Electronic Switches (ES)

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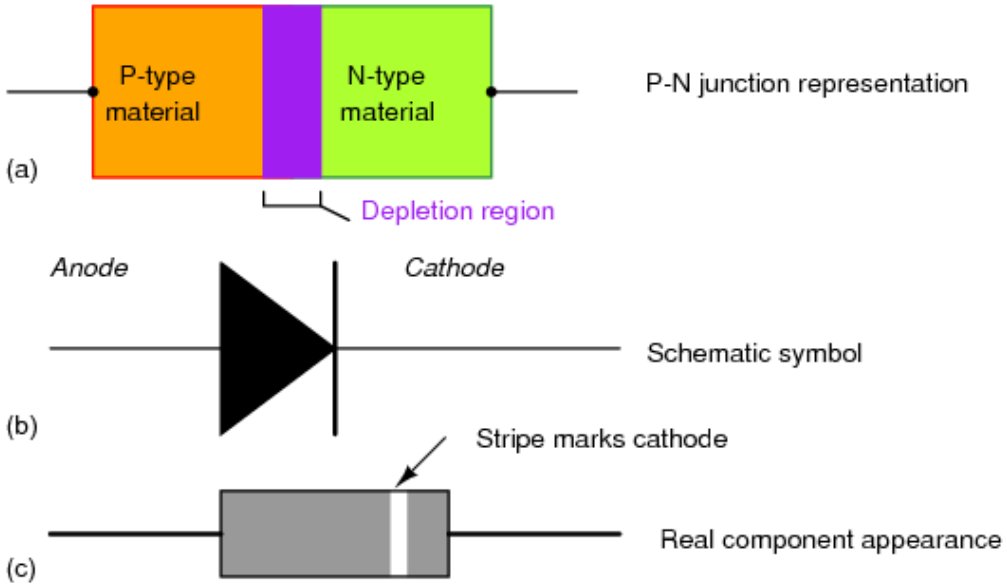
Teknik Komputer

FTEIC - ITS

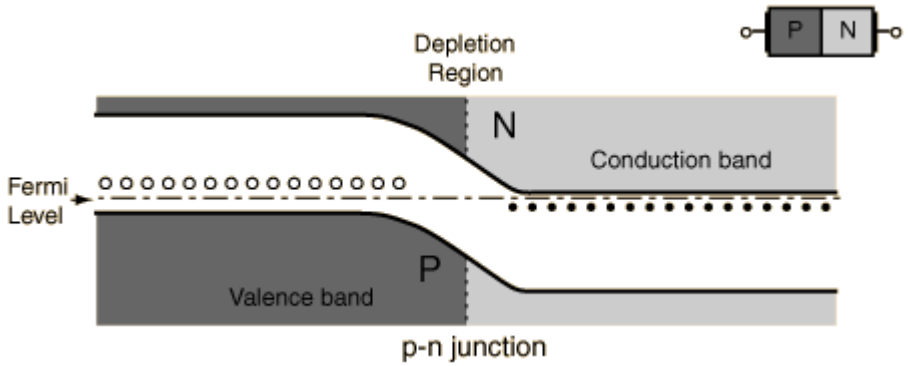
Dioda

- A semiconducting device, that allows current to flow in one direction but not the other
- A P-N junction diode, is a doped semiconductor device that act essentially as a voltage-controlled switch.

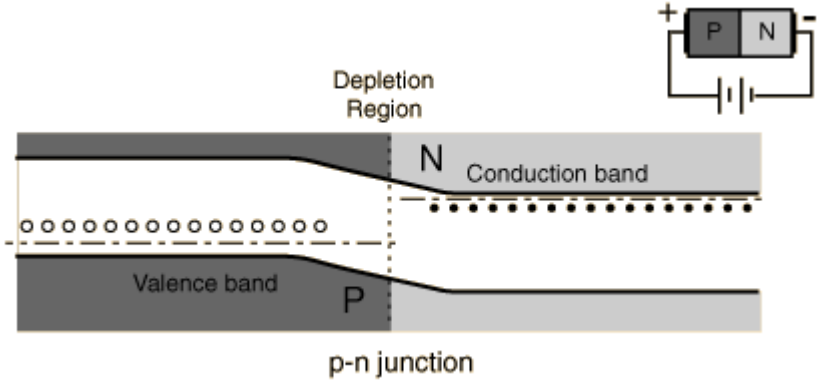


http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

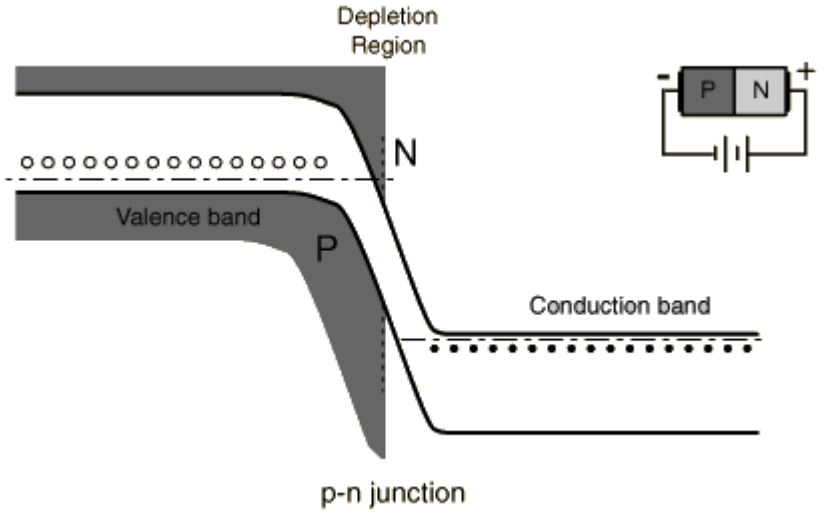
Diode Activation



P-N Junction at Equilibrium



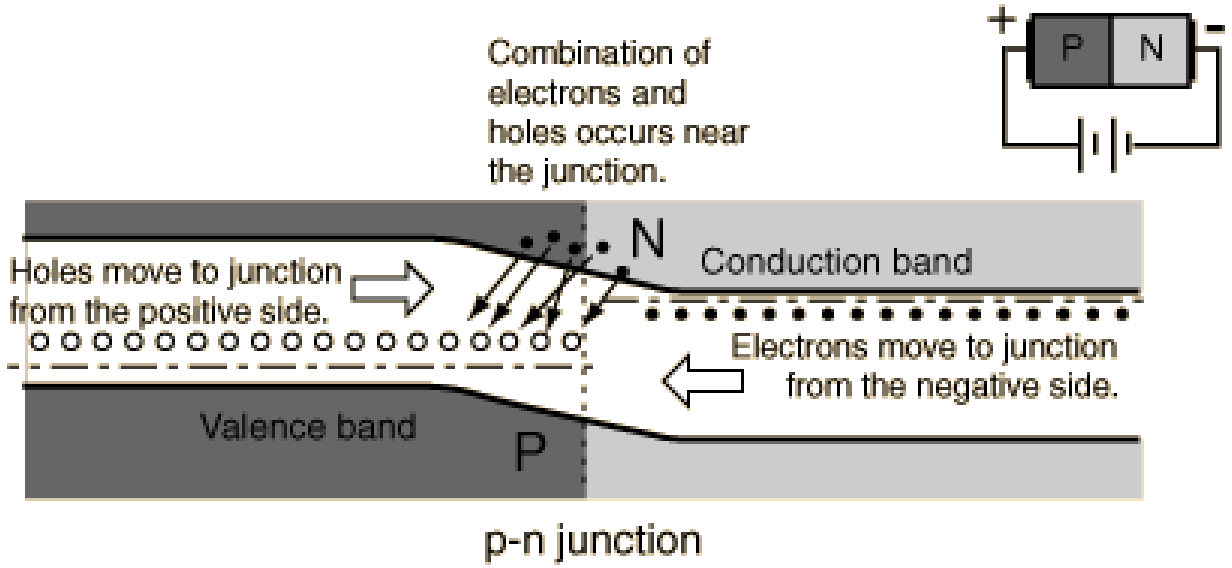
P-N Junction at Forward Bias



P-N Junction at Reverse Bias

http://hyperphysics.phy-astr.gsu.edu/hbase/solids/pnjun2.html#c2

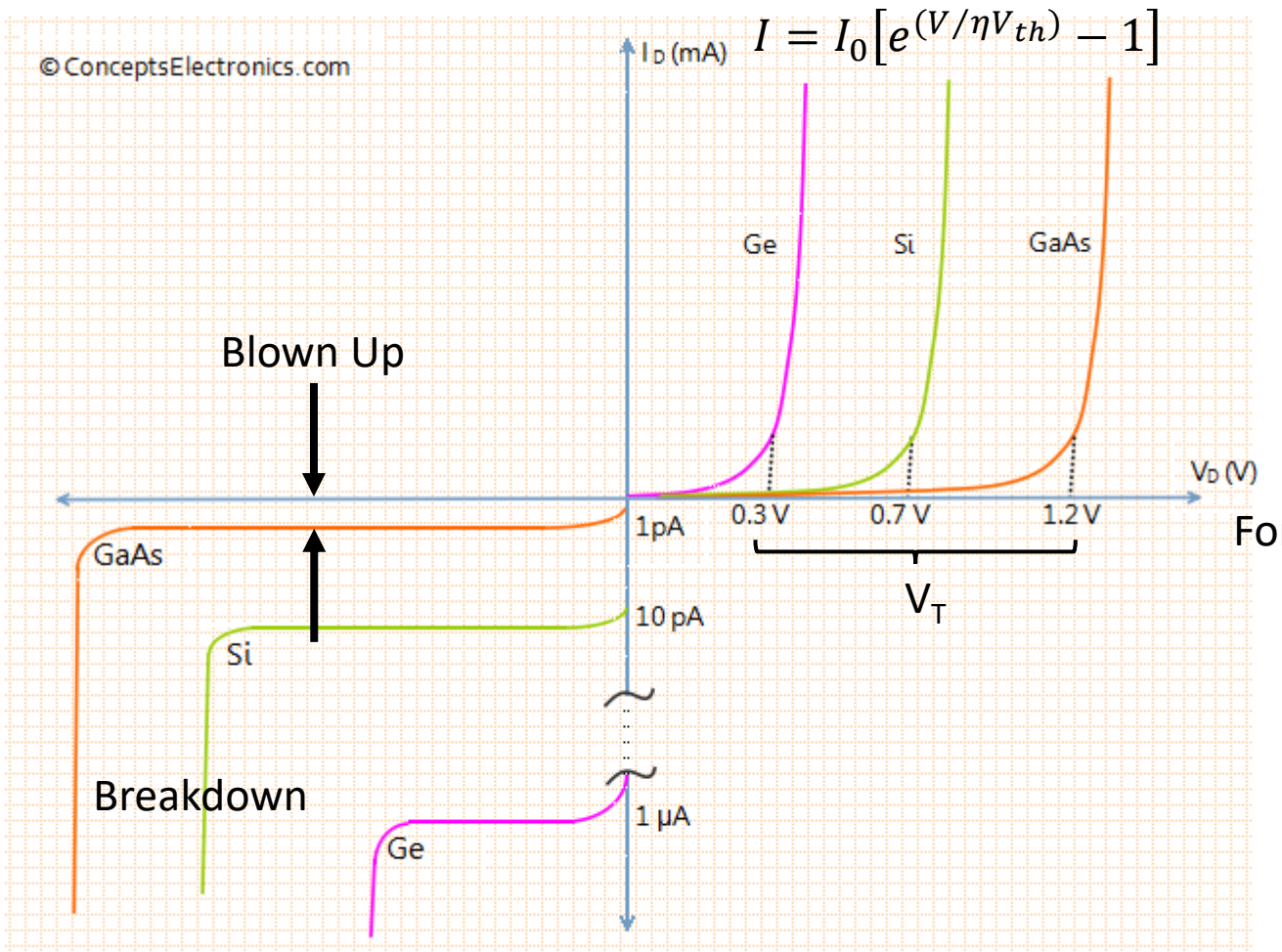
Forward Bias



p-n junction

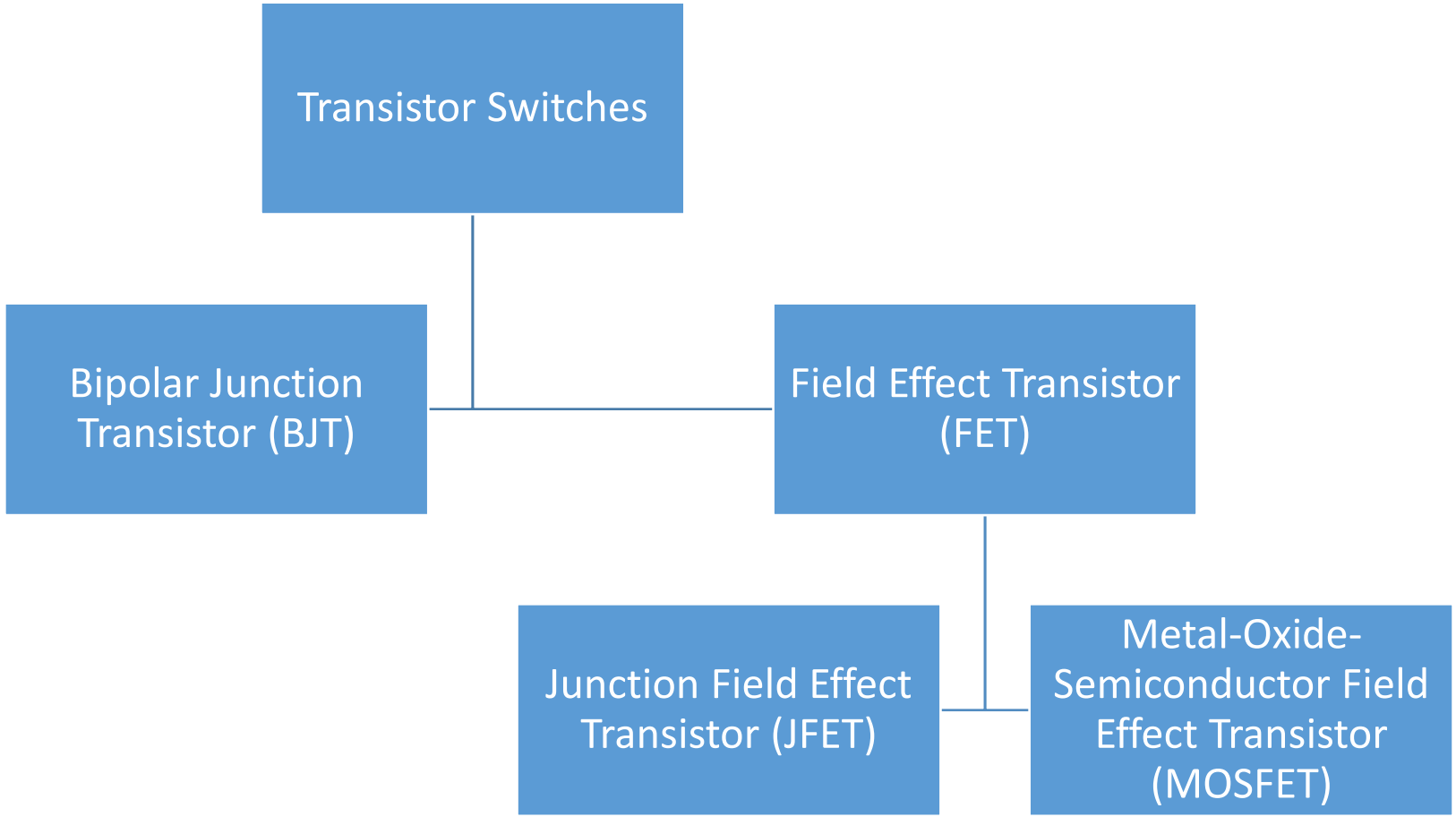
http://hyperphysics.phy-astr.gsu.edu/hbase/solids/pnjun2.html#c2

I – V Characteristics P-N Junction

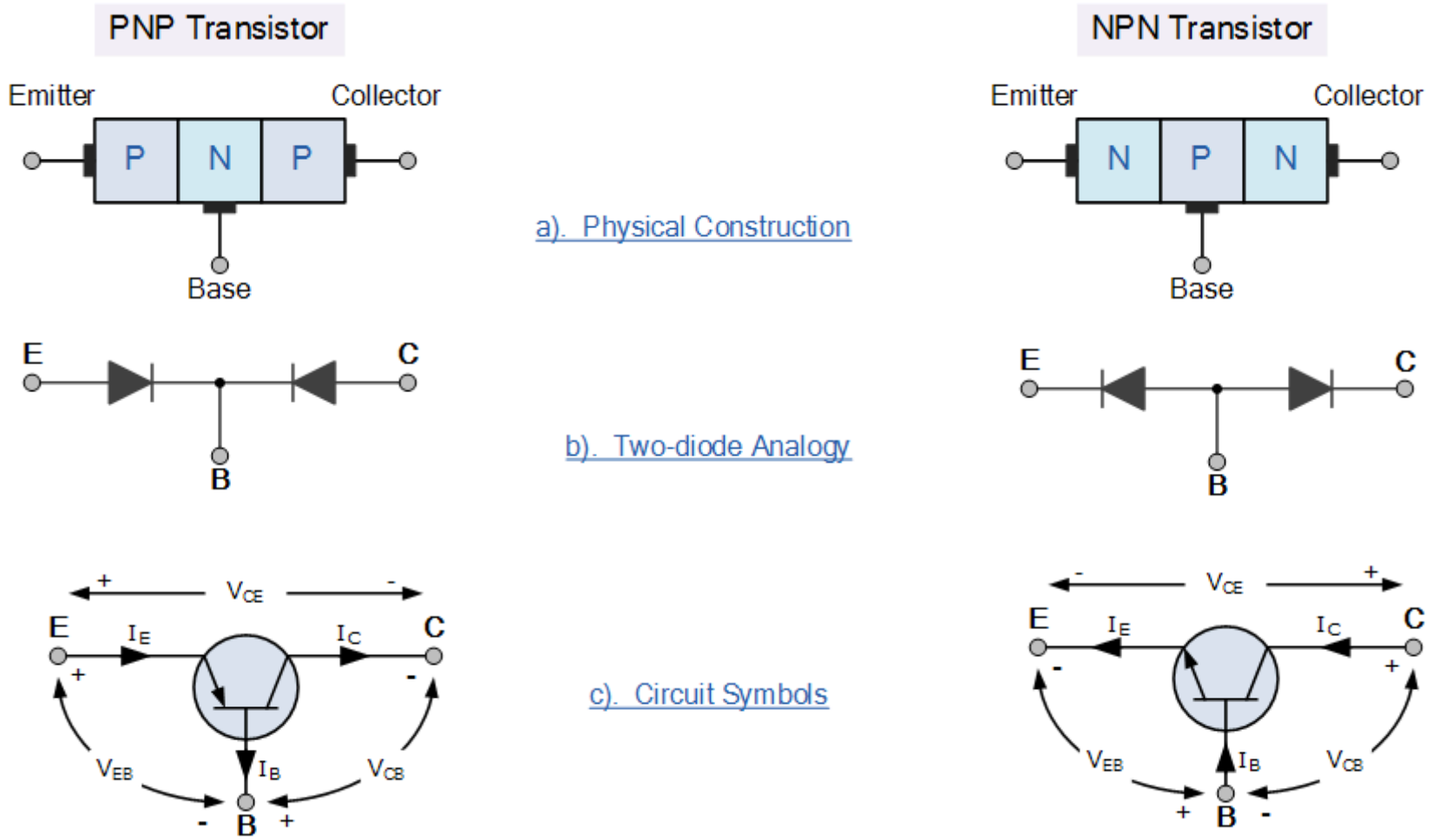


Comparison between Si, Ge and GaAs diodes

Classifications of Transistor Switches

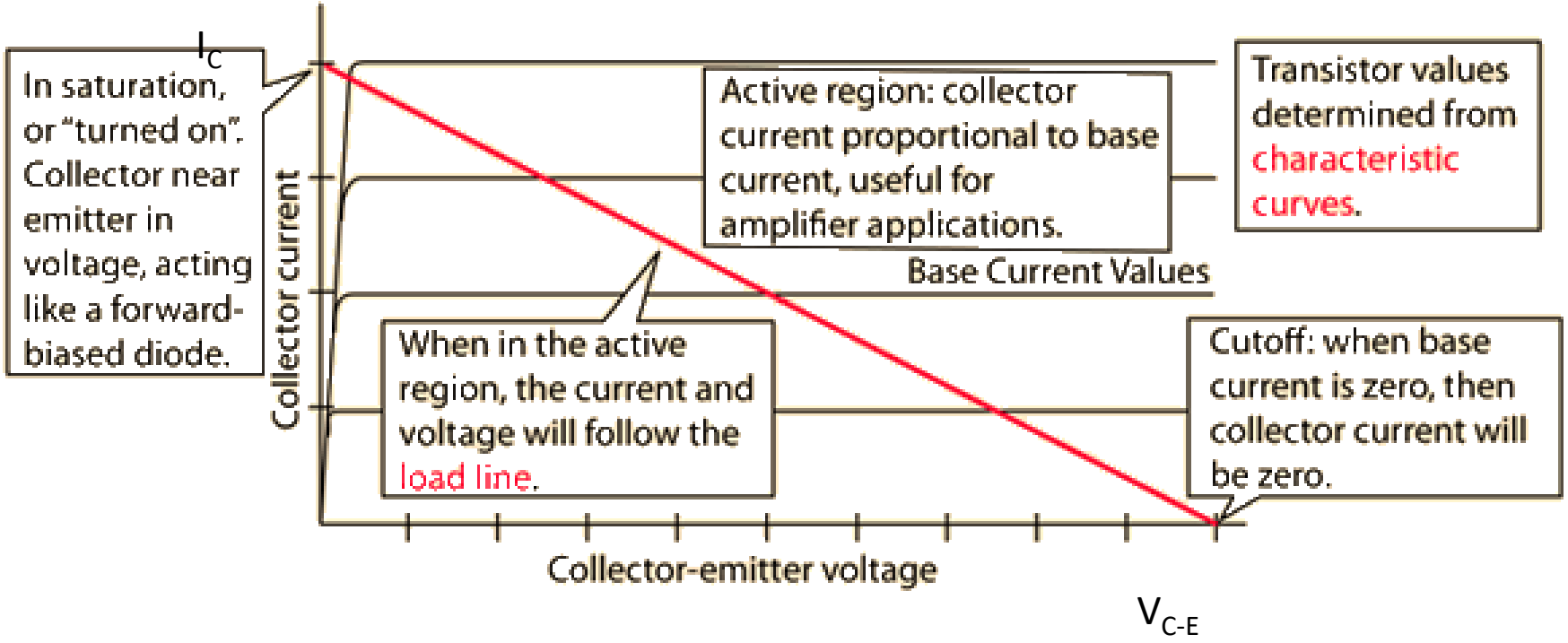


Bipolar Junction Transistor (BJT)



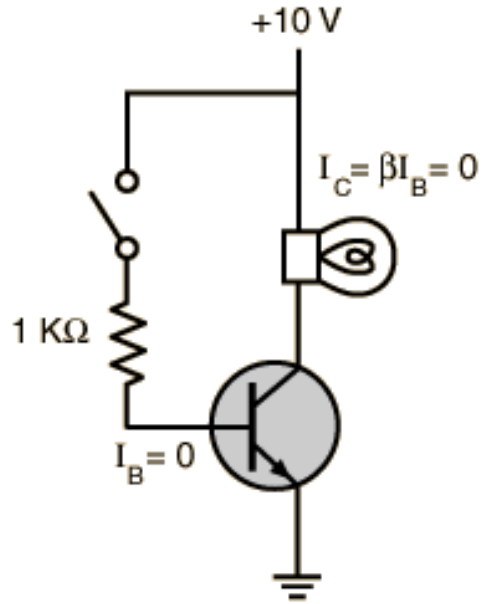
http://www.electronics-tutorials.ws/transistor/tran_1.html

Transistor Operation

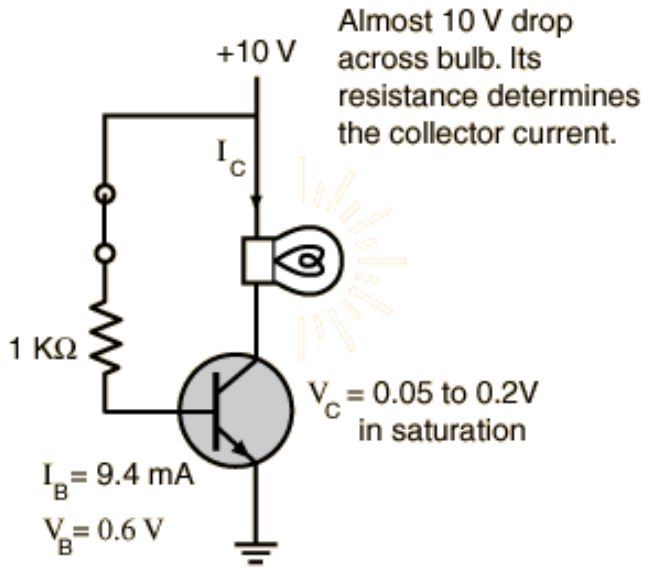


http://hyperphysics.phy-astr.gsu.edu/hbase/solids/trans2.html#c1

BJT as switches

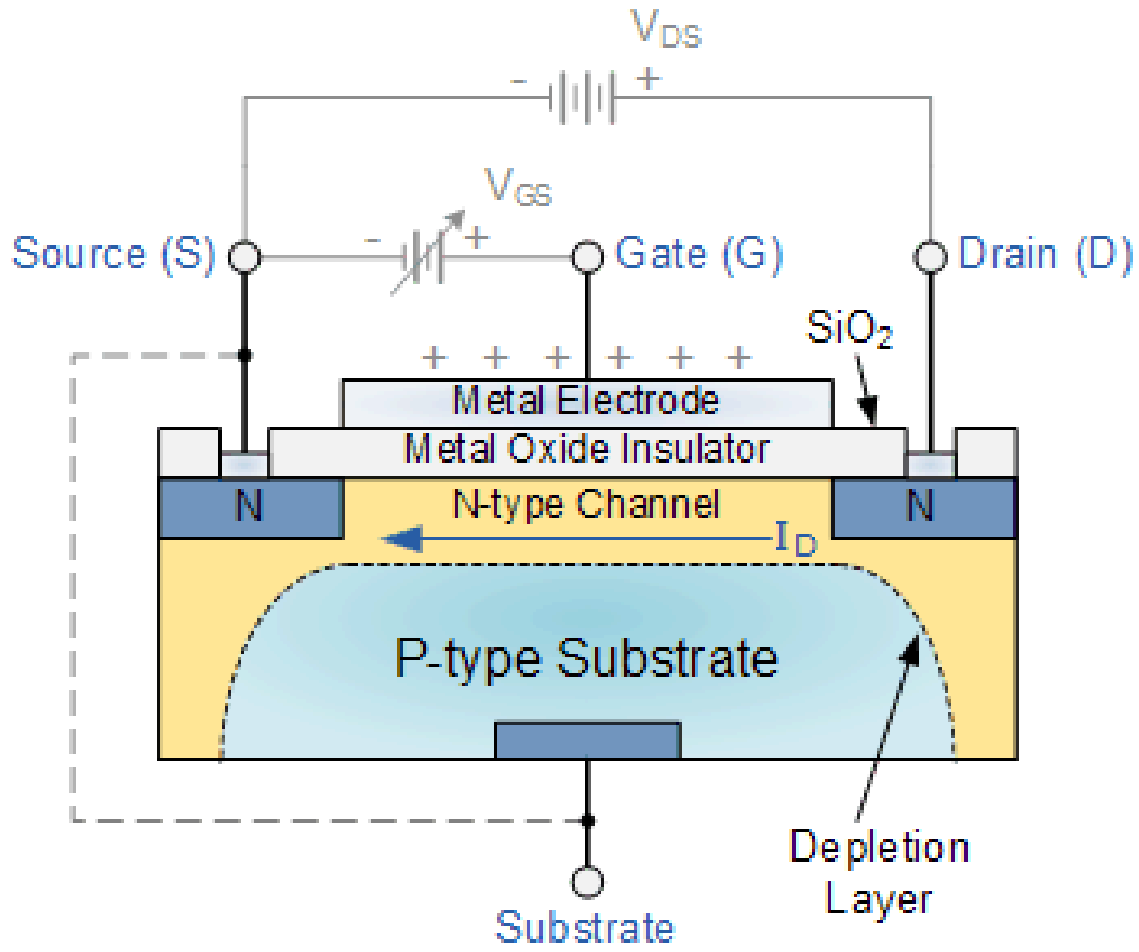


Cut Off ≈ Turn Off ≈ Open Circuit



Saturation ≈ Turn On ≈ Short Circuit

Metal-Oxide-Semiconductor Field-Effect Transistors (MOSFET)



http://www.electronics-tutorials.ws/transistor/tran_6.html

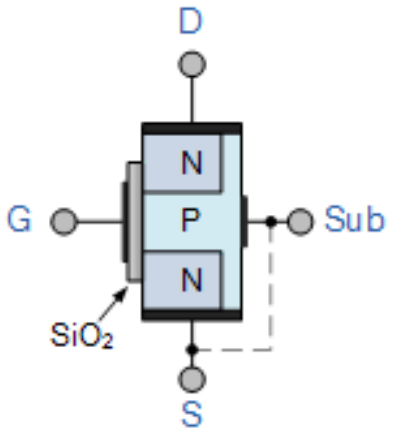
Metal-Oxide-Semiconductor Field-Effect Transistors (MOSFET)

Two Basic Forms of MOSFET

1. Depletion Type → The depletion mode MOSFET is equivalent to a “Normally Closed” switch. It needs the Gate-Source voltage (VGS) to switch the device “OFF”.
2. Enhancement Type → The enhancement mode MOSFET is equivalent to a “Normally Open” switch. It needs a Gate-Source voltage (VGS) to switch the device “ON”.

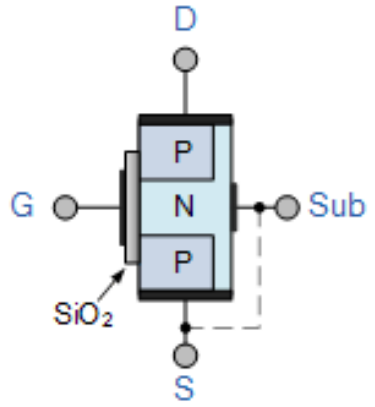
Symbol and Basic Construction

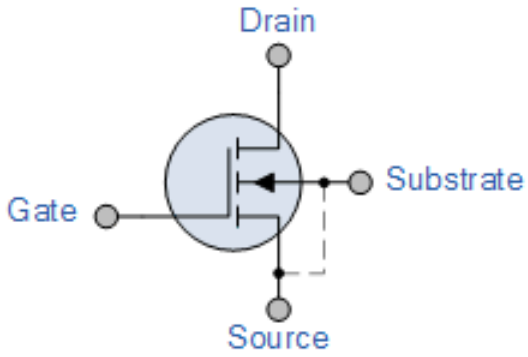
N-channel MOSFET



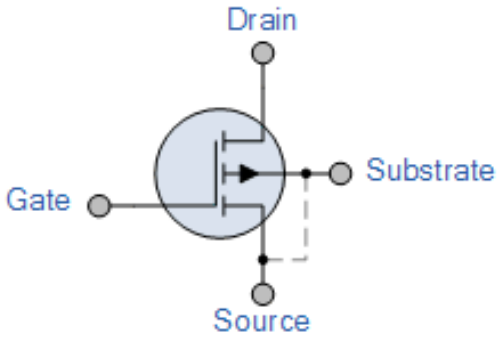
Enhancement MOSFET
channel construction

P-channel MOSFET





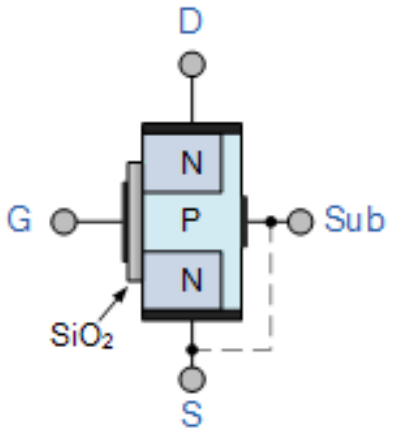
Enhancement Type
(normally-off)



http://www.electronics-tutorials.ws/transistor/tran_6.html

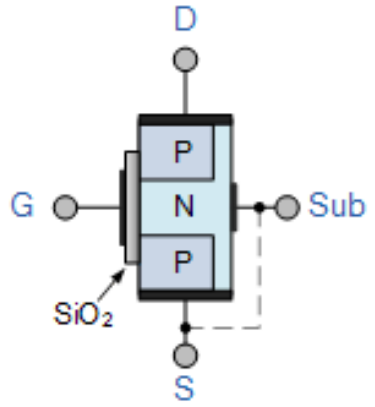
Symbol and Basic Construction

N-channel MOSFET

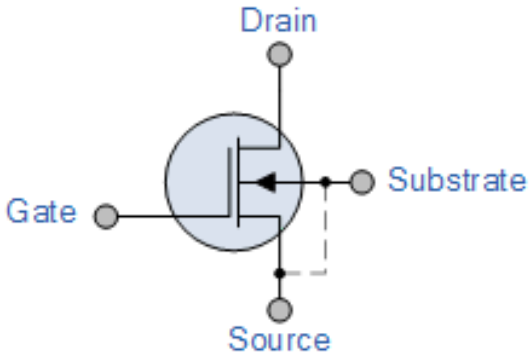


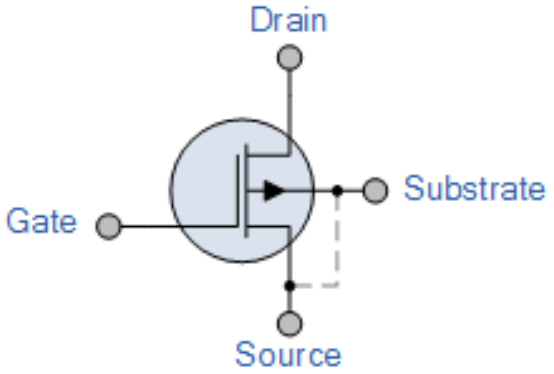
Enhancement MOSFET
channel construction

P-channel MOSFET



Depletion Type
(normally-on)





http://www.electronics-tutorials.ws/transistor/tran_6.html

Reading Reff.

- Tinder, Richard F.,Digital Engineering Design “A Modern Approach”, Prentice Hall International Inc.