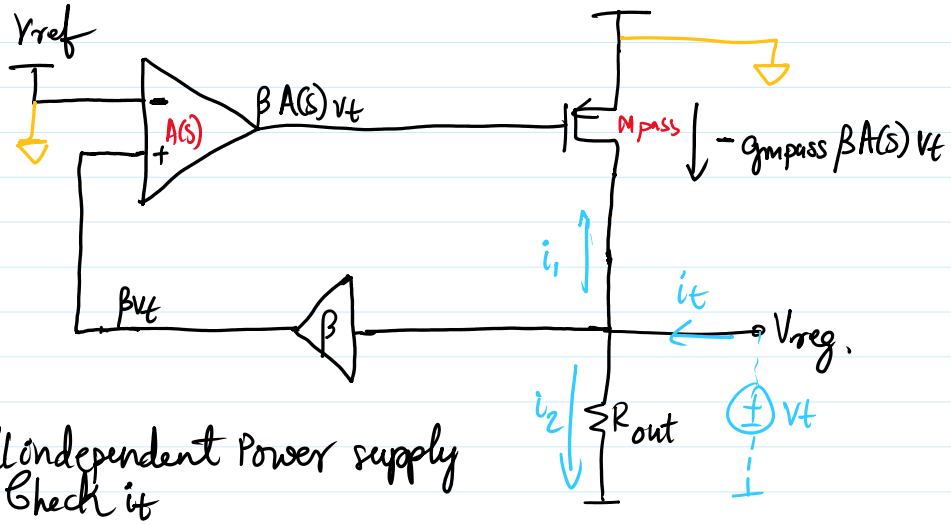
22/06/24
22 June 2024 09:22

Output Impedance of LDO

$\beta = \frac{R_2}{R_1+R_2}$



Step-1:-
1). Switch off all independent Power supply
2). Apply V_t, Check i_t

$R_{out(dc)} = r_{dspass} \| R_1+R_2 \| R_L$

$i_2 = \frac{V_t}{R_{out}}$ }

$i_1 = g_{mpass}\beta A(s) V_t$

$\# \quad i_t = \frac{V_t}{R_{out}} + g_{mpass}\beta A(s) V_t$

$i_t = V_t\left(\frac{1+g_{mpass}\beta A(s) R_{out}}{R_{out}}\right)$ $\quad \{g_{mpass}\beta A(s) R_{out} = \beta A_0(s)\}$

$i_t = \frac{V_t(1+\beta A_0(s))}{R_{out}}$

$R_{out}' = R_{th} = \frac{V_t}{i_t} = \frac{R_{out}}{1+\beta A_0(s)}$

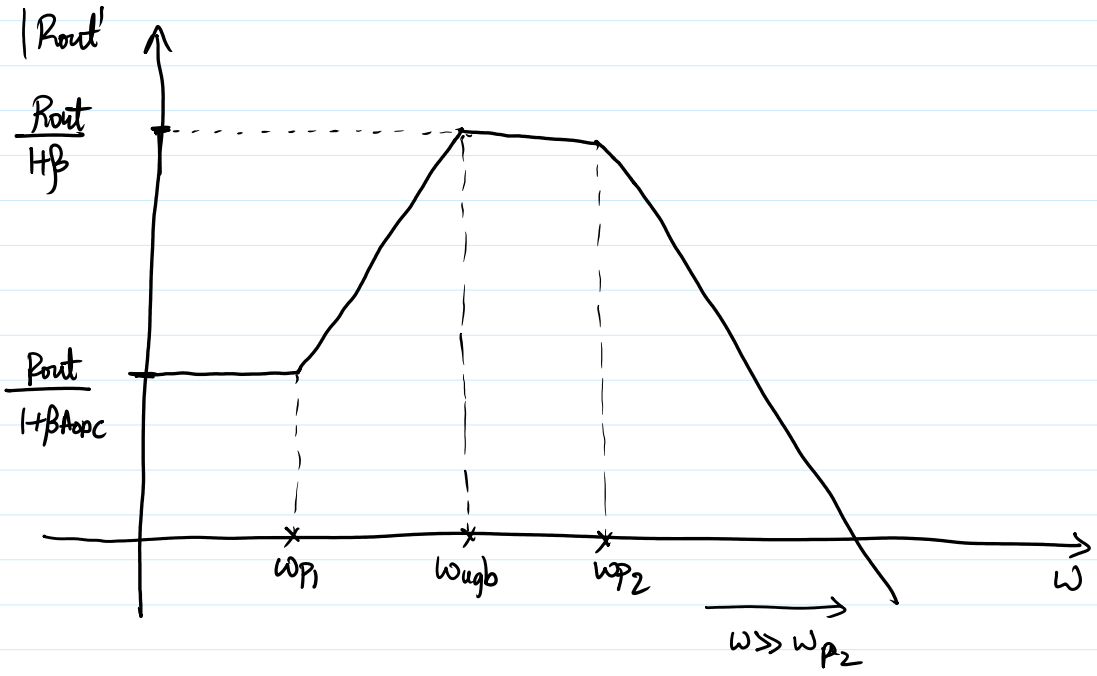
i) at DC $A_0(s) = A_{0DC}$ $\quad R_{out}' = \frac{R_{out}}{1+\beta A_{0DC}}$

ii) as $\omega \to \omega_p$ $A_0(s) \to$ remains constant so R_{out}' remains same as $R_{out}'_{DC}$

iii) as $\omega \to \omega_{ugb}$ $A_0(s) \to$ droops and approaches 0dB So R_{out}' increases

iv) as $\omega \to \omega_{p2}$ $A_0(s) \to$ const and same as that of $\omega \to \omega_{ugb}$

v) as $\omega > \omega_{p2}$ The output cap becomes short so $Z_{out} = 0$


|Rout'
Rout / Hβ
Rout / 1+βAolc
ωp1
ωugb
ωp2
ω
ω ≫ ωp2