

THERMAL INTERFACE MATERIALS

Indium Corporation is the leader in metal thermal interface materials (TIMs).



THERMAL INTERFACE MATERIALS

Metal Thermal Interface Materials (TIMs) aid in the transfer of heat between surfaces and minimize the thermal resistance at each device connection. Metals are known to have higher thermal conductivity than any non-metals, such as greases. The keys to deciding the best metal TIM include:

- Thermal conductivity
- Long-term reliability
- Compressibility
- Interfacial resistance
- Operating temperature

Thermal Conductivity: Rate at which heat flows through a material.

Thermal Resistivity: Rate at which a system resists heat flow. Thermal resistivity is more representative of actual heat dissipation of a system because it includes the contact interfaces.

Our Approach:

- TIM is an integral part of the thermal system
- Collaborative design and manufacturing
 - Material selection based on system requirements
 - Comprehensive applications engineering
 - World-class thermal laboratory
 - Optimized supply chain and logistics
 - Worldwide fabrication and service
 - Customized solutions
 - 40 years and >1 billion TIM preforms

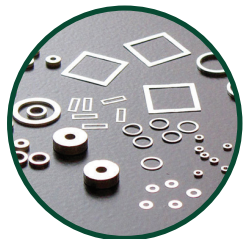
Indium Corporation offers a variety of options for thermal management including:

- Processors
 - TIM1 (die-to-lid)
 - TIM1.5 (die-to-heat spreader/heat-sink)
 - TIM2 (lid-to-heat spreader/heat-sink)
- Power semiconductor devices
 - IGBT
 - MOSFET
- High-power LED
- Burn-in and test
- Liquid immersion cooling
- Cryogenic applications
- Other applications requiring high thermal dissipation and high-reliability

World-Class Thermal Lab:

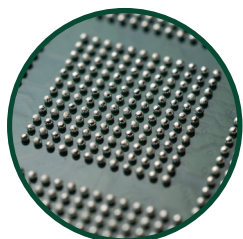
Indium Corporation's Advanced Thermal Lab allows us to:

- Analyze the thermal resistance and conductivity of thermal interface materials
- Develop new reliability tests and test vehicles
- Partner with equipment suppliers and customers in process optimization
- Create industry-leading thermal materials and products to solve problems for today and tomorrow



SOLDER TIM SOLUTIONS

Reflowed solder joints are also thermally conductive because of the intermetallic bond that is created. Indium Corporation offers a wide variety of fluxes and solders including indium-, gold-, and silver-based alloys for socketed and non-socketed package types that undergo multiple reflow cycles.



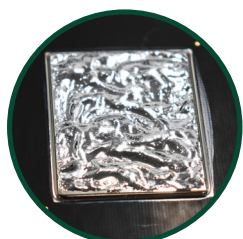
SOLDER TIM SOLUTIONS FOR BGAS

Revolutionary new manufacturing processes enable uniform distributions of IMCs ensuring consistent reflow and void performance over multiple reflow cycles.



LIQUID METAL

Gallium-based liquid metals show a lot of promise as a thermal interface material in TIM1 and TIM1.5 applications due to their high thermal conductivity, reduced interfacial resistance, excellent wetting to most surfaces, including bare silicon, and eliminating the need for soldering or surface metallization. Indium Corporation has been a trusted supplier of gallium-based liquid metals around the globe for decades.



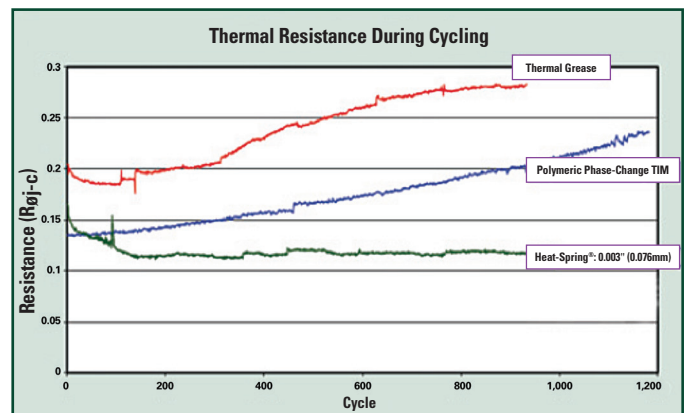
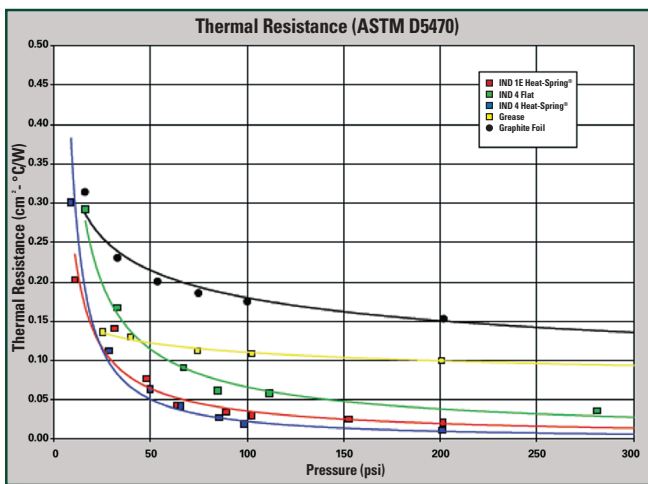
LIQUID METAL PASTE

Unlike traditional gallium-based liquid metal which is prone to pump-out and typically requires specialized spreading processes, liquid metal paste has a higher viscosity that offers predictable spreading characteristics required for scalable high-volume applications.

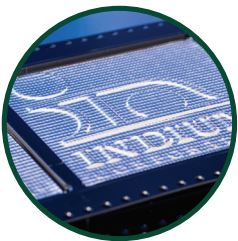
Heat-Spring® Specifications

	Thermal Conductivity (W/mK)	Maximum Operating Temperature	Minimum Pressure	Thermal Resistance at 100psi (cm ² -°C/W)
99.99In	86	130°C	40psi	0.0514 @ 0.004"
99.99In clad with 0.0002" Al	86	130°C	40psi	0.0606 @ 0.006"
52In/48Sn	40	90°C	40psi	0.0390 @ 0.004"
Sn+	73	200°C	100psi	0.4961 @ 0.008"

Application	Product	Thickness
Interfaces with flat, smooth, and parallel surfaces	HSD Heat-Spring®	0.004" to 0.006" (0.10mm to 0.15mm)
• Heat-sinks that are extruded or unfinished • Field fit plates that have surface imperfections	HSHP Heat-Spring®	0.006" (0.15mm) minimum
Burn-in and test	HSK Heat-Spring® with Al cladding	0.006" (0.15mm) minimum



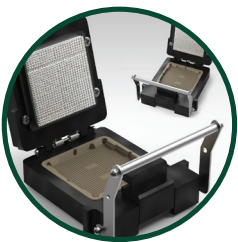
Comparative thermal resistance under clamped condition with power cycling over time—1,000 power cycles



HEAT-SPRING®

A Heat-Spring® is a compressible interface between a heat source and a heat-sink. The surface of a Heat-Spring® is patterned to optimize performance. Heat-Spring® unique properties include:

- No pump-out or bake-out, as with thermal greases
- No surface preparation required and easy cleanup
- Available in standard, as well as custom, shapes and thicknesses
- Better contact between surfaces to eliminate air voids



INDIUM TIM FOR BURN-IN

Because of its high thermal conductivity (86W/mK), indium is used for a variety of demanding burn-in and test applications. The pure indium can be clad with a thin aluminum layer on the side facing the DUT to prevent the soft metal from adhering to the surface.



PHASE CHANGE METAL ALLOY

Phase change metals are installed in the interface as a solid foil at room temperature for easy assembly. The alloy melts at 60°C and changes phase to a liquid, enabling extremely low interfacial resistance during operation of the CPU/GPU.

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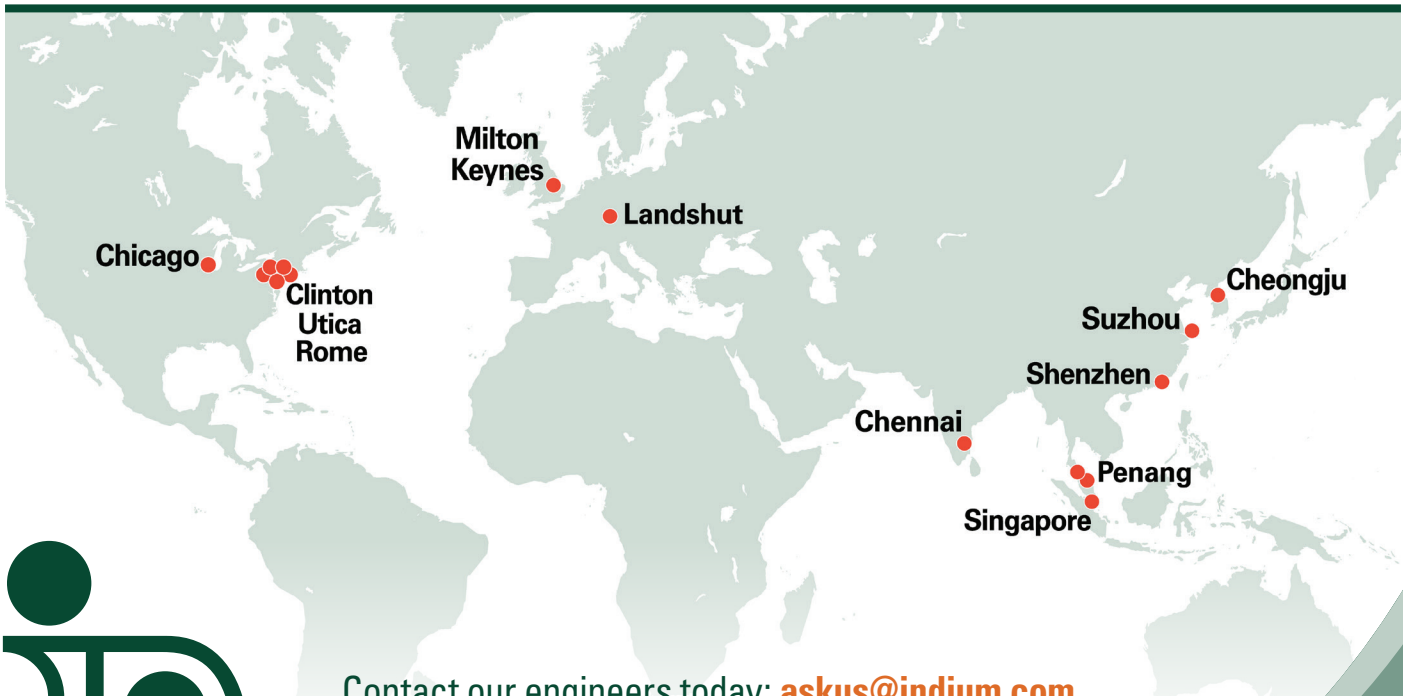
AVAILABLE PACKAGING

- Bulk packaging
- Tape & reel
- Trays



INDIUM CORPORATION

WORLDWIDE



Contact our engineers today: askus@indium.com

Learn more: www.indium.com/tim

All of Indium Corporation's solder paste and preform manufacturing facilities are IATF 16949:2016 certified.
Indium Corporation is an ISO 9001:2015 registered company.

From One Engineer To Another®

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