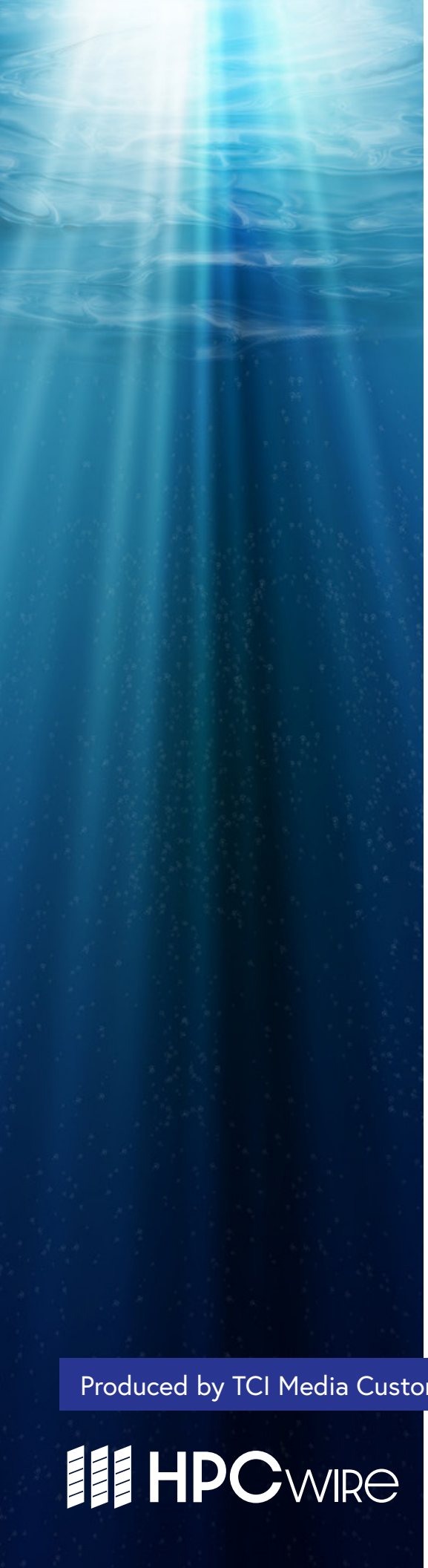

LITEON INTEGRATED POWER AND COOLING SOLUTIONS TO MEET AI WORKLOAD NEEDS

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LITEON®

In the High-Performance Computing (HPC) and artificial intelligence (AI) era, the power needed to run HPC and AI workloads has increased. HPC data center infrastructure can run HPC workloads but face heat and thermal issues. Running these workloads may surpass CPU and GPU built-in power and Thermal Design Power (TDP) temperature thresholds. Data centers increasingly use more power and generate more heat resulting in increased operating costs (OPEX). Traditional data center air-cooling includes chilling towers, pumps, Computer Room Air Conditioner (CRAC) units and Computer Room Air Handling (CRAH) units that cannot meet cooling needs. With the increased heat generated, data centers require specialized power and cooling solutions. LITEON Technology power and cooling solutions running on HPC infrastructure solve data center power, heat, energy usage and cost issues.

Introducing LITEON Technology

LITEON Technology is the first listed electronic company in Taiwan and has been in operation for 50 years. LITEON provides high energy-efficient solutions with their LITEON power and cooling solutions for data centers including hardware, software management system, and support. LITEON's products adhere to the Open Rack v3 (Orv3) specification within the broader Open Compute Project (OCP) concept that focuses on redesigning hardware technology to efficiently support the growing demands of compute infrastructure. In addition, LITEON's power and cooling solutions are designed to support NVIDIA GPU power solution platforms, making them ideal for high-performance computing (HPC) and GPU-intensive data center environments.

LITEON Power Technology

LITEON is a leading global provider supplying efficiency grade power supplies. Their products support AC or DC input and feature ultra-high power, energy efficiency, power density, reliability, and modular design with diverse scalability. LITEON power products include:

LITEON Power Modules: For over two decades, LITEON has supplied power modules for CRPS, GPU and SLIM series power modules for general servers, AI servers and industrial needs. CRPS power modules were created for Intel based CPUs and produced AC 2kW to 5.5kW of output power. As specialized HPC/AI workloads evolved, data centers required power modules designed to meet GPU requirements. LITEON developed High Power for GPU/AI power modules capable of providing output power to meet GPU needs for processing AI workloads. LITEON has created power solutions to meet NVIDIA requirements since the GPU power modules and continues to work with NVIDIA to design power solutions to meet GPU and AI workload needs. Other top server solution providers also use LITEON power solutions as their key approved vendor.

Power Shelf Solutions: The Power Shelf series provides high quality power to data center server racks. Available in various power ranges, and multiple form factors for 19 and 21-inch data racks, these highly efficient power shelves support single-phase and three-phase power configurations.

- **LITEON Power 21" Power Module and Shelf Solutions:** The LITEON 21" Power shelf solution uses single phase power, has 200-277 Vac input, and 50Vdc output. The 33kW and 72kW modules produce 5.5kW to12kW of power output to meet AI processing needs. The product meets ORV3 HPR standards and has 97.5% power efficiency.
- **LITEON 21" Battery Backup Unit (BBC) and Shelf Solutions:** A Battery Backup System is a critical component for uninterruptible service. The LITEON 21" Battery Backup Unit provides up to 12kW of output power and supports full backup for over three minutes during AC power loss or fault condition.
- **LITEON 21" Super Capacitor (SCS) Shelf:** The LITEON Super Cap Shelf 1OU 20kW and 72kW units slow down input current transitions during GPU load dynamics to lower the peak input power for better usage of utility capacity.
- **LITEON 19" Power Module and Shelf Solutions:** The LITEON 19" Power shelf 33kW uses single phase power, has 200-277 Vac input, and 50Vdc output. The three phase 55kW unit has 480Vac input, 50Vdc output, and provides 97.5% power efficiency. LITEON collaborates with NVIDIA on power solutions and NVIDIA uses the 19" power shelf as a standard power supply solution and listed LITEON in NVL.
- **LITEON Power Rack Solution:** The LITEON Power Rack solution is designed to fit in the LITEON standard 21" 500kW and 1MW power rack solution. The Power Rack includes space for a 1OU composed with compatible power module, SCS Shelf, and Tailored connection to IT rack per customer demand.

Introducing the LITEON Cooling Solution

Heat generated by hardware equipment can be absorbed by liquid cooling technology. This solution can significantly improve the heat dissipation capability. Using a liquid cooling system cools down the electronic equipment by circulating coolant (usually Glycol or DI-water) that absorbs the heat generated to dissipate heat. Cooling HPC infrastructure helps keep HPC power usage within Thermal Design Power (TDP) temperature thresholds and aids in reducing data center power costs.

The LITEON cooling solutions including the liquid-to-liquid multi-intelligent in-row CDU 600kW, liquid-to-liquid 120kW in-rack CDU, and liquid-to-air 140kW sidecar are compatible with the NVIDIA GB200 NVL72 architecture. These solutions offer flexible combinations for customers to meet various field and application needs, overcoming the limitations of traditional air cooling. If the data center uses only air cooling, the

LITEON Cooling solution will be liquid-to-air. However, if the facility has water, then LITEON can use a liquid-to-liquid cooling solution. The LITEON Cooling solutions significantly improve cooling efficiency by enabling data centers to maintain high-performance workloads while reducing energy and carbon footprint consumption to create more environmentally friendly green resilient data centers.

At SC24, LITEON demonstrated the LITEON 600kW in-row CDU liquid cooling system, recently added to NVIDIA's recommended vendor list (RVL). LITEON high-efficiency power and liquid cooling systems are compatible with the NVIDIA GB200 NVL72 and the NVIDIA MGX™ modular system design cabinet, and meet Open Rack v3 (Orv3) specification and Open Compute Project (OCP) standards.

LITEON products under NVIDIA RVL

LITEON 2024 Liquid-to-Liquid (LTL), in-row CDU (600kW, ATD 4-degree C)

LITEON 2025 LTL, in-row CDU (1.5MW, ATD 4-degree C), Modular 3+1

LITEON 2025 LTL, in-rack CDU (120K, ATD 4-degree C)

Future-LITEON LTL, in-rack CDU (280Kw, ATD 4-degree C)

LTA-Sidecar, 2024 (60kW, ATD 10-degree C)

Liquid-to-Air (LTA)-Sidecar, 2024 (140kW, ATD-10 degree C) Width 120cm

LTA-Sidecar, 2025 (140kW, ATD 10 degrees C) Width 90cm

LITEON Cooling Loop

The LITEON cooling loop includes the following:

- Cold plate which transfers heat from the CPU or GPU of IT servers to the liquid of the cold plate.
- Manifold pair, collects hot liquid and delivers cool liquid.
- Coolant Distribution Units (CDUs) are external heat exchangers that let hot liquid be cooled by either cool air (called liquid-to-air) or facility chill water (called liquid-to-liquid) where the cool liquid is sent back to IT servers.
- Other solutions can include Power Supply Units (PSUs) in power shelf, Battery Backup System (BBS), dual radiators, and a MCU distributed control system.

LITEON Liquid-to-Air (LTA) 140kW Sidecar

The LITEON Sidecar is a liquid-to-air cooling solution that moves heat away from AI servers in data centers. The LITEON liquid-to-air 140kW sidecar is compatible with the NVIDIA GB200 NVL72 platform and uses the MCU-based remote management card with easy expansion to accept more signals. With its high heat exchange efficiency, the sidecar is designed to meet the high computing demands of data

centers. Because the sidecar is a liquid-to-air product, more fans are included to increase air flow of heat into the data center.

Sidecar Key Features

1. Adopts DC48V power shelf for various input of voltages.
2. Liteon in-house MCU-based controllers provide more efficient and security.
3. Provides communication among upper-level management and internal components.
4. Designing the CDU as 90cm wide allows users to place and transport the units in the container more efficiently and conveniently.
5. Highly compact fan wall design to implement 32 pcs of fans to support high airflow.
6. 2+1 redundancy for pumps and filters by the integrated modules kits.
7. Installed 2x finned tube heat exchangers in series and face directly to the incoming air flow.
8. Introduced the coolant quality monitoring into CDU for pH & conductivity detecting in real-time.

The 140kW Sidecar meets CDU flow rate performance, cooling capacity versus flow rate (@ 12500 CFM), and ATD heat. The Flow rate (LPM) and Liquid flowrate (LPM) provide the minimum of 30psi pressure drop across the sidecar at 168LPM.

Liquid-to-Liquid (LTL) In-Rack 120kW CDU

The LITEON liquid-to-liquid 120kW in-rack CDU is compatible with the NVIDIA GB200 NVL72 platform. It is located in the lower portion of the IT rack and uses the DC48Volt rather than an air conditioner AC source and the MCU controller for easy communication with the IT rack. The front location of the filter and display provide easy access for data center operators.

Key Features

1. Leverages DC48V, no need of an AC-to-DC Power Supply Unit (PSU).
2. MCU-based controller for more efficient communication with IT rack.
3. Front human machine interface (HMI) for convenient operation.
4. 1+1 pump redundancy.
5. Filter can be maintained from the front side during operation.
6. New type of plate heat exchanger (PHE) for compact size and high heat exchange capacity.
7. LITEON plans to introduce a 280kW CDU in Q3 2025.

The maximum flow rate limits are 168 LPM for primary/secondary loop:

- Pressure drops = 43.9 kPa (6.4psi) @ 155 LPM (Estimated)
- Pressure drops available from CDU secondary loop

Liquid-to-Liquid (LTL) In-Row 1.5MW CDU

The LITEON liquid-to-liquid 1.5MW in-row CDU is compatible to serve more than 10 racks of NVIDIA GB200 NVL72 platform and meets cooling performance curve specifications. There is a flow path between the CDU and the master manifold. This CDU will be 90 centimeters in size and will launch in Q2 2025. LITEON is expanding the LTL In-Row CDU products with two 1.5 MW CDU, achieving the maximum 3MW, to be available in 2025 to 2026. A four 1.5MW CDU maximum 6MW product is scheduled to be available for 288 GPUs in 2026.

Key Features

1. Adapts wide voltage input range for various voltage requirements.
2. LITEON in-house designed MCU-based controller, Integrated control, and remote monitoring.
3. Modular redundant kit design for easy maintenance and replacement.
4. 3+1 pump redundancy
5. Integrated 25-micron filters, 3+1 redundancy and on-line serviceable.
6. On-line coolant quality monitoring.

The maximum flow rate limits of the 1.5MW Liquid-to-Liquid In-Row CDU are 1,800 LPM/1,500LPM for the primary and secondary loops.

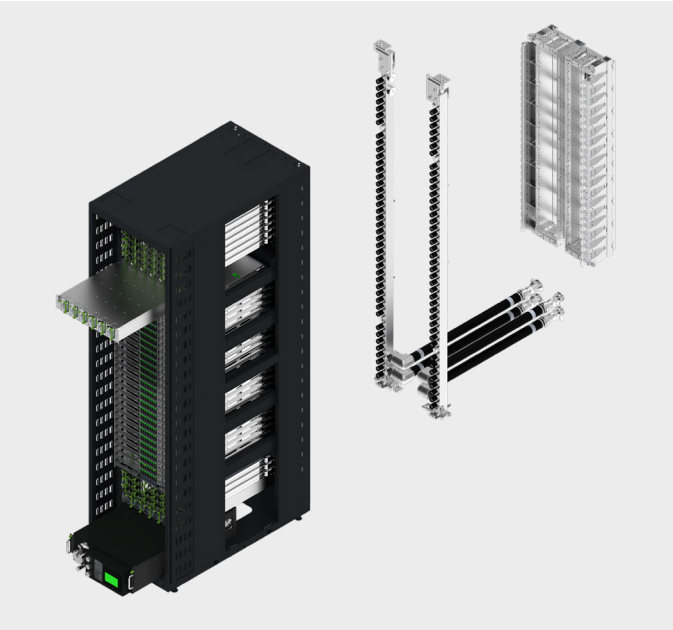
LITEON Cooling Manifolds

LITEON's cooling manifolds help to manage cooling capacity, improve thermal efficiency, and reduce energy consumption. LITEON's manifolds include:

- Inlet manifolds: Connect to the cooling liquid source and have multiple liquid inlets.
- Rack manifolds: Connect the coldplate loops in servers to the CDU.
- Blind mate liquid cooling nozzles: Connect to the rack's liquid cooling loop when a server slides into place.

LITEON has a variety of manifolds and can customize manifolds for customer needs.

The controller and power/computing server can be fully integrated using an MCU (Microcontroller Unit) as shown in the graphic below.



The LITEON designed MCU Base Distributed Control System provides more efficient and secure communication among upper-level management, internal components, and the IT rack. The MCU Base Distributed Control System includes a Pump Controller (MCU) and Fan Controller (MCU) that controls cooling system pumps, pump modules, fans, and fan modules. The Remote Management Controller (AST2620) uses the RedFish open-source API and standard for managing IT infrastructure including servers, networks, and storage. It also uses the Intelligent Platform Management Interface (IPMI) that allows system administrators to remotely manage servers. The MCU Base Distributed Control System is connected via a Controller Area Network (CAN) bus.

THE LITEON MCU based Distributed Control System provides:

1. **Space and Cost Efficiency:** The MCU-based system is easy to fit into space-limited environments and provides a lower-cost solution compared to traditional PLC-based control systems.
2. **Redundancy:** The system includes redundant components, such as pump controllers and fan controllers, which improve system reliability and help prevent downtime.
3. **Realtime Control:** The system provides real-time control features for special events, such as liquid leaks, via the CAN bus.
4. **Scalability:** The system can be easily expanded to control larger and more complex processes, making them adaptable to growing needs.

LITEON Entire Cooling System

The LITEON MGX rack contains these LITEON power and liquid-to-air cooling products. This solution is compatible with the NVIDIA GB200 NVL2 designed to work with the NVIDIA MGX modular design cabinet and the fanless liquid-cooled power supply unit.

- Rack cabinet
- Power shelf: 55 kW rack-mounted power shelf
- BBU shelf: The Backup Battery System (BBS) provides up to 7 kW of output power with only a height of 1U. It supports full load 12VDC bus backup for over 3 minutes during an AC loss. The BBS shelf contains four slots for Battery Backup Units (BBUs).
- Liquid-to-Air (LTL) in-rack CDU
- Manifold + mounting kit

Customer Testimonials about LITEON COOLING Solution

Here are what some customers say about LITEON Cooling systems:

- Front-access filter in 120kW in-rack CDU:
  Easy to maintain and repair. Great feature per practical experience."
- MCU-based controller:
  "Right solution to align with IT servers."
- DC-48V to power on in-rack CDU:
  "Exactly matches the power solution of the MGX system, performance curves and data of heat exchange capacity."

Summary: LITEON Power and Cooling Solutions

With HPC and AI workloads, data centers increasingly use more power and generate more heat resulting in increased operating costs (OPEX). Data centers need a power and cooling solution that works better than traditional data center power and air-cooling solutions. LITEON Technology provides a wide range power modules, power shelves, and battery backup solutions along with liquid-to-liquid and liquid-to-air cooling solutions to meet the cooling needs of modern data centers.

LITEON Technology made its grand debut at the 2025 NVIDIA GTC conference, showcasing solutions specifically designed for the NVIDIA GB200, GB300 NVL72 systems. With integrated power, cabinet, and liquid cooling systems, they provide high power density power solutions that comply with the NVIDIA Blackwell architecture design. These solutions help customers accelerate the integration of next-generation AI server cabinets, creating efficient and energy-saving data centers to meet the growing high-performance computing demands of the AI era.

LITEON's first-time exhibits at NVIDIA GTC 2025 include:

- 55 kW rack-mounted power shelf that meets NVIDIA MGX rack specifications
- 33 kW 2RU high-efficiency lithium battery backup unit (BBU)
- Cold plate compatible with NVIDIA GB300
- New generation of compact liquid-to-air 140 kW sidecar cooling cabinets
- 120 kW in-rack CDU compatible with the NVIDIA MGX NVL72 architecture

For more information, see:

https://www.liteon.com/en
https://liteonevent.accessus.cloud

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