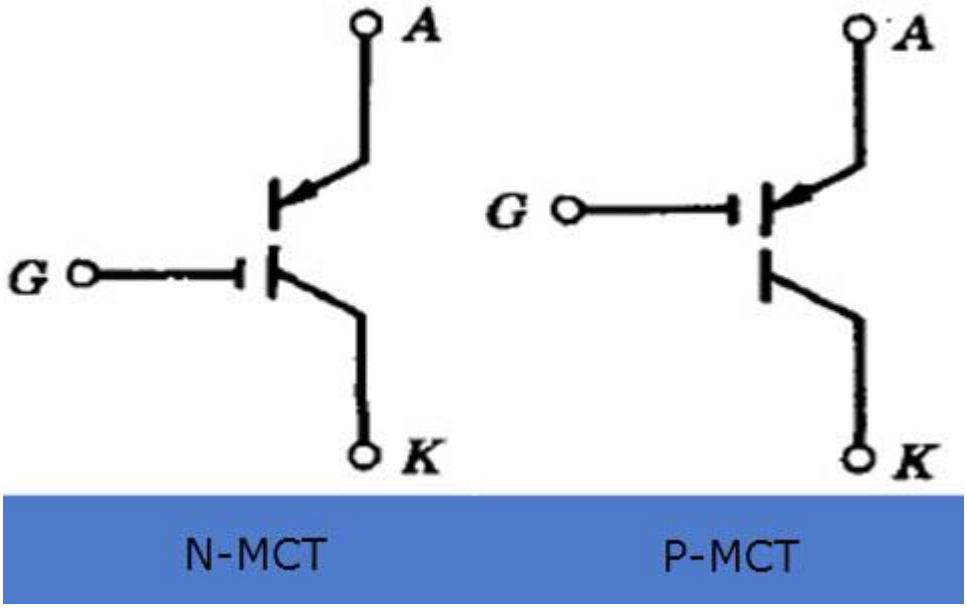
MOS Controlled Thyristor

What is MOS Controlled Thyristor Its Working and Applications

The MOS controlled thyristor has developed by the V.A.K Temple. It is a voltage controller and the Thyristor is totally controllable thyristor. The operation of a MOS controlled thyristor is quite similar to the GTO thyristor but, it has the gates of voltage controlled insulated. It has two MOSFETs(metal–oxide–semiconductor field-effect transistor) used for the turn ON and OFF purpose and it has in the opposite conductivity in the equivalent circuit. If the equivalent circuit has one thyristor and used for the switched on is called as the MOS gated thyristor.

What is a MOS Controlled Thyristor?

The MOS controlled thyristor is a type of power semiconductor device. It has the capabilities of current and thyristor voltage through the MOS gated used for the turn ON and OFF purpose. It is used in high power applications like high power, huge frequency, low conduction and it is used in further process. The following symbols are P-MCT and N-MCT shown below.



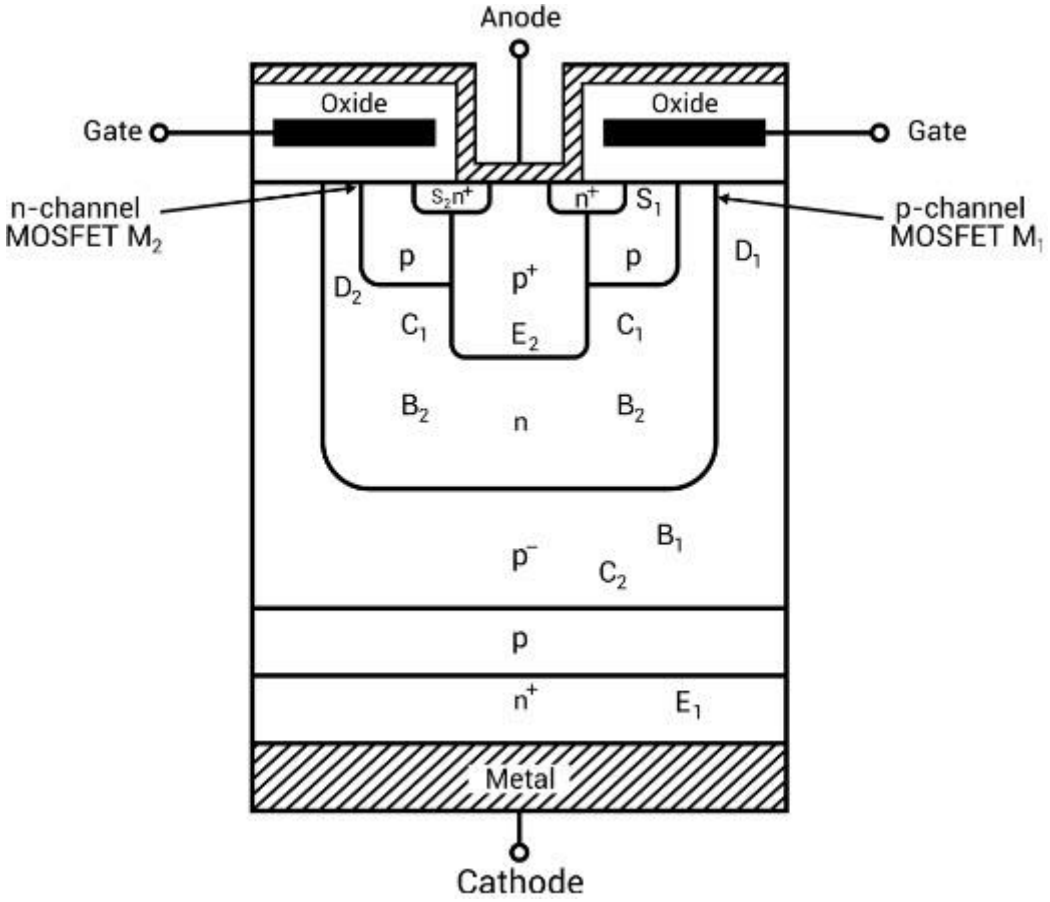
Working of MCT

The following diagram shows the working principle of the MOS control thyristor. It is a combination of current and voltage capabilities with the help of MOS gated. The MOS gated is used for the switch ON/OFF of MCT.

When the MOSFET is turned ON MCT

By using the negative voltage pulse the device is turned in ON state with respect to the anode. The gate terminal is made negative with respect to the anode with the help of the voltage

pulse in between the anode and gate terminals. Hence the MOS control thyristor is switched ON state. In the starting stage the MOS control thyristor is a forward bias. If the negative voltage is applied to the negative voltage pulse, then the ON mode FET is turned ON as well as the OFF FET mode is already existed as OFF state.



MOSFET is turned ON MCT

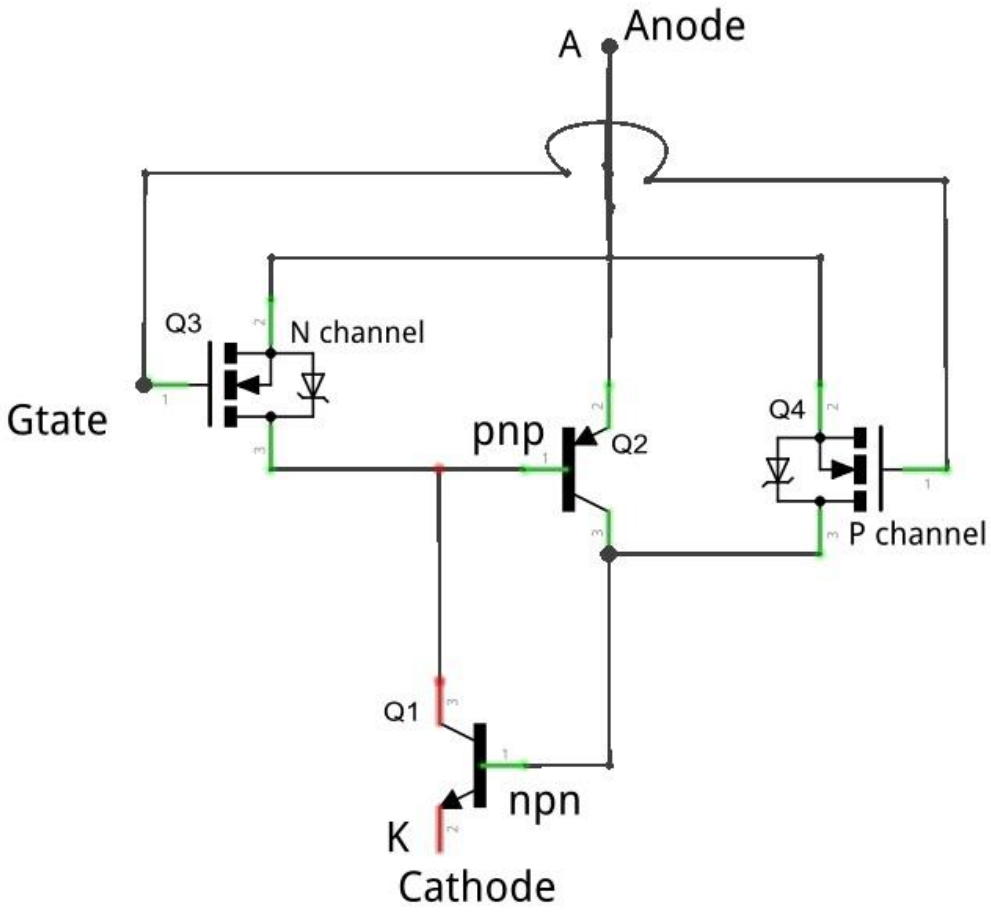
When the FET is in ON state the current passes from the anode through the ON FET then passes through the base current and n-p-n transistor of emitter terminal and finally current passes through the cathode. Hence this process turns on the n-p-n transistor. The NPN transistor acts as a base current of P-N-P transistor if the OFF FET is OFF mode. Similarly, the P-N-P transistor turned ON if both the transistors are in ON state and relating actions takes place hence the MCT is switched on.

When the MOSFET is turned OFF MCT

The device is turned OFF with the help of the positive voltage pulse. It is applied to the gate terminal with respect to the anode. Then the OFF FET switched ON mode and the ON FET switched to the OFF state. If the OFF FET is switched ON then the p-n-p transistor is short circuited by the emitter and base terminals. Thus the anode current flows through the OFF FET. Hence the base current of N-P-N transistor is decreased. Reverse voltage blocking capability is the negative point of this device.

Equivalent Circuit Diagram

The following diagram shows the equivalent circuit diagram of the MOS control Thyristor. The circuit consists of two MOSFET transistors which are N-channel and the other one is a P-channel. The p-channel is used for the switch on the ON FET and n-channel is used for the switch off the OFF FET. The circuit consists of two transistors which are n-p-n and p-n-p transistors. If these two transistors are joined together to form the structure of n-p-n-p of the MOS control Thyristor. The p channel MOSFET is identified by an arrow which is connected from the gate terminal.



Circuit Diagram of the MOS Control Thyristor

Applications of MCT

The applications of MCT includes the following

- MCT's are used in the circuit breakers.
- It is used in higher power applications like high power conversions.
- MOS control Thyristor are used in the induction heating. UPS systems
- It is also used in the converters like DC to DC converter.
- Variable power factors, operations are used in the MCT's as a force committed power switch.

Advantages of the MCT

- The MOS control Thyristor have a low forward conduction drop.
- It has low switching losses.
- It has high gate input impedance.
- It can turn ON/ OFF very fast.