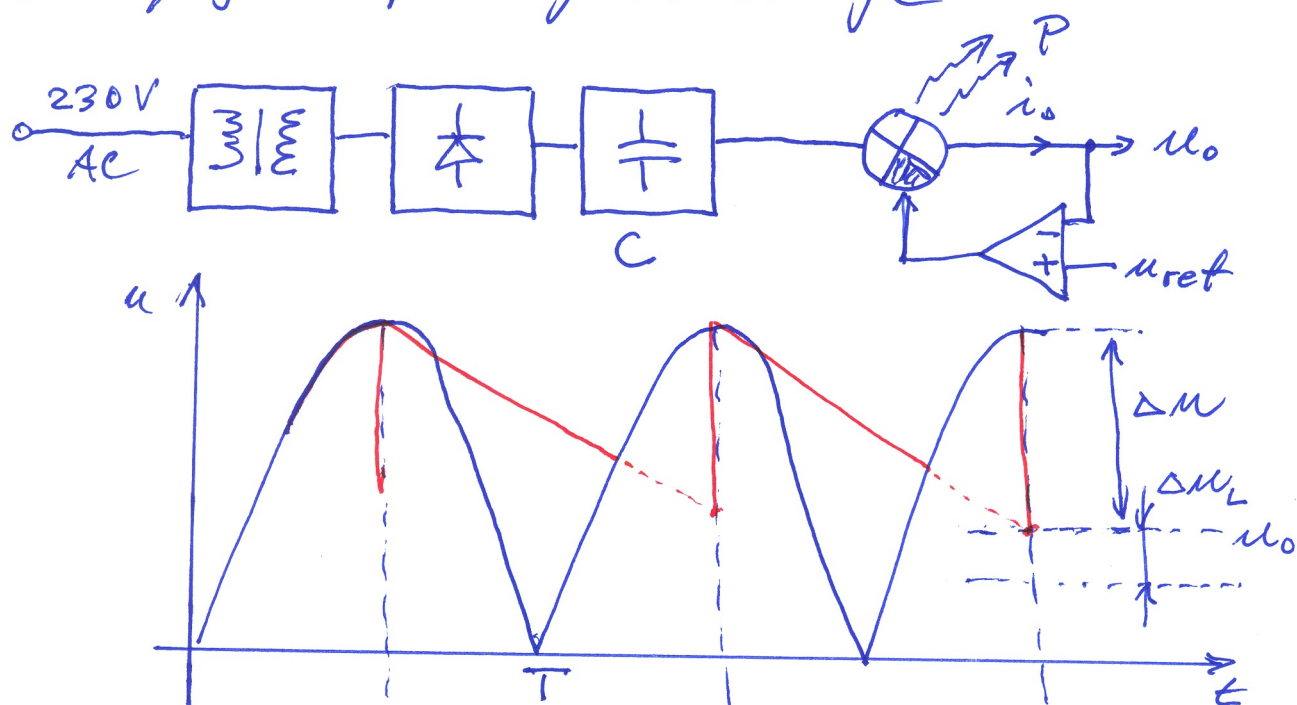


# Napajecí zdroje

- spojitě pracující zdroje
- spínací zdroje

## 1. Spojitě pracující zdroje



$$Q = i_o \cdot T ; Q = C \cdot u$$

$$u \cdot C = i_o \cdot T$$

$$\Delta u = \frac{i_o \cdot T}{C}$$

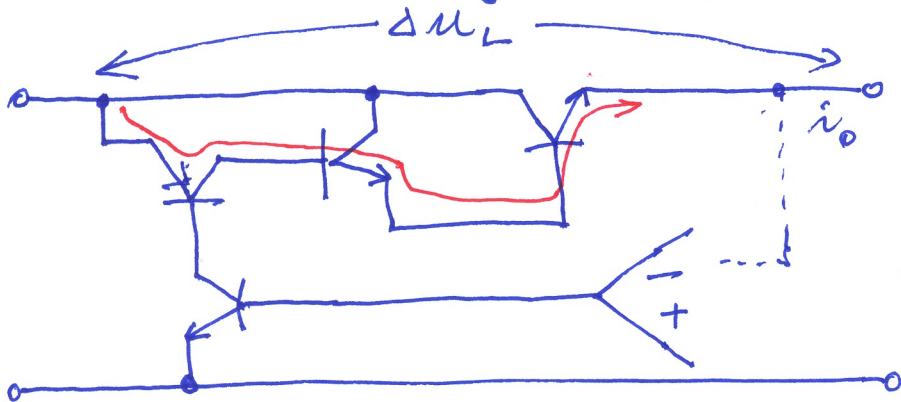
$$P = \frac{1}{2} \Delta u \cdot i_o = \left[ \frac{1}{2} \frac{1}{C} \cdot T \cdot i_o^2 \right] [W]$$

$$i_o = 1A, u_o = 3.3V, 0.01sec = T, C = 1000\mu F$$

$$P = \frac{1}{2} \cdot \frac{1}{10^{-3}} \cdot 10^{-2} \cdot 1^2 = \underline{\underline{5 [W]}}$$

# Spojitě pracující regulátor

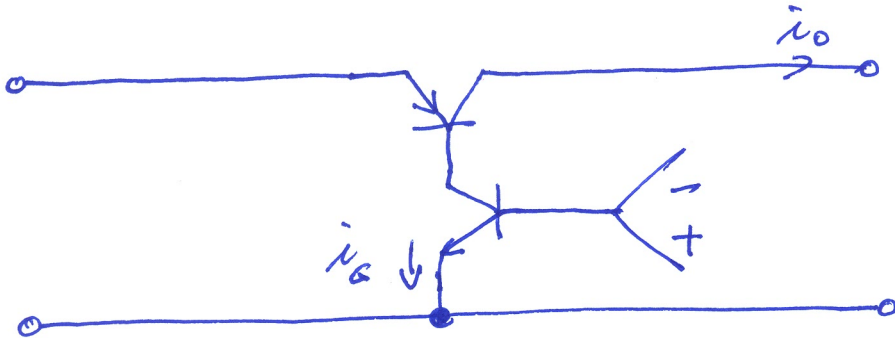
41



$$\Delta U_L = 2 \cdot U_{BE} + U_{SAT}$$

$$\Delta U_L \approx 1.7 - 2.5 V$$

$$i_{o max} \approx 10 A$$

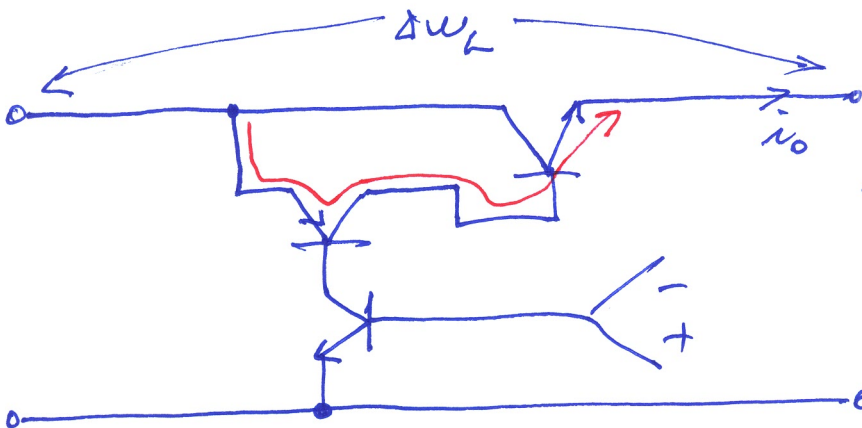


$$\Delta U_L = U_{SAT}$$

$$\Delta U_L \approx 0.1 - 0.7 V$$

$$i_B \approx 20 - 40 mA$$

$$i_{o max} \approx 1 A$$



$$\Delta U_L = U_{BE} + U_{SAT}$$

$$\Delta U_L = 0.5 - 1.5 V$$

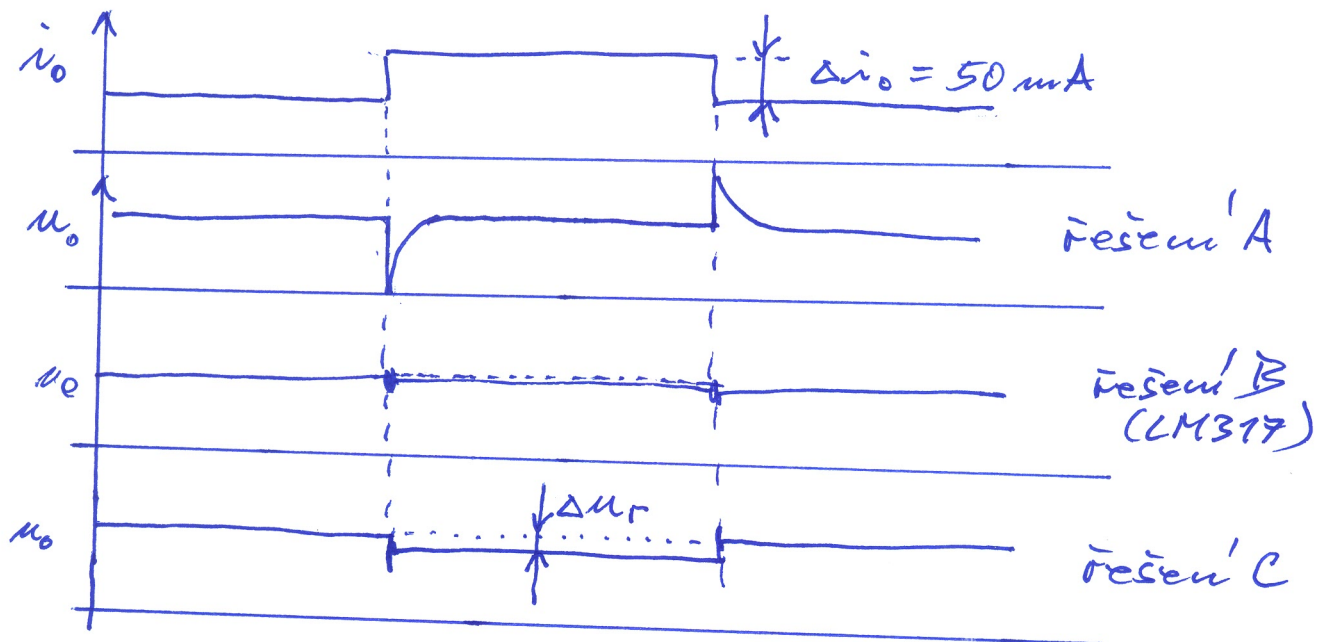
$$i_{o max} = 7 A$$

Príklad: zdroj 5V, 0.1A, napájený z 24V DC <sup>42</sup>

Řešení: A .... spřámený zdroj (BUCK)

B .... LM317

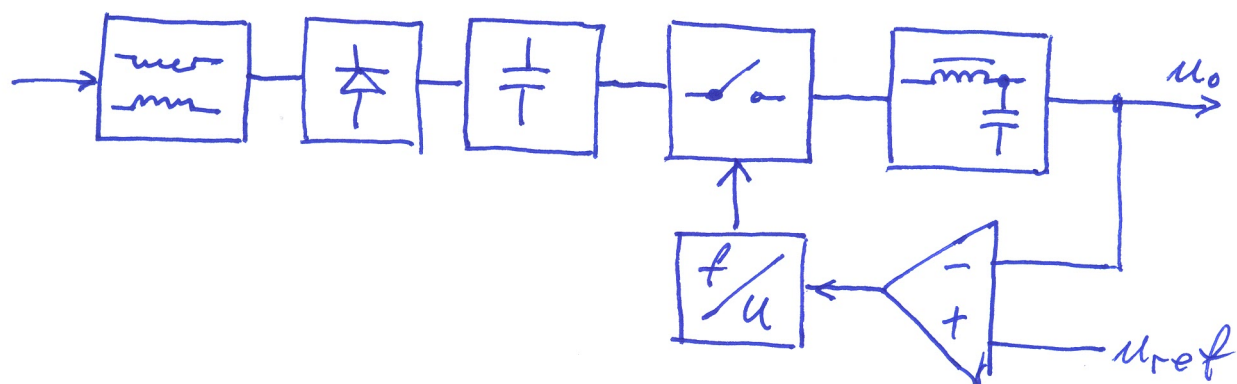
C .... diskrétní lin. regulátor



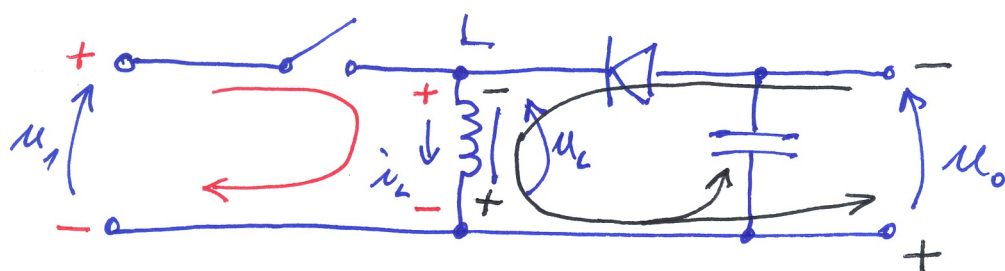
	A	B	C
volubelnost (šum) [mV]	75	< 10	< 10
základní pář $i_o = 50 \rightarrow 100 \text{ mA}$ [mV]	250	40	40
regul. odchylka $i_o = 0 - 100 \text{ mA}$ [mV]	1.5	0.7	22
účinnost [%]	85	20	20

## 2. Spinače' z dooje

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a) inverzijski menič (Buck-Boost)



- v aktivni periodi ( $T_A$ ):

$$u_L = u_1;$$

$$i_L = u_o + \frac{1}{L} \int u_L dt$$

$$\Delta i_{LA} = \frac{1}{L} \cdot u_1 \cdot T_A$$

- v pasivni periodi ( $T_P$ )

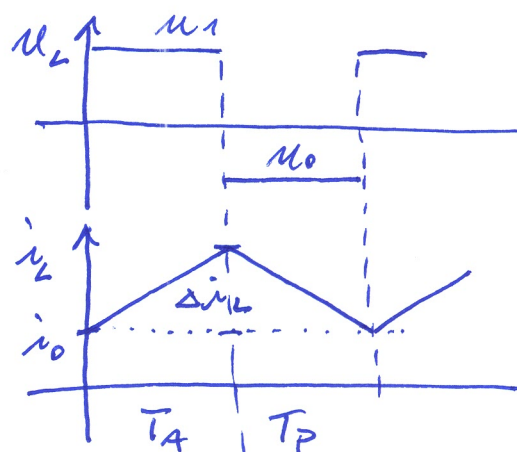
$$u_L = u_o$$

$$\Delta i_{LP} = \frac{1}{L} \cdot u_o \cdot T_P$$

v ustaljenem stavu:

$$\Delta i_{LA} = \Delta i_{LP}$$

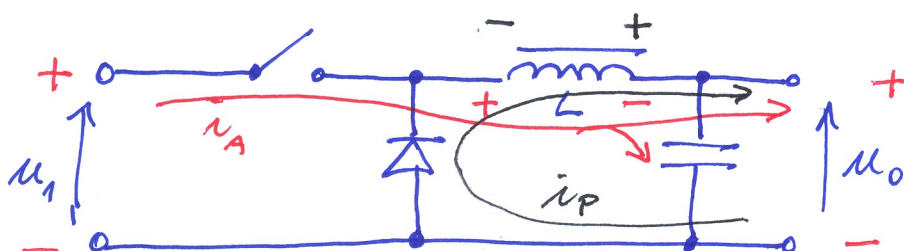
$$\frac{1}{L} \cdot u_1 \cdot T_A = \frac{1}{L} \cdot u_o \cdot T_P$$





$$u_0 = u_1 \cdot \frac{T_A}{T_P}$$

b) prostoprymý měnič (Buck)



v aktivní periodě ( $T_A$ ):

$$u_1 = u_L + u_0 \Rightarrow u_L = u_1 - u_0$$

$$\Delta i_{LA} = \frac{1}{L} \cdot T_A \cdot (u_1 - u_0)$$

v pasivní periodě ( $T_P$ ):

$$u_L = u_0$$

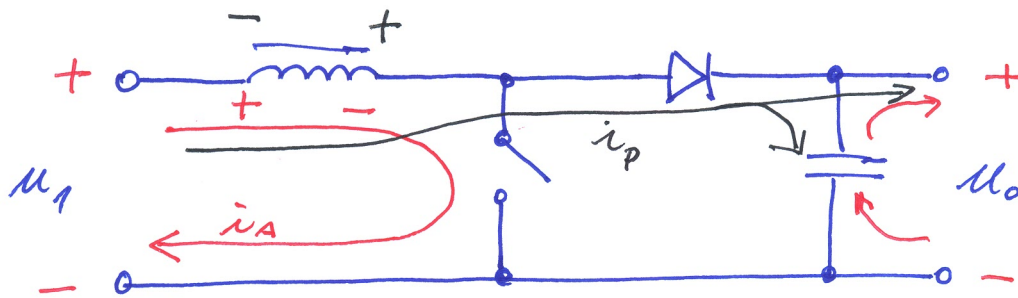
$$\Delta i_{LP} = \frac{1}{L} \cdot T_P \cdot u_0$$

$$\frac{1}{L} \cdot T_A \cdot (u_1 - u_0) = \frac{1}{L} \cdot T_P \cdot u_0$$

$$T_A u_1 - T_A u_0 = T_P u_0$$

$$u_0 = u_1 \cdot \frac{T_A}{T_A + T_P}$$

### c) zvyšující měnič (Boost)



v aktivní periodě:  $u_L = u_1$

$$\Delta i_{LA} = \frac{T}{L} \cdot u_1 \cdot T_A$$

v pasivní periodě:  $u_L + u_C = u_0$

$$u_C = u_0 - u_1$$

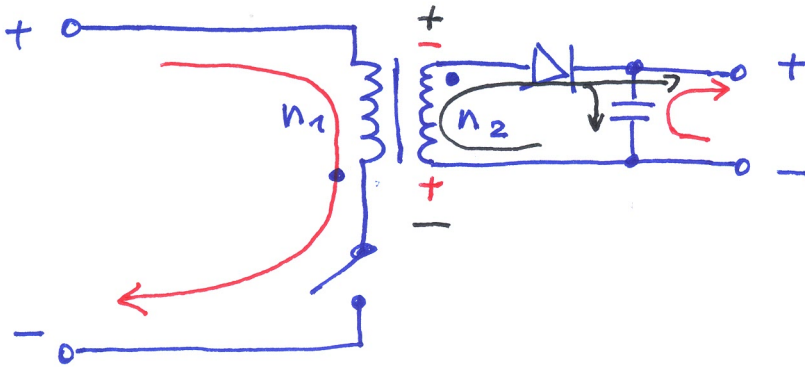
$$\Delta i_{LP} = \frac{T}{L} \cdot (u_0 - u_1) \cdot T_P$$

$$u_1 T_A = u_0 T_P - u_1 T_P$$

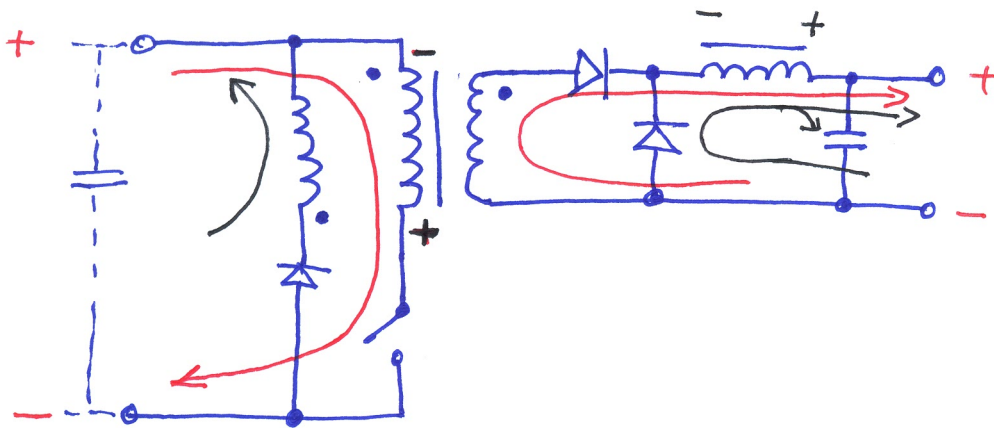
$$u_0 = u_1 \cdot \frac{T_A + T_P}{T_P}$$

d) zdroj s galvanickým oddělením

Flyback :

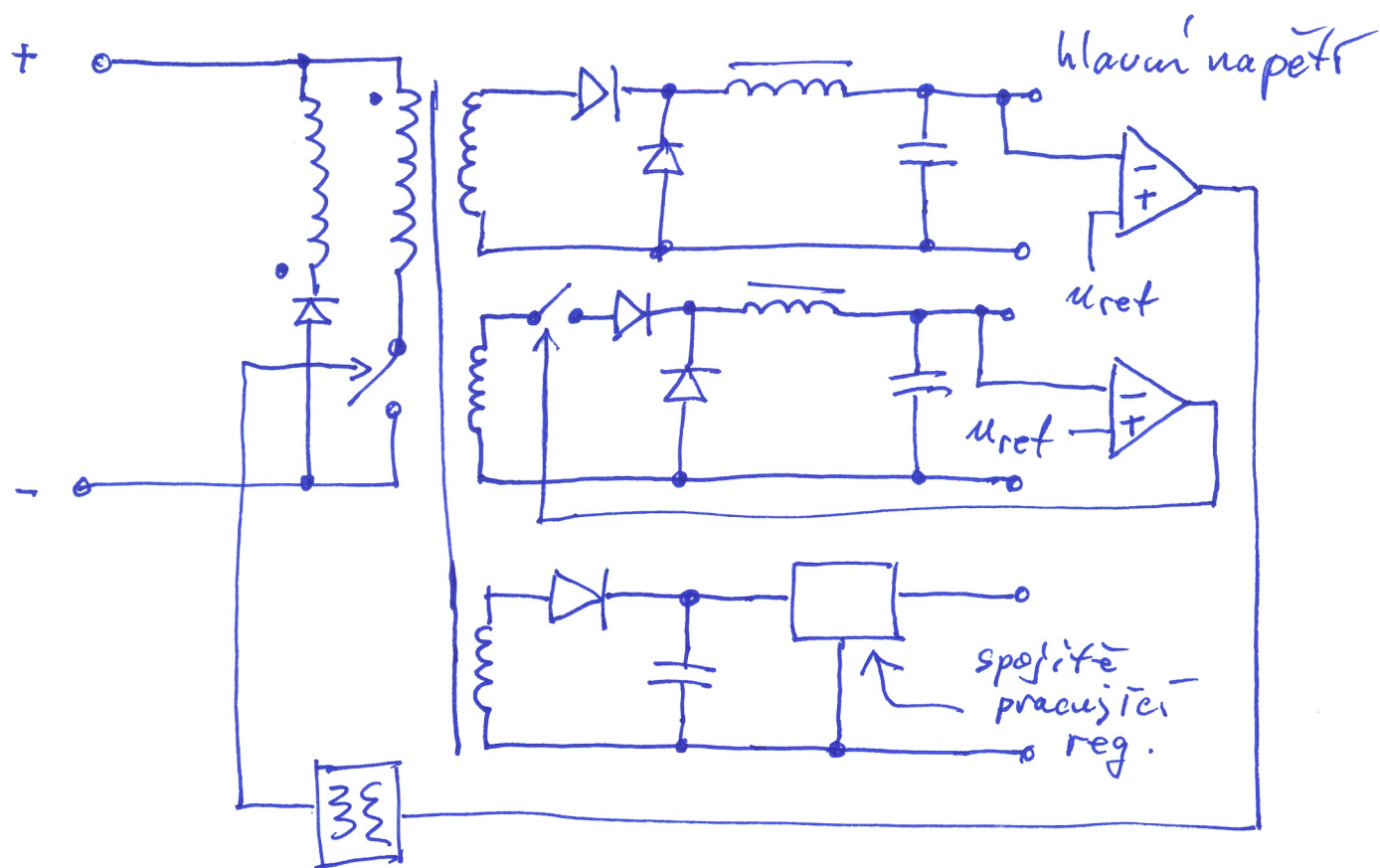


Forward



# e) vícetladi'nový zdroj

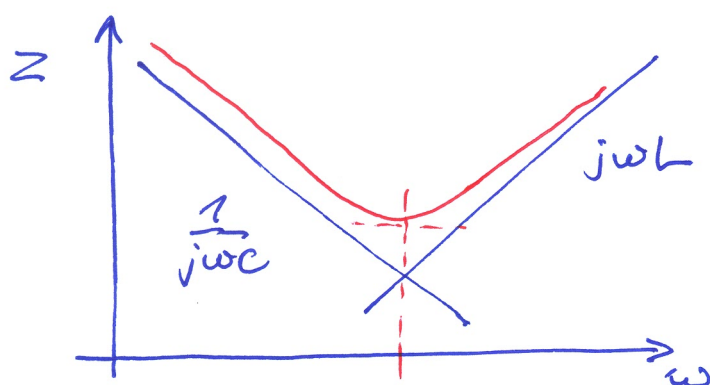
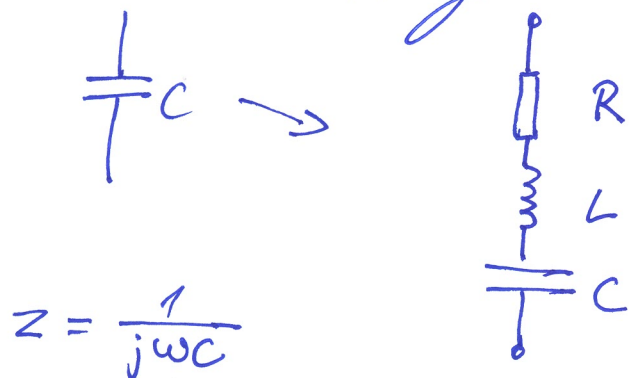
47



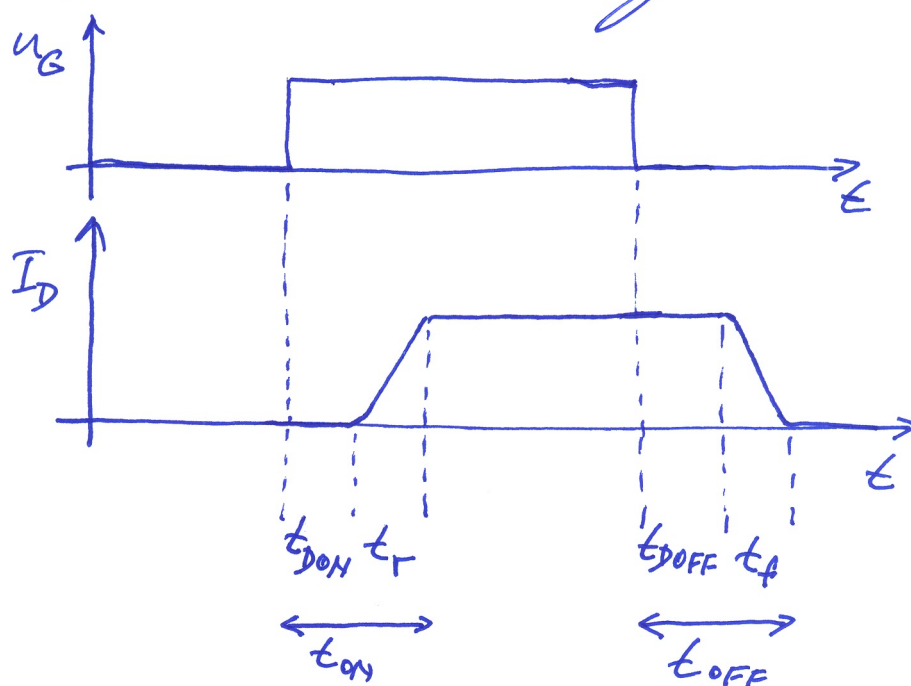


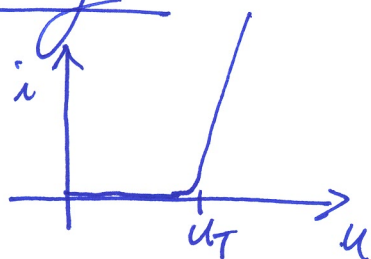
# Součastky pro spínací zdroje

## 1. Kondenzátory

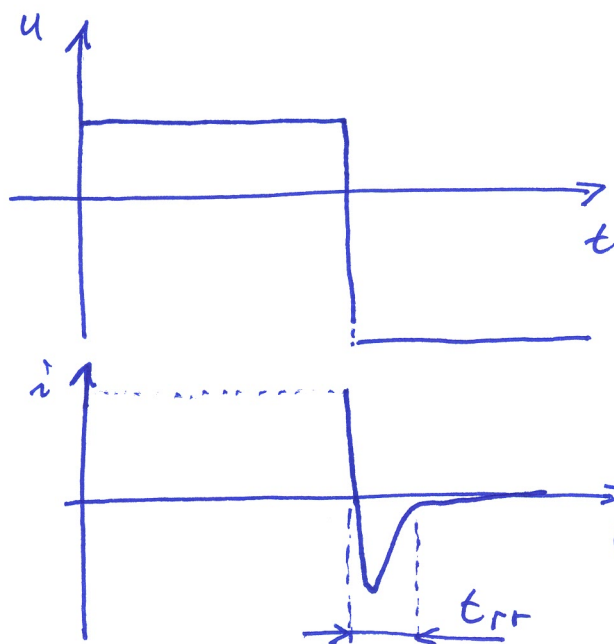


## 2. Spínací tranzistory



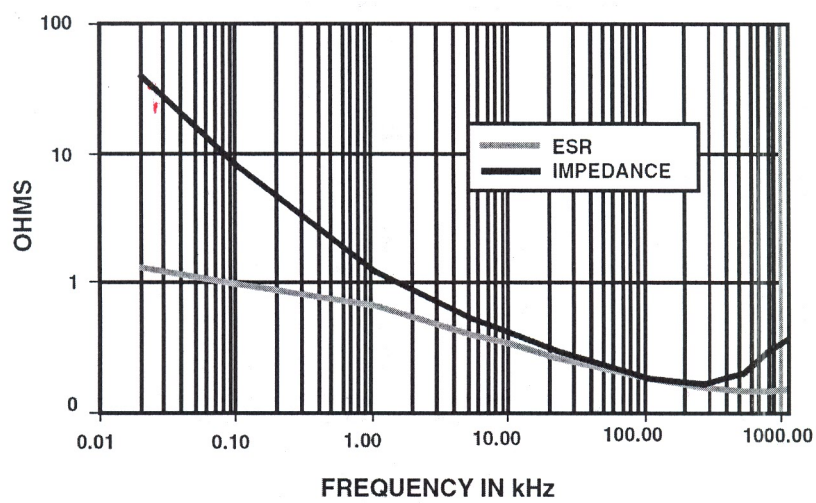
BUZ 11 : $t_{\text{DON}}$  40 - 60 ns $t_r$  145 - 210 ns $t_{\text{DOFF}}$  220 - 320 ns $t_f$  135 - 200 nsIRF7832 N FET 0.004  $\Omega$   
30V, 20A $t_{\text{DON}}$  12 ns $t_r$  6.7 ns $t_{\text{DOFF}}$  27 ns $t_f$  13 ns3. Diody

$U_T$  .... Si 0.7 ... 1.1V  
Sch. 0.3 ... 0.6

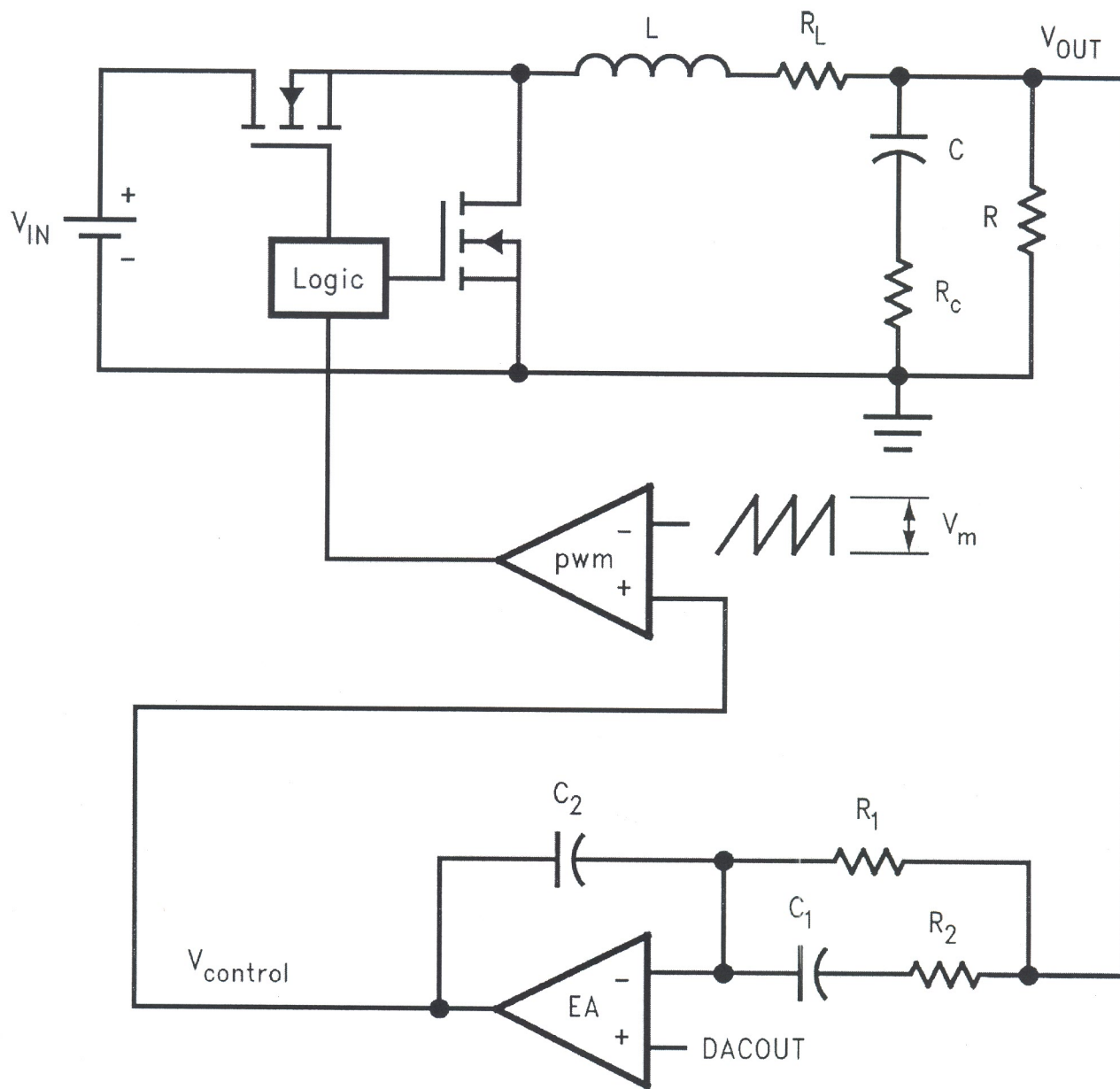


např. RURP 3010  
100V, 30A  
 $t_{rr} = 45 \text{ ns}$

220  $\mu$ F - 4 V S-Case  
ESR/Z vs. Freq.



*tanfalonj kondenzátor Vishay*



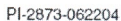
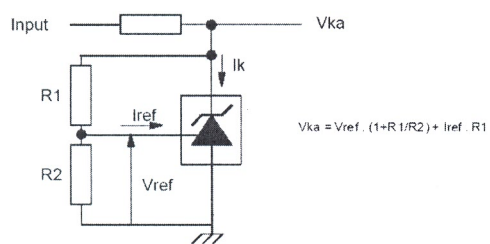


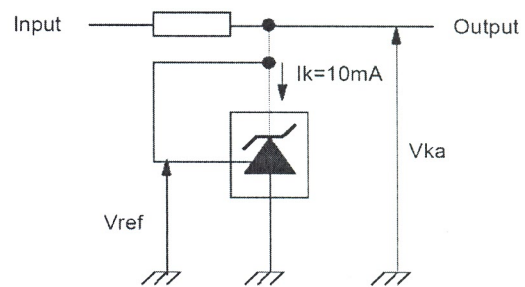
Figure 1. Typical Configuration of DPA-Switch in a Single-Ended DC-DC Forward Converter with One Output.



**Test circuit for  $V_{ka} > V_{ref}$**



**Test circuit for  $V_{ka} = V_{ref}$**



**Cathode current vs Cathode voltage**

