SAND2010-4817P

Sandia National Laboratories

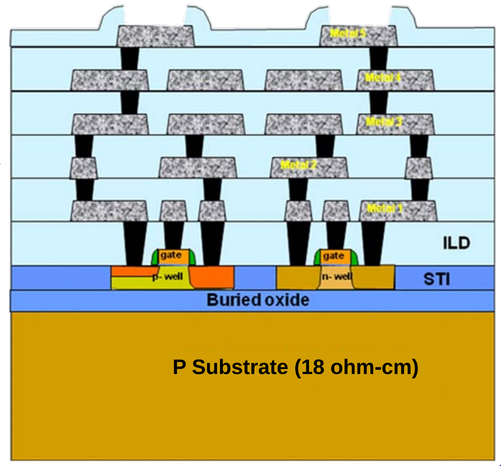
Critical Capabilities for the Europa-Jupiter System Mission

Key Capabilities

- The highly-reliable radiation-hardened microelectronics required for nuclear weapons are also extremely well suited for mitigating the issues that occur in many other harsh environments.
- For many decades, Sandia has had a prominent role in advancing the state-of-the-art in microsystems R&D, radiation effects, reliability physics, failure analysis, and both rad-hard-by-design and rad-hard-by-process techniques.
- Sandia has developed and maintains a fully-qualified SOI, radiation-hardened CMOS technology for custom, high reliability digital, analog, and mixed-signal integrated circuits (ICs).
- Sandia's ISO 9001:2008 certified ASIC design, fabrication, packaging and test capabilities include a DMEA accredited Trusted Foundry and Design Center.

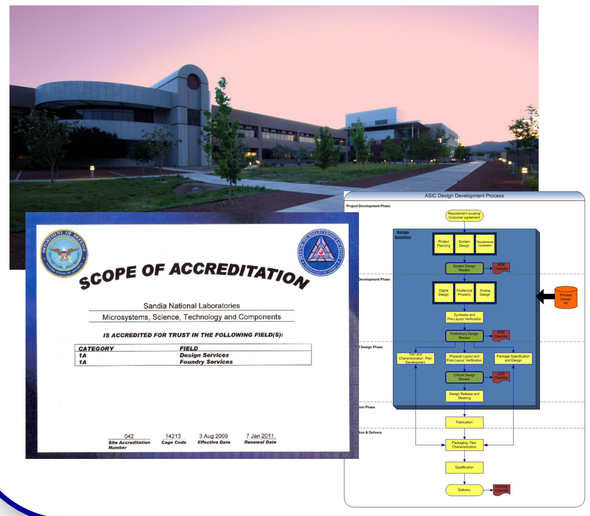
Radiation-Hardened SOI CMOS

- CMOS7 Rad-Hard Base Technology
  - 0.35 µm technology node
  - SOI substrate
  - 5 metal layers for interconnect
  - 3.3V V_{DD}, 3.3V I/O
- Mixed Signal Components
  - MIM capacitor
  - N+ poly resistor
- Additional Extensions
  - Anti-Fuse for OTP-NVM
  - SONOS non-volatile memory
  - High-voltage transistors



Sandia built many key ICs for the Galileo mission

Sandia's Trusted Foundry and Design Center

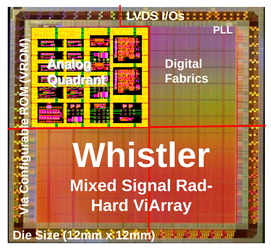


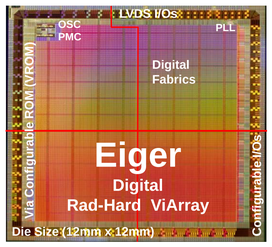
- **Multiple ways to engage Sandia's CMOS7 rad-hard foundry**
  - Low cost Multi-Project Wafer (MPW) program.
  - Quick-turn Structured ASIC ViArray platforms.
  - Low-volume production ASICs.
- **Sandia's CMOS7 technology is NNSA's primary source of custom rad-hard ICs**
  - Currently delivering thousands of ASICs.
  - DoD Cat 1A Trusted Design and Fabrication Process.

Rad Hard, Fast-turn, Low NRE, Via-Configurable Structured ASIC Platform

Benefits

- Structured ASIC enables rapid turn-around and lowers the non-recurring engineering (NRE) and development costs.
- Pre-qualified base arrays reduce the development risks.
- ASIC-like performance.
- Regular, fabric-like structure enhances verifiability of trusted parts.



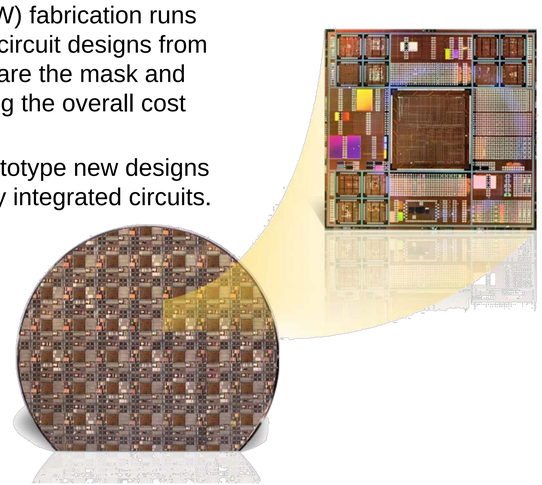


Special Features

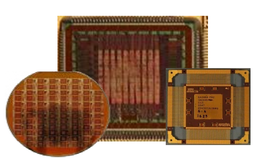
- Metal-via configurable, fabric-like structure using ViASIC® via-mask technology.
- Four power quadrants with specialized interface circuits that allow up to four independent power supplies for power sequencing.
- Unused transistors and circuits are isolated from power and ground to minimize overall power consumption.
- On-package decoupling capacitors.

Sandia's Multi-Project Wafer Program

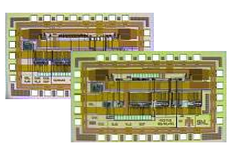
- Multi-Project Wafer (MPW) fabrication runs allow several integrated circuit designs from multiple customers to share the mask and wafer resources, reducing the overall cost per design.
- Cost effective way to prototype new designs or produce small quantity integrated circuits.
- Uses CMOS7 rad-hard, mixed-signal CMOS-SOI technology.



Radiation-Hardened Application Specific Integrated Circuits (ASICs)



Custom Rad-Hard Digital ASICs



Custom Rad-Hard Mixed Signal ASICs

- **ISO 9001 Certified ASIC Development Process**
  - Disciplined and controlled design process.
- **Process Design Kit (PDK)**
  - Technology model files and support for custom design, layout, and validation.
- **Standard Cell and I/O Libraries**
  - Full suite of standard cell and I/O cells with support for simulation, synthesis, and physical design.
- **Analog Intellectual Property (IP) Modules**
  - Including A-to-D Converters, PLLs, and D-to-A Converters (contact us for full listing).
- **SRAM and ROM Memory Macros**
  - Pre-configured memory array macros (contact us for full listing).

For more information contact:
Rich Dondero, Manager
Rad-Hard CMOS Technology Development Department
505-284-1457 *rdonder@sandia.gov*

National Nuclear Security Administration

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2010-XXXXP

Sandia National Laboratories