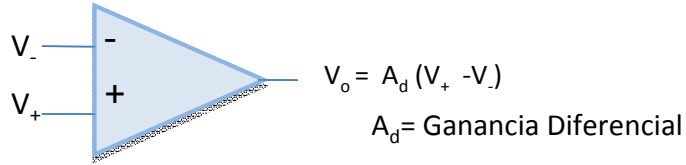
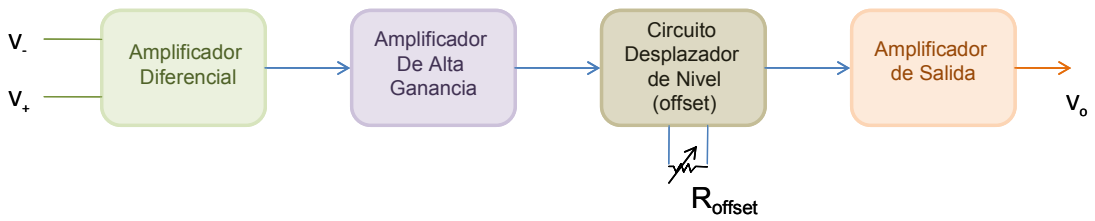


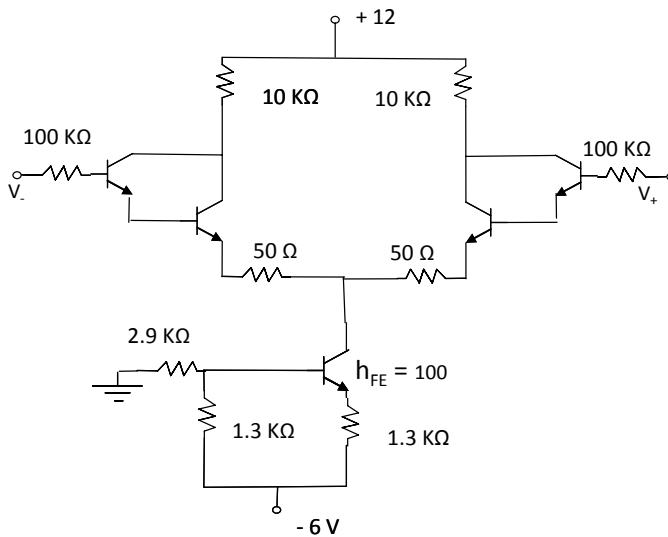
# Amplificador Operacional



1. Alta ganancia de voltaje
2. Alta impedancia de entrada
3. Baja impedancia de Salida



## Amplificador diferencial



Amplificador diferencial – Pequeña Señal

$h_{fe} = 100$

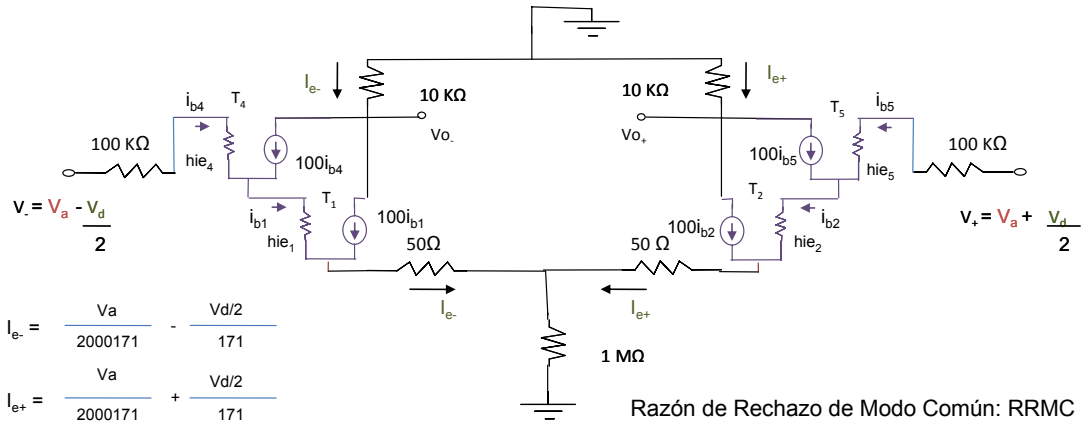
$I_{C1} = I_{C2} \approx 0.45 \text{ mA}$

$h_{ie1} = h_{ie2} = 5.5 \text{ K}\Omega$

$I_{C3} \approx 0.9 \text{ mA}$

$I_{C4} = I_{C5} \approx 4.5 \text{ uA}$

$h_{ie4} = h_{ie5} = 555 \text{ K}\Omega$



$V_{o-} = -10 \text{ K}\Omega I_{e-}$   
 $V_{o+} = -10 \text{ K}\Omega I_{e+}$

$V_{o_d} = V_{o+} - V_{o-} = 10 \text{ K}(I_{e-} - I_{e+}) = -58.5 \text{ Vd}$        $A_{vd} = 58.5$

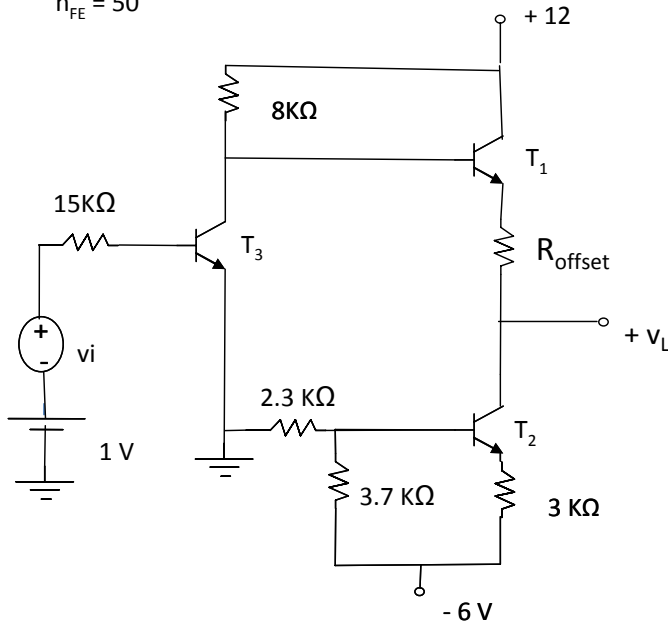
$RRMC = \frac{A_{vd}}{A_{va}}$

$V_{o_a} = \frac{V_{o+} + V_{o-}}{2} = -10 \text{ K} \left( \frac{I_{e-} + I_{e+}}{2} \right) = -V_a / 200$        $A_{va} = 0.005$

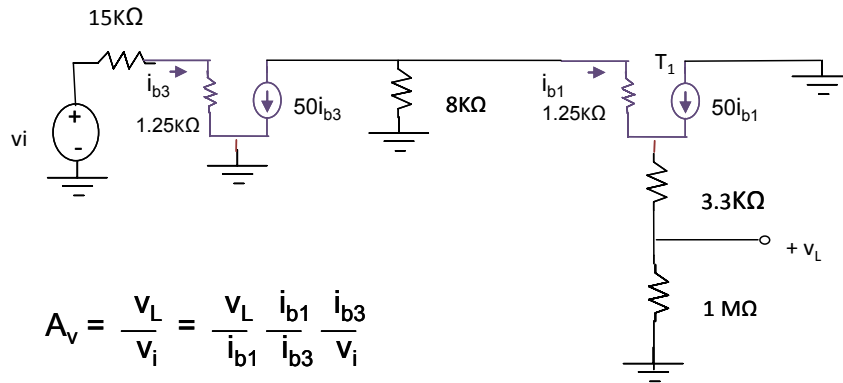
$RRMC = 11700$

Amplificador Cascodeo

$h_{FE} = 50$



Encuentre el valor de Roffset para que el voltaje DC en  $v_L$  sea cero.



$$A_v = \frac{V_L}{V_i} = \frac{V_L}{i_{b1}} \frac{i_{b1}}{i_{b3}} \frac{i_{b3}}{V_i}$$

Amplificador operacional *National Semiconductor* LH0061

