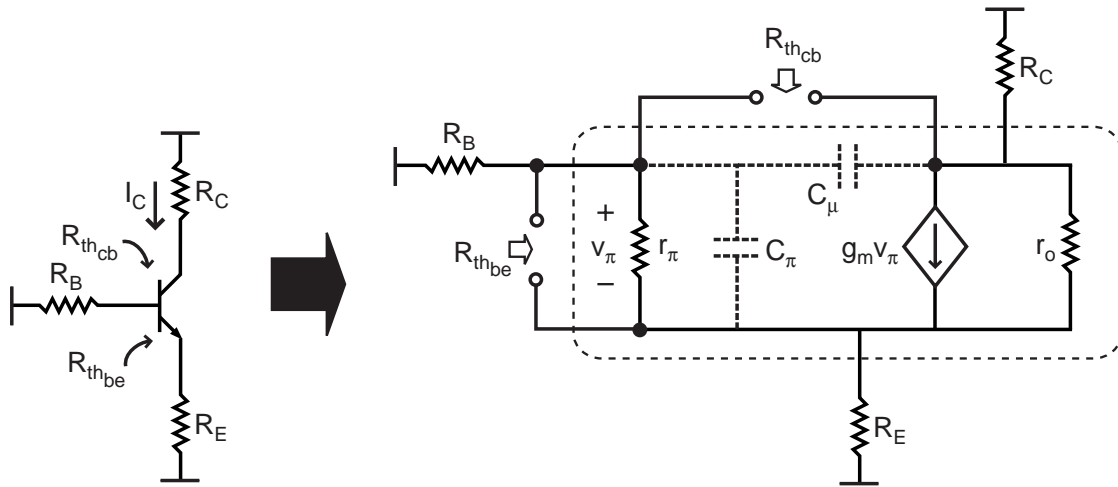


Open Circuit Time Constant Calculations

6.301 — Spring 2002

Michael H. Perrott (c) 2002



C_π : Thevenin resistance from base to emitter:

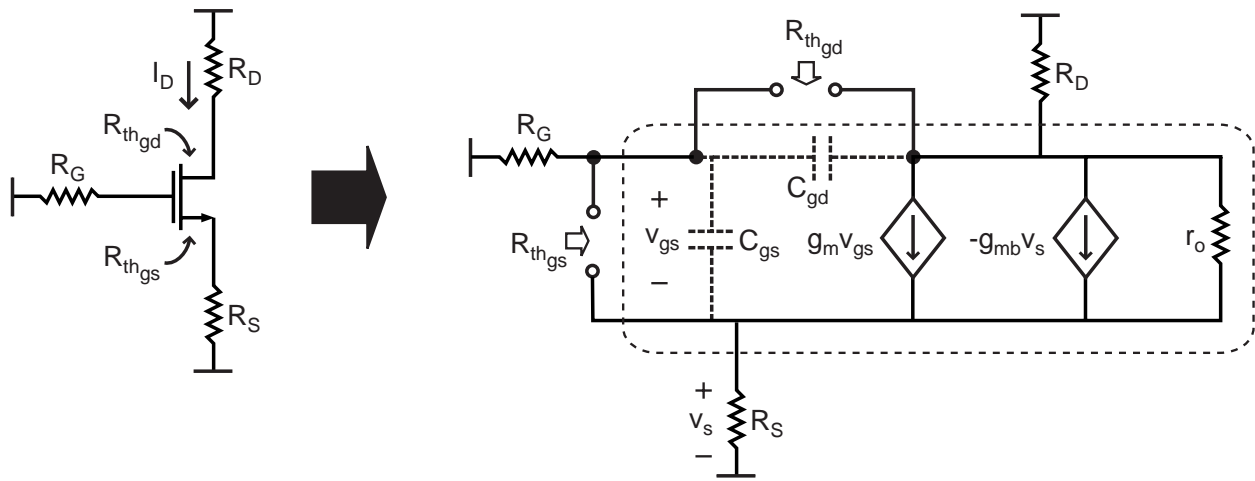
$$R_{th_{be}} = r_\pi \parallel \frac{R_E + R_B}{1 + g_m R_E / (1 + R_C / r_o)}$$

C_μ : Thevenin resistance from collector to base:

$$R_{th_{cb}} = (R_{th_b} \parallel R_B) + \left(1 + \frac{\beta_o}{1 + R_{th_b} / R_B} \right) R_C$$

where:

$$R_{th_b} = r_\pi + (\beta_o + 1)R_E$$



C_{gs} : Thevenin resistance from gate to source:

$$R_{th_{gs}} = \frac{R_S(1 + R_D/r_o) + R_G(1 + (g_{mb} + 1/r_o)R_S + R_D/r_o)}{1 + (g_m + g_{mb})R_S + (R_S + R_D)/r_o}$$

C_{gd} : Thevenin resistance from gate to drain:

$$R_{th_{gd}} = (R_D + R_G)(1 - \alpha/r_o) + \alpha g_m R_G, \quad \text{where } \alpha = r_o \parallel \frac{R_D}{1 + (g_m + g_{mb})R_S}$$