Low-Stress Die Attach for High Reliability Smart Cards

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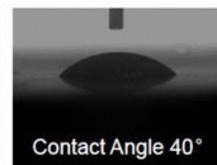
Smart cards have been in the market for a long time. And, in some regions of the world -- namely Europe and Asia Pacific – these devices are the norm. In other locales, such as the US and China, the proliferation of smart cards is a more recent phenomenon. In the US, for example, magnetic strip cards have represented the more prevalent method for data transfer and point of sale transactions. However, the amount of data that can be stored is far more limited with the magnetic strip and certainly not as secure. For these reasons, the smart card is the secure transaction method of choice – at least for now. With the advent of mobile device payment systems, the future is uncertain for smart cards. But, at least in the near term, they will remain the dominant technology for the identification and banking markets and their penetration is far from complete.

In terms of their size, the IC dies used in smart cards can range from very small (1 mm x 1 mm) to quite large (7 mm x 7 mm) and therefore require materials that can accommodate the processability and reliability requirements dictated by smart card manufacturing demands and in-field use. For die attach materials, specifically, fast processing, low stress characteristics, good adhesion and encapsulant compatibility are critical to high-yield, high-volume production of reliable smart cards.

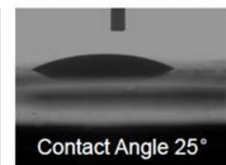
As the leader in smart card die attach solutions, Henkel has recently developed a brand new die attach formulation designed for exceptionally fast processing and compatibility with the most widely used encapsulants in the market, including Henkel encapsulants such as LOCTITE EO 7021. The new die attach, LOCTITE ABLESTIK ABP 2035SCR, has been designed as the successor to the popular LOCTITE ABLESTIK ABP 2035SC material, and has been improved to be compatible with UV-curable smart card encapsulants. Compared to its predecessor, LOCTITE ABLESTIK ABP 2035SCR allows faster encapsulant wetting of the die and die fillet area, eliminating the need for complex dispense patterns. Previous generation die attach materials often presented challenges with complete wetting of the encapsulant material due to differences in surface energy between the fillet of cured die attach material and the encapsulating dielectric. These surface energy differences lead to high interfacial contact angles which correlate to poor material flow and incomplete wetting, much like water beading up on a lotus leaf. With LOCTITE ABLESTIK ABP 2035SCR, the cured die attach film's surface energy is increased and encapsulant flow is optimized to result in low contact angles and complete

Water on Lotus Leaf

UV Encapsulant on older-generation cured die attach



UV Encapsulant on cured LOCTITE ABLESTIK ABP 2035SCR



UV Encapsulant on FR4 with no die attach

wetting. In addition to its surface energy compatibility, LOCTITE ABLESTIK ABP 2035SCR is also fully chemically compatible with encapsulants commonly used for smart card production.

Outside of LOCTITE ABLESITK ABP 2035SCR's broad encapsulant compatibility, the material offers smart card production specialists several additional benefits. The new formulation offers excellent high speed dispensing with absolutely zero tailing. Good adhesion and very fast curing are also key advantages of LOCTITE ABLESTIK ABP 2035SCR. The material adheres exceptionally well to FR4 and polyimide substrates, providing a strong bond to most rigid and flexible PCBs and gold-plated surfaces. Fast processing also underpins the processability benefits of LOCTITE ABLESTIK ABP 2035SCR. With snap cure capability that allows for complete curing in 90 seconds at 120°C, LOCTITE ABLESTIK ABP 2035SCR enables high-speed production of today's smart card devices.

While LOCTITE ABLESTIK ABP 2035SCR is ideally suited for smart card manufacture, its benefits aren't limited to a single application. The material has exhibited excellent performance for applications that require bonding of metal to metal and metal to plastic surfaces. When planarity and low stress are critical to quality – such as with image sensors – LOCTITE ABLESTIK ABP 2035SCR provides superb low temperature processing and low stress for high-quality results.

Priced extremely competitive with differentiable processing and performance advantages, LOCTITE ABLESTIK ABP 2035SCR is the die attach material of choice for smart card and other high volume, low-stress applications.