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Conclusions

In Part I, the development of integrated circuits, design objectives, and other general issues are discussed. With increasing current requirements and lower voltage margins, focus is placed on the design of high performance power distribution networks. The quality of the voltage greatly affects the performance of an integrated circuit.

With advancements in technology, additional focus is placed on the inductive properties of the network. The power and ground lines create a closed current loop, where the loop inductance is composed of the self- and mutual inductance of these lines. With increasing number of current loops, accurately estimating the grid inductance has become increasingly complicated since significantly more mutual inductive elements need to be considered.

Electromigration is also reviewed here, since the long-term reliability of integrated circuits is a primary concern. High levels of current propagate within the power distribution network, creating stress on the network interconnects. Electromigration can be significantly reduced in those lines where the current direction alternates. The current in the power supply network however is primarily unidirectional; therefore, electromigration can significantly degrade the reliability of these networks.

Decoupling capacitors are introduced and reviewed in this part. In addition, scaling theory is applied to power distribution networks, providing scaling trends for these networks. The topics reviewed in Part I are intended to provide a general background to the area of on-chip power networks, permitting the reader to more easily follow the remainder of the book.

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