NPN Large Signal (Assume FAR)

VDD = 10V
Beta = 100
VA = infinity
RB=1k
RE=1k
VBEon=0.7V
VCEsat=0.5V

1. Substitute large-signal FAR model
2. Solve for IC
3. Check assumption

NPN Large Signal (Assume SAT)

VDD = 10V
Beta = 100
VA = infinity
RB=1k
RE=1k
VBEon=0.7V
VCEsat=0.5V

1. Substitute large-signal SAT model
2. Solve for IC
3. Check assumption
PNP Large Signal (1)

- VDD = 10V
- Beta = 100
- VA = infinity
- RC=1k
- VBEon=-0.7V
- VCEsat=-0.5V

Solve for IC

1. Choose region of operation
2. Substitute model
3. Solve for IC
4. Check assumption

PNP Large Signal (2)

Find expression for IC

1. Choose region of operation
2. Substitute model
3. Find expression for IC
**NMOS DC Model**

Find expression for $I_D$

1. Choose region of operation
2. Substitute model
3. Find expression for $I_D$

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**NPN Small Signal Rout**

Neglect $r_s$ in BJT model

1. Find small signal AC model
2. Apply test source to measure $R_{out}$
3. $R_{out} = \frac{v_t}{i_t}$
OCTC to Find $f_L$

Neglect $r_o$ in BJT model

1. Find small signal low-freq model
2. Apply OCTC

NPN Design Example (1)

Find relationship between Power, DC bias stability, and gain
NPN Design Example (2)