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Research Article

Analysis of Low Power Gdi Based Alu for High-Speed Applications

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ABSTRACT
In this paper we designed the GDI based 1-bit ALU using the 90nm technology. In order to minimize the number of transistors and area these can be evolved as a one of the primary factor for the days electronic devices respectively. These can be wieldy used for the low power applications in order to save the energy and power respectively. It eventually decreases the delay of 9% as compared to the existed techniques. And the given cane be designed and simulated using the cadence virtuoso.

Keywords: ALU, GDI, low power, high speed.

Introduction

With ever increasing of the electronic devices and communication systems, there is always trade off among the power, speed and area. In current day modern digital systems ALU plays a one of the hard core for the digital signal processors, microprocessors, and etc. a bunch of literature work is already has been developed to mitigate the above mentioned problems. The critical aspect of the modern micro electronic systems was high speed and low area. Based on these factors a set of architectures has been developed and employed respectively[1-6].

Over the past decade Gate Diffusion Input (GDI) based architectures were employed instead of CMOS transistors. The conventional CMOS based circuits occupies the many number of transistors and more area, hence by replacing the above mentioned problems designed all the combinational blocks in the ALU with the help of GDI. The rest of the paper organised as follows section 2 describes the basic over view of gate diffusion inputs and section 3 describes the proposed ALU architecture and its operation.

Back ground

Here to reduce the power loss and to diminish circuit complexity GDI is plays a vital role. The basic configuration of two transistor GDI cell as shown in figure 1. Which has different nodes such as G, P and N. Basically the AND cell requires the more number of transistors but if the cell has designed with the help of GDI it requires only two number of transistors.

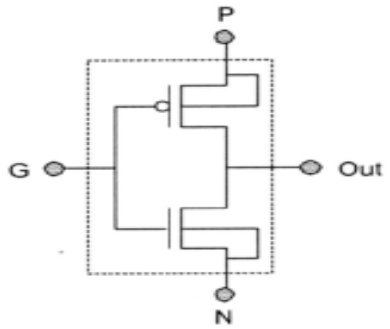

Fig.1: Basic GDI cell.

Proposed 1 BIT ALU

The proposed 12 T GDI based cell can performs the both logic as well arithmetic operations. The proposed ALU cell as shown in the figure 3, it can be performs the all the required operations such as addition, subtraction, multiplication, division etc. And also performs the NOT, AND, OR, and XOR operations respectively.

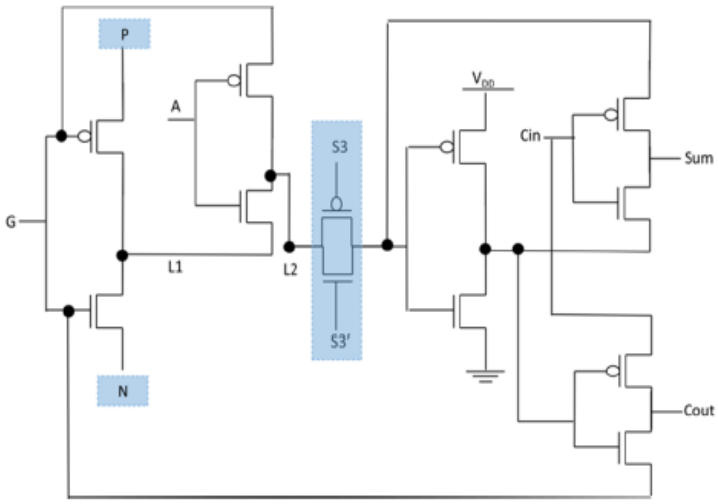

Fig.2: 1-Bit GDI based full adder.

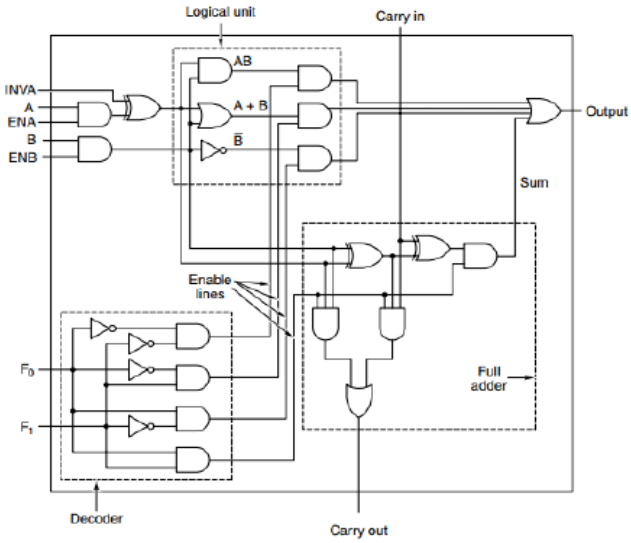

Fig.3: Proposed 1 bit ALU.

The basic operation of the proposed 1 bit ALU shown by the table 1:
When N=0, P= Vdd and G= B then it produces the inverting operation.
When N=A, P= 0 and G= B then it produces the AND operation.
When N=VDD, P= A and G= B then it produces the OR operation.
When N=0, P= Vdd and G= B then it produces the XOR operation.
When N=0, P= Vdd and G= B then it produces the SUM operation.
When N=0, P= Vdd and G= B' then it produces the SUB operation.

Table I. Input combinations for Logic/adder functionality.

Function	S0	S1	N	P	G	Output Node
INV	0	0	0	Vdd	B	L1
And	0	1	A	0	B	L1
OR	1	0	Vdd	A	B	L1
XOR	0	0	0	Vdd	B	L2
ADD	0	0	0	Vdd	B	Sum
SUB	1	1	0	Vdd	B'	Sum

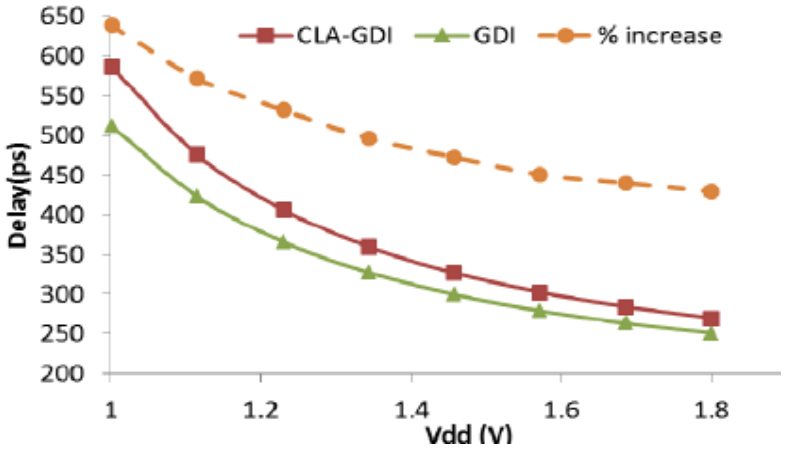

Fig.4: delay vs VDD

Conclusion

The 1 bit GDI based ALU is one of the prominent and low power ALU and it can emerged to be the one of the most important building block in the current day electronic systems. And it can provides the multiple operations such as arithmetic and logical operations. To reduce the power consumption and eliminate the switching activity over the period of time.

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