INDIA'S ELECTRONIC BOOM HAS A HEAT PROBLEM

Why thermal interface materials matter more than ever?

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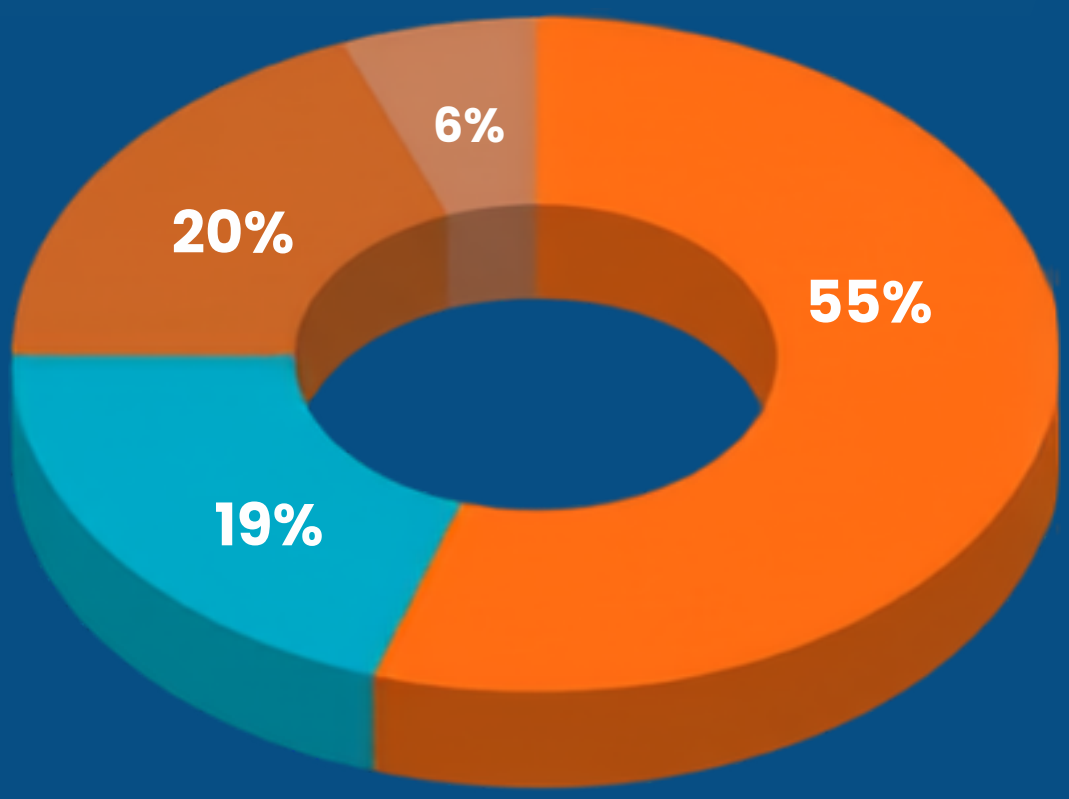
HEAT IS THE HIDDEN BOTTLENECK

India's rapidly growing electronics sector is driving demand for smartphones, EVs, 5G infrastructure, and IoT hardware. As devices shrink in size but grow in complexity, modern devices are increasing thermal density at an unprecedented rate.

Major causes of electronics failure



Modern devices are

More powerful

More compact

More integrated

Poor heat management leads to

Performance drop

Reliability issues

Shorter lifespan

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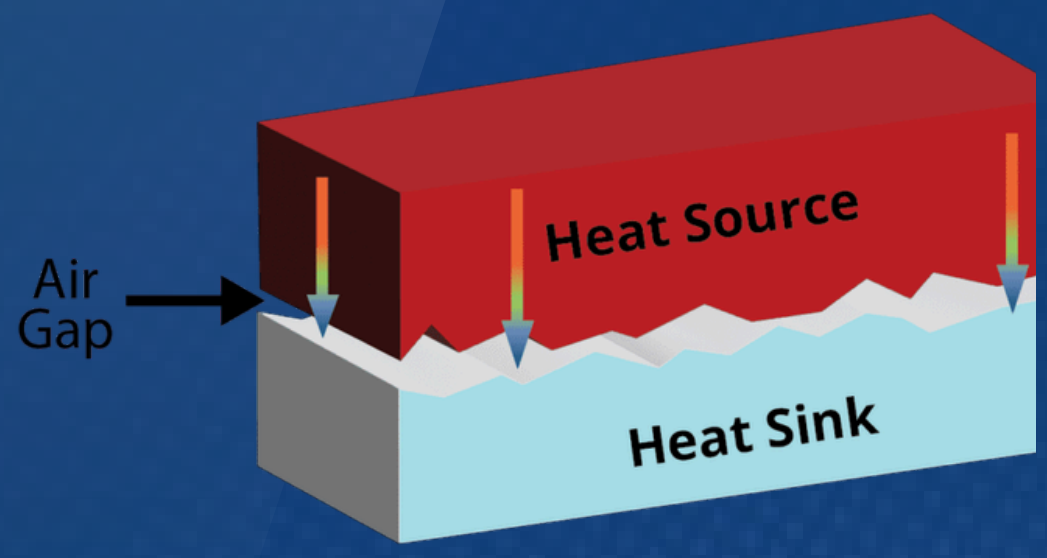
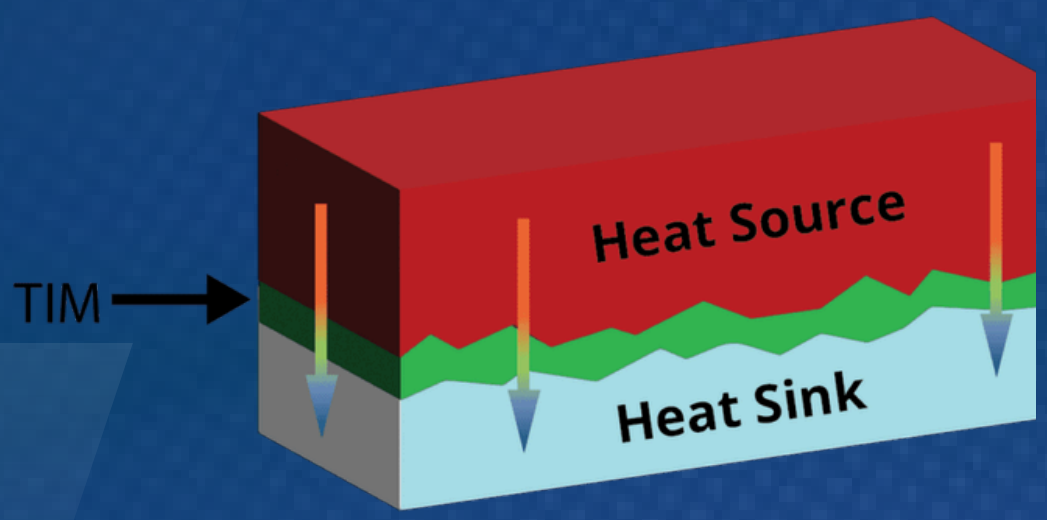
THE SOLUTION
Thermal Interface Materials

Efficient heat dissipation is critical for device reliability and performance. **Thermal interface materials (TIMs)** bridge the microscopic air gaps between uneven surfaces—such as CPUs, chips, and heat sinks to maximize heat transfer





TIMs are designed to :

FILL AIR GAPS BETWEEN COMPONENTS

TIMs fill microscopic air gaps between components and heat sinks, preventing hotspots and improving heat transfer

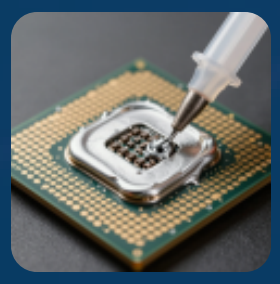
TRANSFER HEAT EFFICIENTLY

TIMs replace insulating air gaps with conductive pathways, improving heat transfer and preventing overheating

ENABLE DEVICE RELIABILITY

TIMs improve thermal management by preventing overheating, and extending component lifespan.

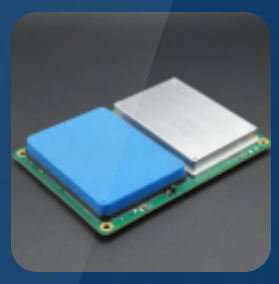
CATEGORIES OF TIMs



Thermal Grease / Paste

Fills microscopic air gaps between surfaces

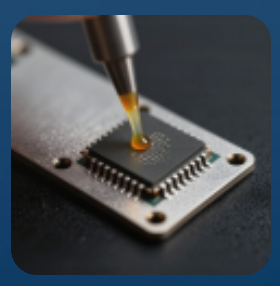
Used In: CPUs, GPUs, power modules, heat sinks



Thermal Pads & Gap Fillers

Bridges larger gaps between uneven components

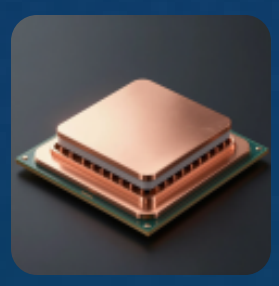
Used In: EV battery packs, LED modules, automotive ECUs



Thermal Adhesives

Provides both heat transfer and structural bonding

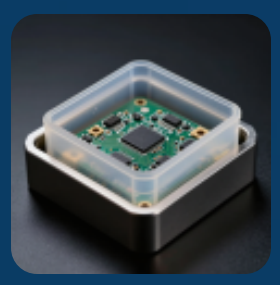
Used In: Sensors, compact electronics, wearable devices



Phase Change Materials

Reduces interface resistance through phase transition

Used In: High-performance processors, servers, telecom



Encapsulants & Potting

Provides thermal management and environmental protection

Used In: Automotive electronics, transformers, chargers

Advanced Thermal Materials

Next-generation materials engineered with graphene, CNTs, and hybrid fillers for enhanced thermal performance

Used In: AI hardware, aerospace, semiconductor cooling

SELECTING THE RIGHT TIMs

Key factors to consider when choosing thermal interface materials for your application

- **Thermal Conductivity**
  Efficient heat transfer and low thermal resistance
- **Ease of Application**
  Dispensing, assembly time, curing, and rework considerations
- **Reliability & Long-Term Stability**
  Consistent performance over device lifetime
- **Thermal Cycling Resistance**
  Ability to withstand repeated heating and cooling cycles
- **Material Compatibility**
  Compatibility with heat sinks, sensors, substrates, and components
- **Environmental Resistance**
  Performance under humidity, vibration, dust, salt mist, and corrosive conditions
- **Reusability & Maintenance**
  Important for serviceable or replaceable electronic modules
- **Cost vs Performance**
  Balance between thermal efficiency, manufacturing cost, and scalability

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EVOLVING TIM LANDSCAPE

6X

India electronics sector growth over the last decade

Make in India

PLI Schemes

Strong Manufacturing Base

Key Drivers of TIM Market Growth

- Consumer Electronic Surge
- 5G Infrastructure Rollout
- EV & Power Electronics Growth
- AI & Data Center Expansion

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CHALLENGES & OPPORTUNITIES

CHALLENGES

India still faces

- High cost of advanced materials
- Heavy import dependence
- Limited local manufacturing
- Supply chain risks are real

OPPORTUNITIES

- Local manufacturing
- Advanced material Innovation
- Application specific solutions

"More than a materials opportunity, this is a shift toward **precision-led thermal engineering**."

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INNOVATION DEMANDS BETTER THERMAL SOLUTIONS

The global electronics landscape is being reshaped. India is at the centre of this transition. Thermal management is no longer support, it's a core design decision.

Ready to build thermally reliable electronics?

From material selection to thermal interface solutions, VantageChem Consulting helps OEMs and electronics manufacturers choose the right materials for performance, reliability, and scalability.

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