

# A Review on Design of Sub Threshold Inverter

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**Abstract:** The prediction of Gordon Moore has directed the innovation in integrating more and more devices on a single chip resulted in million devices integrating on a chip. Power consumption and dissipation or generation of more heat has brought a limit to the integration of more transistors. Design of a transistor working in sub threshold region where conduction is done due to minority charge carriers is a solution to decrease the consumption of power.

**Key words:** CMOS, Process voltage, Sub threshold voltage, Threshold voltage.

## 1. Introduction

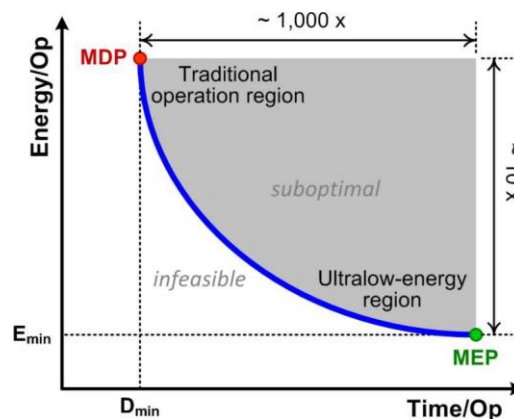
In the fabrication of transistors the concept of scaling of devices was used where length and width of channel was scaled oxide thickness and power supply was also scaled. Since the channel length between source and drain was getting reduced the concept moved to make the transistor work in a condition where the supply voltage is less than threshold voltage and minority carriers are used for conduction.[3]

The concept of making the transistor work in sub threshold are ideal for applications where performance is not important and the main criteria is reducing energy consumption. Low performance is due to instability increased variations and functional failure.[5]

Management of power allowed the exploration of sub threshold circuit operation. Intention for low power design is aimed in decreasing the power dissipation in the surroundings. The demand for energy consumption has drastically increased since every electronic goods have become part and parcel of common man. The fabrication cost is decreased due to less power consumption and less heat generation. The behavior of sub threshold circuits is affected by voltage and temperature variations. [2]

## 2. Working of inverter.

In all digital circuits inverter is the basic block. The supply voltage for inverter is decreased and made less than threshold voltage. The transfer characteristic is shown in below simulation graph. A CMOS inverter is designed using pmos and nmos where the inverter works as follows i.e. when input is high nmos starts conduction and when input is low pmos starts conduction.[1]



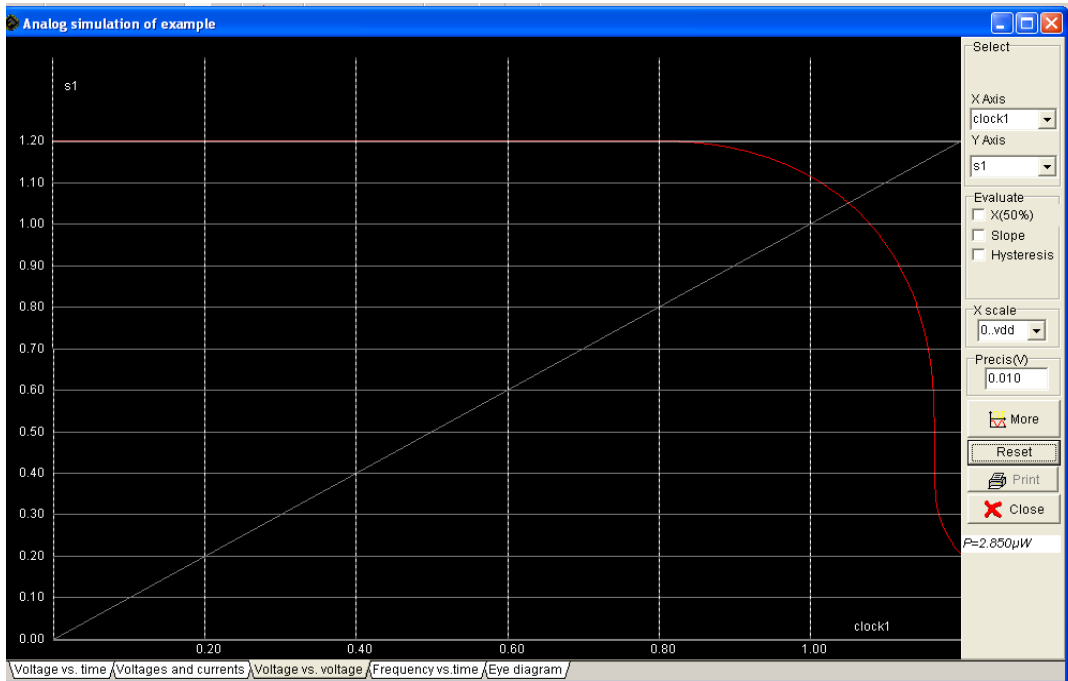


Figure 1 Transfer characteristics of inverter.

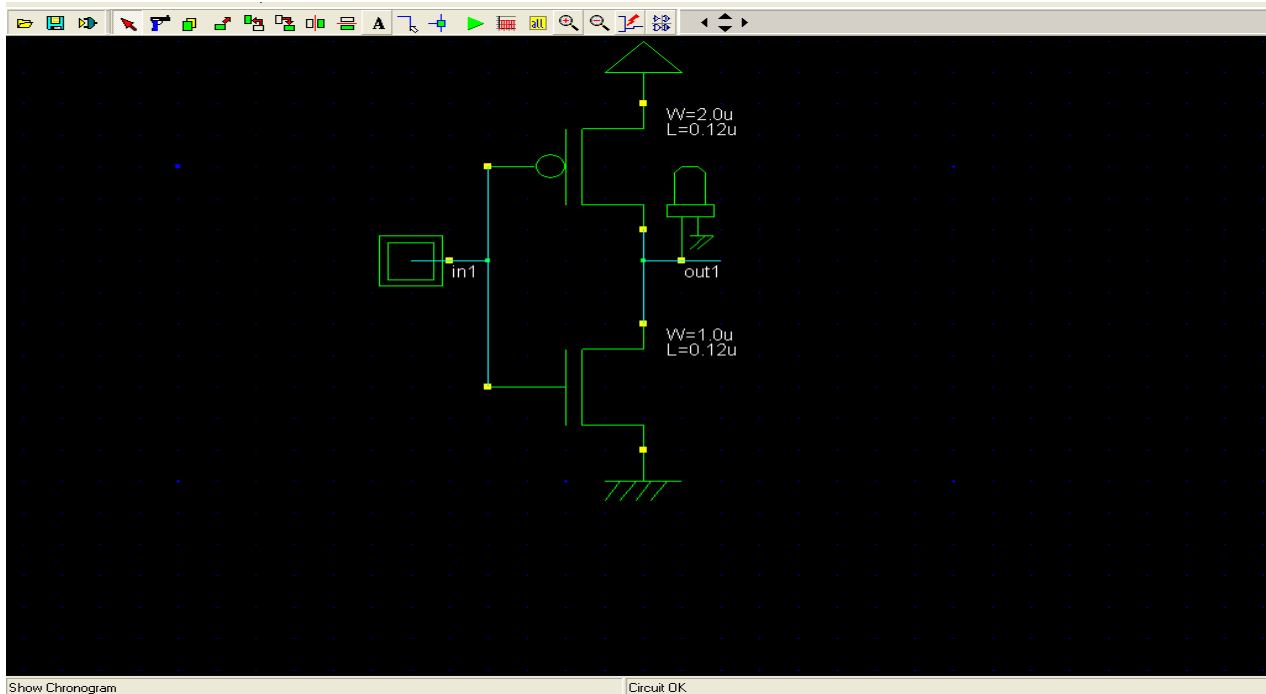


Figure 2 Schematic diagram of inverter.

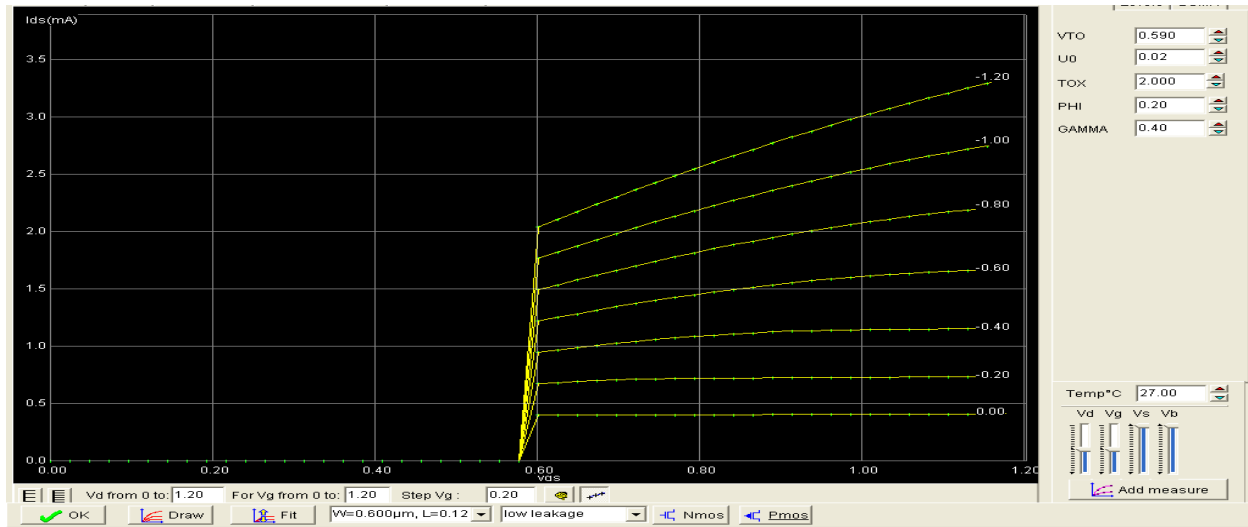


Figure 3 Variations of drain and gate voltages

## Conclusions

Management of power allowed the exploration of sub threshold circuit operation. Design of a transistor working in sub threshold region is a solution to decrease the consumption of power. Basis for low power design is related to decrease the power dissipation to the surroundings. An optimization path can be taken between speed and power consumption for certain application. An effort is made to design an inverter which satisfies the condition.

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