MOS Resistor
Introduction

• Resistor is an important sub-system of Analog System.
• Some applications like Digital to Analog conversion, use the resistor.
• For Analog design a resistor is required which is compatible to the MOS technology.
• Resistors compatible with the MOS technology include diffused, polysilicon and n-well or p-well resistors.
• Though not as common, metal can be used as resistor as well.
**Diffused Resistor**

- A diffused resistor is formed using source/drain diffusion and is shown in Figure below.
- The sheet resistance of such resistors in a non-salicided process is usually in the range of 50-150 Ohms/square. For a salicide process, these resistors are in the range of 5-15 Ohms/square.
- The fact that the source/drain diffusion is needed as a conductor in integrated circuits conflicts with its use as a resistor.
- The diffused resistor is found to have a voltage coefficient of resistance in the 100-500 ppm/V range.
Polysilicon Resistor

- A polysilicon resistor is shown in Figure below.
- This resistor is surrounded by the thick oxide and has a sheet resistance in the range of 30-200 Ohm/square, depending on doping levels.
- For a polysilicide process, the effective resistance of the polysilicon is about 10 Ohms/square.
N-well(P-well) Resistor

- An n-well resistor shown in Figure below is made up of a strip of n-wells contacted at both the ends with $n^+$ source/drain diffusion.
- This type of resistor has a resistance of 1-10 kOhms/square and a high value for its voltage coefficient.
- In cases where accuracy is not required, such as pull-up resistors or protection resistors, this structure is very useful.
- p-well resistor is designed in a similar manner as n-well resistor.