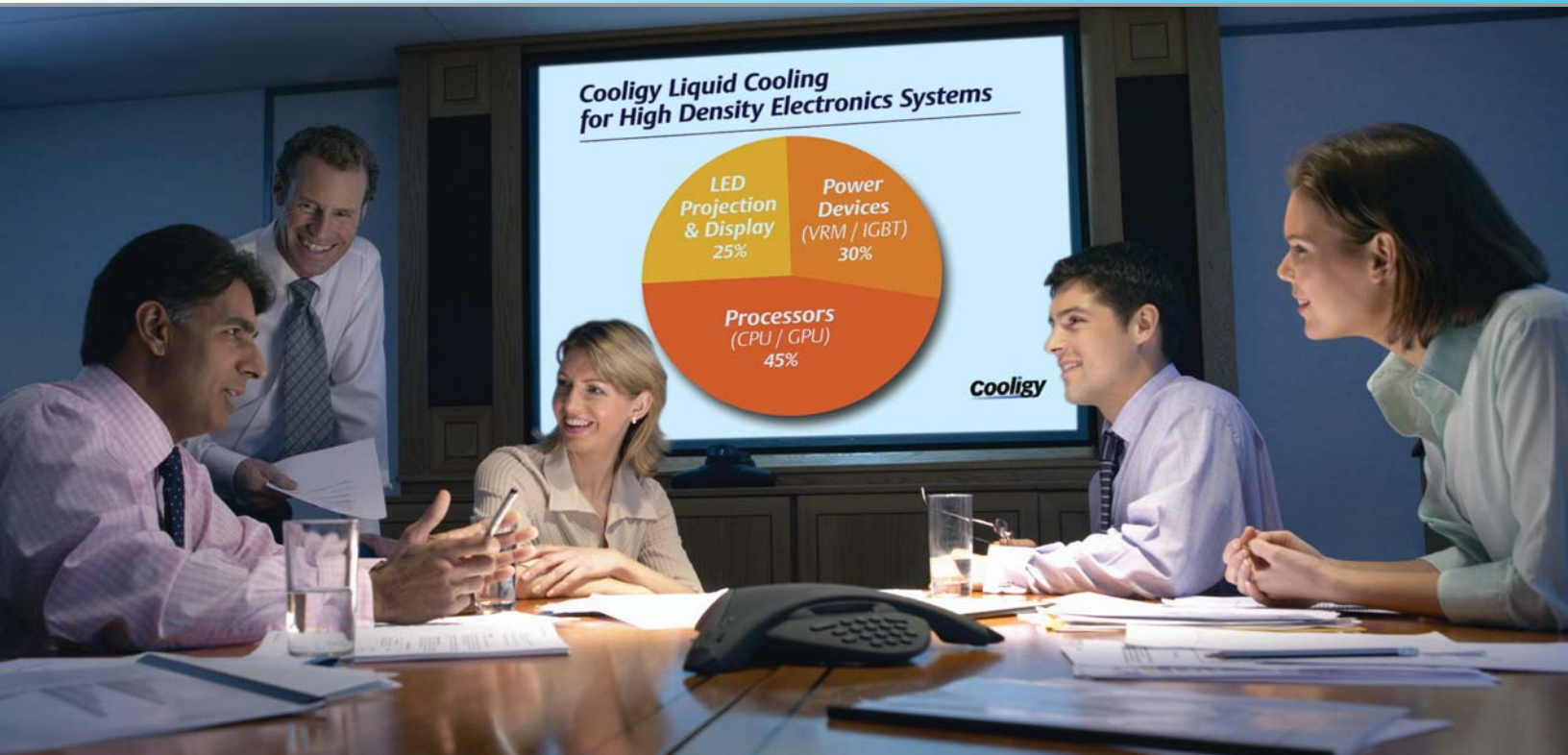


Precision Cooling for  
Business-Critical Continuity

## Cooligy Active Micro-Structure™ Cooling System






# *A New Approach to Cool.*

From commercial blade servers to consumer video game consoles and LED projectors, the pressure to increase performance is putting the heat on. Conventional cooling technologies are hitting the limit in the battle to keep up with system performance. Effective cooling is essential to keeping your competitive edge.

Cooligy liquid cooling systems set the standard for thermal performance, acoustic performance and reliability. Our patented micro-structure technology, materials technologies, customer-focused design and high-volume manufacturing enable solutions to the most difficult cooling problems.



## Keep it Cool.

Our patented Micro-Structure™ Cooling Module utilizes laminar flow of liquid across custom configured micro-structures to deliver the lowest thermal resistance between the component and the cooling system.

## Keep it Quiet.

Cooligy's cooling performance enables smaller systems with minimized air-flows that deliver low noise and greater cooling performance.

## Make it Reliable.

The Cooligy triple-sealed liquid cooling solution is carefully designed to provide long life and trouble-free operation with no user intervention.

## Make it Easy.

A qualified and reliable supply chain is critical in today's global marketplace. We'll not only design a liquid cooling system that optimizes thermal performance within your system's space and acoustic envelopes, we'll also back our design expertise with manufacturing capacity, flawless execution and supply logistics to meet your schedule.

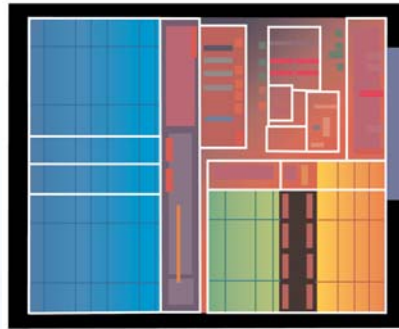
# Cooligy Micro-Structure Liquid Cooling

## Cool, Quiet, Reliable...Essential

Moore's Law has moved forward with immutable force. Computing and processing power has kept pace. Clock rates are rising...and with that comes increasing power dissipation.

The requirements for thermal management in high performance computers are rapidly outpacing the capabilities of the best commercial heat sinks, including those with integrated heat pipes. The problem lies in three compounding trends: a) higher total chip power, b) higher local heat flux in chip hot spots, and c) smaller system enclosures.

Nowhere are these problems more in evidence in high performance consumer electronics devices:

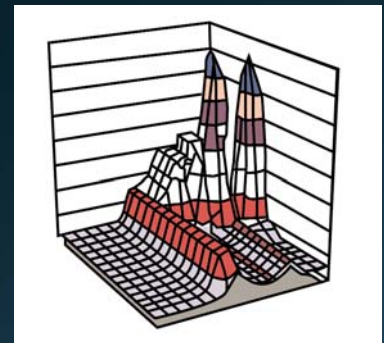


- High performance computers (including gaming systems) with high-end video circuits and over-clocked processors
- LCD projectors and large screen displays with LED light sources
- Servers
- Workstations

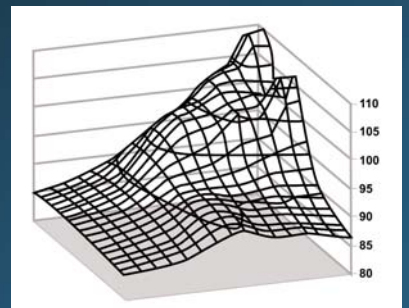
It is not uncommon to see chips operating at average power levels exceeding 100 W/cm<sup>2</sup> and with hot spots approaching 500 W/cm<sup>2</sup>!

Benefit	Heat pipes	Macro cold plate cooling	Cooligy™ Technology
Power dissipation	no	neutral	yes
Noise less than 28dB	no	neutral	yes
Reliable thermal contact to the chip	neutral	neutral	yes
Cost	yes	neutral	neutral
Moving heat large distances	no	yes	yes

The Cooligy solution combines the elements needed to put the cooling right where it needs to be to optimize performance and system reliability. With micro-structure liquid cooling, you can extend performance, and minimize space and audible noise.

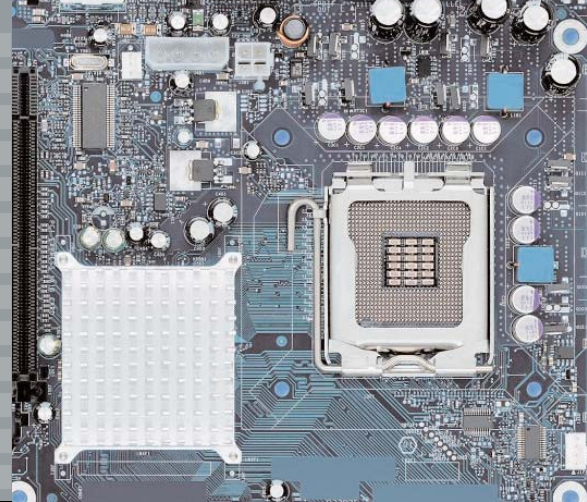


A power map illustrates the non-uniform nature of power consumption in many computer and graphics chips

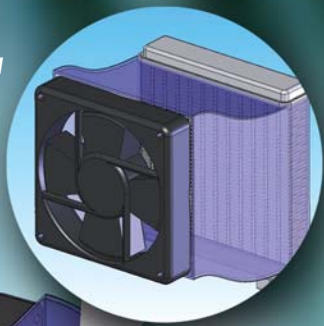


The corresponding heat map highlights the resulting thermal hot spots.

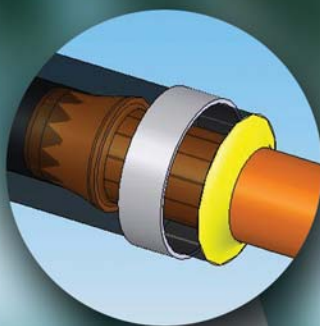
# Advanced Cooling Systems:



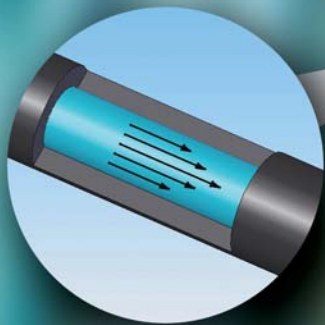
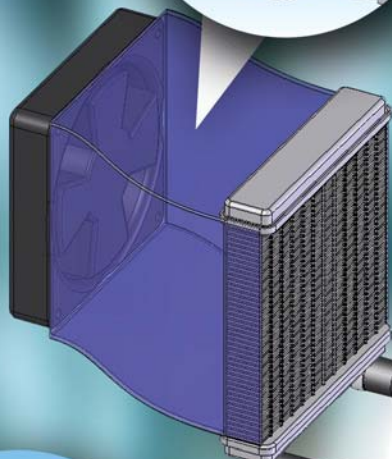
Proprietary heat exchanger construction and Low velocity fan assure optimal heat removal and minimal audible noise.



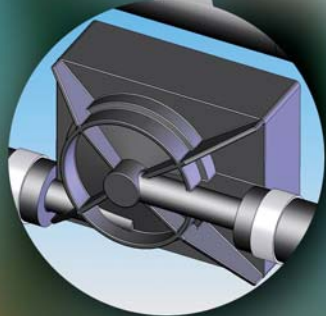
Robust, triple-sealed joints completely eliminate fluid leakage.



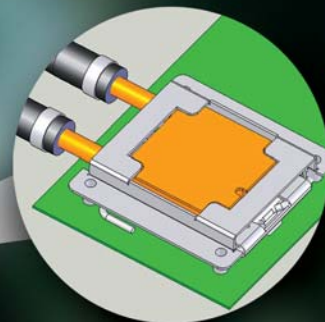
Custom engineered high-profile micro-structures, the width of a human hair, provide optimized heat transfer in hot spot areas



Lower viscosity fluid results in higher flow rates and higher heat transfer rates. Cooligy's "patented water" system optimizes system performance and reliability.



Ultra-reliable pump mechanism, custom developed by Cooligy engineers for optimum performance.

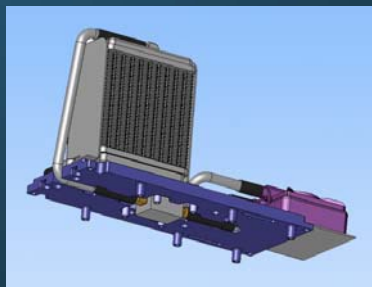


Cooligy's proprietary attachment mechanism assures the lowest overall thermal resistance. The best heat exchanger design is only as good as the quality of the bond to the component below.



Ultra-low permeability flexible tubing assures the long-term integrity of the cooling fluid, patent pending.

Cooligy leads the industry in the development of advanced micro-structure heat exchangers. By carefully engineering the channel dimensions in relation to the chip's temperature profile, optimum heat transfer is obtained.



*The typical Cooligy liquid cooling system is packaged to meet the physical constraints of the product. This illustration shows a complete pump, radiator and micro-structure heat exchanger system.*

## *Advanced Engineering and World-Class Volume Manufacturing*



Mountain View, California is home to the company's advanced research efforts in liquid cooling technology. It is here that custom-designed and application-optimized cooling solutions are developed and proven.

Our products are produced in an ISO 9001 facility in Asia—in volume production since 2005—and capable of producing tens of thousands of systems each week.

Our world wide supply base and proven supply chain provide support for both our development in California and our manufacturing in Asia.

Thanks to our flexible manufacturing operations, capacity can be easily



and rapidly expanded to meet customer requirements. Customer-specific designs can be quickly introduced and scaled.

Continuous reliability testing coupled with ongoing process improvement through Design for Excellence (DFX) ensure superior product quality and long-term reliability.

Exceeding customer on-time delivery, quality and service requirements are the foundation of our manufacturing charter.

**Emerson Network Power  
Cooligy**

800 Maude Avenue  
Mountain View, CA 94043

**Telephone:** 650-417-0300

**Fax:** 650-417-0380

**Web:** Cooligy.com

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| ■ Connectivity     | ■ Integrated Cabinet Solutions | ■ <b>Precision Cooling</b>     |
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