

Article

A Review Paper on Semiconductor Device Silicon Control Rectifier (SCR)

Piyush Kumawat¹, Monika Tanwani², Rakesh Sharma³

¹Student, Department of Electrical Engineering, Arya College of Engineering & Research Centre, Jaipur, India.

²Assistant Professor, Department of Electrical Engineering, Arya College of Engineering & Research Centre, Jaipur, India.

³Assistant Professor, Department of Electronics Communication, Arya College of Engineering & Research Centre, Jaipur, India.

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Corresponding Author:

Piyush Kumawat, Department of Electrical Engineering, Jaipur.

E-mail Id:

kumawatpiyush69@gmail.com

Orcid Id:

<https://orcid.org/0000-0002-2994-5361>

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A B S T R A C T

Silicon Control Rectifier (SCR) is a three terminal device anode, cathode, gate. It have three junctions J_1, J_2, J_3 and having 4 layers P-N-P-N. SCR is unidirectional device. SCR is charge controlled device. In this paper I am discussing about SCR its introduction, it's working, advantages, disadvantages, application, references. SCR has wide application. We can on it by applying small positive voltage between gate and cathode.

Keywords: Junction, unidirectional, controlled

Introduction

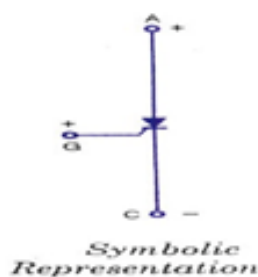


Figure 1. Symbol of SCR

Silicon control rectifier is unidirectional device because it blocks the current from cathode to anode but unlike diode it also block current from anode to cathode. It is semi controlled device. SCR is a solid state device like a thyristor. Inner layer of SCR is lightly doped so that strength of junction J_2 is more than strength of junction J_1 and J_3 . SCR is actually a thyristor, it is used to control the high voltage supply. SCR is turned off by interrupting anode current. SCR has fast switching action, small size and high voltage and current

ratings. SCR is looks like two diodes connected end to end.

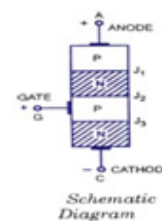


Figure 2. Structure of SCR

Working of SCR

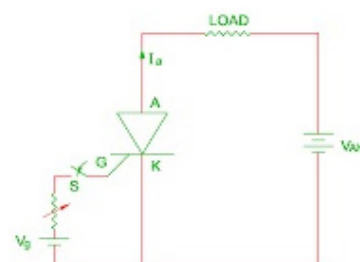


Figure 2. Circuit diagram for static V-I characteristic of the SCR

SCR conducts when it is in forward biased.

There are 3 modes of operating SCR

Reverse blocking mode

In this mode anode is negative and cathode is positive and junction J_1 and J_3 are in reverse biased and J_2 is forward biased. The device is in off state in reverse blocking mode. Only small amount of current flow through SCR that is reverse leakage current flows due to minority charge carriers.

Forward blocking mode

In this mode anode is positive and cathode is negative and J_1 and J_3 are in forward biased and junction J_2 is in reverse biased. The device is in off state in this mode. Only slight amount of leakage current flow finished it that is forward leakage current.

Forward conducting mode

In this mode anode is positive and cathode is negative and gate pulse is applied J_1, J_2, J_3 all three are in forward biased. When anode voltage is greater than forward break over voltage than avalanche breakdown occurs at junction J_2 and device starts conducting. SCR starts conducting only when current through it is greater than minimum current called as latching current during turn on process.

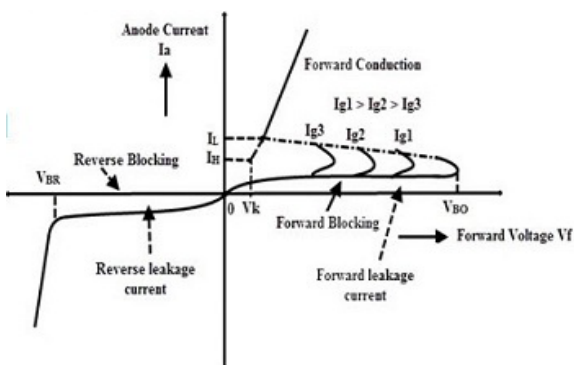


Figure 4. Output characteristics

Advantages

- It is not more costly.
- It is simple to control and able to control AC power.
- It can be protected with the help of fuse.
- Its triggering circuit is simple.
- SCR is easy to turn on.
- It handle large voltage, current and power.
- For turn on it requires small amount of gate current.
- During on state losses are reduced in SCR.

Disadvantages

- It cannot be easily turned off.
- It operates at very low frequency.
- It requires proper cooling.

Applications

- It is used for power control.
- Used for switching and for DC circuit breaker.
- SCR are used in electronic circuit breakers.
- SCR are used in AC regulators and heating application.
- Best suitable for controlled rectifiers.
- Used in charging regulator.
- For over voltage protection etc.

Conclusion

SCR are widely used in many areas of electronics. These electronics components are not more costly and widely available. SCR behaves like a switch because it has two states either it does not conduct or it conduct heavily. There is no state in between. SCR is best for switching. Mainly used in high voltage use.

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