

On-chip, Real-time Logic Analysis

with ChipScope ILA

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The need for thorough de-bugging capabilities in today's multi-million gate FPGA designs is critical, and verifying logic externally, by probing package pins or board traces, is becoming increasingly difficult. To solve this problem, Xilinx has created a solution called ChipScope ILA™ that integrates the verification capability into the silicon itself. The new ChipScope Software, combined with the Integrated Logic Analysis (ILA) and the Integrated Control (ICON) cores, allows you to have real-time, full speed access to any node or bus in the chip, with an easy-to-use GUI interface. With these powerful tools, you will spend less time verifying chip functionality and shorten your time-to-market for Virtex, Virtex-E, and Spartan-II FPGA designs.

Xilinx Partners with Agilent Technologies

Xilinx developed ChipScope ILA with Agilent Technologies, the industry leader in Logic Analysis. Output from the ChipScope ILA tool is compatible with the Agilent 16700 series logic

analyzers, as well as other industry standards. Using the Agilent analyzers along with ChipScope ILA output gives you the possibility of expanding analysis to the board and system level.

The Advantages of Programmability in Logic Analysis

Programmable logic provides many unique advantages for on-chip logic analysis compared to fixed logic (ASIC) solutions. Since ChipScope ILA cores compiled into a device can be removed after analysis is complete, customers save silicon overhead by not having to permanently lodge test structures on their die. In addition, the cores can be modified and re-placed on the device depending on the signals chosen for analysis. Only a programmable solution allows the user to change the physical silicon. In an ASIC, if similar cores were included and a subsequent change was required, a new mask set, additional NRE, prototype leadtime and engineering time would be required. For ASIC proto-

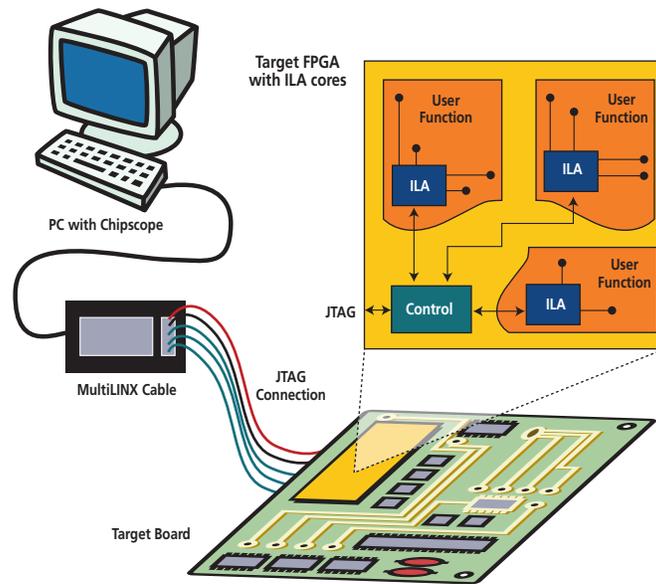


Figure 1 - Integrated Logic Analyzer (ILA) block diagram.

typing, ChipScope ILA provides a highly accurate analysis vehicle that can speed up ASIC development time. For programmable systems, it is truly an innovative method to speed up verification and get to market quickly.

How it Works

ChipScope ILA cores are generated through the Web, and the ChipScope software can be quickly downloaded to your PC. Once the ILA and ICON cores are integrated into your FPGA design, the ChipScope software leads you through the process of downloading control information to the FPGA, modifying trigger and set-up functions, and displaying the captured waveforms. The

Integrated Logic Analyzer core (ILA) provides the triggering and trace capturing functions, and the Integrated Control core (ICON) communicates to the dedicated FPGA JTAG pins. A MultiLinx cable provides a USB/RS232 interface for communication between the FPGA and the ChipScope software. This is illustrated in Figure 1.

The process works as follows, and is illustrated in Figure 2:

1. The ILA and ICON cores are generated through the Web using a Java application.
2. You insert the cores into your HDL code and connect them to the internal busses and signals that you want to monitor.

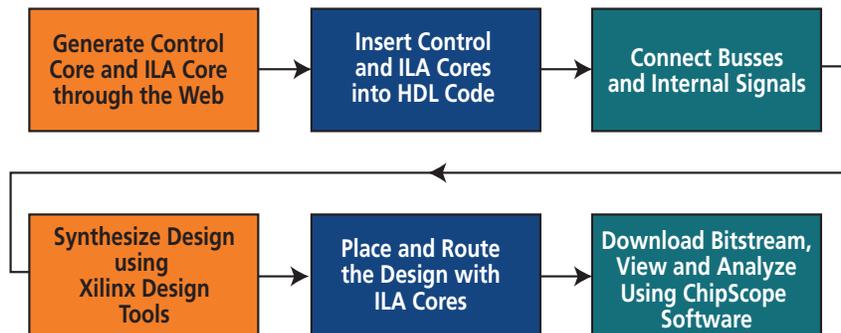


Figure 2 - ChipScope ILA flow.

Co-Developed with Agilent Technologies

The ChipScope software and ILA core were developed in partnership with Agilent Technologies, today's market leaders in logic analysis, and the FBDF format output from ChipScope is compatible with the Agilent Technology 16700 series analyzer. Visit Agilent at www.agilent.com

3. You synthesize your design, and place and route it using either the Xilinx Foundation Series or Alliance Series tools.
4. You download the final bitstream to the FPGA.
5. Your design can then be analyzed through the ChipScope software.

Features

The ChipScope ILA tools are powerful and accurate, and they provide everything you need to thoroughly verify your logic and make your job easier, including:

- User selectable data channels (from 1 to 256 channels) - Accurately captures wide data bus functionality.
- User selectable sample size (from 256 to 4096 samples) - The large sample size increases accuracy and the probability of capturing infrequent events.
- Separate bus trigger (with user selectable width of 1 to 64 bits) - Separate trigger bus reduces the need for sample storage.
- All data and trigger operations are synchronous to your clock (up to 155 MHz) - Capable of high speed data capture.
- Triggers are in-system changeable without affecting your logic - No need to signal step or stop your design for logic analysis.
- Writes waveforms to VCD and FBDF format - Compatible with Agilent Technologies and other waveform viewers.
- Easy to use graphical interface - Makes learning the software very easy; it guides you

through selecting the correct options.

- Up to 15 independent ILA capture cores per device - Can segment logic and test smaller sections of a large design for greater accuracy.
- Multiple trigger settings - Records duration and number of events along with matches and ranges for greater accuracy and flexibility.
- Downloadable from the Xilinx website - Software and cores easily accessed and downloadable through the Xilinx Xpresso Cafe e-commerce site.

And More to Come

In the following months, additional verification tools will be available for use within the ChipScope suite. The Internal Performance Analyzer (IPA) core will allow you to log and capture events, and the Integrated Self-Test module (IST) will provide self test capability at the device level. In addition to being available through the Xilinx Xpresso Cafe e-commerce site, the tools will be integrated into the Xilinx 3.1i series software tools.

Conclusion

On-chip, full speed, full-featured logic analysis is now a reality. With ChipScope ILA, your designs will be up and running faster than ever and with less effort. For more information see www.xilinx.com or purchase the tools from the Xilinx e-commerce site at www.xilinx.com. ❧