Ultrasonic Applications

What Are Ultrasonics?

Ultrasonic (also know as ultrasound) technology is a technique that uses acoustic (sound) waves for locating objects. This method is enabled by a transducer which detects and creates waves via an actuator; generally a piezoelectric device. Once the waves are made, they have to be shaped, or channeled correctly using a lens layer that receives the phase change of these reflective sound waves. Acoustic matching and backing layers (i.e. blocking) are used in combination to isolate waves of significance and avoiding waves of waste or interference. These isolated waves produce an image that can be read.

How Are Ultrasonics Used?

Ultrasound technology is most well known in the medical/healthcare industry, not just for fetal imaging, but for imaging in general. It is a much less invasive technique than endoscopic procedures for diagnostic purposes. Ultrasonics also enable cleaning technologies, whether in dentistry, or electronics. For industrial applications ultrasound is used for oil & gas exploration (finding pockets below ground or sea level), plastics welding and consumer speaker and microphone electronics. A final application in ultrasonics is non-destructive tests for inspection and scientific instruments.

What Types of EPO-TEK® Products Are Used in Ultrasonic Applications?

Epoxy Technology manufactures a variety of optical, electrically conductive & thermally conductive adhesives. Here is a listing of specific ultrasonic areas and adhesives best suited for them:

- Dielectric epoxies for fabricating and laminating the PZT structures to the ceramic carriers:
  301-2, 301-2FL, 353ND
- Dielectric epoxies for acoustical matching & backing loaded with acoustical fillers such as Ag, W and Pb:
  301, 301-2
- Flexible potting epoxy used at the lens level:
  310M-1, T7109-19
- Thermally conductive epoxy for wicking away heat generated by the device:
  T905BN-3, TJ1104-LH
- Electrically conductive epoxy for connecting the PZT array to the flex circuit:
  EJ2189-LV, H20E, H20E-LC, H24

Characteristics To Help Choose the Correct EPO-TEK® Product

EPO-TEK	Key advantages and characteristics
301	Low viscosity, low stress, short pot life dielectric for acoustic matching & blocking, and filling PZT kerfs
301-2	Low viscosity, low stress, long pot life dielectric for acoustic matching & blocking, and filling PZT kerfs
301-2FL	Low viscosity, low stress, long pot life, flexible dielectric for acoustic matching & blocking, and underfill
310M-1	Low viscosity, lowest stress, most flexible dielectric for acoustic matching & blocking, resists 180° peel testing, Au to Au foil bonding
353ND	Medium viscosity, high strength, industry standard dielectric for laminating and fabrication of PZT
EJ2189-LV	Medium viscosity, low temp cure ECA* for Au/PZT connections to flex PCB
H20E	Medium viscosity, thixotropic, industry standard rigid ECA* for Au/PZT connections to flex PCB
H20E-LC	Medium viscosity, thixotropic, rigid ECA* for chip bonding and thermal management for hybrids
H24	Medium viscosity, compliant ECA* for PCB/circuit connections, blocking layer with low density
T7109-19	High viscosity, low temp cure, low stress, flexible TCA† for lens layers replacing polyurethane
T905BN-3	Low viscosity, self-leveling, low stress, low temp cure TCA† for large volume potting and casting in fetal ultrasound transducers
TJ1104-LH	Black, single component thixotropic TCA† for MEMs IC die attach of SMD speakers and microphones

*ECA – Electrically Conductive Adhesive †TCA – Thermally Conductive Adhesive

EPOXY TECHNOLOGY

How Do The EPO-TEK Properties Compare?

EPO-TEK®	NO. of COMPONENTS	COLOR Before/ After CURE (thin film)	CURE TEMPERATURE (minimal)	VISCOSITY @ 23°C	GLASS TRANSITION TEMPERATURE (Tg)	DIE SHEAR STRENGTH @ RT (80mil x 80mil)	INDEX OF REFRACTION* (Nd)	SPECTRAL TRANSMISSION	TGA DEGRADATION TEMPERATURE	CTE Below Tg/ Above Tg (in/in/°C)	POT LIFE (@ room temp.)	SHELF LIFE (@ room temp. unless noted)
301	Two	Clear/ Colorless	65°C – 2 hours 23°C – 24 hours	100 - 200 cPs @ 100 rpm	≥65°C	≥10 kg/3,400 psi	1.5190 (uncured)	>99% @ 380-980nm >97% @ 980-1640nm >95% @ 1640-2040nm	430°C	39×10^{-6} 98×10^{-6}	1-2 hours	1 year
301-2	Two	Clear/ Colorless	80°C – 3 hours 23°C – 24 hours	225 - 425 cPs @ 100 rpm	≥80°C	≥15 kg/5,100 psi	1.5318 (uncured)	>94% @ 320nm >99% @ 400-1200nm >98% @ 1200-1600nm	360°C	61×10^{-6} 180×10^{-6}	8 hours	1 year
301-2FL	Two	Clear/ Colorless	80°C – 3 hours 23°C – 3 days	100 - 200 cPs @ 100 rpm	≥45°C	≥10 kg/3,400 psi	1.5115 (uncured)	>99% @ 400-1000nm >97% @ 1000-1600nm	325°C	56×10^{-6} 211×10^{-6}	10 hours	1 year
310M-1	Two	Clear/ Light Yellow	65°C – 2 hours 23°C – 1 day	300 cPs @ 100 rpm	28°C	7.3 kg/2,482 psi	1.5129 (uncured)	>98% @ 360-1060nm	300°C	60×10^{-6} 229×10^{-6}	2 hours	1 year
353ND	Two	Amber/ Dark Red	150°C – 1 min 80°C – 30 min	3,000 - 5,000 cPs @ 50 rpm	≥90°C	≥15 kg/5,100 psi	1.5694 (uncured)	>50% @ 550nm >98% @ 800-1000nm >95% @ 1100-1600nm	412°C	54×10^{-6} 206×10^{-6}	≤3 hours	1 year
EJ2189-LV	Two	Silver/Silver	150°C – 15 min 23°C – 72 hours	2,500 - 4,500 cPs @ 1 rpm	≥40°C	≥10 kg/3,400 psi	N/A	N/A	340°C	52×10^{-6} 89×10^{-6}	4 hours	1 year
H20E	Two	Silver/Silver	175°C – 45 sec 80°C – 3 hours	2,200 - 3,200 cPs @ 100 rpm	≥80°C	>10 kg/3,400 psi	N/A	N/A	425°C	31×10^{-6} 158×10^{-6}	2.5 days	1 year
H20E-LC	Two	Silver/Silver	175°C – 45 sec 80°C – 3 hours	2,200 - 3,200 cPs @ 100 rpm	≥80°C	≥5 kg/1,700 psi	N/A	N/A	451°C	44×10^{-6} 174×10^{-6}	4 days	1 year
H24	Two	Silver/Silver	150°C – 5 min 80°C – 45 min	15,000 - 23,000 cPs @ 10 rpm	≥100°C	≥5 kg/1,700 psi	N/A	N/A	470°C	28×10^{-6} 104×10^{-6}	18 hours	6 months
T7109-19	Two	Grey/Grey	80°C – 2 hours 23°C – 2 days	40,000 - 70,000 cPs @ 5 rpm	≤40°C	≥5 kg/1,700 psi	N/A	N/A	338°C	59×10^{-6} 216×10^{-6}	2 hours	1 year
T905BN-3	Two	Grey/Grey	80°C – 2 hours	2,000 - 7,000 cPs @ 50 rpm	≥40°C	≥10 kg/3,400 psi	N/A	N/A	347°C	37×10^{-6} 151×10^{-6}	3 hours	1 year
TJ1104-LH	One	Black/ Black	200°C – 5 min 140°C – 40 min	50,000 - 130,000 cPs @ 1 rpm	≥100°C	≥20 kg/6,800 psi	N/A	N/A	393°C	43×10^{-6} 130×10^{-6}	≥7 days	1 year @-40°C

* Measured @ 589nm
N/A - not available/applicable

Please consult our *Application Experts* at Epoxy Technology to find the most suitable adhesives for specific technical challenges at: techserv@epotek.com.

Epoxy Technology Inc. • 14 Fortune Drive • Billerica, MA 01821
phone 978-667-3805 fax 978-663-9782 techserv@epotek.com