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# LOW POWER FLIP-FLOP DESIGN USING DOUBLE EDGE TRIGGERING TECHNIQUE

Jaishankar[1], Bhavya[2], Divya[3], Haritha[4]
*Electronics and Communication Engineering*
*KPR Institute of Engineering and Technology*
*Arasur, Coimbatore.*
*jaishankar1977@gmail.com[1] ,bhavyaks2779@gmail.com[2],divyathen99@gmail.com[3], haritha7200@gmail.com[4]*

***Abstract***

*In a ultralow-power genuine single-stage timing flip-flop (FF) plan accomplished utilizing just 19 transistors is existing work. It beats the 16 transistor in Flip lemon. The plan follows a Flip Flop rationale structure and highlights a cross breed rationale configuration including both static-CMOS rationale and reciprocal pass-transistor rationale. In the plan, a rationale structure decrease plot is utilized to diminish the quantity of transistors for accomplishing high force and defer execution. In spite of its circuit straightforwardness, no inside hubs are left skimming during the activity to keep away from spillage power utilization. Right now, planned utilizing Double Edge Triggered Technique. This force decreasing method is applied to advance the structure.*

**Keywords:** CMOS, D flipflop, Double Edge Triggered FlipFlop.

## 1. Introduction

FLIP-FLOPS (FFs) are fundamental stockpiling components utilized broadly in computerized framework plans, which receive serious pipelining procedures and utilize a few FF-rich modules, for example, register records, move registers, and FIFO. The force utilization of the FFs utilized in a regular computerized framework plan, alongside that of clock conveyance systems, comprises as high as 20%–45% of the absolute framework power. FF plans are in this manner basic to the force utilization execution of the framework structure and may likewise significantly affect the chip territory. FF structures experience ceaseless improvement with the advances in new procedure innovation. Explicit application requests, for example, rapid, low force, and low voltage likewise call for new FF structures. Albeit various FF plans have been created, late structure accentuations have exchanged steadily from ultrahigh-speed flipping to amazingly low-control tasks. Notwithstanding the exchanging power, the spillage power utilization ought to be decreased. The structure is likewise expected to work appropriately for voltage settings underneath the ostensible voltage. Right now, low-power FF configuration meeting these prerequisites is explored.

In DET FF, a regular positive-edge-activated flip-flop (FF) faculties and reacts to the control info or contributions at the time the clock input is changing from 0 to 1. It doesn't react at all to alters in the contrary course. Negative-edge-set off FF's act in an integral way. Therefore, these FF's can react all things considered once per clock beat cycle. It is suggested that twofold edge-activated (DET) FF's, reacting to the two edges of the clock heartbeat would have points of interest as for speed and vitality scattering. In Double edge activating strategy, this technique can be utilized to spare the half of the force on the clock appropriation organize. It utilizes the half recurrence on the tickers conveyance organize by cutting the recurrence of the clock by one half will parts the force utilization on the clock dispersion arrange.

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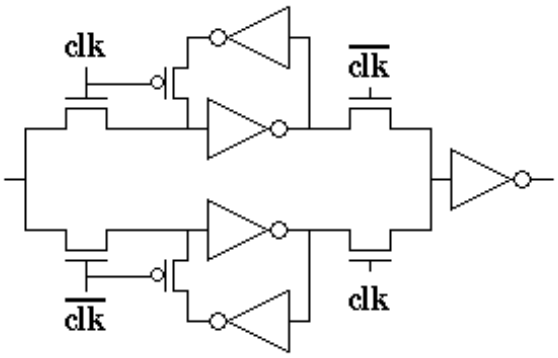


**Fig 1: Double Edge Triggered FlipFlop**

In Double Edge Triggered, D FlipFlop is been structured as proposing model. The D Flip-flop utilized as an inverter for the activity of a circuit.

## 2. EXISTING MODEL

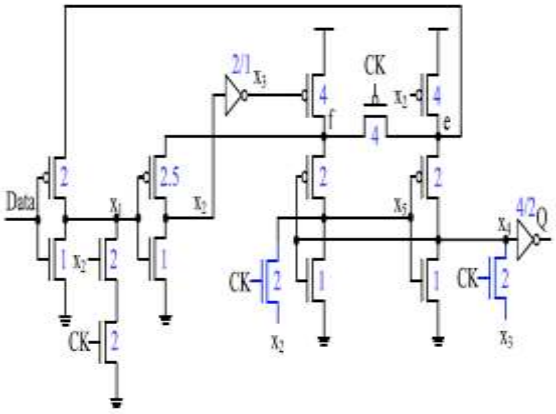


**Fig 2: Low paper 19T True Single Phase Clocking Flip Flop using Master-Slave.**

The circuit schematic after the use of the two rationale structure decrease plans is introduced in Fig. 2. The all out number of transistors is just 19. Just one single period of the clock is required, and the fan-out for the clock signal is four (one p MOS and three n MOS transistors). The leaving TSPC FF is completely static and can stay away from the instance of impermanent yield hub gliding. When CPL is presented, the circuit unpredictability of its p-rationale arrange is to a great extent diminished, despite the fact that the plan is certifiably not a powerful rationale. Taking everything into account, the current structure can effectively accomplish circuit unpredictability decrease and timing parameter upgrade at the same time.

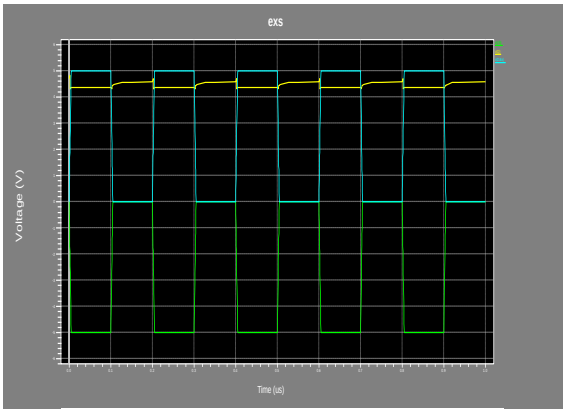


**Fig 3: Waveform of Existing Model**

For lessening force and postponement for the circuit, we go for proposing model. In which the transistor check gets decreased from 19 Transistors to 16 Transistors, so by this transistor decrease we increase low force utilization and less intricacy.

## 3. PROPOSED MODEL

The proposed structure, named Double Edge Triggered Flip-Flop, can be considered as an improvement of the FF plan in various execution angles. This structure is accomplished by different enhancement measures. The primary measure is circuit rearrangements for bringing down the force utilization, and the subsequent one is the decrease of intensity and postpone execution.

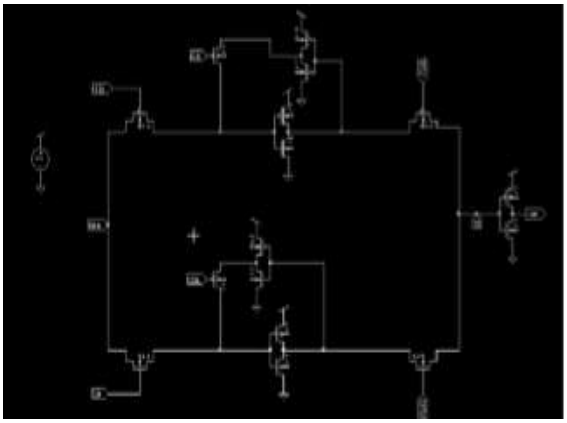

**Fig 4. Design of the Proposed model**

In twofold edge activated flip-flop the input way has been changed when contrasted with ace slave Flip Flop. The upper information way is activated on raising edge and lower information way is activated at on falling edge. Right now an inverter and a PMOS transistor are utilized to hold the rationale level when TG is put. On the off chance that information esteem is high the inverter changes the sign to low this prompts PMOS transistor pulls the information up to high. On the off chance that information is low the inverter changes the sign to high which will detach the information from VDD and keep the incentive to low.

The DET flip-flop goes about as a static usefulness for high yield in light of the fact that PMOS transistor associated with VDD is utilized in the criticism organize. The low yield isn't given the static usefulness of this flip-flop. Hence the circuit carries on as a powerful circuit.

This flip-flop is quicker than past flip-tumbles because of number of clock transistor are decreased and supplanting transmission entryway by utilizing n type pass transistor. This Flip lemon is an ace slave flip-flop structure and it comprises of two information ways.

The n type pass transistor is trailed by an inverter which brings about solid high. The recently DET flip-flop is liberated from edge voltage misfortune issue of pass transistor. By utilizing NMOS transistor in transmission door. Supplanting the p-type pass transistor by n-type transistor we can diminish the region due to NMOS is not exactly PMOS transistor. It is remunerated the versatility requirement of NMOS and PMOS. Therefore recently twofold edge activated flip-flop is progressively proficient in territory, force and speed when contrasted with past flip-flop.

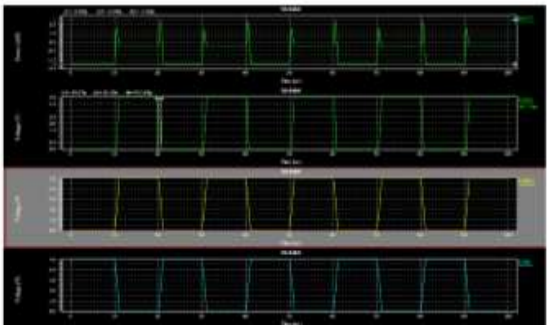

**Fig 5: Waveform of Proposed Model**

## 4. PERFORMANCE EVALUATION

Different FF structures were remembered for the post-format recreations for execution assessment, and these are laid out as follows: FF plans (DET FF) : one most recent FF plan, for example, Double Edge Triggered FF is more proficient than Master-Slave FF. The info signal is taken care of through a couple of inverters. The primary inverter is utilized to make the ascent time and fall time delays. The subsequent inverter is considered to demonstrate the driving phase of the FF, and its capacity utilization was considered in the force estimation.

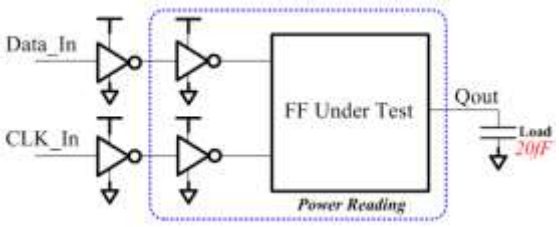


Fig 2: Model setup for FF simulations

Thus, while comparing with existing method, the power and delay has been reduced in the proposed system. In terms of circuit complexity, the proposed DET FF uses the least number of transistors and features the smallest area among all designs.

The force utilization levels subject to various info exchanging exercises were first mimicked. The force estimation was performed by averaging the complete force utilization over the clock cycles. In spite of the fact that the dynamic force is the predominant factor, the estimation included spillage power and any interior hub exchanging power regardless of whether the yield stayed static.

## 5. RESULT

The simulation results are obtained using Tanner EDA software. The design is being simulated in S-Edit V13.0, the waveform is obtained in W-Edit V13.0 and the Power and Delay performance are being calculated in T-Edit V13.0 by including Nanometer Technology files such as T88F or TSMC018.

**Table: Comparison Output of TSPC and DET flip flop**

| FLIP FLOP | No. of Transistor | Power(μ w) | Delay(Ns) |
|---|---|---|---|
| TSPC FF | 19 | 5.768 | 8.11 |
| DET FF | 16 | 3.450 | 5.4 |

The number of transistors in TSPC FF is 19, power is 5.768 and delay is 8.11.while in DET FF the number of transistors is 16, power is 3.450 and delay is 5.4.Thus the power and delay has been reduced while comparing with TSPC FF.

For a reasonable examination the force versus delay as been appeared previously. By looking at the reproduction consequences of the planned CMOS DET flip-flop with ones detailed in it is discovered that our plan has a less complex structure, less postpone time and the most noteworthy greatest date rate. What's more, we recreated an improved DET flip-lemon and found that this DET flip-flop has the most lean toward low force quality.

## 6. CONCLUSION

This paper presents a novel FF configuration accomplished by utilizing an altered Double edge activated FF. The key thought is to lessen force and postponement through decrease of transistor tally. This along these lines demonstrates the proficiency of the proposed DET FF plan. TSPC FF experiences bigger force utilization as a result of more transistors while contrasting and DET FF. The recently proposed D-Flip Flop utilizing Double-Edge Triggered method which viably lessens number of transistors which brings about low force while keeping up a serious speed. Since DET FF has least number of transistors and most minimal force it is helpful in elite and low force situations.

Versatile correspondence requests long battery life, and low force utilization framework. The clock framework, which comprises of the clock dispersion system and timing components (flip-slumps and locks), is one of the most force expending parts in a VLSI framework. It represents 30% to 60% of the complete force dissemination in framework. Thus, lessening the force devoured by flip-failures will deeply affect the all out force expended.

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