

Title: Double Patterning Overlay budget for 45nm technology node single and double mask approach

Abstract: In this paper we want to present the overlay budget applied to a double patterning technique for the definition of a 45nm technology node Flash memory device, with $k_1 \sim 0.20$ using 193nm dry lithography.

By using double exposure, final pattern is decomposed into two patterns well within the resolution capability of the exposure tool and then combined together using double etching processes (Photo Etch Photo Etch).

The PEPE approach makes the overlay between the two exposures the most critical issue to be addressed.

In order to approach the overlay roadmap requirements of 9 nm for the 45nm technology node, we present here what are the tricks utilized in terms of scanner set up, masks and overlay metrology.

First evaluation has been carried out using a single mask with even and odd patterns in two portions of the same mask. Best overlay achieved using this approach was less than 10nm.

In order to achieve demanded overlay a double mask approach have been carried out. In this case the overlay was at 8nm allowing prototyping activity to start.