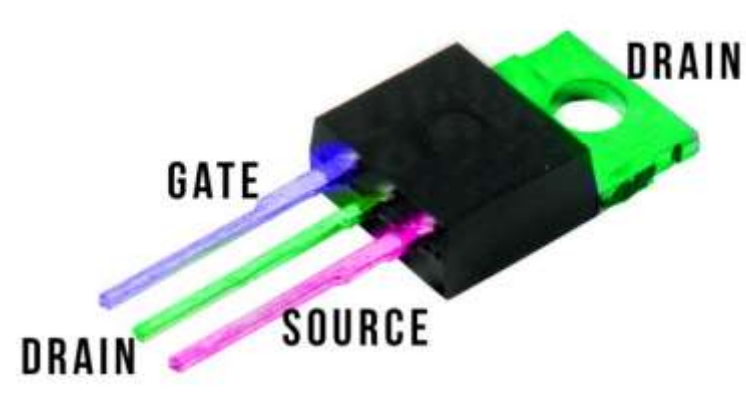
UNIT IV



METAL-OXIDE SEMICONDUCTOR FIELD EFFECT TRANSISTOR

MOSFET'S

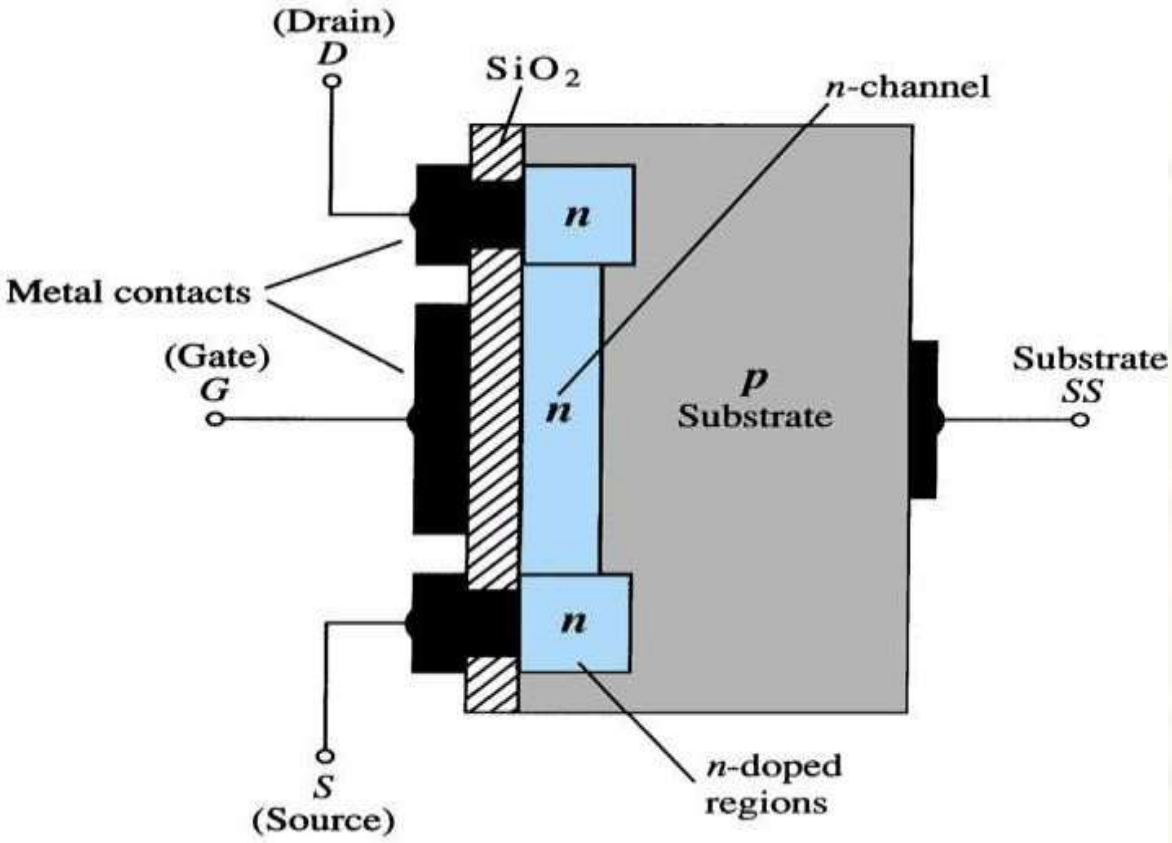
- There are 2 types of MOSFET's:

  - Depletion mode MOSFET (D-MOSFET)

    N-channel D-Type MOSFET

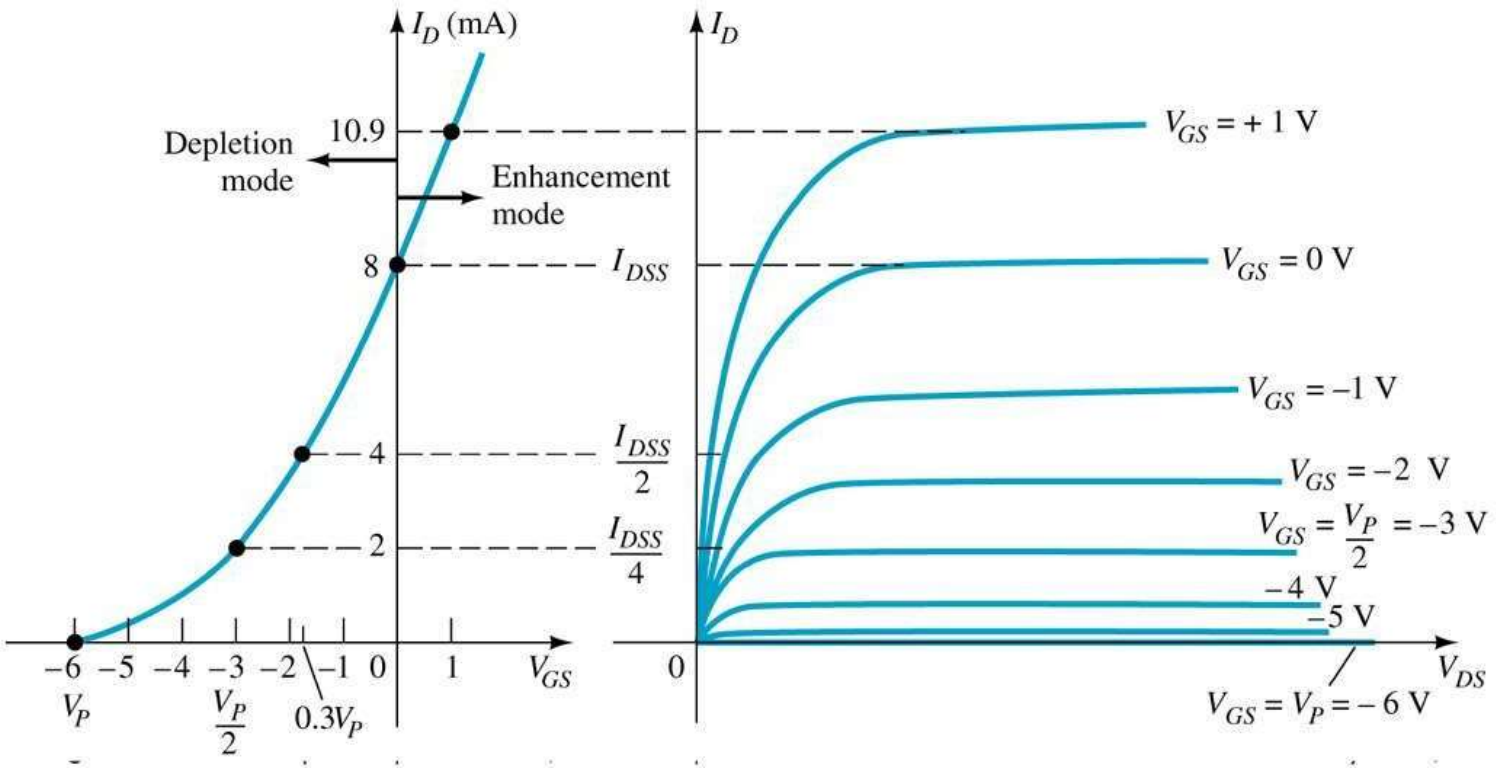
    P-channel D-Type MOSFET
  - Enhancement Mode MOSFET (E-MOSFET)

DEPLETION MODE MOSFET CONSTRUCTION



- The Drain (D) and Source (S) leads connect to the to n-doped regions
- These N-doped regions are connected by an n-channel
- This n-channel is connected to the Gate (G) via a thin insulating layer of SiO_2
- The n-doped material lies on a p-doped substrate that may have an additional terminal connection called SS

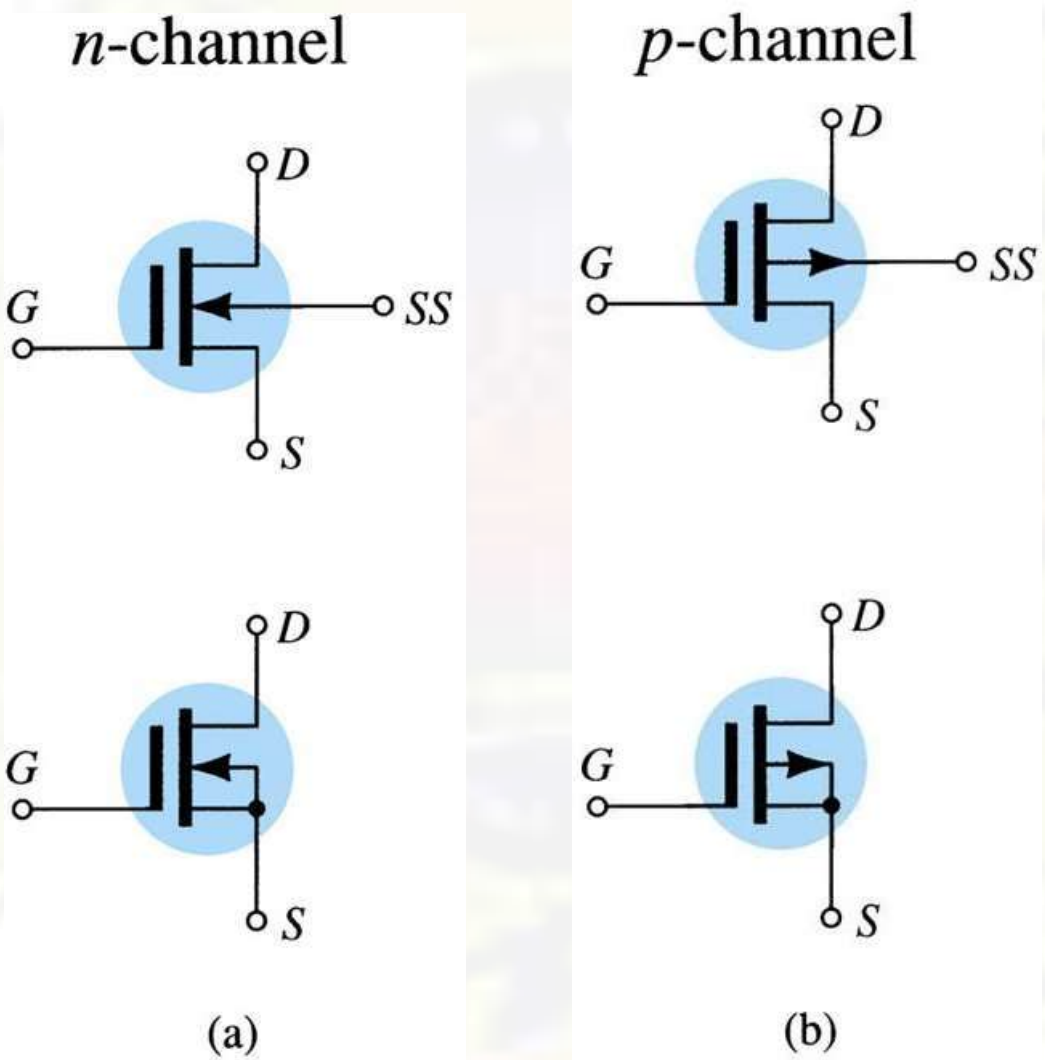
BASIC OPERATION



D-MOSFET may be biased to operate in two modes:

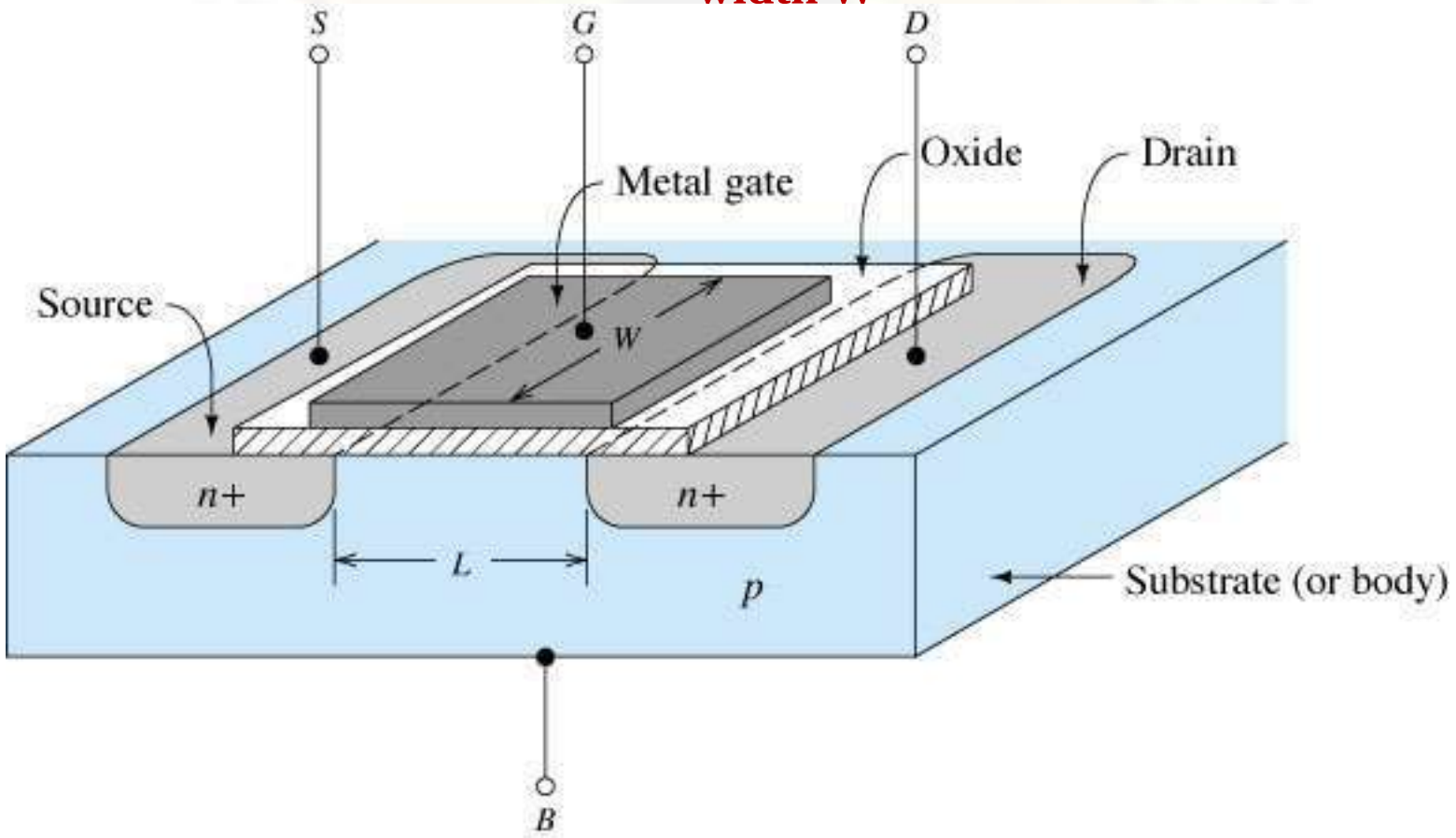
- The **Depletion** mode or The **Enhancement** mode

D-MOSFET Symbols

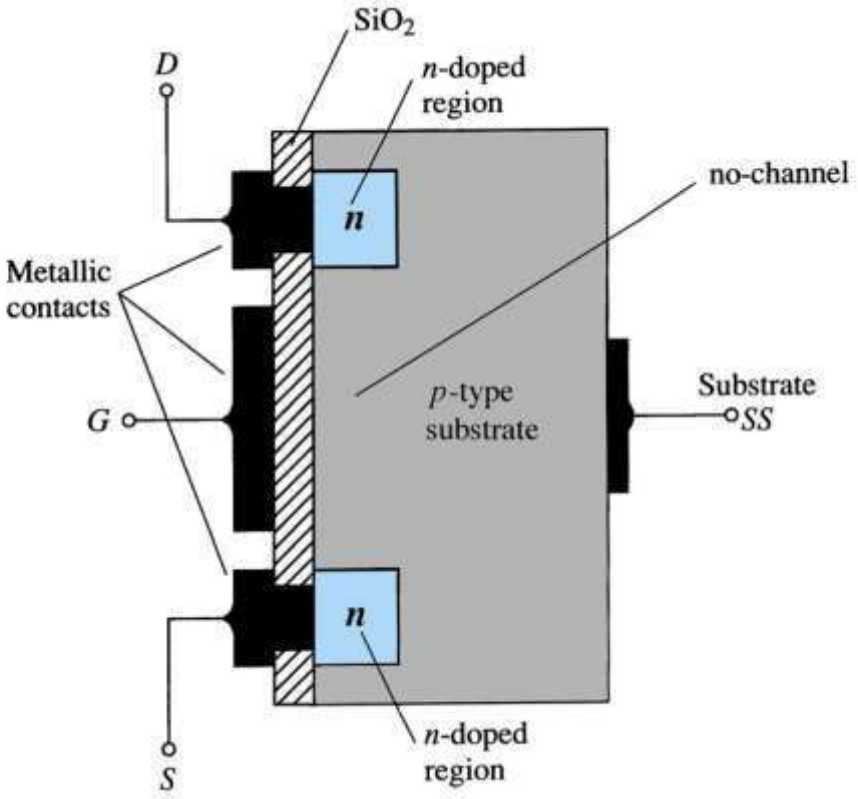


ENHANCEMENT MODE MOSFET'S

n-Channel E-MOSFET showing channel length L and channel width W



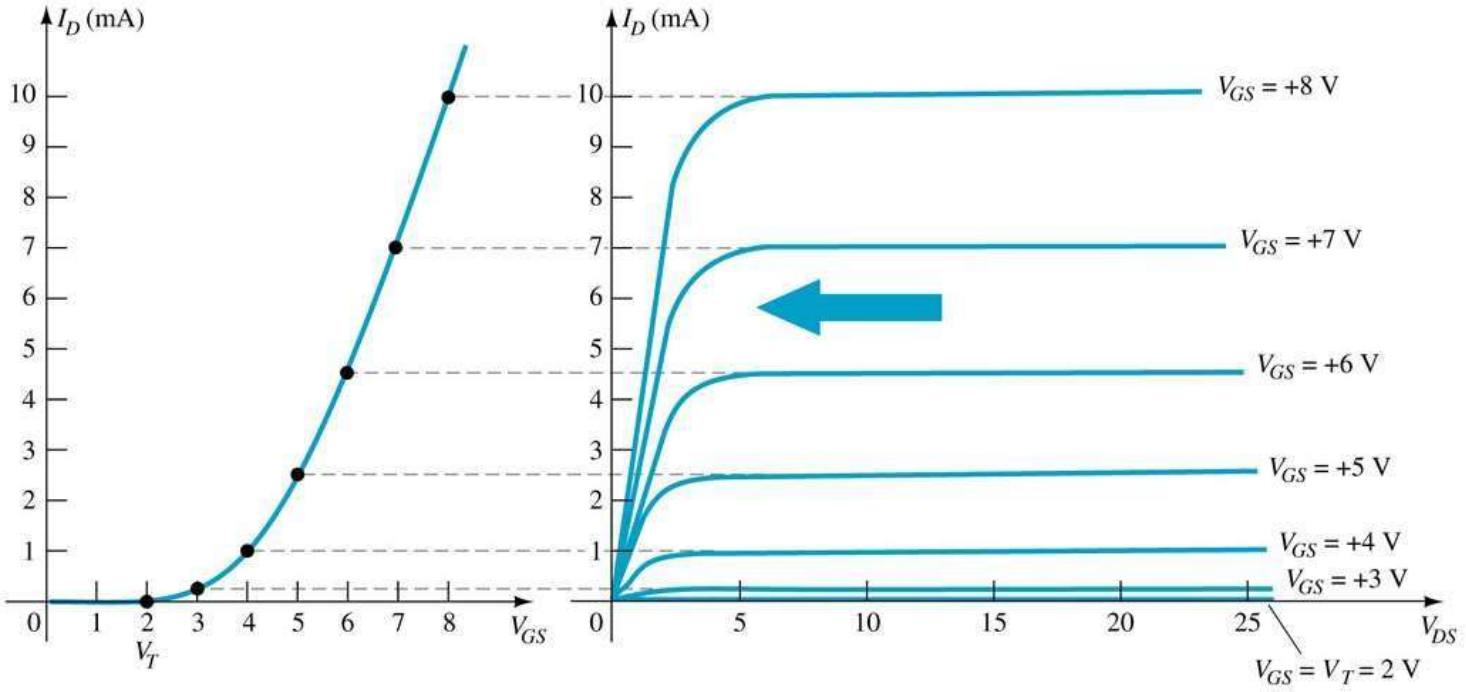
Enhancement Mode MOSFET Construction



The Drain (D) and Source (S) connect to the to n-doped regions
These n-doped regions are not connected via an n-channel without an external voltage
The Gate (G) connects to the p-doped substrate via a thin insulating layer of SiO_2
The n-doped material lies on a p-doped substrate that may have an additional terminal connection called SS

Basic Operation

The Enhancement mode MOSFET only operates in the enhancement mode.



V_{GS} is always positive

$I_{DSS} = 0$ when $V_{GS} < V_T$

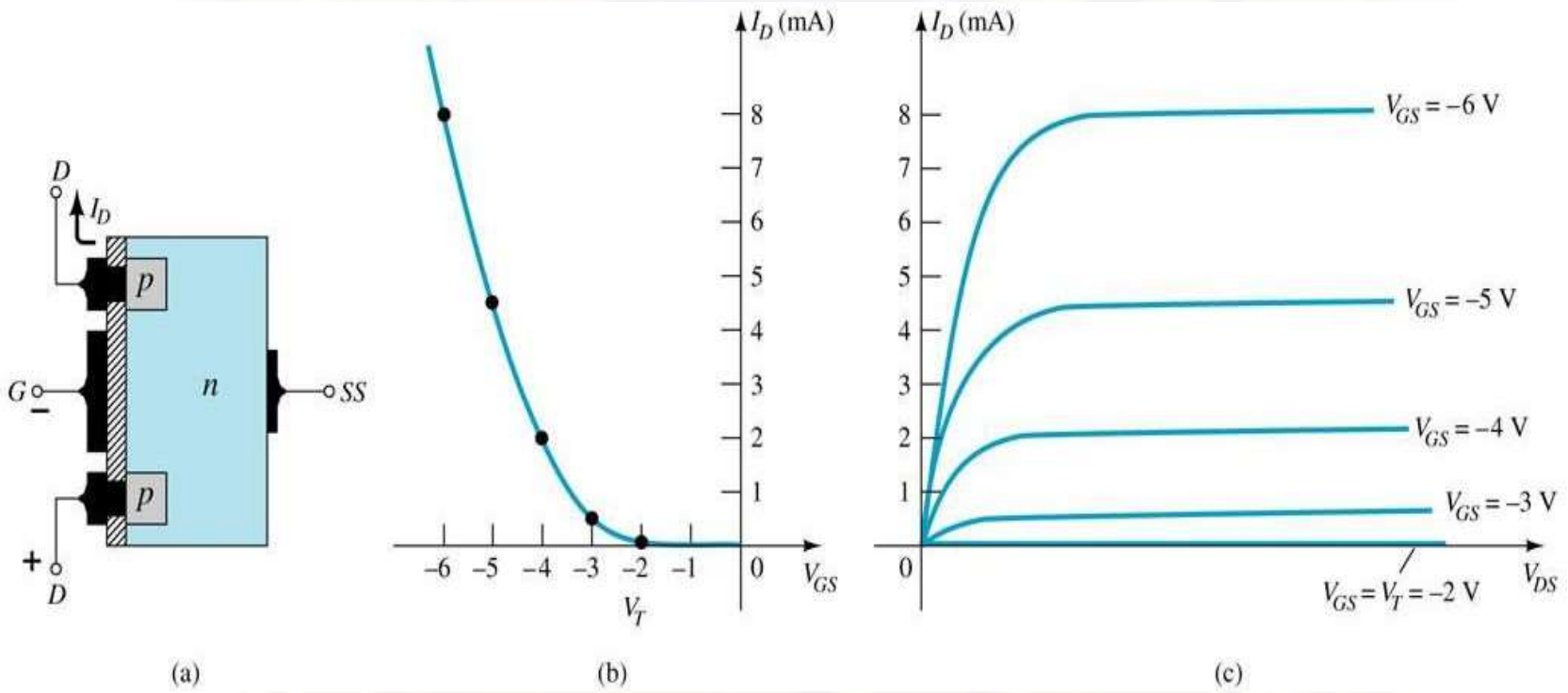
As V_{GS} increases above V_T, I_D increases

If V_{GS} is kept constant and V_{DS} is increased, then I_D saturates (I_{DSS})

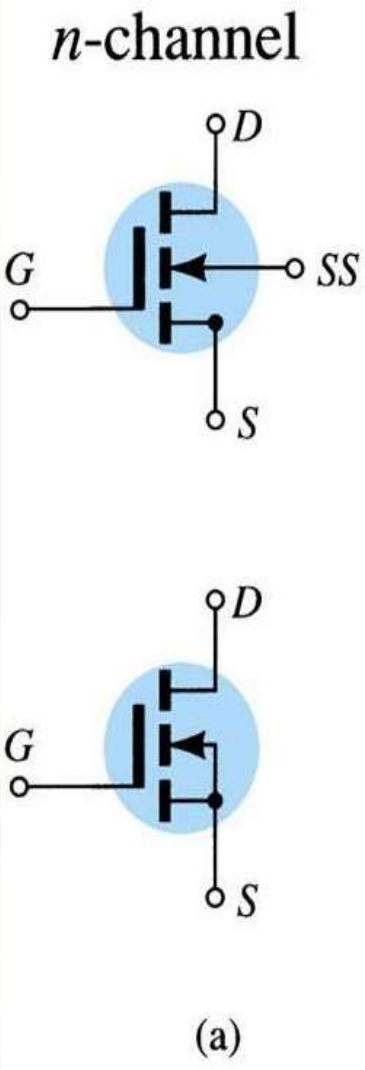
The saturation level, V_{DSsat} is reached.

p-Channel Enhancement Mode MOSFETs

The p-channel Enhancement mode MOSFET is similar to the n-channel except that the voltage polarities and current directions are reversed.



E-MOSFET Symbols



sOME PACKAGES OF MOSFET