Nov , 2025

NVIDIA Rubin GPUs Ignite the Cooling Revolution 3.0: The Rise and Challenges of Microchannel Lid Technology

Topology Research Institute

The rise of AI and HPC workloads has significantly increased GPU power consumption, from a few hundred watts to over 2,300W in the Rubin generation. This evolution has elevated cooling from a mere support component to a critical factor for maximizing computational performance. As traditional liquid-cooling methods near their physical limits, the industry is turning to a next-generation solution: Microchannel Lids (MCL). Quietly, a new “cooling revolution” is underway.

Comparing Traditional “Vapor Chamber + Cold Plate” Cooling to MCL

Category	“Vapor Chamber + Cold Plate”	Microchannel Lid
Structural Design	SoC→TIM1→Lid→ TIM2→Cold plate	SoC→TIM1→ Microchannel Lid
Cooling Channel Location/Size	Channels approx. 1–3 mm wide, located inside the cold plate	Micron-scale channels etched directly into the package lid
Cooling Capacity	Up to ~1,500W	Able to surpass 2,600W
Advantages	Lower cost; mature, widely adopted technology	Eliminates TIM2 for lower thermal resistance; no cold plate needed; more space; significantly more uniform cooling
Cost	Relatively low	Estimated to be 8–10x higher than the traditional solution
Maturity & Deployment Timeline	Current mainstream solution in mass production	In development and validation; expected to enter deployment around late 2026

Source : TrendForce

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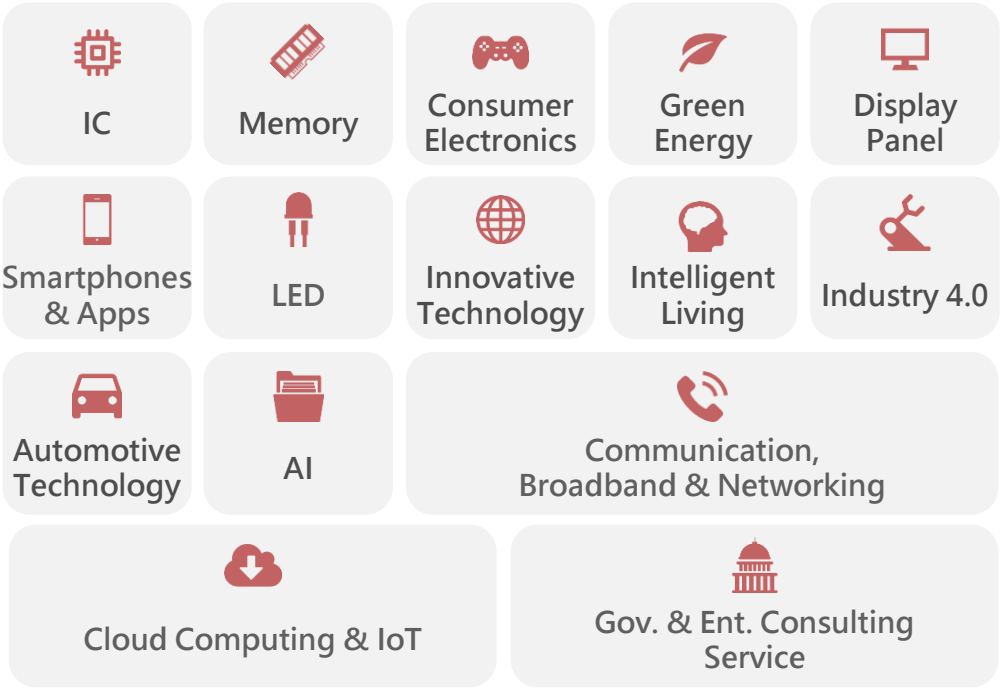

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