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ASURT Task 02
Power electronics
Session

Switches Types

Diode

Mosfet

BJT

IGBT

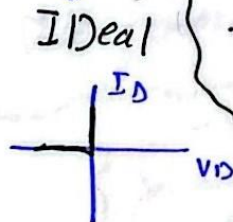
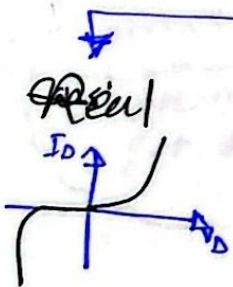
others

• Diode

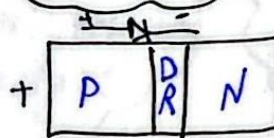
Symbol



Characteristics

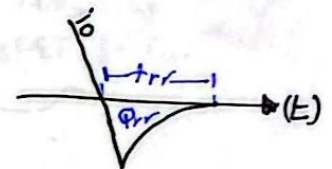


Construction



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

Diode Reverse Recovery



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

	General Purpose	Fast recovery	shot key
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

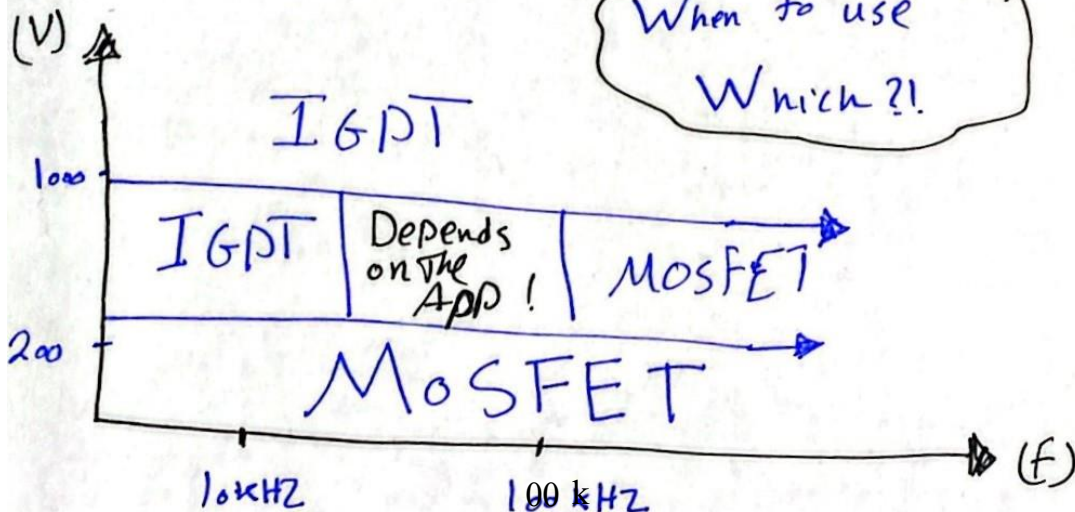
	* MOSFET *	* IGBT	BJT
Control Method	Voltage Controlled	Voltage Controlled	Current Controlled
Power Capability	Low	Medium	Medium
Switching Speed	High	Medium	Medium
Temp Coefficient	Positive	Depends on design	Negative
Inherent body Diode	Exists	Absent	Absent

Temperature coefficient

It means how the transistor resistance get effected by the temperature

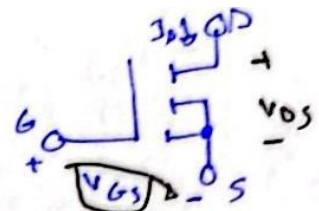
The most preferred transistors types in today's industry are MOSFET & IGBT

When to use
Which?!



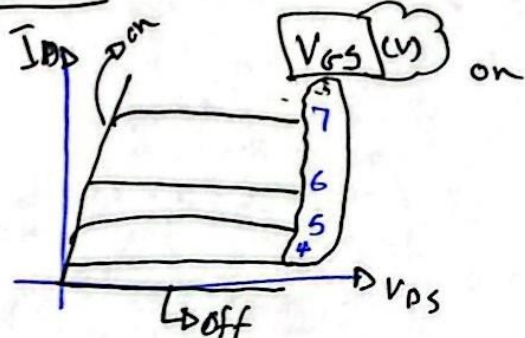
What is MOSFET

Symbol

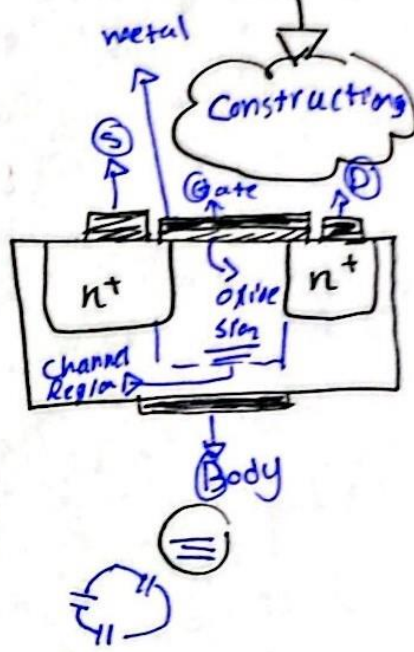
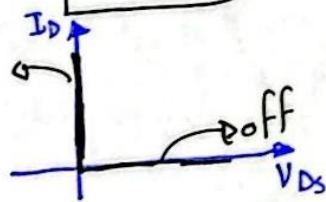


Characteristics

Real



Ideal



Conduction Losses

* During ON Time MOSFET acts like a resistor

$$P = I_{(rms)}^2 R_{ds(on)}$$

MOSFET Losses

Diode Losses

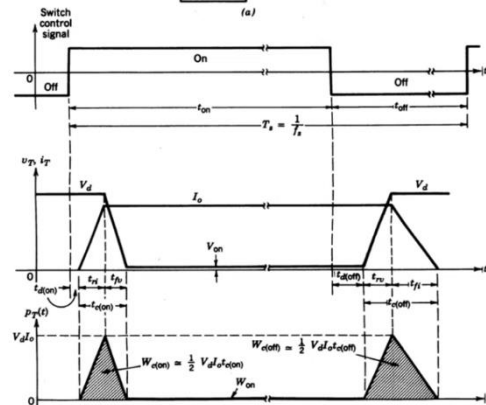
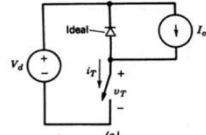
* The conduction losses of the anti-parallel Diode can be estimated using Diode DC approx.
 $P = U_{Do} \cdot I_{Fav}$
 No. 1 Average Forward current

Switching Losses

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

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

To reduce the switching losses reduce f or T_{on} & t_{off}



2. The other MOSFET

I found that STP55NF06L power transistor is more better than the MOSFET used in the video because of:

1. Higher I_d up to 55 A instead of 50
2. Higher V_{ds} up to 60 V
3. Lower $R_{ds\ on}$ up to 0.02 ohm