Data Selectors
$\left\{\begin{array}{c} S_0 \\ S_1 \end{array}\right.$

1×1 multiplexer

y data output

Data Inputs
$\left\{\begin{array}{c} D_0 \\ D_1 \\ D_2 \\ D_3 \end{array}\right.$

	S_1	S_0	y
(0)	0	0	D_0
(1)	0	1	D_1
(2)	1	0	D_2
(3)	1	1	D_3

$$y = D_0 \overline{S_1} \overline{S_0} + D_1 \overline{S_1} S_0 + D_2 S_1 \overline{S_0} + D_3 S_1 S_0$$

De-Multiplexer is a combinational circuit that performs the reverse operation of Multiplexer. It has single input, 'n' selection lines and maximum of 2^n output lines. The input will be connected to one of these outputs based on the values of selection lines.

S_1
S_0

1×4 De multiplexer

D_3
D_2
D_1
D_0

I

Data input	S_1	S_0	D_3	D_2	D_1	D_0
I	0	0	0	0	0	I
I	0	1	0	0	I	0
I	1	0	0	I	0	0
I	1	1	I	0	0	0

$$D_0 = I \,\overline{S_1}\,\overline{S_0}$$
$$D_1 = I\,\overline{S_1}\,S_0$$
$$D_2 = I\,S_1\,\overline{S_0}$$
$$D_3 = I\,S_1\,S_0$$

Data in: $1, 1, 0, 1, 0, 0, 1, 1$

$S_0 = 0, 1, 0, 1, 0, 1, 0, 1$

$S_1 = 0, 0, 1, 1, 0, 0, 1, 1$

D_0 ⎍‾‾‾‾‾‾‾‾‾‾

D_1 _‾|_____

D_2 _____

D_3 _⎍_⎍__⎍_