

# XQR Versal™ for Space 2.0 Applications

## SPACE-GRADE VERSAL ADAPTIVE SOC

The Space-Grade (XQR) Versal device is a continuation of AMD's full radiation tolerant, ultra-high throughput, machine learning capable and bandwidth performance offering of reconfigurable devices for satellite and space applications. Built on the Versal platform, this family includes Versal devices with flexible and dynamically reconfigurable high-performance AI/ML compute engines, DSP engines, programmable logic, 32Gb/s transceivers, dual-core Arm® Cortex-A72 and dual-core Arm Cortex-R5 embedded processors.

The XQR Versal is targeted for on board processing payload applications with a dramatic increase in compute density for vector-based algorithms, system logic cells, on-board SRAM and multi-gigabit transceivers as compared to the previous space devices. The devices will offer a processing sub-system, hardened peripherals and a platform controller facilitating true unlimited on-orbit reconfiguration and SEU mitigation.

Building on AMD's space heritage and highly successful 20nm and 65nm space-grade devices, the launch of the next generation of space devices advances the space industry by multiple process node generations setting a new benchmark for reconfigurable solutions in space.

### 7nm Adaptable SoC for Space Applications

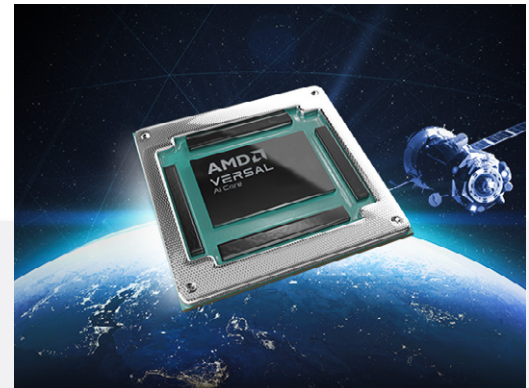
- > Versal AI Core and AI Edge family members with Scalar, Intelligent and Adaptable Engines (ARM CPUs, AI Engines & Prog. Logic)
- > Innovative silicon design for SEU mitigation
- > No SEL & Meets TID needs for LEO environments
- > True on-orbit reconfiguration with unlimited programming cycles

### Ruggedized Organic Packaging

- > Lidless, ruggedized package with stiffener ring for added thermal mitigation capabilities
- > Footprint compatible with commercial packages
- > AI Core 45mm x 45mm, AI Edge TBD

### Production Space Test Flow

- > MIL-PRF-38535 QML Class B Flow Screened for Organic Substrates
- > Designed for Space 2.0 Applications - 5 to 7 Year Mission Duration



## AMD IN SPACE 2.0 APPLICATIONS

- > ML/AI
- > Cloud & Object Detection
- > Broadband Internet
- > High-Speed Networks
- > Hyperspectral Camera
- > Synthetic Aperture Radar
- > GPS
- > Instrumentation

## KEY TAKEAWAYS

- > Industry's first 7nm Radiation Tolerant Adaptive SoC targeted for Broadband and Constellation Satellite Applications
- > True unlimited on-orbit reconfiguration to enable "Upgrade-on-the-Fly" capability
- > No external scrubber required. XiSEM meets LEO SEU mitigation requirements
- > Complete solution to "process and analyze" for real-time on-board processing needs including machine learning and artificial intelligence

## SCALAR ENGINES

The Scalar Engines are built from the dual-core Arm® Cortex-A72, providing a 2X increase in per-core single-threaded performance compared to AMD's previous-generation Arm Cortex-A53 core. A combination of advanced architecture and power improvements from the 7nm FinFET process yield a 2X improvement in DMIPs/watt over the earlier 16nm implementation. The ASIL-C certified(1) UltraScale+™ Cortex-R5F Scalar Engines migrate forward to 7nm with additional system-level safety features based on learning from AMD's current automotive volume deployments.

## ADAPTABLE ENGINES

The Adaptable Engines are made up of programmable logic and memory cells connected with the next generation of the industry's fastest programmable logic. In addition to supporting legacy designs, these structures can be reprogrammed to form memory hierarchies customized to a particular compute task. This allows AMD's Intelligent Engines to achieve a much higher cycle efficiency and a much higher memory bandwidth per unit compute than the latest GPUs and CPUs. This is key to optimizing for latency and power at the edge and for optimizing for absolute performance in the core.

## INTELLIGENT ENGINES

The Intelligent Engines are an array of innovative very long instruction word (VLIW) and single instruction, multiple data (SIMD) processing engines and memories, all interconnected with 100s of terabits per second of interconnect and memory bandwidth. These permit 5X-10X performance improvement for machine learning and digital signal processing (DSP) applications.



### AMD Space Offering

- > Versal – XQRV for Space 2.0 Applications
- > Zynq™ UltraScale+™ – XQ Ruggedized for proton environments
- > RT Kintex™ UltraScale™ – XQRKU060
- > Virtex™-5QV – XQR5V
- > Virtex™-4QV – XQR4V

### Longstanding Heritage

- > Iridium Next
- > NovaSAR
- > SpaceCube 3.0
- > Next-Gen OPIR
- > Mars Perseverance
- > Many more
- > 20+ Years of Heritage

## TAKE THE NEXT STEPS

Check out all Space-grade offerings from AMD on the web  
[www.xilinx.com/applications/aerospace-and-defense/space](http://www.xilinx.com/applications/aerospace-and-defense/space)

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