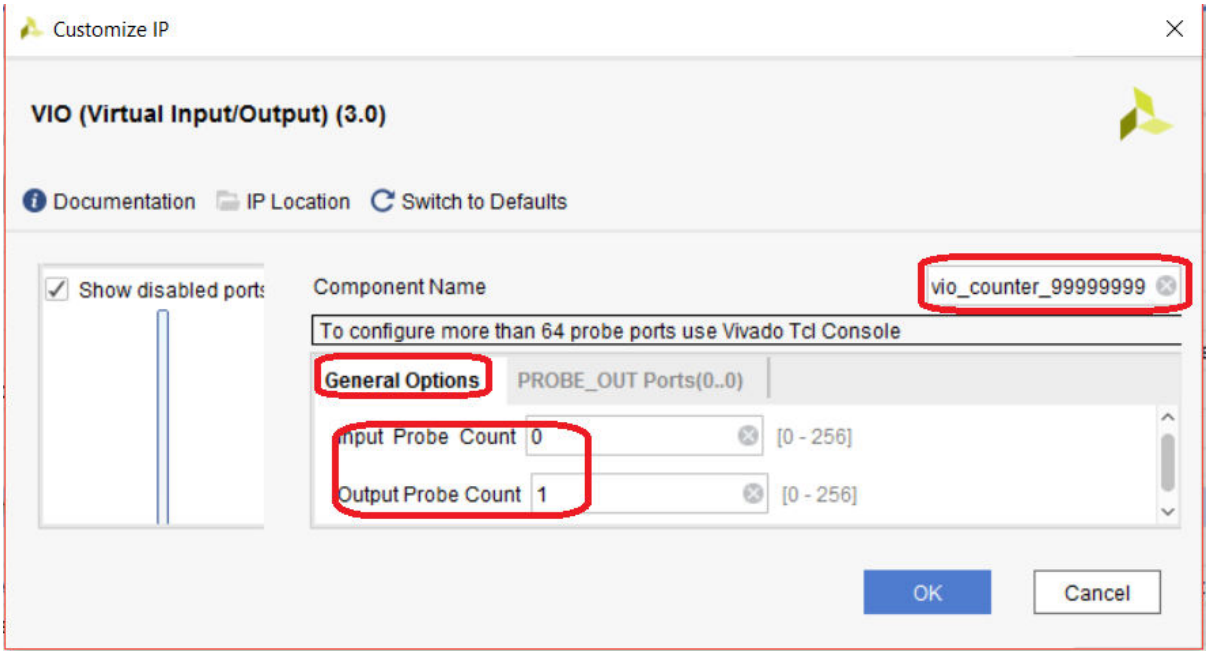
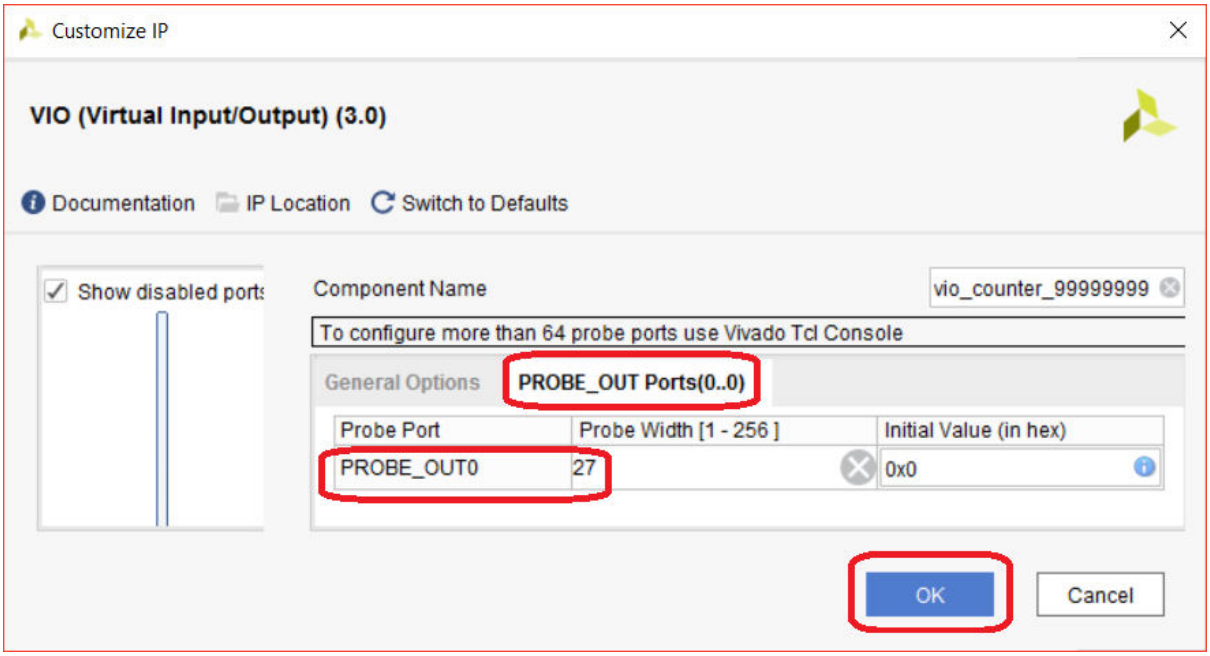
# 1. Instantiation of Virtual Input Output(VIO) IP

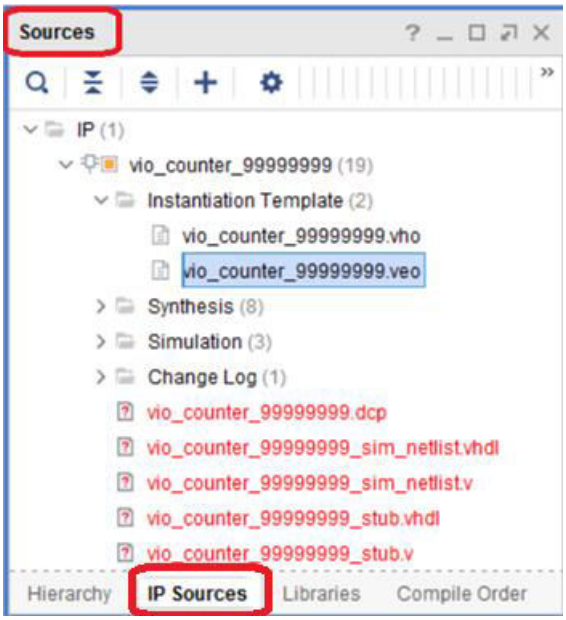
Project Manager → IP Catalog → Vivado Repository
→ Debug & verification → Debug → VIO (Virtual Input/Output)

Double click on VIO (Virtual Input/Output) to get Customize IP window



Double click on .veo icon to generate instantiation template in verilog

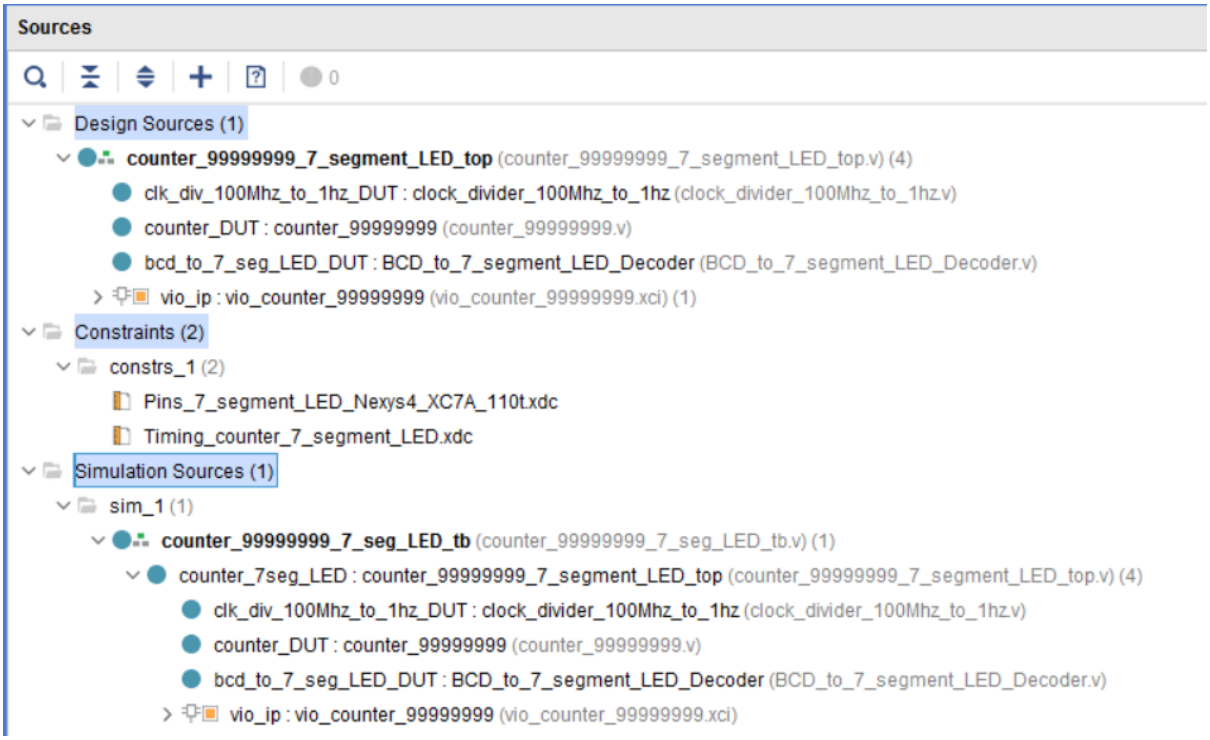



```
vio_counter_99999999  your_instance_name (
    .clk(clk),              // input wire clk
   .probe_out0(probe_out0)  // output wire [26 : 0] probe_out0
);
```

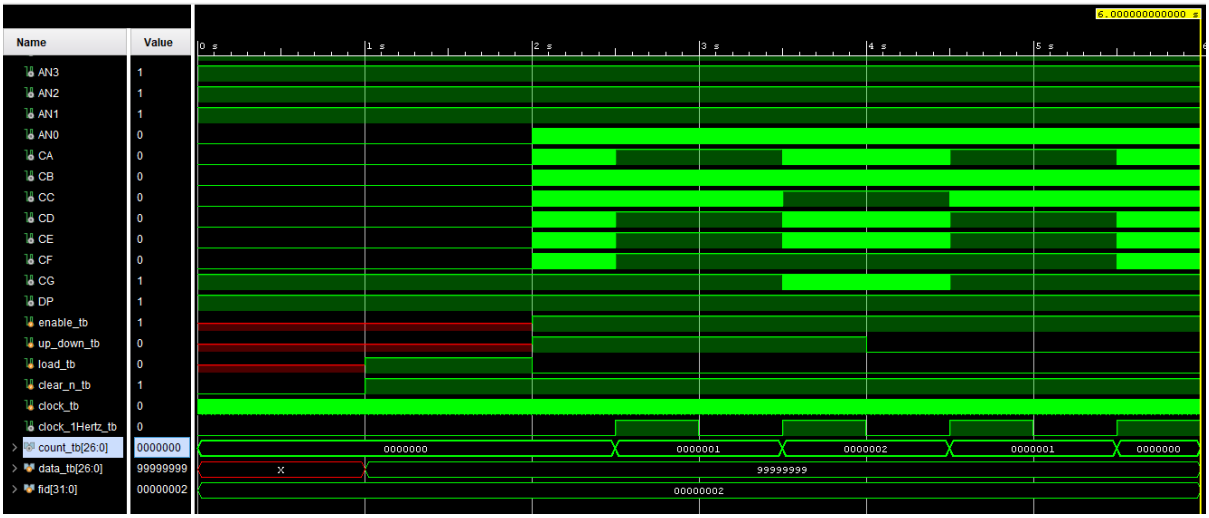
Copy and paste the above instantiation template in top module and
Change your_instance_name to vio_ip and do the port mapping

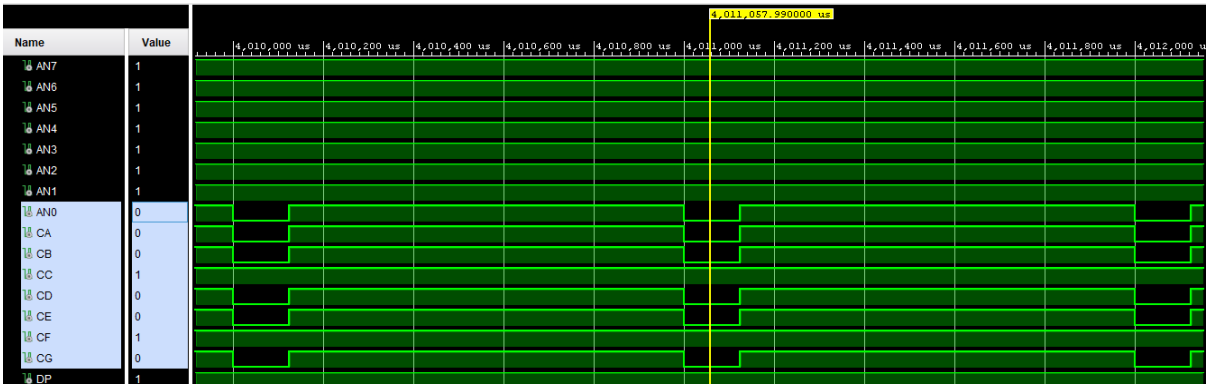
```
  vio_counter_99999999  vio_ip (
     .clk(Clock_100MHz),            //  input wire clk
     .probe_out0(data)   //  output wire [26 : 0] probe_out0
    );
```

# Project Hierarchy

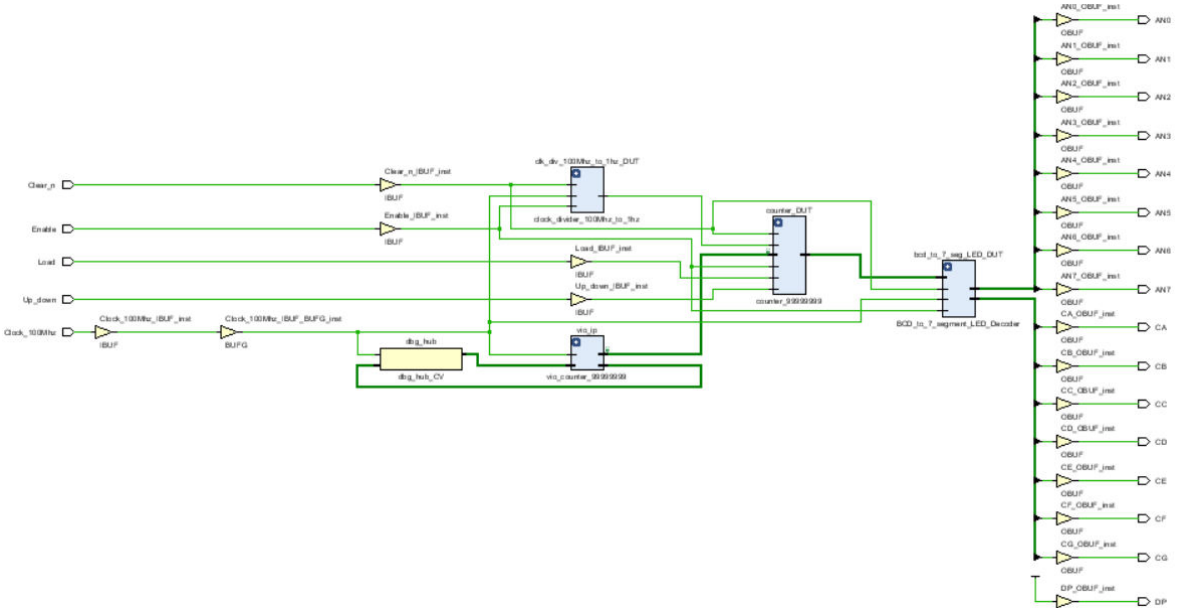


## 2. Simulation



# 3. Synthesis



Timing

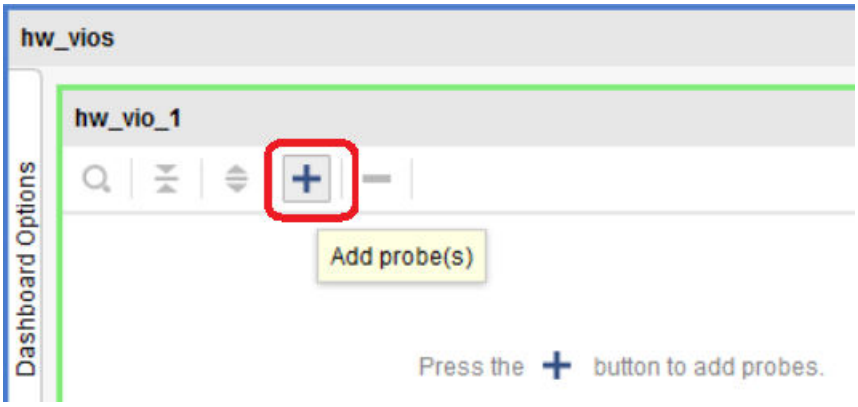
Design Timing Summary

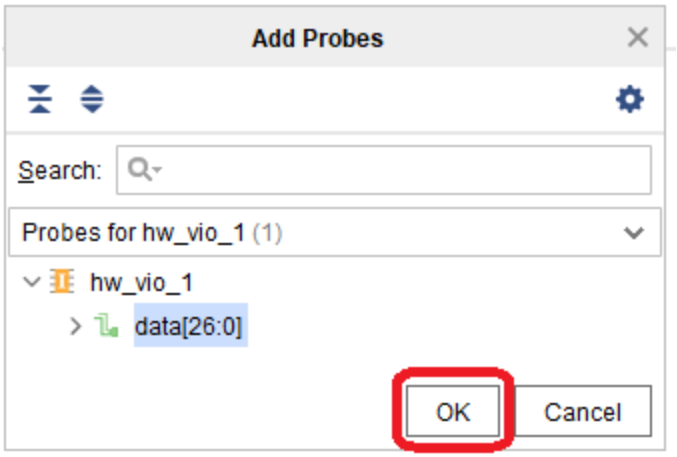
- General Information
- Timer Settings
- Design Timing Summary
- Clock Summary (3)
- Check Timing (590)
- Intra-Clock Paths
- Inter-Clock Paths
- Other Path Groups
- User Ignored Paths
- Unconstrained Paths

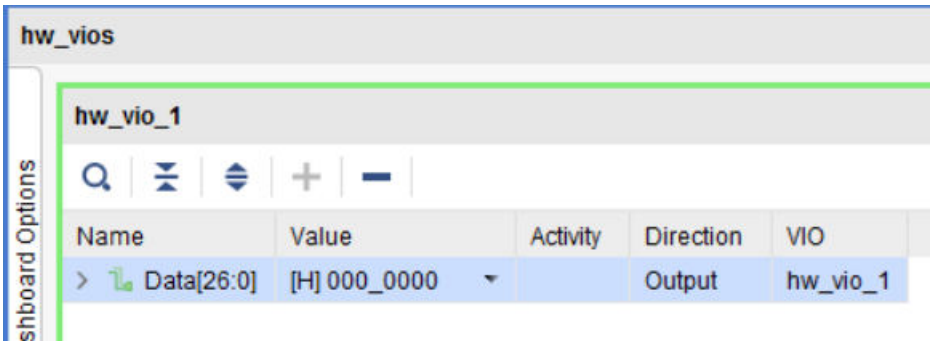
| Setup | | Hold | | Pulse Width | |
|---|---|---|---|---|---|
| Worst Negative Slack (WNS): | 5.804 ns | Worst Hold Slack (WHS): | 0.045 ns | Worst Pulse Width Slack (WPWS): | 4.500 ns |
| Total Negative Slack (TNS): | 0.000 ns | Total Hold Slack (THS): | 0.000 ns | Total Pulse Width Negative Slack (TPWS): | 0.000 ns |
| Number of Failing Endpoints: | 0 | Number of Failing Endpoints: | 0 | Number of Failing Endpoints: | 0 |
| Total Number of Endpoints: | 165 | Total Number of Endpoints: | 165 | Total Number of Endpoints: | 116 |

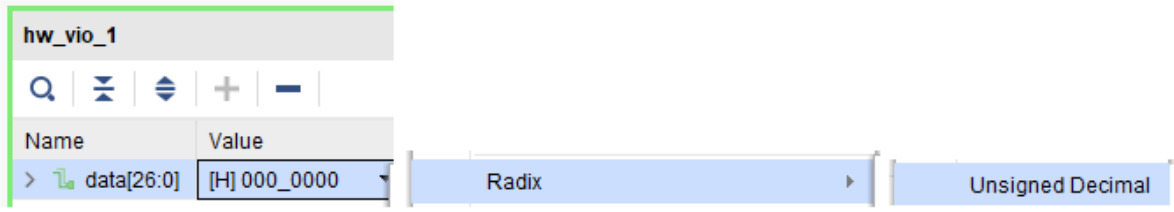
**All user specified timing constraints are met.**

## 4. Implementation

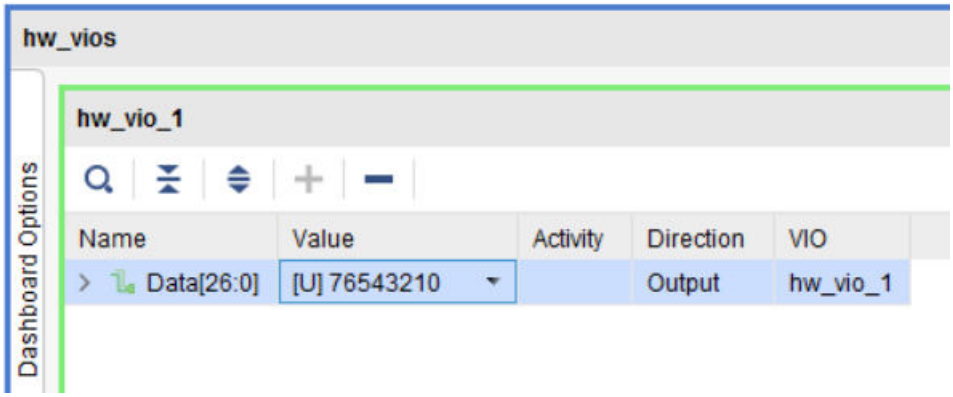


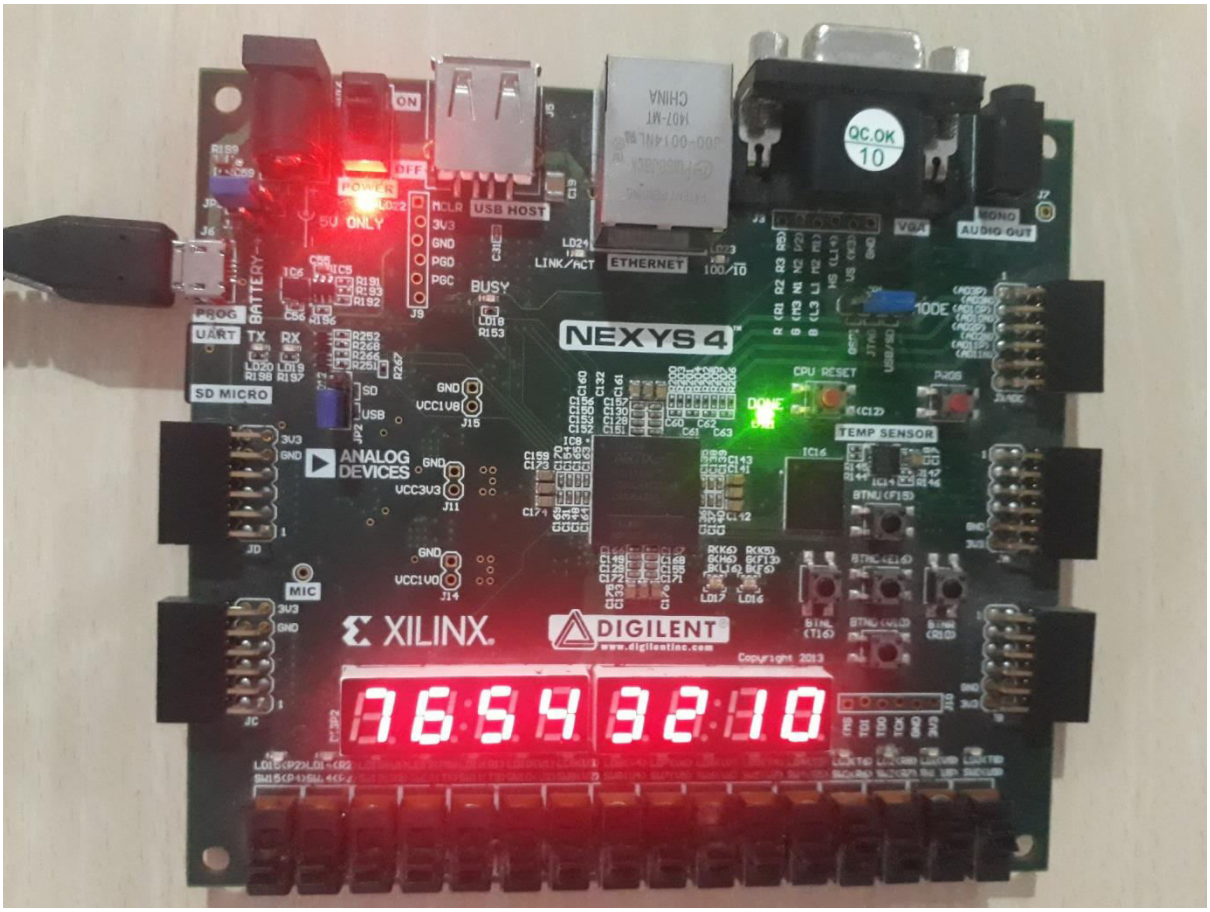



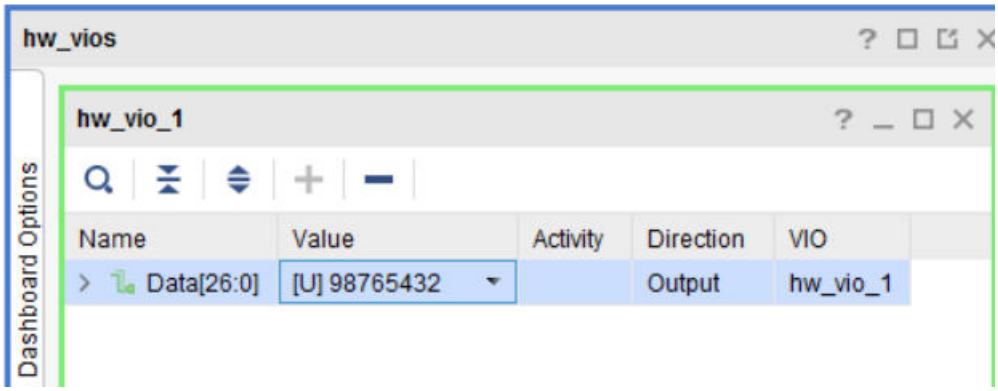



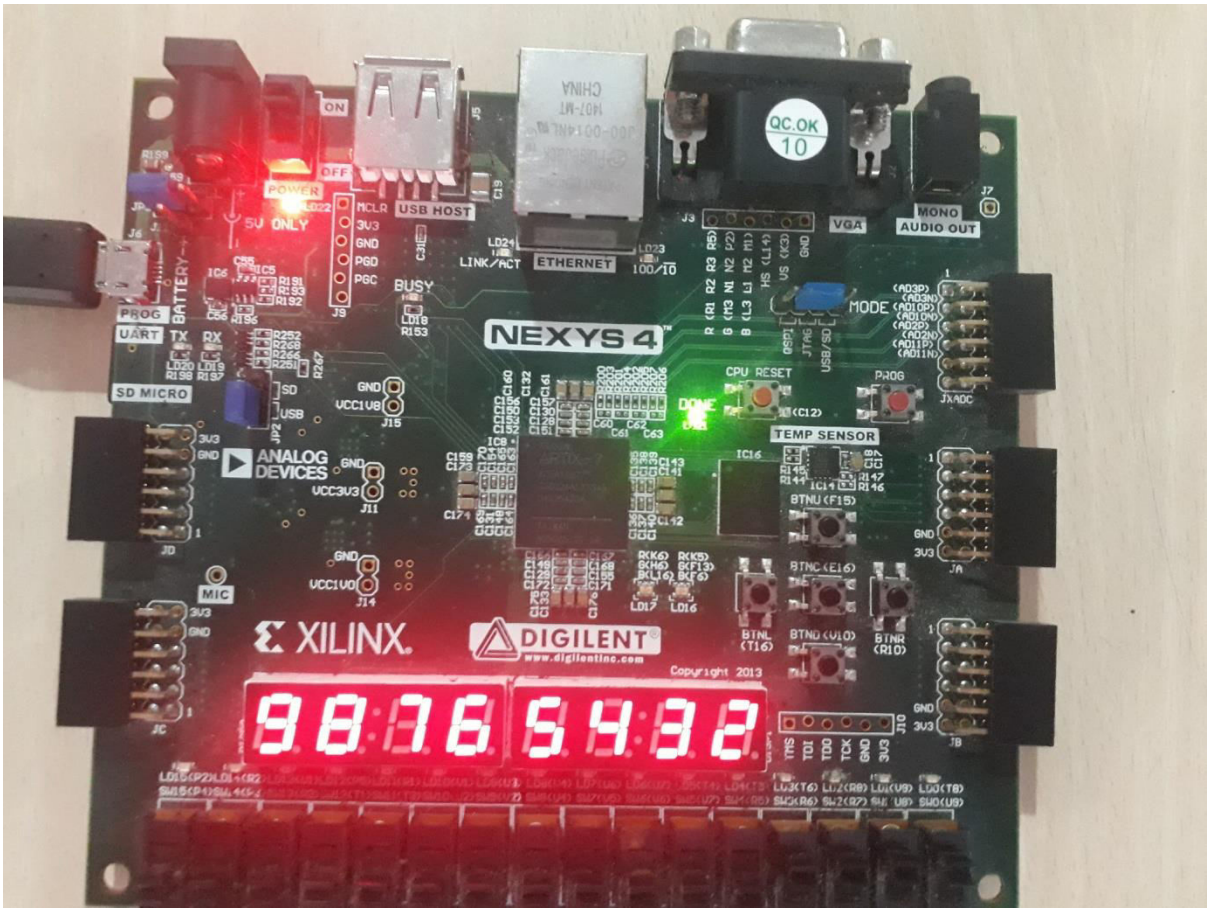
4.1. Enable = 1; Load = 1; Data = 76543210



4.2. Enable = 1; Load = 1; Data = 98765432



4.3. Enable = 1; Load = 1; Data = 134217727