电子与通信专业英语

（第3版）

Specialized English on Electronics & Communication Technology, Third Edition

主编 王琳 夏怡

北京理工大学出版社
BEIJING INSTITUTE OF TECHNOLOGY PRESS

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内 容 简 介

本书由电子技术基础篇、仪器仪表使用篇、通信篇和计算机与网络篇 4 部分组成，共计 23 个单元。电子技术基础篇主要包括电路理论的基本概念、电路的组成元件及符号、二极管、晶体管、放大器、运放、集成电路、逻辑电路等；仪器仪表使用篇主要包括安培表、电压表、欧姆表、万用表、示波器、信号发生器等仪器仪表的使用；通信篇主要包括通信的基本知识、光纤通信、移动通信、宽带通信和异步传输模式等；计算机与网络篇主要包括计算机的配置和硬件、操作系统、网络、因特网、计算机安全等。本书所有原文均精心选自国外相关专业的网站和教材，具有专业性和实用性强、难度适宜等特点，有助于培养学生阅读电子和通信类英文资料的能力。为了便于学生自学，书后附有译文。

本书可作为各类高等院校电子信息、通信、电气自动化等专业的教材，也可供高等职业学校相关专业学生使用以及相关专业英语爱好者学习、参考。

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前言（第3版）
Preface

本书在2007年出版第1版以来，受到使用学校的诸多好评，我们在2010年对该教材进行了第一次改版。为了更好地适应时代的发展，增强师生的互动，我们对该教材进行了第二次改版。

在改版过程中，我们遵循“增加实用性、增强师生互动、突出实践能力培养”的原则。本版教材具有以下特点：

1. 教材内容安排上，按电子通信类专业所涉及的专业课程分成电子技术基础篇、仪器仪表使用篇、通信篇和计算机与网络篇四部分，共计23个单元。电子技术基础篇含8个单元；仪器仪表使用篇含5个单元；通信篇含5个单元，计算机与网络篇含5个单元。每个单元由课文、习题和阅读理解三部分组成。每一篇突出一个领域的技术与应用，是电子通信类专业的通用专业英语教材。

2. 选材新颖，注重各专业、学科间知识的相关性。选材注重体现专业性、实用性，同时尽可能体现趣味性。

3. 每篇课文后都提供了练习题。为了便于学生进行自测，本版我们增加了客观性习题的习题量。学生可以借助手机，通过扫码，自行判定对错。增强了学生的自主学习能力。

4. 同行普遍反映学生的英语实用能力较薄弱，为了改善这个状态，本版我们加入了英文原版口语视频教学环节，每课均配有和课文内容相贴切的英文原版视频，可以更好地增强学生听力水平的训练、更好地提升学生的专业英语实用能力。

5. 为了让学生更好地阅读，并具有一定的分析能力，本版增加了专业英语实用翻译技巧，对专业英语中常出现的语法现象、长句、难句给出了专门的介绍。

《电子与通信专业英语》尽量结合实际电子与通信技术，注重师生间的互动，并配有大量的插图，浅显易懂，可作为高等院校电子信息、通信、电气自动化等专业的教材，也可作为高等职业学校相关专业的教材。

本书由王琳、夏怡主编。本次修订王琳负责Chapter 2和Chapter 3，夏怡负责Chapter 1和Chapter 4。感谢相关网站提供了和课文内容贴切的英语视频。由于编者水平有限，虽然经过两次改版，书中可能还存在不妥之处，敬请读者批评指正。

编　者

目录 Contents

Chapter 1

Electronic Technology Fundamental

本章知识点

1. 掌握电子技术基础相关材料的阅读技巧。
2. 掌握电路基本知识、电子器件及电子电路的英文描述方式。
3. 了解科技文献的书写特点。

先导案例

产品概述一般简要说明产品的用途、功能特点、使用范围等，因此读懂产品概述对产品的使用是非常重要的。请尝试读下面的运算放大器 uA741 产品概述实例。

The uA741 is a general-purpose operational amplifier featuring offset-voltage null capability.

The high common-mode input voltage range and the absence of latch-up make the amplifier ideal for voltage-follower applications. The device is short-circuit protected and the internal frequency compensation ensures stability without external components. A low value potentiometer may be connected between the offset null inputs to null out the offset voltage as shown below.

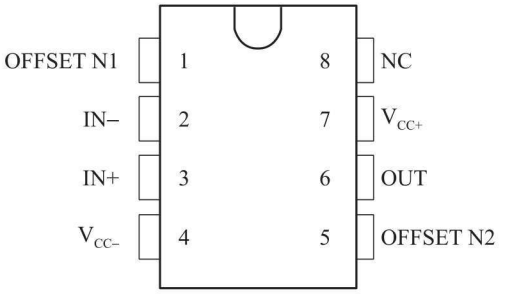
The uA741C is characterized for operation from 0 ℃ to 70 ℃. The uA741I is characterized for operation from –40 ℃ to 85 ℃. The uA741M is characterized for operation over the full military temperature range of –55 ℃ to 125 ℃.

先导案例解决

uA741 为通用型的运算放大器，不需加补偿电压。其共模电压范围宽，而且没有闩锁效应，因而它适合用于电压跟随器中。该运放有短路保护功能，而且在不接外部器件的情况下，内部频率补偿可保证运放的稳定性。如下图所示，在输入信号为零的情况下，

在补偿输入端间接一个低阻值的分压器可以使输出电压为零。

uA741 C 的工作温度范围为：0 ℃～70 ℃。uA741I 的工作温度范围为：–40 ℃～85 ℃。uA741M 的工作温度范围为：–55 ℃～125 ℃。



Text 1 Basic Concepts of Circuit Theory

Voltage and Current

Voltage and current are vital to understanding electronics, but they are quite hard to grasp because we can't see them directly.

Voltage attempts to make a current flow, and current will flow if the circuit is complete. Voltage is sometimes described as the "push" or "force" of the electricity, it isn't really a force but this may help you to imagine what is happening. It is possible to have voltage without current, but current cannot flow without voltage.

Voltage, *V*

- Voltage is a measure of the energy carried by the charge. Strictly: voltage is the "energy per unit charge".
- The proper name for voltage is potential difference or p.d. for short, but this term is rarely used in electronics.
- Voltage is supplied by the battery (or power supply).
- Voltage is used up in components, but not in wires.
- We say voltage across a component.
- Voltage is measured in volts, V.
- Voltage is measured with a voltmeter, connected in parallel.
- The symbol *V* is used for voltage in equations.

Voltage at a point and 0 V (zero volts)

Voltage is a difference between two points, but in electronics we often refer to voltage at a point meaning the voltage difference between that point and a reference point of 0 V (zero volts).[1]

Zero volts could be any point in the circuit, but to be consistent it is normally the negative terminal of the battery or power supply. You will often see circuit diagrams labelled with 0 V as a reminder.

You may find it helpful to think of voltage like height in geography. The reference point of zero height is the mean (average) sea level and all heights are measured from that point. The zero volts in an electronic circuit is like the mean sea level in geography.

Current, *I*

- Current is the rate of flow of charge.
- Current is not used up, which flows into a component must flow out.
- We say current through a component.
- Current is measured in amps (amperes), A. A (1 amp) is quite a large current for electronics, so mA (milliamps) are often used. m (milli) means "thousandth": 1 mA = 0.001 A, or 1 000 mA = 1 A.
- Current is measured with an ammeter, connected in series.
- To connect in series you must break the circuit and put the ammeter across the gap.
- The symbol *I* is used for current in equations.[2]

Series and Parallel Connections

There are two ways of connecting components:

In series (Fig. 1-1): each component has the same current. The battery voltage is divided between the two lamps. Each lamp will have half the battery voltage if the lamps are identical.

In parallel (Fig. 1-2): each component has the same voltage. Both the two lamps have the full battery voltage across them. The battery current is divided between the two lamps.

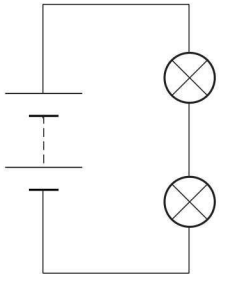


Fig. 1-1 In series

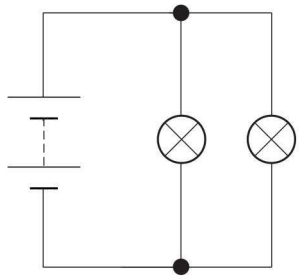


Fig. 1-2 In parallel

Most circuits contain a mixture of series and parallel connections.

The terms series circuit and parallel circuit are sometimes used, but only the simplest of circuits are entirely one type or the other. It is better to refer to specific components and say they are connected in series or connected in parallel.

Analogue and Digital Systems

Analogue systems

Analogue systems process analogue signals which can take any value within a range, for example the output from an LDR (light sensor) or a microphone.

All electronic circuits suffer from "noise" which is an unwanted signal mixed in with the desired signal.[3] For example, an audio amplifier may pick up some mains "hum". Noise can be difficult to eliminate from analogue signals because it may be hard to distinguish from the desired signal.

Digital systems

Digital systems process digital signals which can take only a limited number of values (discrete steps). Usually just two values are used: the positive supply voltage ($+V_s$) and zero volts (0 V).

Digital systems contain devices such as logic gates, flip-flops, shift registers and counters. A computer is an example of a digital system.

Logic signals

Most digital systems use the simplest possible type of signal which has just two values. This type of signal is called a logic signal because the two values (or states) can be called true and false. Normally the positive supply voltage $+V_s$ represents true and 0 V represents false. Other labels for the true and false states are shown in Table 1-1.

Table 1-1 Logic states

Logic states	
True	False
1	0
High	Low
$+V_s$	0 V
On	Off

Noise is relatively easy to eliminate from digital signals because it is easy to distinguish from the desired signal which can only have particular values. For example, if the signal is meant to be +5 V (true) or 0 V (false), noise of up to 2.5 V can be eliminated by treating all voltages greater than 2.5 V as true and all voltages less than 2.5 V as false.

Technical Words and Expressions

vital	['vaitl]	*adj.*	极为重要的；关系重大的
electronics	[ilek'trɔniks]	*n.*	电子学
electricity	[ilek'trisiti]	*n.*	电，电流；电学
measure	['meʒə]	*n. & v.*	大小；测量
charge	[tʃɑːdʒ]	*n.*	负荷，电荷
potential difference			〈电〉电位差，电势差

across	[ə'krɔs]	*adv. & prep.*	跨越［接］，并联
volt	[vəult, vɔlt]	*n.*	伏特（电压单位）
voltmeter	['vəult,mi:tə(r)]	*n.*	电压表，伏特计
parallel	['pærəlel]	*n.*	〈电〉并联
symbol	['simbəl]	*n.*	符号，记号
negative terminal		*n.*	负极，负极接线柱［端子］
ampere	['æmpɛə]	*n.*	安培
ammeter	['æmitə]	*n.*	安培计，电流表
series	['siəri:z]	*n.*	〈电〉串联
analogue system			模拟系统
digital system			数字系统
LDR (light dependent resistor)			光敏电阻
microphone	['maikrəfəun]	*n.*	扩音器，麦克风
noise	[nɔiz]	*n.*	干扰，噪声，噪音
audio amplifier			音频放大器
frequency	['fri:kwənsi]	*n.*	频率，周率，发生次数
eliminate	[i'limineit]	*vt.*	排除，消除
distinguish	[dis'tiŋgwiʃ]	*v.*	区别，辨别
discrete step			离散阶跃
logic gate			逻辑门
flip-flop	['flipfləp]	*n.*	触发器，双稳态多谐振荡器
shift register			移位寄存器
counter	['kauntə]	*n.*	计数器

Notes

1. Voltage is a difference between two points, but in electronics we often refer to voltage at a point meaning the voltage difference between that point and a reference point of 0 V (zero volts).

译文：电压是两点间的差值，但在电子学中我们常说的某一点上的电压其实是指这点和零伏参考点之间的一个电压差。

meaning...是现在分词短语做定语，修饰 voltage at a point。

2. The symbol *I* is used for current in equations.

译文：符号 *I* 表示方程中的电流。

谓语为被动时，经常可译成主动句，把主语译成宾语构成无主语的动宾结构。

3. All electronic circuits suffer from “noise” which is unwanted signal mixed in with the desired signal, ...

译文：所有的电子电路都会受到“噪声”干扰，噪声是混合在有用信号中的无用信号。

which 引导定语从句，修饰 noise；mixed...过去分词做后置定语，修饰 unwanted signal。

Exercises

I. Mark the following statements with T (true) or F (false) according to the text.

1. It is possible to have voltage without current, but current cannot flow without voltage. ( )
2. Current is used up in components, but not in wires. ( )
3. In parallel each component has the same current. ( )
4. Noise can be easy to eliminate from analogue signals. ( )
5. Most digital systems use the simplest possible type of signal which has just two values. ( )
6. In electronics we often refer to voltage at a point meaning the voltage at the point. ( )
7. To measure current in a circuit, you must break the circuit and put the ammeter across the gap. ( )
8. Most circuits are entirely series circuit or parallel circuit. ( )
9. Digital signals can take only a limited number of values. ( )
10. There are three ways of connecting components. ( )

II. Select the right answer from the following choices.

1. _____ is sometimes described as the 'push' or 'force' of the electricity.
   A. Resistance B. voltage C. current D. Transistor
2. Zero volts could be _____ in the circuit, but to be consistent it is normally the _____ terminal of the battery or power supply.
   A. fixed point; positive B. any point; negative
   C. any point; positive D. fixed point; negative
3. In series each component has the same _____.
   A. current B. voltage C. power D. resistance
4. Since logic gates are _____ ICs, their input and output signals can only be in one of two possible states, i.e., logic '0' or logic '1'.
   A. digit B. analog C. digital D. analogue
5. The output from a microphone is _____.
   A. analog signal B. digital signal C. discretesignal D. all

III. Complete the following sentences.

1. We say voltage _____ a component, current _____ a component.
2. The proper name for voltage is _____ or _____ for short.
3. Current is measured in _____ and is measured with an _____.
4. Most circuits contain a mixture of _____ and _____ connections.

5. Normally the positive supply voltage $+V_S$ represents _____ and 0 V represents _____.

Answer

Reading 1 AC, DC and Electrical Signals

AC means Alternating Current and DC means Direct Current. AC and DC are also used when referring to voltages and electrical signals which are not currents! For example: a 12 V AC power supply has an alternating voltage (which will make an alternating current flow). An electrical signal is a voltage or current which conveys information, and usually it means a voltage. The term can be used for any voltage or current in a circuit.

Alternating Current (AC)

Alternating Current (AC) flows one way, then the other way, continually reversing direction. An AC voltage is continually changing between the positive (+) and negative (–). The rate of changing direction is called the frequency of the AC and it is measured in hertz (Hz) which is the number of forwards-backwards cycles per second. Mains electricity in the UK has a frequency of 50 Hz.

Direct Current (DC)

Direct Current (DC) always flows in the same direction, but it may increase and decrease. A DC voltage is always positive (or always negative), but it may increase and decrease. Electronic circuits normally require a steady DC supply which is constant at one value or a smooth DC supply which has a small variation called ripple.

Properties of Electrical Signals

An electrical signal is a voltage or current which conveys information, and usually it means a voltage. The term can be used for any voltage or current in a circuit.

The voltage-time graph (Fig. 1-3) shows various properties of an electrical signal. In addition to the properties labelled on the graph, there is frequency which is the number of cycles per second.

Fig. 1-3 shows a sine wave but these properties apply to any signal with a constant shape.

- Amplitude is the maximum voltage reached by the signal.
- Peak voltage is another name for amplitude.
- Peak-peak voltage is twice the peak voltage (amplitude). When reading an oscilloscope trace it is usual to measure peak-peak voltage.
- Time period is the time taken for the signal to complete one cycle.
- Frequency is the number of cycles per second. It is measured in hertz (Hz), but frequencies tend to be high so kilohertz (kHz) and megahertz (MHz) are often used. 1 kHz = 1 000 Hz and 1 MHz = 1 000 000 Hz.

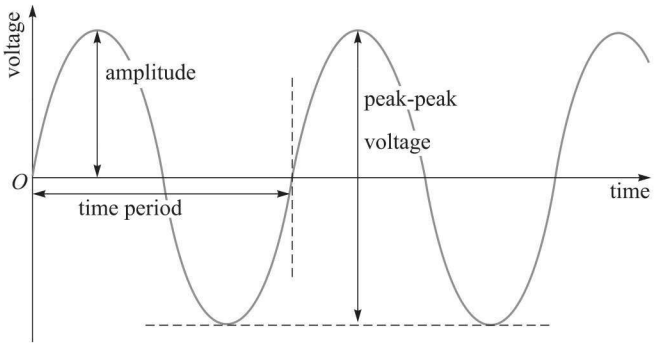


Fig. 1-3　A sine wave

● frequency = $\frac{1}{\text{time period}}$ and time period = $\frac{1}{\text{frequency}}$.

Technical Words and Expressions

AC (alternating current)		交流电
DC (direct current)		直流电
convey	*vt.*	传送
amplitude	*n.*	振幅
oscilloscope	*n.*	（物）示波器
kilohertz	*n.*	千赫
megahertz (MHz)	*n.*	兆赫
ripple	*n.*	脉动，波纹

Comprehension

1. AC and DC are also used when referring to _____.

A. voltages, electrical signals and currents

B. currents and voltages

C. currents and electrical signals

D. voltages and electrical signals

2. Which of the following is right?

A. Alternating Current flows one way, then the other way, continually reversing direction.

B. An AC voltage is continually changing between the positive (+) and negative (–).

C. The rate of changing direction is called the frequency of the AC.

D. All of the above.

3. DC _____.

A. means Direct Current

B. means Alternating Current

C. always flows in the same direction and can increase and decrease

D. voltage is always positive, but it may increase and decrease

4. Which of the following descriptions of electrical signal properties is not right?

A. Amplitude is the maximum voltage reached by the signal.

B. Peak voltage is another name for amplitude.

C. Peak-peak voltage is twice the peak voltage (amplitude).

D. Frequency is the number of cycles per minute.

5. Frequency _____.

A. is the number of cycles per minute

B. is measured in second

C. tends to be high so kilohertz (kHz) and megahertz (MHz) are often used

D. is equal to time period

Answer

Video: Explaining an electrical circuit

Text 2 Circuit Components and Their Symbols

Circuit symbols are used in circuit diagrams which show how circuits are connected together. The actual layout of components is usually quite different from the circuit diagram. To build a circuit you need a different diagram showing the layout of the parts on the printed circuit board.

Wires and Connections

Wire: To pass current very easily from one part of a circuit to another. (Fig. 1-4 (a))

Wires joined: A "blob" should be drawn where wires are connected (joined), but it is sometimes omitted.[1] The wires connected at "crossroads" should be staggered slightly to form two T-junctions, as shown in Fig. 1-4 (b).

Power Supplies (Fig. 1-5)

Cell: Supplies electrical energy. The larger terminal (on the left) is positive (+). A single cell is often called a battery, but strictly a battery is two or more cells joined together.

(a) (b)

Fig. 1-4 Wire

(a) Wire; (b) Wires joined

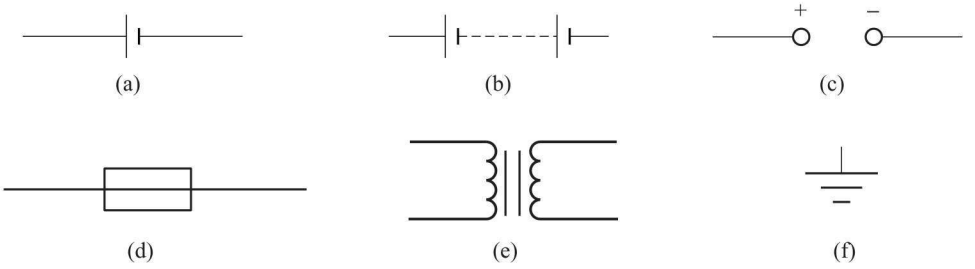
Battery: Supplies electrical energy. A battery is more than one cell. The larger terminal (on the left) is positive (+).

DC supply: Supplies electrical energy. DC = Direct Current, always flowing in one direction.

AC supply: Supplies electrical energy. AC = Alternating Current, continually changing directions.

Fuse: A safety device which will "blow (melt)" if the current flowing through it exceeds a specified value.

Transformer: Two coils of wire linked by an iron core. Transformers are used to step up (increase) and step down (decrease) AC voltages. Energy is transferred between the coils by the magnetic field in the core. There is no electrical connection between the coils.



(a) (b) (c)

(d) (e) (f)

Fig. 1-5 Power supplies

(a) Cell; (b) Battery; (c) DC supply; (d) Fuse; (e) Transformer; (f) Earth (Ground)

Earth (Ground): A connection to earth. For many electronic circuits this is the 0 V (zero volts) of the power supply, but for mains electricity and some radio circuits it really means the earth. It is also known as ground.

Output Devices (Fig. 1-6)

Lamp: A transducer which converts electrical energy to light. Fig. 1-6 (a) symbol is used for a lamp which is an indicator, for example a warning light on a car dashboard.

Heater: A transducer which converts electrical energy to heat.

Motor: A transducer which converts electrical energy to kinetic energy (motion).

Inductor: A coil of wire which creates a magnetic field when current passes through it. It may have an iron core inside the coil. It can be used as a transducer converting electrical energy to mechanical energy by pulling on something.

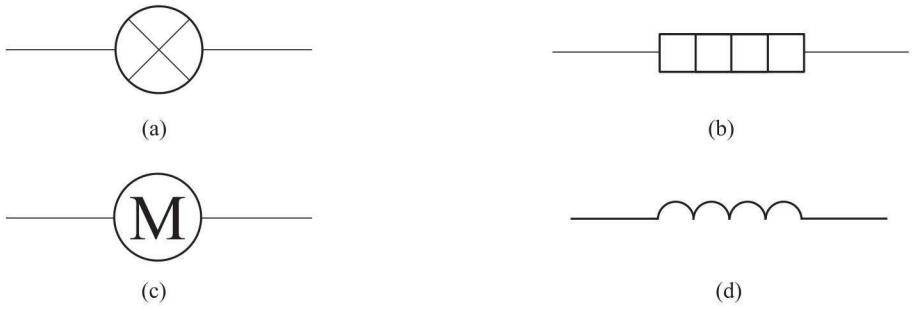


Fig. 1-6 Output devices

(a) Lamp; (b) Heater; (c) Motor; (d) Inductor

Switch (Fig. 1-7)

On-Off Switch: SPST = Single Pole, Single Throw. An on-off switch allows current to flow only when it is in the closed (on) position.

Dual On-Off Switch: DPST = Double Pole, Single Throw.

Reversing Switch: DPDT = Double Pole, Double Throw.

Relay: An electrically operated switch, for example a 9 V battery circuit connected to the coil can switch a 230 V AC mains circuit.

NO = Normally Open. COM = Common. NC = Normally Closed.

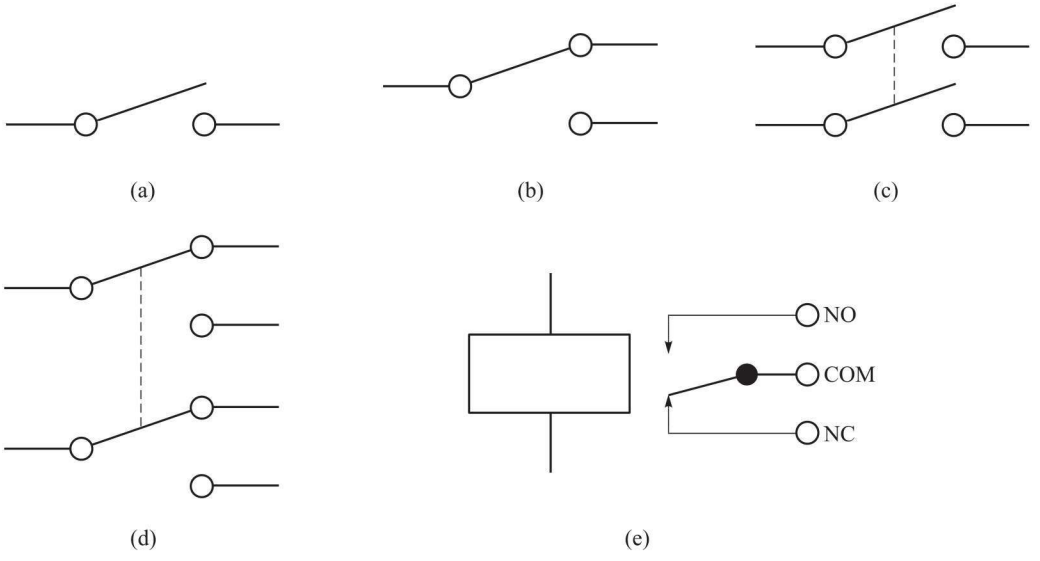


Fig. 1-7 Switches

(a) SPST; (b) SPDT; (c) DPST; (d) DPDT; (e) Relay

Resistors, Capacitors, Diodes and Transistors (Fig. 1-8)

Resistor: A resistor restricts the flow of current, for example to limit the current passing