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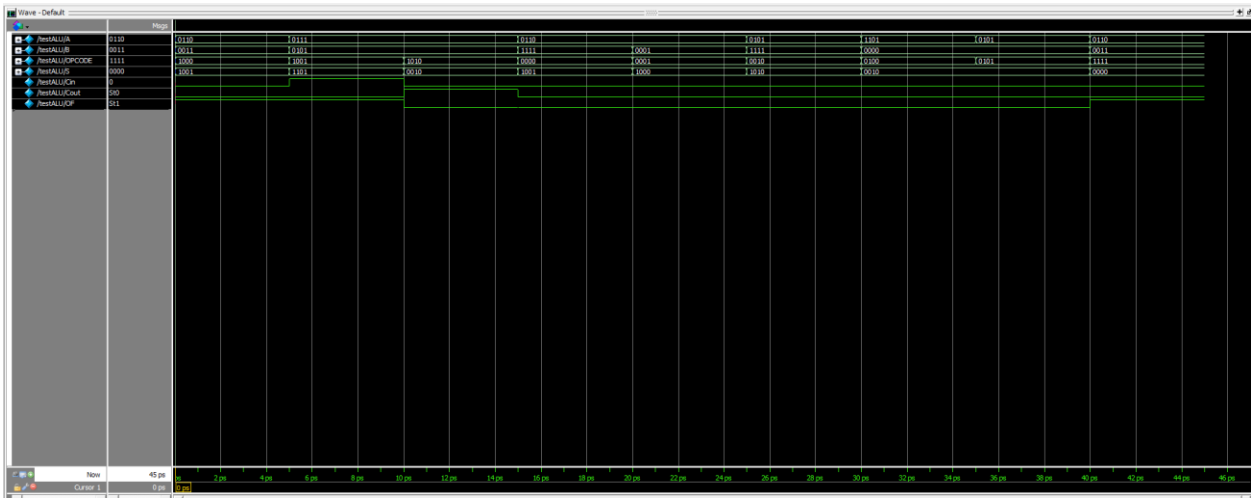
EEE333

Lab 2

**ALU Test Bench Waveform:**

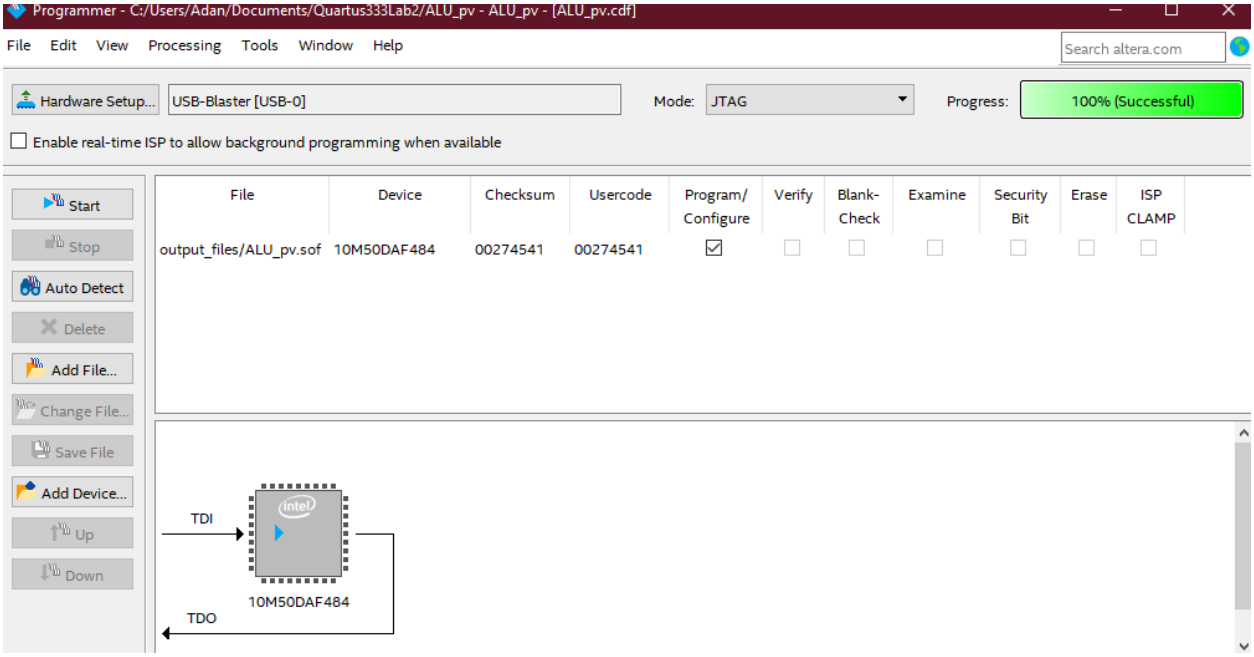


**ALU Test Bench Table:**

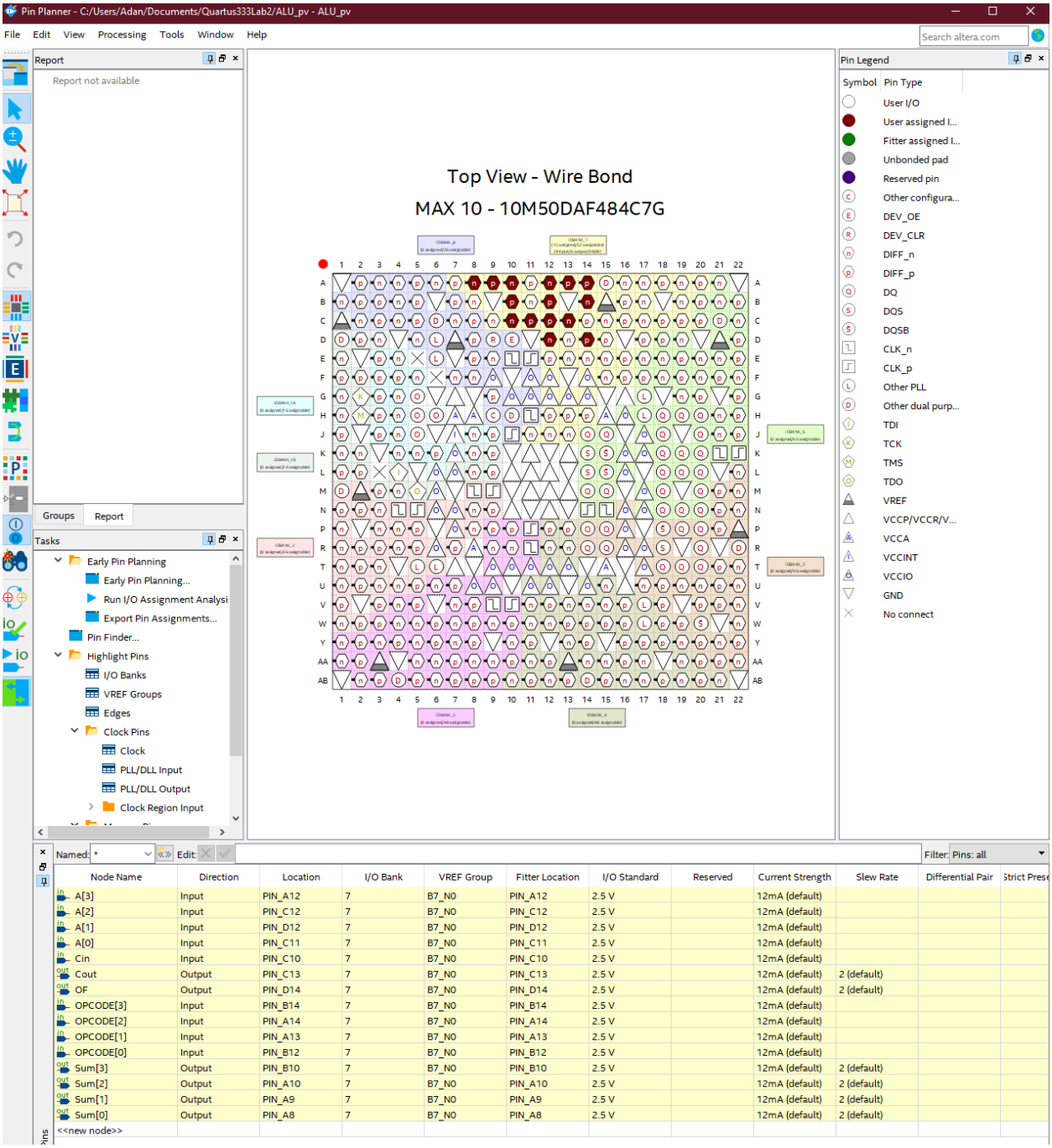
**Test Bench Tests**

| # | *Operation* | *aluin_a* | *aluin_b* | *Cin* | *alu_out* | *Cout* | *OF* |
|---|---|---|---|---|---|---|---|
| 1 | add | 0110 | 0011 | 0 | 1001 | 0 | 1 |
| 2 | add with Cin | 0111 | 0101 | 1 | 1101 | 0 | 1 |
| 3 | sub b from a | 0111 | 0101 | 0 | 0010 | 1 | 0 |
| 4 | Bitwise NAND | 0110 | 1111 | 0 | 1001 | 0 | 0 |
| 5 | Bitwise NOR | 0110 | 0001 | 0 | 1000 | 0 | 0 |
| 6 | Bitwise XOR | 0101 | 1111 | 0 | 1010 | 0 | 0 |
| 7 | Bitwise NOT | 1101 | 0000 | 0 | 0010 | 0 | 0 |
| 8 | logical right shift | 0101 | 0000 | 0 | 0010 | 0 | 0 |
| | | | | | | | |
| | | | | **result** | | | |
| | | *aluin_a* | *aluin_b* | *Cin* | *Result* | *Carry out* | *Overflow* |
| 9 | Function given | 0110 | 0011 | 0 | 0000 | 0 | 1 |

## ALU Board Programming:



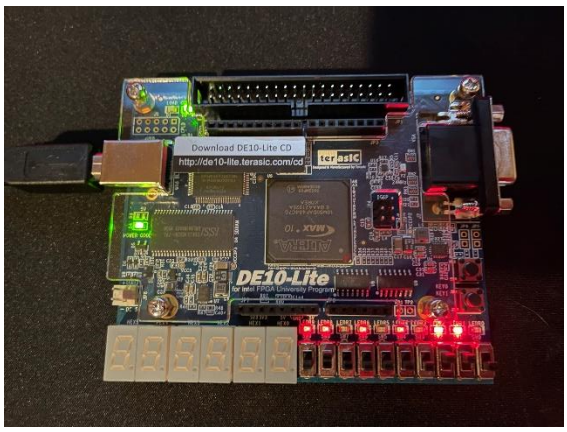
# Pin Assignments:



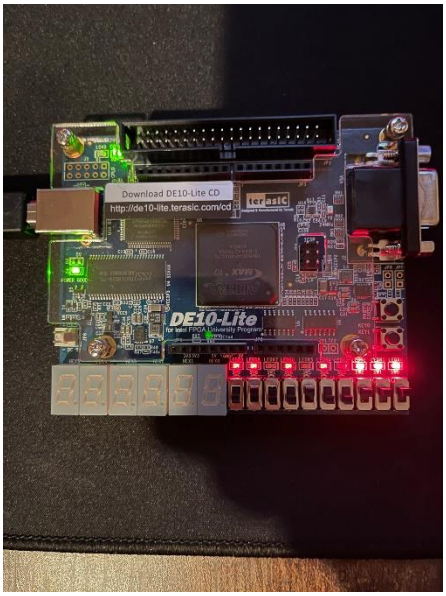

| Node Name | Direction | Location | I/O Bank | VREF Group | Fitter Location | I/O Standard | Reserved | Current Strength | Slew Rate | Differential Pair | Strict Pres |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A[3] | Input | PIN_A12 | 7 | B7_N0 | PIN_A12 | 2.5 V | | 12mA (default) | | | |
| A[2] | Input | PIN_C12 | 7 | B7_N0 | PIN_C12 | 2.5 V | | 12mA (default) | | | |
| A[1] | Input | PIN_D12 | 7 | B7_N0 | PIN_D12 | 2.5 V | | 12mA (default) | | | |
| A[0] | Input | PIN_C11 | 7 | B7_N0 | PIN_C11 | 2.5 V | | 12mA (default) | | | |
| Cin | Input | PIN_C10 | 7 | B7_N0 | PIN_C10 | 2.5 V | | 12mA (default) | | | |
| Cout | Output | PIN_C13 | 7 | B7_N0 | PIN_C13 | 2.5 V | | 12mA (default) | 2 (default) | | |
| OF | Output | PIN_D14 | 7 | B7_N0 | PIN_D14 | 2.5 V | | 12mA (default) | 2 (default) | | |
| OPCODE[3] | Input | PIN_B14 | 7 | B7_N0 | PIN_B14 | 2.5 V | | 12mA (default) | | | |
| OPCODE[2] | Input | PIN_A14 | 7 | B7_N0 | PIN_A14 | 2.5 V | | 12mA (default) | | | |
| OPCODE[1] | Input | PIN_A13 | 7 | B7_N0 | PIN_A13 | 2.5 V | | 12mA (default) | | | |
| OPCODE[0] | Input | PIN_B12 | 7 | B7_N0 | PIN_B12 | 2.5 V | | 12mA (default) | | | |
| Sum[3] | Output | PIN_B10 | 7 | B7_N0 | PIN_B10 | 2.5 V | | 12mA (default) | 2 (default) | | |
| Sum[2] | Output | PIN_A10 | 7 | B7_N0 | PIN_A10 | 2.5 V | | 12mA (default) | 2 (default) | | |
| Sum[1] | Output | PIN_A9 | 7 | B7_N0 | PIN_A9 | 2.5 V | | 12mA (default) | 2 (default) | | |
| Sum[0] | Output | PIN_A8 | 7 | B7_N0 | PIN_A8 | 2.5 V | | 12mA (default) | 2 (default) | | |
| <<new node>> | | | | | | | | | | | |

**Physical Board Pics:**

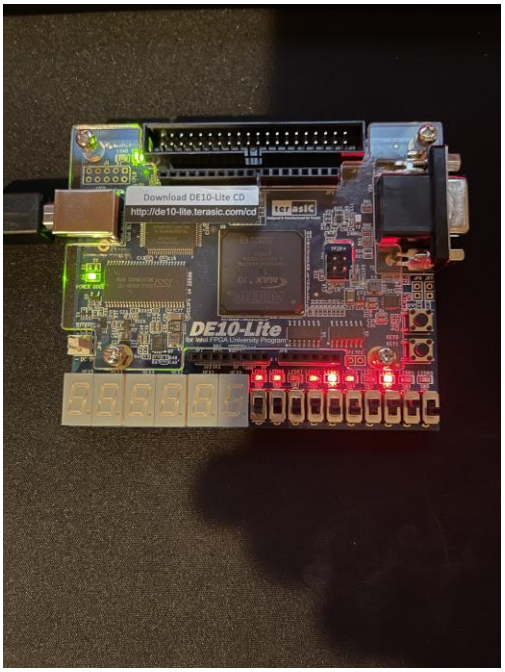
**#1 add:**



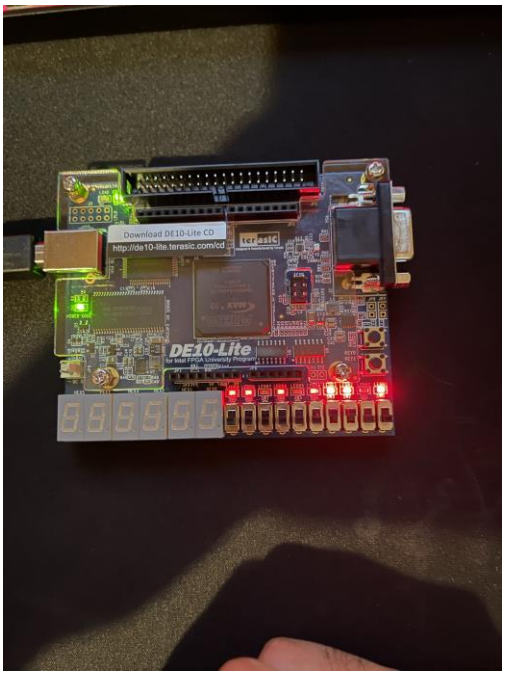

**#2 add with Cin:**



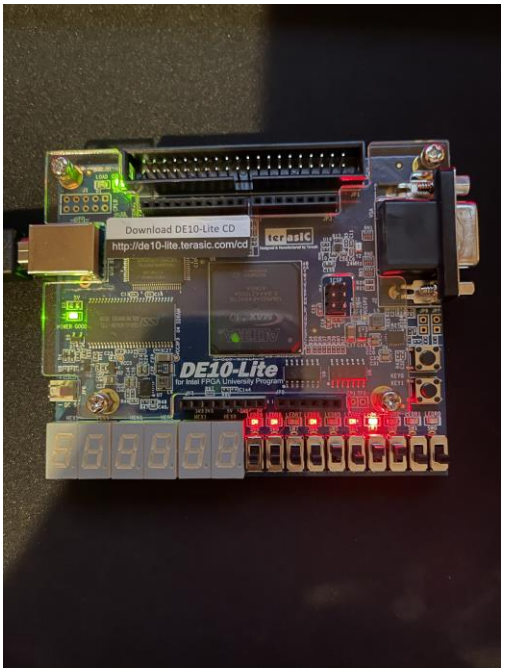
**#3 sub b from a:**



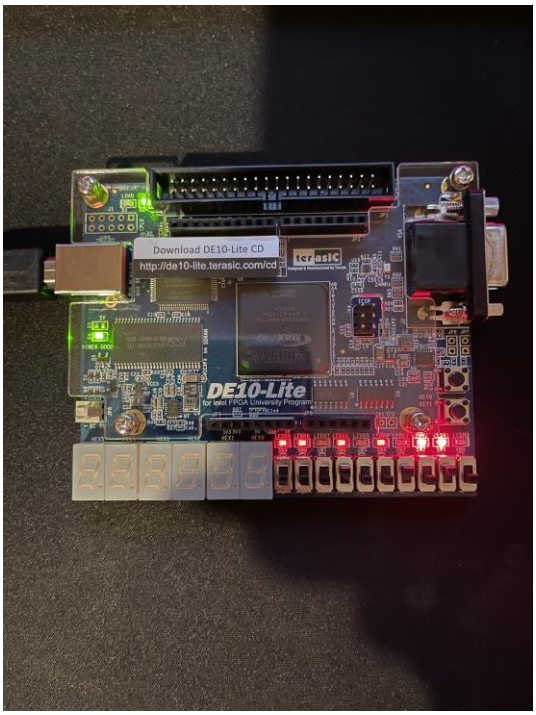

**#4 Bitwise NAND:**



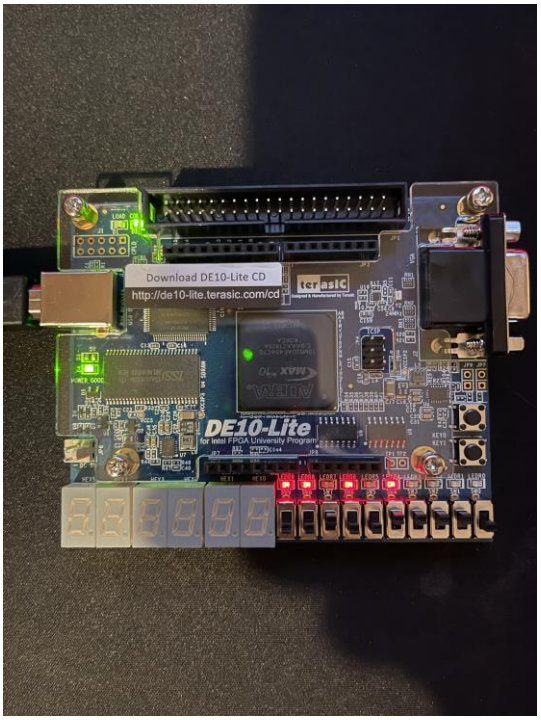
**#5 Bitwise NOR:**



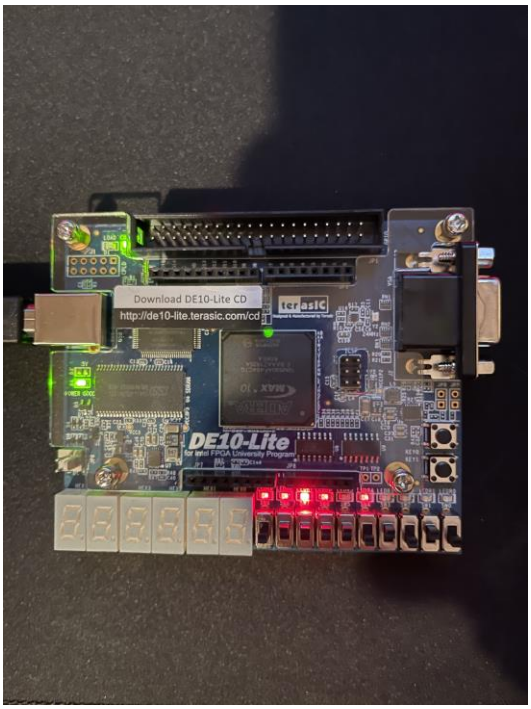

**#6 Bitwise XOR:**



**#7 Bitwise NOT:**




**#8 logical right shift:**



**ALU Physical Board Demo Table:**

## Demo

Take a snapshot showing the window that indicates your board is programmed (the progress bar should show 100% and include the full programming window in the image. And paste it into power point along with an image showing your pin assignments. Label each image and make sure it is clear.

| # | *Operation* | *aluin_a* | *aluin_b* | *Cin* | *alu_out* | *Cout* | *OF* |
|---|---|---|---|---|---|---|---|
| 1 | add | 0011 | 0011 | 0 | 0110 | 0 | 0 |
| 2 | add with Cin | 0011 | 0011 | 1 | 0111 | 0 | 0 |
| 3 | sub b from a | 0111 | 0011 | 0 | 0100 | 0 | 1 |
| 4 | Bitwise NAND | 0110 | 0011 | 0 | 1101 | 0 | 0 |
| 5 | Bitwise NOR | 0110 | 0011 | 0 | 1000 | 0 | 0 |
| 6 | Bitwise XOR | 0101 | 0011 | 0 | 0110 | 0 | 0 |
| 7 | Bitwise NOT | 1111 | 0011 | 0 | 0000 | 0 | 0 |
| 8 | logical right shift | 0101 | 0011 | 0 | 0000 | 0 | 1 |
| note, hardcoded | | | | | | | |