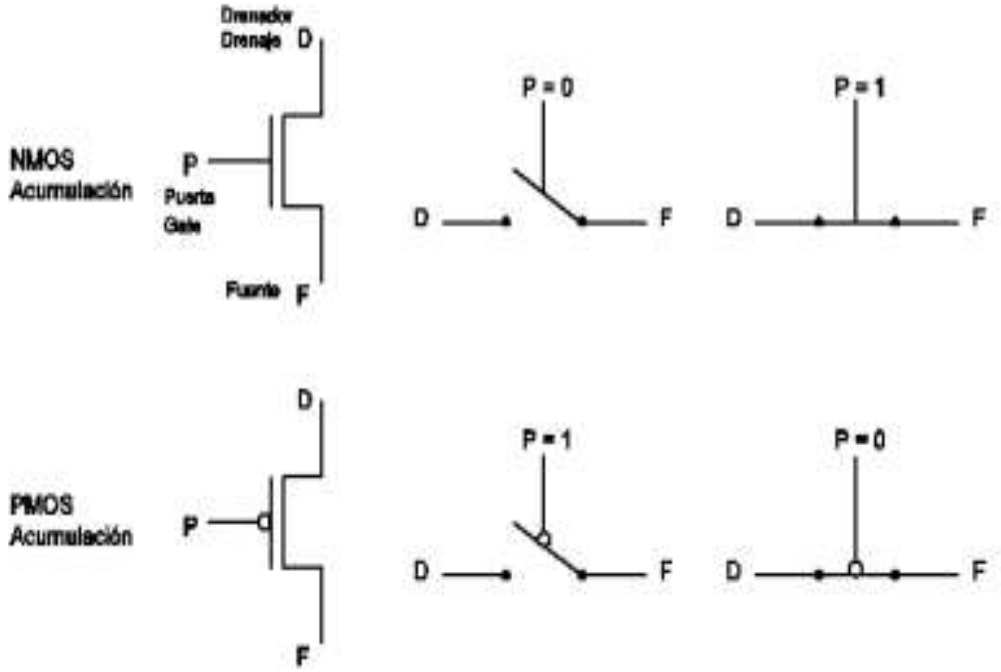
CMOS

(Complementary Metal Oxide Semiconductor)

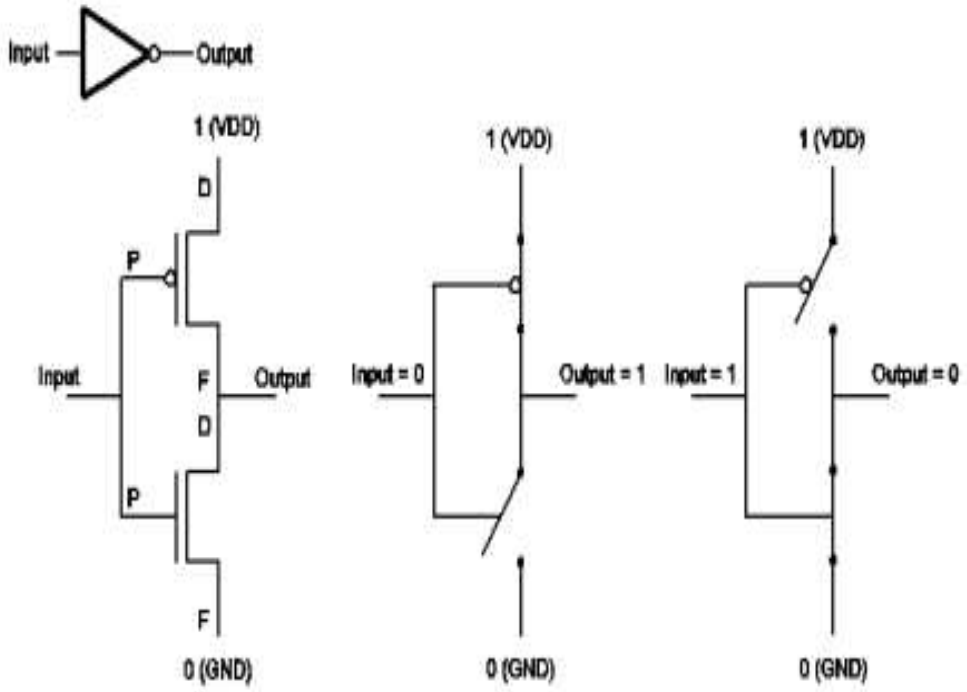
We will now see the use of transistor for designing logic gates. Further down in the course we will use the same transistors to design other blocks (such as flip-flops or memories).

Ideally, a transistor behaves like a switch. For NMOS transistors, if the input is a 1 the switch is on, otherwise it is off. On the other hand, for the PMOS, if the input is 0 the transistor is on, otherwise the transistor is off. Here is a graphical representation of these facts:



When a circuit contains both NMOS and PMOS transistors we say it is implemented in CMOS (Complementary MOS).

Understanding the basics of transistors, we can now design a simple NOR gate. Next figure shows the implementation in transistors of the NOR gate and how it works for different inputs (1 and 0). On the left there is the implementation, on the right the behavior. The symbol VDD is the source voltage (or the logic 1), GND is the ground (or the logical 0).



We have just seen how to implement a simple logic gate using transistors. To implement the rest of logical gates (and whatever circuit we might think off), we will analyze first the behavior of the transistors when connected in a “series” fashion or in a “parallel” way.