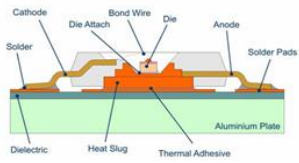


TECHNOLOGIES

- DIE ATTACH
- THERMAL DISSIPATION
- COATING/ENCAPSULATION

ADVANTAGES

- High thermal conductivity / Non-yellowing
- Low thermal resistivity, also for ceramic onto heatsink
- Optically clear, non yellowing, in UV or thermal cure



➤ DIE ATTACH

Typical Application

LED chips need to be bonded onto lead frames which are typically Ag-metallized. PROTAVIC offers a range of electrically conductive die attach adhesives which have been developed specifically for this application.

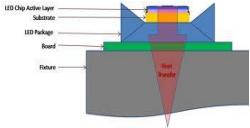
For good wire-bondability, the adhesives have excellent mechanical resistance at elevated temperature, which is also important in case of LED's which are soldered onto PCB boards.

In case of LED applications, also B-stageable conductive adhesives can be considered. These offer the advantage of being applicable by stencil printing, allowing higher throughput, combined with the technical advantage of controlled bondlines, and less fillets, which becomes increasingly important as LED chips are getting thinner.

ELECTRO-CONDUCTIVE PROTAVIC®	CHEMISTRY	VISCOSITY AT 5 RPM (mPa.s)	THERMAL CONDUCTIVITY (W/m.K)	ELECTRICAL CONDUCTIVITY (mΩ.cm)	TG (°C)	CTE (ppm / °C)	STORAGE COND.	POT LIFE AT 20±2°C	CURING SCHEDULES
PROTAVIC® ACA 20510	Acrylic	10000	>17	0.1	37		6 months@-40°C	1 day	30min @ 200°C
PROTAVIC® ACE 30512	Epoxy	10000		0.05			6 months@-20°C	1 month	90min @ 180°C
PROTAVIC®ACH 30200	Hybrid	10000	29	0.01	60	20	6 months@-20°C	7 days	15min @ 150°C +15min @ 200°C
PROTAVIC®ACE 30032	Epoxy	8000	3	0.1	80	100	6 months@-20°C	1 day	60 min @ 150°C
PROTAVIC®ACE 34030	Epoxy	8700	3.6	0.175	74	35	6 months@-20°C	>1 day	30 min @ 175°C
PROTAVIC®ACE 34683	Epoxy	6100	2.6	0.370	134	77	1 year@-40°C	3 days	20min @ 200°C 1hr @ 150°C
PROTAVIC®ACH 35001	Hybrid	9600	15	0.13	209	45	6 months@-20°C	1 day	30min @ 80° +60min @ 175°C
PROTAVIC®BCE 20240	Epoxy B-stageable	25000	2.8	1	65	50	1 year@0°C	1 month	30min @ 90°C +30min @ 180°C
PROTAVIC®BCE 34815	Epoxy	10400	10	0.07	101	72	1 year@-40°C	1 day	1hr @ 175°C

Some LED designs, require chip bonding with transparent die attach materials, to enable reflection from Ag-metallized base-substrate. **PROTAVIC** has developed a non-yellowing, transparent die attach adhesive for LED assembly

NON CONDUCTIVE PROTAVIC®	CHEMISTRY	VISCOSITY AT 5 RPM (mPa.s)	TG (°C)	CTE (ppm / °C)	STORAGE COND.	POT LIFE AT 20±2°C	CURING SCHEDULE	HEGMANN FINENESS (micron)
PROTAVIC® ANE 30050	Epoxy	15000	83	65	1 year@-20°C	14 days	60min@170°C	1 max



➤ THERMAL DISSIPATION

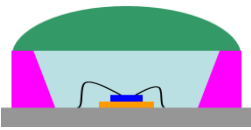
Typical Application

Especially high power LED's generate a lot of heat during operation. To increase the lifetime, as well as the efficiency of the LED's, it's important to bond the LED's with adhesives with excellent thermal dissipation.

Unlike the die attach adhesives which have best thermal conductivities, in some applications, the thermal adhesive must be dielectric.

For those applications, **PROTAVIC** has developed a range of materials, as listed in below table.

THERMAL DISSIPATION PROTAVIC®	CHEM.	MIXING RATIO (BY WEIGHT)	VISCOSITY AT 5 RPM (mPa.s)	THERMAL CONDUCTIVITY W/m.K	TG (°C)	CTE1 (ppm / °C)	STORAGE COND.	POT LIFE AT 20±2°C	CURING SCHEDULES
PROTAVIC® ATE 10120	Epoxy	One part	10000		75	65	1 year@-20°C	Several weeks	10min @ 150°C
PROTAVIC® ATE 10601 A&B	Epoxy	1/1	15000	>1.5	70	50	1 year@25°C	12 hrs	2hrs @ 80°C 8min @ 150°C 6sec @ 200°C
PROTAVIC® ATE 46439A&B	Epoxy	100/9	12000	3			1 year@25°C	4hrs	3hrs @ 75°C 1hr @ 100°C
PROTAVIC® ATE 46439A&B BLACK	Epoxy	100/9	8000	3			3 months@25°C	4hrs	3hrs @ 75°C 1hr @ 100°C



➤ COATING AND ENCAPSULATION

Typical Application

To protect LED's from external factors such as moisture, dust, etc., in many applications LED's are protected by potting materials. Large lighting manufacturers for outdoor applications also require suitable environmental protection.

PROTAVIC has developed a range of materials, with different chemistries, offering long term non-yellowing protection. The products include water-clear silicones, polyurethanes and/or UV-curable materials.

COATING & ENCAPSULANT PROTAVIC®	CHEM.	MIXING RATIO (BY WEIGHT)	VISCOSITY AT 5 RPM (mPa.s)	TG (°C)	CTE (ppm / °C)	STORAGE COND.	POT LIFE AT 20±2°C	CURING SCHEDULES
PROTAVIC® PNU 46202 A&B	Urethane	1/1	8000	-38	230	1 year @25°C	5min	24hrs @ 25°C 30min @ 50°C 10sec @ 95°C
PROTAVIC® PNU 46202 A&B Translucent	Urethane	1/1	8000	-38	230	1 year @25°C	5min	24hrs @ 25°C 30min @ 50°C
PROTAVIC® PNS 56226 A&B	Silicone	1/1	600	-64	5500	1 year @25°C	10min	12 hrs @ 25°C
PROTAVIC® PNS 30110 A&B	Silicone	1/1	2200			1 year @25°C	7 days	2hrs @ 150°C
PROTAVIC® ANO 90161	Prop.		350@100rpm	80	120	6 months @ -20°C	Several days	5 sec.120mW/cm ²