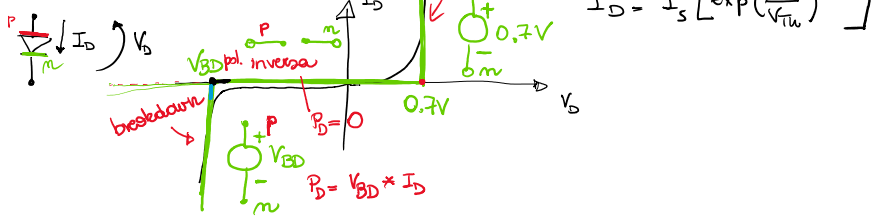


MODELLO DEL DIODO

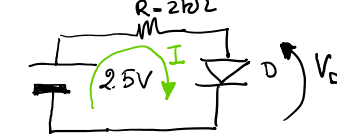


ESEMPIO 1



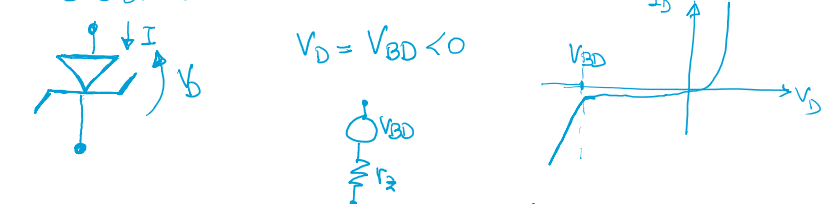
Hp. Diodo off (polarizzato in inverso)  
 ↳ Circuito equivalente circuito aperto (I=0) per il diodo  
 $V_D = -9V$  Diodo in 1 inverso.  
 $V_D < 0$  de Hp verificata

ESEMPIO 2

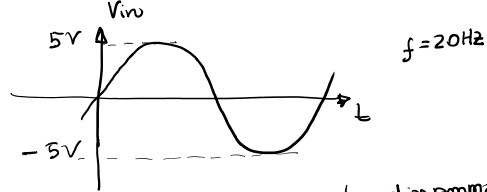
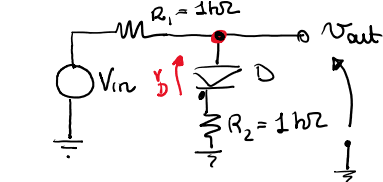


Hp Diodo on (polarizzato in diretto)  
 ↳ modellizzo il diodo con un generatore DC di valore 0.7V e polarità opportuna  
 $I = \frac{2.5V - 0.7V}{R} = 900\mu A$   
de diodo polarizzato in diretta

Diodi ZENER

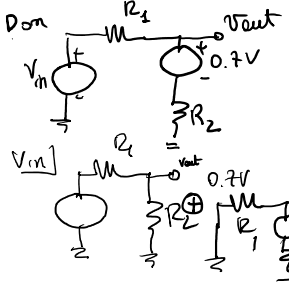
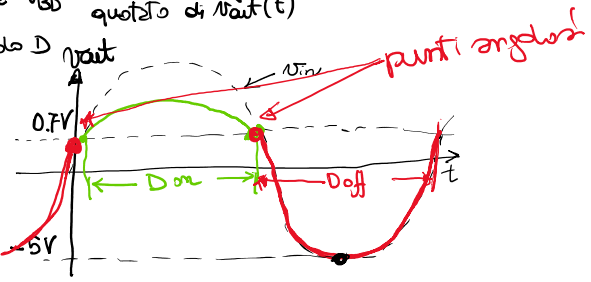


ESERCIZIO



- a) con tensione di BD infinita, diagramma temporale quotato di  $V_{out}(t)$
- b) se  $V_{BD} = -4V \Rightarrow$  diagramma temporale quotato di  $V_{out}(t)$

condizioni di accensione del diodo D  
 $D \text{ off} \approx V_{out} \leq 0.7V$   
 $D \text{ on} \approx V_{out} \geq 0.7V$   
 $D \text{ off} \approx V_{in} \leq 0.7V$   
 $D \text{ on} \approx V_{in} \geq 0.7V$



princ. sovrapposizione effetti

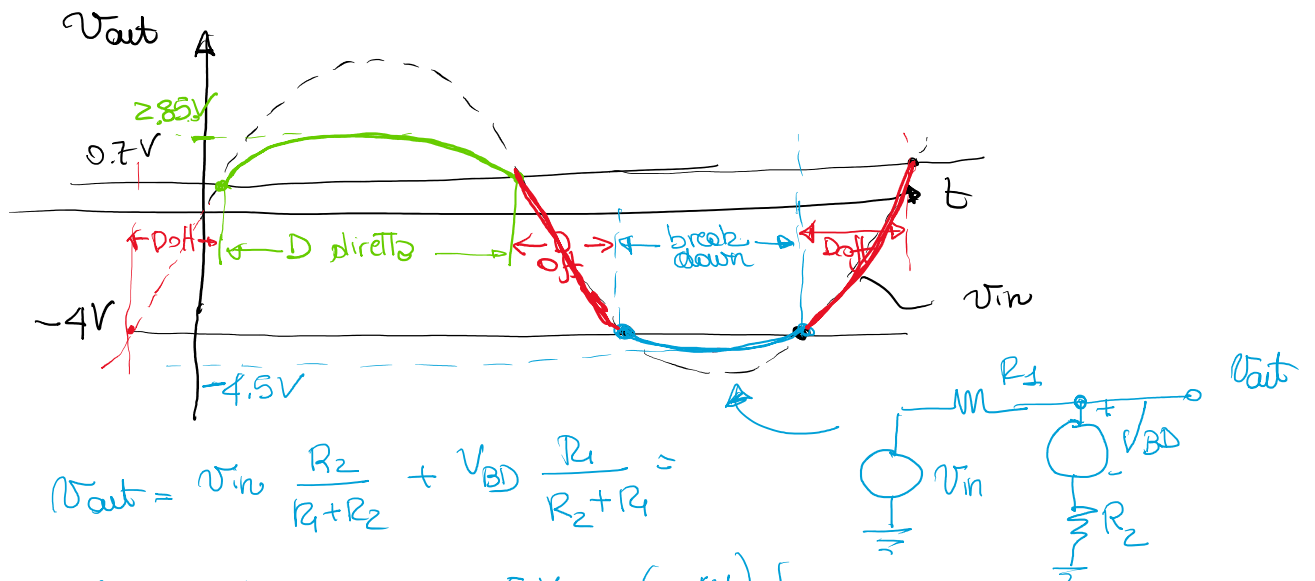
$$V_{out}(t) = \frac{R_2}{R_1 + R_2} V_{in} + 0.7V \frac{R_1}{R_1 + R_2} = \frac{V_{in}}{2} + 0.35V$$

$V_{out}|_{max} = \frac{5V}{2} + 0.35V = 2.85V$

$V_{out}(t) = \frac{0.7V}{2} + 0.35V = 0.7V$

b) Max  $|V_{REVERSE}| = 5V \Rightarrow$  diodo  $\approx$  in breakdown  
 condizione di breakdown  $V_{out} \leq V_{BD} \Rightarrow V_{in} \leq V_{BD}$   
 $V_{out} \Delta$

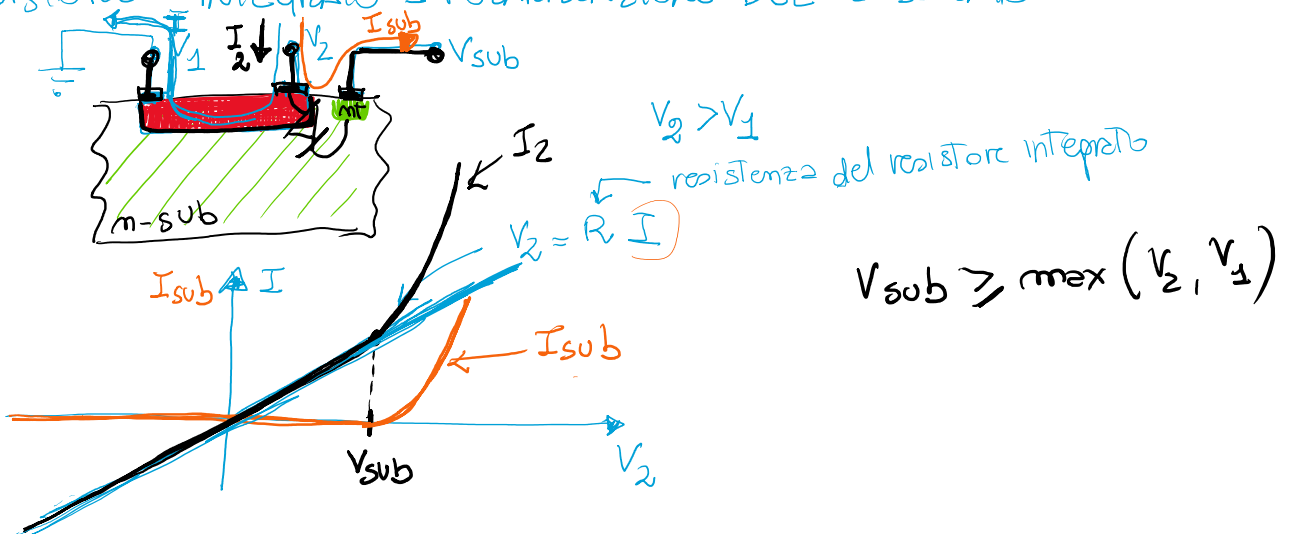
Condizione di breakdown  $V_{out} \leq V_{BD} \Rightarrow v_{in} = -5V$



$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2} + V_{BD} \frac{R_1}{R_2 + R_1}$$

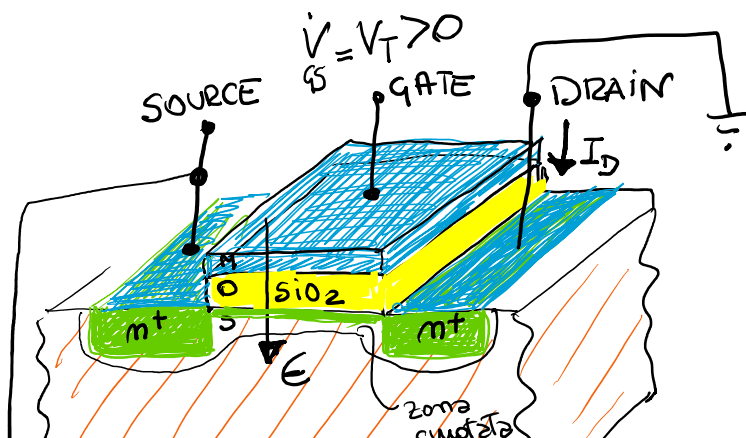
$$\text{② } V_{in} = -5V \quad V_{out} = -\frac{5V}{2} + (-4V) \frac{1}{2} = -2.5V - 2V = -4.5V$$

### RESISTORE INTEGRATO - POLARIZZAZIONE DEL SUBSTRATO



### TRANSISTORE MOSFET

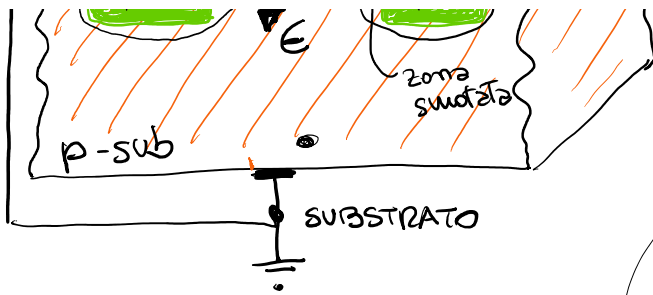
- Transistore {
- \* terminale di ingresso
  - \* terminale di uscita
  - \* terminale di riferimento comune



### n MOSFET

MOSFET a canale n ad enhancement

e x e i f e s n  
 t e i m e t t e n  
 l e c c o d e c t  
 n o t c a n o t s i s t e n  
 t e



$V_T$  = TENSIONE DI SOGLIA  
(THRESHOLD VOLTAGE)  
INVERSIONE

tensione al gate  $V_G$

$$V_{GS} \triangleq V_G - V_S$$

$I_D$  corrente entrante al morsetto di drain