VLSI Design EE 523
Spring 2026

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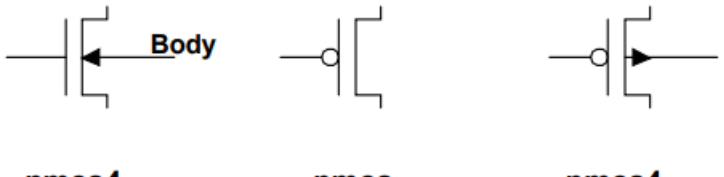
Lecture 6

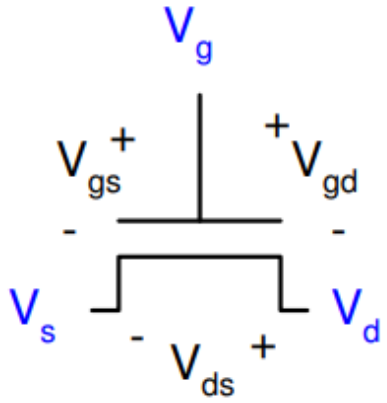
Topics for lecture 6

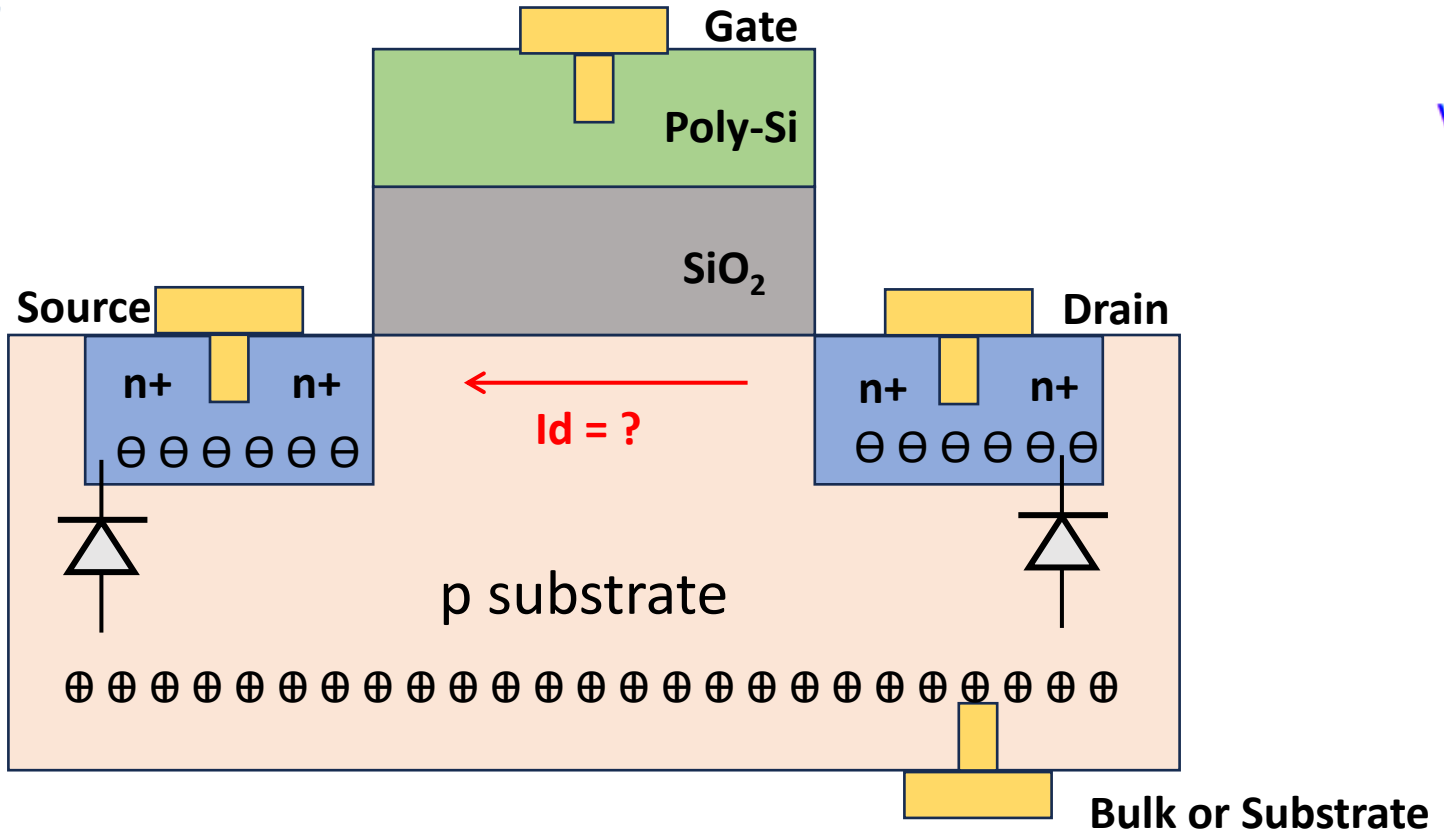
- MOS transistor theory and operation
- Mathematical Equations for:
  - Gate Capacitance, and charge stored
  - Velocity of electron forming current flow
  - W, L ratios in MOS
- Schokley model of MOSFET:
  - Equation for current Ids in three regions of operation
- Quiz 1 today
- Readings: Chapter 2 of textbook

MOS Transistor with Zero Bias Voltages

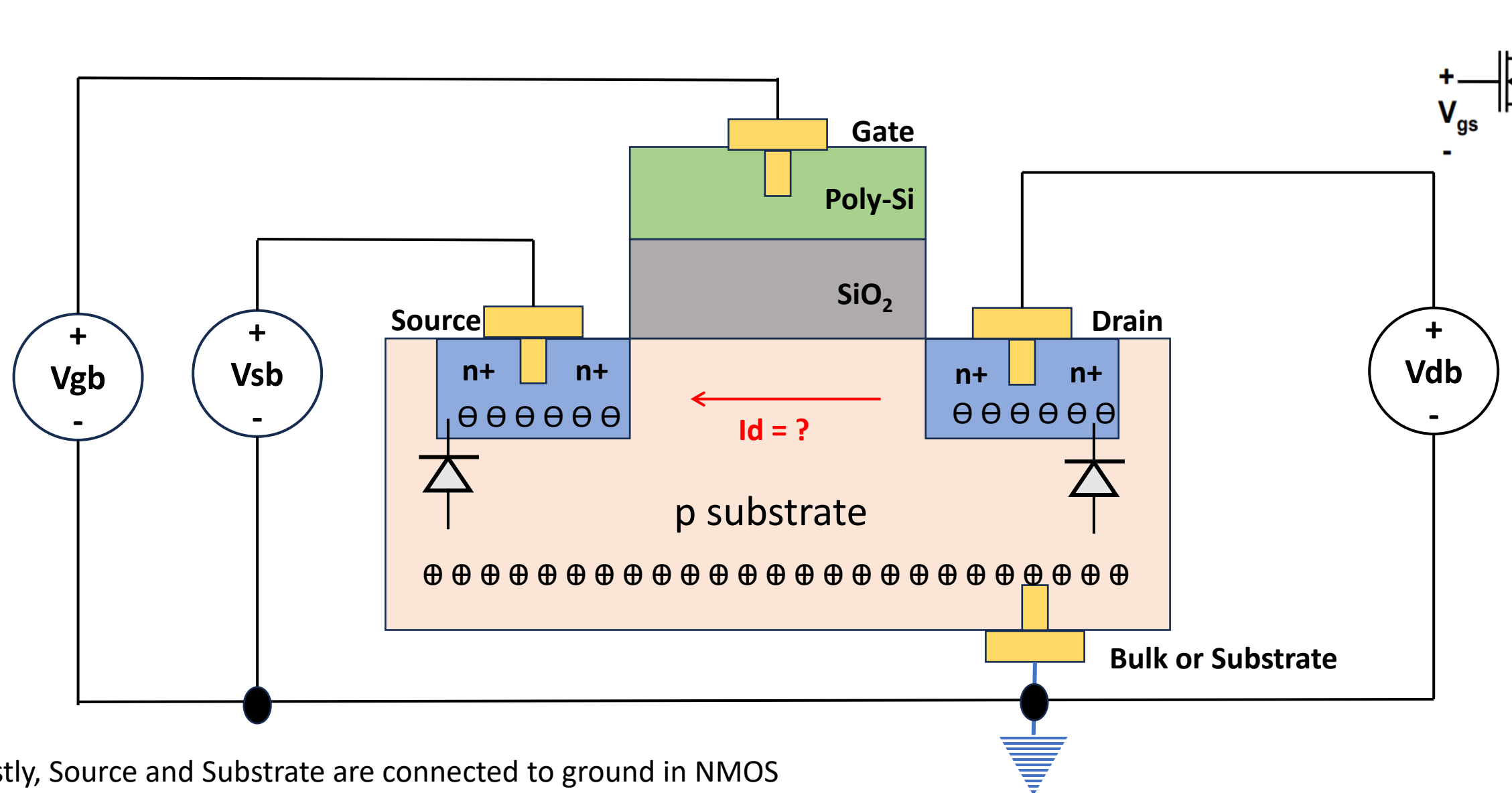


symbols



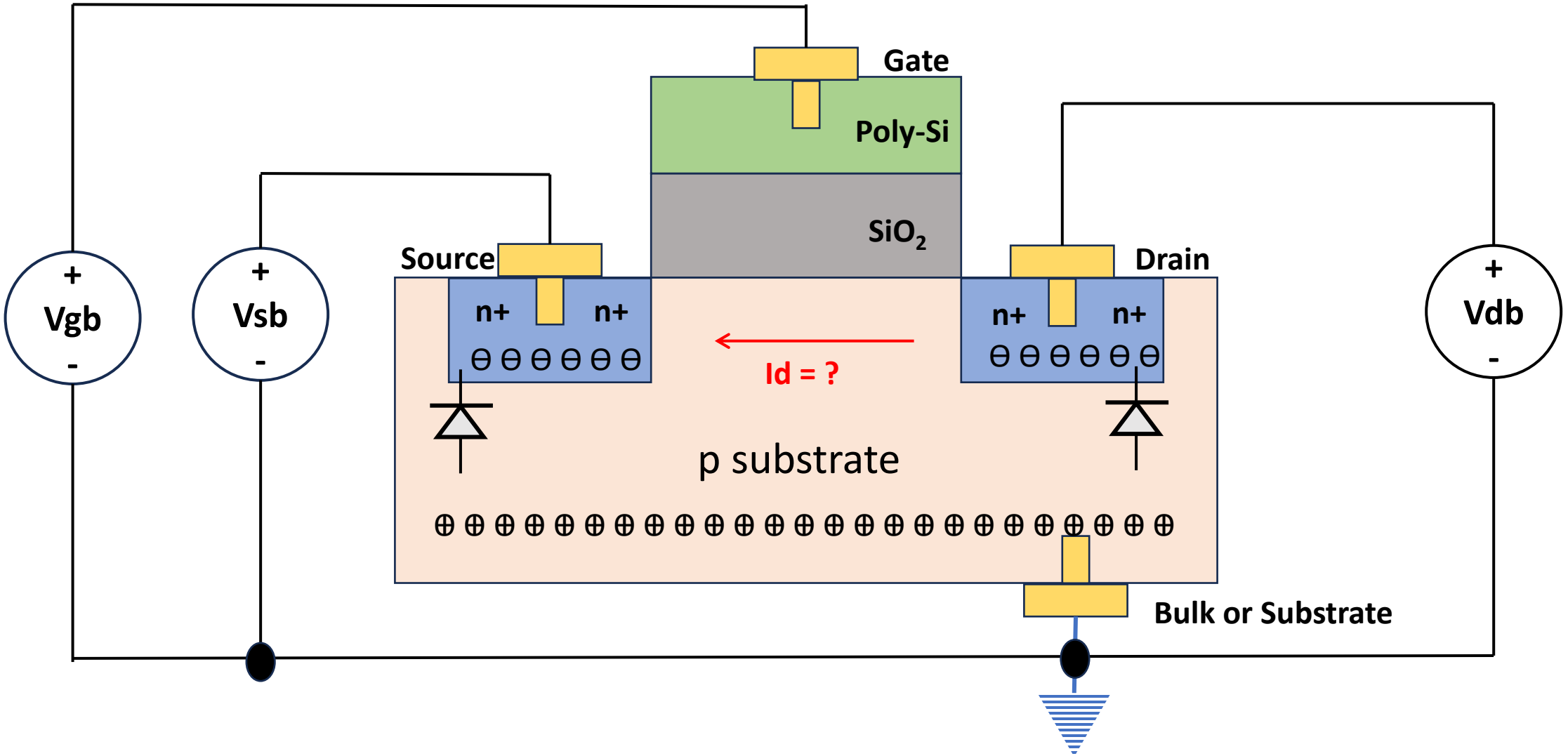


MOS Transistor showing Bias Voltages

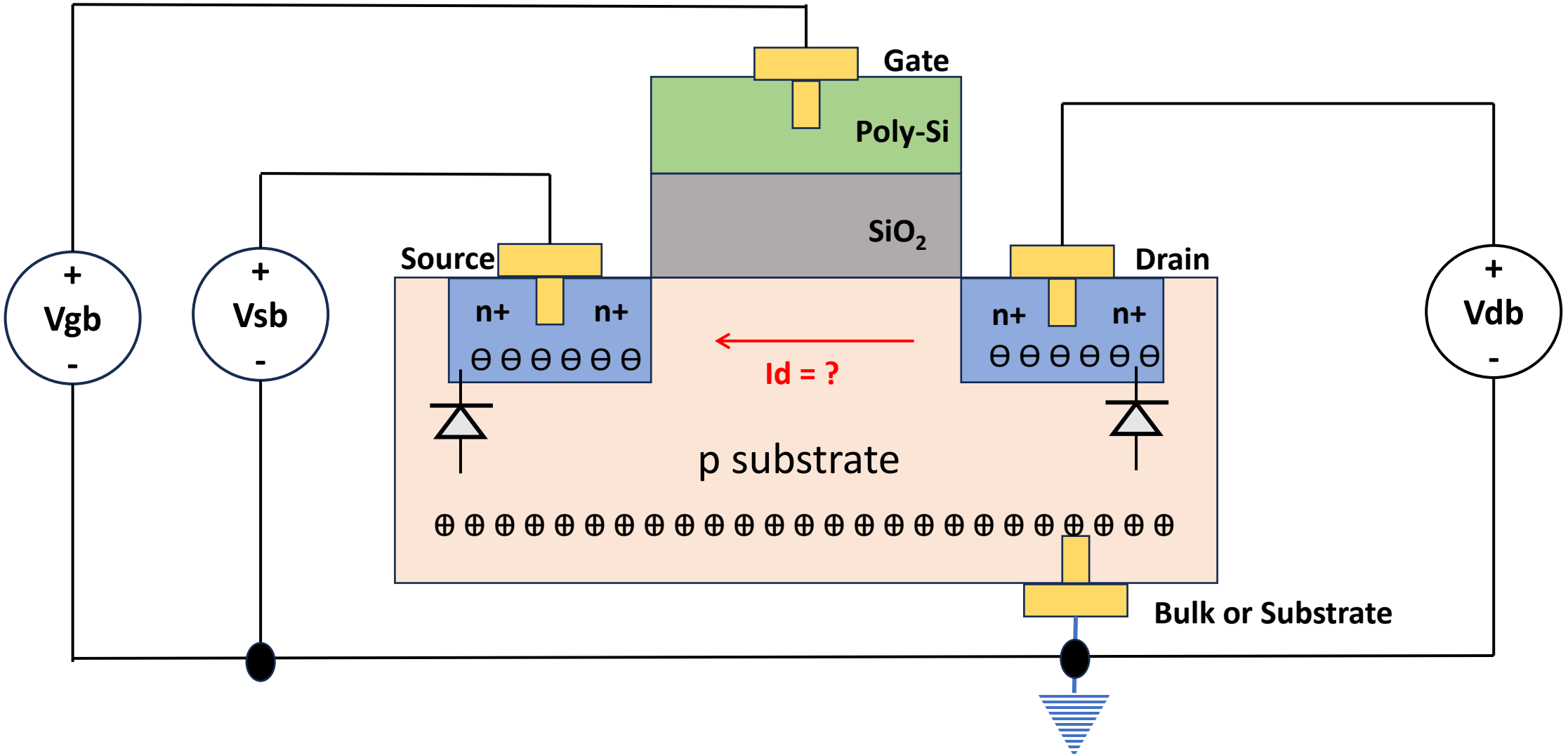


Mostly, Source and Substrate are connected to ground in NMOS

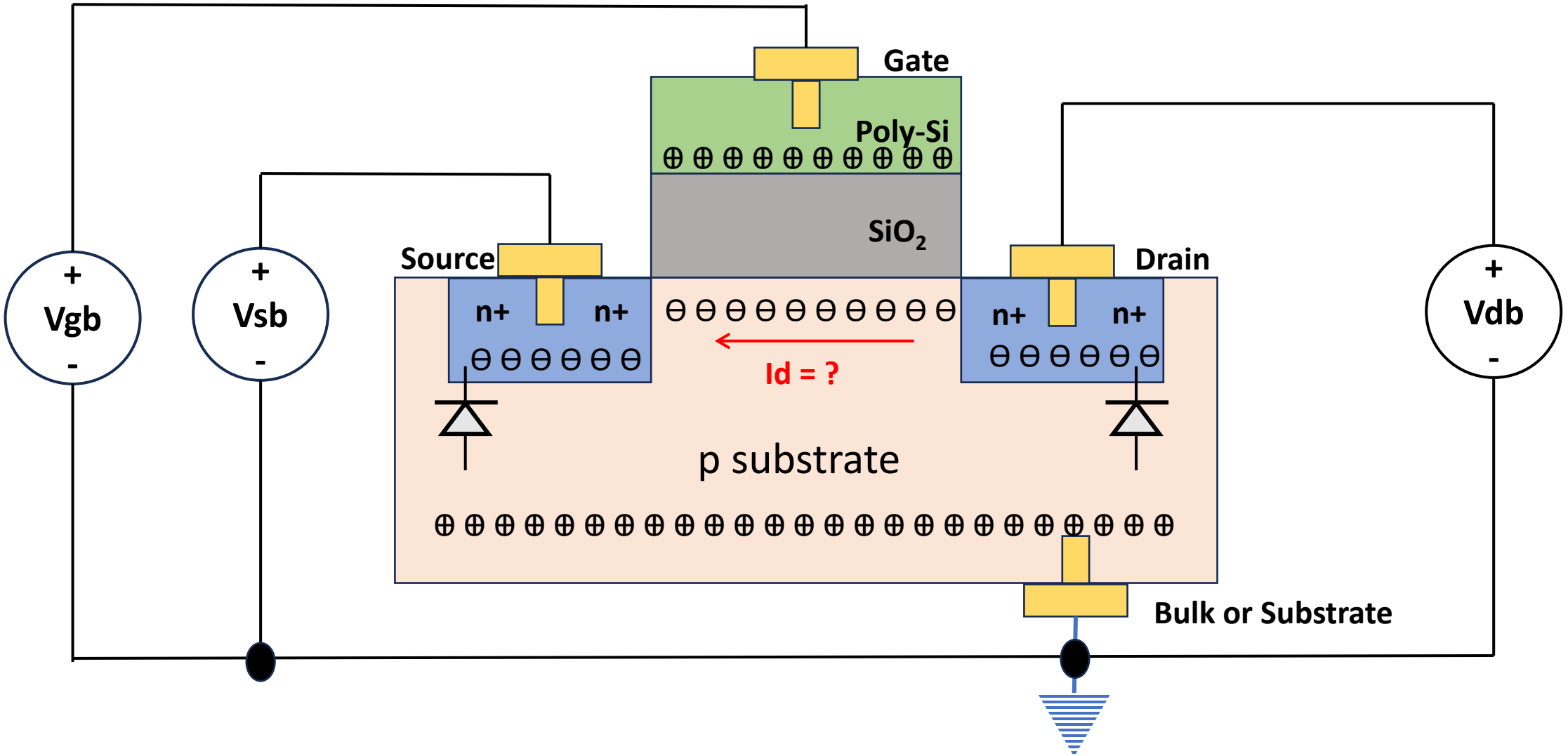
MOS Transistor – Identify Cutoff Region



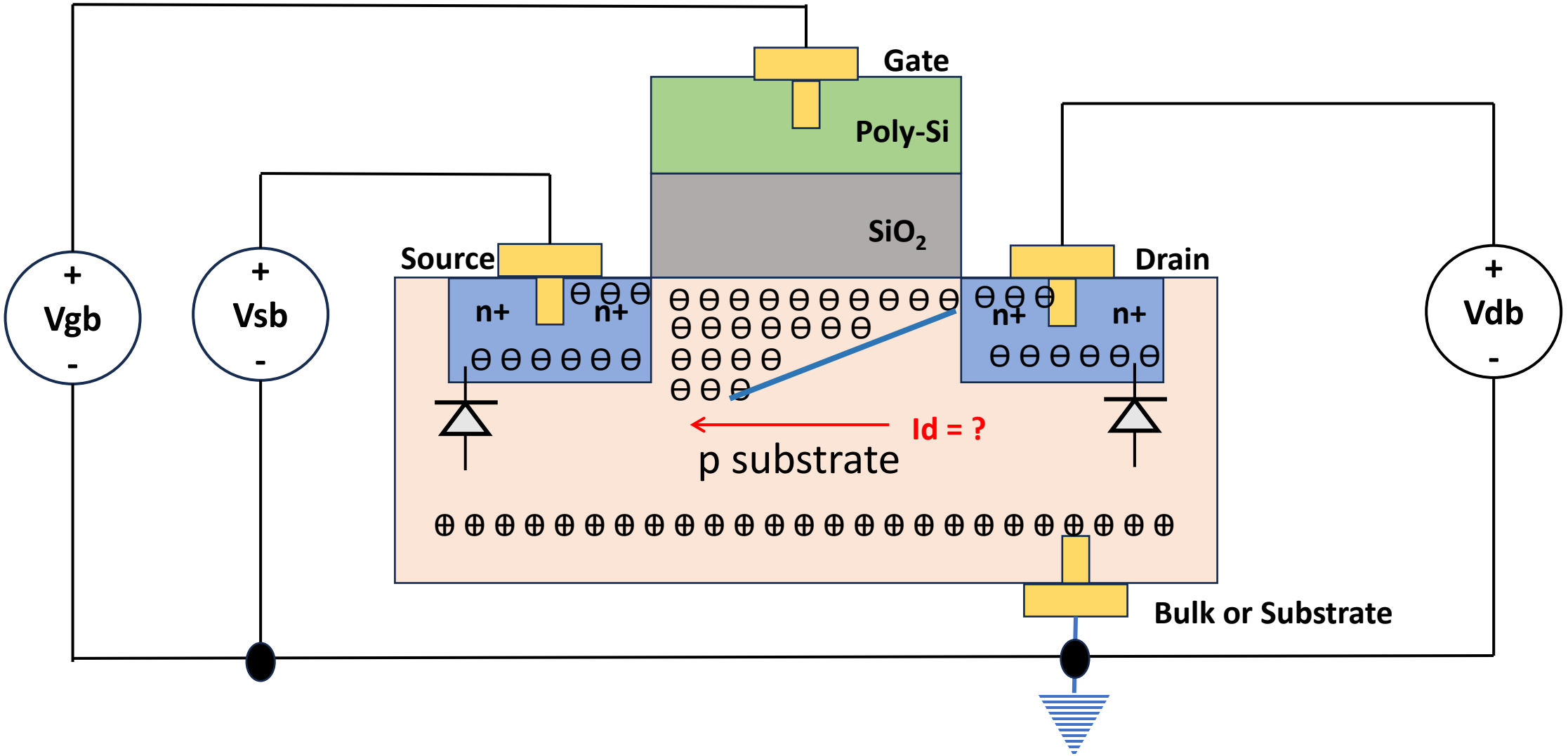
MOS Transistor – Identify Depletion Region



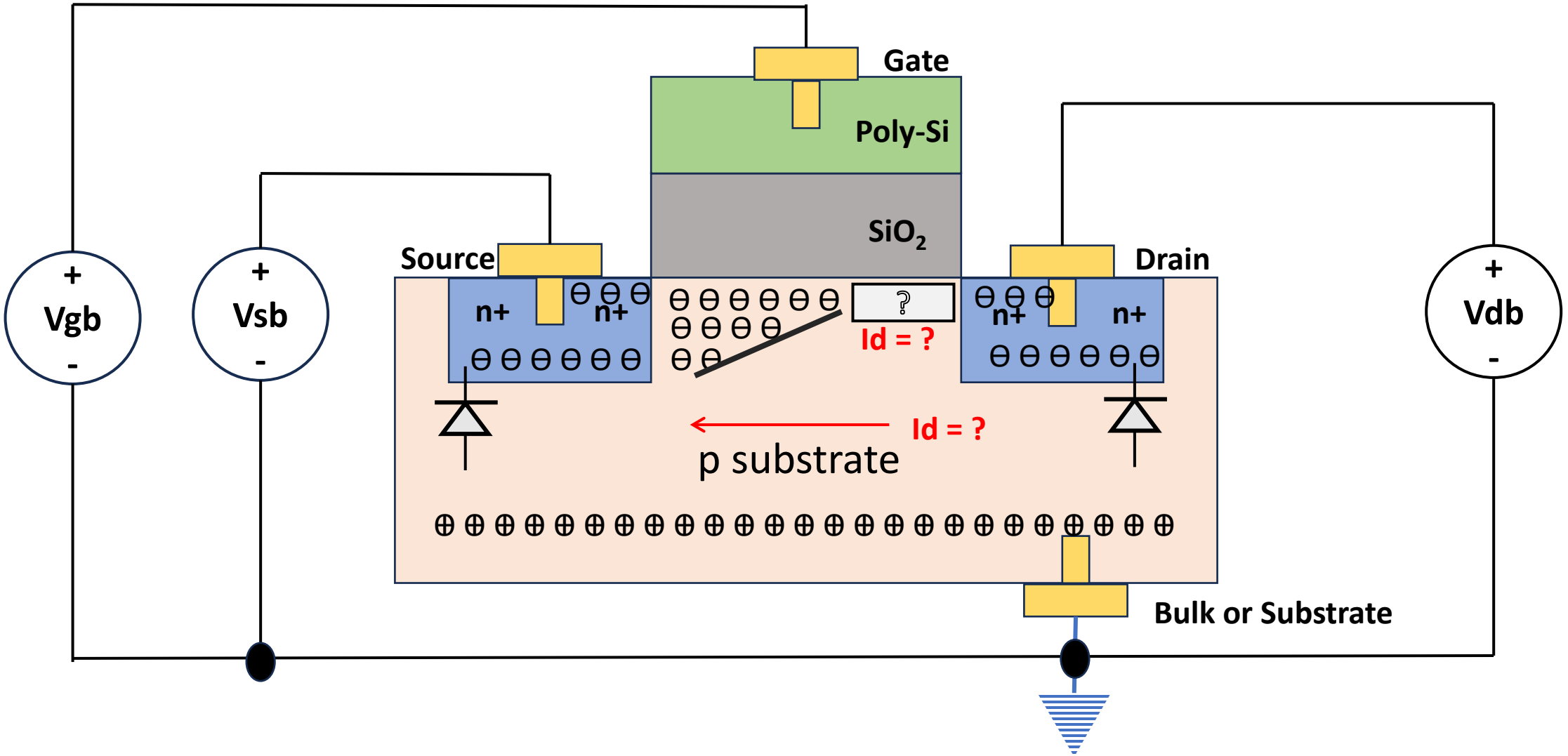
MOS Transistor – Identify Accumulation Region



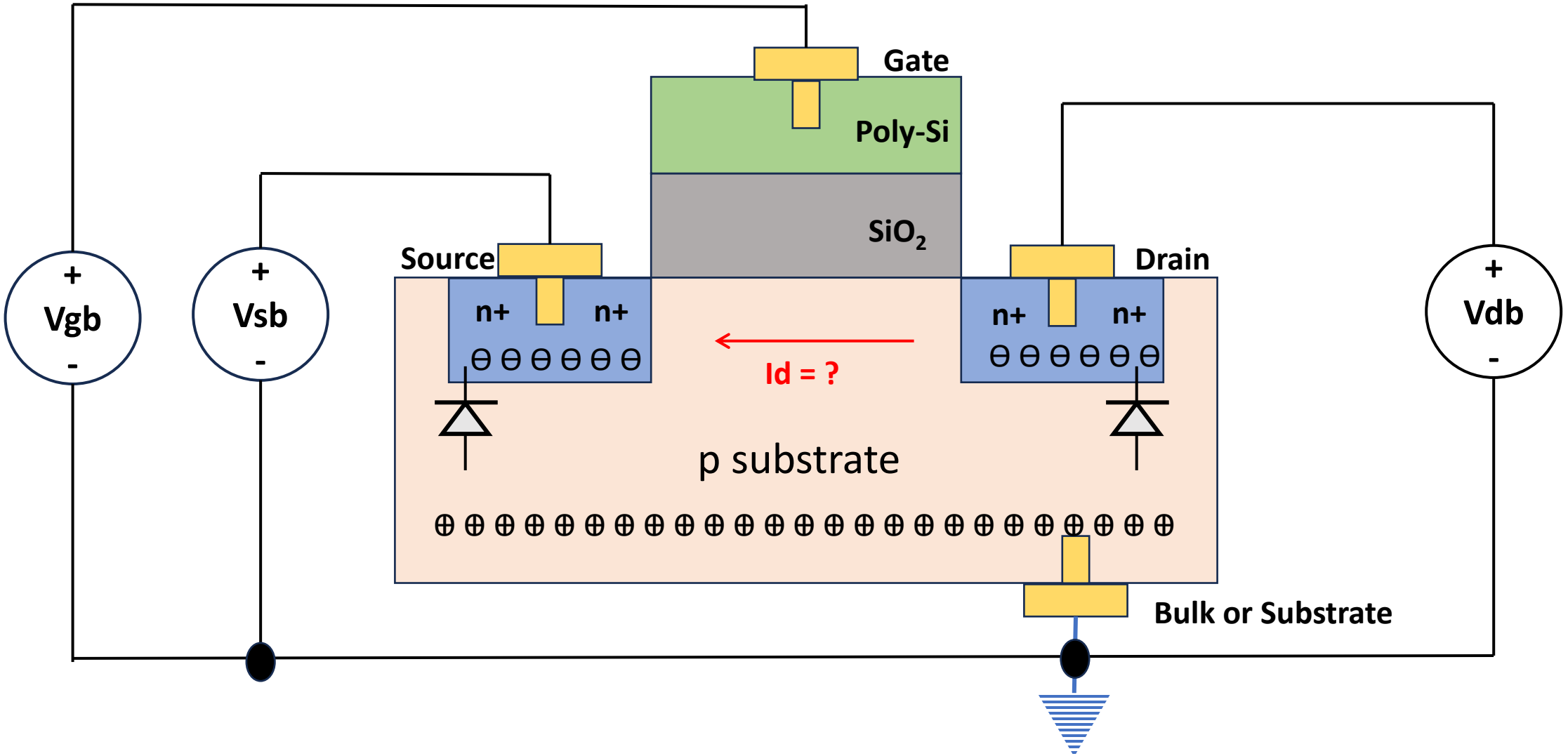
MOS Transistor – Identify Linear Region



MOS Transistor – Identify Saturation Region



MOS Transistor – Identify Saturation Region



MOS Transistor Equations for Operation

Reading and Book

- Textbook Chapter