Virtex-II Platform FPGA Solution Launches New Era of High Performance System Design

The result of the largest silicon and software R&D effort in the history of programmable logic, the Virtex-II Platform FPGA solution has produced major improvements in engineering productivity, silicon efficiency, and system flexibility.

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The Xilinx Platform FPGA Initiative has brought a new level of meaning to the concept of the integrated circuit. Components that used to clutter up a printed circuit board have migrated directly onto Virtex-II devices themselves – providing superior system integration previously unavailable for programmable devices.

As the first embodiment of the Xilinx Platform FGPA Initiative, the Virtex®-II Platform FPGA solution ensures success in today's market of complex systems by enabling rapid time-to-market and providing many of the features necessary to support today's complex systems in a single device. Consider:

• XCITE (Xilinx Controlled Impedance TEchnology) breakthroughs have brought DCI (Digitally Controlled Impedance) onboard the FPGA platform. External resistors are no longer needed to preserve signal integrity on single-ended I/Os.

- Up to 12 sophisticated, on-chip DCMs (Digital Clock Managers) provide phase shifting, clock de-skewing, and frequency synthesis functions.

- Virtex-II Platform FPGAs provides up to 16 pre-engineered, glitch-free, global clock multiplexers.

- Flexible SelectI/O™ Ultra technology supports 840 Mb/s I/Os with as many as 1,108 user I/O pins (554 differential I/O pairs).

- State-of-the-art SystemIO™ capability supports interfaces for RapidIO™, PCI-X, OIF SPI-4 (POS-PHY L3/L4, Flexbus 4), and HyperTransport (formerly known as LDT – Lightning Data Transport) standards.

- Proprietary IP designs are protected from piracy and reverse engineering by on-chip Triple DES (Data Encrypted Standard) bitstream encryption.

- High logic capacity Virtex-II devices provide up to 10 million system gates.

- Platform FPGAs support up to 4.5 Mb of memory.

- QDR/DDR (Quad Data Rate/ Double Data Rate) registers deliver more than 400 Mb/s performance.

- Active Interconnect™ routing technology optimizes throughput over fast, wide buses.

- A single Virtex-II device provides as many as 192 multipliers capable of up to 250 MHz of pipelined performance.

- Virtex-II Platform FPGAs carry out more than 600 billion multiply-and-accumulate operations per second for XtremeDSP™ performance.
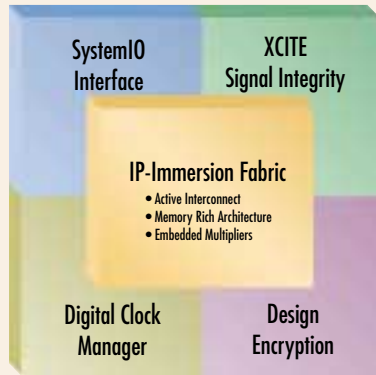
Figure 1 - Virtex-II Platform FPGA Solution

IP-Immersion Architecture

Virtex-II IP-Immersion™ architecture is specially designed to aid the seamless integration of a wide variety of new hard-

In addition, the inherent flexibility of Xilinx FPGA devices allows unlimited design changes throughout the development and production phases of system design. This reduces design cycles from years to months. As shown in Figure 1, the Platform FPGA is a combined suite of advanced design tools and intellectual properties (IPs) that provide the ultimate system design platform for today's cutting-edge applications.

macro building blocks, including enhanced configurable logic blocks (CLBs), memories, and multipliers. The IP-Immersion architecture also enables easy future integration of hard-macro blocks that are now in development, such as the IBM PowerPC™ processor and high-speed serial I/Os. These new hard macros dramatically increase the data processing and transmission capabilities available in a single-chip solution. Figure 2 shows a typical Virtex-II silicon block diagram.

XCITE DCI

Xilinx is the first in the semiconductor industry to provide on-chip digitally controlled impedance (DCI). As shown in Figure 3, the DCI capability of the Virtex-II FPGA enables designers to improve signal integrity, while dramatically reducing the number of external resistors needed for impedance-matching components on print-

Figure 2 - A typical Virtex-II silicon block diagram

ed circuit boards. Thus, Virtex-II FPGAs with DCI technology reduce overall system costs and board layout complexity. Furthermore, XCITE increases overall system reliability and assists designers in meeting their time-to-market goals.

Active Interconnect Technology

With up to 10 million system gates, the highest capacity in the industry, the Virtex-II architecture with Active Interconnect technology enables designers to achieve optimized, predictable routing delays in their designs, thus maximizing front-end design performance. On-chip support for high-speed I/O standards with up to 1,108 user I/O pins is included. Advanced DSP applications, such as echo cancellation, forward error-correction, and image compression/decompression, all benefit from the abundance of embedded high-speed 18-bit x 18-bit multipliers within the Virtex-II Platform FPGAs. The Virtex-II solution enables rapid development of the two most technically challenging system applications: data communications and digital signal processing. These system applications are characterized by the need for high logic integration, fast and complex routing of wide buses, extensive pipeline, and requirements for FIFO memory.

Software Design Tools

The Virtex-II solution is empowered by a suite of sophisticated design tools that support the industry's fastest run times and most advanced design methodologies. This combination delivers unequalled productivity and the fastest possible time-to-market of any logic solution available today. The Xilinx innovative, incremental design flow facilitates efficient "what if" analyses, accelerates timing closure, and increases system performance. High-level floorplanning and modular design make it easy to

realize the promise of true team design.

The Xilinx System Generator, together with The MathWorks' MATLAB™ and Simulink™ modeling programs, provides a powerful design package using tools already familiar to system and DSP designers. These software tools and the library of Xilinx Smart-IP™ cores, which are pre-optimized for Xilinx devices, enable
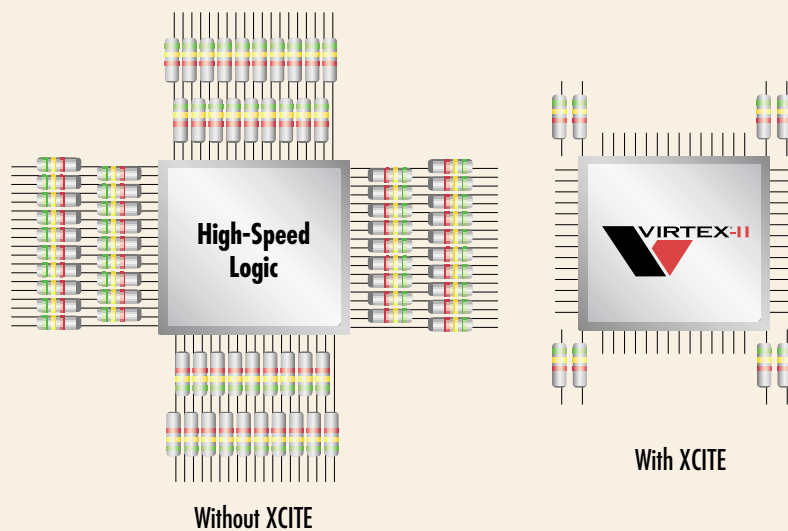

Figure 3 - Virtex-II XCITE capability

designers to increase overall design productivity and reduce time to market. Engineering productivity is also enhanced by the Xilinx IP delivery process. Everything from IP building blocks to sophisticated IP cores for design reuse is at the designer's command with Xilinx CORE Generator™ software. Up-to-the-minute new IP cores and IP updates are available from the Xilinx IP Center at www.xilinx.com/ipcenter/.

Verification Solution

One of today's biggest challenges is the verification bottleneck. Platform FPGA programmability makes many time-consuming verification tasks, such as chip-level signal integrity analysis and scan insertion, unnecessary. Xilinx design tools allow efficient use of desktop and in-lab verification times. With complete support for all verification checkpoints – including RTL (Register Transfer Level) simulation,

accelerated timing simulation, and even powerful static timing analysis – Xilinx design tools ensure that designers and engineers make the most of their time.

Board-level verification is supported through STAMP (Static Timing Analysis Modeling Procedure) and LMG (Logic Modeling Group) smart models. The Xilinx ChipScope ILA (Integrated Logic Analyzer) is a revolutionary tool for real-time, on-chip debugging. Logic analysis cores can be inserted into the actual design, and the real-time behavior of any signal can be displayed, analyzed, and even exported for board-level analysis, using industry leading logic analyzers. Results are extremely accurate. ChipScope ILA easily handles wide buses, complex triggering, and multiple clocks, which cuts debugging time from weeks to just a few hours. ChipScope ILA is integrated with industry leaders' tools, including Agilent Technologies' 16700 Series logic analyzers and Synplicity's Certify tools.

From Platform to Launchpad

A new era in system platform design has begun. The Virtex-II Platform FPGA fully integrates soft- and hard-IP cores by partnering with the world's leading technology companies. By introducing the powerhouse Virtex-II solution, Xilinx has set the industry's highest possible benchmark in performance and flexibility. Together, the unique features of the revolutionary Virtex-II Platform FPGA solution provide the ultimate launchpad for system connectivity, DSP, and processing applications. With the rich system feature set, designers can develop new architectures with Virtex-II Platform FPGAs at the heart of their designs for tomorrow's optical networking, SANs (Storage Area Networks), VoIP (Voice-over-Internet-Protocol), video, and wireless applications.