New! Spartan-II FPGA Family

The Programmable ASSP

The Spartan-II family, combined with a vast portfolio of soft IP, is the first programmable logic solution to effectively penetrate the ASSP marketplace.

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Spartan-II FPGAs offer more than 100,000 system gates at under $10.00 and are the most cost-effective PLD solution ever offered. They build on the capabilities of the very successful Virtex™ FPGA family and include all of the Virtex features, including SelectI/O™, BlockRAM™, Distributed RAM, and DLLs, with clock speeds up to 200 MHz.

PLDs Penetrating the ASSP Market

In the past, programmable logic devices had limited success in penetrating the ASSP market because they could not compete in the key areas of density, features, performance, and cost. However, the Spartan family competes very well due to the use of advanced process technologies. This approach has allowed Xilinx to significantly reduce die sizes, and therefore reduce the cost of the overall solution. This rapid process transition allows the Spartan family to compete with ASICs and ASSPs, and has opened up many new markets for PLDs.

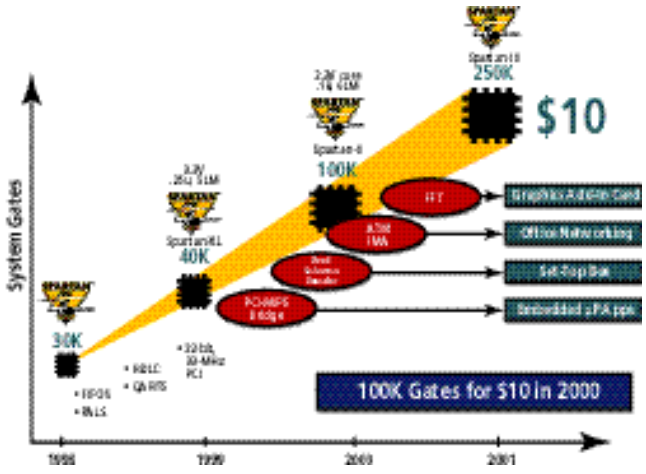


Figure 1 - PLD evolution - addressing the ASSP marketplace.

Advantages of a Programmable ASSP

A programmable ASSP like the Spartan-II family offers significant advantages over a stand-alone ASSP. The advantages are broadly classified under the following areas:

- The value of programmable ASSPs.
- Accommodating specification changes.
- Testing and verification.
- Xilinx Online™ - field upgradability.
- Problems in creating a stand-alone ASSP.

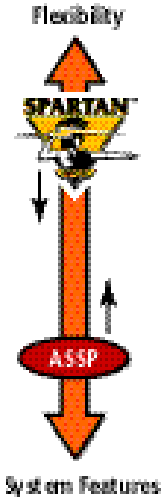
The Value of Programmable ASSPs

ASSPs, designed for a wide array of applications, are rarely able to meet your exact needs. With a programmable ASSP solution, such as Spartan-II FPGAs, you can choose the optimum feature set and optimize your design to achieve best possible results—this gives you a better design and saves money.

The PCI case study shown in Figure 3 is a good example. This Spartan-XL PCI solution was able to effectively cut the total product cost in half and also allow room to accommodate the extra logic that you may want to add to the backend PCI interface, such as a DMA controller, SDRAM controller, or FIFO.

Accommodating Specification Changes

ASSP vendors are motivated to quickly create solutions for emerging markets because of the high profit



- Spartan FPGAs migrate to higher densities to handle system features
  - –Maintaining low cost
- ASSPs attempt to offer flexibiity
  - –Differentiation need due to market pressures
  - –Available ASSPs require programmable logic
  - –Changing system standards
- ASSPs have large role in consumer, networking & data-processing
  - –Where Spartan FPGAs are successful
- PCI is the first successful ASSP competition

Figure 2 - Spartan-II family penetrates ASSP markets.

margins they stand to gain. However, the standards change constantly in these markets, often making ASSPs a risky choice. These conditions create many opportunities for the Spartan-II family, because with a Spartan device, you can upgrade your design to accommodate evolving specifications even after your systems are deployed in the field.

Testing and Verification

Another problem users encounter with stand-alone ASSPs is that the devices do not always behave as expected. Identifying problems is a lot easier with pro-

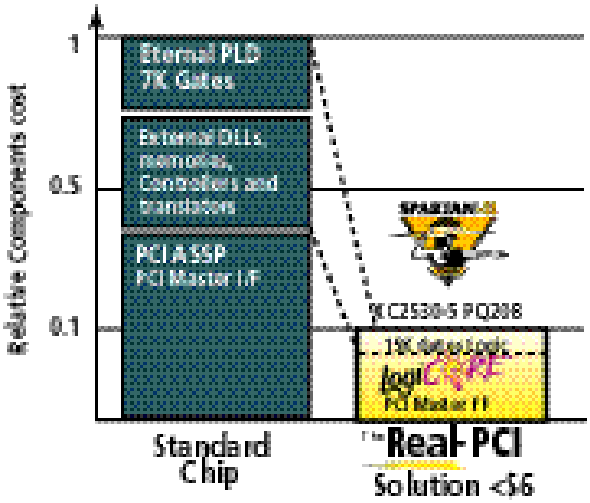


Figure 3 - Xilinx PCI solution vs. stand-alone ASSP.

grammable ASSPs, such as the Spartan-II FPGAs, because they are built on the fabric of a proven FPGA technology and the silicon has been pre-verified and guaranteed to perform. Because a programmable ASSP is inherently re-programmable, fixing any problem is simple. This is a tremendous value-added feature that a stand-alone ASSP cannot offer.

Xilinx Online for Field Upgradability

The Xilinx Online capability allows you to add new hardware features and fix bugs, over a network, without sending a technician to the field; this can add up to considerable maintenance and support savings over the entire life of the system. The value of field upgradability is illustrated in Figure 4.

Problems in Creating a Stand-alone ASSP

Vendors who create stand-alone ASSP devices must over-design their products to meet the requirements of a wide range of customers. A list of the various hurdles that an ASSP vendor faces today are:

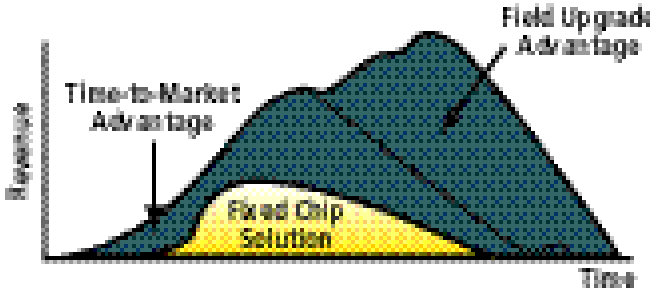


Figure 4 - Field upgradability extends the value of programmable ASSPs.

- **Choosing the Right ASSP** - The ASSP vendor must choose the right market segment.
- **Product Customization** - ASSP vendors face the challenge of creating one solution that must successfully meet the demands of a wide range of customers.
- **Development Cost and Amortization** - Stand-alone ASSPs have high NRE and engineering costs. These costs are increasing with process technology migration.

The Spartan-II family is unaffected by these hurdles and offers a cost-effective programmable ASSP solution.

Spartan-II ASSP Replacement Value

The Spartan-II family replaces and or competes against three classes of ASSPs, broadly classified as:

- Feature-Replacement ASSPs
- Logic-Replacement ASSPs
- Value-Added ASSPs

Feature-replacement ASSPs

Examples of "Feature-replacement ASSPs" are shown in Table 1. All of these functions are available in a Spartan-II FPGA without using any of the PLD's logic resources. Plus, the price of some of the Spartan-II devices is about the same as that of the ASSP they replace.

Feature Replacement ASSPs	Price
32-bit SSTL-3 Transceivers with Tristate Outputs	$ 4.00
32-bit to 64-bit HSTL-to-LVTTL Memory Address Latch	$ 6.00
32-bit LVTTL to GTL/GTL+ Transceivers with Live Insertion	$ 6.00
High Speed CMOS Digital PLLs	$ 1.00
High Speed Programmable Board Skew Clock Buffer	$ 7.50
2K x 8 Dual-Port Static RAM	$ 2.00
64,256,512,1K,2K,4K x 18 Synchronous FIFOs	$ 7.00
Hot Swap Controller	$ 2.00
Note:Pricing shown is approximate and for volumes of 100,000 units	

Table 1 - A list of potential feature replacement ASSPs replaced by the Spartan-II Family.

Logic-replacement ASSPs

Logic-replacement ASSPs are those that can be replaced by using the logic resources of a Spartan-II chip in combination with various IP cores. Examples of potential logic-replacement ASSPs are shown in Table 2.

Value-added ASSPs

Value-Added ASSPs fall into either of two categories:

- ASSPs that take unique advantage of the Xilinx architecture, like the ATM IMA devices from Applied Telecom. The class of field-upgradable ASSPs and network processors also fall into this category.
- ASSPs that serve emerging markets and markets that do not exist today, such as a PCI-X Master/Target Controller.

The Spartan-II family services all three classifications of ASSPs very well. Examples of Value Added ASSPs are shown in Table 3.

Logic Replacement ASSPs	Price
64-bit,66-MHz PCI v2.2 Bus Master	$ 25.00
32-bit,33-MHz CompactPCI(r) Bus Master Hot Swap Friendly PCI interface chip	$ 15.00
32-bit,33-MHz Bus Target chip	$ 12.00
32-bit,33-MHz PCI Master/Slave Controller	$ 14.00
32-bit,33-MHz PCI Target Controller	$ 12.00
STS-12C/STS-3C POS/ATM SONET Mapper	$ 120.00
PCI System Controller for 64-bit MIPS CPUs w/ Integrated SDRAM controller	$ 12.00
Advanced PCI System Controller for 64-bit MIPS CPUs	$ 40.00
Secondary Cache Controller for the R4600/R4700	$ 15.00
Low-Cost 8-Port 10/100 Fast Ethernet Switch Controller	$ 28.00
High Speed Microcontrollers are direct performance upgrades for the 8051	$ 8.00
256-Channel HDLC Controller	$ 60.00
Multi-Channel HDLC Controller with 32-bit, 66-MHz PCI Controller	$ 120.00
Block Floating Point 16 x 16 Complex Floating Point Multiplier	$ 300.00
Programmable FIR Filter	$ 310.00
Standalone FFT Processor	$ 450.00
Integrated Digital Switch	$ 12.00
HDLC Protocol Controller	$ 4.50
Multi Channel ATM AAL1 SAR	$ 90.00
Dual ADPCM Transcoder	$ 4.00
Integrated PCM Filter CODEC	$ 4.00
Viterbi with Reed-Solomon Decoder	$ 25.00
Reed-Solomon Forward Error Correction	$ 20.00
ALDC Data Compression	$ 12.00
DCLZ Compression	$ 22.00
ISDN Terminal Adapter with HDLC Controller	$ 10.00
Multichannel Network Interface Controller for HDLC	$ 60.00
Fast Ethernet (100 Mbps) Media Access Controllers (MAC)	$ 20.00
Note:Pricing shown is approximate and for volumes of 100,000 units	

Table 2 - A List of potential logic-replacement ASSPs supported by the Spartan-II family.

Value Added ASSPs	Price
64-bit,66-MHz PCI-X System Controller	NA
Quad ATM IMA Chip	$ 30.00
Octal ATM IMA Chip	$ 50.00
ARC Processor	NA
Note:Pricing shown is approximate and for volumes of 100,000 units	

Table 3 - A list of potential value added ASSPs supported by the Spartan-II Family.

Conclusion

The new Spartan-II FPGA family, due to its advanced features and low cost, is uniquely capable of replacing many standard ASSP devices. And though it may not replace all ASSPs, the Spartan family is now being used in many new high-volume, low-cost applications that were once dominated by stand-alone ASSPs.