Spartan-3 Generation FPGAs

Lowest Total Cost...Period.

The World’s Most Widely Adopted Low-Cost FPGAs
ONE GENERATION –
MULTIPLE DOMAIN

All the Choice You Need to Solve Any Design Challenge

With the introduction of the Spartan™-3AN and Spartan-3A DSP platforms, the Spartan-3 Generation of FPGAs now offers a choice of five platforms, each delivering a unique cost-optimized balance of programmable logic, connectivity, and dedicated hard IP for your low-cost applications.

Mainstream FPGAs

Multiple platforms — Each optimized to a specific application domain for lowest system cost

- **Spartan-3A platform** — For applications where I/O count and capabilities matter more than logic density
  - Ideal for bridging, differential signaling and memory interfacing applications
- **Spartan-3E platform** — For applications where logic densities matter more than I/O count
  - Ideal for logic integration, DSP co-processing and embedded control
- **Spartan-3 platform** — For applications where both high logic density and high I/O count are important
  - Ideal for highly integrated data-processing applications

Mainstream

- Broad range of densities, general functionality and targeted specific application solutions
- Lower total system cost while increasing functionality

DSP

- Integrated DSP MACs and expanded memory
- Optimized for signal processing applications

Non-Volatile

- Combines leading-edge technology FPGAs & Flash technologies
- New evolution in security, protection and functionality
Digital Signal Processing FPGAs

**Breakthrough Price for High Performance DSP**

- **Spartan-3A DSP Platform** — For applications where integrated DSP MACs and expanded memory are required
- Supports high-density designs with up to 53K logic cells and robust on-chip memory
- Over 20 GMACS DSP performance for under $30 utilizing cost-optimized integrated DSP48A slices
- Ideal for designs requiring low-cost FPGAs for signal processing applications such as military radio, surveillance cameras, medical imaging, etc.
- Significant gains in application efficiency using highly parallel architectures

Non-Volatile FPGAs

**Non-Volatile Secure FPGAs for Highest System Integration**

- **Spartan-3AN Platform** — For applications where non-volatile system integration, security or large user Flash is required
- Breakthrough marriage of uncompromised SRAM FPGA and Flash technologies
- Outperforms non-volatile FPGAs with unparalleled Flash reliability combined with performance and features previously available only in SRAM FPGAs
- Industry-leading security helps prevent reverse engineering, cloning, and unauthorized overbuilding
- Superior system flexibility with up to 11 Mb of on-chip user Flash

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**Algorithmic Complexity** – As demand for processing power rapidly increases, sequential processing cannot support algorithmic complexities within required response times. To overcome these architectural limitations, the parallel processing offered by Virtex™ DSP and Spartan™ DSP FPGAs is essential.
THE LOWEST TOTAL-COST.

Up to 50% Lower Total Cost
Lowest cost devices for your application

• Industry’s largest selection of low-cost devices and packages
• Allows an optimal match for any customer requirement
• Small form-factor packages for extremely cost-sensitive consumer applications

Reduced Bill of Materials cost

• High on-chip integration reduces number of external components including voltage regulators, buffers, and line drivers
• More tolerant Vcc specification allows use of inexpensive voltage regulators
• Noise-resistant circuits eliminate or minimize need for expensive filtering components such as ferrite beads and decoupling capacitors

Cost-effective engineering design

• Fewer components simplify and shrink board designs
• Comprehensive IP library (8X bigger than nearest competitor), extensive portfolio of boards/kits and software tools significantly reduce time-to-market

Lower Inventory and manufacturing costs

• Fewer components minimize ordering, reduce material holding cost, and simplify logistics
• Use of standard components allow reuse of excess inventory

Improved quality and reliability

• Decreased PCB complexity with fewer components, lower layer count and increased signal integrity
• Reduced device count significantly decreases failures from misalignment and cold solder joint failures, etc.
**Lower Power, Lower Cost**

**On-chip power management**
- No complex design requirements
- Fewer external components such as heat sinks, fans, etc.
- Suspend Mode lowers static power by more than 40%
- Hibernate Mode offers maximum power savings by lowering static power by up to 99%

**Industry-leading power management tools**
- ISE™ 10.1 delivers automatic dynamic power reduction
- XPower analyzer tools with full environment, voltage, and worst-case evaluation

**Robust, Low-cost Design Security**

**Helps prevent unauthorized manufacturing**
- Protects revenues from cloning, overbuilding and reverse-engineering
- Design security to safeguard both hardware and software IP
- Cost-based flexible security solutions based on unique requirements
- Unique Device DNA serial number
- Customizable algorithms for security as well as responses to failures
# The Right Fit for the Right Application

The comprehensive portfolio of Spartan platforms allows customers to choose the best solution for their unique design requirements.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Spartan-3</th>
<th>Spartan-3E</th>
<th>Spartan-3A</th>
<th>Spartan-3AN</th>
<th>Spartan-3A DSP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost Optimization</strong></td>
<td>High logic density and I/O count</td>
<td>Logic density</td>
<td>I/O count &amp; Capabilities</td>
<td>Non-volatile Capabilities</td>
<td>DSP Capabilities</td>
</tr>
<tr>
<td><strong>Ideal Applications</strong></td>
<td>High logic and I/O densities– highly integrated data-processing</td>
<td>Lowest-cost density– logic integration, DSP co-processing, embedded control</td>
<td>Wide or multiple interfaces– bridging, differential signaling, memory interfaces</td>
<td>Space-critical or secure applications as well as low cost embedded controllers</td>
<td>Signal Processing applications such as military radio, cameras, medical imaging, etc.</td>
</tr>
<tr>
<td><strong>Logic Cells</strong></td>
<td>1,728 to 74,880</td>
<td>2,160 to 33,192</td>
<td>1,584 to 25,344</td>
<td>1,584 to 25,344</td>
<td>37,440 to 53,712</td>
</tr>
<tr>
<td><strong>I/Os</strong></td>
<td>63 to 633</td>
<td>66 to 376</td>
<td>108 to 502</td>
<td>108 to 502</td>
<td>309 to 519</td>
</tr>
<tr>
<td><strong>User Flash</strong></td>
<td>—</td>
<td>—</td>
<td>Internal with Device DNA</td>
<td>Internal with on-chip configuration, Device DNA, and Factory Flash ID</td>
<td>Internal with Device DNA</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>External with secure PROM</td>
<td>External with secure PROM</td>
<td>Internal with Device DNA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Power Management</strong></td>
<td>• XPower Analyzer and Web Power Tools</td>
<td>• XPower Estimator and XPower Analyzer Tools</td>
<td>• Suspend–more than 40% reduction</td>
<td>• Suspend–more than 40% reduction</td>
<td>• Suspend–more than 40% reduction</td>
</tr>
<tr>
<td></td>
<td>• Supports 24 differential and single-ended I/O standards</td>
<td>• Supports 18 differential and single-ended I/O standards</td>
<td>• Hibernate–up to 99% reduction</td>
<td>• Hibernate–up to 99% reduction</td>
<td>• Hibernate–up to 99% reduction</td>
</tr>
<tr>
<td></td>
<td>• Up to 24mA drive</td>
<td>• Enhanced differential signaling with on-chip termination</td>
<td>• XPower Estimator and XPower Analyzer Tools</td>
<td>• XPower Estimator and XPower Analyzer Tools</td>
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</tr>
<tr>
<td></td>
<td>• DDR and DDR2 memory interfaces</td>
<td>• Up to 16mA drive</td>
<td>• Full 3.3V and hot swap compliance</td>
<td>• Full 3.3V and hot swap compliance</td>
<td>—</td>
</tr>
<tr>
<td><strong>SelectIO™ Technology</strong></td>
<td>• Supports 26 differential and single-ended I/O standards</td>
<td>• Supports 26 differential and single-ended I/O standards</td>
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<tr>
<td></td>
<td>• Enhanced differential signaling with on-chip termination</td>
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</tr>
<tr>
<td></td>
<td>• TMDS, PPDS, RSDS, LVDS, DDR, DDR2 and SSTL3 class I &amp; II</td>
<td>• TMDS, PPDS, RSDS, LVDS, DDR, DDR2 and SSTL3 class I &amp; II</td>
<td>• Platform Flash, with easy in-system reprogrammability, and compression</td>
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<td>—</td>
</tr>
<tr>
<td></td>
<td>• Up to 24mA drive</td>
<td>• Full 3.3V and hot swap compliance</td>
<td>• JTAG and ISE™ tool support</td>
<td>• JTAG and ISE™ tool support</td>
<td>—</td>
</tr>
<tr>
<td><strong>DSP Resources</strong></td>
<td>• Embedded 18 x 18 multipliers</td>
<td>• Pipelined, embedded 18 x 18 multipliers</td>
<td>• Platform Flash, with full support</td>
<td>• Platform Flash, with full support</td>
<td>• Integrated XtremeDSP™</td>
</tr>
<tr>
<td></td>
<td>• 18 Kbit dual-port RAM</td>
<td>• 18 Kbit dual-port RAM</td>
<td>• Parallel Flash with MultiBoot</td>
<td>• Parallel Flash with MultiBoot</td>
<td>• DSP48A provides an 18-bit x 18-bit multiplier, 18-bit pre-adder, 48-bit post-adder/accumulator</td>
</tr>
<tr>
<td></td>
<td>• Distributed RAM and shift registers</td>
<td>• Distributed RAM and shift registers</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>—</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
</tr>
<tr>
<td></td>
<td>• Parallel Flash with MultiBoot</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
</tr>
<tr>
<td></td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
</tr>
<tr>
<td></td>
<td>• JTAG and ISE tool support</td>
<td>• JTAG and ISE tool support</td>
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<td>• JTAG and ISE tool support</td>
</tr>
<tr>
<td></td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>• Platform Flash with full support</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>• Parallel Flash with MultiBoot plus watchdog</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>• SPI Flash</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>• JTAG and ISE tool support</td>
<td>• JTAG and ISE tool support</td>
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<td>• JTAG and ISE tool support</td>
<td>—</td>
</tr>
</tbody>
</table>
FAST, FLEXIBLE
SYSTEM

Implement Customizable Low-Cost Solutions with Pre-Engineered IP

Optimized silicon and application-specific IP enables optimized solutions with popular low-cost interface standards.

**PCI Express®**
- Fully-compliant to PCIe® Specification v1.1
- Starter Kit for PCI Express including development board
- LogiCORE™ PIPE Endpoint for PCI Express
- Reference Design with third-party PHY
- Bundled solution pricing

**PCI™ 33 and 66MHz, fully PCI 3.0-compliant**
- PCI32 and PCI64 LogiCORE IP cores
- Customizable back-end functionality

**Ethernet**
- Designed to the IEEE 802.3-2002 specification for 1000 Mbps, 100 Mbps, and 10 Mbps modes
- Customizable LogiCORE Tri-Mode Ethernet MAC
- Integrates with the Ethernet 1000BASE-X PCS/PMA or SGMII LogiCORE for implementation of Ethernet Link and Physical layers
- Trimode Ethernet MAC and Ethernet Lite Peripherals for Embedded Processing Applications

**DSP**
- FEC blocks including Viterbi, Reed Solomon, Convolution Encoder and standard specific IP blocks such as WIMAX, W-CDMA, DOCSIS
- Video Codecs: MPEG4, H.264, etc.

**Embedded Processing**
- Customizable 32-bit MicroBlaze™ soft processor with complete set of Peripheral IP cores
- Platform Studio tool suite simplifies embedded processing system design
- Comprehensive embedded software tools & RTOS ecosystem providers
- Small footprint PicoBlaze for 8-bit controller for assembly programmed applications

**SPI-4.2, functionally compliant with OIF and SATURN® specifications**
- SPI4.2(PL4) Lite LogiCORE delivers Sink and Source cores selected and configured through Xilinx CORE Generator™

**CAN, designed to ISO 11898-1, CAN2.0A and CAN2.0B specifications**
- User-configurable CAN LogiCORE IP
- Stand-alone mode or connected to Xilinx MicroBlaze processor

**Memory Interfaces**
Dynamic Input Delay Technology and the Memory Interface Generator tool make it easy to build reliable interfaces to the latest low-cost memories, including DDR2 and DDR

<table>
<thead>
<tr>
<th>Memory Device</th>
<th>Electrical Interface</th>
<th>Clock Rate</th>
<th>Data Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDR2 SDRAM</td>
<td>SSTL 1.8V</td>
<td>200 MHz</td>
<td>400 Mbps</td>
</tr>
<tr>
<td>DDR SDRAM</td>
<td>SSTL 2.5V</td>
<td>166 MHz</td>
<td>333 Mbps</td>
</tr>
</tbody>
</table>

Over 300 IP Blocks Available Today – www.xilinx.com/ipcenter
Accelerate Time-to-Market with Development Boards and Starter Kits

The Spartan boards and Starter Kits provide a complete development solution giving designers instant access to the capabilities of the Spartan FPGAs. The Starter Kit includes a development board, power supply with universal adaptors, and much more.

<table>
<thead>
<tr>
<th>Board/Kit</th>
<th>Part numbers</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spartan-3AN Starter Kit</td>
<td>HW-SPAR3AN-SK-UNI-G</td>
<td>$199</td>
</tr>
<tr>
<td>Spartan-3A Starter Kit</td>
<td>HW-SPAR3A-SK-UNI-G</td>
<td>$189</td>
</tr>
<tr>
<td>Spartan-3E Starter Kit</td>
<td>HW-SPAR3E-SK-UNI-G</td>
<td>$149</td>
</tr>
<tr>
<td>Spartan-3 Starter Kit</td>
<td>HW-SPAR3-SK-UNI-G</td>
<td>$149</td>
</tr>
<tr>
<td>Spartan-3A DDR2 SDRAM Interface Development Kit</td>
<td>HW-SPAR3ADDR2-DK-UNI-G</td>
<td>$235</td>
</tr>
<tr>
<td>Spartan-3E PCI Express Starter Kit</td>
<td>HW-S3PCIE-DK</td>
<td>$349</td>
</tr>
<tr>
<td>Automotive ECU Development Kit</td>
<td>HW-XA3S1600E-UNI-G</td>
<td>$1495</td>
</tr>
<tr>
<td>Spartan-3E Display Development Kit</td>
<td>HW-SPAR3E-DISP-DK-UNI-G</td>
<td>$1595</td>
</tr>
<tr>
<td>XtremeDSP Starter Kit – Spartan-3A DSP Edition</td>
<td>DO-SD1800A-DSP-SK-UNI-G-PROMO</td>
<td>$495</td>
</tr>
<tr>
<td>XtremeDSP Video Starter Kit — Spartan-3A DSP Edition</td>
<td>DO-S3ADSP-VIDEO-SK-UNI-G</td>
<td>$1595</td>
</tr>
</tbody>
</table>

Note: For more information on development boards, please visit www.xilinx.com/spartankits

Spartan-3A Starter Kit

Spartan-3A DSP Development Board
Flexibility and Low Cost –
The Ultimate Choice for Volume Applications

Systems designers worldwide are leveraging the unique advantages of Spartan-3 Generation FPGAs across a wide range of end applications, adapting their products to rapidly changing interface and data standards, differentiating functionality with minimum design time, and reducing risk as they ramp to higher production volumes.

<table>
<thead>
<tr>
<th>Examples</th>
<th>Application Challenges</th>
<th>Spartan-3 Generation Advantages</th>
</tr>
</thead>
</table>
| Flat Panel Displays           | • Panel board and video/tuner board cost  
• Constantly evolving I/O requirements  
• Shorter product life cycles with higher amortized cost risk for new ASICs  
• Constantly evolving, subjective image quality requirements  
• Differentiating vs. competing hardware | • 5 domain-optimized platforms for lowest-cost fit to each application  
• SelectIO Technology with on-chip differential termination and widest I/O standards compliance, including LVDS, RSDS, mini-LVDS, PPDS and TMDS  
• Pre- or post-processing video enhancement, LVDS TxRx (FPDLink), and peripheral interface bridging solutions  
• TCON (timing control) and video co-processing flexibility  
• Flexible peripheral interfacing and video switching  
• Reference designs for precise gamma correction, image dithering, color temperature correction and other video-enhancement functions |
| Set-Top Boxes                 | • Evolving interface standards for memory, disks, and other components  
• Managing inventory with multiple product feature sets  
• Differentiating video processing capability at lower power and cost  
• Accelerating and updating algorithms for conditional access/security | • SelectIO Technology with support for up to 26 different I/O standards  
• MultiBoot reconfigurability and density migration within a single package  
• XtremeDSP Technology with industry-leading price/performance for digital video decoding  
• Fast, compact IP cores for authentication and content encryption |
| Wireless Access               | • Low-level MAC-layer co-processing in Customer Premises Equipment  
• Forward Error Correction and DSP co-processing efficiency  
• Peripheral bridging and interfacing | • IP cores for MAC, FEC, encryption, digital up/down conversion and security  
• XtremeDSP Technology with flexible high performance  
• SelectIO Technology with on-chip termination and wide I/O standards support |
| Industrial Ethernet and Motion Control | • Bridging multiple connectivity protocols  
• Customizing PWM and control algorithms  
• Accelerating motion control algorithms | • IP cores for EtherCAT, SerCOS III, CAN, Ethernet, PCI and PCI Express  
• Flexible Xilinx Embedded Processing Technology  
• Hardware acceleration with Fast Simplex Link and XtremeDSP Technology |
| Automotive                    | • Full compliance to industry production process and quality standards  
• Interconnecting different automotive/multimedia standards | • Extended Automotive temperature ranges, both Industrial and Q-Grade; full PPAP support and AEC-Q100 qualification for Spartan-3 and Spartan-3E platforms  
• IP cores for bridging CAN, LIN and MOST®, as well as USB 2.0 and Ethernet  
• XtremeDSP Technology with industry-leading price/performance/power and IP for filtering, edge detection, and codes  
• SelectIO Technology with on-chip termination for LVDS, RSDS and other standards |
| Video Surveillance            | • DSP performance need for object recognition, motion detection and advanced compression algorithms  
• Changing industry standards  
• Rapidly evolving technology such as automated scene analysis | • XtremeDSP performance through parallelism in FPGA fabric  
• FPGA flexibility and scalability  
• Field upgradeability |

**TAKE THE NEXT STEP**
Visit us online at [www.xilinx.com/spartan](http://www.xilinx.com/spartan)
<table>
<thead>
<tr>
<th>Spartan-3E</th>
<th>Spartan-3A</th>
<th>Spartan-3AN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part Number</strong></td>
<td><strong>System Gates</strong></td>
<td><strong>Logic Cells</strong></td>
</tr>
<tr>
<td>XC3S100E</td>
<td>100K</td>
<td>2,160</td>
</tr>
<tr>
<td>XC3S250E</td>
<td>250K</td>
<td>5,508</td>
</tr>
<tr>
<td>XC3S500E</td>
<td>500K</td>
<td>10,476</td>
</tr>
<tr>
<td>XC3S1200E</td>
<td>1,200K</td>
<td>19,512</td>
</tr>
<tr>
<td>XC3S1600E</td>
<td>1,600K</td>
<td>33,192</td>
</tr>
<tr>
<td>XC3S50A</td>
<td>50K</td>
<td>1,584</td>
</tr>
<tr>
<td>XC3S200A</td>
<td>200K</td>
<td>4,032</td>
</tr>
<tr>
<td>XC3S400A</td>
<td>400K</td>
<td>8,064</td>
</tr>
<tr>
<td>XC3S700A</td>
<td>700K</td>
<td>13,248</td>
</tr>
<tr>
<td>XC3S1400A</td>
<td>1,400K</td>
<td>25,344</td>
</tr>
<tr>
<td>XC3S50B</td>
<td>50K</td>
<td>1,728</td>
</tr>
<tr>
<td>XC3S200B</td>
<td>200K</td>
<td>4,320</td>
</tr>
<tr>
<td>XC3S400B</td>
<td>400K</td>
<td>8,064</td>
</tr>
<tr>
<td>XC3S1000B</td>
<td>1,000K</td>
<td>17,280</td>
</tr>
<tr>
<td>XC3S1500B</td>
<td>1,500K</td>
<td>29,952</td>
</tr>
<tr>
<td>XC3S2000B</td>
<td>2,000K</td>
<td>46,080</td>
</tr>
<tr>
<td>XC3S4000B</td>
<td>4,000K</td>
<td>62,208</td>
</tr>
<tr>
<td>XC3S5000B</td>
<td>5,000K</td>
<td>74,880</td>
</tr>
<tr>
<td>XC3S50AN</td>
<td>50K</td>
<td>1,584</td>
</tr>
<tr>
<td>XC3S200AN</td>
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<tr>
<td>XC3S1400AN</td>
<td>1,400K</td>
<td>25,344</td>
</tr>
<tr>
<td>XC3SD1800A</td>
<td>1,800K</td>
<td>37,440</td>
</tr>
<tr>
<td>XC3SD3400A</td>
<td>3,400K</td>
<td>53,712</td>
</tr>
</tbody>
</table>

Note: 1. System Gates include 20-30% of CLBs used as RAMs.
2. Numbers in table across device packages indicate maximum number of user I/Os.
3. For detailed information on device and package offerings, please check the data sheet for the specific platform at www.xilinx.com/spartan.
4. * Integrated in the DSP48A slices (Advanced Multiply Accumulate Element)

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