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Simple Arithmetic Logic Unit (ALU) Verification

Verification Plan

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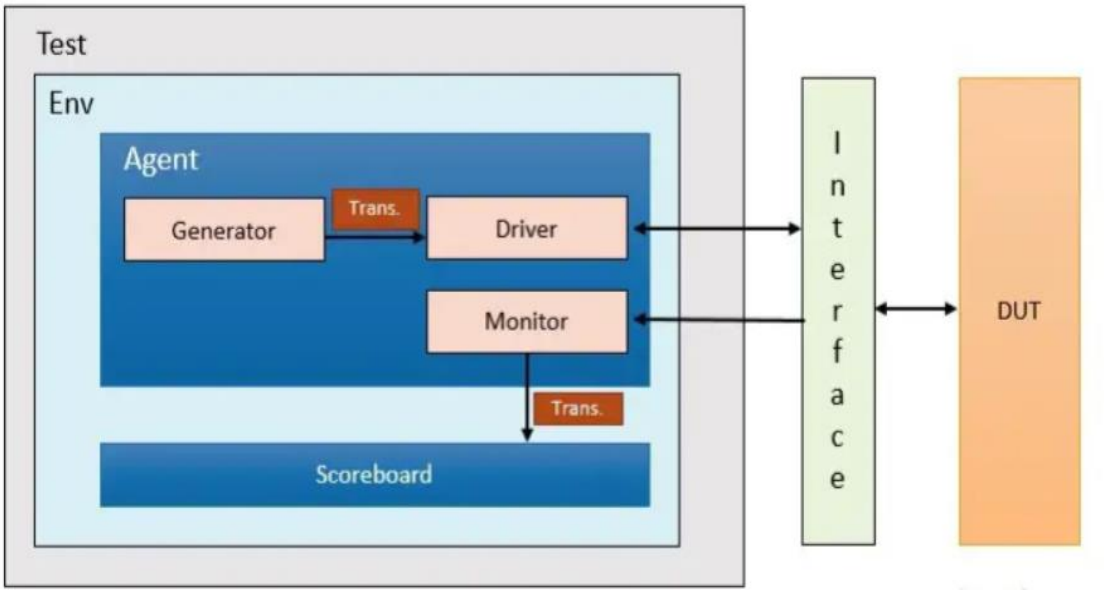
Description

An arithmetic logic unit (ALU) is a major component of the central processing unit of a computer system. It is responsible for performing arithmetic and logic operations on binary numbers.

The primary functions of an ALU include arithmetic operations (these involve basic mathematical calculations such as additions, subtraction, multiplication and division and logic operations (these include bitwise operations such as AND, OR, XOR and NOT.

Diagram Description of the environment



DUT = DUT stands for Design Under Test and is the hardware design, in the specific case, the ALU.

Generator = Generates different input stimulus to be driven to DUT.

Interface= Contains design signals that can be driven or monitored.

Monitor= Monitor the design input-output ports to capture design activity.

Driver= Drives the generated stimulus to the design.

Scoreboard = Checks output from the design with expected behavior.

Environment = Contains all the verification components mentioned above.

Test = Contains the environment that can be adjusted with different configuration settings.

VERIFICATION FLOW AND TEST CASES

Verification flow:

1.Receive two 4-bit data inputs (A and B) and the operation code (Opcode) that specifies the desired arithmetic or logical operation.

2.Decode the operation code to determine the type of operation to be performed (ADD, SUB, AND, OR, NOT, etc.).

3.If the operation is arithmetic, perform the arithmetic operation (ADD, SUB) on the corresponding bits of A and B. Handle overflow and generate a carry-out if necessary. If the operation is logical, perform the logical operation (AND, OR , XOR) on the corresponding bits A and B.

4.Generate the result of the arithmetic or logical operation.

5.Output the result of the operation.

The test cases for the ALU verification

1.Addition Test Cases (the basic addition, test with carry and test overflow)

2.Subtraction Test Cases (the basic subtraction, test with carry and test overflow)

3.Logical (AND, OR,XOR, etc.)Test Cases(test basic operation, test with zeros).

4.