

## Power Electronics: DIAC, TRIAC

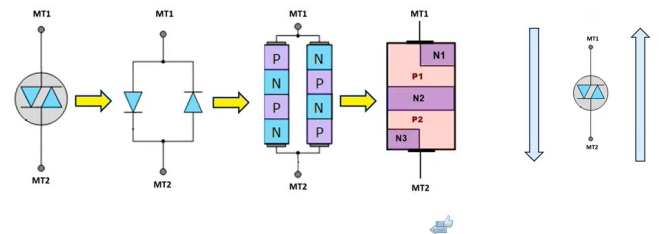
### Other Members of Thyristor Family

- DIAC (Diode for Alternating Current)
- TRIAC (Triode for Alternating Current)

### DIAC (Diode for Alternating Current)

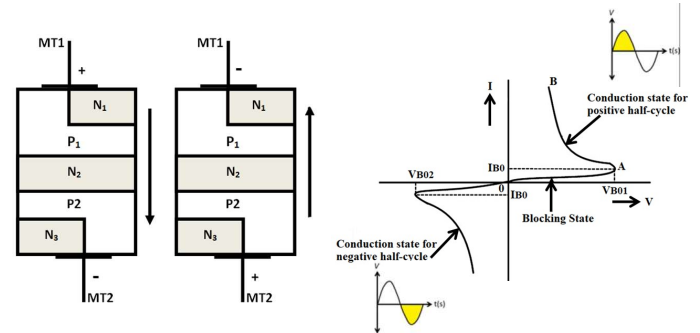
- DIAC is a bi-directional semiconductor switch that can be turned on in both forward and reverse polarities.
- DIAC is a three layer two terminal semiconductor device.  $MT_1$  and  $MT_2$  are the two main terminals which are interchangeable. It acts as a bidirectional Avalanche diode.
- It does not have any control terminal. It has two junctions  $J_1$  and  $J_2$ .
- It acts as a switch in both the directions.

### DIAC Construction and Symbol

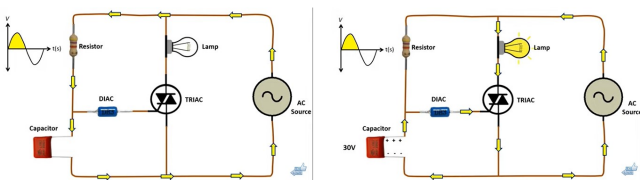


- As the doping level at the two ends of the device is the same, the diac has identical characteristics for both positive and negative half cycle of an ac cycle.
- During the positive half cycle, MT1 is positive with respect to MT2 whereas MT2 is positive with respect to MT1 in the negative half cycle.
- At voltage less than the break over voltage, a very small amount of current called the leakage current flows through the device and the device remains in OFF state.
- When the voltage level reaches the break over voltage the device starts conducting and it exhibits negative resistance characteristics i.e. the current flowing in the device starts increasing and voltage across it starts decreasing.
- The diac is not a control device. It is used as triggering device in Triac phase control circuits used for light dimming, motor speed control and light control.

### Forward & Reverse Characteristics of DIAC

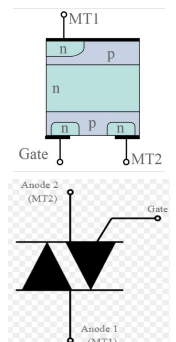


### Power Control Using DIAC

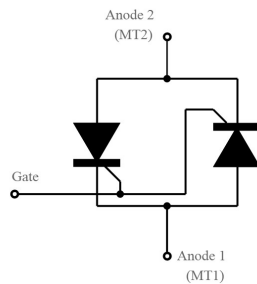


### TRIAC (Triode for Alternating Current)

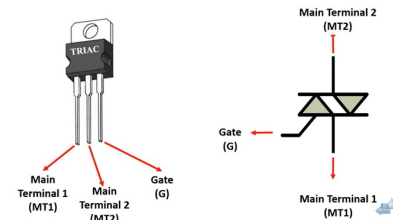
- Triac is a three terminal semiconductor switching device which controls alternating current in a load.
- Its three terminals are MT1, MT2, and the gate (G).
- The TRIAC is equivalent to two SCRs connected in parallel but in reverse direction. So triac will act as a switch for both directions.



## TRIAC Equivalent Circuit



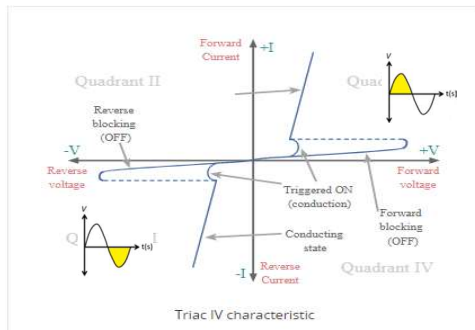
## TRIAC



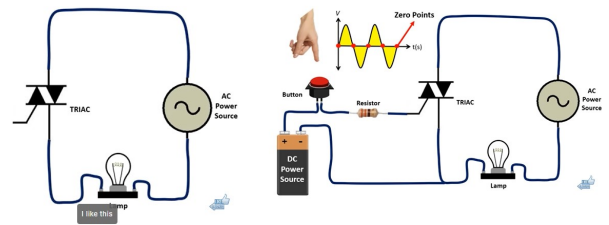
- Like an SCR, a Triac also starts conducting only when the break over voltage is reached.
- The device, when starts conducting allows very heavy amount of current to flow through it. The high inrush of current must be limited using external resistance, or it may otherwise damage the device.
- During the positive half cycle,  $MT_1$  is positive with respect to  $MT_2$ , whereas  $MT_2$  is positive with respect to  $MT_1$  during negative half cycle.
- A triac is a bidirectional device and can be triggered either by positive or by a negative gate signal.

- By applying a proper signal at the gate, the break over voltage i.e. the firing angle of the device can be changed.
- **Applications:**
  - Lighting control - especially domestic dimmers.
  - Temperature and liquid level control
  - Control of fans and small motors.
  - Electronic switches for general AC switching and control

## TRIAC Characteristics



## Power Control.....



## Power Control.....

