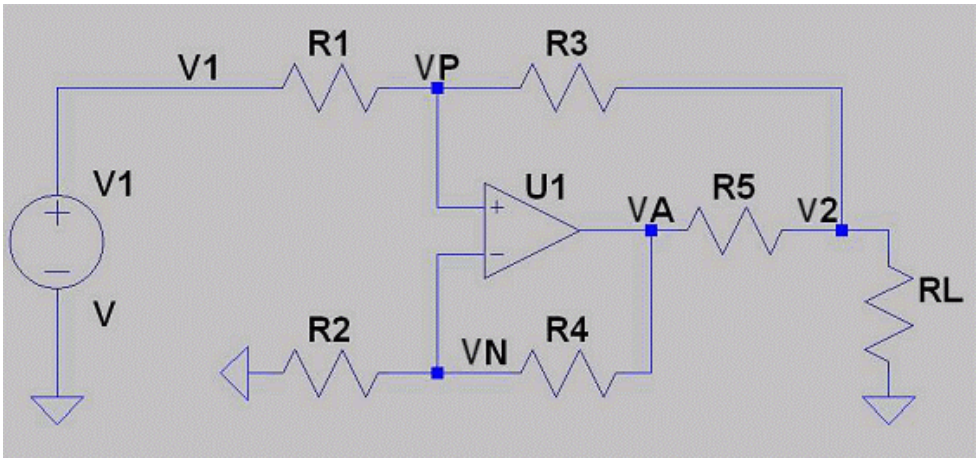
Dimensioning of an OP Current Source



$$\frac{V_A - V_N}{R_4} - \frac{V_N}{R_2} = 0 \qquad (1)$$

$$\frac{V_1 - V_P}{R_1} + \frac{V_2 - V_P}{R_3} = 0 \qquad (2)$$

$$\frac{V_A - V_2}{R_5} + \frac{V_P - V_2}{R_3} = I_2 \qquad (3)$$

$$V_A = V_N \frac{R_2 + R_4}{R_2} \qquad (1a)$$

$$V_P = V_1 \frac{R_3}{R_1 + R_3} + V_2 \frac{R_1}{R_1 + R_3} \qquad (2a)$$

$$V_N = V_P$$

$$V_A = V_1 \frac{R_3(R_2 + R_4)}{(R_1 + R_3)R_2} + V_2 \frac{R_1(R_2 + R_4)}{(R_1 + R_3)R_2} \qquad (1a+2a)$$

$$I_2 R_3 R_5 = V_1 \left(\frac{R_3{}^2(R_2 + R_4)}{(R_1 + R_3)R_2} + \frac{R_3 R_5}{R_1 + R_3} \right) + V_2 \left(\frac{R_1 R_3(R_2 + R_4)}{(R_1 + R_3)R_2} - R_3 + \frac{R_1 R_5}{R_1 + R_3} - R_5 \right) \qquad (1\text{-}3)$$

Condition for Infinite Output Resistance:

$$R_1 R_3(R_2 + R_4) - R_3(R_1 + R_3)R_2 + R_1 R_5 R_2 - R_5(R_1 + R_3)R_2 = 0 \qquad I_2 \neq f(V_2)$$

$$R_1 R_4 = R_2(R_3 + R_5) \qquad (4)$$

Case 1: $R_1 = R_2$

$$R_4 = R_3 + R_5 \tag{4a}$$

$$I_2 = V_1 \frac{R_3 + R_5}{R_1 R_5} \tag{5a}$$

Case 2: $R_3 = R_4$

$$R_1 = R_2 \frac{R_3 + R_5}{R_3} \tag{4b}$$

$$I_2 = V_1 \frac{R_3}{R_2 R_5} \tag{5b}$$