The Challenge:
Driving Down Size and Cost while Increasing Performance and Monitoring

• System requirements necessitate higher performance for any-to-any connectivity and sensor fusion
• Systems are required to meet smaller power budgets with less power support circuitry
• Form factor is continuing to shrink in order to meet more challenging mechanical requirements
• The onset of ubiquitous network connectivity demands increased security and monitoring

The Solution:
Spartan-7 FPGAs

• Industry-leading performance-per-watt at the lowest cost; half the power of previous devices with 30% more performance
• 200DMIPS of processing power, plus drag n’ drop peripherals with MicroBlaze soft processor
• Cost efficient connectivity solution for both legacy and cutting-edge interfaces
• RoHS 6/6 compliant packaging options as small as 8mm
• Comprehensive device security and environmental monitoring
• Scalable across the industries broadest All Programmable Cost-Optimized Portfolio
• Q temperature grade (−40°C to +125°C) on all commercial devices

Unmatched Performance and Power Efficiency at the Lowest Cost

If your power or performance requirements are just as challenging as your cost, look to Spartan®-7 FPGAs. Manufactured with TSMC’s 28nm HPL process, this family brings together the extensive capabilities of the Xilinx 7 series FPGA architecture with small form factor and RoHS-compliant packaging for the most optimized connectivity solution in the 7 series portfolio. The efficient 7 series CLB architecture, enhanced DSP, and block RAM enable a roughly 50% power reduction vs. previous Spartan families, while at the same time deliver a 30% performance improvement. The MicroBlaze™ 32-bit RISC processor delivers 200DMIPS of processing power on a Spartan-7 device. Spartan-7 devices enable key connectivity and processing applications in industrial, automotive, infotainment, consumer, and communications markets, among others.

Industry-leading Tool and IP Support with the Vivado Design Suite

Get a jump-start generating correct-by-construction block-level design by leveraging the vast catalog of over 200 available 7 series IP solutions in the Vivado® Design Suite IP Integrator. For fast deployment of the MicroBlaze processor, presets are available for Microcontroller, Real-Time Processor, and Application Processor use cases. Start with a preset, then further customize specific processor features to meet the specific needs of your application. Then expand your MicroBlaze processor system using drag n’ drop IP from a catalog of driver-enabled peripherals such as PWMs, UARTs, serial interfaces, etc. Achieve timing closure faster and attain up to 20% higher utilization using the Vivado Design Suite’s expert place and route technology. Verify your design with less hassle using the mixed-language simulator with no code line limits, at no extra cost. The MicroBlaze processor, drag n’ drop peripherals, Vivado(R) HLx Design Suite WebPACK™ edition, and Eclipse-based Software Development Kit are all available at no cost from Xilinx, allowing you to use the fastest and lowest-cost design tools for these devices.

Part of the Broader All Programmable Cost-Optimized Portfolio

The Spartan-7 family complements Artix®-7 FPGAs and Zynq®-7000 All Programmable SoCs to introduce a new, lower-cost entry point into the Xilinx 7 series portfolio, delivering the best value for its target applications.
Key Capabilities Overview

Half the Power with Increased Performance
- Half the total power of the previous Spartan family
- Sub-watt performance ranging from 6K – 102K logic cells
- Lowest-power industrial speed grade offering (-1LI)
- 30% faster logic performance than the previous generation Spartan family
- A smart mix of logic resources with capacity of up to 102K logic cells for high-performance systems
- Enhanced DSP block provides up to 176GMACs at 551MHz
- 200DMIPs MicroBlaze processor in Microcontroller, Real Time Processor, or Application Processor configuration
- Wide temperature grade offering allows –40°C to +125°C on commercial devices

Any-to-Any Connectivity
- Support for major single-ended and differential I/O standards
- Connect faster with 1.25Gb/s differential I/O, and up to 240Gb/s max aggregate bandwidth
- 800Mb/s DDR3 line rates and 25.6Gb/s peak bandwidth per memory controller
- Connect at lower cost and with ultimate flexibility using the optimized, soft memory controller
- Simplify high-bandwidth interfaces with multi-voltage, multi-standard high-performance SelectIO™ interface banks with 3.3V capability

Lowest Cost
- 28nm HPL process from TSMC with cost-optimized packaging and dedicated IP blocks like the XADC integrated dual analog-to-digital converters, and voltage/thermal monitoring to help reduce overall BOM cost

Innovative Packaging
- At 8mm, industry's smallest form factor package for a 28nm FPGA
- Lowest cost packaging with simple breakout
- RoHS 6/6 Compliant

Security and Monitoring
- Device DNA serial number and eFUSE identifier
- AES256 CBC Mode bitstream decryption & SHA-256 bitstream symmetric authentication
- Tamper monitoring and responses
- Integrated supply voltage and thermal monitoring

Industry's Best Tool Flow
- Faster timing closure and up to 20% higher utilization using the Vivado Design Suites' expert place and route technology
- Bare metal, freeRTOS, and Linux support for MicroBlaze processor with drag n' drop peripherals
- 200+ available IP solutions in Vivado IP Integrator for correct-by-construction block-level design
- Easier verification with Vivado's mixed-language simulator at no extra cost and with no code line limits
- Spartan-7 production devices supported by the free Vivado HL WebPACK Edition. Download at www.xilinx.com/vivado
<table>
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<tr>
<th>Features Overview</th>
<th>Details</th>
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<tr>
<td>28nm TSMC HPL Process Technology</td>
<td>• Scalable 7 series CLB architecture&lt;br&gt;• Flexible LUTs are configurable as logic, distributed RAM, or shift registers&lt;br&gt;• From 6K – 102K logic cells for system-level integration</td>
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<td>Low Cost by Design</td>
<td>• Multiple efficient integrated blocks for BOM cost reduction, including XADC dual 12-bit analog-to-digital converters with supply voltage and thermal monitoring&lt;br&gt;• Optimized selection of I/O standards</td>
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<td>Embedded Processing</td>
<td>• 200+ DMIPs MicroBlaze processor in Microcontroller, Real Time Processor, or Application Processor configuration</td>
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<td>Integrated Memory Block Capacity up to 4.2Mb</td>
<td>• Efficient and high-performance block RAM with byte write enables and optional FIFO configuration&lt;br&gt;• 36K blocks can be split into two independent 18K block RAMs</td>
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<td>Soft Memory Controller</td>
<td>• DDR3/DDR2/LPDDR2 support&lt;br&gt;• Data rates up to 800Mb/s (25.6Gb/s peak bandwidth)&lt;br&gt;• Ultimate pinout flexibility&lt;br&gt;• Software wizard to guide through the entire process</td>
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<tr>
<td>SelectIO Interface Technology</td>
<td>• Up to 1.25Gb/s LVDS data rate, with up to 240Gb/s aggregate bandwidth&lt;br&gt;• 3.3V to 1.2V I/O standards and protocols&lt;br&gt;• HSTL and SSTL memory interfaces&lt;br&gt;• Adjustable slew rates for added signal integrity</td>
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<tr>
<td>Efficient DSP48E1 Slices</td>
<td>• Each slice contains a fast 18x25 wide multiplier with 48-bit accumulator and 25-bit pre-add&lt;br&gt;• Capable of up to 176GMACs at 551MHz&lt;br&gt;• Pipelining, balancing, cascading, SIMD support, integrated pattern detect, and ALU</td>
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<tr>
<td>Extensive Design Security</td>
<td>• Device DNA serial number and eFUSE identifier&lt;br&gt;• AES256 decryption and SHA-256 authentication for bitstream&lt;br&gt;• Tamper monitoring and response</td>
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<tr>
<td>Small, RoHS 6/6 Compliant Packaging</td>
<td>• 8mm – 27mm package footprints at 0.5mm – 1mm pitch&lt;br&gt;• Extensive footprint-compatible package migration</td>
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