

Number of Components:	<u>Two</u>	<u>Frozen Syringe</u>	Minimum Bond Line Cure Schedule*:	
Mix Ratio By Weight:	1:1		175°C	45 Seconds
Specific Gravity:		2.67	150°C	5 Minutes
Part A	2.03		120°C	15 Minutes
Part B	3.07		100°C	2 Hours
Pot Life:	2.5 Days		80°C	3 Hours
Shelf Life:	One year at 23°C	One year at -40°C		

*Note: Container(s) should be kept closed when not in use. For filled systems, mix contents of each container (A & B) thoroughly before mixing the two together. \*Please see Applications Note available on our website.*

### Product Description:

EPO-TEK<sup>®</sup> H20E is a two component, 100% solids silver-filled epoxy system designed specifically for chip bonding in microelectronic and optoelectronic applications. It is also used extensively for thermal management applications due to its high thermal conductivity. It has proven itself to be extremely reliable over many years of service and is still the conductive adhesive of choice for new applications. Also available in a single component frozen syringe.

### EPO-TEK<sup>®</sup> H20E Advantages & Application Notes:

- Processing info: It can be applied by 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.
- Misc / Other notes
  - Many technical papers written over 30-40 year lifetime. Contact [techserv@epotek.com](mailto:techserv@epotek.com).
  - Over 1 trillion chips attached at a single company: no failures, Six Sigma and Certified Parts Supplier award winner.
  - Versatility in curing techniques including box oven, SMT style tunnel oven, heater gun, hot plate, IR, convection, or inductor coil.
  - Many custom modified products available, for the following improvements: viscosity and appearance, flexibility and thermal conductivity. Contact [techserv@epotek.com](mailto:techserv@epotek.com) for your best recommendation.

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

### Physical Properties:

\*Color: Part A: Silver Part B: Silver  
 \*Consistency: 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—200°C @ 20°C/Min)  
 Coefficient of Thermal Expansion (CTE):  
 Below Tg:  $31 \times 10^{-6}$  in/in/°C  
 Above Tg:  $158 \times 10^{-6}$  in/in/°C  
 Shore D Hardness: 75  
 Lap Shear Strength @ 23°C: 1,475 psi  
 Die Shear Strength @ 23°C: > 5 Kg / 1,700 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: Cl<sup>-</sup> 73 ppm  
 Na<sup>+</sup> 2 ppm  
 NH<sub>4</sub><sup>+</sup> 98 ppm  
 K<sup>+</sup> 3 ppm

\*Particle Size: ≤ 45 Microns

### Electrical Properties:

\*Volume Resistivity @ 23°C: ≤ 0.0004 Ohm-cm

### Thermal Properties:

Thermal Conductivity: 2.5 W/mK  
 Thermal Conductivity: 29 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<sup>®</sup> H20E (2 mils thick)  
 EPO-TEK<sup>®</sup> H20E: 6.7 to 7.0°C/W  
 Solder: 4.0 to 5.0°C/W

### EPOXY TECHNOLOGY, INC.

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Epoxies and Adhesives for Demanding Applications<sup>™</sup>

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# EPO-TEK<sup>®</sup> 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 I 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 applications up to 77GHz.
- SMD attach adhesive which can be cured simultaneously with die-attach processes.
  - 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. Pads 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 used in solar concentrator technology, such as CdTe and GaAs.
  - An effective heat-sink on thermal 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, SMDs 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 heat 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.

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