PRODUCT DATA SHEET

SiPaste® 3.2HF Pb-Free

Water-Soluble Solder Paste for SiP Designs

Introduction

SiPaste® 3.2HF is an air or nitrogen reflow, water-soluble solder paste specifically formulated to accommodate the higher processing temperatures required by the SnAgCu, SnAg, SnSb, and other Pb-free alloy systems. This product formulation offers consistent, repeatable printing performance combined with a long stencil life and sufficient tack strength to handle the challenges of today's miniaturization in System-in-Package (SiP) design. In addition to consistent printing and reflow requirements, this solder paste offers superb wetting to the various Pb-free metallizations and has exceptional low-voiding performance on fine-pitch components, including BGAs and CSPs.

Features

- Exceptional printing
- Long stencil life
- Good response-to-pause
- Wide reflow profile window
- Outstanding slump resistance
- Excellent wetting capability
- Superior fine-pitch soldering ability
- Low-voiding
- Halogen-free

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 3 and Type 4 powders are standard offerings with SnAgCu, SnAg, and SnSb Pb-free alloy systems. Type 5, Type 6, and Type 7 powders are offered for more complicated designs with small passive components such as 008004. 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 Specifications

Alloy	Metal Load (Type 5, Type 6, and Type 7)
	Printing
96.5Sn/3.0Ag/0.5Cu (SAC305)	87–89%
99.3Sn/0.7Cu	

Packaging

SiPaste® 3.2HF is currently available in 250g and 500g jars or 600g cartridges. 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 **SiPaste® 3.2HF** is no less than 6 months when stored at <10°C. Solder paste packaged in cartridges and syringes should be stored tip down.

When refrigerated, solder paste should be allowed to reach ambient working temperatures 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 the container size and the solder paste temperature should be verified before use. Jars and cartridges should be labeled with the date and time of opening. It is not recommended to remove worked paste from the stencil and mix it with the unused paste in the jar, because this may alter the rheology of the unused paste.

Compatible Products

- Rework Flux: **TACFlux® 025-NP**
- Flux Pen: **FP-300**
- Cored Wire: **CW-301**
- Wave Flux: **1095-NF**

SiPaste® 3.2HF Test Data Summary

Test	Result	Test	Result
J-STD-004* (IPC-TM-650)		**J-STD-005* (IPC-TM-650)**	
Flux Type (per J-STD-004A)	ORH0	Typical Solder Paste Viscosity (SnAgCu, 89%, Type 6) Malcom (10rpm)	4,000 poise
Halide Content	0.0%		
SIR	Pass	Typical Tackiness	50g
Wetting Test	Pass	Slump Test	Pass
Electromigration	Pass	Solder Ball Test	Pass

All information is for reference only. Not to be used as incoming product specifications.
*The most current revision of the applicable IPC Joint Industry Standard shall always be referenced.

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:

Recommended Printer Operation	
Solder Paste Bead Size	20–40mm in diameter
Print Speed	12–150mm/second
Squeegee Pressure	0.018–0.027Kg/mm of blade length
Underside Stencil Wipe	Start at once every 5 prints, then decrease frequency until an optimum value is determined
Solder Paste Stencil Life	>8 hours @ 60% RH and 22–28°C

Wetting

SiPaste® 3.2HF exhibits excellent wetting under both air and nitrogen reflow atmosphere, although nitrogen reflow is recommended for Type 5, Type 6, and Type 7 powder sizes. The solder joints are shiny and smooth, including those for ultrafine-pitch components. **SiPaste® 3.2HF** has low-voiding performance, including those for BGAs and CSPs.

Cleaning

Residue Removal

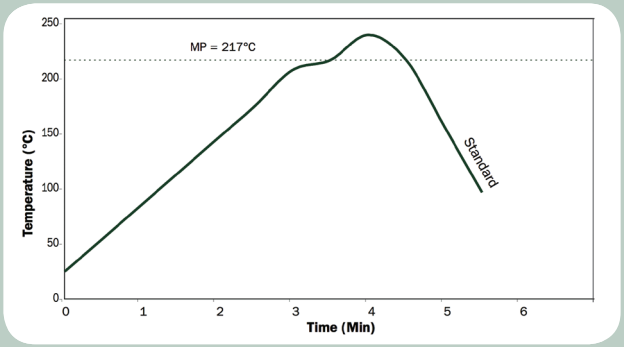
SiPaste® 3.2HF flux residues are water-soluble and best removed by an inline or batch type cleaning process using spray pressure and heated DI water. A spray pressure of 60psi and a DI water temperature of 55°C can be used as a starting point. The optimal spray pressure and temperature are a function of board size, complexity, and the efficiency of the cleaning equipment and should be optimized accordingly. For gaps less than about 50µm (2mil), the addition of an appropriate surfactant in the water washing tank will lower the surface tension of the water to allow for faster penetration of the cleaning medium and improve cleaning effectiveness. We recommend cleaning the flux residue 12 hours (or sooner) after reflow for optimal test performance. Electrical testing should be completed after the flux residue is removed.

Stencil Cleaning

This is best performed using an automated stencil cleaning system for both stencil and misprint cleaning to remove extraneous solder particles. Most commercially available stencil cleaners and isopropyl alcohol are acceptable.

Reflow

Recommended Profile:



SiPaste® 3.2HF should be reflowed using a linear profile in an air or nitrogen atmosphere. The stated profile recommendations can be used as a general guideline in establishing a reflow profile for **SiPaste® 3.2HF** with SnAgCu, SnAg, and SnSb alloy systems.

Heating Stage:

A linear ramp rate of 0.5–2.0°C/second allows gradual evaporation of volatile flux constituents and helps minimize defects such as solder balling and/or beading and bridging resulting from hot slump. It also prevents unnecessary depletion of fluxing capacity when a high peak temperature and extended time above liquidus is used.

Liquidus Stage:

SiPaste® 3.2HF can accommodate a peak temperature range from 235–260°C. The actual peak temperature is determined by the board size, complexity, and component limitations. The time above liquidus (TAL) should be 30–90 seconds. 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 (2–6°C/second is ideal).

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.

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