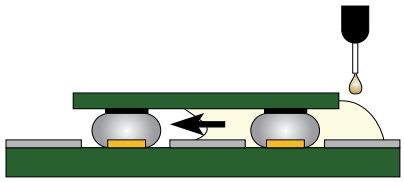
UNDERFILLS



Flip Chip Underfill

What Are Underfills?

Underfills are used to fill space beneath a die and adhere to its carrier. They add structural strength, increase impact resistance, bolster thermal cycling resistance and improve overall reliability. Underfills can be found in a wide variety of applications including flip-chip, fine pitch BGA, and chip scale packages.

How Can Underfills Be Used?

Underfills are used most often in three distinct applications:

- Capillary Underfills
- Non-Flow Thermally Conductive Underfills
- Four Corner Bonding Underfills

Which EPO-TEK® Products Are Best Suited For Underfills?

Epoxy Technology manufactures a variety of underfills for several applications, with a key distinction being **cure temperature**:

- Capillary (Low Viscosity With Excellent Wicking For Increased Strength)
  - *Room Temperature (RT) Cure*: 301-2, 301-2FL, OE121, OE121 Black
  - *Thermal Cure*: 323LP, 353ND, 353ND Black, U300-2
- Non-Flow Thermally Conductive (Alternate To Capillary, For Heat Dissipation)
  - *Room Temperature (RT) Cure*: T7110-38, T7109-19
  - *Thermal Cure*: 930-4, H70E
- Four Corner Bonding (Non-Flow, Dispensed After Die Placement, Less Strength)
  - *Thermal Cure*: 353ND-T, OE188
  - *UV:* OG116-31

Characteristics To Help Choose the Correct EPO-TEK® Product?

EPO-TEK	Key advantages/ Characteristics
301-2	Low viscosity, RT cure with long pot life
301-2FL	Low viscosity, RT cure with 10 hour pot life
323LP	Medium viscosity, heat cure, long pot life version of 353ND
353ND	Medium viscosity, heat cure with built in color change indicating cure completion
353ND Black	Black version of 353ND for opacity in the IR and VIS regions
353ND-T	Non-flowing version of our 353ND for four corner bonding
930-4	Medium viscosity, thermally conductive, non-flow material with excellent thermal dissipation
H70E	Medium viscosity, heat cure, thermally conductive, non-flow material
OE121	Low viscosity, RT cure, with excellent flow properties
OE121 Black	Black version of OE121 for easy identification
OE188	Higher viscosity, heat cure with great flow properties and very low CTE
OG116-31	Higher viscosity, UV cure, low flow material with high strength and low stress
T7109-19	High viscosity, thermally conductive, slightly flowing paste with flexibility and high toughness
T7110-38	Higher viscosity, RT cure with high thermal conductivity
U300-2	Medium viscosity, long pot life, with excellent capillary flow

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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)
301-2	Two	Clear/ Colorless	80°C – 3 hours 23°C – 2 days	225-425 cPs @ 100 rpm	≥80°C	≥15 kg/5,100 psi	1.5318	>99% @ 400-1200 nm >98% @ 1200-1600 nm	360°C	61 x 10^{-6} 180 x 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	>99% @ 400-1000 nm >97% @ 1000-1600 nm	325°C	56 x 10^{-6} 211 x 10^{-6}	10 hours	1 year
323LP	Two	Clear/ Light Yellow	150°C – 1 hour 90°C – 30 hours	3,500-5,000 cPs @ 50 rpm	≥100°C	≥20 kg/6,800 psi	1.5704	>94% @ 820-1620 nm >90% @ 640-800 nm	413°C	31 x 10^{-6} 132 x 10^{-6}	24 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	>50% @ 550 nm >98% @ 800-1000 nm >95% @ 1100-1600 nm	412°C	54 x 10^{-6} 206 x 10^{-6}	≤3 hours	1 year
353ND Black	Two	Tan/Dark Red	150°C – 10 min 120°C – 30 min 80°C – 2 hours	11,000-20,000 cPs @ 20 rpm	≥95°C	≥10 kg/3,400 psi	N/A	N/A	485°C	51 x 10^{-6} 179 x 10^{-6}	3 days	6 months
353ND-T	Two	Tan/Dark Red	150°C – 1 min 80°C – 30 min	9,000-15,000 cPs @ 20 rpm	≥90°C	≥15 kg/5,100 psi	N/A	N/A	409°C	43 x 10^{-6} 231 x 10^{-6}	3 hours	1 year
930-4	Two	Ivory/Amber	150°C – 10 min 80°C – 6 hours	12,000-17,000 cPs @ 20 rpm	≥90°C	≥15 kg/5,100 psi	N/A	N/A	425°C	27 x 10^{-6} 136 x 10^{-6}	1 day	1 year
H70E	Two	Grey/Grey	175°C – 1 min 80°C – 90 min	4,000-7,000 cPs @ 50 rpm	≥80°C	≥10 kg/3,400 psi	N/A	N/A	451°C	15 x 10^{-6} 64 x 10^{-6}	56 hours	1 year
OE121	Two	Light Yellow/ Yellow	90°C – 1 hour 23°C – 2 days	300-500 cPs @ 100 rpm	≥55°C	≥15 kg/5,100 psi	1.5271	>94% @ 380-1640 nm	350°C	43 x 10^{-6} 158 x 10^{-6}	5 hours	1 year
OE121 Black	Two	Black/Black	90°C – 1 hour 23°C – 2 days	300-500 cPs @ 100 rpm	≥55°C	≥15 kg/5,100 psi	N/A	<1% @ 340-1260 nm	350°C	43 x 10^{-6} 158 x 10^{-6}	5 hours	1 year
OE188	Two	Off-White/ Off-White	150°C – 1 min 80°C – 30 min	20,000-30,000 cPs @ 10 rpm	≥90°C	≥15 kg/5,100 psi	N/A	N/A	417°C	19 x 10^{-6} 68 x 10^{-6}	1.5 hours	1 year
OG116-31	One	White/White	100mW/cm² for >2 min @ 320-500 nm	20,000-30,000 cPs @ 10 rpm	≥115°C	≥10 kg/3,400 psi	1.5662	>96% @ 660-1640 nm >92% @ 500 nm	409°C	41 x 10^{-6} 170 x 10^{-6}	N/A	1 year
T7109-19	Two	Grey/Grey	80°C – 2 hours 23°C – 24 hours	40,000-70,000 cPs @ 5 rpm	<40°C	5 kg/1,700 psi	N/A	N/A	338°C	59 x 10^{-6} 216 x 10^{-6}	2 hours	1 year
T7110-38	Two	Grey/Grey	23°C – 3 days	18,886 cPs @ 10 rpm	48°C	18 kg/6,120 psi	N/A	N/A	329°C	N/M	30 min	1 year
U300-2	Two	Amber/ Dark Amber	150°C – 1 hour 80°C – 3 hours	3,700-6,700 cPs @ 20 rpm	≥115°C	N/A	N/A	N/A	425°C	55 x 10^{-6} 184 x 10^{-6}	2 days	1 year

N/A - not applicable, as these are filled systems
N/M - not measured

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

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