



Scaling in 3D NAND and Implications

Hanan Weingarten

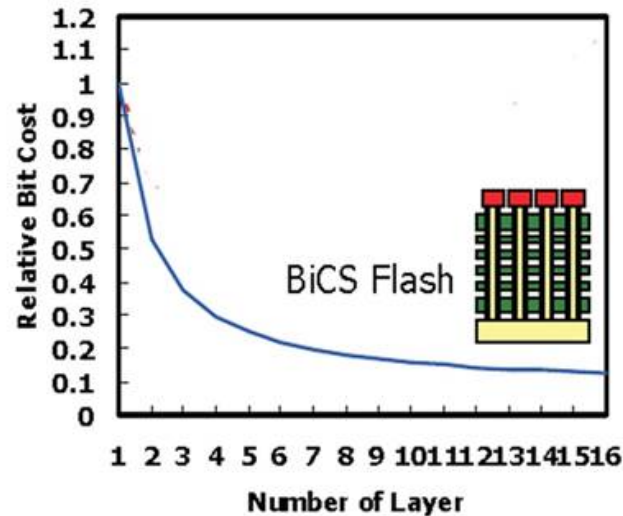
DensBits Technologies

- Initial declarations on 3D:
 - More reliable
 - Faster
- Will this continue with scaling?

- Diminishing returns:
 - Price per layer
 - 32 - > 64 – only 15%

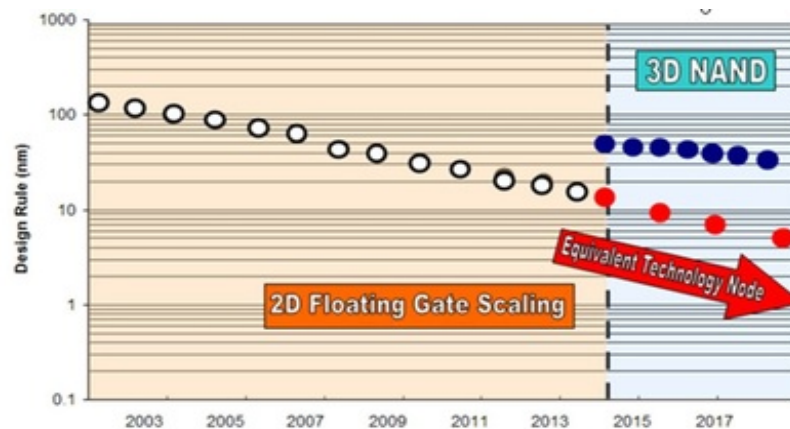
- Tool limitations:
 - Shaping pipes with more layers

- Reliability Impact:
 - Read / Program Disturbs
 - Tool accuracy



Source:
Toshiba
H. Tanaka, et al.,
Symposium on VLSI
Technology, 2007.

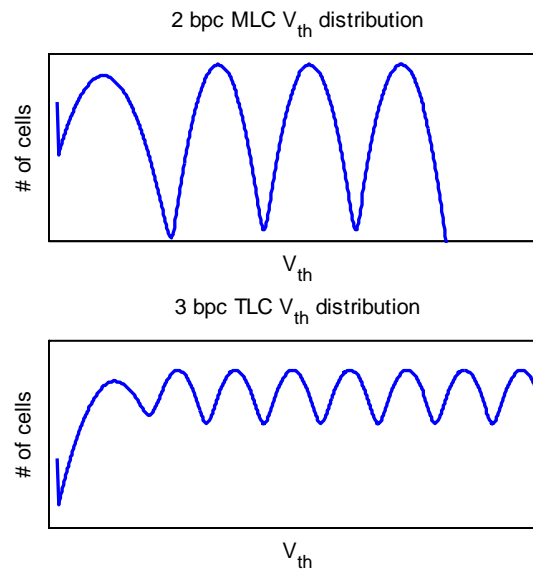
- Limited by:
 - No double patterning
 - Light source



Taken from <http://www.monolithic3d.com/blog/3d-nand-opens-the-door-for-monolithic-3d>

- Reliability impact

- MLC -> TLC or TLC -> QLC
- Reliability Impact:



- Scaling is likely to hurt reliability
- A strong PHY / Memory Modem™ layer is required