

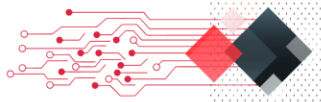
Power Integrity Analysis for Endoscopy Camera Module

Scope : Power Integrity Analysis

Application : Industry Camera Application

An Endoscopy Camera Module is a specialized imaging device used primarily in medical and industrial applications to capture high-quality images and videos from within confined spaces or internal cavities. It integrates advanced optics, sensor technology, and illumination to deliver clear and detailed images from areas that are otherwise inaccessible.

Power Integrity (PI) Analysis is essential for ensuring the reliable performance of an endoscopy camera module. We conduct a thorough Power Integrity Analysis to guarantee its dependable operation and high-quality performance.



Power Integrity Analysis - Challenges

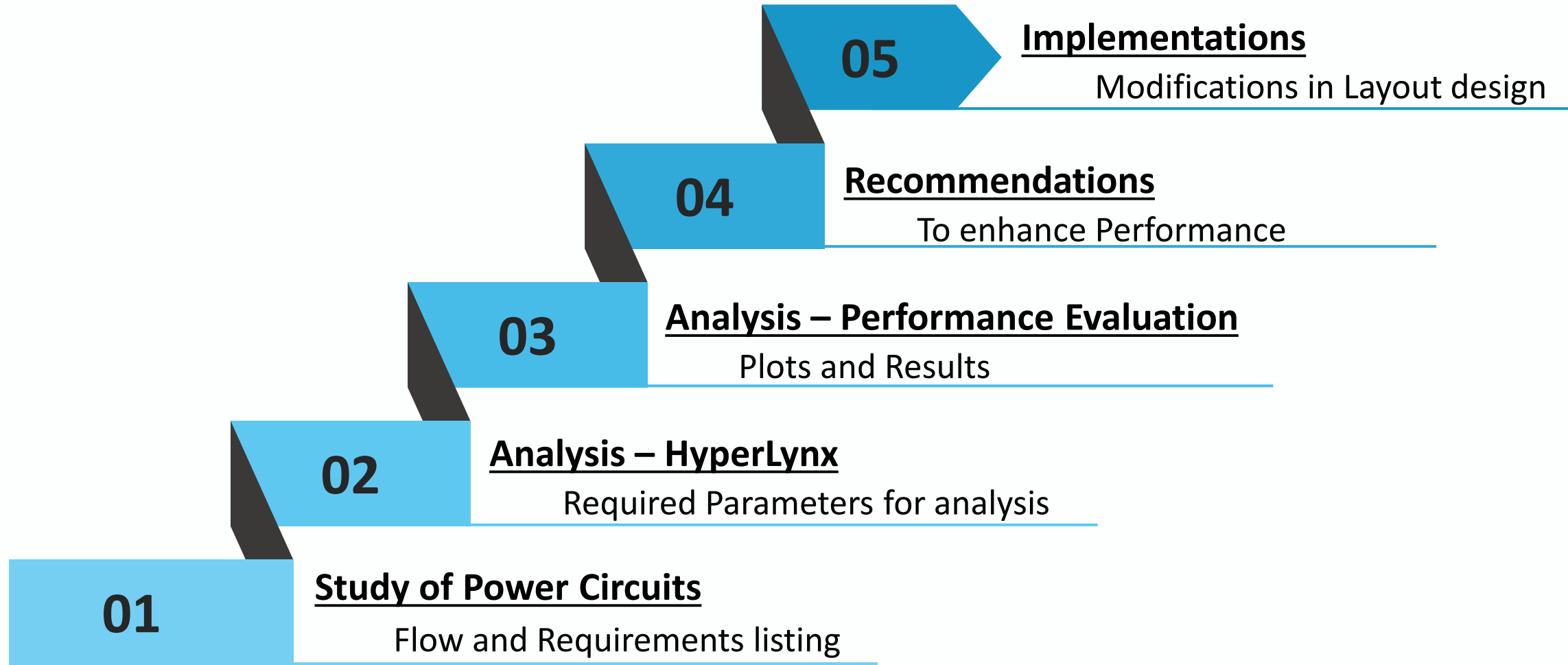
The client asked to analyze the power integrity of the 3.3V layout to meet out the required performance. Following are the list of challenges involved in the Power Integrity Analysis.

Challenges

- ◆ Max Voltage Drop need to be within 5% of the supply voltage.
- ◆ Current Density need to be under 30mA/mil².
- ◆ Via Current can be as high as 1A.
- ◆ Need to consider the PDN Impedance, Power Rail Ripple & Noise, Ground bounce effects, EMI effects, Thermal Effect and Internal Resistance of power planes for real time result.



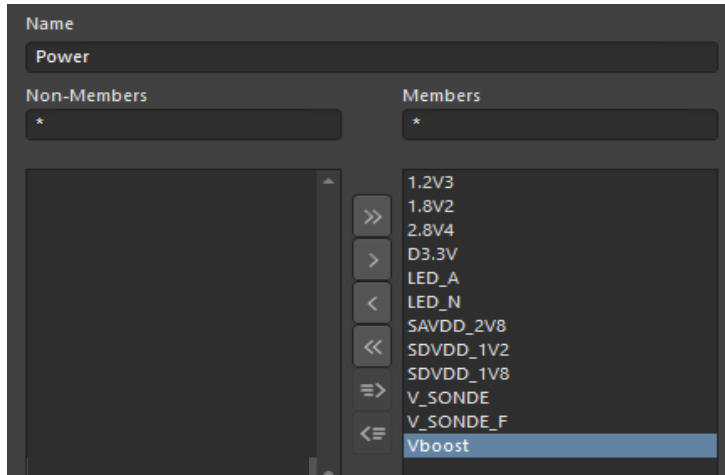
Power Integrity Analysis - SoW



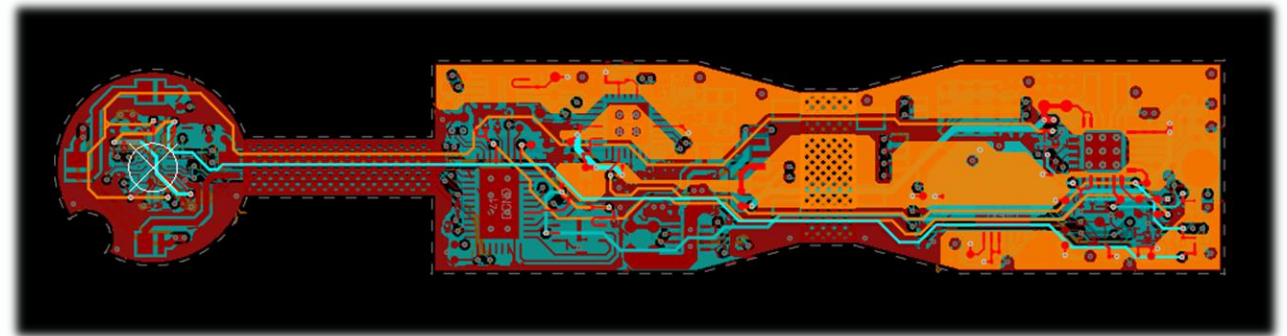
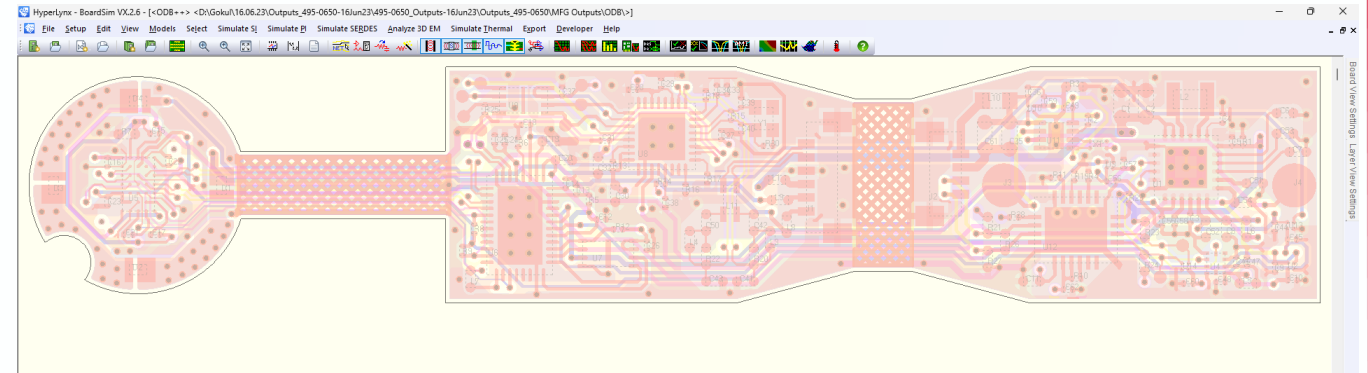
Study of Power Circuits

The power circuits in the project is studied thoroughly to evaluate the performance of the power delivery network

Power Circuits



The client asked us to analyze the 3.3V power area.



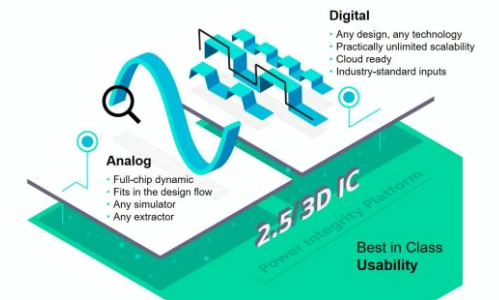
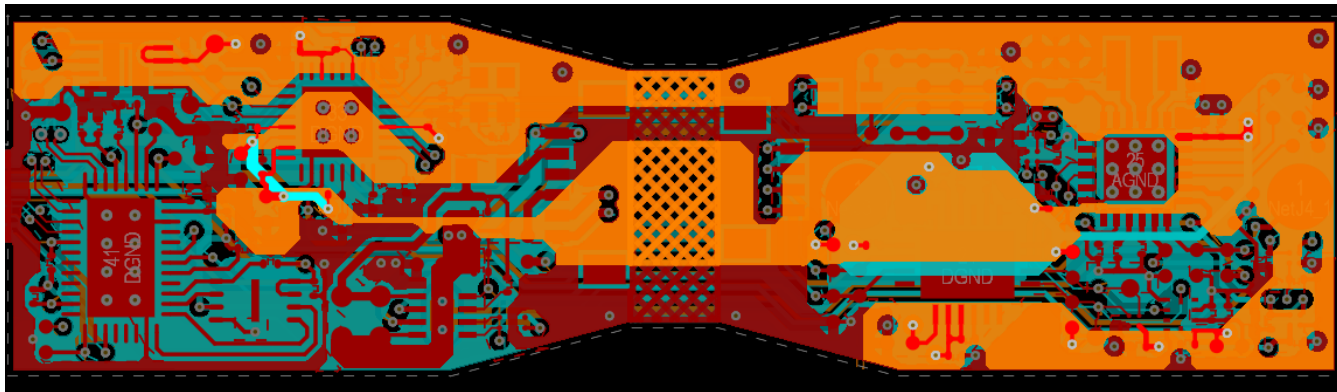
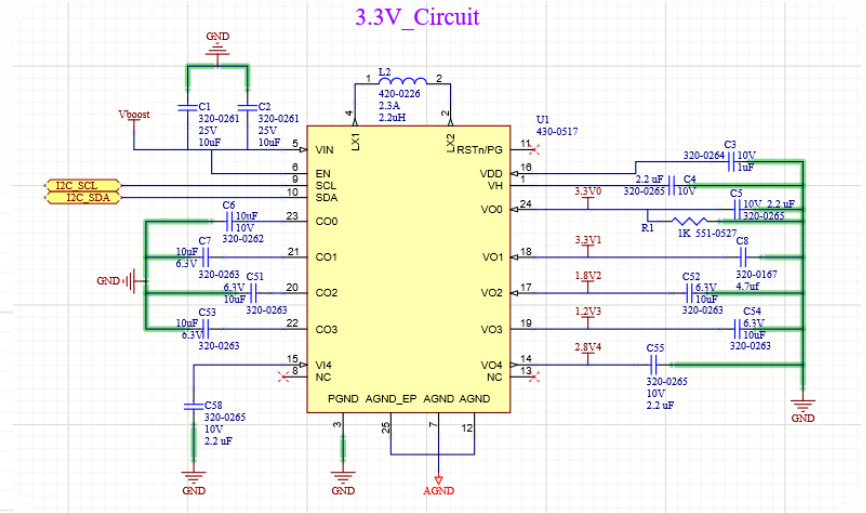
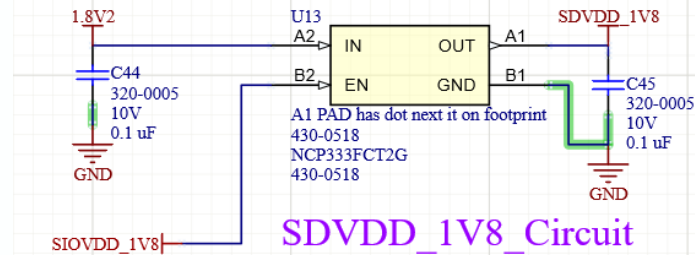
Analysis Execution

We executed the analysis in **HyperLynx** tool, to evaluate the power integrity performance of the layout.

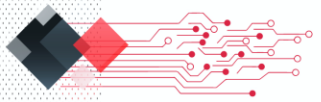
Problems of power delivery network is identified from DC (IR Drop) perspective.

Quantities to calculate include:

- ✓ Current Density
- ✓ Voltage Drop
- ✓ Via Current



Analysis – Plots and Results



Net Name: D3.3V

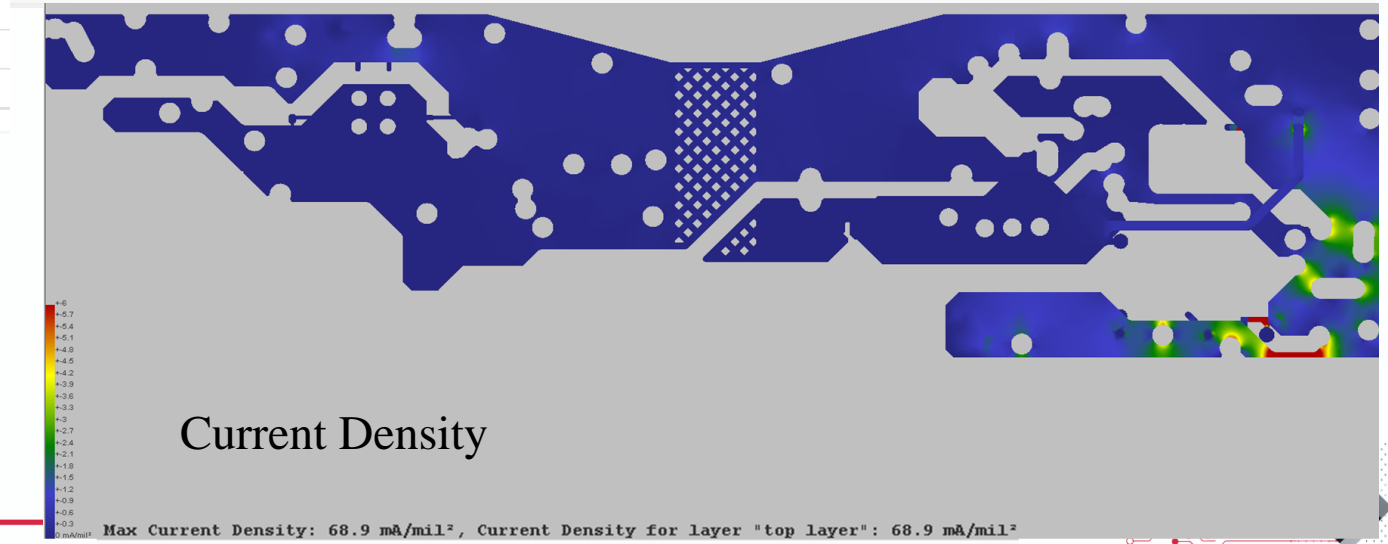
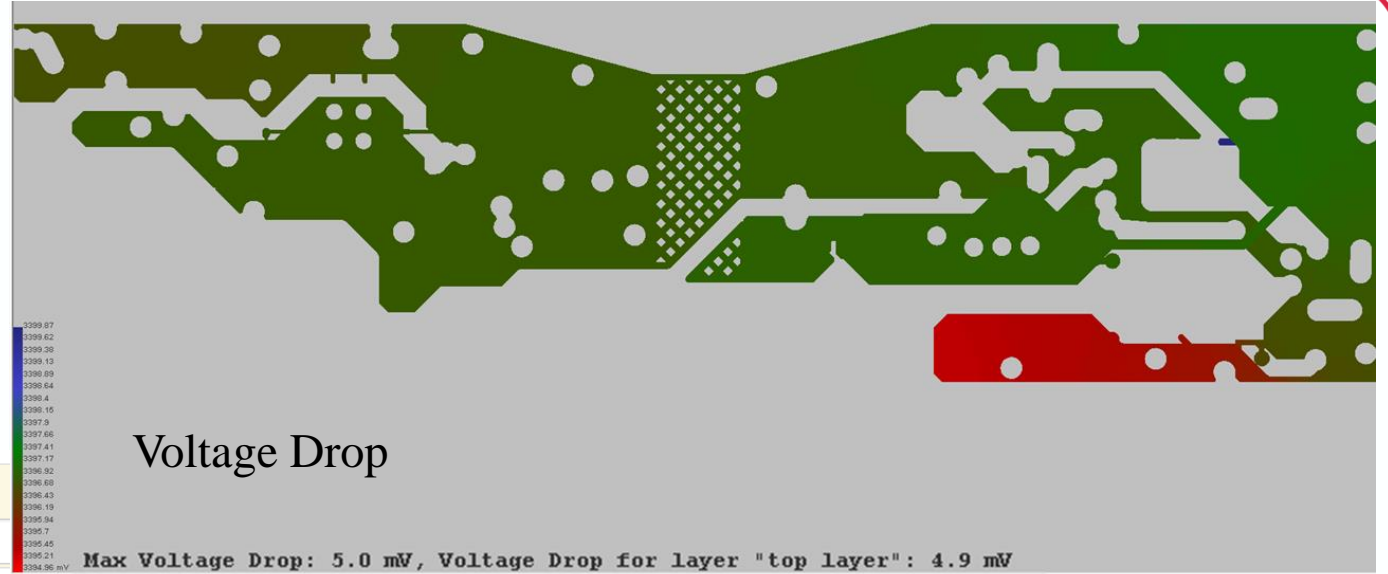
Voltage: 3.3V

Analysis Parameters – Results

Max. Voltage Drop – 5.0 mV

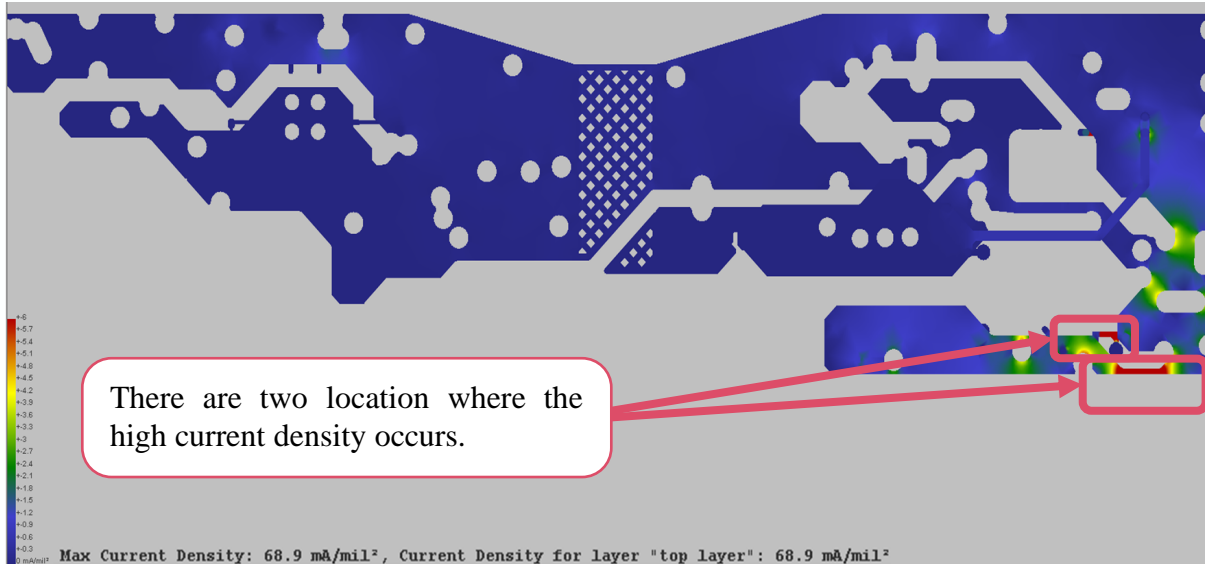
Max. Current Density – **68.9mA/mil²**

Measurement	Test	Constraint
	Filter	Filter
Max Voltage Drop	PASS	5.000%
Max Current Density	FAIL	30.00mA/mil ²
Max Via Current	PASS	1000.0mA



Layout Recommendations

Current Density Result

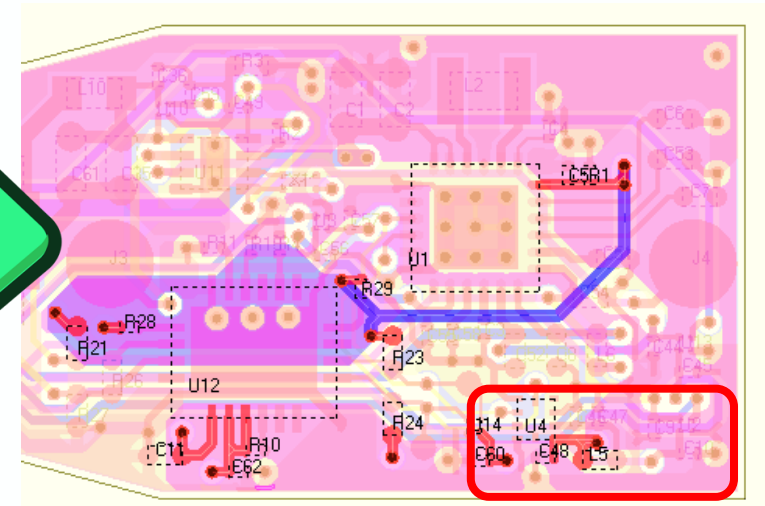


There are two location where the high current density occurs.

Locations:

- Trace on top layer
- Polygon on layer 3

Solution



The PCB layout's performance can be increased by the following recommendation:

- Trace width increase on top layer.
- Increased area for power polygon in layer 3.



Analysis – Plots and Results

Net Name: D3.3V

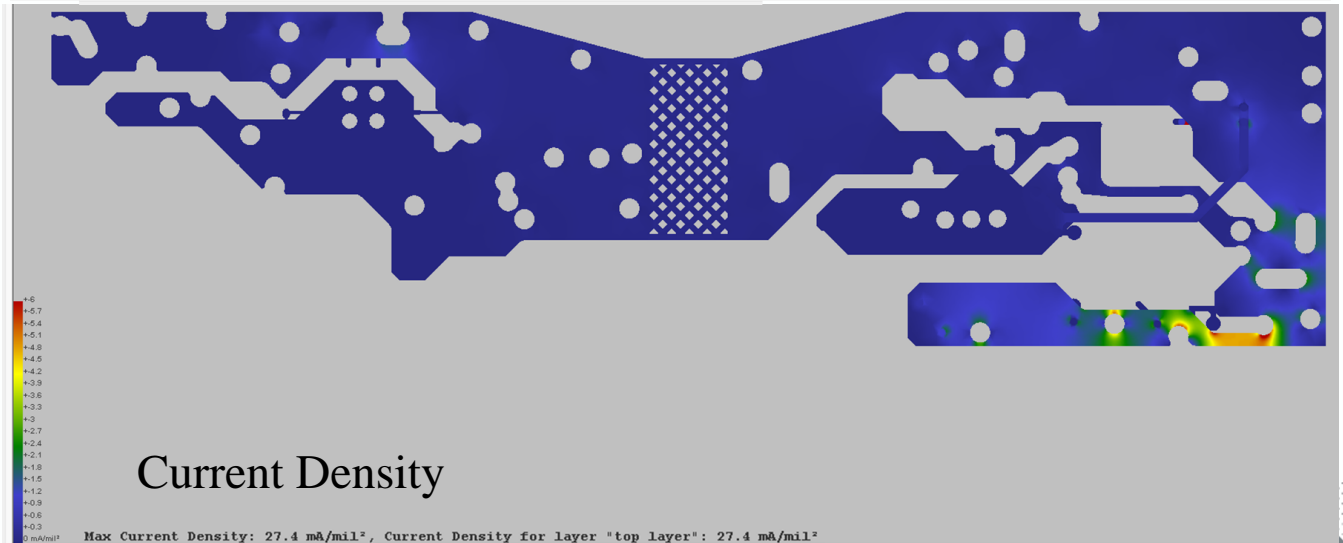
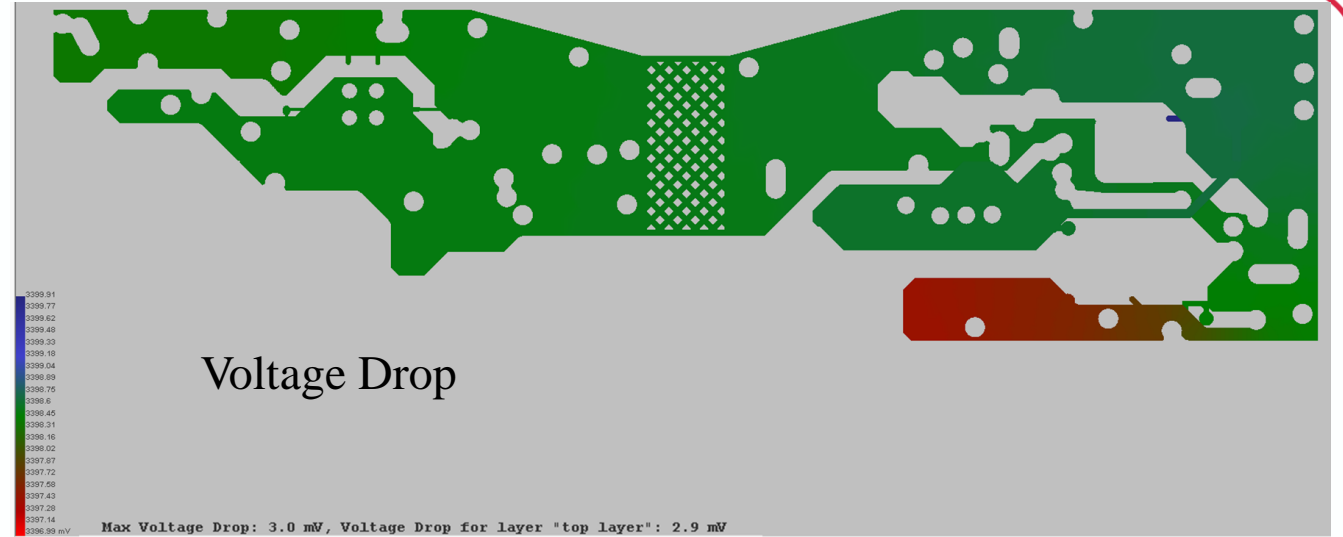
Voltage: 3.3V

Analysis Parameters – Results

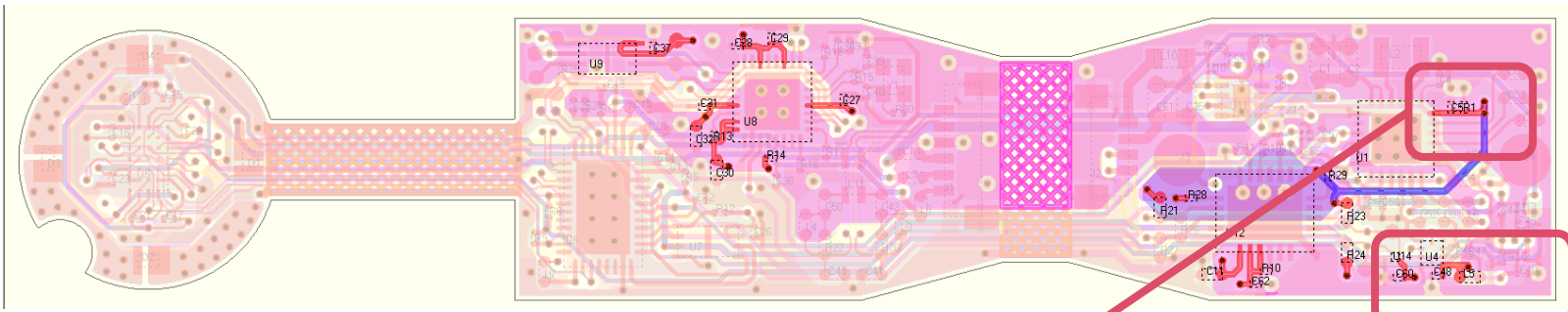
Max. Voltage Drop – 3.0 mV

Max. Current Density – **27.4mA/mil²**

#	Measurement	Test	Constraint
	Filter	Filter	Filter
1	Max Voltage Drop	PASS	5.000%
2	Max Current Density	PASS	50.00mA/mil2
3	Max Via Current	PASS	1000.0mA



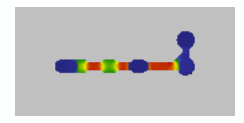
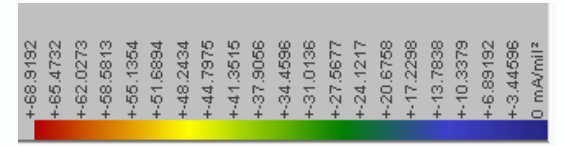
Analysis – Plots and Results (Cont.)



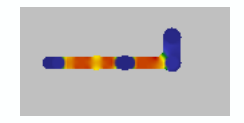
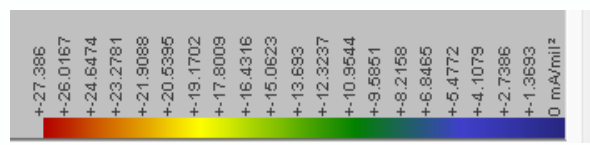
Value Add's:

After the changes, the maximum current density parameter also passed the test, showing a 60% reduction (approx.) compared to the old layout.

Before

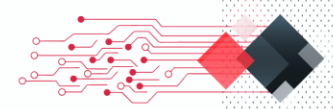


After



Trace on top layer

Polygon on layer 3



Customer Testimonial

"We enlisted the team for Power Integrity Analysis of our PCB layout, and the results were outstanding. Their thorough analysis identified potential issues that could have affected overall performance. The detailed insights and practical recommendations, along with cost-effective modifications to copper pours, enabled us to make informed decisions to optimize our power distribution network. The team's expertise and dedication to delivering high-quality results were evident throughout the process. We are extremely satisfied with the quality and timely delivery of the analysis, which has undoubtedly enhanced the reliability and efficiency of our design!"



Conclusion

We provided the client with an optimized PDN layout design, incorporating layout enhancements to significantly boost overall performance. This underscores our unwavering commitment to delivering high-quality work and showcases our technical expertise.

Our collaboration goes beyond just technical aspects; it involves optimizing the PDN layout for improved performance by integrating our expertise with a deep understanding of the client's specific requirements.

We are dedicated to delivering top-tier analysis services, demonstrating our exceptional skills and unwavering reliability in achieving outstanding results.

