

**Course/Topic:** VLSI Design / CMOS fabrication

**Course Outcome:**

**Activity Chosen:** Animation Video

**Faculty:** N.Pavan Kumar

CMOS fabrication:

Animation is a brilliant and innovative new way to encourage students to communicate stories, ideas and concepts in a creative and original way. It can be particularly useful as a tool to encourage the creativity of students. Animated videos are a one stop solution that can grab the attention of the students. With its entertaining visuals, it can clearly comprehend the concept. Since it is an analogy to cartoons, students will get hooked to it. By using animation videos, students learn analytical thinking as to how to present a scenario. Video explain how Integrated circuits are made from silica available in sand. Animation videos of different IC fabrication companies such as Global foundries, TSMC, Intel foundries etc. are shown to the students.

The components over the wafer include resistors, transistors, diodes, capacitors etc... The most complicated element to manufacture over IC's is transistors. Transistors are of various types such as CMOS, BJT, FET. We choose the type of transistor technology to be implemented over an IC based on requirements. In this article let us get familiarized with the concept of CMOS fabrication (or) fabrication of transistors as CMOS.

CMOS Fabrication

For less power dissipation requirement CMOS technology is used for implementing transistors. If we require a faster circuit then transistors are implemented over IC using BJT. Fabrication of CMOS transistors as IC's can be done in three different methods.

The N-well / P-well technology, where n-type diffusion is done over a p-type substrate or p-type diffusion is done over n-type substrate respectively The Twin well technology, where NMOS and PMOS transistor are developed over the wafer by simultaneous diffusion over an epitaxial growth base, rather than a substrate. The silicon On Insulator process, where rather than using silicon as the substrate an insulator material is used to improve speed and latch-up susceptibility.

**Details of the Implementation:**

- The CMOS transistors are used in various applications, such as **amplifiers, switching circuits, logic circuits, Integrated circuit chips, microprocessors**, etc. The importance of CMOS in semiconductor technology is its low power dissipation and low operating currents. Its manufacturing requires fewer steps as compared to the Field Effect Transistors and Bipolar Junction transistors. Hardware is used to take data from a user, process it, and show the results, as well as to execute orders given by an individual.

The types of CMOS fabrication are as follows:

1. N-TUB Fabrication, P-TUB Fabrication, Twin-TUB Fabrication
2. **Create n well or p well region and channel stop region. Grow field oxide or SiO<sub>2</sub> (Thick Oxide) layer and gate oxide(Thin oxide). Deposit and Pattern Polysilicon layer**



### **Benefit of the practice:**

CMOS circuit has the advantages of simple structure, low power consumption, large noise tolerance and strong temperature stability, which is conducive to high integration. In addition, due to the high degree of integration, the entire circuit is integrated in the chip.