Experiment2: Multiplier

Prakhar Mittal Roll Number 190070046

EE-214, WEL, IIT Bombay

March 06, 2021

## Overview of the experiment:

|  |
| --- |
| The purpose of the experiment was to design a logical circuit to multiply 2 4-bit inputs using behavioural architecture in VHDL and use scan-chain to test the design. |

## Approach to the experiment:

|  |
| --- |
| First calculate all the partial products as 8-bit vectors and then add all of them to find the multiplication. |

## Design document and VHDL code if relevant:

|  |
| --- |
| adder function adds two 8-bit number :  function adder(A: in std\_logic\_vector; B: in std\_logic\_vector)  return std\_logic\_vector is  -- variable declaration  variable sum : std\_logic\_vector(NN downto 0):= (others=>'0');  variable carry : std\_logic\_vector(NN downto 0):= (others=>'0');  begin  -- describing behaviour of adder  for i in 0 to NN-1 loop  sum(i) := A(i) xor B(i) xor carry(i);  carry(i+1) := (A(i) and B(i)) or (carry(i) and (A(i) xor B(i)));  end loop;  sum(NN):=carry(NN);  return sum;  end adder;  mul process multiplies the two 4-bit input vectors :  begin  -- Calculation of partial products  row: for i in 0 to N-1 loop  col: for j in 0 to N-1 loop  pp(i)(i+j) := (A(j) and B(i));  end loop col;  end loop row;    -- summation of partial product  temp1 := adder(pp(0),pp(1));  temp2 := adder(temp1(7 downto 0),pp(2));  temp3 := adder(temp2(7 downto 0),pp(3));  result := temp3(7 downto 0);  M <= result; -- assignment of final result  end process; -- multiplier |

## RTL View:

|  |
| --- |
|  |

## DUT Input/Output Format:

|  |
| --- |
| Input format:  (A3 A2 A1 A0 B3 B2 B1 B0) (M7 M6 M5 M4 M3 M2 M1 M0) (1 1 1 1 1 1 1 1)  Output format:  (A3 A2 A1 A0 B3 B2 B1 B0) (M7 M6 M5 M4 M3 M2 M1 M0)  Example Testcases:  Input:  00011000 00001000 11111111  00011001 00001001 11111111  00011010 00001010 11111111  00011011 00001011 11111111  Output:  00011000 00001000  00011001 00001001  00011010 00001010  00011011 00001011 |

## RTL Simulation:

|  |
| --- |
|  |

## Gate-level Simulation:

|  |
| --- |
|  |

## Krypton board\*:

|  |
| --- |
|  |

## Observations\*:

|  |
| --- |
| The Scan Chain returned that all testcases were passed. It means that our Behavioural design works as intended. |

## References:

|  |
| --- |
| Nil |

\* To be submitted after the tutorial on Using Krypton.