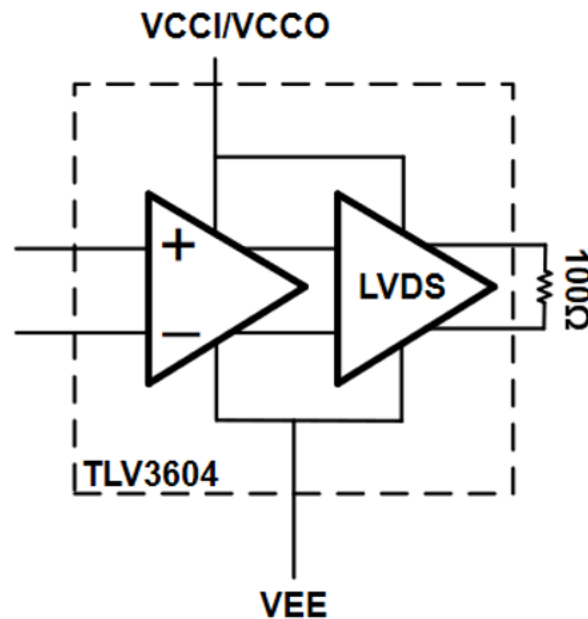
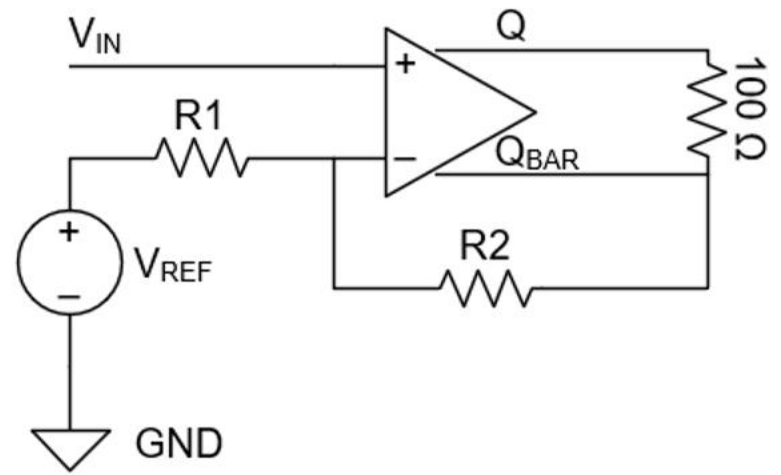
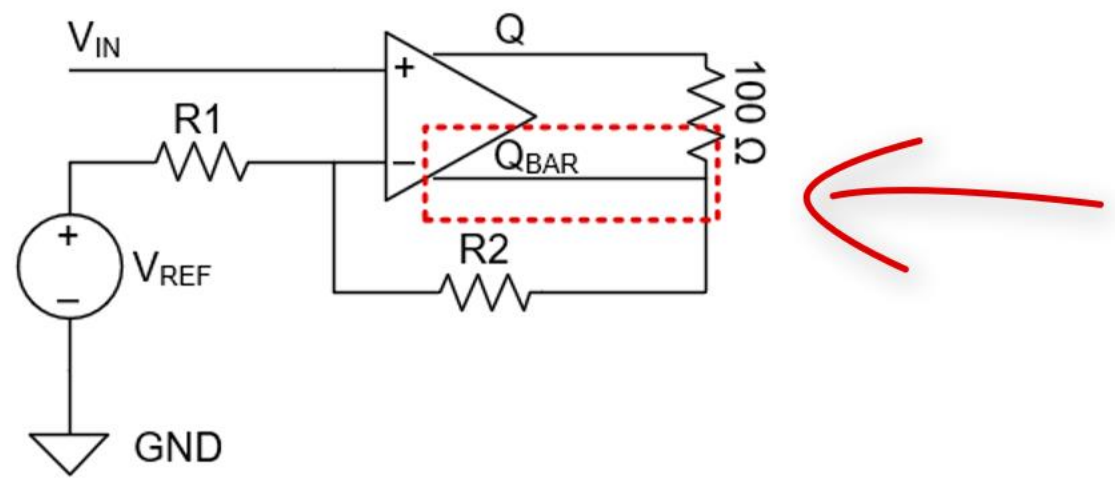
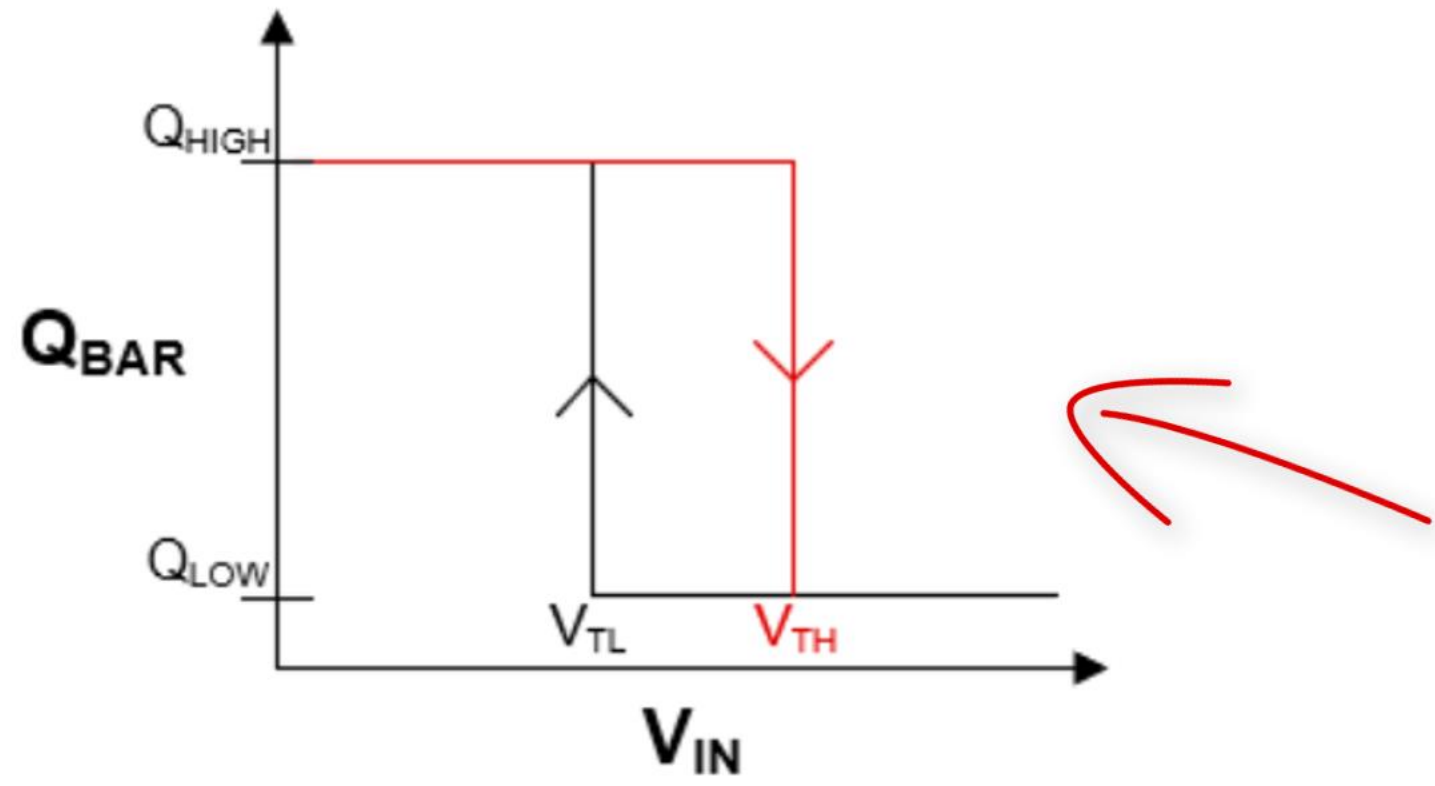


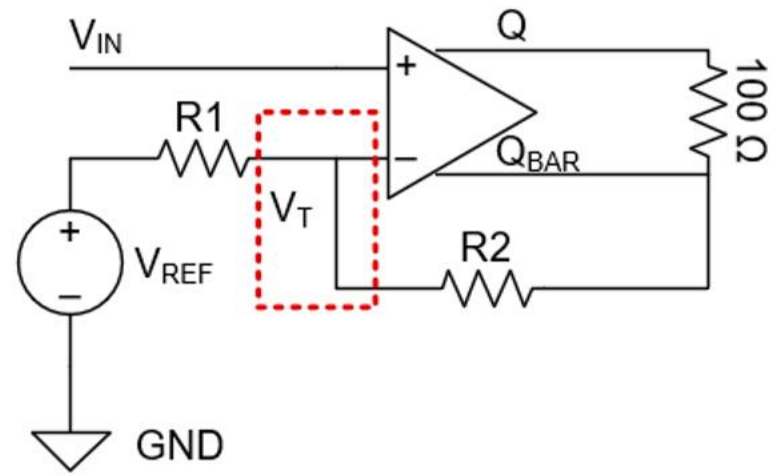
How to add external hysteresis to a high speed LVDS comparator

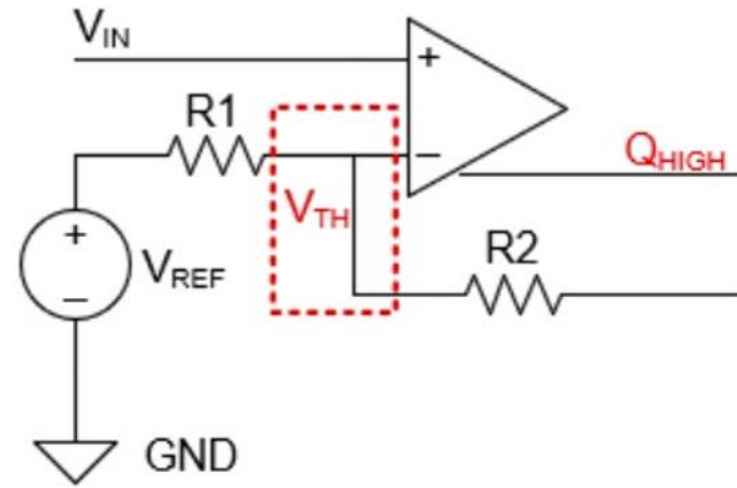
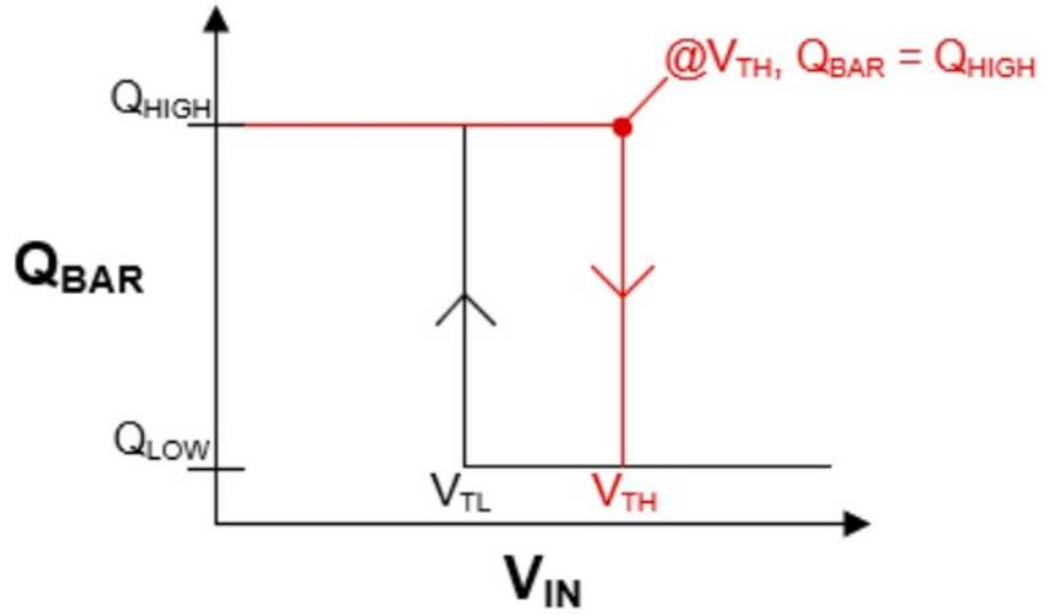




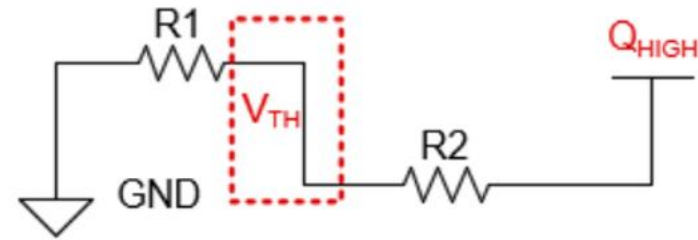
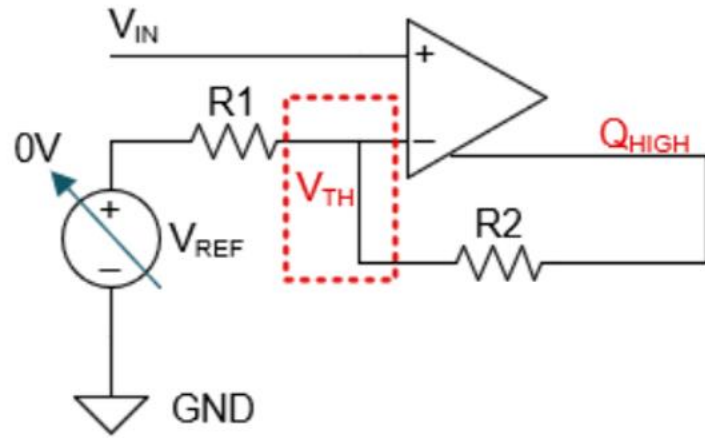






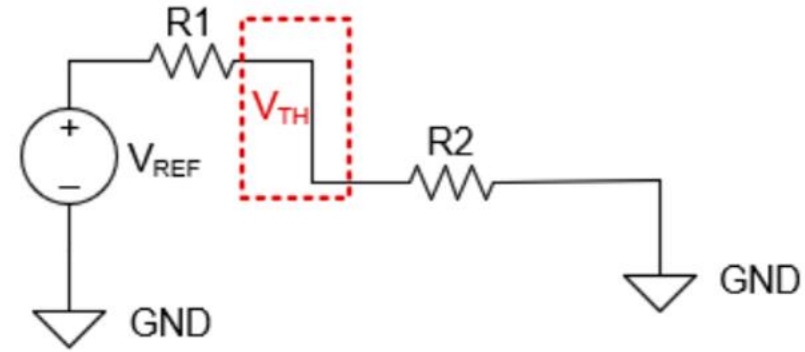
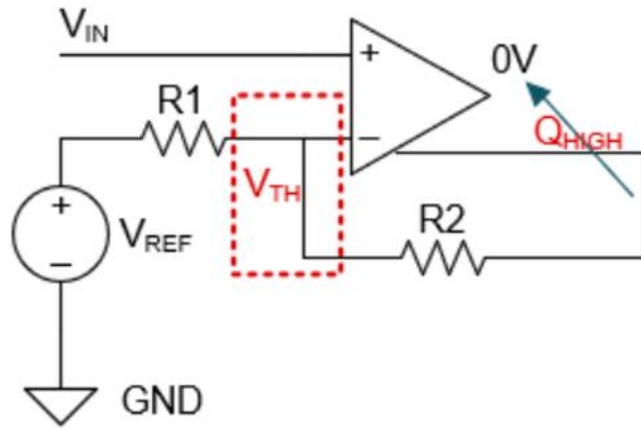


Step 1: Short V_{REF} Voltage to ground and solve for voltage contribution to V_{TH} from Q_{HIGH}

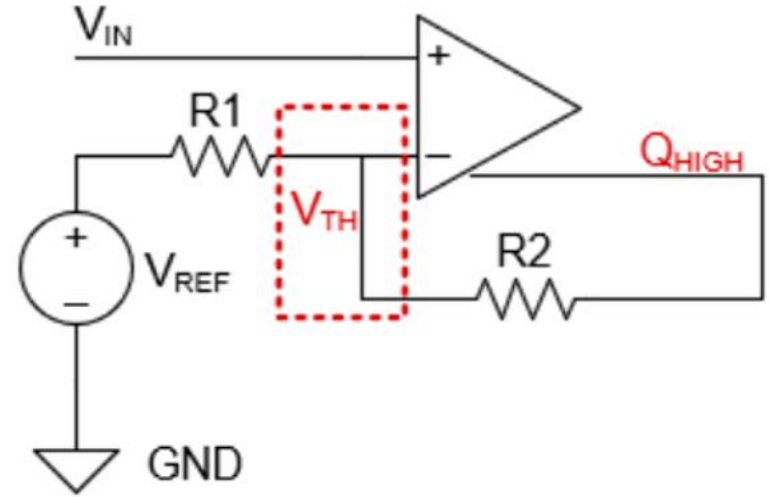
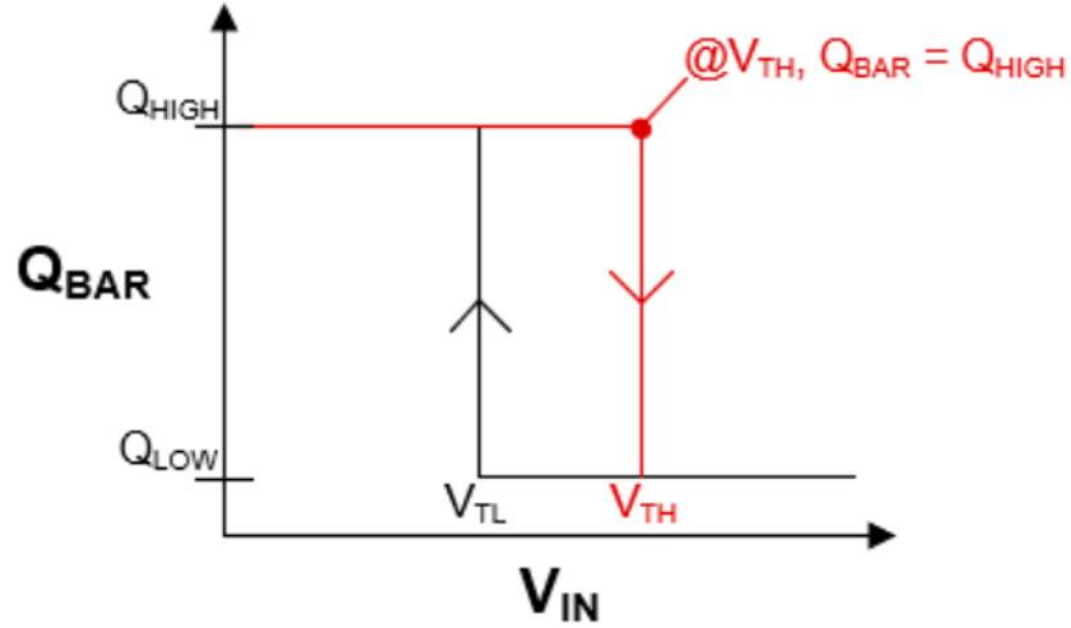


→ $V_{TH} = 0V \times \frac{R2}{R1 + R2} + Q_{HIGH} \times \frac{R1}{R1 + R2}$

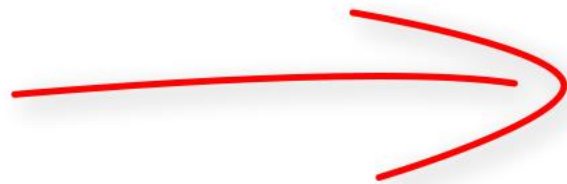
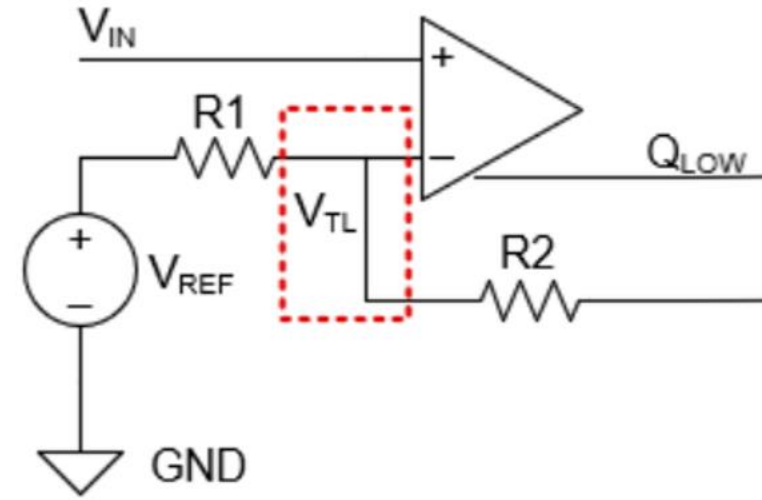
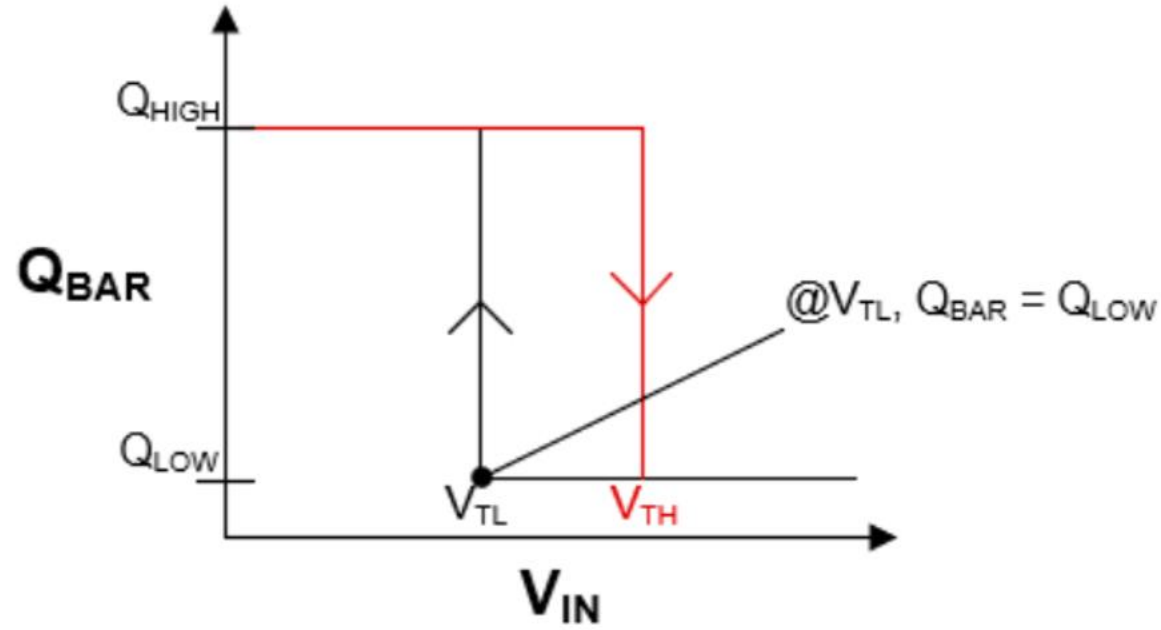
Step 2: Short Q_{HIGH} Voltage to ground and solve for voltage contribution to V_{TH} from V_{REF}



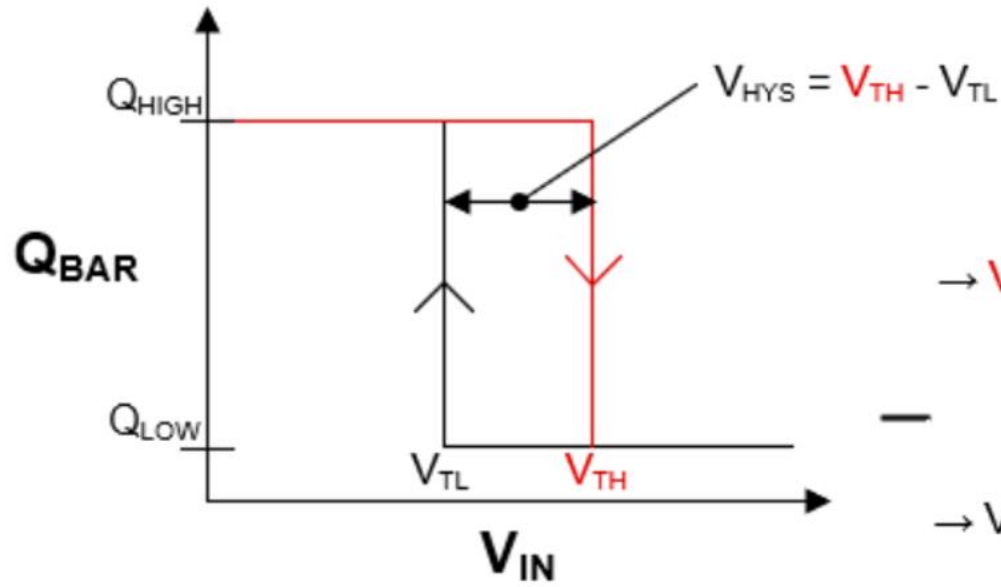
→ $V_{TH} = V_{REF} \times \frac{R2}{R1 + R2} + 0V \times \frac{R1}{R1 + R2}$



$$\rightarrow V_{\text{TH}} = V_{\text{REF}} \times \frac{R2}{R1 + R2} + Q_{\text{HIGH}} \times \frac{R1}{R1 + R2} \quad \text{Equation 1}$$



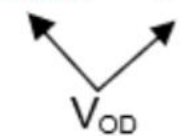
$$\rightarrow V_{\text{TL}} = V_{\text{REF}} \times \frac{R2}{R1 + R2} + Q_{\text{LOW}} \times \frac{R1}{R1 + R2} \quad \text{Equation 2}$$



$$\rightarrow V_{TH} = V_{REF} \times \frac{R2}{R1 + R2} + Q_{HIGH} \times \frac{R1}{R1 + R2} \quad \text{Equation 1}$$

$$\rightarrow V_{TL} = V_{REF} \times \frac{R2}{R1 + R2} + Q_{LOW} \times \frac{R1}{R1 + R2} \quad \text{Equation 2}$$

$$\rightarrow V_{HYS} = (Q_{HIGH} - Q_{LOW}) \times \frac{R1}{R1 + R2}$$



Therefore, $V_{HYS} = (V_{OD}) \times \frac{R1}{R1 + R2}$ Equation 3



$$\rightarrow R1 = (V_{HYS}) \times \frac{R1 + R2}{V_{OD}}$$

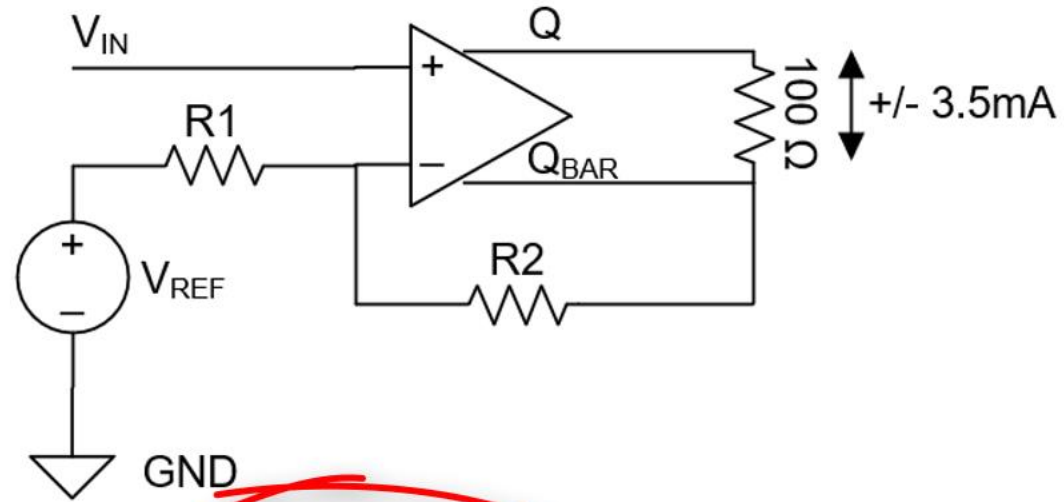
$$\rightarrow R1 = \frac{\frac{V_{HYS} \times R2}{V_{OD}}}{1 - \frac{V_{HYS}}{V_{OD}}}$$

$$\rightarrow R1 = \frac{R2}{\frac{V_{OD}}{V_{HYS}} - 1}$$

$$\rightarrow V_{TH} = V_{REF} \times \frac{R2}{R1 + R2} + Q_{HIGH} \times \frac{R1}{R1 + R2} \quad \text{Equation 1}$$

$$\rightarrow V_{TL} = V_{REF} \times \frac{R2}{R1 + R2} + Q_{LOW} \times \frac{R1}{R1 + R2} \quad \text{Equation 2}$$



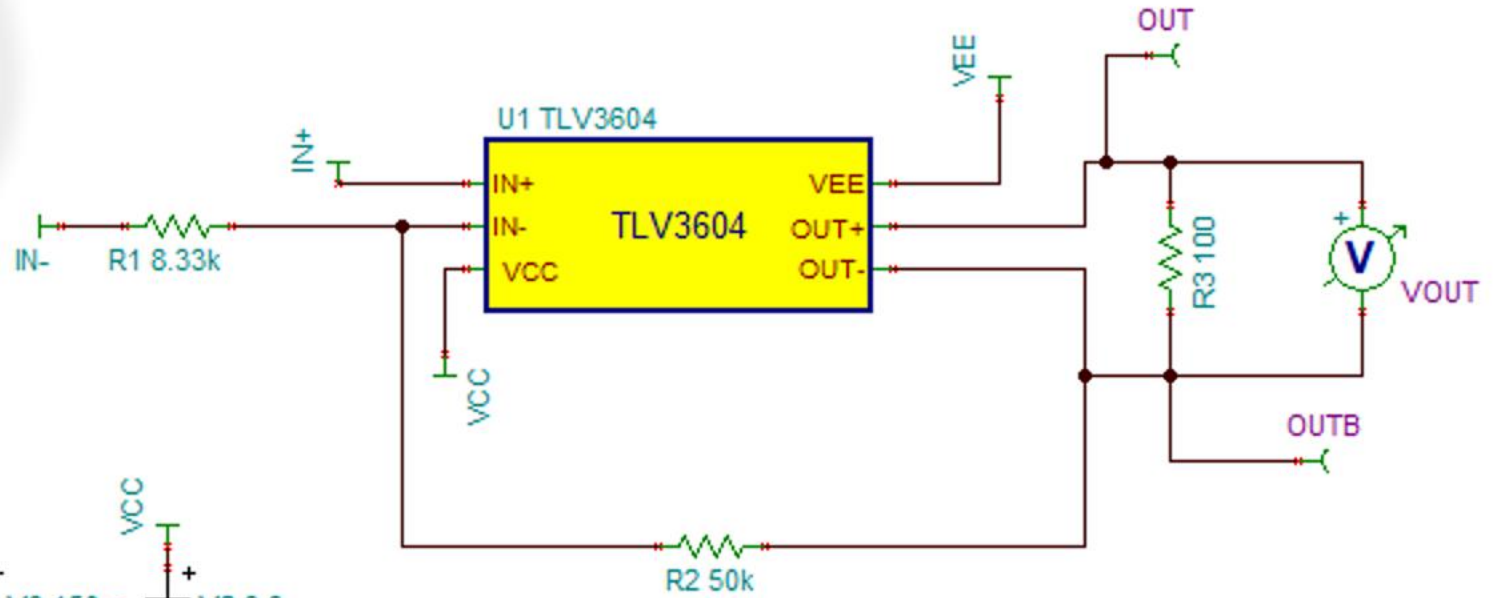
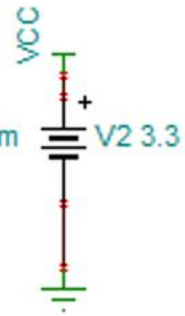
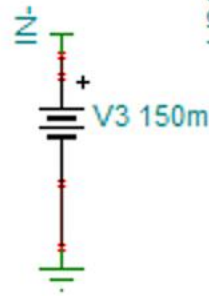
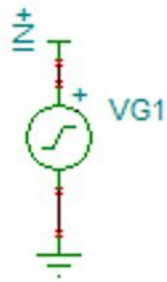
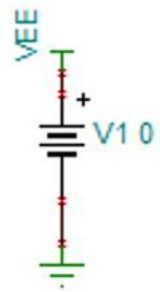


$$\rightarrow 35\mu\text{A} > \frac{V_{CM}}{R2}$$

$$\rightarrow R2 > \frac{V_{CM}}{35\mu\text{A}}$$

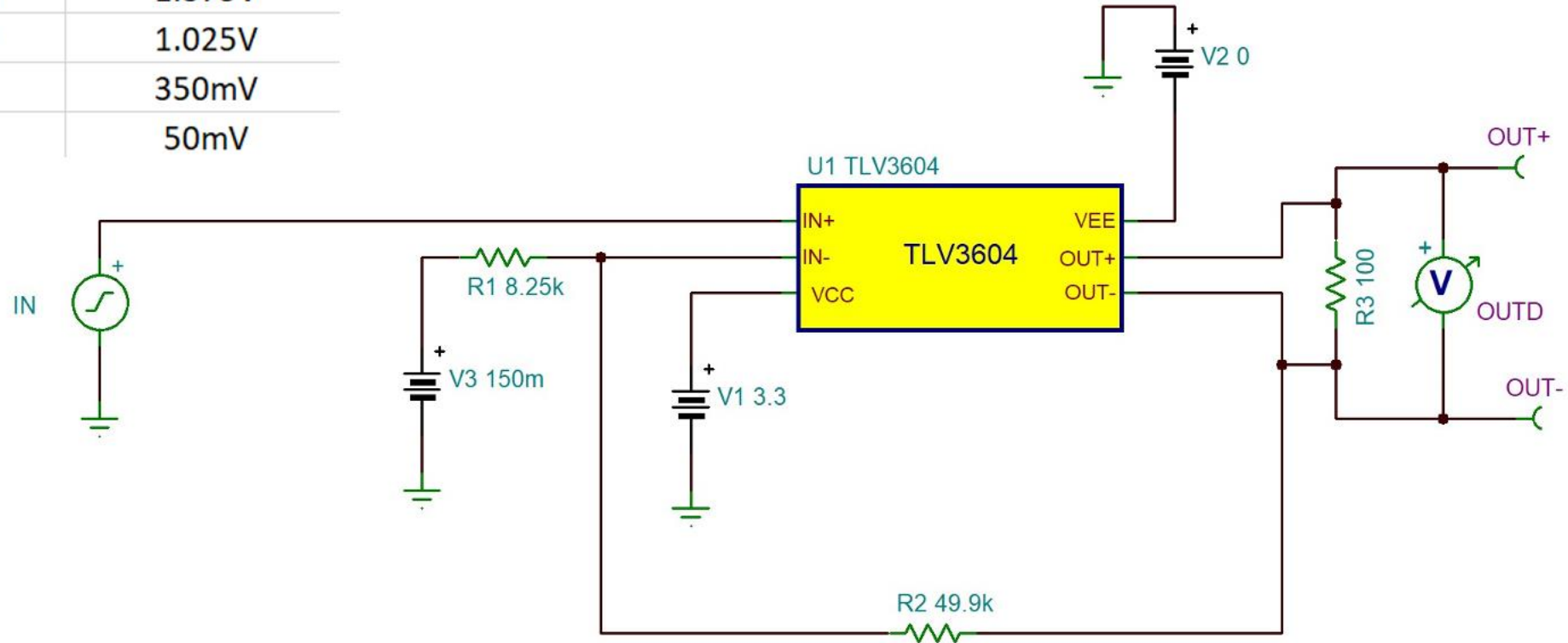
Example Design Parameters

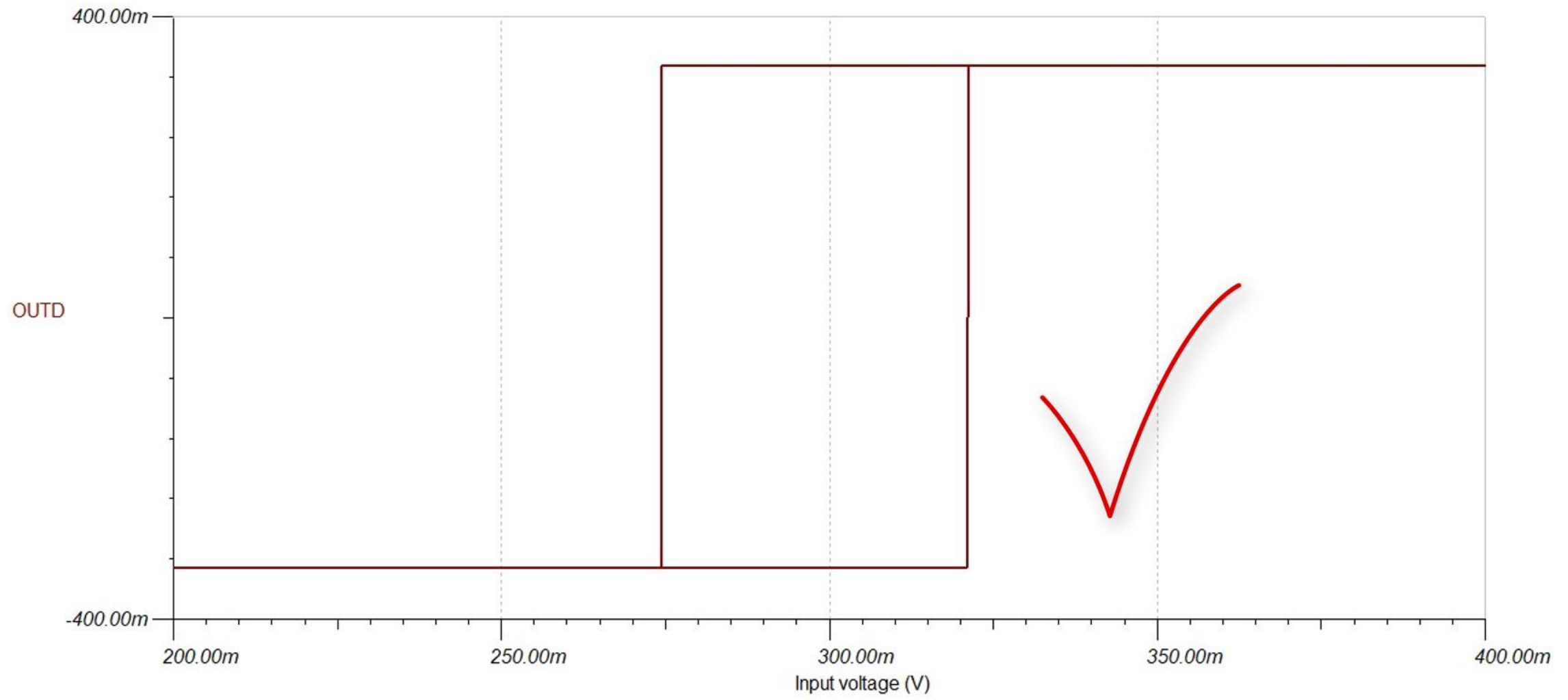
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VTL	275mV
VTH	325mV
QHIG	1.375V
QLOW	1.025V
VOD	350mV
VHYS	50mV



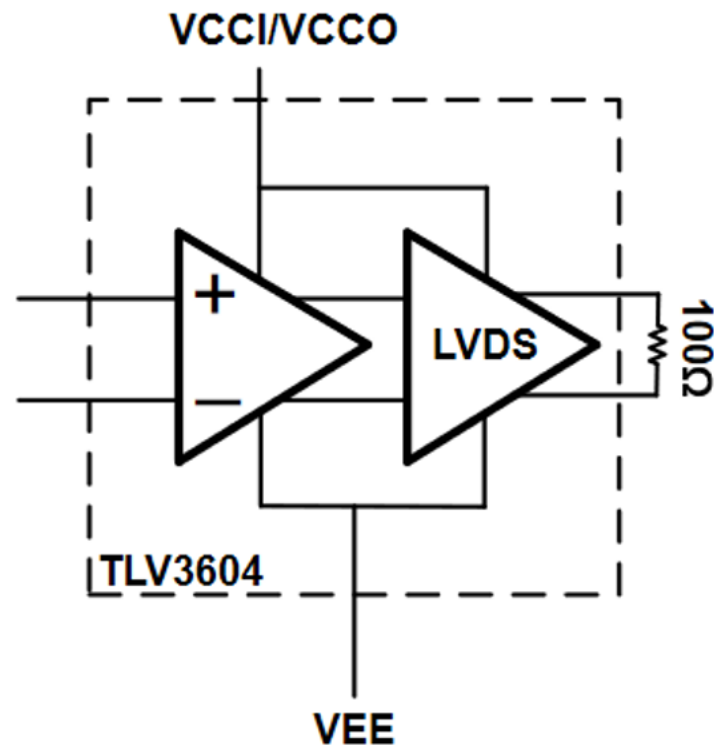
Example Design Parameters

R2	50k
VTL	275mV
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VOD	350mV
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Conclusions



<https://www.ti.com/product/TLV3604>

Conclusions

