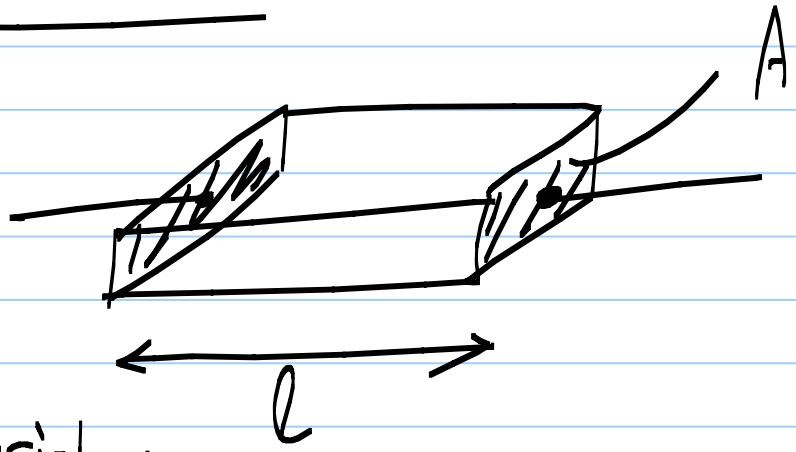
Lecture 38

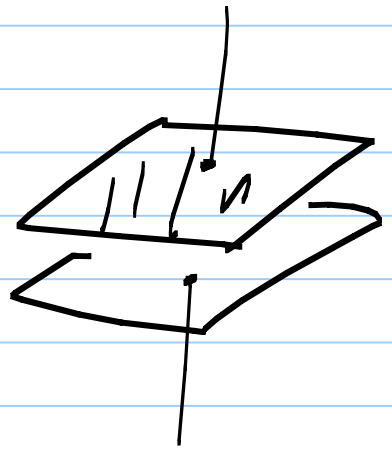


$$R = \rho \cdot \frac{l}{A}$$

$$P = I^2 R$$

Resistors

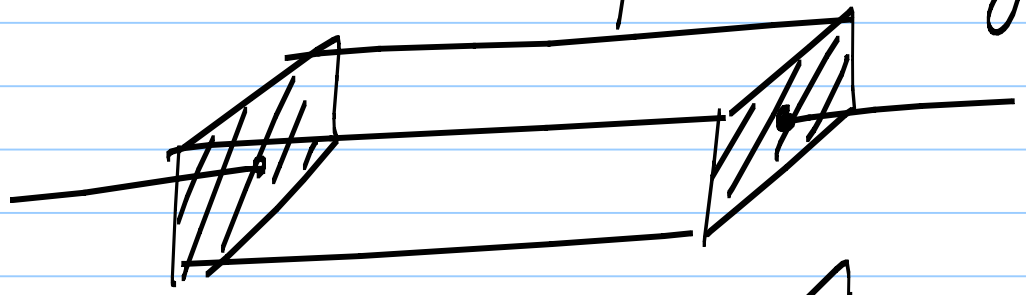
Capacitors:

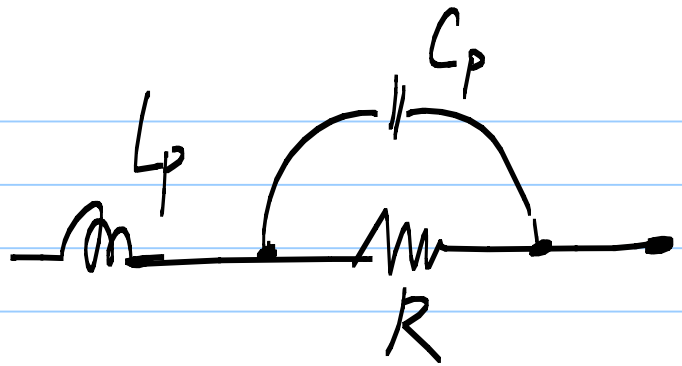


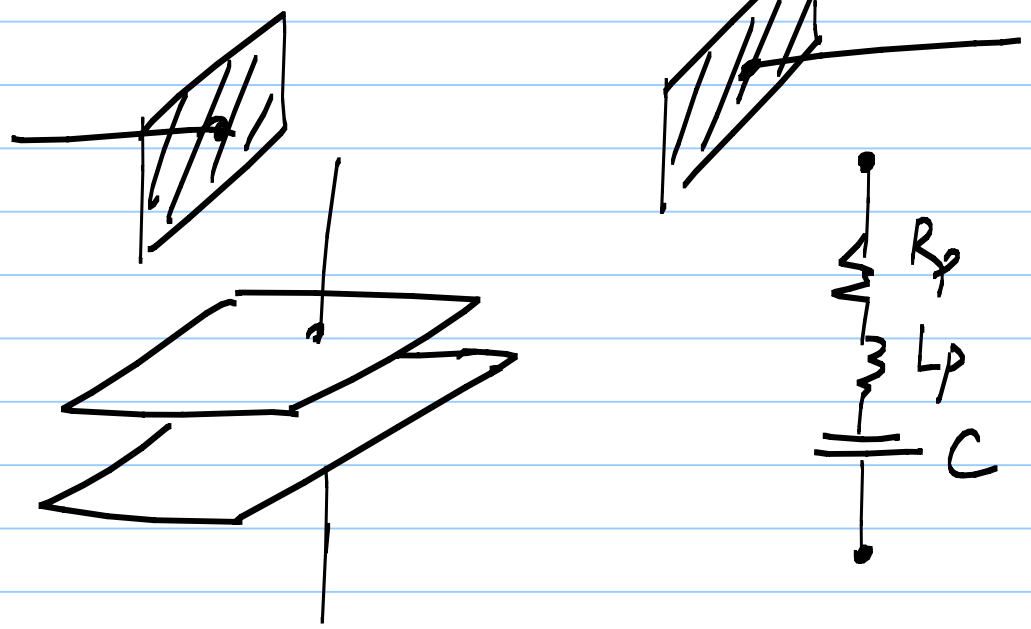
$$C = \epsilon_r \epsilon_0 \cdot \frac{A}{d}$$

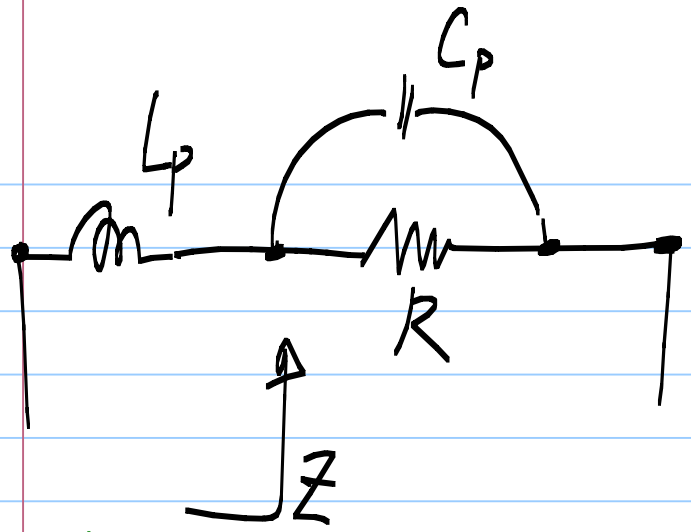
Resistors :

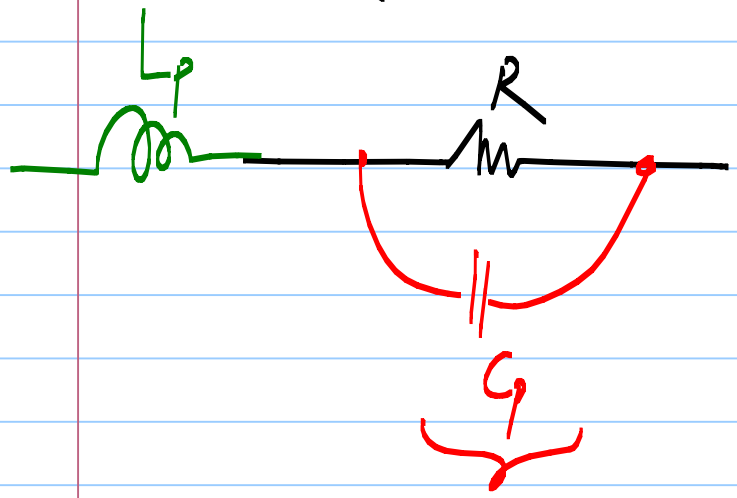
- Resistance value
- Power rating

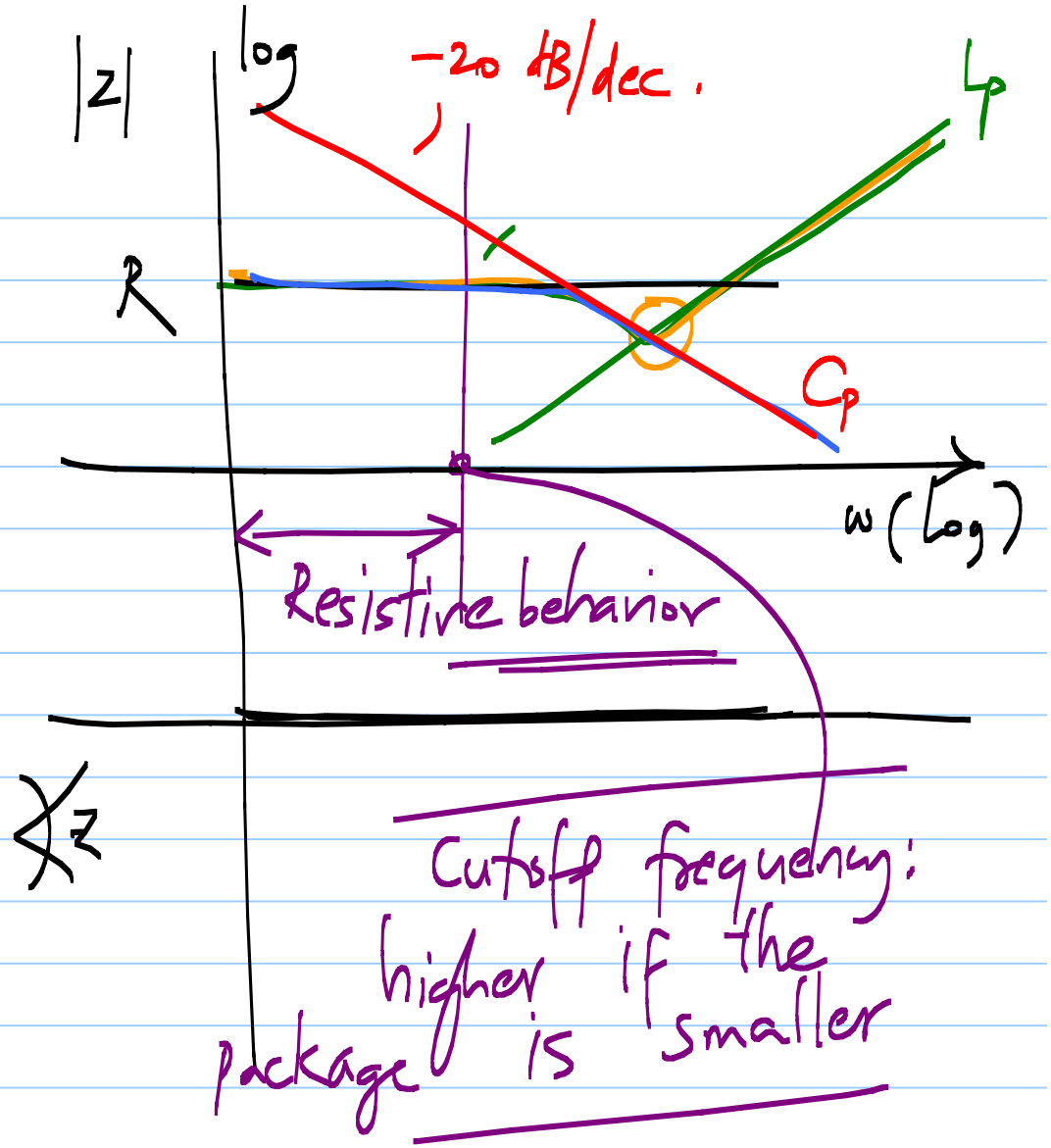


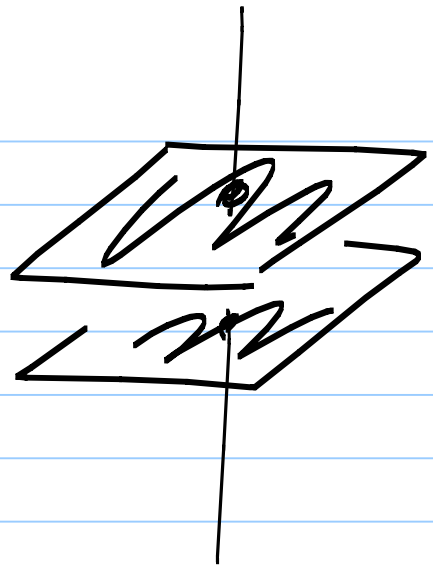


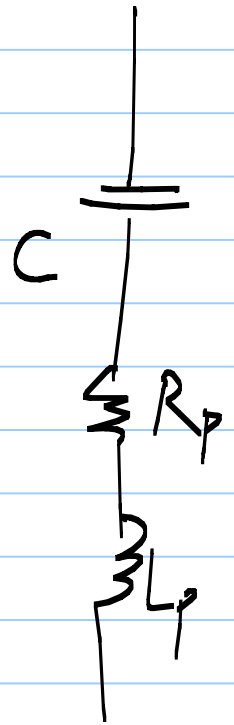


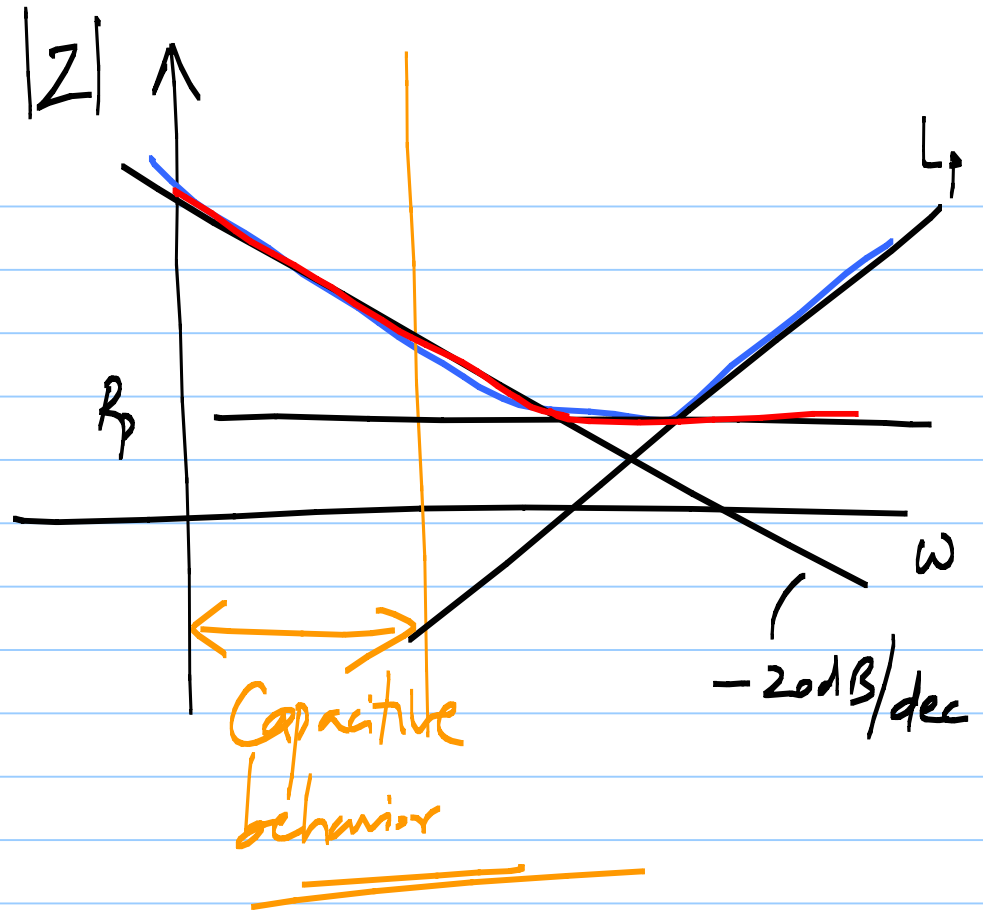

C_p
L_p
R
Z

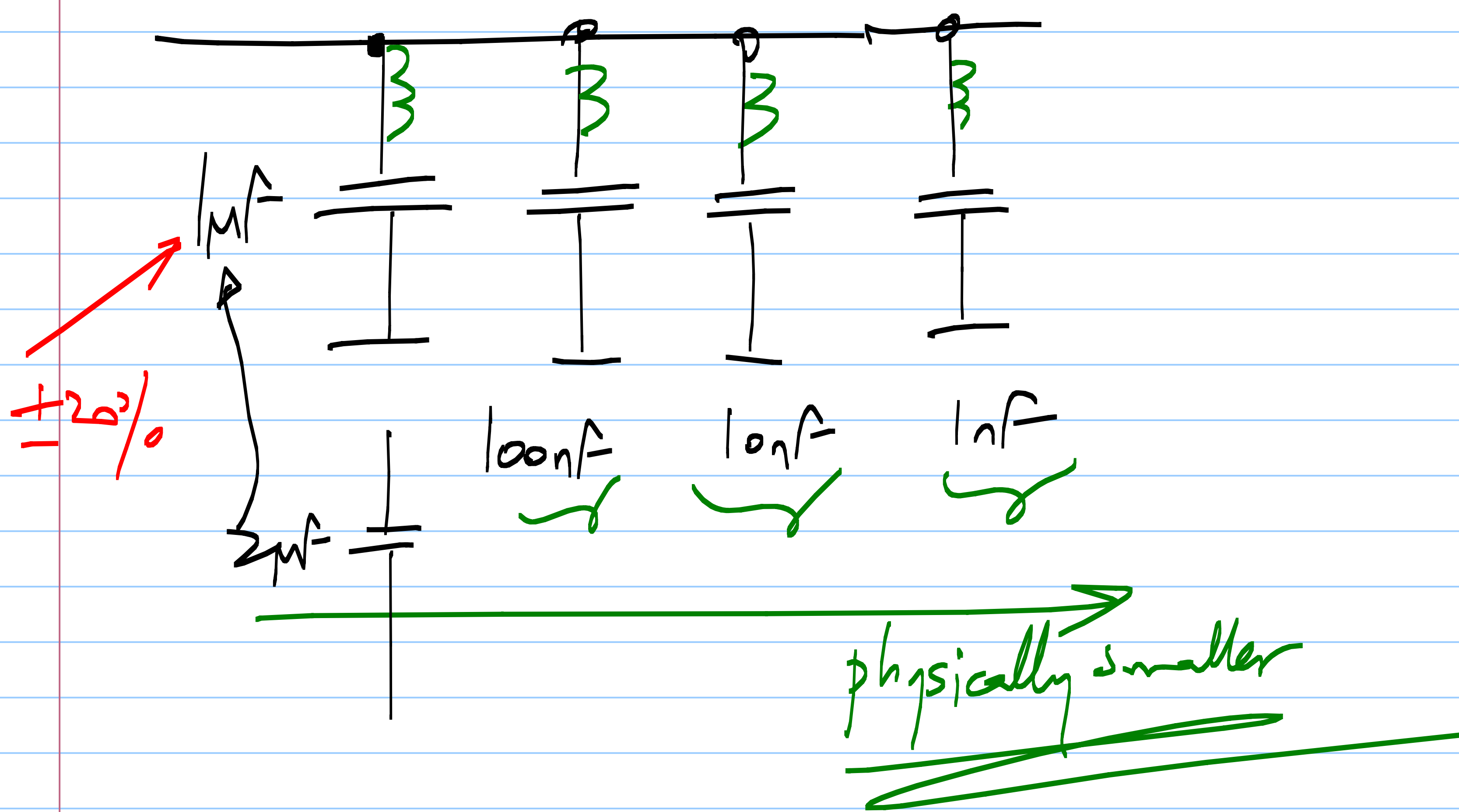

L_p
R
C_p


|Z|
log
-20 dB/dec.
L_p
R
C_p
ω (log)
Resistive behavior
∠Z
Cutoff frequency: higher if the package is smaller

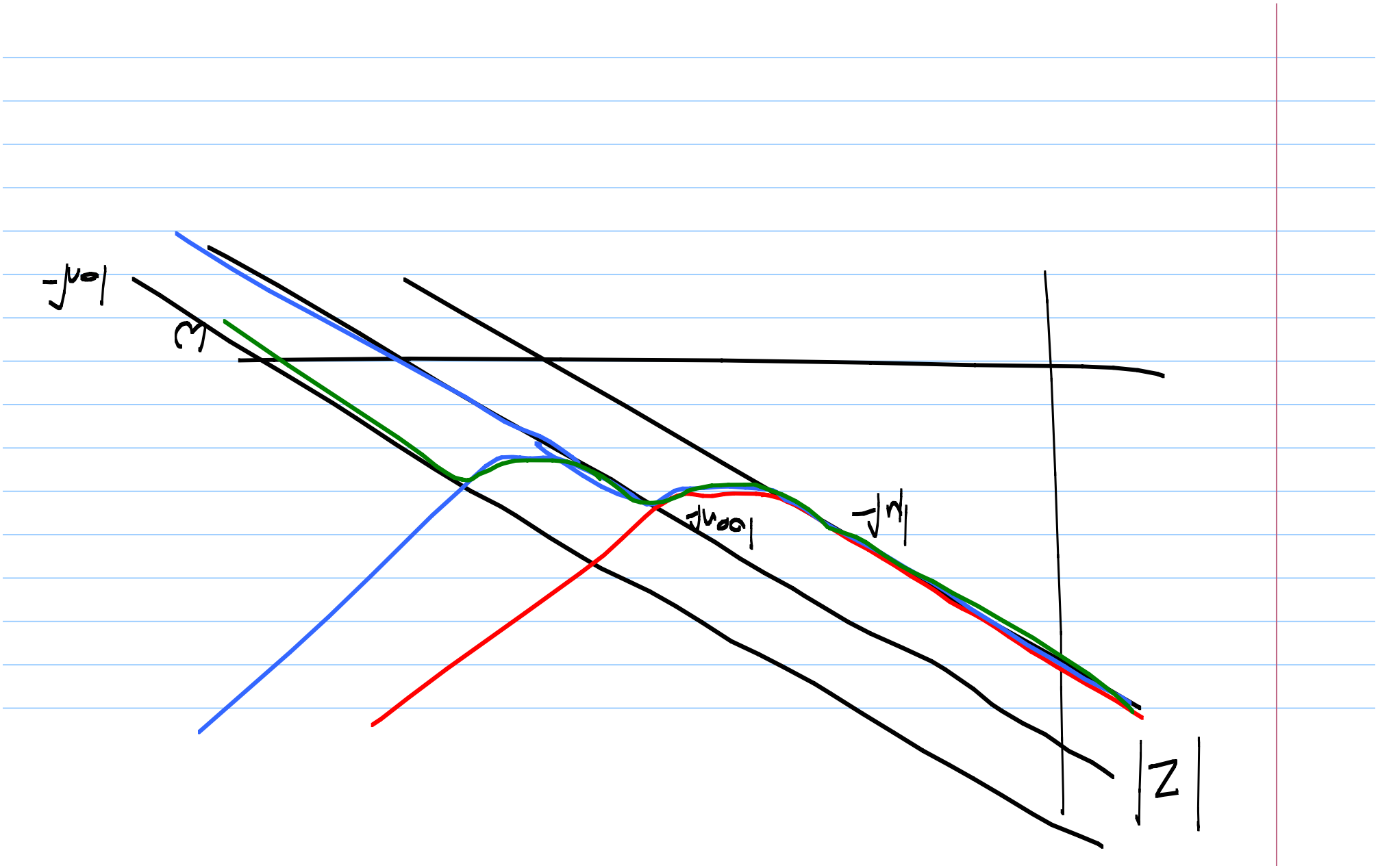



C
R_p
L_p


|Z|
L_p
R_p
ω
−20dB/dec
Capacitive behavior

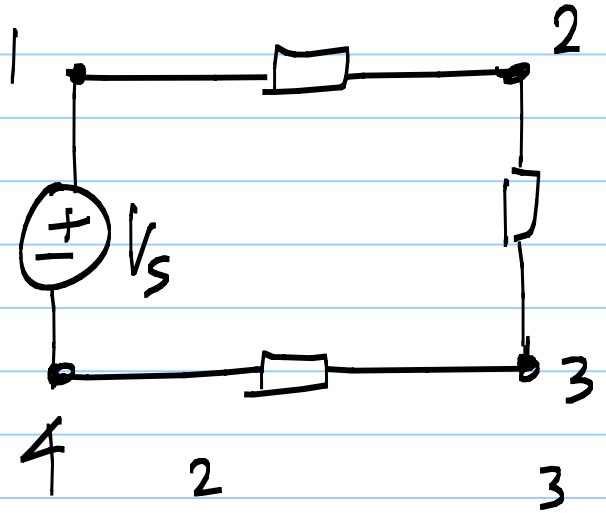


1µF
±20%
2µF
100nF
10nF
1nF
physically smaller


-jv0
M
-jv∞
-jn
|Z|

Electric circuit:

$$\oint \bar{E} \cdot d\bar{l} \simeq 0 \qquad \frac{dB}{dt} \text{ small}$$



$$V_s = \int_1^2 \bar{E} \cdot d\bar{l} + \int_2^3 \bar{E} \cdot d\bar{l} + \int_3^4 \bar{E} \cdot d\bar{l}$$

Flux density

$$\oint_C \bar{B} \cdot d\bar{l} = \mu_0 I$$

Current cutting the surface bounded by the contour C

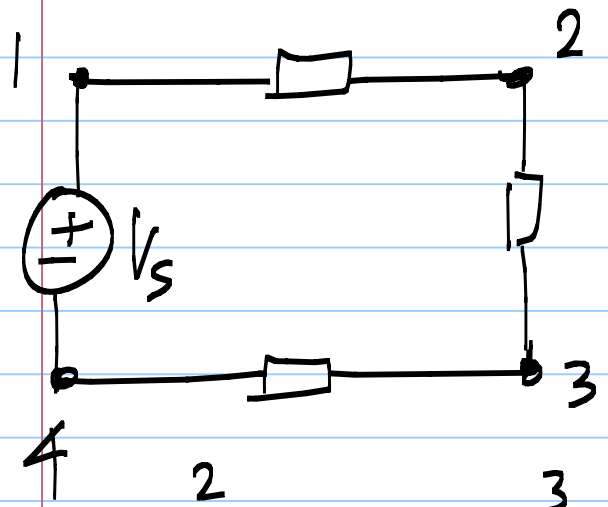
$$\bar{H} = \frac{\bar{B}}{\mu_0} - \bar{M}$$

$\bar{H}$: Magnetic field

$\bar{M}$: internal magnetization

$\bar{M}$: linear with $\bar{B}$

$\bar{H}$ is linear with $\bar{B}$



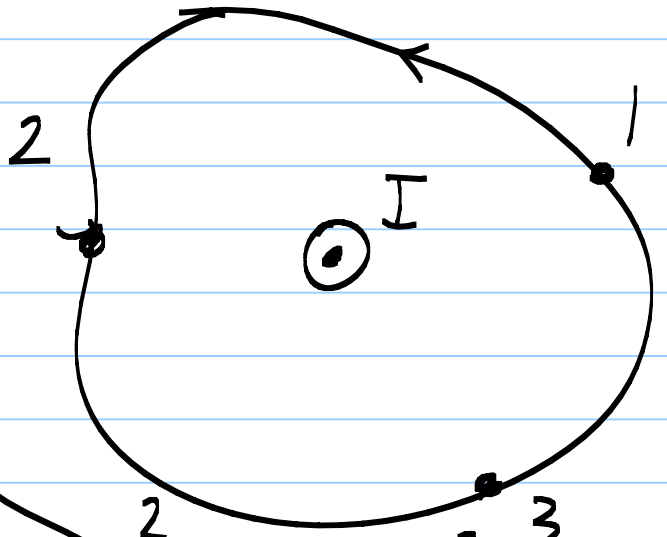
$$V_s = \int_1^2 \bar{E}\cdot d\bar{l} + \int_2^3 \bar{E}\cdot d\bar{l} + \int_3^4 \bar{E}\cdot d\bar{l}$$

KVL $\Longleftrightarrow$

Magnetomotive force (MMF)

d'rgs

$$\oint \bar{H}\cdot d\bar{l} = I$$



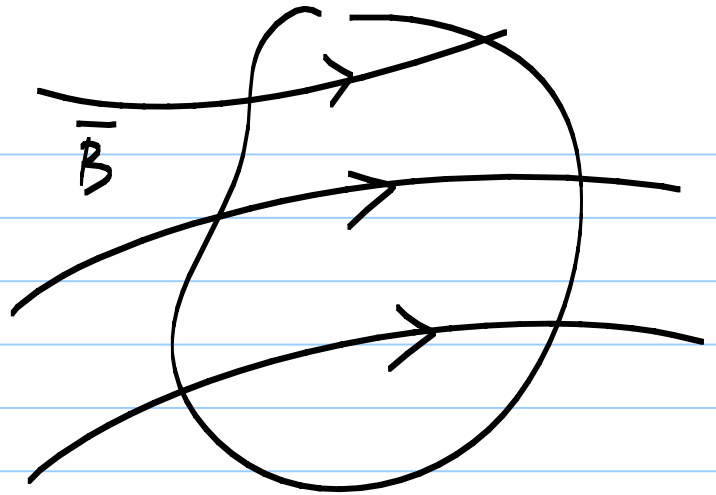
$$I = \int_1^2 \bar{H}\cdot d\bar{l} + \int_2^3 \bar{H}\cdot d\bar{l} + \int_3^1 \bar{H}\cdot d\bar{l}$$

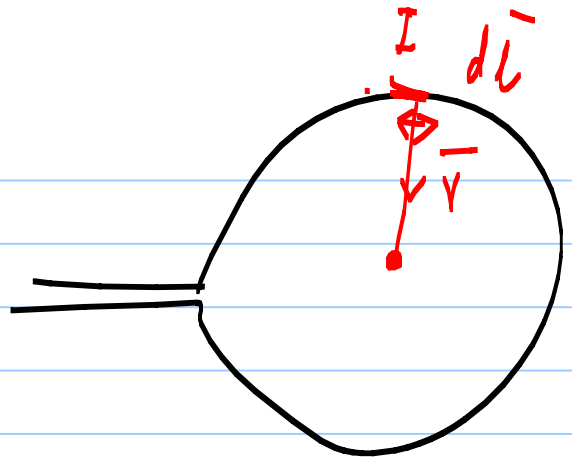
Flux density

$$\oint_S \bar{B} \cdot d\bar{s} = 0$$

Flux

$$\oint_S \bar{J} \cdot d\bar{s} = 0$$

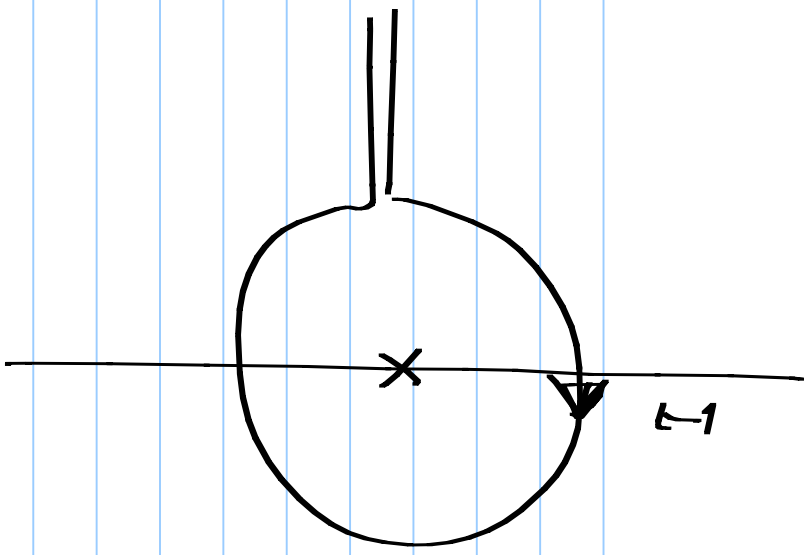




$$\frac{\mu_0}{4\pi} \int \frac{I\, d\bar{l} \times \bar{r}}{r^3}$$

$$\phi = L \cdot I$$

Inductance


L1