

A decorative network diagram in the top-left corner, featuring a complex web of interconnected nodes and lines. Some nodes are highlighted with blue circles, and a few lines are solid blue, while others are light gray.

EEE 1231

Electronic Devices and Circuits

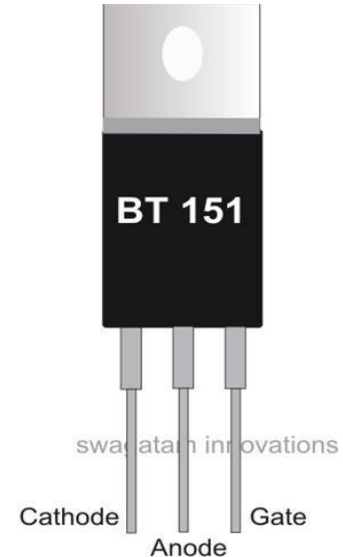
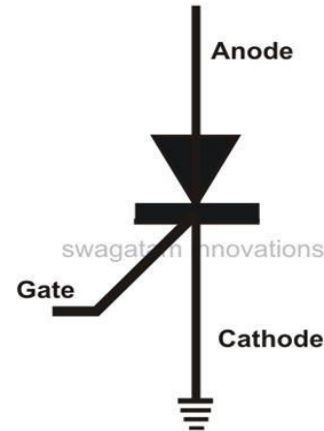
Lecture-9

A decorative network diagram in the bottom-right corner, similar to the one in the top-left, with a web of nodes and lines, some highlighted in blue.

Silicon Controlled Rectifier (SCR)

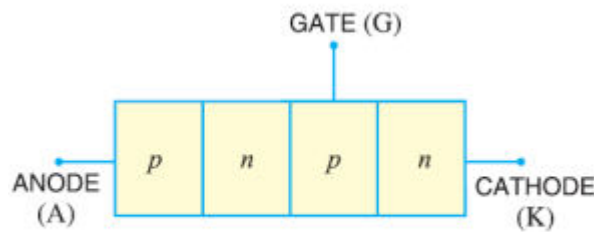
SCR

- © A silicon controlled rectifier is a semiconductor device that acts as a true electronic switch. It can change alternating current into direct current and at the same time can control the amount of power fed to the load. Thus SCR combines the features of a rectifier and a transistor.

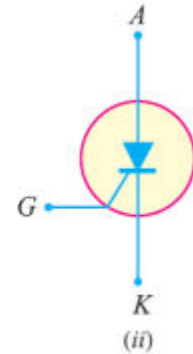


Constructional details

- When a p-n junction is added to a junction transistor, the resulting three p-n junction device is called a silicon controlled rectifier. Figure (i) shows its construction. It is clear that it is essentially an ordinary rectifier (p-n) and a junction transistor (n-p-n) combined in one unit form p-n-p-n device. Three terminals are taken; one from the outer p-type material called anode A, second from the outer n-type material called cathode K and the third from the base of transistor section and is called gate G. In the normal operating conditions of SCR, anode is held at high positive potential with respect to cathode and gate at small positive potential with respect to cathode. Figure (ii) shows the symbol of SCR.



(i)



(ii)

Working of SCR

- ◎ The working of SCR is to be studied under two different conditions:
 1. When Gate (G) is open
 2. When Gate (G) is positive with respect to Cathode (K)

When Gate (G) is open

- ⊙ No voltage to the gate. J2 is reverse biased while J1 & J3 are forward biased. reverse bias, no current will flow through the device => SCR is cut-off.

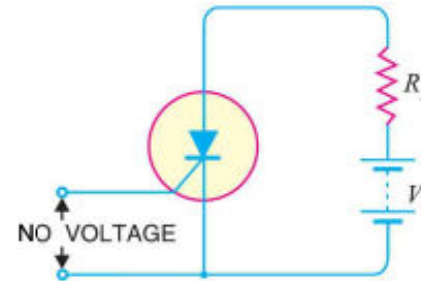
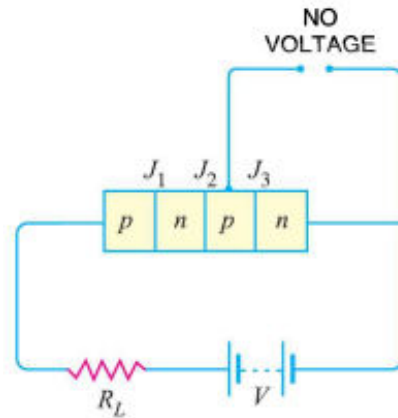


Fig. 20.2

When Gate is positive with respect to cathode

- ⊙ J3 is forward biased, J2 is reverse biased.
- ⊙ Electrons from n-type material start moving across J3 towards left
- ⊙ Similarly, holes move from p-type material towards the right.
- ⊙ Eventually, the electrons that moved across J3 are now attracted across J2. This initiates the Gate current and the J2 is now conducting.

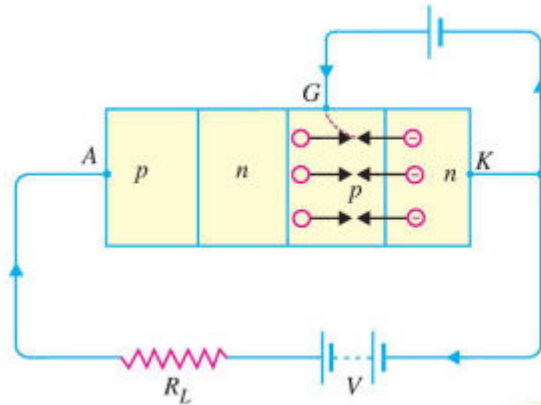
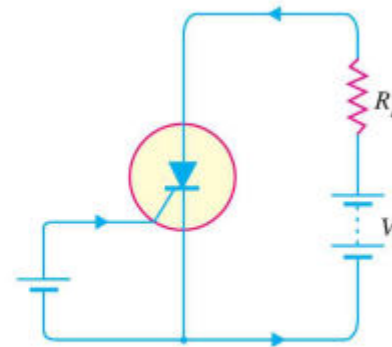


Fig. 20.3



V-I Characteristics of SCR

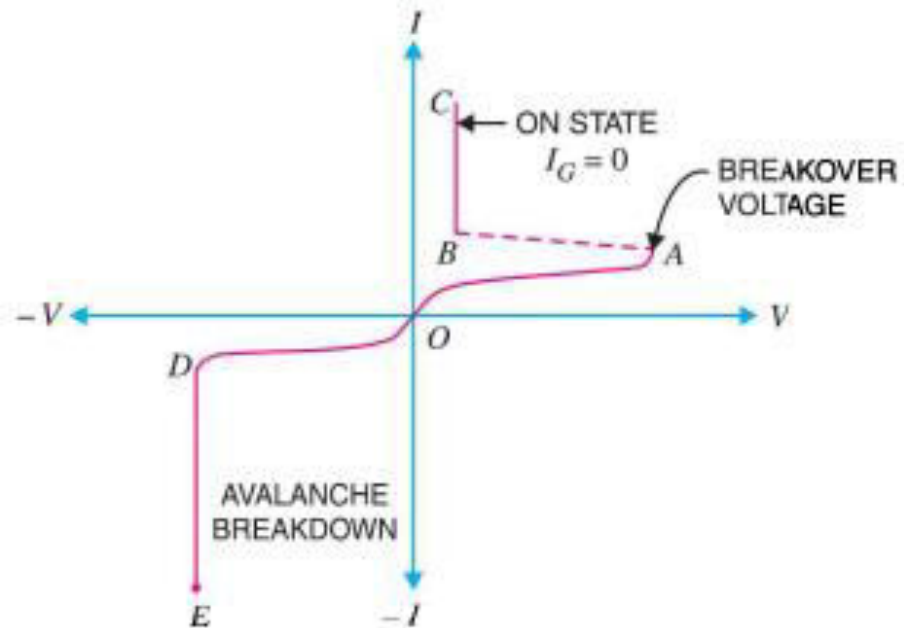


Fig. 20.7

The SCR has three basic states:

- ◎ **Forward blocking mode or off state:** In this state the SCR operation is such that it blocks forward current conduction that would normally be carried by a forward biased diode.
- ◎ **Forward conduction mode or on state:** In this mode the SCR has reached into conduction.
- ◎ **Reverse blocking mode or off state:** In this state the SCR blocks the current in the same way as that of a reverse biased diode.