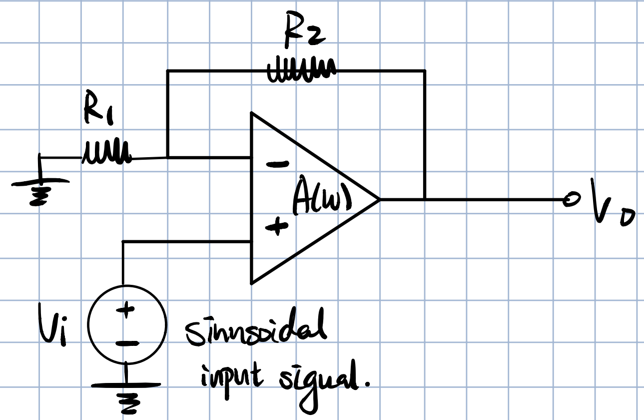
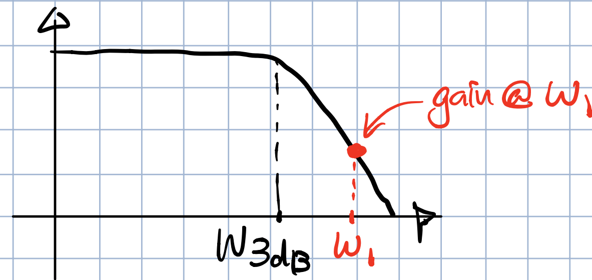
Example 1



$$\frac{V_o}{V_I} = \frac{1+R_2/R_1}{1+j\omega/\omega_{3dB}}$$



to avoid SR limiting

$$SR = V_{opk}\cdot\omega$$

$$V_{opk} = \frac{SR}{\omega}$$

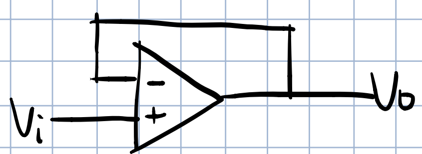
given

Say you have to work with ω

the input signal level will be calculated

$$V_{Ipk} = \frac{V_{opk}}{\text{gain}@\omega_1} = \frac{SR/\omega_1}{\text{gain}@\omega_1}$$

Example



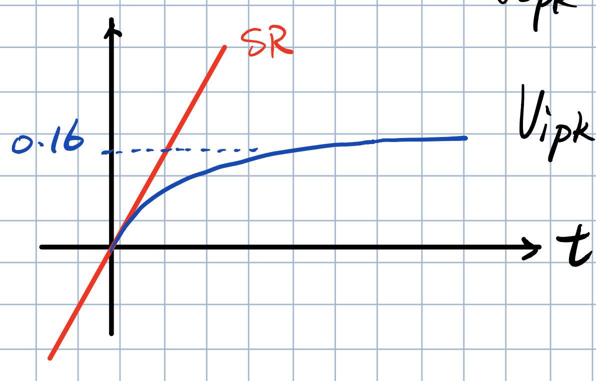
given that the Op-amp has SR of $1V/\mu s$ and unity gain-BW product of 1MHZ

a) find the largest possible input voltage step for with the output is not SR limited.

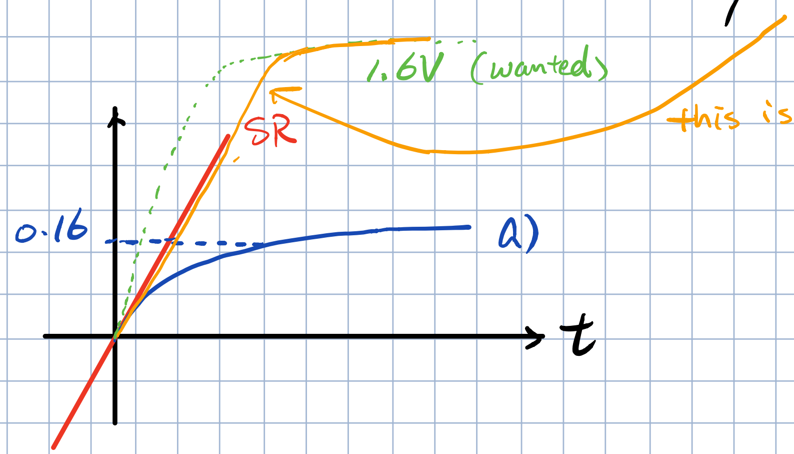
$$\omega_t\cdot V_{opk} = SR = 1V/\mu s = 10^6\,V/s\,,\quad f_t = 1MHz$$

$$V_{opk} = \frac{10^6}{2\pi\times10^6} = \frac{1}{2\pi} = 0.16V\,,$$

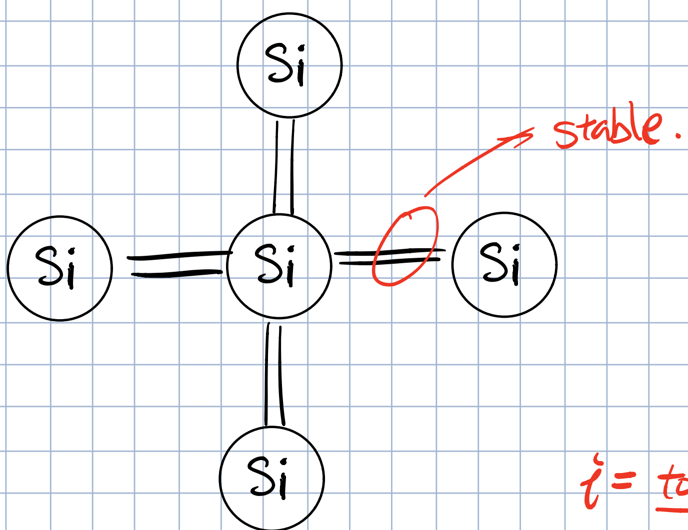
$$V_{ipk} = \frac{V_{opk}}{\text{gain}} = 0.16V$$

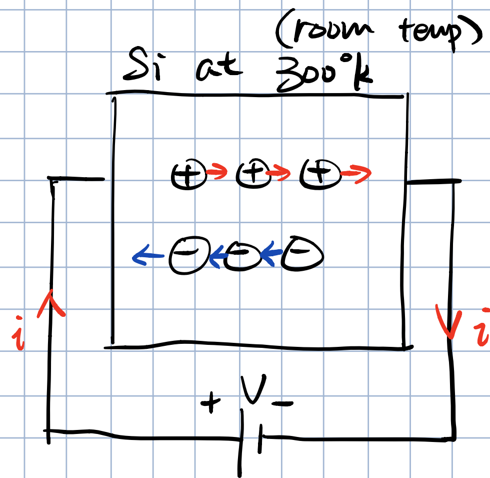


b) If an input of 10x of this value in a) is used. What would be the output voltage look like.?



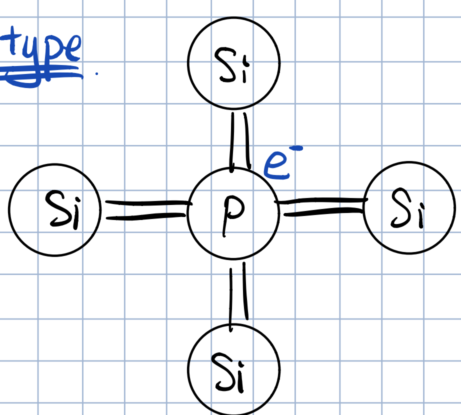
Semiconductor Physics.



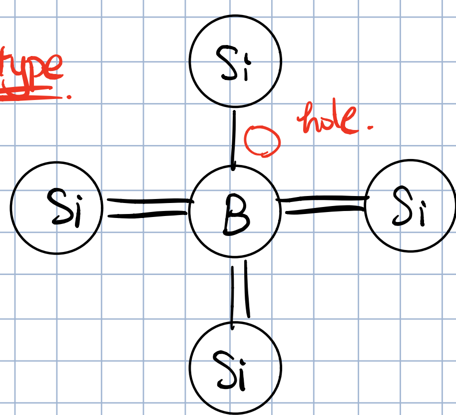


$$i = \frac{\text{total charge}}{\text{time}} = \frac{\#\text{ of holes} + \#\text{ of electrons}}{\text{time}}$$

n-type.



p-type.

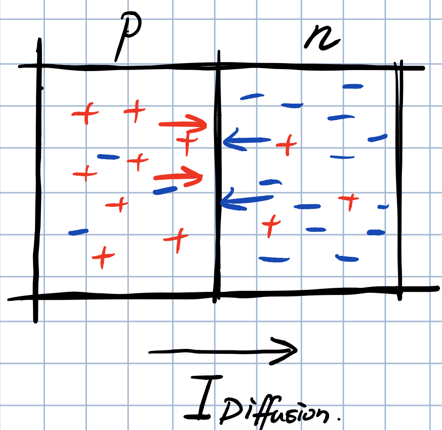


higher e^- concentration. (major carrier)

higher hole concentration. (major carrier) mechanism for currents to move.

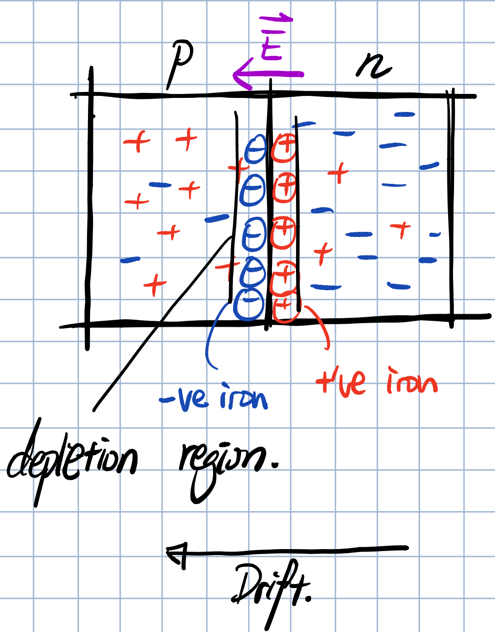
① Diffusion.

higher concentration of major carriers → lower.



② Drifting.

minority carriers are swept across the boundary by the $\vec{E}$

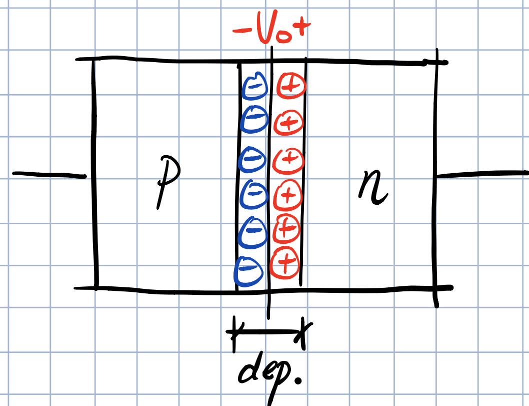


① Equilibrium. (open-cct)

$I_{Diff} = I_{Drift}\ (I_S)$

$I_{Diff} \rightarrow$

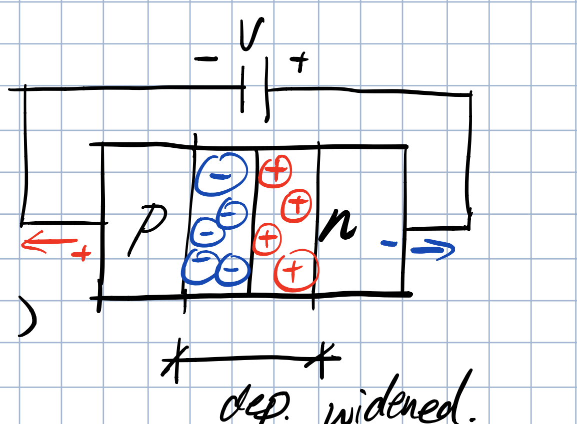
$\leftarrow I_{Drift}$



② Reverse Bias.

$I_{Diff} \rightarrow$

$\leftarrow I_{Drift}\ (I_S)$



③ Forward Bias.

I_{Diff} →

← I_{Drift} (I_s)