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

By

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A theses submitted in partial fulfillment of the
Requirements for the degree of

MASTER OF SCIENCE
(Mechanical Engineering)

at the

UNIVERSITY OF WISCONSIN-MADISON

1999

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 μm 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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December 13, 1999

Acknowledgments

The research in this thesis was supported by international SEMATECH, the Semiconductor Research Corporation, and the University of Wisconsin-Madison Graduate School.

I would like to thank God for giving me the opportunity to work with such an expert group of people in the Computational Mechanics lab and the Solar Energy lab in the University of Wisconsin-Madison.

Special thanks to my advisors, Professors William A. Beckman and John W. Mitchell and my supervisor Professor Roxann L. Engelstad, for their generosity and patience throughout my work. I also would like to thank Professor Edward G. Lovell for helping me in my work in the computational mechanics lab. It is a privilege to have the experience of working with these professors.

Finally, thanks to my family, especially my wife Ghada and my daughter Sarah for their love and support.

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