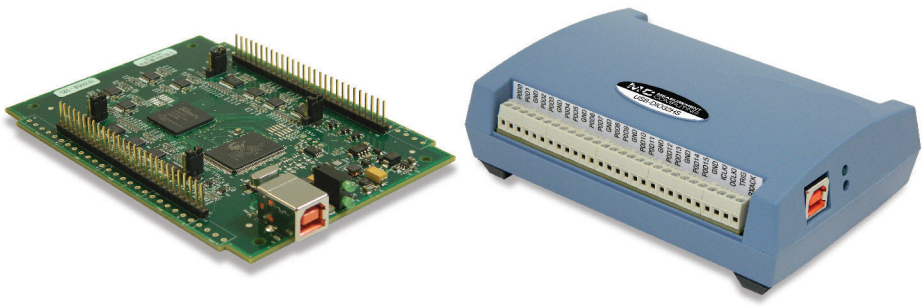
USB-DIO32HS

High-Speed Digital I/O



USB-DIO32HS devices provide 32 bits of high-speed digital I/O, input/output scan rates up to 8 MS/s, and simultaneous hardware and software scanning. The USB-DIO32HS-OEM (above left) has a board-only form factor and header connectors. The USB-DIO32HS (above right) is a cased version with screw terminals.

Overview

The USB-DIO32HS provides 32 bits of high-speed digital I/O, and features independent input and output scan clocks, hardware and software triggering, and pattern detection/generation.

Digital I/O

The 32 DIO bits are available as two 16-bit ports that are bit-configurable for input or output. Each port is configured independently, so both software polling and hardware scanning operations can be performed at the same time.

When performing software polling, the port can contain any combination of input or output bits. When performing hardware-paced output scans, all bits in the port must be set for output. For input scans, however, the current state of any bits in the port that are configured for output are read.

Digital Output Scanning

Either digital port can output a 16-bit digital pattern. The pattern is updated at a rate up to 8 MS/s, and clocked using the output scan clock. Use both ports to output a 32-bit digital pattern. Data from one port is read and stored in the FIFO buffer until the second port is read. Both ports are output simultaneously on the rising edge of the next pacer clock signal.

Pull-Up/Down Configuration

The DIO bits can be pulled up to 5 V or down to 0 V through 47 kΩ resistors via onboard jumpers.

Clock I/O

Users can pace input scanning operations with the onboard input scan clock or with an external signal. The input clock frequency is 8 MHz, maximum.

A duty cycle of 50% is maintained when the internal input clock paces operations. When using an external clock, the signal is output immediately after the external clock input is received.

Data Transfer

The USB-DIO32HS uses a delay between the output scan clock and the data transfer pin, which allows an external device that is receiving the data to know that the data is stable at that point, and ensures a coherent data transfer between devices.

Features

- 32 bits of bidirectional TTL digital I/O
- Pattern detection and generation
- Input scan rate up to 8 MS/s
- Update rate up to 8 MS/s
- Independent input and output scan clocks
- 24 mA source, 10 mA sink output current
- External trigger and clock inputs
- Available with enclosure and screw terminals, or as a board-only OEM version with header connectors (no case, CD, or USB cable included)

Supported Operating Systems

- Windows® 11/10/8/7/Vista®/ XP, 32/64-bit
- Linux®
- Android™

Triggering

Digital and pattern triggering are supported.

The TRIG pin is used for external TTL-level triggering, and can be used to trigger input or output scans. Trigger latency is less than 1 µs. The trigger mode is software-selectable for edge or level sensitive, and high or low logic.

Either digital port can be used for pattern triggering. A scan is triggered when a specified pattern is detected. Specific bits can be masked or ignored. Trigger latency is 1 scan clock period. You can input or output a digital pattern under the timing control of a clock signal.

USB-DIO32HS-OEM

The USB-DIO32HS-OEM has a board-only form factor with header connectors for OEM and embedded applications (no case, CD, or USB cable included). The device can be further customized to meet customer needs.

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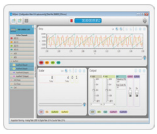
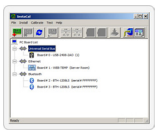
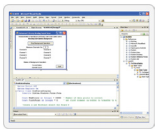
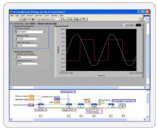
Software

Software Support

The USB-DIO32HS is supported by the software in the table below.

Ready-to-Run Applications		
DAQami™		Data acquisition companion software with drag-and-drop interface that is used to acquire, view, and log data, and generate signals. DAQami can be configured to log analog, digital, and counter channels, and to view that data in real-time or post-acquisition on user-configurable displays. Logged data can be exported for use in Excel® or MATLAB®. Windows OS DAQami is included with the free MCC DAQ Software bundle.
InstaCal™		An interactive installation, configuration, and test utility for MCC hardware. Windows OS InstaCal is included with the free MCC DAQ Software bundle.
TracerDAQ™ and TracerDAQ Pro		Virtual strip chart, oscilloscope, function generator, and rate generator applications used to generate, acquire, analyze, display, and export data. Supported features may vary by hardware. The Pro version provides enhanced features. Windows OS TracerDAQ is included with the free MCC DAQ Software bundle. TracerDAQ Pro is available as a purchased software download.
General-Purpose Programming Support		
Universal Library™ (UL) for Windows		Library for developing applications in C, C++, VB, C# .Net, VB .Net, and Python on Windows. The UL for Windows is included with the free MCC DAQ Software bundle. The UL Python API for Windows is available on GitHub (https://github.com/mccdaq/mcculw).
UL for Linux®		Library for developing applications in C, C++, and Python on Linux. UL for Linux is available on GitHub (https://github.com/mccdaq/uldaq). Open-source, third-party Linux drivers are also available for supported MCC devices.
UL for Android™		Library of Java classes for programmers who develop apps for Android-based mobile devices. UL for Android communicates with select MCC DAQ devices. Supports Android project development on Windows, Linux, Mac OS X. UL for Android is included with the free MCC DAQ Software bundle.
Application-Specific Programming Support		
ULx for NI LabVIEW™		A comprehensive library of VIs and example programs for NI LabVIEW that is used to develop custom applications that interact with most MCC devices. Windows OS ULx for NI LabVIEW is included with the free MCC DAQ Software bundle.
DASYLab®		Icon-based data acquisition, graphics, control, and analysis software that allows users to create complex applications in minimal time without text-based programming. Windows OS DASYLab is available as a purchased software download. An evaluation version is available for 28 days.

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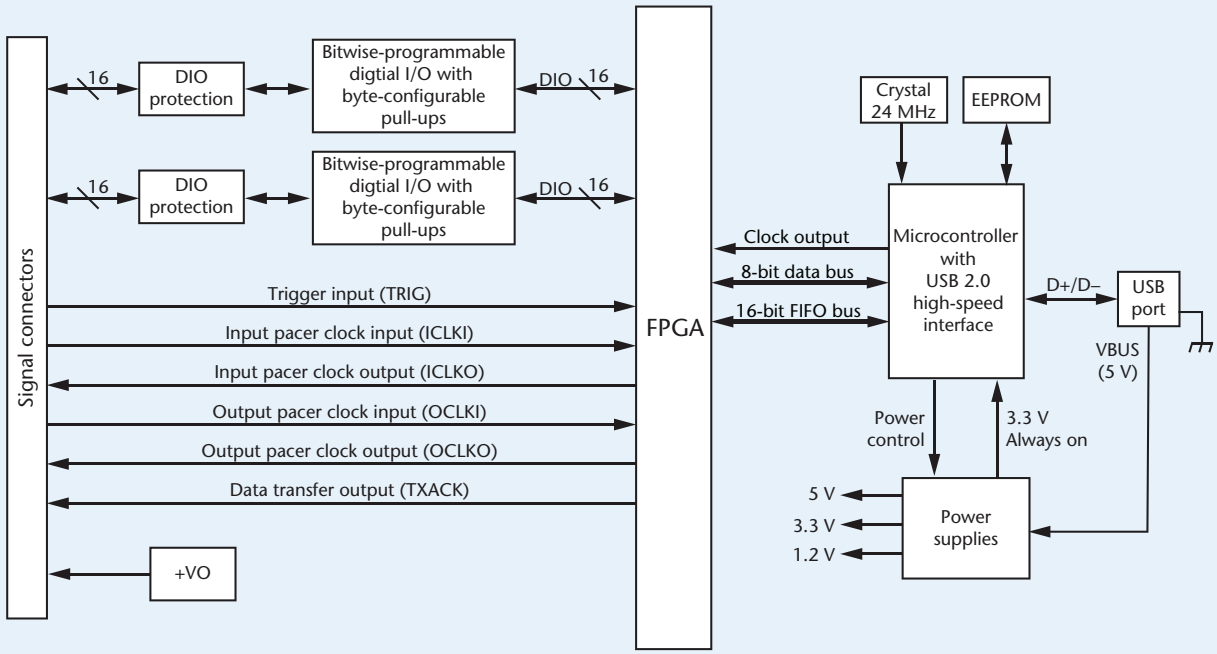
Specifications

USB-DIO32HS Block Diagram



Specifications

These specifications apply to both USB-DIO32HS standard and OEM versions unless noted otherwise.

Digital Input/Output

Digital type: TTL
Number of I/O: 32 (2 ports of 16 bits)
Configuration: Bit-configurable as input (power on default) or output
Pull-up configuration: Each port has two 47 kΩ resistors configurable as a pull-up or pull-down (default) with an internal jumper.
  Jumper W3: configures port 0 bit 0 to bit 7
  Jumper W4: configures port 0 bit 8 to bit 15
  Jumper W5: configures port 1 bit 0 to bit 7
  Jumper W6: configures port 1 bit 8 to bit 15
Digital I/O transfer rate
  System-paced, asynchronous: 33 to 8000 port reads/writes or single bit reads/writes per second typical, system dependent.
  Synchronous: 0.022 Hz to 8 MHz, based on the internal clock speed of 96 MHz
Digital input pacing: Onboard clock, external input scan clock (ICLKI)
Digital input trigger source: External single channel digital trigger (TRIG) or Pattern Detection
Digital output pacing: Onboard clock, external output scan clock (OCLKI)
Digital output trigger source: External single channel digital trigger (TRIG) or Pattern Detection
Input high voltage: 2.0 V min, 5.0 V absolute max
Input low voltage: 0.8 V max, 0 V recommended min
Output high voltage: 4.4 V min (IOH = –50 µA), 2.96 V min (IOH = –24 mA)
Output low voltage: 0.1 V max (IOL = 50 µA), 0.77 V max (IOL = 10 mA)
Output current: 24 mA source, 10 mA sink max per pin, constrained to 384 mA across all output pins (digital outputs, pacer clock outputs, and +VO)

Pattern Trigger

Trigger source: Port 0 or Port 1
Trigger types: Above pattern, Below pattern, Equal pattern, or Not equal pattern
Trigger stability: Digital port must be stable for 31.25 ns to be recognized as a pattern
Trigger bit width: Up to 16, adjustable through bitmask
Trigger latency: Up to 1 scan period

External Trigger

Trigger source: External digital; TRIG terminal
Trigger mode: Software-selectable for edge or level sensitive, rising or falling edge, high or low level.
Retrigger mode: Trigger is rearmed after each trigger event
Trigger latency: 100 ns max
Trigger pulse width: 100 ns min
Input type: Schmitt trigger, 47 kΩ pull-down to ground with 33 Ω in series
Schmitt trigger hysteresis: 0.76 V typ, 0.4 V min, 1.2 V max
Input high voltage threshold: 1.74 V typ, 1.3 V min, 2.2 V max
Input high voltage limit: 5.5 V absolute max
Input low voltage threshold: 0.98 V typ, 0.6 V min, 1.5 V max
Input low voltage limit: –0.5 V absolute min, 0 V recommended min

Clock Input/Output

Terminal names: ICLKI, ICLKO, OCLKI, OCLKO
Terminal type
  ICLKI: Input scan clock input, active on rising edge
  ICLKO: Input scan clock output, power on default 0 V, active on rising edge
  OCLKI: Output scan clock input, active on rising edge
  OCLKO: Output scan clock output, power on default 0 V, active on rising edge
Input clock frequency: 8 MHz max
Input clock pulse width: 10.417 ns min
Input type: Schmitt trigger, 47 kΩ pull-down to ground with 33 Ω in series
Input Schmitt trigger hysteresis: 0.76 V typ, 0.4 V min, 1.2 V max
Input high voltage threshold: 1.74 V typ, 1.3 V min, 2.2 V max
Input high voltage limit: 5.5 V absolute max
Input low voltage threshold: 0.98 V typ, 0.6 V min, 1.5 V max
Input low voltage limit: –0.5 V absolute min, 0 V recommended min
Output clock frequency: 8 MHz max
Output clock pulse width: Minimum 62.5 ns at 8 MHz, varies with sample rate; maintains 50% duty cycle using the internal clock. When using the external clock, it follows the external clock input.
Output high voltage: 4.4 V min (IOH = –50 µA), 2.96 V min (IOH = –24 mA)
Output low voltage: 0.1 V max (IOL = 50 µA), 0.77 V max (IOL = 10 mA)
Output current: 24 mA source, 10 mA sink max per pin, constrained to 384 mA across all output pins (digital outputs, pacer clock outputs, and +VO)
Handshaking: The TXACK output will have an 83.33 ns delay from the OCLKO signal to ensure coherent data transfers between devices.

USB-DIO32HS

Ordering

Power

Supply current, USB source
During enumeration: <100 mA
After USB enumeration: <500 mA
+VO voltage output range
After USB enumeration: 5 V, ± 5%
+VO output current
After USB enumeration: 24 mA max per pin, constrained to 384 mA across all output pins (digital outputs, pacer clock outputs, and +VO)

USB

Device type: USB 2.0 (high-speed)
Device compatibility: USB 1.1, USB 2.0, USB 3.0
USB cable length: 3 m (9.84 ft) max

Environmental

Operating temperature range: 0 °C to 50 °C
Storage temperature range: –40 °C to 70 °C
Humidity: 0% to 90% non-condensing

Mechanical

Signal I/O Connector
Standard: 2 banks of screw-terminals (wire gauge range 16 AWG to 30 AWG)
OEM: Two 1 × 28 pin 0.1 in. pitch headers
Dimensions (L × W × H):
Standard: 128.52 x 88.39 × 35.56 mm (5.06 × 3.48 × 1.43 in.)
OEM: 119.38 × 86.36 × 15.24 mm (4.70 × 3.40 × 0.60 in.)

Order Information

Hardware

Part No.	Description
USB-DIO32HS	USB digital I/O device with 32 bit-configurable DIO lines, and I/O scan rates up to 8 MS/s max. Includes USB cable and MCC DAQ software.
USB-DIO32HS-OEM	Board-only USB-based digital I/O board with 32 bit-configurable digital I/O lines, and I/O scan rates up to 8 MS/s max.

Software also Available from MCC

Part No.	Description
TracerDAQ Pro	Out-of-the-box virtual instrument suite with strip chart, oscilloscope, function generator, and rate generator – professional version
DASYLab	Icon-based data acquisition, graphics, control, and analysis software