

(1)

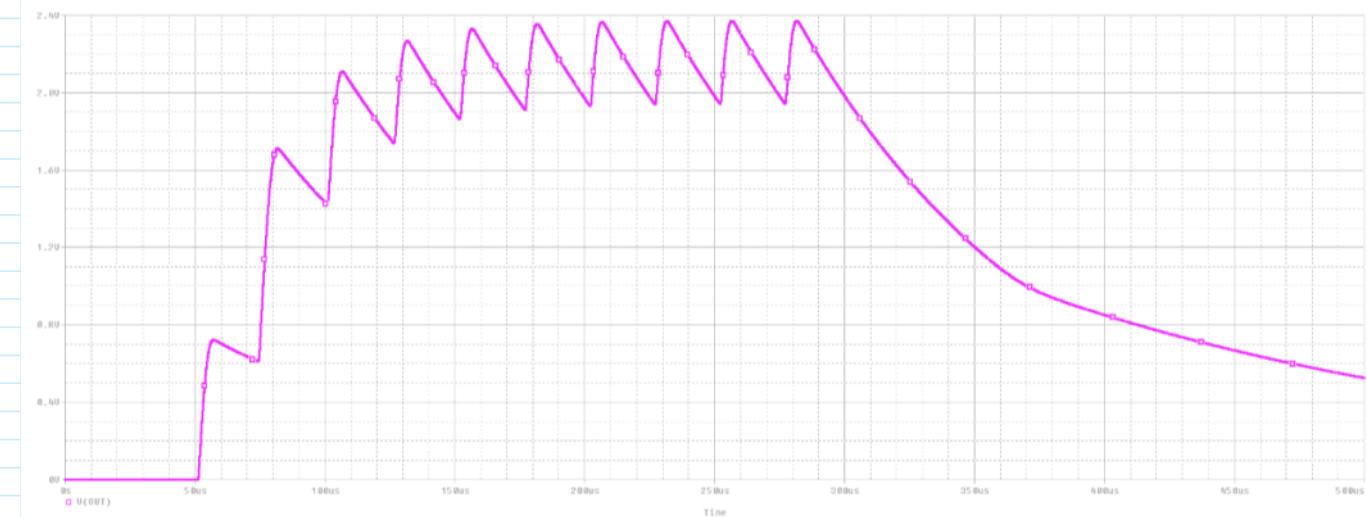
$$TOF = \frac{2 \cdot d}{c}$$

• 50cm :  $TOF = \frac{2 \cdot 0.5 \cdot 10^{-2}}{340} = 2,94 \text{ ms}$

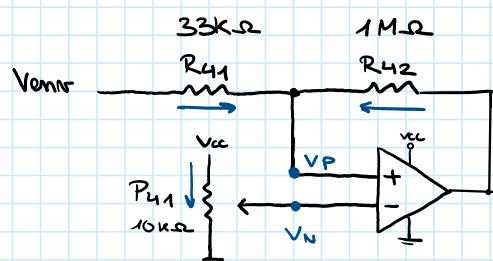
• 1m :  $TOF = \frac{1 \cdot 2}{340} = 5,88 \text{ ms}$

• 2m :  $TOF = \frac{2 \cdot 2}{340} = 11,76 \text{ ms}$

(2)



(3)



SAT. (+)  $V_{comp} = V_{sat\ p} \approx V_{cc} : V_p > V_N$

(KCL  $V_p$ ):  $\frac{V_{env} - V_p}{R_{41}} + \frac{V_{comp} - V_p}{R_{42}} = 0$

$$\frac{V_{env}}{R_{41}} - V_p \left( \frac{1}{R_{41}} + \frac{1}{R_{42}} \right) + \frac{V_{cc}}{R_{42}} = 0$$

(KCL  $V_N$ ): "potenciómetro al revés"

$$V_{cc} \cdot \frac{\frac{1}{2} \cdot 10k}{\frac{1}{2} \cdot 10k + \frac{1}{2} \cdot 10k} = \frac{V_{cc}}{2} = V_N //$$

$$V_p = \frac{V_{env} \cdot R_{42} + V_{cc} \cdot R_{41}}{R_{42} + R_{41}} //$$

$$V_p > V_N \rightarrow \frac{V_{AV} \cdot R_{42} + V_{CC} \cdot R_{41}}{R_{42} + R_{41}} > \frac{V_{CC}}{2}$$

$$\frac{V_{AV} \cdot R_{42}}{R_{42} + R_{41}} > V_{CC} \left( \frac{1}{2} - \frac{R_{41}}{R_{42} + R_{41}} \right) = V_{CC} \left( \frac{R_{42} + R_{41} - R_{41} \cdot 2}{(R_{42} + R_{41})^2} \right)$$

$$\hookrightarrow V_{AV} \cdot R_{42} > V_{CC} \frac{R_{42} - R_{41}}{2} \rightarrow V_{AV} > V_{CC} \frac{R_{42} - R_{41}}{2 R_{41}} = 5,802V$$

$$V_{AV} > 5,802V //$$

SAT  $\ominus$   $V_{COMP} = V_{SAT} \approx 0 ; V_p < V_N$

$$(KCL V_p): V_p = \frac{R_{42}}{R_{41} + R_{42}} V_{AV}$$

$$(KCL V_N): \frac{V_{CC}}{2} = V_N$$

$$\left. \begin{array}{l} V_N > V_p \rightarrow \frac{V_{CC}}{2} > \frac{R_{42}}{R_{41} + R_{42}} V_{AV} \rightarrow V_{AV} < \frac{V_{CC}}{2 R_{42}} (R_{41} + R_{42}) = 6,198V \end{array} \right\}$$

$$V_{AV} < 6,198V //$$

Histeresi:

