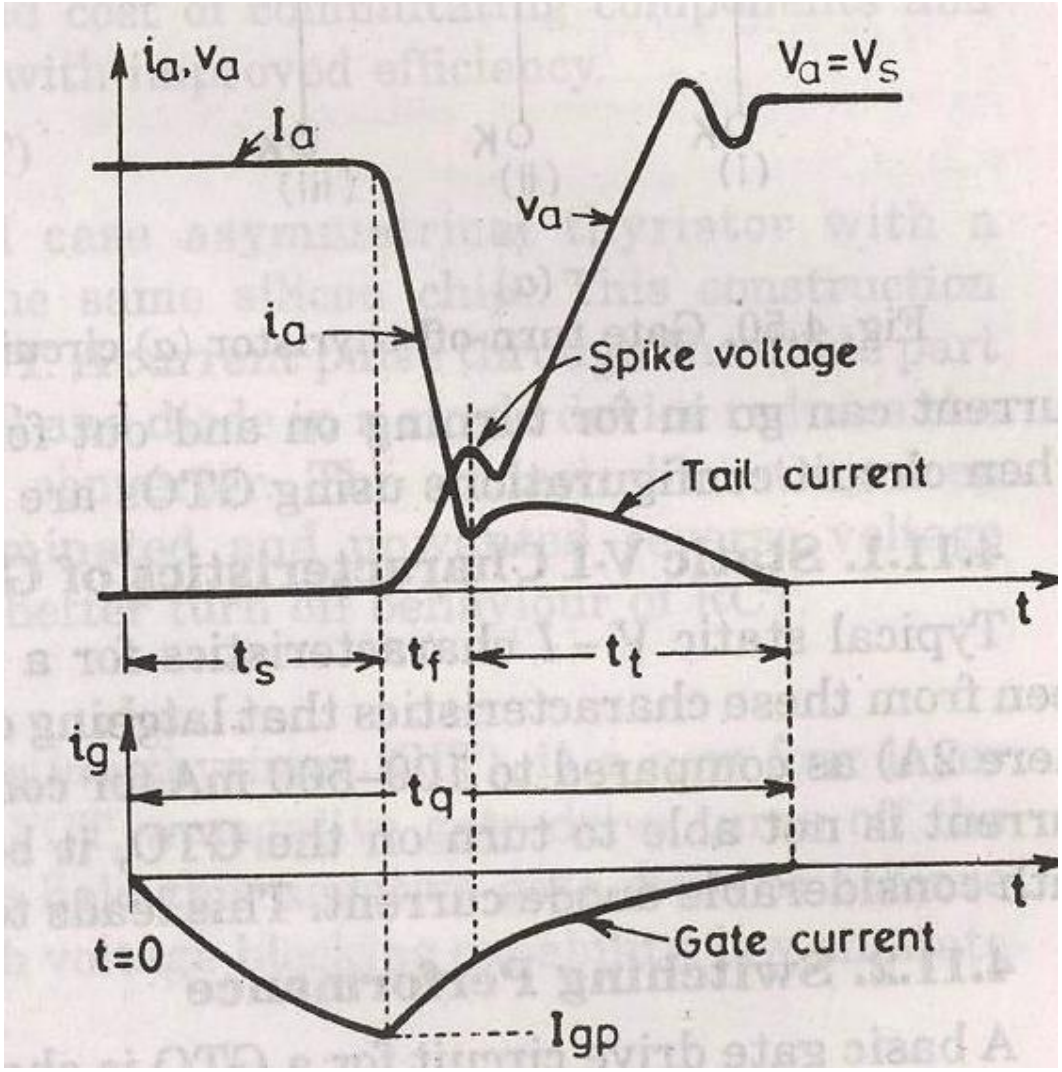
GATE TURN OFF

Turn off time is different for SCR.Turn off characteristics is divied into 3 pd

1. Storage time
2. Fall time
3. Tail time

   $T_q=t_s+t_f+t_t$

   At normal operating condition gto carries a steady state current.The turn off process starts as soon as negative current is applied after t=0.



STORAGE TIME

During the storagepd the anode voltage and current remains constant.The gate current rises depending upon the gate circuit impedance and gate applied voltage.The beginning of pd is as soon as negative gate current is applied.The end of storage pd is marked by fall in anode current and rise in voltage,what we have to do is remove the excess carriers.the excess carriers are removed by negative carriers.

FALL TIME

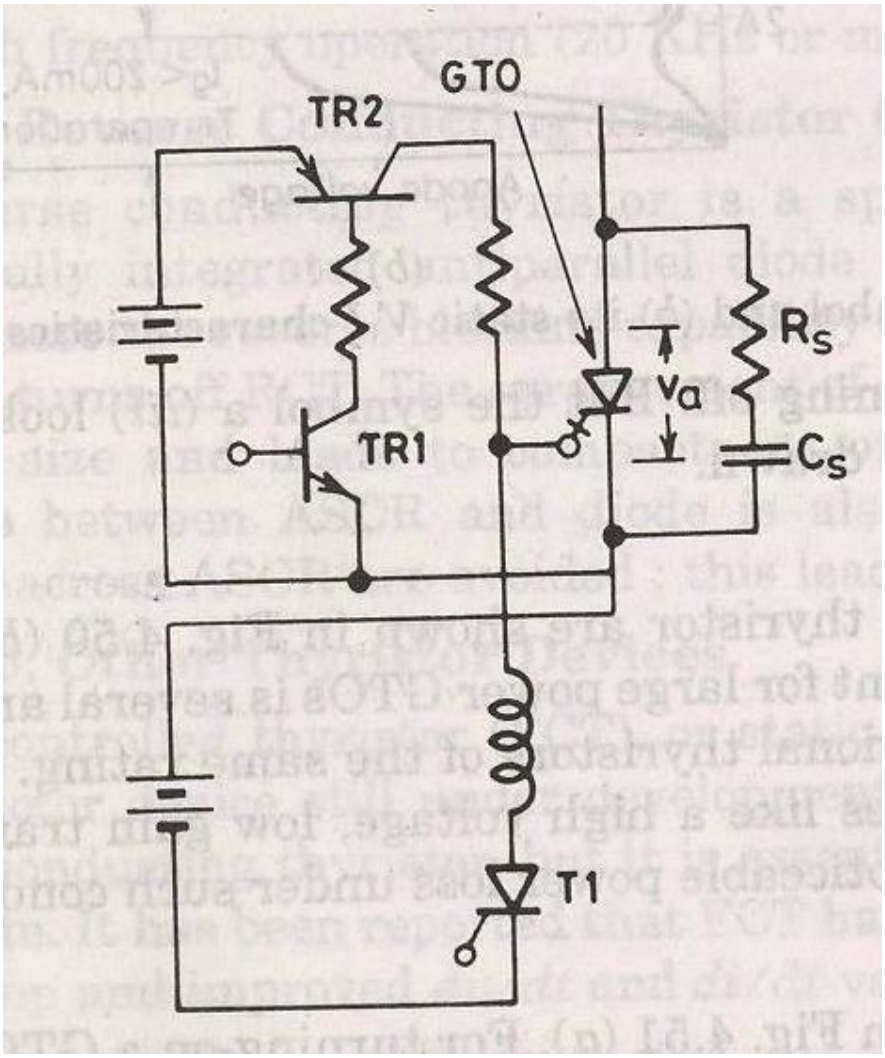
After t_s, anode current begins to fall rapidly and anode voltage starts rising.After falling to a certain value,then anode current changes its rate to fall.this time is called fall time.

SPIKE IN VOLTAGE

During the time of storage and fall timethere is achange in voltage due to abrupt current change.

TAIL TIME

During this time ,the anode current and voltage continues towards the turn off values.The transient overshoot is due to the snubber parameter and voltage stabilizes to steady state value.

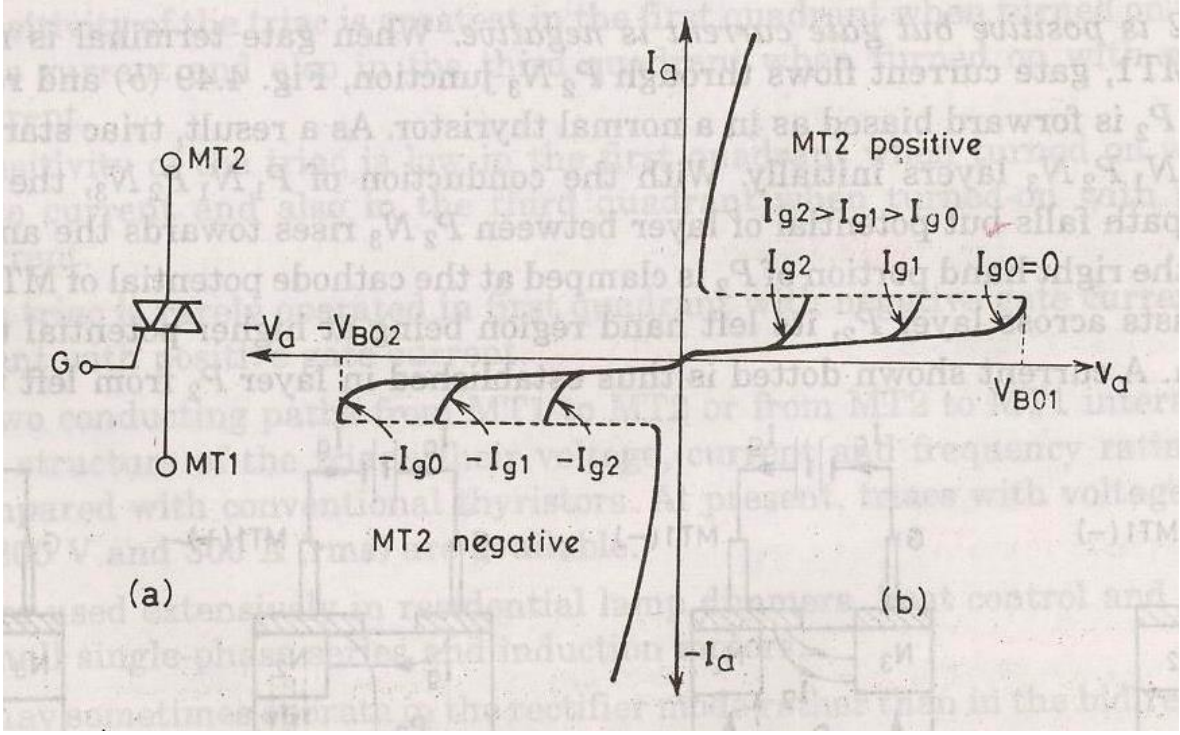


THE TRIAC

As SCR is a unidirectional device,the conduction is from anode to cathode and not from cathode to anode. It conducts in both direction.It is a bidirectional SCR with three terminal.

TRIAC=TRIODE+AC

Here it is considered to be two SCRS connected in anti parallel.As it conducts in both direction so it is named as MT1,MT2 and gate G.



SALIENT FEATURES

1.Bi directional triode thyristor

2.TRIAC means triode that works on ac

3.It conduct in both direction

4.It is a controlled device

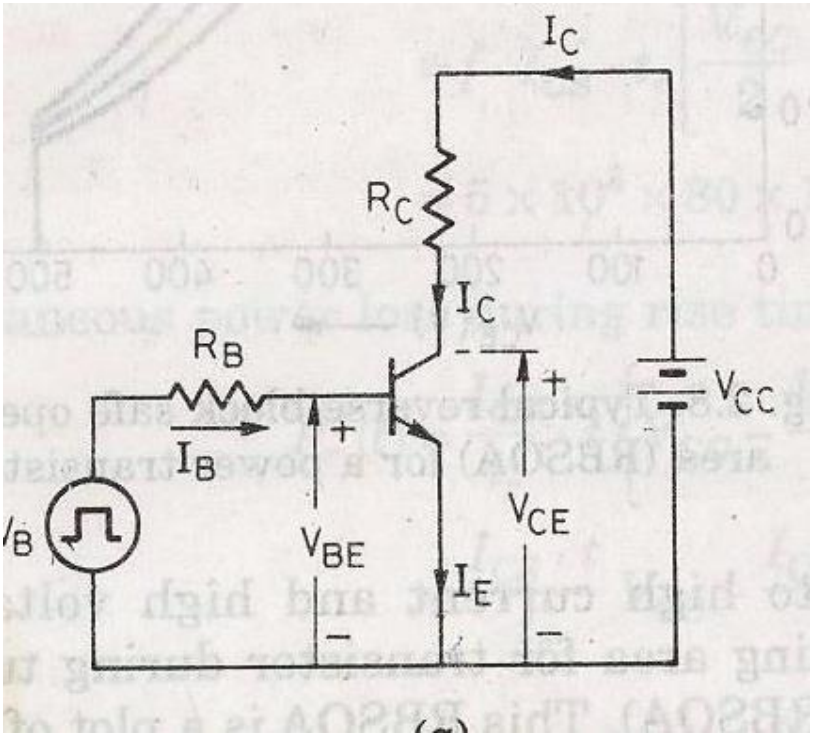
5.Its operation is similar to two devices connected in anti parallel with common gate connection.

6.It has 3 terminals MT1,MT2 and gate G

Its use is control of power in ac.

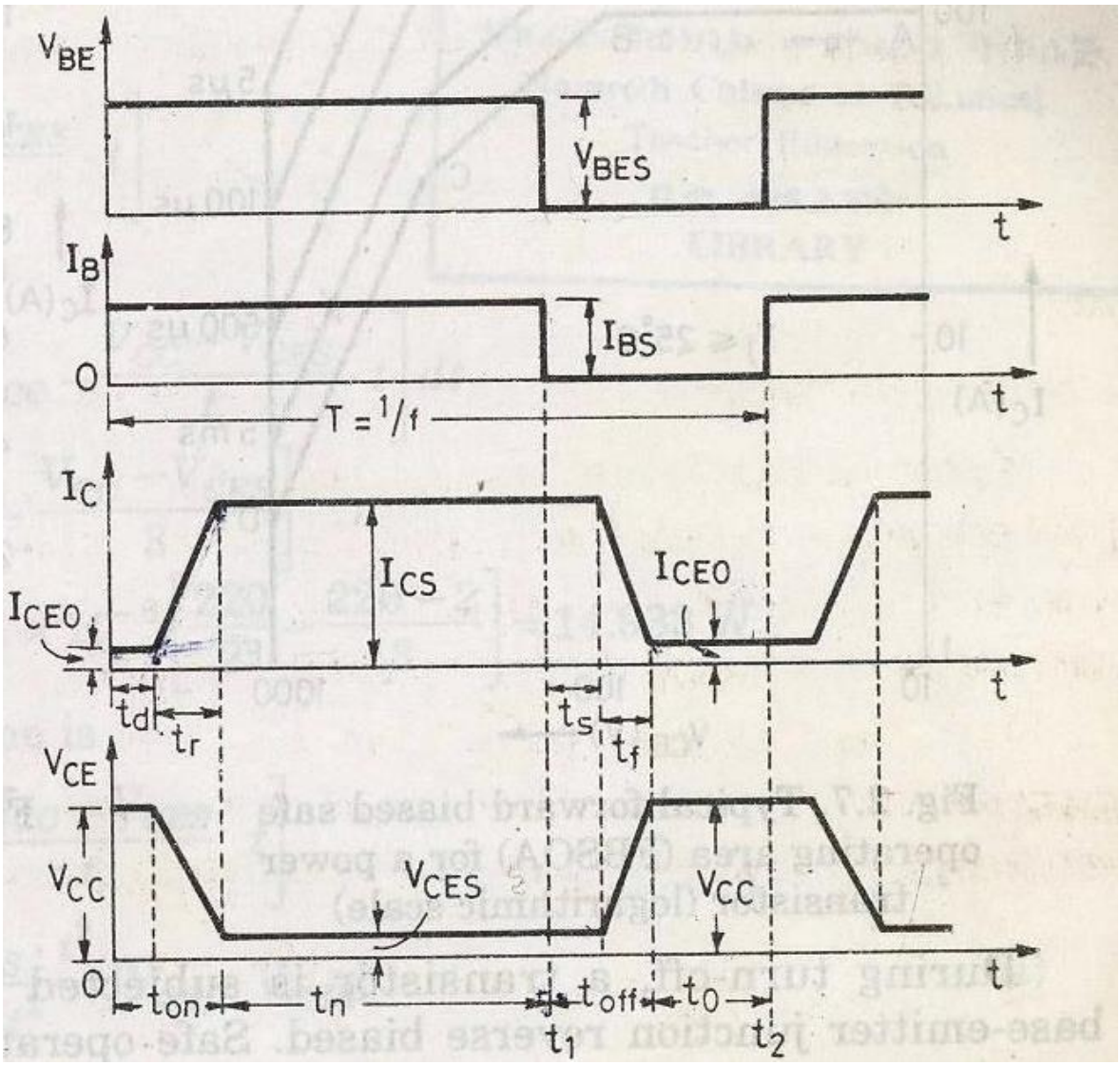
POWER BJT

Power BJT means a large voltage blocking in the OFF state and high current carrying capability in the ON state. In most power application, base is the input terminal. Emitter is the common terminal. Collector is the output terminal.



SIGNAL LEVEL OF BJT

n+ doped emitter layer ,doping of base is more than collector.Depletion layer exists more towards the collector than emitter



POWER BJT CONSTRUCTION

The maxium collector emitter voltage that can be sustained across the junction, when it is carrying substantial collector current.

Vceo=maxium collectorand emitter voltage that can be sustain by the device.

Vcbo=collector base breakdown voltage with emitter open

PRIMARY BREAKDOWN

It is due to convention avalanche breakdown of the C-B junction and its associated large flow of current.The thickness of the depletion region determines the breakdown voltage of the transistor.The base thickness is made as small as possible,in order to have good amplification capability. If the thickness is too small, the breakdown voltage is compromised.So a compromise has to be made between the two.

THE DOPING LEVELS-

1.The doping of the emitter layer is quite large.

2.The base doping is moderate.

3.n- region is lightly doped.

4.n+ region doping level is similar to emitter.

1.THICKNESS OF DRIFT REGION-

It determines the breakdown length of the transistor.

2.THE BASE THICKNES –

Small base thickness- good amplification capability

Too small base thickness- the breakdown voltage of the transistor has ti be compromised.

For a relatively thick base,the current gain will be relatively small.so it is increase the gain.Monolithicesigns for darlington connected BJT pair have been deveploed.

SECONDARY BREAKDOWN

Secondary breakdown is due to large power disspation at localized site within the semi conductor.

PHYSICS OF BJT OPERATION-

The transistor is assumed to operate in active region. There is no doped collector drift region. It has importance only in switching operation, in active region of operation.

B-E junction is forward biased and C-B junction is reverse biased. Electrons are injected into base from the emitter. Holes are injected from base into the emitter.

QUASI SATURATION-

Intially we assume that, the transistor is in active region. Base current is allowed to increase then lets see what happens.first collector rises in response to base current.So there is a increase voltage drop across the collector load.So C-E voltage drops.

Because of increase in collector current, there is a increase in voltage in drift region. This eventually reduces the reverse biased across the C-B junction.so n-p junction get smaller, at some point the junction become forward bised. So now injection of holes from base into collector drift region occurs. Charge neutrality requires the electron to be injected in the drift region of the holes. From where these electron came. Since a large no of electron is supplied to the C-B junction via injection from emitter and subsequent diffusion across the base. As excess carrier build up in the drift region begins to occur quasi saturation region is entered. As the injected carrires increase in the drift region is