SPECIFICATIONS

USB-6000

8 AI (10 kS/s), 4 DIO USB Multifunction I/O Device

Definitions

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

The following characteristic specifications 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* specifications describe 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.

Analog Input

Number of analog inputs	8, single-ended
Input resolution	12 bits
Maximum sample rate (aggregate), system-dependent	10 kS/s
Converter type	Successive approximation
AI FIFO	2,047 samples
Timing resolution	125 ns (8 MHz timebase)
Timing accuracy	100 ppm of actual sample rate
Input range	±10 V
Working voltage	±10 V
Input impedance	>1 MΩ

NATIONAL INSTRUMENTS

Overvoltage protection	±30 V
Trigger sources	Software, PFI 1
System noise[1]	10 mVrms
Absolute accuracy at full scale, single-ended	
Typical at 25 °C	26 mV
Maximum over temperature	135 mV

Note Absolute accuracy at full scale on the analog input channels is determined using the following assumptions: *Number of readings* = 100, *Coverage factor* = 3 σ.

Digital I/O

Number of digital I/O	4
Function	
P0.0/PFI 0	Static digital I/O or counter source
P0.1/PFI 1	Static digital I/O or AI Start Trigger
P0.2	Static digital I/O
P0.3	Static digital I/O
Direction control	Each channel individually programmable as input or output
Output driver type	Each channel individually programmable as open collector or active drive
Absolute maximum voltage range	0 V to 5 V with respect to D GND
Pull-down resistor	47.5 kΩ to D GND
Power-on state	Input

Digital Input

Input voltage range	
Powered on	0 V to 5 V
Powered off	0 V to 3.3 V
Input voltage protection	±20 V, for up to 24 hours

[1] System noise measured at maximum sample rate.

Caution Do not leave a voltage above 3.3 V connected on any DIO line when the device is powered off. This may lead to long term reliability issues.

Minimum V_{IH}	2.4 V
Maximum V_{IL}	0.8 V
Maximum input leakage current	
At 3.3 V	0.8 mA
At 5 V	4.5 mA

Digital Output (Active Drive)

Maximum V_{OL}	
At 4 mA	0.8 V
At 1 mA	0.2 V
Minimum V_{OH}	
At 4 mA	2.2 V
At 1 mA	2.9 V
Maximum V_{OH}	3.6 V
Maximum output current per line	±4 mA

Digital Output (Open Collector)

Maximum V_{OL}	
At 4 mA	0.8 V
At 1 mA	0.2 V
Minimum V_{OH}	Dependent on user provided pull-up resistor and pull-up voltage
Maximum output (sinking) current per line	-4 mA
Maximum pull-up voltage	5 V
Maximum leakage current	
At 3.3 V	0.8 mA
At 5 V	4.5 mA

Counter

Number of counters	1
Resolution	32 bits
Counter measurements	Edge counting, rising or falling

Counter direction	Count up
Counter source	PFI 0
Maximum input frequency	5 MHz
Minimum high pulse width	100 ns
Minimum low pulse width	100 ns

Bus Interface

USB specification	USB Full Speed
USB bus speed	12 Mb/s

Power Requirements

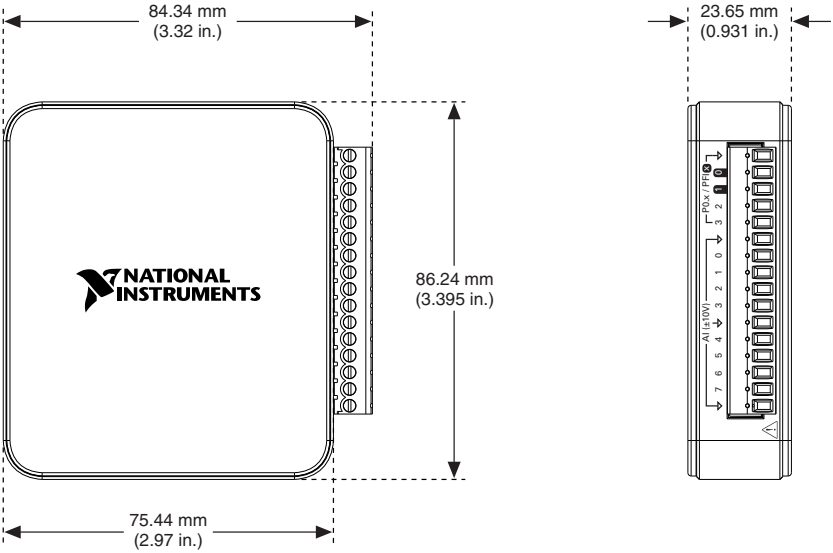
From USB, 4.30 VDC to 5.25 VDC	150 mA maximum

Note A typical bus-powered hub provides 100 mA on its USB lines. The USB-6000 does not work on a bus-powered hub.

Physical Characteristics

Dimensions	
Without screw terminal connector plug	75.44 mm × 86.24 mm × 23.65 mm (2.97 in. × 3.40 in. × 0.93 in.)
With screw terminal connector plug	84.34 mm × 86.24 mm × 23.65 mm (3.32 in. × 3.40 in. × 0.93 in.)

Figure 1. USB-6000 Dimensions



Weight	
Without screw terminal connector plug	73 g (2.58 oz)
With screw terminal connector plug	84 g (3 oz)
USB connector	USB Micro-B receptacle (1)
I/O connector	
Type	16-position screw terminal plug (1)
Screw-terminal wiring	1.31 mm^2 to 0.08 mm^2 (16 AWG to 28 AWG)
Torque for screw terminals	0.22 N · m to 0.25 N · m (2.0 lb. · in. to 2.2 lb. · in.)

If you need to clean the module, wipe it with a dry towel.

Safety Voltages

Connect only voltages that are within these limits.

Channel-to-GND	±30 V max, Measurement Category I

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

Caution Do not use this module for connection to signals or for measurements within Measurement Categories II, III, or IV

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

Environmental

Temperature (IEC 60068-2-1 and IEC 60068-2-2)	
Operating	0 °C to 40 °C
Storage	-40 °C to 85 °C
Humidity (IEC 60068-2-56)	
Operating	5% to 90% RH, noncondensing
Storage	5% to 95% RH, noncondensing
Pollution Degree (IEC 60664)	2
Maximum altitude	2,000 m

Indoor use only.

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 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 generate 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:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product 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.

Environmental 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 *Minimize Our Environmental Impact* 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 Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

电子信息产品污染控制管理办法（中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

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