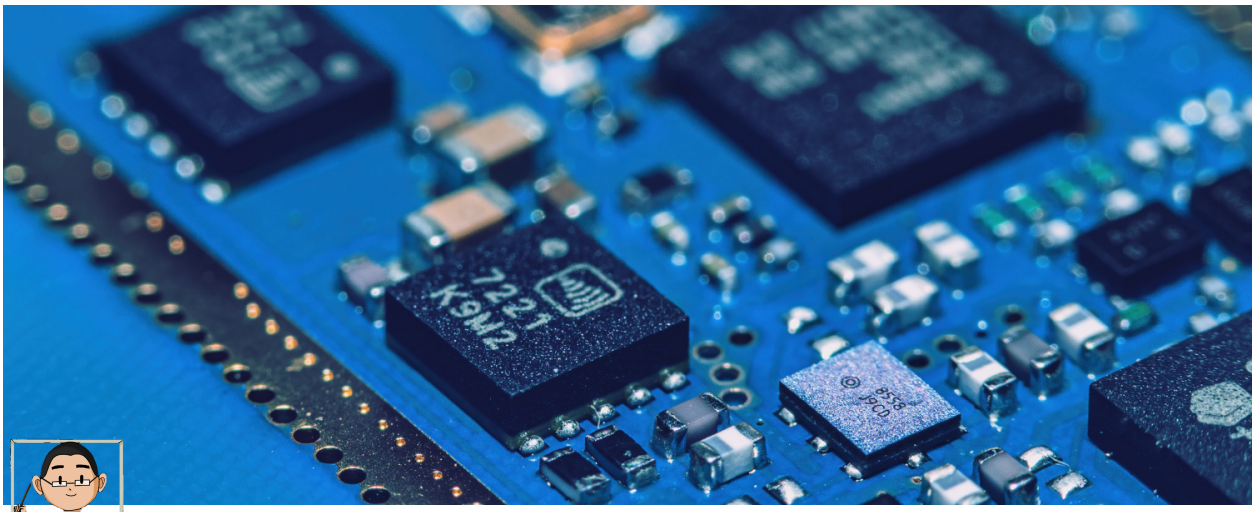


組合電路 (Combinational Circuits) 1

Notes | done

參考資料

- Fundamentals of Digital Logic With Verilog Design (2013/02/12), Brown, Stephen/ Vranesic, Zvonko

數位系統設計概論 I

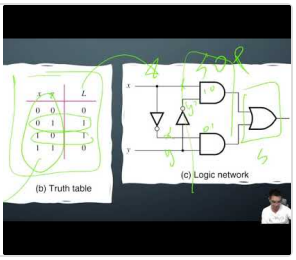
數位系統設計實務 (2020 Spring)

https://youtu.be/Q4cjOd8d1jY

數位系統設計概論 II

數位系統設計實務 (2020 Spring)

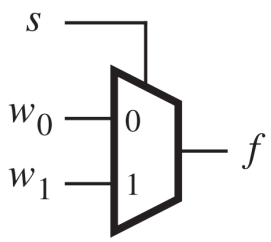
https://youtu.be/MZTLEU8LAhE



課程設計

2-to-1 Multiplexers (Mux)

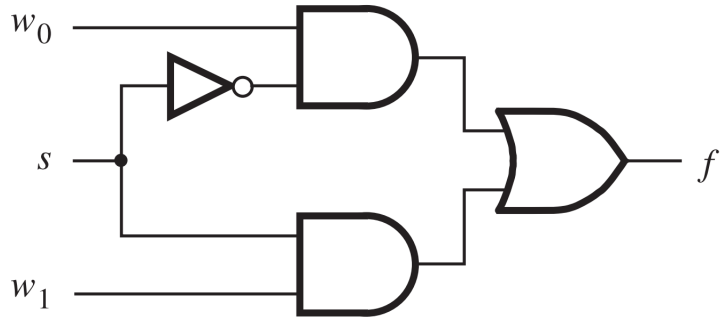
Brown, Stephen/ Vranesic, Zvonko p.190



(a) Graphical symbol

s	f
0	w_0
1	w_1

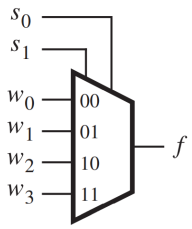
(b) Truth table



(c) Sum-of-products circuit

4-to-1 Multiplexers (Mux)

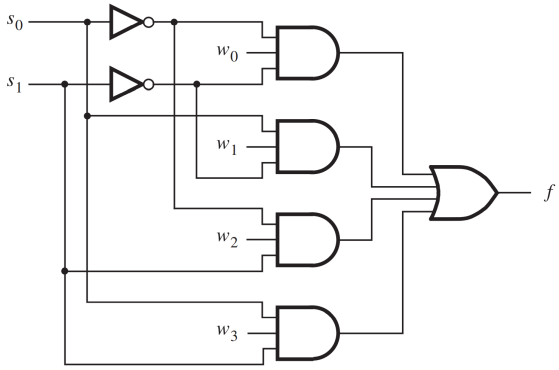
Brown, Stephen/ Vranesic, Zvonko pp.191、192



(a) Graphical symbol

s_1	s_0	f
0	0	w_0
0	1	w_1
1	0	w_2
1	1	w_3

(b) Truth table



(c) Circuit

Figure 4.2 A 4-to-1 multiplexer.

$$f = \bar{s}_1\bar{s}_0w_0 + \bar{s}_1s_0w_1 + s_1\bar{s}_0w_2 + s_1s_0w_3$$

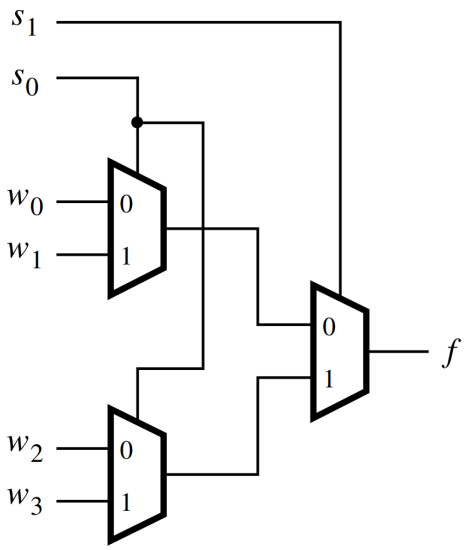
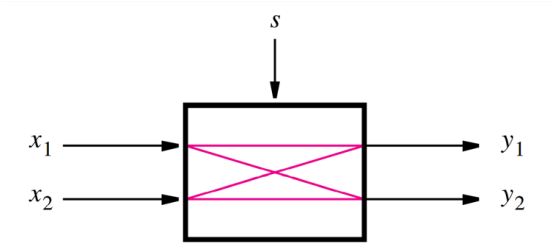


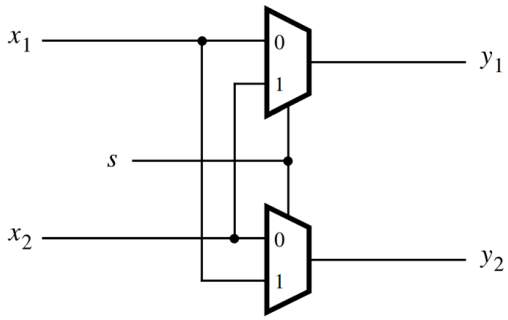
Figure 4.3 Using 2-to-1 multiplexers to build a 4-to-1 multiplexer.

A 2x2 Crossbar Switch

> Brown, Stephen/ Vranesic, Zvonko p.193



(a) A 2x2 crossbar switch



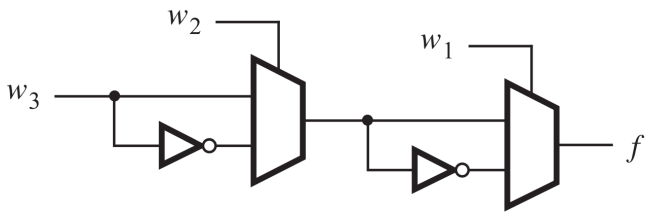
(b) Implementation using multiplexers

3-input XOR Implemented with 2-to-1 Mux

> Brown, Stephen/ Vranesic, Zvonko p.196

w_1	w_2	w_3	f	
0	0	0	0	$w_2 \oplus w_3$
0	0	1	1	
0	1	0	1	
0	1	1	0	
1	0	0	1	$\overline{w_2 \oplus w_3}$
1	0	1	0	
1	1	0	0	
1	1	1	1	

(a) Truth table



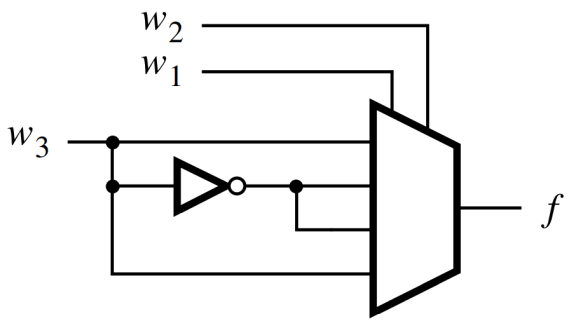
(b) Circuit

3-input XOR Implemented with 4-to-1 Mux

> Brown, Stephen/ Vranesic, Zvonko p.196

w_1	w_2	w_3	f	
0	0	0	0	w_3
0	0	1	1	
0	1	0	1	$\overline{w}_3$
0	1	1	0	
1	0	0	1	$\overline{w}_3$
1	0	1	0	
1	1	0	0	w_3
1	1	1	1	

(a) Truth table



(b) Circuit