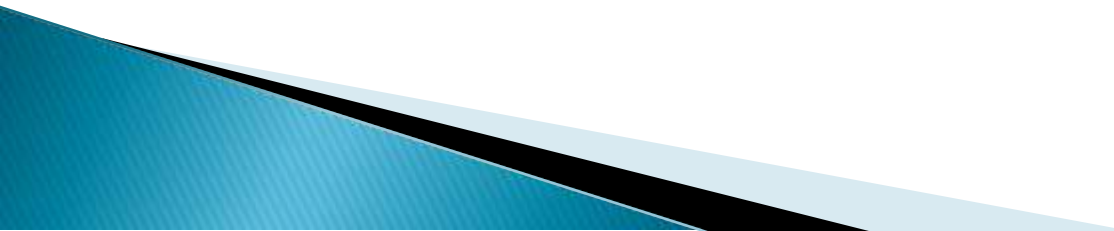


Thyristors-SCR

Working & V-I Characteristics

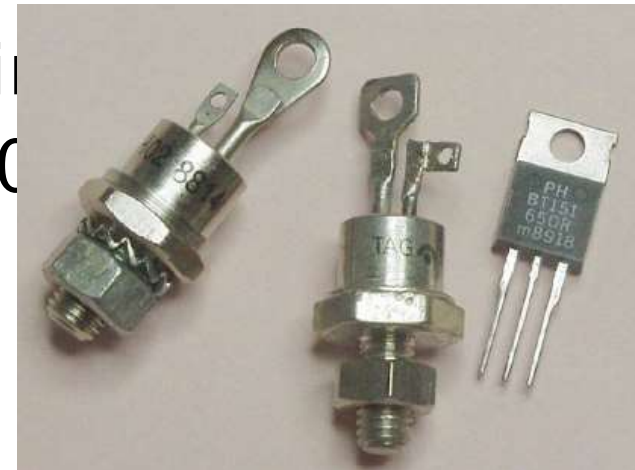
S.Soujanya
Asst.Prof
ECE Department

Content

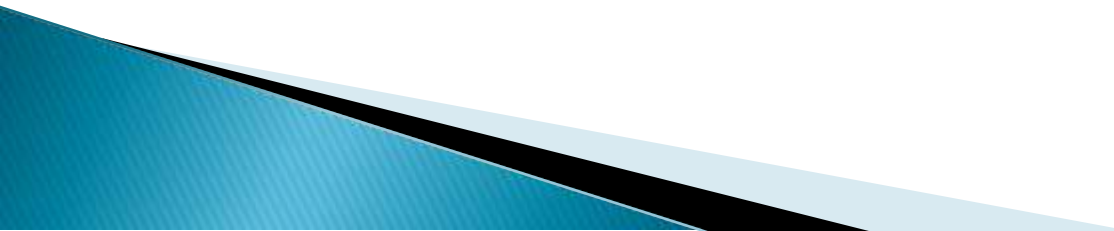
- ▶ Introduction
 - ▶ Thyristor Family Devices
 - ▶ Symbol and Construction of SCR
 - ▶ V-I Characteristics of SCR
 - ▶ Applications of SCR
 - ▶ Conclusion
- 

Introduction

- ▶ One of the most important type of power semiconductor device.
- ▶ Compared to transistors, thyristors have lower on-state conduction losses and higher power handling capability.
- ▶ However, they have worse switching performances than transistors.
- ▶ Have the highest power handling capability.
- ▶ It has a rating of 1200V / 1500A and switching frequencies ranging up to 20KHz.

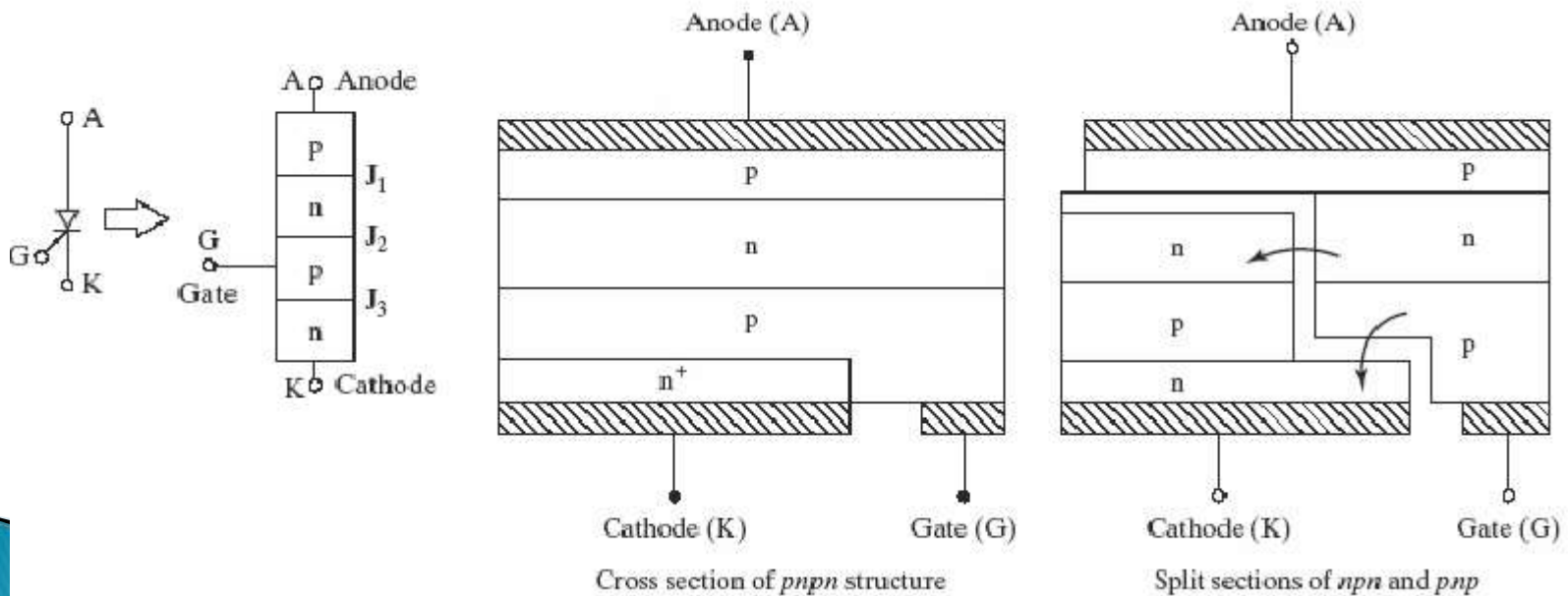


Different Thyristor Family Devices

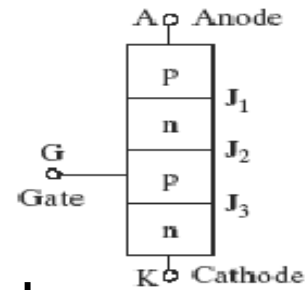
- ▶ Silicon Controlled Rectifier (SCR).
 - ▶ TRIAC.
 - ▶ DIAC.
 - ▶ SUS
 - ▶ SBS
 - ▶ SCS
 - ▶ LASCR
 - ▶ PUT..etc
- 

Symbol and construction of SCR

The thyristor is a four-layer, three terminal semiconducting device, with each layer consisting of alternately N-type or P-type material, for example P-N-P-N. The main terminals, labeled anode and cathode, are across the full four layers, and the control terminal, called the gate, is attached to p-type material near to the cathode.

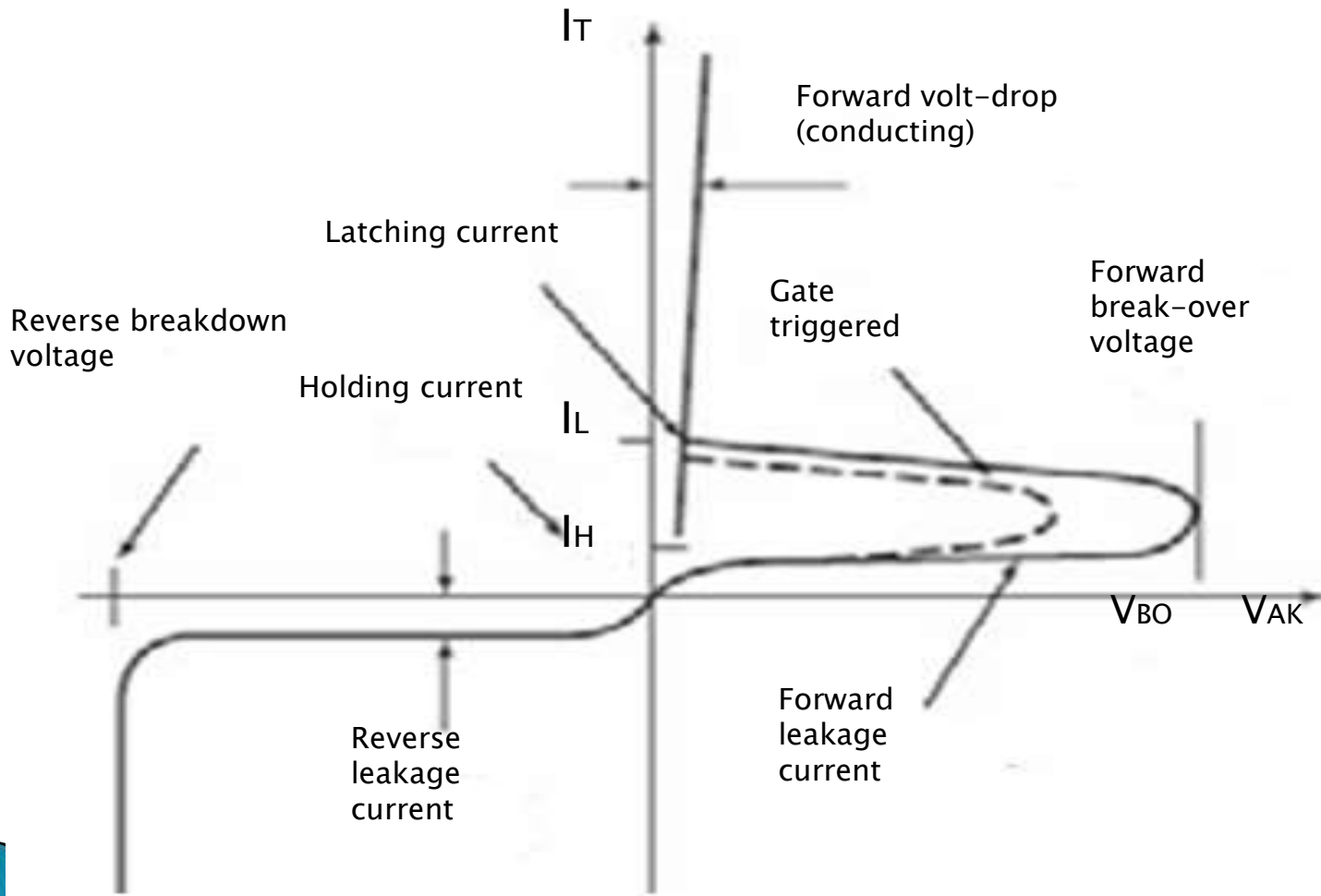


Characteristics of SCR

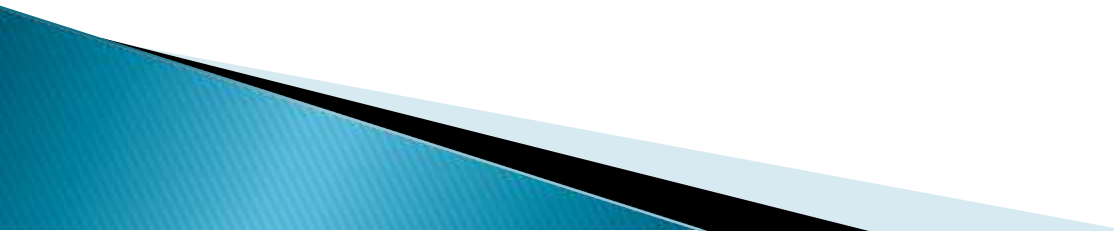


- ▶ When the anode is at a positive potential V_{AK} with respect to the cathode with no voltage applied at the gate, junctions J_1 and J_3 are forward biased, while junction J_2 is reverse biased. As J_2 is reverse biased, no conduction takes place.
- ▶ Now if V_{AK} is increased beyond the breakdown voltage V_{BO} of the thyristor, avalanche breakdown of J_2 takes place and the thyristor starts conducting.
- ▶ If a positive potential V_G is applied at the gate terminal with respect to the cathode, the breakdown of the junction J_2 occurs at a lower value of V_{AK} . By selecting an appropriate value of V_G , the thyristor can be switched into the on state suddenly.

Switching Characteristics (IV)



Applications

- ▶ Mainly used where high currents and voltages are involved, in switching applications.
 - ▶ Used as a rectifier.
 - ▶ Used in cyclo converters
 - ▶ Used in HVDC Transmission
 - ▶ Used in light dimmer circuits
 - ▶ Used in motor speed control circuits
 - ▶ Used in heat control circuits
- 

Conclusion

- ▶ The old and most popular device of Thyristor family is SCR
- ▶ SCR can conduct current only in one direction but it can block the voltage in two directions.
- ▶ SCR can be triggered by applying the current at the GATE terminal.
- ▶ Once the SCR is in ON position it can be turned off even by removing the GATE pulse also.
- ▶ By reversing the polarities of supply or by Commutation circuit SCR can be turned off.
- ▶ Applications are mainly centered around control of high current flow.

Thank you

