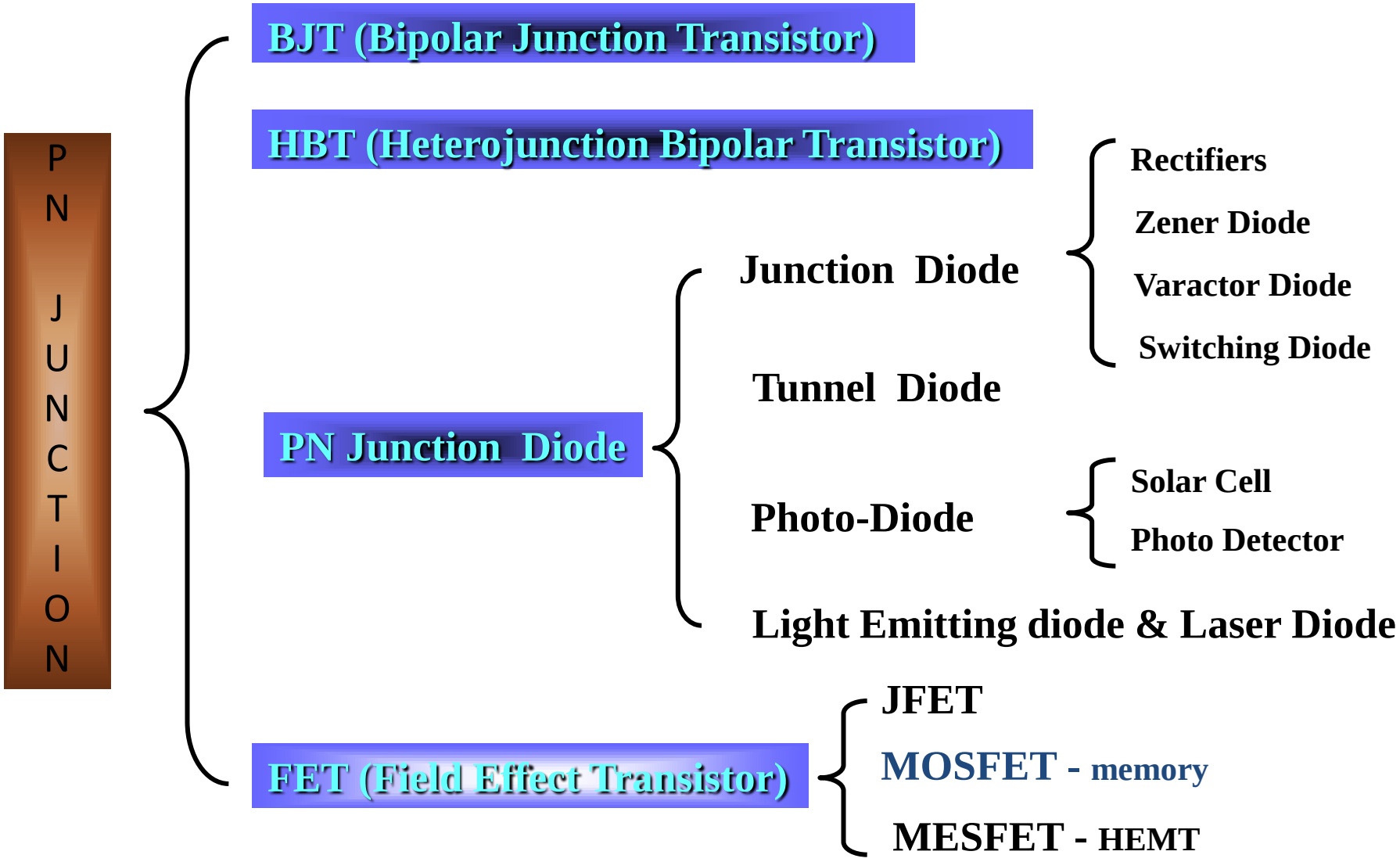
UNIT-I:

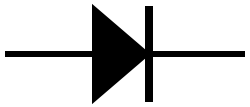
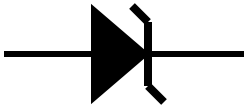
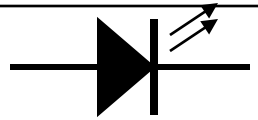
Special Diodes-

LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications. Transistors as a switch.

Applications of PN Junctions:

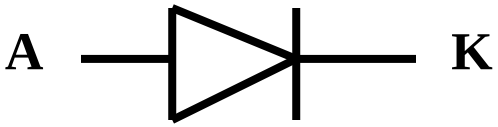


Common Applications of Diodes:

	Rectifier	Zener	LED
Schematic symbol			
Bias for normal operation	Switched back and forth between forward and reverse.	Reverse	Forward
Normal V_F	Si: $V_F = 0.7$ V Ge: $V_F = 0.3$ V	$V_F = 0.7$ V (not normally operated)	$1.2\text{V} \leq V_F \leq 4.3\text{V}$
Normal V_R	Equal to applied voltage.	Equal to V_Z.	Equal to applied voltage.
Primary factors to consider for device substitution	I_0 and V_{RRM} ratings.	$P_{D(\max)}$ and V_Z ratings.	$V_{F(\min)}$, $I_{F(\max)}$, and V_{BR}

Types of Diodes and Their Uses

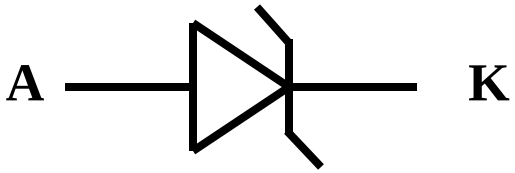
PN Junction Diodes: Are used to allow current to flow in one direction while blocking current flow in the opposite direction. The PN junction diode is the typical diode that has been used in the previous circuits.



Schematic Symbol for a PN Junction Diode

Representative Structure for a PN Junction Diode

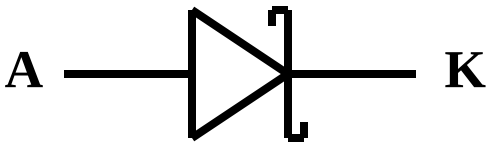
Zener Diodes: Are specifically designed to operate under reverse breakdown conditions. These diodes have a very accurate and specific reverse breakdown voltage.



Schematic Symbol for a Zener Diode

Types of Diodes and Their Uses

Schottky Diodes:

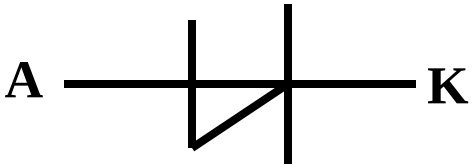


Schematic Symbol for a Schottky Diode

These diodes are designed to have a very fast switching time which makes them a great diode for digital circuit applications. They are very common in computers because of their ability to be switched on and off so quickly.

Shockley Diodes:

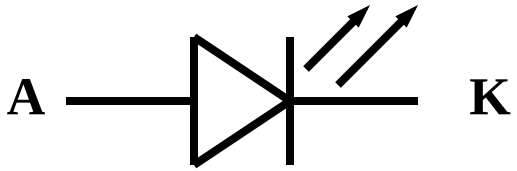
The Shockley diode is a four-layer diode while other diodes are normally made with only two layers. These types of diodes are generally used to control the average power delivered to a load.



Schematic Symbol for a four-layer Shockley Diode

Light-Emitting Diodes:

- Light-Emitting Diodes LEDs, are designed with very large band gap materials, so movement of carriers across their depletion region emits photons in the visible region.
- Lower band gap LEDs emit infrared radiation, while LEDs with higher band gap energy emit visible light.
- Many traffic signal are now starting to use LEDs because they are extremely bright and last longer than regular bulbs for a relatively low cost.

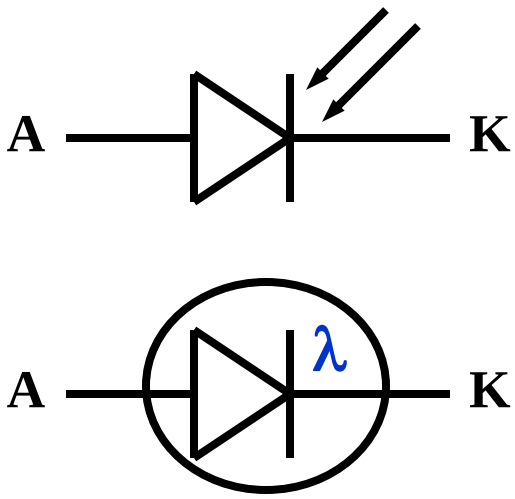


Schematic Symbol for a Light-Emitting Diode

The arrows in the LED representation indicate emitted light.

Types of Diodes and Their Uses:

Photodiodes:



Schematic Symbols for Photodiodes

- While LEDs emit light, Photodiodes are sensitive to received light. They are constructed so their PN junction can be exposed to the outside through a clear window or lens.
- In Photoconductive mode the saturation current increases in proportion to the intensity of the received light. This type of diode is used in CD players.
- In Photovoltaic mode, when the PN junction is exposed to a certain wavelength of light, the diode generates voltage and can be used as an energy source. This type of diode is used in the production of solar power.