高等学校专业英语教材

电子信息工程专业英语教程

任治刚　主编

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内 容 简 介

本书的主要目的是使读者掌握电子信息工程专业英语术语及用法，培养和提高读者阅读和翻译专业英语文献资料的能力。本书由10个主题单元组成，涵盖电子信息领域的主要技术分支，主要内容包括电子器件、电子电路、电子系统组件、电子系统、现代数字设计、数字信号处理、语音和音频、图像和视频、嵌入式应用、电子仪器与测量等内容。每个主题单元由3篇课文、3篇阅读材料、课文词汇、课文注释和练习组成。为了方便教学，书后还附有课文参考译文、练习参考答案及缩略语表。

本书可作为电子信息工程专业的专业英语教材，也可供从事相关专业的工程技术人员参考使用。

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前　言

电子信息工程是当今国际国内发展最为迅速、技术更新最为活跃的工程领域之一。为了应对国际化竞争，学生在学习阶段就应打下坚实的基础。而专业英语的阅读和写作能力就是电子信息工程专业毕业生所应具备的一项重要能力。

本书以提高学生英语阅读和写作能力，扩展、深化学生对本学科关键技术的认识，培养具备国际竞争力的技术人才为目的；本着先进、实用的选材原则和简明、系统的组织原则，充分吸收当前最新技术成果和外语教学成果，为电子信息工程专业学生提供一个提高英语水平和专业素养的平台。

为了保证本书的先进性和实用性，所有文章均出自国外最近几年电子信息各个领域的最新教材、专著及国际著名公司网站提供的技术应用文章（详见参考文献）。在具体内容的遴选上，尽量保证学生利用既有专业知识理解课文内容，并使学生通过学习加深和扩展相关专业知识。

全书由10个主题单元组成，涵盖电子信息领域的主要技术分支。这10个主题单元分别是：电子器件、电子电路、电子系统组件、电子系统、现代数字设计、数字信号处理、语音和音频、图像和视频、嵌入式应用、电子仪器与测量。每个主题单元由3篇课文，3篇阅读材料，课文词汇，课文注释和练习组成。其中，课文侧重展示本主题领域核心或关键的技术，选取了那些能够扩展、深化学生对本学科认识的内容；而阅读材料着力介绍该主题中的实用技术、重大科技成果、前沿领域及未来前景等；课文注释旨在解决课文中英语语言难点和专业知识难点。练习则利用与单元主题相关的材料，以完型填空、英汉互译的形式培养学生使用英语的能力。为了方便教学，书后还附有课文参考译文、练习参考答案、缩略语表和参考文献。

由于水平所限，书中难免有纰漏和欠妥之处，请各位读者不吝赐教。可通过电子邮件将您发现的问题或者对本书的建议发送给 renmacro@sohu.com。

编　者

2004年2月

Contents

Unit 1

Electronic Devices

Lesson 1 VLSI Technology

One of the key inventions in the history of electronics, and in fact one of the most important inventions ever period, was the transistor. It was invented by Bell Laboratories [1] in 1948. In short, a transistor is a device that conducts a variable amount of electricity through it, depending on how much electricity is input to it. In other words, it is a digital switch. However, unlike the vacuum tube [2], it is solid state. This means that it doesn't change its physical form as it switches. There are no moving parts in a transistor.

The advantages of the transistor over the vacuum tube were enormous. Compared to the old technology, transistors were much smaller, faster, and cheaper to manufacture. They were also far more reliable and used much less power. The transistor is what started the evolution of the modern computer industry in motion [3].

The transistor was originally a single, discrete device, which you could place individually into a circuit much like any other. Today, some special-purpose transistors are still used that way. What allowed the creation of modern processors was the invention of the integrated circuit, which is a group of transistors manufactured from a single piece of material and connected together internally, without extra wiring [4]. Integrated circuits are also called ICs or chips.

A special material is used to make these integrated circuits. While most materials either insulate from electrical flow (air, glass, wood) or conduct electricity readily (metals, water), there are some that only conduct electricity a small amount, or only under certain conditions. These are called semiconductors. The most commonly used semiconductor is of course silicon.

By careful chemical composition and arrangement, it is possible to create a very small transistor directly on a layer of silicon, using various technologies to manipulate the material into the correct form. These transistors are small, fast and reliable, and use relatively little power. The first integrated circuit was invented in 1959 by Texas Instruments[5]. It contained just six transistors on a single semiconductor surface.

After the invention of the integrated circuit, it took very little time to realize the tremendous benefits of miniaturizing and integrating larger numbers of transistors into the same integrated circuit. More transistors (switches) were required in order to implement more complicated functions. Miniaturization[6] was the key to integrating together large numbers of transistors while increasing hardware speed and keeping power consumption and space requirements manageable.

Large-scale integration ("LSI") came to refer to the creation of integrated circuits that had previously been made from multiple discrete components. These devices typically contained hundreds of transistors. Early computers were made from many of these smaller ICs connected together on circuit boards

As time progressed after the invention of LSI integrated circuits, the technology improved and chips became smaller, faster and cheaper. Building on the success of earlier integration efforts, engineers learned to pack more and more logic into a single circuit. This effort became known as very large scale integration (VLSI). VLSI circuits can contain millions of transistors.

Originally, the functions performed by a processor were implemented using several different logic chips. Intel[7] was the first company to incorporate all of these logic components into a single chip. This was the first microprocessor, the 4004, introduced by Intel in 1971. All of today's processors are (highly advanced!) descendants of this original 4-bit CPU.

Words and Expressions

transistor [træn'zistə] *n.* [电子] 晶体管

device [di'vais] *n.* 器件,装置,设计,策略,发明物

conduct ['kɔndʌkt, -dəkt] *v.* 引导,管理,传导;*n.* 行为,操行

solid state *n.* 固态(电路)

in motion 在开动中,在运转中,处于活跃状态

discrete [dis'kriːt] *adj.* 不连续的,离散的

integrated ['intigreitid] *adj.* 综合的,完整的

insulate ['insjuleit] *vt.* 使绝缘,隔离

semiconductor ['semikən'dʌktə] *n.* [物] 半导体

silicon ['silikən] *n.* [化] 硅,硅元素

manipulate [mə'nipjuleit] *vt.* 操作,使用,操纵,处理

implement ['implimənt] *vt.* 实现;*n.* 工具,器具

miniaturization [ˌminiətʃərai'zeʃən] *n.* 小型化

consumption [kən'sʌmpʃən] *n.* 消费,消耗

manageable ['mænidʒəbl] *adj.* 易处理的,易管理的,便于管理的

component [kəm'pəunənt] *n.* 成分,组件;*adj.* 组成的,构成的
large-scale integration 大规模集成(电路)
very large-scale integration 超大规模集成(电路)
incorporate [in'kɔ:pəreit] *vt.* 合并,使组成公司; *adj.* 合并的,一体化的
descendant [di'send(ə)nt] *n.* 子孙,后裔,后代

Notes

1. Bell Laboratories 贝尔实验室。AT&T Bell Laboratories, Inc., byname Bell Labs, the longtime research and development arm of the American Telephone and Telegraph Company (AT&T). It now serves the same function in Lucent Technologies Inc., which was spun off from AT&T in 1996. Headquarters for the laboratories are in Murray Hill, N. J.
2. The vacuum tube is an electron tube from which all or most of the gas has been removed, permitting electrons to move with no or low interaction with any remaining gas molecules. (真空管是一种内部气体全部或部分抽空的电子管,从而使电子在不受或少受气体分子的干扰下运动。)
3. 此句可译为:晶体管(的发明)启动了现代计算机工业的蓬勃发展进程。本句采用 what 引导的从句做表语,是一种对主语"the transistor"进行强调的表达方式。其意思相当于: The transistor started the evolution of the modern computer industry in motion. 在本句中,"start"为及物动词。"start"为及物动词时,通常有如下涵义:开始(to commence; begin),启动(to set into motion, operation, or activity),引进;创办(to introduce; originate),创立;建立(to found; establish)。
4. 此句可译为:集成电路的发明为现代处理器的诞生创造了条件;集成电路是单片材料制造的一组内部互联的(无额外连线)晶体管。本句采用 what 引导的从句做主语,是对表语"the invention of the integrated circuit"的强调。
5. Texas Instruments 德州仪器公司。Texas Instruments Incorporated (TI) is an American manufacturer of calculators, microprocessors, and digital signal processors with its headquarters in Dallas, Texas.
6. Miniaturization means the reduction in size of components and circuits for increasing package density and reducing power dissipation and signal propagation delays. (小型化是指减少元件和电路的几何尺寸,从而增加封装密度、降低功耗、减少信号传播延迟。)
7. Intel 英特尔公司。Intel Corporation is an American manufacturer of semiconductor computer circuits. Besides microprocessors, the company makes micro-

controllers (single-chip computers), memory chips, computer modules and boards, network and conferencing products, and parallel supercomputers. The company was founded in 1968 by Robert Noyce and Gordon Moore. Its headquarters are in Santa Clara, California.

Lesson 2 Memory Devices

Memories can be made in mechanical, magnetic, optical, biological and electronic technologies. Examples of magnetic memories are tapes, floppy disks, hard drives and ferroelectric[1] RAMs. Examples of optical memories are CD-ROMs, rewrittable CDs. Electronic memory is used extensively in computer equipment since it is the fastest available. For applications where speed is less important, magnetic and optical technologies are often used.

All electronic memory today can be in separate IC format, module format, or can be part of an IC as a macrofunction or 'cell'. In the table below is an overview of some electronic memories.

Table 1.1

Type	Properties	Read/write	Non-volatile	Speed	Cost/bit
Flip-flop	One-bit register. Usually used as a basic building block in digital circuits.	Yes	No	Ultra fast	Very high
Register	Set of flip-flops holding a byte, word or long word. Used in complex chips such as CPUs.	Yes	No	Ultra fast	Very high
SRAM	Array of flip-flops that is addressable. Used for temporary storage of data or cache.	Yes	No	Very fast	High
DRAM	Array of storage cells which is addressable. Used for main computing data storage.	Yes	No	Fast	Moderate
ROM	Array of hard-wired cells that is addressable. Programming done at time of chip manufacture.	No	Yes	Very Fast	Low
EEPROM	Electrically erasable programmable ROM. Number of write cycles is limited.	Yes	Yes	Low	High

The flip-flop A flip-flop is basically a bi-state circuit in which either a 0 or 1 state can resides. Because of its simplicity, the flip-flop is extremely fast. As a basic element, the flip-flop is used in digital circuits and ICs. A flip-flop will lose its state when the supply voltage is removed. Therefore, it is volatile.

The register A register is a set of flip-flops in parallel. Typically a register is 8, 16, 32 or 64 bits wide. Often a register is used to hold data, address pointers, etc. A register is volatile and very fast just like the flip-flop.

SRAM (Static Random Access Memory) An SRAM is an array of addressable flip-flops. The array can be configured as such that the data comes out in single bit, 4-bit, 8bit, and etc. format. SRAM is simple, fast and volatile just like the flip-flop, its basic memory cell. SRAM can be found on microcontroller boards (either on or off the CPU chip), where the amount of memory required is small and it will not pay off to build the extra interface circuitry for DRAMs. In addition, SRAM is often used as cache[2] because of its high speed.

SRAM comes in many speed classes, ranging from several ns for cache applications to 200ns for low power applications. SRAM exists in both bipolar and MOS technology. CMOS[3] technology boasts the highest density and the lowest power consumption. Fast cache memory can be constructed in BiCMOS technology, a hybrid technology that uses bipolar transistors for extra drive. The fastest SRAM memories are available in ECL (Emitter Coupled Logic) bipolar technology. Because of the high power consumption, the memory size is limited in this technology.

A special case of SRAM memory is Content Addressable Memory (CAM)[4]. In this technology, the memory consists of an array of flip-flops, in which each row is connected to a data comparator. The memory is addressed by presenting data to it (not an address!). All comparators will then check simultaneously if their corresponding RAM register holds the same data. The CAM will respond with the address of the row (register) corresponding to the original data. The main application for this technology is fast lookup tables. These are often used in network routers.

DRAM (Dynamic Random Access Memory) The word "dynamic" indicates that the data is not held in a flip-flop but rather in a storage cell. The data in a storage cell must be refreshed (read out and re-written) regularly because of leakage. The refresh time interval is usually 4 to 64 ms. The storage cell only requires one capacitor and one transistor, whereas[5] a flip-flop connected in an array requires 6 transistors. In trench capacitor memory technology, which is used in all modern DRAMs, the transistor is constructed above the capacitor so that the space on chip is ultimately minimized. For this reason, DRAM technology has a lower cost per bit than SRAM technology. The disadvantage of the extra circuitry required for refreshing is easily offset by the lower price per bit when using large memory sizes.

DRAM memory is, just like SRAM memory constructed as an array of memory cells. A major difference between SRAM and DRAM, however, lies in the addressing technique. With an SRAM, an address needs to be presented and the chip will respond with presenting the data of the memory cell at the output, or accepting the data at the input and write it into the addressed cell. With DRAM technology, this simple approach is impossible since addressing a row of data without rewriting it will destruct all data in the row because of the dynamic nature.

ROM (Read Only Memory) ROMs are also called mask[6]-ROMs or mask programmed ROMs. This is because a ROM needs to be programmed by setting its cells to either 0 or 1 at the time of manufacture. Usually the 0 or 1 is formed by the presence or absence of an aluminium line. This aluminium pattern is defined by a lithographic mask used in one of the last steps of manufacture. Therefore these devices are often called mask-ROMs.

The advantage of ROM is that it can be manufactured at the lowest price in high volumes. Another advantage in some applications is that it is impossible to alter the data once the chips are made, and that no further programming and testing are required. On the other hand, if the data or code must be changed this can be a small disaster. The rest of the chips will end in the dustbin and new chips will have to be made.

EEPROM (Electrically Erasable Programmable ROM) This means that the chip can be programmed like an EPROM, but can be erased electrically. As a result, no UV source is required. EEPROMs can be erased on a byte-by-byte basis.

Words and Expressions

memory ['meməri] *n.* 记忆，记忆力，回忆，存储(器)，内存
mechanical [mi'kænikl] *adj.* 机械的，机械制的，呆板的
magnetic [mæg'netik] *adj.* 磁的，有磁性的，有吸引力的
optical ['ɔptikəl] *adj.* 眼的，视力的，光学的
floppy disk *n.* 软盘
ferroelectric [ˌferəui'lektrik] *n.* [电] 铁电物质；*adj.* 铁电的
macrofunction 宏功能
format ['fɔːmæt, -mɑːt] *n.* 版式，格式；
vt. 安排……的格局(或规格)，[计]格式化(磁盘)

flip flop 双稳态多谐振荡器;触发电路,触发器(如:J-K flip flop J-K 触发器)
volatile ['vɔlətail] *adj.* 易失;易变;挥发
register ['redʒistə] *n.* 记录,登记,注册,寄存器;*v.* 记录,登记,注册,挂号
address pointer 地址指针(a word that gives the address of a core storage location)
array [ə'rei] *n.* 排列,编队
in parallel 并行的[地],平行的[地]
static ['stætik] *adj.* 静态的,静力的
configure [kən'figə] *vi.* 配置,设定;*vt.* 使成形,使具一定形式
pay off 带来利益(to effect profit);偿清(债务)
interface circuitry 接口电路
cache [kæʃ] *n.* 高速缓冲存储器,隐藏处所,储藏物;*vt.* 隐藏,窖藏
ns *abbr.* Nanosecond 纳秒,毫微秒(等于1秒的10亿分之一)
bipolar [bai'pəulə] *adj.* 有两极的,双极的
MOS *abbr.* 金属氧化物半导体(Metal-Oxide Semiconductor)
CMOS *abbr.* 互补金属氧化物半导体(Complementary Metal-Oxide-Semiconductor)
boast [bəust] *v.* 以有……而自豪,拥有(让人满意的特点)*n.* 值得夸耀的事物
hybrid ['haibrid] *adj.* 混合的;*n.* 混合电路,混血儿,混合物
drive *n.* 驱动,动力,干劲,驱动器
Emitter Coupled Logic 射极耦合逻辑(电路)
comparator ['kɔmpəreitə] *n.* 比较器
simultaneously [siməl'teiniəsly] *adv.* 同时地
corresponding [ˌkɔris'pɔndiŋ] *adj.* 相应的,通讯的
dynamic [dai'næmik] *adj.* 动力的,动力学的,动态的
leakage ['li:kidʒ] *n.* 漏,泄漏,渗漏
refresh [ri'freʃ] *v.* 刷新,更新,再生;(使)精神振作,(使)精力恢复
capacitor [kə'pæsitə] *n.* (=capacitator)电容器
whereas [(h)wɛər'æz] *conj.* 然而,反之,鉴于,尽管,但是
trench capacitor 沟道式电容器
offset ['ɔ:fset] *v.* 弥补,抵销;*n.* 偏移量,抵销,弥补,分支
approach [ə'prəutʃ] *n.* 方法,步骤,途径,通路;*vt.* 接近,动手处理
mask [mɑ:sk] *n.* 掩模;掩码;屏蔽
aluminium [ˌælju:'minjəm] *n.* [化]铝
pattern ['pætən] *n.* 模式,图案
lithographic [ˌliθə'græfik] *adj.* 平版印刷的,平版的
alter ['ɔ:ltə] *v.* 改变