高等职业教育电气自动化专业“双证课程”培养方案规划教材

The Projected Teaching Materials of "Double-Certificate Curriculum" Training for Electrical Automation Discipline in Higher Vocational Education

电气自动化专业英语

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黄晶 主审

English for

- 图文并茂，以图释文
- 学练结合，以练为先
- 重点突出，贵在实践

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内 容 提 要

本书系高职高专学生完成基础英语后，进行专业学习的英语衔接教材，旨在满足电气自动化及相关专业学生及行业从业人员学习专业英语的需要。

《电气自动化专业英语》教材依照高职高专的培养目标及企业的实际要求，突出“实用、可用、好用、用得上”的原则；在内容编排上突出贴近企业，贴近实际，贴近岗位，并力求通俗、易懂、好学、可用。

全书共含 10 个单元，每个单元都力求与企业生产岗位紧密衔接。

本书既可作为高职高专、成人高校及相关院校的专业英语教材，也可用作企业培训教材，还可供相关教师、学生及技术人员学习参考。

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高等职业教育电气自动化专业
“双证课程”培养方案规划教材编委会

前　言

《电气自动化专业英语》是高职高专基础英语的后续衔接教材。力求向学生提供未来工作岗位所需的必备专业英语知识。

本教材依照《高职高专教育英语课程教学基本要求（试行）》的标准，本着培养高级应用型人才的总体目标及专业的实际需要，结合企业岗位的实际编写而成。

全书共设 10 个单元，每个单元共设 4 个模块。

1. 专业阅读（Technical and Practical Reading）

着重培养学生专业英语的阅读能力。它包括两篇文章：A 篇精讲，突出自动化专业的基础与常识；B 篇泛读，补充或扩展专业知识，以扩大学生视野。

文章（500～650 字）既涵盖自动化专业的基础内容，也包括当今自动化专业方面的最新发展、最新工艺、最新设备及最近技术等。

2. 专业认知（Glance at a…）

本部分主要帮助学生了解自动化原理、知识及设备常用知识、部件名称、使用功能及应用范畴，是学生到实训基地与企业实习的必学专业英语内容。

所学内容与企业实际应用形成衔接，所以本部分内容是有助于提高学生实际应用能力的一大亮点。

3. 实际应用（Put in Use）

Section A：“技能认知”——Test Your Skill。本部分提供了与企业生产紧密相关的自动化设备及辅助配件等资料图片，让学生感受一下专业英语如何应用；

Section B：“试试你的动手能力”——Have a Try。为实践上述所学常用设备及辅助配件知识，让学生通过所学专业英语进行实践。

同时，在其他的练习中配有相应的简单产品广告、配件说明书、操作与使用指南等应用文翻译。

4. 扩大视野（Broaden Your Horizon——Practical Activity）

本部分的目标是：一、提高学生学习专业英语的兴趣；二、扩大学生相关专业知识；三、提高学生专业知识的实际应用能力；四、较好地实现与企业实际衔接。

本教材以实际应用为目标，以提高学生的职业能力和职业素质为目的；因而，本书构思力求实用为先，理论为辅，贴近岗位，靠近专业，打造自己的风格。

◎　图文并茂。选材实用，图文相配，语言纯正，内容新颖，可读性强，针对性高，内涵丰富。

◎　实用可用。重点突出，针对性强，学中练，练中学，学用结合，融贯全书；充分体现职业英语大教育观。

◎　拉近实际。与岗位接轨，与实际衔接，内涵体现高职要求，外需拉近与企业距离，从

而实现岗位目标。

◎ 注重实践。练习形式多样，涵盖专业所需；实际动手逼真，上手演练真实；一切强调“双动（动手、动口）能力”。

5. 学时分配

章　序	1	2	3	4	5	6	7	8	9	10	总　计
理论学时	3	3	3	3	3	3	3	3	3	3	20
实践学时	2	2	2	2	2	2	2	2～4	2～6	2～6	20～32

本书主编为长春汽车工业高等专科学校黄星、王晓平；副主编为赵九九、张巍、张霞。黄星完成全书的文字资料收集与整理，全书的设计、统稿与校对；赵九九进行了全书的文章翻译；蒋凌编写第 1、2 单元；张巍编写第 3 单元，并协助整理全书；漯河职业技术学院冯凯编写第 4 单元；王暖编写第 5 单元；王黎编写第 6、7 单元；曹杨编写第 8 单元；高晓霞编写第 9 单元；郭冬梅编写第 10 单元；王俊制作了全书的多媒体课件。

在编写过程中，本书聘请了有着 30 多年丰富专业与工作经验的中国第一汽车集团公司——蓝迪公司（原一汽机械动力处）黄晶高级工程师为主审。他曾为多本专业英语教材担当过主审，而本书与其专业结合又非常紧密。在对全书专业部分进行了认真审核的基础上，他提出了许多实用的建议与意见，在此表示感谢。

由于本书是从实用、可用、能用的理念出发，因而在编排、设计与构思上与传统教材有很大不同，故在编写过程中难免会出现一些这样或那样的缺点和错误，加之编者水平有限，恳请广大专家、读者批评指正，在此深表谢意。

编　者

2010 年 8 月

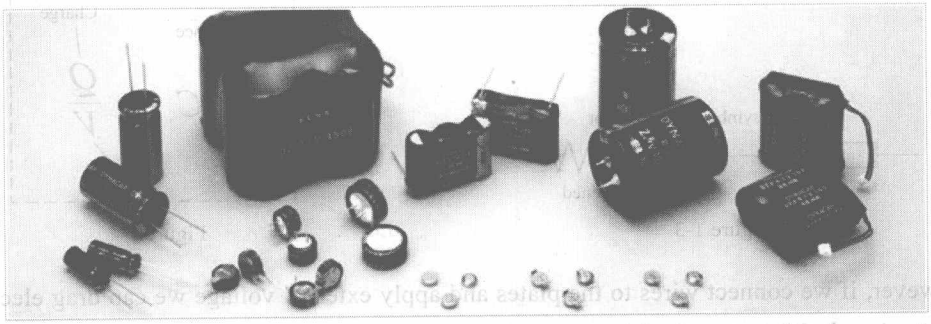
Contents

Unit 1

Introduction to Electronic Components

Part I Technical and Practical Reading

Reading A Electronic Components (I)



The main components used in electronics are of two general types: passive (e.g. resistors and capacitors) and active (e.g. transistors and integrated circuits). The main difference between active and passive components is that active ones require to be powered in some way to make them work.

Passive Components

The Resistor

A resistor (Figure 1-1) is a piece of material that obeys *Ohm's Law*. The name comes from its main property; it resists the flow of charge through itself, hence allowing us to control the current. Resistors can be made of various kinds of material, but whatever the choice it must conduct some electricity otherwise it wouldn't be of any use.

Two wires are connected to opposite ends of the resistor (Figure 1-2). When we apply a potential difference between the wires we set up a current from one wire to the other, through the resistor. The size of the current is proportional to the difference in voltage between the wires. The resistance (in units of Ohms) is defined as the ratio of the applied voltage, V (in Volts), divided by the current, I (in

Amps), produced by the applied voltage.

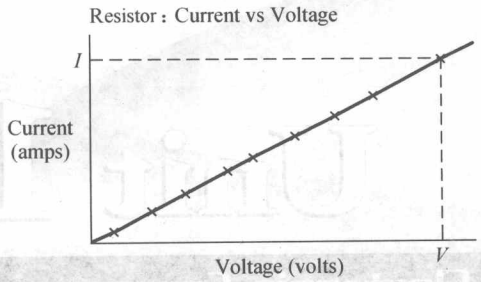


Figure 1-1

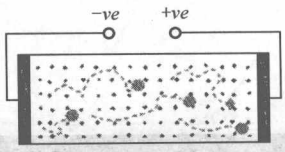


Figure 1-2

The value is usually displayed using standard colour code (Figure 1-3).

The Capacitor

If you look at a catalogue of electronic components you'll find an enormous variety of sizes and types of capacitor. However, for most purposes we can divide capacitors into two basic types: dielectric and electrolytic.

A capacitor acts as a charge store (Figure 1-4). It contains a pair of metal plates separated by a thin sheet of insulating material. The plates are electrically neutral—the number of positive protons in each exactly equals the number of negative electrons.

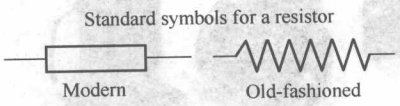


Figure 1-3

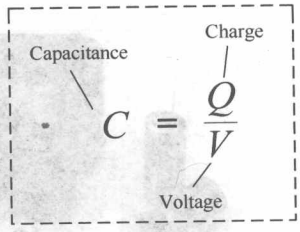


Figure 1-4

However, if we connect wires to the plates and apply external voltage we can drag electrons off one plate and push them on to the other.

This takes energy, i.e. we have to do work charging the capacitor. The result is a capacitor with one plate positively charged and the other negatively charged. The energy used to move charge is stored by this imbalance. If we connect two plates together with a resistor, the electrons "rush back home" releasing their energy again. The voltage between the plates of a charged capacitor is proportional to the amount of charge moved. The charge/voltage ratio for any specific capacitor is called the *capacitance* (Figure 1-5).

The Diode

There are a number of different electronic devices which tend to be called diodes (Figure 1-6). Although they're made differently they all have three things in common.

- They have two leads like a resistor.
- The current they pass depends upon the voltage between the leads.
- They do *not* obey Ohm's law!

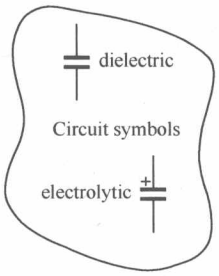


Figure 1-5

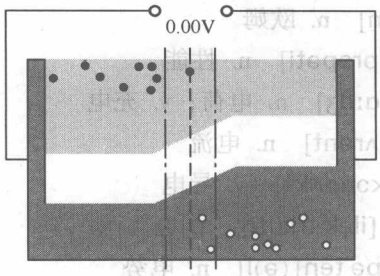


Figure 1-6

As an example we will use a typical diode called a pn-junction. This allows us to explain behavior of diodes. Remember, however, that there are other sorts of diodes which are built differently but show the same general behavior.

We create a pn-junction by joining together two pieces of semiconductor, one doped n-type, the other p-type. This causes a *depletion zone* to form around the junction (the join) between the two materials. This zone controls the behavior of the diode.

Notes

1. When we apply a potential difference between the wires we set up a current from one wire to the other, through the resistor. 本句是由 When we...引导的时间状语从句。本句可译为：当在两根导线间施加一个电势差时，就会有电流通过电阻器从一根导线传递到另一根导线。

2. If we connect wires to the plates and apply an external voltage we can drag electrons off one plate and push them on to the other. 本句是由 If we...引导的条件状语从句，we can drag...为主句部分。本句可译为：如果我们将导线连接到金属板上，并且外加电压，就可以把电子从一块金属板拖到另一块上。

3. There are other sorts of diodes which are built differently but show the same general behavior. 本句为简单句，可译为：有很多别的以不同方式制作的二极管，但它们的一般性能相同。

New Words

electronic [ilek'trɔnik] a. 电子的
component [kəm'pəunənt] n. 元件
electronics [ilek'trɔniks] n. 电子设备
passive ['pæsiv] a. 无源的
active ['æktiv] a. 有源的
resistor [ri'zistə] n. 电阻器
capacitor [kə'pæsitə] n. 电容器
transistor [træn'zistə] n. 晶体管
integrated ['intigreitid] a. 集成的
circuit ['sə:kit] n. 电路

Ohm [əum] n. 欧姆
property ['prɔpəti] n. 性能
charge [tʃɑ:dʒ] n. 电荷；v. 充电
current ['kʌrənt] n. 电流
conduct [kən'dʌkt] v. 导电
electricity [ilek'trisiti] n. 电
potential [pə'tenʃ(ə)l] n. 电势
wire ['waiə] n. 导线
voltage ['vəultidʒ] n. 电压
resistance [ri'zistəns] n. 电阻
ratio ['reiʃiəu] n. 比率
apply [ə'plai] v. 施加
amp [æmp] n. 安培
volt [vɔlt] n. 伏特
value ['vælju:] n. 值
dielectric [ˌdaii'lektrik] a. 电介质的
electrolytic [iˌlektrəu'litik] a. 电解质的
plate [pleit] n. 金属板
sheet [ʃi:t] n. 板
insulate ['insjuleit] v. 绝缘
neutral ['nju:trəl] a. 中性的
positive ['pɔzətiv] a. 正的
proton ['prəutɔn] n. 质子
negative ['negətiv] a. 负的
electron [i'lektrɔn] n. 电子
imbalance [im'bæləns] n. 不平衡
release [ri'li:s] v. 释放
capacitance [kə'pæsitəns] n. 电容
diode ['daiəud] n. 二极管
lead [li:d] n. 引线
junction ['dʒʌŋkʃən] n. 结
behavior [bi'heivjə] n. 性能
semiconductor ['semikən'dʌktə] n. 半导体
dope [dəup] v. 掺杂
depletion [di'pli:ʃən] n. 耗尽
join [dʒɔin] n. 结

Phrases and Expressions

electronic component 电子元件

passive component 无源元件
active component 有源元件
integrated circuit 集成电路
Ohm's Law 欧姆定律
potential difference 电势差
be proportional to 与……成正比
in units of 单位为
be defined as 定义为
applied voltage 施加电压
insulating material 绝缘材料
positive proton 正质子
negative electron 负电子
do work 做功
electronic device 电子器件
pn-junction p-n 结
depletion zone 耗尽层

EXERCISE

EXERCISE 1

Mark the following statements with T (True) or F (False) according to the passage.

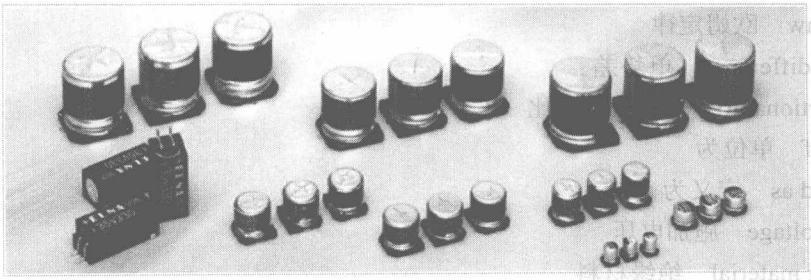
1. Active components are different from passive components in some way to make them work.
2. The resistance is often considered as the ratio of the current, I (in Amps) against the applied voltage,V(in Volts).
3. If wires are connected to the plates and an external voltage is applied,electrons can be dragged off one plate and pushed onto the other.
4. Although diodes are made differently,they all have three things in common.
5. Some of diodes are built differently and show different behavior.

EXERCISE 2

Translate the following phrases into Chinese or English.

1. active components
2. _____ 欧姆定律
3. potential difference
4. _____ 施加电压
5. insulating material
6. _____ 正质子
7. electronic device
8. _____ 耗尽层

Reading B Electronic Components (Ⅱ)



Active Components

Junction Field Effect Transistors

Junction field effect transistors (JFETs) come in two "flavors", *p-channel* and *n-channel* (Figure 1-7). In each case a bar, or channel, of one type of semiconductor material is located inside a bulk material of the other kind i.e. p inside n, or n inside p.

A pair of metallic contacts is placed at each end of the channel. When we apply a voltage between these, a current can flow along the channel from one contact to the other. The contact which launches charges along the channel is called the *source*; the one that "eats" them at the other end is called the *drain*.

In an n-channel device, the channel is made of n-type semiconductor, so the charges free to move along the channel are negatively (hence n) charged—they are electrons. In a p-channel device the free charges which move from end-to-end are positively (hence p) charged—they are holes (Figure 1-8). Remember that a hole is the absence of an electron. In each case the source puts fresh charges into the channel while the drain removes them at the other end.

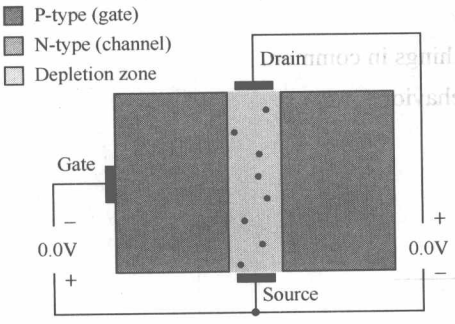


Figure 1-7

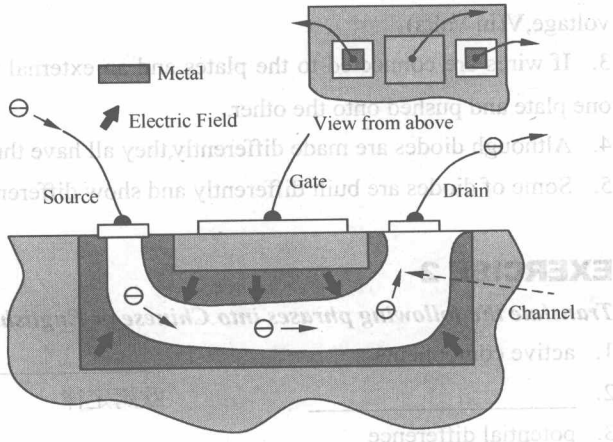


Figure 1-8

Bipolar Transistor

A Bipolar Transistor (Figure 1-9) essentially consists of a pair of PN Junction Diodes that are joined back-to-back. This forms a sort of a sandwich where one kind of semiconductor is placed in-between two others. There are therefore two kinds of bipolar sandwich, the NPN and PNP varieties.

The three layers of the sandwich are conventionally called the Collector, Base, and Emitter. The reasons for these names will become clear later once we see how the transistor works.

Some of the basic properties exhibited by a Bipolar Transistor are immediately recognizable as being diode-like. However, when the "filling" of the sandwich is fairly thin some interesting effects become possible that allow us to use the Transistor as an amplifier or a switch. To see how the Bipolar Transistor works we can concentrate on the NPN variety.

Figure 1-10 shows the energy levels in an NPN transistor when we aren't externally applying any voltages. We can see that the arrangement looks like a back-to-back pair of PN Diode junctions with a thin P-type filling between two N-type slices of "bread". In each of the N-type layers conduction can take place by the free movement of electrons in the conduction band. In the P-type (filling) layer conduction can take place by the movement of the free holes in the valence band. However, in the absence of any externally applied electric field, we find that depletion zones form at both PN-Junctions, so no charge wants to move from one layer to another.

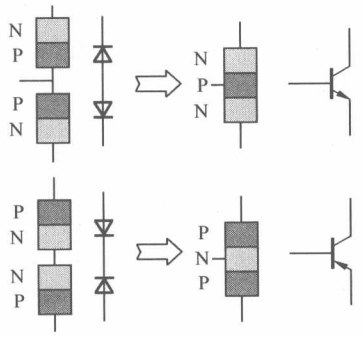


Figure 1-9

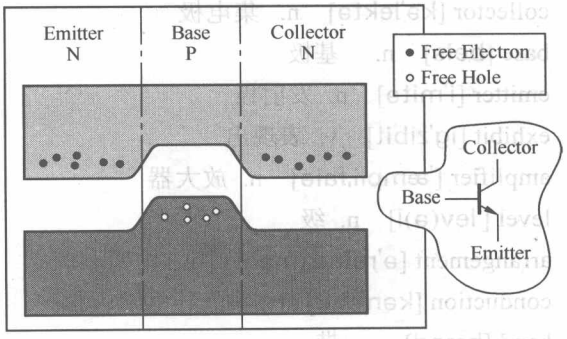


Figure 1-10

Consider now what happens when we apply a moderate voltage between the Collector and Base parts of the transistor. The polarity of the applied voltage is chosen to increase the force pulling the N-type electrons and P-type holes apart (Figure 1-11). This widens the depletion zone between the Collector and base and so no current will flow. In effect we have reverse-biased the Base-Collector diode junction. The precise value of the Base-Collector voltage we choose doesn't really matter to what happens provided we don't make it too big and blow up the transistor!

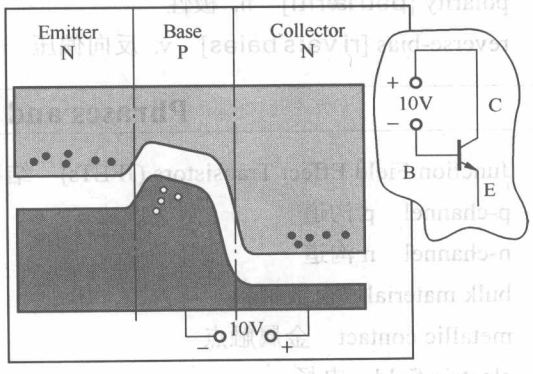


Figure 1-11

New Words

field [fi:ld] n. 场
effect [i'fekt] n. 效应

flavor ['fleivə] n. 沟道
channel ['tʃænl] n. 沟道
bulk [bʌlk] n. 松散
gate [geit] n. 门极
source [sɔ:s] n. 源极
drain [drein] n. 漏极
metallic [mi 'tælik] a. 金属的
contact ['kɔntækt] n. 触点
launch [lɔ:ntʃ] v. 释放
hole [həul] n. 空穴
view [vju:] n. 视图
bipolar [bai'pəulə] a. 双极的
layer ['leiə] n. 层
collector [kə'lektə] n. 集电极
base [beis] n. 基极
emitter [i'mitə] n. 发射极
exhibit [ig'zibit] v. 表现出
amplifier ['æmpli,faiə] n. 放大器
level ['lev(ə)l] n. 级
arrangement [ə'reindʒmənt] n. 排列
conduction [kən'dʌkʃən] n. 导电
band [bænd] n. 带
valence ['veiləns] n. 原子价
polarity [pəu'læriti] n. 极性
reverse-bias [ri'və:s'baiəs] v. 反向偏压

Phrases and Expressions

Junction Field Effect Transistors (JFETs) 结型场效应晶体管
p-channel p 沟道
n-channel n 沟道
bulk material 松散材料
metallic contact 金属触点
electric field 电场
view from above 俯视图
Bipolar Transistor 双极型晶体管
PN Junction Diode PN 结二极管
energy level 能级
conduction band 导电带
valence band 价电子带