Analysis of Low Power and High-Speed Double Tail Comparator using GNRFET Technology

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Abstract **-** In this paper, we analysing with simulation for the Analysis of Low Power and High-Speed Double Tail Comparator using GNRFET Technology because the GNRFET having so many advantages that it having less power consumption. Here we are using GNRFET using circuits the out having low average power, delay and energy. Here we are comparing the different circuit with proposed circuits and we are using MOSFET based Comparator, GNRFET based Proposed Comparator, MOSFET based Proposed Comparator and GNRFET based Proposed Comparator. Here we are aimed to getting low power, low delay and low energy system.

Keywords **-** comparator, GNRFET, MOSFET, average power. Delay, energy

I. INTRODUCTION

Comparator is one of the fundamental building blocks in most analog-to-digital converters (ADCs). Many highspeed ADCs, such as flash ADCs, require high-speed, low power comparators with small chip area. High-speed comparators in ultra-deep submicrometric (UDSM) CMOS technologies suffer from low supply voltages especially when considering the fact that threshold voltages of the devices have not been scaled at the same pace as the supply voltages of the modern CMOS processes [1]. Comparators have a crucial influence on the overall performance in high speed analog to digital converters. Due to low-offset, fast speed, low power consumption, high input impedance, CMOS dynamic latched comparator are very attractive for many applications such as high speed analog-to digital convertors (ADCs), memory sense amplifiers (SAs) and data receivers [1]. Scaling is used in CMOS transistor to decrease power consumption and occupying area. Offset voltage of the comparator exceeds tens mV due to transistor mismatch [2]. They use positive feedback mechanism with one pair of back-to-back cross coupled inverters.[3]. Comparator is one of the fundamental building blocks in most analog-to-digital converters (ADCs). Many high-speed ADCs, such as flash ADCs, require high-speed and low-power when the supply voltage is smaller. In other words, in a given technology, to achieve high speed, larger transistors are required to compensate the reduction of supply voltage, which also means that more die area and power is needed. Besides, low-voltage operation results in limited common-mode input range, which is important in many high-speed ADC architectures, such as flash ADC. Many techniques, such as supply boosting methods [2], [3], techniques employing body-driven transistors [5].

The Comparator design is an extremely influence of the overall performance in high speed ADCs. In wide range of comparator device, which compare to the currents or voltages and produces the digital output based on the comparison. Since comparators are more usually not used with the feedback there is not compensation, it either the area reductions or speed reduction value are invited. Comparators are known as 1-bit ADC and for that reason they are mostly used in large quantity. A/D converter, Dynamic comparators are widely used in the design of high-speed ADCs [8].

II. PROPOSED METHODOLOGY

GNRFET -The graphene nano-ribbon field effect transistor (GNRFET) is an emerging technology that received much attention in recent years. Recent work on GNRFET circuit simulations has shown that GNRFETs may have potential in low power applications. In this paper, we review the existing work on GNRFET circuit modelling, compare the two varieties of GNRFETs, Metal-Oxide-Semiconducting-(MOS-)type and Schottky-Barrier-(SB-)type GNRFETs, and thoroughly discuss and explore their respective strengths in terms of delay, power, and noise margin. From this point of view, we discuss their possible applications, especially the use towards low-power computing.

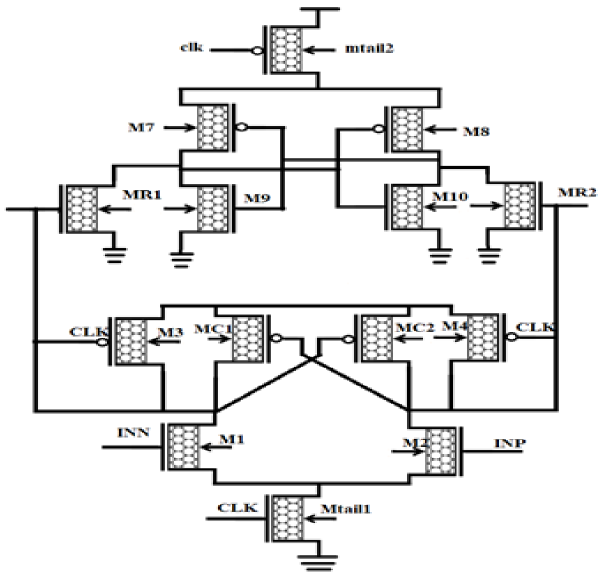

Figure 1:dynamicdouble-tailcomparator using GNRFET

The above figure shows the dynamicdouble-tailcomparator using GNRFET.it is used in low voltage application.

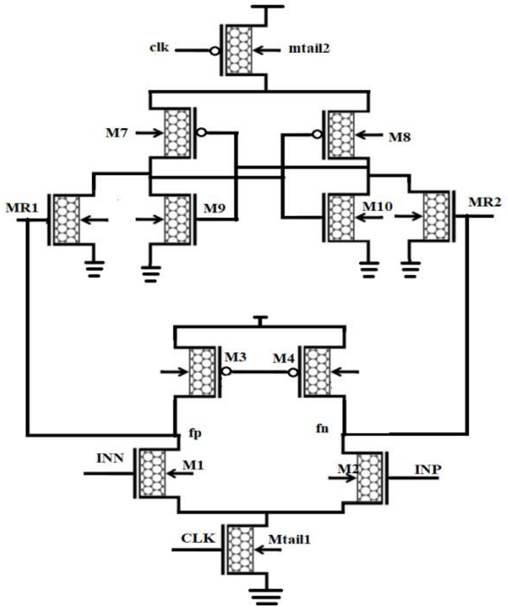

Figure 2: proposed Dynamic comparator

The above figure shows the proposed Dynamic comparator. Here we are using the GNRFET.because it is having low delay, low average power and energy.

III. RESULT

Table 1: comparison table 1

circuit1	MOSFET based Comparator	GNRFET based Proposed Comparator
Average Power(W)	5.56E-07	7.43E-09
Delay(S)	4.09E-10	4.02E-11
Energy(J)	2.28E-16	2.99E-19

The above table 1 shows the comparison of average power, delay and energy ofMOSFET based Comparator and GNRFET based Proposed Comparator. Here we can see the average power is high in GNRFET based Proposed Comparator low in MOSFET based Comparator and the delay is low in GNRFET based Proposed Comparator high in MOSFET based Comparator and the energy is high in GNRFET based Proposed Comparator low in MOSFET based Comparator.

Table 2: comparison table 2

circuit2	MOSFET based Proposed Comparator	GNRFET based Proposed Comparator
Average Power(W)	5.93E-07	8.10E-09
Delay(S)	3.23E-10	3.98E-11
Energy(J)	1.92E-16	3.23E-19

The table 2 is shows the comparison table ofMOSFET based Proposed Comparator and GNRFET based Proposed Comparator. Here we can see the average power, delay and energy of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator. The average power is high in GNRFET based Proposed Comparator and low in MOSFET based Proposed Comparator and the average power is high in GNRFET based Proposed Comparator and low in MOSFET based Proposed Comparator and the average power is high in GNRFET based Proposed Comparator and low in MOSFET based Proposed Comparator.

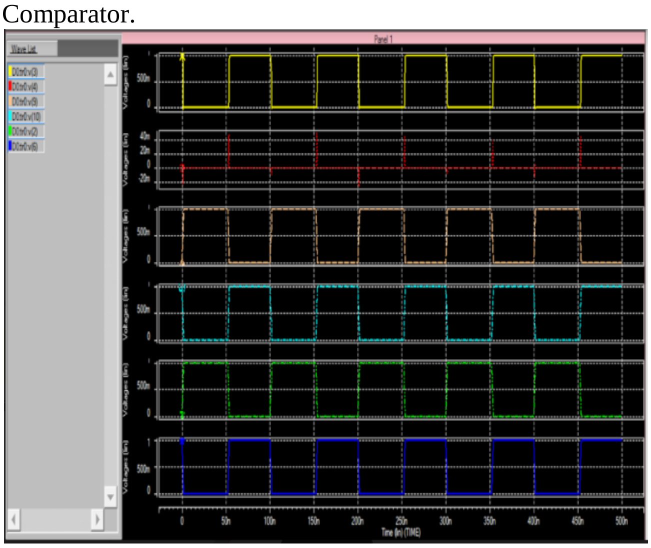

Figure 3: Input output waveform of proposed system

The figure 3 shows the input and output wave form of proposed system.

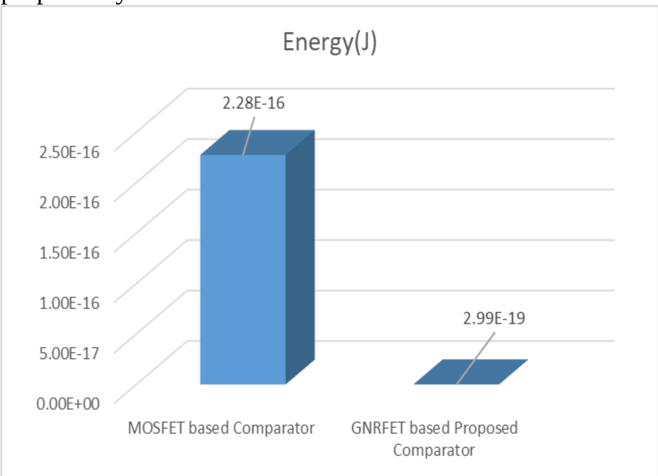

Figure 4: Energy of MOSFET based Comparator and GNRFET based Proposed Comparator

In figure 4 shows the energy diagram of MOSFET based Comparator and GNRFET based Proposed Comparator. Here we can see the energy is less in GNRFET based Proposed Comparator and high in MOSFET based Comparator.

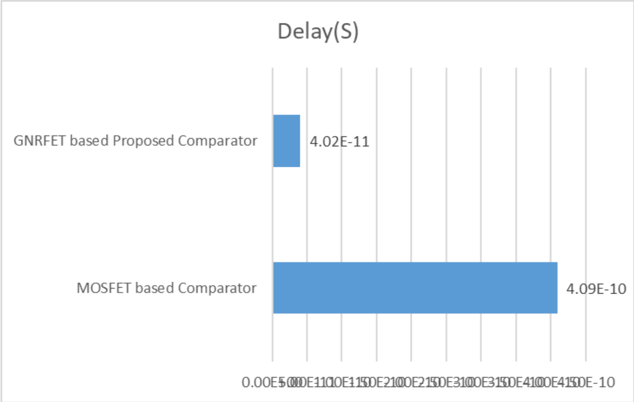

Figure 5: Delay of MOSFET based Comparator and GNRFET based Proposed Comparator

In figure 5 shows the Delay diagram of MOSFET based Comparator and GNRFET based Proposed Comparator. Here we can see the delay is less in GNRFET based Proposed Comparator and high in MOSFET based Comparator.

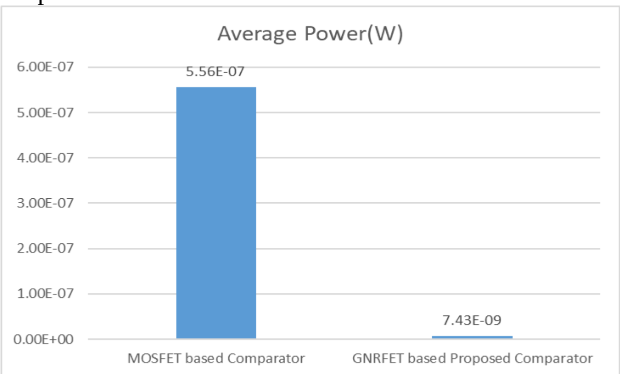

Figure 6: Average power MOSFET based Comparator and GNRFET based proposed Comparator

In figure 6 shows the average power diagram of MOSFET based Comparator and GNRFET based Proposed Comparator. Here we can see the average is less in GNRFET based Proposed Comparator and high in MOSFET based Comparator.

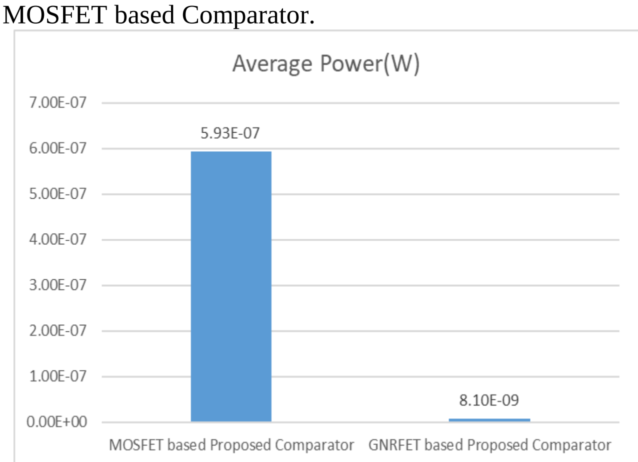

Figure 7: Average power of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator

The graph figure 7 diagram shows the Average power of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator. here we can see the average power is less in GNRFET based Proposed Comparator and high in MOSFET based Proposed Comparator.

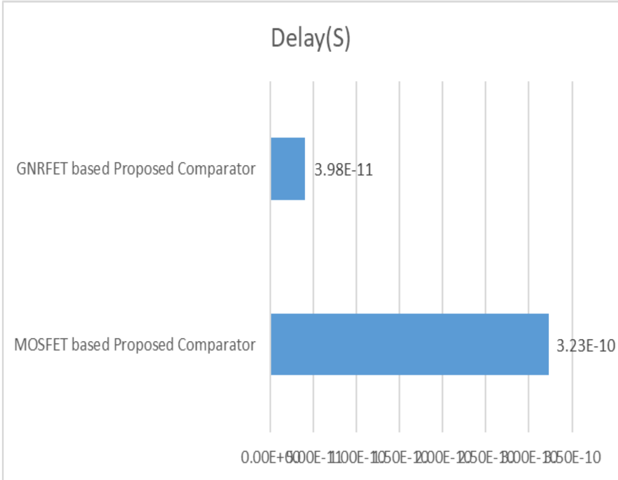

Figure 8: Delay of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator

The above figure 8 graph diagram shows the Delay of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator. here we can see the delay is less in GNRFET based Proposed Comparator and high in MOSFET based Proposed Comparator.

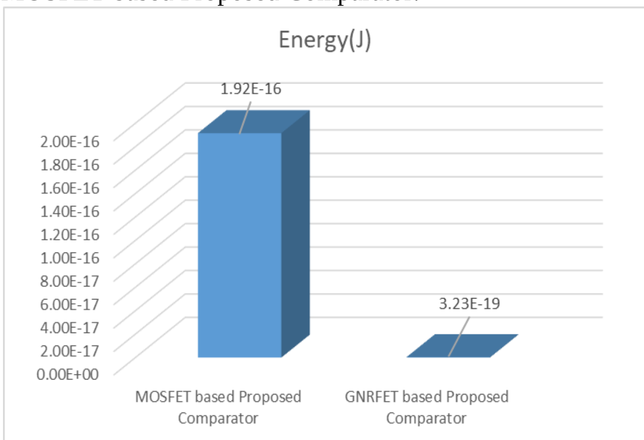

Figure 9: Energy of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator

The above figure 9 graph diagram shows the energy of MOSFET based Proposed Comparator and GNRFET based Proposed Comparator. here we can see the energy is less in GNRFET based Proposed Comparator and high in MOSFET based Proposed Comparator.

IV. CONCLUSION

Hence, here we are comparing different circuits likeMOSFET based Comparator and GNRFET based Proposed Comparator and MOSFET based Proposed Comparator and GNRFET based Proposed Comparator and finding the different parameters in different comparator. Here we are getting the parameters are energy, average power and delay. The energy, average power and delay is less in GNRFET based Proposed Comparator that is main advantage of this proposed system.The performance limits of a multilayer graphene nanoribbon (GNR) field-effect transistor (FET) are assessed and compared with those of a monolayer GNRFET and a carbon nanotube (CNT) FET.

V. REFERENCES

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