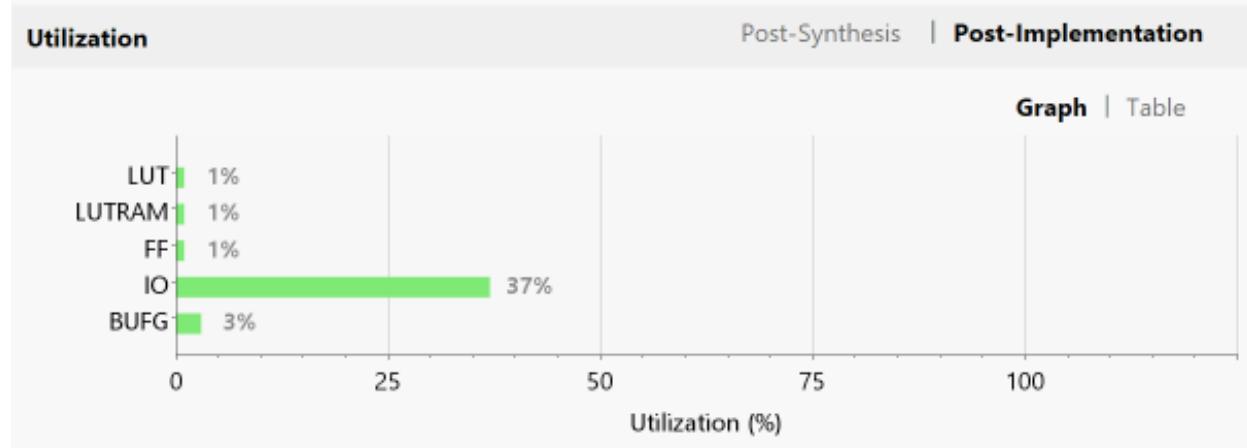


# EE 599 Spring 2020 Homework 2

## Barrel Shifter

16 elements (clk=10ns)



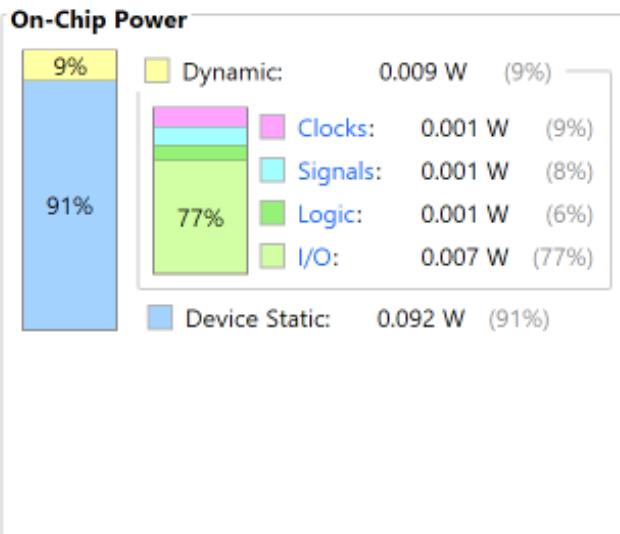
Setup	Hold	Pulse Width
Worst Negative Slack (WNS): <b>7.110 ns</b>	Worst Hold Slack (WHS): <b>0.057 ns</b>	Worst Pulse Width Slack (WPWS): <b>4.146 ns</b>
Total Negative Slack (TNS): <b>0.000 ns</b>	Total Hold Slack (THS): <b>0.000 ns</b>	Total Pulse Width Negative Slack (TPWS): <b>0.000 ns</b>
Number of Failing Endpoints: <b>0</b>	Number of Failing Endpoints: <b>0</b>	Number of Failing Endpoints: <b>0</b>
Total Number of Endpoints: <b>388</b>	Total Number of Endpoints: <b>388</b>	Total Number of Endpoints: <b>389</b>

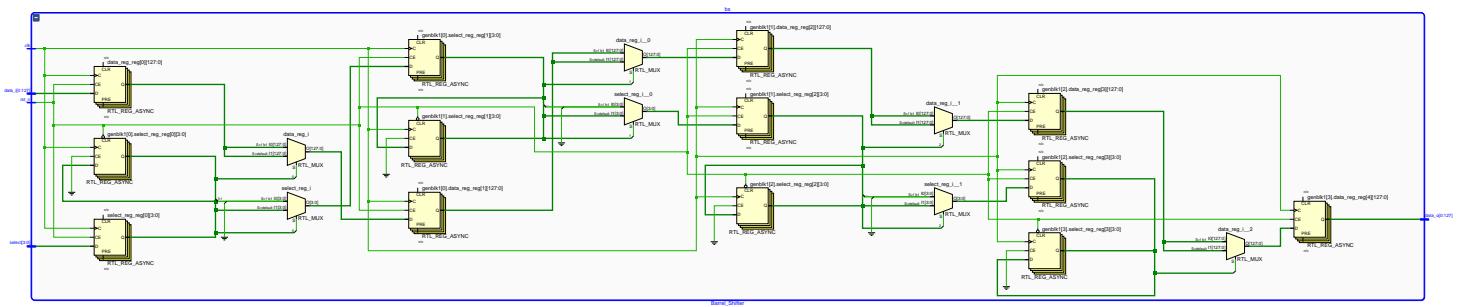
All user specified timing constraints are met.

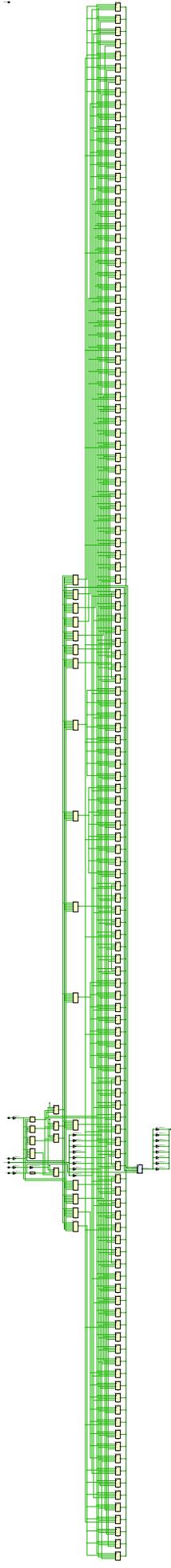
Power analysis from Implemented netlist. Activity derived from constraints files, simulation files or vectorless analysis.

**Total On-Chip Power:** 0.1 W  
**Design Power Budget:** Not Specified  
**Power Budget Margin:** N/A  
**Junction Temperature:** 26.2°C  
Thermal Margin: 58.8°C (5.0 W)  
Effective  $\theta_{JA}$ : 11.5°C/W  
Power supplied to off-chip devices: 0 W  
Confidence level: Low

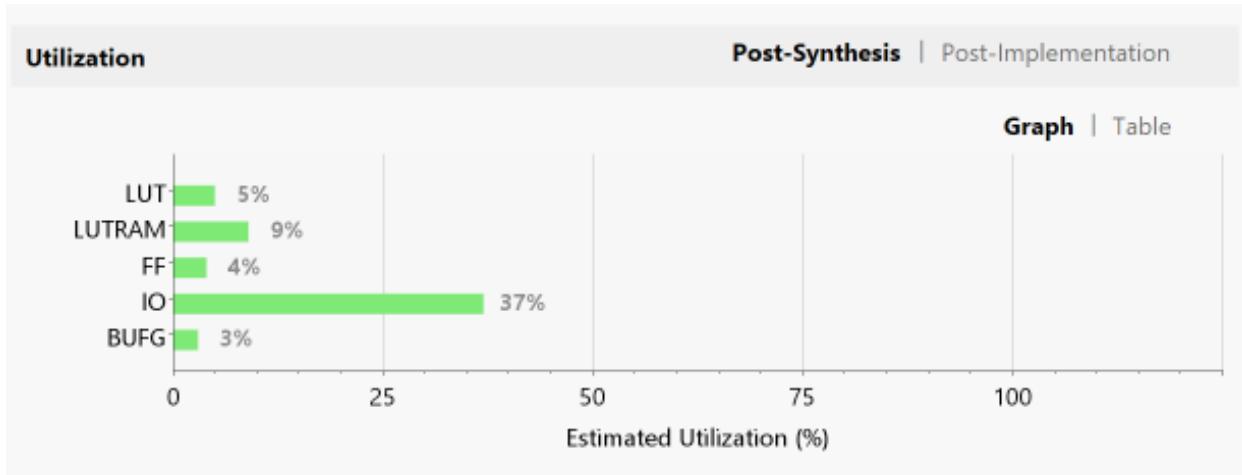
[Launch Power Constraint Advisor](#) to find and fix invalid switching activity







64 elements (clk=10ns)



#### Design Timing Summary

Setup	Hold	Pulse Width	
Worst Negative Slack (WNS):	5.475 ns	Worst Pulse Width Slack (WPWS):	4.146 ns
Total Negative Slack (TNS):	0.000 ns	Total Pulse Width Negative Slack (TPWS):	0.000 ns
Number of Failing Endpoints:	0	Number of Failing Endpoints:	0
Total Number of Endpoints:	1542	Total Number of Endpoints:	1543

All user specified timing constraints are met.

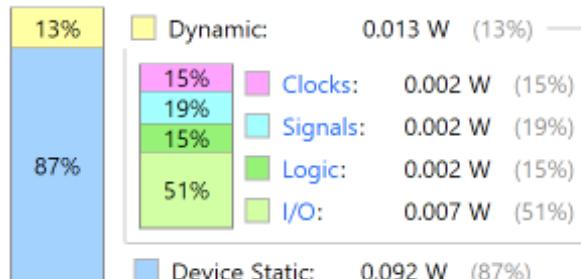
#### Summary

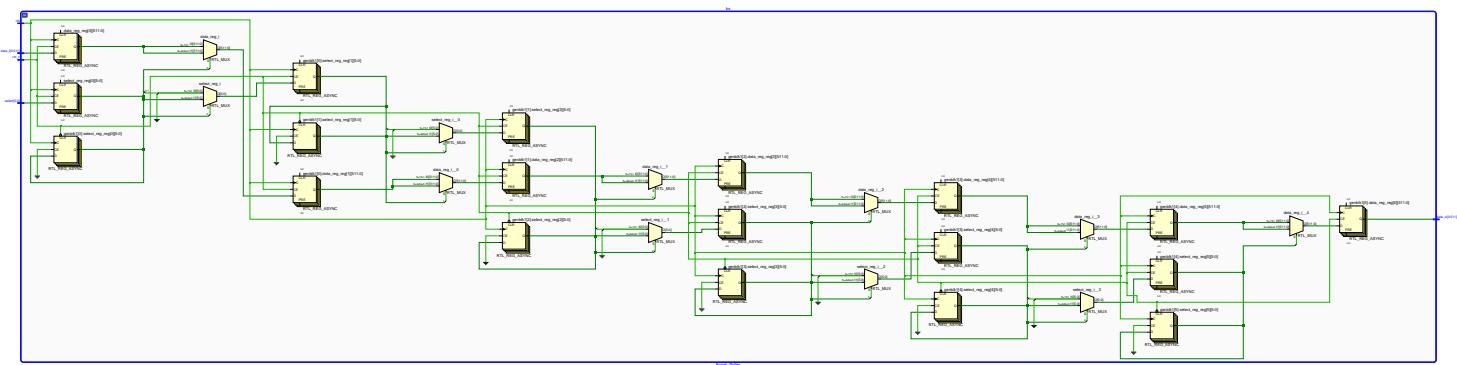
Power analysis from Implemented netlist. Activity derived from constraints files, simulation files or vectorless analysis.

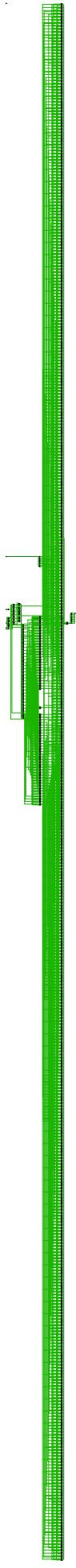
<b>Total On-Chip Power:</b>	<b>0.105 W</b>
<b>Design Power Budget:</b>	<b>Not Specified</b>
<b>Power Budget Margin:</b>	<b>N/A</b>
<b>Junction Temperature:</b>	<b>26.2°C</b>
Thermal Margin:	58.8°C (5.0 W)
Effective θJA:	11.5°C/W
Power supplied to off-chip devices:	0 W
Confidence level:	Low

[Launch Power Constraint Advisor](#) to find and fix invalid switching activity

#### On-Chip Power





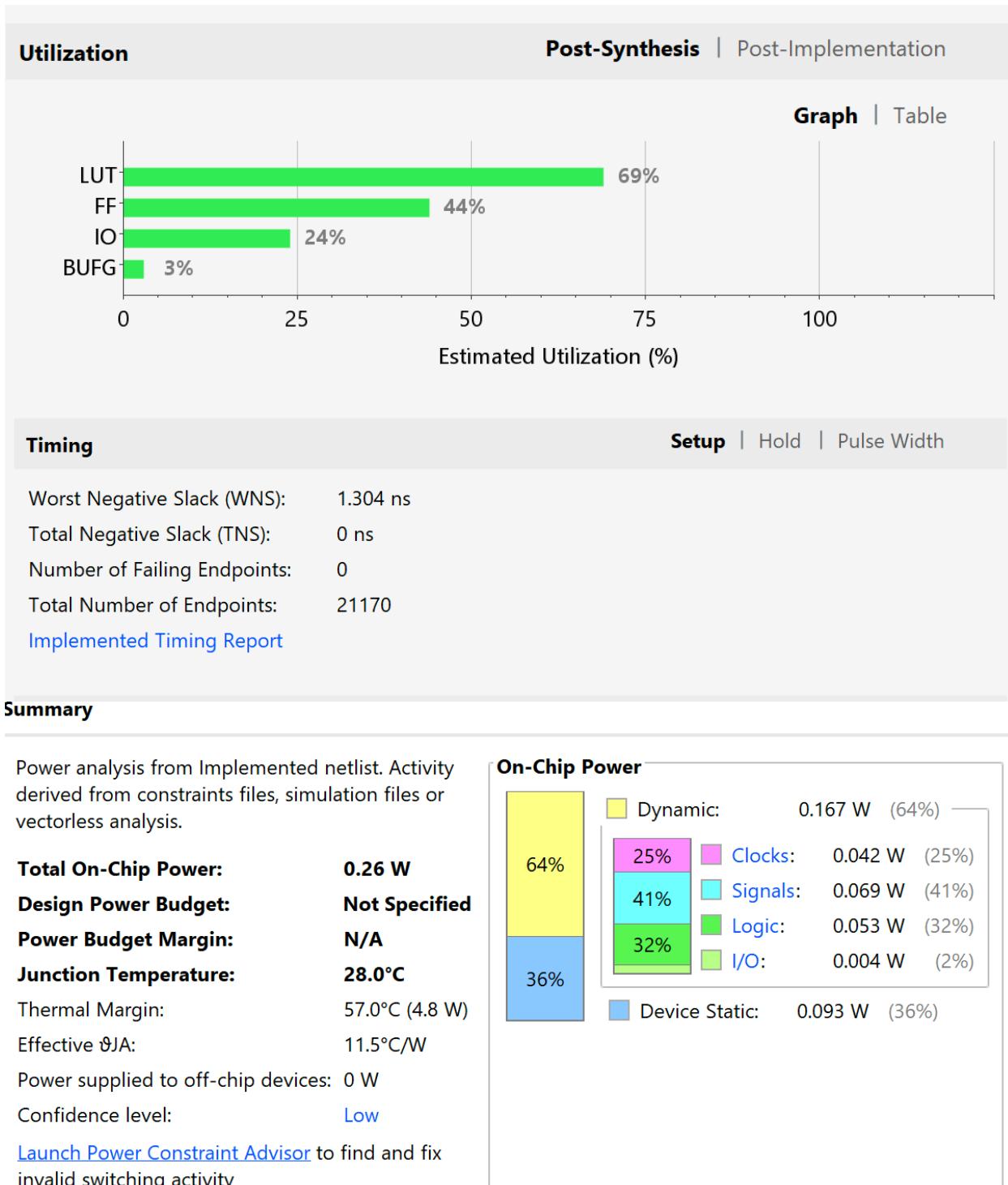


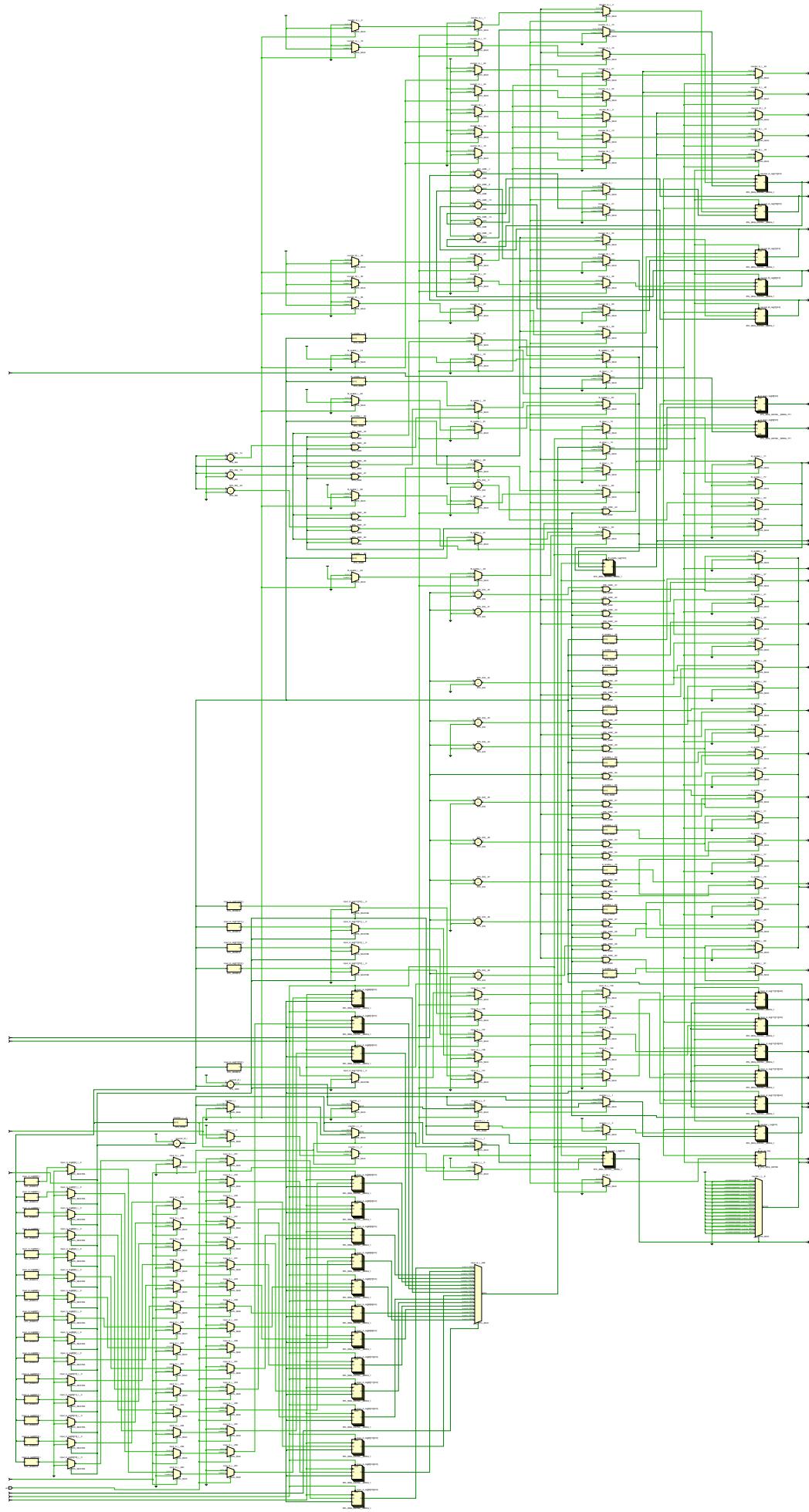
# Systolic Array for Dense Matrix-Matrix Multiplication

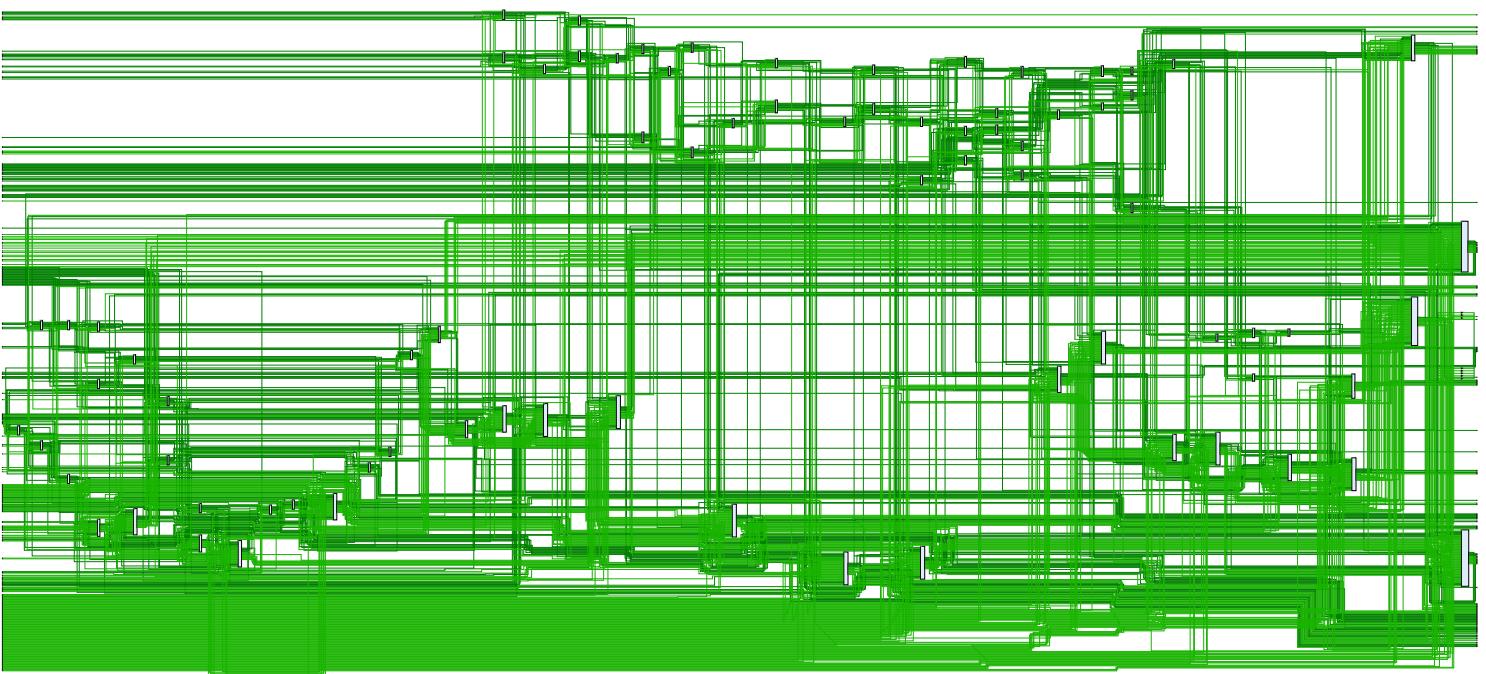
I put all data input and how to arrange the input signal in the design, so the total register usage increases a lot, and I try to reduce data width to reduce the lut usage, but the delay is quite large.

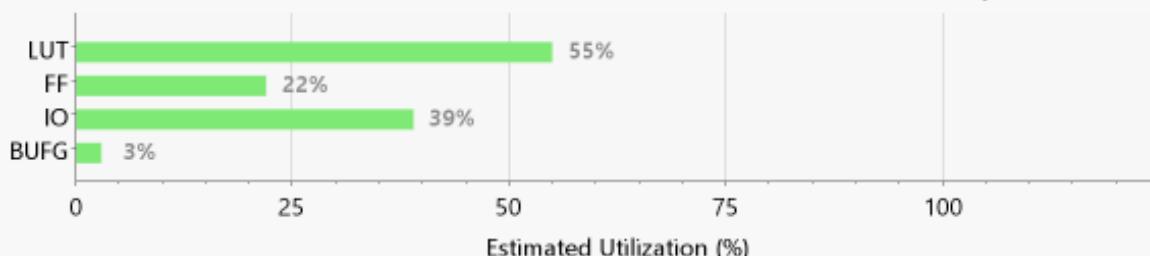
16\*16 (clk=10ns)

32\*32 (clk=10ns)







**Setup**Worst Negative Slack (WNS): **0.433 ns**Total Negative Slack (TNS): **0.000 ns**Number of Failing Endpoints: **0**Total Number of Endpoints: **10576****Hold**Worst Hold Slack (WHS): **0.041 ns**Total Hold Slack (THS): **0.000 ns**Number of Failing Endpoints: **0**Total Number of Endpoints: **10576****Pulse Width**Worst Pulse Width Slack (WPWS): **4.500 ns**Total Pulse Width Negative Slack (TPWS): **0.000 ns**Number of Failing Endpoints: **0**Total Number of Endpoints: **6330****All user specified timing constraints are met.****Summary**

Power analysis from Implemented netlist. Activity derived from constraints files, simulation files or vectorless analysis.

**Total On-Chip Power:****0.342 W****Design Power Budget:****Not Specified****Power Budget Margin:****N/A****Junction Temperature:****28.9°C**

Thermal Margin:

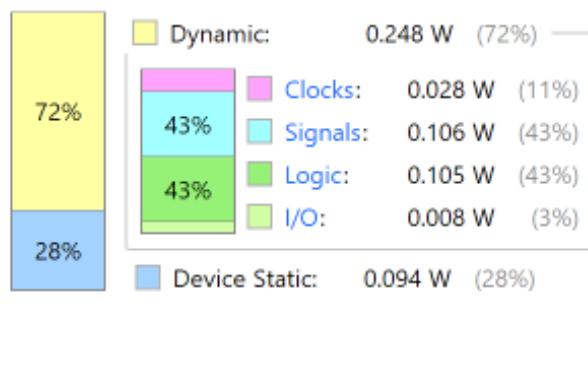
56.1°C (4.8 W)

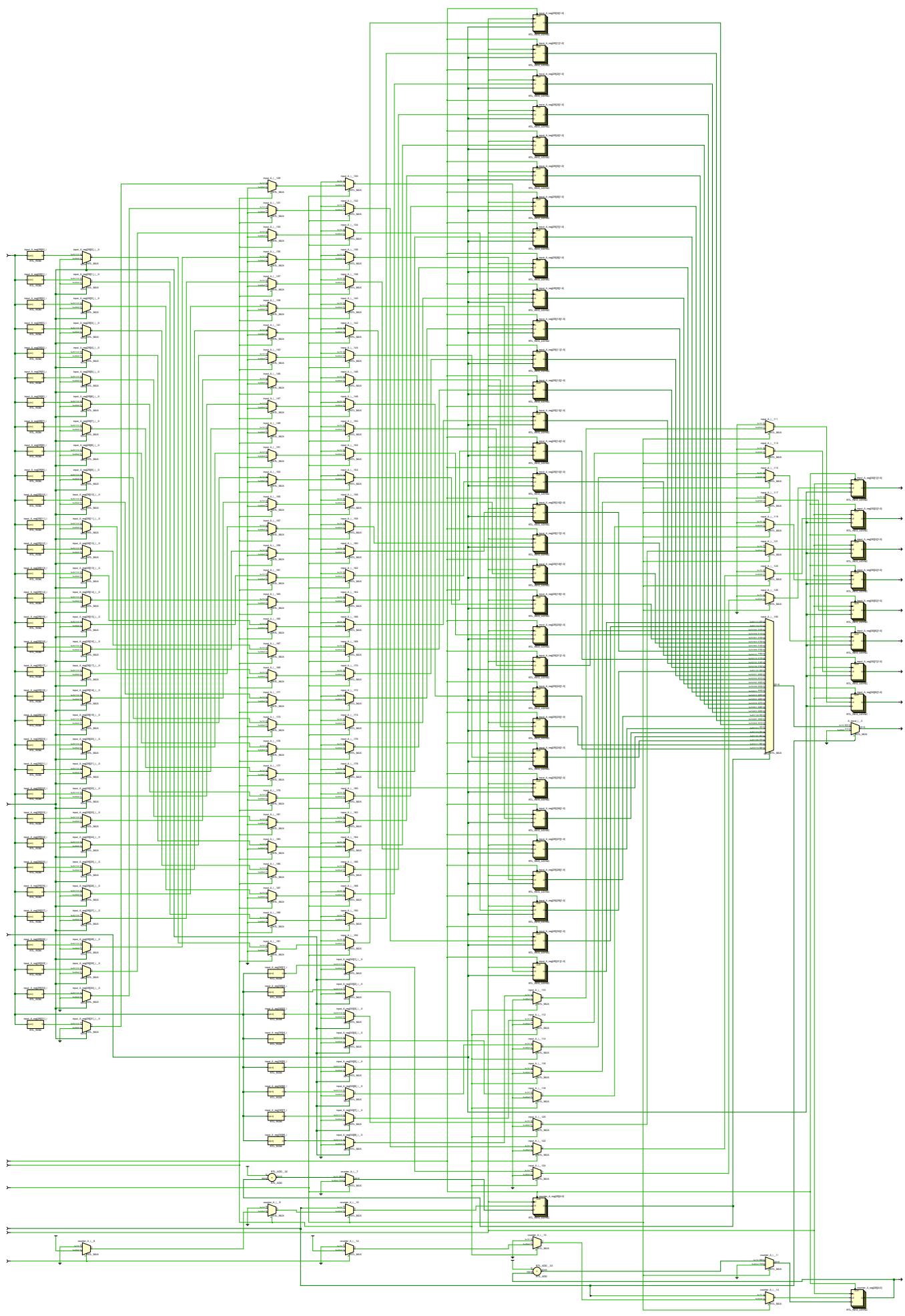
Effective θJA:

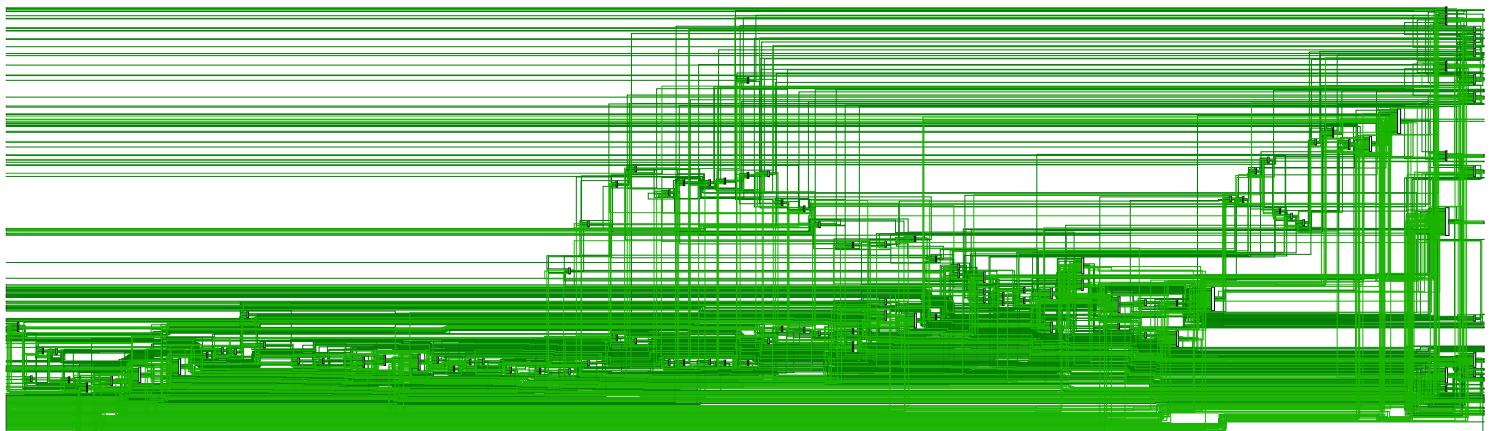
11.5°C/W

Power supplied to off-chip devices: **0 W**Confidence level: **Low**

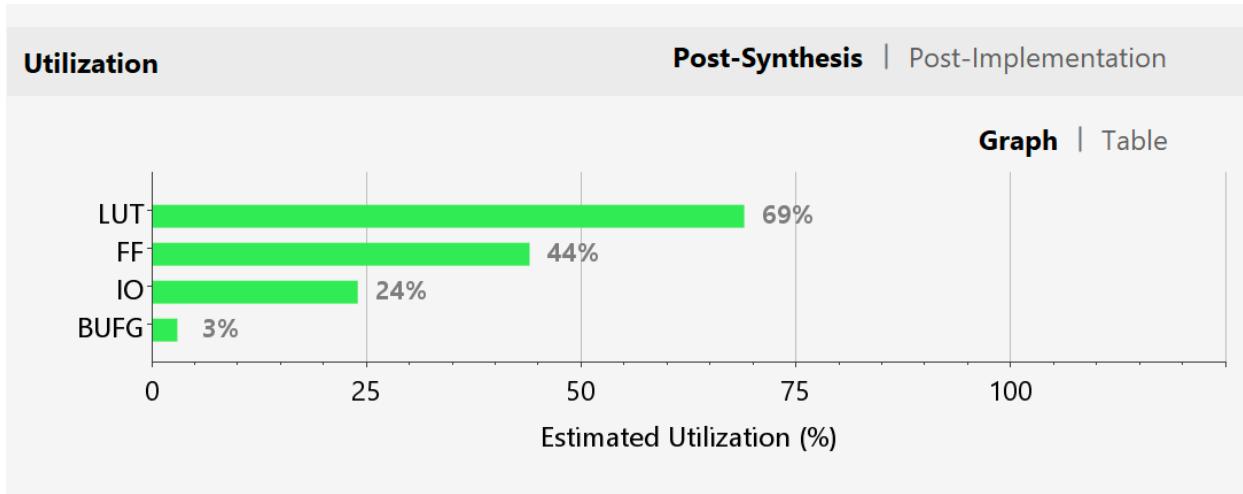
[Launch Power Constraint Advisor](#) to find and fix invalid switching activity

**On-Chip Power**





32\*32 (clk=10ns)



#### Design Timing Summary

Setup	Hold	Pulse Width
Worst Negative Slack (WNS): 1.304 ns	Worst Hold Slack (WHS): 0.061 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: 21170	Total Number of Endpoints: 21170	Total Number of Endpoints: 12731

All user specified timing constraints are met.

#### Summary

Power analysis from Implemented netlist. Activity derived from constraints files, simulation files or vectorless analysis.

**Total On-Chip Power:** 0.26 W

**Design Power Budget:** Not Specified

**Power Budget Margin:** N/A

**Junction Temperature:** 28.0°C

Thermal Margin: 57.0°C (4.8 W)

Effective θJA: 11.5°C/W

Power supplied to off-chip devices: 0 W

Confidence level: Low

[Launch Power Constraint Advisor](#) to find and fix invalid switching activity

#### On-Chip Power

