

# APPLICATION NOTE

# PCMA Users' Guide

## Introduction

Indium Corporation offers a number of innovative high-performance metal TIM solutions with our portfolio of alloys that are solid at room temperature but liquid during operational temperatures. Metals conduct heat and electricity with their valence electrons. This very effective conduction mechanism is a property of liquid as well as solid metals and alloys. In addition to the high thermal conductivity of all metals, those in the liquid form will also exhibit low interfacial resistance ensuring that they can dissipate heat quickly. Indium Corporation's Phase Change Metal Alloy (PCMA) TIMs are designed to offer superior thermal conductivity and reliability for both TIM0 and TIM1 applications.

## Preform (Size to Die Ratio)

We recommend that the PCMA preform be slightly larger than the die size. Depending on how close other components are to your die, the PCMA preform can be as much as 2mm wider and longer than the die (1mm overhang on all four sides).

## Preform Thickness Recommendation

Depending on the specific warpage of the customer die and/or heat-sink/lid/substrate, we recommend using a PCMA preform that is thicker than the total warpage. PCMA preforms can be made as thick as 20mils and, during our own internal testing on our TTVs with approximately 5mil warpage, we determined at least 8mil was required before "burn-in" to effectively compensate for die warpage.

## Pressure for PCMA

We recommend applying 30–40psi of force when using PCMA materials. Applying this much force during burn in and during operation is recommended.

## Burn-In of PCMA

We have determined from our own internal testing that if there is any warpage in your package/assembly, then it is highly recommended to do a burn-in step with the PCMA preform. We recommend burning in PCMA preforms at around 70°C for at least 30 seconds.

## Barrier Material

When the PCMA is in the liquid state, it is vulnerable to oxidation from humidity similar to other liquid metals. You can use a wide range of barrier materials like UV curable, heat/thermal cure, or even foam barrier materials (Norseal F-20 Foam). Indium Corporation does not provide any barrier materials and it is the responsibility of the customer to determine which barrier works best for their specific application.

## Holding Preform in Place

It is not recommended to use a tacking agent with PCMA preforms as this can prevent wetting of surfaces where a tacking agent has been applied. This will affect the interfacial resistance and reduce the thermal performance of PCMA products.

PCMA	Phase Change Temp (°C)	Thermal Conductivity (W/mK)	Contains Ga?	Manufacturability	Oxidation	Surface Planarity	Reliability
PCMA2305	59.5–72.6	18.4	N	EASY	GOOD	GOOD	GOOD
PCMA1	58–60	21.5	N	EASY	GOOD	OK	GOOD
Indalloy®19	60	19.6	N	EASY	BAD	BAD	BAD
PCMA2	71–76	22.6	N	EASY	GOOD	GOOD	GOOD
Indalloy®162	72	29	N	EASY	OK	GOOD	OK
Indalloy®174	79	10	N	OK	OK	OK	OK
Indalloy®27	81	12	N	OK	OK	OK	OK
Indalloy®224	108	44	N	EASY	GOOD	GOOD	GOOD
Indalloy®1E	118	41	N	EASY	GOOD	GOOD	GOOD
Indalloy®281	138	16	N	OK	OK	GOOD	GOOD
Indalloy®290	143	73	N	EASY	GOOD	GOOD	GOOD
Indalloy®4	157	86	N	EASY	GOOD	GOOD	GOOD

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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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