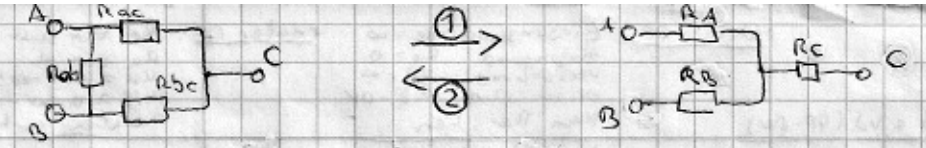
DREIECK - STERN



① $R_A = \frac{R_{ab} \cdot R_{ac}}{R_{ab}+R_{ac}+R_{bc}}$; $R_B = \frac{R_{ab} \cdot R_{bc}}{R_{ab}+R_{ac}+R_{bc}}$; $R_C = \frac{R_{ac} \cdot R_{bc}}{R_{ab}+R_{ac}+R_{bc}}$

② $R_{ac} = \frac{R_A \cdot R_B + R_A \cdot R_C + R_B \cdot R_C}{R_B}$; $R_{bc} = \frac{R_A R_B + R_A R_C + R_B R_C}{R_A}$; $R_{ab} = \frac{R_A R_B + R_A R_C + R_B R_C}{R_C}$

LEISTUNG

$P = \frac{U^2}{R} = U \cdot I$ [W]

Verlustleistung Transistor: $P_V = U_{CE} \cdot I_C + U_{BE} \cdot I_B$

„Vom Widerstand aufgenommene Leistung <=> Im Widerstand umgesetzte Leistung"

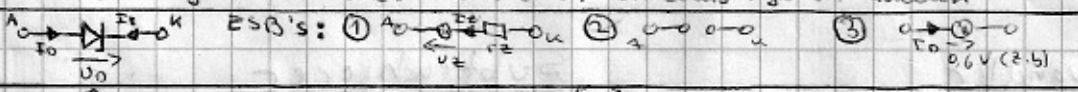
Leistungsanpassung: $R_i = R_L$

Wirkungsgrad: $\eta = \frac{\text{genutzte Leistung}}{\text{ges. erzeugte Leist.}} = \frac{P_N}{P_Q}$

erz. Leistung ersatzquelle: $P_{ers} = U_L \cdot I_{Kurz} = \frac{U_L^2}{R_{ers}}$ bzw. $P_{ers} = I_K \cdot U_{IK}$

erz. Leistung reale Quelle: Summe d. Einzelleistungend Quellen

ZENERDIODE



KONDENSATOR

$C = \frac{Q}{U}$, wobei [C] = Farad, und [Q] = Coulomb

Parallelschaltung von n Kond

$Q_{ges} = Q_1 + Q_2 + \dots + Q_n$

$U_{ges} = U_1 = U_2 = U_3 = U_n$

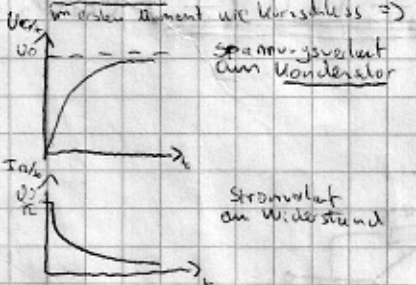
Reihenschaltung von n Kond

$Q_{ges} = Q_1 = Q_2 = Q_3 \dots = Q_n$

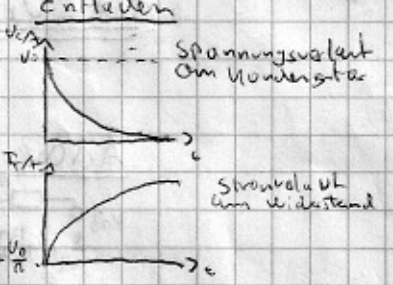
$U_{ges} = U_1 + U_2 + U_3 \dots + U_n$

Aufladen

im ersten Moment wie Kurzschluss =>

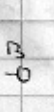
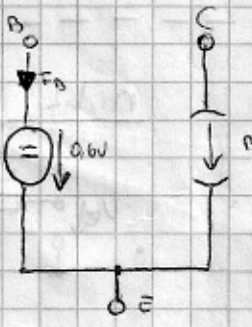
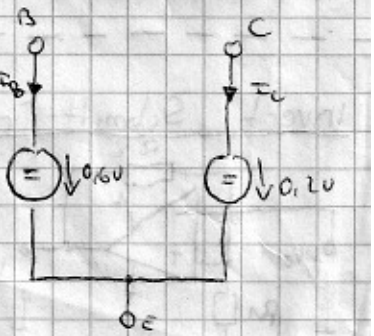


Entladen



(für Kondensator in Reihe m. Widerstand)

TRANSISTOR

Sperrbereich	aktiver Bereich		Sättigung	
				
$U_{BE} < 0,6V$	$U_{BE} = 0,6V$	$U_{BE} = 0,6V$	$U_{BE} = 0,6V$	$U_{BE} = 0,6V$
$I_C = I_E = I_B = 0A$	$I_B = I_C = I_E > 0A$	$I_C = B \cdot I_B$	$I_C = B \cdot I_B$	$I_C < B \cdot I_B$
		$U_{CE} > 0,2V$	$U_{CE} = 0,2V$	$U_{CE} = 0,2V$

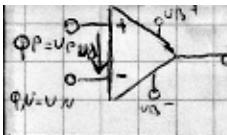
MISC

Arbeitspunkt

$AP_{T_n} : (U_{CE}; I_C) = (x; y)$

relativer Fehler

$\frac{\text{„neuer" Wert} - \text{„ursprünglicher" Wert}}{\text{ursprünglicher Wert}} \cdot 100 = X\ \%$



$U_A = v_d \cdot U_d = v_d (\varphi_P - \varphi_N)$

idealer OP: Eingangswid $R_e = \infty$; Ausgangswid $R_a = 0$; Verstärkung $v_d = \infty$; offset-Spann. $U_{off} = 0V$; kein Rauschen

realer OP: $R_e \approx x\,G\Omega$; $R_a \approx x\,\Omega$; $v_d \approx 10^4 - 10^6$; $U_{off} \approx 0{,}1mV - 10mV$; Rauschen vorhanden

① nicht rückgekoppelt (Komparator)

$U_D > 0 \Rightarrow U_A = U_B^+$

$U_D < 0 \Rightarrow U_A = U_B^-$

② mitgekoppelt (Schmit-trigger)

$+U_A \rightarrow +U_D$

$+U_A \rightarrow -U_D$

$U_D > 0 \Rightarrow U_A = U_B^+$

$U_D < 0 \Rightarrow U_A = U_B^-$

③ gegengekoppelt

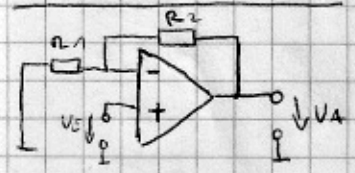
$+U_A \rightarrow -U_D$

$-U_A \rightarrow +U_D$

$\Rightarrow U_D = 0V$

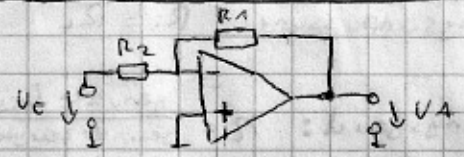
(Betriebsarten)

nicht inv. Verstärker



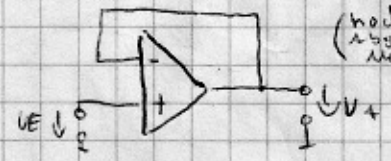
$$U_A = U_E \left(1 + \frac{R_2}{R_1}\right)$$

invertierender Verstärker



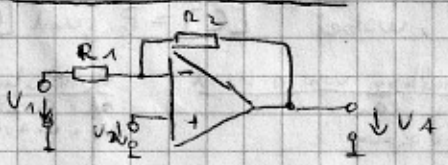
$$U_A = -\frac{R_2}{R_1} \cdot U_E$$

Impendanzwandler



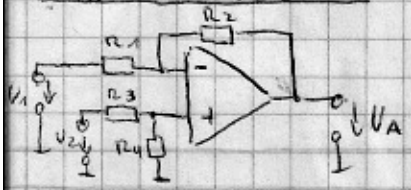
$$U_A = U_E \quad (V = 1)$$

Subtrahierer



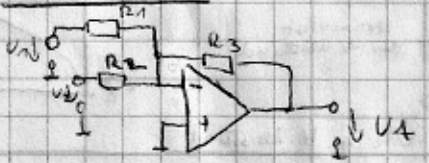
$$U_A = U_2 \left(1 + \frac{R_2}{R_1}\right) - U_1 \left(\frac{R_2}{R_1}\right) \quad (= c_1 \cdot V_2 - c_2 \cdot V_1)$$

Differenzverstärker



$$U_A = \frac{R_2}{R_1} (V_2 - U_1) \quad (= c \cdot (U_2 - V_1))$$

Addierer



$$U_A = -R_3 \left(\frac{V_1}{R_1} + \frac{U_2}{R_2}\right)$$

(Grundschaltungen)

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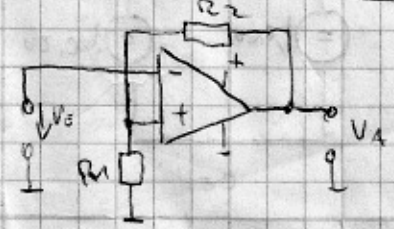
invert. Schmit-Trigger



nicht invert. Schmit-Trigger