

Spartan-7 FPGAs



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

I/O OPTIMIZATION WITH THE HIGHEST PERFORMANCE-PER-WATT

Unmatched Performance and Power Efficiency at the Lowest Cost

If your power or performance budgets are just as challenging as your cost budget, 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 Broadest 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 fabric 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

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
- Baremetal, 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

FEATURES OVERVIEW
28nm TSMC HPL Process Technology

Delivering best-in-class performance-per-watt

- Scalable 7 series CLB architecture
- Flexible LUTs are configurable as logic, distributed RAM, or shift registers
- From 6K – 102K logic cells for system-level integration

Low Cost by Design

Cost-optimized, 7 series-based architecture

- Multiple efficient integrated blocks for BOM cost reduction, including XADC dual 12-bit analog-to-digital converters with supply voltage and thermal monitoring
- Optimized selection of I/O standards

Embedded Processing

Faster embedded processing with MicroBlaze soft processor

- 200+ DMIPs MicroBlaze processor in Microcontroller, Real Time Processor, or Application Processor configuration

Integrated Memory Block Capacity up to 4.2Mb

Block RAM with tremendous flexibility

- Efficient and high-performance block RAM with byte write enables and optional FIFO configuration
- 36K blocks can be split into two independent 18K block RAMs

Soft Memory Controller

Efficient soft memory controller for the ultimate flexibility

- DDR3/DDR2/LPDDR2 support
- Data rates up to 800Mb/s (25.6Gb/s peak bandwidth)
- Ultimate pinout flexibility
- Software wizard to guide through the entire process

SelectIO Interface Technology

Multi-voltage, multi-standard SelectIO interface banks

- Up to 1.25Gb/s LVDS data rate, with up to 240Gb/s aggregate bandwidth
- 3.3V to 1.2V I/O standards and protocols
- HSTL and SSTL memory interfaces
- Adjustable slew rates for added signal integrity

Efficient DSP48E1 Slices

Drive high-performance arithmetic and signal processing

- Each slice contains a fast 18x25 wide multiplier with 48-bit accumulator and 25-bit pre-add
- Capable of up to 176GMACs at 551MHz
- Pipelining, balancing, cascading, SIMD support, integrated pattern detect and ALU

Extensive Design Security

Reduce system cost, increase reliability, and safeguard your design

- Device DNA serial number and eFUSE identifier
- AES256 decryption and SHA-256 authentication for bitstream
- Tamper monitoring and response

Small, RoHS 6/6 Compliant Packaging

Flexible and cost-optimized for challenging mechanical requirements

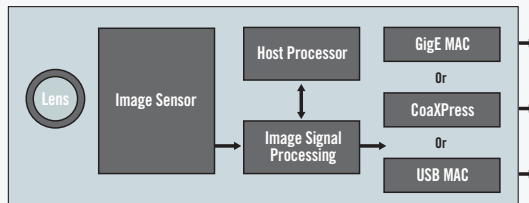
- 8mm – 27mm package footprints at 0.5mm – 1mm pitch
- Extensive footprint-compatible package migration

Enabling Next-Generation Systems

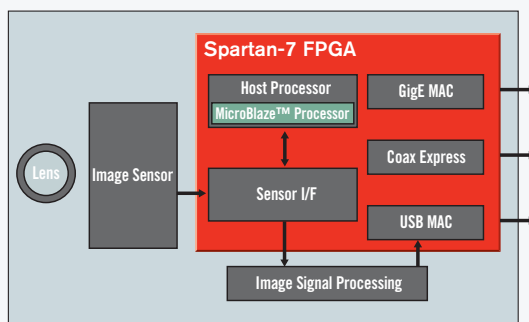
Machine Vision Interfacing

Key Spartan-7 FPGA Benefits

Existing Infrastructure



Spartan-7 FPGA Solution



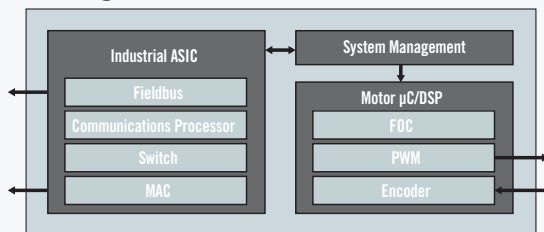
Solution Benefits
System Integration Multi-chip ⇒ 2 chips
BOM Cost Reduction 30% lower
Total Power Savings >50% lower

- Flexibility to support multiple sensors and connectivity options
- Programmable system integration
- MicroBlaze soft processor for host processor

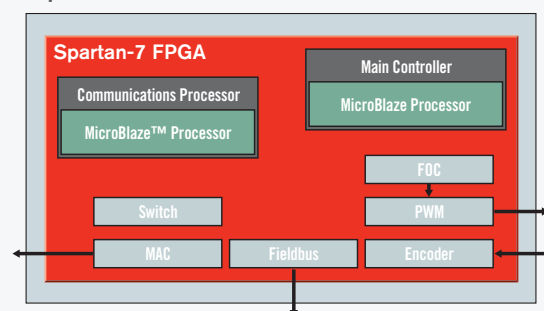
Single-Axis Motor Control

Key Spartan-7 FPGA Benefits

Existing Infrastructure



Spartan-7 FPGA Solution



Solution Benefits
System Integration Multi-chip ⇒ 1 chip
Performance Advantage 20X faster
BOM Cost Reduction 10-25% lower
Total Power Savings 20% lower

- Flexibility to support multiple communication standards
- Single-chip design for higher reliability
- MicroBlaze soft processors for system control and communications
- Full suite of production ready peripherals and IP for faster design productivity

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