Lithography Source Requirements in DUV and its EUV Status Updates
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Conventionally, lithography technology has contributed to the miniaturization of semiconductors by improving resolutions achieved though making wavelength shorter and shorter.

In the past years, DUV lithography units have achieved further evolution enabling the contrast to be further improved by mitigating optical aberration gap. In line with this, a parameter called E95 which is for Monochromaticity for light sources has been mitigated, which made it possible to further reduce the spectrum width. Assuming that optical setting parameters NA and σ are set for the same value in a legacy lithography unit and a latest model lithography unit, there should be differences in parameters such as Iso-Dense Bias which is sensitive to contrast, due to optical differences and the difference in contrast caused by the optical differences. For mass production sites equipped with various immersion lithography units keeping up with the times, we have studied the feasibility to compensate the CD bias differences caused by the differences in NA and σ settings, by handling the light source E95% as a variable number. We have also derived the scopes (coverages) necessary for E95% to compensate gaps between existing units or recipes, and presented optical challenges with the E95% set for what we derived.

In the other hand, EUV is promising technology for 7nm node and beyond, projecting in 2019 for risk process HMV. Gigaphoton has been developing CO_2-Sn-LPP EUV light source which is the most promising solution as the 13.5nm high power light source for HVM EUVL. Unique and original technologies such as; combination of pulsed CO_2 laser and Sn droplets, dual wavelength laser pulses shooting and mitigation with magnetic field have been developed in Gigaphoton Inc.. We have proved integration of high average power CO2 laser operation at or higher than 20kW cooperate with Mitsubishi electric cooperation. Pilot#1 is up running and demonstrating HVM capability; EUV power recorded at111W average with 5% conversion efficiency for 22hours operation in October 2016. Availability is achievable at 89% (2weeks average), also superior magnetic mitigation has demonstrated promising mirror degradation rate at 0.5%/Gp above 100W level operation. Recently we have demonstrated actual collector mirror reflectivity degradation rate is less than 0.4%/Gp by using real collector mirror around 100W (at I/F clean) in burst power during 30 Billion pulses operation. We will report latest data at STS 2019 during Semicon Korea.