

The ESH International Technology Roadmap for Semiconductors

1999

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International Technology Roadmap for Semiconductors

Santa Clara, CA; July 1999

Work in Progress --- Not for Publication



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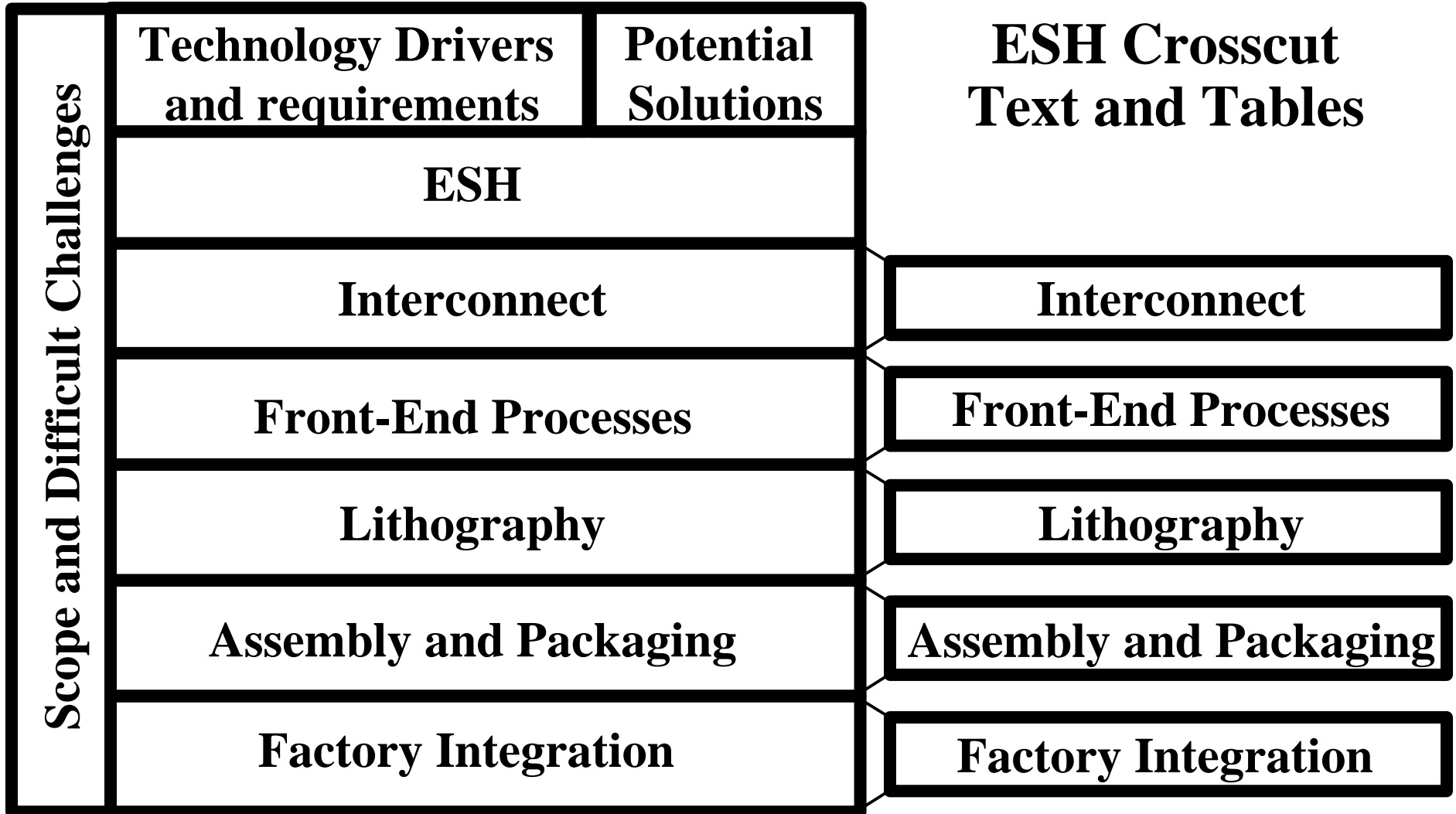
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ESH Roadmap

ESH Section

Thrust Section



ESH Roadmap Scope

Identifies ESH research and development challenges that result when new design, wafer processing, and assembly technologies are created to meet semiconductor technology requirements of the future.

Proposes possible technology and management systems to meet the challenges.

Gives focus to research centers, suppliers, and semiconductor manufacturers.

ESH Difficult Challenges/ Before 2005

Chemicals, Materials and Equipment Management

- Chemical Data Collection
- New Chemical Assessment
- Environment Management

Climate Change Mitigation

- Reduce Energy Use of Process Equipment
- Reduce Energy Use of the Manufacturing Facility
- Reduce High Global Warming Potential Chemicals Emissions

Worker Protection

- Equipment Safety
- Chemical Exposure Protection

Resource Conservation

- Reduce Water, Energy, Chemicals and Materials
- Waste Recycle

ESH Design and Measurement Methods

- Evaluate and Quantify ESH Impact

ESH Difficult Challenges/ Beyond 2006

Chemicals, Materials and Equipment Management

- Chemical Use Information

Climate Change Mitigation

- Reduce Energy Use
- Reduce High Global Warming Potential Chemicals Emissions

Worker Protection

- Equipment Safety

Resource Conservation

- Reduce Water, Energy, Chemicals and Materials

ESH Design and Measurement Methods

- Evaluate and Quantify ESH Impact

New Chemicals and Materials

Technical drivers

Interconnect

- Lo-K
- Copper
- Advanced Metalization
- Hi-K

Lithography

- Photoresists
- Thinners
- Developers
- Rinses
- Strippers

Front-End Processes

- Precursors for Hi-K and electrode films
- Metal-containing precursors
- Hydride-based dopant precursors
- Cleaning processes

Assembly and Packaging

- Lead alternatives
- Flame retardants
- Solvents

New Chemicals and Materials Needs

Need standardized assessment and selection methods that comprehend acquisition, process, by-products, and disposal for each new chemical. Key elements:

- **Risk Assessment Methodology**
- **Safety and Health Data**
- **Environmental Impact Data**
- **Database**
- **List of Chemicals and Materials to be Avoided/Eliminated**

Need to adopt “Sustainability” concept. Key elements:

- **Resource Conservation of Water, Energy, Chemicals and Materials**
- **Zero Emissions and Waste Concept**
- **No Resource Depletion or Environmental Impact**

Worker Protection

New Chemicals, Materials and Processes

- **Standardized assessment and selection methods**
- **Testing and rating for personal protective equipment**

New Equipment

- **Design all equipment to ensure that no single point failure will result in worker risk**
- **Design and construct equipment to meet global industry consensus requirements (e.g. SEMI S2/S8; CE Mark)**
- **Procedures and training for maintenance and disposal**

New Radiation Sources

- **Proper shielding**
- **Exposure monitoring**
- **Personal protective equipment**

ESH Expectations

While minimizing risk to the public and employee health, and the environment.

ESH improvements must:

- Meet local, national and international needs
- Have positive impact on cost, technical performance and product timing

ESH must be fully integrated into process, equipment and facilities research and engineering **to ensure successful technology development**