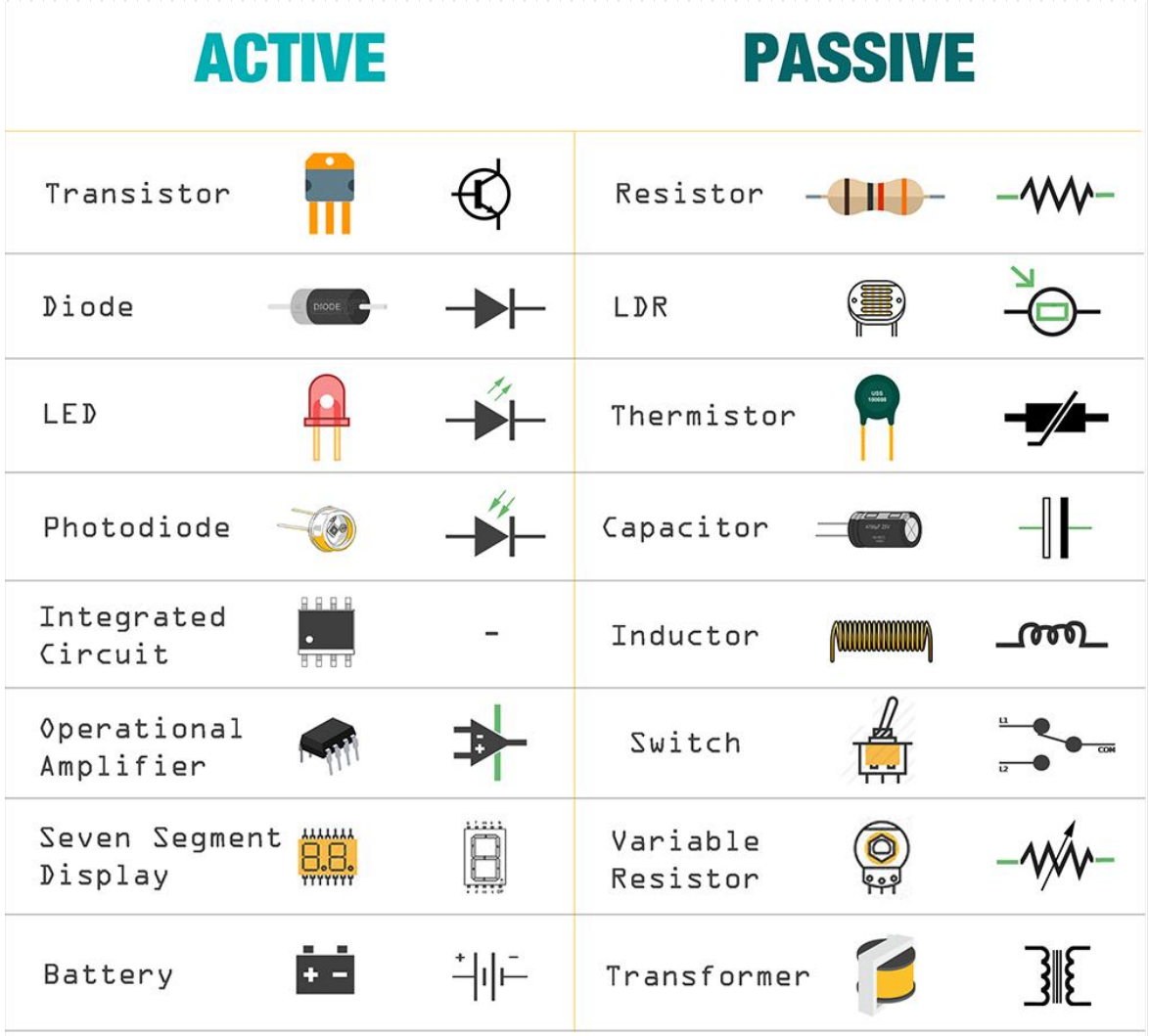
Dasar Elektronika

Materi

- Teori Rangkaian: komponen pasif, arus, tegangan, daya.
- Teori elektronika dasar: komponen aktif
- Konsep sinyal analog dan digital.
- Representasi sinyal analog vs digital.
- Wawasan teknologi digital.
- Rangkaian terintegrasi.
- Pengantar mikrokontroler.

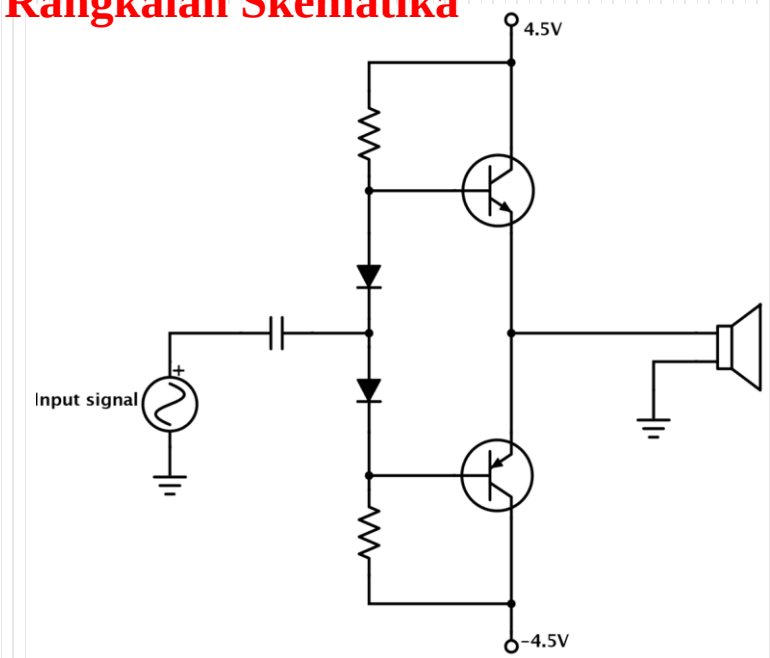
Sistem Elektronika: Komponen

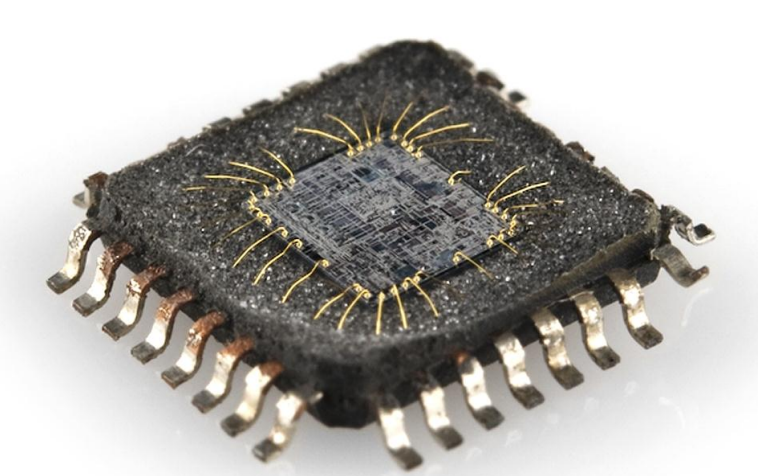
Komponen listrik/elektronika: Pasif dan Aktif



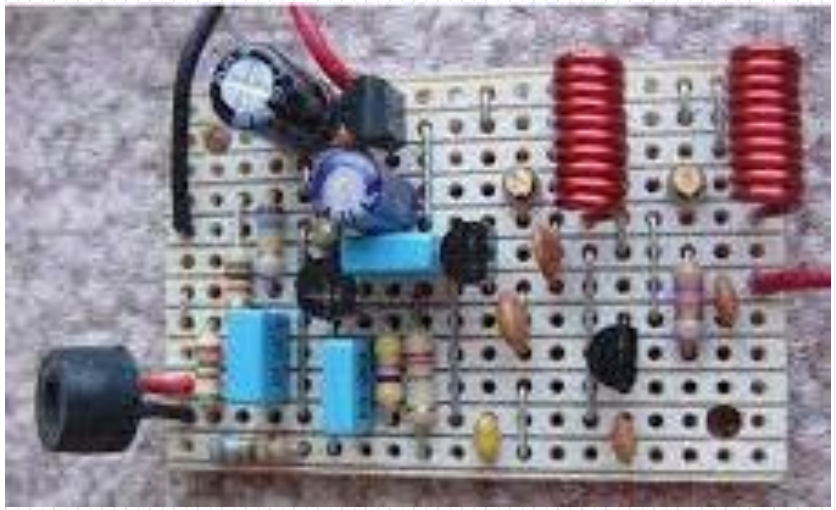
Sistem Elektronika: Rangkaian

Rangkaian Skematika

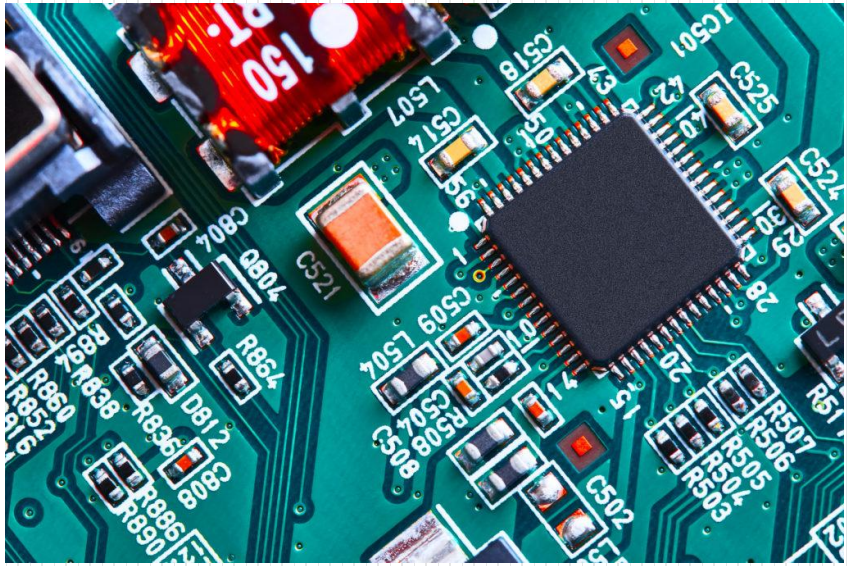




Rangkaian Terintegrasi (IC)



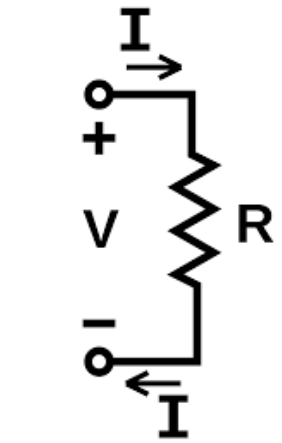
Rangkaian Hibrid



Sistem elektronika pada PCB

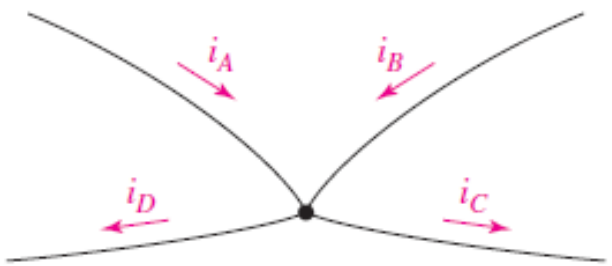
Teori dasar rangkaian

* Hukum Ohm



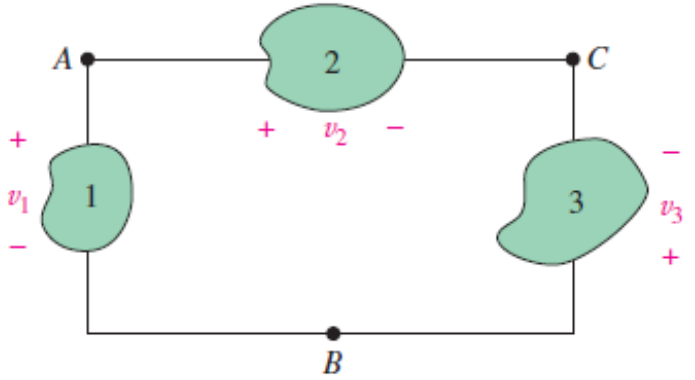
V = I x R

* Hukum Kirchhoff



$$\sum_{n=1}^{N} i_n = 0$$

$$i_1 + i_2 + i_3 + \ldots + i_N = 0$$



$$\sum_{n=1}^{N} v_n = 0$$

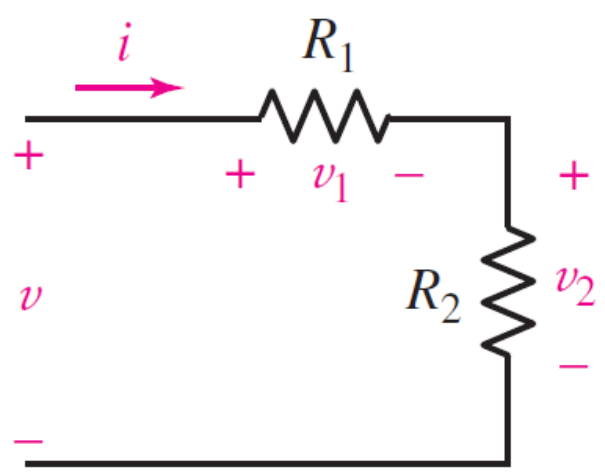
$$v_1 + v_2 + v_3 + \ldots + v_N = 0$$

* Daya P=V x I (watt (W))

  Dalam rangkaian berlaku hukum kekekalan energi,

Teori dasar rangkaian

- Rangkaian pembagi tegangan.



KVL dan hukum Ohm :

$$v = v_1 + v_2 = iR_1 + iR_2 = i\left(R_1 + R_2\right)$$

dimana : $i = \dfrac{v}{R_1 + R_2}$

diperoleh :

$$v_2 = iR_2 = \left(\frac{v}{R_1 + R_2}\right)R_2 = \frac{R_2}{R_1 + R_2}v$$

$$v_1 = \frac{R_1}{R_1 + R_2}v$$

- Rangkaian pembagi arus.

Arus pada R_2 :

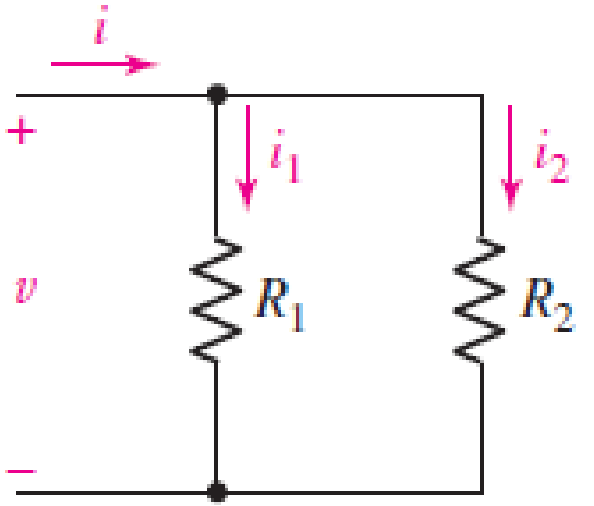
$$i_2 = \frac{v}{R_2} = \frac{i\left(R_1 \parallel R_2\right)}{R_2}$$

$$= \frac{i}{R_2}\frac{R_1R_2}{R_1 + R_2}$$

$$= \frac{R_1}{R_1 + R_2}.i$$

Untuk arus pada R_1 :

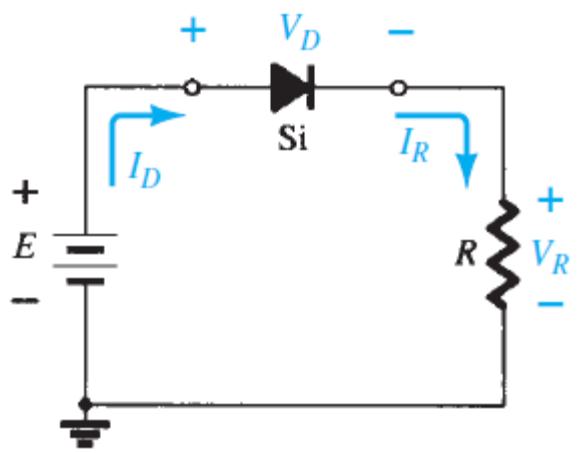
$$i_1 = \frac{R_2}{R_1 + R_2}.i$$



Teori Elektronika dasar

Dioda

→Rangkaian dioda seri. (*forward-bias*)

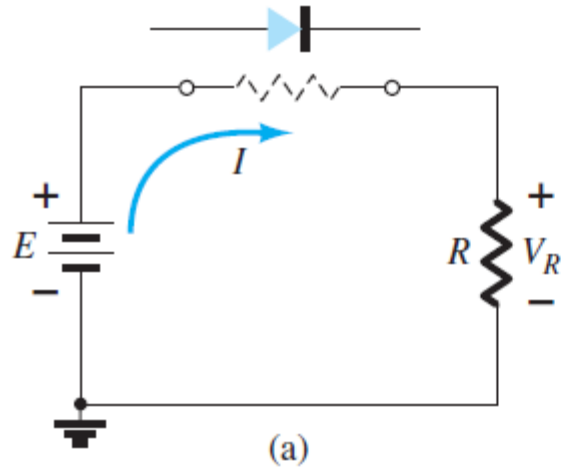


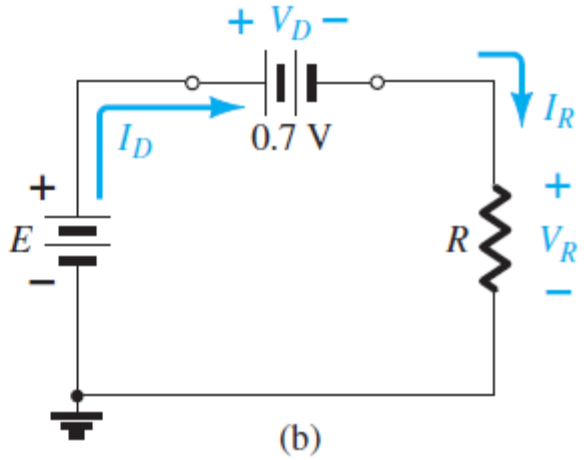
Tegangan dan Arus :

$$V_D = V_K$$

$$V_R = E - V_K$$

$$I_D = I_R = \frac{V_R}{R}$$

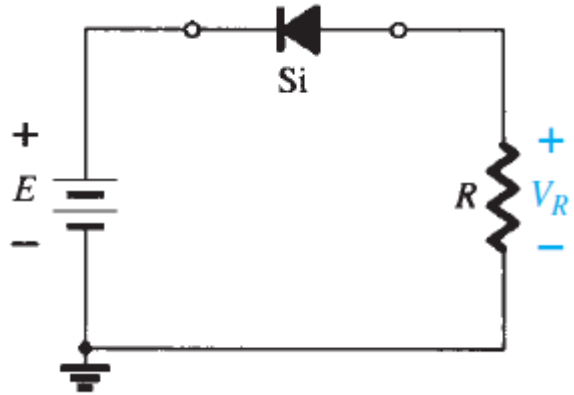




Teori Elektronika dasar

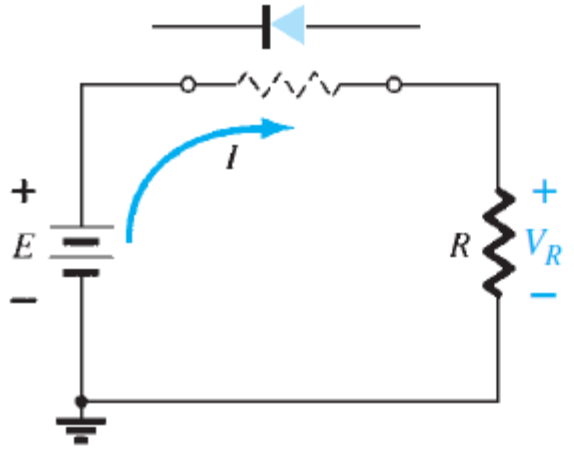
Dioda

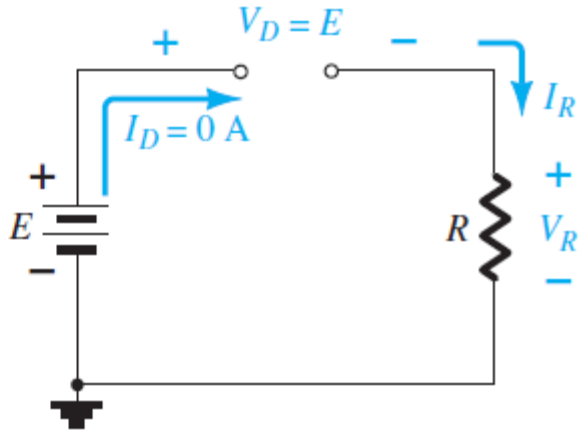
→Rangkaian dioda seri. (reverse-bias)



Tegangan pada V_R :

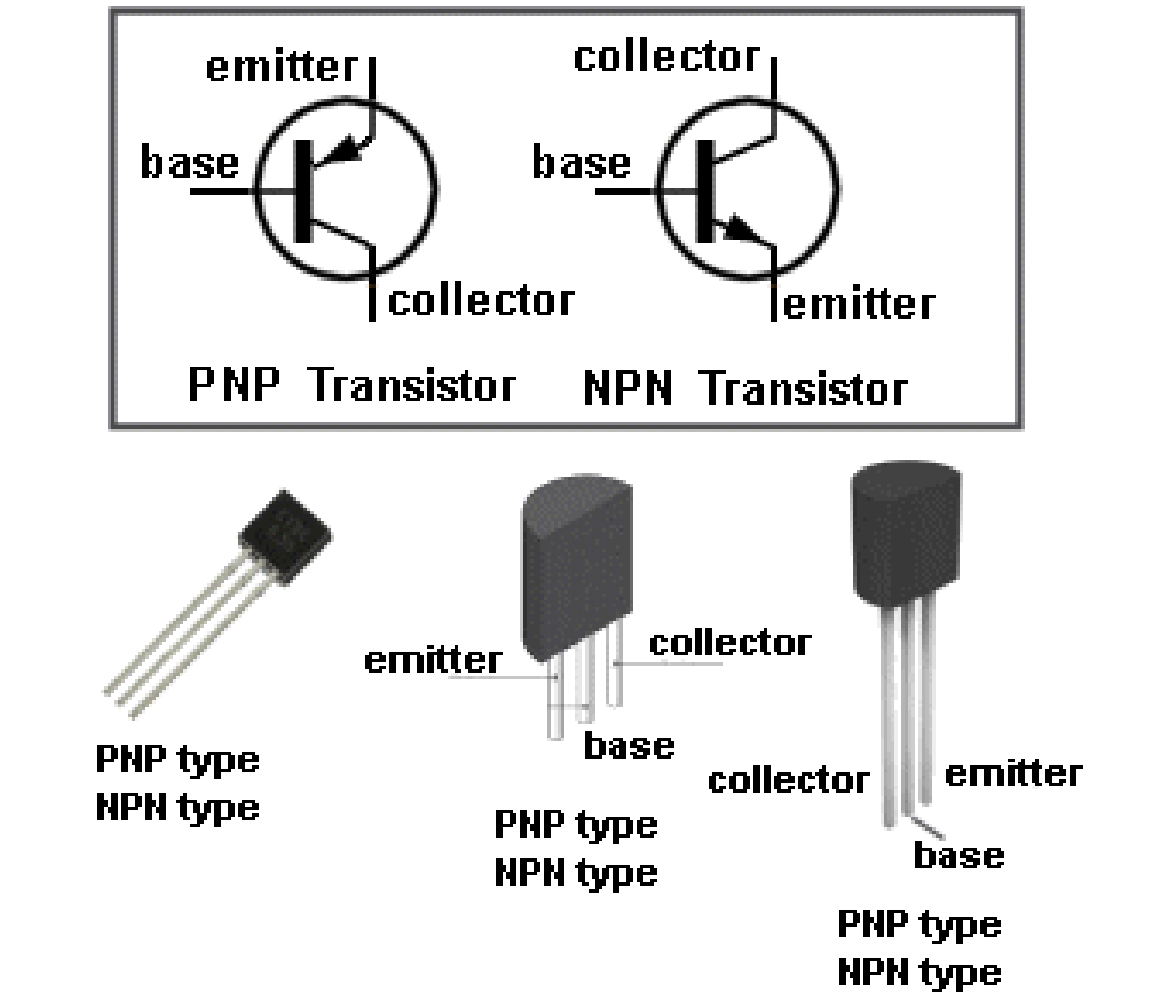
$$V_R = I_R R = I_D R = 0V$$





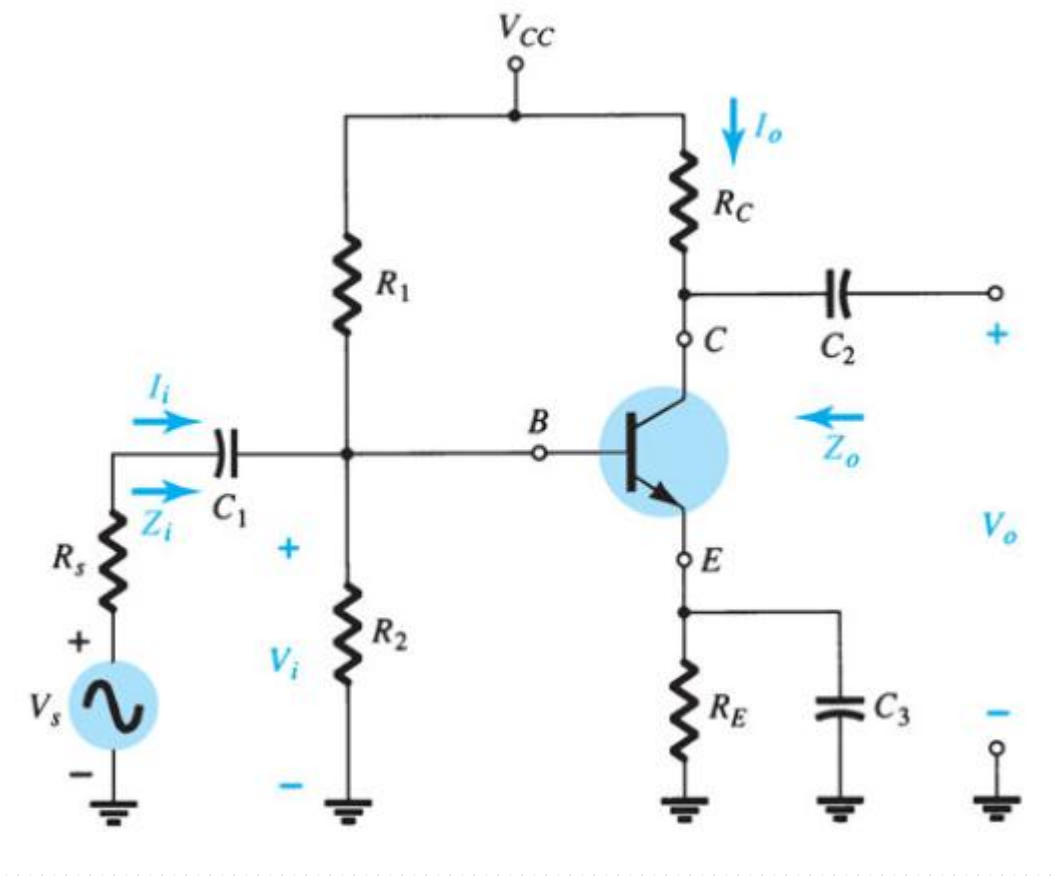
Teori Elektronika dasar

Transistor



Teori Elektronika dasar

Transistor sebagai penguat



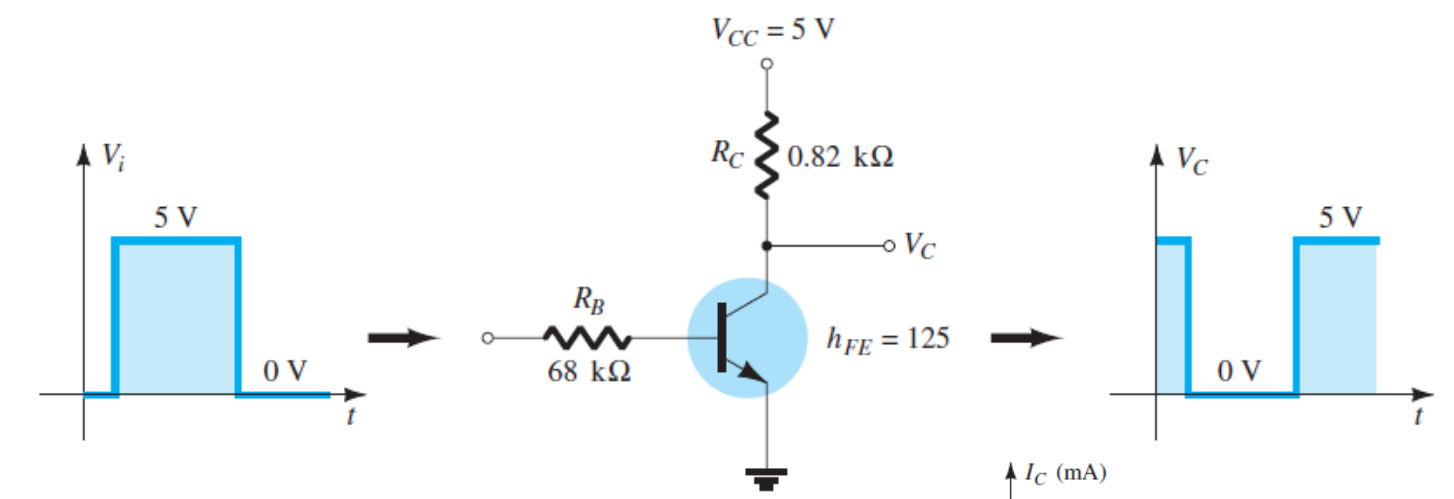
Penguat :

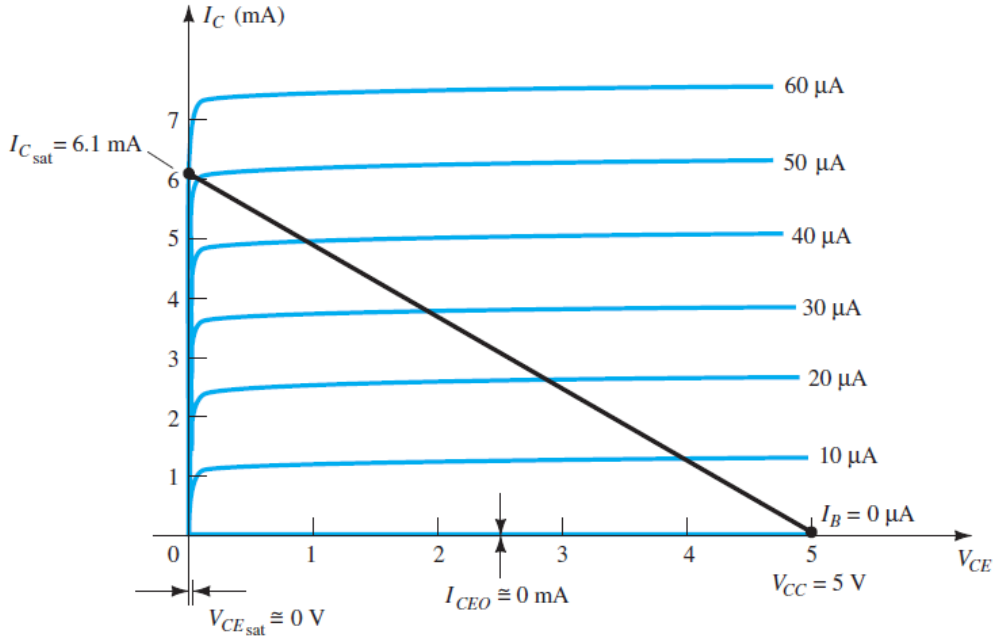
$$A_v = \frac{V_o}{V_i}$$

$$A_i = \frac{I_o}{I_i}$$

Teori Elektronika dasar

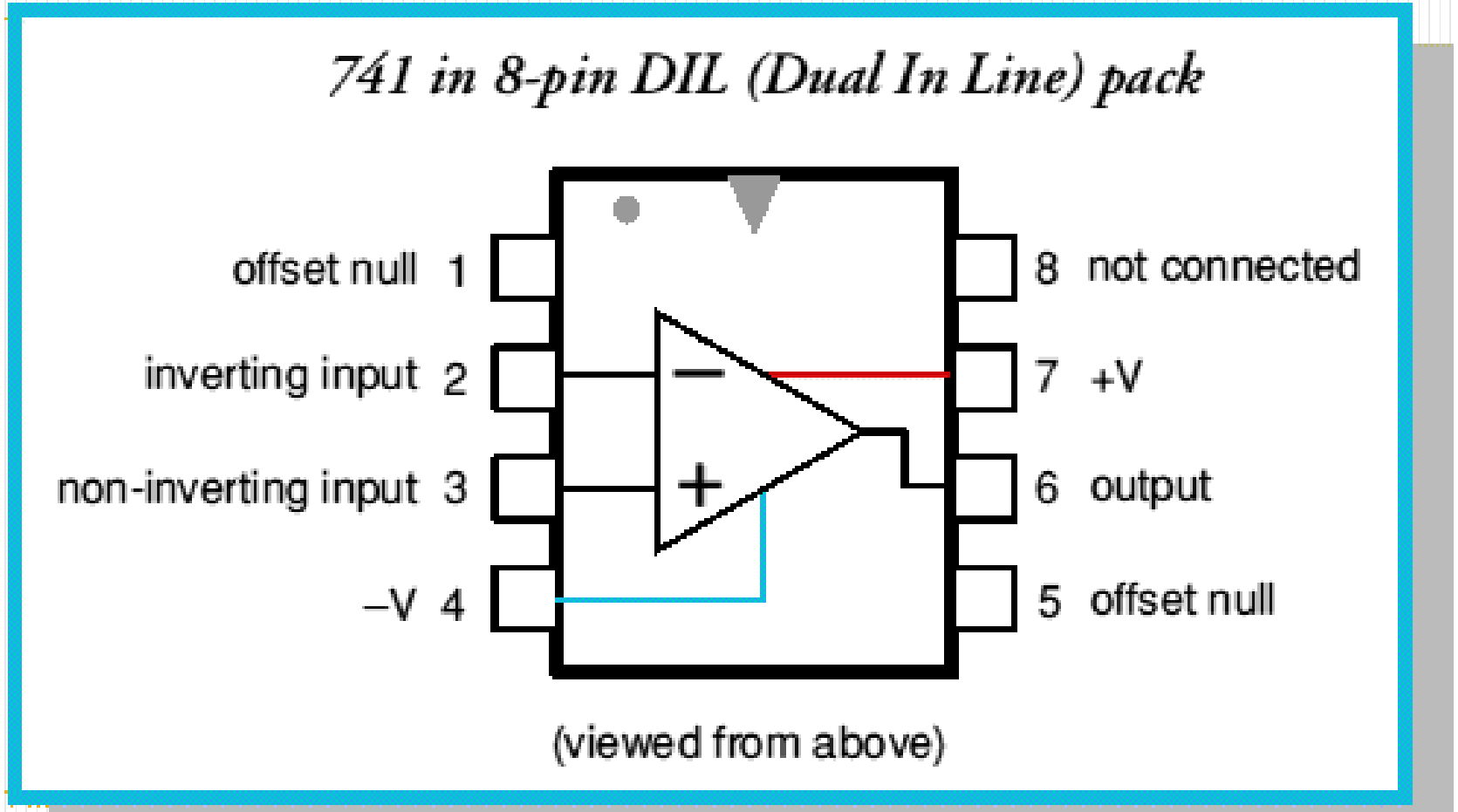
Transistor sebagai saklar





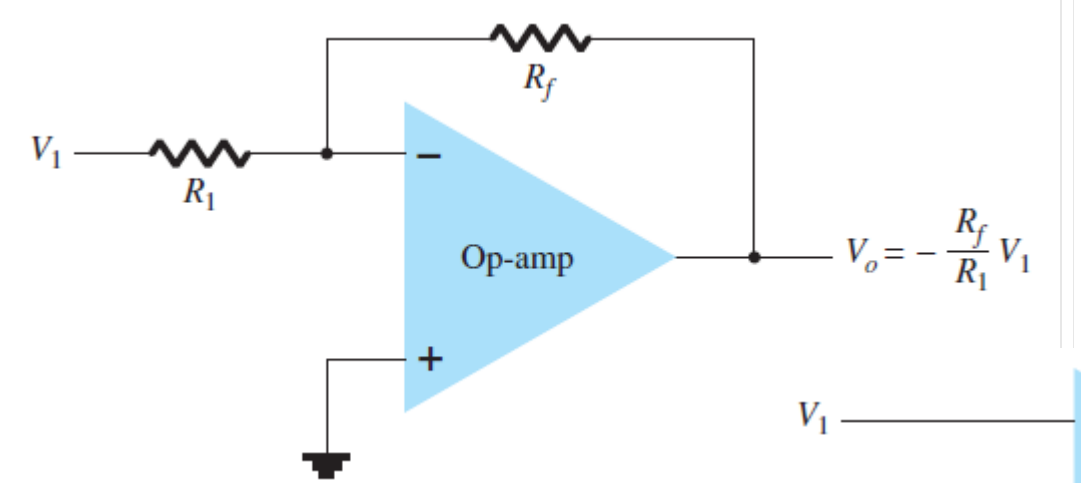
Teori Elektronika dasar

Penguat operasional (OpAmp)



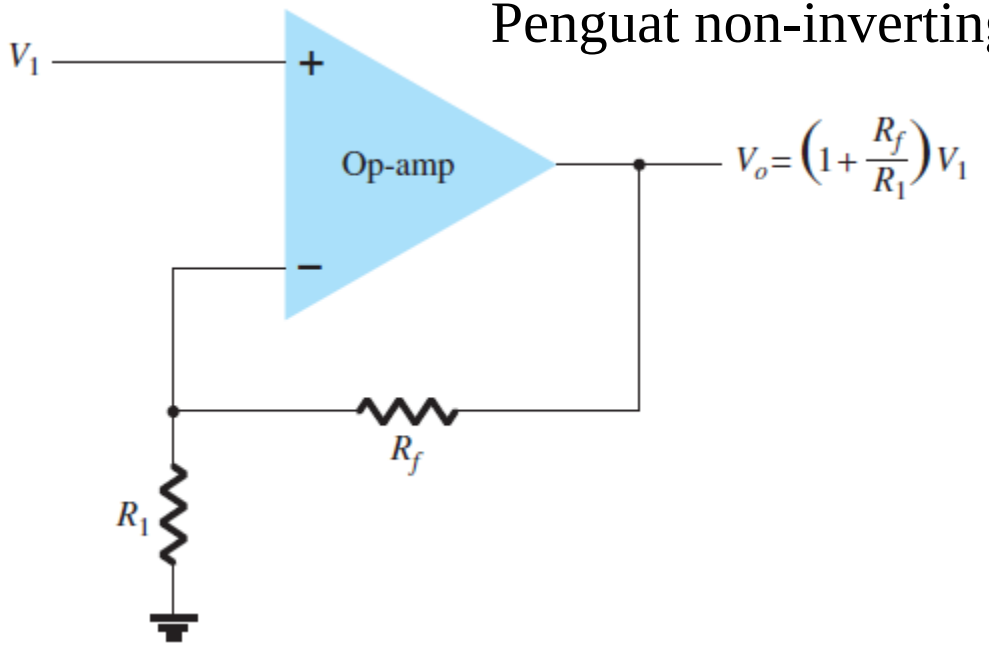
Teori Elektronika dasar

Penguat operasional (OpAmp)



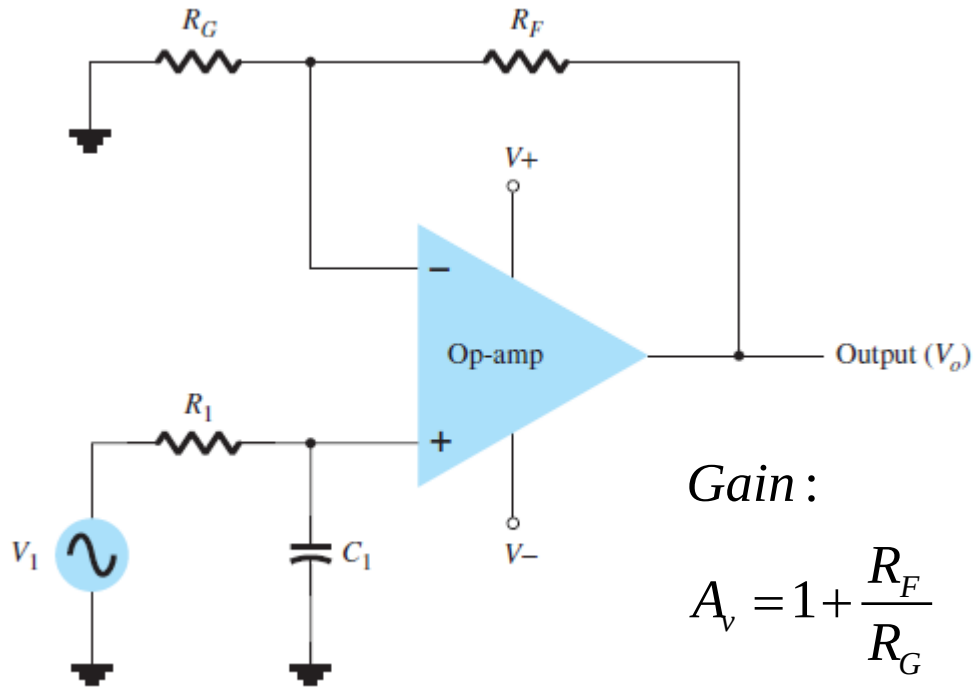
Penguat inverting

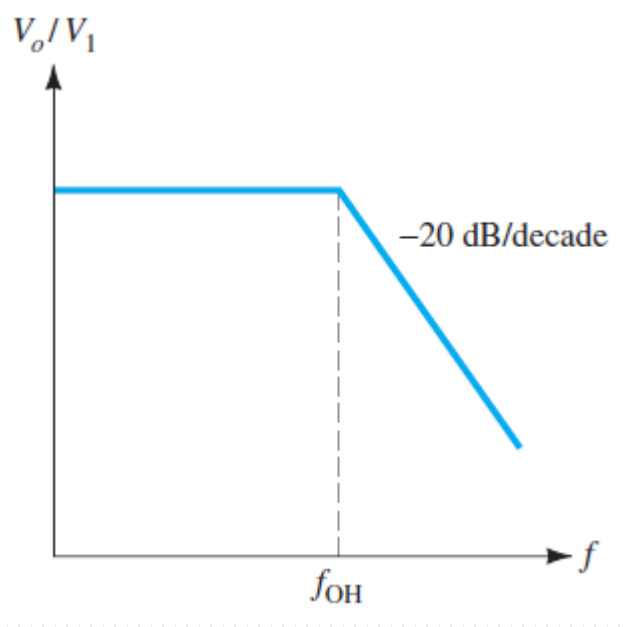
Penguat non-inverting



Teori Elektronika dasar

Filter aktif (OpAmp) – Low Pass Filter





Gain :

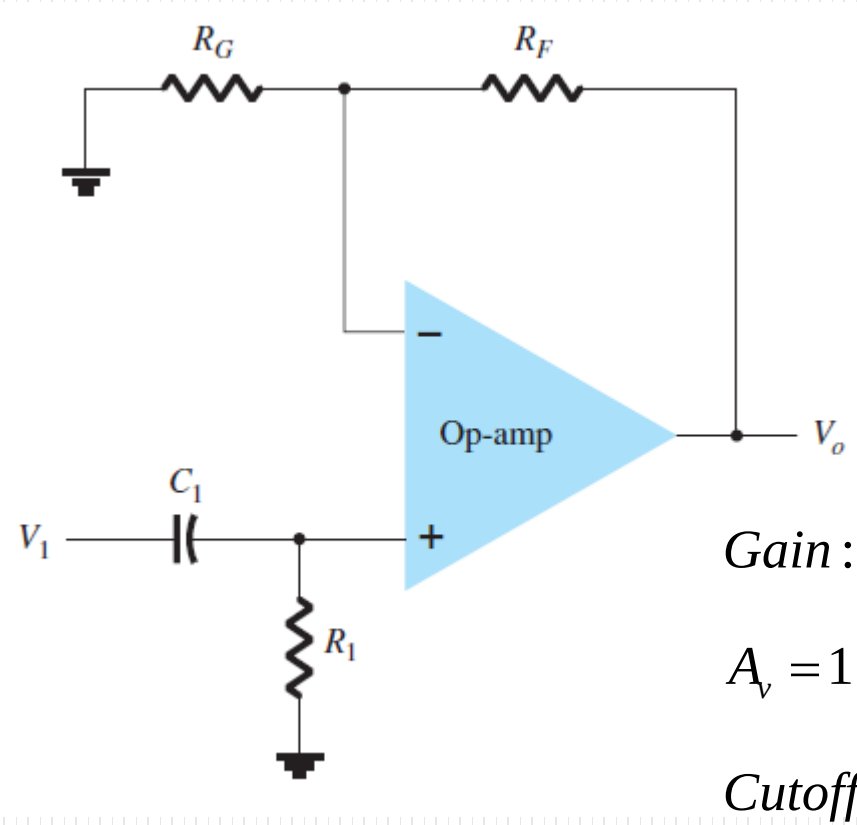
$$A_v = 1 + \frac{R_F}{R_G}$$

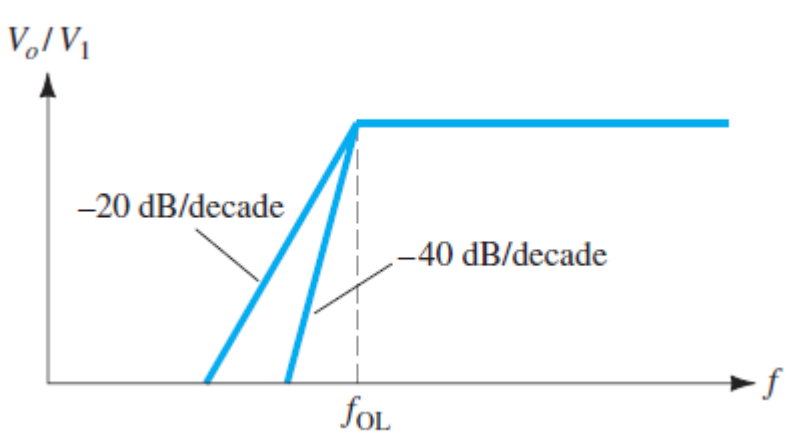
Cutoff frequency :

$$f_{OH} = \frac{1}{2\pi R_1 C_1}$$

Teori Elektronika dasar

Filter aktif (OpAmp) – High Pass Filter





Gain:

$$A_v = 1 + \frac{R_F}{R_G}$$

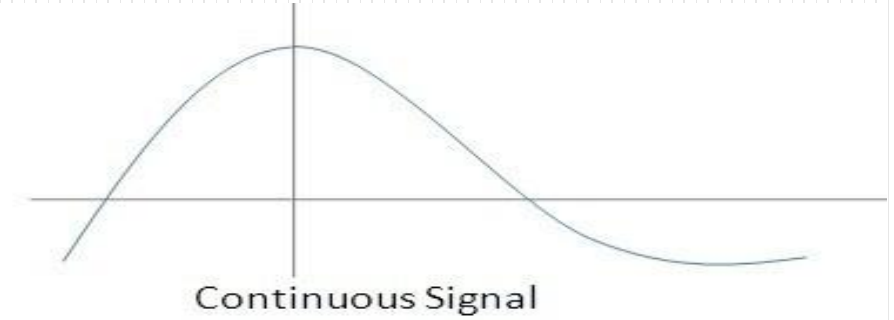
Cutoff frequency:

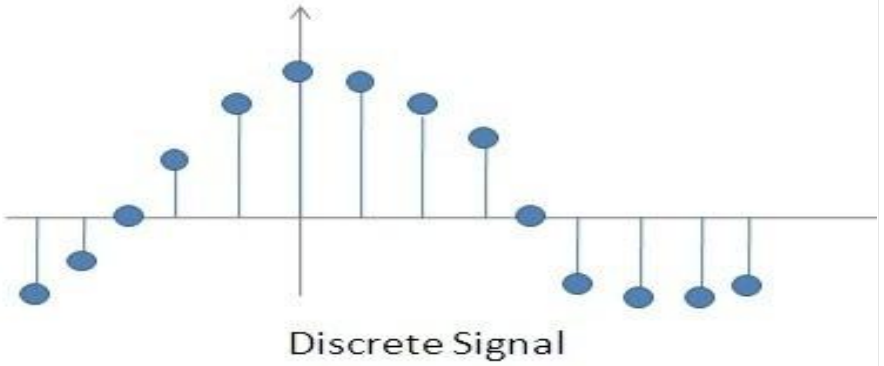
$$f_{OL} = \frac{1}{2\pi R_1 C_1}$$

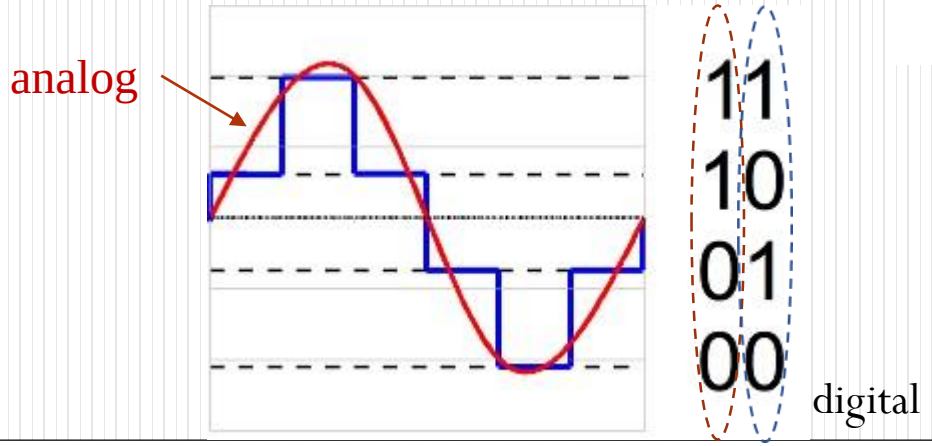
Sistem Elektronika: Sinyal listrik

Masukan dan keluaran sistem elektronika adalah sinyal listrik

- Sinyal listrik:
  - Arus listrik (Ampere (A))
  - Tegangan Listrik (Volt (V)).
- Sinyal listrik:
  - Diskrit
  - Kontinyu
- Sinyal Listrik:
  - Analog
  - Digital (Diskrit)

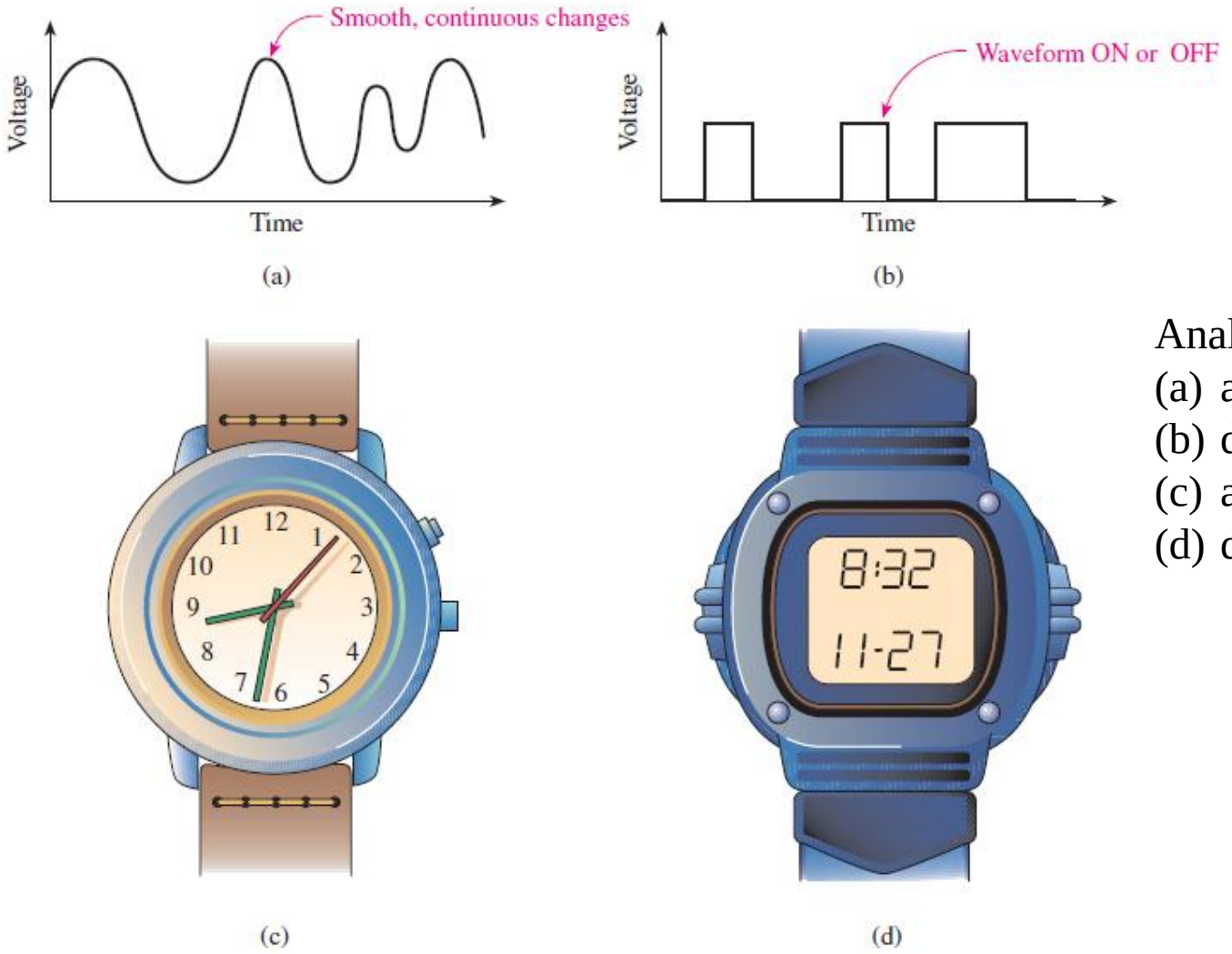






Sistem Elektronika: Representasi sinyal

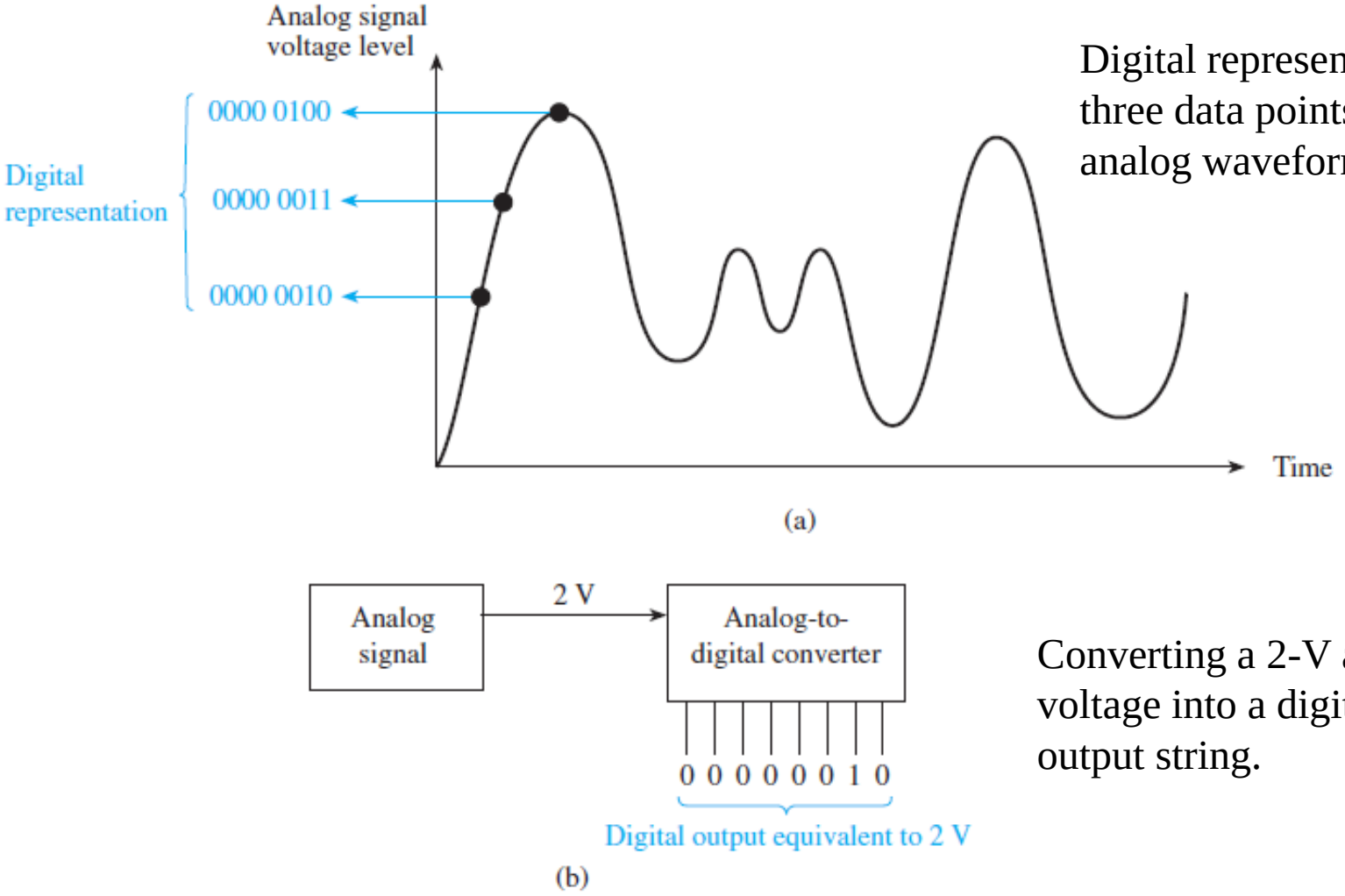
Sinyal analog vs digital



Analog versus digital:
(a) analog waveform;
(b) digital waveform;
(c) analog watch;
(d) digital watch.

Sistem Elektronika: Representasi sinyal

Sinyal analog vs digital

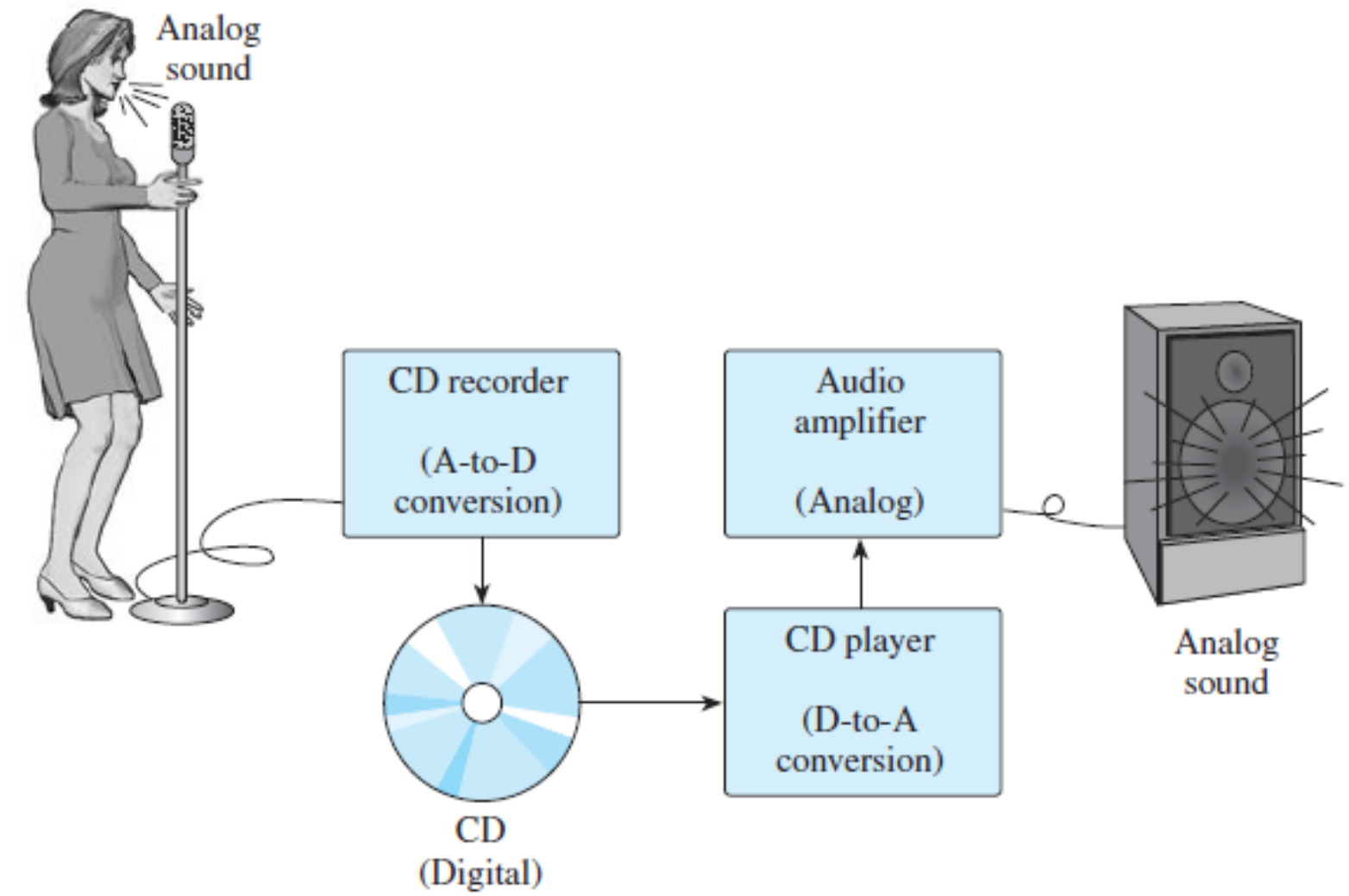


Digital representation of three data points on an analog waveform;

Converting a 2-V analog voltage into a digital output string.

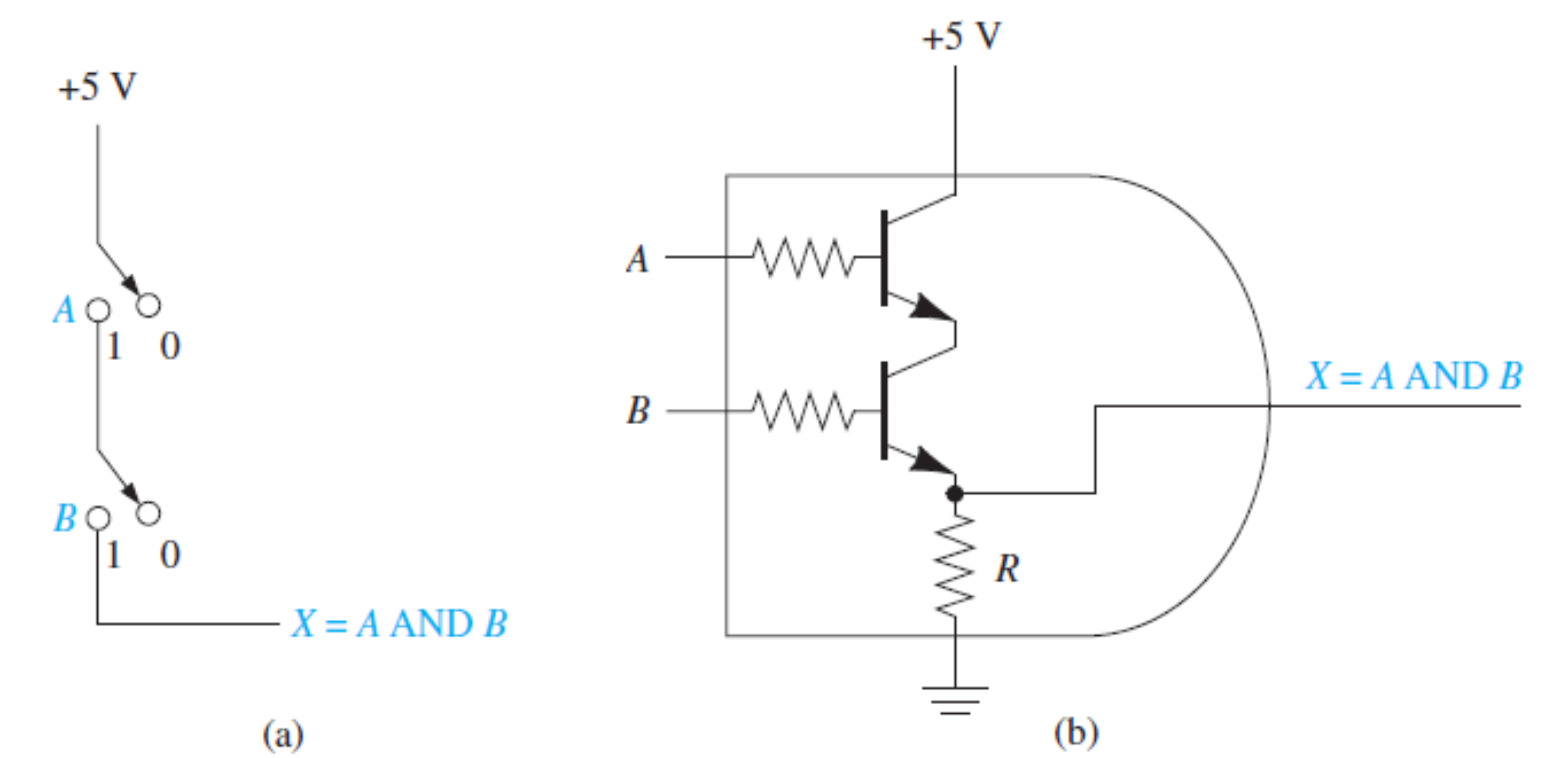
Sistem Elektronika: Representasi sinyal

Sinyal analog vs digital



Sistem Digital: Gerbang logika

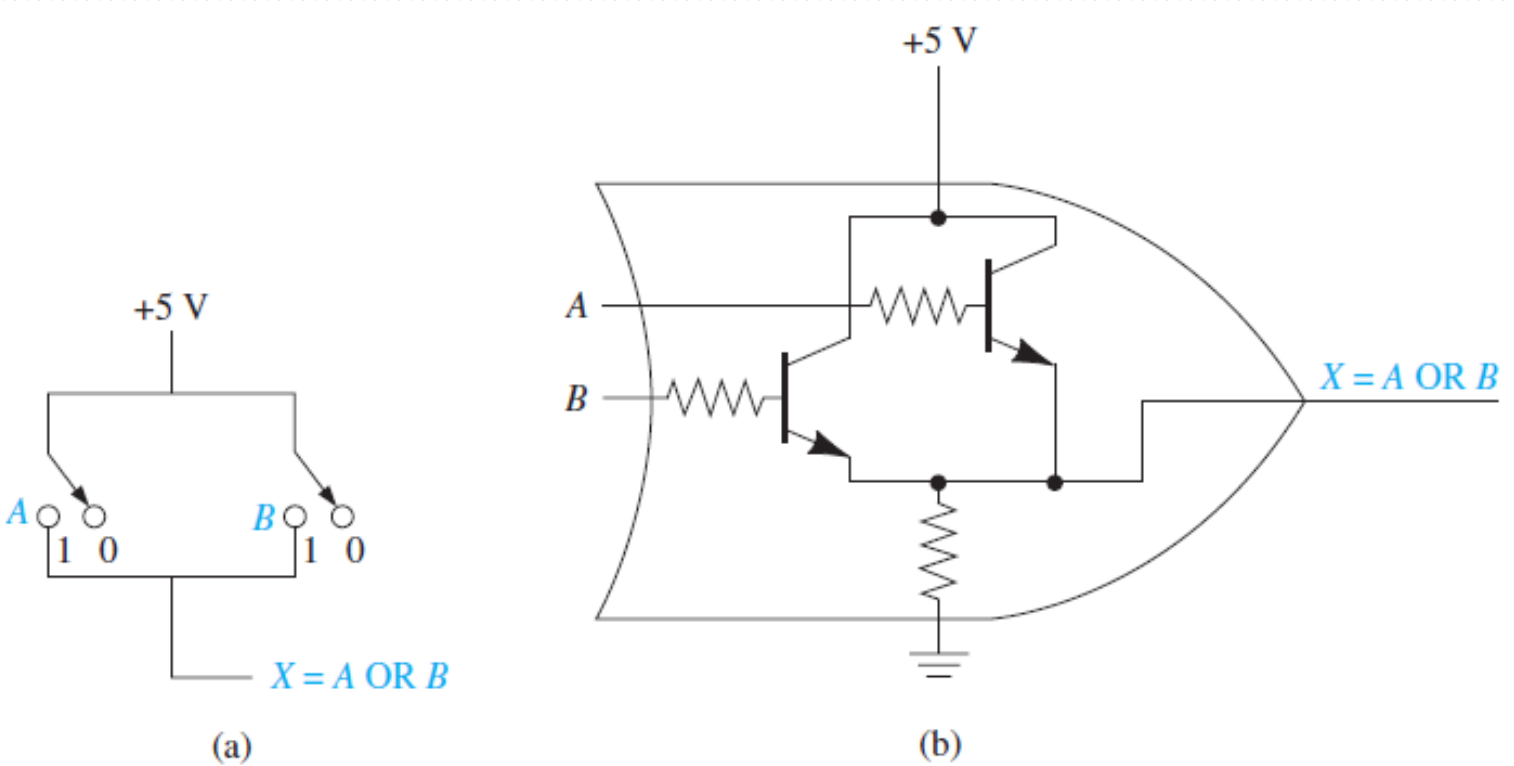
Logika “AND”



Electrical analogy for an AND gate:
(a) using manual switches;
(b) using transistor switches.

Sistem Digital: Gerbang logika

Logika “OR”



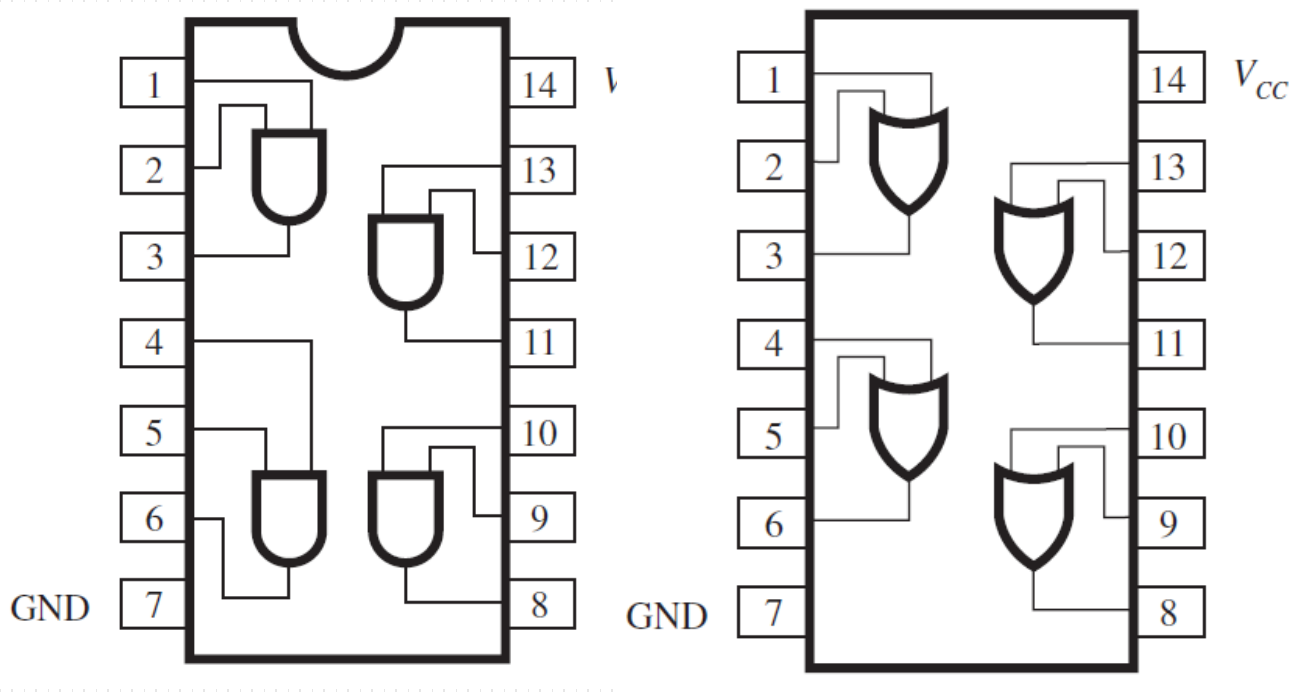
Electrical analogy for an OR gate:
(a) using manual switches;
(b) using transistor switches.

Sistem Digital: Implementasi

Integrated circuit (IC)

❖Gerbang AND dan OR sudah dalam chip (IC).

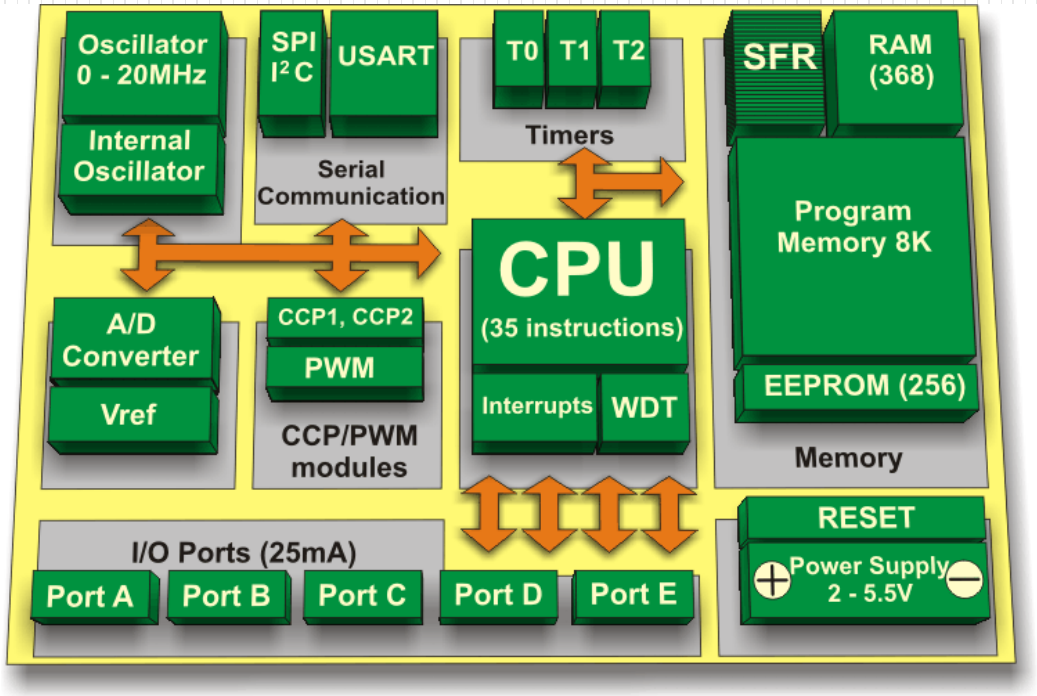
IC 7408 → quad two-input AND gate.
IC 7411 → tripel three-input AND gate.
IC 7421 → dual four-input AND gate.
IC 7432 → quad two-input OR gate.

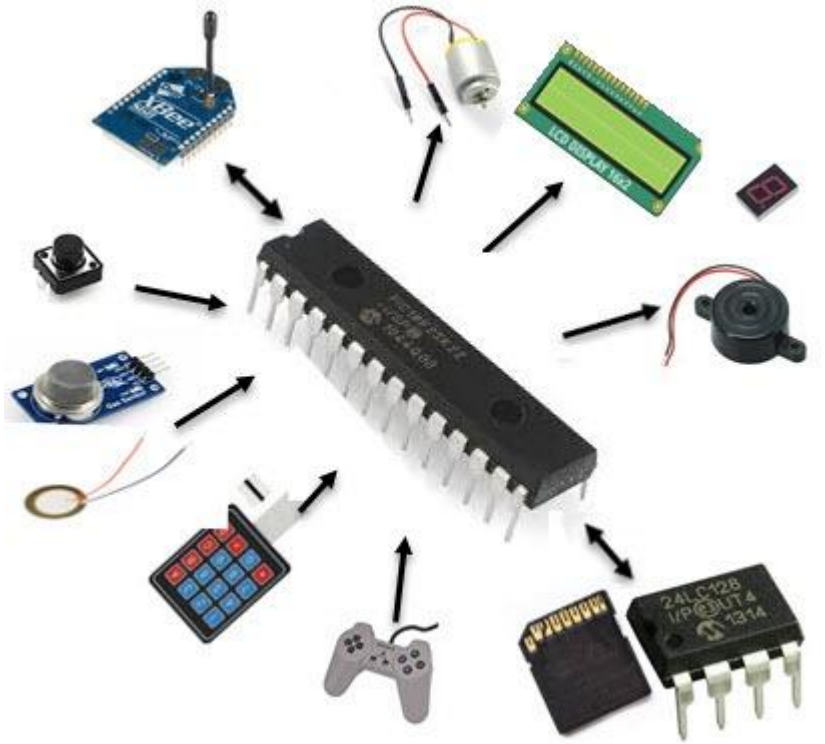


Mikrokontroler

- Mikrokontroler adalah komputer kecil dengan sedikit memori dan memiliki peralatan input/output terprogram (programmable).
- Mikrokontroler banyak dipakai karena berdaya rendah dan berharga murah.
- Mikrokontroler baru dilengkapi dengan fasilitas komunikasi wireless.
- Mikrokontroler merupakan salah satu penopang teknologi yang memungkinkan berkembangnya teknologi IoT.

Mikrokontroler





Terima kasih