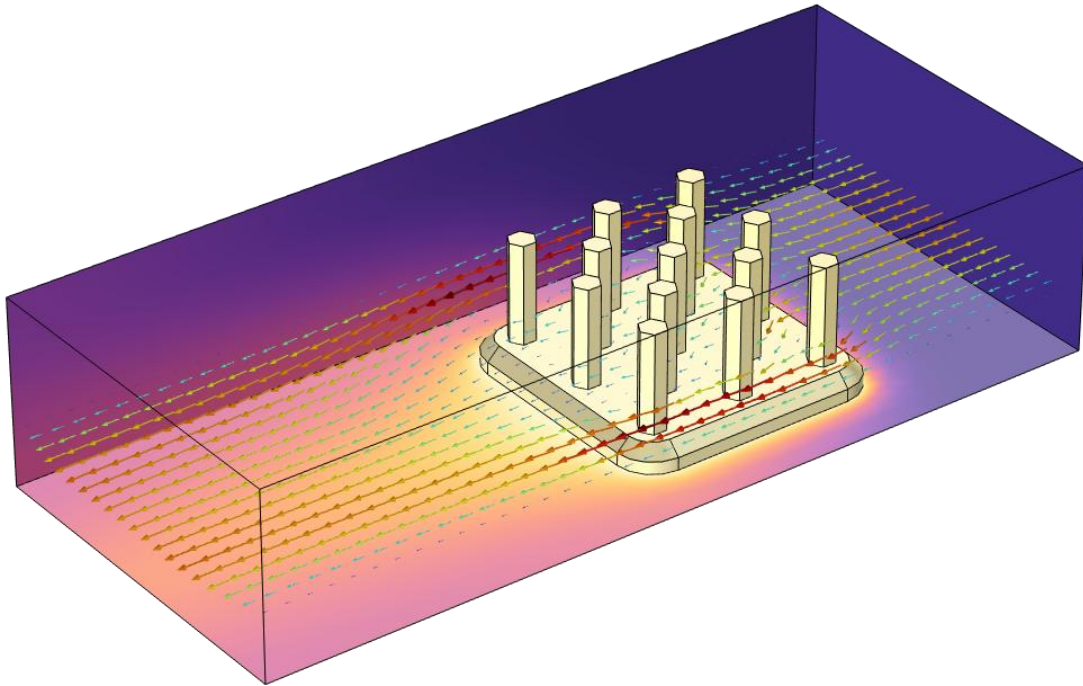


Heat Sink



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Report date

May 20, 2023, 8:58:40 PM

SUMMARY

This example models the cooling characteristics of the n19 aluminum heat sink from Alpha Company Ltd. The model studies the temperature distribution in the sink and in the flow.

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1 Global Definitions

1.1 PARAMETERS

PARAMETERS 1

Name	Expression	Value	Description
L_channel	7[cm]	0.07 m	Channel length
W_channel	3[cm]	0.03 m	Channel width
H_channel	1.5[cm]	0.015 m	Channel height
L_chip	1.5[cm]	0.015 m	Chip size
H_chip	2[mm]	0.002 m	Chip height
U0	5[cm/s]	0.05 m/s	Mean inlet velocity
P0	1[W]	1 W	Total power dissipated by the electronics package

2 Component 1

2.1 DEFINITIONS

2.1.1 Coordinate Systems

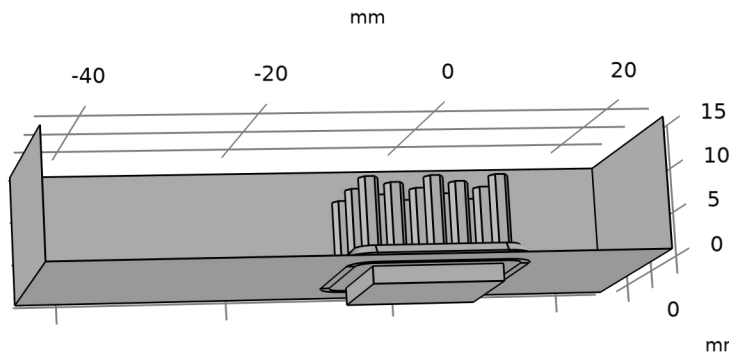
Boundary System 1

Coordinate system type	Boundary system
Tag	sys1

COORDINATE NAMES

First	Second	Third
t1	t2	n

2.2 GEOMETRY 1



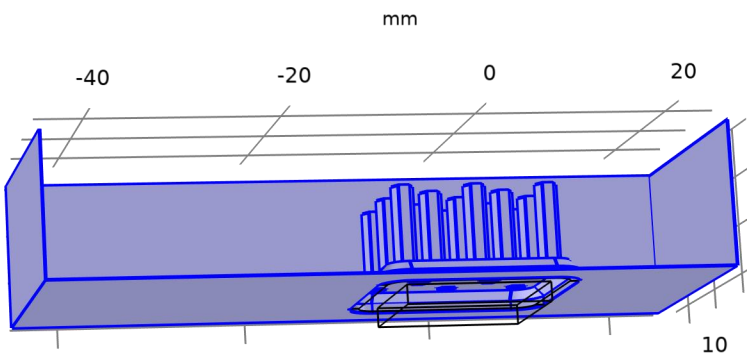
Geometry 1

UNITS

Length unit	mm
Angular unit	deg

2.3 MATERIALS

2.3.1 Air

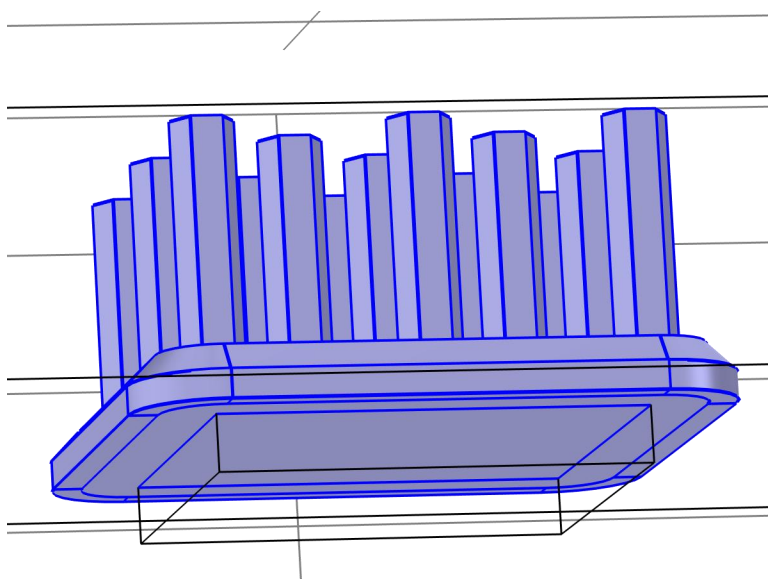


Air

SELECTION

Geometric entity level	Domain
Name	Air
Selection	Named geom1_sel1: Geometry geom1: Dimension 3: Domain 1

2.3.2 Aluminum 3003-H18

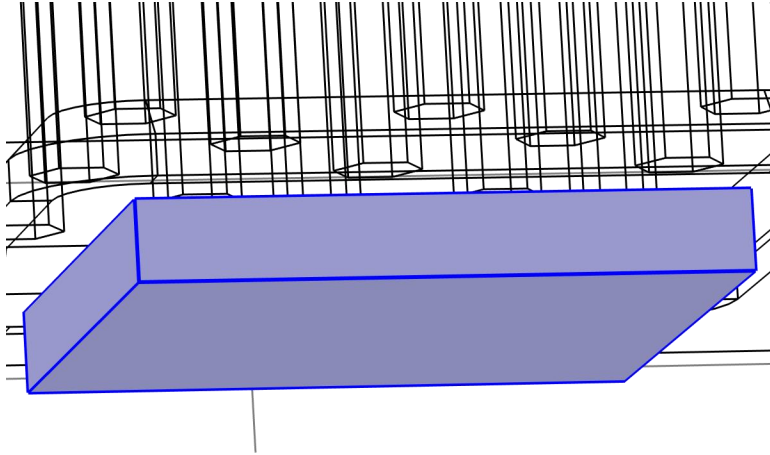


Aluminum 3003-H18

SELECTION

Geometric entity level	Domain
Name	Aluminum
Selection	Named geom1_csel1_dom: Geometry geom1: Dimension 3: Domain 2

2.3.3 Silica glass

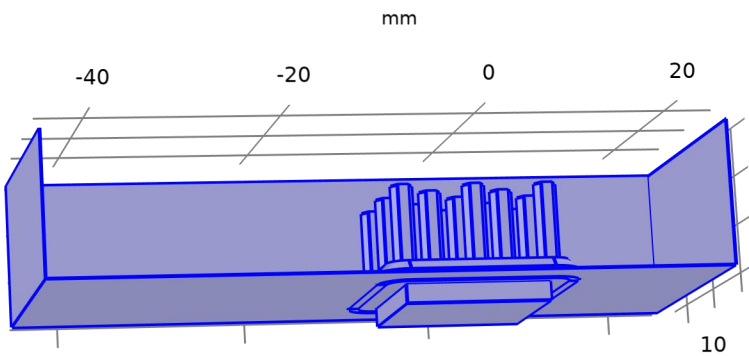


Silica glass

SELECTION

Geometric entity level	Domain
Name	Silica Glass
Selection	Named geom1_csel2_dom: Geometry geom1: Dimension 3: Domain 3

2.4 HEAT TRANSFER IN SOLIDS AND FLUIDS



Heat Transfer in Solids and Fluids

EQUATIONS

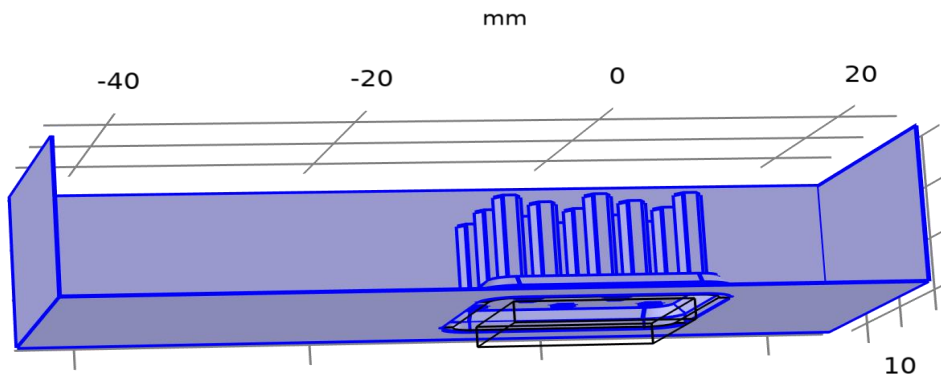
$$\rho C_p \mathbf{u} \cdot \nabla T + \nabla \cdot \mathbf{q} = Q + Q_{\text{ted}}$$

$$\mathbf{q} = -k \nabla T$$

FEATURES

Name	Level
Solid 1	Domain
Fluid 1	Domain
Initial Values 1	Domain
Thermal Insulation 1	Boundary
Inflow 1	Boundary
Outflow 1	Boundary
Heat Source 1	Domain

2.5 LAMINAR FLOW



Laminar Flow

EQUATIONS

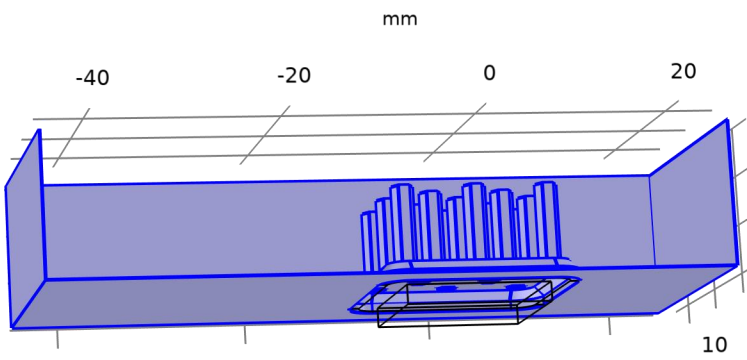
$$\rho(\mathbf{u} \cdot \nabla)\mathbf{u} = \nabla \cdot [-p\mathbf{I} + \mathbf{K}] + \mathbf{F}$$
$$\nabla \cdot (\rho\mathbf{u}) = 0$$

FEATURES

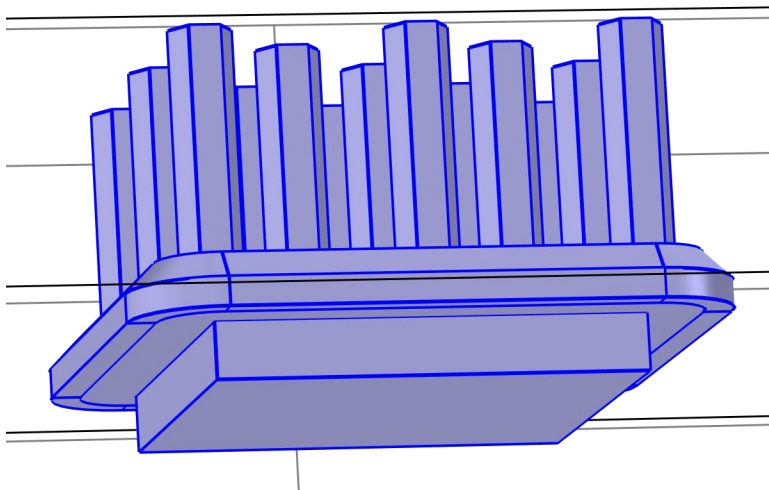
Name	Level
Fluid Properties 1	Domain
Initial Values 1	Domain
Wall 1	Boundary
Inlet 1	Boundary
Outlet 1	Boundary

2.6 MULTIPHYSICS

2.6.1 Nonisothermal Flow 1



Nonisothermal Flow 1

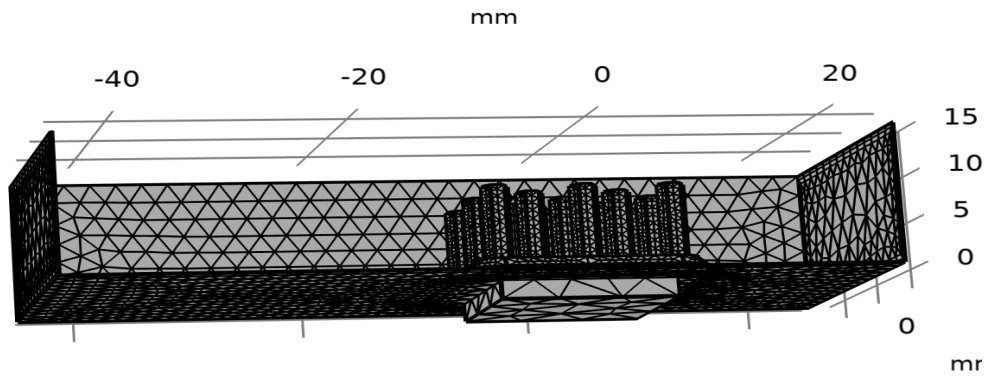


Complementary selection

EQUATIONS

$$Q_{vd} = \tau : \nabla \mathbf{u}$$

2.7 MESH 1



Mesh 1

Study 1

COMPUTATION INFORMATION

Computation time	4 min 1 s
------------------	-----------

2.8 STATIONARY

STUDY SETTINGS

Description	Value
Include geometric nonlinearity	Off

PHYSICS AND VARIABLES SELECTION

Physics interface	Discretization
Heat Transfer in Solids and Fluids (ht)	physics
Laminar Flow (spf)	physics

MESH SELECTION

Geometry	Mesh
Geometry 1 (geom1)	mesh1

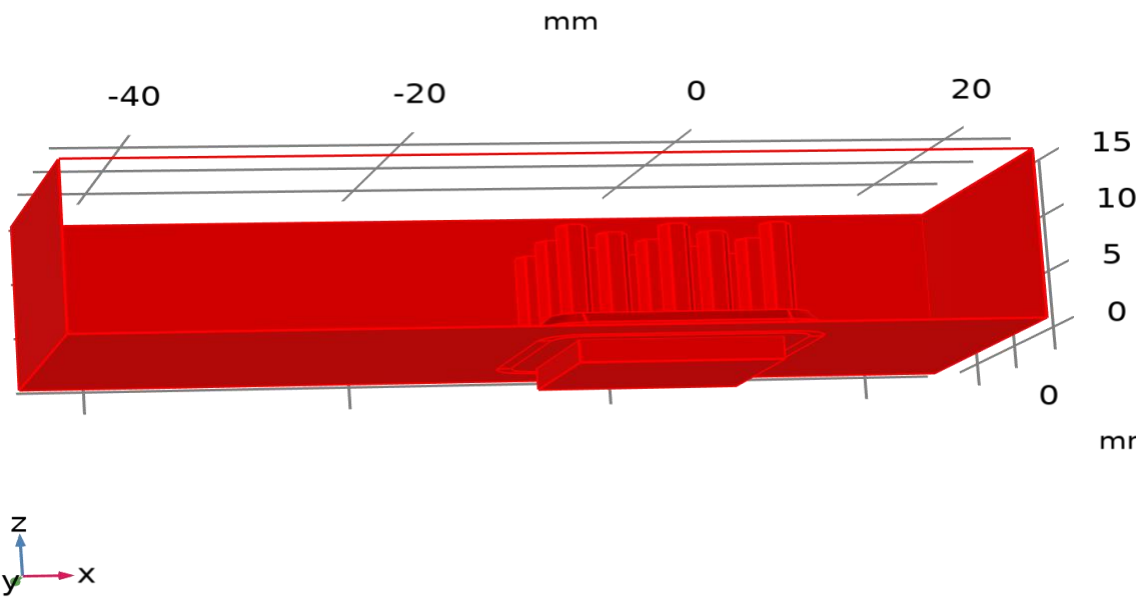
3 Results

3.1 DATASETS

3.1.1 Study 1/Solution 1

SOLUTION

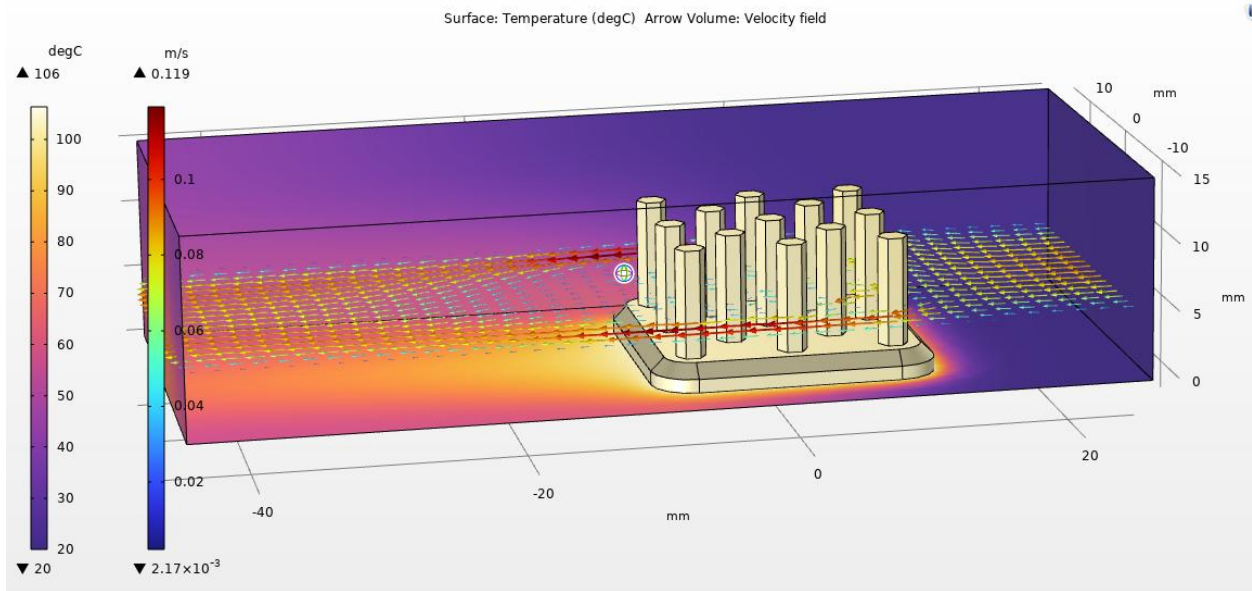
Description	Value
Solution	Solution 1
Component	Component 1 (comp1)



Dataset: Study 1/Solution 1

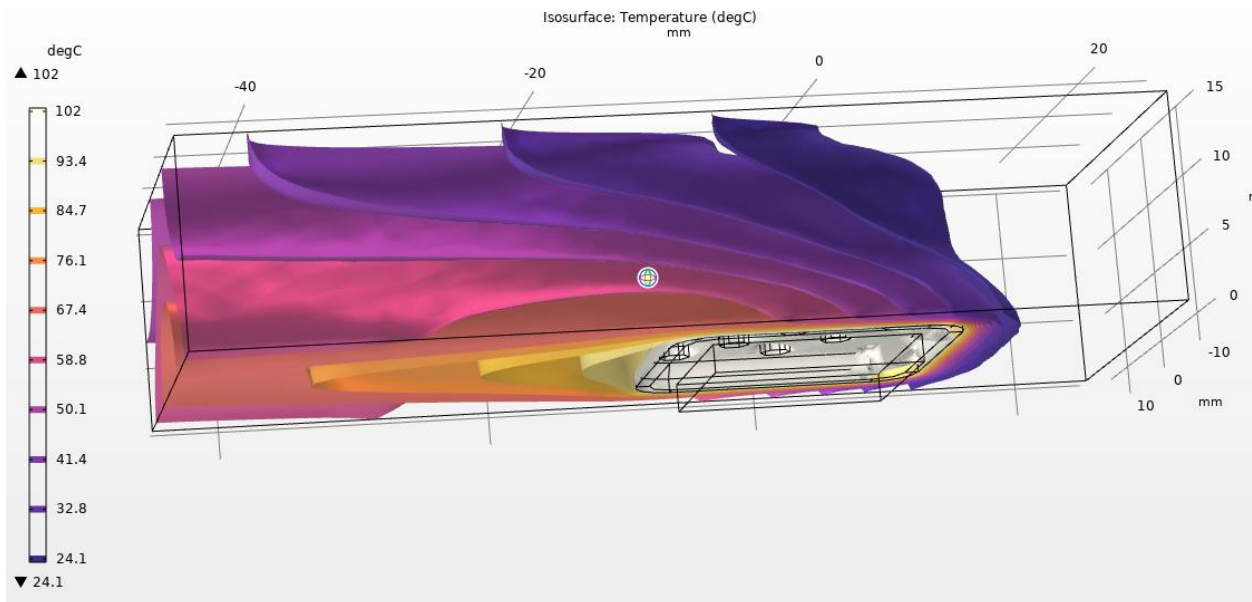
3.2 PLOT GROUPS

3.2.1 Temperature (ht)



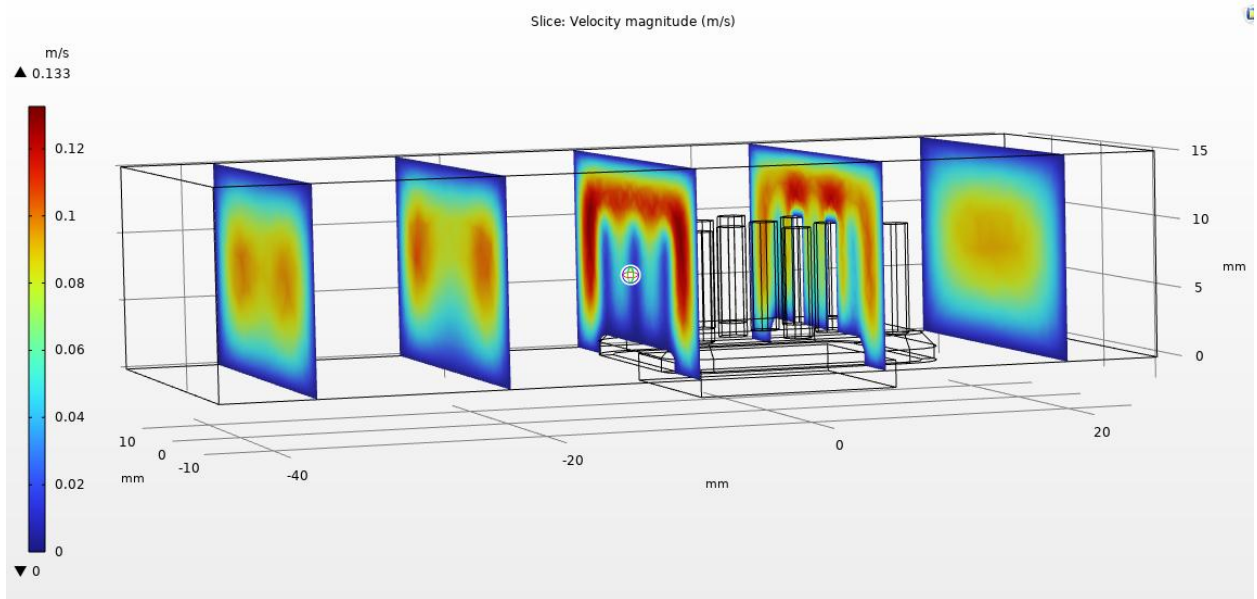
Surface: Temperature (degC) Arrow Volume: Velocity field

3.2.2 Isothermal Contours (ht)



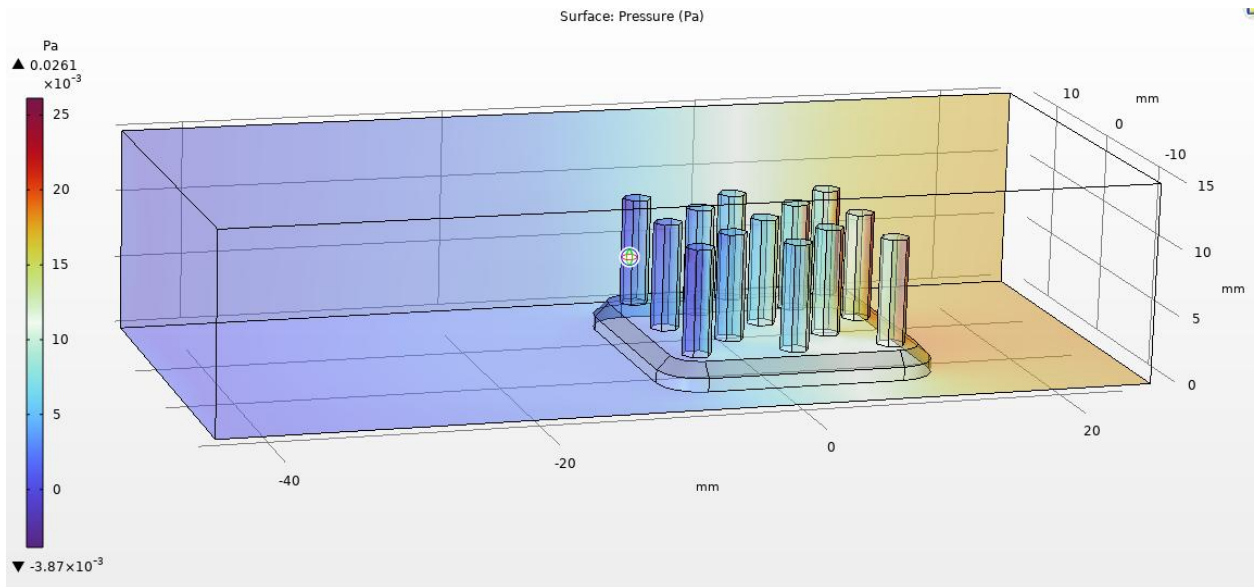
Isosurface: Temperature (degC)

3.2.3 Velocity (spf)



Slice: Velocity magnitude (m/s)

3.2.4 Pressure (spf)



Surface: Pressure (Pa)