BASIC MOS TRANSISTORS

MOS

We should first understand the fact that why the name Metal Oxide Semiconductor transistor, because the structure consists of a layer of Metal (gate), a layer of oxide (Sio2) and a layer of semiconductor. Figure 3 below clearly tell why the name MOS.

Figure 3.cross section of a MOS structure

We have two types of FETs. They are Enhancement mode and depletion mode transistor. Also we have PMOS and NMOS transistors.

In **Enhancement mode transistor** channel is going to form after giving a proper positive gate voltage. We have NMOS and PMOS enhancement transistors.

In **Depletion mode transistor** channel will be present by the implant. It can be removed by giving a proper negative gate voltage. We have NMOS and PMOS depletion mode transistors.

1.2.1 N-MOS enhancement mode transistor:-

This transistor is normally off. This can be made ON by giving a positive gate voltage. By giving a +ve gate voltage a channel of electrons is formed between source drain.

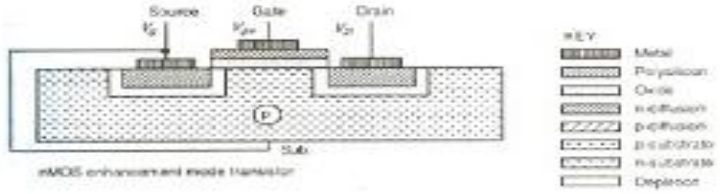

Figure 4. N-MOS enhancement mode transistor.

1.2.2 P-MOS enhancement mode transistor:-

This is normally on. A Channel of Holes can be performed by giving a –ve gate voltage. In P-Mos current is carried by holes and in N-Mos it's by electrons. Since the mobility is of holes less than that of electrons P-Mos is slower.

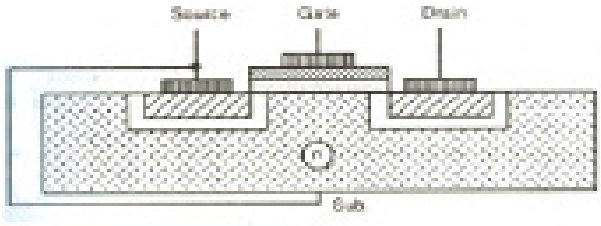

Figure 5. P-MOS enhancement mode transistor.

1.2.3 N-MOS depletion mode transistor:-

This transistor is normally ON, even with Vgs=0. The channel will be implanted while fabricating, hence it is normally ON. To cause the channel to cease to exist, a – ve voltage must be applied between gate and source.

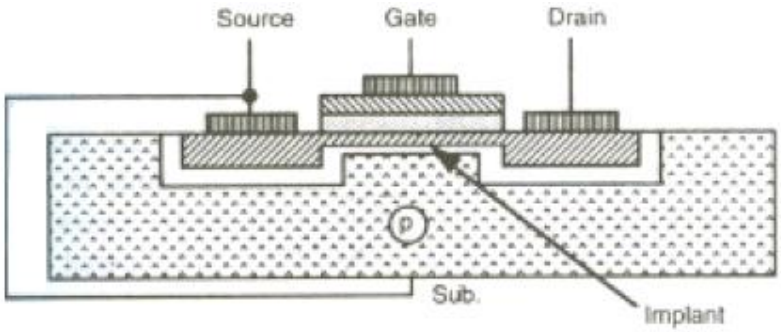

Figure 6. N-MOS depletion mode transistor

NOTE: Mobility of electrons is 2.5 to 3 times faster than holes. Hence P-MOS devices will have more resistance compared to NMOS.

Source : http://elearningatria.files.wordpress.com/2013/10/ece-v-fundamentals-of-cmos-vlsi-10ec56-notes.pdf