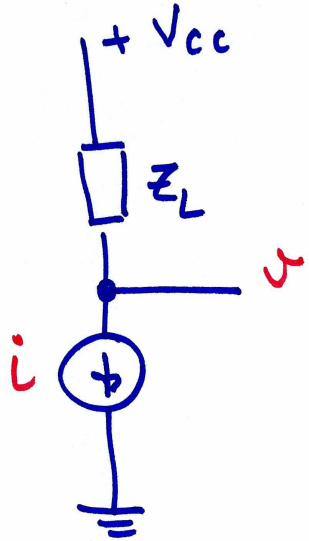
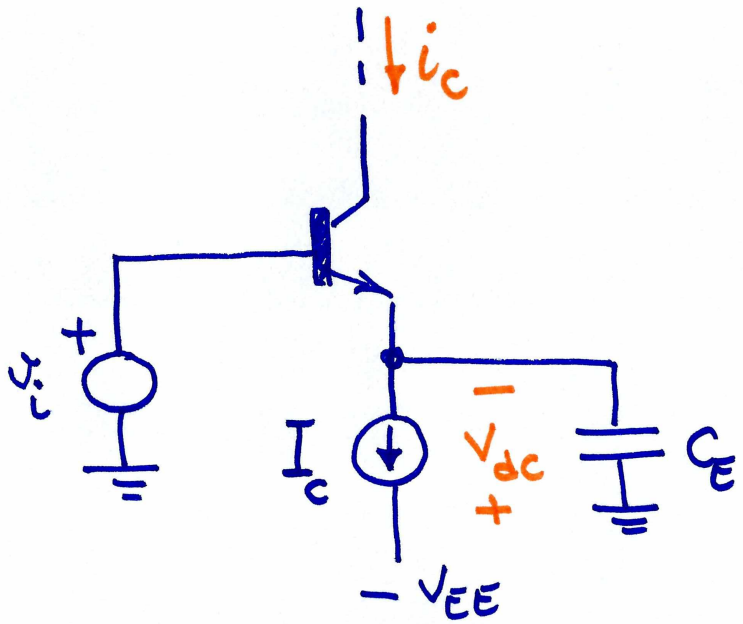
Amplificadores de banda estrecha



$Z_L \equiv$ impedancia de carga

$i \equiv$ corriente del dispositivo activo

i es función de la señal que queremos amplificar.



$$v_i = V_1 \cos \omega_0 t$$

$$\begin{cases} v_{BE} = V_{dc} + V_1 \cos \omega_0 t \\ i_c = I_s \, e^{v_{BE}/V_T} \end{cases}$$

$$i_c = I_c + I_c \sum_k a_k \cos k\omega_0 t$$

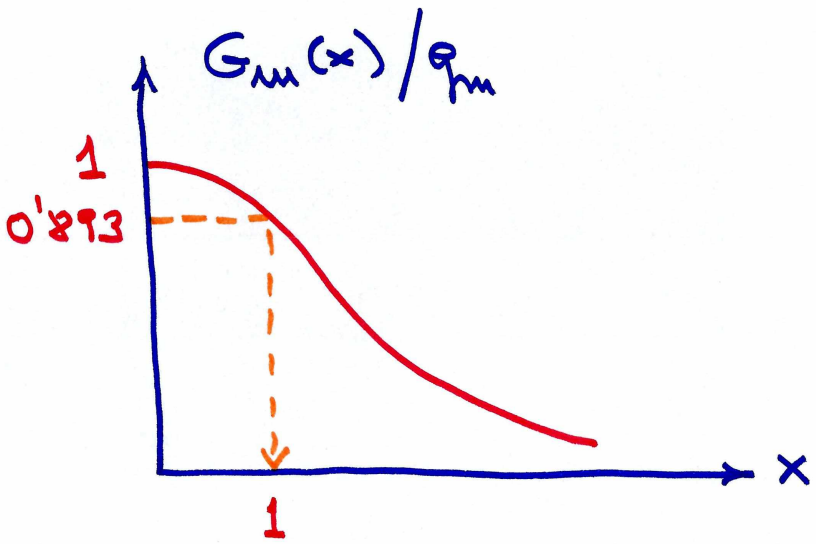
$$= I_c + G_m V_1 \cos \omega_0 t + \text{harmônicas}$$

Si $x \equiv \frac{V_i}{V_T}$ donde $V_T = \frac{kT}{q} \simeq 25\,mV$

$G_M = G_M(x) \equiv$ transconductancia

Si $x \to 0$ $\quad G_M(x) \longrightarrow g_m = \frac{I_C}{V_T}$

$$\Rightarrow \begin{cases} i_C = I_C + g_m v_i \\ \Delta i_C = g_m v_i \end{cases}$$



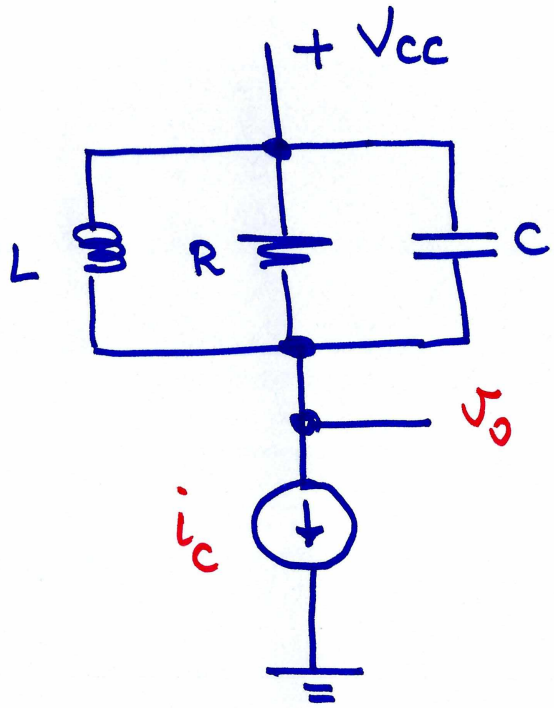
Si $x < 1$

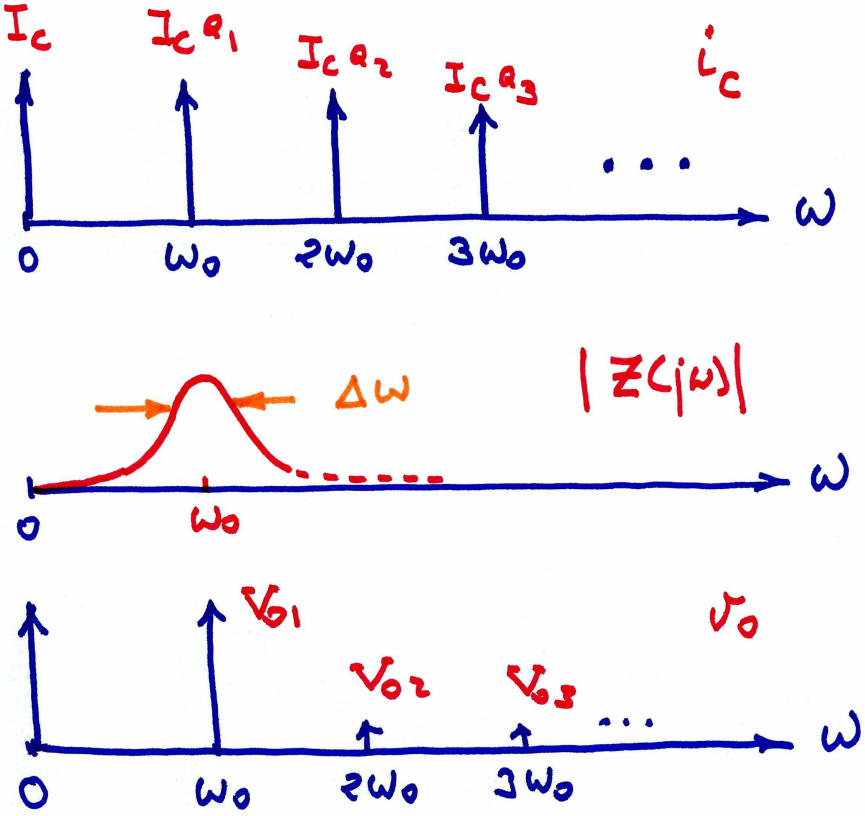
$G_M \approx g_m$

Conclusiones

(1) Si $x \leq 0'1$ ⟶ Δi_c es proporcional a v_i

(2) Si $x < 1$ ⟶ i_c tiene un armónico proporcional a v_i, pero hay otros armónicos





$$V_{o1} = I_c\, a_1\, |Z|_{max} = G_m\, |Z|_{max}\, V_1$$

Si $\Delta\omega \ll \omega_0$ $\Rightarrow$ $v_o(t) \simeq V_{cc} - G_m\, |Z|_{max}\, v_i$

Distorsión

$$2^{\circ}\ \text{armónico} = \frac{V_{o2}}{V_{o1}} \cdot 100\%$$

$$= \frac{a_2 \left| Z(2j\omega_o) \right|}{a_1 \left| Z(j\omega_o) \right|} \cdot 100\%$$

$$\xrightarrow[x \to 0]{} 0$$