



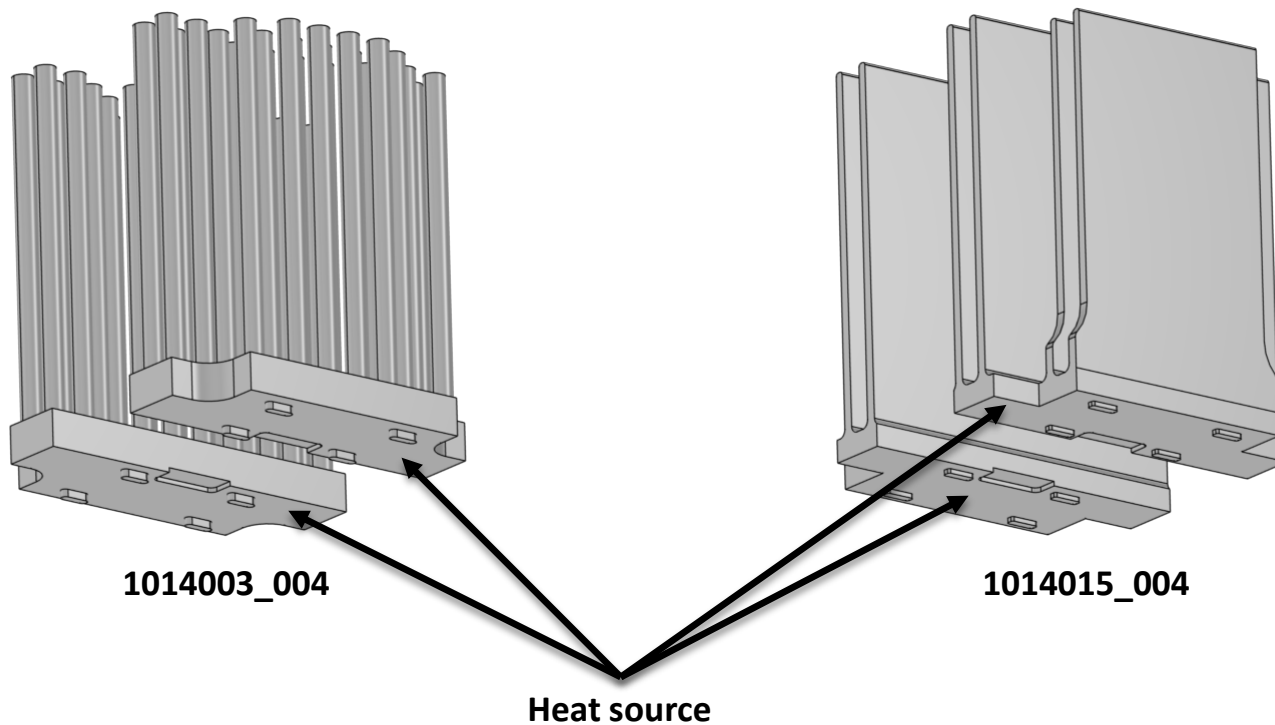
PCIe400 Thermal Model

Jean-Marc NAPPA on behalf of the LAPP team

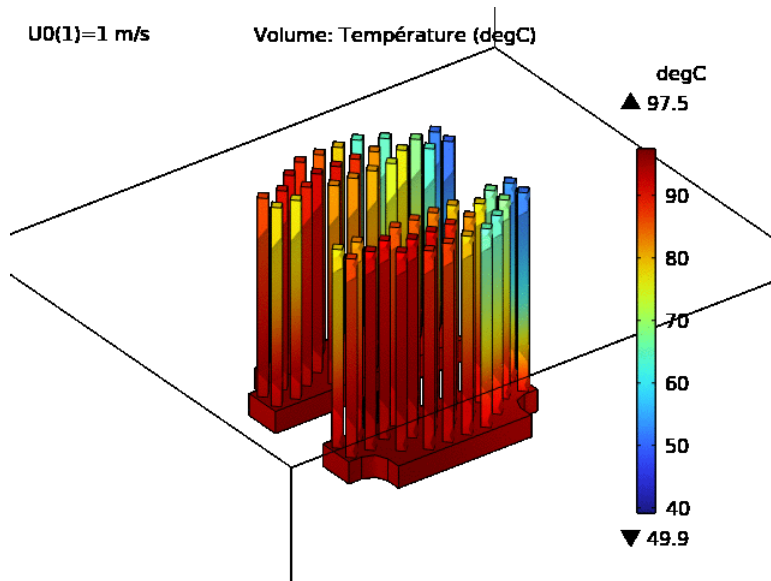


Heat Sink 10140015_004 vs 10140003_004

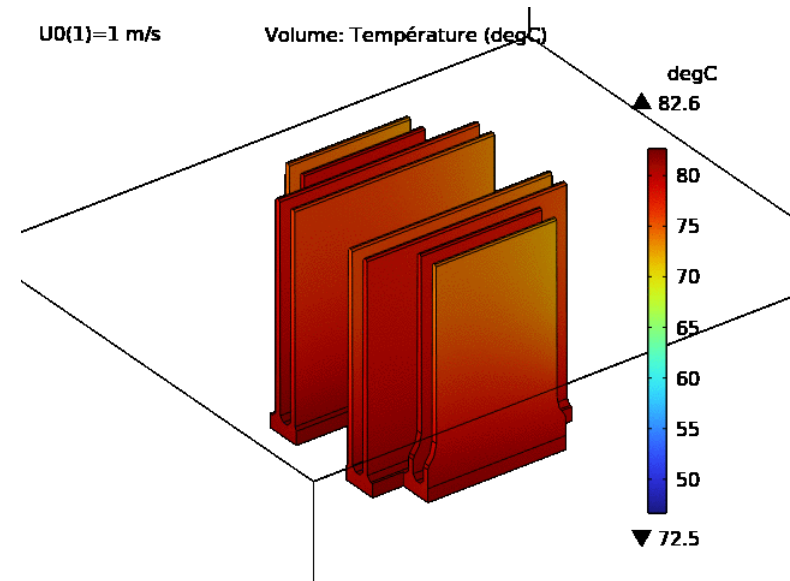
- Matériaux : Aluminum
- Heat source : 10 W
- Tamb : 38 °C



Heat Sink 10140015_004 vs 10140003_004



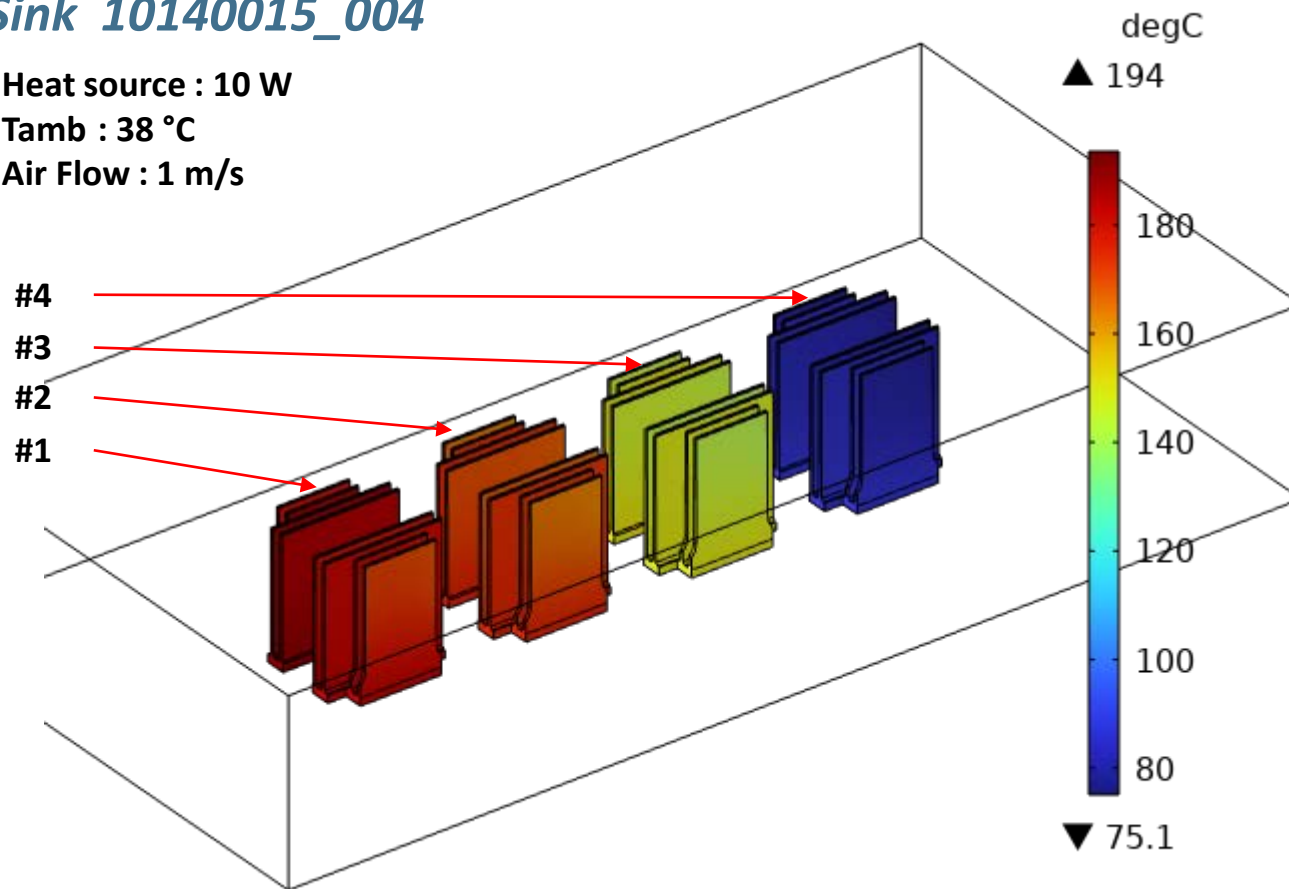
U0 (m/s)	T_moy (degC)
1.0000	95.531
2.0000	71.280
3.0000	62.622



U0 (m/s)	T_moy (degC)
1.0000	81.796
2.0000	61.130
3.0000	54.408

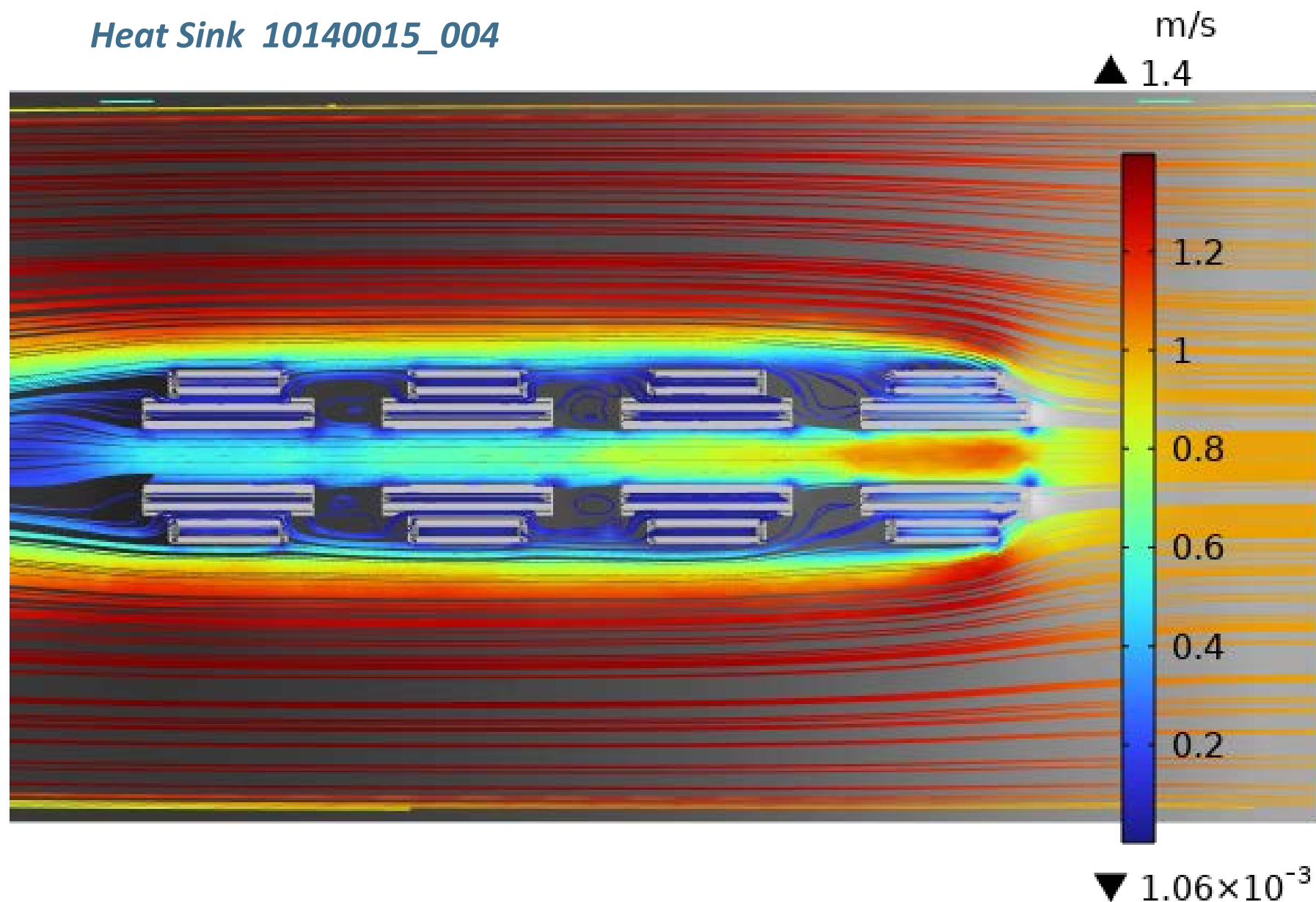
Heat Sink 10140015_004

- Heat source : 10 W
- Tamb : 38 °C
- Air Flow : 1 m/s



T1_moy (degC)	T2_moy (degC)	T3_moy (degC)	T4_moy (degC)
189.24	177.43	151.99	84.032

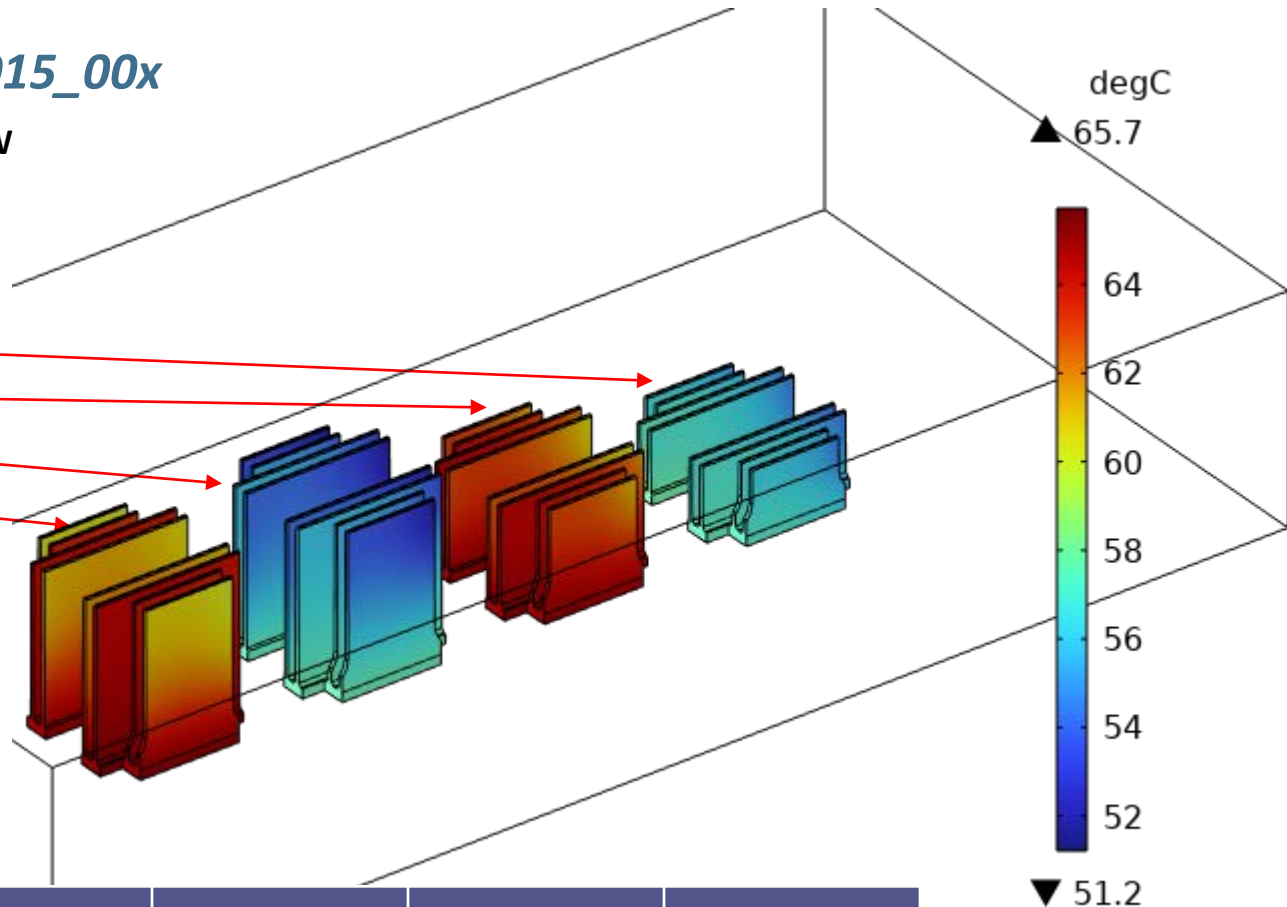
Heat Sink 10140015_004



Heat Sink 10140015_00x

- Heat source : 5 W
- Tamb : 38 °C

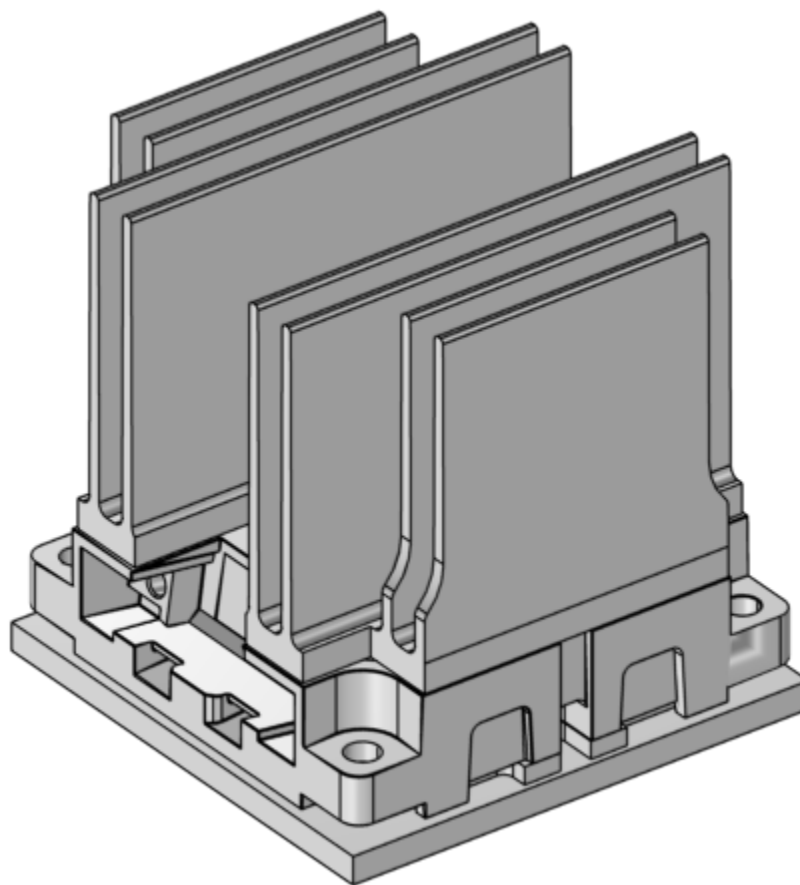
10140015_002 #4
 10140015_003 #3
 10140015_004 #2
 10140015_004 #1



U0 (m/s)	T1_moy (degC)	T2_moy (degC)	T3_moy (degC)	T4_moy (degC)
1.0000	108.12	87.830	110.05	93.298
2.0000	77.027	65.627	77.701	66.337
3.0000	65.402	57.631	65.262	57.167

OBT with Heat Sink 10140015_003

- Heat rate LD : 3.89 W
- Heat rate TIA : 3.63 W
- Tamb : 38 °C



OBT with Heat Sink 10140015_003

10140015_003

200 W/mK

Aluminum

TIM3

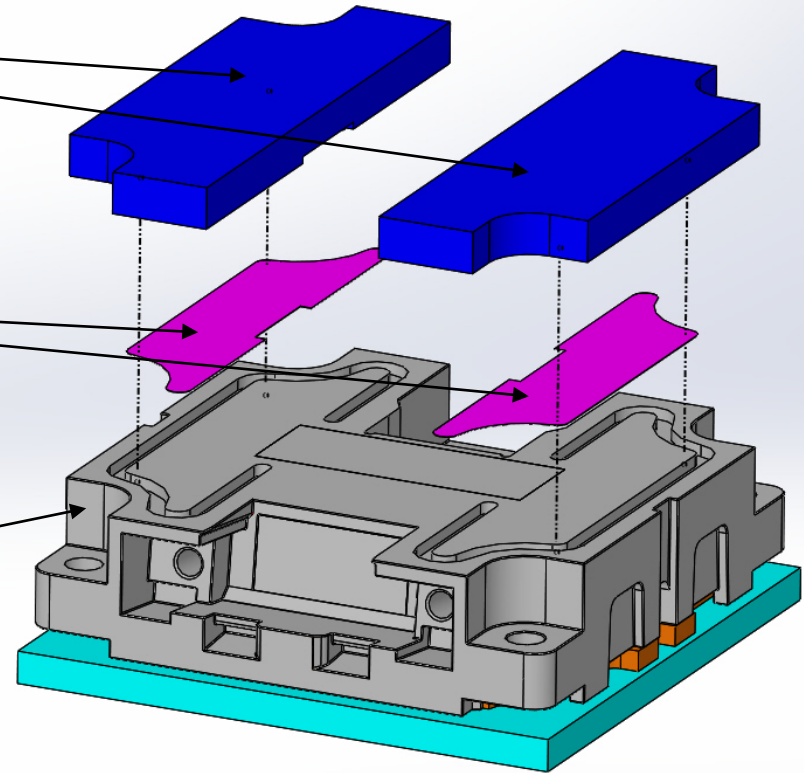
2.30 W/mK

Thermal grease

Housing

108.90 W/mK

Aluminum



OBT with Heat Sink 10140015_003

TIM2

2.30 W/mK

Thermal grease

Heat Spreader

380.00 W/mK

Aluminum

Module PCB

xy32.7 W/mK

z0.28 W/mK

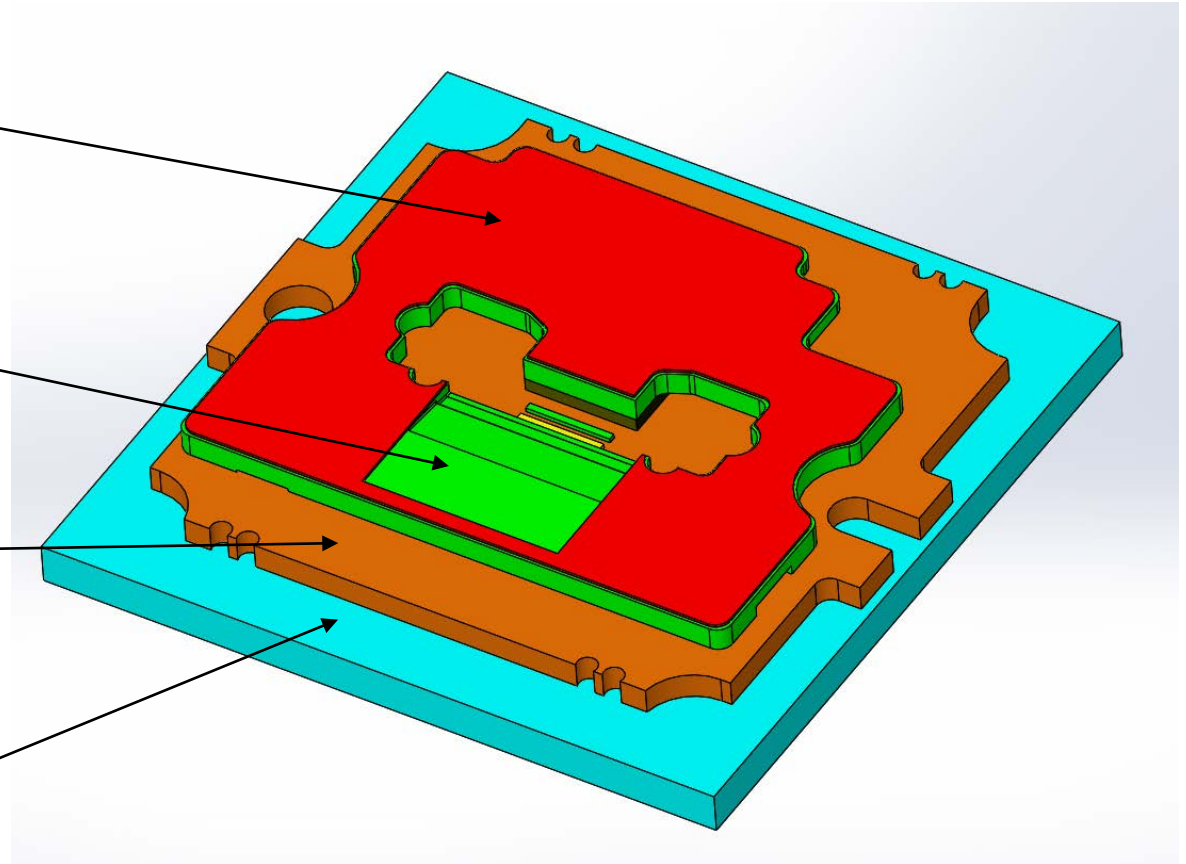
FR4

Socket

xy0.20 W/mK

z0.3 W/mK

Acrylic plastic



OBT with Heat Sink 10140015_003

- Matériaux : Silica glass

VCSEL
PIN Diode

TIM0 (VCSEL/ PIN Diode)

on bottom side

3.25 W/mK

0.01mm Thickness

TIM1 TIA+LD (on top side)

5.40 W/mK

0.02 mm Thickness

TIA+LD

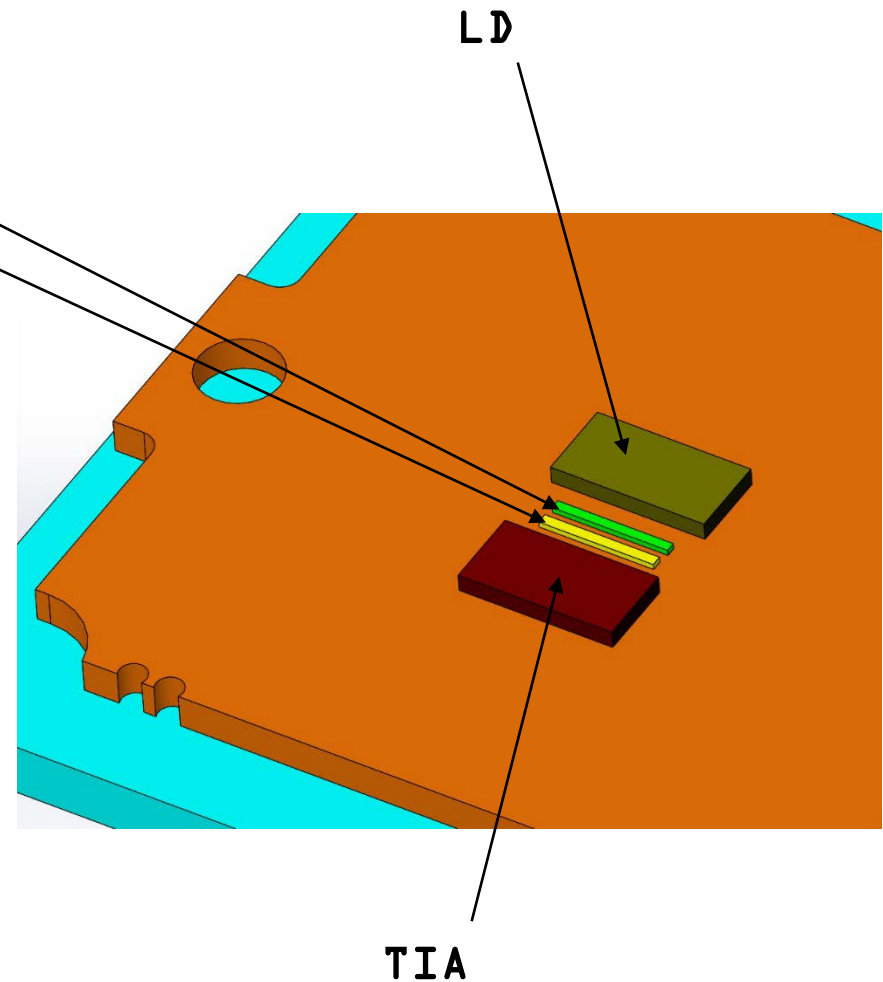
~150 W/mK (Silizium)

Solder + Underfill TIA+LD (on bottom side)

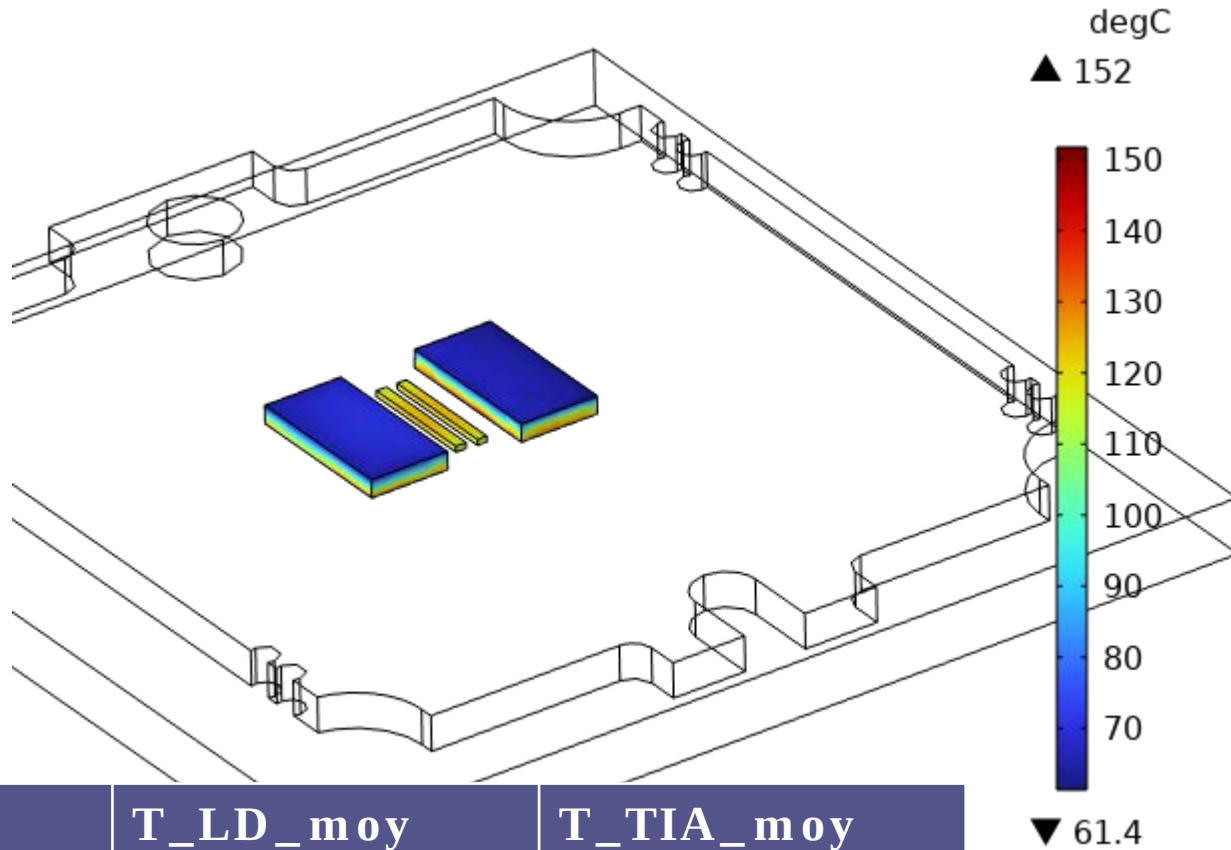
xy 2.5 W/mK

z 33.17 W/mK

0.04mm Thickness

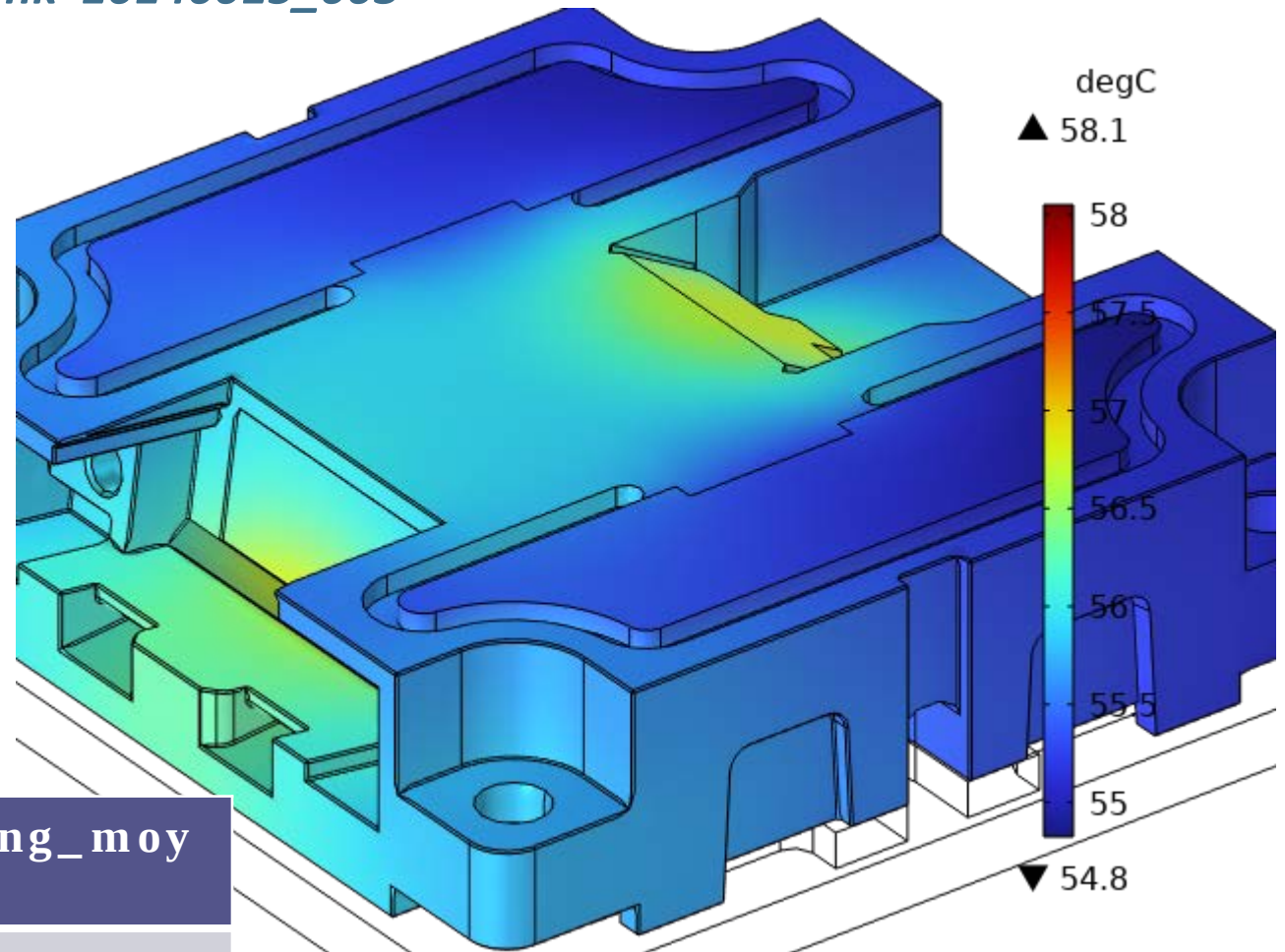


OBT with Heat Sink 10140015_003



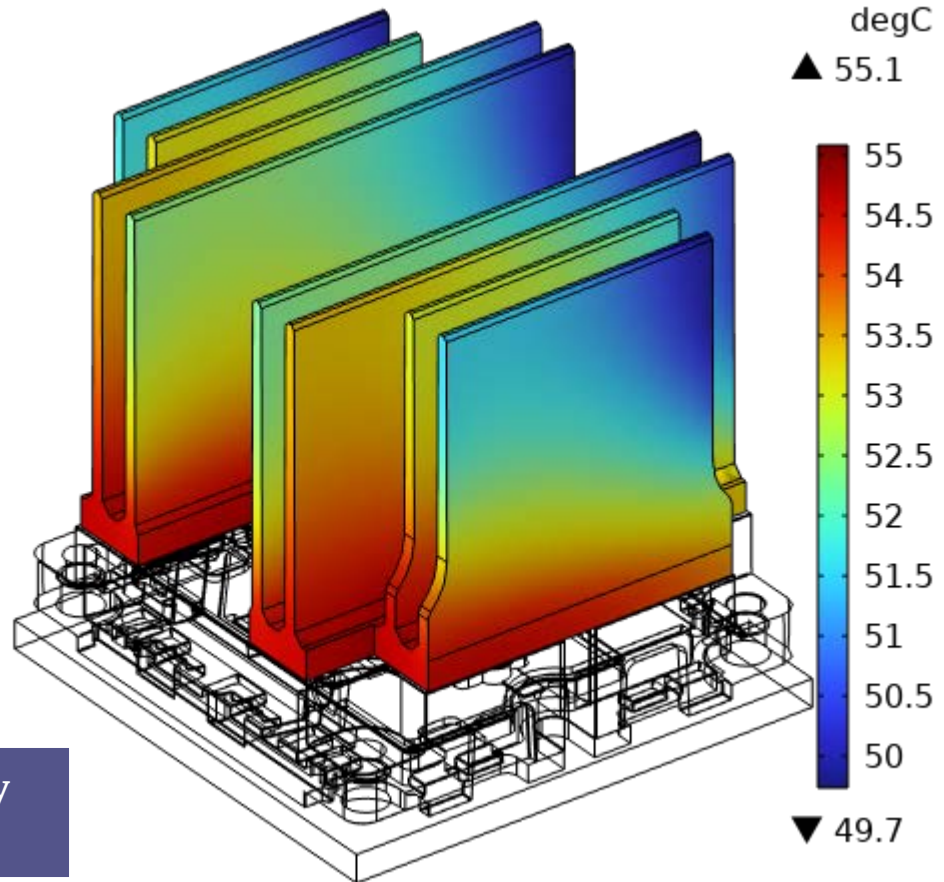
U0 (m/s)	T_LD_moy (degC)	T_TIA_moy (degC)
1.0000	133.88	131.82
2.0000	113.08	111.06
3.0000	105.95	103.99

OBT with Heat Sink 10140015_003



U0 (m/s)	T_Housing_moy (degC)
1.0000	83.767
2.0000	62.813
3.0000	55.664

OBT with Heat Sink 10140015_003

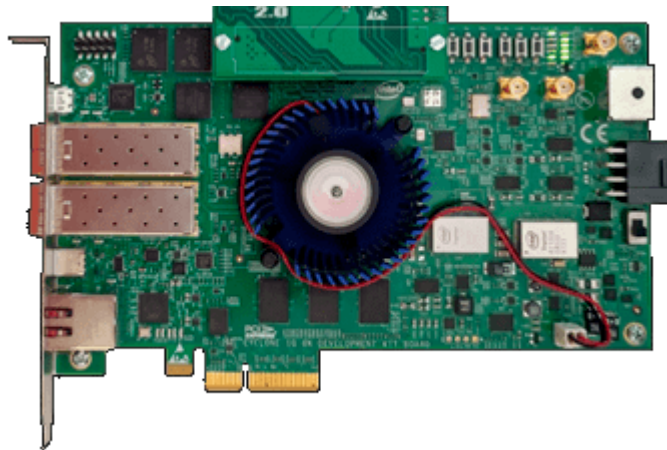
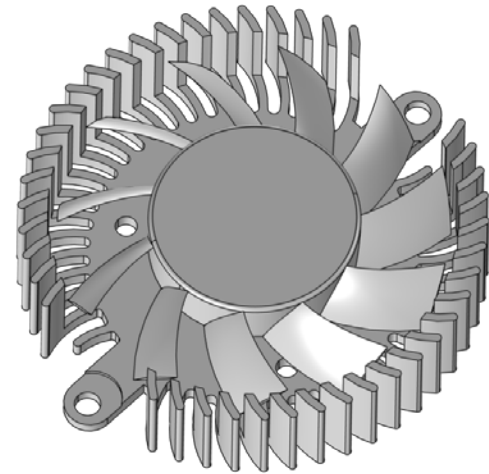


U0 (m/s)	T_HeatSink_moy (degC)
1.0000	81.464
2.0000	60.436
3.0000	53.275

Simulation Velocity Fan (Dynatron T052 50x50x10 mm)

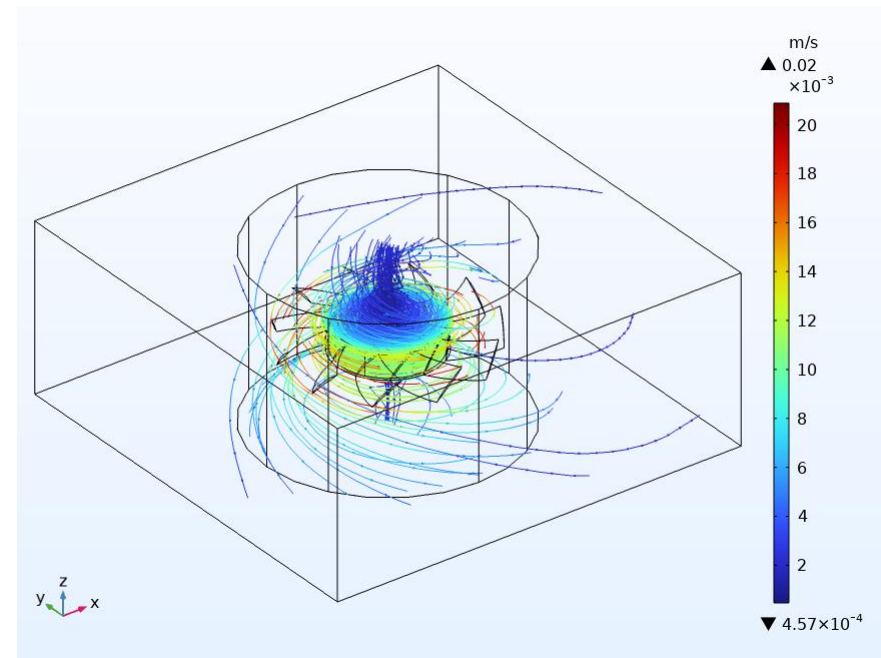
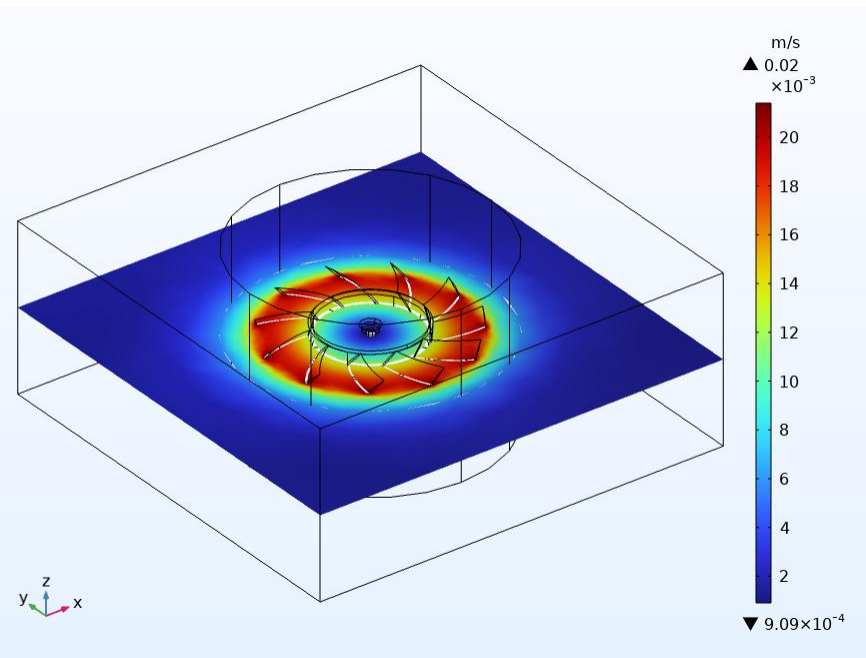


3D Model Thermal

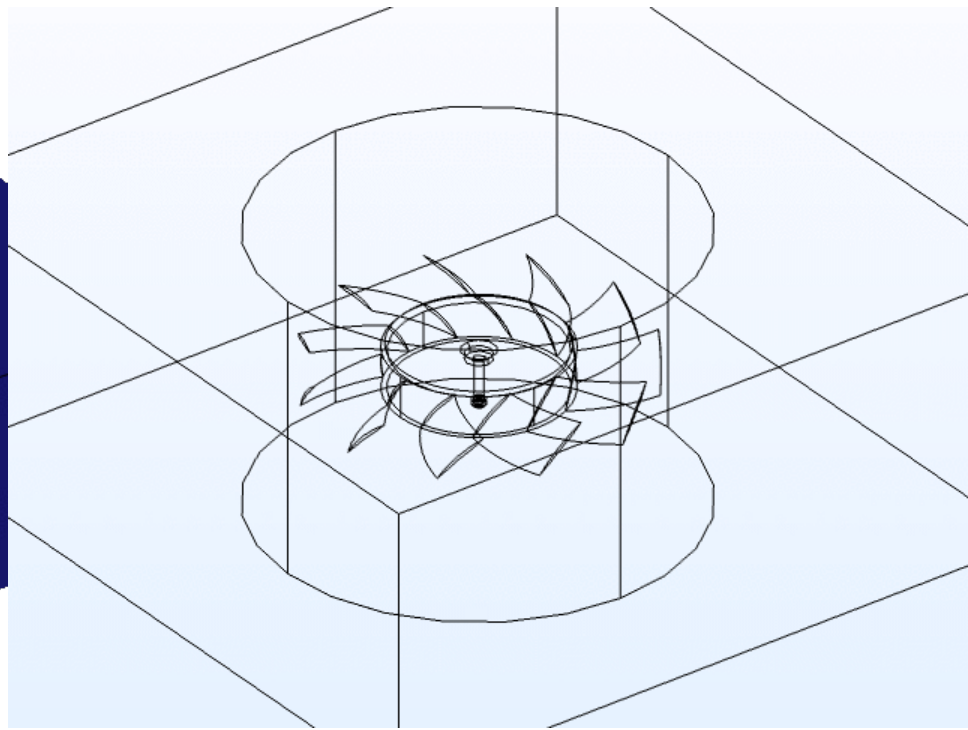
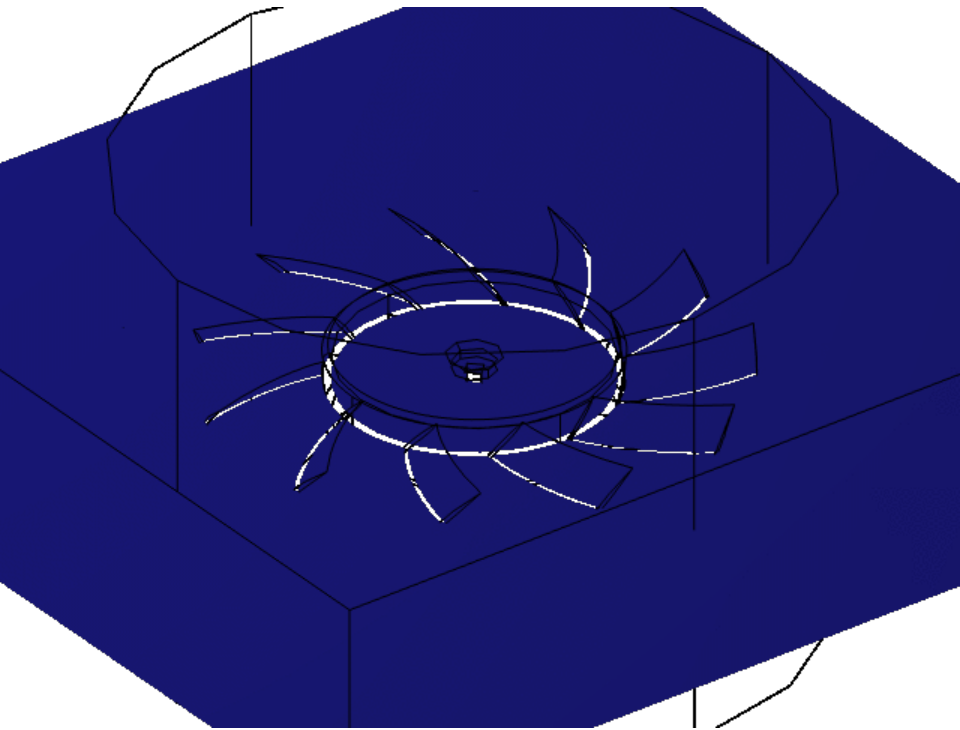


Kit de développement FPGA Intel® Cyclone® 10 GX

Simulation Velocity Fan (Dynatron T052 50x50x10 mm)

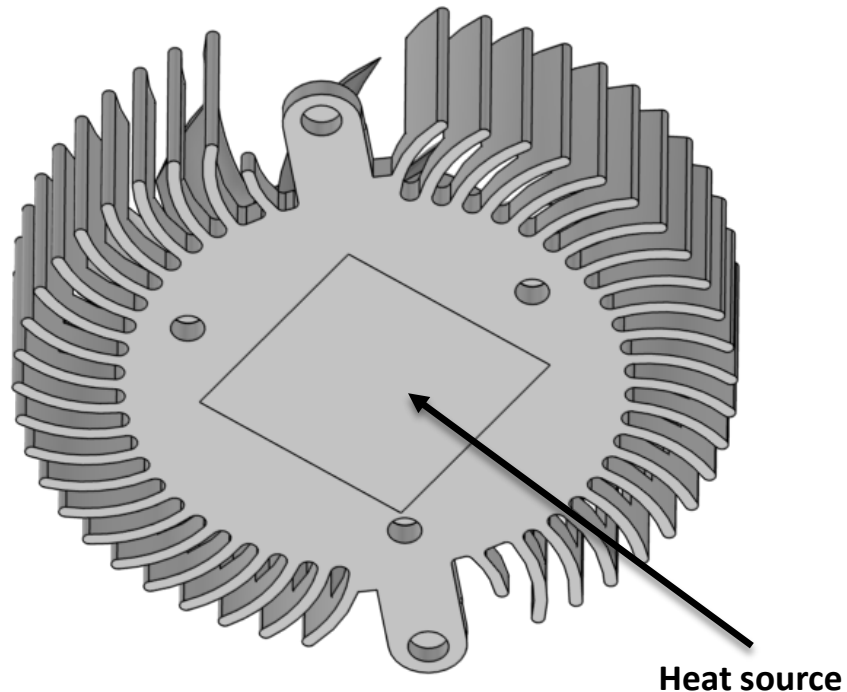


Simulation Velocity Fan (Dynatron T052 50x50x10 mm)



Simulation Thermal Fan (Dynatron T052 50x50x10 mm)

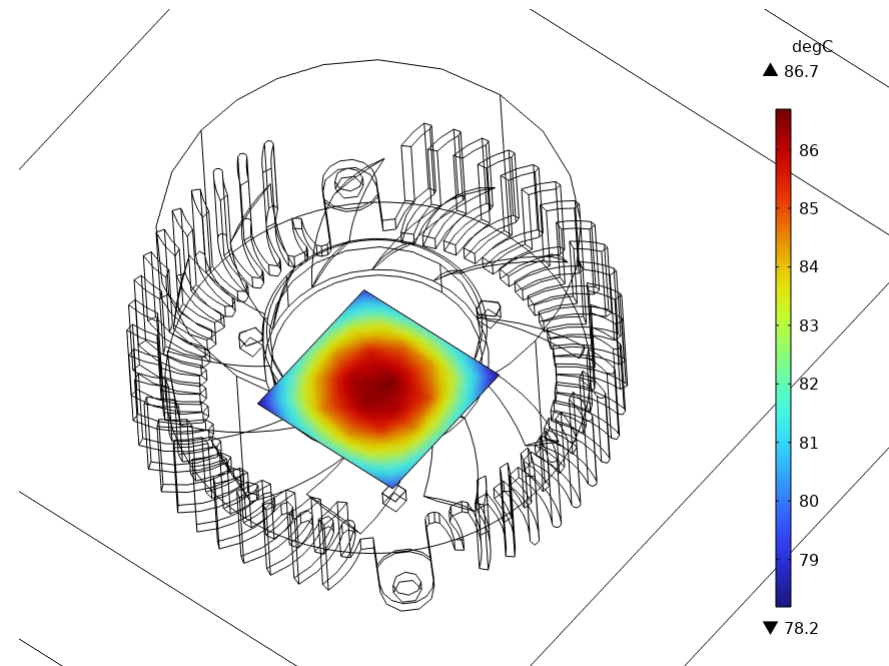
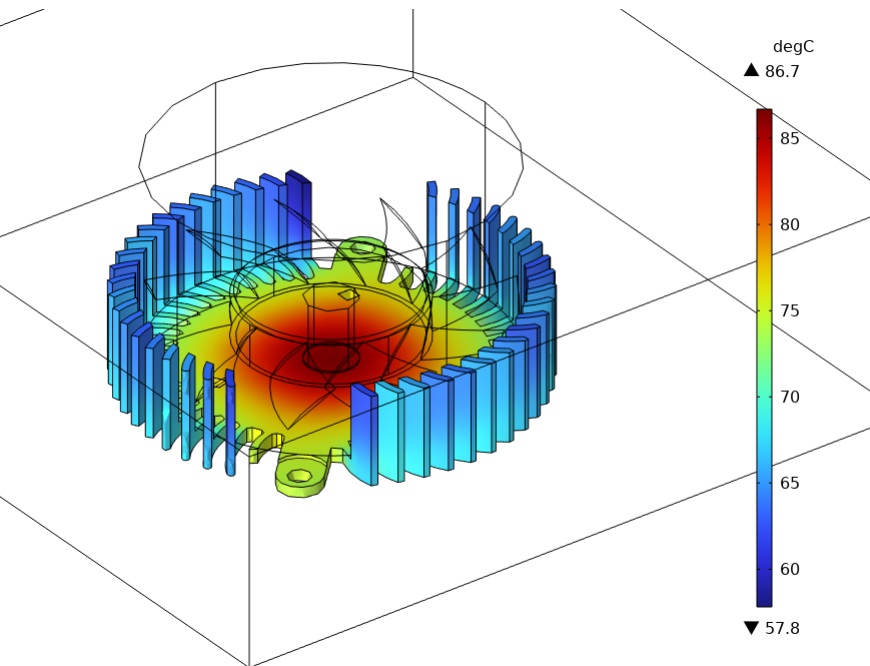
- Heat source : 35 W (surface 19x19 mm)
- Tamb : 38 °C
- Air Flow : 1 m/s
- Revolution : 5000 rpm



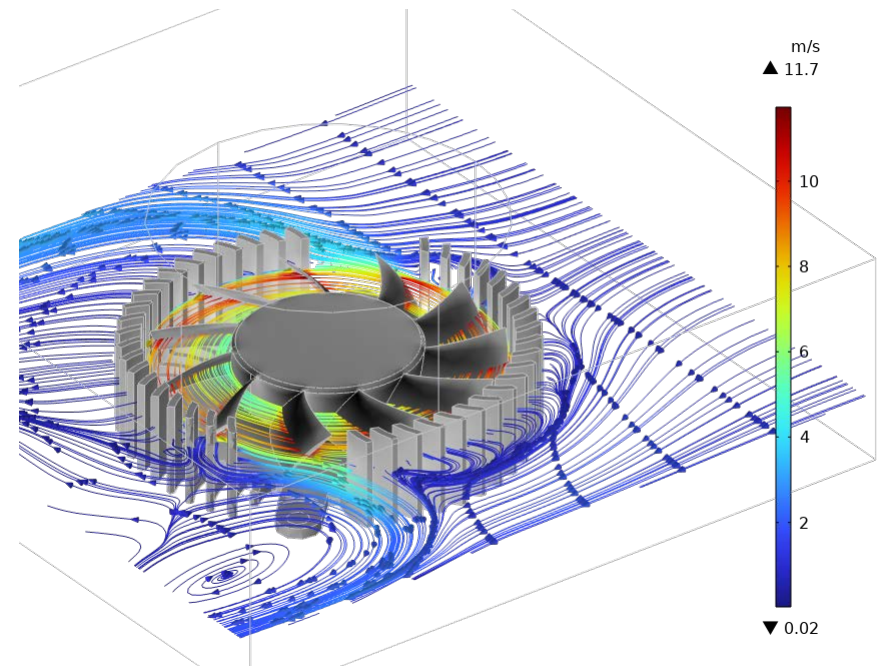
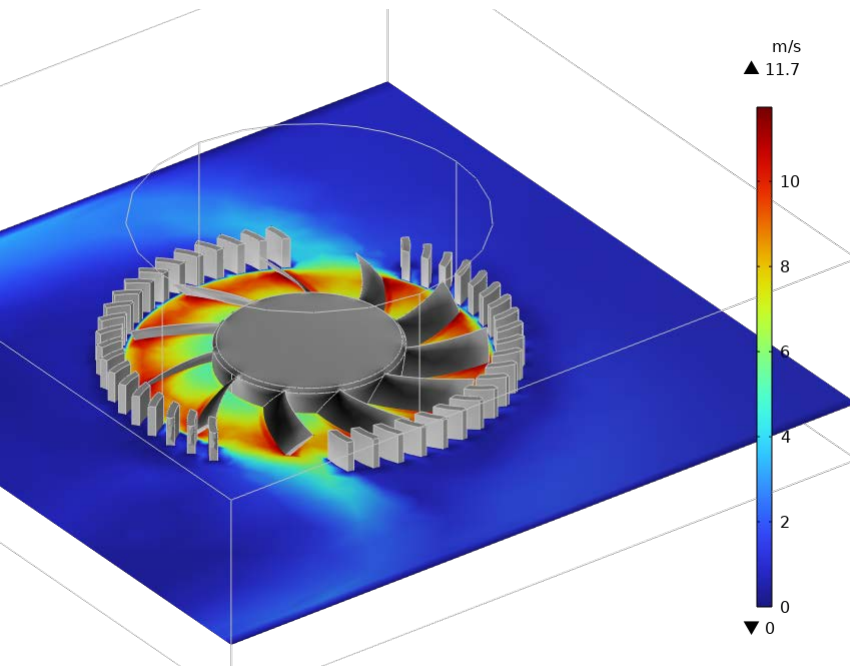
T_moy (degC)

83.606

Simulation Thermal Fan (Dynatron T052 50x50x10 mm)

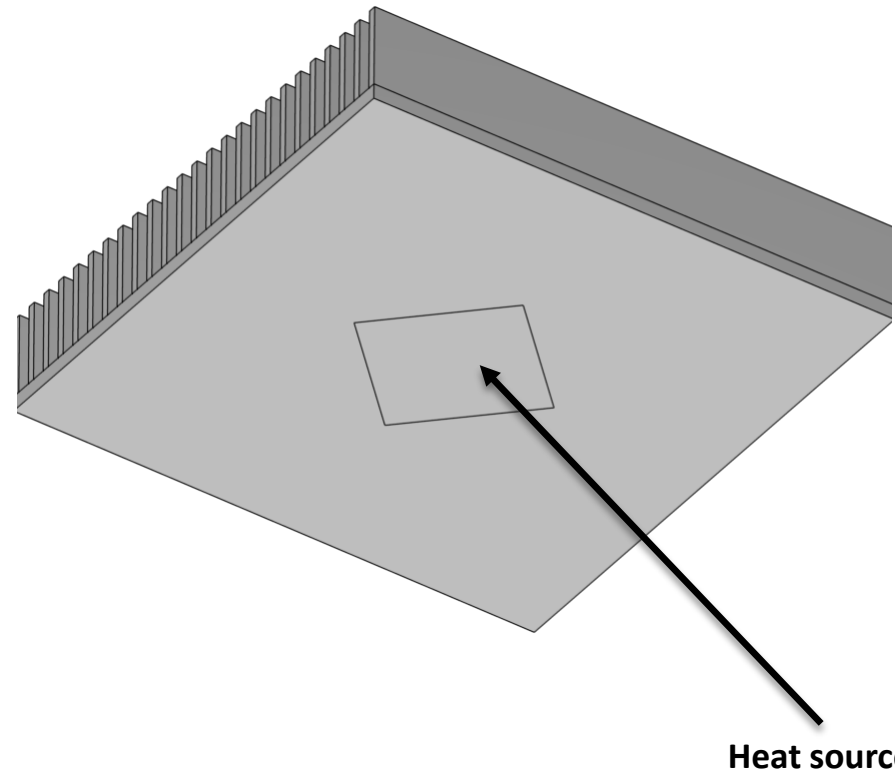
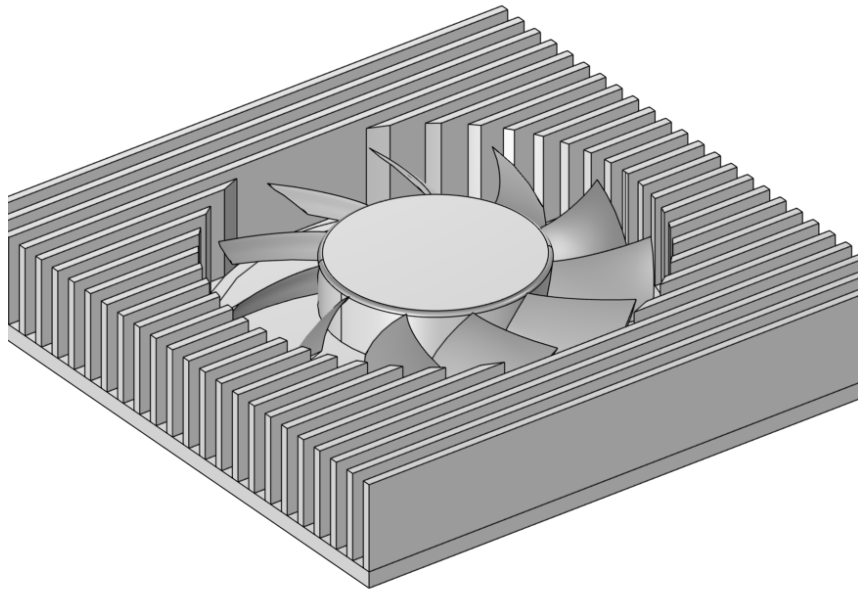


Simulation Thermal Fan (Dynatron T052 50x50x10 mm)



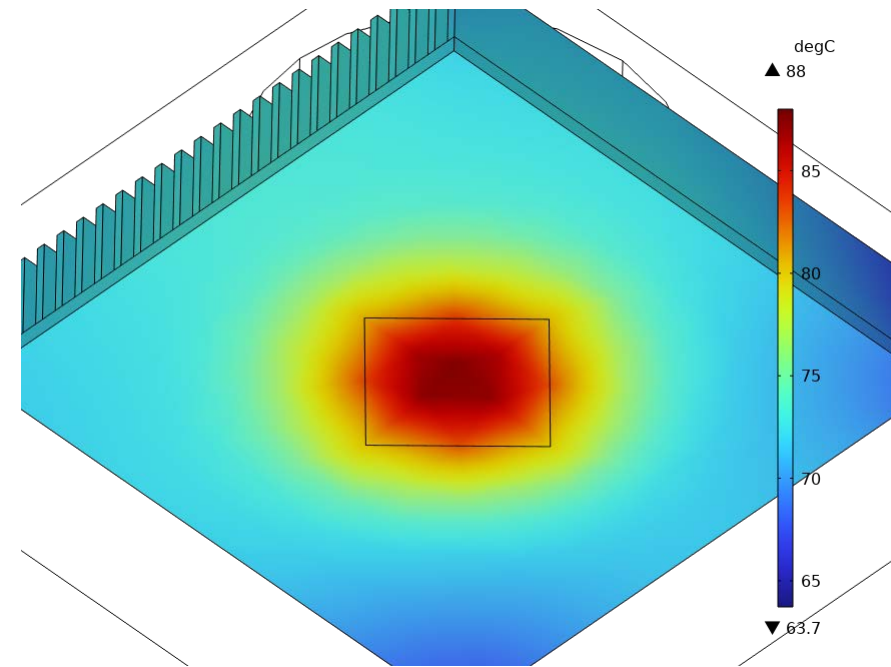
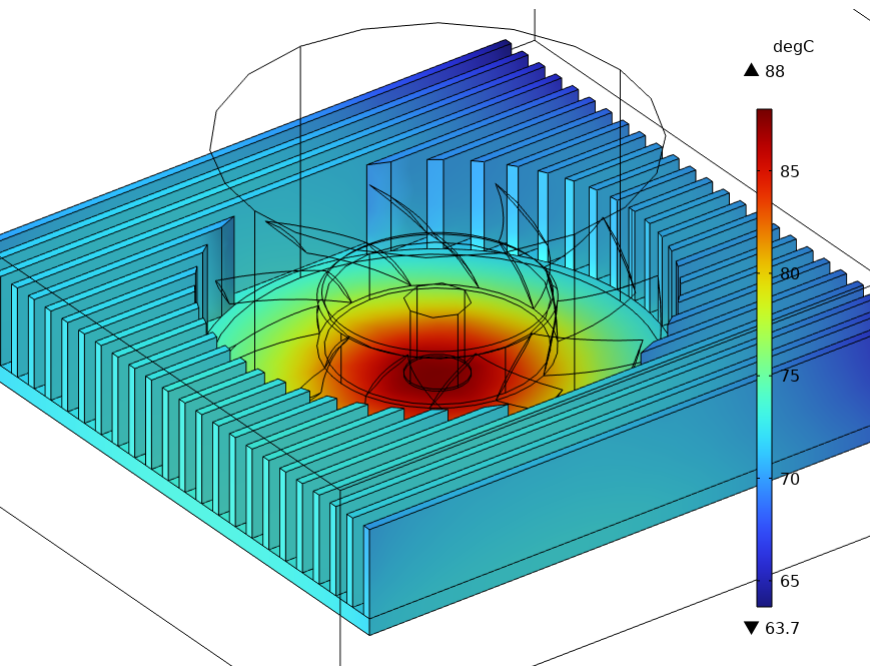
Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm)

- Heat Sink : 70x70x10 mm with 25 fins
- Heat source : 35 W (surface 19x19 mm)
- Tamb : 38 °C
- Air Flow : 1 m/s
- Revolution : 5000 rpm



Heat source

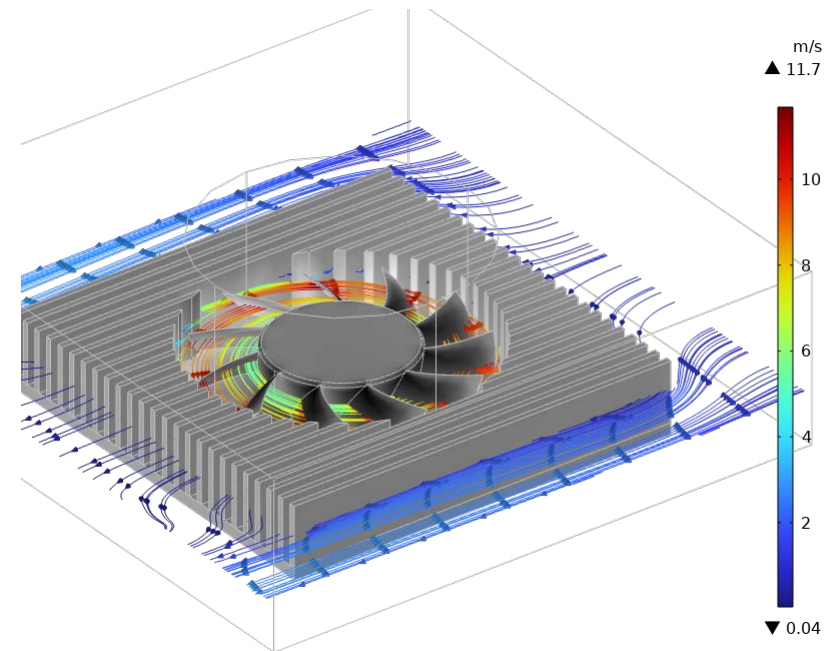
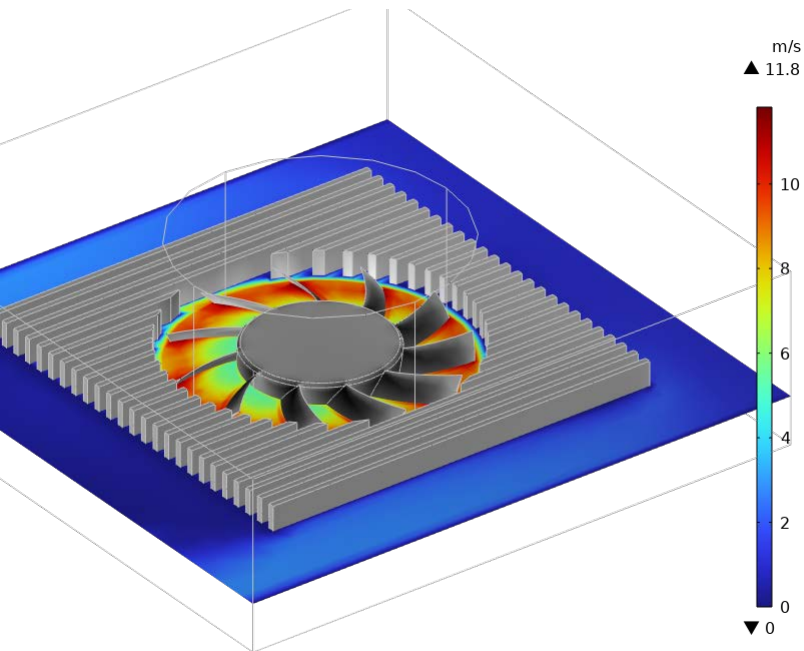
Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm)



T_moy (degC)

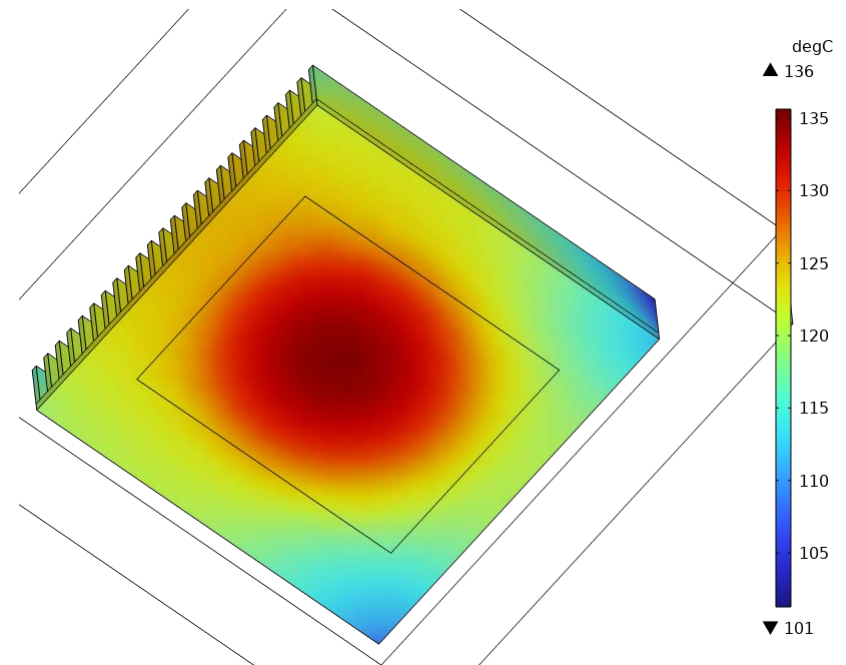
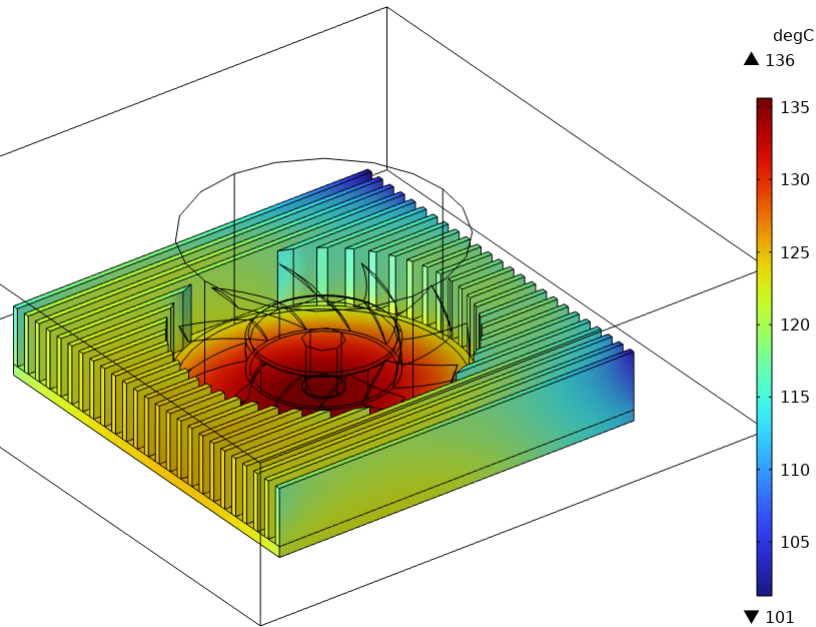
84.836

Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm)



Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm)

- Heat Sink : 70x70x10 mm with 25 fins
- Heat source : 85 W (surface 52x42 mm)
- Tamb : 38 °C
- Air Flow : 1 m/s
- Revolution : 5000 rpm

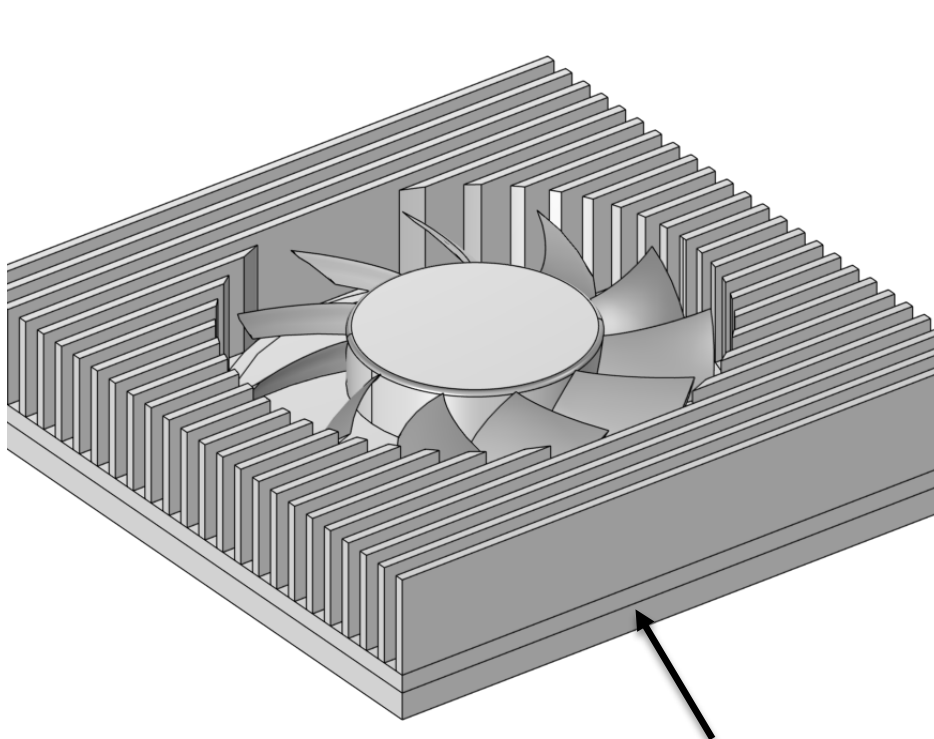


T_{moy} (degC)

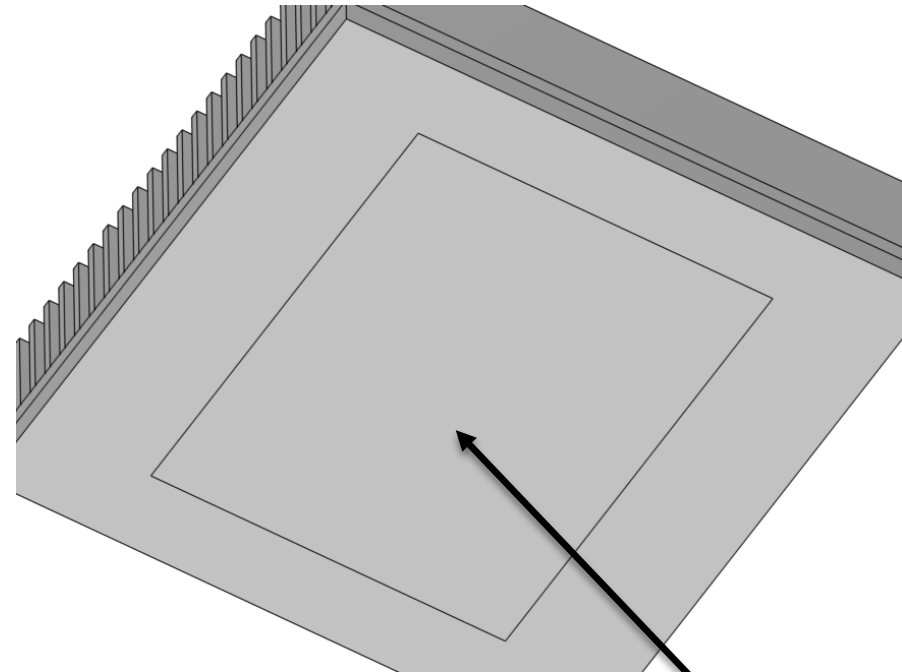
129.02

Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm) & VC

- Valor Chamber : 70x70x3 mm
- Heat Sink : 70x70x10 mm with 25 fins
- Heat source : 85 W (surface 52x42 mm)
- Tamb : 38 °C
- Revolution : 5000 rpm

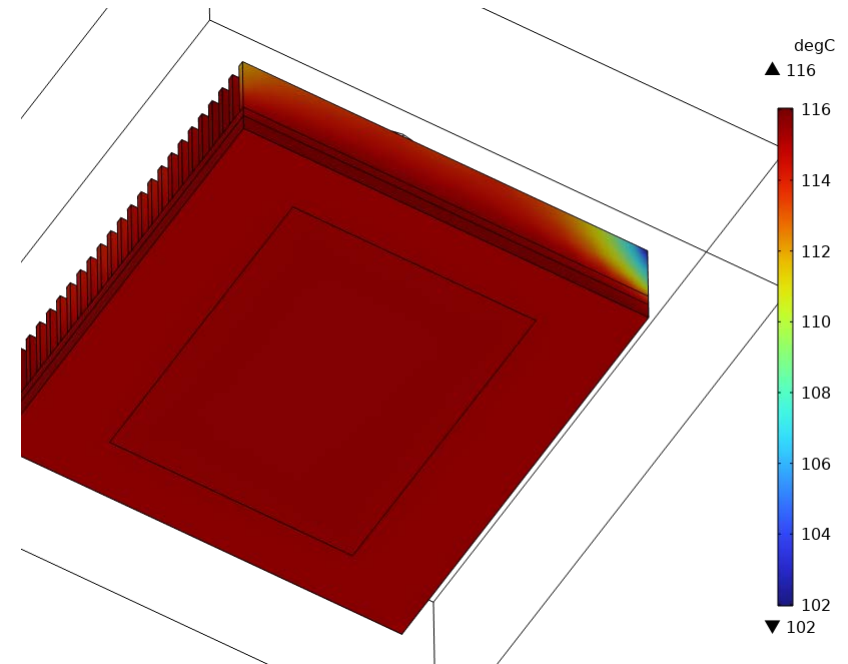
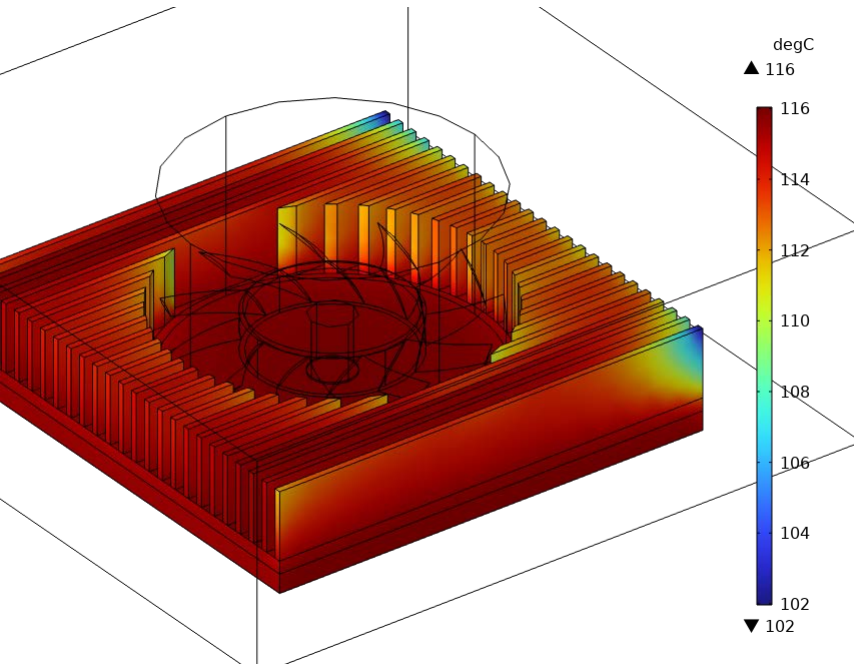


Valor Chamber



Heat source

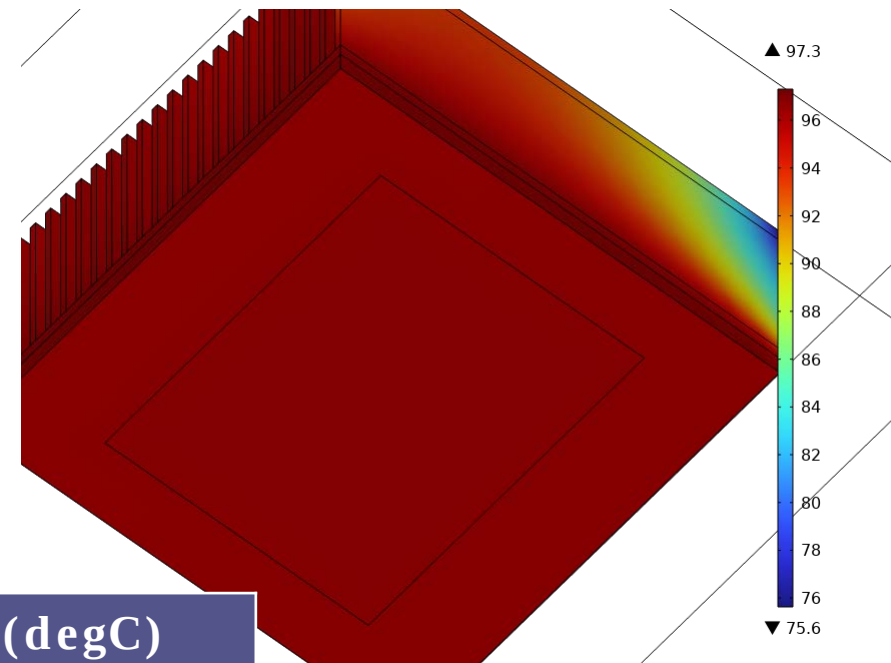
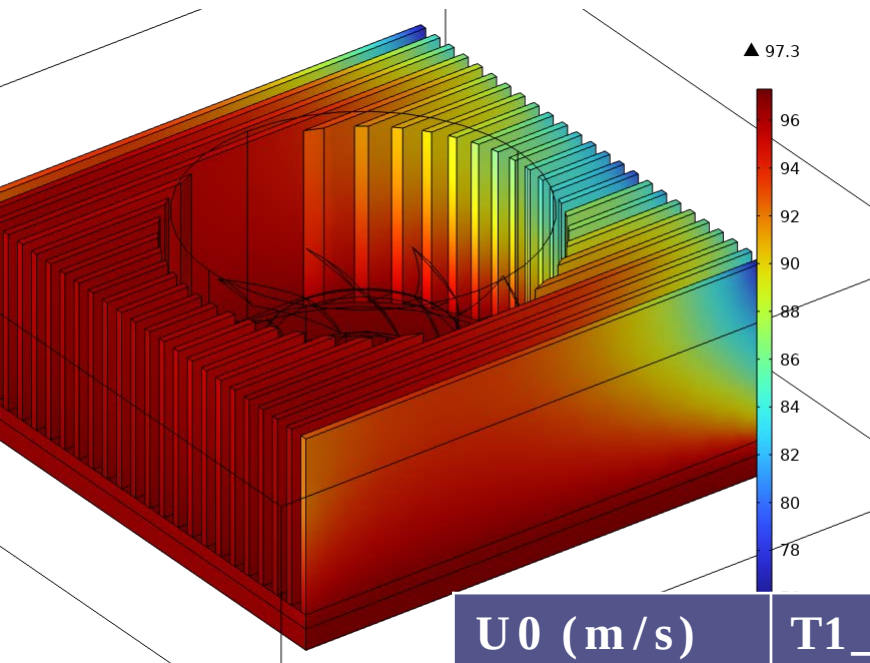
Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm) & VC



U0 (m/s)	T1_moy (degC)
1.0000	116.02
2.0000	79.501
3.0000	68.543

Simulation Thermal Custom Fan (Dynatron T052 50x50x10 mm) & VC

- Valor Chamber : 70x70x3 mm
- Heat Sink : 70x70x25 mm with 25 fins
- Heat source : 85 W (surface 52x42 mm)
- Tamb : 38 °C
- Revolution : 5000 rpm



U0 (m/s)	T1_moy (degC)
1.0000	97.280
2.0000	66.117
3.0000	56.710