VLSI Design
The MOS Transistor
Supplementary Material

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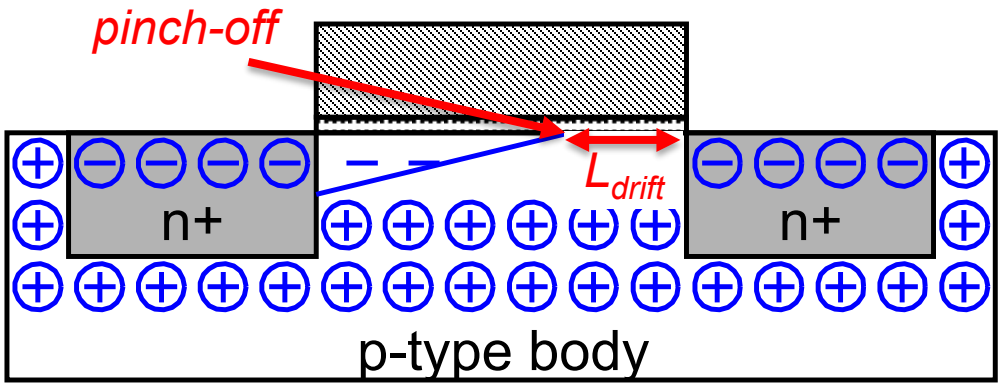
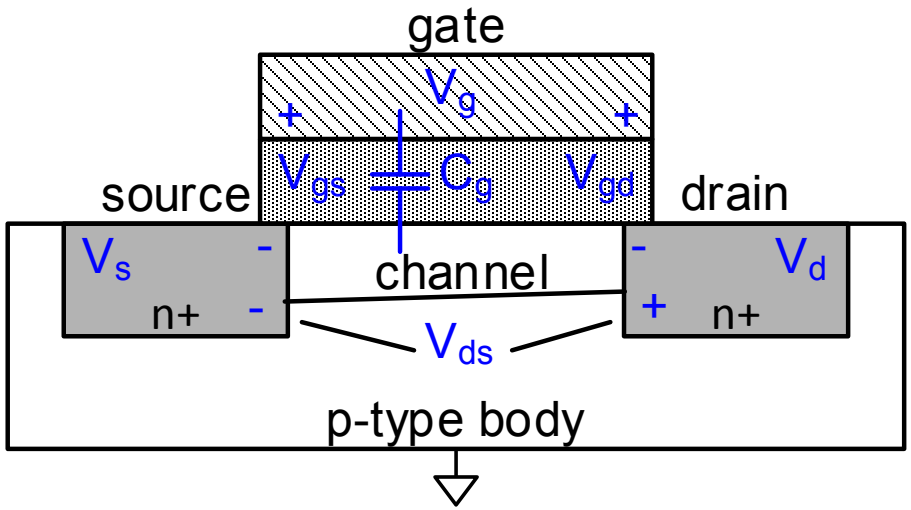
nMOS Saturation (p. 12)

- Drift depends on electric field E_{drift} between drain and pinch-off
- $E_{drift} \propto V_{ds}/L_{drift}$ (L_{drift} = Distance between drain and pinch-off)
- If V_{ds} increases → L_{drift} increases → E_{drift} stays constant
- → Equilibrium between V_{ds}, L_{drift} and E_{drift}



Channel Charge (p. 18)

- Why $V = V_{gc} - v_t$?
  - v_t is required for inverting the channel → related charge $Q' = C_g * v_t$ not available for current, i.e. not inside channel



Gate Capacitance (p. 32)

- Cut-off
  - No channel => changes on V_g don't affect charge on drain/source
- Linear
  - Channel acts as bottom plate (no capacitance between gate and bulk)
  - Charge (roughly) shared between drain and source
- Saturation
  - Charge only at source region