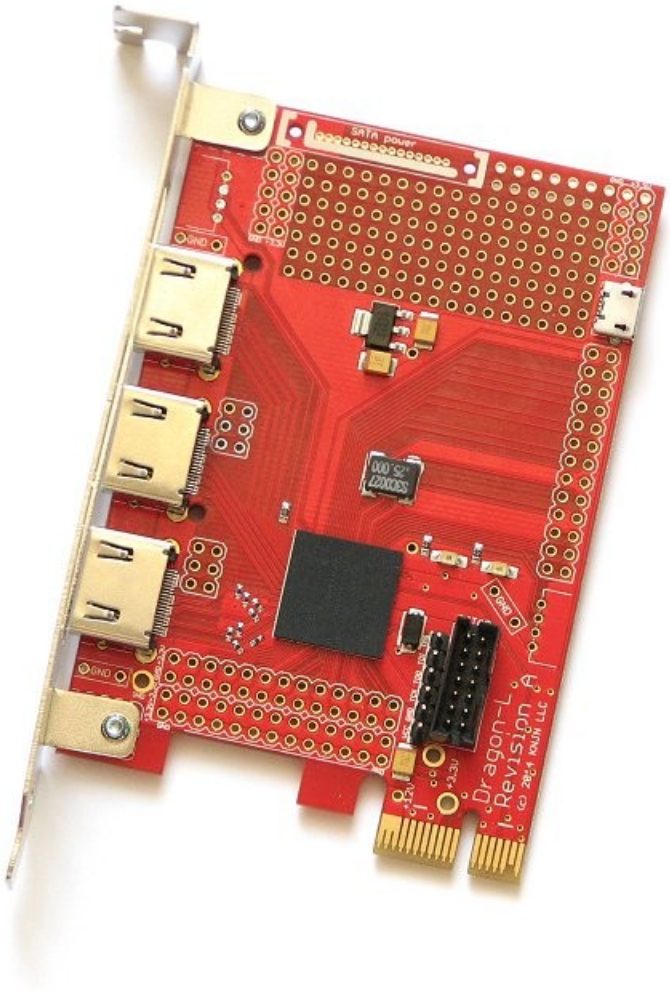
KNJN Dragon-L development board

http://www.knjn.com/

This document applies to the following board.

- Dragon-L (revision A)



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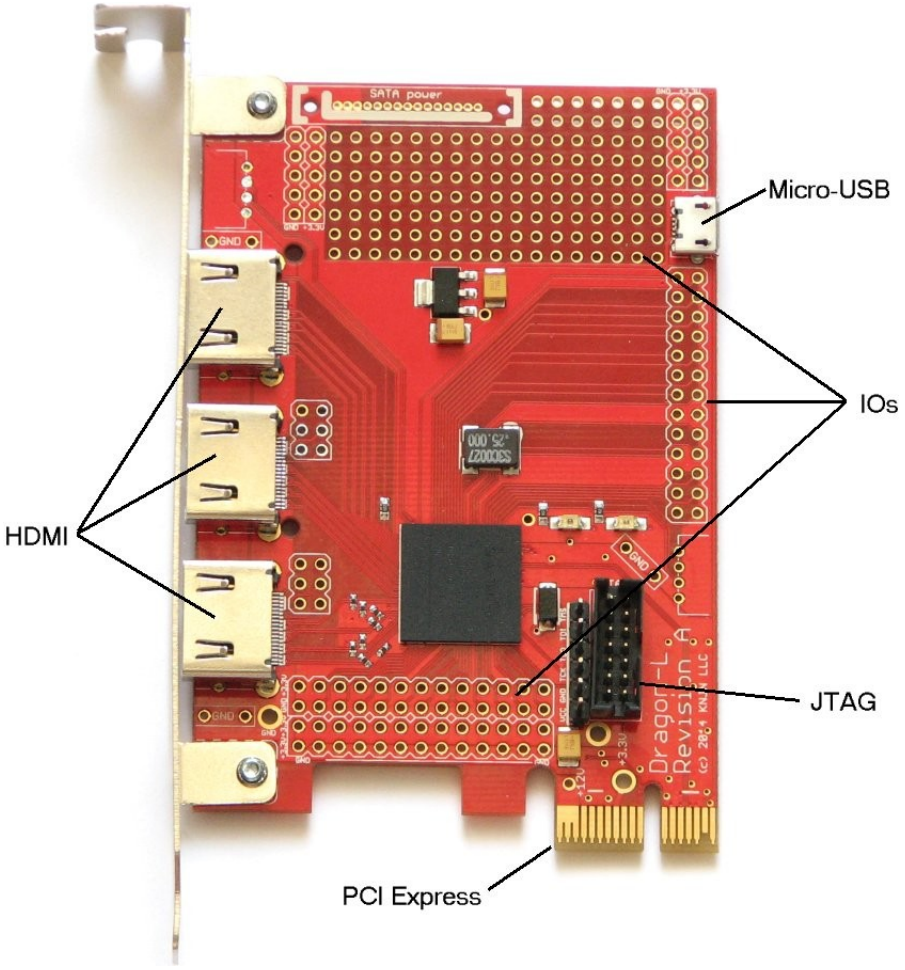
1 Board features

Dragon-L is a simple FPGA board that makes PCI Express and HDMI development very easy.



Dragon-L can be used in PCI Express or standalone mode.

- PCI Express: the board is powered by the PC.
- Standalone: the board is powered using either the Micro-USB or the JTAG port.

Dragon-L features:

- Xilinx XC6SLX25T Spartan-6 FPGA and 8Mb boot-PROM.
- One PCI Express port.
- Three HDMI ports.
- Forty five IOs.
- One Micro-USB port (power only).
- One SATA port (optional, power only).
- JTAG port.
- FlashyD compatible.

Dragon-L requires a JTAG cable for most operations. Check chapter 5 for more details.

2 FPGA project

To create an FPGA project, proceed as follow:

1. Download and install ISE WebPACK on your computer.

2. Start Xilinx's “Project Navigator”.
3. Create a new project. In the New Project Wizard, select the “Spartan6” family, “XC6SLX25T” device in a “CSG324” package with -2 speed. Then finish the wizard.
4. Select the top-level design in your project, right-click on “Generate Programming File” and choose “Properties”. In “Configuration Options”, choose “Unused IOB Pins” and change “Pull Down” to “Pull Up”.

For a graphical walk-through, try also this Xilinx ISE quick-start guide

3 FPGA pins

Pin name	FPGA	Dragon-L	Comments
CLK	Input	K3	25MHz free running clock.
LED1	Output	C1	Active high.
LED2	Output	C2	Active high.
PCI Express			Check the demo project provided with the board.
HDMI			Check the demo project provided with the board.
IOs			Check chapter 7 (Board layout and IO pin assignment).

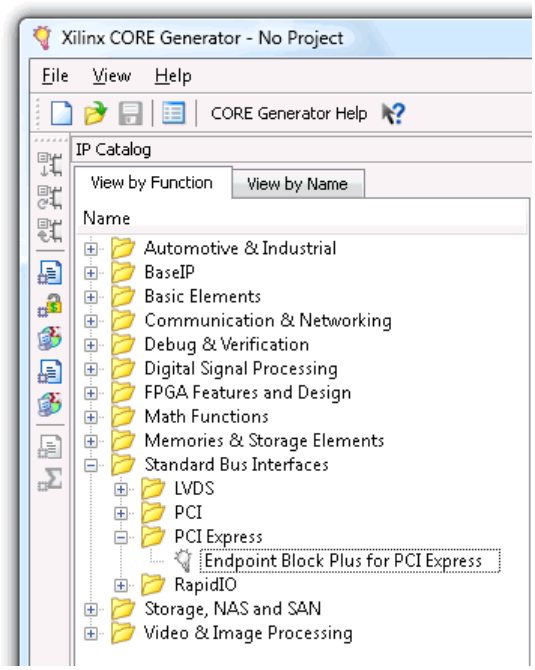
4 PCI Express

Dragon-L comes with all the source code required to begin PCI express development quickly, including PC software/driver and FPGA code.

4.1 FPGA PCI Express

The transaction layer FPGA source code implements reads and writes. It interfaces with Xilinx “Endpoint Block Plus for PCI Express” wizard.

Make sure ISE WebPACK is installed on your computer.



4.2 Application level PC software

The C++ source code shows how to open the PCI driver and issue reads and writes.

Use the latest Visual studio for Windows Desktop to compile the source code.

4.3 Driver level PC software

The driver source code shows how to create a basic PCI driver with read and write memory accesses.

We provide x86 and x64 unsigned driver binaries, or you can use the Windows Driver Kit to compile the driver source code (we used 6.1.6001.18002.081017-1400_wdksp-WDK18002SP_EN_DVD.iso)

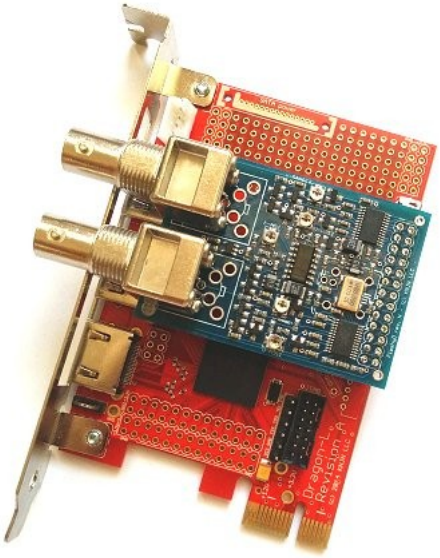
4.4 Development cycle

To try a PCI Express file, program the Dragon-L boot-PROM with the FPGA bitfile you want to try. Then insert the board into the PCI Express slot of a PC (or reboot the PC if the board is already plugged-in) and the boot-PROM is loaded automatically in the FPGA when the PC boots.

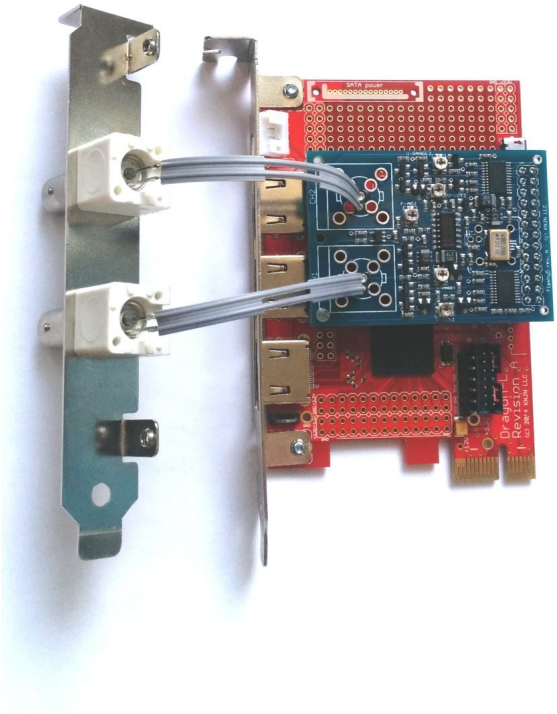
Dragon-L can be plugged in the PC used to compile the code so you can use a single PC for development.

5 FlashyD

Dragon-L accepts FlashyD boards to create a PCI Express acquisition system.



An optional bracket kit is available that fits standard PC cases.



6 JTAG

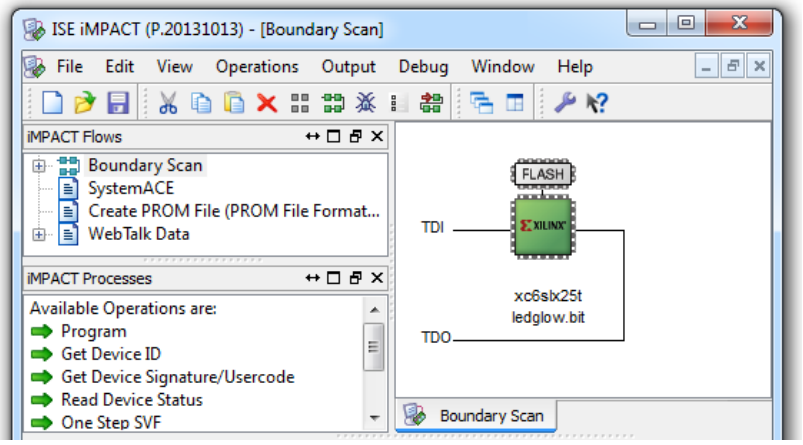
Dragon-L supports the Xilinx Platform Cable USB II and KNJN USB JTAG cables. In general, the KNJN USB JTAG cable is more convenient than the Xilinx cable, but for advanced JTAG operations, the Xilinx cable is required.

Here's a summary of each cable capabilities.

	Xilinx cable	KNJN cable
FPGA configuration	Yes	Yes
Boot-PROM programming	Yes	Yes
Can use with Xilinx iMPACT	Yes	No
Can use with Xilinx Chipscope	Yes	No
Can use with KNJN FPGAconf	No	Yes
Powers Dragon-L	No	Yes

6.1 Xilinx Platform Cable USB II

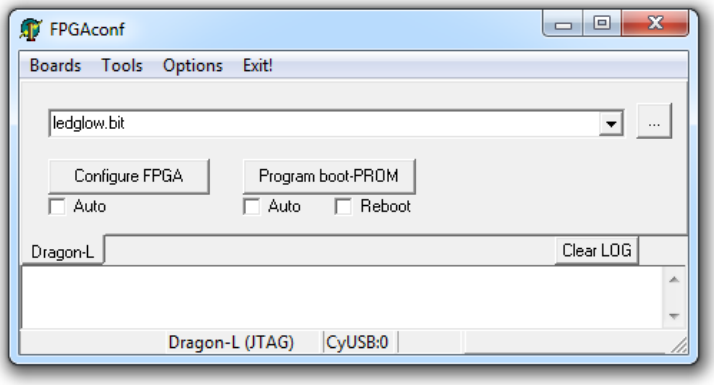
The Xilinx cable runs with iMPACT and Chipscope analyzer.



1. Plug-in the cable into a USB port. The cable should be detected automatically (the USB driver is part of ISE installation).
2. Connect the cable to Dragon-L and run iMPACT. Choose to detect automatically the JTAG chain.
3. To configure the FPGA, select a bitfile and double-click on “Program”.
4. To program the boot-PROM, it is a bit complicated but here's a quick rundown of the main steps. First double-click on “Create PROM File” and follow the wizard to create an MCS file. Then select the MCS file in the Boundary scan window. Double-click on “Program” and choose M25P80 as SPI PROM type.

6.2 KNJN USB JTAG cable

The KNJN cable runs with the FPGAconf software, which is convenient for FPGA configuration and boot-PROM programming.



1. Plug-in the KNJN USB JTAG cable into a USB port. Windows fails to recognize the cable by default so go to the Device manager, and install the driver from there.
2. Run FPGAconf. Make sure the Menu → Boards → Dragon-L is selected.
3. Choose a bitfile and click either “Configure FPGA” or “Program boot-PROM”.

7 Board layout and IO pin assignment