$$I_{LED_1} \cdot (\underbrace{R_{18} + R_{19} + R_{20} + R_{21} + R_{22} + R_{23}}_{Rech.}) = V_{im} - V_{LED_1}$$

$V_{LED_1} = 2V.$

$V_z = 10V.$

$V_{im} = 56V.$

$$\Rightarrow \bar{I}_{LED_1} = \frac{V_{im} - V_{LED_1}}{Rech} = \frac{56-2}{5,1} = 10,58 \, mA.$$

$$I_{LED_3} \cdot (\underbrace{R_{16} + R_{24} + R_{25}}_{Rech.}) = V_{out} - V_{LED_3}.$$

$V_{LED_3} = 2V.$

$V_{out} = 28V.$

$$\Rightarrow \bar{I}_{LED_3} = \frac{V_{out} - V_{LED_3}}{Rech} = \frac{28-2}{2,46} = 10,56 \, mA.$$

$$\bar{I}_{D_2} \cdot (R_2 + R_{29}) = V_{im} - V_z$$

$V_z = 10.$

$$\Rightarrow \bar{I}_{D_2} = \frac{V_{im} - V_z}{R_2 + R_{29}} = \frac{56-10}{8,6} = 5,34 \, mA.$$

$$V_z - V_{BE5} - \bar{I}_{E5} R_6 = 0.$$

$V_{BE} = 0,7V.$

$$\Rightarrow \bar{I}_{E5} = \frac{V_z - V_{BE5}}{R_6} = \frac{10 - 0,7}{2,2} = 4,22 \, mA.$$

$$V_{E2} = V_{E4} = V_z - V_{BE} = 9,3V.$$
$$\underbrace{}_{0,7V}$$

$V_z = V_{B2}.$

$$V_{CE5} = V_{B2} - V_z + 2 V_{BE}$$

$$= 9,3 + 10 + 1,4 \approx 0,7V.$$

$$V_{BE1} = V_{BE3} \Rightarrow I_{C1} = I_{C3} = \bar{I}_{C2} = \bar{I}_{C4} = \frac{\bar{I}_{C2}}{2} \simeq 2mA.$$

$$V_{BC3} = 0 \Rightarrow V_{CE1} = V_{CE3} = V_{BE} = 0,7V.$$

$$V_{CE2} = V_{CE4} = V_{im} - V_{BE3} - V_{E2}$$
$$\simeq 56 - 0,7 - 9,3 = 46V.$$

$$V_{R8} = V_{out} + V_{BE}$$
$$\sim 28 + 0,7 > 28,7V.$$

$$\bar{I}_{R8} = I_{C7} = \frac{V_{R8}}{R_{b1}\, R_{27} + R_6} = \frac{28,7}{7,1} \equiv 4,04\,mA.$$

$$V_{CE7} = V_{im} - V_{Th} - V_{R8}.$$
$$\underbrace{V_{R8} + V_{R27} + V_{R26}}$$
$$= 56 - 28,7 - 1 = 26,3\,V.$$

$$V_{CE6} = V_{im} - V_{out} = ?$$
$$\sim 56 - 28 = 28\,V.$$

$$\bar{I}_{out} = \frac{V_{out}}{R_{LOAD}} = \frac{28}{1120} \simeq 25\,mA.$$

$$\bar{I}_{o\,max} = \frac{V_{BE}}{R_{10} + R_{11}} = \frac{0,7}{1,47} \sim 0,5\,A.$$

$$I_{C6} = \bar{I}_{out} = 25\,mA.$$

$$Q_8 - blocat \left/ \Rightarrow I_{c8}, I_{c9} = 0. \right.$$
$$Q_9 - blocat$$
$$(\text{Reg. norm})$$