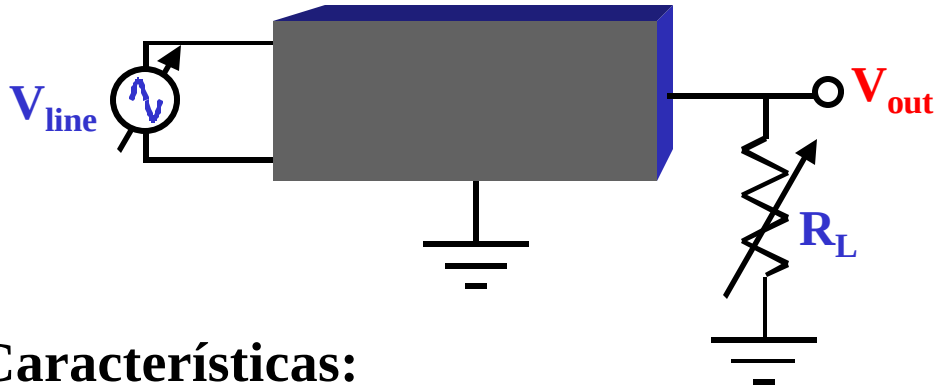
Fuentes de alimentación reguladas



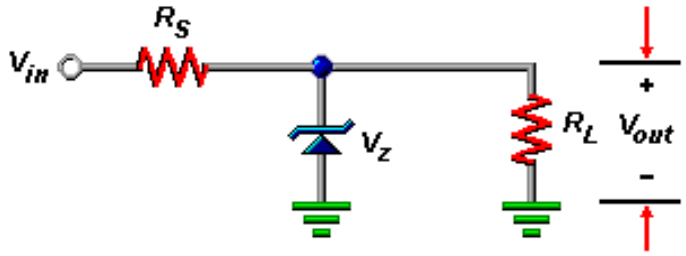
Características:

$$\text{Load regulation} = \frac{V_{NL} - V_{FL}}{V_{FL}} \times 100\%$$

$$\text{Line regulation} = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

$$R_{TH} = \frac{V_{NL} - V_{FL}}{I_{FL}}$$

Reguladores paralelos – Diodo Zener

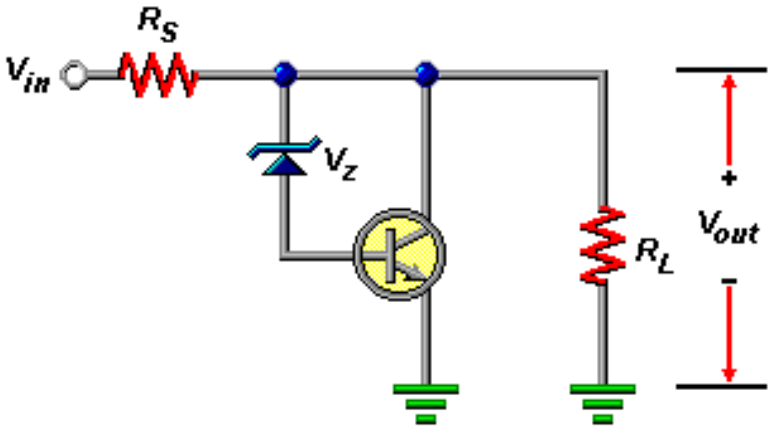


$V_{out} = V_Z$

$I_S = \frac{V_{in} - V_{out}}{R_S}$

$I_L = \frac{V_{out}}{R_L}$

$I_Z = I_L - I_S$



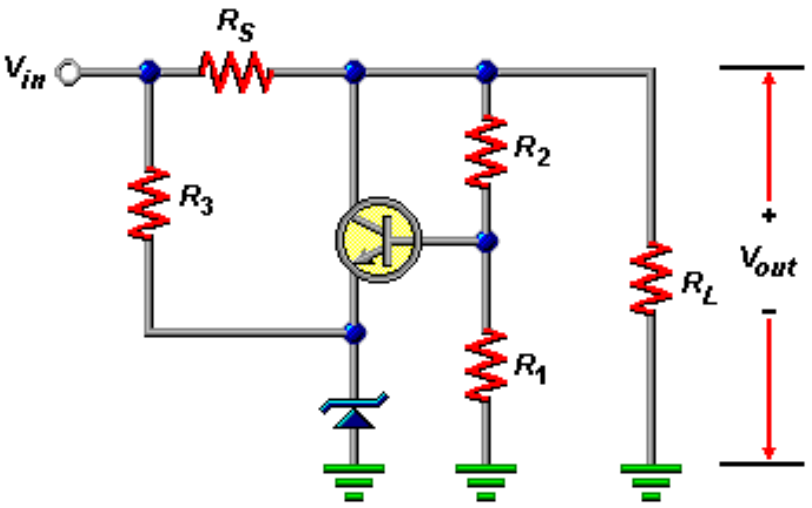
$V_{out} = V_Z + V_{BE}$

$I_S = \frac{V_{in} - V_{out}}{R_S}$

$I_L = \frac{V_{out}}{R_L}$

$I_C \cong I_S - I_L$

Reguladores paralelos – Diodo Zener
Tensión de salida mayor que V_Z



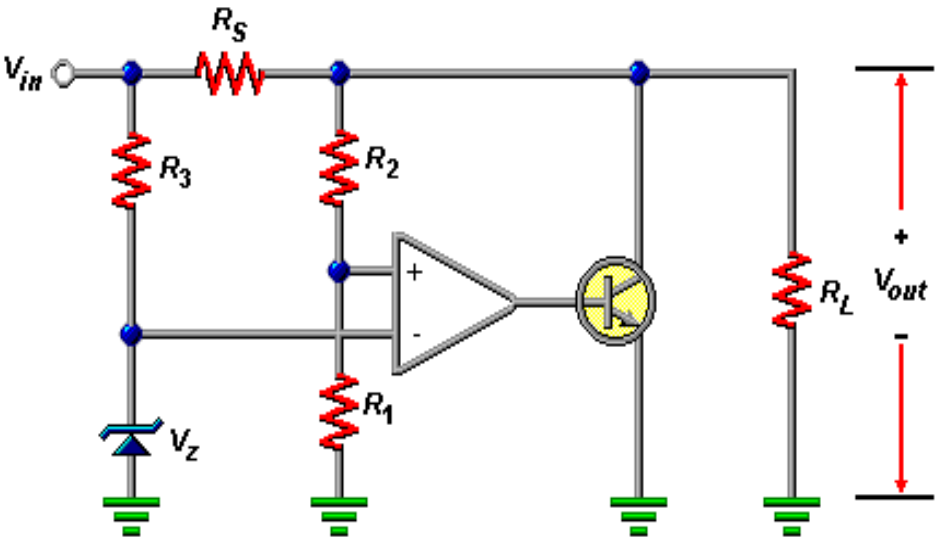
$$V_{out} \cong \frac{R_1 + R_2}{R_1}(V_Z + V_{BE})$$

$$I_S = \frac{V_{in} - V_{out}}{R_S}$$

$$I_L = \frac{V_{out}}{R_L}$$

$$I_C \cong I_S - I_L$$

Reguladores paralelos – Diodo Zener
Regulación mejorada



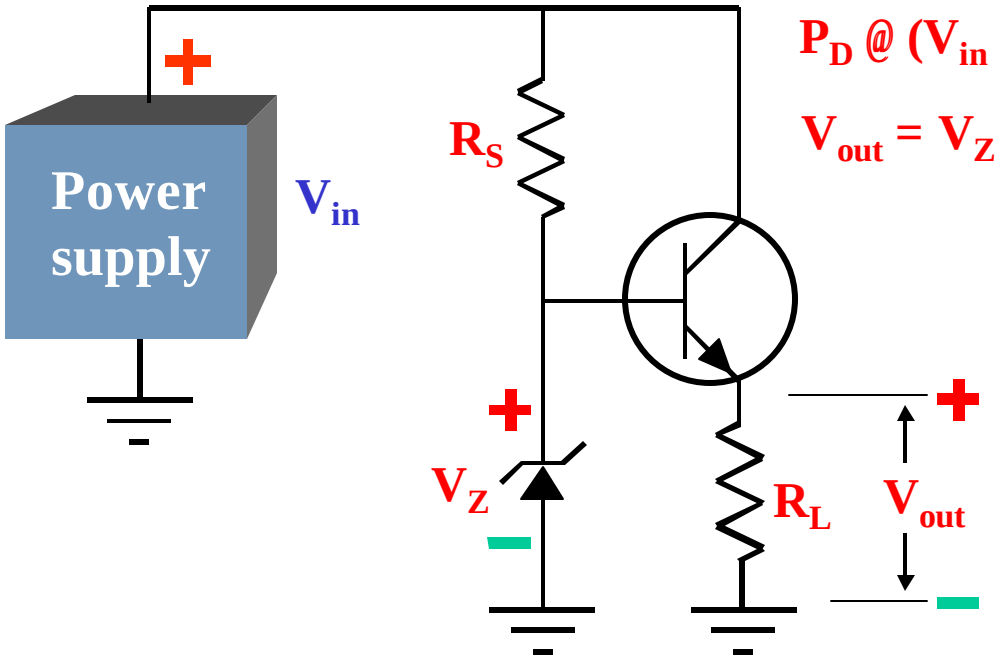
$$V_{out} = \frac{R_1 + R_2}{R_1} V_Z$$

$$I_S = \frac{V_{in} - V_{out}}{R_S}$$

$$I_L = \frac{V_{out}}{R_L}$$

$$I_C \cong I_S - I_L$$

Regulador serie – Seguidor de zener

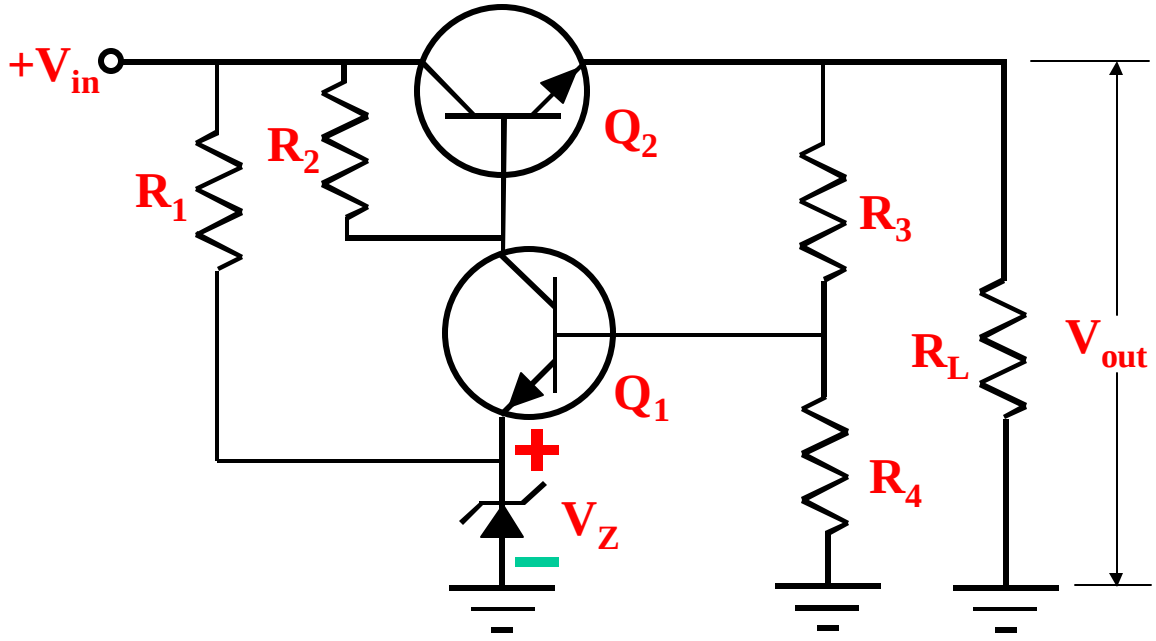


$$P_D @ (V_{in} - V_{out})I_L$$

$$V_{out} = V_Z + V_{BE}$$

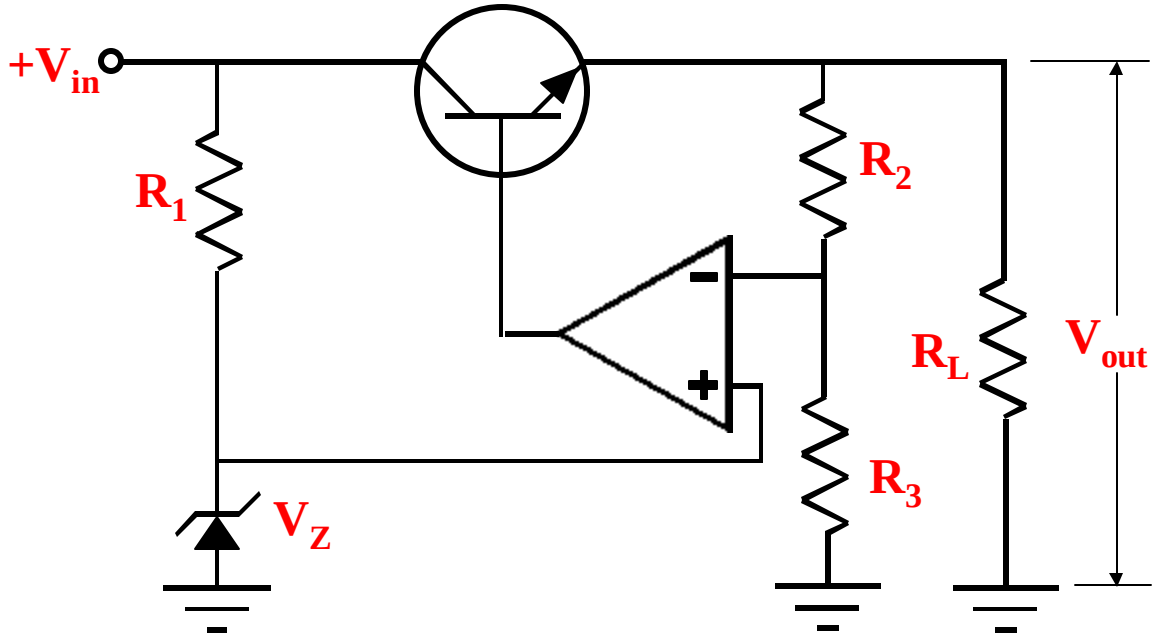
Regulador serie con dos transistores

$$V_{out} = \frac{R_3 + R_4}{R_4}(V_Z + V_{BE})$$



Regulador serie mejorado

$$V_{out} = \frac{R_2 + R_3}{R_3} V_Z$$



Disipasión de potencia y eficiencia

- Ver: Fuentes Reguladas - Especificaciones y Disipación de Potencia del Transistor de Paso

- Eficiencia $= \frac{V_{OUT}}{V_{IN}} \times 100\%$

- **Disipación de potencia en el transistor de paso**

$P_{Q1} = V_{CE}\ I_C$

V_{CE} = Vent - Vsal

$I_C = I_L$ (corriente de carga)

- **Potencia máxima**

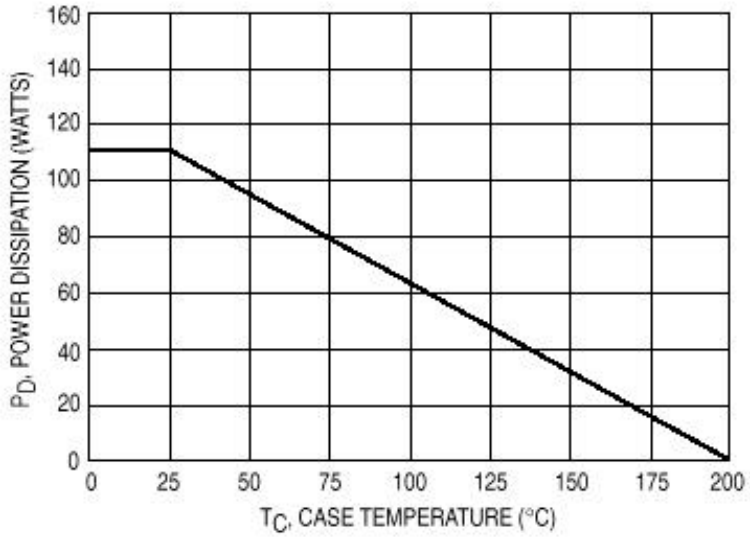
Vent = $Vent_{max}$

$I_L = I_{Lmax}$

$P_{Q1max} = (Vent_{max} - Vsal)\ I_{Lmax}$

Especificaciones del transistor de paso

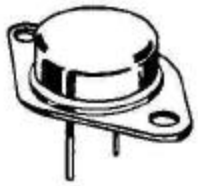
- **Condiciones de carga normales**
  - $I_{Cmax} > I_{Lmax}$
  - $V_{CEOmax} > Vent_{max}$
  - $h_{FEmin} > I_{Lmax}/I_{Bmin}$
  - $P_{Dmax} > P_{Q1max}$



Disipadores y transistores de potencia

- **Encapsulados**

CASE 221A
(TO–220AB)



CASE 1–07
TO–204AA
(TO–3)

- **Resistencia térmica**

R_q [ºC/W]=DT/Pot

$DT = T_J - T_A$

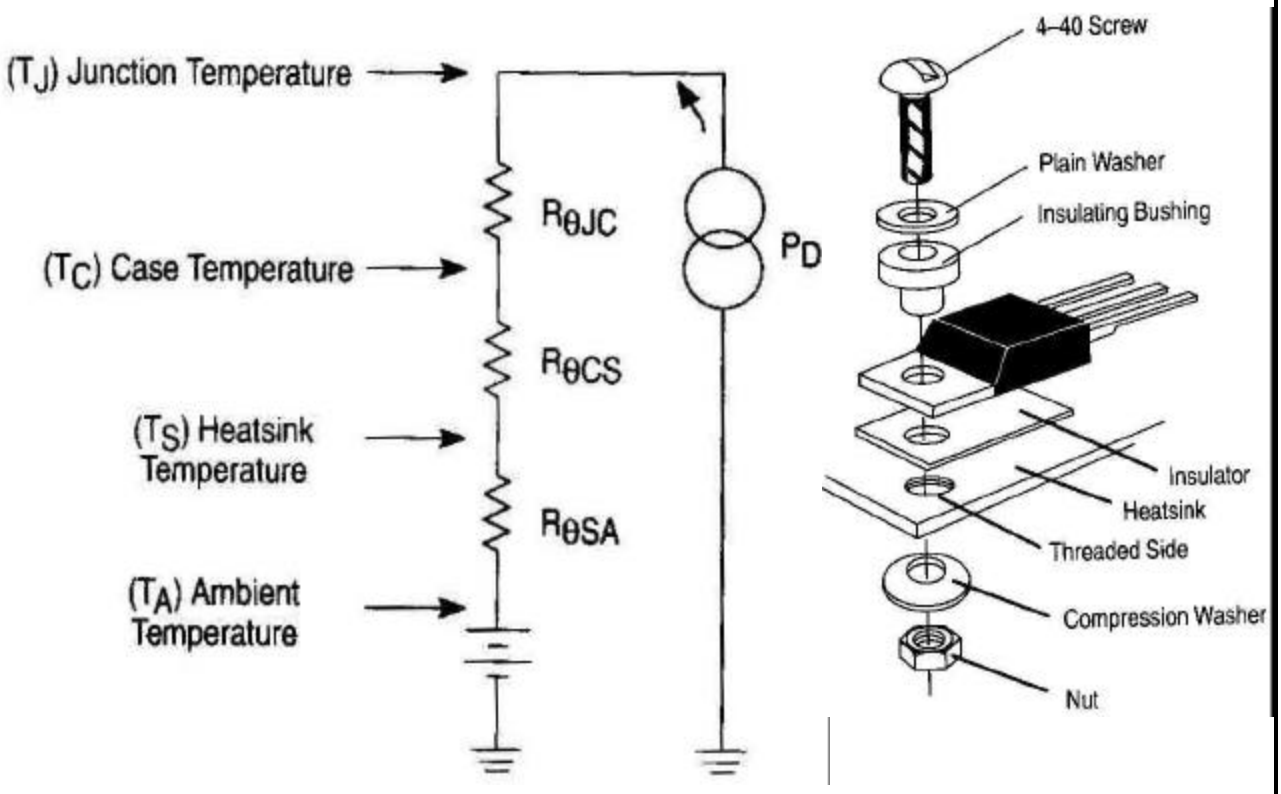
$R_{qTotal} = R_{qjc} + R_{qcd} + R_{qda}$

$T_j = T_A + (R_{qjc} + R_{qcd} + R_{qda})$ Pot

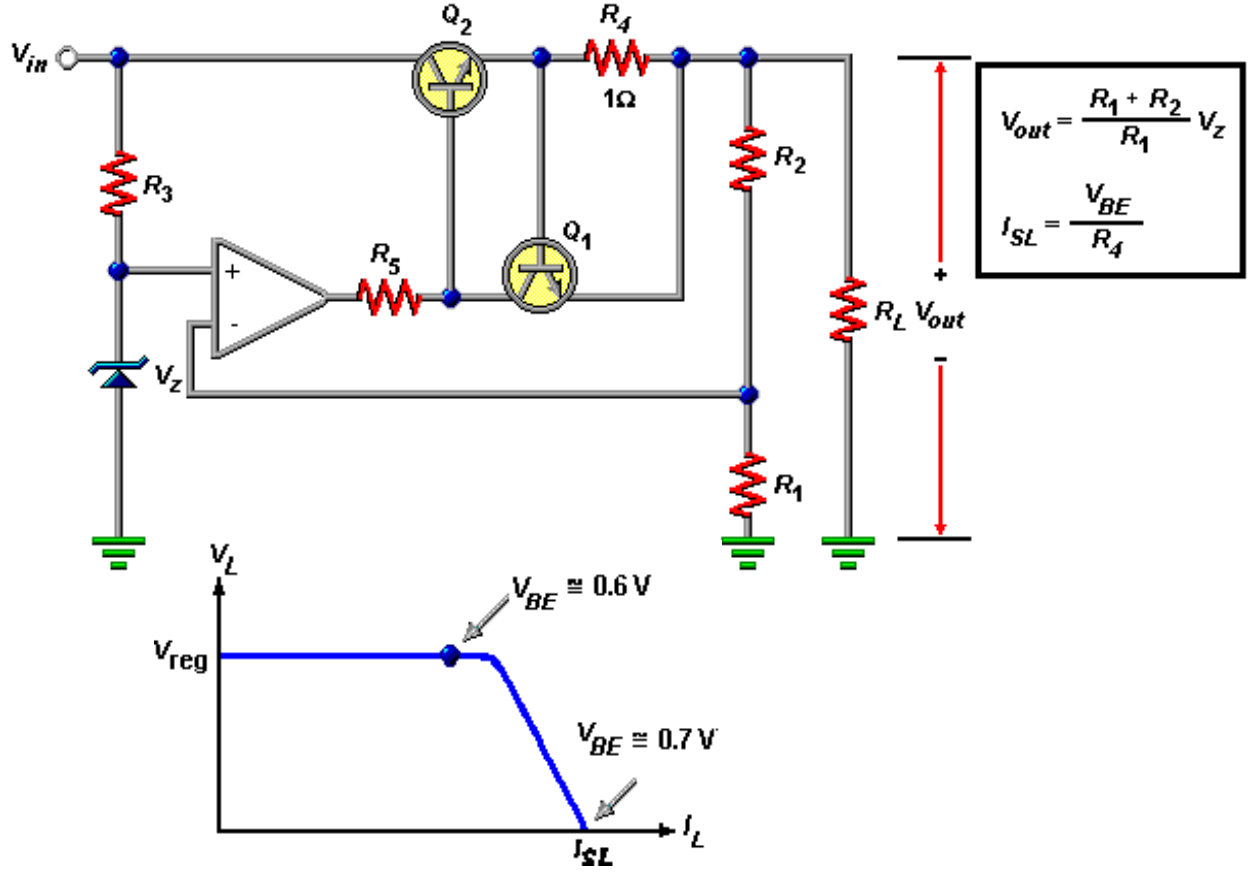
Cálculo:

$R_{qda} = (T_j - T_A)/Pot - R_{qjc} - R_{qcd}$

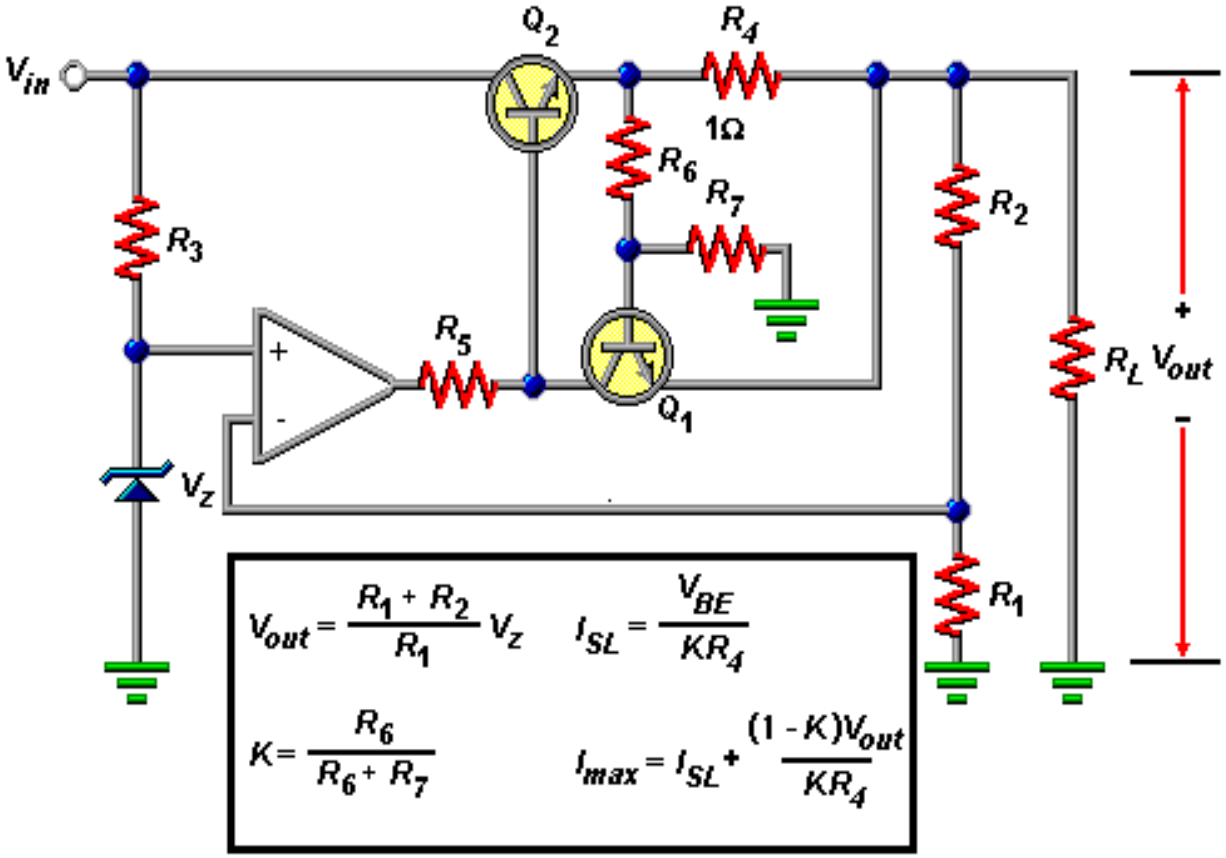
Disipadores y transistores de potencia



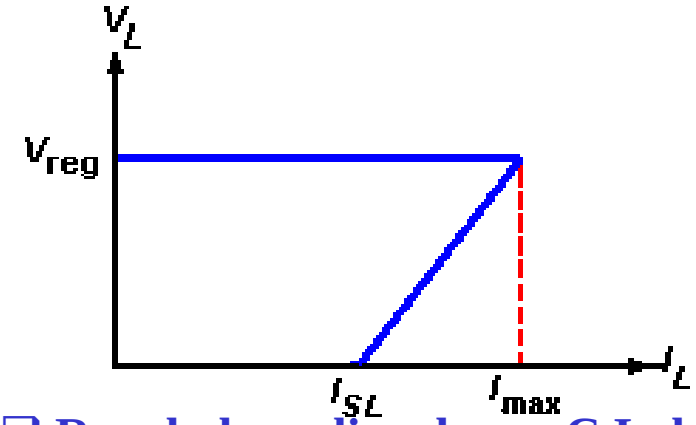
Regulador con limitación de corriente



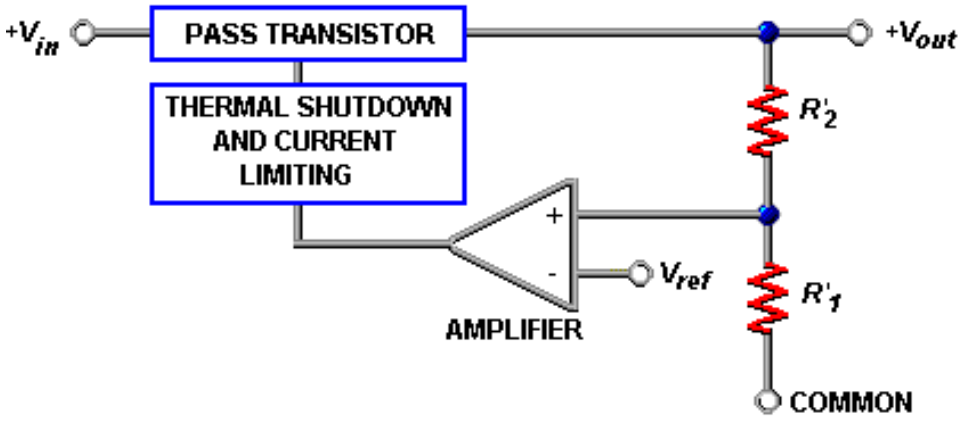
Limitación de corriente de corte plegado (Foldback)



❑ Limitación de corriente de corte plegado (Foldback)



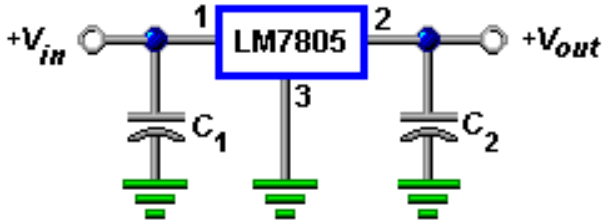
❑ Reguladores lineales en C.I. de tres terminales



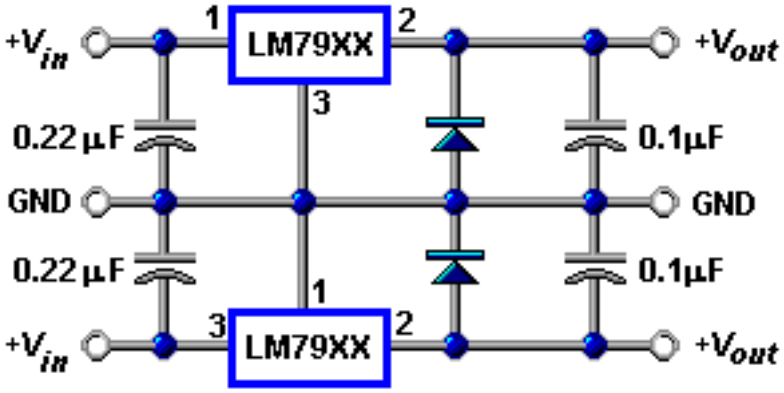
❑ Reguladores fijos

❑ Serie 78XX

❑ Serie 79XX



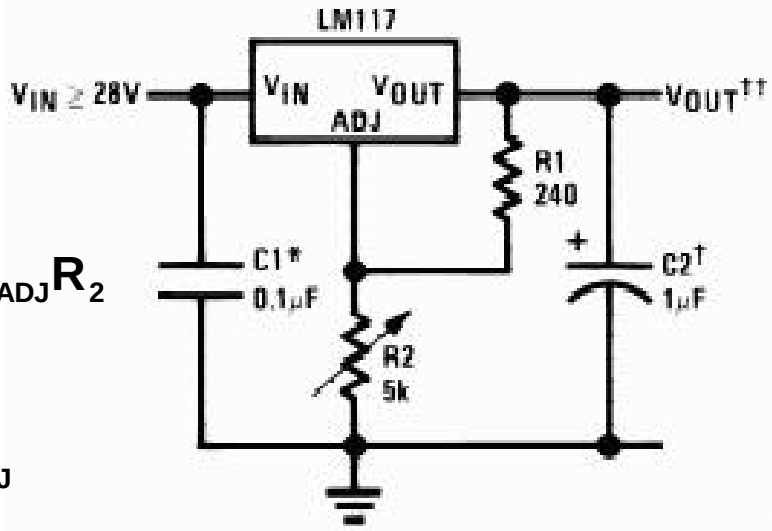
❑ Fuentes duales



❑ Reguladores ajustables

❑ LM317

❑ Tensión de salida



$$V_{OUT} = \frac{R_1 + R_2}{R_1} V_{REF} + I_{ADJ} R_2$$

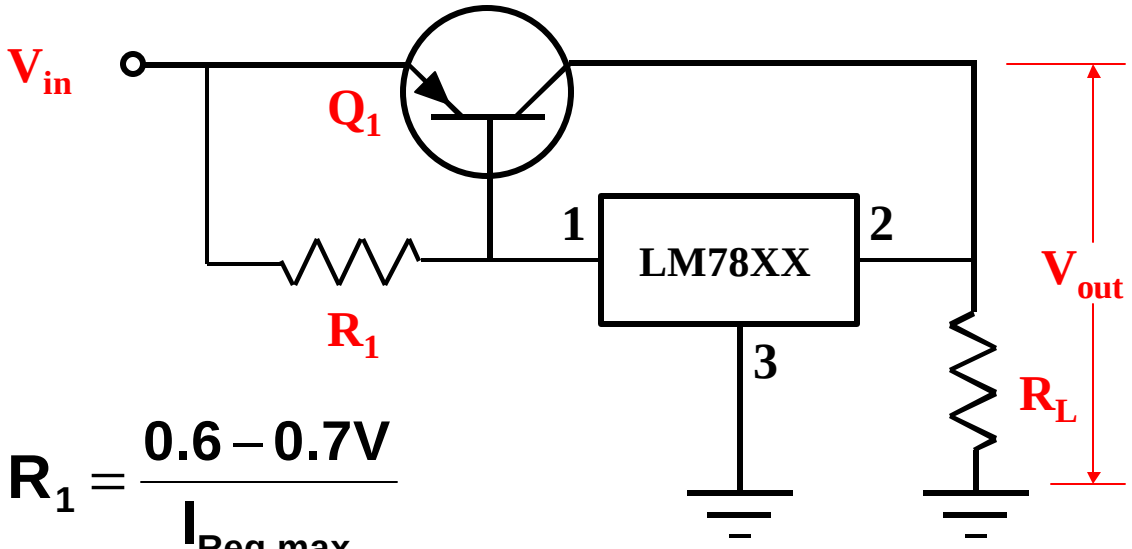
$$V_{REF} = 1.25V$$

$$R_1 \leq 240\Omega \Rightarrow I_{REF} > I_{ADJ}$$

$$V_{OUT} = \frac{R_1 + R_2}{R_1} (1.25V)$$

❑ Rechazo al rizado

Regulador integrado con amplificador de corriente

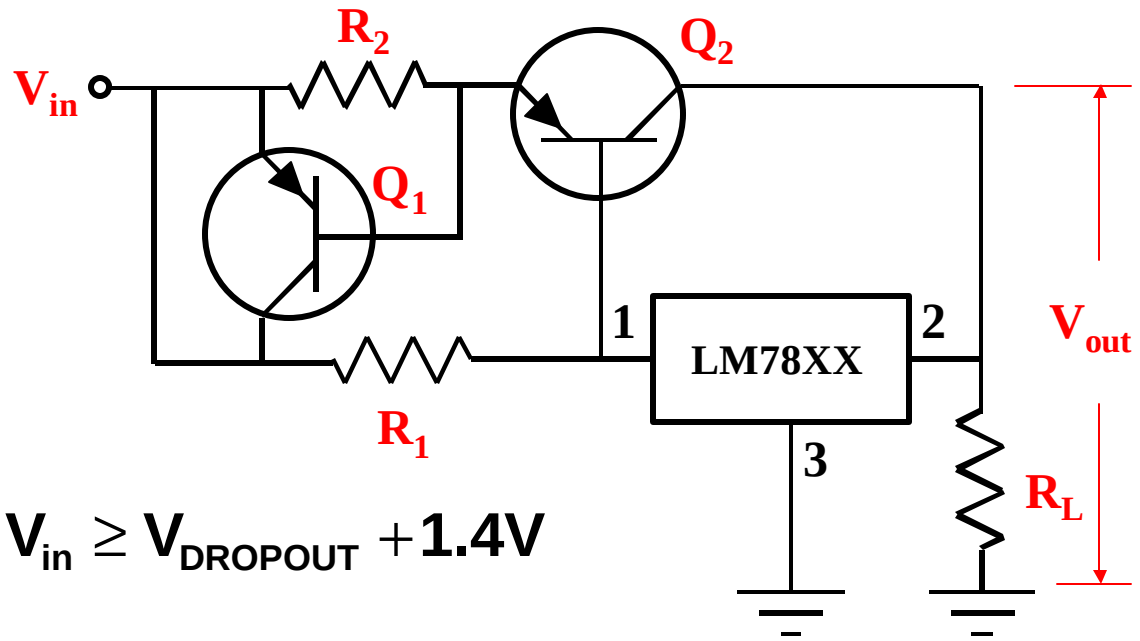


$$R_1 = \frac{0.6 - 0.7V}{I_{Reg.max}}$$

$$I_{Reg.max} > \frac{I_{L.max}}{h_{FE_{MIN}}}$$

$$V_{in} \geq V_{DROPOUT} + 0.7V$$

Con limitación de corriente



$$V_{in} \geq V_{DROPOUT} + 1.4V$$