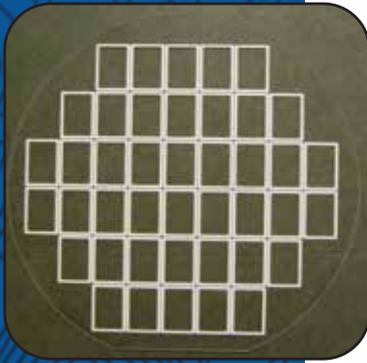


**What >** Understanding *B-stage* Epoxy Adhesives

**Why >** *B-stage* epoxy provides many processing advantages in mass production



## B-stage Epoxy

### Definition

*B-stage* epoxy resin is a descriptive term used to define a one component epoxy system, using a latent (low reactivity) curing agent. This unique product can be partially cured (sometimes referred to as “pre-dried”), as an initial stage after being applied onto one substrate/surface. It can, at a later time, be completely cured under **heat and pressure**.

This is significantly different from a typical thermal cure epoxy system that is provided in a one or two component format and, is cured in one step at ambient or elevated temperatures.

### Why is B-stage Important?

*B-stage* epoxy adhesives have processing advantages. These adhesives can have their initial application and partial cure in one location, and final cure in another location, days later. In short, *B-stage* epoxies are typically considered and ultimately chosen for process assembly reasons, rather than technical or performance reasons.

### Why Consider B-stage Process?

- Mass production; apply epoxy on one day, adhere the parts together at a later date
- Facility; apply epoxy at one location, drop ship them to 2nd location for final assembly
- Service/Value-Added Provider; subcontractors, or electronic packaging companies can apply epoxy in mass production, then ship pre-applied epoxy resin parts to their customers
- Avoiding manufacturing bottlenecks; increases production capacity because bonding of parts does not have to immediately follow deposition of the epoxy adhesive

### Applications of B-stage Epoxy Adhesives

- Hybrid Microelectronics
  - Adhering lids over air-cavity / hermetic packages
  - Adhering substrates into package housing
- Semiconductor Packaging
  - Flip chip processes - flip chip on board, on glass, in package
  - Wafer passivation enabling 3D stacking, wafer back side adhesive
- Optical
  - Gasket and perimeter sealing of glasses in LCDs / Flat Panel Displays (FPDs)
  - Window mounting in opto-sensors
  - Fiber optic bonding in ferrules
- PCB level
  - Pre-applying epoxy on heat sinks

### Available Formats of B-stage Epoxy Adhesives

*B-stage* epoxies are available in various forms including liquids and pastes. Most pastes can be easily patterned directly onto the electronic parts, comparable to diced films and tapes.

## Deposition Method for B-stage Epoxy

Liquid B-stage epoxy can be applied by hand processes, dip, roller and spray coating.

Paste B-stage epoxy is typically screen, stencil or pad printed and can even approach “ultra-fine pitch” resolution as seen in figure 1.

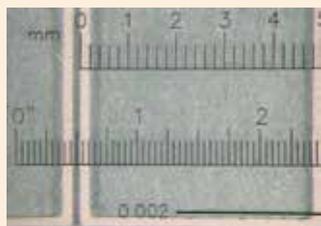


Figure 1. Single chip photo from a 25 x 25 chip array across an 8 inch wafer. Picture of 5mm x 5mm sensor window screen printed with 200um gasket seal of EPO-TEK® epoxy, at 150 um pitch from its neighbor

## General Considerations of B-stage Epoxies:

- The epoxy is typically applied onto one surface only, then dried. Their results is a “tape style” adhesive in the form of a layer with some surface tack; without a plastic carrier material. Once it is joined to the 2nd surface, with final curing, it looks like any normal adhesive joint.
- There is no general rule, but a user should always be careful of “over-drying” the adhesive, as the surface will lose its tackiness, thus make wetting to the 2nd surface more difficult. Individuals should consult the respective product data sheets for suggested drying conditions.

## Application:

- Thickness is controlled by the users processes and design specifications. Normally, the wet layer does not exceed 200-250um. After the drying process, the adhesive layer is typically greater than 10um and less than 150-200um.
- The epoxy thickness will be reduced by applying force to the parts during final cure. The curing process includes mounting and bonding force during the cure. For example, in an LCD gasket sealing process, a 9um dried layer is reduced to a 6um final cured layer.

## Handling:

- It is recommended that pre-applied adhesive on electrical /optical parts be protected from shipping materials, via waffle or gel-pack style trays. Any potentially contaminated B-stage dried adhesive layer may add to the risk of reduced final bond strength and integrity.
- For long term storage, stocking or transportation of B-stage adhesives and parts initially cured should be kept at -40°C conditions.

## Final Processing Recommendations:

- Recommended pressure or force during the final cure can also vary. For example, a 5mm x 5mm optical sensor window shown in Figure 1, 15N pressure at 150°C for 15 sec was realized during the mounting process. Not only does it make acceptable fillets, but it also “forces the wetting” process. These parts were later post-cured in gang assembly, via off-line process at 150°C for 30 minutes.

## B-stage Product Line From Epoxy Technology

| Category               | Product          | Application/Comments   |
|------------------------|------------------|--|
| <b>Optical</b>         | <b>MA-5</b>      | Fiber optic connectors, fiber-ferrule gluing                                 |
| <b>Thermal</b>         | <b>B9021-15</b>  | PCB heat sinking, PCB structural assembly, slow drying                       |
| <b>Next Generation</b> | <b>115-170-2</b> | Enhanced die shear   |
|                        | <b>131-71-1</b>  | Enhanced adhesion, lower bonding temperature version of 131-8-1, Low Halogen |
|                        | <b>131-8-1</b>   | Excellent adhesion, Low Halogen  |
| <b>General</b>         | <b>M10-D</b>     | Very thixotropic paste, lid sealing hybrids, optical window-attach           |
| <b>Silver filled</b>   | <b>EE149-6</b>   | Hybrid packaging, semiconductor flip chip                                    |

For other useful tips, contact our Tech Service Group:  
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Epoxy Technology Inc. • 14 Fortune Drive • Billerica, MA 01821  
phone 978-667-3805 fax 978-663-9782 Toll Free 800-227-2201 techserv@epotek.com  
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