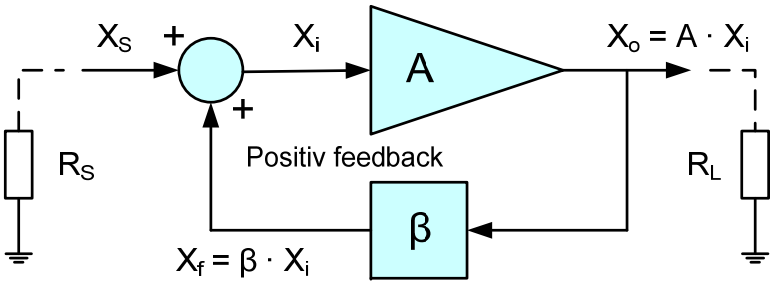
Oscillatorer

1. Phase-shift oscillator
2. Wien bridge oscillator
3. Tuned oscillator circuits
4. Crystal oscillators



Faseskift oscillator

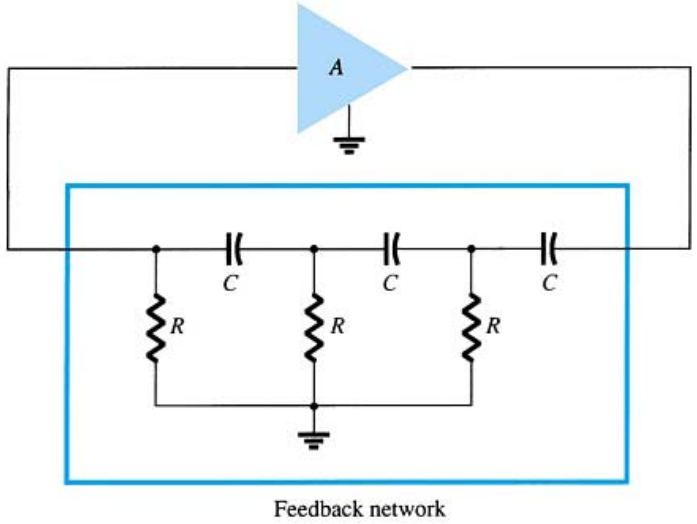
$$\frac{x_o}{x_s} = A_f = \frac{A}{1 - A \cdot \beta}$$

Forsterkningen må være tilstrekkelig til å kompensere for tapene i RC nettverket. Loopgain må være 1.

$$Når\ A \cdot \beta \to 1\ vil\ A_f \to \infty$$

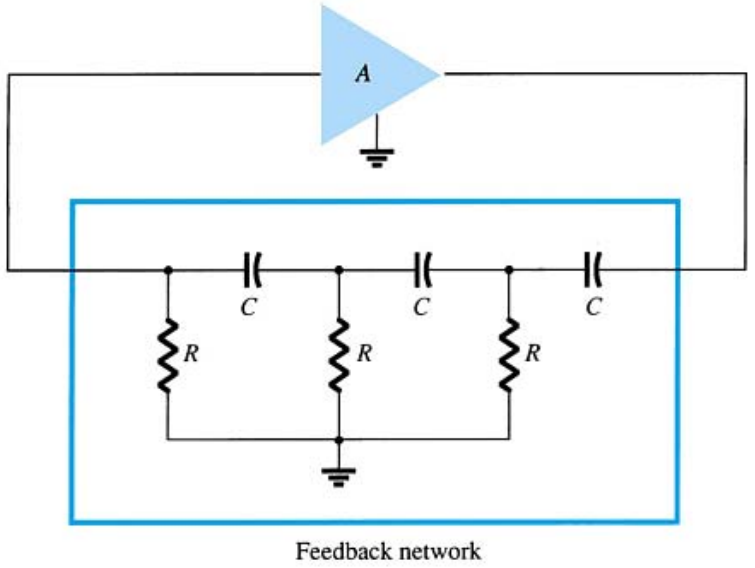
(Barkhausen – loopgain >= 1)

RC-nettverket gir tilstrekkelig faseskift slik at positiv feedback oppstår for en gitt frekvens..



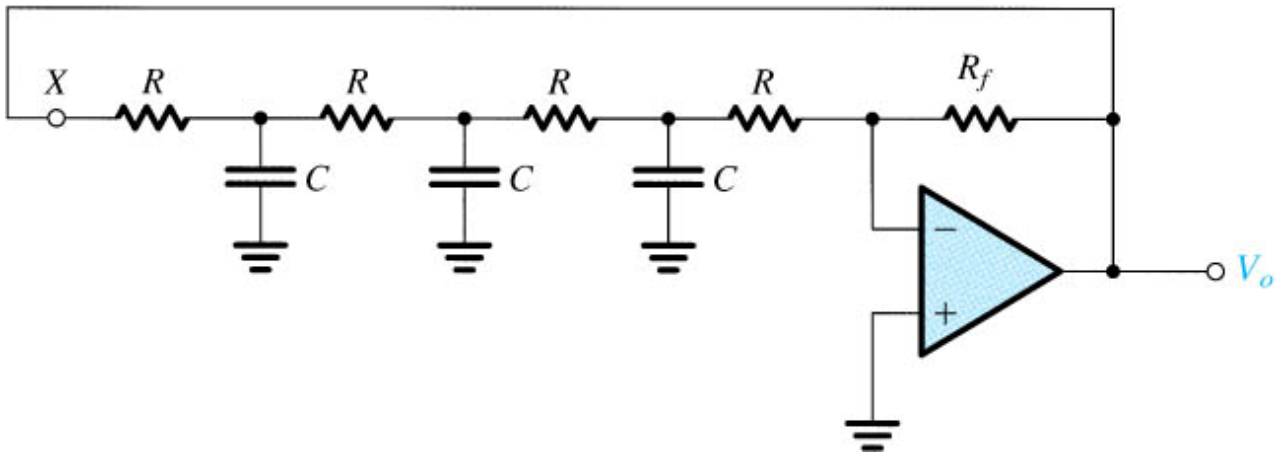
Oscillatorer

Faseskiftoscillator



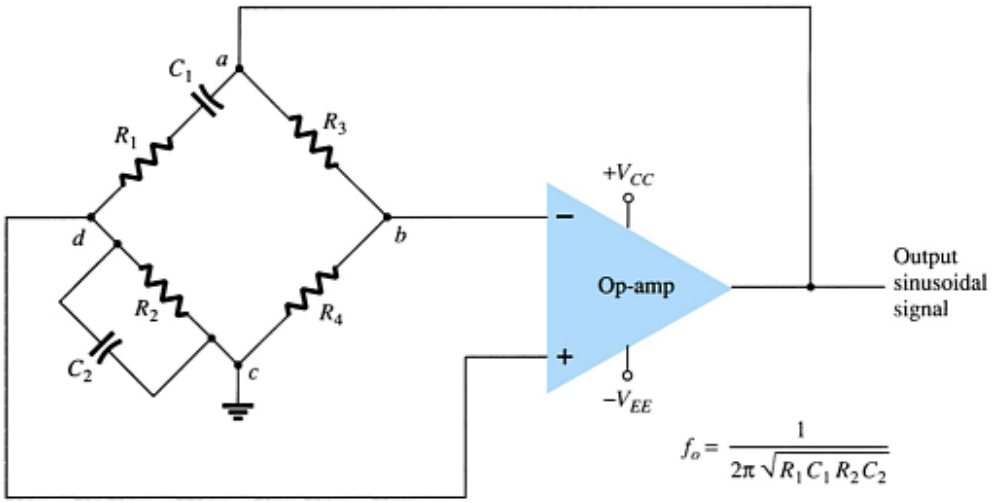
Praktisk kopling vha. operasjonsforsterker

$$f = \frac{1}{2\pi RC\sqrt{6}}$$

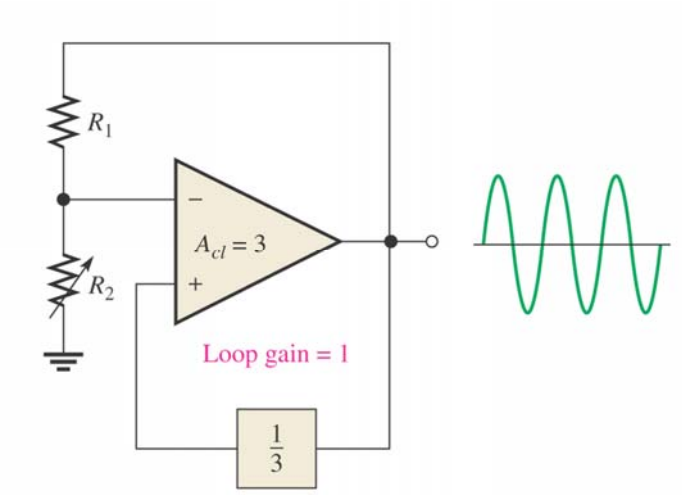


Wien Bridge Oscillator

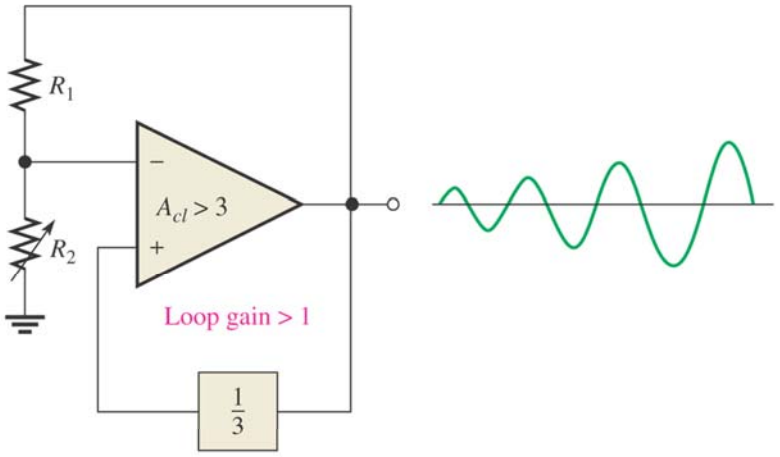
Forsterkningen må være tilstrekkelig til å kompensere for tapene i RC nettverket. Loopgain må være 1.



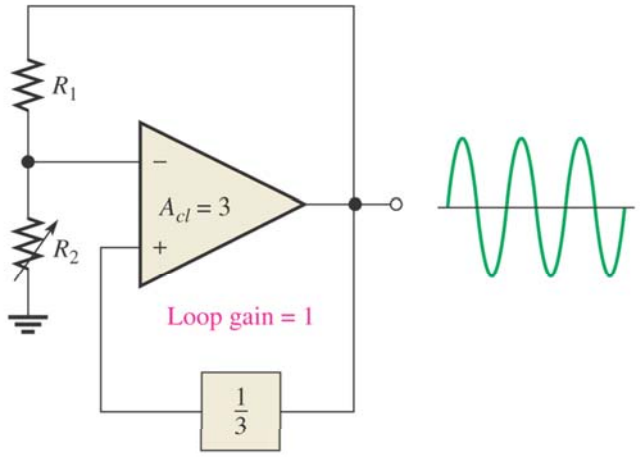
- **The feedback resistors are R_3 and R_4.**
- **The phase-shift components are R_1, C_1 and R_2, C_2.**



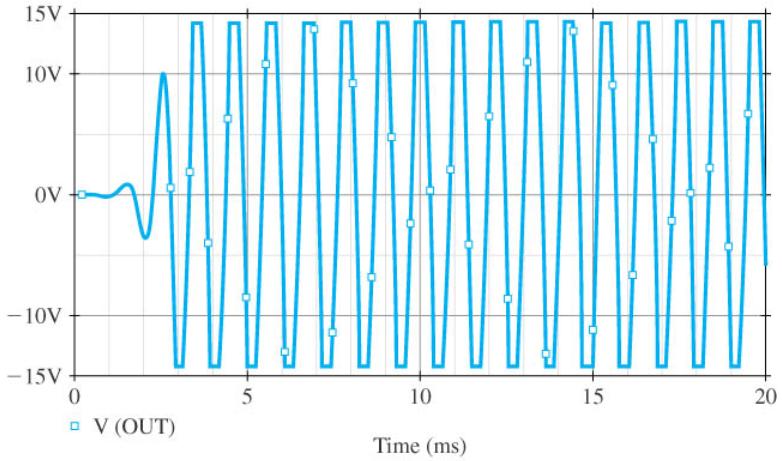
Wien Bridge Oscillator



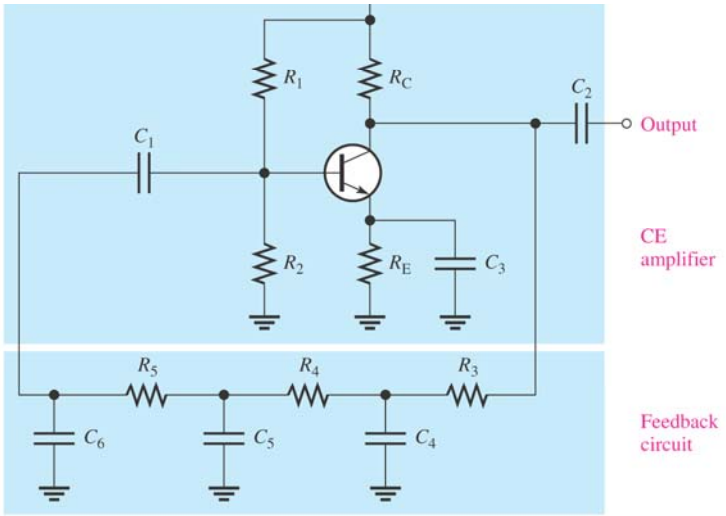
(a) Initially, loop gain greater than 1 causes output to build up.



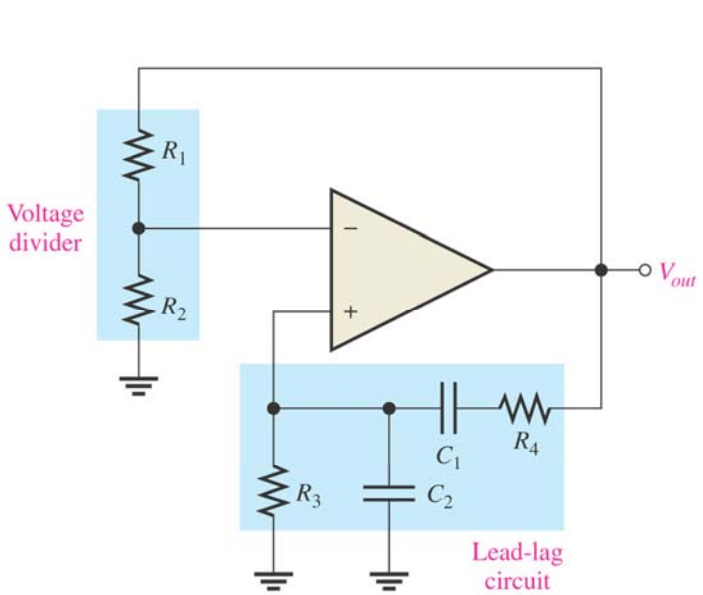
(b) Loop gain of 1 causes a sustained constant output.

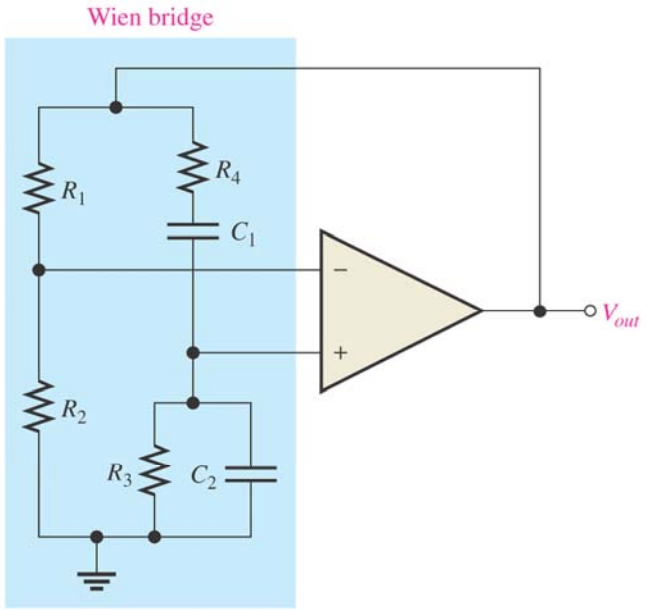


(a) R_{1a} = 15kΩ, Loop Gain = 1.33

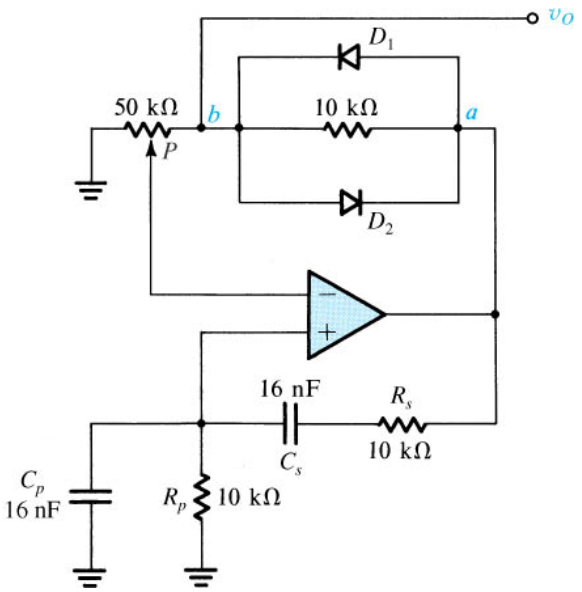


Wien Bridge Oscillator





R1 =100 ohm R2 = 50 ohm. Forsterkning A = 3
Bytter ut R2 med en liten lyspære med Ri = 50 ohm når den er kald.
Alternativt brukes to zenerdioder. Se fig. ⟶



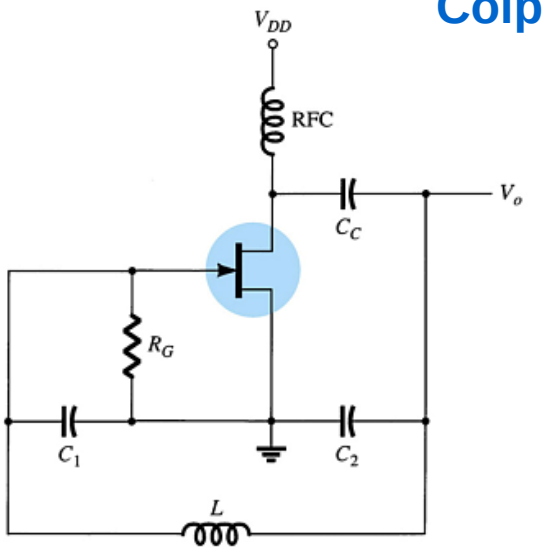
Avstemte oscillatorer Tuned Oscillator Circuits

Avstemte oscillatorer bruker en LC-resonanskrets (LC tank) for å frembringe oscillasjon

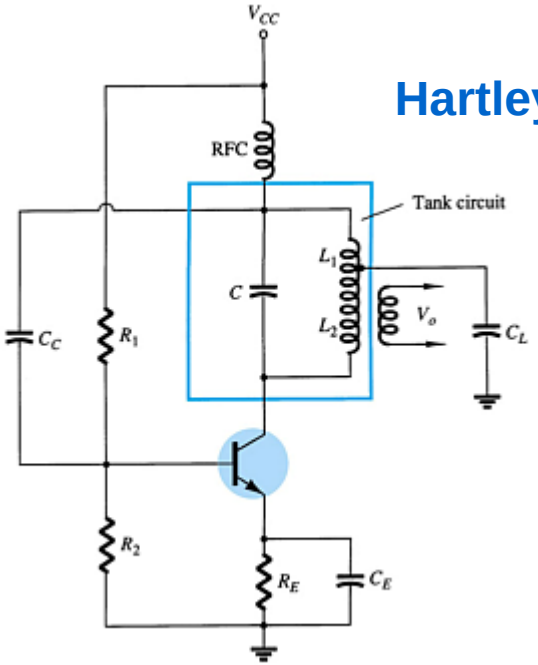
Det finnes flere typer slike avstemte oscillatorer – de vanligste er :

Colpitts Resonanskretsen består av en spole og to kondensatorer
Hartley resonanskretsen består av en to spoler og en kondensator

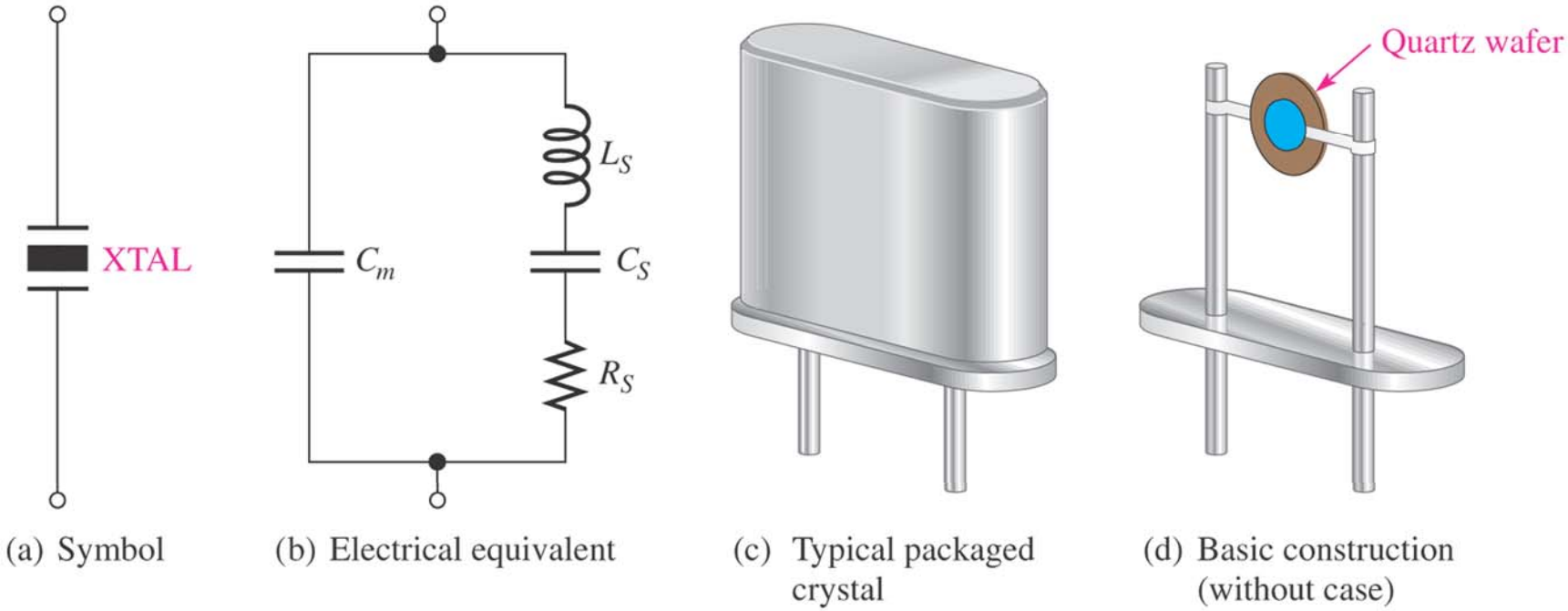
Colpitts



Hartley



Krystalloscillator

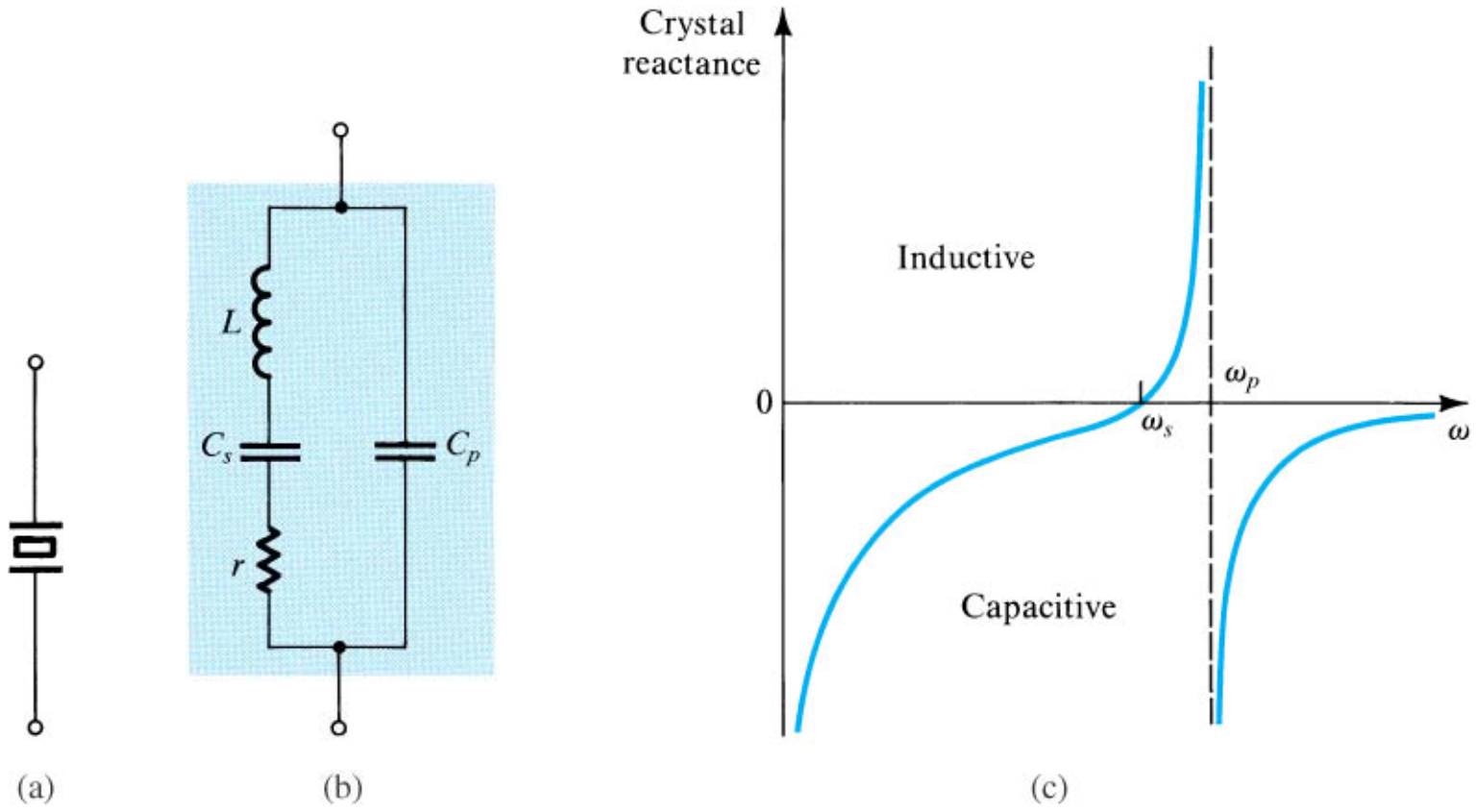


(a) Symbol (b) Electrical equivalent (c) Typical packaged crystal (d) Basic construction (without case)

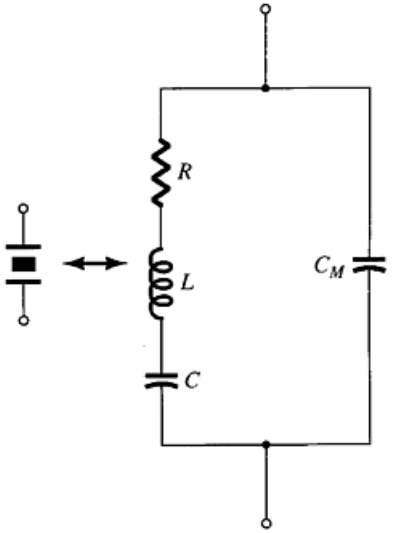
Krystallet (pietzoelektrisk materiale - kvarts) opptrer som en resonanskrets

Krystalloscillator

Krystallet (pietzoelektrisk materiale - kvarts) opptrer som en resonanskrets



Krystalloscillator



Krystallet har to resonansfrekvenser :

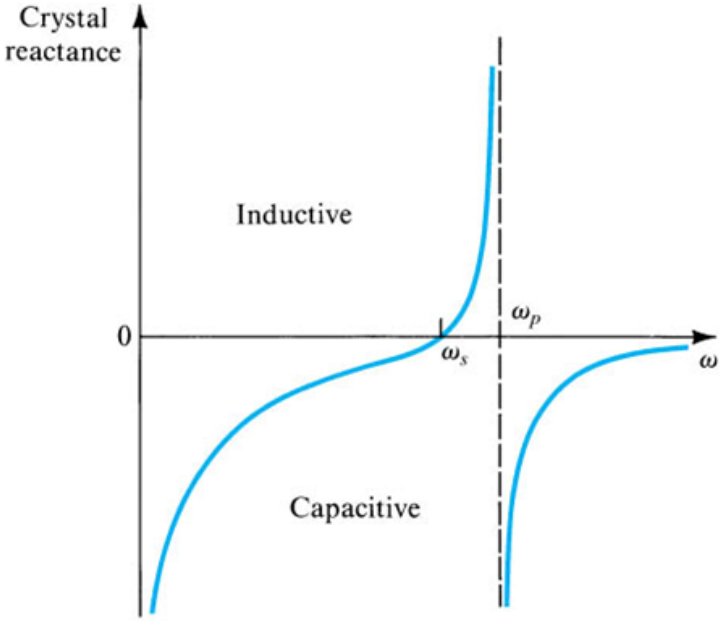
Serieresonans

- **RLC bestemmer resonansfrekvensen**
- **Krystallet har lav impedans**

Parallellresonans

- **RL and C_M bestemmer frekvensen**
- **Krystallet har høy impedans**

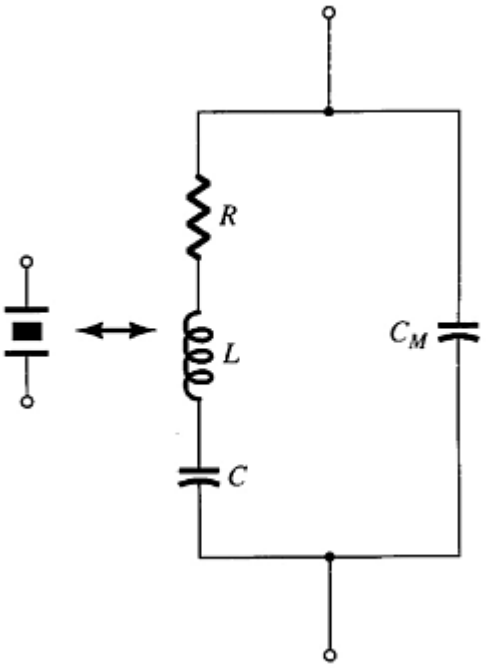
Disse to frekvensene ligger svært nær hverandre – innenfor 1%

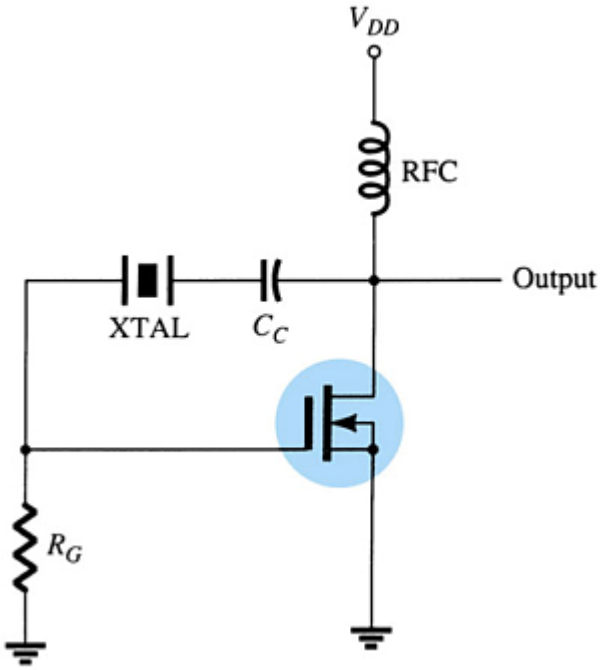


Krystalloscillator - serieresonans

RLC bestemmer resonansfrekvensen

Krystallet har lav impedans

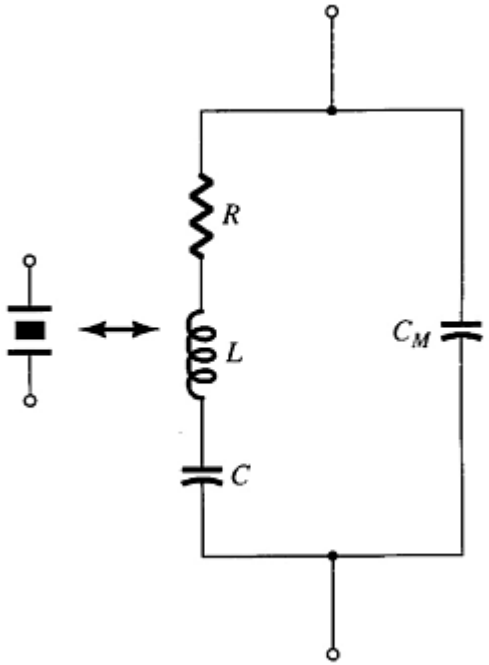


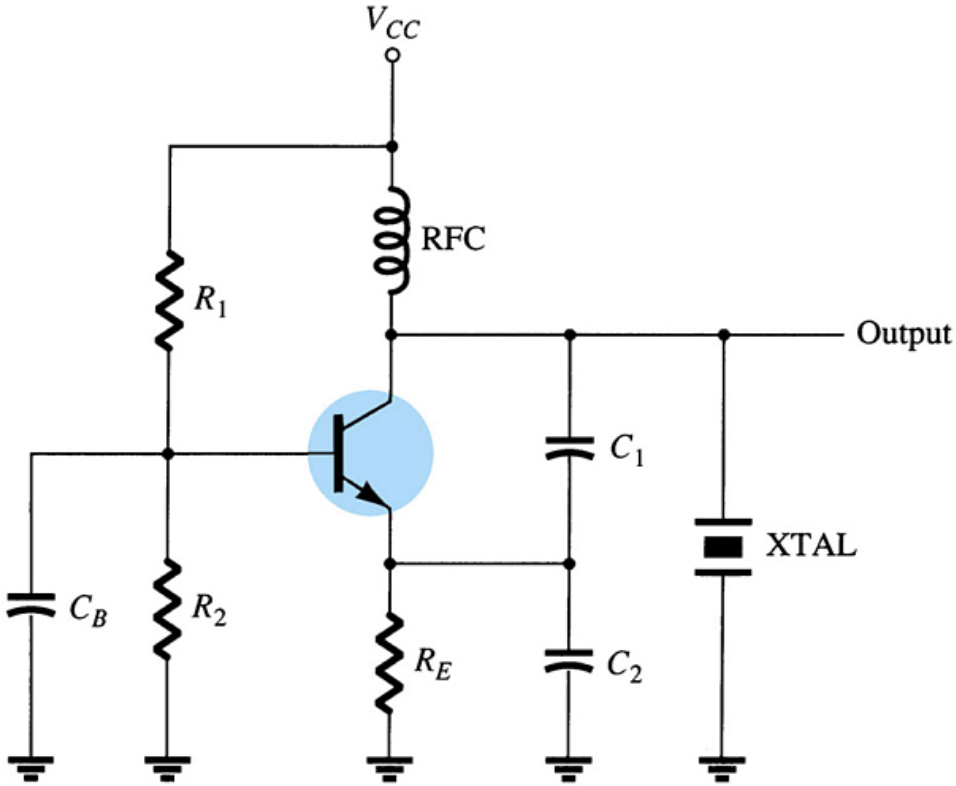


Krystalloscillator - parallellresonans

R L og C_M bestemmer resonansfrekvensen

Krystallet har stor impedans





Piezoelektriske materialer – et utvalg :

Lithium tantalate
Polyvinylidene fluoride
Lanthanum gallium silicate
Potassium sodium tartrate
Ceramics with perovskite tungsten-bronze structures:
$BaTiO_3$,
$KNbO_3$,
$Ba_2NaNb_5O_5$,
$LiNbO_3$,
$SrTiO_3$,
$Pb(ZrTi)O_3$,
$Pb_2KNb_5O_{15}$,
$LiTaO_3$,
$BiFeO_3$,
Na_xWO_3