

# REPORT-3

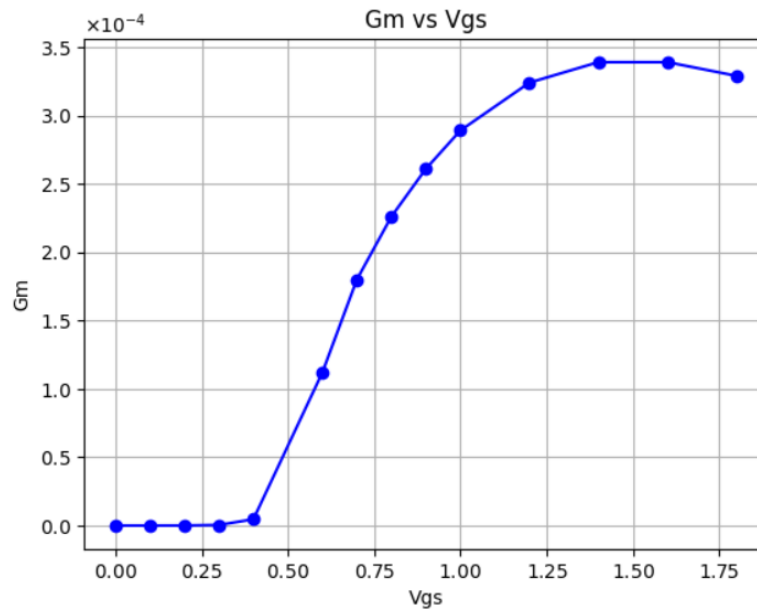
Jaiveer Kiran S. K ee22b042

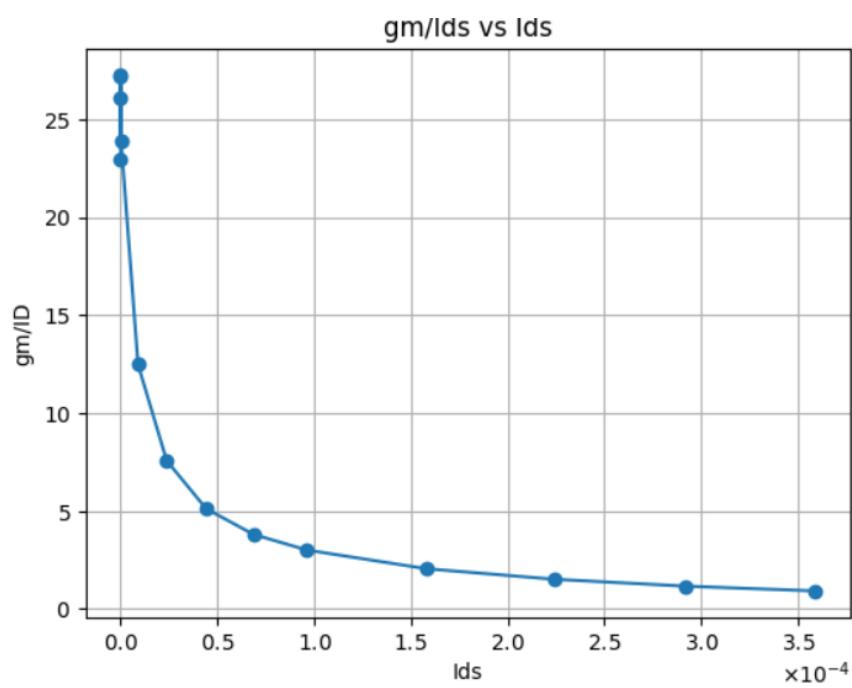
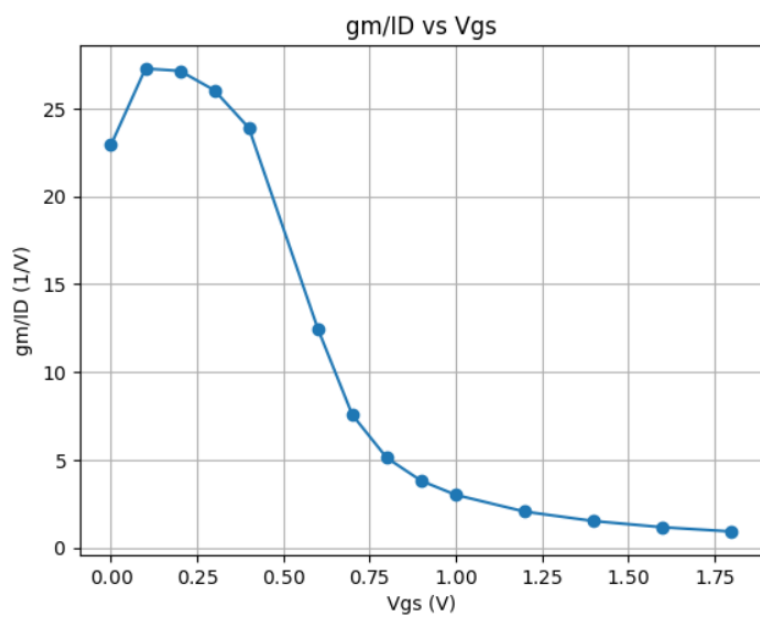
MAY 2025

## MOS Characterization :

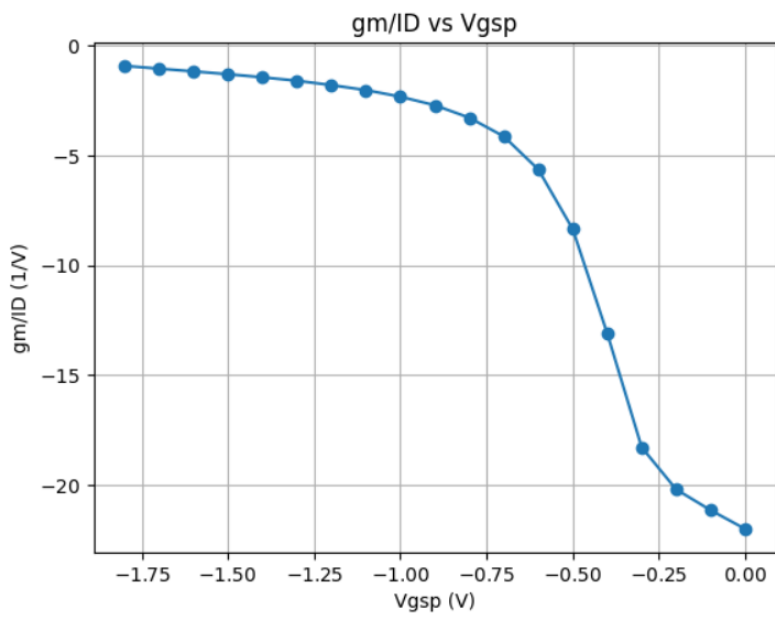
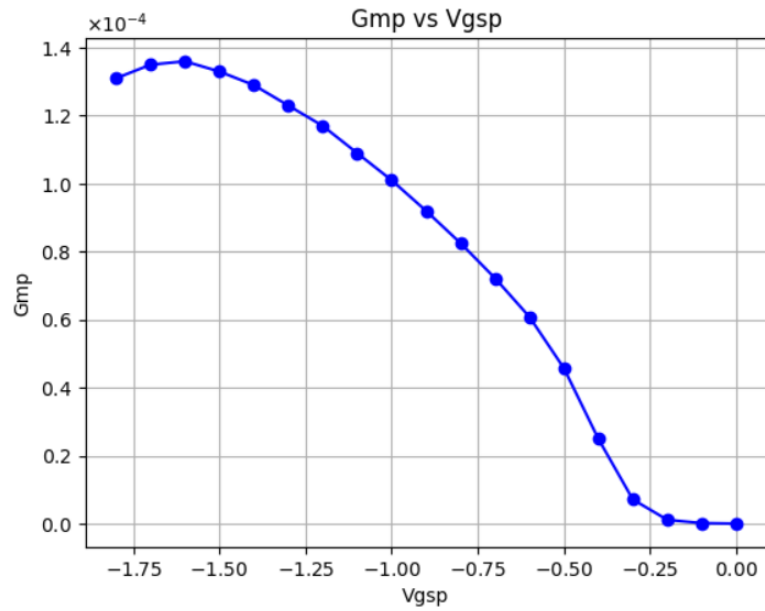
- $G_m/I_d$  parameter is used as a key design parameter because it is independent of the size of the MOSFET and the range of values is limited to **1-30**.
- More suited for small channel mosfets as well.

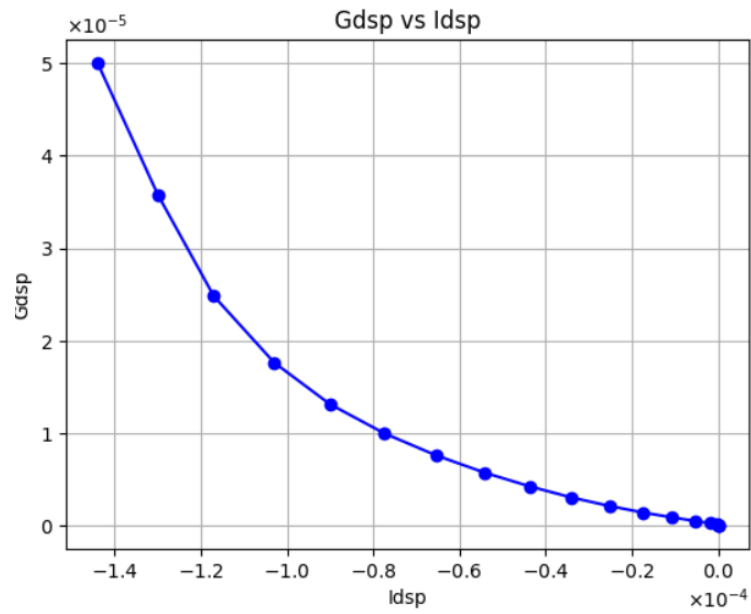
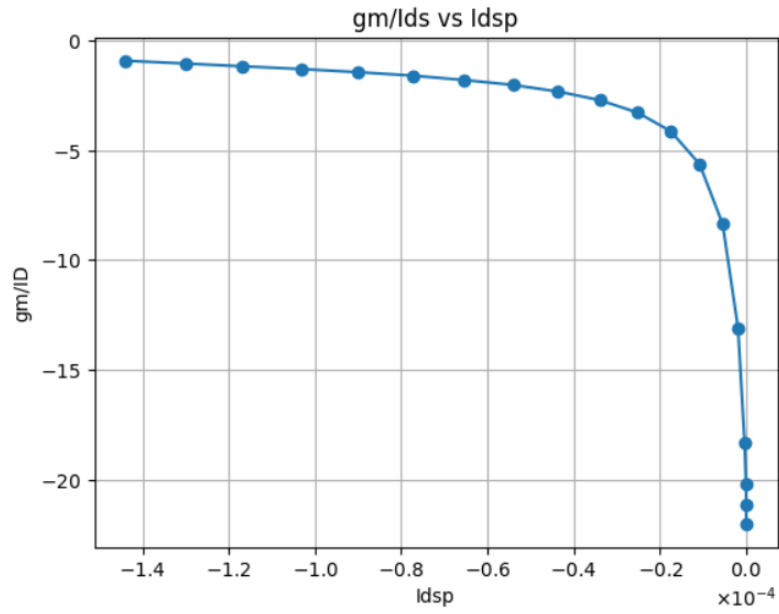
## TSMC 180nm Nmos:





# TSMC 180nm Pmos:





## Resistors:

- Here  $R_1 = R$  and  $R_2 = M * R$ .

- From the above simulation  $R = 1k$  and  $M = 5$  seems a better choice.

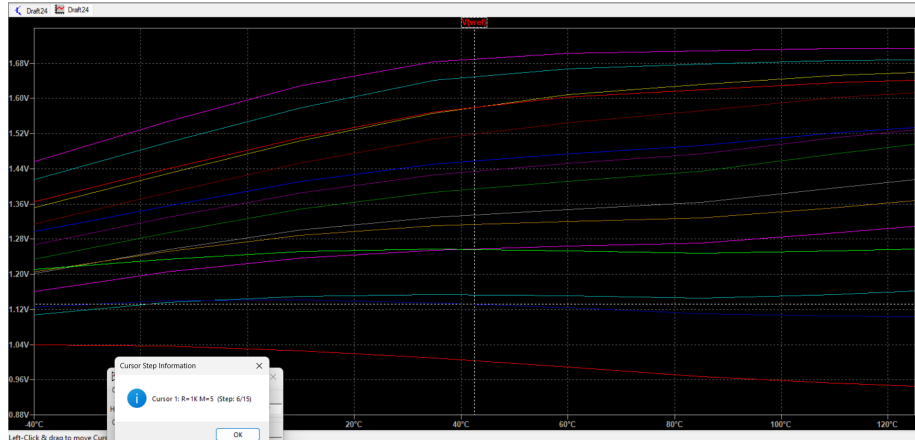


Figure 1: Vref when R and M values are varied simultaneously

## Opamp

:

- I value is varied to find a better fit.
- a Reference inverter is taken with fixed no. of fingers, When I is varied the region of operation ( $GM/I_d$ ) is also varied.
- I value chosen:  $1\mu A$ .

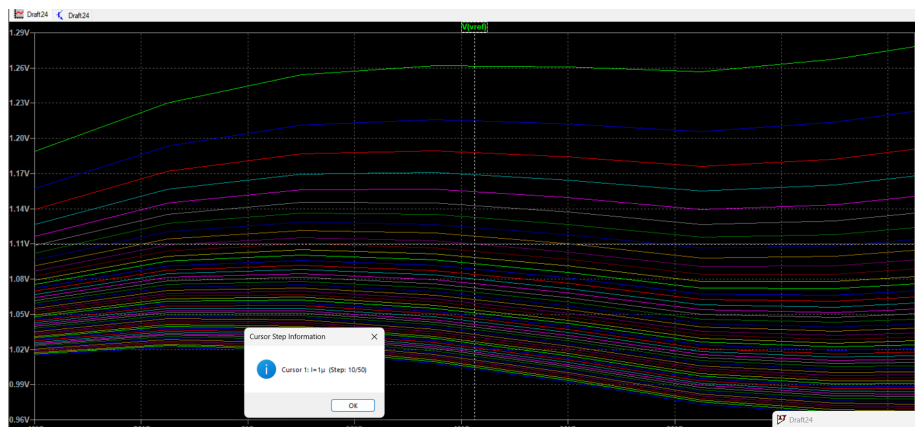


Figure 2: Vref when I is varied between  $0.1\mu A$  to  $10\mu A$

## Bandgap reference voltage generator:

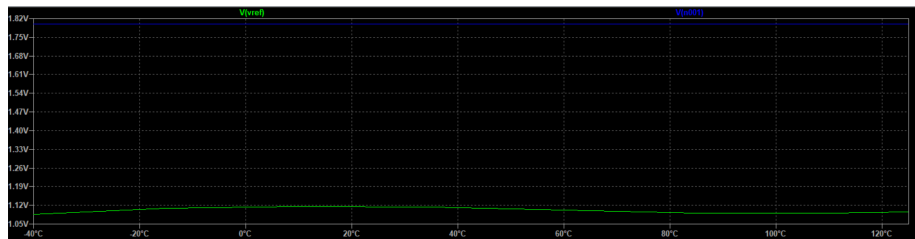
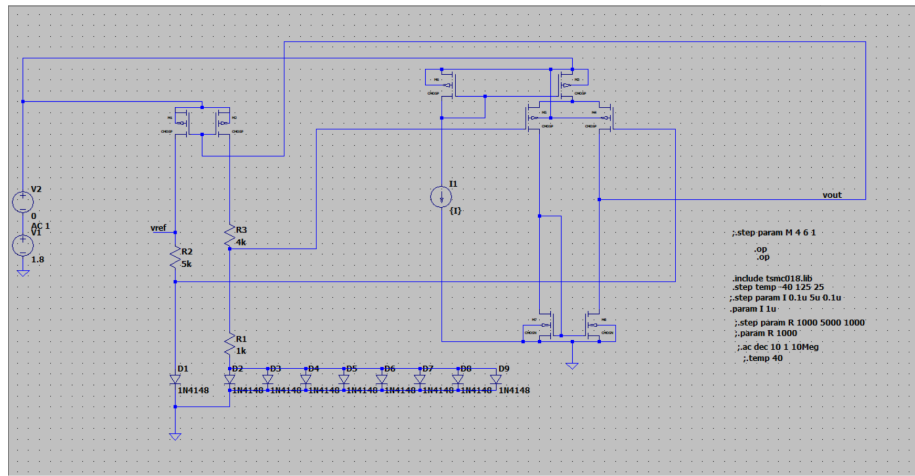


Figure 3: Reference voltage generated

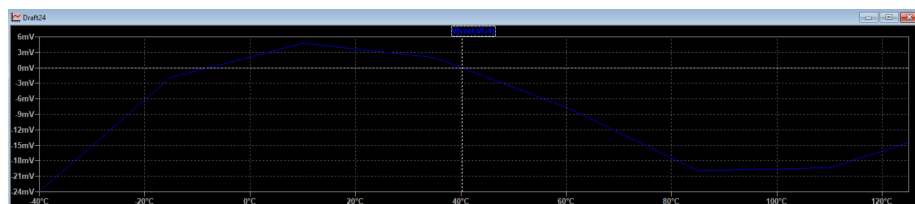


Figure 4: Error in Vref wrt values at 40°C

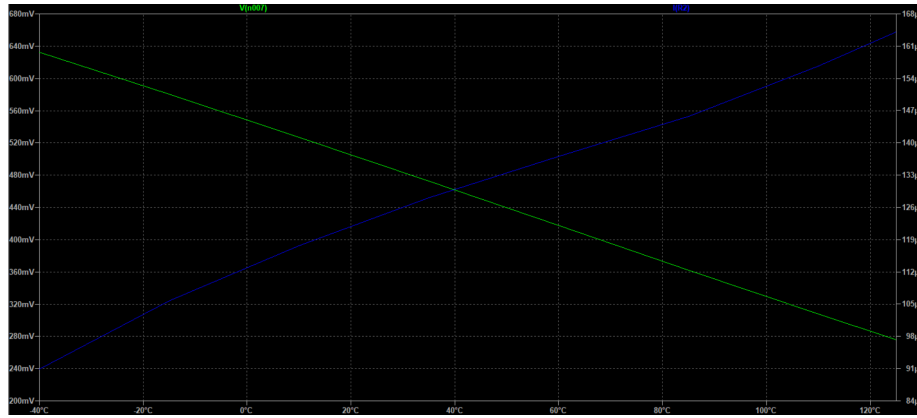


Figure 5: CTAT and PTAT

### Observations:

- From earlier analysis,  $R_2 = 5 \text{ K}$ .
- To balance the slopes  $R_1 = 1 \text{ K}$ .
- CTAT slope observed:  $-2.1689 \text{ mV/C}$ .
- $V_{\text{ref}} = 1.1107178 \text{ V}$ . Range of errors:  $(-24 \text{ mV to } 6 \text{ mV})$ .