

1.2 Introduction to Snubber and Driver Circuits

A snubber circuit limits or stops (snubs) switching voltage amplitude and its rate of rise, therefore reducing power dissipation. In its simplest form, a snubber circuit basically consists of a resistor and capacitor connected across the thyristor.

MOSFET DRIVE CIRCUIT

A driver circuit need to turn on the semiconducting devices. A MOSFET usually needs a gate driver to do the on/off operation at the desired frequency. For high frequencies, MOSFETs require a gate drive circuit to translate the on/off signals from an analog or digital controller into the power signals necessary to control the MOSFET. Since the MOSFET is a voltage-driven device, no DC current flows into the gate. In order to turn on a MOSFET, a voltage higher than the rated gate threshold voltage V_{th} must be applied to the gate. While in a steady on or off state, the MOSFET gate drive basically consumes no power. The gate-source capacitance of a MOSFET seen by the driver output varies with its internal state. MOSFETs are often used as switching devices at frequencies ranging from several kHz to more than several hundreds of kHz. The low power consumption needed for gate drive is an advantage of a MOSFET as a switching device. MOSFETs designed for low-voltage drive are also available.

The basic requirements for a MOSFET drive circuit include an ability to apply a voltage sufficiently higher than V_{th} to the gate and a drive capability to sufficiently charge the input capacitance. This section describes

an example of a drive circuit for an N-channel MOSFET.

The below figure shows a basic MOSFET drive circuit. In practice, the capacitance of a MOSFET to be driven and its usage conditions must be considered in designing a drive circuit.

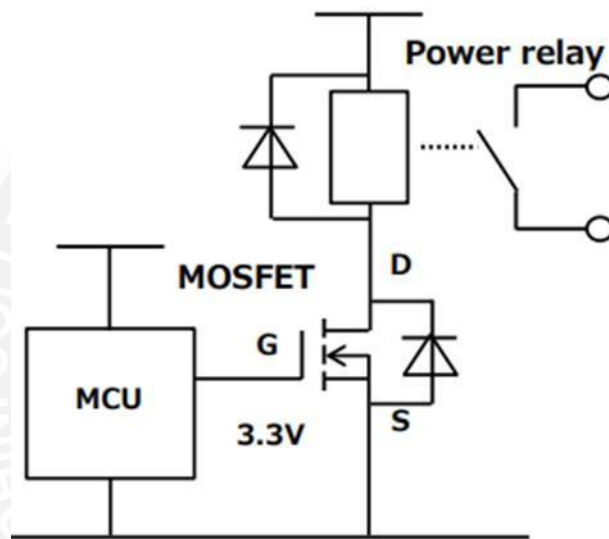


Figure 1.2.1 MOSFET drive circuit

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 23]

There is a growing need for MOSFETs for switching applications (load switches) to provide a conducting path in a circuit only when it is operated, and thereby reduce the power consumption of electronic devices. At present, MOSFETs are directly driven by a logic circuit or a microcontroller in many applications. Figure 2.2 shows an example of a circuit for turning on and off a power relay. Since turn-on and turn-off times may be as slow as a few seconds for load switches, the MOSFET gate can be driven with a small current. There are other ways of triggering MOSFET are using a high-voltage device and a bootstrap circuit, Pulse transformer drive (insulated switching)

,using a photo coupler and a floating power supply.

