Single Phase Half Wave AC Voltage Controller

The basic principle of ac phase control technique is explained with reference to a single phase half wave ac voltage controller (unidirectional controller) circuit shown in the below figure.

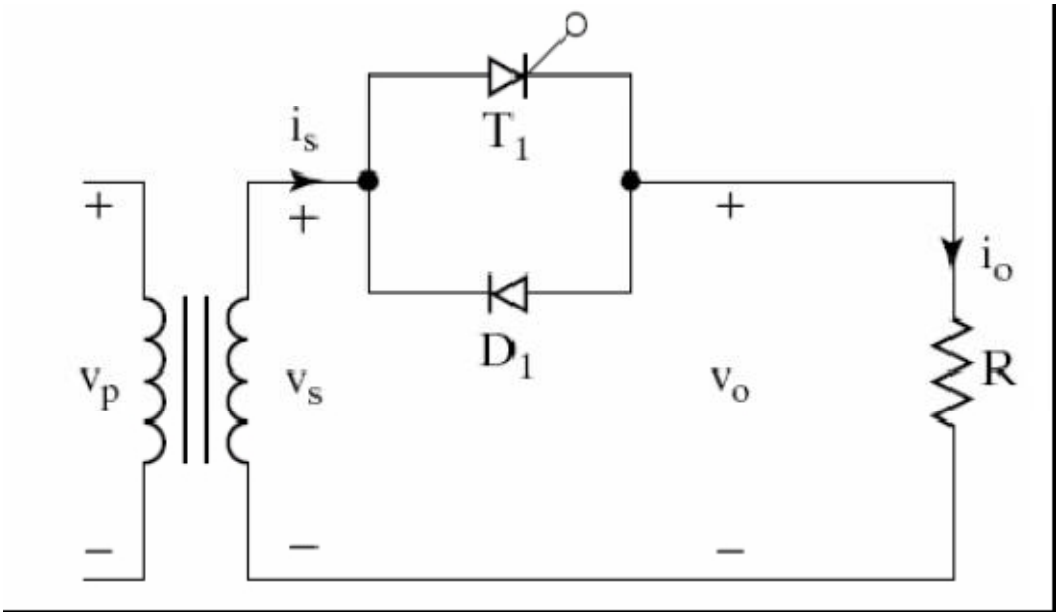
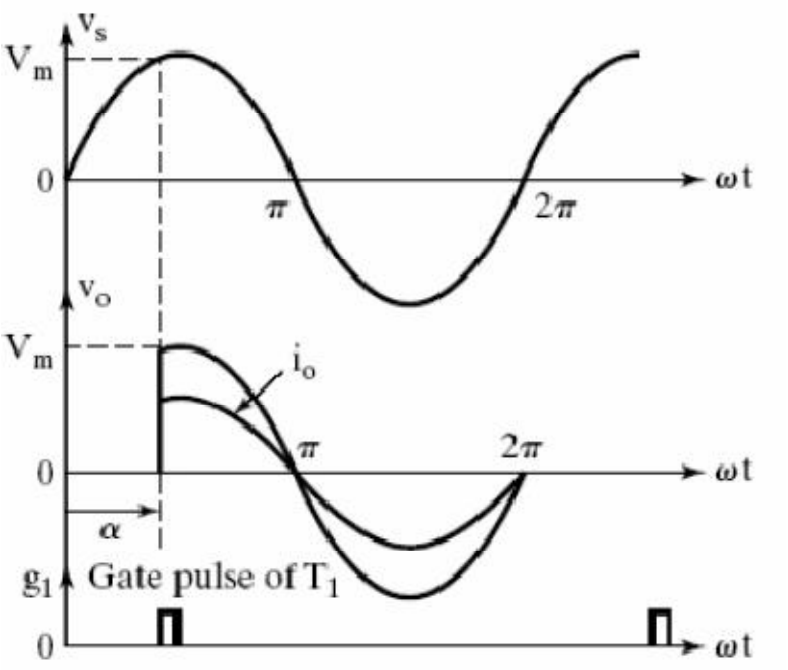


Fig. Single Phase Half Wave AC Voltage Controller



Waveform

The half wave ac controller uses one thyristor and one diode connected in parallel across each other in opposite direction that is anode of thyristor 1 *T* is connected to the cathode of diode 1 *D* and the cathode of 1 *T* is connected to the anode of 1 *D* . The output voltage across the load resistor 'R' and hence the ac power flow to the load is controlled by varying the trigger angle 'α'.

The trigger angle or the delay angle 'α' refers to the value of ωt or the instant at which the thyristor 1 *T* is triggered to turn it ON, by applying a suitable gate trigger pulse between the gate and cathode lead.

The thyristor 1 *T* is forward biased during the positive half cycle of input ac supply. It can be triggered and made to conduct by applying a suitable gate trigger pulse only during the positive half cycle of input supply. When 1 *T* is triggered it conducts and the load current flows through the thyristor 1 *T* , the load and through the transformer secondary winding.

By assuming 1 *T* as an ideal thyristor switch it can be considered as a closed switch when it is ON during the period $\omega t = \alpha$ to π radians. The output voltage across the load follows the input supply voltage when the thyristor 1 *T* is turned-on and when it conducts from $\omega t = \alpha$ to π radians. When the input supply voltage decreases to zero at $\omega t = \pi$, for a resistive load the load current also falls to zero at $\omega t = \pi$ and hence the thyristor 1 *T* turns off at $\omega t = \pi$. Between the time period $\omega t = \pi$ to 2π , when the supply voltage reverses and becomes negative the diode 1 *D* becomes forward biased and hence turns ON and conducts. The load current flows in the opposite direction during $\omega t = \pi$ to 2π radians when 1 *D* is ON and the output voltage follows the negative half cycle of input supply.