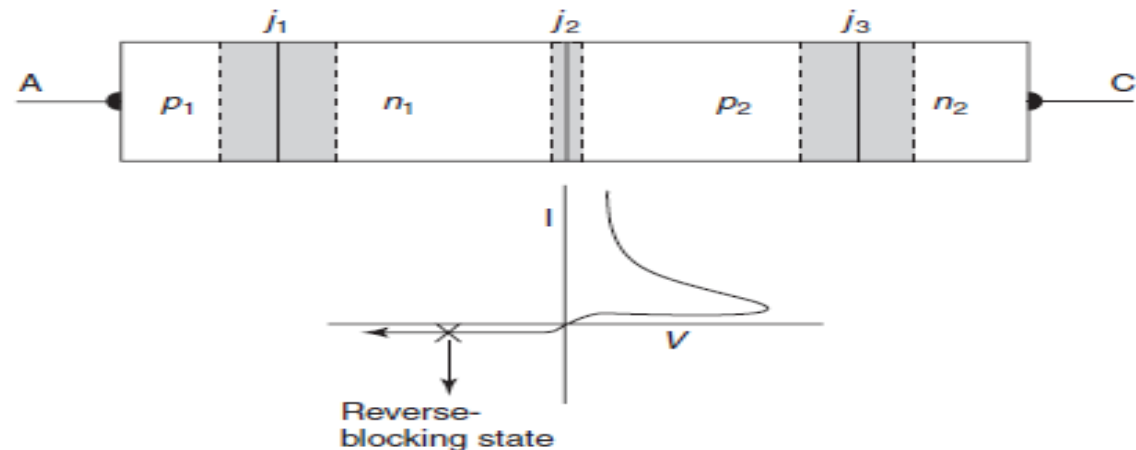


# Lecture 4

# Reverse-Blocking State of the SCR:

- The SCR in reverse-biased condition allows almost negligible current to flow through it. This is shown in Fig. 8-4(c).
- In the reverse-blocking state of the SCR, a small saturation current flows from anode to cathode. Holes will flow from the gate into  $p_2$ , *the base of the n-p-n transistor, due to positive gate current.*
- The required gate current for turn-on is only a few milli-amperes, therefore, the SCR can be turned on by a very small amount of power in the gate.



**Figure 8-4 (c)** Reverse-blocking state of the SCR

# I–V Characteristics of the SCR:

- As shown in Fig. 8-5, if the gate current is 0 mA, the critical voltage is higher, i.e., the SCR requires more voltage to switch to the conducting state.

- But as the value of gate current increases, the critical voltage becomes lower, and the SCR switches to the conducting state at a lower voltage.

- At the higher gate current  $I_{G2}$ , the SCR switches faster than at the lower gate current  $I_{G1}$ , because  $I_{G2} > I_{G1}$ .

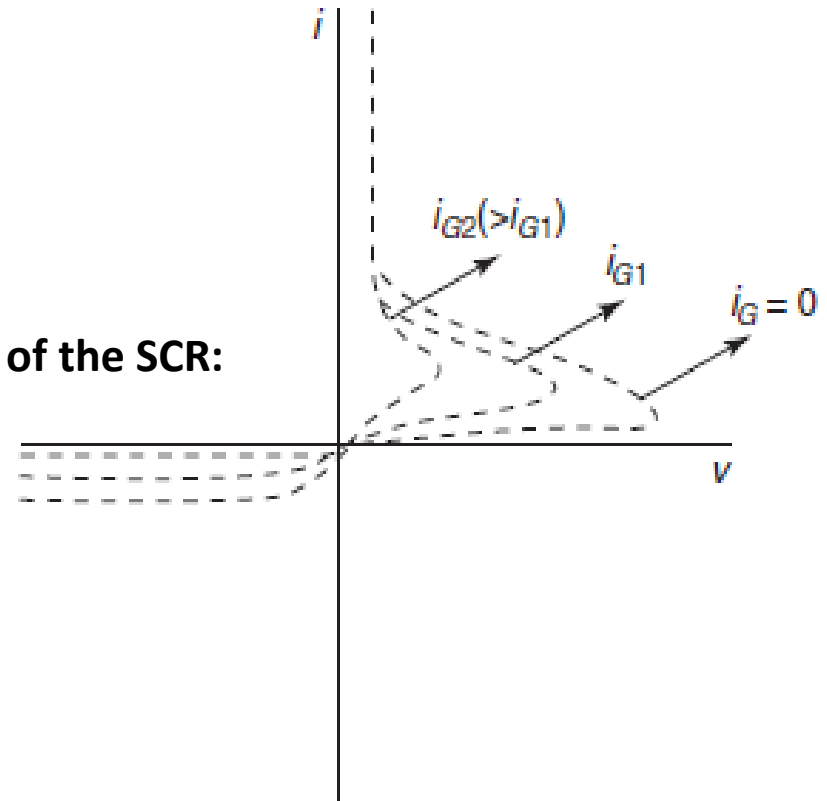
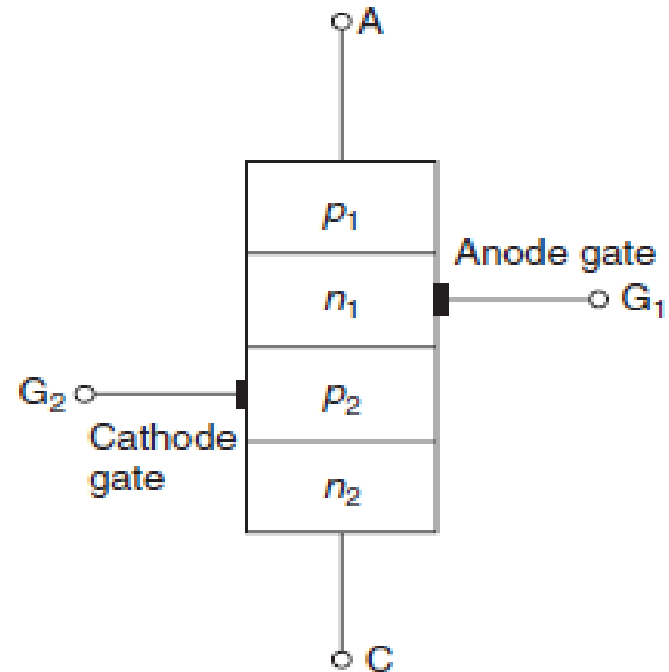


Figure 8-5 I–V characteristics of SCR

# Semiconductor-controlled switch (SCS):

- Few SCRs have two gate leads,  $G_2$  attached to  $p_2$  and  $G_1$  attached to  $n_1$ , as shown in Fig. 8-6. This configuration is called the semiconductor-controlled switch (SCS).
- The SCS, biased in the forward-blocking state, can be switched to the conducting state by a negative pulse at the anode gate  $n_1$  or by a positive current pulse applied to the cathode gate at  $p_2$ .



**Figure 8-6** Schematic diagram for a semiconductor-controlled switch

# Simple Applications:

- The SCR is the most important member of the thyristor family. The SCR is a capable power device as it can handle thousands of amperes and volts.
- Generally the SCR is used in many applications such as in high power electronics, switches, power-control and conversion mode.
- It is also used as surge protector.
- **Static Switch:** The SCR is used as a switch for power-switching in various control circuits.
- **Power Control:** Since the SCR can be turned on externally, it can be used to regulate the amount of power delivered to a load.
- **Surge Protection:** In an SCR circuit, when the voltage rises beyond the threshold value, the SCR is turned on to dissipate the charge or voltage quickly.
- **Power Conversion:** The SCR is also used for high-power conversion and regulation. This includes conversion of power source from ac to ac, ac to dc and dc to ac.

# NPTTEL LINK

- <http://nptel.ac.in/courses/108101038/7>