



## BALANCING COST, POWER, AND PERFORMANCE FOR I/O CONNECTIVITY

### Optimized Connectivity and Integration at the Lowest Cost

When design requirements call for extensive I/O and integration capabilities at the lowest cost, the Spartan<sup>®</sup>-6 family is the answer. Based on Samsung's 45nm low power (LP) process, the family merges best-in-class process and programmable logic with best-in-class I/O and lowest power per I/O, highest pin count to logic cell ratio, and fast parallel I/O performance. These FPGAs support over 40 interface protocols, and include highly capable transceivers and an intelligent mix of integrated interface IP. Spartan-6 devices enable key bridging and connectivity for cost-sensitive applications in automotive, video, infotainment, consumer, industrial, and automotive markets, among others.

### High Performance & Low Power

The sixth generation in the Spartan FPGA Series enables system developers to meet the performance and low power demands for complex connectivity, commonly needed between subsystems and peripherals. The efficient, dual-register 6-input look-up table (LUT) logic structure enables optimal bridging logic integrated with high-speed signal processing blocks, integrated memory, and low power serial transceivers. Innovation in advanced power management technology and the ability to operate at a low power 1.0V core option enable the Spartan-6 FPGA family to achieve 65% lower power than previous Spartan families.

### Part of the Broadest All Programmable Cost-Optimized Portfolio

With millions of production parts sold and a broad selection of kits for domain-based applications, Spartan FPGAs are the market leading, industry proven, and lowest cost solution for sensor fusion and any-to-any connectivity. As part of the broadest All Programmable Cost-Optimized Portfolio, the Spartan FPGAs complement Artix<sup>®</sup>-7 FPGAs and Zynq<sup>®</sup>-7000 All Programmable SoCs to deliver the best value for their target applications.

### Challenge:

#### The Need for Low-Cost Any-to-Any Connectivity Solutions

- The number of interface protocols in today's modern system cause inevitable integration challenges
- Systems demand diverse connectivity between peripherals and subsystems
- Designers need solutions that support high-performance bridging at low power

### The Solution:

#### Spartan-6 FPGAs

- Best-in-class I/O per dollar and interface support
- High-performance architectural blocks and serial transceivers
- Lowest power per I/O
- Part of the broadest All Programmable Cost-Optimized Portfolio
- 10+ year life cycle support
- Supported by free ISE WebPack tools on Windows7, Windows10, and Linux
- Get started today with low cost eval kits

The Spartan®-6 FPGA family comprises two domain-optimized subfamilies with a mix of features matched to stringent market requirements for price-sensitive, high-volume applications:

**Spartan-6 LX FPGAs** are optimized for applications that require the absolute lowest cost. They support up to 147K logic cell density, 4.8Mb memory, integrated memory controllers, DSP slices, and high-performance integrated IP with support for industry standards.

**Spartan-6 LXT FPGAs** are optimized to provide the industry's lowest risk and lowest cost solution for serial connectivity. The LXT subfamily extends LX devices by adding up to eight 3.2Gb/s GTP transceivers and an integrated block for PCI Express®, both derived from proven Virtex® FPGA family technology.

## Key Capabilities Overview

### Comprehensive Connectivity

- Connect to more with support for major single and double differential I/O standards
- Connect faster with 1Gb/s differential I/O, multiple 3.2Gb/s integrated serial transceivers, and 12.8Gb/s memory bandwidth access
- Connect at lower cost with integrated SDRAM memory controller and PCI Express interfaces
- Simplify high-bandwidth interfaces with multi-voltage, multi-standard high-performance SelectIO™ interface banks with 3.3V capability, an integrated memory controller block, and DisplayPort-enabled 3.2Gb/s GTP transceivers

### Lowest Cost

45nm process technology optimized for low-cost, cost-optimized, wire-bond packaging and dedicated IP blocks reduce size to help you drive down system costs

### High Performance

- Abundant logic resources with increased logic capacity of up to 147K logic cells enables high-performance systems
- Efficient, second-generation DSP48A1 architectural blocks for high-performance digital signal processing systems for video, wireless, and many other applications
- Integrated memory controller blocks with streamlined access to external DDR3 memory for video and data storage applications
- Speedy embedded processing with enhanced MicroBlaze™ processor

### Power Advantage

- Spartan-6 offers the lowest power per I/O.

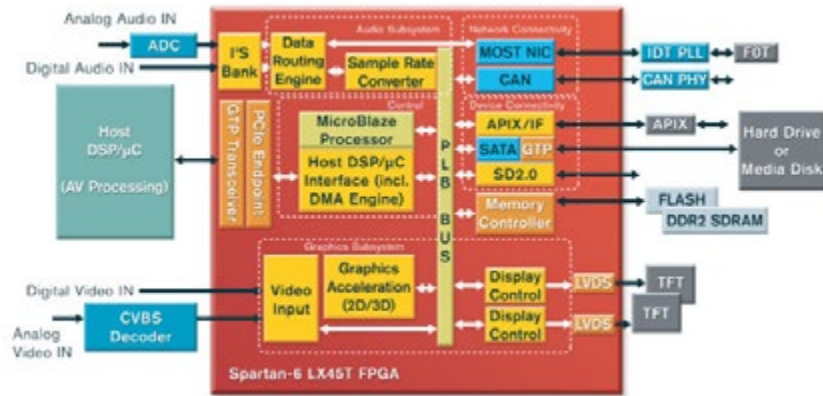
### Ease of Use

- Fast design closure using integrated wizards for built-in blocks, an efficient logic architecture derived from the Virtex series as well as development kits complete with IP and reference designs
- Easier configuration with broad, low-cost alliance partner flash support, and simplified two-pin auto-detect configuration
- [ISE® WebPACK™ design software](#), the industry's only no cost, fully featured front-to-back FPGA design solution for Linux, Windows XP, Windows7, and Windows10
- Free downloadable tools at [www.xilinx.com/ise](http://www.xilinx.com/ise)

**FEATURES OVERVIEW**

<p><b>45nm Low Power Process Technology</b></p> <p>Optimized for cost, power, and performance, most efficient utilization of low-power copper process technology</p>	<ul style="list-style-type: none"> <li>• Efficient six-input LUTs improve performance and minimize power</li> <li>• LUT designed with dual flip-flops for pipelined applications</li> <li>• Flexible LUTs are configurable as logic, distributed RAM, or shift registers</li> <li>• From 3,800 to 147,000 logic cells for system-level integration</li> </ul>
<p><b>Low Cost by Design</b></p> <p>Cost-optimized Virtex® series based architecture</p>	<ul style="list-style-type: none"> <li>• Multiple efficient integrated blocks</li> <li>• Optimized selection of I/O standards</li> <li>• Staggered I/O pads for high pin-to-package ratios</li> <li>• High-volume plastic wire-bonded packages</li> <li>• Low-cost third-party configuration</li> </ul>
<p><b>Embedded Processing</b></p> <p>Faster embedded processing with enhanced, low-cost, MicroBlaze soft processor</p>	<ul style="list-style-type: none"> <li>• MicroBlaze processor adds MMU and FPU for greater functionality</li> <li>• Six-input LUT architecture improves performance and efficiency for comparators and multiplexers</li> <li>• 2X flip-flops for embedded registers</li> <li>• Integrated DRAM memory controller with 12.8Gb/s memory bandwidth</li> </ul>
<p><b>Integrated Memory Block Capacity up to 4.8Mb</b></p> <p>Block RAM with a wide range of granularity</p>	<ul style="list-style-type: none"> <li>• Efficient and high performance block RAM with byte write enable</li> <li>• 18Kb blocks can be split into two independent 9Kb block RAMs</li> </ul>
<p><b>Integrated Memory Controllers</b></p> <p>Low power, high-performance controller for rapid implementation</p>	<ul style="list-style-type: none"> <li>• DDR, DDR2, DDR3, and LPDDR support</li> <li>• Data rates up to 800Mb/s (12.8Gb/s peak bandwidth)</li> <li>• Multiport bus structure with independent FIFO to reduce design timing issues</li> <li>• Simplified memory interface and board layout</li> <li>• Predictable timing for memory interface designs</li> <li>• Software wizard to guide through the entire process</li> </ul>
<p><b>SelectIO™ Interface Technology</b></p> <p>Multi-voltage, multi-standard SelectIO interface banks</p>	<ul style="list-style-type: none"> <li>• Up to 1,050Mb/s data transfer rate per differential I/O</li> <li>• Selectable output drive, up to 24mA per pin</li> <li>• 3.3V to 1.2V I/O standards and protocols</li> <li>• Low cost HSTL and SSTL memory interfaces</li> <li>• Hot-swap compliance</li> <li>• Adjustable I/O slew rates to improve signal integrity</li> </ul>
<p><b>Efficient DSP48A1 Slices</b></p> <p>Drive high-performance arithmetic and signal processing</p>	<ul style="list-style-type: none"> <li>• Each slice contains a fast 18 x 18 multiplier and a 48-bit accumulator capable of operating at 390MHz</li> <li>• Pipelining and cascading capability</li> <li>• Pre-adder to assist in symmetric filter applications</li> </ul>
<p><b>Enhanced Configuration and Bitstream Protection</b></p> <p>Reduce system cost, increase reliability, and safeguard your design</p>	<ul style="list-style-type: none"> <li>• Simplified configuration, supports low-cost standards</li> <li>• Broad SPI (up to x4) and NOR flash support</li> <li>• Feature-rich Xilinx Platform Flash with JTAG</li> <li>• Multiboot support for remote upgrade with multiple bitstreams, using watchdog protection</li> <li>• Unique Device DNA identifier for design authentication</li> <li>• AES bitstream encryption in the larger devices</li> </ul>
<p><b>GTP Transceivers in Spartan-6 LXT: 100Mb/s to 3.2Gb/s</b></p> <p>Implements serial protocols at low power</p>	<ul style="list-style-type: none"> <li>• Up to 3.2Gb/s performance</li> <li>• High-speed interfaces: Serial ATA, Aurora, 1G Ethernet, PCI Express, OBSAI, CPRI, EPON, GPON, and XAUI</li> <li>• Low power consumption: &lt; 150mW (typical) at 3.2Gb/s</li> </ul>
<p><b>Integrated Block for PCI Express in Spartan-6 LXT FPGA</b></p> <p>Integrated block for PCI Express designs</p>	<ul style="list-style-type: none"> <li>• Works with GTP transceivers to deliver PCIe endpoint functionality</li> <li>• Built-in dedicated IP frees user logic resources and reduces power</li> <li>• PCI SIG-verified Gen1 compliance (on integrators list)</li> </ul>
<p><b>Optimized Power Saving Modes</b></p> <p>Hibernate power down mode for zero power</p>	<ul style="list-style-type: none"> <li>• Suspend mode maintains state and configuration with multi-pin wake up, control enhancement</li> <li>• Software power optimization option</li> </ul>

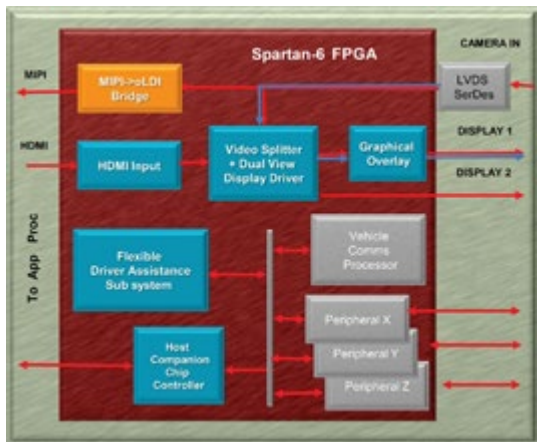
## Infotainment Companion Chip



### In-Car Infotainment System

Serving as a companion to the host processor, a single Spartan-6 LX45T FPGA supports audio/video acceleration, graphics subsystem, and vehicle networking functions.

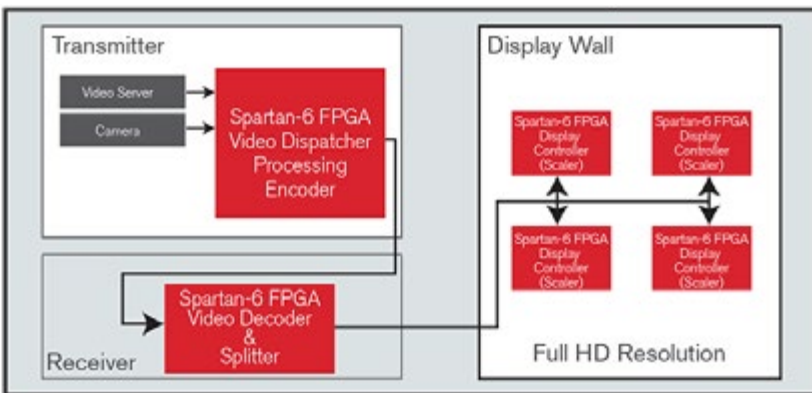
## Automotive Infotainment



### The Xilinx Automotive Infotainment Companion Chip Platform

Spartan-6 FPGAs are an ideal companion chip to an ASSP, microcontroller, or DSP device for a cost-effective, application-specific solution.

## Digital Signage



### Full-HD Intelligent Digital Signage

Spartan-6 FPGAs provide the ideal programmable platform to perform dispatcher and splitter functions, and integrated video processing for full HD quality intelligent digital signage.

## Enhance the user experience

Spartan-6 FPGAs provide the flexibility to respond rapidly to changing consumer requirements.

- Improve video performance with customized graphics accelerators and flexible parallel and serial interface capabilities
- Simplify interfacing to host processors and reduce component count with integrated PCI Express® technology
- Accelerate design with IP offerings for graphics processing, video conversion, high-speed interfacing, and vehicle networks

## Increase picture quality

The Xilinx Automotive Infotainment Companion Chip Platform provides flexible interfacing and is optimized to complement existing or preferred host processors. Available IP and software enables rapid extension of system interfaces, peripherals or processing with minimal development effort. Various popular host processor interfaces are supported and can be changed quickly based on host availability and overall bandwidth required.

## Increasing display intelligence through facial recognition and intelligent eye contact

Spartan-6 FPGAs provide the ideal programmable platform to optimally perform these computationally intensive video processing functions. The tightly integrated programmable logic and IO optimization enable feature-rich implementation and hardware accelerated video processing functions for the ultimate mix of performance with low BOM cost and reduced power consumption.

- Increase system performance with hardware acceleration for computationally intensive functions such as: metadata acquisition/tagging, autosense facial recognition eye contact, and object tracking
- A fully programmable platform with Full HD image and video processing to enable customized picture quality differentiation
- I/O optimization through integration of the latest interface technologies like SD/HDMI/3G-SDI, DisplayPort, HDMI
- Integrated video over IP bridging standards like Ethernet AVB

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## BOARDS AND KITS

Xilinx as well as Alliance partners offer a broad array of evaluation kits that enable rapid development for cost-sensitive applications based on Spartan-6 FPGAs. This includes all the basic components of hardware, design tools, IP, and pre-verified reference designs.

To learn more, visit [Spartan-6 FPGA Boards and Kits](#).



Spartan-6 FPGA SP601 Evaluation Kit



Spartan-6 FPGA Connectivity Kit



Inrevium Spartan-6 FPGA  
Consumer Video Kit



TED Spartan-6 FPGA Broadcast  
Connectivity Kit - Foundation



Spartan-6 FPGA SP605 Evaluation Kit



Spartan-6 FPGA SP601 Evaluation Kit



Spartan-6 FPGA Embedded Kit



Nexys 3 Spartan-6 FPGA Trainer Board