



Solutions for Adhesive Curing
An Application Case Summary

Large Area Die Attach

Ref: 2-304

Topic Reference:

High value DWDM products for opto electronic package die attach cure

Problem Statement:

Automated manufacturing of high-end, opto-electronic devices is still evolving. Reducing yield loss in high value DWDM (Dense Wavelength Division Multiplexing) products is a key factor for overall cost reduction in opto-electronic devices. The complexity of these devices leads to challenging assembly practices. High precision assembly is required to alleviate stress build up on large die that could warp resulting in signal loss. Reported manufacturing yields are as low as 50%. One manufacturing process that contributes to this yield loss is the die-attach and cure process. Stress and/or minor warpage in the large silicon chip due to mismatch of coefficients of thermal expansion (CTE) between die and substrate will cause minor distortions of light paths or misalignment at interconnects. A controlled, stress free cure cycle is mandatory and very difficult to obtain with a long convection cure process.

Proposed Solution:

Variable Frequency Microwave (VFM) technology reduces cycle time while tightly controlling the cure profile. Generally, microwave is well known for accelerating reaction rates such as needed to cure adhesives, by as much as 10 to 20 fold. VFM is a unique microwave technology that allows the benefit of microwave rapid curing without the associated side effects of fixed frequency such as arcing and non-uniformities. By rapid sweeping through a broad range of frequencies, VFM produces uniform energy distribution while eliminating the problem of arcing. This permits use of microwave (VFM) in the presence of metal, circuits, and high value semiconductor assemblies. VFM absorption characteristics are such that fibers are not heated while the die attach adhesive and silicon die are at cure temperatures. The controlled cure profiles along with selective heating minimize CTE mismatch, reducing stress and enhancing process yields.

Realized Benefit:

A leading manufacturer fiber optic components and assemblies used VFM for the die attach process required on DWDM devices. The results showed a dramatic improvement in process yields and reduced the oven cycle time from 30 minutes to just 5 minutes. The yield improvement was two fold: first, the apparent reduction in die warpage minimized signal loss during cure and second, the ability to test components every 5 minutes instead of waiting 30 minutes enhanced throughput efficiency. The customer also found that they could adjust and optimize the VFM cure profile during the process by monitoring signal level while curing.

Summary:

- ~~///~~ **Reduced Process Cycle From 30 Minutes to 5 Minutes**
- ~~///~~ **Changed Manufacturing Yields From 50-60% to Over 90%**
- ~~///~~ **Permitted In-situ Cycle Profile Optimization – Minimizing Loss**