

PSF:

β_{FE} da BJT $> 100 \Rightarrow I_{B5}$ negligibel
 $I_C = I_E$

$$I_{E5} = \frac{V_{Z1} - V_{BE5}}{R_6} \Rightarrow I_{E5} \approx 2,4 \text{ mA}$$

$$V_{Z1} = 10 \text{ V}; V_{BE} = 0,6 \text{ V}$$

$$I_{E10} = \frac{V_{DC} - V_{BE10}}{R_{12}} = \frac{4,4}{680} = 6,47 \text{ mA} \Rightarrow I_{C10} = 6,47 \text{ mA}$$

$$-V_{DC} = -I_{E5} \cdot R_6 - V_{BE} - R_{13} I_{B5} \cdot (-1)$$

\downarrow
negligibel

$$5 = I_{E5} \cdot 3,9 + 0,6 \Rightarrow I_{E5} = \frac{4,4}{3,9} \approx 1,12 \text{ mA}$$

$$-V_{DC} = -I_{E5} \cdot R_6 - V_{CE5} - V_{BE1} \cdot (-1)$$

$$5 = 4,36 + V_{CE5} + 0,6 \Rightarrow V_{CE5} = 0,04 \text{ V}$$

$$V_{DC} = \underbrace{R_1 I_{E3}}_{\text{mic}} + V_{CE2} - V_{BE1}$$

*

$$V_{CE2} = 5,6 \text{ V} > V_{BE2} \Rightarrow T_2 \text{ in RAN}$$

$$I_{E3} = 522 \mu\text{A} = I_{E4} \quad (I_{E5} = 2I_{E3} = 2I_{E4})$$

$$V_{BC4} = 0 \Rightarrow V_{CE4} = V_{BE4} \Rightarrow T_4 \text{ in RAN}$$

$$\text{Pt LED-wür: } I_F = 20 \text{ mA}, V_F \in [1,6, 2,5] \text{ V}$$

$$V_{CC} = I_F \cdot R_{18,14} + V_F \Rightarrow V_F = 2 \text{ V} \in [1,6, 2,5]$$

$$V_{R15} + V_{R10} + V_{R17} + V_{RL} \Rightarrow \text{negligibel}$$

$$I_{C1} = I_{C2} = I_{C3} = I_{C4}$$

$$V_{DC} \approx V_{CE8} \Rightarrow V_{CE8} = 5 > V_{BE8} \Rightarrow T_8 \text{ în RAN}$$

$$2V_{DC} = R_2 \cdot I_{E4} + V_{CE4} + V_{CE2} + \underbrace{V_{CE5}}_{mic} + V_{R6}$$

Din foaia de catalog: $I_{D4} = 1 \text{ mA}$ și $V_{D4} = \overset{0,6 \text{ V}}{0,6 \text{ V}}$
(La fel pt ~~D2~~ și ~~D3~~)

$$2V_{DC} = V_{CE8} + V_{CE9} \Rightarrow V_{CE9} \approx 5 \text{ V} > V_{BE9} \Rightarrow T_9 \text{ RAN}$$

$$2V_{DC} = V_{CE8} + V_{EB9} + V_{CE10} + R_2 \cdot I_{E10}$$

$$5 = 0,6 + V_{CE10} + 4,36 \Rightarrow V_{CE10} = 0,04 \text{ V} \Rightarrow \text{N.B.}$$

$$2V_{DC} = V_{D4} + V_{EB7} + V_{CE1} + \underbrace{V_{CE5}}_{mic} + R_6 \cdot I_{E5}$$

$$V_{CE1} = 10 - 0,6 - 0,6 - 4,36 = 4,44 > V_{BE1} \Rightarrow T_1 \text{ RAN}$$

$$2V_C = V_{CE3} + V_{CE1} + \underbrace{V_{CE5}}_{mic} + I_{E5} R_6$$

$$V_{CE3} = 10 - 4,44 - 4,44 = 1,12 \text{ V} > V_{BE3} \Rightarrow T_3 \text{ în RAN}$$

$$I_{D6} = I_{DSS} \left(1 - \frac{\overset{mic}{V_{GS}}}{V_T} \right)^2 \Rightarrow I_{D6} < 20 \text{ mA}$$

$$V_{DS} = 5,53 \text{ V}$$

$$|V_{GS}| < |V_T| ; \text{ pt } V_T = 3 \text{ V}$$

$$I_{E8} = I_{E9} = 13 \text{ mA}$$

$$2V_{DC} = V_{D4} + I_{12} R_{12} \Rightarrow I_{12} = \frac{10 - 1,8}{680} = 12 \text{ mA}$$

$$I_{E7} = I_{E10} \approx 6 \text{ mA}$$

$$P_{T1} = V_{CE1} \cdot I_{C1} = 4,74 \cdot 522 \mu A = 23 \text{ mW}$$

$$P_{T2} = V_{CE2} \cdot I_{C2} = 5,6 \cdot 522 \mu A = 29 \text{ mW}$$

$$P_{T3} = V_{CE3} \cdot I_{C3} = 1,22 \cdot 522 \mu A = 6,36 \text{ mW}$$

$$P_{T4} = V_{CE4} \cdot I_{C4} = 0,6 \cdot 522 \mu A = 3,13 \text{ mW}$$

$$P_{T5} = V_{CE5} \cdot I_{C5} = 0,04 \cdot 1,12 = 4,48 \mu W$$

$$P_{T7} = V_{CE7} \cdot I_{C7} = 5 \cdot 6 = 30 \text{ mW}$$

$$P_{T8} = V_{CE8} \cdot I_{C8} = 5 \cdot 13 = 65 \text{ mW}$$

$$P_{T9} = V_{CE9} \cdot I_{C9} = 5 \cdot 13 = 65 \text{ mW}$$

$$P_{T10} = V_{CE10} \cdot I_{C10} = 0,04 \cdot 6 = 0,24 \text{ mW}$$

$$P_{LED1} = P_{LED2} = I_F \cdot V_F = 20 \cdot 2 = 4 \text{ mW}$$

$$P_{D2} = P_{D3} = P_{D4} = 0,6 \cdot 1 = 0,6 \text{ mW}$$