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Global Direct-to-chip Liquid Cooling Market Size study, by Cooling Solution Type, Component Cooling, Liquid Coolant Type, Application, End Use, and Regional Forecasts 2022-2032

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Abstracts

Global Direct-to-chip Liquid Cooling Market is valued at approximately USD 1.5 billion in 2023 and is anticipated to grow with an impressive compound annual growth rate of more than 20.5% over the forecast period 2024-2032. As data centers evolve to meet the escalating demands of high-performance computing, artificial intelligence, and cloud infrastructure, thermal management has emerged as a defining priority. Direct-to-chip liquid cooling, a disruptive approach that transfers heat directly from critical components to a circulating liquid medium, is gaining rapid traction due to its unmatched efficiency and energy-saving potential. By channeling coolants directly to heat-generating CPUs, GPUs, and memory modules, this method drastically reduces the need for air-cooling infrastructure and enhances system density—ushering in a new era of thermal innovation for next-generation computing environments.

A growing sense of urgency among hyperscale data centers, colocation providers, and enterprise IT environments to minimize power usage effectiveness (PUE) and carbon emissions is catalyzing adoption. Traditional air-based cooling systems are no longer sufficient to handle the heat generated by AI-intensive workloads and densely packed servers. Direct-to-chip solutions fill this gap by facilitating precise, localized cooling, while simultaneously enabling greater compute per rack. As global environmental regulations tighten and ESG pressures rise, enterprises are shifting their strategies toward sustainable infrastructure—thereby elevating liquid cooling technologies from experimental to essential.

The market is being further propelled by technological advancements in dielectric fluids

and thermal interface materials, which are broadening the application scope of direct-to-chip cooling. In particular, integration of smart sensors and closed-loop control systems allows real-time temperature optimization and predictive maintenance, reducing operational risk and prolonging hardware lifecycle. However, the transition from air to liquid requires overcoming legacy infrastructure barriers and necessitates upfront capital investment, system redesign, and technician retraining—factors that may impede early adoption in cost-sensitive segments. Nevertheless, growing R&D funding and strategic alliances among key players continue to bridge these gaps.

Strategic investments by semiconductor leaders, system integrators, and OEMs have significantly intensified competition, spurring rapid innovations in both single-phase and two-phase liquid cooling systems. As organizations race to optimize performance per watt and footprint utilization, modular and retrofit-friendly cooling systems are being aggressively deployed across new builds and legacy data centers alike. Additionally, the rise of edge computing and micro data centers in remote and space-constrained environments is creating untapped opportunities for compact and high-efficiency cooling technologies that ensure thermal stability without expanding energy budgets.

From a regional standpoint, North America currently leads the global direct-to-chip liquid cooling market, driven by early adoption among hyperscale data centers, favorable energy regulations, and advanced IT infrastructure. Europe follows closely, with strong policy support for green data center initiatives and increasing investments in digital transformation. Meanwhile, the Asia Pacific region is expected to exhibit the fastest growth throughout the forecast period. Rapid digitization in countries such as China, India, and Japan—coupled with the proliferation of cloud service providers and AI startups—has generated a surging demand for thermally efficient and scalable cooling systems tailored for high-density workloads.

Major market player included in this report are:

Vertiv Group Corp.

Schneider Electric SE

Asetek A/S

CoolIT Systems Inc.

Fujitsu Limited

Midas Green Technologies

Submer Technologies

Rittal GmbH & Co. KG

Chilldyne Inc.

Lenovo Group Limited

IBM Corporation

Advanced Cooling Technologies Inc.

Hewlett Packard Enterprise

Alibaba Group (via Alibaba Cloud)

LiquidStack

The detailed segments and sub-segment of the market are explained below:

By Cooling Solution Type

Single-Phase Cooling

Two-Phase Cooling

By Component Cooling

Processor Cooling (CPU, GPU)

Memory & Storage Cooling

Power Supply Unit (PSU)

Others

By Liquid Coolant Type

Water-Based Coolants

Dielectric Fluids

Others

By Application

High-Performance Computing (HPC)

Artificial Intelligence & Machine Learning

Edge Computing

Cloud Computing

Others

By End Use

Data Centers

Enterprises

Government & Defense

Research & Academia

Others

By Region:

North America

- U.S.
- Canada

Europe

- UK
- Germany
- France
- Spain
- Italy
- Rest of Europe

Asia Pacific

- China
- India
- Japan
- Australia
- South Korea
- Rest of Asia Pacific

Latin America

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Brazil

Mexico

Middle East & Africa

Saudi Arabia

South Africa

Rest of Middle East & Africa

Years considered for the study are as follows:

Historical year – 2022

Base year – 2023

Forecast period – 2024 to 2032

Key Takeaways:

Market Estimates & Forecast for 10 years from 2022 to 2032.

Annualized revenues and regional level analysis for each market segment.

Detailed analysis of geographical landscape with Country level analysis of major regions.

Competitive landscape with information on major players in the market.

Analysis of key business strategies and recommendations on future market approach.

Analysis of competitive structure of the market.

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Demand side and supply side analysis of the market.

Companies Mentioned

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