



## Film Adhesive Applications and Handling Guide

Henkel epoxy based film products are designed for use in a variety of PCB or hybrid applications. This includes such applications as basic heatsink attach, die attach, coining, and grounding for gigahertz frequency RF parts. All Henkel film products are prepared into a dry “B-staged” state where they can be easily handled with minimal need for tools or equipment. Products are available in three basic categories: Electrically Conductive, Thermally Enhanced, or Non-Filled films.

**Electrically Conductive Films:** Conductive films are specially designed to maximize electrical conductivity while giving a variety of other options such as: low temperature cure, high flexibility, superior adhesion, and/or high thermal stability. **LOCTITE® ABLESTIK CF 3350**, the core product in this line, combines high conductivity and flexibility with superb adhesion and homogeneity to make it an excellent choice for most mid or high-end applications.

**Thermally Enhanced Films:** Henkel Thermally Enhanced Film products offer the perfect blend of high thermal conductivity with varying degrees of flexibility and adhesion specially formulated for heatsinking or thermal dissipation applications.

**Non-Filled Films:** Non-Filled Film Products may be used for various applications including electrical isolation, liquid crystal displays, solvent resistant bonding, or basic substrate assembly.

### Application Techniques

**Substrates:** Film products provide excellent adhesion to a large variety of substrate materials, including most metals, ceramics, and PWB materials.

**Cutting and Custom Preforms:** For most applications, the most convenient and cost-effective cutting solution is to obtain die cut preforms prepared directly from customer supplied CAD drawings. For prototype or low volume applications, cutting sheet stock with a razor blade or scissors may suffice. Tacky films may require that the release liner be left on for this step. For larger volume applications, selected products are available in reel format for in-situ cutting as part of the assembly process.

**Cleaning & Handling:** Product is ready to use upon removal of polyester or silicone paper release liners, and green plastic interleaf layers. While cleaning of substrates is not mandatory, an organic solvent wipe is recommended to remove any oils that might interfere with the bonding process or electrical interface. Plasma cleaning is also recommended, though it may enhance

film flow. Substrates and film product may easily be assembled by hand as desired. While not required, the use of gloves is recommended to reduce the chance of contamination.

**Storage & Handling:** All film products have a recommended set of storage conditions. Check the Technical Data Sheet for conditions specific to each product. Most films recommend storage from - 40 to 0°C. It is best to leave sheets or preforms bagged until use. Thawing time varies depending on quantity of film removed, but may be as little as a few minutes for a single sheet. Once thawed, it is not recommended to restore back to the freezer.

**Pre-Tacking:** In some small area applications such as die attach, it may be desirable to pre-tack the substrates into place. Most products will develop a moderate amount of tack when heated to temperatures in the range of 40 – 60°C. After preheating one substrate to this temperature, the film may be gently applied and tacked into place by either sandwiching it between the release Liner and substrate, or between both substrates being attached\*. From here, parts may be cooled to room temperature before exposing to the final cure profile. It is possible to cure very small parts without applied pressure if they are adequately pre-tacked.

### Curing

**Time & Temperature:** All products have at least one recommended cure profile as listed on the Technical Data Sheet for that product. It is highly recommended to stay to these conditions as curing at different temperatures may cause the film to wet the substrate poorly, or possibly not fully cure. If a different cure temperature is needed, consult customer support for possible advice on this or consider an alternative product that will better fit the application. Most products list cure profiles at 150°C with an alternative cure at 125°C. It is also important to note that cure times are listed as a minimum temperature exposure at the bondline. Larger metal parts may take a significant amount of time to reach peak temperature and will therefore need longer to bond properly. Most products may be safely cured for times longer than needed with negligible adverse effects.

**Cure Pressure:** Adequate pressure is needed to ensure that the film fully wets substrate surfaces during the cure profile. The following chart gives recommended\*\* cure pressures for most major products.

\* For larger areas (above 1 sq. in.) it is recommended to apply the film from one end to another by use of a treated releasable roller to help prevent entrapment of air in the bondline. A hot roll laminator may also be used in applications where one substrate is at least moderately flexible.

\*\* These recommendations are meant to be guidelines only, actual application requirements may vary. Often higher pressure is needed on large parts to flatten out the camber that is naturally in the board or heat sink.

## Curing – continued

Resin Flow During Cure
<b>High (1 pt)</b> 506, 550, ECF 506, Unfilled Films
<b>Medium (2 pts)</b> CF 3366, 555, 561, 563K, 566K, 5662, 5020K, 5025E, Most Filled Films
<b>Low (3 pts)</b> ECF 550, ECF 563, CF 3350, CF 3352, 561K, ECF 561, ECF 561E



Bondline Surface Area
<b>Small (1 pt)</b> Less than 3 sq inches
<b>Medium (2 pts)</b> Between 3 and 24 sq inches
<b>Large (3 pts)</b> Greater than 24 sq inches



Point Total	
2 pts	2 – 8 psi
3 to 4 pts	8 – 15 psi
5 pts	15 – 25 psi
6 pts	25 – 60 psi

**Example:** An application that uses a 5 x 6" board and **LOCTITE® ABLESTIK CF 3350** to bond would have a recommended pressure of 25 – 60 psi (Low Flow 3 pts + Large Board 3 pts = 6pts total = 40 – 60 psi).

## Troubleshooting

**Pressure Application:** Films need applied pressure during cure to promote proper wetting of substrate surfaces. Henkel recommends the use of spring clamps, lamination presses, or vacuum bagging to achieve even and predictable pressure during the cure process. No matter what method is used, it is important to evenly distribute pressure over the entire contact area to ensure even wetting and a uniform bondline. Conformable pads such as silicone rubber may be used to help distribute pressure. Screw clamps are not generally recommended. Weights are effective for small parts but become cumbersome for larger boards.

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**Vacuum Cure Option:** Vacuum bag or Vacuum lamination press curing may be beneficial for some applications. Curing under vacuum can significantly reduce the risk of entrapping air in the bondline, thus helping to ensure the best thermal and/or electrical properties attainable. Less pressure may be required, as curing under a vacuum has been known to increase flow and substrate wet-out.

**Controlling Flow:** In the case of excessive resin flow or bleed, try one of the following alternatives:

- Use a lower cure pressure
- Have preforms made with edge cutback
- Use a faster oven ramp rate

**Poor Electrical Contact:** In the case of poor electrical contact or grounding, an acoustic scan can verify if bonding is poor. If a poor interface is suspected, try these alteration to the cure profile:

- Use a higher cure pressure
- Use vacuum cure to prevent entrapped air
- Ensure even distribution of pressure to eliminate any pinching or areas of low compression.

If after adjusting, grounding requirements are still not met, it may be necessary to try a more conductive product. Films without a fiberglass support, such as **LOCTITE® ABLESTIK CF 3350** or **LOCTITE® ABLESTIK 5025E**, are generally more conductive.

**Exposing to Solder Reflow:** While exposing a cured application to solder reflow temperatures is not generally recommended, it is often necessary. In these situations, please follow the guidelines listed below for the best outcome. The following chart lists products that show minimal degradation at listed peak temperatures. Exposure time is expected to be around 30 seconds. Products may withstand higher temp exposures if the duration is kept short.

Temp Range	Product
Low (< 200C)	561, 561K, 566, 566K, 5662, 506, ECF 506, ECF 561, ECF 561E
Mid (up to 230C)	563K, ECF 563, CF 3350, 5025E, CF 3352
High (up to 270C)	ECF 568, 550K, CF 3366

Exposing film to solder reflow temperatures may result in weakening of the bond an/or reduction in electrical and thermal conductivity. Slower ramp rates may help reduce complications as will the use of smaller boards.

**High Frequency Applications:** Proper grounding for high frequency RF applications may require special film characteristics. For this type of application, **LOCTITE® ABLESTIK CF 3350** or **LOCTITE® ABLESTIK 5025E** are highly recommended for their uniformity and high conductivities.

