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Below is copy taken from an internal memorandum of an Aptek® Laboratories' customer

Introduction

The materials lab recently experimented with a new BGA underfill, DIS-A-PASTE 2150-PMF, developed by APTEK Laboratories, Inc. from Valencia, CA. This material is a hybrid epoxy based BGA underfill that is designed to be ***thermally conductive***. Tests were done to characterize the flow characteristics and the feasibility of the material for BGA underflow applications. Various pre mounted BGA's were processed using this new underfill to determine if the viscosity and pot life of the product would produce an underfill adequate for possible use in production.

Experiment

The installation procedure consisted of heating each Practical Components dummy board BGA assembly to 105-110°C on a hot plate and dispensing the thawed liquid adhesive in three progressively increasing "L" shaped patterns. Application was accomplished using a 3cc manual syringe with a 20-mil inner diameter. The different BGA configurations used a 1.5mm pitch 23mm full grid BGA, a 1.5mm pitch 27mm full grid BGA, and a 1.27mm pitch 35mm blank center BGA. The APTEK adhesive flowed smoothly under each BGA via capillary action and complete fillets were formed outside around the perimeters. The assemblies were heated for 90 minutes @ 125°C and inspected for cure completeness. The 35mm BGA was then de-soldered to expose the underfill material. The BGA chip separated cleanly and very few voids were found as seen in Figure 1.

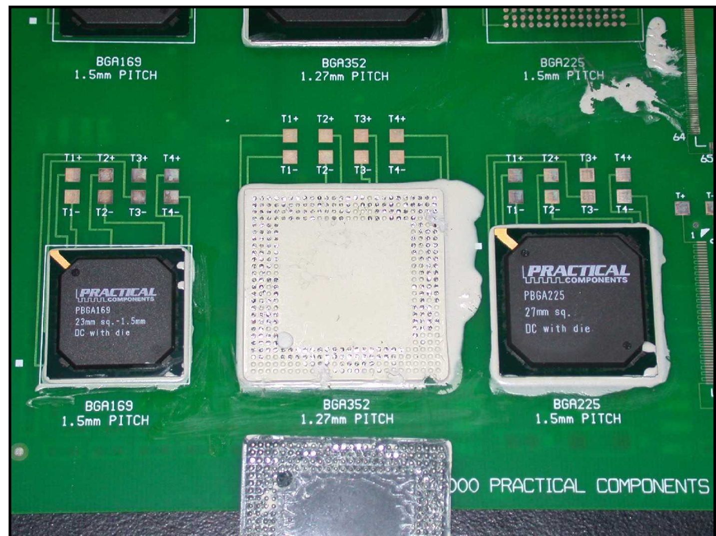

Figure 1. 1.27mm pitch, 35mm blank center BGA removed after APTEK underfill installation. Photo demonstrates good flow characteristics.

Properties

APTEK's DIS-A-PASTE 2150-PMF is a thermally conductive ceramic filled epoxy adhesive. It is delivered in premixed frozen form and has a shelf life of 3 months. 100-105°C work time is approximately 5 minutes with a gel time of 10 minutes and a tested cure schedule of 90 minutes @125°C. The adhesive is designed to provide thermal, shock, and electrical stability to the BGA as well as have re-workable capabilities. Quantifying these characteristics has been done by APTEK Laboratories and typical values for key properties of the BGA underfill are listed in Table 1.

Table 1.

Cured Physical Properties	DIS-A-PASTE 2150-PMF	Test Method
Lapshear, Al to Al, 5 mil bondline, psi	100	ASTM D-1002
Hardness, Durometer A	88	ASTM D-2240
Thermal Conductivity, @25°C (W/m-K)	0.9	Comparison
Cured Electrical Properties	**DIS-A-PASTE 2150-PMF**	**Test Method**
Volume Resistivity, @25°C (ohm-cm)	1.0×10^{14}	ASTM D-257
Dissipation Factor (D)/Dielectric constant (K) @25°C,1KHz	0.030/5.8	ASTM D-150

* Values supplied by APTEK Laboratories