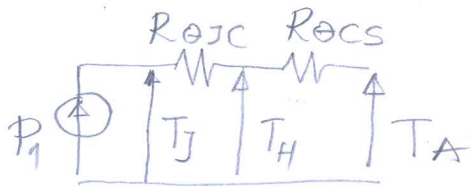


①



$$T_A = 40^\circ\text{C} = \text{const.}$$

$$P = 20\text{ W}$$

$$T_H = T_A + R_{\theta CS} \cdot P_1 \Rightarrow R_{\theta CS} = \frac{T_H - T_A}{P_1} = \frac{120 - 40}{20} = 4^\circ\text{C/W}$$

$$T_J = T_H + R_{\theta JC} \cdot P_1 \Rightarrow R_{\theta JC} = \frac{T_J - T_H}{P_1} = \frac{150 - 120}{20} = 1,5^\circ\text{C/W}$$

$$P_2 = \frac{r_{DSon}}{3} I^2 = \frac{20}{3} = 6,67\text{ W.}$$

$$T_H = T_A + R_{\theta CS} \cdot P_2 = 40 + 4 \cdot 6,67 = 66,7^\circ\text{C}$$

$$T_J = T_H + R_{\theta JC} / 3 \cdot P_2 = 66,7 + \frac{1,5}{3} \cdot 6,67 = 70^\circ\text{C}$$

②

$$\int_0^T v_L = 0 \Rightarrow (V_{out} + V_D - V_{in})(1-D) = (V_{in} - V_Q)D$$

$$I_{out} = (1-D)I_L$$

$$P_{out} = V_{out} \cdot I_{out}$$

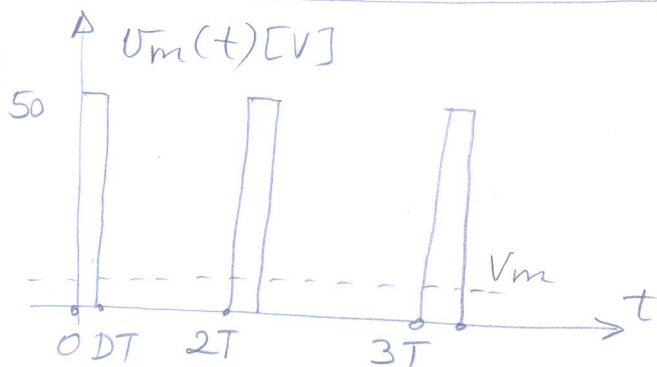
$$V_Q = r_{DSon} \cdot I_L$$

$$V_{out} \cdot 0,4 - 11,68 + \frac{2,7}{V_{out}} = 0 \Rightarrow 0,4 V_{out}^2 - 11,68 V_{out} + 2,7 = 0$$

$$V_{out,1,2} = \frac{11,68 \pm \sqrt{11,68^2 - 4 \cdot 0,4 \cdot 2,7}}{2 \cdot 0,4} = \frac{11,68 \pm 11,49}{0,8}$$

$$V_{out} = 28,96\text{ V}; \quad I_{out} = \frac{P_{out}}{V_{out}} = \frac{150}{28,96} = 5,18\text{ A}; \quad R = \frac{V_{out}}{I_{out}} = 5,59\Omega$$

③



$$V_m = \overline{V_m(t)} = D \cdot 50$$

$$V_m = R_r \cdot I_m = 0,6\Omega \cdot 20\text{ A} = 12\text{ V}$$

$$12 = D \cdot 50$$

$$D_{max} = \frac{12}{50} = 0,24 = 24\%$$