Design and Analysis of SR Flipflop

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Abstract

A flip flop is an electronic circuit that has two stable states and that can be used to store information so flip-flops are the main elements of electronic memory devices. Circuit can be made to change its state by applying signals to the inputs and will have two outputs. Flip flops are used in many applications such as data storage , counter and frequency division. A memory consist of combination of flip-flops. Flip-flop is constructed using logic gate, logic gates constituted by transistors. Flip flops will maintain data for a limited period. Flip-flop is also knew as a Bistable Multivibrator. In flipflop the output and next state depend not only on its current input, also on its current input state.
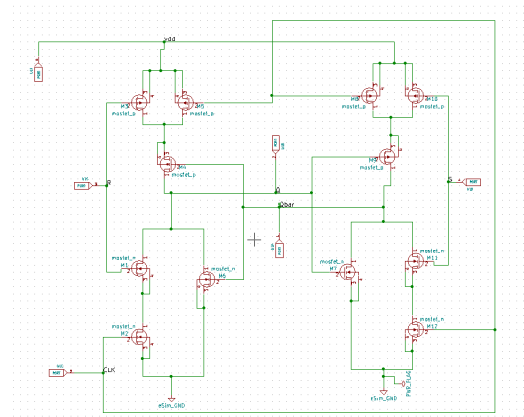
1 Circuit Details

Circuit is implemented with NMOS transistors and PMOS transistors. The two PMOS transistors are connected in parallel pattern and the two NMOS transistors are connected in series pattern. It has two inputs set(S) and reset(R). And two outputs Q and Qbar. To get a synchronous operation the circuit response can be controlled by adding a clock signal. The circuit is equivalent to combination of 2 NAND gates. When the both set and reset are zero there is no change in output. When the input R is set to low or 0 and the input S is set to high or 1, the NAND gate has an input 0, which will produce the output qbar 1. The value of Qbar is provided to the another NAND gate as input, and now both the inputs of the another NAND gate are 1, which will produce the output Q= 0. And when reset is 1 and set is 0 , the output is reset (output Q is 0 and Qbar is 1). The input states set and reset 1 is an undesirable or invalid condition and that state must be avoided. In the waveform S and R are the inputs and also CLK is also given. Based on the input, output Q and Qbar will change. If both the S and R inputs are 0 then the output wont change.it will follow the pervious one. Even through SR flip-flop is very simple, it is not widely used in practical circuits due to illegal states when the both the inputs S and R are high. But the switching circuits are used because they provide a simple switching function between set and reset. One of the application is a switching circuit switching.
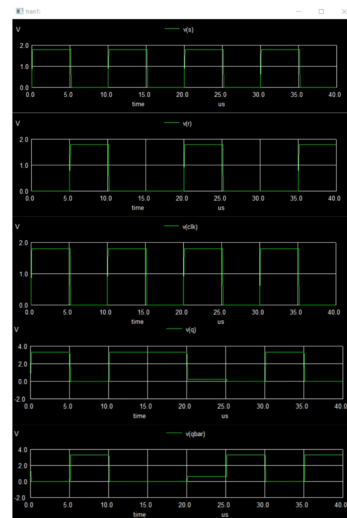
2 Implemented Circuit

Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

Figure 2: Implemented waveform.

References

[1] L. N. S V S V PRABHU DEVA KUMAR, PAGADALA VENKAT. Implementation and designing of low power sr flip-flop using 45nm cmos technology. https://zenodo.org/record/3675047#.YNm7nugzaMo.