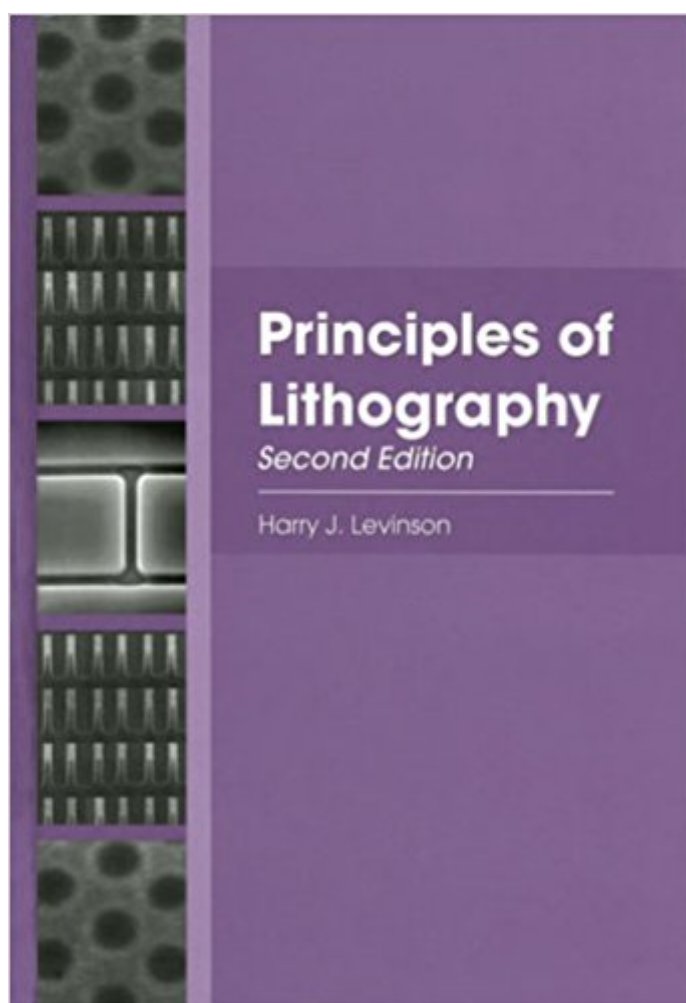


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Principles Of Lithography, Second Edition (SPIE Press Monograph Vol. PM146)



Synopsis

Lithography is a field in which advances proceed at a swift pace. This book was written to address several needs, and the revisions for the second edition were made with those original objectives in mind. Many new topics have been included in this text commensurate with the progress that has taken place during the past few years, and several subjects are discussed in more detail. This book is intended to serve as an introduction to the science of microlithography for people who are unfamiliar with the subject. Topics directly related to the tools used to manufacture integrated circuits are addressed in depth, including such topics as overlay, the stages of exposure, tools, and light sources. This text also contains numerous references for students who want to investigate particular topics in more detail, and they provide the experienced lithographer with lists of references by topic as well. It is expected that the reader of this book will have a foundation in basic physics and chemistry. No topics will require knowledge of mathematics beyond elementary calculus. Contents - Preface - Overview of lithography - Optical pattern formation - Photoresists - Modeling and thin film effects - Wafer steppers - Color Plates overlay - Masks and reticules - Overcoming the diffraction limit - Metrology - The limits of optical lithography - Lithography costs - Alternative lithography techniques - Appendix A: Coherence - Index

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Customer Reviews

This book is intended as an introduction to the science of microlithography for those new to the subject, and it covers advanced topics useful to experienced lithographers who seek information outside their own areas of expertise. Numerous references to the literature in optical lithography will guide both novice and experienced lithographers who want greater detail in specific areas. A number of discussions--such as thin-resist modeling, metrics for imaging, thin-film optics, and the modeling of focus effects--first appeared in Advanced Micro Design internal reports. Eventually, parts of these reports were published elsewhere. Their tutorial nature is not coincidental, as they were analyses that I used to develop my own understanding of lithography. Complex situations often are best comprehended through simple models that describe the relevant physics, with remaining effects considered as perturbations. This is the approach I used in learning lithography and it is the method used here. Students in my classes on lithography science will recognize many of the figures and equations. Several also appear in the first chapter of the SPIE Handbook on Microlithography, Micromachining, and Microfabrication, Volume I: Microlithography, which I coauthored with Bill Arnold of ASM Lithography. Other topics have been added or significantly expanded, especially those concerning light sources, photomasks, and next-generation lithography. The chapter on photoresists is approached from the perspective of the practicing lithographer, rather than the resist chemist. Some knowledge of resist chemistry is essential for using resists properly, but the emphasis here is on operational considerations. --This text refers to an out of print or unavailable edition of this title.

Dr. Harry J. Levinson has worked in microlithography for nearly two decades, at companies such as IBM, Sierra Semiconductor, and Advanced Micro Devices. He has published many articles on lithography science, from thin film optical effects and metrics for imaging to overlay and process control. He teaches courses in lithography science, process control, and total quality management.

This is an excellent book for engineers, whether in photolithography or not, to acquire an overview and understanding of modern deep sub-micron photolithography and the challenges microlithographers face. It is well written and easy to read. Levinson takes you through the entire process of lithography step by step with both the mathematics involved, but also, an intuitive explanation of what the technical issues involved are. The drawings done for the figures are done well and easily understood and printed with clarity. As for photos used for figures in the book, they are also well done, and of the proper brightness and contrast so that they are easy to view and comprehensible. They are not like some books, where you wonder if the illustration was a fifth

generation photocopy or just incomprehensible. Levinson also includes a chapter on metrology. If you are producing a microlithographic pattern you need to be able to measure it, and critical dimensions in lithography are not *dues ex machina*. The book has problem exercises at the end of each chapter to allow the reader to test themselves on what they have learned. I also recommend working out many of the equations as an exercise. Levinson also doesn't neglect the historical development of the practice of lithography. There is an explanation on why early lithography tended to have high overexposure and then went to 1:1 imaging and issues driving this. Also, there is a good chapter on the claims in the 1980s that optical lithography would not get past 1 micron resolution, and why this subsequently didn't prove to be true. Levinson bravely also writes up a section on the future limits of lithography and in a few years we will see if he was right. Regardless whether he will turn out to be right or not, it is an excellent explanation of the challenges involved. I think that there is an under appreciation that of the tremendous obstacles overcome in the advancement of microlithography. It isn't an automatic step down, and we do face the prospect that maybe 65 nm or 45 nm or 32 nm or 22nm will be the end. Next generation lithography is not neglected either and Levinson reviews the technologies and challenges for each of them. The book is a worthy successor to David Elliot's handbook on photolithography. (Perhaps some of you will regard that as paleolithography.) It is not expensive and should be on your book shelf. I wrote a supplementary paper in WORD for this book. I work out some of the equations in more detail than the text making it easier to understand. There are some errors in the text which I identify and provide the correction. Additionally, I added some supplementary information not in the book. If you would like a copy email me. .

Great book.

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