NI-9381 Specifications

2025-03-10

Contents

NI-9381 Specifications

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*** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

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

Related information:

- Software Support for CompactRIO, CompactDAQ, Single-Board RIO, R Series, and EtherCAT

Conditions

Specifications are valid for the range -40 °C to 70 °C unless otherwise noted.

NI-9381 Pinout

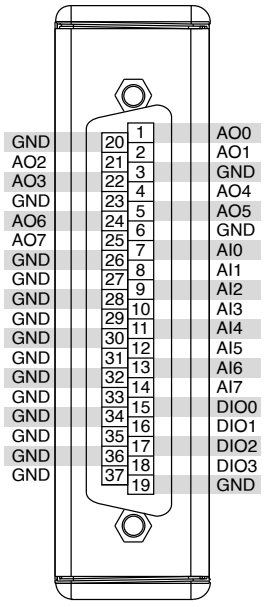

Table 1. Signal Descriptions

Signal	Description
AI	Analog input signal connection
AO	Analog output signal connection
DIO	Digital input/output signal connection
GND	Ground connection

Analog Input

Number of channels	8 single-ended channels
ADC resolution	12 bits
Type of ADC	Successive approximation register (SAR)
Input range	0 V to 5 V ±1%

DNL	±1.25 LSB
Conversion time	50 µs (20 kS/s)
Input coupling	DC
Input impedance	1 MΩ in parallel with 50 pF
Bandwidth	1 kHz
Stability	
Gain drift	80 ppm/°C
Offset drift	85 µV/°C

Table 3. Accuracy[1]

Measurement Conditions		**Percent of Reading (Gain Error)**	**Percent of Range (Offset Error)**
Calibrated	Maximum (-40 °C to 70 °C)	±0.70%	±13 mV
	Typical (23 °C, ±5 °C)	±0.15%	±6.5 mV
Uncalibrated[2]	Maximum (-40 °C to 70 °C)	±1.00%	±16 mV
	Typical (23 °C, ±5 °C)	±0.50%	±7.5 mV

1. Accuracy is impacted for AC signals by an amount equal to 4.0f µV, where f is the signal frequency in hertz
2. Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

Analog Output

Number of channels	8 channels
DAC resolution	12 bits
Type of DAC	String
Startup voltage	0 V
Output range	0 V to 5 V ±1%
Current drive	±1 mA
Output impedance	5 Ω
Update time	50 µs (20 kS/s)
Short-circuit protection	Indefinitely
Slew rate	30 V/ms
Settling time	900 µs
DNL	±1 LSB

Capacitive drive	1,500 pF
Stability	
Gain drift	85 ppm/°C
Offset drift	180 µV/°C

Table 3. Accuracy[3]

Measurement Conditions		**Percent of Reading (Gain Error)**	**Percent of Range (Offset Error)**
Calibrated	Maximum (-40 °C to 70 °C)	±1.02%	±23.5 mV
	Typical (23 °C, ±5 °C)	±0.19%	±5 mV
Uncalibrated[4]	Maximum (-40 °C to 70 °C)	±1.9%	±50 mV
	Typical (23 °C, ±5 °C)	±0.6%	±10 mV

Digital Input/Output

Number of channels	4 channels
Default power-on line direction	Input
Input/output type	LVTTL, single-ended
Digital logic levels	

3. Accuracy is impacted for AC signals by an amount equal to 4.0f µV, where f is the signal frequency in hertz
4. Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

Maximum input voltage	5.2 V
Input high, V_{IH}	2 V
Input low, V_{IL}	0.8 V
Output high, V_{OH}	
Sourcing 100 µA	2.7 V
Output low, V_{OL}	
Sinking 100 µA	0.2 V
Maximum I/O switching frequency	1 MHz
Capacitive drive	100 pF

Safety Voltages

Isolation	
Channel-to-channel	None
Channel-to-earth ground	None

Environmental Characteristics

Temperature

Operating	-40 °C to 70 °C
Storage	-40 °C to 85 °C
Humidity	
Operating	10% RH to 90% RH, noncondensing
Storage	5% RH to 95% RH, noncondensing
Ingress protection	IP40
Pollution Degree	2
Maximum altitude	2,000 m
Shock and Vibration	
Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

To meet these shock and vibration specifications, you must panel mount the system.

Power Requirements

Power consumption from chassis	
Active mode	600 mW maximum
Sleep mode	1 mW maximum
Thermal dissipation (at 70 °C)	
Active mode	600 mW maximum
Sleep mode	1 mW maximum

Physical Characteristics

Dimensions	Visit ni.com/dimensions and search by module number.
Weight	145 g (5.1 oz)