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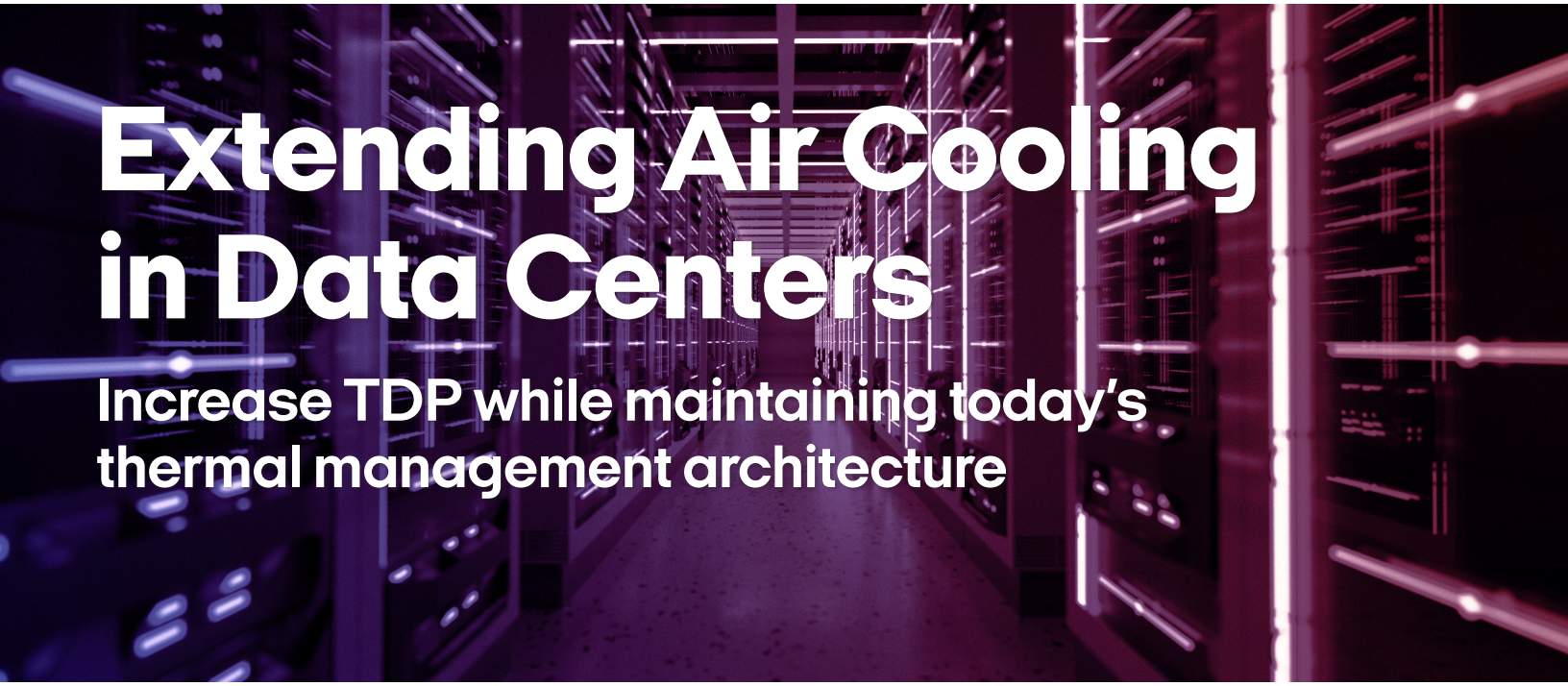


Extending Air Cooling in Data Centers

Increase TDP while maintaining today's thermal management architecture

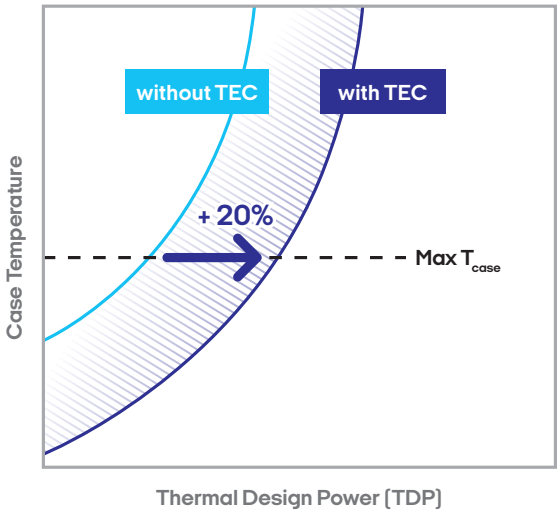
The majority of data centers are still air cooled, relying on fans to pull air through conventional heat exchangers, which are approaching their limits due to increasing heat and rack density. Responsive Cooling™ enables a higher thermal design power (TDP) for xPUs and switch ASICs, maintaining the same max operating temperature while using the same heat exchanger and airflow.

For these air cooled data centers, Responsive Cooling™ enables a longer runway to amortize the cost of existing air cooled infrastructure without compromising performance. The Thermal Design Power (TDP) of xPUs and switch ASICs continues to rise as core count and port density rises, and with that comes requirements for thermal management innovations in heat exchangers and adjustments in air flow. These innovations have costs like taking up chassis space, growing chassis height taking up valuable rack space, and increasing fan noise.

Thermoelectric cooling embedded into the xPU or switch ASIC heat spreader or chassis heat exchanger can be an effective solution to increase the TDP of chips by as much as 20% while maintaining the same air flow and thermal management architecture. When power is applied to these thermoelectric devices, they are able to respond as required to maintain the required operating temperature, and remain passive when not needed. Since the thermoelectric devices are only about a millimeter thick and can be tiled into virtually any X – Y dimensions, they can easily fit into server and switch form factors without impacting the size or layout of the systems. This can extend the useful life of air cooled infrastructure while still allowing for increase power and performance for next-generation semiconductors.

RESULTS:

Responsive Cooling™: Unlock ~20% increase in TDP while holding T_{case} constant.



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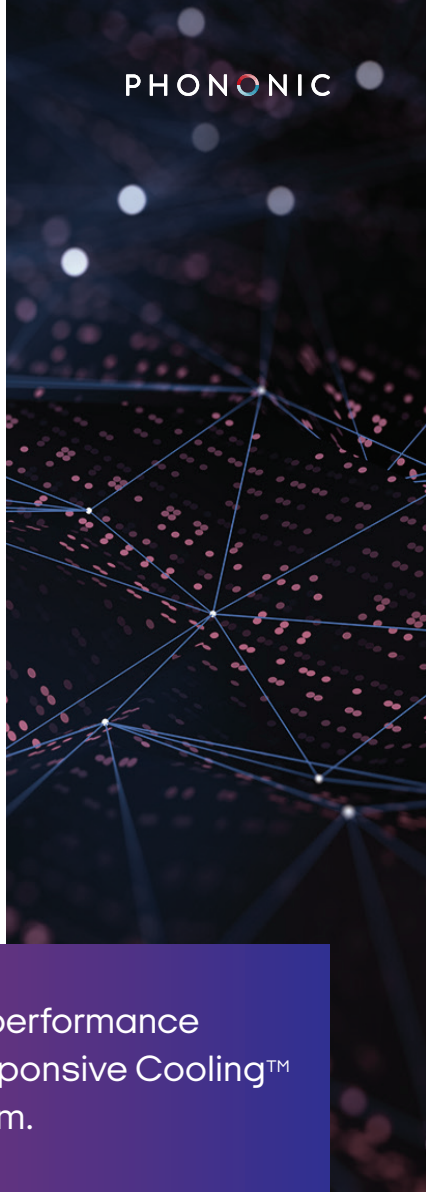

PHONONIC RESPONSIVE COOLING SYSTEM™

Take Your Compute Performance to the Next Level with Phononic.

Thermal management has always been a constraint to achieving higher memory and compute performance, but it's increasingly becoming a bottleneck to the step-change progress required to support the future of AI. AI performance is delivered by faster GPUs and GPU performance is constrained by the power and cooling capabilities of the system. At the heart of the issue? The ability to respond immediately and precisely to changes in workload demand, at a system-level, not merely component to component. This stands in stark contrast to current approaches that over-provision cooling, resulting in energy 'wasted' on cooling that could have been deployed to compute.

Phononic's Responsive Cooling System™ approach to cooling throughout the data center integrates thermoelectric chips (TECs), existing cooling platforms, and proprietary control electronics to deliver distributed cooling that optimizes to temperature management needs. This approach decouples temperature where needed to eliminate hot spots, lowers total power requirements and unleashes meaningful TDP improvement quickly and reliably. **Scale your compute performance, with Phononic.**

Multiply Your AI Performance with Phononic. Increasing future AI performance requires a fundamental change in cooling approach. Phononic's Responsive Cooling™ transforms cooling into a performance enhancing, intelligent platform.

Design Capabilities that Push the Cooling Boundaries to Enable AI

Phononic has a deep understanding of data centers and the components that are powering the future. With more than 30M+ devices in field today, deployed across all major US hyperscalers, Phononic's engineering team has been setting the standard for performance, efficiency and cost-effectiveness in our TECs.

Our IP library is robust and growing, with hundreds of patents covering materials, software integrations, thermal management approaches and more.

A wealth of reference design kits, along with the backing of ISO Quality Management Systems, IATF and Telcordia certifications ensures that our designs are consistently real-world predictive, reliable and deployable.

Industry-Leading Design, Delivered Consistently and at Scale

At Phononic, as part of our design approach, we work closely with our customers to make system level tradeoffs that optimize not just the custom TEC we deliver, but the entire product for the end customer.

By leveraging our proprietary TEC technology and scalable device architecture, we are uniquely positioned to reliably deliver high performance cooling that meets the most rigorous demands, regardless the sector.

Together with our partners in Thailand, Phononic has the ability to scale availability of devices, and fully integrated solutions to our partners and licensees in a manner that both leverages the deep R&D and engineering expertise in HQ in RTP, NC while enabling full global scale and supply chain flexibility.

Learn more:
https://phononic.com/datacenter-cooling

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