Technical Data Sheet

Epo-Tek® H20E Adhesive

#12671-20E

EPO-TEK® H20E is a two-component, 100% solids silver-filled epoxy system designed for chip bonding in microelectronic and optoelectronic applications. It is also used for thermal management applications due to its high thermal conductivity. It is a reliable system, making it the conductive adhesive of choice for new applications. In addition, it is also available in single component frozen syringe.

Technical Information

Composition Properties

Number of Components	Two
Mix Ratio by Weight	1:1
Specific Gravity	Part A: 2.03 Part B: 3.07 (Frozen Syringe: 2.67)
Pot Life	2.5 Days
Shelf Life	One year at 23°C (Frozen Syringe: One year at -40°C)

Minimum Bond Line Cure Schedule

175°C	45 seconds
150°C	5 minutes
120°C	15 minutes
100°C	2 hours
80°C	3 hours

Note: Container should be kept closed when not in use. For filled systems, mix contents of each container (A&B) thoroughly before mixing the two together.

Epo-Tek® H20E Advantages and Application Notes

- Processing Information: It can be applied to many dispensing, stamping, and screen printing techniques

- Dispensing: Compatible with pressure/time delivery, auger screws, fluid jetting and G27 needles, in a single-component fashion
- Screen Printing: Best using >200 metal mesh, with polymer squeegee blade with 80D hardness
- Stamping: Small dots 6 mil in diameter can be realized

Miscellaneous/Other Notes

- Many technical papers written over 30-40 year lifetime
- Over 1 trillion chips attached at a single company
- Versatility in curing techniques including box oven, SMT style tunnel oven, heater gun, hit plate, IR, convection, br inductor coil
- Many custom modified products available for the following improvements: viscosity and appearance, flexibility, and thermal conductivity

Typical Properties

To be used as a guide only, not as a specification. Data below is not guaranteed. Different batches, conditions and applications yield different results; Cure condition: 150°C/1 hour; * Denotes test on lot acceptance basis.

Physical Properties

Property	Value
*Color	Part A: Silver Part B: Silver
*Consistancy	Smooth, thixotropic paste
*Viscosity (@ 100 RPM/23°C)	2,200-3,200 cPs
Thixotropic Index	4.63
*Glass Transition Temp. (Tg)	≥80°C (Dynamic cure 20-200°C/ISO 25 min; Ramp -10 to 200°C @ 20°C/min)
Coefficient of Thermal Expansion (CTE):	Below Tg: 31 x 10^{-6} in/in/°C Above Tg: 158 x n10^{-6} in/in/°C
Shore D Hardness	75
Lap Shear Strength @ 23°C	1,475 psi
Die Shear Strength @ 23°C	>10 Kg/3,400 psi
Degradation Temp. (TGA)	425°C
Weight Loss	@ 200°C: 0.59% @ 250°C: 1.09% @ 300°C: 1.67%

Operating Temp.	Continuous: -55°C to 200°C Intermittent: -55°C to 300°C
Storage Modulus @ 23°C	808,700 psi
Ions	C1-: 73 ppm Na+: 2 ppm NH_4+: 98 ppm K+: 3 ppm
*Particle Size	≤45 microns
Electrical Properties	
*Viscosity Resistivity @ 23°C	≤0.0004 Ohm-cm
Thermal Properties	
Thermal Conductivity	2.5 W/mK Based on standard method: Laser flash
Thermal Conductivity	25 W/mK Based on thermal resistance data: $R = L \times K^{-1} \times A^{-1}$
Thermal Resistance (Junction to Case)	TO-18 package with nickel-gold metallized 20 x 20 mil chips and bonded with EPO-TEK® H20E (2 mils thick) Epo-Tek® H20E: 6.7 to 7.0°C/W Solder: 4.0 to 5.0°C/W

Epo-Tek®H20E Suggested Applications

Semiconductor IC Packaging

- Die-attaching chips to leadframes; compatible with Si and MEM's chips, 260°C lead-free reflow and JEDEC Level 1 packaging requirements
- Capable of being snap cured in-line, as well as traditional box oven techniques
- Adhesive for solderless flip chip packaging and ultra-fine pitch SMD printing

Hybrid Micro-Electronics

- A comparable alternative to solder and eutectic die attach, in terms of thermal performance; very commonly no more than 1-2°C/watt difference in thermal resistance
- Die-attaching of quartz crystal oscillators (QCO) to the Au posts of TO-can style lead frame
- Used with GaAs chips for microwave/radar application up to 77GHz
    - Compatible with Au, Ag, Ag-Pd terminations of capacitors and resistor SMDs
- NASA approved low outgassing adhesive
- Adhesive for EMI and Rf shielding of Rf, microwave and IR devices

Electronic & PCB Circuit Assembly

- Used to make electrical contacts in acoustical applications of speakers/microphones
- Electrical connection of piezo's to PCB. Oads of PZT are connected to many kinds of circuits using H20E, including ink jet heads, MEMs and ultrasound devices
- Automotive applications include pressure sensing and accelerometer circuits
- Electrically conductive adhesive (ECA) for connections of circuits to Cu coils in Rf antenna applications such as smart cards and RFID tags
- ECA for attaching SMDs to membrane switch flex circuits. Compatible with Ag-PTF and carbon graphite PCB pads. A low temperature "solder-free" solution
- Solar-Photovoltaic industry
  - ECA for the electrical connection of transparent conductive oxide (TCO) to PCB pads
  - Replacement of solder joints of Cu/Sn ribbon wire, from cell-to-cell; a common "solar cell stringing" adhesive
  - Die-attach of III-V semiconductor chips to substrates using Cu, BeO, aluminum nitride, etc.
- Ability to be dispensed in high volumes via dots, arrays, and writing methods

Medical Applications

- USP Class VI adhesive for circuits requiring implantation/biocompatibility
- Die-attaching photo diode arrays in X-ray circuits
- Vibration resistant adhesive for ultrasound applications <20 MHz frequency; making the electrical connection of PZT to Au/PCB substrate
- Electrical connections of die, SMFs and QCO for pacemaker hybrid circuits
- A common ECA for hearing aid applications using hybrid, ECM or MEMs technology

Opto-Electronic Packaging Applications

- Adhesive for fiber optic components using DIP, Butterfly or custom hybrid IC packages. As an ECA it attaches waveguides, die bonds laser diodes and hear sinks the high power laser circuits
- Die-attaching IR-detector chips onto PCBs or TO-can style headers
- Die-attaching LED chips to substrates using single chip packages, or arrays
  - Adhesion to Ag, Au, and Cu plated leadframes and PCBs
- Electrical connection of ITO to PCBs found in LCD industry
  - A low temp ECA for OLED displays and organically printable electronics