

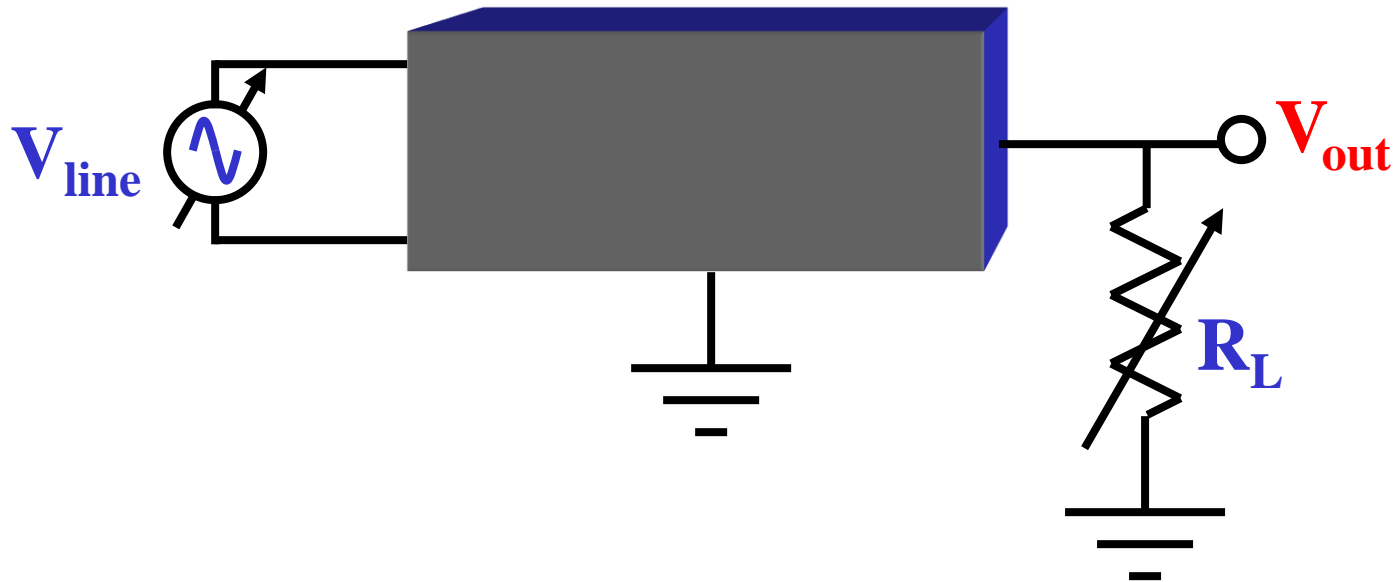
Catu Daya Teregulasi

Elektronika

(TKE 4012)

Eka Maulana

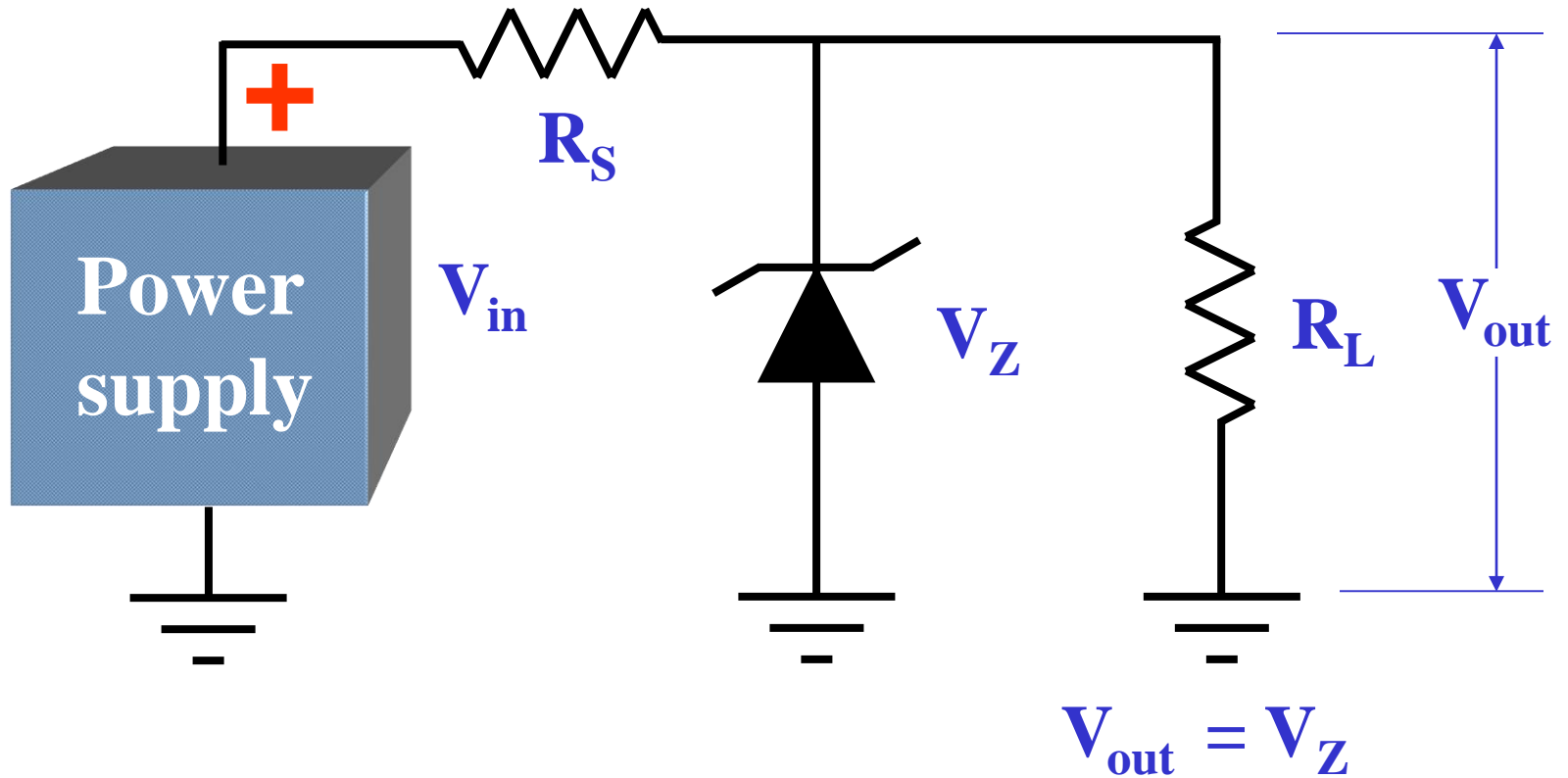
Power supply regulation



$$\text{Load regulation} = \frac{V_{\text{NL}} - V_{\text{FL}}}{V_{\text{FL}}} \times 100\%$$

$$\text{Line regulation} = \frac{V_{\text{HL}} - V_{\text{LL}}}{V_{\text{LL}}} \times 100\%$$

A zener diode shunt voltage regulator

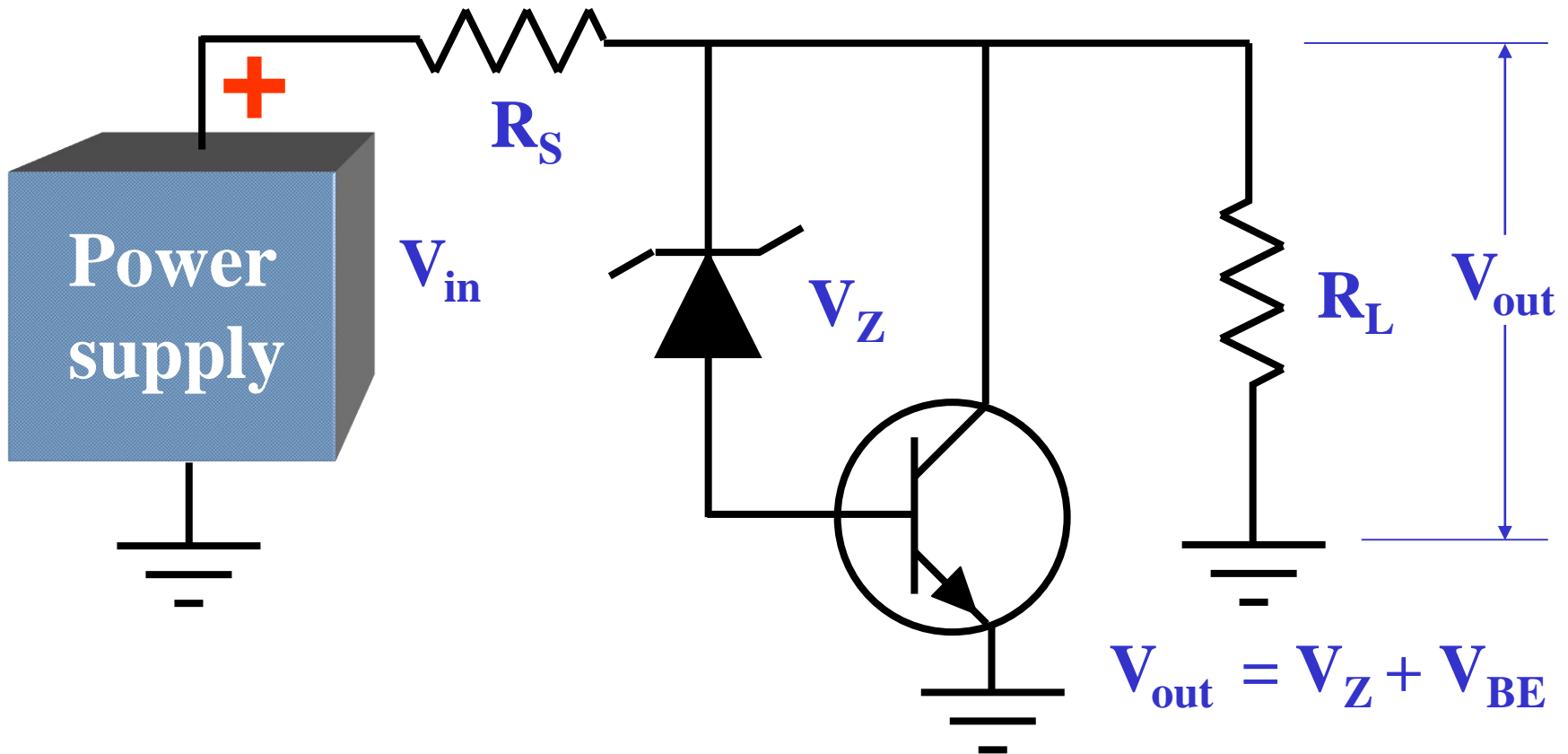


$$I_S = \frac{V_{in} - V_{out}}{R_S}$$

$$I_L = \frac{V_{out}}{R_L}$$

$$I_Z = I_S - I_L$$

Improved shunt voltage regulator

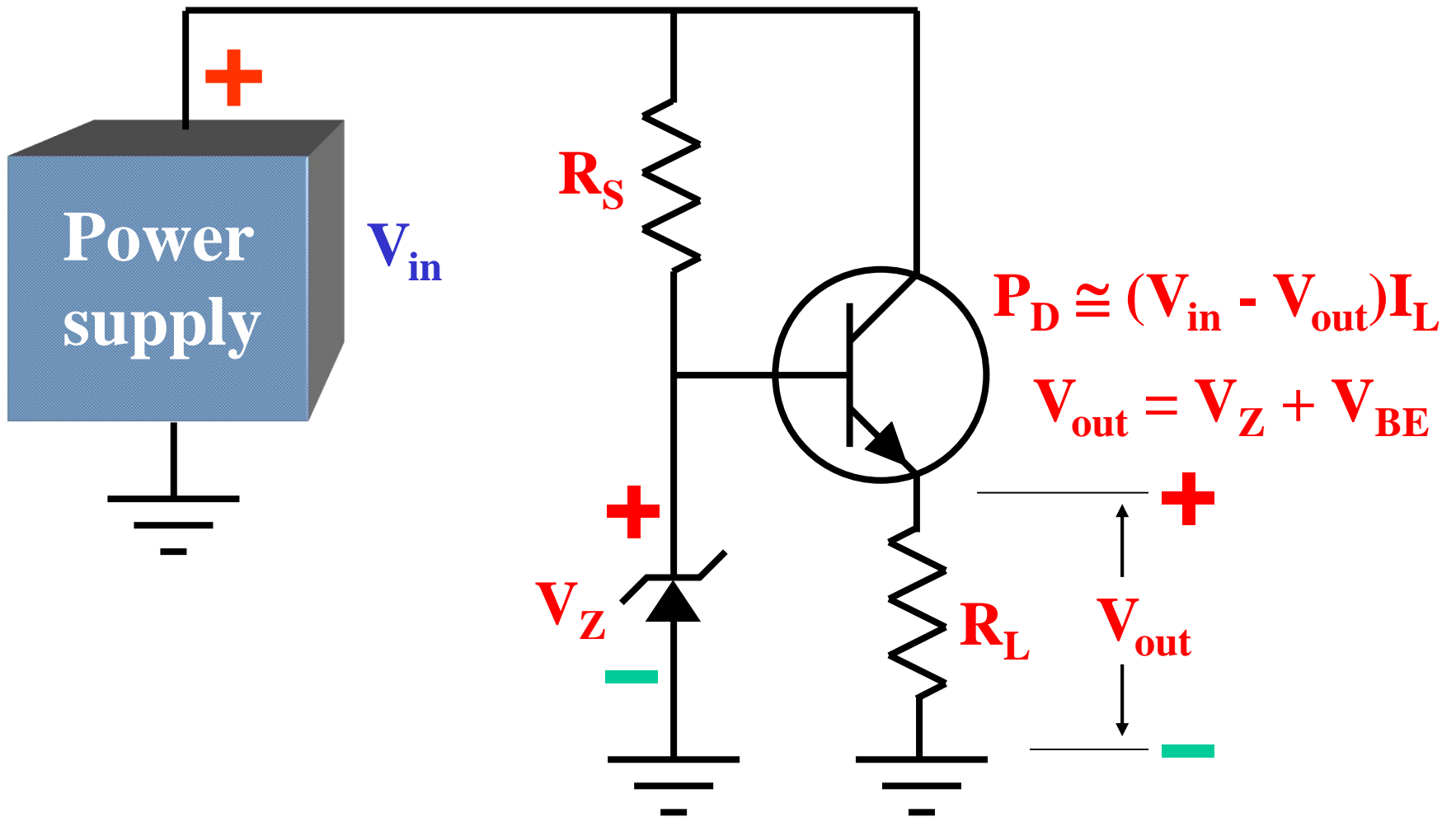


$$I_S = \frac{V_{in} - V_{out}}{R_S}$$

$$I_L = \frac{V_{out}}{R_L}$$

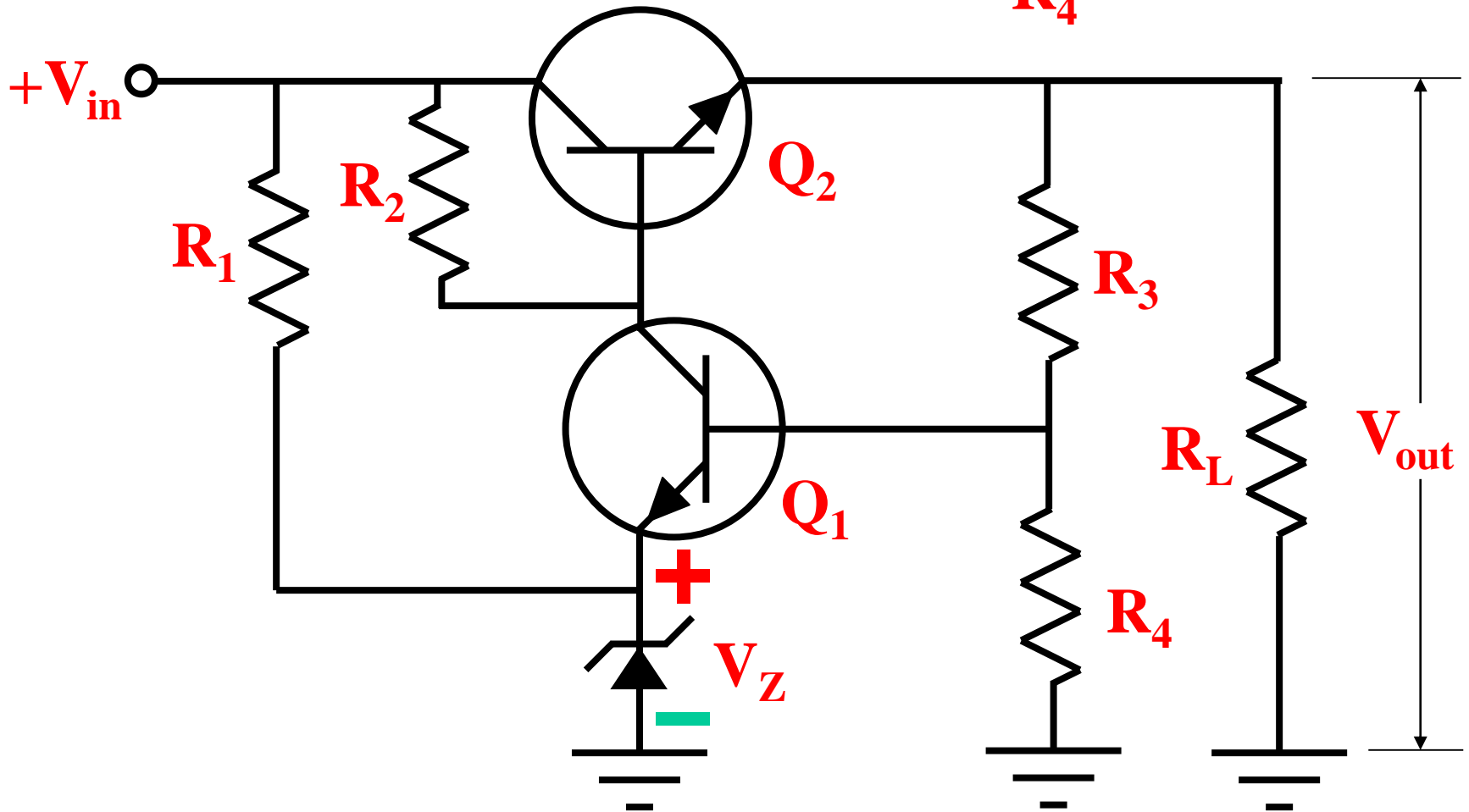
$$I_C \approx I_S - I_L$$

Zener follower is a series voltage regulator.



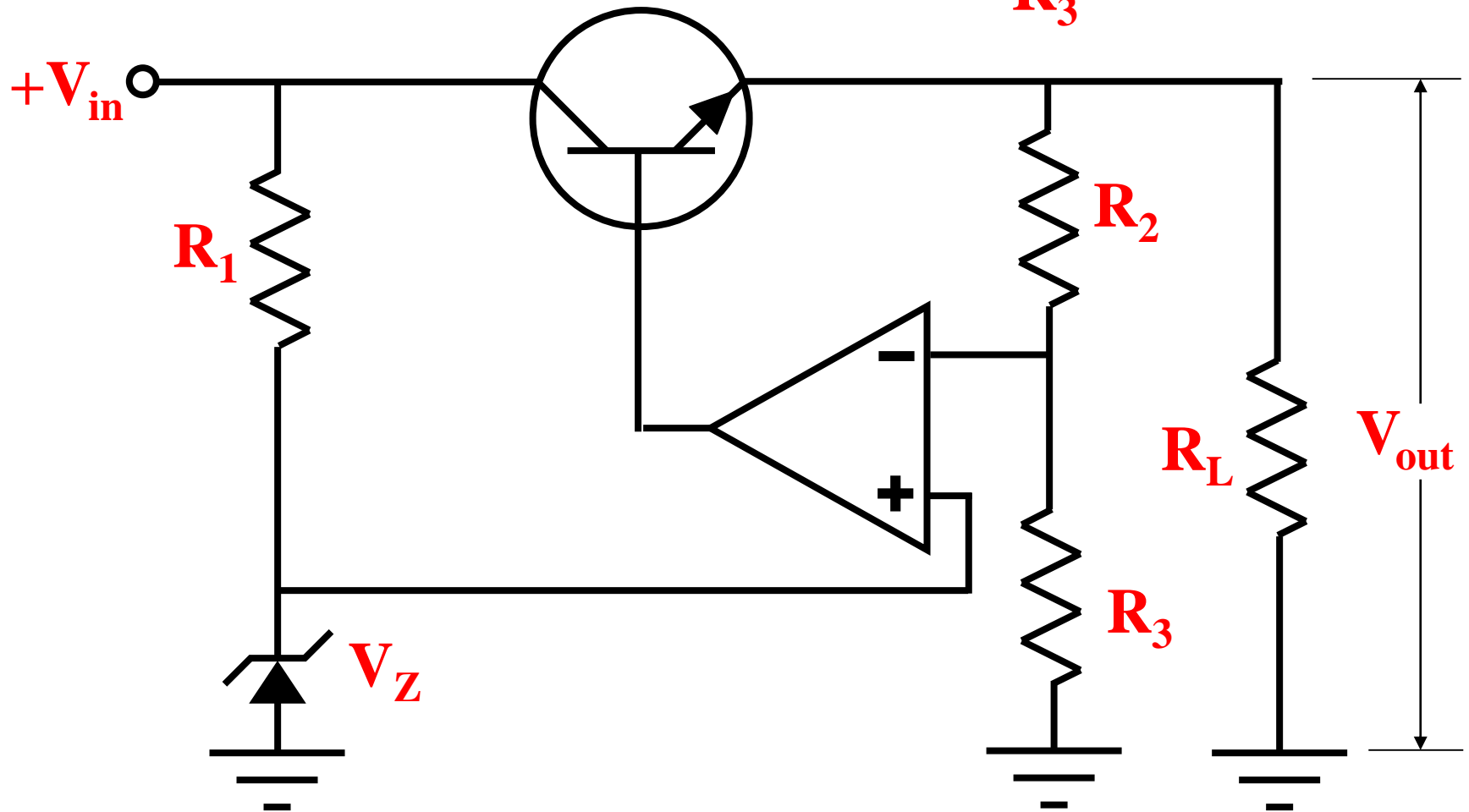
Two-transistor voltage regulator

$$V_{\text{out}} = \frac{R_3 + R_4}{R_4} (V_Z + V_{\text{BE}})$$

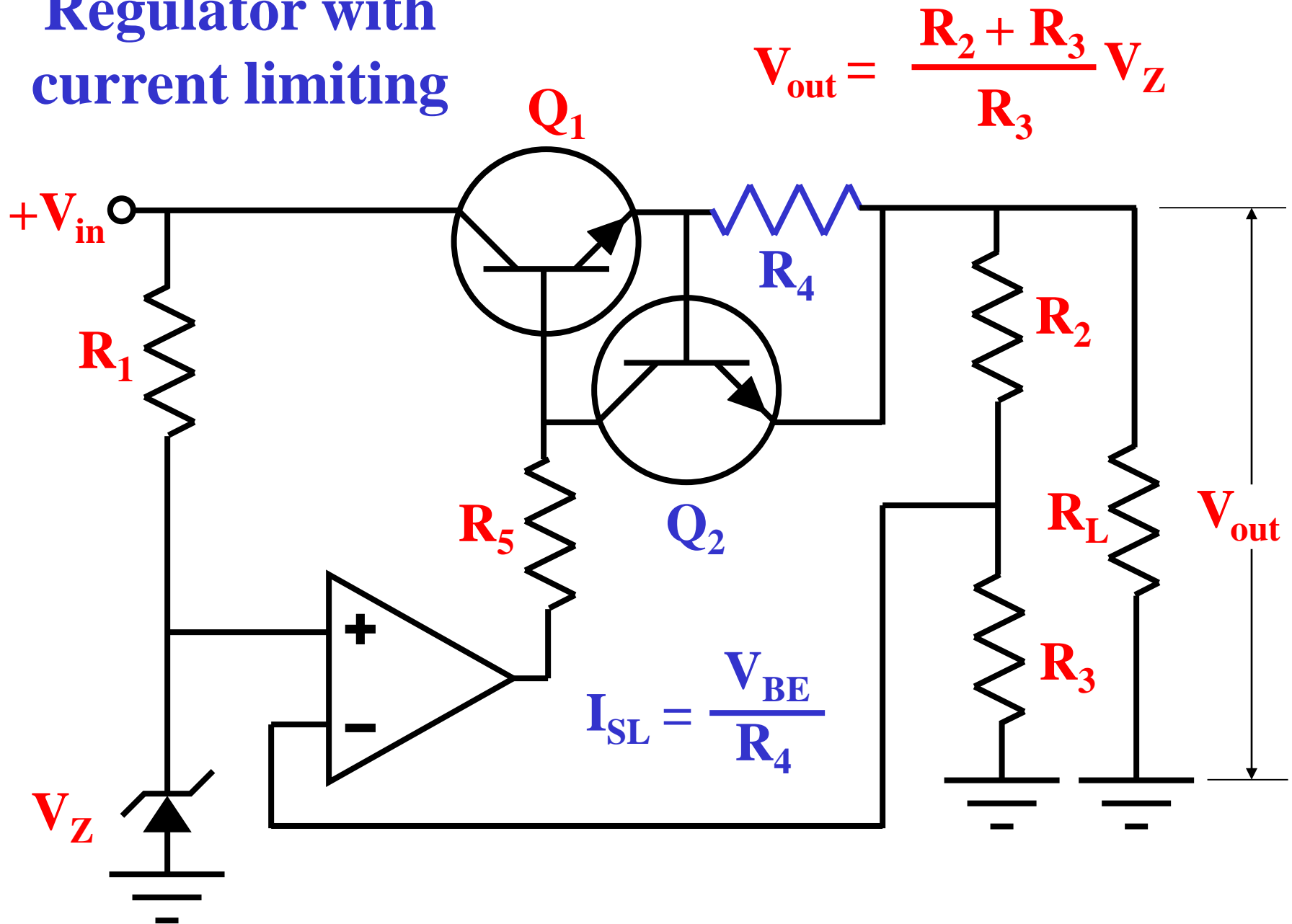


Improved voltage regulator

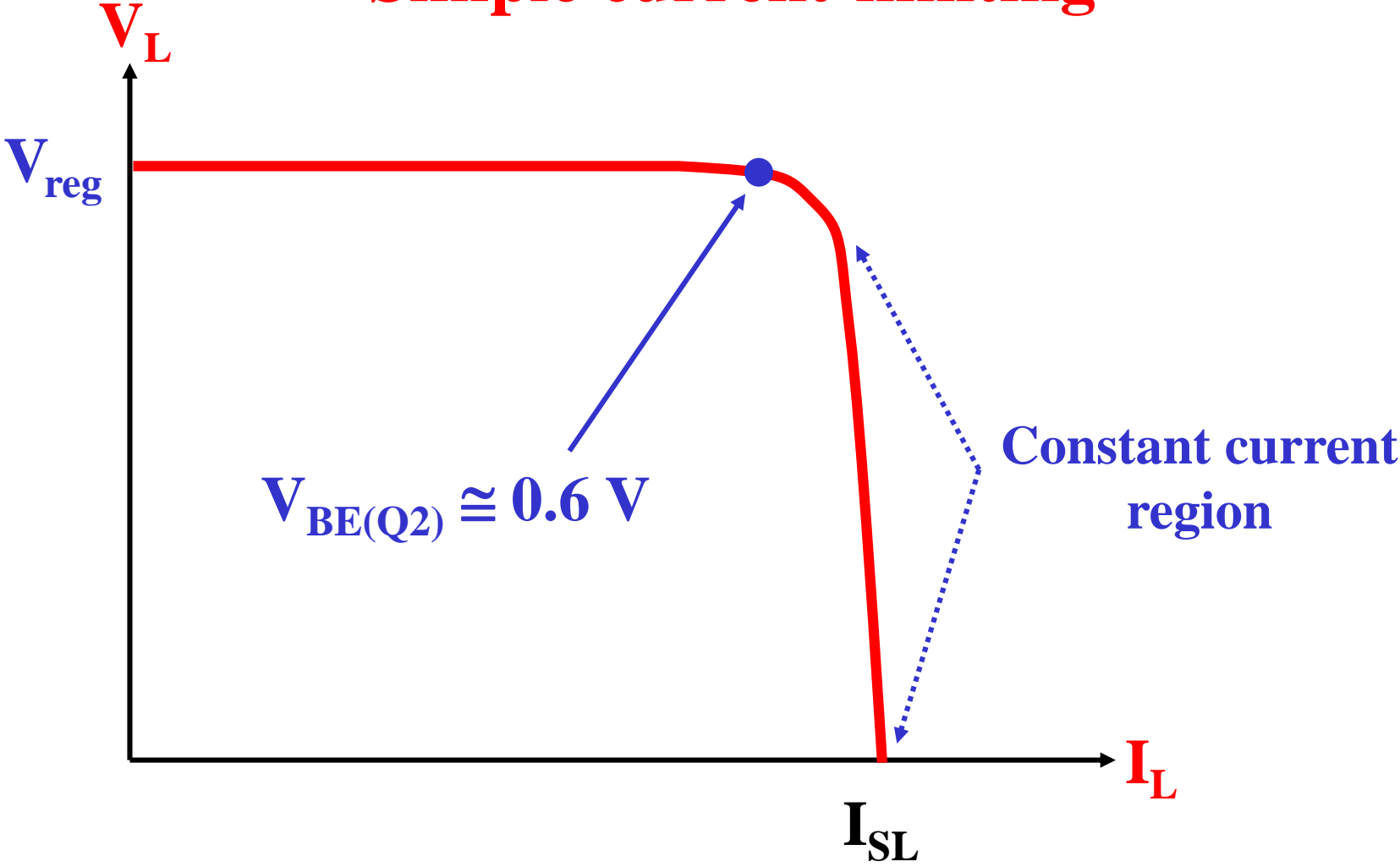
$$V_{\text{out}} = \frac{R_2 + R_3}{R_3} V_Z$$



Regulator with current limiting

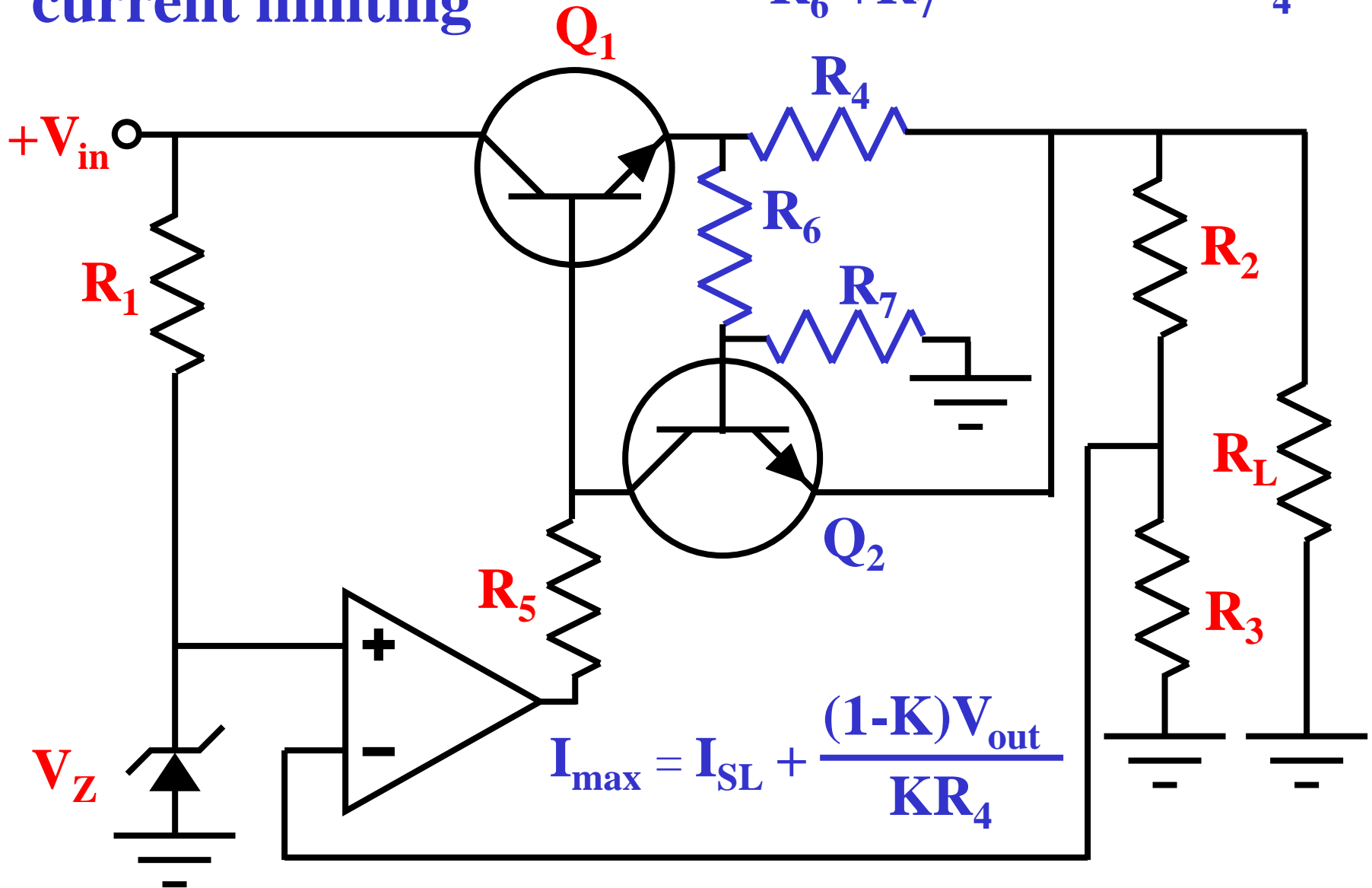


Simple current-limiting

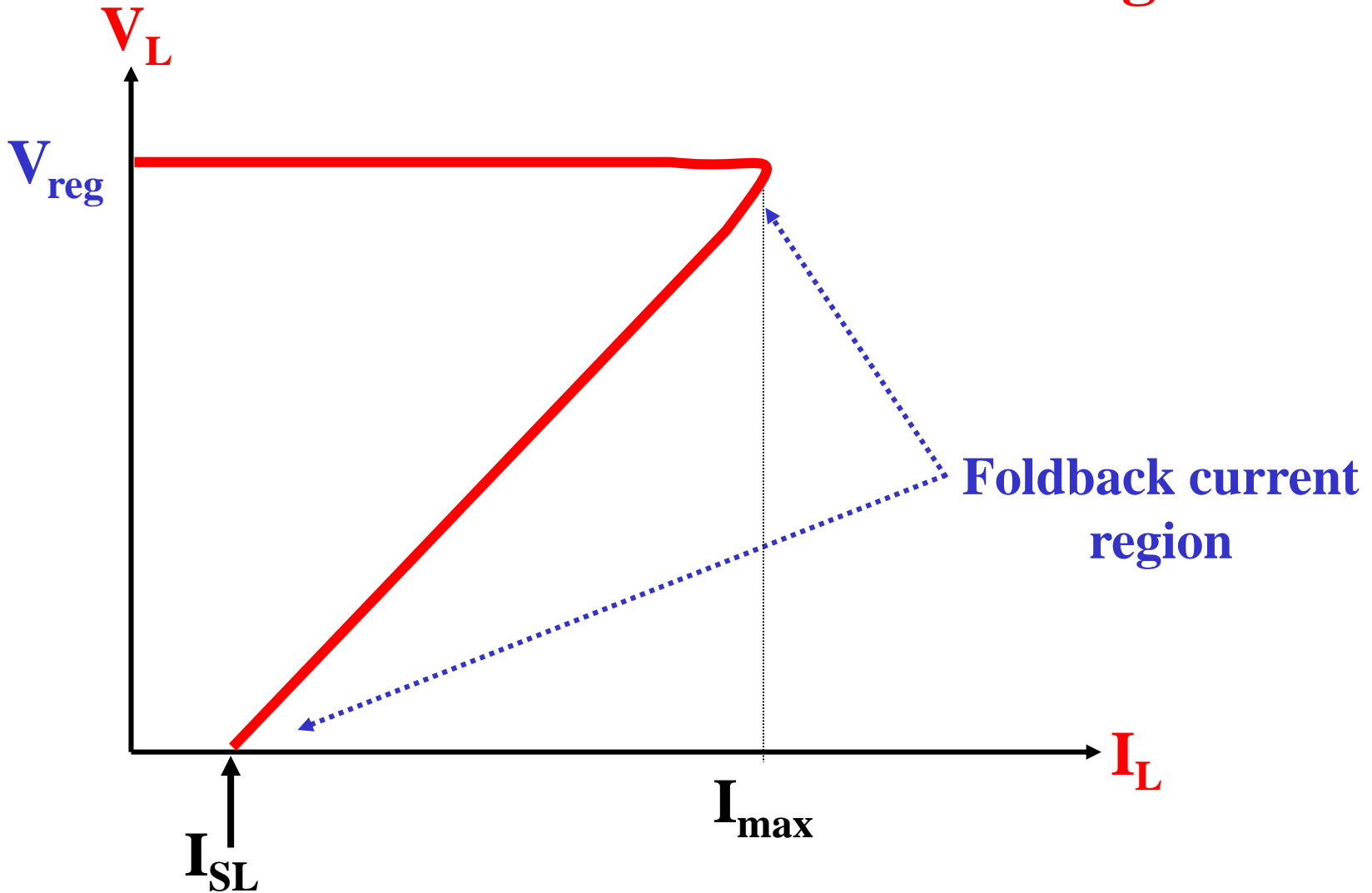


Foldback current limiting

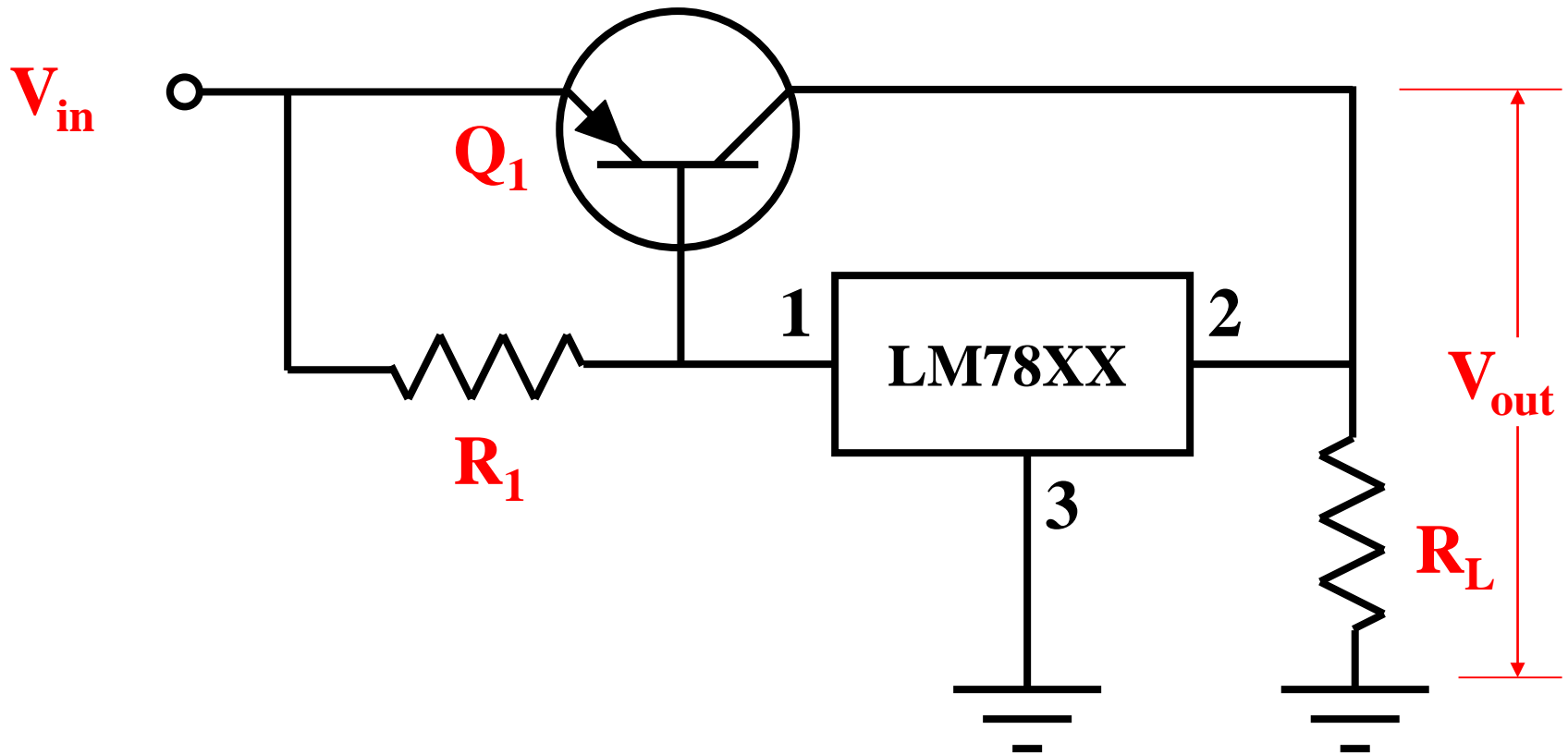
$$K = \frac{R_7}{R_6 + R_7} \quad I_{SL} = \frac{V_{BE}}{KR_4}$$



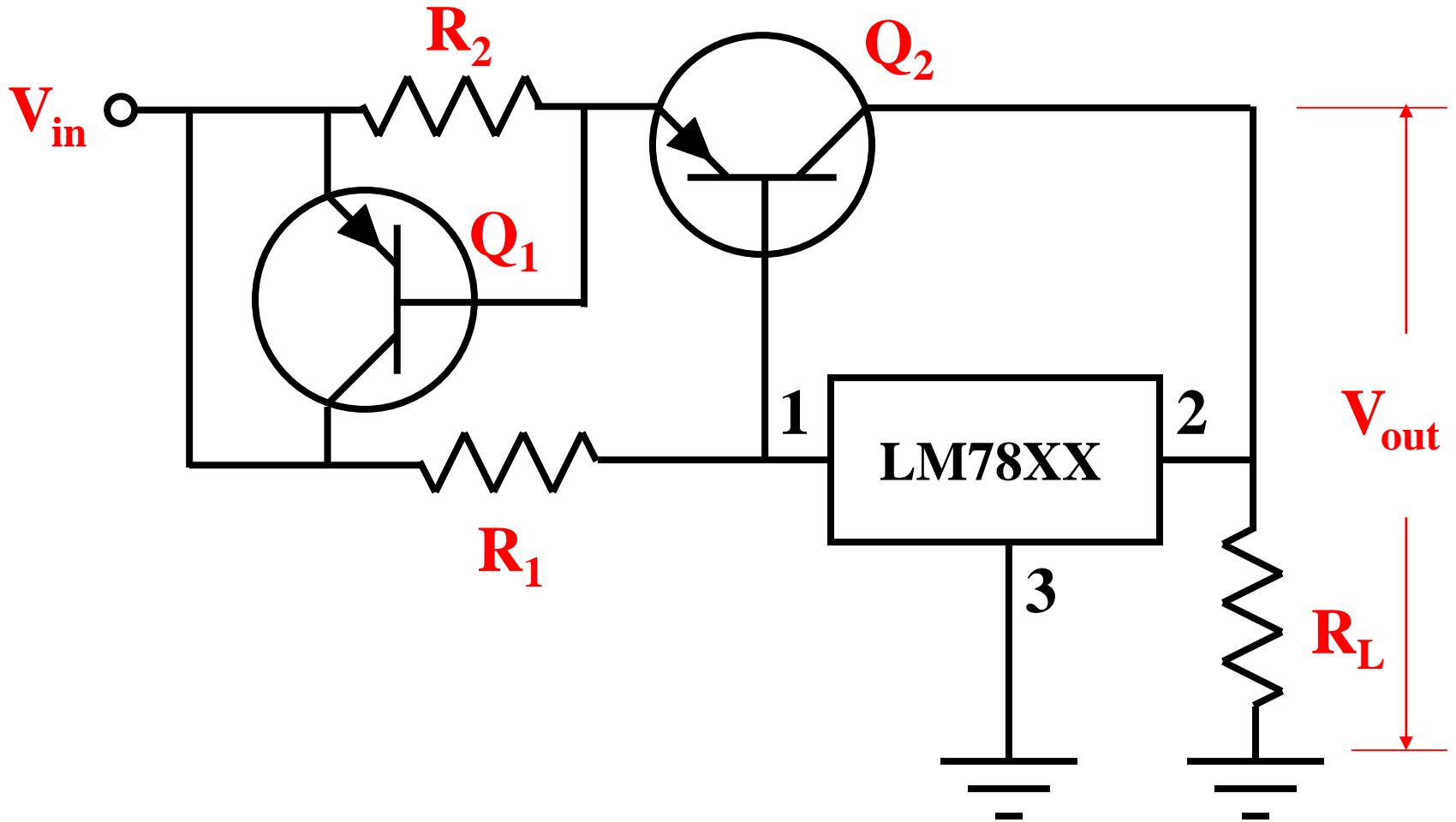
Foldback current-limiting



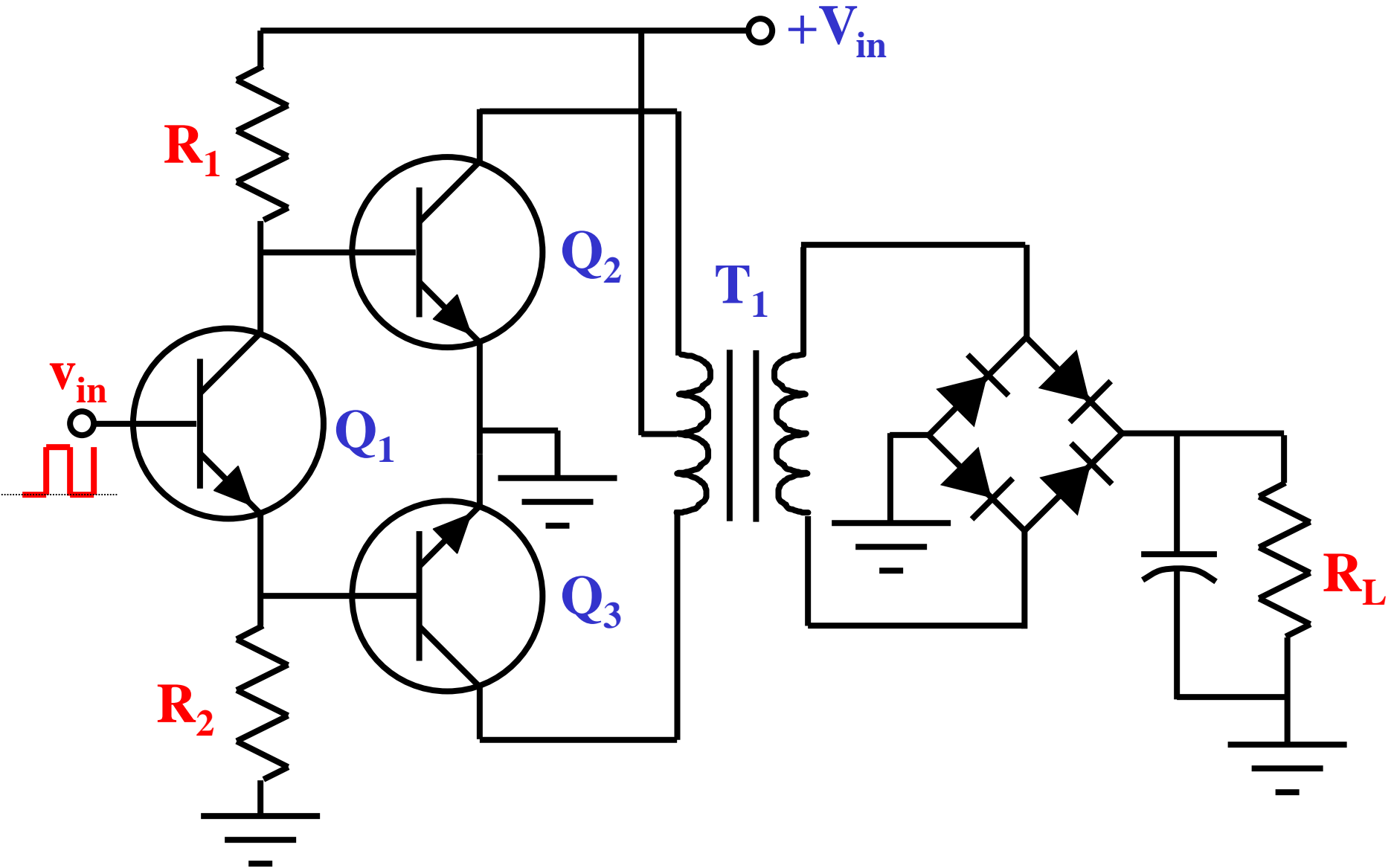
Monolithic regulator with current booster



Current booster with current limiting



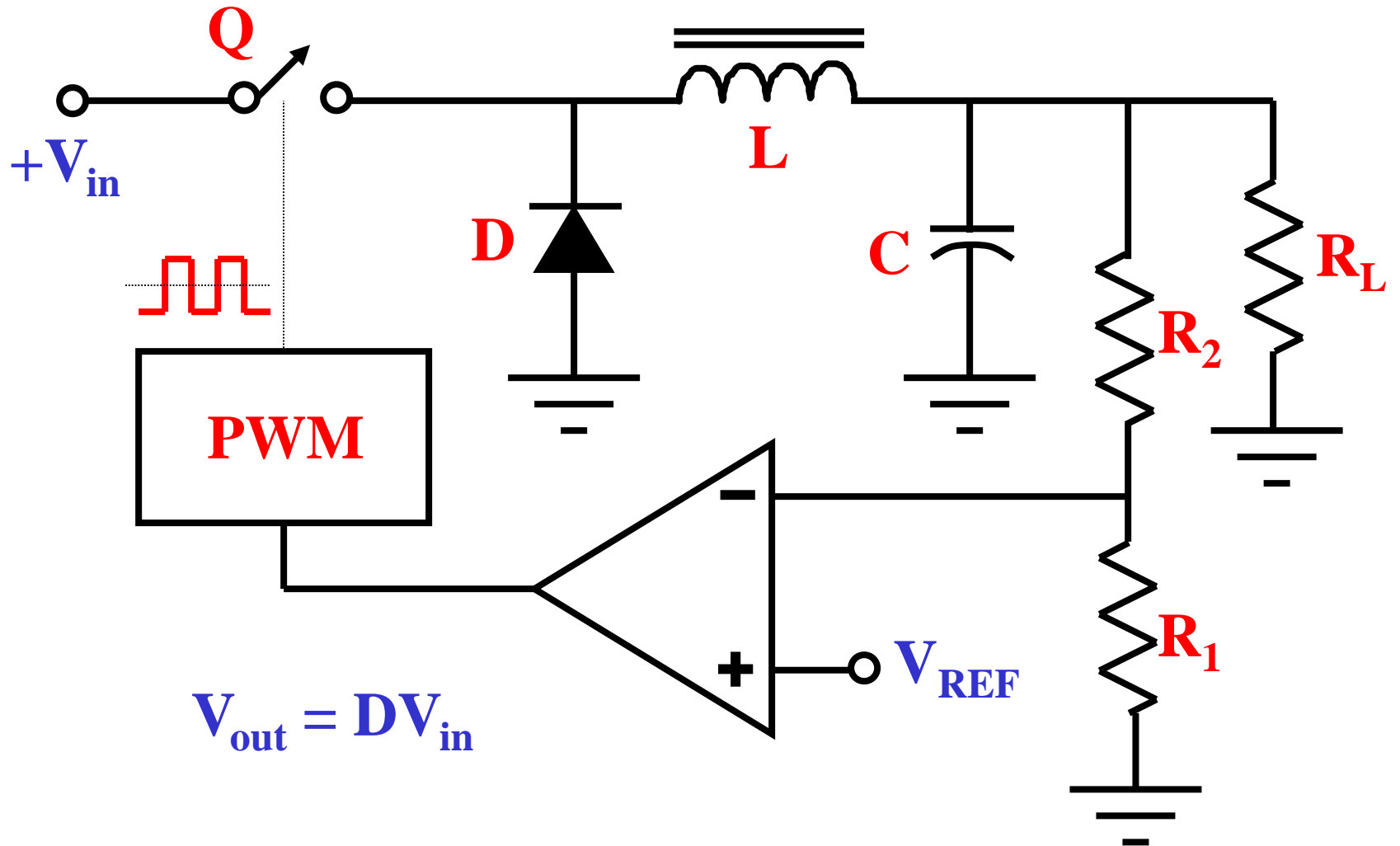
DC-to-DC converter



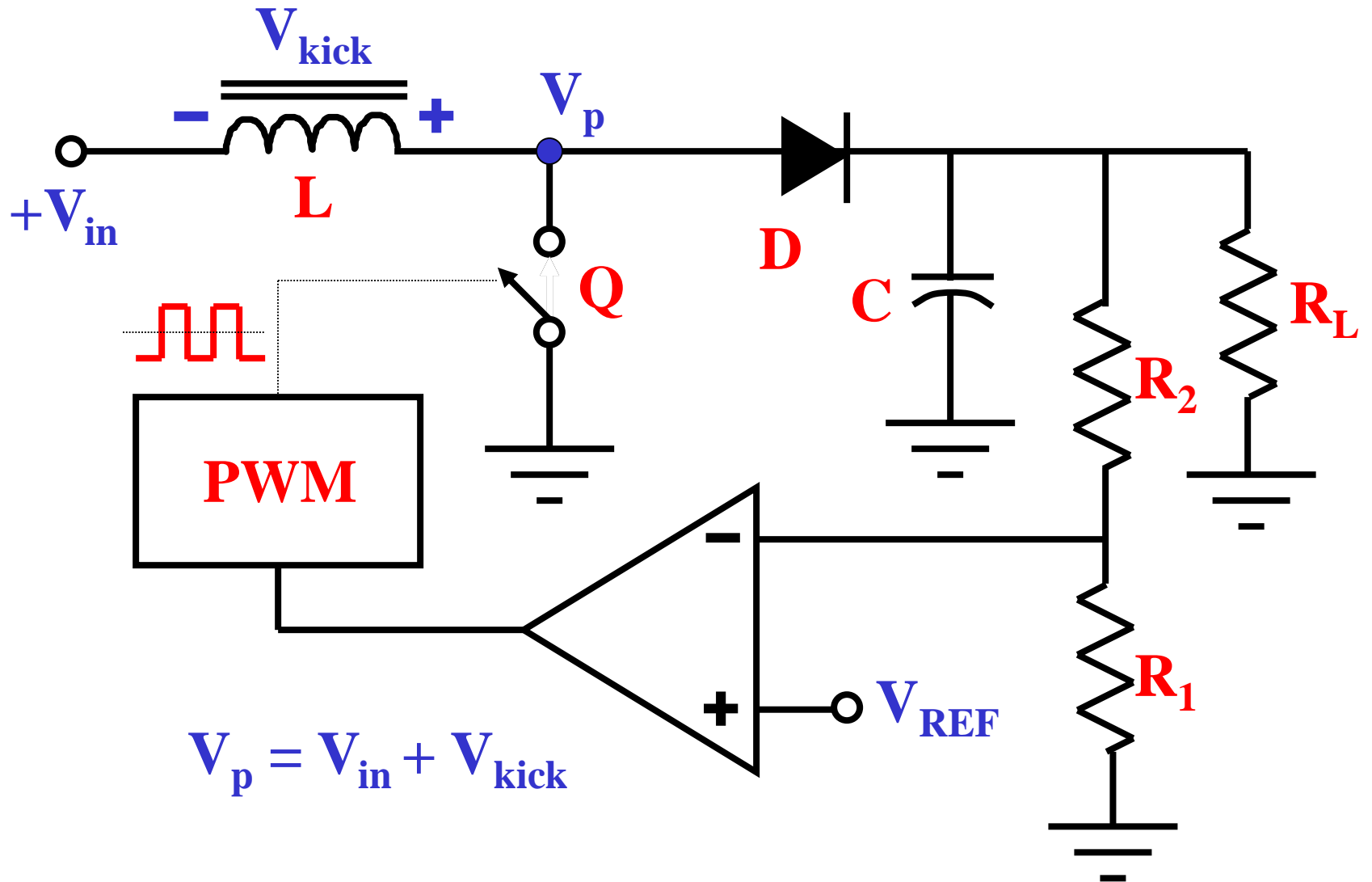
Switching regulators

- **The pass transistor is switched between cutoff and saturation.**
- **Better efficiency than linear.**
- **Topologies:**
 - **Buck: steps the voltage down**
 - **Boost: steps the voltage up**
 - **Buck-boost: inverts the input voltage**

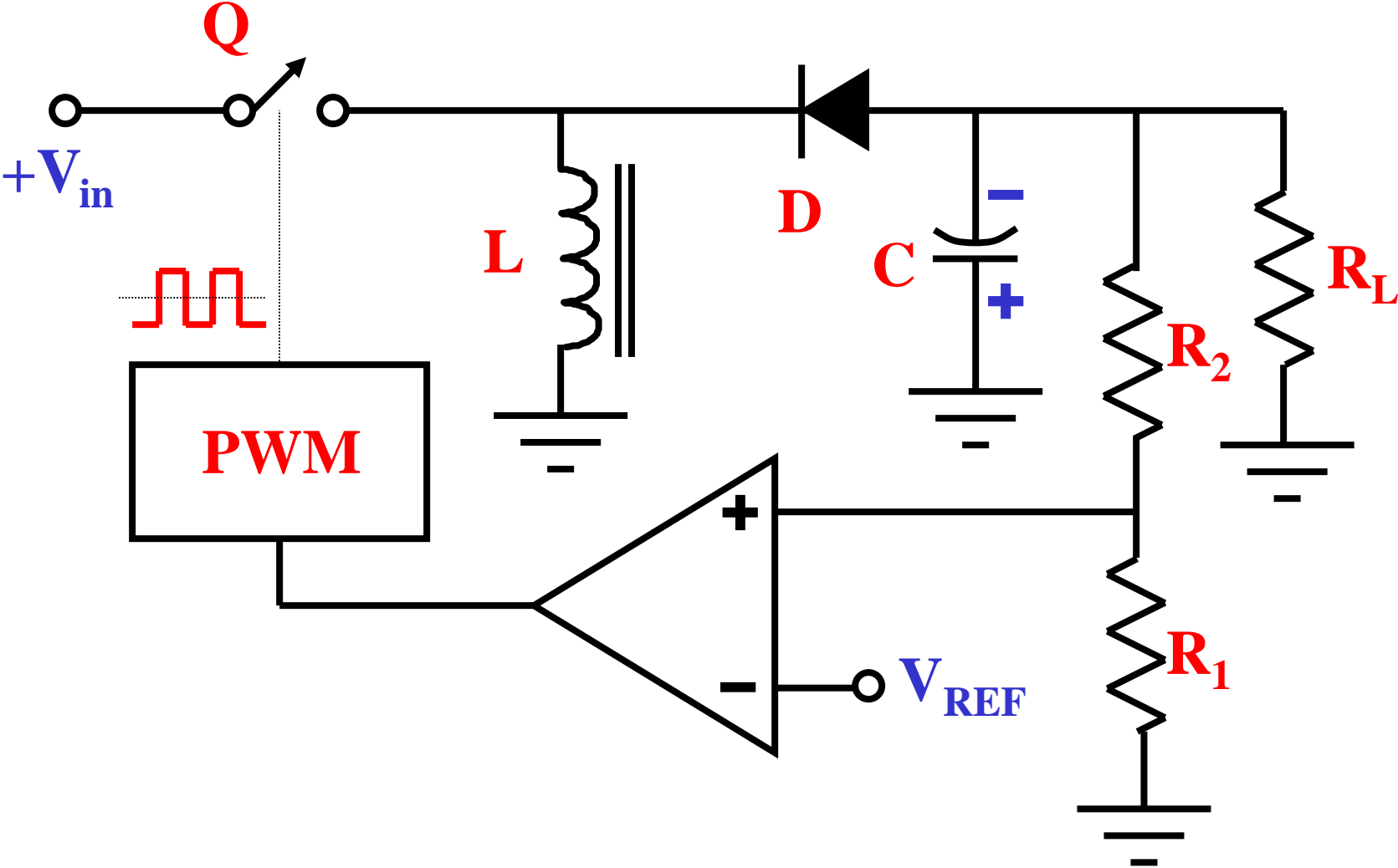
Buck regulator



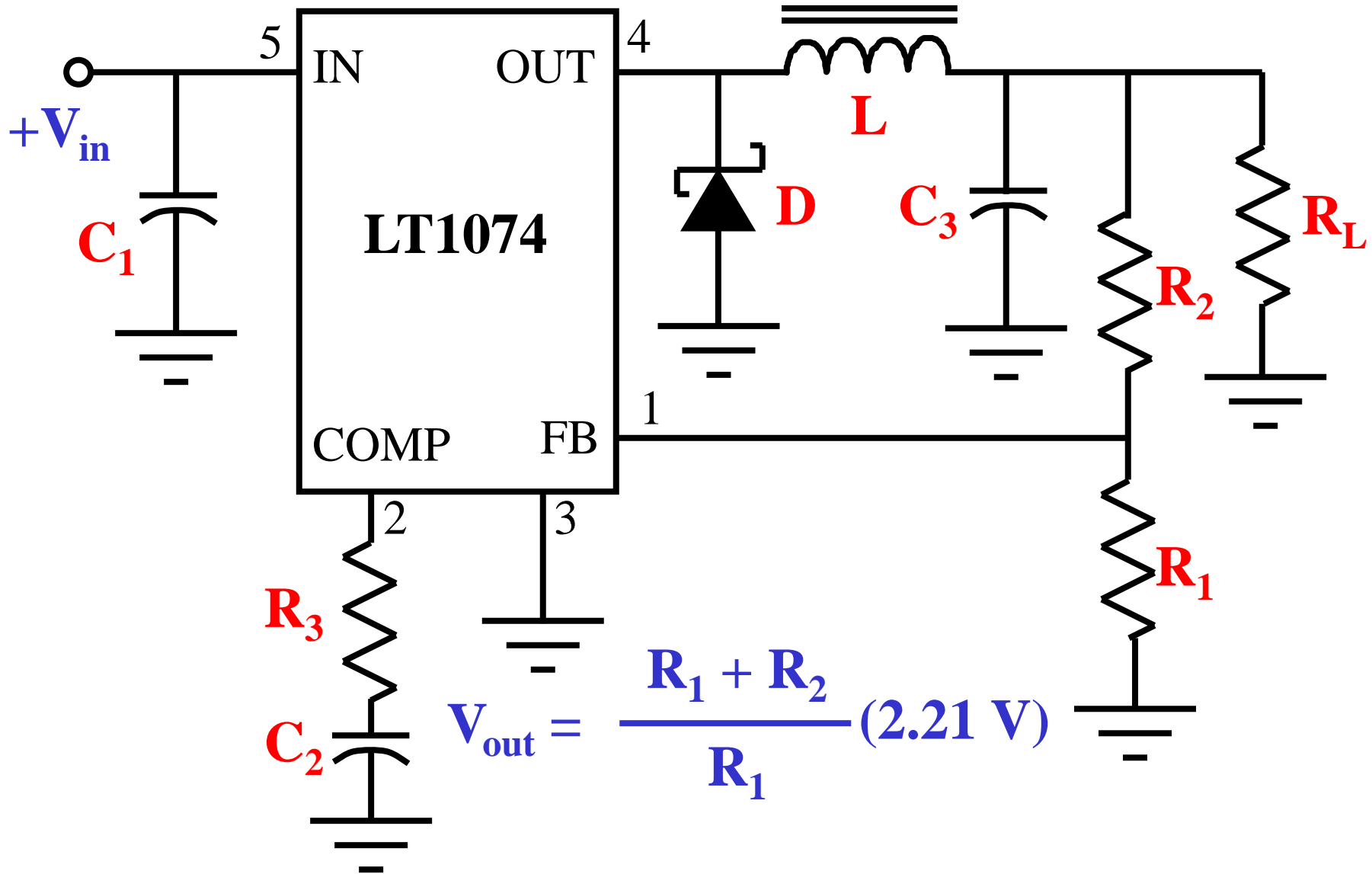
Boost regulator



Buck-boost regulator



Monolithic buck regulator



Using the charge pump of the MAX633 IC

