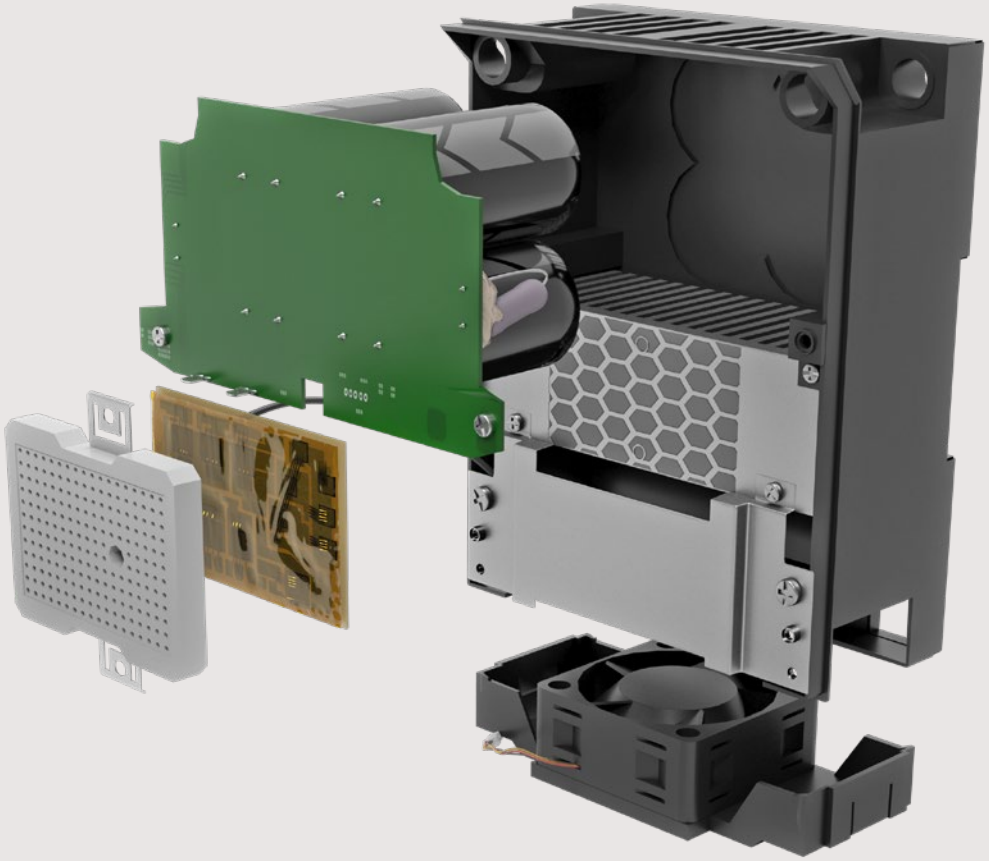
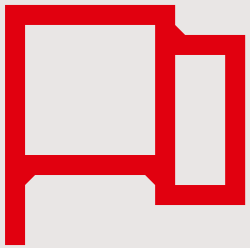
Henkel

LOCTITE®

CASE STUDY

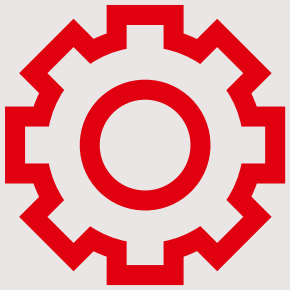
Improving Power Module Reliability with Phase Change Material





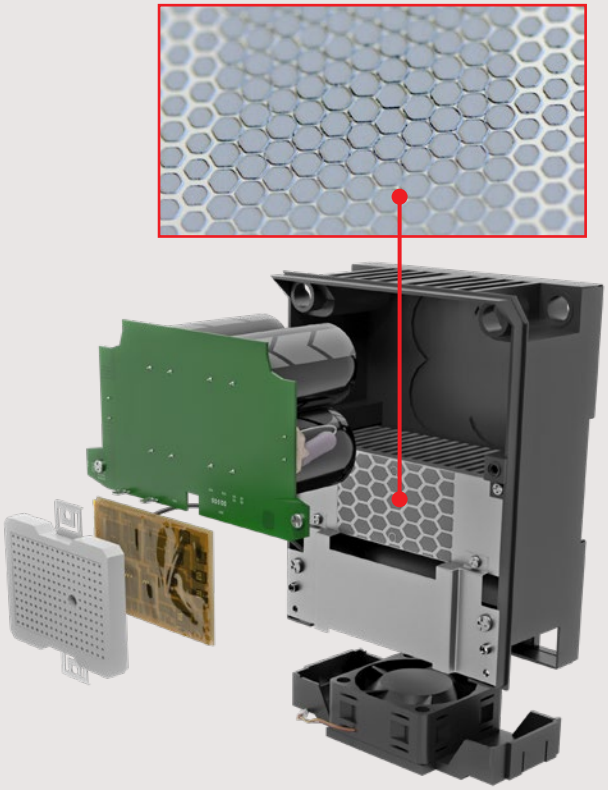
Customer Challenge

- The customer's new drive system design had a higher power density than prior versions and required a reliable, efficient mechanism to remove operational heat.
- Previous experience with conventional thermal grease suggested that, due to inherent material migration (also known as 'pump out'), a grease thermal interface would not deliver the reliability and performance required.
- Improvements in manufacturing efficiency were also objectives of the customer.



Process and Performance Requirements

- The device must have stable thermal performance over its lifetime, as these types of systems are expected to operate reliably for 25 to 30 years.
- Thermal interface material formulation should have low thermal impedance to ensure more effective heat dissipation and operational reliability.
- Process efficiency and ease-of-use with an automated, high throughput solution was an important criterion for low cost-of-ownership.



LOCTITE TCP 7000
Phase Change Thermal Interface,
Thermal Management

Henkel Solution

- Henkel proposed the use of *LOCTITE TCP 7000*, a phase change thermal interface material with high thermal conductivity of 3.0/W-mK.
- Once applied, the material remains solid at room temperature until the device's operational heat causes it to 'melt' and wet out across the interface without the risk of pump out as is common with thermal grease.
- In internal comparative testing, *LOCTITE TCP 7000* outperformed common thermal greases across important metrics:

  Active Power Cycling Testing:
  In -50°C to 150°C cycling, thermal grease A experienced a fatal result after 600 hrs.; thermal grease B experienced a fatal result after 800 hrs.;
  LOCTITE TCP 7000 did not fail and the chip's temperature did not exceed 125°C even after 1,000 hrs.

  Thermal Impedance:
  Typical thermal impedance value for thermal grease is 0.160 versus an impedance value of 0.062 for *LOCTITE TCP 7000*. The lower the value, more effective the thermal transfer.

- *LOCTITE TCP 7000* can be applied via stencil printing, allowing an automated, multi-device material application process. Once the phase change material is dried, devices can be stored until needed for system integration.

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