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ASURT Task 02

Power electronics session

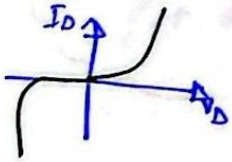
Switches Types

- Diode
- Mosfet
- BJT
- IGBT
- others

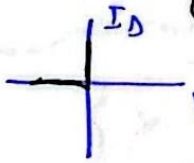
Diode

- symbol

- Characteristics
  - Real



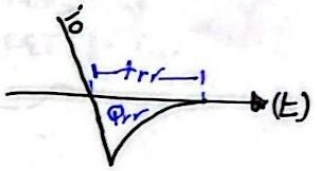
  - IDeal



- Construction

2 materials ~~called~~ are put together to form a PN junction which separates between them a depletion Region

- Diode Reverse Recovery



The current Required to sweep out the excess carriers and allow the diode to block the (-ve) polarity from occurs

	General purpose	Fast recovery	shottky
switching (f)	Low	Highest	High
Ratings	Highest	Medium	Low
V drop	Low	medium	Lowest
APP	Low (f) APPS	High (F) apps	Low (V) out

Types of Transistors

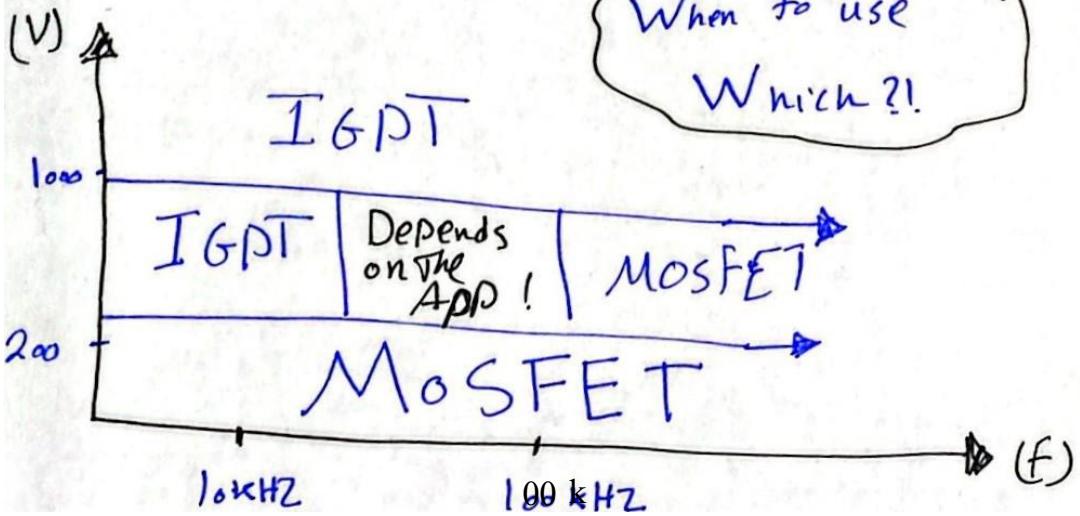
	* MosFET *	* IGPT	BJT
Control Method	Voltage controlled	Voltage controlled	Current controlled
Power capability	Low	Medium	Medium
Switching speed	High	Medium	Medium
Temp Cofficient	Positive	Depends on design	Negative
Inherent body Diode	Exists	Absent	Absent

Tempreture cofficient

It means how the transistor resistance get effected by the tempreture

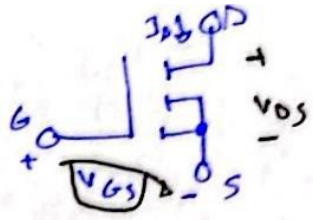
The most preferred transistors types in today's industry are MosFET & IGPT

When to use Which ?!



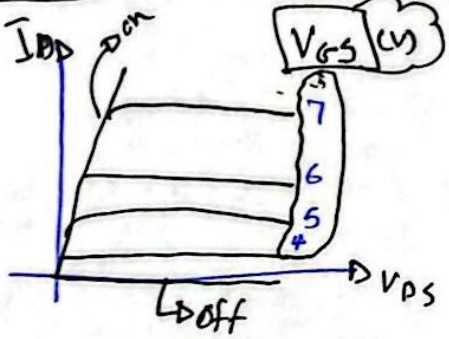
What is MOSFET

symbol

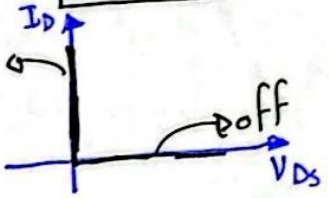


Charactristics

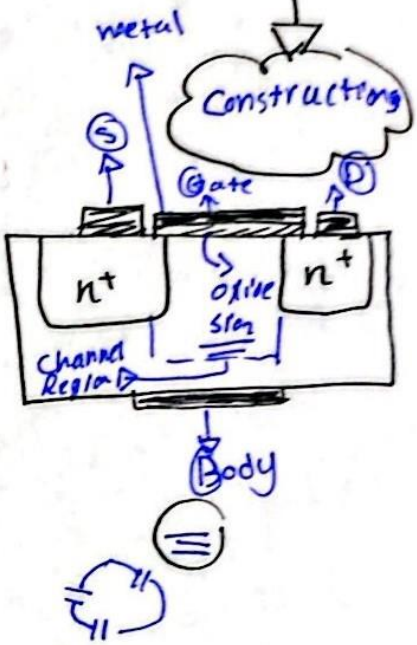
Real



IDeal



Constructing



MOSFET losses

Conduction losses

* During ON Time mosFET acts like a Resistor

$$P = I^2_{(rms)} R_{ds\,on}$$

Switching losses

$$W_c = \frac{1}{2} V_D I_o (t_{c(on)} + t_{c(off)})$$

$$P_s = \frac{W_c}{T_s} = W_c f_s = \frac{1}{2} V_D I_o (t_{on} + T_{off})$$

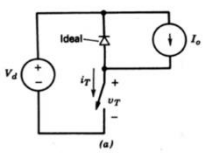
To reduce the switching losses reduce F or Ton & toff

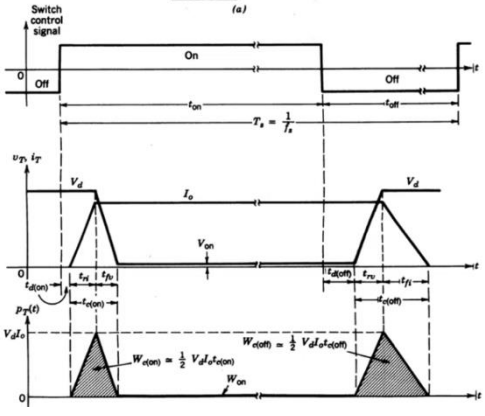
Diode Losses

* The conduction losses of the anti-parallel Diode can be estimated using Diode DC approx

$$P = U_{Do} \cdot I_{Favt} R_d I^2_{Frms}$$

No.1 — Averay Forward current — Rms





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