

Lecture 6

Advantages of the TRIAC:

- *The TRIAC has the following advantages:*
 - (i) They can be triggered with positive- or negative-polarity voltage.
 - (ii) They need a single heat sink of slightly larger size.
 - (iii) They need a single fuse for protection, which simplifies their construction.
 - (iv) In some dc applications, the SCR has to be connected with a parallel diode for protection against reverse voltage, whereas a TRIAC may work without a diode, as safe breakdown in either direction is possible.

Disadvantages of the TRIAC:

- *The TRIAC has the following disadvantages:*
 - (i) TRIACs have low *dv/dt ratings compared to SCRs.*
 - (ii) Since TRIACs can be triggered in either direction, the trigger circuits with TRIACs needs careful consideration.
 - (iii) Reliability of TRIACs is less than that of SCRs.

Simple Applications of the TRIAC:

- *The TRIAC as a bidirectional thyristor has various applications. Some of the popular applications of the TRIAC are as follows:*

- (i) In speed control of single-phase ac series or universal motors.
- (ii) In food mixers and portable drills.
- (iii) In lamp dimming and heating control.
- (iv) In zero-voltage switched ac relay.

DIODE AC SWITCH (DIAC):

- The DIAC is a combination of two diodes. Diodes being unidirectional devices, conduct current only in one direction.
- If bidirectional (ac) operation is desired, two Shockley diodes may be joined in parallel facing different directions to form the DIAC.

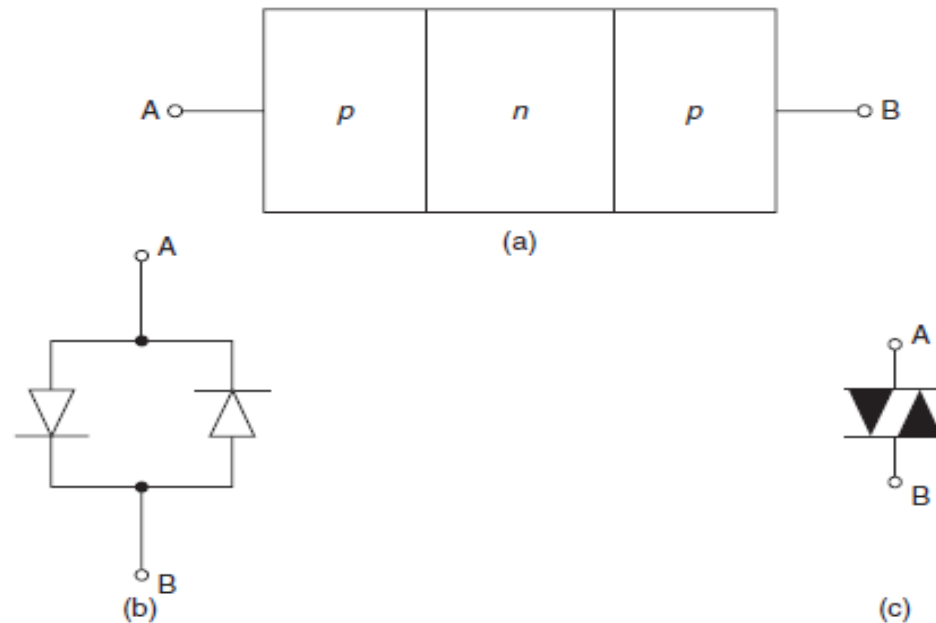


Figure 8-13 (a) Basic structure of the DIAC (b) Equivalent circuit of the DIAC (c) Symbol of the DIAC

Constructional Features:

- The construction of DIAC looks like a transistor but there are major differences.
- **They are as follows:**
 - (i) All the three layers, $p-n-p$ or $n-p-n$, are equally doped in the DIAC, whereas in the BJT there is a gradation of doping. The emitter is highly doped, the collector is lightly doped, and the base is moderately doped.
 - (ii) The DIAC is a two-terminal diode as opposed to the BJT, which is a three-terminal device.

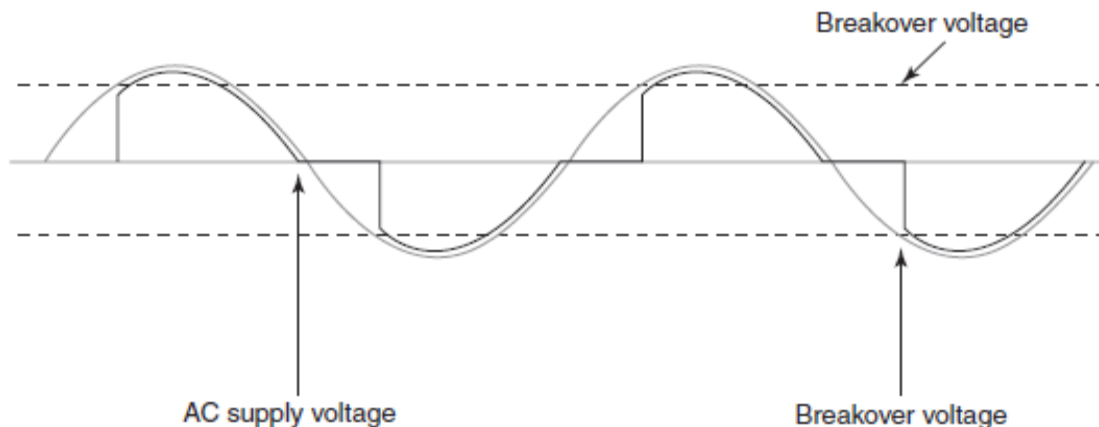


Figure 8-14 Current waveform in the DIAC

Physical Operation and Characteristics:

- **The main characteristics are of the DIAC are as follows:**
 - (i) Break over voltage
 - (ii) Voltage symmetry
 - (iii) Break-back voltage
 - (iv) Break over current
 - (v) Lower power dissipation
- Although most DIACs have symmetric switching voltages, asymmetric DIACs are also available. Typical DIACs have a power dissipation ranging from 1/2 to 1 watt.