Transistors, SCRs & TRIACs

By G8MNY (Updated Feb 10)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

SCRs or THYRISTORS (trade name)
Silicon Controlled Rectifiers are equivalent to 2 transistors one PNP & one NPN with their collectors & bases connected to the other transistor's base & collector (swapped around).

If an on condition of +0.6V is now placed on the NPN's base, & there is a +ve supply/load on the PNP's emitter, current flows into the PNP's base turning it on, which in turn hold the NPN fully on.

![Diagram of SCR](image)

Only the removal of the supply current, will turn off the SCR switch. With the SCR a -ve gate signal does nothing, not even turning off a turned on SCR, this is due to the gate connection only being on the edge of that layer & not affecting the currents flowing further in. There are turn off capable types made though.

False triggering is possible if the anode pulses +ve very quickly (dV/dT) due to stray capacitance to the gate.

<table>
<thead>
<tr>
<th>V</th>
<th>Not Triggered</th>
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<tbody>
<tr>
<td>0.5V</td>
<td>~ Triggred</td>
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Unlike transistors, SCR & TRIACS peak current handling is very large like diodes, with a 1 Amp rated device is able to withstand 40 Amp surge.

Breakdown -1000V

TRIACS
These are AC triggered switches, like SCR but have 2 additional junctions which are shorted together, it is a complex 3d device in practice.

![Diagram of TRIAC](image)

The Gate can only handle low power (e.g. 1/100,000 the anode switching power) so narrow pulse triggering is often used.
A diac (not the battery) is like a triac with internal 30V zeners anode to gate. So over 30V it goes short until the power is removed. With a suitable CR it provides simple AC phase shifted gate pulse trigger, used in mains light dimmers.

DIACS
These are triggering devices used with TRIACS gates & a capacitor to provide a short sharp high current trigger pulse. Basically they are 2 like transistors in series with the same 30V breakdown voltage.

See my buls on "TRIAC Light Dimmer", "Auto SCR charger for Car Batt". "Simple SCR Regulated Charger" & "SCR Drill Speed Controller".

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