

Dioda Sambungan P-N

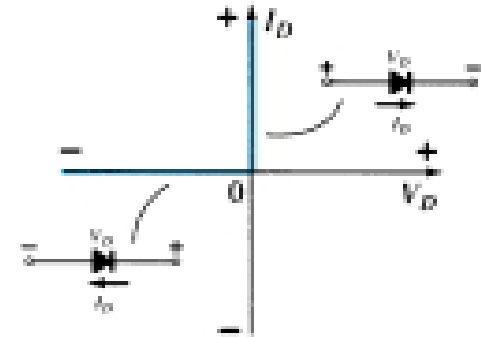
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IDEAL DIODE



(a)

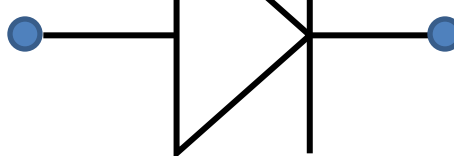


(b)

Anode



A



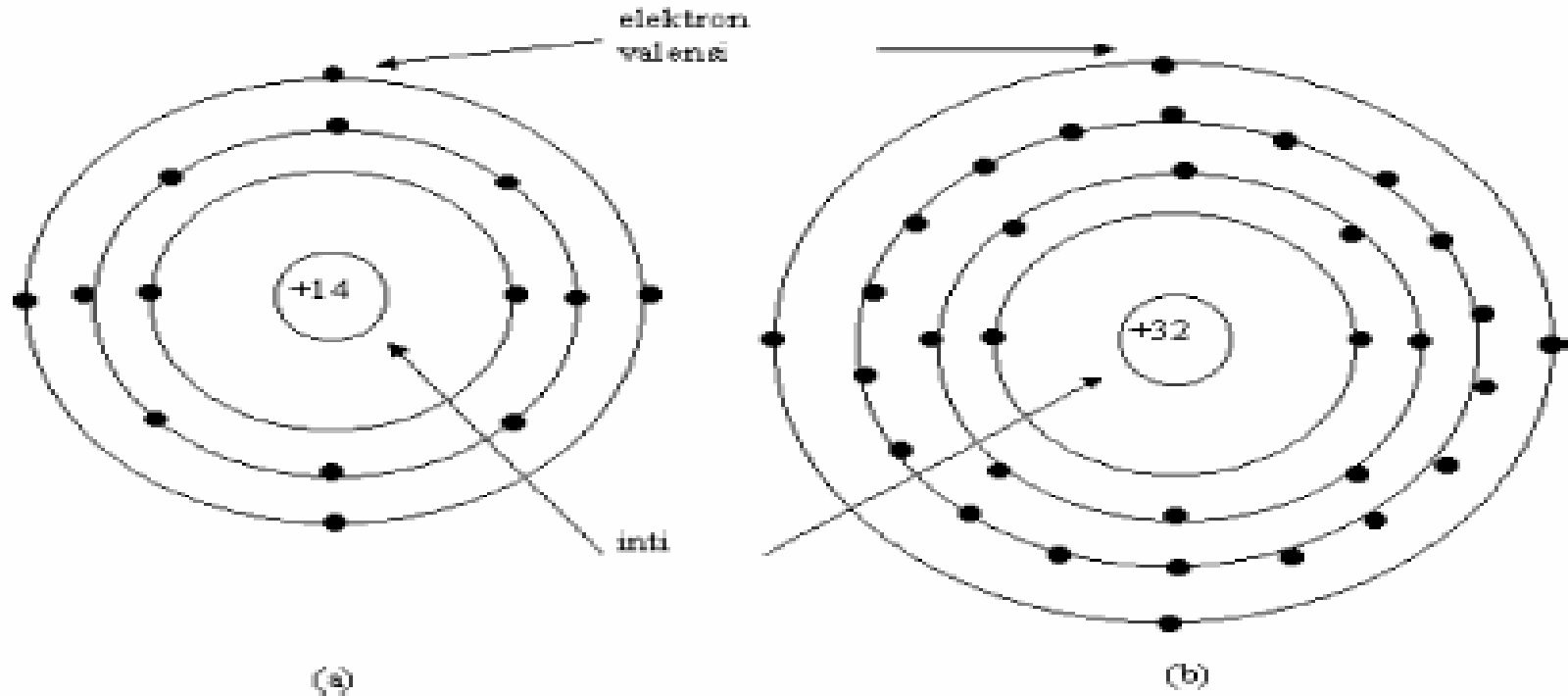
K



Cathode

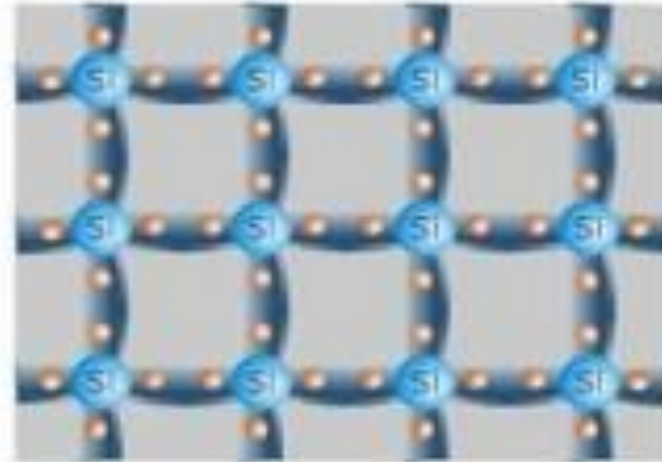
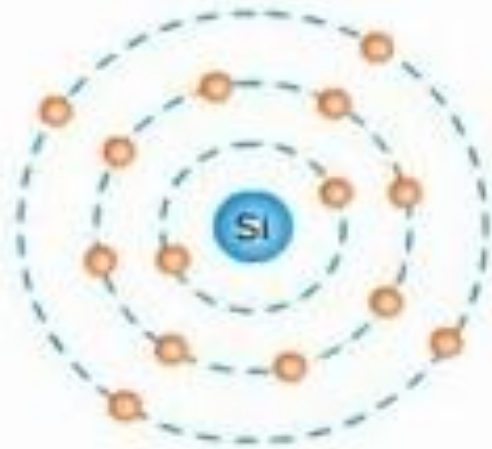


SEMICONDUCTOR MATERIALS



Atomic structure: (a) silicon;(b) germanium.

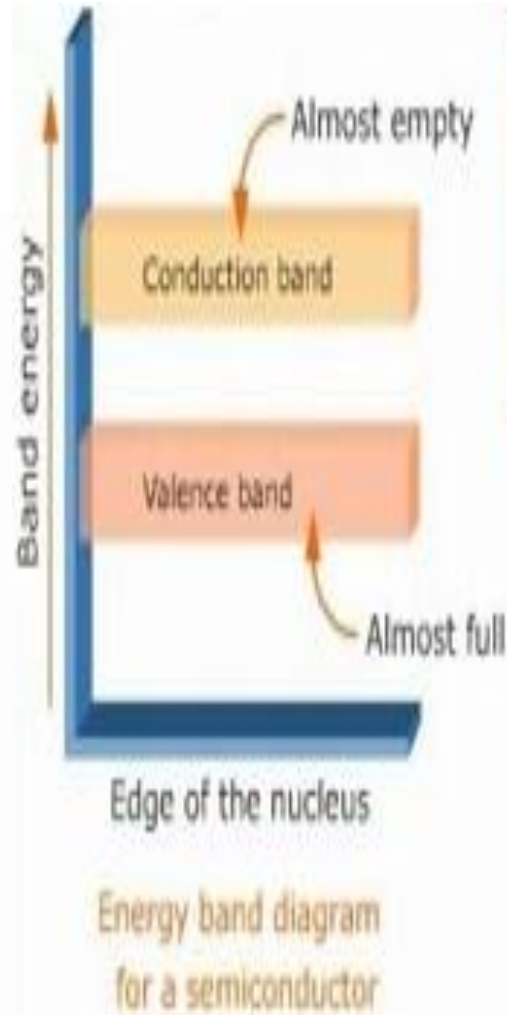
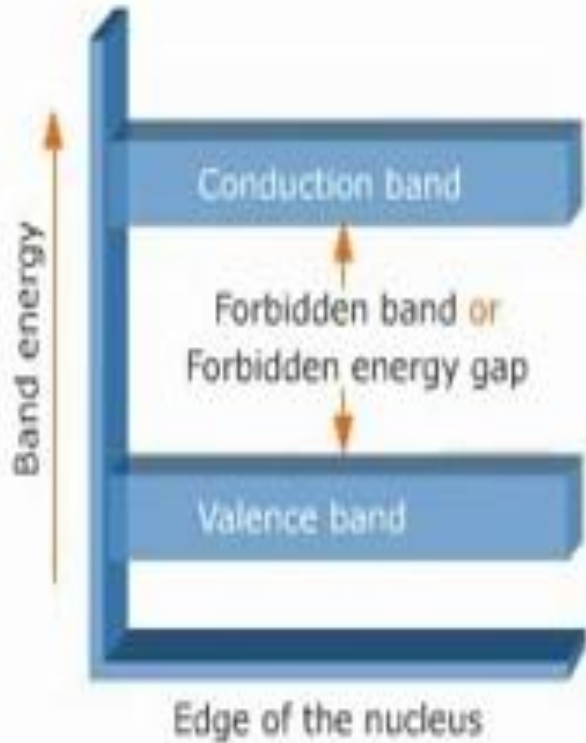
Covalent bonding of the silicon atom



The distribution of electrons in ${}_{14}^{28}\text{Si}$ atom is given here



Energy Band Diagram



• Semiconductor is a substance whose electrical conductivity lies between that of conductors and insulators.

• Semiconductors are the elements of the periodic table that exhibit high conductivity at high temperatures and nearly zero conductivity at low temperatures.



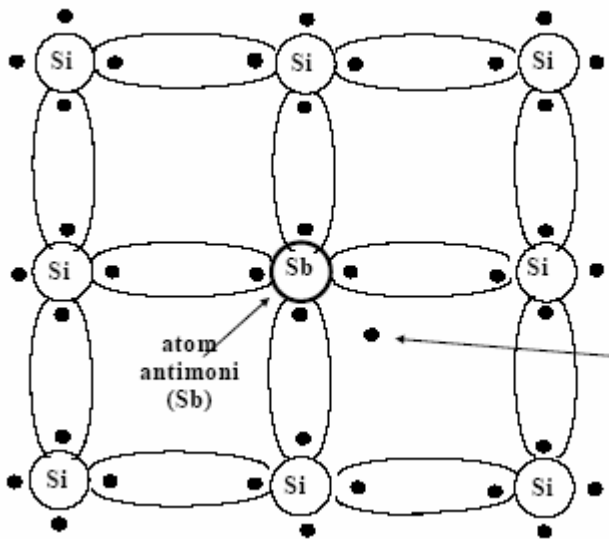
Silicon



Germanium

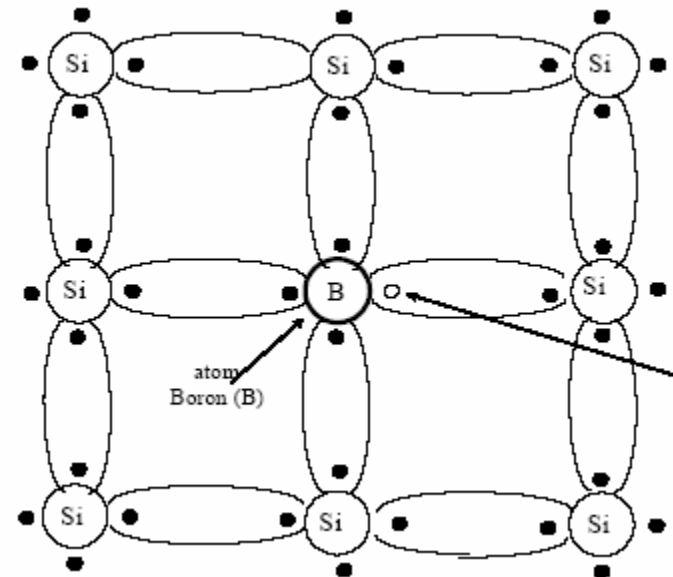
EXTRINSIC MATERIALS

N-Type Material



elektron
valensi
kelima

P-Type Material



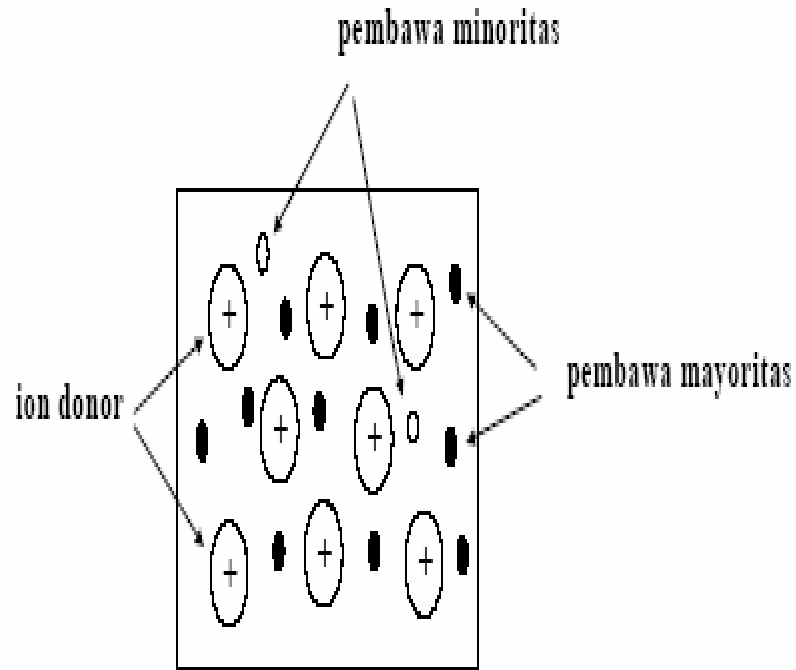
hole

MAJORITY AND MINORITY CARRIERS

N-type material

The electron : majority carrier

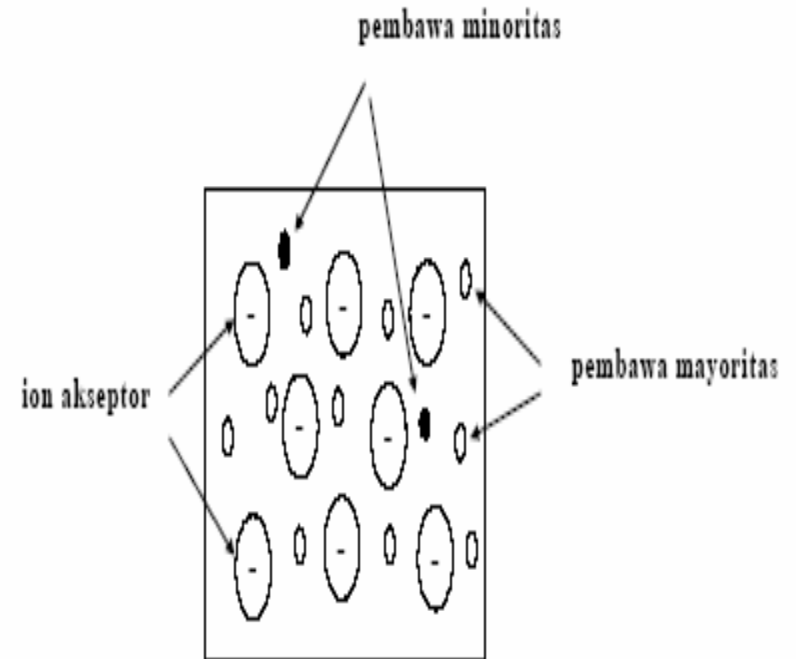
The hole : minority carrier



P-type material

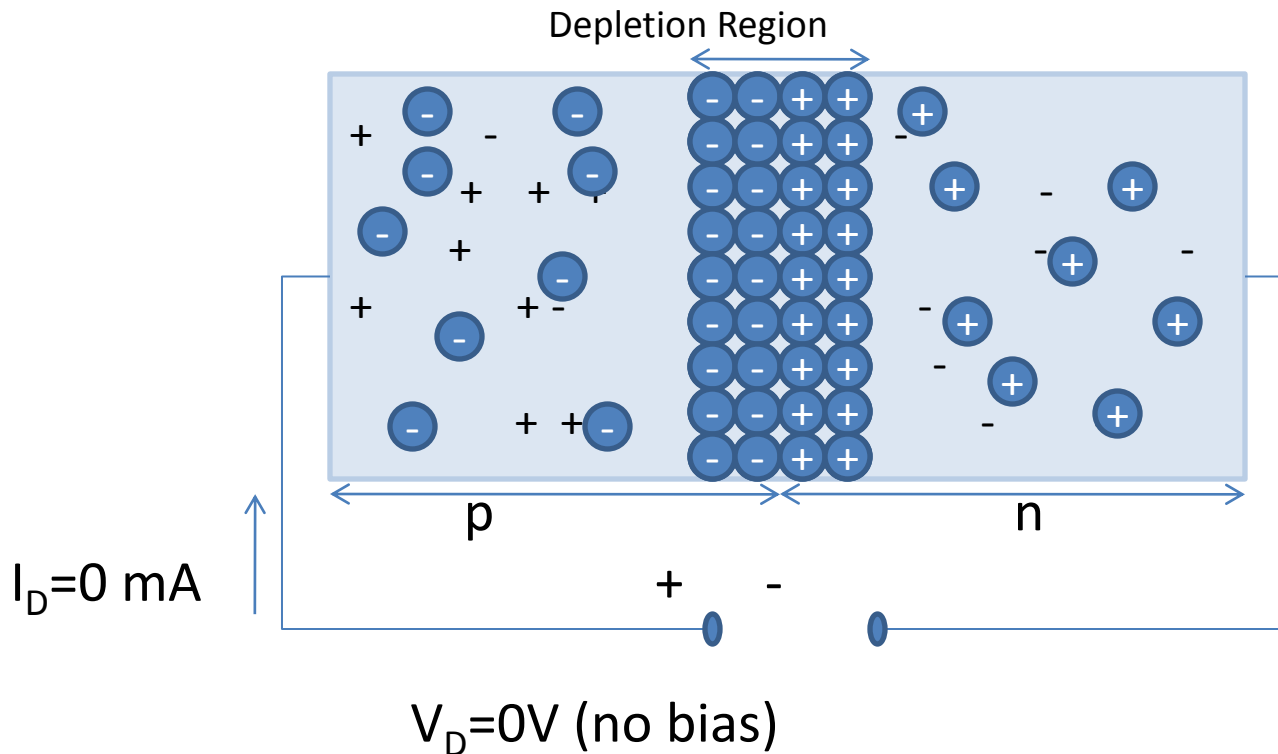
The electron : minority carrier

The hole : majority carrier



Semiconductor Diode

No Applied bias ($V_D=0V$)

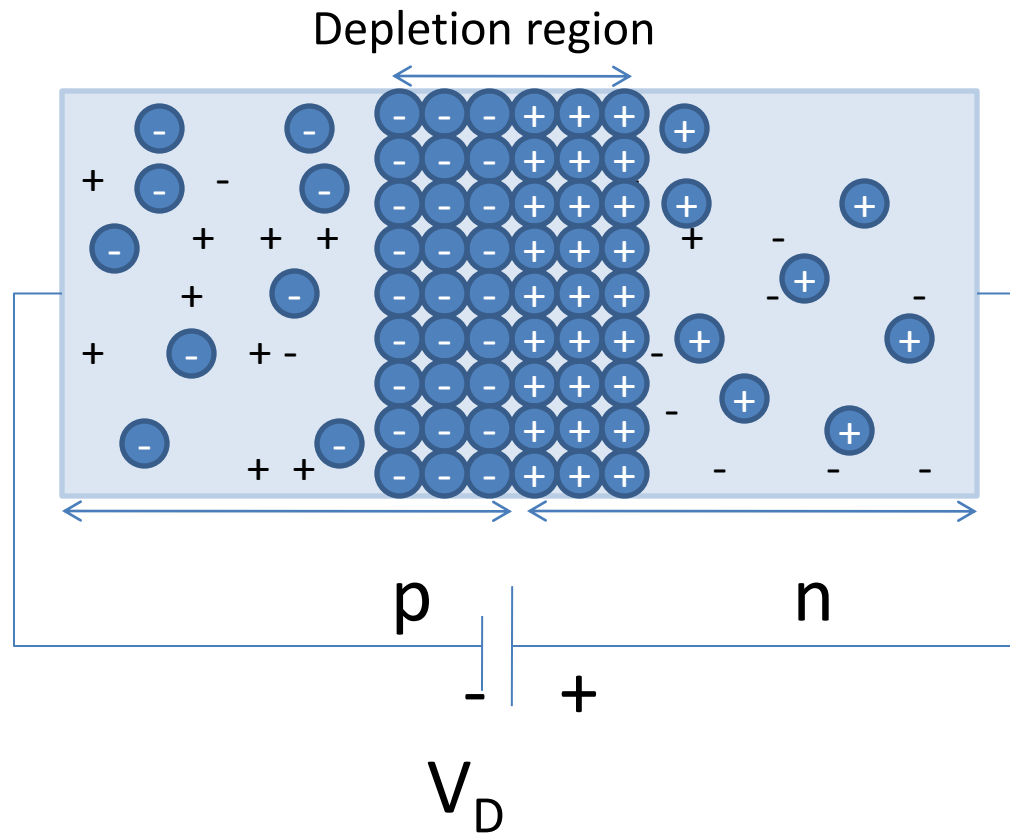


No Applied Bias

- Diffusi elektron dari tipe n ke tipe p.
- Terbentuk daerah deplesi.
- Pada daerah deplesi, karena adanya perbedaan jenis muatan, terbentuklah medan listrik.
- Medan listrik inilah yang menghentikan proses difusi elektron.
- Medan listrik ini menimbulkan adanya beda potensial.

Semiconductor Diode

Reverse-Bias Condition ($V_D < 0$ V)

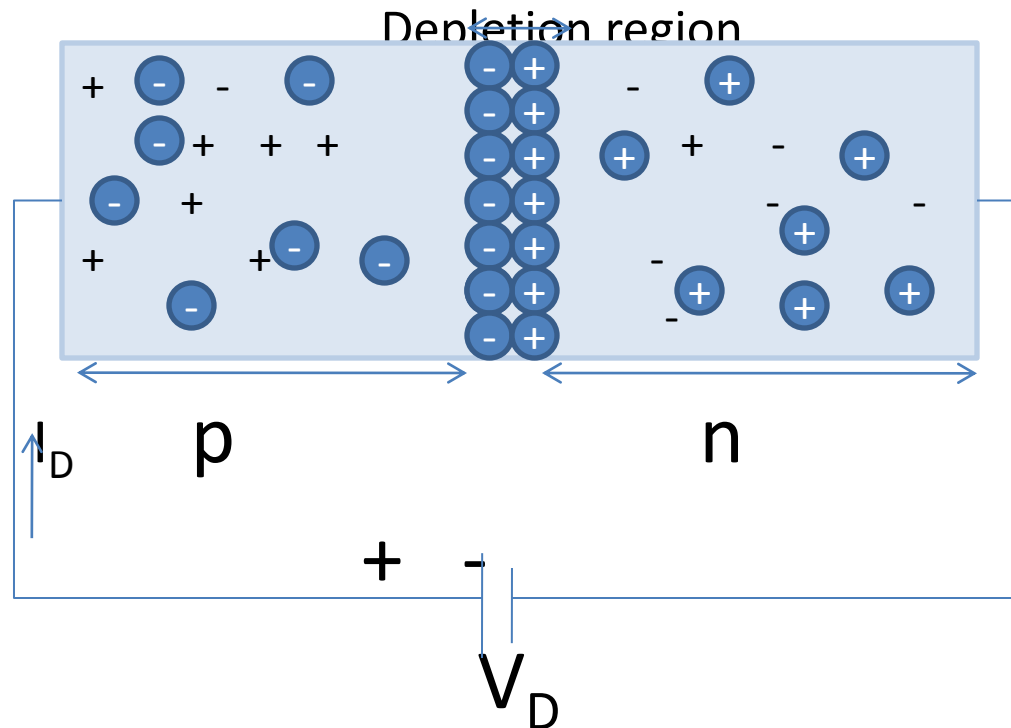


Reverse Bias Condition

- Pada reverse bias, tipe p dihubungkan pada kutub negatif sumber tegangan dan tipe n dihubungkan pada kutub positif sumber tegangan.
- Daerah deplesi melebar, potensial penghalang semakin besar, sehingga arus yang mengalir pada dioda sangat kecil atau mendekati nol.

Semiconductor Diode

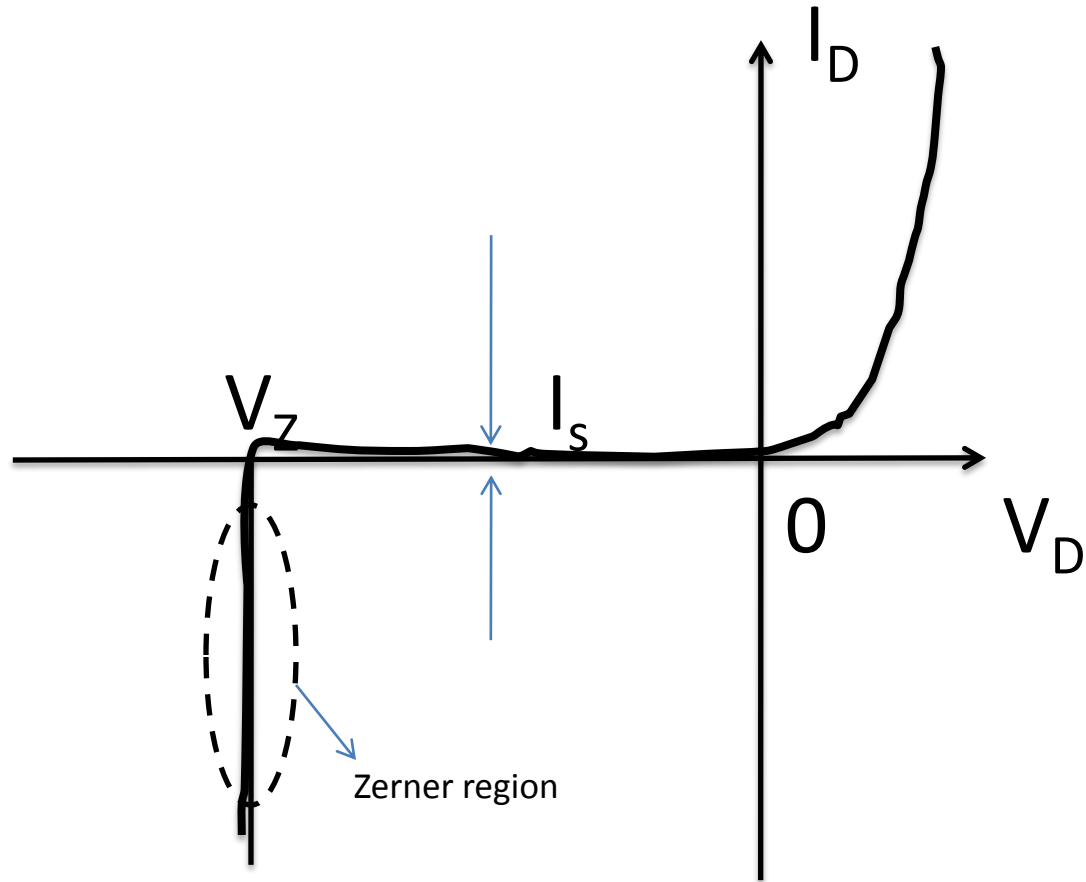
Forward-Bias Condition ($V_D > 0$ V)



Forward Bias Condition

- Pada forward bias, tipe p dihubungkan pada kutub positif sumber tegangan dan tipe n dihubungkan pada kutub negatif sumber tegangan.
- Daerah deplesi menyempit, potensial penghalang semakin kecil, arus dapat mengalir pada dioda.

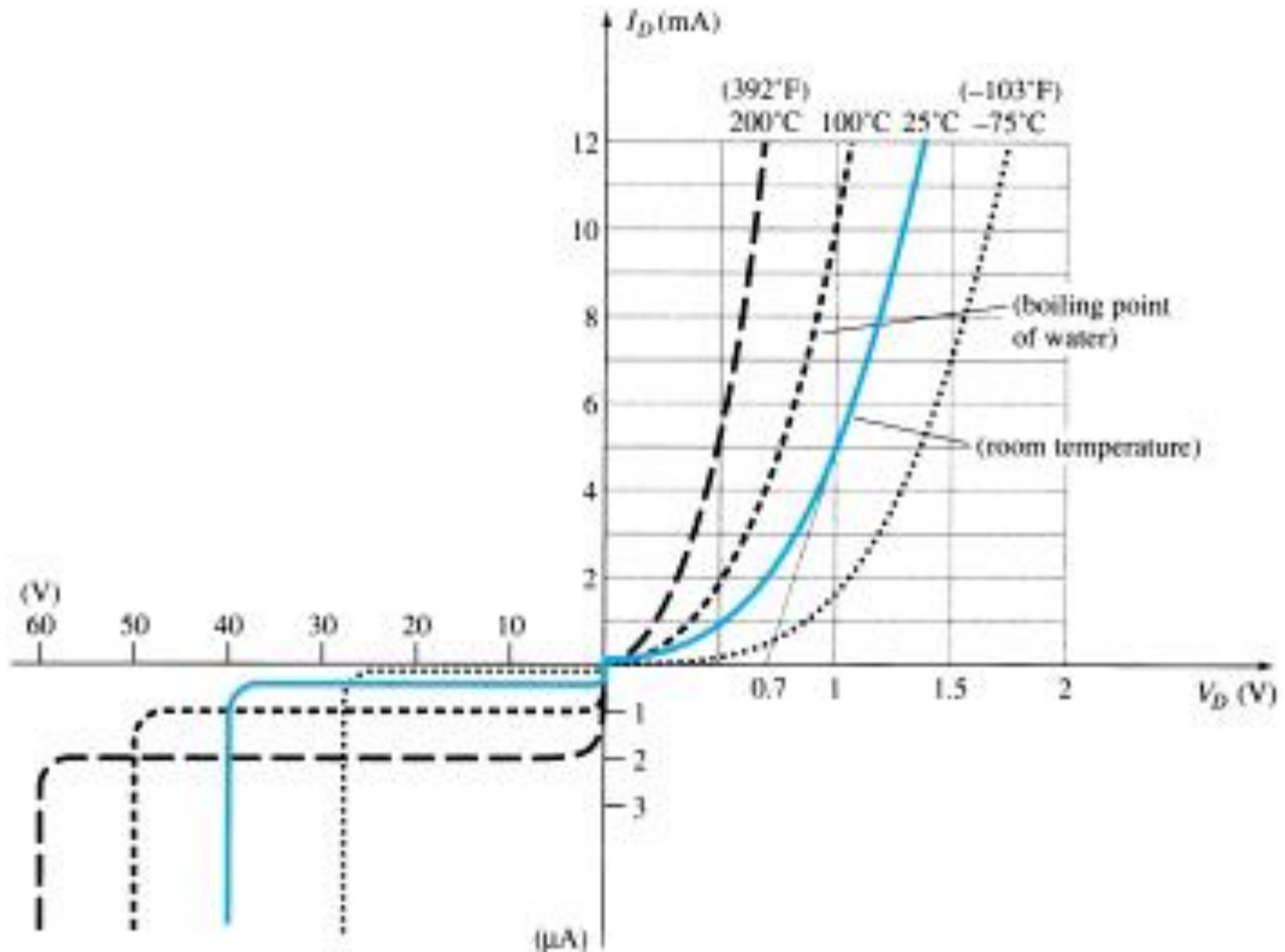
ZENER REGION



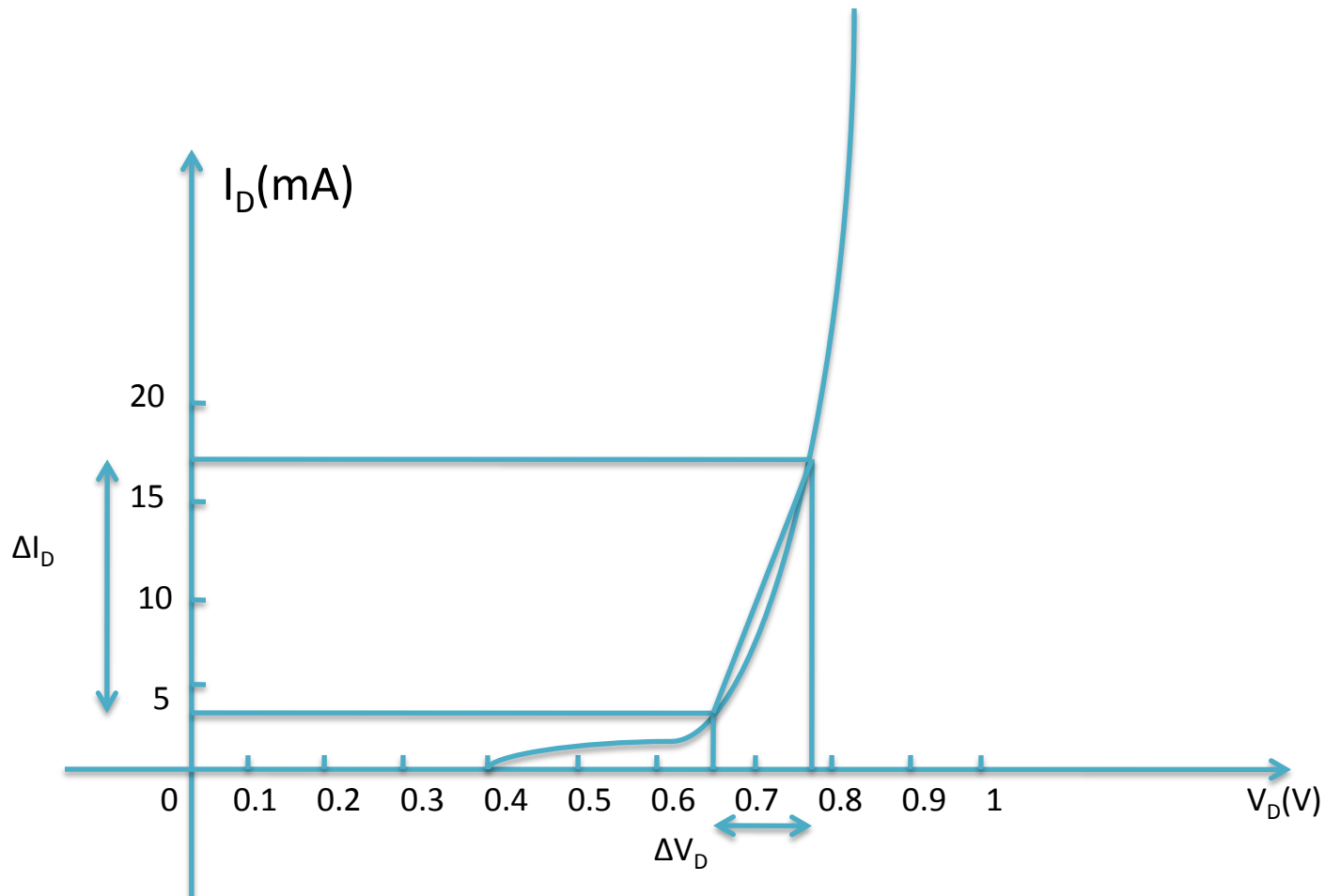
Silicon Vs Germanium

Silicon diodes have, in general, higher PIV and current rating and wider temperature ranges than germanium diodes.

Temperature effects



Average AC resistance



Diode Equivalent Circuits

- Piecewise-Linear Equivalent Circuit
- Simplified Equivalent Circuit
- Ideal Equivalent Circuit

