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Effect die attach adhesives on wire bonding integrity and its viscoelastic analysis

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Thermosetting resins like epoxies have been most widely used for die attach adhesive but their application in plastic packaging has reached the limit of mechanical reliability due to packaging trends toward larger die sizes, thinner package body, higher integration levels: typical example is high pin TQFP(thin quad flat package). In TQFP, epoxy adhesive currently in use is being applied only to smaller die size less than 20 mm in length or so, because of its high modulus resulting in thermal stress during board mounting as well as critical warp during packaging process. On the other hand, a low modulus adhesive tailored with linear polymer can reduce such demerits of high modulus one. The flexible thermoplastics behave as stress absorber in cured epoxy matrix so that low modulus adhesive is fit for somewhat large die size application. Inversely, such adhesive has lower die size limit in use mostly because of dampening of ultrasonic energy being applied to the bonding pad during thermosonic wire bonding. In this study, viscoelastic properties of die attach adhesive affecting wire bonding stability were investigated as a function of modulus, and dampening effect was experimentally simulated using DMA (dynamic mechanical analyzer). As a result, we could suggest optimal viscoelastic behavior of die attach adhesive ensuring stable packaging process and high reliability. Even though the modulus at room temperature is low enough for getting stress absorbing, the modulus at wire bonding temperature around 240C has to sustain to some extent to get rid of dampening effect. For the better performance both in processability and reliability, material with smaller modulus difference between room temperature and high wire bonding temperature is recommendable.