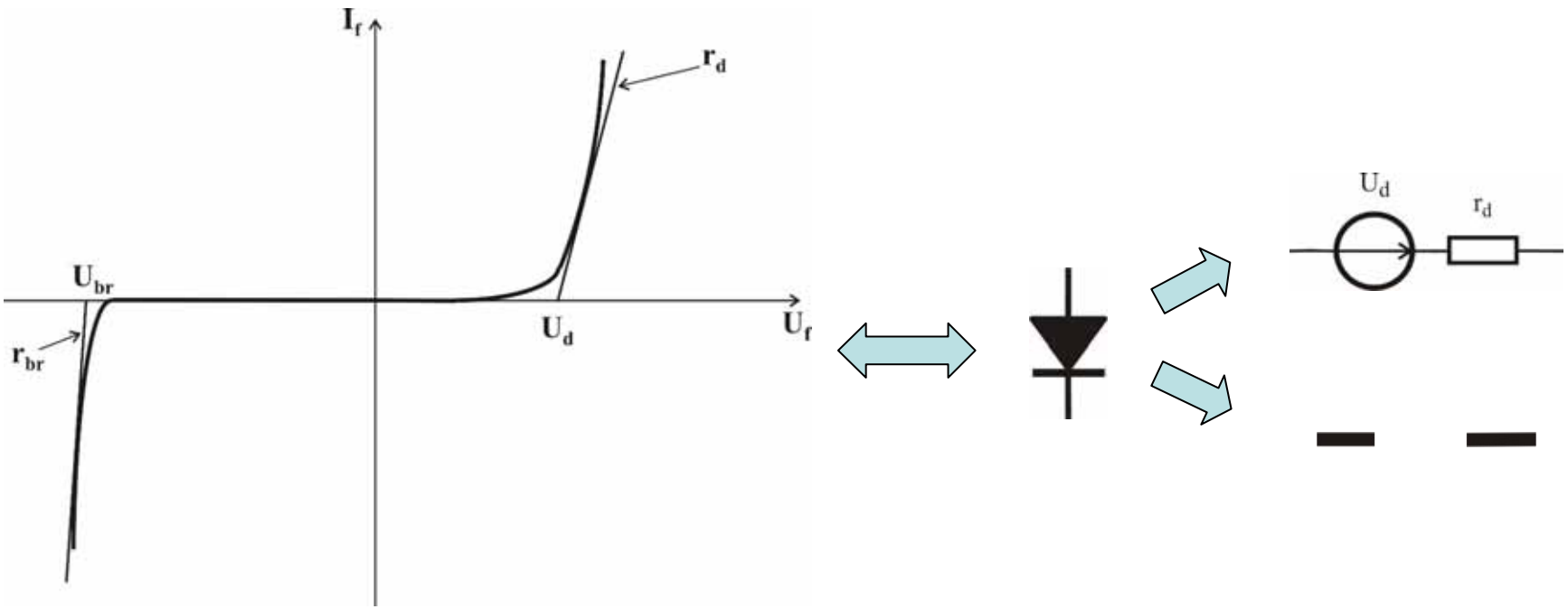
Семинарно занятие No: 3

ПАСИВНИ ДИОДНИ ОГРАНИЧИТЕЛИ

Цел на занятието:

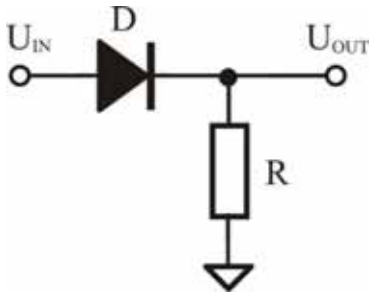
Дефиниране, определяне, математически и логически анализ на предавателните функции в нелинейните пасивни вериги, взаимната връзка в развитието на процесите между входа и изхода във времето, както и преходните процеси в тях .

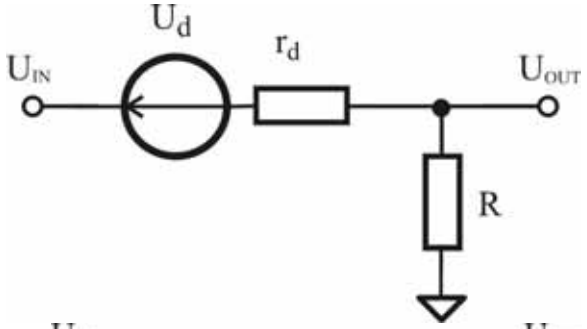


ПОСЛЕДОВАТЕЛНИ ПАСИВНИ ДИОДНИ ОГРАНИЧИТЕЛИ

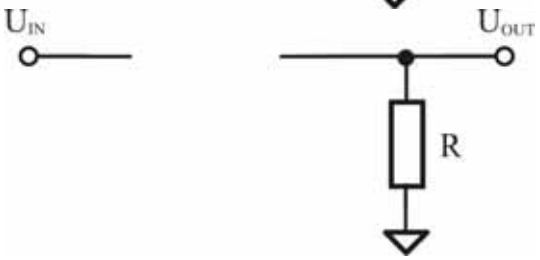
!!! Във всички схеми на едностранните последователни пасивни диодни ограничители работят в режим на предаване, когато входният сигнал се предава на изхода през отпушен диод или са в режим на ограничение, когато диодът е запушен.

Еквивалентни схеми



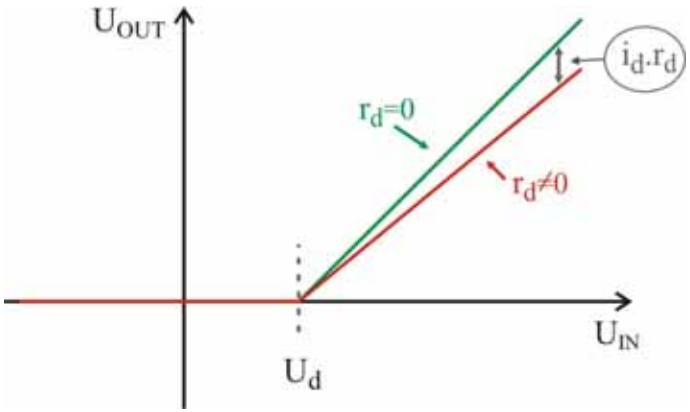


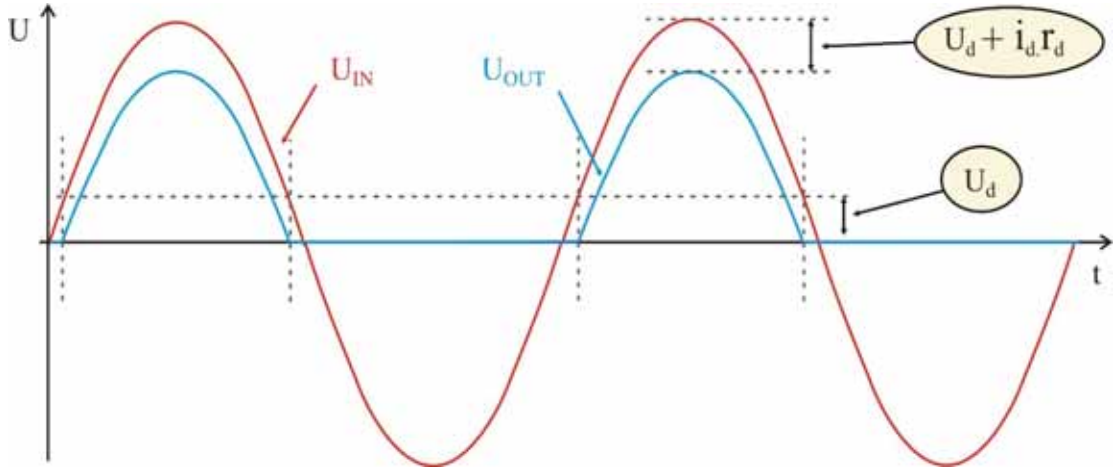
$U_{IN} > U_d$



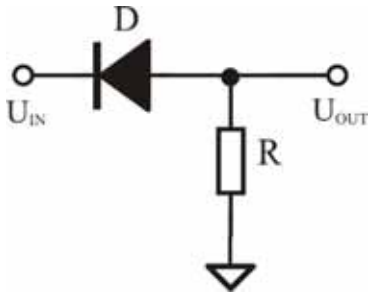
$U_{IN} \le U_d$

$$Uout = \begin{cases} 0 \quad \text{за} \quad Uinp < Ud \\ (Uinp - Ud).\dfrac{R1}{R1 + rd} \quad \text{за} \quad Uinp \ge Ud \end{cases}$$





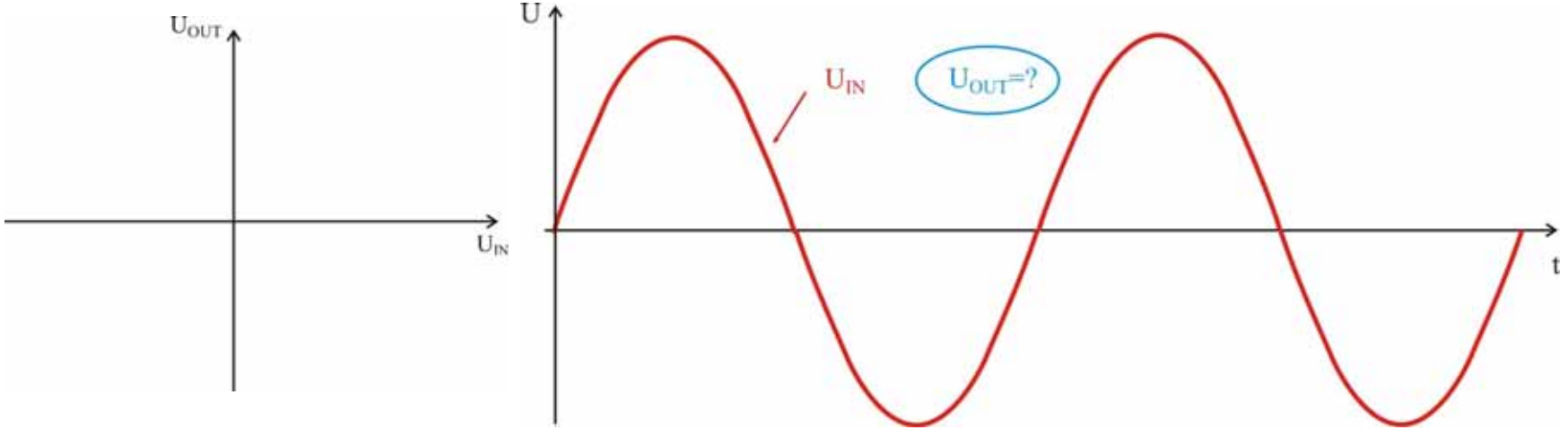
Еквивалентни схеми



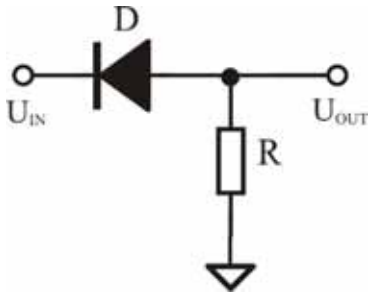
$U_{IN} \Leftrightarrow ?$

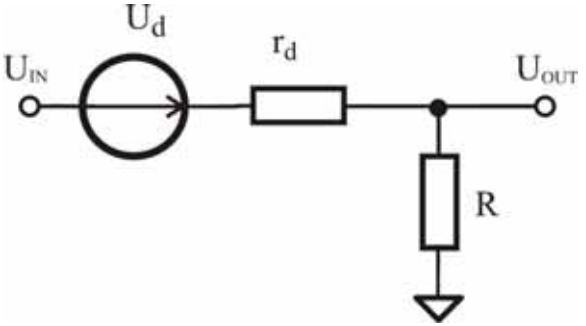
$U_{IN} \Leftrightarrow ?$

$$Uout = \begin{vmatrix} ? & за & ? \\ ? & за & ? \end{vmatrix}$$

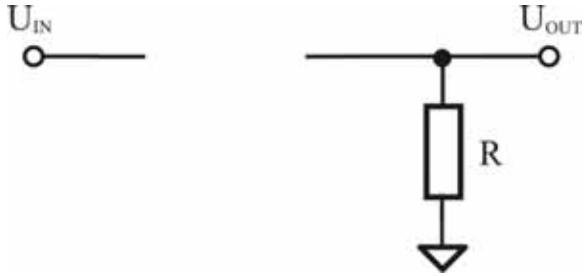


Еквивалентни схеми



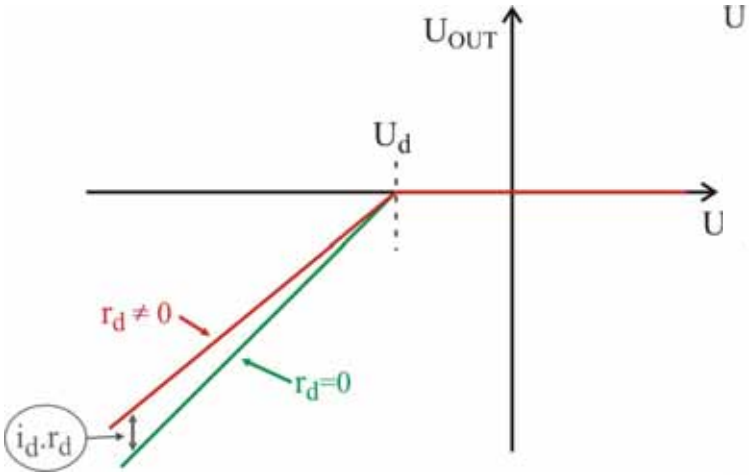


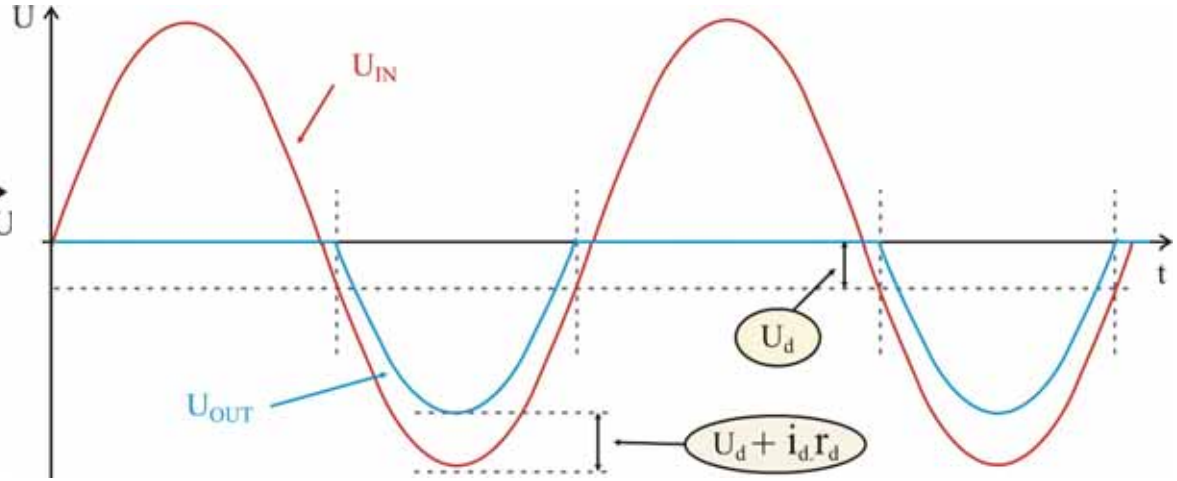
$U_{IN} \le -U_d$



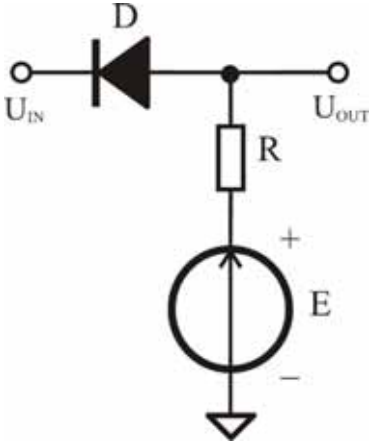
$U_{IN} > -U_d$

$$Uout = \begin{cases} 0 & \text{за} \quad Uinp \ge -Ud \\ (Uinp - Ud).\dfrac{R1}{R1 + rd} & \text{за} \quad Uinp < -Ud \end{cases}$$





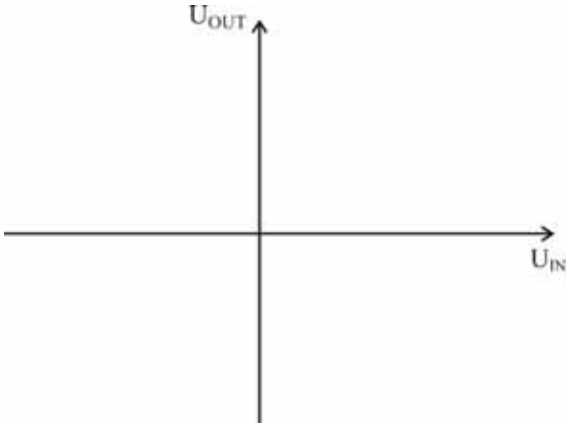
Еквивалентни схеми

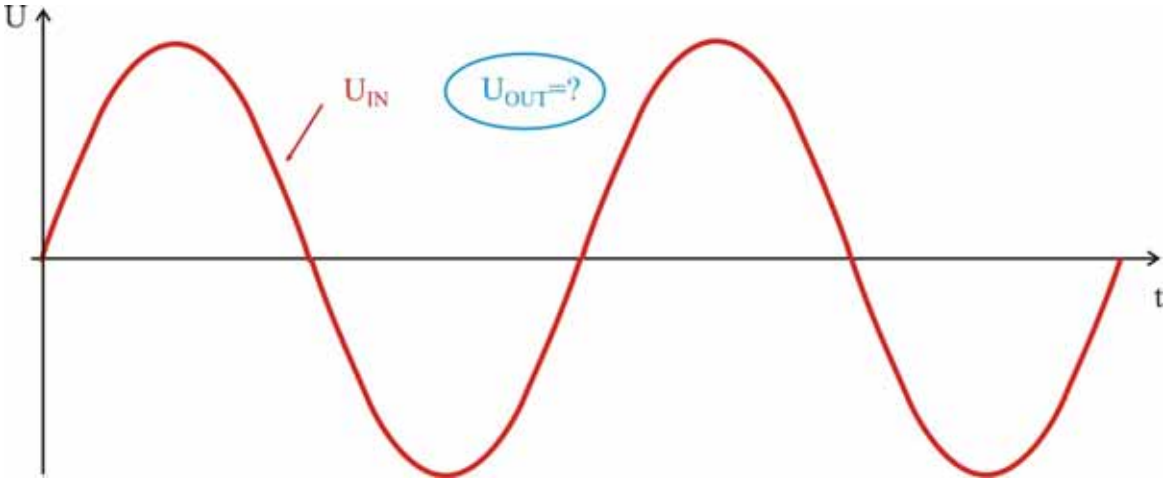


$U_{IN} \Leftrightarrow ?$

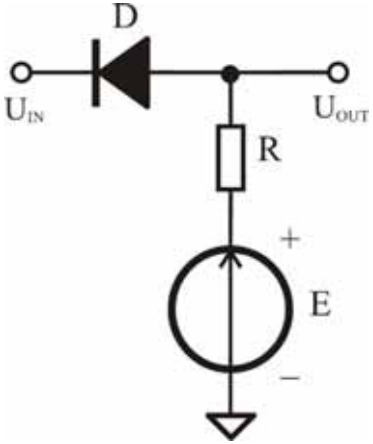
$U_{IN} \Leftrightarrow ?$

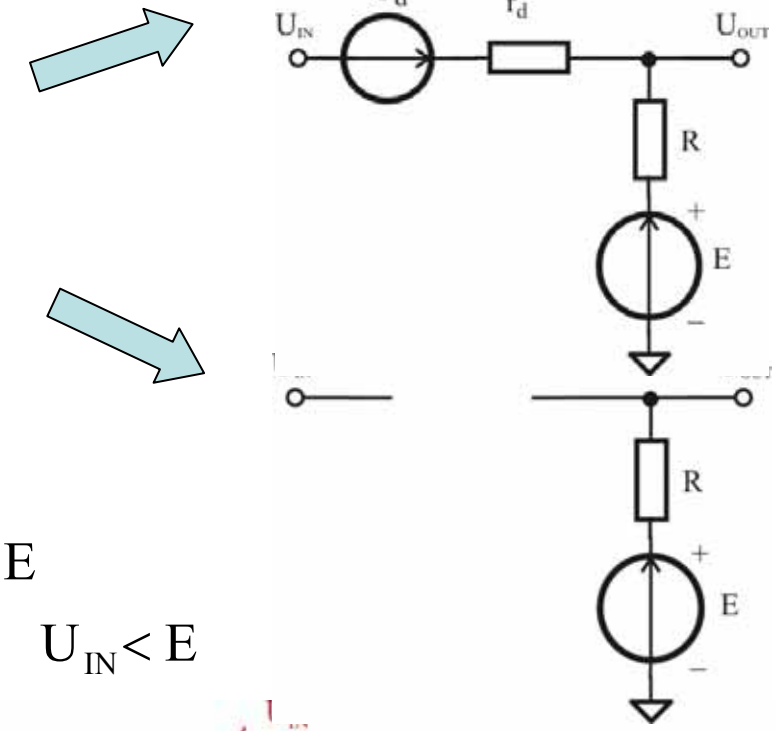
$$Uout = \begin{vmatrix} ? & за & ? \\ ? & за & ? \end{vmatrix}$$





Еквивалентни схеми

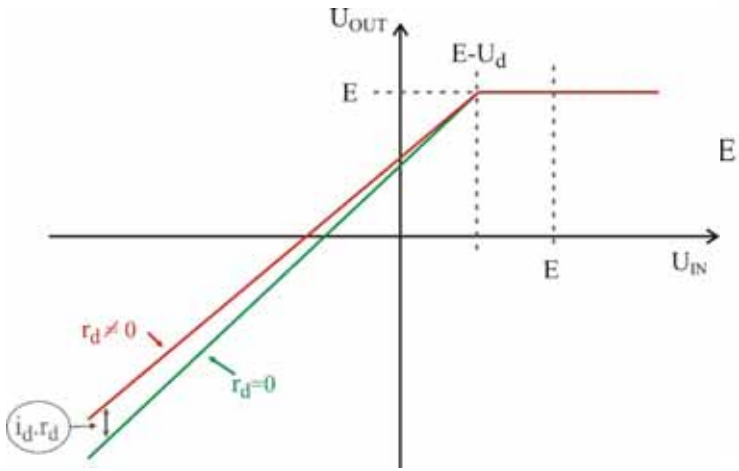


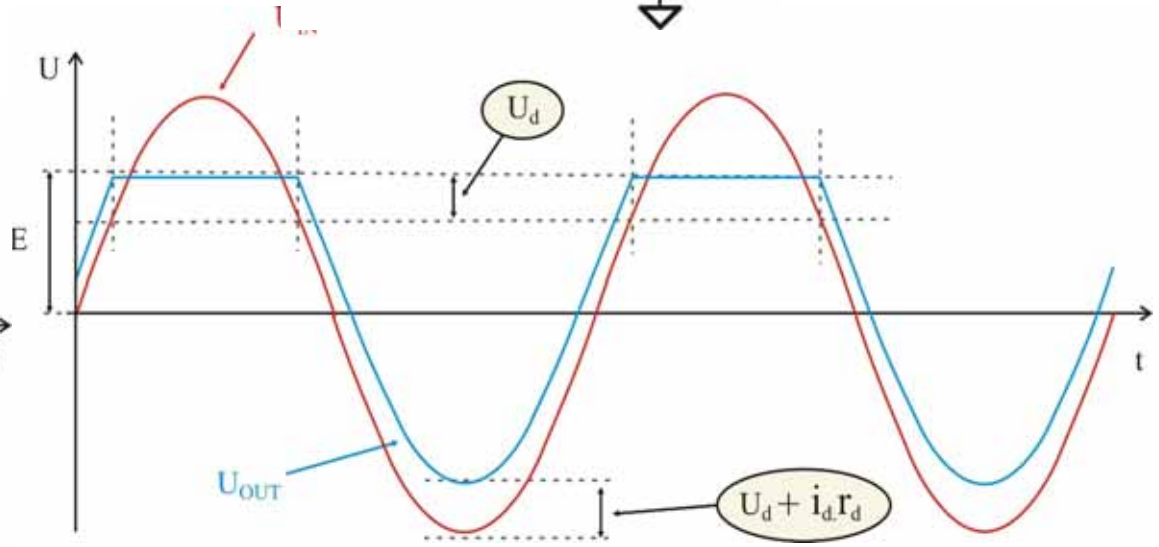


$U_{IN} \le E$

$U_{IN} > E$

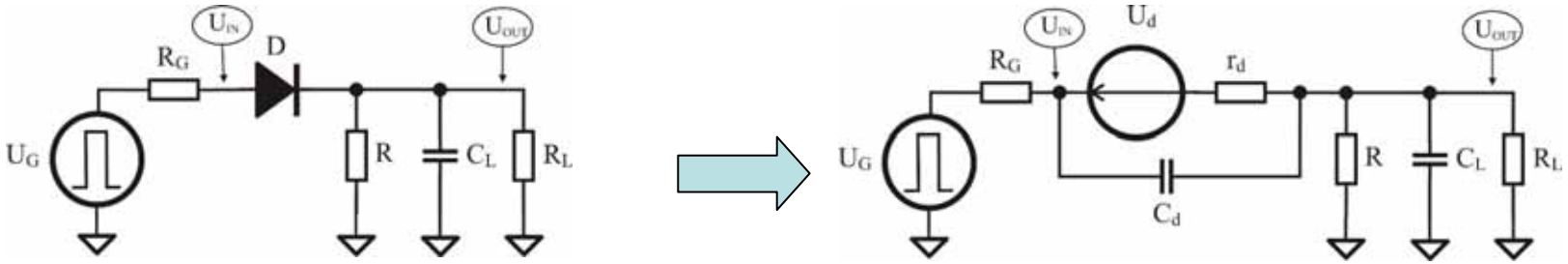
$$Uout = \begin{cases} E & \text{за} \quad U_{IN} \ge E \\ \left(U_{IN} + Ud + i_d.r_d\right) & \text{за} \quad U_{IN} < E \end{cases}$$



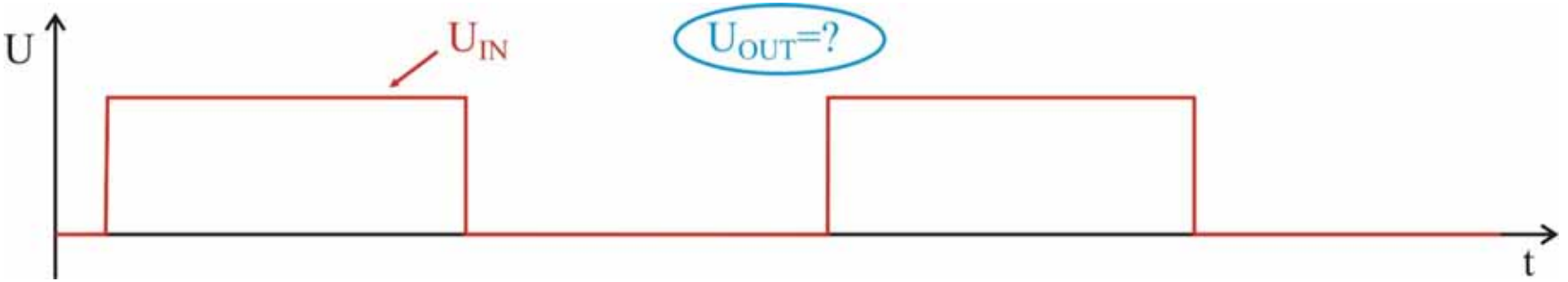


Преходни процеси в едностранни последователни диодни ограничители

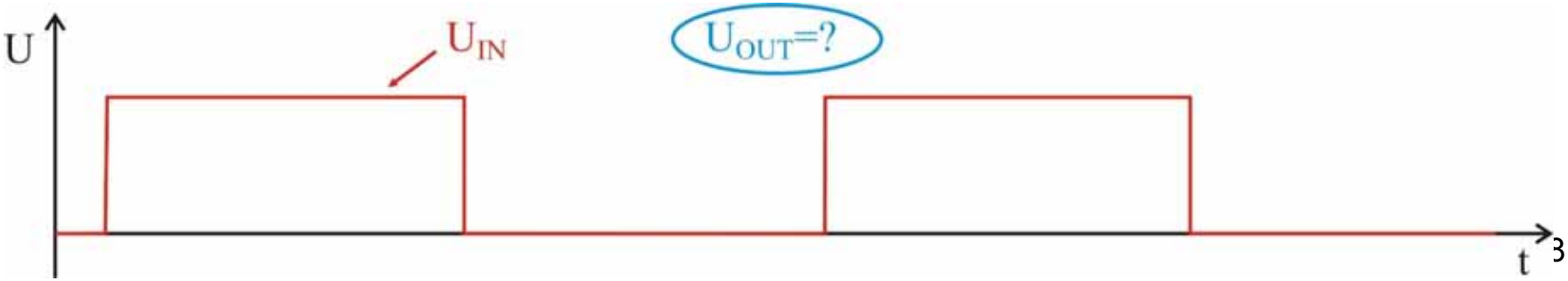
Еквивалентна схема



Влияние на $\mathbf{C_L}$ $C_L >> C_d$

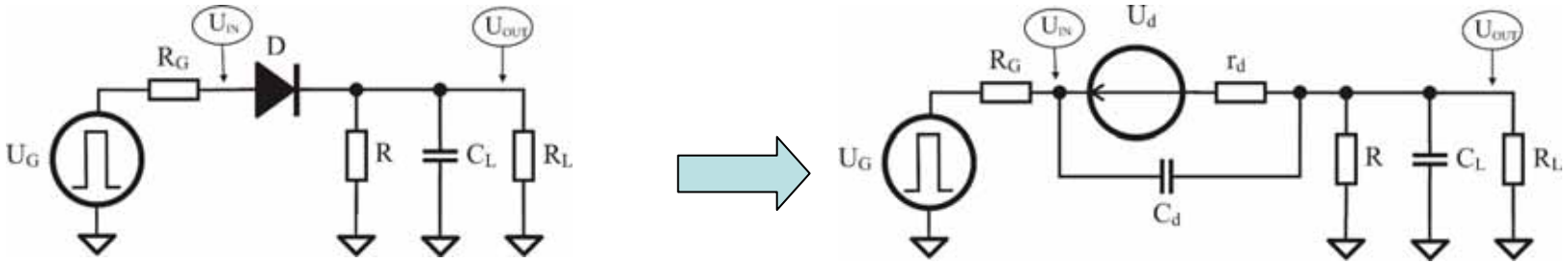


Влияние на $\mathbf{C_d}$ $C_d >> C_L$

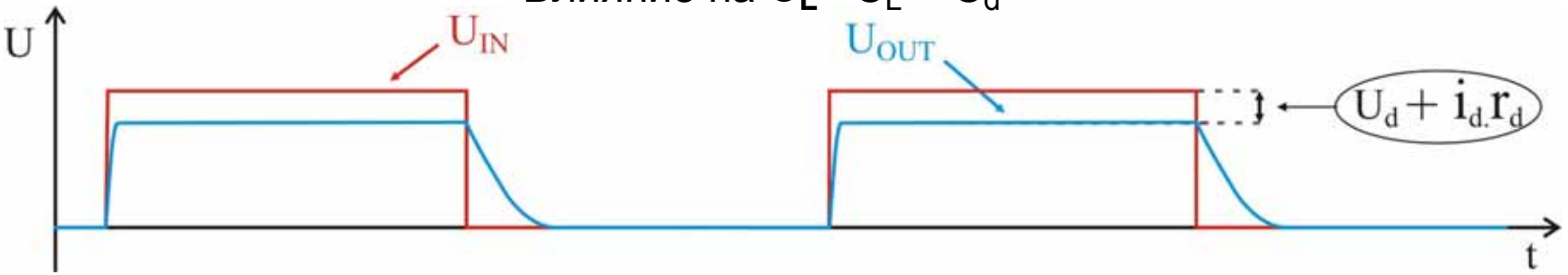


Преходни процеси в едностранни последователни диодни ограничители

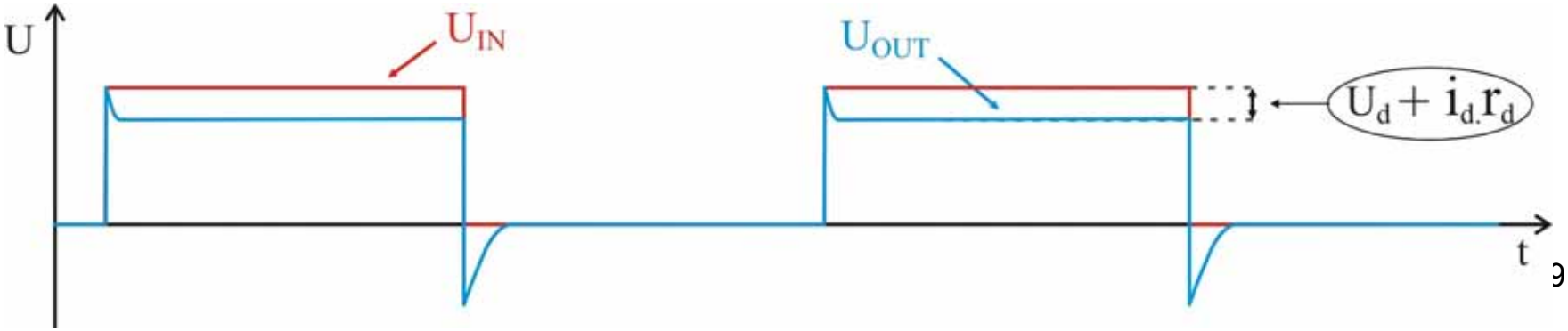
Еквивалентна схема



Влияние на $\mathbf{C_L}$ $C_L >> C_d$

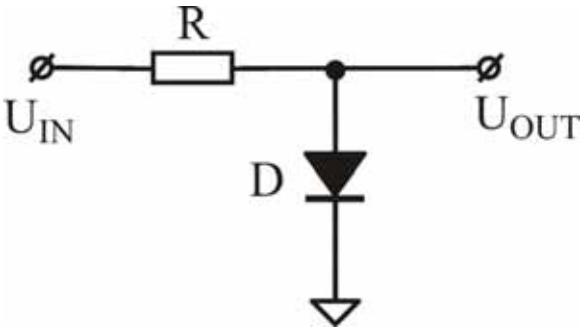


Влияние на $\mathbf{C_d}$ $C_d >> C_L$



ПАРАЛЕЛНИ ПАСИВНИ ДИОДНИ ОГРАНИЧИТЕЛИ

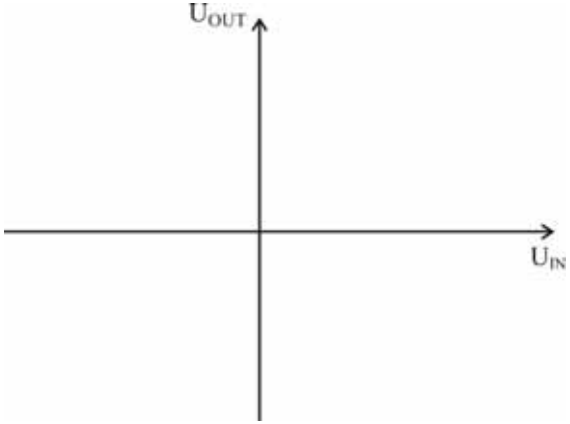
Еквивалентни схеми

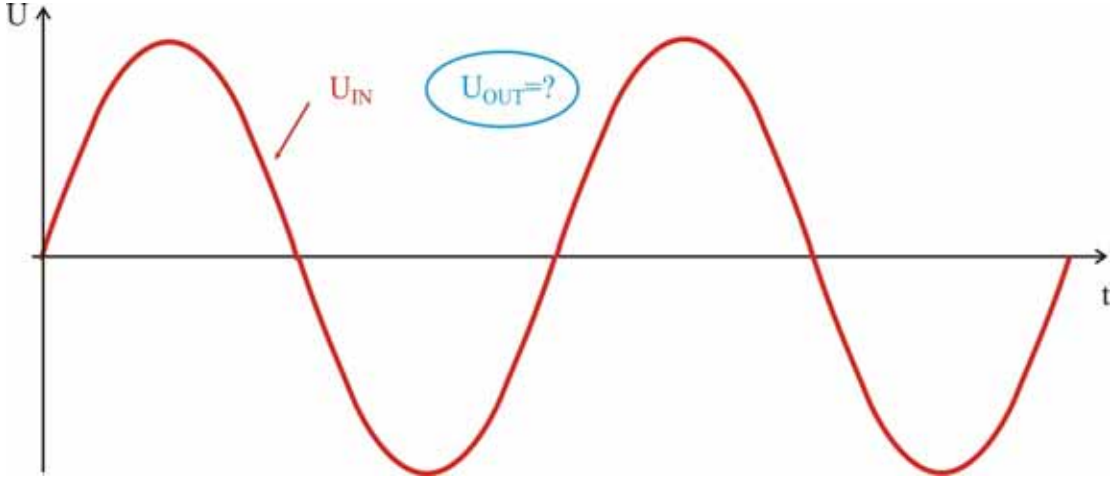


$U_{IN} \Leftrightarrow ?$

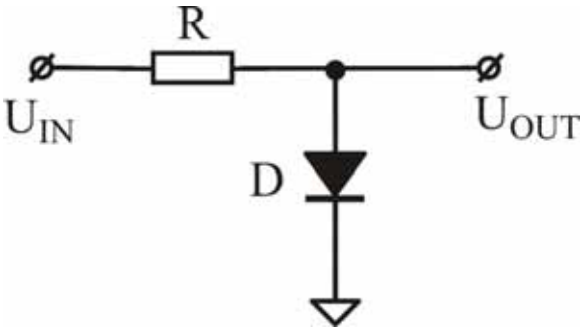
$$U_{OUT} = \begin{cases} ? \text{ за } ? \\ ? \text{ за } ? \end{cases}$$

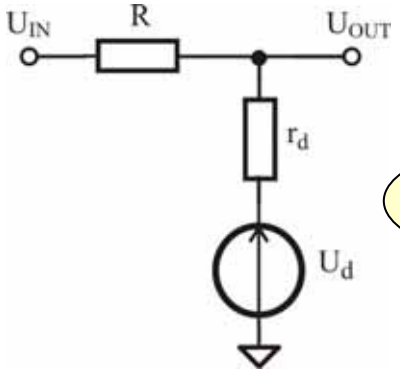
$U_{IN} \Leftrightarrow ?$



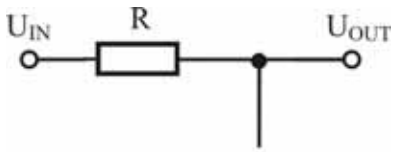


Еквивалентни схеми



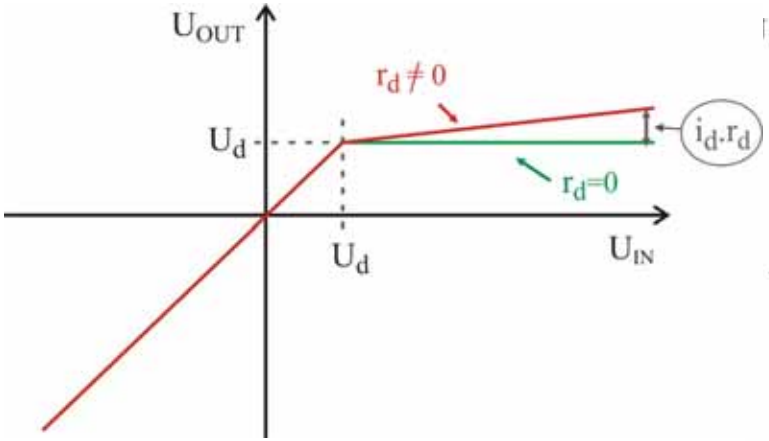


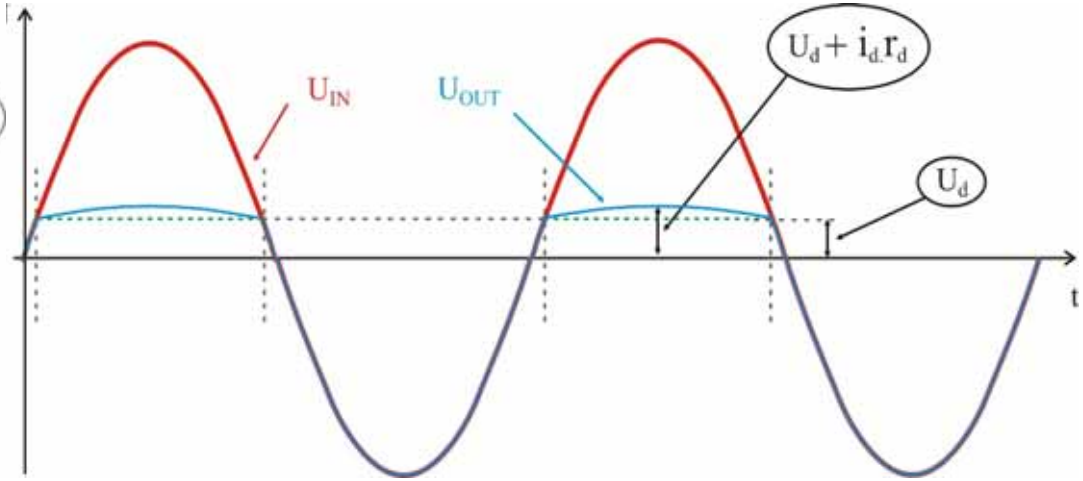
$U_{IN} > U_d$



$U_{IN} \le U_d$

$$U_{OUT} = \begin{cases} U_{IN} & \text{за} \quad U_{IN} \le U_d \\ (U_d + i_d.r_d) & \text{за} \quad U_{IN} > U_d \end{cases}$$





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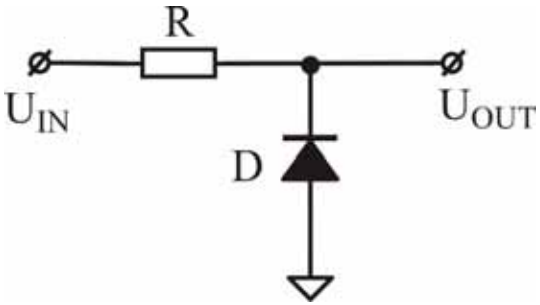
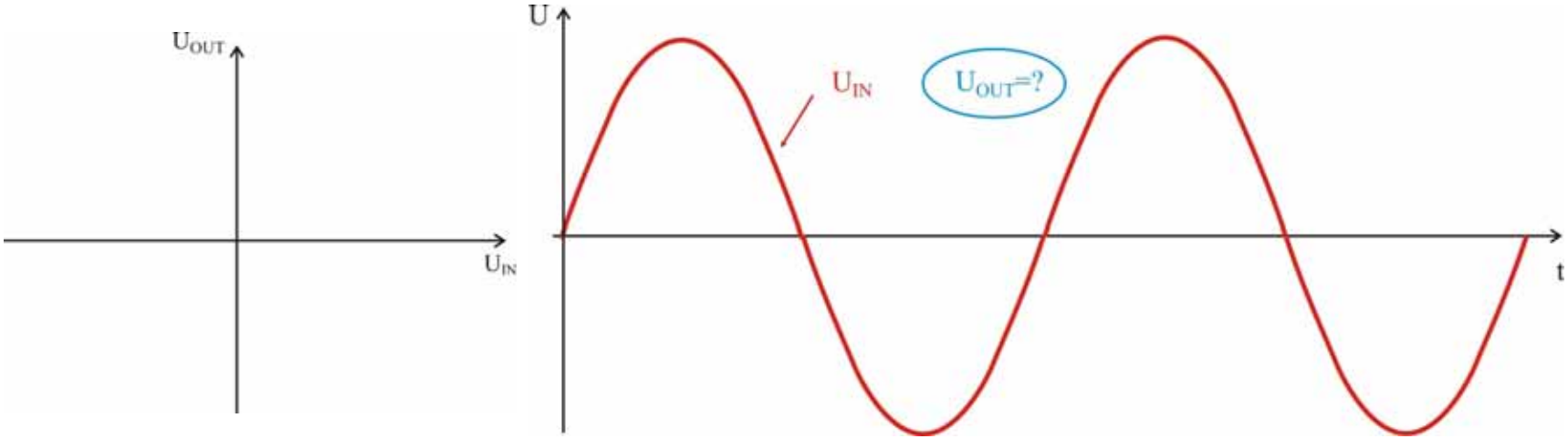


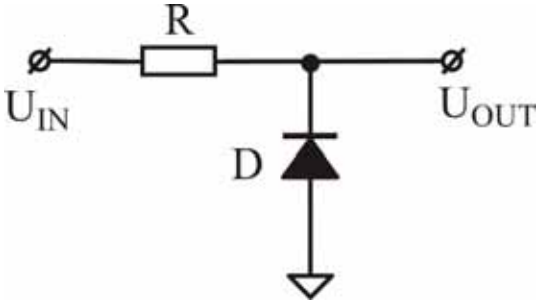
$U_{IN} \Leftrightarrow ?$

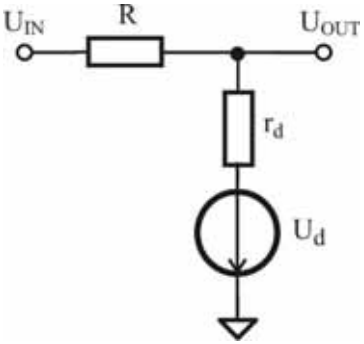
$$U_{OUT} = \begin{vmatrix} ? & за & ? \\ ? & за & ? \end{vmatrix}$$

$U_{IN} \Leftrightarrow ?$

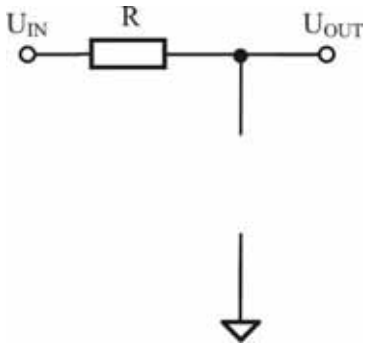


Еквивалентни схеми



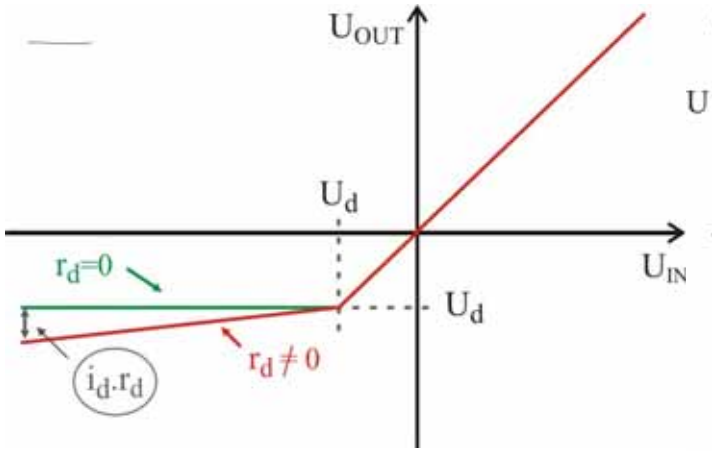


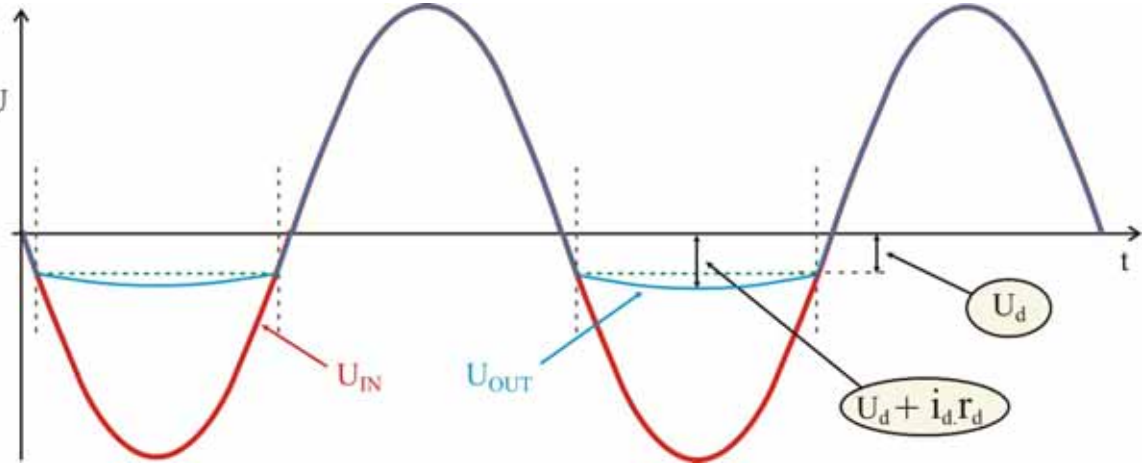
$U_{IN} \le -U_d$



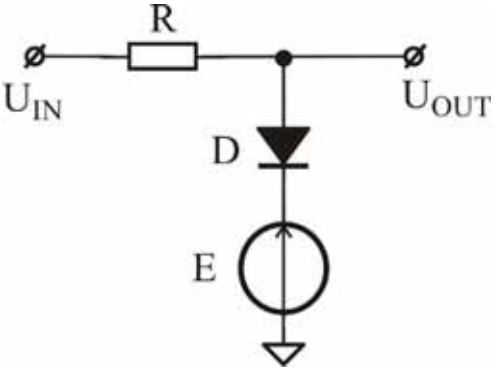
$U_{IN} > -U_d$

$$U_{OUT} = \begin{cases} U_{IN} & \text{за} \quad U_{IN} > -U_d \\ -U_d - i_d.r_d & \text{за} \quad U_{IN} \le -U_d \end{cases}$$





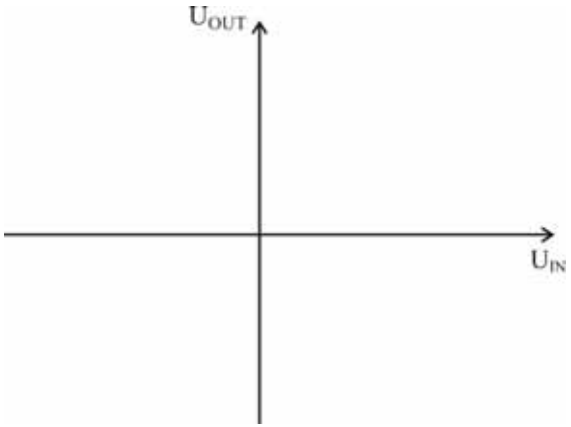
Еквивалентни схеми

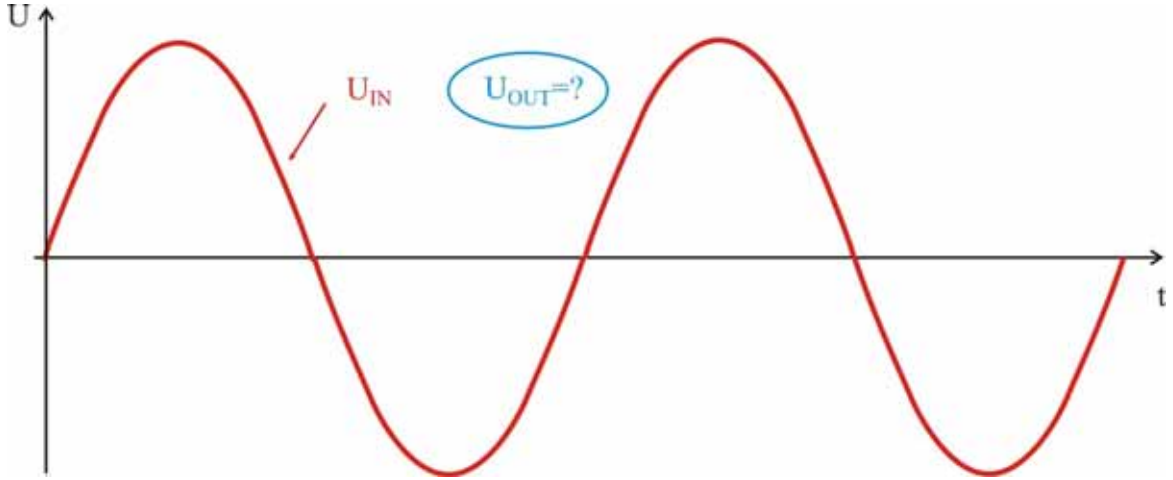


$U_{IN} \Leftrightarrow ?$

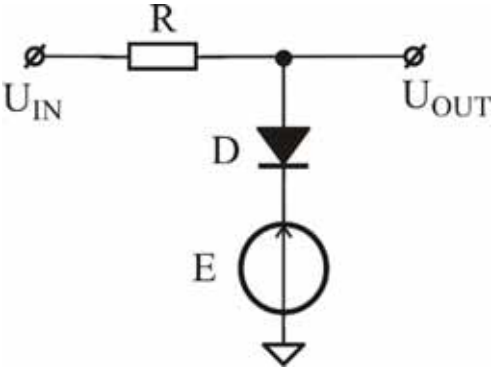
$$U_{OUT} = \left| \begin{array}{ccc} ? & \text{за} & ? \\ ? & \text{за} & ? \end{array} \right|$$

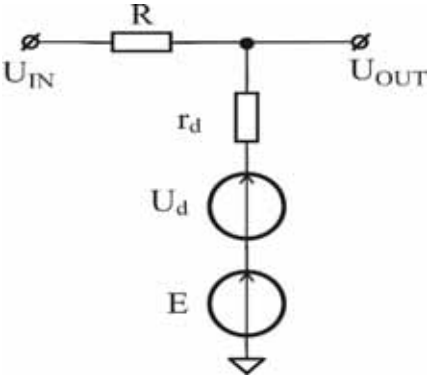
$U_{IN} \Leftrightarrow ?$



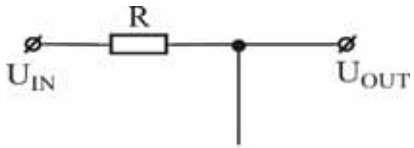


Еквивалентни схеми



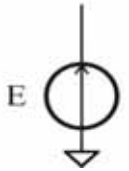


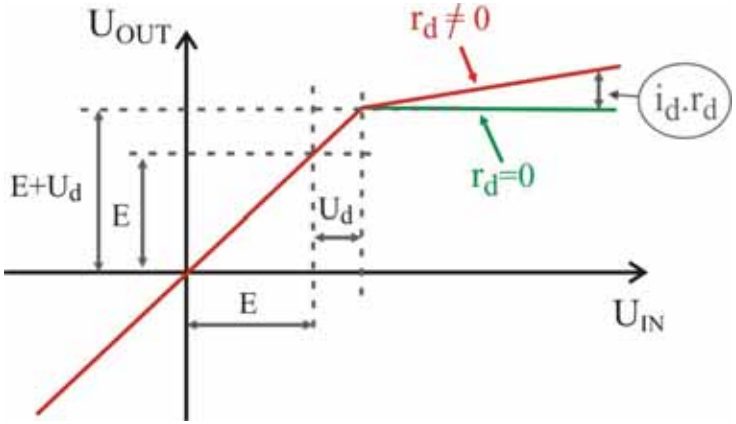
$$U_{IN} > E + U_d$$

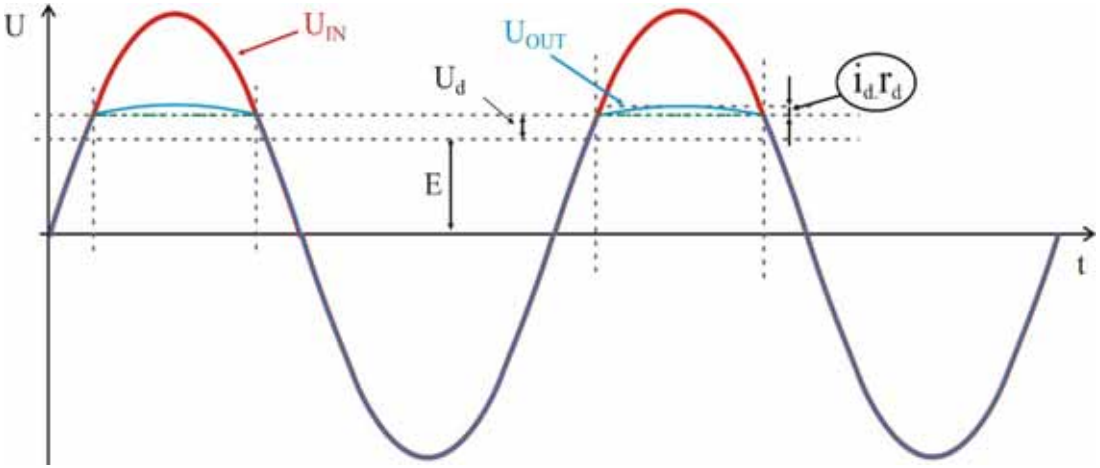


$$U_{IN} \le E + U_d$$

$$U_{OUT} = \begin{cases} U_{IN} & \text{за} \quad U_{IN} \le (E + U_d) \\ (E + U_d) + i_d . r_d & \text{за} \quad U_{IN} > (E + U_d) \end{cases}$$

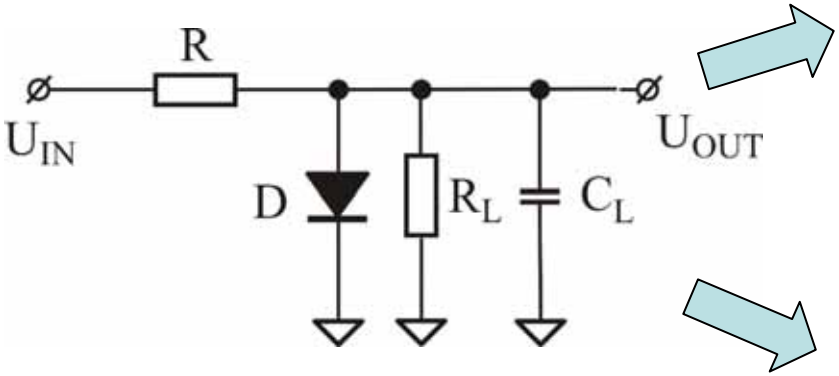






Преходни процеси в едностранни паралелни диодни ограничители

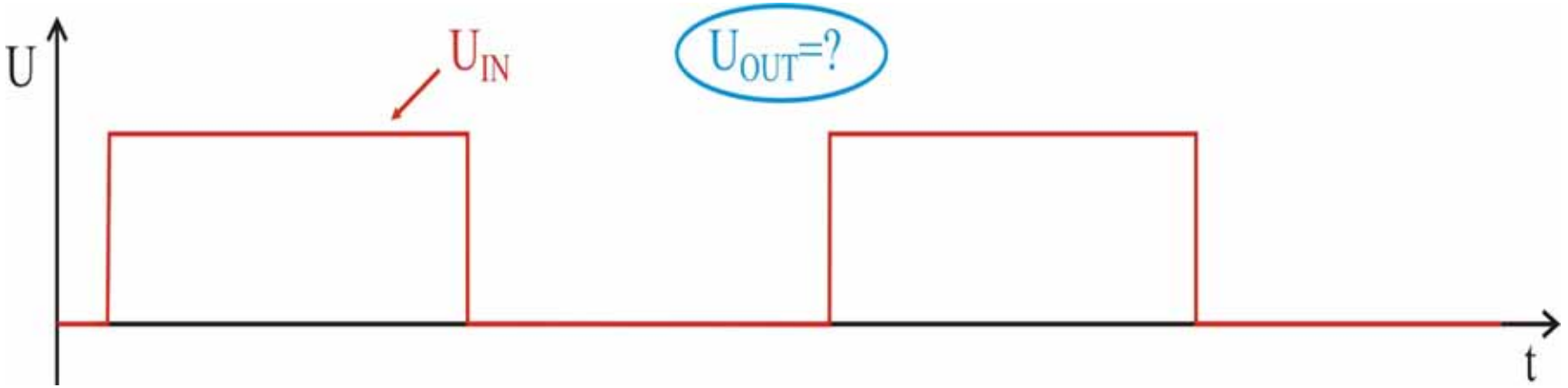
Еквивалентни схеми



$\tau_r = ?$

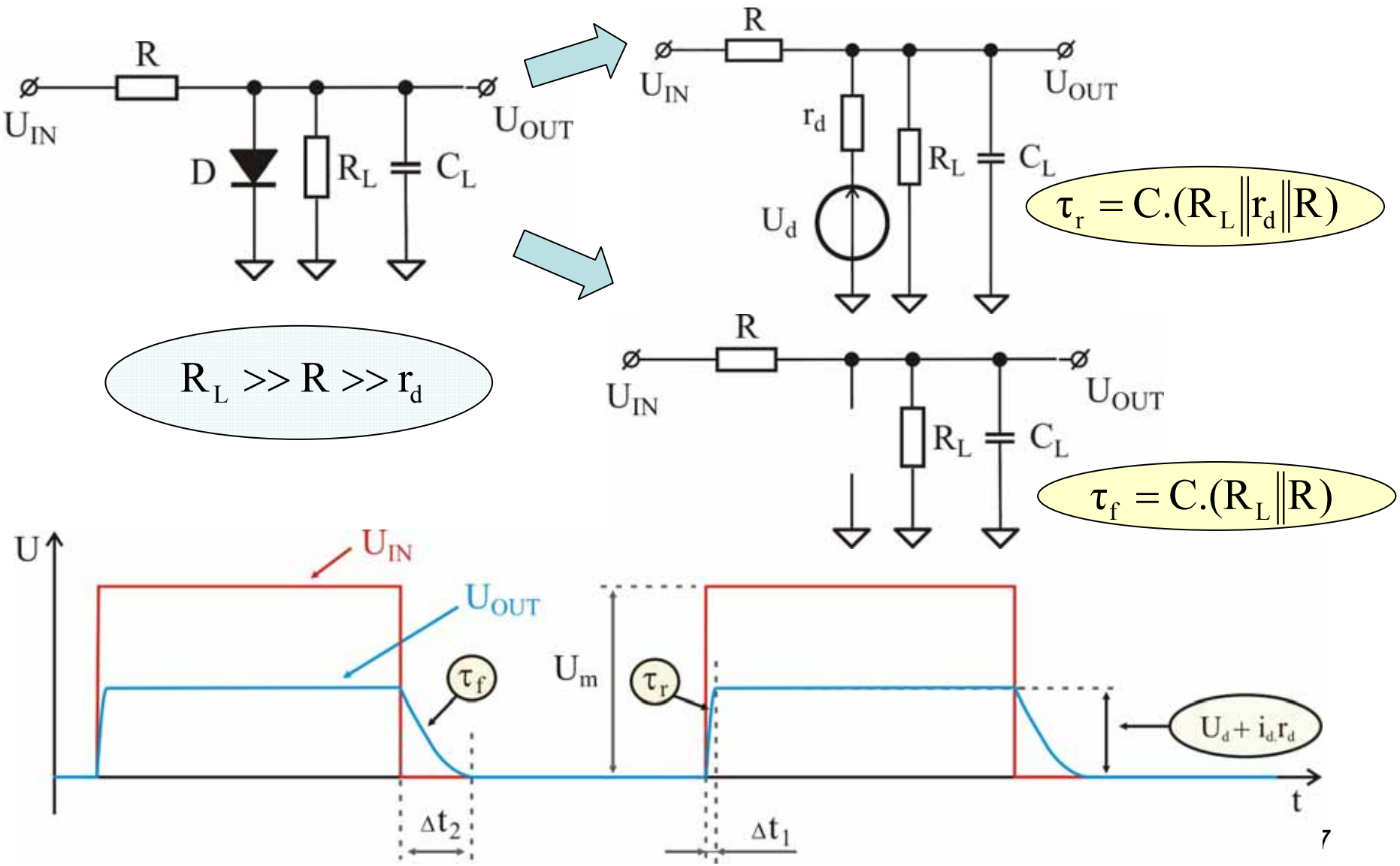
$R_L >> R >> r_d$

$\tau_f = ?$

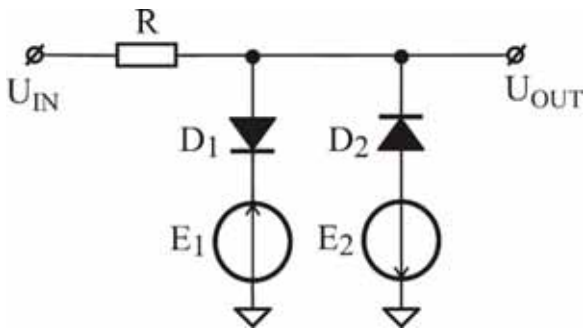


Преходни процеси в едностранни паралелни диодни ограничители

Еквивалентни схеми



ДВУСТРАННИ ПАРАЛЕЛНИ ДИОДНИ ОГРАНИЧИТЕЛИ



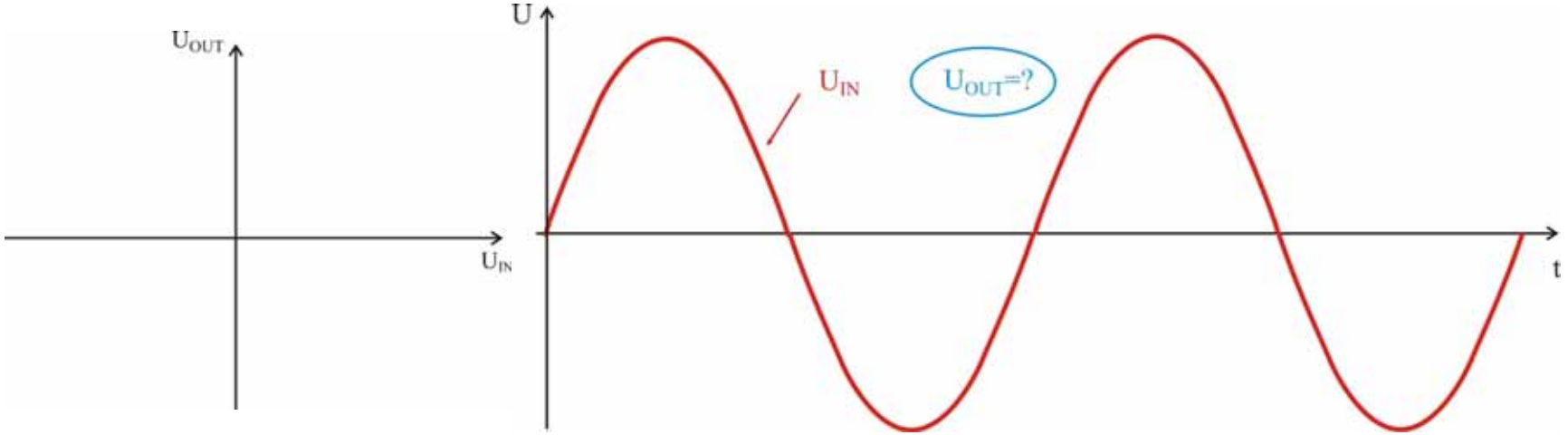
Еквивалентни схеми

$U_{IN} \Leftrightarrow ?$

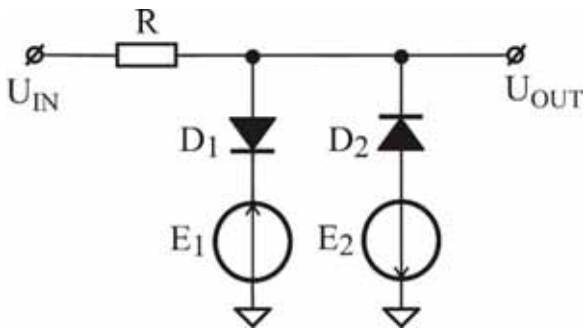
$? \Leftrightarrow U_{IN} \Leftrightarrow ?$

$U_{IN} \Leftrightarrow ?$

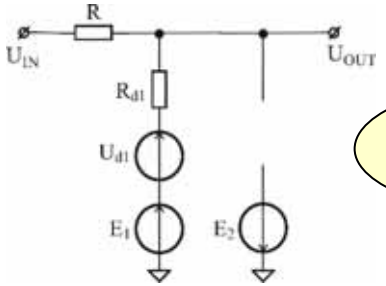
$$U_{OUT} = \left| \begin{array}{l} ? \quad \text{за} \quad ? \\ ? \quad \text{за} \quad ? \\ ? \quad \text{за} \quad ? \end{array} \right.$$



ДВУСТРАННИ ПАРАЛЕЛНИ ДИОДНИ ОГРАНИЧИТЕЛИ



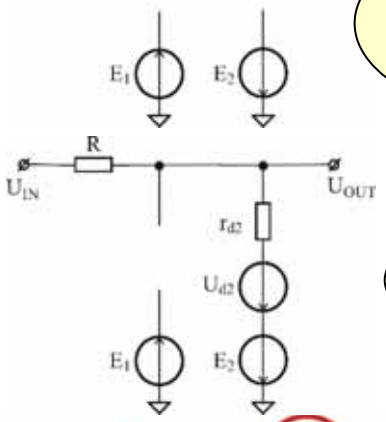
Еквивалентни схеми



$U_{IN} > (E_1 - U_{d1})$

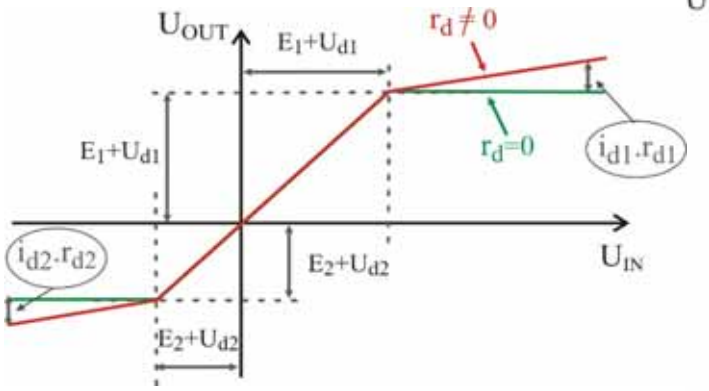
$(E_1 + U_{d1}) \le U_{IN}$

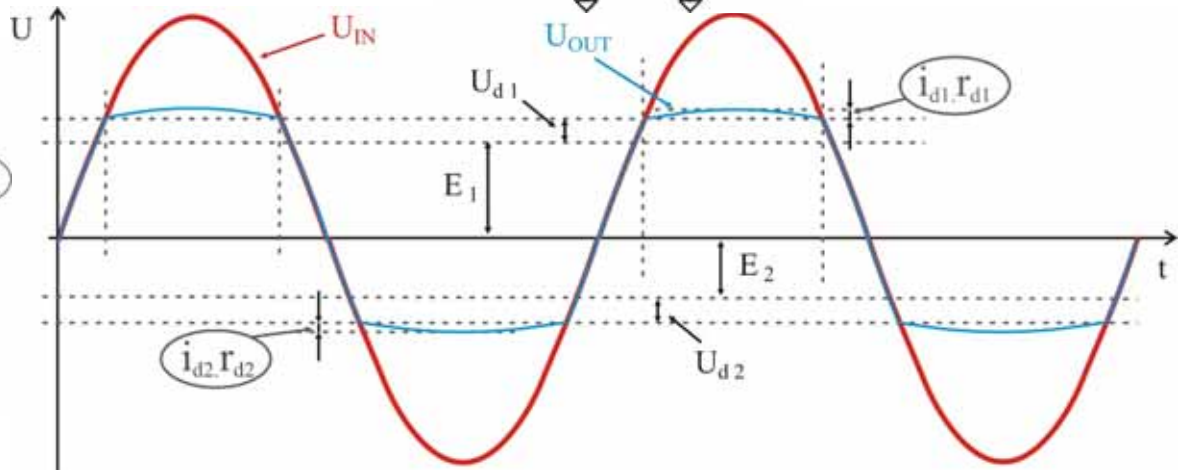
$U_{IN} \le (E_2 - U_{d2})$



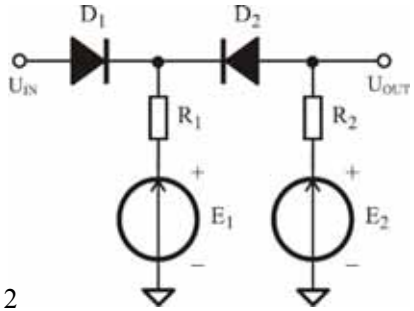
$U_{IN} < (E_2 - U_{d2})$

$$U_{OUT} = \begin{cases} (E_1 + U_{d1}) + i_{d1}.r_{d1} & \text{за} \quad U_{IN} > (E_1 + U_{d1}) \\ U_{IN} \quad \text{за} \quad (E_2 - U_{d2}) \le U_{IN} \le (E_1 + U_{d1}) \\ (E_2 - U_{d2}) - i_{d2}.r_{d2} & \text{за} \quad U_{IN} < (E_2 - U_{d2}) \end{cases}$$





ДВУСТРАННИ ПОСЛЕДОВАТЕЛНИ ДИОДНИ ОГРАНИЧИТЕЛИ



$E_1 < E_2$

$R_1 = R_2 = R$

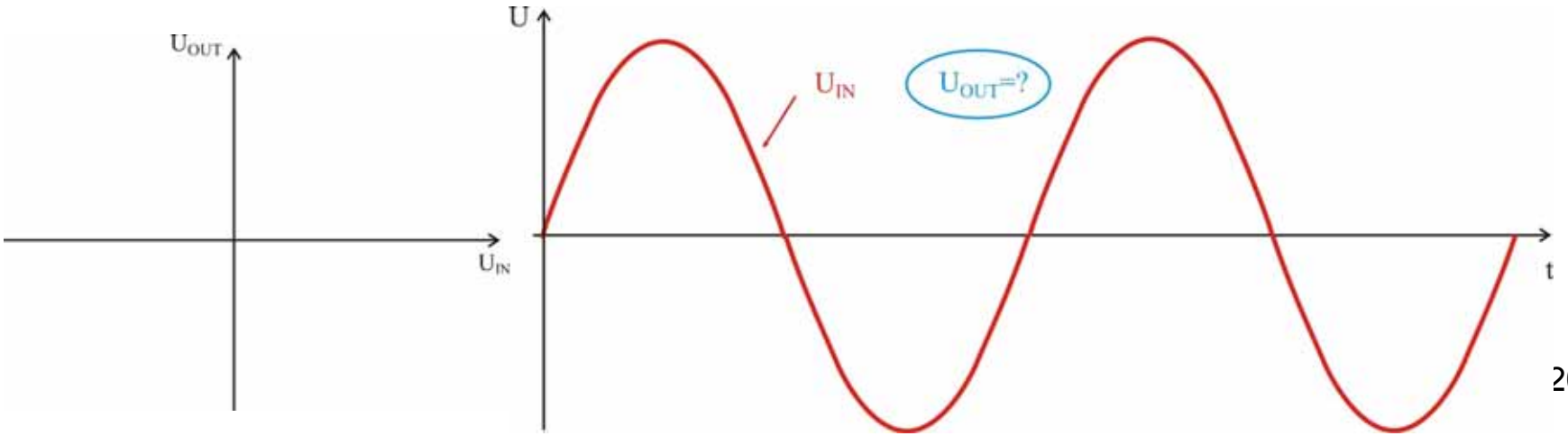
Еквивалентни схеми

$U_{IN} \Leftrightarrow ?$

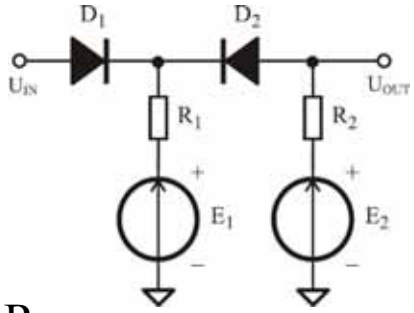
$? \Leftrightarrow U_{IN} \Leftrightarrow ?$

$U_{IN} \Leftrightarrow ?$

$$U_{OUT} \cong \left| \begin{array}{l} ? \quad за \quad ? \\ ? \quad за \quad ? \\ ? \quad за \quad ? \end{array} \right.$$



ДВУСТРАННИ ПОСЛЕДОВАТЕЛНИ ДИОДНИ ОГРАНИЧИТЕЛИ



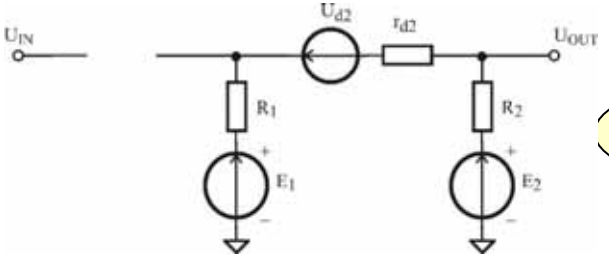
$E_1 < E_2$

$R_1 = R_2 = R$

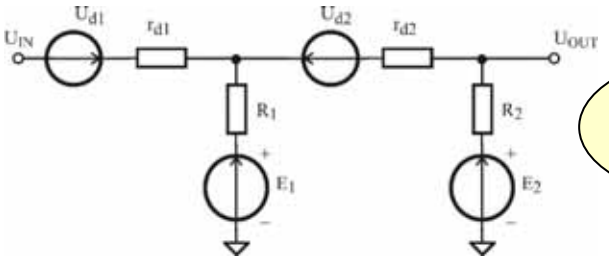
$\Delta U = 0{,}5.(E_2 - E_1 - U_{d2})$

$$U_{OUT} \cong \begin{cases} E_1 + U_{d2} + \Delta U & \text{за} \quad U_{IN} < (E_1 + U_{d1}) \\ U_{IN} & \text{за} \quad (E_1 + U_{d1}) \le U_{IN} \le E_2 \\ E_2 & \text{за} \quad U_{IN} > E_2 \end{cases}$$

Еквивалентни схеми

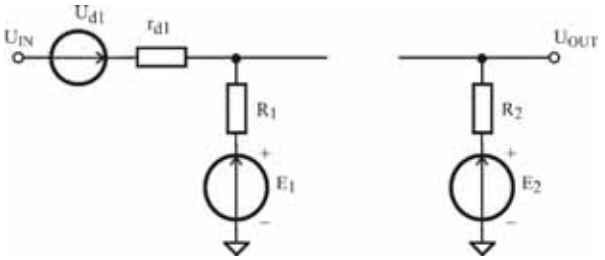


$U_{IN} < (E_1 + U_{d1})$

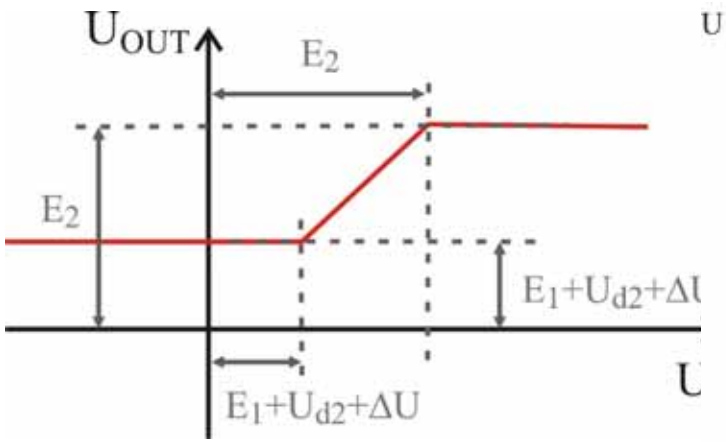


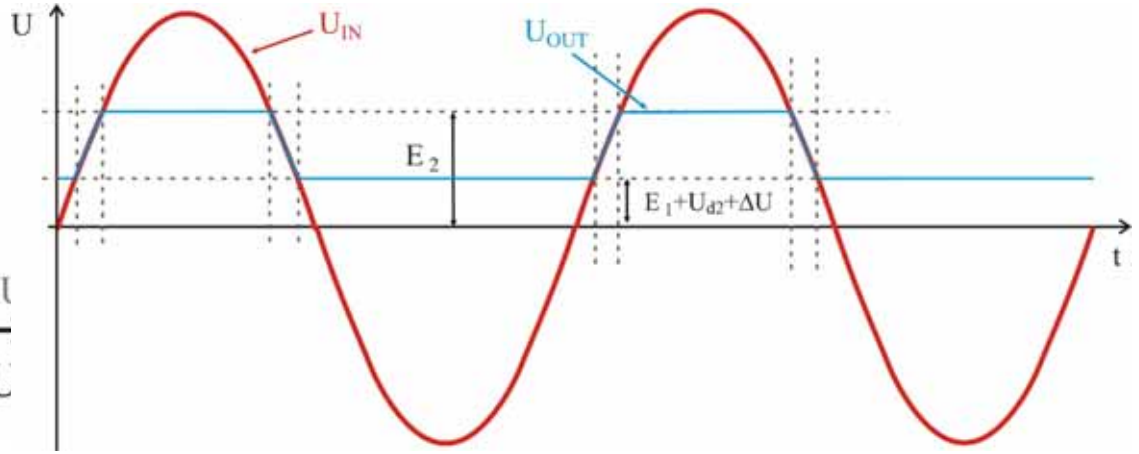
$(E_1 + U_{d1}) \le U_{IN}$

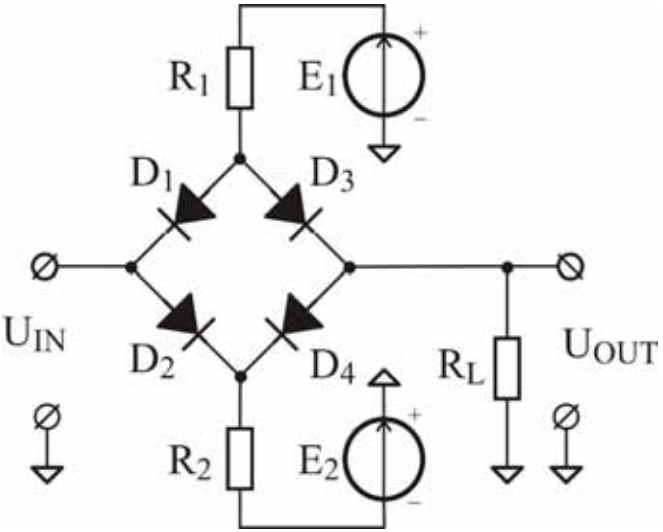
$U_{IN} \le E_2$

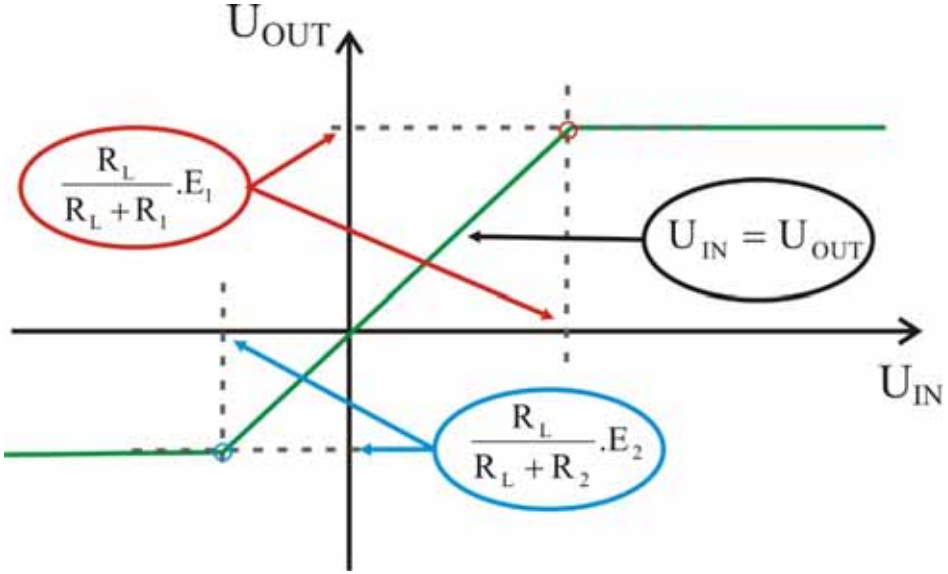


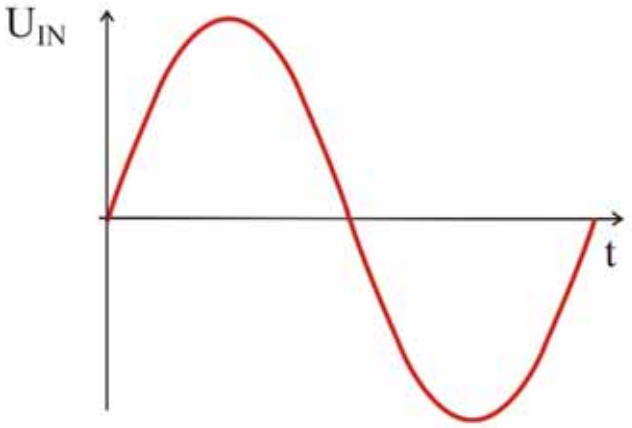
$U_{IN} > E_2$

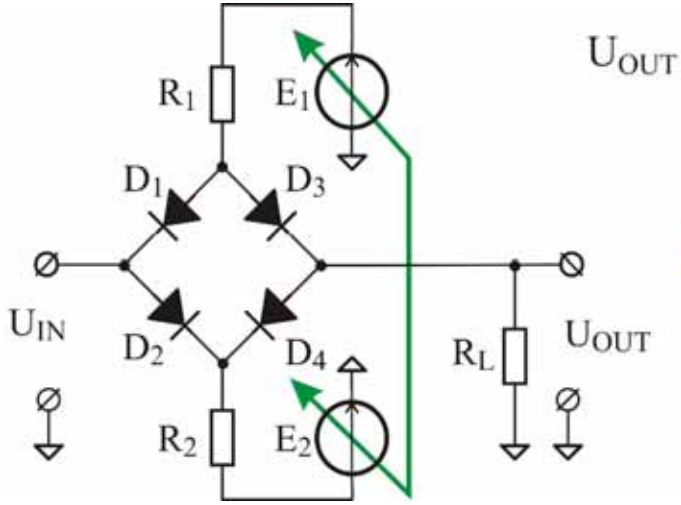


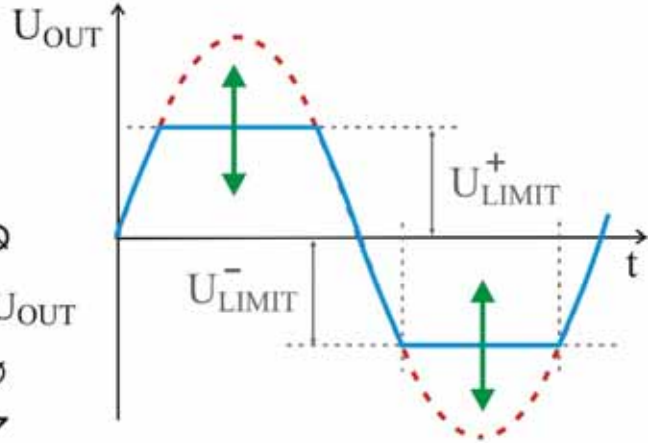



R1
E1
D1
D3
UIN
D2
D4
RL
UOUT
R2
E2


UOUT
RL/(RL+R1).E1
UIN = UOUT
UIN
RL/(RL+R2).E2


UIN
t


R1
E1
D1
D3
UIN
D2
D4
RL
UOUT
R2
E2


UOUT
U+LIMIT
U−LIMIT
t

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