Special Topics on Basic EECS I Design Technology Co-Optimization

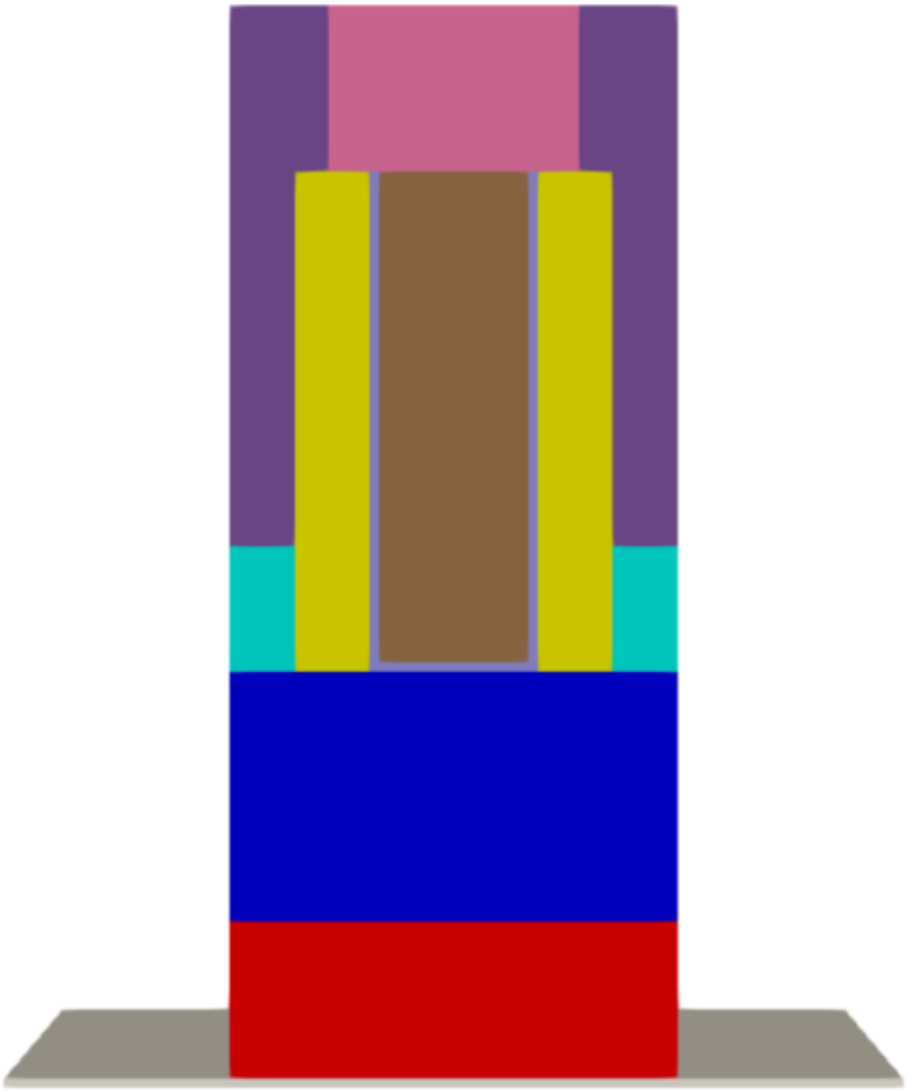
Lecture 21

Sung-Min Hong (smhong@gist.ac.kr)
Semiconductor Device Simulation Laboratory
Department of Electrical Engineering and Computer Science
Gwangju Institute of Science and Technology (GIST)

L21

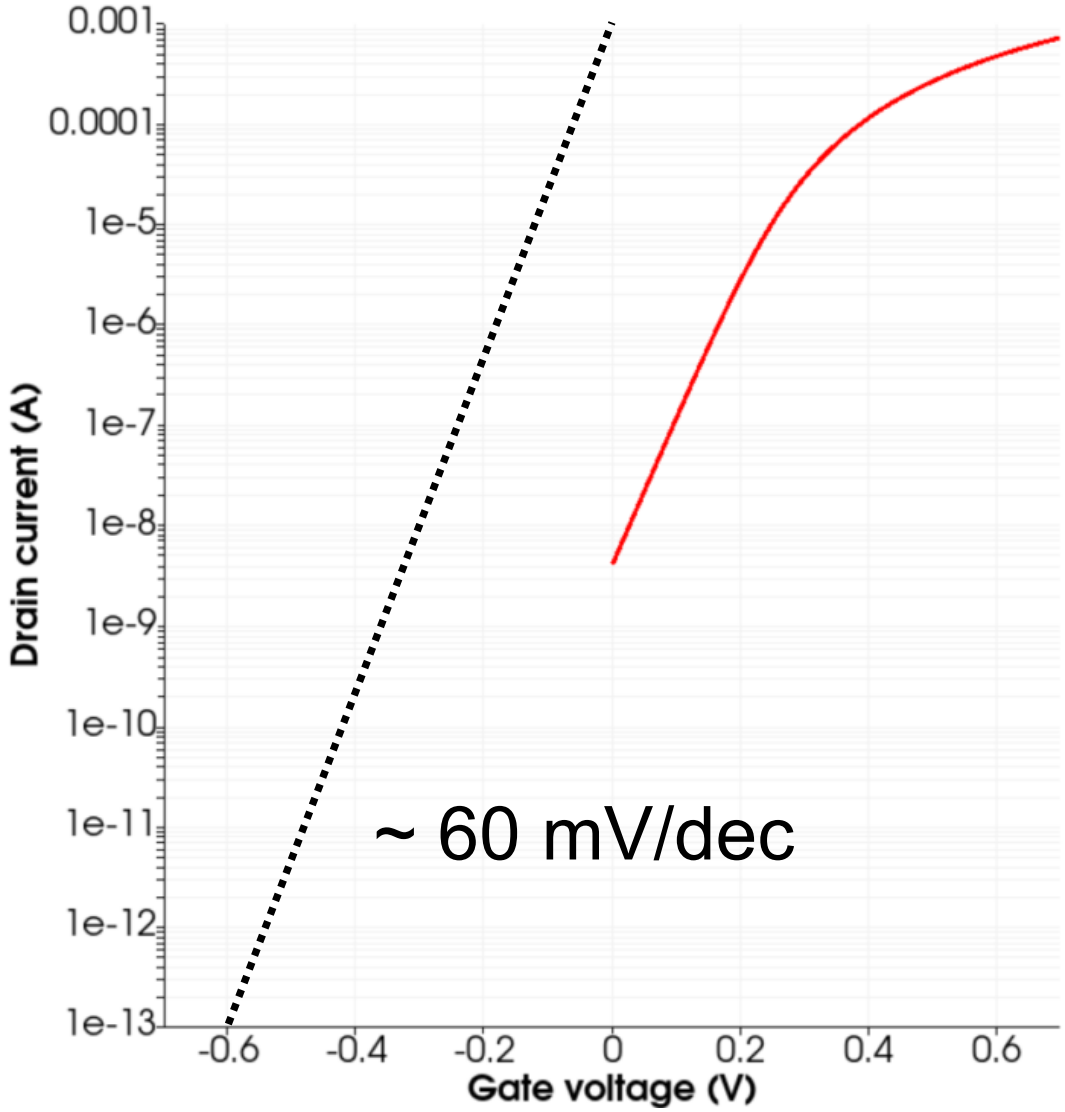
Reduction of vertex counts

- Keep only a part within the CPP.
  - The very initial region is kept.
  - Now, about 100k vertex points



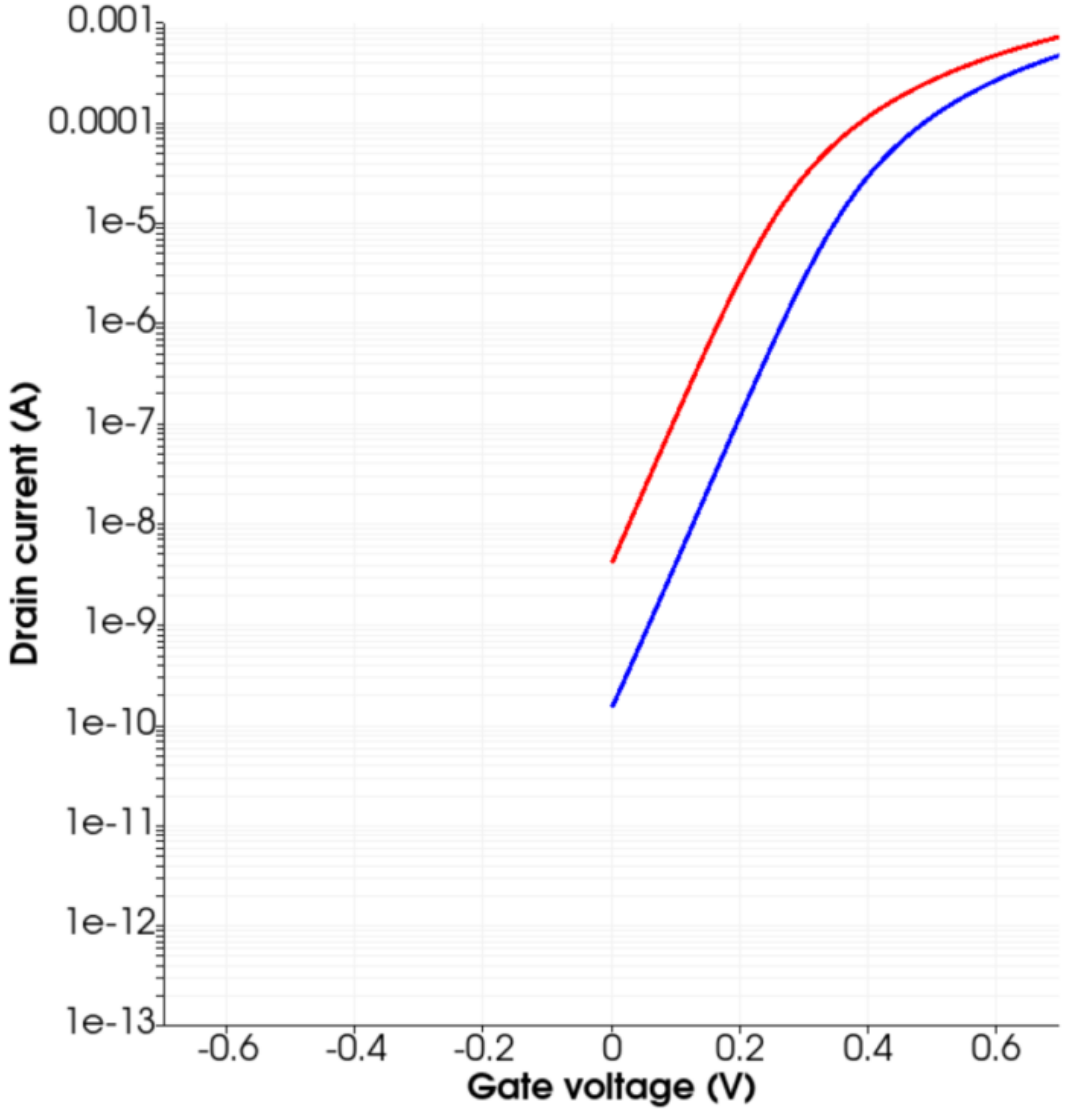
Input curve without any physical model

- Using the previous input file, we can simulate the FinFET.
  - Gate workfunction of 4.4 eV
  - It takes time. (4k sec in my environment)
  - The OFF current, 4.1 nA
  - The ON current, 723.9 μA (🡸 Again, highly overestimated)
  - Start your simulation now.



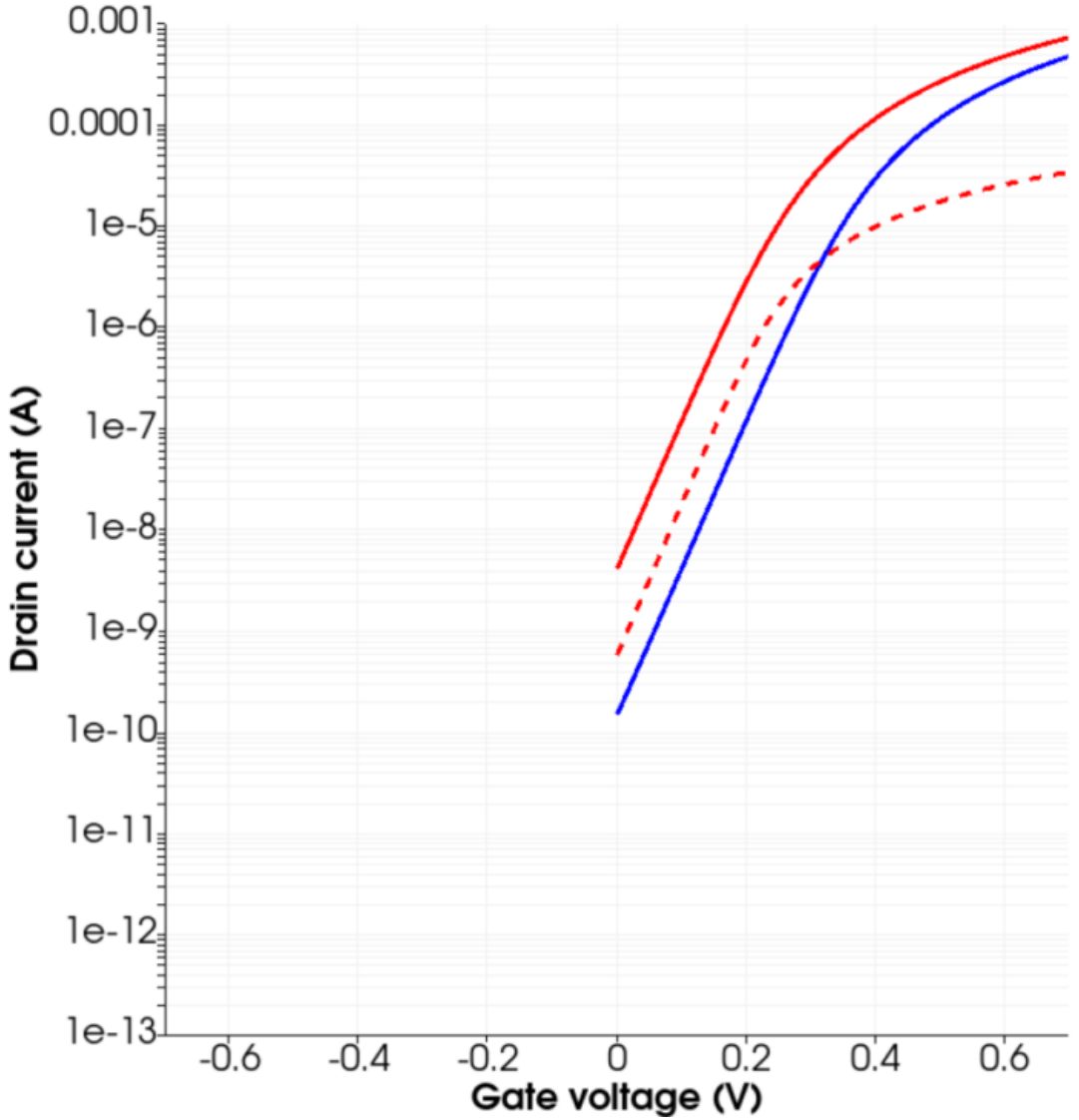
Workfunction of 4.5 eV

- As expected, the IV curves shifts with the workfunction.
  - The OFF current, 0.14 nA
  - The ON current, 472.1 μA



Mobility model and SRH model

- Significant reduction of drain current
  - Gate workfunction of 4.4 eV
  - The OFF current, 0.57 nA (It was 4.1 nA.)
  - The ON current, 33.9 μA (It was 723.9 μA.)



Homework#21

- Due: 08:00 on Dec. 1
- Submit a report through the GIST LMS system.
  - The ASAP7 PDK results are shown below. Calculate your I_{dsat} and I_{off} with your own setting. Then, compare your results with the table.

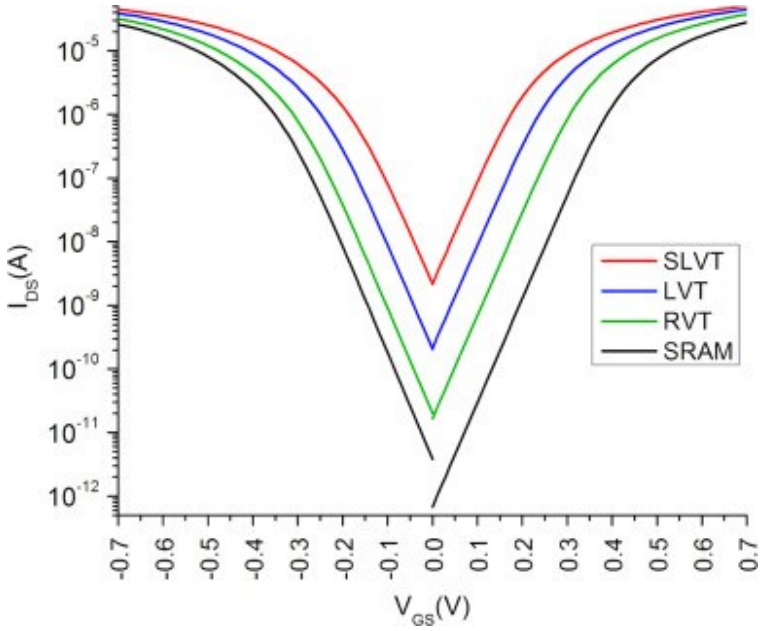


Table 3. NMOS typical corner parameters (per fin) at 25°C.

Parameter	SRAM	RVT	LVT	SLVT
I_{dsat} (μA)	28.57	37.85	45.19	50.79
I_{eff} (μA)	13.07	18.13	23.56	28.67
I_{off} (nA)	0.001	0.019	0.242	2.444
V_{tsat} (V)	0.25	0.17	0.10	0.04
V_{tlin} (V)	0.27	0.19	0.12	0.06
SS (mV/decade)	62.44	63.03	62.90	63.33
DIBL (mV/V)	19.23	21.31	22.32	22.55

Thank you!