

Tema 4. Amplificadores Monoetapa

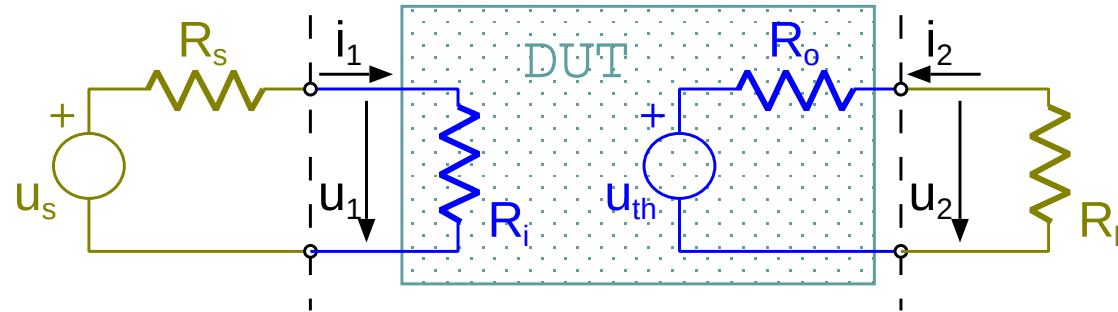
- Definiciones
- Amplificador EC
- Amplificador CC
- Amplificador BC
- Comparativa

Bibliografía

“Circuitos Electronicos”, Norbert R. Malik, Prentice Hall

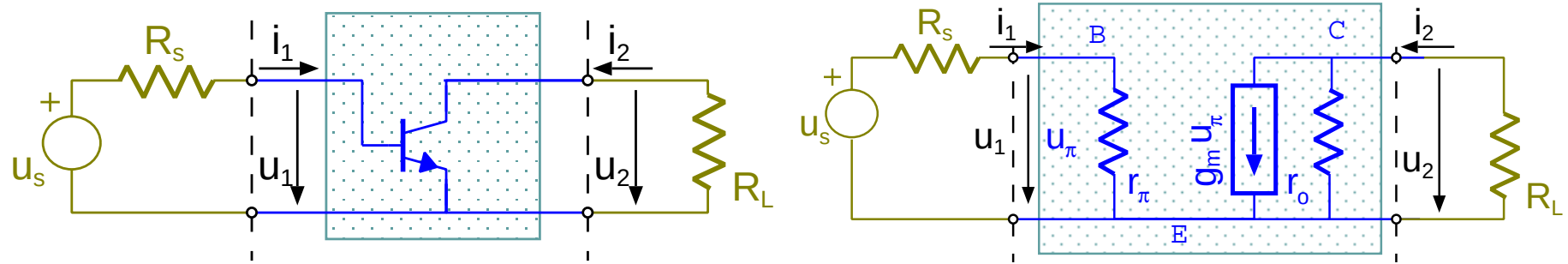
“Microelectrónica”, Jacob Millman & Arvin Gravel, McGraw Hill

Definiciones



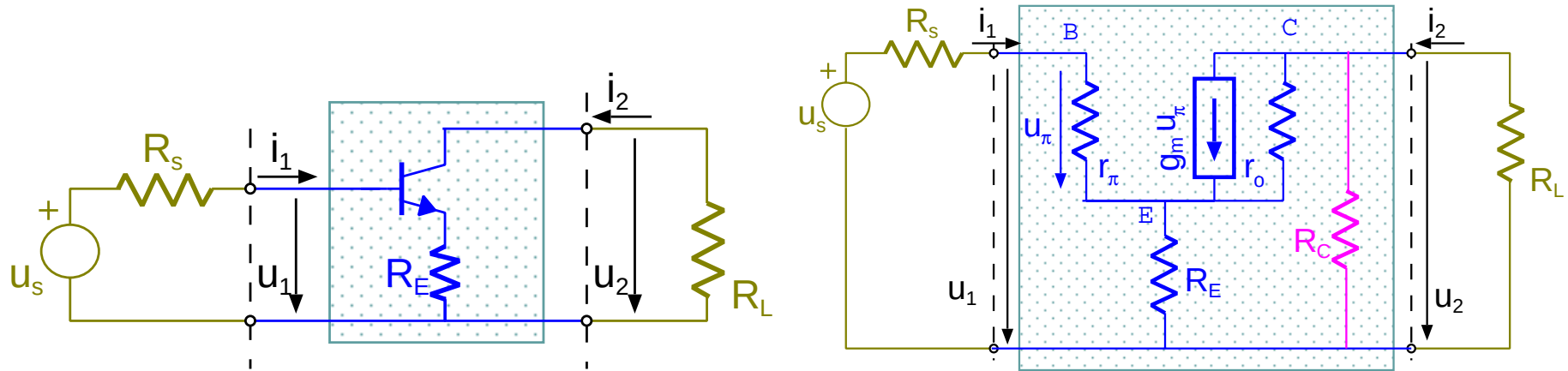
- **Resistencia de Entrada:** $R_i = \left[\frac{u_1(t)}{i_1(t)} \right]_{DUT}$
- **Resistencia de Salida:** $R_o = \left[\frac{u_2(t)}{i_2(t)} \right]_{DUT, u_s(t)=0}$
- **Ganancia de Intensidad:** $A_i = \left[\frac{i_2(t)}{i_1(t)} \right]_{R_L=0}$
- **Ganancia de Tensión:** $A_v = \left[\frac{u_2(t)}{u_s(t)} \right]_{R_L=\infty}$

EC: Emisor Común



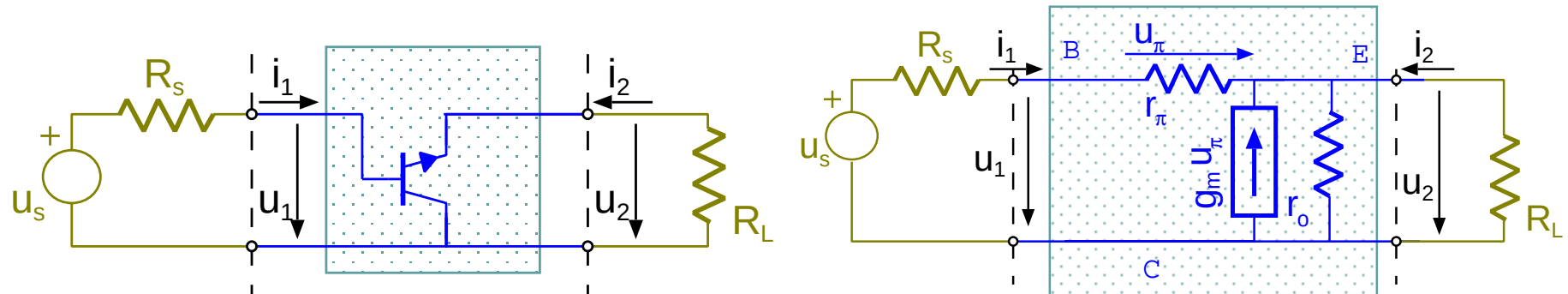
- $R_i = r_\pi$
- $R_o = r_o$
- $A_i = h_{fe}$
- $A_v = \frac{h_{fe} r_o}{R_s + r_\pi}$

EC+RE: Emisor Común con RE



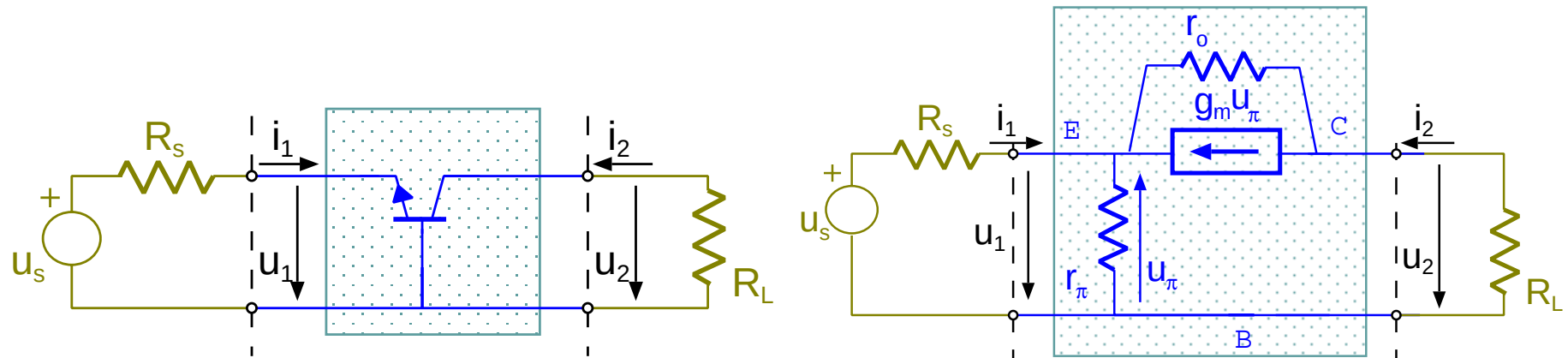
- $R_i \simeq r_\pi + h_{fe}R_e$
- $R_o \simeq r_o + h_{fe}r_o \frac{R_e}{R_e + R_s + r_\pi}$
- $A_i \simeq h_{fe}$
- $A_v \simeq \frac{h_{fe}R_c}{R_s + r_\pi + h_{fe}R_e} \simeq \frac{R_c}{R_e}$

CC: Colector Común



- $R_i \simeq r_\pi + h_{fe} R_L$
- $R_o \simeq \frac{R_s + r_\pi}{h_{fe}}$
- $A_i \simeq h_{fe}$
- $A_v \simeq 1$

BC: Base Común



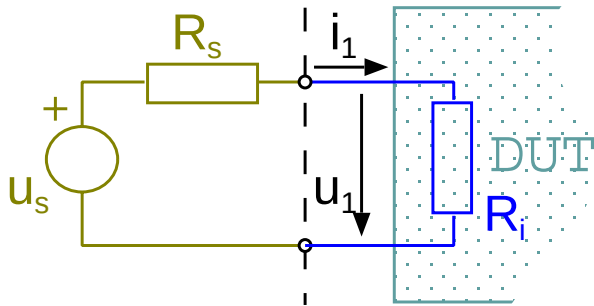
- $R_i \simeq \frac{1}{g_m}$
- $R_o \simeq g_m r_o (R_s || r_\pi)$
- $A_i \simeq 1$
- $A_v \simeq \frac{R_L}{R_s}$

Comparativa

	EC	EC+RE	CC	BC
R_i	r_π	$r_\pi + h_{fe} R_e$	$r_\pi + h_{fe} R_L$	$\frac{1}{g_m}$
R_o	r_o	$r_o + h_{fe} r_o \frac{R_e}{R_e + R_s + r_\pi}$	$\frac{R_s + r_\pi}{h_{fe}}$	$g_m r_o (R_s r_\pi)$
A_i	h_{fe}	h_{fe}	h_{fe}	1
A_v	$\frac{h_{fe} R_L}{R_s + r_\pi}$	$\frac{h_{fe} R_c}{R_s + r_\pi + h_{fe} R_e} \simeq \frac{R_c}{R_E}$	1	$\frac{R_L}{R_s}$

Acoplamiento Impedancias (*Impedance Matching*)

Acop. Tensiones Entrada

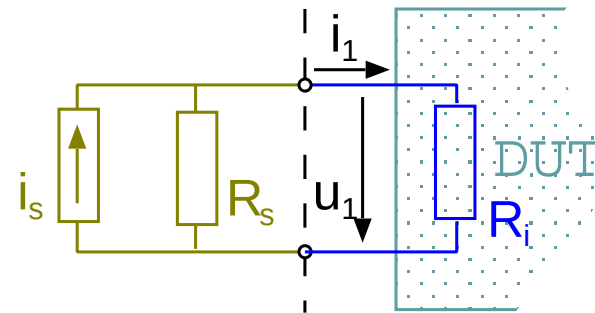


- $R_s \gg R_i: u_1(t) \ll u_s(t) \quad :- ($
- $R_s \ll R_i: u_1(t) \simeq u_s(t) \quad :D$

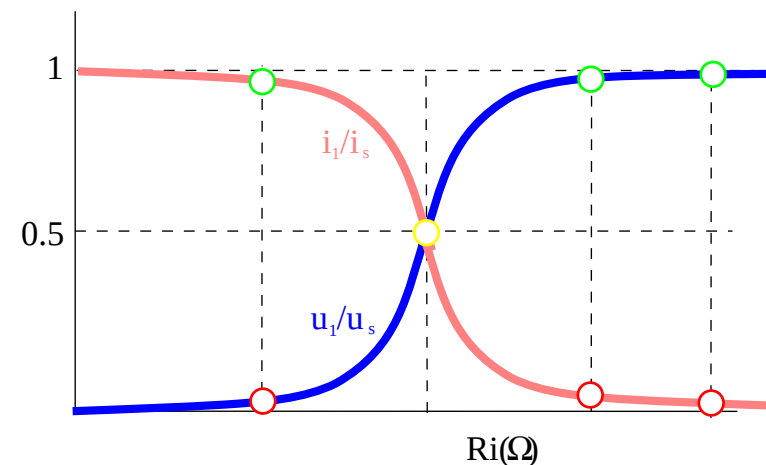
$R_i(\Omega)$	$u_1(\text{mV}_{pp})$	u_1/u_s	i_1/i_s
10k	9.950	0.995	0.005
1k	9.524	0.952	0.047
50	5	0.500	0.500
10	1.666	0.166	0.833

$u_s=10\text{mV}_{pp}; R_s=50 \Omega$

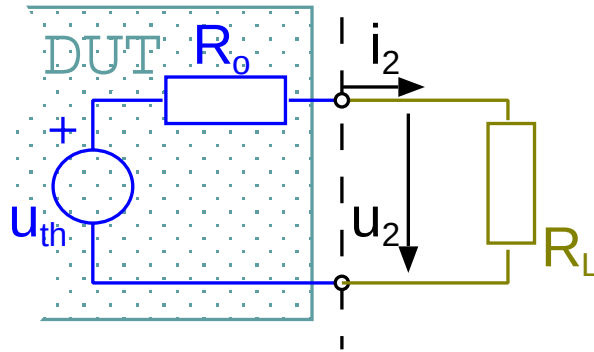
Acop. Corrientes Entrada



- $R_s \gg R_i: i_1(t) \simeq i_s(t) \quad :D$
- $R_s \ll R_i: i_1(t) \ll i_s(t) \quad :- ($

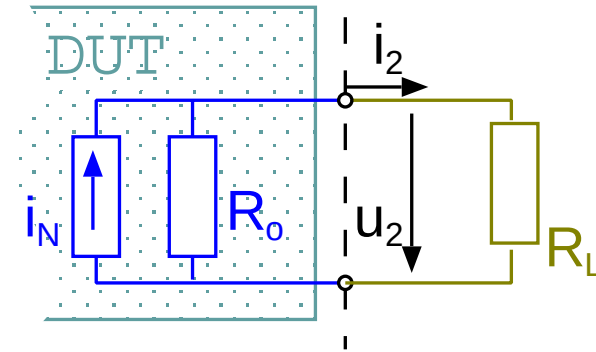


Acop. Tensiones Salida



- $R_o \gg R_L: u_2(t) \ll u_{th}(t)$:- (red)
- $R_o \ll R_L: u_2(t) \simeq u_{th}(t)$:D (green)

Acop. Corrientes Salida



- $R_o \gg R_L: i_2(t) \simeq i_N(t)$:D (green)
- $R_o \ll R_L: i_2(t) \ll i_N(t)$:- (red)