SPI Storm

Data sheet

Revision 1.00 - April 2011

Table of Contents

Table of Tables

Table of Figures

References

[]

Revision history

Version	Date	Description
1.00	April 2011	Document creation

1 Main features

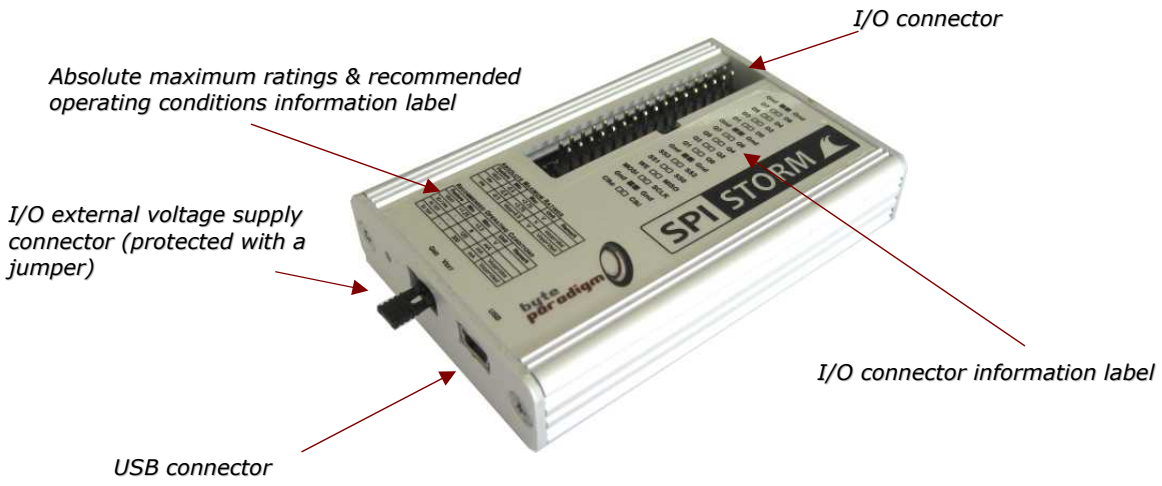
- High-speed USB 2.0 host interface (full-speed 12 Mbps and high-speed 480 Mbps)
- SPI (Serial Peripheral Interface) Host Adapter on 3- and 4- wires
- Dual- and Quad- SPI Host Adapter
- Custom protocol support
- GPO (General-Purpose Output) port for additional arbitrary digital signal generation (8-bit digital pattern generator)
- Up to 100 MHz operation
- USB-powered and controlled
- Selectable internal (USB bus) or external power supply for I/Os voltages
- System interface operating from +1.25 V to +3.3V
- Open-drain I/O support
- Delivered with the SPI Storm Studio(TM) including: documentation, drivers and host control software (MS-Windows XP / MS-Windows 7, 32-bit and 64-bit)
- 32 MB total internal memory

2 SPI Storm Overview

2.1 SPI Storm at a glance

Byte Paradigm's SPI Storm is a high-speed Serial Protocol Host Adapter used for chips and electronic board stimulation with serial protocols and digital patterns.
It operates on standard SPI protocol, Dual-SPI, Quad-SPI and custom serial protocol interfaces including 3 wires interfaces with bidirectional data lines, up to 100 MHz operation. SPI Storm also supports open-drain output signalling.
SPI Storm is delivered with SPI Storm Studio(TM) control software with graphical user interface and direct C/C++ DLL access.

Figure 1: SPI Storm - Overview



2.2 Minimum Host PC requirements

SPI Storm connects to any PC using Microsoft Windows XP or Windows 7 operating systems (32-bit/64-bit) through a USB 2.0 port connector.
.NET 4.0 or .NET 4.0 (or a more recent version) client profile framework must be installed – link:
http://www.microsoft.com/downloads/en/details.aspx?FamilyID=e5ad0459-cbcc-4b4f-97b6-fb17111cf544

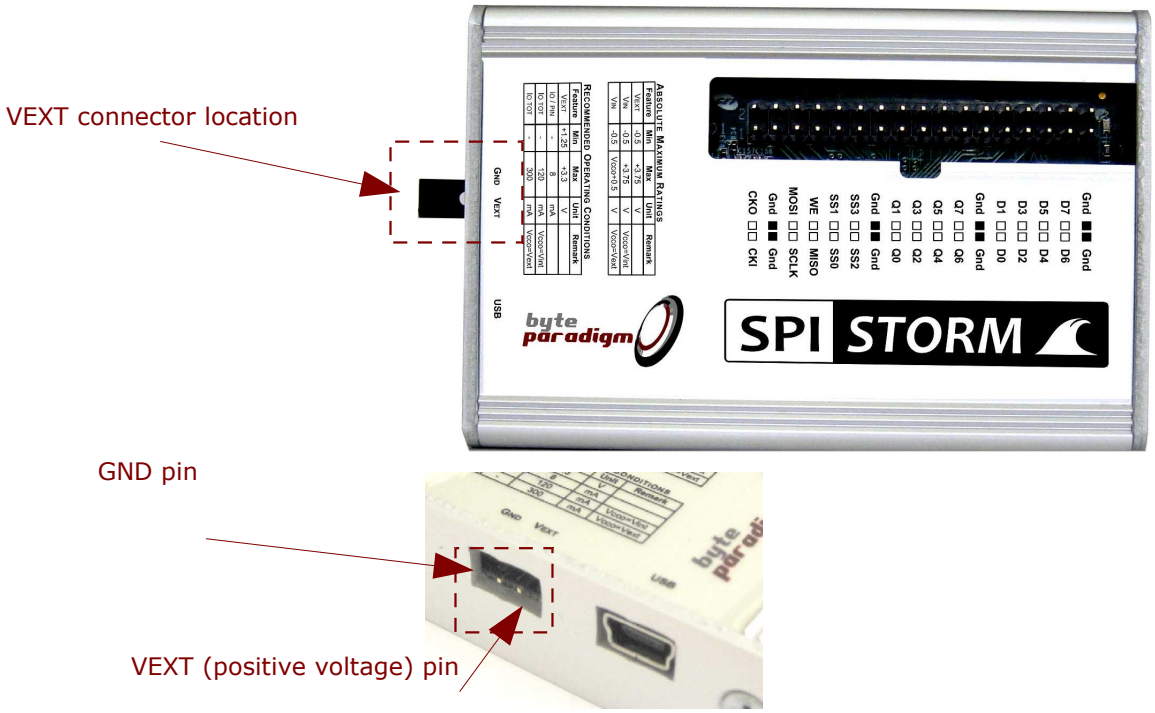
2.3 Operating power

The main power supply of the SPI Storm device is taken from the USB bus to provide the necessary voltage to the device core. By default, the I/O voltage standard is +3.3V LVCMOS.

To use a different voltage standard for the I/O, the jumper located on the I/O external voltage supply connector must be removed and an external voltage source must be applied on this connector. External voltage level must be between +1.25V and +3.3V.

The external power supply connector is located at the side of the device. It is protected with a jumper. This power connector is labelled "GND VEXT". **! Respect the connector polarity !**

Figure 2: System connector external power supply pins



2.4 USB and system interface connections

A USB mini-B to USB type A cable is provided with the SPI Storm device.

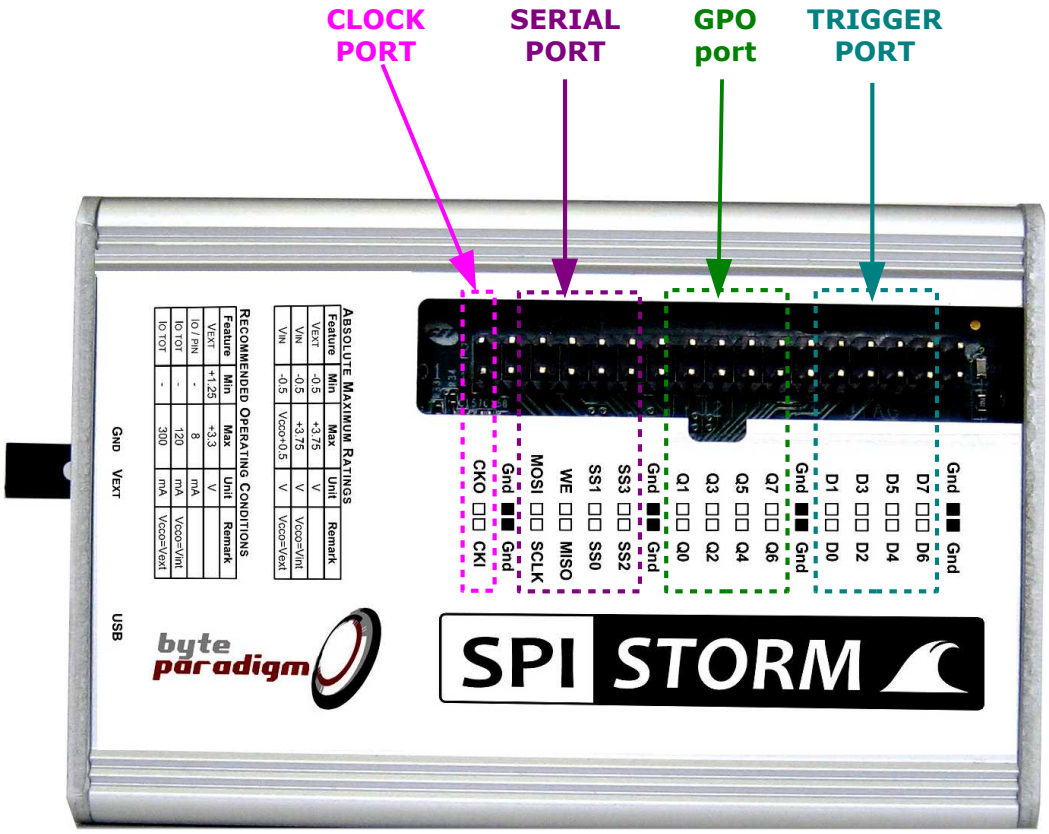
A set of 34 flying lead wires connect the SPI Storm device to the board under test. A standard pin header with 2.54 mm (0.1 inch) pitch must be foreseen on the target board where access is desired.

3 SPI Storm I/O connector

PORTS:

- CLOCK PORT : CKI clock input for external reference clock; CKO: reserved for future use.
- SERIAL PORT: used for interfacing slaves with standard SPI protocols, dual- and quad-SPI protocols and custom serial protocols;
- GPO PORT: used as a 8-bit arbitrary digital pattern generator;
- TRIGGER PORT: up to 8 bits usable as trigger input signals for the SERIAL and the GPO ports

Figure 3: SPI Storm I/O connector ports



The other pins are ground pins (**'GND'**) and cannot be used for functional signalling. Ground pins must be connected to the ground of the system under test for proper operation.

Table 1 : SPI Storm I/O connector details

Pin name	Direction	Description / Options
		CLOCK PORT
CKO	Output	Reserved for future use
CKI	Input	Input used to supply an external reference clock signal.
		SERIAL PORT
SCLK	Output	Serial clock
MOSI (DQ0)	In/Out/Inout	Multi-purpose I/O used as data line for serial protocols and dual- / quad-'serial' protocols. Used as MOSI (Master Out Slave In) signal for standard SPI (Serial Peripheral Interface) protocol.

Pin name	Direction	Description / Options
MISO (DQ1)	In/Out/Inout	Multi-purpose I/O used as data line for serial protocols and dual- / quad- 'serial' protocols. Used as MISO (Master In Slave Out) signal for standard SPI (Serial Peripheral Interface) protocol.
WE	Output	Used to indicate the direction of the bus for bi-directional SPI (Serial Peripheral Interface) protocol on 3 wires ('SPI-3').
SS0	Output	Used as 'Slave Select' output for standard SPI (Serial Peripheral Interface) protocols
SS1	Output	
SS2 (DQ2)	In/Out/Inout	Multi-purpose I/O used as data line for quad- 'serial' protocols
SS3 (DQ3)	In/Out/Inout	Multi-purpose I/O used as data line for quad- 'serial' protocols
GPO PORT		
Q0 ... Q7	Output	8-bit 'General-Purpose Output' port. Used to apply arbitrary output data.
TRIGGER PORT		
D0 … D7	Input	8-bit input port used as trigger for the SERIAL and the GPO ports.

4 DC and Switching Characteristics

4.1 Absolute maximum ratings

Table 2: Absolute maximum ratings

Symbol	Description	Conditions	Min	Max	Unit
V_{EXT}	External DC supply voltage relative to GND		-0.5	+3.75	V
V_{IN}	Voltage applied to any user I/O pins relative to GND	V_{CCO}[2] = V_{INT}	-0.5	+3.75	V
V_{IN}	Voltage applied to any user I/O pins relative to GND	V_{CCO}[2] = V_{EXT}	-0.5	V_{CCO}+0.5	V

Notes:

1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those listed under the Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Ratings conditions for extended periods of time adversely affects device reliability.
2. Vcco is the supply voltage of the I/O pin output driver. It can be supplied internally (VINT) or externally (VEXT), through the external connector.

4.2 Recommended operating conditions

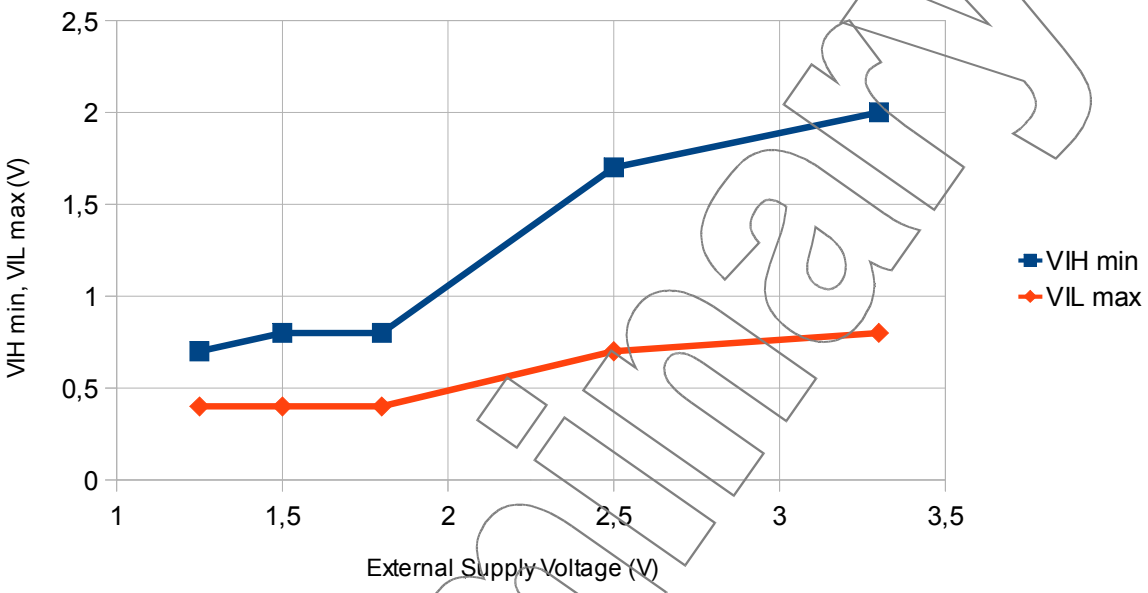
Table 3: Recommended operating conditions

Symbol	Description		Min	Max	Unit
V_{EXT}	External DC supply voltage relative to GND		+1.25	+3.3	V
I_{CCO}	Quiescent supply current for any user I/O pin.	I/O voltage > 1,38 V 1.25 V> I/O voltage > 1.38 V	- -	8 6	mA mA
$I_{CCO-TOT}$	Total quiescent current for all user I/O used simultaneously	V_{CCO}[1] = V_{INT}	-	120	mA
$I_{CCO-TOT}$	Total quiescent current for all user I/O used simultaneously	V_{CCO}[1] = V_{EXT}	-	300	mA
T_{OP}	Operating ambient temperature		0	45	°C
V_{IH}[2]	Logic high voltage threshold	V_{CCO}[1] = V_{INT}	2.0	-	V
V_{IL}[2]	Logic low voltage threshold	V_{CCO}[1] = V_{INT}	-	0.8	V

Notes:

1. Vcco is the supply voltage of the I/O pin output driver. It can be supplied internally (VINT) or externally (VEXT), through the external connector.
2. Refer to Figure 4 for the V_{IH} and V_{IL} threshold voltage when the external supply voltage is selected.

Figure 4: User I/O input threshold voltage vs external supply voltage



4.3 System Characteristics and Performance

Table 4: System characteristics

Description	Min	Typ.	Max	Unit
USB 2.0 interface total throughput	-	-	480 60	Mbps MByte/s
USB 2.0 interface useful throughput for data	-	-	48	MByte/s
User I/O operating frequency	-	-	100	MHz
Internal memory buffer	-	-	32	MByte

4.4 Switching Characteristics

Table 5: Clock frequencies, rise and fall time and skews

Symbol	Description	Conditions	Min	Typ	Max	Unit
SCLK	Output clock frequency		98 kHz	-	100 MHz	
t_{skw}	Skew between SCLK and data lines		-200	0	200	ps
t_{lh}	Output pin rise time	**VCCO = 3.3V**	690	780	1000	ps
		VCCO = 2.5V	650	716	1000	ps
		VCCO = 1.8V	700	785	1000	ps
		VCCO = 1.5V	900	1100	1400	ps
		VCCO = 1.25V	930	1100	1500	ps
t_{hl}	Output pin fall time	**VCCO = 3.3V**	632	800	1000	ps
		VCCO = 2.5V	710	800	1000	ps
		VCCO = 1.8V	671	770	1000	ps
		VCCO = 1.5V	1000	1160	1400	ps
		VCCO = 1.25V	1110	1300	1500	ps