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EPO-TEK® H20E

Technical Data Sheet
For Reference Only
Electrically Conductive, Silver Epoxy

Date:	August 2024
Rev:	XIX
No. of Components:	Two
Mix Ratio by Weight:	1 : 1
Specific Gravity:	Part A: 2.03 Part B: 3.07 Syringe: 2.67
Pot Life:	2.5 Days
Shelf Life- Bulk:	One year at room temperature
Shelf Life- Syringe:	One year at -40°C

Recommended Cure: 150°C / 1 Hour

Minimum Alternative Cure(s):
May not achieve performance properties below
150°C / 5 Minutes
120°C / 15 Minutes
80°C / 3 Hours

NOTES:

- Container(s) should be kept closed when not in use.
- Filled systems should be stirred thoroughly before mixing and prior to use.
- Performance properties (rheology, conductivity, others) of the product may vary from those stated on the data sheet when bi-pak/syringe packaging or post-processing of any kind is performed. Epoxy's warranties shall not apply to any products that have been reprocessed or repackaged from Epoxy's delivered status/container into any other containers of any kind, including but not limited to syringes, bi-paks, cartridges, pouches, tubes, capsules, films or other packages.

Product Description: EPO-TEK® 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.

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

PHYSICAL PROPERTIES:			
* Color (before cure):	Part A: Silver	Part B: Silver	
* Consistency:	Smooth thixotropic paste		
* Viscosity (23°C) @ 100 rpm:	2,200 - 3,200	cPs	
Thixotropic Index:	4.6		
* Glass Transition Temp:	≥ 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	x 10^{-6} in/in°C	
Above Tg:	158	x 10^{-6} in/in°C	
Shore D Hardness:	75		
Lap Shear @ 23°C:	1,475	psi	
Die Shear @ 23°C:	≥ 10	Kg	3,556 psi
Degradation Temp:	425	°C	
Weight Loss:			
@ 200°C:	0.59	%	
@ 250°C:	1.09	%	
@ 300°C:	1.67	%	
Suggested Operating Temperature:	< 300	°C (Intermittent)	
Storage Modulus:	808,700	psi	
Ion Content	Cl^-: 73 ppm	Na^+: 2 ppm	
	NH_4^+: 98 ppm	K^+: 3 ppm	
* Particle Size:	≤ 45	microns	

ELECTRICAL AND THERMAL PROPERTIES:		
Thermal Conductivity:	2.5	W/mK *based on standard method: Laser Flash*
Thermal Conductivity:	29	W/mK *based on Thermal Resistance Data: R = L x K^{-1} x A^{-1})*
Thermal Resistance (Junction to Case):		TO-18 package with nickel-gold metallized 20 x 20 mil chips and bonded with H20E (2mils thick) *EPO-TEK® H20E*: 6.7 to 7.0°C/W *Solder:* 4.0 to 5.0°C/W
* Volume Resistivity @ 23°C:	≤ 0.0004	Ohm-cm

This information is based on data and tests believed to be accurate. Epoxy Technology, Inc. makes no warranties (expressed or implied) as to its accuracy and assumes no liability in connection with any use of this product.

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EPO-TEK® H20E Suggested Applications

- **Semiconductor IC Packaging**
  - Die-attaching chips to lead frames; compatible with Si and MEM's chips, 260ºC 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 1-2ºC/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 piezos 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.
- **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 lead frames and PCBs.
  - Electrical connection of ITO to PCBs found in LCD industry.
    - A low temp ECA for OLED displays and organically printable electronics.

EPO-TEK® 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.

Miscellaneous/Other Notes:

- Many technical papers written over 30-40 year lifetime. Contact 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 for your best recommendation.

Epoxies and Adhesives for Demanding Applications™
This information is based on data and tests believed to be accurate. Epoxy Technology, Inc. makes no warranties (expressed or implied) as to its accuracy and assumes no liability in connection with any use of this product.

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