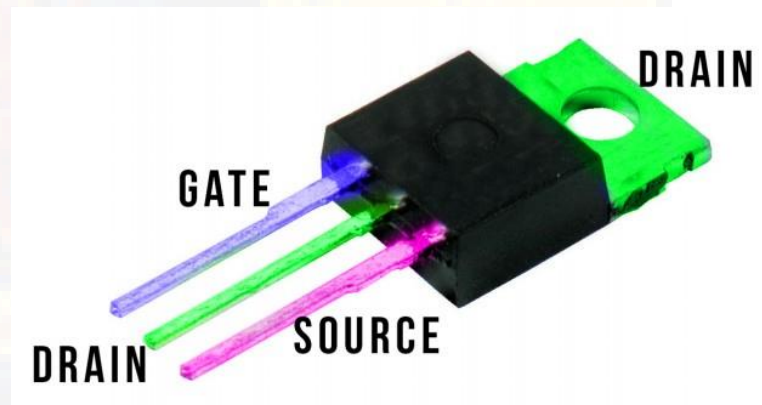




UNIT IV



METAL-OXIDE SEMICONDUCTOR FIELD EFFECT TRANSISTOR

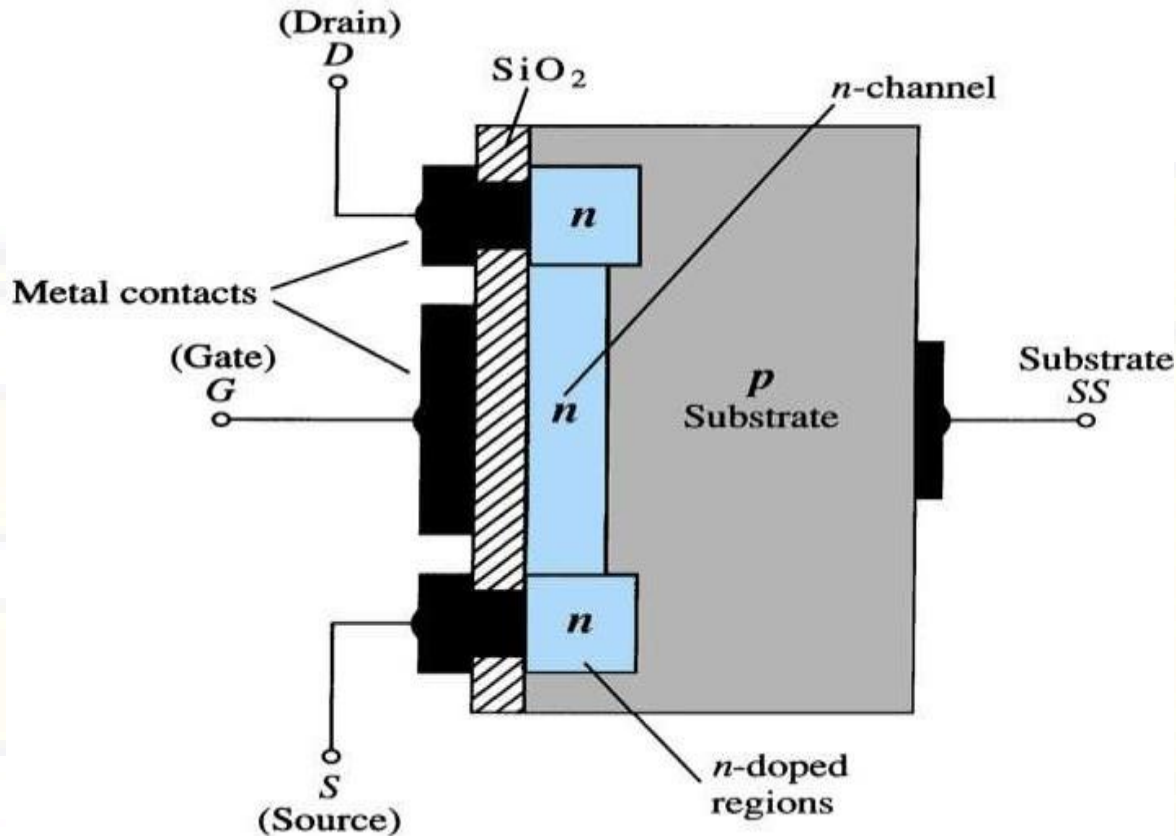


MOSFET'S

- 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)



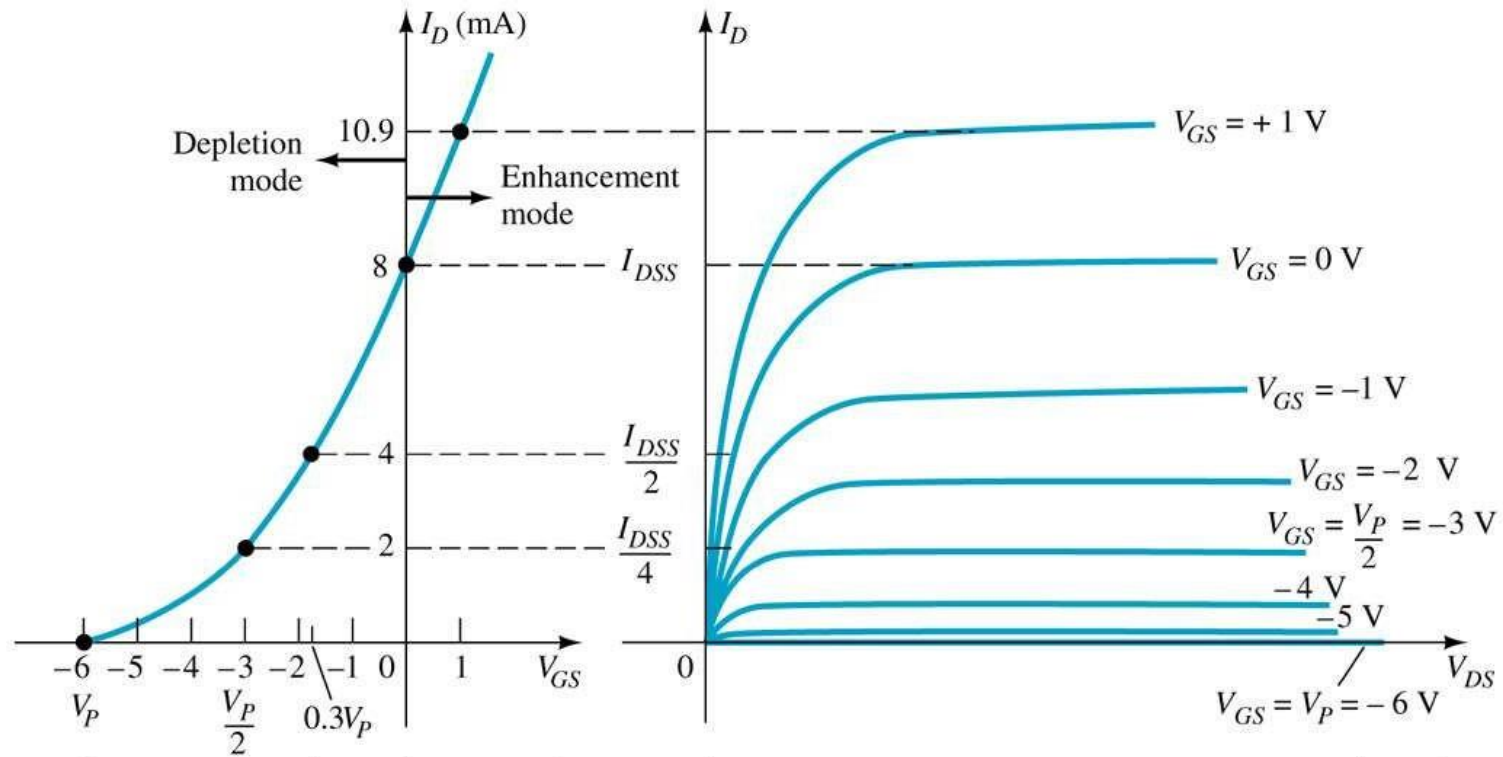
DEPLETION MODE MOSFET CONSTRUCTION



- The Drain (D) and Source (S) leads connect to the 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:

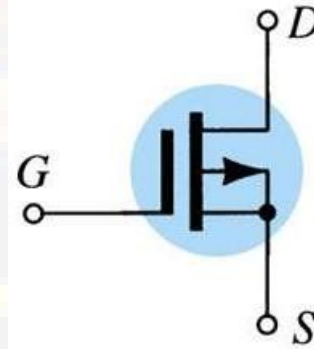
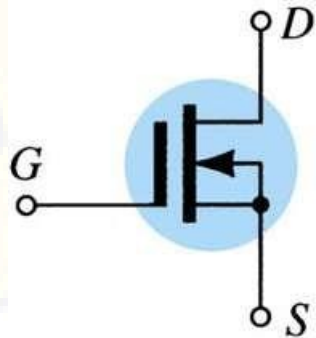
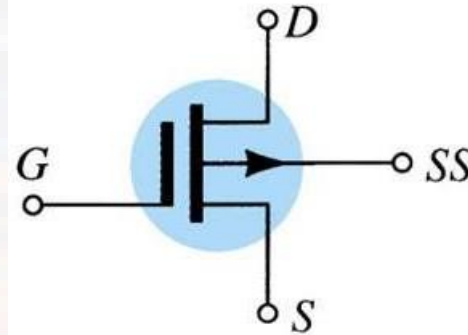
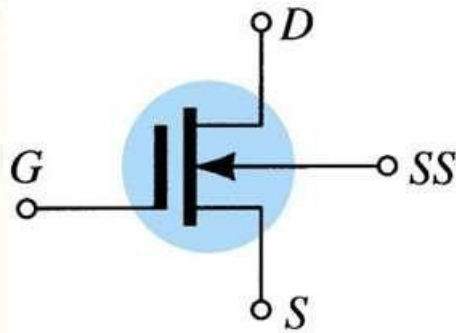
- The **Depletion** mode or The **Enhancement** mode



D-MOSFET Symbols

n-channel

p-channel



(a)

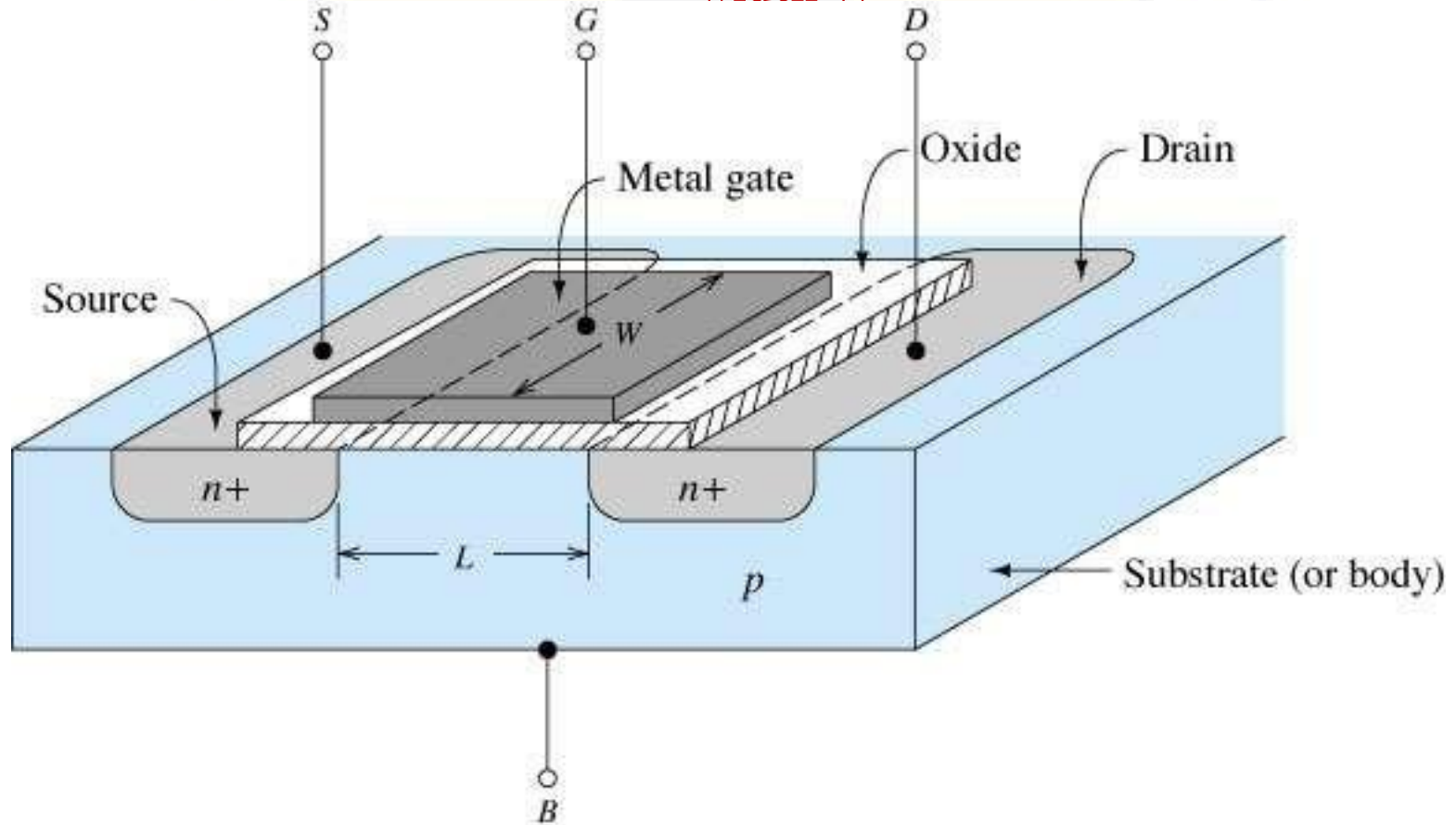
(b)



ENHANCEMENT MODE MOSFET'S

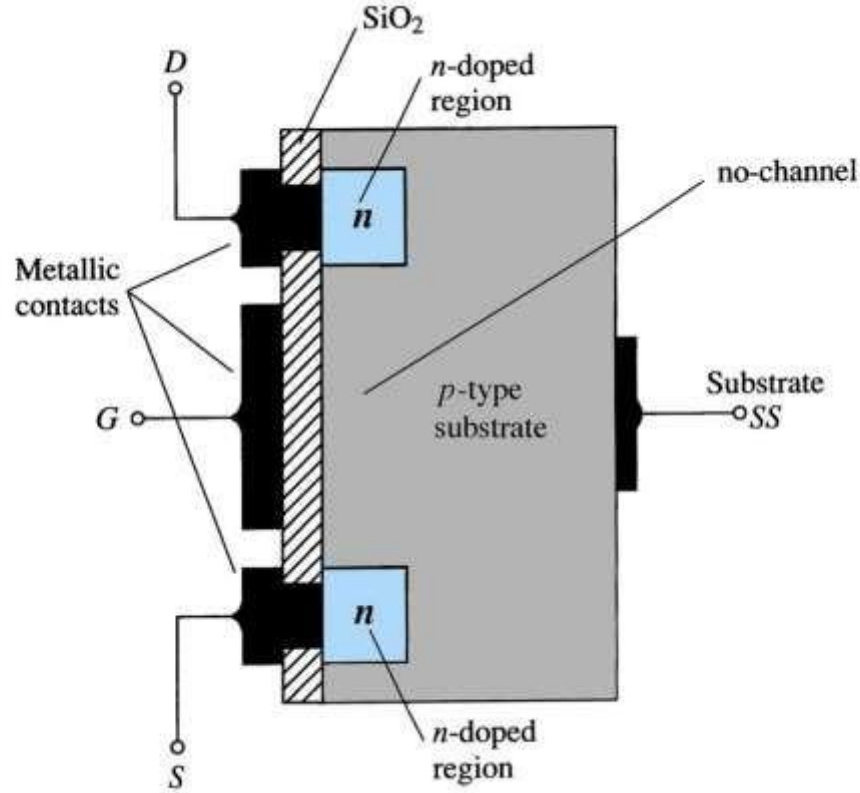


***n*-Channel E-MOSFET showing channel length L and channel width W**





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

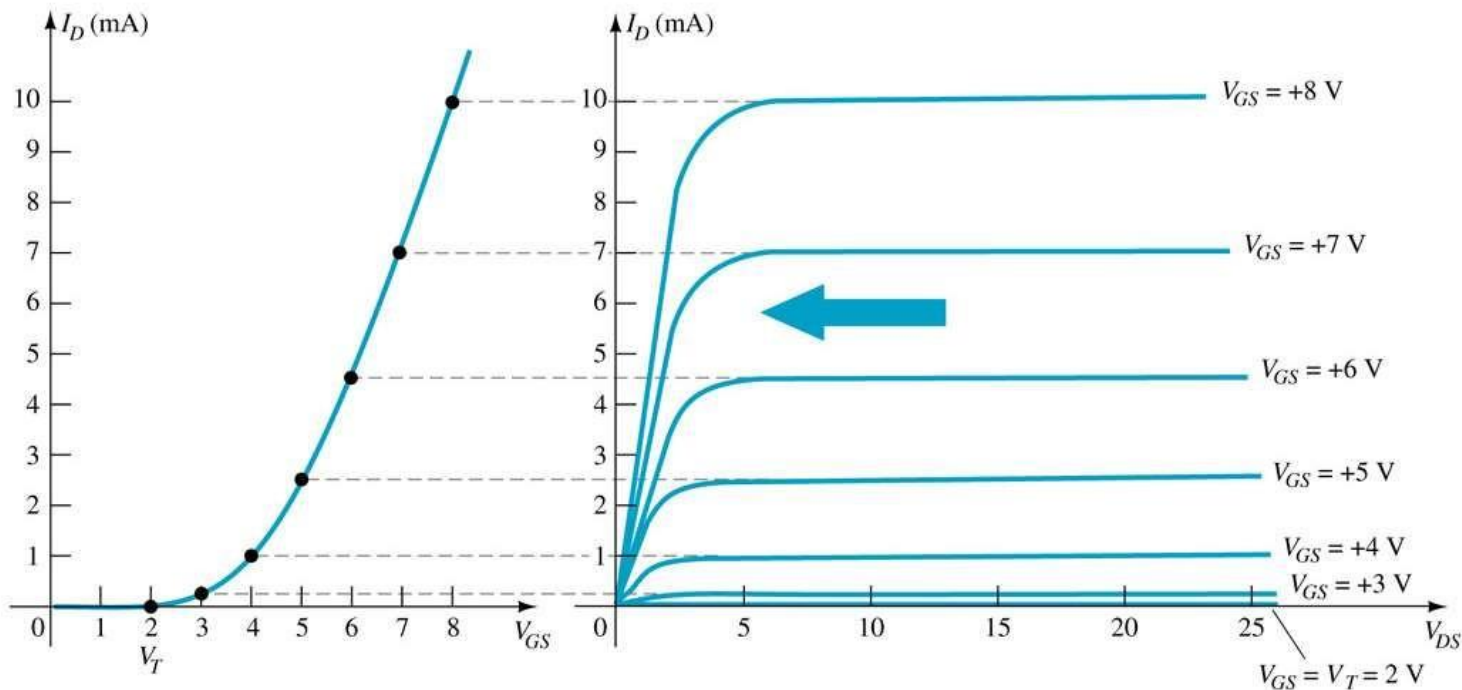
The Gate (G) connects to the p-doped substrate via a thin insulating layer of SiO₂

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

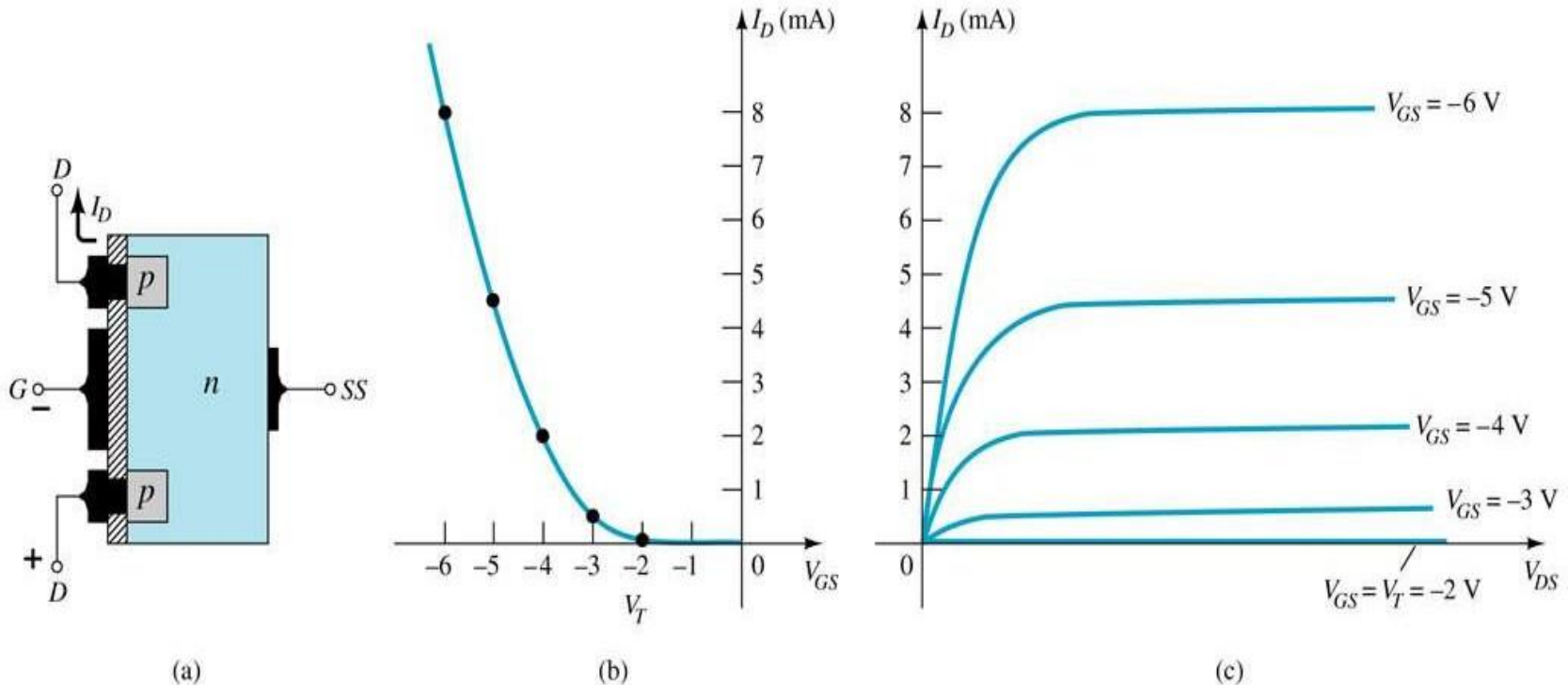
If V_{GS} is kept constant and V_{DS} is increased, then I_D saturates (I_{DSS})

The saturation level, V_{DSSat} is reached.



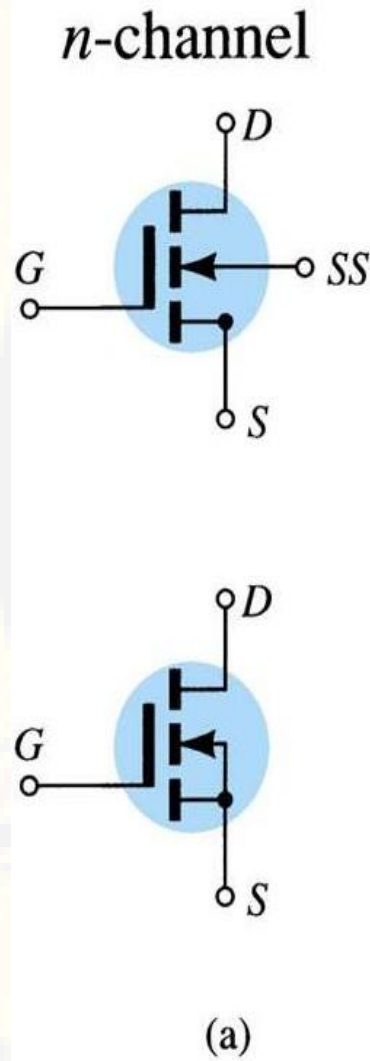
p-Channel Enhancement Mode MOSFETs

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

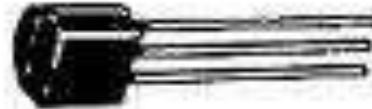
CASE STYLES:



TO-3



TO-18



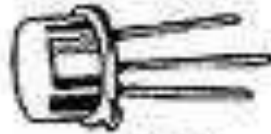
TO-92



TO-202



TO-5



TO-39



TO-126



TO-220

