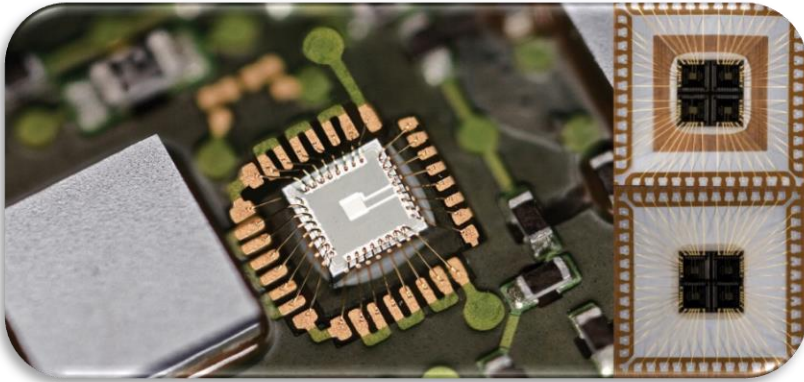


# High Thermal Semi-Sintering Die Attach Paste

No Solder, No Pressure, No Problem

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No matter where you look, it seems that nearly every part of the electronics sector is being impacted by the integration of smaller, higher-functioning devices. Smartphones, data centers, automobiles, airplanes, smart home systems and even gaming devices are all packing massive capability into more compact spaces. As consumers, we love what this brings to our lives. As designers and manufacturers,

we understand what this brings to the device – more heat! Thermal management isn't a new concern; effectively dissipating heat has always been a key component of reliable operation. Today, however, power densities are being maximized, making managing the thermal load increasingly challenging.

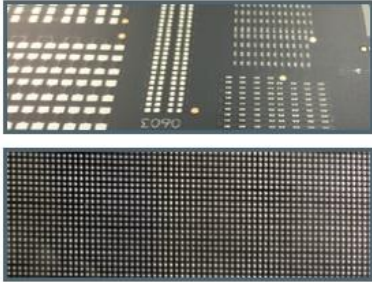
While thermal interface materials are a large part of the equation at the board level, die level thermal management is also an important element of optimized device reliability. Until recently, high thermal die attach solutions were limited to high-lead solders which are subject to impending environmental phase-out legislation; or, silver sintering materials that require integration of complex processes. Even previous generation, so-called high thermal die attach pastes have been unable to deliver ultra-high thermal conductivity because of silver filler interface contact limitations.

With these shortcomings understood, Henkel materials scientists embarked on a development project to formulate a high thermal die attach portfolio that is processed as easily as standard die attach and provides the high thermal conductivity of high-lead solder and pure silver sintering, while delivering the reliability characteristics of resin-based die attach pastes. The result is a semi-sintering – also referred to as hybrid sintering – die attach paste that allows simultaneous silver particle sintering and resin matrix curing. The new, patent-pending LOCTITE® ABLESTIK® ABP 8068T semi-sintering die attach paste series has successfully addressed the regulatory challenges of high-lead solders, thermal conductivity drawbacks of conventional die attach pastes, and processability shortcomings of sintering products that require high pressure.

## Processability and Performance

### Consistent Printing and Dispensing for 24 Continuous Hours

Good printability and consistent dispensing with no separation or missing dots



Ease-of-use is a key advantage of LOCTITE ABLESTIK ABP 8068T materials; they can be processed with existing methods, allowing use of needle dispensing and/or printing platforms and standard bonding equipment for maximized UPH. There is no requirement to invest in additional equipment or change current processes; the pressure and high heat needed to achieve sintering with some sintering products aren't necessary. Henkel's semi-sintering materials exhibit no missing dots, paste separation or adhesion degradation after 24 hours of continuous dispensing. Excellent resin bleed out control on different lead frame surfaces is also a characteristic of the new semi-sintering die attach pastes.

In many cases, high power applications integrate miniaturized packages where multiple packages are processed on a single strip. Because of this serial approach, the die attach paste materials used must be compatible with long post-dispense times while awaiting die placement and adhesive curing. This time after material deposition and prior to die placement is referred to as 'open time' and, if the paste does not have a long open time and dries out or cures from exposure, poor wetting, incomplete fillets or inconsistent bond line thicknesses may result and adversely affect reliability. LOCTITE ABLESTIK ABP 8068T's stage time – the time after the die is bonded but before the material is cured -- is also very forgiving in order to achieve optimal manufacturability.

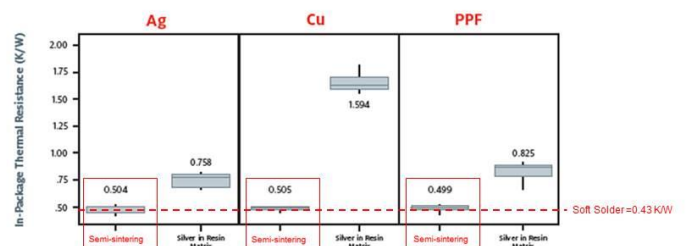
The adhesion performance of the LOCTITE ABLESTIK ABP 8068T series semi-sintering pastes on various die sizes (as large as 5 mm x 5 mm) and lead frame finishes (including Ag, Cu, PPF and Au) is also robust. In addition, thermal conductivity of the material when cured at 200°C is 110 W/m-K, which is comparable to pure silver sintered materials.

## Reliability

As in-package thermal conductivity is a more accurate predictor of reliability performance than standard bulk thermal conductivity measurements, an in-package thermal test was conducted to evaluate LOCTITE ABLESTIK ABP 8068T within a functional QFN package. The semi-sintering material exhibited better in-package thermal performance than traditional Ag-filled die attach adhesives on all lead frame surfaces – even Cu, where conventional materials struggle to form an intermetallic

### LOCTITE® ABLESTIK Semi-Sintering System

In Package Thermal Resistance (R<sub>th</sub>)



➤ In-package thermal resistance comparable to soft solder on multiple lead frames

layer and have high interfacial thermal resistance. Here, the semi-sintering die attach paste showed in-package thermal resistance similar to that of soft solder, indicating it is a viable replacement for solder materials.

Finally, because of LOCTITE ABLESTIK ABP 8068T's ability to bind the silver sintered structure in its unique resin matrix, the semi-sintering materials do not exhibit the brittleness of pure silver sintered materials. This makes Henkel's semi-sintering portfolio applicable to a wide die size range, providing high elongation (toughness) for better thermal cycling performance and, therefore, reliability.

For more information about Henkel's novel semi-sintering die attach pastes, visit [Henkel's semi-sintering product page](#).