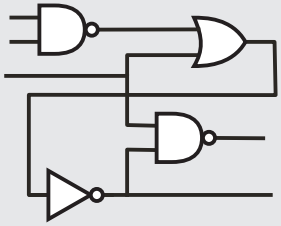
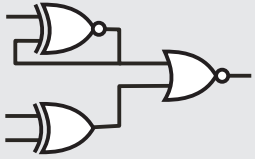
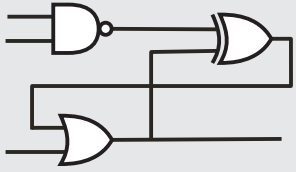
Circuitos combinacionales y secuenciales



Circuito 1

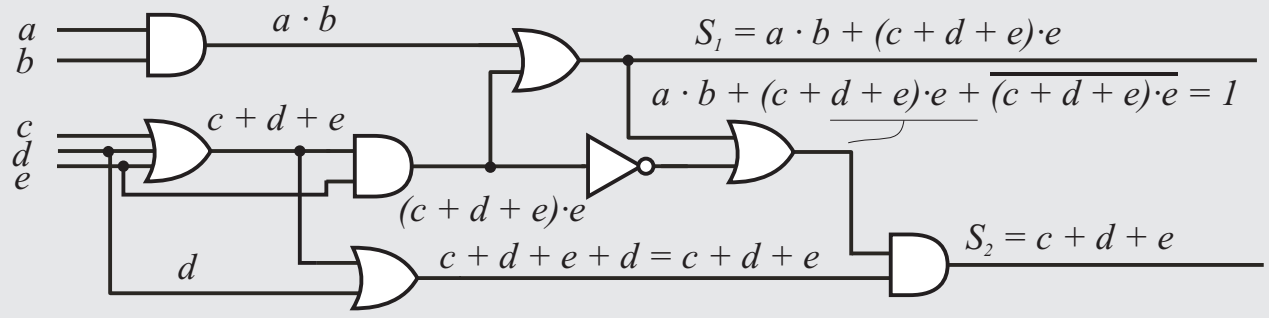


Circuito 2

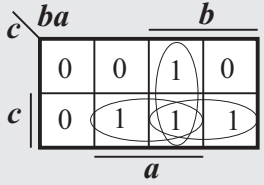


Circuito 3

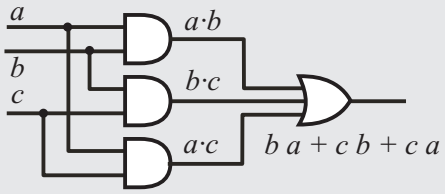
Ejemplo de análisis de un circuito combinacional

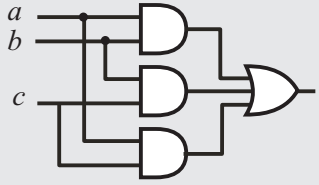


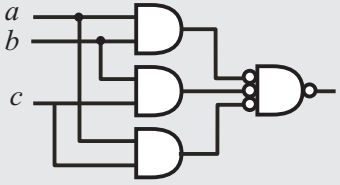
Transformación para sintetizar una función lógica con un mismo tipo de puerta

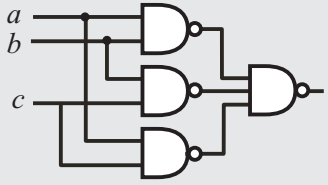


$f = b\,a + c\,b + c\,a$

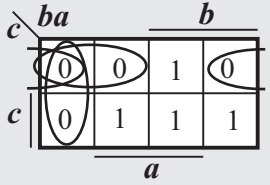




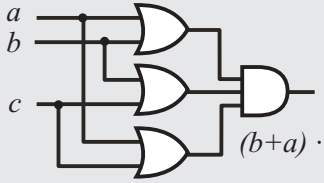




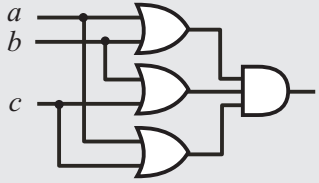
Transformación para sintetizar una función lógica con un mismo tipo de puerta

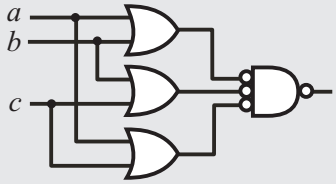


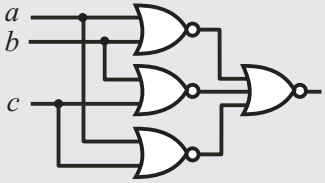
$f = (b+a) \cdot (c+b) \cdot (c+a)$



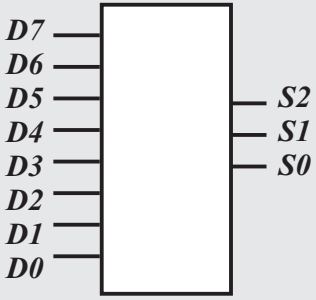
$(b+a) \cdot (c+b) \cdot (c+a)$







Codificadores



Codificador 8:3

- Sin prioridad
- con prioridad a la entrada de **mayor** peso
- con prioridad a la entrada de **menor** peso

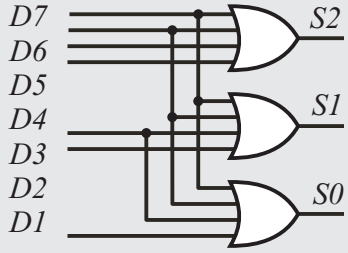
Codificador sin prioridad

D7	D6	D5	D4	D3	D2	D1	D0	S2	S1	S0
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1
Resto de los casos, hasta 256										

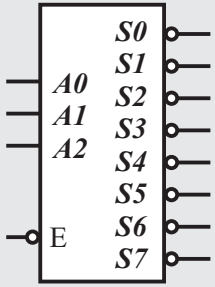
$S2 = D7 + D6 + D5 + D4$

$S1 = D7 + D6 + D3 + D2$

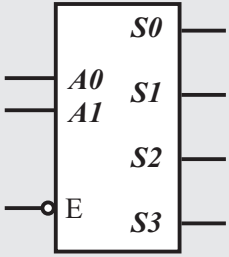
$S0 = D7 + D5 + D3 + D1$



Decodificadores



Decodificador 3:8

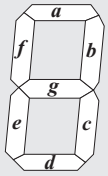


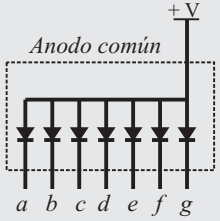
Decodificador 2:4

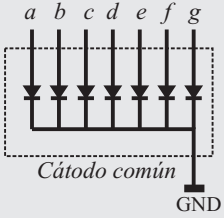
E	A1	A0	S0	S1	S2	S3
0	0	0	1	0	0	0
0	0	1	0	1	0	0
0	1	0	0	0	1	0
0	1	1	0	0	0	1
1	x	x	0	0	0	0

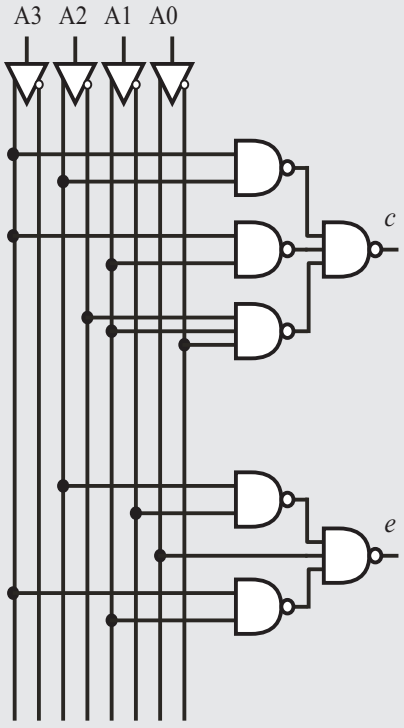
$$S0 = \overline{E} \cdot \overline{A1} \cdot \overline{A0}$$
$$S1 = \overline{E} \cdot \overline{A1} \cdot A0$$
$$S2 = \overline{E} \cdot A1 \cdot \overline{A0}$$
$$S3 = \overline{E} \cdot A1 \cdot A0$$

Decodificador de 7 segmentos







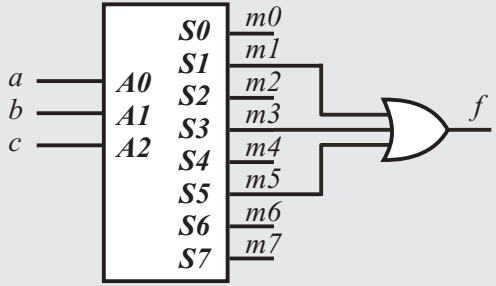


A3	A2	A1	A0	a	b	c	d	e	f	g	
0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	1	1	0	0	1	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0	2
0	0	1	1	0	0	0	0	1	1	0	3
0	1	0	0	1	0	0	1	1	0	0	4
0	1	0	1	0	1	0	0	1	0	0	5
0	1	1	0	0	1	0	0	0	0	0	6
0	1	1	1	0	0	0	1	1	1	1	7
1	0	0	0	0	0	0	0	0	0	0	8
1	0	0	1	0	0	0	0	1	0	0	9
1	0	1	0	1	1	1	1	1	1	1	

Ejemplo de síntesis de una función con decodificadores

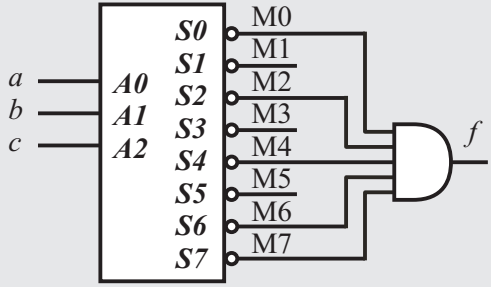
Con minitérminos $f = \sum_{3} (1, 3, 5)$

y un decodificador 3:8 activo por nivel alto.

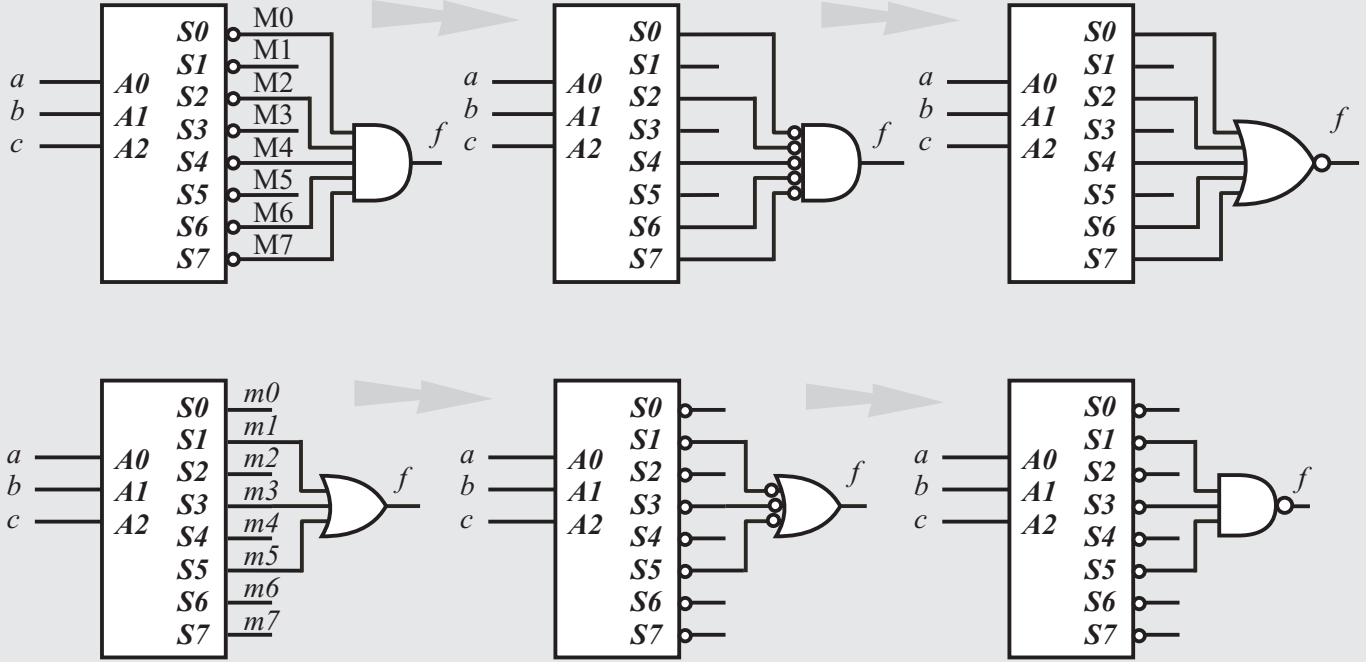


Con maxitérminos $f = \prod_{3} (0, 2, 4, 6, 7)$

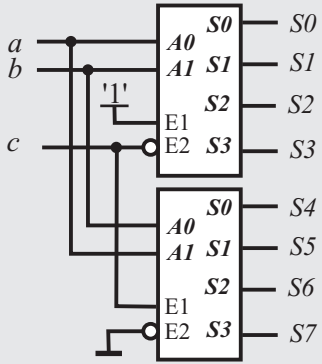
y un decodificador 3:8 activo por nivel bajo.



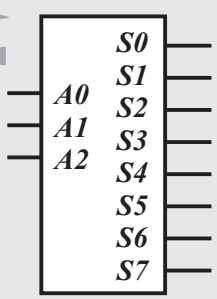
Implementaciones de $f = \sum_{3} (1, 3, 5) = \prod_{3} (0, 2, 4, 6, 7)$



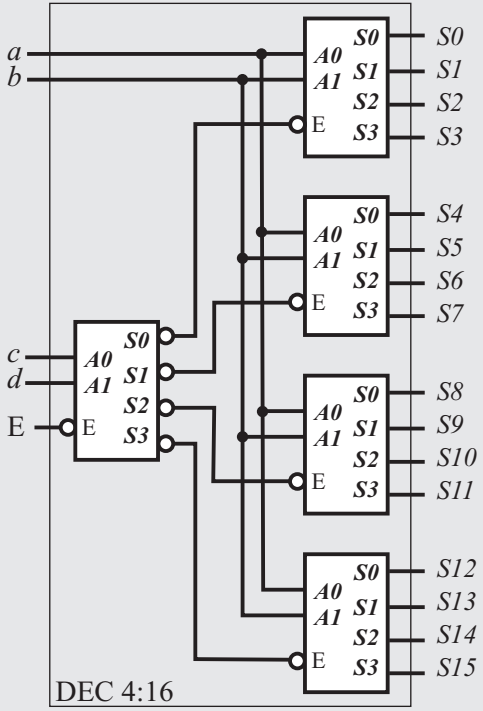
Expansión de decodificadores



Decodificadores 2:4

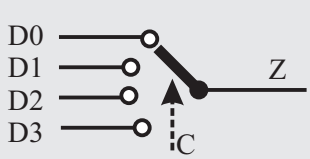


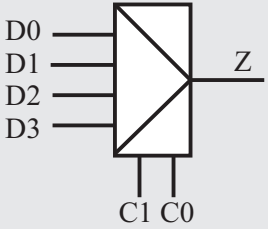
Decodificador 3:8



Modelos y símbolos de Multiplexor y Demultiplexor

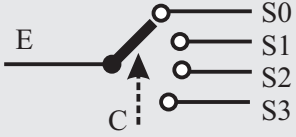
Multiplexor

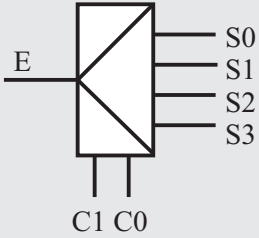




$$Z = \overline{C1} \cdot \overline{C0} \cdot D0 + \overline{C1} \cdot C0 \cdot D1 + C1 \cdot \overline{C0} \cdot D2 + C1 \cdot C0 \cdot D3$$

Demultiplexor





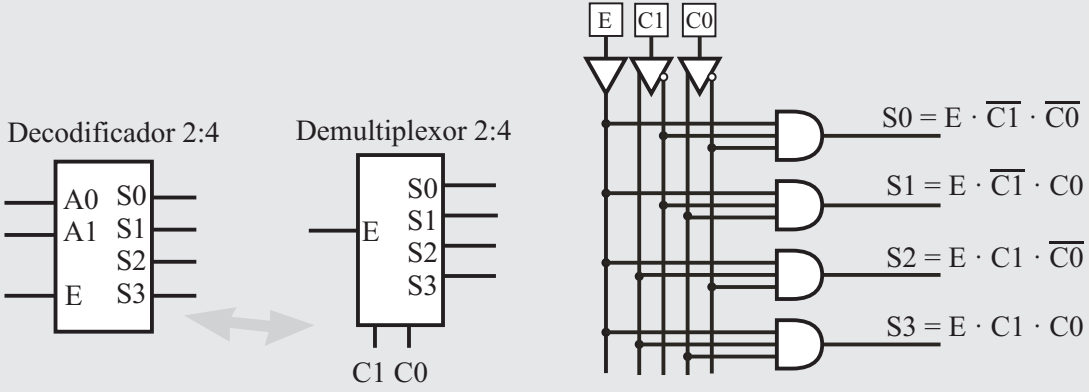
$$S0 = \overline{C1} \cdot \overline{C0} \cdot E$$

$$S1 = \overline{C1} \cdot C0 \cdot E$$

$$S2 = C1 \cdot \overline{C0} \cdot E$$

$$S3 = C1 \cdot C0 \cdot E$$

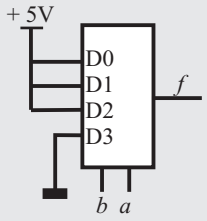
Equivalencia entre decodificador con entrada Enable y demultiplexor



Ejemplos de implementación de funciones lógicas con Multiplexores

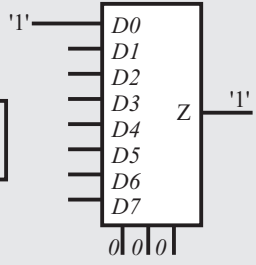
$f = \sum_{2} (0, 1, 2)$ con un multiplexor 4:1

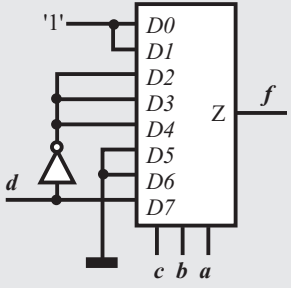
b	a	f
0	0	1
0	1	1
1	0	1
1	1	0



$f = \sum_{4} (0, 1, 2, 3, 4, 8, 9, 15)$ con un multiplexor 8:1

	cba							
d	000	001	010	011	100	101	110	111
0	1	1	1	1	1	0	0	0
1	1	1	0	0	0	0	0	1
	1	1	$\bar{d}$	$\bar{d}$	$\bar{d}$	0	0	d





Ejemplos de implementación de funciones lógicas con Multiplexores

$f = \sum_{4} (2, 4, 6, 9, 10, 11, 12, 20, 22, 23, 25\ 31)$

$+ \sum_{0} (0, 8, 13, 16, 24, 28)$ con un multiplexor 8:1

	c b a							
e d	000	001	010	011	100	101	110	111
0 0	x	0	1	0	1	0	1	0
0 1	x	1	1	1	1	x	0	0
1 0	x	0	0	0	1	0	1	1
1 1	x	1	0	0	x	0	0	1
		D	$\overline{\mathbf{E}}$	**D**·$\overline{\mathbf{E}}$	**1**	**0**	$\overline{\mathbf{D}}$	**E**