Conductive adhesives for printed and flexible electronics
DELO paves the way to your success
We…

→ have expertise
→ are fast-growing
→ invest in the future
→ live innovation
LED Packaging

VCSEL, IR LED, conventional LED and FlipChips
Requirements in LED packaging

**Dam (receiver/ emitter)**
- Tailored transmission
- Aspect ratio
- Stackable
- Light fixable

**Lens/ optics**
- Positioning accuracy
- Shear stable
- Light fixable
- B-stage

**Frame/ Housing**
- Constant BLT
- Transparent or white
- Reflow capability
- Light fixable

**Coating**
- Tailored transmission
- Tailored color
- Light fixable
- Dual curing

► Transfer of proven solutions and continuous development
Beneficial product features

1. Low outgassing & yellowing
   - Closed cavities do not allow condensable outgassing products
     ➔ Possible yellowing or browning
   - Halogen-free (Cl, Br < 900 ppm)
   - Reflow resistant
   - Optimized outgassing
   - Optimized yellowing

2. Dispensing process optimized

3. Tailored Transmission

► Continuous product improvement @DELO by Engineering + R&D
### Properties

1. **DELO MONOPOX VLT = Very Low Temperature**
   - One-component epoxy resin
   - Curing temperature: min. + 60 °C

2. **Processing**
   - 72 h processing time
   - Low shrinkage
   - Glass transition temperature at + 30 °C possible

3. **Good strength on various materials**
   - Glass transition temperature, typically around + 30 °C when curing at + 60 °C
   - Normally used in the temperature range between -40 °C to +150 °C
   - Low outgassing acc. to ECSS-Q-70-02 or ASTM E 595-93, and NASA outgassing test
Strength comparison

Particularly good strength of LT204 even after storage

DELO MONOPOX LT204

- curing 60°C 90min
- curing 60°C 90min + 168h THT (85/85)

Compression shear strength before and after THT (85°C/85 r.h.) storage
**Takeaways**

1. **DELO MONOPOX VLT enables curing at + 60 °C!**
   - Ideal solution for low temperature applications
   - Ideal solution for material with low melting point

2. **Low thermal stress**
   - Ideal solution for sensitive applications
   - Ideal solution for low stress during curing

3. **Good strength on various materials**
   - Ideal solution for difficult substrates
   - Ideal solution for bonding applications e.g. housing, packaging

Dr. Tim Cloppenborg | 06.06.2019
General difference between “ACA” and “NCA”

Flip chip bonding

- **Non-Conductive Adhesives (NCA/NCP)**: Connection via bump
- **Anisotropic Conductive Adhesives (ACA/ACP)**: Connection via particle
- **Isotropic Conductive Adhesives (ICA/ICP)**: Connection via particle
How a final package could look like

- ACA fillet
- Die
- Conductive particles
- Metallization
- Substrate
- Bump
Curing process with ACF

1. Dispensing of the adhesive with DELO-DOT PN3

2. Die placing (parameters: e.g. 1 N/mm²; 1 s)

3. Final heat curing by thermo-compression with thermode

3 steps in total
Reliability comparison

Die shear strength [N]

- MP AC6550
- MP AC6545
- MP VE 120415

- initial
- 168h @ +85°C/85% r.h.
- 500 @ +85°C/85% r.h.
- 1000 @ +85°C/85% r.h.

High reliability even under long term THT for SMD interconnection

Dr. Tim Cloppenborg | 06.06.2019
Takeaways

1. **DELO MONOPOX ACA products are reliable**
   - Under THT (up 1000 h) and different substrates
   - On temperature sensitive materials

2. **Application**
   - Multiple bump applications
   - FlipChip applications

3. **Processing**
   - Ideal solution for rigid and flexible substrates
   - Flexible solution for different dispensing options
The data and information provided are based on tests performed under laboratory conditions. Reliable information about the behavior of the product under practical conditions and its suitability for a specific purpose cannot be concluded from this. It is the customer's responsibility to test the suitability of a product for the intended purpose by considering all specific requirements and by applying standards the customer deems suitable (e.g. DIN 2304-1). Type, physical and chemical properties of the materials to be processed with the product, as well as all actual influences occurring during transport, storage, processing and use, may cause deviations in the behavior of the product compared to its behavior under laboratory conditions. All data provided are typical average values or uniquely determined parameters measured under laboratory conditions. The data and information provided are therefore no guarantee for specific product properties or the suitability of the product for a specific purpose. Nothing contained herein shall be construed to indicate the non-existence of any relevant patents or to constitute a permission, encouragement or recommendation to practice any development covered by any patents, without permission of the owner of this patent. All products provided by DELO are subject to DELO’s General Terms of Business. Verbal ancillary agreements are deemed not to exist.