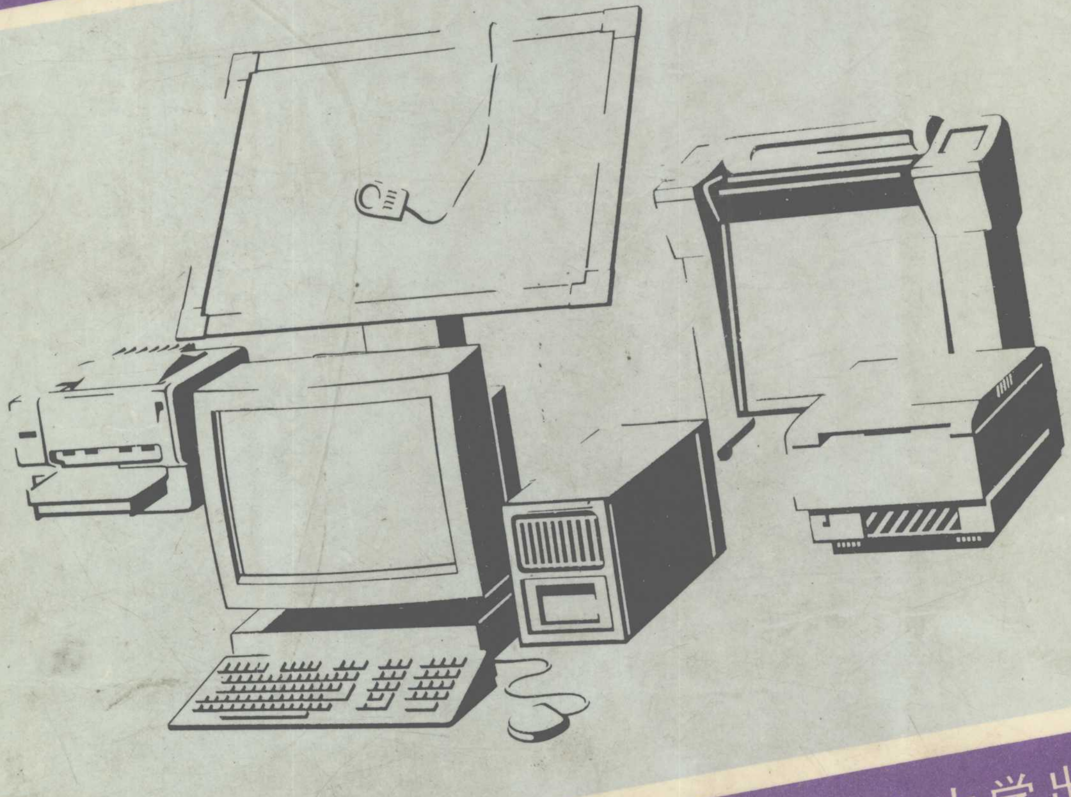
ENGLISH FOR COMPUTERS & TELECOMMUNICATIONS

计算机与通信
专业英语

徐秀兰　成文德　徐　劲　编



北京邮电大学出版社

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图书在版编目(CIP)数据

计算机与通信专业英语/徐秀兰等编. —北京:北京邮电大学出版社,1995. 12
ISBN 7-5635-0216-5

Ⅰ. 计… Ⅱ. 徐… Ⅲ. ①电子计算机-英语-语言读物-高等学校-自学参考资料 ②通信-英语-语言读物-高等学校-自学参考资料 Ⅳ. H319. 4

中国版本图书馆 CIP 数据核字(95)第 10839 号

内 容 简 介

本书是为计算机与通信专业本科学生而编写的。目的是提高学生阅读英语专业书籍的能力。本教材涉及计算机与通信技术两大方面。在内容安排上力求从基础到专业,从硬件到软件,从基本知识到新技术、新知识,与其他课程相匹配,并符合学生接受知识的规律和兴趣。在选材方面,本书内容涉猎广泛,其中许多内容跟踪了这两个专业 90 年代的新知识、新技术(如分布式算法、并行处理、ISDN、SDH、多媒体、光通信、移动通信等)的发展。所选内容尽可能地覆盖这两个专业的基本常用术语、词汇、词组及科技语法。

本书既可作为计算机与通信两个专业学生的专业英语教材,也可供其他专业(如信息、广播)作为专业英语的主要教学参考书和自学读物使用,还可作为自学材料供从事计算机、通信、信息等工作的技术人员使用。

计算机与通信专业英语
English for Computers and Telecommunications
编　　者　徐秀兰　成文德　徐　劲
责任编辑　周　明

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北京邮电大学出版社出版
新华书店北京发行所发行　各地新华书店经售
北京邮电大学印刷厂印刷

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787×1092 毫米　1/16　印张 19. 625 字数 487 千字
1995 年 12 月第一版　1995 年 12 月第一次印刷
印数:1—4000 册
ISBN 7-5635-0216-5/TN · 82　定价:20. 30 元

前言

在迈向21世纪的最后几年里，计算机技术早已不再局限于科学计算、实时控制、办公自动化或人工智能等人们熟知的领域。它正以其巨大的生命力和惊人的速度向纵深发展。一个趋于成熟而又先进的新兴产业——信息产业——诞生了。它标志着信息时代的来临。

信息的传播可以超越国界、超越时空，还能渗透到日常生活的各个角落。

作为信息产业的基础之一是计算机网络化。这种高效的计算机网使大容量的决策系统与数字长途网络相结合，因而使用户对自己的信息处理空前得心应手。

信息产业的基础之二是各种先进的通信技术的出现。程控交换、光纤传输、移动通信以及可视通信的发展使得各类用户能通过这些终端突破时空的限制及时获得网上的最新信息。

与计算机网及通信技术同步发展的信息传输服务，例如多媒体技术的前景同样也是很诱人的。集传真、电视、录像、电子邮件、音频邮件、音乐与游戏于一体的多媒体技术已有产品进入市场。

可以概括地说，计算机技术及其应用已走向与通信及其服务业相结合的道路。今天，在这种新的观念的支配下，建设一个世界范围的信息基础设施——信息高速公路——的设想已经形成。西方各主要发达国家在过去一年多已决定投巨资以筹建一个符合全球范围内总体结构的信息高速公路。

在我国，目前虽然还没有建立起一个完整和庞大的信息基础设施（计算机网），但自改革开放以来，我们在这方面已作了巨大的努力并取得了显著的成就。在1995年年初的有关会议上，明确了“九五”期间的发展指导思想为：积极调整产业结构，建设现代信息产业。建设从单纯的制造转向既制造同时也开发软件、提供信息服务诸业并举的信息新产业。

为了使计算机与通信专业、通信工程专业以及与通信有关专业的学生能够较快阅读和理解有关的英文原版资料，进而了解计算机与通信领域方面的动向并从中汲取营养，以便为投身我国的经济建设作好准备，我们特编写了这本教材。

全书共分20个单元。分别选自近十年来国外20余种原版教材，内容广泛，语言现象丰富。在内容上涉及了基本逻辑元件、数字计算机、中央处理单元、存储器的层次结构、输入/输出及其接口、操作系统、程序设计、数据结构、数据库、并行处理、数据的完整性及安全性、分布式算法、多媒体、人工智能、卫星通信、光纤通信、移动通信、SDH及ATM等专题。既有基础理论，又有90年代公众关心的热点与新技术。目的在于一方面力求所选教材内容能基本覆盖计算机、通信这两个专业常用的技术术语、词汇、词组及常见的科技语法，另一方面则希望在学生获得语言知识的同时，扩大视野，丰富专业知识及兴趣。

教材的编写遵循了由浅入深、由表及里的认识规律。为了给教和学创造有利条件，各专题除正文外，还列出了关键字，注释，习题及参考译文，某些课文还列出了相关词的解释。为了给学生留有一定的空间，让他们有自由发挥的余地，在教材后，附了各专题中的部分译文。

在以往教学实践中，执教的老师和听课的学生都给本教材以巨大的鼓励。当然也提出了不少宝贵的意见。这一稿，就是根据编者本人的教学体会，参考执教老师和听课学生的意见修改删节而成的。付稿之前，又蒙北方交通大学莫安民、谭维康教授及中国科学院研究生院董占球教授热心指点，在此特致谢意。

本书由徐秀兰同志主编并负责其中第一、三、四、五、六、七、八、十、十三等9个单元的编译。本书的二、九、十一、十二、十四等5个单元由成文德同志编译，十五、十六、十七、十八、十九、二十等6个单元由徐劲同志编译。全书注释由成文德、徐秀兰二同志编写。

虽经编者一再努力，但囿于水平，错误及疏忽之处在所难免，尚乞读者批评指正。

编　者
一九九五年二月

目 录
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UNIT 1

Fundamental Logic Elements

1-1 Types of Logic and Memory Devices

In this chapter, we shall present a brief and rather general discussion of some of the basic types of logic and memory devices used in digital computers. The actual design of these devices is not the concern of the system designer, who generally regards them as "black boxes" with certain known characteristics. On the other hand, intelligent selection and application of these devices does require some understanding of their operation and an appreciation of their limitations. In addition, without some physical interpretation of registers, memory, and the like, much of the material in following chapters may seem too abstract to many readers. Readers who are already familiar with digital hardware may skip the majority of the topics in this chapter without loss of continuity.

Logic circuits are implemented in a tremendous variety of technologies. There are, for example, transistor-transistor logic (TTL), MOS logic, and emitter-coupled logic (ECL). These various types differ in matters of speed, cost, power consumption, physical dimensions, immunity to environmental influences, and other factors[1]; but they all accomplish the same basic purpose, and from the point of view of this book, the differences are of little importance. All of them accept input signals in which the voltage levels represent the values of certain logical (binary) variables and produce output signals in which the voltage levels correspond to logical functions of the input variables.

The purpose of logic circuits, then is to process signals and produce outputs that are functions of the inputs. The outputs are available only during the duration of the input signals. The purpose of memory devices is to store information for later use, generally returning it without alteration, in the same form in which it was originally stored. The definition of memory is elusive. We shall simply settle for the intuitive idea that a memory device that we place in a specific, identifiable physical state for the specific purpose of preserving information, without alteration, until a later time. The terms memory and storage are often used interchangeably, but many authors make a distinction between main memory and secondary storage, in main memory, the storage medium is a permanent physical component of the computer system. The information stored cannot be removed from the system except by reading it out of the main memory. In secondary storage systems, the storage media, for example, magnetic tape, can be physically removed from the system, with the information stored there in available for later use when the storage media are put back into the system.

Memory or storage devices may be classified in a number of different ways. First, most may be classified as being either magnetic or electronic. Magnetic devices use ferro magnetic materials, which can be placed in a specific magnetic state by the passage of electric currents through them or near them, and which then maintain these states indefinitely until interrogated. The chief types of magnetic memory are tape, disk, and core. Electronic memory devices are primarily transistor circuits in which the outputs can be set to certain voltage levels by the application of certain input signals and will be maintained even when the input signals are removed. A common electronic memory device is the bistable latch, or flip - flop, which can be used to construct register memories (RM).

Memories may also be classified by the type of access to the stored information. In random access memories (RAM), all stored information is equally accessible, in the sense that any given piece of informaion may be retrieved in exactly the same length of time as any other piece of information. Semiconductor memories are usually classified as RAM. Tape, by contrast, is sequential access storage (SAS), in which information can be retrieved only in the same order in which it was stored. When you want a particular piece of information off tape, you simply start running the tape until the desired information comes into position to be read. The access time is thus dependent on where the desired information is located relative to the starting point.

Between these two categories is disk memory, which is classified as direct access storage (DAS). Disks store information in the same sequential manner as tapes, but the total storage area is divided into segments that can be accessed directly, without reading through all the information between the current and desired segment. Once the desired segment has been accessed, information will then be read out sequentially in the same manner as with tape.

A final special category, which resembles logic as well as memory, is the read only memory(ROM)[2]. The stored information is actually built into the structure of the device. The stored information can then be read out electronically but can be changed only by alteration of the structure of the device.

The foregoing classification and listing is quite broad and general and is not intended to be complete. There are many other specialized memory devices, some fitting into the preceding categories, some not really fitting into any category.

Keywords

bistable	双稳态锁存器
device	器件，元件
direct access storage (DAS)	直接访问存储器
emitter - coupled logic	发射极耦合逻辑
ferromagnetic	铁磁体的

flip - flop	触发器
main memory	主存储器
memory	存储器
random access memory (RAM)	随机访问存储器
read - only memory (ROM)	只读存储器
register	寄存器
resemble	相似的
retrieve	检索
segment	段，扇区
secondary storage	辅助存储器
sequential access storage (SAS)	顺序访问存储器
transistor - transistor logic	三极管-三极管逻辑

Notes

1. These various types differ in matters of speed, cost, power consumption, physical dimensions, immunity to environmental influences, and other factors.
   in matter of 在…事情上，在…方面
   immunity to 免除，不受影响
2. A final special category, which resembles logic as well as memory, is the read only memory (ROM).
   最后一种特殊元件类，它既象逻辑元件，也象存储元件，那就是只读存储器（ROM)。

1-2 Logic Elements

In this section, we shall present what will be to many of you a review of fundamental logic elements. We shall briefly introduce the circuits that implement the combinational logic operations AND, OR, NOT, NAND, and NOR, which will be used freely in subsequent chapters. There are several families of logic elements, each with its unique circuit properties. We shall introduce one such family that is easily described and is used extensively in the design of very - large - scale integrated circuits (VLSI) such as microprocessors.

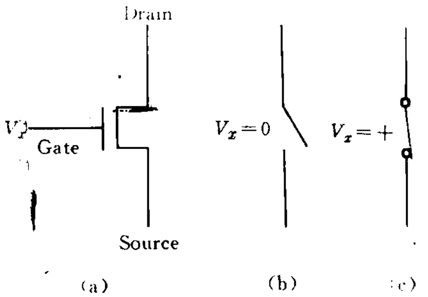
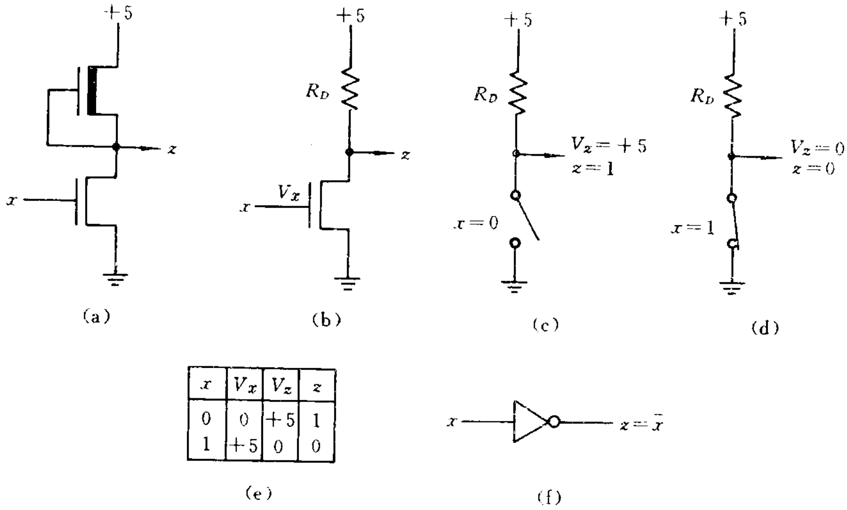


Figure 1. 1 Operation of a MOS transistor

The MOS (metal oxide semiconductor) logic family is based almost entirely on a single device, a MOS field effect transistor, that very closely approximates an ideal switch. Shown in Figure. 1. 1 (a) in the standard symbol for the MOS transistor with the accepted names for its three terminals. Actually, the device is symmetric, and the source and drain can be readily interchanged. The gate may be regarded as the input line. As shown in Figure 1. 1(b). the device is a close approximation of an open switch when the gate voltage V_x is close to 0. When V_x is a positive voltage, typically 1 to 5 volts, the switch is closed and behaves as a very small electrical resistance. This situation is depicted in Figure. 1. 1 (c). In the logic circuits to be described following, we shall let 0 volts represent logical 0 and the positive voltage represent logical 1. To be consistent with the prior edition, we shall let the nominal positive voltage be +5 volts.

The fundamental MOS logic element is the inverter shown in Figure 1. 2 (a). The upper (pull - up) device is actually a depletion mode transistor designed to function as a relatively large resistor when connected as given and when the lower transistor switch is closed. For purposes of this simplified discussion, you should simply regard it as a large resistor, as shown in Figure 1. 2(b). When x is logical 0 and V_x is 0 volts, as in Figure 1. 2(c), the lower transistor (pull - down) switch is open. Because no current is present in the resistor R_D, the output voltage is +5 volts and the logical output, z, is 1. When $x=1$ and V_x is positive, the lower transistor switch is closed, as depicted in Figure 1. 2 (d). Now the output is connected to 0 volts, and $z=0$. These values are tabulated in Figure 1. 2(e). We observe from this table that the circuit of Figure 1. 2(a) implements the logical NOT operation and is indeed an inverter, as asserted at the beginning of the paragraph. The standard symbol for the inverter is given in Figure 1. 2(f).



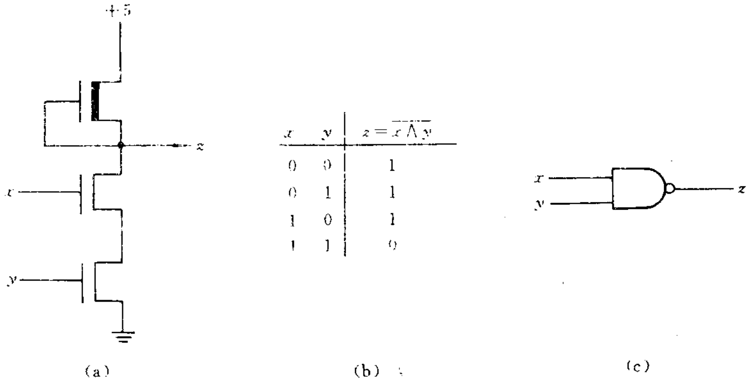
(a) (b) (c) (d)

x	V_x	V_z	z
0	0	+5	1
1	+5	0	0

(e) (f)

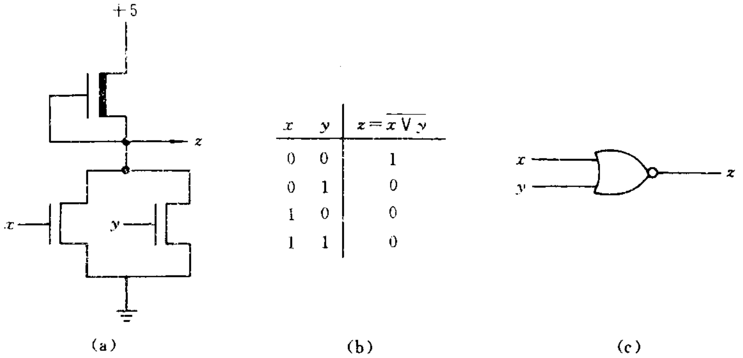
Figure 1. 2 A MOS inverter

Next consider the circuit of Figure 1. 3(a), in which a second pull - down transistor has been added in series. Now both inputs must be logical 1 if the output is to be pulled down to 0 volts. If either or both devices has a 0 input, the output will be +5 volts or logical 1. The tabulation of these values in Figure 1. 3(b) describes a device that is called a logical NAND (NOT AND) gate. The standard symbol for this device is given in Figure 1. 3 (c). Figure 1. 4 shows a similar device in which the two pull - down transistors are connected in parallel. Now



x	y	$z=\overline{x\wedge y}$
0	0	1
0	1	1
1	0	1
1	1	0

Figure 1.3. MOS NAND gate



x	y	$z=\overline{x\vee y}$
0	0	1
0	1	0
1	0	0
1	1	0

Figure 1.4. MOS NOR gate

the output, z, will be 0 if either input is 1. It will be logical 1 if both inputs are 0. This device is a NOR (NOT OR) gate.

As we shall see shortly, it is possible to represent any logical function using only NAND gates, and this is often done in practice[1]. In this book, we shall find it convenient to express designs in terms of AND, OR, and NOT gates rather than in terms of NAND gates only or NOR gates only. An AND gate may be realized by adding an inverter to the output of a NAND gate ($\bar{\bar{z}}=z$), as shown in Figure 1.5. The standard symbol for an AND gate is given in Figure 1.5(c). Adding an inverter to the NOR yields an OR gate, the standard symbol for which is given in Figure 1.5(d).

Looking again at Figure 1.5(a) will reveal a capacitor depicted at the gate input of the second inverter. This capacitor is not a separate component but instead represents an inherent property of the MOS device. The gate of a MOS transistor will draw no steady-state current. The input resistance is infinite. However, when the value of the line connected to the device input changes, time is required for the charging or discharging of the capacitor to the new value.

Space will not permit the detailed analysis of all logic families in use[2]. A second family of considerable importance is bipolar TTL (transistor-transistor logic). Usually, TTL gates

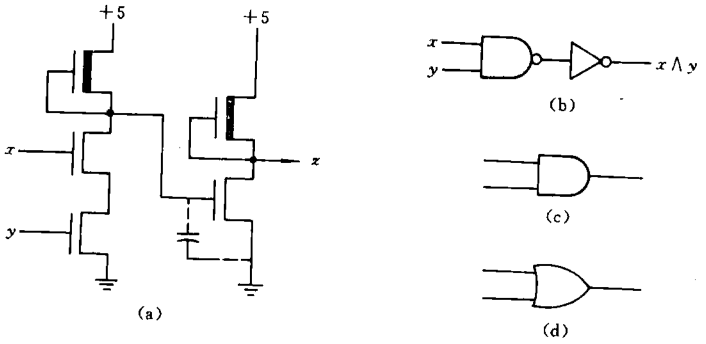


Figure 1.5. MOS AND and OR gates

can change values at higher speeds than can MOS but require a larger area on the integrated circuit chip to implement. For this reason, TTL is used where relatively less complex digital networks are implemented within an integrated circuit package. TTL is the most widely used technology where only a few individually accessible gates or memory elements are included in a package. A TTL NAND gate is shown in Figure 1.6.

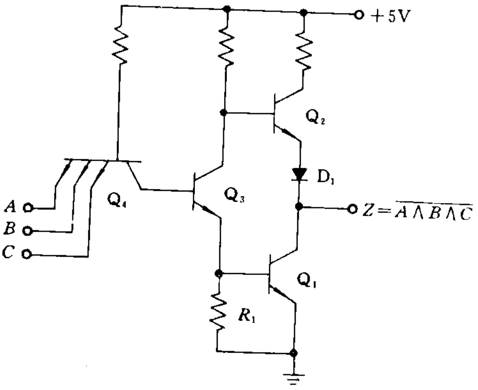


Figure 1.6. TTL NAND gate

The logical inversion noted in MOS occurs in most types of electronic logic, so that NAND and NOR are often cheaper and more convenient to realize than are AND and OR. In this book, we shall find it convenient to rely on the AND and OR functions. This does not present a problem, since networks of AND, OR, and NOT gates can always be converted to NAND or NOR networks.

Consider the simple logical circuit of Figure 1.7(a), which consists of three NAND gates driving another NAND gate. From De Morgan's law,

$$\overline{X \wedge Y \wedge Z} = \bar{X} \vee \bar{Y} \vee \bar{Z}$$

we see that the final NAND gate can be replaced by an OR gate with inversion on the inputs (Figure 1.7(b)). Next,

$$\bar{\bar{X}} = X$$

so that the two successive inversions on the lines between the input and output gates cancel, giving the circuit of Figure 1.7(c). Thus we see that a two-level NAND circuit is equivalent to a two-level AND-OR circuit. In a similar fashion, we can show that a two-level NOR circuit is equivalent to a two-level OR-AND circuit.

Until about 1970, gate circuits such as those discussed in this section were commonly realized from discrete components - resistors, transistors, diodes - mounted on plastic cards and wired together. Today, logic circuits are almost invariably realized in integrated circuit

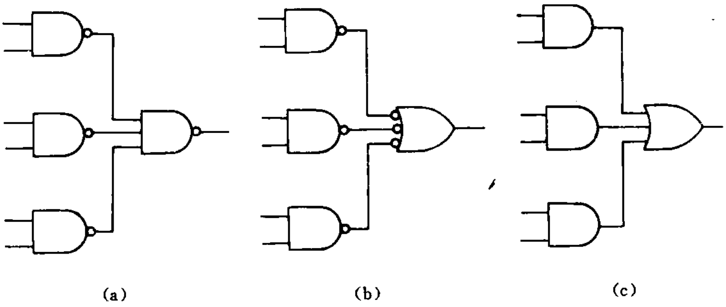


Figure 1.7. Conversion of NAND - NAND to AND - OR circuit

form. An integrated circuit is a complete electronic circuit implamented by electrochemical methods on a single chip of silicon. The earliest integrated circuits typically realized a few gates on a single chip. As the technology advanced, the circuit density steadily increased, until today complete computers, comprising tens of thousands of components, can be placed on 1/4 - in. square chips.

Inegrated circuits can be classified in a variety of ways. One classification is in terms of the type of electronic technology used. Currently popular technologies include TTL, ECL, CMOS, and PMOS. NMOS and PMOS are two slightly different physical realizations of the MOS model discussed in this section. These Five technologies differ in such characteristics as speed, power consumption, and packing density. ECL is very fast but consumes a lot of power. CMOS is slower but consumes so little power that it is suitable for battery - powered applications, such as electronic watches. NMOS has the highest packing density and is used in very complex circuits, such as microprocessors. TTL, which falls about in the middle in all characteristics, is by far the most popular technology and is available in more different circuirts than all the others put together.

Integrated circuits can also be classified in terms of circuit complexity. Small scale integration (SSI) encompassed circuits with up to 10 gates per chip. Medium scale integration (MSI) includes circuits with from 10 to 100 gates per chip. From 100 to about 5000 gates per chip we have large - scale integration. (LSI), and above. this we have very large scale integration (VLSI) . In SSI chips, we have individual gates and flip - flops, MSI chips realize more complex logic functions, such as code conversion and arithmetic operations. LSI and VLSI chips realize complete digital systems, such as memory units and microprocessors.

Keywords

approximation	近似值
bipolar	双极性
charge	充电，电荷
comprise	包含
component	成份，元件，部分

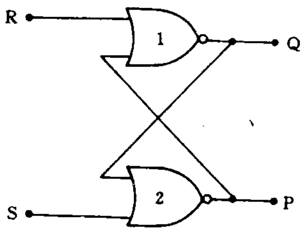
depletion	耗尽
discharge	放电
drain	漏极
inverter	反向器
metal oxide semiconductor (MOS)	金属氧化物半导体
MOS field effect transistor (MOS)	场效应三极管
norminal	标称的
source	源极，源
symmetric	对称的

Notes

1. As we shall see shortly, it is possible to represent any logical function using only NAND gates, and this is often done in practice. 正如我们很快就将看到的那样，只用 NAND 门，就可能重现任何逻辑功能。而这在实践中常常是如此做的。
2. Space will not permit the detailed analysis of all logic families in use. 实际应用的所有逻辑系列，恕不一一赘述。

1-3 Flip-Flops and Register Memory (RM)

As we have seen, memory, the ability to store information, is essential in a digital system. The most common type of electronic memory device is the flip-flop. Figure 1.8 shows the circuit for a flip-flop constructed from two NOR gates and the timing diagram for a typical operating sequence. We have also repeated the truth table for NOR for convenience in explaining the operation.



A	B	NOR
0	0	1
0	1	0
1	0	0
1	1	0

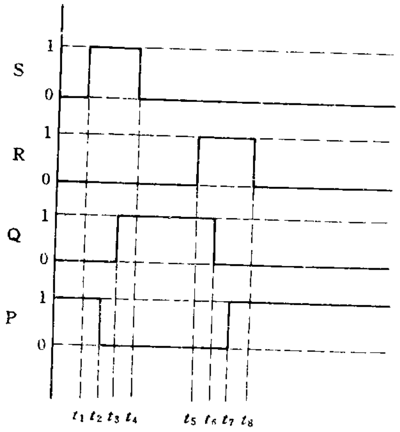


Figure 1.8. Operation of flip-flop

At the start, both inputs are at 0, the Q output is at 0, and the P output at 1. Since the outputs are fed back to the inputs of the gates, we must check to see that the assumed condi-