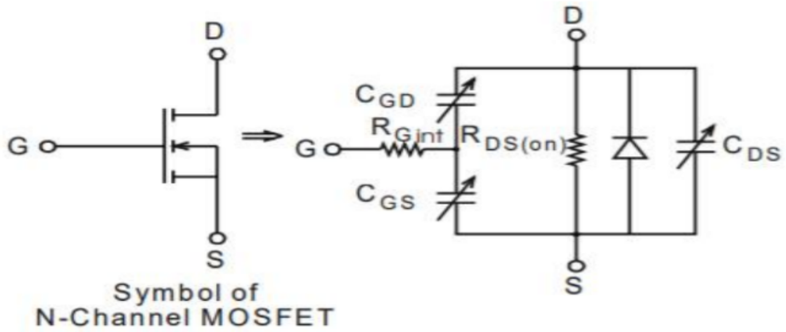
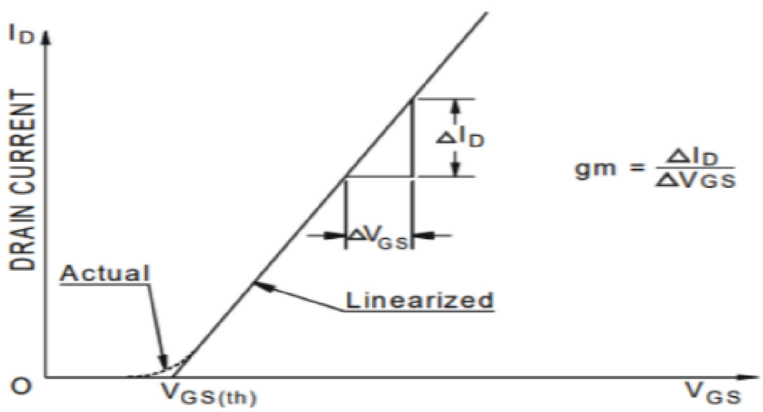
How did you Drive the MOSFETS?

MOSFETs are capable of being switched at much higher frequencies due to the absence of minority carrier transport. However, the speed of switching is limited by two factors: the transit time of electrons across the drift region and the time required to charge and discharge the input Gate and 'Miller' capacitances. The figure below shows a symbol of an N-Channel MOSFET and an equivalent model with three inter-junction parasitic capacitances: CGS, CGD, and CDS.



The switching performance of MOSFETs is primarily determined by how quickly the voltages can be changed across these capacitors. Therefore, in high-speed switching applications, the parasitic capacitances of the device are the most important parameters. Two of these capacitors, the CGS and CGD capacitors, correspond to the actual geometry of the device, while the CDS capacitor is the capacitance of the base collector diode of the parasitic bipolar transistor (body diode).

A MOSFET's transfer characteristic (ID vs. VGS) is shown in the figure below.



When the VGS value is below VGS(th), the drain current is negligible, but the device is in its linear (Ohmic) region. Applying large values of VDS concurrently in this region can cause a considerable amount of localized heating of the junction, which can lead to device failure. Therefore, when using a MOSFET as a switch, any operation in its linear region could cause overheating or device failure.

The driver's job is to bring the MOSFET quickly into saturation from its off-state. If Vcc is below the minimum required value, linear operation can occur, which can be detrimental to the MOSFET.