SCR and MOSFET performance analysis and Comparison

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Abstract :-

A BJT is also a semiconductor device with PN junctions that can amplify the signals. It is also a three-terminal device emitter, collector, and base. BJTs are mainly used in switching and amplifier circuits that increase the strength of a weak signal, whereas SCRs are used in rectifier and power control applications.

Bipolar Junction Transistor (BJT) :

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Metal Oxide Semiconductor Field Effect Transistor (MOSFET) :

MOSFETs are similar to BJTs used in switching and amplifier circuits. It is a three-layer, three/four-terminal (drain, source, and gate) unipolar device. The main difference between BJT and MOSFET is that BJT is a current-controlled device whereas the flow of current in MOSFET is controlled by voltage i.e., it is a voltage-controlled device.

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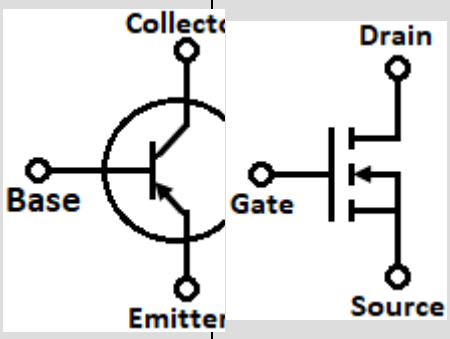
Difference between thyristor and MOSFET:

- In thyristor majority carrier device current-driven device low switching speed low resistive input impedance while in MOSFET majority carrier device voltage-driven device high switching speed purely capacitive high input impedance.
- Thyristor has only a single pulse to turn ON but MOSFET has no DC required to maintain conduction except during turn on and turn off.
- The thyristor can be connected series easily with voltage equalizing circuit whereas in MOSFET series connection is difficult with voltage equalizing circuit.
- The thyristor can be parallel with a forced current sharing circuit while in MOSFET can be easily paralleled due to the positive temperature coefficient of resistance of the device.
- Thyristor has less temperature-sensitive, no second breakdown but in MOSFET has too much temperature sensitivity, less susceptible to the second breakdown.

- **Comparison Between SCR, BJT, MOSFET, and IGBT :**

Parameter	**SCR**	**BJT**	**MOSFET**
Full Form	SCR stands for silicon-controlled rectifier.	BJT stands for bipolar junction transistor.	MOSFET stands for metal oxide semiconductor field effect transistor.
Symbol			
Terminals	It has three terminals anode, cathode, and gate.	It has three terminals emitter, collector, and base.	It has three terminals emitter, collector, and gate.
Type of Device	It is a majority carrier device.	It is a bipolar device.	It is a majority carrier device.
Gate or Base Control	Gate has no control once it is turned ON.	Base has full control over the operation.	Gate has full control over the operation.
Voltage and Current Ratings	The voltage and Current Ratings of SCR are 10kV and 4kA respectively.	The voltage and Current Ratings of SCR are 2kV and 1kA respectively.	The voltage and Current Ratings of SCR are 1kV and 50A respectively.
Switching Frequency	It has a low switching frequency (up to 500Hz).	It has a medium switching frequency (up to 10kHz).	It has a high switching frequency (up to 100kHz).
Gate Drive	Current	Current	Voltage
Snubber Circuit	Unpolarized	Polarized	Not essential
Voltage Blocking Capability	It has both symmetric and asymmetric voltage blocking capability.	It has asymmetric voltage blocking capability.	It has asymmetric voltage blocking capability.

Temperature Coefficient	Negative	Negative	Positive
Paralleling	SCR can be connected easily in parallel.	BJTs cannot be easily connected in parallel due to the base-emitter voltage mismatch problem.	Paralleling MOSFETs is easy.

- **Conclusion:-** We all know about what is thyristor and what is MOSFET. The main difference between thyristor and MOSFET is that thyristor called as SCR is a solid-state semiconductor device with four alternating P and N-type materials while in MOSFET is a metal-based field-effect transistor and it most commonly fabricated by the controlled oxidation of the silicon side. So that here this article gives information about the difference between thyristor and MOSFET to know more detail about it.

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