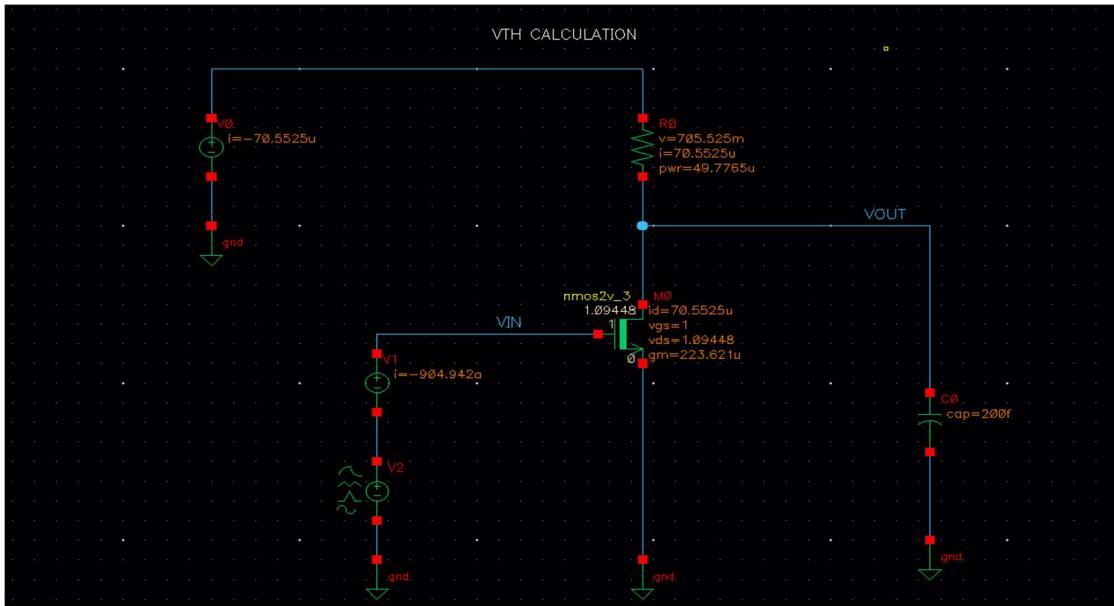


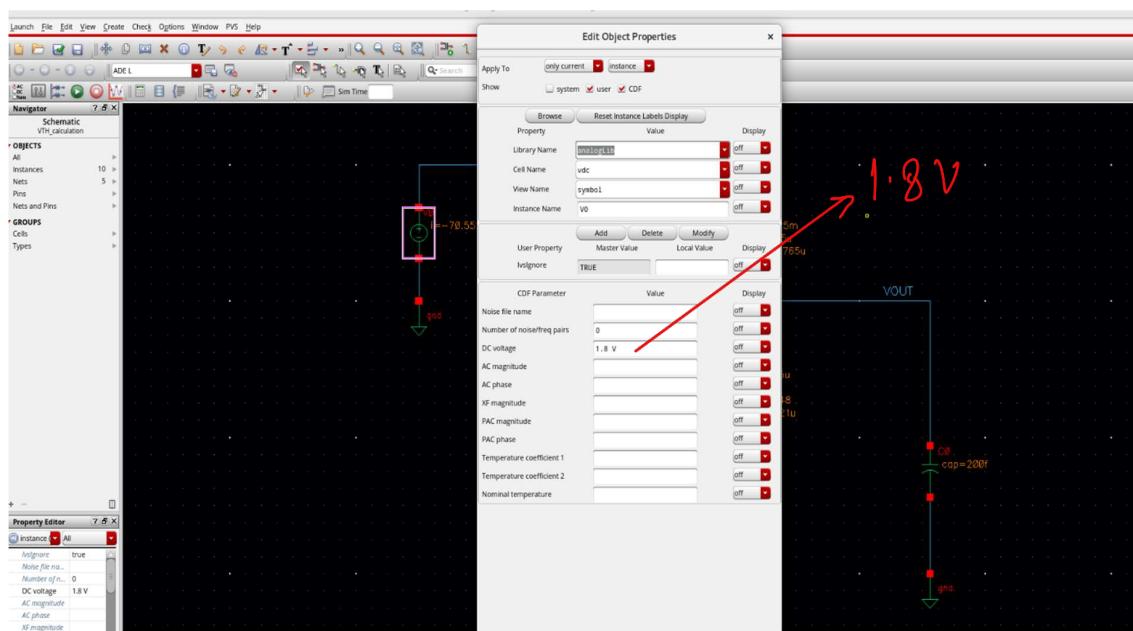
Vth Calculation

① Draw Schematic



② Give the values

$45nmgbdk$ $V_{dd} = 1.8V$
 $nmos2v$

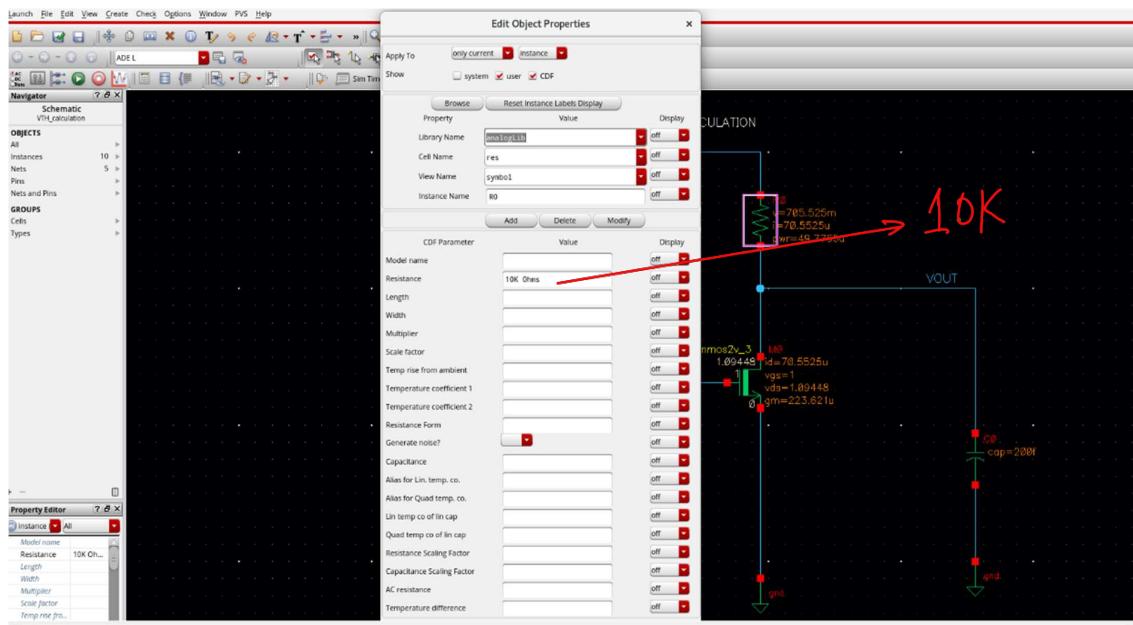


\rightarrow 4 terminal

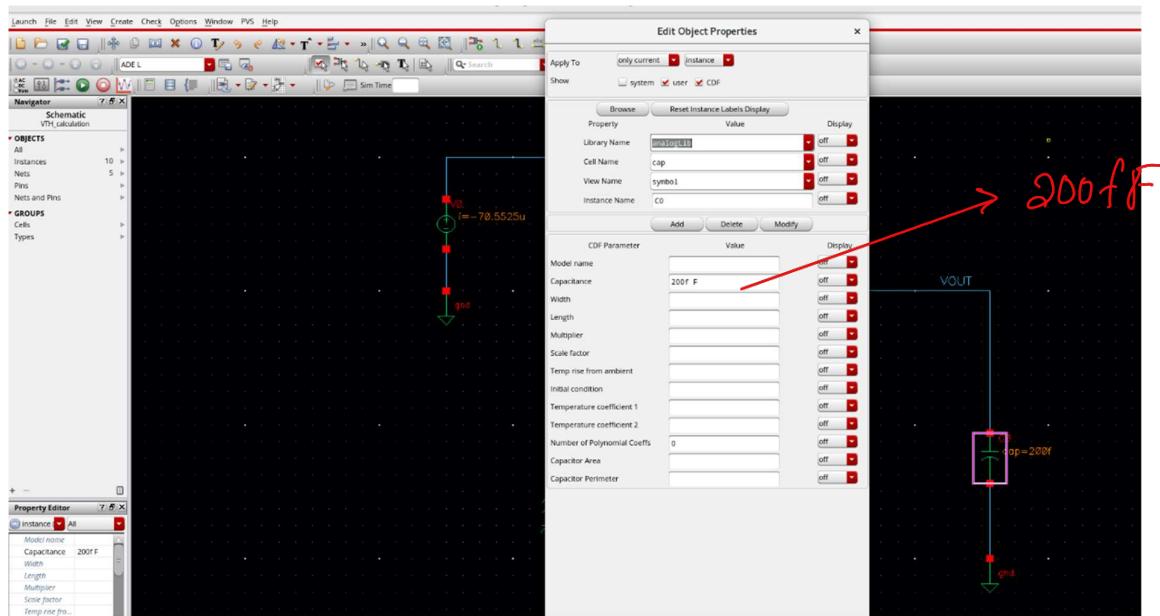
$nmos2v_3 \rightarrow$ 3 terminal (Body = GND by default)

operation near 2V

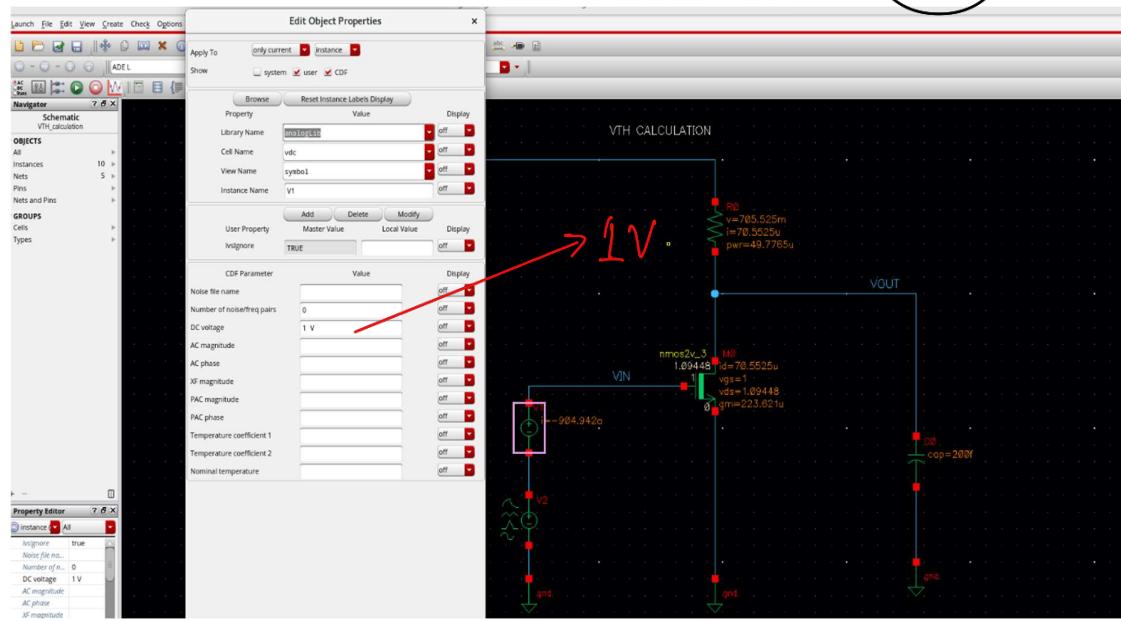
(ii) R_D take $10K - 1M\Omega$ V_{TH} , m_{HON} don't really depends on R_D . So, choose any in between



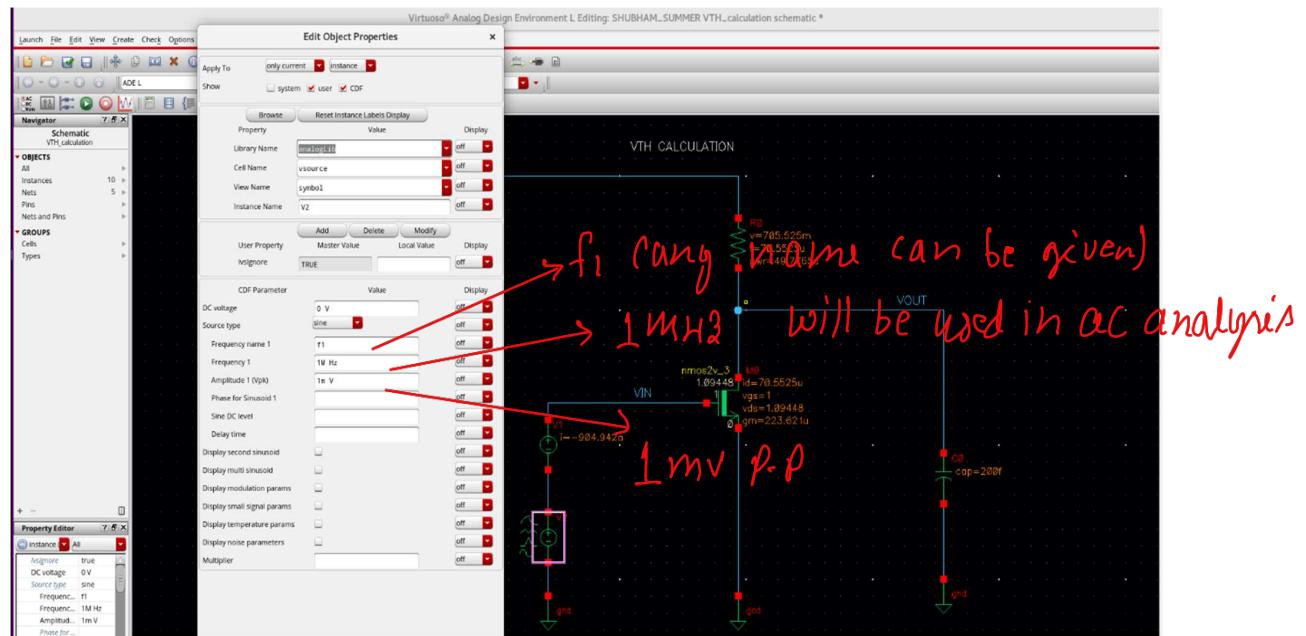
(iii) Again V_{TH} , m_{HON} don't really depends on C_L . choose $\approx ff$ to pf



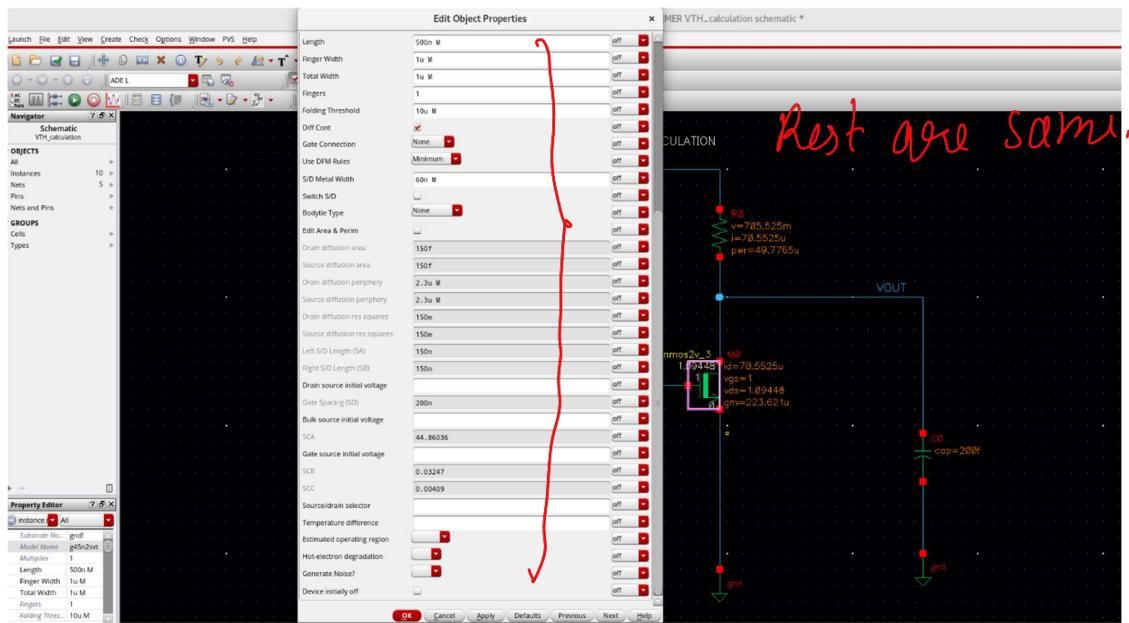
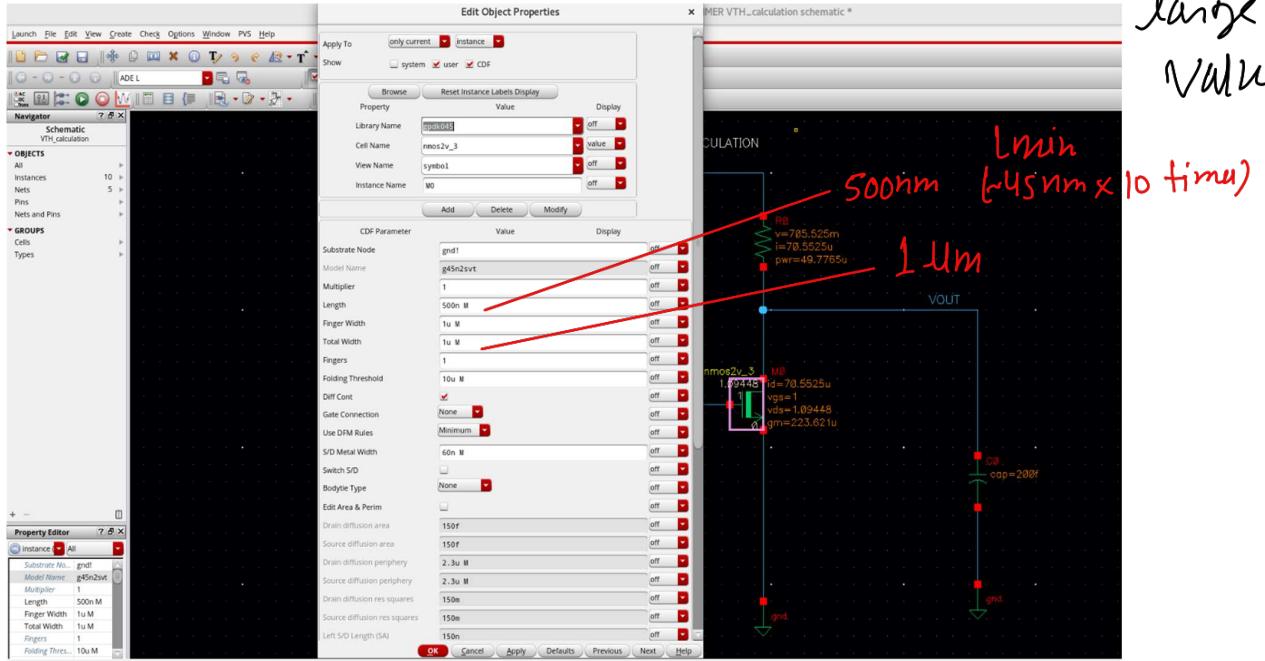
(iv) DC biasing : Assuming $V_{TH} \approx 0.4 - 0.8$
 so, choose $V_{GS} > V_{TH}$
 1V



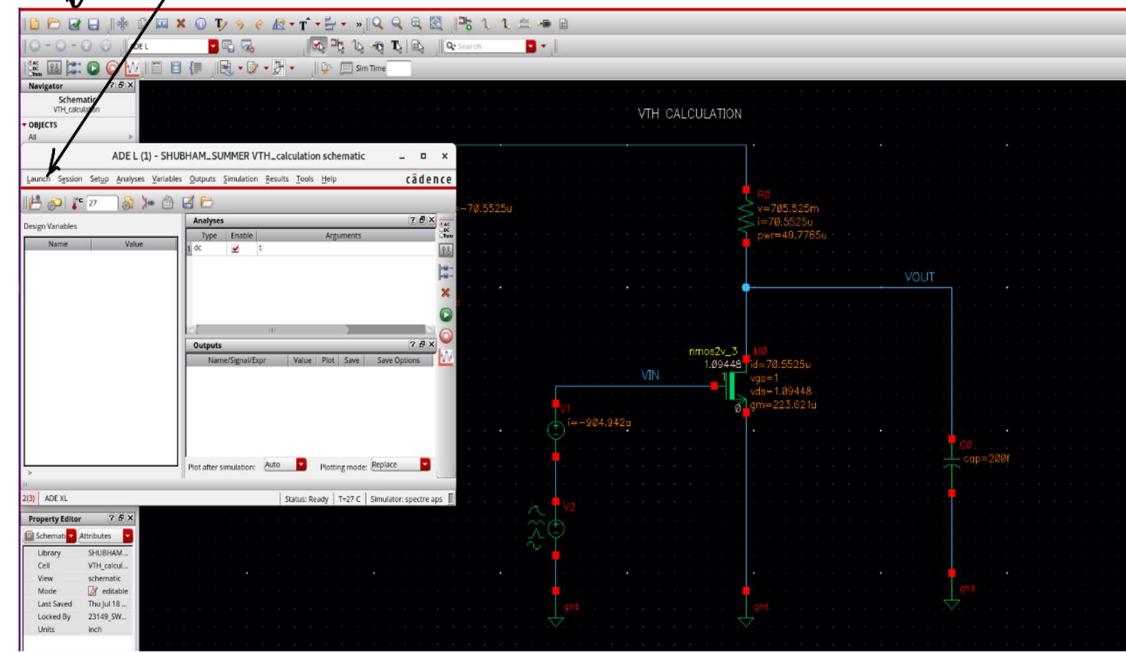
(v) Small signal ΔP : we don't want to disturb
 other operating pt. so choose 1mV. (P-P)



(vi) $\left(\frac{W}{L}\right) = ?$. We want to ignore d (CM) so, we can use $I_d = \frac{1}{2} \mu n C_o x \left(\frac{W}{L}\right) (V_{GS} - V_{TH})^2$. So choose large value.

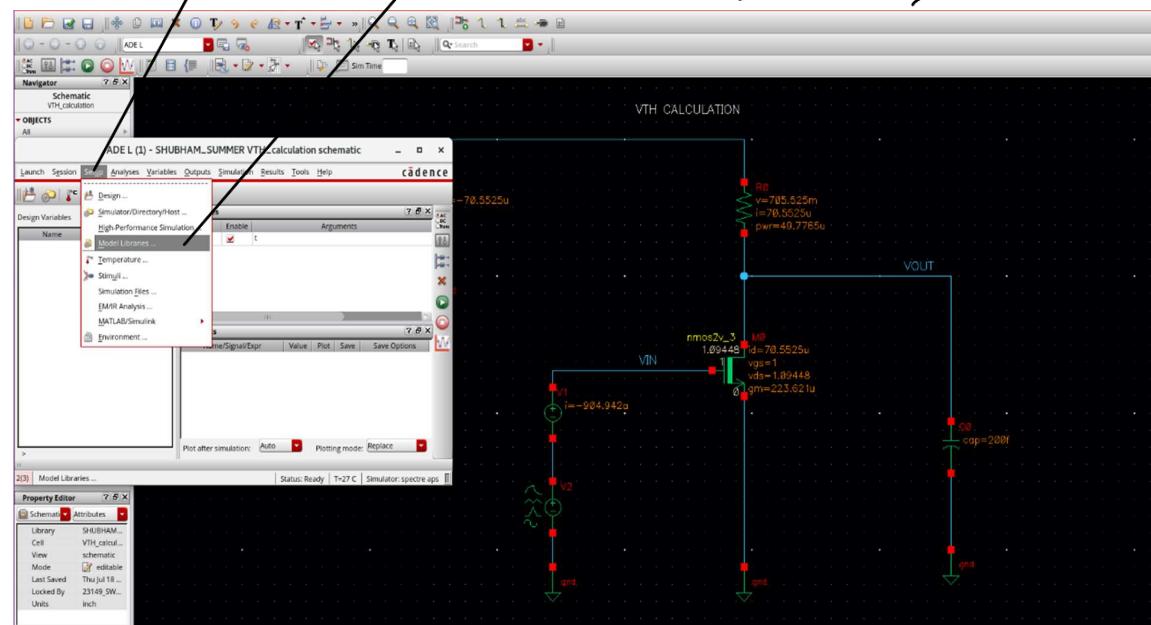


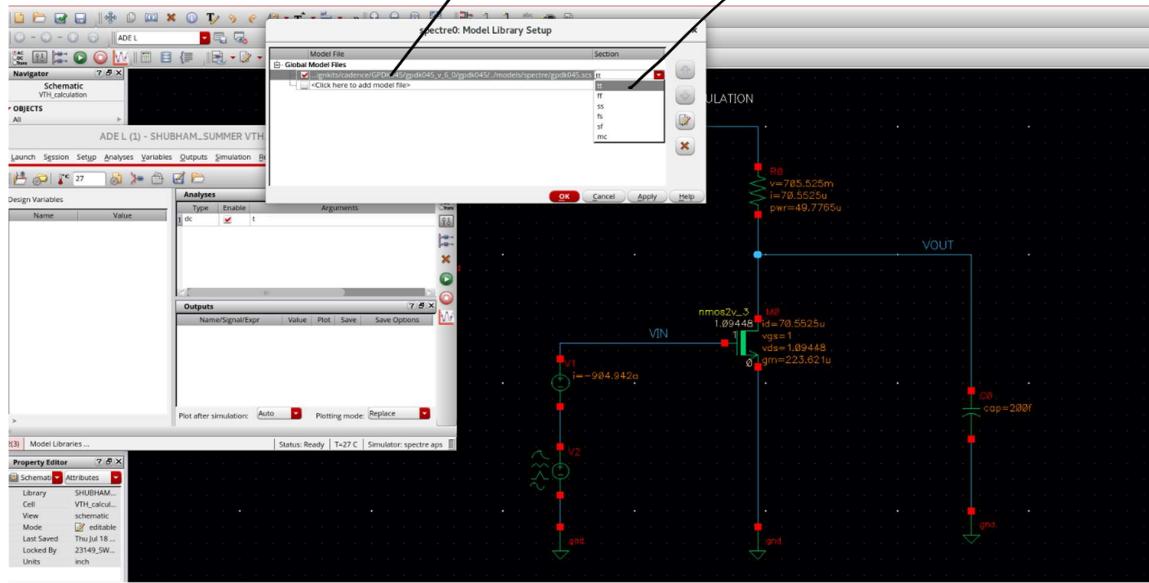
③ Check & Save Launch AOL



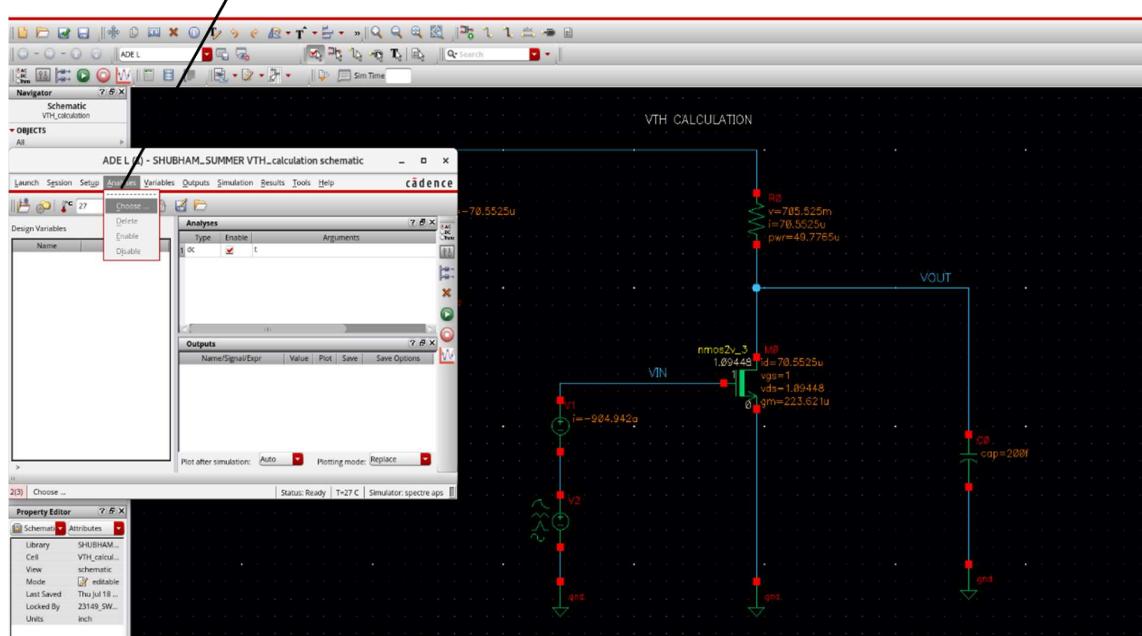
③ Setup

model Libraries

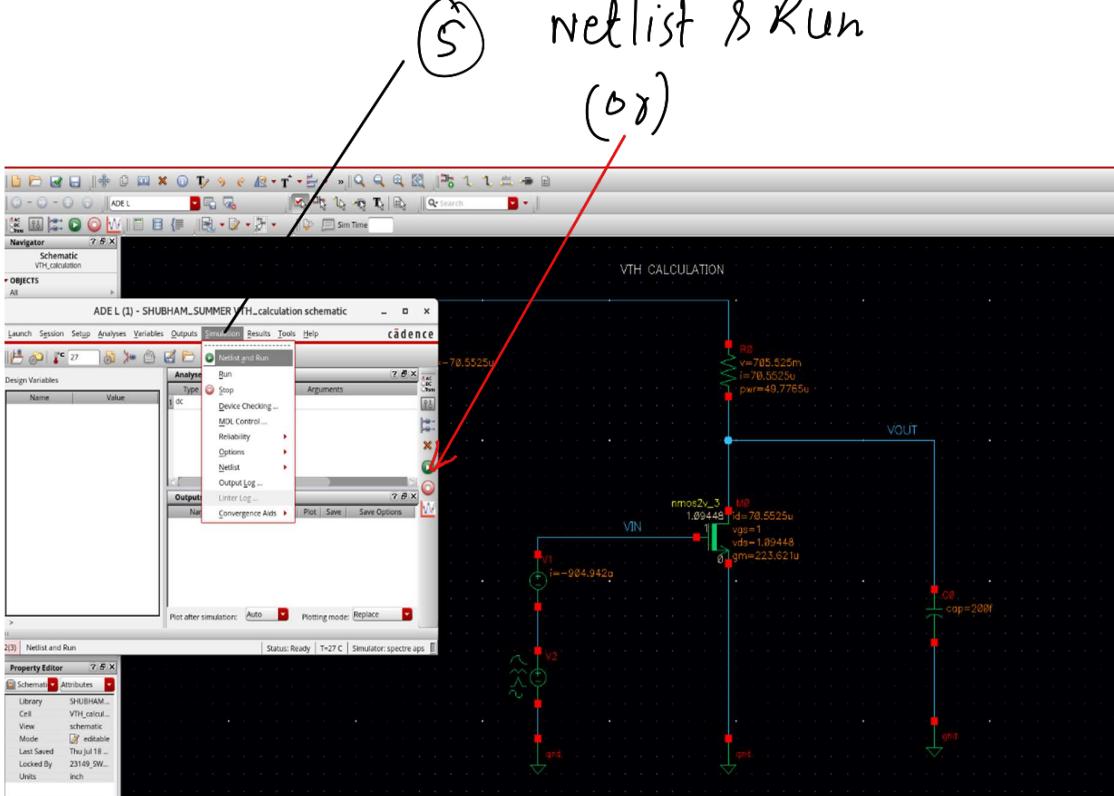
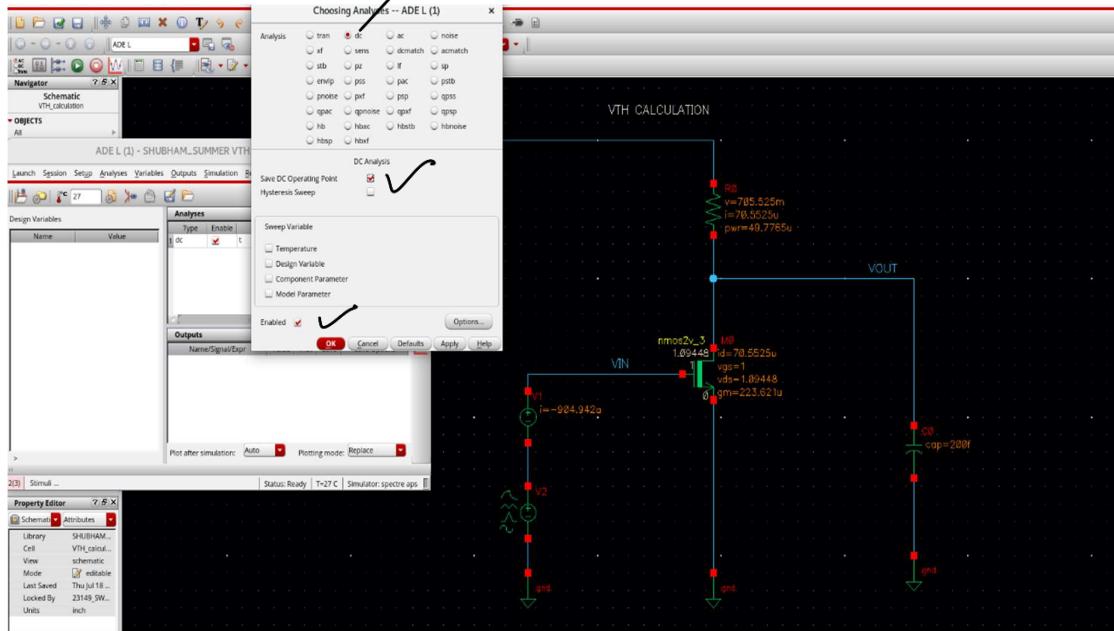


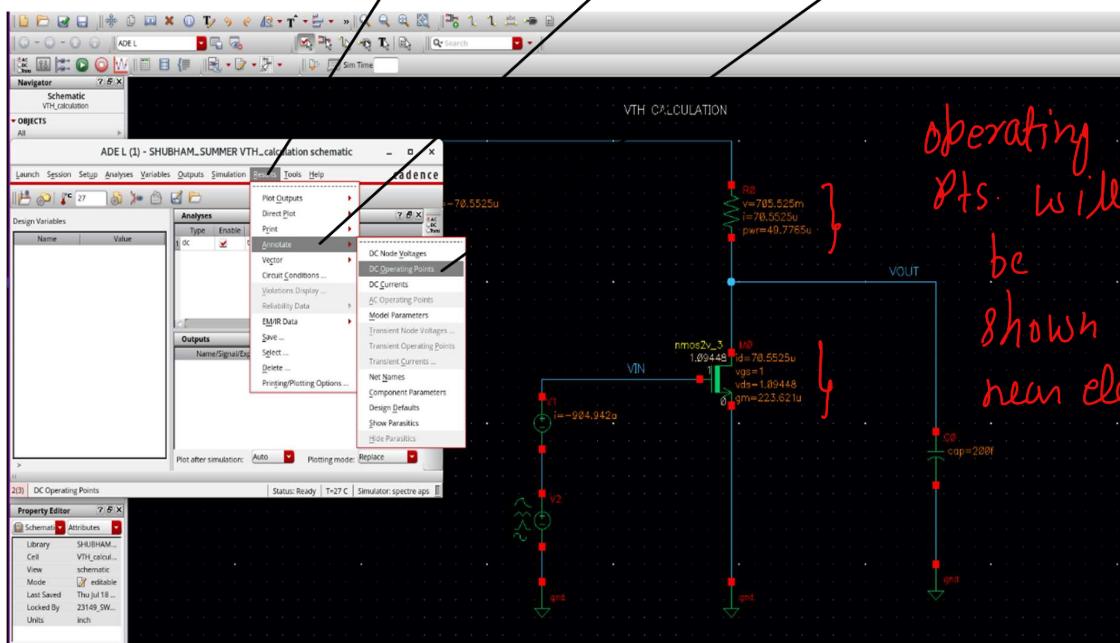


typical-typical corner-

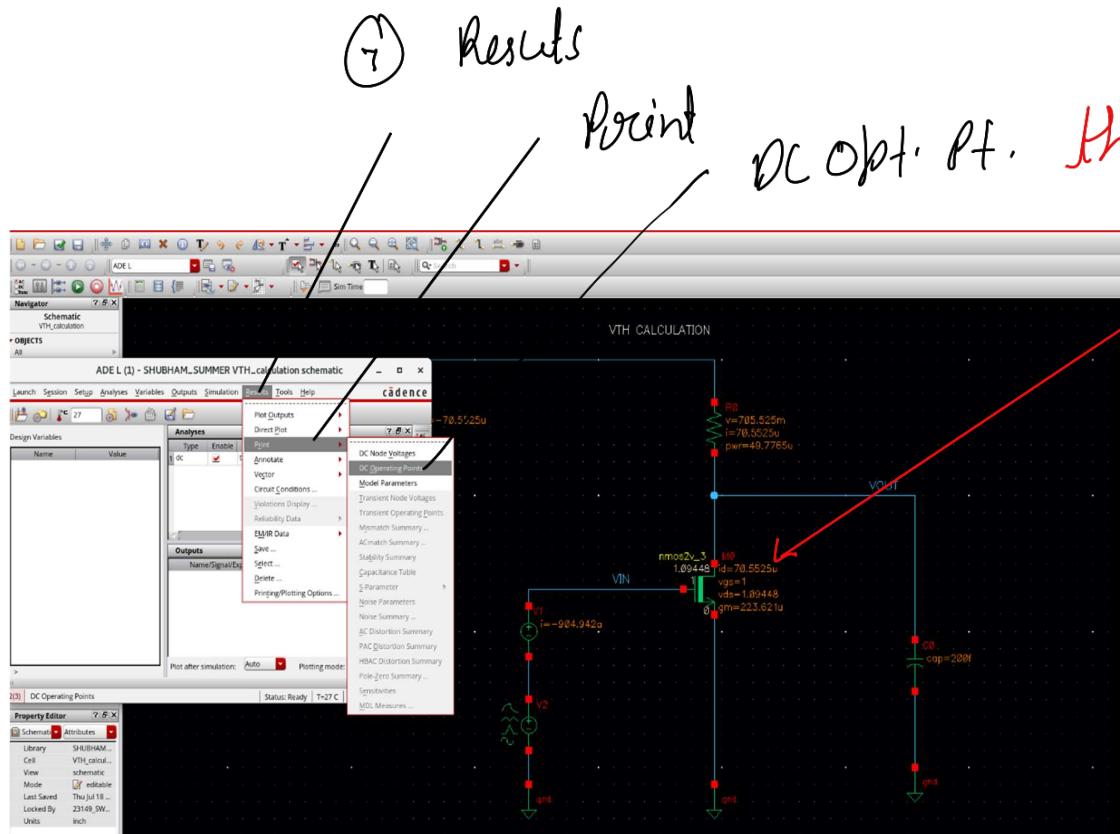


Analysis
→ dc

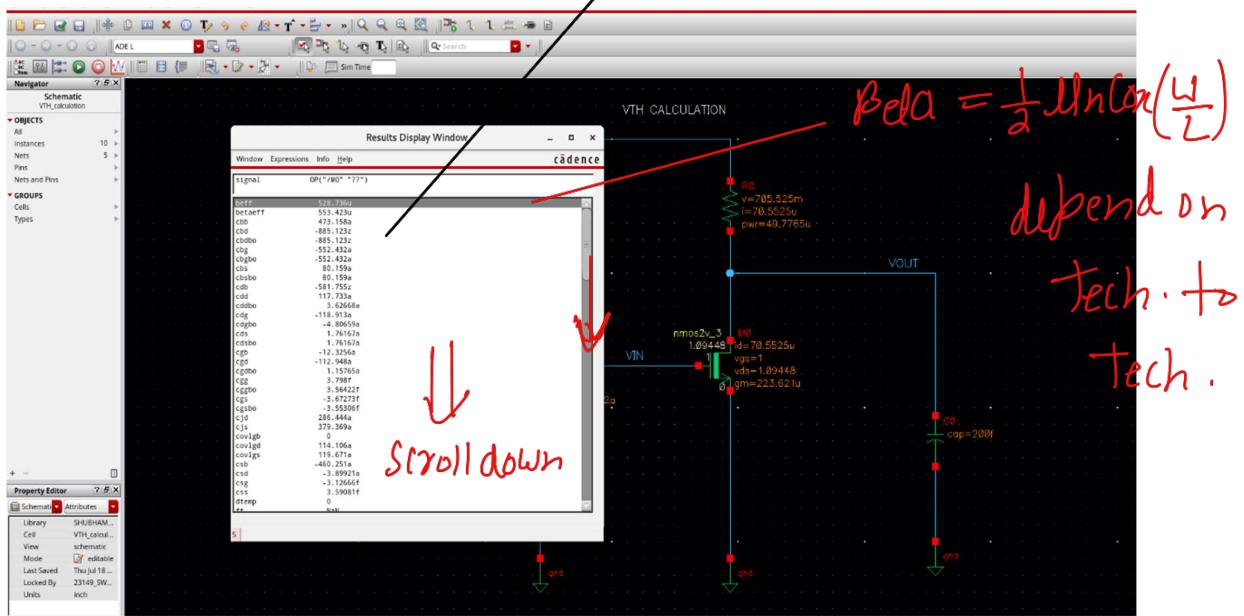




V_{th}, ΔV_{IN} won't point.



Reset window will
Pop up.



Don't rely on printed resets.

check Region :
0 → cutoff
1 → linear
2 → saturation
3 → subthreshold

$$g_{ds} = ? \quad \checkmark$$

$$I_d = ? \quad \checkmark = 70.5525$$

$$V_{th} = ? \quad \text{Known} \quad \checkmark = 0.48$$

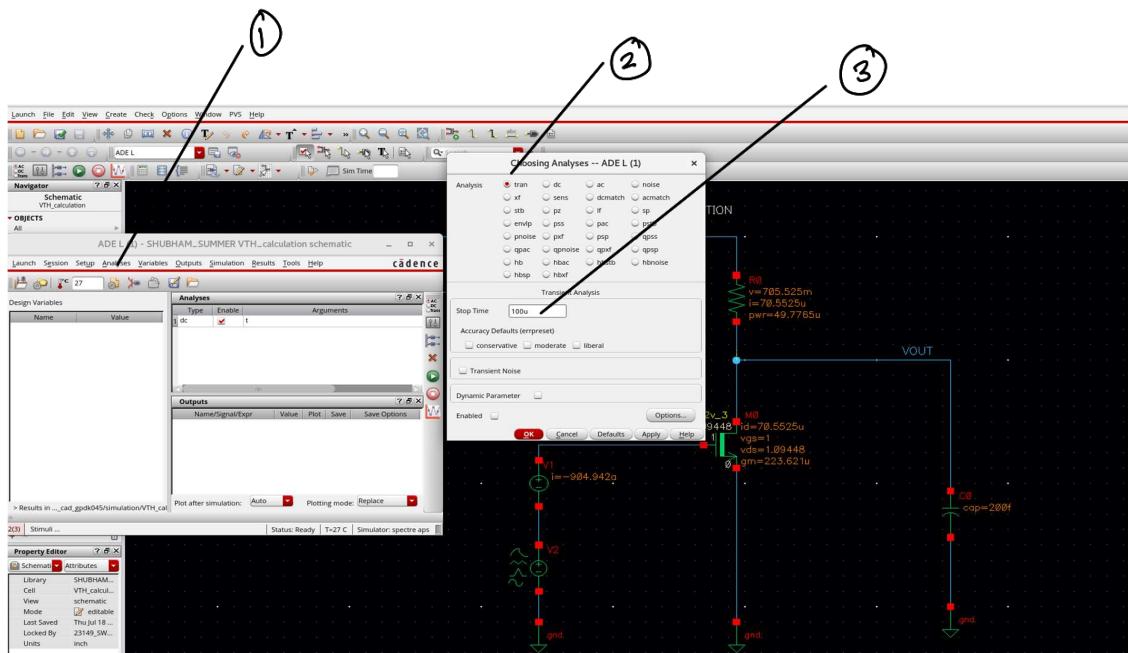
NOW, USE $I_d = \frac{1}{2} \underbrace{\mu_{nCox}}_{(W/L)} (V_{GS} - V_{th})^2$

$$\mu_{nCox} = \frac{2 I_d}{\left(\frac{W}{L}\right) (V_{GS} - V_{th})^2} = \frac{2 \times 70.5525}{\left(\frac{14}{0.54}\right) (1 - 0.48)}$$

$$\approx \textcircled{262} \quad \checkmark \quad \underline{\text{use it}}$$

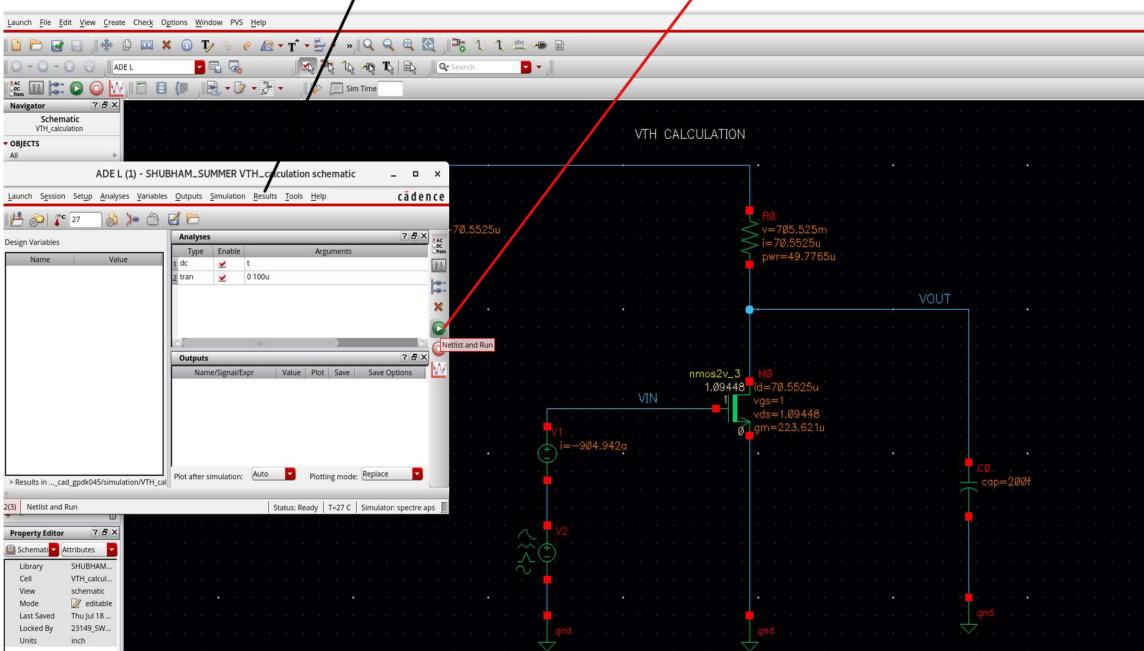
$$250 - 260 \quad \checkmark$$

Transient Analysis



⑤ Results
↳ main form
↳ click.
vout/Vin

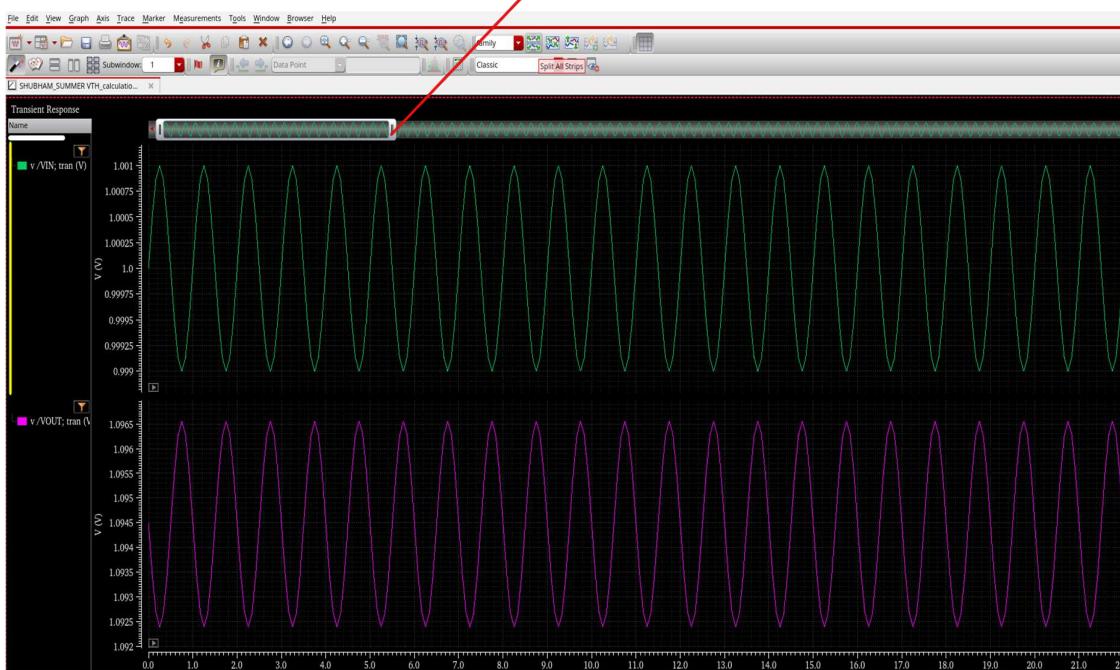
⑥

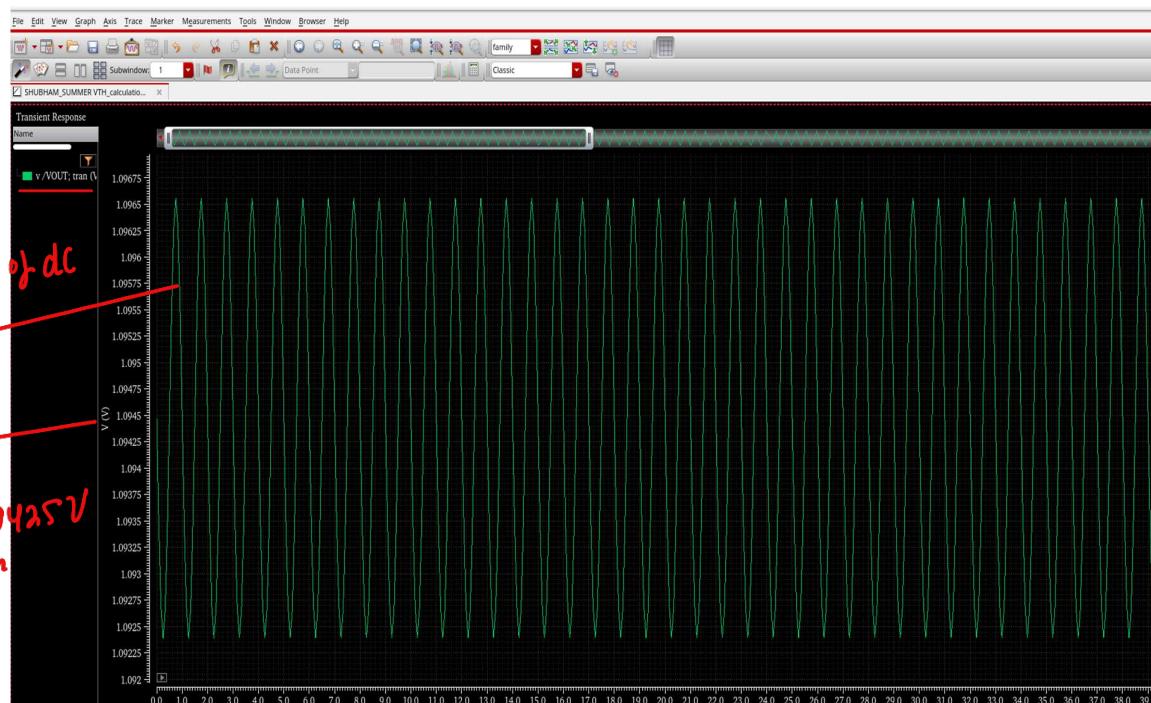
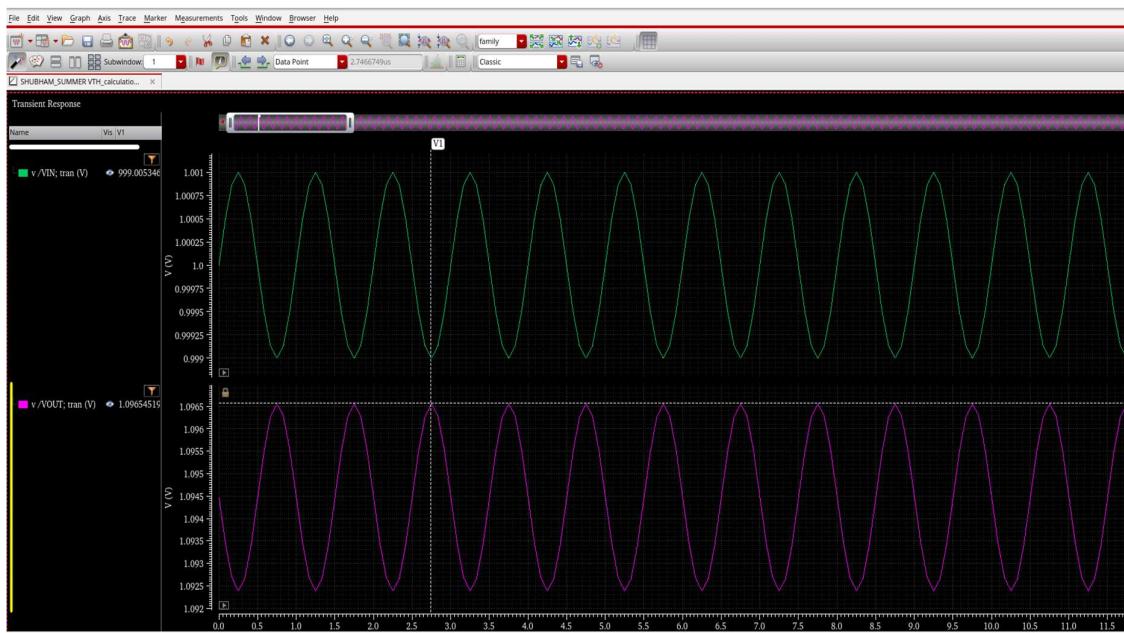


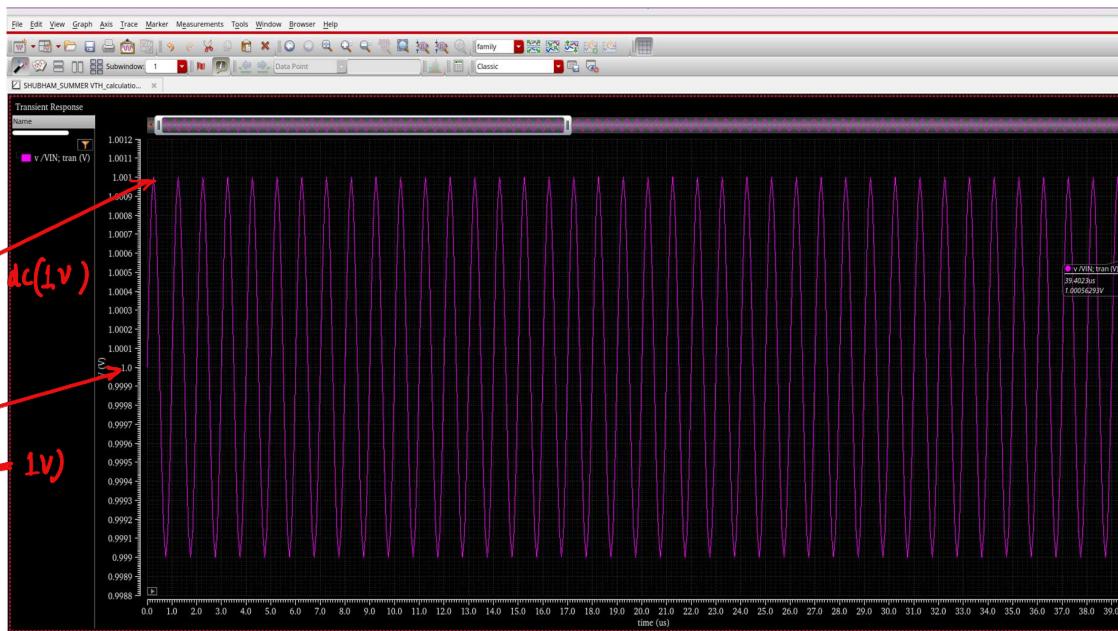
seperate waveform



←→ stretch/compress







Some useful short keys :

Schematic window

c → copy
 w/W → wire
 N → add text
 p → Create pins

Result window

v → vertical marker
 h → horizontal marker
 m → mark any points