

APPLICATION USE CASE

Data Center Line Card Raises Operating Performance with Low Thermal Resistance Phase Change Material

01 Application Challenges and Objectives



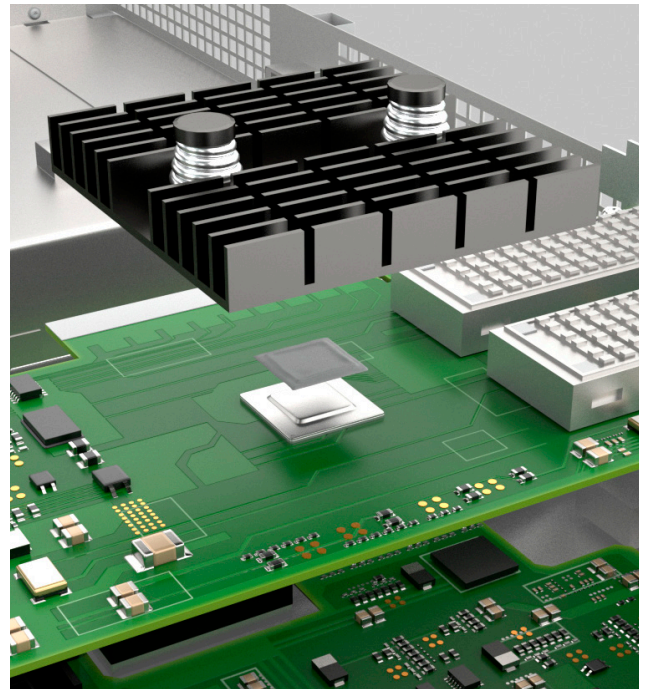
A high power, high wattage data center line card with multiple processors required a robust, heat management solution to optimize performance.



Server line cards are expected to have high reliability with a relatively long lifetime, with in-service use projections in the range of 10 years or more.



As design goals change, CPUs/processors are maintaining current thicknesses but expanding in the X, Y dimension to accommodate increasing function. This dynamic makes the larger footprint devices more susceptible to thermal stress, so the thermal interface materials (TIMs) employed must address this condition.

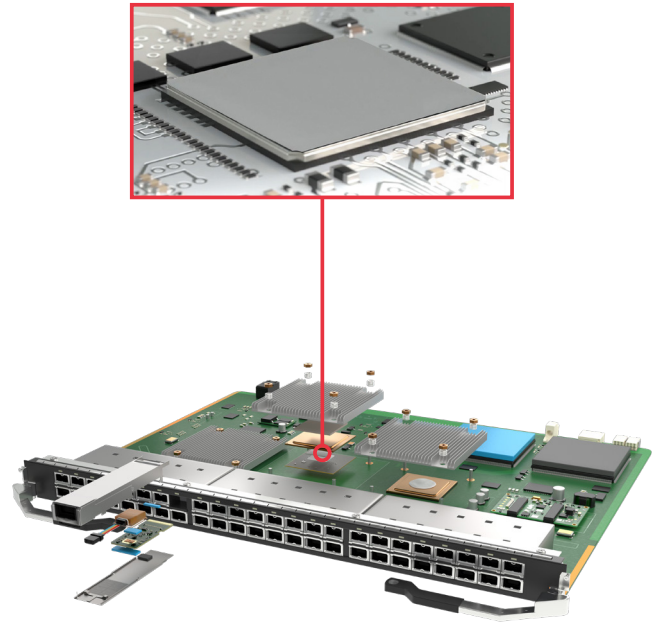


02 Process and Performance Requirements

While high thermal conductivity is important, the primary aim of the thermal solution for this data center application is low thermal impedance to enable exceptionally thorough heat transfer from the processor to the heat sink.

Easy handling and application of the TIM is also important to allow for streamlined production and manufacturability.

The solution should exhibit low assembly stress to alleviate the opportunity for component damage, provide good material stability to comply with system lifetime expectations, and maintain its material integrity even during routine server maintenance shutdowns.



03 Henkel Solution and Results

Working with the customer to evaluate performance in-application, Henkel recommended the use of a phase change TIM film, LOCTITE® TCF 4000PXF, as it provides low thermal impedance with a very thin bond line (8 μm to 10 μm in operation) and high thermal conductivity of 3.4 W/m-K. A phase change formulation, the material is solid at room temperature and, when heated during component cycling, becomes flowable to fill gaps between the component and heat sink to provide excellent thermal transfer.

The phase change material is an excellent alternative to thermal grease, as it offers the same void filling properties and low thermal impedance, but in a clean, non-messy formulation that will not pump out over time and lose its effectiveness. As data center systems are expected to perform for

15 years or more, TIM integrity is a key component of long-term reliability. In addition, the material returns to solid state when cool (or during maintenance shut-downs) and stays in place and available when system operation resumes.

Henkel phase change film-based materials are custom-cut to application-specified sizes and easily release from the liner for simple application.

With proven success in the high-performance computing sector for more than 15 years, LOCTITE PCF 4000PXF continues to be a top TIM of choice for data center thermal management solutions including this application, where it is employed on high power server line cards that are used in data centers globally.

Contact:

Keri Fladeboe

keri.fladeboe@henkel.com

Phone: 612-552-4863

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