Task 1: MOSFET Parameters

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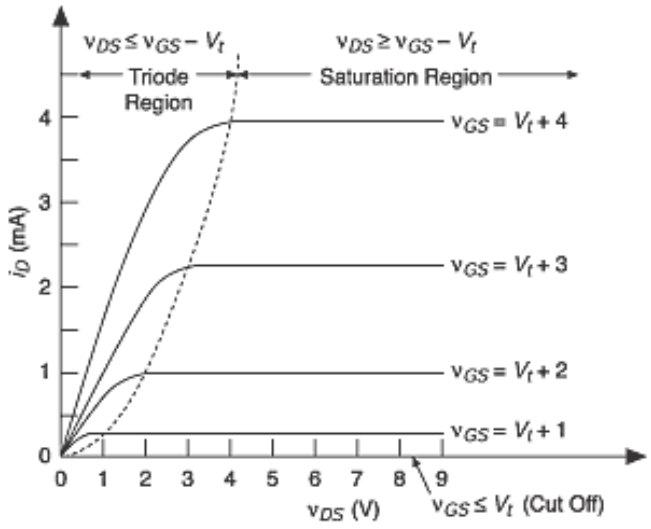
Key Parameters of MOSFETs:

1. Saturation Drain-Source Current (IDSS)
2. Transfer guide (gm)
3. Negative Temperature Coefficient of Gain (TCAG)
4. Forward capacitance (Cgs)
5. Blocking capacitance (Cgd)

Operating regions:



Cut off region: when the gate-to-source voltage is less than V_{th}.

Triode region: when $V_{GS} > V_{th}$, if V_{DS} is greater than 0, current starts to flows. The drain current will increase in proportion to V_{DS}.

Saturated region: occurs at a certain level of voltage for drain, beyond which, increasing drain voltage does not affect the current.

How to choose a MOSFET?

- Vds(max) should be above the voltage you want to switch.
- Ids(max) rating should be above the current you want to switch.
- Check Rds(on) (Drain to source resistance) and thermal properties to calculate the amount of power that will be dissipated when it is turned on which should be low
- Qg (total gate charge) refers to the amount of charge that needs to be input to the gate for the device to turn it fully on therefore it affects the speeds MOSFETs can open and close. Qg should be strongly taken into consideration when designing high switching frequency applications.