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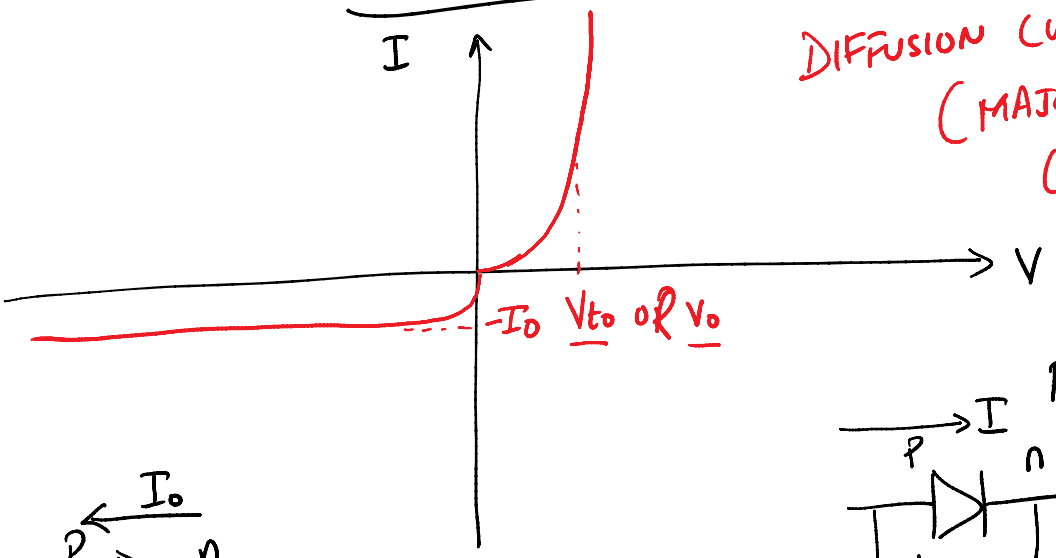
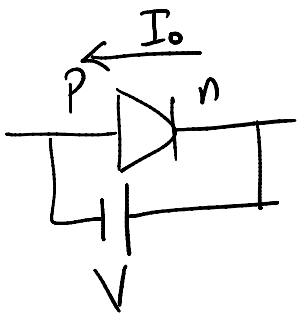
LECTURE - 17

DIODE I-V CHARACTERISTICS

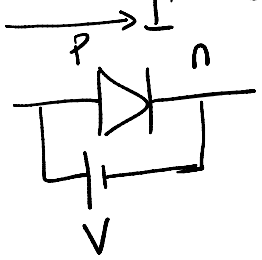


DIFFUSION CURRENT
(MAJORITY CURRENT CARRIERS)

RB



FB



I_0 → REVERSE ~~AT~~ SATURATION CURRENT
(DRIFT CURRENT)
MINORITY CARRIERS

$$|I_0|_{RB} \ll |I|_{FB}$$

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DIODE EQUATION → NON-LINEAR

$$I = I_0 \left[e^{qV/KT} - 1 \right]$$

$I \rightarrow$ CURRENT THROUGH DIODE

$V \rightarrow$ VOLTAGE ACROSS DIODE

APPROXIMATIONS

FB $\quad V >>> 0$

$$I \approx I_0 \left[e^{qV/KT} \right] \rightarrow \text{NON LINEAR}$$

RB $\quad V << 0$

$$I \approx -I_0$$

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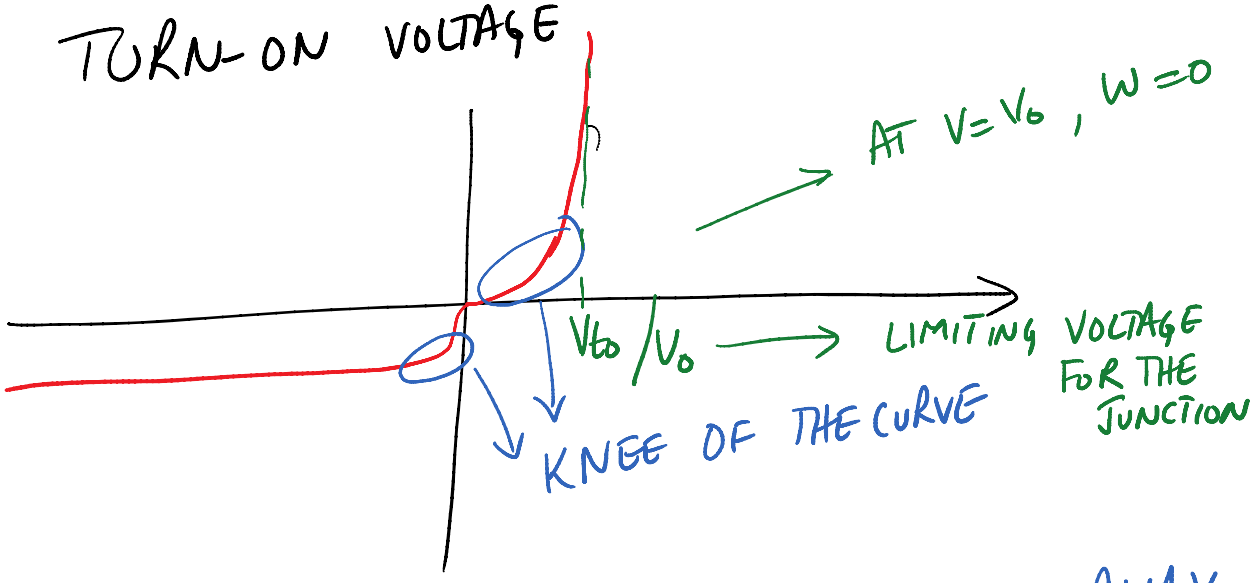
REALISTIC MODIFICATIONS TO THE IV CURVE

① TURN-ON VOLTAGE



* GENERAL OPERATING CONDITION IS AWAY FROM THE KNEE OF THE CURVE!

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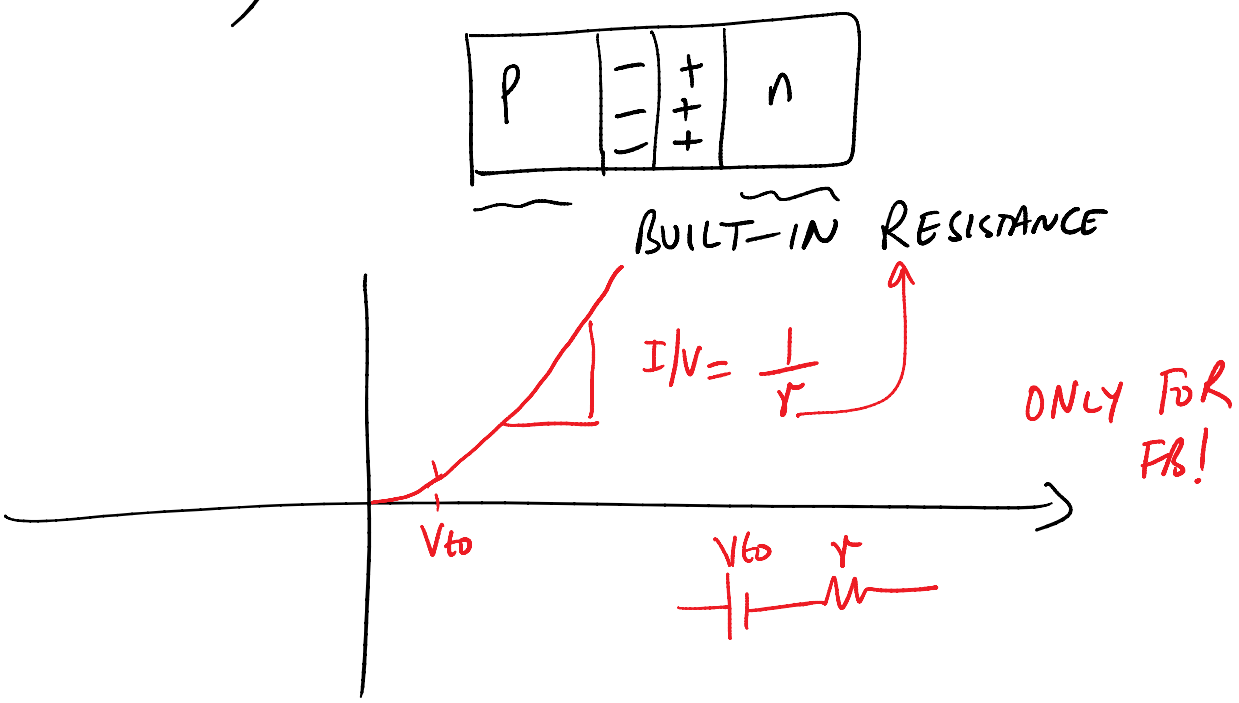
2) OHMIC EFFECTS



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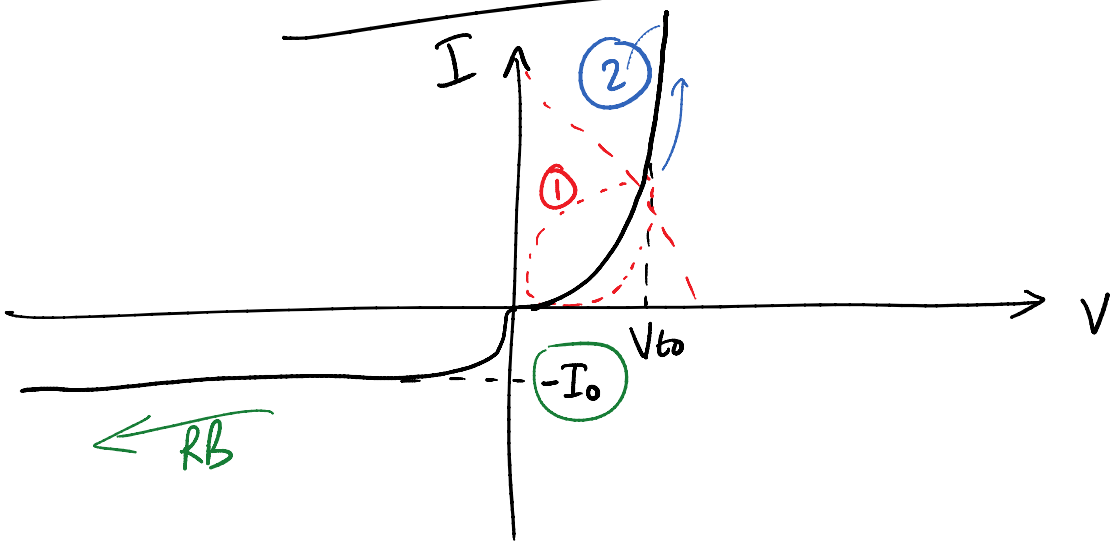
DIODE CIRCUIT MODEL



(1) NEAR V=0, IV CHARACTERISTIC FOLLOWS $I = I_o(e^{qV/kT} - 1)$ NON-LINEAR EQUATION

LOW LEVEL INJECTION DIODE EQUATION

(2) AWAY FROM THE KNEE OF THE CURVE (FB CASE) V APPROACHES V_{to} (V_o)

APPROX. $\Rightarrow$ $\boxed{V = V_{to}}$

(3) REVERSE SATURATION CURRENT $= -I_o$ (RB CASE)

?

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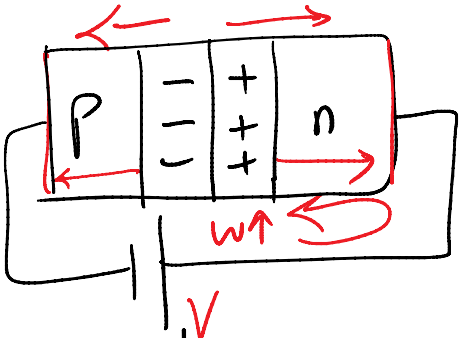
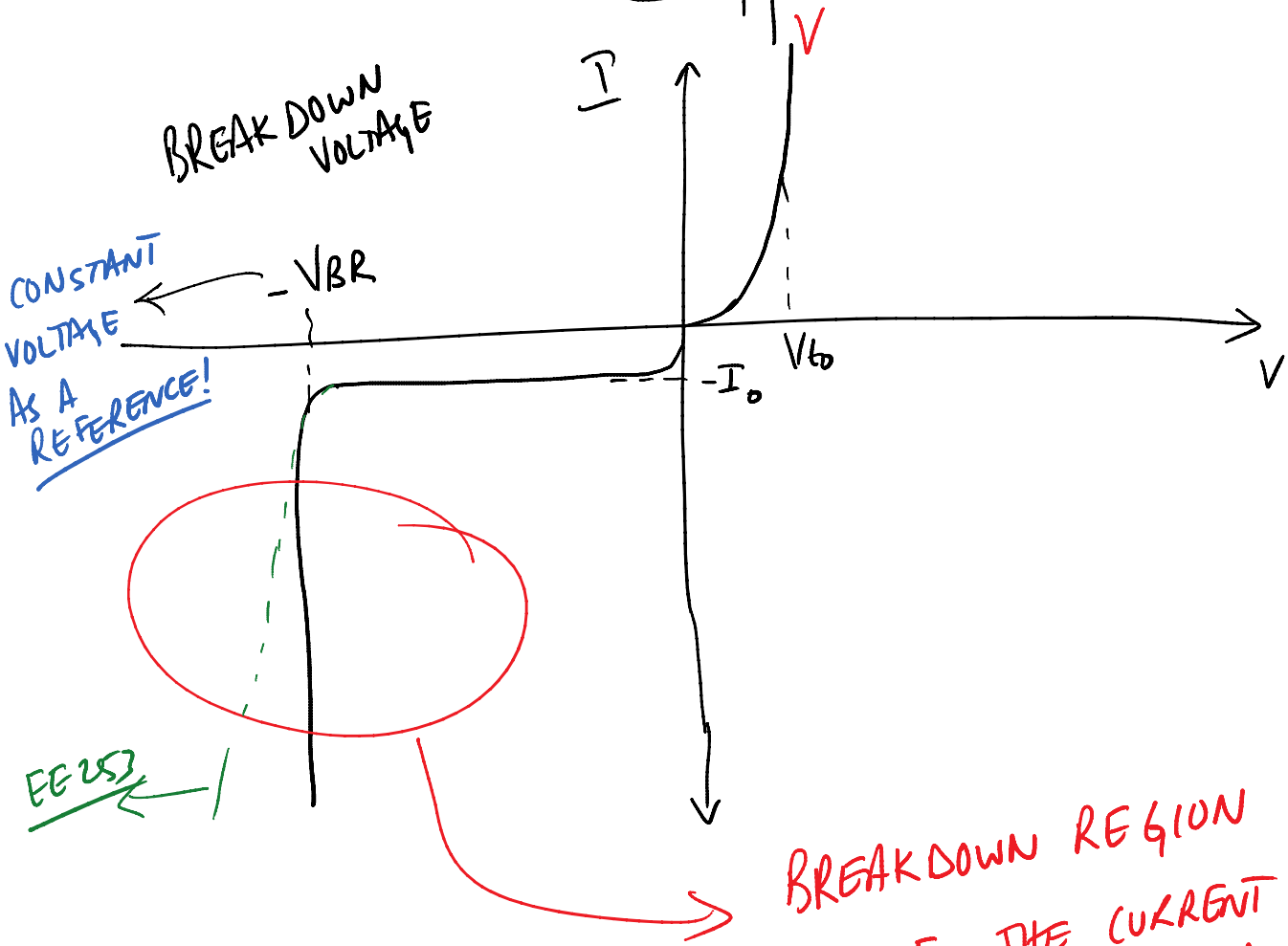
ZENER DIODES

ARE DESIGNED TO BREAKDOWN AT A CERTAIN RB VOLTAGE





BREAKDOWN REGION

"MAGNITUDE OF THE CURRENT CAN INCREASE BEYOND A CERTAIN VOLTAGE"