Basic ALU Design

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Abstract

A basic design of a 1-bit ALU has been proposed in this report. The circuit is capable of perfoming logical and arithmetic operations. The design comprises of both digital and analog blocks. It is intended for a mixed-signal application.

Keywords:- ALU, Full-Adder, Selection Lines

Introduction

An Arithmetic Logic Unit(ALU) is a combinational digital circuit that performs arithmetic and logical operations on binary numbers. It is an fundamental building block of many types of computing circuits, including the Central Processing Unit(CPU) of computers, Graphical Processing Units(GPU), and etc.

In the above circuit the ALU performs 1-bit operations. It comprises of pins A,B,Cin as the operand inputs and S1,S0 as the selection line inputs, VDD as power supply input and Y and Cout as the output. It is capable of perfoming addition, AND, OR and XOR operation. The design comprises of a full-adder, AND gate, OR gate and XOR gate connected to the 4x1 multiplexer.

The table presents the operation of the ALU based on the selection line inputs.

TABLE I : Operation of the ALU based on Selection Lines

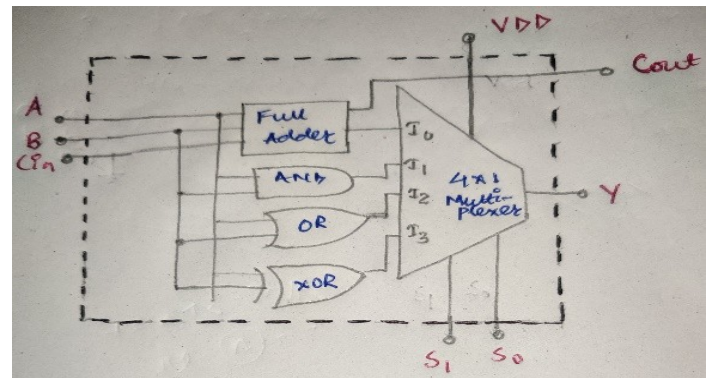| S1	S0	Operation
0	0	A+B
0	1	A.B
1	0	A|B
1	1	A^B

Circuit Design
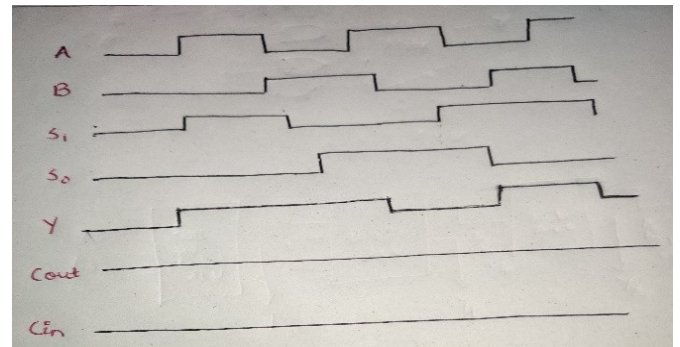

Fig. 1: ALU Circuit Diagram

Output

Fig. 2: ALU Output Waveform

References

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