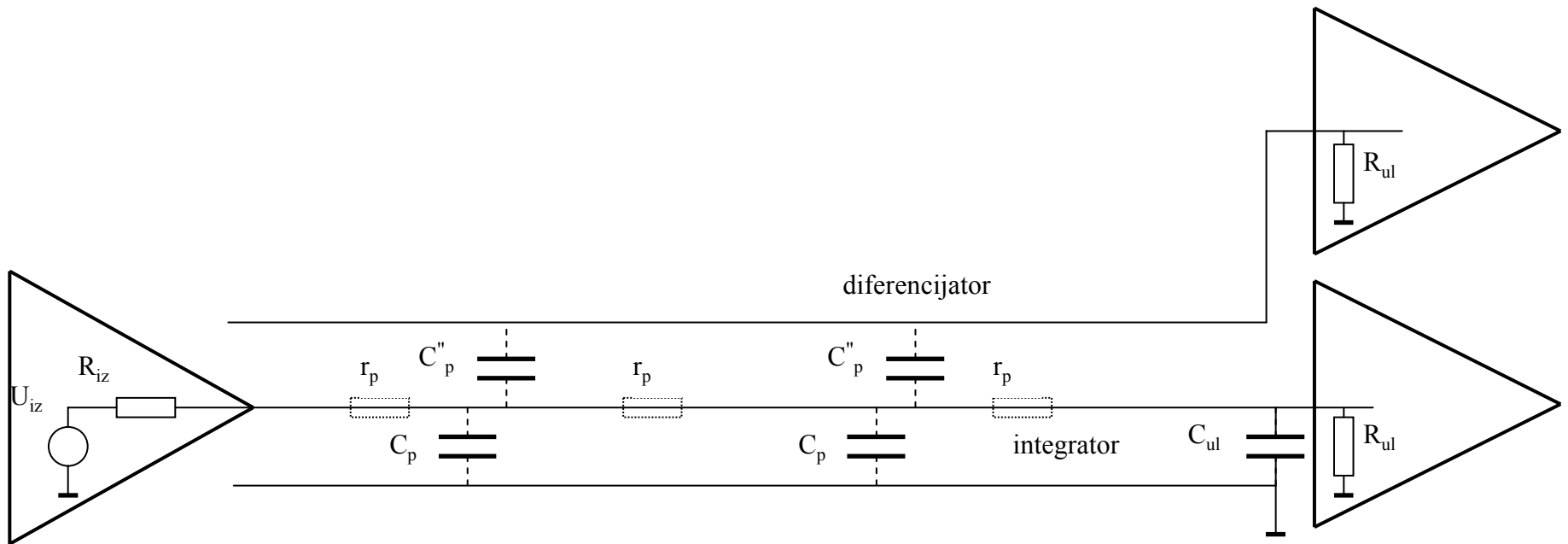
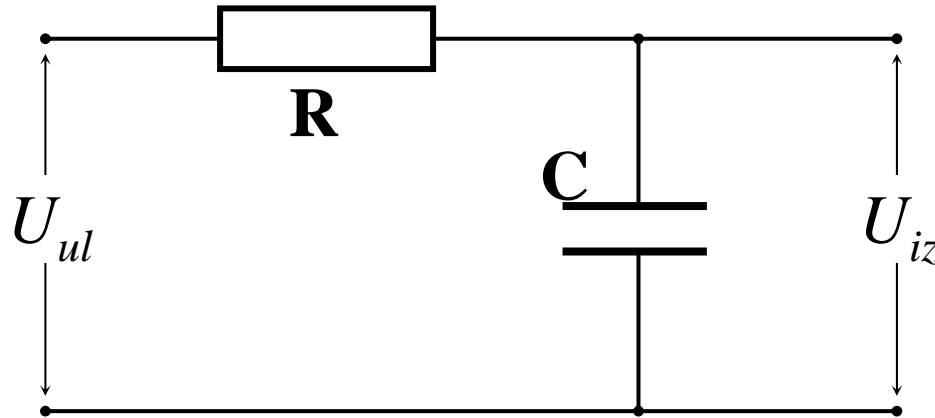


Realno postojanje parazitnih kola - integratora i diferencijatora



INTEGRATOR



$$U_{iz} = \frac{\frac{1}{j\omega \cdot C}}{R + \frac{1}{j\omega \cdot C}} \cdot U_{ul} = \frac{1}{1 + j\omega \cdot C \cdot R} \cdot U_{ul}$$

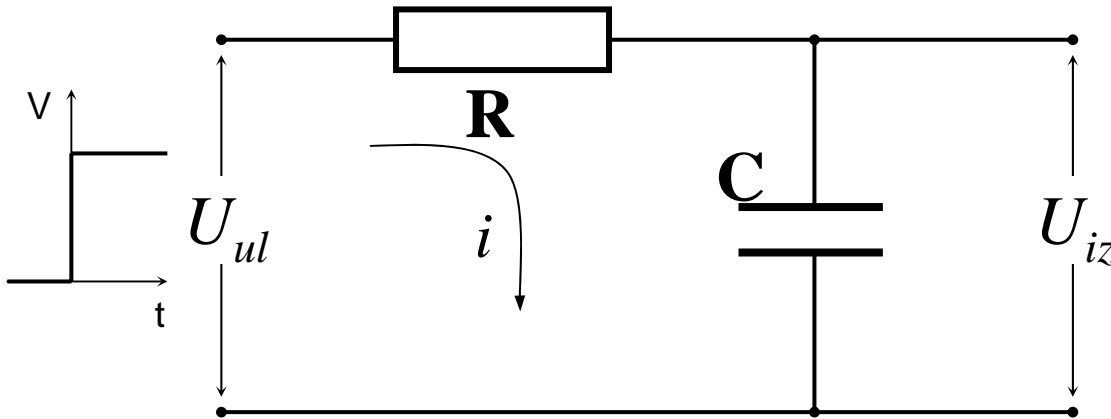
$$\frac{U_{iz}}{U_{ul}} = \frac{1}{1 + j\frac{\omega}{\omega_g}}; \quad \omega_g = \frac{1}{RC} = \frac{1}{\tau}$$

$$\left| \frac{U_{iz}}{U_{ul}} \right| = \frac{1}{\sqrt{1 + \frac{\omega^2}{\omega_g^2}}} \quad \varphi = -\arctg\left(\frac{\omega}{\omega_g}\right)$$

$$\frac{\omega}{\omega_g} \rightarrow \infty; \quad \varphi = -\frac{\pi}{2}$$

$$\omega_g \rightarrow 0; \quad \tau = RC \rightarrow \infty$$

INTEGRATOR



$$U_{ul} = R \cdot i + \frac{1}{C} \int i \cdot dt$$

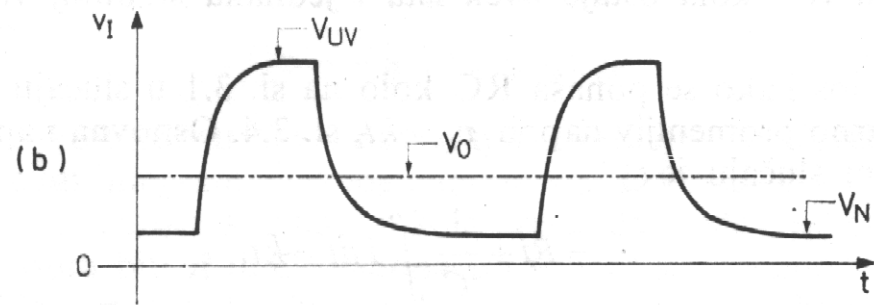
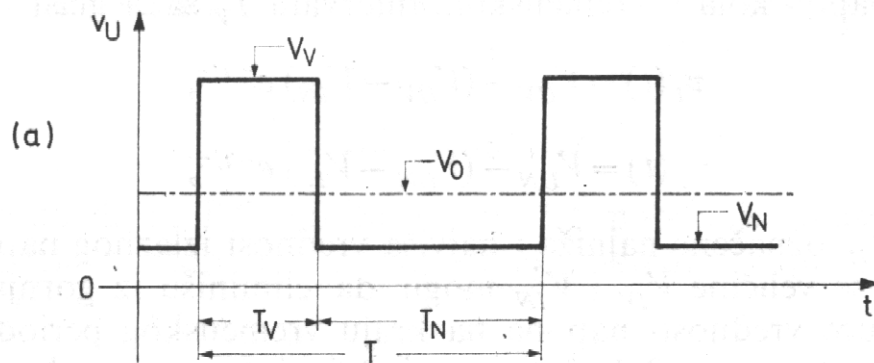
$$U_{iz} = \frac{1}{C} \int i \cdot dt$$

$$U_{iz} = U_{ul} - R \cdot i \quad RC \rightarrow \infty; \quad t \ll \tau; \quad U_{iz} \ll U_{ul} \Rightarrow i \approx \frac{U_{ul}}{R}$$

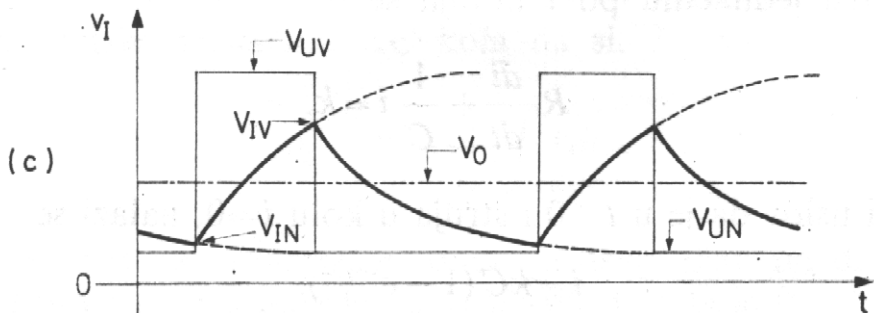
$$U_{iz} = \frac{1}{C} \int \frac{U_{ul}}{R} \cdot dt$$

$$U_{iz} = \frac{1}{RC} \int U_{ul} \cdot dt$$

Napon na izlazu integratora za pobudu povorkom pravougaonih impulsa

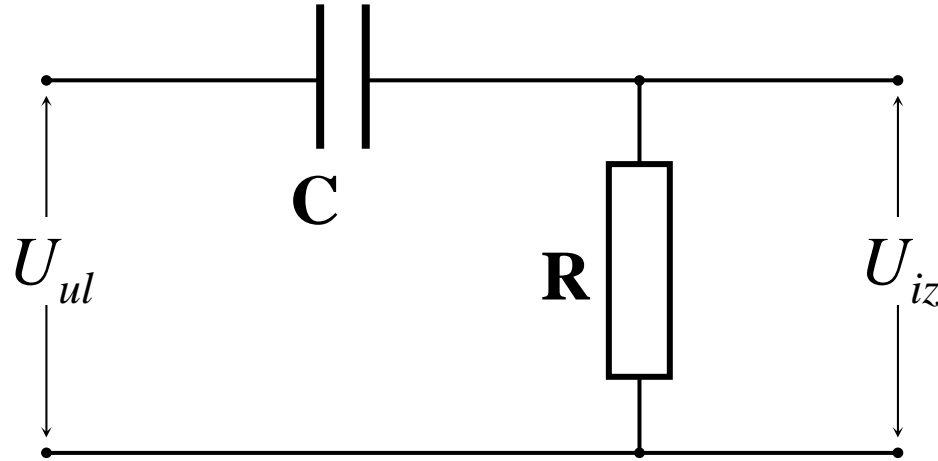


$$\tau < T_V \text{ i } \tau < T_N$$



$$\tau > T_V + T_N$$

DIFERENCIJATOR



$$U_{iz} = \frac{R}{R + \frac{1}{j\omega \cdot C}} \cdot U_{ul} = \frac{j\omega \cdot R \cdot C}{1 + j\omega \cdot C \cdot R} \cdot U_{ul}$$

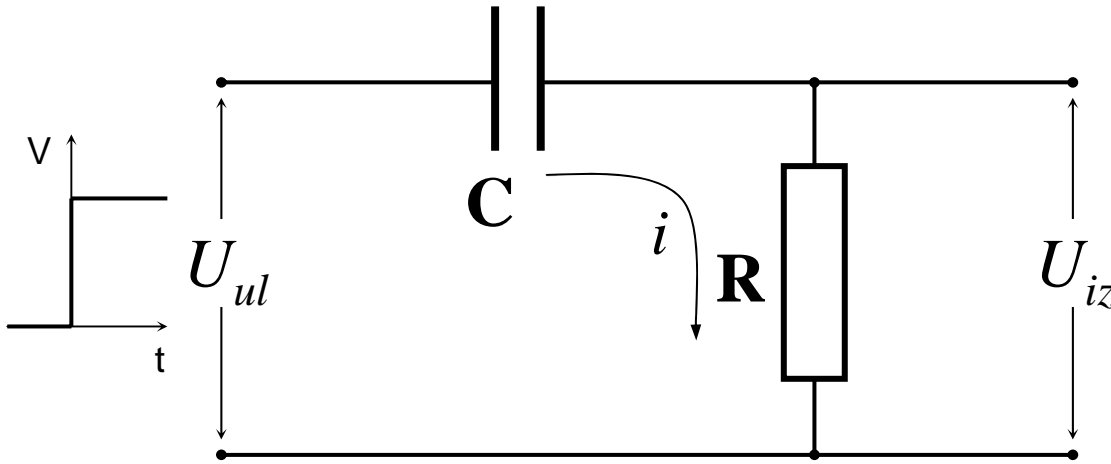
$$\frac{U_{iz}}{U_{ul}} = \frac{1}{1 - j \frac{\omega_g}{\omega}}; \quad \omega_g = \frac{1}{RC} = \frac{1}{\tau}$$

$$\left| \frac{U_{iz}}{U_{ul}} \right| = \frac{1}{\sqrt{1 + \frac{\omega_g^2}{\omega^2}}} \quad \varphi = \text{arctg} \left(\frac{\omega_g}{\omega} \right)$$

$$\frac{\omega_g}{\omega} \rightarrow \infty \quad ; \quad \varphi = \frac{\pi}{2}$$

$$\omega_g \rightarrow \infty; \quad \tau = RC \rightarrow 0$$

DIFERENCIJATOR



$$U_{ul} = \frac{1}{C} \int i \cdot dt + R \cdot i$$

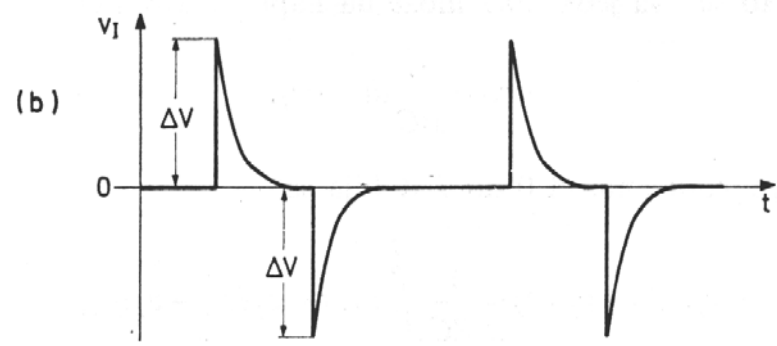
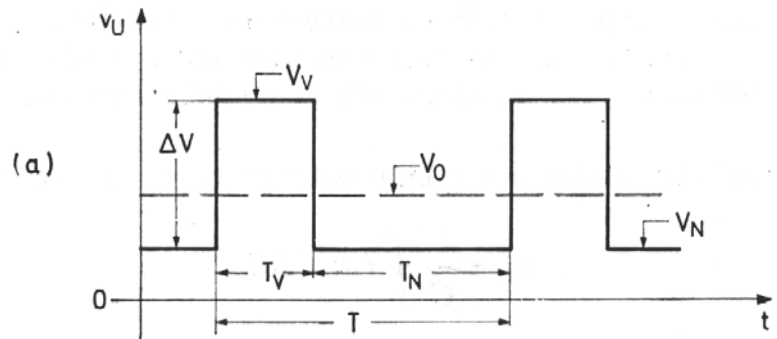
$$U_{iz} = R \cdot i$$

$$U_{iz} = U_{ul} - \frac{1}{C} \int i \cdot dt$$

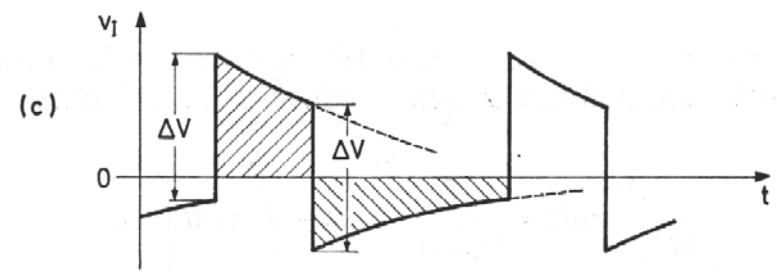
$$RC \rightarrow 0; \quad t \gg \tau; \quad U_{iz} \ll U_{ul} \Rightarrow U_{ul} \approx \frac{1}{C} \int i \cdot dt \Rightarrow i = C \cdot \frac{dU_{ul}}{dt}$$

$$U_{iz} = RC \frac{dU_{ul}}{dt}$$

Napon na izlazu diferencijatora za pobudu povorkom pravougaonih impulsa

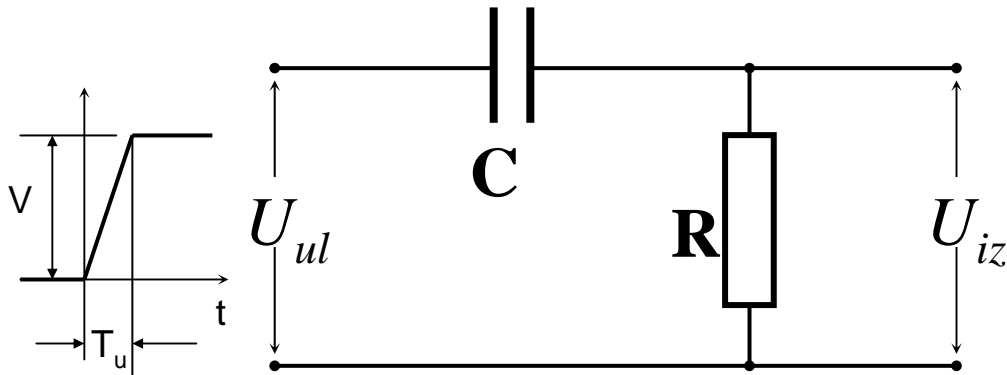


$$\tau \ll T_V \text{ i } \tau \ll T_N$$



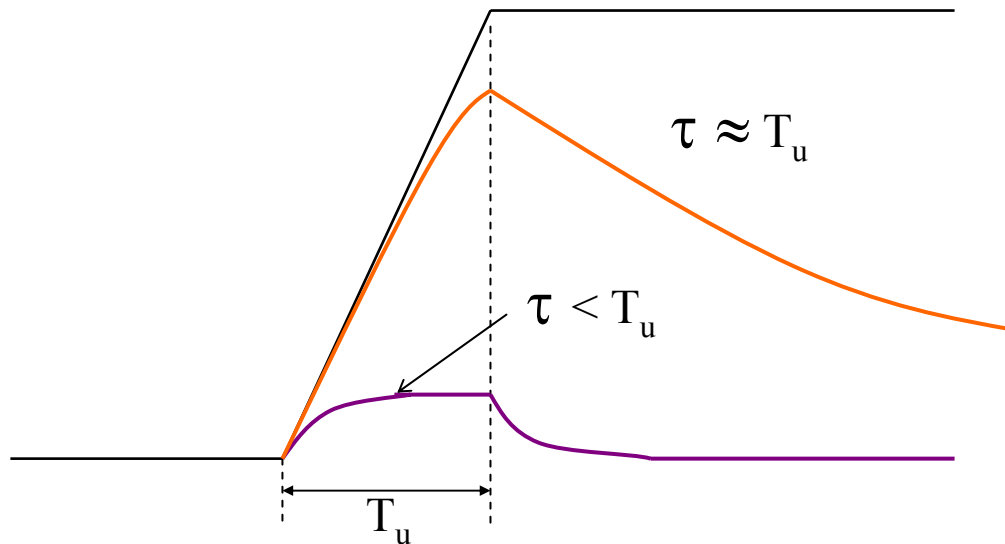
$$\tau > T$$

Diferenciranje impulsnog signala sa vremenom uspostavljanja prednje ivice većim od 0



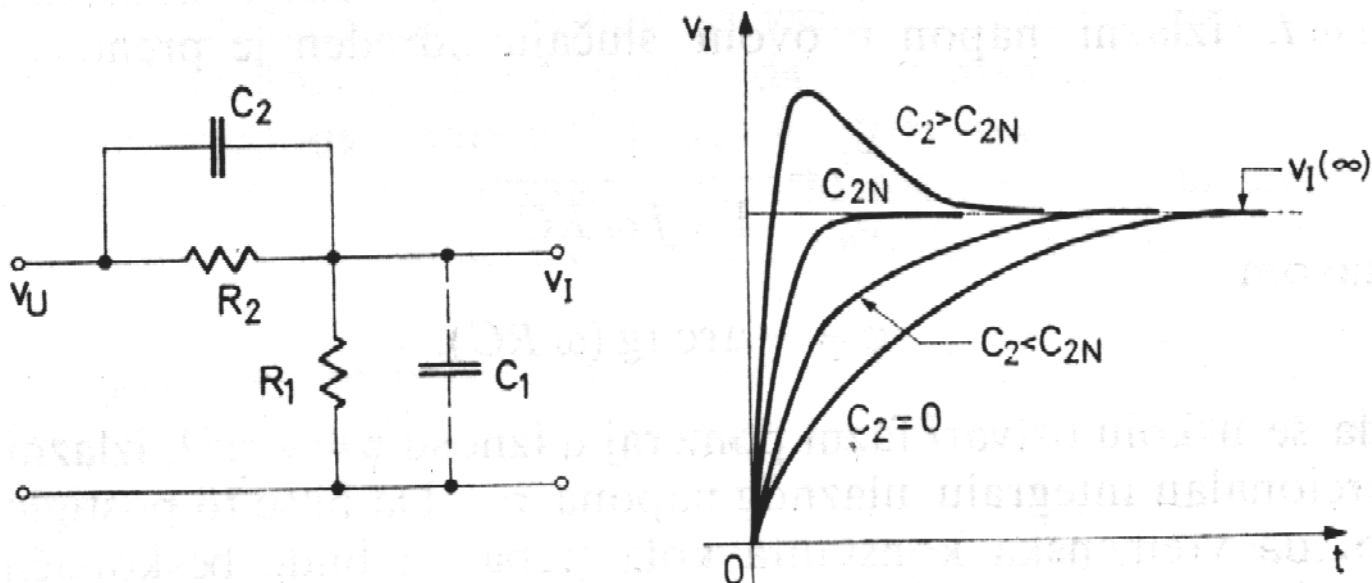
$$U_{ul} = k \cdot t = \frac{V}{T_u} \cdot t$$

$$U_{iz} = RC \cdot \frac{dU_{ul}}{dt} = RC \frac{V}{T_u}$$



$$U_{iz} = \frac{\tau}{T_u} V$$

KOMPENZIRANI RAZDELNIK NAPONA



$$U_i(0^+) = C_2 / (C_1 + C_2) * U_u(0^+)$$

$$U_i(\infty) = R_1 / (R_1 + R_2) * U_u(0^+)$$

$$U_i(0^+) = U_i(\infty)$$

$$R_1 C_1 = R_2 C_2$$

$$C_{2N} = C_1 * (R_1 / R_2)$$

DIODA (Si)

$$i_D = I_{DS0} \left(e^{\frac{U_D}{\eta V_T}} - 1 \right)$$

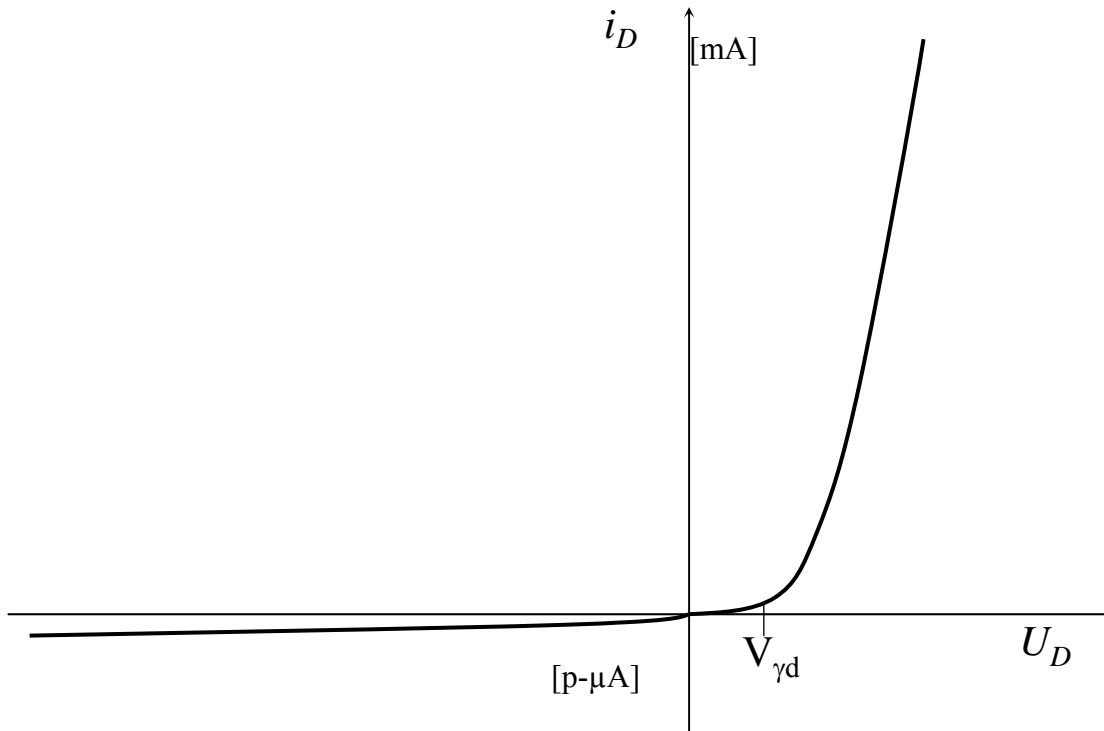
$$V_T = \frac{kT}{q}$$

Pri $T=300 \text{ }^0\text{K}$
 $V_T=25,9 \text{ mV}$

$$R_D = \frac{U_D}{i_D}$$

$$r_D = \frac{dU_D}{di_D} = \frac{\eta \cdot V_T}{i_D}$$

$$I_{DS0}(T) = I_{DS0T_0} \cdot 2^{\frac{T-T_0}{10}}$$



U-I Karakteristika diode

$$\frac{dU_D}{dT} = -(2 \div 2,5) \frac{mV}{^0C}$$