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Direct-to-Chip Liquid Cooling Market Forecasts to 2034 – Global Analysis By Cooling Technology (Direct?to?Chip Liquid Cooling, Immersion Cooling, Hybrid Cooling Systems, Microchannel Cooling, and Two?Phase Cooling Systems), Component, System Type, Cooling Architecture, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Direct-to-Chip Liquid Cooling Market is accounted for $2.90 billion in 2026 and is expected to reach $13.96 billion by 2034 growing at a CAGR of 21.7% during the forecast period. Direct-to-Chip Liquid Cooling is an advanced thermal management technique used in data centers and high-performance computing systems, where liquid coolant is delivered directly to the surface of heat-generating components such as CPUs, GPUs, and accelerators. Cold plates mounted on the chips circulate liquid to absorb heat efficiently at the source, significantly reducing thermal resistance. This approach improves cooling efficiency, supports higher power densities, lowers energy consumption, and enables more compact system designs compared to traditional air-based cooling methods.

Market Dynamics:

Driver:

Sustainability & water conservation

Data center operators are under increasing pressure to reduce water usage and carbon footprints as digital infrastructure expands globally. Direct-to-chip liquid cooling systems

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significantly improve thermal efficiency compared to traditional air cooling, enabling substantial reductions in water and energy consumption. These systems allow higher rack densities while maintaining optimal operating temperatures, supporting sustainable scaling of data centers. Regulatory frameworks and corporate ESG commitments are further accelerating adoption of efficient cooling technologies. Advances in coolant formulations and heat exchanger designs are enhancing system reliability and environmental performance. As hyperscale and colocation data centers pursue greener operations, sustainability-driven investments continue to propel market growth.

Restraint:

Complexity of retrofitting

Many legacy facilities were designed around air-cooling architectures, making integration of liquid cooling systems technically challenging. Retrofitting often requires modifications to server hardware, piping infrastructure, and facility layouts, increasing implementation time and costs. Operational disruptions during installation can deter data center operators from adopting these systems. Compatibility issues with existing IT equipment further complicate deployment decisions. Skilled labor and specialized engineering expertise are required to ensure safe and efficient retrofits. As a result, some operators delay adoption despite the long-term efficiency benefits.

Opportunity:

Advancements in two-phase cooling

Two-phase systems leverage phase-change mechanisms to achieve superior heat transfer efficiency compared to single-phase solutions. These innovations enable effective cooling of high-power chips used in AI, HPC, and advanced analytics workloads. Improved reliability, reduced pumping energy, and compact system designs are increasing industry interest. Ongoing R&D is also addressing challenges related to fluid stability and system control. As chip power densities continue to rise, two-phase cooling is becoming increasingly attractive for next-generation data centers. These advancements are expected to expand adoption across hyperscale and enterprise environments.

Threat:

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Competition from immersion cooling

Immersion cooling offers comprehensive thermal management by submerging entire servers in dielectric fluids. This approach delivers high cooling efficiency and simplifies heat removal for extremely dense computing workloads. Some data center operators prefer immersion cooling due to its potential for reduced infrastructure complexity. Rapid innovation and declining costs are strengthening immersion cooling's market position. Vendors are actively promoting immersion solutions for AI and cryptocurrency mining applications. This competitive landscape may limit market share growth for direct-to-chip systems in certain use cases.

Covid-19 Impact:

The COVID-19 pandemic had a mixed impact on the direct-to-chip liquid cooling market. Initial disruptions affected global supply chains, delaying component manufacturing and system deployments. Data center construction timelines were temporarily slowed due to workforce restrictions and logistical challenges. However, the surge in cloud computing, remote work, and digital services significantly increased demand for data center capacity. This rapid digital acceleration intensified the need for efficient thermal management solutions. Operators began prioritizing resilient and energy-efficient cooling systems to support continuous operations. Post-pandemic recovery strategies now emphasize automation, efficiency, and scalable liquid cooling adoption.

The single?phase direct?to?chip systems segment is expected to be the largest during the forecast period

The single?phase direct?to?chip systems segment is expected to account for the largest market share during the forecast period, due to its proven reliability and relatively simpler system architecture. Single-phase solutions are easier to integrate with existing server designs compared to more complex cooling technologies. They offer effective heat removal for high-performance processors while maintaining operational stability. Lower initial costs and reduced maintenance requirements further support widespread adoption. These systems are well suited for hyperscale and enterprise data centers seeking incremental efficiency gains. Continuous improvements in cold plate design and coolant performance reinforce segment dominance.

The AI/ML workloads segment is expected to have the highest CAGR during the forecast period

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Over the forecast period, the AI/ML workloads segment is predicted to witness the highest growth rate. Rapid expansion of artificial intelligence and machine learning applications is driving unprecedented increases in chip power density. Direct-to-chip liquid cooling is increasingly adopted to manage the intense thermal loads generated by GPUs and accelerators. These workloads require consistent performance and low latency, which efficient cooling systems help ensure. Growth in generative AI, deep learning, and real-time analytics is further accelerating demand. Hyperscale cloud providers are investing heavily in liquid cooling to support AI clusters.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest market share. The region benefits from a high concentration of hyperscale data centers and cloud service providers. Strong investments in AI, HPC, and digital infrastructure are driving advanced cooling adoption. The presence of leading technology vendors and cooling solution providers supports rapid commercialization. Regulatory focus on energy efficiency is encouraging deployment of sustainable cooling technologies. Enterprises in the U.S. and Canada are early adopters of innovative thermal management systems.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR. Rapid digitalization and expanding cloud adoption are fueling large-scale data center construction across the region. Countries such as China, India, Japan, and Singapore are investing heavily in high-density computing infrastructure. Rising AI deployment and 5G expansion are increasing thermal management requirements. Government initiatives promoting energy-efficient data centers are supporting liquid cooling adoption. Local manufacturing capabilities are also improving system availability and cost competitiveness.

Key players in the market

Some of the key players in Direct-to-Chip Liquid Cooling Market include Asetek, Lenovo, CoolIT Systems, Dell Technologies, ZutaCore, Supermicro, LiquidStack, Hewlett Packard Enterprise (HPE), Submer, Advanced Micro Devices (AMD), Schneider Electric, Fujitsu, Vertiv, JetCool Technologies, and Iceotope Technologies.

Key Developments:

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In January 2026, Lenovo unveiled the Lenovo AI Cloud Gigafactory with NVIDIA, expanding and reinforcing its partnership with NVIDIA through a shared commitment to accelerating hybrid AI adoption across personal, enterprise and public AI platforms. Lenovo Chairman and CEO Yuanqing Yang, joined by NVIDIA founder and CEO Jensen Huang, debuted this new gigawatt-scale AI factory program as a major advancement that enables AI cloud providers to bring next generation AI workloads and applications online faster.

In January 2026, Dell Technologies is collaborating with AI Singapore to enhance its SEA-LION family of open-source large language models (LLMs). The organizations are testing and validating SEA-LION models across various Dell AI PCs and edge infrastructure, supporting AISG's efforts towards building models that are resource-efficient and deployable on lightweight setups.

Cooling Technologies Covered:

- Direct?to?Chip Liquid Cooling
- Immersion Cooling
- Hybrid Cooling Systems
- Microchannel Cooling
- Two?Phase Cooling Systems

Components Covered:

- Coolant Fluid
- Cold Plates
- Pumps
- Heat Exchangers
- Pipes/Tubes & Fittings

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- Sensors & Control Units

System Types Covered:

- Single?Phase Direct?to?Chip Systems
- Two?Phase Direct?to?Chip Systems
- Modular Direct?to?Chip Solutions
- Integrated AI/High?Performance Computing (HPC) Solutions

Cooling Architectures Covered:

- On?Chip Cooling
- Close?Coupled Cooling
- Rack?Level Integration
- System?Level Integration

End Users Covered:

- Data Centers
- Cloud & Hyperscale
- High?Performance Computing (HPC)
- Telecom & 5G Infrastructure
- Automotive
- Consumer Electronics

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- AI/ML Workloads
- Other End Users

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany
  - UK
  - Italy
  - France
  - Spain
  - Rest of Europe
- Asia Pacific
  - Japan
  - China
  - India
  - Australia

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New Zealand

South Korea

Rest of Asia Pacific

South America

Argentina

Brazil

Chile

Rest of South America

Middle East & Africa

Saudi Arabia

UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:

- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2023, 2024, 2025, 2026, 2027, 2028, 2030, 2032 and 2034
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations

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- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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