

# **Modeling of the Thermal Response and the Thermal Distortion of Optical Mask during Optical Lithography Exposure Process**

By

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### **Abstract**

Optical lithography is the only commercial method for producing integrated circuits chips in 1999, but it may be replaced by other technologies due to its minimum feature size limit. The demand of faster integrated circuits chips continuously drives down the feature size on these microchips. To extend the optical lithography technology minimum feature size limit, all the mask-related distortions must be eliminated or minimized.

This work is to model and predict the thermal distortion of optical mask during full field and scanning exposure processes to help the industry in its effort to extend the life of the optical lithography below the 0.10  $\mu\text{m}$  feature size limit. Thermal and structural modeling of the optical mask during full field and scanning exposures for both fused silica and calcium fluoride are presented in this work.

An averaging technique is developed and used to predict the thermal distortion during both full field and scanning exposure processes to cut down the required computational time for the simulation. It was found that the calcium fluoride is not suitable for optical lithography masks materials as an alternative for fused silica for below 157-nm light wavelength.

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