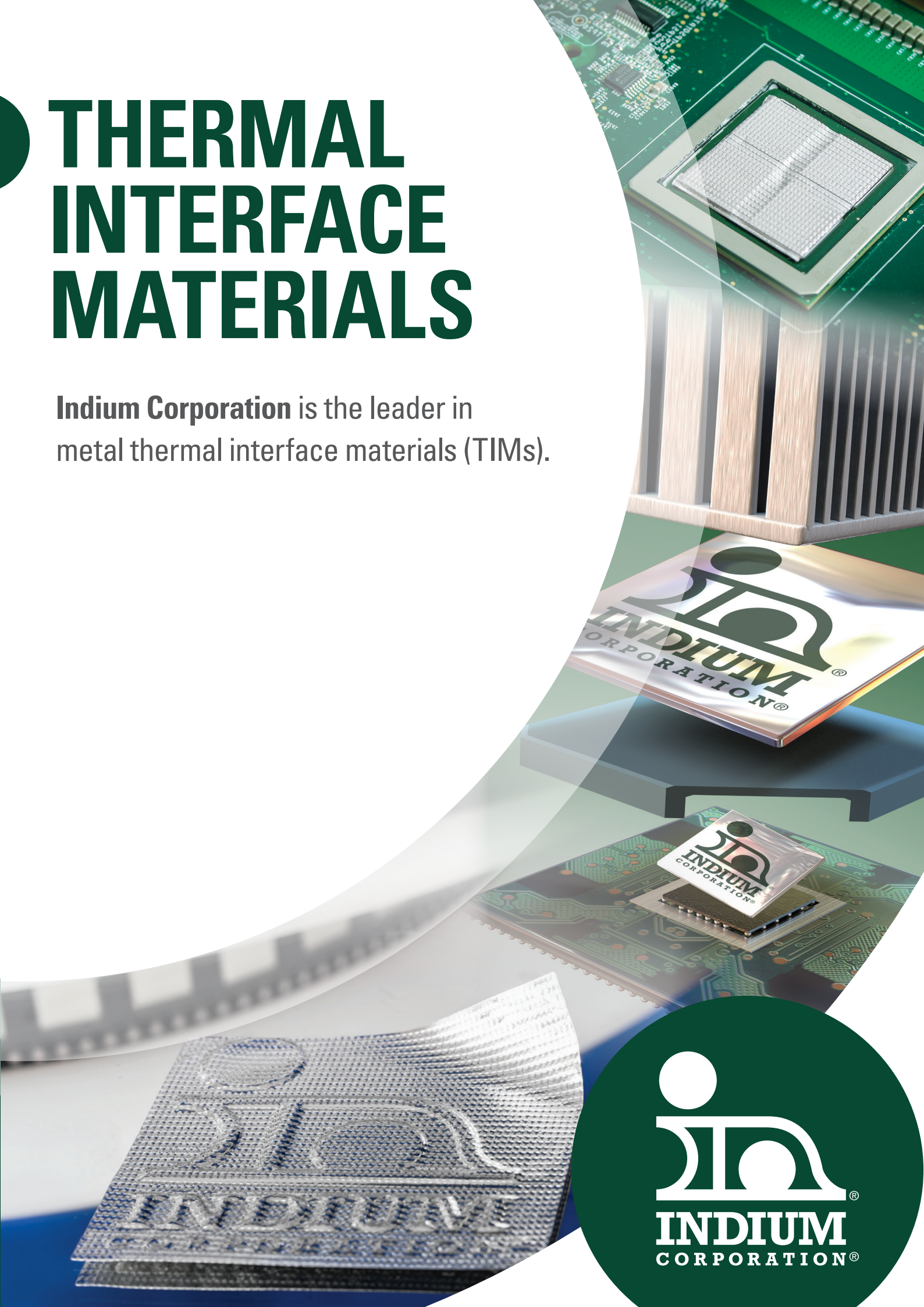
THERMAL INTERFACE MATERIALS

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



INDIUM®
CORPORATION®

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.

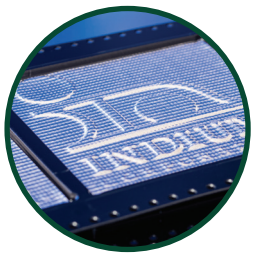
The keys to deciding the best metal TIM include:
- Thermal conductivity
- Compressibility
- Operating temperature

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.*

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

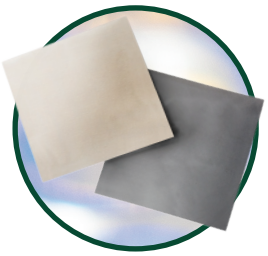
- Processors
  - TIM1 (die to lid)
  - TIM1.5 (die to heat spreader/heat-sink)
  - TIM2: (lid to heat spreader/heat-sink)
- Power semiconductor devices
  - IGBT
  - MOSFET
- High-power LED
- Burn-in and test
- Other applications requiring high thermal dissipation and high-reliability



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



HSMF AND HSMF-OS

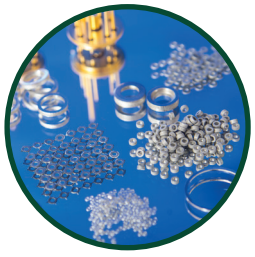
HSMF and HSMF-OS are non-silicon-based thermal compounds on an aluminum carrier. The HSMF works well in applications such as IGBT that have large area thermal interface requirements. It is also helpful for die-cast heat-sinks with poor planarity.

The material has an inherent adhesive property that allows for easy placement and cleans up with IPA, which makes rework easier. Like metal TIM solutions, this material does not pump out or bake out over time.

HSMF-OS has the thermal compound on one side only and has adhesive properties that allow it to be affixed to the test head since it adheres to the copper heat-sinks but not to the device under test (DUT). The Al interface provides a robust surface allowing for a greater number of insertions.

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. InSn and InAg alloys are also good options, depending on your process requirements.

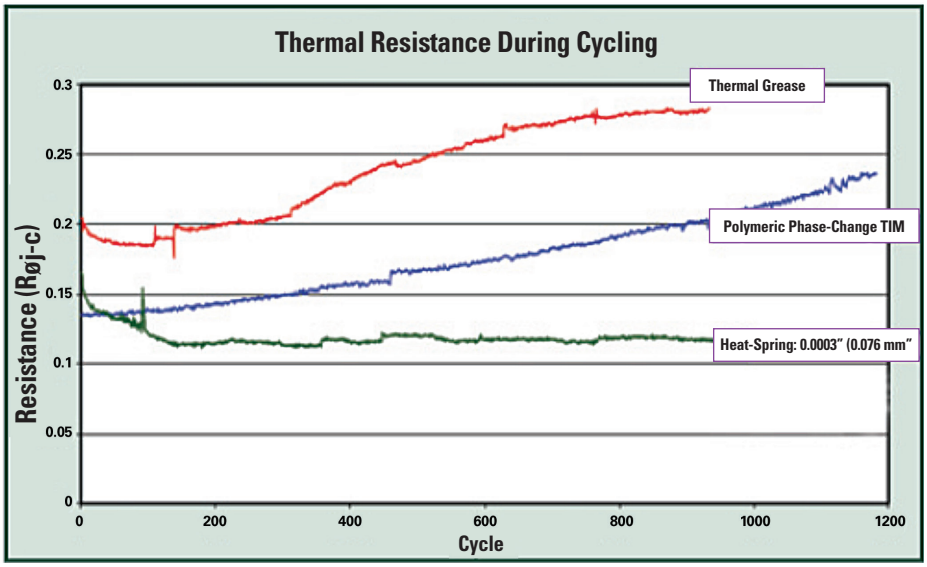


SOLDER TIM SOLUTIONS

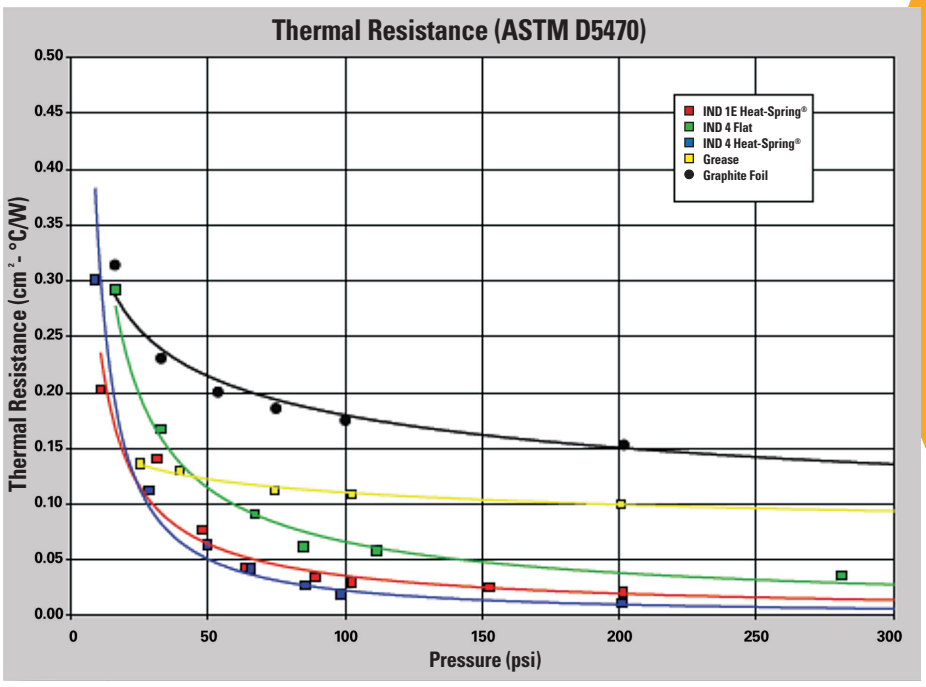
Reflowed solder joints are also thermally conductive because of the intermetallic bond that is created. Indium Corporation offers a wide variety of solders and fluxes that can work, including indium, gold, and silver-based alloys. Because the material is reflowed, it will help reduce voiding, which can impede thermal conductivity.

	Thermal Conductivity (W/mK)	Maximum Operating Temperature	Minimum Pressure	Thermal Resistance at 100 psi (cm²-°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"
HSMF	4.5	200°C	10psi	0.4156 @ 0.010"
HSMF-OS	4.5	200°C	10psi	0.3688 @ 0.0028"

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
Large modules mounted to heat-sinks	HSMF	0.006" (0.15mm) and 0.010" (0.254mm)
Burn-in and test	HSK Heat-Spring® with Al cladding	0.006" (0.15mm) minimum
Burn-in and test	HSMF-OS	0.010" (0.254mm)



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



THERMAL INTERFACE MATERIALS

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