7-SERIES DEFENSE-GRADE FPGAS

ALL PROGRAMMABLE DEFENSE-GRADE DEVICES
WITH HIGH PERFORMANCE, LOW POWER,
AND 4TH GENERATION SECURITY

AEROSPACE AND DEFENSE

Xilinx Solutions Highlights

- Industry's first 28nm defense-grade portfolio, with high performance, low power and maximum integration
- Off-the-shelf availability, and pin compatibility with commercial-grade devices
- 4th-generation Information Assurance and Anti-Tamper technology with fail-safe heritage
- Ruggedized, full compliance with MIL-PRF-38535 Pb content standards and anti-counterfeiting features
- Full range extended temperature tested
- Long-term availability

Xilinx 7-Series Defense-Grade FPGAs

- Artix-7Q
- Kintex-7Q
- Virtex-7Q

Defense-Grade 7-Series FPGAs: Ruggedized All Programmable Devices

Increasingly complex defense systems must meet stringent, secure design requirements without exceeding budgets, and developers must design systems with decades-long life-spans. Without restricting designers' choices, Xilinx® Defense-grade 7-Series FPGAs provide a broad portfolio of ruggedized, off-the-shelf devices that reduce risk and deployment time with high levels of integration, high performance, high capacity, and built-in fail-safe Information Assurance (IA) and Anti-Tamper (AT) technology. Built on the industry's first 28nm HPL process technology, 7-Series FPGAs enable design consolidation into fewer chips or a single device with reduced power consumption.

Besides reducing BOM cost, the Xilinx Defense-grade portfolio of FPGAs helps project teams stay on schedule, with programmable logic and an extensive IP portfolio that significantly reduces development work and minimizes design cycles. The flexible platforms and on-chip logic are especially critical for addressing security mandates and other integration-sensitive requirements that are often moving targets for system designers.

With pin-compatibility to their commercial counterparts, the Artix®-7Q, Kintex®-7Q, and Virtex®-7Q families enable defense designers to start and migrate to the best-suited defense-grade device when extended temperature range or harsh environmental operation is required.

Meeting Military Standards: Reliability & Security

A long history of partnering with military agencies and the defense industry has resulted in Xilinx 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 Xilinx 7-Series Defense-grade devices for the rigorous demands of the most sensitive defense-related designs. Having evolved over four generations of devices, Xilinx's fail-safe heritage in IA methodology and AT technology are backed by support from a dedicated team of security application experts.

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Take the NEXT STEP

For more information about Defense-grade 7 Series FPGAs and other All Programmable solutions from Xilinx, please visit www.xilinx.com/aerospace.

Full Range Extended Temperature Testing

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

- Military: –55°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. Xilinx tests 100% of all die at wafer sort and 100% of all devices at Final Production testing. Xilinx 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. Xilinx 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 Xilinx 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

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

Xilinx 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.

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 Kintex-7, Virtex-7, Artix-7 FPGAs and Zynq-7000 All Programmable 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

Xilinx 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.

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