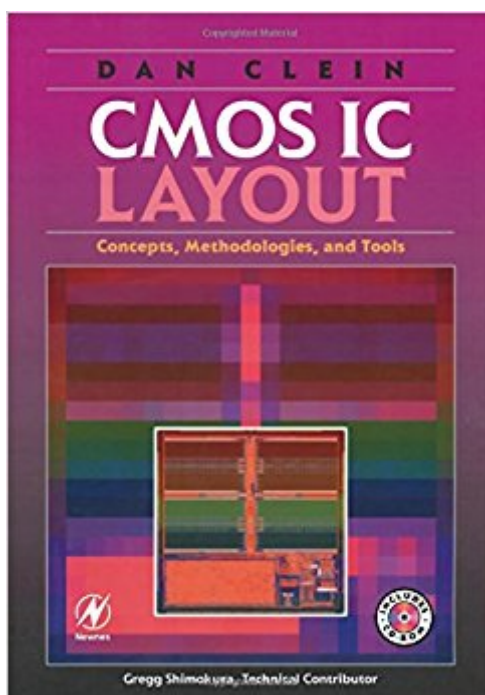


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# CMOS IC Layout: Concepts, Methodologies, And Tools



## Synopsis

This book includes basic methodologies, review of basic electrical rules and how they apply, design rules, IC planning, detailed checklists for design review, specific layout design flows, specialized block design, interconnect design, and also additional information on design limitations due to production requirements. \*Practical, hands-on approach to CMOS layout theory and design\*Offers engineers and technicians the training materials they need to stay current in circuit design technology.\*Covers manufacturing processes and their effect on layout and design decisions

## Book Information

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## Customer Reviews

This book includes basic methodologies, review of basic electrical rules and how they apply, design rules, IC planning, detailed checklists for design review, specific layout design flows, specialized block design, interconnect design, and also additional information on design limitations due to production requirements.

Manager, Mixed-Signal Layout, PMC-Sierra Inc., Ottawa, Canada.

This book is a good choice to learn mask design if you want to keep it as simple and cook-book like as possible. The book focuses on basic CMOS digital. Approximately 80 percent of all mask design is in CMOS digital, so that makes sense. Ancillary topics are brought up, such as simplified

electronic conceptualizations of transistors, resistors, capacitance, current density, it even touches on more specialized areas such as floor planning and routing. This book covers a lot of ground lightly, but never with any engineering depth. I ignored those areas where, in my opinion, the author crossed the line of over-simplification for the sake of simplicity (the indication of current flow in P transistors is well meaning but incorrect, for example). (Now that several years have passed and I have seen first-hand how this has at times confused mask design students, I feel that it should be mentioned.) Engineers and experienced mask designers should consider one of the more in-depth books, such as *The Art of Analog Layout*, or *IC Layout Basics: A Practical Guide*, or *IC Mask Design: Essential Layout Techniques*, or one of the many VLSI Design 101 texts for electronic engineering students. Purchase 'The Art of Analog Layout' if you want to focus on analog mask design issues, the physical issues rather than the software), or any of the above-mentioned books for the more specialized or difficult material such as analog layout, the bipolar transistor, power, VFET, MESFET, heterojunction, GaAs, SiGe, discrete, infra-red low bandgap materials, light collection, minority carriers, high voltage layout techniques, or anything more difficult, advanced, unusual, or for engineers versus mask designers. 'The Art of Analog Layout' is good enough to be an excellent reference for even the working mask designer and engineer. If you wish to learn mask design as if it were more like drafting, as some vocational schools still do, then this book is for you. I'm a senior analog chip design engineer and an advanced-level mask designer. I've worked with beginning mask designers. My opinion is that the mask-design-like-drafting path does not an excellent mask designer make, but you've got to start somewhere.

Nice reference book.

I have been a layout designer for 10 years and this is the first book I have found that is devoted exclusively to ic layout. It is about time. Your book does a good job of covering layout in the broad sense which make sit good for beginners and junior layout designers. I especially think you did a good job explaining the concepts of layers, basic design rules and transistor fingering. I do feel that you could have spent more time with transistor, resistor and capacitor matching from an analog perspective. Like most text and tools, your emphasis was on digital circuit. Keep up the good work and I look forward to the 2nd edition...

In 1980, Carver Mead and Lynn Conway published their classic "Introduction to VLSI Systems". For the first time, it abstracted the key concepts of VLSI design, common to most fabs. In such a way

that undergrads could use the book to design a chip that would then be fabricated. Now, from 1999 we have this book by Clein. It goes into more details about various types of CMOS circuits. Accompanied by a good section on the proliferation of standard cell libraries. Of course, you'd expect some changes in 20 years. Moore's Law and all that. But what is striking about the book is that there is no significant conceptual difference between both books. It is as though you took two introductory physics texts, 20 years apart, and diffed the content. No new laws of physics appeared in the interim. What it means is that a hypothetical user of Mead and Conway in the 80s could pick up Clein's book and just focus on what are essentially subsidiary details. Plus, the book was written in 1999. It is now 2007. Three cycles of Moore's Law have elapsed. Maybe Clein should update it. But in the absence of this, it is still quite germane. This book will become obsolete when CMOS becomes obsolete.

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