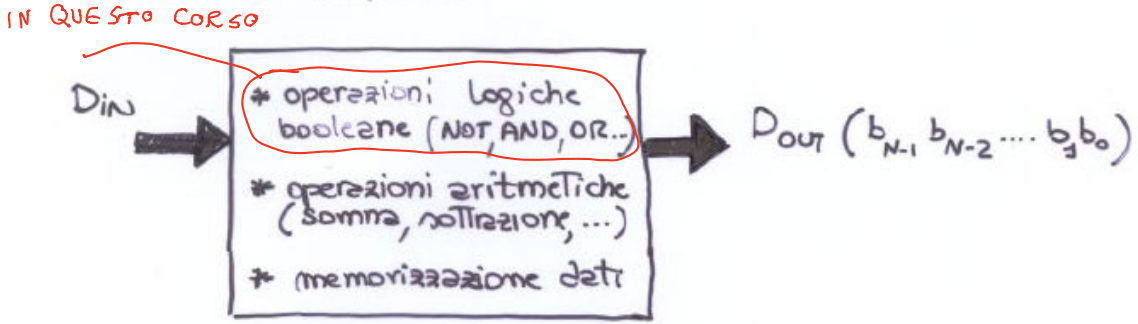
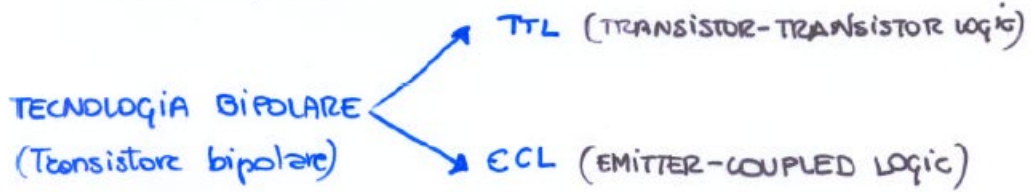
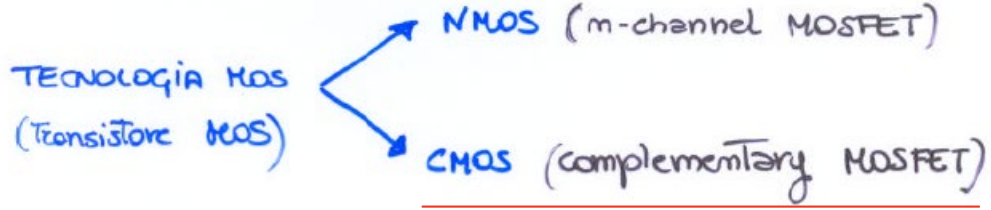
LOGICA CMOS

* SISTEMA DIGITALE



* FAMIGLIE LOGICHE



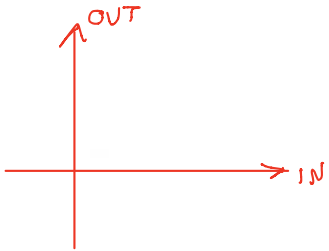


COME SI ANALIZZA UNA PORTA LOGICA?

1. funzione logica svolta

$$y = f(A, B, C \ldots)$$

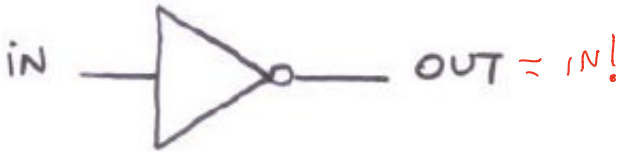
2. Caratteristica ingresso - uscita



3. Dissipazione di potenza
4. Velocità di risposta

} PRODOTTO (RITARDO x CONSUMO)

INVERTITORE LOGICO (NOT GATE)

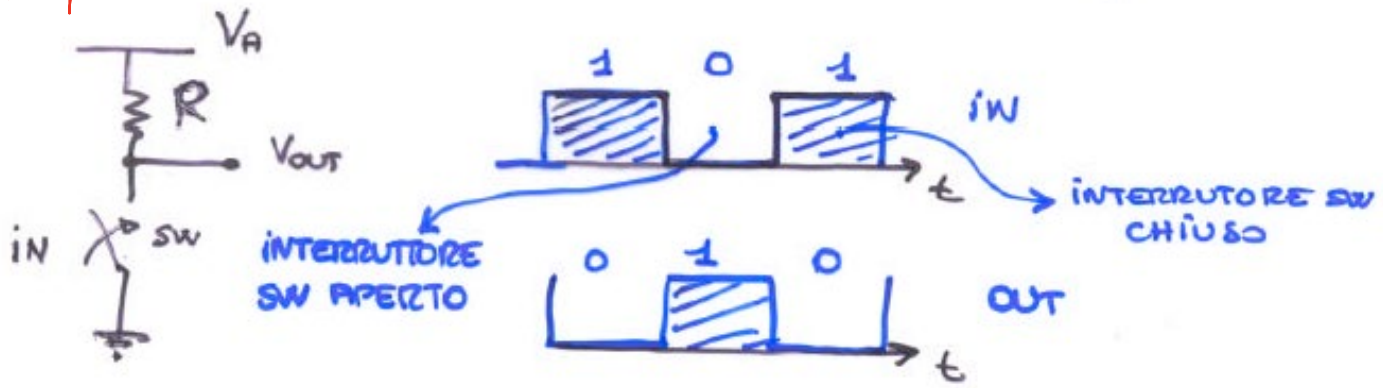


simbolo elettrico

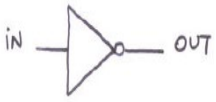
IN	OUT
0	1
1	0

funzione logica

esempio



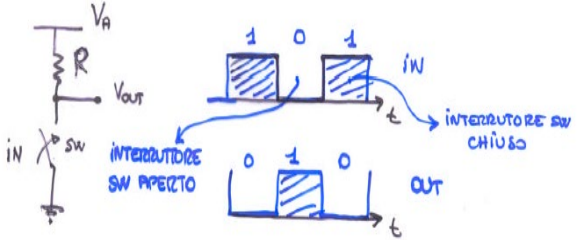
INVERTITORE LOGICO (NOT GATE)



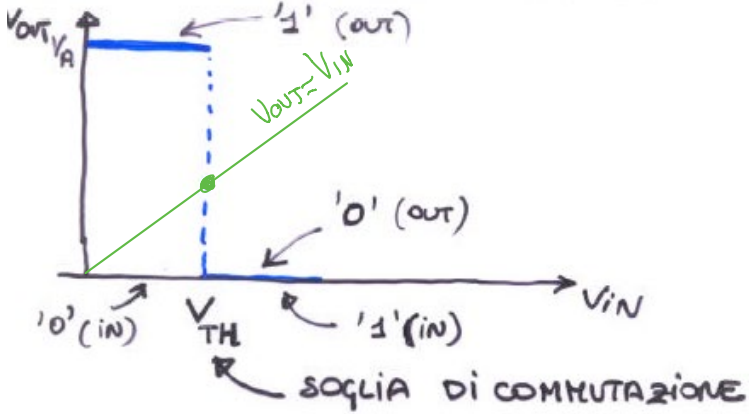
simbolo elettrico

IN	OUT
0	1
1	0

funzione logica



→ CARATTERISTICA DI TRASFERIMENTO "IDEALE"



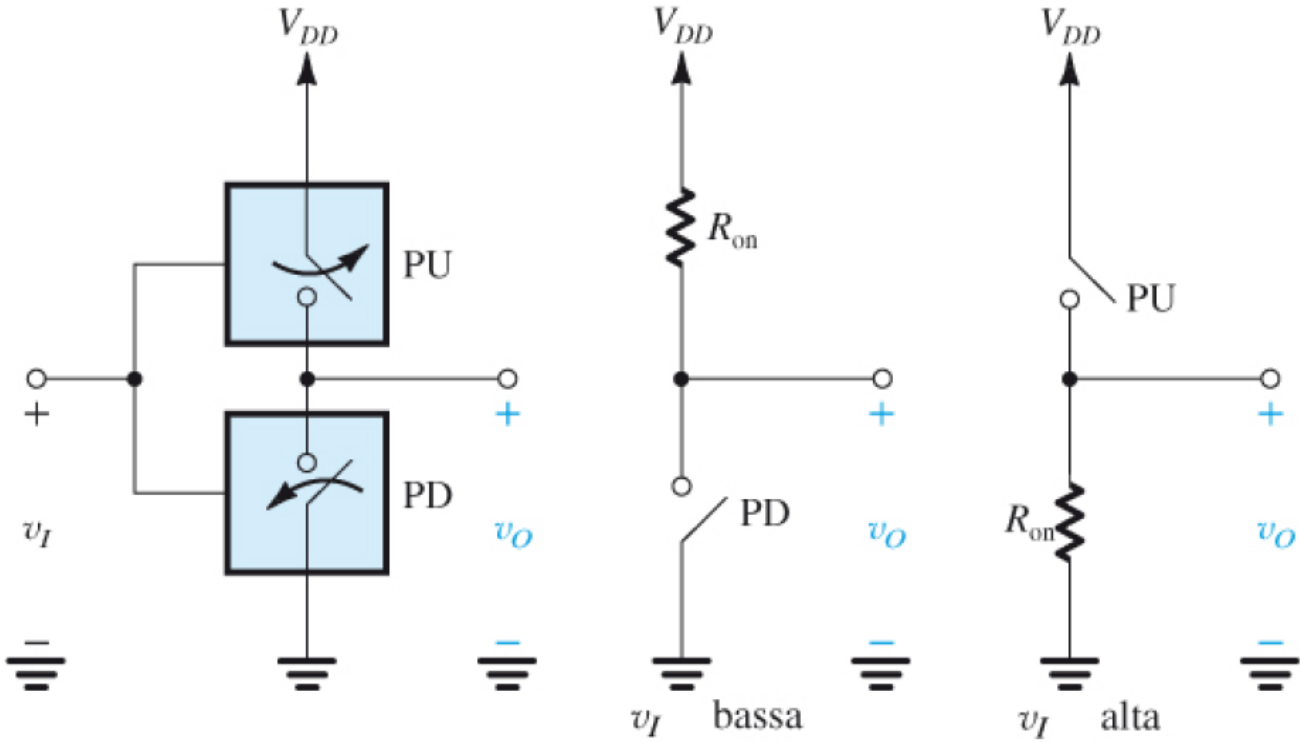
- $V_{IN} < V_{TH} \Rightarrow$ SW APERTO $\Rightarrow I_R = 0 \doteq I_H$
  - $V_{OUT} = V_A - R I_R = V_A$
- $V_{IN} > V_{TH} \Rightarrow$ SW CHIUSO $\Rightarrow$ USCITA CORTOCIRCUITATA A MASSA
  - $V_{OUT} = 0$; $I_R = \frac{V_A}{R} \doteq I_L$

↓

DISSIPAZIONE DI POTENZA STATICA

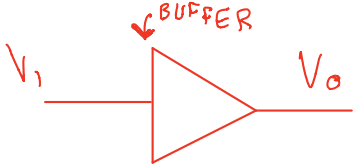
$$P_{STAT} = V_A \frac{I_L + I_H}{2} = \frac{1}{2} V_A^2 \frac{1}{R}$$

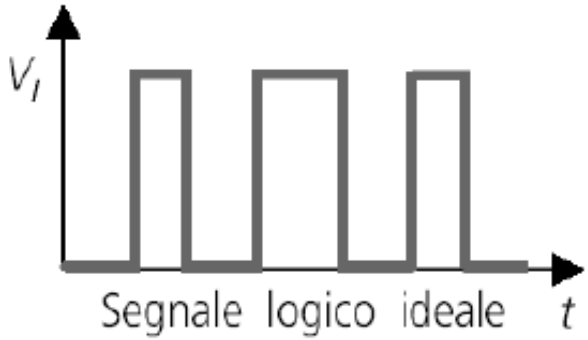
INVERTITORE LOGICO A 2 INTERRUTTORI

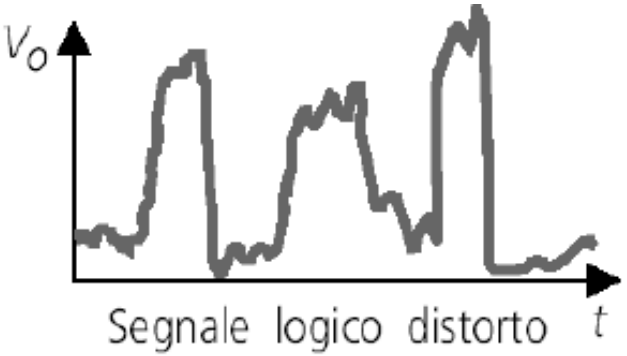


- ✓ La rete di pull-up e' costituita da un interruttore controllato in tensione che si chiude quando V_I e' bassa. La rete di pull-down e' costituita da un interruttore controllato in tensione che si apre quando V_I e' bassa.
- ✓ La dissipazione di potenza statica e' nulla

SEGNALE LOGICO

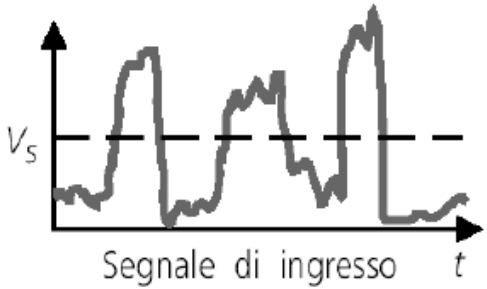


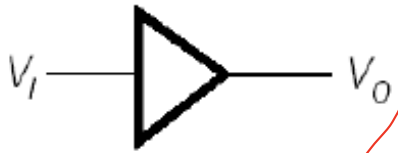


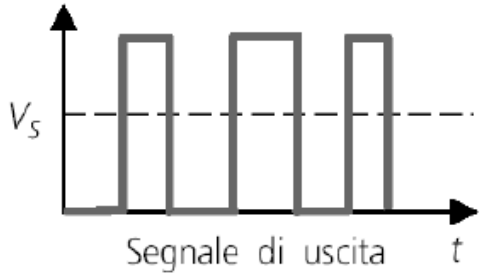


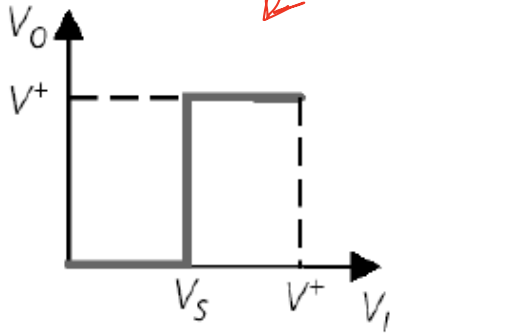
BUFFER LOGICO

rigenerazione dei livelli logici



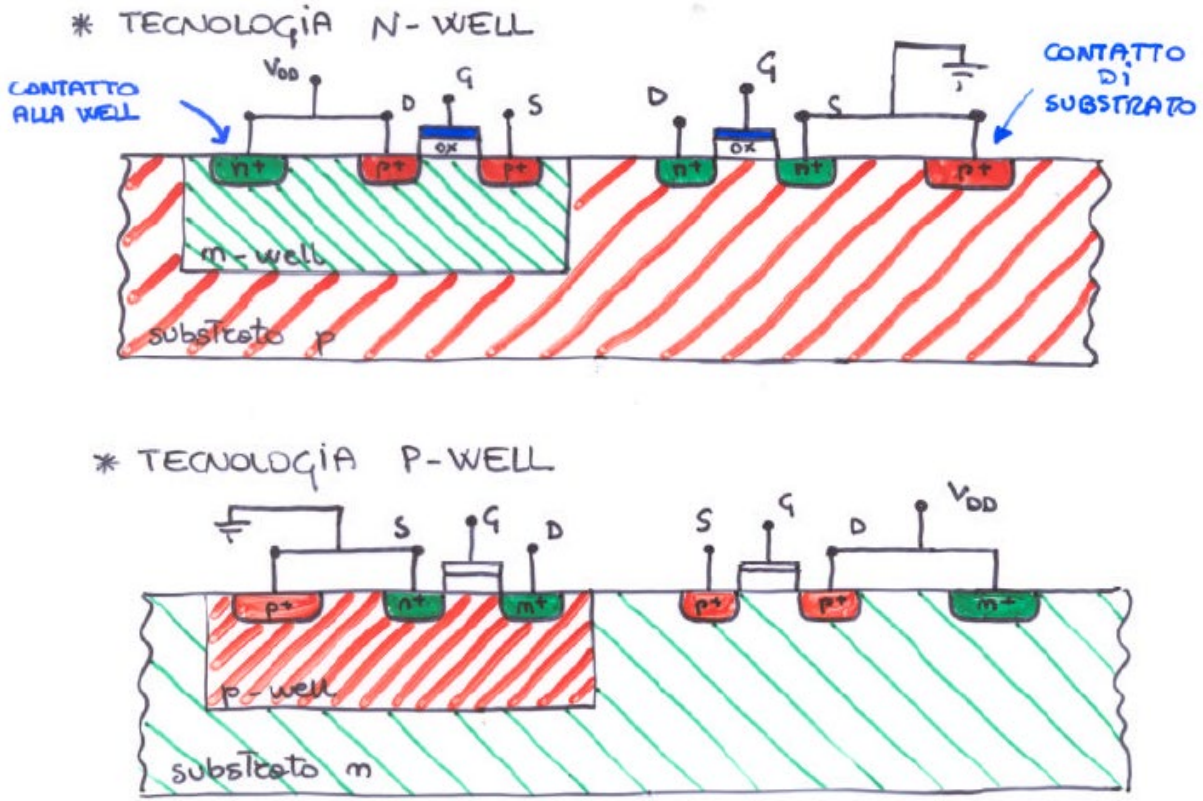




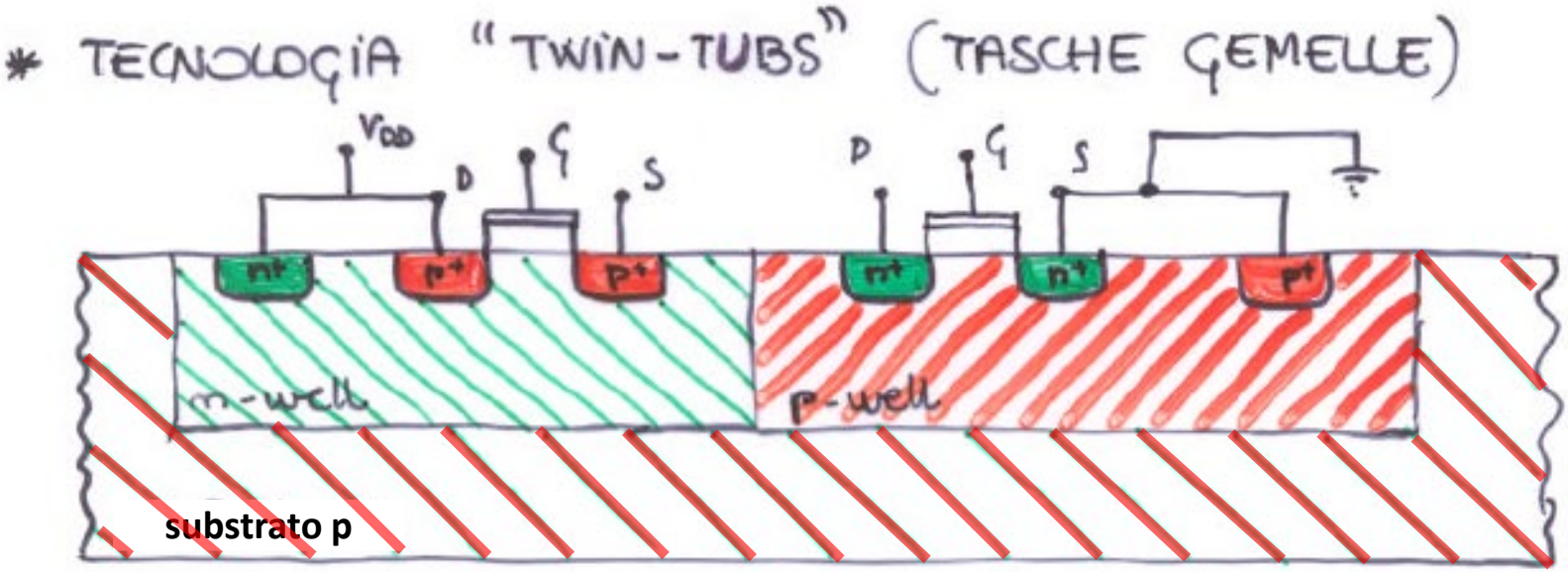


Caratteristica di trasferimento

TECNOLOGIE CMOS
(Complementary Metal Oxide Silicon)

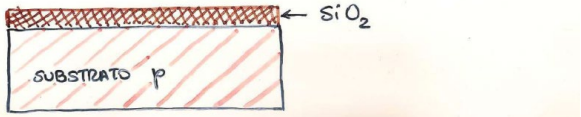


TECNOLOGIE CMOS
(Complementary Metal Oxide Silicon)

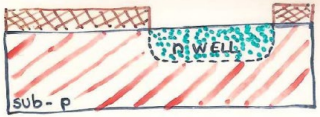


TECNOLOGIA DI FABBRICAZIONE DI CIRCUITI INTEGRATI – PROCESSO CMOS

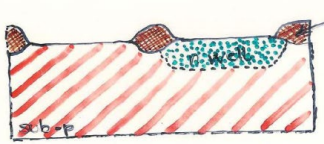
1) OSSIDAZIONE DEL WAFER DI SILICIO (mediante processo termico)



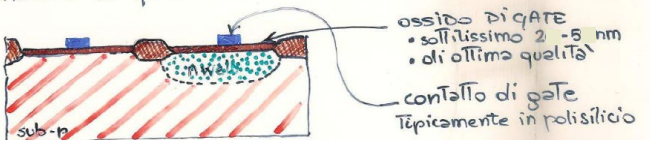
2) REALIZZAZIONE DELLA "TASCA" n (n-WELL)



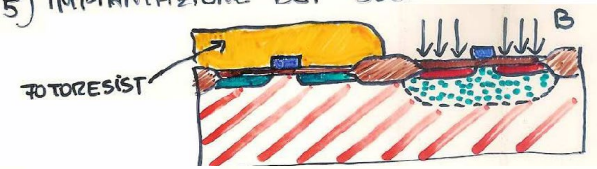
3) OSSIDAZIONE SELETTIVA per definire le regioni dei diversi dispositiv



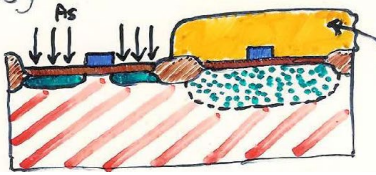
4) OSSIDAZIONE DI GATE E REALIZZAZIONE DEL CONTATTO DI GATE



5) IMPIANTAZIONE DEI SOURCE E DRAIN DI TIPO P



5) IMPIANTAZIONE DEI SOURCE E DRAIN DI TIPO N



6) STRUTTURA FINALE CON LE METALLIZZAZIONI