LOCTITE®

BERGQUIST®

HIGH-PERFORMANCE MATERIALS FOR
OPTICAL NETWORK EXCELLENCE

ADVANCED MATERIALS FOR AI DATA CENTER OPTICAL NETWORKS



Henkel

Henkel Adhesive Technologies



CONTENTS

3 INTRODUCTION

6 MATERIAL SOLUTIONS FOR OPTICAL TRANSCEIVERS

10 BONDING MATERIALS

19 PROTECTING MATERIALS

22 THERMAL MATERIALS

24 MATERIAL SOLUTIONS FOR CABLES AND CONNECTORS

25 LOW PRESSURE MOLDING MATERIALS

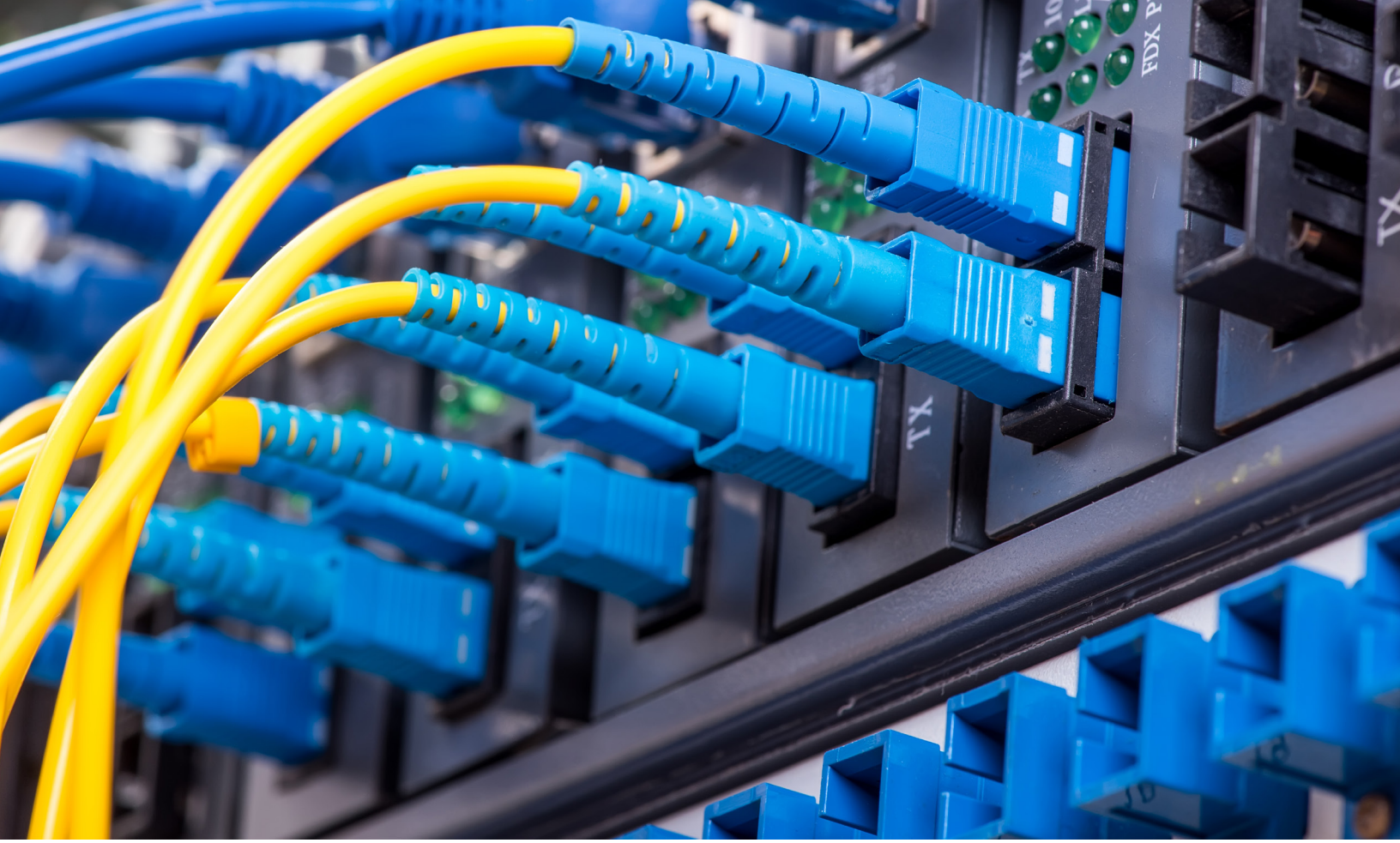
26 MATERIAL SOLUTIONS FOR OPTICAL SWITCH

30 BONDING MATERIALS

37 CONNECTING MATERIALS

38 PROTECTING MATERIALS

40 PROTECTING MATERIALS

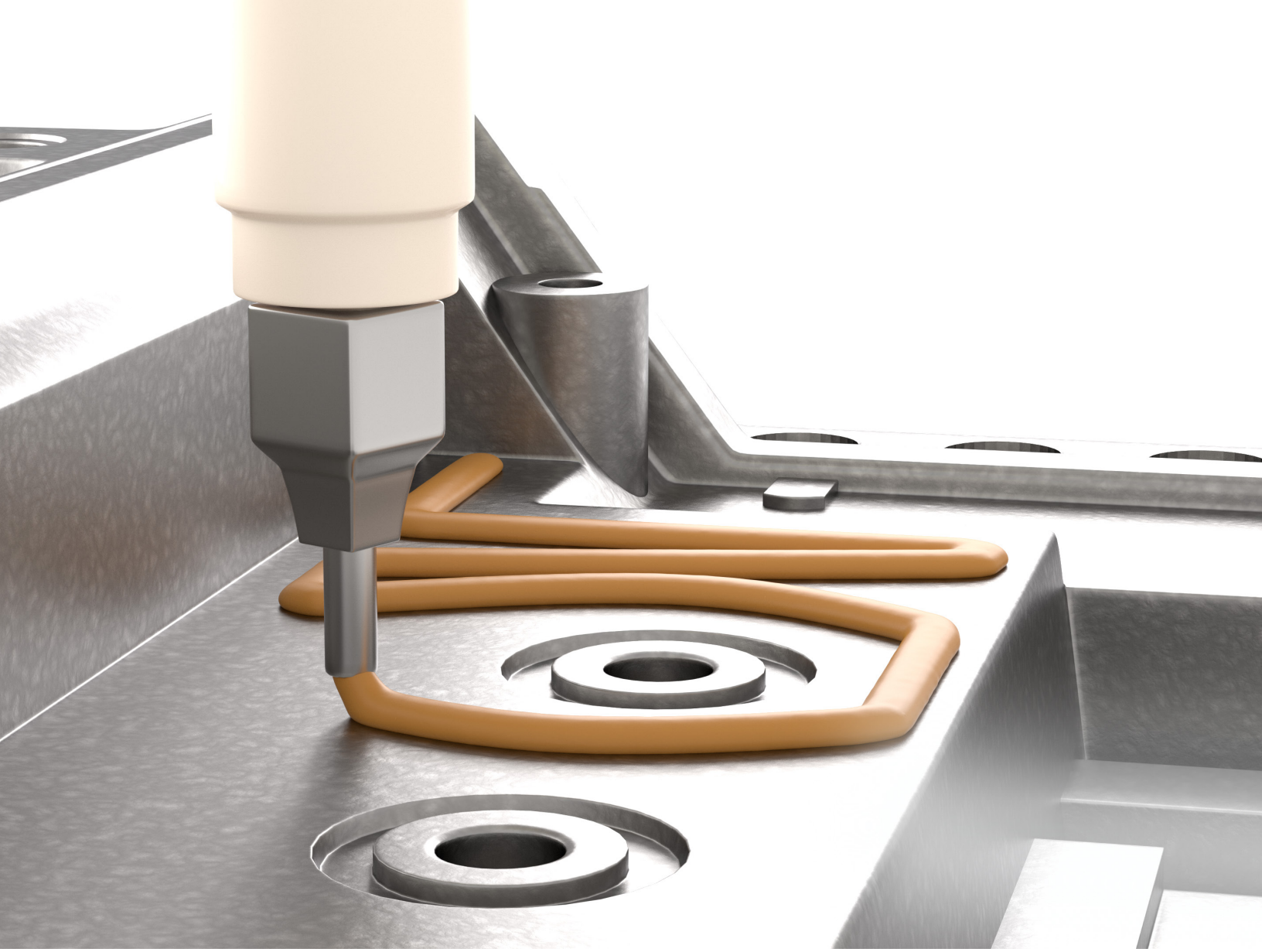


NEXT-GENERATION AI DATA CENTERS DEMAND CUTTING-EDGE OPTICAL MATERIALS

Artificial Intelligence (AI) workloads are surging, requiring the evolution of data center and telecom architectures to meet the speed, efficiency, low latency, and unprecedented bandwidth expectations of compute-intensive applications. These demands can only be satisfied through high-performance optical connectivity. And, to thrive, next-generation optoelectronic systems require cutting-edge adhesive and thermal management materials. Designed to meet the rigorous demands of high power density 800G and emerging 1.6T optical transceivers, coherent optical modules, and co-packaged optics, Henkel's advanced optoelectronic adhesives, thermal interface, and protective materials elevate performance and secure reliability. Through robust thermal conductivity, mechanical stability, and optical clarity, Henkel materials enable high-speed data transmission and power efficiency for AI workloads.

CABLES AND CONNECTORS

Optical component reliability and performance are also dependent on the ruggedness of the cables and connectors that join them. Ensuring protection against stress, moisture, and environmental contaminants fortifies network connectivity and reduces the need for premature repair or replacement. Henkel's portfolio of low-pressure molding and potting solutions is formulated to enable cycle time speed, durability, and compatibility with numerous substrate materials.



MATERIAL SOLUTIONS FOR OPTICAL SYSTEMS

PROTECTION

Henkel protection materials for optical modules and components include a broad portfolio of underfills, encapsulants, and low pressure molding materials that guard against stress and vibration, as well as EMI shielding pastes and coatings designed to minimize signal interference.

THERMAL MANAGEMENT

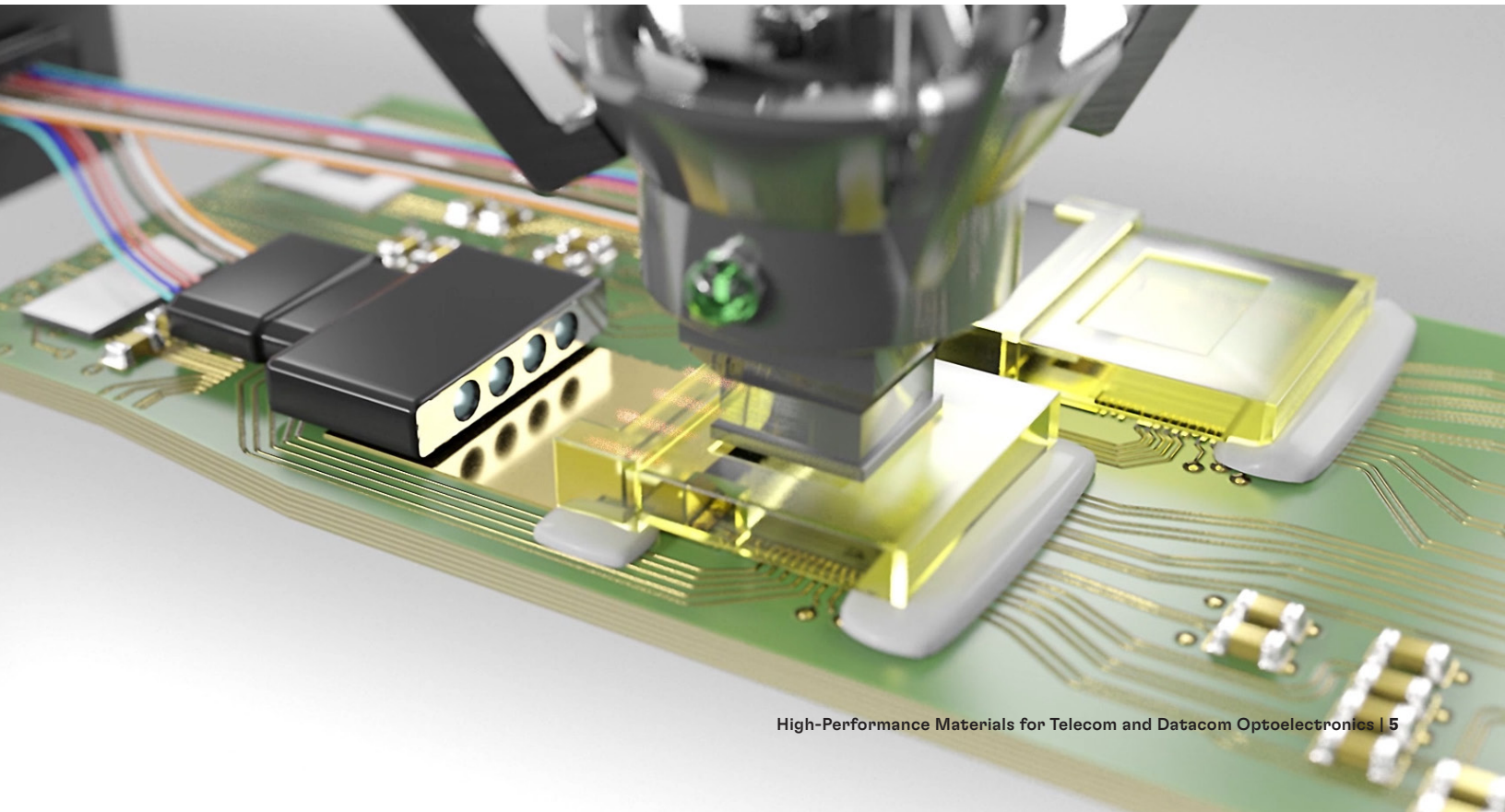
AI-enabling optical systems are heat-intensive, and thermal management is one of the most critical aspects of performance optimization. Electronic component densities are increasing, and high-function, small form factor components are now the norm. Processing speeds of new optical transceiver technologies require more power to meet transmission demands, which results in higher thermal loads. Henkel's thermal interface materials (TIMs), available in numerous formats, provide exceptional thermal conductivity, process flexibility, and low assembly stress for delicate optical components.

BONDING

AI data center optical interconnect devices must deliver maximum light into the optical fiber to enable high-speed, high-integrity data transmission. Henkel's portfolio of adhesives for die attach, optical sub-assembly, module assembly, lens bonding, sealing, light path, and fiber bonding provides process adaptability, precision, and reliability.

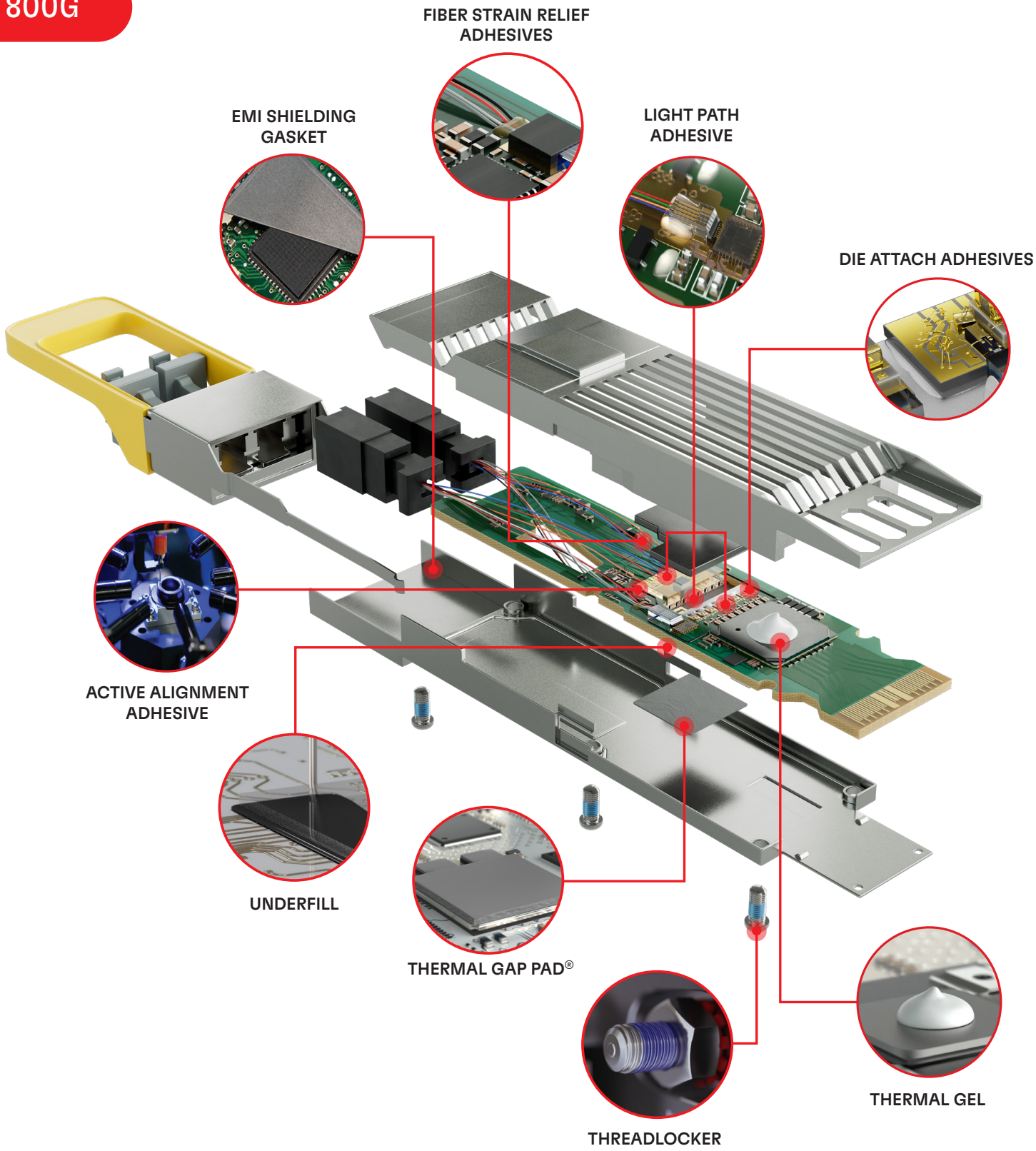
- Die attach adhesives enable strong die bonding for reliable laser diodes. Available in multiple formulations and mediums, Henkel's innovative die attach materials deliver high-performance, cost-competitive application solutions.
- Dual-cure UV adhesives are designed to precisely align optical components and facilitate maximum optical signal strength through low shrinkage, low coefficient of thermal expansion (CTE), and high integrity light transmittance.
- Module assembly materials, available in dual-cure and thermal-only options, allow reliable bonding and sealing of lenses, front covers, and housings.
- Light path adhesives are photocurable and have a matched refractive index (RI) to enhance productivity and minimize power loss in optical fibers, FAUs, and optical devices.

All Henkel optical adhesives are formulated to maximize light transmittance, integrating critical properties such as high bond strength, minimal shrinkage on cure, low CTE, matched RI, low outgassing, and high resistance to humidity.



MATERIAL SOLUTIONS
FOR OPTICAL TRANSCEIVERS

800G

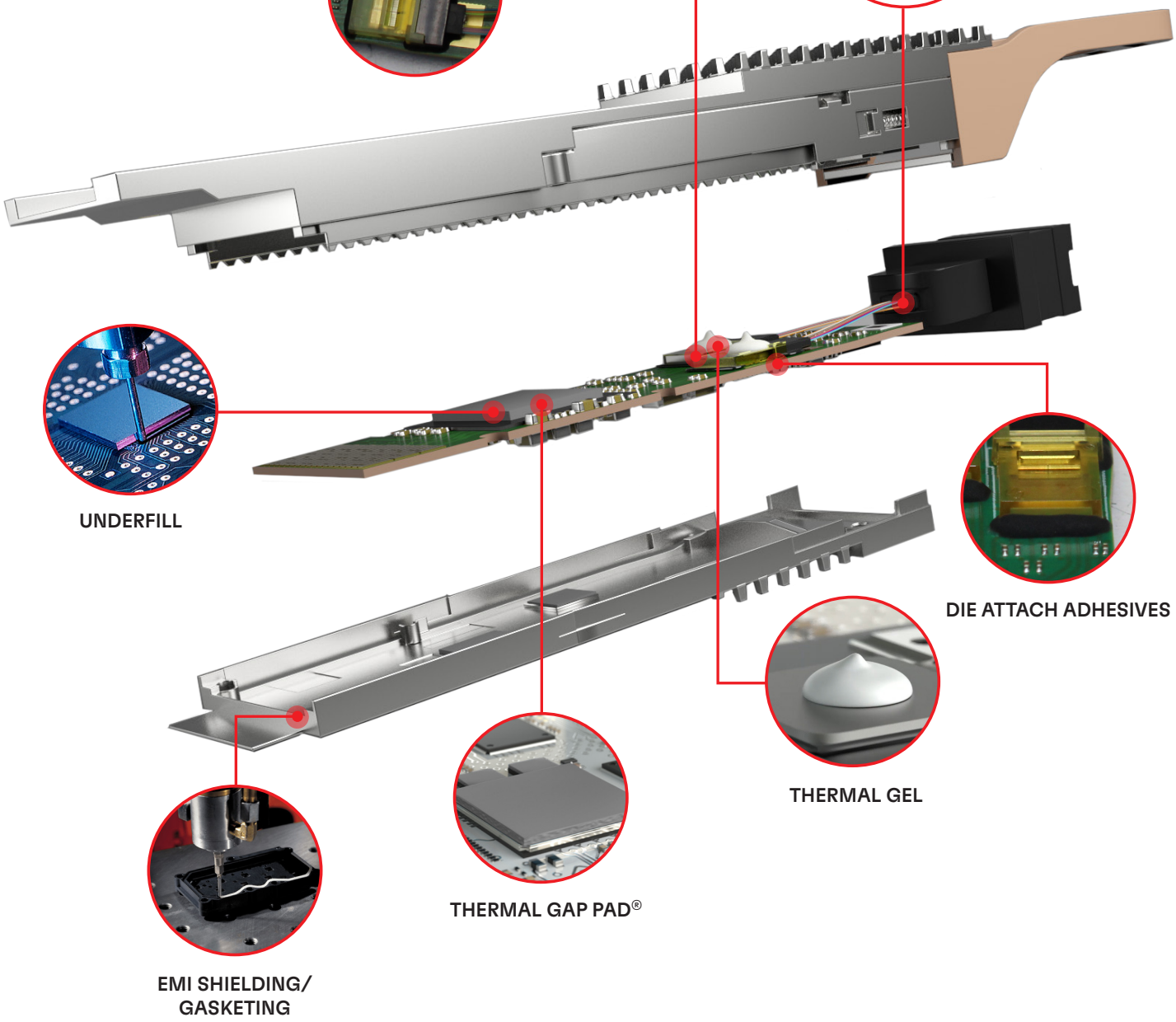


400G

OPTICAL SUB-ASSEMBLY (OSA)

- ACTIVE ALIGNMENT & BONDING ADHESIVES
- STRUCTURAL ADHESIVES

OPTICAL FIBER ADHESIVES



UNDERFILL

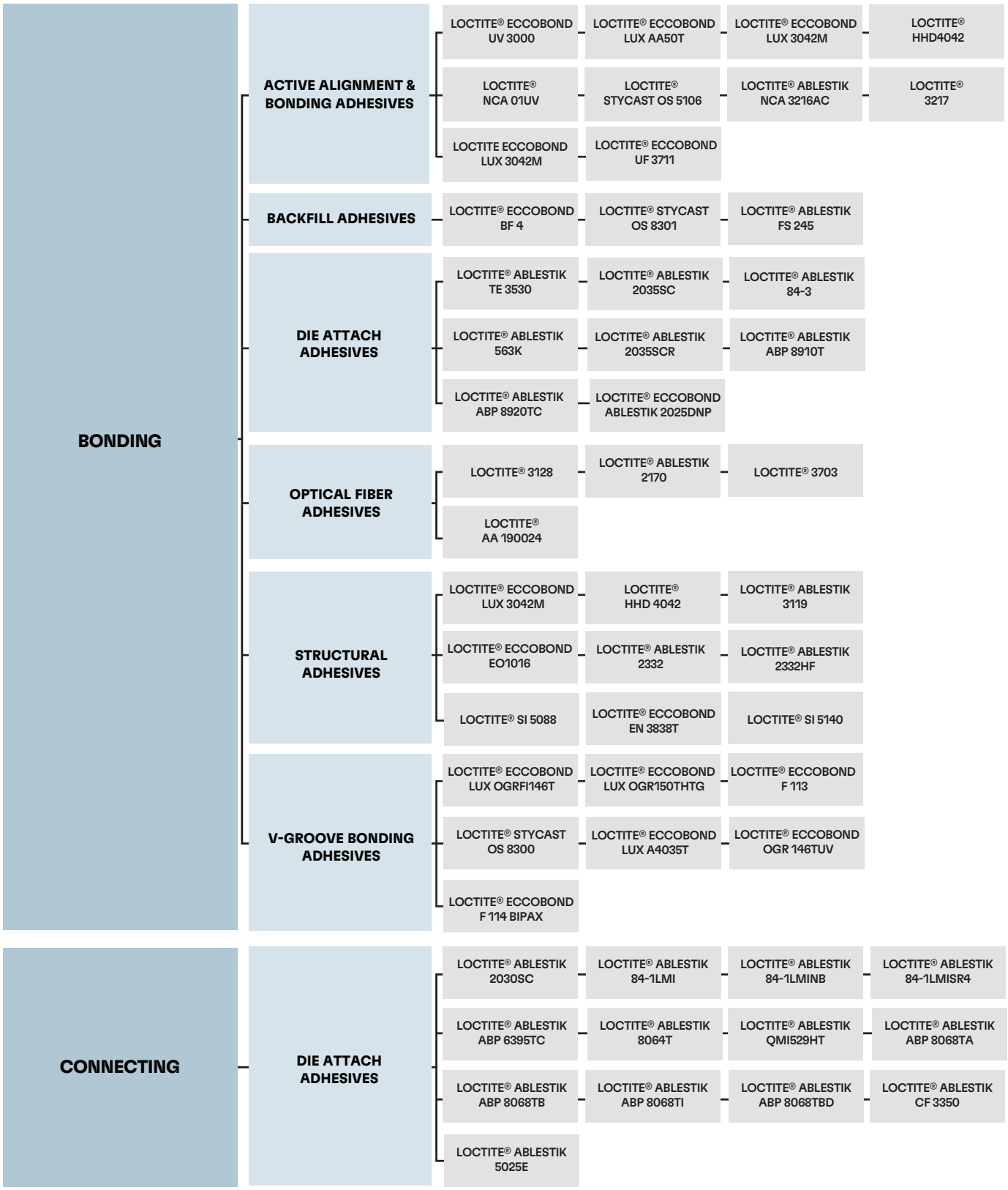
DIE ATTACH ADHESIVES

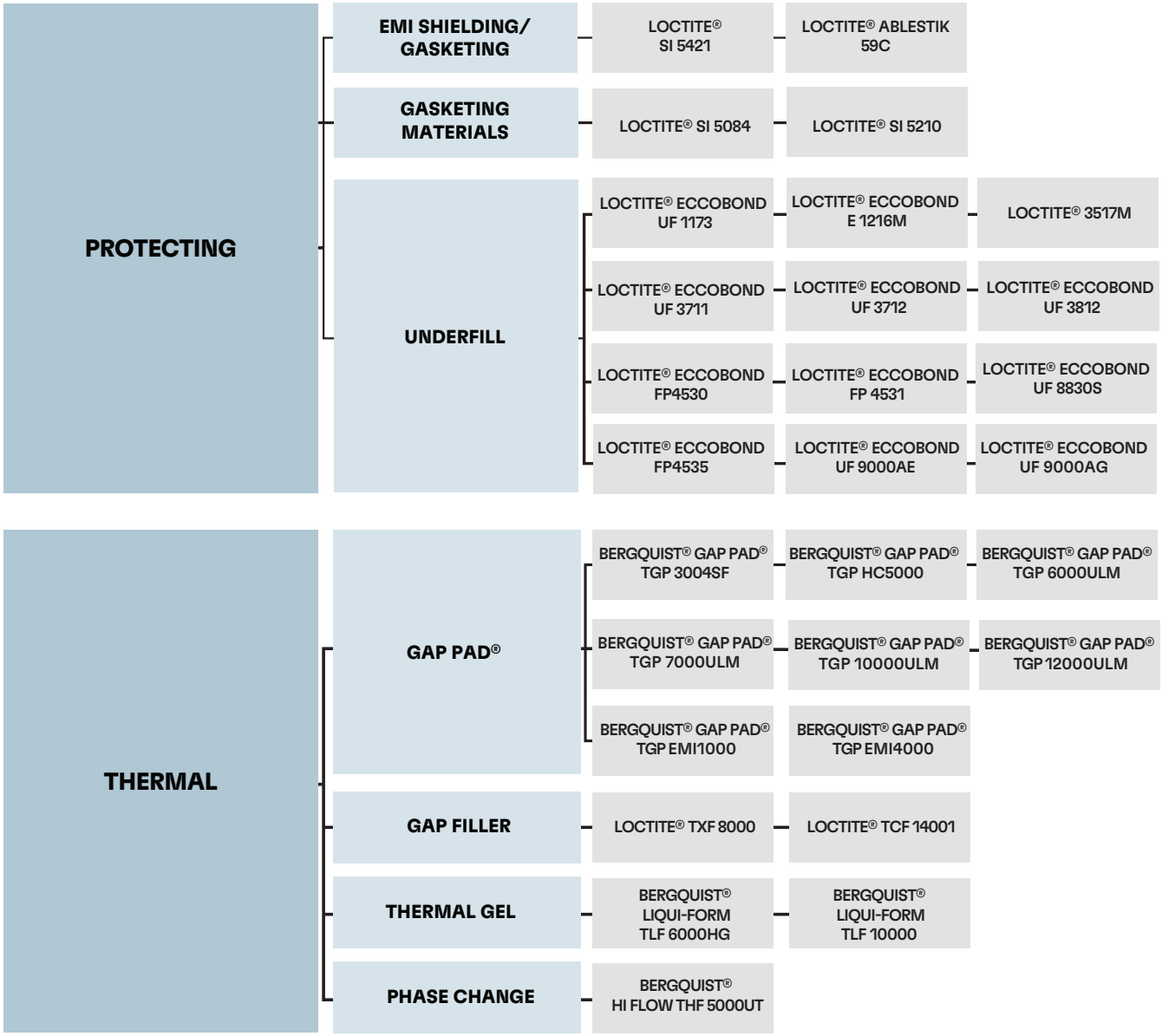
THERMAL GEL

THERMAL GAP PAD®

EMI SHIELDING/ GASKETING

MATERIAL SOLUTIONS
FOR OPTICAL TRANSCEIVERS




PROTECTING
EMI SHIELDING/ GASKETING
LOCTITE® SI 5421
LOCTITE® ABLESTIK 59C
GASKETING MATERIALS
LOCTITE® SI 5084
LOCTITE® SI 5210
UNDERFILL
LOCTITE® ECCOBOND UF 1173
LOCTITE® ECCOBOND E 1216M
LOCTITE® 3517M
LOCTITE® ECCOBOND UF 3711
LOCTITE® ECCOBOND UF 3712
LOCTITE® ECCOBOND UF 3812
LOCTITE® ECCOBOND FP4530
LOCTITE® ECCOBOND FP 4531
LOCTITE® ECCOBOND UF 8830S
LOCTITE® ECCOBOND FP4535
LOCTITE® ECCOBOND UF 9000AE
LOCTITE® ECCOBOND UF 9000AG
THERMAL
GAP PAD®
BERGQUIST® GAP PAD® TGP 3004SF
BERGQUIST® GAP PAD® TGP HC5000
BERGQUIST® GAP PAD® TGP 6000ULM
BERGQUIST® GAP PAD® TGP 7000ULM
BERGQUIST® GAP PAD® TGP 10000ULM
BERGQUIST® GAP PAD® TGP 12000ULM
BERGQUIST® GAP PAD® TGP EMI1000
BERGQUIST® GAP PAD® TGP EMI4000
GAP FILLER
LOCTITE® TXF 8000
LOCTITE® TCF 14001
THERMAL GEL
BERGQUIST® LIQUI-FORM TLF 6000HG
BERGQUIST® LIQUI-FORM TLF 10000
PHASE CHANGE
BERGQUIST® HI FLOW THF 5000UT

BONDING MATERIALS

Active Alignment and Bonding Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ppm/°C)		CURE TYPE	CURE SCHEDULE
						Below T_g	Above T_g		
ACTIVE ALIGNMENT									
LOCTITE® ECCOBOND UV 3000	Epoxy	Sealant	• High strength • Chemical resistant • Low outgassing • Capable of 200°C • Cationic epoxy	5,300	150	–	–	UV	UV
LOCTITE® ECCOBOND LUX AA50T	Acrylate	Active alignment	• Fast light cure • High viscosity • Low shrinkage • Good mechanical stability	96,000	163	36	98	UV/ Heat	UV or visible light + 60 min. at 100°C
LOCTITE® ECCOBOND LUX 3042M	Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	85,000	114	87	174	UV & Heat	UV + 30 min. at 120°C
LOCTITE® HHD4042	Epoxy/ Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	125,000	114	45.38×10^{-6}	138.73×10^{-6}	UV & Heat	UV + 30 min. at 120°C
LOCTITE® NCA O1UV	Epoxy	Assembly	• Full one step UV cure adhesive • High T_g, low CTE • Low shrinkage • SVHC free and Antimony free	13,800	138	–	–	UV	UV wavelength, 365 nm
LOCTITE® STYCAST OS 5106	Epoxy	Optoelectronic lens assembly	• One component • Non-conductive • Dual cure system • Cures in shadowed areas • with heat • High adhesion • Low CTE • Low curing shrinkage	54,000	99	18	47	UV/ Heat	UV wavelength, 365 nm
LOCTITE® ABLESTIK NCA 3216AC	Epoxy	Active alignment camera and Lidar module assembly	• Fast UV cure • High Tg and low CTE • Good SFR performance • High and stable RA reliability • Good dispensing capability • Excellent adhesion to different • substrate	21,450	134	29	116	UV/ Heat	UV Light: 365 nm
LOCTITE® 3217	Epoxy/ Acrylate	Assembly	• Dual cure	109,000 cP t shear rate of 2 s^{-1}, 37,600 cP at shear rate of 20 s^{-1}	82	53	178	UV/ Heat	UV wavelength, 365 nm, 30 min at 60°C
LOCTITE® ECCOBOND LUX 3042M	Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	85,000	114	87	174	UV & Heat	UV + 30 min. at 120°C
LOCTITE® ECCOBOND UF 3711	Epoxy	Edgebond, encapsulation, active alignment	• UV curable • Thixotropic • Very low CTE • High Tg and modulus • Low curing shrinkage	35,000 cP at 25°C, at shear rate of 15 s^{-1}	150	20	62	UV/ Heat	UV wavelength, 365 nm

Back Fill Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ppm/°C)		CURE TYPE	CURE SCHEDULE
						Below T_g	Above T_g		
LOCTITE® ABLESTIK BF 4	Epoxy	Back fill	• Low outgassing • Low moisture absorption • High T_g • Non-conductive	23,500	94	32	87	Heat	30 min. at 100°C
LOCTITE® STYCAST OS 8301	Epoxy	Active alignment	• Excellent adhesion • Low weight loss • High T_g	7,500	105	55	184	Hot air drying	60 min. at 150°C
LOCTITE® ABLESTIK FS 245	Epoxy	Back fill	• Two component • Thermally conductive • Excellent impact and chemical resistance	13,500	55	50.9	N/A	RT/ Heat	72 hr. at 27°C or 2 hr. at 65°C

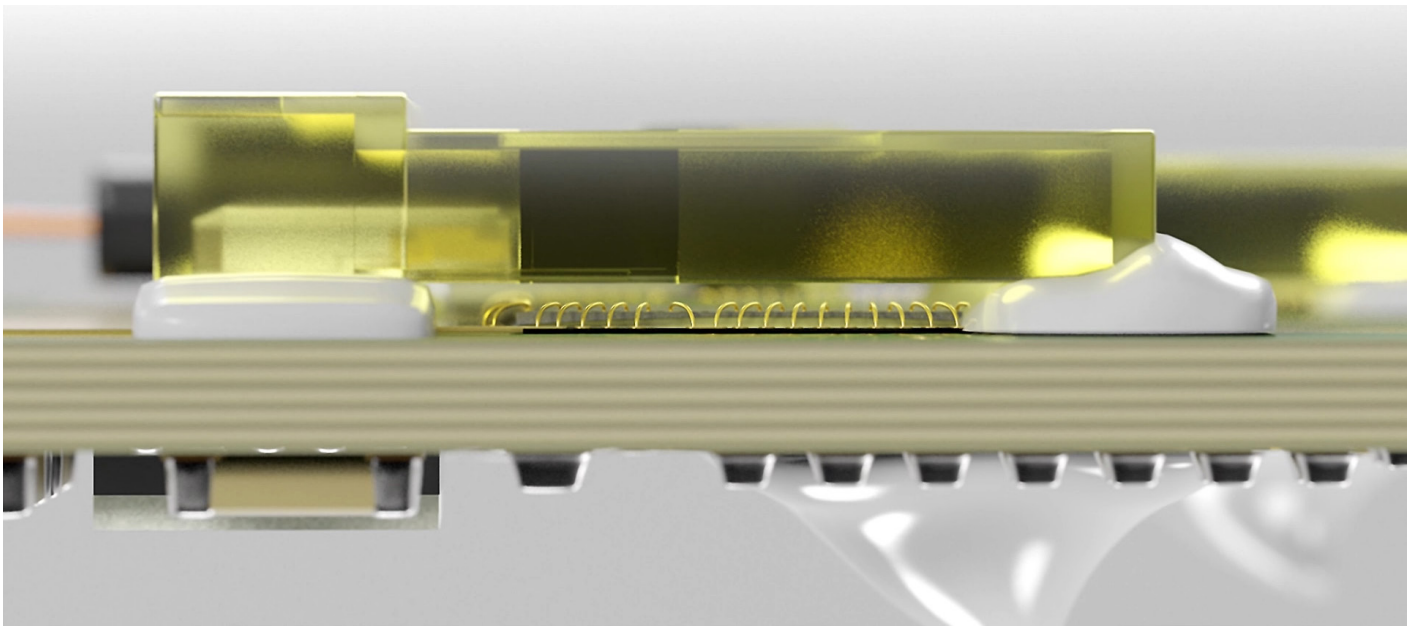
Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK TE 3530	Epoxy	Sensor attach and die attach	• One component • Thermally conductive • Low viscosity • Low temperature cure	60,000	55	2.3	Heat	30 min. at 100°C
LOCTITE® ABLESTIK 2035SC	Proprietary Hybrid Chemistry	Die attach	• Non-conductive • Single component • Fast cure • Low cure temperature • Low stress	11,000	120	0.35	Heat	90 sec. at 110°C
LOCTITE® ABLESTIK 84-3	Epoxy	Die-attach	• Non-conductive • Solvent free formulation • Long work life	50,000	85	0.8	Heat	60 min. at 150°C
LOCTITE® ABLESTIK 563K	Epoxy	Assembly	• Thermally conductive • Thin bondline • Uniform bondline control • Good heat transfer	-	97	1.1	Heat	30 min. at 150°C

BONDING MATERIALS

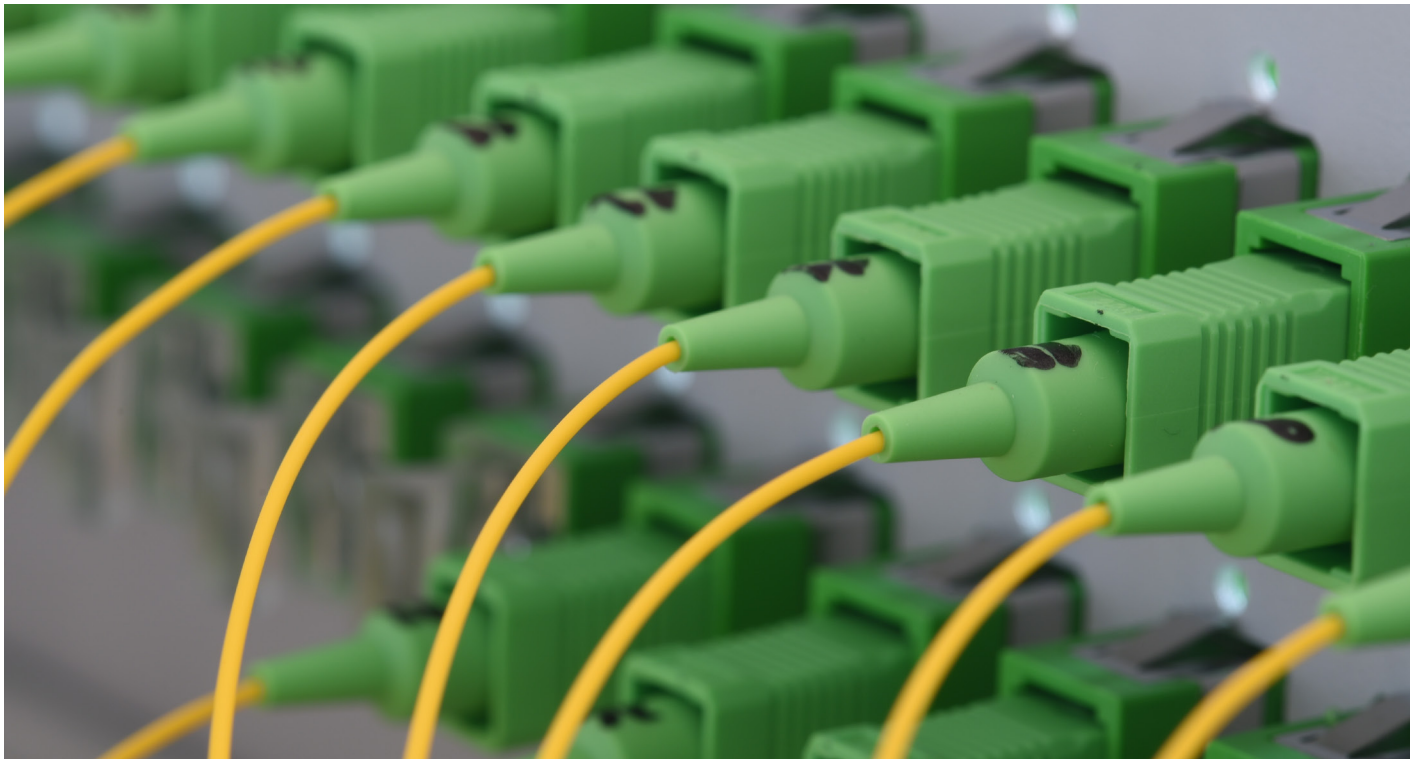
Die Attach Adhesives – Continued

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK 2035SCR	Proprietary Hybrid Chemistry	Die attach	• One component • Low stress • Snap curable • Low cure temperature • Good dispense behavior • Compatible for use with encapsulant material	9,830	118	0.4	Heat	30 min. at 100°C
LOCTITE® ABLESTIK ABP 8910T	BMI Hybrid	Die attach	• High MRT performance • High thermal conductivity • Electrically Insulating • High reliability	13,000	30	1.3	Heat	30 min. ramp to 175°C + 15 min. at 175°C
LOCTITE® ABLESTIK ABP 8920TC	BMI Hybrid	Electronic material, semiconductor die attach paste	• High MRT performance • High thermal conductivity • Good adhesion • Good electrical insulation • Small and controlled particle size	16,000	49	3	Heat	30 min. ramp to 175°C, hold for 1 hr. in air or N2
LOCTITE® ABLESTIK ABP 2025DNP	Proprietary hybrid chemistry	Die attach	• Minimum bleed • Good adhesion to a variety of • substrates • High hot/wet die shear strength • 260°C reflow capability for Pbfree applications • Non-conductive	13,500	Post mold: 36 Post cure: -35	0.3	Heat	30 min. ramp to 175°C + 15 min. at 175°C in N2



Optical Fiber Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® 3128	Epoxy	Bonding heat sensitive components	• Low cure temperature • Excellent adhesion on wide range of materials • Typical applications: memory cards, CCD/ CMOS assemblies	7,000 – 27,000	45	88D	Heat	30 min. at 80°C
LOCTITE® ABLESTIK 2170	Epoxy	Non-conductive adhesive	• Flexible • Thixotropic • Low viscosity • Easy application • Easy mix ratio • Room temperature cure	3,500	10	65D	RT/ Heat	25 hr. at 25°C, or 1 hr. at 65°C
LOCTITE® 3703	Acrylic	Bonding	• Load bearing and shock absorbing characteristics • Thixotropic • Excellent adhesion to a wide variety of substrates: glass, plastics and most metals	18,000 –35,000	–	–	UV / visible light	30 mW/cm², measured at 365 nm, for 80 sec. using a Zeta® s7410 light source
LOCTITE® ABLESTIK AA 190024	Acrylic	Bonding	• Load bearing and shock absorbing characteristics • Thixotropic • Excellent adhesion to a wide variety of substrates: glass, plastics and most metals	18,000 –35,000	–	–	UV/ visible light	30 mW/cm², measured at 365 nm, for 80 sec. using a Zeta® s7410 light source



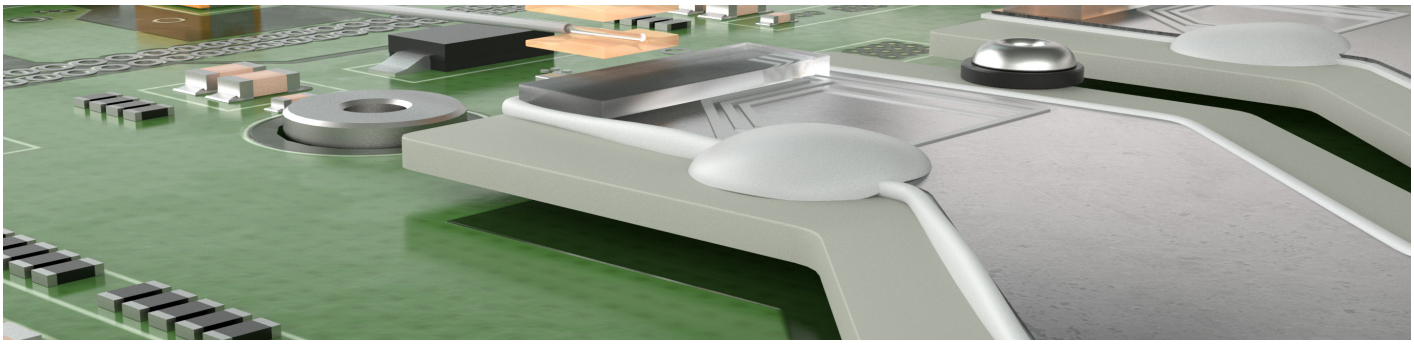
BONDING MATERIALS

Structural Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX 3042M	Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	85,000	114	UV & Heat	UV + 30 min. at 120°C
LOCTITE® HHD 4042	Epoxy/Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	125,000	145	UV & Heat	UV + 60 min. at 120°C
LOCTITE® ABLESTIK 3119	Epoxy	Bonding	• Low-temperature cure • Excellent adhesion on wide range of substrates • Very low shrinkage	7,000 – 23,000	110	Heat	60 min. at 100°C or 20 min. at 75°C
LOCTITE® ECCOBOND EO1016	Epoxy	Encapsulation	• Excellent shelf stability • Fast curing • Flame-out	Spindle 6, Speed 2.5 rpm – 62,000 Spindle 6, Speed 20 rpm – 58,000	126	Heat	20 min. at 120°C
LOCTITE® ABLESTIK 2332	Epoxy	Non-conductive adhesive	• One component • Excellent adhesion • Non-conductive • Low temperature cure • High strength	65,000 – 85,000	105	Heat	1 hr. at 120°C
LOCTITE® ABLESTIK 2332HF	Epoxy	Non-conductive adhesive	• One component • Excellent adhesion • Non-conductive • Low temperature cure • High strength • Low halogen content (total Cl & Br <1500 ppm)	75,000	105	Heat	1 hr. at 120°C
LOCTITE® SI 5088	Silicone	Gasketing or Sealing	• One component • Thixotropic	50,000 – 80,000	–	UV	Cured at 40 mW/cm², for 60 sec. per side plus 7 days at 22 °C / 50% RH
LOCTITE® ECCOBOND EN 3838T	Epoxy	Encapsulant	• One component • Thixotropic • Fast cure at moderate temperatures • Low Tg • Low modulus • Reworkable • Pb-free applications	6,700	2	Heat	8 min. at 130°C
LOCTITE® SI 5140	Silicone	Sealing or Coating	• One component • Non-corrosive • Resists weathering, moisture, ozone • Retains its properities through severe environments	Spindle 6, Speed 2.5 rpm – 85,000 Spindle 6, Speed 20 rpm – 35,000	–	RTV	Cured for 1 week at 21 to 26°C / 50±5% RH

V-groove Bonding Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX OGRFI146T	Acrylate	Adhesive	• One component • Photo-curable • Optical grade • Low refractive index • Cures in shadowed areas	1,250	85	64D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND LUX OGR150THTG	Acrylate	Assembly	• One component • Photo-curable • High T_g • Fast UV cure • Cures in shadowed areas • Low-temperature cure	1,000	145	76D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND F 113	Epoxy	Assembly	• Low viscosity • Optically clear • Resistant to mechanical impact • Excellent wettability • Excellent thermal shock resistance	180	45	78D	Room Temperature or Heat Cure	24 hr. at 25°C or 1 – 2 hr. at 65°C
LOCTITE® STYCAST OS 8300	Epoxy	Assembly	• Two components – requires mixing • High spectral transmission • Excellent adhesion • Low weight loss • Low halogen content	4,000	103	85D	Heat Cure	60 min. at 150°C
LOCTITE® ECCOBOND LUX A4035T	Acrylate	Assembly	• Single Pack • Photocurable • Optical grade • Thin bondline	500	145	82D	Ultraviolet (UV) light, Visible light and Heat cure	Ultraviolet (UV) light: 365 UV wavelength, (nm) Light Intensity at bondline: 50 mW/cm²
LOCTITE® ECCOBOND OGR 146TUV	Acrylate	Adhesive	• Single component • Photocurable • Cures in shadowed areas • Low refractive index	1,250	77	60D	Ultraviolet (UV) light	UV 365 nm wavelength, 1 hr. at 100°C or 2 hr. at 85°C
LOCTITE® ECCOBOND F 114 BIPAX	Epoxy	Assembly	• Low viscosity • Solvent free • Excellent wicking • Good wetting • Good adhesion • Blush free cure under high humidity	625	53	83D	Room Temperature or Heat Cure	24 hr. at 25°C, or 4 hr. at 65°C



BONDING MATERIALS

Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK 2030SC	Proprietary hybrid chemistry	Die-attach	• Snap curable • Low Stress	11,600	–	2.3	Heat	90 sec. at 110°C
LOCTITE® ABLESTIK 84-1LMI	Epoxy	Die-attach	• Conductive • Low outgassing • Low bleed • Meets MIL-STD-883 • Method 5011 requirements	30,000	103	2.4	Heat	60 min. at 150°C
LOCTITE® ABLESTIK 84-1LMINB	Epoxy	Die-attach	• Electrically conductive • High purity die attach adhesive • Solvent-free	60,000	117	4.5	Heat	30 min. at 150°C
LOCTITE® ABLESTIK 84-1LMISR4	Epoxy	Die-attach	• Conductive • Excellent dispensability • Minimal tailing and stringing	8,000	120	2.5	Heat	60 min. at 175°C
LOCTITE® ABLESTIK ABP 6395TC	Proprietary epoxy chemistry	Die attach, Electronic adhesive	• Good adhesion on non-BSM and BSM • die • Good workability and open time • One component • High reliability • High thermal & electrical conductivity • Good RBO control • Good adhesion on Ag, Cu and PPF	11,500	55	30	Heat	30 min. ramp to 200°C + 30 min. at 200°C in N2 or Air oven
LOCTITE® ABLESTIK 88064T	Hybrid chemistry	Die-attach	• High thermal conductivity • High electrical conductivity • Medium modulus • Low outgassing • Stable at high temperatures • Good reliability performance • Soft solder replacement • Use for wide range of package sizes	12,000	44.5	22	Heat	60 min. ramp from 25°C to 180°C, hold 60 min. at 180°C in N2 oven
LOCTITE® ABLESTIK QMI529HT	Heat	Die-attach	• Excellent electrical conductivity • Excellent thermal conductivity • Hydrophobic • Stable at high temperatures • High resistance to delamination • Void-free bondline • Excellent adhesive strength • High resistance to heat and humidity • Good resistance to "popcorning" after exposure to reflow temperatures	18,500	3.3	6.5	Heat	60 sec. at 185°C

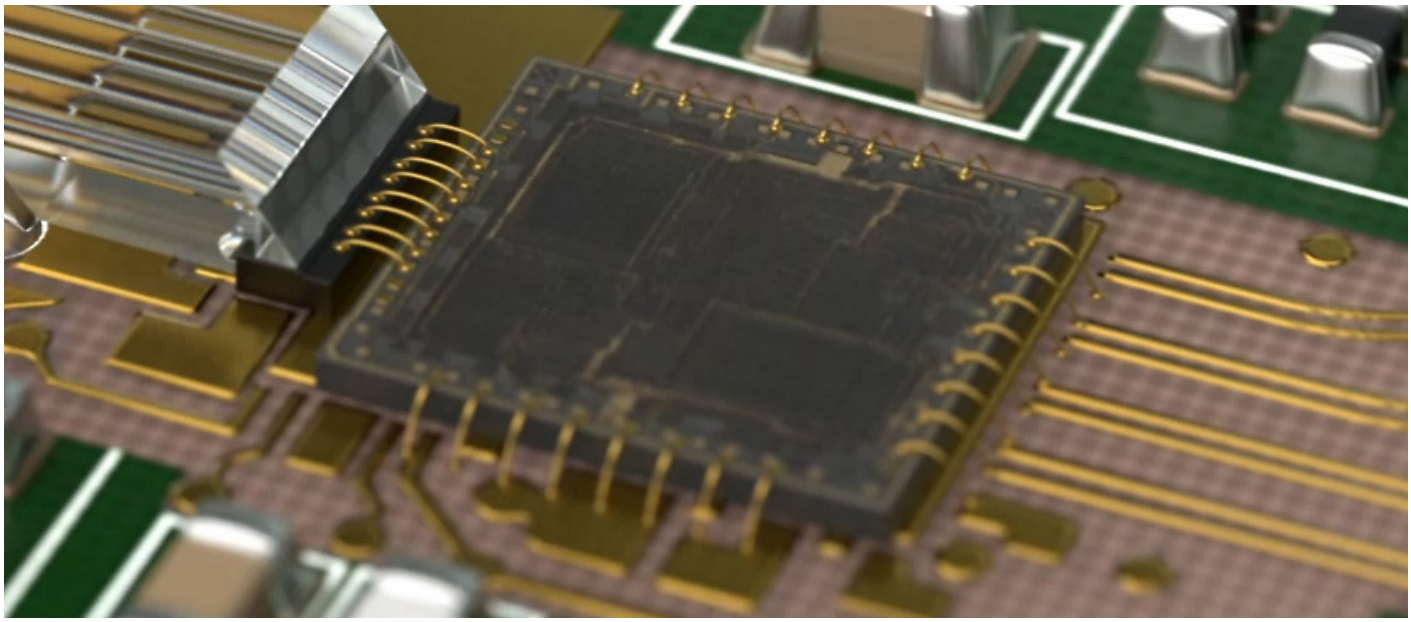
Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK ABP 8068TA	Semi-sintering	Conductive adhesive	• One component • Dispensable • Printable low-temperature cure semi-sintering paste • High lead solder replacement • High thermal conductivity • High reliability	9,000	–	110	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 to 60 min.; 15 min. ramp to 200°C hold for 60 min. in N_2 or air oven **For die size > 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 120 min.; 15 min. ramp to 200°C, hold for 60 min. in N_2 or air oven
LOCTITE® ABLESTIK ABP 8068TB	Semi-sintering	Conductive adhesive	• No resin bleed-out • One component • Good workability • Printable low-temperature cure semi-sintering paste • Good electrical stability • High thermal stability • High reliability • Solder replacement	11,500	25	110	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 – 60 min.; 15 min. ramp to 200°C, hold for 120 min. in N_2 or air oven. **For die size > 5 x 5 mm:** 20 min. ramp from 25°C – 130°C, hold for 120 min.; 15 min. ramp to 200°C, hold for 120 min. in N_2 or air oven
LOCTITE® ABLESTIK ABP 8068TI	Pressure-less sintering	Electronic Adhesives & Solder, Semiconductor Pastes, Conductive die attach paste	• One component • Dispensable • Excellent workability • Low sintering temperature • High thermal and electrical properties • Good toughness • High reliability • Solder replacement • Void-free bondline • Excellent sintering properties when used on Ag, Au and PPF leadframe	13,000	–	165	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 to 60 min.; 15 min. ramp to 200°C, hold for 60 min. in air or N2 oven **For die size > 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 to 60 min.; 10 min. ramp to 175°C, hold for 60 min. in N2 or air oven

BONDING MATERIALS

Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK ABP 8068TBD	Semi-sintering	Semiconductor, Conductive adhesive	▪ No resin bleed-out ▪ One component ▪ Good workability ▪ Good sintering properties when ▪ used on Ag, PPF, Au and Cu ▪ substrates ▪ High thermal stability ▪ Good electrical stability ▪ High reliability ▪ Solder replacement	11,500	25	100	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 to 60 min.; 15 min. ramp to 200°C, hold for
LOCTITE® ABLESTIK CF 3350	Epoxy Film	Assembly	▪ High electrical conductivity ▪ High thermal conductivity ▪ Uniform bondline adhesion ▪ Custom preforms available ▪ Adhesion with flexibility ▪ Void-free bondline ▪ Clean, easy application with no waste ▪ Even heat dissipation ▪ Provides electrical continuity ▪ Minimum thermal resistance to heat sink ▪ Passes NASA outgassing	–	90	7	Heat	30 min. at 150°C
LOCTITE® ABLESTIK 5025E	Epoxy Film	Die attach	▪ Thin, uniform bondline control ▪ Provides RF/EMI shielding ▪ Electrically conductive in x, y, z axes ▪ Excellent electrical and thermal ▪ conductivity ▪ Passes NASA outgassing	–	90	6.5	Heat	30 min. at 150°C



PROTECTING MATERIALS

EMI Shielding / Gasketing Materials

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® SI 5421	Silicone	Bonding/ Gasketing	▪ Electrically conductive RTV silicone ▪ Bonding and gasketing of EMI/RFI shielded enclosures	Paste	N/A	RTV	Tack free in 60 min. at 23 ±2°C/50 ±5% RH
LOCTITE® ABLESTIK 59C	Silicone	Assembly	▪ Electrically conductive silicone ▪ EMI/RFI shielding ▪ Thermally conductive ▪ High flexibility ▪ High tack ▪ Can be used with a variety of catalysts	N/A	N/A	Heat	6 hr. at 150°C

Gasketing Materials

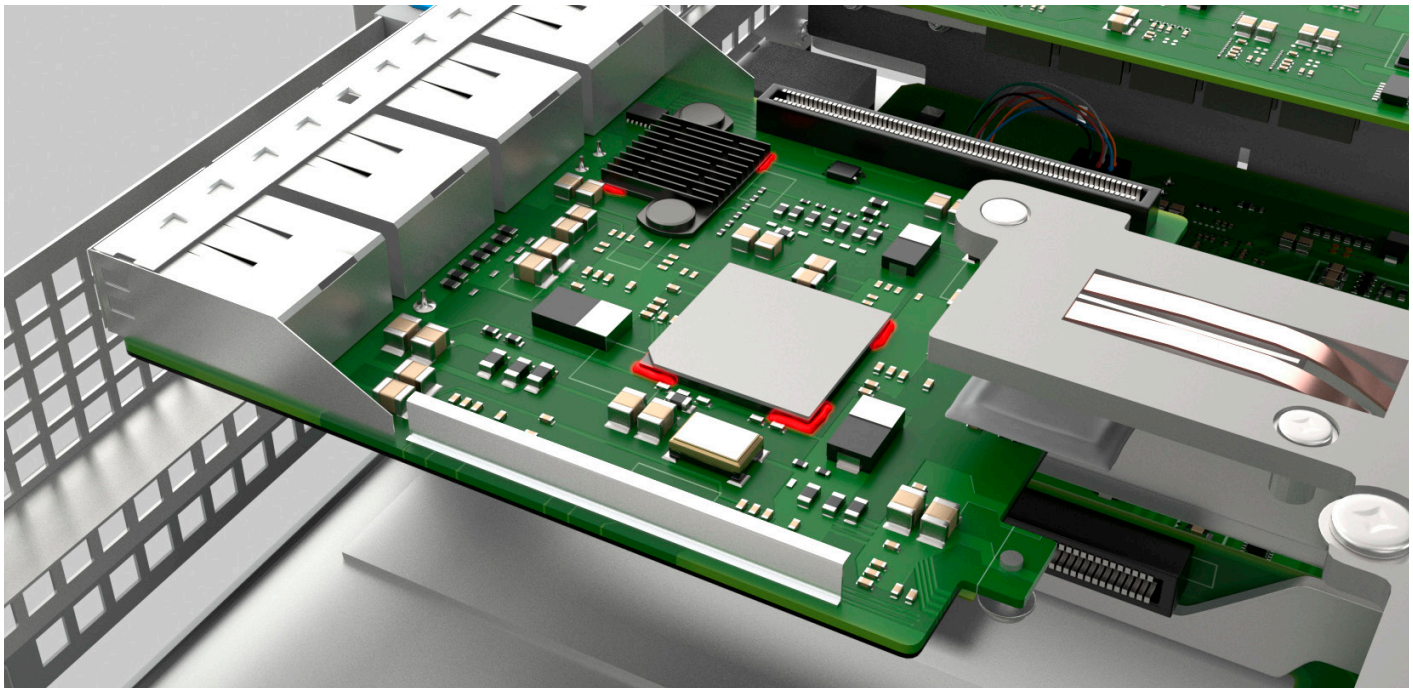
PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® SI 5084	Silicone	Gasketing	▪ Highly flexible ▪ Non-corrosive ▪ Enhances load bearing and shock absorbing characteristics of the bond area	Paste	N/A	UV & RT	UV + Moisture
LOCTITE® SI 5210	Silicone	Potting	▪ Ultra-fast curing ▪ Non-corrosive RTV ▪ Designed for potting, wire tacking, selective sealing ▪ Vibration dampening and repair/ rework applications on PCBs	Paste	-52	RTV	22 °C/50% RH AT ≤5 min.



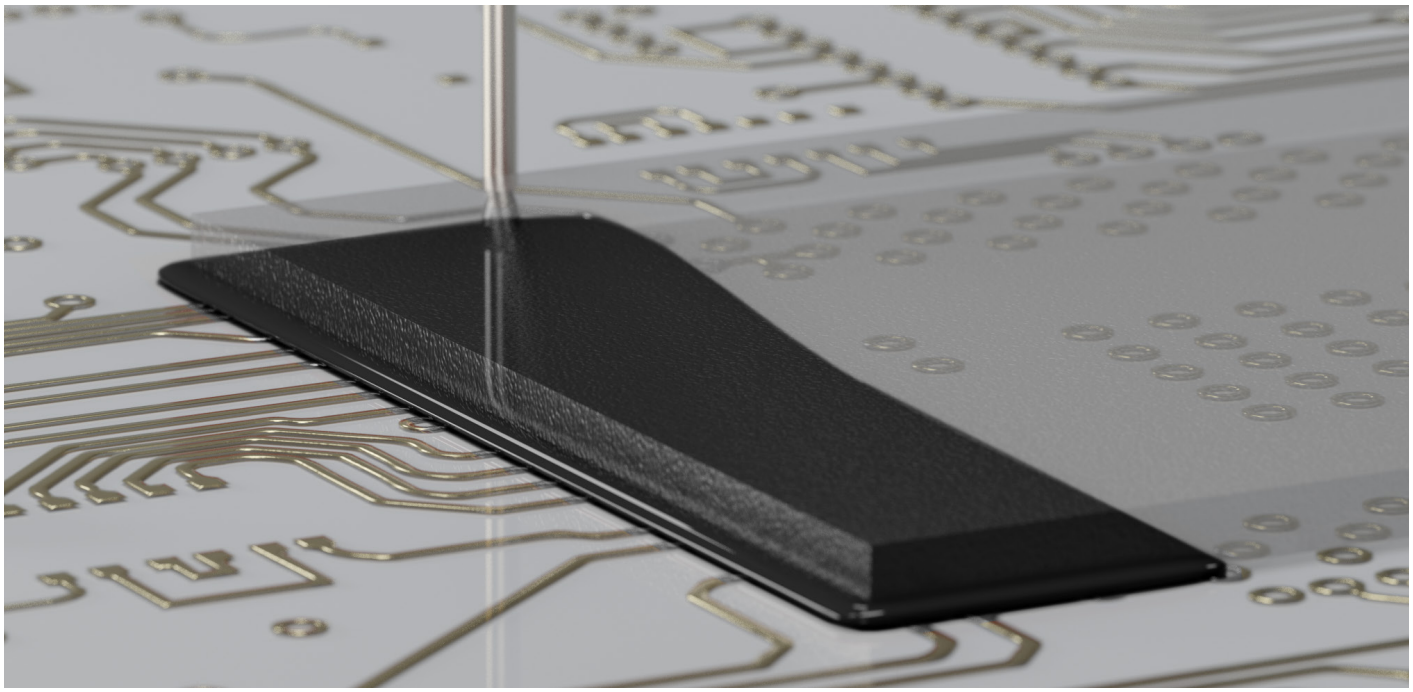
PROTECTING MATERIALS

Underfill Adhesives

PRODUCT	DESCRIPTION	VISCOSITY (PA·S)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 1 - PPM/°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 2 - PPM/°C)	GLASS TRANSITION TEMPERATURE, T_G (°C)	POT LIFE (DAY)
UNDERFILL						
LOCTITE® ECCOBOND UF 1173	Low CTE, high T_g underfill for extreme T-Cycle conditions	7.5	26	103	160	2
LOCTITE® ECCOBOND E 1216M	Fast flow, non-anhydride underfill	4	35	131	125	–
LOCTITE® 3517M	Low temperature cure, reworkable underfill	2.6	65	191	78	7
LOCTITE® ECCOBOND UF 3711	Curable adhesive is formulated for chips to enhance the reliability performance	35	20	62	150	–
LOCTITE® ECCOBOND UF 3712	Fast-cure, thixotropic, reworkable, reliable, and fully compliant with ROHS, REACH, and halogen-free standards	11.6	32	115	133	–
LOCTITE® ECCOBOND UF 3812	Room temperature flow, reworkable underfill	0.35	48	175	131	3



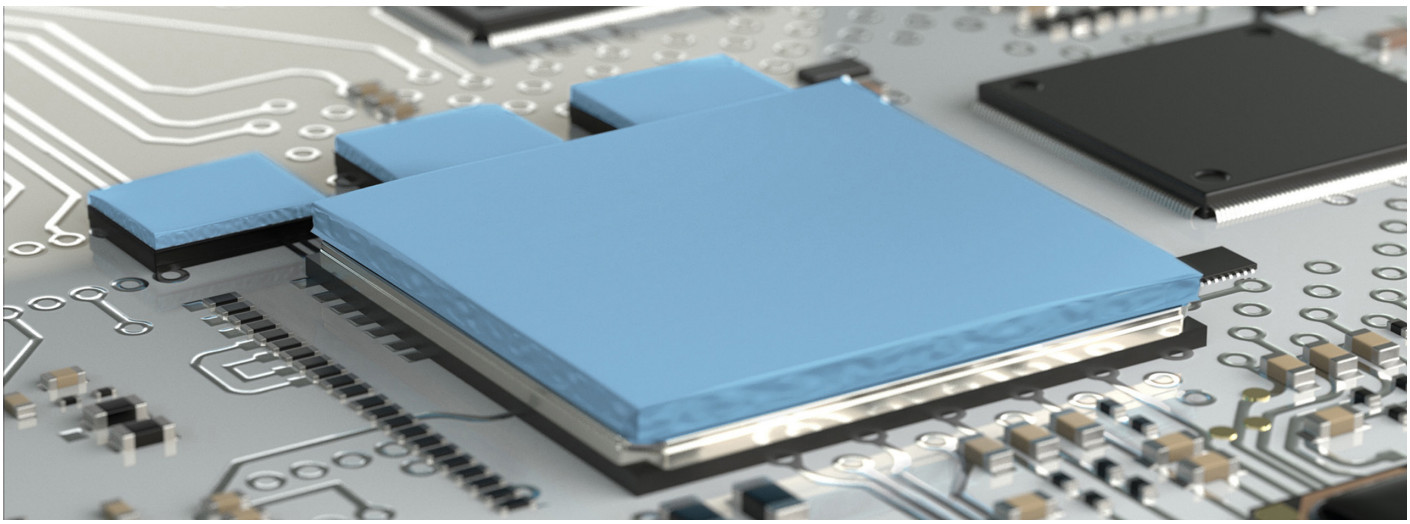
PRODUCT	DESCRIPTION	VISCOSITY (PA·S)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 1 - PPM/°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 2 - PPM/°C)	GLASS TRANSITION TEMPERATURE, T_G (°C)	POT LIFE (DAY)
UNDERFILL						
LOCTITE® ECCOBOND FP4530	Snap curable, compatible with small gap sizes, fast flow	3.5	46	150	145	1 day at 25°C
LOCTITE® ECCOBOND FP4531	Snap curable, fast flow, passes NASA outgassing	10	28	104	161	1 day at 25°C
LOCTITE® ECCOBOND FP4535	Uniform and void-free, one-component encapsulant edgebond	155.6	19	81	147	–
LOCTITE® ECCOBOND UF 8830S	Liquid epoxy underfill encapsulant is formulated for tight bump pitch and narrow gap in flip chip BGA applications	22.12	25	100	118/126	–
LOCTITE® ECCOBOND UF 9000AE	Liquid epoxy underfill encapsulant is designed for large die flip chip BGA and Cu pillar package applications requiring low thermal expansion, fast capillary flow and long worklife	9.082	23	85	111/112	1 day at 25°C
LOCTITE® ECCOBOND UF 9000AG	Liquid epoxy underfill encapsulant is designed for FCBGA and Cu pillar applications requiring low CTE, fast capillary flow and long worklife	11.93	19	62	135/160	–

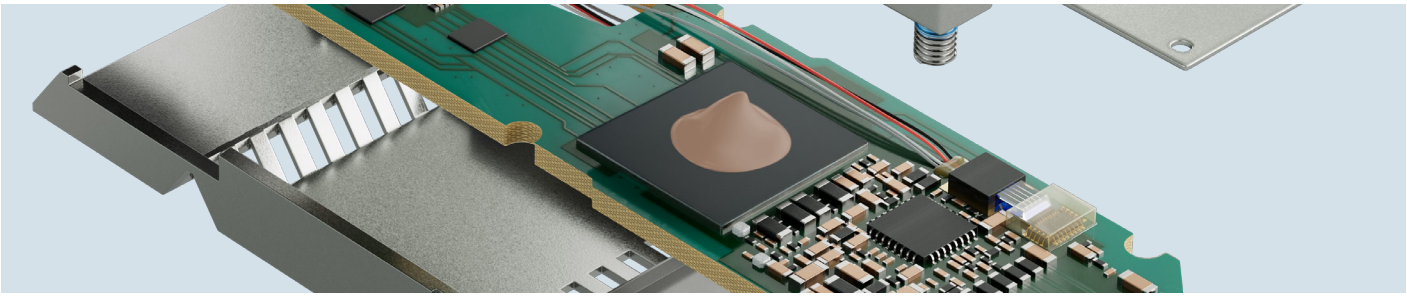


THERMAL MATERIALS

GAP PAD®

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	THICKNESS (mm)	SHORE HARDNESS	THERMAL CONDUCTIVITY (W/m·K)
THERMAL PAD						
BERGQUIST® GAP PAD® TGP 3004SF	Silicone-free	Thermal pad	• Silicone-free formulation • 0.25 mil PET provides easy disassembly, leaving no residue • Tacky side allows for ease of handling and placement	0.254 ~ 3.175	70 (Shore 00)	3.0
BERGQUIST® GAP PAD® TGP HC5000	Silicone	Thermal pad	• High-compliance, low compression stress • Fiberglass reinforced for shear and tear resistance	0.508 ~ 3.175	35 (Shore 00)	5.0
BERGQUIST® GAP PAD® TGP 6000ULM	Silicone base	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.524 ~ 3.175	60 (Shore 000)	6.0
BERGQUIST® GAP PAD® TGP 7000ULM	Silicone base	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	0.500 ~ 3.180	75 (Shore 000)	7.0
BERGQUIST® GAP PAD® TGP 10000ULM	Silicone	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.000, 1.500, 2.000, 2.500, 3.180	75 (Shore 000)	10
BERGQUIST® GAP PAD® TGP 12000ULM	Silicone	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.000, 1.500, 2.000, 2.500, 3.180	68 (Shore 000)	12
EMI ABSORPTION						
BERGQUIST® GAP PAD® TGP EMI1000	Silicone	EMI absorbing	• EMI absorbing • Highly conformable • Low hardness • Fiberglass reinforced for puncture, tear and shear resistance • Electrically isolating	0.508 – 3.175	5 (Shore 00)	1.0
BERGQUIST® GAP PAD® TGP EMI4000	Silicone free	Thermal management, EM absorbing, TIM (Thermal Interface Material)	• Thermal Conductivity: 4 W/mK • Silicone-free formulation • Electromagnetic radiation absorbing up to 77 GHz • Highly conformable with natural tack	0.75 – 2.0 mm	60 (Shore 00)	4.0





Gap Filler

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	OPERATING TEMPERATURE	SHORE HARDNESS	THERMAL CONDUCTIVITY (W/m·K)
LOCTITE® TXF 8000	Silicone	Thermal management, Gap filler (2K)	▪ High thermal conductivity ▪ Low modulus ▪ Excellent TI reliability ▪ Stable interface adhesion ▪ Low compression force	-40 to 200°C	Shore 00, 6 mm thick sample – 49	8.4 W/m-K
LOCTITE® TCF 14001	Silicone	Thermal management, Gap filler (2K)	▪ High thermal conductivity ▪ Low thermal impedance ▪ High gap deflection tolerance ▪ Excellent ageing performance ▪ Stable interface adhesion ▪ Low modulus	-40 to 200°C	Shore 00, 6 mm thick sample – 62	14.5 W/m-K

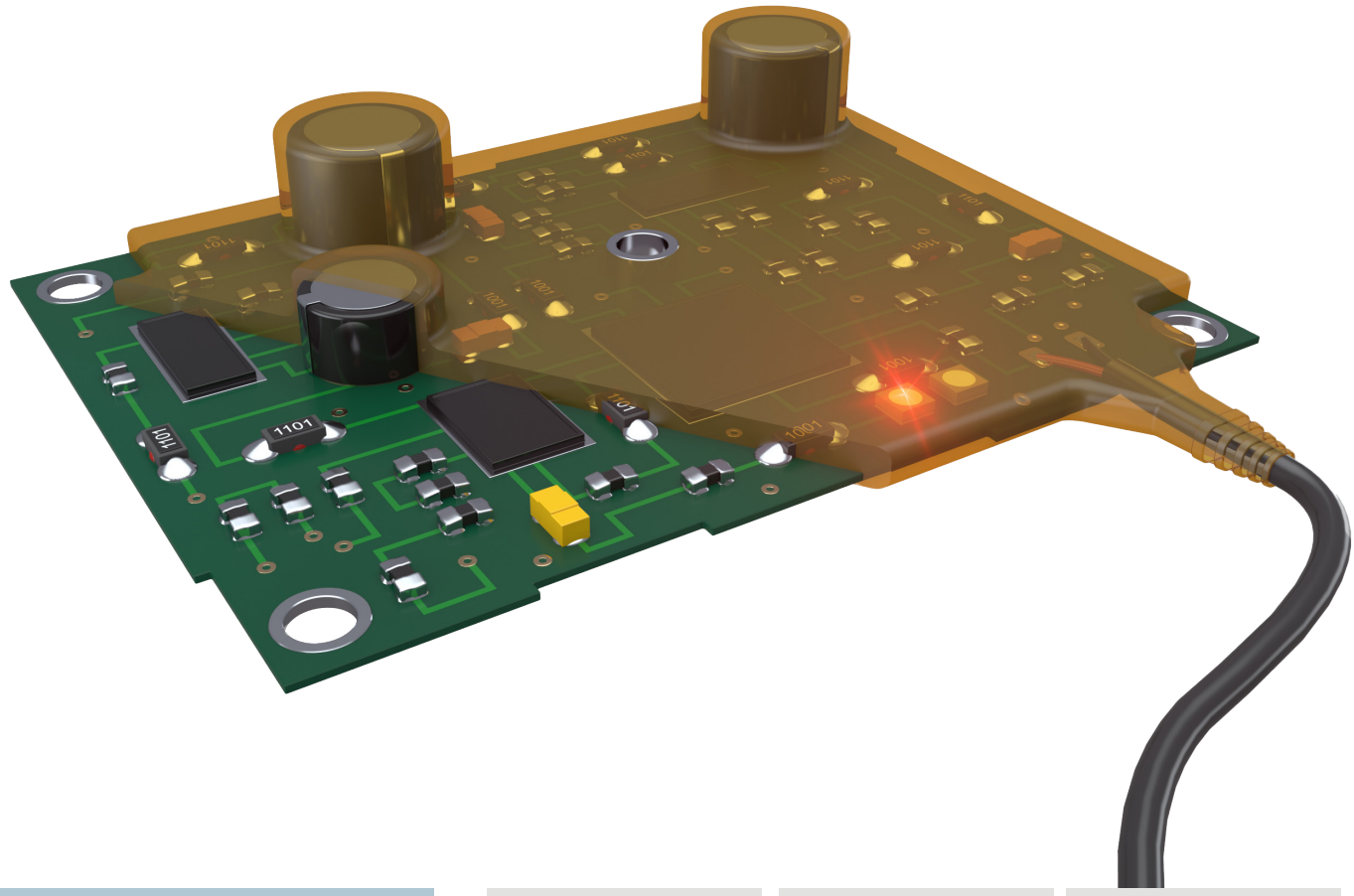
Thermal Gel

PRODUCT	DESCRIPTION	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	DIELECTRIC STRENGTH	VOLUME RESISTIVITY (Ω·cm)	OPERATING TEMPERATURE
BERGQUIST® LIQUI-FORM TLF 6000HG	Thermally conductive, one-part, liquid formable gel material	6.0	Pre-cured	10,500 V/mm	4.37×10^{11}	-60 – 200°C
BERGQUIST® LIQUI-FORM TLF 10000	Thermally conductive, pre-cured gel material	10	Pre-cured	7,080 V/mm	9.0×10^{13}	-60 – 200°C

Phase Change

PRODUCT	DESCRIPTION	MATERIAL THICKNESSES (mil)	PHASE CHANGE TEMPERATURE	OPERATING TEMPERATURE	THERMAL CONDUCTIVITY (W/m·K)	UL FLAMMABILITY RATING
BERGQUIST® HI-FLOW THF 5000UT	Reworkable phase change thermal interface material suitable for use between a heat sink and variety heat generating components	8, 10, 12, 16	45°C	-40 to 150°C	Multiple Thickness, ASTM D5470 5.3 Thin Bondline Materials, modified ASTM D5470 8.5	UL 94 V-0

MATERIAL SOLUTIONS
FOR CABLES AND CONNECTORS

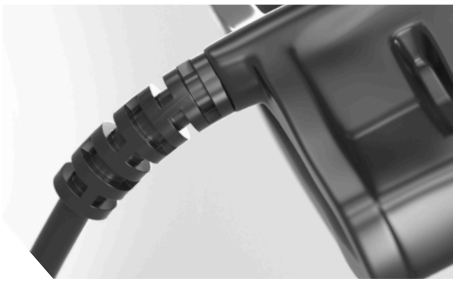


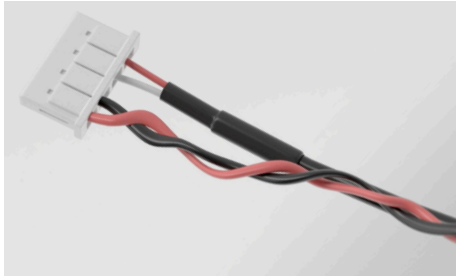
LOW PRESSURE MOLDING	TECHNOMELT® PA 6208 N / PA 6208 BLACK	TECHNOMELT® PA 652 N / PA 657 BLACK	TECHNOMELT® PA 653 / PA 658 BLACK
	TECHNOMELT® PA 633 N / PA 638 BLACK	TECHNOMELT® PA 641 / PA 646 BLACK	TECHNOMELT® PA 653 / PA 658 BLACK
	TECHNOMELT® PA 6481 BLACK	TECHNOMELT® PA 676 BLACK	TECHNOMELT® PA 673 N / PA 678 BLACK
	TECHNOMELT® PA 2035 / PA 2035 BLACK	TECHNOMELT® PA 2302 BLACK	TECHNOMELT® PA 668 WHITE
	TECHNOMELT® AS 5376	TECHNOMELT® AS 292	

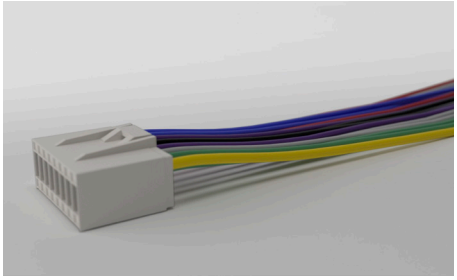
LOW PRESSURE MOLDING MATERIALS

TECHNOMELT®

PRODUCT	TECHNOLOGY	SERVICE TEMPERATURE (°C)	SOFTENING POINT (°C)	COLD FLEXIBILITY (°C)	APPLICATION TEMPERATURE (°C)	SHORE HARDNESS (20°C)	ELONGATION AT BREAK (%)	VISCOSITY (mPas AT 210°C)	DETAILS
TECHNOMELT® PA 6208 / NPA 6208 BLACK	Polyamid	-40 bis +100	155 ± 5	-37	+190 bis +210	A 82	450	3.200 ± 800	Good adhesion
TECHNOMELT® PA 652 / NPA 657 BLACK	Polyamid	-40 bis +100	155 ± 5	-45	+190 bis +210	A 77	350	4.000 ± 1,000	UL94-V0, good cold-flexibility
TECHNOMELT® PA 653 / PA 658 BLACK	Polyamid	-40 bis +100	155 ± 5	-50	+190 bis +210	A 77	400	4.500 ± 1000	Hydrolyse resistsance
TECHNOMELT® PA 633 / NPA 638 BLACK	Polyamid	-40 bis +130	175 ± 5	-30	+200 bis +240	A 90	300	3.700 ± 800	UL94-V0 (638)
TECHNOMELT® PA 641 / PA 646 BLACK	Polyamid	-40 bis +130	175 ± 5	-35	+200 bis +240	A 92	650	7.000 ± 2000	UL94-V0, good adhesion to PVC
TECHNOMELT® PA 6481 BLACK	Polyamid	-40 bis +130	175 ± 5	-35	+210 bis +230	A 93	550	7.300 ± 1000	UV-Resitance
TECHNOMELT® PA 676 BLACK	Polyamid	-50 bis +140	190 ± 5	-55	+220 bis +240	A 89	500	7.000 ± 1000	Very good, cold flexibility
TECHNOMELT® PA 673 / NPA 678 BLACK	Polyamid	-40 bis +140	185 ± 5	-40	+210 bis +240	A 90	400	3.000 ± 800	Universal use, good processable
TECHNOMELT® PA 2035 / PA 2035 BLACK	Polyamid	-20 bis +150	200 ± 5	-20	+240 bis +250	D 42	500	5.000 ± 2000	UL94-V0 (2035 BLACK)
TECHNOMELT® PA 2302 BLACK	Polyamid	-20 bis +150	205 ± 5	-20	+240 bis +250	D 53	500	4.000 ± 2000	Autoclave-resistent
TECHNOMELT® PA 668 WHITE	Polyamid	-30 bis +100	155 ± 5	-25	+190 bis +210	A 90	600	7.000 ± 1000	White, UV resistance
TECHNOMELT® AS 5376	Polyolefin	-30 bis +90	141 ± 6	-35	+180 bis +200	A 44	–	2.000 ± 800	Broad adhesion spectre
TECHNOMELT® AS 292	Polypropylen	-20 bis +90	141 ± 5	–	+180 bis +200	D 55	–	7.500 ± 1000	Hard PP hotmelt







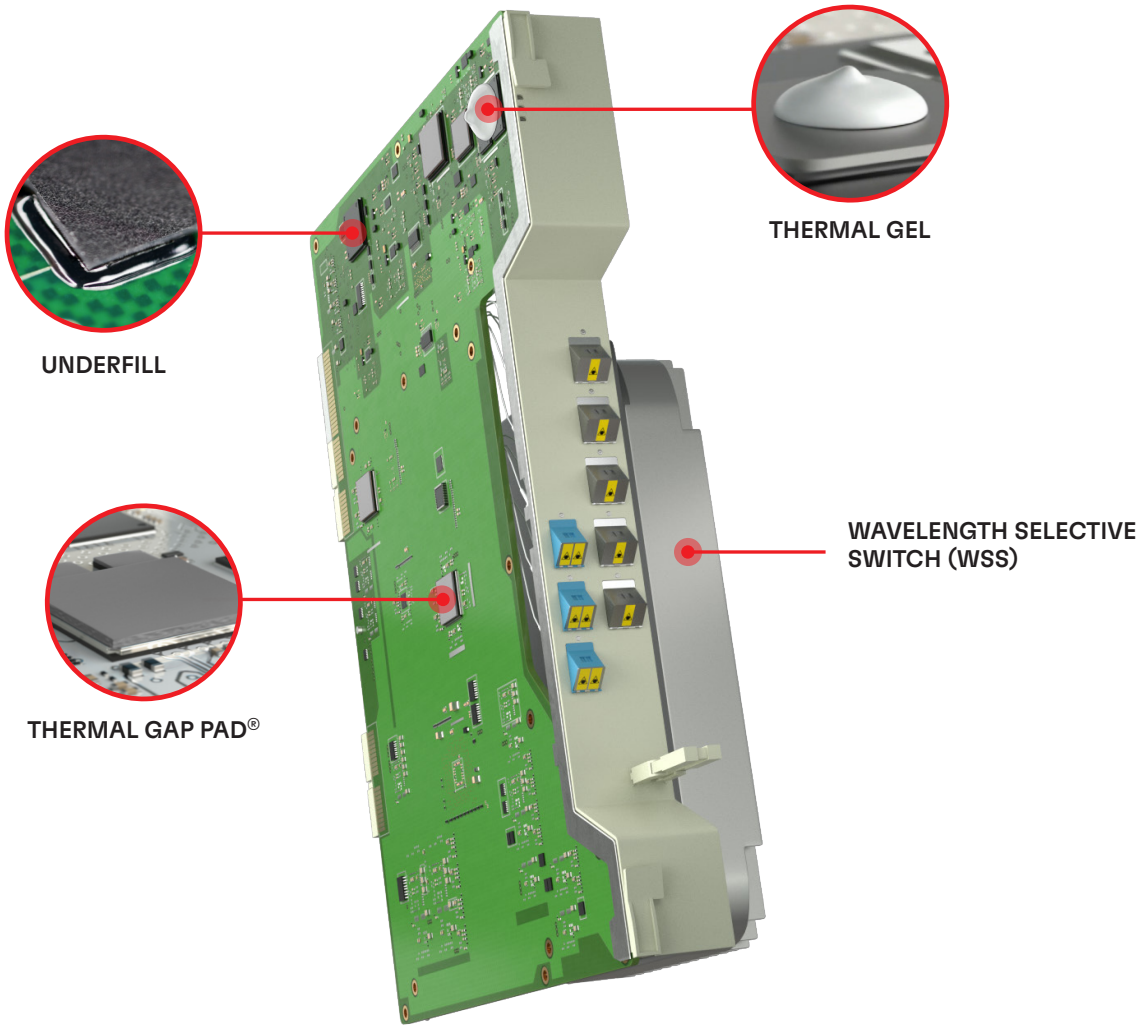
MATERIAL SOLUTIONS

FOR WAVELENGTH SELECTIVE SWITCH (WSS)



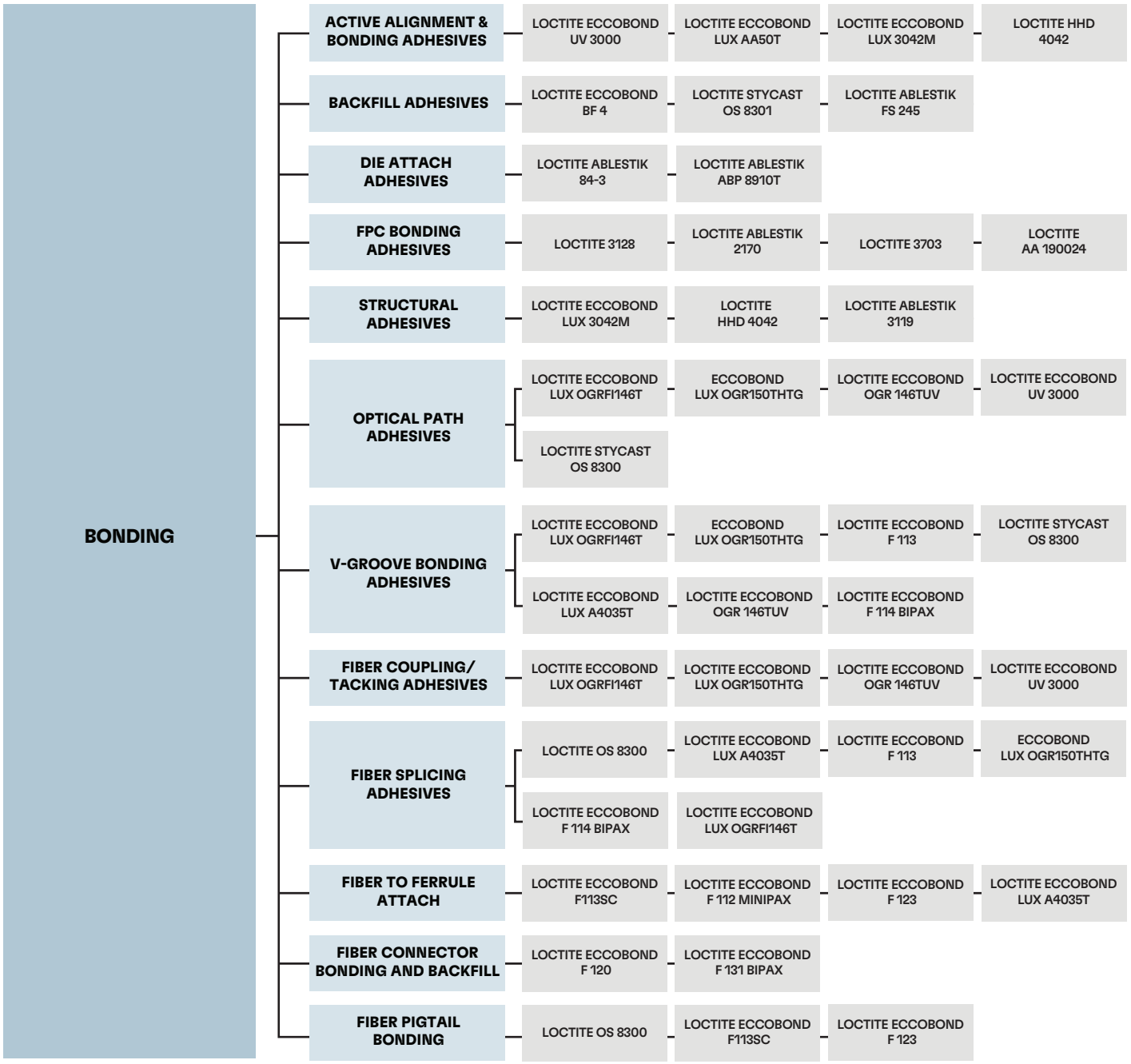
MATERIAL SOLUTIONS

FOR RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXER (ROADM)



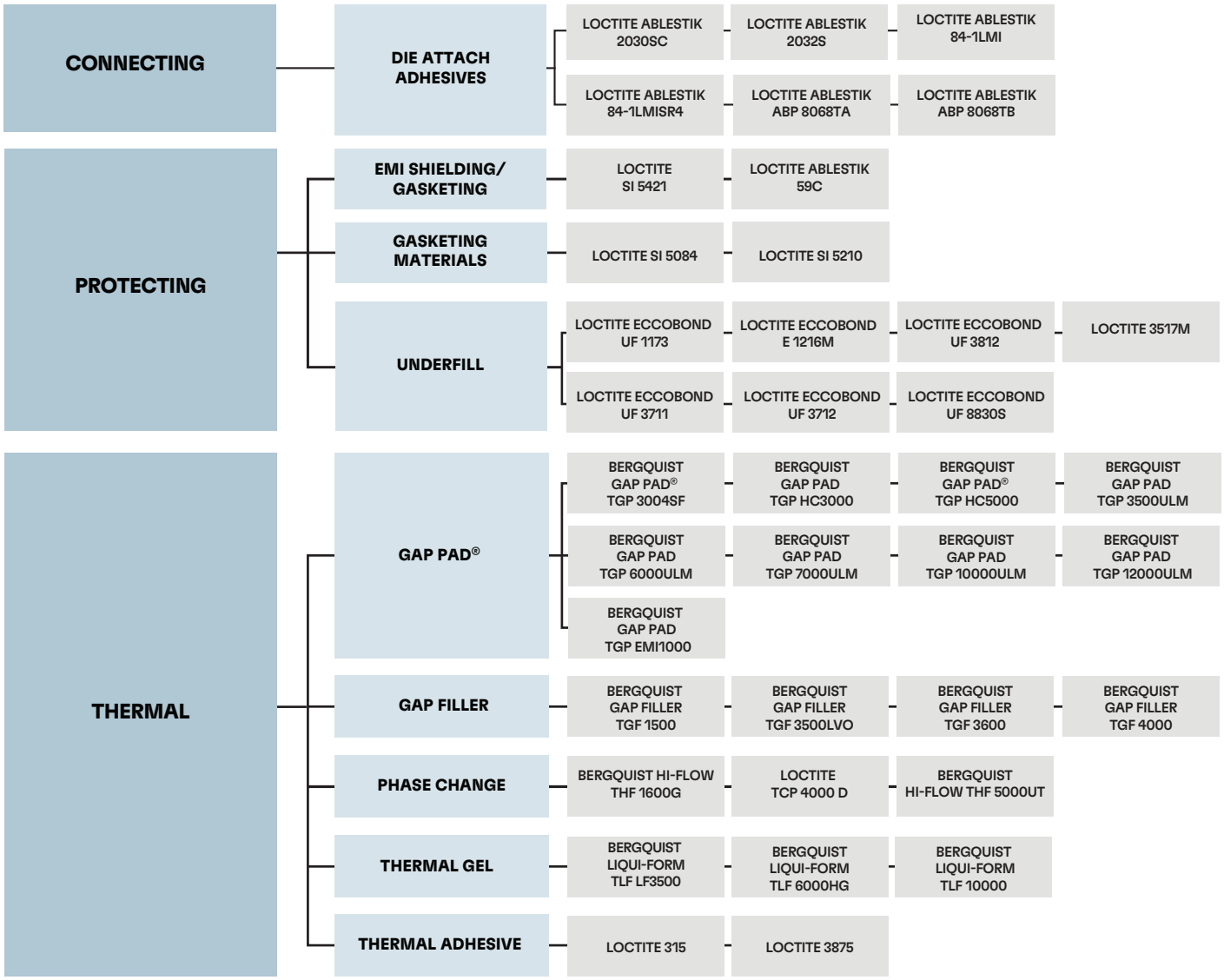
MATERIAL SOLUTIONS

FOR OPTICAL SWITCH (WSS & ROADM)



MATERIAL SOLUTIONS

FOR OPTICAL SWITCH (WSS & ROADM)



BONDING MATERIALS

Active Alignment and Bonding Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ppm/°C)		CURE TYPE	CURE SCHEDULE
						Below T_g	Above T_g		
ACTIVE ALIGNMENT									
LOCTITE® ECCOBOND UV 3000	Epoxy	Sealant	• High strength • Chemical resistant • Low outgassing • Capable of 200°C • Cationic epoxy	5,300	150	–	–	UV	UV
LOCTITE® ECCOBOND LUX AA50T	Acrylate	Active alignment	• Fast light cure • High viscosity • Low shrinkage • Good mechanical stability	96,000	163	36	98	UV/Heat	UV or visible light + 60 min. at 100°C
LOCTITE® ECCOBOND LUX 3042M	Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	85,000	114	87	174	UV & Heat	UV + 30 min. at 120°C
LOCTITE® HHD4042	Epoxy/Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	125,000	114	45.38×10^{-6}	138.73×10^{-6}	UV & Heat	UV + 30 min. at 120°C

Back Fill Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ppm/°C)		CURE TYPE	CURE SCHEDULE
						Below T_g	Above T_g		
LOCTITE® ABLESTIK BF 4	Epoxy	Back fill	• Low outgassing • Low moisture absorption • High T_g • Non-conductive	23,500	94	32	87	Heat	30 min. at 100°C
LOCTITE® STYCAST OS 8301	Epoxy	Active alignment	• Excellent adhesion • Low weight loss • High T_g	7,500	105	55	184	Hot air drying	60 min. at 150°C
LOCTITE® ABLESTIK FS 245	Epoxy	Back fill	• Two component • Thermally conductive • Excellent impact and chemical resistance	13,500	55	50.9	N/A	RT/ Heat	72 hr. at 27°C or 2 hr. at 65°C

BONDING MATERIALS

Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK 84-3	Epoxy	Die-attach	• Non-conductive • Solvent free formulation • Long work life	50,000	85	0.8	Heat	60 min. at 150°C
LOCTITE® ABLESTIK ABP 8910T	BMI Hybrid	Die attach	• High MRT performance • High thermal conductivity • Electrically Insulating • High reliability	13,000	30	1.3	Heat	30 min. ramp to 175°C + 15 min. at 175°C

Optical Fiber Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® 3128	Epoxy	Bonding heat sensitive components	• Low cure temperature • Excellent adhesion on wide range of materials • Typical applications: memory cards, CCD/ CMOS assemblies	7,000 – 27,000	45	88D	Heat	30 min. at 80°C
LOCTITE® ABLESTIK 2170	Epoxy	Non-conductive adhesive	• Flexible • Thixotropic • Low viscosity • Easy application • Easy mix ratio • Room temperature cure	3,500	10	65D	RT/ Heat	25 hr. at 25°C, or 1 hr. at 65°C
LOCTITE® 3703	Acrylic	Bonding	• Load bearing and shock absorbing characteristics • Thixotropic • Excellent adhesion to a wide variety of substrates: glass, plastics and most metals	18,000 –35,000	–	–	UV / visible light	30 mW/cm², measured at 365 nm, for 80 sec. using a Zeta® s7410 light source
LOCTITE® ABLESTIK AA 190024	Acrylic	Bonding	• Load bearing and shock absorbing characteristics • Thixotropic • Excellent adhesion to a wide variety of substrates: glass, plastics and most metals	18,000 –35,000	–	–	UV/ visible light	30 mW/cm², measured at 365 nm, for 80 sec. using a Zeta® s7410 light source

Structural Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX 3042M	Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	85,000	114	UV & Heat	UV + 30 min. at 120°C
LOCTITE® HHD 4042	Epoxy/Acrylate	Assembly	• One component • Dual cure system • Good adhesion on PEI plastics, FR4 and various other substrates	125,000	145	UV & Heat	UV + 60 min. at 120°C
LOCTITE® ABLESTIK 3119	Epoxy	Bonding	• Low-temperature cure • Excellent adhesion on wide range of substrates • Very low shrinkage	7,000 – 23,000	110	Heat	60 min. at 100°C or 20 min. at 75°C

Optical Path Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	REFRACTIVE INDEX (RI)	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX OGRFI146T	Acrylate	Adhesive	• One component • Photo-curable • Optical grade • Low refractive index • Cures in shadowed areas	• 1.463 at 589 nm • 1.457 at 830 nm • 1.452 at 1,320 nm • 1.449 at 1,550 nm	1,250	85	64D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND LUX OGR150THTG	Acrylate	Assembly	• One component • Photo-curable • High T_g • Fast UV cure • Cures in shadowed areas • Low-temperature cure	• 1.5202 at 589 nm • 1.5123 at 830 nm • 1.5061 at 1,320 nm • 1.5038 at 1,550 nm	1,000	145	76D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND OGR 146TUV	Acrylate	Adhesive	• Single component • Photocurable • Cures in shadowed areas • Low refractive Index	• 1.464 at 589 nm • 1.462 at 633 nm • 1.458 at 830 nm • 1.455 at 1,320 nm • 1.454 at 1,550 nm	1,250	77	60D	UV light	UV 365 nm wavelength, 1 hr. at 100°C or 2 hr. at 85°C
LOCTITE® ECCOBOND UV 3000	Epoxy	Sealant	• High strength • Chemical resistant • Low outgassing • Capable of 200°C • Cationic epoxy	–	5,300	150	N/A	UV	UV
LOCTITE® STYCAST OS 8300	Epoxy	Assembly	• Two components – requires mixing • High spectral transmission • Excellent adhesion • Low weight loss • Low halogen content	• 1.5683 at 25°C 589 nm	4,000	103	85D	Heat	60 min. at 150°C

V-groove Bonding Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX OGRFI146T	Acrylate	Adhesive	• One component • Photo-curable • Optical grade • Low refractive index • Cures in shadowed areas	1,250	85	64D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND LUX OGR150THTG	Acrylate	Assembly	• One component • Photo-curable • High T_g • Fast UV cure • Cures in shadowed areas • Low-temperature cure	1,000	145	76D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND F 113	Epoxy	Assembly	• Low viscosity • Optically clear • Resistant to mechanical impact • Excellent wettability • Excellent thermal shock resistance	180	45	78D	Room Temperature or Heat Cure	24 hr. at 25°C or 1 – 2 hr. at 65°C
LOCTITE® STYCAST OS 8300	Epoxy	Assembly	• Two components – requires mixing • High spectral transmission • Excellent adhesion • Low weight loss • Low halogen content	4,000	103	85D	Heat Cure	60 min. at 150°C
LOCTITE® ECCOBOND LUX A4035T	Acrylate	Assembly	• Single Pack • Photocurable • Optical grade • Thin bondline	500	145	82D	Ultraviolet (UV) light, Visible light and Heat cure	Ultraviolet (UV) light: 365 UV wavelength, (nm) Light Intensity at bondline: 50 mW/cm^2
LOCTITE® ECCOBOND OGR 146TUV	Acrylate	Adhesive	• Single component • Photocurable • Cures in shadowed areas • Low refractive Index	1,250	77	60D	Ultraviolet (UV) light	UV 365 nm wavelength, 1 hr. at 100°C or 2 hr. at 85°C
LOCTITE® ECCOBOND F 114 BIPAX	Epoxy	Assembly	• Low viscosity • Solvent free • Excellent wicking • Good wetting • Good adhesion • Blush free cure under high humidity	625	53	83D	Room Temperature or Heat Cure	24 hr. at 25°C, or 4 hr. at 65°C

BONDING MATERIALS

Fiber Coupling / Tacking Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND LUX OGRFI146T	Acrylate	Adhesive	• One component • Photo-curable • Optical grade • Low refractive index • Cures in shadowed areas	1,250	85	64D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND LUX OGR150THTG	Acrylate	Assembly	• One component • Photo-curable • High T_g • Fast UV cure • Cures in shadowed areas • Low-temperature cure	1,000	145	76D	UV / visible light & Heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND OGR 146TUV	Acrylate	Adhesive	• Single component • Photocurable • Cures in shadowed areas • Low refractive Index	1,250	77	60D	Ultraviolet (UV) light	UV 365 nm wavelength, 1 hr. at 100°C or 2 hr. at 85°C
LOCTITE® ECCOBOND UV 3000	Epoxy	Sealant	• UV curable • Medium viscosity • High temperature performance • Chemical resistant • Low outgassing	Spindle 7, speed 10 rpm - 5,300	150	–	UV/ Cationic	–

Fiber Splicing Adhesive

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® STYCAST OS 8300	Epoxy	Assembly	• Two components – requires mixing • High spectral transmission • Excellent adhesion • Low weight loss • Low halogen content	4,000	103	85D	Heat	60 min. at 150°C
LOCTITE® ECCOBOND LUX A4035T	Acrylate	Assembly	• Single Pack • Photocurable • Optical grade • Thin bondline	500	145	82D	Ultraviolet (UV) light, visible light and heat cure	Ultraviolet (UV) light: 365 UV wavelength, (nm) Light Intensity at bondline: 50 mW/cm^2
LOCTITE® ECCOBOND F 113	Epoxy	Assembly	• Low viscosity • Optically clear • Resistant to mechanical impact • Excellent wettability • Excellent thermal shock resistance	180	45	78D	Room temperature or heat cure	24 hr. at 25°C or 1 – 2 hr. at 65°C
LOCTITE® ECCOBOND LUX OGR150THTG	Acrylate	Assembly	• One component • Photo-curable • High T_g • Fast UV cure • Cures in shadowed areas • Low-temperature cure	1,000	145	76D	UV / visible light & heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C
LOCTITE® ECCOBOND F 114 BIPAX	Epoxy	Assembly	• Low viscosity • Solvent free • Excellent wicking • Good wetting • Good adhesion • Blush free cure under high humidity	625	53	83D	RT/ Heat	24 hr. at 25°C, or 4 hr. at 65°C
LOCTITE® ECCOBOND LUX OGRFI146T	Acrylate	Adhesive	• One component • Photo-curable • Optical grade • Low refractive index • Cures in shadowed areas	1,250	85	64D	UV / visible light & heat	UV/visible light + 1 hr. at 100°C, or 2 hr. at 85°C

Fiber to Ferrule Attach

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND F113SC	Epoxy	Assembly	• High T_g • Low viscosity • High bond strength • Low stress connections with no pistoning • Dark blue color	1,800	95	83D	Room temperature or heat cure	18 hr. 25°C or 1 hr. 65°C
LOCTITE® ECCOBOND F 112 MINIPAX	Epoxy	Assembly	• Low viscosity • Thermal shock and impact resistant • Low stress connections with no pistoning	1,800	102	86D	Room temperature or heat cure	24 hr. at 25°C or 1 hr. at 65°C
LOCTITE® ECCOBOND F 123	Epoxy	Assembly	• Fast cure • Low viscosity • Good wicking • Tough adhesion to a wide variety of fiber optic and optic materials • Resistant to mechanical impact • Excellent thermal shock resistance • Low stress connections with no pistoning • Color keyed formulation that indicates cure status	4,000	120	87D	Heat cure	5 min. at 100°C
LOCTITE® ECCOBOND LUX A4035T	Acrylate	Assembly	• Single Pack • Photocurable • Optical grade • Thin bondline	500	145	82D	Ultraviolet (UV) light, visible light and heat cure	Ultraviolet (UV) light: 365 UV wavelength, (nm) Light Intensity at bondline: 50 mW/cm^2

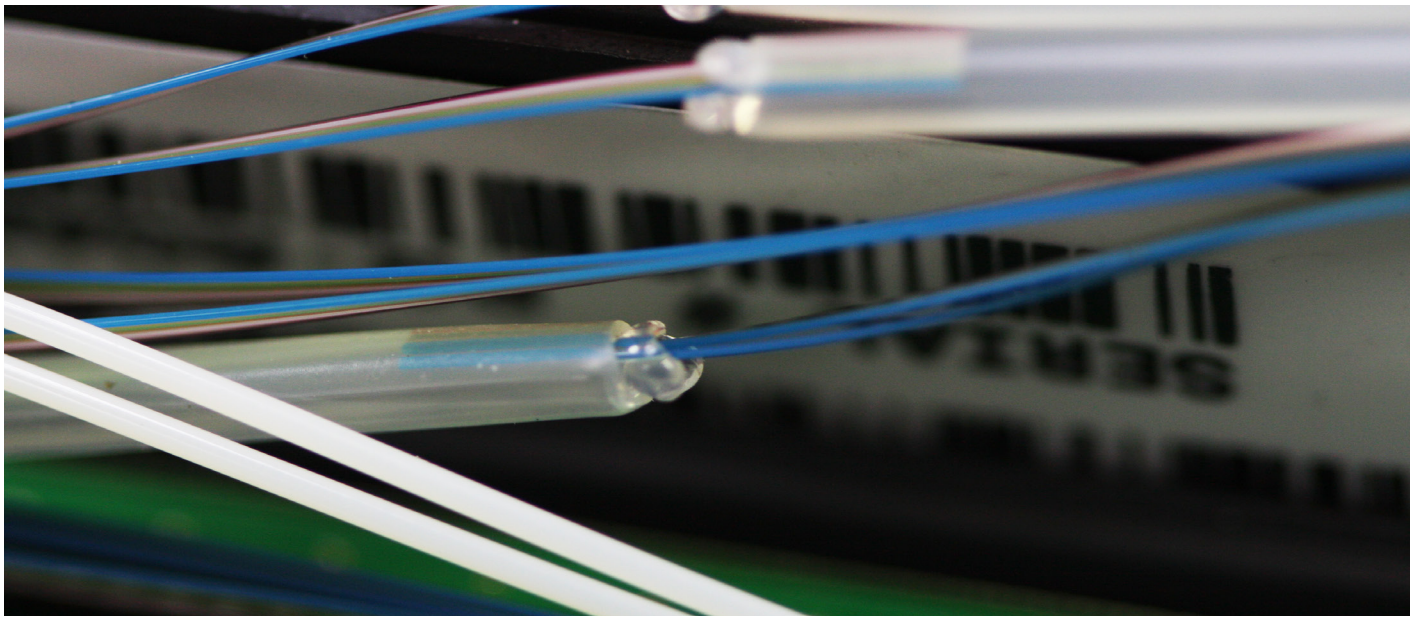
Fiber Connector Bonding and Backfill

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® ECCOBOND F 120	Epoxy	Assembly	• Fast cure • Solvent-free • Low shrinkage • Medium viscosity • Good electrical insulation • Excellent mechanical properties • Excellent chemical resistance	Resin: 14,000 Hardener: 35,000	–	72D	Room Temperature or Heat Cure	24 hr. at 25°C or 1 hr. at 65°C
LOCTITE® ECCOBOND F 131 BIPAX	Epoxy	Opto/ Photonics	• Room temperature cure capability • High T_g	1,800	95	78D	Room Temperature or Heat Cure	18 hr. at 25°C or 1 hr. at 65°C or 15 min. at 90°C

BONDING MATERIALS

Fiber Pigtail Bonding

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	HARDNESS	CURE TYPE	CURE SCHEDULE
LOCTITE® STYCAST OS 8300	Epoxy	Assembly	• Two components – requires mixing • High spectral transmission • Excellent adhesion • Low weight loss • Low halogen content	4,000	103	85D	Heat	60 min. at 150°C
LOCTITE® ECCOBOND F113SC	Epoxy	Assembly	• High T_g • Low viscosity • High bond strength • Low stress connections with no pistoning • Dark blue color	1,800	95	83D	Room Temperature or Heat cure	18 hr. 25°C or 1 hr. 65°C
LOCTITE® ECCOBOND F 123	Epoxy	Assembly	• Fast cure • Low viscosity • Good wicking • Tough adhesion to a wide variety of fiber optic and optic materials • Resistant to mechanical impact • Excellent thermal shock resistance • Low stress connections with no pistoning • Color keyed formulation that indicates cure status	4,000	120	87D	Heat cure	5 min. at 100°C



CONNECTING MATERIALS

Die Attach Adhesives

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	CURE SCHEDULE
LOCTITE® ABLESTIK 2030SC	Proprietary hybrid chemistry	Die-attach	• Snap curable • Low Stress	11,600	–	2.3	Heat	90 sec. at 110°C
LOCTITE® ABLESTIK 2032S	Epoxy	Die attach	• Electrically conductive • Low temperature cure • Good adhesion • Good dispensing characteristics	11,000	110	1	Heat	60 minutes at 80°C
LOCTITE® ABLESTIK 84-1LMI	Epoxy	Die-attach	• Conductive • Low outgassing • Low bleed • Meets MIL-STD-883 • Method 5011 requirements	30,000	103	2.4	Heat	60 min. at 150°C
LOCTITE® ABLESTIK 84-1LMISR4	Epoxy	Die-attach	• Conductive • Excellent dispensability • Minimal tailing and stringing	8,000	120	2.5	Heat	60 min. at 175°C
LOCTITE® ABLESTIK ABP 8068TA	Semi-sintering	Conductive adhesive	• One component • Dispensable • Printable low-temperature cure semi-sintering paste • High lead solder replacement • High thermal conductivity • High reliability	9,000	–	110	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 to 60 min.; 15 min. ramp to 200°C hold for 60 min. in N_2 or air oven **For die size > 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 120 min.; 15 min. ramp to 200°C, hold for 60 min. in N_2 or air oven
LOCTITE® ABLESTIK ABP 8068TB	Semi-sintering	Conductive adhesive	• No resin bleed-out • One component • Good workability • Printable low-temperature cure semi-sintering paste • Good electrical stability • High thermal stability • High reliability • Solder replacement	11,500	25	110	Heat	**For die size < 5 x 5 mm:** 20 min. ramp from 25°C to 130°C, hold for 30 – 60 min.; 15 min. ramp to 200°C, hold for 120 min. in N_2 or air oven. **For die size > 5 x 5 mm:** 20 min. ramp from 25°C – 130°C, hold for 120 min.; 15 min. ramp to 200°C, hold for 120 min. in N_2 or air oven

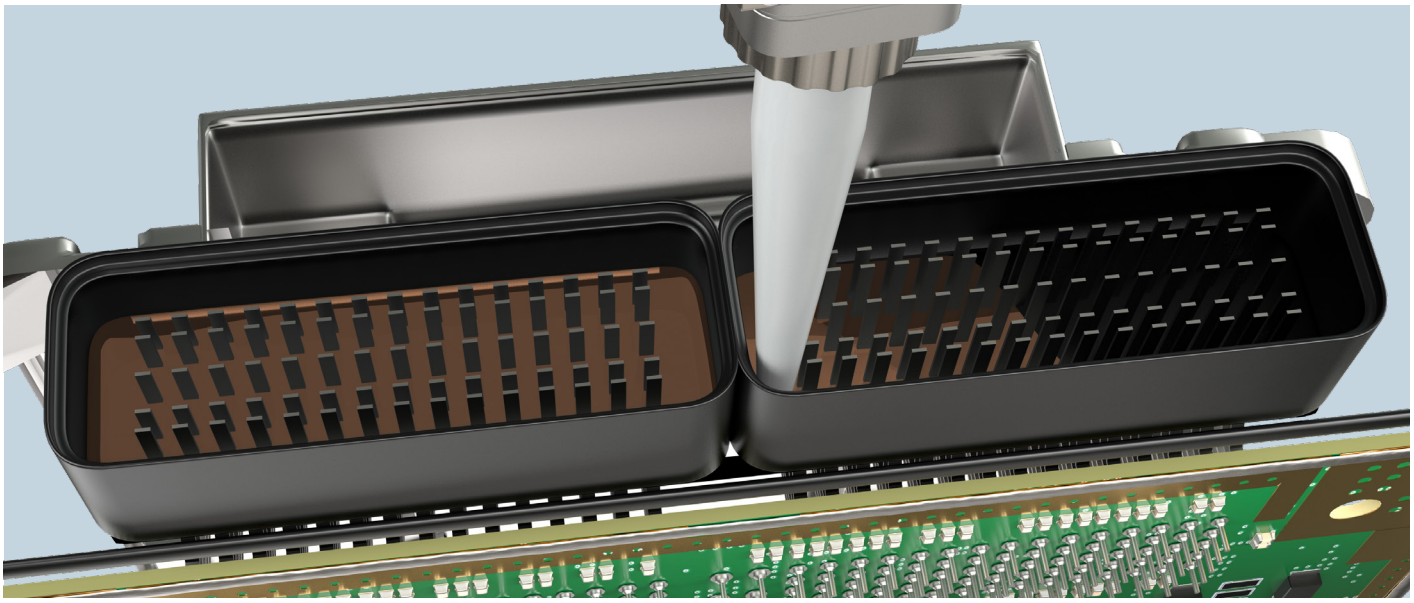
PROTECTING MATERIALS

EMI Shielding / Gasketing Materials

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® SI 5421	Silicone	Bonding/ Gasketing	▪ Electrically conductive RTV silicone ▪ Bonding and gasketing of EMI/RFI shielded enclosures	Paste	N/A	RTV	Tack free in 60 min. at 23 ±2°C/50 ±5% RH
LOCTITE® ABLESTIK 59C	Silicone	Assembly	▪ Electrically conductive silicone ▪ EMI/RFI shielding ▪ Thermally conductive ▪ High flexibility ▪ High tack ▪ Can be used with a variety of catalysts	N/A	N/A	Heat	6 hr. at 150°C

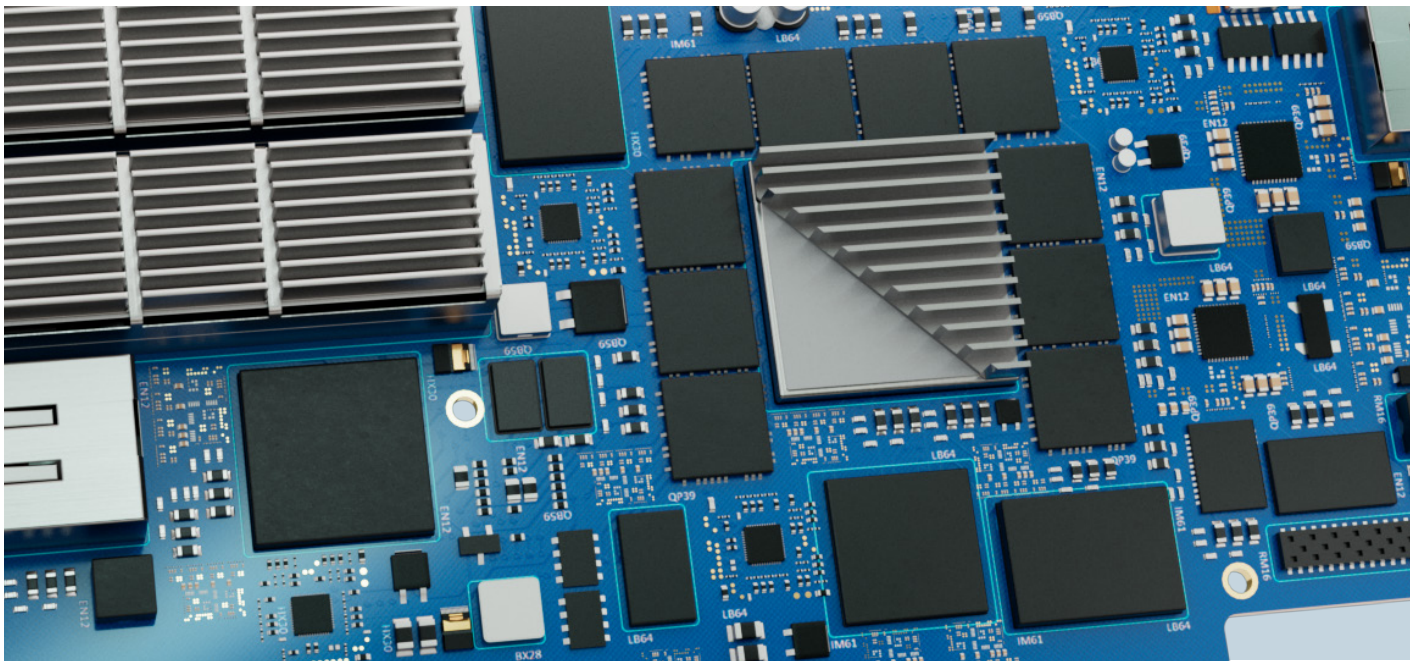
Gasketing Materials

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	VISCOSITY (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE TYPE	CURE SCHEDULE
LOCTITE® SI 5084	Silicone	Gasketing	▪ Highly flexible ▪ Non-corrosive ▪ Enhances load bearing and shock absorbing characteristics of the bond area	Paste	N/A	UV & RT	UV + Moisture
LOCTITE® SI 5210	Silicone	Potting	▪ Ultra-fast curing ▪ Non-corrosive RTV ▪ Designed for potting, wire tacking, selective sealing ▪ Vibration dampening and repair/ rework applications on PCBs	Paste	-52	RTV	22 °C/50% RH AT ≤5 min.



Underfill Materials

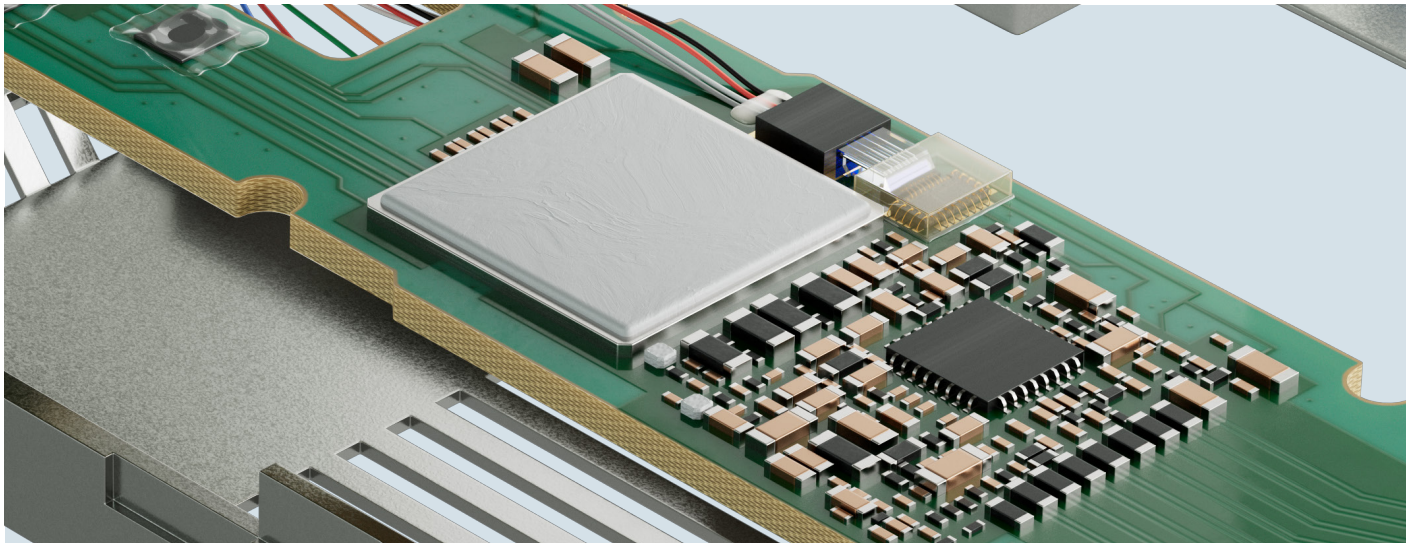
PRODUCT	DESCRIPTION	VISCOSITY (PA·S)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 1 - PPM/°C)	COEFFICIENT OF THERMAL EXPANSION, CTE (ALPHA 2 - PPM/°C)	GLASS TRANSITION TEMPERATURE, T_G (°C)	POT LIFE (DAY)
UNDERFILL						
LOCTITE® ECCOBOND UF 1173	Low CTE, high T_g underfill for extreme T-Cycle conditions	7.5	26	103	160	2
LOCTITE® ECCOBOND E 1216M	Fast flow, non-anhydride underfill	4	35	131	125	–
LOCTITE® ECCOBOND UF 3812	Room temperature flow, reworkable underfill	0.35	48	175	131	3
LOCTITE® 3517M	Low temperature cure, reworkable underfill	2.6	65	191	78	7
LOCTITE® ECCOBOND UF 3711	Curable adhesive is formulated for chips to enhance the reliability performance	35	20	62	150	–
LOCTITE® ECCOBOND UF 3712	Fast-cure, thixotropic, reworkable, reliable, and fully compliant with ROHS, REACH, and halogen-free standards	11.6	32	115	133	–
LOCTITE® ECCOBOND UF 8830S	Liquid epoxy underfill encapsulant is formulated for tight bump pitch and narrow gap in flip chip BGA applications	22.12	25	100	118/126	–



THERMAL MATERIALS

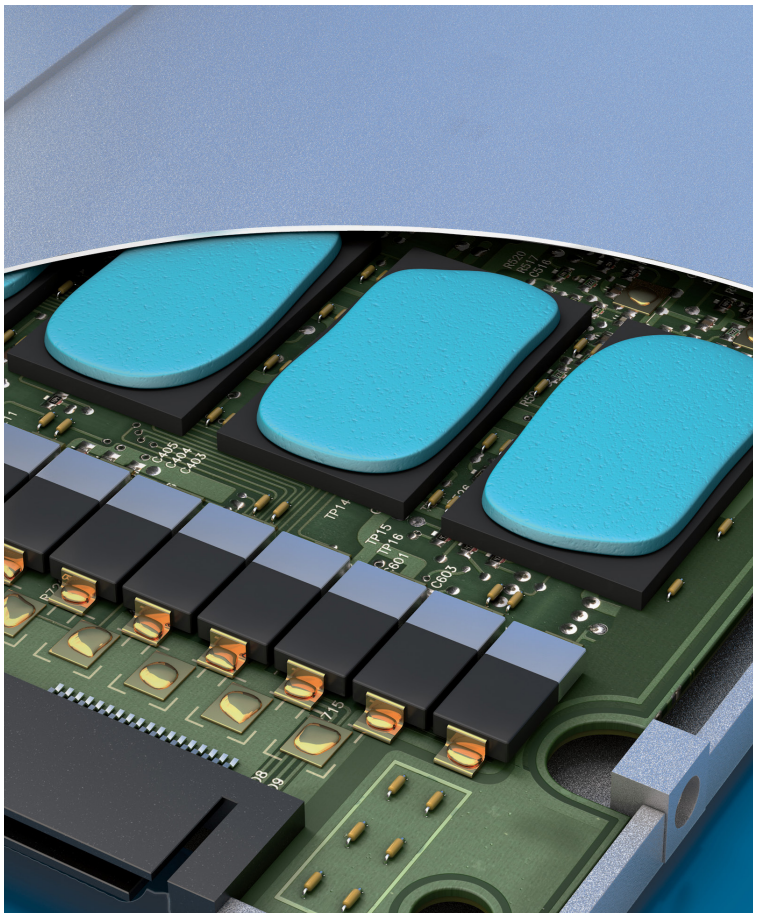
GAP PAD®

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	THICKNESS (mm)	SHORE HARDNESS	THERMAL CONDUCTIVITY (W/m·K)
THERMAL PAD						
BERGQUIST® GAP PAD® TGP 3004SF	Silicone-free	Thermal pad	• Silicone-free formulation • 0.25 mil PET provides easy disassembly, leaving no residue • Tacky side allows for ease of handling and placement	0.254 ~ 3.175	70 (Shore 00)	3.0
BERGQUIST® GAP PAD® TGP HC3000	Silicone	Thermal pad	• Thermal Conductivity: 3.0 W/m-K • High-compliance, low compression stress • Fiberglass reinforced for shear and tear resistance	0.508 – 3.175 mm	15 (SHORE 00)	3.0
BERGQUIST® GAP PAD® TGP HC5000	Silicone	Thermal pad	• High-compliance, low compression stress • Fiberglass reinforced for shear and tear resistance	0.508 ~ 3.175	35 (Shore 00)	5.0
BERGQUIST® GAP PAD® TGP 3500ULM	Silicone	Thermal pad	• Thermal Conductivity: 3.5 W/m-K • Fiberglass reinforced for shear and tear resistance • Non-fiberglass option for applications that require an additional reduction in stress	0.508 ~ 3.175 mm	70 (Shore 000)	3.5
BERGQUIST® GAP PAD® TGP 6000ULM	Silicone base	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.524 ~ 3.175	60 (Shore 000)	6.0
BERGQUIST® GAP PAD® TGP 7000ULM	Silicone base	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	0.500 ~ 3.180	75 (Shore 000)	7.0
BERGQUIST® GAP PAD® TGP 10000ULM	Silicone	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.000, 1.500, 2.000, 2.500, 3.180	75 (Shore 000)	10
BERGQUIST® GAP PAD® TGP 12000ULM	Silicone	Thermal pad	• High-compliance, low compression stress • Ultra-low modulus	1.000, 1.500, 2.000, 2.500, 3.180	68 (Shore 000)	12
EMI ABSORPTION						
BERGQUIST® GAP PAD® TGP EMI1000	Silicone	EMI absorbing	• EMI absorbing • Highly conformable • Low hardness • Fiberglass reinforced for puncture, tear and shear resistance • Electrically isolating	0.508 – 3.175	5 (Shore 00)	1.0



Gap Filler

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	THICKNESS (mm)	SHORE HARDNESS	THERMAL CONDUCTIVITY
GAP FILLER						
BERGQUIST® GAP FILLER TGF 1500	Silicone	Gap filler	• Thermal Conductivity: 1.8 W/m-K • Optimized shear thinning characteristics for ease of dispensing • Excellent slump resistance (stays in place) • Ultra-conforming, with excellent wet-out for low stress • interface applications • 100% solids - no cure by-products • Excellent low and high temperature mechanical and chemical stability	N/A	40 (Shore A)	1.5
BERGQUIST® GAP FILLER TGF 3500LVO	Silicone	Gap filler	• Low volatility for outgassing sensitive applications • Ultra-conforming with excellent wet-out for low stress interface on applications • 100% solids - no cure by-products	N/A	40 (Shore 00)	3.5
BERGQUIST® GAP FILLER TGF 3600	Silicone	Gap filler	• Thixotropic nature makes it easy to dispense • Two-part formulation for easy storage • Ultra-conforming – designed for fragile and low stress applications • Ambient or accelerated cure schedules	N/A	35 (Shore 00)	3.6
BERGQUIST® GAP FILLER TGF 4000	Silicone	Gap filler	• Thickness variations • Little to no stress • 100% solids – no cure by-products • Excellent low and high temperature chemical and mechanical stability	N/A	75 (Shore 00)	4.0





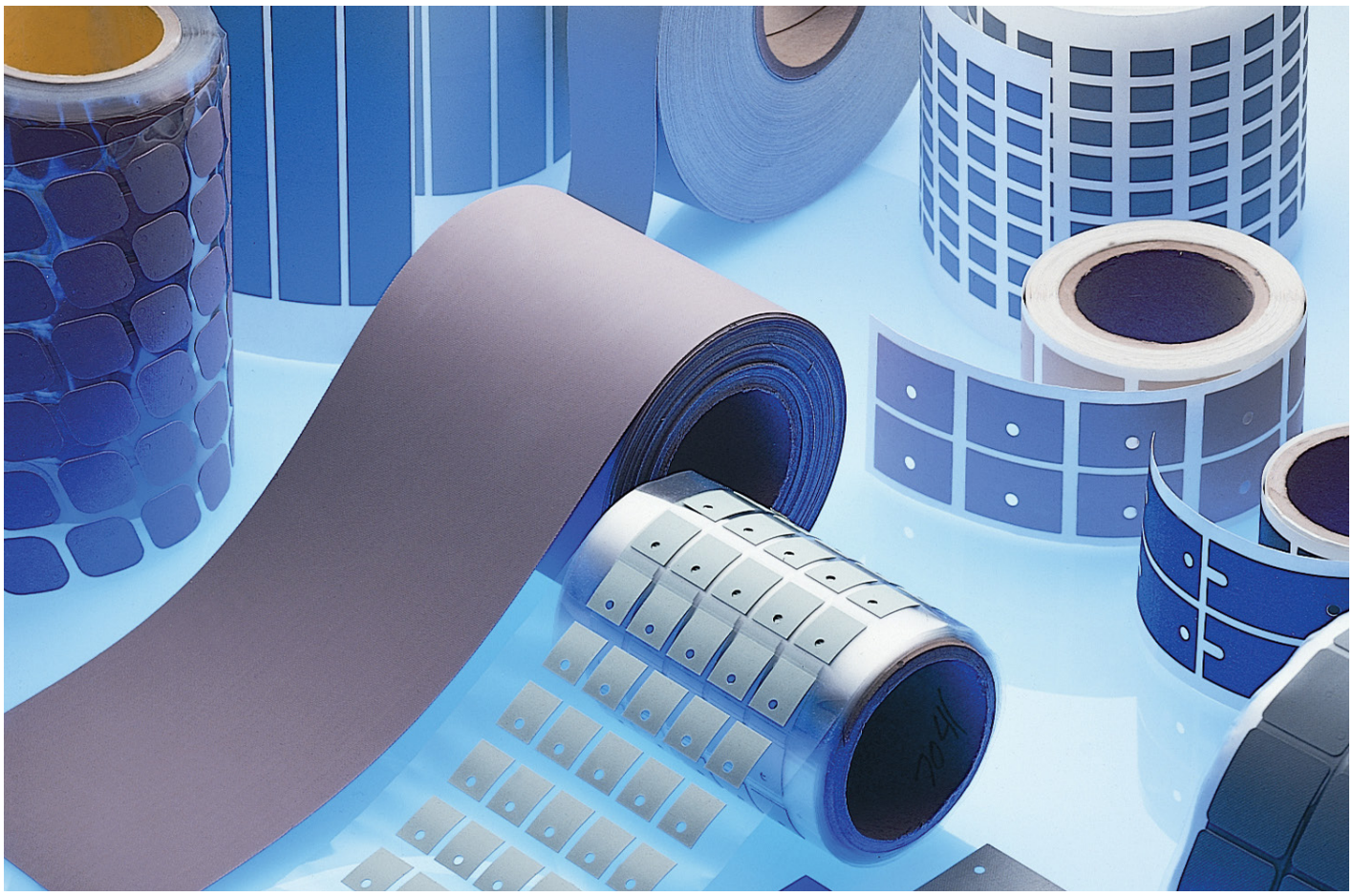


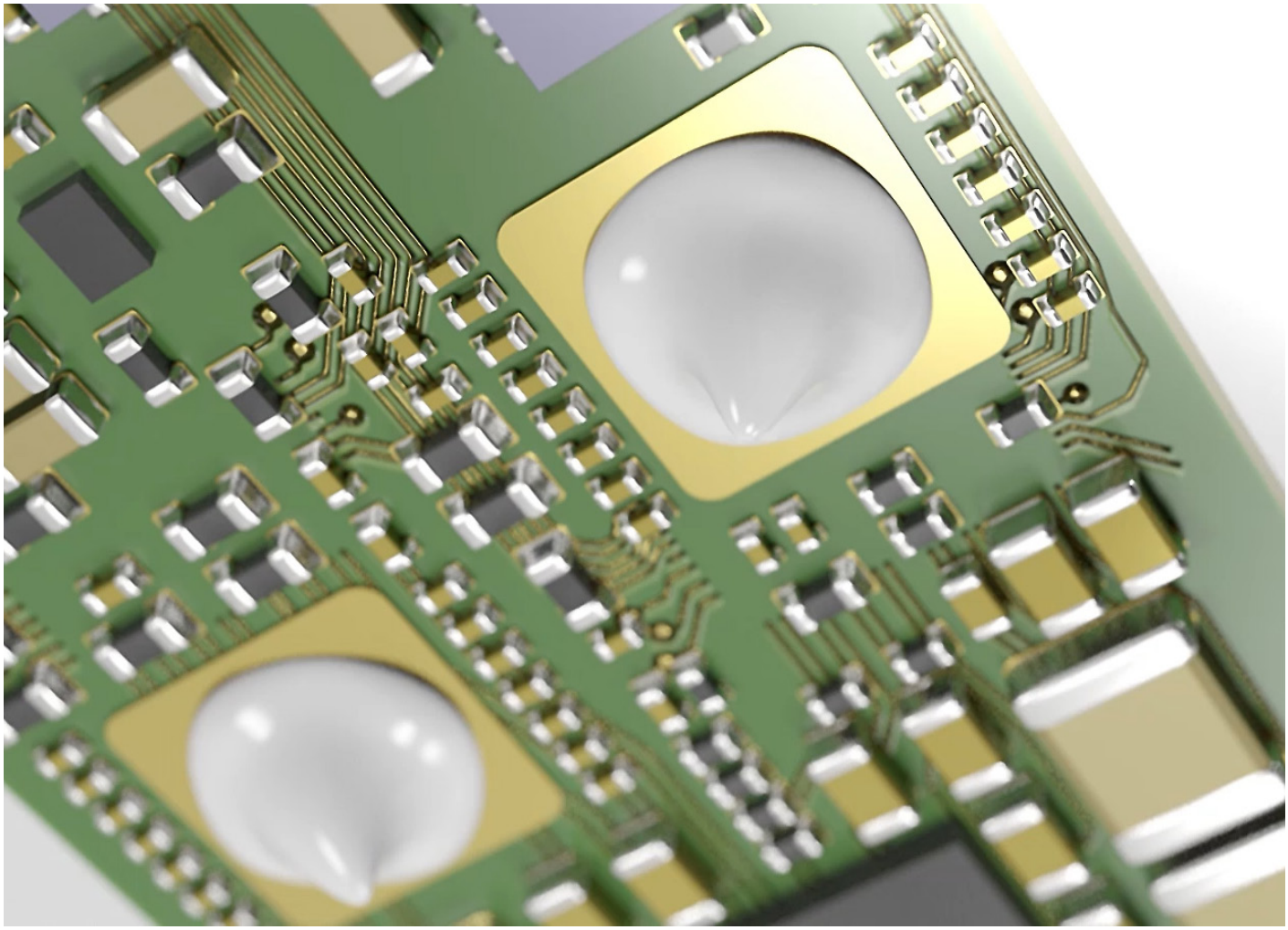
THERMAL MATERIALS

Phase Change

PRODUCT	TECHNOLOGY	APPLICATION	KEY ATTRIBUTES	THICKNESS (mm)	VOLUME RESISTIVITY (Ω·cm)	THERMAL CONDUCTIVITY (W/m·K)
BERGQUIST® HI-FLOW THF 1600G	Phase Change	Thermal management, thermally conductive adhesive	• Thermal impedance: 0.2°C-in²/W at 25 psi • Will not drip or run like grease • Phase change compound coated on a fiberglass carrier • Typical applications: Computer and peripherals, as a thermal interface where bare die is exposed and needs to be heat sinked	0.127 mm	1×10^{8}	1.6
LOCTITE® TCP 4000 D	Phase Change	Thermal management, thermally conductive adhesive	• Reworkable • Highly efficent thermal transfer • Thixotropic above phase change temperature	0.025 mm, 0.051 mm, 0.102 mm, 0.203 mm	–	3.4

PRODUCT	DESCRIPTION	MATERIAL THICKNESSES (mil)	PHASE CHANGE TEMPERATURE	OPERATING TEMPERATURE	THERMAL CONDUCTIVITY (W/m·K)	UL FLAMMABILITY RATING
BERGQUIST® HI-FLOW THF 5000UT	Reworkable phase change thermal interface material suitable for use between a heat sink and variety heat generating components	8, 10, 12, 16	45°C	-40 to 150°C	Multiple Thickness, ASTM D5470 5.3 Thin Bondline Materials, modified ASTM D5470 8.5	UL 94 V-0





Thermal Gel

PRODUCT	DESCRIPTION	THERMAL CONDUCTIVITY (W/m·K)	CURE TYPE	DIELECTRIC STRENGTH	VOLUME RESISTIVITY (Ω·cm)	OPERATING TEMPERATURE
BERGQUIST® LIQUI-FORM TLF LF3500	Thermally conductive, one-part, liquid formable gel material	3.5	Pre-cured	10,000	1×10^{11}	-60 – 200°C
BERGQUIST® LIQUI-FORM TLF 6000HG	Thermally conductive, one-part, liquid formable gel material	6.0	Pre-cured	10,500 V/mm	4.37×10^{11}	-60 – 200°C
BERGQUIST® LIQUI-FORM TLF 10000	Thermally conductive, pre-cured gel material	10	Pre-cured	7,080 V/mm	9.0×10^{13}	-60 – 200°C

Thermal Adhesive

PRODUCT	DESCRIPTION	THERMAL CONDUCTIVITY	CURE TYPE	DIELECTRIC STRENGTH	VOLUME RESISTIVITY (Ω·cm)	SHEAR STRENGTH (psi)
LOCTITE® 315	Acrylic	0.80	Activator or heat	26.7 kV/mm	1.30×10^{12}	1,000
LOCTITE® 3875	Bead on bead – acrylate	1.75	Activator or heat	–	–	2,400

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