



## Specifications

Typical for 25°C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

### Analog input

Parameter	Conditions	Specification
A/D converter type		Successive approximation type
Input voltage range for linear operation, single-ended mode	CHx to GND	±10 V max
Input common-mode voltage range for linear operation, differential mode	CHx to GND	-10 V min, +20 V max
<i>Absolute maximum input voltage</i>	<i>CHx to GND</i>	<i>±40V max</i>
Input current (Note 1)	V <sub>in</sub> = +10 V	70µA typ
	V <sub>in</sub> = 0V	-12µA typ
	V <sub>in</sub> = -10 V	-94µA typ
<i>Input impedance</i>		<i>122K Ohms</i>
Number of channels		8 single ended / 4 differential, software selectable
Input ranges, single-ended mode		±10V, G=2
Input ranges, differential mode		±20V, G=1 ±10V, G=2 ±5V, G=4 ±4V, G=5 ±2.5V, G=8 ±2.0V, G=10 ±1.25V, G=16 ±1.0V, G=20 Software selectable
Throughput	Software paced	50 S/s
	Continuous scan	1.2 kS/s
	Burst scan to 4 K sample FIFO	8 kS/s
Channel gain queue	Up to 8 elements	Software configurable channel, range, and gain.
Resolution (Note 2)	Differential	12 bits, no missing codes
	Single ended	11 bits
CAL accuracy	CAL = 2.5V	±0.05% typ, ±0.25% max
Integral linearity error		±1 LSB typ
Differential linearity error		±0.5 LSB typ
Repeatability		±1 LSB typ
CAL current	Source	5 mA max
	Sink	20 µA min, 200 nA typ
Trigger Source	Software selectable	External digital: TRIG_IN

**Note 1:** Input current is a function of applied voltage on the analog input channels. For a given input voltage, V<sub>in</sub>, the input leakage is approximately equal to (8.181\*V<sub>in</sub>-12) µA.

**Note 2:** The AD7870 converter only returns 11-bits (0-2047 codes) in single-ended mode.

Table 1. Accuracy, differential mode

Range	Accuracy (LSB)
±20 V	5.1
±10 V	6.1
±5 V	8.1
±4 V	9.1
±2.5 V	12.1
±2 V	14.1
±1.25 V	20.1
±1 V	24.1

Table 2. Accuracy, single-ended mode

Range	Accuracy (LSB)
±10 V	4.0

Table 3. Accuracy components, differential mode - all values are (±)

Range	% of Reading	Gain Error at FS (mV)	Offset (mV)	Accuracy at FS (mV)
±20 V	0.2	40	9.766	49.766
±10 V	0.2	20	9.766	29.766
±5 V	0.2	10	9.766	19.766
±4 V	0.2	8	9.766	17.766
±2.5 V	0.2	5	9.766	14.766
±2 V	0.2	4	9.766	13.766
±1.25 V	0.2	2.5	9.766	12.266
±1 V	0.2	2	9.766	11.766

Table 4. Accuracy components, single-ended mode - all values are (±)

Range	% of Reading	Gain Error at FS (mV)	Offset (mV)	Accuracy at FS (mV)
±10 V	0.2	20	19.531	39.531

## Analog output

Parameter	Conditions	Specification
D/A converter type		PWM
Resolution		10-bits, 1 in 1024
Maximum output range		0 -5 Volts
Number of channels		2 voltage output
Throughput	Software paced	100 S/s single channel mode 50 S/s dual channel mode
Power on and reset voltage		Initializes to 000h code
Maximum voltage (Note 3)	No load	Vs
	1 mA load	0.99 * Vs
	5 mA load	0.98 * Vs
Output drive	Each D/A OUT	30 mA
Slew rate		0.14 V/mS typ

**Note 3:** Vs is the USB bus +5V power. The maximum analog output voltage is equal to Vs at no-load. V is system dependent and may be less than 5 volts.

## Digital input/output

Digital type	82C55
Number of I/O	16 (Port A0 through A7, Port B0 through B7)
Configuration	2 banks of 8
Pull up/pull-down configuration	All pins pulled up to $V_s$ via 47K resistors (default). Positions available for pull down to ground. Hardware selectable via zero ohm resistors as a factory option.
Input high voltage	2.0 V min, 5.5 V absolute max
Input low voltage	0.8 V max, -0.5 V absolute min
Output high voltage ( $I_{OH} = -2.5$ mA)	3.0 V min
Output low voltage ( $I_{OL} = 2.5$ mA)	0.4 V max

## External trigger

Parameter	Conditions	Specification
Trigger source (Note 4)	External digital	TRIG_IN
Trigger mode	Software selectable	Level sensitive: user configurable for TTL level high or low input.
Trigger latency	Burst	25 $\mu$ s min, 50 $\mu$ s max
Trigger pulse width	Burst	40 $\mu$ s min
Input high voltage		3.0 V min, 15.0 V absolute max
Input low voltage		0.8 V max
Input leakage current		$\pm 1.0$ $\mu$ A

**Note 4:** TRIG\_IN is protected with a 1.5KOhm series resistor.

## Counter

Counter type	Event counter
Number of channels	1
Input source	CTR screw terminal
Input type	TTL, rising edge triggered
Resolution	32 bits
Schmidt trigger hysteresis	20 mV to 100 mV
Input leakage current	$\pm 1$ $\mu$ A
Maximum input frequency	1 MHz
High pulse width	500 ns min
Low pulse width	500 ns min
Input low voltage	0 V min, 1.0 V max
Input high voltage	4.0 V min, 15.0 V max

## Non-volatile memory

Memory size	8192 bytes		
Memory configuration	<b>Address Range</b>	<b>Access</b>	<b>Description</b>
	0x0000 – 0x17FF	Read/Write	A/D data (4K samples)
	0x1800 – 0x1EFF	Read/Write	User data area
	0x1F00 – 0x1FEF	Read/Write	Calibration data
	0x1FF0 – 0x1FFF	Read/Write	System data

## Power

Parameter	Conditions	Specification
Supply current (Note 5)		20 mA
+5V USB power available (Note 6)	Connected to Self-Powered Hub	4.5 V min, 5.25 V max
	Connected to Bus-Powered Hub	4.1 V min, 5.25 V max
Output current (Note 7)	Connected to Self-Powered Hub	450 mA min, 500 mA max
	Connected to Bus-Powered Hub	50 mA min, 100 mA max

**Note 5:** This is the total current requirement for the USB-1208LS which includes up to 5mA for the status LED.

**Note 6:** Self-powered refers to USB hubs and hosts with a power supply. Bus-powered refers to USB hubs and hosts without their own power supply.

**Note 7:** This refers to the total amount of current that can be sourced from the USB +5V, analog outputs and digital outputs.

## General

Parameter	Conditions	Specification
USB controller clock error	25 °C	±30 ppm max
	0 to 70 °C	±50 ppm max
Device type		USB 1.1 low-speed
Device compatibility		USB 1.1, USB 2.0

## Environmental

Operating temperature range	-0 to 70 °C
Storage temperature range	-40 to 70 °C
Humidity	0 to 90% non-condensing

## Mechanical

Dimensions	79 mm (L) x 82 mm (W) x 25 mm (H)
USB cable length	3 Meters max
User connection length	3 Meters max

## Main connector and pin out

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

**4-channel differential mode**

Pin	Signal Name	Pin	Signal Name
1	CH0 IN HI	21	Port A0
2	CH0 IN LO	22	Port A1
3	GND	23	Port A2
4	CH1 IN HI	24	Port A3
5	CH1 IN LO	25	Port A4
6	GND	26	Port A5
7	CH2 IN HI	27	Port A6
8	CH2 IN LO	28	Port A7
9	GND	29	GND
10	CH3 IN HI	30	PC+5V
11	CH3 IN LO	31	GND
12	GND	32	Port B0
13	D/A OUT 0	33	Port B1
14	D/A OUT 1	34	Port B2
15	GND	35	Port B3
16	CAL	36	Port B4
17	GND	37	Port B5
18	TRIG IN	38	Port B6
19	GND	39	Port B7
20	CTR	40	GND

**8-channel single-ended mode**

Pin	Signal Name	Pin	Signal Name
1	CH0 IN	21	Port A0
2	CH1 IN	22	Port A1
3	GND	23	Port A2
4	CH2 IN	24	Port A3
5	CH3 IN	25	Port A4
6	GND	26	Port A5
7	CH4 IN	27	Port A6
8	CH5 IN	28	Port A7
9	GND	29	GND
10	CH6 IN	30	PC+5V
11	CH7 IN	31	GND
12	GND	32	Port B0
13	D/A OUT 0	33	Port B1
14	D/A OUT 1	34	Port B2
15	GND	35	Port B3
16	CAL	36	Port B4
17	GND	37	Port B5
18	TRIG IN	38	Port B6
19	GND	39	Port B7
20	CTR	40	GND