



## Fast USB-DIO-16H Series— USB Digital Waveform (Pattern) Generator Modules Feature 16 High-Speed Digital I/O Lines

### FEATURES

- High-speed USB 2.0 device
- 16 high-speed digital I/O lines feature continuous, sustained throughput up to 16 MB/s
- Capable of 80 MB/s bursts with flexible synchronous clock and handshaking capabilities
- Continuous streaming over USB with no maximum waveform length
- On-board embedded FIFO memory up to 128 kByte
- 18 additional digital I/O lines arranged in 4 programmable groups
- All outputs buffered with 24 mA sink/source capabilities
- Type B USB connector features high-retention design
- Standard 68-pin SCSI high density latching connector
- Custom high-speed function driver
- Alternate embedded USB connector
- All required power drawn from USB port, no external power adapter required
- Small, (4" x 4" x 1.25") rugged industrial enclosure
- PC/104 module size and mounting compatibility
- Type B USB connector features industrial strength and high-retention design adaptor
- OEM (board only) version with PC/104 mounting holes and PCB footprint for added flexibility in embedded applications



### FACTORY OPTIONS

- LVTTTL for 3.3V applications
- Input only, output only, and input/output versions
- OEM version (board only) features PC/104 module size and mounting compatibility
- External power for high current capabilities
- Extended temperature and DIN rail mounting provisions
- RoHS available, please contact us for ordering information

### FUNCTIONAL DESCRIPTION

Model USB-DIO-16H features 16 high-speed buffered digital inputs or digital outputs at continuous, sustained streaming speeds up to 16 MB/s for fast, unlimited waveform length. The module is capable of 80 MB/s bursts with handshaking signals for synchronizing communications plus an additional 18 bits of general purpose digital I/O. The USB-DIO-16H is a port-powered high-speed USB 2.0 device and offers hot swapping functionality for quick connect/disconnect whenever you need additional I/O on your USB port.

The USB-DIO-16H includes a programmable clock capable of 1 kHz - 40 MHz transfers or you may choose to use your own external clock. In addition to the 16 high-speed I/O's there are 18 standard TTL-compatible digital I/O channels configurable as 4 separate ports for input or output (see block diagram). All required power is normally supplied to the board via the USB cable, however for higher current sourcing capabilities, optional external power may be used. The I/O wiring connections for the units are via an industry standard high-density pin-in-socket SCSI connector. For external circuits, a jumper selection connects fused +5VDC power to the connector. This resettable fuse is rated at 0.5A.



The series includes four models, choose from input only (USB-DI16A), output only (USB-DO16A), and input/output versions (USB-DIO-16A) with expandable FIFOs (USB-DIO-16H). These modules are especially useful where high-speed data needs to be captured or output for testing or stimulus/response applications. These include testing and debugging, laboratory automation, manufacturing test, image capture, process monitoring, datsource emulation, and many more which require the need for high-speed parallel data transfer.

A type B USB connector is used on all models which features a high retention design that complies with the class 1, Div II minimum withdrawal requirement of over 3 pounds of force. This connector has an orange color-coded insulator to differentiate it from standard USB connectors.

The USB-DIO-16H was designed to be used in rugged industrial environments but is small enough to fit nicely onto any desk or testing station. The board itself is PC/104 sized (3.550 by 3.775 inches) and ships with or without a steel powder-coated enclosure with an anti-skid bottom. A DIN rail mounting provision is available for installation in industrial environments.

### OEM USB/104 FORM FACTOR

The OEM (board only) version is perfect for a variety of embedded applications. What makes the OEM option unique is that its PCB size and pre-drilled mounting holes match the PC/104 form factor (without the bus connections). This ensures easy installation using standard standoffs inside most enclosures or systems. The board can be added to any PC/104, PCI-104, or PCI/104-Express stack by connecting it to a USB 2.0 port usually included on-board with embedded CPU form factors such as EBX, EPIC, and PC/104. This is especially important since many newer CPU chipsets do not support ISA and have plenty of USB ports. The USB-DIO-16H OEM board can also be installed using standoffs inside other enclosures or systems. For embedded OEM type applications, an additional miniature USB input header is provided in parallel with the type B connector.

### High Retention USB Connector

The ever-growing presence of USB in the industrial/military marketplace has driven the need for USB connections to be reliable, dependable, and unfailling. Gone are the days of loose USB connections. A type B USB connector is used on all USB/104 products which features a high retention design that complies with the class 1, Div II minimum withdrawal requirement of over 3 pounds of force (15 Newtons). This connector has an orange color-coded insulator to quickly differentiate it from standard USB connectors. Using these USB connectors increases reliability in your system and ensures a tight connection. For embedded OEM type applications, an additional miniature USB input header is provided in parallel with the type B connector.



### Applications

- Testing and Debugging
- Laboratory Automation
- Manufacturing Test
- Image Capture
- Process Monitoring
- Datasource Emulation
- Embedded OEM

### ACCESSORIES

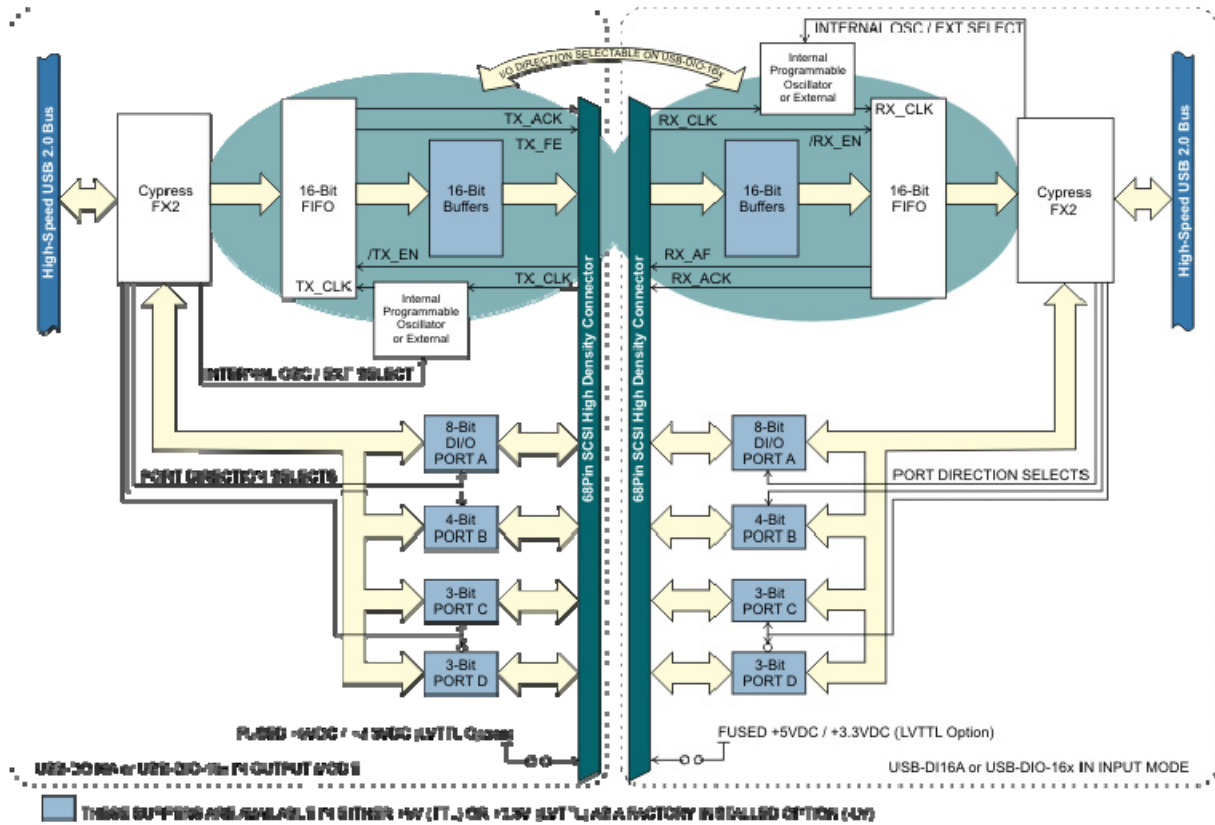
Available accessories include a shielded, round-wire molded cable with latching connectors and a 68-pin screw terminal board for quick and easy connectivity.

### SOFTWARE

The USB-DIO-16H utilizes a high-speed custom function driver optimized for maximum continuous data throughput of 16 MB/s that is hundreds to thousands of times faster than the USB human interface device (HID) driver used by many competing products. This approach maximizes the full functionality of the hardware along with capitalizing on the advantage of high-speed USB 2.0. The boards are supported for use in most USB supported operating systems and includes a free Windows 98se/Me/2000/XP/2003/Vista compatible software package. This package contains sample programs and source code in Visual Basic, Delphi, C++ Builder, and Visual C++ for Windows. Third party support includes a Windows standard DLL interface usable from the most popular application programs and includes example LabView VIs. Embedded OS support includes Windows XPe.



Block Diagram



Specifications

TTL High-Speed Digital I/O's (LVTTL Optional)

Channels / Groups: 16 / 1  
 Configured as Inputs:  
 Logic High: 2.0 to 5.0 VDC  
 Logic Low: -0.5 to +0.8 VDC  
 Configured as Outputs:  
 Logic High: 4.4 VDC minimum, source 24 mA  
 Logic Low: 0.44 VDC maximum, sink 24 mA

TTL Standard Digital I/O's (LVTTL Optional)

Channels / Groups: 18 / 4 (see block diagram)  
 Configured as Inputs:  
 Logic High: 2.0 to 5.0 VDC  
 Logic Low: -0.5 to +0.8 VDC  
 Configured as Outputs:  
 Logic High: 4.4 VDC minimum, source 24 mA  
 Logic Low: 0.44 VDC maximum, sink 24 mA

Internal Clock

Frequency Range: 1 kHz - 40 MHz

External Clock

Frequency: 40 MHz maximum

Data FIFOs

Width: 16-bit  
 Depth: USB-DIO-16H: 128 kByte  
 USB-DIO-16A, USB-DI16A, USB-D016A: 8 kByte

Environmental

Operating Temperature Range: Commercial: 0° to 70°C  
 Industrial: -40° to +85°C  
 Storage Temperature Range: -40° to +85°C  
 Humidity: 5%-95%, non-condensing  
 Board Dimension: 3.550 x 3.775 inches  
 Box Dimension: 4.00 x 4.00 x 1.25 inches

Power

Basic Unit: 100mA typical (no load)  
 Auxiliary Output: +5VDC via 0.5A resettable fuse  
 +3.3VDC via 0.5A resettable fuse (with LVTTL Option)  
 Bus Powered: +5VDC provided via USB bus up to 500mA



## Ordering Information

Item Code	Description
USB-DIO-16H	16 High-Speed Digital I/Os, 18 standard I/Os, 128 kByte FIFO
USB-DIO-16A	16 High-Speed Digital I/Os, 18 standard I/Os, 8 kByte FIFO
USB-DI16A	16 High-Speed Digital Inputs, 18 standard I/Os, 8 kByte FIFO
USB-DO16A	16 High-Speed Digital Outputs, 18 standard I/Os, 8 kByte FIFO

### Accessories

STB-68	Screw terminal board
C68PS18L	68-Pin SCSI 18" shielded cable
MP104-DIN	DIN rail mounting provision
CUSB-EMB-6	6' USB Cable with Type A to mini connector

### Options

-OEM	Board only (no enclosure)
-P	External power components and AC/DC adapter
-LV	LVTTTL Buffers
-T	Extended Temperature Operation