

Product Datasheet - Technical Specifications



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Specifications

All specifications are subject to change without notice.

Typical for 25 °C unless otherwise specified.

Specifications in *italic* text are guaranteed by design.

Analog input

Table 1. General analog input specifications

Parameter	Condition	Specification
A/D converter type		Successive approximation
ADC resolution		16 bits
Number of channels		4 differential, 8 single-ended Software-selectable
Input voltage range		± 10 V, ± 5 V, ± 2 V, ± 1 V; software-selectable per channel
<i>Absolute max input voltage</i>	<i>CHx relative to AGND</i>	<ul style="list-style-type: none"> ■ ± 20 V max (<i>power on</i>) ■ ± 12 V max (<i>power off</i>)
<i>Input impedance</i>		<ul style="list-style-type: none"> ■ $1\text{ G}\Omega$ (<i>power on</i>) ■ $1200\ \Omega$ (<i>power off</i>)
<i>Input bias current</i>		± 10 nA
Input bandwidth	All input ranges, small signal (-3 dB)	700 kHz
<i>Input capacitance</i>		60 pf
Max working voltage (signal + common mode)	± 10 V range	± 10.2 V max relative to AGND
	± 5 V range	± 10.2 V max relative to AGND
	± 2 V range	± 9.5 V max relative to AGND
	± 1 V range	± 9.0 V max relative to AGND
Common mode rejection ratio	($f_{IN} = 60$ Hz, all input ranges)	86 dB
Crosstalk	Adjacent differential mode channels, DC to 10 kHz	-75 dB
Input coupling		DC
Sample rate		0.019 Hz to 250 kHz Software-selectable
Trigger source		TRIG (see External trigger below)
Sample clock source		Internal A/D clock or external A/D clock (AICKI pin)
Internal sample clock stability		± 50 ppm
Internal sample clock timebase		80 MHz timer with 32-bit period (available frequencies are 80 MHz / integer period)
Throughput	Software paced	1000 to 5000 S/s typ, on local network (Note 1)
	Hardware paced	250 kS/s max
Channel gain queue	Up to 8 elements	Software-selectable channel and range for each queue element
Warm-up time		15 minutes min

Note 1: This is the typical throughput when the device and host are both connected by Ethernet to the same local network. The throughput can vary significantly if a wireless connection is involved or data is sent over the internet and is not guaranteed.

Accuracy

Analog input DC voltage measurement accuracy

Table 2. DC Accuracy components and specifications. All values are (\pm)

Range	Gain error (% of reading)	Offset error (μ V)	INL error (% of range)	Absolute accuracy at Full Scale (μ V)	Gain temperature coefficient (% reading/ $^{\circ}$ C)	Offset temperature coefficient (μ V/ $^{\circ}$ C)
± 10 V	0.024	915	0.0076	4075	0.0014	47
± 5 V	0.024	686	0.0076	2266	0.0014	24
± 2 V	0.024	336	0.0076	968	0.0014	10
± 1 V	0.024	245	0.0076	561	0.0014	5

Noise performance

For the peak-to-peak noise distribution test, a differential input channel is connected to AGND at the input terminal block, and 16384 samples are acquired at the maximum rate available at each setting.

Table 3. Noise performance specifications

Range	Counts	LSBrms
± 10 V	6	0.91
± 5 V	6	0.91
± 2 V	7	1.06
± 1 V	9	1.36

Settling time

Settling time is defined as the accuracy that can be expected after one conversion when switching from a channel with a DC input at one extreme of full scale to another channel with a DC input at the other extreme of full scale. Both input channels are configured for the same input range.

Table 4. Input settling time specifications in μ S, typical

Range	4 μ S settling accuracy (% FSR)	6 μ S settling accuracy (% FSR)	10 μ S settling accuracy (% FSR)
± 10 V	0.0061	0.0031	0.0015
± 5 V	0.0061	0.0031	0.0015
± 2 V	0.0061	0.0031	0.0015
± 1 V	0.0061	0.0031	0.0015

Analog output

Table 5. Analog output specifications

Parameter	Condition	Specification
Number of channels		2
Resolution		16 bits
Output ranges	Calibrated	± 10 V
Output transient	Powered on	Duration: 5 ms Amplitude: 2 V p-p
	Powered off	Duration: 400 ms Amplitude: 10 V p-p
Differential non-linearity	16-bit monotonic	± 0.35 LSB typ ± 1 LSB max
Output current	AOUTx pins	± 3.5 mA max (Note 2)

Parameter	Condition	Specification
Output coupling		DC
Power on and reset state		DACs cleared to uncalibrated zero-scale: 0 V, ± 50 mV unless the alarm function is enabled for the output (Note 3)
Alarm functionality		Either or both outputs may be configured to go to defined values when an Ethernet connection with a host is established or lost.
Output update rate		1000 to 5000 S/s typ, on local network (Note 4)
Slew rate		5 V/ μ s
Throughput	Software paced	1000 to 5000 S/s typ, on local network (Note 4)

Note 2: Leave unused AOUTx output channels disconnected.

Note 3: AOUTx defaults to 0 V whenever the device is powered on or a reset command is issued to the device, unless the alarm functionality is enabled for the output.

Note 4: This is the typical throughput when the device and host are both connected by Ethernet to the same local network. The throughput can vary significantly, and typical throughput is not guaranteed if a wireless connection is involved or data is sent over the internet.

Table 6. Calibrated absolute accuracy specifications

Range	Absolute accuracy (\pm LSB)
± 10 V	18.7

Table 7. Calibrated absolute accuracy components specifications

Range	% of reading	Offset (\pm mV)	Offset tempco (μ V/ $^{\circ}$ C)	Gain tempco (ppm of range/ $^{\circ}$ C)
± 10 V	± 0.024	2.2	30.1	13.2

Table 8. Relative accuracy specifications (\pm LSB)

Range	Relative accuracy (INL)
± 10 V	4.0 typ

Analog input/output calibration

Table 9. Analog input/output calibration specifications

Parameter	Specification
Recommended warm-up time	15 minutes min
Calibration method	Factory
Calibration interval	1 year (factory calibration)

Digital input/output

Table 10. Digital input/output specifications

Parameter	Specification
Digital type	5 V TTL input / advanced BiCMOS output
Number of I/O	8
Configuration	Independently configured for input or output
Pull-up configuration	All pins pulled up to 5 V using 47 K resistors (default). Can be changed to pull-down using an internal jumper.
Digital I/O transfer rate (system-paced)	100 to 5000 port reads/writes or single bit reads/writes per second typ, on local network (Note 5)
Alarm functionality	Any combination of DIO bits may be configured to become outputs and go to defined values when an Ethernet connection with a host is established or lost.
Power on and reset state	All bits are input unless the alarm functionality is enabled for them.

Parameter	Specification
Input high voltage threshold	2.0 V min
Input high voltage limit	5.5 V absolute max
Input low voltage threshold	0.8 V max
Input low voltage limit	-0.5 V absolute min 0 V recommended min
Output high voltage	3.8 V typ at no load 3.0 V min (IOH = -3 mA) 2.0 V min (IOH = -32 mA)
Output low voltage	0.15 V typ at no load 0.55 V max (IOL = 64 mA)
Power on and reset state	Input

Note 5: This is the typical throughput when the device and host are both connected by Ethernet to the same local network. The throughput can vary significantly, and typical throughput is not guaranteed if a wireless connection is involved or data is sent over the internet.

External trigger

Table 11. External trigger specifications

Parameter	Condition	Specification
Trigger source	External digital	TRIG
Trigger mode	Software-selectable	Edge or level sensitive: user configurable for CMOS compatible rising or falling edge, high or low level.
Trigger latency		2 μ s + 1 pacer clock cycle max
Trigger pulse width		1 μ s min
Input type		Schmitt trigger, 47 k Ω pull-down to ground
Schmitt trigger hysteresis		1.01 V typ 0.6 V min 1.5 V max
Input high voltage threshold		2.43 V typ 1.9 V min 3.1 V max
Input high voltage limit		5.5 V absolute max
Input low voltage threshold		1.42 V typ 1.0 V min 2.0 V max
Input low voltage limit		-0.5 V absolute min 0 V recommended min

External clock input/output

Table 12. External clock I/O specifications

Parameter	Specification
Terminal names	AICKI, AICKO
Terminal types	AICKI: Input (receives A/D pacer clock from external source) AICKO: Output (outputs internal A/D pacer clock)
Input clock rate	250 kHz max
Clock pulse width	AICKI: 1 μ s min AICKO: 1.8 μ s min
Clock mode	Edge-sensitive, rising
Input type	Schmitt trigger, 47 k Ω pull-down to ground

Parameter	Specification
Schmitt trigger hysteresis	1.01 V typ 0.6 V min 1.5 V max
Input high voltage threshold	2.43 V typ 1.9 V min 3.1 V max
Input high voltage limit	5.5 V absolute max
Input low voltage threshold	1.42 V typ 1.0 V min 2.0 V max
Input low voltage limit	-0.5 V absolute min 0 V recommended min
Output high voltage	4.4 V min (IOH = -50 μ A) 3.80 V min (IOH = -8 mA)
Output low voltage	0.1 V max (IOL = 50 μ A) 0.44 V max (IOL = 8 mA)

Counter

Table 13. Counter specifications

Parameter	Specification
Pin name	CTR
Counter type	Event counter
Number of channels	1
Input type	Schmitt trigger, 47 k Ω pull-down to ground
Input source	CTR screw terminal
Resolution	32 bits
Schmitt trigger hysteresis	1.01 V typ 0.6 V min 1.5 V max
Input high voltage threshold	2.43 V typ 1.9 V min 3.1 V max
Input high voltage limit	5.5 V absolute max
Input low voltage threshold	1.42 V typ 1.0 V min 2.0 V max
Input low voltage limit	-0.5 V absolute min 0 V recommended min
Input frequency	10 MHz max
High pulse width	50 ns min
Low pulse width	50 ns min

Memory

Table 14. Memory specifications

Parameter	Specification
Data FIFO (analog input)	49,152 samples
Non-volatile memory	2,048 bytes (768 bytes for calibration, 256 bytes for user, 1,024 bytes for network settings)

Power

Table 15. Power specifications

Parameter	Condition	Specification
External power supply		5V, 1A
Supply current	Quiescent current	330 mA typical (Note 6) 710 mA max including all external loading
User output voltage range	Available at +VO terminal	4.40 V min to 5.25 V max, assumes supplied AC adapter is used
User output current	Available at +VO terminal	10 mA max

Note 6: This is the total quiescent current requirement for the device that includes the LEDs. This does not include any potential loading of the digital I/O bits, +VO terminal, or the AOUTx outputs.

Network

Ethernet connection

Table 16. Ethernet connection specifications

Parameter	Specification
<i>Ethernet type</i>	100 Base-TX 10 Base-T
<i>Communication rates</i>	10/100 Mbps, auto-negotiated
<i>Connector</i>	RJ-45, 8 position
<i>Cable length</i>	100 meters max
<i>Additional parameters</i>	HP Auto-MDIX support

Network interface

Table 17. Factory default specifications

Parameter	Specification
Protocols used	TCP/IP (IPv4 only), UDP
Network ports used	UDP:54211 (discovery) UDP:6234 (bootloader only) TCP:54211 (commands) TCP:54212 (scan data)
Network IP configuration	DHCP + link-local, DHCP, static, link-local
Network name	E-1608-xxxxxx, where xxxxxx are the lower 6 digits of the device MAC address
Network name publication	By NBNS (responds to b-node broadcasts, therefore only available on the local subnet)

Network factory default settings

Table 18. Factory default specifications

Parameter	Specification
Factory default IP address	192.168.0.101
Factory default subnet mask	255.255.255.0
Factory default Gateway	192.168.0.1
Factory default DHCP setting	DHCP + link-local enabled

Network security

Table 19. Factory default specifications

Parameter	Specification
Security implementation	TCP sockets are not opened unless application sends the correct PIN code (stored in non-volatile memory, may be changed by user, default value 0000)
Number of concurrent sessions	1
Vulnerabilities	TCP Sequence Number Approximation Vulnerability

LED displays and the factory reset button

Table 20. LED and button configurations

Parameter	Specification
Power LED (top)	3.3 V < V _{ext} < 5.9 V: On V _{ext} < 3.3 V, V _{ext} > 5.9 V: Off (power fault)
Activity LED (bottom)	On when there is a valid host connection and blinks when a command is received or an AInScan is running.
Ethernet connector LEDs	<ul style="list-style-type: none"> ■ Left (green): Link/activity indicator; on when there is a valid Ethernet link and blinks when network activity is detected. ■ Right (yellow): Speed indicator; on for 100 Mbps, off for 10 Mbps or no link.
Factory reset button	<p>Used to reset the network configuration settings to the factory default values.</p> <ul style="list-style-type: none"> ■ Press the button when applying power to the device and continue to hold for 4 seconds; the device LEDs stay off, and then both the Power and Activity LEDs blink once indicating that the settings have been restored to the defaults. ■ Release the button so the device continues startup with the default settings. If the button is released before the two LEDs blink, the settings are not affected and the device starts up normally.

Environmental

Table 21. Environmental specifications

Parameter	Specification
Operating temperature range	0 °C to 55 °C max
Storage temperature range	-40 °C to 85 °C max
Humidity	0% to 90% non-condensing max

Mechanical

Table 22. Mechanical specifications

Parameter	Specification
Dimensions (L × W × H)	117.9 × 82.8 × 29.0 mm (4.64 × 3.26 × 1.14 in.)

Screw terminal connector

Table 23. Screw terminal connector specifications

Parameter	Specification
Connector type	Screw terminal
Wire gauge range	16 AWG to 30 AWG

Table 24. Screw terminal pinout

Pin	Signal name	Pin description	Pin	Signal name	Pin description
1	CH0H	Channel 0 high (SE channel 0)	17	DIO0	Digital I/O bit 0
2	CH0L	Channel 0 low (SE channel 1)	18	DIO1	Digital I/O bit 1
3	AGND	Analog ground	19	DIO2	Digital I/O bit 2
4	CH1H	Channel 1 high (SE channel 2)	20	DIO3	Digital I/O bit 3
5	CH1L	Channel 1 low (SE channel 3)	21	DIO4	Digital I/O bit 4
6	AGND	Analog ground	22	DIO5	Digital I/O bit 5
7	CH2H	Channel 2 high (SE channel 4)	23	DIO6	Digital I/O bit 6
8	CH2L	Channel 2 low (SE channel 5)	24	DIO7	Digital I/O bit 7
9	AGND	Analog ground	25	GND	Digital ground
10	CH3H	Channel 3 high (SE channel 6)	26	+VO	User voltage output
11	CH3L	Channel 3 low (SE channel 7)	27	GND	Digital ground
12	AGND	Analog ground	28	AICKO	External clock pacer output
13	AOUT0	Analog output 0	29	AICKI	External clock pacer input
14	AGND	Analog ground	30	CTR	Counter input
15	AOUT1	Analog output 1	31	TRIG	Digital trigger input
16	AGND	Analog ground	32	GND	Digital ground