

LEADING THE CHARGE IN AEROSPACE & DEFENSE FOR 20 YEARS





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The demanding requirements and environments under which mission-critical defense and aerospace electronics must operate place unprecedented challenges on semiconductor suppliers. Programmable platforms combine the time-to-market and cost advantages of off-the-shelf solutions with the functionality of custom solutions.

As the world's leading programmable logic supplier and trusted aerospace and defense (A&D) partner, Xilinx offers the broadest portfolio of COTS (Commercial-Off-the-Shelf) solutions with a migration path to defense—and space-grade field programmable gate arrays (FPGAs). Xilinx FPGAs are built on a foundation of proven, advanced process technology and surrounded by an extensive development ecosystem. Xilinx FPGAs provide advanced built-in features such as embedded processing, digital signal processing (DSP), and

high-speed connectivity that enable developers to replace and integrate multiple ASIC and ASSP devices in a single programmable device. Xilinx solutions reduce system size, weight, power and cost (SWAP-C), while at the same time offer FPGAs that adapt to the ever-changing mission requirements of modern A&D systems.

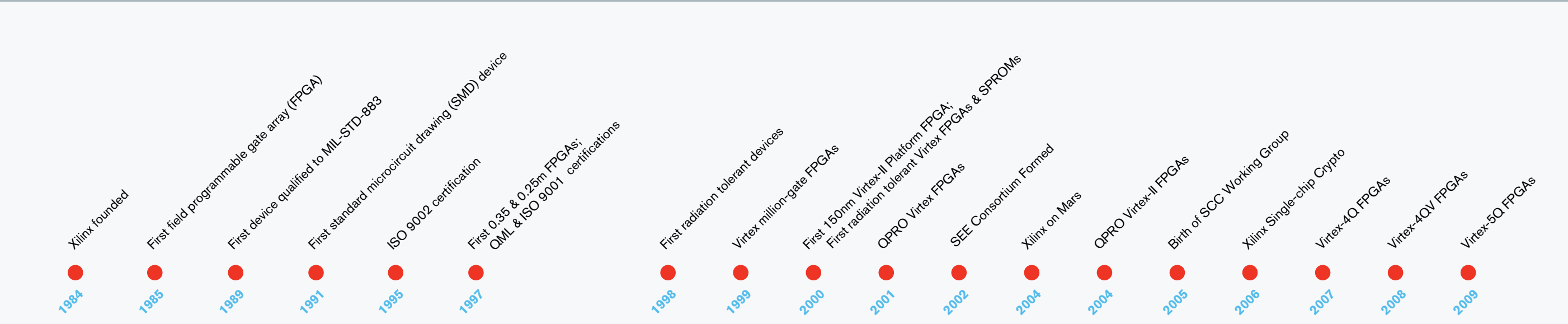
Xilinx FPGAs are delivered with Xilinx targeted design platforms that enable rapid deployment across the full spectrum of A&D applications.

Xilinx A&D solutions are backed by an in-depth knowledge of the market, proven track record of technology leadership, and development partnerships with key suppliers and government agencies. A complete range of services from design feasibility to full turn-key system design enable Xilinx A&D customers to choose an implementation model that best suits their needs.

### Unwavering Commitment to the Market

- FIRST TO MARKET IN 1989 WITH QUALIFIED DEFENSE-GRADE FPGA SOLUTION (MIL-STD-883)
- LEGACY OF SERVICE AND SUPPORT TO THE A&D INDUSTRY FOR MORE THAN TWO DECADES
- TRACK RECORD OF DELIVERING SOLUTIONS TO MAJOR DEFENSE CONTRACTORS AND GOVERNMENTAL BODIES WORLDWIDE

AVIONICS  
ELECTRONIC WARFARE  
HIGH PERFORMANCE COMPUTING  
MILCOM  
MILSATCOM  
MISSILES & MUNITIONS  
RADAR  
SECURE COMMUNICATIONS  
SIGNAL INTELLIGENCE  
SPACE





## MISSION-CRITICAL DEFENSE APPLICATIONS

Xilinx understands the relentless push in today's rapidly changing global environment to create increasingly complex electronics systems with shorter design cycles.

The Xilinx A&D offering includes a full range of off-the-shelf, reprogrammable commercial and defense-grade devices; along with application-specific tools, IP, and boards that give developers the ability to productize new capabilities or upgrade existing hardware. The net result is reduction of risk in all aspects of the defense product lifecycle.

### Supporting a Broad Range of Defense Applications

- Avionics/Aircraft/Unmanned Aerial Vehicles (UAV)
- C4ISR systems (Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance)
- Electronic warfare
- Extreme form factor (bare die)
- Missiles and munitions
- Radar and sonar

### Largest Portfolio of Defense-Grade FPGAs

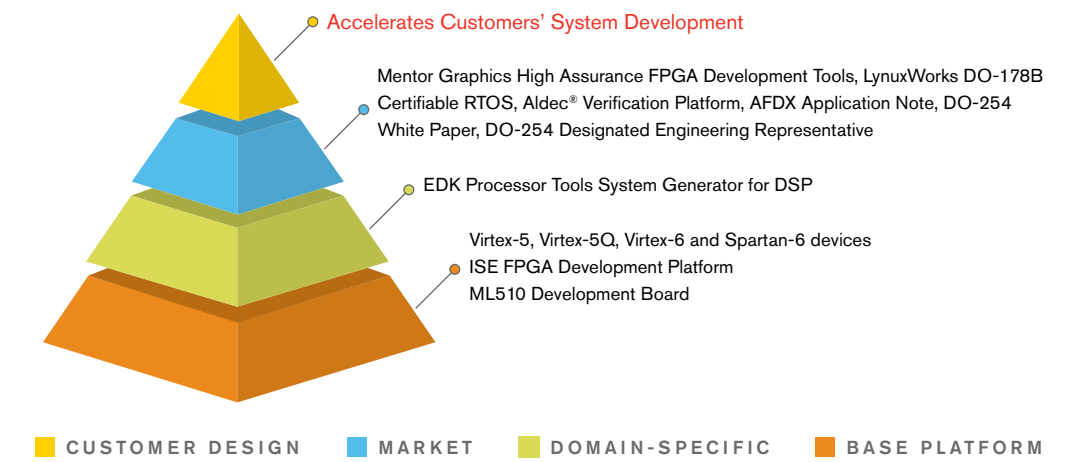
- Domain-specific FPGA sub-families for logic, processing (embedded processing) and DSP
- Highest performance and integration capabilities
- Pin-compatible migration path from commercial grade
- Product Stability
- Fully qualified, characterized extended temperature product offerings
- Packaging variants including ruggedized plastic
- Tin-whiskering mitigation and solvent cleaning processes protection
- QML-certified product offerings and manufacturing flows

### ➤ The Programmable Imperative

Dramatic shifts in the economic and technical landscape have created a need for more flexible, cost-effective approaches to developing and manufacturing electronic systems.

Xilinx targeted design platforms provide the optimum in flexibility, accessibility, applicability, and time to market.

### TARGETED DESIGN PLATFORM ROADMAP FOR AVIONICS APPLICATIONS



### Base Platform

- Commercial grade silicon for COTS requirements
- Defense-grade devices for high stress operational environments
- Flexibility to move between commercial and defense-grade platforms
- Base-level IP, tools, and boards

### Market-Specific Platform

- Ruggedized packaging for harsh environments
- Market-specific IP based on use qualification
- High assurance design U.S. RTCA/DO-254 and EUROCAE/ED-80 standards

### Domain-Specific Platform

- DSP and processing (embedded processing-optimized) silicon
- Dedicated boards for quick prototyping
- Integrated design environment for quick design validation to move beyond the concept stage
- Domain-specific intellectual property (IP)





## THE FUTURE IS SECURE

One of the most critical challenges A&D product developers face is balancing the complex and high security requirements put forth by key agencies with the needs of sophisticated products for this market.

Leveraging the capabilities of its market-leading Virtex® FPGAs, Xilinx developed the first **single-chip cryptography (SCC)** methodology in collaboration with government agencies to enable reductions in SWAP-C through higher levels of integration. SCC allows functionality addressing strict security and reliability requirements that were previously implemented in multiple FPGAs to be implemented in a single FPGA.

### Xilinx Single-chip Crypto: The world's first and only cryptography in a single FPGA

#### The Challenge

- The highest levels of integration
- Type 1 and Type 2 cryptography
- Red (plain text) and black (cipher text) in one FPGA
- Secure communications with multiple independent levels of security (MILS)

#### The Solution

- On-chip channel isolation provides multiple-channel, red and black in a single FPGA

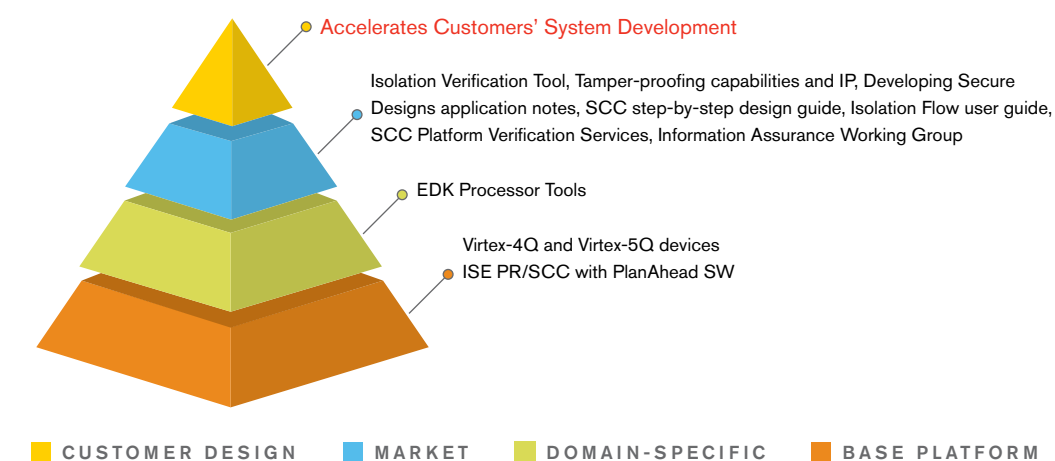
- Tamper-proof capabilities such as bitstream encryption
- Switching encryption algorithms and radio waveforms during service

#### The Benefits

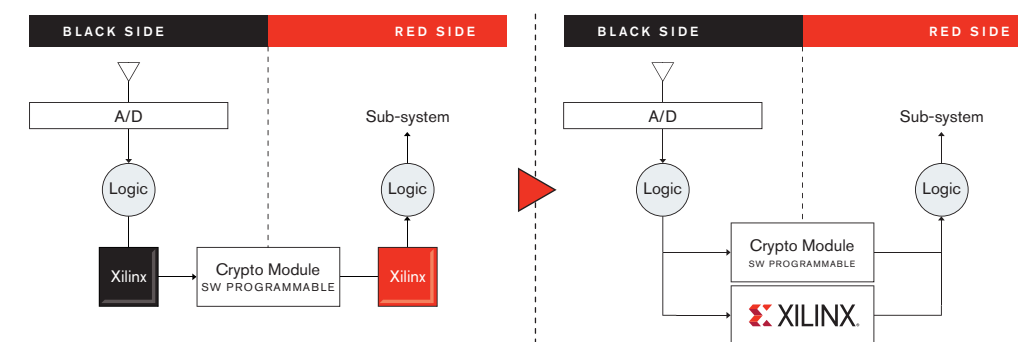
- Minimal program risk due to pre-tested design platform
- Minimal mission risk due to flexibility of FPGA to change even while in-service
- Reduced size, weight and power due to single-chip integration of crypto functions
- Available products: Virtex-4Q and Virtex-5Q FPGAs
- Authenticity assurances for parts

➤ The industry's most integrated and only reprogrammable Type-1 and Type-2 single-chip cryptography solution available today.

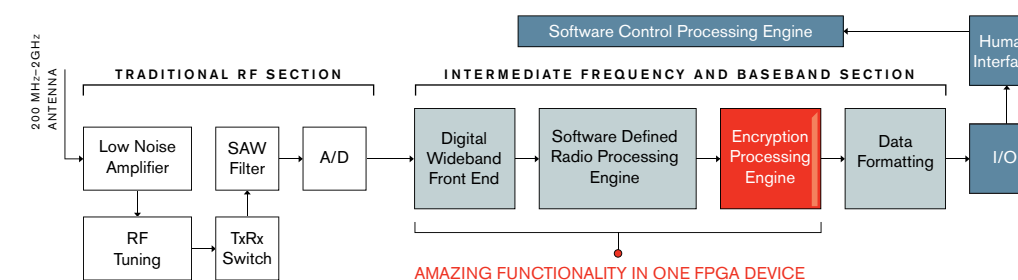
## TARGETED DESIGN PLATFORM FOR SECURE COMMUNICATIONS



## SINGLE-CHIP CRYPTOGRAPHY



## SECURE RADIO



## FAILURE IS NOT AN OPTION IN SPACE

New missions, from satellites to exploration of the outer reaches of deep space, will traverse some of the harshest environments.

Xilinx radiation-tolerant FPGAs are robust, designed, packaged and space-grade qualified to meet the performance, reliability and lifecycle demands of extreme environments, while enabling shorter design times, lower cost, and greater flexibility than feasible with traditional ASIC implementations.

### The Benefit of Xilinx FPGAs in Space

- Time to market—"2 years off critical path" \*
- No mask re-spin risk
- No non-recurring engineering charges
- Better performance per watt than competing solutions
- High integration—"We combined 3 boards into one" \*

\* Xilinx customer quote

### Meeting the Radiation Requirements of Space

- Radiation-tolerant FPGAs
- Guaranteed total ionizing dose (TID) up to 300 krad(Si)
- Industry collaboration for single-event effects (SEE) testing
- Single event latchup (SEL) immunity

### Long Mission Life through Quality and Reliability

- MIL-PRF-38535 QML-Q Certified, QML-V Certification pending
- High pin count, advanced packaging ceramic column grid array technologies
- Quality and reliability, radiation results, device qualification documentation, and "how to" application notes

### Advanced Electronic Design

- Low cost prototyping with commercial grade devices
- SEE Mitigation Techniques and development productivity tools like automated triple-modular redundancy (TMRTool)
- Applications and radiation testing in collaboration with the Xilinx Radiation Test Consortium (XRTC)

➤ Xilinx is the only PLD supplier to offer reprogrammable space-grade FPGAs with commercial prototyping and the logic capacity, performance, and advanced silicon features to enable payload applications.

### HIGHEST PERFORMANCE, LARGEST CAPACITY FPGAS FOR SPACE



Virtex-4QV FPGAs are a pin-compatible member of the world's first 90nm family fabricated in 1.2V, triple-oxide process technology

### Reprogrammable FPGAs for Space

- Industry's only reprogrammable radiation-tolerant FPGAs in full production
- Space-qualified packages including ceramic quad flat packs and column grid arrays
- Full reliability, radiation data and reports available

### Backed by Industry Standard Services

- Xilinx Design Services available to assist at any stage of project planning and execution
- Factory and field application support
- On-site ITAR-compliant Titanium dedicated engineering services

### Full Range of Hard and Soft Processing Capabilities

- Dual PowerPC® processor blocks
- MicroBlaze™ soft processor cores
- Configuration memory error-correction IP
- TMRTool for automated triple modular redundancy
- DSP acceleration engines and IP libraries

## XILINX A&D FPGAs

As a leader in supporting COTS requirements, Xilinx enables the use of commercial grade devices to reduce costs, development time, and risks.

➤ Seamless migration from commercial-grade to defense and space-grade devices.

In addition to commercial grade offerings, Xilinx offers the industry's highest performance, largest capacity defense and space-grade FPGAs.

### VIRTEX



#### Virtex Family of FPGAs: Highest Performance with Ultimate System Integration

- BUILT-IN EMBEDDED PROCESSOR CORES
- MULTI-GIGABIT SERIAL TRANSCEIVERS
- HARD-CODED ETHERNET MAC AND PCIE® ENDPOINT BLOCKS
- HIGH PERFORMANCE DSP ACCELERATION ENGINES
- MEGABITS OF EMBEDDED RAM, CLOCK MANAGEMENT CIRCUITS WITH PLLS, AND MORE

### SPARTAN



#### Spartan® Family of FPGAs: Low Power and Small Form Factors

- OPTIMIZED FOR LOW STATIC AND DYNAMIC POWER
- SOPHISTICATED POWER MANAGEMENT MODES INCLUDING HIBERNATE AND SUSPEND FOR MOBILE AND BATTERY POWERED APPLICATIONS
- HIGH LEVELS OF COMPONENT INTEGRATION, INCLUDING EMBEDDED PCIE AND MEMORY INTERFACES

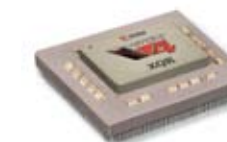
### DEFENSE-GRADE



#### Defense-grade FPGAs

- ONE HUNDRED PERCENT PIN COMPATIBLE TO THEIR COMMERCIAL EQUIVALENT FOR SEAMLESS MIGRATION BETWEEN PROTOTYPING AND LOW RATE INITIAL PRODUCTION (LRIP)
- EXTREME OPERATING TEMPERATURE RANGE—INDUSTRIAL-TEMP (-40 TO + 100°C) AND MILITARY-TEMP (-55 TO + 125°C)
- RUGGEDIZED PLASTIC PACKAGING—STANDARD LEAD CONTENT ELIMINATES TIN-WHISKERING CONCERNS AND PROTECTS AGAINST CAUSTIC PROCESSES
- PRODUCT SPECIFICATIONS AND FUNCTIONALITY STABILITY
- OFF-THE-SHELF—PREQUALIFIED AND READY TO ORDER

### SPACE-GRADE



#### Space-grade FPGAs

- RADIATION TOLERANCE—RESISTANT TO SINGLE EVENT UPSET (SEU) AND LATCH-UP (SEL)
- GROUP TESTING—MEETS STRICT GUIDELINES SETUP BY THE DEFENSE SUPPLY CENTER COLUMBUS (DSCC)
- CERAMIC PACKAGING—EXTREME ENVIRONMENTAL PROTECTION

# BOARDS AND KITS

## Off-the-Shelf Prototyping

DOMAIN-SPECIFIC, FULL FEATURED EASY TO USE BOARDS AND STARTER KITS THAT ADDRESS UNIQUE MISSION-CRITICAL SYSTEM REQUIREMENTS

### Boards



**Virtex-5 FXT FPGA ML510 Embedded Development Platform**  
Xilinx device: XC5VFX130T-FFG1738t

- Implement Dual PowerPC 440 processors with FPGA fabric and I/O capabilities
- High-speed RocketIO™ Multi-Gigabit transceivers
- Two on-board 10/100/1000 Ethernet PHYs
- Two PCI Express downstream connectors

Logic DSP Embedded Connectivity

Logic	DSP	Embedded	Connectivity
		●	●



**Virtex-5 FXT FPGA ML507 Evaluation Platform**  
Xilinx device: XC5VFX70TFFG1136

- Develop high speed serial and embedded designs
- Virtex-5 RocketIO GTX transceivers
- PowerPC440 processor

Logic DSP Embedded Connectivity

Logic	DSP	Embedded	Connectivity
		●	●



**Virtex-5 LX FPGA ML501 Evaluation Platform**  
Xilinx device: XC5VLX50FFG676

- Develop feature-rich, low-cost evaluation/development platform

Logic	DSP	Embedded	Connectivity
●			



**Virtex-5 FPGA Development Board for PCI Express Gen 1 & 2 and Embedded Processing**  
Xilinx devices: XC5VFX100T, XC5VFX70T, XC5VLX110T, and XC5VSX95T

- Create and evaluate designs using PCI Express Gen 1 & 2, and DDR3
- PowerPC 440 embedded processor
- Data-rate-adjustable RocketIO GTX transceivers
- Single-ended and LVDS connections

Logic	DSP	Embedded	Connectivity
		●	●



**Virtex-5 LXT FPGA ML505 Evaluation Platform**  
Xilinx device: XC5VLX50TFF1136

- General purpose evaluation and development platform
- Includes on-board memory and industry standard connectivity interfaces

Logic	DSP	Embedded	Connectivity
●		●	



**Virtex-5 LXT FPGA ML521 RocketIO Characterization Platform**  
Xilinx device: XC5VX50T-FF665

- Evaluate Virtex-5 LXT FPGA RocketIO GTP Transceivers
- RocketIO GTP Transceivers are accessible via 4 SMA connectors

Logic	DSP	Embedded	Connectivity
			●



**Virtex-5 SXT FPGA ML506 Evaluation Platform**  
Xilinx device: XC5VSX50TFF1136

- Create DSP based and high speed serial designs
- Utilizes Virtex-5 FPGA DSP48E slices and RocketIO GTP transceivers

Logic	DSP	Embedded	Connectivity
	●	●	



**Virtex-5 LXT FPGA ML550 Networking Interface & Power Measurement Platform**  
Xilinx device: XC5VLX50T-FFG1136

- Develop and evaluate networking and source synchronous interfaces
- Preferred for analyzing and demonstrating the power consumption

Logic	DSP	Embedded	Connectivity
			●

### Kits

**The PowerPC and MicroBlaze Development Kit**

- Efficiently develop Virtex-5 PPC 440 & MicroBlaze embedded systems
- Pre-installed and Pre-verified demonstrations and examples to accelerate design cycle

Logic DSP Embedded Connectivity

Logic	DSP	Embedded	Connectivity
		●	●

**Virtex-5 LXT ML555 FPGA Development Kit**

- Rapidly create and evaluate designs using PCI Express, PCI-X, and PCI interfaces
- PCI Express endpoint designs in X1, X2, X4, and X8 configurations
- PCI-X: 64b @ 66/100/133 MHz
- PCI: 32b @ 33/66 MHz, 64b @ 33 MHz

Logic DSP Embedded Connectivity

Logic	DSP	Embedded	Connectivity
			●

**Virtex-5 LXT FPGA Gigabit Ethernet Development Kit**

- Rapidly create and evaluate designs for Ethernet applications
- Supports 10/100 Mbps and 1 Gbps speeds

Logic	DSP	Embedded	Connectivity
		●	

**XtremeDSP™ Development Kit— Virtex-5 FPGA DSP Edition**

- Accelerate DSP intensive applications development
- Comprehensive development kit includes hardware, design tools, IP, and pre-verified reference designs
- Unique combination of design technologies enabling thousands of DSP algorithms

Logic	DSP	Embedded	Connectivity
	●		●

## DESIGN AND DEVELOPMENT TOOLS FOR A&D

Complex A&D systems designs require sophisticated tools to streamline the product development process. Xilinx offers a variety of development tools with superior design and debug capabilities to provide the fastest means of designing, verifying, and deploying programmable solutions for defense and space applications.

### ISE Foundation Software

- ISE® software provides a complete RTL design environment for Xilinx FPGAs
- Easy-to-use, built-in tools and wizards make I/O assignment, power analysis, timing-driven design closure and HDL simulation quick and intuitive

### System Generator for DSP

- Integrated flow from design capture to FPGA hardware implementation
- Facilitates use of the Simulink® modeling and simulation environment
- DSP developers can easily exploit the performance and flexibility of FPGA-based signal processing without learning RTL

### Embedded Design Tools

- Intelligent, platform-aware tools simplify design and accelerate the embedded development process
- Automated wizards walk engineers through the design process to reduce errors and ease learning curves
- Xilinx Embedded Development Kit (EDK) includes: award-winning Platform Studio tool suite as well as all the documentation and IP required to design embedded systems with Xilinx FPGAs and embedded PowerPC and MicroBlaze processor cores

### CORE Generator IP Library

- Xilinx CORE Generator™ system provides a library of user-customizable functions for RTL design flows
- Range in complexity from basic building blocks such as memories and FIFOs to complex system-level building blocks
- Streamlines the design process, improves design quality, and helps designers to finish faster

### Xilinx DSP IP Library

- Blockset IP library delivered with System Generator for DSP suite
- Produce optimized logic for Xilinx programmable devices
- Over 90 DSP building blocks available for the Simulink modeling environment

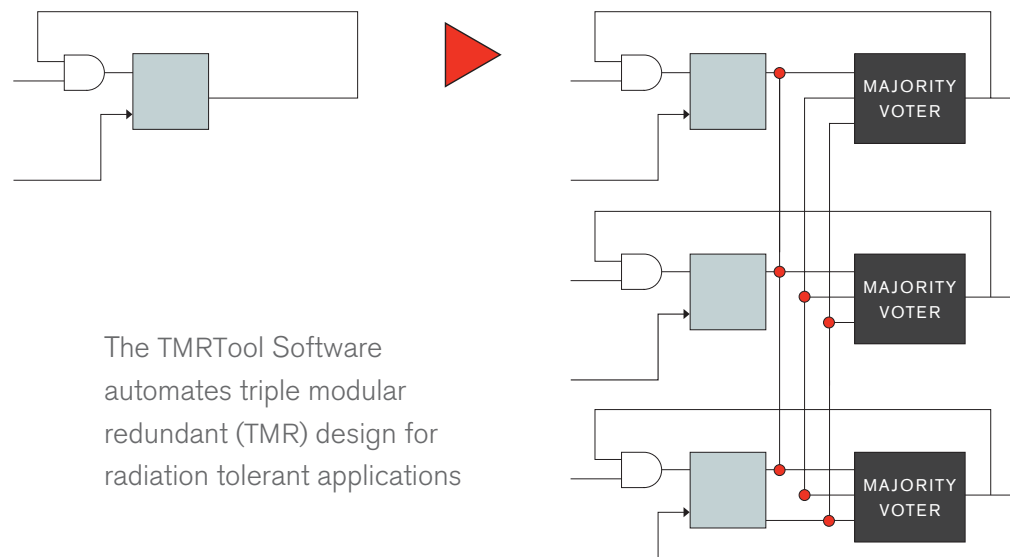
### Xilinx IP Library for Embedded Design

- Pre-verified processor system IP catalog includes a wide variety of processing peripheral cores for customizing embedded systems
- Source drivers are included for all IP components

### Xilinx TMRTool

- Industry's first development tool to automatically generate Triple Module Redundancy (TMR) for reprogrammable FPGAs
- The TMRTool simplifies the process of providing full SEU and SET immunity for high reliability FPGA designs

#### TMRTOOL SOFTWARE AUTOMATIC IMPLEMENTATION OF TRIPLE REDUNDANCY FOR SEU MITIGATION



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Space-Grade FPGAs

	Part Number	Virtex-4QV FPGAs				Virtex-II XQR FPGAs		Virtex XQR FPGAs	
		XQR4VLX200	XQR4VXS55	XQR4VFX60	XQR4VFX140	XQR2V3000	XQR2V6000	XQVR300	XQVR600
	Core Voltage	1.2V	1.2V	1.2V	1.2V	1.5V	1.5V	2.5V	2.5V
Logic Resources	Slices <sup>(1)</sup>	89,088	24,576	25,280	63,168	14,336	33,792	3,072	6,912
	Logic Cells	200,448	55,296	56,880	142,128	32,256	76,032	6,912	15,552
	CLB Flip-Flops	178,176	49,152	50,560	126,336	28,672	67,584	6,144	13,824
Memory Resources	Maximum Distributed RAM (Kbits)	1,392	384	395	987	448	1,056	1,711	3,523
	Block RAM/FIFO w/ECC (18kbits each)	336	320	232	552	96	144	—	—
	Total Block RAM (Kbits)	6,048	5,760	4,176	9,936	1,728	2,592	64	96
Clock Resources	Digital Clock Manager (DCM)	12	8	12	20	12	12	4	4
I/O Resources	Maximum Single-Ended I/Os	960	640	576	896	720	1,104	316	316
	Maximum Differential I/O Pairs	480	320	224	448	360	552	—	—
	Digitally Controlled Impedance	Yes	Yes	Yes	Yes	Yes	Yes	—	—
Embedded Hard IP Resources	DSP Slices	96	512	128	192	—	—	—	—
	18 x 18 Multipliers	—	—	—	—	96	144	—	—
	10/100/1000 Ethernet MAC Blocks	—	—	4	4	—	—	—	—
	PowerPC <sup>®</sup> Processor Blocks	—	—	2	2	—	—	—	—
Miscellaneous	Speed Grades	-10	-10	-10	-10	-4	-4	-4	-4
	Configuration Memory (Mbits)	51.4	22.7	21.0	47.9	10.5	21.9	1.7	3.5
	Manufacturing Grades	V	V	V	V	M,V	H	M,V,B	M,V,B
	Total Ionizing Dose (krad)	300	300	300	300	200	200	100	100
	SEL Immunity (MeV-cm <sup>2</sup> /mg)	>125	>125	>125	>125	>160	>160	>125	>125
	Package <sup>(2)</sup>	Area	Available User I/Os						
CGA Packages (CG): ceramic column grid array (1.27 mm ball spacing)									
	CG717 <sup>(3)</sup>	35 x 35 mm				516			
CFA Packages (CF): flip-chip ceramic column grid array (1.0 mm ball spacing)									
	CF1144 <sup>(4)</sup>	35 x 35 mm			576		824		
	CF1140 <sup>(5)</sup>	35 x 35 mm		640					
	CF1509 <sup>(6)</sup>	40 x 40 mm	960			768			
CQFP Packages (CB): ceramic brazed quad flat pack (0.025 inch lead spacing)									
	CB228	1.55 x 1.55 in						162	162

- NOTES
- Each slice comprises two 4-input logic function generators (LUTs), two storage elements, wide-function multiplexers, and carry logic.
  - For information on DSCC SMD availability contact Xilinx.
  - The BG728 and CG717 packages are footprint / pin compatible.
  - The CF1144 and FF1152 packages are footprint / pin compatible.
  - The CF1140 and FF1148 packages are footprint / pin compatible.
  - For the XQR4VLX200, the CF1509 and FF1513 packages are footprint / pin compatible. For the XQR4VFX140, the CF1509 and the FF1517 are footprint / pin compatible.

Manufacturing Grades

<http://www.xilinx.com/products/milaero/rpt003.pdf>

Grade	Description	Temperature
V	QPro Radiation Hardened QML Class V Military Ceramic	T <sub>c</sub> = -55C to +125C
H	QPro Flip-Chip Radiation Tolerant Ceramic	T <sub>i</sub> = -55C to +125C
B	SMD Radiation Tolerant and Non-RT SMD Military Ceramic	T <sub>c</sub> = -55C to +125C
N	Military Plastic	T <sub>i</sub> = -55C to +125C
M	Military Ceramic or Plastic	T <sub>i</sub> = -55C to +125C (Plastic) T <sub>c</sub> = -55C to +125C (Ceramic)
I	Industrial Plastic	T <sub>i</sub> = -40C to +100C

## Configuration PROMs

		Defense-Grade Configuration PROMs				Space-Grade QPro Radiation Tolerant Configuration PROMs	
		XQ1701L	XQ17V16	XQ18VQ4	XQF32P	XQR1701L	XQR17V16
Core Voltage <sup>(1)</sup>		3.3V	3.3V	3.3V	3.3V	3.3V	3.3V
Storage Bits		1M	16M	4M	32M	1M	16M
Manufacturing Grades		M, N	M, N	N	M	M, V	M, V
Total Ionizing Dose (krad)		—	—	—	—	50	50
Packages <sup>(2)</sup>	Size	CC44, VQ44	CC44, VQ44	VQ44	VO48	CC44	CC44
CC44: ceramic chip carrier	0.69 x 0.69 inches						
VQ44: plastic thin quad flat package	12.0 x 12.0 mm						
VQ48 plastic TSOP package	20 x 20 mm						

- NOTES
1. Xilinx configuration PROMs have adjustable I/O voltages for compatibility with all Xilinx FPGAs.
  2. The CC44 and PC44 packages are footprint/pin compatible.
  2. For information on DSCC qualification contact Xilinx.

### Manufacturing Grades

<http://www.xilinx.com/products/milaero/rpt003.pdf>

Grade	Description	Temperature
V	QPro Radiation Hardened QML Class V Military Ceramic	T <sub>c</sub> = -55C to +125C
H	QPro Flip-Chip Radiation Tolerant Ceramic	T <sub>i</sub> = -55C to +125C
B	SMD Radiation Tolerant and Non-RT SMD Military Ceramic	T <sub>c</sub> = -55C to +125C
N	Military Plastic	T <sub>i</sub> = -55C to +125C
M	Military Ceramic or Plastic	T <sub>i</sub> = -55C to +125C (Plastic) T <sub>c</sub> = -55C to +125C (Ceramic)
I	Industrial Plastic	T <sub>i</sub> = -40C to +100C

Defense-Grade FPGAs

		Virtex-4Q FPGAs					Virtex-II Pro XQ FPGAs		Virtex-II XQ FPGAs		
Part Number		XQ4VLX25	XQ4VLX60	XQ4VLX100	XQ4VLX160	XQ4V5X55	XQ2VP40	XQ2VP70	XQ2V1000	XQ2V3000	XQ2V6000
Core Voltage		1.2V	1.2V	1.2V	1.2V	1.2V	1.5V	1.5V	1.5V	1.5V	1.5V
Logic Resources	Slices <sup>(1)</sup>	10,752	26,624	49,152	67,584	24,576	19,392	33,088	5,120	14,336	33,792
	Logic Cells	24,192	59,904	110,592	152,064	55,296	44,632	74,448	11,520	32,256	76,032
	CLB Flip-Flops	21,504	53,248	98,304	135,168	49,152	38,784	66,176	10,240	28,672	67,584
Memory Resources	Maximum Distributed RAM (Kbits)	168	416	768	1,056	384	606	1,034	160	448	1,056
	Block RAM/FIFO w/ECC (18kbits each)	72	160	240	288	320	192	328	40	96	144
	Total Block RAM (Kbits)	1,296	2,880	4,320	5,184	5,760	3,456	5,904	720	1,728	2,592
Clock Resources	Digital Clock Manager (DCM)	8	8	12	12	8	8	8	8	12	12
I/O Resources	Maximum Single-Ended I/Os	448	640	960	960	640	804	996	432	720	1,104
	Maximum Differential I/O Pairs	224	320	480	480	320	396	492	216	360	552
	Digitally Controlled Impedance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Embedded Hard IP Resources	DSP Slices	48	64	96	96	512	—	—	—	—	—
	18 x 18 Multipliers	—	—	—	—	—	192	328	40	96	144
	RocketIO™ Transceivers	—	—	—	—	—	8 or 12	20	—	—	—
	PowerPC® Processor Blocks	—	—	—	—	—	2	2	—	—	—
Miscellaneous	Speed Grades	-10	-10	-10	-10	-10	-5	-5	-4	-4	-4
	Configuration Memory (Mbits)	4.8	17.7	30.7	40.3	22.7	15.5	25.6	4.1	10.5	21.9
	Manufacturing Grades	M	M	I	I	M	N	N	N	M,N,B	M
	Packages	SF363, FF668	FF668, FF1148	FF1148	FF1148	FF1148	FF1152, FG676	FF1704	FG456, BG575	CG717, BG728	CF1144

NOTE 1. Each slice comprises two 4-input logic function generators (LUTs), two storage elements, wide-function multiplexers, and carry logic.

Manufacturing Grades

<http://www.xilinx.com/products/milaero/rpt003.pdf>

Grade	Description	Temperature
V	QPro Radiation Hardened QML Class V Military Ceramic	T <sub>c</sub> = -55C to +125C
H	QPro Flip-Chip Radiation Tolerant Ceramic	T <sub>i</sub> = -55C to +125C
B	SMD Radiation Tolerant and Non-RT SMD Military Ceramic	T <sub>c</sub> = -55C to +125C
N	Military Plastic	T <sub>i</sub> = -55C to +125C
M	Military Ceramic or Plastic	T <sub>i</sub> = -55C to +125C (Plastic) T <sub>c</sub> = -55C to +125C (Ceramic)
I	Industrial Plastic	T <sub>i</sub> = -40C to +100C

Defense-Grade FPGAs

		Virtex-5Q FPGAs														
		Part Number	XQ5VLX30T	XQ5VLX85	XQ5VLX110	XQ5VLX110T	XQ5VLX155T	XQ5VLX220T	XQ5VLX330T	XQ5VSX50T	XQ5VSX95T	XQ5VSX240T	XQ5VFX70T	XQ5VFX100T	XQ5VFX130T	XQ5VFX200T
Logic Resources	Slices <sup>(1)</sup>	4,800	12,960	17,280	17,280	24,320	34,560	51,840	8,160	14,720	37,440	11,200	16,000	20,480	30,720	
	Logic Cells <sup>(2)</sup>	30,720	82,944	110,592	110,592	155,648	221,184	331,776	52,224	94,208	239,616	71,680	102,400	131,072	196,608	
	CLB Flip-Flops	19,200	51,840	69,120	69,120	97,280	138,240	207,360	32,640	58,880	149,670	44,800	64,000	81,920	122,880	
Memory Resources	Maximum Distributed RAM (Kbits)	320	840	1,120	1,120	1,640	2,280	3,420	780	1,520	4,200	820	1,240	1,580	2,280	
	Block RAM/FIFO w/ECC (36kbits each)	36	96	128	148	212	212	324	132	244	516	148	228	298	456	
	Total Block RAM (Kbits)	1,296	3,456	4,608	5,328	7,632	7,632	11,664	4,752	8,784	18,576	5,328	8,208	10,728	16,416	
Clock Resources	Digital Clock Manager (DCM)	4	12	12	12	12	12	12	12	12	12	12	12	12	12	
I/O Resources	Phase Locked Loop/PMCD	2	6	6	6	6	6	6	6	6	6	6	6	6	6	
	Maximum Single-Ended Pins <sup>(3)</sup>	360	560	800	680	680	680	960	480	640	960	640	680	840	960	
	Maximum Differential I/O Pairs	180	280	400	340	340	340	480	240	320	480	320	340	420	480	
Embedded Hard IP Resources <sup>5</sup>	DSP48E Slices	32	48	64	64	128	128	192	288	640	1,056	128	256	320	384	
	PowerPC <sup>®</sup> 440 Processor Blocks	—	—	—	—	—	—	—	—	—	—	1	2	2	2	
	PCI Express Endpoint Blocks	1	—	—	1	1	1	1	1	1	1	3	3	3	4	
	10/100/1000 Ethernet MAC Blocks	4	—	—	4	4	4	4	4	4	4	4	4	6	8	
	RocketIO <sup>™</sup> GTP Low-Power Transceivers	8	—	—	16	16	16	24	12	16	24	—	—	—	—	
	RocketIO <sup>™</sup> GTX High-Speed Transceivers	—	—	—	—	—	—	—	—	—	—	16	16	20	24	
Configuration	Configuration Memory (Mbits)	9.4	21.9	29.1	31.2	43.1	55.2	82.7	20	35.8	79.7	27.1	39.4	49.3	70.9	
Miscellaneous	Speed Grades	-1, -2	-1, -2	-1, -2	-1, -2	-1, -2	-1	-1	-1, -2	-1	-1	-1, -2	-1, -2	-1, -2	-1	
	Manufacturing Grades	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Packages <sup>(6)</sup>	EF676 (27 x 27 mm)		440	440												
	EF1153 (35 x 35 mm)			800												
	FF323 (19 x 19 mm)	172 (4)														
	EF665 (27 x 27 mm)								360 (8)			360 (8)				
	EF1136 (35 x 35 mm)				640 (16)	640 (16)				640 (16)		640 (16)	640 (16)			
	EF1738 (42.5 x 42.5 mm)						680 (16)	960 (24)			960 (24)		680 (16)	840 (20)	960 (24)	

- NOTES
1. A single Virtex-5Q CLB comprises two slices, with each containing four 6-input LUTs and four Flip-Flops (twice the number found in a Virtex-4 slice), for a total of eight 6-LUTs and eight Flip-Flops per CLB.
  2. Virtex-5 logic cell ratings reflect the increased logic capacity offered by the new 6-input LUT architecture.
  3. Digitally Controlled Impedance (DCI) is available on I/Os of all devices.
  4. I/O standards supported: HT, LVDS, LVDSEXT, RSDS, BLVDS, ULVDS, LVPECL, LVCMOS33, LVCMOS25, LVCMOS18, LVCMOS15, LVTTL, PCI33, PCI66, PCI-X, GTL, GTL+, HSTL I (1.2V, 1.5V, 1.8V), HSTL II (1.5V, 1.8V), HSTL III (1.5V, 1.8V), HSTL IV (1.5V, 1.8V), SSTL2 I, SSTL2 II, SSTL18 I, SSTL18 II.
  5. One system monitor block included in all devices.
  6. Available I/O for each device-package combination: number of SelectIO pins (number of RocketIO transceivers).

Manufacturing Grades

<http://www.xilinx.com/products/milaero/rpt003.pdf>

Grade	Description	Temperature
V	QPro Radiation Hardened QML Class V Military Ceramic	T <sub>c</sub> = -55C to +125C
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I	Industrial Plastic	T <sub>i</sub> = -40C to +100C