

Reflow Viscosity: Thixotropic

Thermaphase is solid, easy to handle, and flexible at room temperature. When heated beyond its re-flow temperature (52°C for example) it does not flow under its own weight. It is Thixotropic*. It takes some pressure to make it flow. This pressure can be applied in many different ways:

- A) Spring Clips. These provide constant closure force even though the interface material thickness decreases during re-flow.
- B) Screws (in this case you may need to re-torque screws after re-flow)
- C) Spring Loaded Screws (don't require re-torque of screws after re-flow)
- D) Bellville Washers (conical, or wavy washers that maintain compressive force when interface becomes thinner during re-flow). These do not require retorquing after interface reflow.

With pressure and heat applied to the Thermaphase, the interface material re-flows and becomes thinner. Excess material forms a bead around the component perimeter during initial re-flow. This is a very important feature of Thermaphase because some competitive products easily flow from between the component and heat sink, especially if there are significant gaps between them. Other products claim low thermal resistance but then you find in the fine print that the thermal resistance is at a closure force of 438 psi! Who has bolts strong enough to do that? For a 2x2" package you would have to apply 1800 psi! Compare that with Thermaphase Free Standing Films, for example, which have a Thermal Resistance of only 0.03 °C/W/in² at 4.5 psi (yes, that is 4.5, not 450...)

The thermal resistance of Thermaphase becomes lower as you increase the closure force. For example, at 4.5psi it is 0.03 °C/W/in². At 60psi the thermal resistance falls to 0.01°C/W/in².

*Note: The word "Thixotropic" is used in a popular sense to mean a material that is of high enough viscosity that it won't flow under its own weight in "thin sections". The correct scientific meaning of "thixotropic" or "thixotropy" is a rheological state where viscosity decreases with increasing shear. The term "dilatants" or "dilatancy" means that the viscosity increases with applied shear. Another viscodynamic state is "rheopectic" which is a time independent dilatancy. The simplest type of fluid behavior is "Newtonian" fluid, which is shear independent.