

SHOCKLEY DIODE

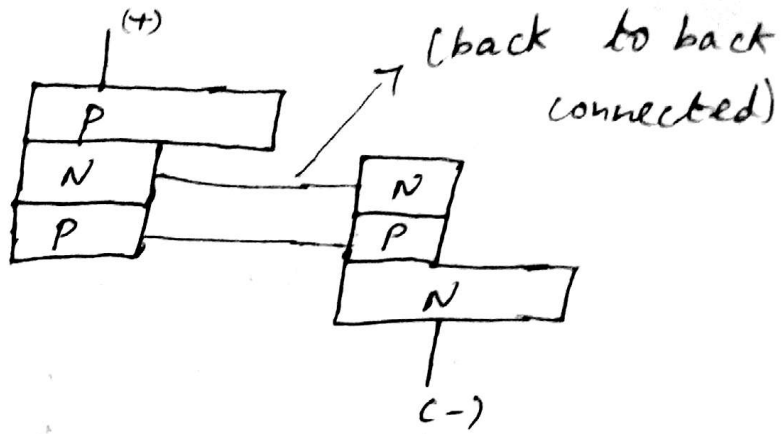
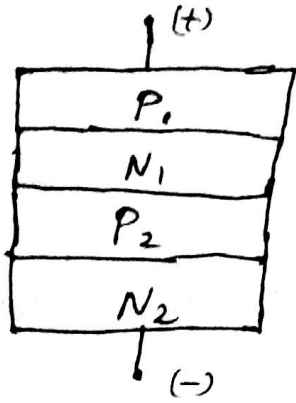
INTRODUCTION:

It is also known as PNPN diode. The name shockley diode comes from its inventor William Bradford shockley. It is a four layer semiconductor. And it is the first semiconductor device. It is similar to thyristor with detached gate. It is not available commercially. But this diode is used in making of other kinds of thyristors such as DIAC, TRIAC and SCR.

CONSTRUCTION:

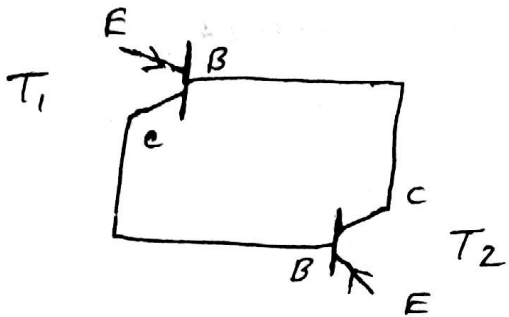
The diode has two terminals anode and cathode, and four layers (P-N-P-N). The function of this diode is similar to the normal diode. when the diode is in the forward bias the current flows through the diode. when it is of reverse bias no current flows.

The basic symbol is



symbol

It is of PNP & NPN transistor
is the basic circuit of this diode



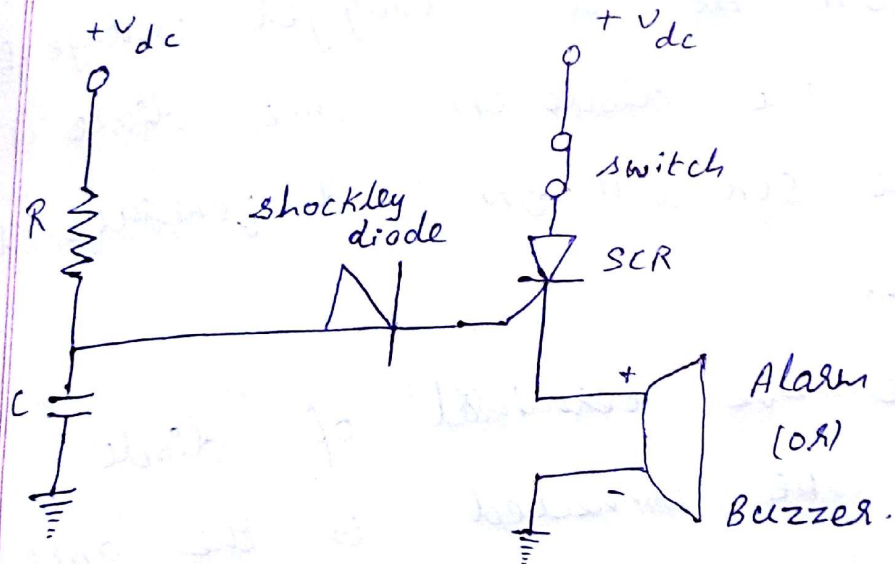
In this circuit the collector terminal
of T_2 transistor is connected
with Base of T_1 transistor.

for collector of T_1 transistor to
Base of T_2 transistor.

to back connected)

Junction (J_1) is designed at the EB junction of T_1 transistor, J_2 is at BC junction between T_1 & T_2 transistor. J_3 is at BE junction. Junction (J_2) should be reverse bias.

CIRCUIT DIAGRAM



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This diode is used as a switch in many circuits to turn ON an SCR. Then it turns in the buzzer until the power is disconnected.

The first part of the circuit is RC circuit, where the RC network is fed DC voltage. Here the capacitor will charge up through the resistor. When DC Power is detached, the capacitor will discharge through the diode. This will be a trigger voltage & makes the diode ON. Once diode is ON the SCR will ON and generate the alarm.

The -ve terminal of diode should be connected to the gate terminal of the SCR. Once the gate terminal of the SCR receives the ample voltage it will conduct the current from anode to cathode until the power is detached.

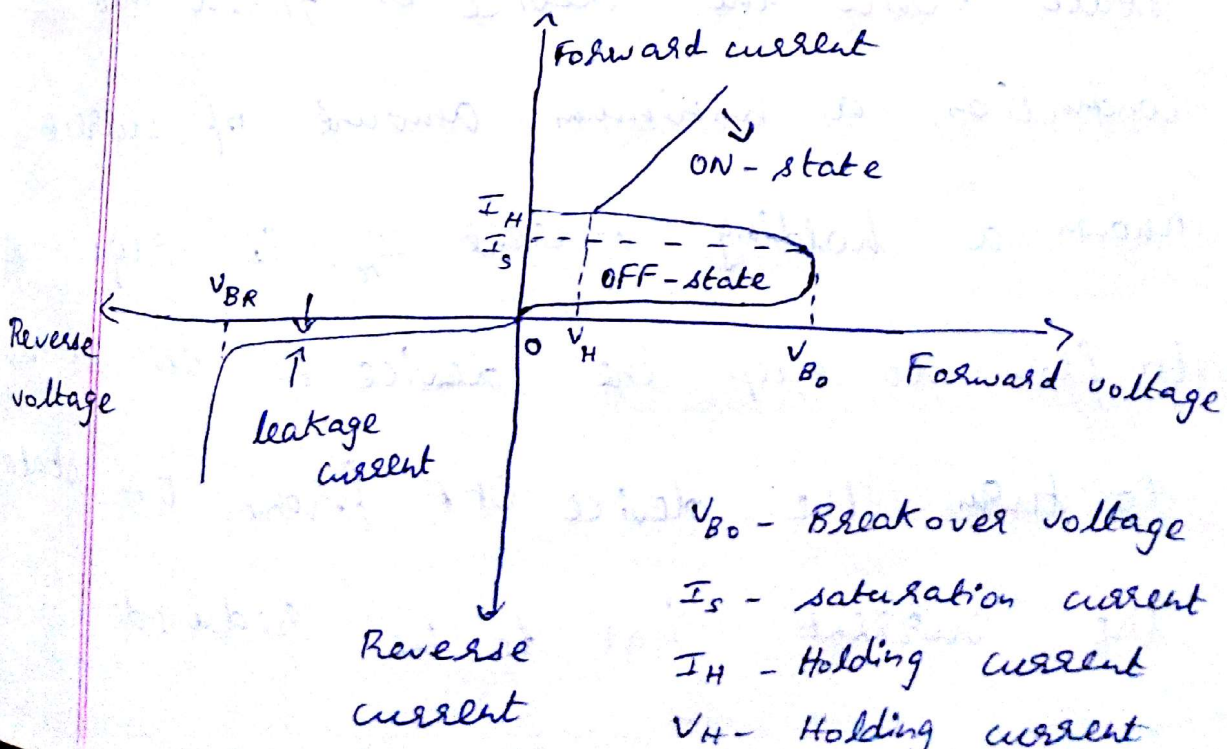
Detaching the gate current will still conduct from +ve to -ve. For this reason SCR are very good

Reverse
voltage

switching of devices like alarm. Circuits which continue ON until the power is deactivated, and another reason is switch is placed at the +ve terminal of the SCR, so if we doesn't want the buzzer, we should remove the power supply from +ve terminal of SCR. For doing this a normal closed switch is kept on the anode terminal.

V-I characteristic

As we have seen it has three junctions J_1, J_2 & J_3 . J_1 & J_3 is forward bias. J_2 is Reverse bias.



The diode consist of two operating modes conducting mode and non-conducting mode. In conducting state which operates on the small current and voltages less than break over voltage.

However, as this applied voltage is increased, the current increases slowly until the so called firing or breakover voltage (V_{BO}) is reached. Once firing takes place, the current increases abruptly and the voltage drop across the device decreases sharply. At this point, the diode switches over from 'OFF' to 'ON' state. Once the device is fired into conduction, a minimum amount of current known a holding current I_H , is required to flow to keep the device in ON state. To turn the device OFF from ON state, the current has to be reduced

below I_H by reducing the applied voltage close to zero. below holding voltage, V_H . Thus the diode act as a switch during forward bias condition.

Application

It is used in the relaxation oscillator.