Advanced Lithography Systems for 450 mm Wafers Processing

Kazuo Ushida
President, Precision Equipment Company
NIKON CORPORATION

December 6, 2012
# Table of Contents

- Semiconductor Lithography Roadmap
- Semiconductor Market Trend
- Transition to 450 mm wafers
- Transition to 300 mm wafers (Review of the Past)
- Performance Required for 450 mm Tools
- R&D Roadmap for Nikon’s Lithography Tools
- Summary
Extension of immersion technology (DP/MP) resulted in continuous volume production of 1X nm devices. EUVL is expected for 16nm and beyond (HVM not until 2018 at the earliest).
Despite the flat growth of the market, the demand for 300mm silicon wafers has almost doubled.
Application Demand

Notebook PC revised downward due to weak macro economy.
Unit demand for lower-priced tablet PCs and smartphones show steady growth.
Transition to 450 mm wafers (Advantages)

- 450 mm wafers will help decrease the number of fabs required for semiconductor manufacturing, thereby reducing the costs for PP&E and manpower significantly.

- Increased wafer size reduces the increase in per unit area process costs associated with the technology evolution.

\[
\begin{align*}
\text{Wafer Area} & \quad \rightarrow \quad 2.25X \\
\text{Effective Chip Area} & \quad \rightarrow \quad 2.4X \\
\text{Throughput / Chip} & \quad \rightarrow \quad 30 - 40\% \text{ time}
\end{align*}
\]

The timing of the transition will have a significant impact on the entire semiconductor industry.
Transition to 300 mm wafers (When did HVM Start at Fabs?)

Transition to 200 mm was not well aligned, so SEMI played a central role in promoting the standardization of 300 mm. Further collaboration is required for transition to 450 mm that requires significant CapEx.
Performance Required for 450 mm Litho Tools

Proven Solutions Through Evolution

- Improved overlay accuracy
- Improved imaging performance
- Higher throughput
Summary

• 450 mm wafers are effective in improving total productivity, and the fundamental technologies Nikon acquired through its cutting edge immersion tools can handle them.

• We need to leverage our experience from the transition to and the standardization of 300 mm wafers, and the chip makers and suppliers have to collaborate further.

• Nikon’s leading tools S621D (immersion) and S320F (dry) have high overlay accuracy and high throughput, both proven effective in accommodating 450 mm wafers.

• Nikon plans to ship 450 mm HVM tools in 2017 through our joint development effort with a chip maker.