DIODA DAYA

(Power Diode)

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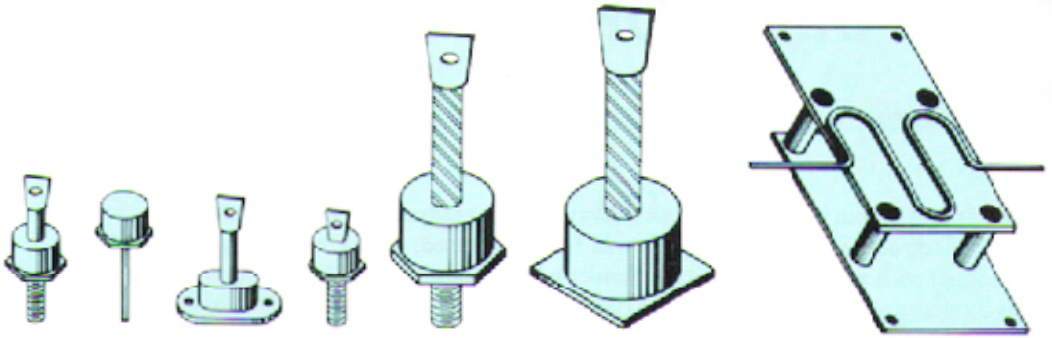
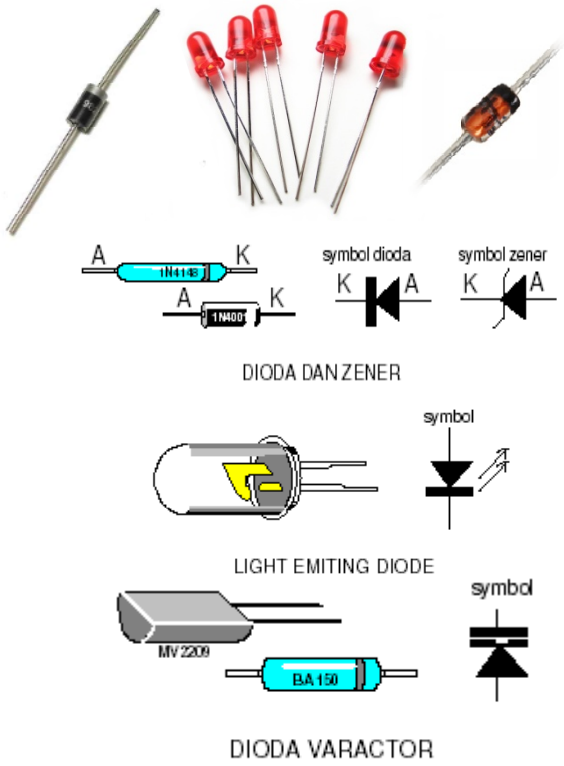
TEKNIK ELEKTRO (D-3)
UNIVERSITAS ISLAM "45" BEKASI

Dioda Daya Vs Dioda Sinyal

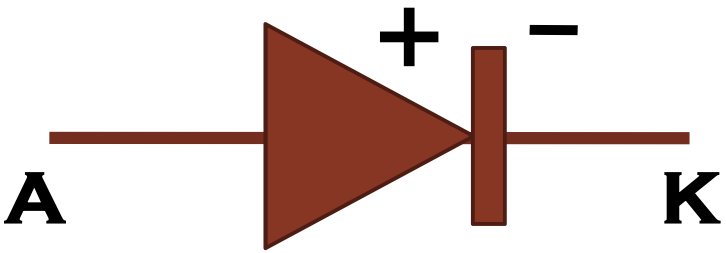


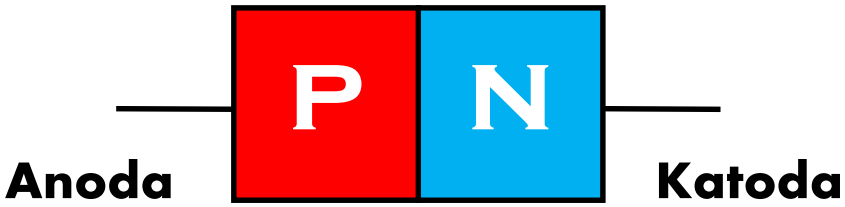


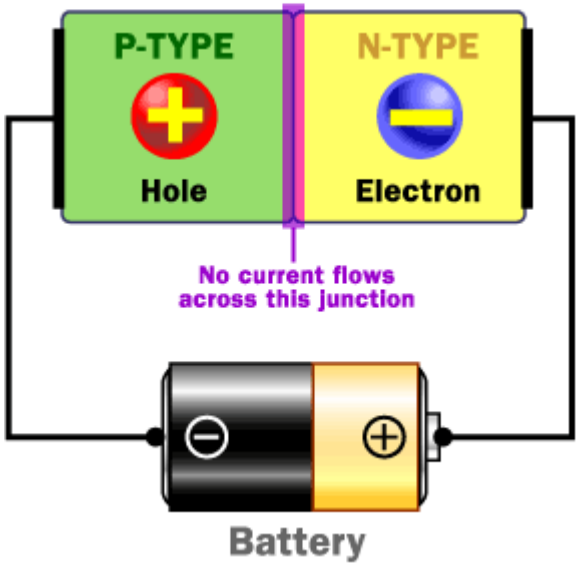
Perbedaan dioda daya dibandingkan dioda sinyal *pn-junction* :

- Memiliki daya yang besar
- Kemampuan menangani tegangan dan arus yang lebih besar
- Respon frekuensi (kecepatan pensaklaran) lebih rendah dibanding dioda sinyal

Simbol Dioda Daya



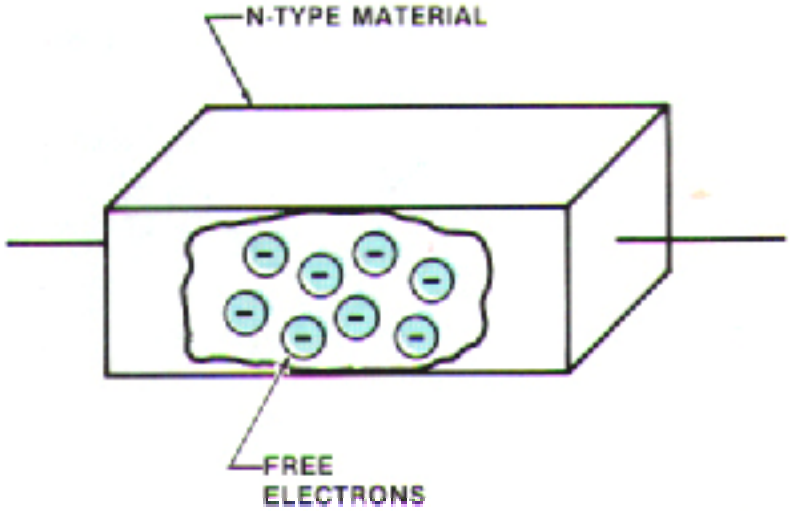


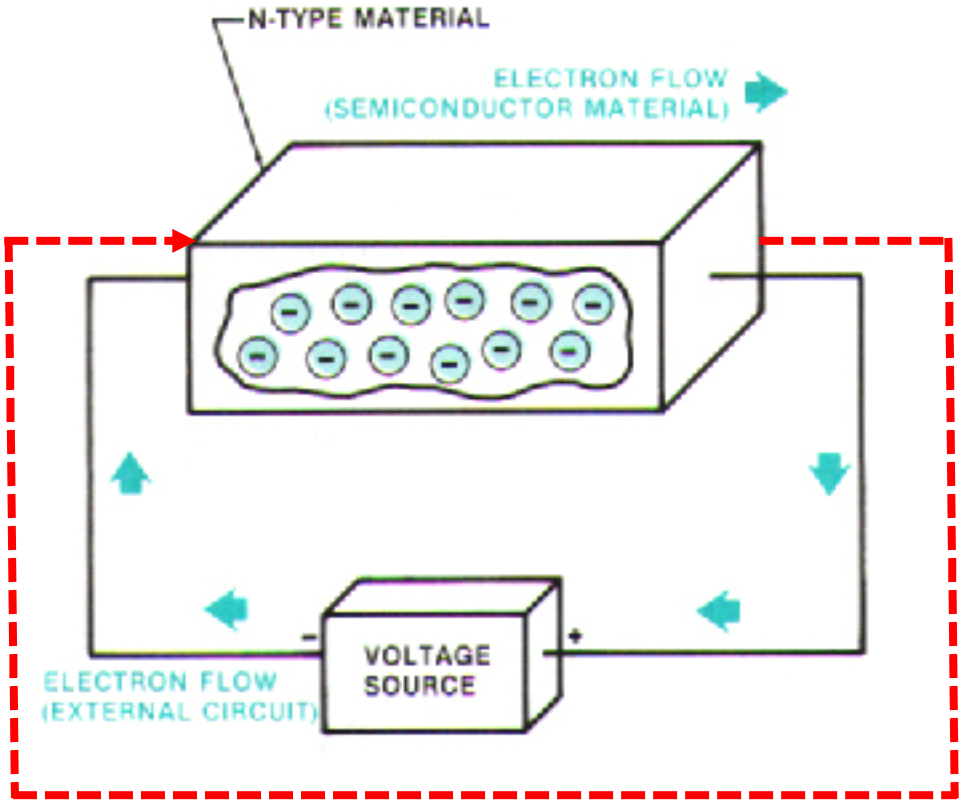


Semikonduktor ?

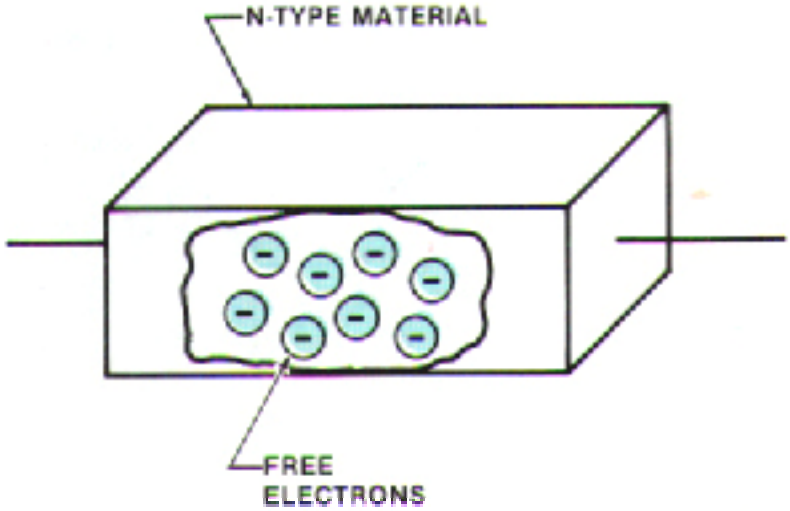
Konduktor	Semikonduktor	Isolator
Resistansi rendah		Resistansi tinggi
Banyak elektron bebas	Beberapa (sebagian) elektron bebas	Tidak ada elektron bebas

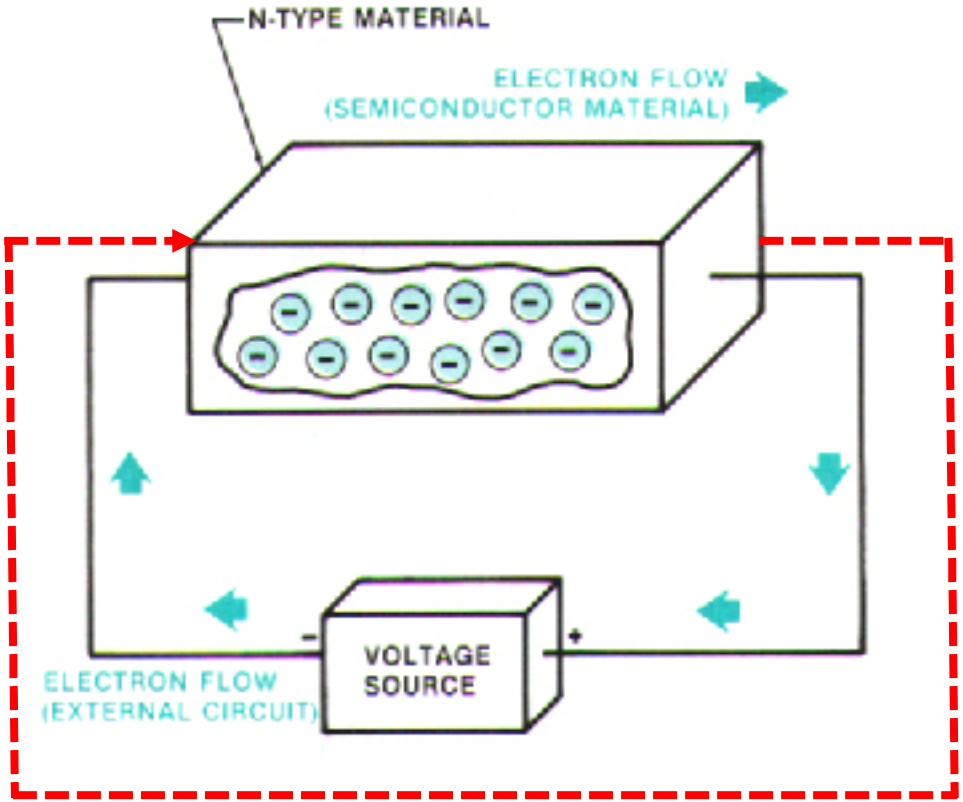
Material Semikonduktor Tipe-N



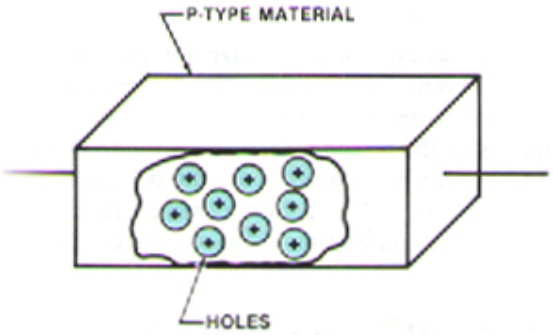


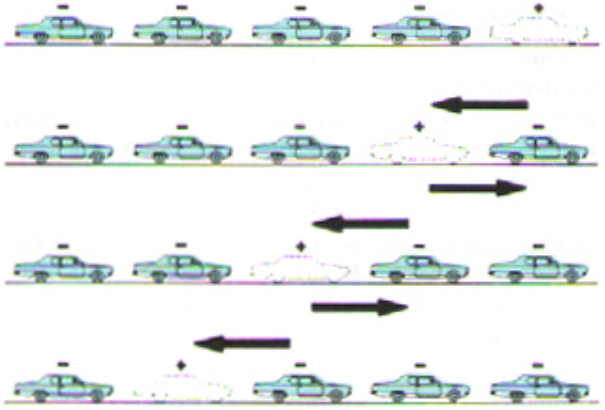
Material Semikonduktor Tipe-N

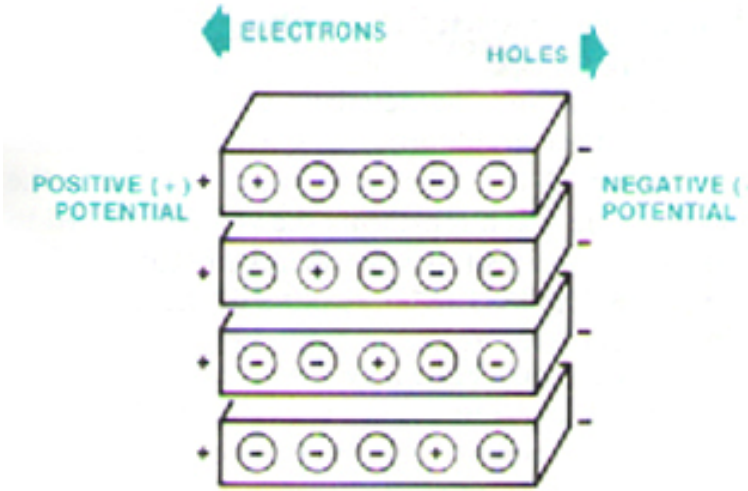


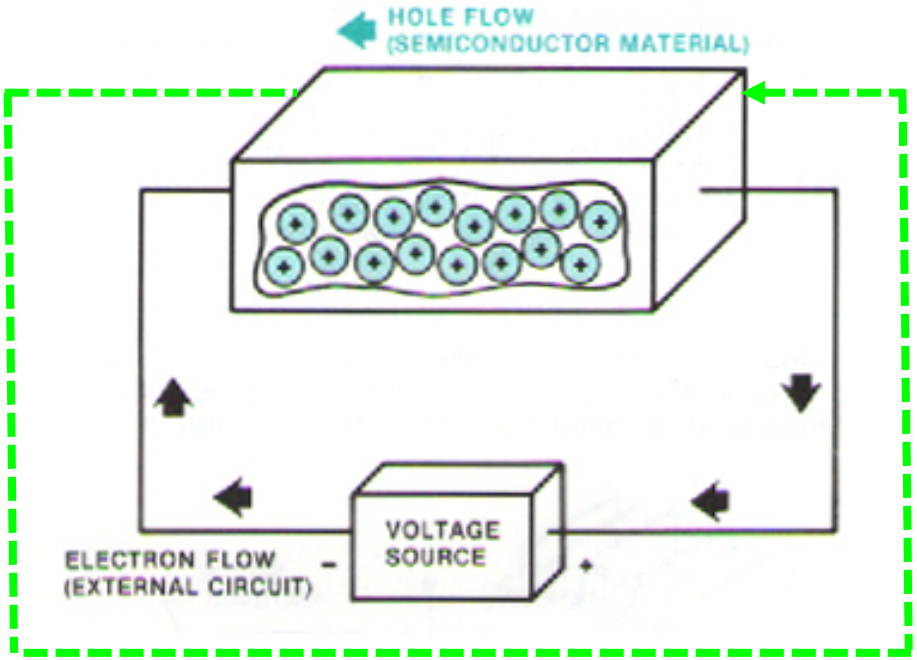


Material Semikonduktor Tipe-P

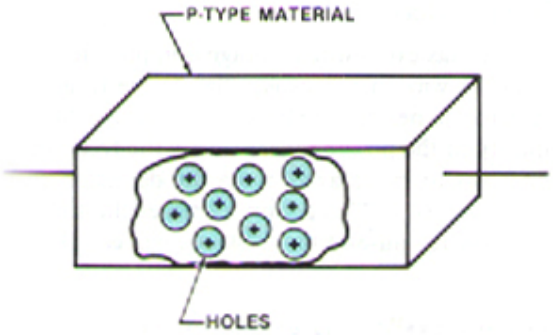


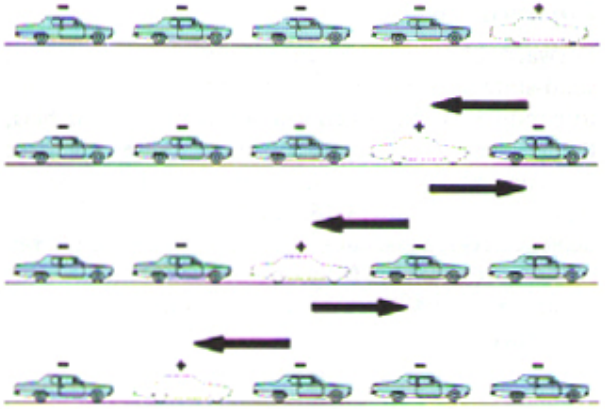


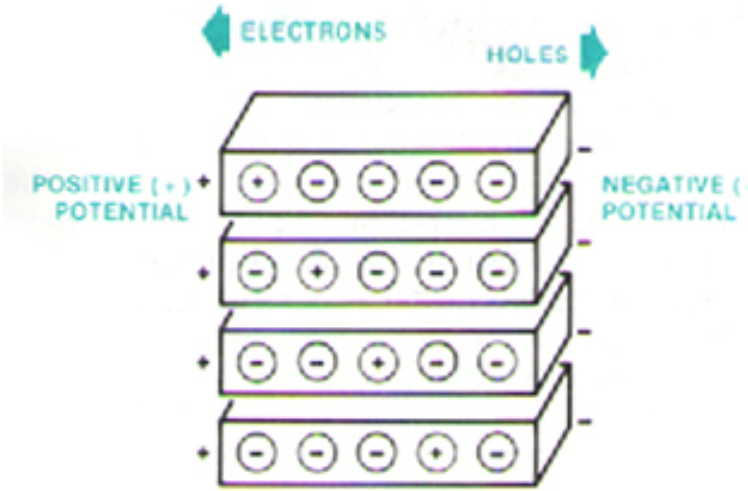


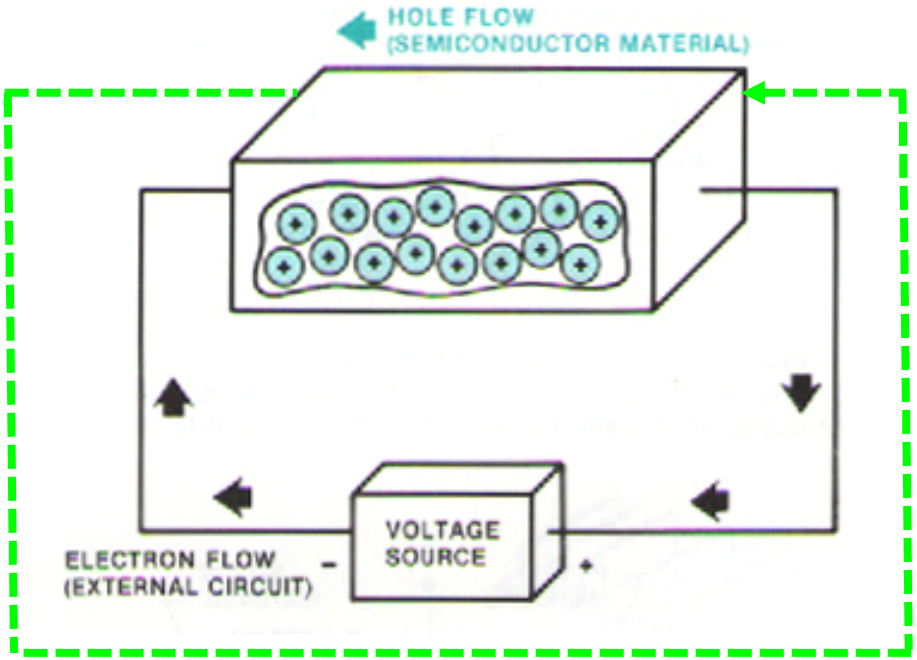


Material Semikonduktor Tipe-P

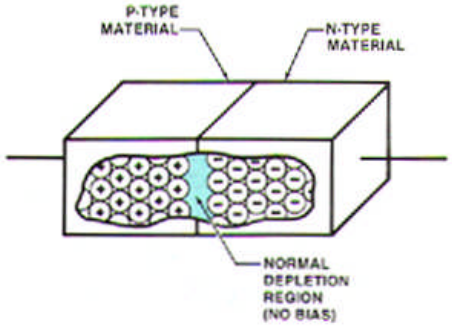


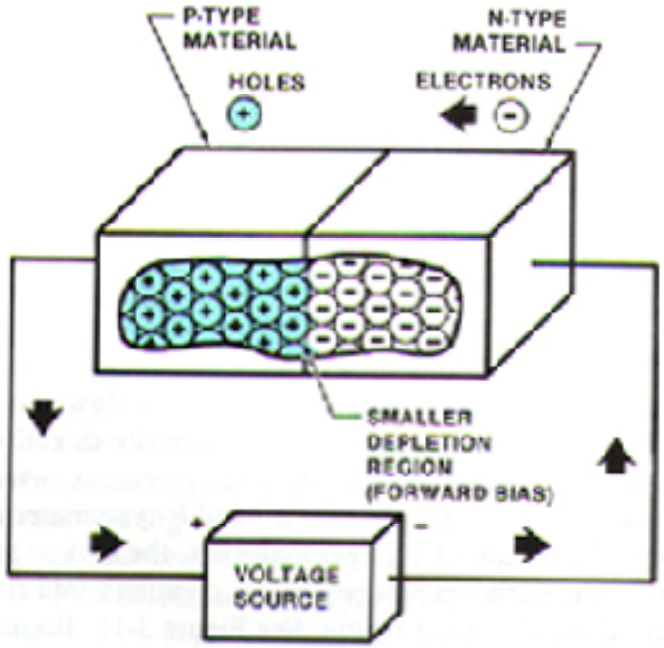




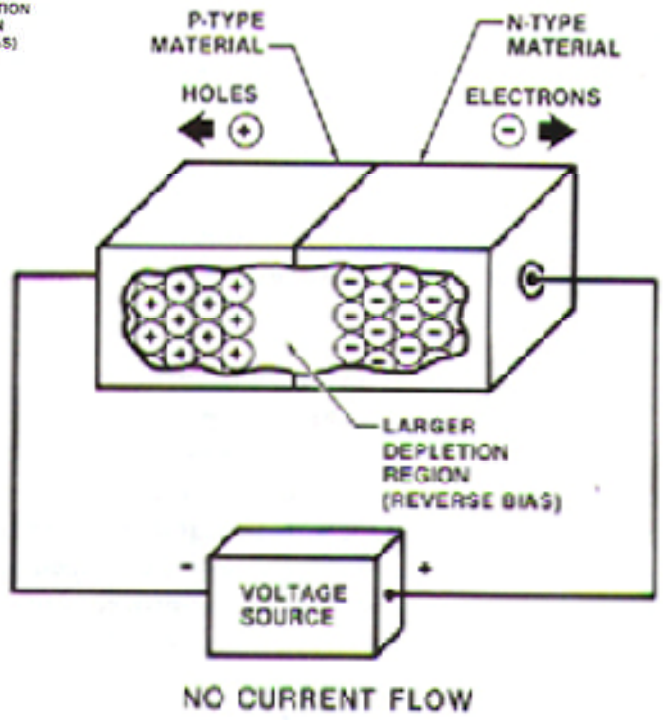


Forward and Reverse Bias
Dioda Daya



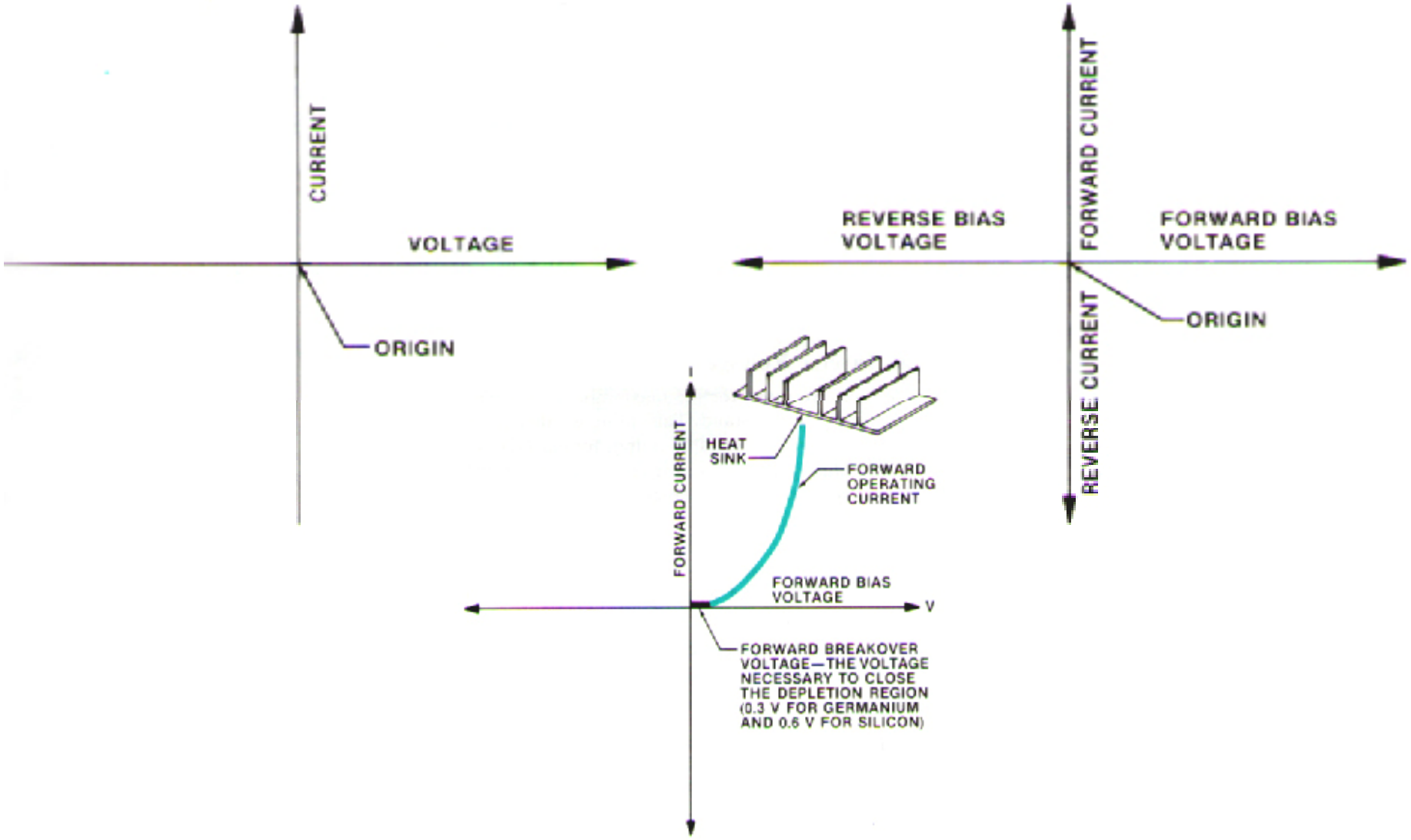


Forward Bias



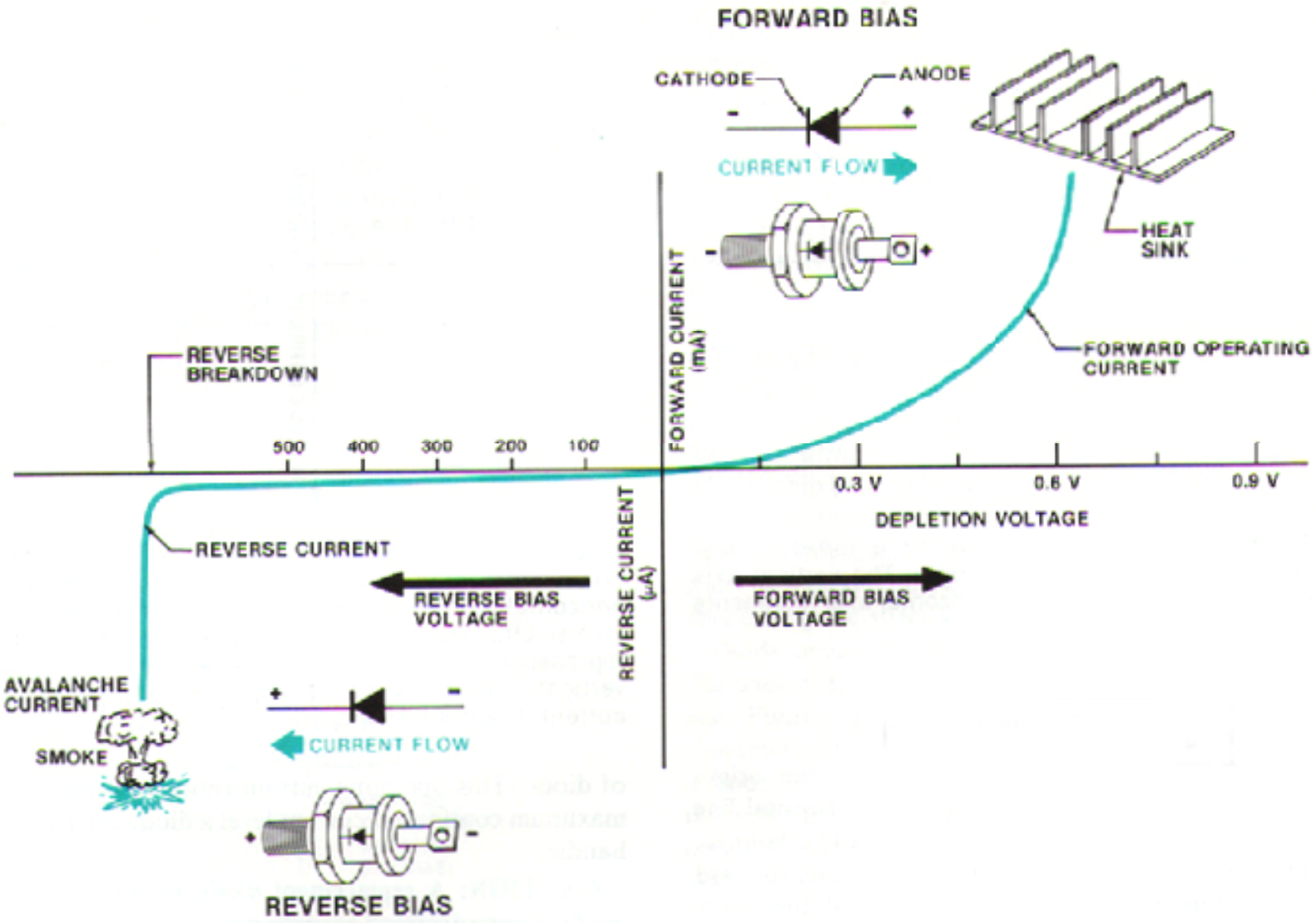
Reverse Bias

Karakteristik Operasi Dioda (1)

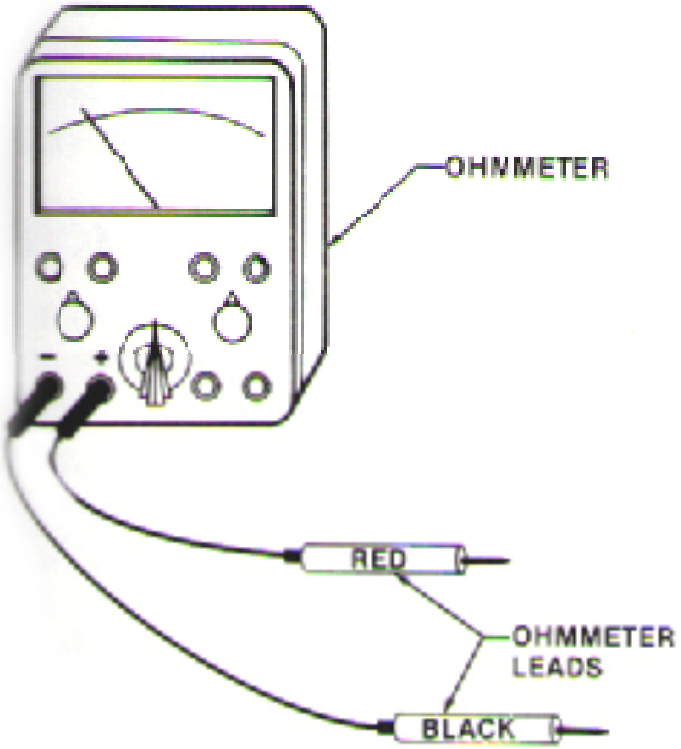


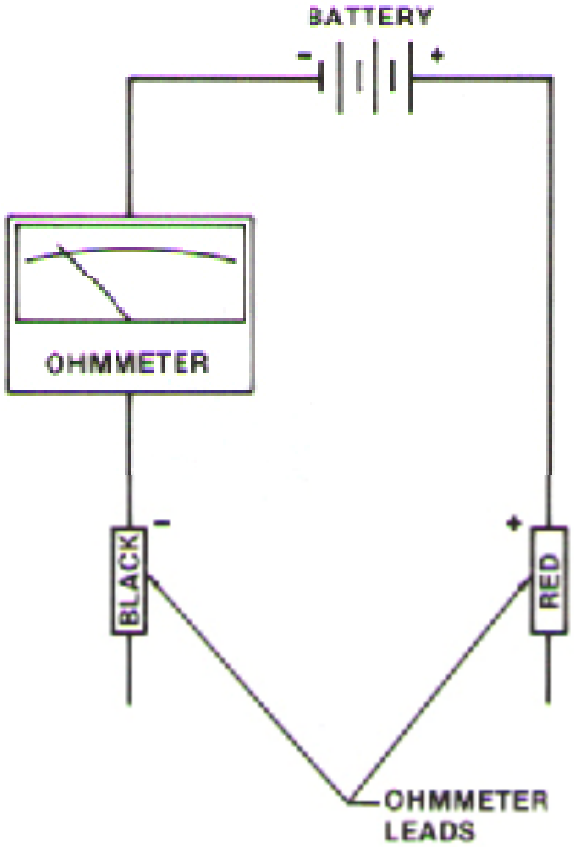
Forward Operating Current

Karakteristik Operasi Dioda (2)

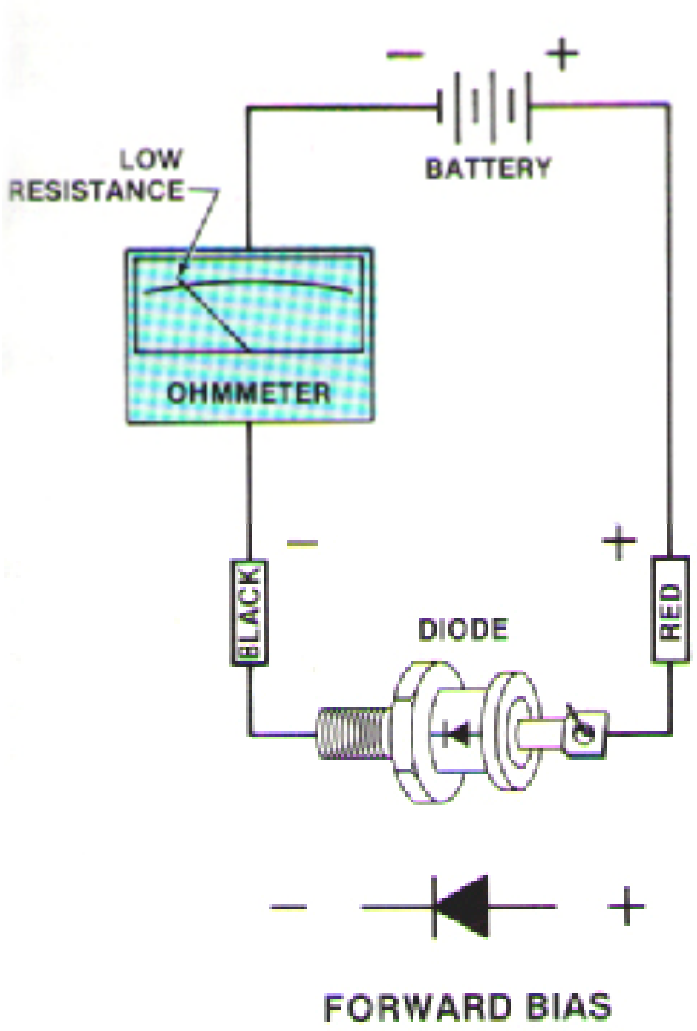


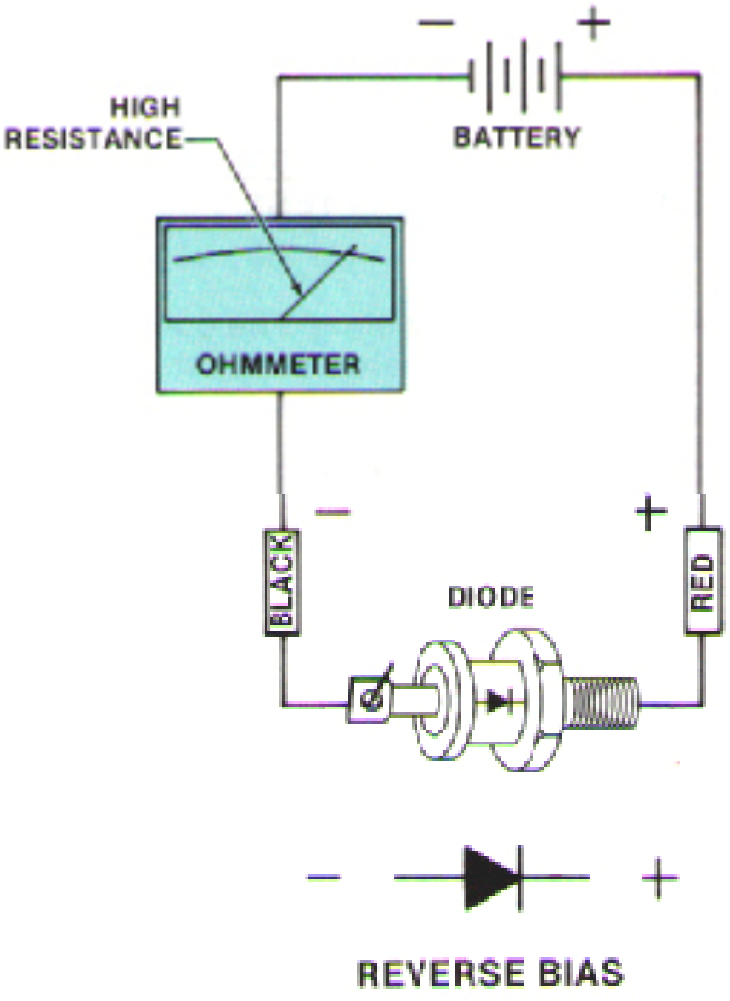
Menguji Dioda Daya (1)



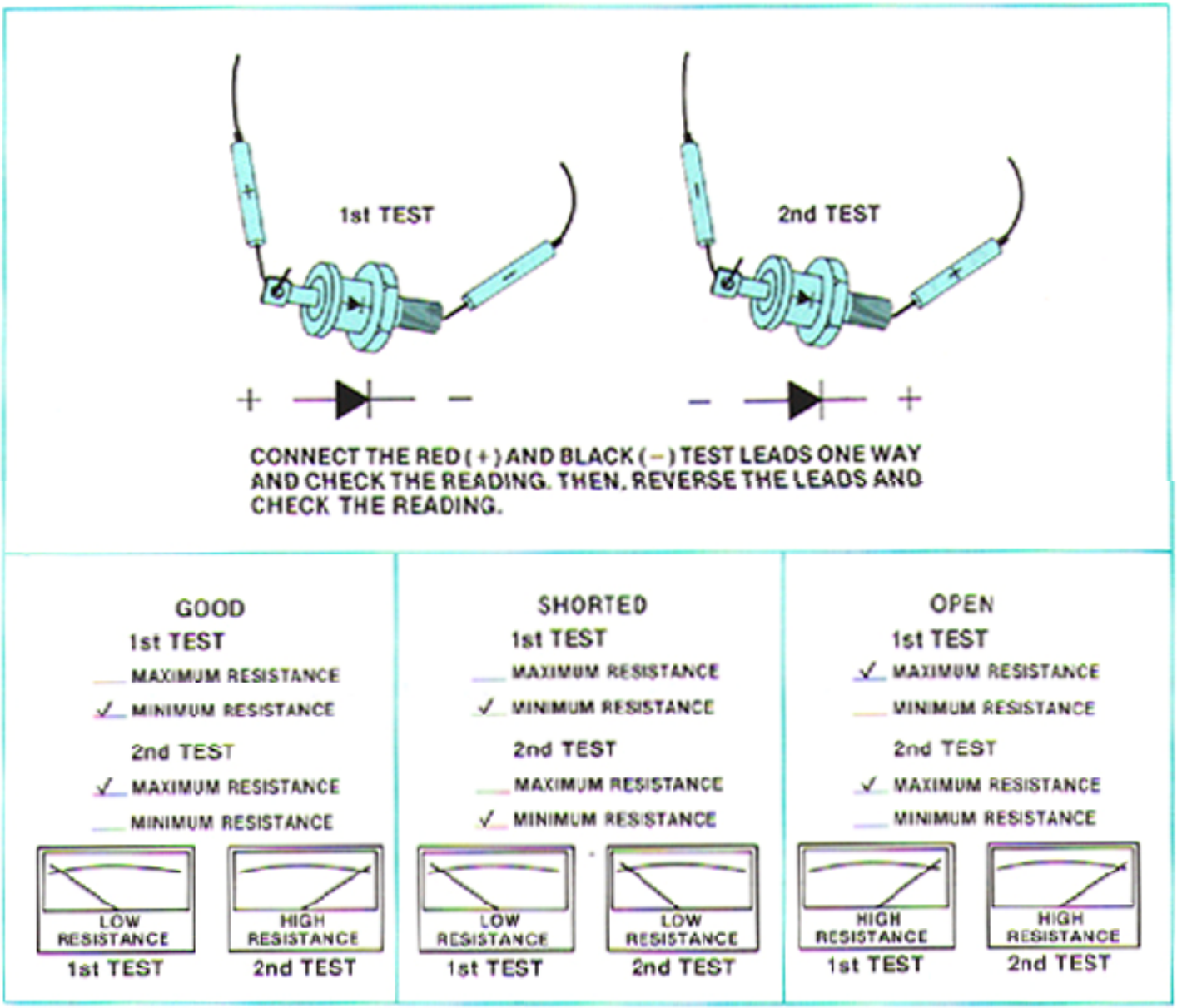


Menguji Dioda Daya (2)

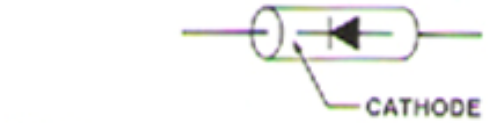




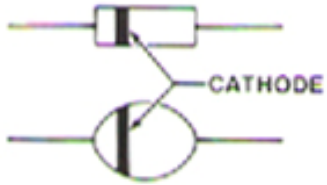
Menguji Dioda Daya (3)



Manufaktur Dioda Daya

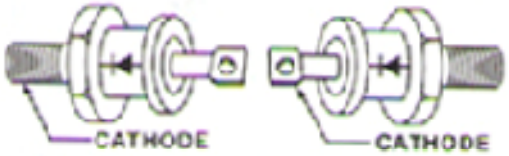


DIODE MARKED WITH SCHEMATIC SYMBOL



CATHODE MARKED WITH A BAND

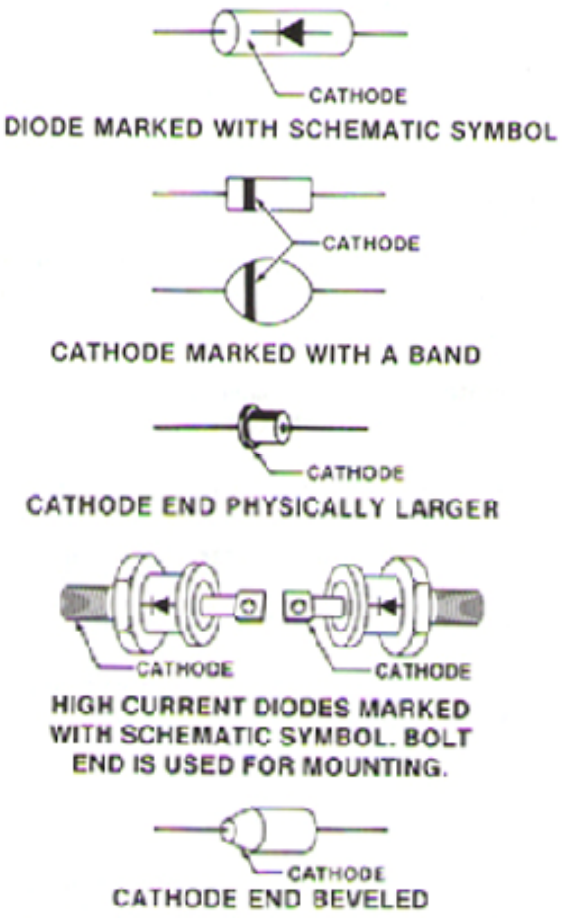
CATHODE END PHYSICALLY LARGER



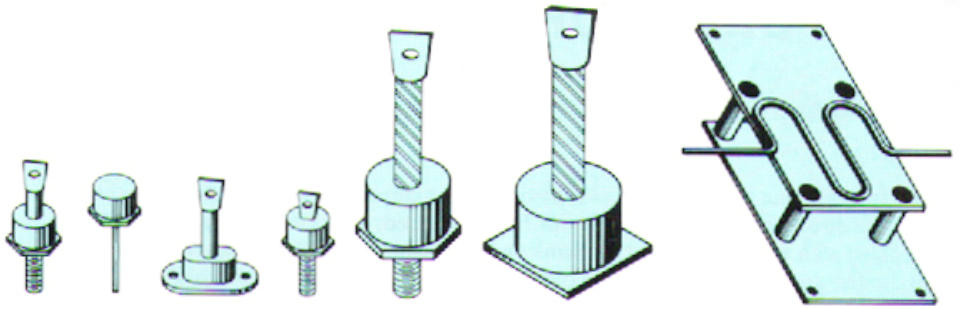
HIGH CURRENT DIODES MARKED WITH SCHEMATIC SYMBOL. BOLT END IS USED FOR MOUNTING.

CATHODE END BEVELED

Tipe Dioda Daya



1. Dioda Umum atau Serbaguna
2. Dioda Pemulihan Cepat
3. Dioda Schottky



15A 30A 50A 80A 160A 400A 1000A

Dioda Umum / Serbaguna

- Waktu pemulihan mundur relatif tinggi, biasanya 25 us
- Digunakan untuk aplikasi kecepatan rendah (waktu pemulihan tidak kritis)
- Arus 1 – ribuan Ampere, tegangan 50 V – 5 kV
- Secara umum dibuat dengan difusi
- Tipe campuran (alloy) dari penyearah yang digunakan untuk suplay daya pengelasan
  - ✓ Paling efektif pembiayaannya
  - ✓ Kasar
  - ✓ Memiliki tingkat kemampuan 300 V – 1000 V

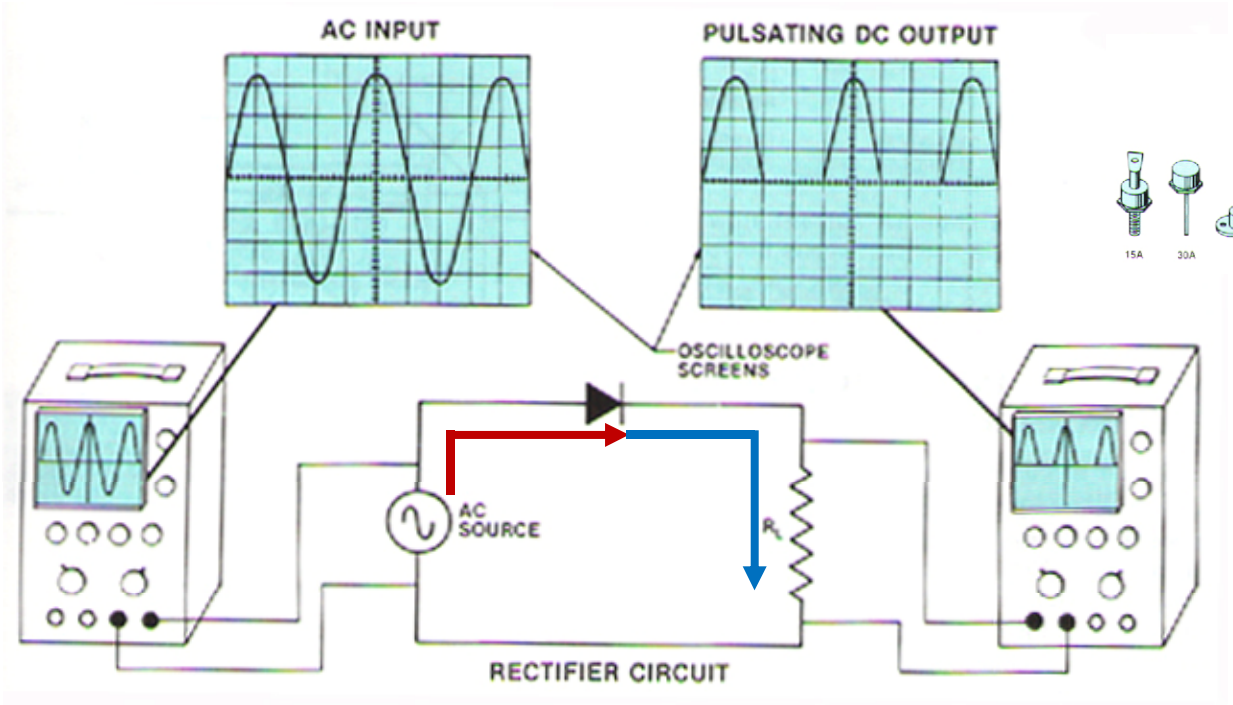
Dioda Pemulihan Cepat

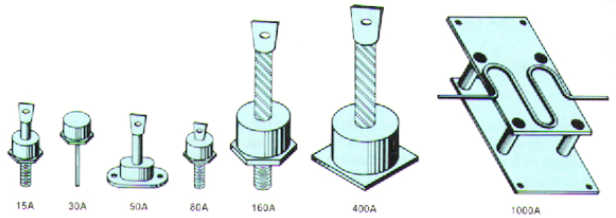
- Waktu pemulihan rendah kurang dari 5 us
- Digunakan untuk konverter dc-dc dan dc-ac
- Arus 1 – ratusan Ampere, tegangan 50 V– 3 kV
- Untuk tingkat tegangan di atas 400 V, dibuat dengan difusi dan waktu pemulihan mundur diatur oleh difusi platina / emas
- Untuk tingkat tegangan di bawah 400 V, dioda epiktasi lebih cepat dibanding dioda difusi
- Dioda pemulihan cepat memiliki lebar basis yang tipis, yang menghasilkan waktu pemulihan ulang kurang dari 50 ns

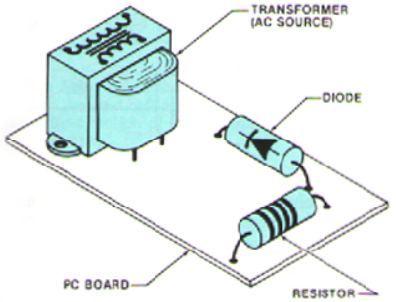
Dioda Schottky

- Masalah pengisian penyimpan pn *junction* dapat diminimalkan bahkan dihilangkan dalam dioda ini
- Pengisian pemulihan jauh lebih kecil daripada dioda pn *junction* yang ekuivalen.
- Dioda schottky memiliki tegangan jatuh yang relatif kecil
- Arus bocor lebih tinggi daripada dioda pn *junction* , olehnya itu tegangan maksimum yang diizinkan dibatas 100 V
- Tingkat arus bervariasi 1 – 300 A
- Ideal digunakan untuk arus tinggi, tegangan rendah catu daya dc. Meskipun demikian dioda ini juga diterapkan pada catu daya arus kecil untuk meningkatkan efisiensi.

Aplikasi Dioda Daya (1)







Aplikasi dioda daya selain sebagai saklar dalam penyearah :

- *Freewheeling* dalam regulator saklar
- Pengisian balik kapasitor dan transfer energi antar komponen
- Isolasi tegangan
- Balikan energi dari beban ke sumber daya

Aplikasi Dioda Daya (2)

APPLICATION NOTE 90

Negative-Output Boost Regulator Has High Efficiency

Abstract: In this design note a switching regulator, the MAX634, operates with a charge pump to produce an adjustable, regulated, negative output voltage with high efficiency. The circuit converts 5V to an adjustable negative output of -12V to -22V for use as a backplane bias supply for LCDs.

The circuit of **Figure 1** converts 5V to an adjustable output of -12V to -22V, suitable for use as a backplane-bias supply for LCDs. The circuit includes a switching regulator that boosts the input voltage to a high positive voltage (top of Q3), and a charge pump that converts this level to the negative output voltage. The scheme provides good load regulation and allows use of an economical, low-side, n-channel MOSFET switch (Q3). Efficiency (90% or so for the entire output range) surpasses that of most inverting-topology converters

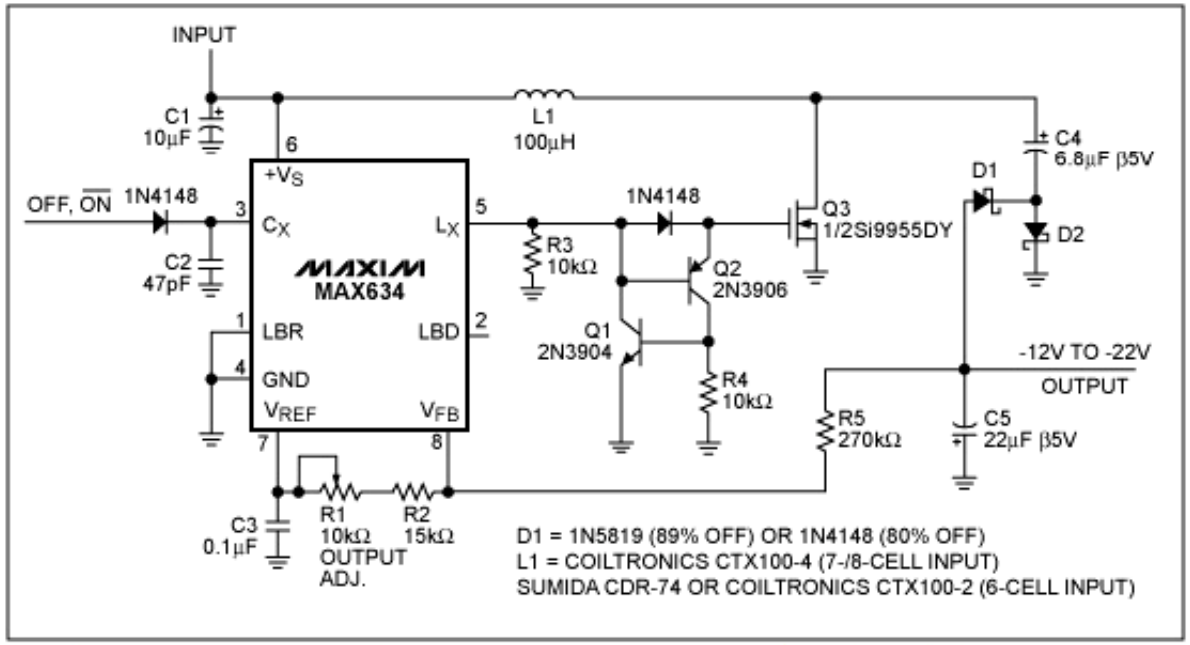


Figure 1. This switching regulator operates with a discrete-component charge pump (D1, D2, C4, and C5) to produce an adjustable, regulated, negative output voltage.

Sumber : http://www.maxim-ic.com/

Aplikasi Dioda Daya (3)

Fiber-coupled diode lasers of the LDF series offering 100 to 10,000 W output power deliver the laser beam to the workpiece through an optical fiber

Sumber : http://www.laserline-inc.com/

DAFTAR PUSTAKA

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Rashid M.H., 1999, *Elektronika Daya*, PT. Prenhallindo, Jakarta
Rockis G., *Solid State Fundamentals for Electricians*, Energy Concepts Inc.

Terima Kasih

Apa yang saya lihat ..., saya lupa
Apa yang saya dengar..., saya ingat
Apa yang saya kerjakan..., saya paham.