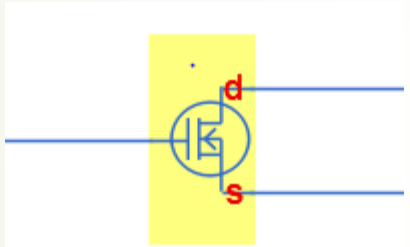
Basics of Mosfets

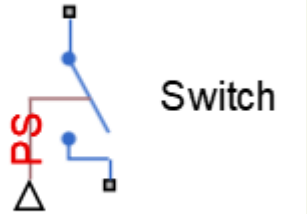
Enes AYAZ

MOSFET(Metal Oxide Semiconductor Field Effect Transistor)

- Transistor is used for amplifiying or switching electronic signals.



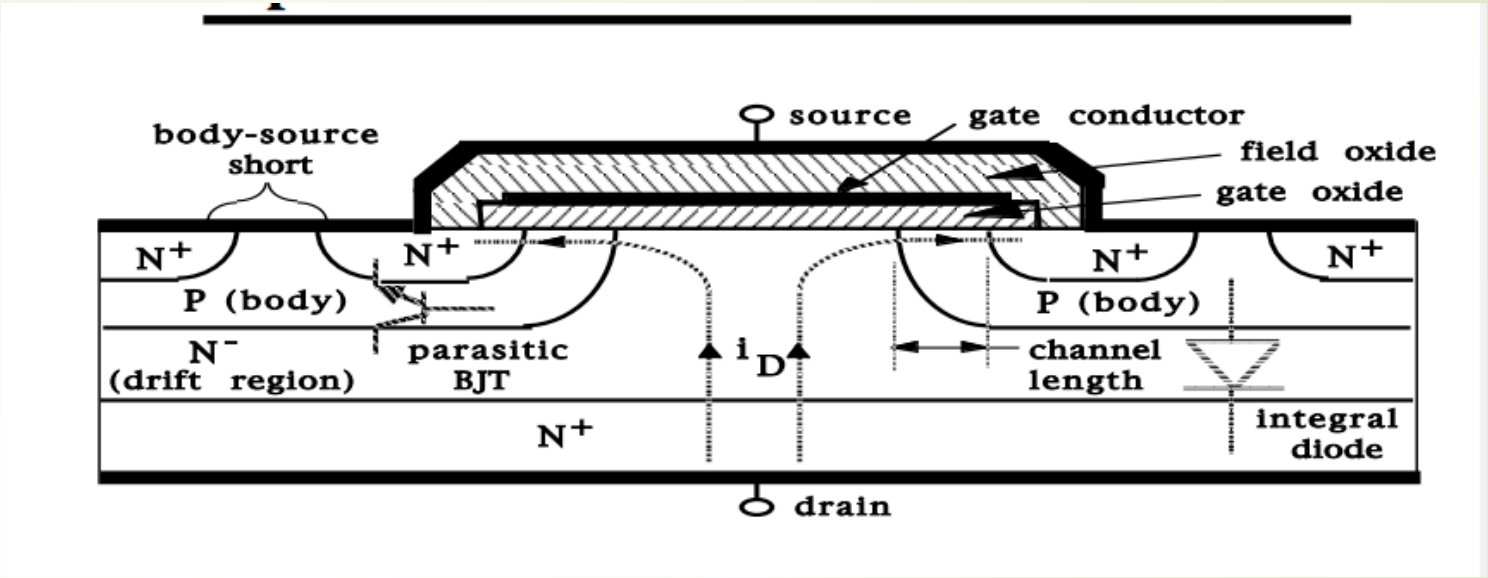
N-Channel MOSFET



Switch

- There is a 3 terminals.
  - GATE
  - SOURCE
  - DRAİN

Geometries of MOSFETS



- There is some manufacturing technologies to produce Mosfets.
- LDMOS,VMOS,UMOS,PLANAR,TrenchMos,HexFet
- VDMOS is shown above.
- Basic structure is n+pn-n+ doping.(n type enhancement)

Working Principles and Operation Regions

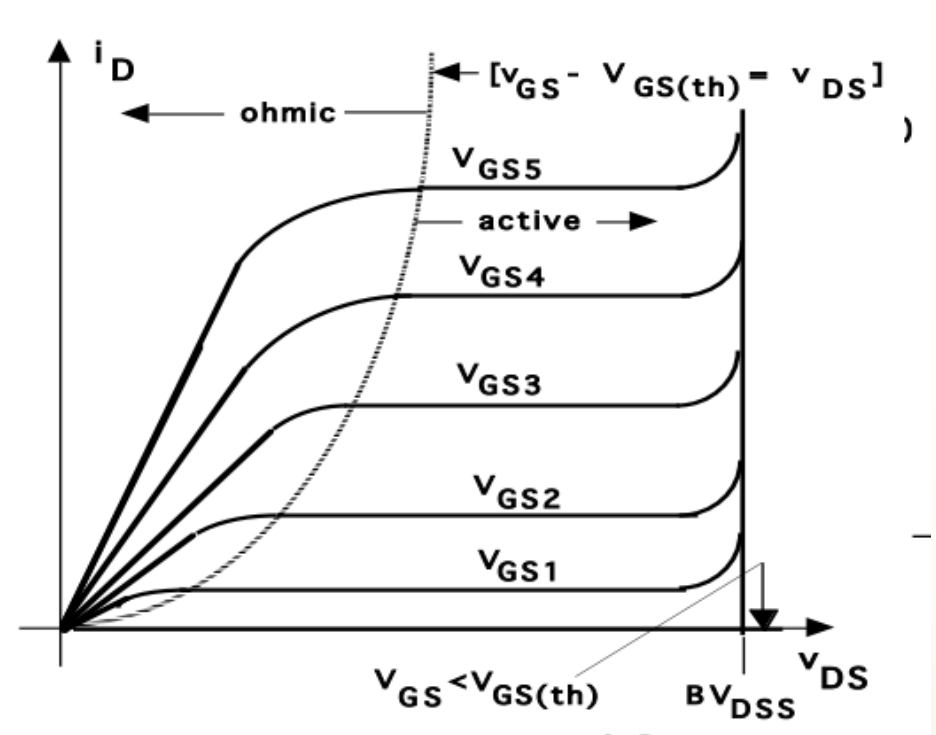
- Gate-to-Source voltage and Drain-to-Source voltage determines the operation of Mosfets.
  - Cut-off Region: Vgs<Vth

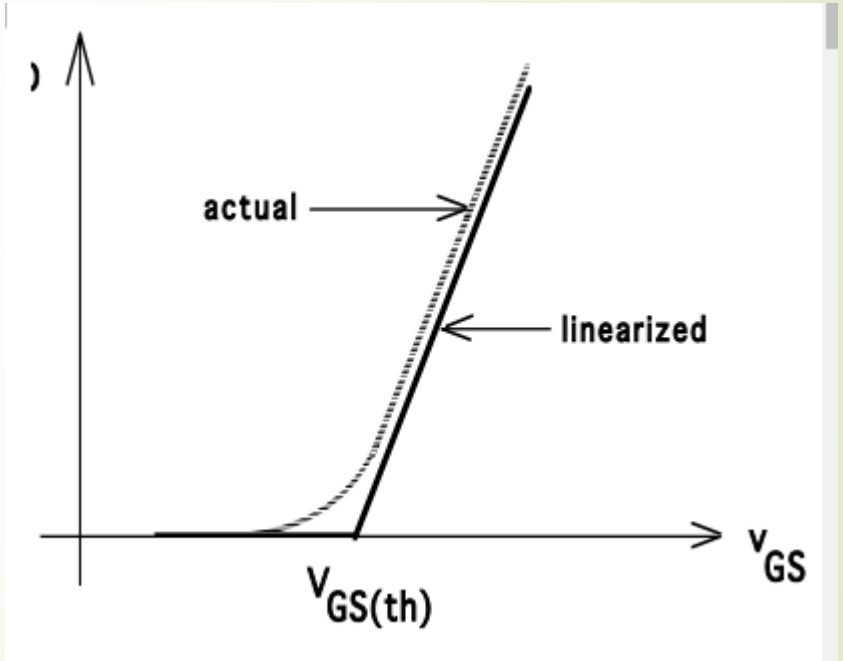
    Id=0
  - Linear Region/Ohmic/Triode Region :Vgs>Vth and Vds<Vgs-Vth

    Id=Kn*((Vgs-Vth)*Vds-)1/2*Vds^2))
  - Saturation Region: Vgs>Vth and Vds>Vgs-Vth

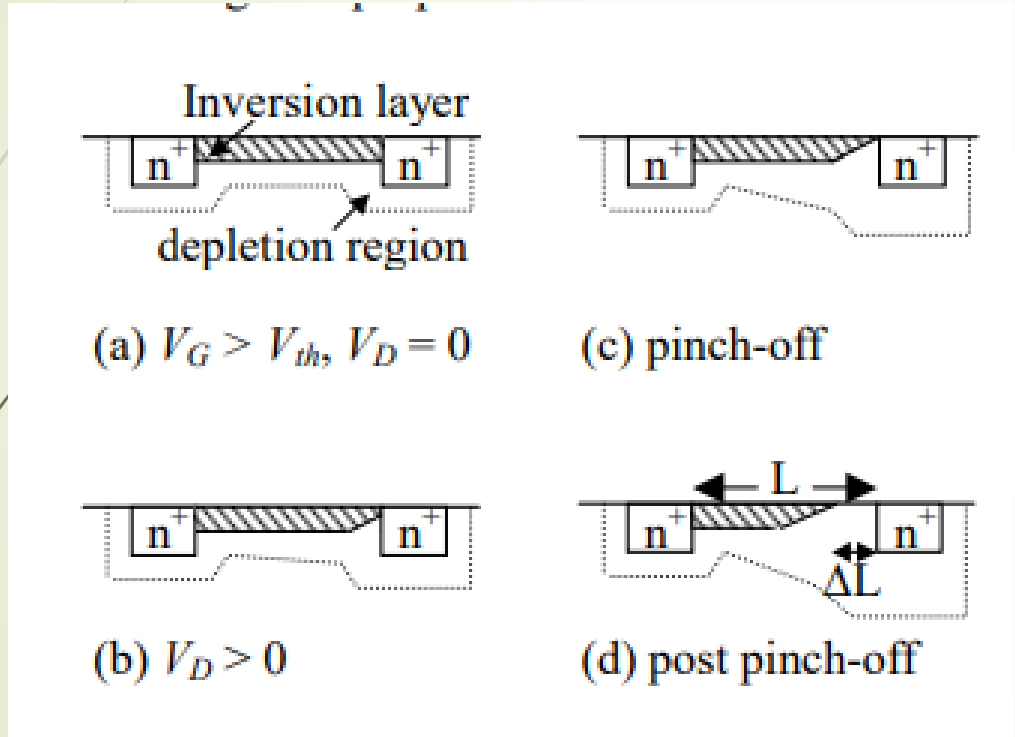
    Id=1/2*Kn*((Vgs-Vtn)^2)

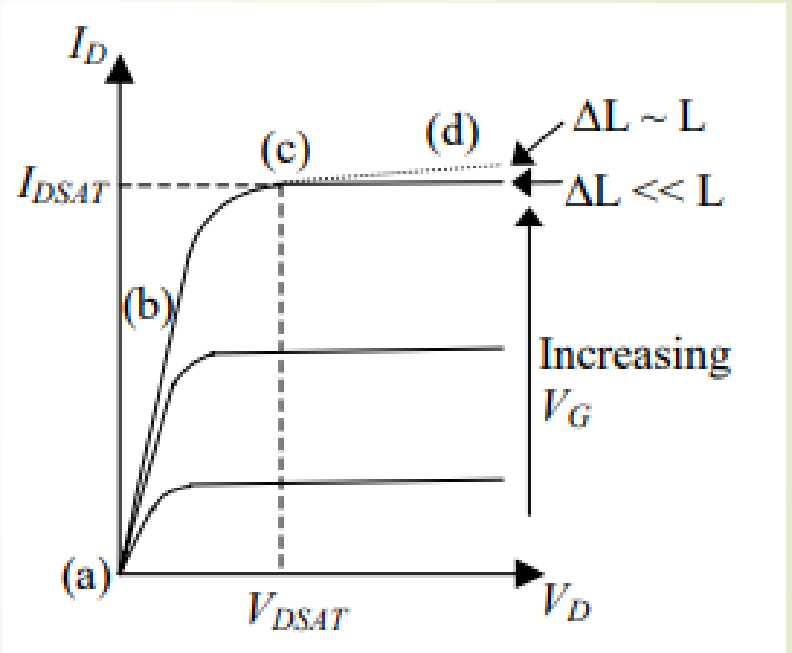
I-V Characteristics





Physics of Device Operation





Mosfet Parasitic Capacitance