



# SOI Simply Greener

An Initiative of the SOI Industry Consortium

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# Electronics Industry at a Crossroads: Must Reduce Power Consumption



- **Demand for greener electronics**

- Social / environmental responsibility awareness
- Reaction to tightening regulatory environment
- Consumers / businesses with rising electric power bills

- **Semiconductor industry struggling with power consumption**

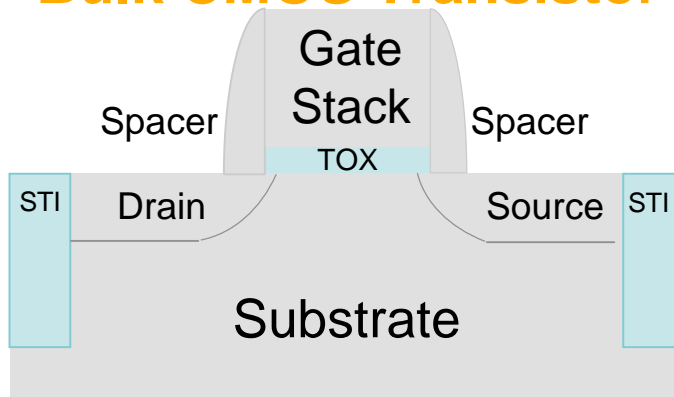
- Exponentially increasing R&D expense to develop new bulk silicon process nodes and control leakage
- Increasing process complexity driving up processed wafer cost

**There is a widening gap between the need for lower power and bulk silicon technology's ability to deliver**



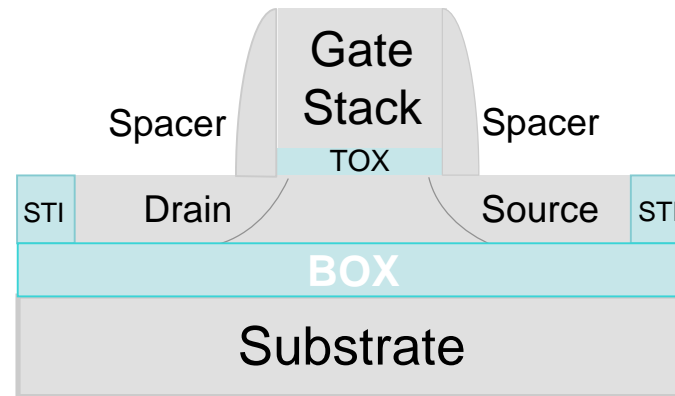
# A Clarion Call for the Energy-Efficient SOI Transistor: Higher Speed and 30 to 40% Lower Power

## Traditional Bulk CMOS Transistor



Bulk transistor carries higher parasitic capacitance and allows current loss into the substrate through multiple leakage paths

## SOI Transistor



SOI transistor sits in its own insulated oxide tub, formed by the BOX and STI sidewalls, that blocks leakage and reduces parasitic capacitance

TOX = Transistor Gate Oxide  
STI = Shallow Trench Isolation  
BOX = Buried Oxide Layer

# SOI is Already Part of Daily Life . . .



and Used in a Variety of Products



# Results from SOI: Material Impact

## 1. Supercomputers

- 18 of top 20 Greenest supercomputers are built on SOI
- (only #5 and #20 are not on SOI) - [www.green500.org](http://www.green500.org)

## 2. Consumer Game Consoles

- Top 3 game platforms all use SOI-based system chips for lower power, cooler operation and higher performance

## 3. ARM's 45nm Process Technology Benchmark

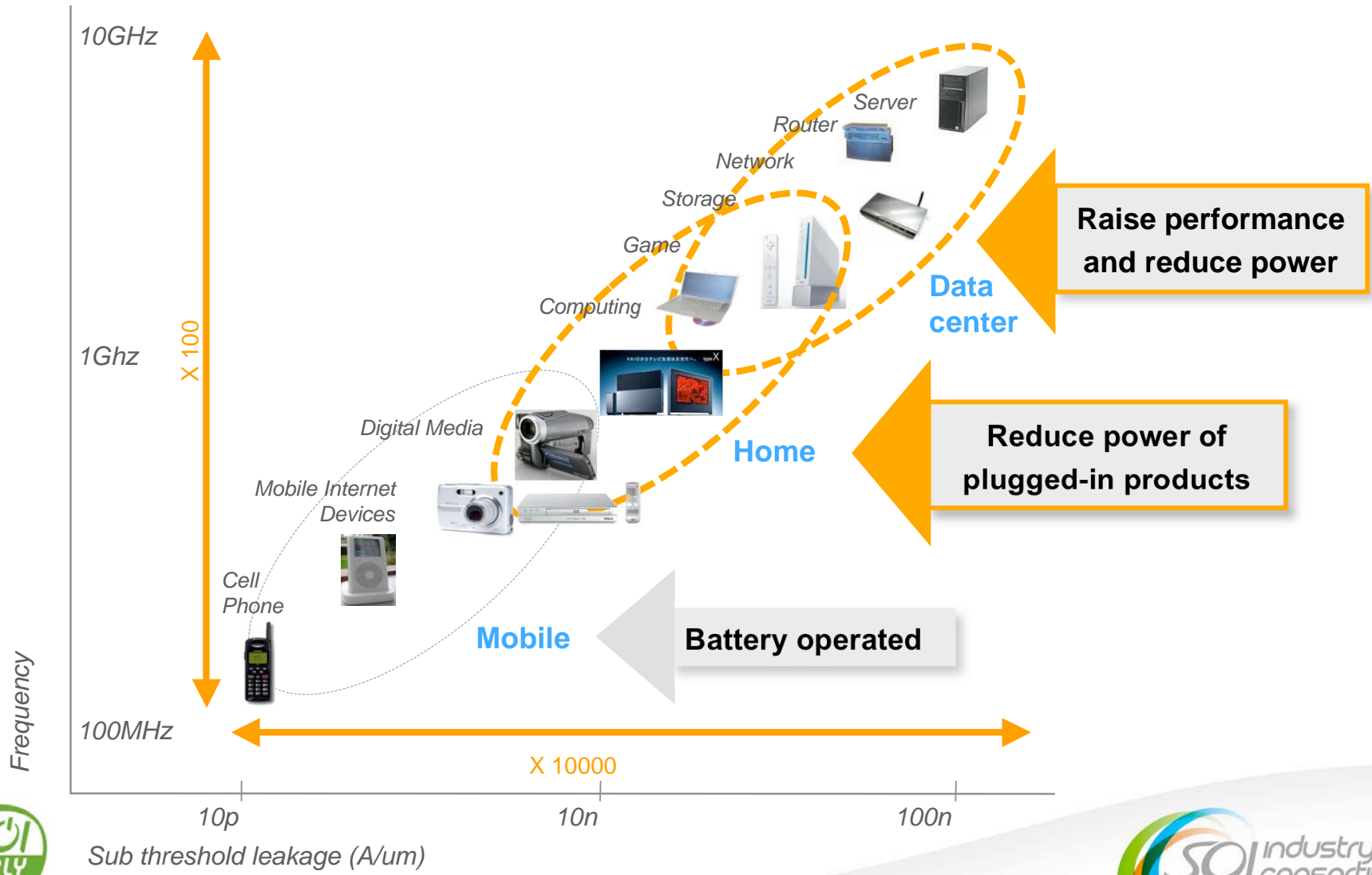
- SOI achieved 25% circuit area reduction, 2.8x reduction in leakage, nearly 22% reduction in dynamic power and 5% higher operating frequency vs. bulk high performance on datapath test circuit - see appendix

## 4. IBM's 65nm bulk silicon to 45nm SOI Chip Migration

- 38% power reduction with 50% performance increase and 64% area reduction - see appendix



# But More SOI Usage is Needed in Home and Data Center Electronics To Reduce Power Bills and Power Demand



# A Collaborative Community is Stepping Up to Help the Electronics Industry Meet this Need

## The SOI Industry Consortium

- 28 innovation leaders from across the electronics industry



*Its mission: accelerate silicon-on-insulator innovation by promoting the technical and commercial benefits of SOI technology and reducing the barriers to adoption. (Founded October, 2007)*



# SOI Industry Consortium's Simply Greener Initiative

## 1. Awareness that SOI = greener, more energy-efficient technology

## 2. Promotion of an expanding SOI semiconductor ecosystem

- SOI substrates: SEH, Soitec
- Foundries: Chartered, Freescale, GLOBALFOUNDRIES, IBM, UMC
- EDA tools and methodology support: Cadence, Magma, Synopsys
- SOI-ready core libraries and IP: ARM, Innovative Silicon, Synopsys
- Design service providers: Infotech
- Standard products on SOI: many, see [www.soiconsortium.org](http://www.soiconsortium.org)
- Research: IMEC, CEA-Léti, Tyndall
- University collaboration: Ritsumeikan, Stanford, Cal-Berkeley, UCL

## 3. Education and training for SOI designers, showing design simplicity and opportunities for power and cost savings



# Why SOI is Simply Greener?

- **Because semiconductors are the leading contributor to energy efficiency gains in our economy**
  - According to [Semiconductor Technologies: The Potential to Revolutionize U.S. Energy Productivity](#), and lead author of the report John A. “Skip” Laitner, Director, Economic and Social Analysis, American Council for an Energy-Efficient Economy ([ACEEE](#) – see [www.aceee.org](http://www.aceee.org) ).
- **SOI provides path forward for semiconductor industry with more significant power savings to:**
  - Lower power demand and lower power bills, \$800B cumulative net electric bill savings through 2030
  - Average new jobs per year: 500,000
  - Reduction in CO2 emissions by 400 million metric tons annually



# SOI is Greener Now and into the Future: SOI Roadmap for Future Sustainability

- **SOI availability at 180, 90, 65, 45 and 32nm**
  - Many existing proof points and market successes
- **SOI substrates now available for 22nm and beyond**
  - Both Partially Depleted and Fully Depleted solutions
  - Enabling continued planar technology and 3D device migration
- **SOI Consortium will assist newcomers**
  - Designer training
  - Ecosystem networking and collaboration
  - Opportunities to join other innovation leaders in defining the future in process development, designer training, design methodology and techniques, EDA productivity tools, and IP development



# Summary

- Universally recognized need for the electronics industry to reduce power consumption – need for change
- SOI is a proven and available technology with an existing ecosystem that offers significant power savings compared to bulk silicon – best path forward
- The SOI Industry Consortium and its members are ready to help companies make the move to SOI and SOI-based products – open invitation to collaboration opportunities





- For more information :

- visit [www.soiconsortium.org](http://www.soiconsortium.org)
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