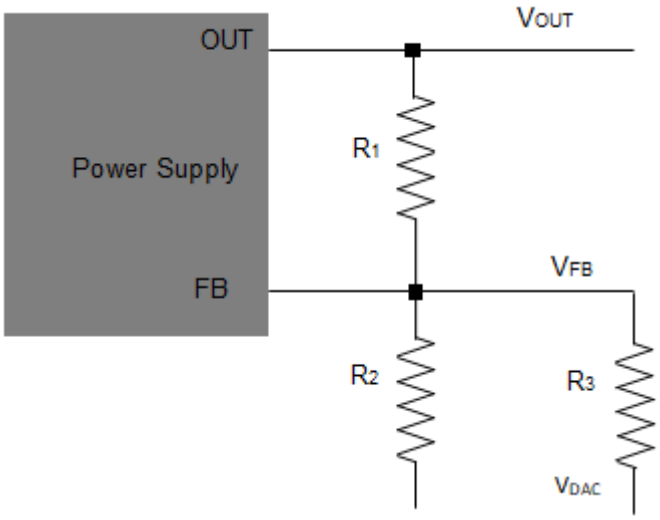
Variable Voltage Power Supply Control Input

This application will calculate the resistances R_1 and R_3 for this power supply.



Circuit equation

$$\text{circuit} := \frac{V_{OUT} - V_{FB}}{R_1} + \frac{V_{DAC} - V_{FB}}{R_3} - \frac{V_{FB}}{R_2} = 0\ \text{A}$$

Solve for V_{OUT}

$$V_{OUT} := \text{solve}\left(\text{circuit}, V_{OUT}\right)$$

$$V_{OUT} = -\frac{R_1 \cdot R_2 \cdot V_{DAC} - R_1 \cdot R_2 \cdot V_{FB} - V_{FB} \cdot R_1 \cdot R_3 - R_2 \cdot R_3 \cdot V_{FB}}{R_3 \cdot R_2}$$

Highest and lowest desired power supply voltage

$$V_{high} := 60\ \text{V} \qquad V_{low} := 20\ \text{V}$$

DAC voltage for maximum and minimum power supply voltage

$$V_{DAC\_low} := 0\ \text{V} \qquad V_{DAC\_high} := 2.5\ \text{V}$$

Feedback voltage that power supply tries to maintain

$$V_{FB} := 2.7\ \text{V}$$

One resistor must be selected arbitrarily

$$R_2 := 8 \times 10^3\ \Omega$$

Solve for R_1 and R_3

$$sol := fsolve\left(\left\{ eval\left(V_{OUT}, V_{DAC} = V_{DAC\_high} \right) = V_{low}, eval\left(V_{OUT}, V_{DAC} = V_{DAC\_low} \right) = V_{high} \right\}, \left\{ R_1 = 300 \times 10^3\ \mathbf{ohm}, R_3 = 20 \times 10^3\ \mathbf{ohm} \right\} \right)$$

$$sol = \left\{ R_1 = 4.178 \times 10^4\ \Omega, R_3 = 2.611 \times 10^3\ \Omega \right\}$$