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QPRO High-Reliability QML Certified and Radiation Hardened Products for Aerospace and Defense Applications

The High-Reliability Programmable Logic Leader

Xilinx is the leading supplier of High-Reliability programmable logic devices to the aerospace and defense markets. These devices are used in a wide range of applications such as electronic warfare, missile guidance and targeting, RADAR, SONAR, communications, signal processing, avionics and satellites. The Xilinx QPRO™ family of ceramic and plastic QML products (Qualified Manufacturers Listing), certified to MIL-PRF-38585, provide system designers with advanced programmable logic solutions for next generation designs. The QPRO family also includes select products that are radiation hardened for use in satellite and other space applications.

The Xilinx QPRO family addresses the issues that are critical to the aerospace and defense market:

- **Q**ML/Best commercial practices. Commercial manufacturing strengths result in more efficient process flows.
- **P**erformance-based solutions, including cost-effective plastic packages.
- **R**eliability of supply. Controlled mask sets and processes insure the same quality devices, every time, without variation, which remain in production for an extended time.
- **O**ff-the-shelf ASIC solutions. Standard devices readily available, no need for custom logic and gate arrays.

Table 1: **High-Density High-Performance and Radiation-Hardened Products**

Family	Devices	Features
XC/XQ4000/E/EX	XC4005/E XC4010/E XC4013/E XC4025E XQ4028EX	• 5,000-28,000+ gates • Up to 256 user-definable I/Os • Extensive system features include on-chip user RAM, built-in 1149.1 test support and fast carry logic
XQ4000XL	XQ4013XL XQ4036XL XQ4062XL XQ4085XL	• Up to 180,000 system gates • 3.3V, 5V-compatible I/O
XQR4000XL Radiation Hardened	XQR4013XL XQR4036XL XQR4062XL	• Up to 130,000 system gates • 60K-Rads total dose, latchup immune
Virtex	XQV100 XQV300 XQV600 XQV1000	• Up to 1,000,000 system gates, 2.5V
Virtex Radiation Hardened	XQVR300 XQVR600 XQVR1000	• 100K-Rads total dose, latchup immune

Unmatched Product Offering

The QPRO family provides a wide variety of devices, delivering the industry's fastest and biggest devices. The Virtex members of the QPRO family offers FPGAs with densities greater than 1,000,000 system gates, and even larger devices planned for the future. This broad range of devices is available in a wide variety of speed and package options. Both military temperature and full QML/SMD versions are available as standard off-the-shelf products. Select software cores, such as complete PowerPC peripherals, is also available.

Products for Space Applications

Xilinx offers the industry's only radiation hardened reconfigurable FPGAs for satellite and space. These devices are manufactured using an epitaxial wafer process, and have guaranteed total dose, latch up immunity, and low soft upset rates. These products allow for the ultimate in design and mission flexibility in a cost-effective manner.

QML Certification Part of Overall Quality Platform

Being certified to MIL-PRF-38535 QML complemented by ISO-9000 certification results in an overall product quality platform that makes Xilinx a world-class supplier of programmable logic devices. Designers can confidently design with Xilinx for High-Reliability systems with the knowledge they are getting unsurpassed quality and reliability, and long-term commitment to the aerospace and defense market.

Commitment to the Aerospace and Defense Market

Xilinx understands that our customers need to be able to count on their suppliers to be around for the long-term. Xilinx is committed to the long-term support of the aerospace and defense market, and we are continually expanding our product portfolio. Because our focus is in the form of a vertical market concept, we are able to provide emphasis on all of our customer's product requirements.

Software and Core Support for Xilinx QPRO High-Reliability Products

Component Selection

The Alliance™ and Foundation™ Series Xilinx core implementation software tool suites do not differentiate between Commercial, Industrial, and Military grade components. From the perspective of the implementation tools these are identical devices with identical architectures and available programming features. Therefore, there is no designation for QPRO or Radiation-Hardened devices in the available device selection menus. However, the High-Reliability product offering does typically include extended package selections to include available ceramic packages.

To select a Hi-Rel device for implementation the user should specify the commercial equivalent along with the specific package selection. Table 2 shows an example of Hi-Rel components and the corresponding device selections that should be specified in the software.

Table 2: **Hi-Rel Device Selections**

Target Device	Device Selection
XQVR1000 CG560-4	XCV1000 CG560-4
XQV300 CB228-4M	XCV300 CB228-4
XQ4085XL HQ240-1N(1)	XC4085XLA HQ240-1
XQR4062XL CB228-3	XC4062XL CB228-3

Notes:

1. The XQ4085XL is the only XQ4000XL series device that uses an XLA rather than XL designation.

Speed Grades

When making a device selection in the implementation tools, always select a speed grade that corresponds to the specific target device. In other words, a “-4” speed grade is still a “-4” regardless of whether it is a Commercial, Industrial, or Military grade part.

The AC characteristics and guaranteed timing specifications for a given device are specified per a specific speed grade. However, these parameters do not vary per product grade (i.e., Commercial, Industrial, Military, or other). Therefore, a Commercial grade device (C) of a particular speed grade will have identical guaranteed worst case timing specifications as the Industrial or Military version (I, M, B, or N) of the same part and same speed grade. However, this is not the case for best case or minimum delay timing specifications.

Xilinx devices are assigned a speed grade based on the whether or not the device can pass all the guaranteed worst case timing (maximum delays) for that speed grade. A device that does not pass all AC parametric tests for the fastest speed grade classification may test successfully for a slower speed grade classification and subsequently be assigned that grade. Therefore, a faster device may be categorized to a slower speed grade as long as there aren’t any associated guaranteed minimum timing delay specifications, or the part successfully meets such specifications.

Industrial and Military grade devices are tested at a greater junction temperature range than Commercial grade devices. The commercial range for junction temperature is 0°C to +85°C. The industrial temperature range –40°C to +100°C, and the military range is –55°C to +125°C. The military version of a specific device must meet the same timing specifications at +125°C as the corresponding commercial version at +85°C (for a specific speed grade). For example, a device that meets all timing specifications for a -6 speed grade at +85°C may only meet the timing specifications for a -4 speed grade when tested at +125°C. Therefore, the commercial grade devices will typically have an extended speed grade offering over the availability of devices tested at extended temperature ranges.

Core and IP Support

Cores and IP modules developed for Commercial grade Xilinx devices may also be implemented in Industrial and Military grade as well as Radiation Hardened devices. Device architectures do vary across product grades. However, some cores may have been characterized for speed grades that are unavailable in the extended temperature ranges. Additionally, some cores, such as the Xilinx PCI Core Solution, have been characterized for required minimum timing specifications. In such a case if the Core or IP module has not been specifically characterized for the extended temperature range then it may not be guaranteed to operate over the full temperature range of the device. However, such a core would operate successfully within the temperature range for which it was characterized.

Standard Microcircuit Drawing (SMD) Cross Reference

XC1700 Products (Serial PROMS)

SMD Number	XC1700 Products (Serial PROMS)	Speed	Package	Mark Loc
5962-9471701MPA	XC1765DDD8B		DD8	TOP
5962-9561701MPA	XC17256DDD8B		DD8	TOP
5962-9951401QXA	XQ1701LS020N		SO20	TOP
5962-9951401QYA	XQ1701LCC44B		CC44	TOP

XC3000 Products(1,2)

SMD Number	Equivalent "B" Grade P/N	Speed	Package	Mark Loc
5962-8994803MXC	XC3020-100PG84B	-100	PG84	TOP
5962-8994803MNC	XC3020-100CB100B	-100	CB100	BASE
5962-8994803MMC	XC3020-100CB100B	-100	CB100	LID
5962-8971303MXC	XC3042-100PG84B	-100	PG84	TOP
5962-8971303MZC	XC3042-100PG132B	-100	PG132	TOP
5962-8971303M9C	XC3042-100CB100B	-100	CB100	BASE
5962-8971303MMC	XC3042-100CB100B	-100	CB100	LID
5962-8982303MXC	XC3090-100PG175B	-100	PG175	TOP
5962-8982303MZC	XC3090-100CB164B	-100	CB164	BASE
5962-8982303MTC	XC3090-100CB164B	-100	CB164	LID

Notes:
1. All devices listed also available as military temperature only.
2. **Do not use for new designs.**

XC4000 Products(1,2)

SMD Number	Equivalent "B" Grade P/N	Speed	Package	Mark Loc
5962-9225203MXC	XC4005-5PG156B	-5	PG156	TOP
5962-9225203MYC	XC4005-5CB164B	-5	CB164	LID
5962-9225203MZC	XC4005-5CB164B	-5	CB164	BASE
5962-9230503MXC	XC4010-5PG191B	-5	PG191	TOP
5962-9230503MYC	XC4010-5CB196B	-5	CB196	BASE
5962-9230503MZC	XC4010-5CB196B	-5	CB196	LID
5962-9473002MYC	XC4013-6CB228B[2]	-6	CB228	BASE
5962-9473002MZC	XC4013-6CB228B	-6	CB228	LID
5962-9473002MXC	XC4013-6PG223B	-6	PG223	TOP

Notes:
1. All devices listed also available as military temperature only.
2. **Do not use for new designs.**

XC4000E Products[1,2]

SMD Number	Equivalent "B" Grade P/N	Speed	Package	Mark Loc
5962-9752201QXC	XC4005E-4PG156B	-4	PG156	TOP
5962-9752201QYC	XC4005E-4CB164B	-4	CB164	BASE
5962-9752201QZC	XC4005E-4CB164B	-4	CB164	LID
5962-9752301QXC	XC4010E-4PG191B	-4	PG191	TOP
5962-9752301QYC	XC4010E-4CB164B	-4	CB196	BASE
5962-9752301QZC	XC4010E-4CB164B	-4	CB196	LID
5962-9752401QXC	XC4013E-4PG223B	-4	PG223	TOP
5962-9752401QYC	XC4013E-4CB228B	-4	CB228	BASE
5962-9752401QZC	XC4013E-4CB228B	-4	CB228	LID
5962-9752501QXC	XC4025E-4PG299B	-4	PG299	TOP
5962-9752501QYC	XC4025E-4CB228B	-4	CB228	BASE
5962-9752501QZC	XC4025E-4CB228B	-4	CB228	LID

Notes:
1. All devices listed also available as military temperature only as "XQ" products.
2. XC4010E/XC4013E are also available in plastic as "XQ" products, to -3 speed grade.

XQ4000EX Products[1]

SMD Number	Equivalent "B" Grade P/N	Speed	Package	Mark Loc
5962-985901NTB	XQ4028EX-4HQ240N[2]	-4	HG240	TOP
5962-985901NUA	XQ4028EX-4BG352N[2]	-4	BG352	TOP
5962-985901QXC	XQ4028EX-4PG299B	-4	PG299	TOP
5962-985901QYC	XQ4028EX-4CB228B	-4	CB228	BASE
5962-985901QZC	XQ4028EX-4CB228B	-4	CB228	LID

Notes:
1. All devices listed also available as military temperature only.
2. Plastic package.

XQ4000XL[1]

SMD Number	Equivalent "B" Grade P/N	Speed	Package	Mark Loc
5962-9851301NTB	XQ4013XL-3PQ240N[2]	-3	PG240	TOP
5962-9851301NUA	XQ4013XL-3BG256B[2]	-3	BG256	TOP
5962-9851301QXC	XQ4013XL-3PG223B	-3	PG223	TOP
5962-9851301QYC	XQ4013XL-3CB228B	-3	CB228	BASE
5962-9851301QZC	XQ4013XL-3CB228B	-3	CB288	LID
5962-9851001NTB	XQ4036XL-3HQ240N[2]	-3	HQ240	TOP
5962-9851001NUA	XQ4036XL-3BG352N[2]	-3	BG352	TOP
5962-9851001QXC	XQ4036XL-3PG411B	-3	PG411	TOP
5962-9851001QYC	XQ4036XL-3CB228B	-3	PG228	BASE
5962-9851001QZC	XQ4036XL-3CB228B	-3	CB228	LID
5962-9851101NTB	XQ4062XL-3HQ240N[2]	-3	HQ240	TOP
5962-9851101NUA	XQ4062XL-3BG432N[2]	-3	BG432	TOP
5962-9851101QXC	XQ4062XL-3PG475B	-3	PG475	TOP
5962-9851101QYC	XQ4062XL-3CB228B	-3	CB228	BASE
5962-9851101QZC	XQ4062XL-3CB228B	-3	CB228	LID

Notes:
1. All devices listed also available as military temperature only.
2. Plastic Package

Revision Control

The following table shows the revision history for this document.

Date	Version	Description
01/01/98	1.1	High-Reliability and QML Military Products, correct erroneous information page 2 "XC3000 Products", delete last page, table - "Mil-PRF-3853 QML, Xilinx M Grade and Plastic Commercial Flows"
11/01/98	1.2	Added new products, corrected XC3000, XC4000 products.
02/02/00	2.0	Updated Introduction and product listing.
06/15/00	2.1	Updated product listing and added "Software and Core Support for Xilinx QPRO High-Reliability Products".