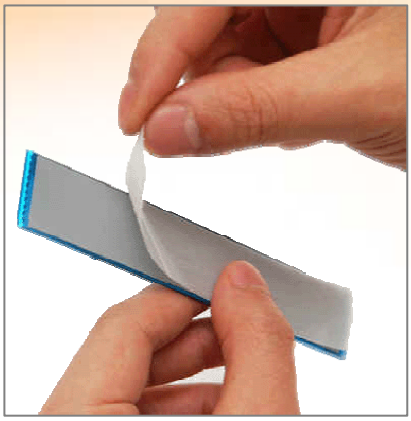
❑ NANOTIM PCM

High Performance Phase Change Material

- **PCM25 troubleshooting the electronic heat**



PCM25 is designed to meet the need of customers in solving the heat problem from the electronic component such as high end CPUs, GPUs, FB-Dimm and custom ASICS chips.

PCM25 is a wax-based phase change material made from a paraffin wax with thermally conductive material and metal oxide fillers. The product offers high thermal conductivity, virtually no wide operating bleed or evaporation over temperature range.

Over the transition temperature (45°C), PCM25 changes solid to soft state. Especially it has superior wetting and low viscosity properties and so effectively fills the microscopic surface of the component, resulting in very low thermal resistance.

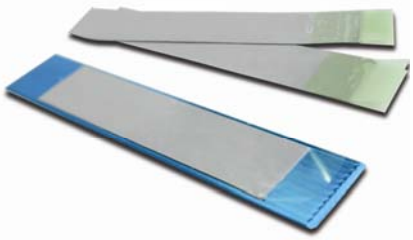
PCM25 is an efficient thermal coupler, effective and positive heat sink sealers and heat transfer agent.

PCM25 is very stable at elevated temperature. It does not dry out, separate or settle. So it is superior reliable properties at temperature range.

PCM25 is easy handling, flexible and sticky properties for their pad-like at room temperature. PCM25 is also to meet all environmental requirements including RoHS.

- **Application Fields**

- CPU (Notebooks, Desktops, Servers)
- Custom ASICS Chips
- GPUs (Graphics Chips)
- North & Southbridge Chipsets
- FBDIMM, UDIMM, RDIMM
- Hi-power Module



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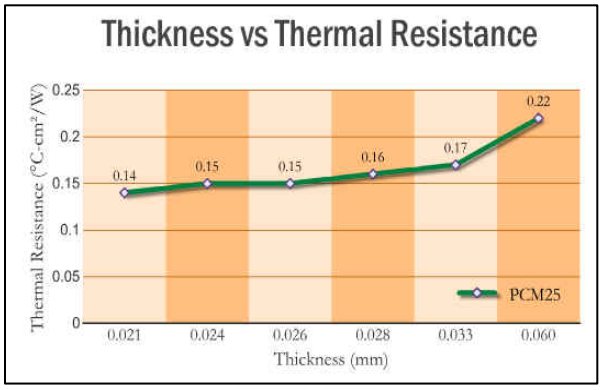
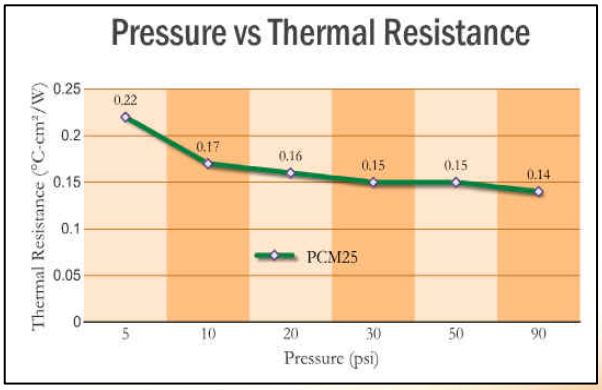
• General Specification

ITEM	Unit	Condition	Test method	PCM25
Reinforcement	–	–	–	Non
Color	–	–	Visual	Gray
Density	–	25°C	ASTM D70	3.2
Thickness	mm	25°C		0.25
Shelf life	Year	–	–	1
Viscosity	Pa • s	10 shear rate, 60°C	Brookfield	75
Thermal conductivity	W/mK	25°C	Laser flash	4.0
Thermal resistance	°C-cm²/W	10 psi	Modified ASTM D5470	0.17
		20 psi		0.16
		50 psi		0.15
		90 psi		0.14
Operating temperature	°C	–	–	−45 ~ 125
Volume resistivity	Ω • cm	–	ASTM D257	2.5X10¹²
Breakdown voltage	kV/mm	–	ASTM D149	2
Flame class	–	–	UL94 rating	V0
RoHS	–	–	–	Not detected

• Thermal Performance Curve





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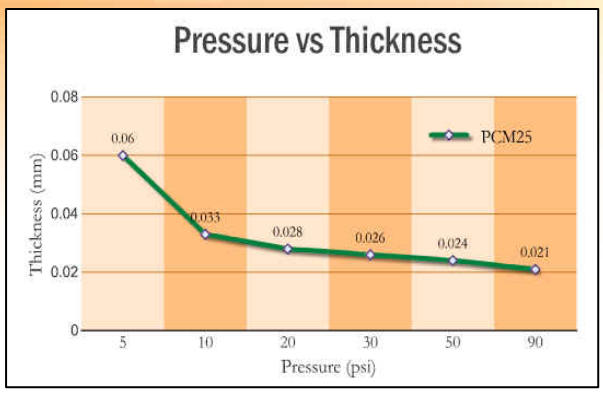
• Reliability Certification

▪ Pressure vs Thickness

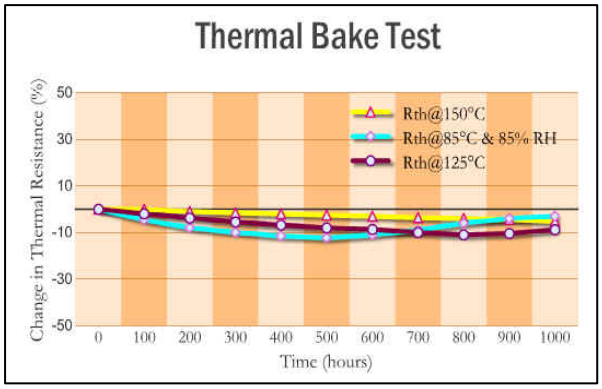
- The important point of applying the component is the relationship between bond line thickness (BLT) and pressure.

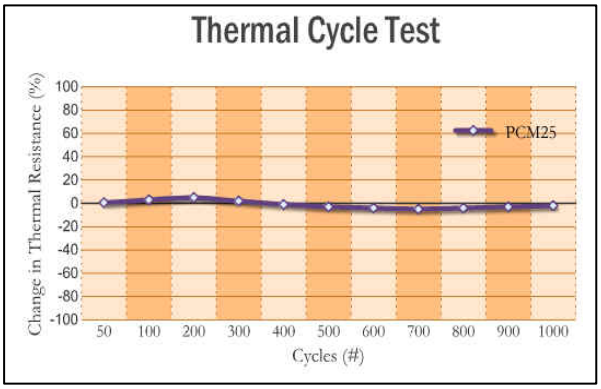
- The chart on the right shows BLT of PCM25 dependent on the pressure. The advantage of this chart can help selecting BLT for tighter control in the use.



▪ Thermal Bake Test

- Thermal bake were tested 125°C, 150°C and HAST condition after the measurement of the thermal resistance.

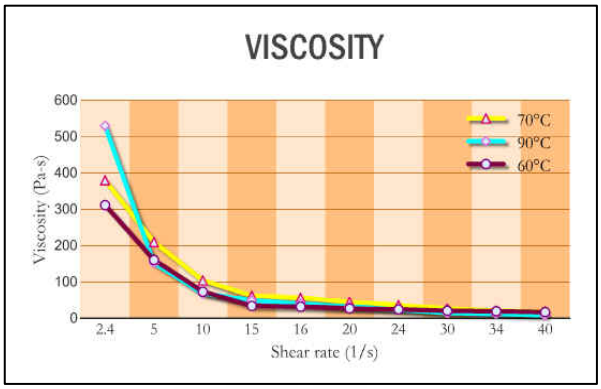




▪ Thermal Cycle Test

- These reliability graph shows PCM25 confirm not to degrade the thermal resistance after thermal cycling, high temperature baking, baking in a high humidity environment.

- During testing, samples of PCM were maintained between two round aluminum disks. Constant pressure was done through clamps



▪Viscosity

- Over the transition temperature, PCM25 changes grease-like state. This chart illustrates the viscosity on the temperature. The Low viscosity on Heating is easy to flow on the surface so that PCM25 completely fill the gap of between microscopic surfaces. The viscosity of PCM25 is very lower than other phase change material.

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- **Application Note**
  - **Organic phase change sheet**
  - **Easy handling/Re-workability**
  - **Low viscosity**
  - **Highly wetting interface material**
  - **Handling/Application Note**

1. Description:

PCM25 is a thermal interface material to meet the requirement of heat in electronic component through high thermal performance. PCM25 is a wax based organic composed of thermal filler, metal oxide and other additive. At typical application operating temperature, PCM25 softens and flows to produce high thermal performance by achieving minimum bond-line and maximum surface wetting. PCM25 is also easy to use and re-workable. PCM25 can be also easily used on the component to need high thermal resistance and reliability. PCM25 meets all environmental requirement Including RoHS and flame rating (UL94). This Application Note contains Recommendations on how to specify, handle and install PCM25 thermal interface pads.

2. PCM25 Size Selection

PCM25 softens and flows under the temperature and pressure conditions encountered in a typical application between a hot component and its cooling component. During the initial power cycle, as the PCM25 pad softens and flows to displace air in the interface gap, the average thickness of the pad will decrease and the total area covered by the pad will increase.

PCM will be increased on the order of 30% in length and width. This 30% length/width increase was determined using a "generic" heat sink, its associated metal spring clip and a microprocessor device with integrated heat spreader. It is very important that thermal interface material is to fully cover the footprint of the heat generating device. Each application will vary in terms of flatness, co-planarity, applied clamping pressure, operating temperature, PCM25-to-spreader placement tolerance, spreader-to component placement tolerance, etc., so it is recommended that the PCM25 size is verified through actual testing to be sure that thermal requirements are met.

3. Mounting Surface Preparation

The mounting surface, usually the heat sink, spreader, pipe or its integrated form, should be clean and free from machining oils and aluminum dust, and may be cleaned with any common solvent, such as isopropyl alcohol (IPA) if necessary.

4. Installation of PCM25

PCM25 does not require pre-heating of the (integrated) heat spreader prior to installing the PCM25 onto the heat spreader substrate. The Inherent "sticky or tacky" nature of PCM25 is sufficient for the PCM25 pad to adhere to the substrate surface.
However, due to the phase change nature of the PCM25 material, please follow the relationship thickness and pressure chart to ensure the best results for a specific assembly process:

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• Application Note

5. Initial Re-Flow of PCM25

As with any (PCM) phase change material, PCM25 material requires an initial phase change to achieve optimum thermal performance. Initial thermal performance will behave as a dry joint thermal interface, because the material has not yet driven out the air gaps between the heat spreader and the component. Re-flow and wetting of the surfaces typically takes only a few minutes once the 45°C phase change temperature is achieved. Also, allowing the monitored electronic component to reach 60°C, the PCM25 sheet would fully change phase for maximum wetting. Pressure enhances and accelerates the effect. After this initial re-flow, the interface resistance will behave as high performance thermal grease, even after powering down of the microprocessor. Unless the heat spreader is removed from the component the initial high interface resistance will not be seen during subsequent power cycles.

6. Rework instruction

Typically, the heat spreader can be separated from the component with the help of a mini screwdriver, without elevating the temperature. If heating is possible, it will facilitate the separation of the heat spreader from the component. If heating is used, then first allow the heat spreader and component to cool down. A razor blade can then be used to scrape the residual

.

PCM25 material away. Chemically, the residual PCM25 can be softened with either MEK (methyl ethyl ketone), or IPA (isopropanol), or toluene. The residual material can be removed by wiping with a cloth.

7. Handling and Storage:

Handling:

- This product may cause skin irritation.
- Avoid skin contact.
- If contact does occur, wash immediately with soap and water.
- Please refer to MSDS for more details.

Storage:

PCM25 is a temperature sensitive material, and should be stored below 35°C. Short term exposure to higher temperatures, up to 45°C during product shipment will not affect product performance. It is recommended there is no weight pressing down onto the PCM25 on preventing wrinkling of the sheet

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