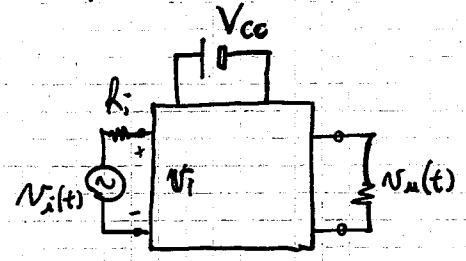
Amplificatore: è un dispositivo la cui tensione di uscita è proporzionale alla tensione di ingresso

$A_V = \frac{V_u}{V_i}$ guadagno di tensione.



$V_u(t) = K \cdot V_i(t)$

tipicamente sinusoidale

segnale amplificato deve essere indipendente:

① • dal generatore

② • dal carico

* il trasformatore non è un ampli perché V_2 dipende dal carico in uscita!!

Drogaggi di Semi-conduttori_ i semi-conduttori appartengono al 4° gruppo della tavola periodica.

Si e Ge

isolante $\rho = 10^{10}$

conduttore $\rho = 10^{-6}$

i semi-conduttori sono molto utili poiché si può controllare la conducibilità con le IMPUREZZE

$\bar{J} = \sigma \bar{E}$ $\quad \bar{E} = \rho \bar{J}$

$\sigma = q n \mu_n$

$q = 1,602 \cdot 10^{-19}\ C$

n = Concentrazioni di portatori mobili (elettroni) $\rightarrow \frac{1}{m^3}$ o $\left[\frac{1}{cm^3}\right]$

μ_n = mobilità $\left[\frac{m^2}{Vs}\right]$

$\rho_{Si} = 10^4\ \Omega cm$

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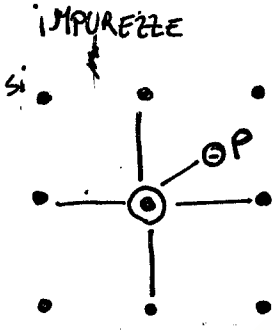
Silicio intrinseco ⟶ Silicio puro

$n \cong 10^{10}\ cm^{-3}$

$= \frac{10^{10}}{cm^3} = \frac{10^{10}}{[10^{-2}\ m]^3} =$

$= \frac{10^{10}}{10^{-6}\ m^3} = 10^{16}\ m^{-3}$

$N_P = \frac{n^\circ \text{ di atomi } P}{\text{Volume}}$



IV	V
C	P
Si	As
Ge	

Il fosforo dona un elettrone e carica negativamente

Si drogа a n con P (fosforo)

$n = N_D + 10^{10}$ concentrazione di portatori di cariche

Drogaggio p con B (Boro)



μ_n INTRINSECO $= 0{,}15\ m^2/Vs$

μ_n Drogato $= 0{,}05\ m^2/Vs$

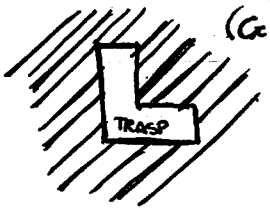
$\sigma_n = q\mu_n n$

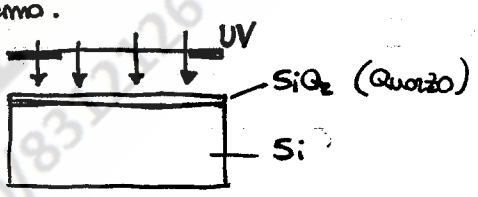
Il Boro prende un elettrone e crea un lacuna (hole) e carica positivamente.

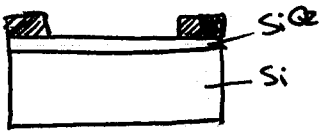
$\mu_p < \mu_n$

LITOGRAFIA: attraverso la litografica si può effettuare un drogaggio selettivo.

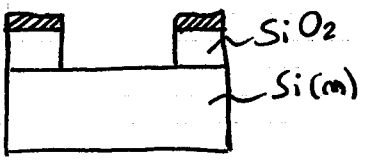
Si seleziona la zona con il cromo.

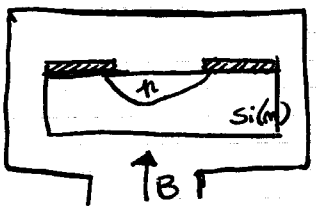






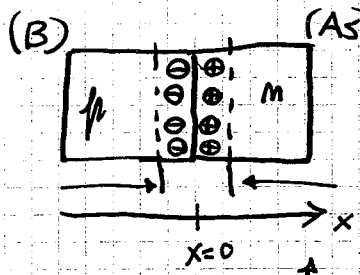
HF acido fluoridrico rimuove il quarzo.





1000 °C

Giunzione p-n

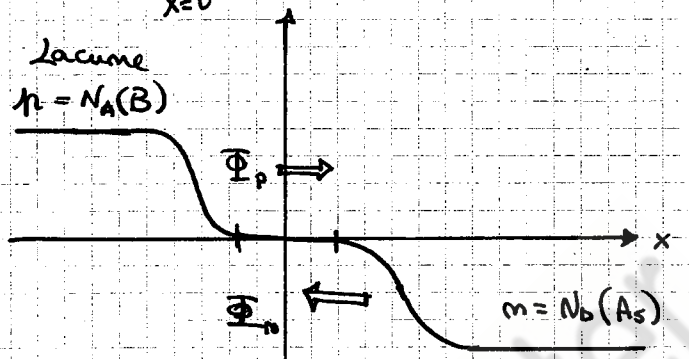


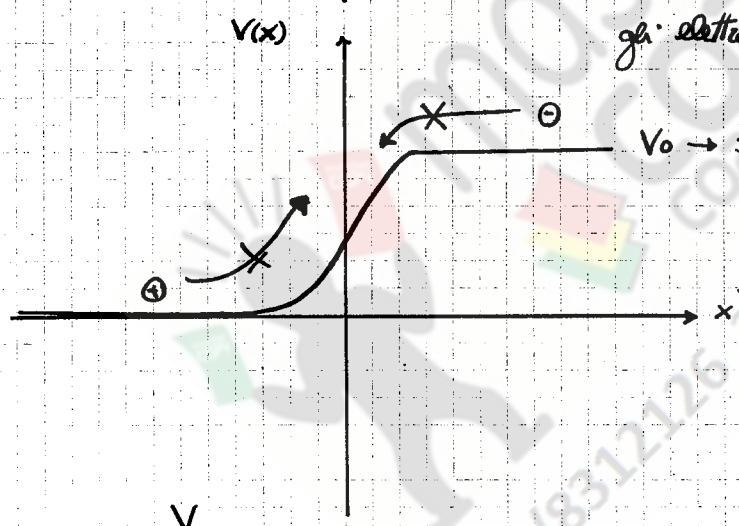
per $x<0$ $p = N_A$ $n \cong 0$

$x>0$ $p \cong 0$ $n = N_D$

accettori

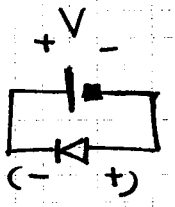
donatori



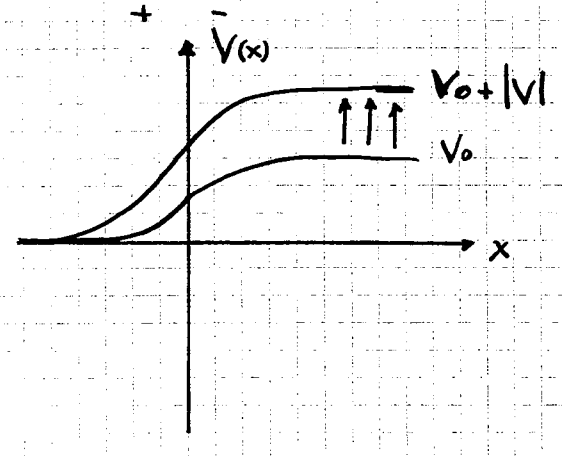


gli elettroni nella "discesa" vedono una "salita"

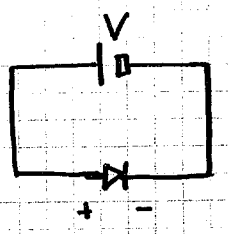
V_0 → barriera di potenziale



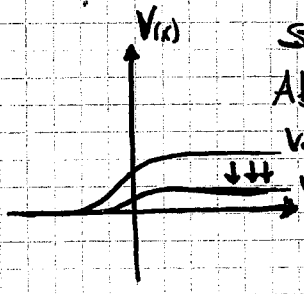
La tensione è discorde a V_0, aumenta la regione di svuotamento aumentando la barriera di potenziale che impedisce il fluire della corrente



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se la tensione è concorde e è di un valore sufficiente, allora si iniziano a diffondere elettroni e lacune. Stringendo la zona di svuotamento. Abbassa la barriera



corrente nel diodo

$$I = I_0\left(e^{\frac{V}{V_T}} - 1\right)$$

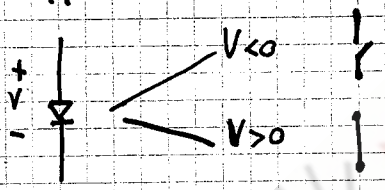
$$V_T = \frac{kT}{q} = 0{,}0258\ V$$

$k = 1{,}38 \times 10^{-23}\ J/K$

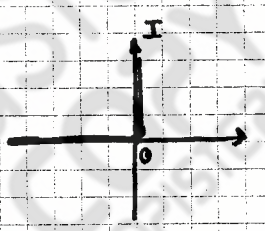
Se $T = 300\ K$

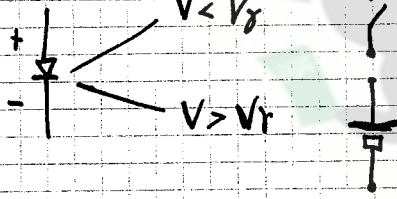
$I_0 \approx 10\ \mu A / mA$

Applicazioni Circuitali.

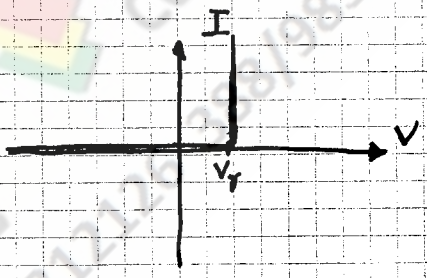


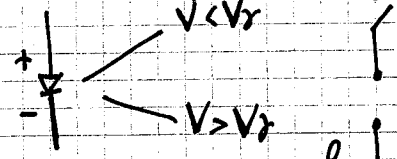
Modello ideale

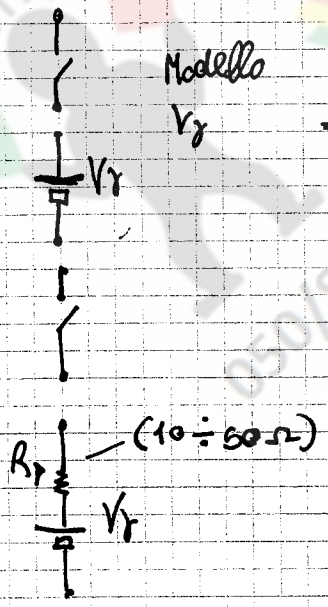


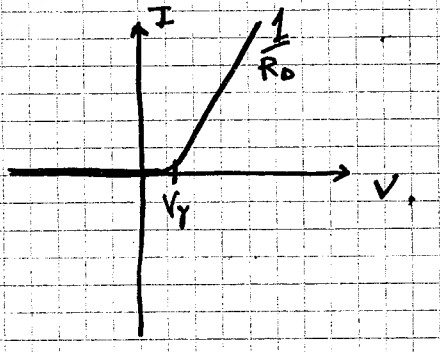


Modello V_γ





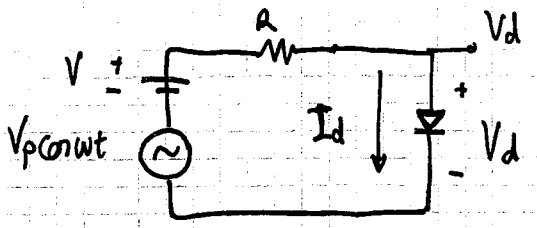


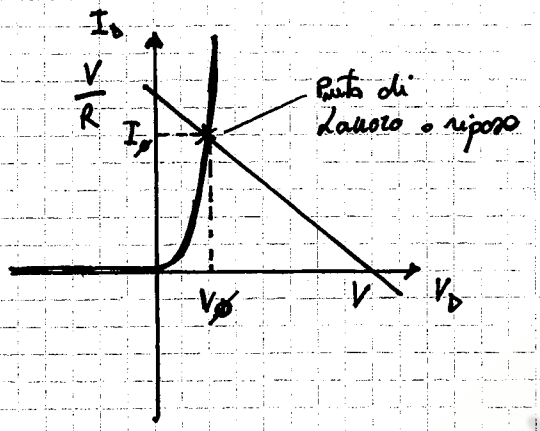


$V(t) = V + V_p \cos(\omega t)$ $\boxed{V_p \ll V}$

$v(t) = V(t) - V = \Delta V(t)$

↙ Variazione di tensione al valore medio





se $V_D > V_T$ $\quad I = I_0 \left(e^{\frac{V_D}{V_T}} - 1\right)$

$V_{DC} + V_p \cos\omega t = R I_D(t) + V_D(t)$

$V_D(t) = V(t) - R I_D(t)$

↙

$V_{DC} + V_p \cos\omega t$

$$\begin{cases} V_D(t) = V(t) - R I_D(t) \\ I_D(t) = I_0 e^{\frac{V_D(t)}{V_T}} \end{cases}$$

retta di carico — Tensioni e correnti di carico non dipendono da "t"

$V_D = V - R I_D$

$V_D(t) = V_D + v_D(t)$

$I_D(t) = I_D + i_D(t)$

Variazioni

$v_D(t) = V_D \cos\omega t - R i_D(t)$

Variazioni

POLARIZZAZIONE ⟶ PUNTO DI RIPOSO ⟶ VARIAZIONI

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