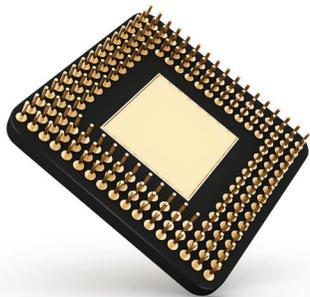


Hybrid Microelectronic Semiconductor Die Attached Adhesives



What are hybrid microelectronic semiconductor die attach adhesives?

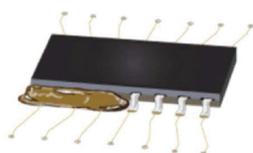
By definition, die attach adhesives for hybrid microelectronics use hermetic, or near hermetic packaging of semiconductor chips. They use metal, ceramic and glass packaging materials to provide the highest degree of protection and reliability from hostile environments in the field.

Alternative forms of semiconductor packaging have evolved from “hybrids”, into plastic Surface Mounted Devices (SMD), and eventually direct chip attachment (DCA's, or package-free) using Chip on Board (COB) or Flip Chip (FC) technologies. The latter packages are known as “plastic IC packaging”, *however the focus of this guide is on “hybrids” only.*

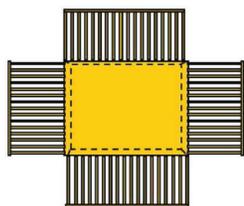
What are HI-REL die attach adhesives?

Die attach adhesives, when used with hybrid packaging technologies provide the highest reliability (“HI-REL”) possible. Some industries requiring HI-REL die attach in conjunction with hybrids are: military/defense, aerospace, avionics, microwave, photonics, medical, petrochemical and automotive.

What are the desirable HI-REL die attach properties?



Plastic SMD



HI-REL Hybrid

In order to survive these harsh temperatures and hermetic packaging processes, HI-REL adhesives must be high temperature resistant, so properties like low outgassing (during and after cure) and very high degradation temperature (decomposition, or ash temperature) are required.

HI-REL die attach adhesives need to be ionically clean and pure, low bleed-out and high strength on Au, whether on ceramic substrates, SMD or diode contact pads. Since no die attach adhesive can be exactly CTE matched to hybrid chips and substrates, a reasonably high modulus is needed for small area devices (<20mil x 20 mil), to ensure that wire bonding processes do not cause die tilt, slip or decoupling.

HI-REL die attach adhesives, like all electronic materials, need to be compatible with industry standard robotic and placement machines, for high yield, high accuracy assembly.

HI-REL industries/applications using EPO-TEK® die attach adhesives

- Military/Defense, aerospace, avionics, (microwave and satellite components and hardware):
H20E, H20E-MP, H20E-HC, H20E-PFC, H35-175MP, H37MP, EK1000, EK1000-MP, EJ2108
- Telecommunications (fiber optic, photonic based IC packages):
H20E, H20E-PFC, H35-175MP, H37MP
- Medical | Healthcare (implants like pacemaker, cochlear):
MED-H20E, MED-H20S
- Automotive | Sensor Device (under hood, down hole oil & gas):
H20E, EM127, H20E-PFC, H20S, EK1000



How to choose a HI-REL die attach adhesive?

Steps to be considered:

1. **Compliance** - Military (MIL-STD 883, TM5011), NASA, or commercial compliance is mandated
2. **Cure Schedule** - Typically in the range of 100 - 200°C and any downstream temperature excursion
3. **Depositions Process** - Manual or Robot; Dispensing, Stamping or Screen printing
4. **Viscosity and Appearance** - Need to be compatible for deposition process
5. **Thermal Management** - Electrically Conductive, Electrically Insulating

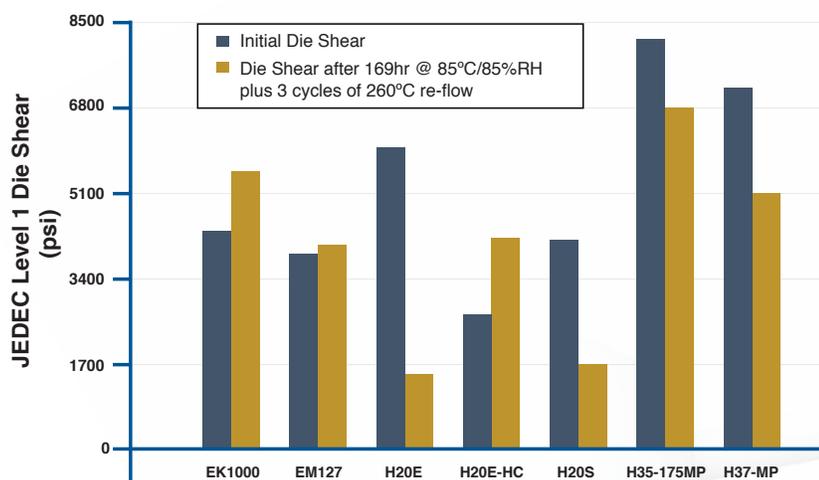
Note: HI-REL die attach adhesives are not typically chosen based on their Tg, CTE or moisture resistance

EPO-TEK®	CURE TEMPERATURE (minimal)	Cl-1 ion (ppm)	Thixo Index	Thermal k (W/m² K)	POT LIFE (@ room temp.)	TGA DEGRADATION TEMPERATURE (°C)	% Outgass @ 300°C	E'modulus (Kpsi)	DIE SHEAR STRENGTH @ RT (80mil x 80mil)	Deposition Method
EJ2108	150°C/1 hour	N/A	2.4	4.0	1 hour	276	5.19	2	8 Kg	Dispensing, hand
EK1000	150°C/1 hour+ 200°C/1 hour	<10	3.6	26.3	14 days	357	1.70	273	13.4 Kg	Dispensing
* EK1000-1	150°C/1 hour+ 200°C/1 hour	3	3.7	22.7	14 days	372	0.50	609	12.7 Kg	Dispensing, stamping, screen printing
† EK1000-1MP	150°C/1 hour+ 200°C/1 hour	<200	3.7	22.7	14 days	372	0.50	609	>10 Kg	Dispensing, stamping, Screen printing
† EK1000-MP	150°C/1 hour+ 200°C/1 hour	<200	3.6	26.3	14 days	357	1.70	273	>10 Kg	Dispensing
EM127	150°C/1 hour	170	5.0	1.0	28 days	332	1.56	677	11.5 Kg	Dispensing, stamping
* H20E	150°C/1 hour	154	4.8	2.5	2.5 days	419	2.49	808	17 Kg	Dispensing, stamping, screen printing
H20E-HC	150°C/1 hour	34	4.1	11.0	2.5 days	31	1.05	217	8 Kg	Dispensing, hand
† H20E-MP	150°C/1 hour	<200	4.6	2.5	2 days	425	1.67	808	10 Kg	Dispensing, stamping, screen printing
* H20-PFC	150°C/1 hour	199	6.7	3.2	3 days	407	1.78	921	5 Kg	Dispensing, stamping, Screen printing
H20S	150°C/1 hour	138	5.1	2.4	2.5 days	403	2.64	339	12 Kg	Dispensing, Stamping
*† H37-175MP	180°C/1 hour	51	3.0	1.9	28 days	431	0.76	1,106	23 Kg	Dispensing
*† H37-MP	150°C/1 hour	90	3.8	2.4	28 days	375	0.38	727	21 Kg	Dispensing
H44	150°C/1 hour	N/A	N/A	N/A	N/A	388	0.06	N/A	10 Kg	Dispensing, hand
H81	150°C/1 hour	N/A	N/A	N/A	2 days	483	0.10	N/A	5 Kg	Dispensing, hand

* NASA Low Outgassing † MIL-STD 883/TM5011

MSL1 (JEDEC Level 1) Die Shear

Die shear strength of Au-Au (80mil x 80mil) die on Au/Kovar® substrate



Our **Adhesive Experts** are available for technical discussions. Contact at: **+1.978.667.3805** & techserv@epotek.com



EPOXY TECHNOLOGY

DISCLAIMER: Data presented is provided only to be used as a guide. Properties listed are typical, average values, based on tests believed to be accurate. It is recommended that users perform a thorough evaluation for any application based on their specific requirements. Epoxy Technology makes no warranties (expressed or implied) and assumes no responsibility in connection with the use or inability to use these products. Please refer to the product data sheets and safety data sheets (SDS) for more detailed information.

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