

A

B

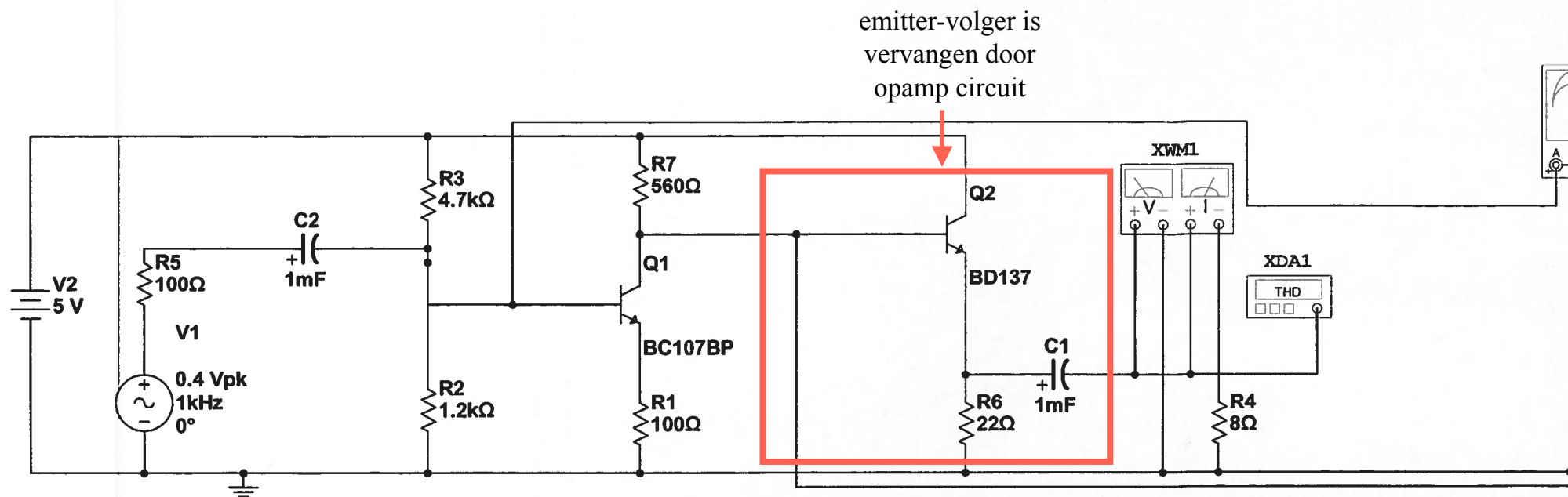
C

D

E

F

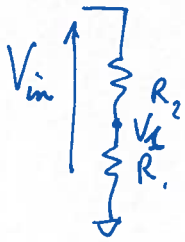
G



* Serie schakeling van V-bronnen.

$$4 \times 1,2V = 4,8V$$

* Weerstandsdeler:

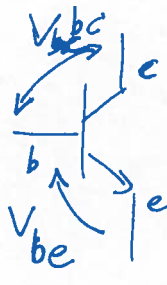


* I gemeenschappelijk

* wet van Ω . $R = R_1 + R_2 \rightarrow I = \frac{V}{R_1 + R_2}$

$$* V_1 = V_{\text{over } R_1} = R_1 I = \frac{R_1}{R_1 + R_2} V_{\text{in}}$$

* Transistor

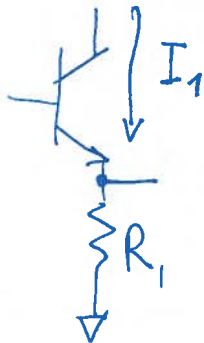


$$V_{be} = 0,7V$$

$$V_{bc} > 0$$

$$\begin{cases} V_b = V_e + 0,7V \\ V_c \geq V_b \end{cases}$$

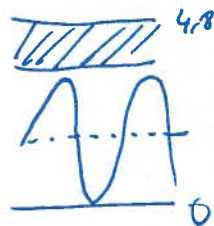
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betreft emitter-volger

$$V_c = 4,8V \geq V_e + 0,7V$$

$$V_e \leq 4,1V$$



midden: 2V

$$\Rightarrow \text{maximale signaalswing} = 0 - 4V \quad (2V \cdot \sin 2\pi f t) + 2V$$

$$\text{Kies } R_1 \cong 8\Omega$$

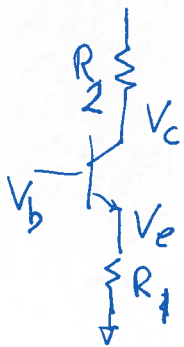
$$2V = R_1 \cdot I_1 \rightarrow I_1 = 250 \text{ mA} \quad \text{te groot.}$$

$$\text{Kies } R_1 \cong 22\Omega \rightarrow I_1 = 91 \text{ mA} \quad \text{doenbaar.}$$

$$I_1 \text{ max} \Rightarrow \frac{4V}{22\Omega} = 180 \text{ mA}$$

$$I_1 \text{ min} = 0 = \frac{0V}{22\Omega}$$

$$V_b = V_e + 0,7V \begin{cases} 4,7 & \text{max} \\ 2,7 & \text{typisch} \\ 0,7V & \text{min} \end{cases}$$



$$V_b = V_e + 0,7$$

$$= R_1 \cdot I + 0,7V$$

$$I = \frac{V_b - 0,7}{R_1}$$

$$V_c = 4,8 - R_2 I$$

$$= 4,8 - \frac{R_2}{R_1} (V_b - 0,7)$$

Versterking van \$V_b\$: $V_c = - \frac{R_2}{R_1} V_b$

→ omgekeerd teken

→ versterking $\frac{R_2}{R_1}$

Uitgang 400 mV → 2V : Versterking factor 5

$$\left\{ \begin{array}{l} \frac{R_2}{R_1} = 5 \end{array} \right.$$

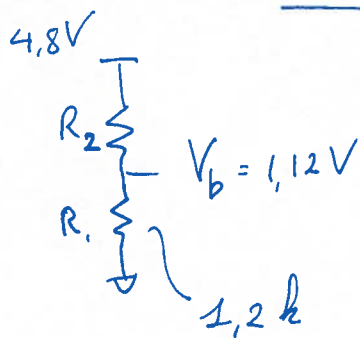
$$2,7V = 4,8V - \frac{R_2}{R_1} (V_b - 0,7V) \Rightarrow V_b = 2,1 / \frac{R_2}{R_1} - 0,7$$

$$\rightarrow V_b = -0,2 \left(2,7 - \underbrace{4,8 - 3,5}_{-8,3} \right) V = +0,2 \cdot 5,6 = 1,12V$$

$$G = 5 \quad R_1 = \frac{100 \Omega}{100 \Omega} R_2 = 2k\Omega$$

$$R_2 = 500 \Omega$$

$$\Rightarrow \text{hier } R_2 = 560 \Omega$$

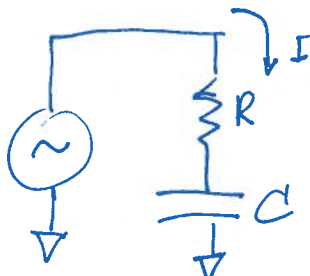


$$V_b = \frac{R_1}{R_1 + R_2} \cdot 4.8V = 1.12V$$

$$R_1 = 1.2k \rightarrow \text{oplossen.}$$

$$4.8V \cdot 1.2k = 1.12V \cdot 1.2k\Omega + 1.12V \cdot R_2$$

$$\Leftrightarrow \frac{(4.8 - 1.12) \cdot 1.2k}{1.12V} = R_2 \approx 4.7k$$



$$V_R = R I$$

$$C \frac{dV_C}{dt} = I$$

$$A \sin 2\pi f t = V_{in} = V_R + V_C$$

$$V_C = V_{in} + R I$$

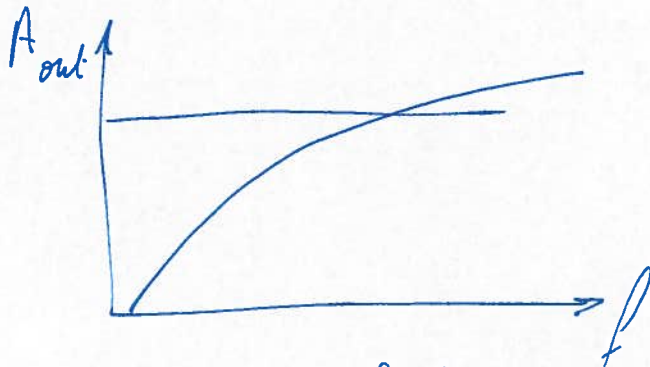
$$A \sin 2\pi f t = V_C + R C \frac{dV_C}{dt}$$

$$A = 0 \rightarrow V_C = -R C \frac{dV_C}{dt}$$

$$V_C = V_0 \cdot e^{-\frac{t}{RC}}$$

$$A \sin 2\pi f t = R C \frac{dV_C}{dt} \Rightarrow V_C = -\frac{A}{R C 2\pi f} \cos 2\pi f t$$

\Rightarrow Ploq.

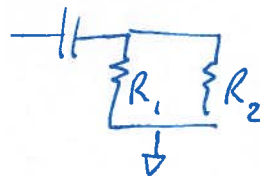
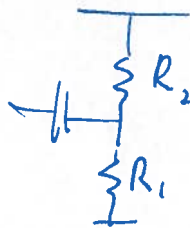


half vermogen $\rightarrow RC' = (2\pi f_{3dB})^{-1}$

50 Hz $8 \text{ m}\Omega$ (eindtrap)

$$C' = \frac{1}{2\pi \cdot 50 \cdot 8} \approx 400 \mu\text{F}$$

Ingang:



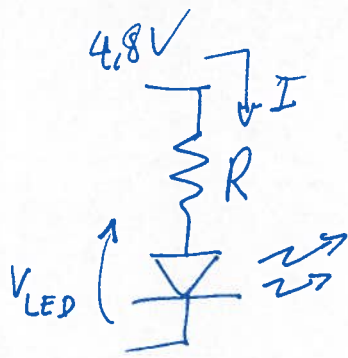
$R_1 // R_2 \approx 12 \text{ k}\Omega$

$$C = \frac{1}{2\pi \cdot 50 \cdot 1200} \approx 2 \mu\text{F}$$

Vermogen: uit batterij: $P_{IV} \approx 100 \text{ mA} \cdot 4.8 \text{ V} = 500 \text{ mW}$

wisselspanning $\sqrt{\frac{1}{2} IV} = \frac{1}{2} \frac{V^2}{R} =$

$$P_b = \frac{(2 \text{ V})^2}{2 \cdot 8 \Omega} = \frac{4 \text{ V}^2}{16} = 0.25 \text{ W}$$



V_{LED} (klein afh.)

Vb voorbeeld $V_{LED} = 1,8 V$

$$V_{LED} + RI = 4,8 V$$

$$I_{LED} = 2 mA \quad (\text{gegeven in datasheet})$$

$$RI_{LED} = 4,8 - 1,8 V \Rightarrow R = \frac{3 V}{2 mA} = 1,5 k\Omega.$$

Levensduur batterij: $I = 100 mA$

Capaciteit batterij: vb: $800 mAh = I \cdot tijd$
 $\rightarrow tijd = 8 h.$

Vermogen in LED $V_{LED} \cdot I_{LED} = 1,8 V \cdot 2 mA = 3,6 mW$

efficiëntie (omzetting elektrische \rightarrow optische energie)

vb: $80\% \rightarrow P_{licht} = 0,8 \cdot 3,6 mW$
 $= 2,88 mW$
