

Characterization of pattern placement error for sub-40-nm memory devices

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Pattern placement error (PPE) is caused by lens aberration and telecentric error [1]. If PPE exists, overlay behavior is different from memory cells to overlay marks. This effect becomes more obvious if the design rule is sub-40-nm. To overcome this problem, overlay marks are usually cell-likely segmented so that PPE behavior is similar to memory cells. In addition, segmented overlay marks are robust to process variations such as reactive-ion-etching and chemical-mechanical polishing [2]. However, cell-like mark segmentation makes the image contrast of alignment signal getting worse. Thus, mark segmentation should be implemented carefully. In this paper, the impact of lens aberration and telecentric error on PPE is characterized for sub-40-nm memory devices so that the size of mark segmentation is optimized as a function of illumination condition, through-pitch behavior, and overlay mark types.

Key words: semiconductor, photolithography, overlay, alignment, aberration

References:

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