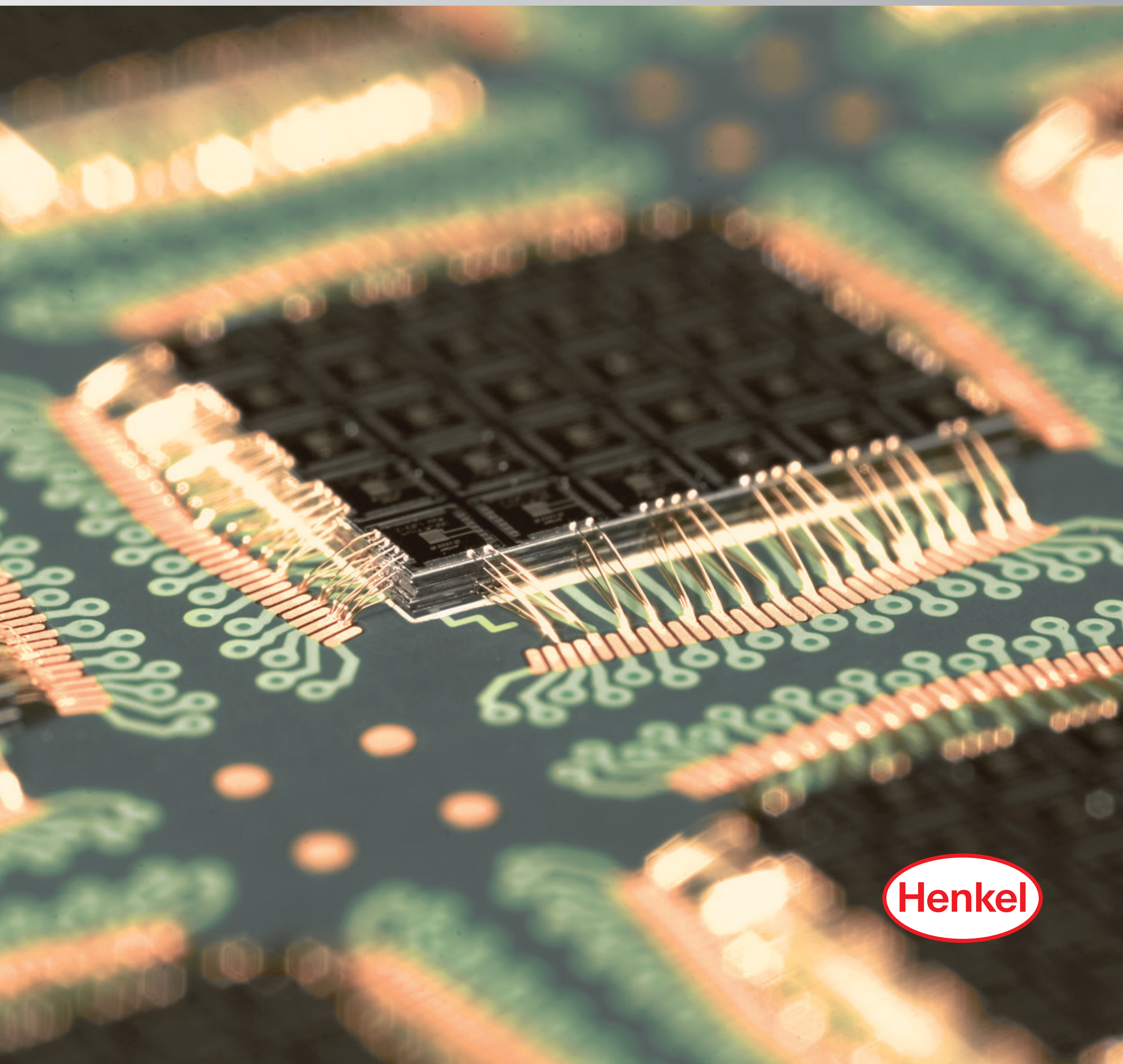
LOCTITE®

MATERIALS FOR WIREBOND PACKAGING

LAMINATE AND LEADFRAME SOLUTIONS



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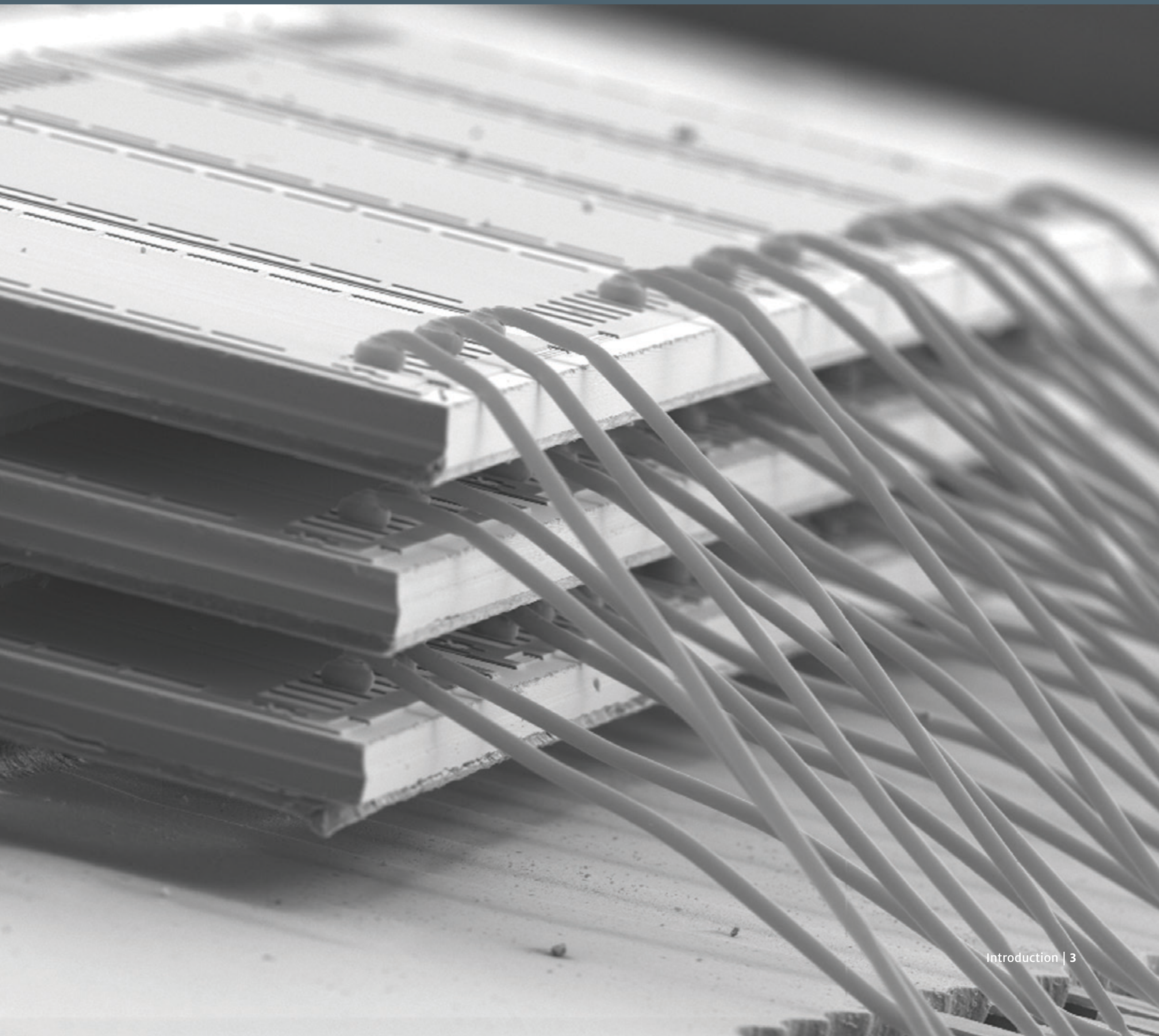
INTRODUCTION

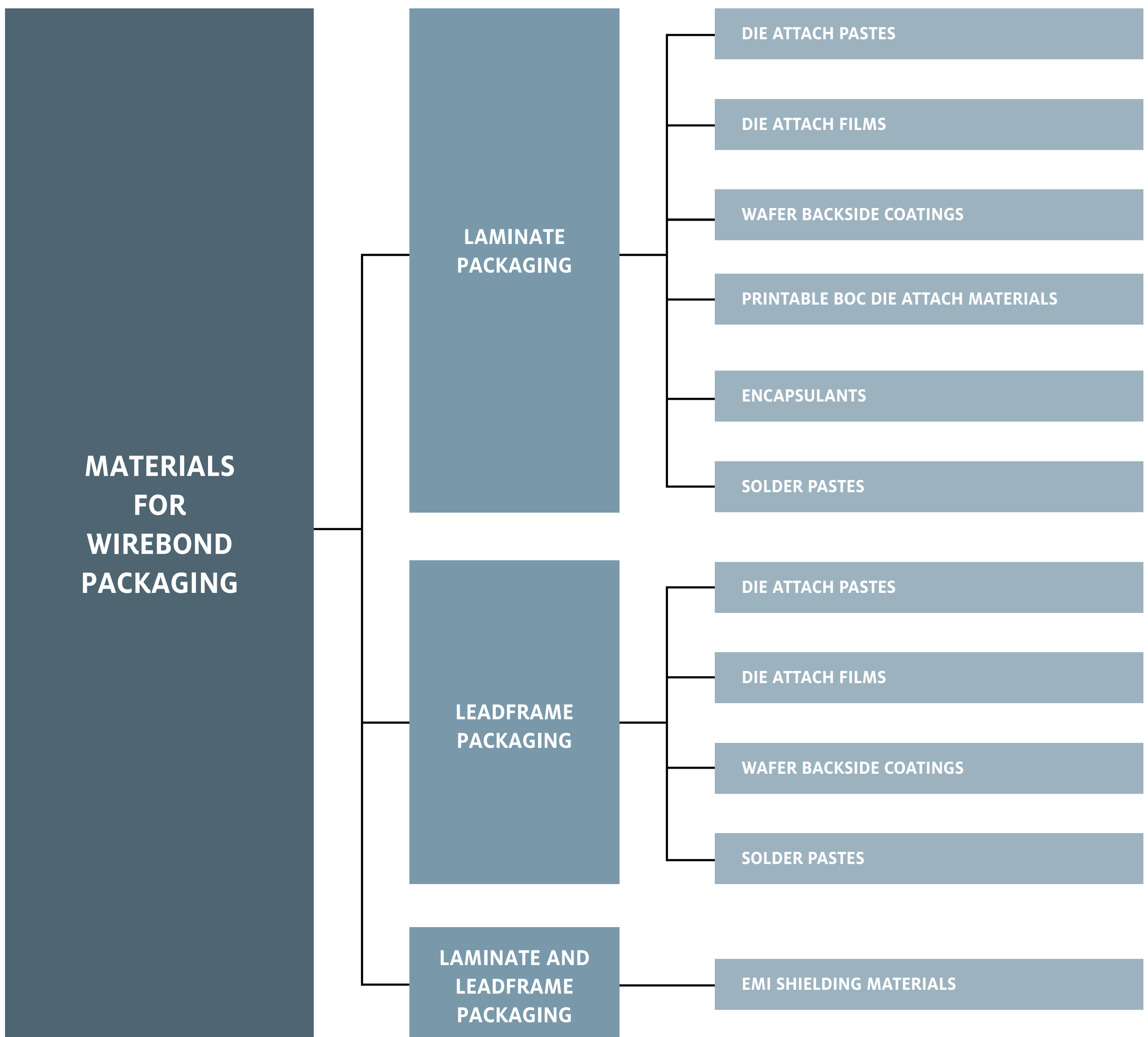
Semiconductor packaging continues to evolve, with semiconductor devices becoming more functional, powerful and integrated. Die sizes are shrinking, wafers are thinner than ever, and the lines between traditional semiconductor packaging and advanced form factors like system-in-package and system-in-module are increasingly blurred. Varying device configurations are addressing the new era of semiconductor manufacturing, with flip-chip and wirebond interconnection methodologies as the most prevalent. And, while flip-chip packaging technology is often preferred for small form factors, wirebond ICs still rule the industry in terms of volume and reliability. According to market research reports, wirebond IC packaging accounted for the majority of all advanced packaging integrated circuit technology, dominating the number of die in units shipped.

For packaging specialists and device designers, the flexibility, cost and existing infrastructure of wirebonding remain among the technology's primary advantages and fuel its stronghold status. Future growth for the wirebond sector will be largely driven by increased semiconductor use in the automotive electronics sector.



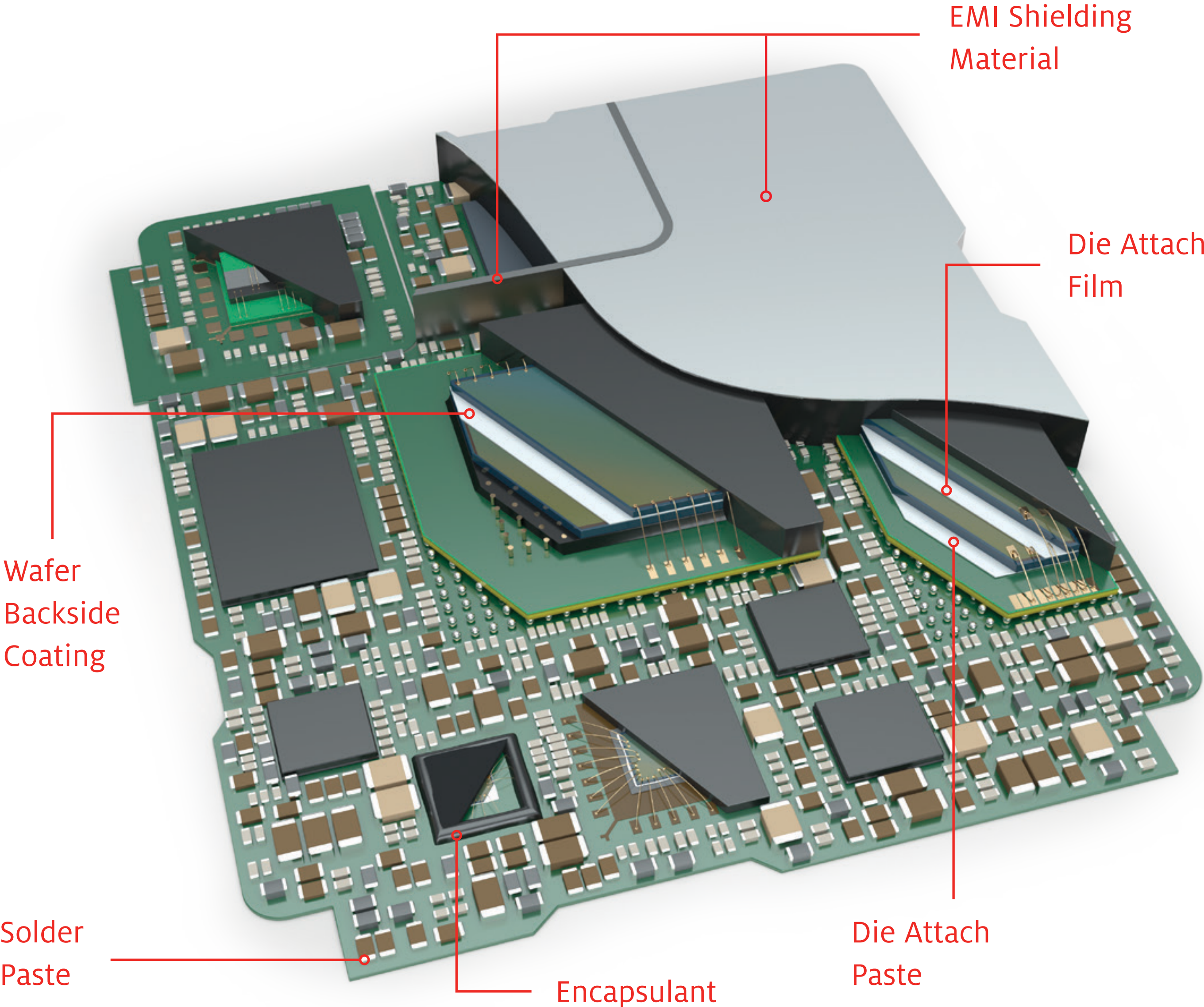
PRODUCT PORTFOLIO

Addressing the requirements for both laminate and leadframe wirebond packages, Henkel has developed a comprehensive portfolio of advanced materials for various wirebond requirements – from smaller die-to-pad ratios to thinner bond lines to low stress to high temperature capability and robust adhesion. A wide range of die attach pastes and films, encapsulants, solder pastes, package-level EMI shielding materials, and alternative wafer backside coating (WBC) die attach solutions deliver the process adaptability, cost-effectiveness and in-field reliability necessary for today's advanced wirebond ICs.



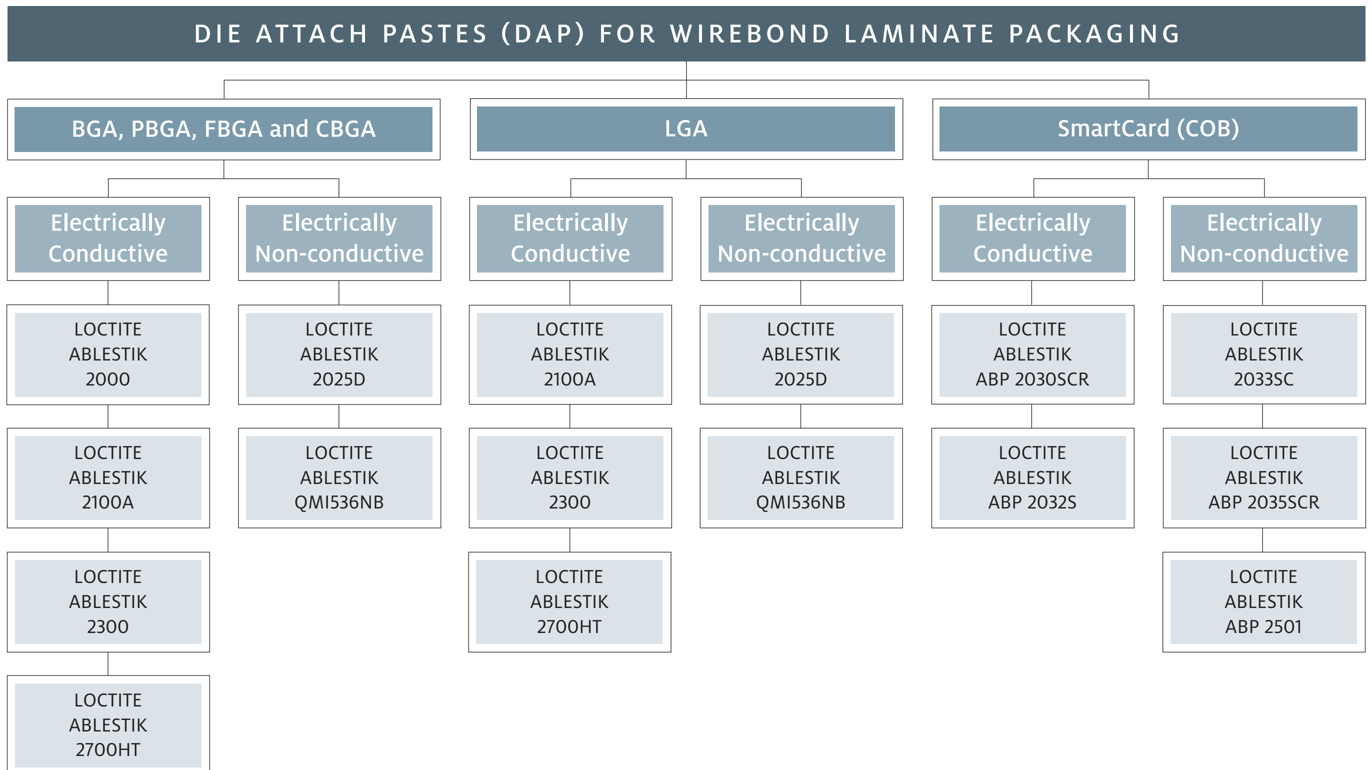
LAMINATE PACKAGING MATERIALS

Henkel's range of BMI-based adhesives enabled the proliferation of array type packaging when it was first introduced. Continuing this tradition, Henkel is facilitating advances in IC packaging with new materials systems designed for high performance and reliability in small formats, such as LGA devices, to very large format system-in-package and system-in-module technology. Whether paste, liquid or film, Henkel's materials are engineered for maximum efficiency and are developed in conjunction with leading-edge applications, giving semiconductor specialists the peace of mind to confidently integrate our materials for the most demanding processes and requirements. For challenging applications such as sensor technology, innovative materials with tightly-controlled physical characteristics like modulus of elasticity help avoid any compromise of parametric performance of packaged devices.



DIE ATTACH PASTES

A broad selection of electrically non-conductive and conductive LOCTITE ABLESTIK die attach paste formulations provide the reliability and performance today's high-density laminate packages demand. Each package type – from BGAs to LGAs to SmartCards – has different requirements, which is why Henkel has developed a suite of products that cater to the unique needs of laminate-based devices. Henkel die attach pastes offer a low modulus for stress reduction and warpage elimination, as well as bismaleimide (BMI) formulations for low moisture absorption to avoid package cracking during high temperature processing.



ELECTRICALLY CONDUCTIVE DIE ATTACH PASTES (DAP)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	VOLUME RESISTIVITY (Ohm·cm)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK 2000	Ag-filled die attach adhesive	• Low bleed • Low stress • Ultra-low moisture absorption • Fast oven cure with no voids	≤ 12 x 12	Solder mask or Au	L2 260°C capable	5.0 x 10^{-4}	1.2	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 2100A	Ag-filled die attach adhesive	• Low bleed • Low stress • Oven cure	≤ 12 x 12	Solder mask or Au	L2 260°C capable	5.0 x 10^{-2}	1.2	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 2300	Ag-filled die attach adhesive	• Low bleed • Low stress • Excellent dispensability • Low voiding • Oven cure	≤ 8 x 8	Solder mask or Au	L2 260°C capable	5.0 x 10^{-2}	0.6	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 2700HT	Ag-filled die attach adhesive	• Excellent bleed performance • Long work life • Strong hot/wet adhesion to Au • Ideal for small needle dispensing • Oven cure	≤ 3 x 3	Solder mask, Ag or Au	L3 260°C capable	3.0 x 10^{-5}	11.0	30 min. ramp and 30 min. hold at 175°C in nitrogen
LOCTITE ABLESTIK ABP 2030SCR	Ag-filled die attach adhesive	• Low stress • Compatible with dam & fill encapsulants • Excellent dispensing performance for high throughput application • Snap cure	≤ 10 x 10	Solder mask, Ag, Au or plastics	L3 260°C capable	2.0 x 10^{-4}	2.0	120 sec. at 120°C
LOCTITE ABLESTIK ABP 2032S	Ag-filled, epoxy die attach adhesive	• Good adhesion to a variety of substrates • Good dispensing characteristics • Low temperature oven cure	≤ 10 x 10	Solder mask, Ag, Au, steel or plastics	L3 260°C capable	2.0 x 10^{-4}	1.0	60 min. at 80°C

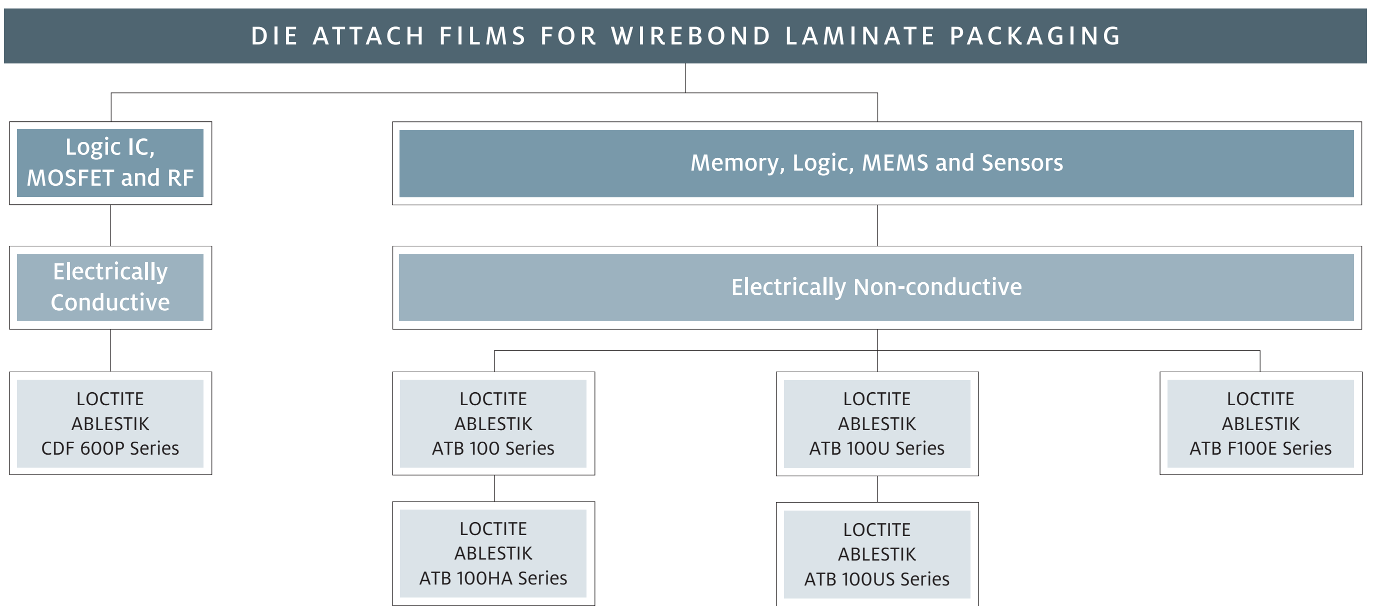
ELECTRICALLY NON-CONDUCTIVE DIE ATTACH PASTES (DAP)

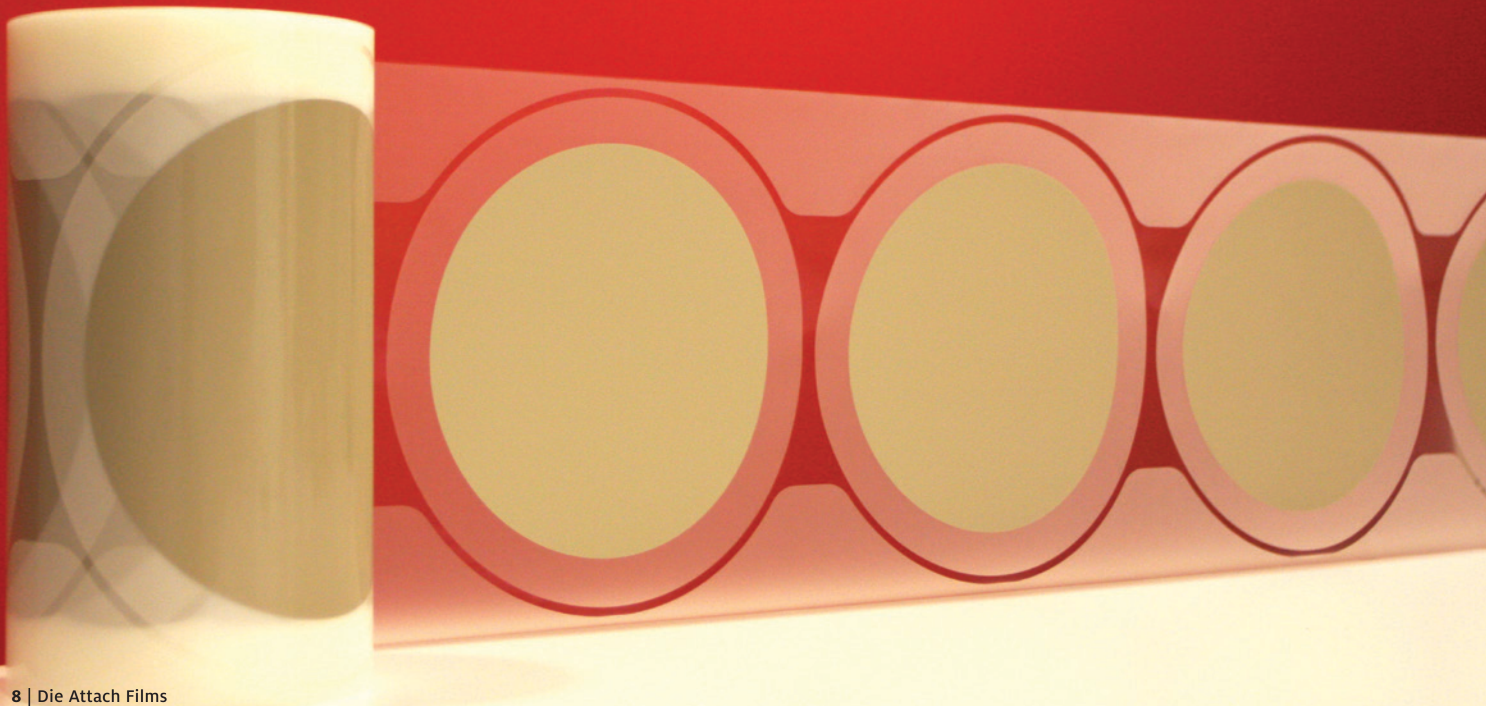
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK 2025D	Silica-filled die attach adhesive	• Low bleed • Very low stress • Red color for vision recognition • Good adhesion to a variety of substrates • Oven cure	≤ 8 x 8	Solder mask, Cu, Ag or Au	L3 260°C capable	407	0.4	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 2033SC	Silica-filled die attach adhesive	• Long work life • Low bleed • Optimized rheology • Snap cure	≤ 8 x 8	Solder mask, Ni, Cu, Ag or Au	L3 260°C capable	2,100	0.35	90 sec. at 110°C
LOCTITE ABLESTIK ABP 2035SCR	Silica-filled die attach adhesive	• Low stress • Compatible with dam & fill encapsulants • Excellent dispensing performance for high throughput application • Snap cure or low temperature oven cure	≤ 5 x 5	Solder mask or Au	L3 260°C capable	1,500	1.0	2 min. at 120°C (snap)
LOCTITE ABLESTIK ABP 2501	Silica-filled, BMI hybrid die attach adhesive	• Excellent dispensing performance for high throughput application • Good adhesion performance for a wide die size range • Low stress • Snap cure	≤ 5 x 5	Solder mask, Ag or Au	L3 260°C capable	1,430	≈ 0.4	90 sec. at 110°C
LOCTITE ABLESTIK QMI536NB	PTFE-filled, BMI die attach adhesive	• Low bleed • Very low stress • White color for vision recognition • Widely used for stacked die • Fast oven cure	≤ 8 x 8	Solder mask or Au	L1 260°C capable	300	0.3	30 min. at 150°C

DIE ATTACH FILMS

Henkel is the established leader in die attach film technology for laminate-based devices. Electrically non-conductive die attach films provide stability and support for thinner wafer handling and facilitate thin bond lines within multi-die stacks for greater functionality. Compatibility with both copper and gold wire and various wafer grinding methods lend process versatility to these high performance products. Henkel's formulation expertise led to the development of the market's first viable electrically conductive die attach film, which is an ideal solution for devices such as Logic ICs, MOSFETs and RF, where low stress, high adhesion, tight die-to-pad clearance and high reliability are required.

DIE ATTACH FILMS FOR WIREBOND LAMINATE PACKAGING





ELECTRICALLY CONDUCTIVE DIE ATTACH FILMS (CDAF)

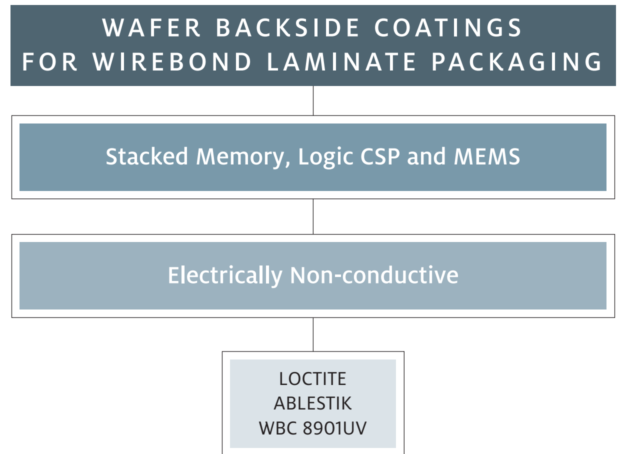
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	FILM THICKNESS (µm)	MOISTURE SENSITIVITY LEVEL, MSL	THERMAL CONDUCTIVITY (W/m·K)	IN-PACKAGE THERMAL RESISTANCE (K/W)
LOCTITE ABLESTIK CDF 600P Series	Ag-filled die attach adhesive	• Low stress and excellent wetting for large die • Compatible with various metal surfaces, including solder • Recommended for thin wafer handling applications • Oven cure	25	L2 260°C capable	1	2.1

ELECTRICALLY NON-CONDUCTIVE DICING DIE ATTACH FILMS (DDF)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DICING TAPE	FILM THICKNESS (µm)	WAFER THICKNESS (µm)	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)
LOCTITE ABLESTIK ATB 100 Series	Silica-filled, rubberized epoxy die attach adhesive	• Compatible with Cu wire or Au wire packages • Good adhesion onto low density fiberboard (LDF) • Compatible with Stealth Dicing Before Grind (SDBG) process • Oven cure	Non-UV	15, 20, 25 or 30	≥ 75	L2 260°C capable	1,170
LOCTITE ABLESTIK ATB 100HA Series	Silica-filled, epoxy die attach adhesive	• Consistent dicing and die pickup for large die applications • Compatible with Stealth Dicing Before Grind (SDBG) process • *Skip*Cure	UV/Non-UV	5, 10, 15, 20, 25 or 30	≥ 50	L1 260°C capable	2,299
LOCTITE ABLESTIK ATB 100U Series	Silica-filled, rubberized epoxy die attach adhesive	• Compatible with Cu wire or Au wire packages • Compatible with Stealth Dicing Before Grind (SDBG) process • Fast oven cure	Non-UV	5, 10, 15, 20, 25 or 30	≥ 75	L2 260°C capable	875
LOCTITE ABLESTIK ATB 100US Series	Silica-filled, epoxy die attach adhesive	• Long thermal budget (4 hr. at 175°C) • Consistent dicing and die pickup for large die applications • *Skip*Cure during molding process	UV/Non-UV	5, 10, 15, 20, 25 or 30	≥ 50	L2 260°C capable	1,277
LOCTITE ABLESTIK ATB F100E Series	Silica-filled, epoxy die attach adhesive	• Suitable for small to large die • Excellent workability for below 3 mm x 3 mm die • Long work life (4 months before and after lamination) • Compatible with Stealth Dicing Before Grind (SDBG) process • Film over wire (FoW) and film over die (FoD) applications • Oven cure	UV/Non-UV	25 FoW: 35 – 80 FoD: 90 – 150	≥ 75	L1 260°C capable	5,256

WAFER BACKSIDE COATINGS

Wafer Backside Coating is a unique process that facilitates automated application of die attach adhesive at the wafer-level followed by B-staging to form a die attach film. Adaptable to spray coating technique, Henkel's Wafer Backside Coatings enable process speed, thickness control and material uniformity. Following thermal or UV B-staging and wafer dicing, die attach is achieved via heat and pressure to produce a consistent bond line and small, controlled fillets. Wafer Backside Coating adhesives are ideal for die attach applications where fillet control is critical.

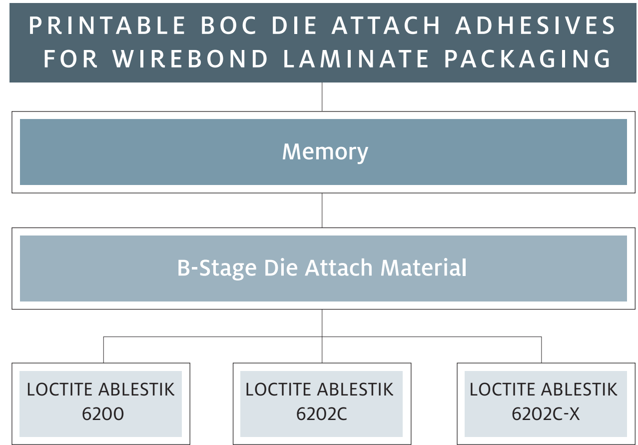


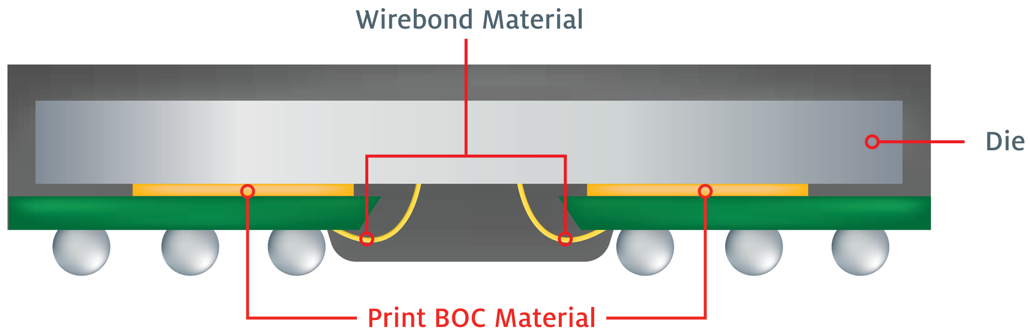
ELECTRICALLY NON-CONDUCTIVE WAFER BACKSIDE COATINGS (WBC)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)	CTE (ppm/°C)		RECOMMENDED CURE
							Below T_g	Above T_g	
LOCTITE ABLESTIK WBC 8901UV	Die attach wafer backside coating adhesive	• Wide process windows • 5 to 60 µm bondline control • Low viscosity before B-stage • Can be spray coated on Dicing Before Grinding (DBG) wafers • UV B-stage and oven cure	≤ 1 x 1	Solder mask, Cu, Ag or Au	L2 260°C capable	3,585	45	142	15 min. ramp and 30 min. hold at 90°C + 4 min. ramp and 45 min. hold at 120°C

PRINTABLE BOC DIE ATTACH MATERIALS

As board-on-chip (BOC) – also known as substrate-on-chip – packaging emerges as the dominant chip-scale packaging configuration for DRAM devices, die attach materials must deliver with precise control of bondline thickness and die tilt, minimal fillet formation and no contamination of wire bond pads. Henkel's B-stage printable adhesives offer a more cost-effective solution than conventional adhesive films, providing the robust performance of film at a paste price point. The portfolio of LOCTITE ABLESTIK materials for BOC applications offers high UPH, printable formulations with low flow, controlled bondlines, minimized tolerance and bleed, as well as long storage and work lives.



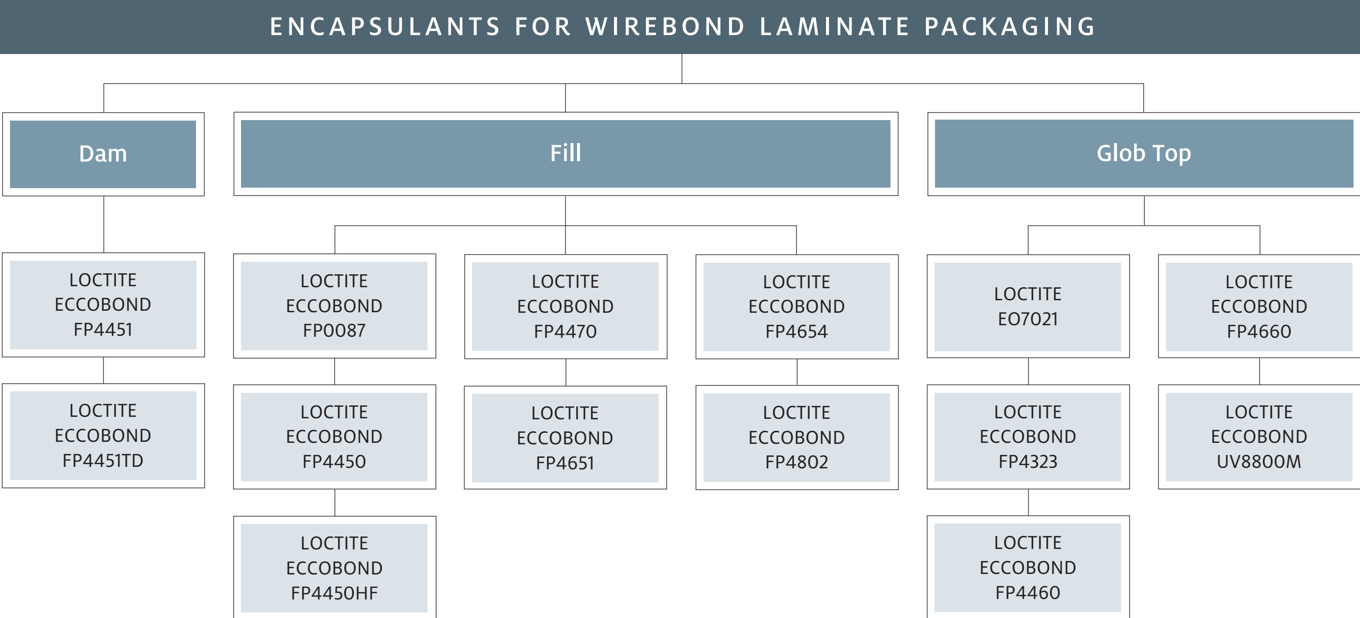


PRINTABLE BOC DIE ATTACH MATERIALS

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	VISCOSITY, BROOKFIELD CP51 AT 25°C AND 5 RPM (CP)	GLASS TRANSITION TEMPERATURE, TG, BY TMA (°C)	CTE (ppm/°C)		RECOMMENDED B-STAGE CONDITION	CURE SCHEDULE
					Below T_g	Above T_g		
LOCTITE ABLESTIK 6200	B-stageable die attach adhesive	• Stencil printing • Low moisture uptake • Low bleed • Ideal for chip scale packages where tolerance and bleed need to be minimized • Oven cure • Designed for flex or laminate based substrates	21,000	-10	94	237	60 min. at 120°C	30 min. ramp + 60 min. soak at 175°C
LOCTITE ABLESTIK 6202C	B-stageable die attach adhesive	• Stencil printing • Low warpage • Ideal for chip scale packages where tolerance and bleed need to be minimized • Oven cure • Recommended for large die sizes • Designed for laminate based substrates	28,000	40	70	350	1 hr. at 125°C	30 min. ramp + 60 min. soak at 175°C
LOCTITE ABLESTIK 6202C-X	B-stageable die attach adhesive	• Small particle size • Stencil printing • Low warpage • Ideal for chip scale packages where tolerance and bleed need to be minimized • Oven cure • Recommended for large die sizes • Designed for laminate based substrates	30,000	40	70	232	30 min. ramp + 90 min. soak at 125°C + 30 min. ramp down to 25°C in vented magazine in oven with good air flow	30 min. ramp + 90 min. soak at 90°C + 30 min. ramp and 60 min. soak at 175°C in vented magazine in oven with good air flow

ENCAPSULANTS

Protection from the effects of mechanical damage and corrosion is essential for the long-term reliability of semiconductor devices. With a range of products to tackle growing application demands, Henkel's advanced encapsulant materials in both dam/fill and glob top systems meet the most stringent JEDEC-level testing, offering outstanding performance in formulations that simplify processing through robust dispensing characteristics and flexible cure mechanisms. Henkel's high-purity epoxy encapsulant solutions provide device safeguarding and manufacturing confidence.

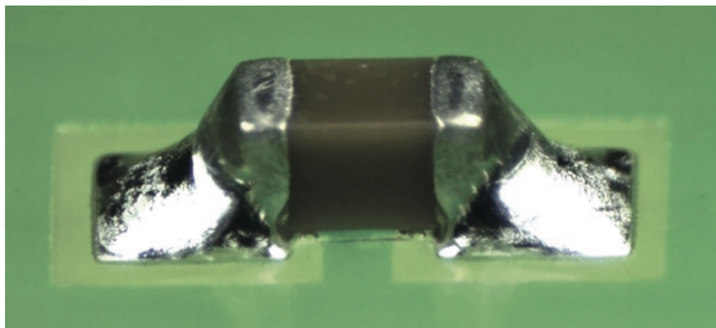


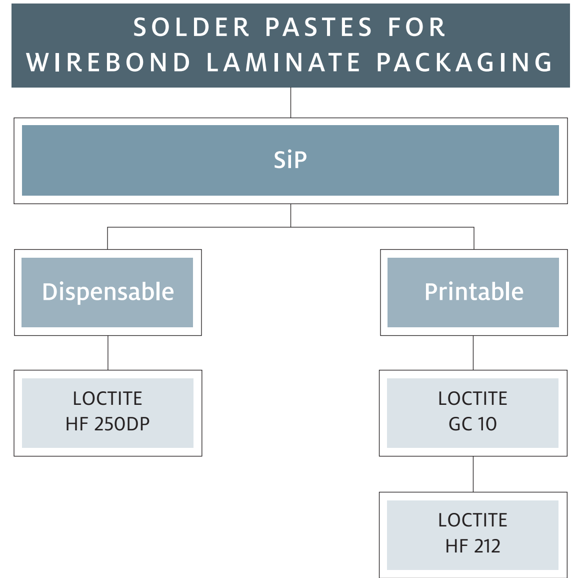
ENCAPSULANTS

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	APPLICATION	VISCOSITY AT 25°C (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CTE, BELOW T_g (ppm/°C)	RECOMMENDED CURE
Dam							
LOCTITE ECCOBOND FP4451	Epoxy dam encapsulant	• Stable and consistent thixotropy with minimal slumping • Excellent pressure pot performance on live devices up to 500 hr. • Designed for use with fill encapsulant LOCTITE ECCOBOND FP4450 • Oven cure	BGA and memory	860,000 at 4 rpm	155	22	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4451TD	Epoxy dam encapsulant	• Ionically clean • High thixotropy with high height to width aspect ratio (0.7) • Excellent chemical resistance and thermal stability • Designed for use with fill encapsulant LOCTITE ECCOBOND FP4450 • Oven cure	BGA and memory	300,000 at 20 rpm	150	21	30 min. at 125°C + 90 min. at 165°C
Fill							
LOCTITE ECCOBOND FP0087	Epoxy fill encapsulant	• Low stress and high flow with reduced warpage and cracking • Low CTE • Excellent thermal shock and moisture resistance • Halogen-free • Oven cure	Stress-sensitive devices and severe automotive environments	20,000 at 20 rpm	175	18	1 hr. at 125°C + 1 hr. at 180°C
LOCTITE ECCOBOND FP4450	Epoxy fill encapsulant	• Low stress and relatively high flow • Good moisture resistance and excellent chemical resistance • Excellent pressure pot performance on live devices up to 500 hr. • Oven cure	Automotive, BGA, memory, COB, SiP and SmartCard	43,900 at 20 rpm	155	22	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4450HF	Epoxy fill encapsulant	• Excellent chemical, corrosion and moisture resistance • High thermal stability • Very high flow and fine filler (max. particle size 25 µm) • Oven cure	Automotive, BGA, memory, COB, SiP and SmartCard	32,000 at 20 rpm	164	21	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4470	Epoxy fill encapsulant	• MSL3 260°C capable • High reliability • Excellent flow good for fine pitch wires and deep cavities • 260°C reflow capability for Pb-free applications • Oven cure	BGA, CSP and full array on low temperature co-fired ceramic (LTCC)	42,000 at 10 rpm	148	18	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4651	Epoxy fill encapsulant	• Low stress • Low CTE • Easy to dispense • Excellent chemical resistance and thermal stability • Oven cure	Automotive, BGA, memory, COB, SiP, SmartCard and chip array ceramic packages	130,000 at 20 rpm	150	11	1 hr. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4654	Epoxy fill encapsulant	• Fine filler • Low stress and low CTE • Excellent chemical resistance and thermal stability • Jettable • Oven cure	MEMS and chip array ceramic packages	32,000 at 20 rpm	146	13	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND FP4802	Epoxy fill encapsulant	• MSL2 260°C capable • Low warpage • Excellent flow good for fine pitch wires and deep cavities • Oven cure	BGA, CSP and full array on low temperature co-fired ceramic (LTCC)	80,000 at 10 rpm	50	20	60 min. at 120°C + 120 min. at 165°C
Glob Top							
LOCTITE ECCOBOND FP4323	Epoxy glob top encapsulant	• Low CTE for improved thermal cycling • Thixotropic • Excellent moisture and chemical resistance • Oven cure	COB and plastic PGA	220,000 at 2 rpm	174	28	4 hr. at 150°C
LOCTITE ECCOBOND FP4460	Epoxy glob top encapsulant	• Low stress and high flow • Improved work life • Good pressure pot performance with low shrinkage • Excellent moisture and chemical resistance • Oven cure	Automotive, BGA, memory, COB, SiP and SmartCard	300,000 at 10 rpm	173	20	3 hr. at 150°C
LOCTITE ECCOBOND FP4660	Epoxy/anhydride glob top encapsulant	• Low stress • Excellent chemical resistance and thermal stability • Jettable • Oven cure	CSP and low stress applications	120,000 at 5 rpm	135	13	30 min. at 125°C + 90 min. at 165°C
LOCTITE ECCOBOND UV8800M	Epoxy glob top encapsulant	• Good pressure pot performance with low shrinkage • Excellent surface cure with adhesion to a wide range of substrates • Accurate dispensing with excellent shape control • UV cure	CSP, BGA and SmartCard	2,500 – 4,000 at 5 rpm	29	41	2 sec. at 100 mW/cm^2
LOCTITE EO7021	Epoxy glob top encapsulant	• One component • Fast oven cure at moderate temperatures	CSP, BGA and SmartCard	17,000 at 5 rpm	125	67	1 hr. at 120°C

SOLDER PASTES

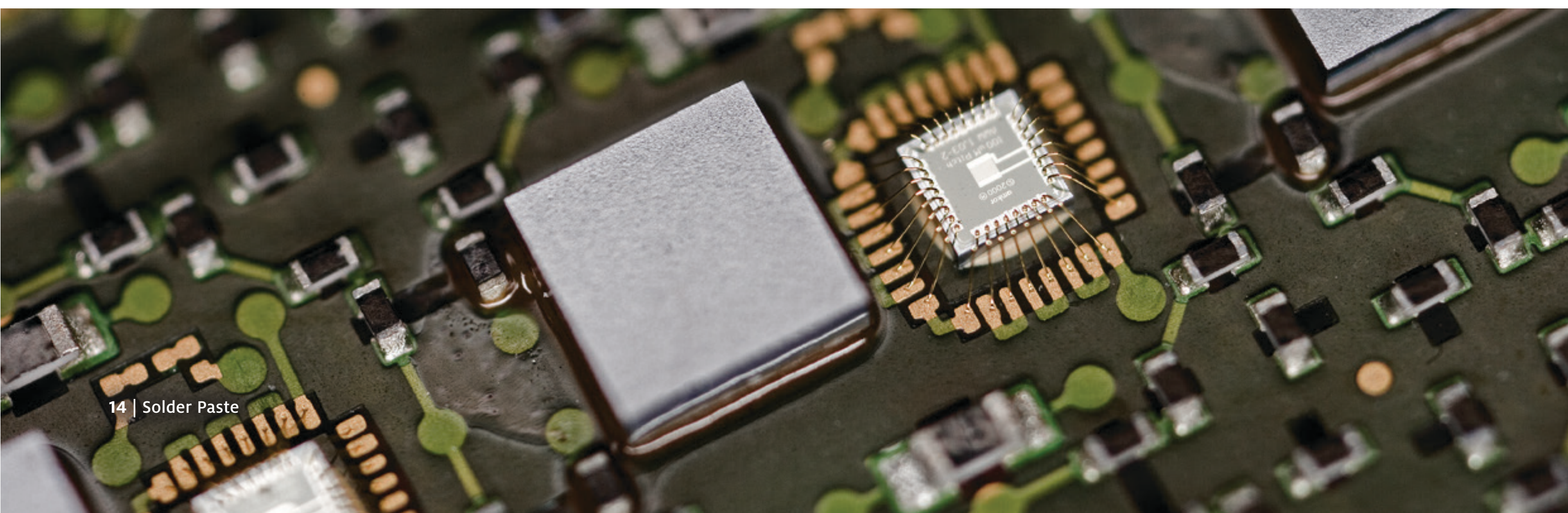
Proper solder alloy formulation is vital for laminate-based packages, as the melting point must be tightly controlled to maintain the integrity of the organic substrate. Award-winning halogen-free, lead-free solder paste materials offer low-voiding performance and can be processed at lower reflow temperatures to align with the requirements of wirebond laminate package processing.





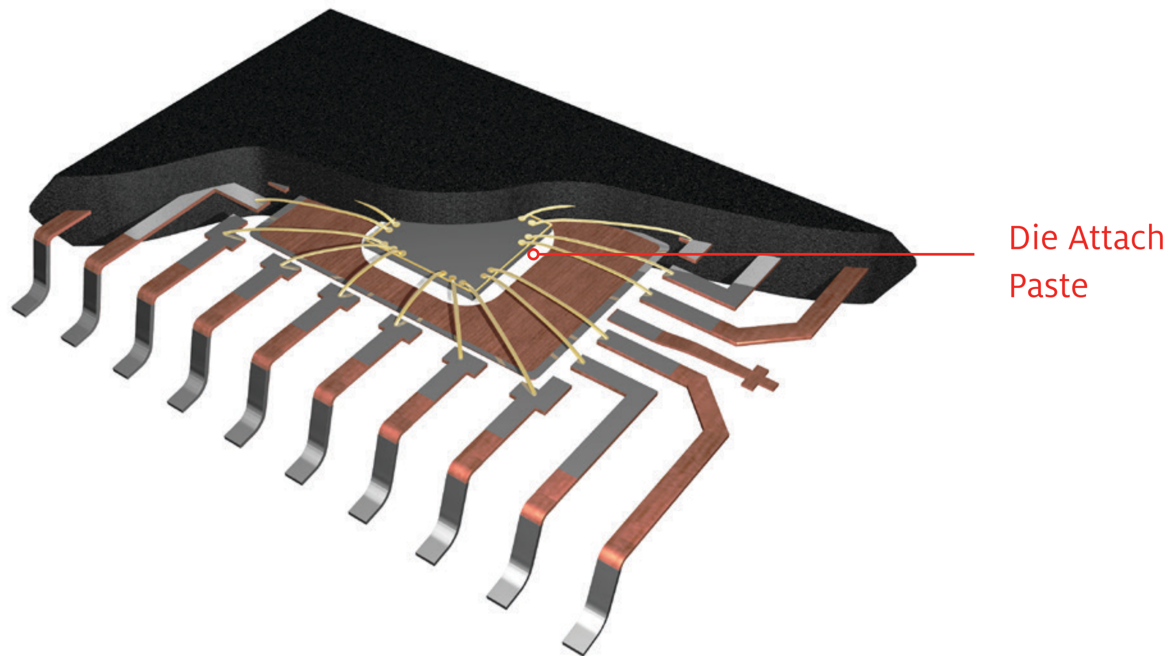
SOLDER PASTES

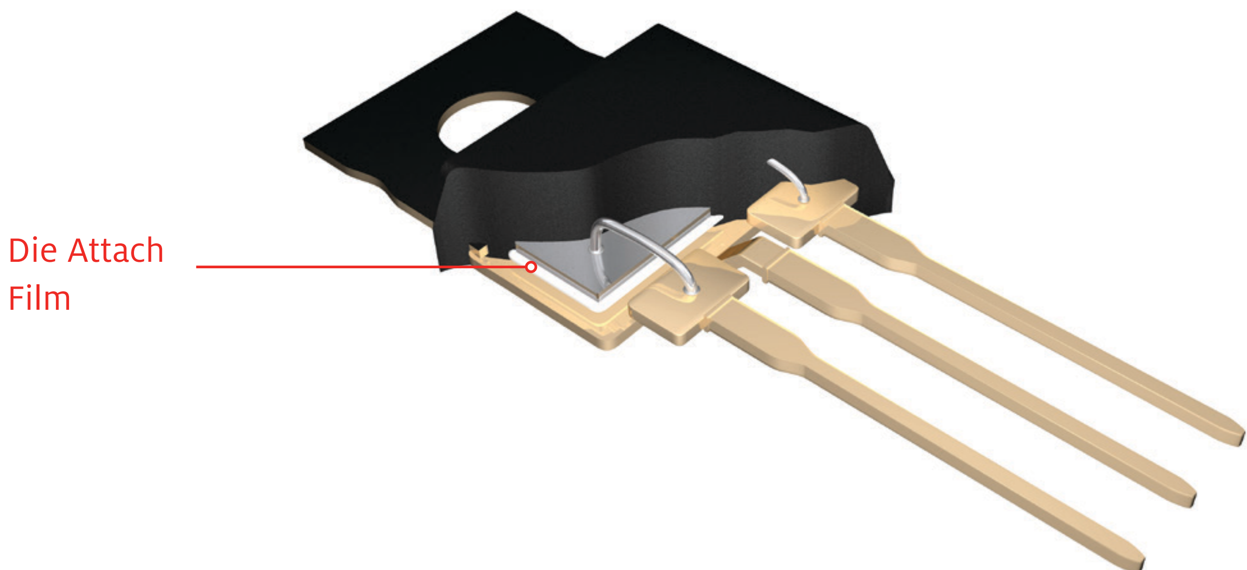
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	ALLOY	PARTICLE SIZE DISTRIBUTION	VISCOSITY AT 25°C (cP)	REFLOW ATMOSPHERE	IPC J-STD 004B CLASSIFICATION	SHELF LIFE
Dispensable								
LOCTITE HF 250DP	Halogen-free, Pb-free, no-clean solder paste	• Low voiding • Exceptional dot-to-dot consistency • High-speed dispense capability with zero slump • Colorless residues	SAC387	Type 5	160,000 at 5 rpm	Nitrogen	ROL0	12 months up to -18°C
Printable								
LOCTITE GC 10	Temperature-stable, halogen-free, Pb-free, no-clean solder paste	• Low voiding • Exceptionally long stencil life and abandon time • Outstanding paste transfer efficiency • Excellent wetting and coalescence in air • Suitable for high density, small to large boards	SAC305	Type 3, 4, 4.5 (4A) and 5	900,000 – 933,000 at 5 rpm	Designed for air; suitable with nitrogen	ROL0	12 months up to 26.5°C
LOCTITE HF 212	Halogen-free, Pb-free, no-clean solder paste	• Low voiding • Extended stencil life and abandon time • Printing, pin-in-paste and enclosed head print capability • Excellent wetting and fine pitch coalescence • Suitable for medium to large boards	90iSC 96S SAC0307 SAC305 SAC387	Type 3, 4, 4.5 (4A) and 5	750,000 – 900,000 at 5 rpm	Air and nitrogen	ROL0	6 months at 0°C – 10°C



LEADFRAME PACKAGING MATERIALS

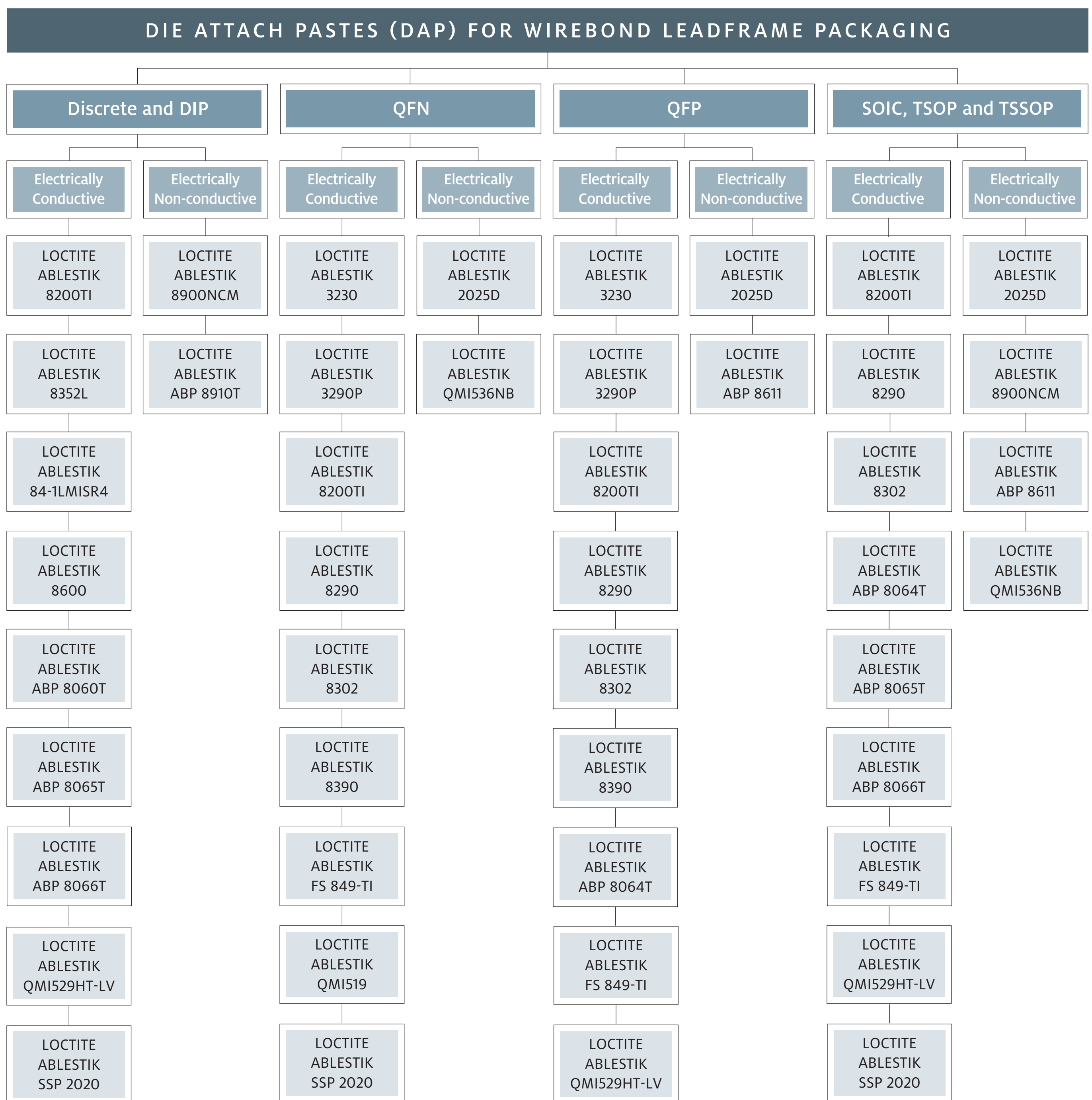
With more than three decades of semiconductor materials development leadership, Henkel has formulated a comprehensive line of products that satisfy the requirements of all forms of leadframe-based packaging. Novel material systems are focused on providing the highest levels of JEDEC MSL performance, the ability to accommodate increasingly demanding requirements for form factor and bond line control, and optimize electrical and thermal performance. Innovations include tighter particle size control, B-stage and controlled flow adhesives, and conductive die attach films that enable multi-chip placement of high power die on a single die pad without increasing package dimensions – all of which are delivering new capability for next-generation devices. For higher power applications, materials with improved in-package thermal performance and electrical conductivity approaching that of pure silver have been introduced. And, as copper wirebonds become the standard across the industry, Henkel's non-conductive and conductive die attach paste and film formulations meet these new demands.

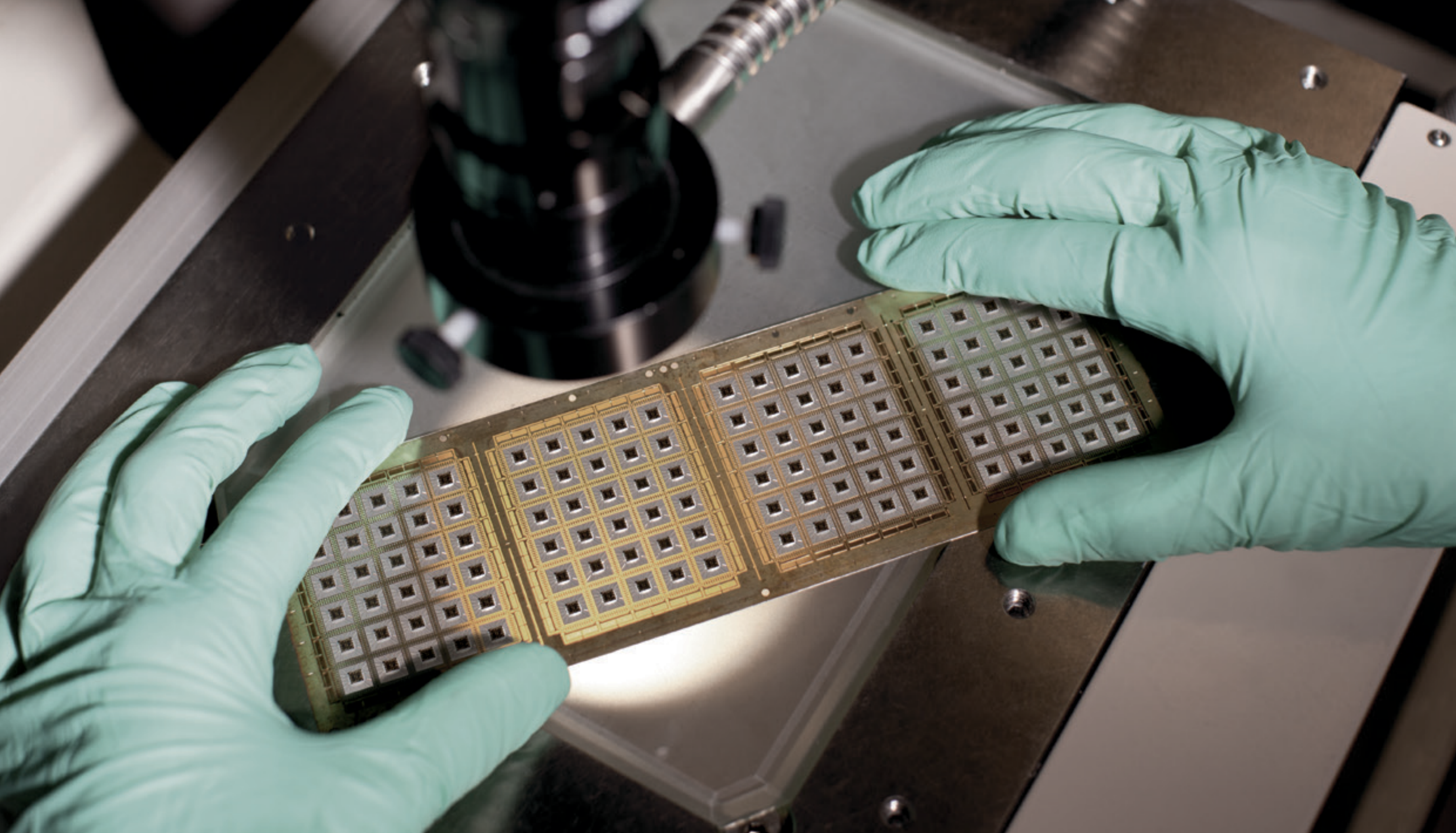




DIE ATTACH PASTES

Process flexibility and superior performance underscore Henkel's complete portfolio of die attach pastes for leadframe devices. Incorporated into applications such as automotive electronics, where temperature control and unfailing function are critical, LOCTITE ABLESTIK die attach pastes deliver high thermal conductivity and high reliability. Robust adhesion to various metal surfaces including palladium, copper, silver, gold and PPF along with proven low-bleed formulas make Henkel's die attach materials the products of choice for leadframe packaging specialists.





ELECTRICALLY CONDUCTIVE DIE ATTACH PASTES (DAP)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	VOLUME RESISTIVITY (Ohm·cm)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK 3230	Ag-filled, epoxy die attach adhesive	• Low stress • Excellent adhesion to Cu • Oven cure	≤ 8 x 8	Cu or Ag	L3 260°C capable	5.0×10^{-2}	0.6	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 3290P	Ag-filled, epoxy die attach adhesive	• Medium modulus • Low outgassing • High reliability • Snap or oven cure	≤ 5 x 5	Cu, Ag or PPF	L2 260°C capable	2.0×10^{-2}	0.8	180 sec. to peak 240°C (snap)
LOCTITE ABLESTIK 8200TI	Ag-filled die attach adhesive	• No bleed • Excellent adhesion to pre-plated finishes (PPF) • Oven or snap cure	≤ 5 x 5	Cu, Ag, PPF or Au	L1 260°C capable	5.0×10^{-5}	3.5	180 sec. to peak 220°C (snap)
LOCTITE ABLESTIK 8290	Ag-filled, epoxy die attach adhesive	• Low stress • Low bleed • Excellent adhesion to Cu • Oven cure	≤ 5 x 5	Cu, Ag, PPF or Au	L3 260°C capable	8.0×10^{-3}	1.6	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 8302	Ag-filled die attach adhesive	• Low stress • Excellent hot/wet adhesion • Excellent peel strength • Low moisture absorption • Oven cure	≤ 8 x 8	Cu, Ag or PPF	L1 260°C capable	1.0×10^{-4}	0.8	30 min. ramp and 60 min. hold at 175°C
LOCTITE ABLESTIK 8352L	Ag-filled die attach adhesive	• Low stress • Minimal voiding • Good bleed performance • Good adhesion to multiple metal surfaces • Oven or snap cure	≤ 8 x 8	Cu, Ag, PPF or Au	L2 260°C capable	5.0×10^{-5}	5.5	120 sec. to peak 220°C (snap)
LOCTITE ABLESTIK 8390	Ag-filled, epoxy die attach adhesive	• Low bleed • Low condensable volatiles • Moderately stress absorbing • Excellent dispensability • In-line oven snap cure or oven cure	≤ 5 x 5	Pd or Ag	L3 260°C capable	8.0×10^{-4}	1.8	80 sec. to peak 220°C (snap)
LOCTITE ABLESTIK 84-1LMISR4	Ag-filled, epoxy die attach adhesive	• Excellent dispense capability • Long work life • High throughput • Box oven cure	≤ 3 x 3	Ag, PPF or Au	L1 260°C capable	$\geq 2.0 \times 10^{-4}$	2.5	1 hr. at 175°C
LOCTITE ABLESTIK 8600	Ag-filled, acrylate die attach adhesive	• Low bleed • Excellent in-package thermal performance • Oven or snap cure	≤ 5 x 5	Cu, Ag, PPF or Au	L1 260°C capable	1.0×10^{-3}	> 4	60 sec. to peak 220°C (snap)

ELECTRICALLY CONDUCTIVE DIE ATTACH PASTES (DAP) (CONTINUED)

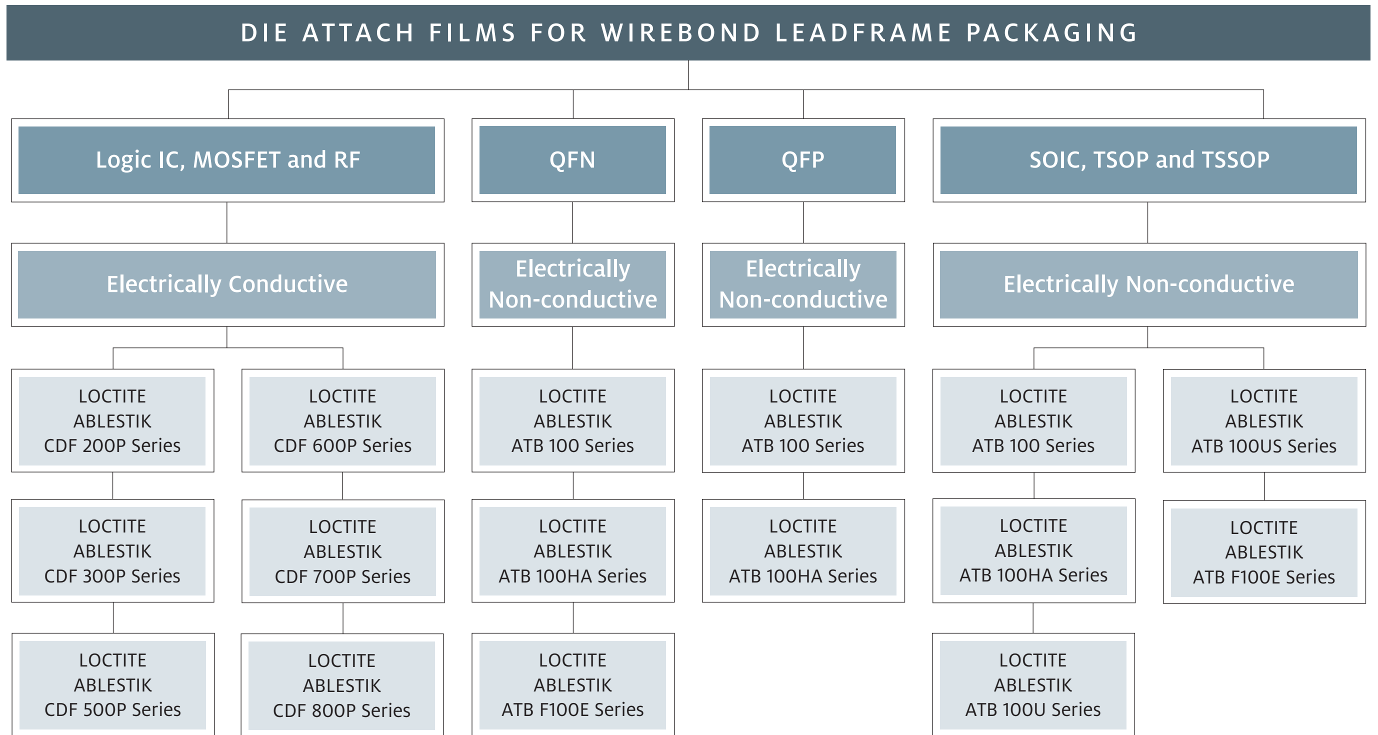
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	VOLUME RESISTIVITY (Ohm·cm)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK ABP 8060T	Ag-filled, BMI hybrid die attach adhesive	• High modulus • High die shear strength • Hydrophobic • Oven cure	≤ 2 x 2	Cu, Ag, PPF or Au	L2 260°C capable	2.5 x 10^{-5}	20	45 min. ramp and 60 min. hold at 200°C
LOCTITE ABLESTIK ABP 8064T	Ag-filled die attach adhesive	• Medium modulus • Low outgassing • Oven cure	3 x 3 – 8 x 8	Cu, Ag, PPF or Au	L1 260°C capable	2.0 x 10^{-5}	22	60 min. ramp and 60 min. hold at 180°C
LOCTITE ABLESTIK ABP 8065T	Ag-filled, epoxy hybrid die attach adhesive	• No channel void issue • High die shear strength • Dispensable silver paste • Oven or snap cure	≤ 2 x 2	Ag or Au	L3 260°C capable	3.0 x 10^{-5}	10	30 min. ramp and 60 min. hold at 185°C in nitrogen (oven)
LOCTITE ABLESTIK ABP 8066T	Ag-filled die attach adhesive	• Long open time • High die shear strength • Hydrophobic • Low outgassing • Oven cure	≤ 5 x 5	Cu, Ag, PPF or Au	L1 260°C capable	4.0 x 10^{-5}	15	30 min. ramp and 60 min. hold at 175°C
LOCTITE ABLESTIK FS 849-TI	Ag-filled die attach adhesive	• Excellent in-package thermal performance • Low bleed • Medium modulus • Low outgassing • Oven cure	≤ 8 x 8	Ag or Au	L2 260°C capable	2.0 x 10^{-5}	7.8	15 min. ramp and 30 min. hold at 175°C
LOCTITE ABLESTIK QMI519	Ag-filled, BMI/ acrylate die attach adhesive	• Excellent dispense capability • Long work life • High throughput • Hydrophobic • Fast oven cure or *Skip*Cure	≤ 5 x 5	Cu, Ag, PPF or Au	L1 260°C capable	1.0 x 10^{-4}	3.8	≥ 10 sec. at 200°C (*Skip*Cure)
LOCTITE ABLESTIK QMI529HT-LV	Ag-filled, BMI hybrid die attach adhesive	• Good dispensing characteristics • Stable at high temperatures • Hydrophobic • Excellent adhesive strength • Oven cure	≤ 8 x 8	Ag or PPF	L2 260°C capable	5.0 x 10^{-5}	8	30 min. ramp and 60 min. hold at 175°C
LOCTITE ABLESTIK SSP 2020	Ag sintering die attach adhesive	• High die shear strength • Robust dispense and stencil print performance • Good workability • High-temperature sinter with or without pressure	≤ 3 x 3	Ag or Au	L3 260°C capable	4.8 x 10^{-5}	> 100	10 min. ramp and 60 min. hold at 250°C (pressureless sintering)

ELECTRICALLY NON-CONDUCTIVE DIE ATTACH PASTES (DAP)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK 2025D	Silica-filled die attach adhesive	• Low bleed • Very low stress • Red color for vision recognition • Oven cure	≤ 8 x 8	Cu, Ag or Au	L3 260°C capable	407	0.4	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK 8900NCM	PTFE-filled, epoxy die attach adhesive	• Low bleed • Low voiding • Moderately stress absorbing • Excellent dispense capability • Contains no category 3 carcinogenic, mutagenic, or reprotoxic (CMR) substances • Oven cure	≤ 8 x 8	Pd, Cu, Ag or PPF	L3 260°C capable	680	0.3	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK ABP 8611	BMI hybrid die attach adhesive	• Excellent dielectric properties • Suitable for Cu wire or Au wire bonding • High modulus at high temperatures • Oven cure	≤ 2 x 2	Cu, Ag or PPF	L3 260°C capable	5,000	0.7	30 min. ramp and 60 min. hold at 175°C
LOCTITE ABLESTIK ABP 8910T	Alumina-filled, BMI hybrid die attach adhesive	• Medium modulus • High reliability • Oven cure	≤ 8 x 8	Cu, Ag or PPF	L3 260°C capable	8,870	1.3	30 min. ramp and 15 min. hold at 175°C
LOCTITE ABLESTIK QMI536NB	PTFE-filled, BMI die attach adhesive	• Low bleed • Very low stress • White color for vision recognition • Widely used for stacked die • Fast oven cure	≤ 8 x 8	Cu, Ag or PPF	L3 260°C capable	300	0.3	30 min. at 150°C

DIE ATTACH FILMS

Henkel's die attach film solutions for leaded devices integrate the unique properties required for a variety of leadframe packages – from QFNs to Logic ICs to TSOPs. Available in both non-conductive and conductive formulations, Henkel's broad die attach film product line has been engineered to account for numerous application-specific requirements such as wire type compatibility, die size capability, wafer grinding techniques, challenging die-to-pad ratios, higher density packaging, wafer thickness limitations and cure mechanisms.



ELECTRICALLY CONDUCTIVE DIE ATTACH FILMS (CDAF)

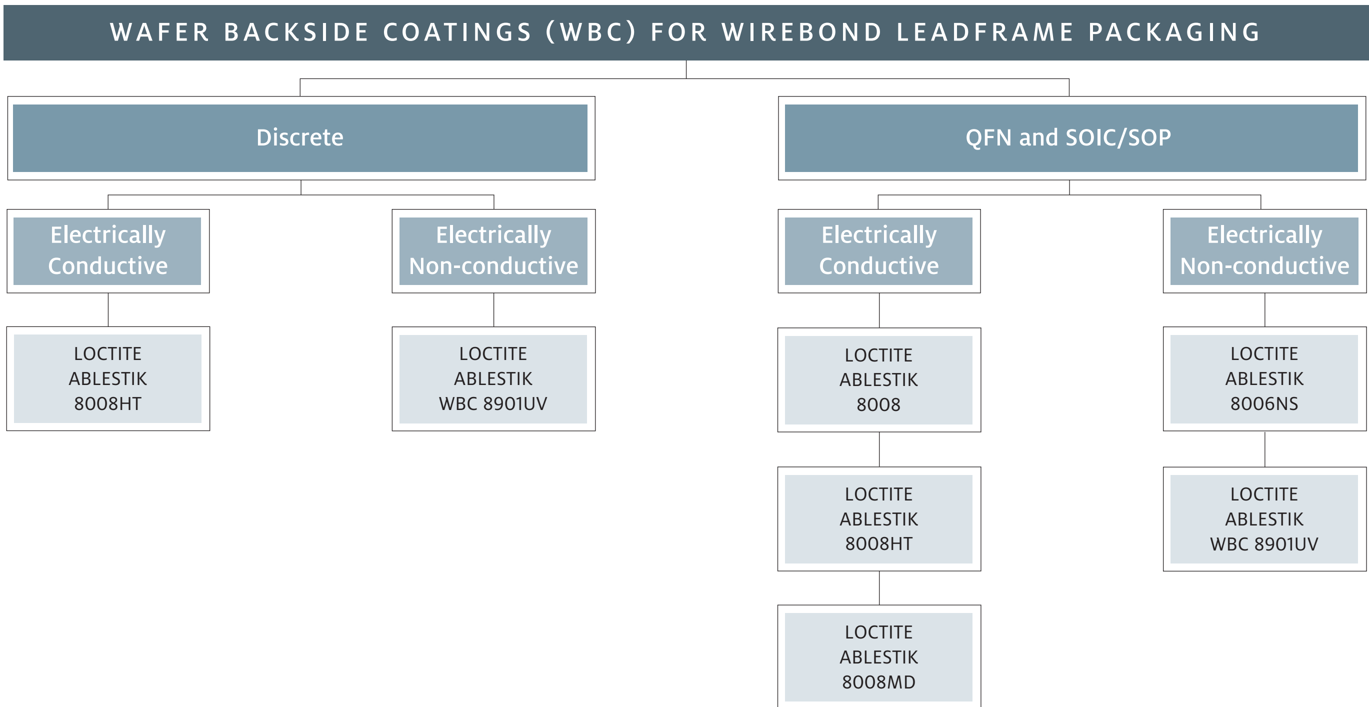
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	FILM THICKNESS (µm)	MOISTURE SENSITIVITY LEVEL, MSL	THERMAL CONDUCTIVITY (W/m·K)	IN-PACKAGE THERMAL RESISTANCE (K/W)
LOCTITE ABLESTIK CDF 200P Series	Ag-filled die attach adhesive	• Suitable for small die • Recommended for thin wafer handling applications • Oven cure	15 or 30	L1 260°C capable	2.3	1.5
LOCTITE ABLESTIK CDF 300P Series	Ag-filled die attach adhesive	• Suitable for small die • High adhesion • Good wetting • Oven cure	15 or 30	L1 260°C capable	1.0	2.1
LOCTITE ABLESTIK CDF 500P Series	Ag-filled die attach adhesive	• Suitable for medium to large dies • Good wetting and low warpage • Recommended for thin wafer handling applications • Oven cure	15 or 30	L1 260°C capable	1.5	1.4
LOCTITE ABLESTIK CDF 600P Series	Ag-filled die attach adhesive	• Low stress and excellent wetting for large die • Compatible with various metal surfaces, including solder • Recommended for thin wafer handling applications • Oven cure	25	L2 260°C capable	1.0	2.1
LOCTITE ABLESTIK CDF 700P Series	Ag-filled die attach adhesive	• Suitable for small and medium die • High adhesion • Oven cure	15 or 30	L1 260°C capable	5.5	0.7
LOCTITE ABLESTIK CDF 800P Series	Ag-filled die attach adhesive	• Suitable for small die • Recommended for thin wafer handling applications • Oven cure	15	L1 260°C capable	3.4	0.7

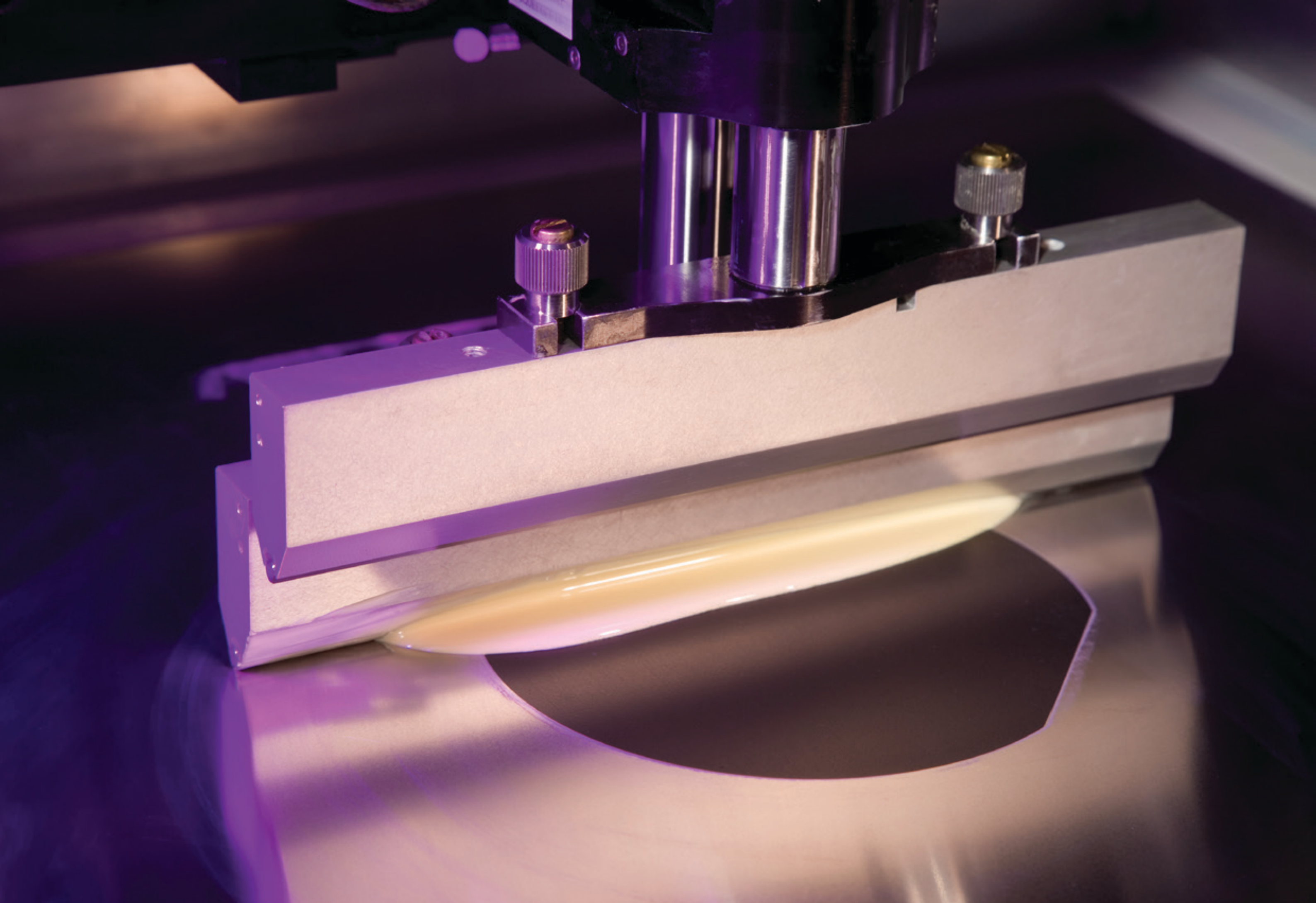
ELECTRICALLY NON-CONDUCTIVE DICING DIE ATTACH FILMS (DDF)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DICING TAPE	FILM THICKNESS (µm)	WAFER THICKNESS (µm)	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)
LOCTITE ABLESTIK ATB 100 Series	Silica-filled, rubberized epoxy die attach adhesive	• Compatible with Cu wire or Au wire packages • Excellent wetting • Compatible with Stealth Dicing Before Grind (SDBG) process • Oven cure	Non-UV	15, 20, 25 or 30	≥ 75	L2 260°C capable	1,170
LOCTITE ABLESTIK ATB 100HA Series	Silica-filled, epoxy die attach adhesive	• Consistent dicing and die pickup for large die applications • No passivation damage • Compatible with Stealth Dicing Before Grind (SDBG) process • *Skip*Cure	UV/Non-UV	5, 10, 15, 20, 25 or 30	≥ 50	L1 260°C capable	2,299
LOCTITE ABLESTIK ATB 100U Series	Silica-filled, rubberized epoxy die attach adhesive	• Compatible with Cu wire or Au wire packages • No passivation damage • Compatible with Stealth Dicing Before Grind (SDBG) process • Fast oven cure	Non-UV	5, 10, 15, 20, 25 or 30	≥ 75	L2 260°C capable	875
LOCTITE ABLESTIK ATB 100US Series	Silica-filled, epoxy die attach adhesive	• Consistent dicing and die pickup for large die applications • No passivation damage • Long thermal budget (4 hr. at 175°C) • *Skip*Cure during molding process	UV/Non-UV	5, 10, 15, 20, 25 or 30	≥ 50	L2 260°C capable	1,277
LOCTITE ABLESTIK ATB F100E Series	Silica-filled, epoxy die attach adhesive	• Suitable for small to large die • Excellent workability for below 3 mm x 3 mm die • Long work life (4 months before and after lamination) • Compatible with Stealth Dicing Before Grind (SDBG) process • Film over wire (FoW) and film over die (FoD) applications • Oven cure	UV/Non-UV	25 FoW: 35 – 80 FoD: 90 – 150	≥ 75	L1 260°C capable	5,256

WAFER BACKSIDE COATINGS

Henkel's novel Wafer Backside Coating materials allow for screen or stencil printing of the paste across the entire wafer in a single stroke, increasing throughput by eliminating the need to individually dispense dots of adhesive. After B-staging to create a film, Wafer Backside Coating provides consistent bond lines and small, controlled fillets, which are particularly effective for attaching small die in miniaturized packages and challenging structures like chip-on-lead, where the die pad is smaller than the die.





ELECTRICALLY CONDUCTIVE WAFER BACKSIDE COATINGS (WBC)

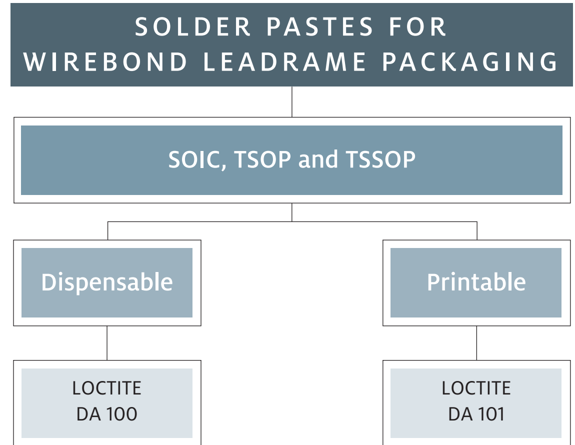
PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	VOLUME RESISTIVITY (Ohm·cm)	THERMAL CONDUCTIVITY (W/m·K)	RECOMMENDED CURE
LOCTITE ABLESTIK 8008	Ag-filled die attach wafer backside coating adhesive	• Excellent stencil printing and low surface roughness • Void-free bondline without bleed • Oven B-stage and snap or oven cure	≤ 3 x 3	Cu, Ag or PPF	L1 260°C capable	1.0×10^{-4}	2.2	60 sec. at 230°C (snap)
LOCTITE ABLESTIK 8008HT	Ag-filled die attach wafer backside coating adhesive	• Applied by stencil printing • Void-free bondline without bleed • Oven B-stage and snap or oven cure	≤ 1 x 1	Cu, Ag or PPF	L1 260°C capable	6.0×10^{-5}	11.0	20 sec. at 170°C (snap)
LOCTITE ABLESTIK 8008MD	Ag-filled die attach wafer backside coating adhesive	• Applied by stencil printing • Low stress • Good substrate wetting • Oven B-stage and oven cure	≤ 4 x 4	Cu, Ag or PPF	L1 260°C capable	5.0×10^{-4}	6.0	10 min. ramp and 60 min. hold at 115°C

ELECTRICALLY NON-CONDUCTIVE WAFER BACKSIDE COATINGS (WBC)

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	DIE SIZE (mm)	SUBSTRATE FINISH	MOISTURE SENSITIVITY LEVEL, MSL	MODULUS AT 25°C (MPa)	CTE (ppm/°C)		RECOMMENDED CURE
							Below T_g	Above T_g	
LOCTITE ABLESTIK 8006NS	Alumina/silica-filled, epoxy die attach wafer backside coating adhesive	• Applied by stencil or screen printing • Consistent bondline downto 25 µm with minimal die tilt • Oven B-stage and oven cure	≤ 4 x 4	Cu, Ag or PPF	L1 260°C capable	4,376	33	136	2 hr. at 160°C
LOCTITE ABLESTIK WBC 8901UV	Die attach wafer backside coating adhesive	• Wide process windows • 5 to 60 µm bondline control • Low viscosity before B-stage • Can be spray coated on Dicing Before Grinding (DBG) wafers • UV B-stage and oven cure	≤ 1 x 1	Cu, Ag or PPF	L2 260°C capable	3,585	45	142	15 min. ramp and 30 min. hold at 90°C + 4 min. ramp and 45 min. hold at 120°C

SOLDER PASTES

Solder is frequently used as an alternative to conventional die attach paste when the application calls for high thermal and electrical performance. As leadframe-based devices such as SOICs, TSOPs and TSSOPs are often exposed to high temperatures during subsequent board assembly processing, high melt point alloys are important. Optimized rheology allows for printing or dispensing depending on process preferences and advanced flux technology is compatible with a wide range of reflow profiles to enable alloy adaptation when required.



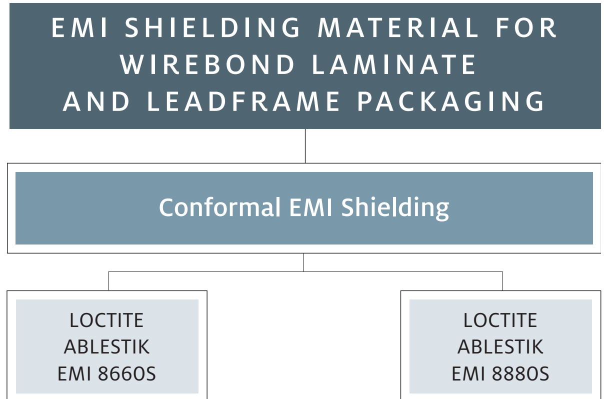
SOLDER PASTES

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	ALLOY	PARTICLE SIZE DISTRIBUTION	VISCOSITY AT 25°C	REFLOW ATMOSPHERE	IPC J-STD 004B CLASSIFICATION	SHELF LIFE
Dispensable								
LOCTITE DA 100	Halide-free, no-clean solder paste with Pb-free and high-Pb options	• Low color residues resistant to charring in reflow • Very low voiding • Vacuum-mixed for reliable dispensing performance • Excellent dispense and pause time capability • Robust flux effective over a wide range of reflow profiles	2.5S 92A	Type 3, 4	300,000 – 310,000 at 5 rpm	Forming gas	ROL0	12 months up to -18°C
Printable								
LOCTITE DA 101	Halide-free, no-clean solder paste with Pb-free and high-Pb options	• Low color residues resistant to charring in reflow • Very low voiding • Robust flux effective over a wide range of reflow profiles	2.5S 92A 95A	Type 3	600,000 at 5 rpm	Forming gas	ROL0	6 months at 0°C – 10°C

PACKAGE LEVEL EMI SHIELDING

FOR LAMINATE AND LEADFRAME PACKAGING

The growth of higher-frequency communication standards, alongside the drive toward thinner profile packages, increased functionality and higher-density PCBs, has underscored the need for more effective, adaptable package-level EMI solutions. Henkel's novel conformal coating metal inks are designed for modern packaging practices, facilitating an ultra-thin, cost-effective spray coating of highly-conductive EMI shielding material on the package exterior. Use of these LOCTITE ABLESTIK EMI solutions provides the shielding effectiveness of pure metal, while delivering an automated and scalable process with high UPH capability. Coatings as thin as 3 µm to 5 µm offer shielding for wide frequency range in formulations that have proven to be more than 80% more effective than traditional organic-based conductive inks.



Substrate with Ground

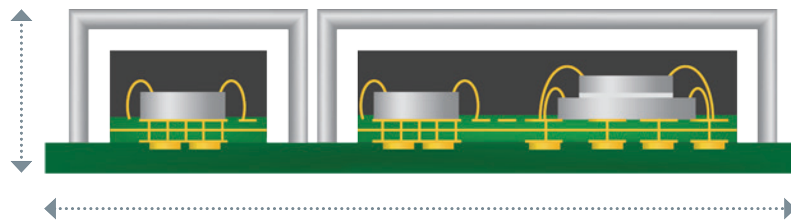
Epoxy Mold Compound

Component/Silicon

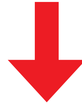
Conformal Shielding Material
External package-to-package shielding with outer coating layer

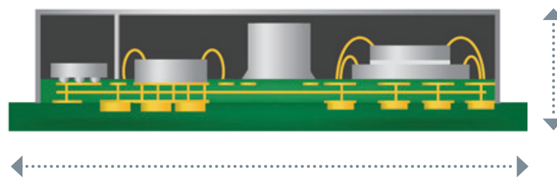
Isolated Compartment

PACKAGE LEVEL EMI SHIELDING ENABLES SMALLER PACKAGES



Board Level Shielding





Package Level Shielding

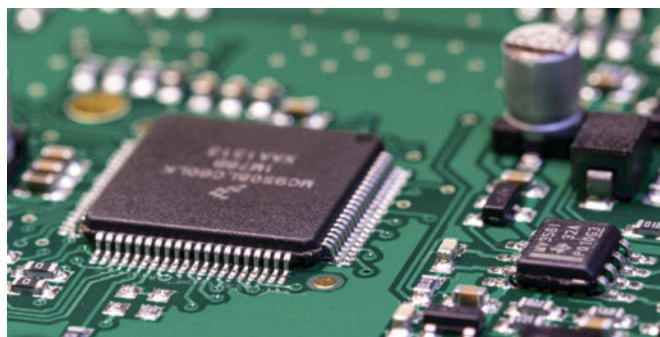
CONFORMAL EMI SHIELDING MATERIAL

PRODUCT	DESCRIPTION	KEY ATTRIBUTES	APPLICATION METHOD	VOLUME RESISTIVITY (Ω•cm)	OPTIMAL COATING THICKNESS (µm)	ADHESION TO EMC (ASTM D3359)	SHIELDED FREQUENCY RANGE
LOCTITE ABLESTIK EMI 8660S	Package-level, conformal EMI shielding coating	• Thinly spray-coated material provides uniform coverage on top and sidewalls of package • Excellent adhesion to mold compound	Spray	1.5×10^{-5}	3 ~ 5	5B (0% peel)	500 MHz ~ 10 GHz
LOCTITE ABLESTIK EMI 8880S	Package-level, conformal EMI shielding coating	• Thinly spray-coated material provides uniform coverage on top and sidewalls of package • Excellent adhesion to mold compound • Excellent EMI performance at a wider frequency range	Spray	7.9×10^{-4}	3 ~ 5	5B (0% peel)	10 MHz ~ 10 GHz

APPENDIX

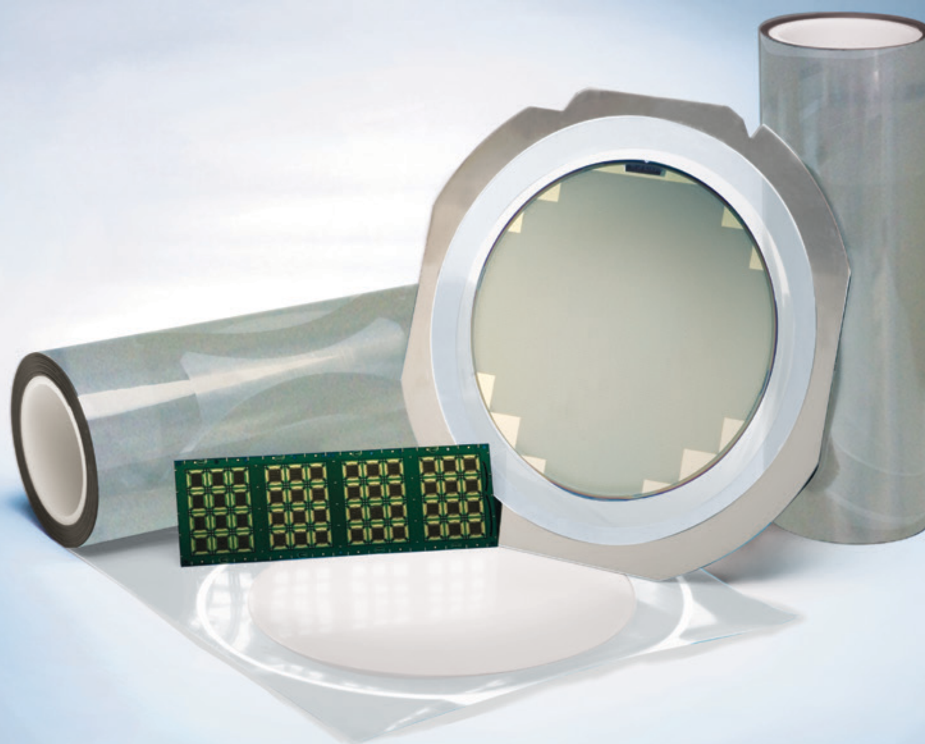
INDEX OF TERMS

TERM	DESCRIPTION
BGA	Ball Grid Array
BMI	Bismaleimide Resin
CBGA	Ceramic Ball Grid Array
COB	Chip On Board
CSP	Chip Scale Package
CTE	Coefficient of Thermal Expansion
DIP	Dual In-line Package
EMI	Electromagnetic Interference
FBGA	Fine Ball Grid Array
IC	Integrated Circuit
LGA	Land Grid Array
MEMS	Micro-Electro Mechanical Systems
MOSFET	Metal-Oxide Semiconductor Field-Effect Transistor
MSL	Moisture Sensitivity Level
PBGA	Plastic Ball Grid Array
PGA	Pin Grid Array
PPF	Pre-Plated Finishes consisting of layers of Ni, Pd and a Au finish
PTFE	PolyTetraFluoroEthylene
QFN	Quad Flat No-leads Package
QFP	Quad Flat Package
RF	Radio Frequency
SiP	System-in-Package
SOIC	Small Outline Integrated Circuit
TSOP	Thin Small Outline Package
TSSOP	Thin-Shrink Small Outline Package



CURE TYPES

CURE TYPE	DESCRIPTION
B-stage	Partial cure until the material is in a solid state and relatively tack-free at room temperature, but will soften and flow when heated
Oven cure	Standard thermal cure in a traditional box oven, usually between 15 min. and 1 hr.
Snap cure	Fast thermal cure via in-line oven, with or without contact heat, usually under 2 min.
*Skip*Cure	Very fast thermal cure that can be partially cured during the wirebonding process and fully cured during the molding process
UV cure	Cure by exposure to ultraviolet light



SOLDER ALLOY PROPERTIES

HENKEL CODE	ALLOY	MELTING POINT (°C)	DENSITY (g/cm^3)	ELECTRICAL RESISTIVITY (μΩ·m)	THERMAL CONDUCTIVITY (W/m·K)
2.5S	Pb92.5/Sn05/Ag2.5	287 – 296	11.02	0.2	44
90iSC (High-Reliability)	SAC387/Bi3/Sb1.5/Ni0.02	209 – 217	7.38	0.132	58
92A	Sn91.5/Sb8.5	235 – 243	7.25	0.145	28
95A	Sn95/Sb5	236 - 240	7.25	0.145	28
96S	Sn96.5/Ag3.5	221	7.37	0.123	55
SAC0307	Sn99/0.7Cu/0.3Ag	217 – 228	7.33	0.15	64
SAC305*	SAC305 or Sn96.5/Ag3.0/Cu0.5	217	7.38	0.132	58
SAC387**	SAC387 or Sn95.5/Ag3.8/Cu0.7	217	7.44	0.132	60

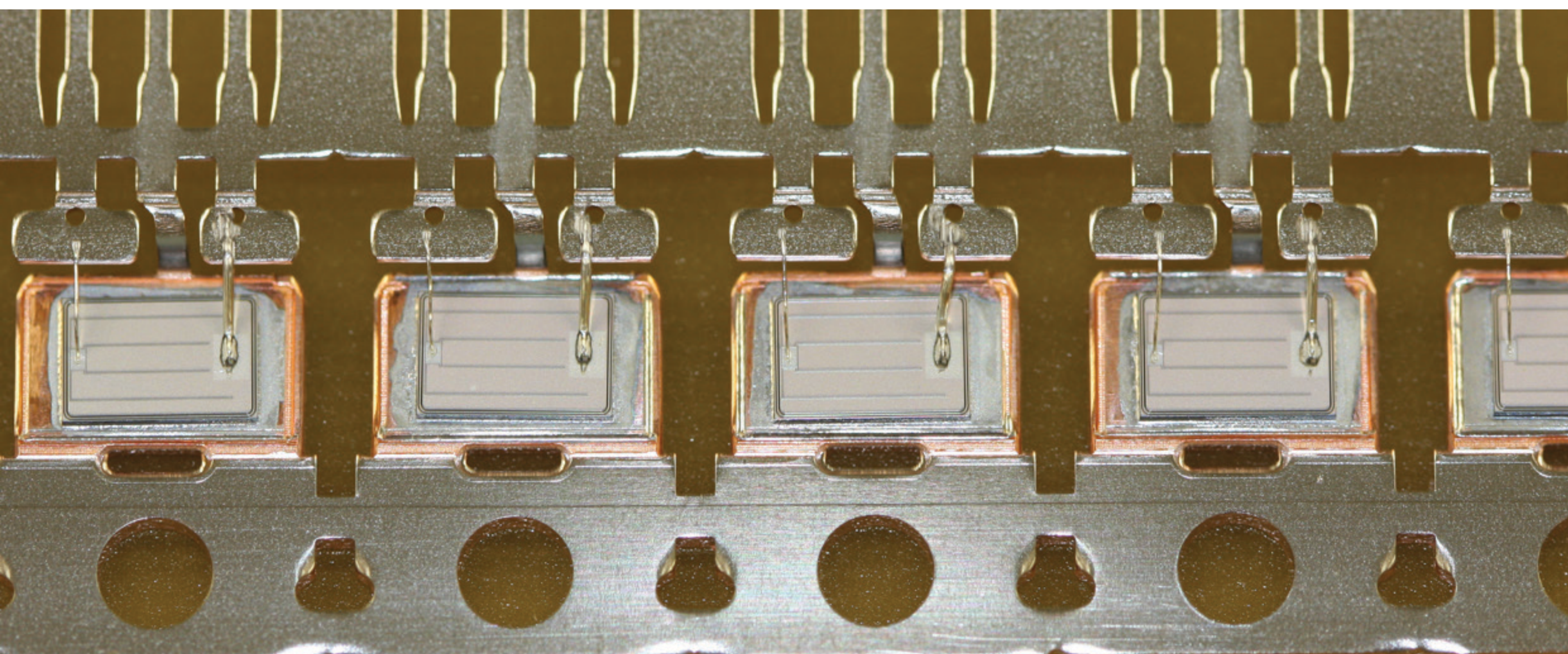
* Formerly known as 97SC
** Formerly known as 96SC

SOLDER FLUX CLASSIFICATION

FLUX INGREDIENT	FLUX ACTIVITY	HALIDE CONTENT (% BY WEIGHT)	CLASSIFICATION	FLUX DESIGNATOR
Rosin (RO)	Low	0	L0	ROL0
		< 0.5	L1	ROL1
	Moderate	0	M0	ROM0
		0.5 – 2.0	M1	ROH0
	High	0	H0	ROH0
		> 2.0	H1	ROH1

SOLDER POWDER PARTICLE SIZES

POWDER DESCRIPTION	HENKEL DESCRIPTION	PARTICLE SIZE (μm)
Type 3	AGS	20 – 45
Type 4	DAP	25 – 38
Type 4.5 (4A)	DAP+	20 – 32
Type 5	KBP	10 – 25



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