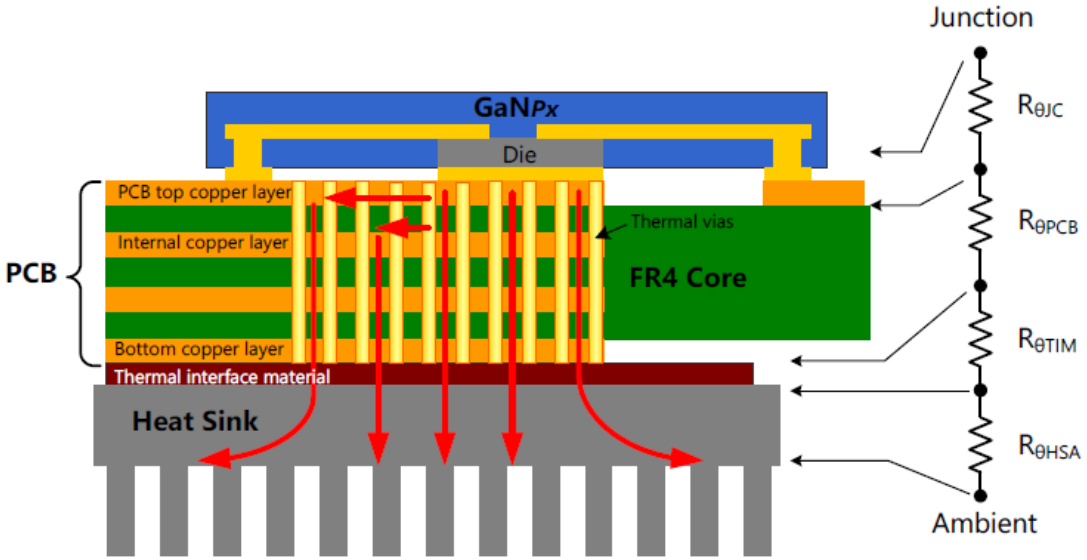
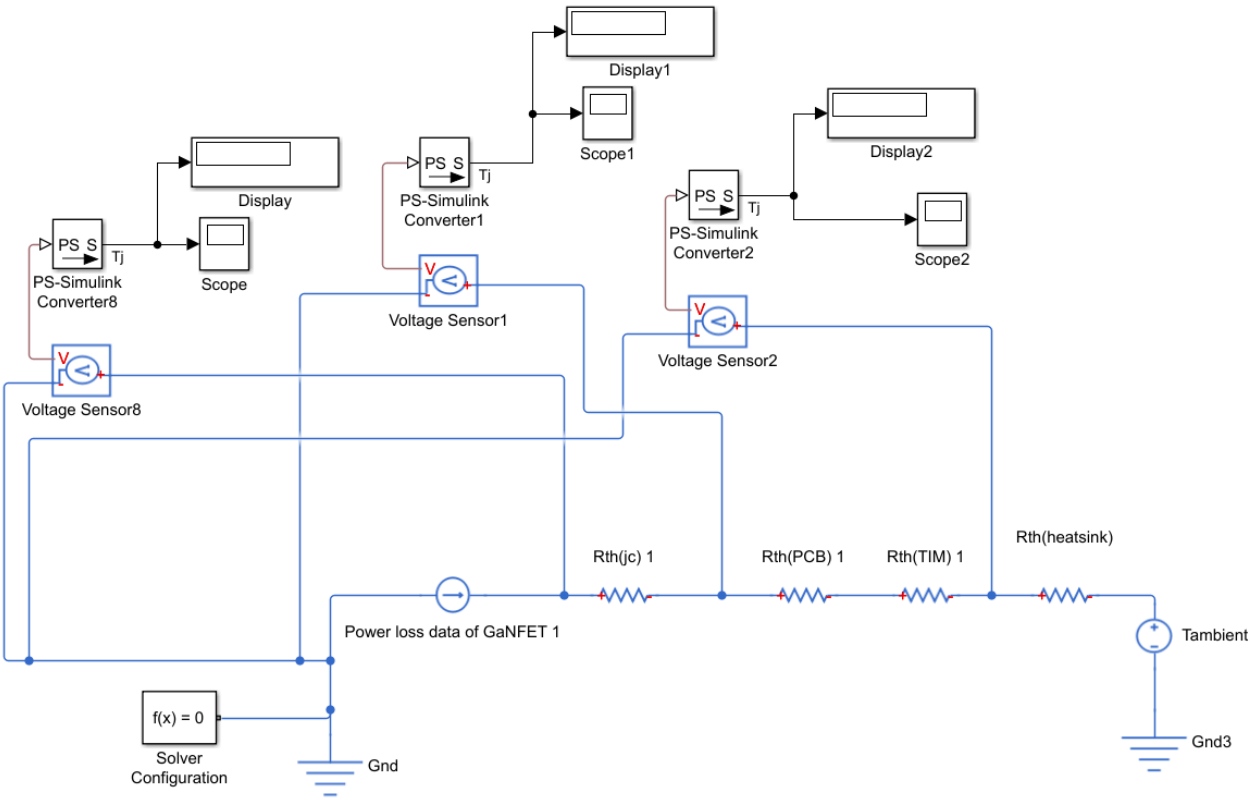
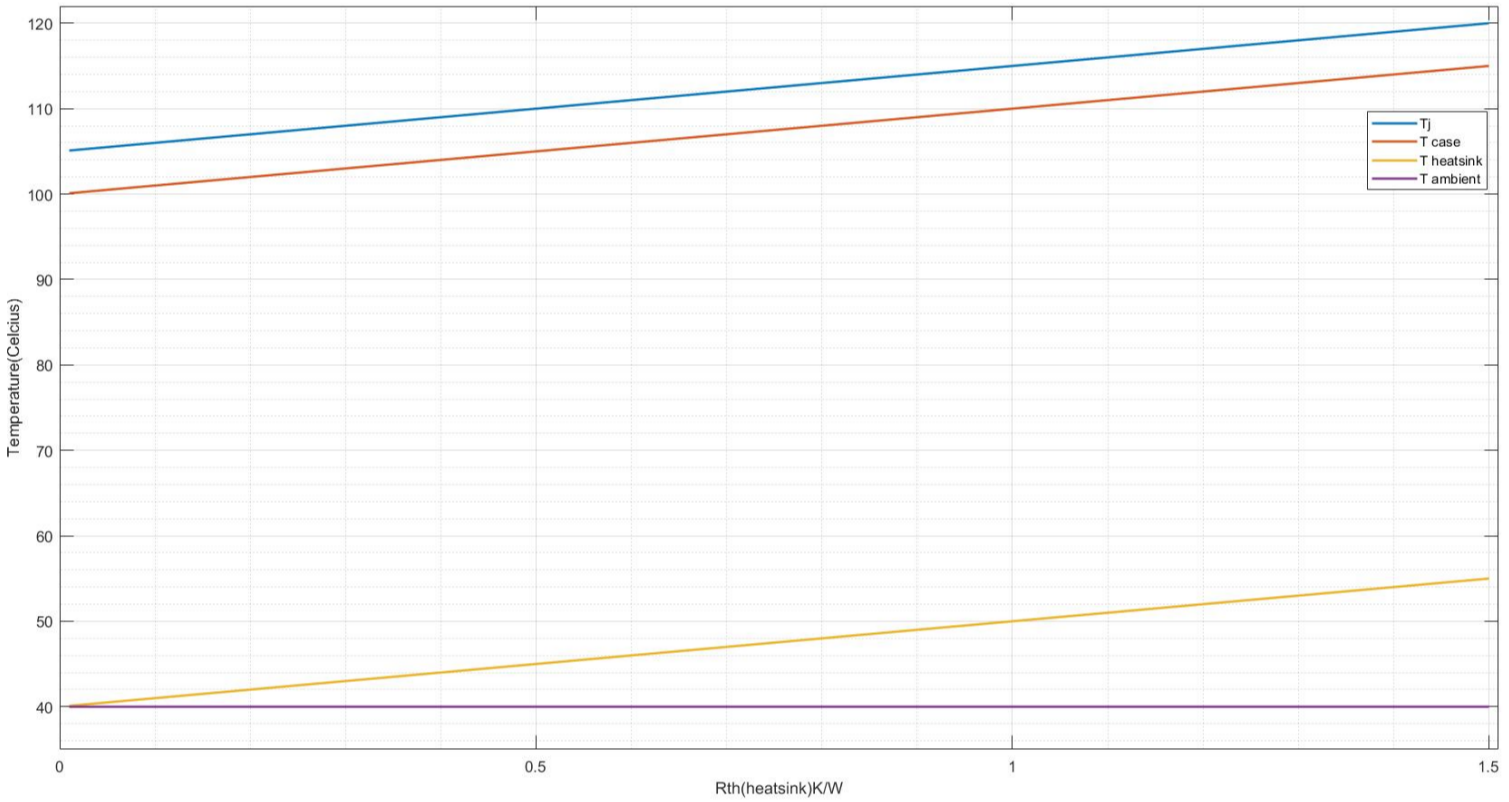
Steady-state Lumped Parameter Analysis

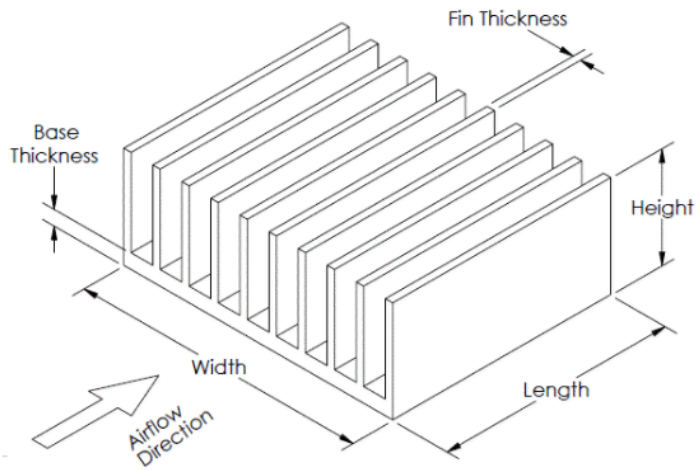


- 123 Thermal via (0.3mm diameter) , 6 Layer PCB, R_{jc}= 0.5 Ω , R_{cpb}= 4.5Ω(1.6mm & 6 layer), R_{TIM} = 1.5 Ω




Tj
T case
T heatsink
T ambient
Temperature(Celcius)
Rth(heatsink)K/W
120
110
100
90
80
70
60
50
40
0
0.5
1
1.5

https://www.myheatsinks.com/calculate/thermal-resistance-plate-fin/



Material: Aluminum (extruded)

Width: 172 mm

Length: 240 mm

Height: 40 mm

Base Thickness: 5 mm

Fin Thickness: 4 mm

Number of Fins: 17

Ben robot değilim

Calculate

Your Input: Parametric Values

Material: Aluminum (extruded)
Width: 172 mm
Length: 240 mm

Height: 40 mm
Base Thickness: 5 mm

Fin Thickness: 4 mm
Number of Fins: 17

Calculation Result: Thermal Resistance & Pressure Drop

Airflow Rate	Thermal Resistance	Pressure Drop
0.5 m/s (~100 LFM)	0.31 °C/W	1.8 Pa (0.007 inH_2O)
1.0 m/s (~200 LFM)	0.22 °C/W	4.7 Pa (0.019 inH_2O)
1.5 m/s (~300 LFM)	0.18 °C/W	8.3 Pa (0.033 inH_2O)
2.0 m/s (~400 LFM)	0.16 °C/W	13.2 Pa (0.053 inH_2O)
2.5 m/s (~500 LFM)	0.15 °C/W	18.6 Pa (0.074 inH_2O)
3.0 m/s (~600 LFM)	0.14 °C/W	24.6 Pa (0.099 inH_2O)
3.5 m/s (~700 LFM)	0.13 °C/W	31.2 Pa (0.125 inH_2O)
4.0 m/s (~800 LFM)	0.12 °C/W	38.5 Pa (0.155 inH_2O)
4.5 m/s (~900 LFM)	0.12 °C/W	46.5 Pa (0.186 inH_2O)
5.0 m/s (~1,000 LFM)	0.11 °C/W	55.0 Pa (0.221 inH_2O)

Please note some assumptions were made in the calculation:
1. No flow bypassing;
2. Uniform heat spreading over base plate.

- The results changes between $R_{th\ (heatsink)}$= 0.25 - 0.45 ℃/W

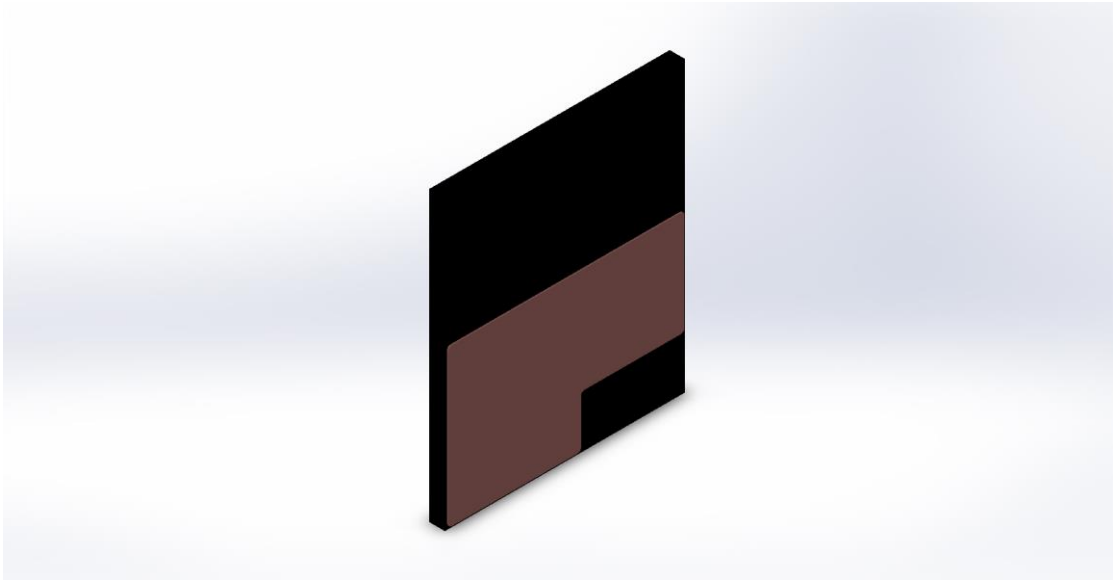
FEA Analysis (Steady State)

If you think that GanFET is a black box with 0.5 R_{jc} ;

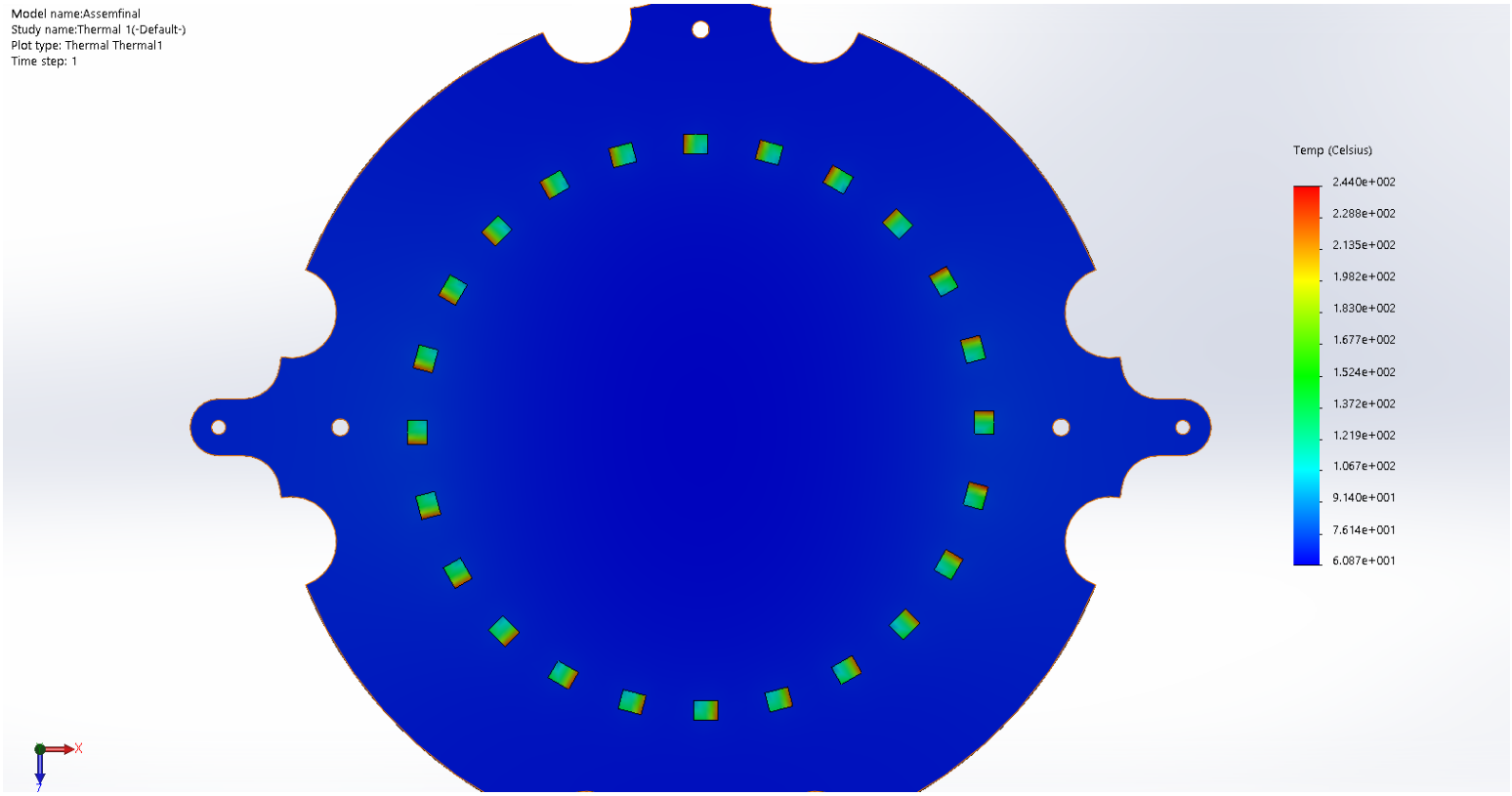
- L is the thickness (m) (thickness of the package and the thermal pad);
- A is the effective contact area (m^2) (Area of the thermal pad) ;
- k is the conductivity of the box (W/(m*K))

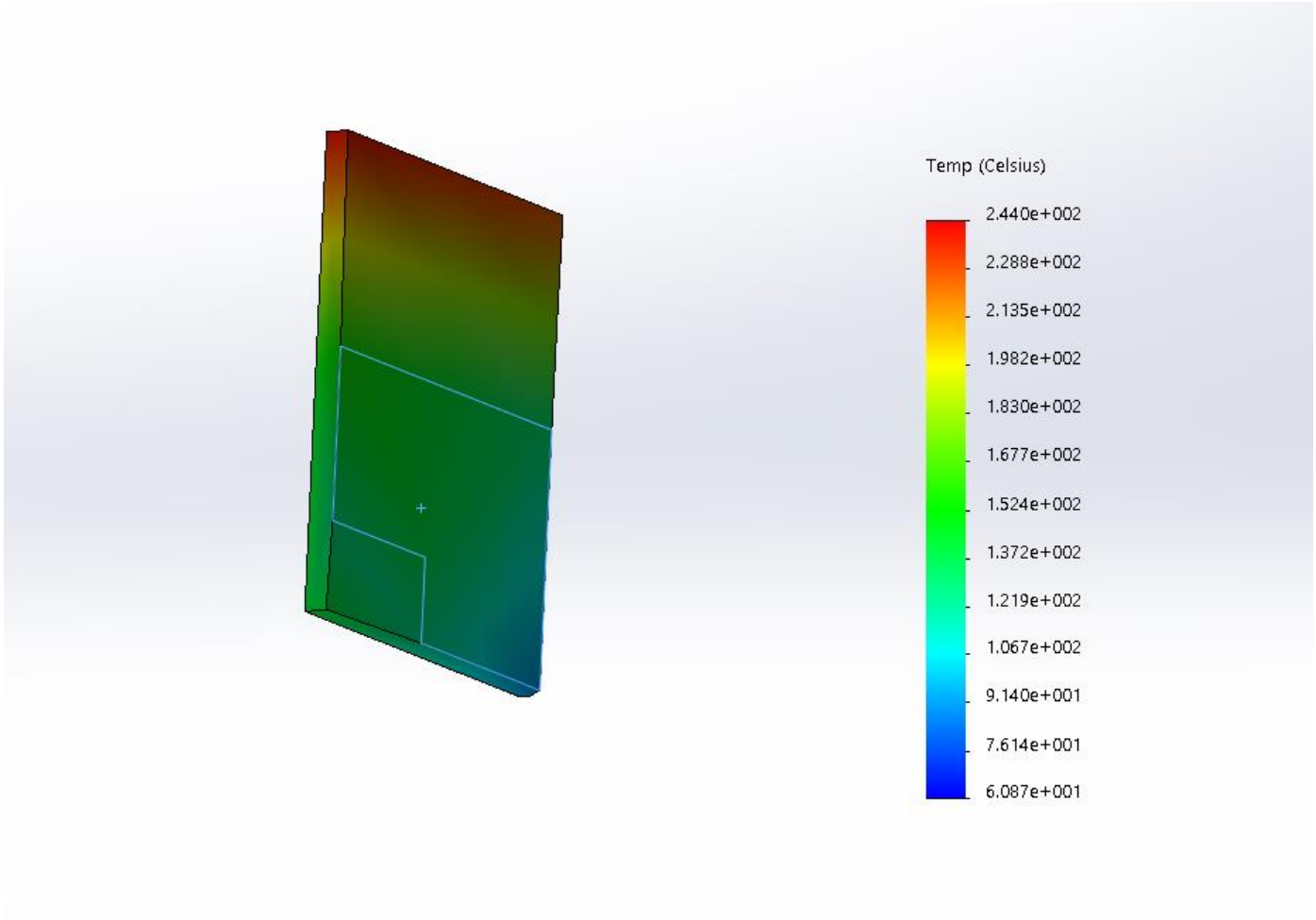
$$R = \frac{L}{A.k} \quad (1)$$

$$k = \frac{L}{A.R} = \frac{0.440\ x\ 10^{-3}}{2.667\ x\ 10^{-3}\ x\ 0.5} = 32.99\ \ W/(m.K)$$



- For the most accurate Heat convection coefficients CFD analysis required.


Model name:Assemfinal
Study name:Thermal 1(-Default-)
Plot type: Thermal Thermal1
Time step: 1
Temp (Celsius)
2.440e+002
2.288e+002
2.135e+002
1.982e+002
1.830e+002
1.677e+002
1.524e+002
1.372e+002
1.219e+002
1.067e+002
9.140e+001
7.614e+001
6.087e+001
X
Y


Temp (Celsius)
2.440e+002
2.288e+002
2.135e+002
1.982e+002
1.830e+002
1.677e+002
1.524e+002
1.372e+002
1.219e+002
1.067e+002
9.140e+001
7.614e+001
6.087e+001

3D Design Engineers are divided into 2 groups;

- MCAD Design engineer (Mechanical)
- ECAD Design Engineer (Electronic)

- These engineers share the common file that is in IDF, EMN or STEP format.
- Each format has different features. (Based on the PCB layout and holes)
- IDF is the most common.

Following weeks;

- **More accurate results**
- **FEA Transient Analysis**