



# Self-regulated heat sink device for uniform temperature distribution

LOOKING FOR A LICENSE AGREEMENT

## THE TECHNOLOGY

The invention consists of a heat sink with an array of fins which are parallel-oriented to the flow direction at low temperature but, as the temperature locally increases, deform to perturb the flow. The flow perturbation reduces the local thermal resistance, allowing high heat flux extraction without increasing the wall temperature. The device has the ability to provide good temperature uniformity to the cooled object under variable and nonuniform heat flux.

## THE NEED

Current heat sink devices are mainly oriented to reduce the average temperature of a cooled device. In some applications, such as electronic systems or dense array photovoltaic receivers, the temperature uniformity is also required for good performance, for improving their reliability and/or their efficiency.



Figure. a) Uniform high heat flux b) Uniform low heat flux c) Uniform medium heat flux d) Hotspot region non-uniform heat-flux.

However, current cooling technologies - standard heat sinks and fans - are rapidly approaching their cooling capacity limit, and thermal management is becoming a critical step in enabling enhanced product functionality.

### THE MARKET

The thermal management market was valued at USD 8.99 Billion in 2016 and is estimated to reach USD 14.24 Billion by 2022, at a CAGR of 7.91% during the period

2017 and 2022. The industry is primarily driven by the growth in the emerging trend of miniaturization of electronic devices and components.

#### ADVANTAGES

- Capacity to provide uniform or also other kinds of temperature distributions of a cooled object, as required by the application, by using several materials and/or shapes for the fins.
- > Combined use of fixed and self-regulated fins is possible.
- Use of different materials with different ranges of temperature for actuation, avoiding the design step as a nearly "universal" cooling device becomes useful for a large number of applications.
- Several ways to locally boost the heat exchange, by creating a vortex or by increasing the heat exchange surface
- > The fins functionality is independent of external electrical power or other energy sources.
- > The pumping power needed for this cooling device is widely reduced with respect to existing solutions,
- > The solution is reliable and can be easily integrated into large arrays.

## APPLICATIONS

The main applications of the device are computers, telecommunications, medical devices, industrial electronics, aerospace/military, concentrated photovoltaics, consumer electronics and automotive.

#### **IP RIGHTS**

#### US provisional filing

Contact:

Universitat de Lleida - Oficina de Suport R+D+i Unitat de Valorització I Transferència (UViT) E: <u>rdi.valoritzacio@udl.cat</u>

