SPIE Advanced Lithography 2014 Highlights

Abde Ali Kagalwalla
A Full-chip DSA Correction Framework

Wei-Long Wang, Azat Latypov, Yi Zou and Tamer H. Coskun

Globalfoundries
Directed Self Assembly (DSA)

Goal of this paper is to find lithographically patterned guiding templates for random contact layer

Source: Hinsberg, DSA Workshop, 2010
Initial Solution Generation

**Step 1**
Size up target to form grouping boundaries

**Step 2**
Use the grouping boundaries as initialize OPC fragmentation

**Step 3**
Generate circle target with appropriate radius from the center of target Contact

**Step 4**
OPC correction to the circle target

**Step 5**
Pass the OPC result as initialize guess to perform DSA PC.

Figure 1: The DSA correction flow
**DSA-OPC Co-optimization**

Edge fragments of template features moved to minimize EPE of final patterns after DSA.
DSA-Aware Assist Feature Insertion

• In conventional lithography assist features must not print on wafer.
• With DSA, printable assist features can be used as long as BCP pattern is not etch transferrable.
Sample Simulation Results

Initial Guess

DSA PC

Group Type 1

Group Type 2

Group Type 3

Group Type 4

Initial Guess

DSA PC

EPE_RMS (nm)

Initial Guess Correction

DSA OPC Correction

Group Type 1

Group Type 2

Group Type 3

Group Type 4

NanoCAD Lab

puneet@ee.ucla.edu

UCLA
Anti-Spacer Double Patterning

Michael Hyatt**, Karen Huang*, Anton DeVilliers***, Mark Slezak*, Zhi Liu*

*JSR Micro, Inc.
**Micron Technology, Inc.
***Tokyo Electron America, Inc.
Process Flow

a. L1 patterning

b. ASG coating

c. ASG Bake

d. Rinse off ASG

e. L2 coating and bake

f. L2 Develop

- L1
- ASG (anti-spacer generator)
- Deprotected Anti-Spacer (DAS)
- L2
Creating Asymmetric Design Target

- Useful for DRAM manufacturing, where SADP is unable to create asymmetric targets.
CD Uniformity Challenge for ASDP Technology

Figure 3.2.2 Symmetric design for equal line space imaging
(a) Post DAS formation  (b) Post L2 develop  (c) Post plasma trim