

# Specifications

## USB-1208LS



**MEASUREMENT  
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# Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

## Analog input section

Parameter	Conditions	Specification
A/D converter type		Successive Approximation type
Input voltage range for linear operation, Single Ended Mode	CHx to GND	±10V max
Input common-mode voltage range for linear operation, Differential Mode	CHx to GND	-10V min, +20V max
<i>Absolute maximum input voltage</i>	<i>CHx to GND</i>	<i>±40V max</i>
Input current (Note 1)	V <sub>in</sub> = +10V	70µA typ
	V <sub>in</sub> = 0V	-12µA typ
	V <sub>in</sub> = -10V	-94µA typ
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	1.2kS/s
	Burst scan to 4K sample FIFO	8kS/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	5mA max
	Sink	20µA min, 200nA 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)
±20V	5.1
±10V	6.1
±5V	8.1
±4V	9.1
±2.5V	12.1
±2V	14.1
±1.25V	20.1
±1V	24.1

Table 2 – Accuracy, Single-Ended Mode

Range	Accuracy (LSB)
±10V	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)
±20V	0.2	40	9.766	49.766
±10V	0.2	20	9.766	29.766
±5V	0.2	10	9.766	19.766
±4V	0.2	8	9.766	17.766
±2.5V	0.2	5	9.766	14.766
±2V	0.2	4	9.766	13.766
±1.25V	0.2	2.5	9.766	12.266
±1V	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)
±10V	0.2	20	19.531	39.531

## Analog output section

Parameter	Conditions	Specification
D/A converter type		PWM
Resolution		10-bits, 1 in 1024
<i>Maximum output range</i>		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
	1mA Load	0.99*Vs
	5mA Load	0.98*Vs
Output drive	Each D/A OUT	30mA
Slew rate		0.14V/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 Vs via 47K resistors (default). Positions available for pull down to ground. Hardware selectable via zero ohm resistors as a factory option.
Input high voltage	2.0V min, 5.5V absolute max
Input low voltage	0.8V max, -0.5V absolute min
Output high voltage (IOH = -2.5mA)	3.0V min
Output low voltage (IOL = 2.5mA)	0.4V 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		3.0V min, 15.0V absolute max
Input low voltage		0.8V max
Input leakage current		$\pm 1.0\mu A$

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

## Counter section

Counter type	Event counter
Number of Channels	1
Input source	CTR screw terminal
Resolution	32 bits
Schmidt Trigger Hysteresis	20mV to 100mV
Input Leakage Current	$\pm 1\mu A$
Maximum input frequency	1 MHz
High pulse width	500ns min
Low pulse width	500ns min
Input low voltage	0V min, 1.0V max
Input high voltage	4.0V min, 15.0V max

## Non-volatile memory

Memory size	8192 bytes		
Memory configuration	Address Range	Access	Description
	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)		20mA
+5V USB power available (Note 6)	Connected to Self-Powered Hub	4.5V min, 5.25V max
	Connected to Bus-Powered Hub	4.1V min, 5.25V max
Output Current (Note 7)	Connected to Self-Powered Hub	450mA min, 500mA max
	Connected to Bus-Powered Hub	50mA min, 100mA 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	79mm(L) x 82mm(W) x 25mm(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

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