

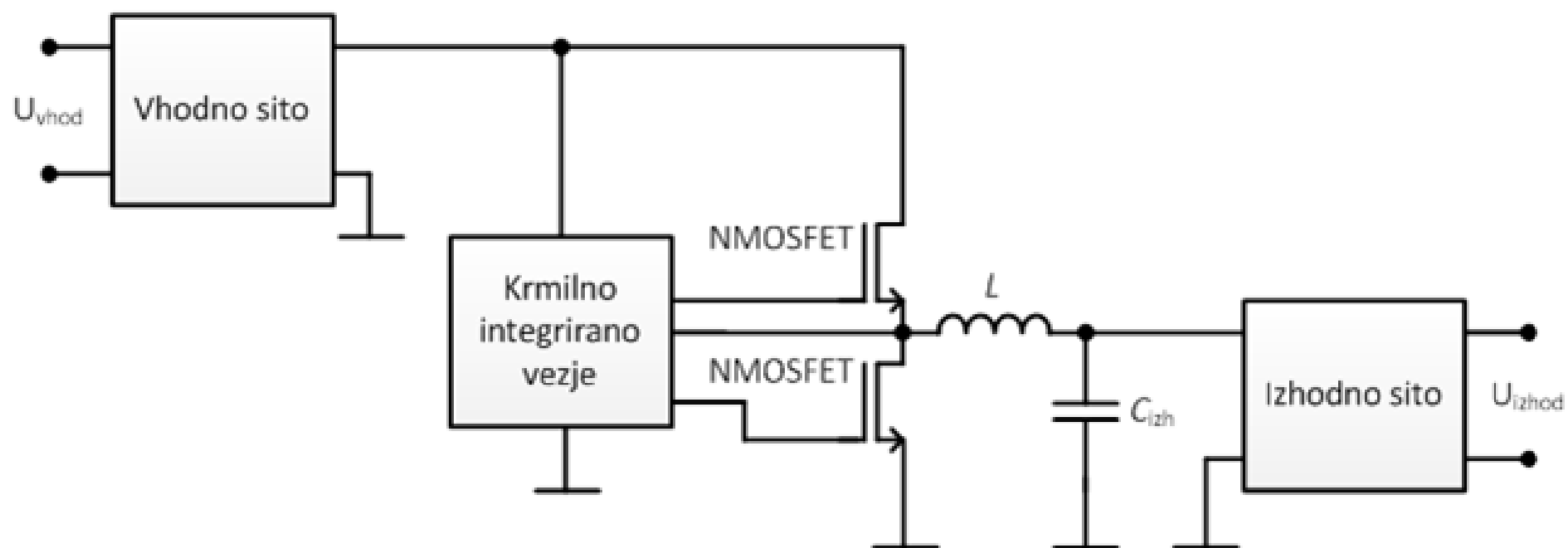
Izzivi pri načrtovanju močnostnih pretvornikov

Jernej Sorta

Mahle Letrika d.o.o.
Ljubljana, 3.4.2018



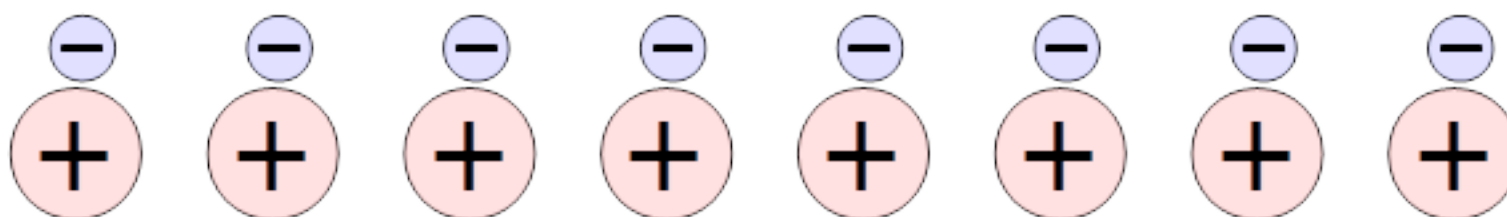
Osnovni načrt



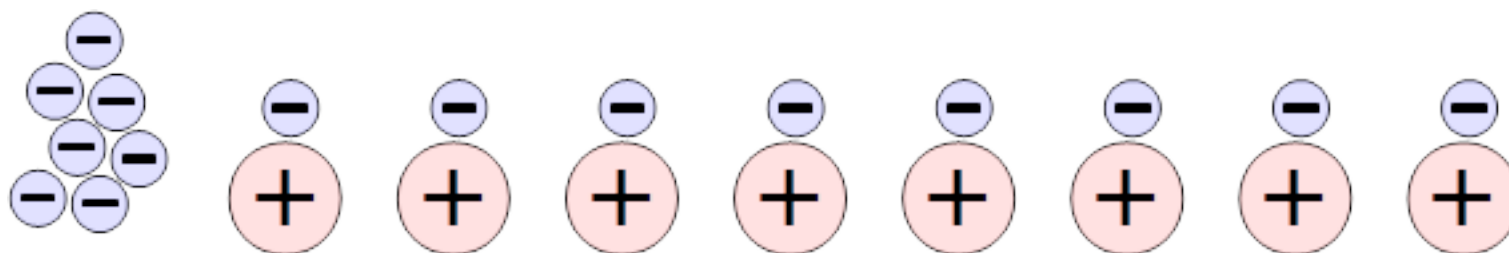


ELMG

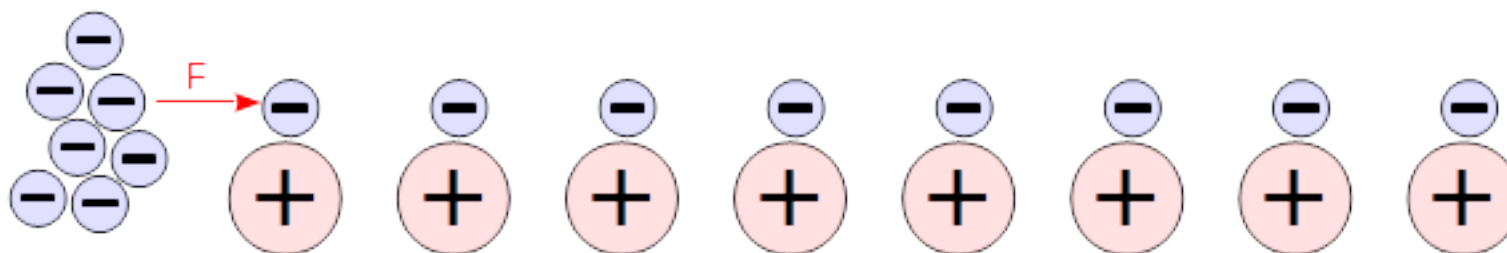
Vodnik



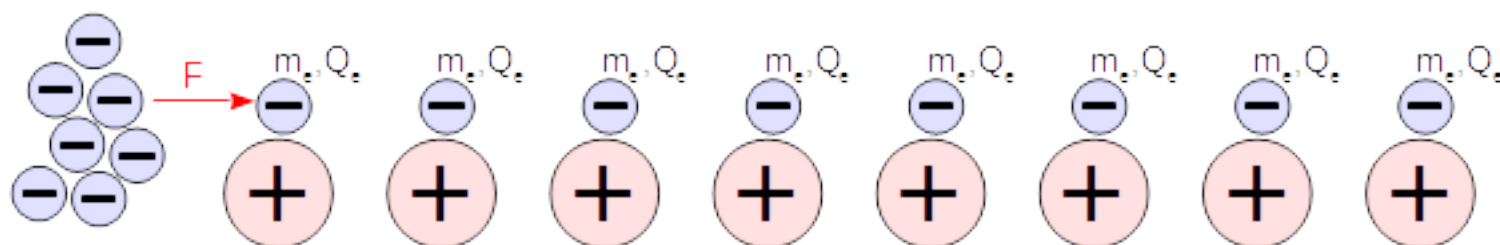
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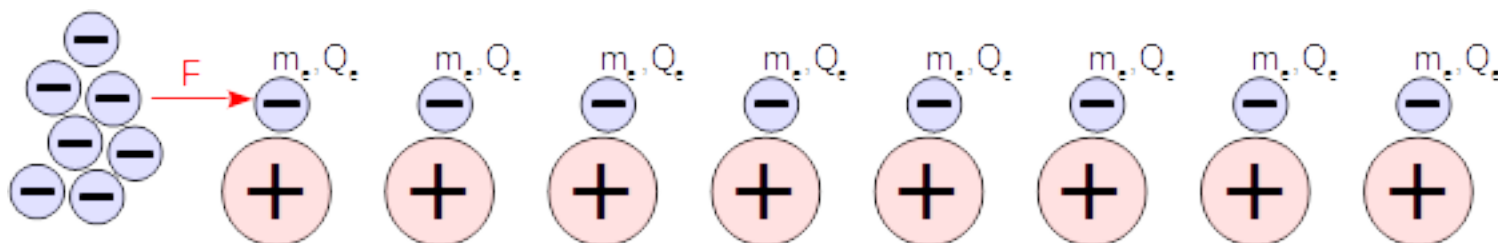
Vodnik



Vodnik



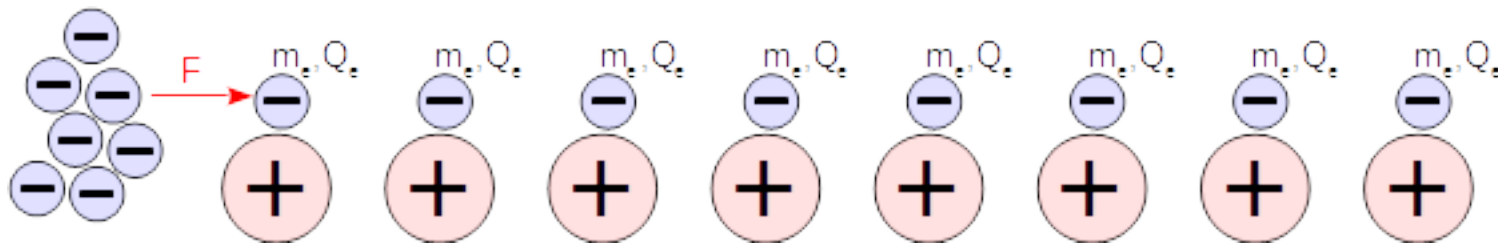
Vodnik



$$\frac{d}{dt}(m_e v_e) = F$$

$$v_e \cdot Q_e \propto I$$

Vodnik

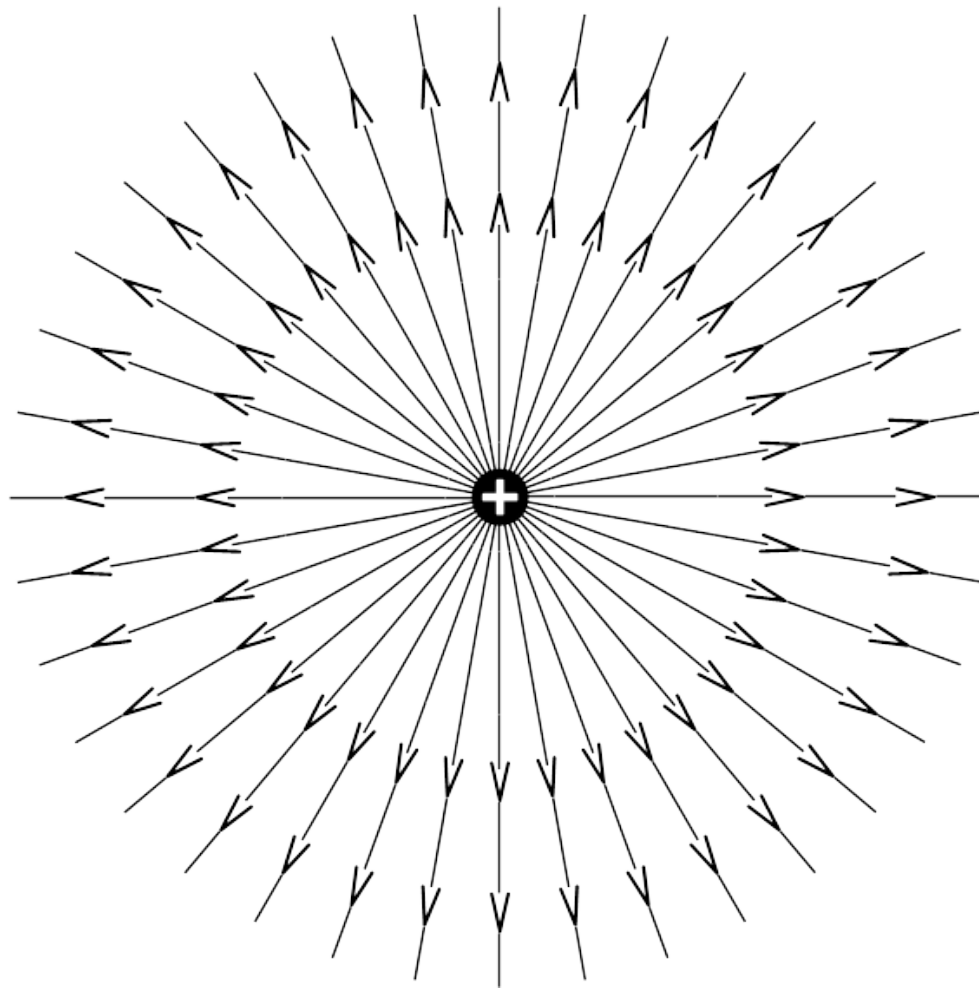


$$\frac{d}{dt}(m_e v_e) = F$$

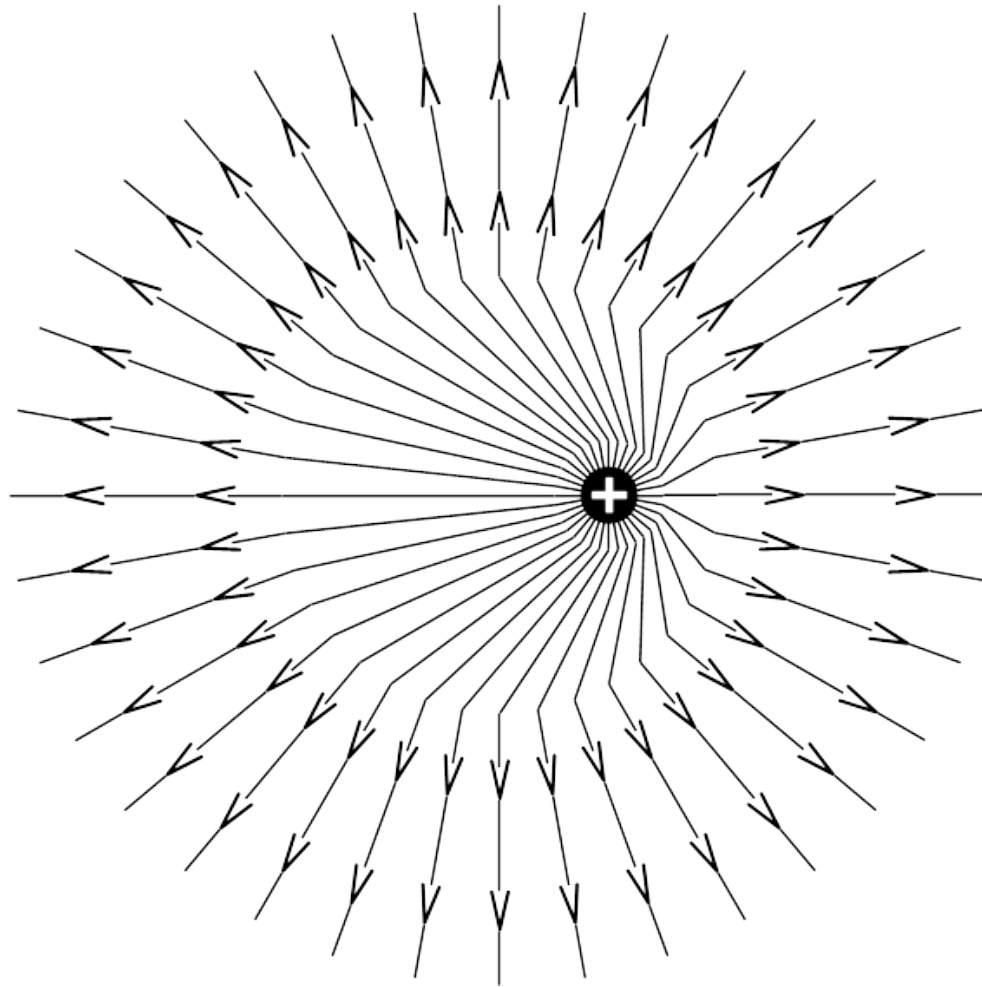
$$v_e \cdot Q_e \propto I$$

$$m \frac{dI}{dt} \propto F \longleftrightarrow L \frac{dI}{dt} = U_L$$

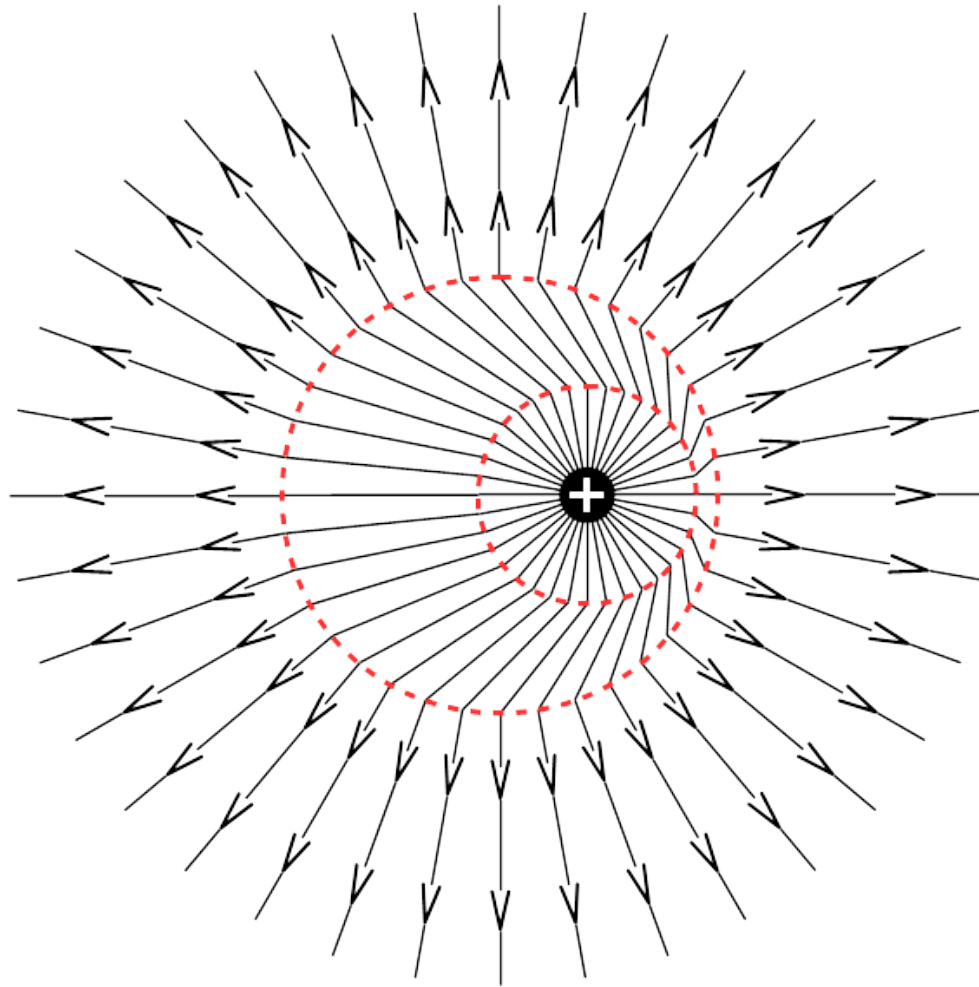
Indukcija



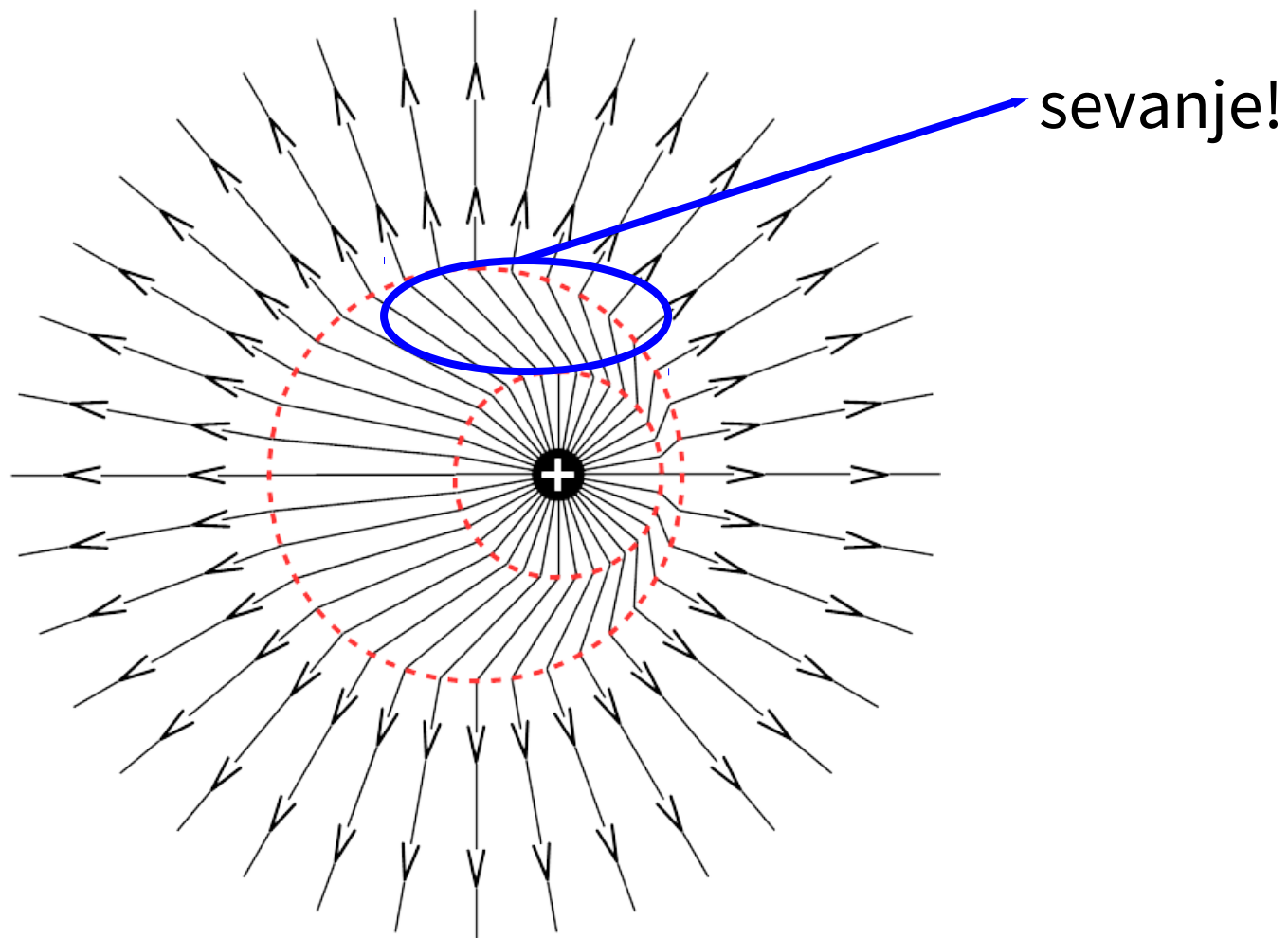
Indukcija



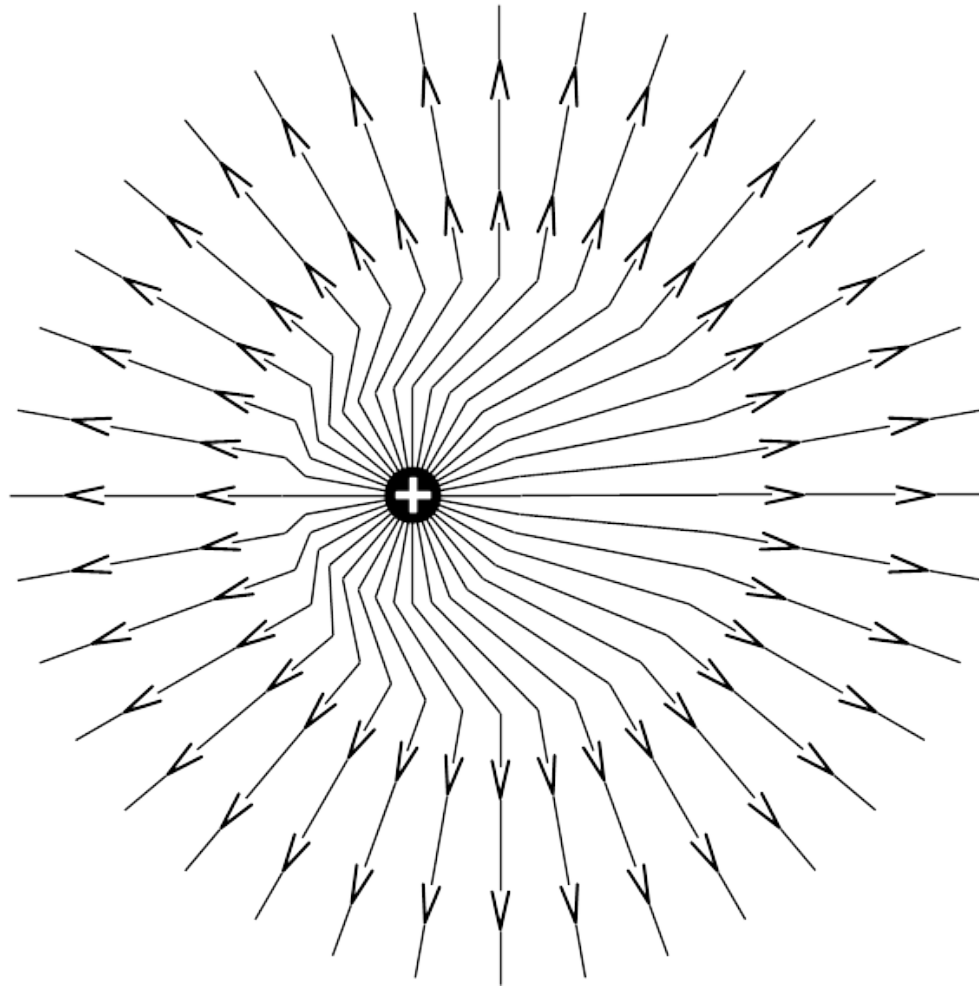
Indukcija



Indukcija



Indukcija



Indukcija- Oliver Heaviside

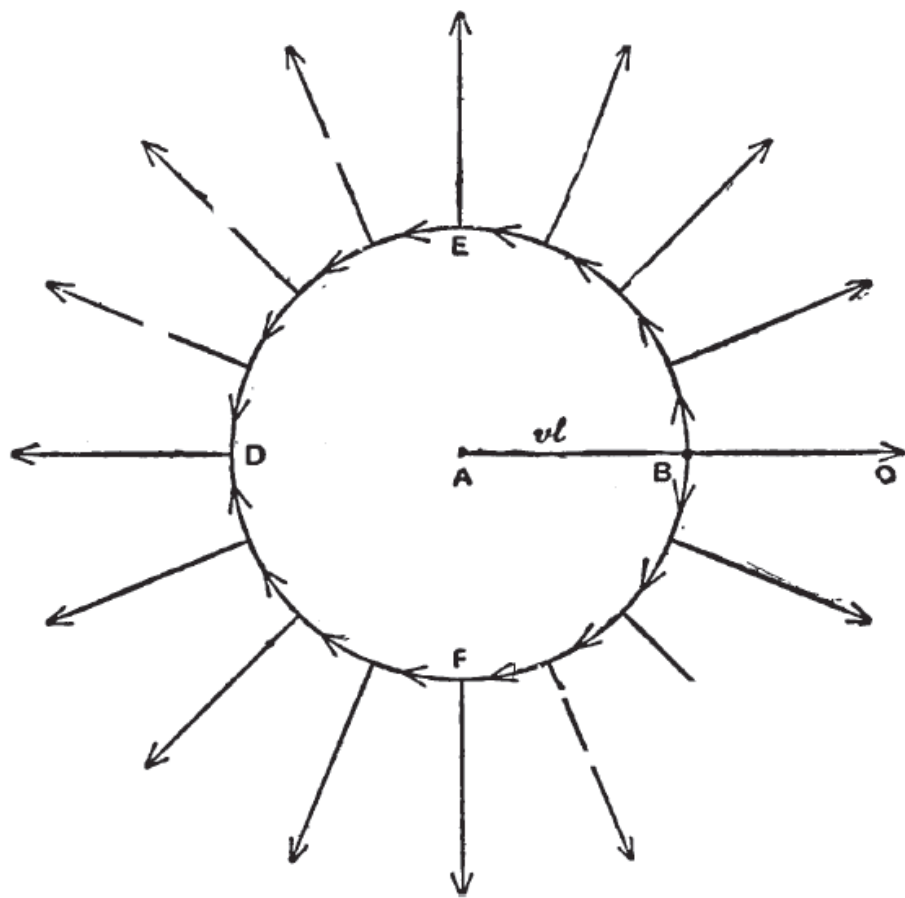


FIG. 1.

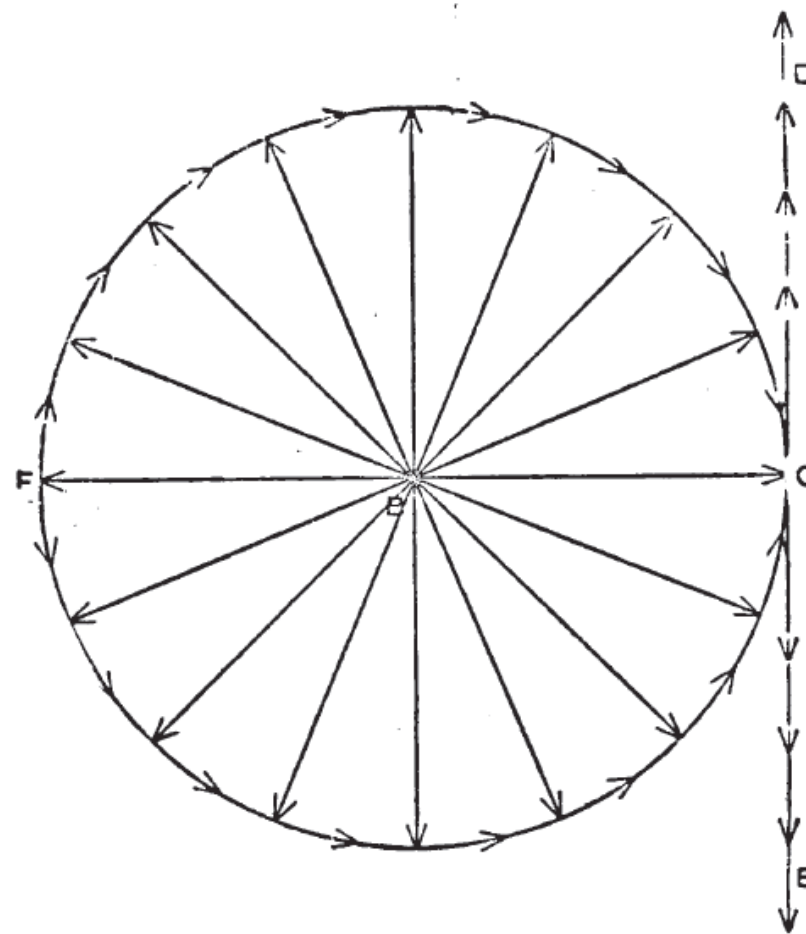
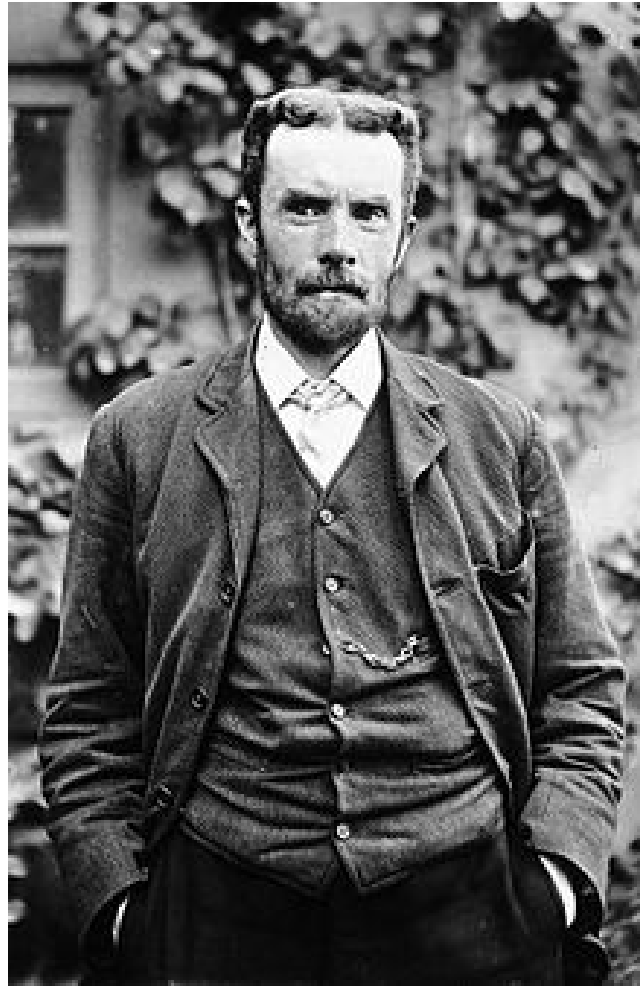
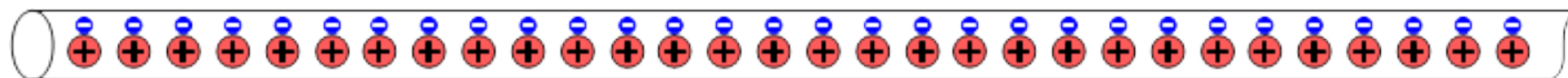


FIG. 2.

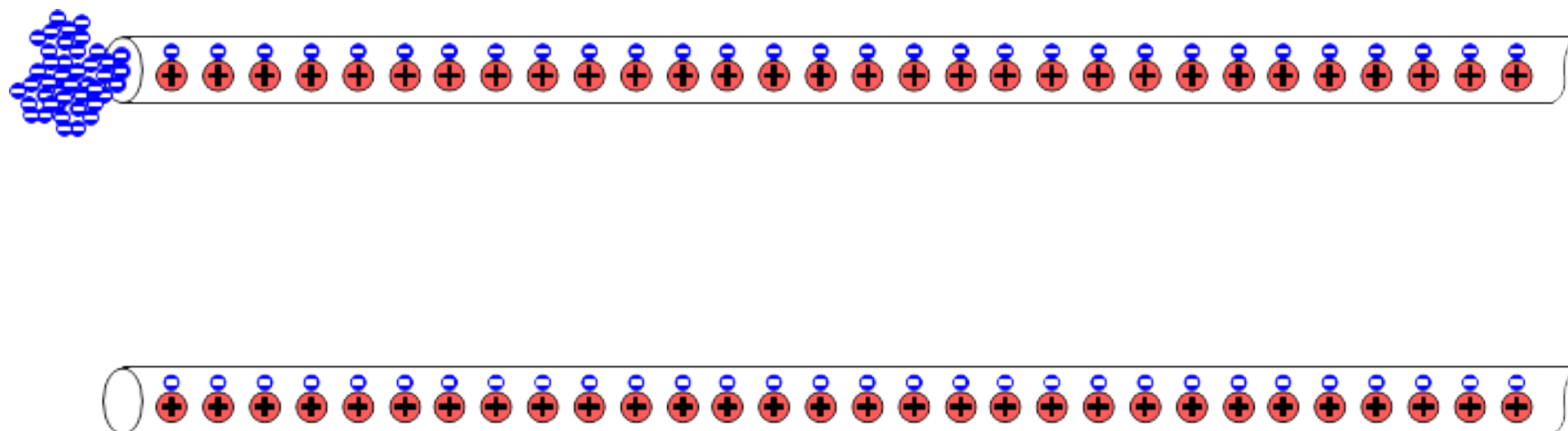
Indukcija- Oliver Heaviside



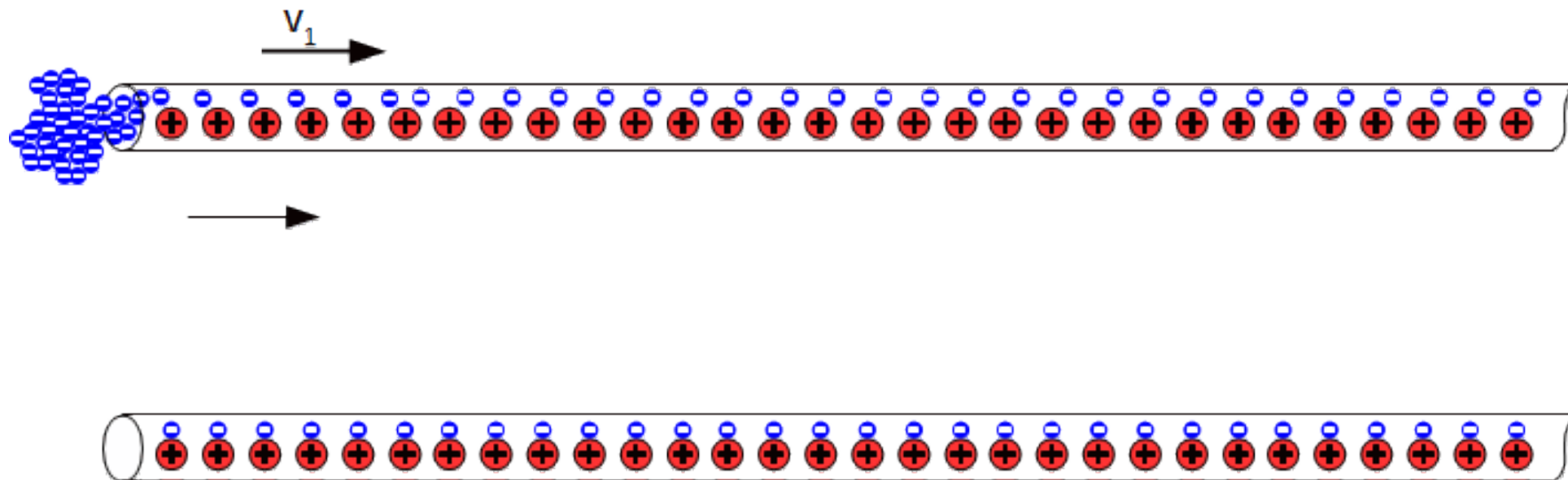
Indukcija - vzporedna vodnika



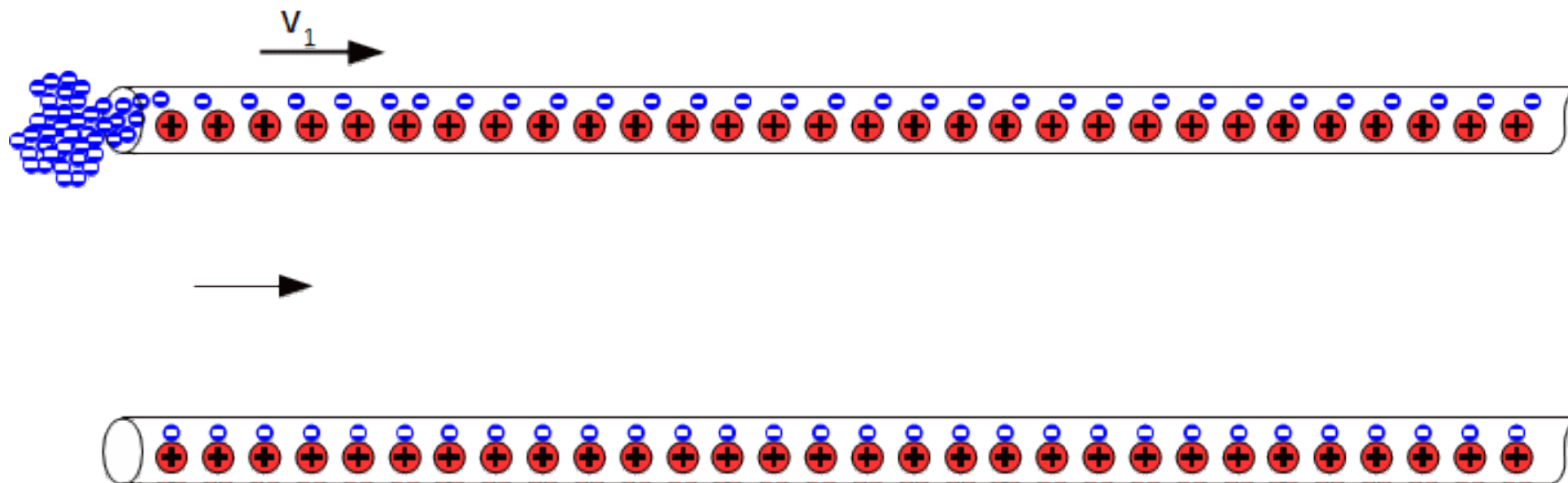
Indukcija - vzporedna vodnika



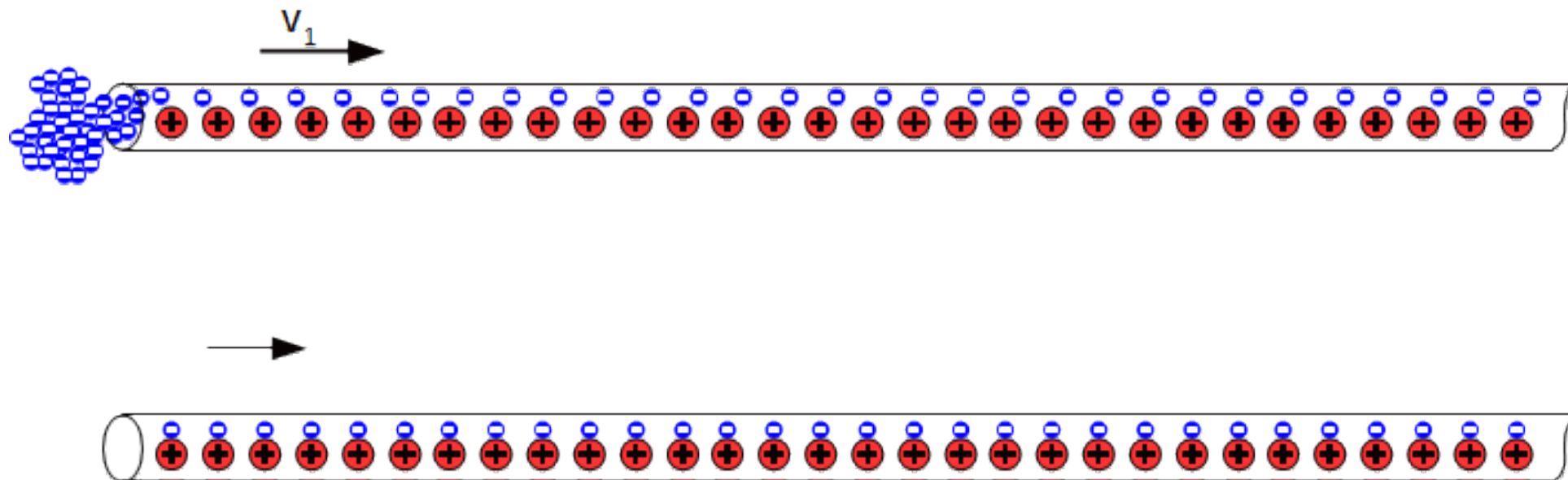
Indukcija - vzporedna vodnika



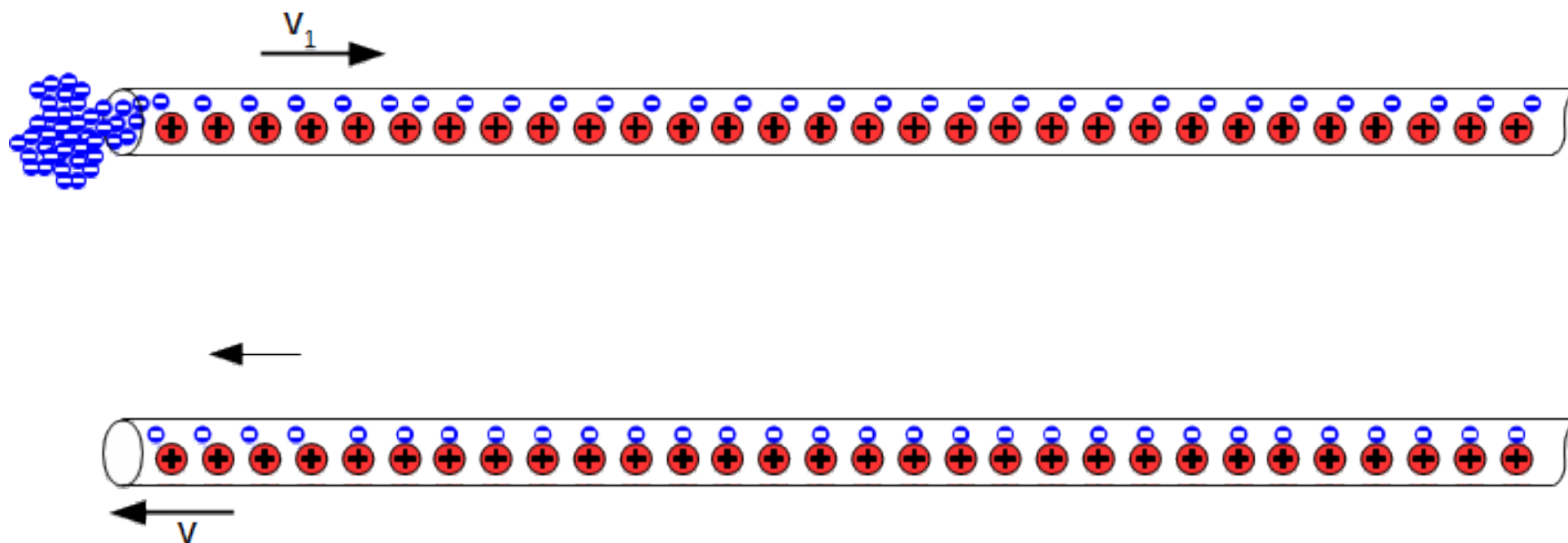
Indukcija - vzporedna vodnika



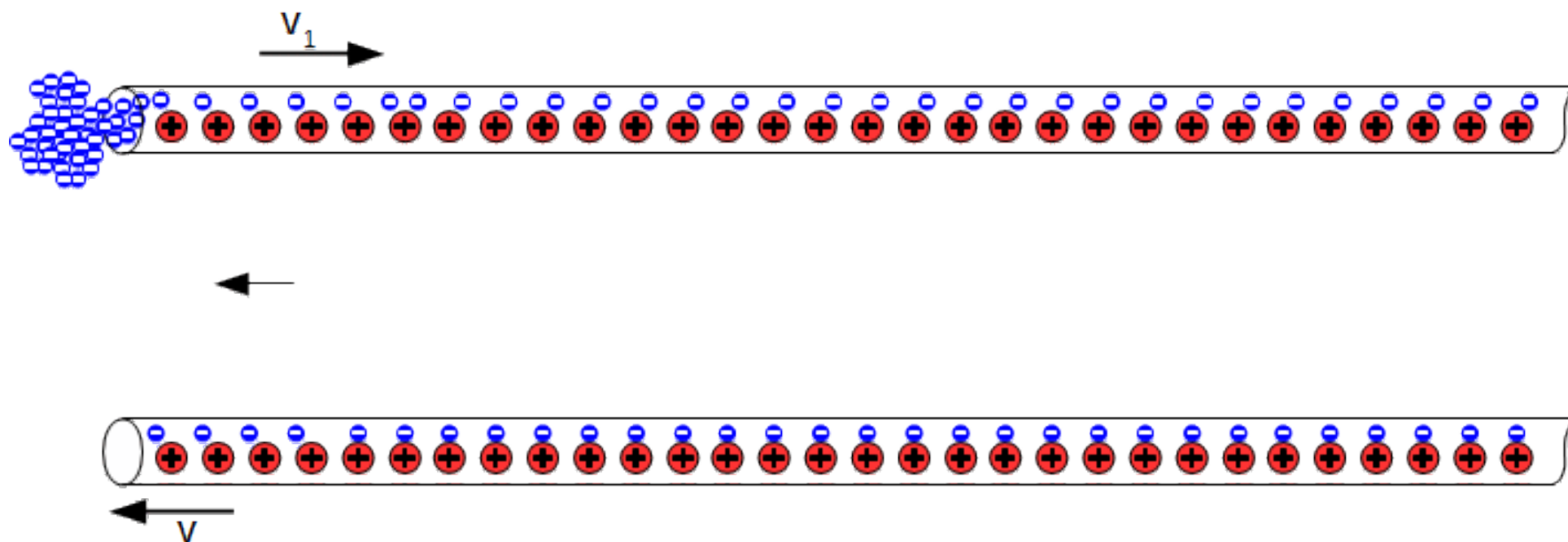
Indukcija - vzporedna vodnika



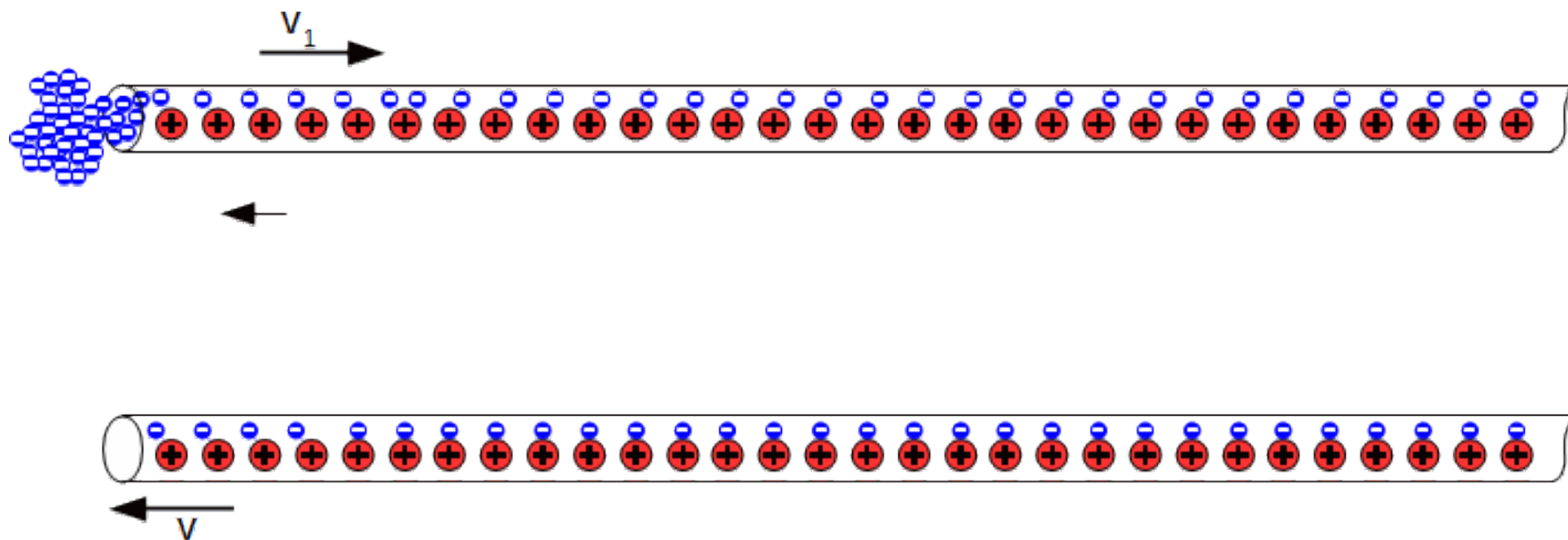
Indukcija - vzporedna vodnika



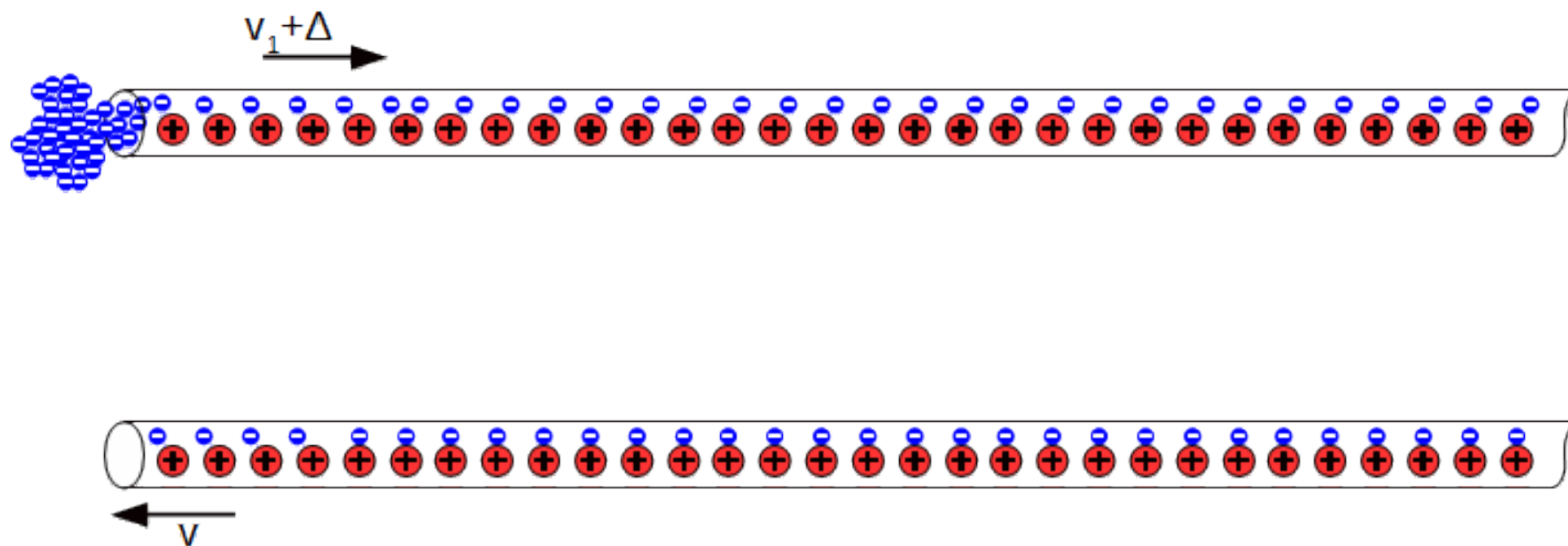
Indukcija - vzporedna vodnika



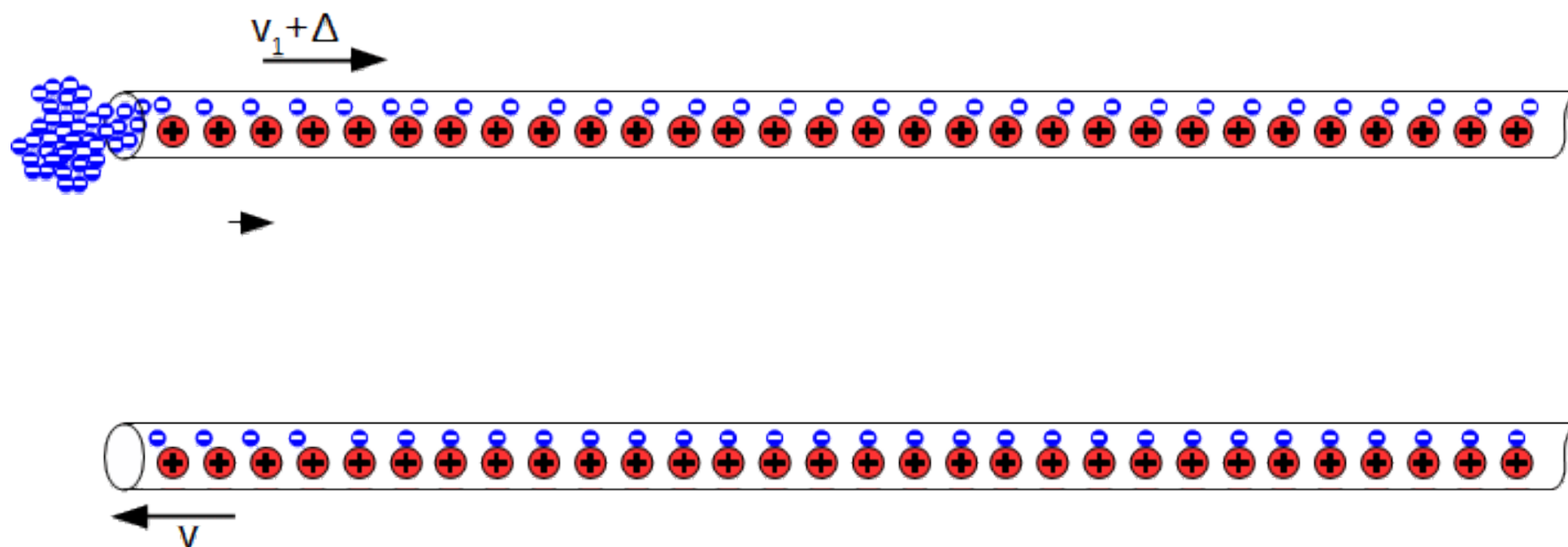
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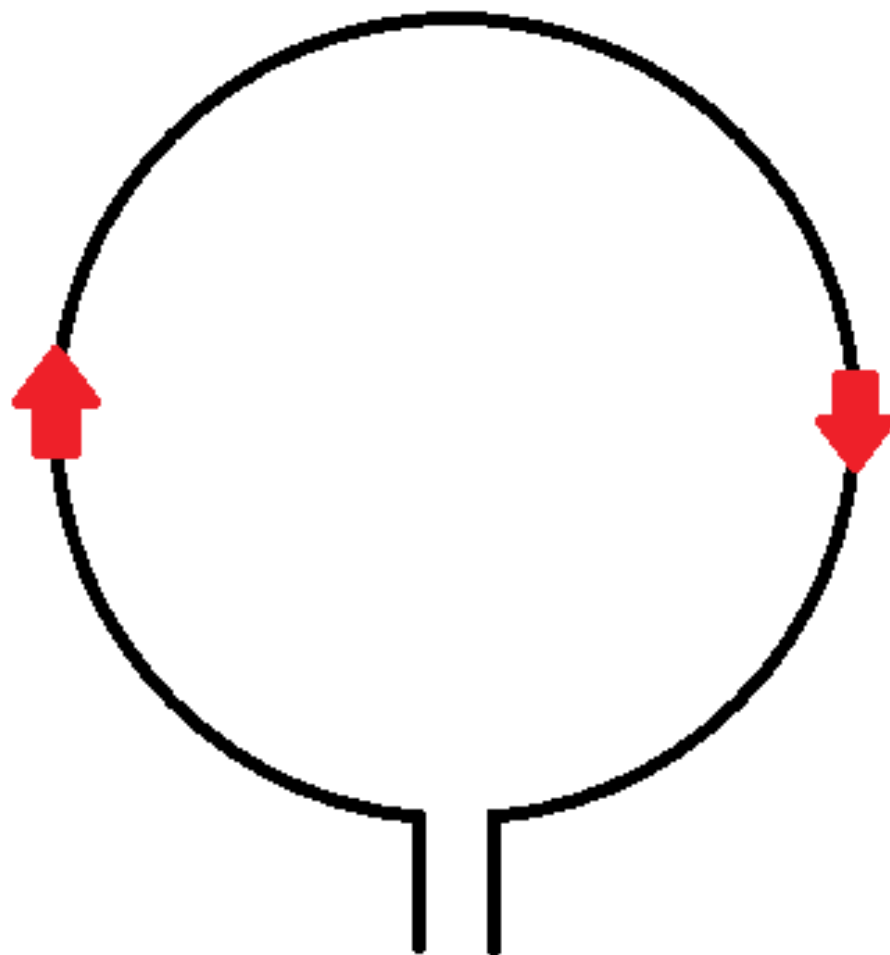
Indukcija - vzporedna vodnika



Indukcija - vzporedna vodnika



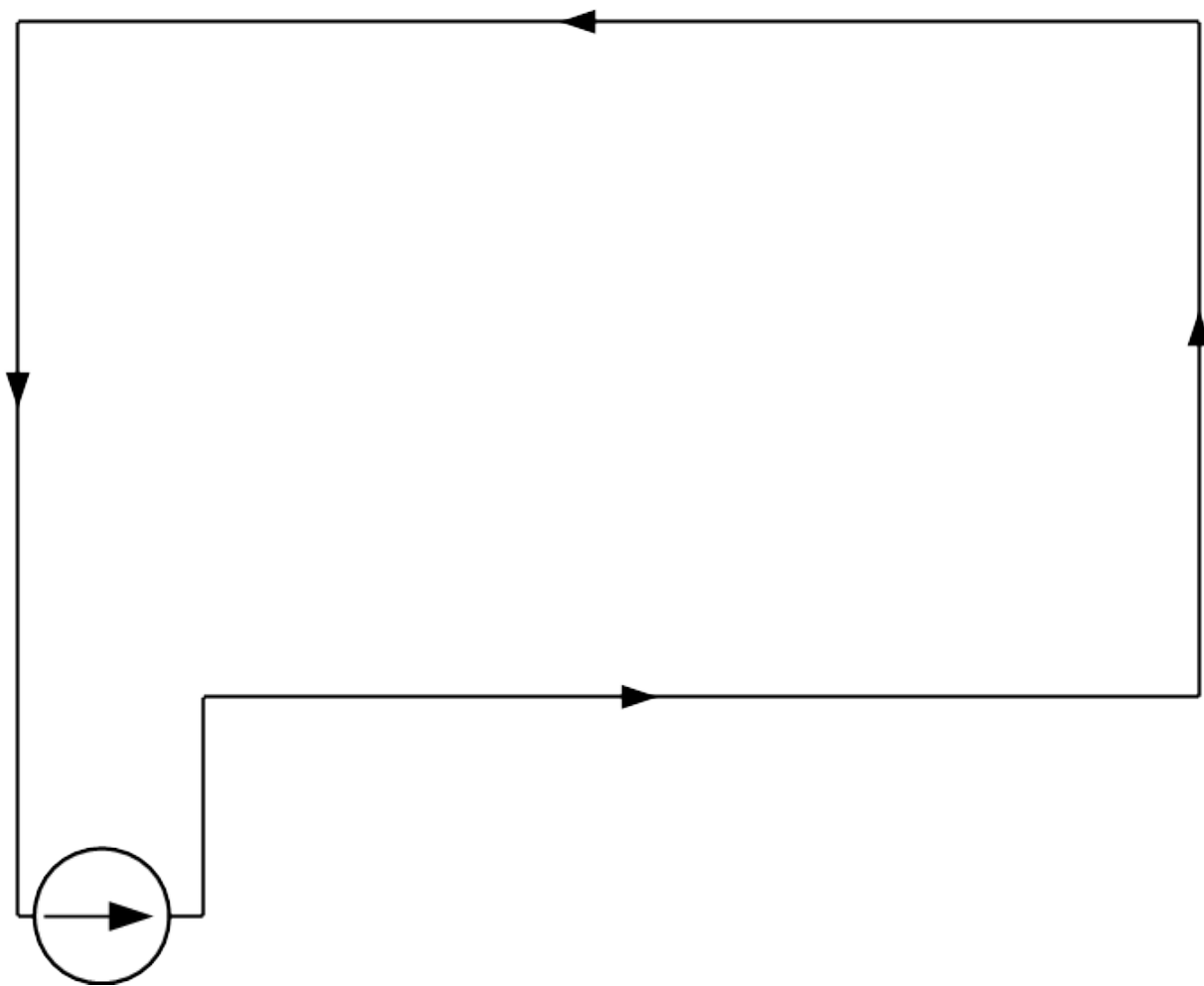
Indukcija-ovoj



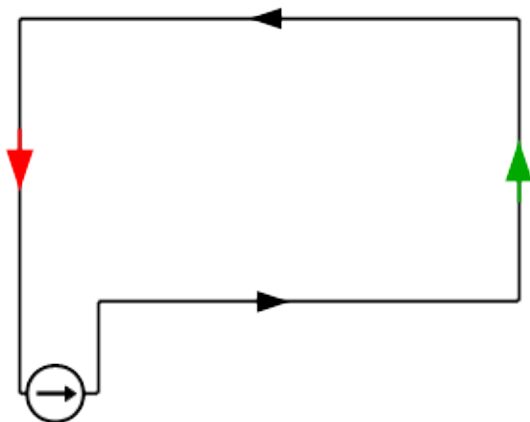
Indukcija-tuljava



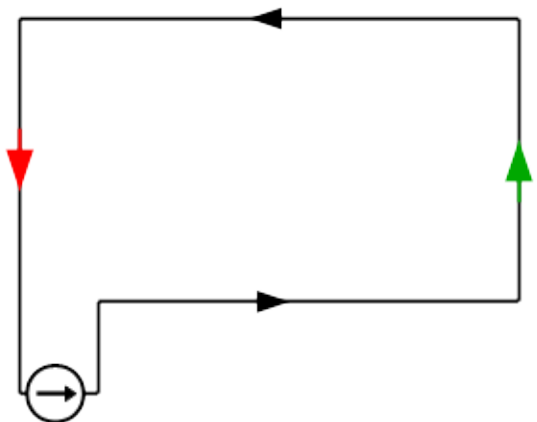
Indukcija-zanka



Indukcija-zanka

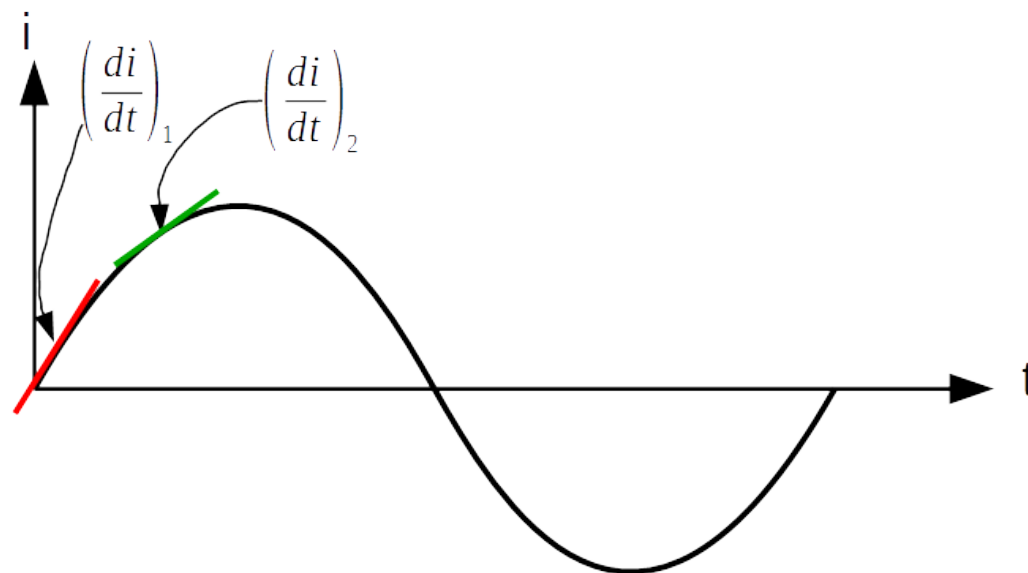
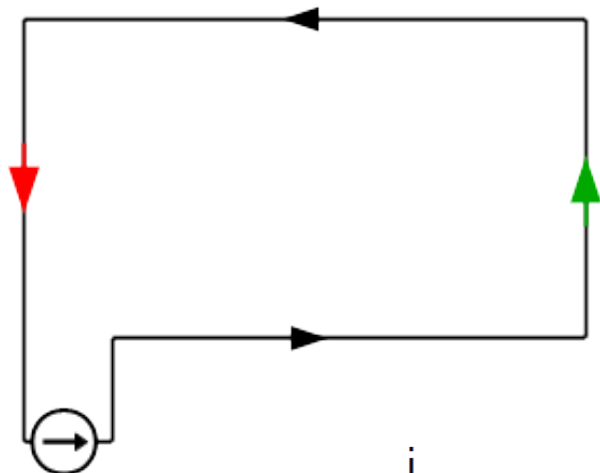


Indukcija-zanka



Indukcija-zanka

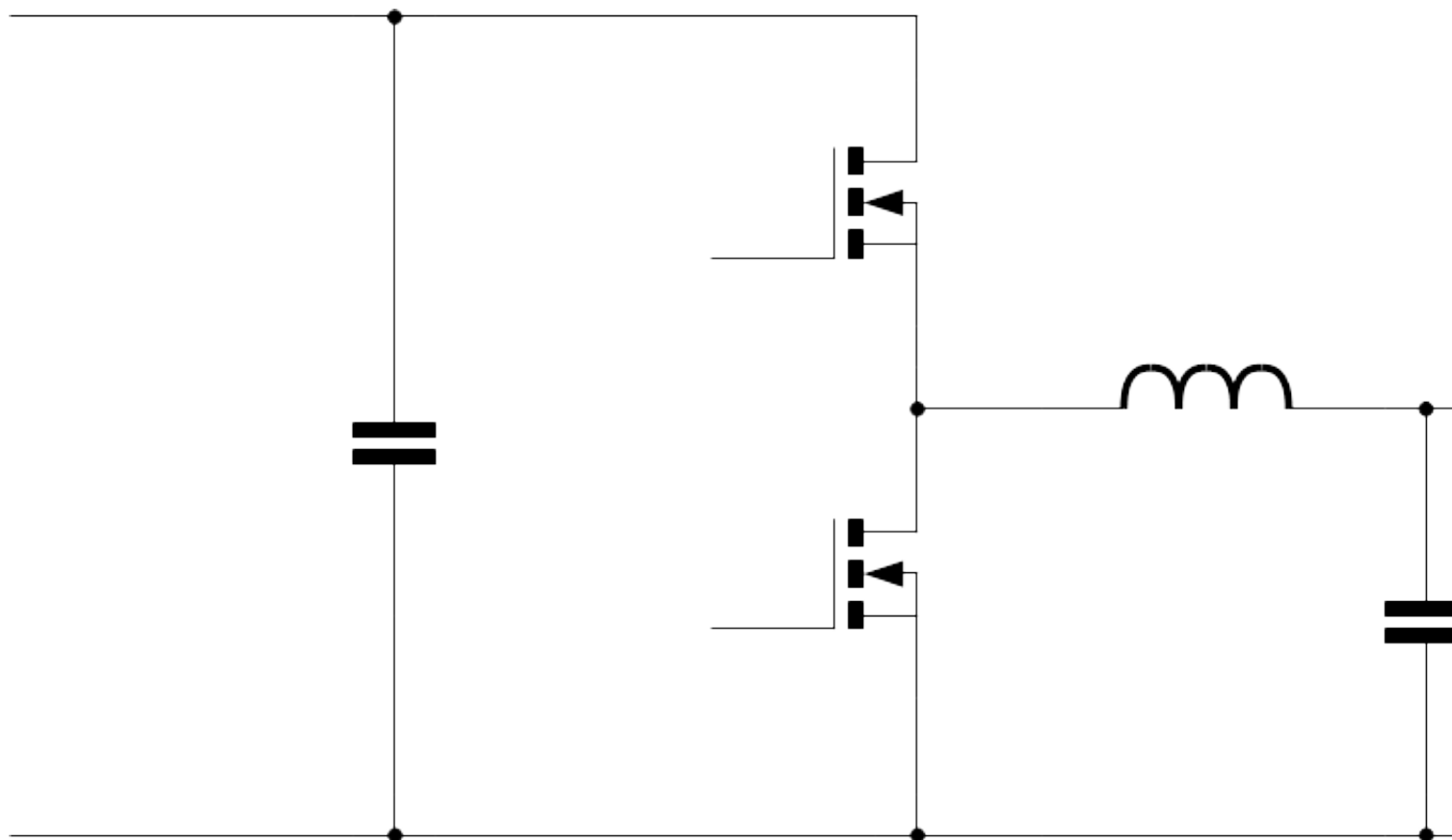
Vpliv faze



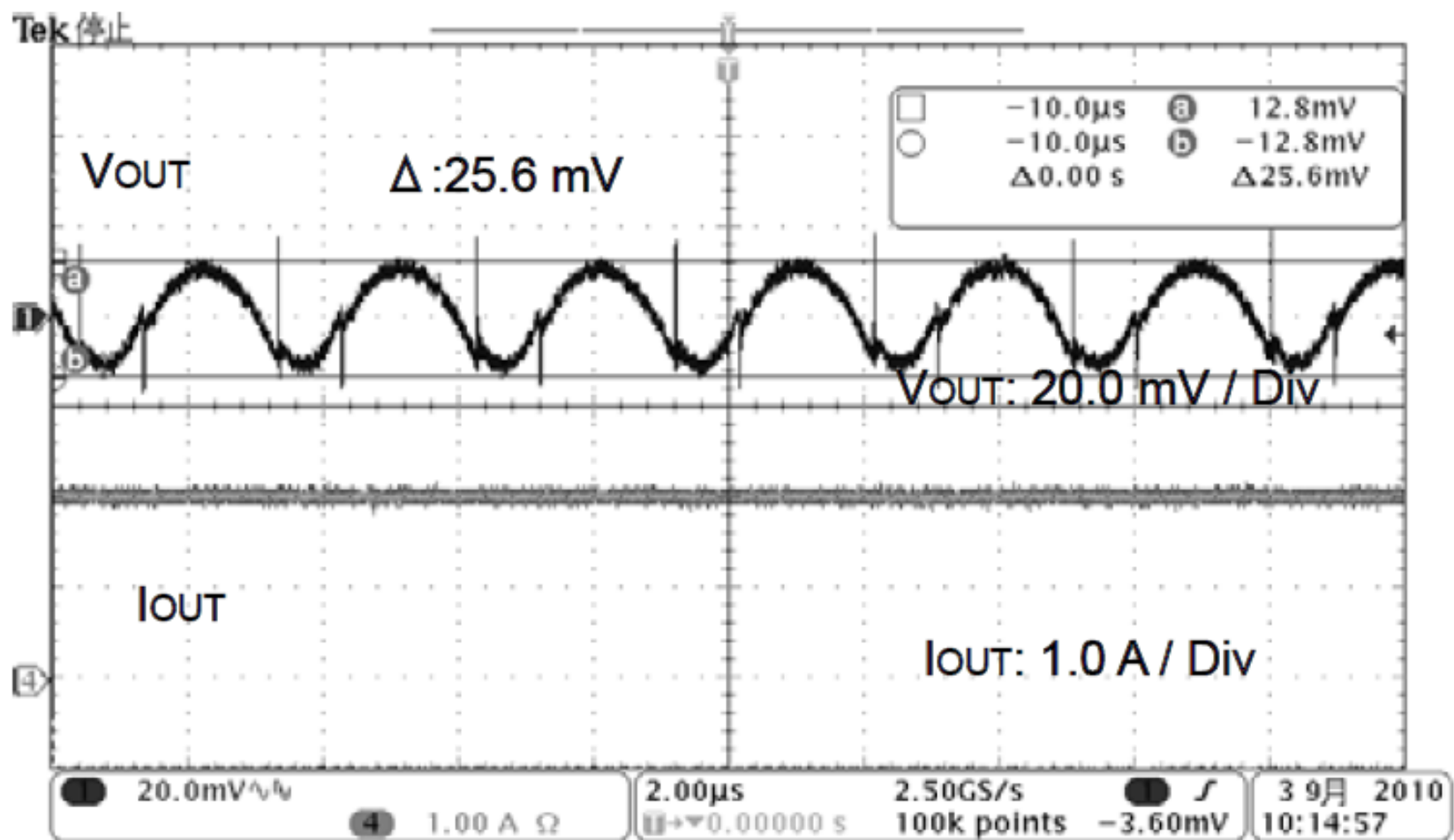
PRIMERI

EMC-kakovost izhodne napetosti

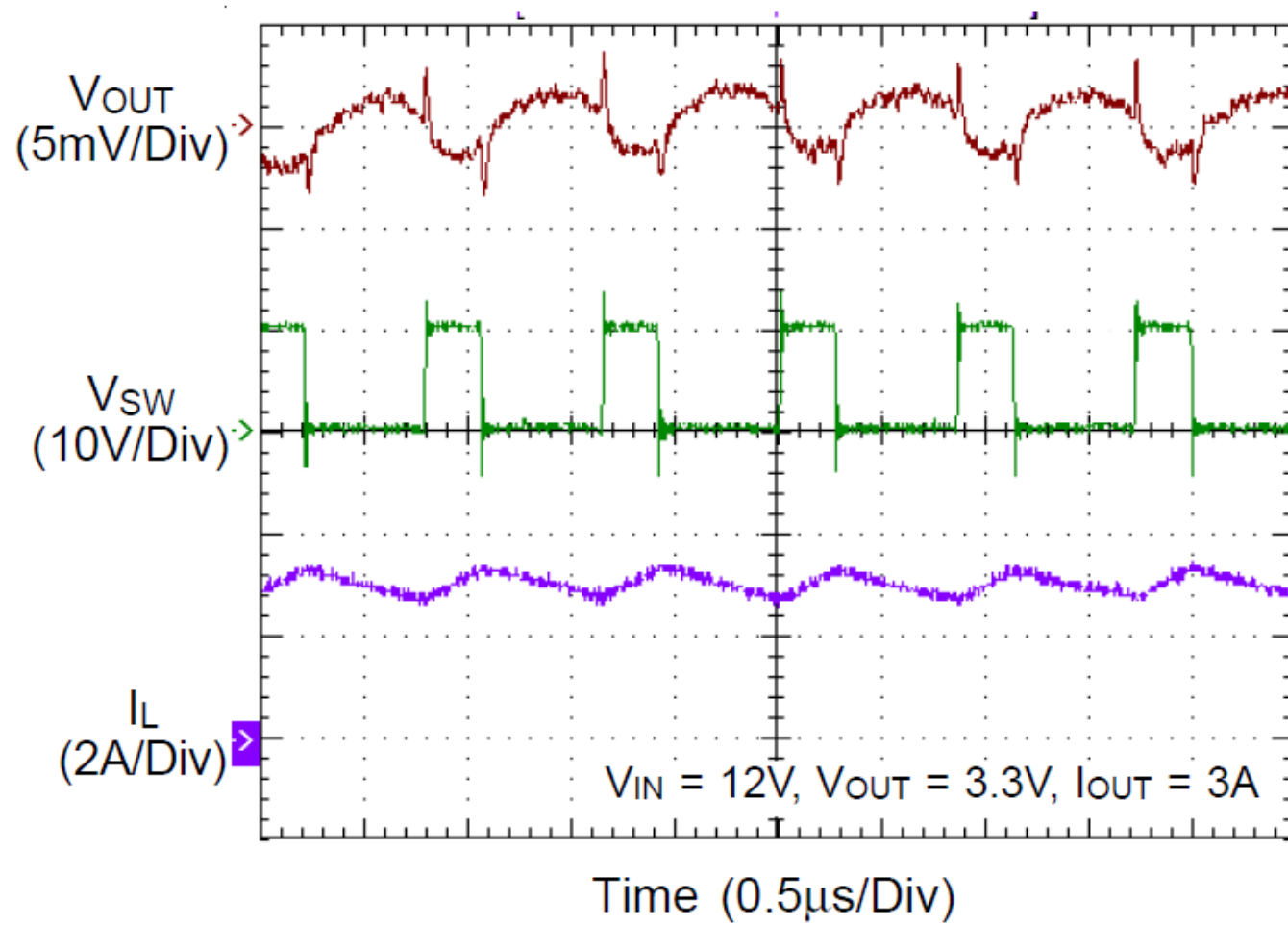
Osnovni načrt



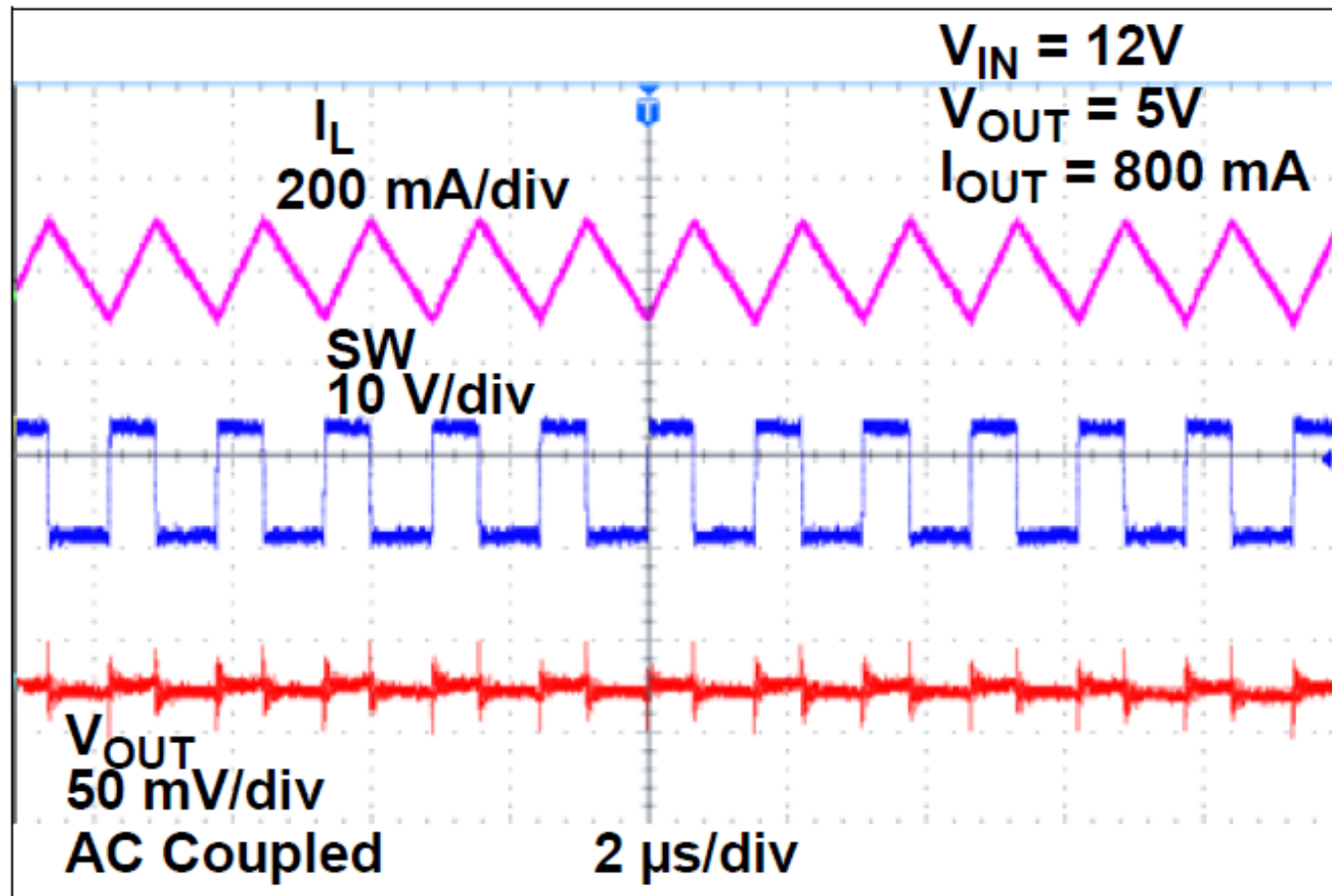
Primeri izhodnih napetosti



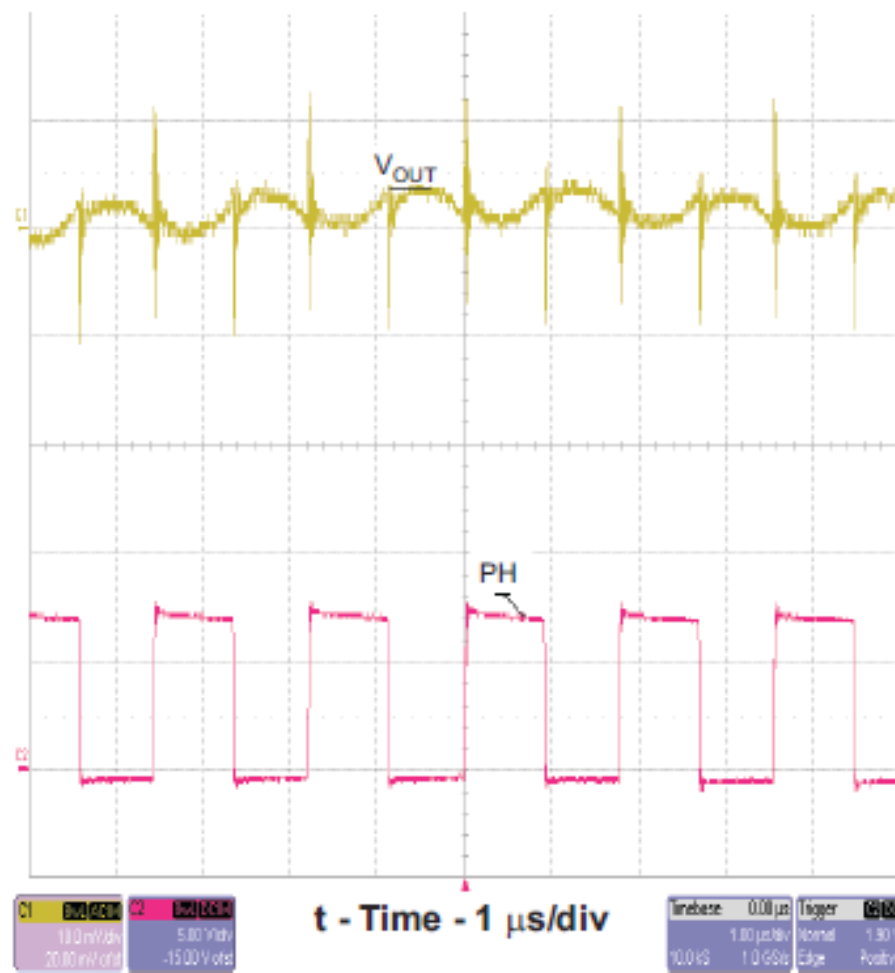
Primeri izhodnih napetosti



Primeri izhodnih napetosti

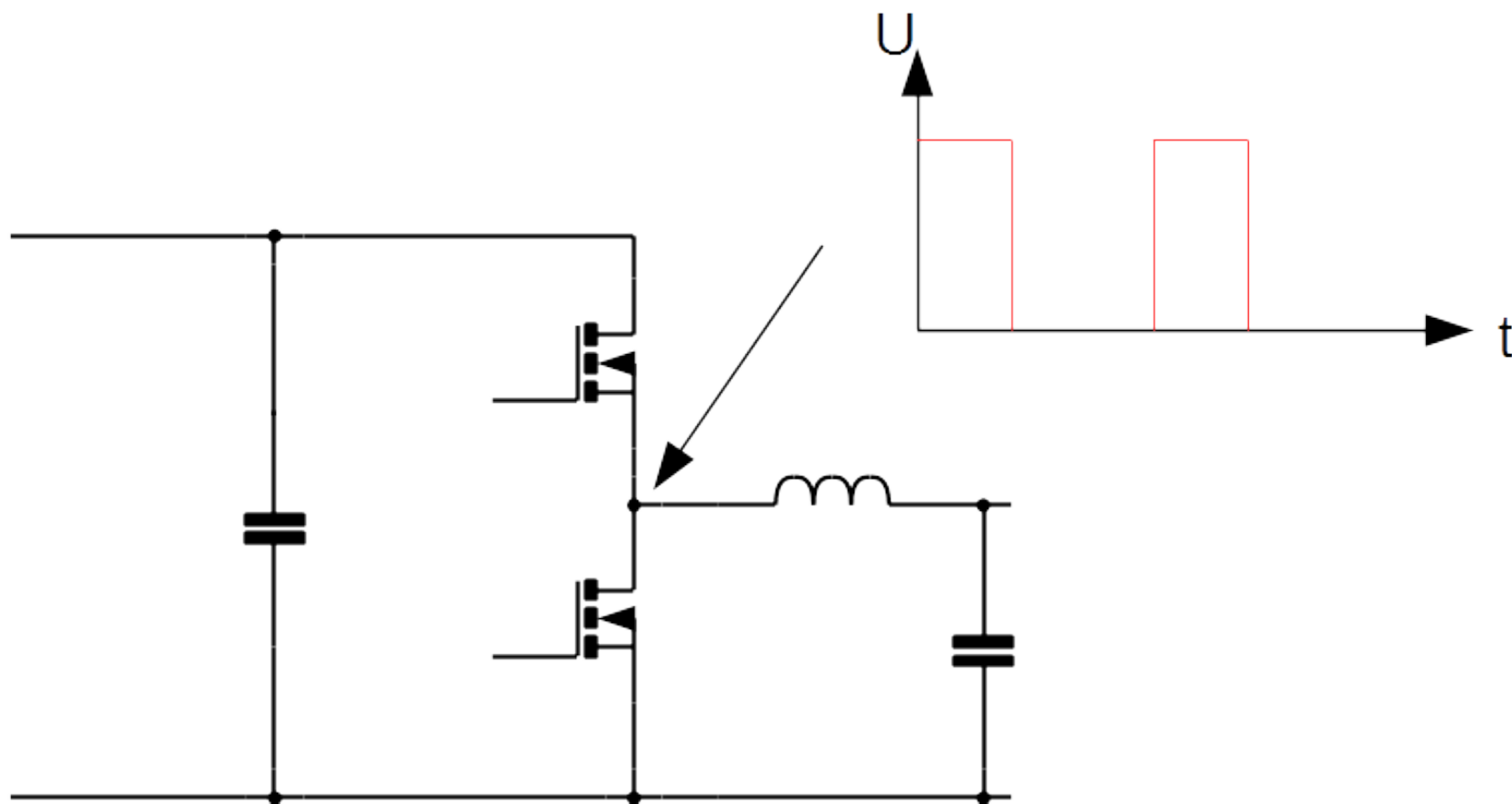


Primeri izhodnih napetosti

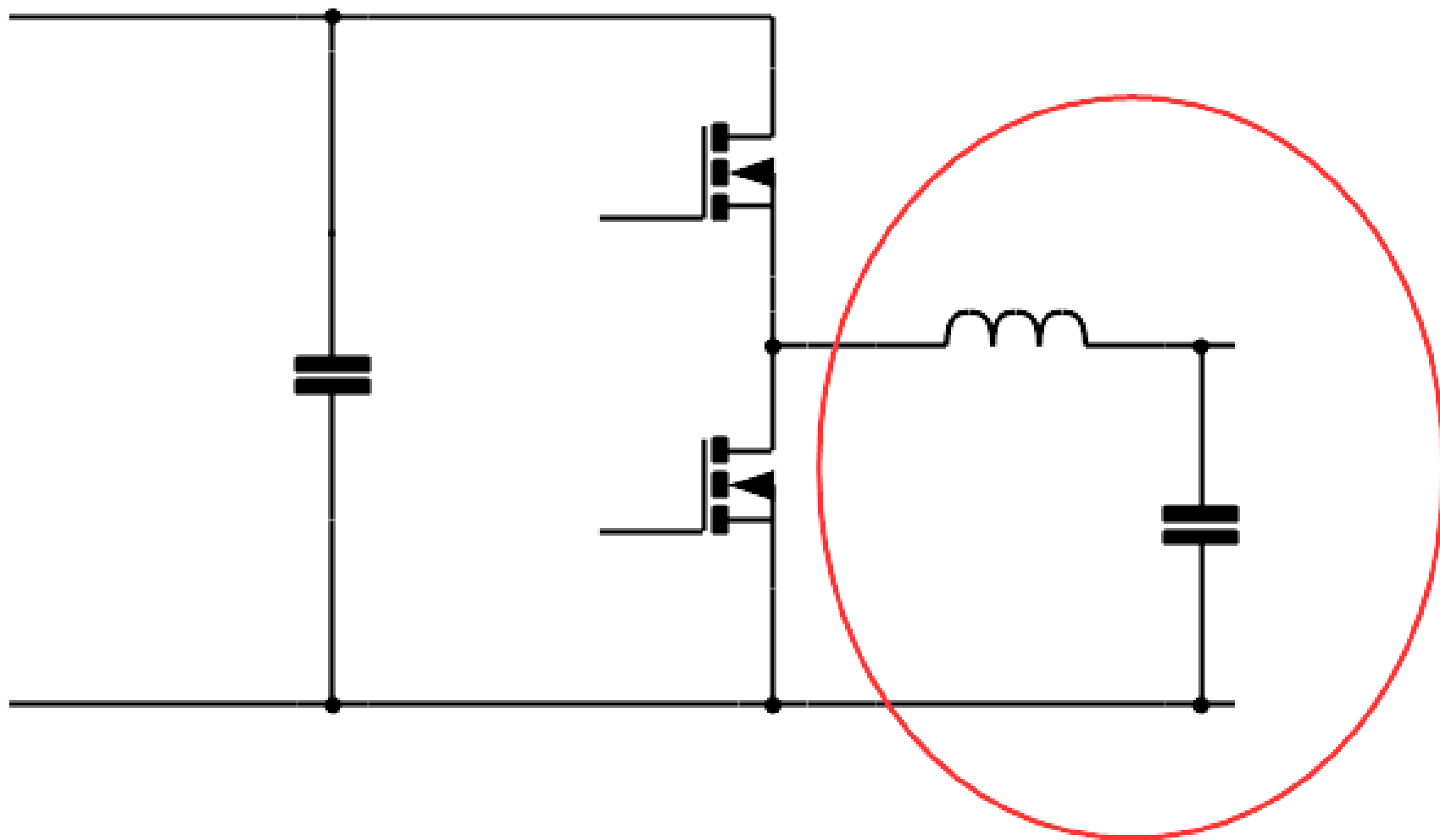


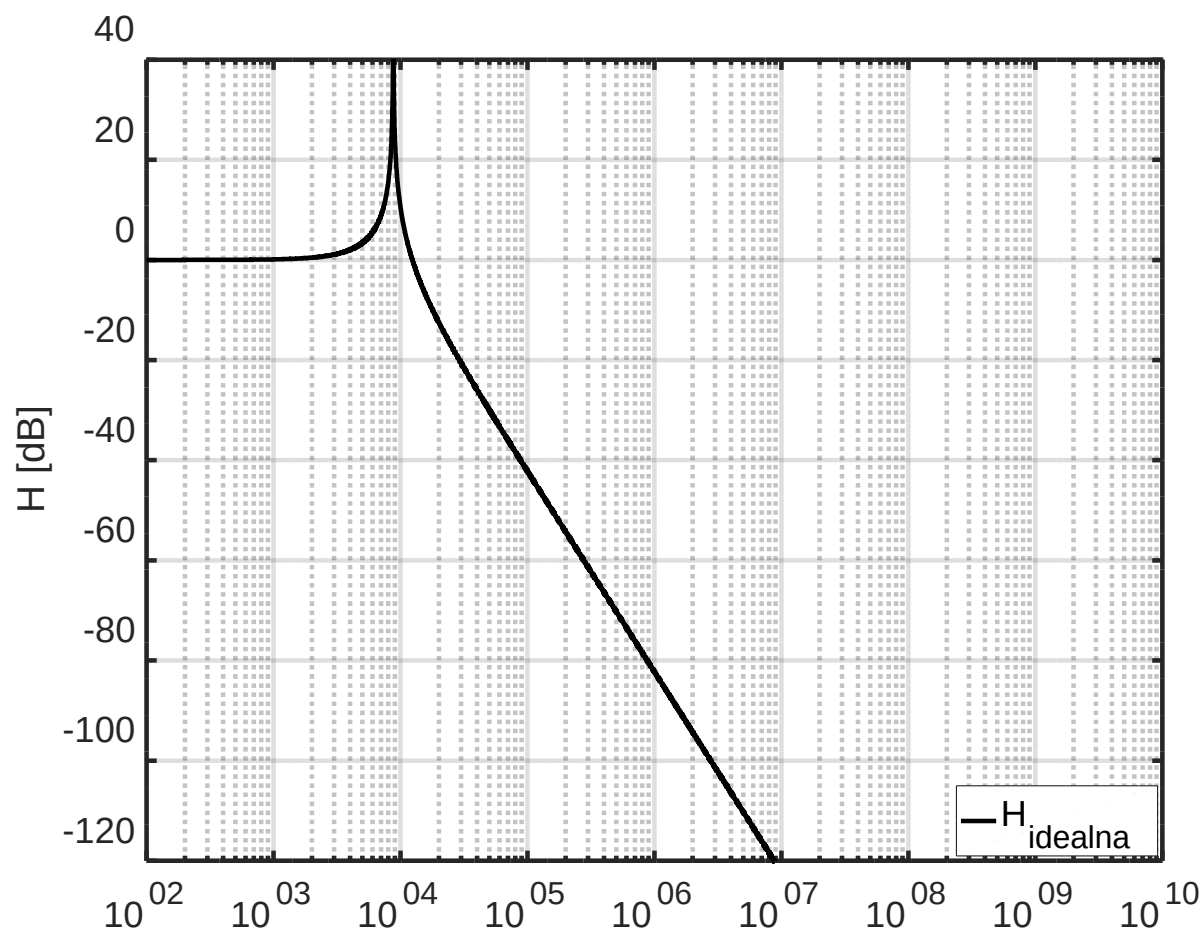
GRADNIKI

Gradniki

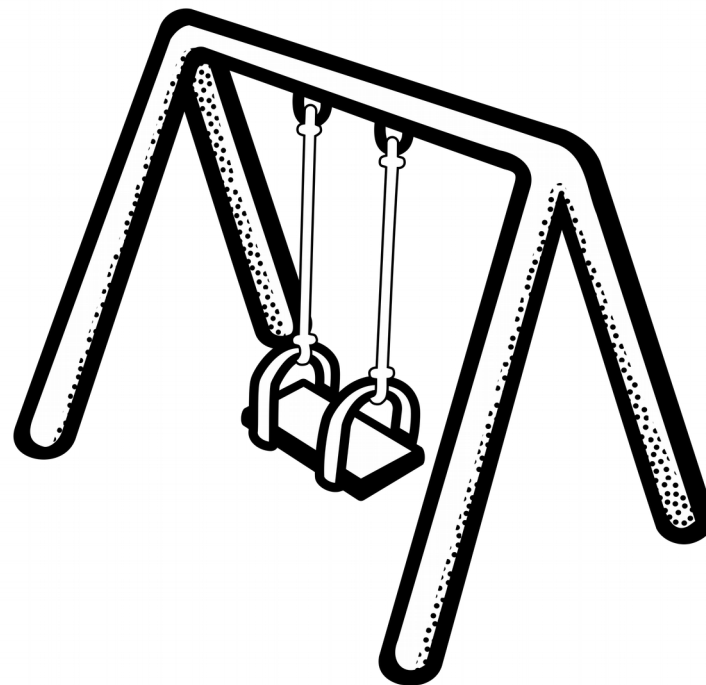
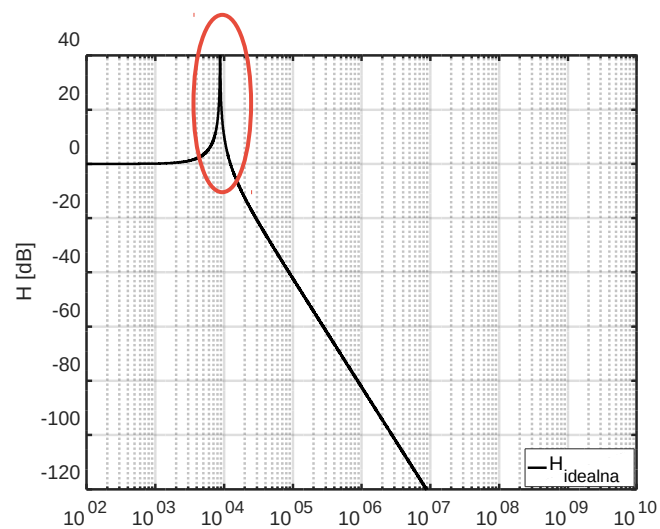


Gradniki





Gradniki

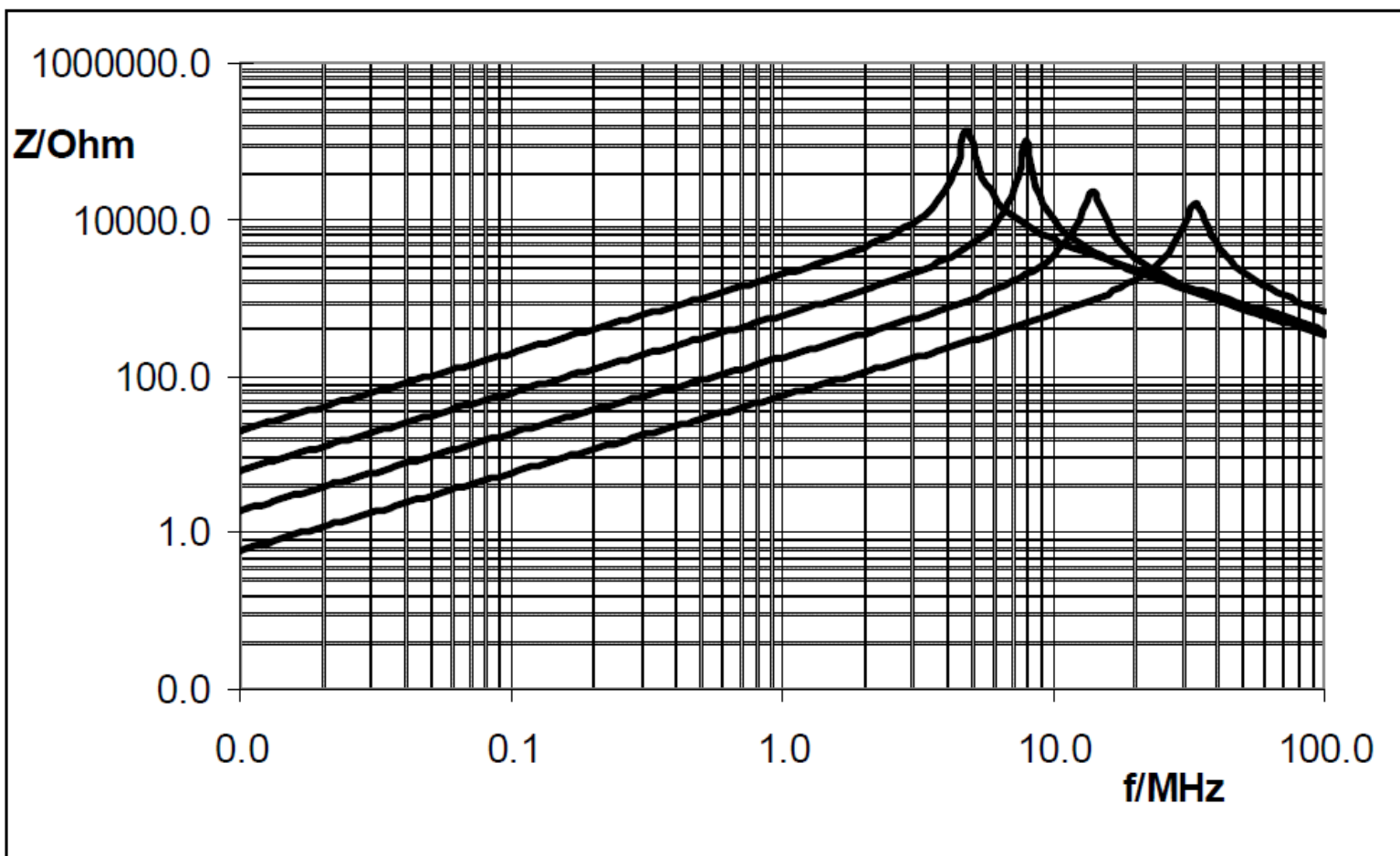


Gradniki-tuljave

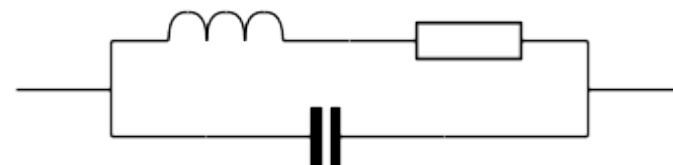
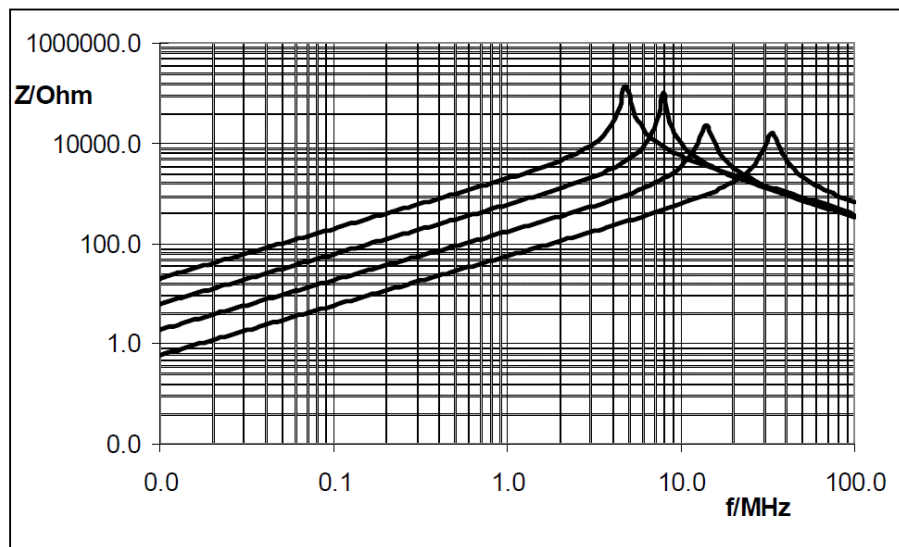
Podatki:

- Nazivna induktivnost
- Tok nasičenja (I_{sat})
- RMS tok (I_{RMS})
- Upornost
- Resonančna frekvenca

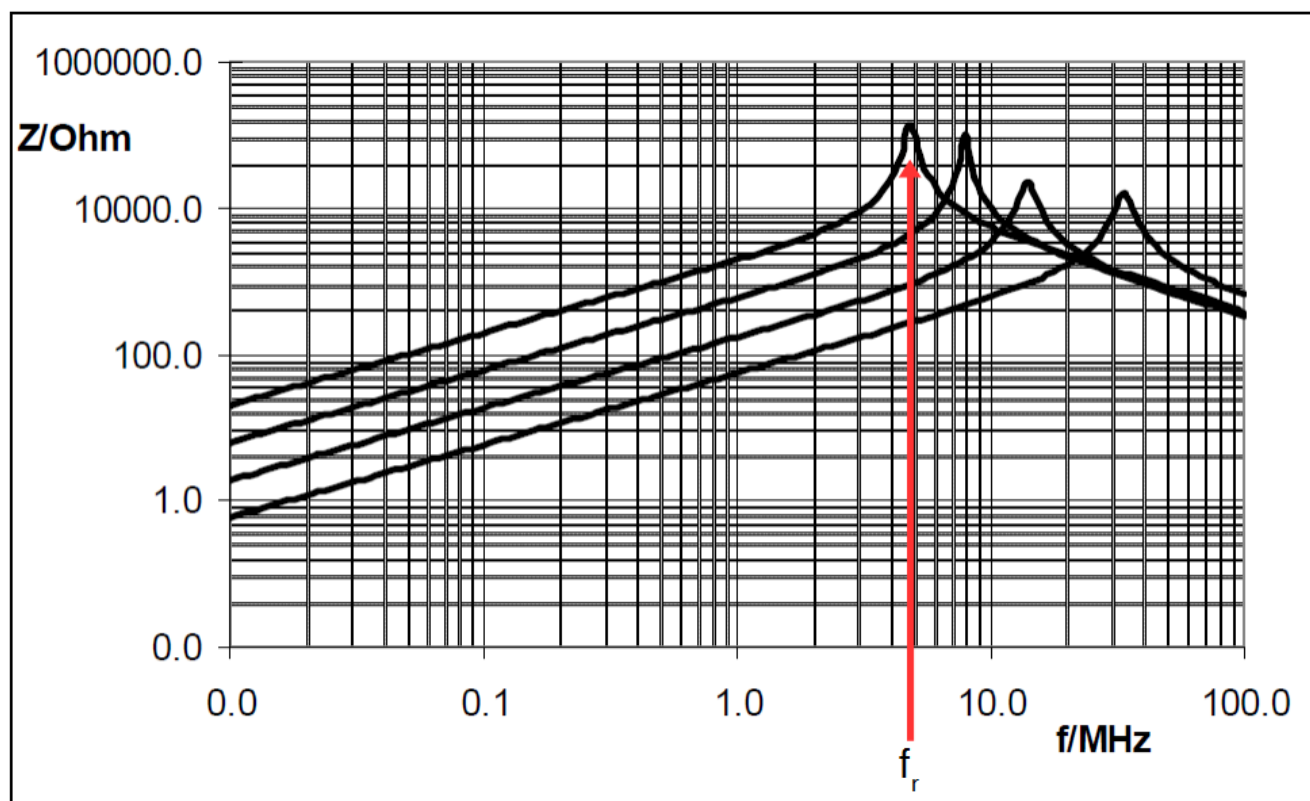
Gradniki-tuljave



Gradniki-tuljave



Gradniki-tuljave



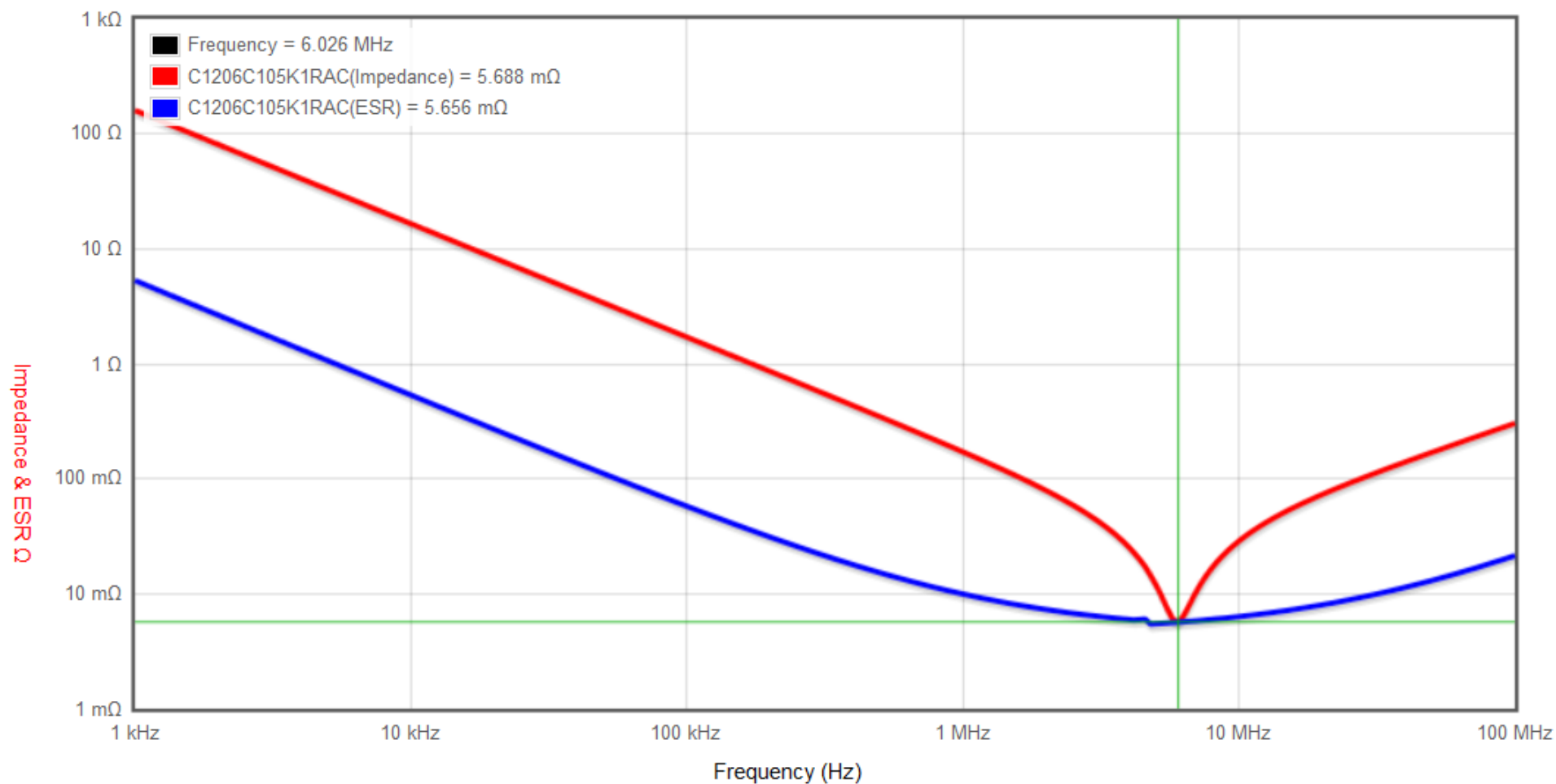
$$C = \frac{1}{(2\pi f_r)^2 L}$$

Gradniki-kondenzatorji

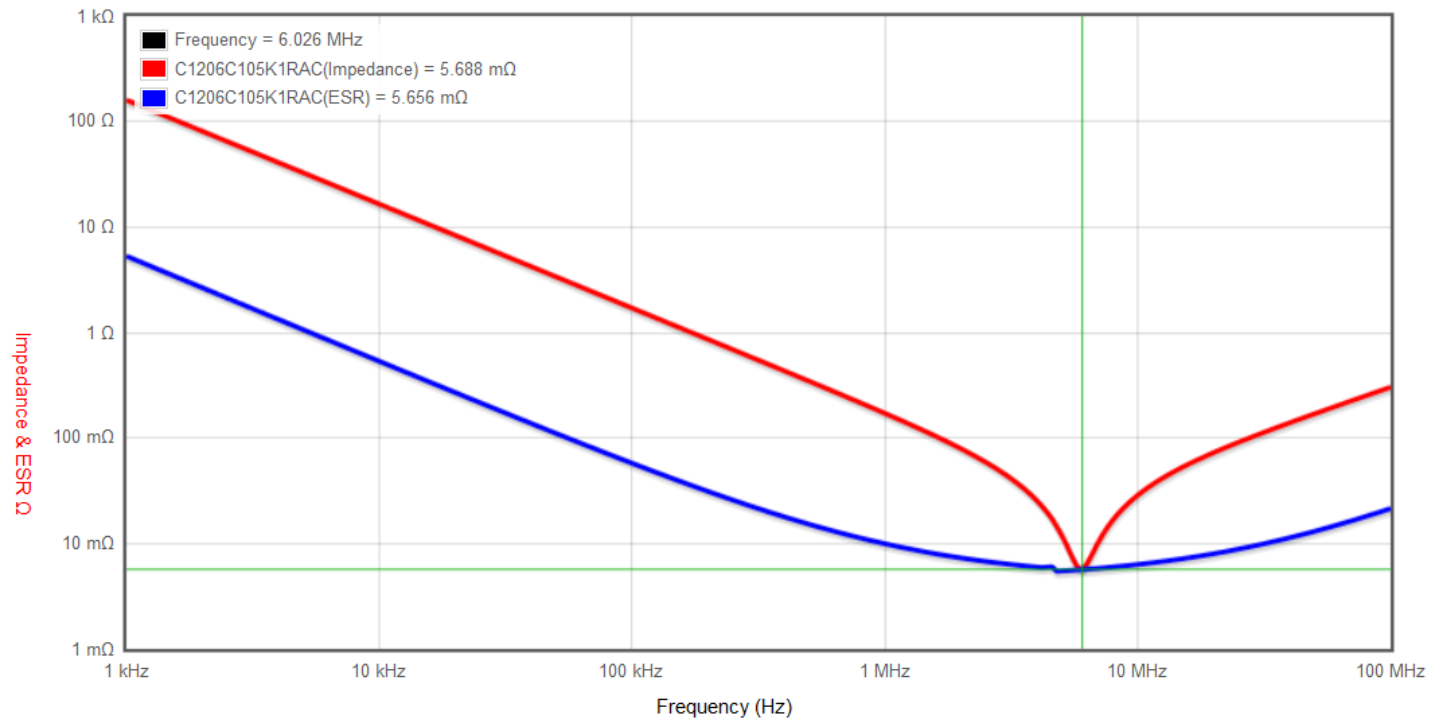
Podatki:

- Nazivna kapacitivnost (?)
- Nazivna napetost
- RMS tok (I_{RMS})
- Upornost
- Resonančna frekvenca (redko podana)

Gradniki-kondenzatorji



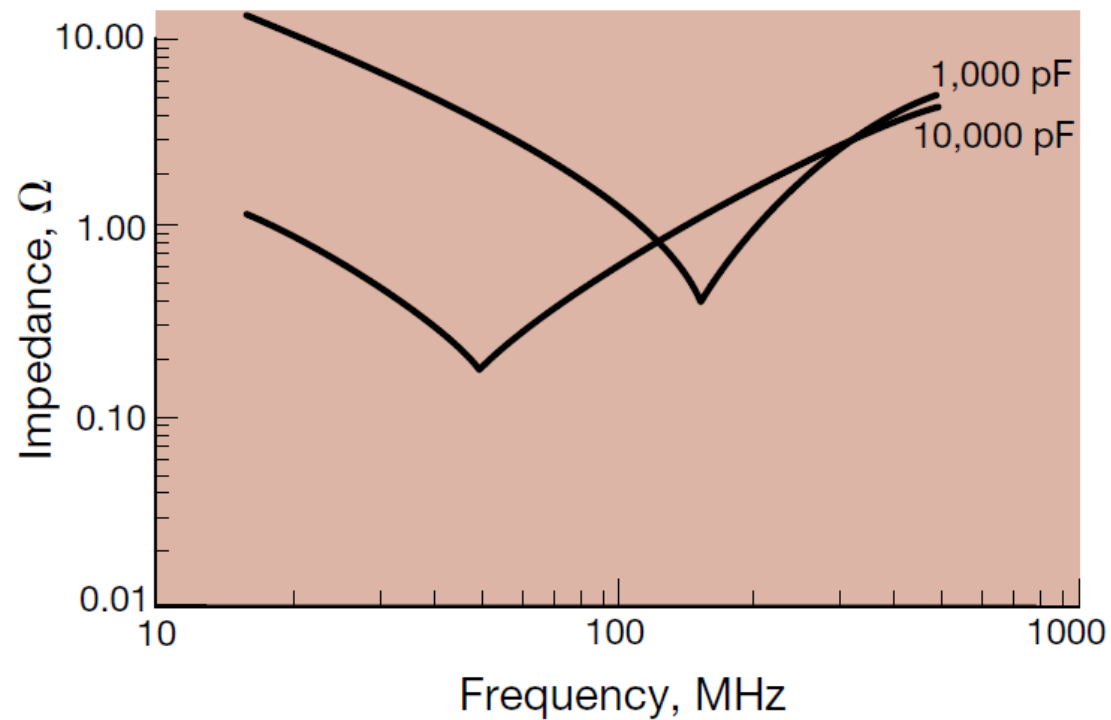
Gradniki-kondenzatorji



$$L = \frac{1}{(2\pi f_r)^2 C}$$

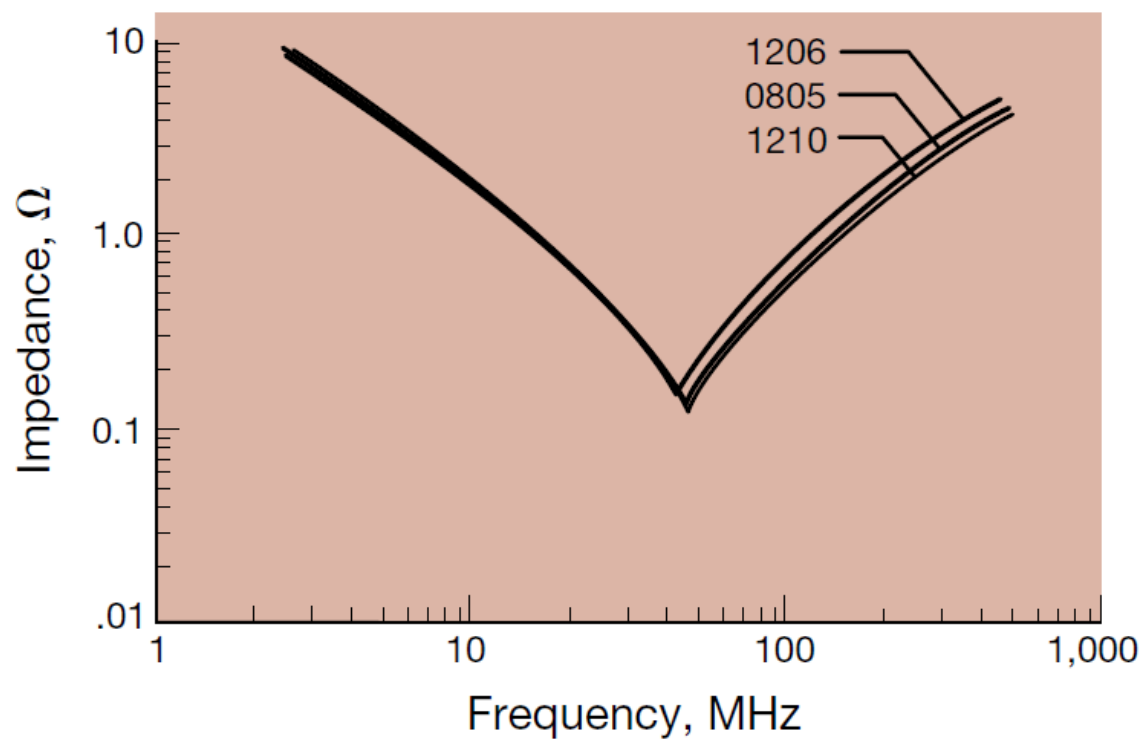
Gradniki-kondenzatorji

Variation of Impedance with Cap Value
Impedance vs. Frequency
1,000 pF vs. 10,000 pF - X7R
0805

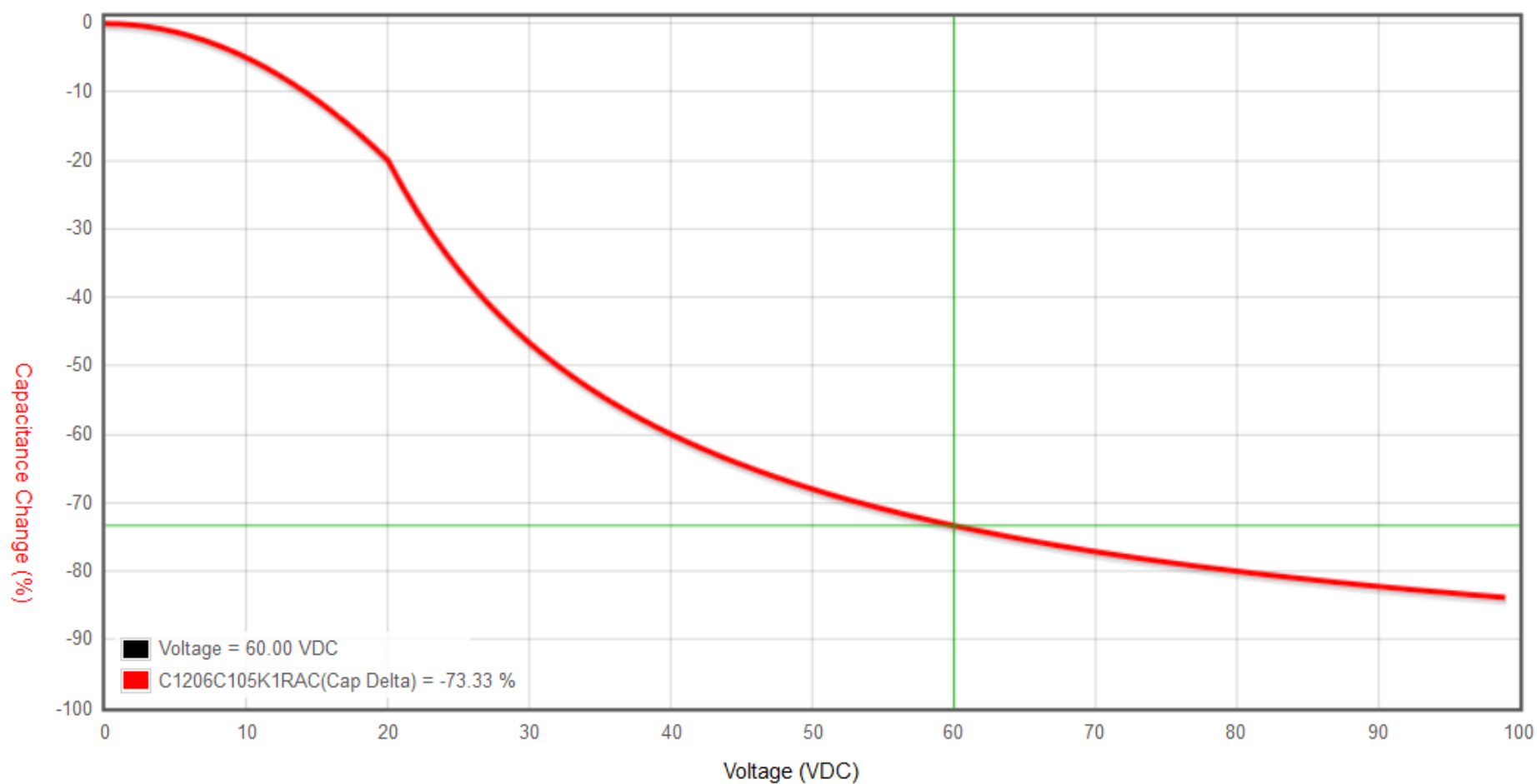


Gradniki-kondenzatorji

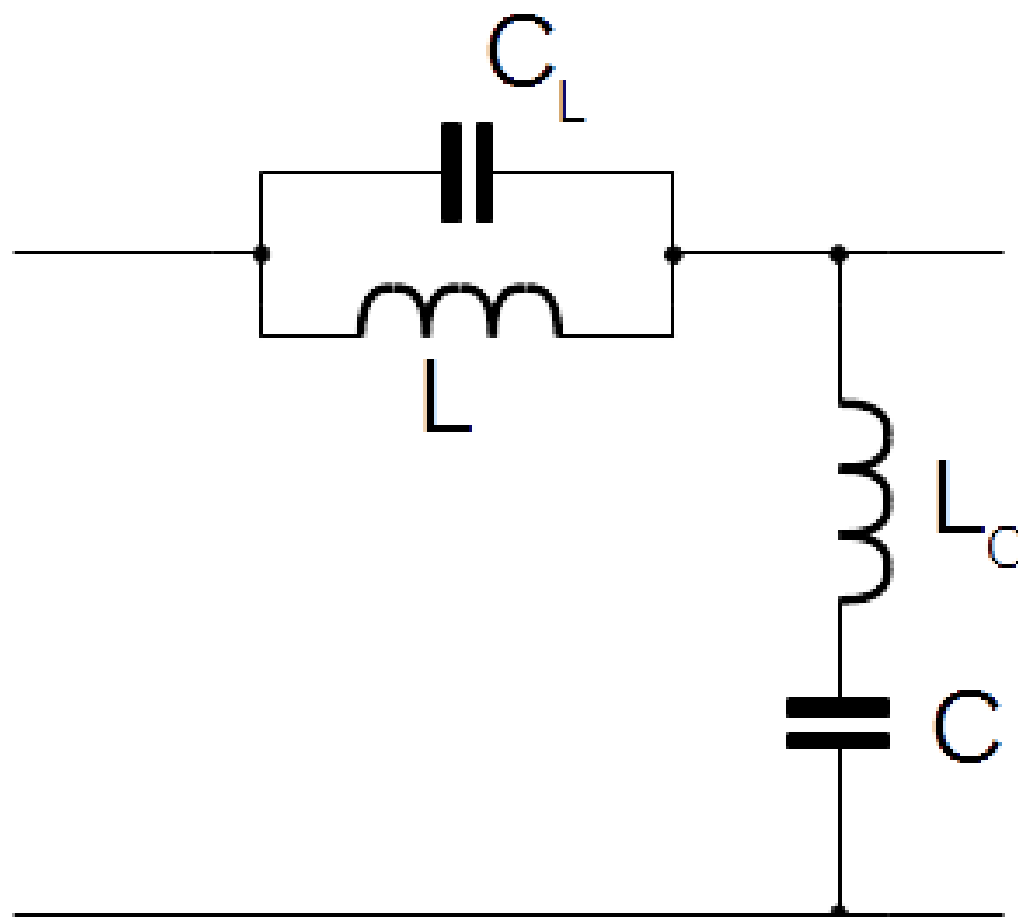
Variation of Impedance with Chip Size
Impedance vs. Frequency
10,000 pF - X7R



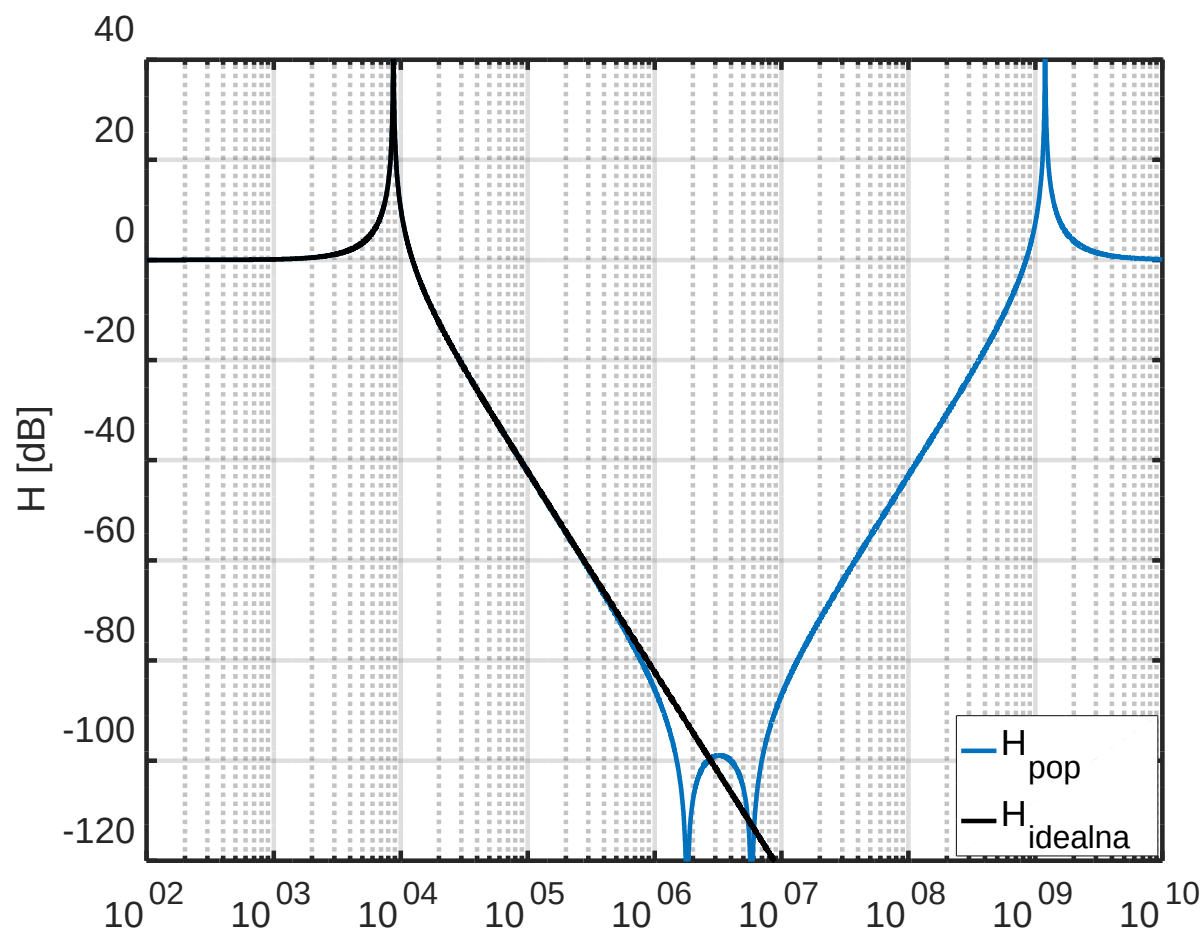
Gradniki-kondenzatorji



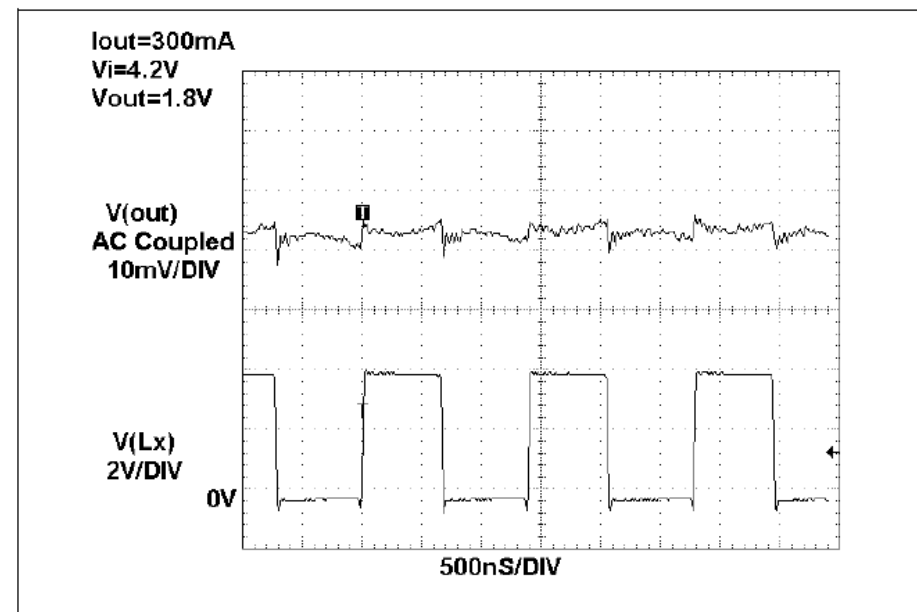
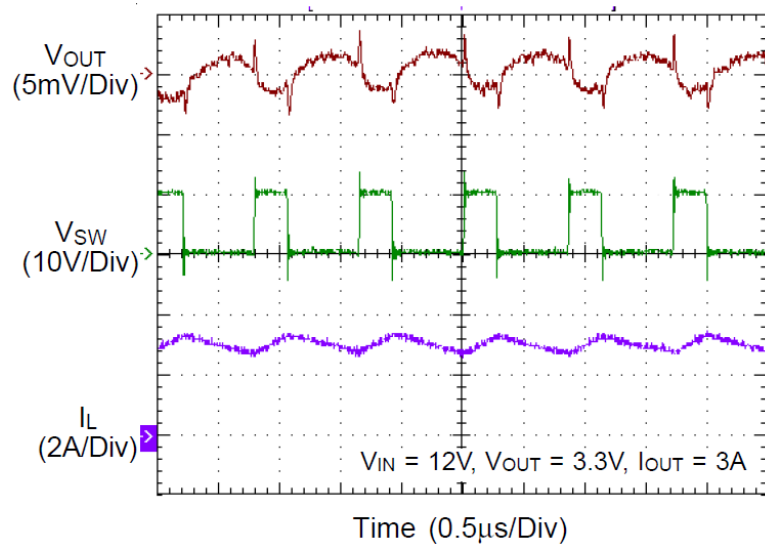
Gradniki- izhodno sito

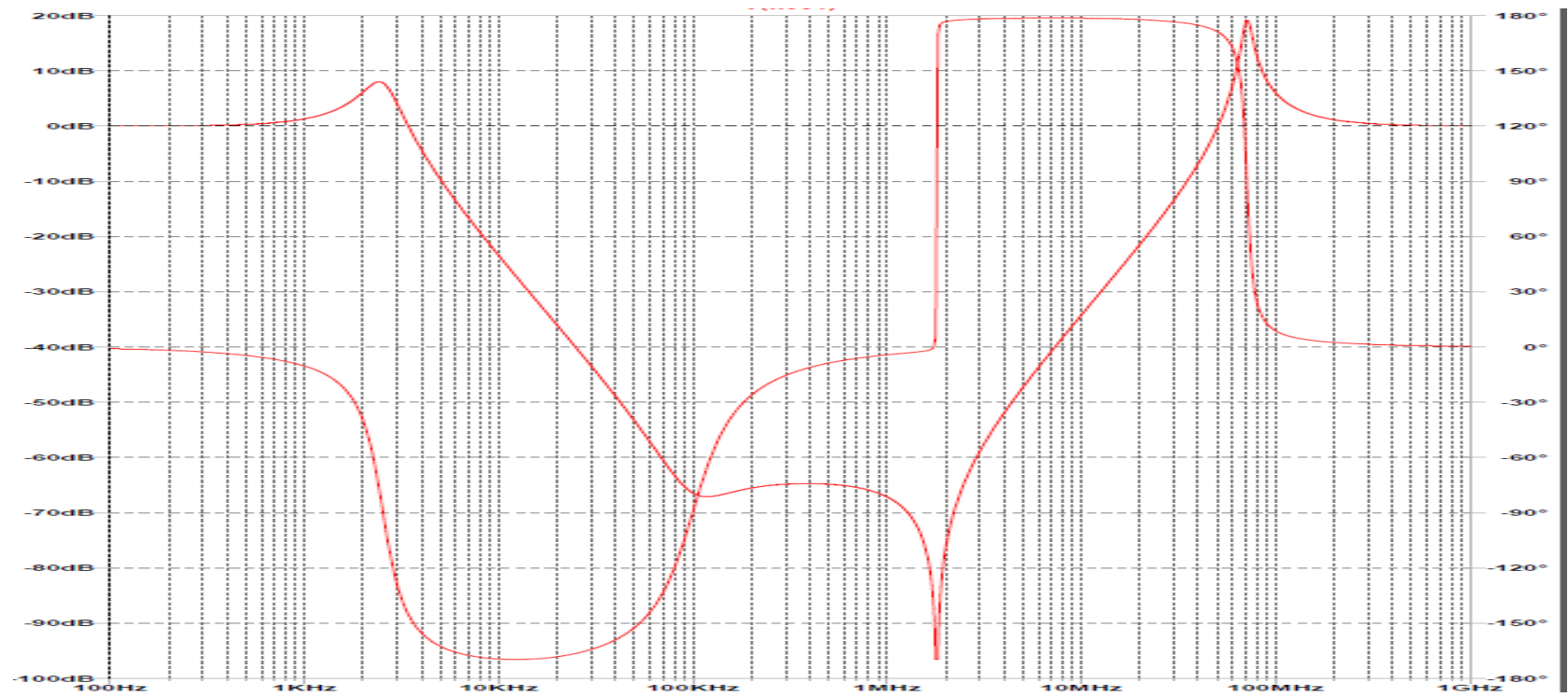


Gradniki- izhodno sito



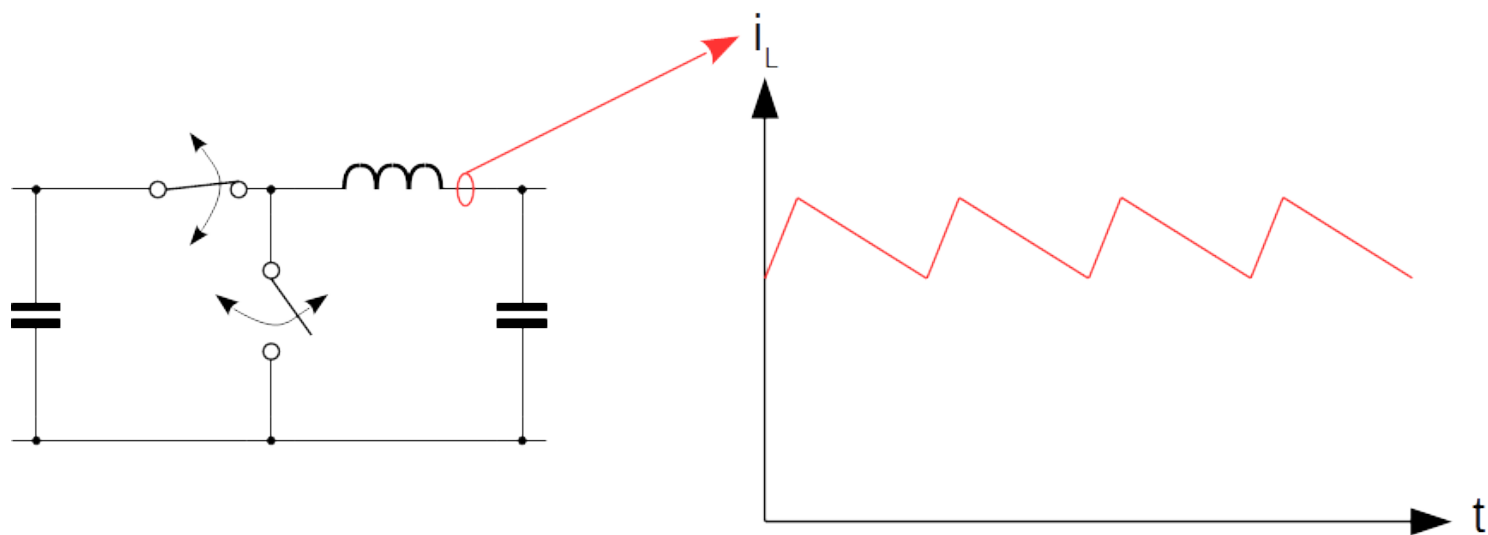
Gradniki- izhodno sito



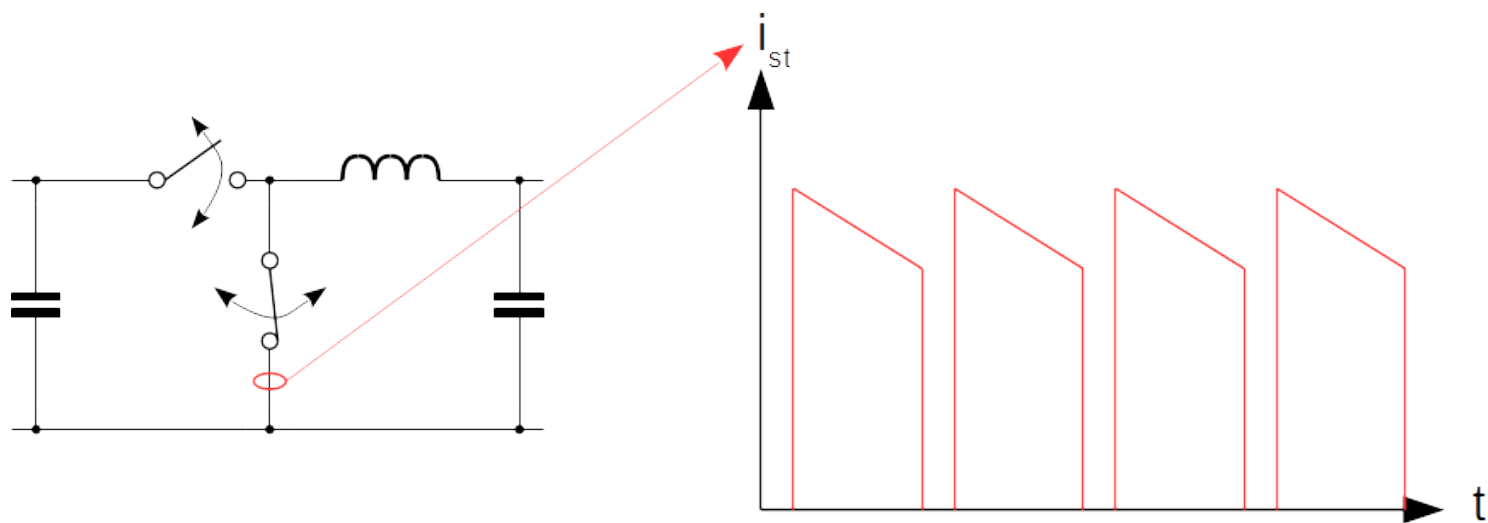


IZVOR SEVALNIH MOTENJ

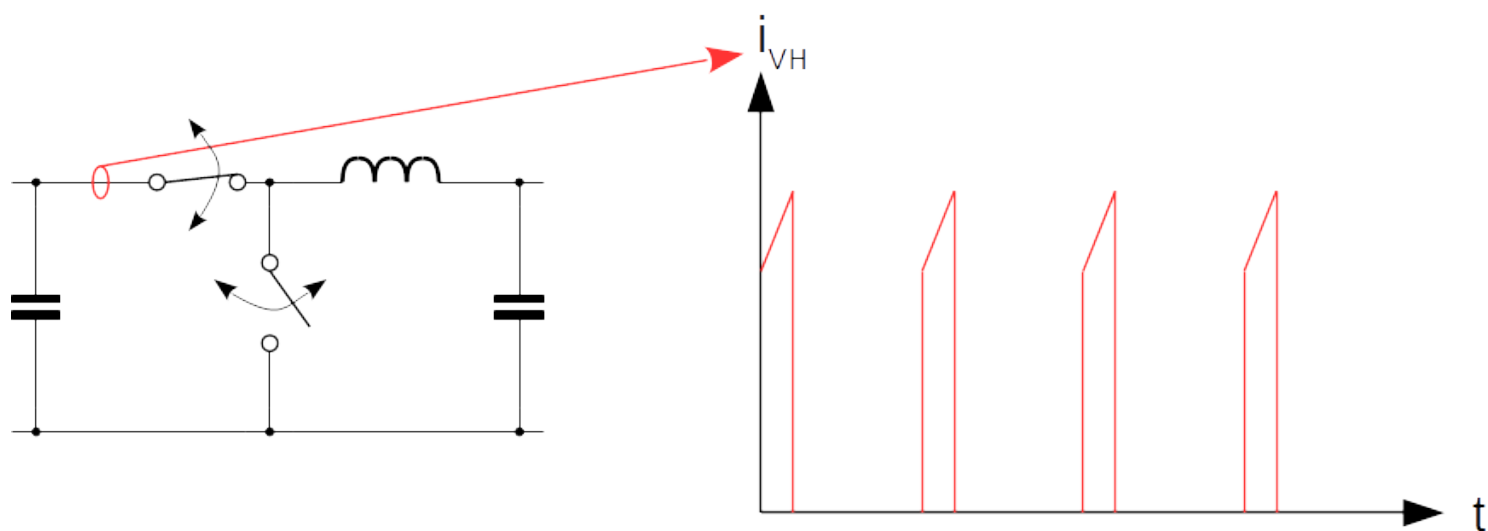
Gradniki- izvor sevalnih motenj



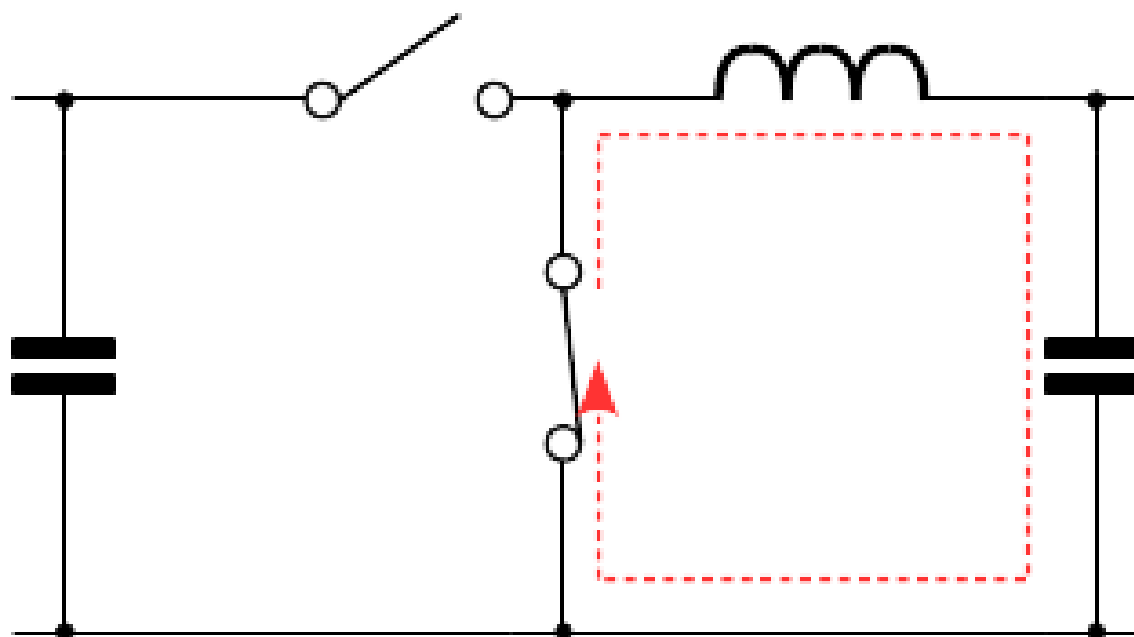
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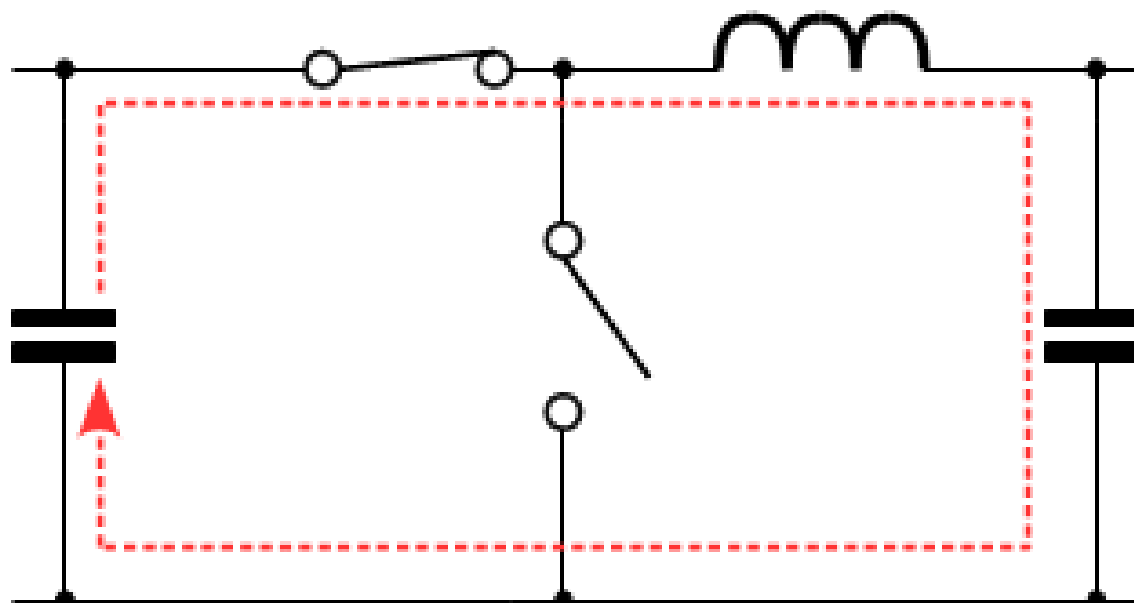
Gradniki- izvor sevalnih motenj



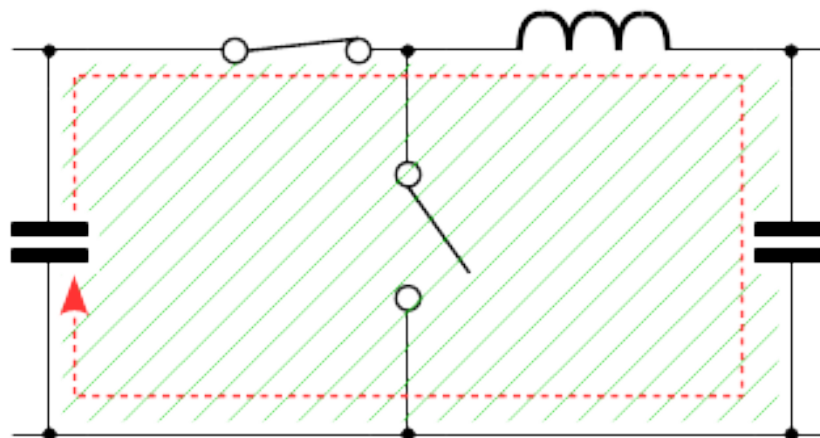
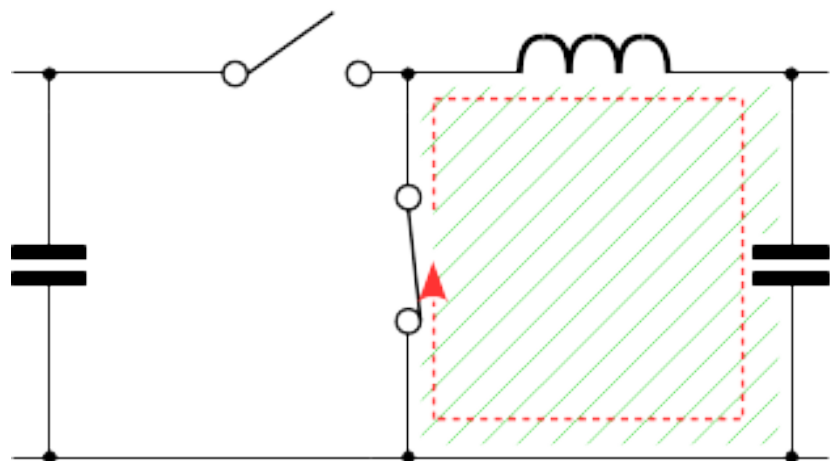
Gradniki- izvor sevalnih motenj



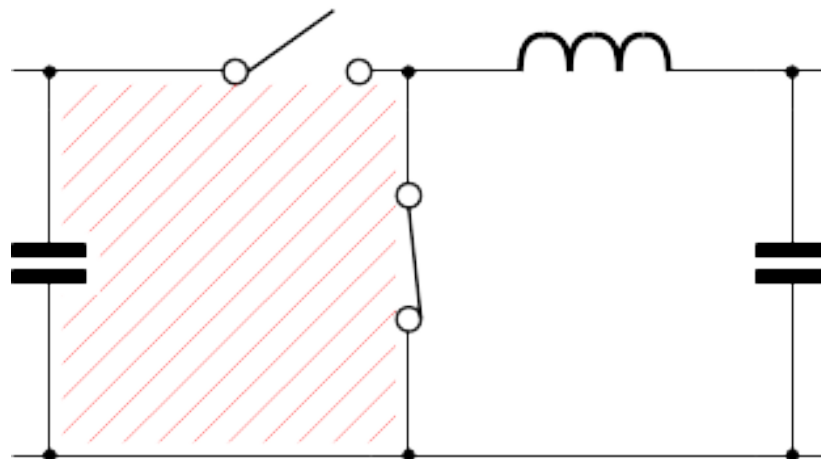
Gradniki- izvor sevalnih motenj



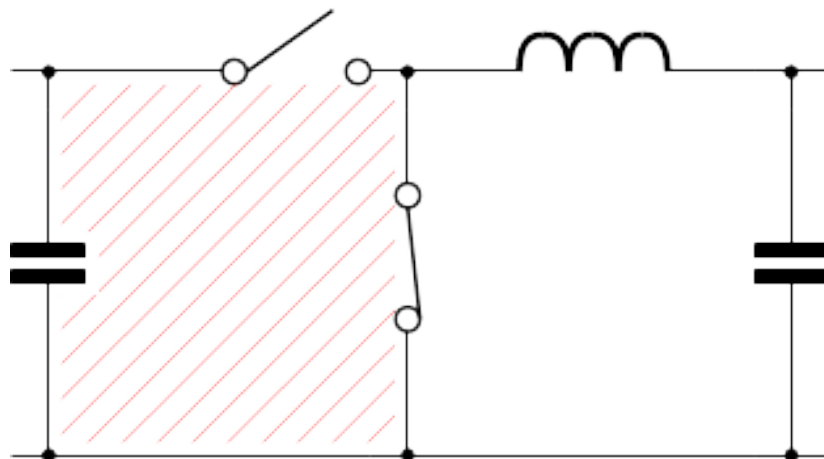
Gradniki- izvor sevalnih motenj



Gradniki- izvor sevalnih motenj

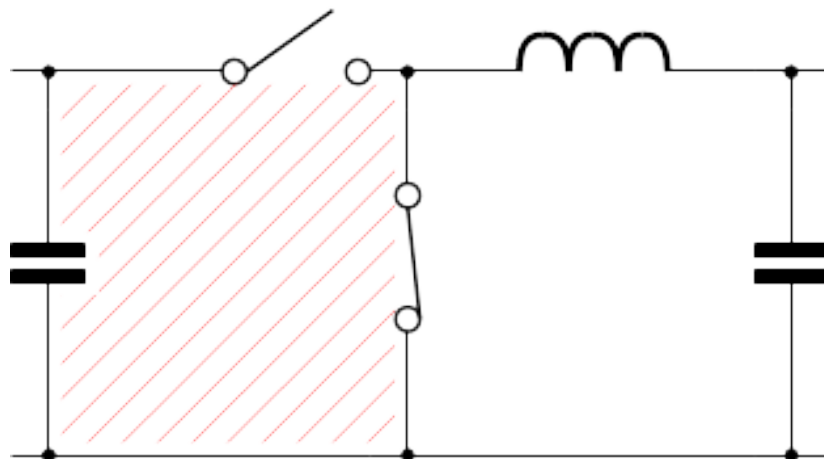


Gradniki- izvor sevalnih motenj



$$U_i = -\frac{d\phi}{dt} = -\frac{d}{dt} \int B dA$$

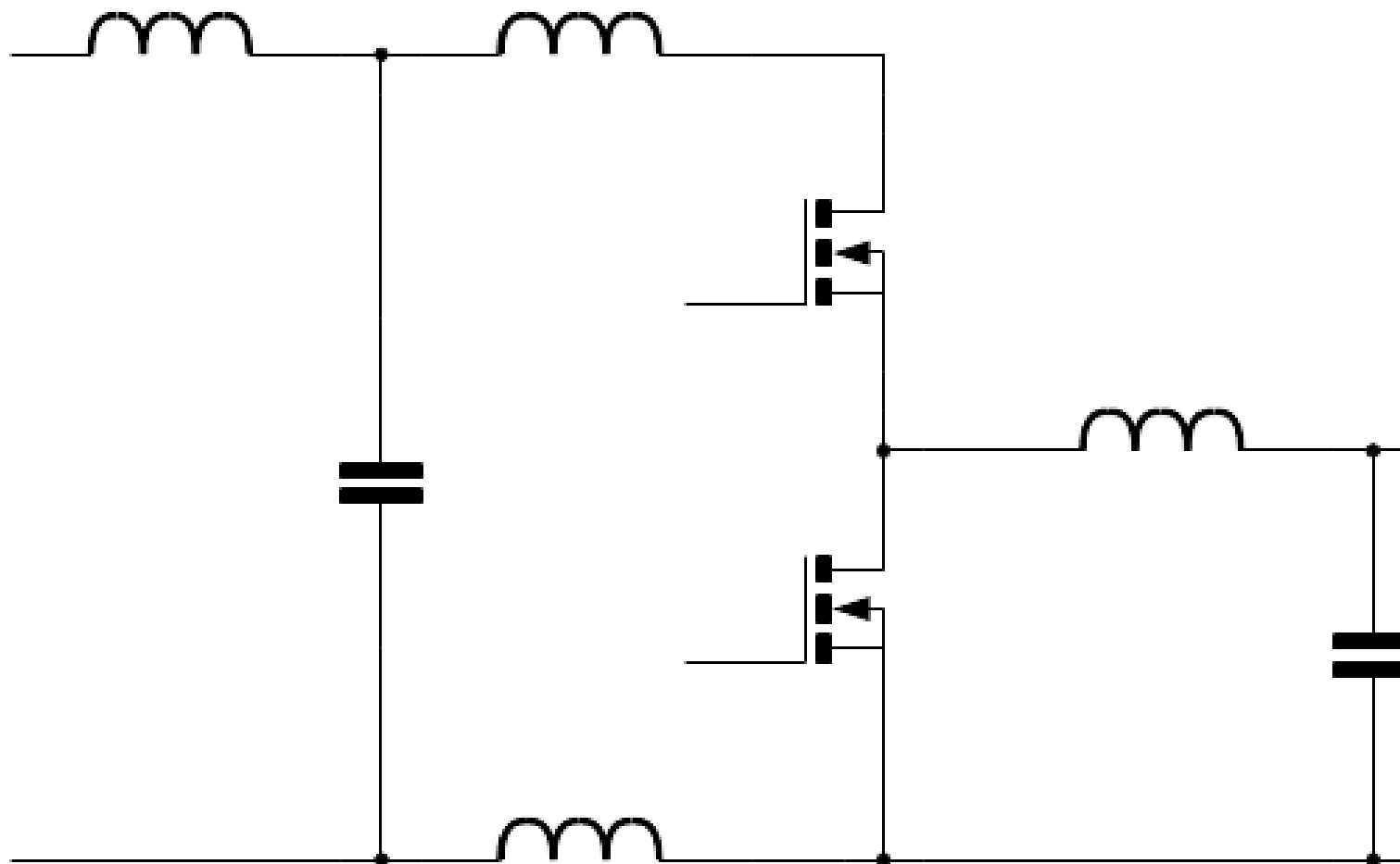
Gradniki- izvor sevalnih motenj



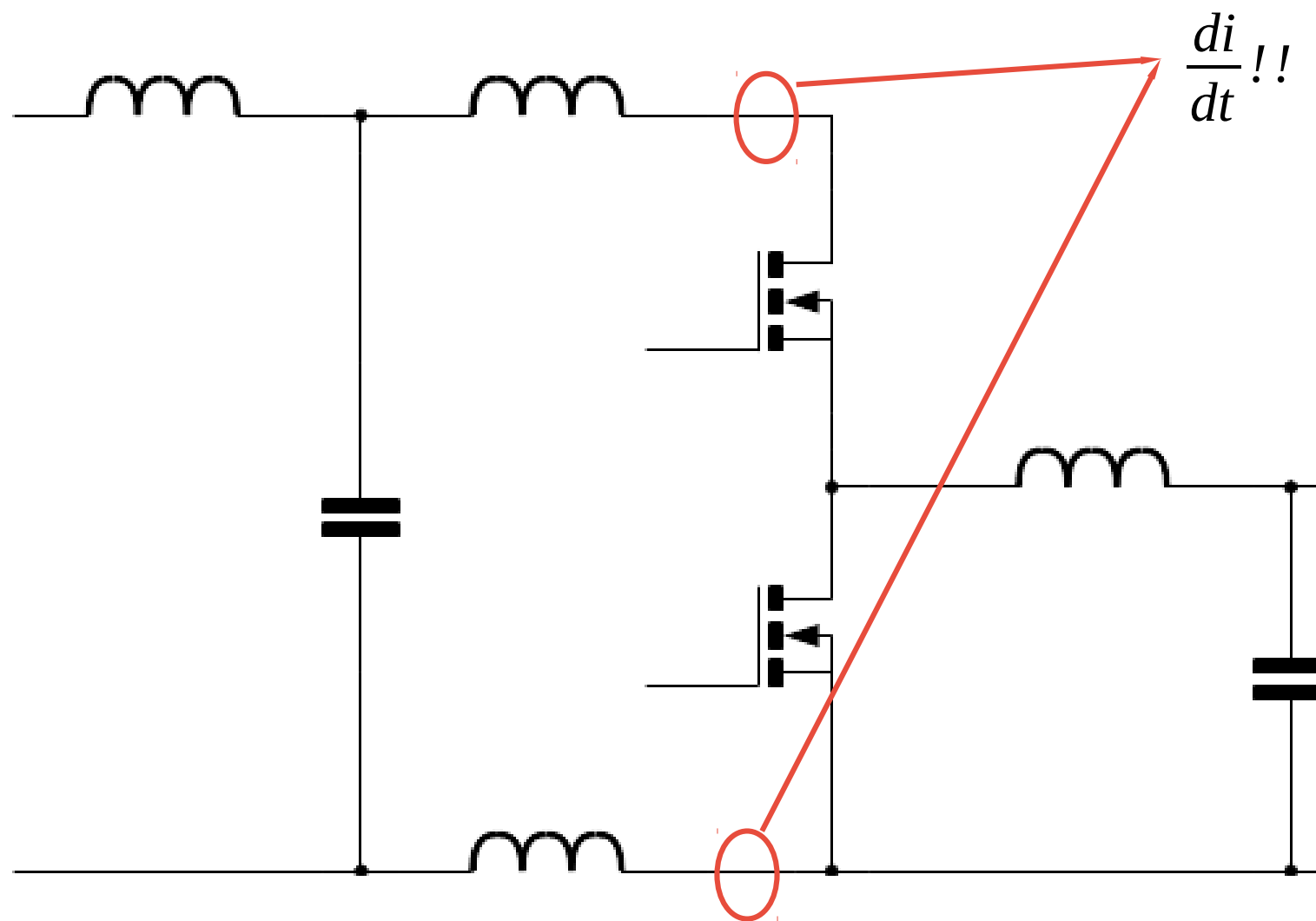
$$U_i = -\frac{d\phi}{dt} = -\frac{d}{dt} \int B dA$$

$$\frac{dA}{dt} \neq \text{konst} !!$$

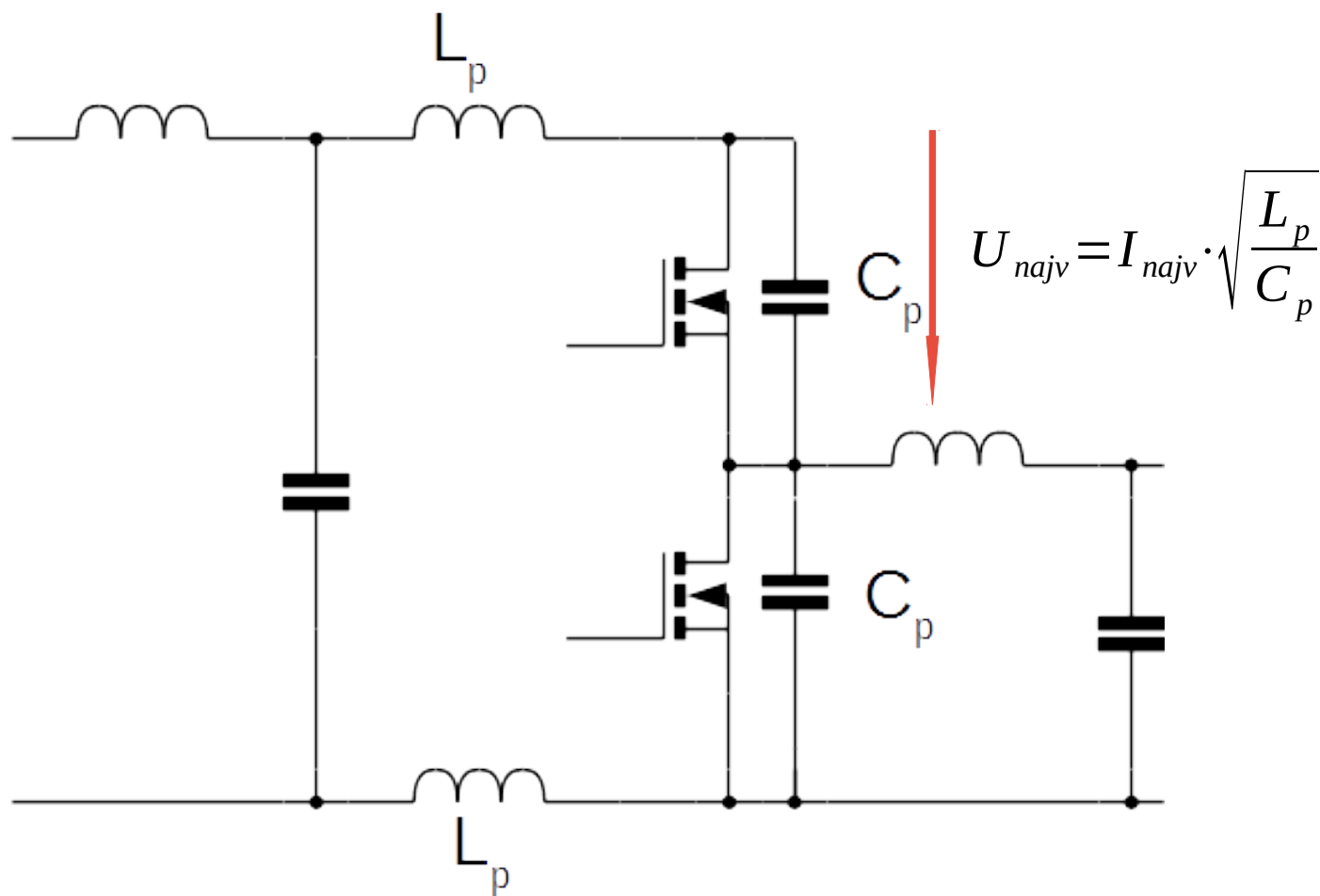
Gradniki-zaščita tranzistorjev



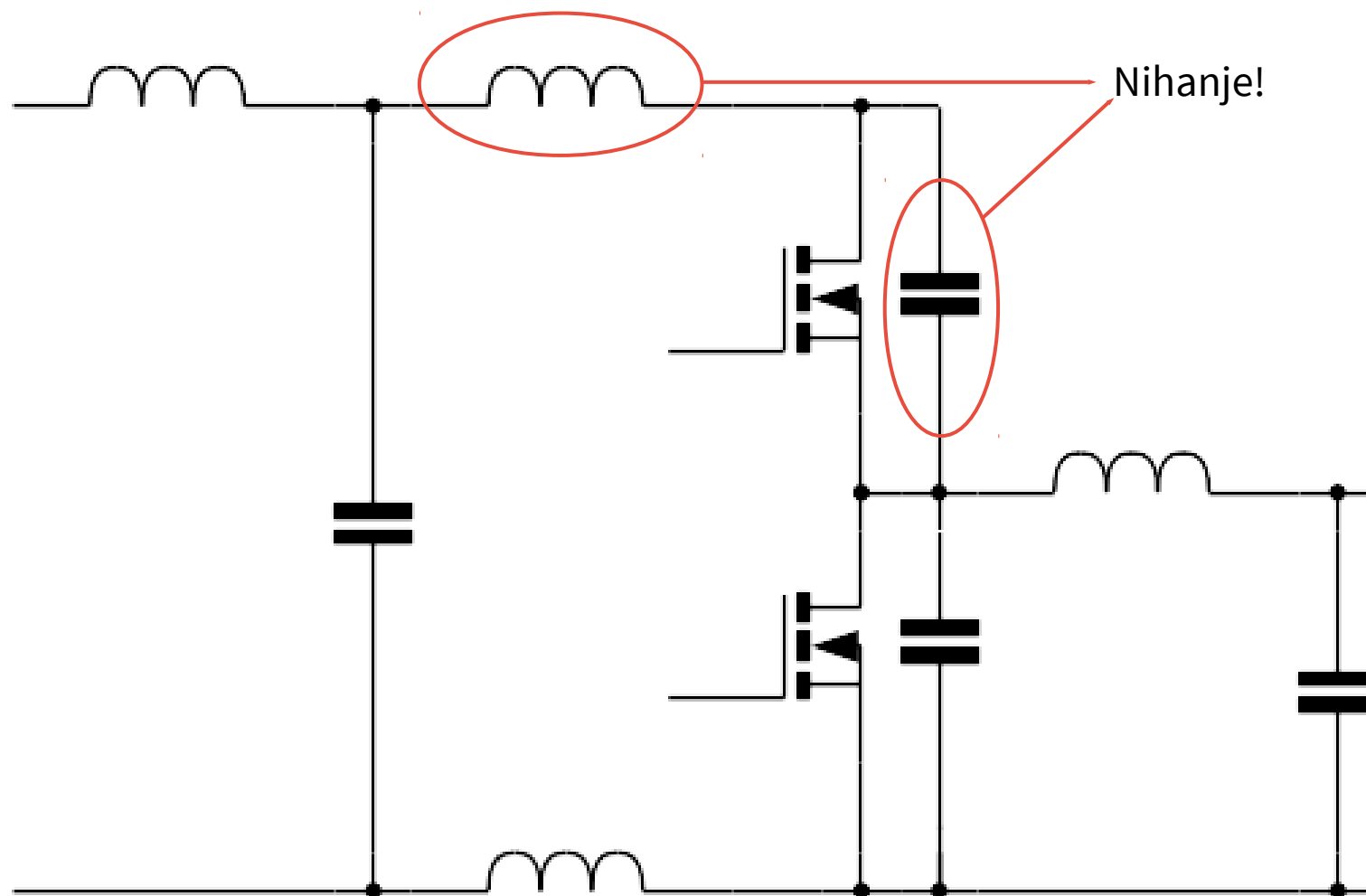
Gradniki-zaščita tranzistorjev



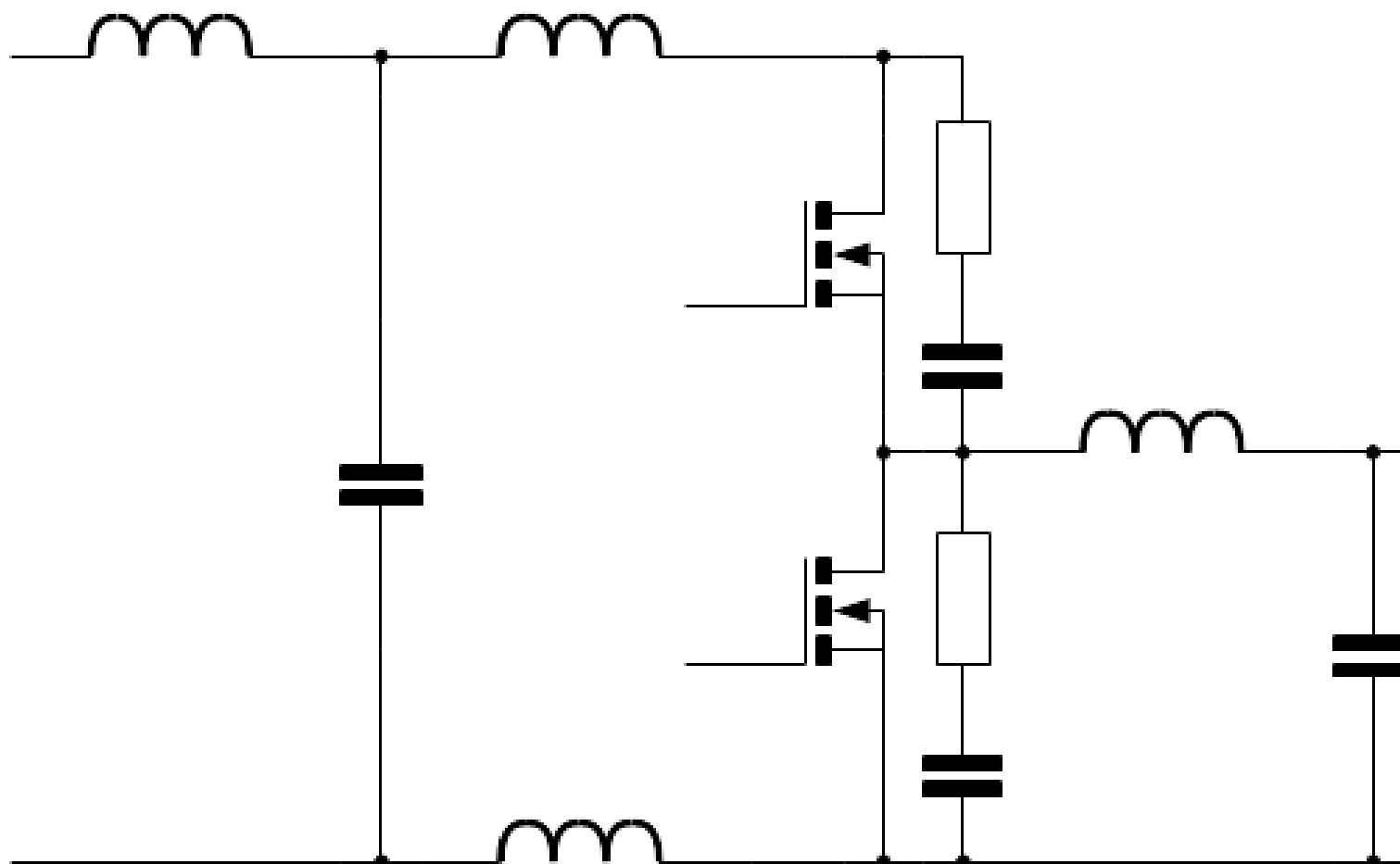
Gradniki-zaščita tranzistorjev



Gradniki-zaščita tranzistorjev



Gradniki-zaščita tranzistorjev



Unotisto!