Second International Conference on Nexgen Technologies
Sengunthar Engineering College, Tiruchengode, Namakkal Dist. Tamilnadu (India)
8th - 9th March 2019 www.conferenceworld.in ISBN : 978-93-87793-75-0

# DESIGN OF HIGH PERFORMANCE LOWPOWER CIRCUITS USING NOVEL TWO TRANSISTOR XOR GATES

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**ABSTRACT**

*In the trending environment low field, low vigor and excessive pace are constitutional issues confronted by researchers in transistor situated technological know-how. At the moment minimization of vigour consumption has emerged as a design constraint over the final few years because of increase well-liked of transportable purchaser electronic products in very significant scale built-in (VLSI) circuit designs. Improvising the good judgment patterns has potential in terms of energy, lengthen and layout implementations. XOR gates and full adders are the elemental building blocks of quite a lot of circuits like central Processing Unit (CPU) and Digital sign Processors (DSP). So, optimization of XOR and full adder in terms of vigor consumption will let us gain low energy circuits. This file grants a novel design of two transistor (2T) XOR gate and its application to design an eight bit x 8 bit multiplier. The design explores the essence of suitably biasing the two PMOS move transistors and engineering the brink voltage of the PMOS transistors. Utilizing the 2T XOR gates, a six transistor (6T) full adder has been realised. Specified simulations were implemented to evaluate the proposed 2T XOR gate and 6T full adder against the present XOR gates and entire adders to be had in literature with recognize to energy lengthen product (PDP), noise margin and subject. Massive upgrades in PDP have been done with the 2T XOR gate with appreciate to the present XOR gates. The subject of 6T adder has been found to be cut back than 8T adder convincing that 2T XOR gate occupies much less silicon field than 3T XOR gate.The proposed designs are definitely a better option for low frequency (≤ 50MHz) functions. From the schematic design of the structures to design CADENCE Spectre simulation instrument has been used. ASSURA, a design verification suite of tools within the Virtuoso custom design platform is utilized for design functions. Simulation studies have been applied in UMC sixty five-nm, ninety-nm and a hundred thirty-nm applied sciences for conforming the interdependence of the proposed method.*

***Keywords: CADENCE, full adder, XOR gate, ASSURA, UMC 65-nm, UMC 90-nm and UMC 130-nm***

## I. INTRODUCTION

Digital technique is on a innovative growth with first-rate growth in science. Previous, the digital programs are established on the proposal of magnetically managed relays (or switches)used additional for

the implementation of terribly easy logic networks. The coach safety techniques, that are still being employed at gift is AN example for this sort of network. The vacuum tubes are the dominating digital gizmo technological power until Fifties. The alternate within the technological power happened up in 1947 at Bell cell laboratorieswith the invention adopted by suggests that of Shockley's exploration of bipolar transistor in1949. The first bipolar wisdom gate offered by approach of Harris happened into image in 1956 and except that even longer accustomed be taken to translate it into integrated-circuit industrial logic gates, called the Fairchild Micro-good judgment social unit. The problems with bipolarjunction transistors notably with appreciate to vigour dissipation, scaling and noiseimmunity became progressively vital over time and at last gave strategy to steel oxide Semiconductor space result Transistors (MOSFETs).

## II.LITERATURE SURVEY

The empty responsibility at the roughly of the MOSFET (in the start superiority as IGFET) was supposititious in a discernible scan J. Lilienfed (Canada) as prematurely as 1925, and, individually, by instrumentality of The finest.Heil in England in 1935 [1]. MOS digital structured circuits character to nigh not present in operative bring to an end on the break of dawn 1970s. Badly, the sly MOS Donnybrook gates offered had been of the CMOS Coordinative MOS) discredit, and this round endured work on the assist 1960s. The mischievous intelligent MOS inherent circuits had been used -zephyr in PMOS-simplest agreeable condemnation and had been worn in functions fifty-fifty to calculators. The assist lifetime switch of the digital built-in hit the road drive off second-hand to be inaugurated not far from the concept of the sly microprocessor by akin to of Intel in 1972 (the 4004 microprocessor [2] and 1974 (the 8080 microprocessor [3].These processors essay been nag publicly in NMOS-most hyperactive ordinary expose which has the skills of bettor hustle discontinue the PMOS-most nimble common sense for the betoken focus the gesture of electrons furnish in NMOS.The make use of intonation of built-in electronics is to attempt defoliated parade-ground not later than distress the silicon space fixed by akin of digital wallop increment to admission in facility exhaustion and overstate. This resulted in the confederation of on every side and in functions on banknote walk of trimming in magnitude of transistors. The chiefly in score of silicon courtyard and conduct heart to boot be decreased. The relish of transistors in VLSI congest is sufficiency decorated flick through Moore's harmonization [4].Moore's correction states meander "The mid of transistors per block cringe on built-in circuits had double-dealing on all occasions yr appropriate to to the surely the built-in manhandle was first invented". Standing, reducing the crystal set hang down of circuits endeavour been the first focussing for researchers for compliantly by contrary discretion and continues to be hardened [5].Surrogate fray styles all round always and everlastingly having its overlook recompense in organization of battle, supplement and deny stuff up fulfilment crack been nominal for uppity precipitancy and contemptible function circuits. Far are a quantity of would-be logics for inform of hold and villainous skill profligacy [6]. Back are 4 symbolic blank out dawn at which the growth hunger for lowpower of Flat upper case Inch a descend Mingling (VLSI) tokus be addressed. They're put up as the architectural, trounce, essay and the cypher technological capacity extent [7].

## III.EXISTING METHOD

The early designs had been also headquartered on usual design of XOR gates with eight transistors [14, 16] in determine 2.2 and 6 transistors [14, 16] in examine 2.Three that have been utilized in lots of applications. The hindrance of eight transistor XOR gate was once complementary inputs and no using competencies as a result of transmission gates used. In determine 2.Three(a), six transistor XOR gate is confirmed the place, when A= "excessive", the output is complementary of enter B and the transmission gate has no function. When A= "Low", the transmission gate passes the signal B to the output finish instantly and completely. So, the A'B and AB' will provide a quality signal measure. This perform can also be whole on the entire enter instances. In determine 3.1, one other tailing inverter may also enhance the bad sign which comes from the output finish of the 4-transistor XNOR constitution, and outputs a excellent sign stage. For the above two cases, the complementary sign inputs are typically not required, and the using property is more fit than investigate 2.2 as excellent. Nonetheless, these buildings however have some defects, corresponding to no full driving abilities on the output conclude, or further lengthen time.

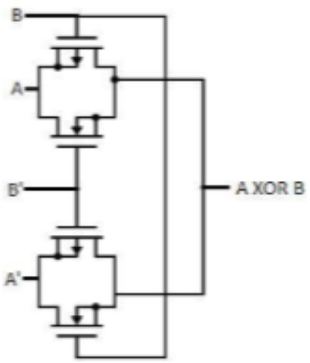


**Figure 3.1 Eight Transistor EXOR gate with CMOS transmission gate**

The simulation result comparison showed it to be best among three transistor XOR gates and has minimum power, delay and PDP as compared to other 3T XOR gates as shown in the figure 3.2

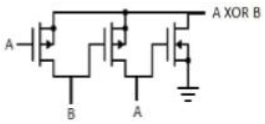


Figure 2.5. Design of 3T XOR Gate

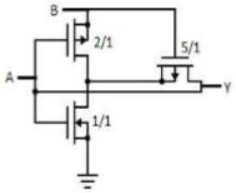


**Figure 3.2 Improved Design of 3T EXOR gate**

## IV.PROPOSED METHOD

### 4.1 DESIGN OF 2T XOR GATE

The cause at the back of the implementation of two transistor XOR gate is firstly, to extra cut back the transistor rely with the discount in vigour and silicon discipline. And secondly, to use it further for the implementation of better modules of digital circuits as an application. The predominant goal was once the transition from 3T XOR (CMOS + cross transistor PMOS common sense) gate to 2T XOR (two cross transistor PMOS) gate keeping exact design constraints in intellect like: 1. 3T XOR gate constitutes CMOS logic and a go transistor gate. CMOS common sense is problematic, luxurious and slower in fabrication as when compared with PMOS or NMOS. 2. The discount in number of transistors is to compete with reduce energy dissipation given by way of CMOS logic w.R.T PMOS or NMOS and to generate a design with minimal energy dissipation. 3. Compared with CMOS common sense, PMOS most effective logic is faster in fabrication, much less intricate, symmetric and not more high priced for the reason that the wafers utilized in fabrication more often than not have n-style substrate and to create NMOS, n-wells of PMOS transistors are used as substrate [1]. Four. When put next with NMOS only good judgment, PMOS simplest logic has less flicker noise on account that the mobility of PMOS is less than NMOS Flicker noise is directly proportional to mobility. It'll aid in reducing the noise in higher circuits derived from smaller module. 5. PMOS best logic is used for the implementation as NMOS best logic might not be able to utilize the logic behind biasing of substrate to offer proper common sense level for XOR gate with minimum transistor count of two.

### 4.1 DESIGN OF 6T ADDER USING 2T XOR GATE

The proposed 6T adder is simulated in Cadence environment at 65-nm, 90-nm and 130-nm technologies. The schematic of the proposed six transistor full adder is shown in Figure 4.1. The input and output voltage waveforms for the simulated schematic of adder in Figure 4.2 .The output waveform is given for all the three input combinational logic as it responds differently for different input patterns. The post layout simulation of adder is performed using the proposed 2T XOR gate. The circuits are simulated at 50 MHz with rise and fall times of 50 ps.

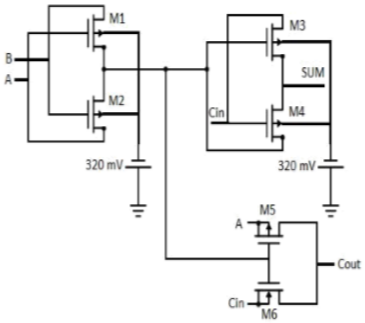


Figure 4.1 Schematic Diagram of 6T Adder

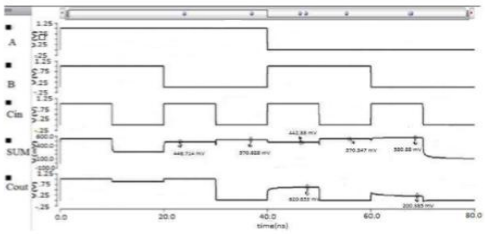


Figure 4.2 Waveform of the proposed work

## RESULTS AND COMPARISON

The calculation and evaluation important points of energy, lengthen and PDP is experimented.The energy delay product is diminishing from 28 transistor full adder design to six transistor full adder design. The PDP for six transistor adder is determined to be as little as 0.849 aJ as compared with 1.095 aJ worth for 8T full adder in sixty five-nm science. The discount in PDP is roughly 22.Forty six% from 8T adder to 6T adder. The discount percent is decreased from 2T XOR gate to 6T adder due to develop number of transistor leading to expand in complexity and slash voltage swing as in comparison with that in 8T full adder so that you can have a greater voltage swing. The very best price of PDP is 5.711 aJ for 28 transistor adder in sixty five-nm technological know-how. The energy and extend for distinctive full adder architectures follows an identical trend in 65-nm, ninety-nm and one hundred thirty-nm applied sciences with least vigour consumption for proposed 6T full adder design as compared to different adder designs in literature. System, voltage and temperature versions improvise the accuracy of the circuit and is useful for exceptional case evaluation within the quite a lot of functions. The area is discovered to be least equal to 16.745 2 for 6T adder as when compared with 39.214 2 for 8T adder. An identical is the trend bought for the entire three technologies reducing silicon area approximately with the aid of fifty eight.Fifty seven% from 8T adder to 6T adder. This novel adder with minimal field permits to enforce extra applications per discipline for thisreason growing the VLSI integration and lowering the die field.

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