

Optical Performance, Optimized to Demanding AI Workloads

**Industry-leading power efficiency,
heat flux density and reliability**

As data centers race to support next-generation AI, the need for high-bandwidth, low-latency interconnects has never been greater. Phononic TECs are engineered to meet these challenges head-on, delivering best-in-class performance, quality, and reliability at scale—combining hyperscale-ready expertise with precision thermal control.

AI workloads are driving a fundamental shift in back-end network design, requiring higher lane rates, longer reach, and more wavelengths per fiber—all while meeting strict power budgets to maintain PUE targets. These demands push optical components to their limits, making advanced thermal management essential for performance and efficiency.

The doubling of modulation with next-generation optics and the growing need for 2 km (“FR”) reach put additional pressure on EML performance specifications. Modulating to encode twice the data increases temperature sensitivity through chirp, making wavelength stability critical. The right thermoelectric cooler (TEC) ensures precise EML temperature control—reducing bit error rate, maintaining low latency, and minimizing module power consumption.

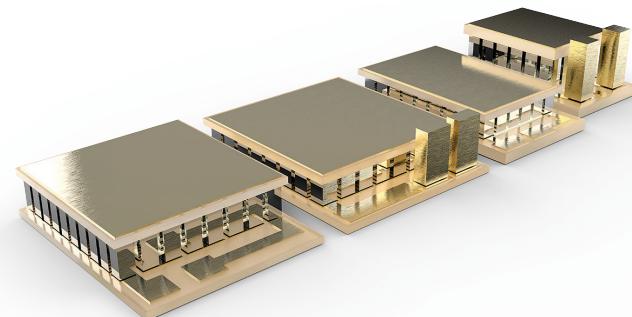
RESULTS:

Phononic TECs have the fastest response time and tightest temperature stability.

The standard approach to 800G [2x400G FR4] pluggables uses CWDM4, combining multiple wavelengths onto a single fiber. Longer reach compared to DR optics amplifies chromatic dispersion, making wavelength stability crucial. Phononic’s proven design process delivers TECs with the fastest response time and tightest temperature stability, locking in wavelength for these strict requirements.

Near-term Co-Packaged Optics (CPO) is reshaping network architecture by integrating optics and switching in a single package. The result: lower power, higher bandwidth density, and reduced latency. AI deployments that take advantage of CPO will continue to need precise and high-quality cooling. Phononic’s unmatched design expertise delivers leading cooling solutions for these CPO deployments, and become even more mission-critical as CPO adoption expands to integrations of optics and compute.

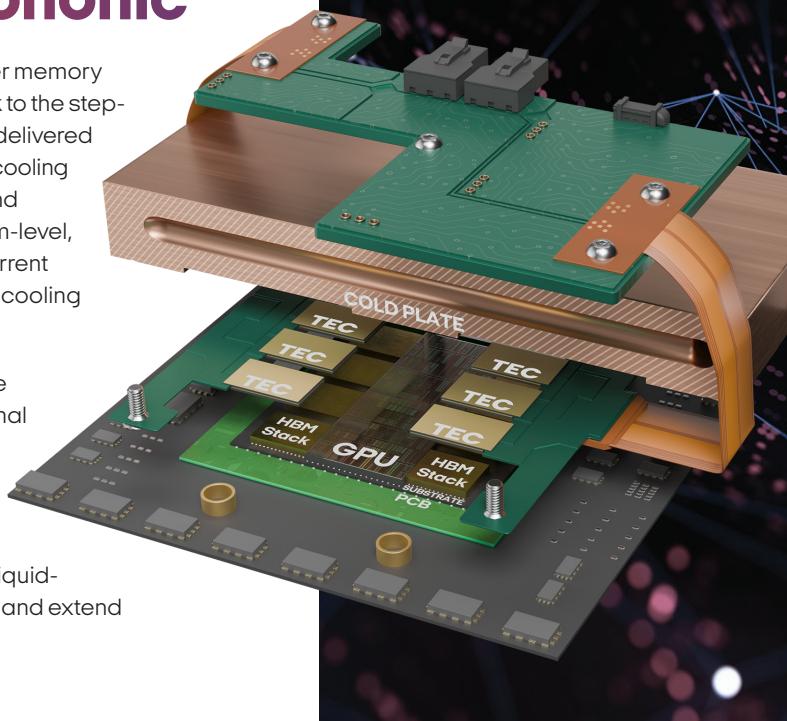
Phononic’s expertise is built on proven innovation with TECs deployed in all major hyperscale cloud data centers across the globe. Our proprietary modeling and design process, combined with ISO-certified quality and global manufacturing, ensures rapid development, supply chain resilience, and zero field failures. Whether your back-end network prioritizes longer reach, higher lane rates, or both, Phononic TECs are custom-engineered to scale optical performance with precision and reliability—empowering the AI-driven future.



PHONONIC'S THERMAL KIT: 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.

Our intelligent "Thermal Kit" utilizes Phononic's proven high performance thermoelectric coolers (TECs) with an integrated mechanical and thermal architecture, all connected using API accessible control firmware and software, to provide precise, performance-enhancing cooling at the node-level. It's a solution that readily integrates with existing liquid cooling systems, and enables rapid, chip-level hotspot thermal control, improves the efficiency of compute and supports the future buildout of liquid-cooled data centers with increasing compute density. Unlock compute and extend the useful life and efficiency of existing AI infrastructure.



Unlock Compute and Extend the Life and Efficiency of AI Infrastructure

Increasing future AI performance requires a fundamental change in cooling approach. Phononic's Thermal Kit 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 35M+ 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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