

## Extending 28nm Leadership with an Expanded Portfolio and Lower Power

With the ongoing success and market leadership of its 7 series FPGAs and Zynq®-7000 All Programmable SoCs, Xilinx continues to invest in the 28nm node to deliver more device configurations that enable customer innovation and greater device selection. From the beginning, Xilinx anticipated a long life for the portfolio in delivering optimal price/performance/watt and SoC integration beyond a traditional product generation. The breakthrough combination of high performance and low power of TSMC's 28HPL process has paid dividends many times over for designers across a wide array of applications, including:

- 10G, 40G, and Nx100G networking systems for data center and wired communications infrastructure
- Heterogeneous wireless networks with broad interface support including LTE, WiMAX, and WCDMA
- Factory automation with smart analytics, processing, and network-based communication
- Mission-critical aerospace and defense systems that meet stringent SWaP-C requirements
- Intelligent consumer and automotive systems with real-time analytics and key interface standards support

With its 7 series, Xilinx established the industry's broadest low-end device portfolio and first All Programmable SoC and 3D ICs with unmatched capacity and performance. Xilinx has now further strengthened its 28nm portfolio to enable greater customer innovation. Specifically, in the last year, Xilinx has added the following to its 7 series portfolio:

- (1) Six additional devices, comprised of low-end and mid-range FPGAs and Zynq-7000 All Programmable SoCs
- (2) New low-power speed grades for all low-end and mid-range devices for up to 30% additional power savings while preserving performance

## Six Additional Devices

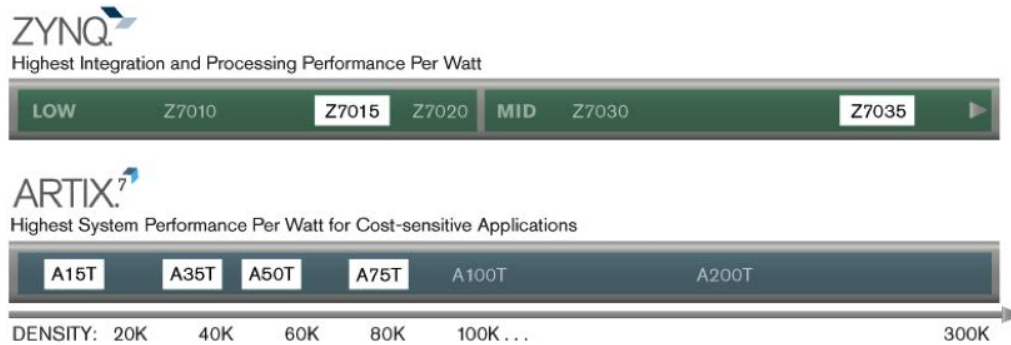
With industry-leading price/performance/watt, the 7 series portfolio addresses a diverse set of applications, from cost-sensitive hand-held radio to large scale Nx100G networking infrastructure. Now with the maturity of the process node, Xilinx has expanded its 28nm portfolio for even more market niches seeking greater price/performance/watt.

### Greater Scalability

Whether at the center of the system or serving as companion devices, exceptional performance and power efficiency are commonly needed in low density (under 100K logic cells) FPGAs, along with advanced features like high-speed transceivers and analog mixed-signal functionality for applications such as programmable logic controllers, video surveillance, and wireless infrastructure. Similarly, developers seeking SoC integration in platform-based designs need a wide range of FPGA density options to choose from when optimizing their designs in applications such as remote radio head for wireless systems, motor control, portable ultrasound, and machine vision.

For this reason, Xilinx has expanded the 7 series portfolio at both the FPGA and Zynq-7000 All Programmable SoC-level, as highlighted below:

New Low-End and Mid-Range 28nm Offering - Six Additional Devices Highlighted



The additional sub-100K logic cell Artix<sup>®</sup>-7 devices provide best-in-class I/O throughput, signal processing bandwidth, and advanced analog/mixed-signal (AMS) functionality for applications like RF connectivity for hand-held software-defined radio, wired communications base station monitoring, digital front-end implementations for 1x1 or 2x2 remote radio head units, and other advanced bridging applications needing high performance features such as 1000+ Mb/s LVDS and DDR3.

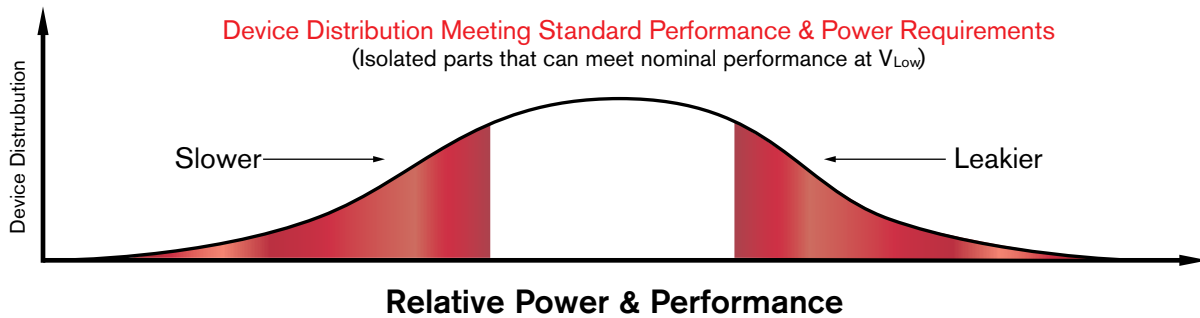
Xilinx also expanded the Zynq-7000 All Programmable SoC portfolio with the Z-7015 and Z-7035 devices. Like all Zynq-7000 devices, these SoCs combine a Dual ARM<sup>®</sup> Cortex™-A9 MPCore™ processor subsystem with programmable logic, enabling key analytics and compute workloads on a single chip, now for applications demanding more density ranges, given that bandwidth and offloading needs vary.

### Common Tool Suite and IP Catalog across Device Ranges and Families

Critical to scalability is not only density range but a common design platform for development. With a low-end density range from 15K to 200K logic cells, customers can leverage designs for multiple projects in adjacent markets or for derivative products by re-using the same IP and tool chain. The simplification of the potentially time-consuming design migration and IP re-optimization process ensures that design teams can execute follow-on projects in predictable time frames. Similarly, a dependable tool flow based on the Vivado<sup>®</sup> Design Suite not only represents a major leap in productivity due to drastic improvements in design integration time and implementation results over traditional flows, but provides a consistent design environment as applications migrate across Artix-7 and Zynq-7000 families as needed.

## Power Reduction

In addition to expanded device densities, the 7 series portfolio now offers new low-power speed grades. This is based on one of Xilinx’s innovative, power-savings design and manufacturing approaches, known as “power binning” and voltage scaling, where special speed-grade devices can be isolated to deliver comparable performance to equivalent standard parts but at lower operating voltages and hence lower power. A method first introduced in the Virtex®-6 (40nm) and Spartan®-6 (45nm) families, power binning is done on all 7 series parts. Through strategic screening, as shown in the figure below, Xilinx identifies parts that can operate at lower voltages ( $V_{Low}$ ) than commercial parts—with minor impact to performance. This results in additional power savings and overall greater performance/watt. Hence, with the same part, designers can scale voltage down for lower power or keep it at a standard level for absolute best achievable performance.



## New Lower Power Speed Grade (-1LI) Comparison for Low-End Devices

Device & Speed Grade	Operating Voltage	Static Power Savings	Dynamic Power Savings
-1I, -2I	1.0V	0%	0%
-2LE	1.0V	22%	0%
Artix-7 -1LI	0.95V	50%	10%
Zynq-7000 <sup>(1)</sup>	0.95V	50%	0%
Low-End -1LI	1.0V <sup>(2)</sup>	45%	0%

1: For Zynq-7000 devices, voltage change is limited to programmable logic; processing system stays at 1.0V  
 2: At 1.0V, one voltage rail can be used for FPGA logic and processor subsystem

## New Lower Power Speed Grade (-2LI) Comparison for Mid-Range Devices

Device & Speed Grade	Operating Voltage	Static Power Savings	Dynamic Power Savings
-2I	1.0V	0%	0%
-2LE	1.0V	22%	0%
Kintex®-7 -2LI (160T - 480T)	0.95V	40%	10%
Zynq-7000 <sup>(1)</sup>	0.95V	40%	10%
Mid-Range -2LI	1.0V <sup>(2)</sup>	40%	0%

1: For Zynq-7000 devices, voltage change is limited to programmable logic; processing system stays at 1.0V  
 2: At 1.0V, one voltage rail can be used for FPGA logic and processor subsystem

Power reduction with no performance impact is particularly useful for applications like radio units for wireless infrastructure, military radio for hand-held use, and other applications that cannot afford heat sinks or cooling fans, and hence are thermally challenged.

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## Conclusion

The low-end and mid-range family enhancements extend Xilinx's leadership with the 7 series portfolio for density range and price/performance/watt. Considered the company's "break-out" node, 28nm represented the generation in which Xilinx went beyond programmable hardware to software, beyond digital to analog mixed signal (AMS), and beyond single die to multi-die 3D IC implementations. With this foundation, Xilinx continued innovation in silicon, tools, and methodology for subsequent UltraScale (20nm) and UltraScale+ (16nm) portfolios. In a multi-node, multi-generational era where different applications need to take advantage of the best node for their respective markets, Xilinx's 28nm 7 series and its extensions will continue to provide best-in-class price/performance/watt for years to come.

## Take the NEXT STEP

Start designing with evaluation boards based on the latest devices including the [Artix-7 A50T FPGA](#), and [Zynq-7000 Z-7010](#) and [Z-7020 All Programmable SoCs](#).

Download the [Xilinx Power Estimator Tool](#) to estimate power for your design with the new low-power speed grades.

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