



A passion for performance.

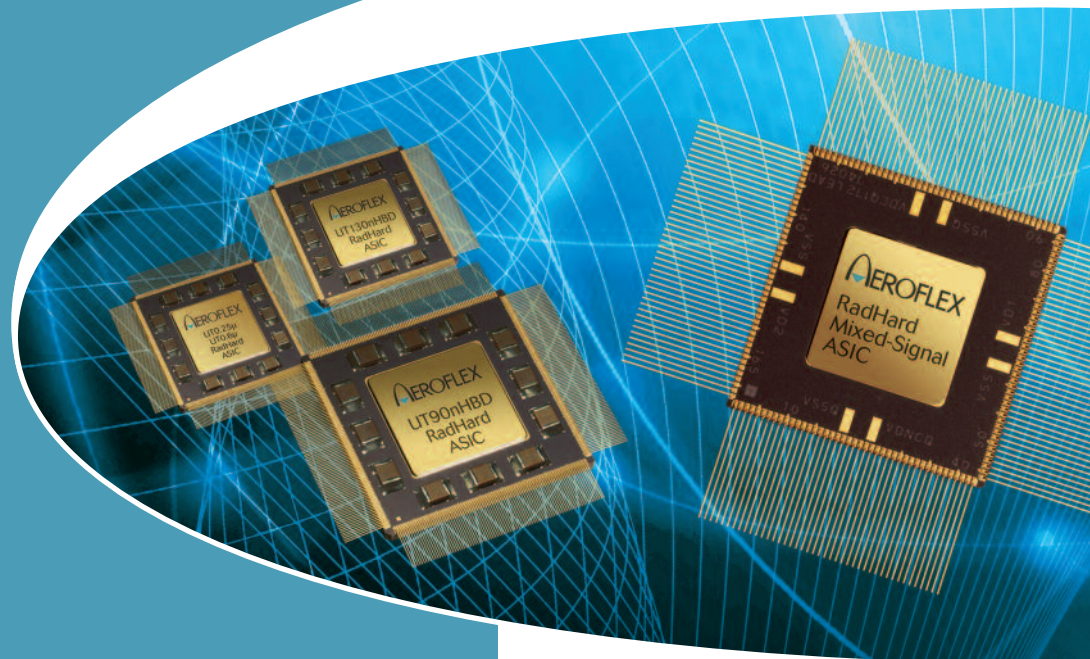
Digital and Mixed-Signal  
custom, semi-custom,  
off-the-shelf designs  
with Aeroflex Gaisler IP

Guaranteed radiation  
performance

QML-V, QML-Q, military,  
medical, industrial grades

Category 1A  
Trusted Accreditation

We connect the real  
world to the digital world™



# RadHard ASICs

Digital and Mixed-Signal

# RadHard ASICs

- Multiple product assurance levels - QML Q and V, military, medical and industrial
- Radiation hardened from 100 krads(Si) to 1 Megarad(Si) total dose available using Aeroflex RadHard techniques
- SEU-immune <1.0E-10 errors/bits-day or better using special library cells
- Robust Aeroflex Design Library of cells and macros
- Full complement of industry standard IP cores and Aeroflex Gaisler IP
- Configurable RAM compilers
- Support of cold sparing for power-down applications
- External chip capacitor attachment option available to space-quality levels for improved SSO response

## RadHard ASIC RADIATION DATA

PARAMETER	RADIATION DATA
Total Ionizing Dose <sup>1</sup>	1.0E5 Rads(Si) 1.0E6 Rads(Si)
Single Event Upset <sup>2</sup>	UT0.13µm < 1.0E-11 errors/bit-day UT0.18µm < 1.0E-12 errors/bit-day UT0.25µm < 2.0E-12 errors/bit-day UT0.35µm < 1.0E-12 errors/bit-day UT0.6µm < 3.0E-9 errors/bit-day
Single Event Latchup	Latchup-immune > 110 MeV-cm <sup>2</sup> /mg@ 125°C
Dose Rate Upset <sup>3</sup>	> 6.6E9 (Si)/sec
Dose Rate Survivability	> 4.8E11 rad (Si)/sec
Projected Neutron Fluence	> 1.0E14 n/sq cm

Notes: 1. Total dose Co-60 testing is in accordance with MIL-STD-883, Method 1019.  
2. Is design dependent; SEU capability based on standard evaluation circuit.  
3. Short pulse 20ns FWHM (full width, half maximum).

## 30 YEARS AND MOVING FORWARD

Aeroflex Colorado Springs has a 30-year history of cost-effective RadHard Digital ASIC solutions for the most critical applications. To meet the new demands of the digital world, Aeroflex offers proven RadHard Mixed-Signal ASIC capabilities, expanding our products to a full range of custom solutions - from FPGA conversions to complete Mixed-Signal system-level solutions, from high-voltage 0.6µm CMOS to dense 90nm CMOS.

Aeroflex RadHard Digital ASICs have flown on Cassini, EOS, Iridium, Milstar, P-91, the International Space Station, and many classified satellites. Aeroflex's commercial Mixed-Signal ASICs are currently installed in medical, security, and industrial applications. With Aeroflex's new custom RadHard Mixed-Signal solutions, system designers do not need to settle for more costly and power-hungry hybrids or MCM-based solutions.

By leveraging our high-volume commercial RadHard product knowledge, our Aeroflex Gaisler portfolio, our proprietary advanced RadHard techniques, and the strength of our foundry partners, Aeroflex has the experience, technology, and motivation to assure your program success. Aeroflex remains committed to assured process supply from 0.6 to 90nm.

## RadHard FPGA-TO-ASIC CONVERSIONS

Aeroflex Colorado Springs has proven experience in converting FPGAs into RadHard ASICs. As FPGAs (most recently the 1020 and 1280) become obsolete, Aeroflex has converted many RadHard FPGAs to ASICs. Examples include Actel RH1020, RH1280, RT54SX32S/72S, RTAX250S/1000S/2000S, Xilinx XC2/3/4000, and Virtex-II/-IIPro/-4/-5.

We offer these benefits.

- CML/SSTL/LVDS/PLL capability
- Chip capacitors on packages
- SEU of <2E-12 error/bit-day
- SEL of >128MeV on 0.6µm process\*
- SEL of >110MeV on 0.25µm process\*
- Actel compatible 84, 172, 208, 256, 352 CQFPs, 624 CCGA
- Xilinx compatible CQFP, Flip Chip, CCGA, PBGA

\* maximum rate possible with test equipment @ 125°C

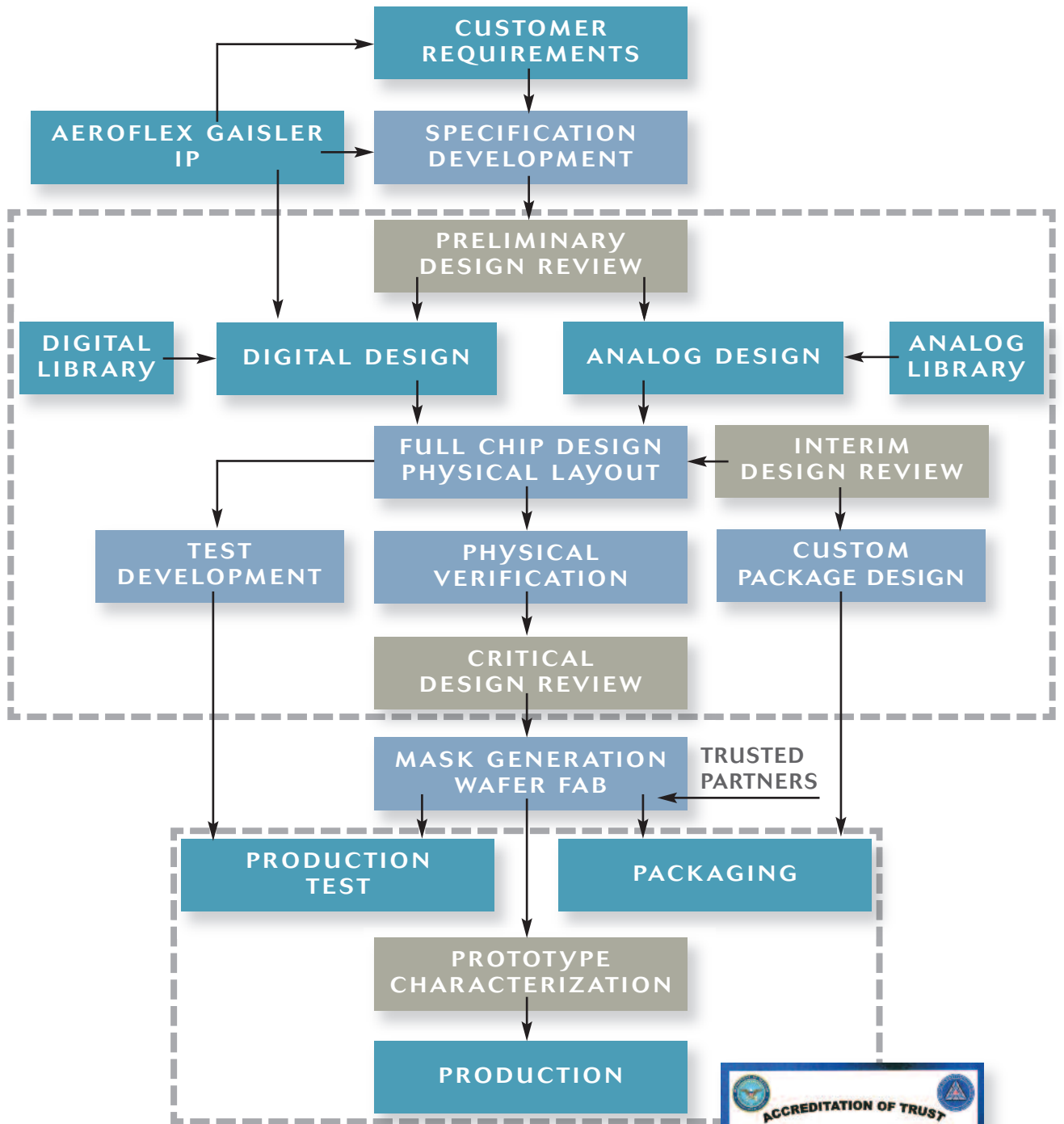
# Aeroflex Process Technology

TECHNOLOGY	90nm CMOS	130nm CMOS	180nm CMOS	0.25µm CMOS	0.35µm CMOS	0.6µm CMOS
PARAMETERS						
Metal layers	6-9 Cu	6-8 Al/Cu	5-6 Al/Cu	4-5 Al/Cu	3-4 Al/Cu	3 Al/Cu
Capacitors	MiM	MiM	MiM	MiM	MiM/PIP	PIP
High-value resistors	No	Yes	Yes	Yes	Yes	Yes
Vertical NPN bipolar	No	No	Yes	Yes	Yes	Yes
Substrate PNP bipolar	Yes	Yes	Yes	Yes	Yes	Yes
HV CMOS support	No	No	5V (self-aligned)	Yes	10V (self-aligned)	20V (ext drain)
Thick metal inductor	No	Yes	Yes	No	Yes	No
Digital/analog supply voltages (DVdd, AVdd; Vss=0)	3.3, 2.5, 1.8, 1.2, 1.0	3.3, 2.5, 1.8, 1.5, 1.2	5.0, 3.3, 1.8	3.3, 2.5	10.0, 5.0, 3.3	5.0, 3.3, 2.5
Alternate analog supply voltages (AVdd/AVss)			±2.5, ±1.65, ±0.9		±5, ±2.5, ±1.65	
Maximum toggle frequency	33GHz	5GHz	2.4GHz	1GHz	375MHz	215MHz
Power dissipation - nW/gate - MHz; 20% duty cycle	7	10	20	40	150	320
Gate delay 25°C (ps)	6	20	50	65	140	225
Usable gates (NAND2 equivalent)	15-20M	10-15M	8M	3M	1.5M	500K
Typical signal I/O	~1024	~1024	~1024	~512	~425	~400
Flip-chip I/O available	Yes	Yes	Yes	No	No	No
Cold sparing	Yes	No	Yes	Yes	Yes	Yes
Full 5V compliance	No	No	Yes	No	Yes	Yes
5V tolerance	No	No	Yes	Yes	Yes	Yes
Example analog IP (full custom analog available)	PLL	ADCs, DACs PLL	Band-gap, Volt. reg. Comp/op-amps, ADCs, DACs, PLL, VCO RC oscillator	Band-gap, Volt. reg. ADCs, DACs PLL	Band-gap, Volt. reg. Comp/op-amps, DACs, ADCs, PLL, VCO	Band-gap, Volt. reg. Comp/op-amps PLL/DLL
SRAM compiled	Yes	Yes	Yes	Yes	Yes	No
Non-volatile memory			Flash* EEPROM* RadHard OTP Metal Fuse**		Flash* EEPROM* RadHard OTP Metal Fuse**	
Special I/O	SSTL, MGT, CML, LVDS, PCI	SSTL, MGT, CML, LVDS, PCI	SSTL, MGT, CML, LVDS, PCI, USB1.1	SSTL, MGT, CML, LVDS PCI	SSTL, MGT, CML, LVDS, PCI, RS232/ RS485 (±5V), USB1.1	SSTL, MGT, CML, LVDS, PCI
Total ionizing dose Rads(Si)	100-300K	100-300K	100-300K	100K-1Meg	100-300K	100-300K
SEL (MeV-cm <sup>2</sup> /mg) @ Vdd max and 125°C	>100	>110	>110	>110	>110	>128
Reliability (FIT rate)	<50	<20	<10	<10	<10	<5
Wafer foundry quality level	ISO-9001	QML-Q&V	QML-Q&V	QML-Q&V	QML-Q&V	QML-Q&V
Trusted foundry level	CAT1A, ITAR	ITAR	ITAR	CAT1A, ITAR	ITAR	ITAR

\*Limited total-ionizing dose environments. Floating Gate Memories such as Flash and EEPROM must be periodically re-written in a total ionizing dose environment for reliability.

\*\* To be QML qualified

# RadHard ASIC Design Flow



## SUPPORTED DESIGN TOOLS

Aeroflex Colorado Springs actively supports robust and easy-to-use design environments including VHDL and Verilog, using third-party design tools. Aeroflex supports libraries for:

- Cadence
- Mentor Graphics
- MATLAB
- Synopsys
- Full mixed-mode simulation
- many others



*Aeroflex's Trusted CAT1A capabilities for customers requiring "Trusted" services*

# RadHard sensor interface solutions

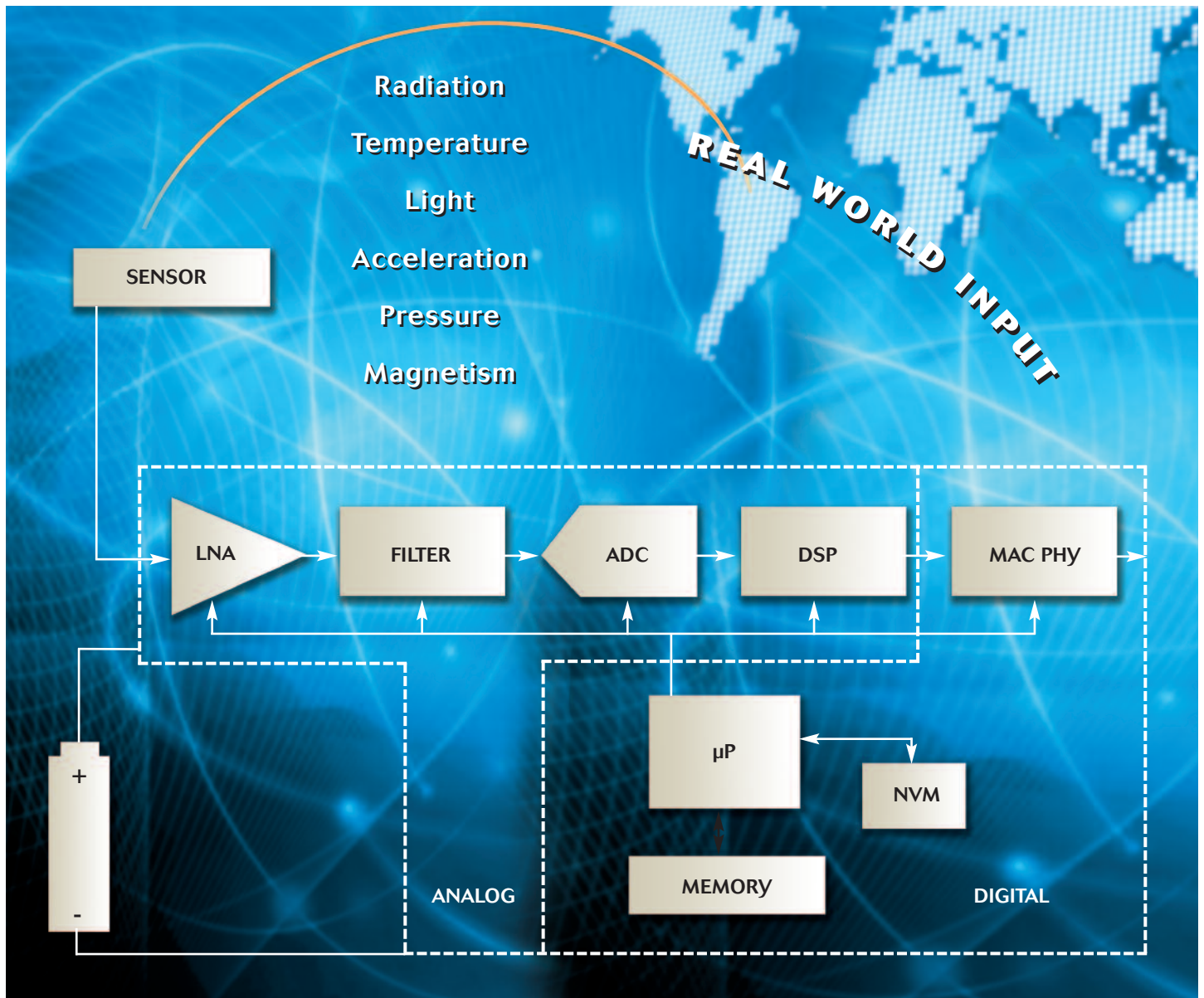
Aeroflex understands that RadHard data conversion solutions must be system oriented. That's why Aeroflex offers Aeroflex Gaisler IP and radiation analysis of photonic sensors using an Aeroflex-proprietary SEE simulator. Using the output of our simulator, we can take into account all radiation-induced noise sources, including the noise generated in the sensor when designing RadHard analog-to-digital conversion ASICs for critical control loop or sensing applications.

Rather than have discrete ADCs for each sensing channel, Aeroflex can integrate multiple, independent ADCs on a single ASIC with low cross-talk between channels. Using Aeroflex's substrate-isolated, RadHard analog library, channel-to-channel isolation of  $>108\text{dB}$  can be achieved. Multiple, parallel ADCs often save power over highly MUXed solutions, since each ADC can operate at significantly lower frequencies.

Contact Aeroflex today to take advantage of the increased performance, reliability and reduced size and power consumption of our RadHard Mixed-Signal ASICs.

**WE CONNECT THE REAL WORLD TO THE DIGITAL WORLD™**

## EXAMPLES OF A RADHARD ASIC SOLUTION



# RadHard ASICs

## PACKAGING

TYPE	LEADS/DESCRIPTION
CQFP	68, 84, 132, 172, 196, 208, 256, 304, 340, 352
CPGA	281, 299
CLGA/CCGA	472, 624
Chip-on-Flex	100 $\mu$ lead pitch
Plug & Sense™	Sensor and read-out ASIC in same package

Aeroflex also offers custom packages including multi-chip modules, end modules, and all JEDEC packages.



**AEROFLEX**  
A passion for performance.



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

**WEB SITE** [www.aeroflex.com/radhardasic](http://www.aeroflex.com/radhardasic)  
[www.aeroflex.com/Gaisler](http://www.aeroflex.com/Gaisler)

**TELEPHONE** 1-800-645-8862

Part No. RHASIC 4 / 2011.  
Specifications are subject to change without notice.