

# USB-1208FS/LS/1408FS Series

12-bit and 14-bit Multifunction Devices with 8 Analog Inputs, 2 Analog Outputs



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## Features

- Low cost, multifunction USB devices with 4 differential or 8 single-ended analog inputs (software-selectable)
- Provides 12-bit or 14-bit analog input resolution
- Maximum sampling rates ranging from 1.2 kS/s to 50 kS/s
- 2 analog outputs
- 16 digital I/O lines
- One 32-bit counter input channel
- No external power required

## Software

- TracerDAQ® software included for acquiring and displaying data and generating analog signals
- Universal Library includes support for Visual Studio® and Visual Studio® .NET, including examples for Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- InstaCal software utility for installing, calibrating, and testing
- ULx for NI LabVIEW™
- DAQFlex open-source software framework - includes support for Linux®, and Mac® platforms (USB-1208FS-Plus/1408FS-Plus only)
- Comprehensive drivers for DASyLab®
- USB-1208LS/1208FS/1408FS supported by MATLAB® Data Acquisition Toolbox™
- Supported Operating Systems: Windows® 8/7/Vista®/XP SP2, 32-bit or 64-bit



All devices in this series offer eight singled-ended or four differential analog inputs, two analog outputs, 16 digital I/O, and one counter input. The USB-1208FS-Plus/1408FS-Plus also include eight high-current (24 mA) digital I/O connections and DAQFlex support.

## Overview

This product series consists of the following low-cost, analog and digital I/O devices:

- USB-1208LS
- USB-1208FS and USB-1208FS-Plus
- USB-1408FS and USB-1408FS-Plus

All of these devices offer four differential (DIFF) or eight single-ended (SE) analog inputs, two analog outputs, 16 digital I/O channels, and one counter input.

Everything you need to begin acquiring, viewing, and storing data is included with these devices, including comprehensive software support.

## Analog Input

**USB-1208LS/1208FS/1208FS-Plus:** These devices provide eight, 11-bit SE analog inputs or four, 12-bit DIFF analog inputs.

**USB-1408FS/1408FS-Plus:** These devices provide eight, 13-bit SE analog inputs or four, 14-bit DIFF analog inputs.

All devices support software-selectable ranges that provide inputs from  $\pm 1$  V to  $\pm 20$  V in a DIFF configuration, and  $\pm 10$  V in a SE configuration.

USB-1208FS/LS/1408FS Series Selection Chart							
Model	Analog Inputs	Sampling Rate	Analog Outputs	Concurrent AI/AO Scanning Operations	Digital Output	Event Counters	DAQFlex Support
USB-1208LS	8 SE/4 DIFF	1.2 kS/s max	2		$\pm 2.5$ mA per Pin	1	-
USB-1208FS	8 SE/4 DIFF	50 kS/s max	2		$\pm 6.0$ mA per Pin	1	-
USB-1208FS-Plus	8 SE/4 DIFF	50 kS/s max	2	✓	$\pm 6.0$ mA per Pin (Port A) $\pm 24.0$ mA per Pin (Port B)	1	✓
USB-1408FS	8 SE/4 DIFF	48 kS/s max	2		$\pm 6.0$ mA per Pin	1	-
USB-1408FS-Plus	8 SE/4 DIFF	48 kS/s max	2	✓	$\pm 6.0$ mA per Pin (Port A) $\pm 24.0$ mA per Pin (Port B)	1	✓



# USB-1208FS/LS/1408FS Series

## General Information

### Sampling Rate

**USB-1208LS:** When scanning continuously to computer memory (hardware-paced mode), the USB-1208LS can sample at a maximum of 1.2 kS/s. Burst mode into the 4 kS FIFO is also available at rates up to 8 kS/s.

**USB-1208FS/1208FS-Plus and USB-1408FS/1408FS-Plus:** When scanning continuously to computer memory (hardware-paced mode), the USB-1208FS/1208FS-Plus can sample at a maximum of 50 kS/s, and the USB-1408FS/1408FS-Plus can sample at a maximum of 48 kS/s.

### Channel-Gain Queue

The channel-gain queue feature lets you configure a list of channels and gains for each scan. Each channel can have a different gain setting. The gain settings are stored in a channel-gain queue list that is written to local memory on the device.

The USB-1208LS channel-gain queue list can contain up to eight channels in SE mode and up to four channels in DIFF mode. The channels can be listed in any order.

The USB-1208FS and USB-1408FS channel-gain queue can contain up to 16 channels listed in any order.

The USB-1208FS-Plus and USB-1408FS-Plus channel-gain queue can contain up to eight unique channels in SE mode and up to four unique channels in DIFF mode. The channels can be non-consecutive, but must be listed in increasing order.

### Analog Output

The maximum analog output update rate for all devices depends on several factors, including USB port speed.

**USB-1208LS:** This device offers two 10-bit analog outputs with a range of 0 V to 5 V.

One analog output updates at a maximum rate of 100 S/s; two analog outputs update at a maximum rate 50 S/s each. The USB-1208LS updates in software-paced mode only.

**USB-1208FS and USB-1408FS:** Both devices offer two 12-bit analog outputs with a range of 0 V to 4.096 V.

When updating continuously from computer memory (hardware-paced mode), one analog output updates at a maximum rate of 10 kS/s; two analog outputs update simultaneously at a maximum rate of 5 kS/s each.

**USB-1208FS-Plus and USB-1408FS-Plus:** Both devices offer two 12-bit analog outputs with a range of 0 V to 5 V.

When updating continuously from computer memory (hardware-paced mode), the analog outputs update at a maximum rate of 50 kS/s per channel.

### Digital I/O

All devices provide 16 TTL-level digital I/O lines. Digital I/O can be programmed on each 8-bit port (Port A and Port B) for either input (default) or output.

**USB-1208FS-Plus and USB-1408FS-Plus:** Port B0 through Port B7 are high-current drive (24 mA) digital I/O connections.

### Event Counter Input

Each device supports one 32-bit TTL-level counter that accepts inputs up to 1 MHz.

### DAQ Software

Each device ships with the DAQ software CD, which includes InstaCal, a software utility for installing, calibrating, and testing hardware, along with the following software packages:

### TracerDAQ

TracerDAQ is an out-of-the-box application that can generate, acquire, analyze, display, and export data within seconds of installing data acquisition hardware.

TracerDAQ includes a strip chart, an oscilloscope, a function generator, and a rate generator, all of which are accessed through a common, easy-to-use interface.



*TracerDAQ provides four virtual instrument applications used to graphically display and store input data.*



# USB-1208FS/LS/1408FS Series

## General Information & Specifications

### Universal Library

The Universal Library (UL) is a set of programming libraries for developing applications with Visual Studio programming languages (and others).

UL includes a complete function library that simplifies the configuration and operation of your measurement device. UL supports Visual Studio and Visual Studio .NET, and includes 64-bit driver support for Windows 8, 7 and Vista.

### ULx for NI LabVIEW

ULx for NI LabVIEW is a comprehensive library of graphical functions and example programs comprising all the power of the Universal Library. ULx for NI LabVIEW is compatible with NI LabVIEW 8.5 and later, and allows quick development of NI LabVIEW instrumentation, acquisition, and control applications with hardware.

### Software Available Separately

#### DAQFlex (USB-1208FS-Plus/1408FS-Plus Only)

For DAQ programming in virtually any OS - including Linux and Mac platforms - the DAQFlex framework combines a small footprint driver with a message-based command protocol. The simplicity of the driver is enabled with a message-based protocol that offers an efficient yet powerful interface to DAQ devices and a common command set that simplifies application development.

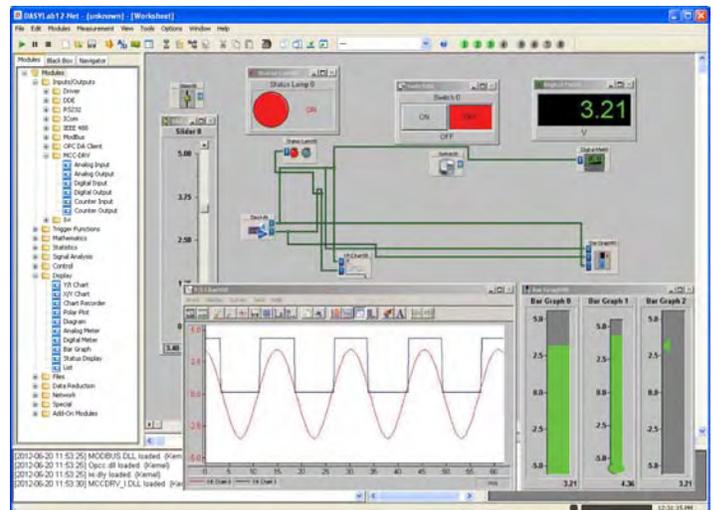
#### TracerDAQ Pro

TracerDAQ Pro is available as a purchased upgrade to TracerDAQ. TracerDAQ Pro supports more active channels, more samples per channel, and a selection of options and enhancements designed to address many test and measurement applications.

### DASYLab

Customers needing more performance than TracerDAQ Pro provides can purchase DASYLab, an icon-based data acquisition, graphics, control, and analysis software package. DASYLab offers real-time analysis and control, and provides the ability to create custom graphical user interfaces without programming.

Compared to other graphical programming environments, DASYLab has a very short user-learning curve. Many applications can be configured in a few minutes, rather than days or weeks.



DASYLab gives users the ability to create applications by simply dragging-and-dropping functional icons on a worksheet, connecting the icons together, and running the program. DASYLab supports most data acquisition hardware.

The USB-1208LS/1208FS/1408FS are also supported by the MATLAB Data Acquisition Toolbox.

## Specifications

### General

#### Environment

- Operating Temperature: 0 °C to 70 °C
- Storage Temperature: -40 °C to 70 °C
- Relative Humidity: 0% to 90% non-condensing

#### Communications

- USB-1208LS: USB 1.1 low-speed mode (1.5 Mbps)
- USB-1208FS/1208FS-Plus/1408FS/1408FS-Plus: USB 2.0 full-speed mode (12 Mbps)

Acquisition Data Buffer (USB-1208LS Only): 4 kS

Signal I/O Connector: 2 banks of screw-terminal blocks

Dimensions (L x W x H): 79 x 82 x 27 mm (3.10 x 3.20 x 1.05 in.)

### Analog Input

A/D Converter Type: Successive approximation

Channels: 8 SE or 4 DIFF, programmable as SE or DIFF

Input Common-Mode Voltage Range for Linear Operation

- SE Mode: CHx to GND, ±10 V max
- DIFF Mode: CHx to GND, -10 V min, 20 V max

Absolute Maximum Input Voltage

- USB-1208LS: CHx to GND, ±40 V max
- USB-1208FS/1208FS-Plus/1408FS/1408FS-Plus: CHx to GND, ±28 V max

Input Impedance: 122 kΩ

#### Input Current

Input current is a function of applied voltage on the analog input channels.

For a given input voltage,  $V_{in}$ , the input leakage is approximately equal to

$(8.181 * V_{in} - 12) \mu A$

$V_{in} = 10 V, 70 \mu A$  typ

$V_{in} = 0 V, -12 \mu A$  typ

$V_{in} = -10 V, -94 \mu A$  typ

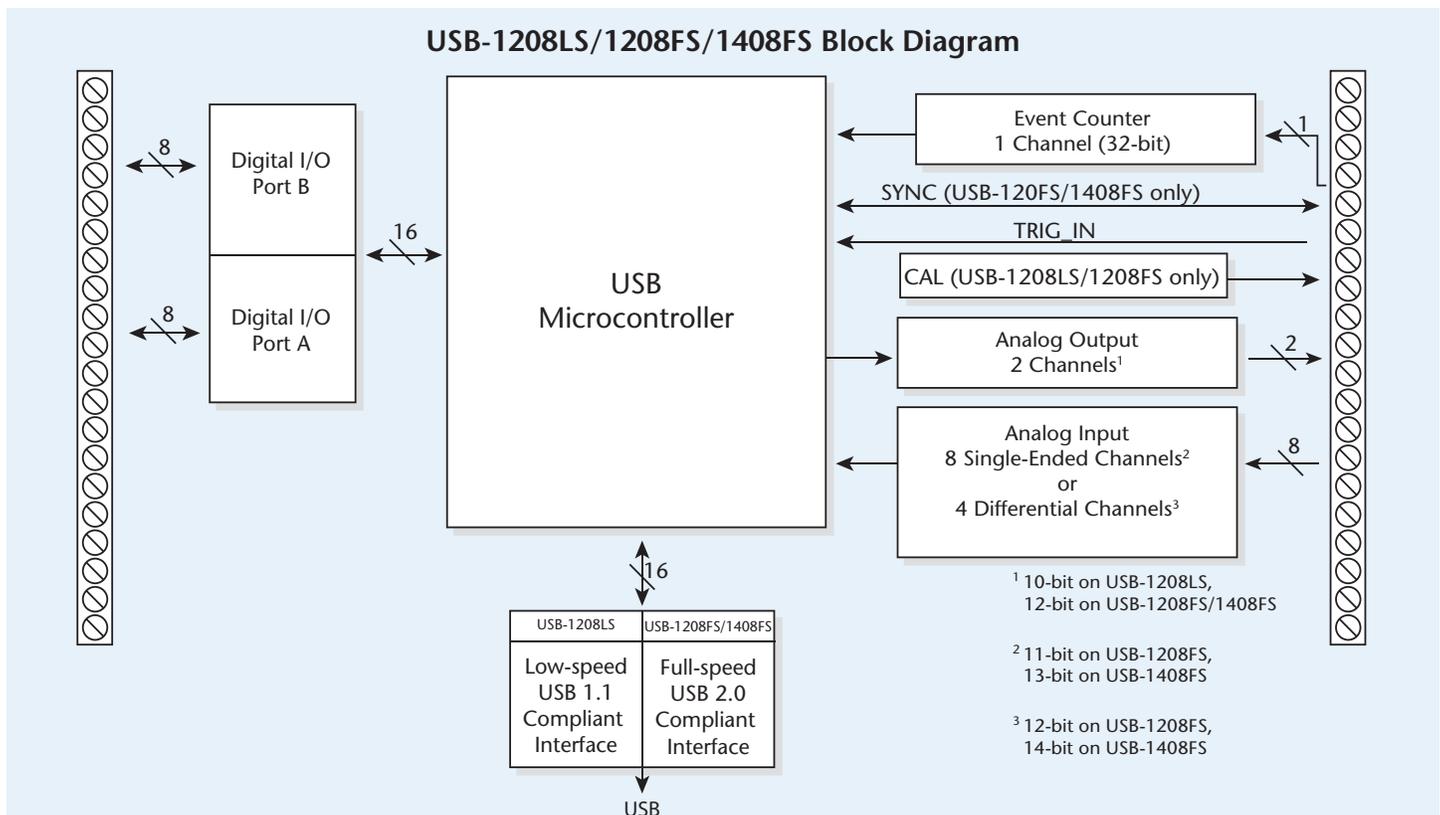
Ranges: Software or selectable on a per-channel basis

SE Mode: ±10 V

DIFF Mode: ±20 V, ±10 V, ±5 V, ±4 V, ±2.5 V, ±2.0 V, ±1.25 V, ±1.0 V



# USB-1208FS/LS/1408FS Series Specifications



## Throughput

Maximum throughput scanning to computer memory depends on the computer being used.

### USB-1208LS

Software Paced: 50 S/s typ, system-dependent

Hardware Paced: 1.2 kS/s

Burst Scan to 4 kS FIFO: 8 kS/s

### USB-1208FS/1208FS-Plus

Software Paced: 250 S/s typ, system-dependent

Hardware Paced: 50 kS/s

### USB-1408FS/1408FS-Plus

Software Paced: 250 S/s typ, system-dependent

Hardware Paced: 48 kS/s

## Channel Gain Queue

USB-1208LS/1208FS-Plus/1408FS-Plus: Up to 8 elements, software-selectable channel and range

USB-1208FS/1408FS: Up to 16 elements, software-selectable channel and range

## Resolution

### USB-1208LS/1208FS/1208FS-Plus

DIFF: 12 bits, no missing codes

SE: 11 bits (the AD7870 converter only returns 11-bits (0–2047 codes) in SE mode)

### USB-1408FS/1408FS-Plus

DIFF: 14 bits, no missing codes

SE: 13 bits (the AD7871 converter only returns 13-bits (0–8192 codes) in SE mode)

## CAL Accuracy

USB-1208LS: CAL = 2.5 V,  $\pm 0.05\%$  typ,  $\pm 0.25\%$  max

USB-1208FS: CAL = 2.5 V,  $\pm 36.25$  mV max

## Integral Linearity Error

USB-1208LS/1208FS/1208FS-Plus:  $\pm 1$  least significant bit (LSB) typ

USB-1408FS/1408FS-Plus:  $\pm 2$  LSB typ

## Differential Linearity Error: $\pm 0.5$ LSB typ

Repeatability:  $\pm 1$  LSB typ

## CAL Current (USB-1208LS/1208FS Only)

Source: 5 mA max

### Sink

USB-1208LS: 20  $\mu$ A min, 200 nA typ

USB-1208FS: 20  $\mu$ A min, 100  $\mu$ A typ

## Absolute Accuracy Long Term Drift (USB-1408FS/1408FS-Plus Only)

Extrapolating the long term drift accuracy specifications provides the approximate long term drift of the USB-1408FS intermediate input ranges.

$\pm 20$  V Range:  $\pm 3$  LSB typ ( $\Delta t = 1000$  hrs)

$\pm 4$  V Range:  $\pm 6$  LSB typ ( $\Delta t = 1000$  hrs)

$\pm 1$  V Range:  $\pm 8$  LSB typ ( $\Delta t = 1000$  hrs)

## 2.5VREF Accuracy (USB-1408FS Only)

$\pm 36.25$  mV max

## 2.5VREF Output Current (USB-1408FS/1408FS-Plus Only)

Source: 5 mA max

Sink: 20  $\mu$ A min, 100  $\mu$ A typ

## Trigger Source (Software-Selectable)

External Digital: TRIG\_IN

## Clock Source (All Devices Except USB-1208LS, Software-Selectable)

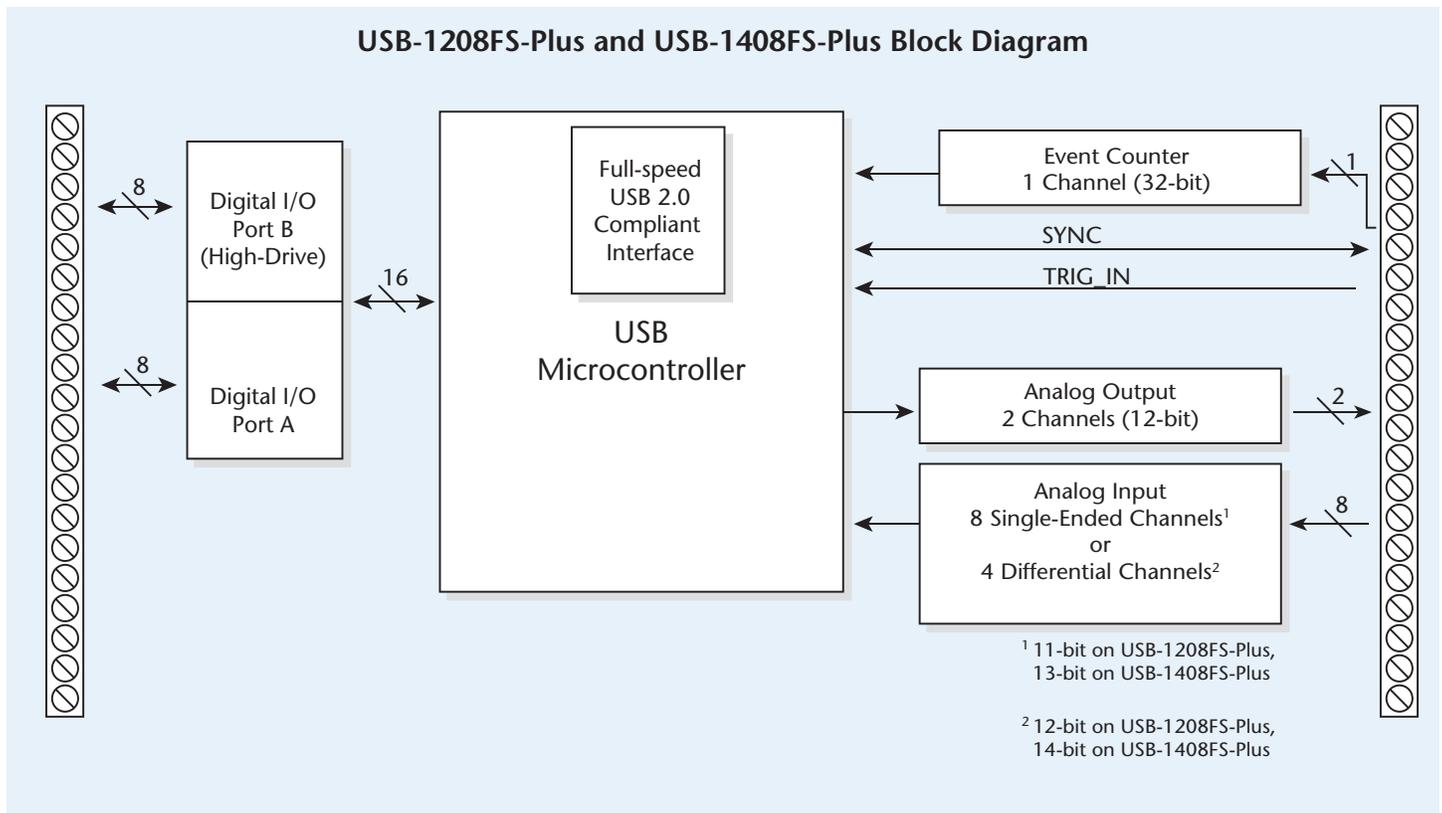
Internal

External (SYNC), Rising Edge Triggered



# USB-1208FS/LS/1408FS Series Specifications

USB-1208FS-Plus and USB-1408FS-Plus Block Diagram



Analog Input Accuracy USB-1208LS/1208FS/1208FS-Plus	
Range	Accuracy (LSB)
Differential Mode	
±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
Single-Ended Mode	
±10 V	4.0

Analog Input Accuracy USB-1408FS/1408FS-Plus		
Range	Absolute Accuracy 25°C	Absolute Accuracy 0 to 50°C
Differential Mode		
±20 V	±10.98 mV	±49.08 mV
±10 V	±7.32 mV	±33.42 mV
±5 V	±3.66 mV	±20.76 mV
±4 V	±2.92 mV	±19.02 mV
±2.5 V	±1.83 mV	±14.97 mV
±2 V	±1.70 mV	±14.29 mV
±1.25 V	±1.21 mV	±12.18 mV
±1 V	±1.09 mV	±11.63 mV
Single-Ended Mode		
±10 V	±10.98 mV	±49.08 mV



# USB-1208FS/LS/1408FS Series Specifications

Analog Input Accuracy Components: USB-1208LS/1208FS				
Range	% of Reading	Gain Error at Full Scale	Offset	Accuracy at Full Scale
Differential Mode				
±20 V	0.2	40 mV	9.766 mV	49.766 mV
±10 V	0.2	20 mV	9.766 mV	29.766 mV
±5 V	0.2	10 mV	9.766 mV	19.766 mV
±4 V	0.2	8 mV	9.766 mV	17.766 mV
±2.5 V	0.2	5 mV	9.766 mV	14.766 mV
±2 V	0.2	4 mV	9.766 mV	13.766 mV
±1.25 V	0.2	2.5 mV	9.766 mV	12.266 mV
±1 V	0.2	2 mV	9.766 mV	11.766 mV
Single-Ended mode				
±10 V	0.2	20 mV	19.531 mV	39.531 mV

Noise Performance USB-1208FS/1208FS-Plus		
Range	Typical Counts	Least Significant Bit- Root Mean Square (LSBRMS)
Differential Mode		
±20 V	2	0.30
±10 V	2	0.30
±5 V	3	0.45
±4 V	3	0.45
±2.5 V	4	0.61
±2 V	5	0.76
±1.25 V	7	1.06
±1 V	8	1.21
Single-Ended Mode		
±10 V	2	0.30

Noise Performance USB-1408FS/1408FS-Plus		
Range	Typical Counts	Least Significant Bit- Root Mean Square (LSBRMS)
Differential Mode		
±20 V	8	1.21
±10 V	8	1.21
±5 V	9	1.36
±4 V	10	1.51
±2.5 V	12	1.81
±2 V	14	2.12
±1.25 V	18	2.72
±1 V	22	3.33
Single-Ended Mode		
±10 V	8.0	1.21

## Analog Output

### Resolution

USB-1208LS: 10 bits, 1 in 1024

USB-1208FS/1208FS-Plus/1408FS/1408FS-Plus: 12 bits, 1 in 4096

### Output Range

USB-1208LS/1208FS-Plus/1408FS-Plus: 0 V to 5 V

USB-1208FS/1408FS: 0 V to 4.096 V, 1 mV per LSB.

### Number of Channels: 2

### Throughput

Maximum throughput scanning to computer memory depends on the computer being used.

### USB-1208LS

#### Software Paced

Single Channel: 100 S/s

Dual channel, simultaneous update: 50 S/s

### USB-1208FS/1208FS-Plus/1408FS/1408FS-Plus

Software Paced: 250 S/s single channel typ, system-dependent

#### Hardware Paced

USB-1208FS/1408FS

Single Channel: 10 kS/s

Dual Channel: 5 kS/s

USB-1208FS-Plus/1408FS-Plus: 50 kS/s max per channel

### Power On and Reset Voltage

USB-1208LS/1208FS/1208FS-Plus: Initializes to 000h code

USB-1408FS/1408FS-Plus: 0 V, ±20 mV typ, initializes to 000h code

### Maximum Voltage (USB-1208LS Only)

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

No Load: Vs

1 mA Load: 0.99 \* Vs

5 mA Load: 0.98 \* Vs

### Output Drive (Each D/A OUT)

USB-1208LS: 30 mA

USB-1208FS and USB-1408FS 15 mA

USB-1208FS-Plus and USB-1408FS-Plus: 5 mA, sourcing

### Slew Rate

USB-1208LS: 0.14 V/ms typ

USB-1208FS/1208FS-Plus/1408FS/1408FS-Plus: 0.8 V/μs typ

### Accuracy (All Values are ±) (All Devices Except USB-1208LS)

USB-1208FS/1408FS

0 V to 4.096 V: 4.0 LSB typ, 45.0 LSB max

USB-1208FS-Plus/1408FS-Plus

0 V to 5 V: 4.0 LSB typ, 45.0 LSB max (accuracy tested at no load)



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# USB-1208FS/LS/1408FS Series

## Specifications

### Analog Output Accuracy Components (All Values are $\pm$ ) (All Devices Except USB-1208LS)

#### USB-1208FS/1408FS

Range: 0 V to 4.096 V

#### USB-1208FS-Plus/1408FS-Plus

Range: 0 V to 5 V

% of FSR: 0.1 typ, 0.9 max

Gain Error at Full Scale: 4.0 mV typ, 36.0 mV max

Offset:<sup>1</sup> 1.0 mV typ, 9.0 mV max

Accuracy at FS: 4.0 mV typ, 45.0 mV max

### Digital I/O

#### Digital Type

USB-1208LS: 82C55

All Other Devices: CMOS

Number of I/O: 16 (Port A0 through A7, Port B0 through B7)

#### Configuration

2 banks of 8

USB-1208FS-Plus/1408FS-Plus: Port B is high-current drive

**Pull Up/Pull-Down Configuration:** All pins pulled up to 5 V through 47 k $\Omega$  resistors (default).

All Devices Except USB-1208LS: Change to pull-down using internal user-configurable jumpers.<sup>2</sup>

USB-1208LS: Positions available for pull-down to ground. Hardware-selectable through 0  $\Omega$  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, 0 V recommended min

#### USB-1208LS

**Output High Voltage (IOH = -2.5 mA):** 3.0 V min

**Output Low Voltage (IOL = 2.5 mA):** 0.4 V max

#### USB-1208FS/1408FS

**Output High Voltage (IOH = -6.0 mA):** 3.84 V min

**Output Low Voltage (IOL = 6.0 mA):** 0.33 V max

#### USB-1208FS-Plus/1408FS-Plus

**Output High Voltage, Port A:** 4.4 V min (IOH = -20  $\mu$ A), 3.84 V min (IOH = -6.0 mA)

**Output Low Voltage, Port A:** 0.1 V max (IOL = 20  $\mu$ A), 0.33 V max (IOL = 6.0 mA)

**Output High Voltage, Port B:** 4.4 V min (IOH = -50  $\mu$ A), 3.76 V min (IOH = -24.0 mA)

**Output Low Voltage, Port B:** 0.1 V max (IOH = 50  $\mu$ A), 0.44 V max (IOH = 24.0 mA)

**Power On and Reset State:** Input

### External Trigger

**Trigger Source:** External digital, TRIG\_IN

USB-1208LS: Schmitt trigger input protected with a 1.5 k $\Omega$  series resistor)

#### Trigger Mode

USB-1208LS: Level sensitive; software-selectable for TTL level high or low input

All Other Devices: Edge sensitive; software-selectable for CMOS-compatible rising or falling edge

#### Trigger Latency

USB-1208LS: Burst, 25  $\mu$ s min, 50  $\mu$ s max

All Other Devices: 10  $\mu$ s max

#### Trigger Pulse Width

USB-1208LS: Burst, 40  $\mu$ s min

All Other Devices: 1  $\mu$ s min

### USB-1208LS

**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

### All Other Devices

**Input Type:** Schmitt trigger, 47 k $\Omega$  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 (All Devices Except USB-1208LS)

**Pin Name:** SYNC

**Pin Type:** Bidirectional

**Direction (Software-Selectable)**

**Input (Default):** Receives A/D clock from external source. Active on rising edge.

**Output:** Outputs internal A/D clock. Active on rising edge.

#### Input Clock Rate

USB-1208FS/1208FS-Plus: 50 kHz, max

USB-1408FS/1408FS-Plus: 48 kHz, max

#### Clock Pulse Width

**Input Mode:** 1  $\mu$ s min

**Output Mode:** 5  $\mu$ s min

**Input Type:** Schmitt trigger, 47 k $\Omega$  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

**Output High Voltage:** 4.4 V min (IOH = -50  $\mu$ A), 3.80 V min (IOH = -8 mA)

**Output Low Voltage:** 0.1 V max (IOL = 50  $\mu$ A), 0.44 V max (IOL = 8 mA)

### Counter

**Pin name:** CTR

**Counter Type:** Event counter

**Number of Channels:** 1

#### Input Type

USB-1208LS: TTL, rising edge triggered

USB-1208FS/1408FS: Schmitt trigger, 47 k $\Omega$  pull-down to ground

**Input Source:** CTR screw terminal

**Resolution:** 32 bits

**Maximum Input Frequency:** 1 MHz

**High Pulse Width:** 500 ns min

**Low Pulse Width:** 500 ns min

#### USB-1208LS

**Schmidt Trigger Hysteresis:** 20 mV to 100 mV

**Input Leakage Current:**  $\pm$ 1  $\mu$ A

**Input High Voltage:** 4.0 V min, 5.5 V absolute max

**Input Low Voltage:** 1.0 V max, -0.5 V absolute min

### All Other Devices

**Schmidt 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

1 USB-1208FS-Plus/1408FS/1408FS-Plus: Zero-scale offsets may result in a fixed zero-scale error producing a *dead-band* digital input code region. In this case, changes in digital input code of less than 0x040 may not produce a corresponding change in the output voltage. The offset error is tested and specified at code 0x040.

USB-1208FS: Negative offsets result in a fixed zero-scale error or *dead-band*. At the maximum offset of -9 mV, any input code of less than 0x009 does not produce a response in the output.

2 USB-1208FS hardware revisions D and later, and USB-1408FS hardware with part number 193331x (where x is the revision letter) can be changed to pull-down using an internal jumper. Other revisions/part numbers can be configured at the factory for pull-down.



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# USB-1208FS/LS/1408FS Series

## Specifications & Ordering

### Non-Volatile Memory

#### USB-1208LS

**Memory Size:** 8192 bytes

#### Memory Configuration

**Address 0x0000 to 0x17FF:** Read/write access, A/D data (4 kS)

**Address 0x1800 to 0x1EFF:** Read/write access, user data area

**Address 0x1F00 to 0x1FEF:** Read/write access, calibration data

**Address 0x1FF0 to 0x1FFF:** Read/write access, system data

#### USB-1208FS/1408FS

**EEPROM:** 1,024 bytes

#### EEPROM Configuration

##### USB-1208FS

**Address 0x000 to 0x07F:** Reserved access, 128 bytes system data

**Address 0x080 to 0x1FF:** Read/write access, 384 bytes calibration data

**Address 0x200 to 0x3FF:** Read/write access, 512 bytes user area

##### USB-1408FS

**Address 0x000 to 0x1FF:** Read/write, access 512 bytes user area

**Address 0x200 to 0x3FF:** Read/write access, 512 bytes calibration data

#### USB-1208FS-Plus/1408FS-Plus

**EEPROM:** 2,048 bytes (768 bytes calibration, 256 bytes user, 1,024 bytes DAQFlex)

### Power<sup>3</sup>

#### USB-1208LS

**Supply Current:** 20 mA (total current requirement; includes up to 5 mA for the status LED)

#### 5 V USB Power Available

**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** (total amount of current that can be sourced from the USB 5 V, analog outputs and digital outputs)

**Connected to Self-powered Hub:** 450 mA min, 500 mA max

**Connected to Bus-powered Hub:** 50 mA min, 100 mA max

#### USB-1208FS/1408FS

**Supply Current:** 80 mA (total current requirement; includes up to 10 mA for the status LED)

#### 5 V USB Power Available

**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** (total amount of current that can be sourced from the USB 5 V, analog outputs and digital outputs)

**Connected to Self-powered Hub or Externally Powered**

**Root Port Hub:** 420 mA max

**Connected to Bus-powered Hub:** 20 mA max

#### USB-1208FS-Plus/1408FS-Plus

#### Supply Current

**During USB Enumeration:** < 100 mA

**After USB Enumeration, Including DIO, AO, SYNC, and**

**+VO Output Loading:** < 500 mA

**+VO Power Available After USB Enumeration:** 4.5 V min, 5.25 V max

**+VO Output Current After USB Enumeration:** 100 mA max

### Ordering Information

Description	Part No.
USB-based DAQ device with eight 12-bit analog inputs, 1.2 kS/s, two analog outputs, and 16 digital I/O lines	USB-1208LS
USB-based DAQ device with eight analog inputs, 50 kS/s, up to 12-bit resolution, two D/A outputs, and 16 digital I/O lines.	USB-1208FS
USB-based DAQ device with eight analog inputs, 50 kS/s, up to 12-bit resolution, two D/A outputs, 16 digital I/O lines (includes eight high-current lines) and DAQFlex support.	USB-1208FS-Plus
USB-based DAQ device with eight analog inputs, 48 kS/s, up to 14-bit resolution, two analog outputs, and 16 digital I/O lines.	USB-1408FS
USB-based DAQ device with eight analog inputs, 48 kS/s, up to 14-bit resolution, two analog outputs, 16 digital I/O lines (includes eight high-current lines) and DAQFlex support.	USB-1408FS-Plus

### Software

Icon-based data acquisition, graphics, control, and analysis software	DASYLab
Out-of-the-box virtual instrument suite with strip chart, oscilloscope, function generator, and rate generator – professional version	TracerDAQ Pro

<sup>3</sup> Self-powered USB hubs and hosts have their own power supply. The USB port(s) on your computer are root port hubs. All externally powered root port hubs (desktop computers) provide up to 500 mA of current for a USB device. Battery-powered root port hubs provide 100 mA or 500 mA, depending upon the manufacturer. A laptop PC that is not connected to an external power adapter is an example of a battery-powered root port hub.

Bus-powered USB hubs and hosts do not have their own power supply.

