Short Circuit Current Gain

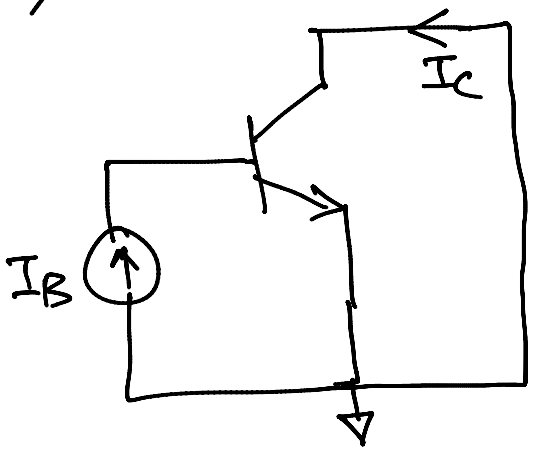
Saturday, 2 March 2019 9:55 AM

Unity Gain Cutoff Frequency – FOM

Ref. – AD book

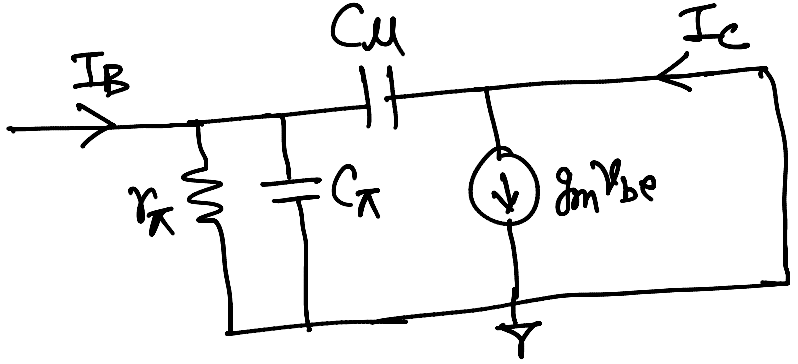
$f_T \Longrightarrow A_i = \frac{i_c}{i_b} = 1$

$\frac{f_T}{10}$



$i_b = v_{be}\left(s(C_\pi + C_\mu) + \frac{1}{r_\pi}\right)$

$i_c = g_m \cdot v_{be}$

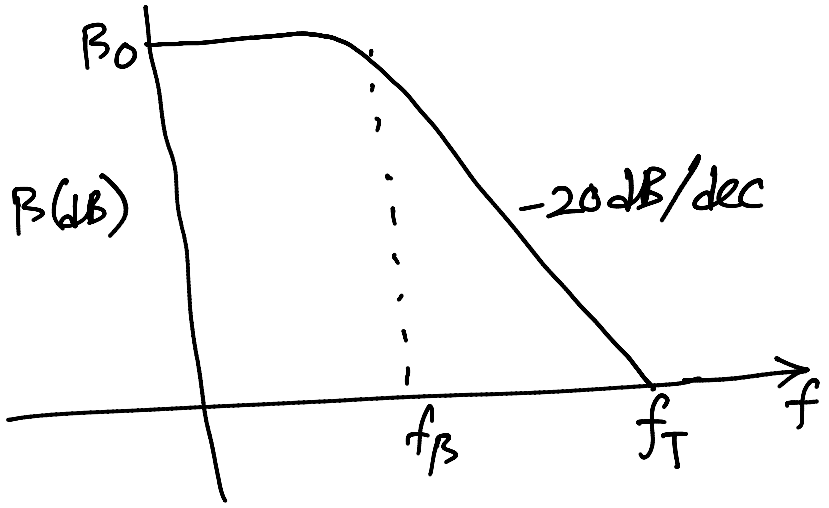


$$A_i = h_{fe} = \frac{i_c}{i_b} = \frac{g_m r_\pi}{1 + s r_\pi (C_\pi + C_\mu)}$$

$$= \frac{\beta_0}{1 + s\frac{\beta_0}{2\pi f_T}}$$

$$f_T = \frac{\beta_0}{2\pi r_\pi (C_\pi + C_\mu)} = \frac{g_m}{2\pi (C_\pi + C_\mu)} \simeq \frac{g_m}{2\pi C_\pi}$$

$$A_i = \frac{\beta_0}{1 + j\frac{f}{(f_T/\beta_0)}}$$



$$f >> \frac{f_T}{\beta_0} \Rightarrow \quad A_i = \frac{f_T}{f}$$

$$f_T \cong \frac{g_m}{2\pi C_\pi} \Rightarrow C_\pi \checkmark$$

Ref. - AD book

$$C_{je} = \frac{C_{je0}}{\left(1 - \frac{V_{BE}}{V_{bi}}\right)^m} \simeq \frac{C_{je0}}{\sqrt{1 - \frac{3}{4}}} = 2C_{je0}$$