

Selecting the Appropriate Tg for Underfill

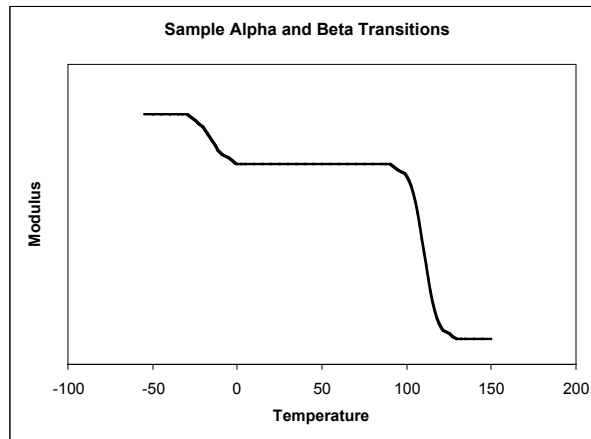
Tg (glass transition temperature) is the temperature at which a polymer drastically changes its properties. Some of the properties that change are modulus, coefficient of thermal expansion, and electrical impedance. Tg is measured to advise the maximum temperature the underfill can encounter before its characteristics change. Tg is not the temperature at which the material fails to work, however, occasionally the material may be less resistant to the environment above this temperature.

Although Tg is specified as a single temperature, it is generally a 15 - 20°C temperature range. It is common for many potential underfill users to simply choose the highest Tg offered, relying on a misconception that high Tg equates to higher reliability. The reality is that choosing a lower Tg that still fits the application may be a better choice.

Choosing an underfill with a Tg slightly above the components operating temperature will allow the underfill to still maintain a good balance of characteristics. As a general rule, the attractive properties of polymers are balanced during formulation, and an especially high Tg may lead to higher modulus, or lower humidity resistance.

A second processing through the glass transition temperature is known to relax stresses in the polymer that occur during component attachment. After secondary heating of a polymer, it is often possible for the material to obtain a lower modulus. This lower modulus should reduce stresses on the underfilled component's solder joints as well.

A high glass transition temperature is a good feature, but it is only one characteristic of the overall material. It should also be mentioned that there are some very good performing underfills which have a Tg value at or below room temperature.



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