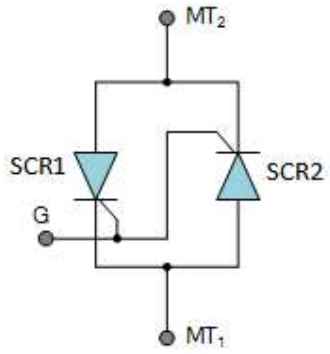
8.2.3 Single phase TRIAC AC Regulator

A triac is a bidirectional, three terminals dual, direction by applying a small current of either polarity between the gate and one of the two main terminals.

Triac is fabricated by integrating two thyristors in an inverse parallel connection

Use of triac

1- **Light dimming**
2- **Motor-speed control**
3- **Microcontroller power control**



Advantage of using Triac

1- Triac are triggered by positive or negative polarity voltage applied at the gate terminal
2- A triac need a single heat sink of slightly large size, whereas anti-parallel thyristor pair need wo heat sinks of slightly smaller size

Disadvantage of using Triac

1- Triacs have low $\frac{dv}{dt}$ rating compare to the thyristor
2- Triacs are available in lower rating as compared to thyristor
3- Since a Triac can be triggered in either direction, a trigger circuit for triac careful consideration
4- The reliability of Triacs is lower than that of thyristor.

$$V_{o\,rms} = \sqrt{\frac{n}{K}} \times V_{rms}$$

$$\text{P.F} = \sqrt{\frac{n}{K}} \quad \text{Where, } \frac{n}{K} = \text{duty cycle}$$

EX.8-2] Triac AC controller supplies electrical furnace of 8 Ω heating element, for 240 v, 50Hz voltage supply, the control circuit is an integral cycle control circuit that allows the current to flow for 2 cycles on and be off 1 cycle.

Calculate: - 1- The load power 2- The supply power factor

Ans.

N=2 and M =1

K = 2+1 =3

$$p_L = \frac{V_{(orms)}{}^2}{R} = \frac{(\sqrt{\frac{n}{K}} \times V_{rms})^2}{8}$$

$$= \frac{(\sqrt{\frac{2}{3}} \times 240)^2}{8} = 4800 watts$$

$$\text{P.F} = \frac{P_L}{P_{in}} = \frac{V_{orms}}{v_{rms}} = \sqrt{\frac{n}{K}} = \sqrt{\frac{2}{3}} = 0.816$$