Title:

An all-optical process for extending GRATE to the 11nm (20nm hp) Technology Node

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Abstract:

The 1-D Gridded Design approach holds great promise to simplify design and extend Moore's Law in a cost effective way. Current implementations of 1-D, highly regular GRATE-like (Gratings and Trim Exposure) designs use 193 immersion lithography with dipole illumination to define the line-space features and define the cut-level with a separate, optically defined double patterning mask.
In extending the GRATE technology to future device generations, CEA-LETI and Tela Innovations have demonstrated sub-20nm hybrid lithography using optical and pitch-division, and e-beam lithography (SPIE 2012; 8323-14), consistent with 11nm Technology Node geometries.

The results, however, show severe LER and LWR, particularly in the personalization layer forming the line cuts.

We present an all-optical approach using stimulated emission-depletion whereby one laser activates and one deactivates select regions in a fashion that narrows the actinic exposure to dimensions compatible with 20nm hp geometries. This approach promises to enhance the quality (such as LER/LWR) of the personalization level features and the line-space patterns.