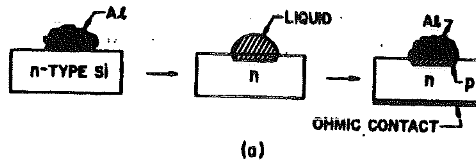
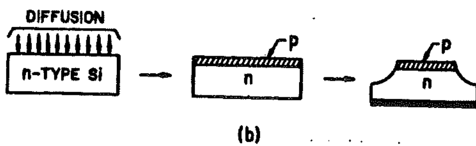
PREPARAZIONE GIUNZIONE P-N

a) LEGA
depos. Al
heating 580°C



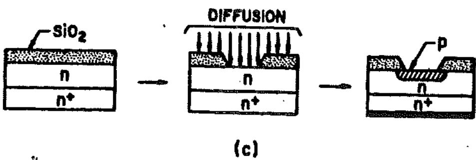
→ AuSb + 400°C n^+

b) diffusione
B (p-type)



1 μm ← termico

c) PLANAR
heating ~ 1000°C



d) impiantazione
heating 700°C

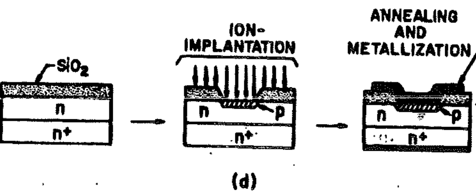
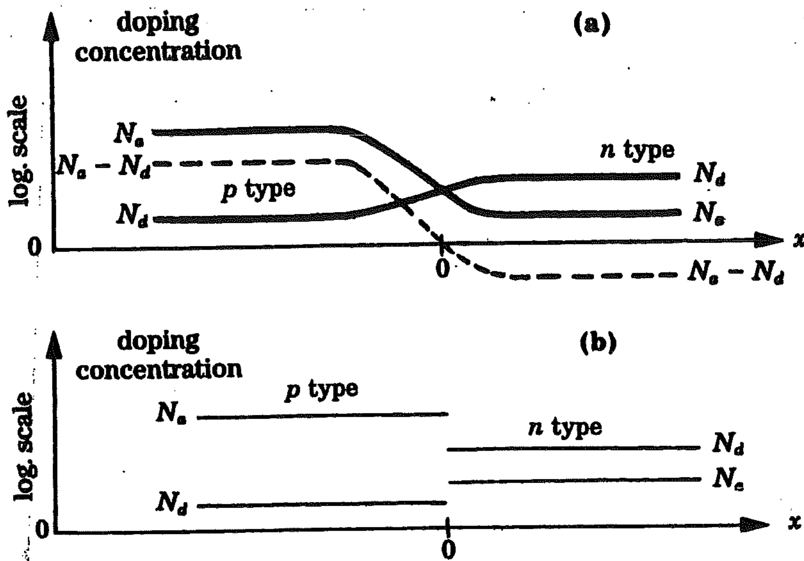


Fig. 1 Some device fabrication methods. (*a*) Alloyed junction. (*b*) Diffused mesa junction. (*c*) Diffused planar junction on epitaxial substrate. (*d*) Ion implantation.

Giunzione p-n



⇒ Modello di Schottky

Fig. 8.2. Doping profile of a p–n junction: (a) real profile; (b) approximation as a discontinuous profile.

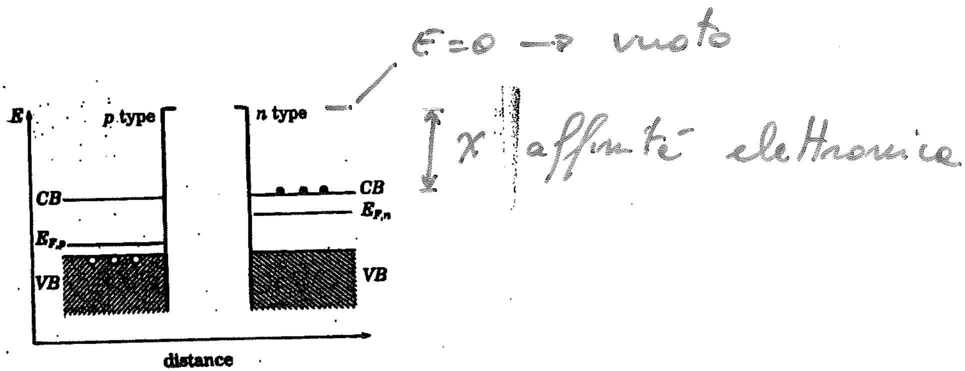
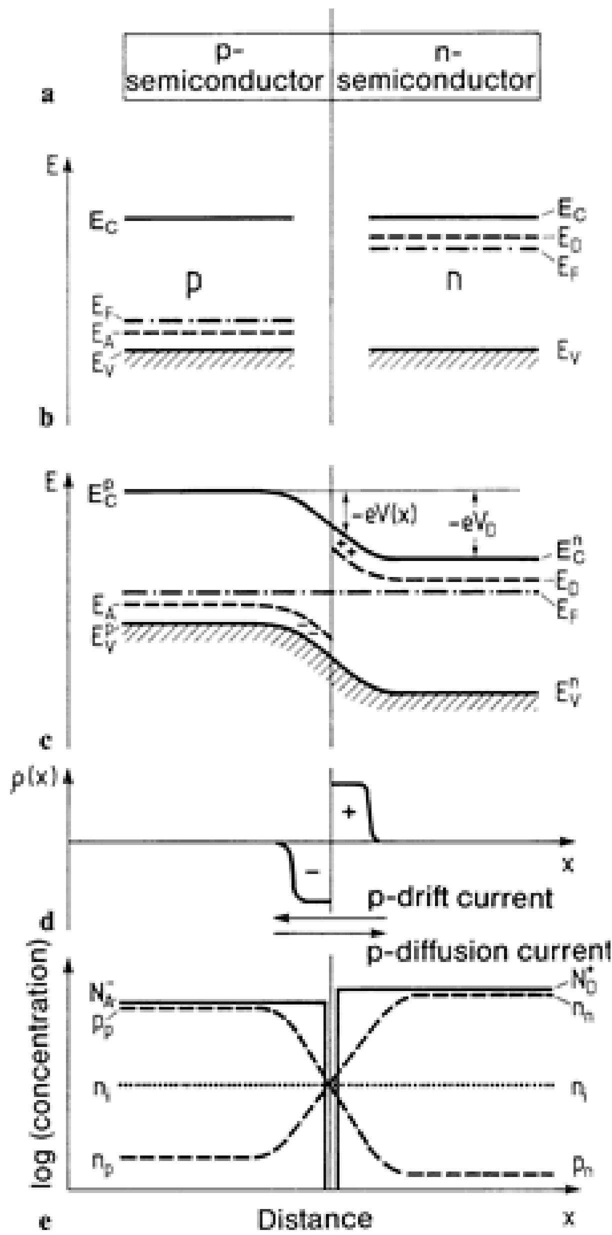
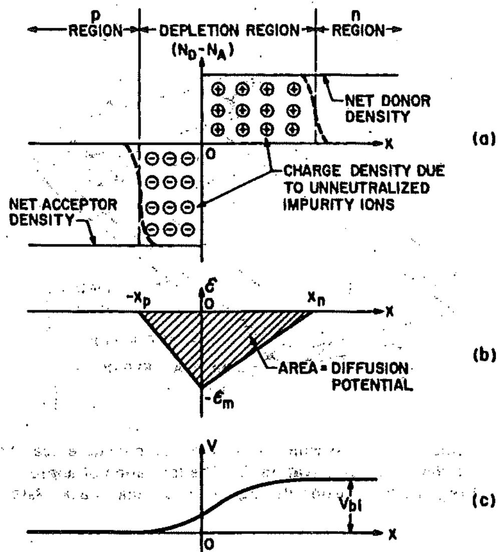


Fig. 8.3. Energy levels in two separated n- and p-type crystals. The hatched zones represent filled states, the heavy dots conduction electrons, and the open dots holes. (After Dalven, "Introduction to Applied Solid State Physics," Plenum Press, 1980.)



a
p-
semiconductor
n-
semiconductor
b
E
E_C
p
E_F
E_A
E_V
E_C
E_D
E_F
n
E_V
c
E
E_C^p
$-eV(x)$
$-eV_D$
E_C^n
E_D
E_F
E_A
E_V^p
E_V^n
d
$\rho(x)$
+
−
x
p-drift current
p-diffusion current
e
log (concentration)
N_A^-
p_p
n_i
n_p
N_D^+
n_n
n_i
p_n
Distance
x



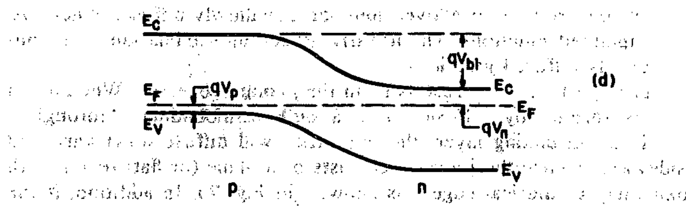


Fig. 10 Abrupt p-n junction in thermal equilibrium. (a) Space-charge distribution. The dashed lines indicate the majority-carrier distribution tails. (b) Electric field distribution. (c) Potential variation with distance where V_{bi} is the built-in potential. (c) Energy-band

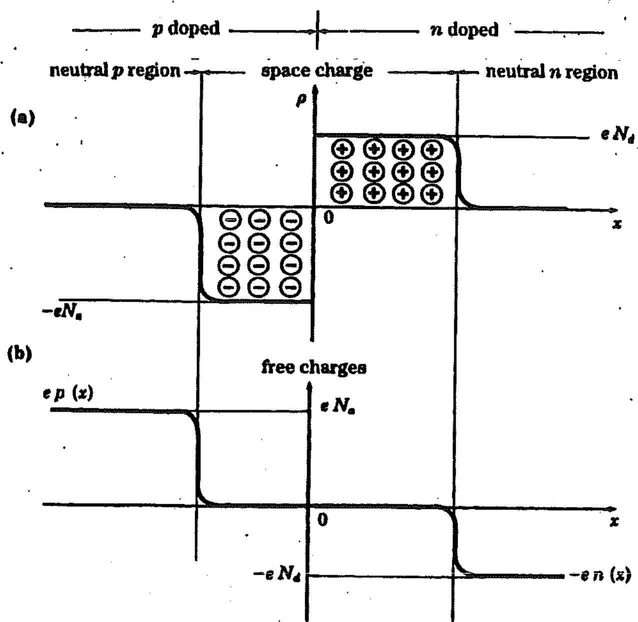
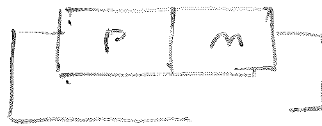
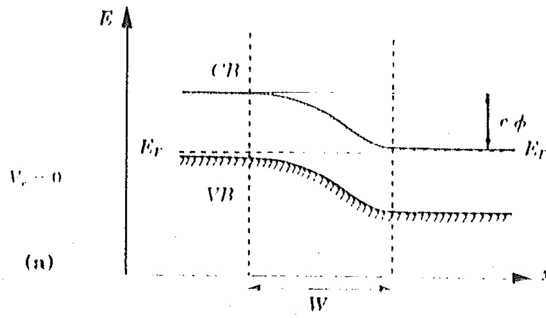


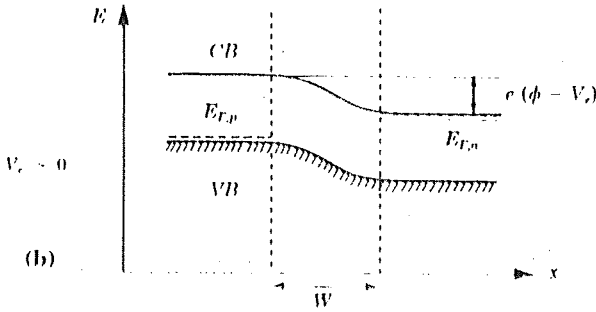
Fig. 8.4. (a) Net charge density $\rho(x)$, and (b) free charge density, in a p–n junction.

Densità di carica totale

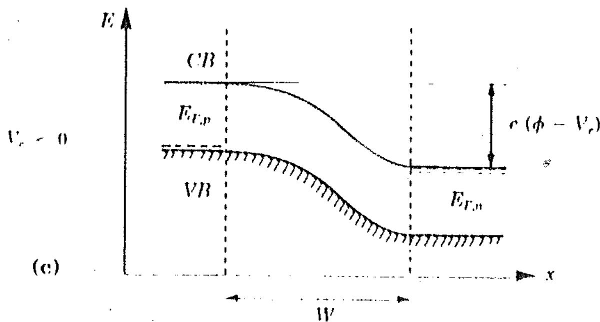
Densità di portatori liberi





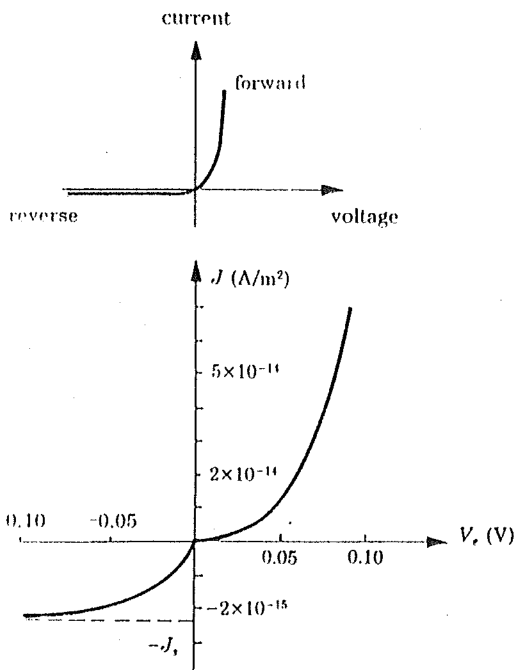


Pol. diretta



Pol inversa

Fig. 8.9. Comparison of band profiles for a p-n junction which is (a) unbiased; (b) forward biased; and (c) reverse biased.



$$J = J_s \left[e^{\frac{eV_e}{kT}} - 1 \right]$$

$$J_s = e n_i^2 \left(\frac{D_e}{L_e N_a} + \frac{D_h}{L_h N_d} \right)$$

Fig. 8.10. Current–voltage characteristic of a p–n junction. (a) Linear scale; (b) enlarged view of the region near the origin. The current density scale is expanded by a factor 10 for the reverse region, causing the change of slope at the origin.