Electronic Thermal control using Heat Sink for Chip Cooling under Forced Convection

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INTRODUCTION: This work addresses electronic industry challenges that encounter in many applications such as thermal control of electronic components. Fins are employed on the chip for enhancing heat transfer rates. Therefore the main objective of the present work is to study the heat transfer characteristics from chip and sink under forced convection in a horizontal channel. Table 1 show the details of sizes and materials used.

Item	W(cm)	D(cm)	H(cm)	Material
Chip	10	10	2	Silicon
Heat sink base	12	10	1	Aluminum
Fins (5 numbers)	10	0.1	3	Aluminum
Air domain	20	50	8	FRP

Table 1. Details of sizes and materials used in the present study

COMPUTATIONAL METHODS: Heat Transfer module, Heat Transfer in Solids and Conjugate Heat Transfer interfaces of COMSOL Multiphysics® 4.3b are used to study the heat transfer from solids and fluids. Fig. 2 show the simulation model.

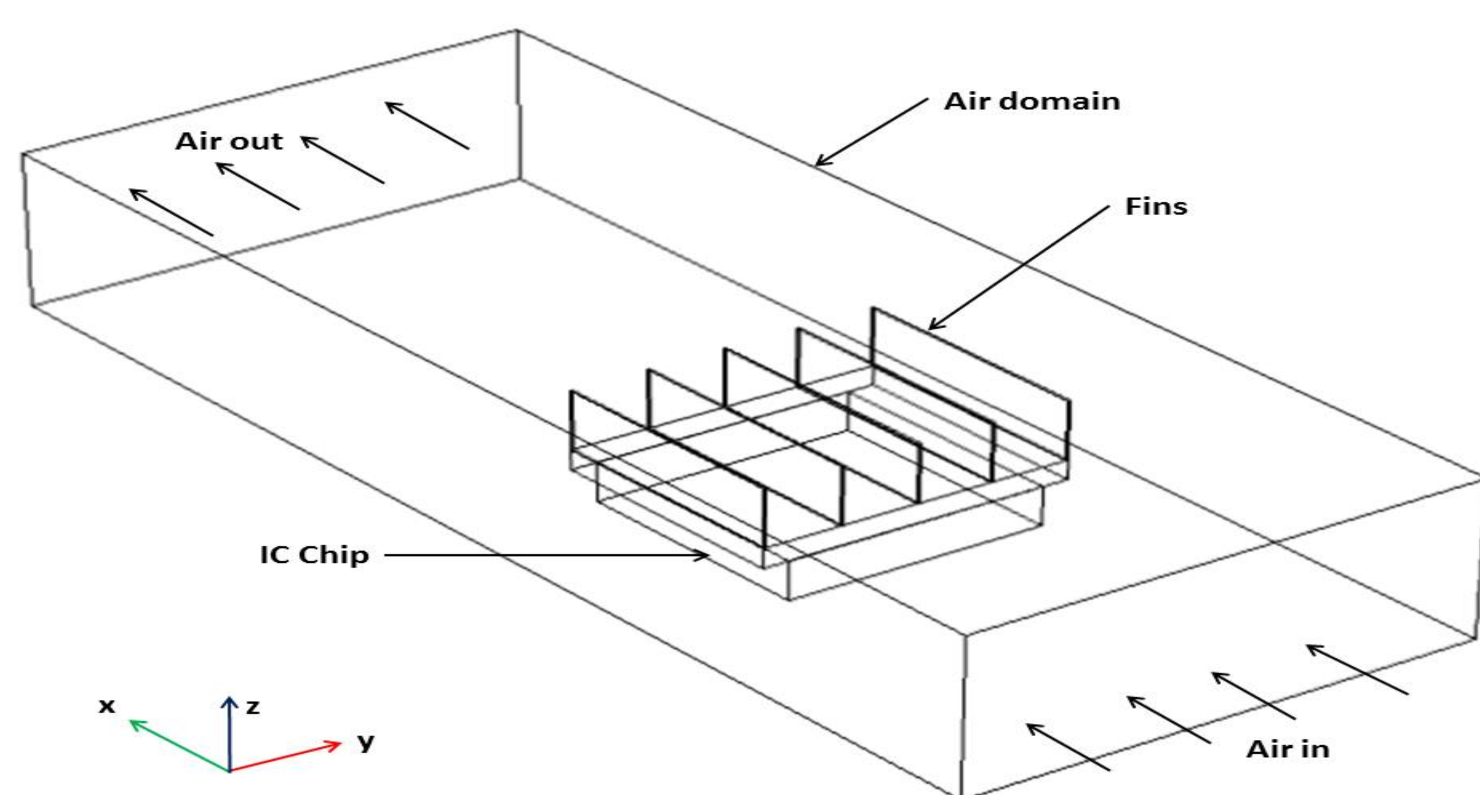

Figure 1. Simulation model

RESULTS: Fig. 2 show heat transfer from solids and fluids. The maximum temperature obtained is 33 deg C for input power, P = 25W, h = 5 W/m^2 K and T = 30 deg C.

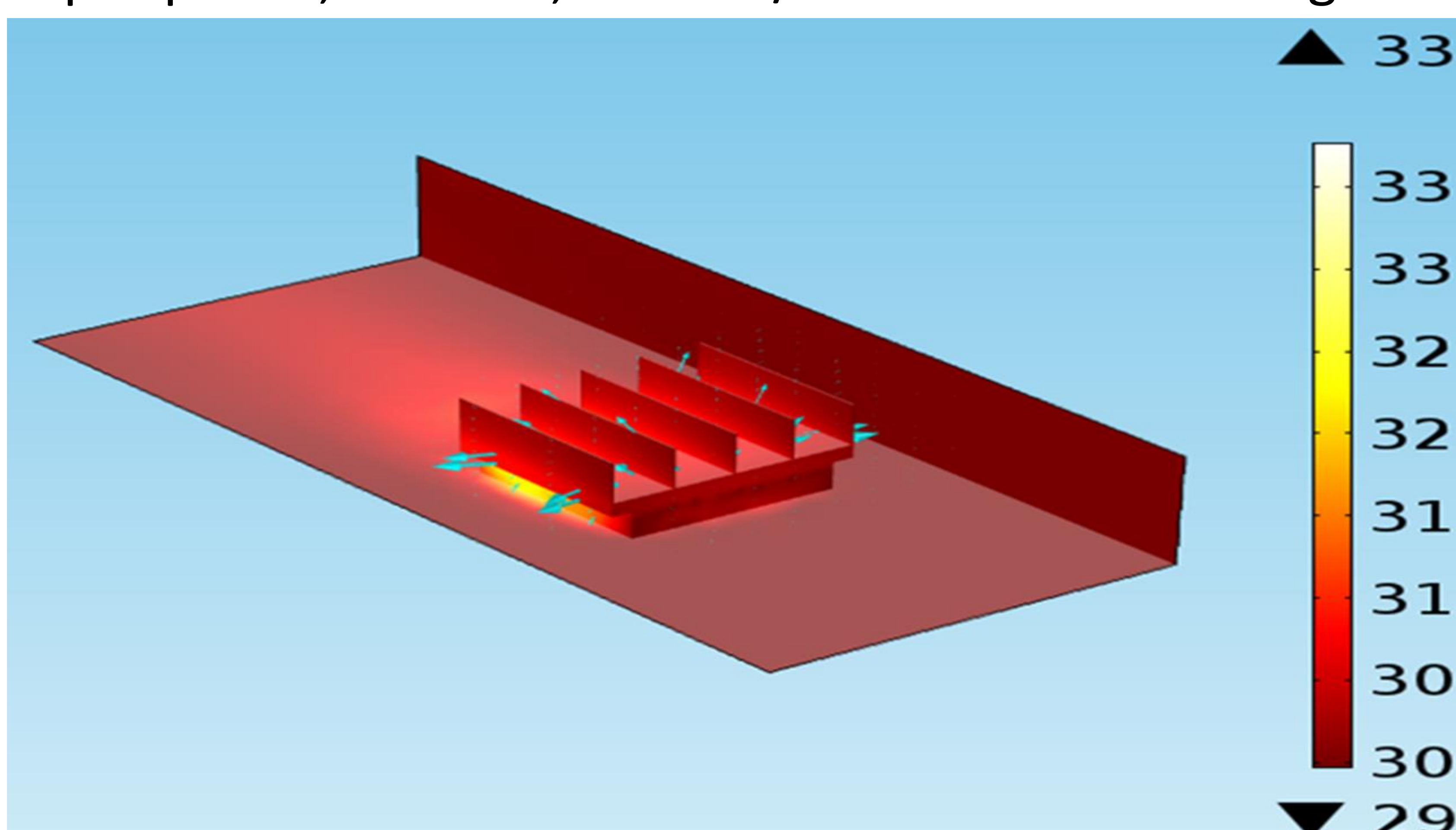

Figure 2. Heat transfer from solid and fluids: temperature contours

Fig. 3 show the heat transfer from solids i.e. chip and Fins. Fig. 4 show the isothermal temperature contours on fin base The maximum temperature obtained in solids is 99.7 deg C. Study shows the maximum temperature in conjugate heat transfer is lower compared with heat transfer in solids alone for the same heat input and inlet air temperature.

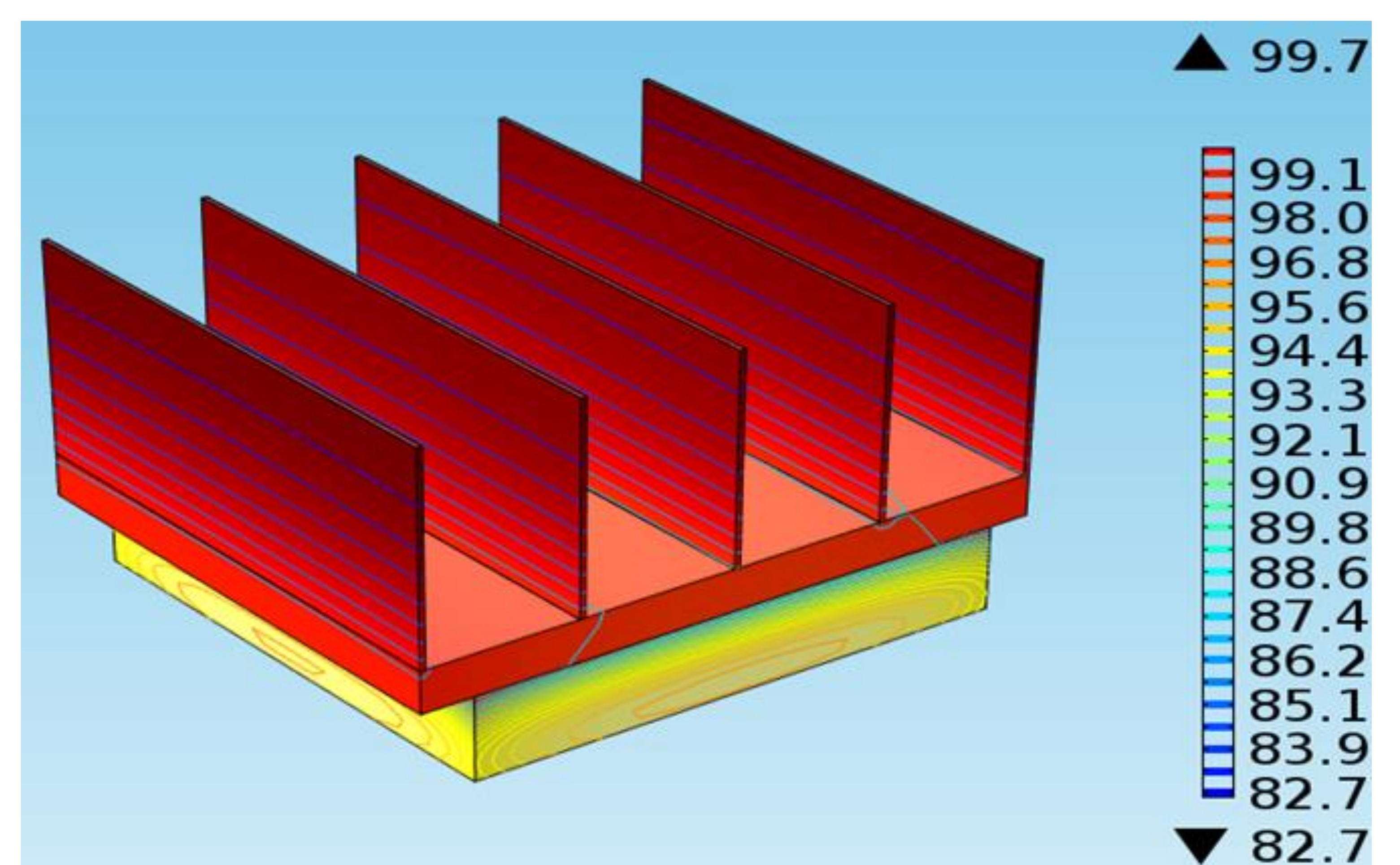

Figure 3. Heat transfer from chip and sink.

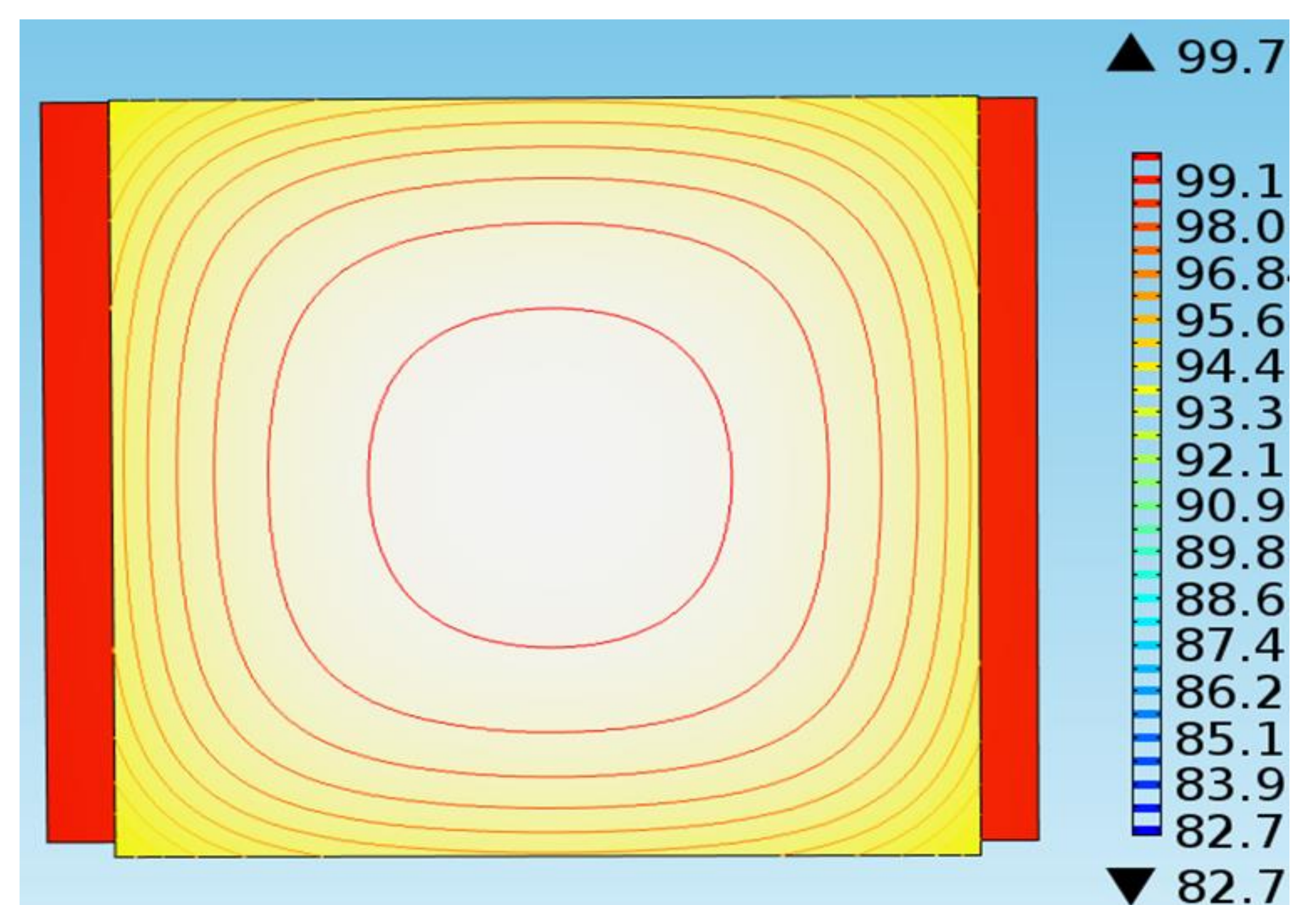

Figure 4. Isothermal contours on IC chip base.

CONCLUSIONS:

- ➢Heat transfer in solids i.e. fins and chip is maximum.
- ➢Heat transfer in solids and fluids is minimum in this study.
- ➢Enhancement in heat transfer by employing fins on IC chip.
- ➢This problem is very useful for electronic industry.

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