

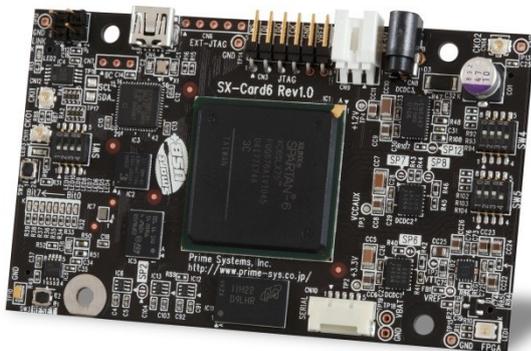
Overview

SX-Card6 is the system development board with a Xilinx Spartan6 FPGA and Pre-installed USB2.0-IF. The main feature is ease of use and high performance. USB2.0 is pre-installed, it is possible to use USB-IF without the knowledge of USB specification.

With increasing complexity of FPGAs year after year, FPGA board design and FPGA logic designs are getting more difficult. [power supply circuits, memory interface circuits etc...]. SX-Card6 reduce the complexity, you use the complicated FPGA system easily.

Reference application software performs FPGA configuration via USB2.0 in a moment. And, control hardware registers and data transferring between a host PC and some SX-Card6 boards.

By using SX-Card6, reduce total cost and turnaround time of system development, expand your system developing.



<SX-Card6 overview>

<Applications...>

◆ Add USB interface to your equipment

SX-Card6 PCB size is the same as a biz card. The size of apparatus is not affected even if it adds SX-Card6 to your equipment.

◆ Evaluation system for ASICs

For ASICs and IPs, SX-Card6 performs data generation and data logging, with real time. By using USB2.0, these functions are performed efficiently.

Feature

✓ Spartan6XL (Xilinx)

- Logic optimized
- 64Mbit configuration ROM available
Use Xilinx platform cable (USB)
- ISE webpack available

✓ USB 2.0 (High Speed) Interface

- Effective data transfer rate 40MB/s (average)
- Device driver and open-source reference application software are available.

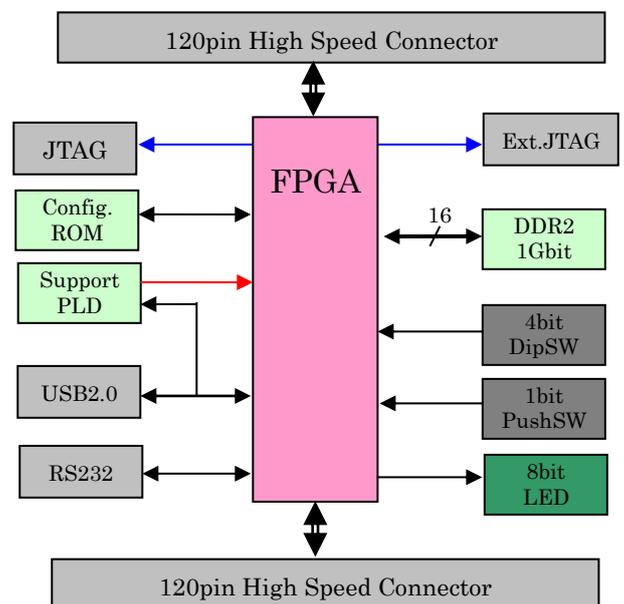
✓ High Speed I/O port

- samtec mezzanine connector 120pin 2pcs.
(P/N : QSH-060-01-L-D-A)
- FPGA usable I/O pin: 100 signals including dedicated clock input and output, each connector.
- By dip-switches setting ,select FPGA I/O bank power supply(1.2V-3.3V)
- All of signal lines are drawn with impedance matching (50ohm).
- LVDS/RSDS signal setting are available. Max.23ch.

✓ Memory bandwidth 1.3GB/s 1Gbit-DDR2

- 8M x 16bit x 8bank DDR2-667
- Memory Controller Block in FPGA is available. MIG generate it automatically.

Hardware spec.



<Block diagram of SX-Card6>

1. FPGA

2 different FPGA type available..

XC6SLX75-3FGG676C : (74.6K LC, 3Mb-MEM, PLL6)
(ISE webpack)

XC6SLX150-3FGG676C : (147.4K LC 、 4.8Mb-MEM 、
PLL6 個)
(ISE tool only)

Spartan6-LX device architecture has efficient 6-input LUTs improve performance. It is same as Virtex5/6 devices. And there is a powerful security for design protection. AES bit stream encryption in the Sparatn6.

2. **USB2.0 Interface**

CY7C68013A-56LFXC : Perform USB2.0 (HighSpeed) function IC (Cypress FX2). This IC interfaces with FPGA via GPIF. GPIF is our original data transferring protocol. We provide some FPGA reference design for SX-Card6 without any charge.

This USB2.0 supports two data transferring protocol as below.

- Control transfer mode
- Bulk transfer mode

The Control transfer is used to access hardware registers in FPGA. The Bulk transfer is used to transfer large size data (MB) between a host PC and the SX-Card6. The actual effective data transferring rate is 40MB/s at Bulk transfer mode.

3. **FPGA Configuration**

USB configuration

Download FPGA bit stream to FPGA via USB in a moment. In general, FPGA bit stream is downloaded by JTAG. It is slow and must use Xilinx specific JTAG download cable. "USB configuration" downloads it to FPGA directory and any time. You don't need any JTAG download cables. The reference application software to control SX-Card6 has useful function to program FPGA. When boot the reference software, FPGA bit stream is downloaded at the same time. It seems the FPGA is like an ASIC.

Config ROM

The USB configuration function needs the reference software to run over host PC. If the software doesn't use, you can use a configuration ROM (64Mbit, M25PX64) to program the FPGA. It is useful to program the final FPGA design and to demonstrate some application without PCs. When you use MicroBlaze CPU in your FPGA design, you can program the instruction data into the config ROM, In the case of programming to the config ROM, must use Xilinx JTAG download cable (e.g.HW-USB-II-G).

4. **Memeory**

MT47H64M16HR-3 : Micron 1GbitDDR2 SDRAM (DDR2-667). 8M x 16bit x 8bank configuration. Use onboard 48MHz Oscillator as DDR2 clock signal. In this case, 648MHz clock signaling is maximum speed. Other clock speed are required, you put specific OSCs on the SX-Card6. OSC: LVDS(EG-2102CA) or CMOS (SG8003CE).

To control DDR2 memory, it is possible to use a MCB (Memory Controller Block) in FPGA I/O bank1. The CORE Generator of ISE tool utility generates the synthesizable IP, automatically.

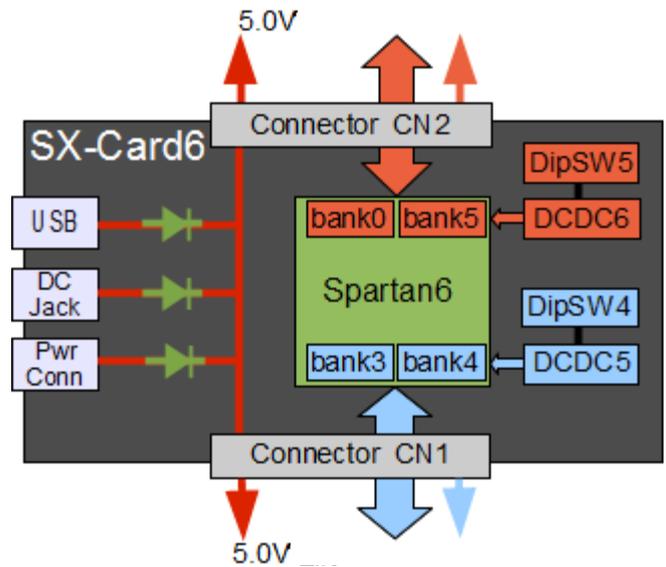
5. **User connector (High speed I/O)**

200 signals I/O pins of FPGA I/O bank 0,3,4,5 are available. User connectors are Smatec mezzanine connector (120pins QSH-060-01-L-D-A). Select I/O bank voltage, 1.2V / 1.5V / 1.8V / 2.5V / 3.0V / 3.3V by using onboard dip-switches.

CN1 user connector have 100pins of I/O bank 3 and 4, CN2 has 100pins of I/O bank 0 and 5. Each connector has dedicated power pins(VCCIO 1A). CN1 : only single end signal available. CN2 : single end signal and differential signal available.

CN1 and CN2 have 5V power pins. You can supply this 5V power (current 1-2A) to external system board. However, this 5V power is dropped to 4.7V.

There are some PLLs in FPGA. Export these PLL output signals via CN1, CN2 and vice versa. By using these sync clockings, synchronized designs are available.



< SX-Card6 I/O connector (power lane) >

6. **Serial port , IIC port**

Serial port is available for FPGA. The connector is HIROSE DF14-5P-1.25H. Use some terminal software to control RS-232C.

USB control IC (FX2) controls IIC port (2.54mm pitch 3pins pin header). The reference application software controls it easily. 8bit normal mode and byte write and byte read mode only.

7. **LEDs , Switches**

8bit green color small factor LEDs are available. There are a 4bit dipswitch and a tact switch(white color). These are used for general purpose. And there is a system reset switch (black color tact sw).

8. External FPGA config port (Ext.Config)

It is not available. Contact: info@prime-sys.co.jp.

9. External JTAG port (Ext.JTAG)

Create a JTAG chain with other JTAG devices. Need to modify soldering pattern on SX-Card6. The connector is a 5pin jumper (2.54mm pitch pin header).

10. Dedicated clock connector

There are 4 mini-BNC connectors on the board. These connect with FPGA dedicated clock 2 input and 2 output pins. It is useful to connect "Signal generator" and external board system.

P/N: 0734120110 (molex)

11. Oscillator

A 48MHz OSC is available. FPGA uses this signal as a GPIF clock.

When another single-end clock freq. is needed, it is possible to mount a SG8002CE series (3.3V, 3.2x2.5(mm)) on a reserved OSC area.

In case of using DDR2 or LVDS/RSDS signaling, it is possible to mount a OSC for differential signaling. (e.g. EG-2102CA 3.3V 7 x 5 mm.)

Power Supply

Power supply condition

+5.0V ±5%

Use power socket(connector), USB cable power or DC jack to supply for SX-Card6. If the supply voltage is over +5.5V, the board will suffer from serious damages.

The specification of USB cable power is +5V/500mA. If the board consumption current is beyond 500mA, you should add an external power supply to DC jack or Power connector.

The plug size of DC jack is φ1.3. An exclusive AC/DC adapter for SX-Card6 has a conversion plug (φ1.3→φ2.1).

The power connector is P/N 53426-0210 Molex. Maximum current is under 3A. The female connector is P/N: 51103-0200 and the terminal is P/N:50351-8000. A female connector and 3 terminals are attached a board.

Actual board current consumption

Condition: USB connection and FPGA blank;
(FPGA: XC6SLX75-3FGG676C) Typ. 220 mA
(FPGA: XC6SLX150-3FGG676C) Typ. 260 mA

Condition : USB connection and FPGA config;
(DDR2 run at 648MHz : slice 1% use , a PLL, memory 39% 48MHz running)
(FPGA: XC6SLX75-3FGG676C) Typ. 640 mA
(FPGA: XC6SLX150-3FGG676C) Typ. 690 mA

➤ inrush current under 300 mA

Software spec.

Overview USB2.0 interface

Effective data transfer rate = 40MByte/s average.

It isn't necessary to develop any USB interface, the USB is pre-installed on SX-Card6. The USB device driver and USB firmware are supplied as binary data. The reference application software to control SX-Card6 is supplied as open source. And some APIs are available for users to customize the application software to control SX-Card6 without knowledge of USB protocol.

Available software...

1. USB target device driver
2. Reference application (open source VC++, VB.net, C++Builder)
3. USB firmware (Programmed an EEPROM on board)

PC hardware requirement

WindowsXPSP1, Vista-32bit / 7-32bit

Windows Vista-64bit版/ 7-64bit

Need USB2.0(High Speed)connectors

Reference application software

It is available to run "RefApp7.exe" Reference application software. This RefApp7.exe controls some hardware registers and onchip memory in FPGA, DDR2 memory access and IIC port. (FPGA can't control the IIC port, directly) The RefApp7.exe include TCL script as special function. It is not necessary to customize RefApp7 by using TCL. Some hardware register settings and memory accesses are automated by TCL script. TCL script is not needed for any exclusive editor and compilers, a text editor is only needed.

Model

Ordering code

SX-Card6/75C3 (XC6SLX75-3FGG676C) Instock

SX-Card6/150C3 (XC6SLX150-3FGG676C) LT: 3W

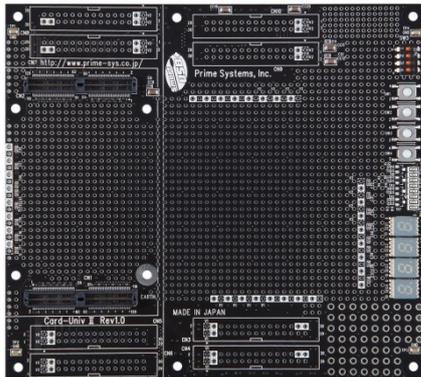
Attached accessory

- ✓ USB cable, power socket (include 3 terminals)
- ✓ DATA-CD-ROM [USB target device driver, board schematic, USB firmware(onboard), Timing chart of USB interface(GPIF), Flowchart of USB data transferring.]

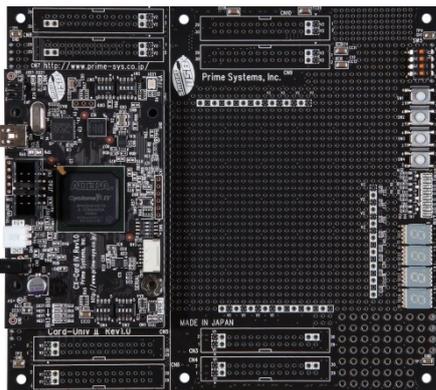
Options

- Exclusive AC/DC adapter (P/N: Card6-AC) 5V/2A (input 100V-240V) Plug size φ1.3 (with plug size conversion)

- Universal board with converting connector pitch
(P/N : Card-UNIV2)
Convert 120pin mezzanine connectors(2pcs) with
30pin connectors(8pcs). 2.54mm, 2.0mm, 3.96mm
pitch universal arias are available. A part of 8pcs
30pin connectors include 8bit-LEDs, 4bit-Dip Switch,
4bit tact-switch, 4 digit 7 segments.



<Card-UNIV2 overview>



<Card-UNIV2+CX-Card4/SX-Card6>

Contact us

Prime Systems Inc.

E-mail: info@prime-sys.co.jp

Official site <http://www.prime-sys.co.jp>

Technical support site <http://www.smartusb.info>

All of our products are made in JAPAN.