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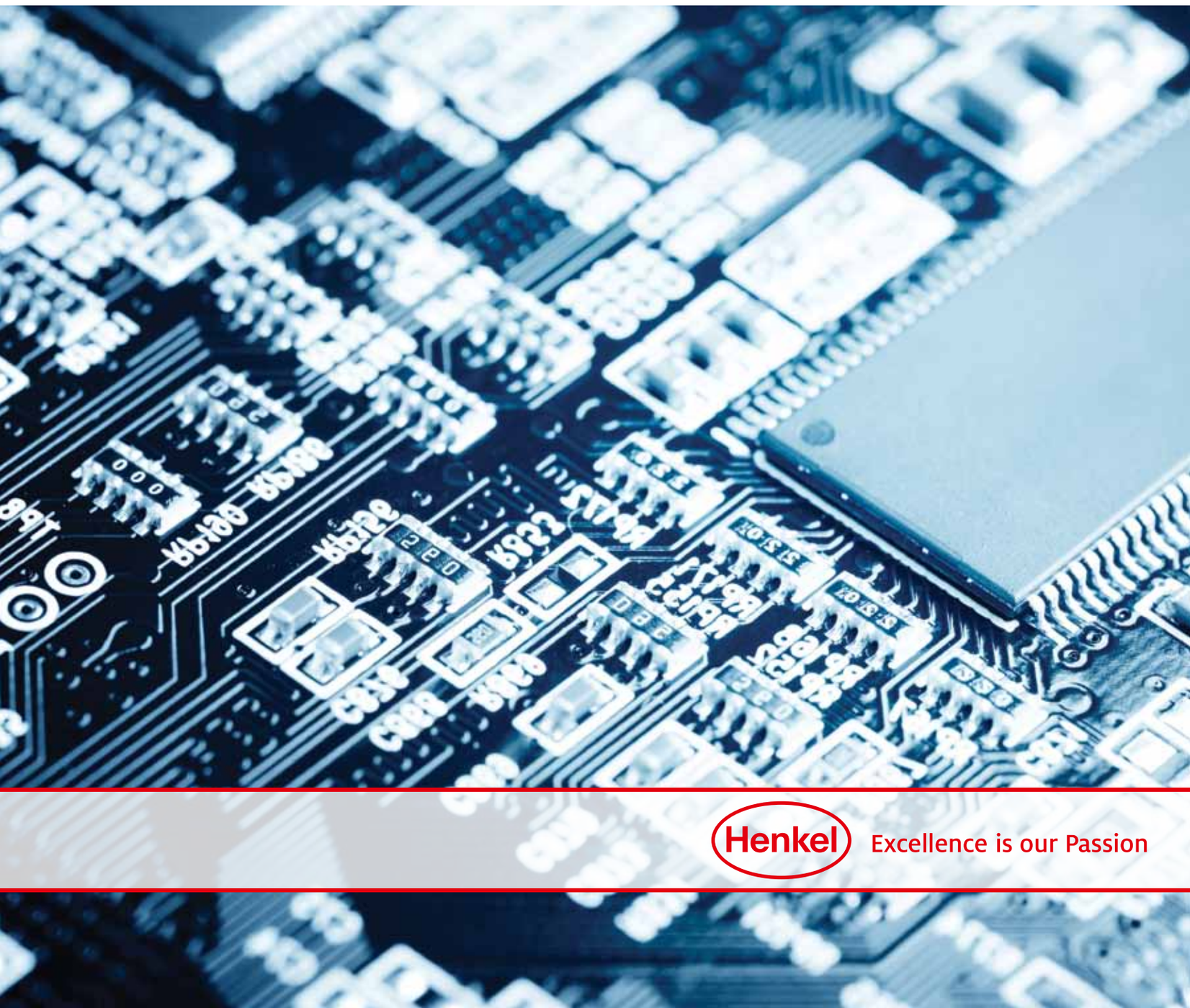
Across the Board,
Around the Globe.
www.henkel.com/electronics

Henkel
Electronics Assembly Solutions



Henkel Excellence is our Passion

WORLDWIDE MANUFACTURING & ORGANIZATION

ELECTRONICS GROUP OF HENKEL

Across the Board, Around the Globe.
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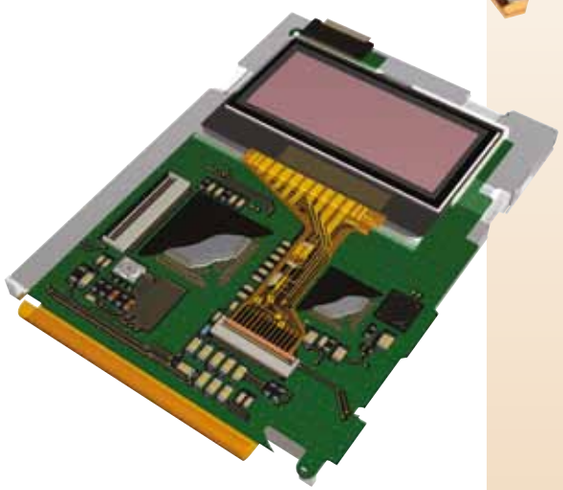
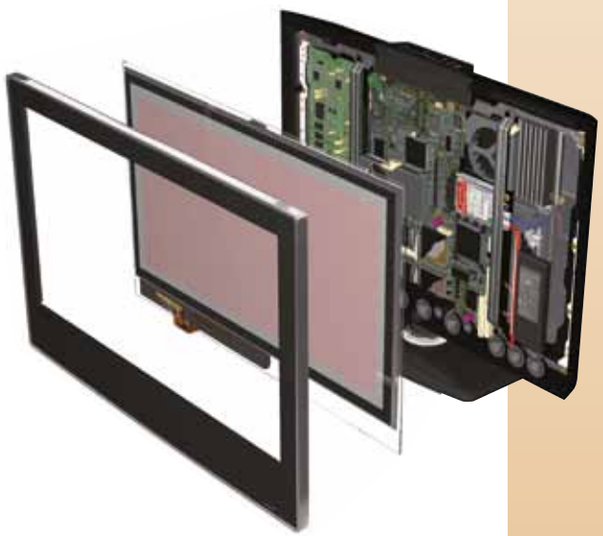
Corporate Profile – Henkel Corporation

Henkel is the world's leading and most progressive provider of qualified materials for semiconductor packaging, printed circuit board (PCB) assembly and advanced soldering solutions. As the only materials developer and formulator with vast technical expertise for all materials required for package production and assembly, Henkel is uniquely positioned to deliver world-class materials products, process expertise, and total solutions across the board to enable tomorrow's electronic industry.

CONTENTS

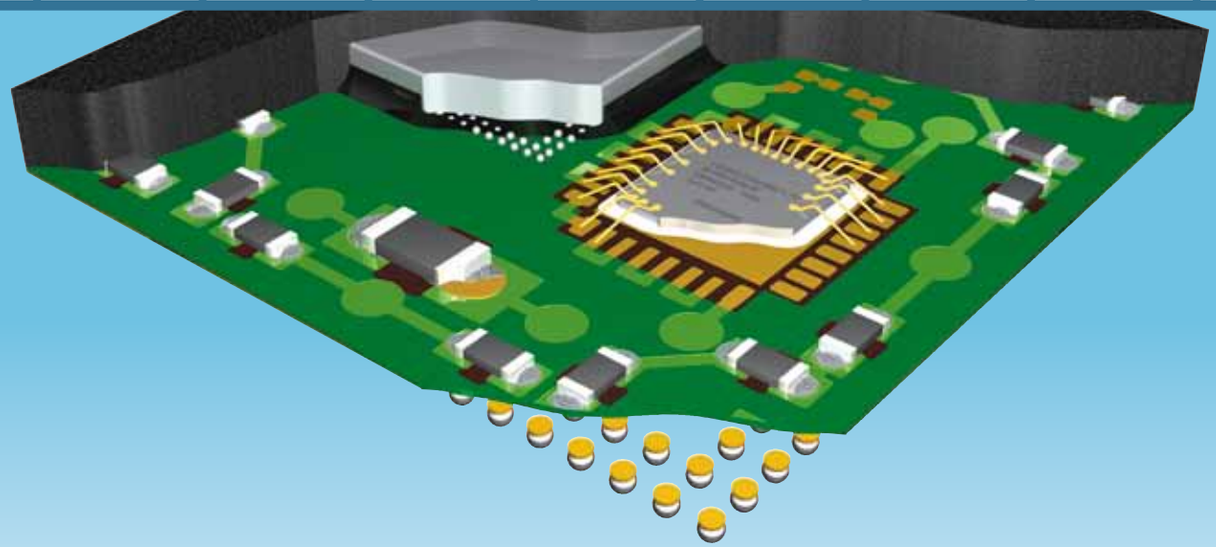




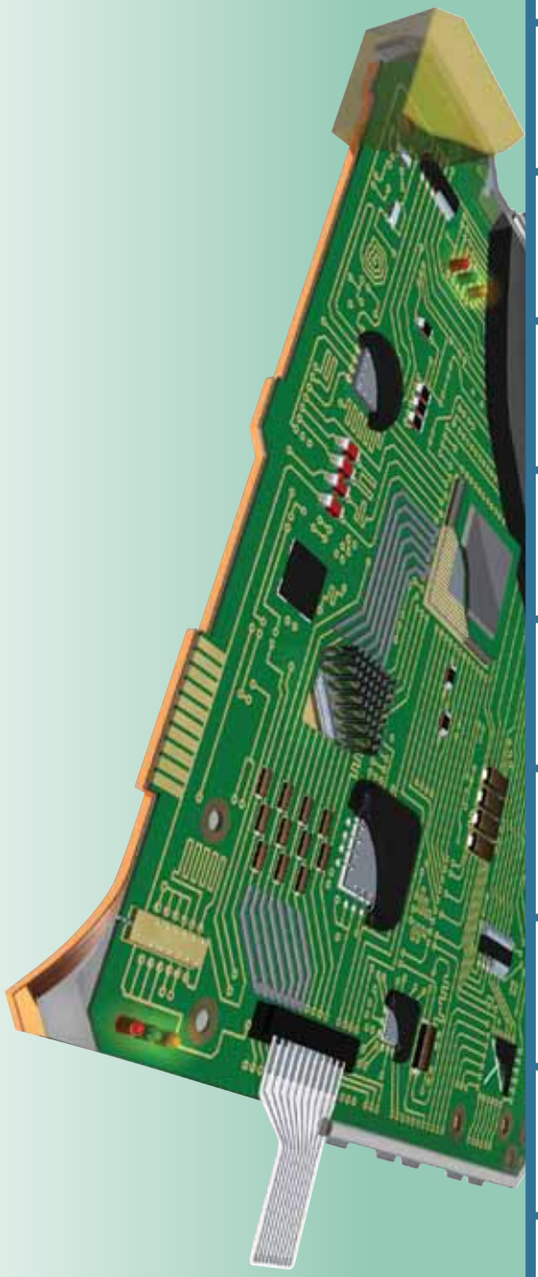
MATERIALS SOLUTIONS FOR ELECTRONIC PACKAGING AND ASSEMBLY

SEMICONDUCTOR MATERIALS

- Die Attach Paste Adhesives
- Die Attach Film Adhesives
- Conductive Pastes and Coatings
- Underfills
- Encapsulants
- Photonics
- Electronic Molding Compounds
- Molding Compounds
- Solder Materials



For more information, please see the *Semiconductor Solutions Guide* (LT-5013).



ASSEMBLY MATERIALS

- Assembly Paste Adhesives
- Assembly Film Adhesives
- Chip-on-Board (COB) Encapsulants
- Display Adhesives
- Inks & Coatings
- PCB Protection
- Solder Materials
- Surface Mount Adhesives (SMA)
- Thermal Management Materials
- Underfills

ASSEMBLY MARKET SOLUTIONS

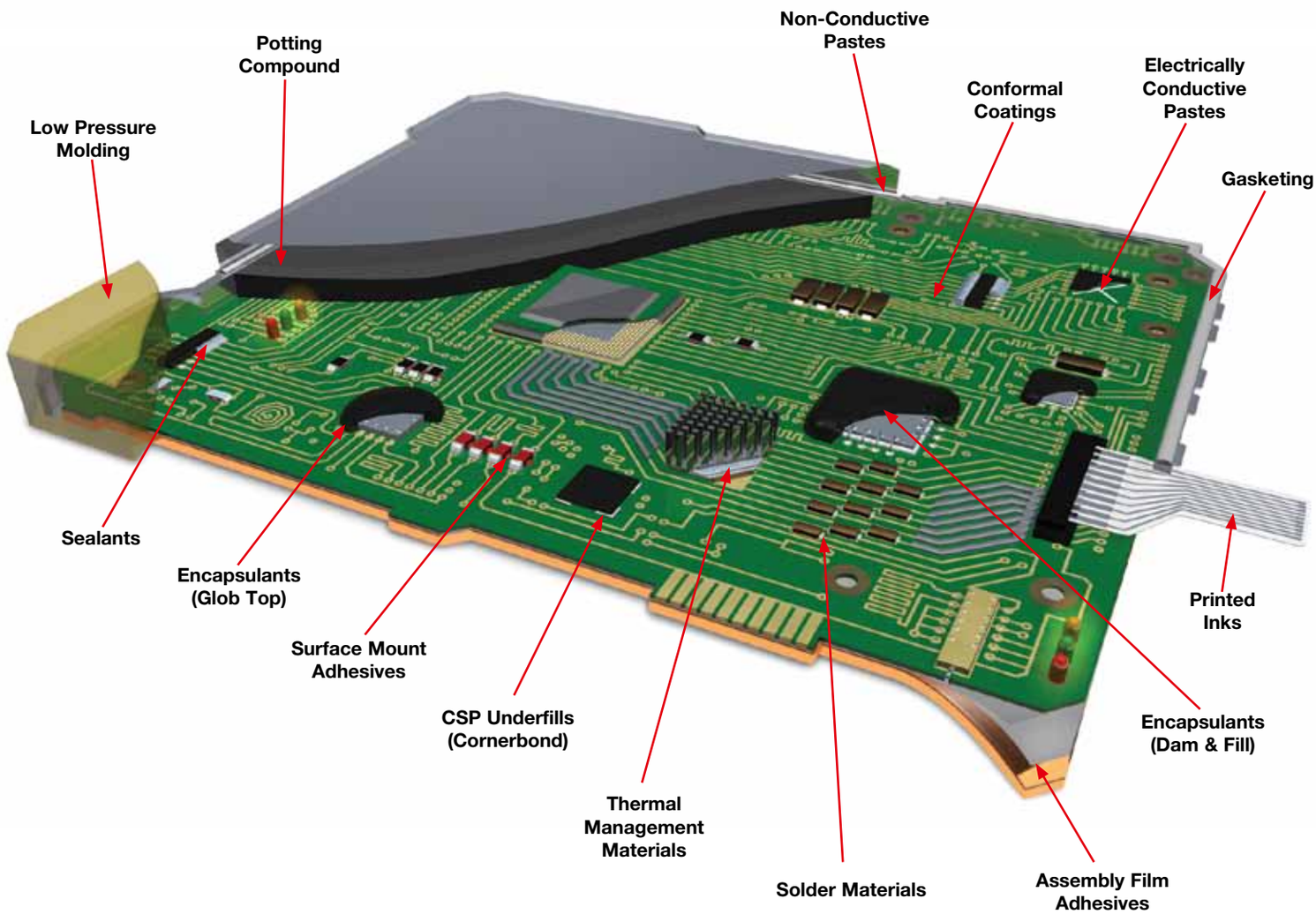
Today's electronics assembly market can be complex. Your materials supplier partnership shouldn't be.

That's why Henkel has researched, analyzed, designed and formulated the most comprehensive range of advanced assembly materials available. We deliver unprecedented choice, convenience and, above all, a low-risk proposition to your business so that complexity is eliminated and performance is elevated. Any application that requires joining, bonding, adhering or protecting an electronic assembly will benefit from the value-added solutions within Henkel's unmatched technology toolbox.

Our leading-edge materials are uniquely strengthened by the exceptional expertise of our people. Bringing together the industry's best and brightest chemists, applications experts, sales professionals, technical support specialists, scientists and researchers all under the guidance of a knowledgeable and dedicated management team, Henkel provides the depth of experience and breadth of capability you need to get the job done. Our worldwide service, manufacturing, sales and product development network delivers the global footprint that enables your company to be competitive – regardless of your requirements or your locale.

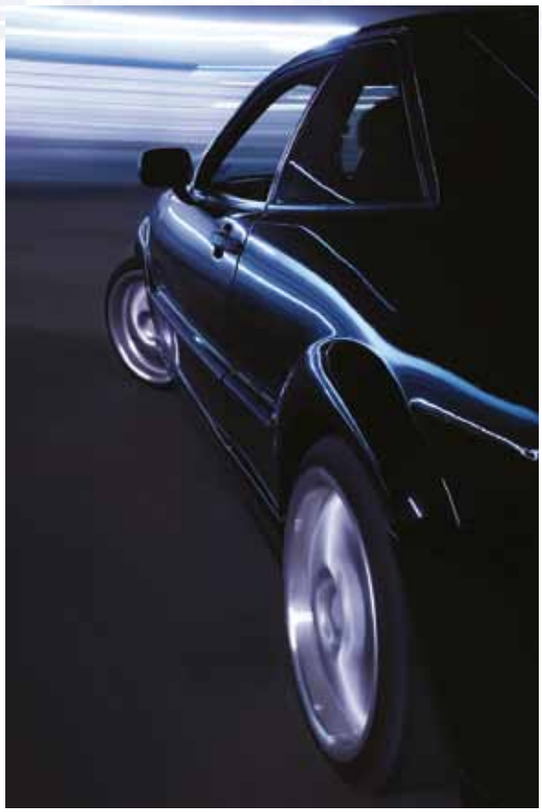
Henkel's successful history is only superseded by our promising future. Even as we have commercialized ground-breaking formulations for modern electronics manufacture, we are diligently researching and developing materials technology that will make tomorrow's products possible.

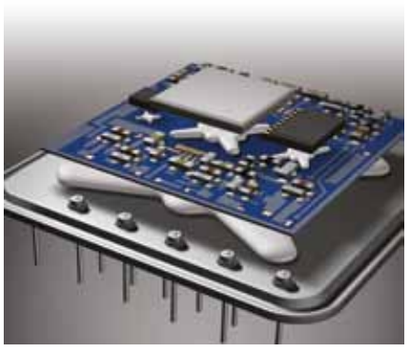
MATERIALS SOLUTIONS ACROSS THE BOARD



AUTOMOTIVE ELECTRONICS

Addressing the needs of today's advanced automotive industry, Henkel has developed a broad range of conductive paste and film adhesives, glob top and underfill encapsulants, conformal coatings, sealants, potting encapsulants and solder products, technical and analytical test support, and customized formulations to meet increasingly demanding requirements. Our solutions are used in a wide range of vehicle electronic and sensor components for common rail fuel systems, safety electronics, engine and powertrain management, infotainment, and lighting applications.



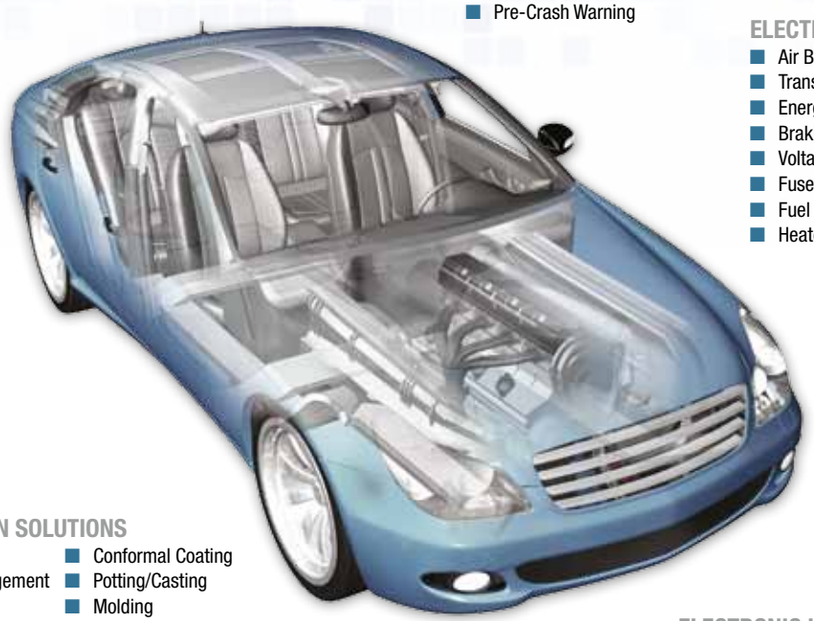


- **Assembly Paste Adhesives**
  - Electrically Conductive
    - ABLESTIK ICP-3535M1
    - ABLESTIK ICP-4001
    - ABLESTIK ABLEBOND 84-1LMISR4
    - HYSOL ECCOBOND CE3520-3
    - HYSOL ECCOBOND CE8500
    - LOCTITE 3880
- **Assembly Film Adhesives**
  - Electrically Conductive
    - HYSOL CF3350
- **Chip-on-Board (COB) Encapsulants**
  - Glob Tops
    - HYSOL EO1061
    - HYSOL XUV-9052
- **Printed Inks**
  - Silver
    - ABLESTIK ECI-1001
    - ACHESON ELECTRODAG 725A
- **PCB Protection**
  - Conformal Coatings
    - HYSOL ECCOCOAT SC3613
    - HYSOL ECCOCOAT UV7993
    - HYSOL PC18M
    - HYSOL PC40-UM
    - LOCTITE 5293
  - Low Pressure Molding
    - MACROMELT OM341
    - MACROMELT OM641
    - MACROMELT OM646
    - MACROMELT OM652
    - MACROMELT OM657
    - MACROMELT OM673
    - MACROMELT OM678
  - Potting
    - HYSOL US2350
    - HYSOL STYCAST 2651-40
    - HYSOL STYCAST 2850FT
    - HYSOL STYCAST 2850KT
    - HYSOL STYCAST U2500
  - Liquid Fluxes
    - VOC-Free
      - MULTICORE MF300
    - No-Clean System
      - MULTICORE MF210
      - MULTICORE MF390HR
      - MULTICORE MFR301

AUTOMOTIVE ELECTRONICS

VISION SYSTEMS
- Passenger Detection
- Pre-Crash Warning

SAFETY/SECURITY
- Keyless Entry
- Alarm Systems
- Air Bag Systems
- Tire Pressure
- Seat Belt Systems



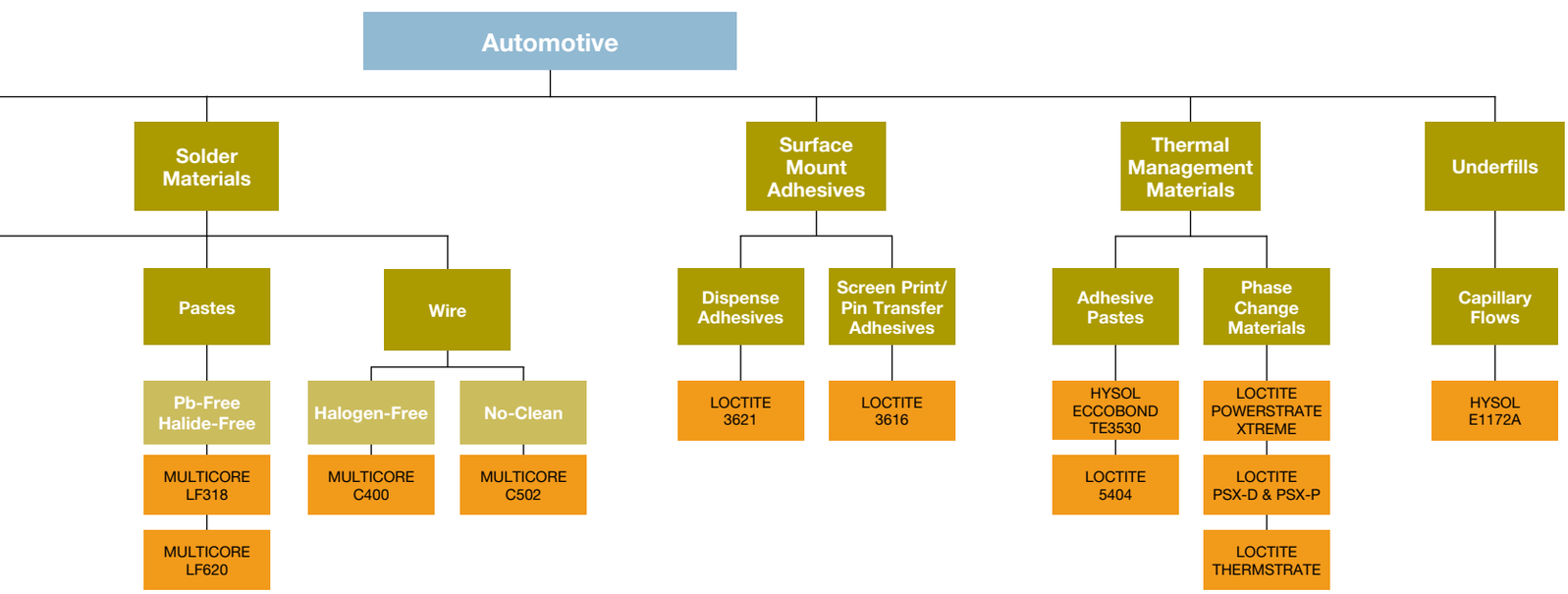
ELECTRONIC CONTROL MODULES
- Air Bag Systems
- Transmission Systems
- Energy Systems
- Braking Systems
- Voltage Regulators
- Fuse Boxes
- Fuel Pump Drive
- Heated Washers

SENSORS
- Speed/Rotation
- Position/Distance
- Temperature/Pressure
- Acceleration
- Occupancy
- Mass Air Flow

CABIN DEVICES
- Instrument Panels
- Navigation Systems
- A/V Systems
- Power Modules
- Seat Heaters

HENKEL'S ELECTRONIC APPLICATION SOLUTIONS
- Component Level
- Conductives
- Encapsulation
- Molding
- PCB Assembly
- Soldering
- SMT Bonding
- Thermal Management
- Conductives
- Encapsulation
- Strain Relief
- PCB Protection
- Conformal Coating
- Potting/Casting
- Molding
- Sealing/Gasketing

ELECTRONIC LIGHTING
- LED Systems



CONSUMER ELECTRONICS

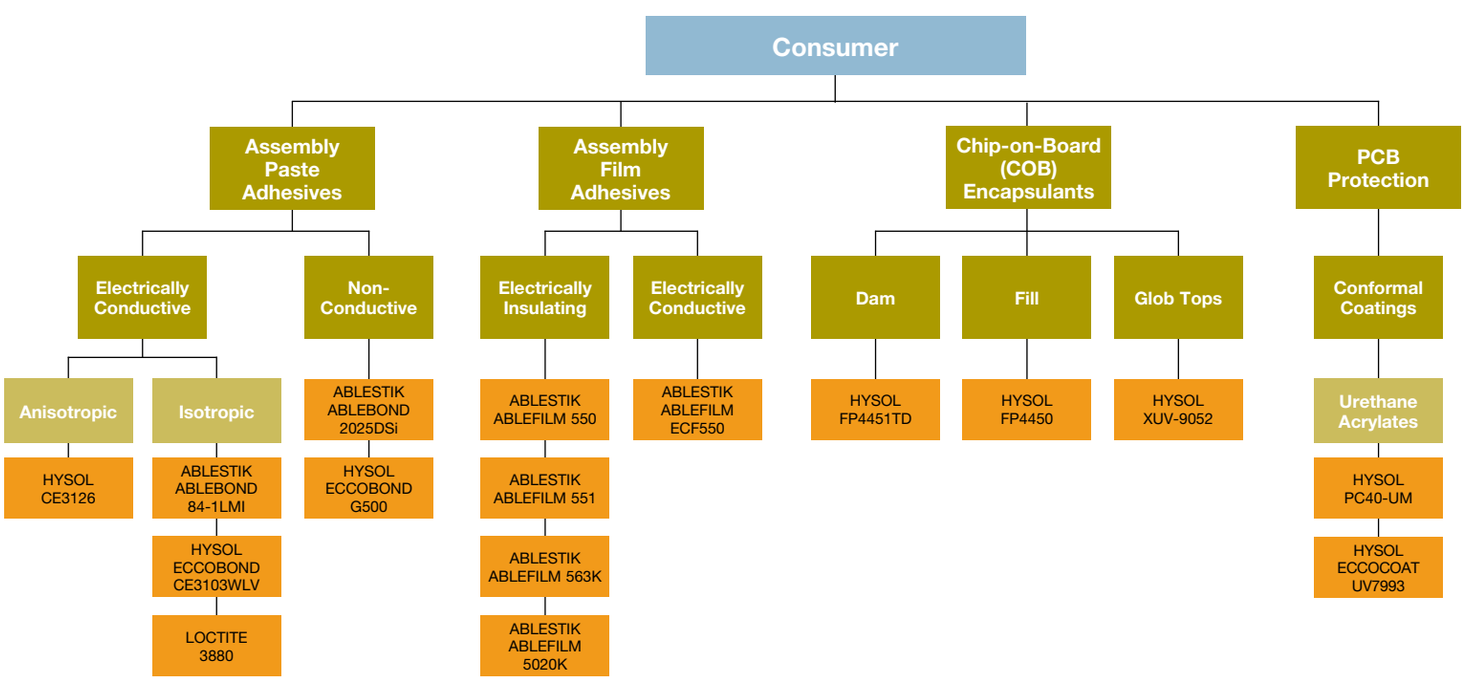
Today's consumers expect their electronics products to be reliable, robust and responsive. Whether it's smart household appliances or smart handheld devices, demanding users want exceptional performance and value. This consumer electronics market reality is precisely why manufacturing specialists turn to Henkel for their advanced materials requirements.

Our broad range of exceptionally formulated encapsulants, adhesives, solder pastes, inks, coatings, underfills and thermal management solutions ensure the quality and reliability of the products we depend on day in and day out. For manufacturers of these life-enhancing electronics, Henkel's product range delivers optimized processability, long-term stability, convenient storage and lower overall cost of use.

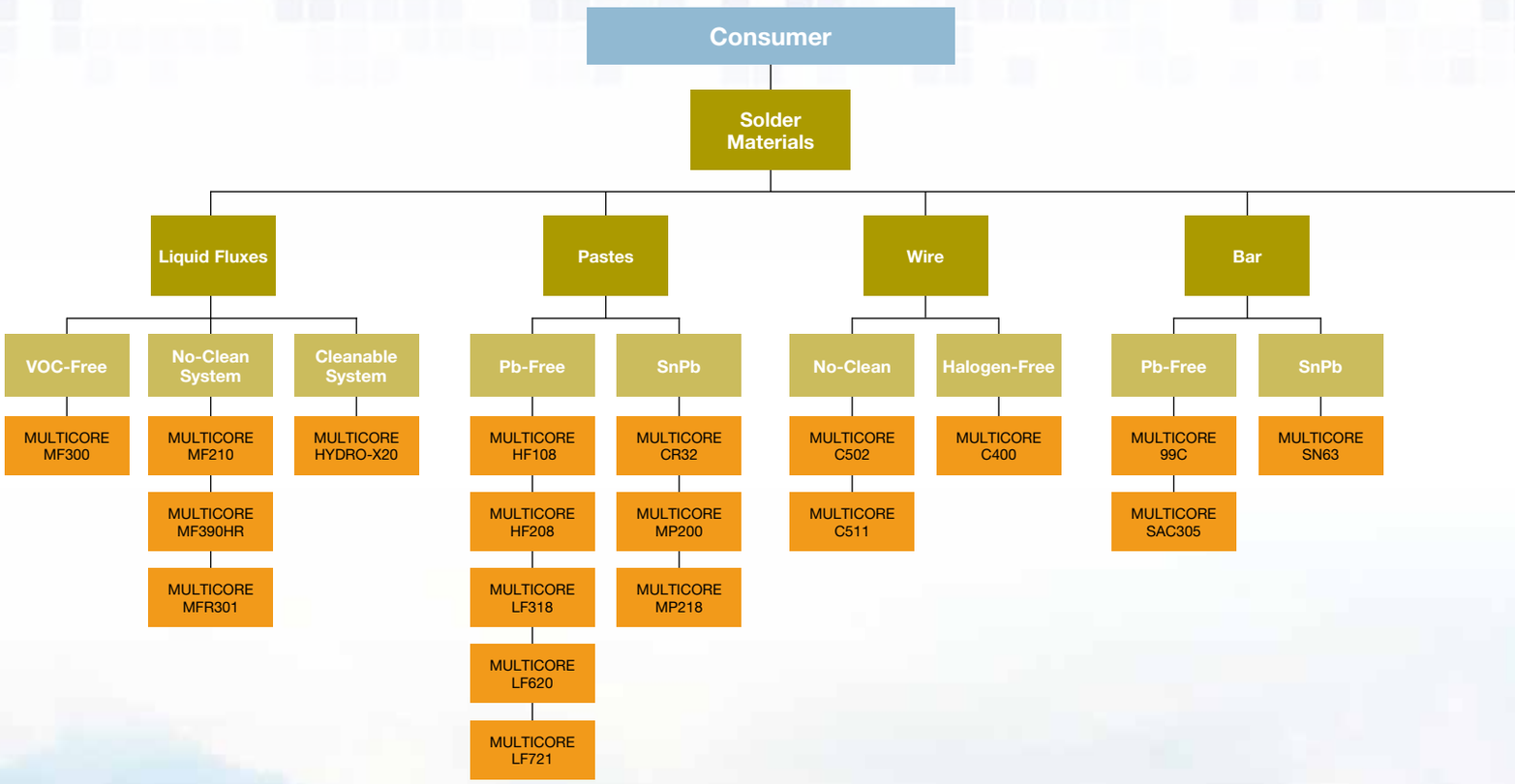
Henkel's line of solder paste and conductive adhesives are fit for purpose, having been custom-designed to interconnect a variety of components and circuitry. Protection of modern miniaturized devices is aided by Henkel's world-renowned underfill line, known for improving the mechanical stability and reliability of CSP, BGA, LGA and WLSP components used in today's handheld electronics. And, as the electronics content of consumer products has dramatically increased with functionality expectations, effective thermal management is more critical than ever. With thermal control materials in a variety of formats for multiple applications, Henkel delivers heat management systems that ensure reliability and instill performance confidence.

From microwaves to laptops, washing machines to electronic tablets, and refrigerators to smart phones, Henkel's next-generation materials are making consumer electronics possible.

CONSUMER ELECTRONICS



CONSUMER ELECTRONICS



CONSUMER ELECTRONICS

- Accessories
  - De-Soldering Wick
    - MULTICORE NC-AB
    - MULTICORE NC-BB
  - Solder Mask
    - MULTICORE SPOT-ON
  - Cleaners
    - MULTICORE MCF800
    - MULTICORE SC-01

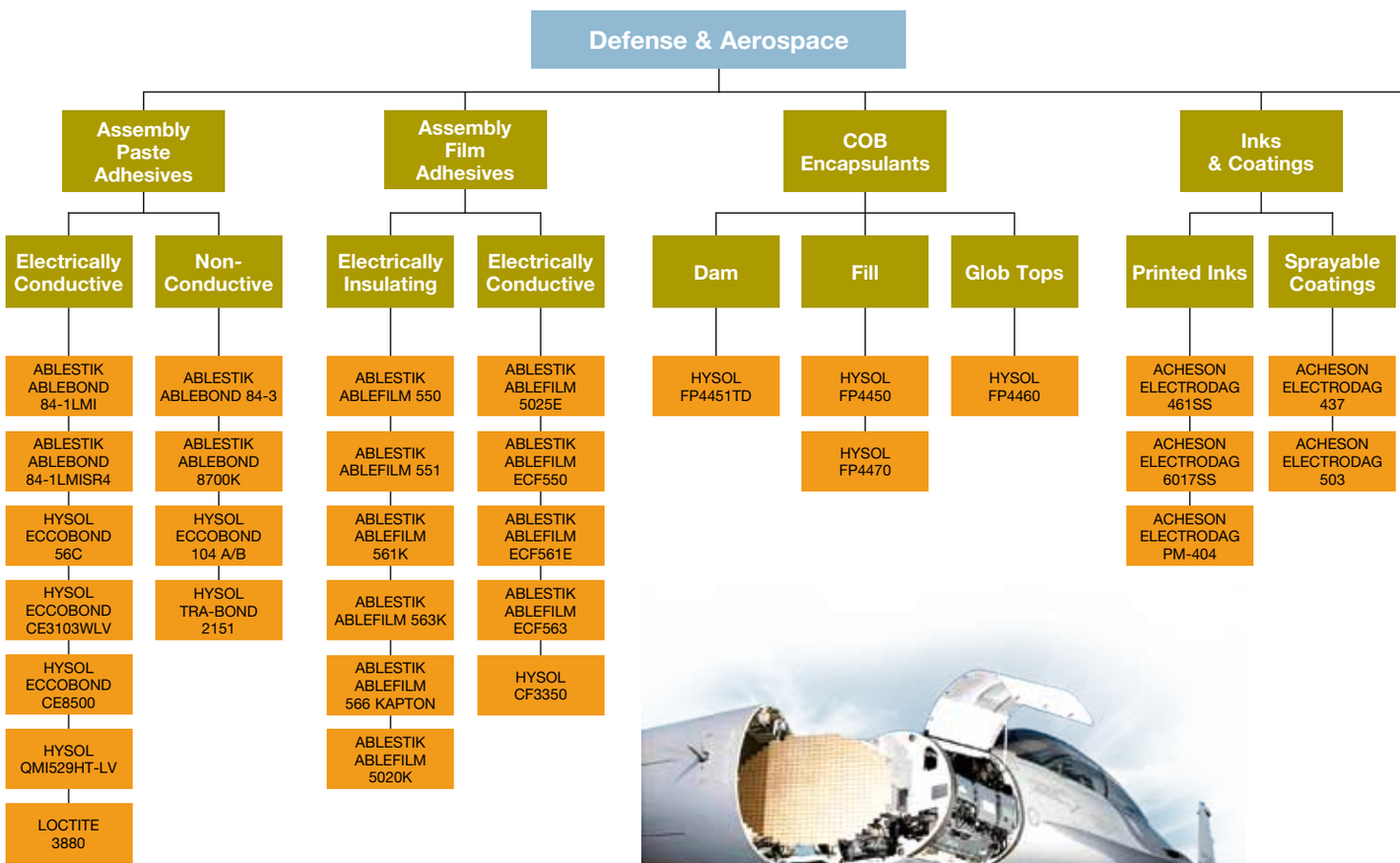
- Consumer
  - Surface Mount Adhesives
    - Dispense Adhesives
      - LOCTITE 3619
    - Screen Print/ Pin Transfer Adhesives
      - LOCTITE 3611
      - LOCTITE 3616
  - Thermal Management Materials
    - Adhesive Pastes
      - HYSOL ECCOBOND TE3530
      - LOCTITE 315
      - LOCTITE 384
      - LOCTITE 3873
      - LOCTITE 3874
    - Phase Change Materials
      - LOCTITE ISOSTRATE
      - LOCTITE POWERSTRATE XTREME
      - LOCTITE PSX-D & PSX-P
    - Accessories
      - LOCTITE 7387
  - Board Level Underfills
    - Package-on-Board
      - Capillary Flows
        - HYSOL E1172A
        - HYSOL E1216M
        - HYSOL E1926
        - HYSOL UF3800 (SERIES)
        - LOCTITE 3513
        - LOCTITE 3536
      - Edgebonds
        - LOCTITE 3705
    - Flip-Chip on Board (Board, Flex or Glass)
      - Capillary Flows
        - HYSOL E1926
        - HYSOL FP4531

DEFENSE & AEROSPACE ELECTRONICS

Henkel has more than 50 years of experience in supplying the defense and aerospace industry with EMERSON & CUMING, ABLESTIK, LOCTITE, HYSOL and MULTICORE product solutions. We are qualified and specified by all major defense and aerospace original equipment manufacturers (OEMs) and contractors, and support our products through a worldwide sales, application engineering, research and development, and manufacturing network.

Our state-of-the-art products, certification to major defense and aerospace specifications, and technical expertise ensure that products built with Henkel electronic assembly materials will be both the highest in performance and in reliability. We are committed to meeting and exceeding your requirements with:

- MIL-STD 883, Method 5011 approved products
- NASA outgassing ASTM E 595-77/84/90 approved products
- Proven film and paste technology in Defense and Aerospace applications
- Custom film preform manufacturing capability
- Low-risk supply chain



DEFENSE & AEROSPACE ELECTRONICS

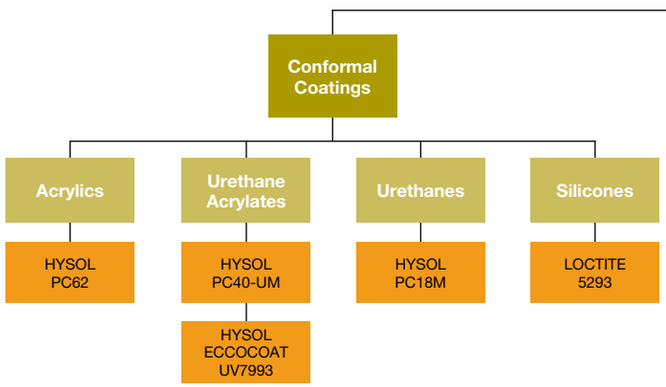
- **PCB Protection**
  - **Conformal Coatings**
    - HYSOL PC18M
    - HYSOL ECCOCOAT UV7993
  - **Potting**
    - HYSOL STYCAST 2651-40*
    - HYSOL STYCAST 2651MM*
    - HYSOL STYCAST 2850FT*
- **Solder Materials**
  - **Pastes**
    - **Pb-Free Water Wash**
      - MULTICORE WS300
    - **SnPb No-Clean**
      - MULTICORE MP218
    - **SnPb Water Wash**
      - MULTICORE WS200
- **Thermal Interface Materials**
  - **Adhesive Pastes**
    - LOCTITE 5404
  - **Phase Change Materials**
    - LOCTITE ISOSTRATE
    - LOCTITE POWERSTRATE XTREME
- **Underfills**
  - **Package-on-Board**
    - **Capillary Flows Reworkable**
      - HYSOL UF3800 (SERIES)
      - LOCTITE 3549
    - **Capillary Flows Non-Reworkable**
      - HYSOL E1172A

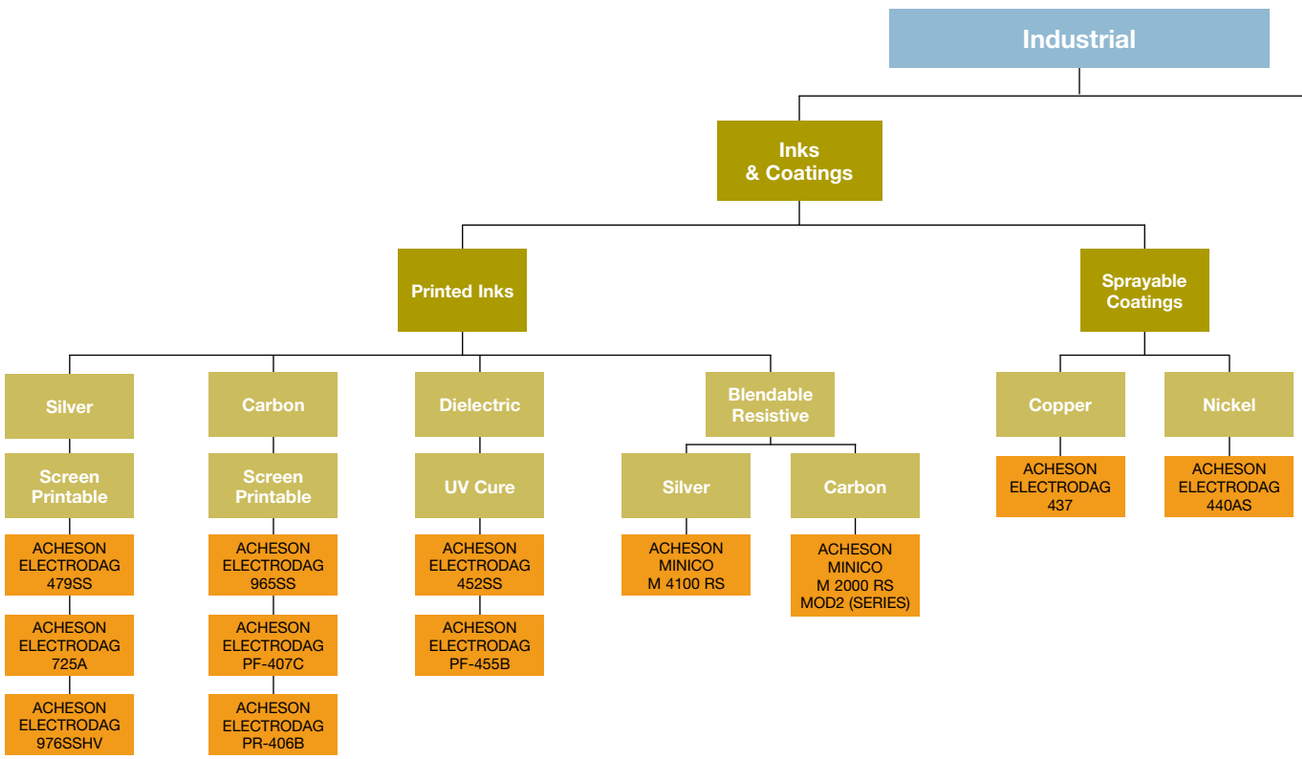
*CATALYST 9, 11 OR 23LV

INDUSTRIAL ELECTRONIC COMPONENTS

Industrial electronics and systems are broad by definition, incorporating products such as transformers, industrial power controls, crystal oscillators and sensors for a variety of market sectors. Regardless of the market segment's breadth, however, each application is related in its requirement for reliability, protection from environmental factors and high-value processes.

Henkel has formulated a wide range of assembly and protection materials for demanding industrial environments. These include sophisticated conformal coatings that protect electronic circuits from moisture, chemicals and other contaminants; printed inks that enable the functionality of critical sensors; chip-on-board encapsulants; market-leading potting solutions for superior stability and protection; and low-pressure molding MACROMELT encapsulants for delicate or temperature-sensitive devices. As one of the world's top ranked sustainability corporations, Henkel has, of course, placed particular emphasis on materials development that is environmentally responsible. Halogen-free, lead-free, solvent-free and low-VOC products are an integral part of our portfolio and uphold Henkel's commitment to eco-conscious manufacturing.



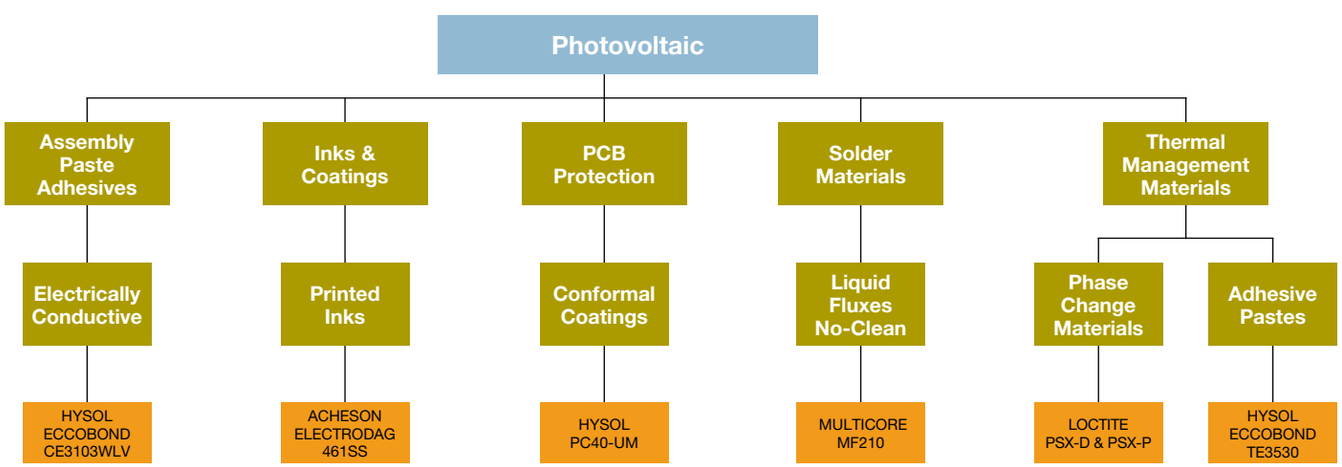


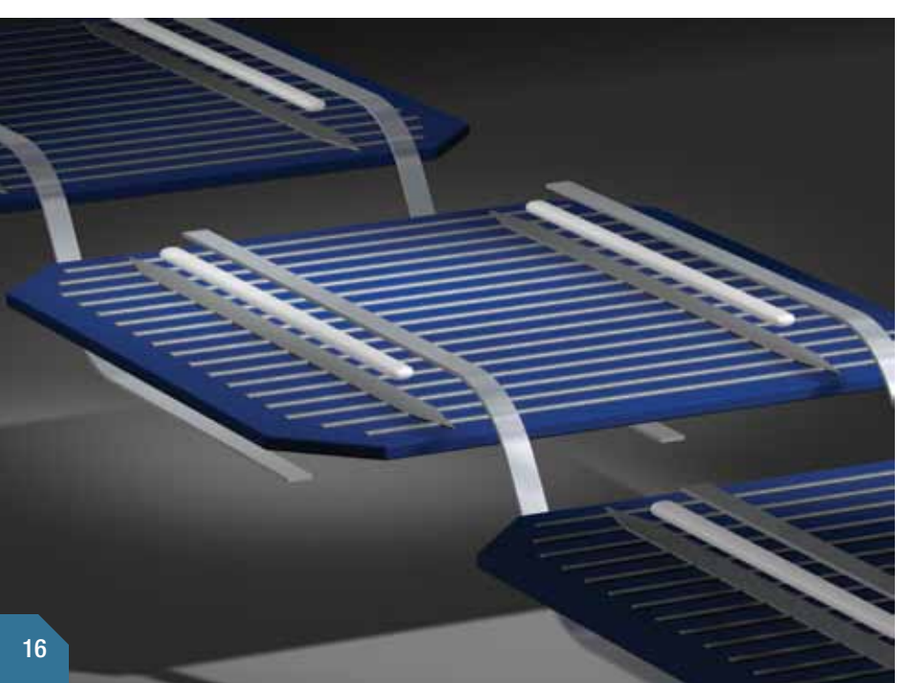
INDUSTRIAL ELECTRONIC COMPONENTS

- **Industrial**
  - **PCB Protection**
    - **Potting**
      - **Urethanes**
        - HYSOL US2350
      - **Epoxies**
        - HYSOL ES1301
        - HYSOL ES1901
        - HYSOL ES2207
        - HYSOL ES2500
        - HYSOL STYCAST 2651MM
        - HYSOL STYCAST 2850FT
    - **Low Pressure Molding**
      - **Polyamide**
        - MACROMELT MM6208
        - MACROMELT OM633
        - MACROMELT OM638
      - **Polyolefin**
        - MACROMELT MM Q-5375
  - **Thermal Management Materials**
    - **Adhesive Pastes**
      - **Shimming Pastes**
        - LOCTITE 315
        - LOCTITE 3873
        - LOCTITE 5404
      - **Non-Shimming Pastes**
        - HYSOL ECCOBOND TE3530
        - LOCTITE 384
        - LOCTITE 3874
  - **Assembly Paste Adhesives**
    - **Electrically Conductive**
      - HYSOL ECCOBOND CE3103WLV
      - HYSOL QMI529HT
    - **Non-Conductive**
      - HYSOL ECCOBOND G500
      - HYSOL ECCOBOND G757HF-D
  - **Chip-on-Board (COB) Encapsulants**
    - **Glob Tops**
      - HYSOL EO1016
      - HYSOL EO1061
  - **UV Curing Adhesives**
    - LOCTITE 352
    - LOCTITE 3106
    - LOCTITE 3220

PHOTOVOLTAIC (SOLAR) ELECTRONICS

Henkel manufactures numerous assembly and protection materials for the demanding requirements of photovoltaic electronics. Whether your solar cells and modules are based on silicon, thin film, concentrator, dye sensitized or organic technology, Henkel materials enable a robust assembly, providing the performance and reliability required. Our portfolio consists of thermally conductive materials, electrically conductive adhesives and inks, as well as fluxes, solders, encapsulation materials, dielectric adhesives and sealants for assembly of photovoltaic modules.

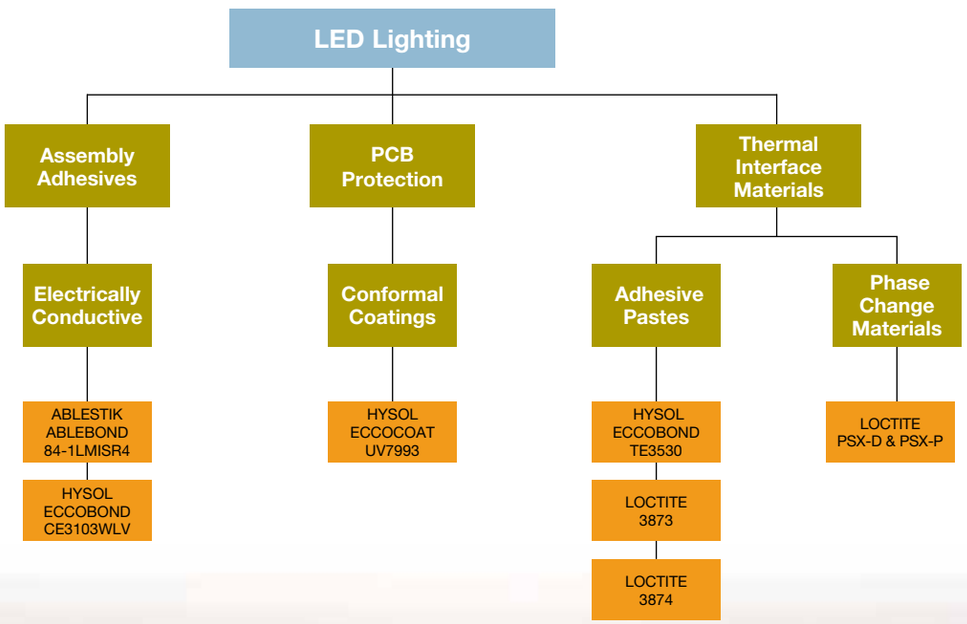


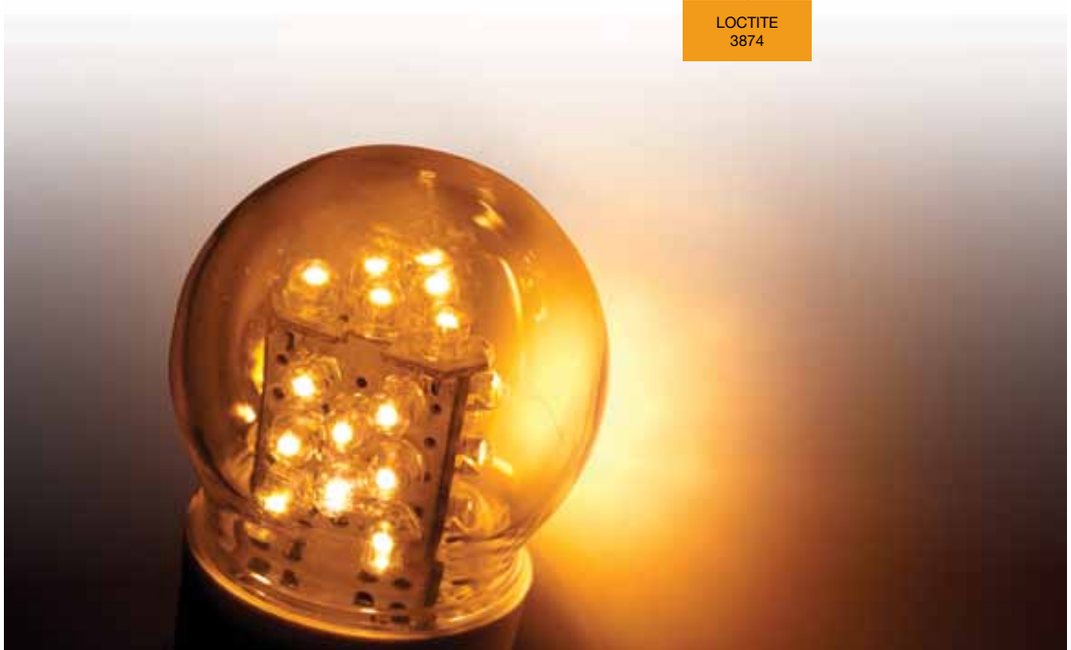


LED LIGHTING

Lighting advancements are one of the most promising areas of electronics market growth. In fact, by some estimates, the LED market is projected to grow at CAGR rates in the double digits over the next few years. Driven by the need for high brightness (HB) LEDs and the requirement to manufacture these even more efficiently, opportunities in the lighting market abound. Success, however, depends on partnering with the right materials supplier who can deliver both LED assembly and protection solutions.

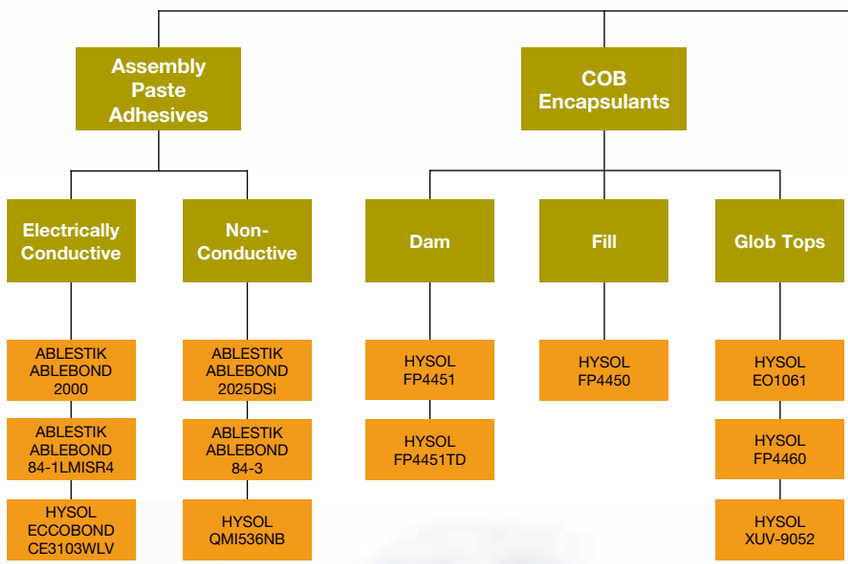
With unmatched expertise in this market and now empowered by the integration of the well-respected ABLESTIK, EMERSON & CUMING, HYSOL and LOCTITE brands, Henkel offers a broad range of products to meet the increasingly demanding requirements of LED-based lighting assembly and protection. Our extended product line covers LED encapsulant, die attach, PCB protection and thermal management materials. High performance inks are also available for applications that dictate a printable solution.

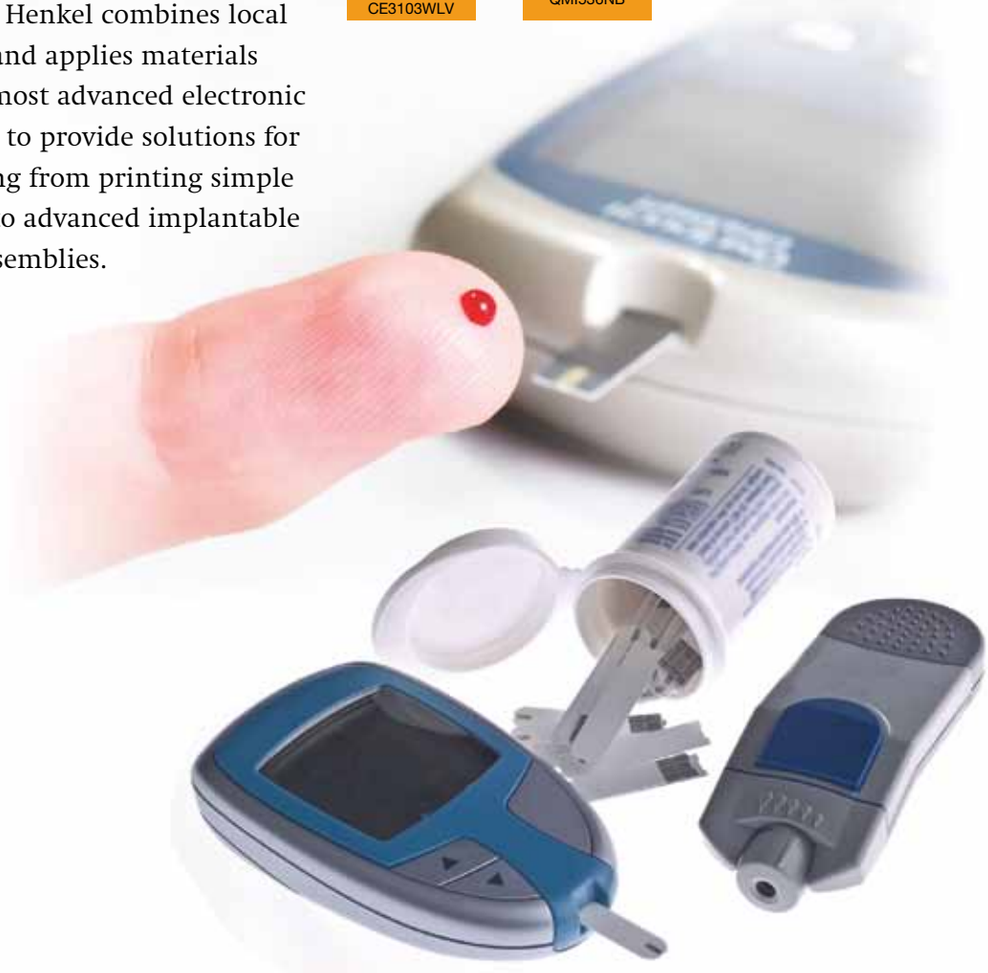




MEDICAL ELECTRONICS

Accurate diagnosis, improved alternative treatments, patient monitoring: electronic technology and related assembly materials are having an ever-increasing impact on healthcare. They improve access to healthcare, enabling more accurate collection of patient data for more precise treatment. They enable doctors to treat more patients with less, reducing the costs and improving the effectiveness of total healthcare and expanding the capability to treat chronic medical conditions. Implanting medical devices, as well as improving ease of use, requires a form factor that is achieved through advanced electronic components, materials and assembly methods. Henkel combines local technical support and applies materials developed for the most advanced electronic assembly processes to provide solutions for applications ranging from printing simple biological sensors to advanced implantable microelectronic assemblies.





MEDICAL ELECTRONICS

RADIO FREQUENCY IDENTIFICATION (RFID)

Used for everything from toll booths to department store inventory control to pet identification, Radio Frequency Identification (RFID) tags are devices capable of uniquely identifying an object via a pre-programmed response when queried by an external radio frequency wave.

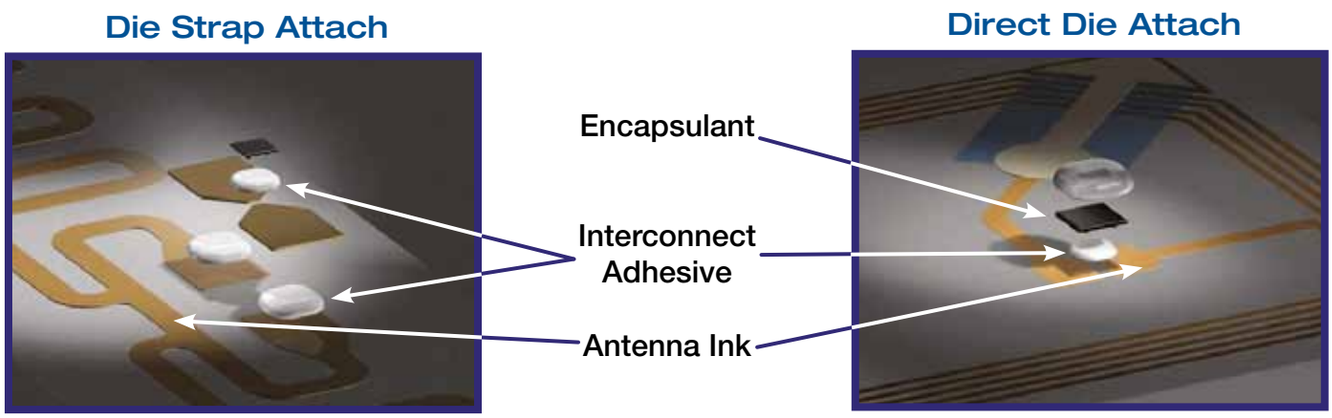
Today's RFID tags consist of a graphic overlay and an inlay, with the inlay being the functional part of the tag and containing the die (used to carry the coded information) and the antenna (used to both transmit and receive RF signals). Critical to the assembly of the tags and their robust in-field performance is the selection of adhesives used to construct these devices.

Adhesive materials are used to attach dies onto an antenna to build the inlays, which can be constructed in one of two ways:

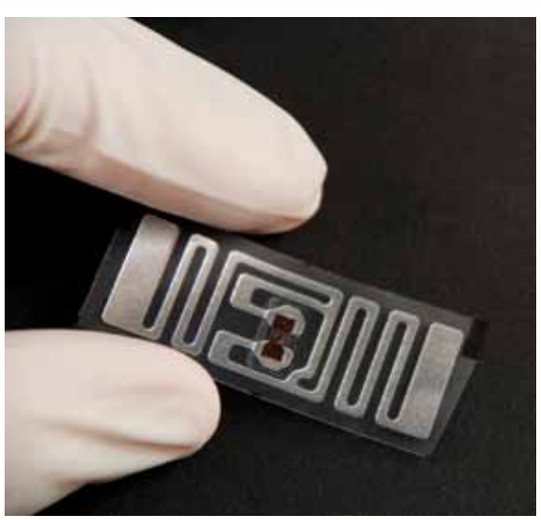
1. An interconnect adhesive is used to attach a small bare die directly to an antenna.
2. An interconnect adhesive is first used to build a much larger packaged die (interposer or die strap), which is then adhered onto an antenna.

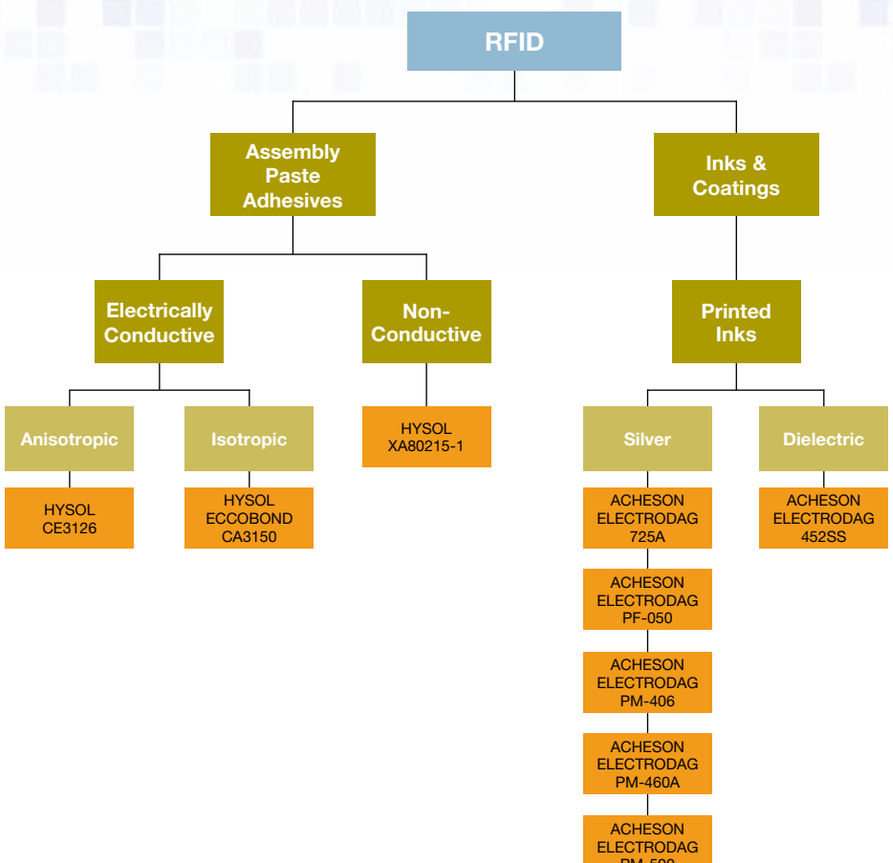
Both methods of assembly have been successfully employed to make active and passive RFID tags.

Henkel's line of RFID adhesives are advancing this critical technology by addressing the dichotomy of high-performance and lower-cost assembly that defines the RFID market. By formulating materials that offer increased throughput, exceptional processability, simplified manufacturing techniques and outstanding in-field reliability, Henkel is facilitating higher-yield, lower-cost manufacturing for modern RFID assembly.



RADIO FREQUENCY IDENTIFICATION (RFID)





WIRELESS DATACOM INFRASTRUCTURE (WDI)

Henkel supplies high-performance assembly materials for electronics in wireless telecommunications infrastructure equipment. With our unique RF grounding adhesives, available in both film and paste formats, we have earned a leading position in the assembly of base station electronics, as well as point-to-point and point-to-multipoint radiolink devices, satellite electronics, wireless home/office equipment and fiber optics.

Henkel products are used in the assembly of power amplifiers, transmitters, receivers, couplers, and filters, as well as RF modules such as system-in-packages, power transistors, oscillators, optical fiber and more.

Our unique product line meets emerging market demands for improved RF performance in next-generation wireless telecommunications equipment, as well as increased thermal dissipation requirements for achieving longer distance communication capabilities. Henkel's solutions for these market challenges include RF grounding adhesives in film and paste formats, thermal interface materials for heat dissipation of high power components, electrically conductive adhesives as lead-free solder alternatives for active and passive component attach, lid seal adhesives, and underfills for component reinforcement.

WIRELESS DATACOM INFRASTRUCTURE (WDI)

WDI Satellite

- **Assembly Pastes Adhesives**
  - **Electrically Conductive**
    - ABLESTIK ABLEBOND 84-1LMI
    - ABLESTIK ABLEBOND 84-1LMISR4
    - HYSOL ECCOBOND CE8500
  - **Non-Conductive**
    - HYSOL QMI536NB
- **Assembly Film Adhesives**
  - **Electrically Insulating**
    - ABLESTIK ABLEFILM 563K
    - ABLESTIK ABLEFILM 5020K
  - **Electrically Conductive**
    - HYSOL CF3350
- **Inks & Coatings**
  - **Sprayable Coatings**
    - ACHESON ELECTRODAG 440AS
    - ACHESON ELECTRODAG 503
- **PCB Protection**
  - **Potting**
    - HYSOL ES1002
    - HYSOL STYCAST 2850FT
- **Thermal Interface Materials**
  - **Adhesive Pastes**
    - HYSOL ECCOBOND TE3530

WDI Base Station

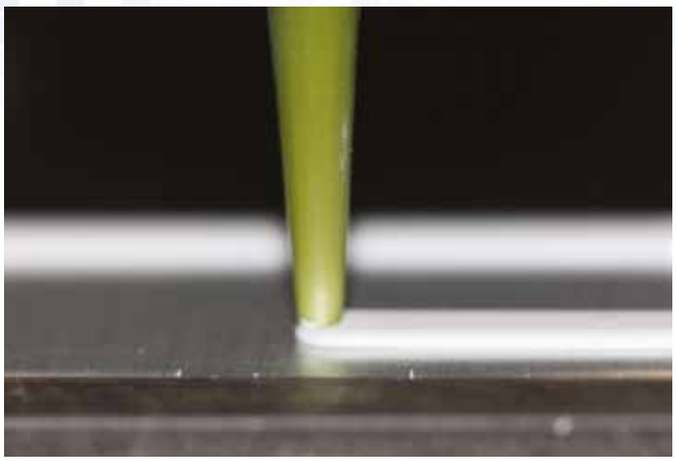
- **Assembly Paste Adhesives**
  - **Electrically Conductive**
    - HYSOL ECCOBOND CE3103WLV
    - HYSOL ECCOBOND CE8500
- **Assembly Film Adhesives**
  - **Electrically Insulating**
    - ABLESTIK ABLEFILM 563K
    - ABLESTIK ABLEFILM 5020K
  - **Electrically Conductive**
    - HYSOL CF3350
- **Solder Materials**
  - **Pastes**
    - **Pb-Free Halide-Free**
      - MULTICORE LF318
    - **Pb-Free Halogen-Free**
      - MULTICORE HF108
    - **SnPb No-Clean**
      - MULTICORE CR32
- **Thermal Interface Materials**
  - **Adhesive Pastes**
    - HYSOL ECCOBOND TE3530
    - LOCTITE 384
  - **Phase Change Materials**
    - LOCTITE ISOSTRATE
    - LOCTITE POWERSTRATE XTREME
    - LOCTITE PSX-D & PSX-P
    - LOCTITE THERMSTRATE

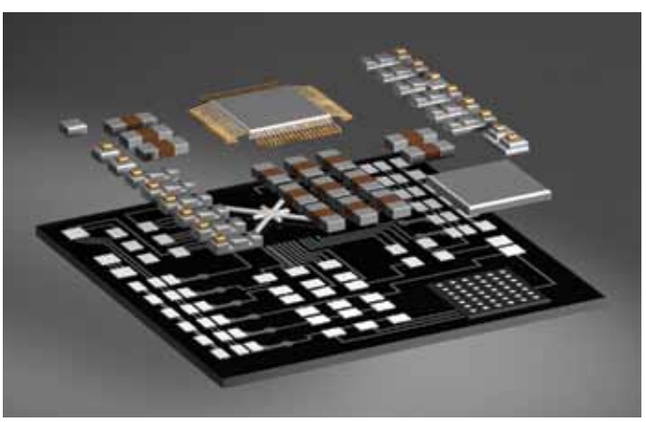
ASSEMBLY PASTE ADHESIVES

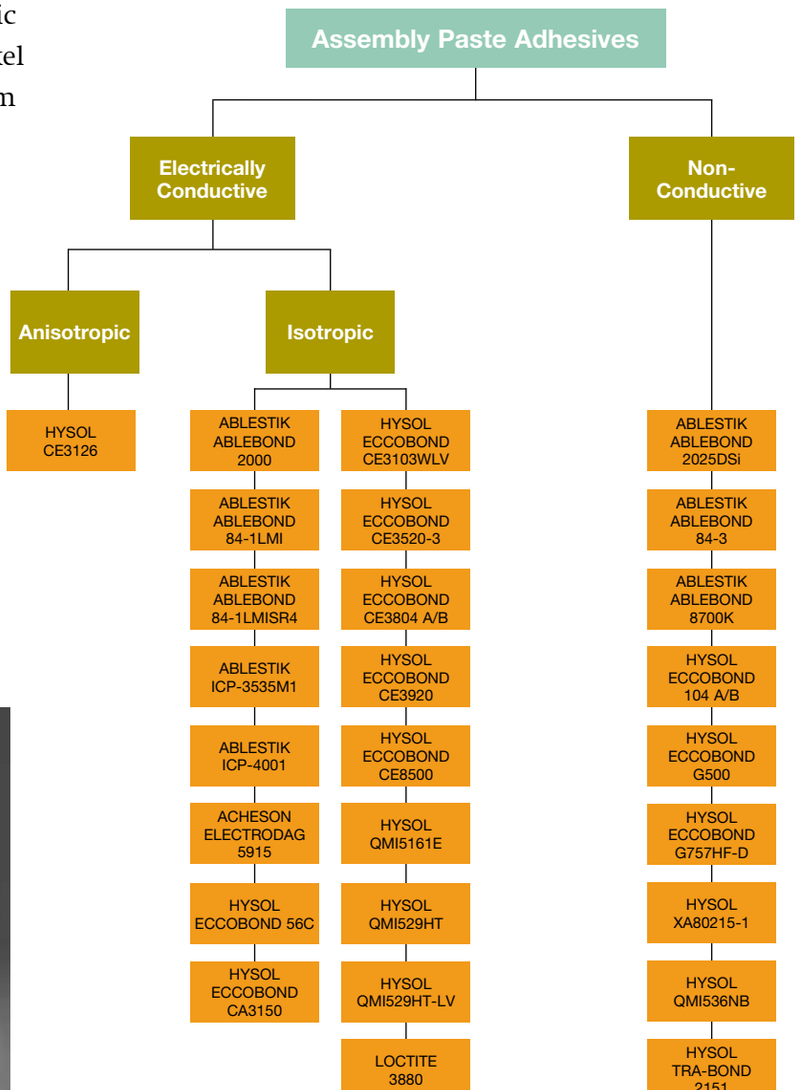
Henkel's diverse portfolio of adhesive and sealant solutions includes advanced materials technologies to address today's most demanding applications. From electrically conductive and non-conductive paste adhesives through to thermally conductive dielectric materials, Henkel's product line affords maximum performance and cost-efficiency.

Our electrically conductive and non-conductive paste adhesives are ideal for withstanding the thermal and physical stresses of Defense, Automotive, Medical and Consumer Electronic assembly applications, while our spot cure technologies enable high-speed assembly for RFID tags and other printed electronic devices. Non-conductive paste systems in the Henkel portfolio include a series of one- and two-part room temperature, thermal and UV cure adhesives for the ultimate in flexibility and performance.

For manufacturers that require both adhesive and thermal dissipation functionality, Henkel's line of thermally conductive dielectric pastes are the most trusted and reliable materials on the market. Providing outstanding adhesion and thermal performance, Henkel offers both shimmed and non-shimmed formulations. For assembly specialists that require the utmost in accuracy, our shimmed adhesives contain engineered spacers for more precise bondline control.







ASSEMBLY PASTE ADHESIVES

ELECTRICALLY CONDUCTIVE ADHESIVES

ELECTRICALLY CONDUCTIVE – ANISOTROPIC

PRODUCT	DESCRIPTION	CURE TYPE	CURE SCHEDULES	VISCOSITY mPa.s (cP)	VOLUME RESISTIVITY (OHM,CM)	SHELF LIFE	POT LIFE
HYSOL CE3126	Snap curable anisotropic adhesive especially suited in applications where throughput is critical. This product is typically used for very fine pitch flip chip interconnections where electrical conductivity is desired in only one direction.	Heat	8 seconds @ 170°C	16,300	Anisotropic	6 months @ -40°C	2 days

ELECTRICALLY CONDUCTIVE – ISOTROPIC

ABLESTIK ABLEBOND 2000	Electrically conductive die attach adhesive designed for Pb-free PBGA and array BGA packaging. Able to withstand the high reflow temperatures at 260°C necessary for Pb-free solders.	Heat	30 minutes ramp to 175°C + 15 minutes @ 175°C	9,000	0.0005	12 months @ -40°C	24 hours @ 25°C
ABLESTIK ABLEBOND 84-1LMI	Enhanced thermal conductivity, fast cure, low stress die & component attach adhesive optimized for GaAs MMIC attach.	Heat	1 hour @ 150°C or 2 hours @ 125°C	30,000	0.0005	12 months @ -40°C	2 weeks @ 25°C
ABLESTIK ABLEBOND 84-1LMISR4	Electrically conductive die attach adhesive has been formulated for use in high throughput, automated die attach equipment. Excellent dispensability, minimal tailing and stringing.	Heat	1 hour @ 175°C	8,000	0.0001	12 months @ -40°C	–
ABLESTIK ICP-3535M1	Recommended for mounting lower cost tin (Sn) finished components onto the conductive trace terminations of printed circuit boards or co-fired ceramic circuitry. Designed for applications with small size components, where no bleeding or wicking is tolerated. Applied by stencil printing.	Heat	1 hour @ 150°C or 10 minutes @ 175°C	80,000	0.004	6 months @ -40°C	–
ABLESTIK ICP-4001	Silicone paste specifically designed for applications where a high degree of flexibility is required.	Heat	35 minutes @ 140°C	40,000	0.0004	5 months @ -40°C	24 hours @ 25°C
ACHESON ELECTRODAG 5915	Silver conductive ink designed for bonding surface mount devices to flexible or rigid printed circuits.	Heat	15 minutes @ 130°C or 10 minutes @ 177°C	120,000	0.0005	12 months @ -20°C	–
HYSOL ECCOBOND 56C	Catalyst 9-Fast, low temperature cure, electrically & thermally conductive adhesive. Ideally suited for low stress die & component attach, this adhesive has a unique silver particle size allowing very thin bond lines. Passes NASA outgassing standards.	Heat	2 hours @ 50°C	–	0.0004	12 months @ 18 to 25°C	< 1 hour @ 25°C
	Catalyst 11-Fast, low temperature cure, electrically & thermally conductive adhesive. Ideally suited for low stress die & component attach, this adhesive has a unique silver particle size allowing very thin bond lines.	Heat	2 hours @ 100°C @ 1 hour @ 120°C	–	0.0002	6 months @ -25°C	< 4 hours @ 25°C
HYSOL ECCOBOND CA3150	Electrically conductive adhesive designed to electrically interconnect die straps, batteries, and other surface mount components. It is suitable for reel-to-reel production lines and high speed jetting or printing applications and allows exceptional fine pitch resolution. The long work life minimizes product waste and clean-up time.	Heat	10 seconds @ 130°C at bondline	13,000	< 0.01	6 months @ -20°C	2 days @ 24°C
HYSOL ECCOBOND CE3103WLV	Electrically conductive adhesive for thin film PV assembly with superior contact resistance stability. Low viscosity for fine line dispensing.	Heat	10 minutes @120°C or 3 minutes @ 150°C	15,000 to 25,000	0.0008	12 months @ -40°C	3 days @ 25°C
HYSOL ECCOBOND CE3520-3	Electrically conductive adhesive combines a high elasticity with a good adhesion on a variety of surfaces, making it suitable for applications with mismatched CTE. Used on substrate attach and heat sink bonding.	Heat	60 minutes @ 120°C or 30 minutes @ 150°C	73,000	0.02	6 months @ -18 to -25°C	3 days @ 18°C to 25°C
HYSOL ECCOBOND CE3804 A/B	Adhesive designed for use in automated assembly operations. Engineered to form a thin layer of conductive coating in the manufacture of discrete components such as resistors and capacitors. It may be applied by screen printing, dipping or dispense.	Heat	90 minutes @ 150°C	7,000	6.4×10^{14}	6 months @ 0-30°C	–
HYSOL ECCOBOND CE3920	One-component electrically conductive adhesive designed for fine dispense applications and SMT assembly processes. The long work life minimizes product waste and clean-up time, providing increased production efficiency.	Heat	5 minutes @150°C batch cure	26,100	0.00033	6 months @ -40°C	–
HYSOL ECCOBOND CE8500	One-component, solventless, electrically conductive, low stress adhesive for mismatched CTE applications.	Heat	90 minutes @ 120°C or 40 minutes @150°C or 15 minutes @ 175°C	120,000 to 140,000	0.0002	4 months @ -25°C to -18°C	–
HYSOL QMI5161E	Electrically conductive adhesive, stable at high temperatures. High adhesion to a variety of substrates. Good on heat sensitive devices. This snap cure adhesive is designed for high throughput bonding applications.	Heat	60 seconds @ 90°C snap cure 90 minutes @ 60°C oven cure	15,900	0.0015	12 months @ -40°C	6 hours @ 25°C
HYSOL QMI529HT	Die attach paste was developed as a soft-solder replacement or for high UPH performance applications. Excellent electrical conductivity and good resistance to "popcorning" after exposure to reflow temperatures.	Heat	60 seconds @ 185°C snap cure 30 minutes @ 185°C	18,500	0.00004	12 months @ -40°C	24 hours @ 25°C
HYSOL QMI529HT-LV	Conductive die attach adhesive has been formulated for use in high throughput die attach applications. Stable at high temperatures, low moisture absorption, excellent adhesion and is thermally stable at 260°C reflow.	Heat	30 minutes ramp to 175°C + 1 hour @ 175°C	16,000	0.00005	12 months @ -40°C	24 hours @ 25°C
LOCTITE 3880	Electrically conductive adhesive for bonding of metals, ceramics, rubbers and plastics with superior adhesion, electrical and thermal conductivity.	Heat	10 minutes @ 125 °C 6 minutes @ 150°C 3 minutes @ 175°C	50,000 to 130,000	0.008	6 months @ 0°C	–

ASSEMBLY PASTE ADHESIVES

NON-CONDUCTIVE ADHESIVES

NON-CONDUCTIVE

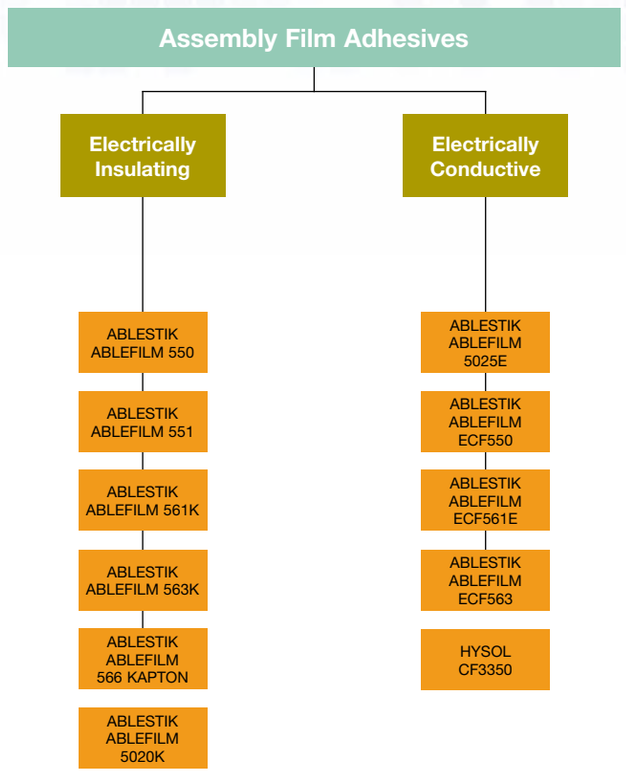
PRODUCT	DESCRIPTION	CURE TYPE	CURE SCHEDULES	VISCOSITY mPa.s (cP)	CTE ABOVE Tg (ppm/°C)	SHELF LIFE	POT LIFE
ABLESTIK ABLEBOND 2025DSi	Non-conductive die attach adhesive is designed for use in array packaging.	Heat	30 minutes ramp to 175°C + 15 minute @ 175°C	11,500	145	12 months @ -40°C	24 hours @ 25°C
ABLESTIK ABLEBOND 84-3	Designed for die attach applications. Ideal for application by automatic dispensing, screen printing or hand.	Heat	1 hour @ 150°C	50,000	100	12 months @ -40°C	2 weeks @ 25°C
ABLESTIK ABLEBOND 8700K	Provides excellent adhesion to thin film and thick film gold surfaces. Adhesive retains its dispensed height after cure, without slumping. Meets MIL-STD-883, Method 5011.	Heat	1 hour @ 175°C	45,000	55	12 months @ -40°C	30 days @ 25°C
HYSOL ECCOBOND 104 A/B	Designed for applications requiring very high temperature exposures. Can withstand continuous exposure at temperatures as high as 230°C and tested to withstand short-term exposures to 280°C.	Heat	1 hour @ 200°C	25,000	60	6 months @ 25°C	–
HYSOL ECCOBOND G500	A one-component, non-conductive epoxy adhesive and sealant. Used as insulation of copper and other materials and attaching leads to coils.	Heat	5 minutes @ 175°C	Paste	–	5.5 months @ 25°C	–
HYSOL ECCOBOND G757HF-D	Low halogen, non conductive epoxy adhesive for ferrite bonding applications. Specifically formulated for high throughput assembly operations.	Heat	45 minutes @ 140°C or 20 minutes @ 160°C or 10 minutes @ 180°C	Paste	–	6 months @ 0°C	1 month @ 25°C
HYSOL XA80215-1	Electrically non-conductive adhesive designed for high throughput assembly operations. This material is suitable for use with temperature sensitive substrates and components.	Heat	< 30 seconds @ 110°C	23,000	–	6 months @ -25°C	24 hours @ 25°C
HYSOL QMI536NB	Low bleed non-conductive, PTFE-filled paste designed for stack die applications that require very low stress and robust mechanical properties. It is used on a wide variety of surfaces, including solder resist, flexible tape, bare silicon and various die passivations.	Heat	30 minutes @ 150 °C	10,000	150	12 months @ -40°C	12 hours @ 25°C
HYSOL TRA-BOND 2151	One-component epoxy adhesive providing high mechanical strength; stable contact resistance on Cu and 100% Sn.	Heat	45 minutes @ 140°C or 20 minutes @ 160°C or 10 minutes @ 180°C	Paste	–	6 months @ 0°C	1 week

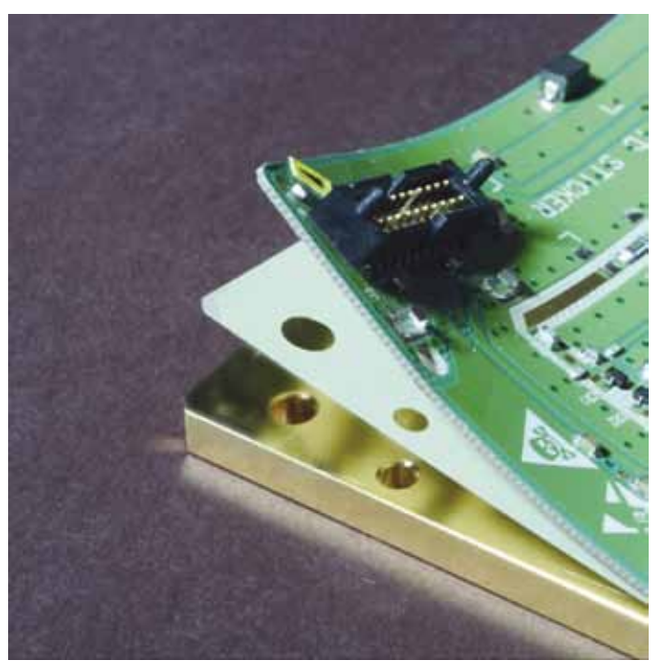
ASSEMBLY FILM ADHESIVES

As the leader in thermal film formulation technology, Henkel has developed a wide variety of film materials for multiple applications. Whether you're seeking high thermal conductivity, electrical conductivity, insulation performance or a combination thereof, Henkel has a thermal film solution for just about any application.

Their advantages are many, especially when there is a requirement for bonding large areas or complex parts together. Thermal adhesive films are most often found in the defense and automotive markets, and the advantages they deliver can extend to any application where robust thermal and electrical performance, void-free bond lines and controlled thicknesses are required. Supplied in custom, pre-cut formats for the applications in which they will be used, films aren't subject to the same flow concerns associated with pastes. The film is placed onto the backside of the device, aligned and attached to its heat sink or chassis, following which pressure and heat is applied to cure the material. Films are remarkably simple to use and the reliability they provide is, in many cases, superior to alternative products.

Manufacturers of smaller, highly complex devices also find that films deliver a far more elegant, reliable and user-friendly alternative to paste-based mediums. As compared to thermal paste adhesives, films offer a cleaner, no-waste, easily processed solution with a lower total cost of ownership. And, when it comes to stacking up against solder as a thermal solution, films also prove their superiority for certain applications.





ASSEMBLY FILM ADHESIVES

ADHESIVE FILMS – ELECTRICALLY INSULATING

PRODUCT	DESCRIPTION	TENSILE STRENGTH, LAP SHEAR (PSI)	THERMAL CONDUCTIVITY (W/mK)	VOLUME RESISTIVITY (OHM.CM)	PRIMARY CURE CYCLE	STORAGE LIFE	FILM THICKNESS AVAILABLE (MILS)
ABLESTIK ABLEFILM 550	Adhesive film designed for substrate attach and sealing microelectronic packages. Good for gold-plated and difficult-to-bond surfaces.	5,700	0.2	1×10^{14}	30 minutes @ 150°C	12 months @ -40ºC	4, 5, 6
ABLESTIK ABLEFILM 551	Flexible unsupported adhesive film designed to produce tough, resilient bonds between materials with differing coefficients of thermal expansion. Also useful for bonding thin, flexible materials, where good peel strength is required.	5,000	N/A	N/A	10 minutes @ 200°C or 1 hour @ 175°C or 1.5 hours @ 165°C	12 months @ -40°C	3, 5, 7, 9
ABLESTIK ABLEFILM 561K	Designed for substrate attach and heat sink bonding and for bonding materials with severely mismatched coefficients of thermal expansion.	4,345	0.9	9.1×10^{12}	30 minutes @ 150°C	12 months @ -40°C	4, 5, 12
ABLESTIK ABLEFILM 563K	Electrical insulation film with high thermal conductivity and adhesion strength. Uniform bondline control.	3,000	1	1×10^{13}	30 minutes @ 150°C	12 months @ -40°C	2, 3, 4, 5, 6
ABLESTIK ABLEFILM 566 KAPTON	Epoxy film designed for bonding dissimilar materials with mismatched coefficients of thermal expansion.	2,300	0.2	N/A	3 hours @ 90°C	12 months @ -40ºC	4, 5, 8
ABLESTIK ABLEFILM 5020K	A high purity adhesive with excellent adhesion to gold-plated surfaces, particularly suited for use in hermetic packages. Certified to MIL-STD-883, Method 511. NASA outgassing approved.	3,000	0.7	8×10^{14}	1 hour @ 150°C	12 months @ -40°C	4, 5, 6

ADHESIVE FILMS – ELECTRICALLY CONDUCTIVE

ABLESTIK ABLEFILM 5025E	Epoxy adhesive film ideal for bonding “hot” devices onto heat sinks in applications where electrical insulation is not required. Certified to MIL-STD-883, Method 511. NASA outgassing approved.	2,000	6.5	0.0005	30 minutes @ 150°C	6 months @ 5ºC	2 to 6 mils
ABLESTIK ABLEFILM ECF550	Designed for microelectronic applications that require electrical conductivity. Moisture resistant.	3,000	1	0.001	30 minutes @ 150°C	12 months @ -40ºC	Carrier Film Thickness 1 mil
ABLESTIK ABLEFILM ECF561E	Designed for bonding materials with severely mismatched coefficients of thermal expansion. When used for substrate attach, this adhesive film acts as an electrical ground plane.	2,000	1.6	0.001	1 hour @ 150°C	12 months @ -40ºC	Carrier Film Thickness 1 mil
ABLESTIK ABLEFILM ECF563	Unsupported epoxy adhesive film is ideal for bonding “hot” devices onto heat sinks in applications where electrical insulation is not required. Microwave and heat sink applications.	2,500	1	0.004	30 minutes @ 150°C	6 months @ 5ºC	2 to 6 mils
HYSOL CF3350	For electrical, thermal and mechanical assembly applications. The combination of adhesive properties ensures reliable RF ground plane performance.	3,400	7	0.0002	30 minutes @ 150°C	9 months @ 5ºC	2 or 4 mils (±0.5 mils)

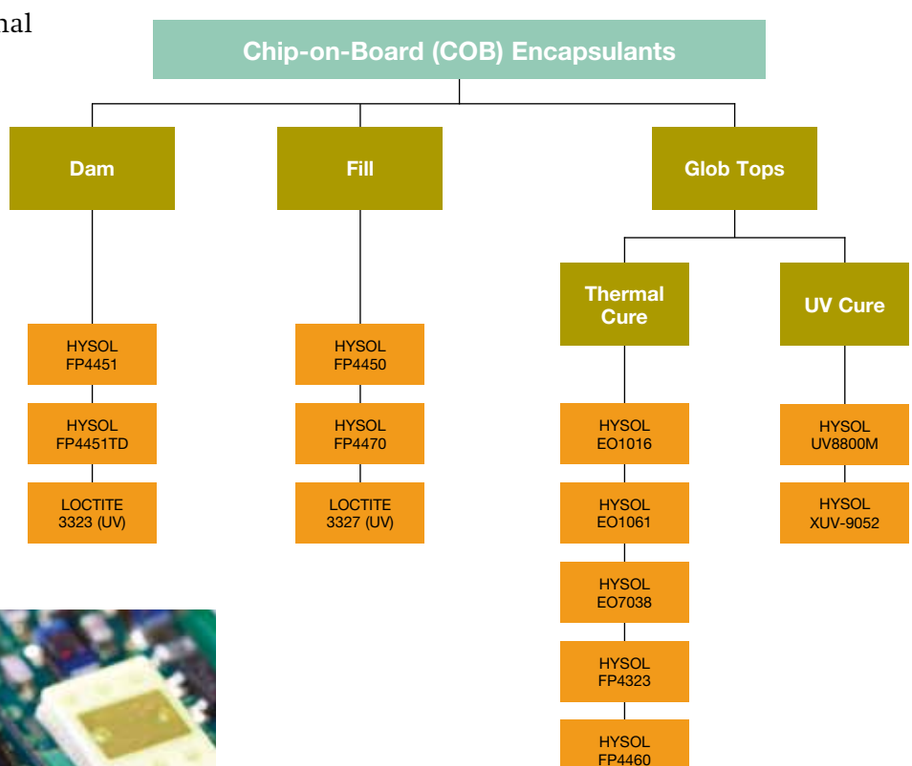
CHIP-ON-BOARD (COB) ENCAPSULANTS

Encapsulants are used to provide environmental protection and add mechanical strength to wire bonded devices. Two different application technologies are employed for the protective encapsulation of wire bonded die:

- Glob top technology requires an encapsulant with a fine-tuned rheology, as the flow capabilities must allow the wires to be covered without the encapsulant flowing beyond the chip.
- Dam and fill technology, where the dam is used to limit the flow of the low viscosity fill material, allowing its use with fine pitch wire leads.

Henkel's HYSOL and ECCOBOND encapsulants are available as either thermal or ultraviolet cure materials and are designed for the highest reliability in that they offer low coefficient of thermal expansion, high glass transition temperature, and low ionic content. These encapsulants have been engineered to provide protection to wire bonds, leads, aluminum and silicon dies from harsh environments, mechanical damage and corrosion.

Formulated from epoxy, polyurethane, acrylate (UV curable) and silicone chemistries, these systems have proven reliability for electronic insulation. Henkel encapsulants offer excellent elevated temperature stability and thermal shock resistance, outstanding electrical insulation at both room and elevated temperatures, minimal shrinkage and low stress during cure, as well as excellent chemical resistance. Our encapsulants have been designed to offer high throughput and low-cost assembly processes.



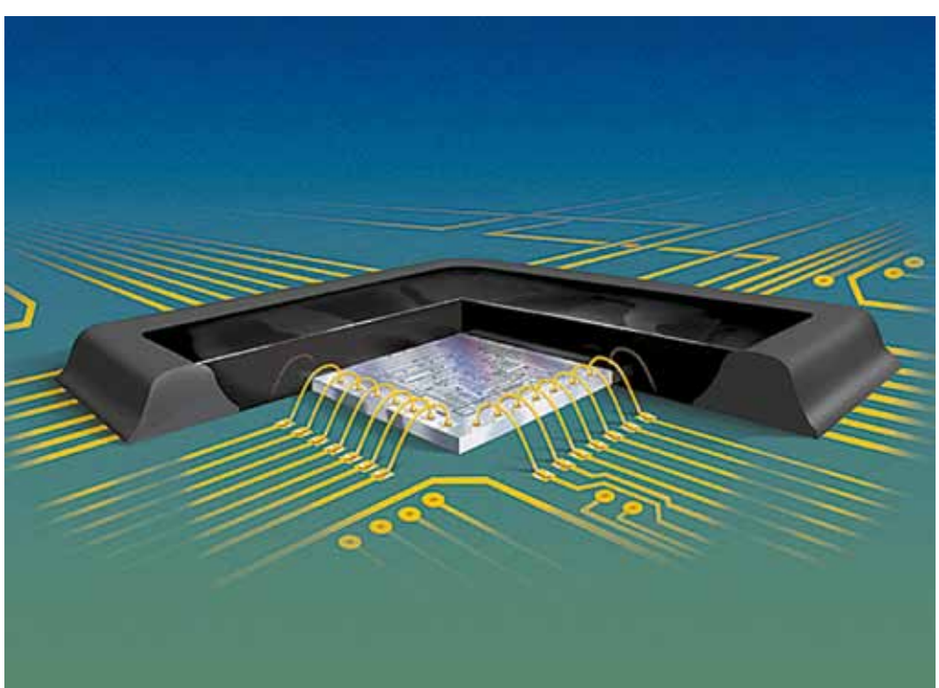
CHIP-ON-BOARD (COB) ENCAPSULANTS

DAM

PRODUCT	DESCRIPTION	CURE TYPE	RECOMMENDED CURE SCHEDULES	VISCOSITY mPa.s (cP)	CTE (ppm/ºC)	Tg (ºC)	% FILLER	POT LIFE	STORAGE TEMP.
HYSOL FP4451	Damming material is designed as a flow control barrier around areas of bare chip encapsulation. It is a high purity green product with minimal slumping.	Heat	30 minutes @ 125°C + 90 minutes @ 165ºC	1,300,000	22	155	72	2 days @ 25ºC	-40ºC
HYSOL FP4451TD	Damming material is designed as a flow control barrier around areas of bare chip encapsulation. It has excellent chemical resistance and exceptional thermal stability.	Heat	30 minutes @ 125°C + 90 minutes @ 165ºC	300,000	21	150	73	10 days @ 25ºC	-40ºC
LOCTITE 3323 (UV)	Developed for encapsulation of wire bonded dies, used for Smartcard IC modules. It is designed for use only with HYSOL UV fill encapsulants, such as 3327 and 3329.	UV	100 mW/cm^2 @ 365 nm (mercury lamp)	19,000 to 46,000	40	140	43	N/A	2ºC – 8ºC

FILL

HYSOL FP4450	Encapsulant designed for protection of bare semiconductor devices. It is high purity, low stress with good moisture resistance. Used on automotive applications, BGA, IC memory cards, chip carriers, hybrid circuits, chip-on-board, multi-chip modules and pin grid arrays.	Heat	30 minutes @ 125°C + 90 minutes @ 165ºC	43,900	22	155	73	3 days @ 25º C	-40ºC
HYSOL FP4470	Liquid encapsulant features excellent flow properties, allowing it to penetrate fine pitch wires and deep cavities without entrapping voids. A cavity or potting dam is required for flow control. Typical applications are BGA, chip scale packages, PBGA and full arrays on LTCC.	Heat	30 minutes @ 125°C + 90 minutes @ 165ºC	48,000	18	148	75	3 days @ 25º C	-40ºC
LOCTITE 3327 (UV)	Developed for encapsulation of wire bonded dies, used for Smartcard IC modules. It is designed for use only with HYSOL UV dam encapsulants, such as HYSOL 3323.	UV	100 mW/cm^2 @ 365 nm (mercury lamp)	6,500 to 9,500	45	110	40	N/A	2ºC – 8ºC



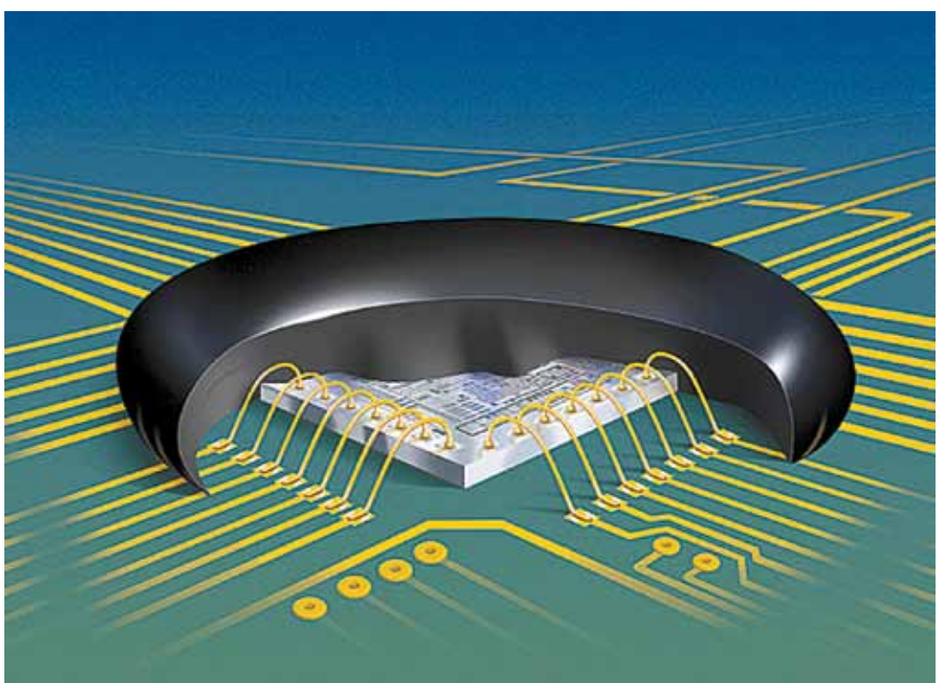
CHIP-ON-BOARD (COB) ENCAPSULANTS

GLOB TOPS – THERMAL CURE

PRODUCT	DESCRIPTION	CURE TYPE	RECOMMENDED CURE SCHEDULES	VISCOSITY mPa.s (cP)	CTE (ppm/ºC)	Tg (ºC)	% FILLER	POT LIFE	STORAGE TEMP.
HYSOL EO1016	Epoxy encapsulant particularly suited for use on transistors and similar semiconductors, can be used for encapsulation of watch ICs. Nonabrasive filler allows for grinding if necessary.	Heat	20 minutes at 150°C	62,000	46	126	41.2	3 months @ 25ºC	4ºC
HYSOL EO1061	Medium glob formulation for lower CTE and lower ionic than EO1016. Exceptional viscosity stability at 25°C provides easier control of shot size using conventional time/pressure dispensing equipment.	Heat	3 hours @ 140ºC	50,000	40	125	61.3	25 days @ 25ºC	4ºC
HYSOL EO7038	One component epoxy potting system, formulated to protect sensors used in harsh environments, such as automotive applications.	Heat	3 hours @ 130ºC or 2 hours @ 140ºC	40,000	30	140	61	3 days @ 25º C	-20ºC
HYSOL FP4323	High purity liquid epoxy encapsulant for chip-on-board (COB) plastic substrate and plastic PGA applications.	Heat	4 hours @ 150ºC or 1 hour @ 170º C	220,000	28	174	65	48 hours @ 25ºC	-40ºC
HYSOL FP4460	High purity, high flow, low stress glob top semiconductor encapsulant with improved work life. High temperature performance, excellent moisture resistance.	Heat	3 hours @ 150ºC	420,000	20	173	75	2 days @ 25ºC	-40ºC

GLOB TOPS – UV CURE

HYSOL UV8800M	A UV encapsulant for IC protection. A grey paste that hardens by UV exposure to a hard translucent coating.	UV	100 mW/cm^2 @ 315 to 400 nm (mercury lamp)	2,500 to 4,000	41	29	53.6	–	0ºC - 5ºC
HYSOL XUV-9052	One-component dual cure (UV & moisture) adhesive. Fast cure, withstands exposure to ink, cures in shadowed areas with no stringing. Suited for inkjet applications.	UV/Moisture	300 W/in, 5 – 10 ss, 0.5 – 1 Joules (medium pressure mercury vapor lamp)	4,100	–	64	–	24 hours @ 25°C	-20ºC



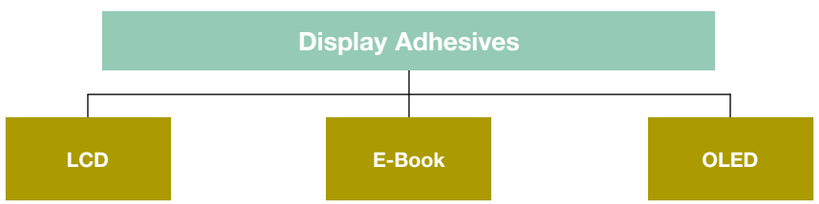
DISPLAY ADHESIVES

Displays have become an integral part of our lives. Whether flatscreen TV's, electronic readers, laptops or smartphones, just about everything we use on a daily basis incorporates a display for user interface. And the reliability of these products depends on Henkel. Our broad range of display materials enable efficient manufacturing and outstanding in-field reliability.

For liquid crystal display (LCD) production, Henkel's main and end sealants deliver a robust and complete panel assembly, ensuring excellent in-use reliability and long-term performance. In addition, our flexible printed circuit board (FPCB) materials reinforce and facilitate dependable product-to-host connection. Combined, this portfolio of material systems offers LCD manufacturers a no-risk, high-value assembly proposition. Our technology isn't limited to LCDs, however, as Henkel's main sealant and frit enforcement products enable next-generation development of organic light-emitting diode (OLED) displays.

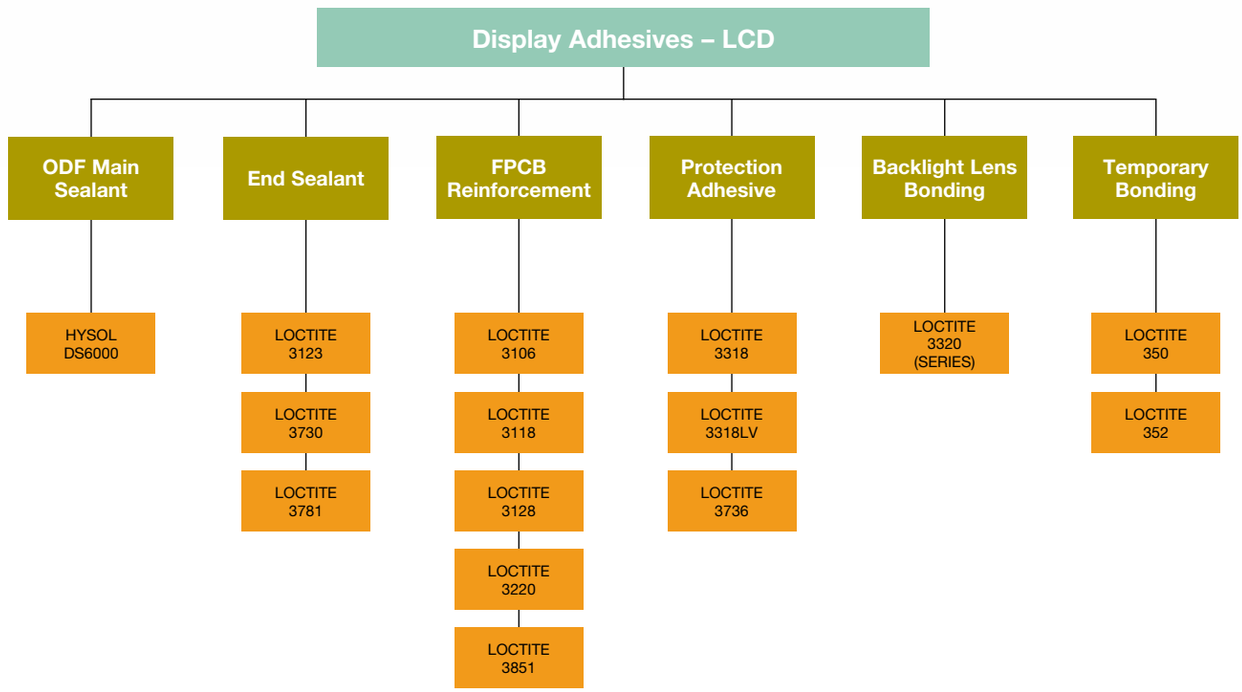
As the popularity of e-books has grown, so have the requirements for high-volume, cost-effective production. Leveraging decades of display materials development expertise, Henkel has designed a complete range of edge sealants and flexible, color filter attachment products that enable efficient manufacturing of these high-value devices.

Henkel's resource investment for ensuring continued advancement within the display sector is considerable and our global support and development footprint unmatched. With advanced research and manufacturing centers located around the globe, Henkel is poised to deliver on your display technology roadmap requirements.



DISPLAY ADHESIVES

LCD



ODF MAIN SEALANT

PRODUCT	DESCRIPTION	CURE TYPE	COLOR	CURE SCHEDULES	VISCOSITY mPa.s (cP)	POT LIFE	SHELF LIFE	KEY CHARACTERISTICS
HYSOL DS6000	Heat curable ODF main sealant for LCD application.	Heat	Light grey	1 hour @ 120°C	300~450 Pa.s	5 days @ RT	N/A	Low WVTR & low temp curable material.

END SEALANT

LOCTITE 3123	UV curable end-sealant for LCD application. Convectional type process.	UV	Transparent amber	100 mW/cm^2 @ 40 second	10,000	6 months @ RT	6 months @ RT	No LC compatibility.
LOCTITE 3730					25,000			
LOCTITE 3781					12,000			

DISPLAY ADHESIVES

LCD

FPCB REINFORCEMENT

PRODUCT	DESCRIPTION	CURE TYPE	COLOR	CURE SCHEDULES	VISCOSITY mPa.s (cP)	POT LIFE	SHELF LIFE	KEY CHARACTERISTICS
LOCTITE 3106	Backside FPCB reinforcement after bonding.	UV	Transparent	100 mW/cm^2 @ 25 seconds	6,000	12 months @ RT	12 months @ RT	High toughness & good elongation.
LOCTITE 3851		UV+ Anaerobic	Pale yellow	100 mW/cm^2 @ 60 seconds	5,500	12 months @ RT	12 months @ RT	
LOCTITE 3118	Drive IC chip reinforcement after drop test.	Heat	White	20 minutes @ 80°C 60 minutes @ 60°C	15,000	14 days @ RT	12 months @ -40°C	Strong adhesion with drive IC chip.
LOCTITE 3128		Heat	Black	20 minutes @ 80°C 60 minutes @ 60°C	15,000	14 days @ RT	12 months @ -40°C	
LOCTITE 3220		Heat	Black	5 –10 minutes @ 80°C	4,500	14 days @ RT	12 months @ -40°C	

PROTECTION ADHESIVE

LOCTITE 3318	Reworkable & fast curable UV.	UV	Transparent	100 mW/cm^2 @ 2 seconds	2,100	12 months @ RT	12 months @ RT	Curable by LED UV source. Easy dispensing. No damage to metal layer.
LOCTITE 3318LV		UV	Transparent	100 mW/cm^2 @ 2 seconds	968	12 months @ RT	12 months @ RT	
LOCTITE 3736		UV	Transparent pale yellow	100 mW/cm^2 @ 40 seconds	500	12 months @ RT	12 months @ RT	Easy dispensing. No damage to metal layer.

BACKLIGHT LENS BONDING

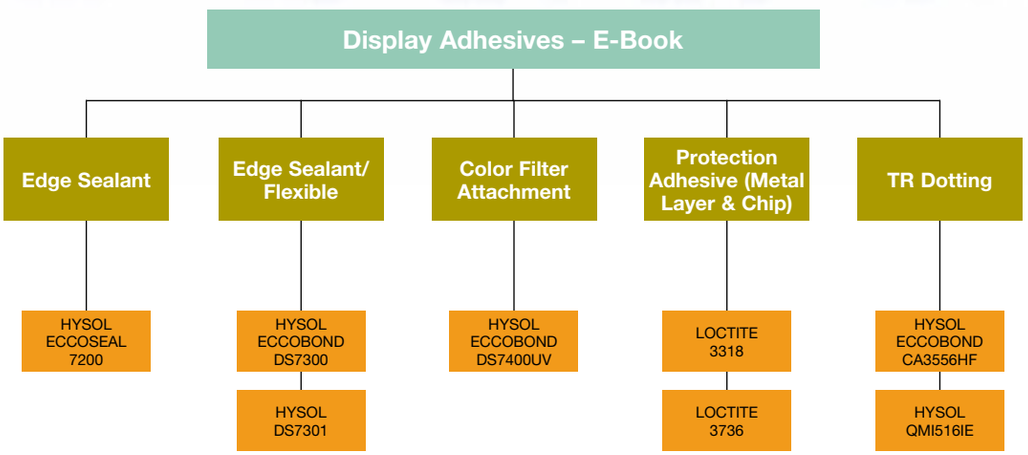
LOCTITE 3220 SERIES	Strong adhesion on PCB & lens.	Heat	Various	5 – 10 minutes @ 80°C	4,500	14 days @ RT	12 months @ RT	Good reliability performance.

TEMPORARY BONDING

LOCTITE 350	Temporary bonding for cell alignment.	UV	Transparent	100 mW/cm^2 @ 30 seconds	5,000	12 months @ RT	12 months @ RT	Good adhesion with LCD cell (glass).
LOCTITE 352		UV	Transparent light amber	100 mW/cm^2 @ 30 seconds	20,000	12 months @ RT	12 months @ RT	

DISPLAY ADHESIVES

E-BOOK



EDGE SEALANT

PRODUCT	DESCRIPTION	CURE TYPE	COLOR	CURE SCHEDULES	VISCOSITY mPa.s (cP)	POT LIFE	SHELF LIFE	KEY CHARACTERISTICS
HYSOL ECCOSEAL 7200	Edge sealant for e-book application.	Heat	Beige	30 minutes @ 70°C	2,500	12 hours @ RT	6 months @ -40°C	Low WVTR & low temp curable material.

EDGE SEALANT/FLEXIBLE

HYSOL ECCOBOND DS7300	Edge sealant for semiflexible e-book application.	Heat	White	60 minutes @ 70°C	1,200	24 hours @ RT	6 months @ -25°C	Low WVTR, low temp curable & semiflexible. No crack after bending.
HYSOL DS7301		Heat	Beige	90 minutes @ 70°C 60 minutes @ 80°C	600	10 hours @ RT	6 months @ -40°C	

COLOR FILTER ATTACHMENT

HYSOL ECCOBOND DS7400UV	Color filter attachment on e-media to make color EPD.	UV	Transparent	100 mW/cm^2 @ 60 seconds	500	1 month @ 0-8°C	6 months @ RT	High transmittance & good adhesion with plastic.

PROTECTION ADHESIVE (METAL LAYER & CHIP)

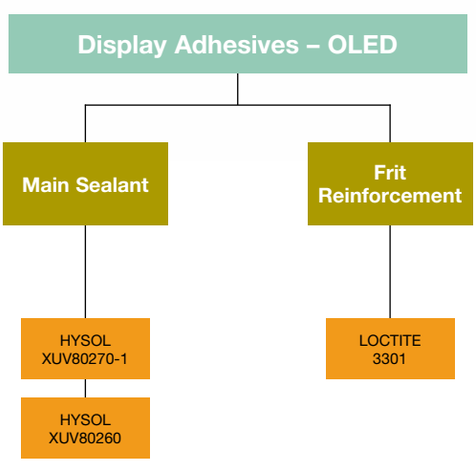
LOCTITE 3318	Reworkable & fast curable UV.	UV	Transparent	100 mW/cm^2 @ 2 seconds	2,100	12 months @ RT	12 months @ RT	Curable by LED UV source. Easy dispensing. No damage to metal layer.
LOCTITE 3736		UV	Transparent pale yellow	100 mW/cm^2 @ 40 seconds	500	12 months @ RT	12 months @ RT	Easy dispensing. No damage to metal layer.

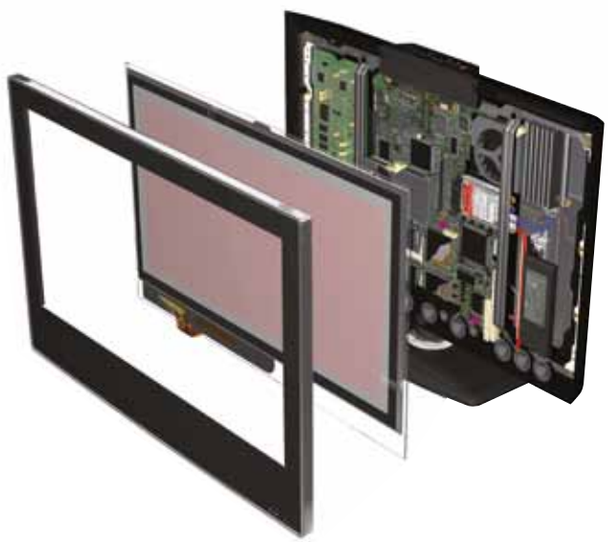
TR DOTTING

PRODUCT	DESCRIPTION	CURE TYPE	COLOR	CURE SCHEDULES	VISCOSITY mPa.s (cP)	POT LIFE	SHELF LIFE	VOLUME RESISTIVITY
HYSOL ECCOBOND CA3556HF	Transfer dotting between e-media & TFT.	Heat	Silver	60 seconds @ 110°C 80 minutes @ 70°C	30,000	2 days @ RT	6 months @ -20°C	0.0025 ohm-cm^2
HYSOL QMI516IE		Heat	Silver	60 seconds @ 90°C 90 minutes @ 60°C	15,900	6 hours @ RT	12 months @ -40°C	0.0015 ohm-cm^2

DISPLAY ADHESIVES

OLED





MAIN SEALANT

PRODUCT	DESCRIPTION	CURE TYPE	COLOR	CURE SCHEDULES	VISCOSITY mPa.s (cP)	POT LIFE	SHELF LIFE	KEY CHARACTERISTICS
HYSOL XUV80270-1	Main sealant for rigid type OLED.	UV	White paste	100 mW/cm² @ 60 seconds	100 – 120	1 month @ RT	6 months @ 2°C - 8°C	Low water vapor transmission rate and good adhesion on ITO coated glass.
HYSOL XUV80260		UV	White paste	100 mW/cm² @ 60 seconds	2,500	1 month @ RT	6 months @ 2°C - 8°C	

FRIT REINFORCEMENT

LOCTITE 3301	Frit reinforcement adhesive for OLED application. Fluorescent version of LOCTITE 3301 is LOCTITE 190992.	UV	Transparent, light pale yellow	100 mW/cm² @ 25 seconds	90 – 150	12 months @ RT	12 months @ RT	Good adhesion on frit & easy to flow cell gap.

INKS & COATINGS

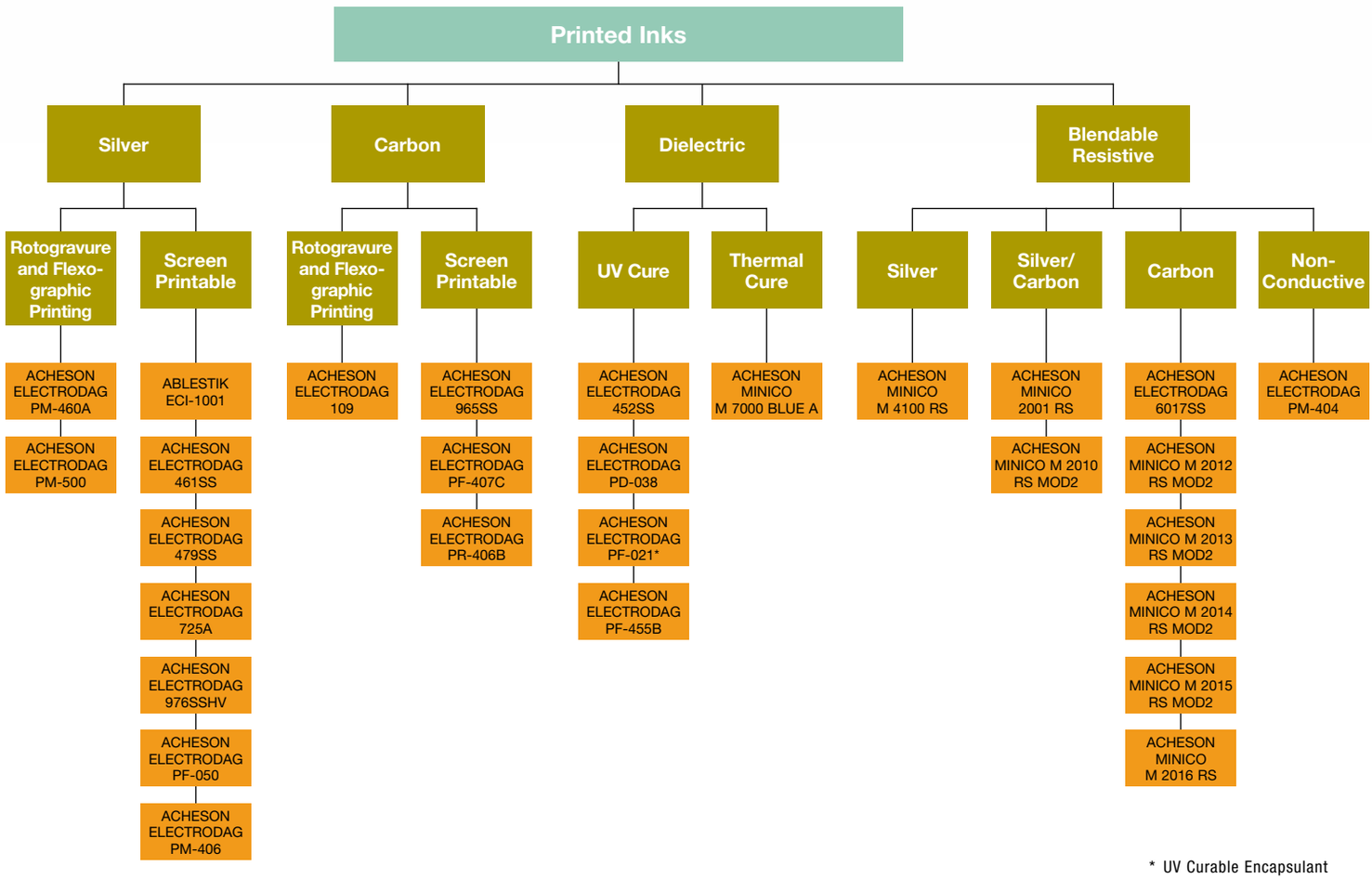
For decades, Henkel's product range of conductive, dielectric and other functional polymer thick film inks have been used to apply selective coatings on a variety of flexible and rigid substrates, via screen, flexographic and rotogravure printing methods.

They can be effectively dried or cured through heat or UV radiation. Henkel's conductive (silver, silver/silverchloride, carbon-based), dielectric and other functional (e.g., electroluminescing pigments–based) inks are used for the production of:

- Flexible circuits for membrane touch switches and keyboards for desktop and notebook PCs
- Heating elements
- Automotive sensors
- Biosensors and EKG/ECG electrodes
- Antennas for contactless smartcards and RFID labels
- Touch screens
- EL lamps
- Printed circuit boards and potentiometers

INKS & COATINGS

PRINTED INKS

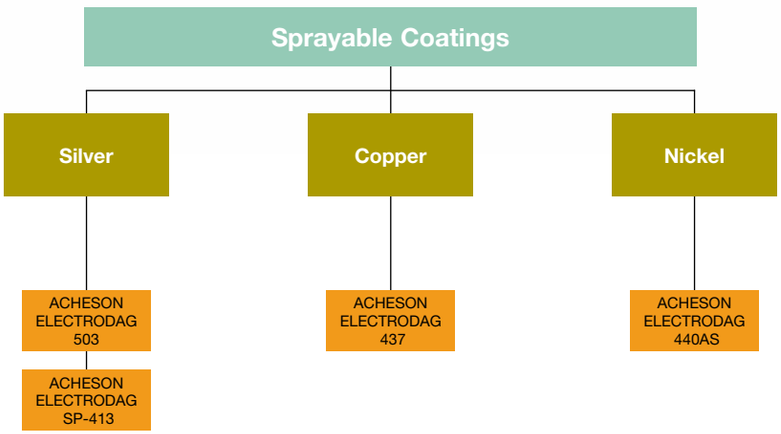


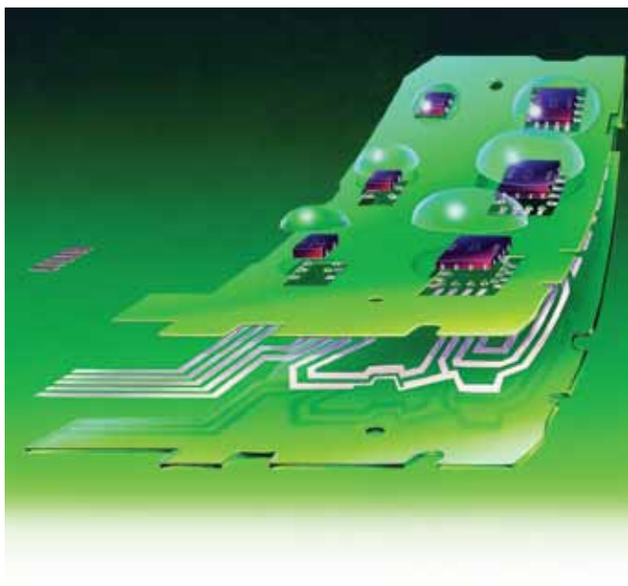
* UV Curable Encapsulant

SILVER INKS – ROTOGRAVURE AND FLEXOGRAPHIC PRINTING

PRODUCT	DESCRIPTION	APPLICATION	CURE SCHEDULE	SHEET RESISTANCE – OHM/SQUARE/25µ	STORAGE LIFE
ACHESON ELECTRODAG PM-460A	Silver ink designed to dry rapidly to form a flexible, conductive coating. It is suitable for applications using flexographic or rotogravure printing techniques. The coating will maintain its low resistance even after exposure to heat, cold and humid conditions.	Electronic circuitry, RFID antenna and bio and medical sensors.	50 minutes @ 100°C	< 0.01	12 months @ 5°C to 30°C
ACHESON ELECTRODAG PM-500	Water-based silver ink for flexographic printing on paper and plastic film.	Printed antennas for RFID labels, bio and medical sensors.	1 minute @ 120°C	< 0.025	6 months @ 5°C to 40°C

SPRAYABLE COATINGS

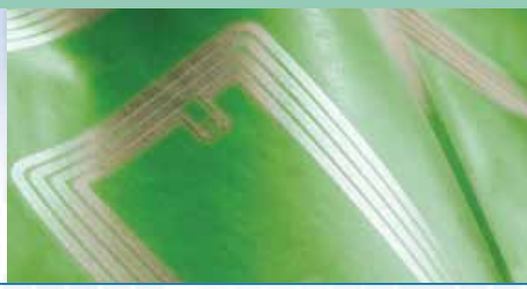




SILVER INKS – SCREEN PRINTABLE

PRODUCT	DESCRIPTION	APPLICATION	CURE SCHEDULE	SHEET RESISTANCE – OHM/SQUARE/25µ	STORAGE LIFE
ABLESTIK ECI-1001	Screen printable, conductive ink designed for membrane touch switch and other flex circuit applications. Offers excellent balance of flexibility, hardness and adhesion.	PTF circuits, membrane touch switches and flexible circuits.	10 minutes @ 120°C Minimum, in Convection oven	< 30	12 months @ 5°C
ACHESON ELECTRODAG 461SS	Conductive ink is designed for display applications on ITO film. It consists of very finely divided silver particles dispersed in a thermoplastic resin.	Busbar in touch screens and computer/palm-top panels. Electrode/ busbar in El lamps.	30 minutes @ 71°C or 15 minutes @ 93°C or 5 minutes @ 121°C	< 0.020	12 months @ 5°C to 27°C
ACHESON ELECTRODAG 479SS	Silver conductive screen printable polymer thick film ink is designed for use on membrane switches.	Conductive traces in membrane touch switches and other flexible circuitry.	15 minutes @ 93°C	< 0.020	12 months @ 2°C to 8°C
ACHESON ELECTRODAG 725A	Silver conductive polymer thick film ink is designed for use in the production of low voltage circuitry on polyester film.	Conductive traces in membrane touch switches and other flexible circuitry.	15 minutes @ 120°C	< 0.015	12 months @ 4°C to 8°C
ACHESON ELECTRODAG 976SSHV	Silver conductive ink designed for use in the production of rigid printed circuit boards	Cross-overs and through-hole connection (vacuum suction).	Pre-dry 15 minutes @ 70°C, cure 30 minutes @ 150-160°C	< 0.025	12 months @ 4°C to 8°C
ACHESON ELECTRODAG PF-050	Screen printable silver ink for plastic film and paper substrates. Highly conductive, superior fine line printability.	Printed antennas for contactless smartcards and RFID labels.	15 minutes @ 121°C or 3 minutes 140°C	< 0.01	12 months
ACHESON ELECTRODAG PM-406	Conductive screen printable ink that consists of very finely divided silver particles in a thermoplastic resin. It is designed to be applied by screen printing and can be applied with high coating thicknesses of 10 – 20 µm.	Printed antennas.	30 minutes @ 90°C and 15 minutes @ 120°C	< 0.015	12 months @ 4°C to 8°C

INKS & COATINGS



CARBON INKS – ROTOGRAVURE AND FLEXOGRAPHIC PRINTING

PRODUCT	DESCRIPTION	APPLICATION	CURE SCHEDULE	SHEET RESISTANCE – OHM/SQUARE/25µ	STORAGE LIFE
ACHESON ELECTRODAG 109	Carbon ink for flexographic/rotogravure printing on plastic film (PET, PVC) and paper substrates.	Electronic circuitry, RFID antenna, hearing elements and bio and medical sensors.	15 to 30 minutes @ 70°C to 80°C	< 30	12 months

CARBON INKS – SCREEN PRINTABLE

ACHESON ELECTRODAG 965SS	For use in the production of low voltage circuitry on polyester to protect silver pads and tracks from chemical attack and silver migration. It consists of very finely divided graphite particles dispersed in a thermoplastic resin.	Protective coating on silver tracks and pads in membrane switches, keyboards. Conductive jumpers in membrane switches or protection against electrostatic discharge (ESD).	30 minutes @ 90 °C 15 minutes @ 120 °C	< 60	12 months @ 5°C to 30°C
ACHESON ELECTRODAG PF-407C	Thick film carbon ink is designed for production of low voltage circuitry on polyester film and solvent sensitive substrates such as polycarbonate.	Membrane touch switches and keyboards. Bio and medical.	15 minutes @ 120°C	< 20	12 months @ 5°C to 30°C
ACHESON ELECTRODAG PR-406B	Carbon polymer thick film ink for application on most rigid substrates.	Copper contact protection; conductive pads and jumpers, printed resistors.	30 minutes @150°C	< 10	12 months @ 5°C to 30°C

DIELECTRIC INKS – UV CURE

ACHESON ELECTRODAG 452SS	Dielectric ink is designed as an insulating and protective ink in the production of low voltage circuitry on untreated or print receptive polyester and polycarbonate film.	Tail coating membrane touch switches and PC desktop/notebook keyboards.	0.5 joules/cm^2	> 2×10^9	12 months @ 5°C to 25°C
ACHESON ELECTRODAG PD-038	Screen printable, UV curable dielectric ink for ITO treated PET film and copper-etched circuitry.	Dot spacer for touch screens and computer/palm-top panels. Spacer for copper-etched circuitry.	0.5 joules/cm^2	> 2×10^9	12 months below 60°C
ACHESON ELECTRODAG PF-021	Encapsulating photopolymer designed to secure low profile surface mount devices (SMD) to rigid or flexible substrates. Effective for use as a physical and environmental protection of the mounted device.	Encapsulant.	0.5 joules/cm^2	> 2×10^9	12 months @ 32°C
ACHESON ELECTRODAG PF-455B	Non-conductive ink formulated as a crossover dielectric and is compatible with other ELECTRODAG inks.	Crossover dielectric in membrane touch switches and PC desktop/ notebook keyboards.	0.5 joules/cm^2	> 2×10^9	12 months @ 5°C to 25°C

DIELECTRIC INKS – THERMAL CURE

ACHESON MINICO M 7000 BLUE A	Screen printable solvent-based dielectric ink designed for insulating hybrid circuitry. This adhesive is compatible with MINICO M 4100 and MINICO M 2000 Series inks.	Printed circuit boards and hybrid circuits.	25 minutes @ 165°C	> 2×10^9	12 months @ 18°C to 25°C

BLENDABLE RESISTIVE INKS – SILVER

ACHESON MINICO M 4100 RS	One-component silver-filled, electroless nickel plateable conductive polymer.	Polymer material can also be utilized in interconnect or crossover applications.	5-10 minutes @ 120°C	< 0.04	12 months @ 18°C to 25°C

BLENDABLE RESISTIVE INKS – SILVER/CARBON

ACHESON MINICO 2001 RS	MINICO M 2000 RS MOD2 are a series of one-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/ sq/25 µm. The MOD2 series are a modification of the standard MINICO M 2000 RS Series with improved sliding characteristics. The MINICO M 2001 RS can be mixed with the MINICO M 2010 RS MOD2.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5-10 minutes @ 120°C	1	12 months
ACHESON MINICO M 2010 RS MOD2	MINICO M 2000 RS MOD2 are a series of one-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/ sq/25 µm. The MOD2 series are a modification of the standard MINICO M 2000 RS Series with improved sliding.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5-10 minutes @ 120°C	10	12 months

INKS & COATINGS

BLENDABLE RESISTIVE INKS – CARBON

PRODUCT	DESCRIPTION	APPLICATION	CURE SCHEDULE	SHEET RESISTANCE – OHM/SQUARE/25µ	STORAGE LIFE
ACHESON ELECTRODAG 6017SS	Screen printable carbon ink for PET film.	Heating elements, printed resistors blendable with ELECTRODAG PM-404 to provide a range of resistance values.	5 to 10 minutes @ 120°C	< 35 50-3500 when blended with ELECTRODAG PM-404	12 months @ 5°C to 30°C
ACHESON MINICO M 2012 RS MOD2	One-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/sq/25 µm.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5 to 10 minutes @ 120°C	100	12 months
ACHESON MINICO M 2013 RS MOD2	One-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/sq/25 µm.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5 to 10 minutes @ 120°C	1	12 months
ACHESON MINICO M 2014 RS MOD2	One-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/sq/25 µm.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5 to 10 minutes @ 120°C	10	12 months
ACHESON MINICO M 2015 RS MOD2	One-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/sq/25 µm.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5 to 10 minutes @ 120°C	100	12 months
ACHESON MINICO M 2016 RS	One-component, screen printable resistive carbon inks covering a resistance range of 10 till 105 Ohm/sq/25 µm.	Printing potentiometers and resistors onto printed circuit boards. Rigid circuits, LED attach.	5 to 10 minutes @ 120°C	> 5 x 10^5	12 months

BLENDABLE RESISTIVE INKS – NON-CONDUCTIVE

ACHESON ELECTRODAG PM-404	Non-conductive, screen printable, highly resistive ink for PET film.	Heating elements, printed resistors blendable with ELECTRODAG 6017SS to provide a range of resistance values.	15 minutes @ 120°C	> 2×10^9	12 months @ 5°C to 30°C

SPRAYABLE COATINGS – SILVER

ACHESON ELECTRODAG 503	One-component, solvent resistant, silver conductive coating that withstands temperature over 260ºC. Counter electrode silver paint for solid tantalum capacitors.	Counter electrode silver paint for solid tantalum capacitors.	Air dry @ 4 hours	0.05	6 months @ 25°C
ACHESON ELECTRODAG SP-413	Shielding coating is designed to provide electromagnetic compatibility (EMC) on plastic enclosures for electronic equipment housing. This material provides excellent shielding against radiated electromagnetic interference (EMI) at low coating thicknesses.	Plastic housing of consumer electronics and medical equipment, scientific and medical equipment, and Industrial.	30 minutes @ 70°C to 80ºC	0.015	12 months @ 5°C to 30°C

SPRAYABLE COATINGS – COPPER

ACHESON ELECTRODAG 437	EMC shielding coating is designed to provide electromagnetic compatibility (EMC) in electronic equipment housing. It is an extremely conductive copper coating that provides excellent shielding against radiated electromagnetic interference (EMI) and protection against electrostatic discharge (ESD).	Reflective coating on parabolic antennas and plastic housing of consumer electronics and medical equipment.	15 minutes @ 70°C	0.5	12 months @ 5°C to 30°C

SPRAYABLE COATINGS – NICKEL

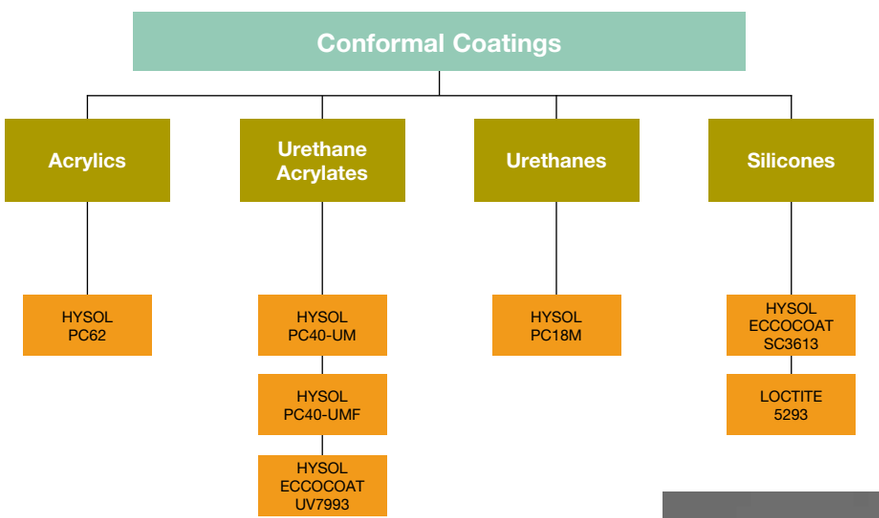
ACHESON ELECTRODAG 440AS	EMC shielding coating is designed to provide electromagnetic compatibility (EMC) in electronic equipment housing. Used as a reflective coating on parabolic antennas and plastic housing of consumer electronics and medical equipment.	Plastic cabinetry of computers, printers, keyboards, visual display units, disc drive units, teleprinters, telephone equipment, electronic typewriters, copiers, consumer electronics and industrial, scientific and medical equipment.	30 minutes @ 70°C to 80ºC	0.5	12 months @ 5°C to 30°C

PCB PROTECTION

CONFORMAL COATINGS

While Henkel is providing the leading materials used inside advanced packages and on sophisticated assemblies, we also deliver next-generation LOCTITE and ECCOCOAT brand conformal coating materials to ensure superior product protection. Many applications expose printed circuit boards (PCBs) to harsh environments and Henkel is committed to delivering materials that provide extraordinary environmental and thermal cycling protection.

Our advanced conformal coating materials protect PCBs from thermal shock, moisture corrosive materials, and a variety of other adverse conditions to ensure long product life cycles in harsh marine, automotive, aerospace and consumer electronics applications. LOCTITE and ECCOCOAT conformal coatings are available in solvent-free and fast cure materials, enabling process efficiency and environmental responsibility.



PCB PROTECTION

CONFORMAL COATINGS

ACRYLICS

PRODUCT	DESCRIPTION	CURE SCHEDULES	VISCOSITY mPa.s (cP)	OPERATING TEMPERATURE RANGE
HYSOL PC62	Conformal coating that provides environmental and mechanical protection. Toluene-free alternative with superior toughness and abrasion resistance.	45 minutes @ 75°C	50	-40°C to 125°C

URETHANE ACRYLATES

HYSOL PC40-UM	Solvent-free, low viscosity, rapid gel, UV-moisture cure, one-component conformal coating.	30 seconds UV + 3 days @ RT	500	-40°C to 135°C
HYSOL PC40-UMF	Conformal coating specifically formulated to rapidly gel and immobilize when exposed to UV light and then fully cure when exposed to atmospheric moisture, ensuring optimum performance even in shadowed areas.	10 seconds UV + 3 days @ RT	250	-40°C to 135°C
HYSOL ECCOCOAT UV7993	Conformal coating designed to provide rugged protection from moisture and harsh chemicals. It is compatible with industry standard solder masks, no-clean fluxes, metalization, components and substrate materials.	50 hours @ 25°C at > 70% humidity	120	-40°C to 105°C

URETHANES

HYSOL PC18M	Flexible one-component solvent-based urethane coating which may be cured at room temperature. Meets MIL-I-46058C.	2 hours @ 60°C	350	-40°C to 110°C

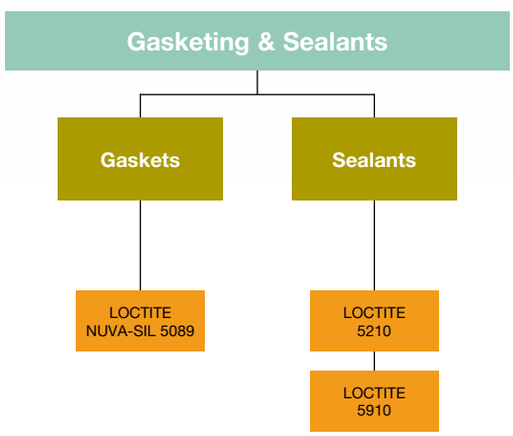
SILICONES

HYSOL ECCOCOAT SC3616	One-component, protective coating engineered to meet high reliability performance requirements for the optoelectronic/semiconductor industry. It minimizes alpha particle interactions with sensitive circuitry.	< 5 minutes @ 175°C	3,500	-40°C to 200°C
LOCTITE 5293	Repairable, solvent-free, medium viscosity, UV/moisture silicone.	20 seconds UV + 3 days @ RT	600	-40°C to 200°C

PCB PROTECTION

GASKETING & SEALANTS

LOCTITE silicone gasketing materials offer precise, reliable sealing for electronic enclosures, ensuring that housing modules are tightly secured and componentry is protected. LOCTITE silicone encapsulants are specially formulated to isolate sensitive fine-pitch leads from potentially damaging thermal cycling conditions. Like all Henkel products, these materials have been designed for ease-of-use and are conveniently packaged for dispense operations.



GASKETS

PRODUCT	DESCRIPTION	CURE SCHEDULES	CHEMISTRY	VISCOSITY mPa.s (cP)	SHORE A HARDNESS
LOCTITE NUVA-SIL 5089	Used for gasketing and sealing applications. Upon exposure to sufficient UV light and/or atmospheric moisture, this product cures to form a durable, flexible rubber sealant. Typical applications include gasketing/sealing of enclosures that require a rapid curing, post-applied sealant that facilitates immediate on-part inspection.	60 seconds UV + 3 days RT	Alkoxy silicone	100,000	> 25

SEALANTS

LOCTITE 5210	One-component ultra fast curing, non-corrosive RTV silicone designed for potting, wire tacking, selective sealing, vibration dampening and repair/rework applications on PCBs. Suited for high-volume manufacturing and is particularly effective for automotive electronics applications or other harsh environments. Fast surface cure allows material to be handled quickly after dispensing.	24 hours @ 25 °C	Alkoxy silicone	N/A	48
LOCTITE 5910	One-component silicone sealant. Typical applications include stamped sheet metal covers (timing covers and oil sumps) where good oil resistance and the ability to withstand high joint-movement is required.	7 days @ 25°C	Oxime silicone	N/A	30

PCB PROTECTION

LOW PRESSURE MOLDING (MACROMELT)

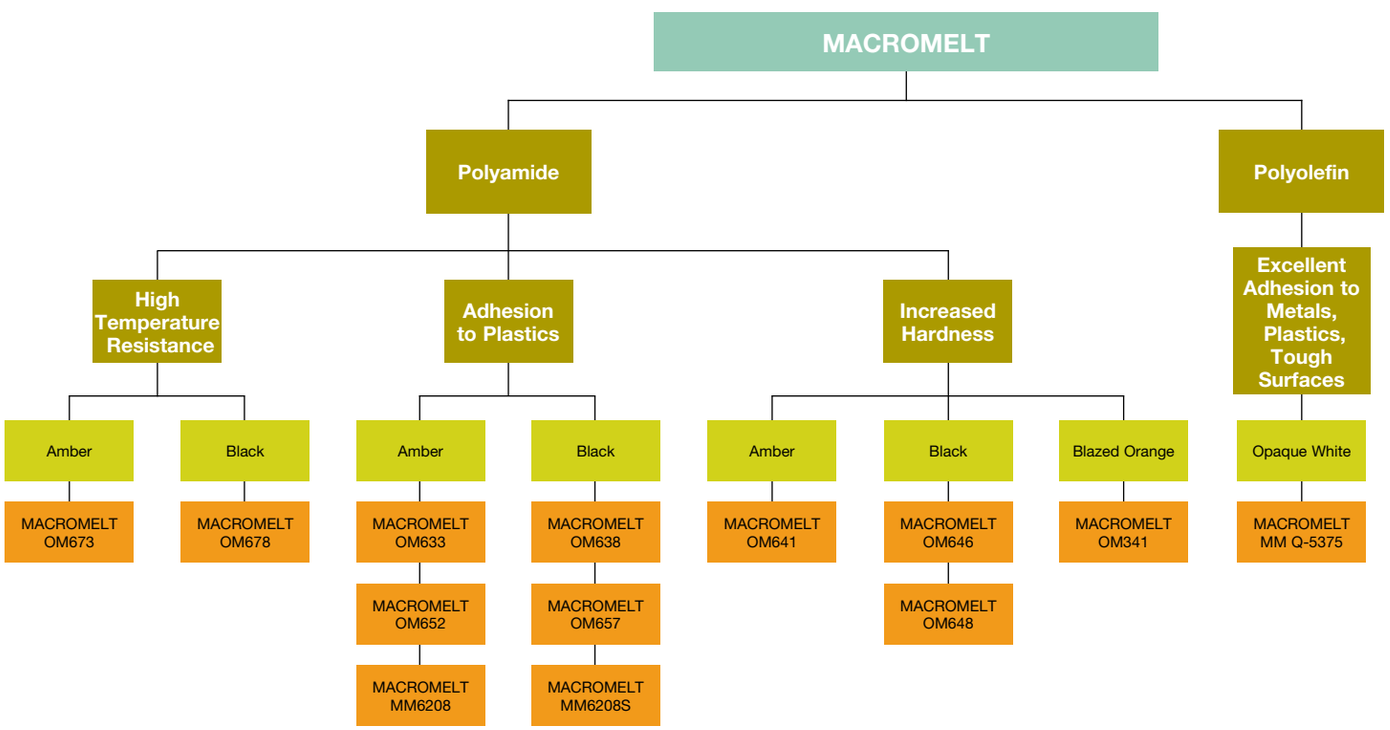
Henkel's renowned MACROMELT low-pressure molding solution is delivering superior sealing adhesion and excellent temperature and solvent resistance. The simplicity of these materials is their advantage: because the entire MACROMELT operation takes place at low pressure, cycle time is short and fine or fragile circuitry is not damaged, delivering measurable improvements over that of traditional potting or encapsulating processes. PCB and circuitry protection is essential in modern, challenging applications; and Henkel delivers manufacturers proven, reliable solutions and peace-of-mind.

Advantages:

- Complete watertight encapsulation
- Fast cycle time (15 to 45 seconds)
- Low capital equipment costs
- Safe, one-component, UL 94V-0 approved
- Low pressure and high speed molding for electronics encapsulation

Applications:

- Automotive sensors
- Hall effect sensors
- Circuit board protection
- Strain relief
- Switches
- Battery sealing



PCB PROTECTION

LOW PRESSURE MOLDING (MACROMELT)

POLYAMIDE – HIGH TEMPERATURE RESISTANCE - AMBER

PRODUCT	DESCRIPTION	OPERATING TEMP (°C)	VISCOSITY @ 210°C mPa.s (cP)	SOFTENING POINT (°C)	Tg (°C)	CTE ABOVE Tg (ppm/°C)	SHORE A HARDNESS	ELONGATION AT BREAK, %
MACROMELT OM673	High performance thermoplastic polyamide is designed to meet low pressure molding process requirements. This product can be processed at low processing pressure due to its low viscosity, allowing encapsulation of fragile components without damage. Used in automotive underhood applications, where high service temperature performance is critical.	-40 to 140	3,400	182 to 192	-50	160	88	400

POLYAMIDE – HIGH TEMPERATURE RESISTANCE - BLACK

MACROMELT OM678	High performance thermoplastic polyamide is designed to meet low pressure molding process requirements. This product can be processed at low processing pressure due to its low viscosity, allowing encapsulation of fragile components without damage. This material produces no toxic fumes in process and provides a good balance of low and high temperature performance.	-40 to 140	3,400	182 to 192	-50	161	88	400

POLYAMIDE – ADHESION TO PLASTICS - AMBER

MACROMELT OM633	Moldable polyamide with service temperature up to 125°C, such as in an automobile firewall.	-40 to 125	3,500	170 to 180	-36	224	90	400
MACROMELT OM652	Moldable polyamide where excellent adhesion and cold temperature flexibility are important, such as in an automotive exterior. Also used extensively in white goods.	-40 to 100	4,000	157 to 165	-45	273	77	400
MACROMELT MM6208	Moldable polyamide with excellent adhesion to tough substrates. Great flexibility offers incredible strain relief on cables and wires. Ideal for encapsulation of heat producing components in appliance and consumer electronics. UL RTI 95°C.	-40 to 130	3,200	150 to 160	-37	193	79	570

POLYAMIDE – ADHESION TO PLASTICS - BLACK

MACROMELT OM638	Moldable polyamide that produces no toxic fumes in process and provides a good balance of low and high temperature performance. Used in applications requiring service temperatures as high as 125°C, such as in an automotive firewall.	-40 to 125	3,400	170 to 180	-36	224	90	400
MACROMELT OM657	Moldable polyamide where excellent adhesion and cold temperature flexibility are important, such as in an automotive exterior. Also used extensively in white goods.	-40 to 100	3,700	157 to 165	-45	235	77	400
MACROMELT MM6208S	Moldable polyamide with excellent adhesion to tough substrates. Great flexibility offers incredible strain relief on cables and wires. Ideal for encapsulation of heat producing components in appliance and consumer electronics. UL RTI 95°C.	-40 to 130	3,600	150 to 160	-42	193	78	600

LOW PRESSURE MOLDING (MACROMELT)

POLYAMIDE – INCREASED HARDNESS - AMBER

PRODUCT	DESCRIPTION	OPERATING TEMP (°C)	VISCOSITY @ 210°C mPa.s (cP)	SOFTENING POINT (°C)	Tg (°C)	CTE ABOVE Tg (ppm/°C)	SHORE A HARDNESS	ELONGATION AT BREAK, %
MACROMELT OM641	Moldable polyamide where strength and hardness are needed, such as in memory sticks and computer connectors.	-40 to 125	7,000	170 to 180	-35	160	92	800

POLYAMIDE – INCREASED HARDNESS - BLACK

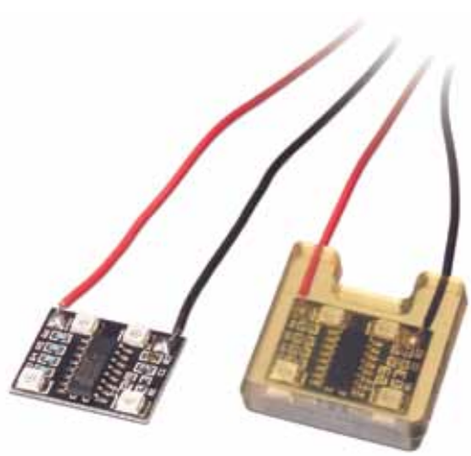
MACROMELT OM646	Moldable polyamide where strength and hardness are needed, such as in memory sticks and computer connectors.	-40 to 125	7,000	170 to 180	-35	160	92	800
MACROMELT OM648	Designed for the bonding of cylindrical fitting parts. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. Typical applications include holding gears.	-40 to 130	7,300	107 to 180	-30	160	93	550

POLYAMIDE – INCREASED HARDNESS - BLAZED ORANGE

MACROMELT OM341	High performance thermoplastic polyamide designed to offer blaze orange color for easy identification of components. It is typically used to encapsulate high voltage modules.	-25 to 125	7,700	168 to 178	-25	160	92	600

POLYOLEFIN – ADHESION TO METALS, PLASTICS AND TOUGH SURFACES - OPAQUE WHITE

MACROMELT MM Q-5375	Moldable polyolefin for demanding moisture and solvent resistance. Excellent adhesion to the most difficult substrates.	-40 to 100	2,000	135 to 144	-35 to -40	20	55	~400

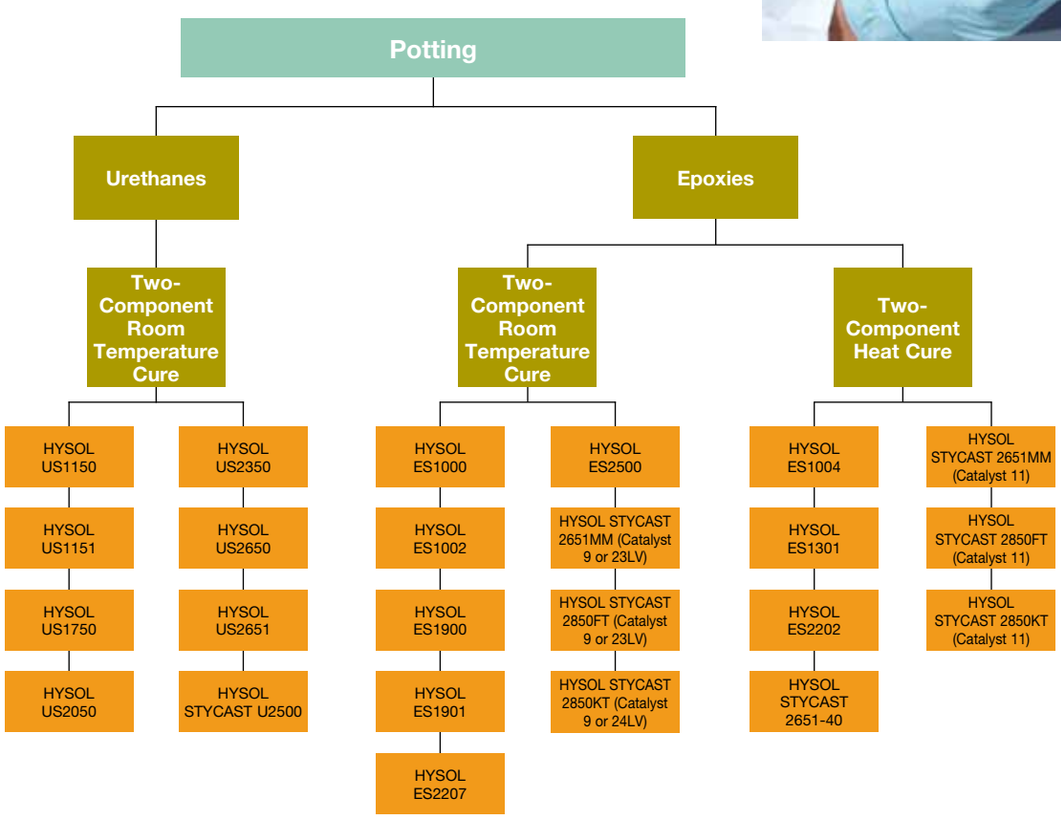


PCB PROTECTION

POTTING

Ensuring that electronics products function as they are designed to is just one piece of the materials solution Henkel delivers. Protecting printed circuit boards and electronic assemblies from thermal cycling and adverse environmental conditions is the other critical component for product durability and reliability. Under the leading HYSOL and STYCAST brands, Henkel offers several PCB protection products to minimize external product stress and maximize performance. Our portfolio of conformal coatings keeps moisture, humidity and other adverse conditions from deteriorating printed circuit boards used in harsh marine, automotive, aerospace and consumer electronics applications. Henkel also strives to keep environmental consciousness at the forefront of all our product development efforts, which is why we have moved toward solvent-free, low-VOC materials and processes.

Henkel's potting and encapsulation compounds protect PCBs and electrical devices by enhancing mechanical strength, offering electrical insulation, and protecting against vibration and shock.



POTTING

URETHANES – TWO-COMPONENT ROOM TEMPERATURE CURE

PRODUCT	DESCRIPTION	MIX RATIO BY WEIGHT	COLOR	RECOMMENDED CURE SCHEDULE	ALTERNATE CURE CYCLE	VISCOSITY mPa.s (cP)	POT LIFE AT 25°C	HARDNESS	THERMAL CONDUCTIVITY W/M*C	FLAMMABILITY RATING	TEMPERATURE RANGE	SHELF LIFE
HYSOL US1150	Extended polybutadiene/ MDI base, mineral filled, medium hardness, ambient cure urethane encapsulant/ sealant. This material can be used for potting electronics or devices for protection against environmental hazards.	21:100	Black	24 to 48 hours @ 25°C	2 to 4 hours @ 60°C	3,500	40 to 60 minutes	60A	0.486	94V-0	-65°C to 125°C	12 months
HYSOL US1151	Low viscosity, reenterable potting and encapsulation compound. It has excellent low temperature properties. It can be used to encapsulate electronics for various applications including under-the-hood automotive and marine.	12.8:100	Black	24 hours @ 25°C	2 to 4 hours @ 60°C	1,000	45 to 60 minutes	30A/780O	0.18	None	-65°C to 125°C	12 months
HYSOL US1750	Elastomeric polyurethane, is a water white, clear, medical grade, fast gel potting material. It is ideal for blood heat exchanger, dialyzer and oxygenerator units.	50.5:49.5	Water white clear	16 hours @ 25°C	1 hour @ 60°C	510	5 minutes	78A	0.19	None	-40°C to 125°C	12 months
HYSOL US2050	Quick set, optically clear polyurethane compound that exhibits excellent ultraviolet resistance. The excellent electrical properties also suggest its use for electrical and electronic component encapsulation.	100:55	Clear	48 hours @ 25°C	2 hours @ 60°C	1,200	4 minutes	90A	0.18	None	-40°C to 125°C	12 months
HYSOL US2350	Flexible, flame retardant, mineral filled, polyurethane compound. This potting compound has long pot life, and is low viscosity so it flows well and adheres to many substrates.	21.2:100	Black	24 hours @ 25°C	2 hours @ 60°C	2,400	45 minutes	85A	0.51	94V-0	-65°C to 125°C	12 months
HYSOL US2650	Inexpensive, low viscosity, flexible, flame retardant, castor oil/MDI-based urethane potting/ encapsulating compound. This material was designed for potting indoor and outdoor telephone connector blocks. It is suitable for potting and encapsulating other electronic or electrical devices or assemblies.	21.2:100	Tan	16 hours @ 25°C	1 hour @ 60°C	3,500	19.5 minutes	83A	0.47	94V-0	-65°C to 125°C	12 months
HYSOL US2651	Unfilled, low viscosity, reenterable potting and encapsulation compound. It can be used to encapsulate electronics for automotive applications including under the hood.	52.3:47.7	Clear amber	16 hours @ 25°C	1 hour @ 65°C	1,000	10 minutes	6000	0.18	None	-65°C to 125°C	12 months
HYSOL STYCAST U2500	Encapsulant designed for transformer, PCBs and other insulation applications. Allows complete impregnation of either small slightly wound coils or large castings.	100:7	Amber	24 hours @ 25°C	4 hours @ 60°C	6,000	2 hours	72A	0.5	None	-40°C to 125°C	6 months

PCB PROTECTION

POTTING

EPOXIES – TWO-COMPONENT ROOM TEMPERATURE CURE

PRODUCT	DESCRIPTION	MIX RATIO BY WEIGHT	COLOR	RECOMMENDED CURE SCHEDULE	ALTERNATE CURE CYCLE	VISCOSITY mPa.s (cP)	POT LIFE AT 25°C	HARDNESS	THERMAL CONDUCTIVITY W/M*C	FLAMMABILITY RATING	TEMPERATURE RANGE	SHELF LIFE
HYSOL ES1000	Two-component, long pot life, casting system. This low cost, flexible system is filled with a nonabrasive filler for machine metering/dispensing. Good thermal shock resistance and low exotherm, making it suitable for encapsulation of various components and modules.	100:90	Black	36 hours @ 25°C	3 hours @ 60°C	25,000	180 minutes	75D	0.42	94HB	-25°C to 105°C	12 months
HYSOL ES1002	Two-component casting system with excellent handling properties. This low cost, flexible system is filled with a nonabrasive filler for machine metering/dispensing or regular hand mixer applications.	100:100	Black	36 hours @ 25°C	3 hours @ 60°C	19,500	60 minutes	88D	0.644	94V-0	-25°C to 105°C	12 months
HYSOL ES1900	Transparent, medium-viscosity epoxy resin formulation recommended for small potting and laminating applications where clarity and excellent structural, mechanical and electrical properties are required.	100:46	Clear	24 hours @ 25°C	2 hours @ 65°C	6,000	10 minutes	90D	0.2	None	-60°C to 125°C	12 months
HYSOL ES1901	Fast-setting, toughened, medium viscosity, industrial grade epoxy adhesive. Ideal for bonding plastic, metal, glass, wood, ceramic, rubber, and masonry materials where flexibility is needed. Designed for a variety of applications such as flex circuits, cable boots, and staking fillet bonds.	100:105	Clear	24 hours @ 25°C	1 hour @ 65°C	2,400	3 minutes	55D	0.2	None	-40°C to 105°C	12 months
HYSOL ES2207	Filled, resilient, low viscosity, room temperature cure epoxy potting compound. This material has excellent adhesion to many substrates, and has good surface appearance.	100:15.8	Black	24 hours @ 25°C	2 hours @ 65°C	8,800	90 minutes	75D	0.4	94V-0	-40°C to 125°C	12 months
HYSOL ES2500	Resilient, low cost, fast gelling, potting compound. Designed for easy 2 to 1 meter-mix-dispense machinery and low abrasion. This material is ideal for potting and encapsulating high volume parts.	100:29.5	Black	16 hours @ 25°C	1 hour @ 65°C	1,500	10 minutes	70D	0.288	94HB	-40°C to 105°C	12 months
HYSOL STYCAST 2651MM (Catalyst 9 or 23LV)	Filled, low viscosity, general purpose, epoxy encapsulant which requires low viscosity and low abrasion. It is especially useful for machine dispensing and for parts that require post molding machining.	100:7	Black	24 hours @ 25°C	2 hours @ 65°C	14,000	45 minutes	88D	0.6	None	-40°C to 130°C	12 months
HYSOL STYCAST 2850FT (Catalyst 9 or 23LV)	Two-component, thermally conductive epoxy encapsulant that can be used with a variety of catalysts. Used in the encapsulation of components which need heat dissipation and thermal shock properties.	100:3.5	Black	24 hours @ 25°C	2 hours @ 65°C	58,000	45 minutes	96D	1.25	None	-40°C to 130°C	12 months
HYSOL STYCAST 2850KT (Catalyst 9 or 23LV)	Two-component, thermally conductive epoxy encapsulant designed for replacement for heat sinks in nonintegrated electrical components and assemblies.	100:2.0	Black	24 hours @ 25°C	2 hours @ 65°C	174,000	45 minutes	94D	2.68	None	-40°C to 130°C	12 months

POTTING

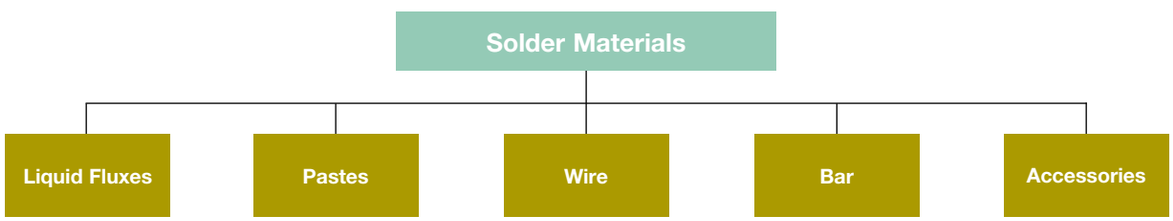
EPOXIES – TWO-COMPONENT HEAT CURE

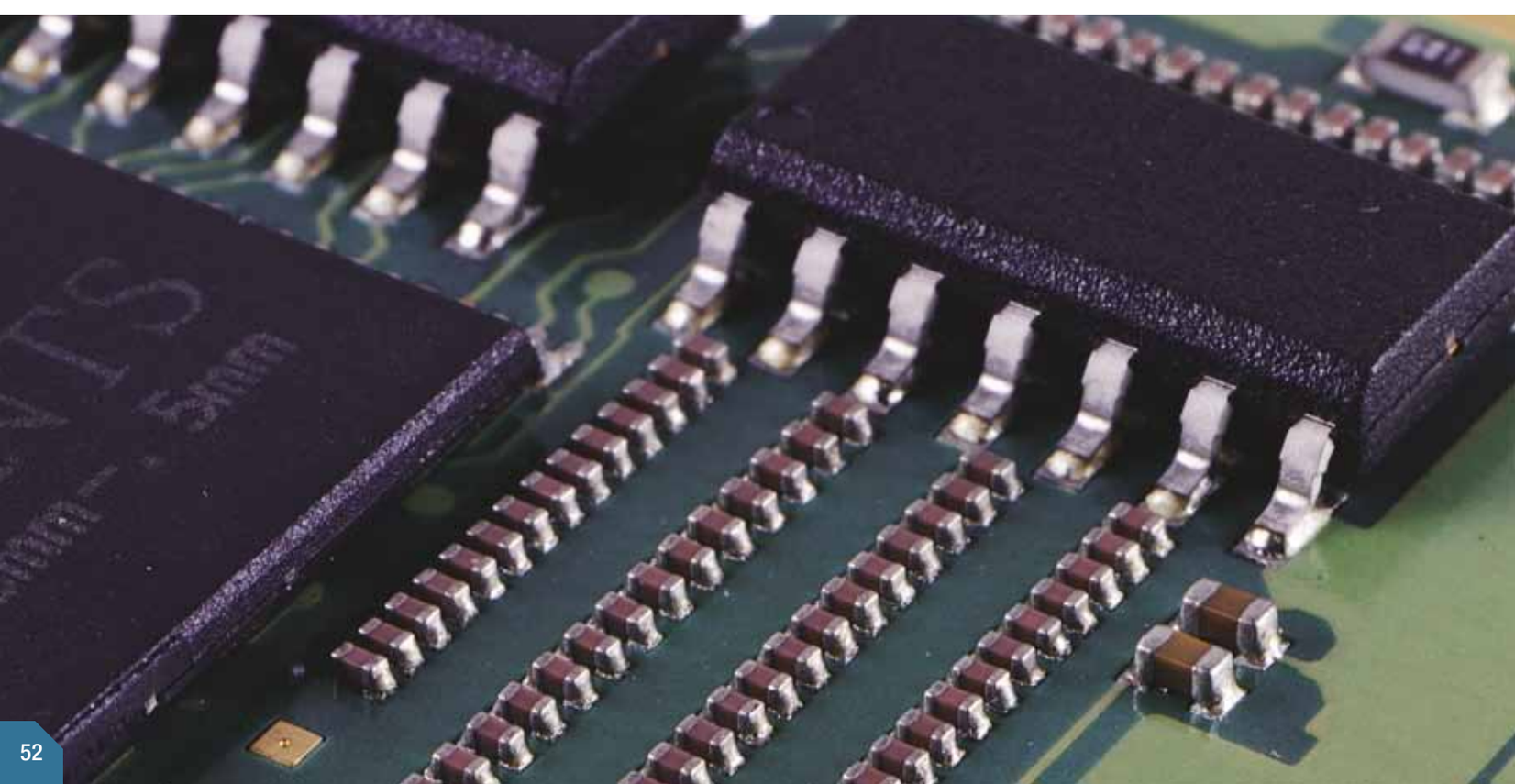
PRODUCT	DESCRIPTION	MIX RATIO BY WEIGHT	COLOR	RECOMMENDED CURE SCHEDULE	ALTERNATE CURE CYCLE	VISCOSITY mPa.s (cP)	POT LIFE AT 25°C	HARDNESS	THERMAL CONDUCTIVITY W/M*C	FLAMMABILITY RATING	TEMPERATURE RANGE	SHELF LIFE
HYSOL ES1004	Casting compound formulated to meet the needs for flame-out, easily handled casting systems. The cured system is nonburning of self-extinguishing according to ASTM D 635 and meets UL requirements for 94V-0.	100:13	Black	2 hours @ 80°C plus 2 hours @ 150°C	None	26,000	8 hours	88D	0.6	94V-0	-40°C to 150°C	12 months
HYSOL ES1301	Silica filled epoxy casting system recommended for coils, transformers, and general purpose casting.	100:38	Black	4 hours @ 110°C	2 hours @ 125°C	1,600	> 8 hours	90D	0.42	None	-40°C to 150°C	12 months
HYSOL ES2202	Unfilled epoxy system with a high operating temperature and long pot life. Recommended for servo stators, high temperature resistors, transformers, and high temperature cast shapes.	100:25	Clear/ amber	2 hours @ 80°C plus 2 hours @ 150°C	None	8,000	8 hours	85D	0.2	None	-40°C to 180°C	12 months
HYSOL STYCAST 2651-40	Two-component, easy to use, low viscosity, epoxy encapsulant with excellent adhesion to metals, plastics and ceramics.	100:10.5	Black	60 minutes @ 120°C	Gel @ 75°C plus 2 hours @ 105°C	5,000	4 hours	85D	0.5	None	-75°C to 175°C	12 months
HYSOL STYCAST 2651MM (Catalyst 11)	Filled, low viscosity, general purpose, epoxy encapsulant which requires low viscosity and low abrasion. It is especially useful for machine dispensing and for parts that require post molding machining.	100:8.5	Black	60 minutes @ 120°C	4 hours @ 100°C or 16 hours @ 85°C	13,000	> 4 hours	89D	0.6	None	-55°C to 155°C	12 months
HYSOL STYCAST 2850FT (Catalyst 11)	Two-component, thermally conductive epoxy encapsulant that can be used with a variety of catalysts. Used in the encapsulation of components which need heat dissipation and thermal shock properties.	100:4.5	Black	60 minutes @ 120°C	4 hours @ 100°C or 16 hours @ 85°C	64,000	> 4 hours	96D	1.28	None	-55°C to 155°C	12 months
HYSOL STYCAST 2850KT (Catalyst 11)	Two-component, thermally conductive epoxy encapsulant designed for replacement for heat sinks in nonintegrated electrical components and assemblies.	100:2.5	Black	60 minutes @ 120°C	4 hours @ 100°C or 16 hours @ 85°C	125,000	> 4 hours	95D	2.78	None	-55°C to 155°C	12 months

SOLDER MATERIALS

Henkel offers innovative solutions for any type of solder materials, depending on the specific requirements. Henkel has developed a broad range of liquid fluxes, solder pastes, and solder wires to suit a variety of applications as a global leader in brands and technologies.

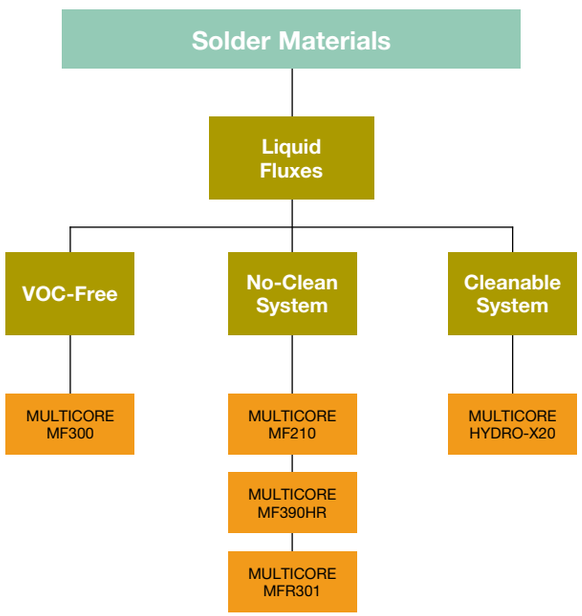
We offer soldering material solutions supported by global technical and process support suitable for the most rigorous modern assembly processes: ultra-fine pitch printing at high speed, long abandon times, pin testability across all types of assemblies and surface finishes.





LIQUID FLUXES

With a variety of formulations for various wave soldering processes, MULTICORE brand high performance liquid flux technology is compatible with dual-wave and lead-free processes, delivering outstanding results. From no-clean to low-residue to VOC-free, MULTICORE brand fluxes deliver unique properties for individualized manufacturing needs. Henkel's flux formulation teams are unmatched when it comes to expertise and ingenuity – two characteristics that are essential to the development of modern, lead-free and environmentally responsible processes. Through careful process analysis and a complete understanding of chemical interactions and manufacturing requirements, Henkel has developed a broad range of MULTICORE brand liquid fluxes to suit a variety of applications.



LIQUID FLUXES – VOC-FREE

PRODUCT	DESCRIPTION	SOLID CONTENT (%)	ACID VALUE (mg KOH/g)	IPC/J-STD-004 CLASSIFICATION	APPLICATION
MULTICORE MF300	General-purpose, VOC-free (water-based), no-clean, halide-free and resin-free flux with special formulation to minimize solder balling. Compatible with lead-free processes.	4.6	37	ORM0	Spray/Foam

LIQUIDS FLUXES – NO-CLEAN SYSTEM

MULTICORE MF210	No-clean, resin-free, halide-free liquid flux designed for surfaces with poor solderability. Dual wave soldering application.	2.9	22.5	ORM0	Spray/Foam
MULTICORE MF390HR	Halogen-free liquid flux designed for applications where the customer requires low levels of residue, has poor solderable surfaces, has multiple lines with different alloys and wants to use one flux system, and is keen to reduce process cleaning costs.	6.0	22.5	ROL0	Spray/Foam/Wave
MULTICORE MFR301	Higher solids, halide-free flux for better wetting on reduced solderability surfaces and to minimize bridging on complex geometries. Fully lead-free and dual wave compatible. Solvent-based flux may be thinned with IPA.	6.0	40	ROM0	Spray/Foam

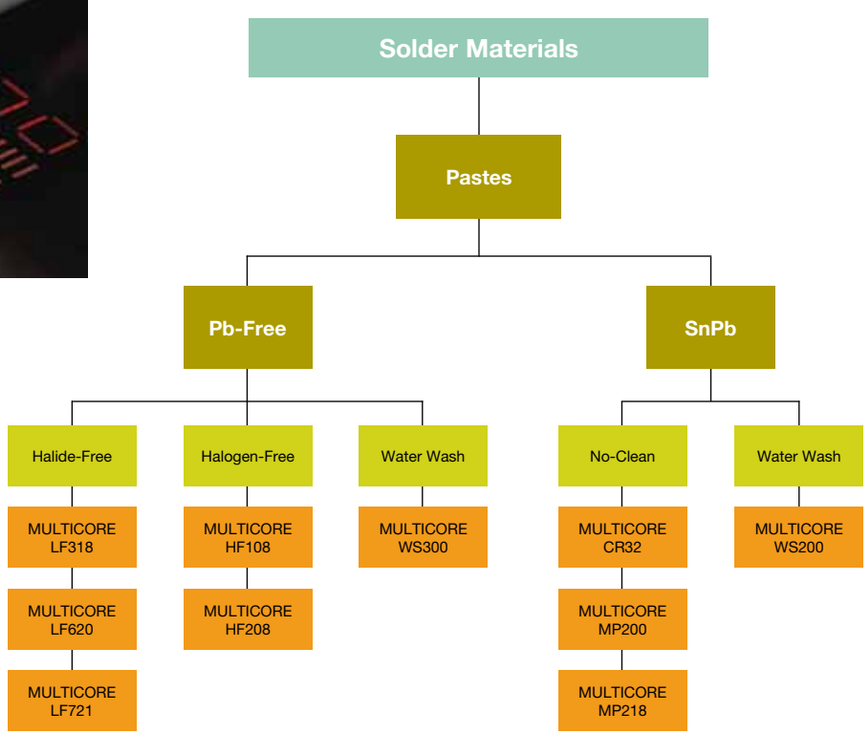
LIQUIDS FLUXES – CLEANABLE SYSTEM

MULTICORE HYDRO-X20	A high activity, water washable flux designed for the soldering of the most difficult electronic assemblies. Unique activator package enables a wider process window and the soldering of all common electronic surfaces with ease. Residues are readily and completely removable by water wash after soldering.	20	24	ORH1	Spray/Foam

SOLDER MATERIALS

SOLDER PASTES

As the world's leading developer of advanced solder paste materials, Henkel delivers decades of technology and expertise for optimized process performance. With groundbreaking new formulations to provide an easy transition to lead-free as well as proven, traditional tin-lead formulations, MULTICORE brand solder materials are enabling the production of some of today's most advanced products. Our portfolio of solder paste materials addresses a variety of manufacturing requirements and offers performance characteristics unmatched by any other materials supplier. Low-voiding lead-free solder pastes, halogen-free and halide-free pastes, no-clean pastes, water-wash pastes and crossover pastes for mixed-metal manufacturing are all part of our vast offering. Supporting ultra-fine pitch printing at high speed, delivering long open and abandon times and pin-testability across all types of assemblies and surface finishes, MULTICORE pastes deliver the flexibility modern electronics firms require to stay competitive. Our materials also offer outstanding resistance to high temperature and high humidity, providing multinational firms with the confidence they need to deploy MULTICORE materials on a global level with consistent performance. Plus, all of our products are supported locally with outstanding technical expertise and are backed by Henkel's global infrastructure and inimitable resource base.



SOLDER PASTES

PASTES – Pb-FREE - HALIDE-FREE

PRODUCT	DESCRIPTION	ALLOY	METAL LOADING (% WEIGHT)	TACK (g/mm²)	PRINT SPEED (mm/s)	IPC/J-STD-004 CLASSIFICATION
MULTICORE LF318	A halide-free, no-clean, Pb-free solder paste that has excellent humidity resistance and a broad process window for both reflow and printing. Offers high tack to resist component movement during high-speed placement, long printer abandon times and excellent solderability over a wide range of reflow profiles in air and N2 reflow ovens and across a wide range of surface finishes.	97SC (SAC305)	88.5	1.8 AGS (Type 3 powder) 2.3 DAP (Type 4 powder)	25 – 150	ROL0
MULTICORE LF620	A halide-free, no-clean, low-voiding, Pb-free solder paste with excellent humidity resistance and broad process window. Suitable for both reflow and printing.	97SC (SAC305)	88.5	2.3 AGS	25 – 150	ROL0
MULTICORE LF721	A halide-free, no-clean, low-voiding Pb-free solder paste, which has excellent humidity resistance and a broad process window both for printing and reflow. Four hours between print abandon time even on small CSP apertures.	96SC (SAC387)	88.5	2.4 AGS	25 – 150	ROL0

PASTES – Pb-FREE - HALOGEN-FREE

MULTICORE HF108	A halogen-free, no-clean, low-voiding Pb-free solder paste development product. Shows excellent humidity resistance and solderability when reflowed in both air and nitrogen across a wide range of surface finishes including Immersion Ag and OSP copper.	96SC (SAC387) 97SC (SAC305)	88.5	2.9 DAP (Type 4 powder)	25 – 150	ROL0
MULTICORE HF208	A halogen-free, no-clean, low-voiding Pb-free solder paste. Shows excellent humidity resistance and solderability when reflowed in both air and nitrogen across a wide range of surface finishes including OSP copper.	97SC (SAC305)	88.5	1.9 DAP (Type 4 powder)	25 – 175	ROL0

PASTES – Pb-FREE - WATER WASH

MULTICORE WS300	A no-clean flux system specially formulated for lead-free alloys. High performance, water washable solder paste. Residues are easily removed with DI water, without the need for a saponifier. Good open time with excellent print definition and soldering.	96SC (SAC387) 97SC (SAC305)	87	0.8 DAP (Type 4 powder)	25 – 100	ORH1

PASTES – SnPb - NO-CLEAN

MULTICORE CR32	A modest residue level solder paste for printing and reflow in air. Non-corrosive residues which eliminates the need for cleaning. Excellent resistance to solder balling and suitable for fine pitch, stencil printing applications.	Sn62, Sn63	89.5	1.2 AGS (Type 3 powder)	25 – 150	ROL0
MULTICORE MP200	A no-clean solder paste for high speed printing and reflow in both air and nitrogen. Extended printed open time and tack life. Resistant to both hot and cold slump.	Sn62, Sn63	90	1.1 AGS (Type 3 powder)	25 – 200	ROL0
MULTICORE MP218	High activity, soft residue, colorless, halide-free, no-clean solder paste that displays outstanding resistance to high temperature and humidity environments. Suitable for a large range of assembly processes, including rheo pump, proflow, and large high-density circuit boards.	Sn62/Sn63/63S4 (Anti-Tombstoning)	89.5	1.6 AGS (Type 3 powder)	25 – 150	ROL0

PASTES – SnPb - WATER WASH

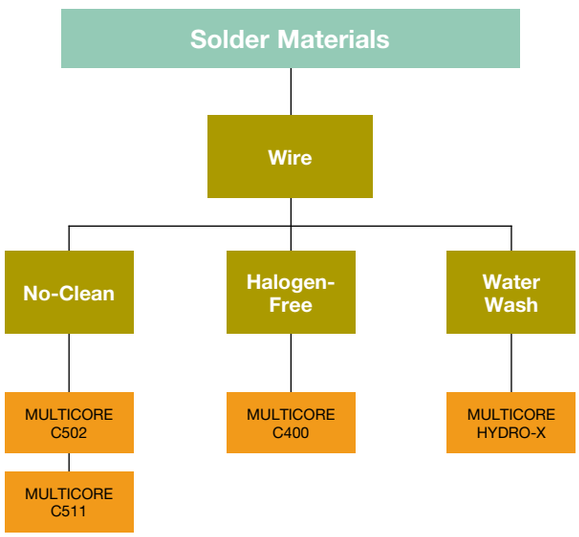
MULTICORE WS200	High performance, water-washable solder paste. Residues are readily removed with DI water, without the need for a saponifier. Good open time with excellent print definition and soldering activity.	Sn62/Sn63 (Anti-Tombstoning)	88.5	0.8 AGS (Type 3 powder)	25 – 100	ORH1

SOLDER MATERIALS

SOLDER WIRE

The MULTICORE portfolio of cored solder wire features the award-winning multiple flux core technology that ensures the even and consistent distribution of flux throughout the solder wire. This mainstay in Henkel's line of solder products delivers ease of use and outstanding performance for today's delicate hand soldering assembly and rework operations.

Formulated with a variety of different alloy selections, MULTICORE cored wires support traditional tin-lead manufacturing operations as well as modern lead-free processes. Our fast-wetting materials deliver excellent solder joint integrity and outstanding long-term performance.



WIRE – NO-CLEAN

PRODUCT	DESCRIPTION	ALLOY OPTION (SnPb)	ALLOY OPTIONS* (Pb-Free)	IPC/J-STD-004 CLASSIFICATION
MULTICORE C502	No-clean, clear residue, cored solder wire with medium activity flux with good wetting on difficult substrates.	Sn60, Sn62, Sn63	96SC (SAC387), 97SC (SAC305), 99C (SnCu)	ROM1
MULTICORE C511	No-clean, clear residue, heat stable cored solder wire. Complement no clean wave and reflow soldering processes.	Sn60, Sn62, Sn63	96SC (SAC387), 97SC (SAC305), 99C (SnCu)	ROM1

WIRE – HALOGEN-FREE

MULTICORE C400	Halide-free, no-clean, clear residue, cored solder wire with increased flux content for improved wetting.	Sn60, Sn62, Sn63	96SC (SAC387), 97SC (SAC305), 99C (SnCu)	ROL0

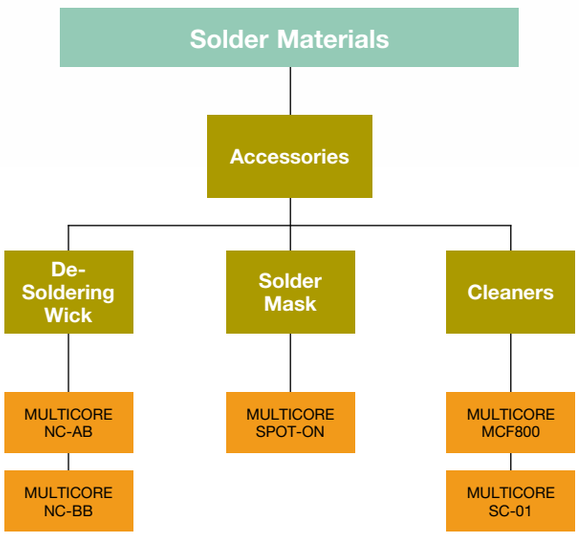
WIRE – WATER WASH

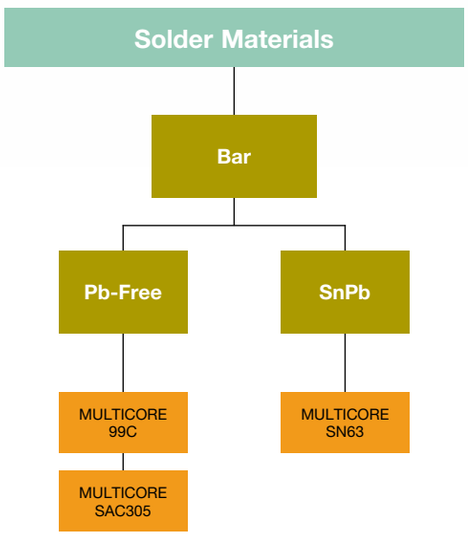
MULTICORE HYDRO-X	High activity, water washable flux cored solder wire with excellent wetting on difficult substrates.	Sn60, Sn62, Sn63	96SC (SAC387), 97SC (SAC305), 99C (SnCu)	ORH1

* See appendix for Solder Reference

SOLDER MATERIALS

SOLDER BAR, ACCESSORIES & CLEANERS





ACCESSORIES – DE-SOLDERING WICK

PRODUCT	APPROXIMATE WIDTH
MULTICORE NC-AB	2.2 mm (0.08 in.)
MULTICORE NC-BB	2.7 mm (0.10 in.)

ACCESSORIES – SOLDER MASK

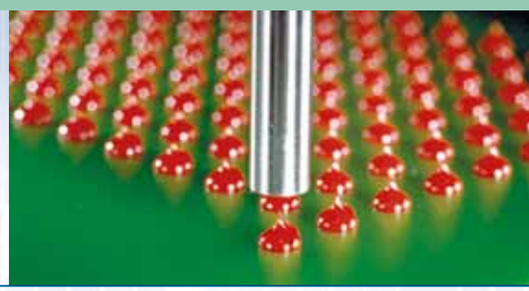
PRODUCT	DESCRIPTION
MULTICORE SPOT-ON	Temporary solder used with circuit boards prior to soldering. Will withstand flux and soldering. Suitable for use with hand or pneumatic applications.

ACCESSORIES – CLEANERS

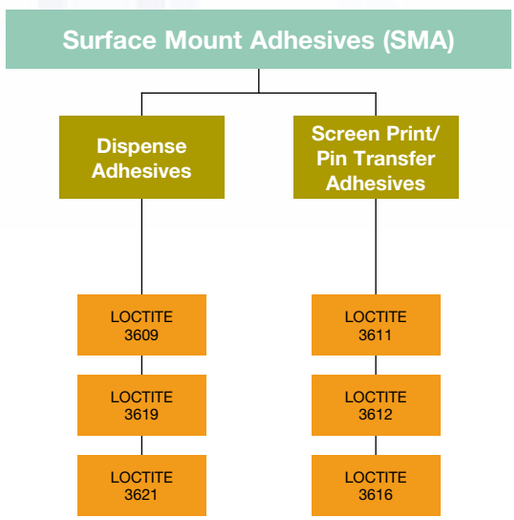
MULTICORE MCF800	Designed for the effective removal of all types of soldering process residues from circuit boards, screens, fixtures, and equipment. Flash point of 105°C makes it ideal for use in heated cleaning systems.
MULTICORE SC-01	Designed for the stencil cleaning and hand cleaning of process soldering residues. A highly effective cleaner that dries rapidly (fast evaporation).

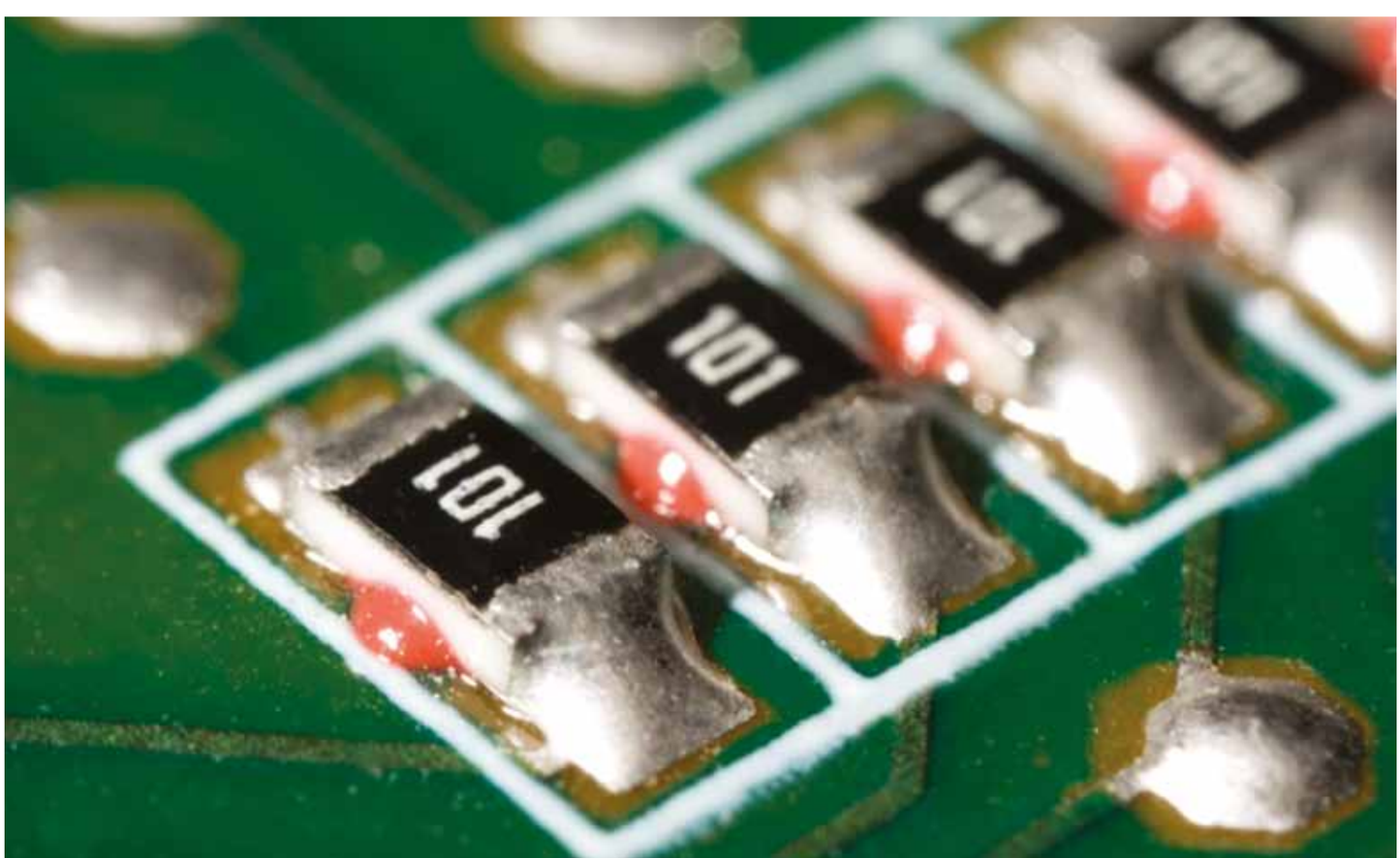
* See appendix for Solder Reference

SURFACE MOUNT ADHESIVES (SMA)



As the first commercially available adhesive to address the emerging surface-mount market in the 1980s, LOCTITE CHIPBONDER and ECCOBOND products today are the industry standard for mixed-technology and double-sided surface mount technology (SMT) applications. Henkel offers a wide range of CHIPBONDER and ECCOBOND products to meet the diversity and challenges of today's manufacturing requirements. Developed using in-process analysis, Henkel's surface mount adhesives can address high-speed assembly processes while delivering lead-free compatibility with no loss in productivity. The portfolio includes formulations for low-temperature screen printing and dispensing.





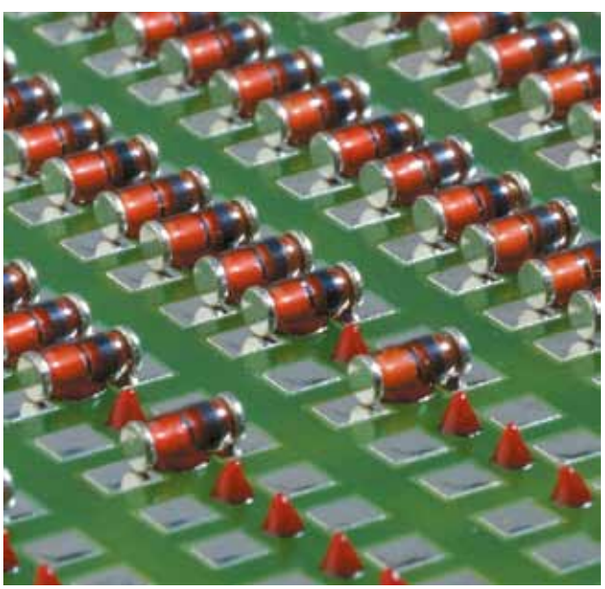
SURFACE MOUNT ADHESIVES (SMA)

DISPENSE ADHESIVES

PRODUCT	DESCRIPTION	COLOR	CURE SCHEDULES	APPLICATION	STORAGE TEMP	SHELF LIFE
LOCTITE 3609	For the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited for applications where medium to high dispense speeds, high dot profile, high wet strength and good electrical characteristics are required.	Red	90 seconds @ 150°C 3 – 4 minutes @ 125°C	General-purpose syringe dispense	2°C – 8°C	6 months
LOCTITE 3619	For the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited where low curing temperatures are required with heat sensitive components, and in applications where short curing times are required.	Red	2 minutes @ 100°C 5 – 6 minutes @ 85°C	High speed syringe dispense 40,000+ DPH capable	2°C – 8°C	10 months
LOCTITE 3621	For the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited for applications where very high dispense speeds, high dot profile, high wet strength and good electrical characteristics are required. Suited where dispense speeds greater than 35,000 dots/h are required.	Red	90 seconds @ 150°C 3 – 4 minutes @ 125°C	Very high speed syringe dispense 47,000 DPH capable	2°C – 8°C	10 months

SCREEN PRINT/PIN TRANSFER ADHESIVES

LOCTITE 3611	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited where very fast cure is required on high speed SMT lines. Very low moisture absorption allows longer exposure to humidity in open baths, without affecting dispensability or causing void formation in the cured adhesive.	Red	90 seconds @ 150°C	Stencil print (20 – 150 mm/s)	2°C – 8°C	6 months
LOCTITE 3612	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited for applications where medium print speeds, high dot profile, high wet strength and good electrical characteristics are required.	Yellow	90 seconds @ 150°C	Stencil print (20 – 150 mm/s)	2°C – 8°C	9 months
LOCTITE 3616	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Suited to printing a range of dot heights with one stencil thickness and where high wet strength characteristics, and high print speeds are required.	Red	90 seconds @ 150°C 2 – 3 minutes @ 125°C	Stencil print (60 – 150 mm/s)	2°C – 8°C	9 months



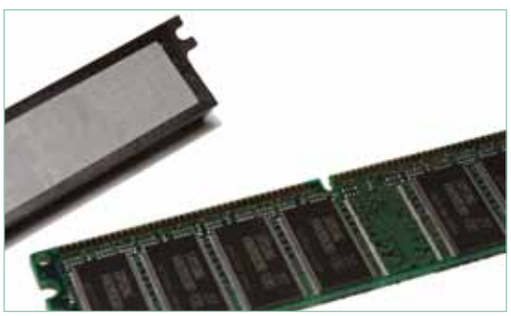
THERMAL MANAGEMENT MATERIALS

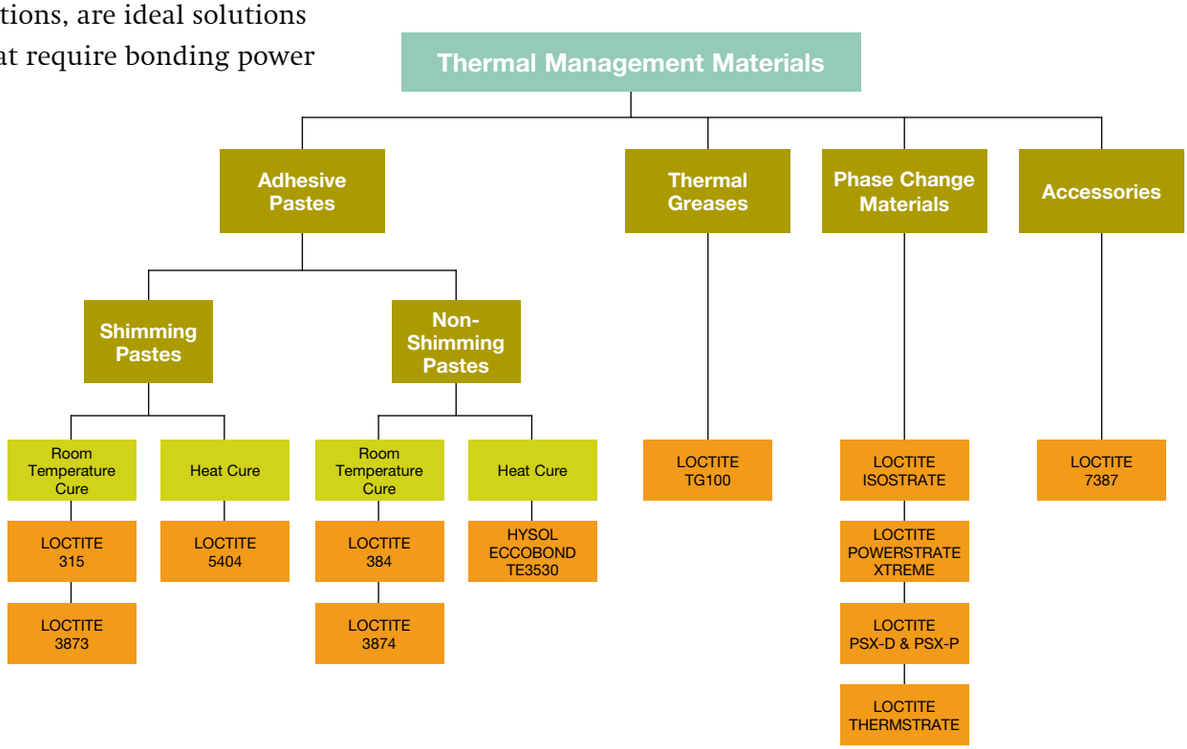
With smaller device footprints and significant increases in functionality, today's electronics products are producing more heat than ever before. Effective thermal management is vital and Henkel has established itself as the leading supplier of performance-critical thermal control solutions. Including, but not limited to, adhesive pastes and phase change materials, Henkel's comprehensive thermal portfolio ensures that thermal challenges will not inhibit performance.

Perhaps most well-known among Henkel's thermal interface materials (TIMs) are its Phase Change products, which offer outstanding thermal impedance between heat dissipating devices and their opposing assembly surface. Within this class of thermal systems are Henkel's LOCTITE POWERSTRATE XTREME materials, which include a variety of formats – including printable and dispensable versions – for the ultimate in process flexibility and performance.

Thermal adhesive pastes, in both shimming and non-shimming formulations, are ideal solutions for applications that require bonding power devices to thermal spreaders or high temperature resistant applications, such as ceramic substrates. Henkel's adhesive pastes address emerging requirements for device size and weight reductions and improved processability, making them the go-to materials for many thermal management experts. What's more, the permanent bond these products provide eliminates the need for fastening devices, such as screws and clips.

Thermal control will remain as one of the top priorities in electronics manufacturing, and Henkel will continue to lead the field in reliable, robust solutions.





THERMAL MANAGEMENT MATERIALS

ADHESIVE PASTES – SHIMMING PASTES - ROOM TEMPERATURE CURE

PRODUCT	DESCRIPTION	CURE TYPE	THERMAL CONDUCTIVITY (W/MK)	VOLUME RESISTIVITY (OHM.CM)	CURE SCHEDULE	SHELF LIFE
LOCTITE 315	Self-shimming thermally conductive, one-part adhesive for bonding electrical components to heat sinks with an insulating gap.	Activator or Heat	0.81	1.3×10^{12}	72 hours @ 22°C	9 months @ 5°C
LOCTITE 3873	Self-shimming, thermally conductive adhesive used with Activator LOCTITE 7387. Cures rapidly to form a high strength, high modulus, thermoset acrylic polymer. Applications include the bonding of various heat generating devices (power devices) to thermal spreaders.	Activator or Heat	1.25	4.3×10^{14}	Fixture time: 5 minutes	21 months @ 5°C

ADHESIVE PASTES – SHIMMING PASTES - HEAT CURE

LOCTITE 5404	Self-shimming, flexible silicone adhesive for high temperature resistant applications such as ceramic boards.	Heat	1	2.9×10^{14}	10 minutes at 150°C or 15 minutes at 130°C	5 months @ 5°C

ADHESIVE PASTES – NON-SHIMMING PASTES - ROOM TEMPERATURE CURE

LOCTITE 384	One-component, repairable, room temperature curing adhesive designed for bonding heat generating components to heat sinks.	Activator or Heat	0.76	1.3×10^{12}	24 – 72 hours @ 20°C	9 months @ 5°C
LOCTITE 3874	No-bead containing version of LOCTITE 3873. Thermally conductive adhesive when used with Activator LOCTITE 7387.	Activator (7387) or Heat	1.25	4.3×10^{14}	24 – 72 hours @ 20°C	10 months @ 5°C

ADHESIVE PASTES – NON-SHIMMING PASTES - HEAT CURE

HYSOL ECCOBOND TE3530	One-component, low temperature curing, thermally conductive epoxy adhesive.	Heat	2.3	1.0×10^{15}	30 minutes @ 100°C	6 months @ -18°C to -25°C

THERMAL GREASES

PRODUCT	DESCRIPTION	THERMAL CONDUCTIVITY (W/MK)	VOLUME RESISTIVITY (OHM.CM)	DIELECTRIC STRENGTH (V/MIL)	THICKNESS (IN)
LOCTITE TG100	Ultra-high performance thermal grease recommended for high-temperature heat transfer in normal applications. Nonflammable, oxidation resistant and does not promote rust or corrosion.	3.4	N/A	N/A	0.0005 – 0.010+

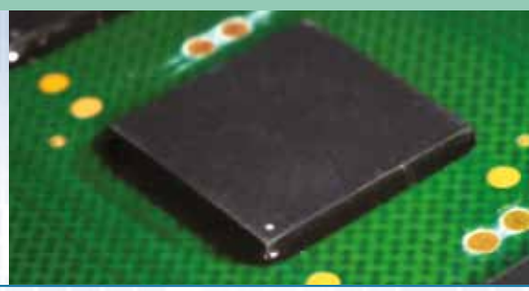
PHASE CHANGE MATERIALS

PRODUCT	DESCRIPTION	THERMAL IMPEDANCE (°C-IN.²/W @ 80 PSI)	THERMAL IMPEDANCE (°C-CM²/W @ 550 KPA)	THERMAL CONDUCTIVITY (W/MK)	PHASE CHANGE TEMP (°C)	VOLUME RESISTIVITY (OHM.CM)	DIELECTRIC STRENGTH (V/MIL)	THICKNESS (IN.)
LOCTITE ISOSTRATE	Industry standard electrically insulating phase change material.	0.12	0.78	0.45	60	N/A	4,500 minimum	0.002 – 0.006
LOCTITE POWERSTRATE XTREME	Unsupported film with superior thermal performance even at low pressure. Direct attach to heat sink at room temperature without adhesive.	0.003	0.022	3.4	45	N/A	N/A	0.008
LOCTITE PSX-D & PSX-P	Repeatable phase change thermal interface material. Supplied as a paste that can be stenciled, needle dispensed, screen printed, or applied manually onto a heat sink, baseplate or other surfaces.	0.003	0.022	3.4	45	N/A	N/A	0.0005 – 0.010+
LOCTITE THERMSTRATE	Industry standard phase change thermal interface material. Suitable for power IGBTs, semiconductors, DC-DC converters and other electrically isolated packages.	0.022	0.143	1	60	1.0×10^{12}	N/A	0.0025 – 0.008

ACCESSORIES

PRODUCT	DESCRIPTION	SPECIFIC GRAVITY @ 25 °C	VISCOSITY @ 25°C, mPa.s (cP)	STORAGE TEMP.
LOCTITE 7387	Activator initiates the cure of toughened acrylic adhesives.	0.8	1 to 2	8°C to 21°C

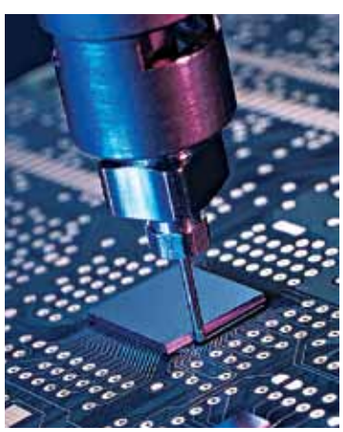
UNDERFILLS

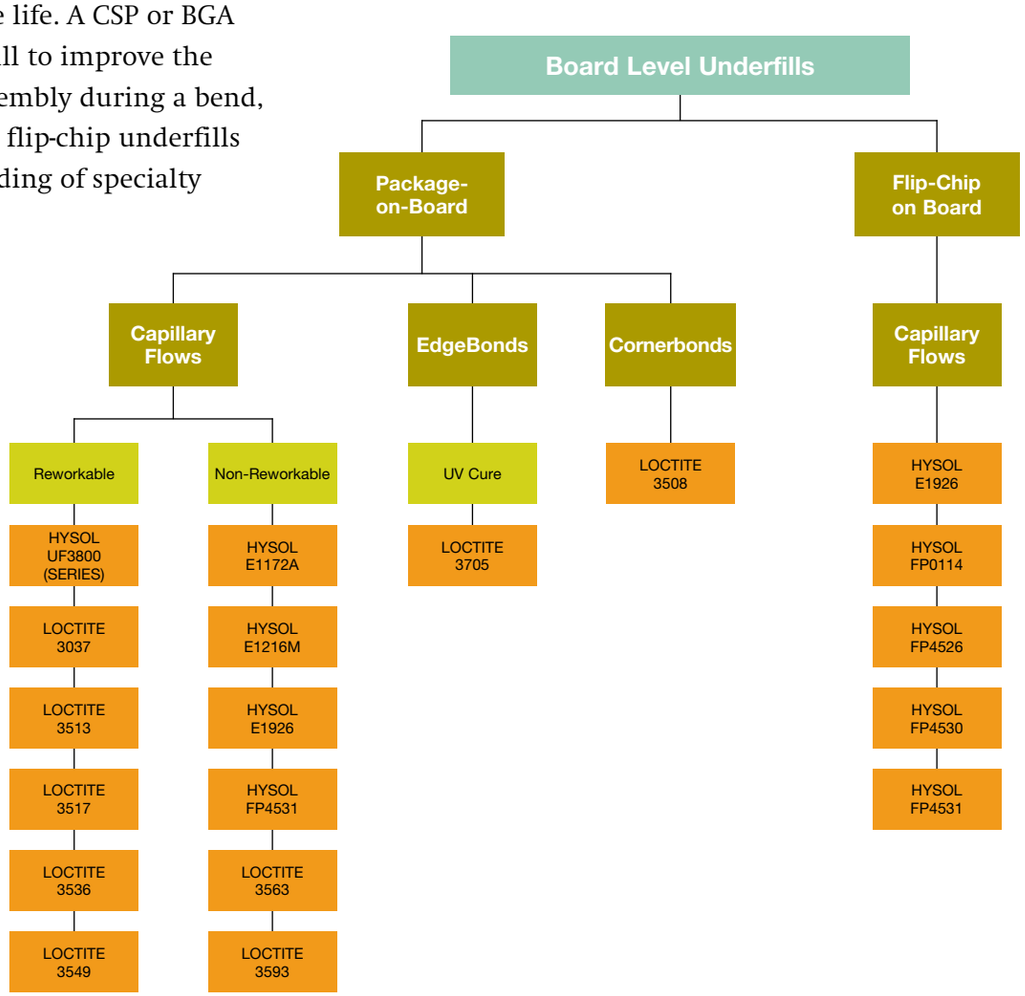


Henkel offers innovative capillary flow underfill encapsulants for flip-chip, CSP and BGA devices. These are highly flowable, high purity, one-component encapsulants. They form a uniform and void-free underfill layer to improve reliability performance by redistributing stress away from the solder interconnects as well as enhancing mechanical performance. We have formulations that quickly fill very small gap/pitch parts, offer fast cure capabilities, have a long pot and shelf life, and are reworkable. Reworkability allows for cost savings by allowing the removal of the underfill to enable re-use of a board.

Flip-chip applications require assistance with redistributing stress away from the solder joints to extend thermal aging and cycle life. A CSP or BGA application requires an underfill to improve the mechanical integrity of the assembly during a bend, vibration or drop test. Henkel's flip-chip underfills are formulated with a high loading of specialty fillers to achieve low CTEs yet maintain the ability to flow fast in small gaps, possessing high glass transition temperatures and high modulus. Our CSP underfills are designed with little to no filler loading, a choice of glass transition temperatures, and modulus to match the intended application.

For certain applications, LOCTITE CORNERBOND and EDGEBOND technologies allow for cost-effective underfill solutions. The CORNERBOND technology is applied at all four corners of the package and then can be cured during the normal solder reflow cycle, allowing for a more efficient process. The material's self-centering characteristic ensures high assembly reliability and outstanding yield rates.





UNDERFILLS

PACKAGE ON BOARD – CAPILLARY FLOWS - REWORKABLE

PRODUCT	DESCRIPTION	RECOMMENDED CURE SCHEDULE	VISCOSITY mPa.s (cP)	CTE (ppm/°C)	Tg	POT LIFE	STORAGE TEMP.
HYSOL UF3800 (SERIES)	Reworkable epoxy underfill for CSP and BGA packages. When cured offer excellent mechanical protection to solder joints. Compatible with most Pb-Free and Halogen solders.	8 minutes @ 130ºC	375	52	69	3 days @ 25 ºC	-20ºC
LOCTITE 3037	A fast flow, low temperature, reworkable underfill. Very good impact and thermal cycle resistant performance.	6 minutes @ 120°C	2,200	22	26	3 days @25 ºC	-20ºC
LOCTITE 3513	A single component, low viscosity, reworkable underfill allows filling in gaps under CSP BGA.	15 minutes @150ºC	3,000 to 6,000	63	69	48 hours @ 25 ºC	2ºC – 8ºC
LOCTITE 3517	High speed, low temperature curing underfill for CSP and BGA.	10 minutes @ 100ºC	2,000 to 4,500	60	85	7 days @ 22 ºC	2ºC – 8ºC
LOCTITE 3536	Underfill of chip scale and BGA package with rapid device throughput. Provide protection to solder joints against mechanical stresses.	5 minutes @ 120ºC	1,800	63	53	14 days @ 25ºC	2ºC – 8ºC
LOCTITE 3549	Fast flow, low temperature cure, reworkable epoxy underfill designed to provide protection for solder joints against induced stress, increasing both drop test and temperature cycle performance of the device.	5 minutes @ 120°C	2,350	55	38	14 days @ 25°C	2ºC – 8ºC

PACKAGE ON BOARD – CAPILLARY FLOWS - NON-REWORKABLE

HYSOL E1172A	Fast cure at low temp high Tg underfill for temperature stable applications.	3 minutes @ 135°C or 3 minutes @ 150°C	17,000	27	135	48 hours @ 25°C	-40°C
HYSOL E1216M	Filler filled nonreworkable, high reliability with 10 µm filler size.	3.5 minutes @ 150ºC	3,252	40	115	4 days @ 25 ºC	-20ºC
HYSOL E1926	Design for fine-pich WL-CSP having 35 µm gap or greater and requiring 260°C reflow resistance.	20 minutes @ 150ºC	6,500	40	125	48 hours @ 25 ºC	-20ºC
HYSOL FP4531	Originally designed as flip-chip underfill, proven workability at high temperature conditions. Qualified in automotive reliability conditions.	7 minutes @ 160°C	10,000	28	161	24 hours @ 25°C	-40°C
LOCTITE 3563	Fast flow, fast cure high temp reliable underfill.	5 minutes @ 165°C	5,000	35	130	12 hours @ 22°C	-40°C
LOCTITE 3593	Rapid curing, fast flowing, liquid epoxy designed for capillary flow underfill for chip size packages and where process speed is a key concern. Its rheology is designed to penetrate gaps as small as 25 µm.	5 minutes @ 150 ºC or 3 minutes @ 165 ºC	4,500 - 6,000	50	110	7 days @ 22 ºC	2ºC – 8ºC

PACKAGE ON BOARD – EDGEBONDS - UV CURE

LOCTITE 3705	UV-cured adhesive designed for bonding electronics components on PCBs. Thixotropic nature reduces migration of product. Excellent adhesion to a wide range of substrates. Bonds in seconds upon exposure to UV light.	UV Cured	40,000	157	-44	30 days @ 25°C	2ºC – 8ºC

PACKAGE ON BOARD – CORNERBONDS

LOCTITE 3508	Reworkable cornerfill is designed to cure during pb-free reflow while allowing self-alignment of IC components. It can be preapplied to the board at the corners of the pad site using a standard SMA dispenser.	3 hours @ 180°C	50,000	55	115	30 days @ 25°C	2ºC – 8ºC

FLIP-CHIP ON BOARD – CAPILLARY FLOWS

PRODUCT	DESCRIPTION	RECOMMENDED CURE SCHEDULE	VISCOSITY mPa.s (cP)	CTE (ppm/°C)	Tg	POT LIFE	STORAGE TEMP.	FILLER (%)
HYSOL E1926	Designed for fine-pich WL-CSP having 35 µm gap or greater and requiring 260°C reflow resistance.	20 minutes @ 150ºC	20 minutes @150 ºC	40	125	48 hours @ 25 ºC	-20ºC	43.8
HYSOL FP0114	Designed for capillary flow for thin gap (25 µm).	30 minutes @ 165ºC	5,000	33	135	36 hours @ 25 ºC	-40ºC	63
HYSOL FP4526	Low viscosity, fast flow flip-chip underfills for 75 micron gaps. Applicable for ceramic, organic and polyimide substrates.	30 minutes @ 165ºC	4,700	33	133	36 hours @ 25 ºC	-40ºC	63
HYSOL FP4530	A snap curable underfill for flip-chip on flex with 25 micron gap. Upon cure, it changes from blue to green.	7 minutes @ 160ºC	3,500	46	145	24 hours @ 25 ºC	-40ºC	50
HYSOL FP4531	A snap curable lower CTE underfill for flip-chip for rigid laminate and ceramic.	7 minutes @ 160ºC	10,000	28	161	24 hours @ 25 ºC	-40ºC	62

APPENDIX

SOLDER FORM AVAILABILITY

MULTICORE CODE	ALLOY	MELTING POINT °C	RoHS	SOLDER PASTE	CORED WIRE	SOLID WIRE	BAR SOLDER
96SC	SAC387 or Sn95.5/Ag3.8/Cu0.7	217	YES	YES	YES	YES	NO
97SC	SAC305 or Sn96.5/Ag3.0/Cu0.5	217	YES	YES	YES	YES	YES
SAC0307	SAC0307	217 - 226	YES	YES	NO	NO	NO
Innolot	SAC387Bi3Sb1.5Ni0.02	205 - 218	YES	YES	NO	NO	NO
96S	Sn96.5/Ag3.5	221	YES	YES	YES	NO	NO
99C	Sn99.3/Cu0.7	227	YES	NO	YES	NO	YES
95A	Sn95/Sb5	236 - 240	YES	YES	YES	NO	NO
92A	Sn91.5/Sb8.5	238 - 246	YES	YES	NO	NO	NO
Bi58	Sn42/Bi58	138	YES	YES	YES	NO	NO
Sn63	Sn63/Pb37	183	NO	YES	YES	YES	YES
Sn62	Sn62/Pb36/Ag2	179	NO	YES	YES	NO	NO
Sn60	Sn60/Pb40	183 - 188	NO	NO	YES	NO	NO
63S4	Sn62.8/Pb36.8/Ag0.4	179 - 183	NO	YES	NO	NO	NO
HMP	Sn5Pb93.5/Ag1.5	296 - 301	NO	YES	YES	NO	NO
SAV1	Sn50.0/Pb48.5/Cu1.5	183 - 215	NO	NO	YES	NO	NO

SOLDER POWDER PARTICLE SIZE DISTRIBUTION

MULTICORE POWDER DESCRIPTION	POWDER SIZE (MICRONS)	IPC J-STD-006 DESIGNATION
BAS	53 - 75	Type 2
AGS	25 - 45	Type 3
DAP	20 - 38	Type 4
KBS	10 - 25	Type 5
LAW	5 - 15	Type 6

HALIDE-FREE AND HALOGEN-FREE COMPARISON CHART

<table>
<tr><th></th><th colspan="4">HALIDE-FREE</th><th colspan="2">HALOGEN-FREE</th></tr>
<tr><td>DRIVERS FOR CLASSIFICATION</td><td colspan="4">High reliability solder interconnects. International standards.</td><td colspan="2">REACH. Non-government organizations (NGOs).</td></tr>
<tr><td>DEFINITION</td><td colspan="4">No flux corrosivity or dendritic growth detection. Specific requirements to give ROL0 classification.</td><td colspan="2">No intentional halogens added to flux. Comply to international standards (see below).</td></tr>
<tr><td>TEST PROCEDURES</td><td colspan="4">Well-established Chloride and Bromide halide test measured by titration.</td><td colspan="2">NEW – O2 bomb on flux Ion chromatography on flux.</td></tr>
<tr><td rowspan="6">INTERNATIONAL STANDARDS</td><td rowspan="6">IPC J-STD-004B, IPC-TM-650</td><td>Copper Mirror</td><td>No penetration.</td><td>JPCA-ES-01-1999</td><td>Bromine < 900 ppm
Chlorine < 900 ppm</td></tr>
<tr><td>Silver Chromate</td><td>No discoloration.</td><td rowspan="3">IEC 61249-2-21</td><td>Bromine 900 ppm max.</td></tr>
<tr><td>Fluoride test</td><td>No color change.</td><td>Chlorine 900 ppm max.</td></tr>
<tr><td>Chloride and Bromide</td><td>< 0.005%</td><td>1,500 ppm max.
(total halogens)</td></tr>
<tr><td>Flux corrosion</td><td>No pitting. No color change.</td><td rowspan="3">IPC-401B</td><td>Bromine 900 ppm max.</td></tr>
<tr><td>SIR</td><td>No discoloration. No dendritic growth. No corrosion > 108Ω.</td><td>Chlorine 900 ppm max.</td></tr>
<tr><td></td><td></td><td>1,500 ppm max.
(total halogens)</td></tr>
</table>

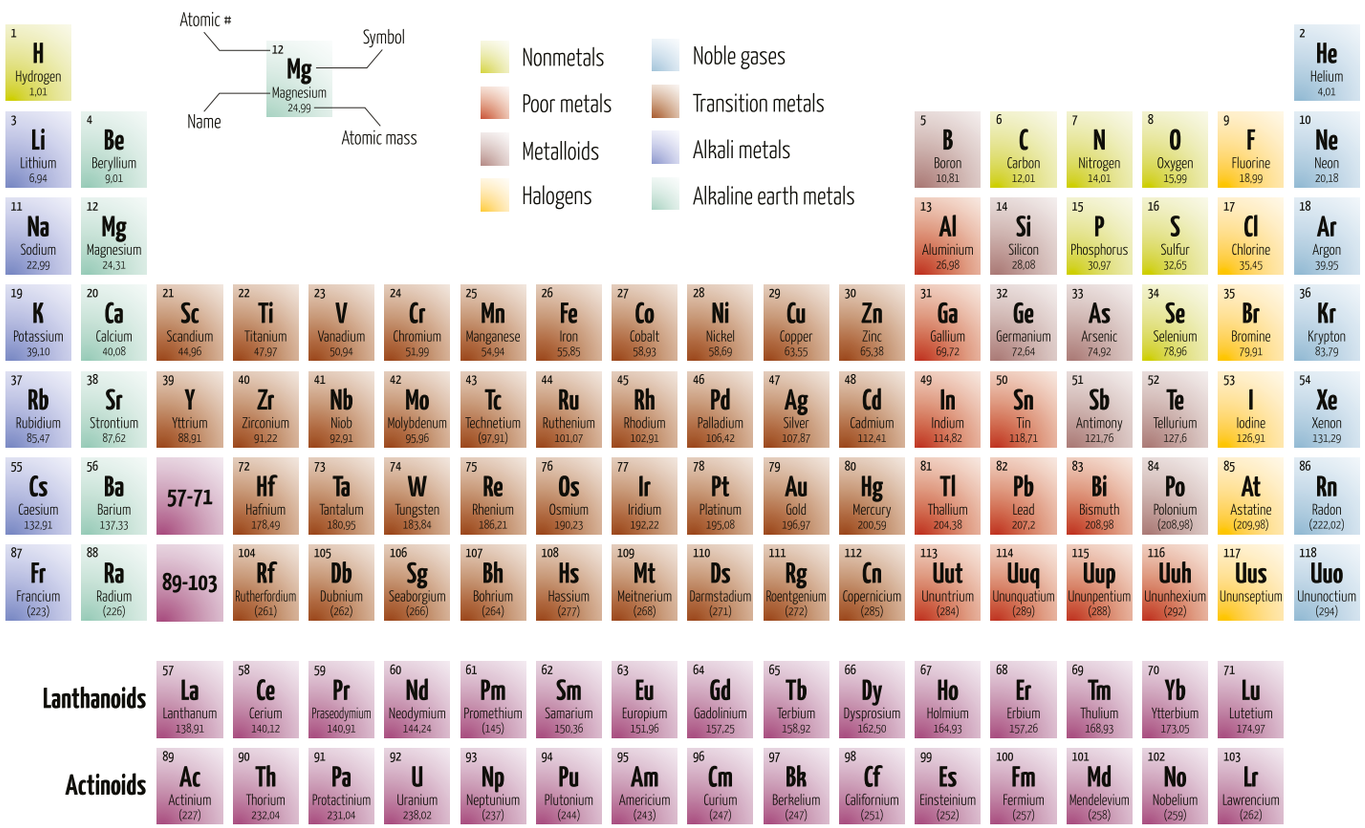
FLUX IDENTIFICATION, MATERIALS OF COMPOSITION, ACTIVITY LEVELS

FLUX MATERIALS OF COMPOSITION	FLUX ACTIVITY LEVELS (% HALIDE) FLUX TYPE		FLUX DESIGNATOR
Rosin (RO)	Low (0%)	L0	ROL0
	Low (<0.5%)	L1	ROL1
	Moderate (0%)	M0	ROM0
	Moderate (0.5-2.0%)	M1	ROH0
	High (0%)	H0	ROH0
	High (>2.0%)	H1	ROH1
Resin (RE)	Low (0%)	L0	REL0
	Low (<0.5%)	L1	REL1
	Moderate (0%)	M0	REM0
	Moderate (0.5-2.0%)	M1	REM1
	High (0%)	H0	REH0
	High (>2.0%)	H1	REH1

FLUX MATERIALS OF COMPOSITION	FLUX ACTIVITY LEVELS (% HALIDE) FLUX TYPE		FLUX DESIGNATOR
Organic (OR)	Low (0%)	L0	ORL0
	Low (<0.5%)	L1	ORL1
	Moderate (0%)	M0	ORM0
	Moderate (0.5-2.0%)	M1	ORM1
	High (0%)	H0	ORH0
	High (>2.0%)	H1	ORH1
SAV1	Low (0%)	L0	INL0
	Low (<0.5%)	L1	INL1
	Moderate (0%)	M0	INM0
	Moderate (0.5-2.0%)	M1	INM1
	High (0%)	H0	INH0
	High (>2.0%)	H1	INH1

The 0 and 1 indicate absence and presence of halides, respectively.
L= Low or no flux/flux residue activity.
M=Moderate flux/flux residue activity.
H= High flux/flux residue activity.

PERIODIC TABLE OF ELEMENTS



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