

# Actel FPGAs for Aerospace Applications

*When Failure is not an Option*

As a leading supplier of high reliability FPGAs, Actel offers programmable logic devices for a variety of high reliability applications ranging from commercial aviation and extreme environments to military systems. Actel's Aerospace FPGAs meet the unique application requirements that commercial devices are unable to fill, delivering reliable and secure performance in extraordinary environments.

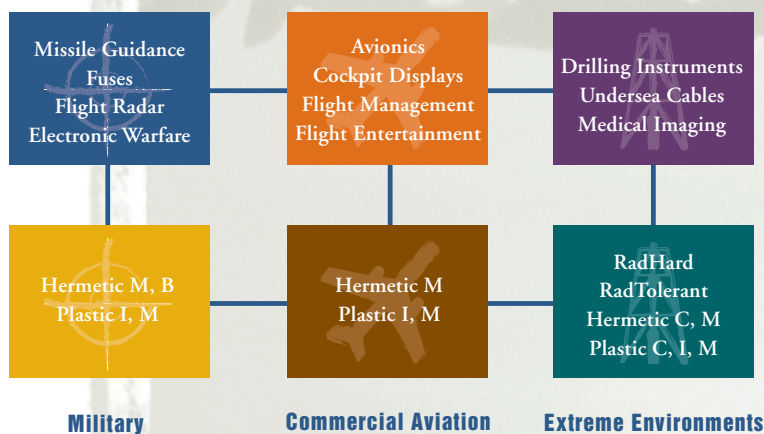
## Commitment

Actel has been manufacturing devices for high reliability applications, such as medical instrumentation, transportation systems, and military subsystems for over a decade. In an industry where programs routinely last 10+ years, Actel understands the need for form, fit, and function replacement. While Actel's device processes change, the devices retain their original functionality, enabling seamless process migration and

offering pin compatible device replacements. Targeting applications placed in extraordinary environments, Aerospace FPGAs meet the requirements for more stringent electrical parameter tolerances and higher reliability standards to minimize the risk of mission failure.

## Low Cost of Ownership

Actel's Aerospace FPGAs offer several advantages over comparable SRAM FPGAs. The nonvolatile nature of the Aerospace FPGAs allows the devices to retain configuration indefinitely without an external storage device, so there is no extended period of nonfunctionality while data is downloaded. With no need for external storage, the cost of a PROM or microprocessor and the associated board space are eliminated. As a single chip solution, Actel's devices also inherently have a lower risk of failure than two chip solutions. In addition, unlike ASICs, Actel's FPGAs can quickly and easily be programmed, eliminating long design cycles and large NRE charges for each design iteration. Actel is committed to offering its customers value for the long term.





## The Actel Aerospace Advantage

### A Broad Range of Products

Actel demonstrates its commitment by offering the broadest range of Aerospace FPGAs to meet the rigorous demands of extreme environment systems. Actel's Aerospace devices offer system performance as high as 250 MHz and densities ranging from 2,000 to 72,000 gates. With pin counts from 68 to 456 pin plastic packages and up to 256 pin ceramic packages, there is a Aerospace device to meet the needs of every designer. Additionally, because of diverse market requirements, Actel offers its Aerospace FPGAs in a range of screening options, from commercial and industrial flows to Class S equivalent products.

### Reliability

Actel's Aerospace FPGAs undergo rigorous screening to ensure high performance and reliability in extreme environmental conditions. These devices meet or exceed the MIL-STD-883 Class B requirements. Additionally, for a market converting from ceramic to plastic components, Actel offers QML certified and plastic components that have been tested across the Mil temp range (-55°C

and +125°C), ensuring reliable operation in Aerospace applications. Actel's Aerospace FPGAs also have very low FIT rates, making them highly reliable for long hours of continuous operation as well as operation after years of storage in unpredictable environments.

### Low Power Consumption

An additional benefit of Actel's antifuse technology is its inherent low power consumption. Because of their smaller switch element, antifuses have less capacitance, resulting in low power consumption. Additionally, the architecture does not require active circuitry to hold a charge, reducing thermal and power supply design problems.

### Security

High reliability devices used in military applications clearly have a need for design security, an inherent benefit of Actel's antifuse technology. The lack of a start-up bitstream eliminates the possibility of intercepting the configuration data while also preventing the in-system errors and accidental data erasures that otherwise might occur during download.

Additionally, the antifuses that form the interconnections are extremely small, are densely distributed throughout the device, and do not leave an observable signature that can be electrically probed or visually inspected. With these safeguards, Actel devices are virtually immune to copying or reverse engineering.

### Actel FPGA Fit Rates

1.0μ CMOS FPGA	10FITS
0.8μ CMOS FPGA	15FITS
0.6μ CMOS FPGA	5FITS
0.45μ CMOS FPGA	23FITS*
0.35μ CMOS FPGA	35FITS*
0.25μ CMOS FPGA	10FITS**
0.18μ CMOS FPGA	10FITS**

\*ongoing data collection \*\*target FIT rates



## Design Tools

### 33/66 MHz, 32/64-Bit PCI Cores

Actel offers the most flexible and cost-effective PCI solution in the FPGA market. Actel's CorePCI is available as a portable, soft RTL macro. Designed to be fully compliant to PCI Specification 2.2, the macro is capable of 33/66 MHz, 32/64-bit implementations with fully compliant zero-wait-state PCI transfers.

### Protocol Design Services

#### The One Stop Design Solution

With a ten-year history of providing hardware and software services, Actel's *Protocol Design Services* team offers its customers varying levels of design support at all stages of project development. With extensive knowledge of FPGA design and prototyping, services are delivered on time, within budget, and to the customers' specifications.

### Development Software

#### Actel Libero

Actel's Libero, an alliance between industry leading design tool vendors, is Actel's fully integrated design tool set. With EDA tools like Synplify, ModelSim, ViewDraw, Wave Former Lite, and Actel's Silicon Explorer and Designer, Libero brings together the best tools available to create a complete and integrated design environment.

**Libero Silver** is ideal for designers who design in 10k or fewer gates. Libero Silver gives you everything but a simulation tool.

**Libero Gold** offers design capacity up to 50k gates and a ModelSim simulator from Mentor Graphics for a complete design solution.

**Libero Platinum** has unlimited design capacity and includes all the tools you need to take your design from concept to silicon.

Family	MIL-STD-883 Class B/ QML Class Q/DSCC SMD Ceramic Devices	Military Temperature Tested Plastic Devices	On-Chip Performance
SX-A	8,000 to 72,000 gates	8,000 to 72,000 gates	to 250 MHz
SX	16,000 to 32,000 gates	8,000 to 32,000 gates	to 240 MHz
MX	36,000 gates	2,000 to 36,000 gates	to 125 MHz
DX	20,000 to 36,000 gates	13,000 to 36,000 gates	to 55 MHz
XL	8,000 gates	8,000 to 16,000 gates	to 50 MHz
ACT 3	5,000 to 20,000 gates	5,000 to 20,000 gates	to 60 MHz
ACT 2	8,000 to 16,000 gates	8,000 to 16,000 gates	to 40 MHz
ACT 1	2,000 to 4,000 gates	2,000 to 4,000 gates	to 20 MHz

**HiRel Devices**



### Designer Series

Designer Series Development System is Actel's suite of FPGA development point tools for PCs and Workstations that includes the ACTgen macro builder, timing driven place-and-route, static timing analysis tools, and the device programming software.

### Programming

Actel offers programming options with the Silicon Sculptor single site and multi-site device programmers for PC. And when the design is ready to go to production, Actel has a programming solution for that too. Actel offers volume programming services through distribution partners.

### Real-time Device Verification

#### Silicon Explorer II

Actel's Antifuse FPGAs contain internal probe circuitry that provides built-in, no-cost access to every node in a design, enabling 100% real-time observation and analysis of a device's internal logic nodes without design iteration. Silicon Explorer II, an easy to use integrated verification and logic analysis tool for the PC, accesses the probe circuitry. Silicon Explorer II allows designers to complete the design verification process at their desks.

### Actel Hermetic Military Product Flow

Class B Screening	833 Test Method
Internal Visual	2010, Test Condition B
Temperature Cycling	1010, Test Condition C
Constant Acceleration	2001, Test Condition E, Y1, Orientation Only
Seal	1014
a. Fine	
b. Gross	
Visual Inspection	2009
Pre-Burn-In Electrical Parameters	In Accordance with Applicable Actel Device Specification
Burn-In Test	1015, Condition D, 160 Hours @ 125°C or 80 Hours @ 150°C
Interim (Post-Burn-In) Electrical Parameters	In Accordance with Applicable Actel Device Specification
Percent Defective Allowable	5%
Final Electrical Test	In Accordance with Applicable Actel Device Specification which include a, b, and c:
a. Static Tests	
[1] 25°C	
(Subgroup 1, Table I)	5005
[2] -55°C and +125°C	5005
(Subgroups 2, 3, Table I)	
b. Functional Tests	
[1] 25°C	
(Subgroup 7, Table I)	5005
[2] -55°C and +125°C	5005
(Subgroups 8A and 8B, Table I)	
c. Switching Tests at 25°C	
(Subgroup 9, Table I)	5005
External Visual	2009

## Aerospace Devices

		Typical Gates	Asic Gates	Logic Modules	Dedicated Flip-Flops	Max Flip-Flops	Max I/O Available	DSCC SMD	3.3V CMOS Drive	5V CMOS Drive	5V Tolerant Inputs	3.3V PCI I/O	5V PCI I/O	Slew Rate Control	Routed Clocks	Hardw Cloc
Military and Avionics	A1010B	2000	1000	295	0	147	57	Yes		Yes	Yes				1	
	A1020B	4000	2000	547	0	273	69	Yes		Yes	Yes				1	
	A1240A	9000	4000	684	348	568	104	Yes		Yes	Yes				2	
	A1280A	16000	8000	1232	624	998	140	Yes		Yes	Yes				2	
	A1280XL	16000	8000	1232	624	998	140	Yes		Yes	Yes				2	
	A1425A	6000	2500	310	360	435	100	Yes		Yes	Yes				2	2
	A1460A	16000	6000	848	768	976	168	Yes		Yes	Yes				2	2
	A14100A	20000	10000	1377	1135	1493	228	Yes		Yes	Yes				2	2
	A32100DX	20000	10000	1362	700	1107	60	Yes		Yes	Yes				2	
	A32200DX	36000	20000	2414	1230	1923	202	Yes		Yes	Yes				6	
	A42MX36	36000	18000	1230	1230	1923	202	Yes	Yes	Yes	Yes				6	
	A54SX16	24000	8000	1452	528	990	177	Yes	Yes		Yes				2	1
	A54SX32	48000	16000	2880	1080	1980	225	Yes	Yes		Yes				2	1
	A54SX32A	48000	16000	2880	1080	1980	228	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2	1
	A54SX72A	72000	36000	6036	2012	4024	215	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6	1
RadHard	RH1020	4000	2000	547	0	273	69	Yes		Yes	Yes				1	
	RH1280	16000	8000	1232	624	998	140	Yes		Yes	Yes				2	
RadTolerant	RT1020	4000	2000	547	0	273	69			Yes	Yes				1	
	RT1280A	16000	8000	1232	624	998	140			Yes	Yes				2	
	RT1425A	6000	2500	310	360	435	100			Yes	Yes				2	2
	RT1460A	16000	6000	848	768	976	168			Yes	Yes				2	2
	RT14100A	20000	10000	1377	1153	1493	228			Yes	Yes				2	2
	RT54SX16	16000	8000	1452	528	990	176	Yes	Yes	Yes	Yes				2	1
	RT54SX32S	32000	16000	2880	1080	1980	226	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2	1
	RT54SX72S	72000	36000	6036	2012	4024	213	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6	1

1. SX32A Qualification Q4, 2001

2. SX72A Qualification Q2, 2002



Wired Tests	JTAG	33 MHz PCI	TID	SEL	SEU	Temp/Screening	Speed Grades
	-					C, M, B	Std, -1
	-					C, M, B	Std, -1
	-					C, M, B	Std, -1
	-					C, M, B	Std, -1
	-					C, M, B	Std, -1
2	-					C, M, B	Std, -1
2	-					C, M, B	Std, -1
2	-					C, M, B	Std, -1
	Yes					C, M, B	Std, -1
	Yes					C, M, B	Std, -1
	Yes					C, M, B	Std, -1
	Yes					C, M, B	Std, -1
	Yes	Yes				C, M, B	Std, -1
	Yes	Yes				C, M, B	Std, -1
	-		300<	120<	22-28	QML V/Q	Std
	-		300<	120<	8 S-mod, 28 C-mod	QML V/Q	Std
	-		100	120<	22-28	Class B through E-Flow	Std
	-		10 to 60	110<	8 S-mod, 28 C-mod	Class B through E-Flow	Std, -1
2	-		20-70	110<	8 S-mod, 28 C-mod	Class B through E-Flow	Std, -1
2	-		20-70	110<	8 S-mod, 28 C-mod	Class B through E-Flow	Std, -1
2	-		20-70	110<	8 S-mod, 28 C-mod	Class B through E-Flow	Std, -1
	Yes		80-135	80<	17-30	Class B through E-Flow	Std, -1
	Yes	Yes	80-135	80<	74<	Class B through E-Flow	Std, -1
	Yes	Yes	80-135	80<	74<	Class B through E-Flow	Std, -1

*For more information about Actel's products, call 1-888-99-ACTEL or visit our Web site at <http://www.actel.com>*

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