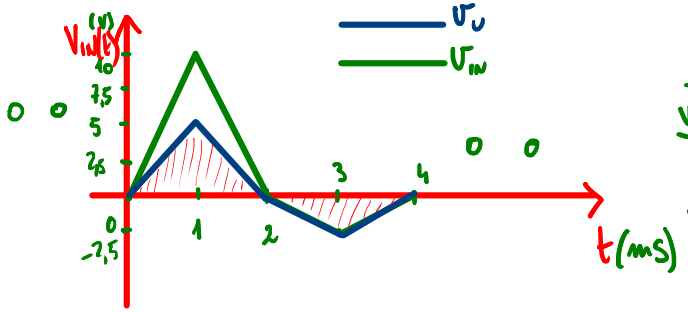
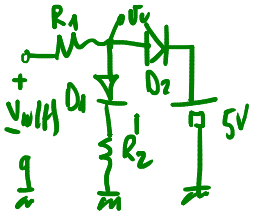
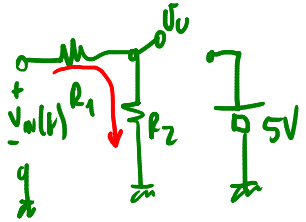




$0 \le t \le 1\,mS$: D1 ON ∧ D_2 OFF

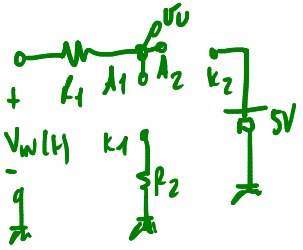


$$V_U(t) = \frac{R_2}{R_1+R_2} V_{IN}(t)$$

$1\,ms < t \le 2\,mS$: D_1 ON ∧ D_2 OFF

$$V_U(t) = \frac{R_2}{R_1+R_2} V_{IN}(t)$$

$2\,mS < t \le 4\,mS$: D_1 OFF ∧ D_2 OFF

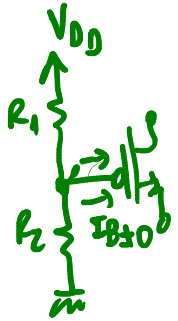


$$V_U(t) = V_{IN}(t)$$

$$\overline{V_U(t)} = \frac{1}{T}\int_0^T V_U(t)\,dt = \frac{2.5 - 2.2,5}{4.2} = \frac{2,5}{4} = \frac{1,25}{2} = 0,625\,V$$

$$V_{GS1} = V_{G1} - V_{S1}$$

$$V_{G1} = \frac{R_{G2}}{R_{G1}+R_{G2}} V_{DD}$$



$$I_B \ll \frac{V_{DD}}{R_1+R_2}$$

$$V_{S1} = ? = R_S I_{DS1}$$

$$\begin{cases} V_{GS1} = \dfrac{R_{G2}}{R_{G2}+R_{G1}} V_{DD} - R_S I_{DS1} \\ I_{DS1} = \dfrac{k}{2}\left(V_{GS1} - V_T\right)^2 \end{cases}$$

$$R_S^2 I_{DS1}^2 - \left[2R_S(V_{G1}-V_T) + \frac{2}{k}\right] I_{DS1} + (V_{G1}-V_T)^2 = 0$$

$$I_{DS1} = \begin{cases} 1\,mA & \text{ok} \quad V_{GS1} \geq V_T \\ 1{,}5625\,mA \end{cases}$$

$V_{GS1} = 2V \geq V_T = 1V$ ok inversione

$I_{DS1} = I_{DS2} = 1\,mA$ $\qquad$ $V_{GS1} = 2V \Rightarrow V_{GS2} = 2V$

V_{DS1} , V_{DS2}

$$V_{G2} = \frac{R_{G4}}{R_{G4}+R_{G3}} V_{DD} = 8V$$

$V_{S2} = V_{G2} - V_{GS2} = 6V = V_{D1}$

$V_{S1} = R_S I_{DS1} = 4V$

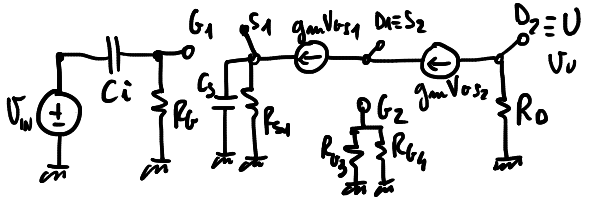
$V_{DS2} = V_{D2} - V_{S2}$ $\qquad$ $V_{D2} = V_{DD} - R_D \cdot I_{DS1} = 8V$

$V_{DS1} = V_{D1} - V_{S1} = 2V \geq V_{GS1} - V_T = 1V$

Sat. M_1 verificata

$V_{DS2} = V_{D2} - V_{S2} = 2V \geq V_{GS2} - V_T = 1V$

Sat M_2 verificata



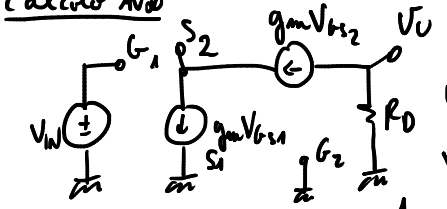
$$A_V(s) = \frac{V_U(s)}{V_{IN}(s)} = \frac{A_{V0}\, s\,(s+\omega_0)}{(s+\omega_{p1})(s+\omega_{p2})}$$

$$\omega_{p1} = \frac{1}{C_i R_G} = 40\ \text{rad/sec}$$

$$\omega_{p2} = \frac{1}{C_S R_{S1} \| \frac{1}{g_m}} = 2{,}25\ \text{Mrad/sec}$$

$$\omega_0 = \frac{1}{C_S R_{S1}} = 250\ \text{Krad/sec}$$

Calcolo A_{V0}

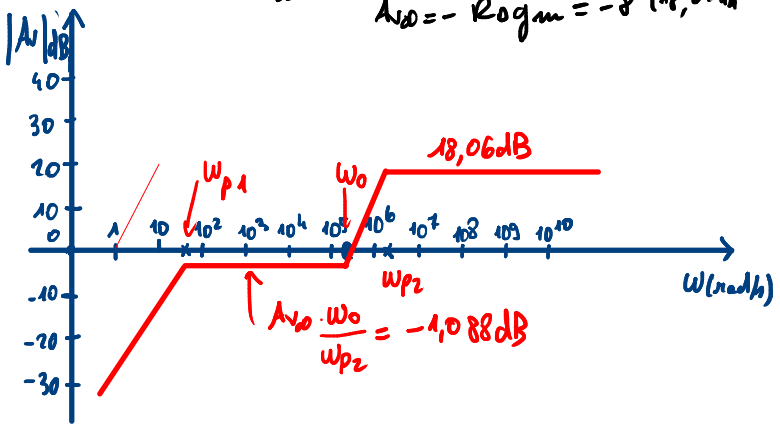


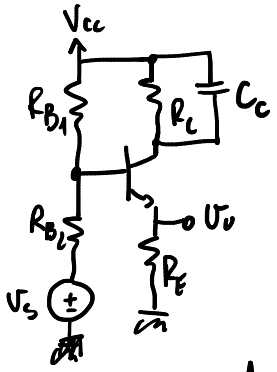
$g_m V_{bs2} = g_m V_{GS1}$

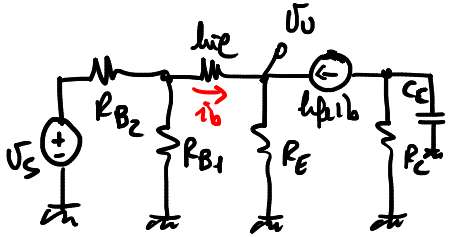
$V_U = -R_D g_m V_{GS2}$

$V_{GS2} = V_{IN}$

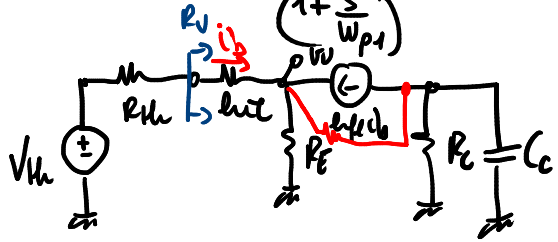
$A_{V0} = -R_D g_m = -8\ (18{,}06\text{dB})$







$$A_V(s) = \frac{\left(1+\frac{s}{\omega_0}\right) h_{fe}}{\left(1+\frac{s}{\omega_{p1}}\right)} \qquad \omega_{p1} = \frac{1}{C_C R_C}$$



$$V_{Th} = \frac{R_{B1}}{R_{B1}+R_{B2}} V_S \qquad R_{Th} = R_{B1} \| R_{B2} \qquad V_U = + R_E (h_{fe}+1) i_b$$

$$R_V = h_{ie} + R_E (h_{fe}+1) \qquad i_b = \frac{V_{Th}}{R_{Th}+R_V} \qquad V_U = + \frac{R_E (h_{fe}+1)}{R_{Th}+R_V} V_{Th}$$

$$\frac{V_U}{V_S} = + \frac{R_E (h_{fe}+1)}{R_{Th}+R_V} \cdot \frac{R_{B1}}{R_{B1}+R_{B2}} = A_V(s)$$

$$A_V(s) = \frac{A_{V0}\left(1+\frac{s}{\omega_0}\right)}{\left(1+\frac{s}{\omega_{p1}}\right)} \qquad \omega_{p1} = \frac{1}{R_C C_C}$$