



ELECTRONICS DEVICES AND CIRCUITS

SECTION - D

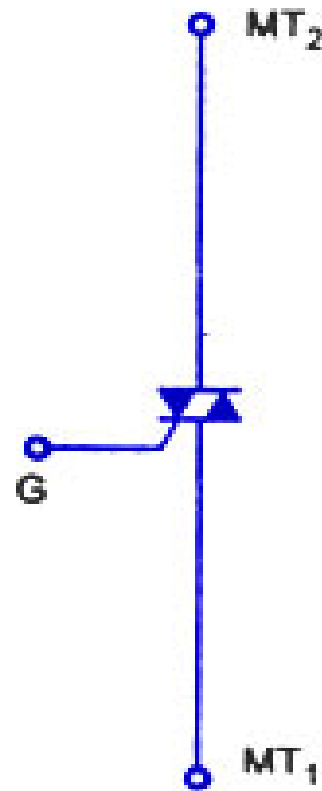
SOME SPECIAL DEVICES

TRIAC

- The TRIAC is another three-terminal ac switch that is triggered into conduction when a low-energy signal is applied to its gate terminal.
- Unlike the SCR, the TRIAC conducts in either direction when turned on.

TRIAC

- The TRIAC also differs from the SCR in that either a positive or negative gate signal triggers it into conduction.



Schematic Symbol

TRAIIC

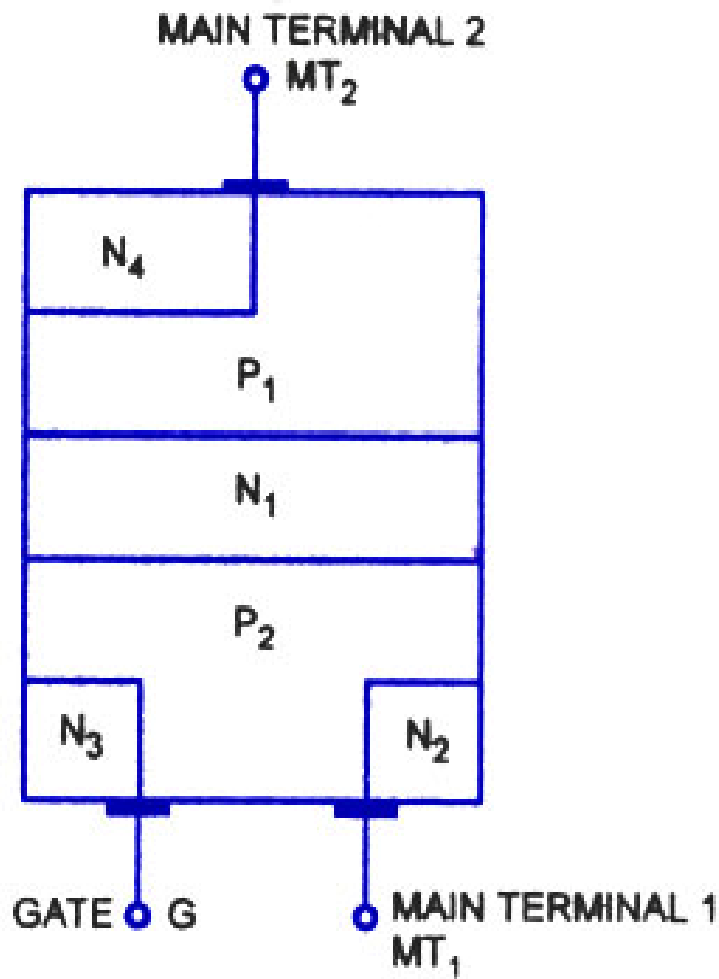
- Thus the triac is a three terminal, four layer bidirectional semiconductor device that controls ac power whereas an SCR controls dc power or forward biased half cycles of ac in a load.
- Because of its bidirectional conduction property, the triac is widely used in the field of power electronics for control purposes.

TRIAC

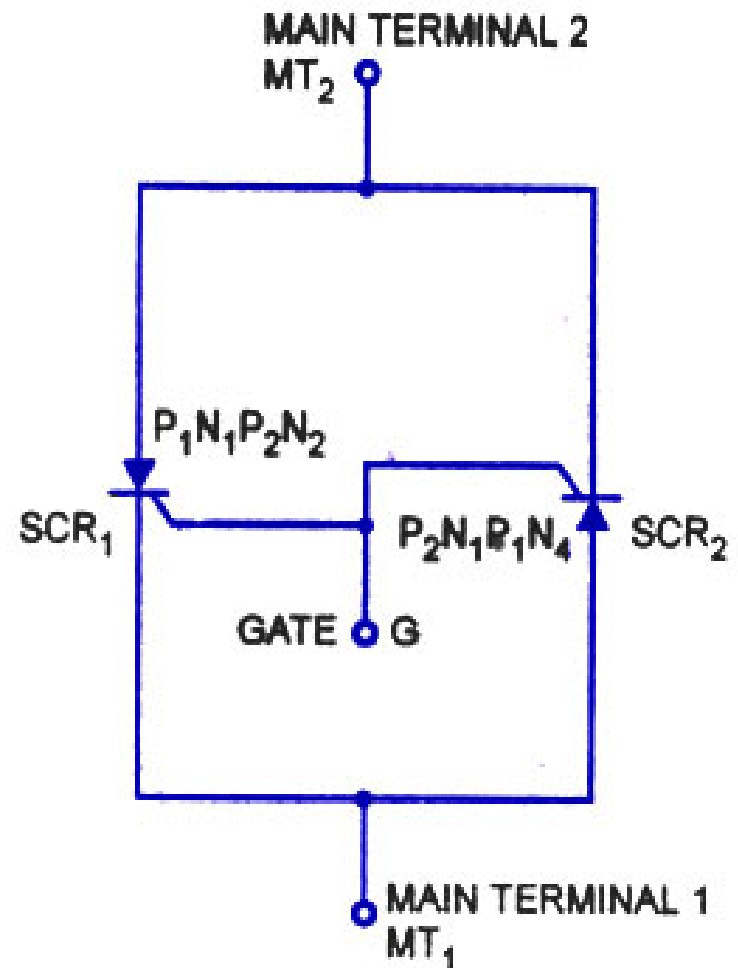
- “**TRIAC**” is an abbreviation for three terminal ac switch.
- ‘**TRI**’-indicates that the device has three terminals and ‘**AC**’ indicates that the device controls alternating current or can conduct in either direction.

Construction of a TRIAC

TRIAC is a three terminal, four layer bilateral semiconductor device. It incorporates two SCRs connected in inverse parallel with a common gate terminal in a single chip device. As seen, it has six doped regions.



Basic Structure



Electrical Equivalent Circuit

Construction of a TRIAC

- The gate terminal G makes ohmic contacts with both the N and P materials.
- This permits trigger pulse of either polarity to start conduction.
- Since the triac is a bilateral device, the term “anode” and “cathode” has no meaning, and therefore, terminals are designated as main terminal 1. (MT1), main terminal 2 (MT2) and gate G.
- To avoid confusion, it has become common practice to specify all voltages and currents using MT1 as the reference.

Operation and Working of a TRIAC

- TRIAC can conduct current irrespective of the voltage polarity of terminals MT1 and MT2 with respect to each other and that of gate and terminal MT2.
- Consequently four different possibilities of operation of TRIAC exists.

Operation and Working of a TRIAC

- They are: ---

(a). Terminal **MT2** and gate are positive with respect to terminal **MT1**.

When terminal MT2 is positive with respect to terminal MT1 current flows through path **P1-N1-P2-N2**. The two junctions P1-N1 and P2-N2 are forward biased whereas junction N1 P2 is blocked. The triac is now said to be positively biased.

Operation and Working of a TRIAC

2. Terminal **MT2** is positive but gate is negative with respect to terminal **MT1**.

Though the flow path of current remains the same as in mode 1 but now junction P2-N3 is forward biased and current carriers injected into P2 turn on the **TRIAC**.

OPERATION AND WORKING OF A TRIAC

3.Terminal **MT2** and gate are negative with respect to terminal **MT1**

- When terminal MT2 is negative with respect to terminal MT1, the current flow path is P2-N1-P1-N4. The two junctions P2-N1 and P1 - N4 are forward biased whereas junction N1-P1 is blocked. The triac is now said to be negatively biased.

Operation and Working of a TRIAC

4. Terminal **MT2** is negative but gate is positive with respect to terminal **MT1**

Though the flow path of current remains the same as in mode 3 but now junction P2-N2 is forward biased, current carriers are injected and therefore, the triac is turned on.