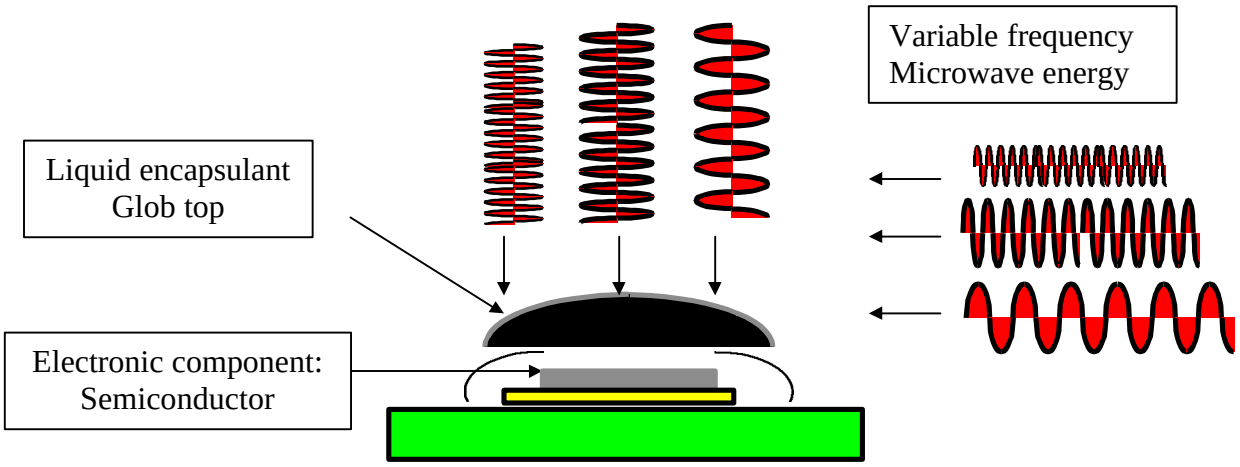
MicroCure™ – VFM
rapid cure processing

Application Note

MC 98 – 203

Subject: **Chip-On-Flex, Glob Top Cure**
Dexter 4401 & 4451

VFM Background: VFM processing is a controlled approach to uniform distribution and selective heating with microwave energy. The technique was developed for the purpose of processing many of today's advanced materials, with particular applications in the area of polymer adhesives and encapuslants used in electronic packaging. VFM provides rapid heating at the molecular level, hence is volumetric, and is distributed uniformly throughout the material by sweeping across a wide frequency spectrum. In addition, by sweeping through the complete variable frequency range in tenths of a second, the process eliminates any conditions that would create arcing or damage to metallic components or circuitry. Furthermore, VFM heating is inherently selective and, as a result, the heating of an encapsulant material to cure temperature is often accomplished without raising the substrate temperature to anywhere near the same level.



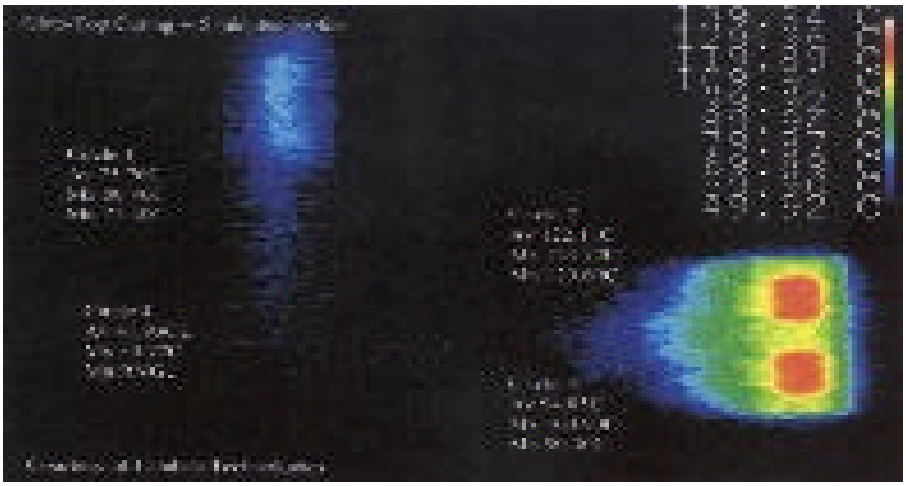
The Encapsulation Process: The demand for lighter, faster, smaller and less expensive products has led the electronics manufacturing industry to the use of new packaging techniques such as DCA and Chip on Board technology. Implementation of Chip on Board design requires the use of a liquid encapsulant as a glob top or a cavity fill and dam process, depending on the circuit configuration. However, these advanced polymeric materials have cure times ranging from 1hour up to as long as 4 hours at temperatures of 150 to 165ºC. This cure process has created problems in manufacture, related to production throughput, factory space, inventory levels, quality control, and overall stress on the die. VFM has been successfully demonstrated as an alternative to conventional oven methods to address all these critical factors.

VFM results of Curing Encapsulant Materials: Dexter FP 4401 and 4451 materials have been evaluated successfully using VFM cure techniques. The table below summarizes the VFM results of trials specifically using Hysol® 4451 for a glob top over COB placed on a polyimide flex circuit. Detail description of process trials, along with suggested cycle profiles when using this material also follow.

	Conventional	**VFM**
Cure cycle time/temp	30 minutes @ 125ºC 90 minutes @ 165ºC	7.5 minutes @ 120ºC 7.5 minutes @ 155ºC

Tg Properties, Radius of Curvature and Adhesion were equivalent between Conventional and VFM cured samples.

The temperature profile conditions with VFM provide for inherent selectivity of heating. This is demonstrated by the IR thermal image taken of the flex circuit after coming out of the VFM curing system. This circuit consists of two 10mm COB assemblies at the end of an L-shaped flex, with a connector on the other end. As noted, the VFM energy heats the die and encapsulant material, without heating the flex circuit traces and just a slight heating of the connector assembly.



Functionality & Reliability Testing: The flex circuit assemblies used in the above trials were live circuits and were subjected to functionality and reliability test cycles. Following microwave cure of approximately 64 assembles the parts were tested for functionality with 100% acceptance. A sample quantity of assembles successfully passed thermal cycling tests, up to 1,000 cycles. Subsequent testing by the original manufacturer for JEDEC Level 4 criteria, resulted in a full **acceptance of the VFM process cycle for production qualification.**

VFM System Configuration: The VFM system used for the above trials was a standard MicroCure 5100, in-line, 700 watt model. This system is a fully automatic package, including SMEMA compatible interface. A cycle time of 15 minutes would be nominal for processing up to six pallets of multiple-up circuits, using approximately 400 watts of total VFM power output.