Print technology for heat dissipation

Stencil printing is cost-effective, scalable and adaptable, so that it is also used to apply the heat dissipation medium in numerous power applications. It is firmly established in the assembly of power components and their heat sinks onto assemblies using solder paste printing. And it can do more...

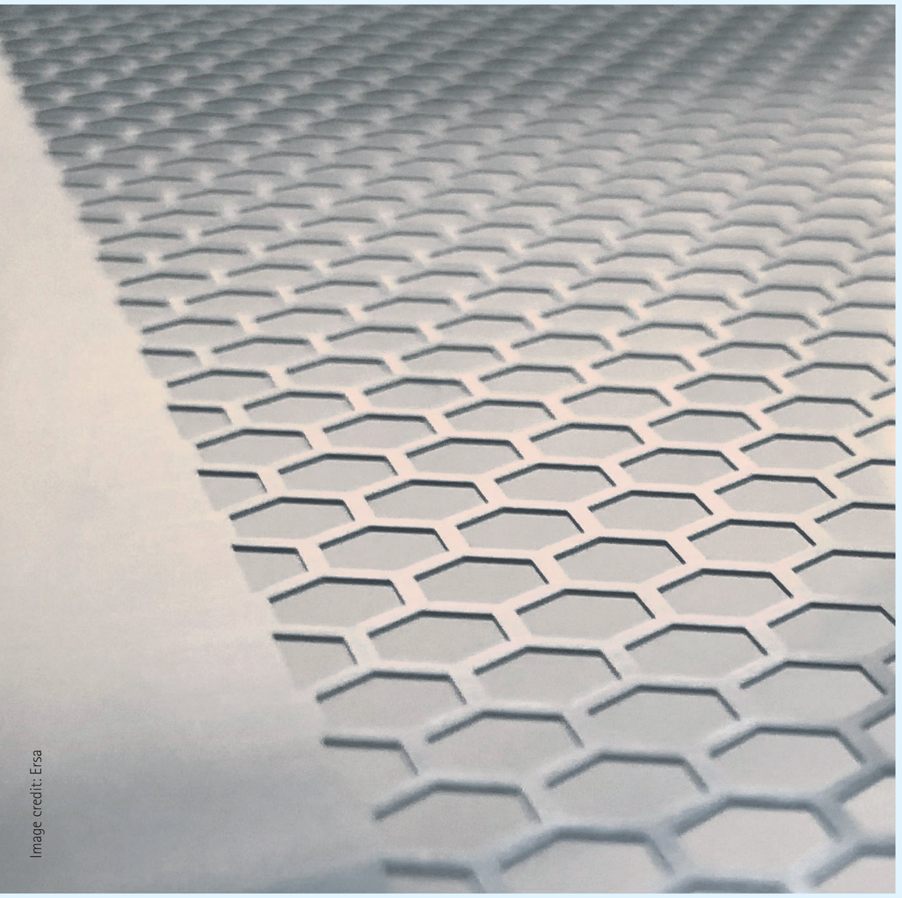


Image credit: Ersa

Honeycomb structure for thermal paste printing

Heat dissipation for LEDs

More and more applications are using stencil printing to establish a reproducible heat dissipation process. The printing process takes over the exact metering of the heat transfer medium between the power component and the heat sink. Essentially, the same tools are used for this as for solder paste printing: the laser-cut printing stencil and the stainless-steel squeegees which are adapted to the requirements of the heat-conducting medium. Depending on the requirements, the heat-conducting medium can be applied over the entire surface and as a very thin layer, or it is partitioned and printed more thickly.

Solder paste printing is primarily used for heat dissipation in LEDs. For this purpose, solder paste is printed onto the heat dissipation pad in the SMT (Surface Mount Technology) process, and the connection between LED and the printed circuit board is formed during the reflow process.

With its low layer thickness, sinter paste printing places special demands on printing tools and environment. With final layer thicknesses <50 µm, any lint or hair is a major concern. Also, the handling of the very thin stencils with ≤50 µm sheet thickness and the relatively large openings, which correspond to the contact areas, is more complex than thermal paste printing.

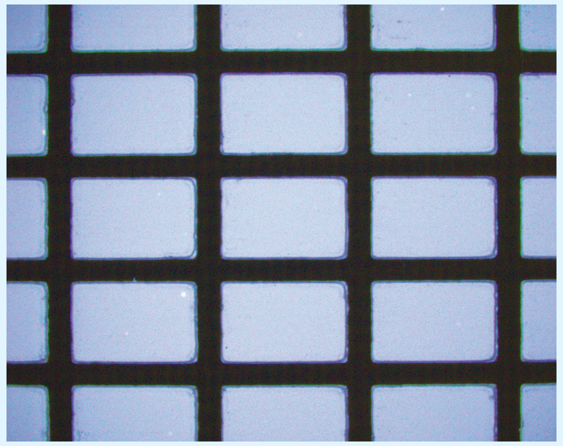


Image credit: Ersa

Thermal paste in a rectangular grid

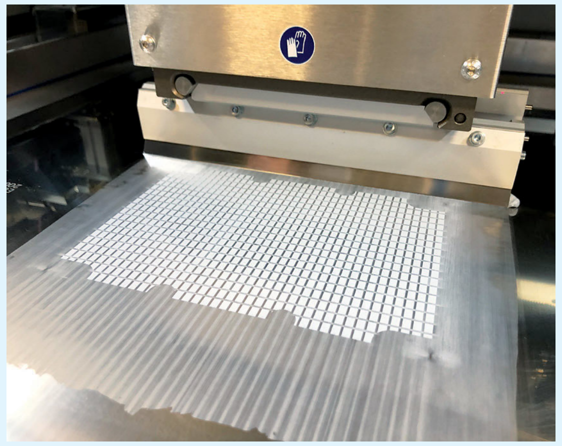
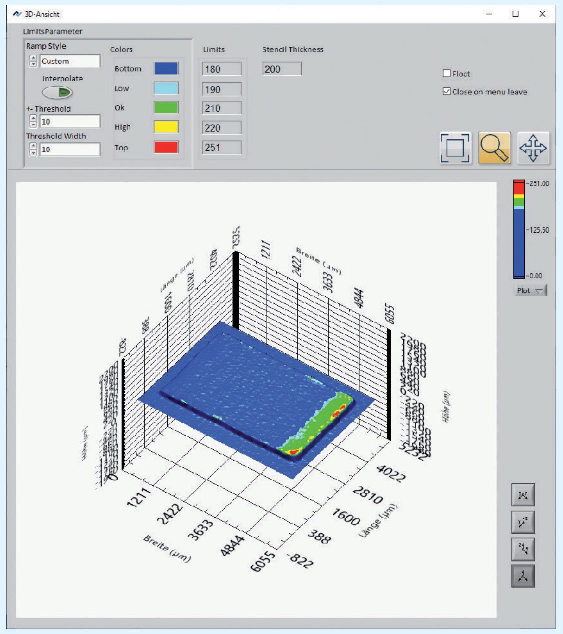


Image credit: Ersa

Thermal paste in a rectangular grid



3D-Ansicht

LimitsParameter

Ramp Style: Custom

Interpolate

+- Threshold: 10

Threshold Width: 10

Colors		Limits
Bottom	🟦	180
Low	🟦	190
Ok	🟩	210
High	🟨	220
Top	🟥	251

Stencil Thickness: 200

☐ Float
☑ Close on menu leave

Image credit: Ersa

3D inspection of the printed thermal paste depot.

When printing with thermal paste, the area to be printed is divided into a grid and printed higher than the final compressed layer thickness of typically 50 ... 250 µm. Only when the printed pattern is compressed the higher printed volume fills the gaps between the printed depots and forms a full-surface bond between component and heat sink. This allows the use of thick stencils with 100 ... 300 µm sheet thickness, which are robust and durable. The higher layer thickness reacts less critically to particles, and printing errors remain locally limited due to the opening grid. This makes thermal paste printing the more resilient process.

In terms of printing technology, the processes' challenge lies in the printing medium rheology. Depending on the paste properties, printing speeds are sometimes very low and double printing is necessary to completely fill the openings.

With sinter paste printing, no calculation is necessary – the desired wet film thickness is selected as the stencil thickness. The opening size corresponds to the contact area. Solder paste printing needs a clear definition of the solder volume to prevent the component from floating on the thermal pad. For thermal paste printing, the calculation of the aperture sizes is essential for a stable process. Here, the goal is to convert the target volume for thermal contacting into the openings in such a way that reproducible and optimal printing is possible.

The presentation covers all three processes and explains the process of layout creation.

CONTACT

Harald Grumm studied precision and electronic equipment engineering at the Technical University of Applied Sciences in Berlin. He has a tremendous know-how in process technology for surface mounting, especially in stencil & screen printing, and shares his knowledge as a speaker and author of various publications. Since 2022, he has been responsible for the Research, Ideas, Technology division at Ersa and is thus responsible for defining new processes and technologies.

Contact: Harald Grumm
Abteilungsleiter Forschung-Ideen-Technologie (FIT)
E-Mail: Harald.Grumm@kurtzersa.de

COMPANY PROFILE kurtz ersa

Celebrating its 100th anniversary in 2021 Ersa has pioneered soldering technology since its very beginnings and developed this technology into an industrial sector. Today Ersa has become the no. 1 in the industry being a system supplier of soldering technology with the most comprehensive portfolio and a global sales and service network. As an innovative technology provider for electronics manufacturing, Ersa sets decisive standards under the claim „GLOBAL. AHEAD. SUSTAINABLE.“, to fuel megatrends such as electromobility, 5G mobile communications standard, digitalization, and automation.

And Ersa will continue to ensure perfect connections in electronics manufacturing in the future – with sustainable energy-efficient production processes, automation solutions and digital transformation in the form of Future Services. The portfolio of soldering systems includes solder paste printers, reflow ovens as well as wave and selective soldering systems. The soldering tools range offered covers everything from smart soldering irons and intelligent soldering stations to fully automated rework systems for soldering and desoldering a wide variety of components.

Ersa GmbH
www.kurtzersa.com
E-Mail: info@ersa.de