디지털 하드웨어의 구현 p.280

이제까지 조합회로와 순차회로의 기초지식을 공부했다.

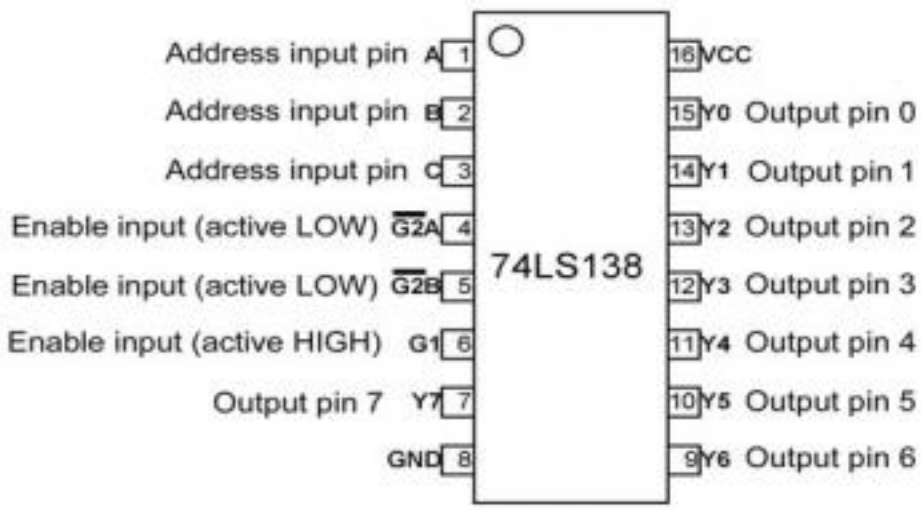
이장에서는 CMOS 기술의 논리 게이트 동작을 이해하자.

1

1

IC (Integrated Circuit) p.281

- IC (chip)
  - 실리콘 반도체 결정판
  - the digital gates and storage elements, 내부연결 포함
  - 외부 연결 핀



3X8 decoder

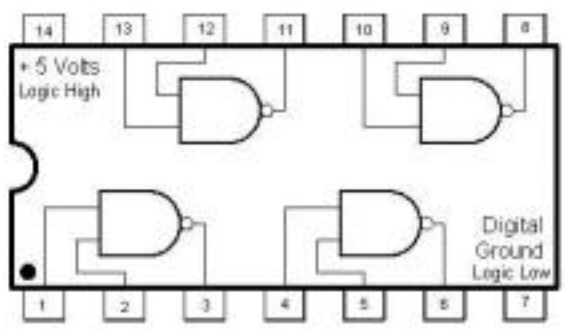
2

2

IC (Integrated Circuit) p.281

- IC (chip)
  - 실리콘 반도체 결정판
  - the digital gates and storage elements, 내부연결 포함
  - 외부 연결 핀

NAND gate(4개)

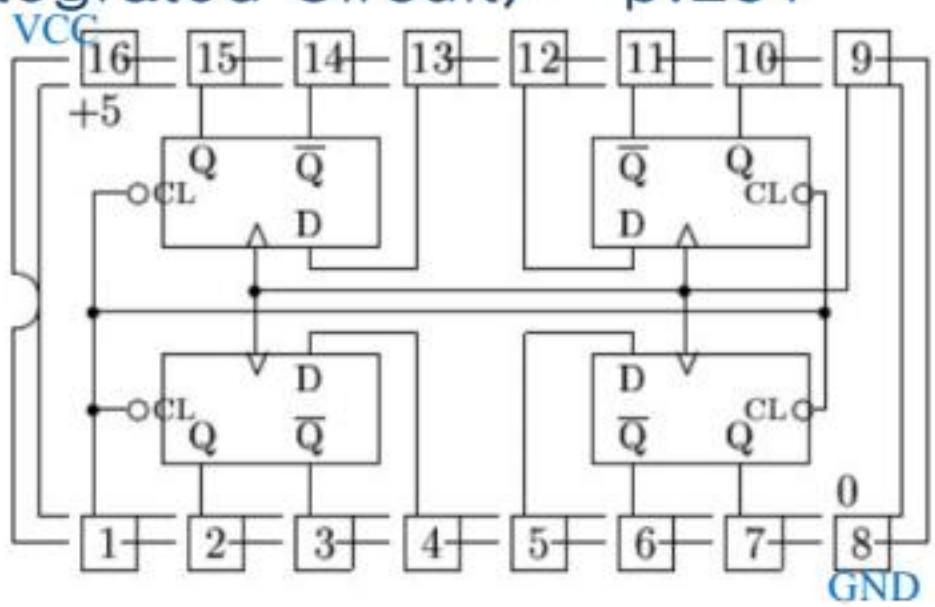


3

3

IC (Integrated Circuit) p.281

- IC (chip)

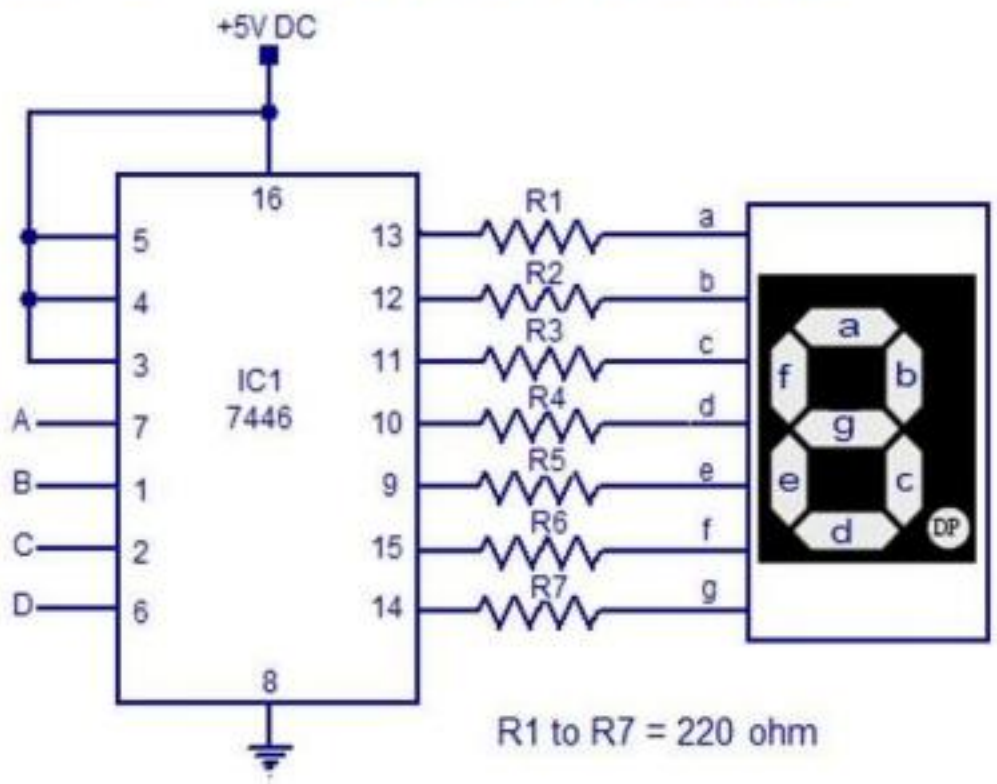


LS175 : Quad D positive-edge-triggered flipflops. 20ns

4

4

BCD ➔ 7 segment decoder



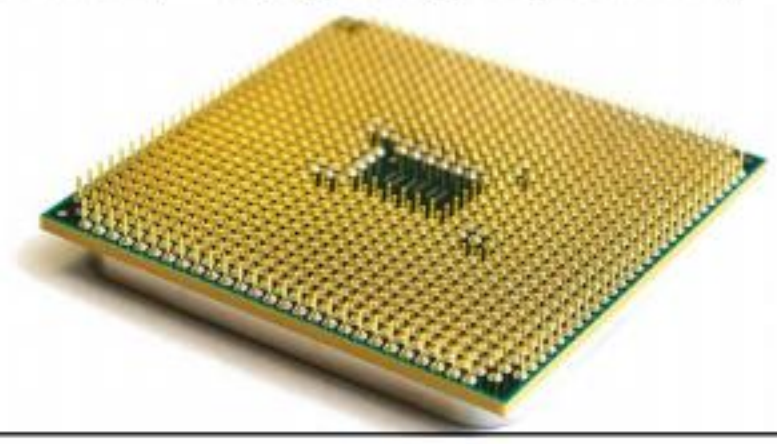
R1 to R7 = 220 ohm

5

5

IC (Integrated Circuit) p.281

- Terminology – 집적도에 따른 분류
  - SSI (small-scale integrated) – fewer than 10 gates
  - MSI (medium-scale integrated) – 10 to 100 gates
  - LSI (large-scale integrated) – 100 to thousands of gates
  - VLSI (very large-scale integrated) – thousands to 100s of millions of gates
    - ex) Microprocessor, DSP(digital signal processor)



6

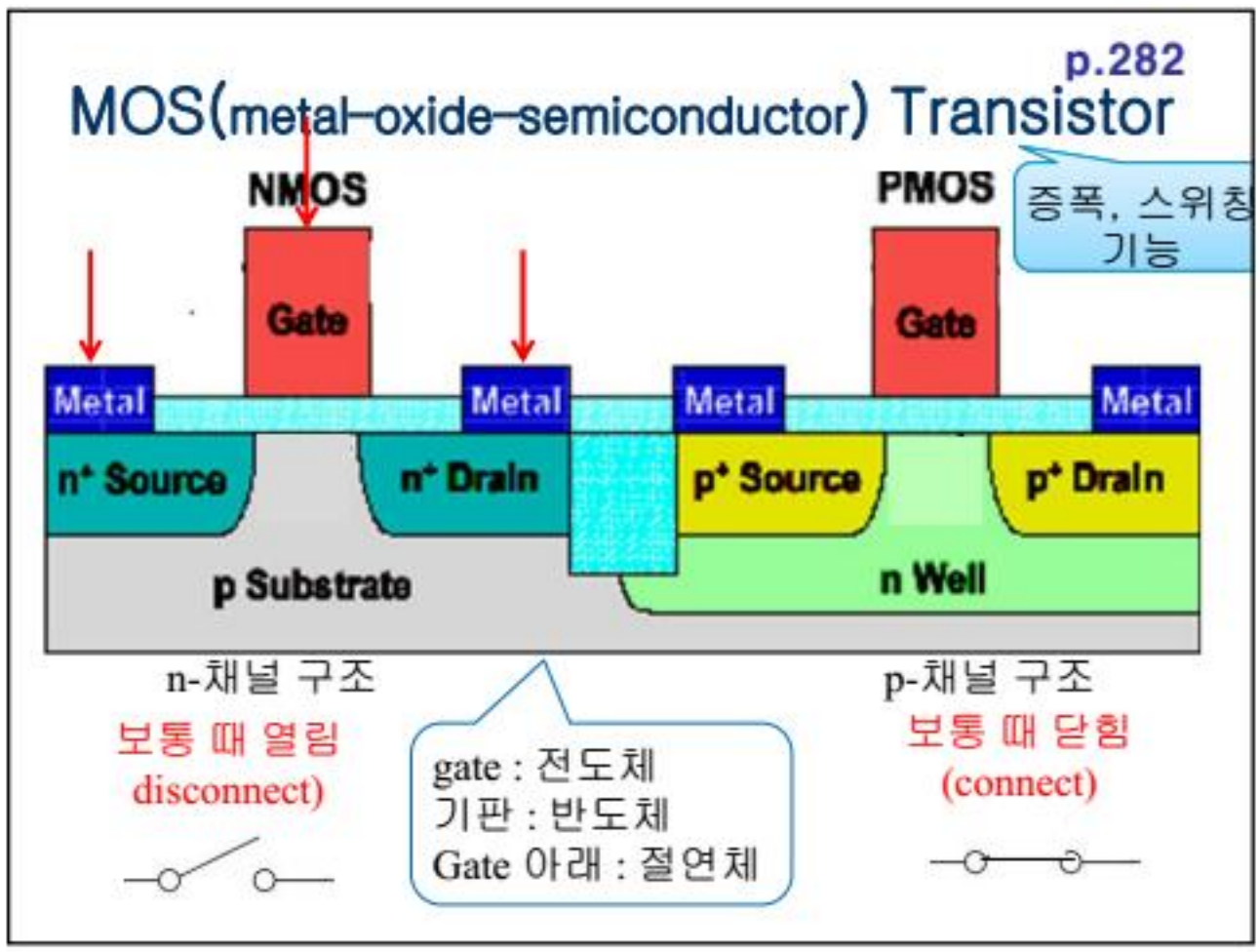
6

CMOS 회로기술 p.282

- 반도체
  - 첨가물질에 따라 전도체/부도체가 될 수 있다.
  - 이를 이용한 Transistor의 개발 : 증폭, 스위칭 기능
- CMOS : Complementary metal-oxide-semiconductor
  - 고집적, 고성능, 저소비전력을 구현하는 기술
  - MOS(metal-oxide-semiconductor)
    - 반도체의 특징을 이용한 회로를 구성하는 기술
    - metal : 전도성 영역
    - oxide : 절연체
    - Semiconductor : 반도체 – 조작에 따라 전도체가 될 수 있다.

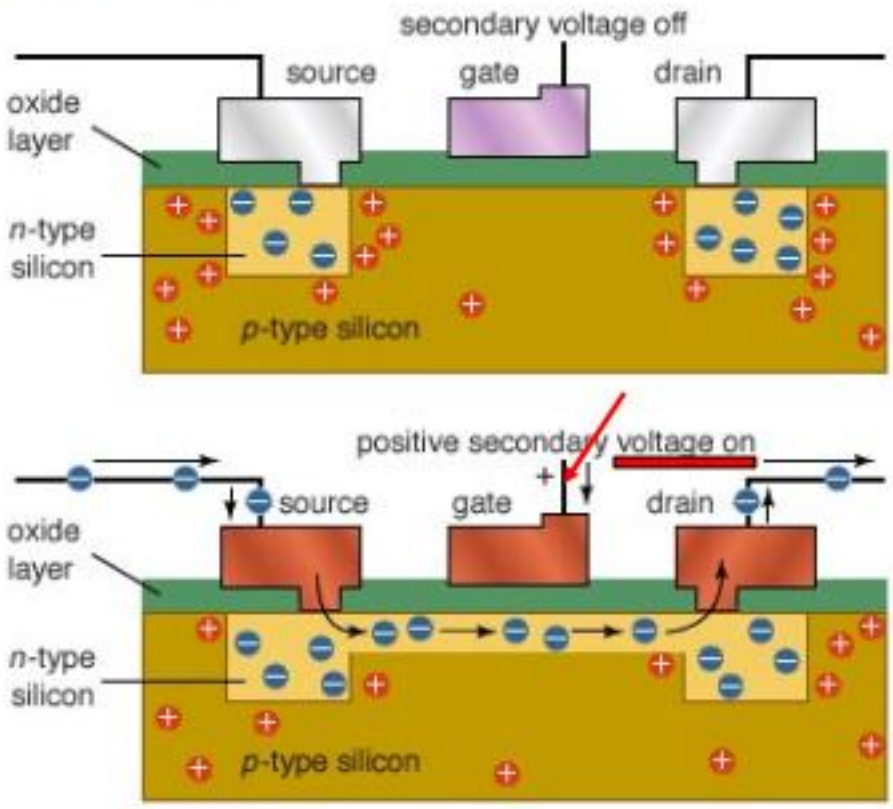
7

7



8

n-채널 구조

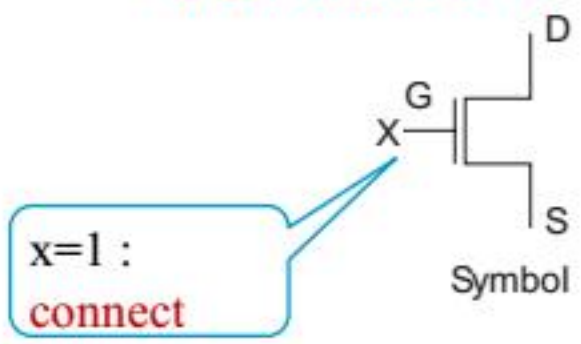


9

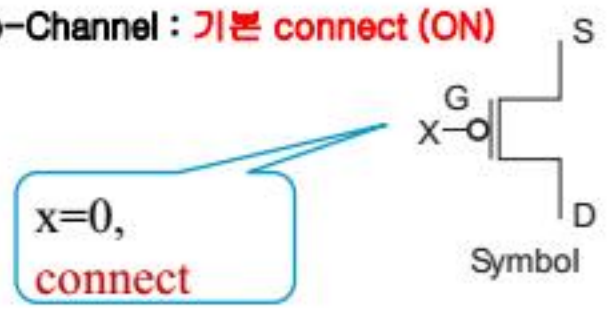
9

Switch Models for MOS Transistors p.282

- n-Channel : 기본 disconnect(OFF)



- p-Channel : 기본 connect (ON)



10

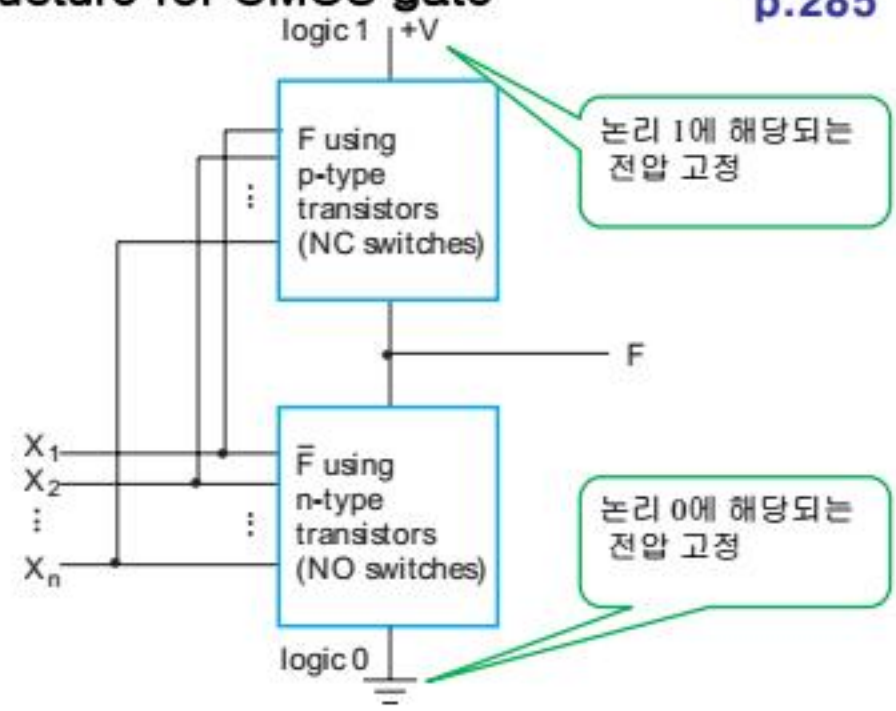
10

보완적인, 상보성

CMOS(Complementary metal-oxide-semiconductor) Circuit

- Circuit structure for CMOS gate

p.285

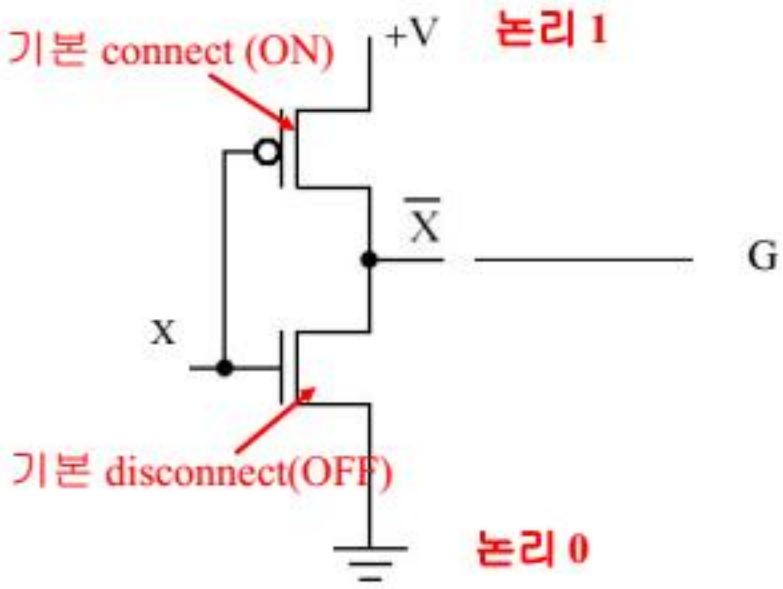


General Structure

11

NOT gate of CMOS Circuit

p.285



X	G
0	
1	

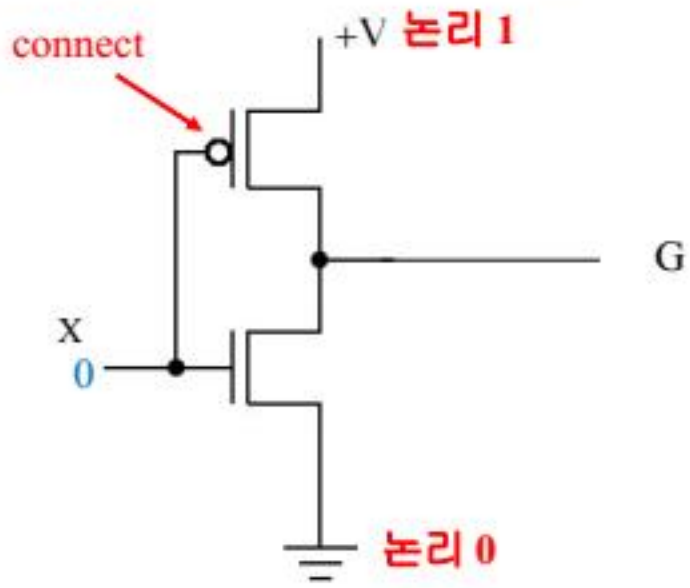
(d) NOT

12

12

NOT gate of CMOS Circuit

p.285



X	G
0	1
1	

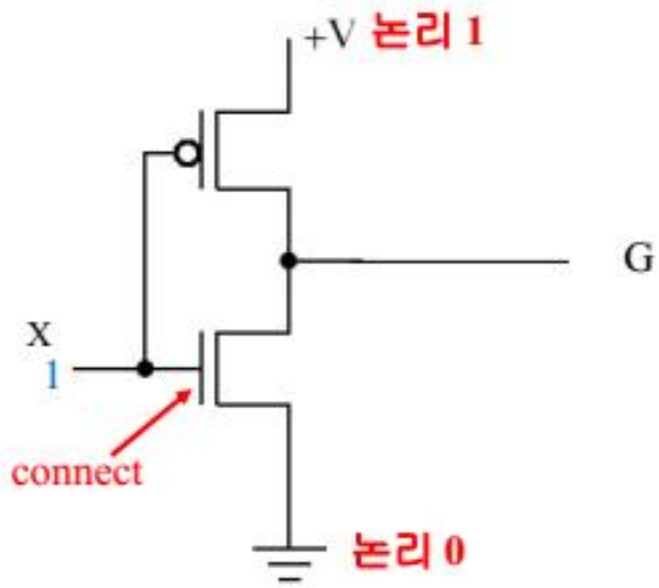
(d) NOT

13

13

NOT gate of CMOS Circuit

p.285



X	G
0	
1	0

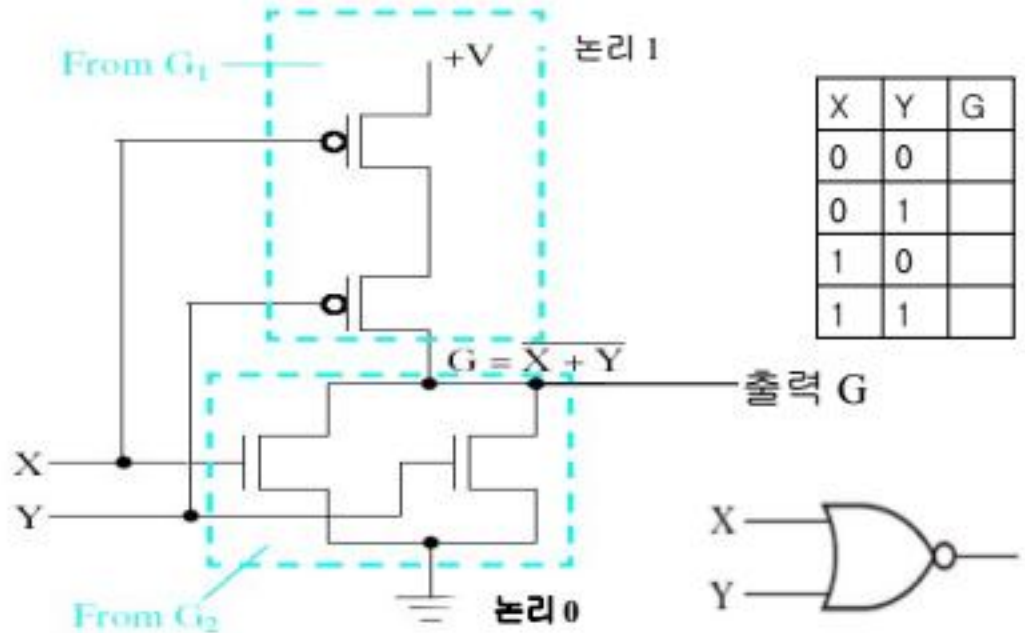
(d) NOT

14

14

p.285

NOR gate of CMOS Circuit



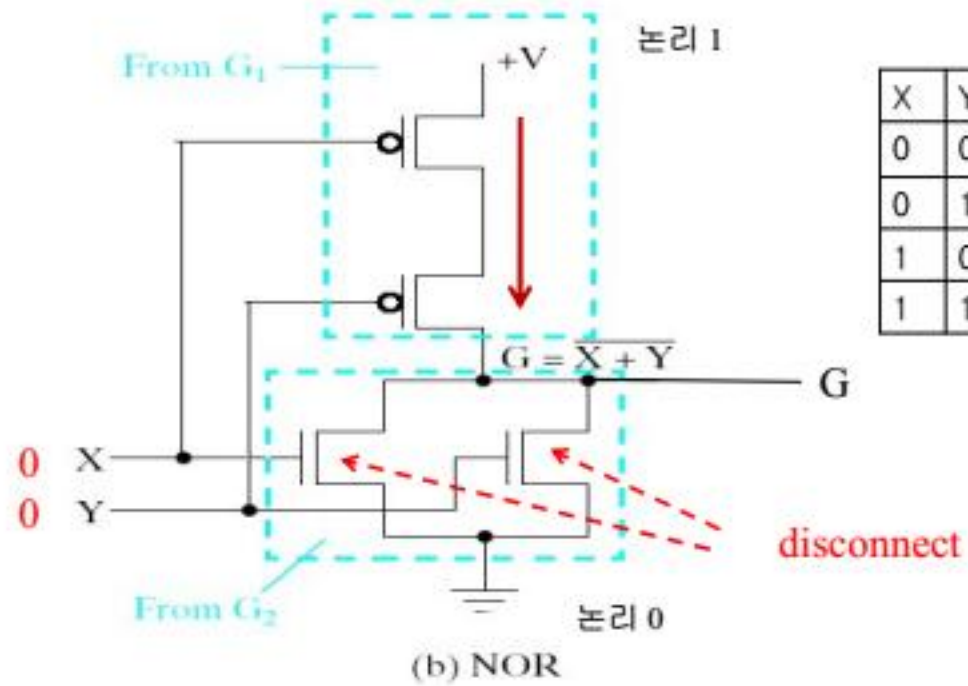
X	Y	G
0	0	
0	1	
1	0	
1	1	

15

15

p.285

NOR gate of CMOS Circuit



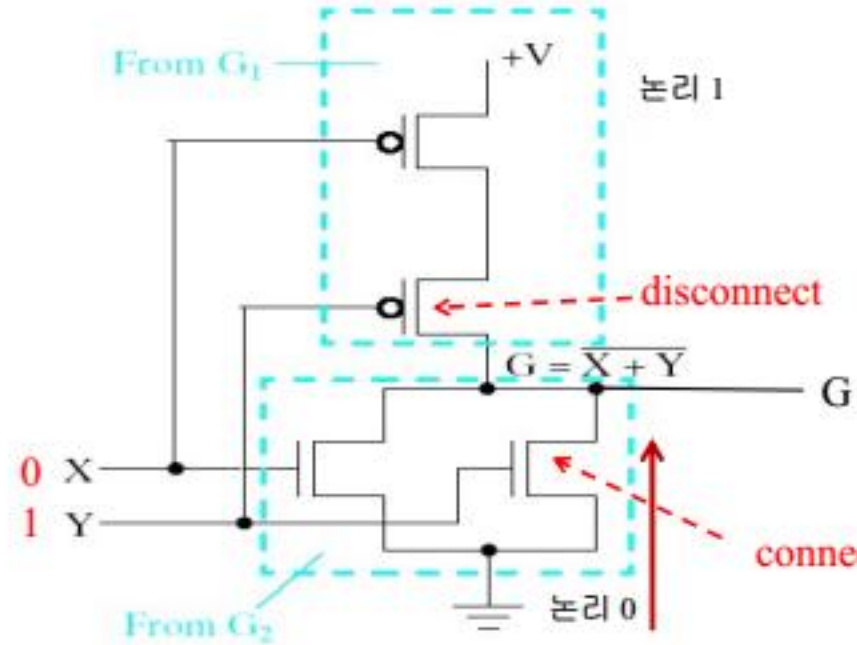
X	Y	G
0	0	1
0	1	
1	0	
1	1	

16

16

p.285

NOR gate of CMOS Circuit



(b) NOR

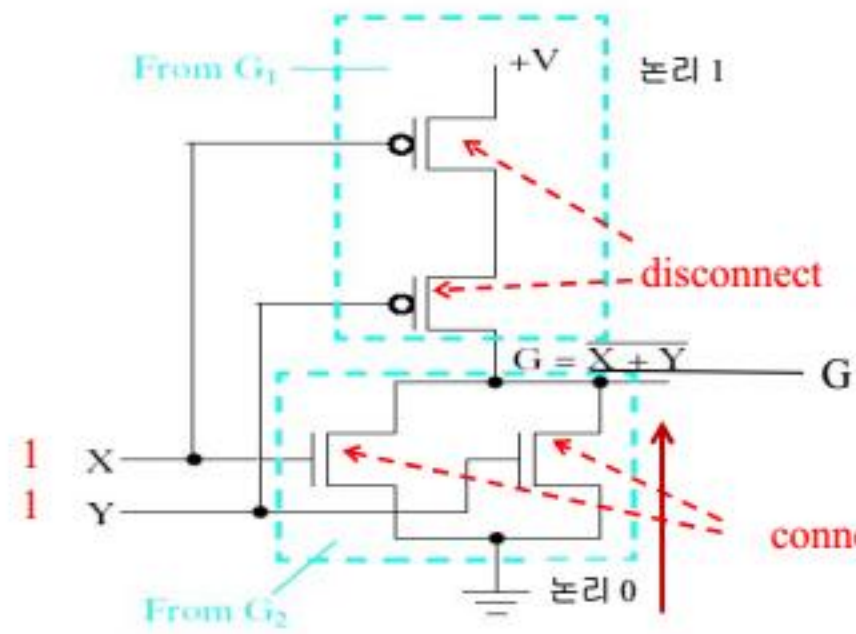
X	Y	G
0	0	
0	1	0
1	0	
1	1	

17

17

p.285

NOR gate of CMOS Circuit



(b) NOR

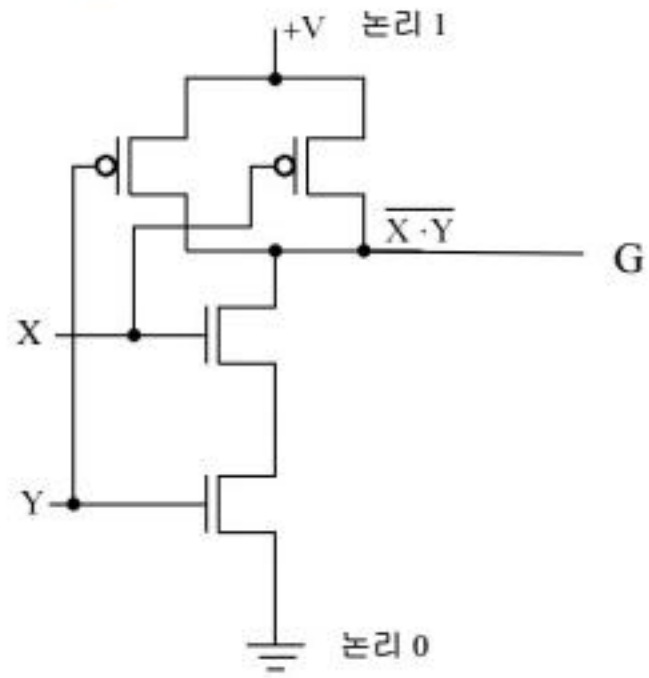
X	Y	G
0	0	
0	1	
1	0	
1	1	0

18

18

NAND gate of CMOS Circuit

p.285



(c) NAND

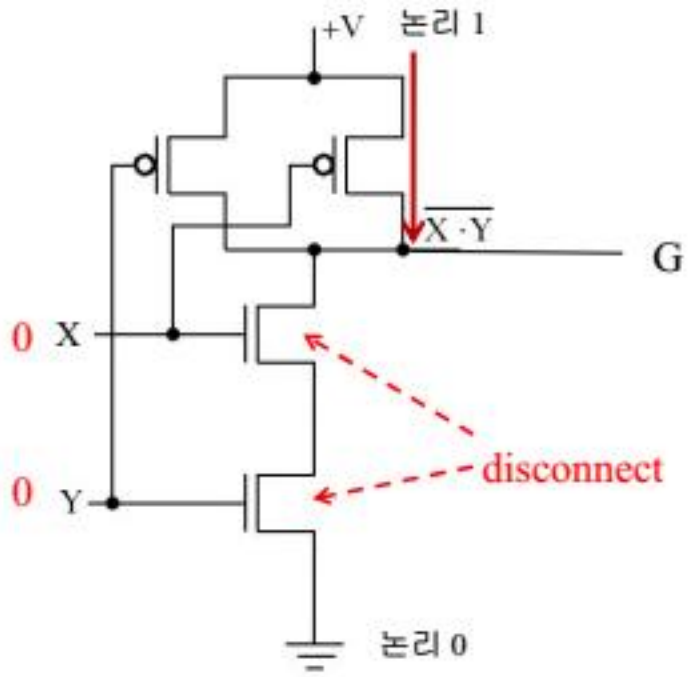
X	Y	G
0	0	
0	1	
1	0	
1	1	

19

19

NAND gate of CMOS Circuit

p.285



(c) NAND

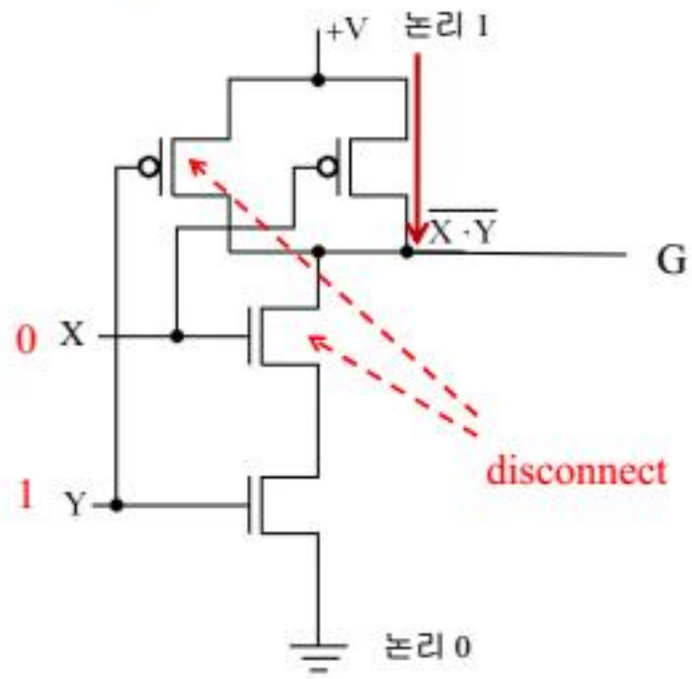
X	Y	G
0	0	1
0	1	
1	0	
1	1	

20

20

NAND gate of CMOS Circuit

p.285



(c) NAND

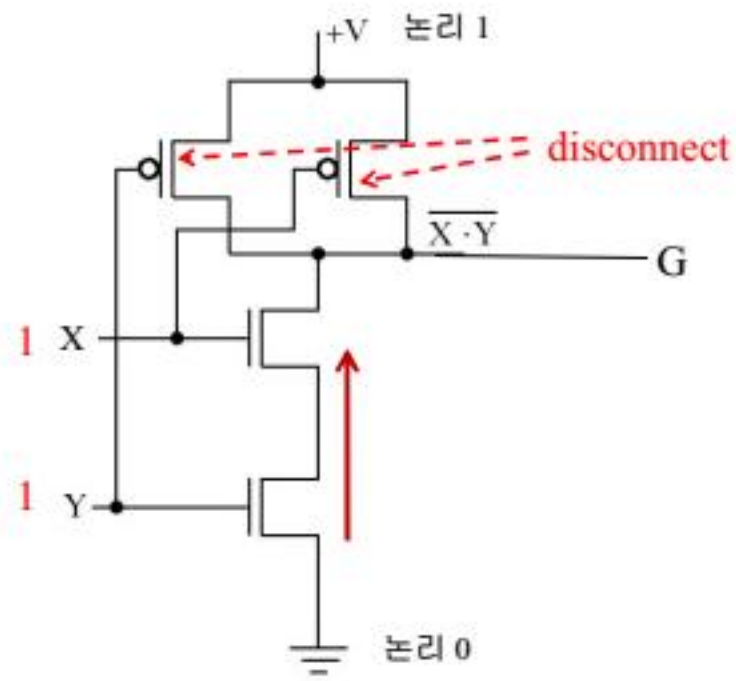
X	Y	G
0	0	
0	1	1
1	0	
1	1	

21

21

NAND gate of CMOS Circuit

p.285



(c) NAND

X	Y	G
0	0	
0	1	
1	0	
1	1	0

22

22

정리

- CMOS 회로 동작
- Transistor