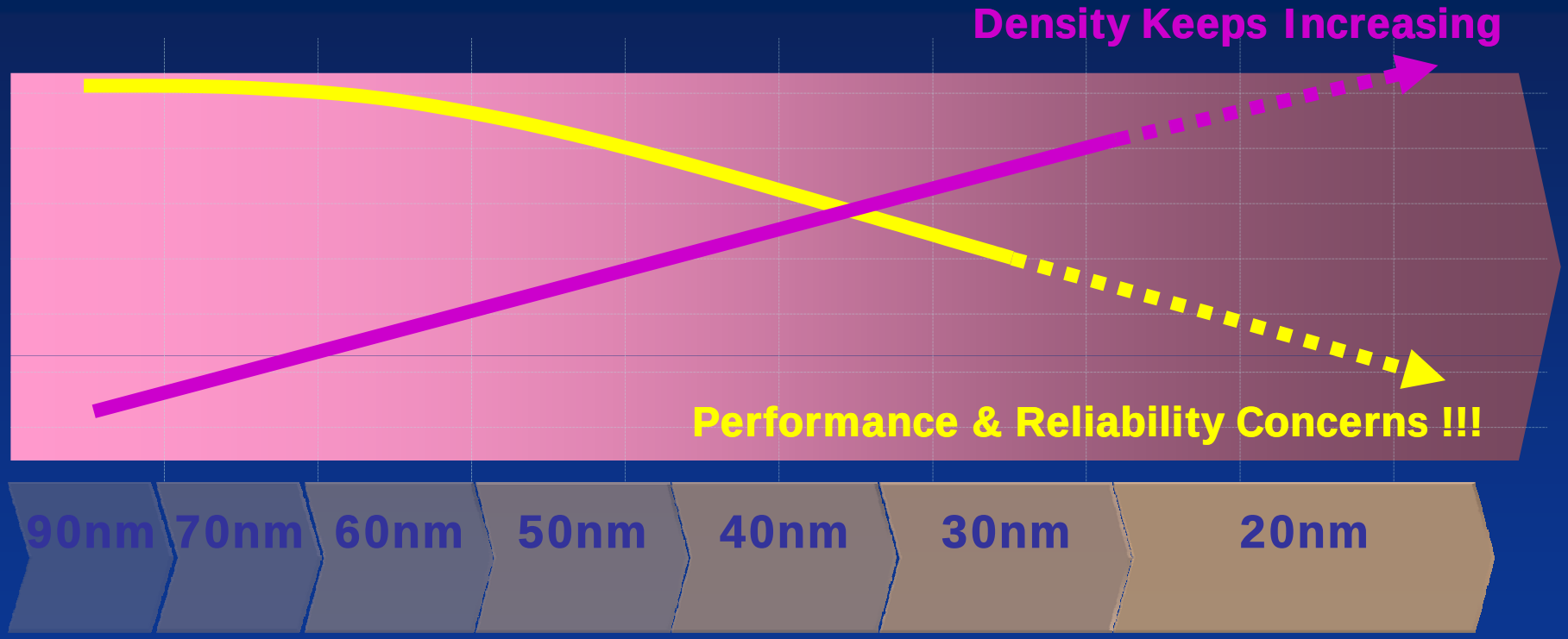
Toggle-Mode NAND to Fill Growing Need for Higher Performance

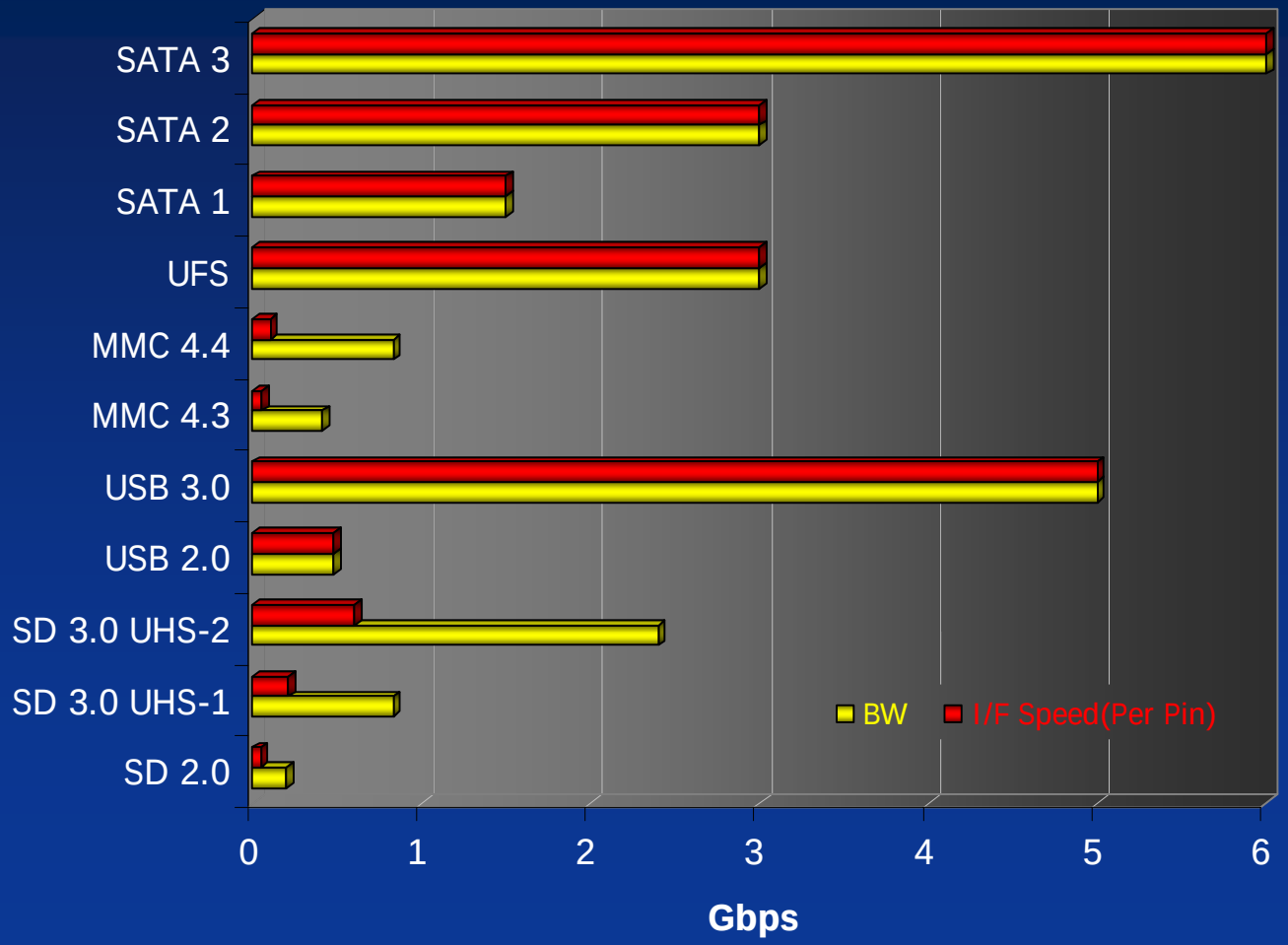
Ha Ryong (Harry) Yoon

Sr. Manager in Technical Marketing
Samsung Semiconductor Inc.

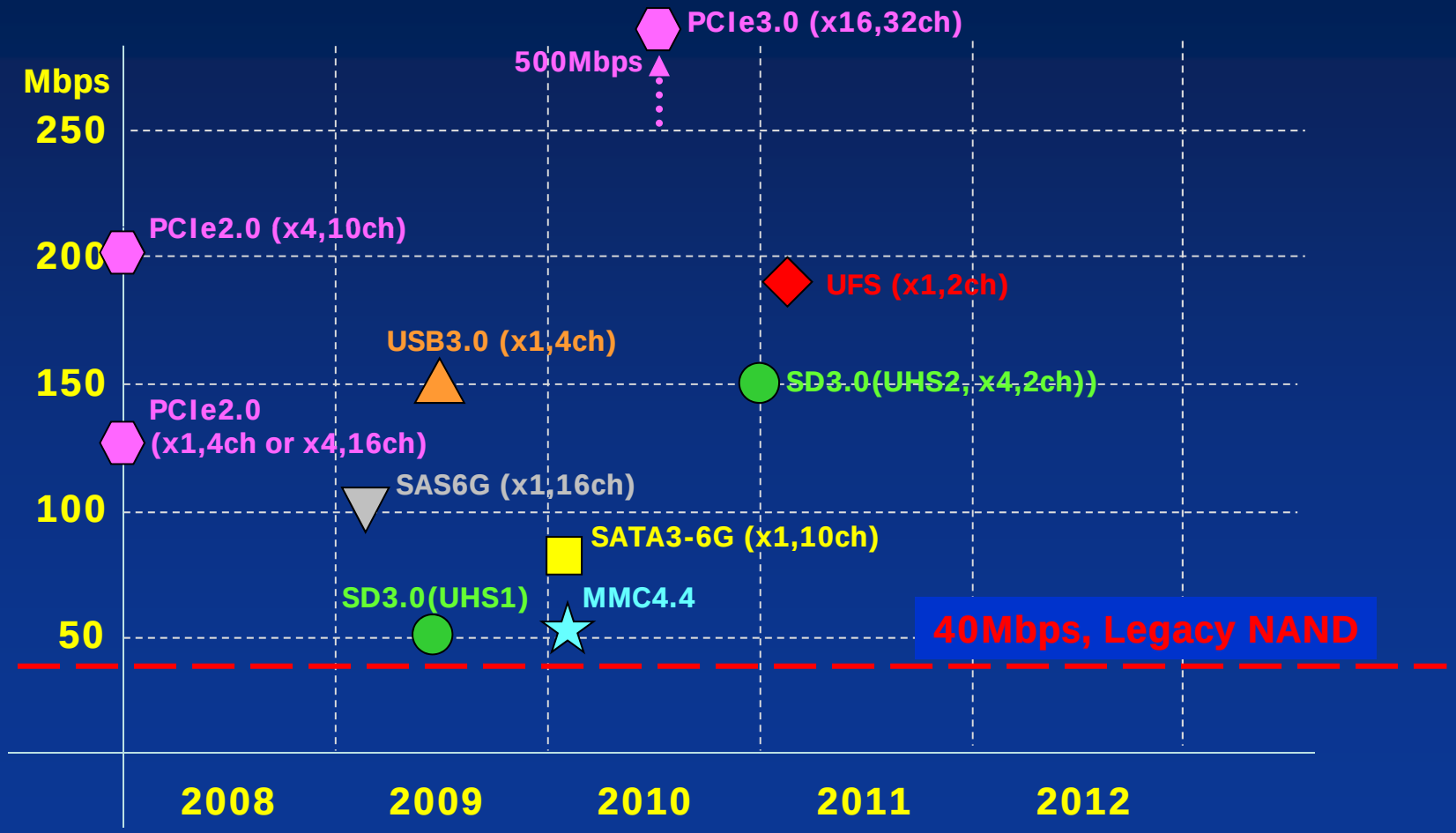
Process Technology Evolution



Growing Need for Higher Performance - Interface Speed Trend

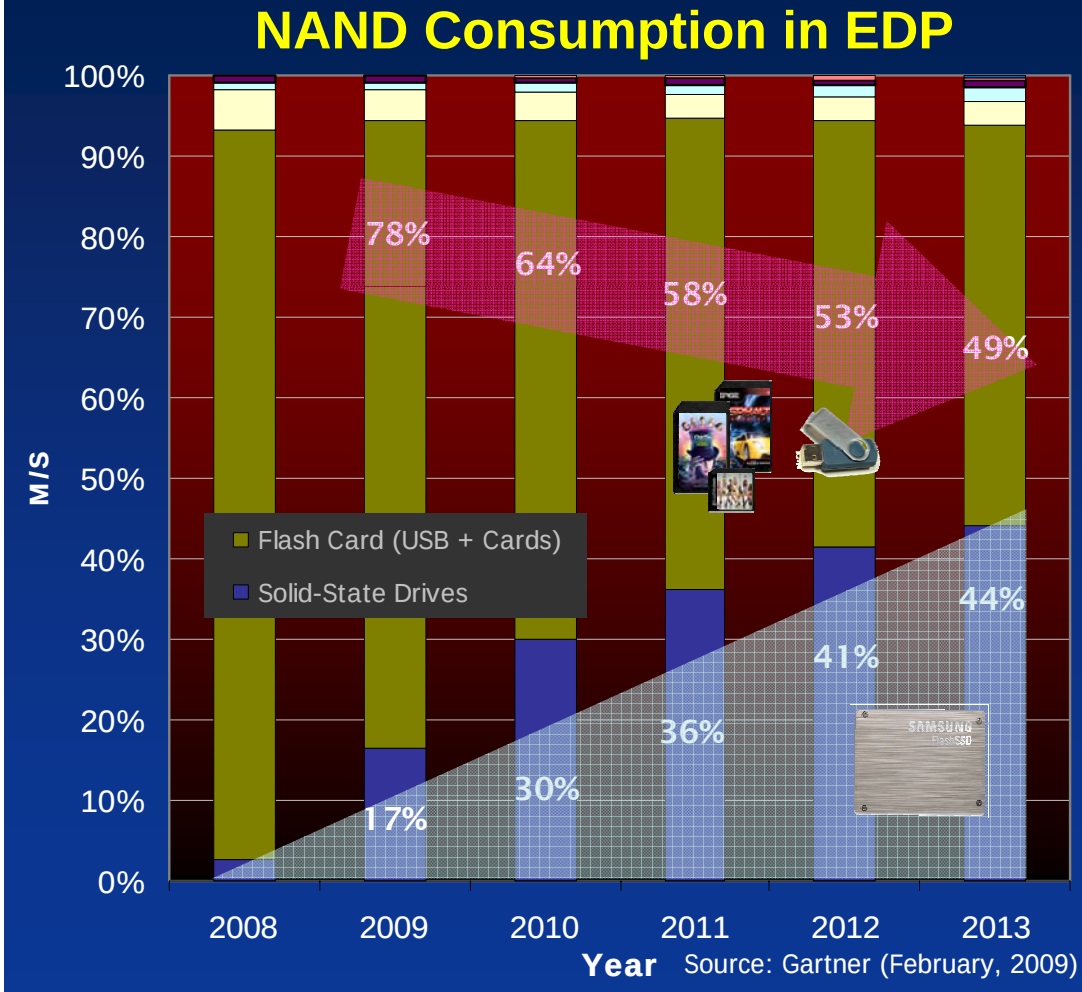


Growing Need for Higher Performance - NAND Performance Requirement



* Only I/F BW translated. If considering latency, min requirement would be increased

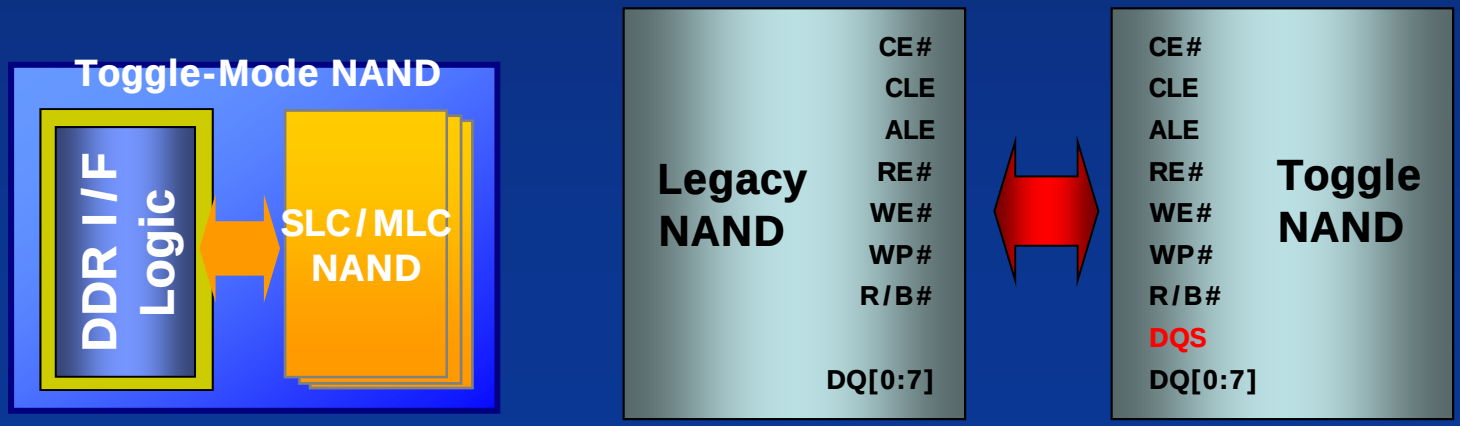
Market Expansion



- Enterprise-class SSD (SATA3, SAS, PCIe) and high-speed card(USB3.0, UHS2, UFS) are fueling the need of higher performance NAND
- Enterprise SSD will take ~65% of SSD market at 2012
- USB will take ~14% of NAND market at 2012
- SD & uSD will take ~80% of flash card market at 2012

Toggle-Mode NAND?

- High speed “Toggle-Mode” operation
  - No clock – Asynchronous Double Data Rate
  - High performance by using the asynchronous interface for backward compatibility
  - Bidirectional DQS for read and write operations

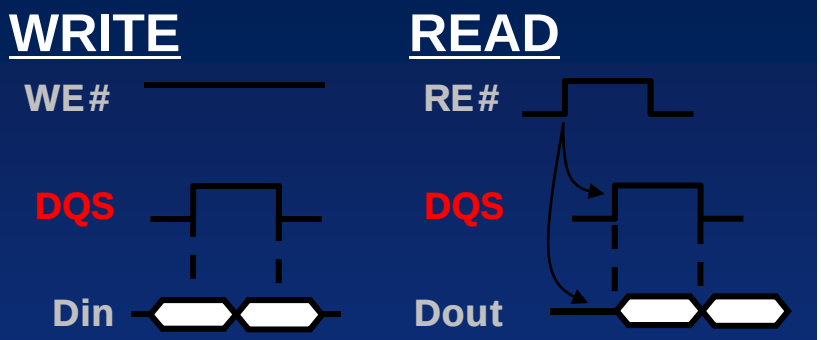


Why Toggle-Mode NAND?

- High performance
  - Supports 133Mbps and higher
- Less power consumption
  - No free-running clock
- Flexibility of operating frequency
  - No additional mode change required
- Easy migration from legacy NAND
  - Same signal functionality as legacy NAND

Differentiation from Others

- No free-running clock
  - Less power consumption
  - Free from IP issues



- Flexibility of operating frequency
  - No additional mode-set change required
- Simple adoption
  - Same signal functionality as legacy NAND

Development Status & Roadmap

- 1st Gen available 2H ’09 at 133Mbps
- 2nd Gen(200Mbps) targeted for early’11, but entry time depends on market needs and requirements

Standardization Status in JEDEC

Item	Status	Comments
Packaging & Pin-out	On Going	Ball Configuration Done
Addressing & Bad Block Definition	Done	
Signal Definition	On Going	Under Documentation
AC Parameter	Done	
Initialization & Identification	Done	
Timing/Command Set	On Going	Basic Command Set Done
Interface & I/O Characteristics	On Going	AC/DC & Operating Condition Done
Parameter Page Definition	On Going	Byte[100:0] Done

Thank You !

For more information,
harry.yoon@ssi.samsung.com