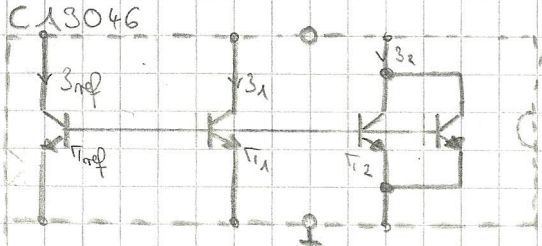


① Stromspiegel



$I_{ref} : I_1 : I_2 = 1 : 1 : 2$
 $I_{ref} : (I_1 + I_2) = 1 : 3$

1.1 Statisches Verhalten - Stromverhältnisse, 3 Terminaler und Innenwiderstand

$U_{BE} = 0,7V ; \beta \gg 1 ; U_S = 15V ; R = 15k$

$\rightarrow I_{ref} = \frac{U_S - U_{BE}}{R} = \frac{15V - 0,7V}{15k} = 953 \mu A$

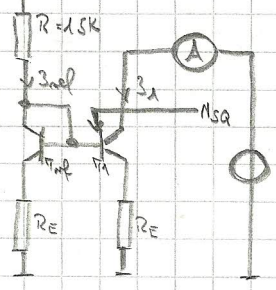
$I_1 = I_{ref} = 953 \mu A$

$I_2 = 2 \cdot I_{ref} = 1906,67 \mu A = 1,91 mA$

Stromverhältnis: $3 \cdot I_{ref} = I_1 + I_2 = 2,86 mA$

1.2 U / I 3 Terminaler

$I_{ref} = \text{konst.}; U_T \approx 50V$
 $R_E = 100 \Omega$



Fall a $R_E = 0$: $r_{SQ} = r_{CE1} = \frac{U_T}{I_{ref}} = \frac{50V}{953 \mu A} = 52,47 k\Omega$

Fall b $R_E = 100 \Omega$: $r_{SQ} = r_{CE1} \cdot (1 + g_{m1} \cdot R_E)$

$r_{CE1} = 52,47 k\Omega$

$g_{m1} = \frac{I_{ref}}{U_T} = \frac{953 \mu A}{50V} = 19,06 mS$

$\Rightarrow r_{SQ} = 52,47 k\Omega (1 + 19,06 mS \cdot 100 \Omega) = 57,47 k\Omega$

Simulation: $r_{SQ} (R_E = 0) = 56,80 k\Omega$

$r_{SQ} (R_E = 100 \Omega) = 57,47 k\Omega$

② Differenzverstärker

2.1 Grundformen des Differenzverstärkers

2.1.1 Arbeitspunkte

A) Form A $u_{1a} = u_{1b} = 0 ; |U_{BE}| = 0,7V ; R_{E1} = 3,5k\Omega ; R_C = 2,7k\Omega$

$U_{BE} = 0,7V \Rightarrow \varphi_3 = -0,7V$ ③

$U_{RE1} = \varphi_3 - U_S = -0,7V - (-5V) = 4,3V$

$I_{RE1} = \frac{U_{RE1}}{R_{E1}} = \frac{4,3V}{3,5k\Omega} = 1,23 mA$

$I_{1a} = I_{1b}$ und beide haben $R_C \rightarrow I_{C1} = I_{C2} = I_{RE1} \cdot \frac{1}{2} = 0,615 mA$

$\rightarrow U_{RC} = R_C \cdot I_{C2} = 2,7k\Omega \cdot 0,615 mA = 1,66 V$

$\rightarrow \varphi_{1a} = U_S - U_{RC} = 5V - 1,66 = 3,34V$ ① ②

