

Osilator

# **Elektronika**

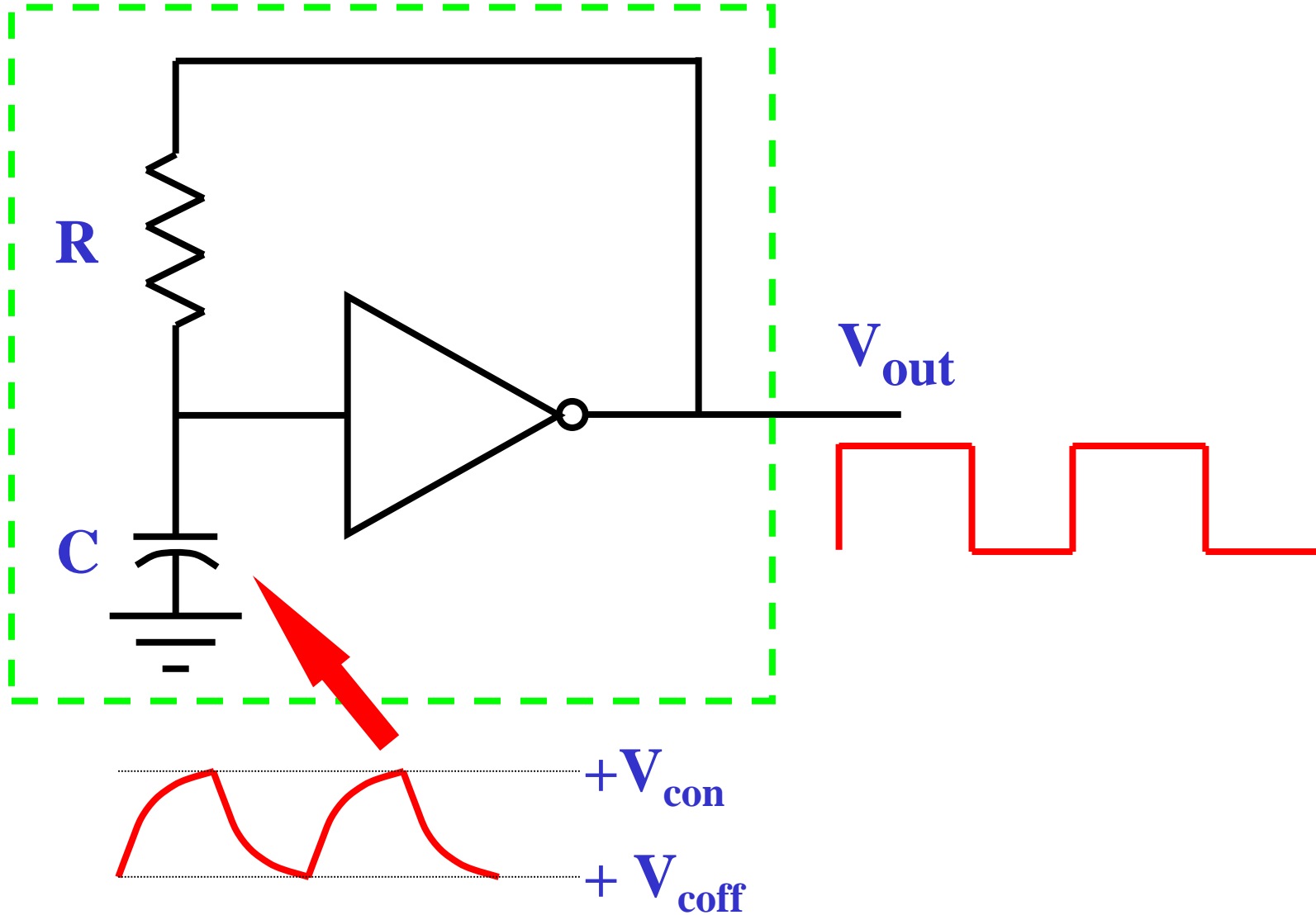
## **(TKE 4012)**

Eka Maulana

# Osilator

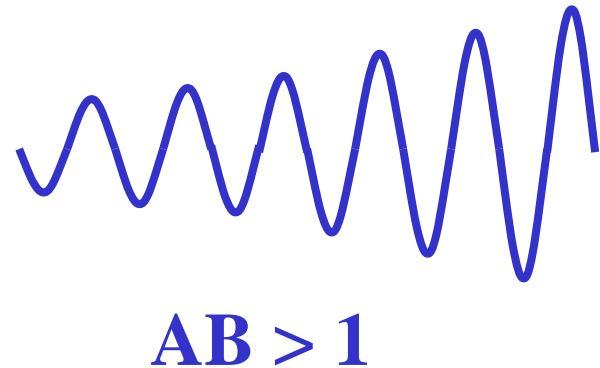
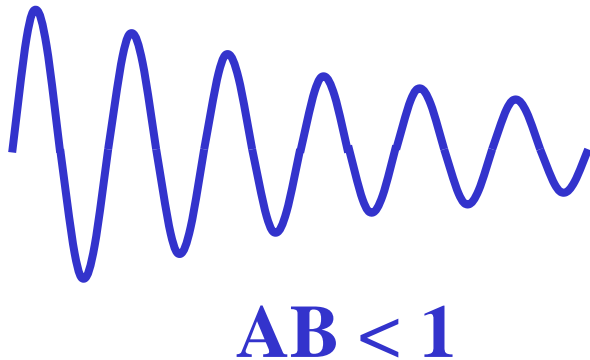
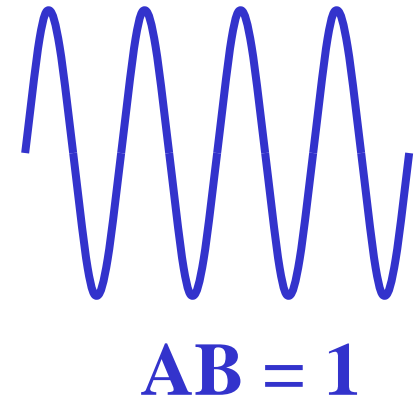
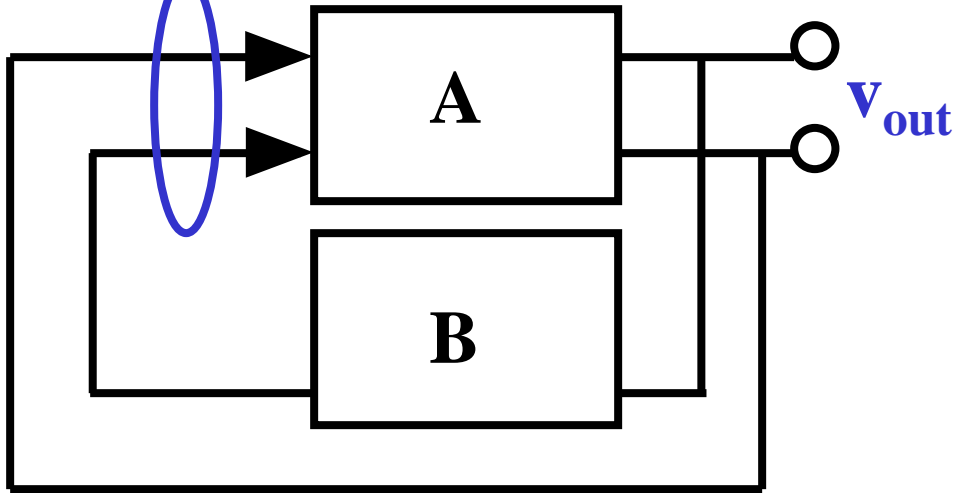
- Dasar dan fungsi Osilator
- Prinsip kerja Osilator
- Jenis-jenis Osilator
- Osilator 555
- Aplikasi

# Dasar Osilator



# Sinusoidal oscillation requires both the correct phase and loop gain.

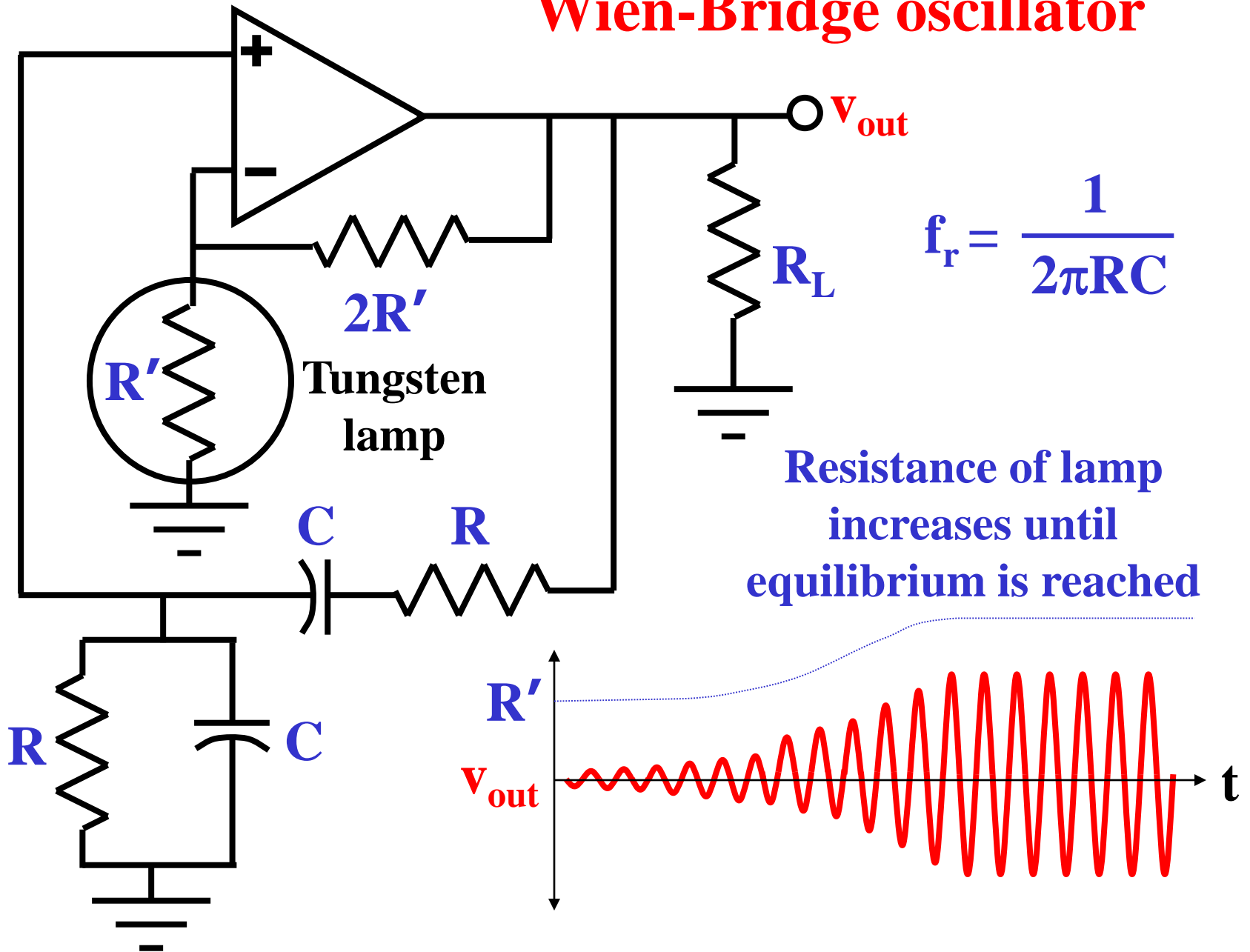
$\phi = 0 =$  positive feedback



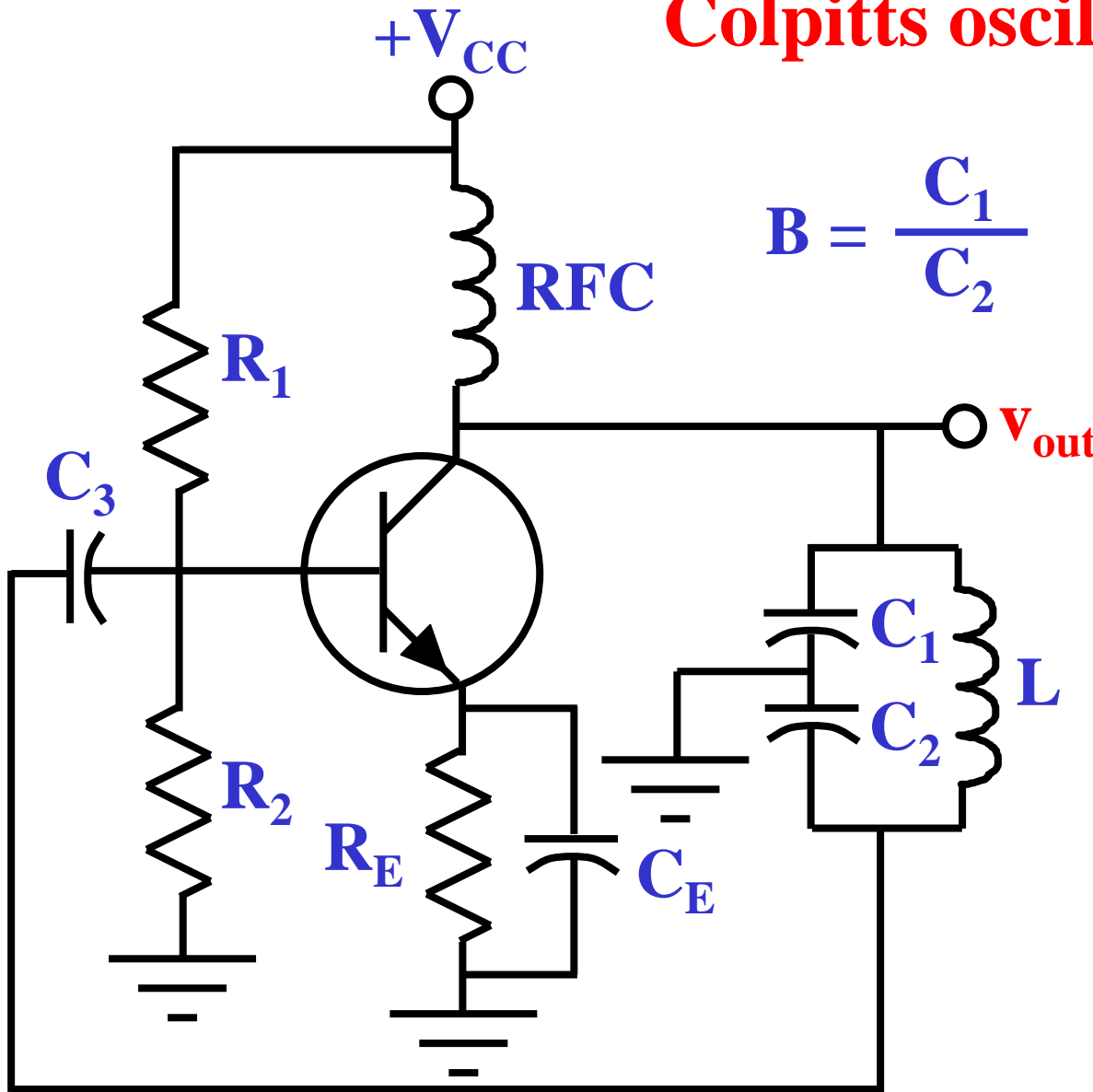
# Sinusoidal oscillators

- The starting signal is thermal noise.
- $AB > 1$  at startup ( $AB$  is the loop gain).
- The feedback network determines  $B$  and the phase of the feedback.
- Only one frequency arrives at the input as an in-phase signal (positive feedback).
- Either  $A$  or  $B$  is eventually decreased so that  $AB = 1$ .

# Wien-Bridge oscillator

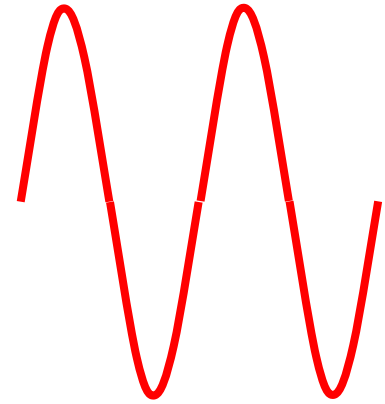


# Colpitts oscillator



$$B = \frac{C_1}{C_2}$$

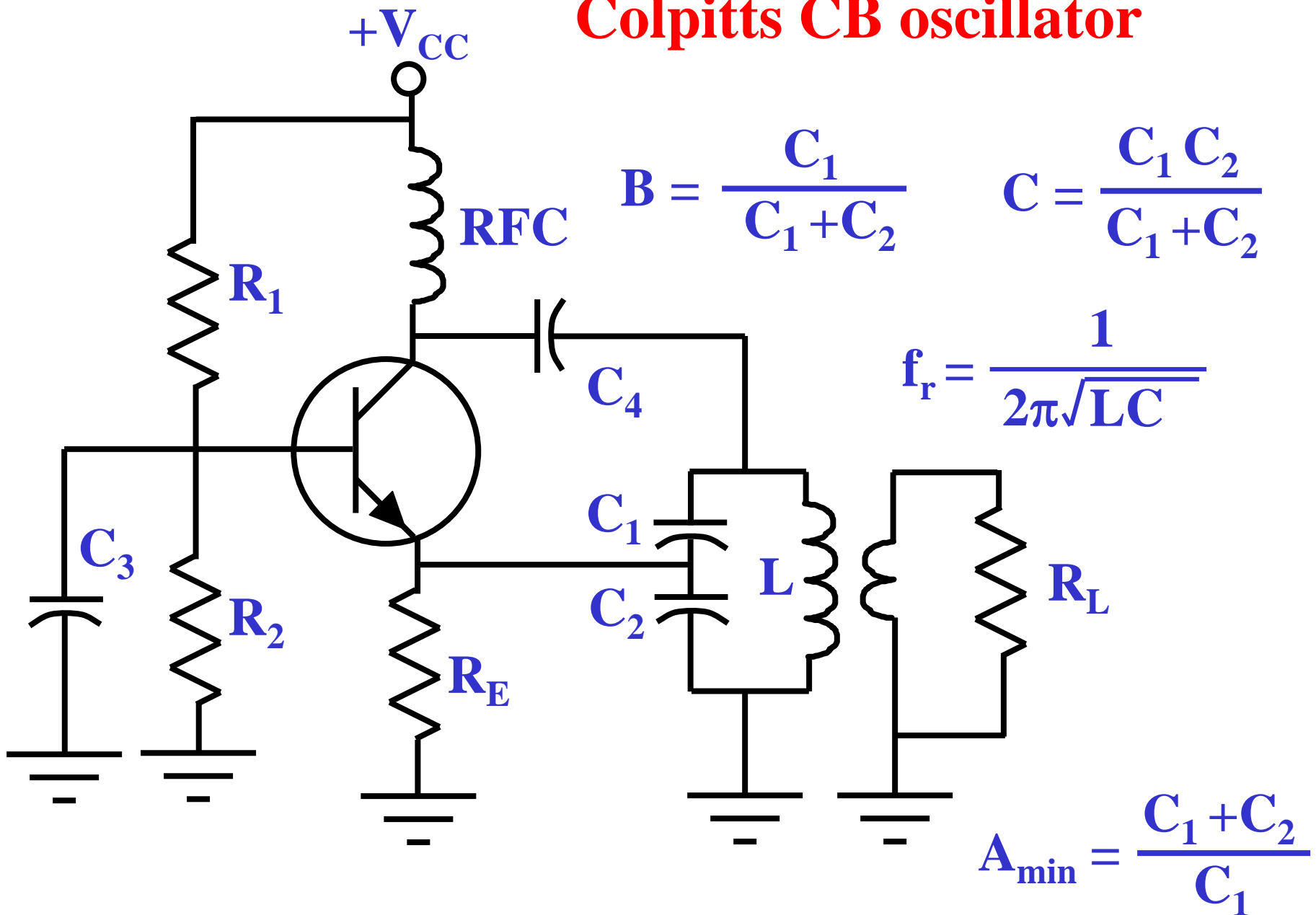
$$A_{\min} = \frac{C_2}{C_1}$$



$$C = \frac{C_1 C_2}{C_1 + C_2}$$

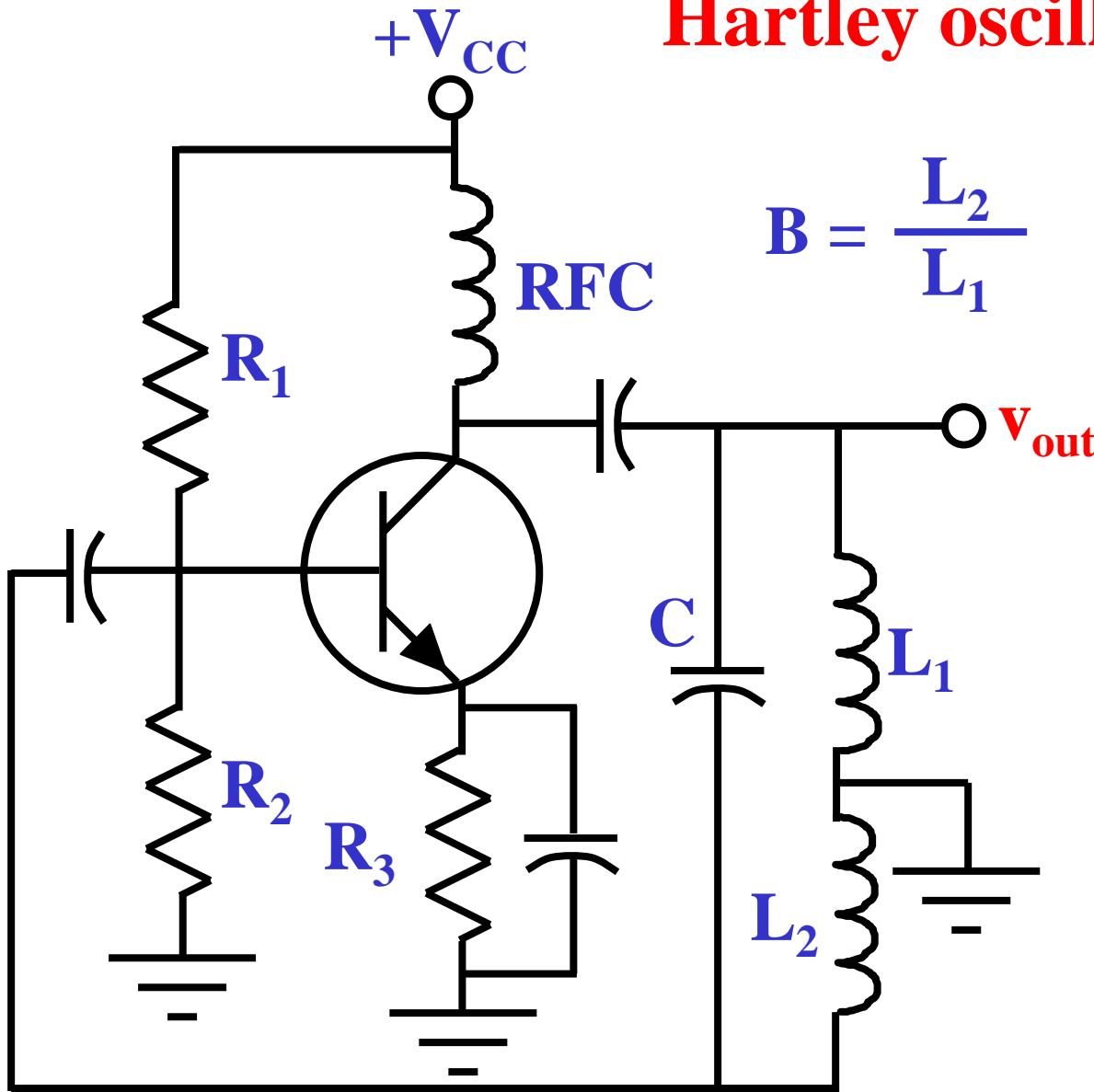
$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

# Colpitts CB oscillator



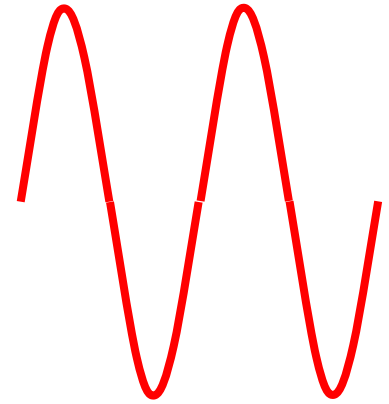


# Hartley oscillator



$$B = \frac{L_2}{L_1}$$

$$A_{\min} = \frac{L_1}{L_2}$$

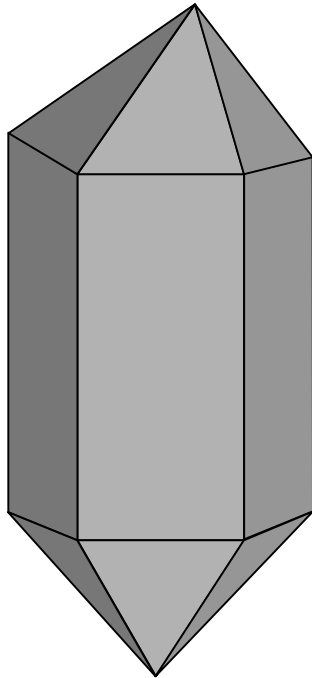


$$L = L_1 + L_2$$

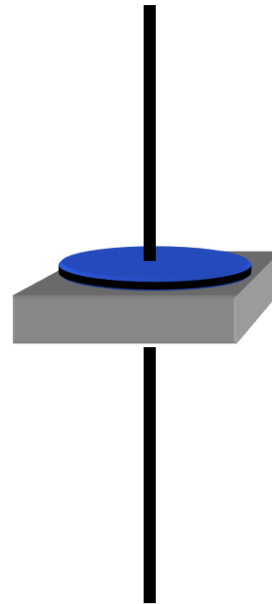
$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

**Crystal-controlled oscillators are used when frequency stability is important.**

**Quartz crystal**

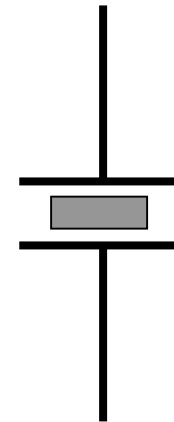


**Slab cut from crystal**

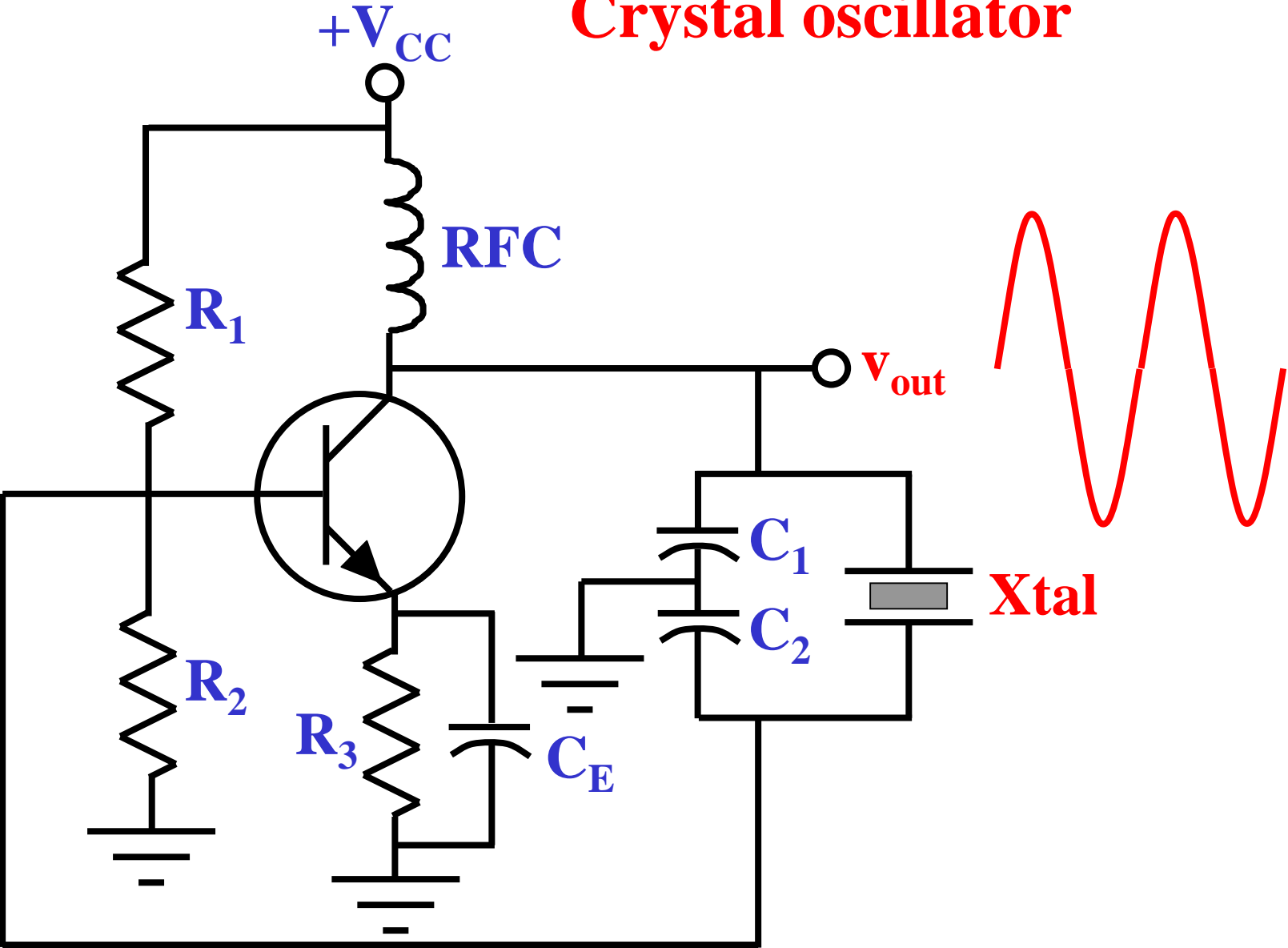


**Electrodes and leads**

**Schematic symbol**



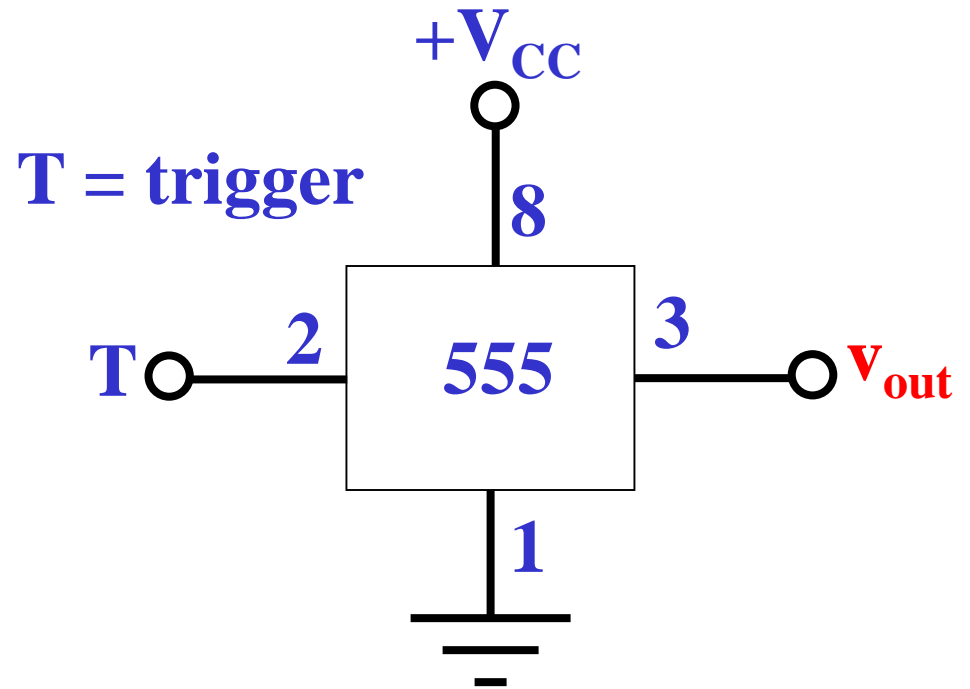
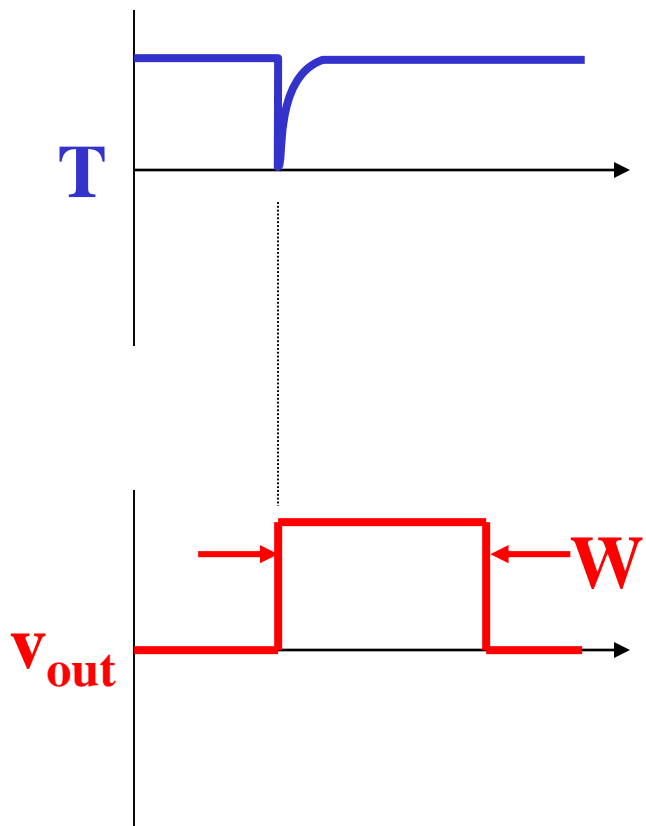
# Crystal oscillator



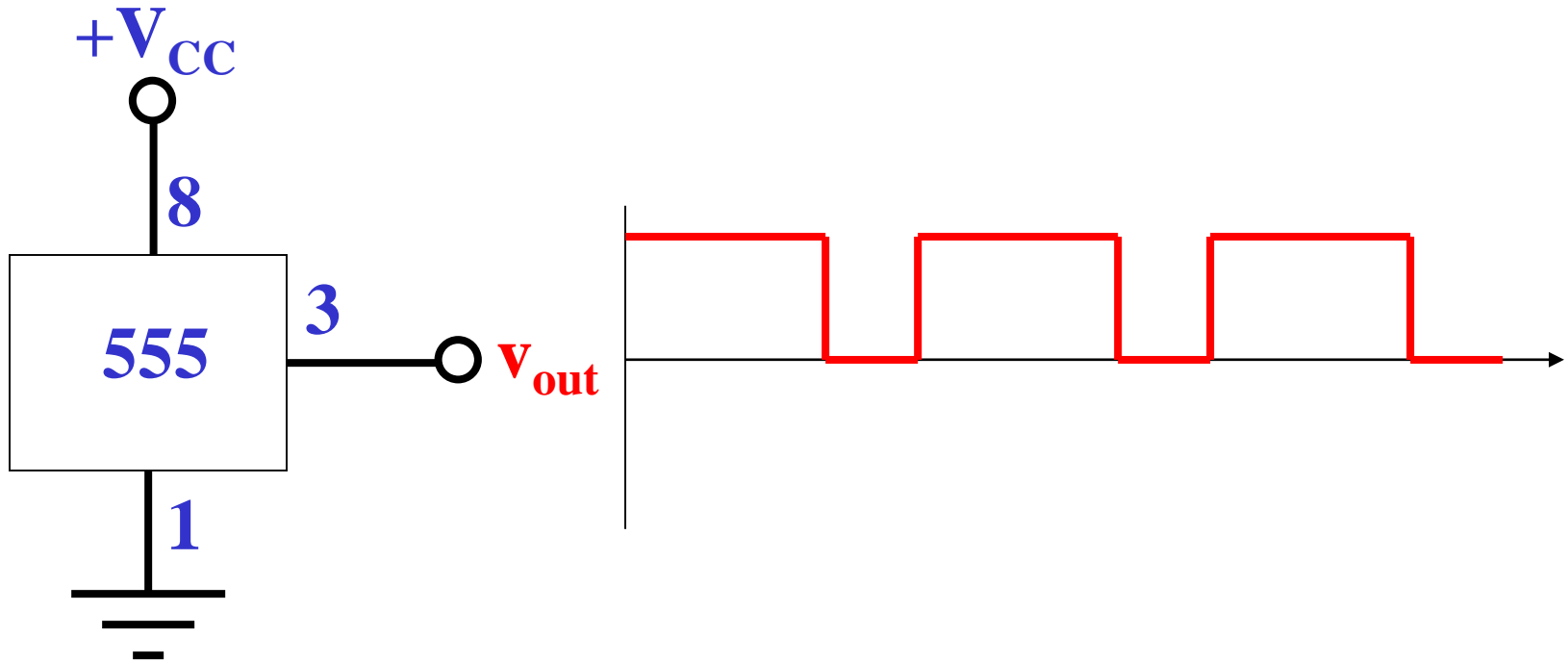
# Crystals

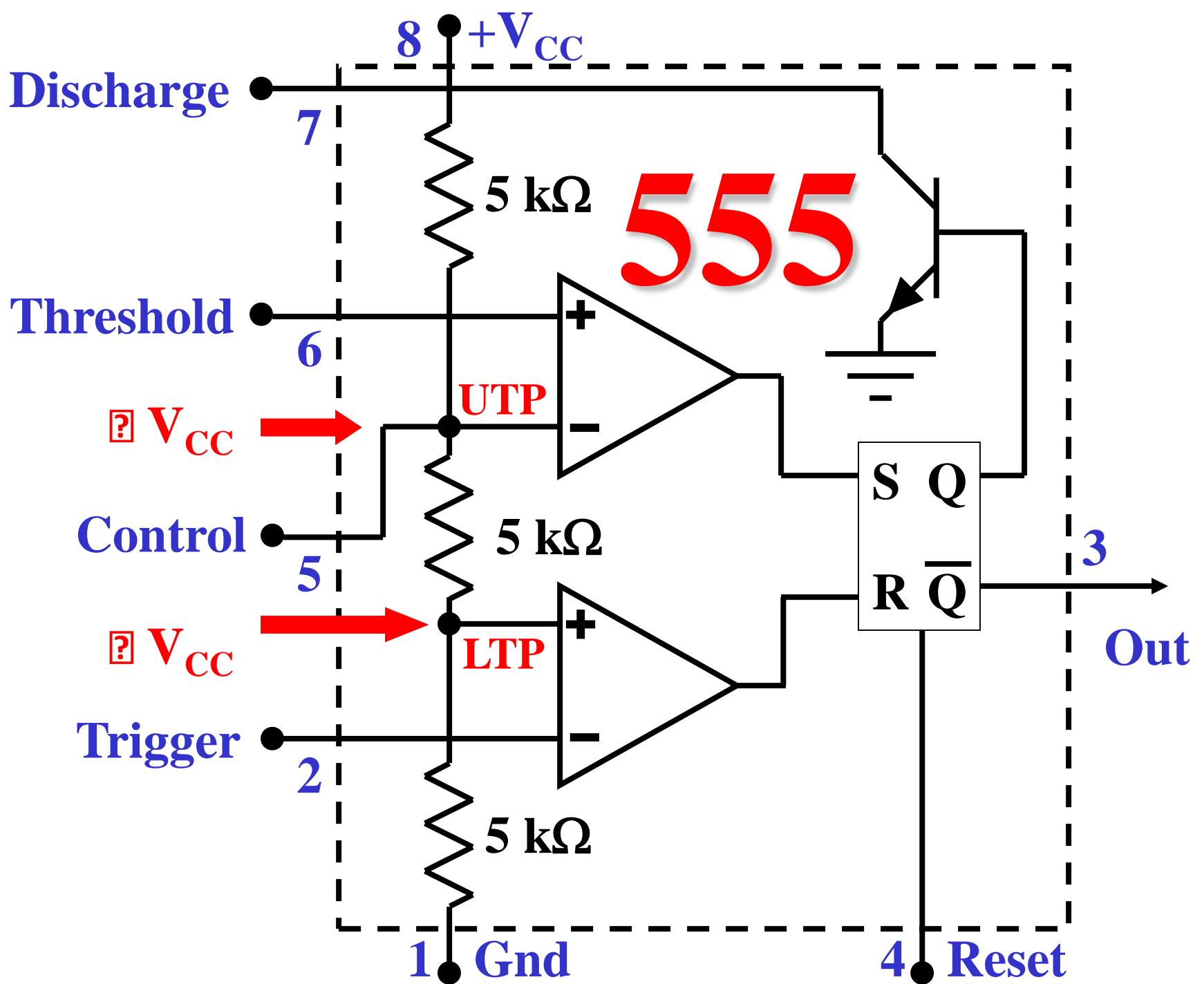
- **The fundamental frequency (series resonance) is controlled by the slab thickness.**
- **Higher multiples of the fundamental are called overtones.**
- **The electrode capacitance creates a parallel resonant frequency which is slightly higher.**
- **Typical frequency accuracy is measured in parts per million (ppm).**

# Monostable operation of the 555 timer IC

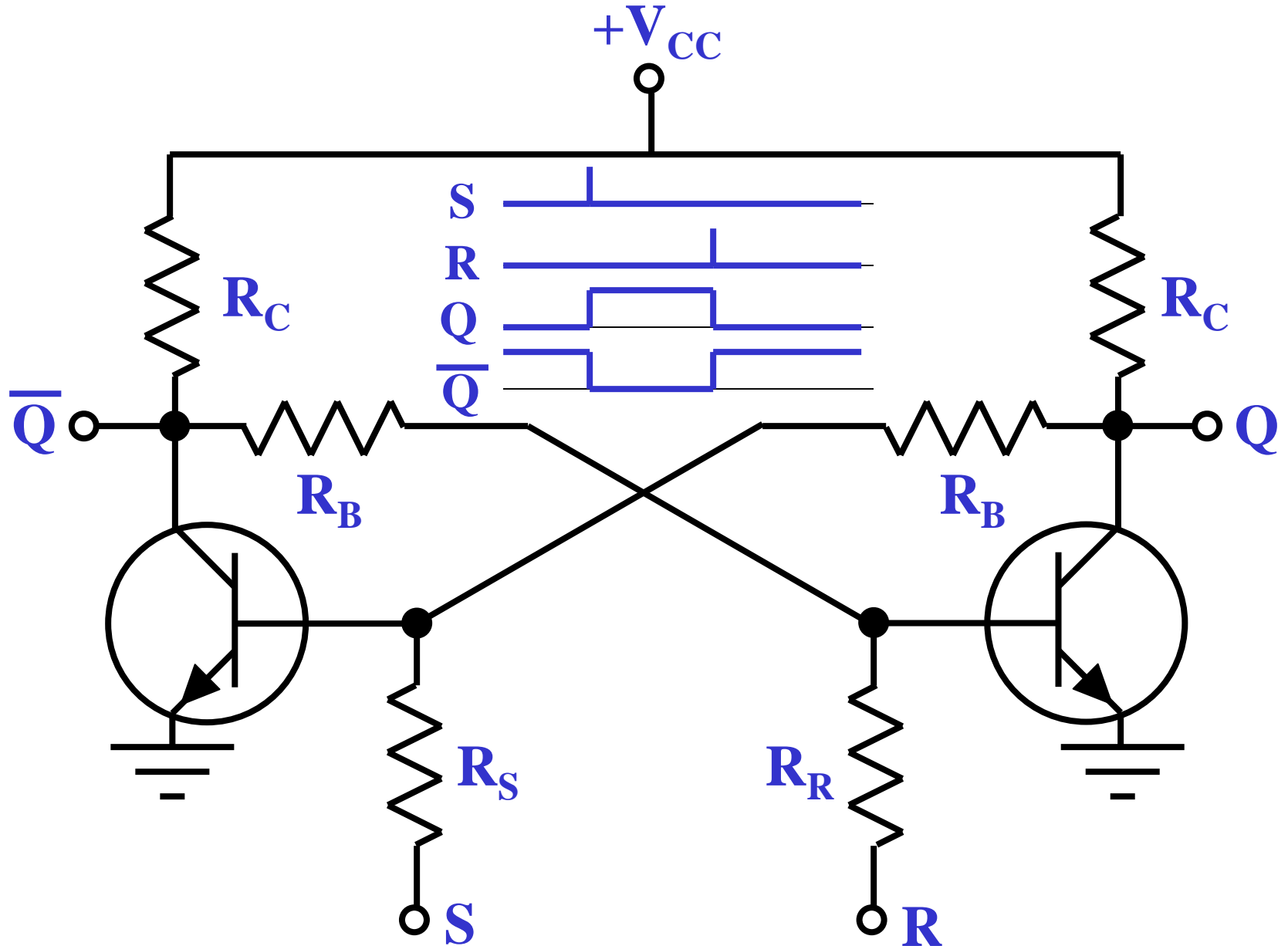


# Astable operation of the 555 timer IC



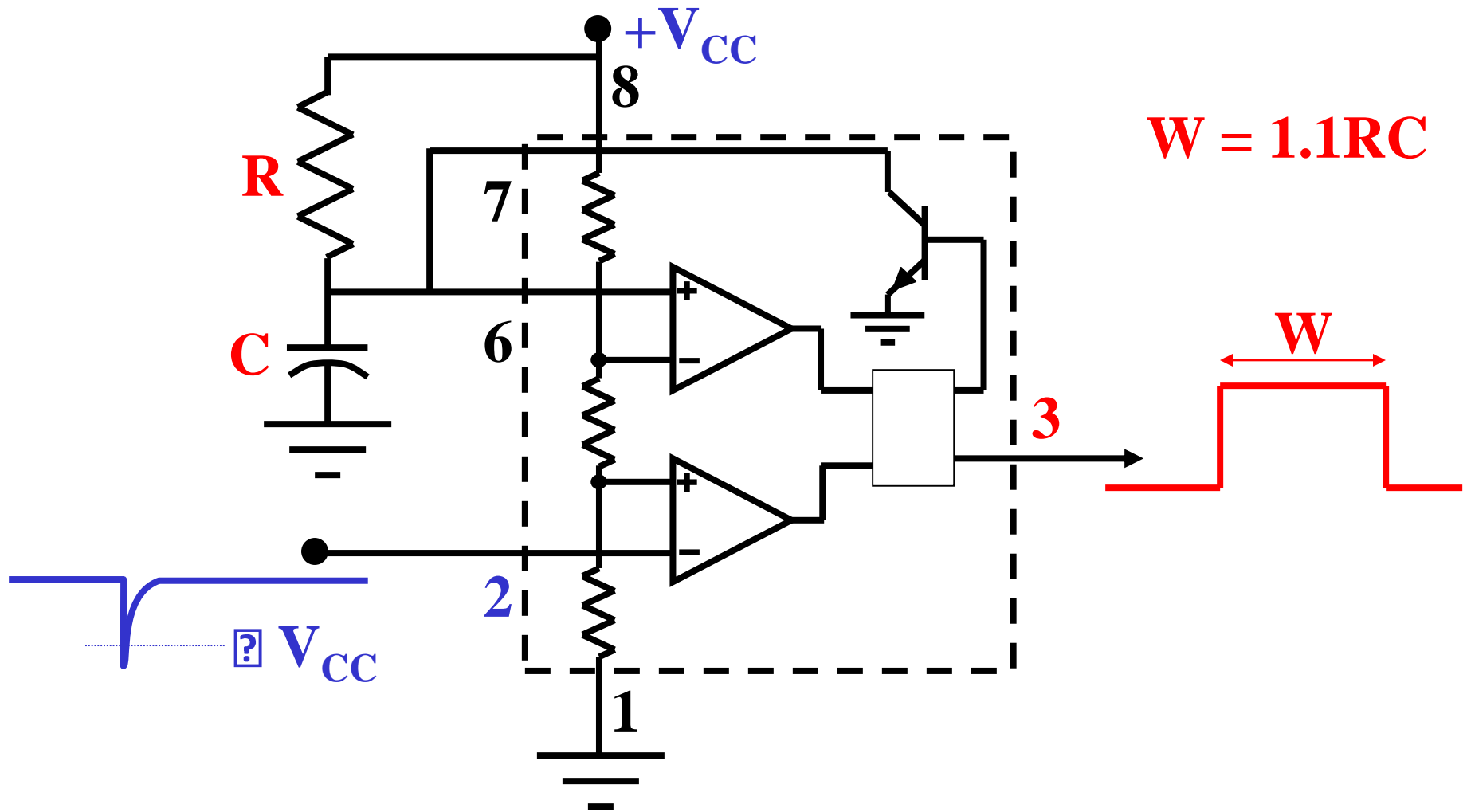


# A discrete RS flip-flop

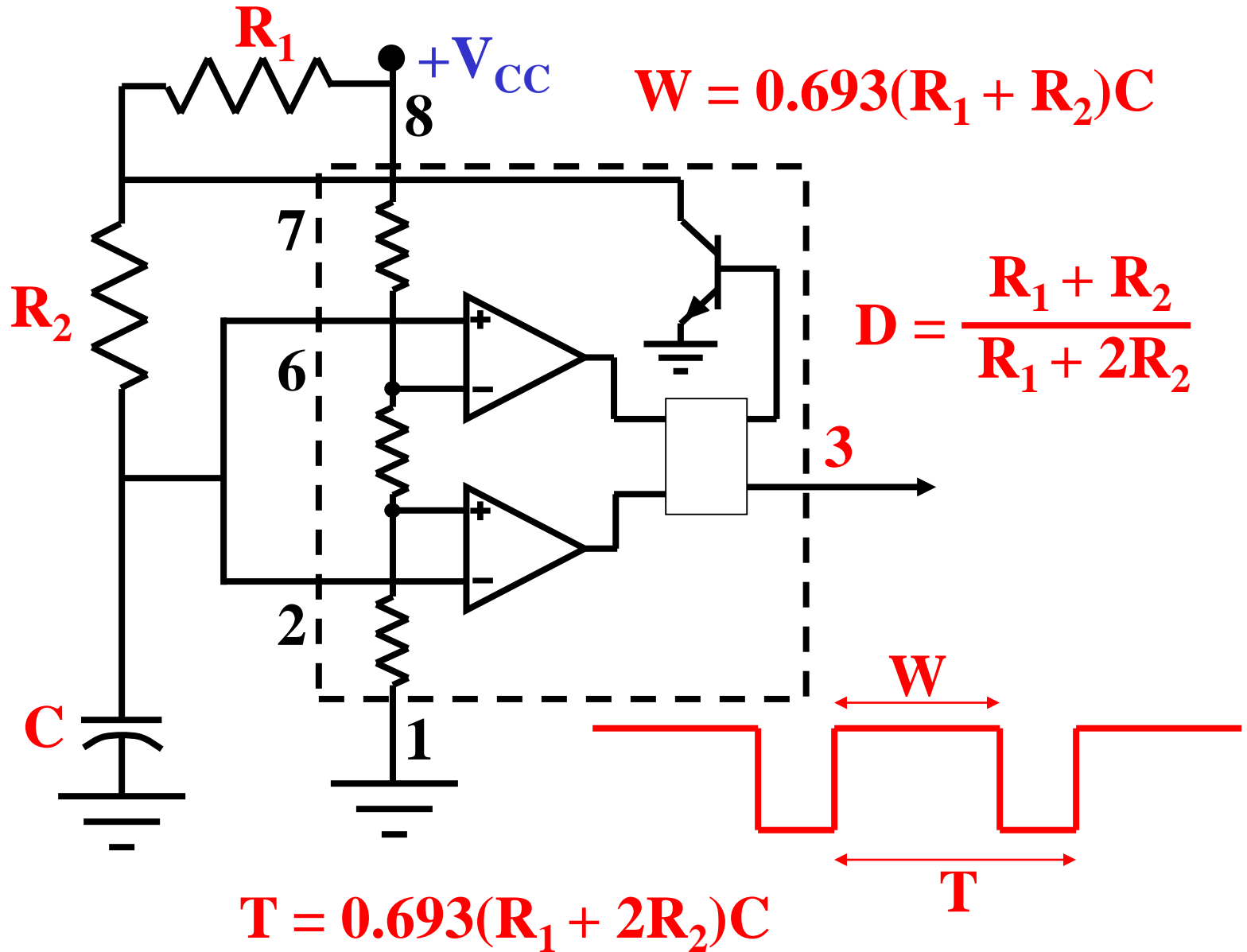




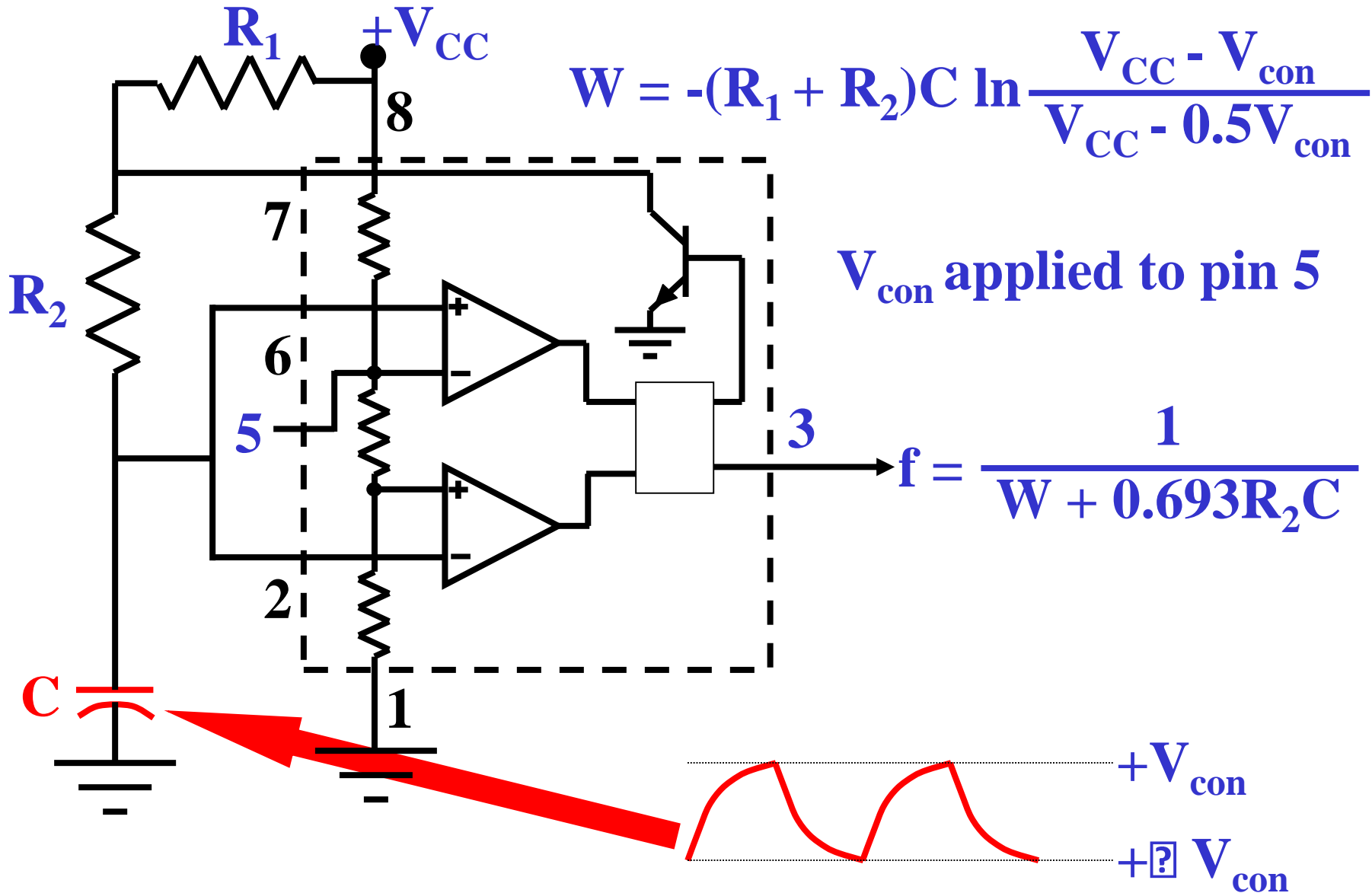
# 555 IC configured for monostable operation



# 555 IC configured for astable operation

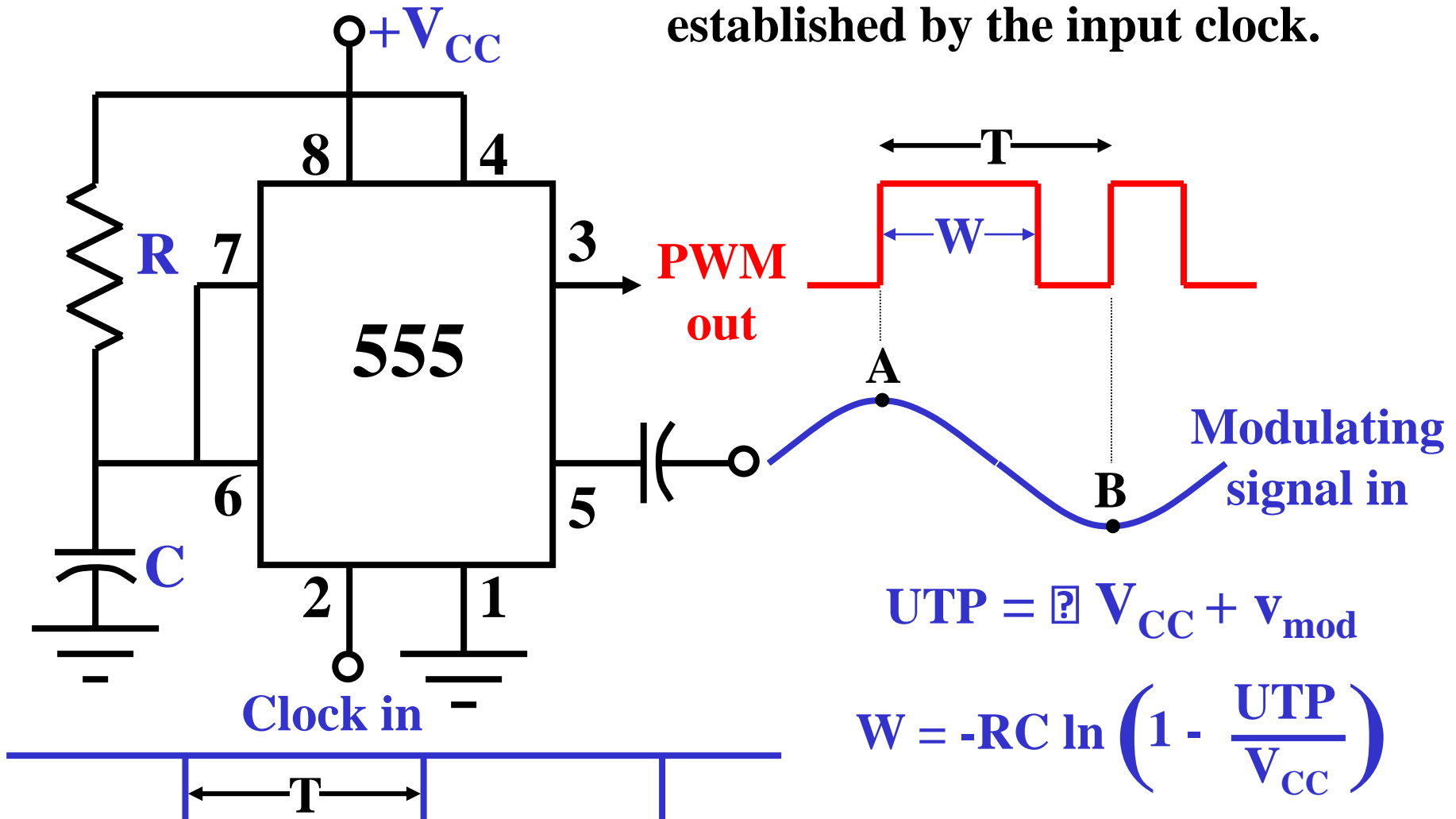


# 555 voltage-controlled oscillator



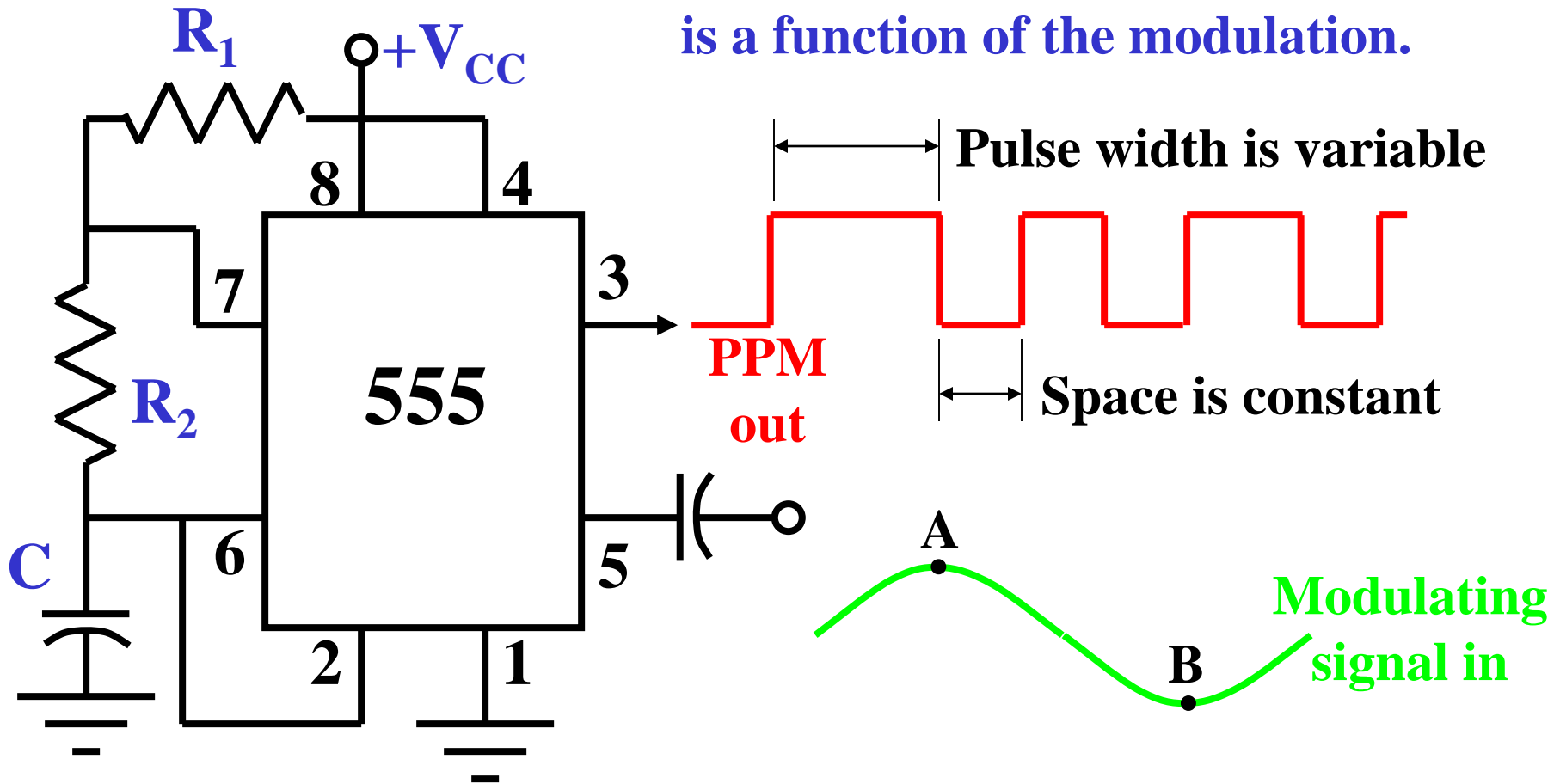
# Pulse-width modulation with the 555 timer IC

The output frequency is established by the input clock.



# Pulse-position modulation with the 555 timer IC

The leading edge of each pulse is a function of the modulation.



$$\text{Space} = 0.693R_2C$$

# Phase-locked loops

- It is possible to phase-lock an oscillator to a signal by using a phase detector and negative feedback.
- PLLs can be used to remove noise from a signal.
- PLLs can be used to demodulate an FM signal.
- PLLs are available as monolithic ICs.