# ALPHA® WS-852

## Water Soluble, Low Temperature Solder Paste

## DESCRIPTION

**ALPHA WS-852** is a SnBiAg low temperature, water soluble solder paste designed for a broad range of SMT processes where aqueous post reflow cleaning is required. The low temperature, lead-free alloy enables lower temperature processing of surface mount technology. The SnBiAg alloy reflows between 160 to 190 °C.

The carefully selected Sn/Bi/Ag alloy in **ALPHA WS-852** was selected to give the lowest melting point, lowest pasty range during melting and re-solidification, along with a very fine grain structure, offering maximum resistance to thermal cycle fatigue. The alloy also yields very low voiding BGA solder joints, even when traditional SAC alloy spheres are used.

All components used with **ALPHA WS-852** must be lead free to eliminate the formation of a tin/lead/bismuth intermetallic which has a melting point under 100 °C.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

## FEATURES AND BENEFITS

- Reduced energy consumption in reflow ovens versus standard lead-free alloys.
- Reduced reflow process time.
- Excellent volume transfer efficiency over a broad range of environmental conditions.
- High throughput and yield with consistent print volumes at print speeds ranging from 1 to 6 inches per second.
- Exhibits resistance to slumping and drying at temperatures up to 66 to 84 °F/19 to 29 °C and relative humidity extremes 35 to 65%RH
- Water cleanable after two solder paste reflow cycles.
- Superior solder spread and wetting on all commonly used lead free surface finishes (ENTEK HT, Alpha Star Immersion Silver, Immersion Tin, Ni/Au, SACX HASL, etc.)
- Meets highest IPC 7095 voiding performance (Class III).
- Low temperature reflow profiles may enable the use of less expensive printed circuit substrates, when appropriate.
- Compatible with either nitrogen or air reflow.
- Excellent overprint capability for paste in hole printing.

## PRODUCT INFORMATION

| | |
|---|---|
| Alloys: | SnBiAg (42%Sn57.6%Bi/0.4%Ag) |
| Powder Size: | Type 3 (25 to 45 µm per IPC J-STD-005) |
| Residues: | Approximately 5% by weight |
| Packaging Sizes: | 500 gram jars, 6" & 12" cartridges |
| Lead Free: | Complies with RoHS Directive 2002/95/EC |

## APPLICATION GUIDELINES

Formulated for both standard and fine pitch stencil printing, at print speeds of between 40mm/sec (1.5"/sec) and 150mm/sec (6"/sec), with stencil thickness of 0.100mm (0.004") to 0.150mm (0.006"), particularly when used in conjunction with ALPHA Stencils. Blade pressures should be 0.27 to 0.36 kg/cm of blade (1.25 to 2.0 lbs/inch), depending upon the print speed. The higher the print speed employed, the higher the blade pressure that is required.

## TECHNICAL DATA

| Category | Results | Procedure/Remarks |
|---|---|---|
| **Chemical Properties** | | |
| Activity Level | ORHO = J-STD Classification | IPC J-STD-004 |
| 10 Day Copper Corrosion | Pass, (post cleaning) | IPC J-STD-004 |
| **Electrical Properties** | | |
| SIR (IPC) 1X Reflow | 4.2 x $10^9$ ohms | Pass, 7 days (>$10^8$ = Pass) |
| SIR (IPC) 2X Reflow with 48 hour delayed cleaning | 1.1x $10^9$ ohms | Pass (>$10^8$ = Pass) |
| Electromigration (Bellcore) | Initial: 2.5 x$10^9$ ohms;<br>Final 5.0 x $10^{10}$ ohms | Pass (Final > Initial/10) |
| **Physical Properties** | | |
| Tack Force vs. Humidity (t = 8 hours) | Pass - Change of <1g/mm$^2$ over 24 hours at 25% and 75% Relative Humidity | IPC J-STD-005 |
| Viscosity | 1600 to 2200 poise | Malcom Spiral Viscometer; J-STD-005 |
| Solderball | Acceptable | IPC J-STD-005 |

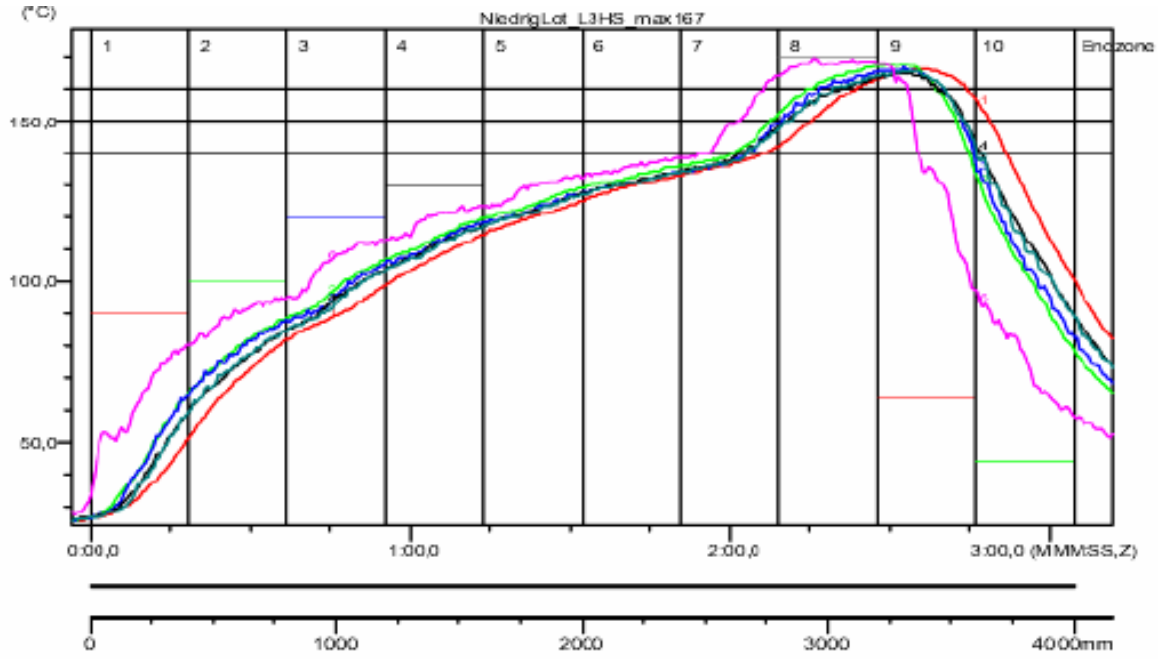
| Category | Results | Procedure/Remarks |
|---|---|---|
| Stencil Life | 8 hours | @30 to 50%RH, 24 to 27 °C (75 to 80 °F) |
| Slump | Pass | IPC J-STD-005 - Pass, cold slump after 10 minutes RH & hot slump after 10 minutes @150 °C at 25%, 50% and 75% RH |

## PROCESSING GUIDELINES

| Storage & Handling | Printing | Reflow | Cleaning |
|---|---|---|---|
| • Refrigerate to guarantee stability at 0 to 10 °C, 32 to 50 °F<br>• Shelf life of refrigerated paste is 6 months.<br>• Paste can be stored for 2 weeks at room temperatures up to 22 °C / 77 °F prior to use.<br>• When refrigerated, allow paste container to warm to room temperature for up to four hours. Paste must be >19 °C /66 °F before processing. Verify paste temperature with a thermometer to ensure paste is 19 °C/66 °F or greater before set-up. Printing can be performed at temperatures up to 29 °C (84 °F).<br>• Do not remove worked paste from stencil and mix with unused paste in jar. This will alter rheology of unused paste.<br>• These are starting recommendations and all process setting should be reviewed independently.<br>• Working conditions:19 to 30 °C on the stencil. | **Stencil:** Recommended ALPHA CUT or ALPHA FORM stencils @ 0.100 to 0.150 mm, 4 to 5 mil thick for 0.4 to 0.5 mm 0.016" or 0.020" pitch. Stencil design is subject to many process variables. Contact your local Alpha sales office.<br><br>**Squeegee:** Metal (recommended)<br><br>**Pressure:** 0.18 to 0.27kg/cm of squeegee length 1.0 to 1.5 lb/inch<br><br>**Speed:** 25 to 100mm per second 1.5 to 4 inches per second<br><br>**Paste Roll:** 1.0 to 1.5cm diameter and make additions when roll reaches 0.5cm, 0.2" diameter min. Max roll size will depend on blade.<br><br>**Stencil Release Speed:** 3 to 10mm (0.12 to 0.4inches)/sec. Lift height 8 to 14mm (.31" to .55") | **Atmosphere:** Clean-dry air or nitrogen atmosphere.<br><br>**Profile:** See figure #1 acceptable reflow / coalescence and IPC Class III voiding were obtained with the given profile.<br><br>Note: Refer to component and board supplier data for thermal properties at elevated temperatures. Lower peak temperatures require longer TAL for improved joint cosmetics.<br><br>Start with straight ramp design if new oven settings are required. | • ALPHA WS-852 can generate foam while being cleaned in recirculating systems. ALPHA 2007 is the recommended defoamer.<br>• The flux residues from ALPHA WS-852 are water cleanable after two paste reflow cycles.<br>• Recommended rinse temperature is 49 to 70 °C /120 to 160 °F *No special nozzle configurations are required.<br>• Effective residue cleanability up to 48 hours reflow. This allows maximum process flexibility and can eliminate an extra cleaning step in double sided reflow.<br>• Ionic contamination levels passes IPC J-STD 001D requirement (<10µg/in2). Typical result is <3 µg/in$^2$ attained with heated solution tested with an Ionograph. |

## REFLOW PROFILES

**Figure 1**




| Parameter | Guideline | Additional Information |
|---|---|---|
| Atmosphere | Air or $N_2$ | Mass production verification both in air and $N_2$. |
| SnBiAg (42/57.6/0.4) alloy | 138 °C (near eutectic) | Use for reflow above liquidus setting |

| Setting Zone | Optimal Dwell Period | Extended Window |
|---|---|---|
| 40 to 138 °C | 2:30 to 4:00 min. | < 4:00 min. |
| 125 to 138 °C | 0:30 to 1:30 min | < 3:00 min. |
| 100 to 138 °C | 1:15 to 2:00 min. | < 1:30 min. |
| TAL (138 °C) | 30 to 90 sec. | NA |
| Peak temperature | <(160 to 190 °C) | No limit to other surface finish |
| Joint cool down rate from 170 °C | >(3 to 8 °C) | Recommended to prevent surface cracking issue. |

## RECYCLING SERVICES

We provide safe and efficient recycling services to help companies meet their environmental and legislative requirements and at the same time, maximize the value of their waste streams. Our service collects solder dross, solder scrap, and various forms of solder paste waste. Please contact your local sales representative for recycling capabilities in your area or link here.


## SAFETY & WARNING

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use. **Safety Data Sheets are available at MacdermidAlpha.com/assembly-solutions/knowledge-base.**

## STORAGE

ALPHA WS852 should be stored in a refrigerator upon receipt at 0 to 10 °C (32 to 50 °F). This paste should be permitted to reach room temperature before unsealing its package prior to use (see handling procedures on page 3), as this will prevent moisture condensation build up. The shelf-life of refrigerated paste is six months. Room temperature storage of sealed containers should not exceed four days.

## CONTACT INFORMATION

**To confirm this document is the most recent version, please contact Assembly@MacDermidAlpha.com**

www.macdermidalpha.com

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|---|---|---|
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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE . Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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