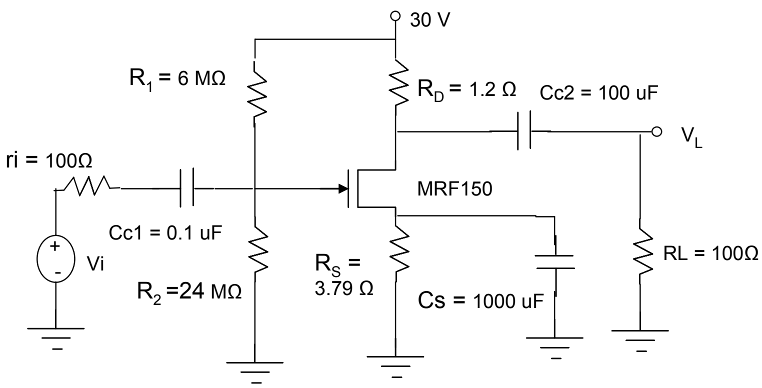
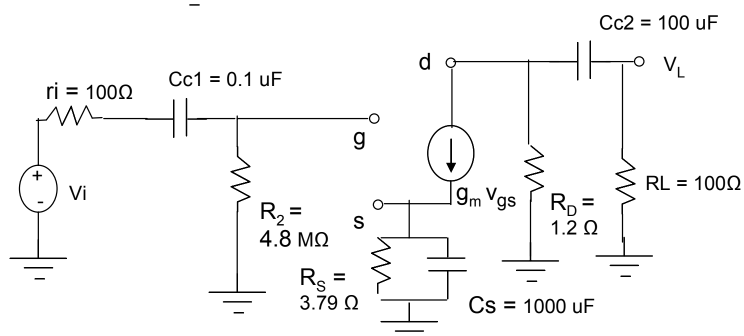
Respuesta en Frecuencia con FET



$i_{DS} = k_n (v_{GS} - V_{TN})^2$

$k_n = 1.25\ A/V^2$, $v_{TN} = 1\ V$: $\left\{ i_{DS} = 5.5\ A,\ v_{GS} = 3.1\ V,\ g_m = 5.24\ \mho \right.$

$k_n = 1.25\ A/V^2$, $v_{TN} = 5\ V$: $\left\{ i_{DS} = 4.5\ A,\ v_{GS} = 6.89\ V,\ g_m = 4.74\ \mho \right.$



$$Z_S = \frac{Rs\,(1/j\omega Cs)}{Rs + 1/j\omega Cs}$$

$$Z_S = \frac{Rs}{j\omega Cs\,Rs + 1}$$

$$A_v = \frac{v_L}{v_i} = \frac{v_L}{v_s}\frac{v_s}{v_g}\frac{v_g}{v_i} \qquad \frac{v_g}{v_i} \qquad v_g = \frac{4.8M}{100 + 4..8M + 1/j\omega Cc1}\,v_i \qquad v_g = \frac{j\omega\,4.8MCc1}{j\omega Cc1(100 + 4..8M) + 1}\,v_i$$

$$\frac{v_g}{v_i} = \frac{0.48\,j\omega}{1 + j\omega/2.08} \qquad v_S = g_m v_{gs} Z_S = g_m Z_S\,(v_g - v_s) = g_m Z_S v_g - g_m Z_S v_s \qquad v_S + g_m Z_S v_s = g_m Z_S v_g$$

$$\frac{v_s}{v_g} = \frac{g_m Z_S}{1 + g_m Z_S} \qquad v_{gs} = \frac{v_S}{g_m Z_S} \qquad v_L = \frac{1.2}{1.2 + 100 + \frac{1}{j\omega Cc2}}\,100 g_m v_{gs}$$

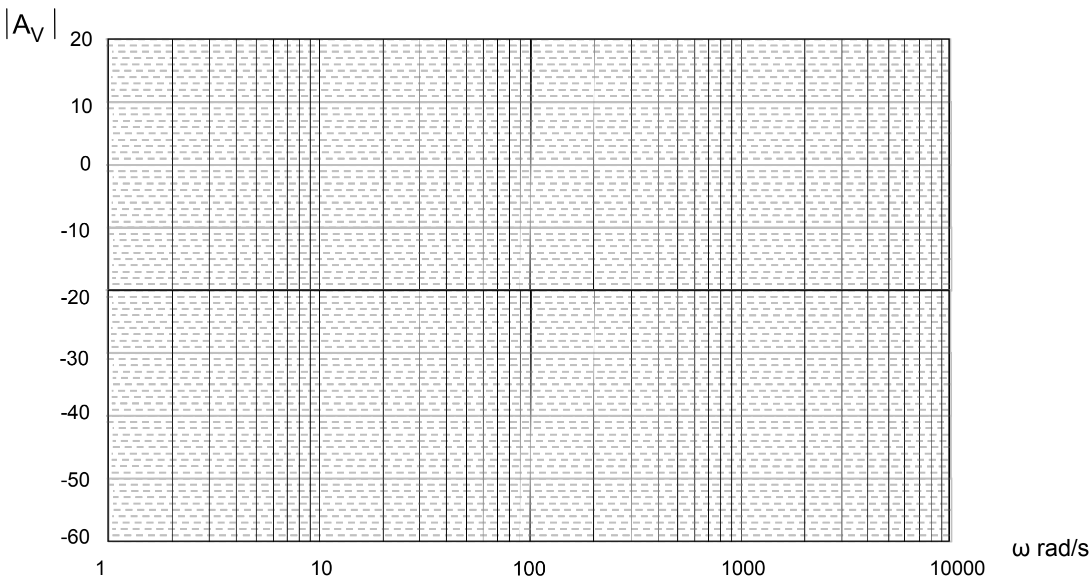
$$\frac{v_L}{v_S} = \frac{120\,j\omega Cc2}{101.2\,j\omega Cc2 + 1}\,\frac{1}{Z_S}$$

$$\frac{g_m}{1 + g_m Z_S} = \frac{g_m}{1 + g_m \frac{Rs}{j\omega Cs\,Rs + 1}} = \frac{g_m(j\omega Cs\,Rs + 1)}{j\omega Cs\,Rs + 1 + Rs\,g_m}$$

$$\frac{g_m \cancel{Z_S}}{1 + g_m Z_S}\,\frac{120\,j\omega Cc2}{101.2\,j\omega Cc2 + 1}\,\frac{1}{\cancel{Z_S}} = \frac{120\,j\omega Cc2}{101.2\,j\omega Cc2 + 1}\,\frac{g_m(j\omega Cs\,Rs + 1)}{j\omega Cs\,Rs + 1 + Rs\,g_m}$$

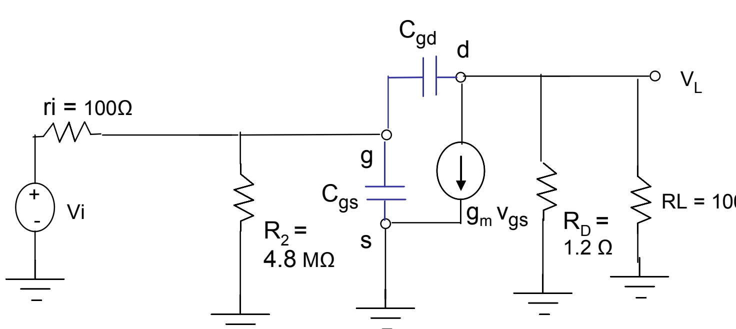
$$A_v = \frac{v_L}{v_i} = \frac{v_L}{v_s}\,\frac{v_s}{v_g}\,\frac{v_g}{v_i} = \frac{(j\omega)^2\,(1 + j\omega_{/263.85})}{692.7\,(1 + j\omega_{/2.08})\,(1 + J\omega_{/98.81})\,(1 + j\omega_{/5263})}$$

$g_m \approx 5\ \mho$



Frecuencia de Corte en Alto

MosFET: MRF150



C_{gd} = 40 pF

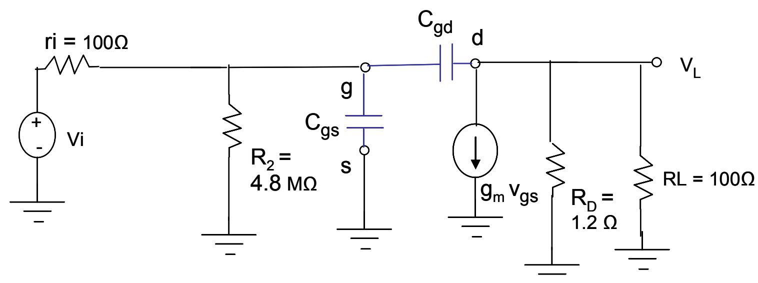
C_{gs} = 360 pF

$C_{gd} + C_{gs}$ = 400 pF

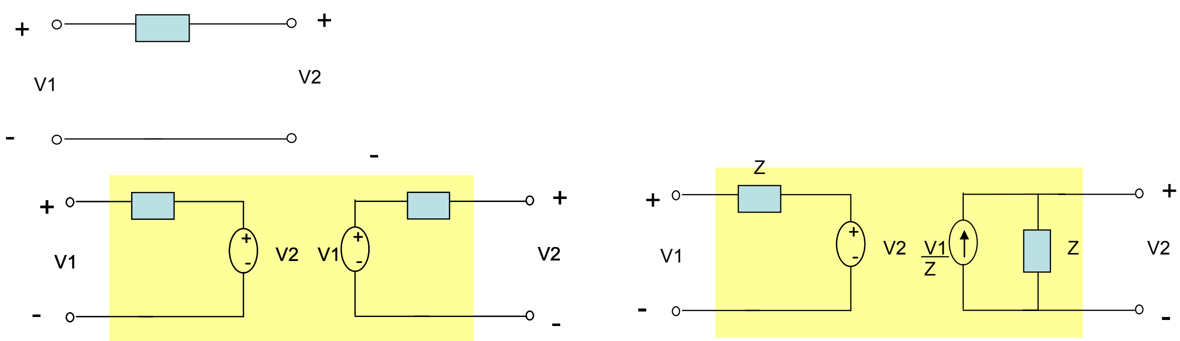
DYNAMIC CHARACTERISTICS

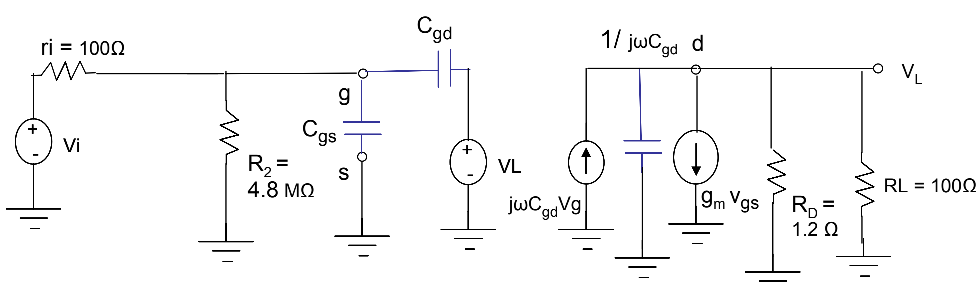
Input Capacitance (V_{DS} = 50 V, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	—	400	—	pF
Output Capacitance (V_{DS} = 50 V, V_{GS} = 0, f = 1.0 MHz)	C_{oss}	—	240	—	pF
Reverse Transfer Capacitance (V_{DS} = 50 V, V_{GS} = 0, f = 1.0 MHz)	C_{rss}	—	40	—	pF

C_{gd} = 40 pF



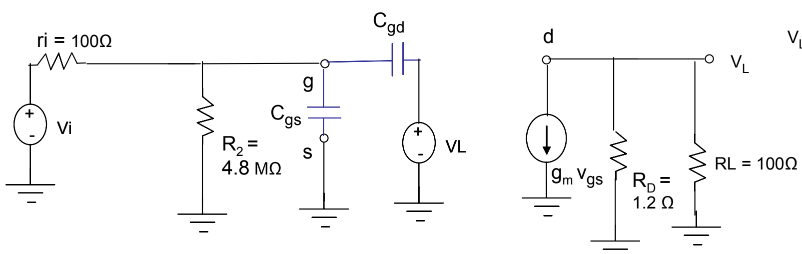
Teorema de Miller:



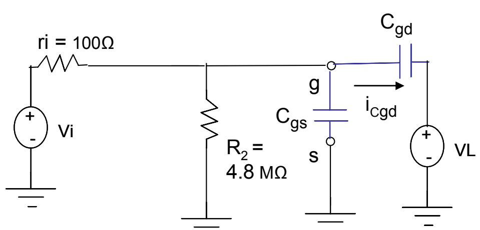


$1/\, j\omega C_{gd} \;>>\; R_D = 1.2\ \Omega$

$g_m v_{gs} \;>>\; j\omega C_{gd} Vg$

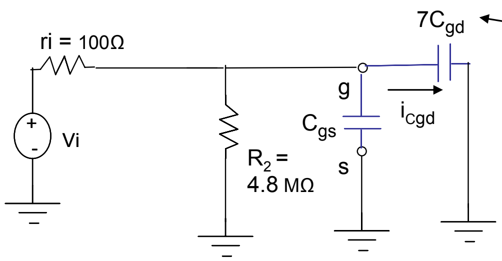


$V_L = - 6\, v_{gs}$



$V_L = - 6\, v_{gs} = - 6\, v_g$

$i_{Cgd} = j\omega C_{gd}\,(v_g - v_L) = j\omega\, 7\, C_{gd}\, v_g$



V_L =- 6 v_{gs} =- 6 v_g

$i_{Cgd} = j\omega\, 7\, C_{gd}\, v_g$

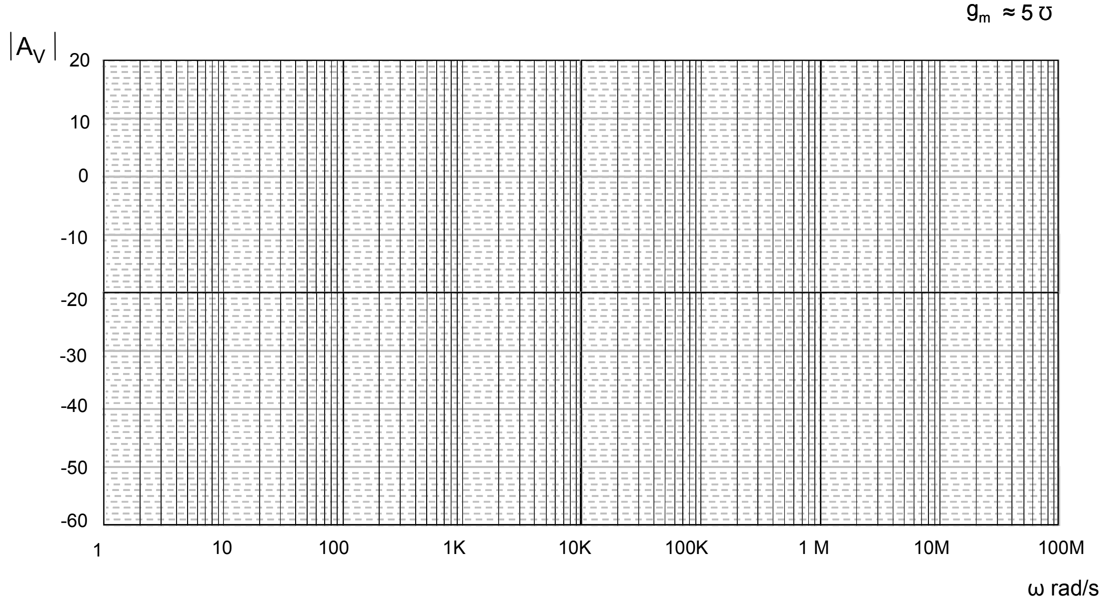
C_T = 360 pF + 280 pF = 640pF

$$R_2 \,/\!/\, j\omega C_T = \frac{R_2\left(1/j\omega C_T\right)}{R_2 + 1/j\omega C_T} = \frac{R_2}{j\omega C_T R_2 + 1}$$

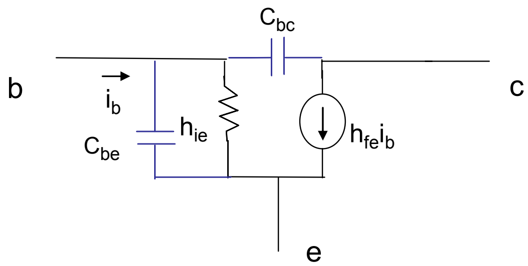
$$\frac{V_g}{V_i} = \frac{\dfrac{R_2}{j\omega C_T R_2 + 1}}{\dfrac{R_2}{j\omega C_T R_2 + 1} + ri} = \frac{R_2}{R_2 + ri + j\omega C_T R_2\, ri} = \frac{1}{1 + j\omega/15.6\ \text{Mrad/s}}$$

$$A_v = \frac{(j\omega)^2\,(1 + j\omega/263.85)}{692.7\,(1 + j\omega/2.08)\,(1 + J\omega/98.81)\,(1 + j\omega/5263)\,(1 + j\omega/15.6\ \text{Mrad/s})}$$

$g_m \approx 5$ ℧



Respuesta en alta frecuencia del transistor Bipolar

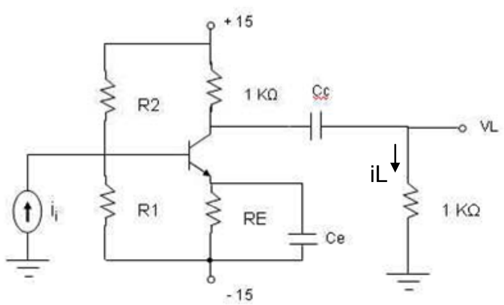


$C_{bc} = C_{ob}$

$$C_{be} = \frac{I_{CQ}}{V_T\,\omega_T} \qquad \omega_T = 2\pi f_T$$

$V_T = 25$ mV

Tarea:
Diseñe el siguiente circuito:
- R1, R2 y RE para máxima excursión simétrica para un ICQ de 10 mA
- Cc y Ce para una frecuencia de corte en bajo de 10 Hz
- Obtenga diagrama de Bode completo (en altas y bajas frecuencias) para los valores típicos del transistor que da el fabricante



Indicaciones: El trabajo debe incluir todo el desarrollo teórico, mostrando la función de transferencia completa (IL/Ii). Debe seleccionar un transistor comercial y adjuntar las especificaciones y marcar todas aquellas características que están en las especificaciones del transistor y que utilizó en su diseño.

*Nota: El transistor presentado por cada alumno debe ser diferente al de los compañeros