PRODUCT DATA SHEET

Indium5.1AT

Pb-Free Solder Paste

Introduction

Indium5.1AT is an air reflow, no-clean solder paste specifically formulated to accommodate the higher processing temperatures required by the SnAgCu, SnAg, and other Pb-free alloy systems favored by the electronics industry to replace conventional Pb-bearing solders. **Indium5.1AT** offers consistent, repeatable printing performance combined with long stencil and tack times to handle the rigors of today's high-speed, as well as high-mix, surface mount lines. In addition to consistent printing and reflow requirements, **Indium5.1AT** offers superb wetting to Pb-free metallizations and low-voiding on CSPs with microvia-in-pad designs.

Features

- Ultra-low-voiding in BGA/CSP components
- Ultra-low-voiding at via-in-pad sites
- Excellent microBGA/CSP printability
- Wide reflow process window
- Good response-to-pause performance

Alloys

Indium Corporation manufactures low-oxide spherical powder composed of a variety of Pb-free alloys that cover a broad range of melting temperatures. Type 4 and Type 3 powder are standard offerings with SAC305 and SAC387 alloys. The metal percent is the weight percent of the solder powder in the solder paste and is dependent upon the powder type and application. Standard product offerings are detailed in the table below.

Standard Product Specifications

Alloy	Metal Load (Powder)	IPN
96.5Sn/3.0Ag/0.5Cu (SAC305)	88.75% (Type 3)	800143
95.5Sn/3.0Ag/0.5Cu (SAC305)	89.00% (Type 4)	800142

Bellcore and J-STD Tests and Results

Test	Result
J-STD-004A (IPC-TM-650)	
Flux Type Classification	ROL1
Flux-Induced Corrosion (Copper Mirror)	L
Presence of Halide –Silver Chromate –Fluoride Spot Test –Quantitative Halide Content	 Pass Pass <0.5%
Post-Reflow Flux Residue (ICA Test)	37%
SIR	Pass

Test	Result
J-STD-005 (IPC-TM-650)	
Typical Solder Paste Viscosity 88.75% metal load (Type 4) 89.00% metal load (Type 3) Malcom (10rpm)	 1,750 poise 1,900 poise
Slump Test	Pass
Solder Ball Test	Pass
Typical Tackiness	35g
Wetting Test	Pass
BELLCORE GR-78	
SIR	Pass
Electromigration	Pass

All information is for reference only.
Not to be used as incoming product specifications.

Packaging

Indium5.1AT is currently available in 500g jars or 600g cartridges. Packaging for enclosed print head systems is also readily available. Alternate packaging options may be available upon request.

Storage and Handling Procedures

Refrigerated storage will prolong the shelf life of solder paste. The shelf life of **Indium5.1AT** is 6 months when stored at <10°C. Solder paste packaged in cartridges should be stored tip down.

Solder paste should be allowed to reach ambient working temperature prior to use. Generally, paste should be removed from refrigeration at least 2 hours before use. Actual time to reach thermal equilibrium will vary with container size. Paste temperature should be verified before use. Jars and cartridges should be labeled with date and time of opening.

Technical Support

Indium Corporation's internationally experienced engineers provide in-depth technical assistance to our customers. Thoroughly knowledgeable in all facets of Materials Science as it applies to the electronics and semiconductor sectors, Technical Support Engineers provide expert advice in solder preforms, wire, ribbon, and paste. Indium Corporation's Technical Support Engineers provide rapid response to all technical inquiries.

Safety Data Sheets

The SDS for this product can be found online at http://www.indium.com/sds

From One Engineer To Another®

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Printing

Stencil Design:

Electroformed and laser cut/electropolished stencils produce the best printing characteristics among stencil types. Stencil aperture design is a crucial step in optimizing the print process. The following are a few general recommendations:

- Discrete components—A 10–20% reduction of stencil aperture has significantly reduced or eliminated the occurrence of mid-chip solder beads. The "home plate" design is a common method for achieving this reduction.
- Fine-pitch components—A surface area reduction is recommended for apertures of 20mil pitch and finer. This reduction will help minimize solder balling and bridging that can lead to electrical shorts. The amount of reduction necessary is process-dependent (5–15% is common).
- For optimum transfer efficiency and release of the solder paste from the stencil apertures, industry standard aperture and aspect ratios should be adhered to.

Printer Operation

The following are general recommendations for stencil printer optimization. Adjustments may be necessary based on specific process requirement:

Solder Paste Bead Size	20–25mm in diameter
Print Speed	25–100mm/second
Squeegee Pressure	0.018–0.027kg/mm of blade length
Underside Stencil Wipe	Start at once every 5 prints and decrease frequency until optimum value is reached
Solder Paste Stencil Life	>8 hours (at 30–60% RH and 22–28°C)

Cleaning

Indium5.1AT is designed for no-clean applications; however, the flux can be removed, if necessary, by using a commercially available flux residue remover.

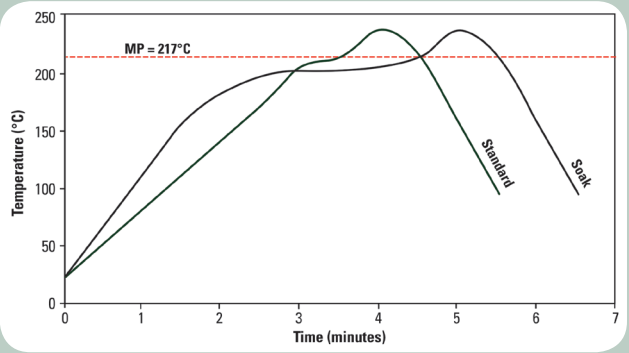
Stencil Cleaning is best performed using isopropyl alcohol (IPA) as a solvent. Most commercially available stencil cleaners work well.

Compatible Products

- **Rework Flux**: TACFlux® 020B
- **Flux Pen**: FP-500 or NC-771
- **Cored Wire**: CW-501

Reflow

Recommended Profile:



The stated profile recommendations apply to most Pb-free alloys in the SnAgCu (SAC) alloy system, including SAC305 (96.5Sn/3.0Ag/0.5Cu). This can be used as a general guideline in establishing a reflow profile when using **Indium5.1AT** Solder Paste. Deviations from these recommendations are acceptable, and may be necessary, based on specific process requirements, including board size, thickness, and density.

Heating Stage:

The use of a linear ramp rate or ramp-to-spike (RTS) type profile assists in minimizing the greatest overall number of defects associated with the reflow process. If the ramp rate is too fast, it can cause solder balling, solder beading, and aggravated hot slump which can lead to bridging. The ramp rate in the preheat stage of the profile can range from 0.5–2.5°C/second (0.5–1°C/second is ideal). A short soak of 20–30 seconds just below the melting point of the solder alloy can help minimize tombstoning when using a RTS type profile.

If necessary, a ramp-soak-spike (RSS) profile can be implemented to minimize voiding on BGA and CSP type packages. A soak zone between 200–210°C for up to 2 minutes is acceptable.

Liquidus Stage:

To achieve acceptable wetting and form a quality solder joint, the acceptable temperature range above the melting point of the solder alloy is 12–50°C (15–30°C is ideal). The acceptable range for time above liquidus (TAL) is 30–100 seconds (45–60 seconds is ideal). A peak temperature and TAL above these recommendations can result in excessive intermetallic formation that can decrease solder joint reliability.

Cooling Stage:

A rapid cool down is desired to form a fine-grain structure. Slow cooling will form a large-grain structure, which typically exhibits poor fatigue resistance. The acceptable cooling range is 0.5–6.0°C/second (2.0–6.0°C/second is ideal).

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