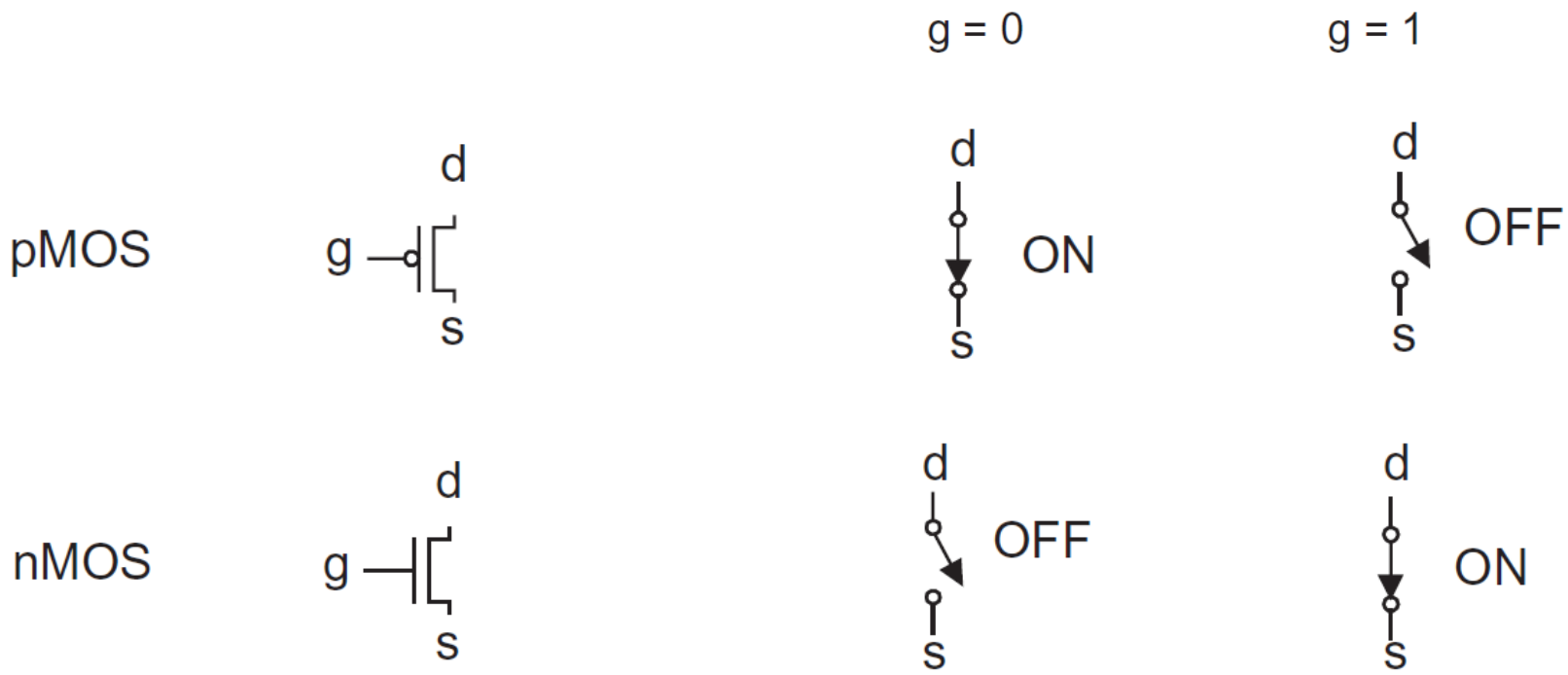
# Полеви транзистор

# MOSFET - metal-oxide-semiconductor field-effect transistor

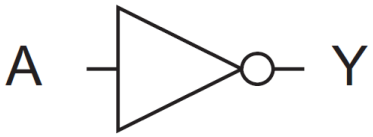
# Тема: MOSFET-и в действие – логически схеми

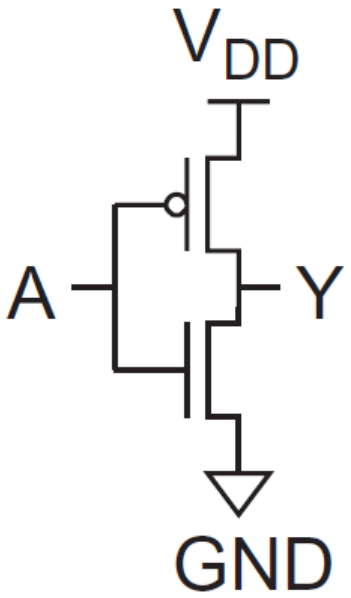
Основата на всеки съвременен компютърен чип е CMOS логиката, което е съкращение от Complementary Metal-Oxide-Semiconductor

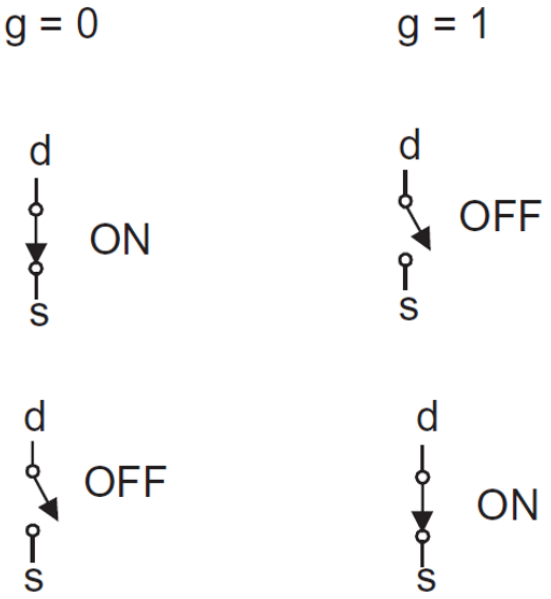
„Комплиментарен“ означава, че използва два вида MOSFET елементи, работещи заедно като перфектна push-pull двойка: N-канален MOSFET и P-канален MOSFET.



# CMOS Inverter

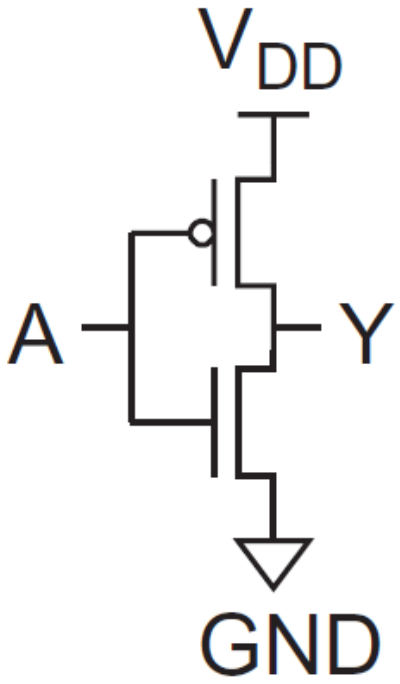


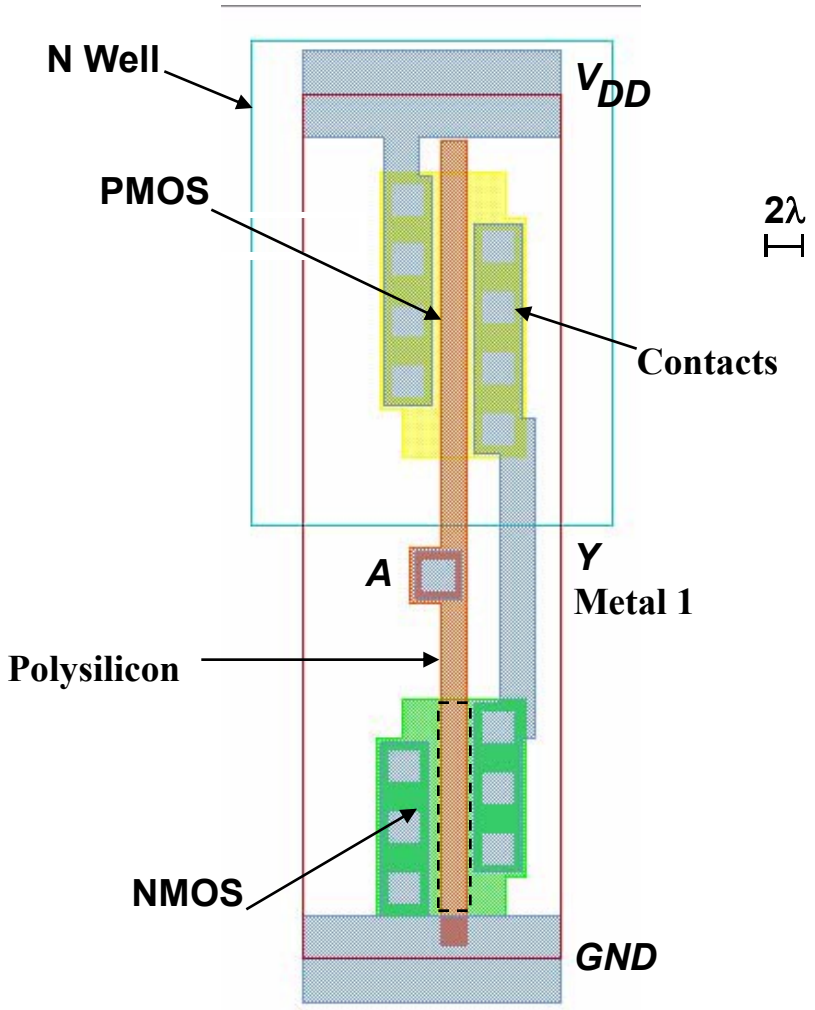



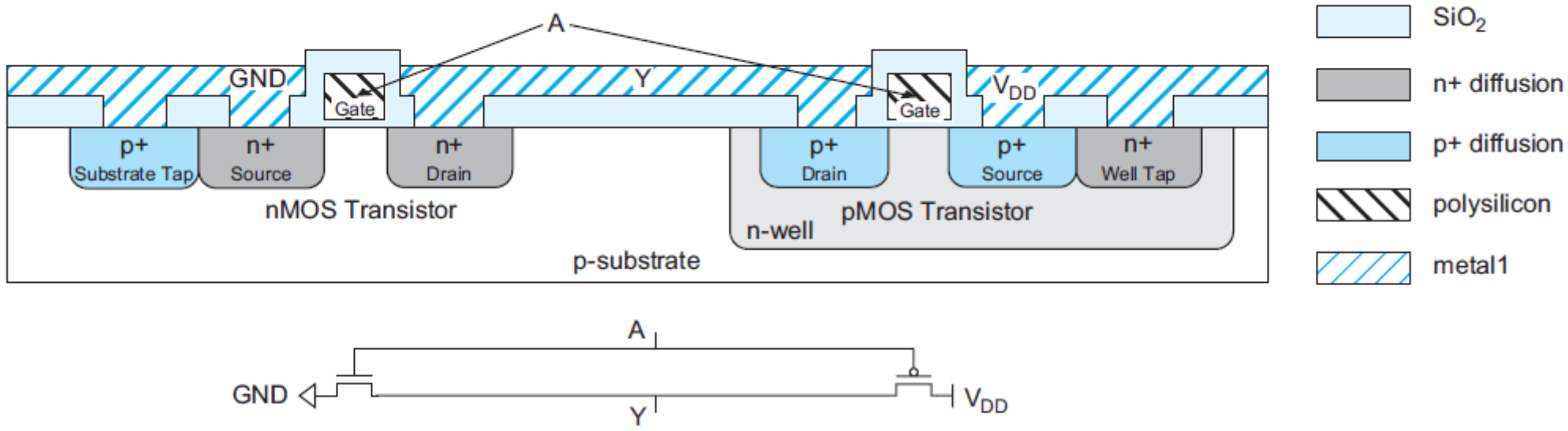

| A | Y |
|---|---|
| 0 | 1 |
| 1 | 0 |

# CMOS Inverter

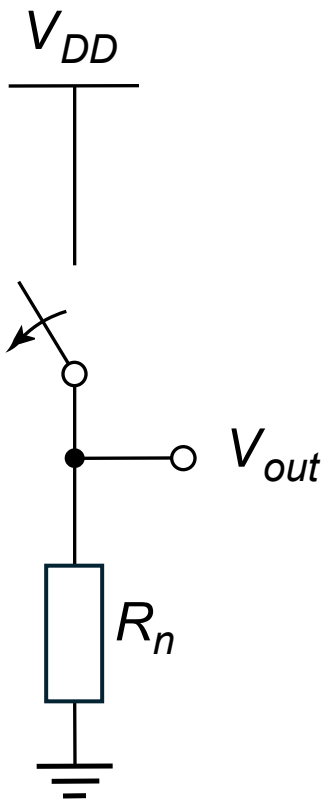


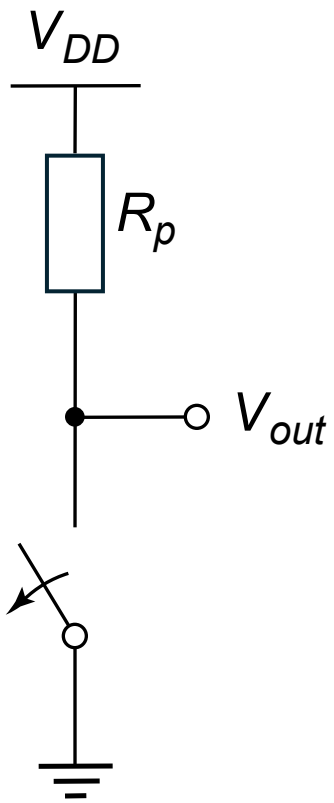
# CMOS Inverter



# CMOS Inverter - First-Order DC Analysis




$V_{in} = V_{DD}$

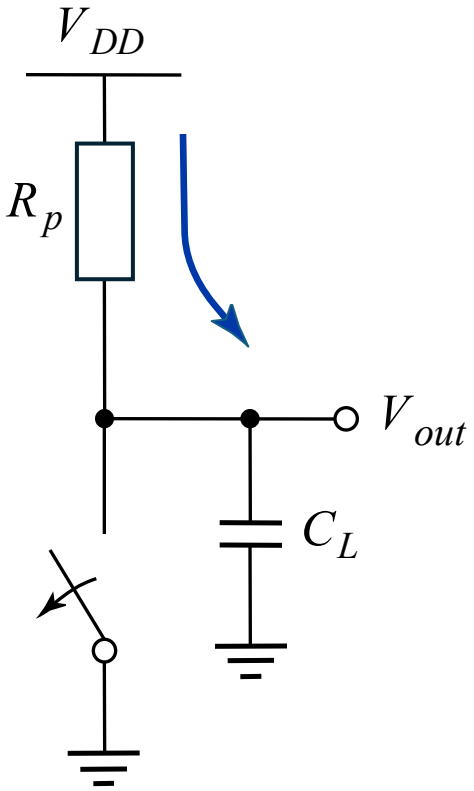



$V_{in} = 0$

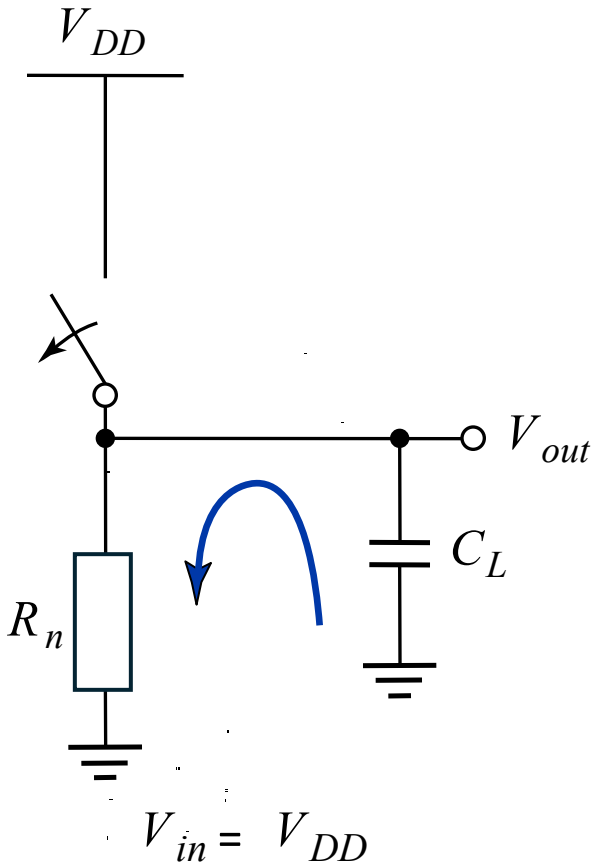
$V_{OL} = 0$

$V_{OH} = V_{DD}$

# CMOS Inverter: Transient Response




(a) Low-to-high




(b) High-to-low

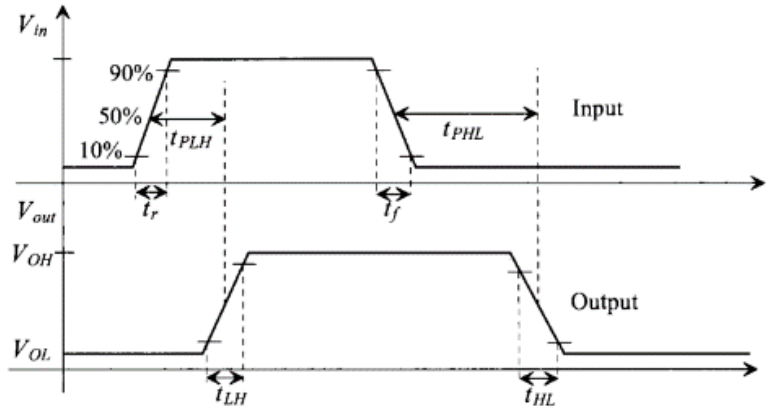
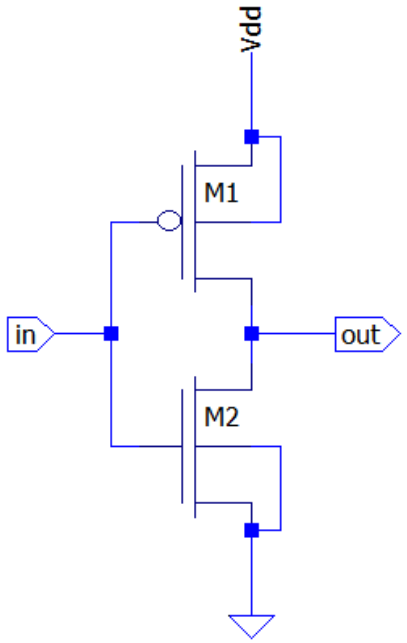
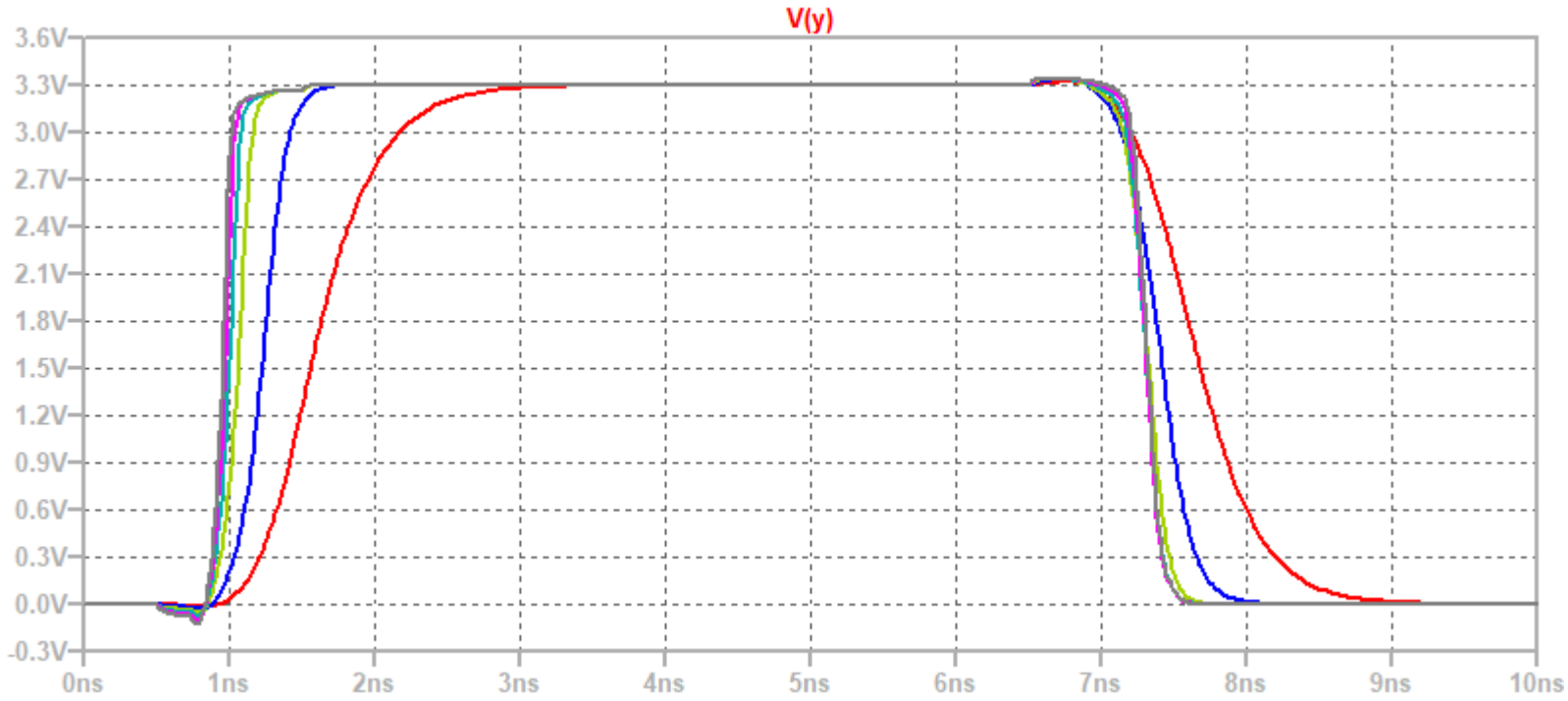



**Figure 10.9** Definition of delays and transition times.

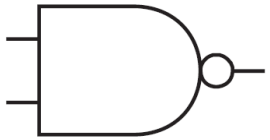
# Инвертор – влияние на W върху бързодействието

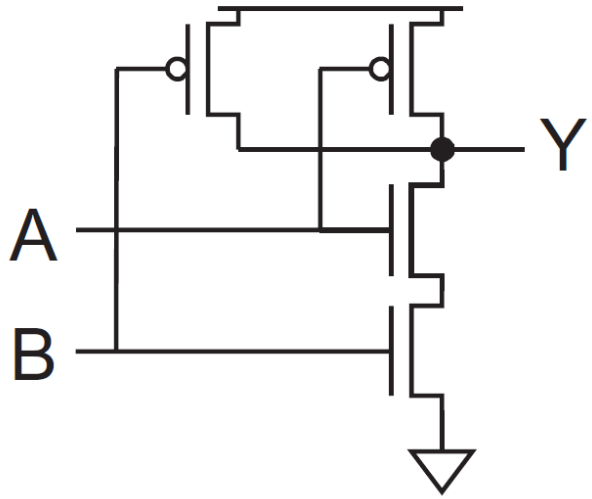


# CMOS Логически Елементи

NAND (NOT+AND)
И-НЕ





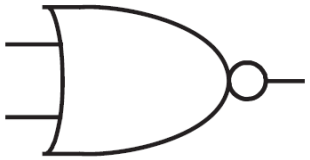

$$Y = \overline{A.B}$$

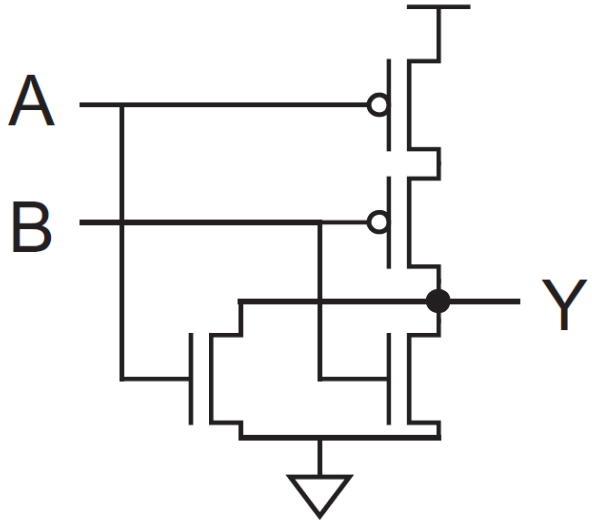
Y = !(A . B)

| A | B | Pull-Down Network | Pull-Up Network | Y |
|---|---|---|---|---|
| 0 | 0 | OFF | ON | 1 |
| 0 | 1 | OFF | ON | 1 |
| 1 | 0 | OFF | ON | 1 |
| 1 | 1 | ON | OFF | 0 |

# CMOS Логически Елементи

NOR (NOT+OR)
ИЛИ-НЕ



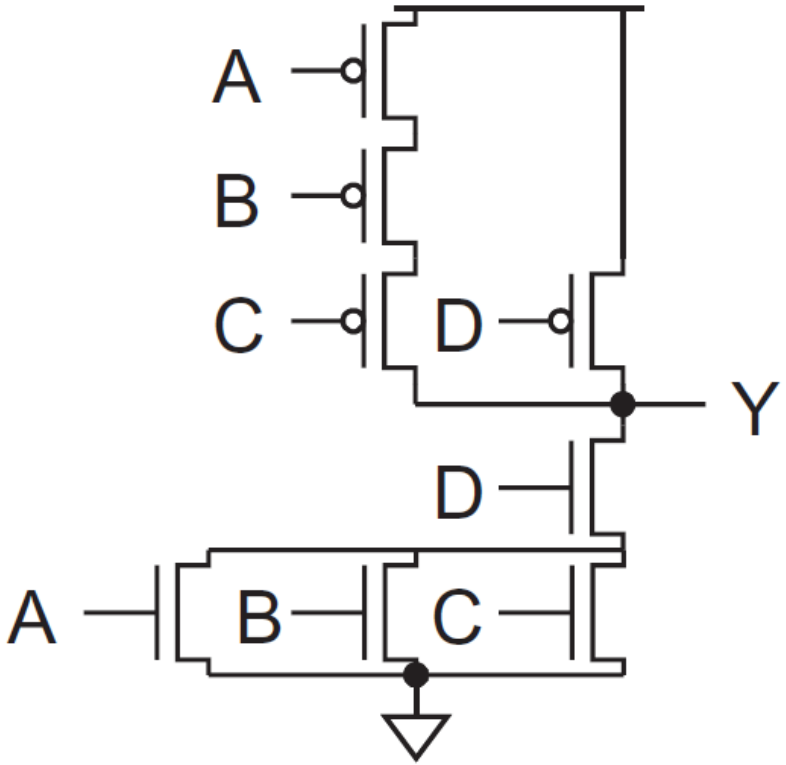



$$Y = \overline{A + B}$$

Y = !(A + B)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

# CMOS Логически Елементи




$$Y = \overline{(A + B + C).D}$$