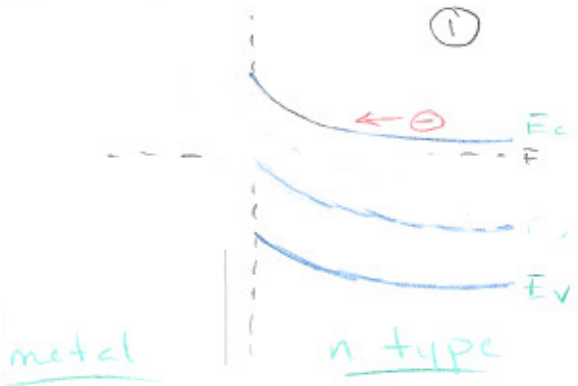
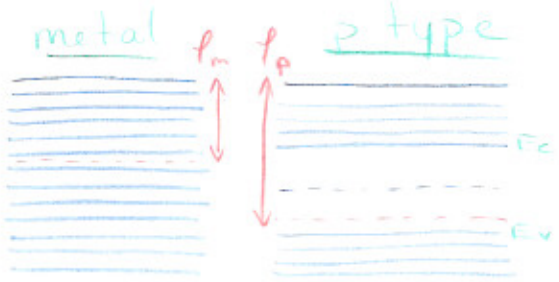
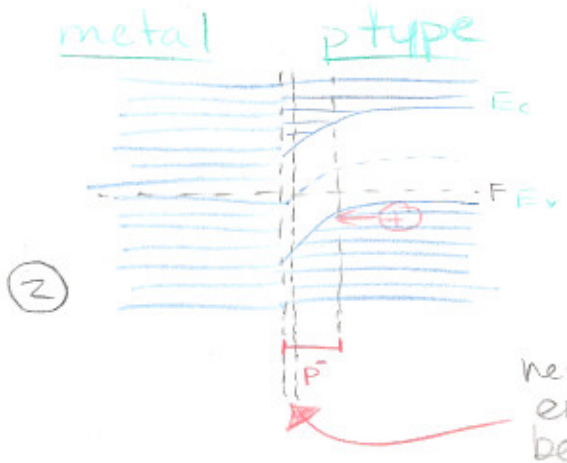
SCHOTKY DIODE



$$\ell_p > \ell_m$$

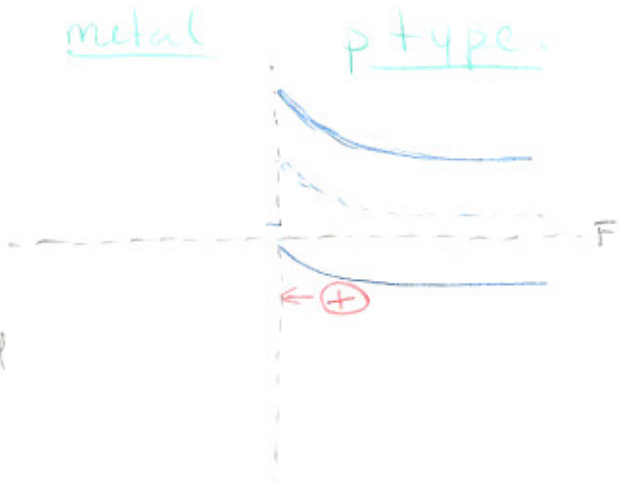




note: here we have created an energy barrier as well.

here if the middle of the energy band gap drops below the fermi level then n type can form.

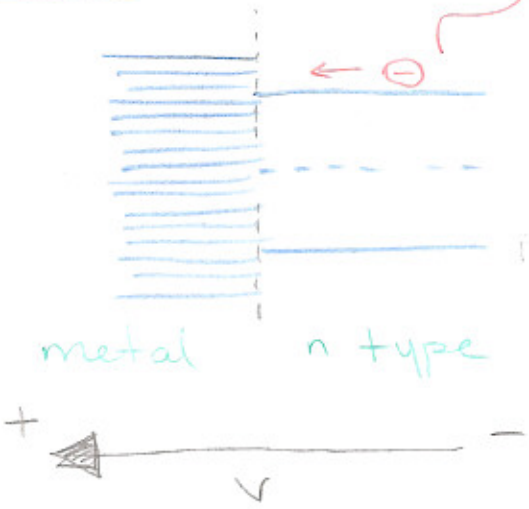
when $\ell_p < \ell_m$



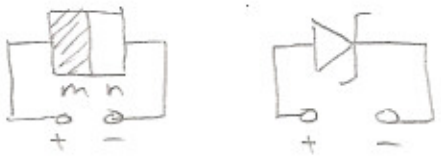
note: no energy barrier

RE: ①:

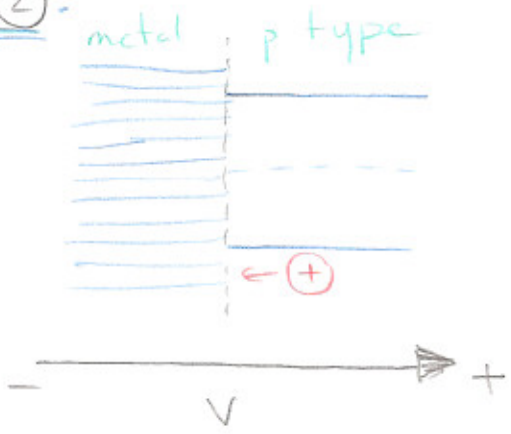
free to flow.



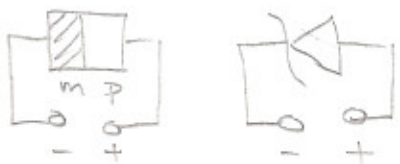
$$V = V_T = \frac{\Delta \varphi}{q_0}$$



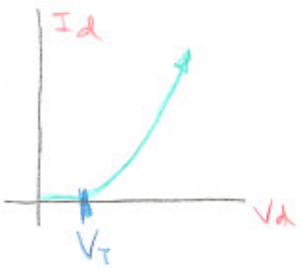
RE: ②:

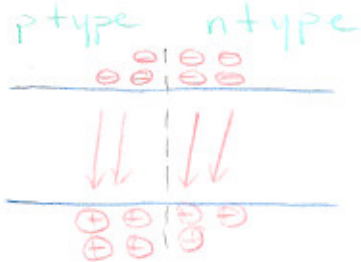


$$V = V_T = \frac{\Delta \varphi}{q_0}$$



note: the advantages are lower threshold voltage and faster switching time.

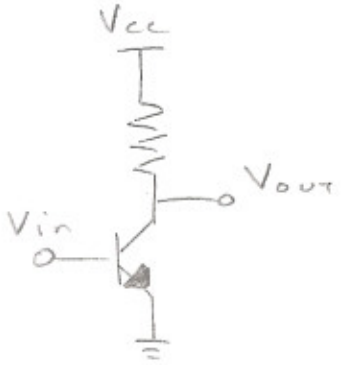




note: the is a time delay for the recombination. (τ)

the schotkey diodes do not have this (τ) is can be assumed $\tau \approx 0$.

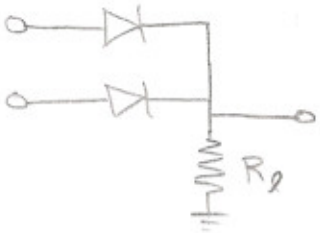
LOGIC CIRCUITS



NOT

$Y = \overline{X}$

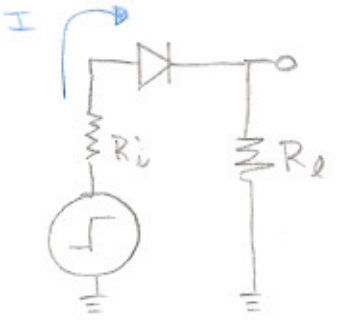
OR



$Z = X + Y$

note: in design of this circuit we should take into account V_T and R_i of diode.

$V_{in}^{0} < V_{T(D)}$



GIVEN: V_{in}', R_i, V_{OUT}', V_{TD}, R_D

FIND: R_l

ANALYSIS:

$$IR_i + IR_D + IR_l + V_{TD} = V_{in}'$$

$$I = \frac{V_{in}' - V_{TD}}{R_i + R_D + R_l}$$

$$V_{OUT} = IR_l > V_{OUT}'$$

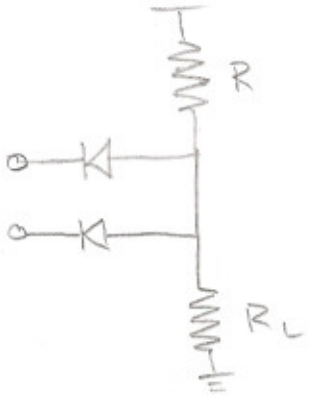
$$R_l \frac{V_{in}' - V_{TD}}{R_i + R_D + R_L} > V_{OUT}'$$

$$R_l (V_{in}' - V_{TD}) > V_{OUT}' R_l + V_{OUT}' R_D + V_{OUT}' R_i$$

$$R_l (V_{in}' - V_{TD} - V_{OUT}') > V_{OUT}' (R_D + R_i)$$

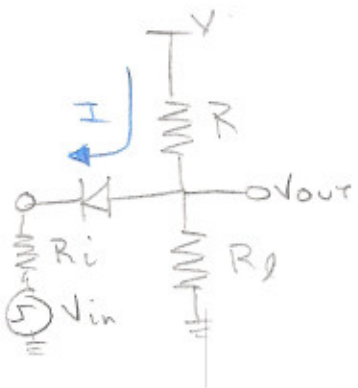
$$\boxed{R_l > \frac{V_{OUT}' (R_D + R_i)}{V_{in}' - V_{TD} - V_{OUT}'}}$$

AND:



$z = x \cdot y$

for design we should consider.



GIVEN: $V, V_{in}^{\circ}, R_i, V_{TD}, R_D$

FIND: R, R_l

ANALYSIS:

if $I \neq 0$, $I_l \approx 0$

$$IR + IR_D + IR_i + V_{TD} + V_{in}^{\circ} = V$$

$$V_{OUT} = V - IR \leq V_{in}^{\circ}$$

$$V - \frac{V - V_{in}^{\circ} + V_{TD}}{R + R_D + R_i} \cdot R \leq V_{in}^{\circ}$$