

CHAPTER

8

INTEGRATED CIRCUITS

8.1 Introduction

Even though detailed discussions on Integrated Circuits (ICs) is beyond the scope of this book, this chapter attempts to present brief description on the types and processes employed in the manufacturing of integrated circuits. Indeed, integrated circuits are such important components in today's computer based technology. To follow the format of this book, some problems and solutions are also provided at the end of this chapter.

In the year 1958, J.S. Kilby became the first person who developed an integrated circuit, a semiconductor chip where active and passive circuit elements and their connections are fabricated through a sequence of processes of melting and deposits. Nowadays, manufacturing technology has advanced so much that very tiny devices are produced with more complex functions and highly reliable. The most current development has turned out nano sized devices.

All electronic circuit elements except inductor may be created in an integrated circuit. A resistor in an IC is a very thin filament which has specific conductivity and connected to metal connectors then isolated by a reverse bias junction. Meanwhile, a capacitor may be

produced by depositing a thin layer of insulated silicone dioxide on a conductive region, then preparing a metal layer to form the second plate of the capacitor.

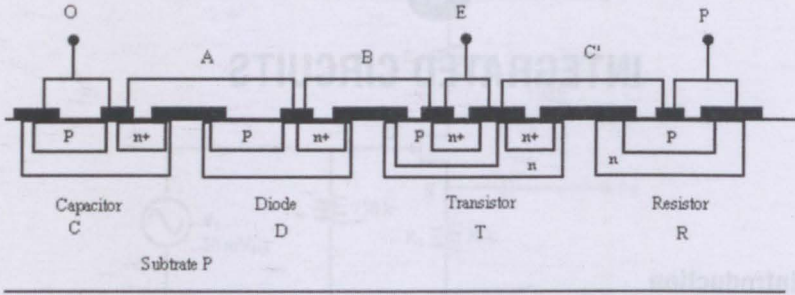


Figure 8.1: Integrated Circuit housing a capacitor, resistor, transistor and diode.

Since all semiconductor components may be fabricated from the same basic semiconductor material, manufacturing concept is based on the use of one 'sheet' of semiconductor where the diffusion technique is applied to form various components on the semiconductor sheet. Figure 8.1 shows an IC unit with components such as resistor, capacitor, transistor and diode in it. We can visualize how such concept may be realized to produce an IC unit consisting of 10000 to 100000 electronic components in it (very large scale integration or VLSI). Figure 8.2 is the equivalent circuit showing how the components are electrically connected.