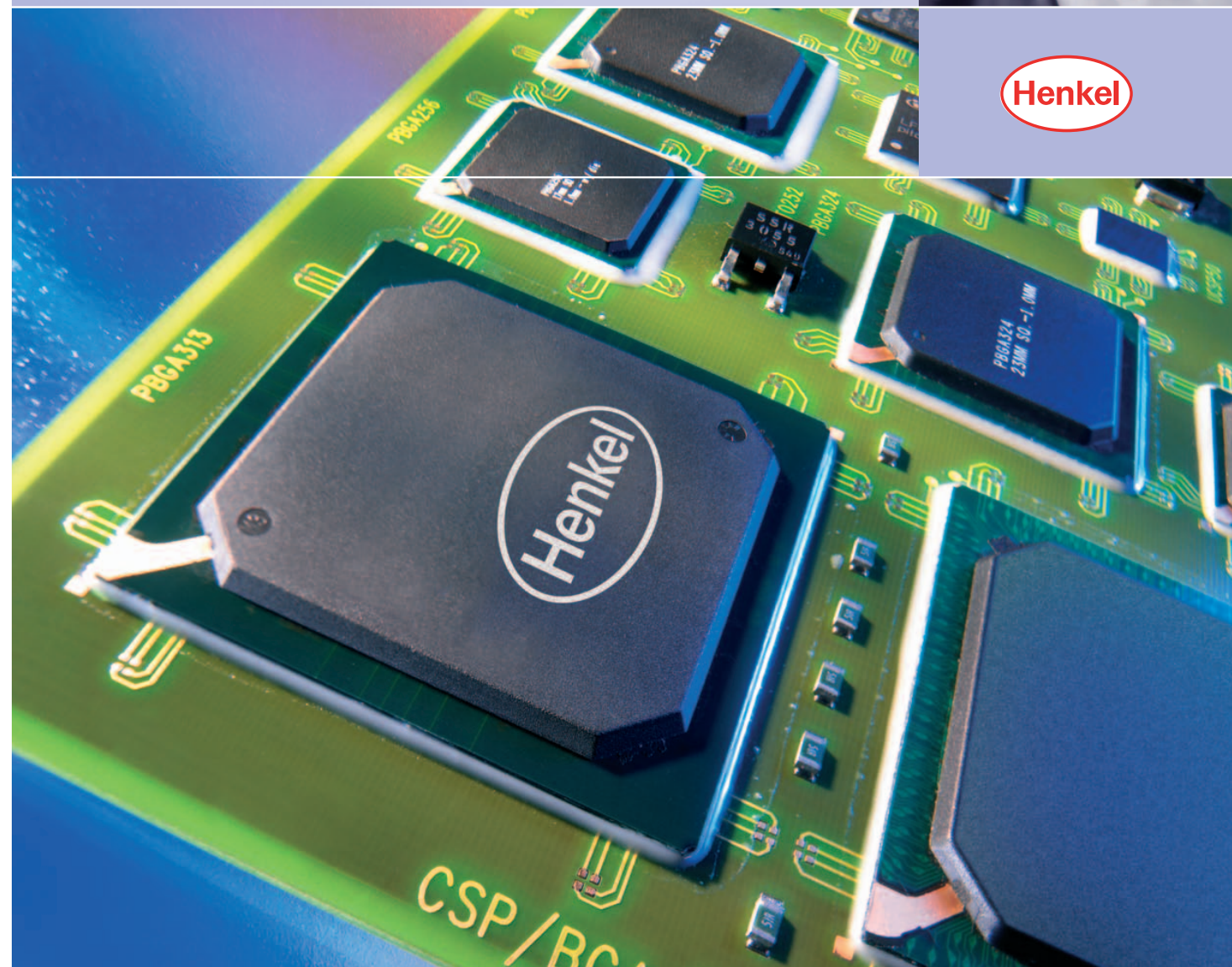


Hysol[®] LOCTITE[®] Multicore[®]

Henkel
Electronic Solutions



Henkel



Worldwide Manufacturing

The electronics group of Henkel is the world's true global supplier of materials solutions for electronic packaging and assembly.

Emphasizing compatibility between materials from wafer-level to board-level and final assembly, Henkel delivers a wide range of off-the-shelf and custom-developed solutions to respond to every requirement of your application.

The Henkel portfolio brings you industry leading brands: Hysol® semiconductor and electronic materials, Loctite® adhesives and phase change thermal interface materials and Multicore® solder products. Each maintains the lead in its field through continuous, targeted research and development, backed by Henkel's continuing reinvestment. Our network of research laboratories positions key resources close to our customers in all territories, with capabilities including accurate modeling and simulation for rapid

and cost-effective turnaround. This is just one facet of the Henkel experience that will give you the edge over your competition.

Henkel is directly represented in more than 80 countries. We deliver consistent products and superior technical support, no matter where you are located. We provide the responsiveness and flexibility of a focused specialist, combined with the strength of one of the world's largest specialty chemicals corporations – our parent company, Henkel KGaA.

Your business choices just became stronger.



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Lead-Free Solutions

The elimination of lead and other hazardous substances from electronic packaging and assembly materials is making much existing knowledge and characterization data obsolete.

Henkel recognized this fact early, and is already leading the race to acquire the necessary data and re-qualify material sets. As a true solutions provider, we believe it is essential for us to do this for our customers. Henkel delivers turnkey solutions, including the technical and engineering support crucial to your process engineers. We will not leave you to fill in the blanks.

Henkel's 'Lead-Free That Works' initiative is ready for action, minimizes the risks of conversion, and gives you the confidence to introduce new lead-free products and processes quickly, in high volumes, and at high quality from the outset. The Henkel range includes lead-free solder, as well as materials for board-level assembly such as surface mount adhesives, conformal coating, underfill and potting materials. In addition, Henkel offers lead-free semiconductor materials including die attach, mold compounds, underfill, and liquid encapsulants for semiconductors and other components.

- Multicore® solder materials offer a variety of solder paste, flux and multiple cored wires for use in lead-free applications.
- Hysol® die attach adhesives offer very high adhesion strength and elongation at lead-free solder reflow temperatures to ensure the entire package will not crack or popcorn.
- Hysol® fast-flow underfill materials offer excellent adhesion to a variety

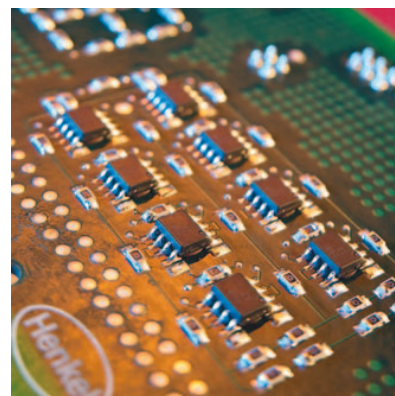
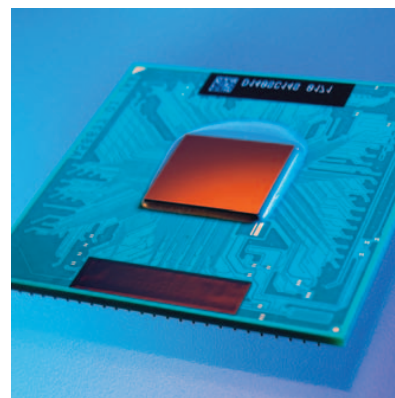
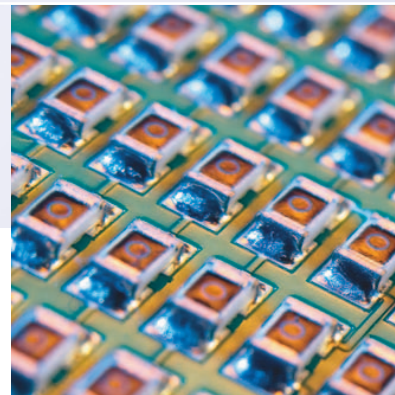
of no-clean flux residues that will not crack after thermal shock or thermal cycling.

- Hysol® liquid encapsulants are designed to withstand up to 260°C peak solder reflow temperatures without degradation, and meet JEDEC Level 2A standards.
- Hysol® molding compounds meet flammability requirements without the use of antimony, bromine, or phosphorous flame retardant compounds. They provide excellent long term high temperature performance and lead-free processing for packaging a variety of power devices, sensors, ICs, and passive components.

CHALLENGE OF 260°C PROCESSING

By striving to continuously improve the JEDEC performance of our packaging materials, we have acquired an in-depth understanding of the increased interactions between all packaging components at the higher processing temperatures required by lead-free applications. Our experienced research and technical service professionals, equipped with the most advanced analytical resources, are ready to work with you to accurately map these interactions and thereby maximize the reliability, stability, and performance of components and assemblies.

Using our knowledge throughout all phases of package development, you can quickly identify optimal material



combinations to greatly accelerate your development project. Our advanced techniques include finite element modeling and acoustic microscopy, for example.

Hysol® Die Attach Adhesives

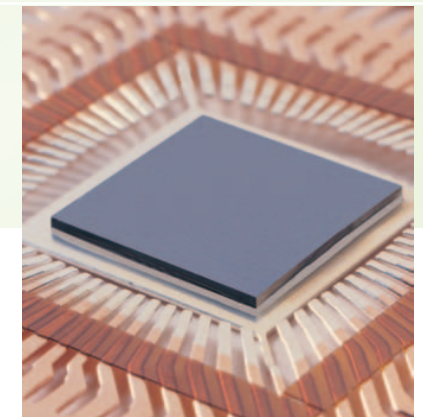
Elevated lead-free processing temperatures demand electronic packaging materials that can withstand polymer decomposition during reflow, increased interfacial stresses, and adhesive and cohesive strength.

Lead-free processing capability is achieved by using Hysol® patented BMI chemistry which allows for lower moisture absorption, lower stress, and higher adhesion to gold and preplated leadframes compared to older epoxy technology. Newer no/low bleed formulations are providing the performance that today's smaller package designs and thinner die requirements demand.

Based on the ultra-hydrophobic chemistry, Bismaleimide (BMI), Hysol® die attach adhesives offer very high adhesive strength, elongation at break, and cohesive energy at high reflow temperatures. These properties help electronic packages retain adhesive strength and structural integrity during moisture soak and absorb stresses during the deformations associated with lead-free reflow processing.

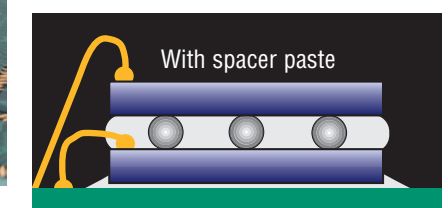
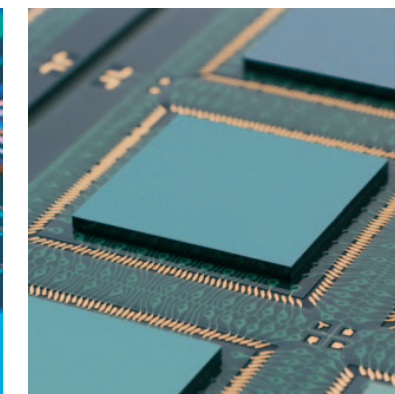
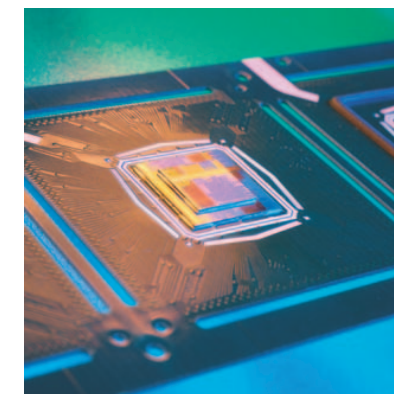
Designed to deliver superior quality and reliability, Hysol® die attach adhesives have won a number of supplier quality awards. Several products are formulated with PTFE, an extremely low dielectric constant material that will not abrade polyimide and other die passivation.

Our fast reaction kinetics and solvent-free formulation enable inline *SkipCure™* processing that increases throughput in Units Per Hour (UPH) for adhesive cure, eliminates the need for separate curing equipment, and decreases package warpage. Our adhesives for organic substrates eliminate substrate prebaking, while our patented polymeric spacers deliver consistent bondline thickness, reduce tilt, and enable high UPHs for die placement.



Henkel materials are compatible with conventional oven cure as well as Snap Cure. You can also use *SkipCure™* and *SkipPrebake™*[*]. Our organic products can also be converted to their CCSP™ (Controlled Collapse Spacer Paste) versions without changing the base paste properties. The ability to exercise these three options, *SkipCure™*, *SkipPrebake™*, and spacers at zero or minimal switching costs reduces both the cost of use and the cost of ownership you will experience.

* For products designed for organic laminates.



Eliminates the need for dummy die in the stack by using spacers in the adhesive.

Hysol® Die Adhesives for Non-Hermetic Packages

For organic substrates including laminates, array, BGA and CSP packages

Product	Description/Application	Filler	Thermal Conductivity	Tg (°C)	CTE α_1/α_2	Modulus @ 25°C	Viscosity 5 rpm @ 25°C	Oven Cure/SkipCure™
QMI536™	Industry standard for die-to-die bonding, dielectric, high adhesive strength.	PTFE	0.3 W/mK	-31	93/174	0.3 GPa	8,500 cps	15 min @ 150°C Oven 10 s @ 150°C SkipCure™
QMI536HT™	High thermal version of QMI536 for mixed stacked die applications and single die BGA.	Boron Nitride	0.9 W/mK	4	66/177	0.9 GPa	13,000 cps	15 min @ 150°C Oven 10 s @ 150°C SkipCure™
QMI550SI™	Low CTE version of QMI550 for low shrinkage and low warpage on laminate and flex substrates.	Silica	0.6 W/mK	42	36/90	1.5 GPa	17,000 cps	15 min @ 150°C Oven 10 s @ 150°C SkipCure™
QMI538NB™	Very low stress dielectric die attach for SCSP.	PTFE	0.3 W/mK	-70	85/149	0.1 GPa	8,500 cps	15 min @ 175°C Oven 10 s @ 200°C SkipCure™
QMI600™	For stacked die applications where the bonding wires go through the die attach paste and mold compound.	Silica	0.6 W/mK	74	31/95	9.3 GPa	10,200 cps	15 min @ 175°C Oven 10 s @ 175°C SkipCure™

For substrates including Cu, Pd, Ag & Au plating, ceramic, and black oxide

Product	Description/Application	Filler	Thermal Conductivity	Tg (°C)	CTE α_1/α_2	Modulus @ 25°C	Viscosity 5 rpm @ 25°C	Oven Cure/SkipCure™
QMI168™	Cost effective version of QMI519, similar properties as QMI519.	Silver	3.8 W/mK	75	40/140	5.3 GPa	9,000 cps	15 min @ 185°C Oven 10 s @ 200°C SkipCure™
QMI505MT™	JEDEC L3 260 in low k CDBGA application. Superior adhesion to palladium, alloy 42 gold and black oxide finishes.	Silver	2.4 W/mK	-10	72/170	.9 GPa	12,000 cps	15 min @ 185°C Oven 10 s @ 200°C SkipCure™
QMI519™	JEDEC L1 260°C for SOIC, industry standard for QFN packages. Good for all preplated leadframes and barE copper. High adhesion, excellent electrical and thermal performance.	Silver	3.6 W/mK	75	40/140	5.3 GPa	9,000 cps	15 min @ 185°C Oven 10 s @ 200°C SkipCure™
NEW QMI529HT™	JEDEC L1 260°C for exposed pad TSOP. Highly filled version of QMI519. For component attach or die attach where very high electrical and thermal conductivity is required. Suitable for high heat dissipation devices and solder replacement applications.	Silver	7.0 W/mK	16	50/127	3.3 GPa	18,000 cps	30 min @ 185°C Oven 60 s @ 185°C SkipCure™
QMI529LB™	Reduced bleed version of the QMI519. JEDEC L1 260°C for Cu, AgCu and NiPdAu leadframe. High adhesion with excellent thermal and electrical performance.	Silver	3.8 W/mK	36	63/121	3.5 GPa	14,300 cps	30 min @ 185°C Oven 10 s @ 200°C SkipCure™
NEW QMI529LS™	Lower stress version of QMI519 for die larger than 300 x 300 mil.	Silver	2.8 W/mK	10	65/192	2.1 GPa	11,000 cps	15 min @ 185°C Oven 150-190°C ramp Snap Cure
NEW QMI529NB™	No bleed version of QMI519, for use on NiPdAu, and Alloy 42 leadframes.	Silver	3.8 W/mK	24	41/104	6.3 GPa	15,000 cps	30 min @ 185°C Oven 30 s @ 175°C SkipCure™
NEW QMI529NC™	Dielectric, low CTE version of QMI519. Silica filled for low shrinkage and low warpage.	Silver	0.6 W/mK	22	50/126	1.9 GPa	13,000 cps	30 min @ 185°C Oven 10 s @ 185°C SkipCure™

Hysol® Die Adhesives for Non-Hermetic Packages

For substrates including Cu, Pd, Ag & Au plating, ceramic, and black oxide CONTINUED

Product	Description/Application	Filler	Oven Cure/SkipCure™	Viscosity 5 rpm @ 25°C	Thermal Conductivity	Tg (°C)	CTE α_1/α_2	Modulus @ 25°C
K00125™	General purpose silver-filled epoxy for general bonding purposes that require electrical and thermal conductivity.	Silver	15 min @ 150°C Oven (No SkipCure™)	9,200 cps	2.1 W/mK	96	65/130	4.0 GPa
QMI534™	Non-Conductive, small die non-conductive, very high adhesive strength on metal substrates for die sizes less than 500x500 mil./13x13 mm.	PTFE	15 min @ 175°C Oven 10 s @ 200°C SkipCure™	9,000 cps	0.4 W/mK	-35	87/171	0.30 GPa
QMI536UV™	UV Cure – CCD/CMOS glass lid sealing non-conductive, UV curing resin with excellent adhesion to glass. Ideal for glass lid-sealing CCD or CMOS lenses.	PTFE	10 s @ 2500mW	6,700 cps	0.3 W/mK	26	62/136	0.70 GPa
QMI538NB™	No Bleed, large die non-conductive, very low stress QMI600 on metal substrates for die sizes greater than 500x500 mil./13x13 mm.	PTFE	15 min @ 175°C Oven 10 s @ 200°C SC	8,500 cps	0.3W/mK	-70	85/149	0.10 GPa

Hysol® Die Adhesives for Hermetic Packages

Product	Description/Application	Resin	Filler	Recommended Cure	Viscosity 5 rpm @ 25°C	Thermal Conductivity	Tg (°C)	CTE α_1/α_2	Modulus @ 25°C	Storage Temp
QMI2419™	No-dry Ag glass die attach for glass-sealed packages. Very high thermal conductivity and >450°C temperature resistance.	Glass/Solvent	Silver	See ramp profile 7-10 min @ 420-460°C	27,000 cps	>60 W/mK	300	21 N/A	15.1 GPa	RT on Rollers
QMI2569™	No-dry Ag glass die attach for glass, solder, and seamed sealed packages. Very high thermal conductivity applications for die as large as 0.80 in².	Glass/Solvent	Silver	See ramp profile 7-10 min @ 360-440°C	35,800 cps	>60 W/mK	250	16 N/A	15.1 GPa	RT on Rollers
QMI301™	Solder and seamed sealed packages Low temperature cure material with very high adhesion and >340°C temperature resistance for solder-sealed hermetic packages.	Cyanate Ester	Silver	10 min @ 150°C	11,400 cps	1.9 W/mK	245	45/85	6.9 GPa	-40°C
QMI3555R™	No-dry Ag glass die attach for glass, solder and seamed sealed packages. Very high thermal conductivity and >450°C temperature resistance for glass-sealed hermetic packages.	Glass/Solvent	Silver	See ramp profile 7-10 min @ 300-450°C	40,000 cps	>80 W/mK	150	16 N/A	11.5 GPa	RT on Rollers

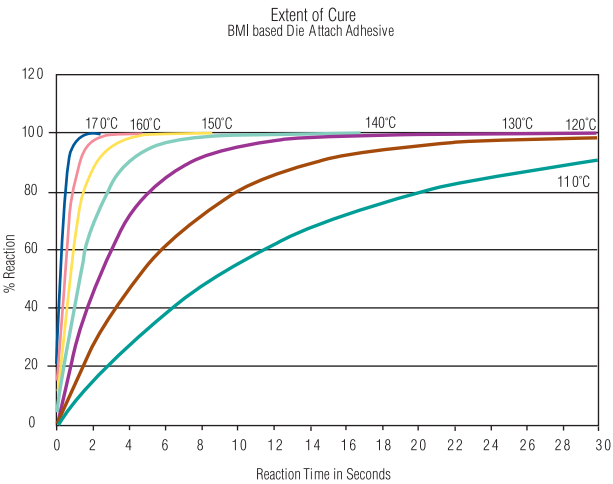
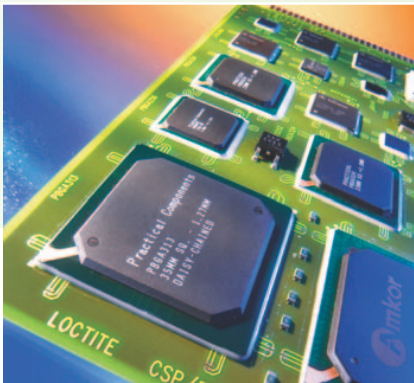


Fig. 1

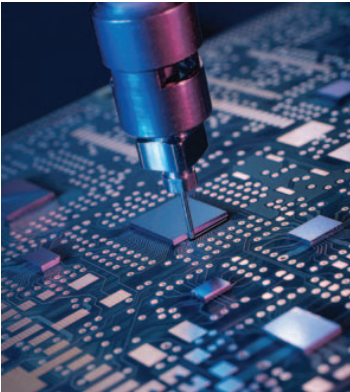
All Hysol® QMI500 series, BMI-based die attach adhesives use free radical cure, enabling extremely fast cure rates (Fig.1). Adhesives in this series cure in seconds at the appropriate temperature. Not minutes or hours, but seconds. Adhesives can now be cured in-line right on the diebonder, immediately after the substrate is indexed onto the post-bond cure station, or on the wirebonder preheater. This enables high UPH, which translates to low total cost-of-use. SkipCure™ also improves the quality of the cured part by holding the substrate flat during die attach cure, for significantly lower warpage compared to oven-cured substrates. Furthermore, the short distance between bondsite and post-bond cure station minimizes adhesive slump and die movement before cure, allowing more consistent bondline thickness.

Hysol® Underfills

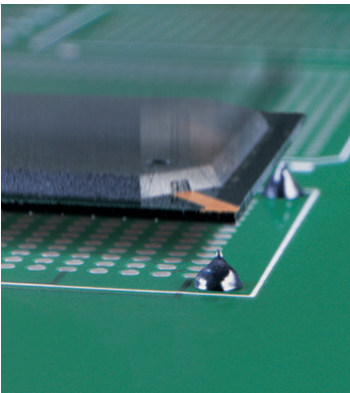
Modern hand held devices and the trend toward thinner, less rigid PCBs are driving the demand for improved shock resistance and increased electronic device reliability.



Hysol® package level underfill encapsulants meet stringent JEDEC testing requirements and are compatible with the high temperature processing required for lead-free assembly. Our environmentally friendly materials are developed to meet demanding end use requirements, including low warpage/low stress, fine pitch, high reliability, and high adhesion.



Hysol® CSP/BGA underfills offer easy reworkability as well as excellent vibration and impact resistance. These underfills offer many processing advantages such as fast flow, fast cure, and long pot life. Our Cornerbond™ technology fits easily into an SMT process flow and eliminates a separate underfill dispense and cure process, saving time and money.



The industry standard for flip chip, Hysol® underfills are used in devices such as FC CSPs and FC BGAs for ASICs, chipsets, graphics chips, digital processors, and microprocessors. These fast flow materials permeate easily under large die. Offering excellent adhesion when used with a variety of no-clean fluxes, these underfills will not crack after thermal shock or thermal cycling.

The latest technology from Henkel includes underfills for low k die, new chemistries offering pot life measured in weeks instead of hours, and high throughput Snap Cure processing. Further innovations include unique reworkable formulations, fluxing no-flow underfills, wafer/pre-applied for flip chip and CSPs, and pre-applied cornerbond adhesives for CSPs that eliminate post-reflow dispense and cure steps.

Henkel is partnering with leading technology companies and research universities to develop future technologies to support forthcoming nanometers-scale semiconductor devices.

Hysol® Underfills

Package Level Underfills

Product	Description/Application	Flow Speed	Viscosity @ 25°C	Tg (°C)	CTE (1) (PPM/°C)	Modulus	% Filler	Recommended Cure
FP0108™	Low-k/Cu flip chip applications; Sn/Pb bumped packages.	Very Fast	900 cps	150	60	3.2	20	1 hr @ 165°C
FP4548FC™	Lead-free flip chip packages (L3/260C); low-k/Cu flip chip packages with hi-Pb bumps.	Medium	25,000 cps	115	22	9.5	65	30 min @ 165°C
FP4549SI™	Fast-flowing, low stress underfill for fine-pitch flip chip applications.	Very Fast	2,500 cps	138	46	5.5	42	30 min @ 165°C

Board Level CSP/BGA and Flip Chip Underfills

Product	Description/Application	Viscosity	Pot Life	Cure Schedule	Tg (°C)	CTE (1) (PPM/°C)	Capillary Flow	Storage Temp
3518™	Non-reworkable underfill. Designed for high reliability requirements. Low CTE for improved thermal cycle performance for packages with small bump diameter. Note: Not sold in the U.S.	3,200 cps	2 days	15 min @ 120°C or 30 min @ 100°C	72	30	Medium	-15°C
3551™	Reworkable underfill for improvement of mechanical reliability. Design to cure at low temperature for heat sensitive components and fast flow for improved process time.	2,000 cps	7 days	20 min @ 120°C or 40 min @ 100°C	61	66	Fast	5°C
3593™	Non-reworkable underfill for high mechanical reliability. Fast flow and snap cure for improved process time.	4,500 cps	7 days	5 min @ 150°C	110	50	Fast	5°C
FP6101™	Reworkable underfill for improvement of mechanical reliability. Fast flow and snap cure for improved process time.	3,700 cps	14 days	5 min @ 165°C or 10 min @ 150°C	15	80	Fast	-20°C
3515™	For corner reinforcement. Designed to cure during reflow while allowing self alignment of the IC package.	7,400 cps	7 days	Reflow cure (see TDS)	73	98	N/A	5°C
3509™	For corner reinforcement. Designed to cure during reflow while allowing self alignment of the IC package. Compatible with lead-free profile.	134,000 cps	1 day	Reflow cure (see TDS)	111	72	N/A	-40°C
FF2200™	CSP/BGA and flip chip fluxing underfill for tin/lead reflow process.	3,600 cps	16 hrs	Reflow cure (see TDS)	72	72	N/A	-40°C
FF2300™	Fluxing underfill for lead-free reflow process. Designed to improve overall process by minimizing dispense time and eliminate use of underfill cure time after reflow.	2,500 cps	16 hrs	Reflow cure (see TDS)	75	75	N/A	-40°C
FP4530™	Snap cure flip chip underfill for FPC. Designed for gap size down to 25 micron.	3,000 cps	24 hrs	7 min @ 160°C	148	44	Fast	-40°C
FP4531™	Snap Cure flip chip underfill for FPC and laminates. Designed for gap size down to 75 micron.	9,000 cps	24 days	7 min @ 160°C	144	28	Fast	-40°C
FP4532™	Snap Cure flip chip underfill for FPC. Designed for gap size down to 75 micron.	16,000 cps	12 hrs	5 min @ 150°C	140	30	Fast	-40°C

Hysol® Encapsulants

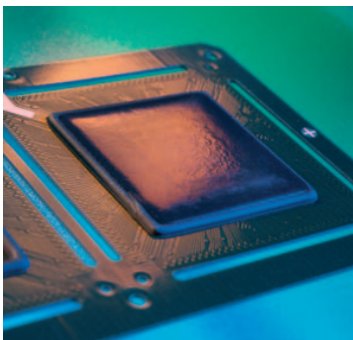
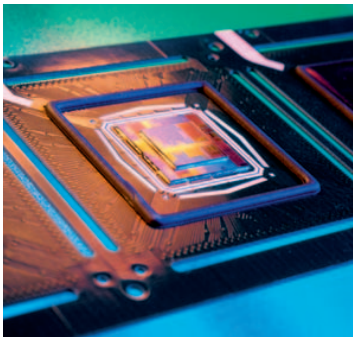
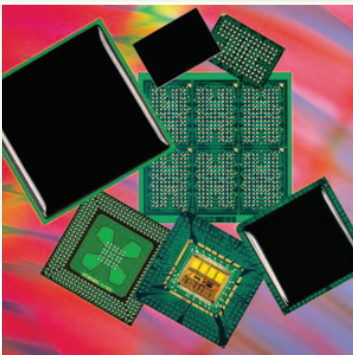
SEMICONDUCTOR LIQUID ENCAPSULANTS

Enabling today’s smaller, thinner, and lighter packages requires new materials that support high-throughput, low-cost package assembly processes. Hysol® high purity encapsulants are self-leveling materials that offer unprecedented performance for transistors, system in package (SIP), microprocessors, and ASICs. Our co-cure dam and fill encapsulants cure in one easy step. We created high-purity liquid-epoxy encapsulants that work together as dam-and-fill materials for bare chip encapsulation, protecting gold wire bonds and silicon die from mechanical damage and corrosion. The low viscosity “fill” materials can also be used alone in devices that contain a cavity.

Hysol® encapsulants meet stringent JEDEC-level testing requirements and are compatible with the high temperature processing demanded for lead-free assembly. Our green materials are developed to meet the demands of end-use requirements.

CHIP ON BOARD LIQUID ENCAPSULANTS

Henkel encapsulants cure with unmatched void-free characteristics for chip-on-board encapsulation applications. Our low-CTE formulations minimize stress on wire bonds during thermal cycling. These encapsulants are easy-to-dispense, minimize induced stresses, provide improved temperature cycling performance, and offer excellent chemical resistance.



Hysol® Encapsulants

Flow Control/Dam Materials

Product	Description/Application	Recommended Cure	Viscosity @ 25°C	Tg (°C)	CTE (1) (PPM/°C)	% Filler
FP4451™	Industry standard damming materials for BGAs.	30 min @ 125°C or +90 min @ 165°C	900,000 cps	145	24	72
FP4451TD™	Tall dam version of FP4451 for applications requiring a taller, narrow dam. Ionically cleaner also.	30 min @ 125°C or +90 min @ 165°C	300,000 cps	150	21	73
FP6401™	Zero stress dam for ceramic or large array packages.	30 min @ 165°C	3,700 cps	15	80	9

Fill Encapsulants

Product	Description/Application	Recommended Cure	Flow Speed	Viscosity @ 25°C	Tg (°C)	CTE (1) (PPM/°C)	% Filler
CB0260™	High adhesion version of FP4450 for 260°C L2A JEDEC.	1 hr @ 110°C or +2 hrs @ 160°C	High	40,000 cps	145	18	74
CB064™	Ultra low CTE, low stress version of FP4450 for large array packages.	2 hr @ 110°C or +2 hrs @ 160°C	Low	80,000 cps	150	8	86
FP4450™	Industry standard fill material for dam and fill or cavity down BGAs.	30 min @ 125°C or +90 min @ 165°C	Medium	50,000 cps	155	22	73
FP4450HF™	High flow version of FP4450LV using synthetic filler for use in fine wire and low alpha application.	30 min @ 125°C or +90 min @ 165°C	Very High	32,000 cps	160	19	73
FP4450LV™	Low viscosity version of FP4450 incorporating cleaner resins.	30 min @ 125°C or +90 min @ 165°C	High	35,000 cps	155	22	72
FP4460™	Glob top version of FP4450.	1 hr @ 125°C or +2 hrs @ 160°C	Low	300,000 cps	170	20	75
FP4470™	High adhesion version of FP4450 for 260°C L3 JEDEC performance.	30 min @ 125°C or +90 min @ 165°C	High	48,000 cps	148	18	75
FP4652™	Fast cure, low stress version of FP4450 for large array packages.	15 min @ 110°C or +30 min @ 165°C	Medium	180,000 cps	150	14	80

Hysol® Chip-On-Board Glob Tops

Product	Description/Application	Pot Life @ 25°C	Recommended Cure	Tg (°C)	CTE (1) PPM/°C	Filler Type	Storage Temp
E01016™	UL94-V0 encapsulant for smart cards and watch ICs. Non-abrasive filler allows for grinding if necessary.	3 months	20 min @ 150°C	115	46	Calcium Carbonate	4°C
E01060™	Low glob formulation for lower CTE and lower ionic than E01016 content for more demanding applications.	25 days	4-6 hrs @ 125°C	125	40	Calcium Carbonate	4°C
E01061™	Medium glob version of E01060.	25 days	4-6 hrs @ 125°C	125	40	Calcium Carbonate	4°C
E01062™	High glob version of E01060.	25 days	4-6 hrs @ 125°C	125	40	Calcium Carbonate	4°C
E01072™	One component, high performance encapsulant with high Tg and low extractable ionics.	1 month	5 min @ 140/150°C	135	43	Silica	4°C
E01080™	Low CTE version of E01016.	3 months	20 min @ 150°C	121	35	Silica	4°C

Hysol® Non-Conductive Pastes

Hysol® NCP encapsulants are designed to provide a high level of reliability for flip chip in package application with excellent moisture and thermal cycling resistance for thermal compression bonding processes.

Our materials also meet stringent JEDEC level testing requirements and are compatible with the high temperature processing required for lead-free assembly. Our environmentally friendly materials are developed to meet demanding end-use requirements, including low warpage/low stress, fine pitch, high reliability and high adhesion.

THERMAL COMPRESSION BONDING PROCESS

By using an innovative process of thermal compression bonding, flipchip interconnection process can be significantly simplified (see figure 2). Unlike traditional C4 process, thermal compression bonding process requires no flux, achieves shorter assembly cycle time, and forms lead-free interconnection with proper bump and pad material selection.

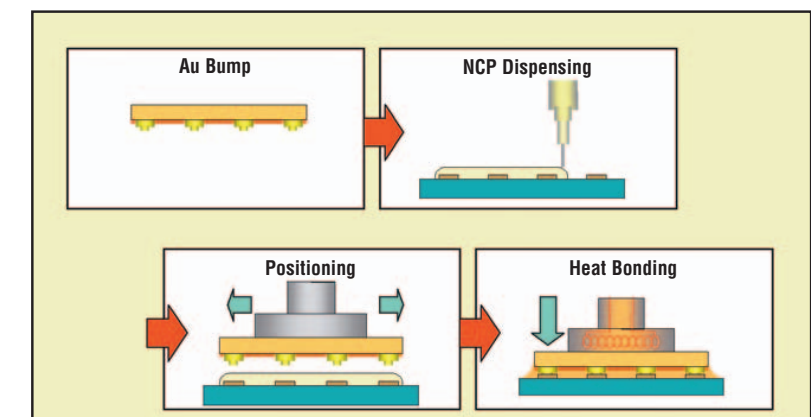
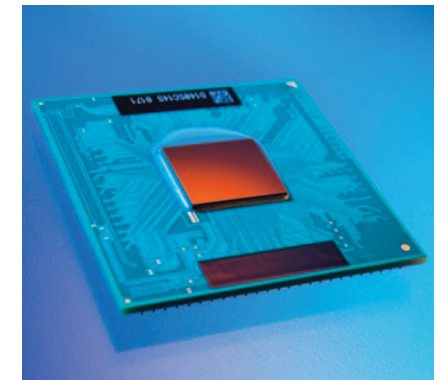


Fig. 2. Schematic of Thermal Compression Bonding Process

Hysol® Package Level NCPs

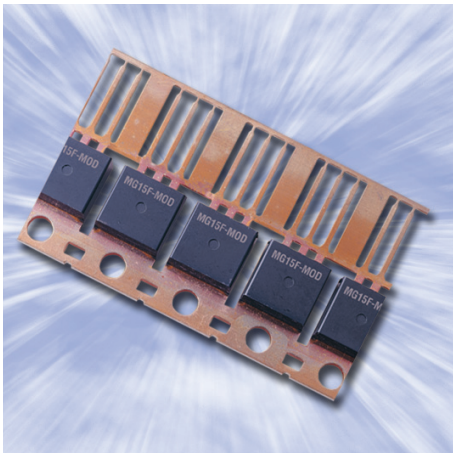
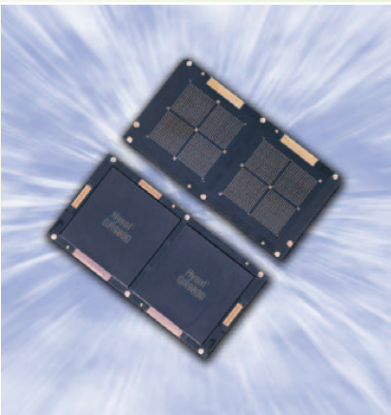
Product	Description/Application	Viscosity	Pot Life	Cure Schedule	Tg (°C)	CTE	% Filler	Storage Temp
FP5000™	Excellent MSL and PCT resistance. Compatible with both constant and pulse heat tool.	110,000 cps	30 days	4 s @ 240°C	171	36	53	-15°C
FP5001™	Excellent thermal cycling resistance. Compatible with both constant and pulse heat tool.	60,000 cps	30 days	4 s @ 240°C	164	30	53	-15°C

Hysol® Semiconductor Molding Compounds

Hysol® Semiconductor Molding Compounds combine low stress and low water absorption properties with high physical strength.

The result: excellent performance across many processes and diverse applications – from discrete/power devices to array packages. Henkel molding compounds for low environmental impact meet reliability requirements for regular and lead-free applications. They also meet flammability requirements without the use of antimony, bromine, or phosphorous flame retardant compounds. Our patented SIGMA technology virtually eliminates intermetallic failures at high temperatures. The use of novel ion scavengers provides advanced moisture resistance.

Maximize your productivity when assembling flip chip array-type packages including CSPs: our molded flip chip underfill materials allow the package matrix to be underfilled as a unit before dicing, rather than processing each chip individually. Also, no liquid underfill is required. JEDEC Level-3 performance, up to 260°C, allows you to boost throughput even in the most demanding applications, including lead-free.



Hysol® Electronic Molding Compounds

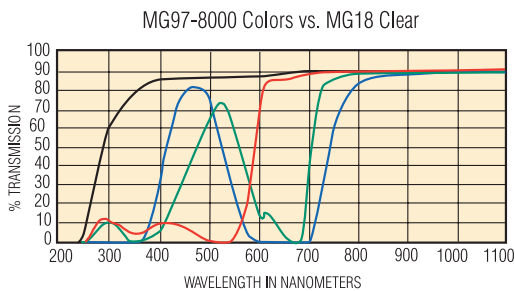
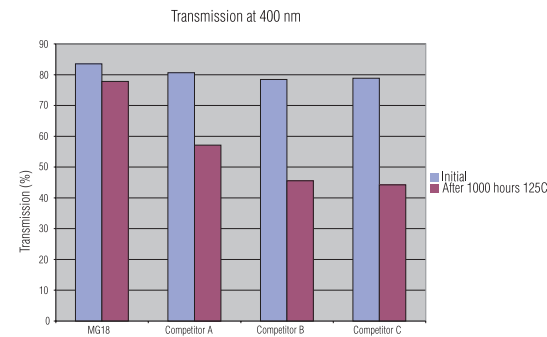
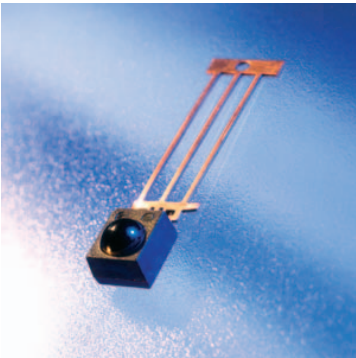
Hysol® Electronic Molding Compounds		Properties and Features											
		Glass Transition Temperature, T _g (°C)	Spiral Flow @ 177°C, in.	Specific Gravity	CTE, α1 (PPM/°C)	CTE, α2 (PPM/°C)	Flexural Modulus (kg/mm ²)	Flexural Strength (kg/mm ²)	Moisture Absorption (85/85 168 hrs)	260°C Reflow Profile Precondition	Green FR	Typical Package Type	
Product	General Description												
Anhydride Chemistry													
MG15F-R™	Power discrete, RF and high voltage rectifier. Designed for high voltage power applications requiring good electrical stability at high temperature.	190	26	1.80	23	71	1,550	11.5	0.45			TO, PDIP	
MG15F-35A™	Power discrete, RF and high voltage rectifier. Designed for high voltage power applications requiring good electrical stability at high temperature.	190	25	1.81	21	70	1,550	12.3	0.45			TO, PDIP	
MG15F-60A™ NEW	Anhydride chemistry with spherical fused silica filler. Designed for high voltage power applications requiring good electrical stability at high temperature.	195	39	1.90	18	60	1,620	11.0	0.40	J3		TO, PDIP, SMD	
MG15F-MOD2™	Asymmetric and surface mount packages. Very high T _g , low stress, power CSP.	235	35	1.95	14	55	1,700	12.0	0.37	J1	•	SMD, SO	
Low Stress – ECN/DCP Chemistry													
MG46F™	Low stress, designed for encapsulation of TO, PDIP & SOIC packages. Applicable for devices having chip dimensions up to 250 mils ² .	160	34	1.83	19	70	1,550	13.4	0.47			PDIP, TO, SOIC	
MG46F-AM™	Automold version of MG46F.	160	26	1.83	17	70	1,550	13.4	0.47			PDIP, TO, SOIC	
MG52F-08™ NEW	Low stress, designed for SOIC, SSOP and PLCC devices. Also can be used for large PDIP, power discrete and high voltage applications.	160	32	1.88	14	58	1,700	14.1	0.35			TSSOP, PLCC SO, QFP	
GR860™ NEW	Ultra low stress, green (non-bromine/antimony) Designed for large package/die, high temperature performance.	195	38	1.92	14	57	1,050	10.5	0.30	J1 Q101	•	SMD, PSO	
Through Hole Discrete													
MG21-02™ NEW	High productivity, low cost material designed for low voltage diodes and small signal transistors.	185	25	1.82	19	62	1,500	11.9	0.40			Diode, TO	
GR330™	Low cost, through hole discretes, diode, and IC.	150	30	1.85	17	55	1,700	14.0	0.40		•	TO	
GR360™	High performance, good reliability, low cost, applicable for low pin count PDIP ICs. Also available in automold version.	170	30	1.82	19	65	1,700	14.0	0.45		•	TO, PDIP	
GR380™	SMD PDIP SOIC packages and QFP. Low stress, high voltage rectifier, power discrete and small outline transistors.	160	34	1.84	17	70	1,350	13.0	0.35		•	PDIP, SO SMD, QFM	
Surface Mount Discrete													
GR625™	Surface mount discrete, IC, QFP. Passes JEDEC Level 1, 260°C reflow.	140	39	1.91	13	40	1,750	13.0	0.25	J1	•	SMD	
GR640™	Designed for small signal and small outline transistors, high speed automold, very fast cure.	165	21	1.82	21	65	1,620	15.5	0.40	J2	•	SOT, SOD	
High Temperature Application													
GR725-AG™ NEW	Automotive (20,000 hrs @ 185°C), green, designed for surface mount discrete packages operating at high temperature. Passes JEDEC Level 1.	135	41	1.95	12	35	2,000	11.6	0.28	J1	•	SO, PSO, SMD	
GR735™ NEW	Medium thermal conductivity, green mold compound. Designed for low voltage diodes, small signal and outline transistors.	170	28	2.05	30	80	1,700	13.4	0.45		•	SOT, ISOT SOD, SO	
GR750™	High thermal conductivity – isolated packages, green, designed to improve thermal management for semiconductor devices. High adhesion to copper and copper alloys.	160	24	2.30	23	70	1,950	12.0	0.40		•	ISOTO, FPAC	
Surface Mount IC													
GR818™ NEW	Green, lower cost, designed for SO type packages.	131	42	1.91	14	39	2,000	12.3	0.34	J1	•	SOIC	
GR828™	Green, specifically designed for SO packages up to TSSOP/TQFP. Passes JEDEC Level 1 @ 260°C reflow.	145	40	1.91	13	45	1,800	12.7	0.25	J1	•	SOIC, SSOP, SOP QSOP, TQFP	
Asymmetric Packages													
GR9800™	Molded flip chip encapsulant designed for flip chip in array package applications. Applicable for underfill and overmolding flip chip assemblies with gap sizes as low as 40 micron.	200	41	1.85	14	48	1,500	11.0	0.40	J2	•	MFC	
GR9810™	Laminate based packages. Designed for use as an overmold, low warpage, green, JEDEC Level 2 capability.	195	45	2.01	11	35	2,300	12.0	0.30	J2	•	SIP, BGA	
GR9820™	Matrix QFN, green, very low stress, ultra low warpage, adhesion can be optimized for specific lead frame metalization. JEDEC Level 1 capable.	195	40	2.01	11	35	2,200	11.0	0.30	J1	•	QFN	
GR9825™	Single cavity QFN lead frame packages passes JEDEC Level 1.	145	40	1.91	13	45	1,800	12.7	0.25	J1	•	QFN	
GR9840™	Green mold compound designed for smart card packages.	165	21	1.81	22	66	1,600	15.5	0.40		•	Smart Card	

Hysol® Optoelectronic Materials

For over 30 years, manufacturers of optoelectronic devices have depended on Hysol® liquid casting and molding materials.

Recent significant advancements in the MG97 molding compound technology have resulted in the development of the OP series of pelletized optoelectronic molding compounds. The OP family of compounds are available in a greater range of pellet sizes than the traditional cast pellets. OP1000 is the premier product, suitable for a wide range of optoelectronic packaging applications. OP2000 offers advanced adhesion characteristics to a wide range of metal lead frame finishes. OP3000 provides

enhanced adhesion along with improved cure speed characteristics. The hallmark OP8000 offers improvements in cure speed coupled with self-release technology. OP8000 is designed for automold applications, eliminating the periodic need for the use of an externally applied lubricant once the mold has been properly cleaned and conditioned. The OP series retains the outstanding optical clarity under thermal and UV aging for which the MG97 chemistry is well-known.



Hysol® Optoelectronic Encapsulants

Optoelectronic Mold Compounds

Product	Description/Application	Spiral Flow (in.)	Mold Cycle	Post Cure	Glass Transition (Tg, °C)	Alpha 1 (PPM/°C)	Mold Shrinkage (%)	Flexural Modulus (kg/MM²)	Dielectric Factor (100kHz)	Dissipation Factor (100kHz)	Dielectric Strength (volts/mil)
MG18™	Transparent epoxy molding compound for LEDs, image sensors, and opto sensors.	25-40	4 min @ 150°C	4 hrs @ 150°C	125	70	1.6	364	3.7	0.017	1140
MG18-5129™	Visually opaque, black epoxy molding compound specifically designed for IR electronic applications such as IR transceivers and IR photo modules.	25-40	4 min @ 150°C	4 hrs @ 150°C	125	70	1.6	352	3.7	0.017	1140
MG97-8000™	Transparent epoxy molding compound specifically designed for surface mount optoelectronic devices such as LEDs, image sensors, and opto sensors.	25-40	4 min @ 150°C	4 hrs @ 150°C	140	72	1.7	377	3.4	0.015	1230
OP1000™	Premier pelletized optoelectronic molding compound.	25-40	4 min @ 150°C	4 hrs @ 150°C	140	72	1.7	359	3.4	0.015	1229
OP2000™	Pelletized optoelectronic molding compound with advanced adhesion properties.	25-40	4 min @ 150°C	4 hrs @ 150°C	131	74	1.5	379	3.4	0.017	1016
OP3000™	Pelletized optoelectronic molding compound with advanced adhesion properties, enhanced cure speed.	25-40	4 min @ 150°C	4 hrs @ 150°C	124	70	1.6	313	3.5	0.016	1260
OP8000™	Pelletized optoelectronic molding compound with internal release, fast cure for automold application.	25-40	2 min @ 150°C	4 hrs @ 150°C	132	89	1.6	322	3.5	0.017	904

Optoelectronic Liquid Encapsulants

Product	Description/Application	Mix Ratio (By Weight)	Pot Life @ 25°C	Gel Time @ 121°C	Cure Schedule	Tg (°C)	Alpha 1 (PPM/°C)	Cured Density	Shore D Hardness
HL3100-3™*	Low stress, clear, water-white, epoxy encapsulant offering low stress. For use where very low stress is required.	100:100	6 hrs	7 min	1 hr @ 100°C plus 4 hrs @ 150°C	125	65	1.19	85
OS1600™	Clear, water-white epoxy LED encapsulant, featuring excellent color and heat stability. UV resistant for blue LEDs.	100:100	8 hrs	6 min	5 hrs @ 120°C	135	78	1.21	95
OS2902™*	Low stress, clear, water-white, epoxy encapsulant offering low stress. For use in LEDs or displays.	100:100	8 hrs	6 min	4 hrs @ 125°C	122	60	1.19	94
OS4210™	Low cost, fast curing, water-white epoxy designed for use on displays.	100:100	4 hrs	4 min	2 hrs @ 100°C	110	65	1.21	90

* Products not for sale in the U.S.

With Reflective Mold Compound

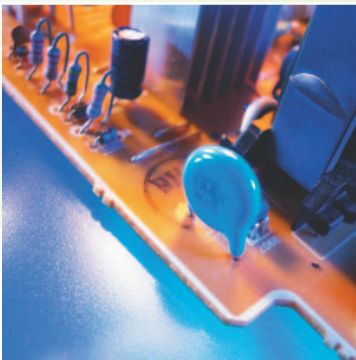
Product	Description/Application	Color	Spiral Flow (in.)	Mold Cycle	Gel Time @ 177°C	Post Cure	Tg (°C)	Alpha 1 (PPM/°C)	Mold Shrinkage (%)	Flammability Rating (@ 3 mm)	Thermal Conductivity	Light Transmission
MG17-0604F™	White molding compound used for opto couplers in optoelectronic encapsulation where high reflectivity is desired.	White	32	75-90 s @ 150°C or 60-75 s @ 180°C	20 s	2-4 hrs @ 150°C	170	35	0.5	V-0	20 x 10 ⁻⁴	1.0 max

Hysol® Electronic Coating Powders

Hysol® Electronic Coating Powders are used to encapsulate both passive and active components requiring reliable environmental protection and excellent physical properties.

Hysol® Coating Powders offer superior performance with all manufacturing processes on a diversity of devices. These range from passive components, including all capacitor types, resistors and varistors, to active components like transistors.

New products meet flammability requirements without the use of bromine, antimony or phosphorus.



Hysol® Electronic Coating Powders

Product	Description/Application	UL 94 V-0	Glass Plate Flow in mm	Gel Time, 160°C s	Dielectric Strength, vpm	Cure Time/ Temperature
DK18-05™ Blue & Gold	All capacitor types – thermistors, resistors and varistors.	•	35	25	1,100	60 min @ 110°C
DK29-0982™ NEW	Large devices where thermal shock resistance is critical.		30	60	1,040	60 min @ 160°C
DK42™	Passive components, including all capacitor types.	•	35	35	1,400	30 min @ 150°C
DK30-0952™	Passive and active components, such as transistors.	•	35	17	1,100	30 min @ 150°C
GK3100™* New Green	Passive components, including all capacitor types.	•	35	18	1,000	30 min @ 150°C
DK18-0913GR™* New Green	All capacitor types – thermistors, resistors, and varistors.	•	38	25	1,000	60 min @ 110°C
DK38A-05GR™* New Green	Passive components, including all capacitor types.	•	35	18	1,200	30 min @ 150°C

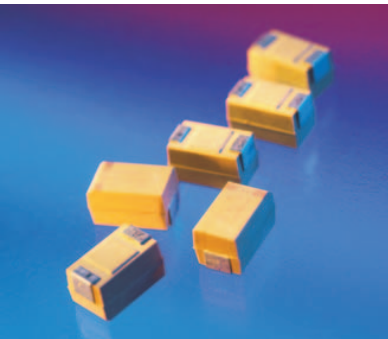
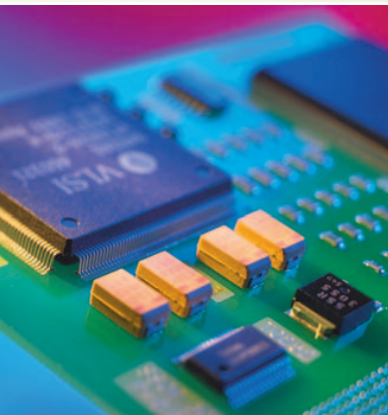
* Uses "green" flame retardant technology, no bromine, antimony, or phosphorous.

Hysol® Electronic Molding Compounds

Hysol® Electronic Molding Compounds protect passive components, such as ceramic and tantalum capacitors and resistors, and are designed for both automolds and conventional molds.

Our unique gold compounds are ideal for high contrast laser marking and are available in fast cure versions. You can also choose from cutting-edge low stress compounds: the perfect response to today's relentless demands to miniaturize every component.

New generation molding powders have been designed to meet the electronics industry's need for plastics that are environmentally friendly and resistant to cracking after 260°C IR reflow. New blends of proprietary flame retardants are used to replace the traditional antimony oxide/halogenated resin flame out systems. The materials are a new family that pass UL standards and meet the EU's environmental requirements (i.e., no halogens, no heavy metals). Combining these new flame retardants with new resin technology and filler blends has produced a series of ultra low stress materials that resist cracking after exposure to 260°C IR reflow conditions.



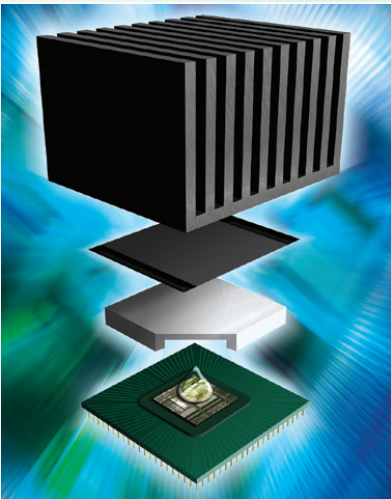
Hysol® Electronic Molding Compounds

Product	Description/Application	Conventional Mold	Automold	Spiral Flow in. @ 250°F	Dielectric Constant	Dissipation Factor	Cure Time min @ 150°C	CTE PPM	Flexural Strength	Flexural Modulus	Laser Markable
MH20-01™ (Black or Gold)	Automotive sensors, solenoid coils, transformers and switches.	•		68	4.20	4.30	1.50-2.0	32 x 10 ⁶	21,800	2.0 x 10 ⁶	
MG33F-0588™ (Gold)	Tantalum and ceramic capacitors, leaded surface mount.		•	27	4.30	0.004	1.25	20	20,500 PSI 141 N/mn ²	2.8 x 10 ⁶	•
MG33F-0593™ (Black)	Tantalum and ceramic capacitors, leaded surface mount sensors.		•	25	N/A	N/A	1.25	19	19,200 PSI 132 N/mn ²	2.4 x 10 ⁶	
MG33F-0602™ (Black)	Tantalum and ceramic capacitors, leaded surface mount sensors automotive.	•	•	43	3.90	0.004	1.75	22	21,600 PSI 149 N/mn ²	2.0 x 10 ⁶	
MG70-0665™ (Black)	Surface mount tantalum capacitors low stress, high Tg and high flexural strength.	•	•	29 (177°C)	3.90	0.003	1.0-1.50	15 x 10 ⁶	19,000	2.6 x 10 ⁶	

Product	Description/Application	Conventional Mold	Automold	Spiral Flow in. @ 177°C	Tg, °C	CTE Alpha 1, ppm	CTE Alpha 2, ppm	Cure Time @ 177°C	Flexural Strength	Flexural Modulus	Laser Markable
GR2310™	Gold/non-halogenated molding powder, tantalum and ceramic capacitors, leaded or surface-mounted sensors.	•	•	27	166	22	75	30 - 45 s	20,500	2.1 x 10 ⁶	•
GR2320™	Black/non-halogenated molding powder, tantalum and ceramic capacitors, leaded or surface-mounted sensors.	•	•	27	172	22	82	30 - 45 s	20,300	2.1 x 10 ⁶	•
GR2710™	Gold/low stress/non-flame retarded molding powder, tantalum and ceramic capacitors, leaded or surface-mounted sensors.	•	•	35	161	13	45	45 - 60 s	19,000	2.6 x 10 ⁶	•
GR2820™	Gold/ultra low stress/non-halogenated molding powder, tantalum & ceramic capacitors, leaded or surface-mounted sensors.	•	•	29	183	12	50	45 x 60 s	17,000	2.9 x 10 ⁶	•

Loctite® Phase Change Thermal Interface Materials

Loctite® Phase Change Thermal Interface Materials (PCTIM) offer exceptionally low thermal impedance between any heat dissipating component and the surface to which the component is mounted.



Phase change technology features a unique wax-based system that is solid at room temperature, but becomes liquid once the excess heat of the device pushes the material past its melt point. This versatility provides the engineer with a material that is manufacturing-friendly, while also delivering the superior performance necessary to meet thermal design requirements. Unlike thermal grease, the phase change compound will not migrate or “pump out” of the interface, which ensures many years of excellent thermal performance even in the harshest environments.

Key features of PCTIMs

- 100% surface wetting eliminates interfacial thermal resistance.
- 15% volumetric expansion at phase-change expels any remaining air gaps.
- Controlled coating thickness leads to consistent and uniform thermal performance.
- “Drop-in-place” feature in the use of these pads speeds assembly and reduces manufacturing costs.

Typical applications include microprocessors, telecom and RF components, power semiconductors and intelligent power modules, IGBTs, converters, etc.

Loctite® Powerstrate® Xtreme PCTIM is formulated for incredible ease of use without compromising thermal performance and adheres to heat sinks or components without heating. Extremely low thermal impedance even at low mounting pressures. Can accommodate gaps and uneven surfaces up to 0.2 mm (0.008"). Heat sinks can be removed even after power cycling without heat or tools. Can be reassembled at least 25 times with no loss of thermal performance.

PCTIM is custom-made for each application. For technical assistance, call your regional sales office – see page 37.

Loctite® Thermal Management Phase Change Materials

Loctite® Phase Change Thermal Interface Material (PCTIM)

Product	Description/Application	Thermal Impedance (°C-in. ² /W) @ 80 PSI	Thermal Impedance (°C-cm ² /W) @ 550 kPa	Thermal Conductivity (W/mK)	Phase Change Temperature °C	Substrate Thickness in./mm	Total Thickness in./mm	Substrate Material
Powerstrate® Xtreme™ NEW	Unsupported film with very low thermal impedance even at low pressure. Fills gaps up to 0.2 mm (0.008") or collapses to form a thin interface. Direct attach to heat sink without heating. Suitable for semiconductor and power electronics applications.	0.003	0.022	3.3	45	N/A	0.008 0.2	None
Powerstrate® 51R™	Low thermal impedance, reworkable grade. Most suited to applications on lidded processors where the heat sink may have to be removed for rework.	0.008	0.052	3	51	0.002 0.051	0.0029 to 0.0033 0.074 to 0.083	AL 1145-0
Powerstrate® 51, 60™	Low thermal impedance, robust grade. Suited to a wide range of applications on bare die processors and other electronics devices.	0.008	0.052	3	51 or 60	0.002 0.051	0.0025 to 0.0063 0.064 to 0.16	AL 1145-0
Thermstrate® 2000™	Good thermal performance most suited to applications on power IGBTs, semiconductors, DC-DC converters and other isolated packages.	0.022	0.143	3	60	0.002 & 0.005 0.051 & 0.128	0.003 to 0.0075 0.076 to 0.191	AL 1145-0
Silverstrate®	Excellent thermal performance, particularly at higher pressures. Typically used on RF devices and SCRs where electrical conductivity is required. (Silver-filled)	0.003	0.022	3.14	51	0.002 0.051	0.004 to 0.005 0.102 to 0.127	AL 1145-0
Thermstrate® TC™	Phase change compound in applicator bar. Ideal for prototyping, rework and small scale production.	0.021	0.137	0.47	60	N/A	N/A	None

Loctite® Phase Change Thermal Interface Material (PCTIM) - Electrically Isolating Products

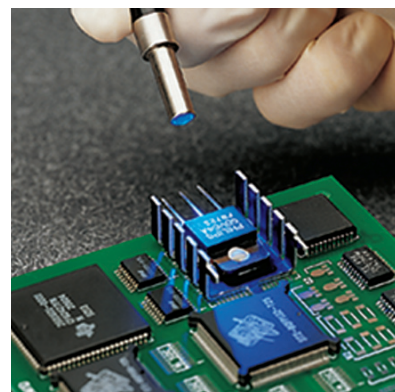
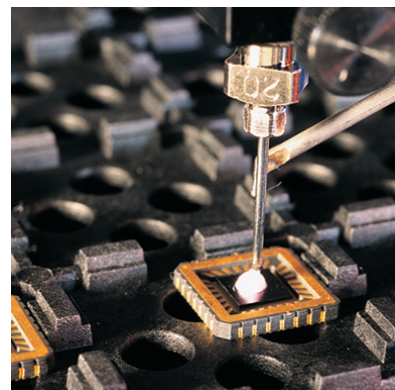
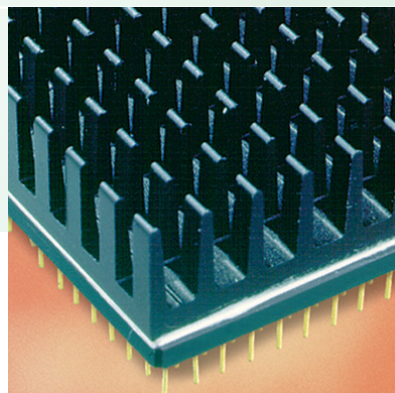
Product	Description/Application	Thermal Impedance (°C-in. ² /W) @ 80 PSI	Thermal Impedance (°C-cm ² /W) @ 550 kPa	Thermal Conductivity (W/mK)	Phase Change Temperature °C	Thickness Substrate in./mm	Total Thickness in./mm	Substrate Material	Dielectric Rating VAC/mil substrate	UL Yellow Card	UL Flammability
Isostrate® 2000™	Electrically isolating phase change material for use with a wide range of non-isolated components.	0.12	0.78	0.45	60	0.001 to 0.005 0.025 to 0.076	0.002 to 0.006 0.051 to 0.153	Polyimide	>5000	E1049 33	94V-0
Isostrate® J-Series™	Electrically isolating phase change material. Ideal for non-isolated devices in high volume applications where high thermal performance is not required.	0.48	3.12	0.155	60	0.002 0.051	0.003 0.076	Polyethylene	>5000	See data sheet	See data sheet
MCM-strate®	Adhesive backed version of Isostrate. Allows pad to be positioned to facilitate assembly.	0.25	1.325	0.4	60	0.001 to 0.003 0.025 to 0.076	0.0025 to 0.0045 0.064 to 0.114	Polyimide	>5000	E1049 35	94V-0
EMI-strate®	Unique combination of thermal and EMI management. Excellent choice for radiated EMI control.	0.4	2.6	0.69	60	See data sheet	See data sheet	Polyimide	N/A	N/A	N/A

Loctite® Thermal Management Adhesives

In applications where the need for process convenience outweighs the need for the extremely low thermal impedance of PCTIMs, Loctite® Thermally Conductive Adhesives provide ease-of-use along with thermal conductivity.

Loctite® Thermally Conductive Adhesives eliminate the need for mechanical fasteners and clips while providing an efficient method of thermal transfer between heat generating electronics devices and their heat sinks.

The Loctite® brand of adhesives offers silicone technology for severe temperature cycling, acrylics for room-temperature-curing, and epoxies for durability. These adhesives are offered as activator, heat, or UV light cure materials for optimum process convenience.



Loctite® Thermal Management Adhesives

Loctite® Thermal Adhesives

Product	Description/Application	Thermal Conductivity	Cure/Chemistry	Specific Gravity	Viscosity	Shelf Life	Cure Schedules
315™ Output™	Self-shimming for electrical isolation; room-temperature-curing adhesive.*	0.80 W/mK	One Component Acrylic	1.7	Paste	9 months @ 5°C	5 min @ 20°C 4-24 hrs @ 20°C
3151™ Output™	Self-shimming, UV/heat cure repairable adhesive for automated heat sink applications.	0.81 W/mK	One Component UV/Heat Cure Acrylic	1.7	Paste	5 months @ 5°C	10 s @ 70-100 umW/cm² 5 min @ 150-180°C
383™ Output™	High-strength , room-temperature-curing adhesive for permanent assemblies.	0.60 W/mK	One Component Activator* Acrylic	1.5	Paste	9 months @ 5°C	5 min @ 20°C 4-24 hrs @ 20°C
384™ Output™	Repairable , room-temperature-curing adhesive utilized for parts subject to disassembly.*	0.76 W/mK	One Component Acrylic	1.6	Paste	9 months @ 5°C	5 min @ 20°C 4-24 hrs @ 20°C
3872™	Medium-strength , flexible adhesive for sensitive components and extreme temperature ranges.	1.20 W/mK	One Component Acrylic/Urethan/UV/Heat Cure	1.8	Paste	12 months @ 5°C	10 s @ 150 umW/cm² 10 min @ 140°C
3873™	Fast-curing, high-conductivity , self-shimming for bonding heat generated devices to thermal spreader.*	1.25 W/mK	One Component Acrylic	2.1	Paste	21 months @ 5°C	5 min @ 20°C 4-24 hrs @ 20°C
3874™	Fast-curing, high-conductivity for bonding heat generated devices to thermal spreader. "Without glass beads."*	1.25 W/mK	One Component Acrylic	2.1	Paste	21 months @ 5°C	5 min @ 20°C 4-24 hrs @ 20°C
5404™ Output™	Self-shimming, flexible silicone adhesive for demanding parts such as ceramic boards.	1.0 W/mK	One Component Heat Cure Silicone	2.4	280** g/min	5 months @ 4°C	10 min @ 150°C
5406™ Output™	Potting or sealing of electronic enclosures that require thermal dissipation of heat.	0.55 W/mK	RTV Silicone	2.0	680** g/min	5 months @ 3°C	72 hrs @ 20°C 25 min skin over @ 20°C
7387 Activator™	Activator for use with Loctite® brand 315, 383, 384 and 3873 output adhesives.	N/A	Base Heptane/Isopropanol	N/A	1.5 cps	On-Part Life 2 hrs	Dry Time 2-5 min

*Use with Loctite® 7387™ Activator. **Extrusion measured @ 50 psi/0.125 in. orifice.

Loctite® Thermal Potting Compounds

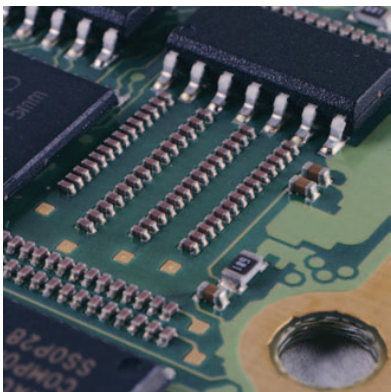
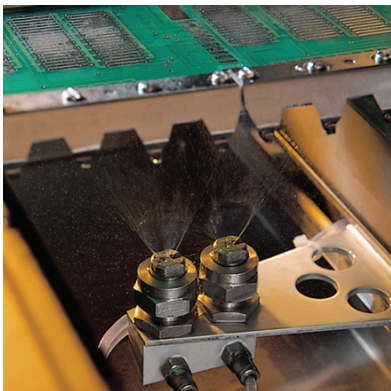
Product	Description/Application	Chemistry	Cure Schedule Cure/Alt. Cure	Viscosity (Mixed)	Work Life @ Room Temp.	Gel Time	Gel Time	TG °C	CTE PPM/°C
3860™	Thermally-conductive, room-temperature-curing potting compound for general applications requiring thermal conductivity.	2-Part Epoxy (100:9.5)	48 hrs @ 25°C 2 hrs @ 65°C	20,000 cps	2 hrs	12 hrs	89 shore D	60	32
3861™	Thermally-conductive, potting compound for automotive electronic applications requiring thermal conductivity and chemical resistance . Resistance to water, gases, and petroleum vapors.	2-Part Epoxy (100:9.5)	4 hrs @ 100°C 2 hrs @ 130°C	10,000 cps	12 hrs	N/A	80 shore D	118	28
3862™	Thermally-conductive, potting compound for automotive electronic applications requiring thermal conductivity and thermal shock resistance . Suitable for military class H applications.	2-Part Epoxy (100:28)	4 hrs @ 100°C 2 hrs @ 130°C	20,000 cps	24 hrs	N/A	75 shore D	153	32

Multicore® Solder Materials

Multicore® solder pastes meet the rigorous demands of diverse electronic manufacturing soldering processes.

Whether your process requires long abandon times, wide process windows, or high-speed printing, there is a Multicore® paste to suit your needs.

Henkel is also breaking new ground in the development of lead-free products. As the industry works toward eliminating lead from its products and processes, Henkel has developed not only the solder technology to meet that need, but will also provide the technical and engineering support crucial to process engineers as they face the unique processing requirements of lead-free operations.



Multicore® Solder Pastes

Multicore® solder materials: ground-breaking new formulations to give users an easy transition to lead-free at the leading edge of technology.

We offer soldering material sets supported by global technical and process support suitable for the most rigorous modern assembly processes: ultra-fine pitch printing at high speed, long abandon times, pin-testability across all types of assemblies and surface finishes. The outstanding resistance to high temperature and high humidity conditions of our solder pastes means users can be confident that process variation due to environmental factors will be minimized.

LF318™ No-Clean Solder Paste: Lead-Free

Description/Application NEW	Alloy	% Metal Load	Tack (g/mm²)	Print Speed (mm/s)	Flux Classification
LF318 is a pin-testable, no-clean lead-free solder paste with soft, colorless residues, halide-free with high activity, suitable for a wide range of assembly process conditions. LF318 has outstanding humidity resistance, minimizing process variation due to environmental factors. 96SC alloy (Sn 95.5, Ag 3.8, Cu 0.7%) with a melt point of 217°C. 97SC alloy (Sn 96.5, Ag 3.0, Cu 0.5%) with a melt point of 217°C. Licensed under US Patent No. 5,527,628 and Japan Patent No. 3,027,441.	96SC (SAC387) 97SC (SAC305)	88.5 %	2.0	25 - 150	ROLO

MP218™ No-Clean Solder Paste: High humidity and temperature resistance

Description/Application NEW	Alloy	% Metal Load	Tack (g/mm²)	Print Speed (mm/s)	IPC/J-STD Classification
High activity, soft residue, colorless, halide-free, no-clean, solder paste which displays outstanding resistance to high temperature and humidity environments. Suitable for a large range of assembly processes , including large high-density boards and high volume, fine pitch, fast-printing applications. Pin testable.	Sn62/Sn63/63S4 (Anti-Tombstoning)	89.5 90	1.6	25 - 150	ROLO

WS200™ Water Wash Paste: Wide Process Window

Description/Application	Alloy	% Metal Load	Tack (g/mm²)	Print Speed (mm/s)	IPC/J-STD Classification
High performance, water washable, solder paste. Residues are readily removed with DI water, without the need for a saponifier. WS200 has good open time with excellent print definition and soldering activity.	Sn62/Sn63	90.5	0.8	25 - 100	ORH1

WS300™ Water Wash Paste: Lead-Free

Description/Application NEW	Alloy	% Metal Load	Tack (g/mm²)	Print Speed (mm/s)	IPC/J-STD Classification
A no-clean flux system specially formulated for lead-free alloys. High performance, water washable, solder paste. Residues are easily removed with DI water , without the need for a saponifier. Good open time with excellent print definition and soldering activity. 96SC alloy (Sn 95.5, Ag 3.8, Cu 0.7%) with a melt point of 217°C. 97SC alloy (Sn 96.5, Ag 3.0, Cu 0.5%) with a melt point of 217°C. Licensed under US Patent No. 5,527,628 and Japan Patent No. 3,027,441.	96SC (SAC387) 97SC (SAC305)	89	0.80	25 - 100	ORH1

Multicore® No-Clean Fluxes

MF101™ No-Clean Rosin based VOC – Lead-Free Compatible

Description/Application	% Solids	Acid Value	IPC Class	Application
High yield, sustained activity for dual wave and lead-free processes. Low solder balling formulation.	6.5 - 7.0	40	ROM0	Spray

MF200™ Liquid Flux: Contract Manufacturing Grade – Lead-Free Compatible

Description/Application	% Solids	Acid Value	IPC Class	Application
A general purpose, halide-free flux with sustained activity to extend flux life in dual wave and lead-free wave soldering applications. Suitable for spray flux application systems. Solvent-based flux may be thinned with IPA.	6.4	48.5	ROM0	Spray/Foam

MF300™ VOC-Free: Clear Residue – Resin-Free – Lead-Free Compataible

Description/Application	% Solids	Acid Value	IPC Class	Application
General purpose, VOC-free (water-based), no-clean, halide-free and resin-free flux with special formulation to minimize solder balling. Compatible with lead-free processes.	4.6	37	ROM0	Spray/Foam

MFR301™: IPA-Based Rosin Flux - Lead-Free Compatible

Description/Application	% Solids	Acid Value	IPC Class	Application
Higher solids, halide-free flux for better wetting on reduced solderability surfaces and to minimize bridging on complex geometries. Fully lead-free and dual wave compatible. Solvent-based flux may be thinned with IPA.	6.5	41	ROM0	Spray/Foam

			Flux Applications		Preheat	Alloy	Electrical Reliability								
Flux Technology	Rosin	Solids	Spray	Foam	IR	Convection	Selective Soldering	Lead-Free	IPC	Beilcore SIR	Beilcore Electromigration	QPL/MIL	JIS	Halide-Free	Product
Water-Based	Rosin-Free, No Clean	Low	•	•		•	•	•	•		•			•	MF300™
	Rosin-Containing, No-Clean	Low	•			•	•	•	•	•	•		•	•	MF101™
Alcohol-Based	Rosin-Free, No Clean	Low	•	•	•	•	•	•	•		•			•	MF200™
	Rosin-Containing, No-Clean	Low	•	•	•	•	•	•	•		•			•	MFR 301™
	Water Soluble	High		•	•	•	•	•	•			•			Hydro-X20™

Multicore® Water Wash Fluxes – IPA-Based

Hydro-X20™ High Activity Flux

Description/Application	% Solids	Acid Value	IPC Class	Application
A high activity, water washable flux designed for the soldering of the most difficult electronic assemblies. Unique activator package enables a wider process window and the soldering of all common electronic surfaces with ease. Residues are readily and completely removed by water wash after soldering. Suitable for lead-free wave soldering.	20	24	ORH1	Spray/Foam

Multicore® Cored Wire

The Multicore® line of cored wire features the renowned multiple flux cores technology to ensure even and consistent distribution of flux throughout the solder wire. This reliability makes Multicore® solder wire the first choice for automated wire soldering processes.

Product	Description/Application	IPC Class	Alloy Options (Sn/Pb)	Alloy Options* (Lead-Free)
309™	No-clean, rosin-based flux with excellent wetting performance on difficult substrates. Can be cleaned extremely in solvents if needed. Note: Not sold in the U.S.	ROM1	60/40	SA305 (97SC) SAC387 (96SC), 99C
400™	Halide-free, no-clean, clear residue, increased flux content for improved wetting.	ROL0	60/40	SA305 (97SC) SAC387 (96SC), 99C
502™	No-clean, clear residue, medium activity flux with good wetting on difficult substrates. Note: Not sold in the U.S.	ROM1	60/40	SA305 (97SC) SAC387 (96SC), 99C
511™	No-clean, clear residue, high activity flux with excellent wetting on difficult substrates.	ROM1	60/40	SA305 (97SC) SAC387 (96SC), 99C
Hydro-X™	High activity, water washable flux with excellent wetting on difficult substrates.	ORH1	60/40,	SA305 (97SC) SAC387 (96SC), 99C

*SAC387/96SC alloy: Sn95.5, Ag 3.8, Cu 0.7 with melting point of 217°C
SAC305/97SC alloy: SnAg 3 Cu 0.5 SnAg 3 Cu 0.5 SAC with melting point of 217°C
99C alloy: Cu 1.0 with melting point of 227°C

Multicore® Cleaners

SC01™

Description/Application
SC01 is designed for the stencil cleaning and hand cleaning of process soldering residues. A highly effective cleaner that dries rapidly (fast evaporation).

MCF800™ NEW

Description/Application
Designed for the effective removal of all types of soldering process residues from circuit boards, screens, fixtures, and equipment. Flash point of 105°C makes it ideal for use in heated cleaning systems.

Other Multicore® Product Offerings

Solder Mask™

Description/Application
Temporary solder resists used with circuit boards prior to soldering. Will withstand flux and wave soldering operations. Suitable for use with copper, hand, robotic, pneumatic or template screening applications and brush.

Mini Fluxers and Cleaners: Perfect for SMT re-work

Description/Application
Controlled release flux and cleaner pen applicators. Range of compatible flux types available. Ideal for controlled applications of flux when carrying out SMT re-work. Cleaner pen easily removes residues.
Description
FluxPen MF101™ FluxPen MF200™ FluxPen MF300™ FluxPen MFR301™ FluxPen Hydro-X20™

No-Clean Desoldering Wicks™

Size Reference	Approximate Width
NC-00	0.8 mm (0.03 in.)
NC-AA	1.5 mm (0.06 in.)
NC-AB	2.2 mm (0.08 in.)
NC-BB	2.7 mm (0.10 in.)

Tip Tinner: Extends solder iron tip life

Description/Application
Handy, non-abrasive, solder iron tip tinner. Easily wets hot solder irons leaving a brightly tinned tip. Improves hand soldering efficiency and extends tip life. Adhesive pad allows easy mounting on or near the solder iron holder.
Description
TTC-LF™ Lead-Free Tip Tinner

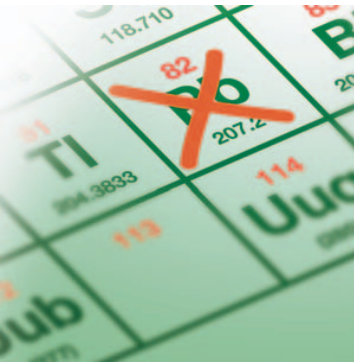
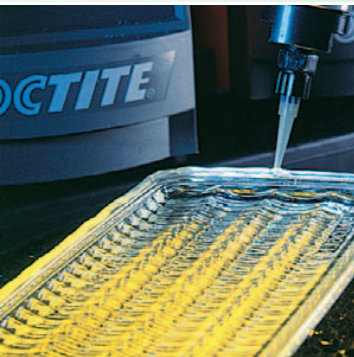
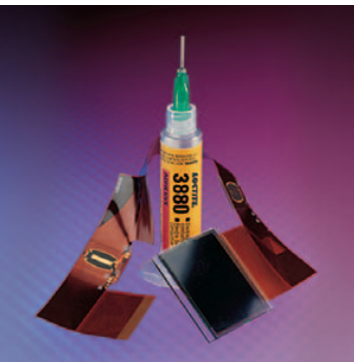
Loctite® Electrically Conductive Adhesives for Board Level Assembly

Loctite® Electrically Conductive Adhesives now deliver a lead-free alternative to solder.

Our formulations provide a robust mechanical bond as well as a low-impedance electrical interconnection.

Curing at room temperature, or processing quickly at temperatures between 100°C and 150°C, electrically conductive adhesives are excellent for bonding temperature-sensitive components. Now, you can innovate using non-solderable substrates like plastic or glass. Rapid assembly and repair of flexible circuits, or bonding flexible substrates and connectors, is now faster and easier. We also

offer Loctite® conductive silicones for sealing and EMI/RFI shielding on electronic enclosures.



Loctite® Electrical Interconnect Adhesive for Board Level Assembly

Product	Description/Cure	Description/Application	Shelf Life	Lap shear Adhesion (AL/AL)	Cure Schedules	TG °C	CTE PPM/°C	Volume Resistivity (ohm-cm)	Work Life @ Room Temp.
3880™	Heat cure	Syringe or stencil dispense, silver conductive adhesive for solder replacement. Long work life. Can be stored in conventional refrigerator (-40°C freezer not required).	3 months @ 1°C	>1,000 psi 6.9 N/mm²	10 min @ 125°C 6 min @ 150°C 3 min @ 175°C	40	45	<0.0005	7 days
3888™	Room Temp. Cure	Room-temperature-cure adhesive for applications requiring a combination of good mechanical and electrical properties.	12 months @ 21-25°C	>1,000 psi 6.9 N/mm²	24 hrs @ 23°C 1 hr @ 125°C 30 min @ 150°C	50	>50	<0.001	90 min

Product	Description/Application	Filler	Thermal Conductivity	Tg, °C	CTE α₁/α₂	Modulus @ 25°C	Viscosity 5 rpm @ 25°C	Oven Cure/SkipCure™
QMI529HT™	For component or die attach where very high electrical and thermal conductivity are required. Suitable for high heat dissipation devices and solder replacement applications.	Silver	7.0 W/mK	16	50 127	3.3 GPa	18,000	30 min @ 185°C Oven 60 s @ 185°C SkipCure™

Loctite® Isotropically Conductive Adhesives (Silicones)

Product	Description/Cure	Description/Application	Specific Gravity	Shelf Life	Cure Schedules	Tensile	Elongation	Shore Hardness	Volume Resistivity (ohm-cm)
5421™	RTV Silicone	Provides EMI/RFI shielding on electronic device enclosures.	3.0	6 months @ 5°C	24 hrs @ 25°C	147 psi 1 N/mm²	118%	68A	0.005

Loctite® Adhesive Clean-Up Solvent

Product	Description/Application	Solvent Type	Flashpoint	Corrosive Properties	Ozone Depletion Potential
7360™	Clean up and removal of uncured adhesive.	Aliphatic Ester Blend	100°C	None	None

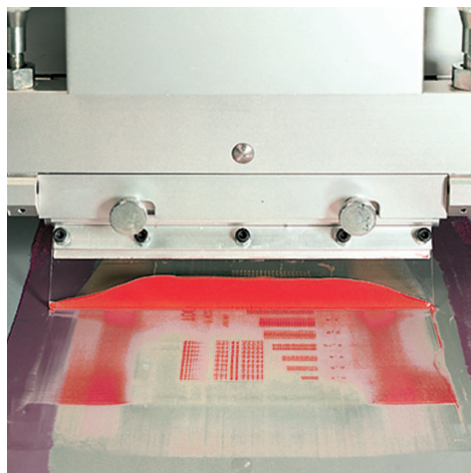
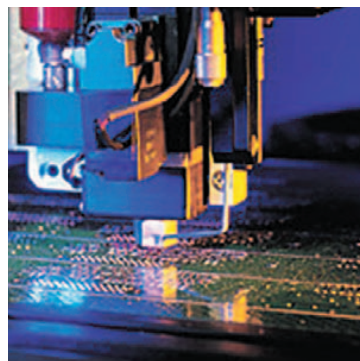
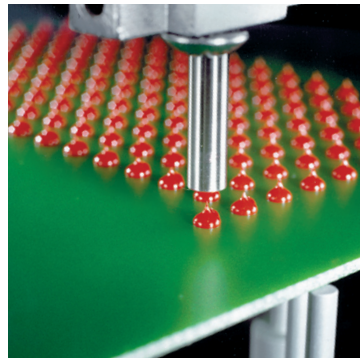
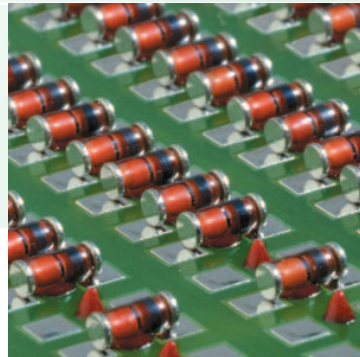
Loctite® Chipbonder® Surface Mount Adhesives

Henkel is the world leader in developing cutting edge technology for high-speed syringe dispense and stencil print Chipbonders®.

Loctite® Chipbonder® surface mount adhesives have been manufactured over the past 20 years, supporting the introduction of wave soldering surface mount components on mixed technology printed circuit boards and double sided SMT boards. Henkel offers a wide range of Loctite® Chipbonders® to meet the challenges of high speed assembly processes, meeting high reliability end-user requirements.

Stringent testing in both laboratory and production environments ensure that our Loctite® Chipbonder® adhesives can meet the new challenge of lead-free wave solder with no loss in productivity for our customers.

Henkel's newest surface mount adhesives, Loctite® 3629 Chipbonder® adhesive, includes lead-free capabilities with low temperature cure energy savings benefits. Lower cure temperatures offer a more environmentally friendly process with the added benefit of lower cost production processes. Loctite® 3629 Chipbonder® adhesive is now available for high-speed dispensing processes and is ideal for use with heat sensitive components such as LED displays.



Loctite® Chipbonder® Surface Mount Adhesives

Loctite® Chipbonder® Syringe Dispense Adhesives

Product	Description/Application	Color	Cure	Process Method	Storage (Protect from heat)	Shelf Life*
Cornerbond 3515™	Specially formulated to allow component realignment in double sided reflow applications.	Black	In solder paste reflow cycle; after paste has reached liquidous.	Syringe dispense self-alignment	5°C ± 3°C	6 months from DOM
3621™	High performance for ultra high-speed syringe dispense. Good green strength. Superior humidity resistance and electrical properties. Can be used in lead-free solder applications. Room temperature storage capable.	Red	90 s @ 150°C or 2-3 min @ 125°C	Very high speed syringe dispensing 47,000 DPH capable. Jetttable.	5°C ± 3°C or 8°C -21°C for 30 days	10 months from DOM
3629™	High reliability low temperature cure, lead-free capable, dispense grade adhesive. Also compatible with DEK® ProFlow® printing.	Pink - to make inspection easier. The uncured product is fluorescent in UV light.	110-140 s @ 120°C or 3-5 min at 110°C. Cure as short as 60 s at 150°C.	Syringe Dispense	5°C ± 3°C	6 months from DOM

Loctite® Chipbonder® Stencil Print/Pin Transfer Adhesives

Product	Description/Application	Color	Cure	Process Method	Storage (Protect from heat)	Shelf Life*
3607™	For pin transfer applications. Very low moisture pick-up designed for use with open reservoir applications.	Pink	150-180 s @ 150°C	Pin Transfer	5°C ± 3°C	6 months from DOM
3616™	High speed stencil print adhesive. Compatible with DEK® ProFlow® and MPM® Rheopump®.	Red	60 s @ 150°C 90 s @ 125°C	Stencil Print (60-150 mm/s)	5°C ± 3°C	6 months from DOM

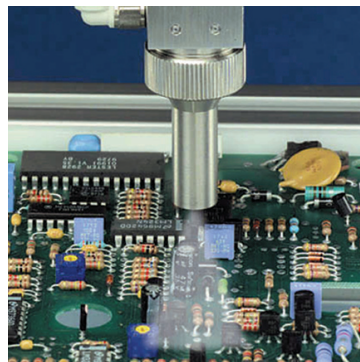
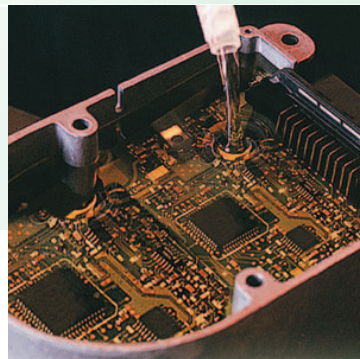
Loctite® Adhesive Clean-up Solvent

Product	Description/Application	Solvent Type	Flashpoint	Corrosive Properties	Ozone Depletion Potential
7360™	Nozzle and dispense machine component cleaner. Excellent for removal of uncured adhesive from the board without causing the adhesive to gel.	Aliphatic Ester blend	100°C	None	None

*DOM = Date of Mfg.

Circuit Board Protection – Potting, Encapsulation, Conformal Coating & Gasketing Materials

Many emerging applications expose printed circuit boards to harsh environmental conditions: automotive systems, telecom central offices, and cellular base stations, to name but a few.



Henkel is committed to meeting the industry's need for materials that provide superior environmental and thermal cycling protection.

Henkel offers a wide variety of chemistries and solution concepts that provide durability and protection, as well as numerous process options, under the respected Hysol® and Loctite® product brands.

Our potting and encapsulation compounds protect PCBs and electrical devices by enhancing mechanical strength, providing electrical insulation, and increasing vibration and shock resistance.

Loctite® silicone encapsulants are uniquely designed to protect sensitive fine-pitch leads, from potentially damaging extreme thermal cycling conditions. Loctite® silicone gasket materials deliver precise, reliable sealing for electronic enclosures.

And Loctite® conformal coatings protect circuit boards from thermal shock, moisture, humidity, corrosive materials, and many other adverse conditions, extending their longevity in harsh marine, automotive, aerospace and consumer electronic applications.

Increased awareness of environmental protection imperatives is behind our migration to solvent-free, low-VOC materials and processes. Henkel has developed a family of conformal coatings that are not only solvent-free but also cure faster than traditional materials.

Henkel has the right chemistry, experience and expertise, whatever your circuit board protection needs.

Use new product designation when ordering part numbers shown below:

Product	New Product Designation	Previously known as
ES0613™	EA0613™	RE2039
	EB0613™	HD3404
ES0614™	EA0614™	RE2039
	EB0614™	HD3561
ES0615™	EA0615™	RE2039
	EB0615™	HD0243
ES0616™	EA0616™	EE4215
	EB0616™	HD3404
ES0617™	EA0617™	EE4215
	EB0617™	HD3561
ES0618™	EA0618™	EE4215
	EB0618™	HD0243
ES0619™	EA0619™	EA6007
	EB0619™	EB6045

Circuit Board Protection

Potting/Encapsulation

Hysol® Epoxy – Room-Temperature-Cure

Product	Description/Application	Type	Viscosity cps	Gel Time	Recommended Cure	Mix Ratio PBW	Shore Hardness
ES0620™	Clear, fast gelling epoxy resin with excellent wetting and good chemical resistance.	Unfilled Clear Epoxy	6,000	200 g 10 min pot life	12-24 hrs @ 25°C	100/46	90D
ES4212™	Versatile, black potting system. Features long pot life, easy mix ratio, soft filler. Machine dispensing or hand mixing.	Filled Black Epoxy	25,000	200 g 230 min pot life	36-48 hrs @ 25°C	100/90	78D
ES4412™	X-Ray opaque potting system. Low viscosity, long pot life, easy mix ratio.	Filled Black Epoxy	10,000	200 g 60 min pot life	24 hrs @ 25°C	100/87	75D
ES4512™	UL 94V-0 recognized potting compound with convenient one-to-one mix ratio.	Filled Black Epoxy	19,000	200 g 90 min pot life	36-48 hrs @ 25°C	100/100	88D
ES6005™	Fast gelling, flame retardant, black potting compound. Easy mix ratio, low viscosity, room-temperature-cure, ideal for potting/encapsulating high volume parts. UL 1446 recognized and UL 94 HB flame retardant.	Filled Black Epoxy	1,500	400 g 25 min pot life	16 hrs @ 25°C	100/29.5	70D

Hysol® Epoxy – Heat Cure

Product	Description/Application	Type	Viscosity cps	Gel Time	Recommended Cure	Mix Ratio PBW	Shore Hardness
3866™	Low viscosity, epoxy resin formulation for small potting applications where fast process cure is required.	Filled Off White Opaque Epoxy	2,500	10 s UV gel	2 hrs @ 80°C	100/43	60D
EE8200™ (EB0363)	Flexible, low stress, casting system for pressure sensitive components. UL94-V0 listed. Note: Not sold in the U.S.	Filled Black Epoxy	11,000	8 min/120°C	3 hrs 100°C	100/35	68D
E07038™	One-component, epoxy casting compound for sensor potting applications. Designed to withstand automotive / harsh environment applications. Note: Not sold in the U.S.	Filled Black Epoxy	40,000	n/a	2 hrs @ 140°C	n/a	92D
ES0613™	Undiluted, unfilled, 100% solids, low moisture absorption, low shrinkage and expansion, general purpose epoxy system.	Unfilled Amber Epoxy	3,000	200 g 20 min pot life	2 hrs @ 60°C	100/11	85D
ES0614™	Impact resistant, low viscosity, room-temperature-cure, unfilled, undiluted epoxy casting system. Exhibits excellent resistance to impact and thermal shock.	Unfilled Amber Epoxy	600	200 g 35 min pot life	3 hrs @ 60°C	100/30	78D
ES0615™	Unfilled, heat cure, higher operating temperature, long pot life, epoxy casting system. Performs well where excellent chemical resistance, high heat distortion temperature and good electrical properties under high humidity conditions are required.	Unfilled Amber Epoxy	10,000	200 g 4-5 hrs @ 40°C	2 hrs @ 80°C Plus 2 hrs @ 150°C	100/25	83D
ES0616™	Undiluted, filled, improved thermal properties, low shrinkage and low expansion characteristics.	Filled Black Epoxy	10,500	200 g 20 min pot life	2 hrs @ 60°C	100/5.5	87D
ES0617™	Impact resistant, low viscosity, room-temperature-cure, filled epoxy casting system. Improved thermal conductivity, increases resistance to heat and thermal shock.	Filled Black Epoxy	2,000	200 g 80 min pot life	3 hrs @ 60°C	100/15	82D
ES0618™	Filled, heat cure, high operating temperature, long pot life, epoxy casting system.	Filled Black Epoxy	25,000	200 g 4-5 hrs @ 40°C	2 hrs @ 80°C Plus 2 hrs @ 150°C	100/12.5	82D
ES0619™	Soft, flexible, epoxy casting system with improved adhesion characteristics, good heat resistance and a convenient mix ratio. It is best suited for low stress applications.	Filled Black Epoxy	1,900	100 g 115 min	5 hrs @ 80°C	100/41	23A

Loctite® Silicones

Product	Description/Application	Type	Viscosity cps	Gel Time	Recommended Cure	Mix Ratio PBW	Shore Hardness
5088™	UV-curing, translucent silicone for high-speed potting of corrosive sensitive substrates.	Silicone	50,000	30 s	UV Moisture 60 s 40 mW/cm²	One Component	30A
5140™	Self-leveling, one component moisture curing silicone. Non corrosive cure mechanism. Performs well where high temperature and good electrical properties under high humidity conditions are required. Loctite® 5140 is tested to the lot requirements of US Military Specification MIL-A-46146B.	Silicone	35,000	<3 hrs (skin over)	Moisture 24 hrs @ 25°C	One Component	30A

Circuit Board Protection

Potting/Encapsulation
Hysol® Urethane

Product	Description/Application	Type	Shore Hardness	Gel Time	Viscosity cps	Recommended Cure	Mix Ratio PBW
US5520™	Economical, flame retardant, UL recognized, urethane potting/encapsulating compound.	Filled Tan Urethane	80A	300 g 15-30 min	3,750	16 hrs @ 25°C	17.6/100
US5529™	Long pot life, good flow, filled polyurethane compound.	Filled Black Urethane	85A	300 g 70-110 min	2,400	24 hrs @ 25°C	15/85
US5538™	Economical, unfilled, low viscosity, excellent wetting, polyurethane encapsulant.	Unfilled Black Urethane	65A	105 g 45-75 min	450	24-48 hrs @ 25°C	30/70
US5544™	Fast gelling version of US5529, recommended for high productivity.	Filled White Urethane	85A	300 g 4-6 min	2,000	2-4 hrs @ 25°C	15/85

Sealing/Gasketing
Loctite® Silicone

Product	Description/Application	Type	Cure Cycle	Viscosity	Tensile PSI/KPa	Elongation	Shore Hardness
5089™ Nuva-Sil®	UV-curing silicone for electronics module sealing. Ideal for high-speed potting. On-line pressure testing possible immediately after cure.	Filled Amber	UV Moisture 60 s 40 mW/cm²	1000,000 cps	145	190	>25A
5084™ Nuva-Sil®	Non-corrosive, non-slumping, UV silicone for gasketing and sealing devices. Provides severe environmental protection.	Filled Amber	UV Moisture 60 s 40 mW/cm²	N/A	550 / 80	200%	45A
5145™	Bonding, sealing and coating electronic devices. Ideal for reinforcing and strain-relieving delicate components. Meets Mil-A46146B.	Filled Translucent	Moisture 24 hrs @ 25°C	N/A	493	>500 %	25A
5421™	Electrical conductive silver-filled material provides EMI/RFI shielding on electronic device enclosures. Volume resistivity = 0.005Ω-cm.	Filled Tan	Moisture 24 hrs @ 125°C	N/A	102	>40 %	50-65A

*Made to order.

Circuit Board Protection

Conformal Coatings

Product	Description/Application	Type	Viscosity cps	Pot Life	Cure Cycle	Alternate Cure	Dielectric Strength (V/mil/KV/cm)	Mix Ratio	Temp Range
3900™	This air-dry coating is designed for small production runs. It may be applied by spray, dip or brush procedures. Aerosol - fast cure. Note: Not sold in Europe.	Acrylic One Component	Aerosol	N/A	Air Dry - 5 min	N/A	1652 / 650	N/A	-40 to 125°C
PC20M™	Repairable, stable, good moisture and environmental protection, superior toughness. MIL-I-46058C. Note: Not sold in Europe.	Acrylic One Component	2,000	N/A	45 min @ 75°C	24 hrs @ 25°C	2000 / 787	N/A	Continuous up to 110°C
PC30STD™ 	Repairable, low VOC, waterborne acrylic, one component, stable printed circuit board coating with superior toughness and abrasion resistance.	Acrylic One Component	380	N/A	2 hrs @ 60°C	7 days @ 25°C	860	N/A	Continuous up to 110°C
PC51™	Rapid drying, one component for acrylic dipping applications. Provides excellent vibration resistance and toughness. Can be removed for repair. Note: Not sold in the U.S.	Acrylic, One Component	140	N/A	45 min @ 75°C		2000 / 780	N/A	Continuous up to 125°C
PC54™	Rapid drying, one component for acrylic non-atomized spray coating applications. provides excellent vibration resistance and toughness. Can be removed for repair. Note: Not sold in the U.S.	Acrylic, One Component	75	N/A	45 min @ 75°C		2000 / 780	N/A	Continuous up to 125°C

Product	Description/Application	Type	Viscosity cps	Pot Life	Cure Cycle	Alternate Cure	Dielectric Strength (V/mil/KV/cm)	Mix Ratio	Temp Range
PC18M™	Flexible solvent-based, one component, urethane coating. Provides good thermal shock resistance. MIL-I-46058C.	Urethane One Component	350	20 min	2 hrs @ 60°C	7 days @ 25°C	1200 / 472	N/A	Continuous up to 110°C
PC28STD™	Convenient aerosol packaging, oxygen-cure, printed circuit board coating system.	Urethane Component	35	N/A	2 hrs @ 60°C	5-7 days @ 25°C	1500 / 591	N/A	Continuous up to 110°C
PC29™	Thin film printed circuit board coating with good toughness and high flexibility. Note: Not sold in Europe.	Urethane Two Component	225	200 g 6 hrs	2 hrs @ 100°C	4 hrs @ 60°C	1500 / 591	100 / 60	Continuous up to 125°C

Product	Description/Application	Type	Viscosity cps	Pot Life	Cure Cycle	Alternate Cure	Dielectric Strength (V/mil/KV/cm)	Mix Ratio	Temp Range
PC12-0007M™	General purpose, 100% solids, epoxy printed circuit board with maximum electrical and ruggedization properties. Suitable for continuous operation up to 125°C. MIL-I-46058C.	Epoxy Two Component	Medium	190 min	2 hrs @ 75°C	4 hrs @ 65°C	1500 / 591	100 / 80	Continuous up to 125°C

Product	Description/Application	Type	Viscosity cps	Pot Life	Cure Cycle	Alternate Cure	Dielectric Strength (V/mil/KV/cm)	Mix Ratio	Temp Range
5293™	UV Silicone for severe temperature cycling environments. High reliability automotive. No solvents. Low VOC.	Silicone One Component	600	N/A	UV 20-40 s 75 mW/cm²	MOISTURE Tack-free: 2-6 hrs Full Cure: 72 hrs	406 / 160	N/A	-40 to 204°C
5296™	Heat cure silicone can be applied with brush, dip, or spray. High reliability automotive. Clear.	Silicone One Component	150 - 235	N/A	Heat 7 min @ 125°C	N/A	524 / 206	N/A	-40 to 204°C
AC0305™	Special blend of solvents, has moderately slow evaporation, used for adjustment of viscosity and/or film thickness on printed circuit coatings. Can be used with all the conformal coating materials above, except with acrylic and silicone systems above.	Thinner							

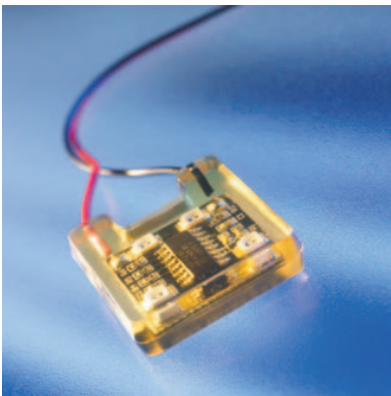
Macromelt® Low Pressure Molding

The Macromelt® line of high performance thermoplastic polyamides is specially designed to meet all your molding process requirements.



The Macromelt® products provide excellent sealing adhesion, and exceptional temperature and solvent resistance. The simplicity of these materials allows for minimal equipment cost. The low viscosity of the resin correlates to low injection pressure that will not damage delicate electronic surface mount components.

Low pressure molding is a viable solution for production issues associated with traditional high pressure injection molding over delicate electronics and circuit boards. The polyamide hot melt adhesive material may actually be used to eliminate traditional housings and covers used in potting and laser welding. The one component materials cure by cooling, providing a finished component in just seconds.



The low viscosity of the molten Macromelt® hot melt adhesive allows for application pressures as low as 1.8 bar (25 PSI). With a short cycle time of 15 to 45 seconds, injection molding results in higher production rates when compared to generic 24 hour cure for two component urethane or epoxy potting operations.

- Advantages
- Water-tight encapsulation
 - Fast cycle times (15-45 seconds)
 - Non-toxic, single component, UL 94-V0 approved
 - Effective strain relief

- Applications
- Automotive and industrial sensors
 - Hall effect sensors
 - PCB protection
 - Electronics modules
 - Connectors
 - Strain Relief
 - Switches
 - Grommets

Macromelt® Hot Melt Adhesives

Product	Description/Application	Color	Performance Temperature	Shore A Hardness	Softening Point
OM633™ OM638™	Moldable polyamide with service temperature up to 125°C such as in an automotive firewall.	Amber Black	-40°C to 125°C	90	157 ± 5°C
OM641™ OM646™	Moldable polyamide where strength and hardness are needed such as in memory sticks and computer connectors.	Amber Black	-40°C to 125°C	92	175 ± 5°C
OM652™ OM657™	Moldable polyamide where excellent adhesion and cold temperature flexibility are important such as in an automotive exterior. Also used extensively in white goods.	Amber Black	-40°C to 100°C	77	175 ± 5°C
OM673™ OM678™	Moldable polyamide with good adhesion for higher temperature applications such as in an automotive under-hood.	Amber Black	-40°C to 140°C	88	187 ± 5°C
OM681™ * OM686™ *	Moldable polyamide for high temperature applications such as in an automotive under-hood.	Amber Black	-40°C to 150°C	79	195 ± 5°C
OM682™ * OM687™ *	Moldable polyamide for the most demanding high humidity applications such as on the inside of an automobile tire. Formulated for very low water vapor transmission.	Amber Black	-40°C to 140°C	88	188 ± 5°C

* Note: Not Sold in Europe.

Macromelt® Low Pressure Molding

Product Properties

Adhesion Property	Standard	Macromelt® OM633™/638™	Macromelt® OM641™/646™	Macromelt® OM652™/657™	Macromelt® OM673™/678™	Macromelt® OM681™/686™	Macromelt® OM682™/687™
Color		Amber/Black	Amber/Black	Amber/Black	Amber/Black	Amber/Black	Amber/Black
Cold Flexibility	°C	-40°C	-40°C	-50°C	-40°C	-40°C	-40°C
Flammability Rating		UL 94-V0	UL 94-V0	UL 94-V0	UL 94-V0	UL 94-V0	UL 94-V0
Glass Transition Temperature	°C	-36°C	-35°C	45°C	-40°C	-40°C	-40°C
Injection Temperature	°C	200-240°C	200-240°C	180-230°C	200-240°C	210-240°C	200-240°C
Performance Temperature	°C	-40 to 125°C	-40 to 125°C	-40 to 100°C	-40 to 140°C	-40 to 150°C	-40 to 140°C
Softening Point	°C	175°C ± 5°C	175°C ± 5°C	157°C ± 5°C	187°C ± 5°C	195°C ± 5°C	188°C ± 5°C
Thermal Expansion Coefficient		5E -04	5E -04	5E -04	5E -04	5E -04	5E -04
Mechanical							
Density		0.98	0.98	0.98	0.98	0.98	0.98
Elongation at Rupture	%	400	800	400	500	400	500
Shore-A-Hardness		90	92	77	88	79	88
Shore-D-Hardness		56	59	41	51	57	57
Tensile Strength at Rupture	N/mm²	4.5	11	2.7	5.7	8.8	5
Electrical Properties							
Dielectric Constant	1kHz	4.5/4.7	5.1/5.5	6.2/6.3	4.9/4.9	5.4/5.5	5.3/5.5
Dielectric Strength 5.3/5.5	kV/mm	24/19	25/22	14/15	20/20	22/21	18/16
Viscosity @ 210°C	cps	3,500	4,500	3,900	3,400	4,500	3,800
Volume Resitivity	Ω cm	1.00E+13	1.00E+14	1.00E+13	1.00E+13	1.00E+13	1.00E+14

Adhesion

Substrate	Treatment	Macromelt® OM633™/638™	Macromelt® OM641™/646™	Macromelt® OM652™/657™	Macromelt® OM673™/678™	Macromelt® OM681™/686™	Macromelt® OM682™/687™
ABS	As received	++	+	+++	+	+	++
PA 6,6	As received	++	+	++++	+	+	++
PBT	As received	+	+	+++	+	+	+
PC	As received	++	+	+++	+	+	++
PE (crosslinked)	With corona	+++	++	+++	+++	++	+++
PE (crosslinked)	Without corona	+	+	++	+	+	+
PEI	As received	+++	++	+++	++	++	+++
PES	As received	+++	++	+++	++	++	+++
PUR	As received	+++	++	+++	++	++	+++
PVC	As received	+++	++	++++	+++	++	+++
Steel	Pre-heated	++	++	+++	+++	++	++
Steel	Room temperature	+	+	+	+	+	+

Adhesion/resistance: ++++ very good +++ good ++ satisfactory + adequate

Information provided herein is based upon our practical knowledge and experience. Due to different materials used as well as to varying working conditions which are beyond our control we strictly recommend to carry out intensive trials as well as consultation of our technical personnel. Any warranty and/or liability shall not be derived from above information.

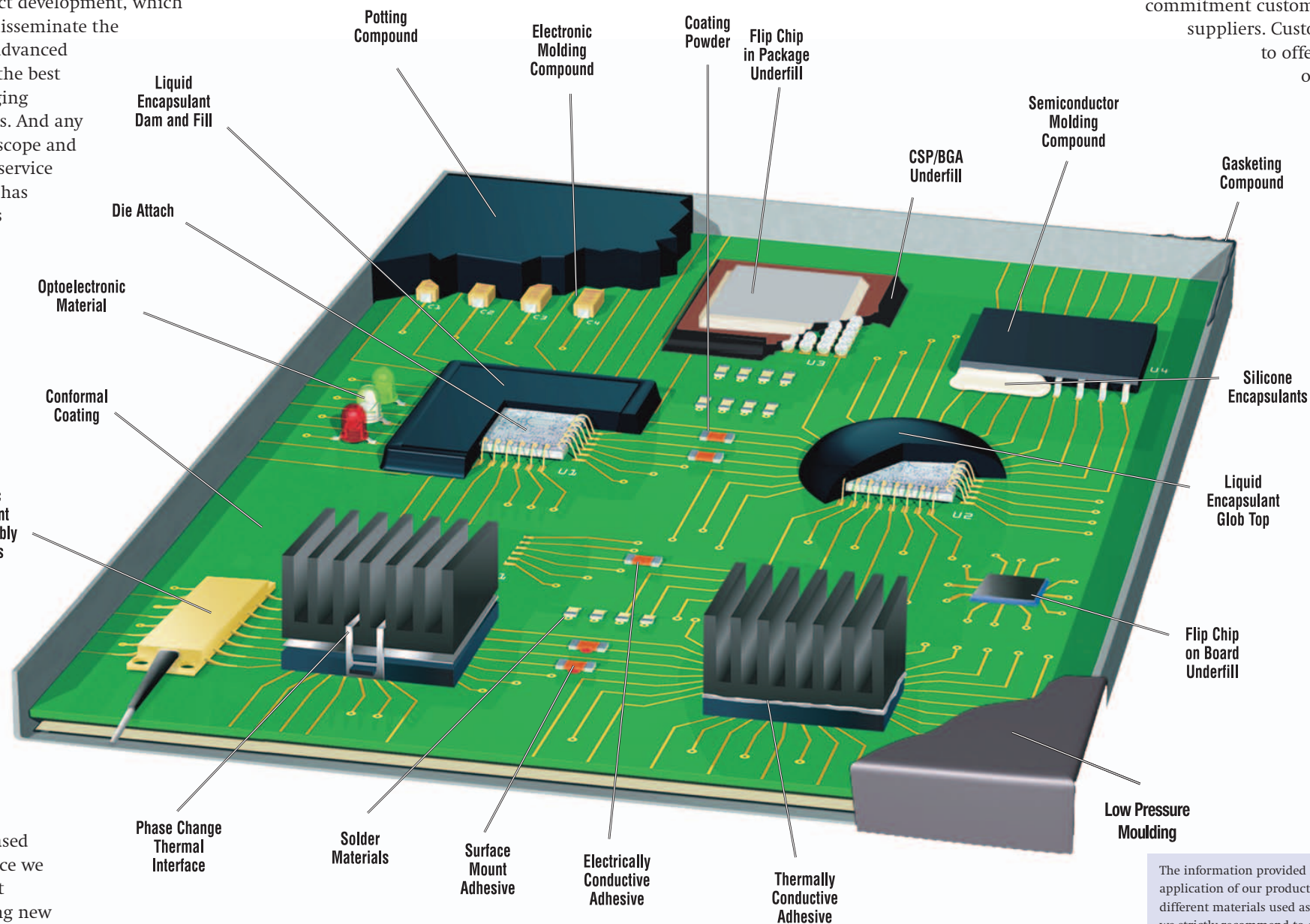
Specific data on fluid resistance and adhesion to various substrates is available at electronics.henkel.com.

Solutions Across the Board and Around the Globe

From component packaging to board level assembly, the electronics group of Henkel provides total solutions across the board and around the globe. Unlike other materials suppliers who specialize in one particular applications area, Henkel and our product brands of Hysol®, Multicore® and Loctite® deliver complete, tested and guaranteed compatible material sets for today's most demanding semiconductor packaging and electronics assembly applications.

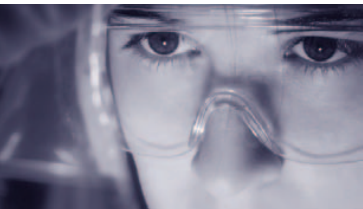
Henkel successfully integrates our customer support initiatives with applications effort and product development, which enables us to acquire and quickly disseminate the knowledge that will allow today's advanced electronics manufacturers to have the best chance of responding to ever-changing technologies and market conditions. And any such effort must have truly global scope and reach, if it is to deliver the level of service required by our customers. Henkel has expanded our research laboratories network, with centers in Southern California, Munich, Singapore, Seoul, Yokohama, and Kaohsiung to bring our expertise to key manufacturing regions.

These centers are strategically located to be near to important customer clusters, thereby delivering a fast and effective localized customer support service. They are also tightly integrated as an application and product development network, creating a technical capability closely coupled with customer support activities. Among their capabilities, our labs are able to model materials and simulate new formulations and combinations, based on the extensive data and experience we have acquired, to accurately predict behavior and interactions, and bring new material sets to market quickly and cost-effectively, fully qualified and guaranteed.



Henkel is taking the lead in elevating the level of service and commitment customers can expect from their materials suppliers. Customers should expect their materials supplier to offer more extensive capabilities, higher levels of expertise, greater responsiveness, and the ability to deliver a turnkey, fully compatible material set for each emerging requirement. And, that's precisely what you will get from Henkel: Solutions Across the Board and Around the Globe.

The information provided herein, especially recommendations for the usage and the application of our products, is based upon our knowledge and experience. Due to different materials used as well as to varying working conditions beyond our control, we strictly recommend to carry out intensive trials to test the suitability of our products with regard to the required processes and applications. We do not accept any liability with regard to the above information or with regard to any verbal recommendation, except for cases we are liable of gross negligence or false intention.



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