

General Thevenin Resistance View with D-G Feedback

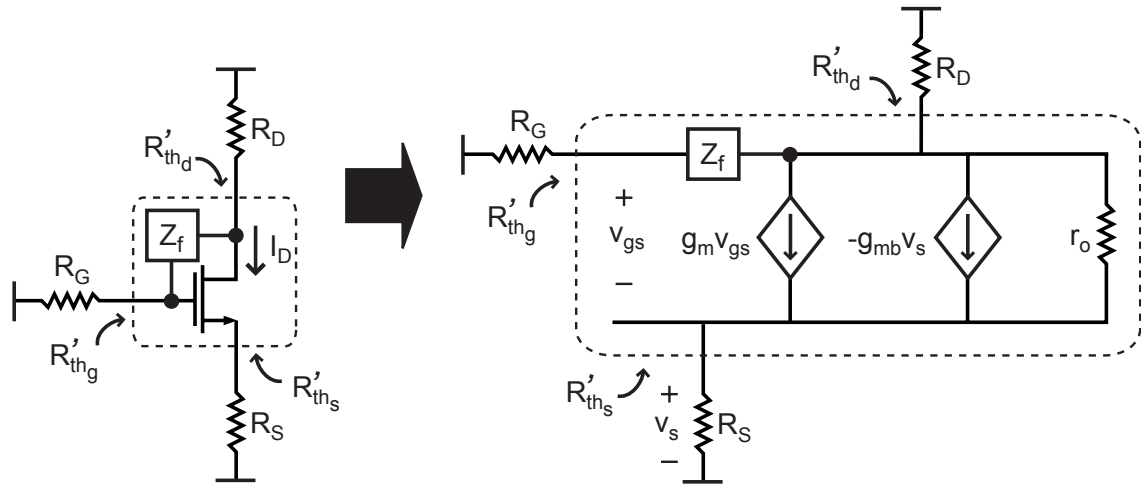


Figure 1 Definition of Thevenin Resistances.

Thevenin resistance at drain:

$$Z'_{thd} \approx R_{thd} \parallel \frac{Z_f}{1 + (Z_f \parallel R_G)(G_m - 1/Z_f)}$$

Thevenin resistance at gate:

$$Z'_{thg} \approx R_{thg} \parallel \frac{Z_f}{1 + (Z_f \parallel R_{thd} \parallel R_D)(G_m - 1/Z_f)}$$

Thevenin resistance at source:

$$Z'_{ths} \approx \frac{1}{g_m} + \frac{1}{1 + \beta_o} \left(R_B \parallel \frac{Z_f}{1 + (Z_f \parallel R_{thc} \parallel R_C)(G_m - 1/Z_f)} \right)$$

Where:

$$R_{thc} \approx (1 + g_m(r_\pi \parallel R_E))r_o \quad \text{for } R_B \ll r_\pi, R_E$$

$$R_{thb} \approx r_\pi + (\beta_o + 1)R_E \quad \text{for } R_C \ll r_o, R_E \ll r_o$$

$$G_m = \frac{1}{1/g_m + R_E}$$

Note: for small signal two-port models, simply replace the non-feedback Thevenin resistances with the Z' Thevenin impedances above, and keep the same G_m and A_v values as before.