Exhibit 3

Reducing Variation in Advanced Logic Technologies, Kelin J. Kuhn, IEDM (2007)

Reducing Variation in Advanced Logic Technologies:

Approaches to Process and Design for Manufacturability of Nanoscale CMOS

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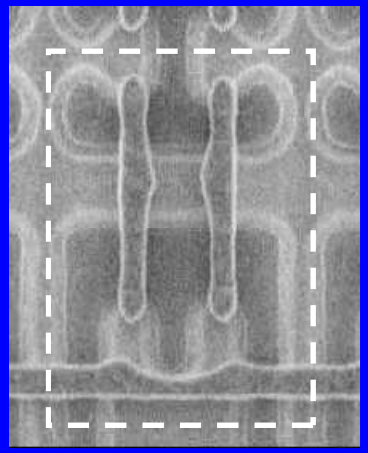
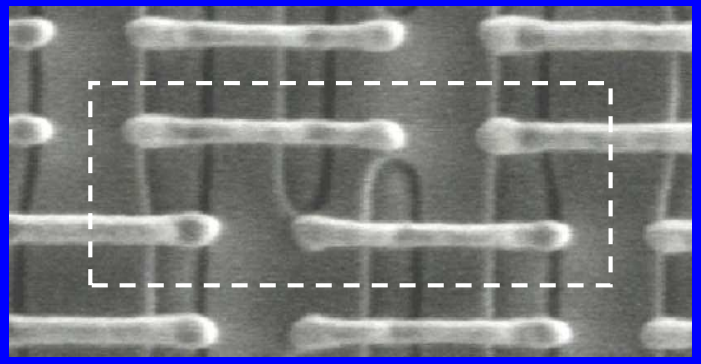
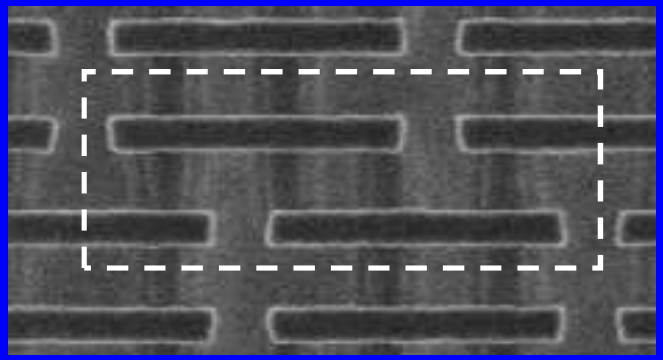
Key messages

- Process variation is not a new problem
- A variety of process, design and layout techniques can be applied to mitigate the impact of random and systematic variation
- Improvements in variation in 45nm illustrate that variation does not pose an insurmountable barrier to Moore's Law, but is simply another challenge to be overcome

Process-Design Mitigation for Variation Management







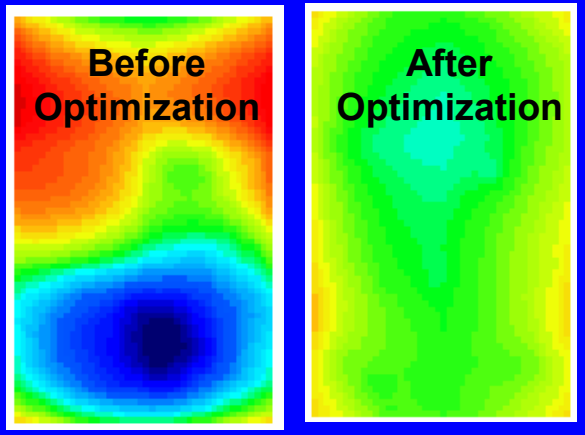
90nm – tall
1.0 μm^2

→

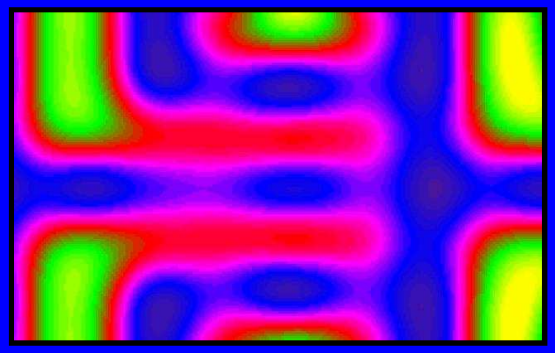
Design mitigation
65nm – wide - 0.57 μm^2

→

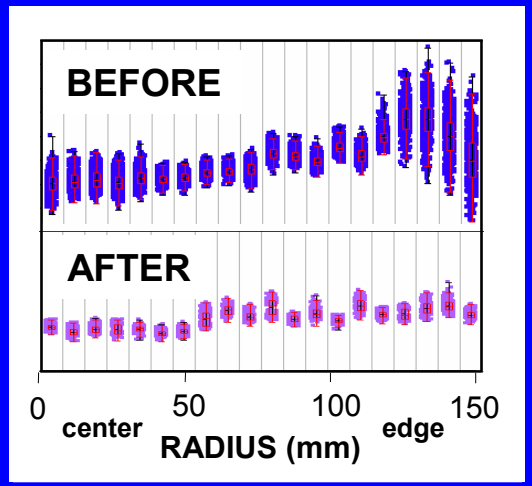
Process mitigation - 45nm – wide
w/ patterning enhancement 0.346 μm^2



Design mitigation
w/ dummification

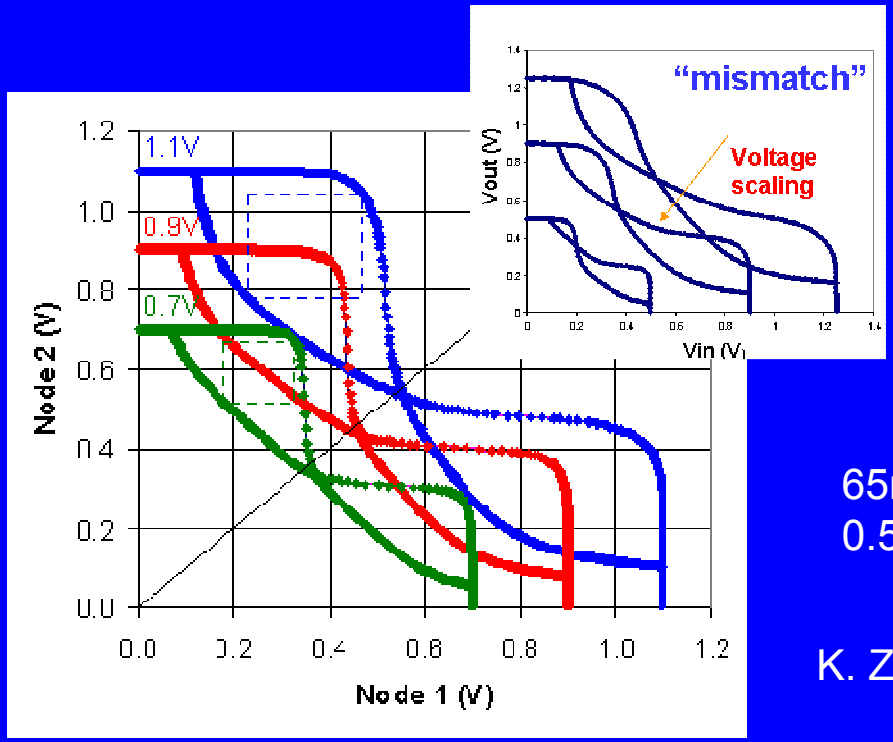


Process/design mitigation with
computational lithography



Process mitigation
w/ CMP improvements

Systematic Mismatch in the SRAM



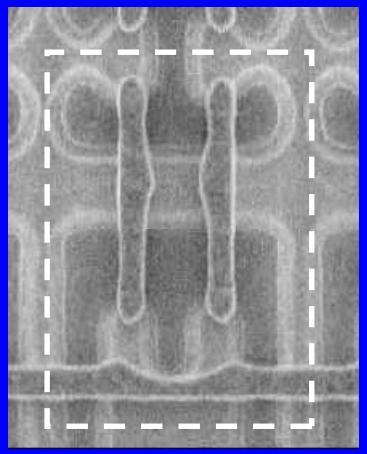
65nm – WIDE
0.57 μm²

K. Zhang, VLSI 2004

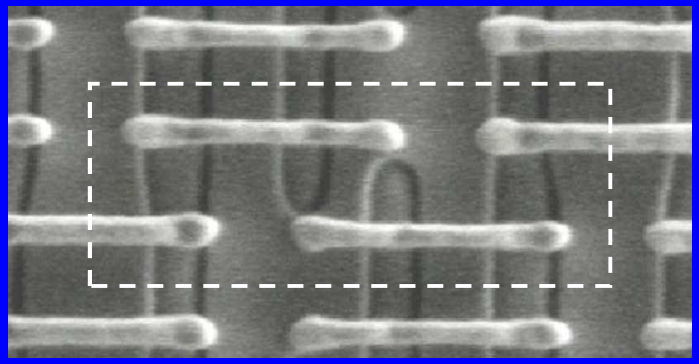
- SRAM circuits exercise the smallest area devices in the technology
- SRAM static noise margin (SNM) is sensitive to device mismatch
- Although RDF is the fundamental limit for mismatch in the SRAM
  a large variety of systematic issues also contribute to SRAM cell mismatch

→ **These systematic issues can be mitigated with design and process changes**

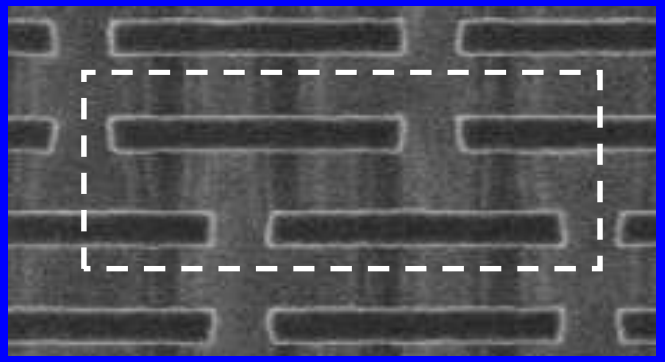
Systematic Variation Mitigation Strategies



90nm – TALL
1.0 μm^2



65nm – WIDE
0.57 μm^2



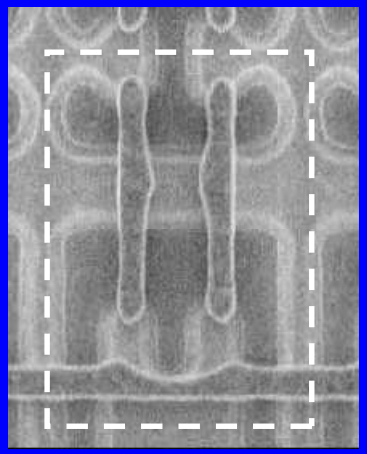
45nm – WIDE
w/ patterning enhancement 0.346 μm^2

DESIGN MITIGATION

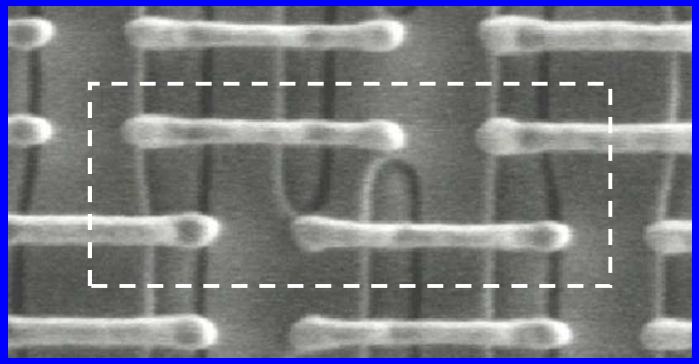
90nm to 65nm: "tall" design to a "wide" design.

- Single direction poly
- Elimination of diffusion corners
- Relaxation of patterning constraints on other critical layers

Systematic Variation Mitigation Strategies



90nm – TALL
1.0 μm^2



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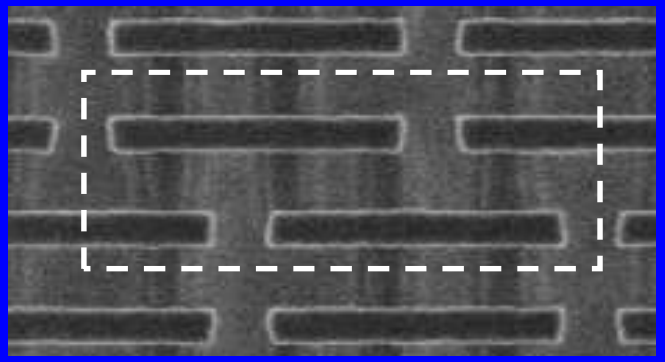
0.57 μm^2



45nm – WIDE
w/ patterning enhancement 0.346 μm^2

PROCESS MITIGATION

65nm to 45nm: Patterning enhancements

- Square corners (eliminate “dogbone” and “icicle” corners)
- Improved CD uniformity across STI boundaries