SILICON-CONTROLLED SWITCH & GATE TURN-OFF SWITCH

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Silicon-Controlled Switch

- It is a four-layer pnpn device
- Its basic construction is the same with the SCR with the addition of the second gate lead.
- Anode, cathode, an anode gate, and a cathode gate.

Anode Gate

Effect: The higher the anode gate current, the lower the required anode-to-cathode voltage to turn the device on.
Use: Used to turn the device either on or off
(To turn on the device, a negative pulse must be applied to the anode gate terminal, while a positive pulse is required to turn off the device.)

ON: A negative pulse at the anode gate will forward-bias the base-to-emitter junction of $Q_1$, turning it on. The resulting heavy collector current $I_{C1}$, will turn on $Q_2$, resulting in a regenerated action and the on state for the SCS device.
OFF: A positive pulse at the anode gate will reverse-bias the base-to-emitter junction of $Q_1$, turning it off, resulting in the open circuit “off” state of the device.

The required turn-on gate current at either terminal is affected by many factors:

- Operating temperature
- Anode-to-cathode voltage
- Load placement
CONT.

A.) SCS BASIC CONSTRUCTION

B.) SCS GRAPHIC SYMBOL
SCS EQUIVALENT TRANSISTOR CIRCUIT
THREE OF THE MORE FUNDAMENTAL TYPES OF TURN-OFF CIRCUITS FOR THE SCS

A.

B.
ADVANTAGES:

- reduced turn-off time, typically within the range 1 to 10µs for the SCS and 5 to 30µs for the SCR.
- Increased control and triggering sensitivity
- A more predictable firing situation
ONE SIMPLE APPLICATION
(SCS ALARM CIRCUIT)
GATE TURN-OFF SWITCH

- Like an SCR, is a four layer, three junction semiconductor device with three external terminals, namely, the anode, the cathode and the gate.
- The main advantage of the GTO over the SCR or SCS is that it can be turned *on* or *off* by applying the proper pulse to the cathode gate (without the anode gate and associated circuitry required for the SCS).
- Because of its turn-off capability, there is an increase in the magnitude of the required gate current for triggering.
Another distinct advantage of GTO is its improved switching characteristics.

The turn-on time is similar to that of an SCR (typically 1 us), but the turn-off time of about the same duration (1 us) is much smaller than the typical turn-off time of an SCR (5 to 30 us).

The fact that the turn-off time is similar to the turn-on time rather than considerably larger permits the use of this device in high speed applications.
APPLICATIONS

- Counters
- Pulse generators
- Multivibrators
- Voltage Regulators
ASSIGNMENT

- Search for a sample circuit using GTO for the counter, pulse generator, multivibrator and voltage regulator.
- To be submitted next meeting.