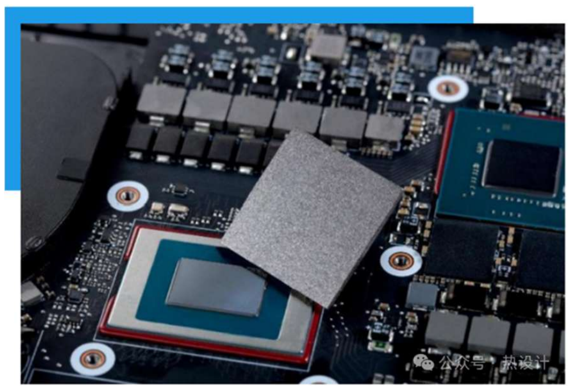
Solving The Heat Crisis of AI Data Centres

Problems

Heat density per unit area

As the integration of AI chips continues to increase (NPU, GPU, CPU, etc.) the volume of the chips has not increased, however the computing load on each chip has significantly increased, this results in a continuously increasing heat density per unit area (W/cm^2)

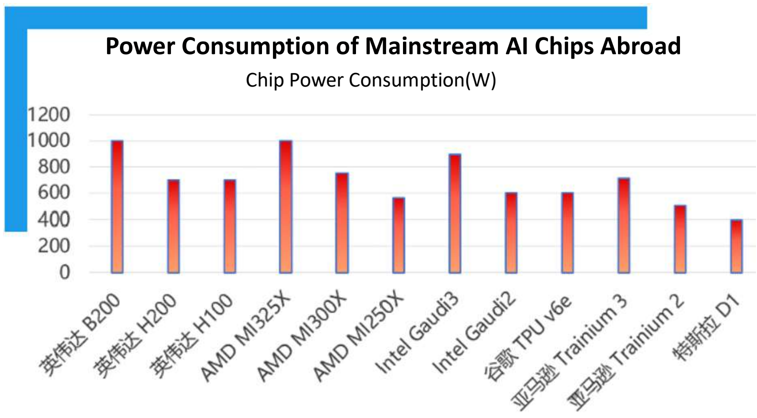


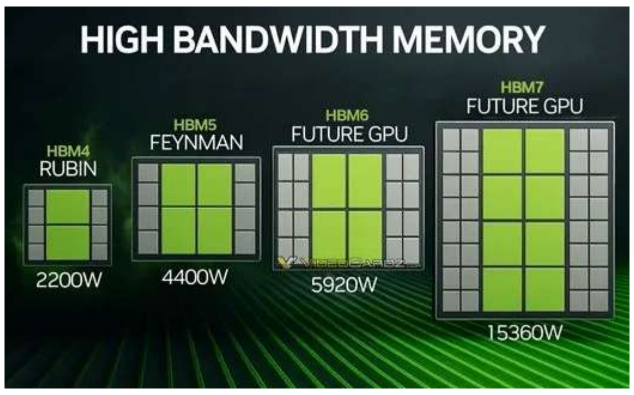
Limitations on vertical heat paths

The head generated by the chip needs to be conducted to the heat sink in the vertical direction, and this path is often limited by factors such as the chip packaging structure and the thermal resistance of the thermal pad, if the thermal conductive material or design is unreasonable, the head of the chip will accumulate in the core area, forming a “thermal bottleneck” and reducing the heat dissipation efficiency, this happens most often in the automotive environment.

Long term high-load operation

Due to AI chips often being in a long-term high load operative state, they are prone to generating continuous and stable high heat output. Traditional passive heat dissipation methods are ineffective to maintain stable chip temperatures for long periods as if the heat is no released in time, it is easy to trigger the frequency reduction protection mechanisms that are incorporated into the chips, this in the long-term reduces system stability and performance.





Solutions

Breakthrough in thermal conductivity

The recent breakthrough of using Graphene Thermal Pads (GTP) for heat dissipation has proved highly successful due to the fact that GTP head transfer is uniform, meaning that it can effectively avoid any hot spot accumulation issues that may occur from using traditional passive methods.

Unlike previously used methods, GTP has no deformation and pumping risk, no cracking from long term high temperature operation, meaning the part is much more stable, and reliable for long-term thermal resistance.

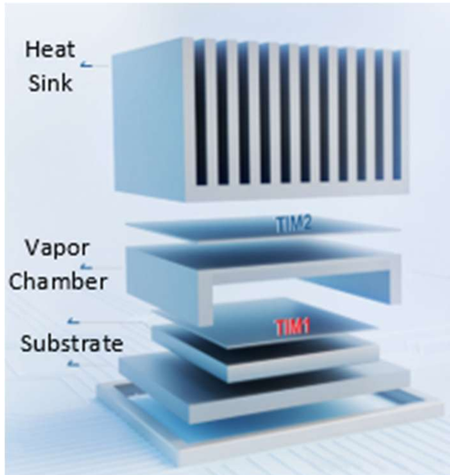
Adaptability

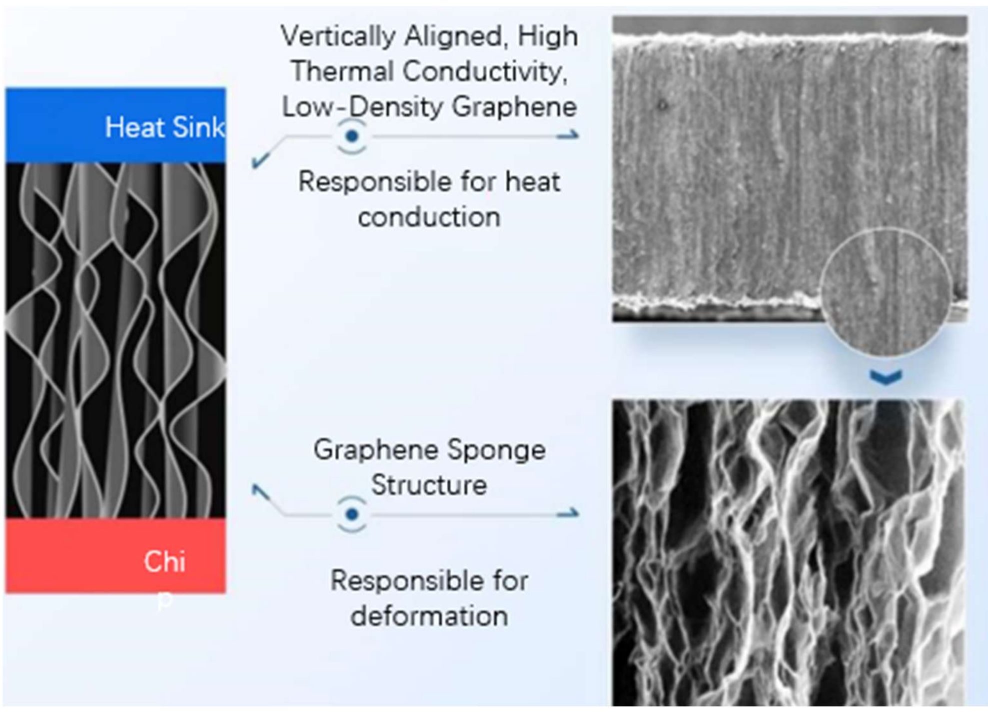
GTP is much more suited to cooling in the AI Chip sector as the parts can offer much better stronger flexibility compared to traditional silicone grease, meaning it can effectively fill interface gaps and increase thermal contact.

The Siloxane content is also extremely low, allowing for a higher cleanliness and high reliability, this makes GTP extremely effective for high-end thermal control applications that have low volatility requirements.

Installation

GTP is far easier to install in applications, compared to products such as indium sheets, GTP can be mounted automatically. It does not require a complex process that comes with other products (gold plating, welding or flux treatment), it avoids problems such as sheet reflow contamination and large voids. All these factors result in reduced equipment costs and increased production efficiency.





GTP75		
颜色/Color	黑色	目视/Visual
厚度/Thickness	0.2～1.0 mm	ASTM D374
密度/Specific Gravity	0.7 g/cm^3	ASTM D792
导热率/Thermal Conductivity	25 W/m・K	ASTM D5470
热阻/Thermal Resistance	0.12 ℃*cm^2/W	ASTM D5470
防火等级/Flammability Rating	V-0	UL 94
适用温度/Operating Temperature	-50～200℃	***
渗油率/Oil leakage rate	≤2.0%	***
回弹率/Rebound rate	50%	***
RoHS	PASS	IEC 62321
Halogen	PASS	EN14582
REACH	PASS	EN14372

Boron Nitride Thermal Pad

The High-Power Electronic Products Promoted

The development of information-based technology accelerates the requirement of miniaturized integration of electronic equipment, due to the miniaturization, heat dissipation and reliability become big issues, causing difficult design bottlenecks.

Mismatched Thermal Expansion Coefficients

Devices tend to have inconsistent TEC due to different designs, temperature changes in these devices can cause bending and deformation, long-term thermal cycle squeezes the gasket, which in turn will cause gaps to form and increase thermal resistance further.

Traditional Silicon-Based Thermal Interface Materials

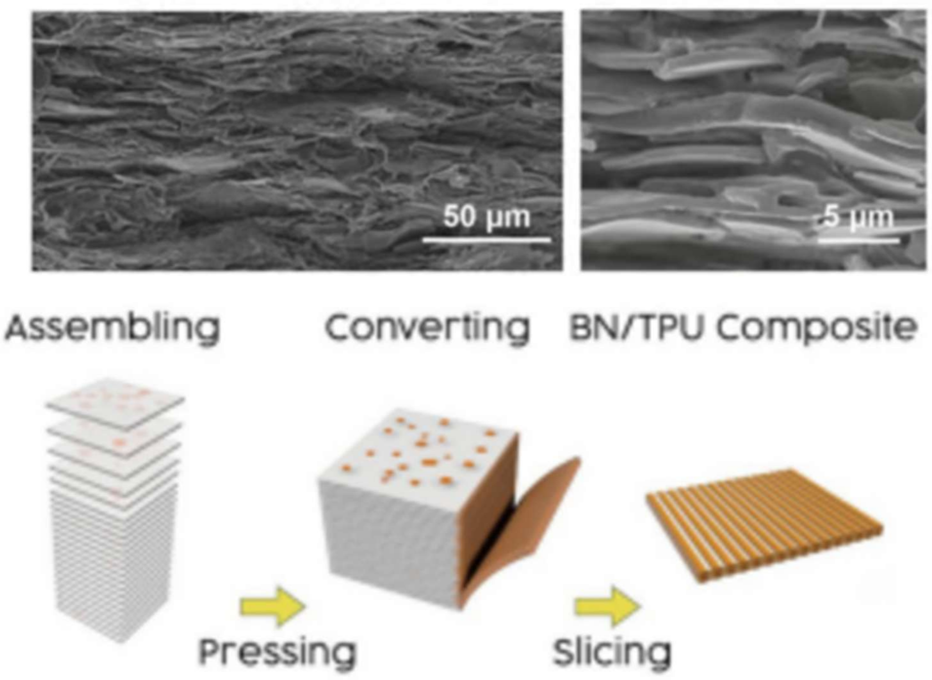
These materials have almost no compression rebound characteristics, long term use of these materials lead to delamination. High-temperature aging aggravates the material and increases chances of failure, causing the integrity of the heat dissipation path to fail.

Either High Thermal Conductivity or Resilience? Meeting The Three Requirements

High thermal conductivity materials require high filler content; this results in outstanding powder characteristics. It is generally difficult for the industry to meet the three requirements of thermal conductivity, softness and rebound at the same time.

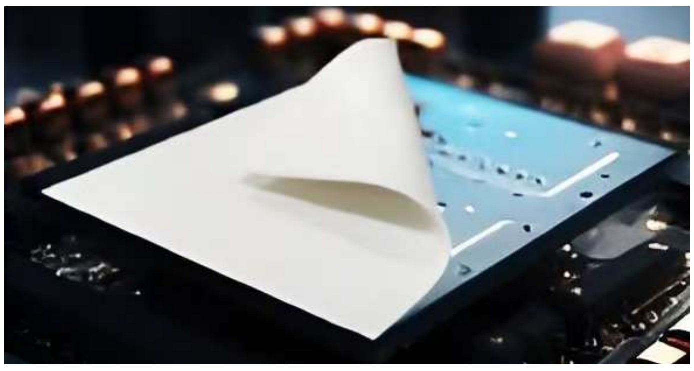
Key Breakthroughs in Material Technology

By optimizing the powder pre-treatment and mixing processes, we have successfully developed a thermal conductivity of 16W/mk and a rebound rate of >60%, this is available in mass production and in applications requiring high thermal conductivity & reliability.



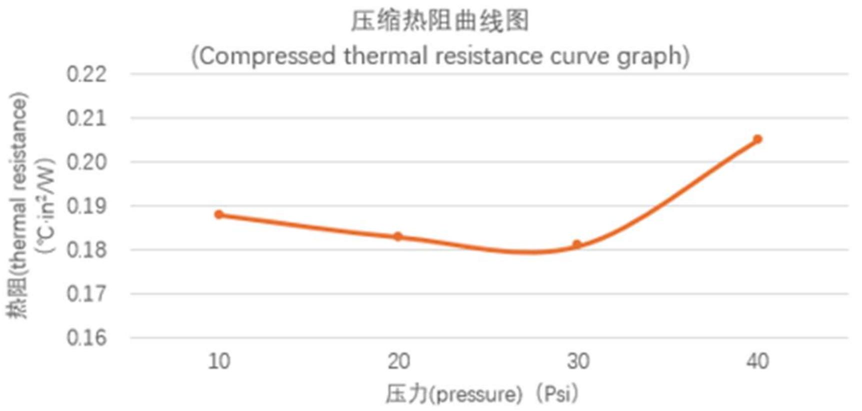
Applications of Boron Nitride Pads

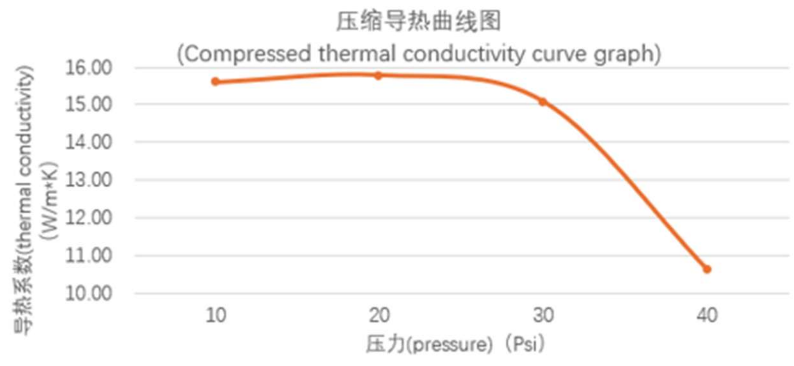
- Car Inverters
- DC-DC Converters
- IGBT Transistors
- Charging Piles

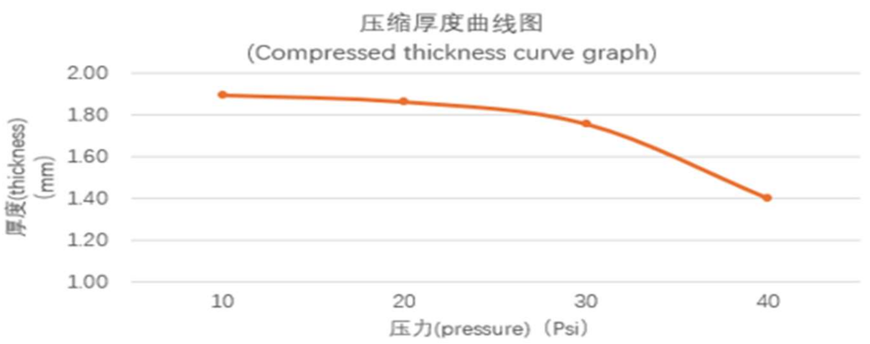


Boron Nitride Thermal Pads

WG-160BN		
颜色/Color	白色white	目视/Visual
厚度/Thickness	2.0±0.05 mm	ASTM D374
密度/Specific Gravity	1.68 g/cm³	ASTM D792
导热率/Thermal Conductivity	16 W/m·K	ASTM D5470
热阻/Thermal Resistance(2mm,@50psi)	0.19 ℃*in²/W	ASTM D5470
常规硬度/hardness (Shore 00)	70±10	ASTM D2240
击穿电压强度/Breakdown Voltage Strength@AC	7KV	ASTM D149
防火等级/Flammability Rating	V-0	UL 94
体积电阻率/Volume resistivity	$2*10^{13}\Omega$.cm	ASTM D257
适用温度/Operating Temperature	-50~200℃	***
渗油率/Oil leakage rate	1.1%	***
回弹率/Rebound rate(2mm,50%)	50%	***
RoHS	PASS	IEC 62321
Halogen	PASS	EN14582
REACH	PASS	EN14372







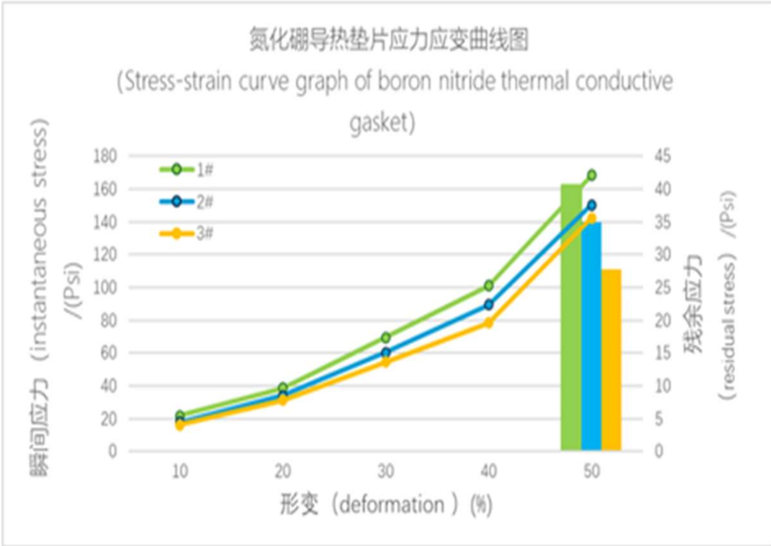
Boron Nitride Thermal Pad

Reference Standard: ASTM D575

Sample Dimensions: 25 mm×25 mm×2 mm (L×W×H)

Test Procedure:

Apply compression at a speed of 0.5 mm/min. The specimen is gradually deformed to 50% of its thickness, and the change in force is recorded. Maintain the deformation for 10 minutes. After releasing the load, measure the thickness change after 30 minutes.



Sample No.	1	2	3	Average	Note
Resilience (%)	28	27	26	27	Proportion of the total thickness

Test Item	Test Date	Deformation				
	Sample No.	10%	20%	30%	40%	50%
Instantaneous stress corresponding to 10 - 50% deformation/Psi	1	21.8	38.51	69.42	101.14	168.26
	2	17.65	34.12	60.32	89.35	150.37
	3	16.35	31.28	54.36	78.24	142.35
	Average	18.6	34.63	61.36	89.57	153.66

Instantaneous Compressive Stress