



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC with ‘A++’(III Cycle) Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECB101 – CIRCUIT ANALYSIS AND DEVICES

I YEAR/ II SEMESTER

UNIT 4 – SEMICONDUCTOR DIODES AND THEIR APPLICATIONS

TOPIC - Silicon Controlled Rectifier



Silicon Controlled Rectifier

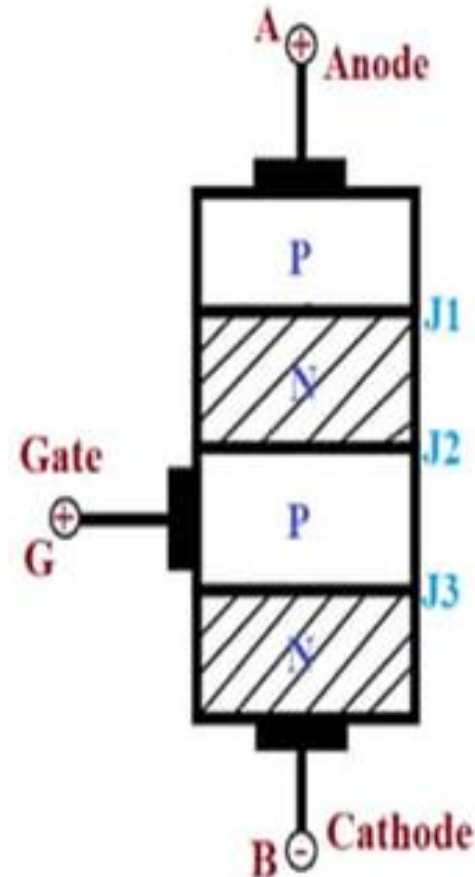
The term **SCR** stands for silicon controlled rectifier which is one of the most important members of the **thyristor family**.





Silicon Controlled Rectifier

- The SCR is a four-layered semiconductor device that forms NPNP or PNPN structure.
- J1, J2, and J3. Among the three terminals of the SCR,
- the **Anode** is a positive electrode, it will be on the P-layer and **Cathode** is a negative electrode, it will be on the N-layer of the SCR, the **Gate** acts as a control terminal of the SCR.





SCR - Working

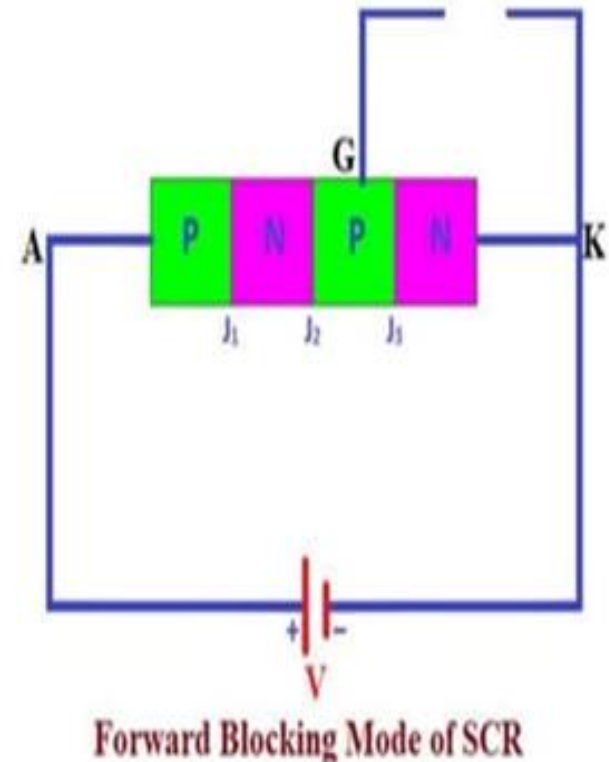


- Forward Blocking mode
- Forward Conduction mode
- Reverse Blocking mode



Forward Blocking Mode

When the voltage applied to the SCR is increased and if it reaches the **breakdown voltage of the SCR**, the junction J_2 gets depleted due to avalanche breakdown. Once the **Avalanche breakdown** occurs the current will start flowing through the SCR. In this mode of operation, the SCR is forward biased, but, there will not be any current flow.



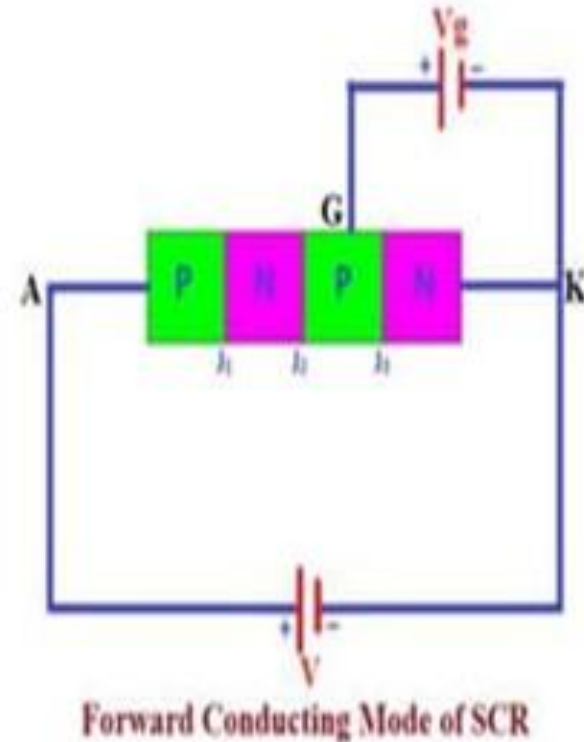


Forward Conduction Mode



□ The Forward Conduction Mode is the only mode at which the SCR will be in the ON state and will be conducting.

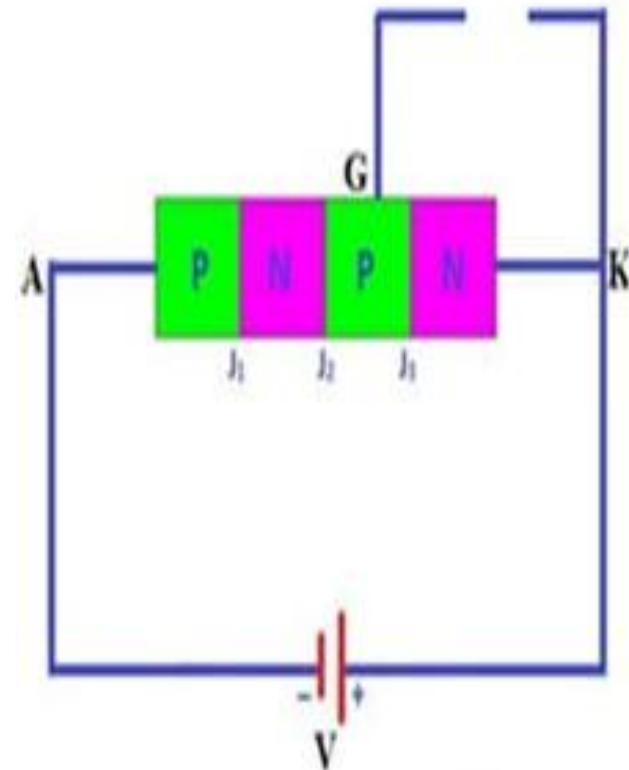
□ we can increase the applied **forward bias voltage beyond the breakdown voltage** or else we can apply a positive voltage to the gate terminal.





Reverse Blocking Mode

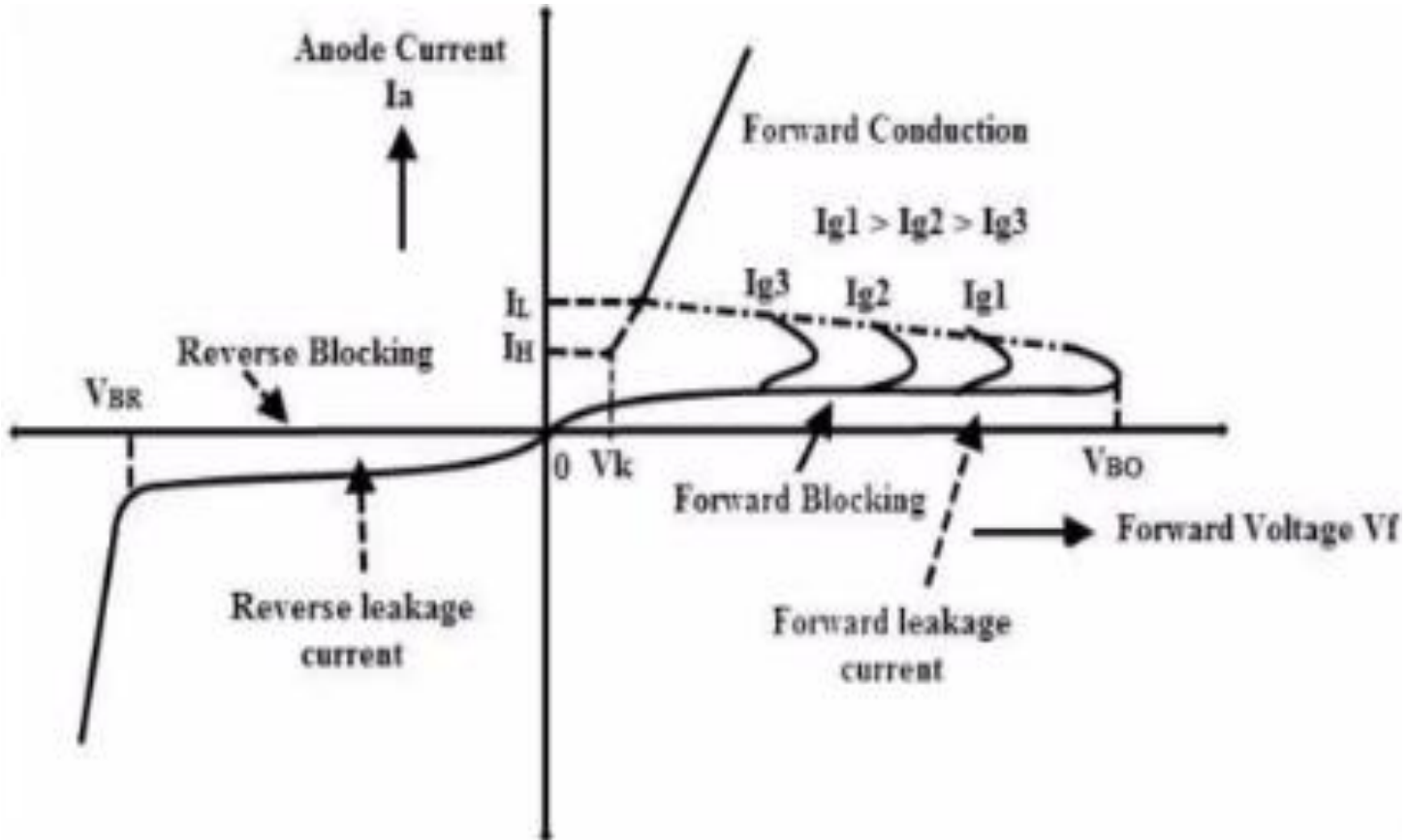
- In the reverse blocking mode, the positive voltage is applied to the Cathode (-) and the Negative voltage is given to the Anode (+),
- There will not be any pulse given to the gate, it will be kept as an open circuit. During this mode of operation the Junctions J1 and J3 will be reverse biased and the junction J2 will be forward biased.
- Since the junctions J1 and J3 are reverse biased there will not be any current flowing through the SCR. Although there will be a **small leakage current flowing due to the drift charge carriers** in the forward-biased Junction J2, it is not enough to turn on the SCR.



Reverse Blocking Mode of SCR



VI CHARACTERISTICS





• Applications of SCR

- Silicon Controlled Rectifiers are used as Switch in electronic circuits.
- There is a huge application of Silicon Controlled Rectifier in Inverter Circuits.
- In controlled Rectifier Circuits SCRs are used.
- SCRs are used in AC Voltage Stabilizer circuits.
- SCRs are also used in Battery Charger circuits.
- SCRs are used to control electrical power.
- SCRs are used for High voltage protection purpose.
- SCRs are used in power regulator devices.



Assessment Questions



1. A thyristor (SCR) is a
 - a) P-N-P device
 - b) N-P-N device
 - c) P-N-P-N device**
 - d) P-N device

2. Which terminal does not belong to the SCR?
 - a) Anode
 - b) Gate
 - c) Base**
 - d) Cathode

3. An SCR is a
 - a) four layer, four junction device
 - b) four layer, three junction device**
 - c) four layer, two junction device
 - d) three layer, single junction device

