A thyristor, also known as a SCR (silicon controlled rectifier), is a special type of diode that only allows current to flow when a control voltage is applied to its gate terminal. Although this appears to be nothing more than a voltage controlled switch the following should be noted: In the presence of forward current (i.e. after the thyristor is turned on by a suitable gate voltage) it will not turn off even after the gate voltage has been removed. The thyristor will only turn off when the forward current drops to zero. In a DC (Direct current) circuit this makes the device almost useless except in certain particular safety (crowbar) protection applications.

The most common use of thyristors is in AC (Alternating Current) circuits. In an AC circuit the forward current drops to zero during every cycle so there will always be a turn off function. This does, however, mean that the gate needs to be triggered every cycle just to turn it back on again. It is in the relative timing of these two functions that the thyristor has its most important role, i.e. Power Control. Consider the waveform shown that corresponds to a typical AC voltage supply. If the thyristor is turned on near the beginning of the positive voltage excursion then the time it is forward conducting is maximised. This means maximum power delivered to the load. Correspondingly if it is turned on near the end of the positive excursion then minimum conduction time is achieved and minimum power delivered.

By suitable timing control of the gate voltage a crude power controller can be designed to, for example, control the heating level of a simple resistive heater.

As you can see from the diagram only half of the AC cycle is available for control since the entire negative half is in the wrong direction for the thyristor to conduct (diode action). This is rather wasteful and a much better option is to use two thyristors (back to back) to control the conduction in both directions. A device specifically designed to do this is called a TRIAC and is shown below.