Line Finder Antenna-Magnetic sensor

Scope: Circuit Design to Prototype board design

Application: Magnetic Signal Detector

A line finder antenna incorporating a magnetic sensor within a magnetic signal detector is a system designed to identify and locate magnetic signals or lines. This technology has various applications, including detecting underground utility lines and tracking magnetic pathways. The process involves selecting an appropriate magnetic sensor, integrating it with signal processing capabilities, and ensuring precise detection through calibration and thorough testing, offering to the specific requirements of magnetic signal detection applications.

Challenges in SoW

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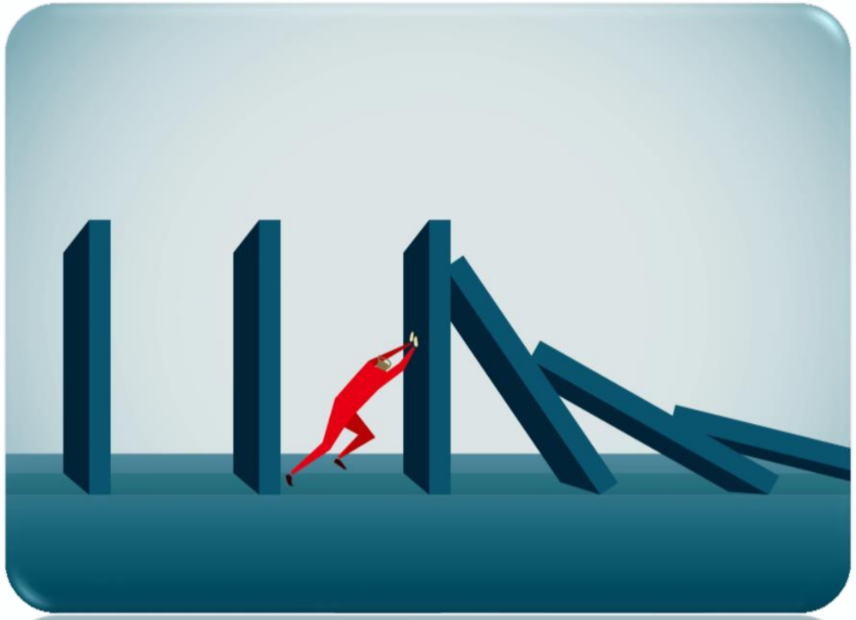
The old design fell short of achieving the desired level of accuracy, leading to subsequent updates and modifications aimed at improving both performance and accuracy. No references or formulas are available for the specific parameters of the old design.



Challenges:

- Sourcing the formulas for the required parameters
- Short timeline for process
- Components availability
- Cost of the design should not exceed 10x compare to old design
- The new design parameters values should match with old design.

Old Design Vs New Design

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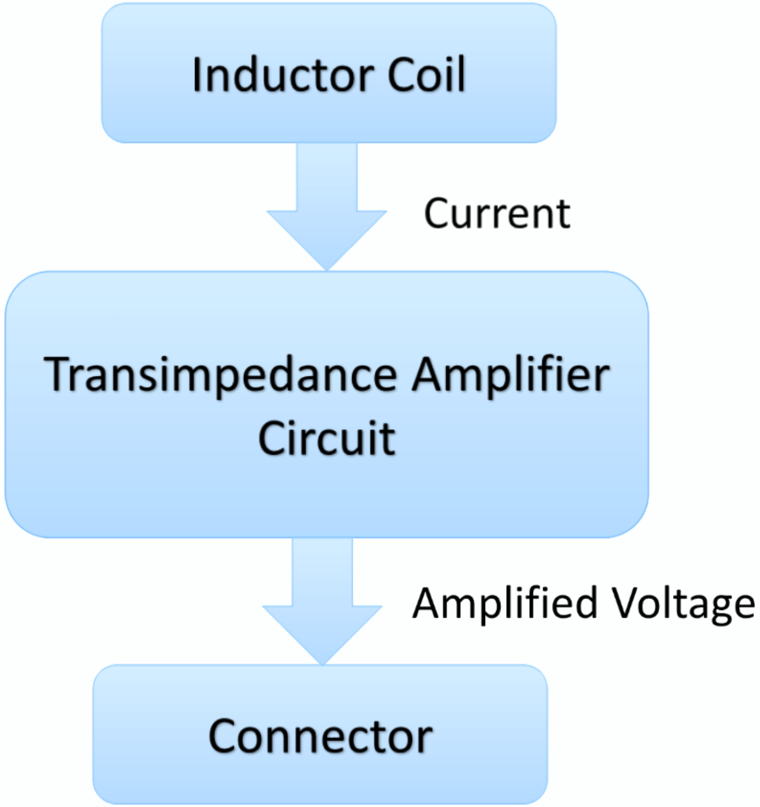
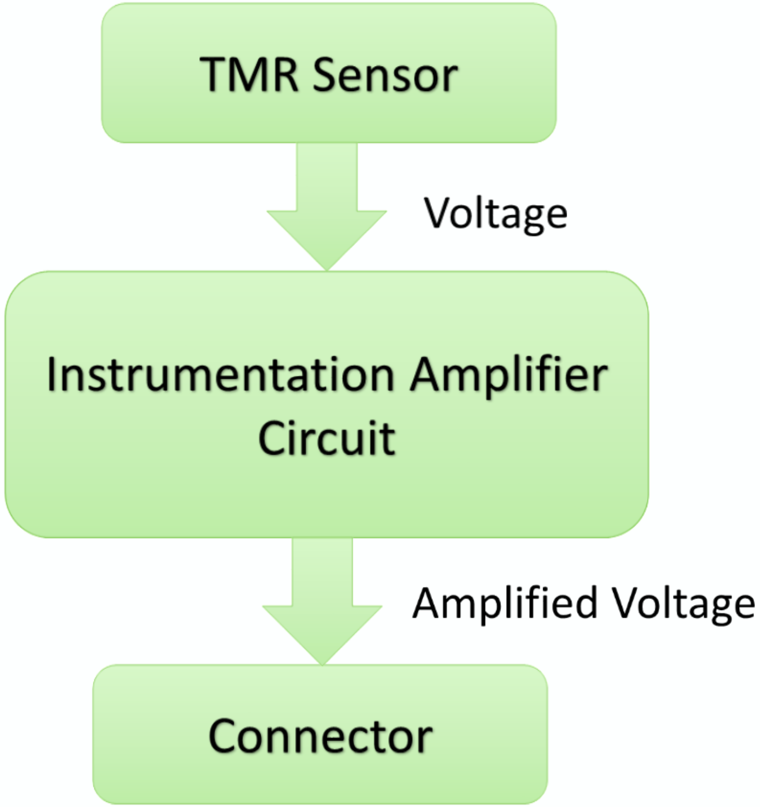
Old Design



New Design



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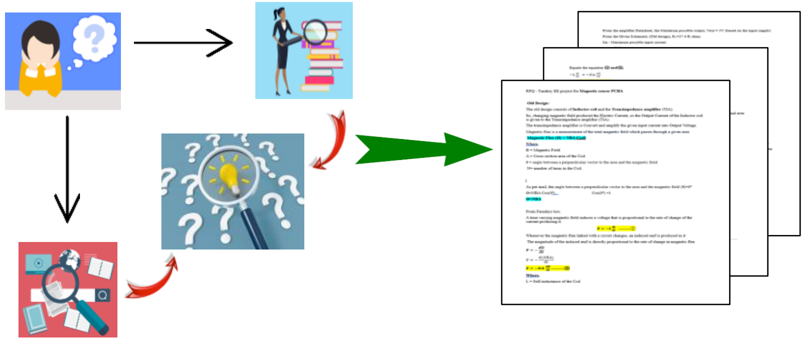
Statement of Work

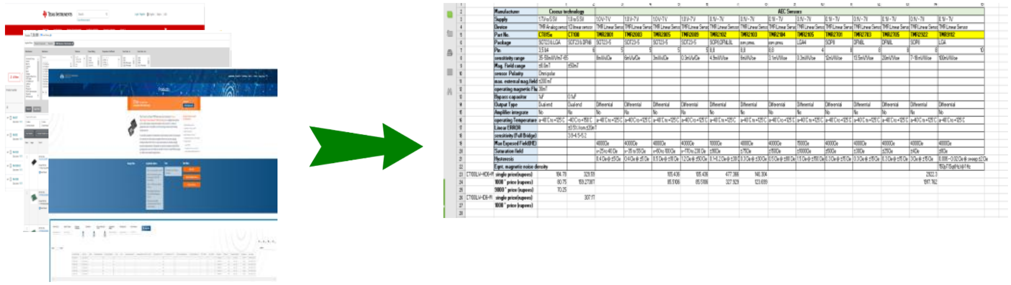
Work Flow:

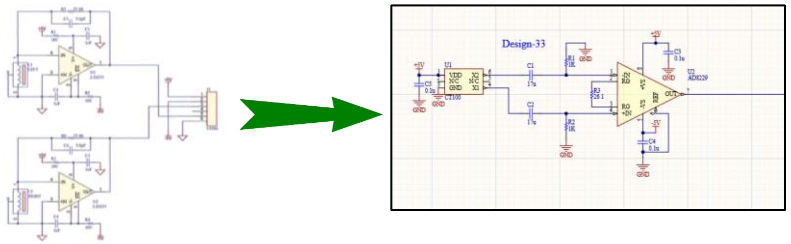
- Explore, identify, Document the formulas, calculations and values for parameters in older design configurations.

- Sourcing and list the alternate components for the new design based on the requirements.

- Create a new model circuit based on the parameter values that should either match or be Exceed the performance of the older version.



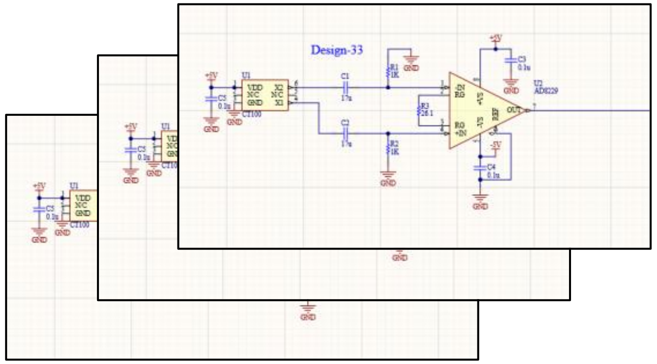


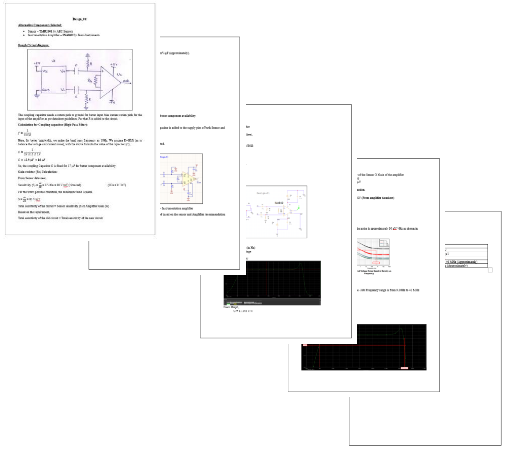


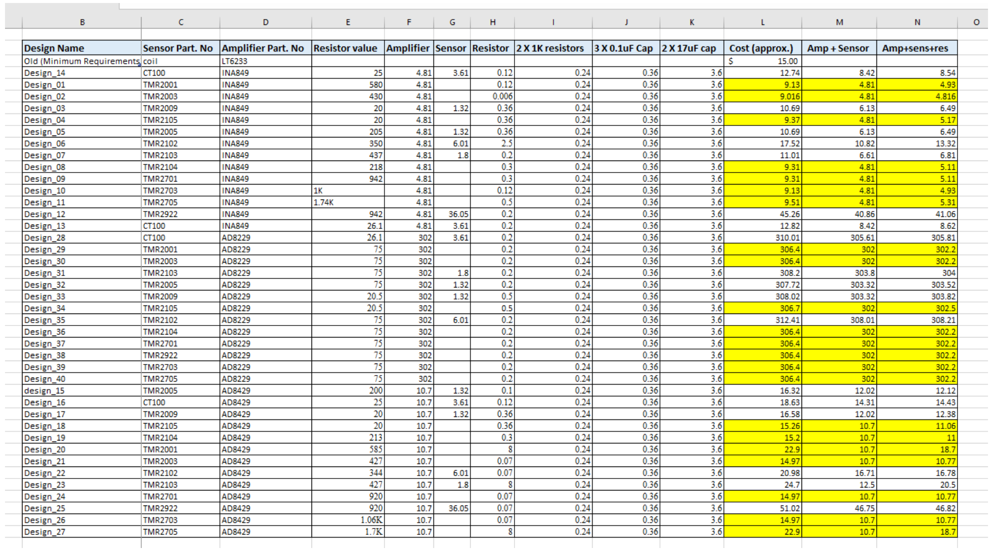
Statement of Work

Work Flow:

- Generating multiple design combinations by integrating components and performing comprehensive analysis and calculations.
- List all combinations with their parameter's results, including the BOM cost.







Design Name	Sensor Part. No	Amplifier Part. No	Resistor value	Amplifier	Sensor	Resistor	2 X 1K resistors	3 X 0.1uF Cap	2 X 17uF cap	Cost (approx.)	Amp + Sensor	Amp+sens+res
Old (Minimum Requirements	coil	LT6233								$ 15.00		
Design_14	CT100	INA849	25	4.81	3.61	0.12	0.24	0.36	3.6	12.74	8.42	8.54
Design_01	TMR2001	INA849	580	4.81		0.12	0.24	0.36	3.6	9.13	4.81	4.93
Design_02	TMR2003	INA849	430	4.81		0.006	0.24	0.36	3.6	9.016	4.81	4.816
Design_03	TMR2009	INA849	20	4.81	1.32	0.36	0.24	0.36	3.6	10.69	6.13	6.49
Design_04	TMR2105	INA849	20	4.81		0.36	0.24	0.36	3.6	9.37	4.81	5.17
Design_05	TMR2005	INA849	205	4.81	1.32	0.36	0.24	0.36	3.6	10.69	6.13	6.49
Design_06	TMR2102	INA849	350	4.81	6.01	2.5	0.24	0.36	3.6	17.52	10.82	13.32
Design_07	TMR2103	INA849	437	4.81	1.8	0.2	0.24	0.36	3.6	11.01	6.61	6.81
Design_08	TMR2104	INA849	218	4.81		0.3	0.24	0.36	3.6	9.31	4.81	5.11
Design_09	TMR2701	INA849	942	4.81		0.3	0.24	0.36	3.6	9.31	4.81	5.11
Design_10	TMR2703	INA849	1K	4.81		0.12	0.24	0.36	3.6	9.13	4.81	4.93
Design_11	TMR2705	INA849	1.74K	4.81		0.5	0.24	0.36	3.6	9.51	4.81	5.31
Design_12	TMR2922	INA849	942	4.81	36.05	0.2	0.24	0.36	3.6	45.26	40.86	41.06
Design_13	CT100	INA849	26.1	4.81	3.61	0.2	0.24	0.36	3.6	12.82	8.42	8.62
Design_28	CT100	AD8229	26.1	302	3.61	0.2	0.24	0.36	3.6	310.01	305.61	305.81
Design_29	TMR2001	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_30	TMR2003	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_31	TMR2103	AD8229	75	302	1.8	0.2	0.24	0.36	3.6	308.2	303.8	304
Design_32	TMR2005	AD8229	75	302	1.32	0.2	0.24	0.36	3.6	307.72	303.32	303.52
Design_33	TMR2009	AD8229	20.5	302	1.32	0.5	0.24	0.36	3.6	308.02	303.32	303.82
Design_34	TMR2105	AD8229	20.5	302		0.5	0.24	0.36	3.6	306.7	302	302.5
Design_35	TMR2102	AD8229	75	302	6.01	0.2	0.24	0.36	3.6	312.41	308.01	308.21
Design_36	TMR2104	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_37	TMR2701	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_38	TMR2922	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_39	TMR2703	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
Design_40	TMR2705	AD8229	75	302		0.2	0.24	0.36	3.6	306.4	302	302.2
design_15	TMR2005	AD8429	200	10.7	1.32	0.1	0.24	0.36	3.6	16.32	12.02	12.12
Design_16	CT100	AD8429	25	10.7	3.61	0.12	0.24	0.36	3.6	18.63	14.31	14.43
Design_17	TMR2009	AD8429	20	10.7	1.32	0.36	0.24	0.36	3.6	16.58	12.02	12.38
Design_18	TMR2105	AD8429	20	10.7		0.36	0.24	0.36	3.6	15.26	10.7	11.06
Design_19	TMR2104	AD8429	213	10.7		0.3	0.24	0.36	3.6	15.2	10.7	11
Design_20	TMR2001	AD8429	585	10.7		8	0.24	0.36	3.6	22.9	10.7	18.7
Design_21	TMR2003	AD8429	427	10.7		0.07	0.24	0.36	3.6	14.97	10.7	10.77
Design_22	TMR2102	AD8429	344	10.7	6.01	0.07	0.24	0.36	3.6	20.98	16.71	16.78
Design_23	TMR2103	AD8429	427	10.7	1.8	8	0.24	0.36	3.6	24.7	12.5	20.5
Design_24	TMR2701	AD8429	920	10.7		0.07	0.24	0.36	3.6	14.97	10.7	10.77
Design_25	TMR2922	AD8429	920	10.7	36.05	0.07	0.24	0.36	3.6	51.02	46.75	46.82
Design_26	TMR2703	AD8429	1.06K	10.7		0.07	0.24	0.36	3.6	14.97	10.7	10.77
Design_27	TMR2705	AD8429	1.7K	10.7		8	0.24	0.36	3.6	22.9	10.7	18.7

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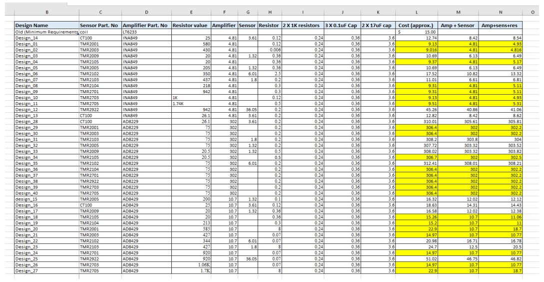
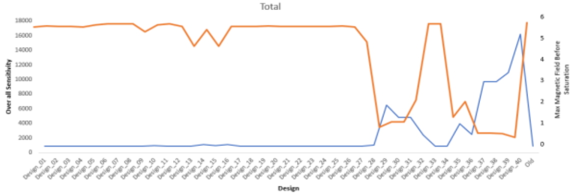
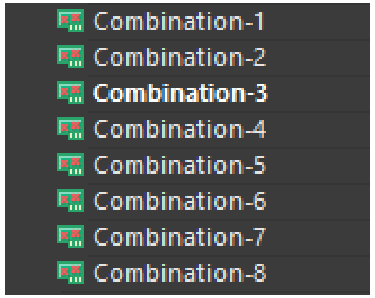
Statement of work

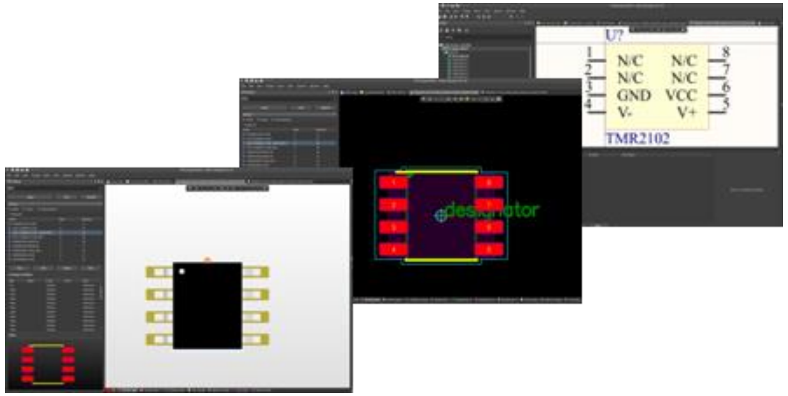
Work Flow:

- Analyze all parameters thoroughly to select the best combinations from the List that fulfill the all specified criteria.
- Develop Symbol and Footprint libraries for all components in the selected best combinations.



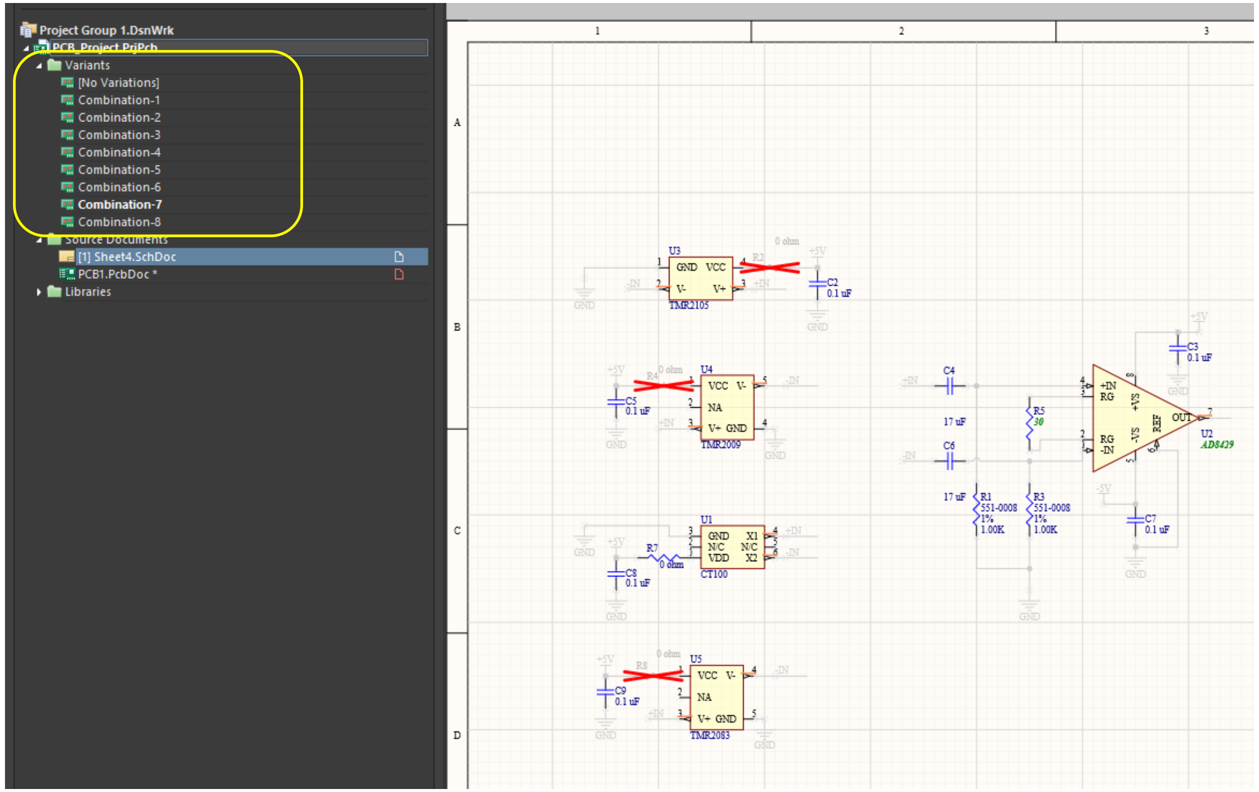






Schematic creation

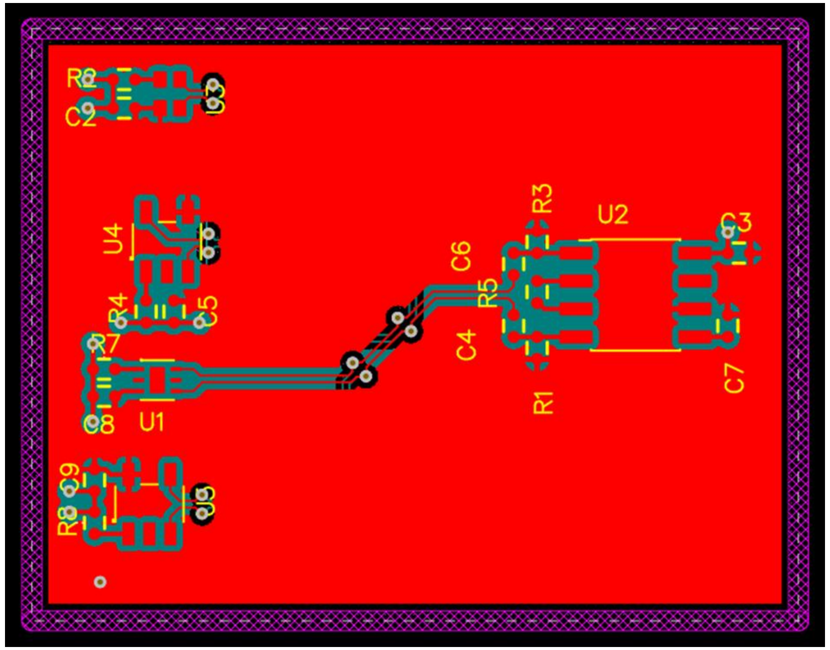
- Design a Schematic diagram for the best combinations using a variant concept to facilitate testing on a single prototype-level board.



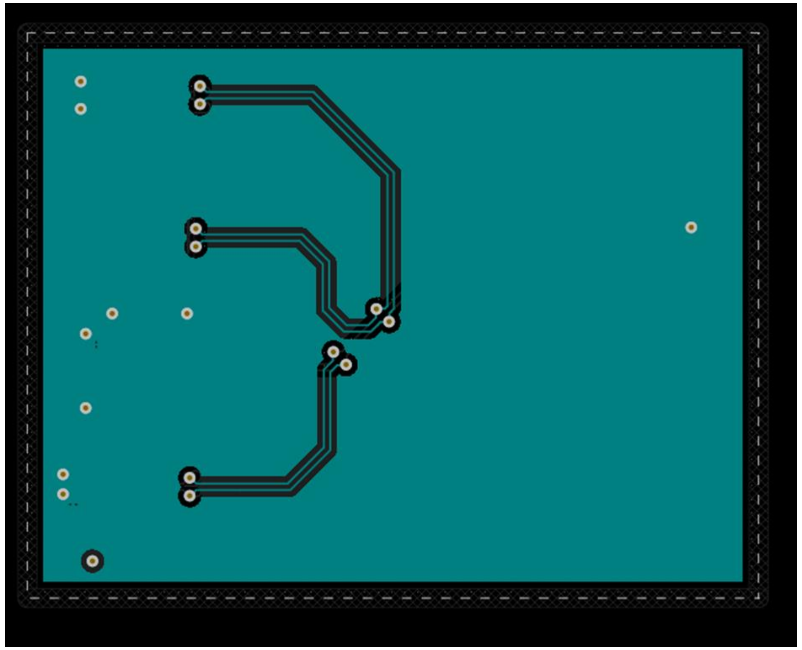
PCB layout

- The PCB layout was developed for this Schematic, in accordance with the client's specified standards.
- Deliverables for PCB design outputs are prepared in accordance with industry standards.

Top Layer



Bottom Layer



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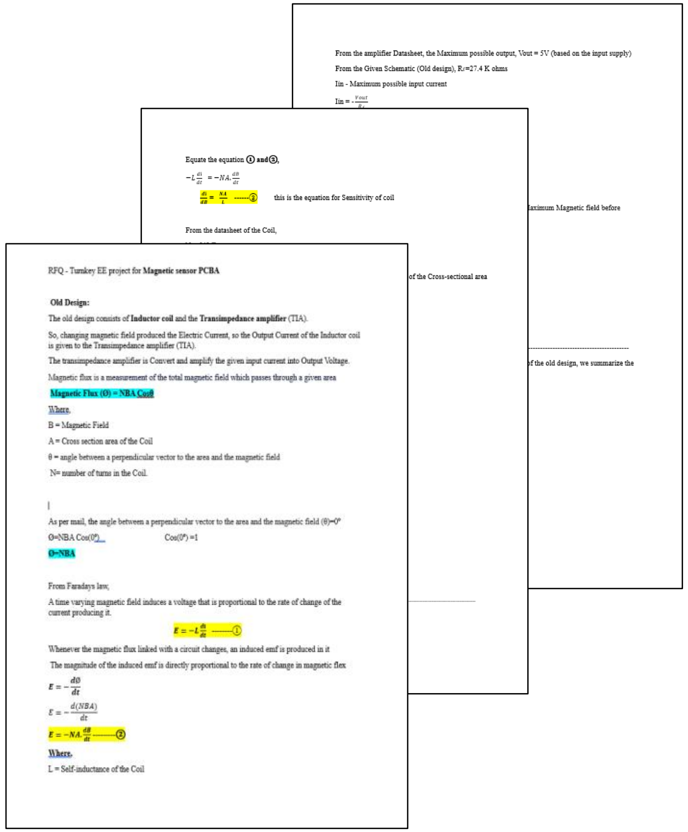
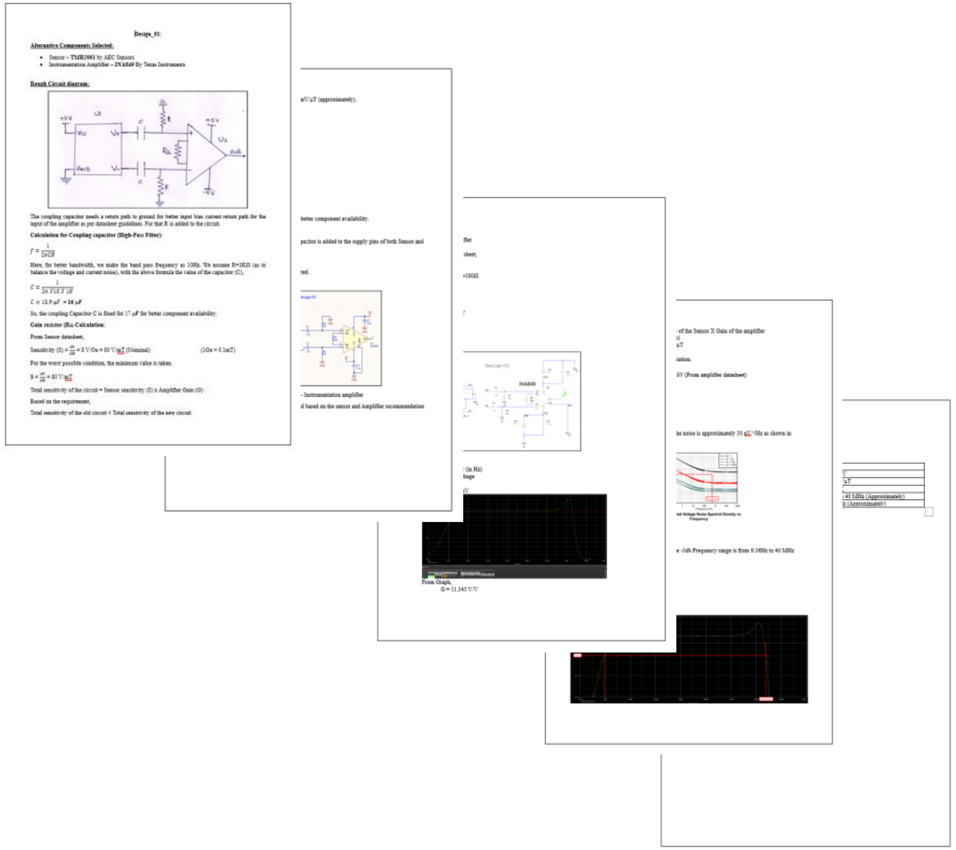
Results

Old Design Parameters calculation Document

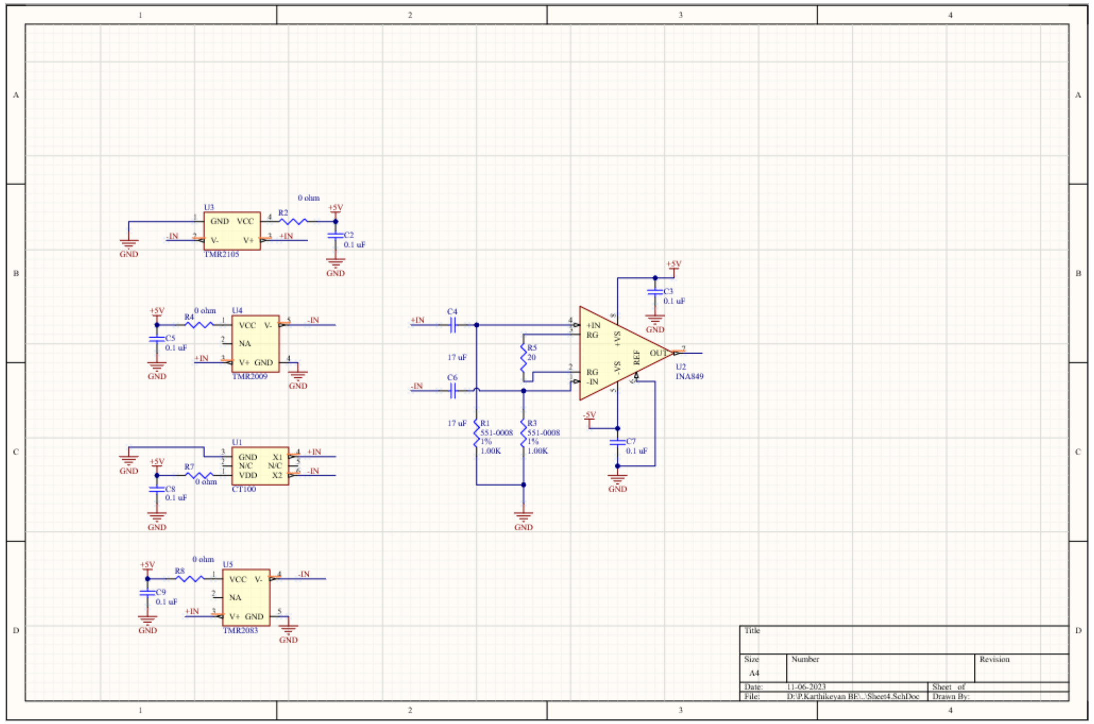


New Design Parameters Calculation Document

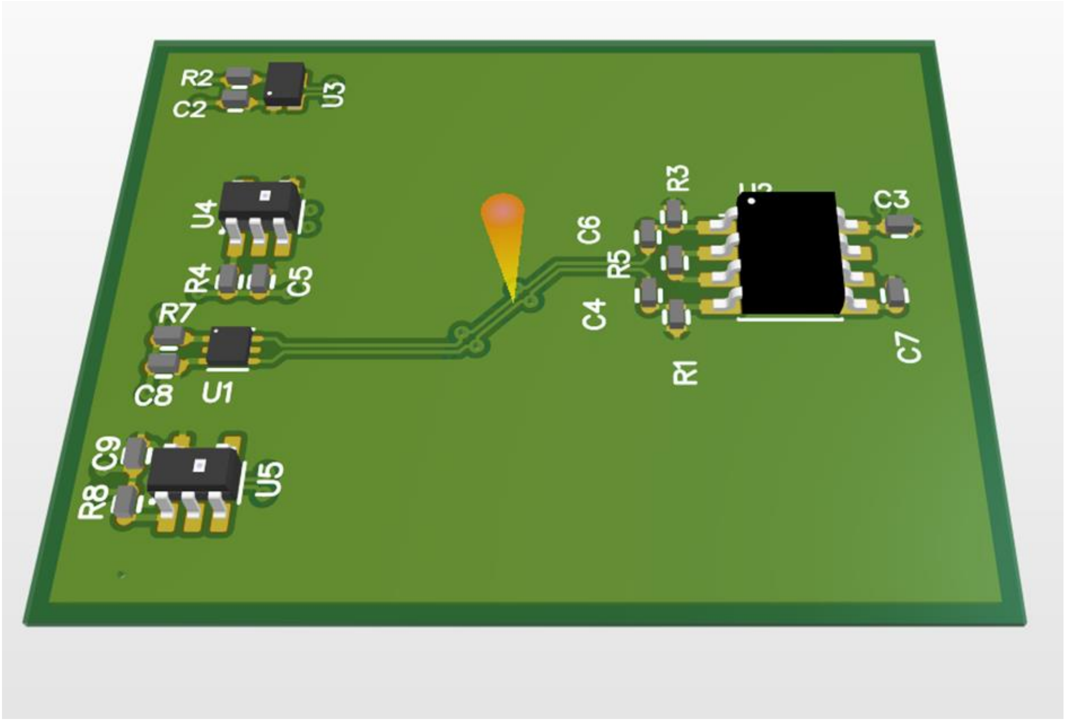


Results

Schematic Diagram



PCB layout



Client Testimonial

Presented is a testimonial from a satisfied client that provides strong evidence of the effectiveness of Hardware Circuit Design to prototype board design.

"We entrusted our previous circuit to this company, with the goal of creating a new circuit within a critical timeframe while enhancing or maintaining performance. We were pleasantly surprised when they not only delivered a new circuit but also provided calculations for the old circuit's parameters, exceeding our expectations by proposing a cost-effective solution. Their expertise brought our vision to fulfillment, and we are genuinely impressed by the exceptional quality of their work. Additionally, their steady commitment to meeting deadlines has solidified our trust in their ability to tackle even the most challenging projects. We now have full confidence in their capabilities "

Conclusion

We showcased our dedication to excellence and technical proficiency by delivering, circuit design to prototype board design and results that precisely aligned with the client's needs.

Our partnership combines proficiency with personalized service in addition to technical expertise.

Our commitment is apparent in our delivery of high-quality circuit design to prototype PCB layout, which not only reduces costs but also underscores our capacity and reliability in consistently achieving exceptional results with a focus on quality and adherence to timelines.