

BBG Tech Tips

“Td” doesn’t mean Touch Down!

Tg, Td, CTE/Z-Axis expansion—some quick definitions about material

Tg—*glass transition temperature*—is the temperature at which the material transitions from a rigid state to a softened state. Surpassing a material’s Tg is believed to result in a significant reduction in copper adhesion, an increased risk of measling and a reduction in the reliability of plated through holes (PTH). It is expected that the copper bond to most epoxy/glass materials will degrade slightly each time the material is exposed to temperatures above the glass transition point.

Td—*decomposition temperature*—is used to assess thermal survivability. (The temperature at which material weight changes by 5%.) Td is considered the point where a material might be inclined to blister and/or delaminate due to pressures created by out-gassing. Industry experts are suggesting that the Td is much more important than the Tg and Z-axis expansion (CTE) should also play a larger part in material selection.

CTE—*coefficient of thermal expansion*—or the change in material length per unit rise in temperature, plays an important role in the assembly process. The higher soldering temperatures and numerous thermal cycles required for a lead-free assembly may result in higher **Z-axis expansion**—*relative to the board thickness*—which may affect PTH reliability. Lower CTE values increase PTH reliability or rather hole barrel integrity.

Managing the radically different and narrow thermal process window of lead-free assembly requires fresh thinking and new procedures. Elevated reflow temperatures threaten hole reliability, increase the risk of delamination and may cause warpage.

Research for the above information may be from, but is not limited to, IPC reference manuals, the PCB Handbook, the Bare Board PWB Design Manual and consultation with industry professionals. Please consult a process engineer familiar with your company’s PCB assembly process before making any procedure changes.