

Álgebra de Boole

$$a + a = a$$

$$a \cdot a = a$$

$$a + 0 = a$$

$$a \cdot 1 = a$$

$$a + 1 = 1$$

$$a \cdot 0 = 0$$

$$a + \bar{a} = 1$$

$$a \cdot \bar{a} = 0$$

$$a + (a \cdot b) = a$$

$$a \cdot (a + b) = a$$

Ley de asociación

$$a + b = \overline{a \cdot b}$$

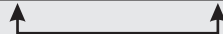
$$a \cdot b = \overline{a + b}$$

Teorema de Morgan

Teoremas en el álgebra de Boole

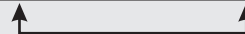
$$a = a + (a \cdot b)$$

a	b	$a \cdot b$	$a + a \cdot b$
0	0	0	0
0	1	0	0
1	0	0	1
1	1	1	1



$$\overline{a \cdot b} = \bar{a} + \bar{b}$$

a	b	$\overline{a \cdot b}$	\bar{a}	\bar{b}	$\bar{a} + \bar{b}$
0	0	1	1	1	1
0	1	1	1	0	1
1	0	1	0	1	1
1	1	0	0	0	0



Demostración de 2 de los teoremas anteriores por inducción completa

Tablas de Karnaugh

Minitérminos en las tablas de Karnaugh

B \ A	0	1
0	m ₀	m ₁
1	m ₂	m ₃

C \ BA	00	01	11	10
0	m ₀	m ₁	m ₃	m ₂
1	m ₄	m ₅	m ₇	m ₆

DC \ BA	00	01	11	10
00	m ₀	m ₁	m ₃	m ₂
01	m ₄	m ₅	m ₇	m ₆
11	m ₁₂	m ₁₃	m ₁₅	m ₁₄
10	m ₈	m ₉	m ₁₁	m ₁₀

$$B A + B \bar{A} = B (A + \bar{A}) = B$$

B \ A	0	1
0	0	0
1	1	1

Ejemplo de la simplificación de una variable

Tablas de Karnaugh

Maxitérminos en las tablas de Karnaugh

B \ A	0	1
0	M_0	M_1
1	M_2	M_3

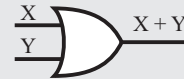
C \ BA	00	01	11	10
0	M_0	M_1	M_3	M_2
1	M_4	M_5	M_7	M_6

DC \ BA	00	01	11	10
00	M_0	M_1	M_3	M_2
01	M_4	M_5	M_7	M_6
11	M_{12}	M_{13}	M_{15}	M_{14}
10	M_8	M_9	M_{11}	M_{10}

Puertas Lógicas

X	Y	$X+Y$	$\overline{X+Y}$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

OR



NOR



X	Y	$X \cdot Y$	$\overline{X \cdot Y}$
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

AND



NAND



X	\overline{X}
0	1
1	0

NOT

Negación



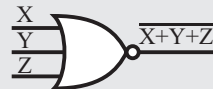
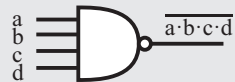
Puertas Lógicas

X	Y	$X \oplus Y$	$\overline{X \oplus Y}$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	0	1

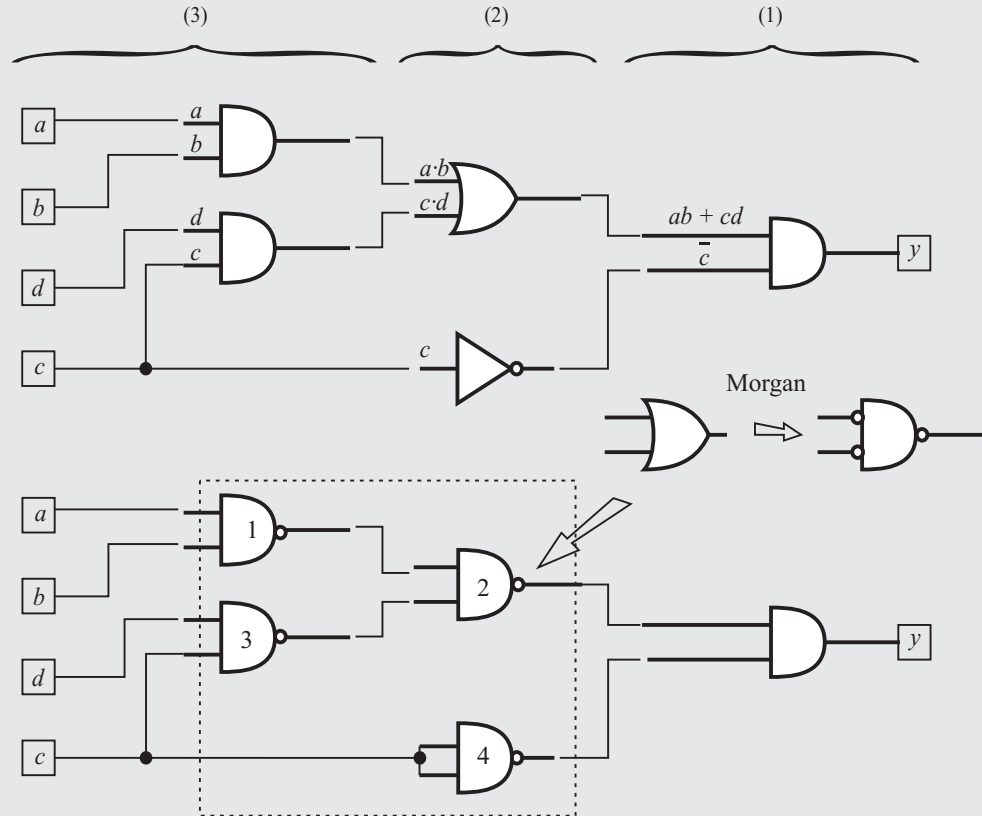
XOR



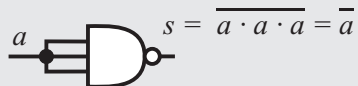
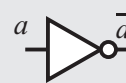
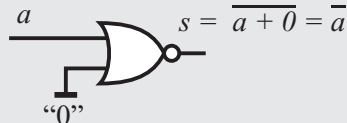
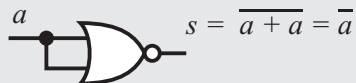
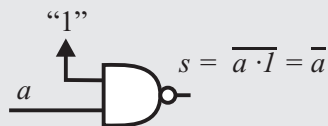
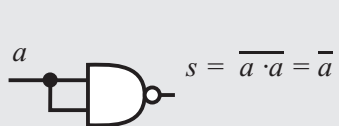
XNOR



Implementación de la función $y = (a \cdot b + c \cdot d) \cdot \bar{c}$



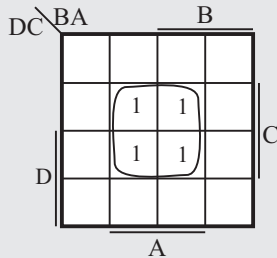
Conexiones y transformaciones usuales con puertas lógicas



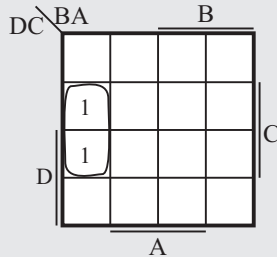
GND
MASA



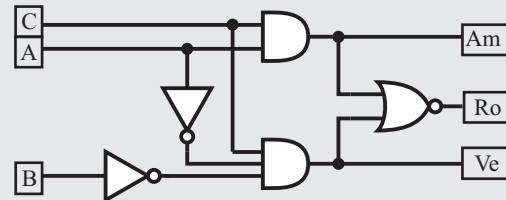
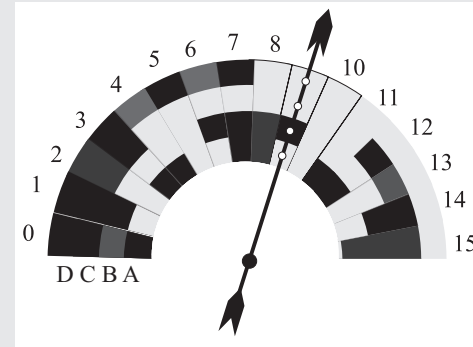
Ejemplo de función lógica múltiple



$$A_m = A \cdot C$$



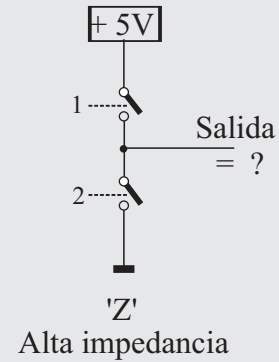
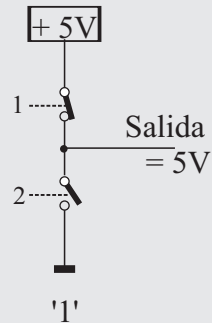
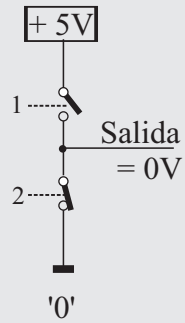
$$V_e = C \cdot \bar{B} \cdot \bar{A}$$



R_o en función de las otras salidas → Simplicidad

R_o en función de las entradas → Rapidez

Modelo simple de salida triestado



Simbolos de buffer con salida triestado