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Glass Transition Temperature: A Critical DAF Characteristic on COL Packages

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I. Overview

- Chip-on-lead (COL) packages in Fig. 1 are very small packages wherein the die is mounted on the leads and on the die pad which is also part of one of the leads

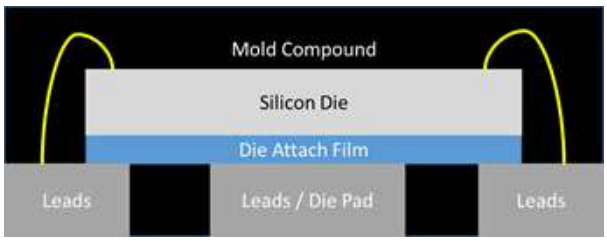

Fig. 1. COL package.

- Non-conductive die attach film (DAF) is normally used as adhesive to connect or attach the silicon die into the leads without any electrical connection to its carrier or leadframe

II. Problem Identification

- One of the critical issues encountered on COL packages is the DAF sagging in Fig. 2, wherein the DAF is bleeding out or sagging with respect to the die pad

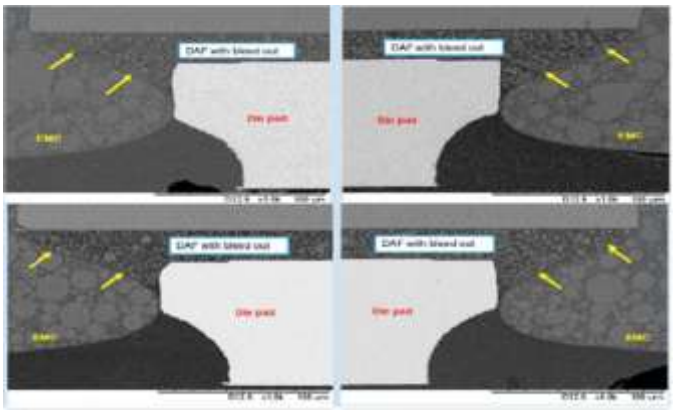

Fig. 2. DAF sagging or bleed out.

- DAF sagging normally happens when there is instability of the uncured DAF material, wherein abrupt thermal loading is happening during the assembly process

III. Process Solution and Improvement

- Series of differential scanning calorimetry (DSC) tests were performed to check if the DAF material is fully cured after several minutes of curing, with results showing DAF material cured at 83% only
- With this, a change of glass transition temperature from 215°C to 50°C was conceived to assure the DAF material to be fully cured even after the DAF attach process
- After DSC test of the new DAF material with low glass transition temperature, its showed a peak temperature of 56°C with 1.4J/g heat flow, and this time, there are no DAF sagging observed in Fig. 3

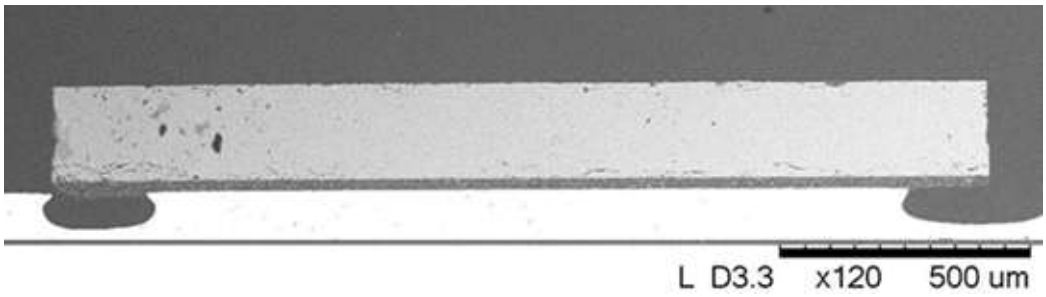

Fig. 3. No DAF sagging were observed

- Ultimately, the change of glass transition temperature significantly aided the DAF material to stabilize its state, which is very critical for overhang applications on COL packages

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