

Thermal Analysis of Die Attach Materials for a High Power GaN Device

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StratEdge recently conducted a series of thermal simulation to compare how well heat is dissipated from a GaN-on-SiC device under various package and assembly conditions. The purpose of this presentation is to describe the simulation model and to present the results. The simulation software used was PTC CREO developed for use with Ansys. The device used in the model is a 10-Watt high power GaN amplifier with three output stages. The output stages are evenly spaced near the output end of the device and each generate 3.333 Watts. The device is attached to a metal heat spreader that is the base of a ceramic package. For the purposes of this study, materials were used that have CTEs known to match that of GaN-on-SiC, therefore the effects of potential mismatches are not discussed. So too for the dieattach materials. The modulus of elasticity of solder alloy verses organic polymers can be important as are many other factors, but the focus of this study is on heat transfer and T_j of the device. The T_j is the highest operating temperature of bottom on the device in the package. The T_j has a direct correlation to reliability; the lower the T_j , the longer the device lasts. By using packages made with copper-molybdenum-copper laminate bases and a AuSn eutectic die attach method that uses mechanical agitation and heat, device temperatures are shown to be reduced compared to industry standard package and assembly materials, which validates customer observations of the system.