

Die Attach

Epoxy has been the most common method of IC component attach used in the microelectronic industry for more than 40 years of its history. Traditionally, paste or liquid epoxy has been used for die and other component attach, whereas film epoxy has been used for large area substrate attach. These materials are particularly useful for microelectronics systems with die and substrates that have mismatched coefficient of thermal expansion (CTEs). Due to their flexibility, these epoxies also provide stress relief for the die as well as substrate attach. However, the misapplication of paste versus film epoxy is epidemic. Film epoxy should not be used for die attach and liquid epoxy, in most cases, should not be used for substrate attach.

Film adhesive is similar to solder or eutectic bonding in its application. It is very important to note that film adhesive requires pressure during the cure cycle of the material. Additionally, some pre-heat may be required to avoid voids at the interface. For curing film adhesives, a ramped or linear oven cure to temperature is advisable.

Solder and eutectic die attach are designed for power devices or a device that requires high thermal conductivity.

Paste versus film epoxies

	PASTE	FILM
Dispense	Needle, Stamp or Screen Apply	Pick & Place Manual or Auto
Curing	Standard Oven 100°C to 200°C	Prefer Ramp or Linear Oven 100°C to 350°C
Post Cure	Some May Be Needed	Not Required
Equipment and Cost	Manual/Automatic Low/Medium	Automatic High
Space and Labor Cost	Increases With Increased Volume	Fixed Up to Very Large Volume
Safety Concerns	Good Ventilation Required. Use of Gloves Necessary.	Little Concern
Cost of Manufacturing	\$0.04 per sq.cm	\$0.04-0.20 per sq.cm.

Component Attachment Methods

Material	Use	Component Temp. During Assembly
Epoxy conductive	Electrical bond	125°C - 160°C
Epoxy non-conductive	Bond only	125°C - 160°C
Eutectic	Power devices	* 450°C
Solder	SMT discrete devices	180°C

* Temperature dependent on eutectic material used

Eutectic Materials

Material	Melting Point
Gold Germanium	360° C
Gold Silicon	370° C
Gold Tin	280° C

Tg, CTE and Thermal Stability of Commonly Used Component Materials

	Tg (°C)	CTE ppm/°C	Therm. Stab.
Epoxy	60-200	60/200	350/150
Epoxy Alumina	-20	40/110	450/180
Solder 60/40	220	26	N/A
Indium	156	30	N/A
Gold Eutectic	350	15	N/A
Silver Glass	350	15	N/A

Tg = Glass transition temperature at which polymers change from rigid to flexible phase.

"Your Job"
Innovation and Marketing

"Our Job"
Quality Manufacturing
Quick Turnaround
Low Cost

With over 25 years of microelectronics experience, Natel understands and has participated in most of the dramatic changes that have taken place in the manufacturing of products for the Defense, Medical, Opto-electronic and RF/Microwave industries, meeting the need for lower cost, high quality components produced by innovative techniques.

With automatic and, in most cases, hands-free assembly capabilities for modules, hybrids, MCM and chip-on-board, Natel has pioneered the precision capabilities necessary for 10G-40G high frequency products -- products such as DWDM, clock drivers, transmitters/receivers and limiting amplifiers.

This level of automation has allowed Natel to address the market's need for cost, performance and size with increased levels of reliability never before possible. Due to our quick response, we are able to shorten "time-to-market" for your prototype as well as "time-to-volume" for your production needs. We realize how critical it is to your success.

**Natel stands ready as your
Manufacturing Partner!**



Automatic Epoxy Dispense
and Die Attach

To be placed on our mailing list to receive
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NATEL

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ISO 9001

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How can we help?

So that we can tailor an information package specific to your needs, please answer the following questions and **fax this page to Natel at 1-800-590-5764**.
For urgent need please call 1-800-590-5774.

What stage is your microcircuit module in?

- Initial design
- Prototype
- Product redesign
- Production

Would you consider packaging assistance?

- Essential
- Nice but not required
- No thank you

What type of module are you considering?

- Hybrid
- MCM
- Chip on board
- Flipchip/BGA
- Other _____

What type of package are you considering?

- Hermetic
- Non hermetic
- Metal
- Other _____

Comments:

YOUR

Name: _____

Phone: _____

email: _____

Please make necessary changes on the address label.

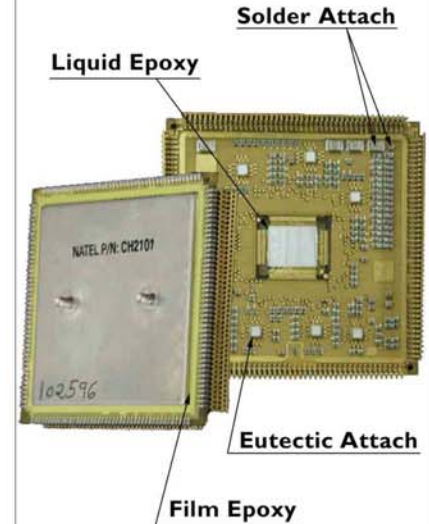
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Design Guide #2

Quick Reference Design Guide



Die Attach

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