CIRCUITOS DIGITAIS

MULTIPLEXADORES E DEMULTIPLEXADORES

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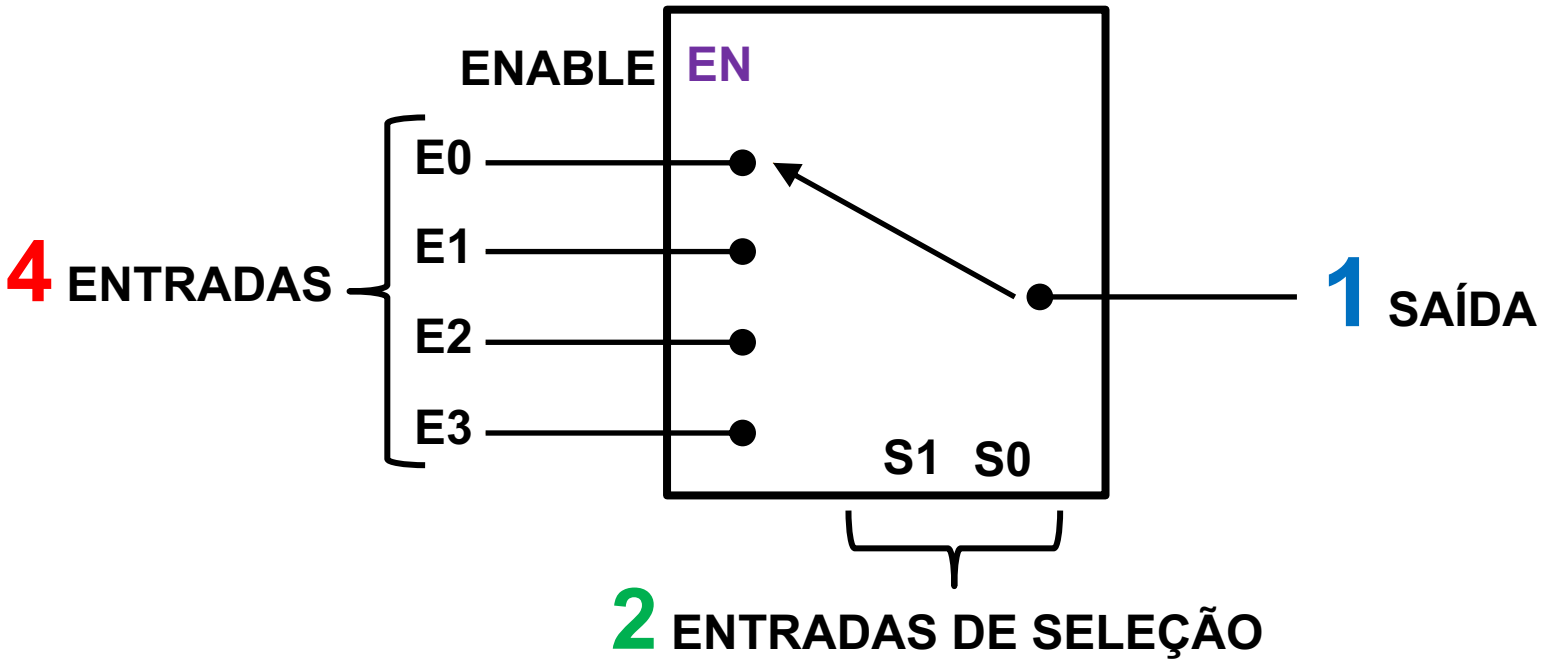
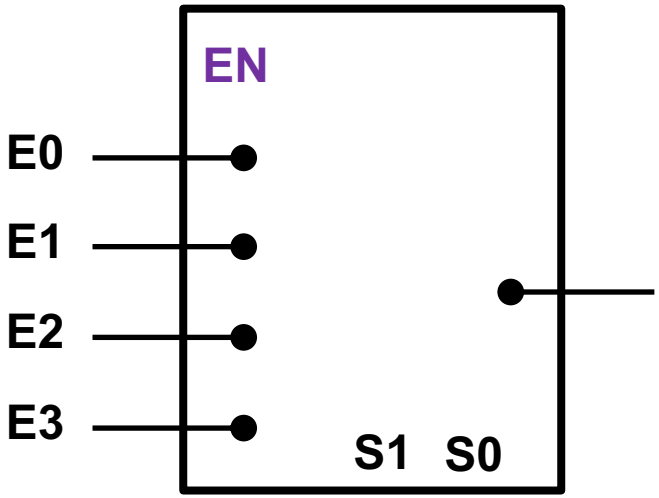
Multiplexadores com Enable

- Exemplo: Multiplexador **4**:**1** com Enable



Multiplexadores com Enable

- **MUX 4:1 com Enable (strobe)**

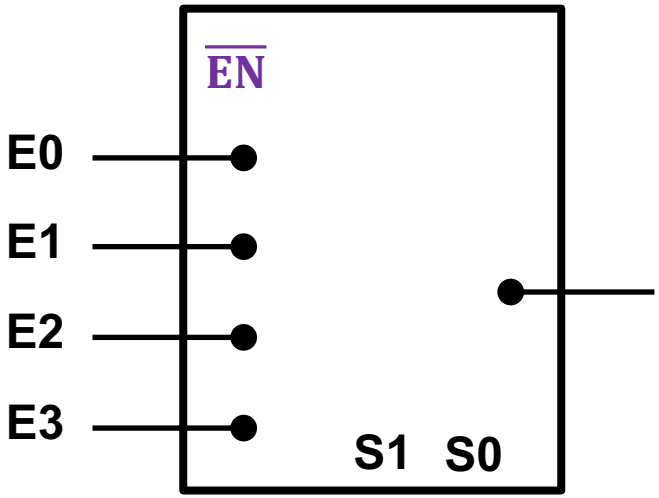


$$F = EN\overline{S1}\,\overline{S0}E0 + EN\overline{S1}\,S0E1 + ENS1\overline{S0}E2 + ENS1S0E3$$

EN	S1	S0	F
0	X	X	0
1	0	0	E0
1	0	1	E1
1	1	0	E2
1	1	1	E3

Multiplexadores com Enable

- **MUX 4:1 com Enable (strobe)**

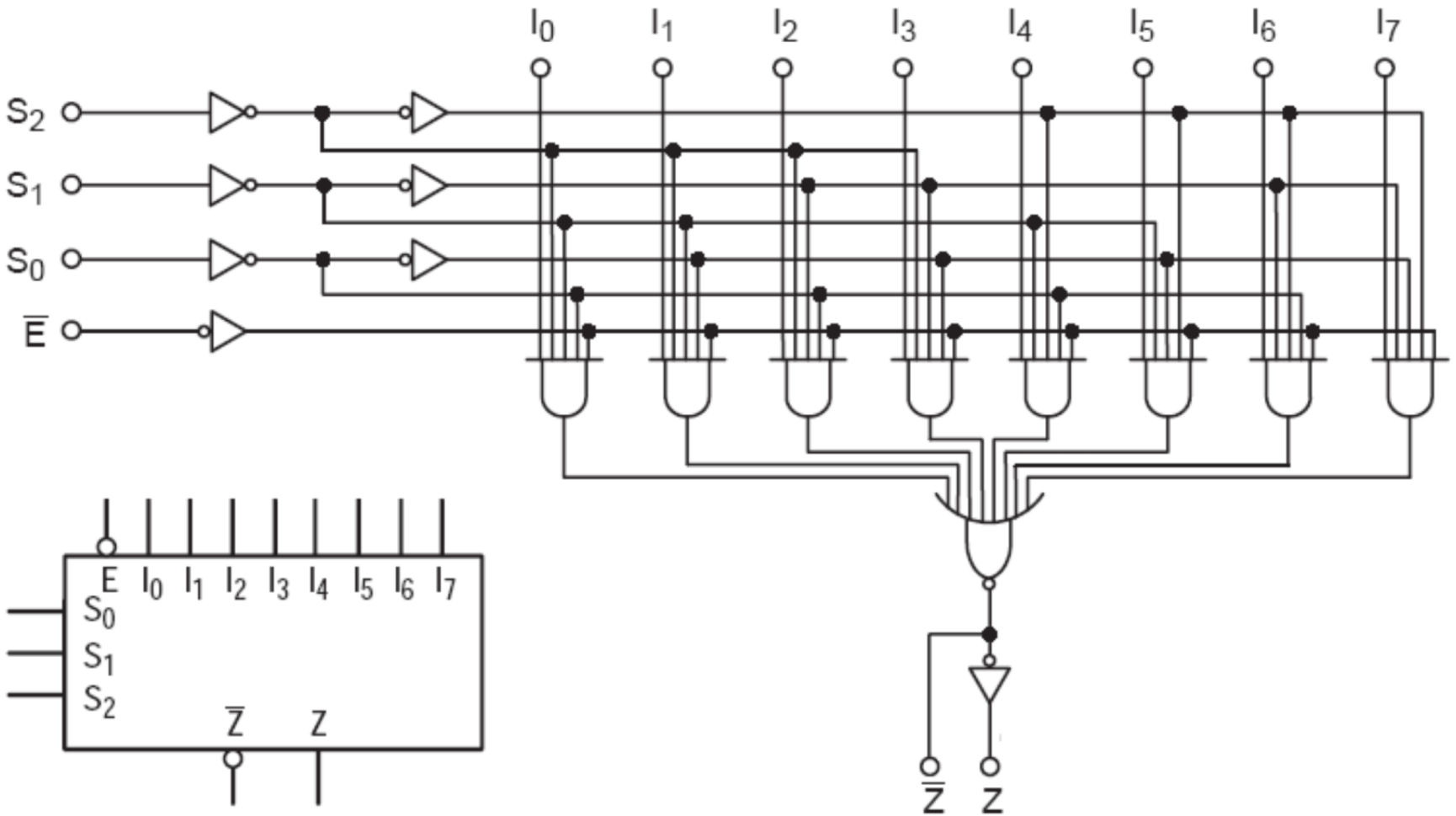


$$F = \overline{EN}\,\overline{S1}\,\overline{S0}E0 + \overline{EN}\,\overline{S1}\,S0E1 + \overline{EN}\,S1\overline{S0}E2 + \overline{EN}\,S1S0E3$$

$\overline{EN}$	S1	S0	F
1	X	X	0
0	0	0	E0
0	0	1	E1
0	1	0	E2
0	1	1	E3

Multiplexadores com Enable

- **74151: MUX 8:1 com enable**



Multiplexadores com Enable

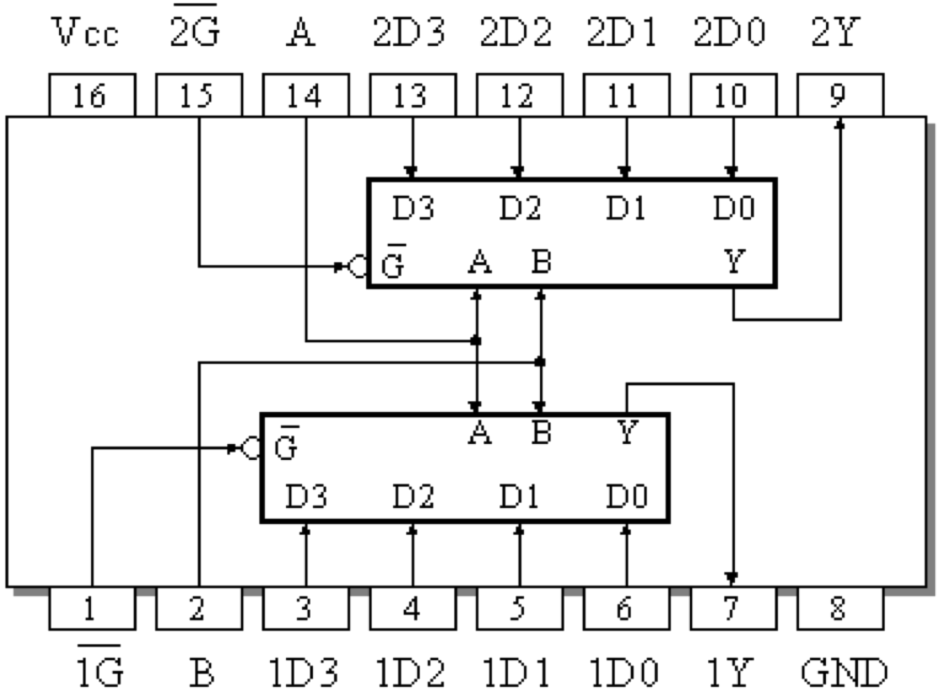
- **74151: MUX 8:1 com enable**

FUNCTION TABLE

INPUTS												OUTPUTS	
$\overline{E}$	S_2	S_1	S_0	I_0	I_1	I_2	I_3	I_4	I_5	I_6	I_7	$\overline{Z}$	Z
H	X	X	X	X	X	X	X	X	X	X	X	H	L
L	L	L	L	L	X	X	X	X	X	X	X	H	L
L	L	L	L	H	X	X	X	X	X	X	X	L	H
L	L	L	H	X	L	X	X	X	X	X	X	H	L
L	L	L	H	X	H	X	X	X	X	X	X	L	H
L	L	H	L	X	X	L	X	X	X	X	X	H	L
L	L	H	L	X	X	H	X	X	X	X	X	L	H
L	L	H	H	X	X	X	L	X	X	X	X	H	L
L	L	H	H	X	X	X	H	X	X	X	X	L	H
L	H	L	L	X	X	X	X	L	X	X	X	H	L
L	H	L	L	X	X	X	X	H	X	X	X	L	H
L	H	L	H	X	X	X	X	X	L	X	X	H	L
L	H	L	H	X	X	X	X	X	H	X	X	L	H
L	H	H	L	X	X	X	X	X	X	L	X	H	L
L	H	H	L	X	X	X	X	X	X	H	X	L	H
L	H	H	H	X	X	X	X	X	X	X	L	H	L
L	H	H	H	X	X	X	X	X	X	X	H	L	H

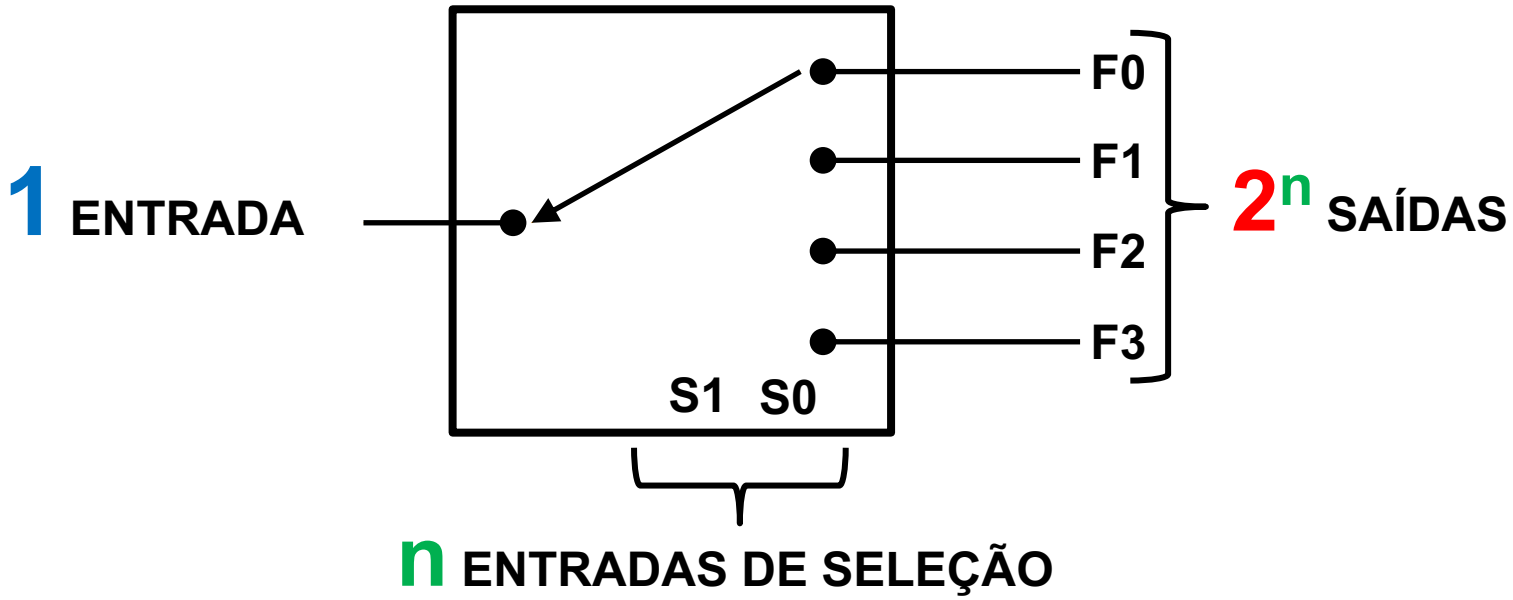
Multiplexadores com Enable

- **74153: dois MUX 4:1 com enable (mesmas porta seletoras)**



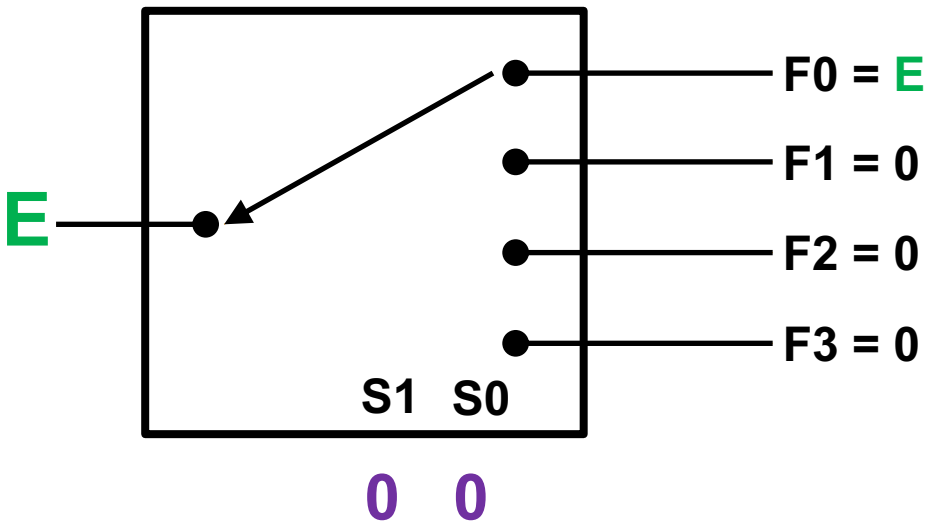
Demultiplexadores (DEMUX)

- Inverte a função da multiplexação
- Seleciona um dos valores de saída para receber o valor de entrada



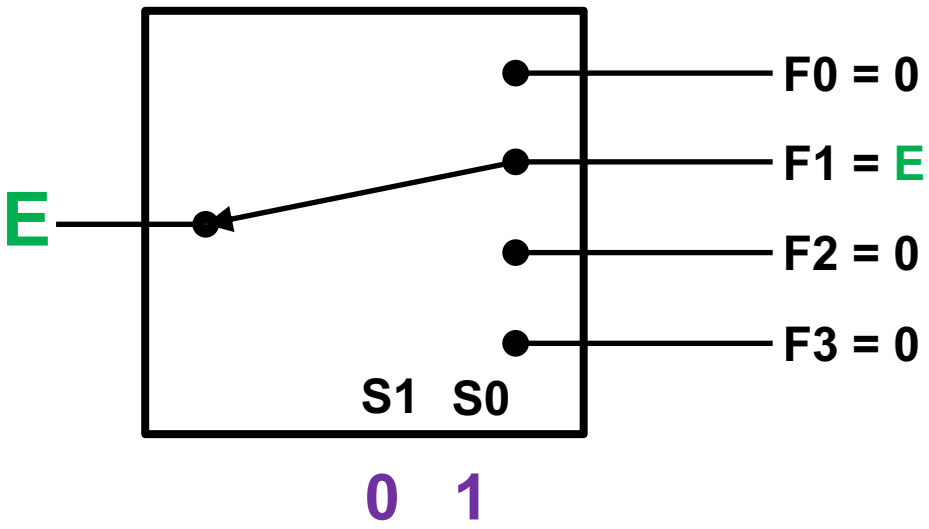
Demultiplexadores (DEMUX)

- Exemplo: **Demultiplexador 1:4**



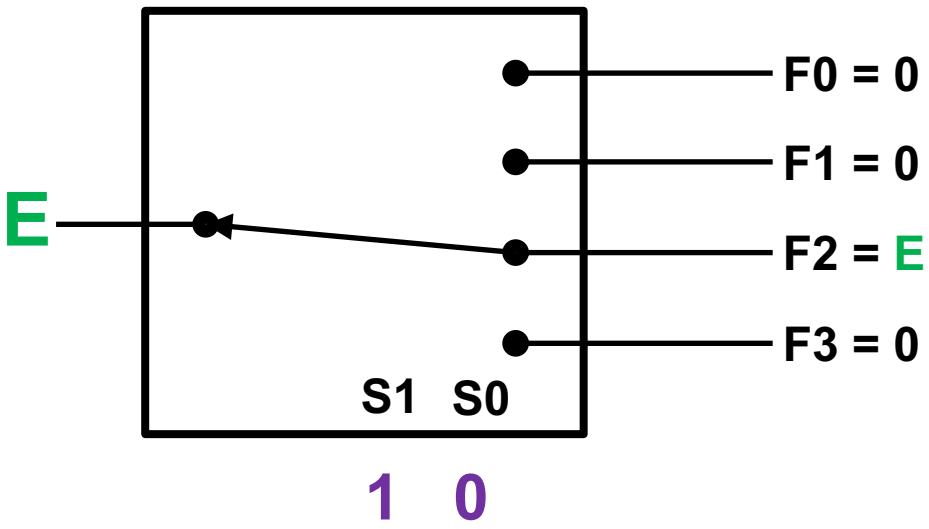
Demultiplexadores (DEMUX)

- Exemplo: **Demultiplexador 1:4**



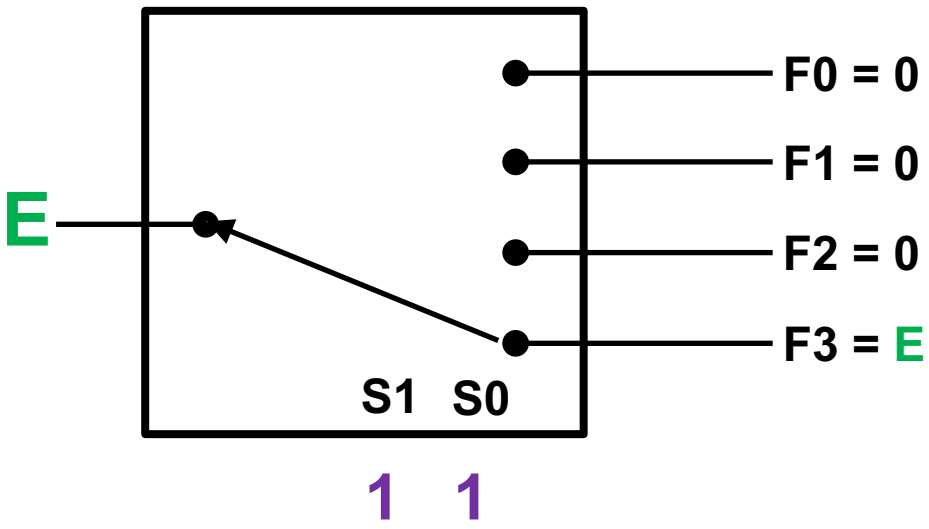
Demultiplexadores (DEMUX)

- Exemplo: **Demultiplexador 1:4**



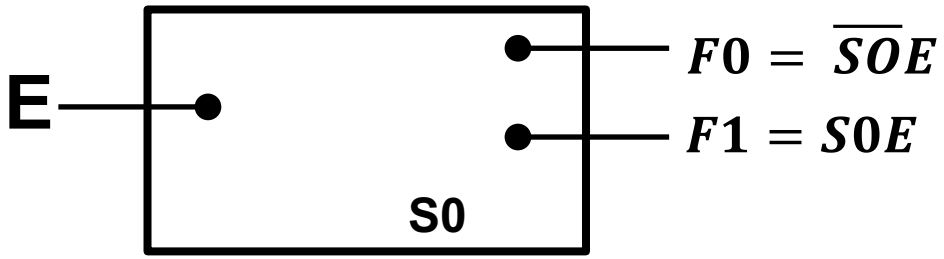
Demultiplexadores (DEMUX)

- Exemplo: **Demultiplexador 1:4**

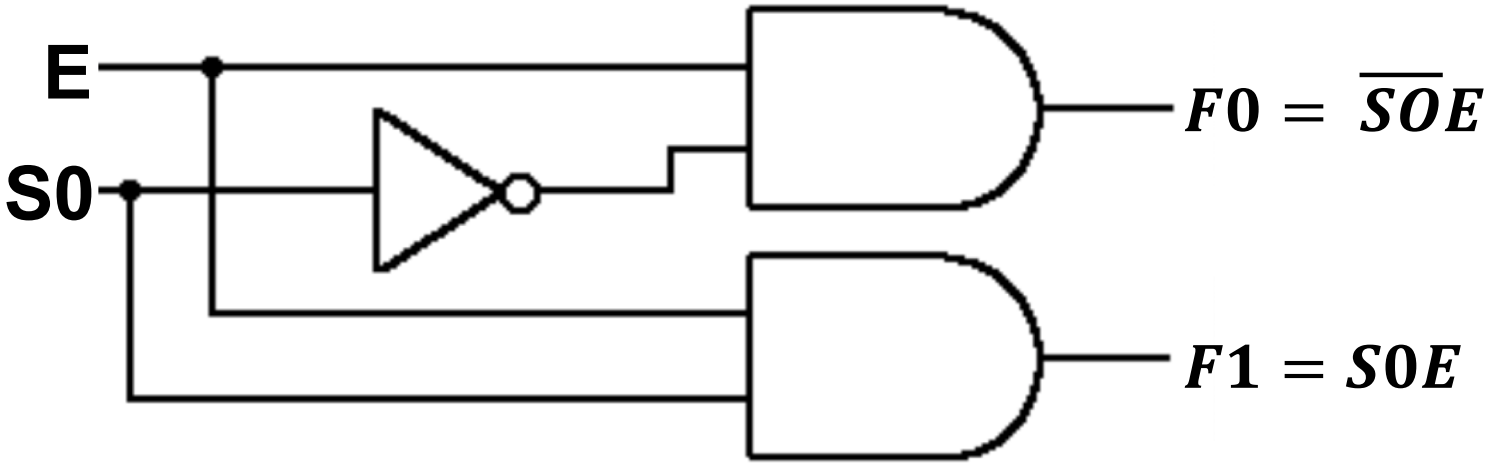


Demultiplexadores (DEMUX)

- **DEMUX 1:2**



S0	F1	F0
0	0	E
1	E	0



Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0	0	0	0	0
0	0	1	1	0	0	0

Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0	**0**	**0**	**0**	**0**
0	0	1	**1**	**0**	**0**	**0**
0	1	**0**	**0**	**0**	**0**	**0**
0	1	**1**	**0**	**1**	**0**	**0**

Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0	**0**	**0**	**0**	**0**
0	0	1	**1**	**0**	**0**	**0**
0	1	0	**0**	**0**	**0**	**0**
0	1	1	**0**	**1**	**0**	**0**
1	0	**0**	**0**	**0**	**0**	**0**
1	0	**1**	**0**	**0**	**1**	**0**

Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0	**0**	**0**	**0**	**0**
0	0	1	**1**	**0**	**0**	**0**
0	1	0	**0**	**0**	**0**	**0**
0	1	1	**0**	**1**	**0**	**0**
1	0	0	**0**	**0**	**0**	**0**
1	0	1	**0**	**0**	**1**	**0**
1	1	**0**	**0**	**0**	**0**	**0**
1	1	**1**	**0**	**0**	**0**	**1**

Demultiplexadores (DEMUX)

- **DEMUX 1:4**

S1	S0	E	F0	F1	F2	F3
0	0	0	**0**	**0**	**0**	**0**
0	0	1	**1**	**0**	**0**	**0**
0	1	0	**0**	**0**	**0**	**0**
0	1	1	**0**	**1**	**0**	**0**
1	0	0	**0**	**0**	**0**	**0**
1	0	1	**0**	**0**	**1**	**0**
1	1	0	**0**	**0**	**0**	**0**
1	1	1	**0**	**0**	**0**	**1**

$$F0 = \overline{S1}\,\overline{S0}E$$

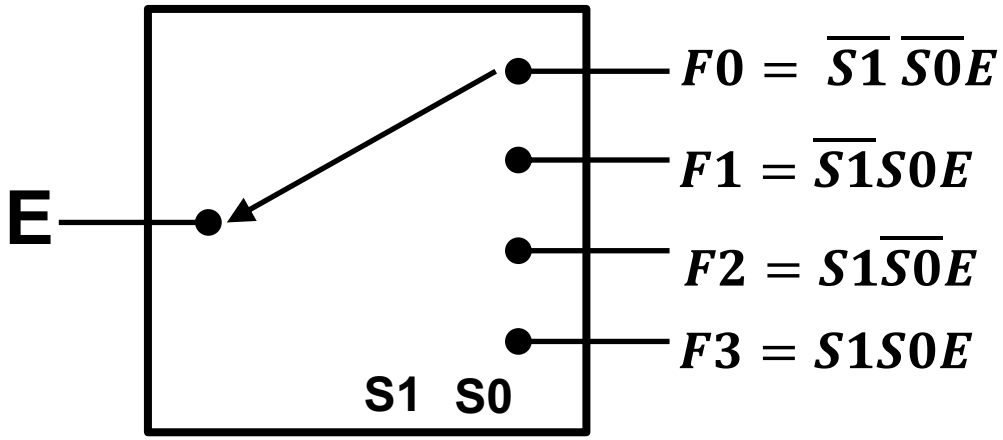
$$F1 = \overline{S1}S0E$$

$$F2 = S1\overline{S0}E$$

$$F3 = S1S0E$$

Demultiplexadores (DEMUX)

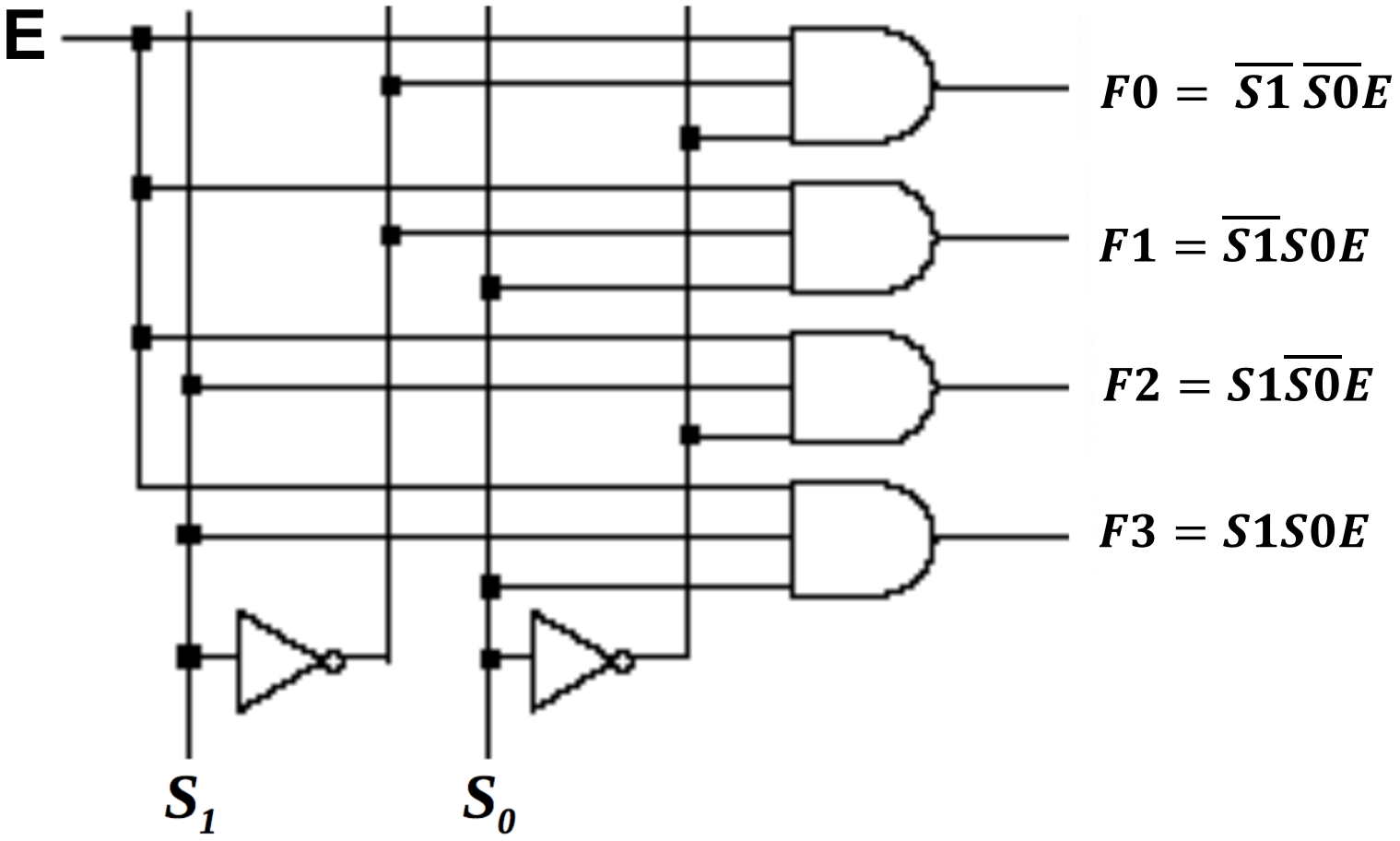
- **DEMUX 1:4**



S1	S0	F0	F1	F2	F3
0	0	**E**	**0**	**0**	**0**
0	1	**0**	**E**	**0**	**0**
1	0	**0**	**0**	**E**	**0**
1	1	**0**	**0**	**0**	**E**

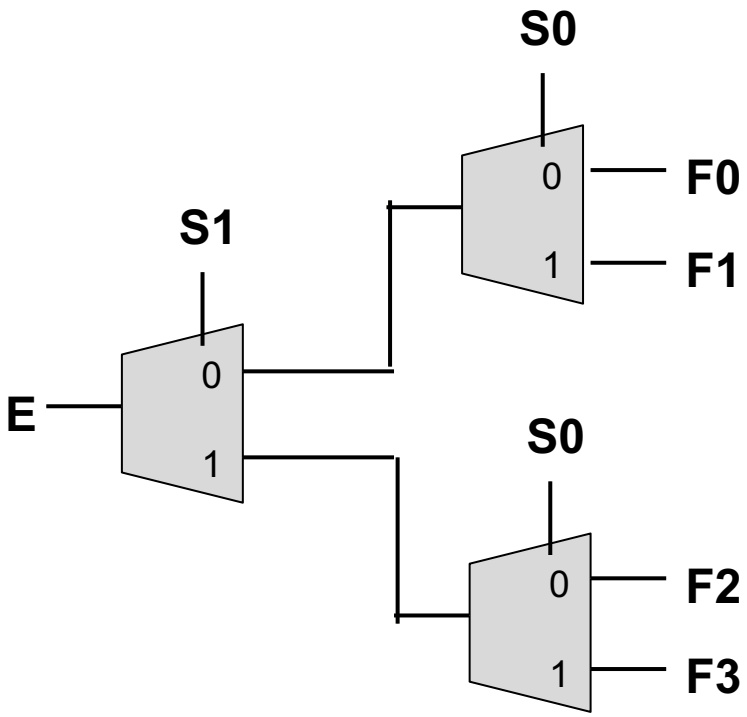
Demultiplexadores (DEMUX)

- **DEMUX 1:4**



Demultiplexadores (DEMUX)

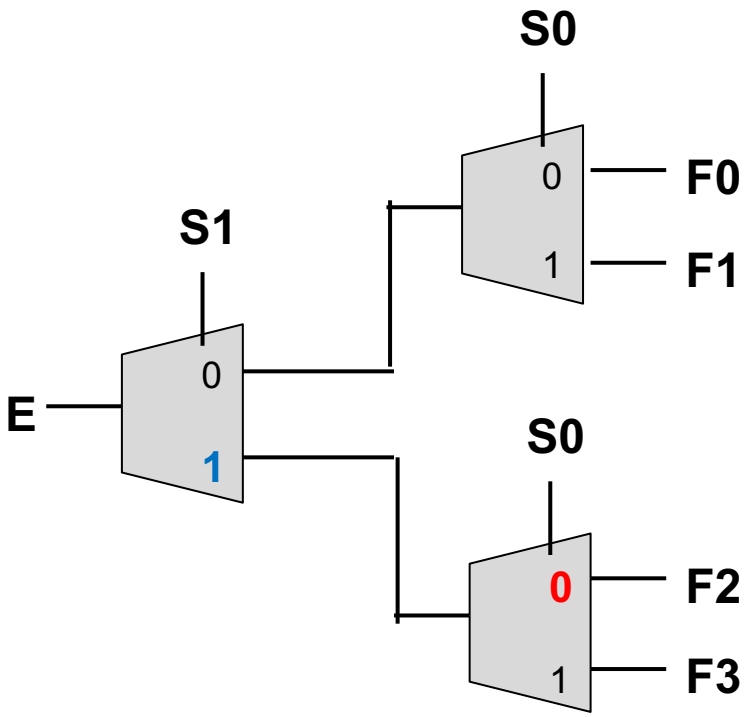
- **DEMUX 1:4 utlizando DEMUXES 1:2**



S1	S0	F0	F1	F2	F3
0	0	**E**	**0**	**0**	**0**
0	1	**0**	**E**	**0**	**0**
1	0	**0**	**0**	**E**	**0**
1	1	**0**	**0**	**0**	**E**

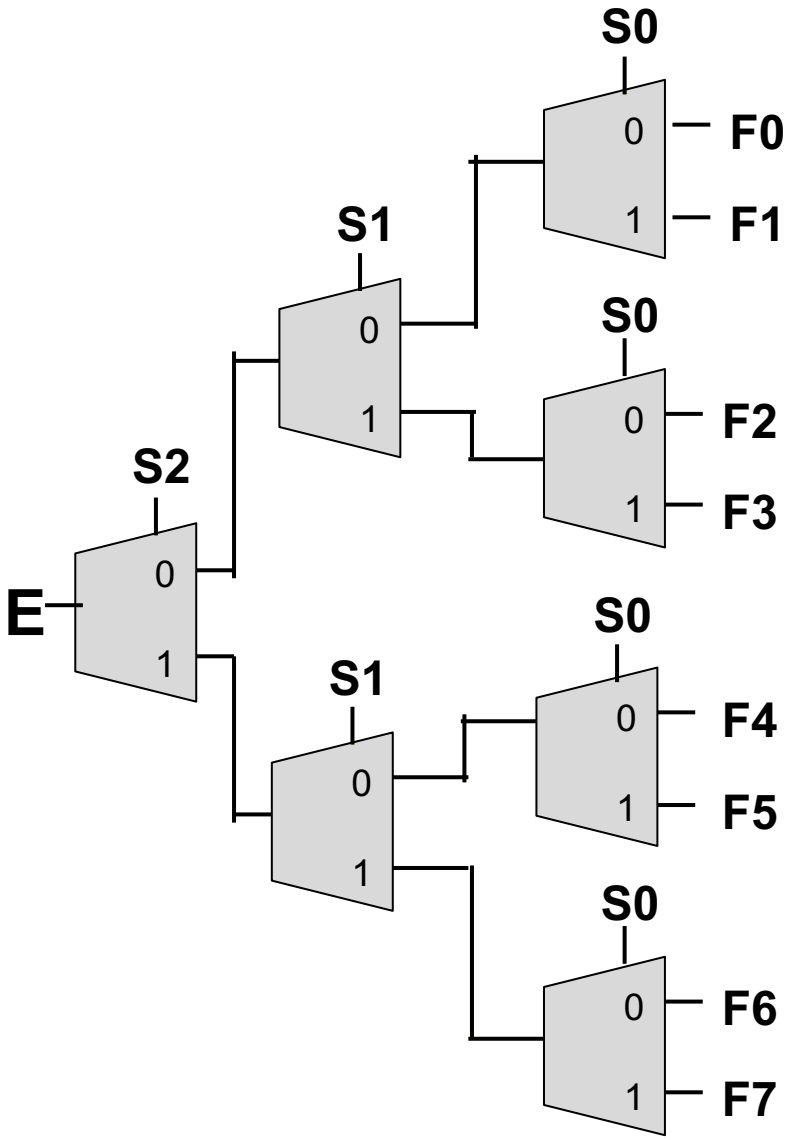
Demultiplexadores (DEMUX)

- **DEMUX 1:4 utlizando DEMUXES 1:2**



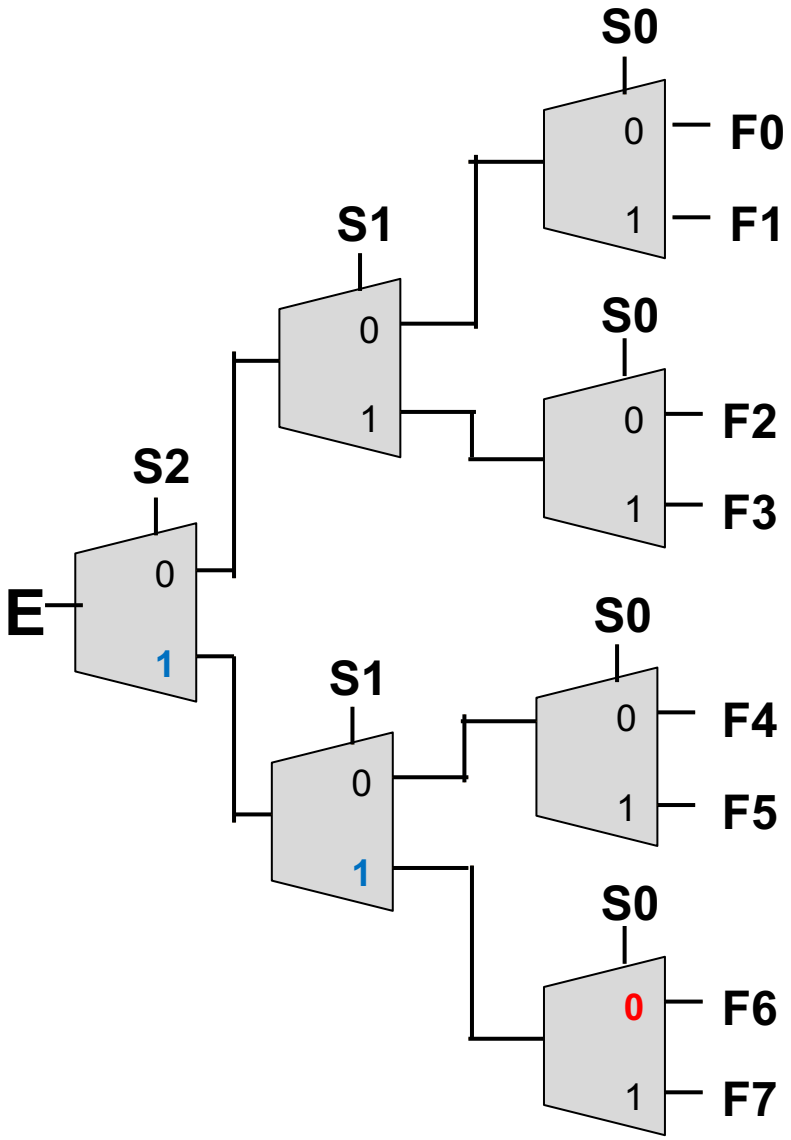
S1	S0	F0	F1	F2	F3
0	0	E	0	0	0
0	1	0	E	0	0
1	0	0	0	E	0
1	1	0	0	0	E

DEMUX 1:8 utlizando DEMUXES 1:2



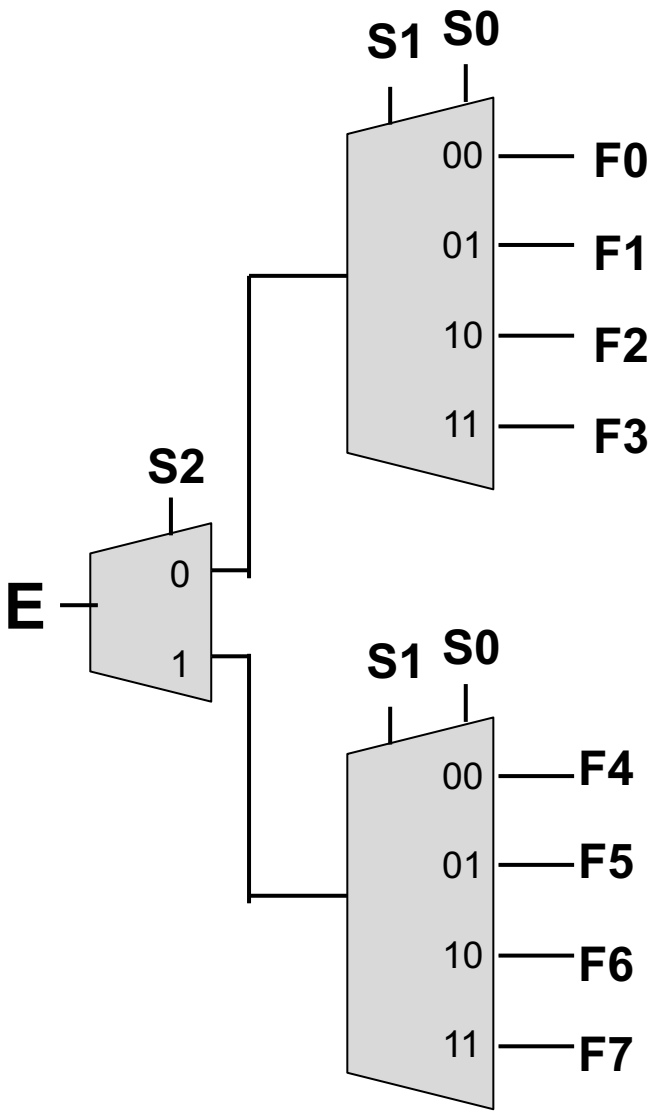
S2	S1	S0	F0	F1	F2	F3	F4	F5	F6	F7
0	0	0	**E**	0	0	0	0	0	0	0
0	0	1	0	**E**	0	0	0	0	0	0
0	1	0	0	0	**E**	0	0	0	0	0
0	1	1	0	0	0	**E**	0	0	0	0
1	0	0	0	0	0	0	**E**	0	0	0
1	0	1	0	0	0	0	0	**E**	0	0
1	1	0	0	0	0	0	0	0	**E**	0
1	1	1	0	0	0	0	0	0	0	**E**

DEMUX 1:8 utlizando DEMUXES 1:2



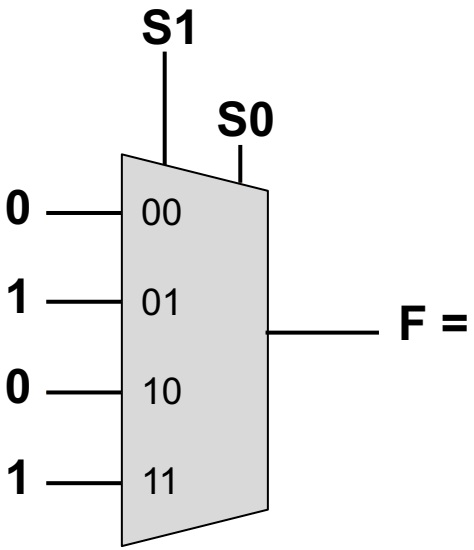
S2	S1	S0	F0	F1	F2	F3	F4	F5	F6	F7
0	0	0	**E**	0	0	0	0	0	0	0
0	0	1	0	**E**	0	0	0	0	0	0
0	1	0	0	0	**E**	0	0	0	0	0
0	1	1	0	0	0	**E**	0	0	0	0
1	0	0	0	0	0	0	**E**	0	0	0
1	0	1	0	0	0	0	0	**E**	0	0
1	**1**	**0**	0	0	0	0	0	0	**E**	0
1	1	1	0	0	0	0	0	0	0	**E**

DEMUX 1:8 com DEMUXES 1:4 e 1:2

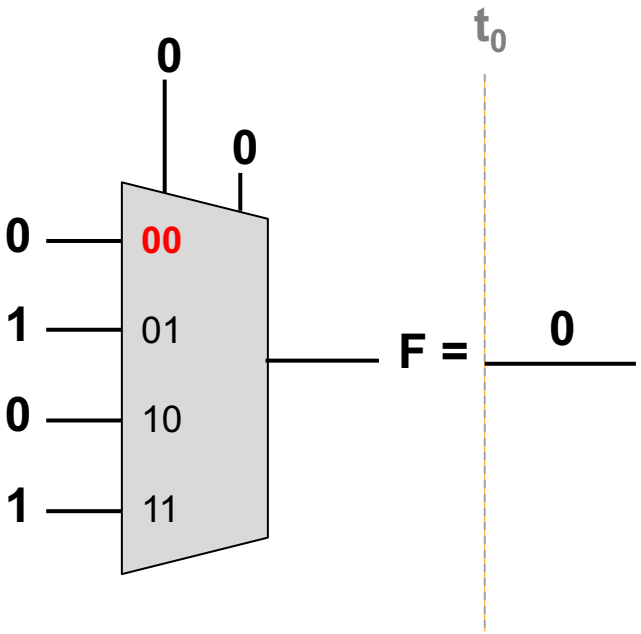


S2	S1	S0	F0	F1	F2	F3	F4	F5	F6	F7
0	0	0	**E**	0	0	0	0	0	0	0
0	0	1	0	**E**	0	0	0	0	0	0
0	1	0	0	0	**E**	0	0	0	0	0
0	1	1	0	0	0	**E**	0	0	0	0
1	0	0	0	0	0	0	**E**	0	0	0
1	0	1	0	0	0	0	0	**E**	0	0
1	1	0	0	0	0	0	0	0	**E**	0
1	1	1	0	0	0	0	0	0	0	**E**

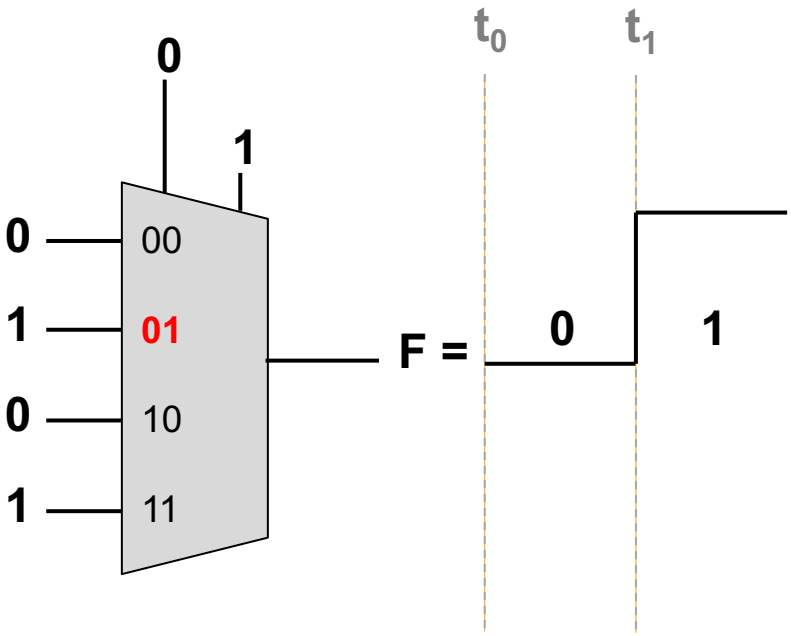
MUX - Paralelo para Serial



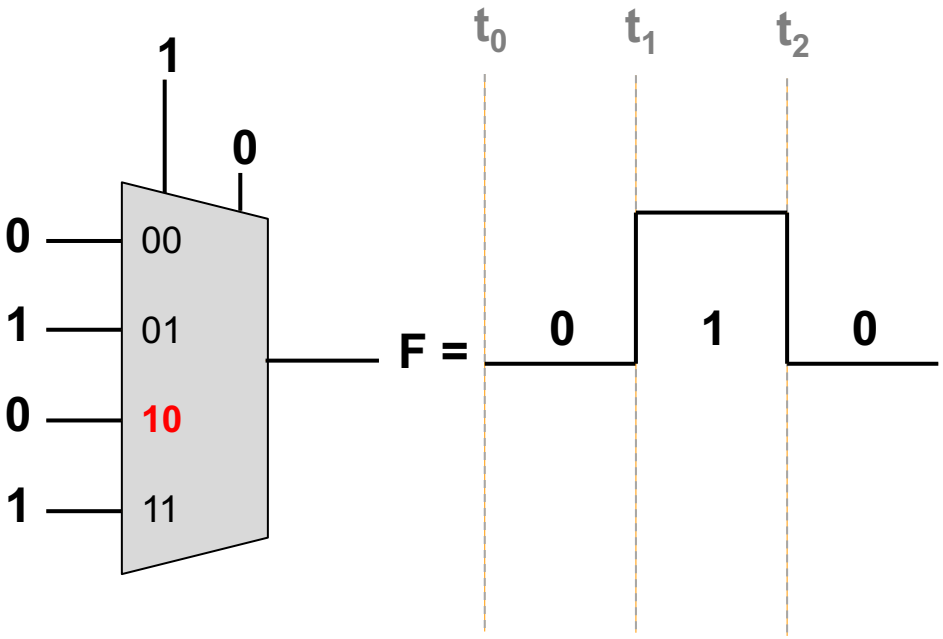
MUX - Paralelo para Serial



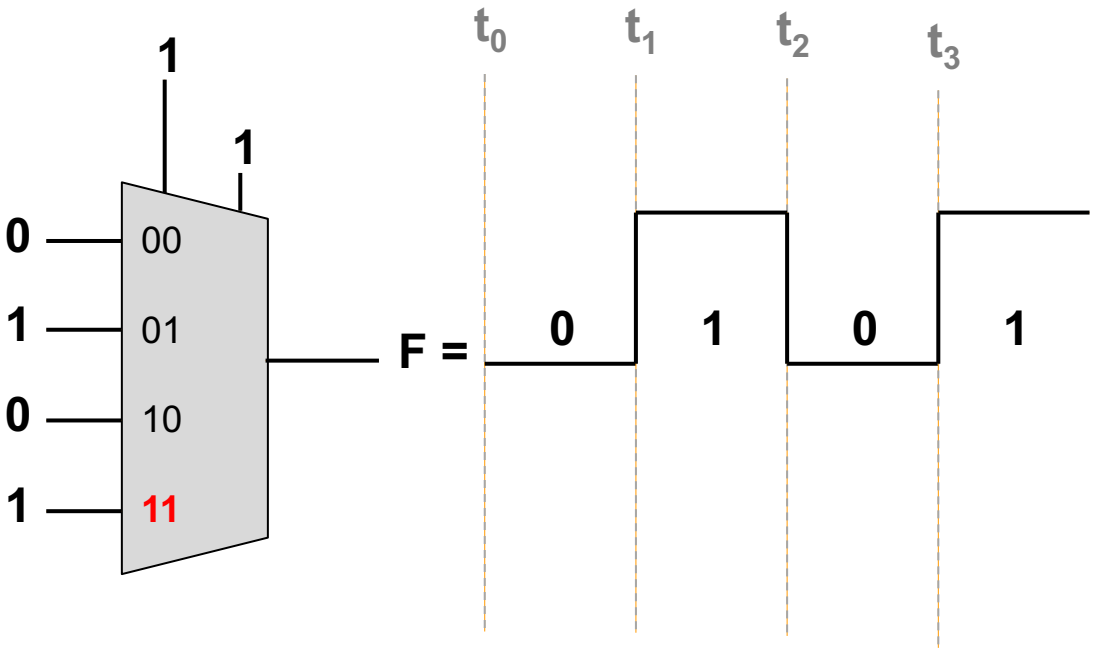
MUX - Paralelo para Serial



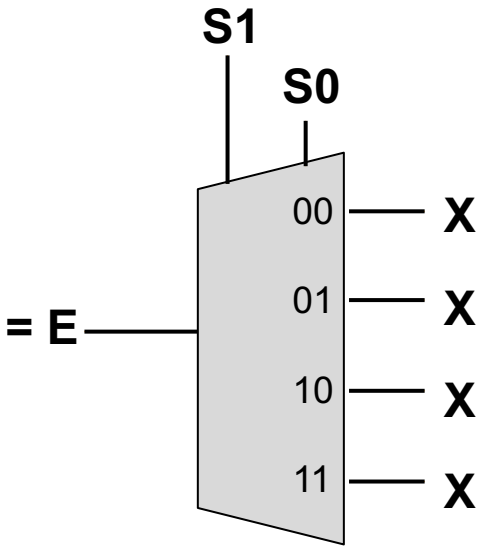
MUX - Paralelo para Serial



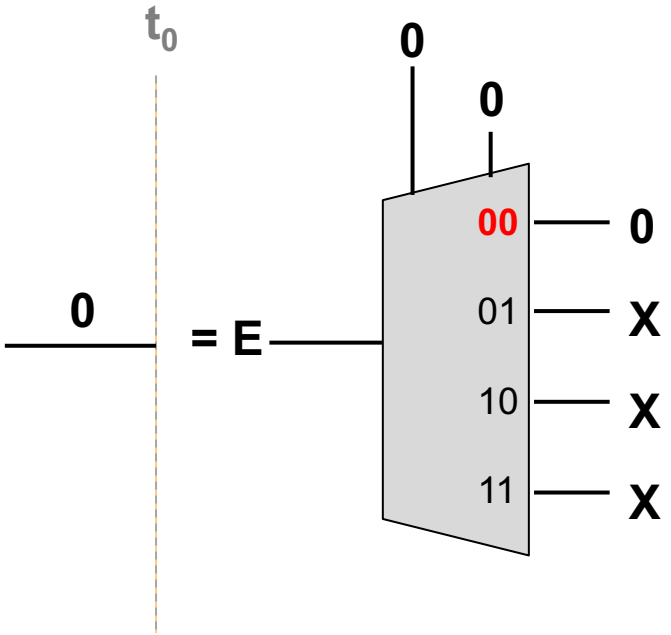
MUX - Paralelo para Serial



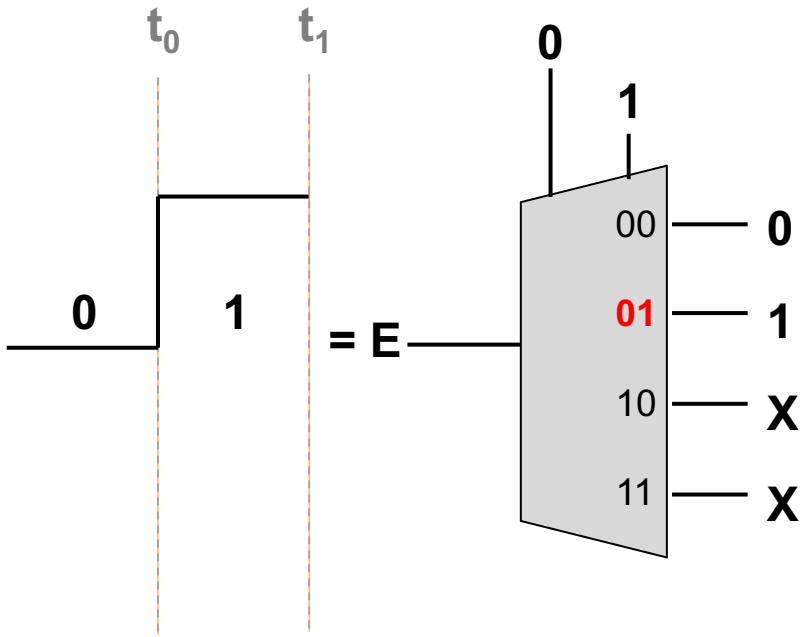
DEMUX – Serial para Paralelo



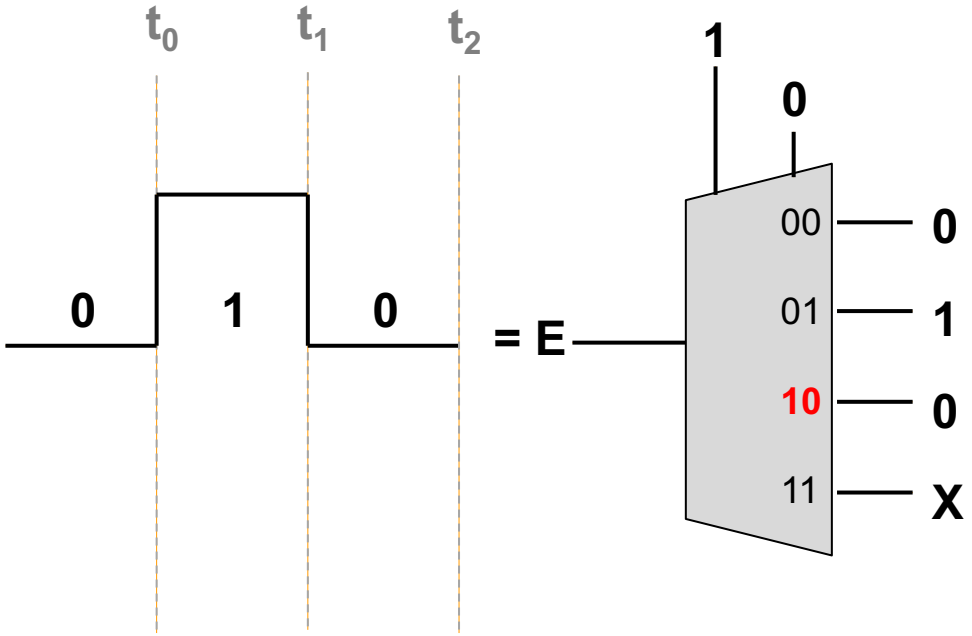
DEMUX – Serial para Paralelo



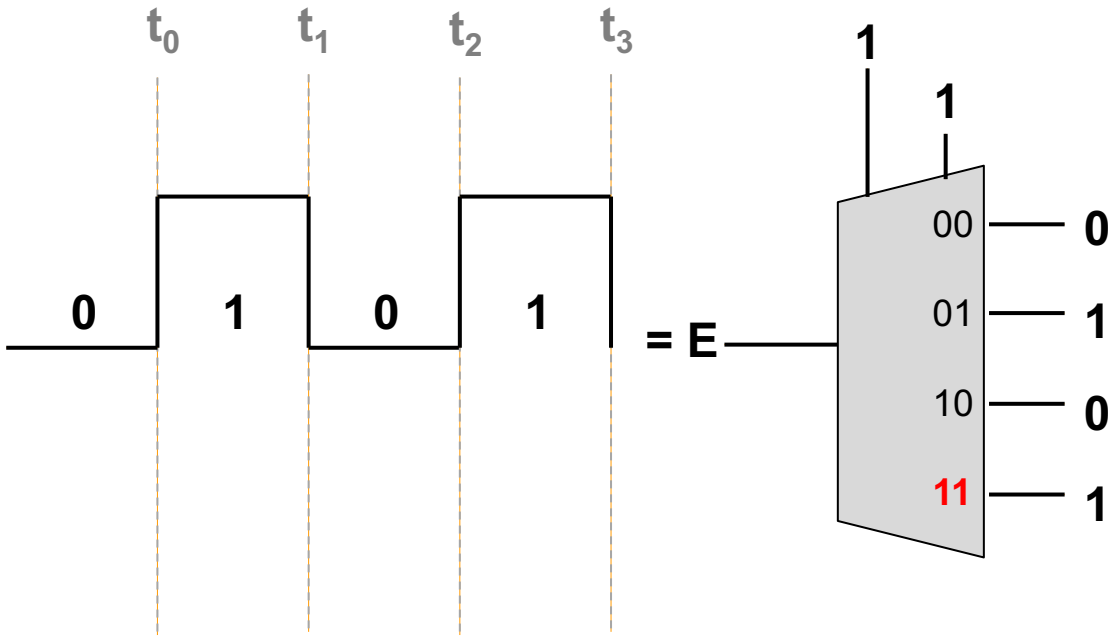
DEMUX – Serial para Paralelo



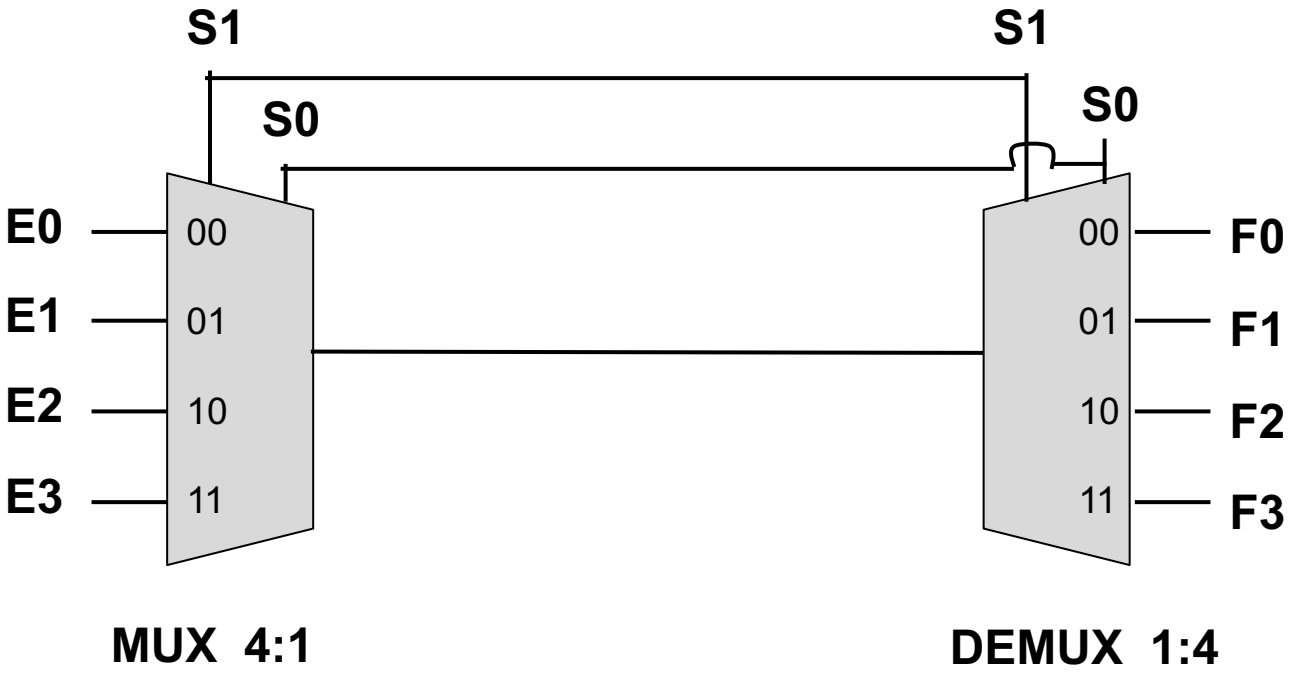
DEMUX – Serial para Paralelo



DEMUX – Serial para Paralelo

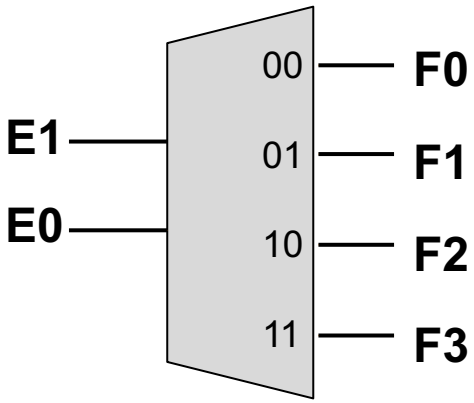


Exemplo: Transmissão de dados



Decodificadores e DEMUXEs

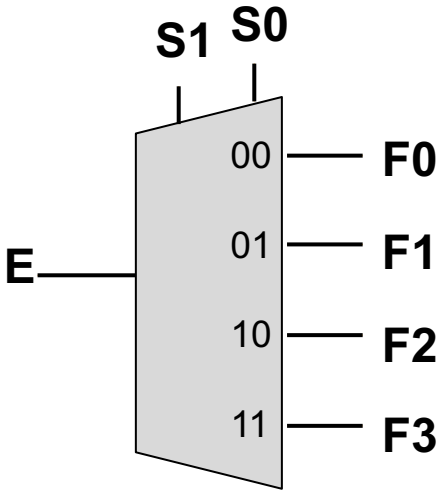
DECODIFICADOR



E1	E0	F0	F1	F2	F3
0	0	**1**	**0**	**0**	**0**
0	1	**0**	**1**	**0**	**0**
1	0	**0**	**0**	**1**	**0**
1	1	**0**	**0**	**0**	**1**

$$F0 = \overline{E1}\,\overline{E0}$$
$$F1 = \overline{E1}\,E0$$
$$F2 = E1\overline{E0}$$
$$F3 = E1E0$$

DEMULTIPLEXADOR

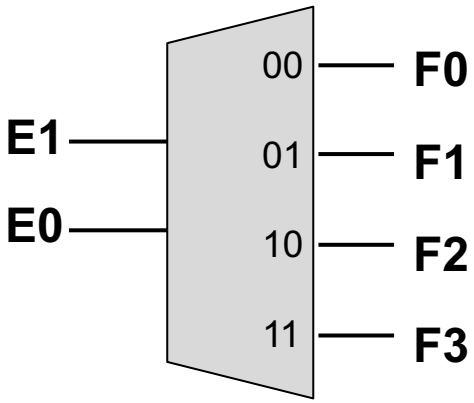


S1	S0	F0	F1	F2	F3
0	0	**E**	**0**	**0**	**0**
0	1	**0**	**E**	**0**	**0**
1	0	**0**	**0**	**E**	**0**
1	1	**0**	**0**	**0**	**E**

$$F0 = \overline{S1}\,\overline{S0}E$$
$$F1 = \overline{S1}S0E$$
$$F2 = S1\overline{S0}E$$
$$F3 = S1S0E$$

Decodificadores e DEMUXEs

DECODIFICADOR



E1	E0	F0	F1	F2	F3
0	0	**1**	**0**	**0**	**0**
0	1	**0**	**1**	**0**	**0**
1	0	**0**	**0**	**1**	**0**
1	1	**0**	**0**	**0**	**1**

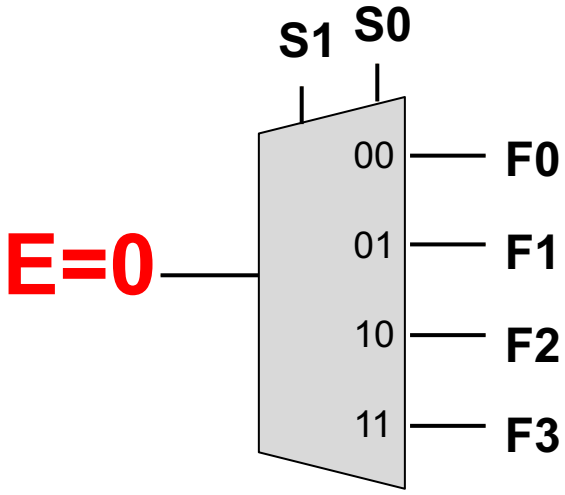
$$F0 = \overline{E1}\,\overline{E0}$$

$$F1 = \overline{E1}\,E0$$

$$F2 = E1\overline{E0}$$

$$F3 = E1E0$$

DEMULTIPLEXADOR



S1	S0	F0	F1	F2	F3
0	0	**0**	**0**	**0**	**0**
0	1	**0**	**0**	**0**	**0**
1	0	**0**	**0**	**0**	**0**
1	1	**0**	**0**	**0**	**0**

$$F0 = 0$$

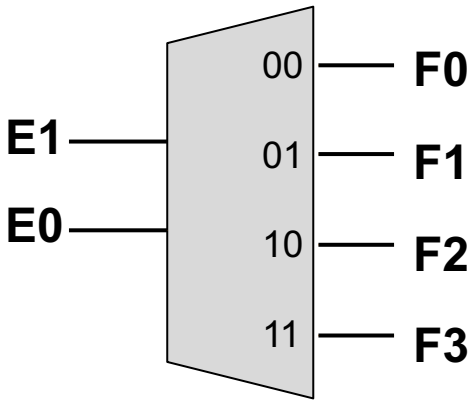
$$F1 = 0$$

$$F2 = 0$$

$$F3 = 0$$

Decodificadores e DEMUXEs

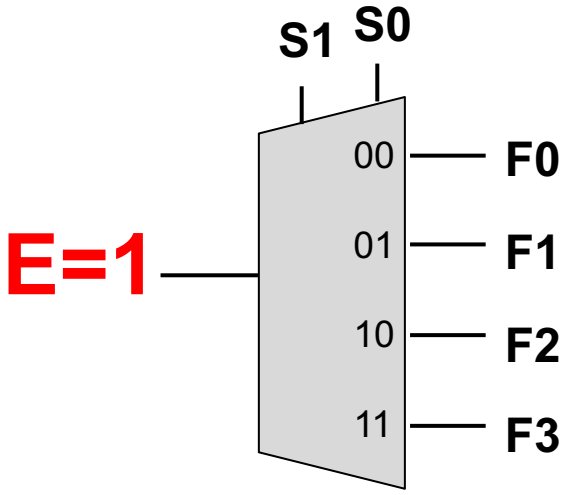
DECODIFICADOR



E1	E0	F0	F1	F2	F3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

$$F0 = \overline{E1}\,\overline{E0}$$
$$F1 = \overline{E1}\,E0$$
$$F2 = E1\overline{E0}$$
$$F3 = E1E0$$

DEMULTIPLEXADOR



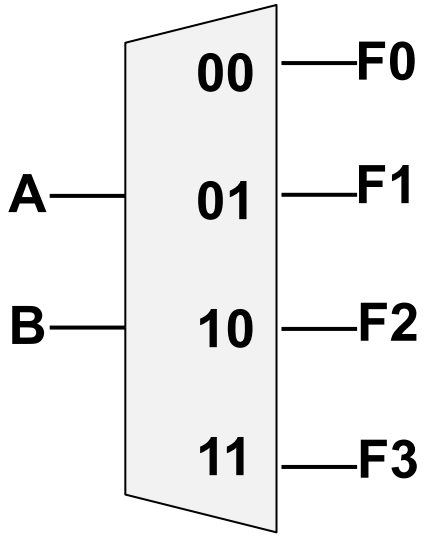
S1	S0	F0	F1	F2	F3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

$$F0 = \overline{S1}\,\overline{S0}$$
$$F1 = \overline{S1}S0$$
$$F2 = S1\overline{S0}$$
$$F3 = S1S0$$

Funções booleanas com DECOD

- **EXEMPLO:** $F(A,B) = \sum m(1,3)$

A	B	F
0	0	**0**
0	1	**1**
1	0	**0**
1	1	**1**

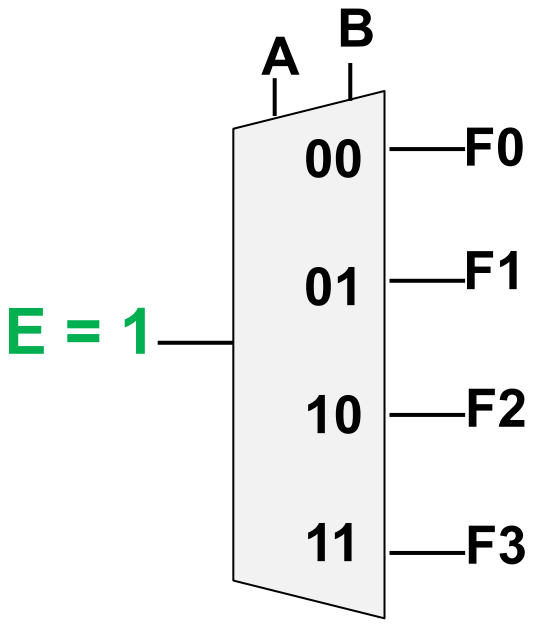


$$F(A,B) = F1 + F3$$

Funções booleanas com DEMUX

- **EXEMPLO:** $F(A,B) = \sum m(1,3)$

A	B	F
0	0	**0**
0	1	**1**
1	0	**0**
1	1	**1**



$$F(A,B) = F1 + F3$$

Exercício 4 – DEMUX 1:4 + MUX 4:1

- **EXEMPLO:** $F(A,B,C,D) = \sum m(2,4,5,10,11,12,14,15)$

A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1