

SEMINAR TOPIC

" THYRISTOR "

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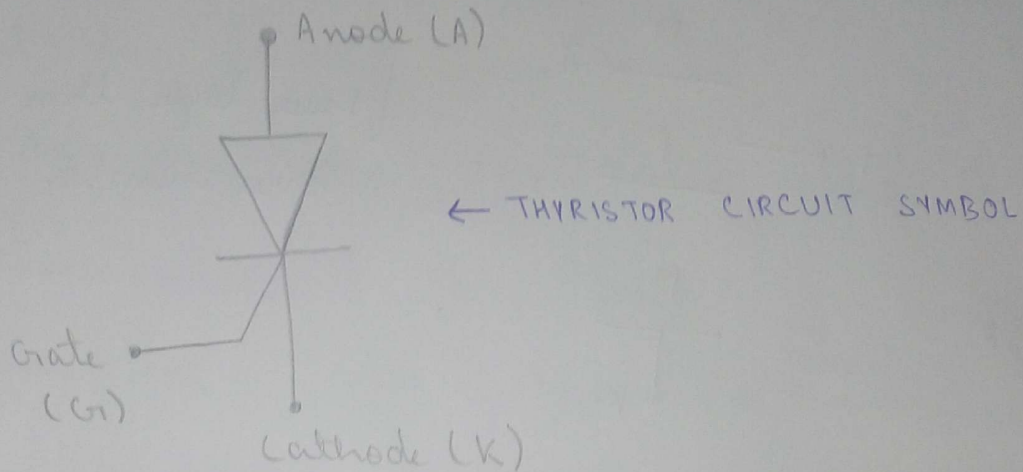
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• THYRISTOR

Thyristor is a four layer (P-N-P-N or N-P-N-P) semiconductor device that contains three PN junctions & is represented by the symbol as shown;

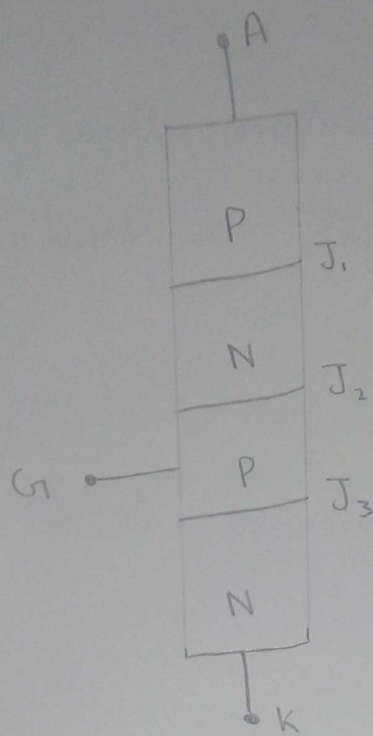


Thyristor can be used as a switch or as a rectifying diode depending upon how the thyristor gate is triggered. They can act as very fast solid state AC switches for controlling large AC voltages & currents & are thus used for controlling AC motors, lamps & for phase control.

Hence, thyristor can be defined as the most atomic switching unit of different power electronic devices like rectifiers.

* The family of thyristors consists of SCR, DIAC, TRIAC, UJT etc.

- Four layer diagram or construction of thyristors:



[Four layer, three terminal, three junction device]

- Working:

working of thyristor is divided into three modes viz;

- (i) Reverse Blocking mode
- (ii) Forward Blocking mode
- (iii) Forward conducting mode

REVERSE BLOCKING MODE

In this mode, reverse power supply is provided to the two terminals (Anode & cathode) of thyristor.

Thus anode is provided with negative supply terminal & cathode is provided with positive supply terminal

Therefore in case of reverse ~~to~~ blocking mode, ~~the~~ junction J_1 is reverse biased & J_3 is also reverse biased ^{while} J_2 is forward biased. For the proper conduction of thyristor, all the three junctions should be forward biased.

Thus, this mode gives the reverse region of VI characteristics of the thyristor.

In reverse region with increase in ^{external} voltage, there is a little increase in current. But, after reverse breakdown there is a steep rise in current which can damage the device, thus, this mode is not suitable for the working of thyristor.

FORWARD BLOCKING MODE

In this mode, both J_1 & J_3 are forward biased whereas J_2 is reverse biased & hence, ^{appreciable} no ↑ conduction.

This mode gives the forward blocking mode characteristics of VI graph.

FORWARD CONDUCTING MODE

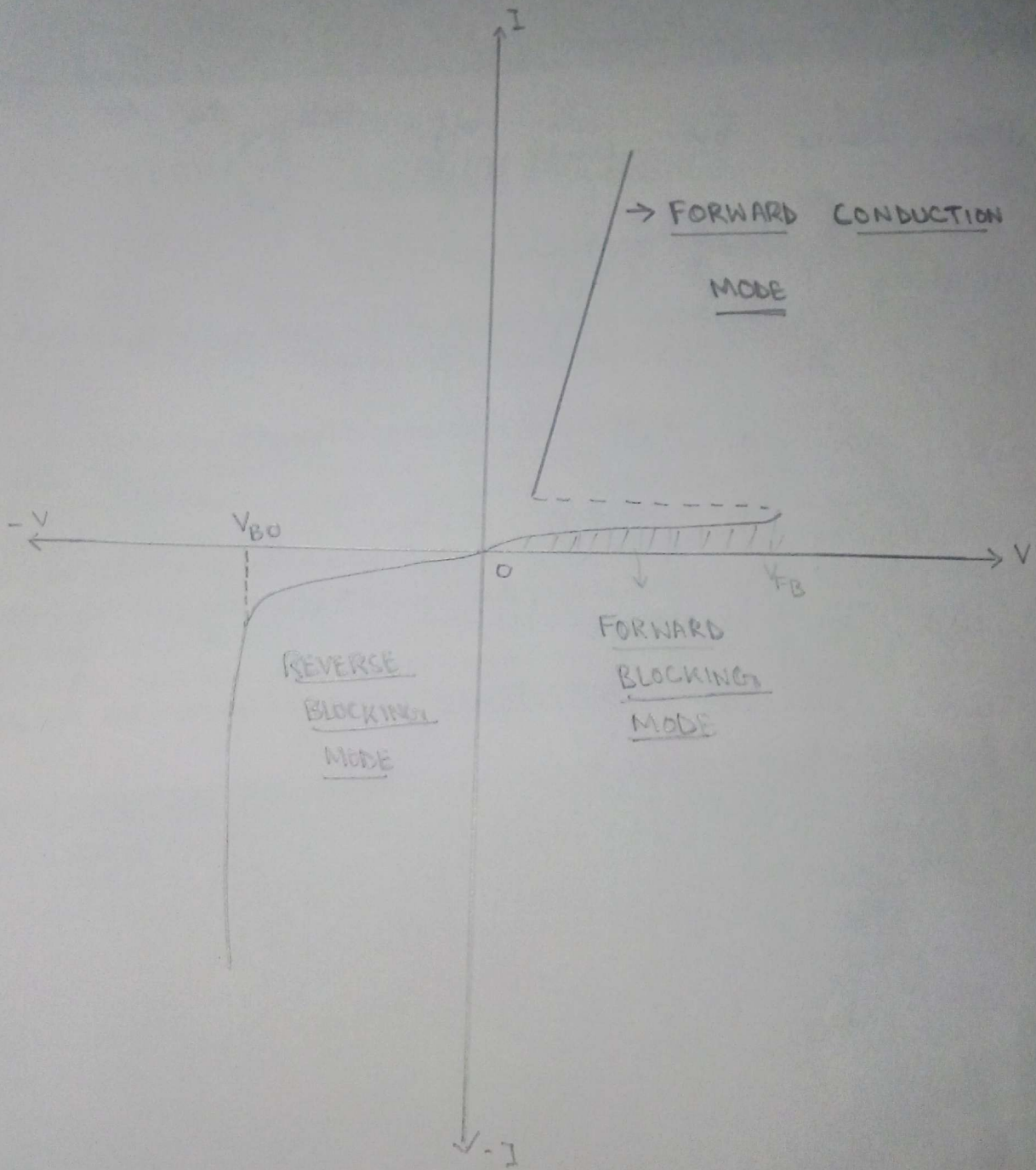
In this ~~reversed~~ mode, supply terminals are kept same as in the forward blocking mode, but in addition to that, we provide a gate terminal used to trigger & thus break junction ' J_2 ' which was earlier reverse biased.

Thus, gate forcefully breaks J_2 & brings it & into forward conduction mode.

Hence, when sufficient gate triggering is provided all the three junctions are forward biased.

Here, with a small increase in voltage there is major rise in current.

Characteristics of a thyristor:



THYRISTOR PARAMETERS :

(i) Latching current (I_L)

It is the minimum current required to trigger the device from its off-state to on-state.

(ii) Holding current (I_H)

It is the min. value of current to hold the device in ON-state.

For turning the device OFF, the anode current should be lowered below I_H by increasing the external circuit resistance.

(iii) Gate current (I_g)

It is the current applied to the gate of the device for control purposes.