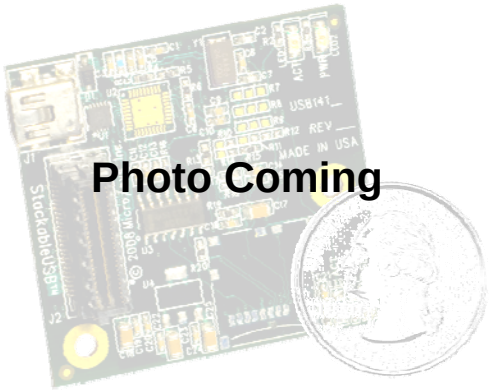
Accelerometer with Analog and Digital I/O for StackableUSB™ USB1600



Features

- ✓ **Tri-axis sensing, six degrees of freedom**
- ✓ **Selectable high-resolution 1.5g – 200g sensing ranges**
- ✓ **12-bit, 250ksps simultaneous sampling on all sensing axis**
- ✓ **UART, SPI, I2C, ADC, Temperature Sensor, Analog Comparators, PCA, Timers, Twenty Configurable I/O Pins**
- ✓ **64KB Flash, 2k (256x8) EEPROM, 4352 bytes RAM**
- ✓ **Small 1.85" x 1.78" StackableUSB, USB 2.0**
- ✓ **Extended temp operation**

RoHS COMPLIANT 2002/95/EC

The USB1600 accelerometer module provides the ideal mix of sensing ranges, resolutions and sampling rates for rugged, compact embedded systems. The module stacks directly onto any StackableUSB Host computer or microcontroller, supplying OEMs with a cost effective solution for measuring acceleration and vibration. The USB1600 comes with sample software and full documentation.

The USB1600 offers standard sensing ranges from 1.5g – 6g and is configurable for ranges up to 200g. In addition, a dedicated Analog Devices ADC provides simultaneous sampling on all three accelerometer axis (X, Y, Z), allowing the USB1600 to sense six (6) degrees of freedom. Powered by a Silicon Labs C8051F340 microcontroller with Pipelined 48-MIPS architecture, the USB1600 also provides a great set of additional features including digital I/O, timers, PWMs, SPI, I2C, RS232, and more.

The 1.85" x 1.78" module is USB 2.0 compliant providing users the advantages of plug and play interfacing. The module stacks onto the top or bottom of any StackableUSB host single board computer or microcontroller forming a small, rugged, embeddable system, ideal for harsh environments. The USB1600 can be connected to desktop PCs and laptops via a Type B mini-USB connector for development.

Software/Driver Support

- Windows XP drivers
- Windows CE drivers
- Linux drivers
- Microcontroller firmware
- Sample software

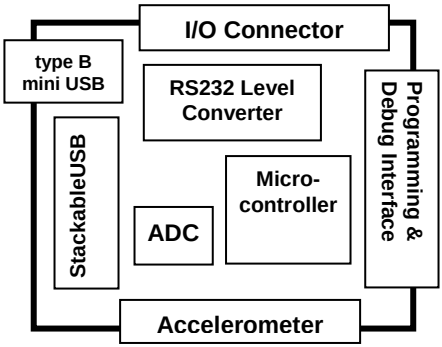
Compatible Hardware

- StackableUSB Host single board computer and microcontroller
- PC Hosts desktops and laptops
- SPI, I2C, UART
- Analog Devices

Mounting/Packaging

- ¼-size 104 Form Factor
- Standoffs, STDOFFUSB

MICRO/SYS 3730 Park Place, Montrose, CA 91020 • (818)244-4600 • Fax (818)244-4246 • email: info@embeddedsys.com



Technical Details:

The USB1600 features software selectable ranges from 1.5g – 6g. Accelerometers with lower g ranges have higher resolutions and can better detect smaller movements than those with high g ranges. For systems requiring a higher magnitude, the USB1600 can be equipped with a more powerful range (maximums of 50g or 200g). The versatility of the USB1600 is important because an ill-matched accelerometer range will result in false readings. If an acceleration outside the sensing range occurs, then the output will be clipped and read as the maximum. As a rule of thumb, a 20% gap should be given in respect to the highest g-force expected to be encountered in an application. (Figure 1.1 provides a scale to help decide which USB1600 configuration best suites the OEM application. The graph shows some acceleration values that are experienced in common day-to-day events along with the sensing ranges of the USB1600 options.)

The USB1600 has highly accurate software algorithms to determine roll, pitch, and yaw with the tri-axis accelerometer eliminating the need for an expensive Gyro.

At the core of the USB1600 is the Silicon labs C8051F340 8-bit microcontroller which houses a high-speed 8051, 48-MIPS pipelined architecture CIP-51™ CPU Core. This provides excellent throughput allowing execution of 70% of instructions in 1 or 2 system clocks.

The USB1600 communicates with a host CPU through the StackableUSB connector, the Type B mini-USB connector, or can serve as a stand-alone sensor board. A 10-pin connector provides access to the programming and debugging interface, and a high-density 50-pin connector provides access to the microcontroller's multiplexed differential ADC with a built-in temperature sensor, comparators, digital I/O, I2C, SPI, UART ports (one RS232 and one TTL level), timers, and counters. Twenty (20) pins on the microcontroller are provided as user configurable pins and can be configured as analog, digital, or any of the other features mentioned above.

The USB1600 also includes an EEPROM which resides on the I2C bus. This provides programmers with 2k (256x8) of storage space in addition to the microcontroller's 64 KB Flash and 4352 bytes of RAM.

The pre-installed software allows the USB1600 to transfer data between the USB port and all of the onboard peripherals with no need to write additional code to the device side of the system. To ease installation on the host side, USB drivers and example source codes are supplied,

eliminating the need for prior USB experience. Host side operating systems supported are Linux, WinCE, and WinXP.

A command and control protocol implemented over the USB interface allows direct communication with the onboard peripherals via inport and outport driver calls executed on the host computer. A custom interrupt service routine can be called directly by the host side USB driver.

The USB1600 is USB 2.0 compliant and supports both full speed (12 Mbps) and low speed (1.5 Mbps) transfer rates.

Power for the USB1600 is drawn through either the StackableUSB or mini-USB port when connected to a PC. An optional power adapter plug may be included for stand-alone functionality.

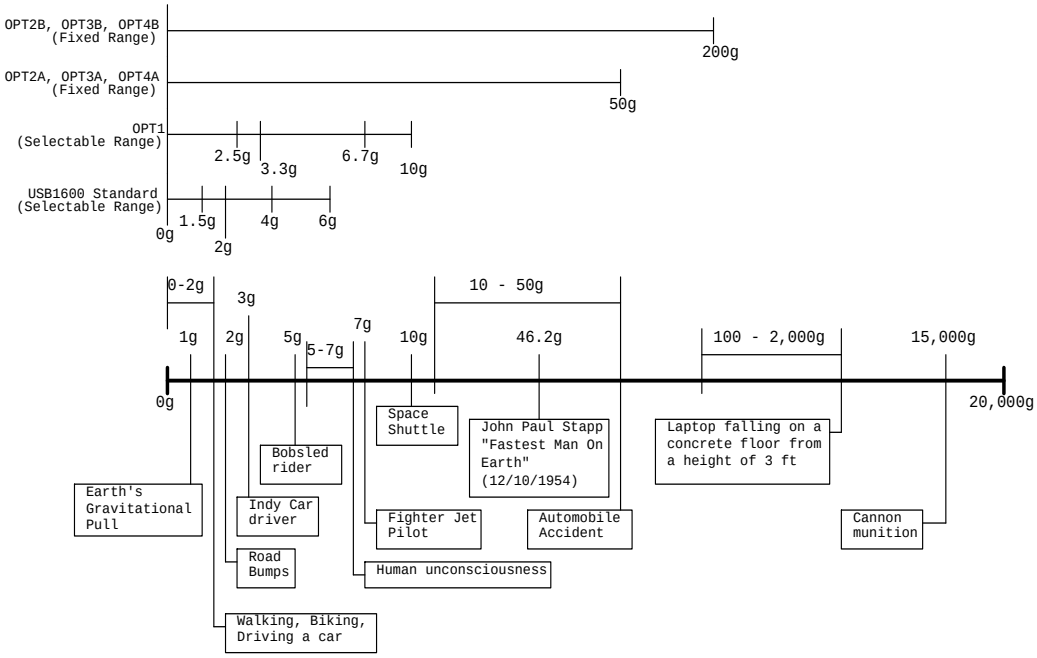


Figure 1.1

Specifications:

Mechanical:
- ❑ 1.85" x 1.78" StackableUSB
- ❑ ¼-Size 104™ Form factor

Power Requirements:
- ❑ +5v ±5% @ 30 mA (max)

Environmental:
- ❑ -40° to +85°C Operating Temp
- ❑ -40° to +85°C Storage Temp
- ❑ 5%-95% relative humidity, non-condensing

Accelerometer:
- ❑ Dedicated 12-bit, 250ksps, Simultaneous sampling ADC (Analog Devices AD7658-1)
- ❑ Refer to Ordering Information for details on accelerometers

Processor:
- ❑ 48 MHZ Silicon Labs C8051F340
- ❑ On chip Debug & Development Interface
- ❑ Sixteen (16) interrupt sources
- ❑ Nine (9) reset sources
- ❑ Watchdog Timer
- ❑ 20 configurable I/O Pins (5V tolerant)

Analog Peripherals:
- ❑ 10-bit ADC (200ksps)
  - Single or Differential inputs
  - Built in temperature sensor
  - External VREF
  - External conversion start trigger
- ❑ Two (2) Comparators

Digital Peripherals:
- ❑ Hardware enhanced SPI
- ❑ SMBus/I2C (Built in 5V pull-up resistors)
- ❑ One (1) RS-232 Level UART Port
- ❑ One (1) TTL Level UART Port
- ❑ Four (4) 16-bit general purpose counters/timers
- ❑ 16-bit Programmable Counter Array with five (5) capture/compare modules
- ❑ USB 2.0 Compliant (Full speed or low speed)

Memory:
- ❑ 4352 bytes RAM
- ❑ 64KB Flash
- ❑ 2K (256x8) EEPROM (on I2C bus)

External Connectors:
- ❑ StackableUSB
- ❑ Type B mini-USB
- ❑ 10 pin Development Interface connector
- ❑ 50-pin I/O connector

Debug Interface:

10 Pin I/O Connector			
Pin	**Signal**	**Signal**	**Pin**
1	NC	GND	**2**
3	GND	C2D	**4**
5	RST#	NC	**6**
7	RST#/C2CK	NC	**8**
9	GND	NC	**10**

I/O Interface:

50 Pin I/O Connector B			
Pin	**Signal**	**Signal**	**Pin**
1	RS232_RX0	GND	**2**
3	RS232_TX0	GND	**4**
5	P00/SCK	GND	**6**
7	P01/MISO	P02/MOSI	**8**
9	GND	GND	**10**
11	P10/SDA	P11/SCL	**12**
13	P14	GND	**14**
15	P15	GND	**16**
17	P16	GND	**18**
19	P17	GND	**20**
21	P20	GND	**22**
23	P21	GND	**24**
25	P22	GND	**26**
27	P23	GND	**28**
29	P24	GND	**30**
31	P25	GND	**32**
33	P26	GND	**34**
35	P27	GND	**36**
37	P30	GND	**38**
39	P31	GND	**40**
41	P32	GND	**42**
43	P33	GND	**44**
45	P34	GND	**46**
47	P35	GND	**48**
49	P36	P37	**50**

Internal Electrical Interface:
- ❑ StackableUSB
- ❑ USB 1.1 & 2.0 compatible, full speed

Development Kit:
- ❑ Module with all options installed
- ❑ Complete cable set
- ❑ Documentation, schematics, sample software

Ordering Information:

OEM Single Board Computers:

USB1600-ST	Accelerometer Sensor Board for StackableUSB; X, Y, Z sensing planes; ±1.5g, ±2g, ±4g, ±6g selectable range
USB1600-PC	Accelerometer Sensor Board for Type B mini USB; X, Y, Z sensing planes ±1.5g, ±2g, ±4g, ±6g selectable range
OPT16001	X, Y, Z sensing planes; ±2.5g, ±3.3g, ±6.7g, ±10g selectable range
OPT16002-A	Z axis range ±50g
OPT16002-B	Z axis range ±200g
OPT16003-A	Y axis range ±50g
OPT16003-B	Y axis range ±200g
OPT16004-A	X axis range ±50g
OPT16004-B	X axis range ±200g

Related Products:

STDOFFUSB	StackableUSB Standoff Kit

Development Board Kits*

DK1600-ST	Accelerometer Sensor Board for StackableUSB; X, Y, Z sensing planes; ±1.5g, ±2g, ±4g, ±6g selectable range, Windows-ready development kit
DK1600-PC	Accelerometer Sensor Board for StackableUSB; Type B mini USB; X, Y, Z sensing planes; ±1.5g, ±2g, ±4g, ±6g selectable range, Windows-ready development kit

**See Development Kit Specifications*