Nano Die attach Material used in High Power Electronic Device Package

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Abstract

Nano material is one of the noble material for next generation high performance power electronic application. The main point of interest of the research is to use the nano silver die attach material as a hotspot thermal management package material in power electronics to achieve lower hotspot temperature, lower thermal resistance and better operating thermal performance. Nano silver die attach material used in complex power electronics hybrid packaging for silicon and SiC die attach that improves thermal conductivity, reliability, and eases manufacturability versus traditional solder paste processes.

Nano silver die attach material will be introduced as a hotspot thermal management die attach material in DCB based MOSFET package with diverse types of ICs for next generation green, complex but smaller and high-power capability electronic product to serve the purpose of the reliable power electronics.

In power electronics silicon is replaced by wide band gap semiconductor materials gallium nitride, silicon carbide because of their high thermal performance capability at elevated level of power. Nano package materials play a key role to handle the elevated temperature and power in high power integrated chips such as power MOSFETs, IGBTs. These nano materials not only suitable for high power devices but also develop the green technology trend by replacing the use of Pb-based solders in electronic ic packaging industry.

Computational fluid dynamic(CFD) based flotherm thermal modeling and simulation tool is used to develop the thermal model of power IC considering diverse types of package materials such as solder paste, epoxy, nano silver die attach material etc. Several types of package materials are compared and analyzed to develop the nano package based thermal model in power package application. Result shows the importance of nano package materials use in power product development.