FCT Assembly
LEADERS IN TECHNOLOGY

Product Data Sheet

WS159 Water Soluble Solder Paste

- ORH0 Per IPC-J-STD-004
- Non-Hygroscopic
- Delayed Cleaning

INTRODUCTION

WS159 water washable solder paste is designed to provide humidity tolerance and excellent wetting to meet the requirements for reliable solder joints in PCB Assemblies. **WS159** offers high levels of repeatability and consistency even in a wide range of temperatures (65-85F) and relative humidity (25-65% RH). **WS159** is formulated to deliver exceptional cosmetics with easy-cleaning residues using warm water.

ATTRIBUTES

- Excellent print volume consistency with Surface Area Ratios (SAR) as low as 0.55 when used with the UltraSlic™ stencil technology
- Non-hygroscopic formulation resistant to slump and dry-out, suitable for areas with extreme humidity conditions.
- Wide reflow window with excellent wetting characteristics on all surface finishes
- Enhanced tack performance and printer open time
- Low voiding/high reliability composition
- Compatible in either Nitrogen or Air reflow

PRODUCT INFORMATION

Alloys:	• SN63 – MP=183°C • 62/36/2 – MP=179°C
Applications:	• Automatic / Manual Printing • Automatic / Manual Dispensing
Powder Size:	• Type-3 and Type-4 standard • Type-5 available upon request
Packaging:	• 500 gram jars or cartridges standard • Enclosed print head systems. • Other packaging upon request
Repair Flux:	• 10CC and 30CC syringes • Larger package sizes upon request

PRINTING

Stencil aperture design and stencil quality are major factors in achieving excellent print consistency with any solder paste.

UltraSlic™ (SAR ≥ 0.45) and Slic™ (SAR ≥ 0.55) stencils from Fine Line Stencil are recommended for optimal print performance, and can be custom designed to minimize rework and improve the yields of any process. Some general stencil aperture design guidelines follow:

- **Fine pitch components (≤ 0.020")**
  A 0.001" reduction (L & W) to minimize bridging and create proper gasketing between the stencil and SMT pad
- **Discrete components**
  A 0.002" reduction (L & W) for water washable and a 0.002" reduction (L & W), with "U-shaped" home-plates, for no clean to minimize mid-chip solder beads.

  Contact Fine Line Stencil at 719-579-8055 for process-specific stencil design recommendations.
  www.finelinestencil.com

PRINTER OPERATION

The following are general recommendations for stencil printer optimization. Further adjustments may be necessary based on specific process requirements.

Solder Paste Bead Size:	• 2cm (~0.75") on startup • Add when bead < 1.4 cm (~0.5") Maintaining a minimal controlled volume of solder paste on the stencil at all times will ensure paste consistency as well as print process repeatability and reliability
Squeegee:	• Metal, Slic™ blade preferred • 60 degrees from horizontal
Speed:	• 25 to 150 mm/sec. (1 to 6 in/sec) Adjust printer for a pull or print-on-demand process
Pressure:	• 0.18-0.27 Kg/cm (squeegee length) Apply only enough pressure to achieve a clean top-side wipe of the stencil surface after each squeegee pass
Underside Wipe:	• Slic™ and Ultraslic™ stencils should exceed >10 prints/wipe
Stencil life / Environment:	• >6 hours • 30+65% RH and 20°C-25°C

STORAGE AND HANDLING

- Cartridges should be stored tip down.
- Paste can be stored up to two weeks at room temperature.
- To prolong shelf life of **WS159**, refrigerate between 5°C~10°C, (41°F~50°F). At this range the shelf life will exceed 9 months.
- **WS159** should not be allowed to freeze.
- When refrigerated, solder paste must be allowed to warm up to room temperature.
- Paste must be ≥22°C, (~66°F) prior to applying to stencil for processing.
- Working range of **WS159** is between 22-32°C, (~66°F – 89.5°F).
- First-In-First-Out (FIFO) inventory management practices should be used with all solder pastes.

REFLOW PROFILE

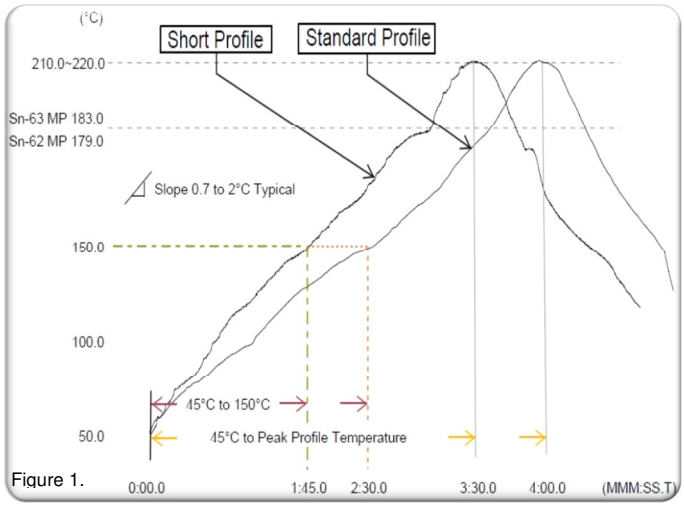

Figure 1.

HEATING

A linear ramp of 0.7˚C to 2.0˚C C/second is suggested to gradually remove the solvents and other volatile components in the solder paste. This also helps in minimizing solder balls, beading and bridging from hot slump.

A linear ramp also helps minimize depletion of flux activity which can occur with excessive temperature, and at extended preheat times, and at very high reflow temperatures.

A profile with a soak between 140-150°C for less than 20 seconds can be used to reduce void formation on BGA and CSP devices. (Request FCTA's profile guide to void reduction).

While a linear profile typically does not produce tombstoning, a short 10-20 second dwell prior to transitioning into the liquidus point of the solder, and minimizing the ΔT between soak and liquid temperatures will help minimize tombstoning if experienced.

STANDARD LINEAR PROFILE GUIDELINES

A linear ramp-style profile (Figure 1) is recommended with **WS159**; however, it will also perform well in ramp-soak profiles. Some general guidelines for a standard linear profile:

Standard Linear Profile	
Ramp Rate	• 0.7˚C ~ 2.0˚C Per Second Typical
Time Above Liquidus (TAL)	• 60 Seconds Nominal • 45~75 Sec. Process Window
Peak Temperature	• 215˚C Nominal • 210˚C~220˚C Process Window
Profile Length	• 3½ ~ 4 Minutes Max • From 45˚C to Profile Peak
Cool Down	• 2.0˚C ~ 3.0˚C Per Second Typical

HIGH TEMPERATURE PROFILE

When Soldering to Au, Pt, Pd, Alloy 42 and Thermally Demanding Assemblies	
Time Above Liquidus (TAL)	• 75 ~ 90 Seconds
Peak Temperature	• 225˚C ~ 230˚C
Profile Length	• 4 ~ 4 ½ Minutes Max • From 45˚C to Profile Peak
Cool Down	• 2.0˚C ~ 3.0˚C Per Second Typical

Soldering hard-to-wet alloys such as Au, Pt, Pd, Alloy 42 leadframe, and heavier OSP coatings can be easily achieved through slight modification of Peak, TAL and Profile Length parameters to overcome secondary eutectic, and lower dissolution rates associated with these alloys.

Densely populated, high layer count, and otherwise thermally demanding PWB's will also typically require, and benefit from these suggested process adjustments.

(Request FCTA's profile bulletin for soldering to high-temperature alloys.

COOLING

A cooling rate of 2°C-3°C per second is typical for most Sn62 and Sn63 applications. These parameters should be utilized to insure a fine grain solder structure and minimal IMC layer.

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS) are available upon request, and online at www.fctassembly.com

TEST RESULTS8

J-STD-004A (IPC Tm-650) Test	Result
Flux Type (per J-STD-004A)	ORH0
Copper mirror	High activity
Halide test	0.00%
Silver chromate	No halides
Fluoride test	None detected
Ion Chromatography	Zero Halide
J-STD-005 (IPC-TM-650) Test	**Result**
Brookfield viscosity Type 3	680 to 760 Kcps
Brookfield viscosity Type 4	680 to 760 Kcps
Slump	Pass
Solder Ball	Pass
Wetting	Pass
Bellcore Test	**Result**
SIR	Pass/Clean
Electromigration	Pass/Clean