

Defense-Grade XQ UltraScale Architecture Portfolio

DEFENSE-GRADE

The Defense-grade UltraScale™ architecture portfolio, inclusive of XQ UltraScale FPGAs, XQ UltraScale+ FPGAs, and XQ Zynq™ UltraScale+™ MPSoCs and RFSocS, enables designers with a broad selection of devices to advance state-of-the-art integrated Aerospace & Defense solutions. This portfolio includes the industry's first heterogeneous multi-processor SoC devices with flexible and dynamically reconfigurable high-performance programmable logic and DSP, 16Gb/s and 32Gb/s transceivers, quad-core Arm® Cortex™-A53 and dual-core Arm Cortex-R5 embedded processors, and optional features of high-speed 5GSPS ADCs and 10GSPS DACs, as well as Arm Mali™-400 GPU, 4k60 H.265/H.264 video codec, and ruggedized-packages with support for -55°C to +125°C operation and 256bit PUF.

XQ Defense-grade devices offer extended temperature range and a packagedesign to enable survivability in harsh environments. AMD invests in these unique packages specifically for the Aerospace and the Defense community. Each XQ device has a footprint compatible XC device.

AMD has 30+ years of continuous focus and heritage in A&D applications, with a history of government and industry partnership and collaboration, which has led to unique advancements in the capability, reliability, and security of XQ devices.

Available Defense-grade features include:

- > Ruggedized packaging
- > Military-temperature, -55°C to +125°C
- > Full range extended temperature testing
- > MIL-STD-883 group D Qualification testing
- > Full compliance with MIL-PRF-38535 Pb content standards
- > Mask set control
- > Anti-counterfeiting features
- > Longer-term availability
- > Information assurance (IA) support
- > Anti-tamper (AT) technology

AMD maintains a focus on Security and Safety, with dedicated support and expertise in these related yet unique domains. This Defense-grade offering expands on a multi-generational commitment and heritage in IA methodology and AT technology, with the introduction of physically unclonable function (PUF), supported in XQ Zynq UltraScale+ MPSoCs and RFSocS. A functional safety focus assists the advancement of our industry leading DO-254 and DO-178 solutions.



AMD DEFENSE-GRADE HIGHLIGHTS

- > Industry's leading Defense-grade portfolio, with high performance, lower power and maximum integration
- > Ruggedized packaging
- > Military-temperature, -55°C to +125°C
- > MIL-STD-883 group D qualification testing
- > Full compliance with MIL-PRF-38535 Pb content standards
- > Mask set control
- > Anti-counterfeiting features

XQ ULTRASCALE ARCHITECTURE PORTFOLIO

- > XQ Zynq™ UltraScale+ RFSoc
- > XQ Zynq™ UltraScale+ MPSoC
- > XQ Virtex™ UltraScale+ FPGA
- > XQ Kintex™ UltraScale+ FPGA

FULL RANGE TEMPERATURE, TESTING AND QUALITY

XQ UltraScale Architecture devices are offered in Military (M) and Industrial (I) temperature grades:

- > **Military:** -55°C to +125°C
- > **Industrial:** -40°C to +100°C

Full range extended temperature testing is offered on XQ Ruggedized devices and includes full functional and parametric testing at room temperature as well as 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 through advancements in design for test (DFT) methods spanning digital logic, IP cores, memory elements, I/O cells, and many other areas. AMD achieves very high test coverage with industry leading manufacturing and foundry processes, as confirmed by our low PPM failure rate and low customer return rates; for more information see www.xilinx.com/quality.

MASK SET CONTROL

Mask-set control is valuable for secure and critical applications where any mask-set change may trigger a detailed silicon-level analysis, re-verification, and/or re-certification process. XQ Ruggedized products have a locked mask-set throughout the production life cycle. In the event that any change must be made, a formal customer notification process is required for these XQ devices.

FULL COMPLIANCE WITH MIL-PRF-38535 PB CONTENT STANDARDS

AMD LEADED	XC	XQ
Package Substrate	Lead-Free	Lead (Sn/Pb)
Chip Cap Finish	Lead-Free	Lead (Sn/Pb)
Wafer Bumps	Lead-Free	Lead (Sn/Pb)
Solder Balls	Lead-Free	Lead (Sn/Pb)
Assembly Re-Flow	Lead-Free	Lead (Sn/Pb)

XQ Ruggedized devices are fully compliant to MIL-PRF-38535 with respect to Pb content in all solder interfaces and contain a minimum of 3% Pb by weight. Aerospace and Defense applications may require compliance to government flow downs where materials cannot contain more than 97% tin (Sn), due to a risk that tin whiskers may develop in the case of greater than 97% tin, such as in ROHS solder interfaces. 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 tin-lead solders, therefore in high vibration and shock applications, the ductile tin-lead solder joints may be required.

XQ RUGGEDIZED PACKAGE LID

XQ Ruggedized packages have a unique 4-corner lid that has wider vent openings around the periphery. This lid simplifies board-level assembly process for applications requiring conformal coating. In the conformal coating process, boards go through a caustic etching process to achieve the required conformal coating adherence. The caustic etching material or other corrosive chemicals can become trapped inside of non-ruggedized packaging, leading to reliability concerns with flip chip packaging. With the XQ Ruggedized package, the 4-corner lid significantly simplifies cleaning and manufacturing process, allowing the device to be fully flushed prior to sealing the device/board with conformal coating.

MIL-STD-883 GROUP D QUALIFICATION TESTING

XQ Ruggedized devices include the following test and qualification prior to production release:

- > Physical Dimensions (TM 2016)
- > Temperature Cycling (TM 1010 Condition C 100 cycles)
- > Vibration - Variable Frequency (TM 2007 Condition A minimum)
- > Salt Atmosphere (TM 1009 Condition A minimum)
- > Thermal Shock (TM 1011 Condition B 15 cycles)
- > Moisture Resistance (TM 1004)
- > Constant Acceleration - Centrifuge (TM 2001 Condition D minimum - Y1 orientation only)

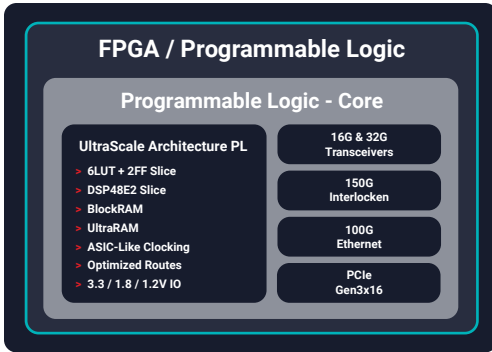
ANTI-COUNTERFEITING FEATURES

XQ UltraScale architecture portfolio 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 difficult 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, whereby certain elements may be verified by the end-user and others only verified by certain AMD staff.

XQ ULTRASCALE ARCHITECTURE FEATURES

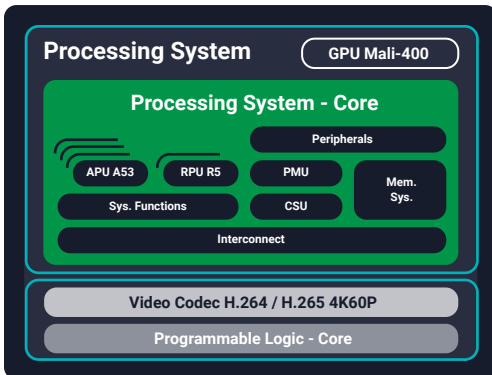
KEY CHARACTERISTICS AND BENEFITS	
<p>16nm FinFET+ & 20nm SoC process technology from TSMC Industry leading processes from the #1 service foundry delivers a step function increase in performance-per-watt</p>	<ul style="list-style-type: none"> > Over 2x performance-per-watt increase 7 series fabric > Scalable density from 100k to 2.8M system logic cells > 10x greater memory bandwidth relative to discrete on chip memory
<p>Next-generation routing, ASIC-like clocking, and enhanced fabric Enabling breakthrough speeds with high utilization</p>	<ul style="list-style-type: none"> > Reduces clock skew for increased performance > Up to one speed-grade advantage vs. competition > Efficient logic packing for optimal performance-per-watt per device
<p>Enhanced DSP slices for diverse applications Enabling a massive jump in fixed-and floating-point performance</p>	<ul style="list-style-type: none"> > Up to 21.2 TeraMACs (38TOP/s) of DSP compute bandwidth > Double-precision floating point using 30% fewer resources > Complex fixed-point arithmetic in half the resources
<p>Integrated high-speed analog/RF functions Massive leap in integration, reducing size, weight, power, and cost</p>	<ul style="list-style-type: none"> > Up to 8 channels 14-bit 5 GS/s ADC (or 16 channels 2.5 GS/s ADC) > Up to 16 channels 14-bit 10 GS/s DAC > Available 8 SD-FEC engines
<p>Quad-Core Arm Cortex A53 Application Processing Unit The heart of Zynq UltraScale+ MPSoCs, with exceptional performance-per-watt</p>	<ul style="list-style-type: none"> > Armv8 64-bit architecture running up to 1.33GHz > Up to 2.7x performance-per-watt over dual-core Arm Cortex-A9 > 2.3DMIPS/MHz performance > Hardware virtualization with terabyte memory access
<p>Dual-core Arm Cortex-R5 Real-Time Processing Unit Low-latency, deterministic engine ideal for real-time applications</p>	<ul style="list-style-type: none"> > Armv7 32-bit architecture running up to 533MHz > 1.67DMIPS/MHz performance > Lock-step mode for high reliability, safety critical functions
<p>Arm Mail-400 MP2 Graphics Processing Unit Embedded graphics and video processing</p>	<ul style="list-style-type: none"> > Multicore 2D/3D acceleration at 667MHz > 1080p resolution graphics > OpenGL ES 1.1 and 2.0 and OpenVG 1.0 and 1.1
<p>Video Codec Unit Ideal for 4K UltraHD multistream video encode and decode</p>	<ul style="list-style-type: none"> > Support H.265 (HEVC)/ H.264(AVC) standards > Simultaneous encode and decode at 4K (60fps)
<p>High-Speed Connectivity and Interface Integrated peripherals with key IP/protocol support</p>	<ul style="list-style-type: none"> > PCI Express (PCIe) Gen3x16, MIPI D-PHY in FPGA logic > Processing system includes USB 3.0, SATA 3.1, PCIe Gen 2, DisplayPort support for resolutions up to 4Kx2K (30fps) > 150 Interlaken and 100G Ethernet MAC cores in FPGA logic > DDR4 support of up to 2,666Mb/s
<p>Advanced Security, Safety, and Reliability Dedicated engines for a secure and reliable platform</p>	<ul style="list-style-type: none"> > Configuration Security Unit for anti-tamper and lockdown > Support for 4096-bit RSA keys with SHA3 hash functions > Secure system boot with AES 256 decryption > Full Arm TrustZone support > Multiple power domains with granular gating control > Platform Management Unit for power, safety, and reliability

DEFENSE-GRADE ULTRASCALE ARCHITECTURE FAMILIES



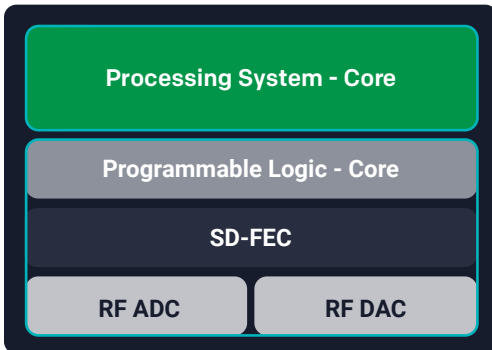
XQ UltraScale Architecture FPGAs (Programmable Logic)

Core architecture leveraged across devices, spanning FPGAs, MPSoCs, and RFSocS. Monolithic FPGAs available in Kintex and Virtex.



XQ Zynq UltraScale+ MPSoCs

Combines a feature-rich core processing system, GPU, programmable logic, and optional video codec, in a monolithic device.



XQ Zynq UltraScale+ RFSocS

Includes core processing system, programmable logic, multi-GSPS RF ADCs & DACs, and SD-FEC engines, in a monolithic device.



XQ UltraScale Architecture SSIT FPGAs

Incorporates multiple programmable logic/FPGA slices, increasing compute density and bandwidth. SSIT offering spans Virtex and Kintex FPGAs.



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