

**TPCM7000 AND  
MAXAIR<sup>TM</sup> VENT PANELS  
FOR GPUS AND TPUS  
AT HYPERSCALE  
DATA CENTERS**

## Abstract

As AI-driven workloads continue to expand, hyperscale data centers face growing challenges in thermal management and electromagnetic interference (EMI). This application note explores how a hyperscale client leveraged Laird's **TPCM7000 phase change material** and **MaxAir™ vent panels** to enhance cooling efficiency, reduce EMI, and improve overall data center reliability. Key design considerations, material specifications, and implementation best practices are covered to help engineers optimize similar high-performance computing environments.

## Introduction

The client's hyperscale data centers support AI applications that demand ever-increasing compute power. GPUs and TPUs generate thermal loads exceeding 500 watts per chip, necessitating highly efficient heat dissipation solutions. Additionally,

high-speed processors in dense server racks introduce EMI risks, impacting signal integrity and compliance with industry regulations.

Traditional cooling and EMI shielding methods presented limitations, including space constraints, insufficient heat dissipation, and complex installation requirements. The tech giant required advanced material solutions that could efficiently manage heat, maintain signal integrity, and ensure compliance without adding excessive bulk or complexity.

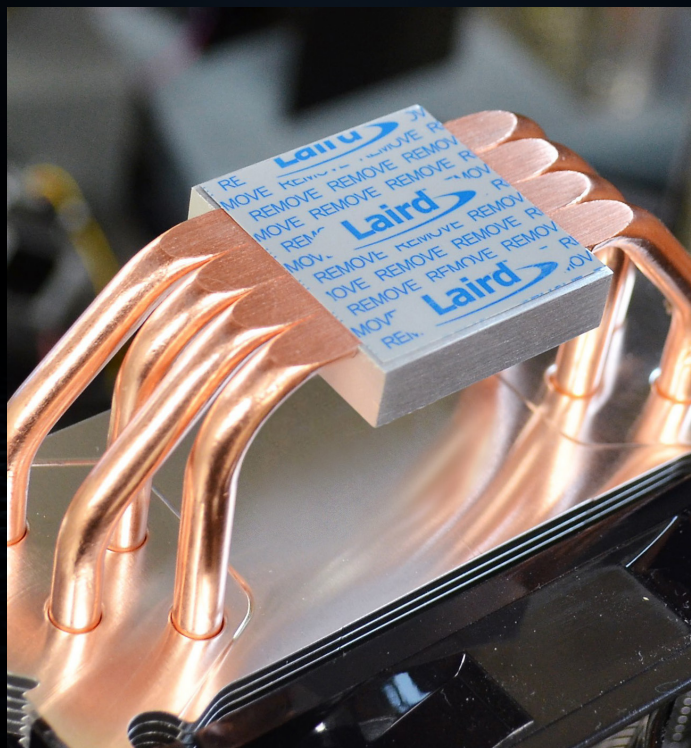
Laird, a leader in materials science for thermal management and EMI shielding, provided two key innovations to address these challenges: TPCM7000 phase change material for high-efficiency heat dissipation and MaxAir™ vent panels for optimized airflow and EMI suppression.

## Technical Details

### TPCM7000 Phase Change Material

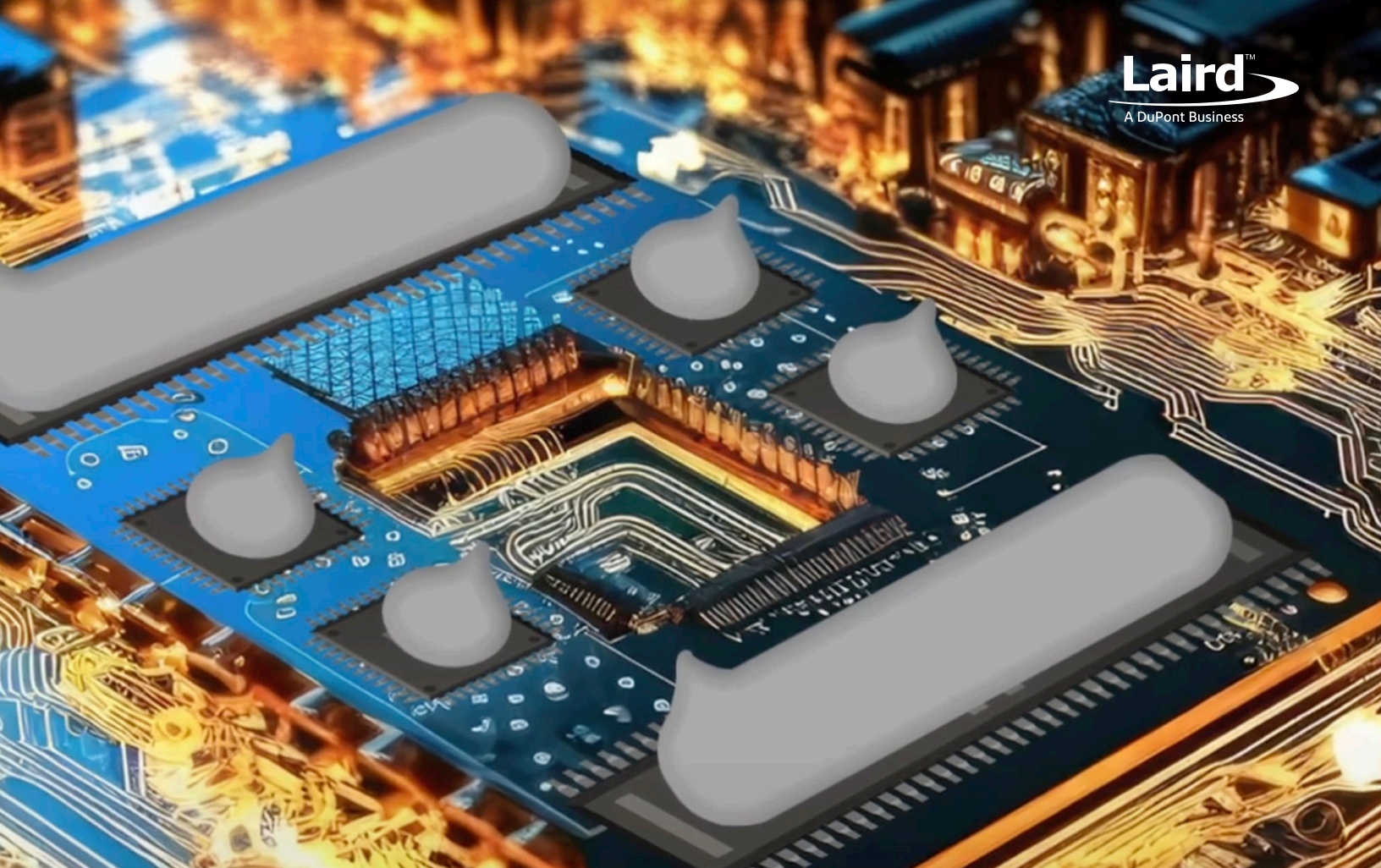
TPCM7000 is a high-performance thermal interface material (TIM) designed to enhance heat dissipation in AI accelerators. This advanced phase change material:

- Offers high thermal conductivity for improved cooling efficiency.
- Forms ultra-thin bondlines to reduce thermal resistance.
- Features a non-silicone formulation for enhanced long-term stability.
- Provides excellent wetting properties to minimize air gaps and pump-out.



### TPCM7000 Specifications

Parameter	Value
Thermal Conductivity	7.5 W/mK
Thermal Resistance (10 psi)	0.10°C-cm <sup>2</sup> /W
Thermal Resistance (50 psi)	0.06°C-cm <sup>2</sup> /W
Dielectric Constant	31.54 @ 1MHz
Volume Resistivity	5.4x10 <sup>11</sup> μΩ-cm
Operating Temperature	-40°C to 150°C
Phase Change Temperature	50°C - 70°C
Minimum Bondline Thickness	35μm



## MaxAir™ Vent Panels

MaxAir™ vent panels are frameless EMI shielding solutions that:

- Maximize airflow in dense server environments.
- Reduce energy consumption by improving cooling efficiency.
- Provide lightweight, durable EMI shielding for high-frequency signals.
- Feature a press-fit installation process, eliminating the need for fasteners.

## MaxAir™ Vent Panel Specifications

Parameter	Value
Shielding Effectiveness	Up to 60 dB (200 MHz to 10 GHz)
Cell Sizes	2.5mm, 6.0mm
Standard Thickness	6.4mm, 12.7mm
Compliance	UL94 V0, Halogen-free (IEC 61249-2-21)



## Design Considerations

### Thermal Management Factors

- **Component Placement:** Ensuring direct thermal interface contact with heat-generating chips.
- **Pressure Optimization:** Applying uniform force to minimize bondline thickness and enhance heat transfer.
- **Long-Term Stability:** Selecting materials with resistance to pump-out and degradation under high-power cycling.

### EMI Shielding Factors

- **Minimizing Airflow Restrictions:** Designing vent panels that balance EMI shielding and cooling efficiency.
- **Material Selection:** Using lightweight, high-durability materials for ease of handling and long-term reliability.
- **Installation Efficiency:** Implementing press-fit designs to reduce assembly time and complexity.

## Application Examples

The customer integrated Laird’s solutions across multiple generations of its AI infrastructure:

- **TPCM7000 replaced previous TIM solutions** to improve heat dissipation, allowing GPUs and TPUs to sustain peak performance without thermal throttling.
- **MaxAir™ vent panels replaced traditional aluminum honeycomb coverings,** increasing airflow efficiency and reducing installation complexity.

## Performance Gains

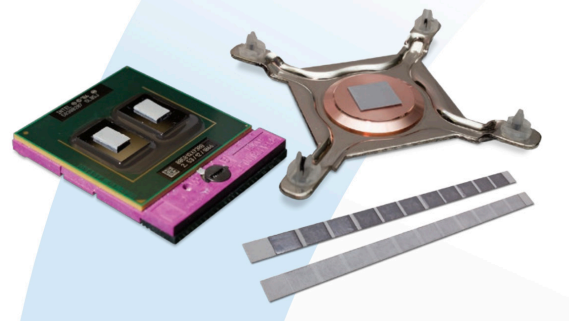
Improvement	Impact
Lower Thermal Resistance	Enhanced heat dissipation and stable GPU/TPU performance
Optimized Airflow	Reduced cooling energy requirements
EMI Shielding Efficiency	Improved signal integrity and compliance
Reduced Installation Complexity	Faster deployment and maintenance

## Implementation and Best Practices

- **TPCM7000 Application:** Ensure surfaces are clean before application, apply uniform pressure, and allow for proper phase transition during operation.

- **MaxAir™ Installation:** Measure and prepare openings accurately for precise fitment, use conductive perimeter gaskets for effective EMI shielding, and optimize positioning for maximum airflow.

- **System Integration:** Regularly monitor thermal and EMI performance, and adjust server layouts to maintain efficiency as AI infrastructure scales.



## Conclusion

Laird's TPCM7000 and MaxAir<sup>™</sup> solutions provided its data-center client with effective thermal management and EMI shielding solutions, enabling enhanced performance, reliability, and scalability in AI-driven data centers. By leveraging advanced materials and optimized designs, The customer successfully addressed the increasing thermal loads and EMI challenges of next-generation AI accelerators.

For engineers designing high-performance computing environments, Laird's materials offer proven, scalable solutions to manage heat and EMI effectively. To learn more or request product samples, contact Laird's engineering team.



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