error before calibration .....	±102 mV max
Gain error (relative to calibration reference)	
After calibration (gain = 1) .....	±30.5 ppm of reading max
Before calibration .....	±2,150 ppm of reading max
With gain error adjusted to 0 at gain = 1	
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 min
Overload.....	820 Ω min
Input bias current.....	±1 nA
Input offset current .....	±2 nA

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

Range	CMRR	
	Bipolar (dB)	Unipolar (dB)
20 V	92	—
10 V	97	92
5 V	—	97
4 V	101	—
2 V	104	101
1 V	105	104
100 mV to 500 mV	105	105

## Dynamic Characteristics

Bandwidth (–3 dB)  
All gains..... 255 kHz

Settling time for full-scale step (DC to all gains and ranges)

Device	Accuracy*		
	±0.00076% (±0.5 LSB)	±0.0015% (±1 LSB)	±0.0061% (±4 LSB)
NI 6030E	40 µs max	20 µs max	10 µs max
NI 6032E			
NI 6031E	50 µs max	25 µs max	10 µs max
NI 6033E			

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

System noise (LSB<sub>rms</sub>, including quantization)

Range	Bipolar	Unipolar
2 to 20 V	0.6	0.8
1 V	0.7	0.8
400 to 500 mV	1.1	1.1
200 mV	2.0	2.0
100 mV	—	3.8

Crosstalk (DC to 100 kHz)

Adjacent channels .....	–75 dB
All other channels.....	–90 dB

## Stability

Offset temperature coefficient

Pregain .....  $\pm 5 \mu\text{V}/^\circ\text{C}$   
 Postgain .....  $\pm 120 \mu\text{V}/^\circ\text{C}$

Gain temperature coefficient .....  $\pm 8 \text{ ppm}/^\circ\text{C}$

## Analog Output (NI 6030E/6031E Only)

### Output Characteristics

Number of channels ..... 2 voltage  
 Resolution ..... 16 bits, 1 in 65,536  
 Max update rate ..... 100 kS/s  
 Type of digital-to-analog converter (DAC) ..... Double-buffered  
 FIFO buffer size ..... 2,048 samples (S)  
 Data transfers ..... DMA, interrupts, programmed I/O  
 DMA modes ..... Scatter-gather (single-transfer, demand-transfer)

### Accuracy Information

Nominal Range (V)		Absolute Accuracy					Absolute Accuracy at Full Scale (mV)
Positive Full Scale	Negative Full Scale	% of Reading			Offset ( $\mu\text{V}$ )	Temp Drift ( $\%/^\circ\text{C}$ )	
		24 Hours	90 Days	1 Year			
10	-10	0.0045	0.0053	0.0062	812.8	0.0001	1.430
10	0	0.0045	0.0053	0.0062	583.9	0.0001	1.201

**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  $\pm 1^\circ\text{C}$  of internal calibration temperature and  $\pm 10^\circ\text{C}$  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  $\pm 10\text{ V}$  range) after one year, assuming 100 points of averaged data. Go to [ni.com/info](http://ni.com/info) and enter info code `rdspec` for example calculations.

### Transfer Characteristics

Relative accuracy, or integral nonlinearity (INL) .....  $\pm 0.5 \text{ LSB typ}$ ,  $\pm 1 \text{ LSB max}$   
 DNL .....  $\pm 1 \text{ LSB max}$   
 Monotonicity ..... 16 bits, guaranteed

Offset error  
 After calibration .....  $305 \mu\text{V max}$   
 Before calibration .....  $20 \text{ mV max}$   
 Gain error (relative to internal reference)  
 After calibration .....  $\pm 30.5 \text{ ppm max}$   
 Before calibration .....  $\pm 2,000 \text{ ppm max}$

## Voltage Output

Range..... $\pm 10$  V, 0 to 10 V  
(software-selectable)

Output coupling.....DC

Output impedance.....0.1  $\Omega$  max

Current drive..... $\pm 5$  mA

Protection.....Short-circuit to ground

Power-on state .....0 V ( $\pm 20$  mV)

## Dynamic Characteristics

Settling time for full-scale step .....10  $\mu$ s to  $\pm 1$  LSB accuracy

Slew rate .....5 V/ $\mu$ s

Noise.....60  $\mu$ V<sub>rms</sub>, DC to 1 MHz

## Stability

Offset temperature coefficient..... $\pm 50$   $\mu$ V/ $^{\circ}$ C

Gain temperature coefficient ..... $\pm 7.5$  ppm/ $^{\circ}$ 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 $\mu$ A
Input high current ( $V_{in} = 5$ V)	—	10 $\mu$ A
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)

Data transfers.....Programmed I/O

Transfer rate

Maximum with NI-DAQ,  
system-dependent.....50 kwords/s

Constant suitable rate.....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)	—	0.4 V
Output high voltage ( $I_{out} = -3.5$ mA)	4.35 V	—

## Base clocks available

Up/down counter/timers ..... 20 MHz, 100 kHz

Frequency scaler..... 10 MHz, 100 kHz

Base clock accuracy..... $\pm 0.01\%$

## Max external source frequency

up/down counter/timers ..... 20 MHz

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

External gate selections ..... PFI <0..9>, RTSI <0..6>,  
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/PXI up/down  
counter/timer ..... DMA (scatter-gather),  
interrupts,  
programmed I/O

DAQCard up/down  
counter/timer ..... DMA (scatter-gather),  
interrupts,  
programmed I/O

Frequency scaler..... Programmed I/O



## Triggers

### Analog Trigger

#### Purpose

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

#### Source

NI 6030E, NI 6032E.....	AI <0..15>, PFI 0/AI START TRIG
NI 6031E, NI 6033E.....	AI <0..63>, PFI 0/AI START TRIG

#### Level

Internal.....	±Full scale
External .....	±10 V

Slope ..... Positive or negative  
(software-selectable)

Resolution ..... 12 bits, 1 in 4,096

Hysteresis..... Programmable

#### Bandwidth (–3 dB)

PCI devices.....	255 kHz internal, 4 MHz external
PXI devices.....	255 kHz internal/external

#### External input (PFI 0/AI START TRIG)

Impedance .....	10 k $\Omega$
Coupling .....	DC

#### Protection

When configured as a digital signal.....	0.5 to VCC + 0.5 V
When configured as an analog signal or disabled.....	±35 V
Powered off.....	±35 V

Accuracy ..... ±1% of full-scale range

### 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>

Compatibility.....5 V TTL

Response.....Rising or falling edge

Pulse width.....10 ns min

### RTSI (PCI Only)

Trigger lines .....7

### PXI Trigger Bus (PXI Only)

Trigger lines .....6

Star trigger.....1

### Calibration

Recommended warm-up time .....15 minutes

Calibration interval.....1 year

External calibration reference .....Between 6 and 9,999 V

#### Onboard calibration reference

Level .....	5.000 V (±1.0 mV), over full operating temperature, actual value stored in EEPROM
Temperature coefficient.....	±0.6 ppm/°C max
Long-term stability .....	±6 ppm/ $\sqrt{1,000}$ h

### Bus Interface

Type.....Master, slave

### Power

#### Bus Requirements

+5 VDC (±5%).....1.5 A



**Note** Excludes power consumed through V<sub>CC</sub> available at the I/O connector.

### I/O Connector

Power available at I/O connector ....+4.65 to +5.25 VDC  
at 1 A

### Physical

#### Dimensions (not including connectors)

PCI devices .....	17.5 cm × 10.6 cm (6.9 in. × 4.2 in.)
PXI devices .....	16.0 cm × 10.0 cm (6.3 in. × 3.9 in.)

#### Weight

NI PCI-MIO-16XE-10/	
NI PXI-6031E .....	.211 g (7.4 oz)
NI PXI-6030E .....	.232 g (8.1 oz)

NI PCI-6031E .....	199 g (7.0 oz)
NI PCI-6032E .....	185 g (6.5 oz)
NI PCI-6033E .....	179 g (6.2 oz)

**I/O connector**

NI 6030E, NI 6032E .....	.68-pin male SCSI-II type
NI 6031E, NI 6033E .....	100-pin female 0.05 D-type

**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 50 °C
Storage temperature.....	-20 to 70 °C
Relative humidity	
PCI devices .....	10 to 90%, noncondensing
PXI devices .....	10 to 90%, noncondensing
Maximum altitude .....	2,000 meters
Pollution Degree (indoor use only) .....	2

**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
- CAN/CSA-C22.2 No. 61010-1



**Note** For UL and other safety certifications, refer to the product label, or visit [ni.com/certification](http://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
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Immunity .....	EN 61326:1997 A2:2001, Table 1
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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](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

AI 8	34	68	AI 0
AI 1	33	67	AI GND
AI GND	32	66	AI 9
AI 10	31	65	AI 2
AI 3	30	64	AI GND
AI GND	29	63	AI 11
AI 4	28	62	AI SENSE
AI GND	27	61	AI 12
AI 13	26	60	AI 5
AI 6	25	59	AI GND
AI GND	24	58	AI 14
AI 15	23	57	AI 7
AO 0	22	56	AI GND
AO 1	21	55	AO GND
AO EXT REF	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	AI HOLD COMP
PFI 0/AI START TRIG	11	45	EXT STROBE
PFI 1/AI REF TRIG	10	44	D GND
D GND	9	43	PFI 2/AI CONV CLK
+5 V	8	42	PFI 3/CTR 1 SRC
D GND	7	41	PFI 4/CTR 1 GATE
PFI 5/AO SAMP CLK	6	40	CTR 1 OUT
PFI 6/AO START TRIG	5	39	D GND
D GND	4	38	PFI 7/AI SAMP CLK
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SRC
CTR 0 OUT	2	36	D GND
FREQ OUT	1	35	D GND

**Figure 1.** NI PXI-6030E/PCI-MIO-16XE-10 Pinout

AI GND	1	51	AI 16
AI GND	2	52	AI 24
AI 0	3	53	AI 17
AI 8	4	54	AI 25
AI 1	5	55	AI 18
AI 9	6	56	AI 26
AI 2	7	57	AI 19
AI 10	8	58	AI 27
AI 3	9	59	AI 20
AI 11	10	60	AI 28
AI 4	11	61	AI 21
AI 12	12	62	AI 29
AI 5	13	63	AI 22
AI 13	14	64	AI 30
AI 6	15	65	AI 23
AI 14	16	66	AI 31
AI 7	17	67	AI 32
AI 15	18	68	AI 40
AI SENSE	19	69	AI 33
AO 0	20	70	AI 41
AO 1	21	71	AI 34
AO EXT REF	22	72	AI 42
AO GND	23	73	AI 35
D GND	24	74	AI 43
P0.0	25	75	AI SENSE 2
P0.4	26	76	AI GND
P0.1	27	77	AI 36
P0.5	28	78	AI 44
P0.2	29	79	AI 37
P0.6	30	80	AI 45
P0.3	31	81	AI 38
P0.7	32	82	AI 46
D GND	33	83	AI 39
+5 V	34	84	AI 47
+5 V	35	85	AI 48
AI HOLD COMP	36	86	AI 56
EXT STROBE	37	87	AI 49
PFI 0/AI START TRIG	38	88	AI 57
PFI 1/AI REF TRIG	39	89	AI 50
PFI 2/AI CONV CLK	40	90	AI 58
PFI 3/CTR 1 SRC	41	91	AI 51
PFI 4/CTR 1 GATE	42	92	AI 59
CTR 1 OUT	43	93	AI 52
PFI 5/AO SAMP CLK	44	94	AI 60
PFI 6/AO START TRIG	45	95	AI 53
PFI 7/AI SAMP CLK	46	96	AI 61
PFI 8/CTR 0 SRC	47	97	AI 54
PFI 9/CTR 0 GATE	48	98	AI 62
CTR 0 OUT	49	99	AI 55
FREQ OUT	50	100	AI 63

Figure 2. NI 6031E Pinout

AI 8	34	68	AI 0
AI 1	33	67	AI GND
AI GND	32	66	AI 9
AI 10	31	65	AI 2
AI 3	30	64	AI GND
AI GND	29	63	AI 11
AI 4	28	62	AI SENSE
AI GND	27	61	AI 12
AI 13	26	60	AI 5
AI 6	25	59	AI GND
AI GND	24	58	AI 14
AI 15	23	57	AI 7
NC	22	56	AI GND
NC	21	55	AO GND
NC	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	AI HOLD COMP
PFI 0/AI START TRIG	11	45	EXT STROBE
PFI 1/AI REF TRIG	10	44	D GND
D GND	9	43	PFI 2/AI CONV CLK
+5 V	8	42	PFI 3/CTR 1 SRC
D GND	7	41	PFI 4/CTR 1 GATE
PFI 5/AO SAMP CLK	6	40	CTR 1 OUT
PFI 6/AO START TRIG	5	39	D GND
D GND	4	38	PFI 7/AI SAMP CLK
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SRC
CTR 0 OUT	2	36	D GND
FREQ OUT	1	35	D GND

NC = No Connect

**Figure 3.** NI 6032E Pinout

AI GND	1	51	AI 16
AI GND	2	52	AI 24
AI 0	3	53	AI 17
AI 8	4	54	AI 25
AI 1	5	55	AI 18
AI 9	6	56	AI 26
AI 2	7	57	AI 19
AI 10	8	58	AI 27
AI 3	9	59	AI 20
AI 11	10	60	AI 28
AI 4	11	61	AI 21
AI 12	12	62	AI 29
AI 5	13	63	AI 22
AI 13	14	64	AI 30
AI 6	15	65	AI 23
AI 14	16	66	AI 31
AI 7	17	67	AI 32
AI 15	18	68	AI 40
AI SENSE	19	69	AI 33
NC	20	70	AI 41
NC	21	71	AI 34
NC	22	72	AI 42
AO GND	23	73	AI 35
D GND	24	74	AI 43
P0.0	25	75	AI SENSE 2
P0.4	26	76	AI GND
P0.1	27	77	AI 36
P0.5	28	78	AI 44
P0.2	29	79	AI 37
P0.6	30	80	AI 45
P0.3	31	81	AI 38
P0.7	32	82	AI 46
D GND	33	83	AI 39
+5 V	34	84	AI 47
+5 V	35	85	AI 48
AI HOLD COMP	36	86	AI 56
EXT STROBE	37	87	AI 49
PFI 0/AI START TRIG	38	88	AI 57
PFI 1/AI REF TRIG	39	89	AI 50
PFI 2/AI CONV CLK	40	90	AI 58
PFI 3/CTR 1 SRC	41	91	AI 51
PFI 4/CTR 1 GATE	42	92	AI 59
CTR 1 OUT	43	93	AI 52
PFI 5/AO SAMP CLK	44	94	AI 60
PFI 6/AO START TRIG	45	95	AI 53
PFI 7/AI SAMP CLK	46	96	AI 61
PFI 8/CTR 0 SRC	47	97	AI 54
PFI 9/CTR 0 GATE	48	98	AI 62
CTR 0 OUT	49	99	AI 55
FREQ OUT	50	100	AI 63

NC = No Connect

**Figure 4.** NI 6033E Pinout

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