

$$U_a = G(jw) \cdot U_e$$

$$\hat{U}_a = |G(jw)| \cdot \hat{U}_e \quad R \parallel Z_L = \frac{R \cdot \frac{1}{jwC}}{R + \frac{1}{jwC}} = \frac{R}{1 + jwRC}$$

Knotenregel: $I_e = I_g + I_n \approx 0$

$$I_e = \frac{U_e - U_n}{R + Z_C}$$

$$U_n = U_p \text{ (Idealisierung)} = 0V$$

$$I_g = \frac{U_n - U_a}{R \parallel Z_C}$$

$$I_e = I_g \Leftrightarrow \frac{U_e}{R + \frac{1}{jwC}} = - \frac{U_a}{R / (1 + jwRC)} = - \frac{U_a \cdot (1 + jwRC)}{R} \quad (\cdot R \cdot (-1))$$

$$\Leftrightarrow U_a \cdot (1 + jwRC) = - \frac{R \cdot U_e}{R + \frac{1}{jwC}} = - \frac{jwRC}{1 + jwRC} \cdot U_e$$

$$G(jw) = \frac{U_a}{U_e} = - \frac{jwRC}{(1 + jwRC)^2} = - \underbrace{\frac{1}{1 + jwRC}}_{RC\text{-Tiefpass}} \cdot \underbrace{\frac{jwRC}{1 + jwRC}}_{RC\text{-Hochpass}}$$

Überblick durch Einsetzen von $w = 0$, $w \rightarrow \infty$, $w = \frac{1}{RC} =: w_g$

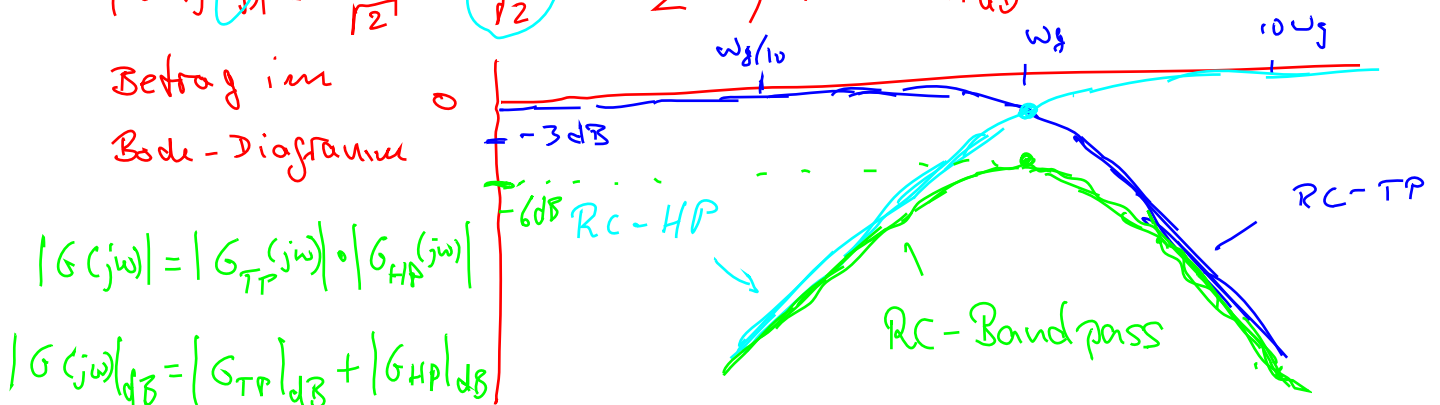
$$G(j0) = - \frac{1}{1+0} \cdot \frac{0}{1+0} = 0$$

$$G(j\infty) = - \frac{1}{1+j\infty} \cdot \lim_{w \rightarrow \infty} \frac{jwRC}{1+jwRC} = \lim_{w \rightarrow \infty} \frac{1}{\frac{1}{jwRC} + 1} = - 0 \cdot 1 = 0$$

$$G(jw_g) = - \frac{1}{1+j \cdot 1} \cdot \frac{j1}{1+j \cdot 1}$$

$$|G(jw_g)| = \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} = \frac{1}{2}, \quad |G(jw_g)|_{dB} = 20 \cdot \lg\left(\frac{1}{2}\right) \approx -6 \text{ dB}$$

Betrag im Bode-Diagramm



$$|G(jw)| = |G_{TP}(jw)| \cdot |G_{HP}(jw)|$$

$$|G(jw)|_{dB} = |G_{TP}|_{dB} + |G_{HP}|_{dB}$$