

Optical Module Heat Dissipation Liquid Cooling Plate



AI Overview

Liquid cooling plates efficiently manage heat in high-power optical modules, enabling stable operation, improved signal integrity, and extended lifespan in high-density data center environments.

Overview of Liquid Cooling for Optical Modules

As optical transceivers evolve from 400G to 800G and 1.6T, their power consumption increases significantly, often exceeding the capabilities of traditional air cooling. Liquid cooling plates, also known as cold plates, provide a compact and highly efficient solution by transferring heat from the module to a circulating coolant, typically water or thermally conductive fluids, which removes heat rapidly and uniformly.

Structure and Function

A typical liquid cooling plate system consists of:

- Heat Dissipation Plate:** Contains an internal cavity with cooling liquid input and output ports, forming a flow path for the coolant.
- Heat Conduction Layer:** Covers the plate and contacts the heat-generating components (e.g., laser assemblies, DSP chips), transferring heat to the plate efficiently.
- Coolant Flow:** Circulates through the plate, absorbing heat and carrying it away to maintain the module within safe operating temperatures.

Cooling can be direct or indirect:

- Indirect Cooling:** The coolant does not contact the heat source directly; heat is transferred via a thermal interface, such as a cold plate.
- Direct Cooling:** The coolant directly contacts the heat source, including immersion or spray cooling, which can further enhance thermal efficiency.

Advantages

Liquid-cooled optical modules offer several benefits over air-cooled solutions:

- Higher Thermal Conductivity:** Liquids remove heat more efficiently than air, preventing overheating and performance degradation.
- Support for High Power Density:** Enables deployment of high-speed modules in dense switch and router environments.
- Stable Optical Performance:** Maintains laser wavelength stability and DSP thermal headroom...

Article Content

WO/2024/001749 LIQUID COOLING STRUCTURE OF OPTICAL

WO2024001749 - LIQUID COOLING STRUCTURE OF OPTICAL MODULE, AND OPTICAL MODULE. A liquid cooling structure of an optical module, and an optical module.

7.0 Thermal Control

The heat exchange depends on several factors listed below. Solar absorptivity and infrared (IR) emissivity are surface optical properties referenced

Deep Dive into Liquid-Cooled Optical Modules in the

As computing systems shift toward liquid cooling, an often-overlooked component, the optical module, is becoming a key focus. In highly

(PDF) Simulation and experimental investigation of

PDF | This study explores the application of cold plate liquid cooling technology in co-packaged optics (CPO). By integrating optical modules and

51.2T NPO Switch Practice And Challenge

Cooling Solutions: Air cooling for Switch ASIC and NPO □ In 1RU device, no space for the huge heat sink; □ The 40mm fans can't provide the enough cooling air; Immersion Cooling system □ NPO

AAC Technologies Holdings Inc. (AACAY) Q4 2025 Earnings Call

And we also have this different CTU and liquid cooling plate and manyfold product capabilities. And we also have different customers and make breakthroughs.

Advanced Thermal Management Strategies | Molex

Thermal management plays a pivotal role in enhancing the reliability and efficiency of high-power pluggable optical modules. Explore the latest strategies in air and

Optical Module Liquid Cold Plate Manufacturer | 400G

Ready for a Manufacturable optical module liquid cold plate? Share your heat load, coolant, flow rate, pressure drop limit, target temperature,

EMIB-T, HBM4 Challenges, Microfluidic Cooling, Photonic Interconnects

Across the full test vehicle, TSMC reported uniform power dissipation above 5 kW. The micropillars brought the liquid coolant into much closer proximity to the heat source, facilitating this

Comparing Thermoelectric Coolers to Liquid & Air

Background: Principles of Thermoelectric, Liquid, and Air Cooling Thermoelectric Cooling (TEC) Basics Exploded Thermoelectric cooler diagram showing p-type

Co Packaged Optics Market Report: Size, Growth,

Co Packaged Optics Market size is projected to reach USD 0.84 Billion by 2032, growing at a CAGR of 27.5% from 2026 to 2032 The report provides key trends,

Optical Module Liquid | Liquid Cold Plate | ToneCooling

designed for next-generation 800G, 1.6T, and beyond optical transceivers. By utilizing efficient micro-channel design and superior thermal conductive

Co-Packaged Optics — a deep dive | APNIC Blog

Thermal Management: Integrating heat-sensitive optical components inside ASIC packages poses significant thermal challenges, and liquid cooling is

Simulation and experimental investigation of liquid-cooling thermal ...

For the unique architecture of CPO, this study analyzes its heat dissipation needs in detail, and a thermal management scheme is designed. The thermal management scheme is simulated and

Liquid-Cooled Heat Dissipation Technology for Co-Packaged Optics

This article explores the liquid-cooling heat dissipation technology for CPO systems over 12.8 Tbps. We designed a heat dissipation structure to address the special heat dissipation needs of CPO systems

Progress in Research on Co-Packaged Optics

Compared to forced air cooling, liquid cooling has a more pronounced cooling effect, such as less noise, more uniform heat dissipation,

Heterogeneous Integration Technology Drives the

The application of impingement liquid cooling has been demonstrated to enhance heat dissipation capacity to 2112 W. However, the high

Liquid-Cooled Optical Transceivers for 800G/1.6T

A liquid-cooled optical transceiver is a high-speed module that incorporates liquid cooling technologies (such as cold plates or microchannels)

Coherent's \$23B Opportunity Lifted by NVIDIA's Optical

Coherent's market on track to reach \$23 billion as NVIDIA's Spectrum-6 and Kyber drive structural demand for co-packaged optics components.

EMIB-T, HBM4 Challenges, Microfluidic Cooling, Photonic Interconnects

Each SoC die consists of 4 SoC heater groups, which together cover roughly half the interposer area. Silicon micropillar formation on the backside of the SoC dies for heat dissipation.

OSFP Optical Module Thermal Design: Structure, Heat Dissipation ...

Explore how OSFP optical modules are thermally designed for optimal cooling and reliability. Learn about airflow impedance, gradient fins, heatsinks, and cooling solutions for 400G+

Gigalight Liquid-Cooled Optics: A Thematic Study on

Cold Plate Liquid Cooling: Suitable for partial retrofits, though less efficient than immersion cooling. Silicon Photonics + Liquid Cooling: Silicon

Simulation and experimental investigation of liquid-cooling thermal ...

Abstract This study explores the application of cold plate liquid cooling technology in co-packaged optics (CPO). By integrating optical modules and the switch chip on the same substrate, CPO shortens the

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Hier sollte eine Beschreibung angezeigt werden, diese Seite lässt dies jedoch nicht zu.

(PDF) Simulation and experimental investigation of

For the unique architecture of CPO, this study analyzes its heat dissipation needs in detail, and a thermal management scheme is designed.

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Optical Module Liquid Cooling Plate – Solution for High-Power Data Center Optics designed for next-generation 800G, 1.6T, and beyond optical transceivers. By

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