

Experiment no.13

§ thyristor characteristics §

13.1 Objective:

To study the characteristics of the thyristor (SCR).

13.2 Theory:

A thyristor is a four-layer p-n-p-n semiconductor device consisting of three p-n junctions. It has three terminals: anode, cathode and a gate.

The Figure below shows the thyristor symbol and a sectional view of the three-pn junctions.

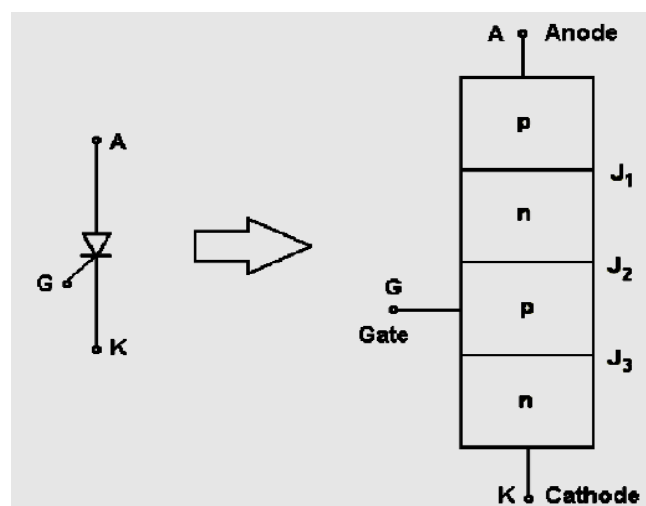


Figure (1)

When the anode voltage made positive with respect to the cathode, junctions J1 and J3 are forward biased and junction J2 is reverse biased. The thyristor said to be in the forward blocking or off-state condition. A small leakage current flows from anode to

cathode and is called the off state current. If the anode voltage V_{AK} is increased to a sufficiently large value, the reverse biased junction J2 would breakdown. This is known as avalanche breakdown and the corresponding voltage is called the forward breakdown voltage V_{BO} . Since the other two junctions J1 and J3 are already forward biased, there will be free movement of carriers across all three junctions.

This results in a large forward current. The device now said to be in a conducting or on state. The voltage drop across the device in the on state is due to the ohmic drop in the four layers and is very small (in the region of 1 V). In the on state an external impedance or resistance as shown in figure below limits the anode current (a).

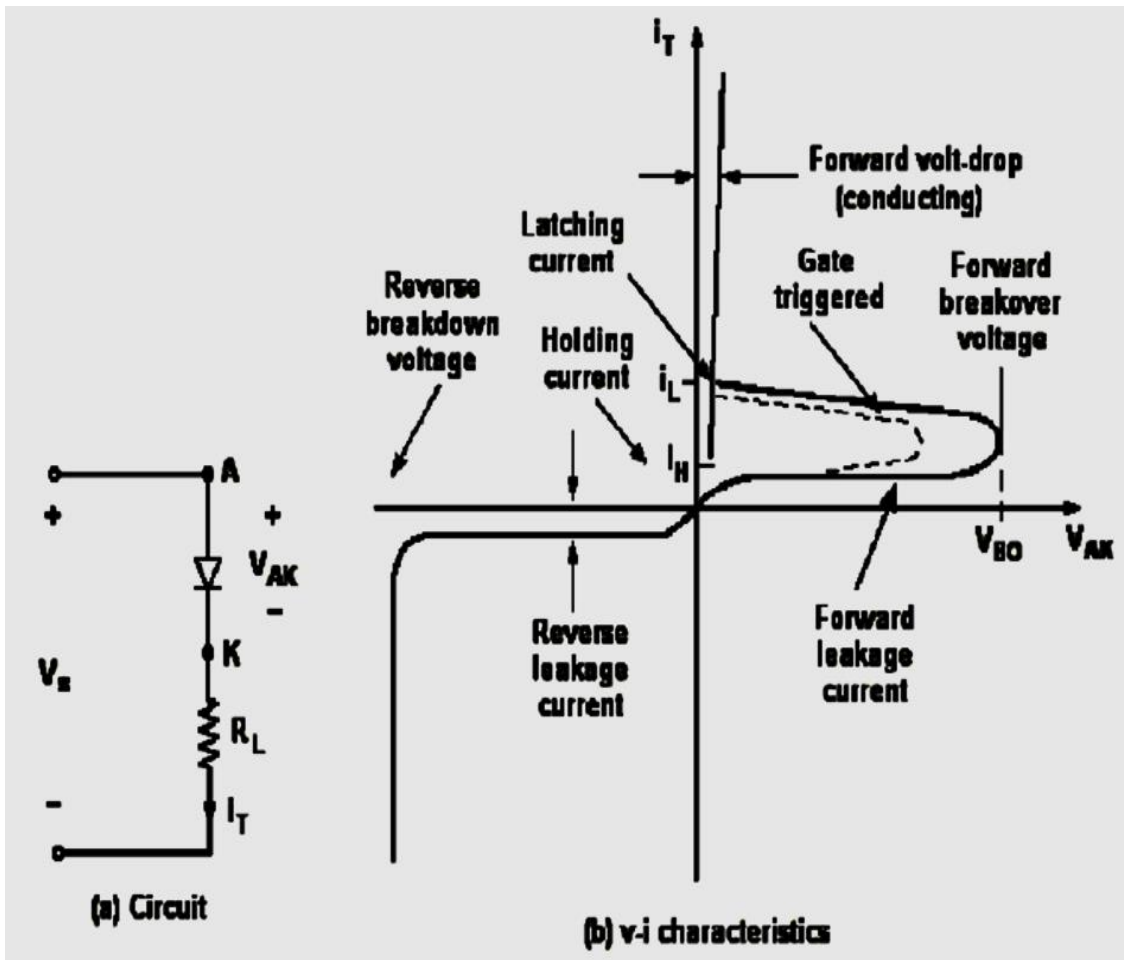


Figure (2)

13.3 Procedure:

1. Enter specific (input voltage) (2V) and frequency (200Hz) from the power supply device and draw input waveform (sin wave) by using Oscilloscope.
2. Connect the circuit shown in the figure (3).

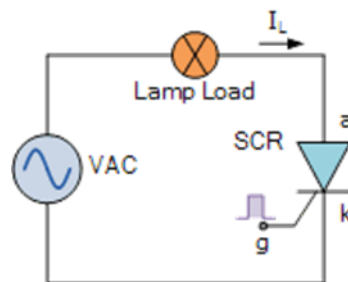


Figure (3)

3. Connect Oscilloscope to the two terminal of resistance.
4. Make specific Sine wave form input voltage to the GATE of the SCR.
5. Draw output waveform by using Oscilloscope.

13.4 Discussion:

1. What are the conditions for operating a thyristor in the normal operation?
2. What is the different between the diode and thyristor?
3. What is an SCR?
4. What are the applications of SCR?