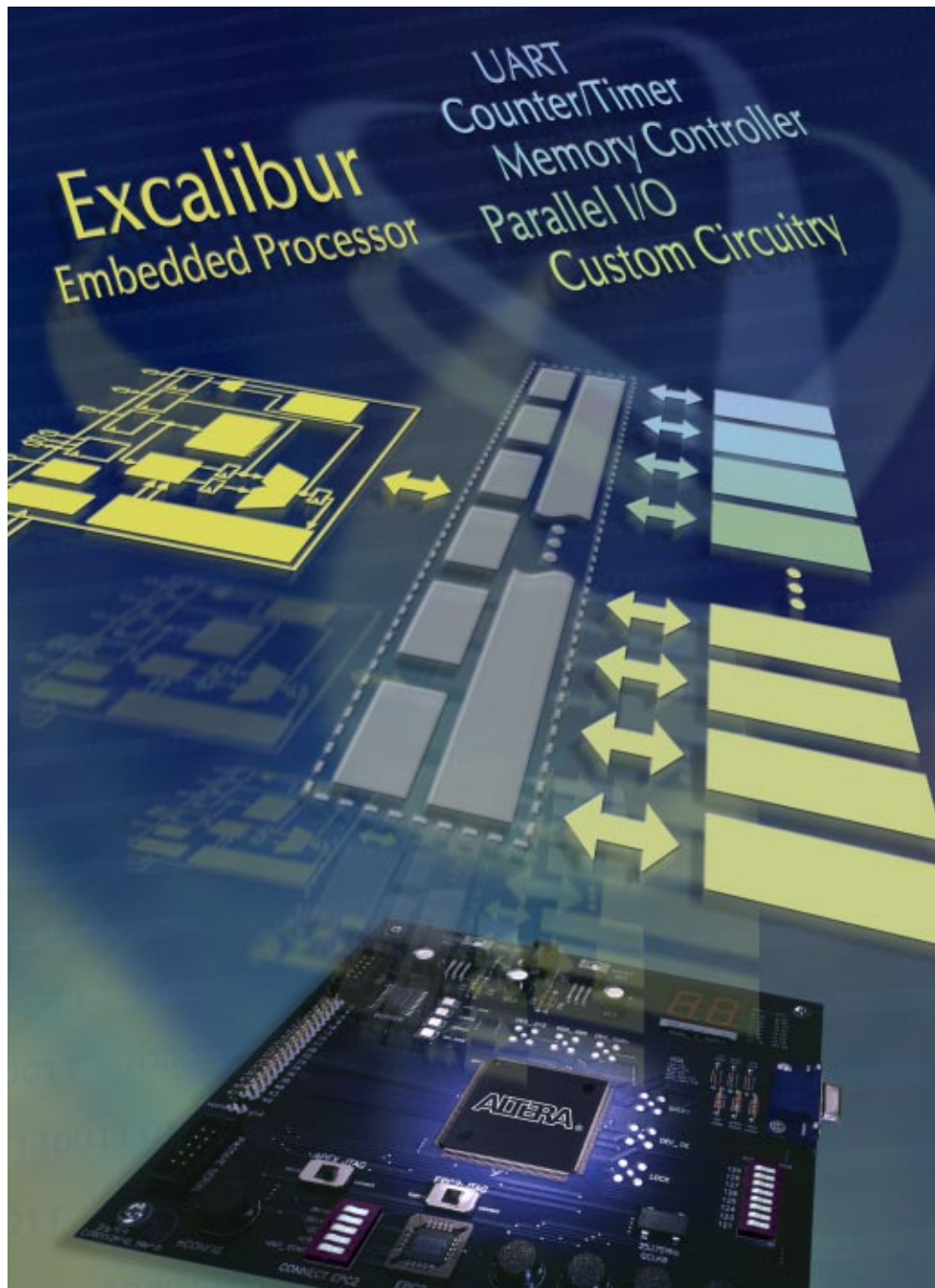




Excalibur

Embedded Processor Programmable Solutions



July 2000

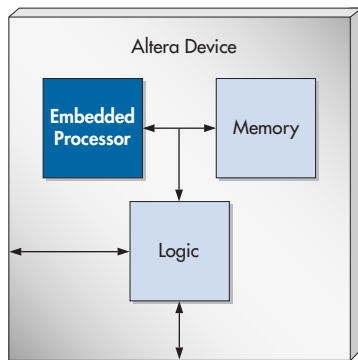
Embedded Processor on a Programmable Chip



EXCALIBUR™

Altera's new Excalibur™ embedded processor solutions give you the tools you need to integrate an entire system on a single programmable logic device (PLD). The Excalibur solutions combine programmable logic, memory, and a processor core to cut through the complexities of processor integration, offering the ease-of-use, fast development time, and low NRE costs needed for embedded systems development.

Excalibur Embedded Processor Solutions

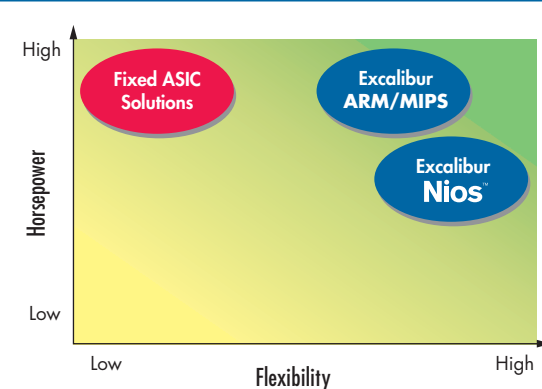


Altera's Excalibur solutions unite the traditional PLD benefit of programmable flexibility with the unique and new benefits associated with open access to processor core technology. The Excalibur solutions bring faster time-to-market, programmable flexibility, and low-risk technology to ASIC users, and low-cost, royalty-free access to advanced processor technology to the broad marketplace. Altera offers this new system-on-a-programmable-chip (SOPC) technology to designers of all applications who require a fast and flexible development platform for system integration.

The Flexibility of PLDs with the Horsepower of Embedded Processors

The Excalibur solutions give you programmable flexibility with single-chip integration for your embedded processor solution. They provide you with a choice of flexible and industry-leading RISC processors, programmable logic, and memory on a single PLD to speed your development and time-to-market.

Excalibur Solutions Offer Flexibility & Horsepower



Excalibur advanced features include:

- High-performance, RISC embedded processor architecture with speeds at 166 MIPS and beyond
- Support for a wide range of end applications
- Integrated hardware and software workflow supported by Altera's Quartus™ design tools, industry-standard EDA tools, and C/C++ code compilers
- Pre-licensed, off-the-shelf devices with no royalties
- Optimized integration with Altera® PLD architectures

The Excalibur embedded processor solutions will expand as Altera introduces more advanced embedded processors with higher performance, including 64-bit architectures.

The Excalibur solutions consist of three embedded processor families:

Nios

Altera's Nios™ soft core embedded processor is the industry's first RISC embedded processor developed for programmable logic.

ARM

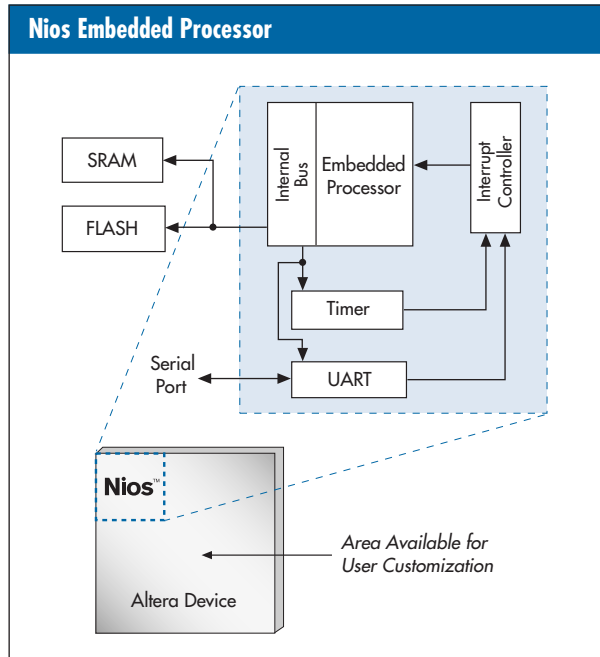
The ARM®-based embedded processor PLD family uses technology licensed from ARM Limited, and will consist of multiple devices that each contain an ARM-based RISC processor core.

MIPS

The MIPS-based™ embedded processor PLD family uses technology licensed from MIPS Technologies, Inc., and will consist of multiple devices that each contain a MIPS-based RISC processor core.

Nios Embedded Processor Family

Nios™ The Nios embedded processor, developed by Altera, can be easily implemented in Altera's PLDs with a complete tool set that simplifies your design process and improves your time-to-market. A configurable RISC soft core processor with a 16-bit instruction set and user-selectable 16- or 32-bit data path, the Nios embedded processor is the first RISC processor soft core to be developed specifically for programmable logic.



Altera provides software development support for the Nios embedded processor through its partnership with Red Hat®, Inc. These embedded processor development tools, created by Cygnus® Software, a division of Red Hat, include the GNUPro® compiler, assembler, and debugger optimized for the Nios instruction set. With the Nios processor and software support, you can obtain up to 50-MIPS performance with volume costs of five dollars, while supporting a wide range of applications previously targeted for stand-alone embedded processors and microcontrollers.

Flexible

With the Nios embedded processor, you can optimize the processor, adding the peripheral functions that suit your specific design requirements. In fact, you can easily change your design in-system, facilitating in-field upgrades. Several peripherals are available or in development for the Nios embedded processor, including

timer/counters, UART, PIO, SPI, PWM, 10/100 Ethernet MAC, and SDRAM controller. In addition, any of the intellectual property (IP) cores offered by Altera and its IP partners can be used as custom peripherals. Users can develop their own custom peripherals to perform any desired digital logic function, making the Nios embedded processor ideal for a wide range of processor applications in the 8-bit, 16-bit and lower end of the 32-bit range.

Low Cost

The Nios embedded processor occupies only 12% of a 200,000-gate EP20K200E, a device which costs about eighty dollars in prototyping quantities, yielding a processor cost of ten dollars. In high-volume production quantities, the cost of an EP20K200E device can be as low as forty dollars, resulting in a processor cost of only five dollars.

Scalable

Several Nios embedded processors can fit onto one Altera PLD, giving you more design horsepower for your most demanding applications. This parallel-processing capability is especially useful in networking, where multiple Nios embedded processors act as a specialized network processor.

The possibilities for the Nios embedded processor are broad. With the addition of items like FIR filters and FFTs, complete DSP systems can be developed. Designers can create industrial or automotive controllers by combining the Nios embedded processor with time processing units. When connected to media access controllers, error correction, or packet processing modules, complete network processing systems can be created. Also, the device utilization efficiency of the Nios embedded processor means that multiple cores can be used in performance-intensive applications that require multiprocessing.

ARM- and MIPS-Based Embedded Processor Families



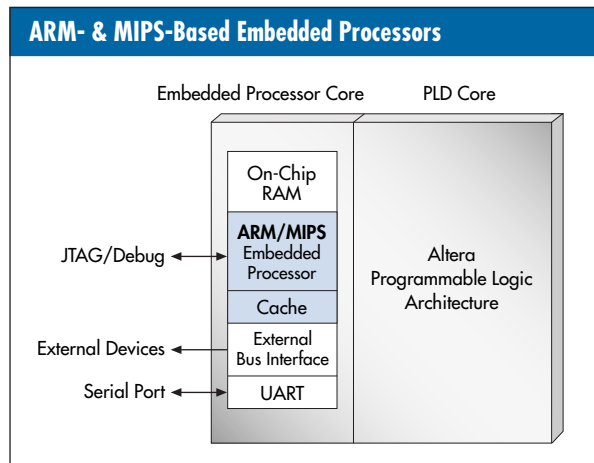
Altera is providing cost-effective access to advanced processor technologies to the broad marketplace through partnerships

with ARM Limited and MIPS Technologies, Inc. These feature hard core implementations of ARM and MIPS processors optimized for and integrated with Altera programmable logic architectures.

As a result, they can deliver processor performance in the range of hundreds of MIPS, complementing the range of applications covered by the Nios embedded processor. They are also fully

covered by the Nios embedded processor. They are also fully compatible with all third-party development and debugging tools that support ARM-based and MIPS-based processors.

In addition to the embedded processor core itself, the devices also include optimized implementations of on-chip



RAM, cache, an external bus interface, and a UART. With these on-chip elements in place, these devices can run software and interface with external components prior to configuration of the programmable logic core. This feature shortens design cycles because software can be written for these devices before developing the programmable logic portion of the design.

The ARM- and MIPS-based embedded processors offer:

Performance

With speeds at 166 MIPS and beyond, the ARM- and MIPS-based embedded processors offer unparalleled performance on a programmable chip.

Accessibility

The ARM- and MIPS-based PLDs offer off-the-shelf availability with no minimum order requirements. There's no need to pay royalties or negotiate a complicated licensing contract.

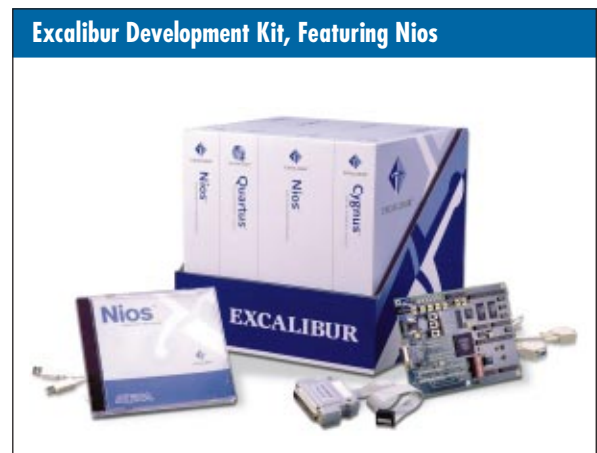
Device Options

Multiple device options with varying amounts of memory and logic provide the choices you need to maximize the efficiency of your designs.

Excalibur Development Kits

The Excalibur Development Kits are complete packages that provide all the necessary software, hardware, and documentation you need for system development. From the processor core and Quartus software, to the development board, reference design, and industry-standard C/C++ compilers, the kits contain everything you need to complete your system design. All you need to add is electricity.

For more information on the Excalibur Development Kits, contact your local Altera representative.



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