



2011 Litho ITRS Update

Lithography TWG

Dec 2011



International Technology Roadmap for Semiconductors

Litho Team

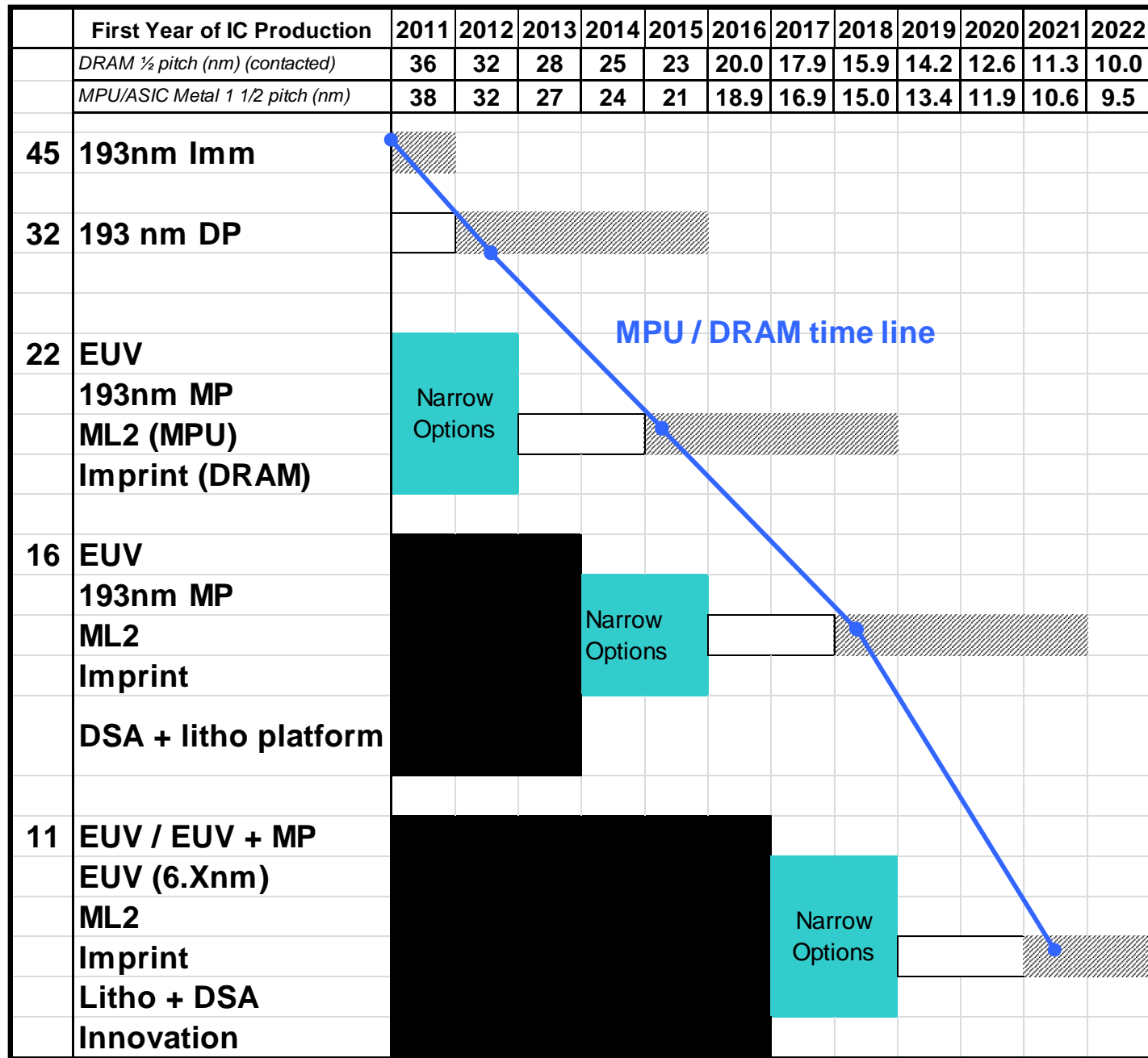
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Outline

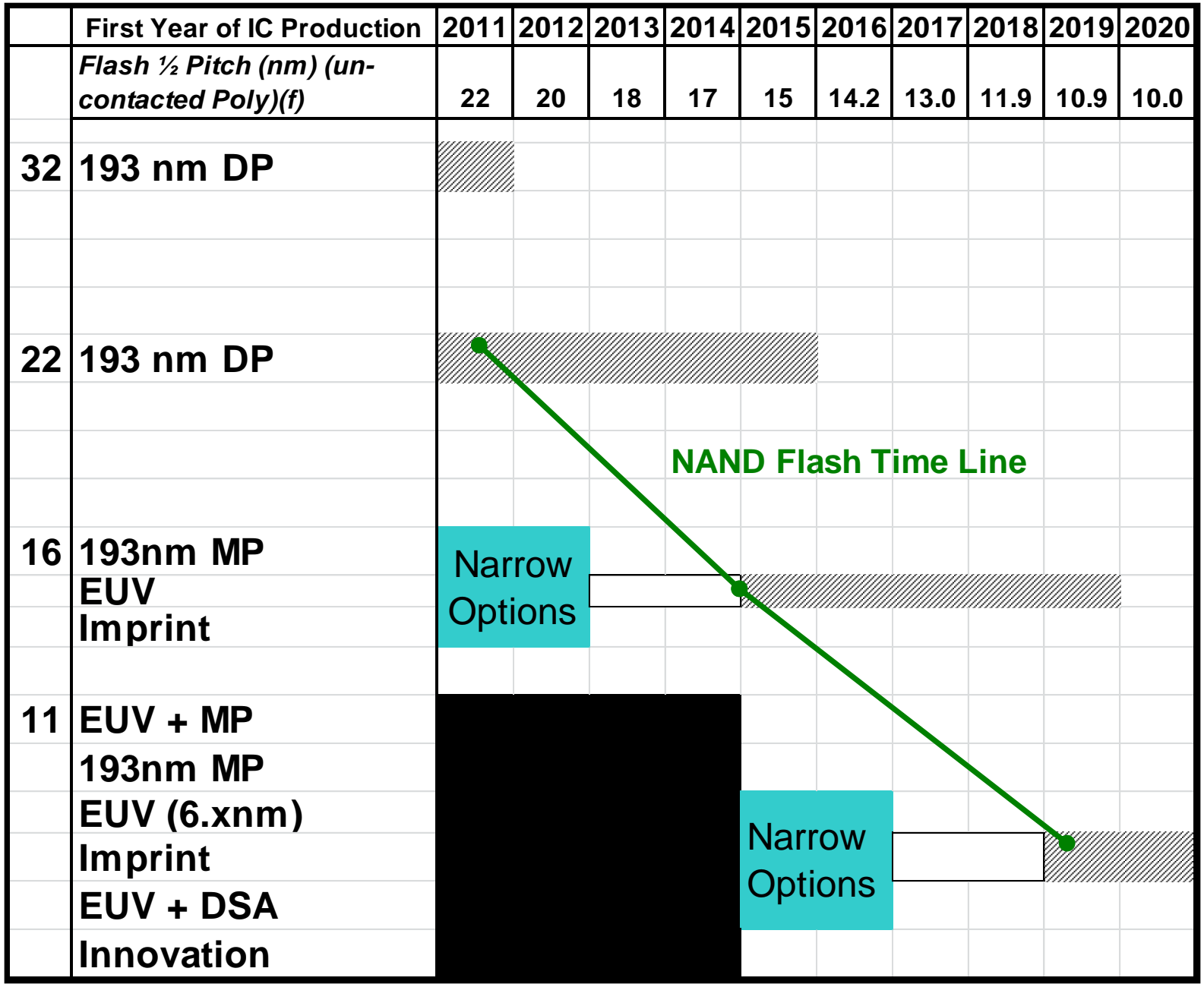
- Lithography Potential Solutions
- Major Challenges
- Table Change Highlights



Potential Litho Solutions



Potential Litho Solutions



Short and Long Term Challenges

Near Term Challenges (2011-2018)

(16nm Logic/DRAM @ HVM; Flash 11nm @ optical narrowing with 16nm in HVM)

- 1 Multiple patterning - cost, throughput, complexity
- 2 Optical mask - complexity with SRAF, long write time, cost
- 3 EUV source power to meet throughput requirement; Defect "free" EUV masks availability; mask infrastructure availability; EUV mask in fab handling, storage, and requalification.
- 4 Resist at 16nm and below that can meet sensitivity, resolution, LER requirements
- 5 Process control on key parameters such as overlay, CD control, LWR at 16nm HVM
- 6 Retooling requirements for 450mm transition

Long Term Challenges (2019 - 2025)

(11nm @HVM)

- 1 Higher source power, increase in NA, chief ray angle change on EUV; Mask material and thickness optimization
- 2 Defect free DSA processing
- 3 Infrastructure for 6.Xnm Lithography or multiple patterning for EUVL 13.5nm
- 4 Metrology tool availability to key parameters such as CDU, thickness control, overlay, defect
- 5 Early narrow and implement ~2 options with viable infrastructures support



Table Change Highlights

- Single patterning optical lithography is at end of life at 40nm. Double and multiple patterning are the main Litho platforms for 32/22nm starting in 2011.
- Expanded MP table and clarify spacer based patterning.
- Updated Litho specific parameters such as MEEF, K1 factors
- Adding new specifications such as absorber film control in EUV Table



Litho Team – Acknowledgement for Contribution to 2011 Revision

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2012 Revision Focus Topics

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Focus Topics

- Logic/memory/flash mask count roadmap
- Negative develop for contacts
- EUV mask roughness specifications
- High Voltage electron beam resist sensitivity
- DSA incorporation
- Upgrade ML2 Table