Challenges in the Transition to 450mm

Kirk Hasserjian
Corporate Vice President, Strategic Programs
Silicon Systems Group
Applied Materials
450mm Transition

When will 450mm transition occur

What determines a successful transition to 450mm

Who will transition to 450mm

450mm Transition Defined by 3 Vectors
Challenges in Transition to 450mm

450mm Transition Defined by 3 Vectors

Macro Economics

Transition Economics

Technical Complexity
Macro-economics
Challenges in Transition to 450mm

Macro Economics decides the timing of 450mm
Silicon Demand

Silicon Area (Million Square Inches)

Source: Gartner
Technical Complexity
Challenges in Transition to 450mm

- Larger Surfaces
- Uniformity Challenges
- Throughput and Robotics
- Standardization

Overcoming Technical Complexity will determine Success of Transition
Technical Challenges

**Fab**
- Automation
- Cycle Time/Productivity
- Material / Parts Transport

**Tool**
- Platform design & Scalars (Tput/Footprint)
- Ease of Maintenance
- Sensors & Data streams

**Chamber**
- Green Scalars (Gas/Water/Elec.)
- Heating/Gas Flow uniformity
- Component/Parts Scaling

**Process**
- Thickness/CD Uniformity
- 1.5mm EE
- Defects
- Spatial effects
Initial Process Data

450mm Plating

450mm Dielectric Etch

450mm ALD

450mm Ox/Nit

Initial Process data from Chambers encouraging
Standardization offers lower costs, higher volumes post 450mm
Transition-economics
Challenges in Transition to 450mm

Transition Economics

- Industry Consolidation
- Driven by Logic transistors
- Dual R&D for 300 & 450mm
- ASP Multipliers

Transition Economics will determine who will transition
450mm Transition Dynamics and Industry Consolidation

1. Limited number of customers
2. Memory not driving the transition
3. High Capital intensity expected ($8 - $10B)

* Dataquest 2008
Initially, 10% of all 300mm wafer capacity expected to go to 450mm (~2018 - 2019)

Based on Applied internal estimates of 300mm wafer capacity installs, 450mm transition primarily driven by Logic + Foundry, on leading edge node.
450mm Transition Requirements
450mm Requirements

Timeline Synchronization:
- Customer timelines need to be synchronized to maximize R&D efficiency

R&D Funding:
- Consortia, government, IC maker funding needed to share costs and risks

Standardization:
- Further standardization across industry required to drive lower costs

Process Performance:
- Pilot tool performance needs to meet the 7/5nm requirements for successful transition
450mm Outlook

HVM 2018-2020

7/5nm Logic

$8-10B
3-5 Customers
Thank You