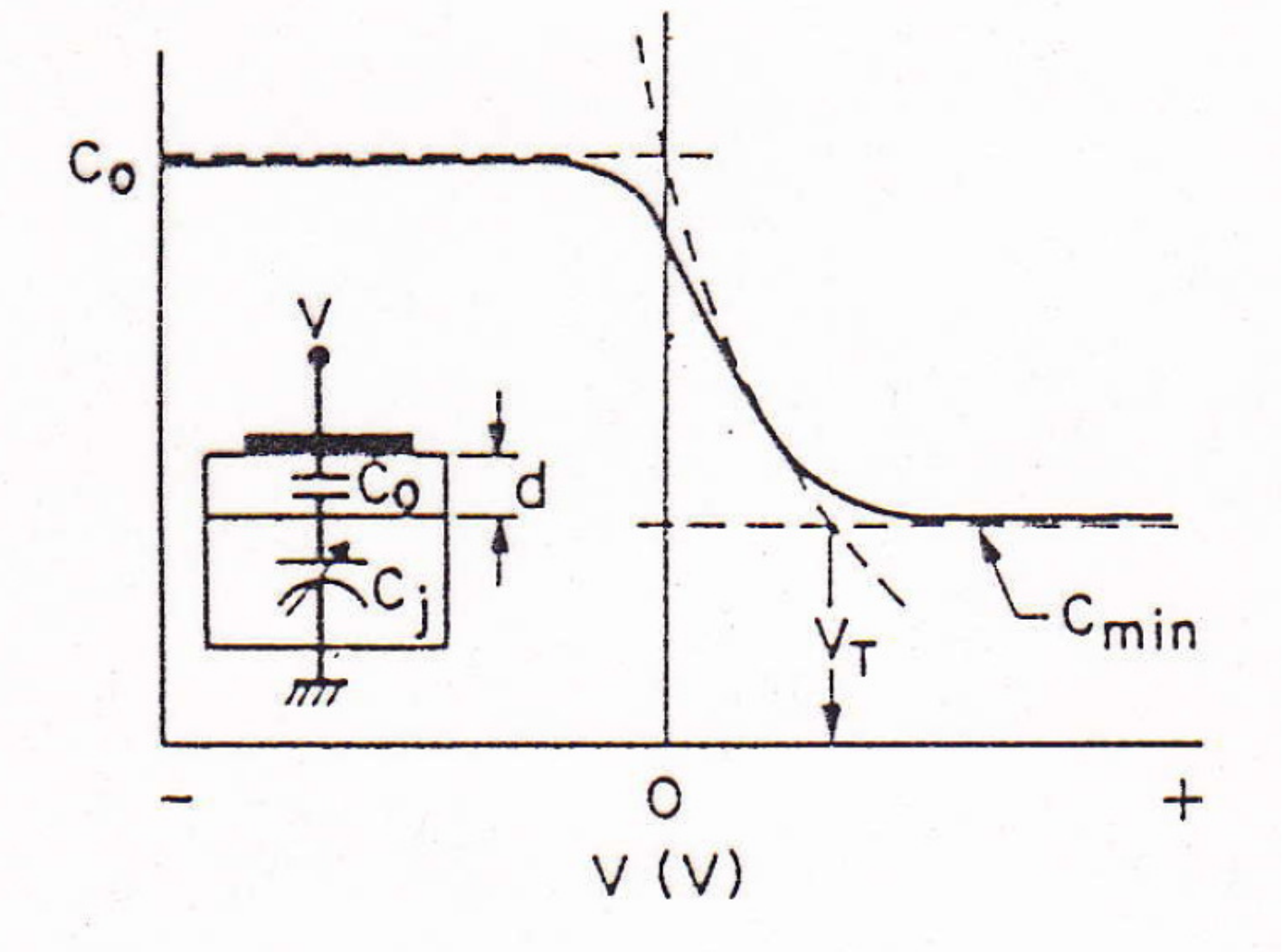
MOS Varactor

$$\frac{1}{C_{MOS}} = \frac{d}{\varepsilon_O} + \frac{W(V)}{\varepsilon_S} = \frac{1}{C_O} + \frac{1}{C_j}$$



Elettrostatica MOS

Accumulo

Svuotamento

Inversione

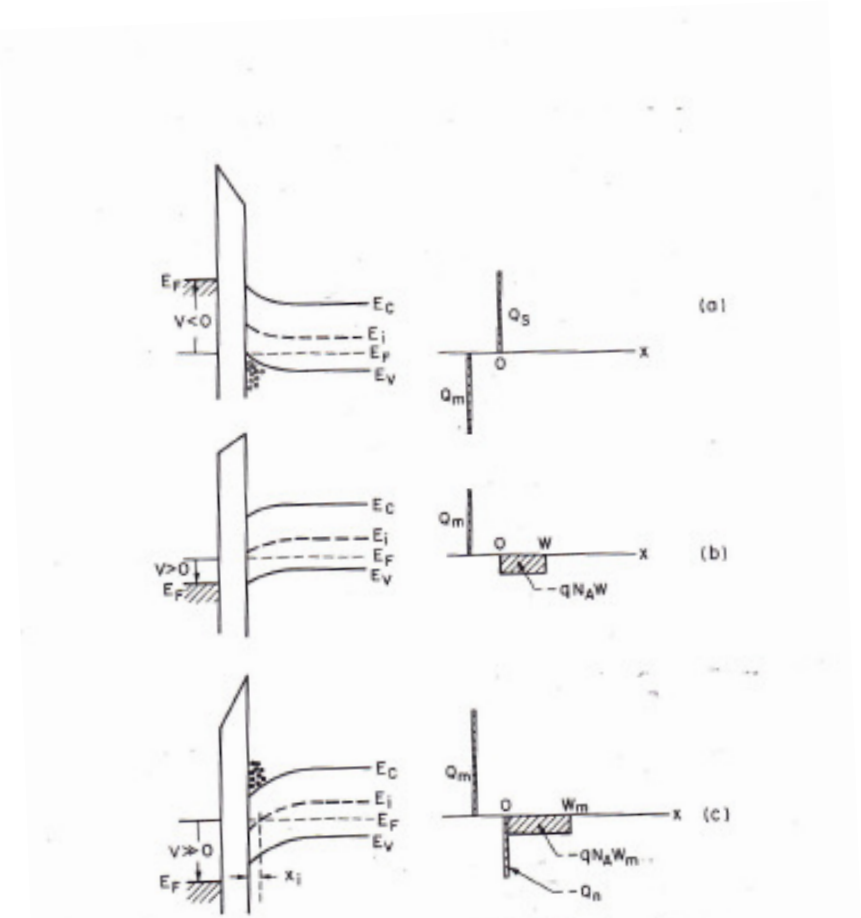
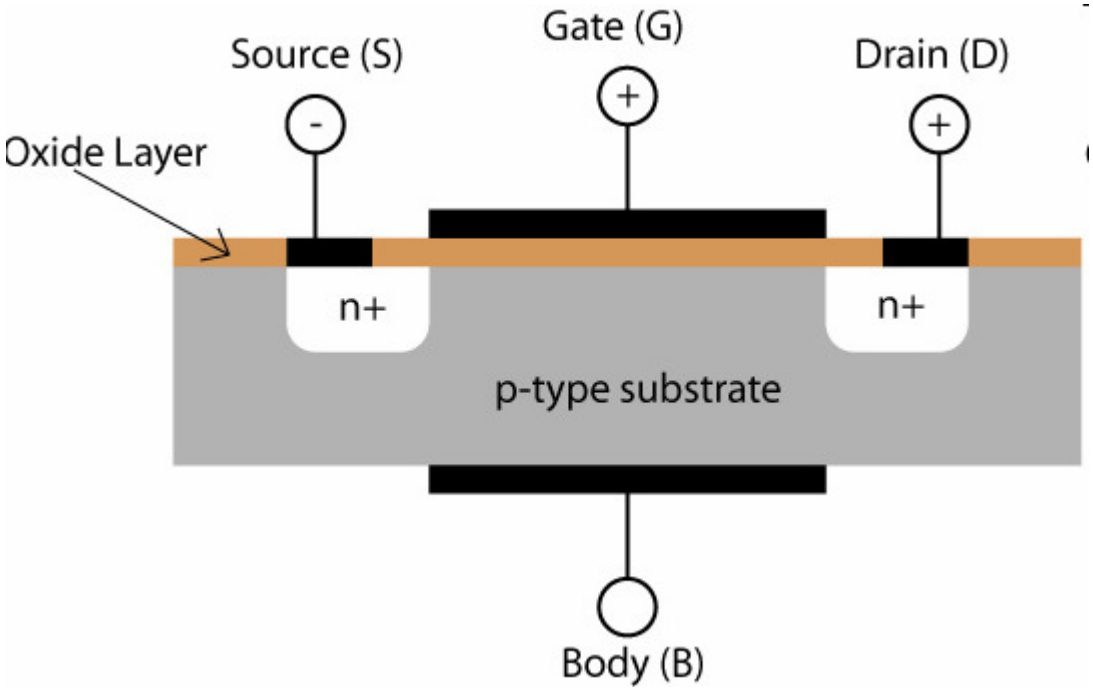
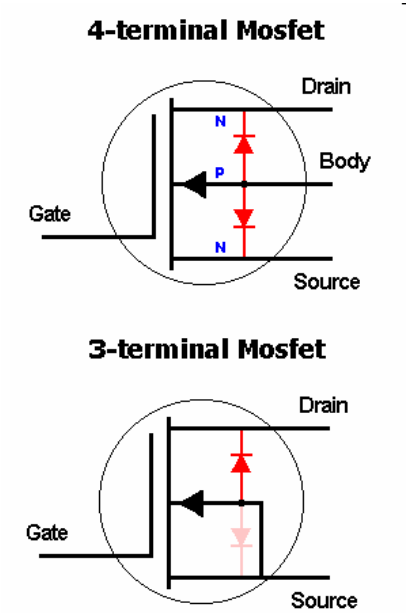


Fig. 23 Energy band diagrams and charge distributions of an ideal MOS diode (a) Accumulation. (b) Depletion. (c) Inversion.

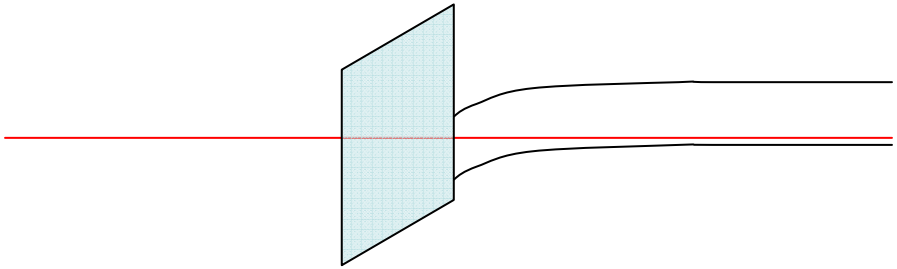
MOSFET


Source (S)
Gate (G)
Drain (D)
Oxide Layer
-
+
+
n+
n+
p-type substrate
Body (B)


4-terminal Mosfet
Drain
N
Body
P
Gate
N
Source
3-terminal Mosfet
Drain
Gate
Source

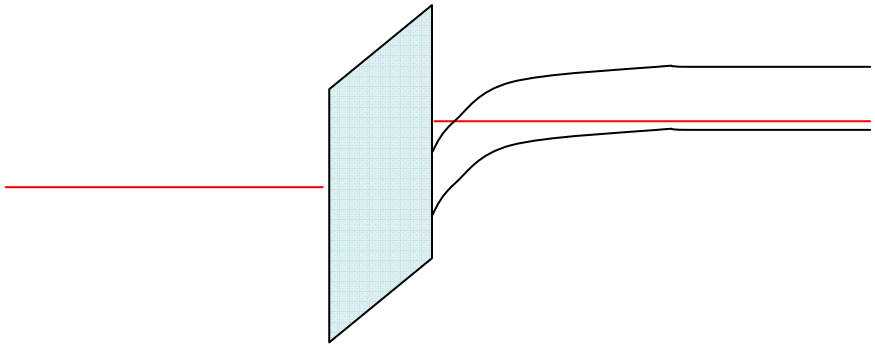
Diodo p-MOS

Svuotamento



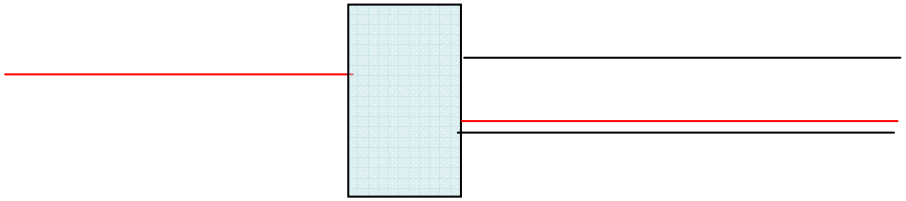
$V_T > V > 0$

Inversione



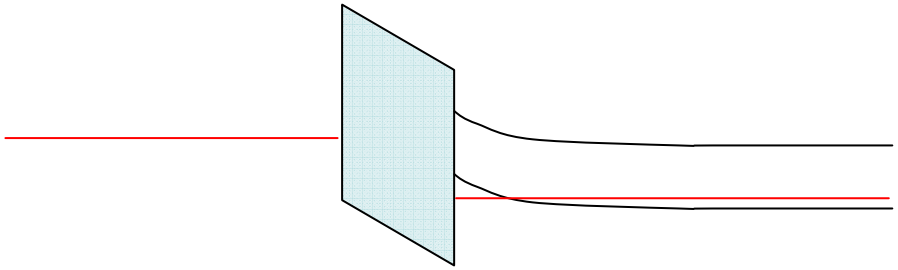
$V > V_T$

Non polarizzato



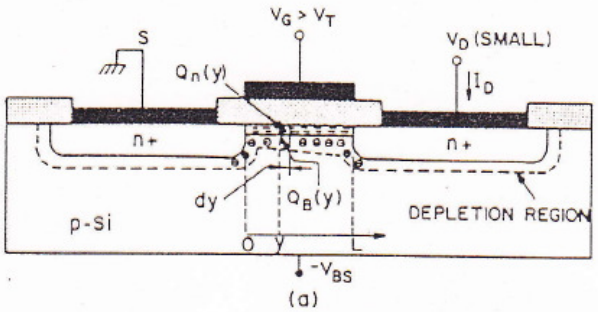
$V = 0$

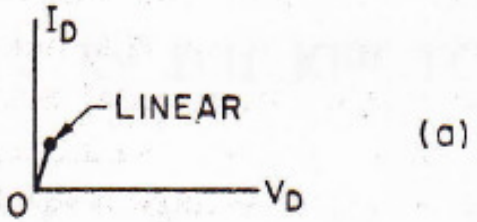
Accumulo



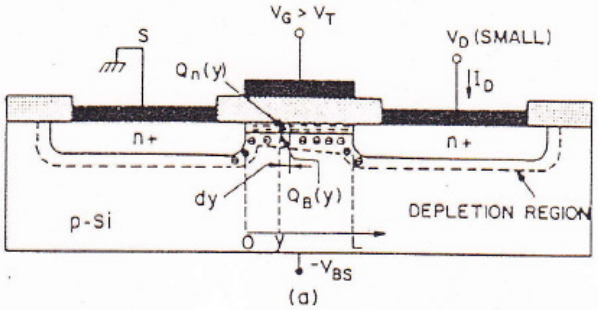
$V < 0$

MOSFET (n channel=pMOS)

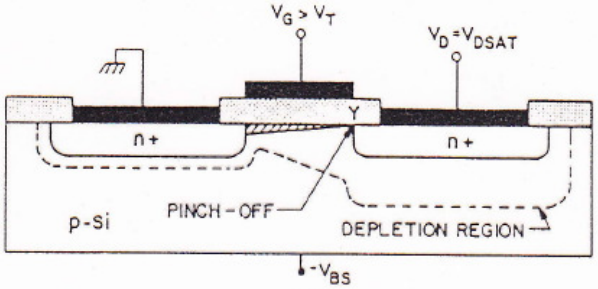




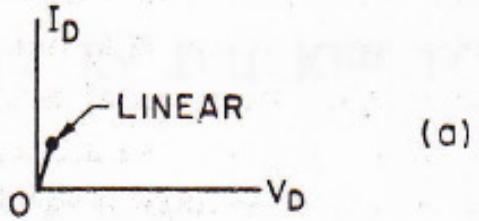
MOSFET


$V_G > V_T$
S
$Q_n(y)$
V_D (SMALL)
I_D
n+
n+
dy
$Q_B(y)$
DEPLETION REGION
p-Si
0
y
L
$-V_{BS}$

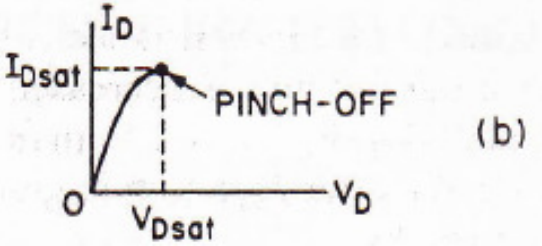
(a)


$V_G > V_T$
$V_D = V_{DSAT}$
Y
n+
n+
p-Si
PINCH-OFF
DEPLETION REGION
$-V_{BS}$

(b)


I_D
LINEAR
O
V_D

(a)


I_D
I_{Dsat}
PINCH-OFF
O
V_{Dsat}
V_D

(b)

MOSFET

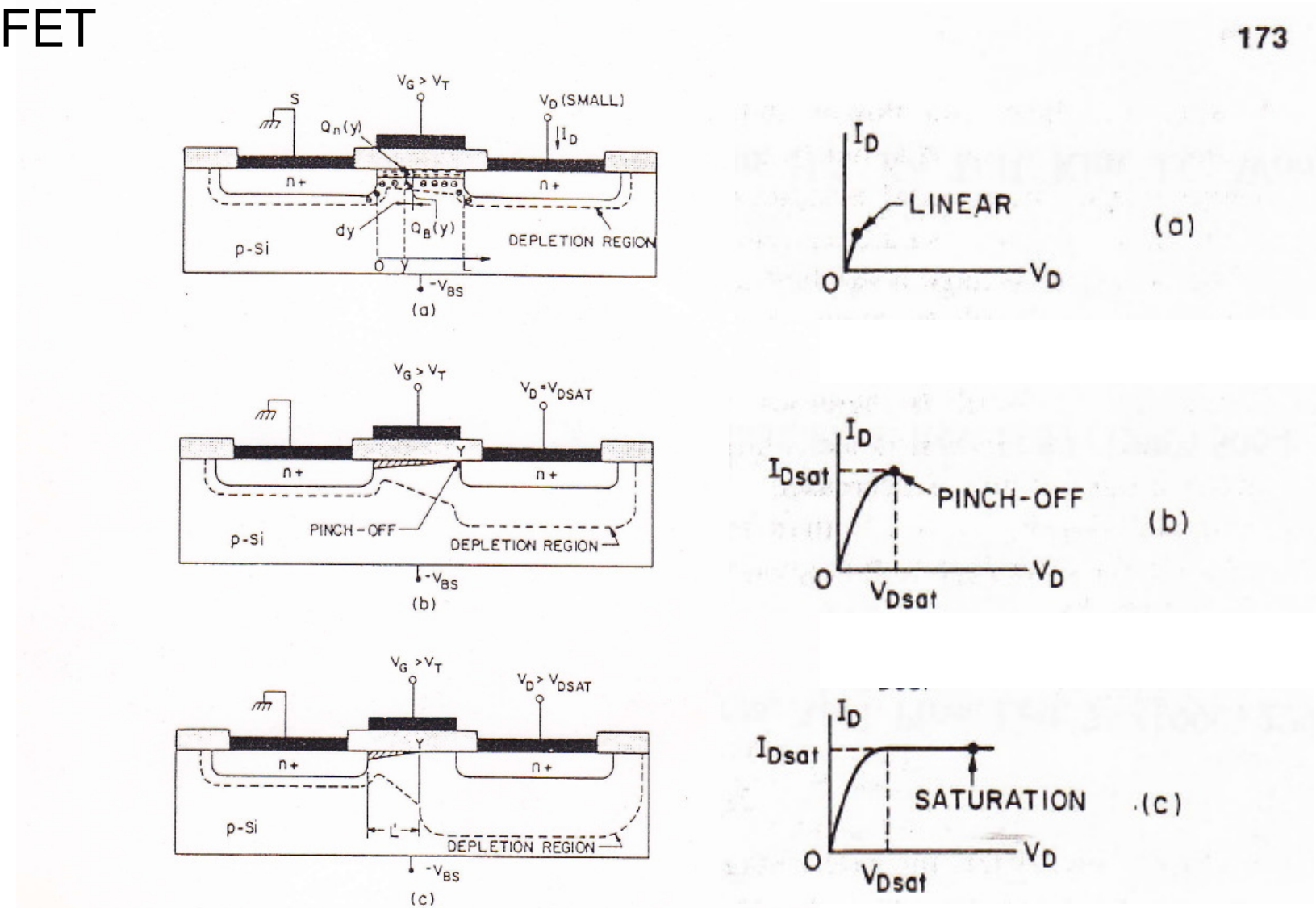
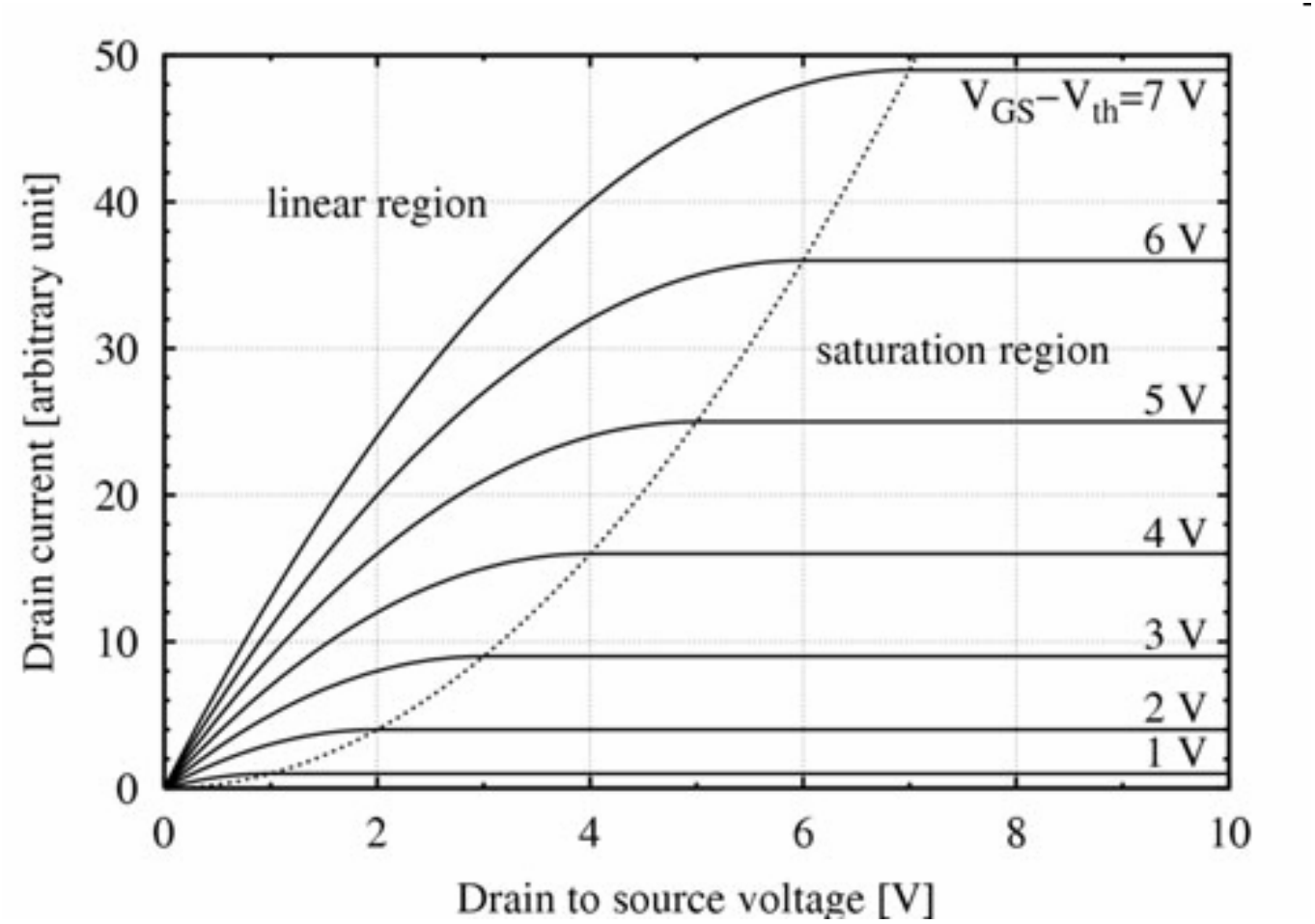


Fig. 6 (a) MOSFET operated in the linear region (low drain voltage). (b) MOSFET operated at onset of saturation. The point Y indicates the pinch-off point. (c) MOSFET operated beyond saturation and the effective channel length is reduced.

MOSFET


50
40
30
20
10
0
0
2
4
6
8
10
Drain current [arbitrary unit]
Drain to source voltage [V]
linear region
saturation region
$V_{GS}-V_{th}$=7 V
6 V
5 V
4 V
3 V
2 V
1 V

Tensione di soglia

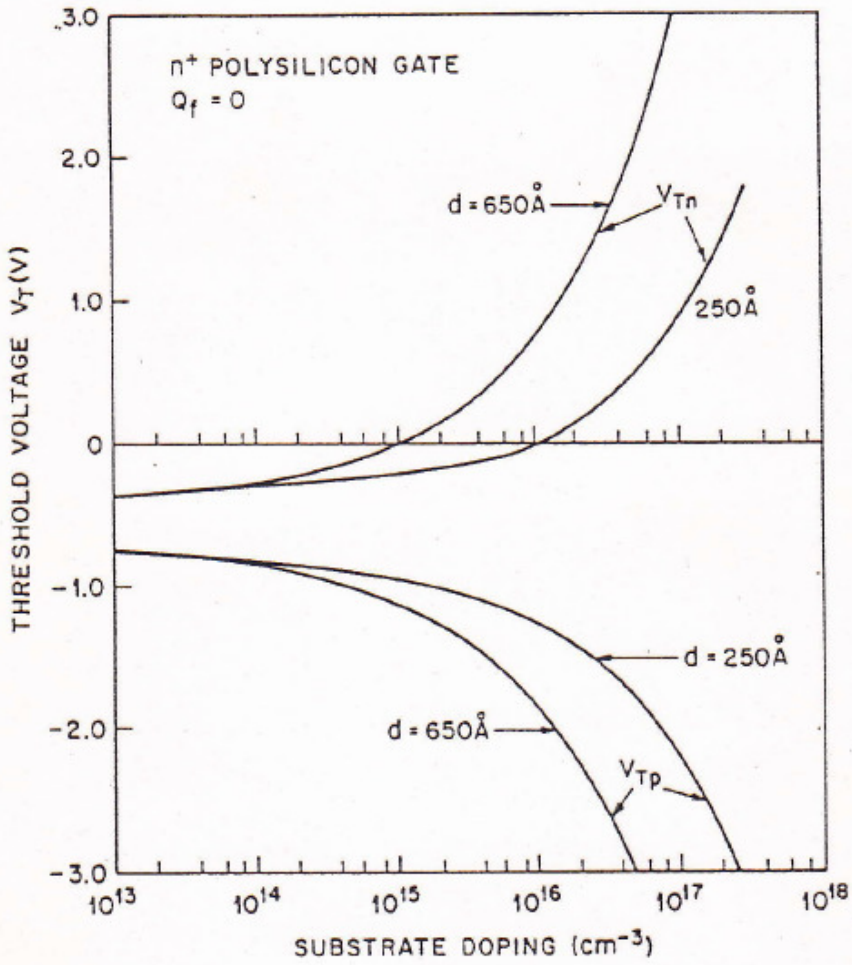


Fig. 41 Calculated threshold voltage of *n*-channel (V_{Tn}) and *p*-channel (V_{Tp}) MOSFETs as a function of impurity concentration, assuming an n^+-polysilicon gate and zero fixed oxide charge.[13]

Tipi di MOSFET

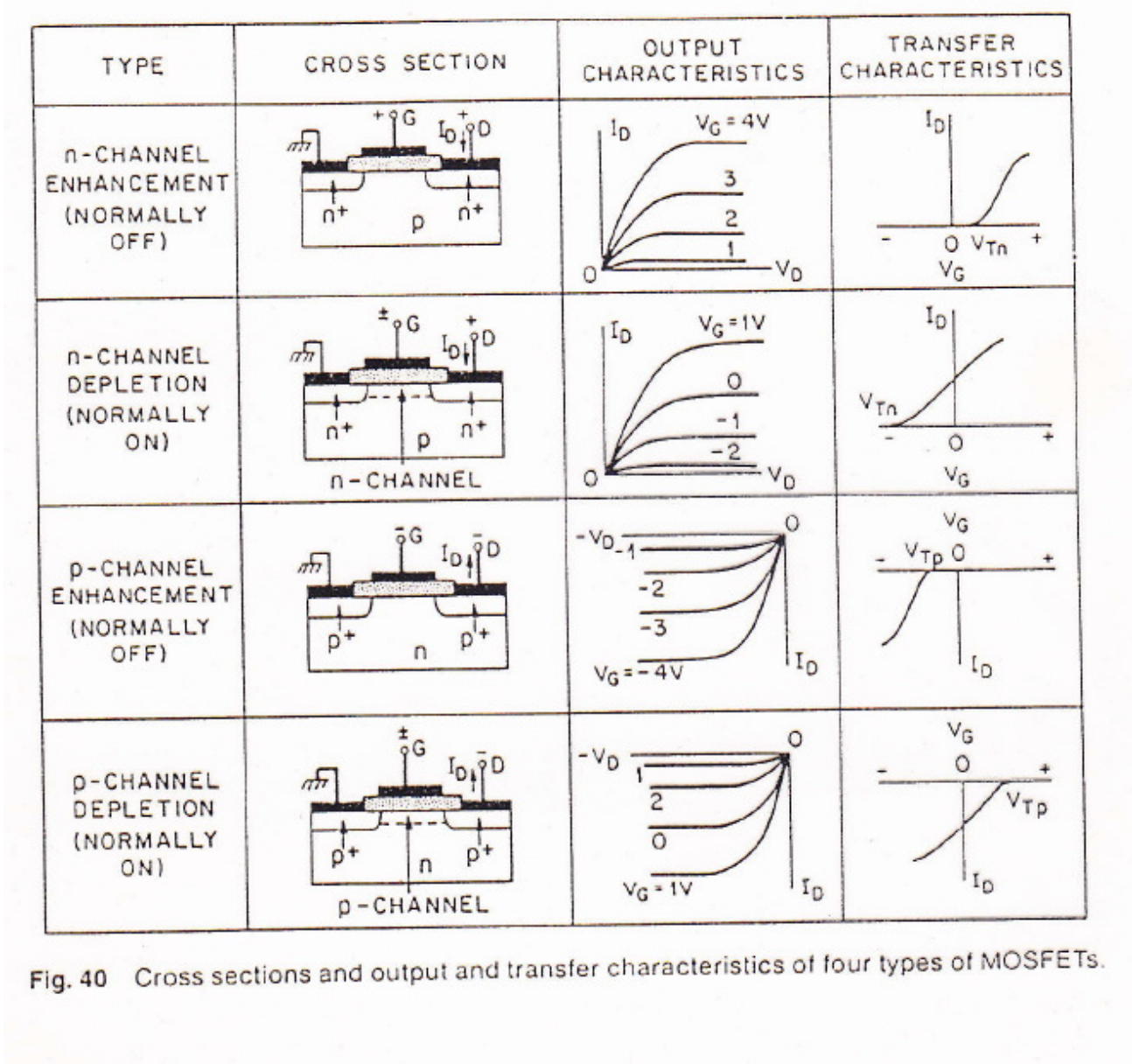
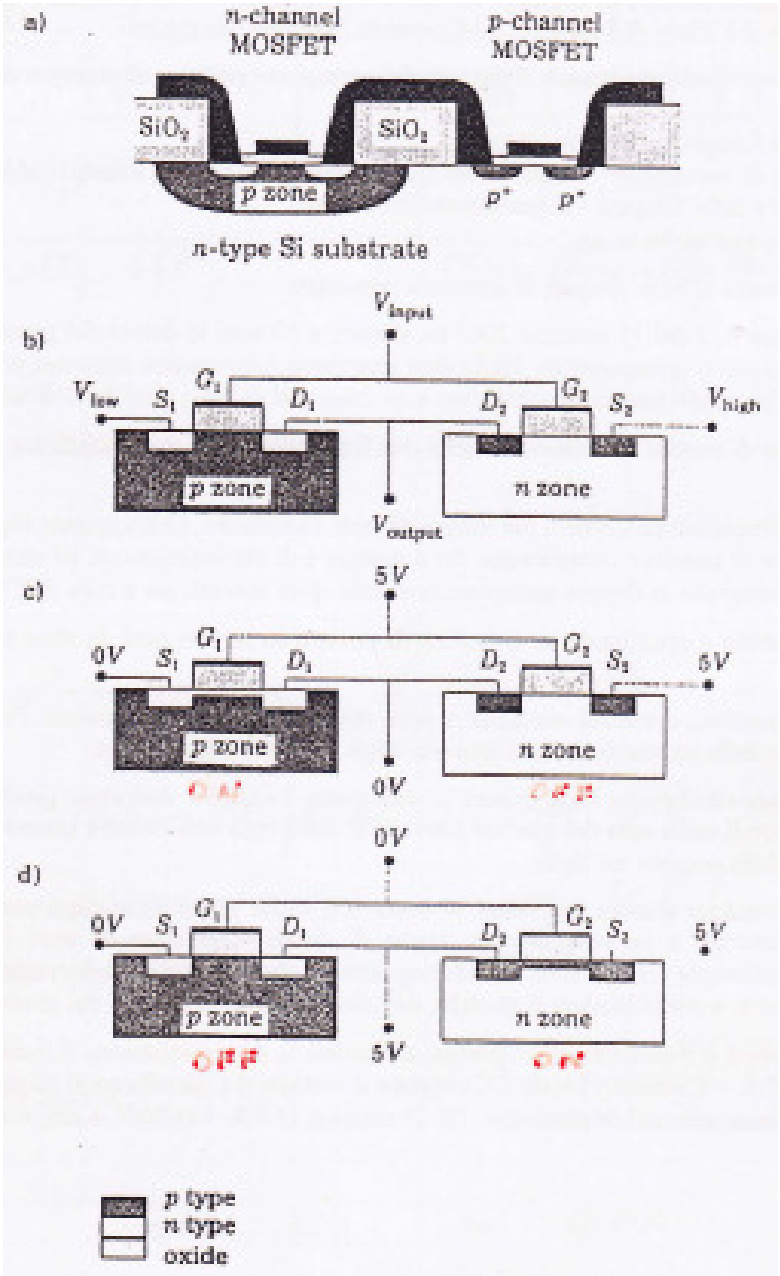


Fig. 40 Cross sections and output and transfer characteristics of four types of MOSFETs.

CMOS

Normally off Normally on



Invertitore