

The Next Big Thing: Self-Aligning, Pb-free Capable Corner Support for CSPs

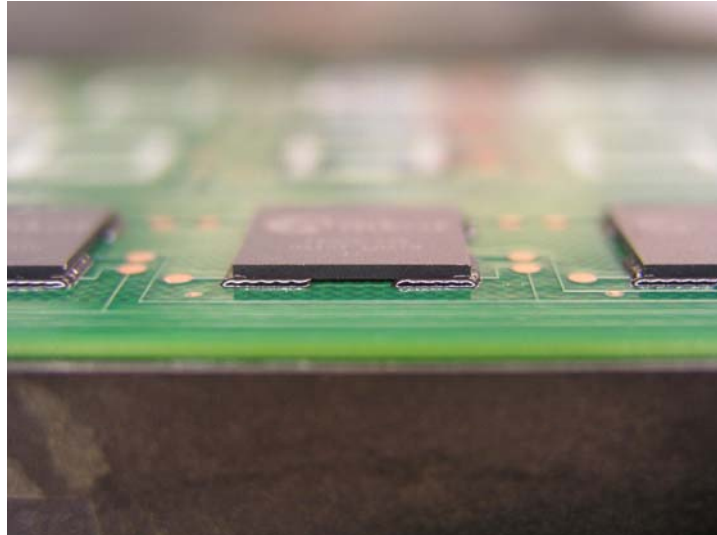
By Brian Toleno, the electronics group of Henkel

In previous writings, I have outlined the case for the use of underfills to enhance CSP support and reduce device stress. While these materials were originally designed to accommodate for coefficient of thermal expansion (CTE) mismatches between the substrate and device, newer generation underfill systems have also found favor among manufacturers seeking to enhance drop test reliability for today's handheld and mobile devices. As the industry has transitioned to lead-free manufacturing and the resulting solder joints have shown a tendency to be more brittle than their SnPb predecessors, providing additional component protection has become imperative for robust long-term in-field performance.

Capillary flow underfills are the best solution for CSP and BGA support in handheld products like cell phones, PDAs and portable music players that have a high likelihood of being dropped. But, for other mobile products like laptops and gaming consoles that may only experience occasional vibration or dropping issues during shipping or bending during card assembly, using a Cornerbond underfill system for these applications is the most cost-effective and time-sensitive solution. With this technology, lines of underfill material are dispensed at the four corners of the CSP or BGA pad site prior to component placement, allowing in-line processing using standard equipment with curing taking place during normal solder reflow. But, like any process, there are some very important considerations – especially in the age of lead-free—that must be evaluated and understood before applying the technology in process.

When using Cornerbond technology, one must realize that the material will be cured during normal reflow and not post-assembly as is the case with traditional capillary flow underfills. Therefore, the materials characteristics of the Cornerbond must be compatible with normal assembly flow and, in the case of lead-free, the higher temperatures of the Pb-free process. In order for the BGA solder reflow process to perform as it should, the solder balls must be able to collapse and self center so that proper interconnections between the device and the board can be formed. When manufacturers attempt to use standard Chipbonder or surface mount adhesive (SMA) materials in a lead-free process to achieve Cornerbond underfill-type reliability enhancement, the results can be catastrophic. SMA materials are not designed for this purpose and, thus, can be quite detrimental. In a lead-free reflow process, most adhesives cure before the BGA solder balls become liquidus and collapse, which normally results in poor interconnections and a high probability of solder joint opens and fractures, yielding decreased reliability or total device failure. In addition, traditional adhesives do not allow for any self-centering so if there has been slight misalignment during the placement process, device and interconnect

centering on the pads cannot occur as the adhesive cures and holds the BGA in place not allowing for any required movement for centering.



Only Henkel's new patented Cornerbond material, Loctite® 3508, delivers the properties necessary to provide superior BGA support while enabling self centering and proper solder sphere collapse. The unique characteristics of the Loctite 3508 Cornerbond system have been designed for lead-free compatibility and move through a standard in-line assembly process, allowing for total ball collapse and providing the self-aligning materials properties necessary to compensate for slight component to pad misalignment during placement. Plus, Loctite 3508 Cornerbond is reworkable, which is key especially in the case of high feature cell phone boards, ultra mobile personal computers, laptops, desktops and server boards. These boards and the larger packages used to populate them are quite often more costly than those used in cell phones, PDAs, MP3 players, digital cameras and the like, so reworkability is a necessary requirement for cost-conscious manufacturers. Easy handling and storage are also advantages of the material. Loctite 3508 can be maintained in standard refrigerated storage, has exceptional stability at room temperature and a pot life of greater than 75 hours – all characteristics which deliver maximum ease-of-use and tremendous cost savings.

All of these benefits – lead-free capability with self-alignment and post ball collapse curing, capital equipment expenditure reductions and significant cycle time improvements– are now available with Henkel's latest generation Cornerbond material, Loctite 3508. Manufacturers can rest assured that components will be well supported, device stress will be reduced, in-line processing can occur with ease and yields and the bottom line will be improved.

For more information on Henkel's Loctite 3508 Cornerbond technology or any of the company's innovative underfill products, log onto www.henkel.com/electronics or call 1-888-9Henkel to speak to a technical specialist.