CMOS SCHMITT TRIGGER

Vighneshwar B Hegde, KLE Technological University Hubballi

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Abstract

The Schmitt trigger circuit is mainly used in the process of providing noise immunity for circuits. There are several architectures for the circuit most popular is the one using opamp in positive feedback. The circuit that is implemented here is used to provide noise immunity for the inverter by means of hysteresis. As the inverter reacts to change in input voltage quickly so that noise in the input will get transmitted to output also. With the use of four more mosfets it is possible to deviate the threshold voltage of the inverter by altering the sizes of each mosfet. The circuit shown here is designed with esim and simulated using Ngspice.

1 Circuit Details
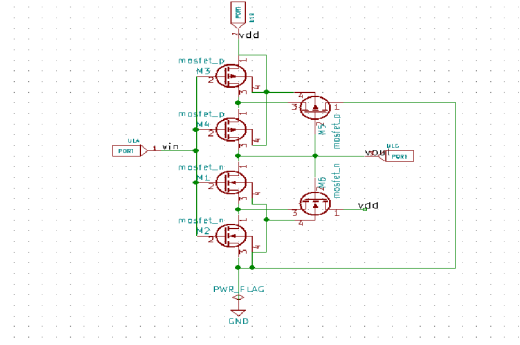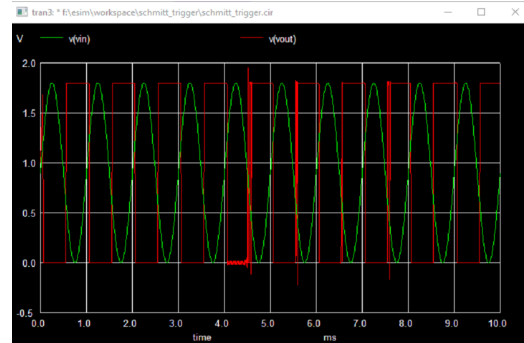
In modern day logic systems as most of the integrated circuits are fabricated using cmos logic the need for noise free circuits is high. The use of inverter is almost in each and every digital circuits fabricated. The following Schmitt trigger circuit gives a solution for noise free inversion of the input logic levels. The circuit is the extended part of inverter with four additional mosfets. The Schmitt trigger plays an important role in deciding the switching point which can be controlled by designing sizes of mosfets. The two feedback devices provide alternate path for current flow in order to induce hysteresis by inactivating the switching for some input voltage range. The upper switching voltage can be termed as vuh and the lower switching voltage can be termed as vlh. The values of vlh and vuh can be determined by designing the sizes of mosfets stated above. The calculations related to design is mentioned in readme file. As long as the input voltage lie above vuh or below vlh the switching will not take place thereby a good noise rejection. We can also make the circuit work in symmetric way by making the design to switch at exactly one third of the supply voltage. The circuit should be simulated against a load capacitor which will not allow the noise present in the output waveforms shown here. Applications of the circuit include noise reduction in data converters switch debouncing and in other noise removal systems.

2 Implemented Circuit

Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

Figure 2: Implemented waveform.

References

[1]

[2] A. I. design. Schmitt trigger. YouTube.

[3] C. T. J. C. P. D. of Electronic Engineering University of ElectroCommunications. Cmos schmitt trigger circuit with controllable hysteresis using logical threshold voltage control circuit. ieeexplore.ieee.orgdocument4276356.