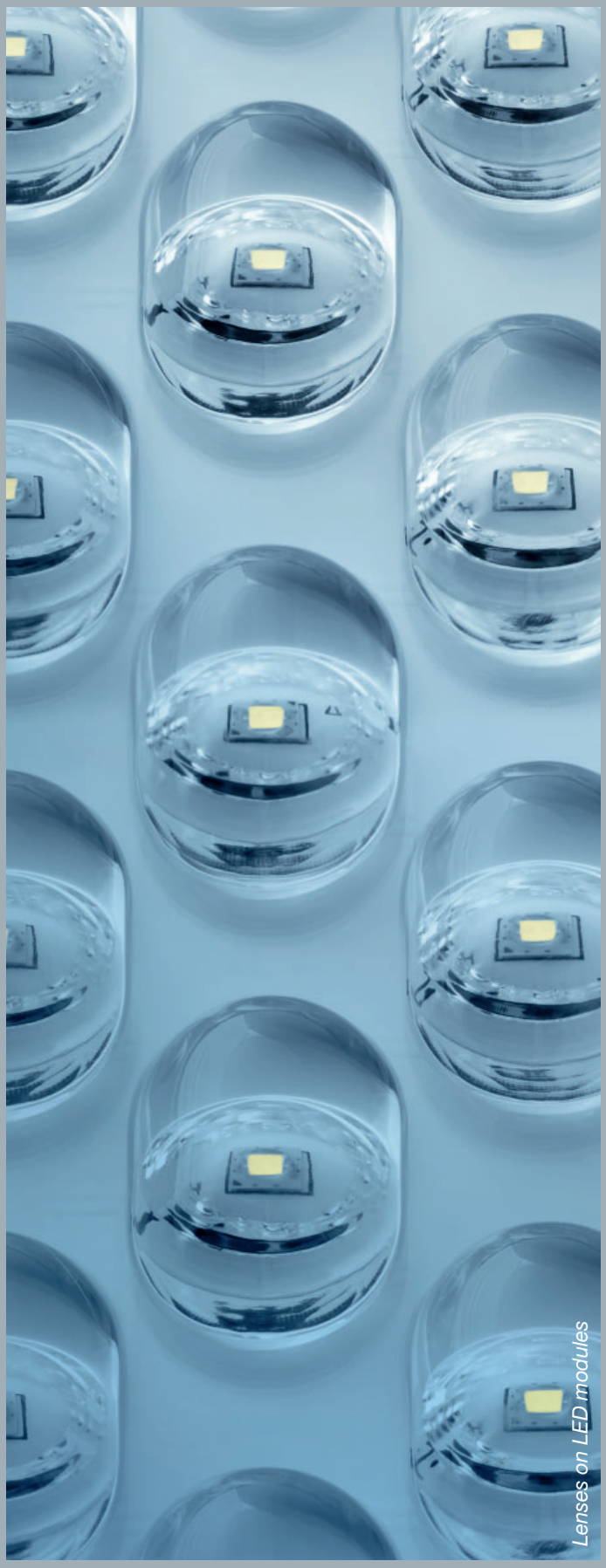
DELO



Lenses on LED modules

Adhesive and Process Solutions for LED Packaging

Bonding LED packages

Adhesives for new lighting concepts

LED technology stands for sustainable modern lighting design. Manufacturers make the most of the infinite design options offered by LEDs to develop versatile, innovative lighting concepts for building technology and lighting engineering in the automotive sector.

Adhesives play a key role in the design and manufacture of LED packages. They are indispensable to the long-lasting function and uniform brightness of the diodes and permit production in the space of a second. The prerequisite however is that the adhesives are precisely tailored to the relevant application area.

DELO® has developed special adhesives both for first-level packaging (p. 3), in which the adhesive is located in the immediate vicinity of the LED semiconductor, and for second-level packaging (p. 6), in which the focus is on reliably bonding lenses and housing. In standard tests and implementation by customers worldwide they yield outstanding results and satisfy the high requirements of LED manufacturers.

Manufacturing ever smaller LED packages is one of the requirements. Flip-chip technology (p. 7), and thus the use of conductive adhesives, unlocks new possibilities for manufacturers in this respect.

LED adhesives – your benefits

- Long-lasting high intensity of the LED and thus high optical quality
- Automated, cost-efficient production possible thanks to light curing
- Design creativity thanks to invisible joining, even of unconventional shapes and materials

WATCH VIDEO NOW

www.DELO.show/LED-Bright-Test

Tell our experts what you need and together we will find the right adhesive and process solution for your application field – no matter whether for first-level packaging, second-level packaging, pin sealing or encapsulation. We will be happy to help you turn your product innovations into reality.

First-level packaging

LED-compatible adhesives

Adhesives and other materials in the immediate vicinity of the LED semiconductor are generally exposed to considerable stressing by high temperatures and LED radiation. In addition, neither the materials themselves, nor potential outgassing elements may be allowed to negatively interact with the LED.

Above all, adhesives based on densely crosslinked epoxies, like DELO DUALBOND® adhesives, have proved their worth in these applications. They not only offer temperature and light resistance, but also low outgassing levels.
Another crucial advantage is their special curing mechanism combining light and heat. Light curing permits swift fixing of the optical components to one another, while heat curing ensures reliable curing even in shadowed areas. And of course, purely light- or heat-curing adhesives are also available.

DELO DUALBOND® product features

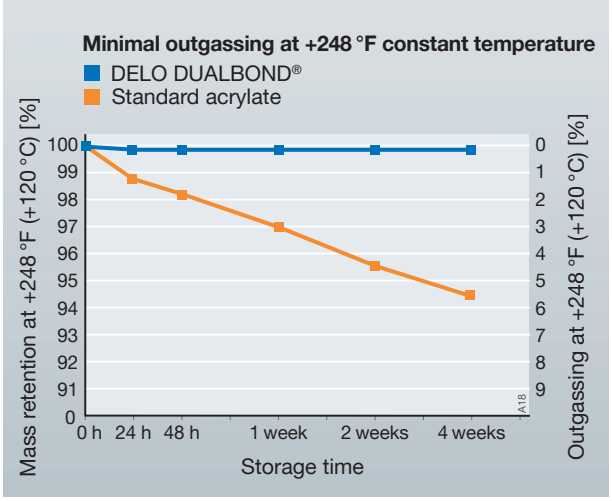
Long-lasting high intensity of the LED
- Minimum outgassing
- Yellowing-resistant
- High temperature resistance

Swift processes
- Easy dispensing and integration into the production process
- Optimum curing with DELOLUX® LED lamps
- Fast prefixing with light possible

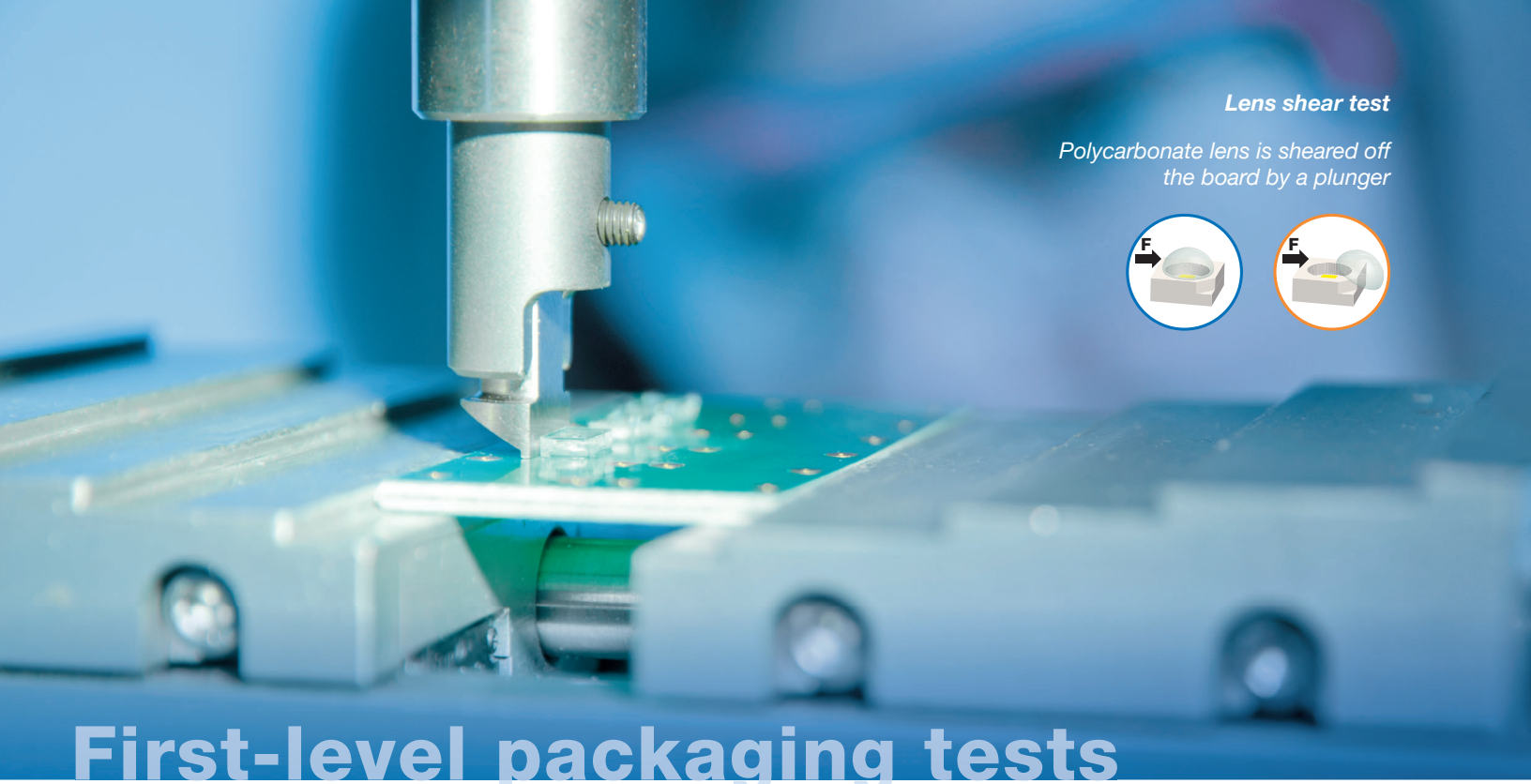
Additional qualities
- Low temperature impact via light curing or heat curing at low temperatures
- Reflow resistance
- Optically clear products available

HALOGEN FREE

Wide range of halogen-free adhesives according to IEC 61249-2-21



Significantly lower outgassing of DELO DUALBOND® compared to standard acrylates.

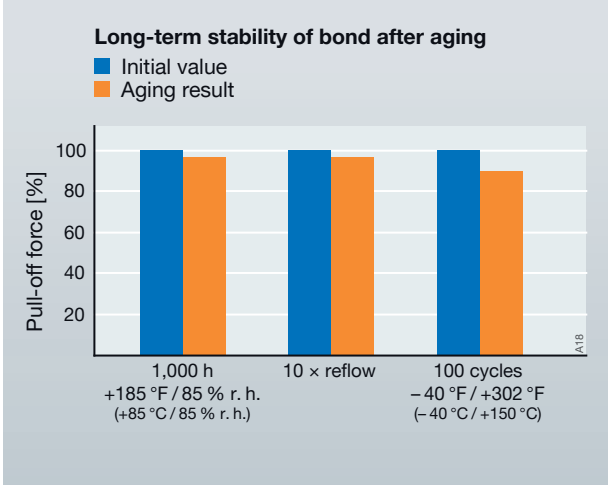


First-level packaging tests

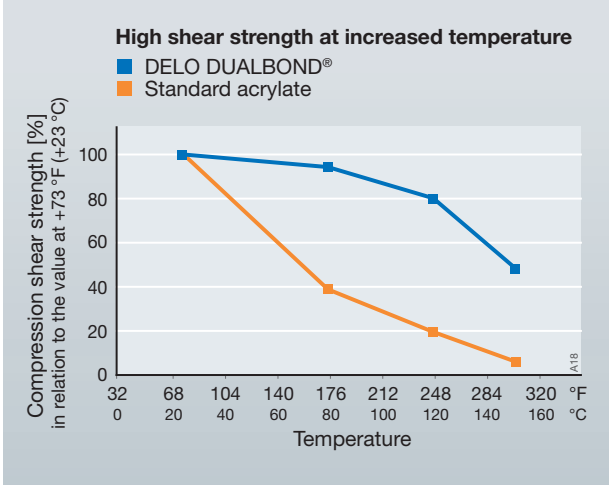
Test procedure

Reliable joining is an essential prerequisite when bonding optoelectronic components. Various standardized test procedures can be used to verify whether adhesives comply with the relevant requirements. These tests are an important reference for us to optimally advise our customers on their choice of adhesives.

Among other things, DELO DUALBOND® adhesives achieve very good results in humidity storage, thermal shock and repeated reflow tests, thus ensure long-lasting bonding stability. They also display high shear strength both at low and high temperatures and thus very good bond strength.



DELO DUALBOND® displays high bond strength in standardized reliability tests.



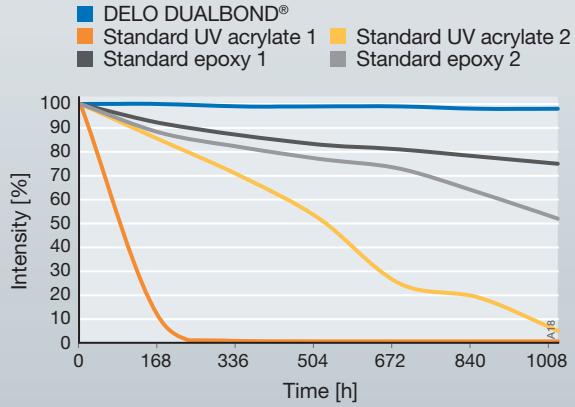
In the lens shear test (see above) DELO DUALBOND® shows high bond strength compared to a standard acrylate – especially at high temperatures.

LED Bright Test™

Adhesives close to the light-emitting diodes are exposed to high stressing due to the heat and radiation given off by the LED. Optical stability may be permanently compromised as a result of yellowing or interaction with decomposition products. DELO DUALBOND® adhesives are based on special properties to avoid both these risks.

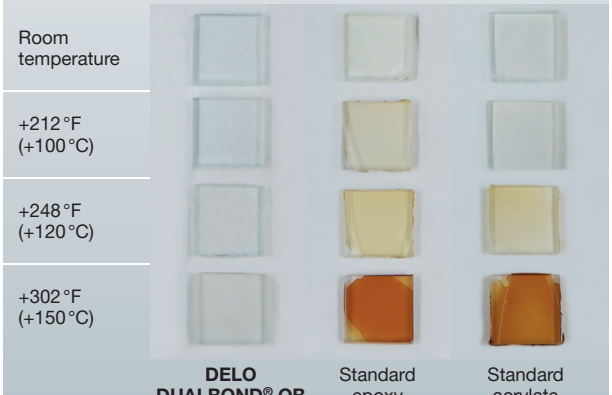
In the LED Bright Test™ the adhesives display only minimum outgassing and changes in intensity. A further temperature test underscores the adhesive's optical stability at high temperatures. DELO DUALBOND® thus ensures permanently uniform LED brightness.

Light intensity path in LED Bright Test™

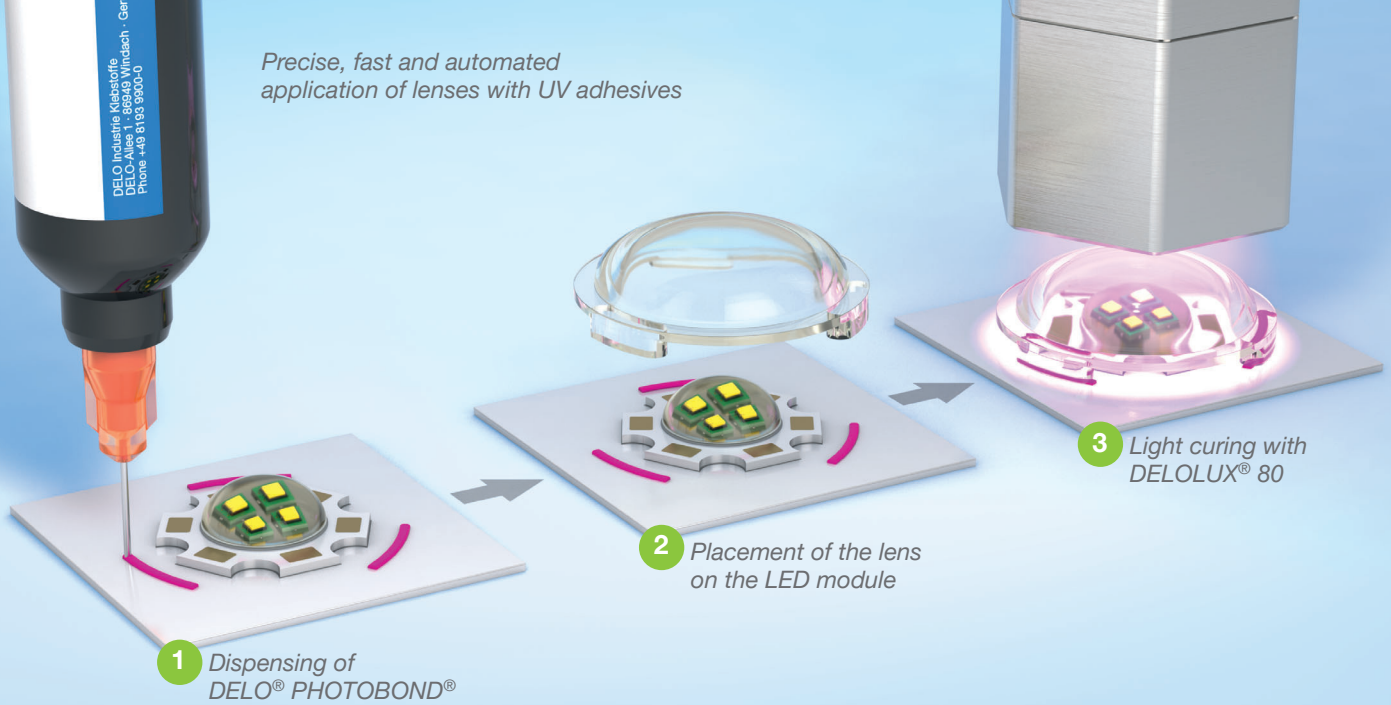


The outgassing behavior of many standard adhesives reduces LED intensity whereas DELO DUALBOND® remains stable.

Constant transparency at high temperatures with DELO DUALBOND® after 168 h



DELO DUALBOND® OB adhesives are stabilized against thermal aging so they remain transparent.



Second-level packaging

Tension-equalizing adhesives

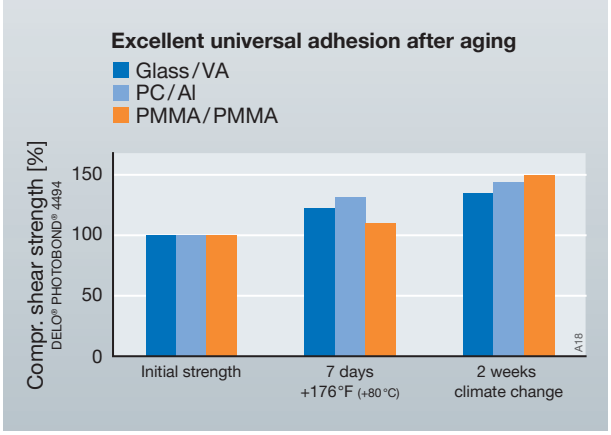
Adhesives used to join lenses, covers, housing and housing components around LED modules are subject to different requirements to first-level packaging. Above all, due to the greater dimensions and different materials used, they need to be proficient in equalizing any tensions that may arise, for instance, due to changes in temperature. As joins are usually accessible to light, light-curing adhesives in the DELO® PHOTOBOND® series have proved their worth in this application area.

DELO® PHOTOBOND® product features

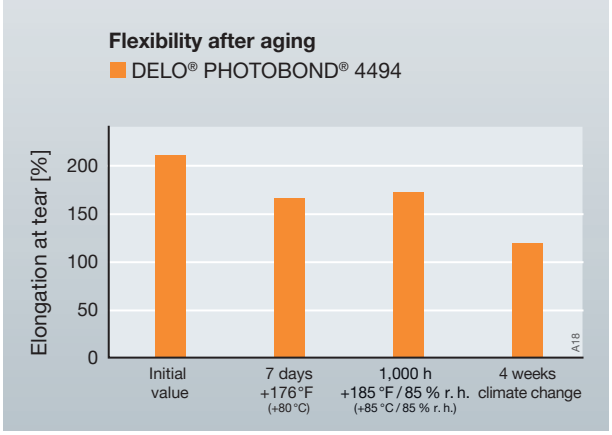
High LED intensity
- Low-outgassing
- Yellowing-resistant

Permanent bonding
- Tension-equalizing
- Humidity-, vibration- and temperature-resistant
- Universally good adhesion

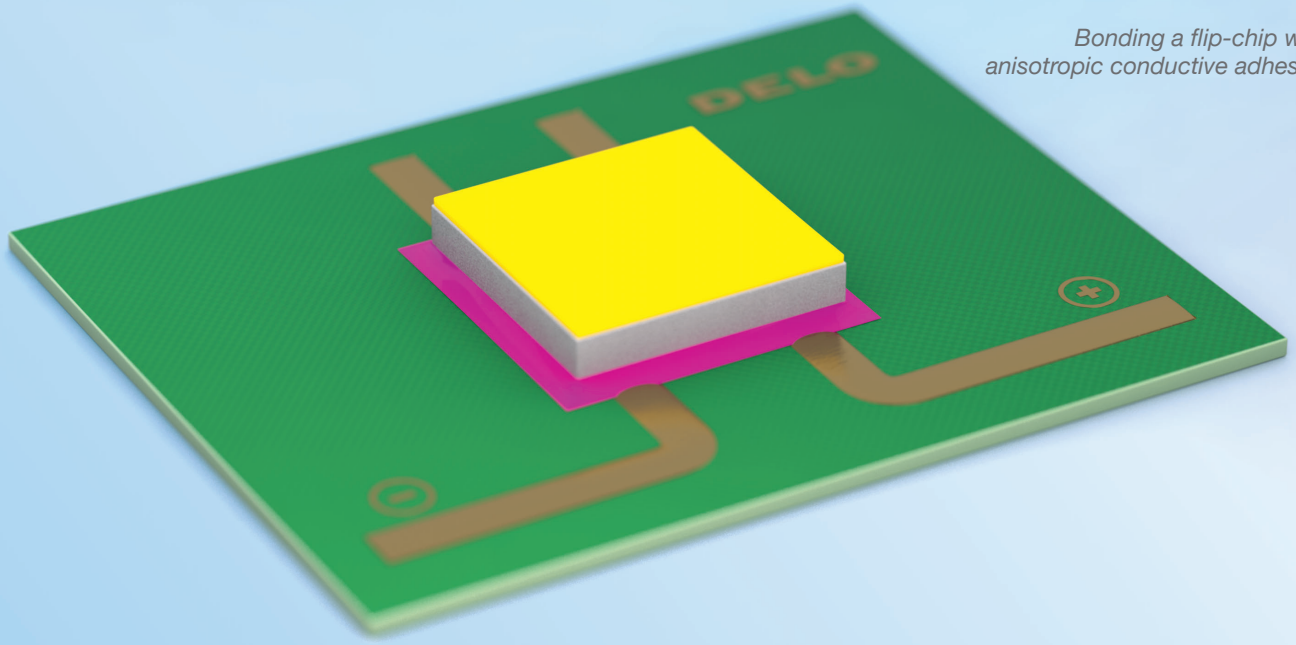
Processing advantage
- Light curing in seconds
- Different viscosity versions



During the aging process compression shear strength increases slightly while at the same time tension-equalizing properties are preserved.



Even after the aging process DELO® PHOTOBOND® 4494 retains its flexibility with elongation at tear greater than 120 %.



Bonding a flip-chip with anisotropic conductive adhesive

Flip-chip technology for LED packaging

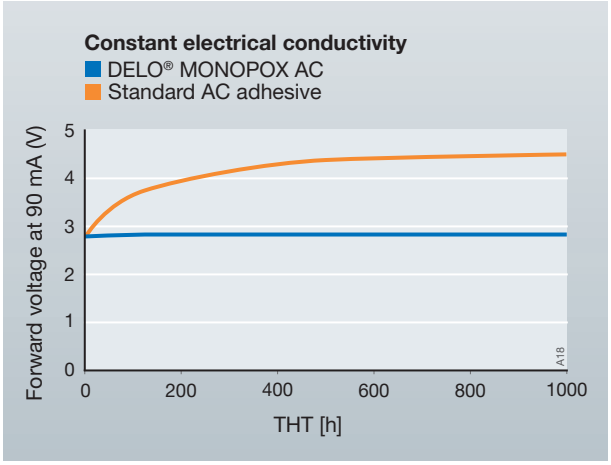
Anisotropic conductive adhesives

In many LED applications there has been a clear trend towards the use of ever smaller LED chips; edge lengths of less than 200 µm are by no means uncommon. However, conventional contacting via bond wires with pad sizes already of similar dimensions, results in high light yield losses and processing difficulties.

In this case, flip-chip LEDs are the technology of the future. With contacts on the substrate side and anisotropic electrically conductive adhesives they can be bonded directly to the substrate, thus eliminating the need for a further wire bond or reflow process. This also enables the use of different substrates, including the flexible films with metallic coating which are indispensable for new lighting concept designs.

DELO® MONOPOX AC series adhesives, which are filled with conductive particles, were specially developed for bonding flip-chips and ensure both permanent contacting and high processing rates.

For many years now DELO® has led the market in contacting flip-chips for RFID labels in roll-to-roll processing. Drawing on close cooperation with machine builders, DELO® can best advise and support customers both in their choice of adhesives and at process level.



DELO® MONOPOX AC adhesives ensure constant electrical conductivity.

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