數位電路導論
Introduction to Circuits Theory and Digital Electronics

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課程概述

- Circuits
  - Introduction
  - Basic RLC Circuit Theory
  - Frequency Response
- Electronics
  - Diodes
  - Fidel-Effect Transistors
- Digital Systems
  - Logic Circuits

參考書目與評分標準

- 參考書目:
  - “Electrical Engineering: Principles and Applications”, Allan Hambley, 6th edition, Pearson, 2014.

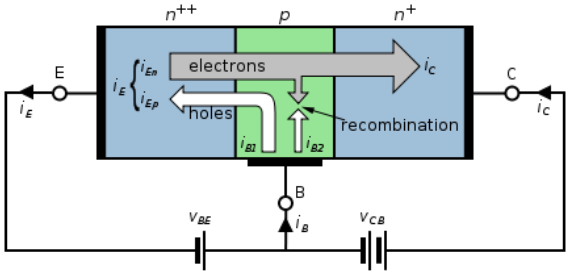
- 評分標準:
  - Presence 10%, Assignment 30%, Midterm Exam. 30%, Final Exame. 30%

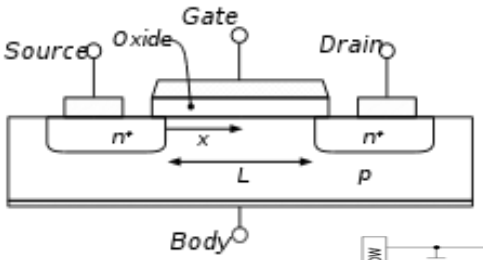
課程相關資訊

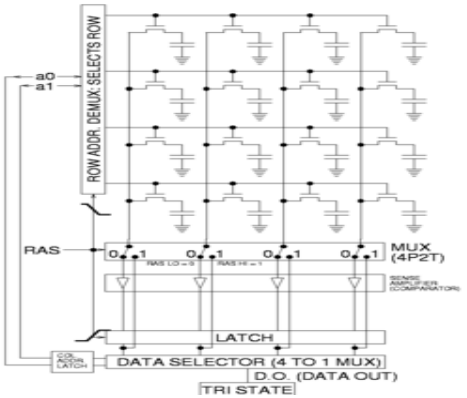
- 課程網頁
  - http://ncbci.csie.ncku.edu.tw/
- Office hour：
  - Wed., 13:30~15:30
  - Office:雲平東棟 416R. Tel: 62549
  - Lab:雲平東棟 301R, Tel: 62530-74
- 助教
  - 雲泰傑：denny61302@gmail.com
  - 林家宏：jiahonglin17@gmail.com

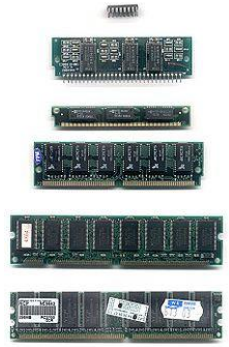
Evolution of Semiconductor Technology

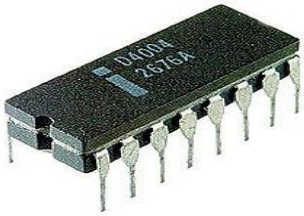
- 1940-1950
  - Bipolar Transistor
- 1950-1960
  - MOSFET
  - CMOS
- 1960-1970
  - DRAM
- 1970-1980
  - Microprocessor







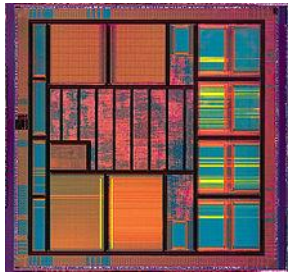


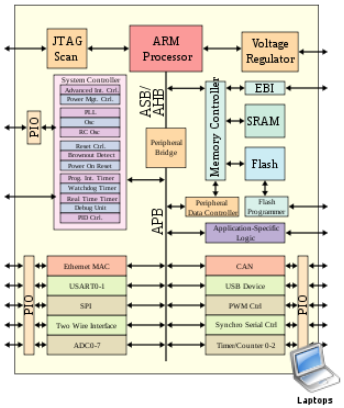


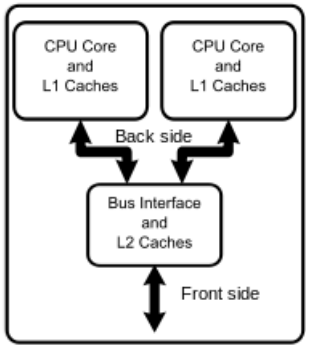
(Figures are from wiki)

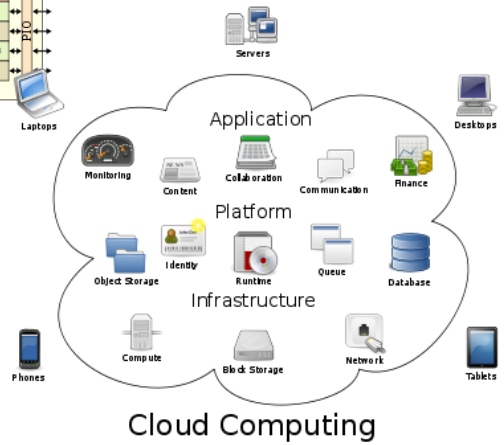
Evolution of Semiconductor Technology

- 1980-2000 (VLSI)
  - Personal Computer (x86, Pentium)
  - *u*P+Memory
- 2000-2013 (SoC)
  - Internet
  - DSP+Analog
  - Multi cores
  - Cloud computing









Cloud Computing

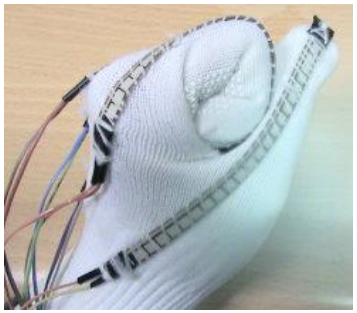
(Figures are from wiki)

Applications of Electronics and Circuits

Consumer Electronics

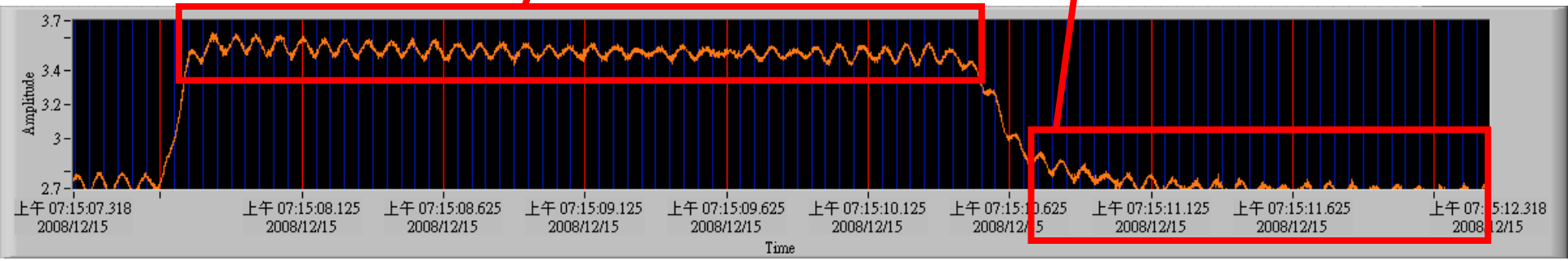
(http://www.deadzones.com/2010/12/must-have-consumer-electronics-for-2011.html)

Applications of Electronics and Circuits
Human Computer Interface-Flex Sensor



手握拳(手指彎曲度最大)

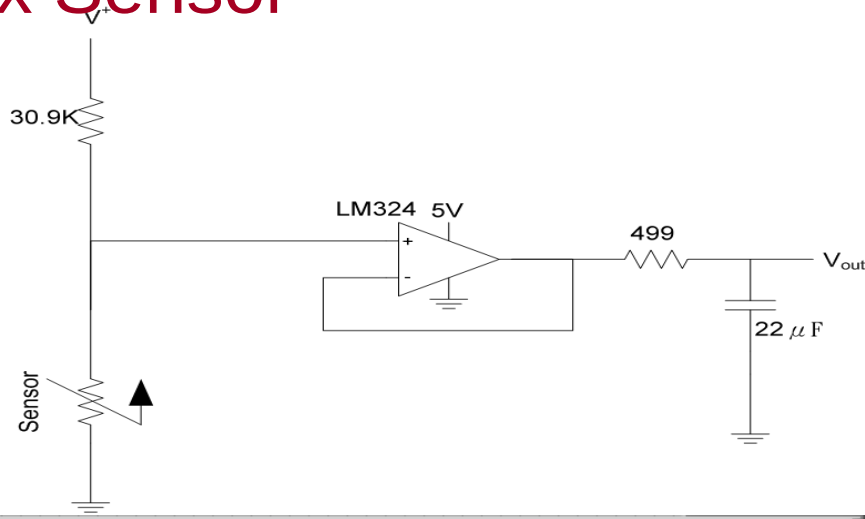
手攤平(手指彎曲度最小)

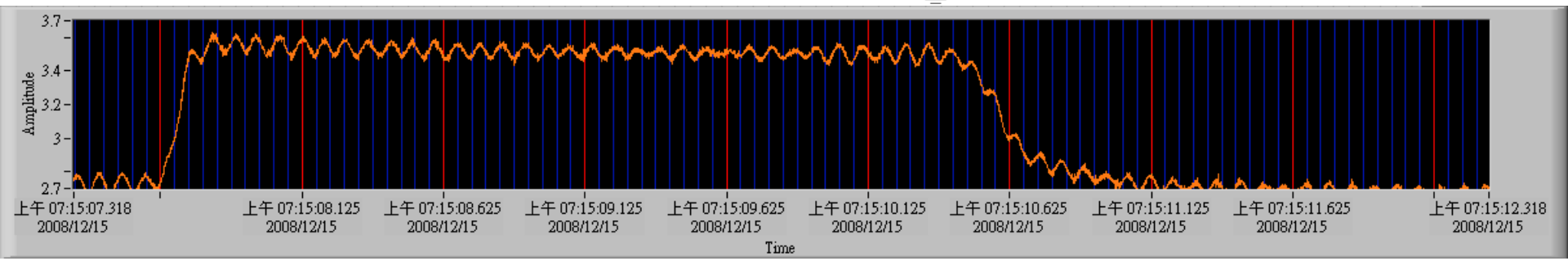


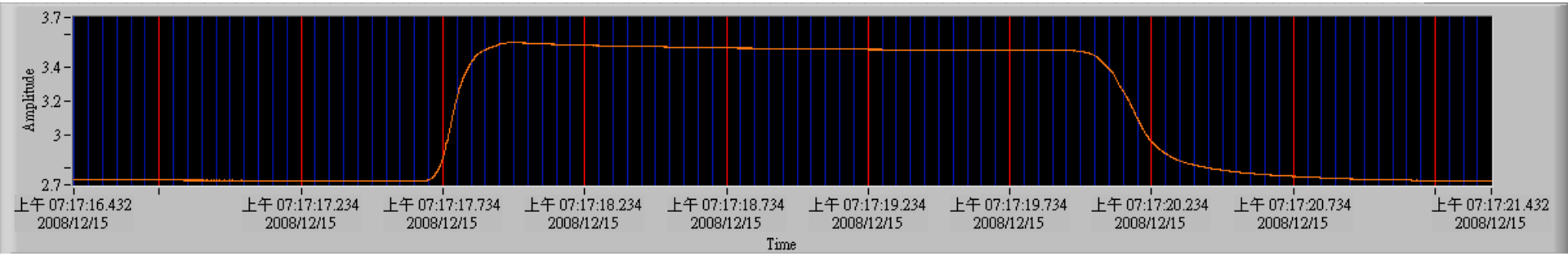
Applications of Electronics and Circuits

Human Computer Interface-Flex Sensor

Low Pass Filter



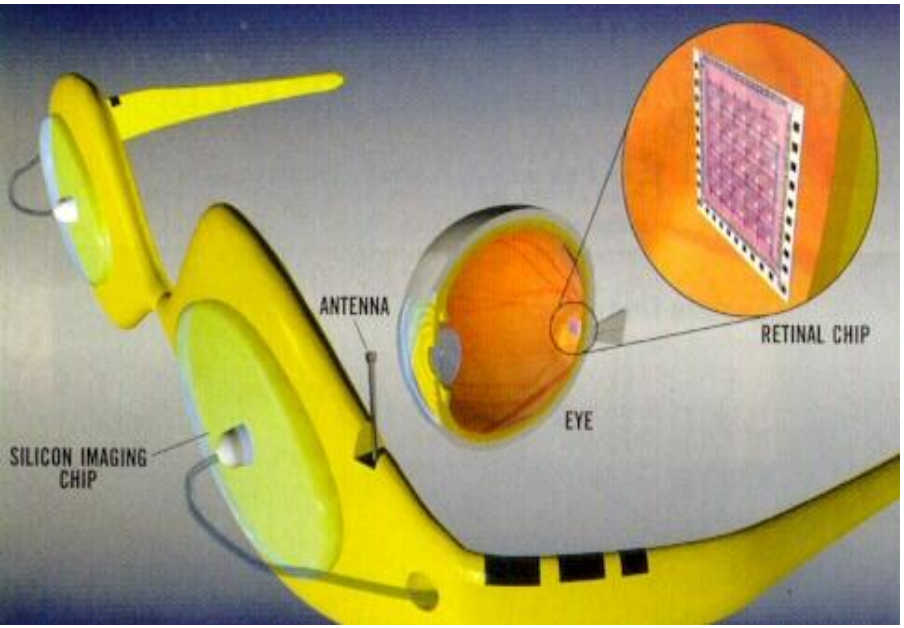




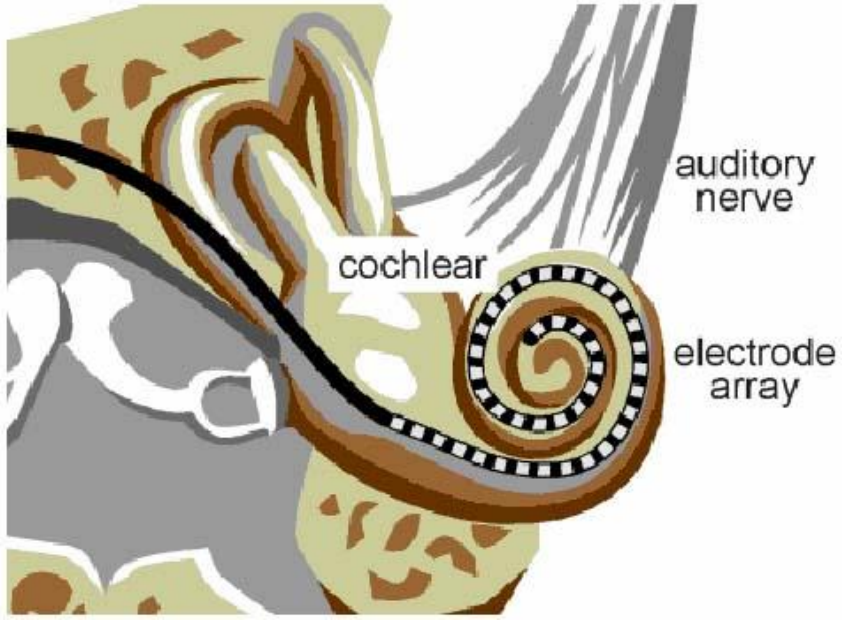
Applications of Electronics and Circuits

Neuroprosthesis (神經彌補裝置)

Retina implants (電子眼)

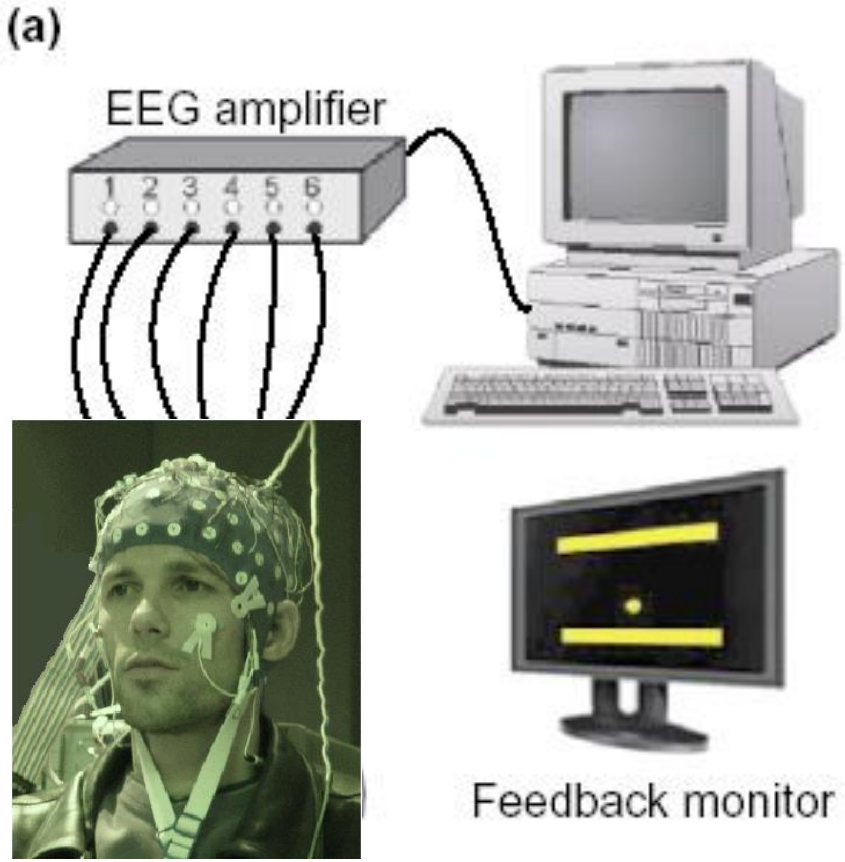


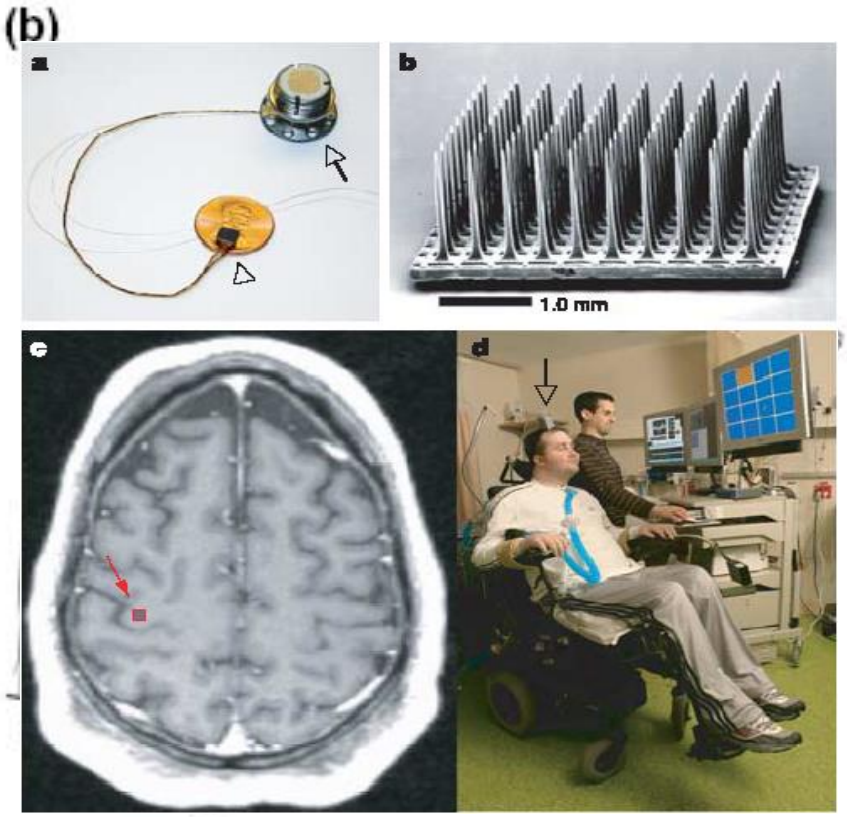
Cochlear implants (電子耳)



Applications of Electronics and Circuits

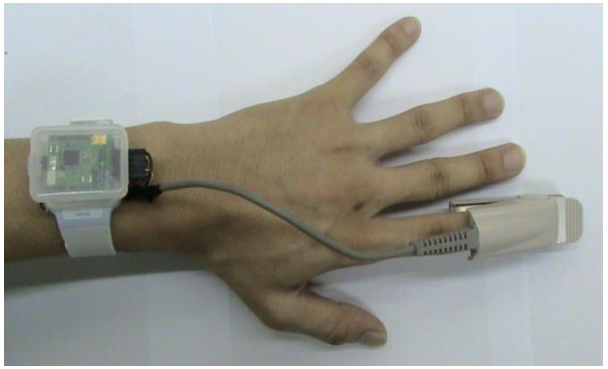
Brain Computer Interface (腦機介面)





Applications of Electronics and Circuits
Health Care Devices-Developed by NCBCI, NCKU

睡眠紀錄錶



血氧心率紀錄錶

多重睡眠生理記錄儀

What We Will Learn?

Circuit Elements

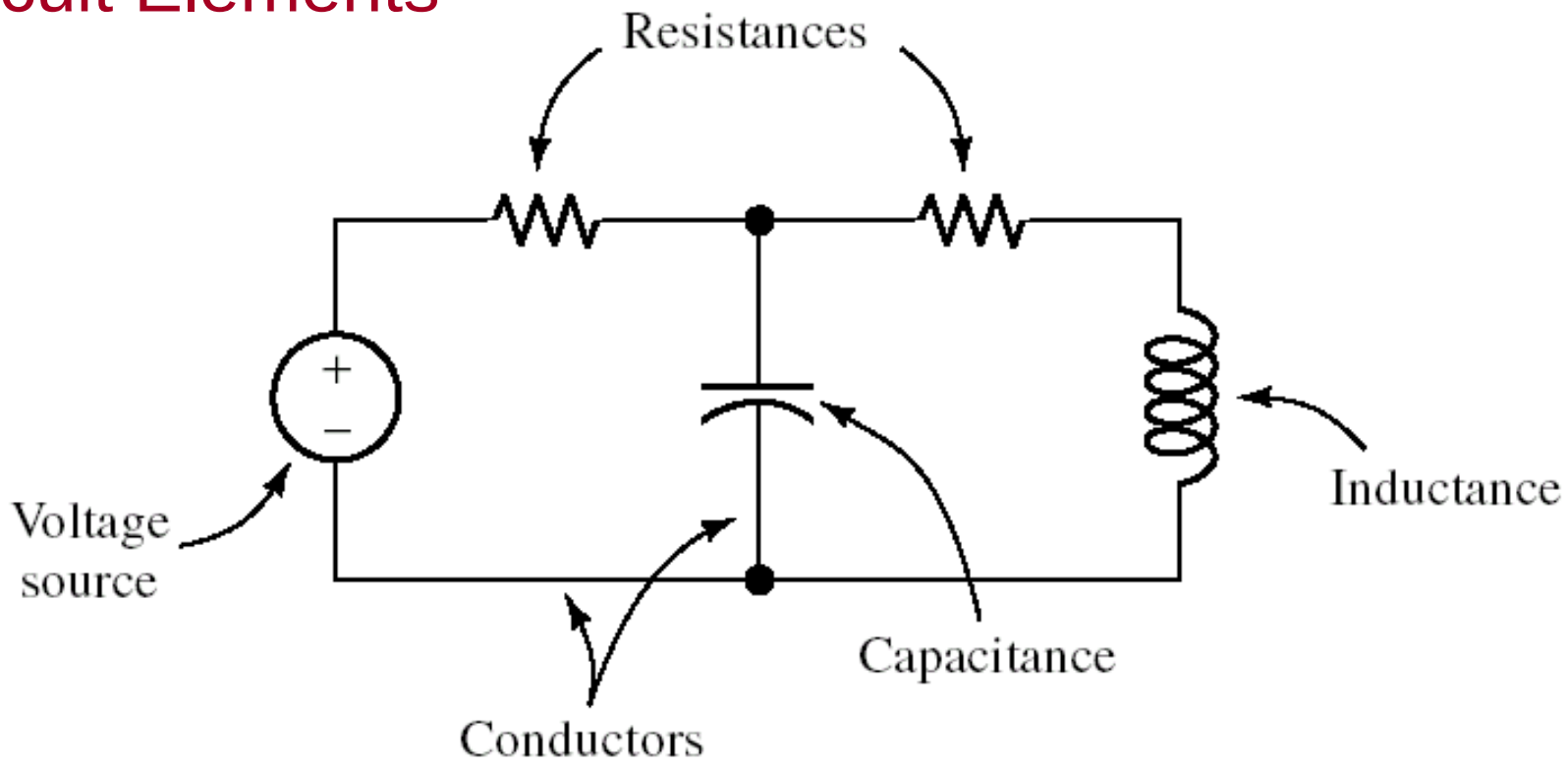
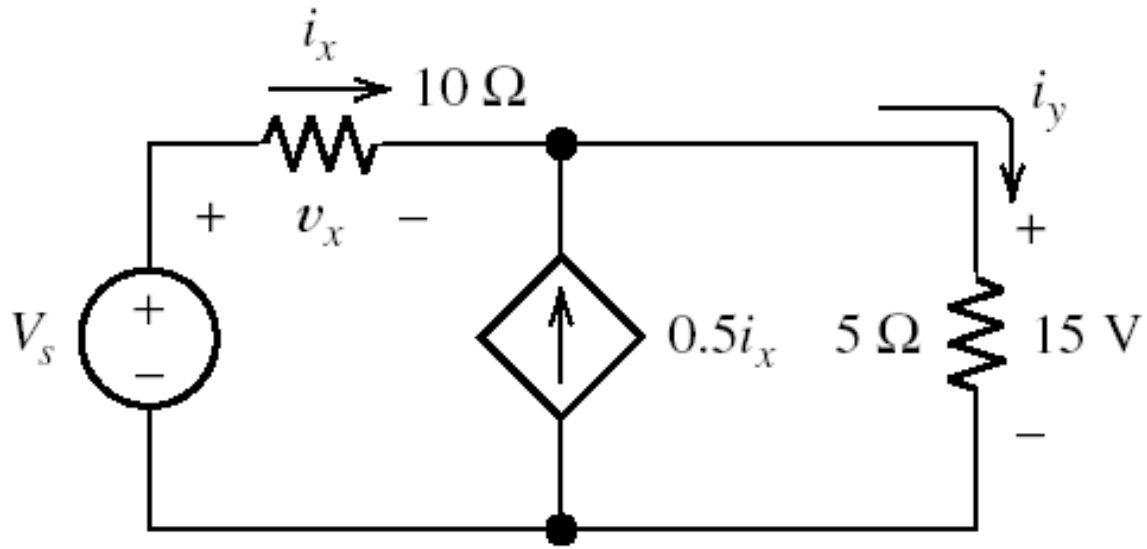


Figure 1.3 An electrical circuit consists of circuit elements, such as voltage sources, resistances, inductances, and capacitances, connected in closed paths by conductors.

What We Will Learn?

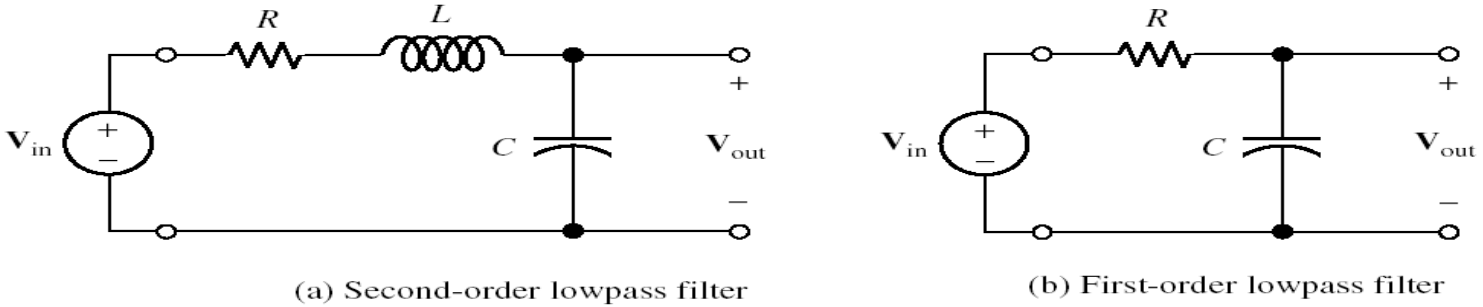
Circuit Analysis

Using KVL, KCL, and Ohm's Law to Analyze a Circuit



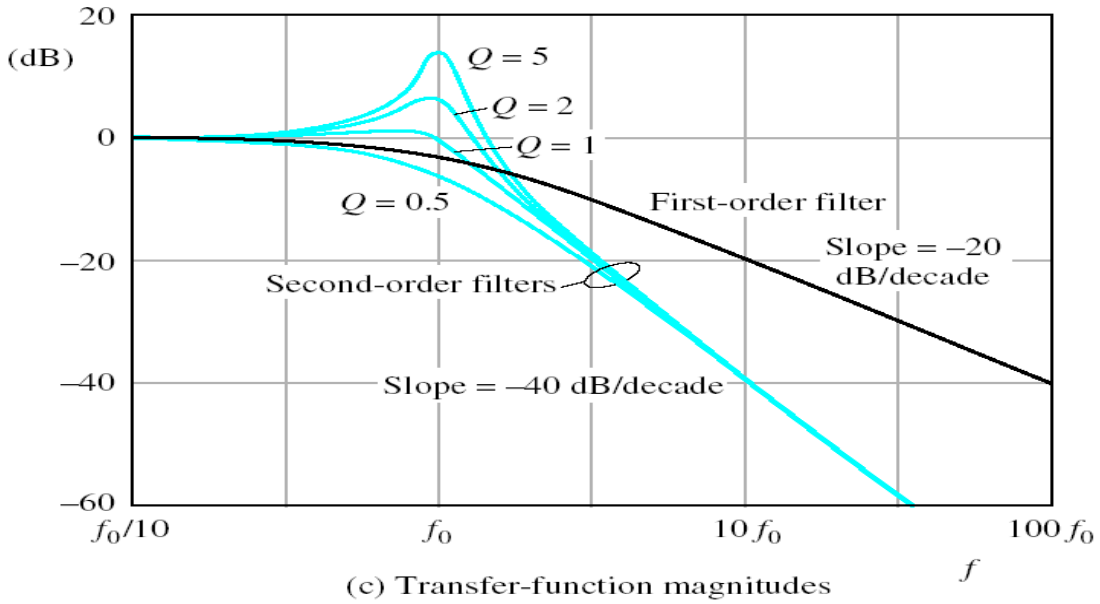
What We Will Learn?

Filter and Frequency Response



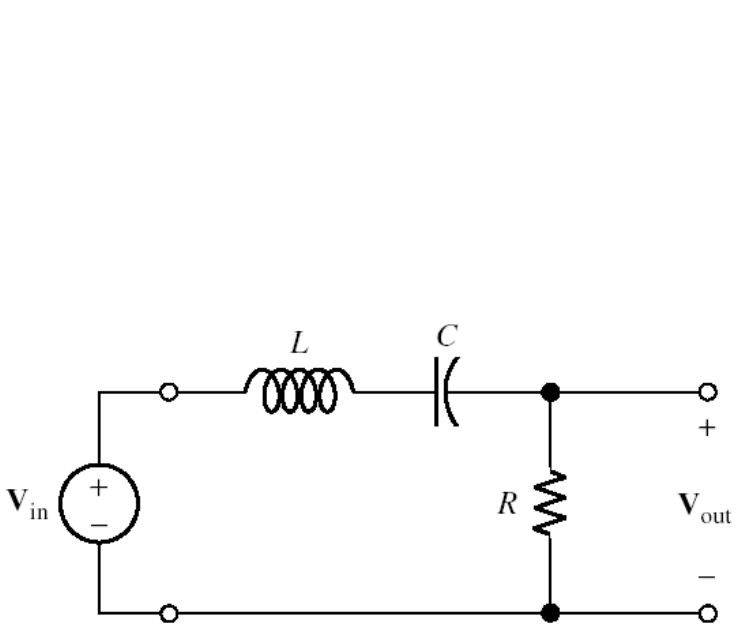
(a) Second-order lowpass filter

(b) First-order lowpass filter

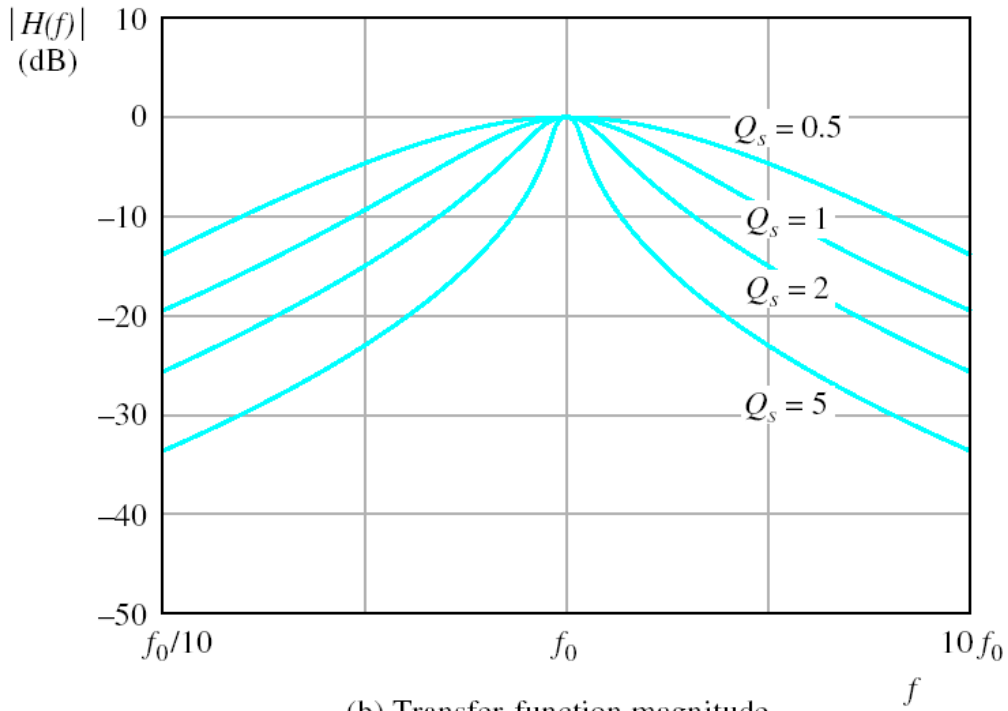


(c) Transfer-function magnitudes

Figure 6.36 Lowpass filter circuits and their transfer-function magnitudes versus frequency.



(a) Circuit diagram

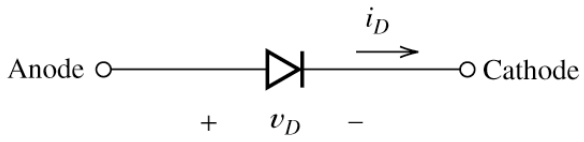


(b) Transfer-function magnitude

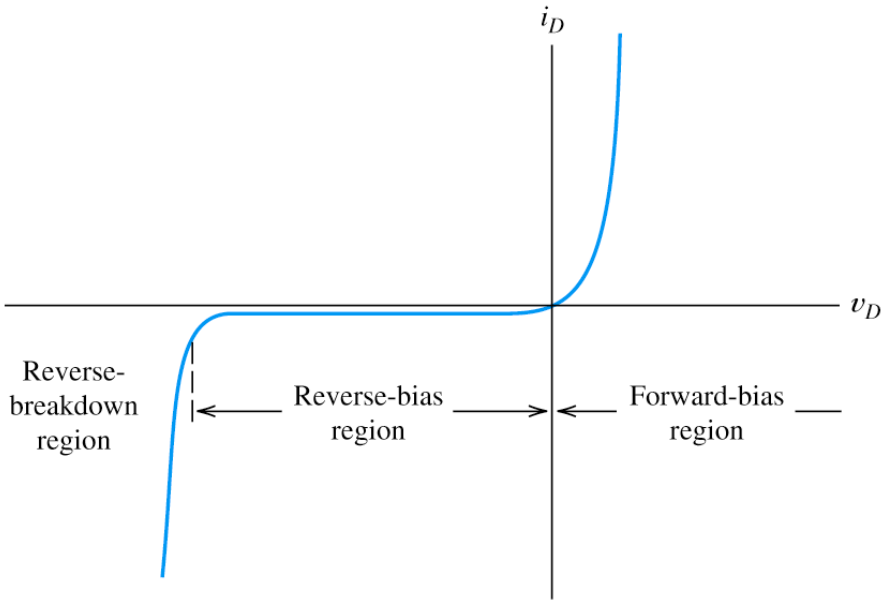
Figure 6.38 Second-order bandpass filter and its transfer-function magnitude versus frequency for several values of Q_s.

What We Will Learn?

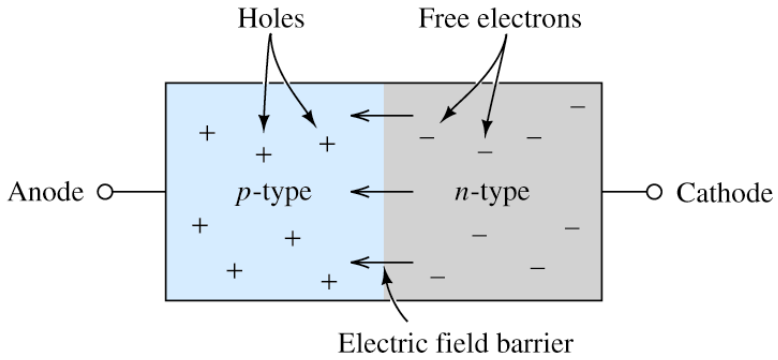
Electronics



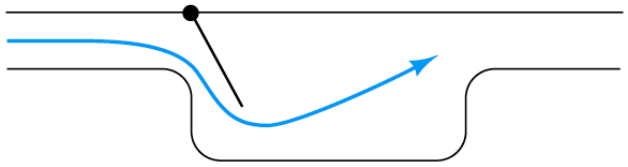
(a) Circuit symbol



(b) Volt–ampere characteristic



(c) Simplified physical structure



(d) Fluid-flow analogy: flapper valve

Figure 10.1 Semiconductor diode.

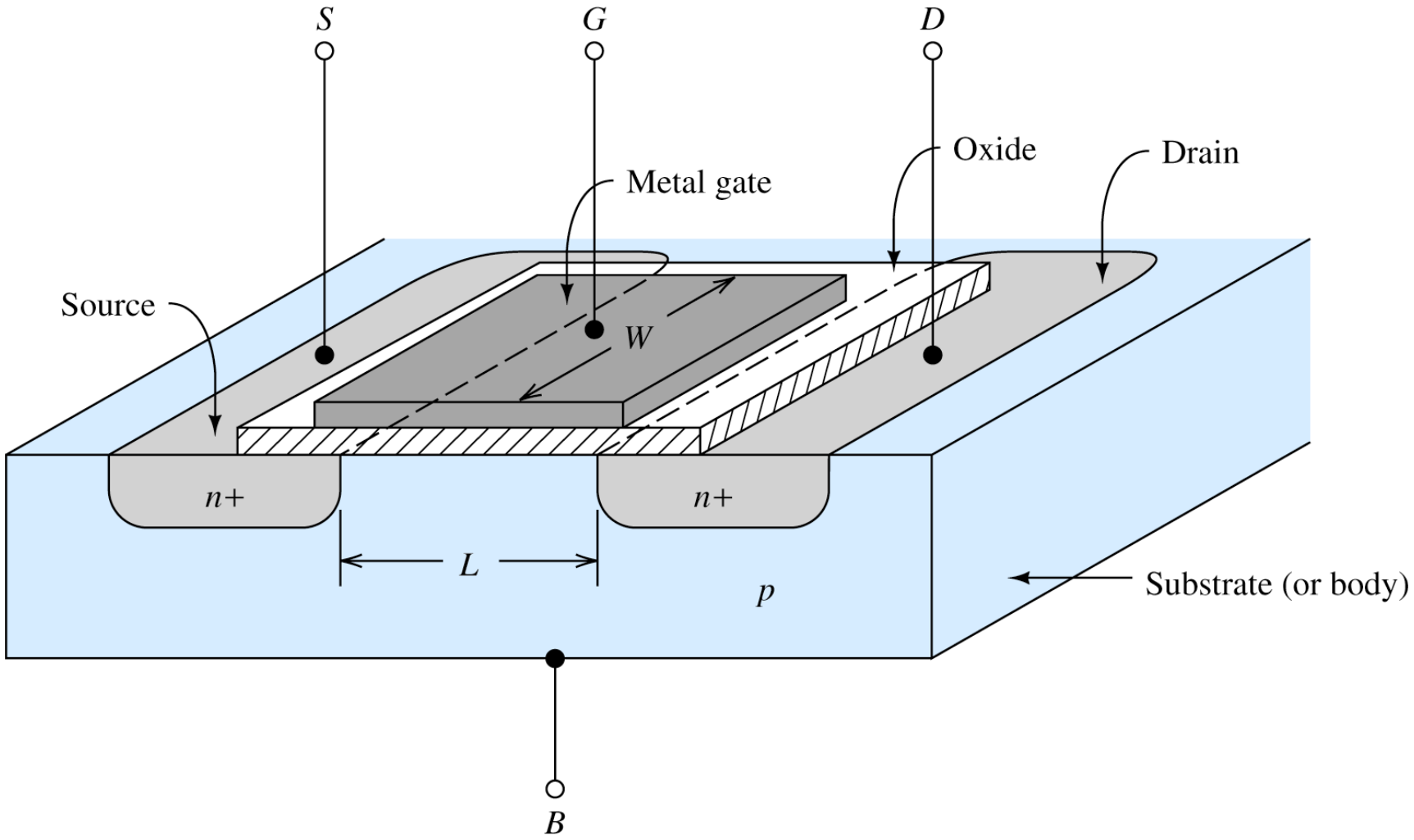
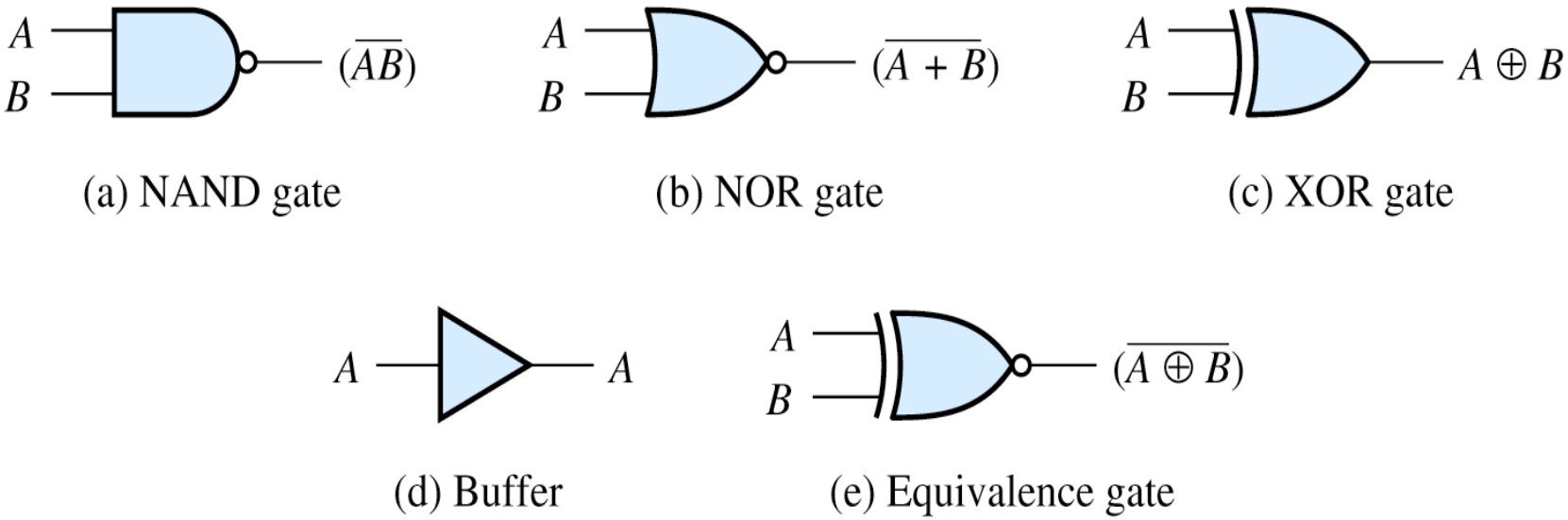


Figure 12.1 n-channel enhancement MOSFET showing channel length L and channel width W.

What We Will Learn?

Digital Systems



(a) NAND gate (b) NOR gate (c) XOR gate

(d) Buffer (e) Equivalence gate

Figure 7.19 Additional logic-gate symbols.