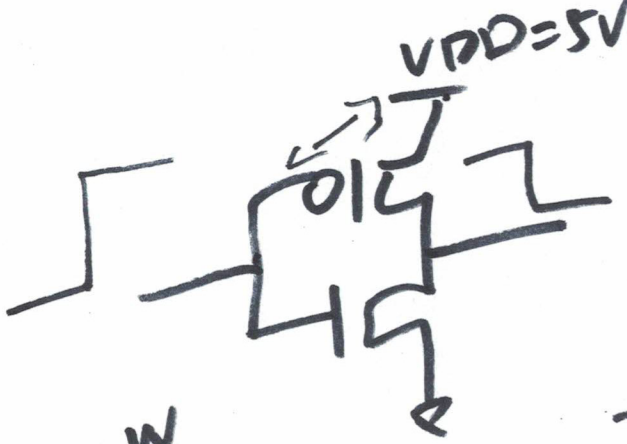
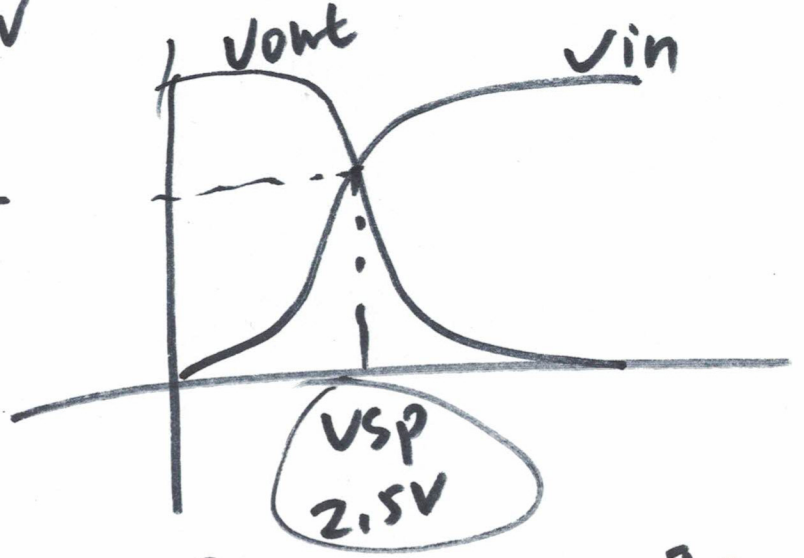
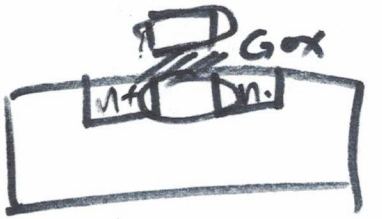
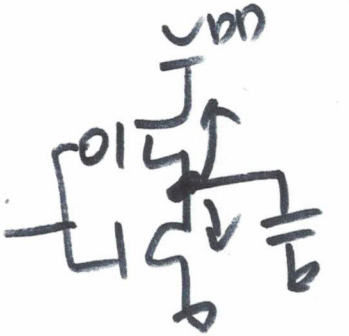








$\beta_n = KP_n \frac{W}{L}$

$\frac{\beta_n}{2}(V_{GS} - V_{THN})^2 = \frac{\beta_p}{2}(V_{SG} - V_{THP})^2$

$V_{GS} = V_{sp} \qquad V_{SG} = V_{DD} - V_{sp}$

$KP_n = \mu_n C_{ox_n}$

$KP_p = \mu_p C_{ox_p}$

$120\,\mu A/V^2$ $\qquad$ $40\,\mu A/V^2$

$$V_{sp} = \frac{\sqrt{\frac{\beta_n}{\beta_p}}\,V_{THN} + (V_{DD} - V_{THP})}{1 + \sqrt{\frac{\beta_n}{\beta_p}}} = 2.5\,V$$

(0.8 V, 5 V, 0.9 V)

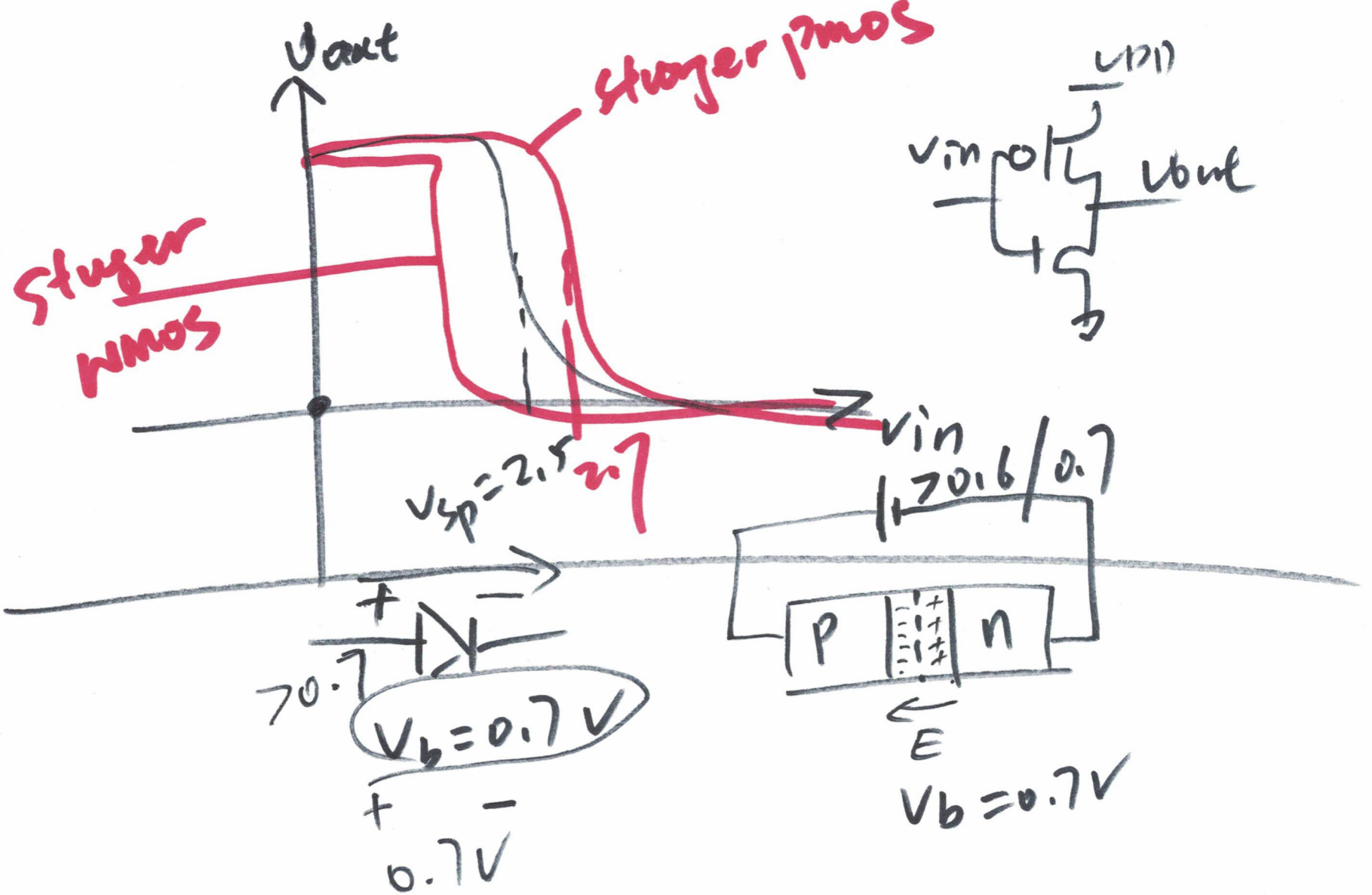
$\sqrt{\frac{\beta_n}{\beta_p}} \approx 1$

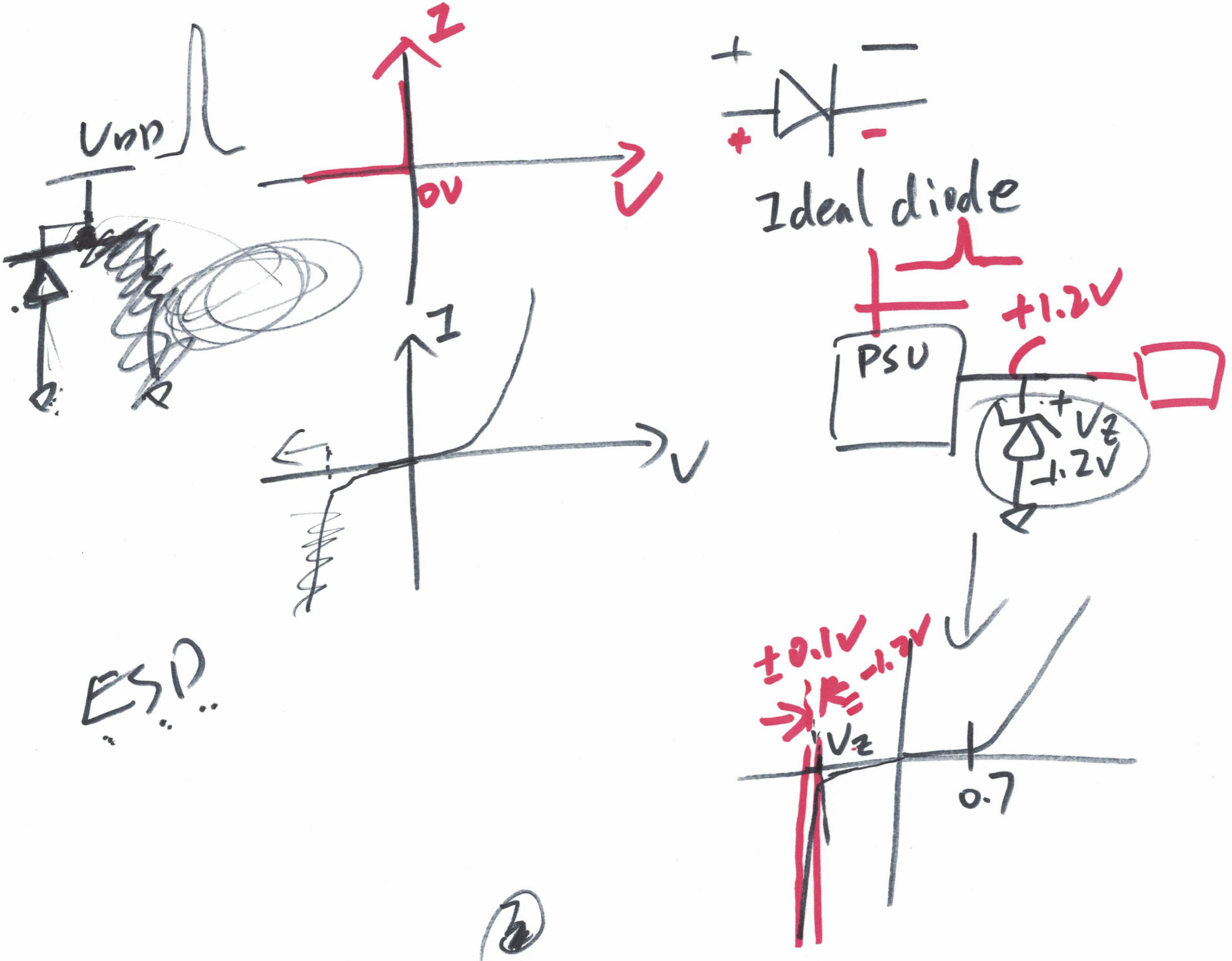
$\frac{\beta_n}{\beta_p} = 1$

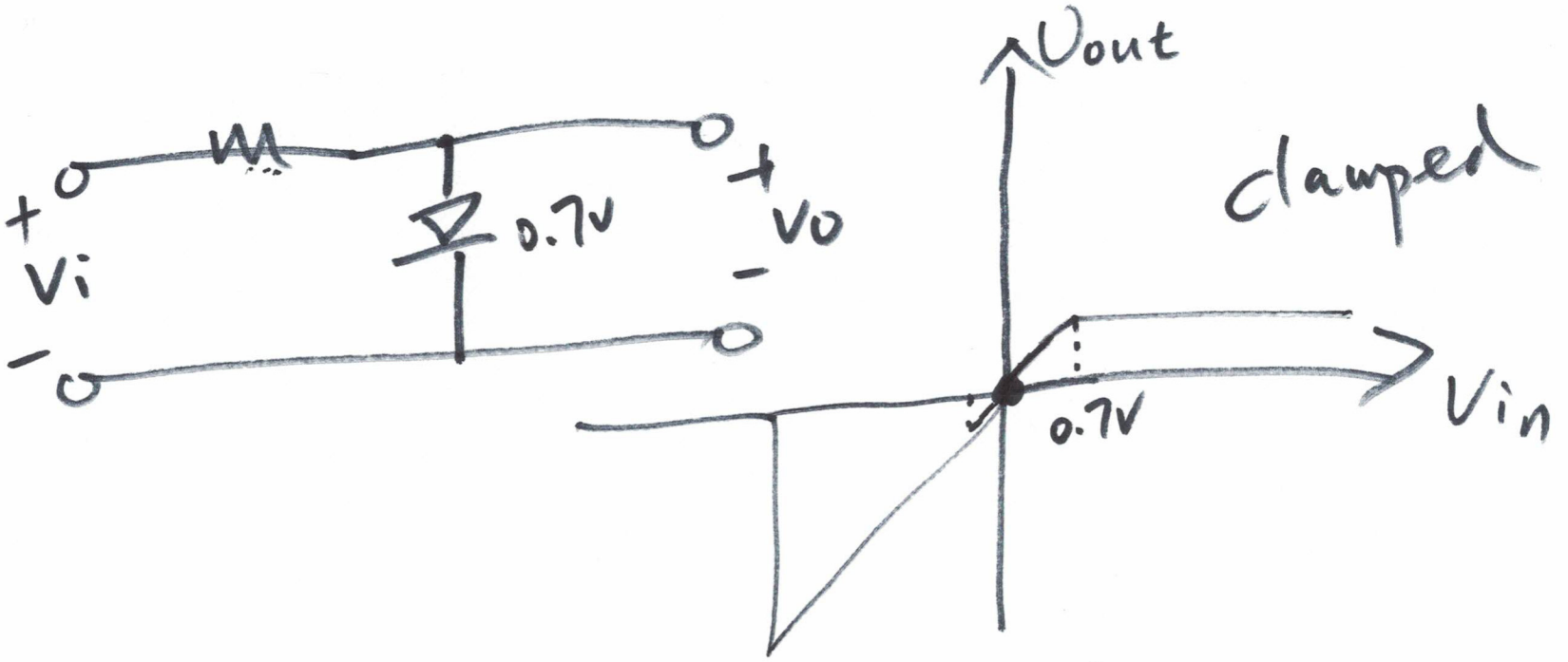
$\beta_n = \beta_p$

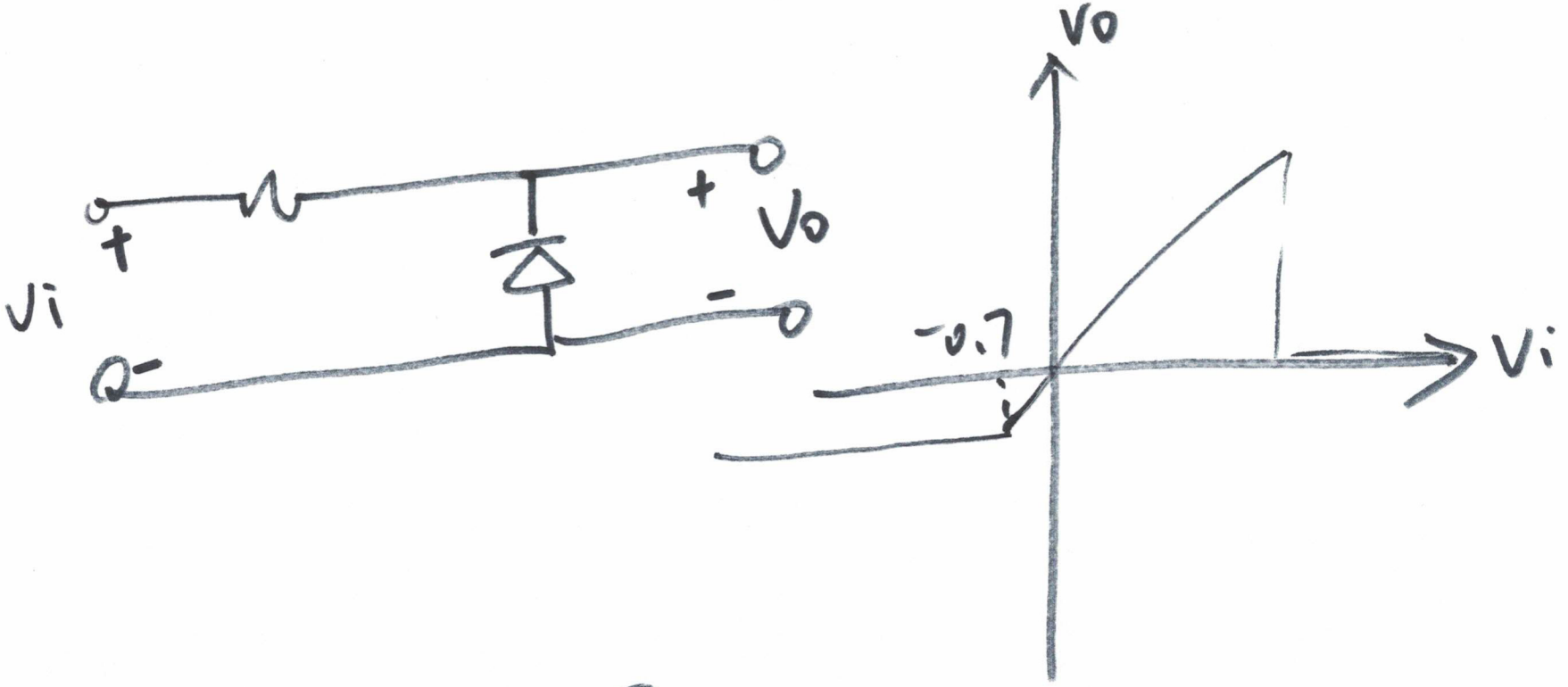
$KP_n \frac{W_n}{L_n} = KP_p \frac{W_p}{L_p}$

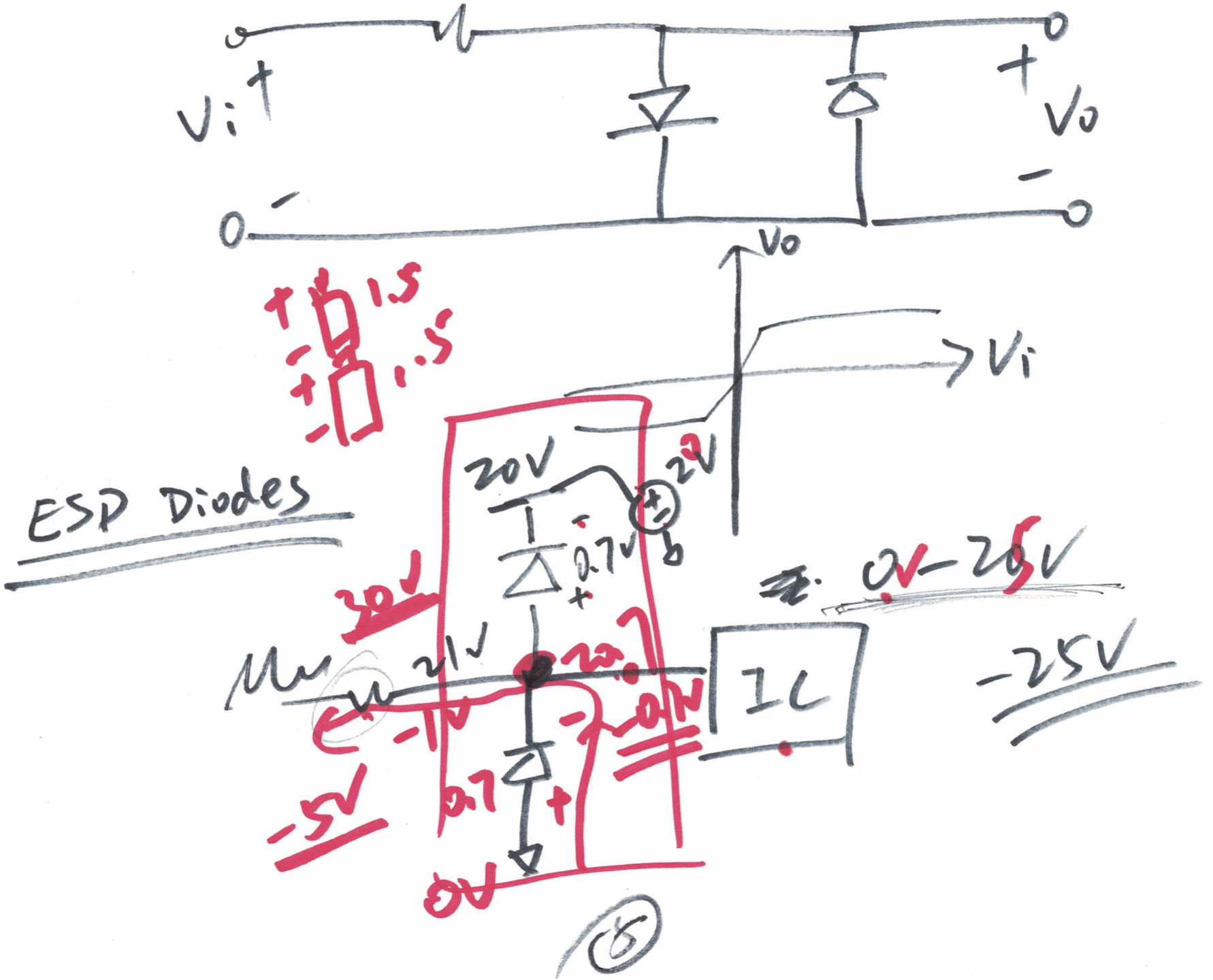
$\frac{W_p}{L_p} = 3\frac{W_n}{L_n}$


Vout
stronger pmos
stronger nmos
Vin
Vsp=2.5
Vin
Vout
Vin
>0.6/0.7
P
n
E
>0.7
Vb=0.7V
+
−
0.7V
Vb=0.7V


Vesd
I
0V
V
+
-
Ideal diode
I
V
PSU
+1.2V
Vz
1.2V
±0.1V
1.3V
Vz
0.7


+
Vi
−
0.7V
+
Vo
−
Vout
clamped
0.7V
Vin


+
Vi
−
+
Vo
−
Vo
-0.7
Vi


Vi
Vo
1.5
1.5
Vo
Vi
20V
2V
0.7V
ESP Diodes
30V
21V
IC
-5V
0.7
0V
-25V