Computer Architecture Final Project (8-Bit ALU System)

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(Github Version)

Introduction

In The 8-Bit ALU System project we exploring the design and functions for an Arithmetic Logic Unit (ALU). An arithmetic unit within the ALU make some tasks such as Addition , Addition with carry, Subtraction, Subtraction with borrow, Decrement , Increment, and Transfer. And other thing is logic unit, The logic unit performing logical operations like AND, OR, XOR, NOT, as well as Shift right and left operations. This ALU circuit provides 8 arithmetic operations, 4 logic operations, and 2 shift operations. The selection of operations is controlled by five variables: S3, S2, S1, S0, and Cin, and specifically the input carry (Cin) used for selecting the arithmetic operations .

Function of ALU

S_3	S_2	S_1	S_0	C_{in}	Result	Operation
0	0	0	0	0	$A + B$	Addition
0	0	0	0	1	$A + B + 1$	Addition with carry
0	0	0	1	0	$A + \overline{B}$	Subtraction with borrow
0	0	0	1	1	$A + \overline{B} + 1$	Subtraction
0	0	1	0	0	$A - 1$	Decrement
0	0	1	0	1	A	Transfer
0	0	1	1	0	A	Transfer
0	0	1	1	1	$A + 1$	Increment
0	1	0	0	x	$A \cdot B$	AND
0	1	0	1	x	$A + B$	OR
0	1	1	0	x	$A \oplus B$	XOR
0	1	1	1	x	$NOT\ A$	Complement
1	0	0	x	x	$LSR\ A$	Logical Shift Right
1	0	1	x	x	$LSL\ A$	Logical Shift Left

8-Bit ALU Diagram: