ZYNQ™ 7000Q SOCS

Defense-Grade SoCs for High Performance and Highly-Integrated Systems

DEFENSE-GRADE ZYNQ™ 7000 SOCS

Aerospace and defense development teams are challenged to deliver increased functionality, while simultaneously delivering progressively smaller systems and portable hand-held devices. The Zynq™ 7000Q SoC devices are ideal for applications requiring advanced system control tightly coupled with sophisticated digital signal processing. Whether to maximize battery life or expand functionality, consolidating designs on fewer chips can result in breakthroughs. Based on the industry's first SoC, the ruggedized defense-grade Zynq™ 7000Q family redefines the possibilities with unprecedented levels of programmable integration. The flexibility of the on-chip programmable logic provides a cost-effective solution for meeting current security mandates and other integration sensitive requirements that present moving targets for system designers.

SOCS: A GENERATION AHEAD

The Zynq™ 7000Q family puts defense designers a generation ahead with industry leading programmable integration. Chip-to-chip latencies are reduced with silicon connections, and the on-chip dual-core ARM® Cortex-A9 processor gives hardware and software designers alike more choices for design optimization and acceleration.

For secure applications, single-chip Zynq™ 7000Q designs can implement the most advanced security while also eliminating performance reducing chip-to-chip interfaces. Embedded fail-safe security features eliminate the cost of external devices and the lead time to deployment of development, verification, and consummation of security designs. The low-power process technology SoC allows battery powered, portable capability not possible before with multiple device designs.

MEETING MILITARY STANDARDS: RELIABILITY & SECURITY

A long history of partnering with military agencies and the defense industry has resulted in AMD pioneering numerous advancements for Defense-grade reliability and security.
Key Defense-grade features include:

• Full range extended temperature testing

• Mask set control

• Full compliance with MIL-PRF-38535 Pb content standards

• Longer-term availability

• Anti-counterfeiting features

• Ruggedized packaging

• Available information assurance

• Available anti-tamper methodology

Industry-leading security capabilities tailor AMD Zynq™ 7000Q Defense-grade devices for the rigorous demands of the most sensitive defense-related designs. Having evolved over four generations of devices, AMD's fail-safe heritage in IA methodology and AT technology are backed by support from a dedicated team of security application experts.

AEROSPACE & DEFENSE

AMD SOLUTIONS HIGHLIGHTS

• SoC with ARM® dual-core Cortex™-A9 application class processor and tightly integrated Programmable Logic

• Industry's first 28nm defense-grade SoC

• Off-the-shelf availability, and pin compatibility with commercial-grade devices

• 4th-generation fail-safe Information Assurance and Anti-Tamper technology

• Ruggedized, full compliance with MIL-PRF-38535 Pb content standards with anti-counterfeiting features

• Full range extended temperature testing

• Long-term availability

FULL RANGE EXTENDED TEMPERATURE TESTING

Defense Grade FPGA products are offered in Military (M), Extended (E) and Industrial (I) temperature grades:

• Q-temp: -40°C to +125°C
• Extended: 0°C to +100°C
• Industrial: −40°C to +100°C

Full range extended temperature testing includes full functional and parametric testing at room temperature plus the hot and cold temperature extremes. AMD tests 100% of all die at wafer sort and 100% of all devices at Final Production testing. AMD continuously improves the test coverage of its products by implementing various design for test (DFT) methods which span digital logic, IP, memory elements, I/O boundary scanning, and many other areas. AMD test coverage improvements are achieving the highest test coverage possible, which are confirmed by PPM results from customer returns and are published on www.xilinx.com.

MASK SET CONTROL

With AMD Defense-grade products, no mask changes are allowed. Because qualified mission critical applications cannot allow introduction of unknown factors, changes to the mask set used for device making may trigger a customer review and may require re-qualification of customer equipment. While Commercial-grade devices can have changes for continuing yield improvement, Defense-grade products are guaranteed to be exactly the same throughout the production life cycle.

FULL COMPLIANCE WITH MIL-PRF-38535 PB CONTENT STANDARDS

AMD Defense-grade products offer devices that are fully compliant to MIL-PRF-38535 with respect to Pb content in all solder interfaces and contain a minimum of 3% Pb. Many Aerospace and Defense applications require compliance to government flow downs where materials cannot contain more than 97% Tin (Sn). A risk for tin-whisker development exists where there is more than 97% Tin. Components with solder terminals comprised of 3% Pb are not prone to tin whisker growth. In addition, the most commonly used lead-free solders are known to be more brittle than lead-tin solders, therefore in high vibration and shock applications, the ductile tin-lead solder joints are required.

AMD Leaded Packages	XC	XQ
Package Substrate Pre-Solder	Lead-Free	Leaded
Chip Cap Finish	Lead-Free	Leaded
Wafer Bumps	Lead-Free	Leaded
Solder Balls	Leaded	Leaded
Assembly Re-Flow	Leaded	Leaded

RUGGEDIZED PACKAGING

Ruggedized packages have a unique 4-corner lid that has wider vent openings around the periphery. This lid used on Defense-grade RF/RS/RB devices helps reduce board level cleaning processes needed prior to conformal coating. In the conformal coating process boards go through a caustic material etch process to achieve the required conformal coating adherence. The selection of solvent cleaner (caustic material etch) or other corrosive chemicals can potentially cause issues with flip chip packaging with smaller vent hole openings present for out-gassing of the organic materials used in the construction of the flip chip packaging. With the 4-corner lid a much better cleaning and shorter manufacturing process can be achieved, as the device can be fully flushed with the enhanced opening on the lid.

Additional MIL-STD-883 group D specification stress tests are completed prior to production release of the defense grade (XQ) devices. The "Defense-Grade AMD Kintex™ 7, AMD Virtex™7, AMD Artix™ 7 FPGA's and AMD Zynq™7000 SoCs Qualification Report" is available upon request.

MIL-STD-883 group D Qualification testing for Defense Grade products include the following:
• Physical Dimensions (TM 2016)
• Thermal Shock (TM 1011 Condition B 15 cycles)
• Temperature Cycling (TM 1010 Condition C 100 cycles)
• Moisture Resistance (TM 1004)
• Vibration - Variable Frequency (TM 2007 Condition A minimum)
• Constant Acceleration - Centrifuge (TM 2001 Condition D minimum - Y1 orientation only)
• Salt Atmosphere (TM 1009 Condition A minimum)

ANTI-COUNTERFEITING FEATURES

AMD Defense-grade devices offer multiple levels of anti-counterfeiting protection. Protection starts with the device package itself, since the unique 4-corner lid construction differentiates it from the commercial product. This aspect makes it significantly more expensive for counterfeiters, who can no longer simply re-mark a commercial device and sell it as a Defense-grade product. Supplementing this is a unique laser marking, which utilizes micro watermarking characters and complex patterns that can be observed under low power magnification.

NEXT STEPS

• For more information: www.xilinx.com/products/silicon-devices/soc/zynq-7000q.html