全国实用专业英语“十二五”规划教材

丛书主编 ◎ 苏　雪

电子信息工程专业英语

张　辉　朱金凤　主编

Specific English for Electronic Information Engineering

华中科技大学出版社
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华中科技大学出版社
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内容简介

本书是一本实用的电子信息专业英语教程，内容涵盖了电子信息及相关专业知识。本书的编写既考虑到电子信息专业基本的体系结构，同时紧跟电子信息技术的最新发展，选材涉及电子技术、电子元器件、传感器、控制器、信号与系统、数字信号处理、通信技术等内容。本教材具有实用性、广泛性和一定的前瞻性。全书分为四个部分，每部分包括 4 ~5 篇课文，每一课由课文、单词和词组、难句分析、练习等内容组成。为了方便教学，本书配有电子备课包和免费教师用书电子档，内容包括所有课后习题参考答案、课文参考译文、实用英语构词法、模拟试题答案等，可供教师参考。免费索取请洽 qq:407168192。

本书旨在提高读者专业英语的能力，了解电子信息领域国内外的最新发展动态。本书既可作为高职高专院校电子信息工程专业及相关专业学生以及二级学院本科学生的专业英语教材，也可供电子技术、通信技术、计算机和英语爱好者使用。

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前　言

现代社会，电工电子与信息技术越来越渗透到社会的各行各业，知识和技术更新迅速，大量的新思想、新概念、新知识和新技术通过互联网及各种渠道不断涌现。电子信息工程专业英语对学习电子信息工程新知识和新技术起着非常重要的作用，现今，根据企业用人特点，需要集理论知识和实践技能于一体的高等技术人才，要求应用型高职高专院校在人才培养过程中，必须紧密结合现行工业企业技术现状，因此，为适应国家发展实用性、广泛性和前瞻性高等教育的形式，我们组织编写了本书。

本书是一本实用的电子信息工程专业英语教程，基本涵盖了电子信息、通信等专业的基础课程和主干专业课程，同时还包括其他非电类专业的电工电子基础课程。充分考虑了电子信息工程专业英语的复杂性和发展性，系统介绍了电子信息工程专业及相关方面的内容，基本涉及了现代电子信息工程的各个领域，其难度由浅入深，注释详细，较适合高职高专电子信息工程专业及相关专业学生以及二级学院本科学生学习。

本书是按照学生熟悉的知识体系结构编写的，读者不仅学习了英语，还学习了相关的专业知识。全书由四部分组成，各课内容互相连贯，构成一个完整的内容体系，不仅使读者掌握常用的专业英语词汇及翻译技巧，而且可以以英语的形式熟悉相关专业知识，培养和提高读者阅读和翻译专业英语资料的能力。

本书由武汉铁路职业技术学院张辉、朱金凤主编，苏雪、熊旻燕任副主编，王彦主审，李一平、赵亚军也参与了本书的部分编写工作。同时，在编写过程中还得到了张慧敏、李皓瑜、覃惠老师以及华中科技大学出版社刘平编辑的支持和帮助，在此表示衷心的感谢！另外，我们参考了大量国内外优秀的文献，对提供文献的作者，我们表示最诚挚的谢意！

由于作者水平有限，书中难免有不当之处，敬请读者批评指正！

编　者

2013 年 1 月

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Part 1

A Brief Introduction to Electronic Technology（电子技术简介）

Lesson 1 A Brief Introduction to Electronic Technology (电子技术简介)

The Development of Electronics

Electronics is a part of the larger field of electricity. The basic principles of electricity are also common to electronics. Modern advances in the field of computer, control system, communications have a close relationship with electronics. The field of electronics includes the electron tube, transistor, integrated circuit and so on.

Electronics began in 1883, when Thomas Edison discovered the vacuum diode as part of his research on materials for a practical electric light. This first electronic device exhibited a nonlinear, unilateral electrical characteristic but was not capable of producing amplification of a signal. ① In 1905 Fleming② produced the first diode in England and in 1906 DeForest③ made the first triode in the United States. The vacuum tubes at that time worked as a miraculous component for the radio devices. The widespread applications of vacuum tubes during that time period were in the communications industry, first in radio and later in television. The use of vacuum tubes declined rapidly when a semiconductor device was invented that could perform many of the functions previously associated with vacuum tubes. ④

The first large digital electronic system was a special-purpose vacuum tube circuit called the electronic numerical integrator and computer (ENIAC⑤). The ENIAC was the forerunner of the computer industry. The transistor was invented in 1948 and made a significant contribution to electronics. The real electronics what it is called today was actually started after the discovery of the transistor effect. ⑥ The transistor opened the road for electronics. The early transistors were made from germanium. The most visible application of these devices was in small, portable AM broadcast receivers. Silicon transistors began to replace germanium transistors in the late 1950s, which made possible the next revolutionary step in electronics. ⑦ And more importantly it opened the road for the computing world. Computers of various types started hitting the market and the research works got a boost.

Some other problems were also there like the assembling of the electronic components on single mother board. Jack Kilby in Texas Instruments found a very nice solution. He suggested to throw away all the wires and tried to connect the resistors, capacitors and transistors on the same piece of wafer internally. Surprisingly his ideas worked and gave birth to the integrated circuit industries.

The commercial success of the integrated circuit industry was based on standard products representing digital logic families. The integrated circuit industry was moving from the era of small-scale circuits to large-scale integration. As the decade of the 1970s came to a close, a new era in integrated circuits was beginning. This era is characterized by the inclusion of larger and larger numbers of components in a single circuit, and it is called very large-scale integration.

Electronic technology is developing rapidly in the world. And electronics industry is equipped to make yet another giant step forward.

Contents of Electronics Courses

1. Direct current (DC) circuits & alternating current (AC) circuits This curriculum includes the elementary theory of passive component (resistor, capacitor and inductor) and electrical networks which supply power with a DC source, then an introduction to the effects of alternating voltage and current in passive electrical circuits is given. This module also covers DC machines, three phase circuits and transformers.

2. Analog electronics This curriculum mainly introduces the characteristics of semiconductor devices in linear application scope. The content involves semiconductor diodes (PN-junction diodes, special purpose diodes), transistors (field effects and bipolar transistors), signal amplifiers, practical amplifiers, biasing circuits, operational amplifiers circuit and other circuits (rectification, regulation and DC power supplies).

3. Digital electronics The content of this curriculum is as follows: the basic logic circuit concept, the digital presentation method, the combinatory logic electric circuit, the CMOS digital circuit, the logic operation law and the Boolean algebra, the digital operation (binary system, Hexadecimal system, integer), the analysis and the synthesis of combinatory logic electric circuit, the analysis and synthesis of succession logic circuit, the register, the counter, bus systems as well as CAD tools for logic design.

4. Signal and systems This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts in this unit will be widely used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

The course includes continuous-time signals (classifications and properties), basic properties of systems (linearity, time-invariance, causality and stability), linear time-invariant system (characterized by differential equations and the convolution integral), Fourier series and Fourier transform (definition, properties, frequency response and analysis of linear time-invariant systems based on Fourier transform, sampling, correlation and power spectral density), Laplace transform[8] (definition, properties and analysis of linear time-invariant systems based on Laplace transform, solution of state space equations using Laplace transform).

5. Circuit theory and design These partial studies take the basic electric circuit theory and the operational amplifier knowledge as the foundation. The main study goal is to enhance understanding of the electric circuit theory. Its main content includes the elementary theory in circuit theory (network functions, characteristic frequencies), types of filter (lowpass, bandpass, etc.), review of operational amplifiers (design of first and second order using operational amplifiers, cascade design), filter characteristics (Butterworth, Chebyshev, frequency transformations in design, sensitivity design of passive LC ladder filters and a brief introduction to switched capacitor filters).

6. Control theory This section is concerned with the application of feedback control to continuous-time, linear time-invariant systems. Knowledge of linear systems theory and the Laplace transform is required. The prime aim of study in this unit is to develop a sound understanding of basics and a capacity for research and inquiry. Completion of the unit will facilitate progression to advanced study in the area and to work in industrial control.

This course includes the history of control, modeling of physical processes design specifications in the time domain, design using the root locus, frequency response and an introduction to state space design for single-input single-output systems.

7. Microcontroller systems At present, computer and microprocessor are widely used in various parts of electronics industry. Along with the computation being more complex and the function more formidable, the microprocessor application will continue to grow very quickly. The ability to program for these devices will make a student an invaluable asset in the growing electronic industry. This course enables the student to program a simple microcontroller to perform typical industrial tasks. Assembler and C language are used to program the microprocessor unit (MPU). The student will set up the internal devices such as RS232 port, timer, interrupts, counters, I/O ports, A/DC, etc. The program will then use these devices for control operations.

8. Computer programming for engineering applications This course will continue to introduce the more advanced programming techniques. In the teaching of the C language, emphasis is the use of programming for engineering applications and problem solving.

New Words and Expressions

principle [ˈprinsəpl] *n.* 法则，原则，原理
relationship [riˈleiʃənʃip] *n.* 关系，关联
include [inˈkluːd] *vt.* 包括，包含
transistor [trænˈsistə] *n.* [电]晶体管
integrate [ˈintigreit] *adj.* 综合的，完整的
vacuum [ˈvækjuəm] *n.* 真空，空间，真空吸尘器 *adj.* 真空的
diode [ˈdaiəud] *n.* 二极管
nonlinear [nɔnˈliniə] *n.* 非线性的
unilateral [ˈjuːniˈlætərəl] *adj.* 单边的，片面的
characteristic [ˌkæriktəˈristik] *adj.* 特有的，典型的 *n.* 特性，特征
miraculous [miˈrækjuləs] *adj.* 奇迹的，不可思议的
decline [diˈklain] *v.*, *n.* 下倾，下降，下垂
widespread [ˈwaidspred, -ˈspred] *adj.* 分布广泛的，普遍的
semiconductor [ˈsemikənˈdʌktə] *n.* [物]半导体
previously [ˈpriːviəsli] *adv.* 先前，以前
associated [əˈsəuʃieitid] *adj.* 联合的，关联的
numerical [nju(ː)ˈmerikəl] *adj.* 数字的，用数表示的
integrator [ˈintigreitə] *n.* 综合者
significant [sigˈnifikənt] *adj.* 有意义的，重要的

contribution [ˌkɔntriˈbjuːʃən] *n.* 捐献，贡献，投稿
germanium [dʒəːˈmeiniəm] *n.* 锗
portable [ˈpɔːtəbl] *adj.* 轻便的，手提(式)的，便携式的
silicon [ˈsilikən] *n.* [化]硅，硅元素
revolutionary [ˌrevəˈluːʃənəri] *adj.* 革命的
resistor [riˈzistə] *n.* [电]电阻器
capacitor [kəˈpæsitə] *n.* 电容器
era [ˈiərə] *n.* 时代，纪元，时期
alternating [ˈɔːltəːneitiŋ] *adj.* 交互的
transformer [trænsˈfɔːmə(r)] *n.* [电] 变压器
curriculum [kəˈrikjuləm] *n.* 课程
amplifier [ˈæmpliˌfaiə] *n.* [电]扩音器，放大器
synthesis [ˈsinθisis] *n.* 综合，合成
causality [kɔːˈzæliti] *n.* 因果关系
stability[stəˈbiliti] *n.* 稳定性
enhancement [inˈhɑːnsmənt] *n.* 增进，增加
aim to 目的在于,旨在,志在
involved in 涉及
throw away 扔掉，丢弃
give birth to 诞生
mother board 主板
Boolean algebra 布尔代数
large-scale integration 大规模集成
integrated circuit 集成电路
linear time invariant systems 线性时不变系统

Notes to the Text

① This first electronic device exhibited a nonlinear, unilateral electrical characteristic but was not capable of producing amplification of a signal. 第一个电子装置显示出其非线性的单一电子特征,但是不能产生放大信号。

句中 nonlinear 意为“非线性”,是数学中的常用术语,相对于 linear(线性)而言。be capable of 指“有能力做某事”。

② Fleming 即 John A Fleming 约翰·佛莱明(1849—1945),英国电学家。

③ DeForest, 德·福雷斯特(1873—1961),美国发明家。

④ The use of vacuum tubes declined rapidly when a semiconductor device was invented that could perform many of the functions previously associated with vacuum tubes. 发明了半导体器件后,真空二极管的使用呈迅速下降趋势,因为半导体器件具有真空管的许多功能。

这是一个复合句。在 when 引导的状语从句中包含一个定语从句。

⑤ ENIAC 电子数字积分计算机,其全称为 the electronic numerical integrator and computer。

⑥ The real electronics what it is called today was actually started after the discovery of the transistor effect. 今天所说的电子技术实际上是在发现晶体管效应以后开始发展的。

be called 意为“被称为,名为”。the transistor effect 意为“晶体管效应”。

⑦ Silicon transistors began to replace germanium transistors in the late 1950s, which made possible the next revolutionary step in electronics. 硅晶体管于 20 世纪 50 年代末代替了锗晶体管,它为电子学带来了又一次的革命性进步。

⑧ Laplace transform 拉普拉斯变换。拉氏变换是自动调节原理中最重要的一种数学运算方法。假如$f(t)$是时间的函数,且$f(t)=0$, $t<0$,那么对于$f(t)$进行积分运算就叫做对函数$f(t)$进行拉氏变换,记为$L[f(t)]=L(s)$, 其中 s 是复变数。一般将 $L(s)$ 叫做时间函数$f(t)$的拉氏函数。在自动调节原理中,为了系统设计和分析的方便,将一个时域函数$f(t)$变换到复频域 s 的函数 $F(s)$,对线性定常微分方程进行拉氏变换,可以将它转化成代数方程。

Exercises to the Text

Ⅰ Translate the following words and phrases into English.

(1) 交流电路　(2) 半导体二极管　(3) 无源器件　(4) 组合逻辑电路

(5) 整流　(6) 拉普拉斯变换　(7) 电感　(8) 傅立叶级数和傅立叶变换

Ⅱ Translate the following words and phrases into Chinese.

(1) control theory　(2) field effects transistors　(3) Boolean algebra　(4) regulation

(5) correlation and power spectral density　(6) types of filter　(7) A/DC

(8) the analysis and synthesis of succession logic circuit

Ⅲ Answer thc following questions according to the text.

(1) What is Electronics?

(2) What do you know about electronic professional courses? Please make a list of them.

(3) Please write out the main contents of analog electronics course.

(4) Please write out the main goal of learning circuit theory and design course.

(5) How do you view the prospect of electronic technology?

Lesson 2　Electrical Components Ⅰ(电子元器件Ⅰ)

Resistors, capacitors and inductors form important elements in electronic circuitry. It is essential to know something about resistance, capacitance and inductance.

Resistors and Resistance

A resistor is an electrical component that resists the flow of electrical current. The amount of current I flowing in a circuit is directly proportional to the voltage across it and inversely proportional to the resistance of the circuit. This is Ohm's law and can be expressed as the formula: $I=U/R$. The resistor is generally a linear device and its characteristic forms a straight line when plotted on a graph.

Resistors may be classified as fixed or variable in their type, and also linear and nonlinear.

Resistance is the opposition to the flow of current and is represented by the letter symbol R. The unit of resistance is Ohm, expressed by using Ω. One Ohm is defined as the amount of resistance that will limit the current in a conductor to one ampere when the voltage applied to the conductor is one volt.[①] Larger amount of resistance are commonly expressed in kilo-ohm(KΩ) and in mega-ohm(MΩ).

A resistance to current flow creates heat, and as such, these devices have a maximum power dissipation, rated in watts. ② Placed in parallel with a voltage source, they limit current to a device. ③ In series with a voltage source they make up a voltage divider.

If a circuit contains resistance in series (Figure 2. 1 (a)), the total resistance can be calculated by adding all the individual resistance. The formula to calculate the total resistance is

$$R_T = R_1 + R_2 + R_3 + \cdots + R_n$$

where R_T is the total resistance, R_1 through R_n are the individual resistance.

Resistance in parallel Figure 2. 1(b) is a bit more difficult to calculate. The reciprocal of the total resistance equals to the sum of the reciprocals of each resistance.

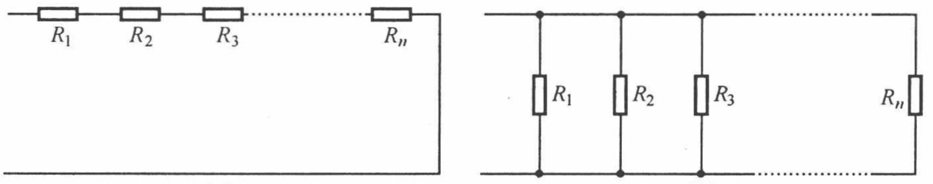


Figure 2. 1 Resistance in serial and parallel circuits

(a) serial circuit; (b) parallel circuit

The formula to calculate the total resistance is

$$1/R_T = 1/R_1 + 1/R_2 + 1/R_3 + \cdots + 1/R_n$$

If there are only two resistances in parallel, an easier formula is

$$R_{总} = (R_1 \cdot R_2)/(R_1 + R_2)$$

If you are interested in the electronics, I recommend you learning the "color code". It makes things a lot easier.

The band positions are interpreted as follows.

- The first band (closest to the end of the resistor) is the first significant digit in the resistor's ohmic value rating.
- The next, or the second band, represents the second significant digit in the resistor's ohmic value rating.
- The third band indicates the multiplier, or number of zeros that should follow the first two digits in order to know the resistor's rated ohmic value.
- The fourth band provides the percentage tolerance information. That is how much, in percentage, the resistor can acceptably vary from its color-code value and still be within the manufacture's specifications.
- The fifth band, when present, indicates the failure rate (in percentage) per 1 000 hours of service. This is sometimes called the reliability factors.

Capacitor and Capacitance

Electrical energy can be stored in an electric field. The device capable of doing this is called a capacitor or a condenser. ④

A simple condenser consists of two metallic plates separated by a dielectric. ⑤ If a condenser is connected to a battery, the electrons will flow out of the negative terminal of the battery and accumulate on the condenser plate connected to that side. At the same time, the electrons will leave the plate connected to the positive terminal and flow into the battery to make the potential difference just the same as that of the battery. [6]

To discharge the condenser the external circuit of these two plates is completed by joining terminals together with a wire. The electrons start moving from one plate to the other through the wire to restore electrical neutrality.

The capacitance is directly proportional to the dielectric constant of the material and to the area of the plates and inversely to the distance of the plates. It is measured in farads. When a change of one volt per second across it causes the current of one ampere to flow, the condenser is said to have the capacitance of one farad. However, farad is too large a unit to be used in radio calculation, so microfarad (one millionth of a farad) and the picofarad (10^{-12} farads) are generally used.

The amount of the stored energy of a charged condenser is proportional to the applied voltage and its capacitance. The capacitance of a condenser is determined by three important factors, namely, the area of the plate surface, the space between them and dielectric material. The larger the plate area, the smaller the space between them, the greater the capacitance.

The capacitors can be found in both polarized and nonpolarized version. The most commonly used types are the electrolytic.

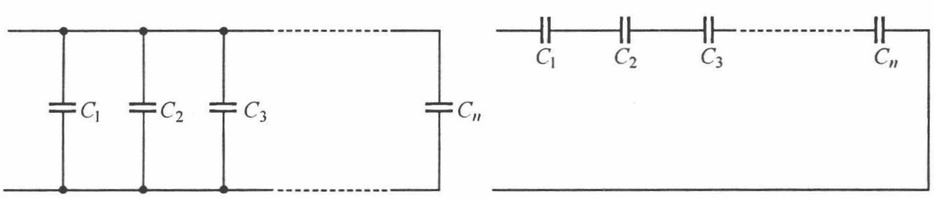
Total capacitance can be calculated from individual capacitance in parallel Figure 2.2(a) by adding each of the individual capacitance. The formula is

$$C_T = C_1 + C_2 + C_3 + \cdots + C_n$$

where C_T is the total capacitance, C_1 through C_n are the individual capacitance in parallel.

Total capacitance can be calculated from individual capacitance in series Figure 2.2(b) by the following formula:

$$1/C_T = 1/C_1 + 1/C_2 + 1/C_3 + \cdots + 1/C_n$$



(a) (b)

Figure 2.2 Capacitance in parallel and serial circuits

(a) parallel circuit; (b) serial circuit

Inductor and Inductance

An inductor is an electrical device which can temporarily store electromagnetic energy in the field. The inductor is a coil of wire that may have an air core of an iron core to increase its inductance. A powered iron core in the shape of a cylinder may be adjusted in and out of the core.

An inductor tends to oppose a change in electrical current; it has no resistance to DC current but has an AC resistance to AC frequency and is given by the formula $X_L = 2\pi f_L L$, with units of ohms. Inductors are used for filtering AC current. It is electrically opposite to the capacitor. Its value is expressed in Henry (more commonly milliHenries). There are two major types of inductors, air core and iron core.

Component Testing

Once a particular component is suspected of being faulty, individual tests must then be performed. ⑦ Ideally, the component should be removed from the circuit completely, but if this is inconvenient (at least until it proves necessary for removal), one or more leads should be disconnected and care taken to avoid current paths in neighboring components when testing. ⑧ Such paths may give false reading and lead to incorrect conclusions. Methods for testing components are described below.

Resistors are normally checked with an ohmmeter (in all probability on one of the resistance ranges of a multimeter). Such an instrument carries its own power supply and the circuit under test must be disconnected from the subunit power supply if the resistor is only partially removed from the circuit (that is, one end disconnected). Zero resistance on an ohmmeter is normally full scale deflection of the pointer and care must be taken not to confuse this reading with "infinite ohms". With the meter leads connected together, the ohmmeter is first zeroed, using the electrical control provided. This removes lead resistance from the leading and adjust the zero control appropriate to the chosen range.

Capacitors may also be checked for component resistance by use of an ohmmeter. On connection the meter initially reads low. Then capacitor is functional, the pointer moves to the high resistance end of the scale as the component charges. The reading given when the pointer stops moving is the insulation resistance, which is normally high if the capacitor is in good condition. Low resistance indicates a short-circuit or a leaky capacitor. Very high resistance indicated immediately (that is, without charging) may indicate an open-circuit except for very low-value capacitors in which the charging time is too short to cause detectable pointer movement as described. Capacitance itself may be measured on a capacitor bridge. The instructions for use of these instruments depend upon the type and are usually given with the instrument.

Inductors may be checked with an ohmmeter in the manner described for resistors, bearing in mind that inductor DC resistance is usually low. Inductance itself may be measured either by using a reliable AC supply to determine the inductive reactance or by a direct reading from a bridge instrument constructed for the purpose.

New Words and Expressions

resist [riˈzist] *vt.* 抵抗，反抗，抗，忍得住
directly [diˈrektli] *adv.* 直接地，立即
proportional [prəˈpɔːʃənl] *adj.* 比例的，相称的，均衡的
formula [ˈfɔːmjulə] *n.* 公式，规则
dissipation [ˌdisiˈpeiʃən] *n.* 消散，分散，挥霍，浪费
voltage [ˈvəultidʒ] *n.* [电]电压，伏特数
individual [ˌindiˈvidjuəl] *n.* 个人，个体 *adj.* 个别的，单独的，个人的
straightforward [streitˈfɔːwəd] *adj.* 简单的，直截了当的 *adv.* 坦率地

reciprocal [riˈsiprəkəl] *adj.* 相应的，倒数的，彼此相反的 *n.* 倒数
interpret [inˈtəːprit] *v.* 解释，说明，口译
band [bænd] *n.* 镶边，波段 *v.* 联合，结合
significant [sigˈnifikənt] *adj.* 有意义的，重大的，重要的
multiplier [ˈmʌltiplaiə] *n.* 增加者，乘数，增效器，乘法器
tolerance [ˈtɔlərəns] *n.* 公差，忍受 *vt.* 给(机器部件等)规定公差
condenser [kənˈdensə] *n.* 冷凝器，电容器
dielectric [ˌdaiiˈlektrik] *n.* 电介质，绝缘体 *adj.* 非传导性的
potential [pəˈtenʃ(ə)l] *adj.* 潜在的，可能的 *n.* 潜能，潜力
neutrality [njuːˈtræliti] *n.* 中立，中性
farad [ˈfærəd] *n.* [电]法拉(电容单位)
picofarad [ˌpikəˈfærəd] *n.* [电]皮法拉(符号为 PF 或 pf)
microfarad [ˌmaikrəuˈfærəd, -æd] *n.* [电]微法拉
polarize [ˈpəuləˌraiz] *v.* (使)偏振，(使)极化，(使)两极分化
nonpolar [ˈnɔnˈpəulə] *adj.* [化] 无极性的
inductor [inˈdʌktə] *n.* 感应器
temporarily [ˈtempərərili] *adv.* 临时地
electromagnetic [iˈlektrəumægˈnetik] *adj.* 电磁的
frequency [ˈfrikwənsi] *n.* 频率，发生次数
core [kɔː] *n.* 果核，中心，核心
fault [fɔːlt] *n.* 过错，故障，毛病 *vt.* 挑剔 *vi.* 弄错
deflection [diˈflekʃən] *n.* 偏斜，偏转，偏差
confuse [kənˈfjuːz] *vt.* 搞乱，使糊涂
initially [iˈniʃəli] *adv.* 最初，开头
detectable [diˈtektəbl] *adj.* 可察觉的，易发现的
tend to　趋势,趋向于
be expressed as　被表示为
linear device　线性器件
be classified as　被分类为
in parallel with　并联连接
be capable of　能够
the insulation resistance　绝缘电阻
one volt per second　每秒 1 伏特

Notes to the Text

① One Ohm is defined as the amount of resistance that will limit the current in a conductor to one ampere when the voltage applied to the conductor is one volt. 1 Ω 的定义是：当加到导体上的电压为 1 V 时，将导体的电流限制为 1 A 所需要的电阻值。

句中的 that will limit the current in a conductor to one ampere 是定语从句，when the voltage applied to the conductor is one volt 是状语从句，applied to the conductor 是过去分词短语作定语。

② A resistance to current flow creates heat, and as such, these devices have a maximum power dissipation, rated in watts.

这是一个并列句，两个单句之间插入一个并列连词 and as such。rated in watts (= which is rated in watts) 是分词短语，修饰前面的 power dissipation。

③ Placed in parallel with a voltage source, they limit current to a device.

这是一个主从复合句。从句 Placed in parallel with a voltage source 省略了主语 they，完整形式应是 They are placed in parallel with a voltage source，它是省略了从属连词 because 的原因状语从句。

④ The device capable of doing this is called a capacitor or a condenser.

capable of doing this 是形容词短语，充当后置定语，修饰 device，如 a place different from the earth。

⑤ A simple condenser consists of two metallic plates separated by a dielectric. 一个电容器由两个被介质隔开的金属平板构成。

to consist of 意思是"由……组成"，separated by a dielectric 是过去分词短语作后置定语，修饰 plates。

⑥ At the same time, the electrons will leave the plate connected to the positive terminal and flow into the battery to make the potential difference just the same as that of the battery. 同时，电子从与电池正极相连的金属平板流进电池正极，由此产生电位差，其值等于电池的电压值。

At the same time 的意思是"同时"，相当于 meanwhile；不定式短语 to make the potential difference just the same as that of the battery 是结果状语，其中 that 指 the difference。

⑦ Once a particular component is suspected of being faulty, individual tests must then be performed. 一旦怀疑某个元件出故障，就得单独做些测试。

suspect 表"怀疑"之意时，常用于介词 of + 名词/动名词的结构，faulty 是形容词，介词后不能直接与形容词连用，所以在 faulty 之前用了联系动词 being 形式。

⑧ one or more leads should be disconnected and care taken to avoid current paths in neighboring components when testing. 应该断开一根或几根引线，避免在测试时的元件之间有电流通路。

care 后省略了 should be。

Exercises to the Text

Ⅰ Translate the following words and phrases into English.

(1) 线性器件 (2) 与电源并联连接 (3) 放电 (4) 元件测试 (5) 绝缘电阻值

Ⅱ Translate the following words and phrases into Chinese.

(1) Ohm's law (2) maximum power dissipation

(3) nonpolarized capacitance (4) AC resistance

(5) capacitance itself may be measured on a capacitor bridge

(6) voltage divider

Ⅲ Answer the following questions according to the text.

(1) Please write out the definition of resistance.

(2) How to define 1 Ω?

(3) If a circuit contains resistance in series, how to figure out the total resistance?

(4) What do you know about inductors and inductance?

(5) Please write out some methods of testing components.

Lesson 3 Electronic Components Ⅱ(电子元器件Ⅱ)

Diode

Semiconductor Diode

A semiconductor diode is a two-terminal device containing a single P-N junction. It is the simplest possible semiconductor device. The P-type material is called the anode, while the N-type material is called the cathode.[①] (Figure 3.1)

A diode is a semiconductor that allows current to flow in only one direction. It can be used to change AC into DC. The two leads of a diode are labeled anode and cathode.

A diode is forward biased (Figure 3.2) when its anode is more positive than cathode (greater than the turn-on voltage, which is approximately 0.3 V for germanium and 0.7 V for silicon). In this condition the internal resistance of the diode is low and a large current will flow through the diode (depending on the external circuit resistance).

(a)　(b)

Figure 3.1 Diode

(a) P-N junction; (b) diode

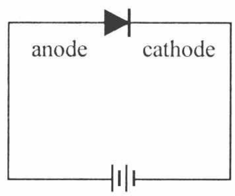


Figure 3.2 Forward biased

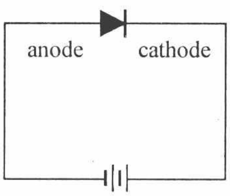


Figure 3.3 Reverse biased

A diode is reverse biased when the diode positive electrode voltage is higher than the cathode electric potential (Figure 3.3). The diode internal resistance is extremely high by now, therefore an ideal diode is allowed to prevent the reverse electric current in one direction while let the electric current to pass in another direction.

A diode objective parameter certainly is not extremely ideal, like the chart shows. When an ideal diode is reverse biased, the electric current can not pass, but the actual diode actually has approximately the 10 μA electric current to pass, (although very small, insufficiently is still ideal). If you adds on enough great reverse voltage, PN junction breaks down and lets current through. Generally, the breakdown voltage is a lot higher than the circuit will ever see, so it is irrelevant.

Zener Diode

A zener diode is a specially doped diode that operates the same as a regular diode in the forward-biased condition (it allows large current to flow). However, in the reverse-biased condition (Figure 3.4), it will not conduct until it reaches the zener voltage (U_Z) at which it is designed. At this point the zener diode conducts current in the reverse direction, while maintaining the zener voltage across its terminals.

The amount of current that flows through it is determined by two factors, a series (current-limiting) resistors (R_S) and the parallel load resistance (R_L). Resistor R_S is found