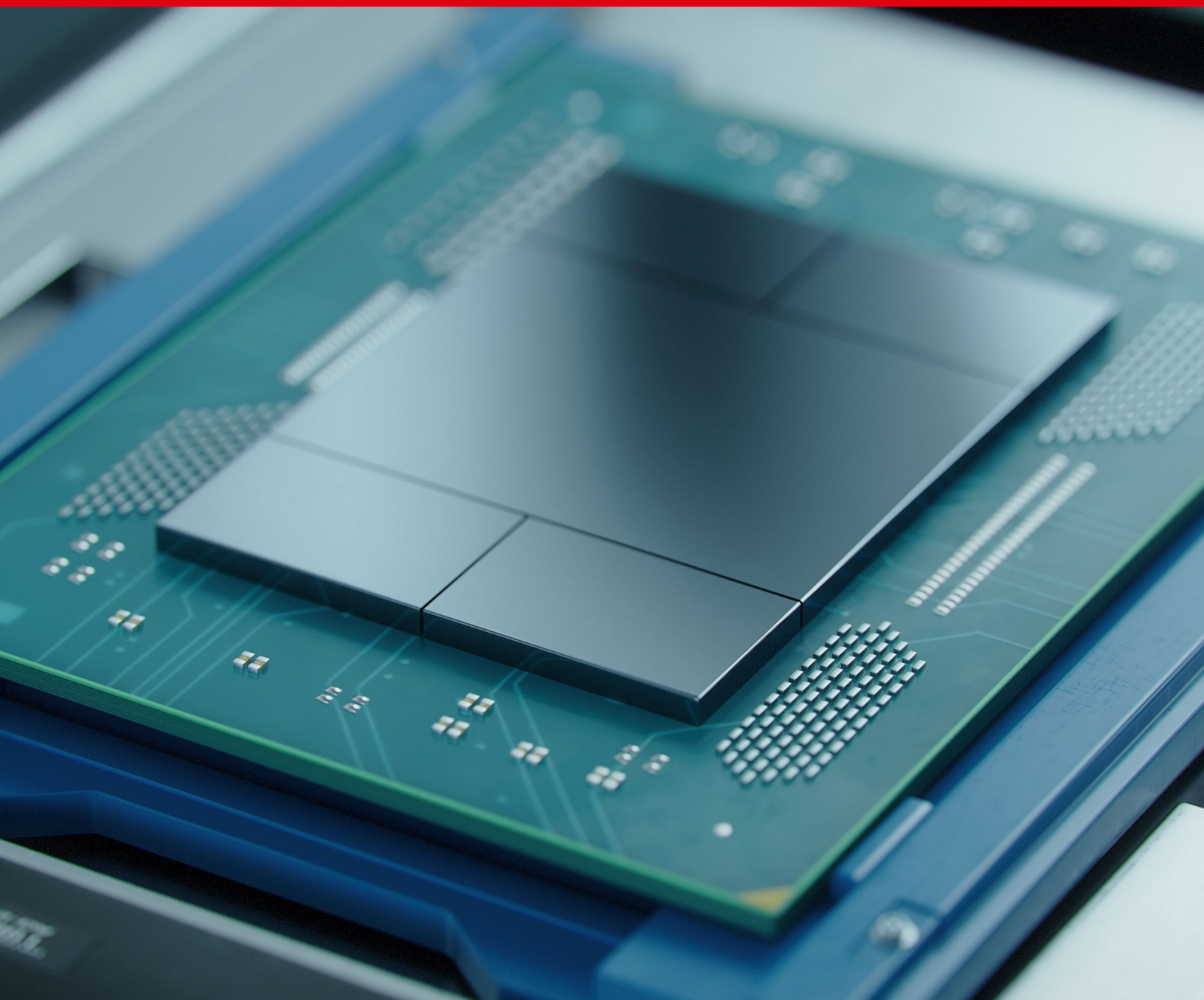
Henkel

Henkel
Adhesive
Technologies

THE FOUNDATION OF INNOVATION

ENABLING FORMULATIONS FOR NEXT GENERATION ADVANCED PACKAGING TECHNOLOGY



SUPERIOR PERFORMANCE, ***UNFAILING RELIABILITY***

Semiconductors are integral to nearly every application in modern-day life – from 5G mobile connectivity to data centers and automotive advanced driver assistance systems (ADAS). To address ongoing requirements for smaller form factors, expanded function, high reliability and lower cost, semiconductor advanced packaging innovation is vital. With a strong development pipeline of solutions for challenging flip-chip and package-on-package designs, fan-in and fan-out wafer-level packaging (WLP) and 2.5D/3D integrated architectures, Henkel semiconductor packaging materials ensure long-term reliability, optimized performance, and high-UPH processability.

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ADVANCED UNDERFILL

The use of underfill materials to protect flip-chip/PoP and next-generation 2.5D/3D integrated packages is necessary for the performance of contemporary semiconductor device designs. With tighter interconnects, thinner dies, complex architectures, and multiple CTEs in a single package, safeguarding against thermal-mechanical stress through the use semiconductor-grade underfills improves overall package reliability and longevity.

CAPILLARY FLOW MATERIALS (CUF)

Product	Feature	Filler Loading (wt %)	Filler Size (Max) µm	Viscosity @ 5 rpm (mPas)	Thixotropic Index (TI)	T_g TMA	T_g DMA (°C)	CTE $<T_g/>T_g$ (ppm/°C)	Storage Modulus @ 25°C/250°C (GPa)	Toughness K1c (MPa√m)	Cure Condition
LOCTITE® ECCOBOND UF 9100AA	• Designed for fcCSP & fcBGA	68	5	18,000	0.8	90	108	22/93	10.4/.105	2.6	15 min. ramp to 100°C; hold 60 min. @ 100°C + 15 min. ramp from 100°C to 165°C; hold 2 hr. / 165°C
LOCTITE® ECCOBOND UF 9000AG	• Advanced Si node • High Tg • Ultra-low CTE • Designed for fcCSP/ fcBGA	72	5*	11,930	1	135	160	19 / 62	15 / .4	3	15 min. ramp to 100°C; hold 90 min. @ 100°C + 15 min. ramp from 100°C to 165°C; hold 2 hr. / 165°C
LOCTITE® ECCOBOND UF 9000AE	• No intentionally added PFAS • Fast flow for high UPH • High K1c • Designed for fcBGA / 2.5D	68	5*	9,082	0.85	112	111	23/85	13/.136	3	15 min. ramp to 100°C; hold 90 min. @ 100°C + 15 min. ramp from 100°C to 165°C; hold 2 hr. / 165°C
LOCTITE® ECCOBOND UF 8000AA	• Longer stage life for CoW • Super-fast flow	50	3	4,700	1	104	120	31 / 120	7 / .2	1	30 min. ramp / 100°C; hold 30 min. / 100°C + 15 min. ramp / 165°C; hold 2 hr. / 165°C
LOCTITE® ECCOBOND UF 8830S	• FCCSP/ Auto grade	60	3	22,120	1	118	126	25 / 100	12 / .3	2	30 min. ramp from 25°C to 150°C; hold 2 hr. / 150°C

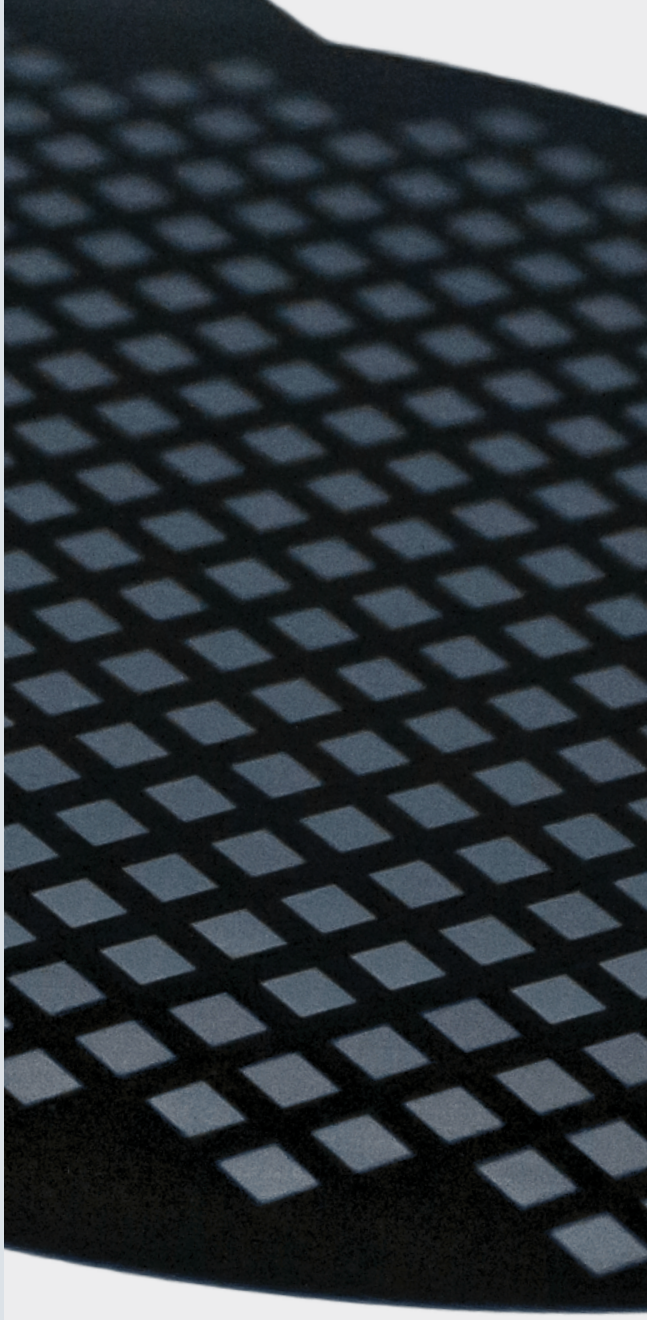
*Based on the COA of filler vendor

NON-CONDUCTIVE PASTES & FILMS (NCP & NCF)

Product	Feature	Filler Loading (wt %)	Viscosity @ 5 rpm (mPas)	Thixotropic Index (TI)	T_g TMA	T_g DMA (°C)	CTE $<T_g/>T_g$ (ppm/°C)	Stage life @ 70°C (min)	Storage Modulus @ 25°C/250°C (GPa)	Cure Condition
LOCTITE® ECCOBOND NCP 5209	• Good reliability • With fluxing power for CuOSP • Longer stage life	53	12,500	2	145 / 187		28 / 80	120	7 / 1	160°C / 2 hr
LOCTITE® ECCOBOND FP 5201	• Good reliability • Works on SOP, NiAu, Sn finishes	62	21,000	4	171 / 177		31 / 65	40-60	6 / 1	165°C / 30 min
LOCTITE® ABLESTIK NCF 218	• Bump protection for fine pitch • Controlled flow • No resin bleed out	40	NA	NA	TMA / 119		24 / 190	NA	6 / 0.1	175°C / 2 hr

WAFER-LEVEL ENCAPSULATION

Fan-in WLP and fan-out WLP technologies are helping packaging engineers progress chip integration and new device designs to meet challenging dimensional requirements, while balancing cost/performance ratio expectations. With both techniques showing significant growth potential, advanced molding and encapsulation materials are enabling accelerated adoption by providing improved handling, protection, and warpage control for thin dies. Built on a REACH-compliant, anhydride-free chemistry platform, Henkel's liquid compression molding materials for fan-in WLP and fan-out WLP processes integrate ultra-fine filler technology (10 µm upper-cut) to deliver void-free gap filling and thorough coverage. In addition, the extreme warpage control and fast in-mold curing of Henkel's formulations molding materials provide high reliability in combination with a high-UPH process for overall lower overall cost.

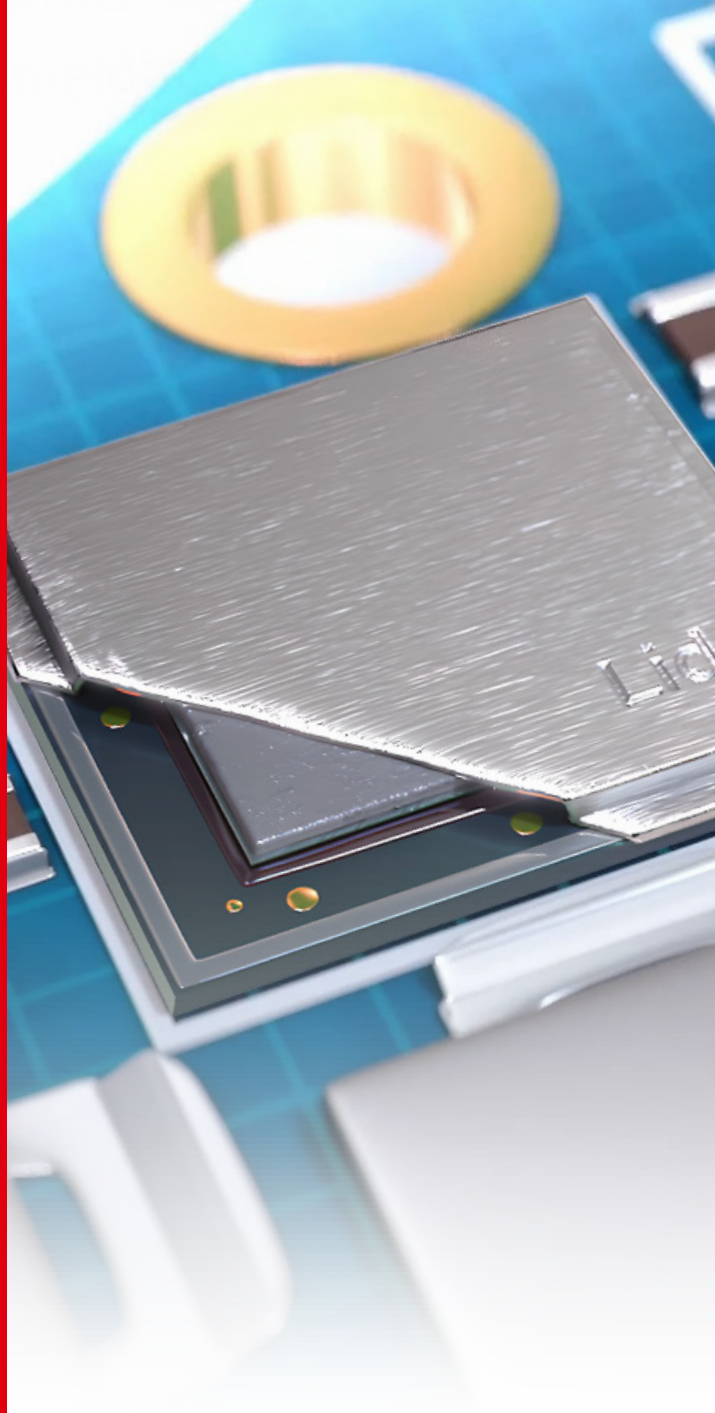


LIQUID COMPRESSION MOLDING (LCM)

Product	Sustainability	Ultra Low Warpage	Gap Fill And Trench Fill	Solvent-Free	Fast Cure Process	Robust Reliability	Viscosity Stability
LOCTITE® ECCOBOND LCM 1000AG-1	• REACH compliance (Anhydride-free chemistry) • CMR-free • No intentionally added PFAS	• Suitable for WLP & PLP • > 70% warpage reduction	Excellent for thin mold cap & narrow trench and gap filling	No solvent; Intrinsically no voids	5 min. in mold cure (120°C), 1 hr. post mold cure (150°C)	MSL1+TCB1000 with high T_g (> 140°C)	> 24 hr. viscosity stability 12–month shelf life at -40°C storage

LID & STIFFENER ATTACH

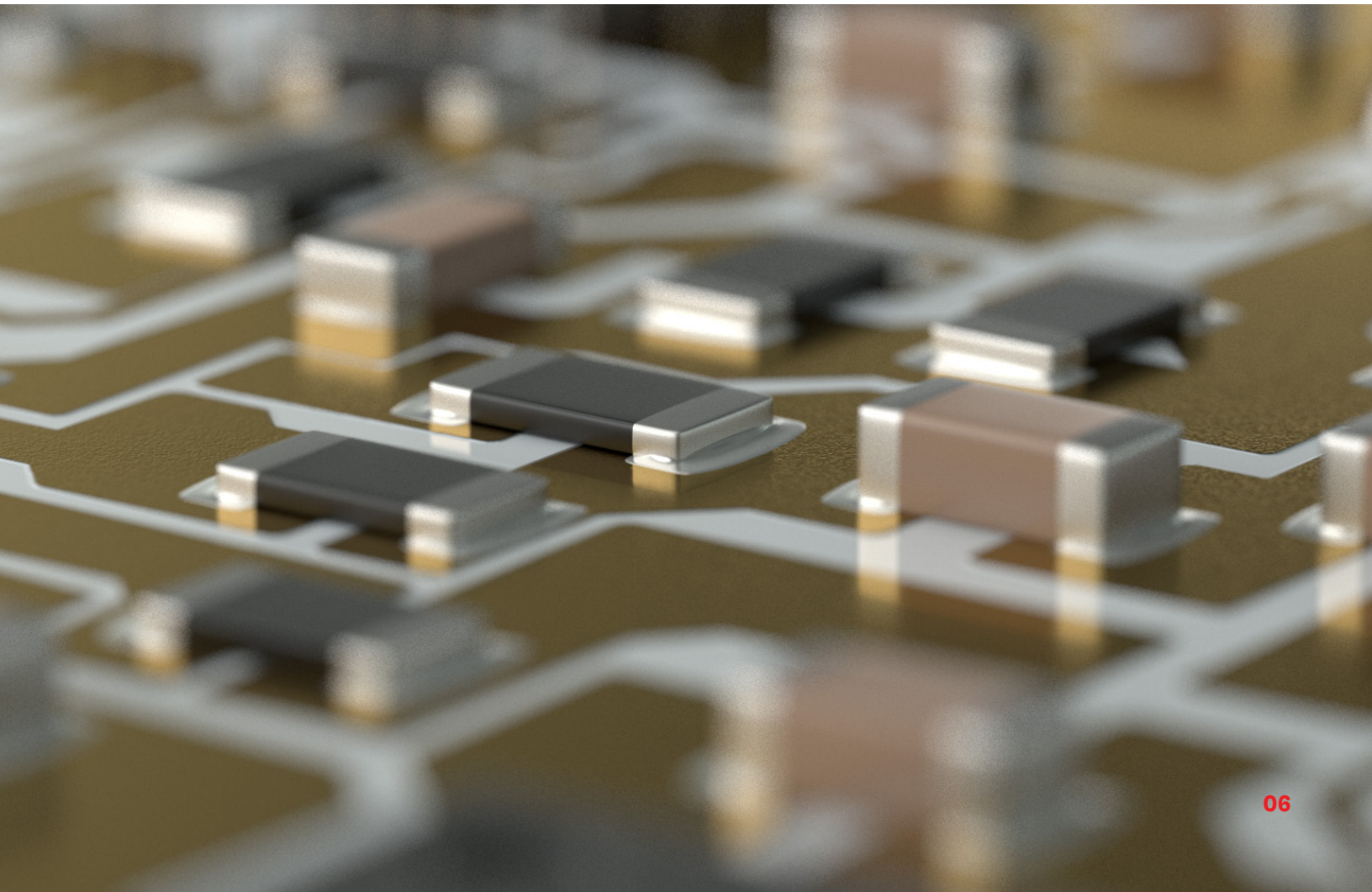
High-performance computing delivers extraordinary processing power for data center, enterprise, autonomous automotive, and industrial applications. To incorporate the considerable functionality required, overall package size, die size, and die quantity are increasing. During the manufacturing process and in operation, these devices and their multiple dies are subjected to several thermal cycles which can stress interconnects, leading to warpage and mechanical damage. Semiconductor adhesives from Henkel reliably bond lid and peripheral stiffeners to the substrate, allowing the package to maintain flatness throughout production and operational thermal cycles.



A portfolio of **stability-enhancing** adhesives is available in conductive and non-conductive formulations, providing warpage-reducing coplanarity as well as grounding or shielding capability.

ELECTRICALLY CONDUCTIVE ADHESIVES

Product	Technology	Viscosity @ 5 rpm (mPas)	Thixotropic Index (TI)	Volume Resistivity (Ω·cm)	T_g BY POST Mold Cure TMA (°C)	CTE $<T_g/>T_g$ (ppm/°C)	Storage Modulus @ (GPa) 25°C	250°C	Thermal Conductivity (W/mK)	Cure Condition
LOCTITE® ABLESTIK CE3920	Epoxy	26,100	6	$3x10^{-4}$	119	29 / 130	5	.1	3	150°C / 5 min.
LOCTITE® ABLESTIK ICP 3920	Epoxy	26,100	6	$3x10^{-4}$	119	29 / 130	5	.1	3	150°C / 5 min.
LOCTITE® ABLESTIK 8175	Epoxy	55,000	2	$5x10^{-4}$	90	55 / 200	7	.2	3	150°C / 30 min.
LOCTITE® ABLESTIK QMI529HT	BMI/Acrylate	18,500	5	$4x10^{-5}$	33	53 / 156	3	.3	7	185°C / 60 sec.
LOCTITE® ABLESTIK 965-1L	Epoxy	12,000	5	$5x10^{-4}$	72	50 / 190	5	.3	3	150°C / 60 min.



GLOBAL RESOURCES, LOCAL EXPERTISE

At Henkel, we take innovation and customer collaboration seriously. That's why we've invested in resources around the world to meet you where you are. With teams of technology experts and digital tools to connect global R&D and application centers, we help you bring new products to market faster, more sustainably, and more competitively. Discover why Henkel's approach to thinking globally and acting locally sets us – and you – apart.

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