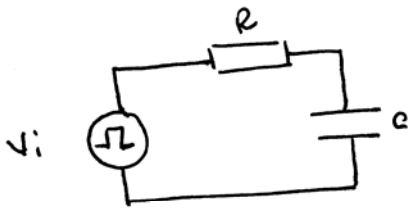


# 10 Temporizadores y relojes

- Circuitos tiempo
- Astable (No estado estable) relaj
  - Monoestable (1 estado estable y otro inestable) Temporizador
  - Biestable (2 estados estables) Flip-Flop

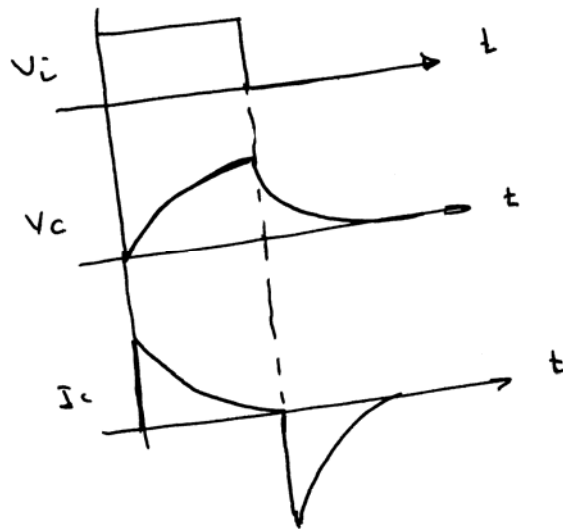
## Principio funcionamiento

t. carga y descarga de un condensador



$$V_{\text{carga}} = V_i (1 - e^{-t/RC})$$

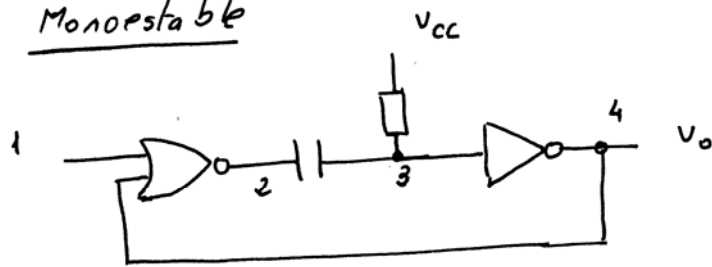
$$V_{\text{descarga}} = V_c \cdot e^{-t/RC}$$



$$T = -RC \ln \frac{V_{CC} - V_T}{V_{CC}}$$

T = tiempo en que carga 63%  
" " " " descarga 36%

# Monostable

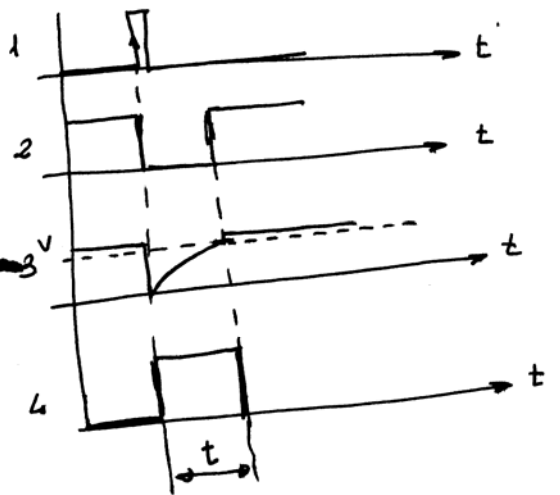


$$V = V_{cc} \cdot (1 - e^{-t/RC})$$

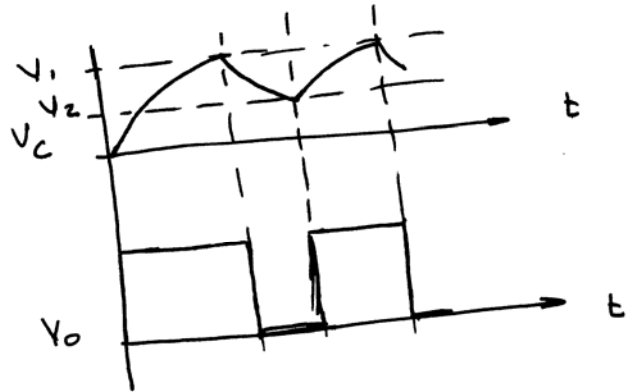
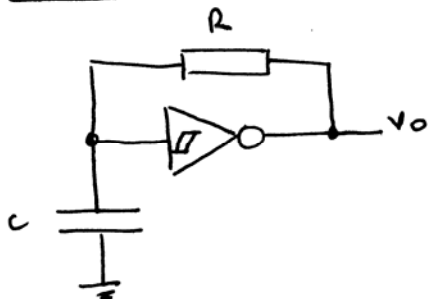
$$\frac{V}{V_{cc}} = 1 - e^{-t/RC} \Rightarrow e^{-t/RC} = 1 - \frac{V}{V_{cc}}$$

$$-\frac{t}{RC} = \ln\left(1 - \frac{V}{V_{cc}}\right)$$

$$t = -RC \ln\left(1 - \frac{V}{V_{cc}}\right)$$

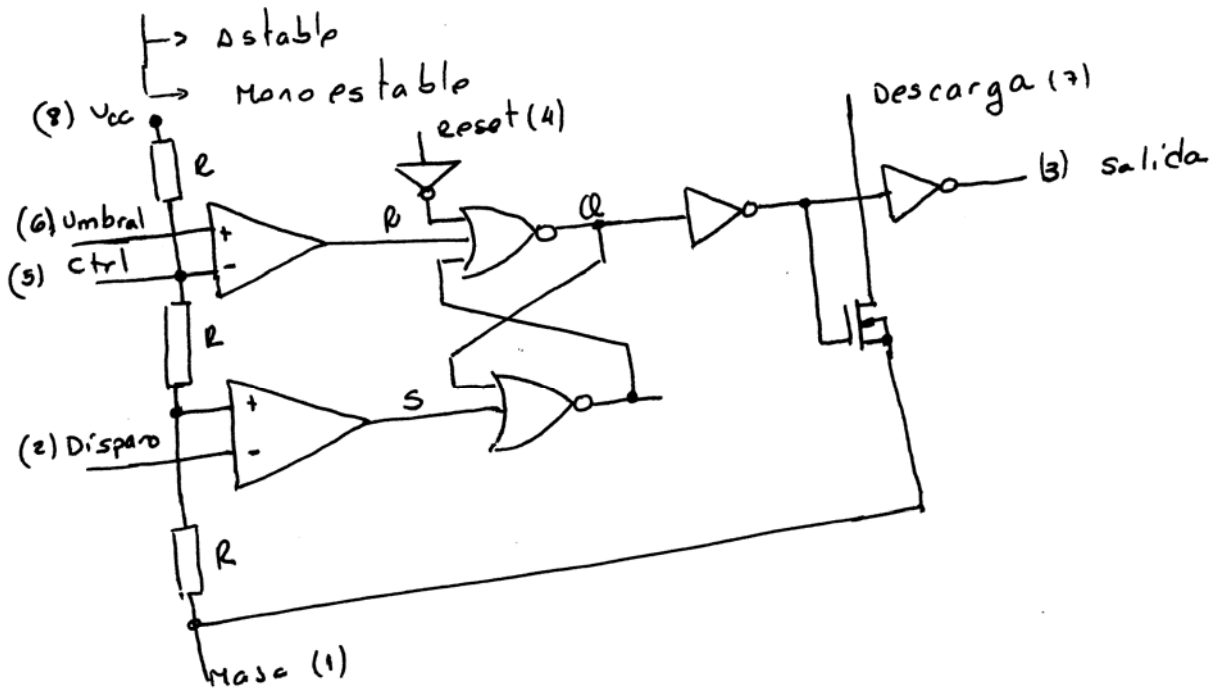


# A stable



$V_1$  = Tensión de umbral de bajo a alto  
 $V_2$  = " " " " alto a bajo

# 555



1 → Tierra

8 → Vcc

3 → salida

(2) Disparo → sensible a  $V_{cc}/3$

(6) Umbral → " "  $2V_{cc}/3$

(5) Ctrl → Varía umbrales

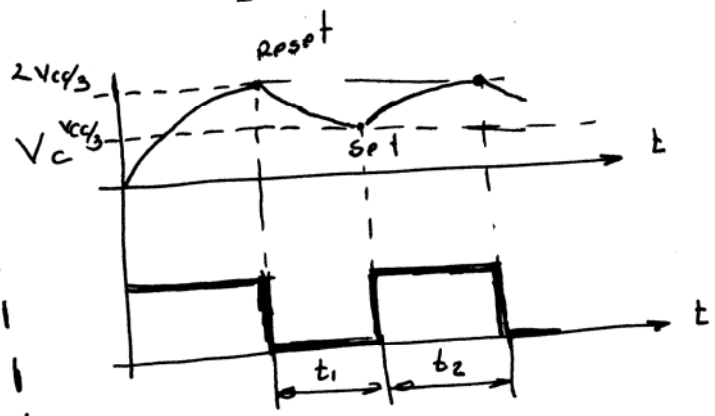
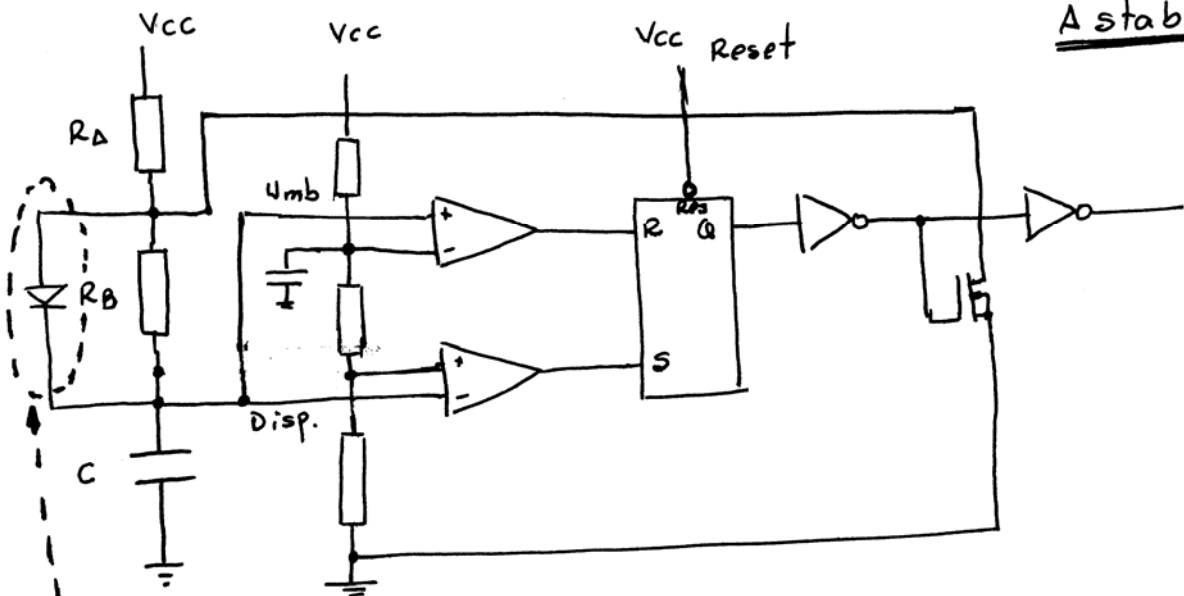
(4) Reset → con "0" resetea salida

(7) Descarga → para descargar c sincronismo.

si  $V < \frac{V_{cc}}{3} \Rightarrow$  Bistable = 1  
salida = 1

Reset predomina sobre Set

A stable



$$t_1 = 0,69 R_B C$$

$$t_2 = 0,69 (R_A + R_B) C$$

$$T = t_1 + t_2 = 0,69 (R_A + 2R_B) C$$

$\text{Con } D = 0 \quad t_2 = 0,69 R_A C$

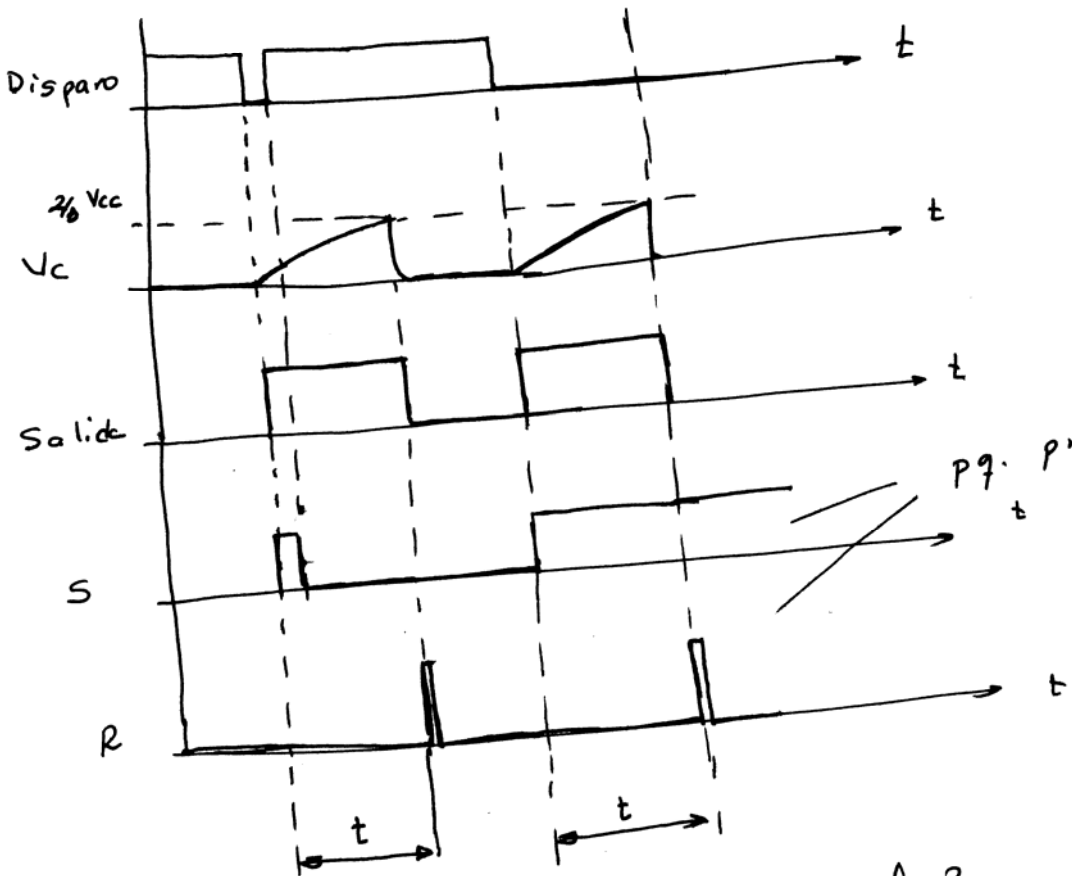
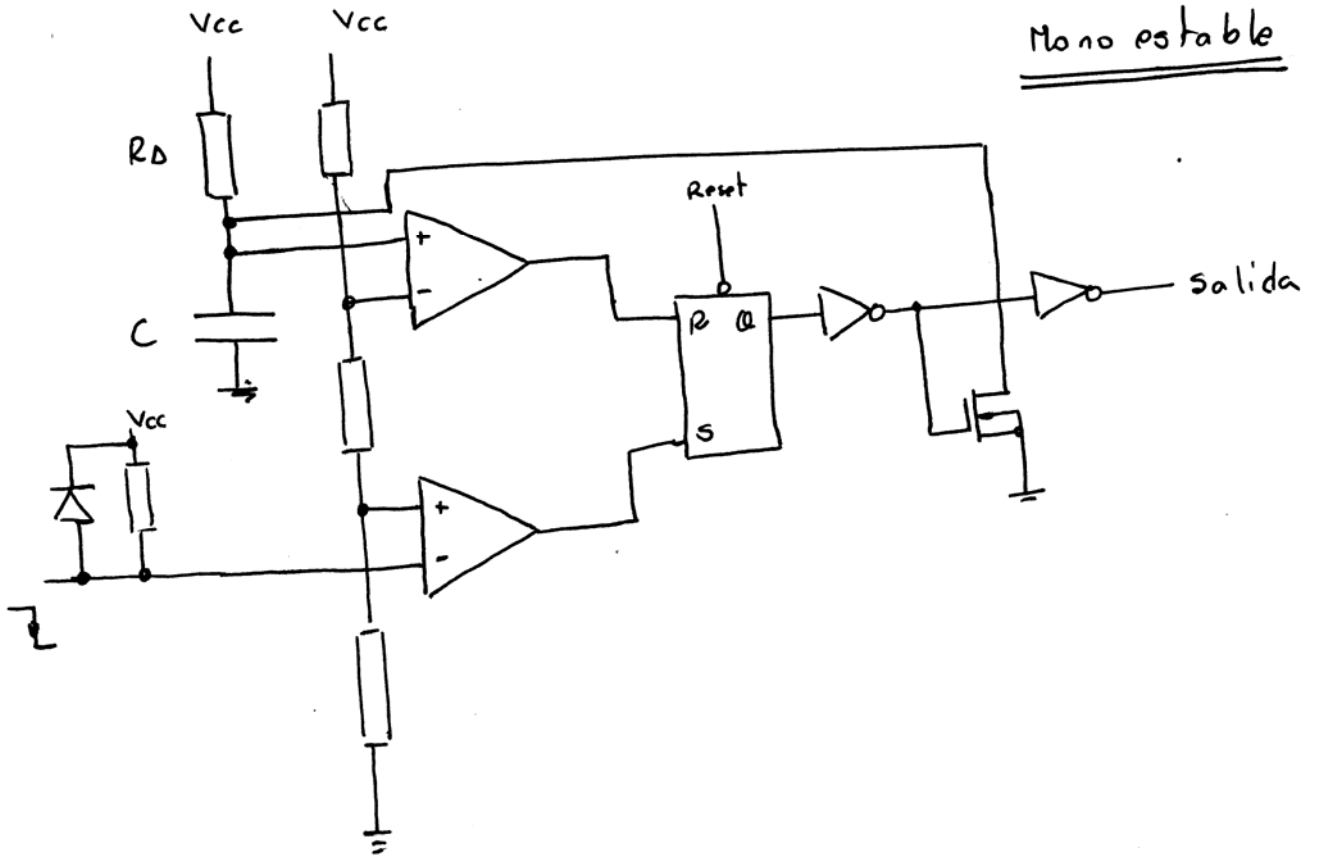
$$V_c = 2V_c (1 - e^{-t/RC}) \Rightarrow \frac{1}{2} = 1 - e^{-t/RC}$$

$$\frac{1}{2} = \frac{1}{e^{t/RC}}$$

$$\frac{t}{RC} = \ln 2$$

$$t = RC \ln 2$$

Mono estable



Pq. predomina R sobre S

$$\frac{2}{3} V_{cc} = V_{cc} (1 - e^{-t/RC})$$

$$t = R \cdot C \cdot \ln 3$$

$$e^{-t/RC} = \frac{1}{3} \Rightarrow \frac{1}{e^{t/RC}} = \frac{1}{3}$$

$$e^{t/RC} = 3 \Rightarrow \frac{t}{RC} = \ln 3 \Rightarrow \underline{\underline{t = RC \cdot \ln 3}}$$