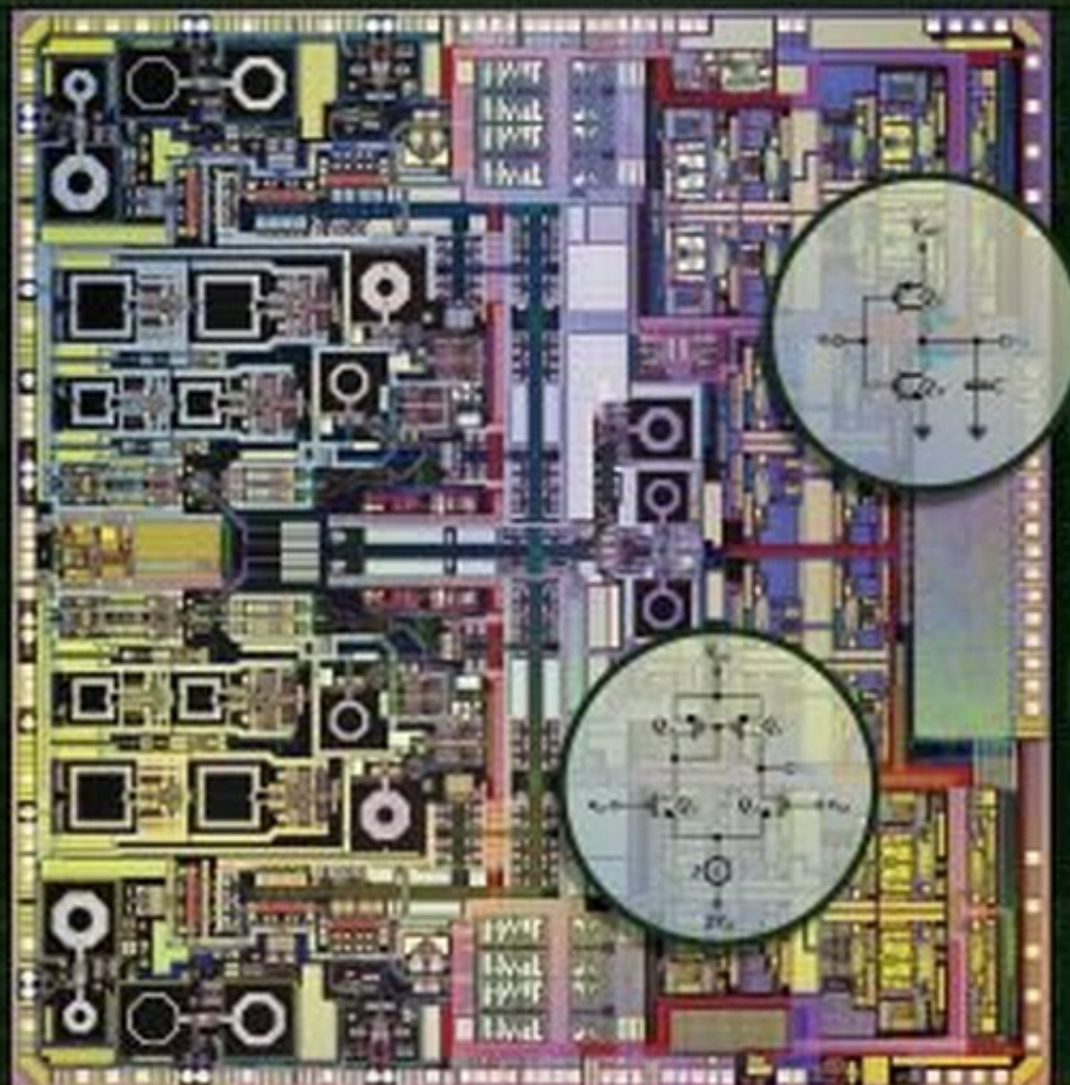


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SEDRA/SMITH

Microelectronic Circuits



SIXTH EDITION

PART I

Devices and Basic Circuits

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Part I, *Devices and Basic Circuits*, includes the most fundamental and essential topics for the study of electronic circuits. At the same time, it constitutes a complete package for a first course on the subject.

The heart of Part I is the study of the three basic semiconductor devices: the diode (Chapter 4); the MOS transistor (Chapter 5); and the bipolar transistor (Chapter 6). In each case, we study the device operation, its characterization, and its basic circuit applications. For those who have not had a prior course on device physics, Chapter 3 provides an overview of semiconductor concepts at a level sufficient for the study of electronic circuits. A review of Chapter 3 should prove useful even for those with prior knowledge of semiconductors.

Since the purpose of electronic circuits is the processing of signals, an understanding is essential of signals, their characterization in the time and frequency domains, and their analog and digital representations. This is provided in Chapter 1, which also introduces the most common signal-processing function, *amplification*, and the characterization and types of *amplifiers*.

Besides diodes and transistors, the basic electronic devices, the op amp is studied in Part I. Although not an electronic device in the most fundamental sense, the op amp is commercially available as an integrated circuit (IC) package and has well-defined terminal characteristics. Thus, despite the fact that the op amp's internal circuit is complex, typically incorporating 20 or more transistors, its almost-ideal terminal behavior makes it possible to treat the op amp as a circuit element and to use it in the design of powerful circuits, as we do in Chapter 2, without any knowledge of its internal construction. We should mention, however, that the study of op amps can be delayed to a later point, and Chapter 2 can be skipped with no loss of continuity.

The foundation of this book, and of any electronics course, is the study of the two transistor types in use today: the MOS transistor in Chapter 5 and the bipolar transistor in Chapter 6. These two chapters have been written to be completely independent of one another and thus can be studied in either order as desired. Furthermore, the two chapters have the same structure, making it easier and faster to study the second device, as well as to draw comparisons between the two device types.

After the study of Part I, the reader will be fully prepared to undertake the study of either integrated-circuit amplifiers in Part II or digital integrated circuits in Part III.