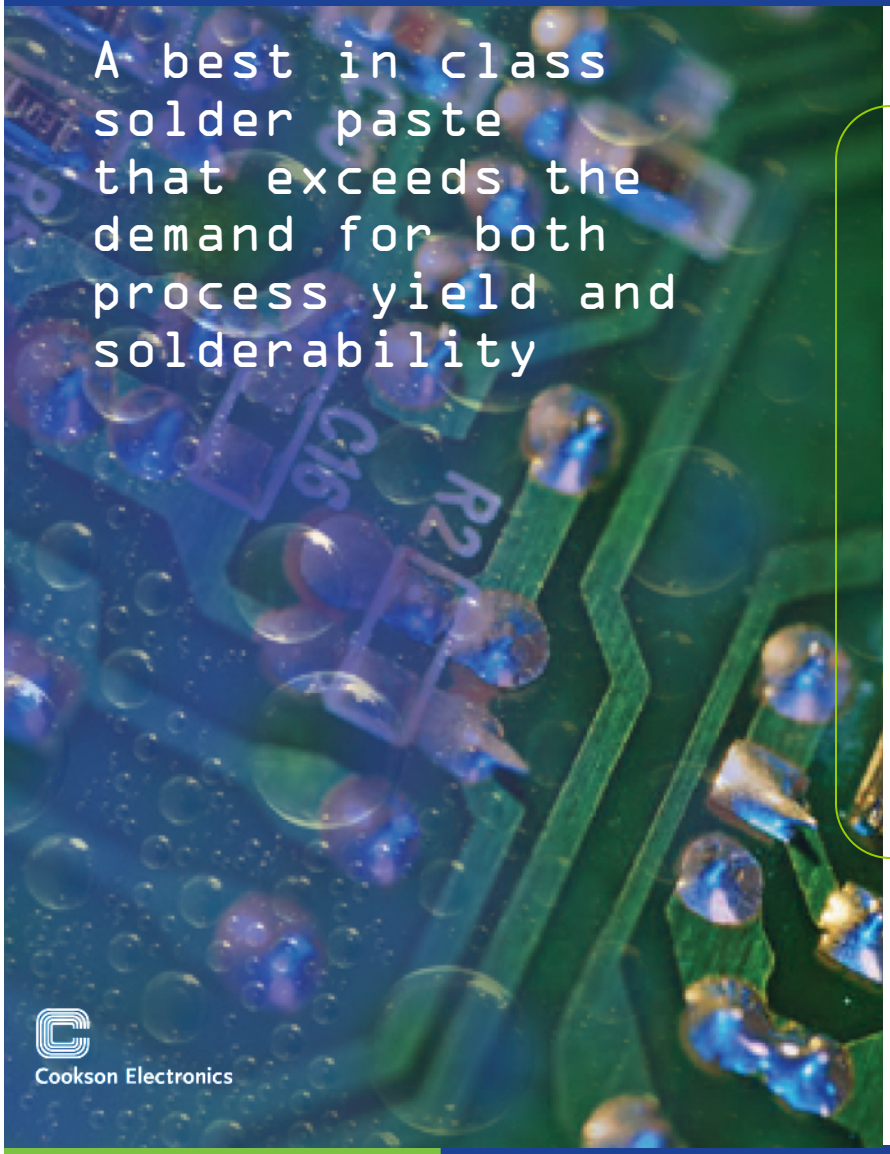
the product:



ALPHA® WS-809 Solder Paste

product guide

alpha

SM-888

WS-809 Water-Soluble Solder Paste

Contents

Welcome to the ALPHA® WS-809 Product Guide

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Introduction

Introducing ALPHA® WS-809, ALPHA's solution to the problems associated with environmental variability when using water soluble solder paste.

Cookson considered what you need from a water soluble solder paste – longer stencil life and superior print volume consistency. In addition, we addressed the need for high reflow throughput and yield, without compromising the cleanability of flux residue. That's why we developed ALPHA WS-809 Water Soluble Tin/Lead Solder Paste.

ALPHA WS-809 was developed with broad print and reflow process windows. It offers best in class resistance to exposure to humidity, while offering residue free results over a broad range of water based cleaning parameters. And with our local teams of technical experts, you can count on Cookson's complete support whenever and however you need us.

It's the kind of support you would expect from a company that's remained dedicated to serving the needs of the electronic assembly market for over 80 years.

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WS-809 Water-Soluble Solder Paste

Performance Summary

Process Benefit	WS-809 Attributes	Performance Capability
Print Process Window	Fine Feature Print Definition	Excellent print definition and consistent volumetric performance to 16 mil pitch QFP and 15 mil circles (BGA225)
	Stencil Life	Superior performance at high temperature and humidity.
	Tack Life	Best in class tack life
Print Cycle Time	Print Speed Range	Repeatable volume deposition and low volume variability at print speeds ranging from 25 to 125 mm/second (1 to 6 inches/second)
Reflow Yield	Mid Chip Solder Balling	Superior pre-cleaning performance versus leading competitors
	Cross Print Wetting	100% cross print wetting across a spectrum of surface finishes and reflow profiles
	Solder Spread	Best in class solder spread on OSP, ENIG, Immersion Tin and Immersion Silver
	Random Solderballs	Best in class even after 4 hour exposure to 75% RH
	Resistance to Voids	Meets requirements of IPC 7095 Class III for low voiding using straight ramp and soak profiles
	Resistance to Hot and Cold Slump	Exceeds the requirements of IPC J-STD-005
Cleanability	Post Cleaning Residue	Extremely low ionic contamination and no visible residue at multiple combinations of conveyor speed and wash water temperatures
	Cleaning Process Window	Ability to effectively clean up to 48 hours after reflow. This provides maximum process flexability and can eliminate a redundant cleaning step in double-sided reflow

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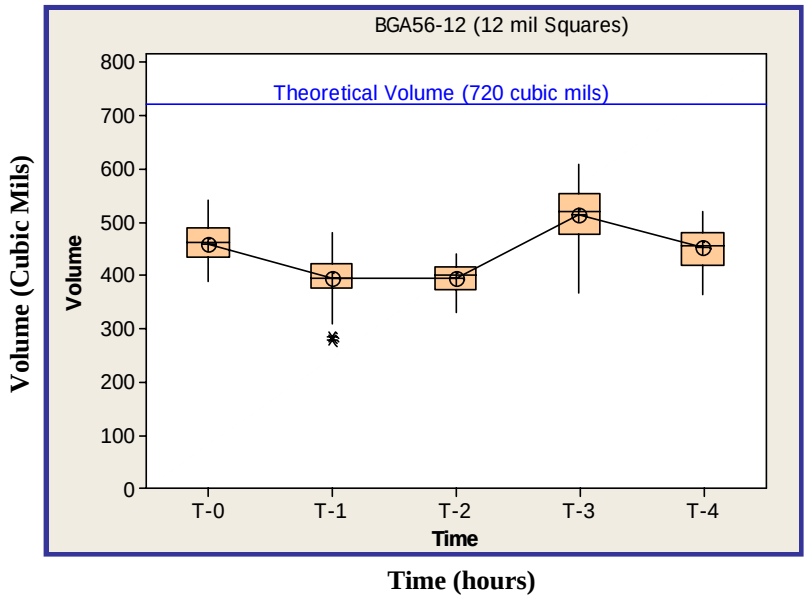
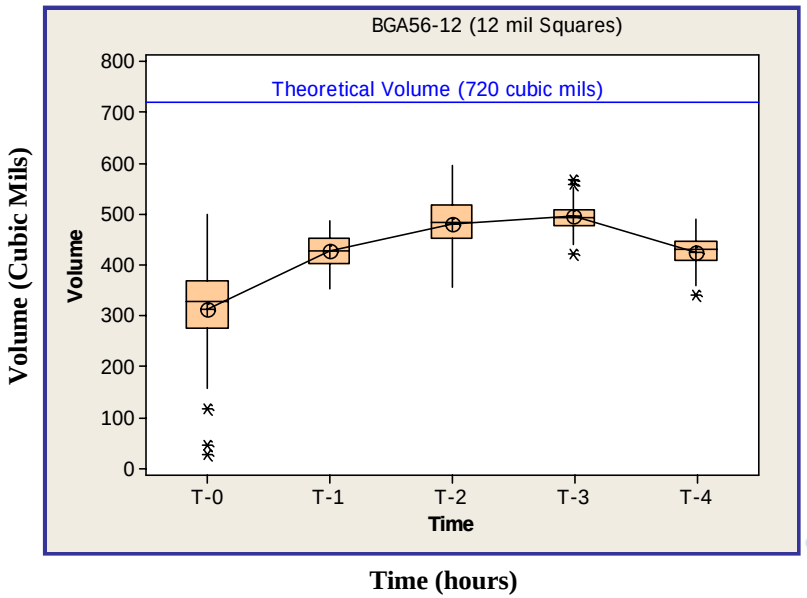
WS-809 Water-Soluble Solder Paste

Superior Volumetric Print Performance

ALPHA WS-809



Competitor C



Process Parameters:

- Stencil: 5mil LC
- Print Speed: 4.9 in/s

Delivers Consistently High Fine Feature Print Yields

- Excellent print definition and consistent volumetric performance to 0.30mm (12mil) squares under extreme environmental conditions
- 4 Hour Continuous Print Test @ 80°F, 55% RH on BGA 12 mil squares

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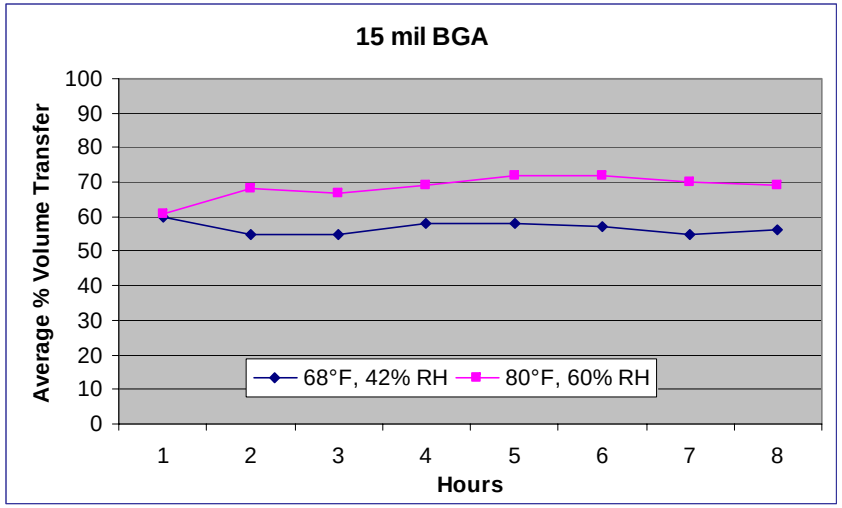
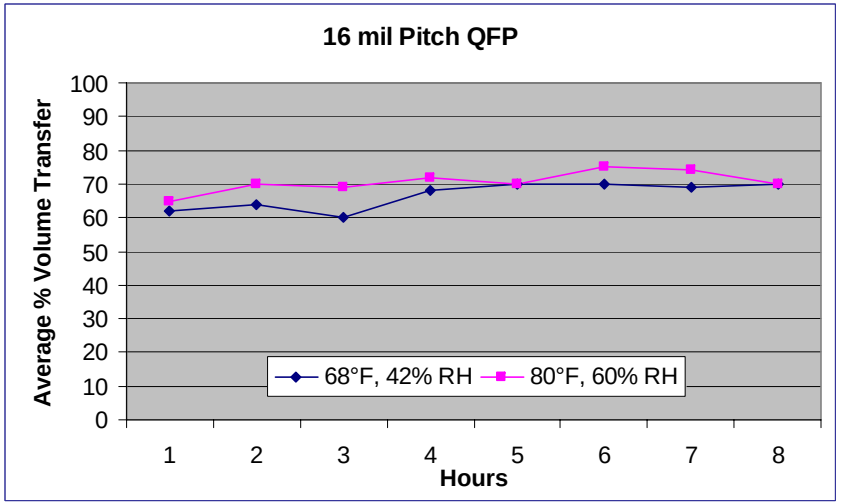
WS-809 Water-Soluble Solder Paste

Print Performance

Stencil Life – Paste Volume





Repeatable volumes over time support high print yields

- Continuous monitoring of paste volume over time demonstrates ALPHA WS-809's consistent printability
- Less than 15% change in average volume over an 8 hour production run down to 0.38mm (15 mil) BGAs and 0.4mm (16 mil) pitch QFPs
- Providing repeatable volumes over time even at environmental extremes

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WS-809 Water-Soluble Solder Paste

Tack Life

	Initial (g/mm^2)	16 hrs @ 25% RH (g/mm^2)	16 hrs @ 50% RH (g/mm^2)	16 hrs @ 75% RH (g/mm^2)
ALPHA WS-809	**2.21**	**2.40**	**1.90**	**1.90**
Competitor C	**1.1**	**1.1**	**0.8**	**0.2**
Competitor A	**1.4**	**1.2**	**1.1**	**0.3**

Maintains consistent tack strength over a broad humidity range

IPC Classification

- Less than 1 unit change in tack when tested at a humidity range of 25% - 75% RH measured over a 8 hour period

Performance Indicator

- High initial tack and low change in tack over time when subject to extreme environmental conditions allow for best-in-class process flexibility between the print and reflow cycles

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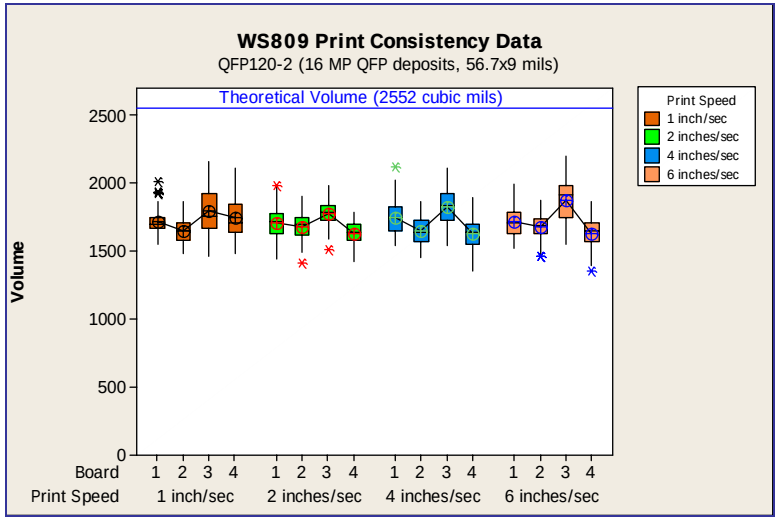
WS-809 Water-Soluble Solder Paste

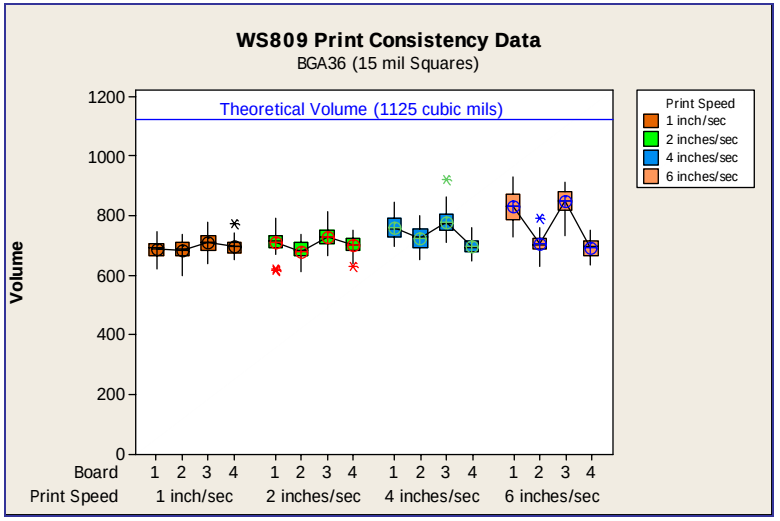
Print Performance

Print Consistency Over Range of Print Speeds

QFP120 – 16 mil Pitch



BGA36 – 15 mil squares



Wide print speed capability allows for maximum throughput

- Repeatable volume deposition and low variability based on theoretical aperture volumes
- Faster print speed reduces print cycle time
- Ability to consistently print at high speeds reduces probability that printing is the rate controlling step

Process Parameter:

- Stencil: 5mil LC

Performance Indicator

- Consistent Transfer Efficiency (i.e. flat line) over a range of print speeds demonstrates robust printing process

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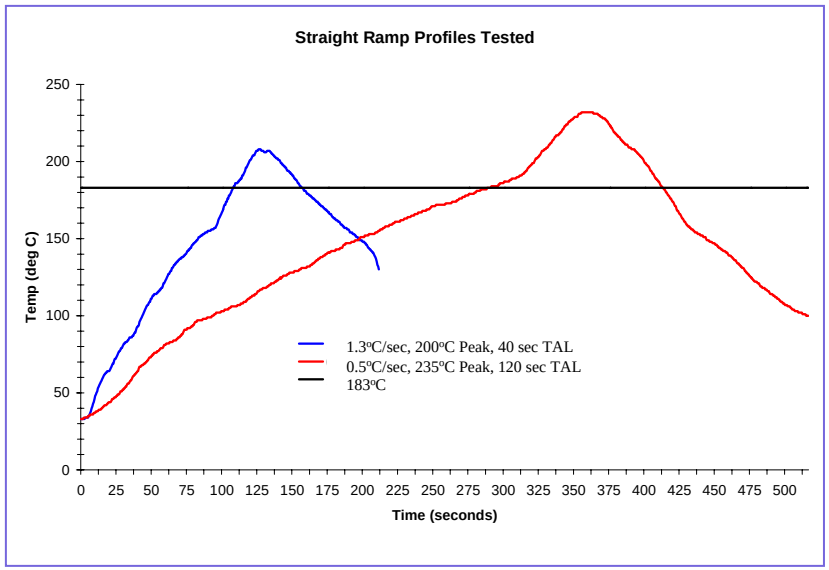
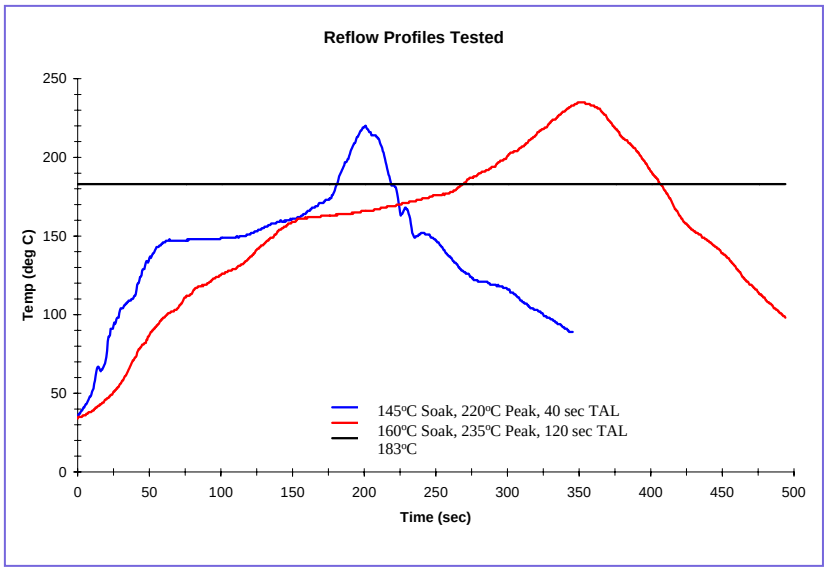
WS-809 Water-Soluble Solder Paste

Reflow Profiles Used for Product Testing



Straight Ramp Profiles



Soak Profiles

Process Window Characterization

	Soak Profile	Straight Ramp Profile
Peak Temp	200˚C - 235˚C	200˚C - 235˚C
TAL	40 - 120 sec	40 - 120 sec
Ramp Rate	N/A	0.5˚C/sec - 1.3˚C/sec
Soak Temp	145˚C - 160˚C	N/A
Recommended Soak Time	< 90 sec.	N/A

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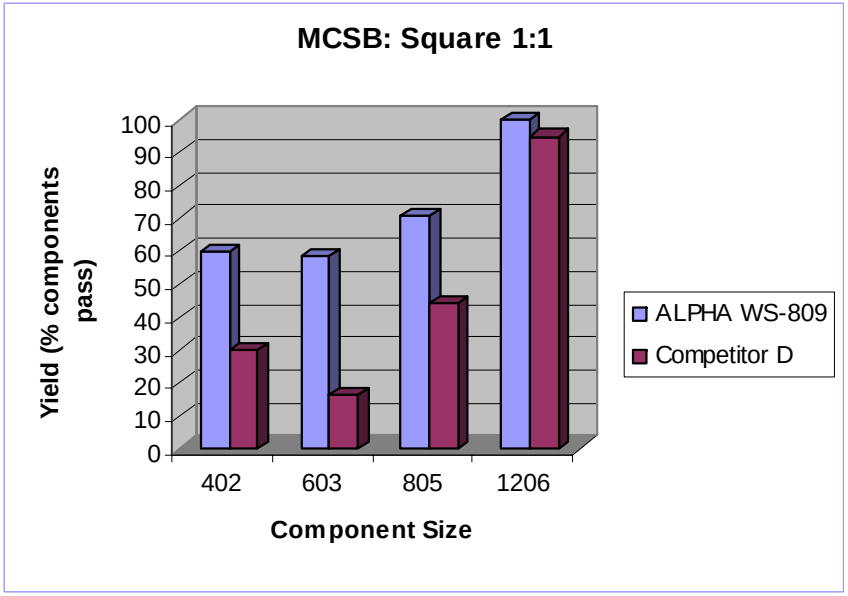
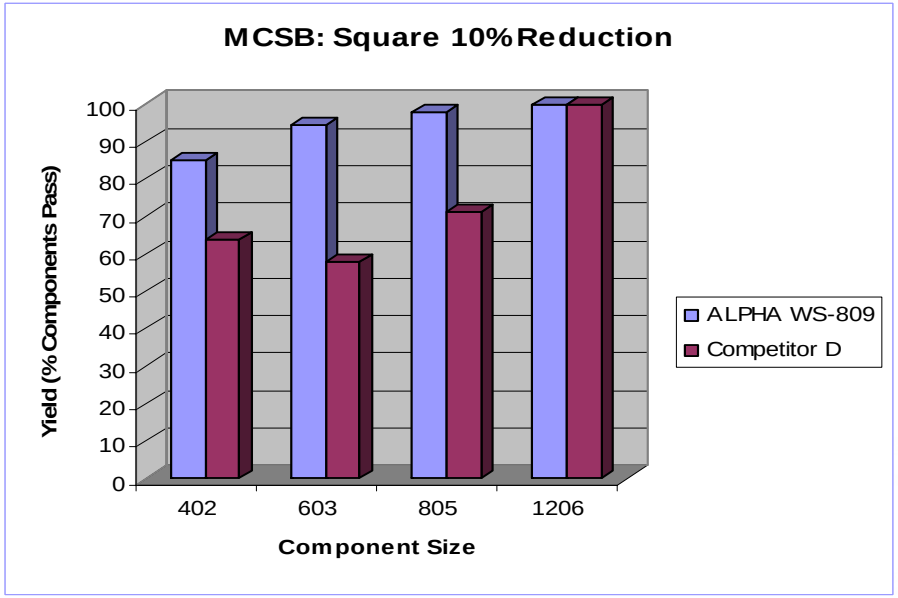
WS-809 Water-Soluble Solder Paste

Reflow Yield: Mid-Chip Solderball Performance





Excellent mid-chip solderball performance

- Outperforms leading competitor for various different stencil designs
  - 1:1 pad to aperture ratio
  - 10% aperture area reduction
- Reduced aperture design recommended for smaller components

Test Parameters:

- 200˚C Straight Ramp
- 0402, 0603, 0805, 1206 component size
- 5 mil LC Stencil
- 1.3˚C/sec ramp rate, TAL=33-50s
- OSP Pad Finish

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Reflow Yield: Application Note

Mid-Chip Solderballs in the Print Process

Print process parameters that can impact mid-chip solderballs

- Excess solder paste being deposited
  - Mask defined pads increase likelihood of mid-chip solder balls because of increased print volumes
  - Ineffective board support (See next page)
  - Excessive print pressure
  - Aperture size or stencil thickness greater than required
  - -- Aperture shape can deposit incorrect amount of paste under component termination
- Accuracy of print deposition
  - Paste deposited on solder mask can increase mid-chip balls

Printing recommendations to minimize mid-chip solderballs

- Consult with IPC guidelines for board design
- Effective board support
- Sufficient print pressure and effective under stencil wiping program
- Stencil aperture modification (reduced size and/or shape)
- Optimized stencil thickness
- Utilize ALPHA WS-809, engineered to reduce mid-chip balls
- Verify accuracy of fiducial alignment and integrity of stencil
- Scale stencil image to compensate for PWB positional inaccuracies
- Consult with Cookson Standard stencil design guidelines

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Reflow Yield: Application Note

Mid-Chip Solderballs in the Print Process

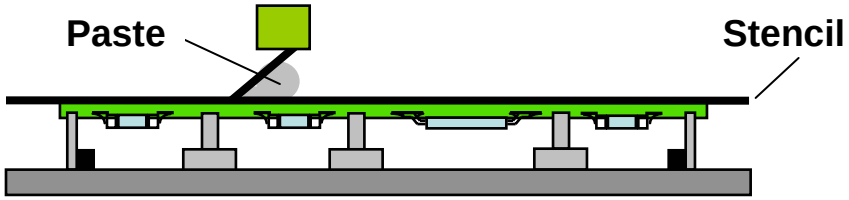
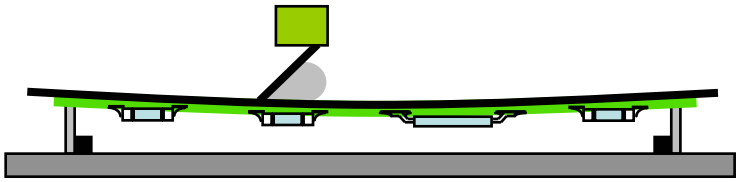
Effect of board support	Close-up of deposits
 **Good Support**	 **Consistent Deposits**
 **Poor Support**	 **Inconsistent Deposits**

Diagram shows how poor board support can lead to inconsistent deposits and potentially increase mid-chip solderballs.

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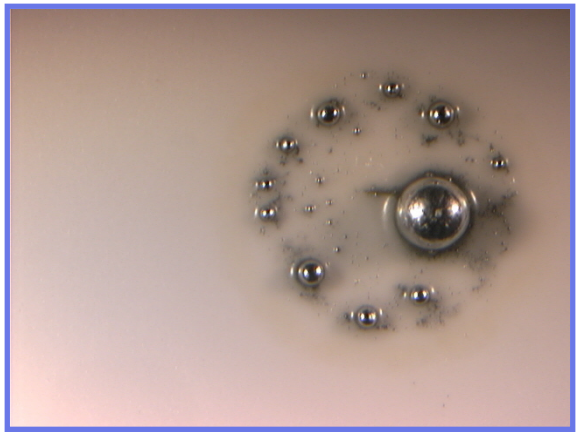
Reflow Performance

Random Solderball Resistance

ALPHA WS-809	Competitor A	Competitor D
		
4 hours @ 75% RH	4 hours @ 75% RH	4 hours @ 75% RH
PASS	**FAIL**	**FAIL**

Excellent Random Solderball Test Results:

- Outperforms the leading competitive products for resistance to random solderball formation
- Rated Preferred for solderballing per the IPC J-STD-005

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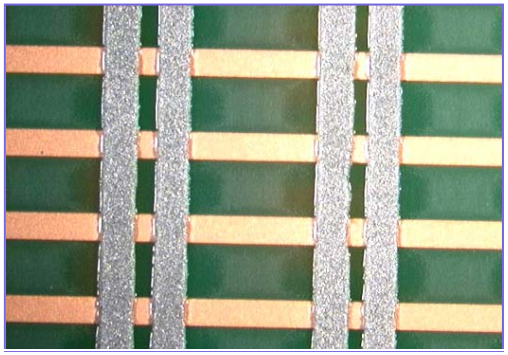
WS-809 Water-Soluble Solder Paste

Cross-Print Wetting: Description of Test



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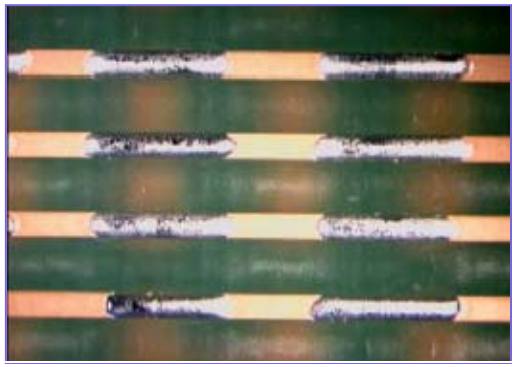
Spreading Test Cross Print pattern Prior to reflow



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Spreading Test Cross Print pattern Post reflow

Excellent spreading characteristics

- Spacing between the solder paste stripes range from 0.1mm up to 0.8mm (increasing by 0.1mm increments)
- Stripes of solder are printed perpendicular to the traces on the board
- Upon reflow, the solder melts.
- Since it does not wet to the masked surface between the traces, it “pulls back” to the metal and spreads out along the traces.
- If there is enough solder spread, the gap between the two adjacent solder spots is bridged.

Performance Indicator

- The higher the percentage of gaps bridged the better the spreading characteristics.
- As the inter-stripe distance between printed paste deposit increases, spreading becomes more difficult

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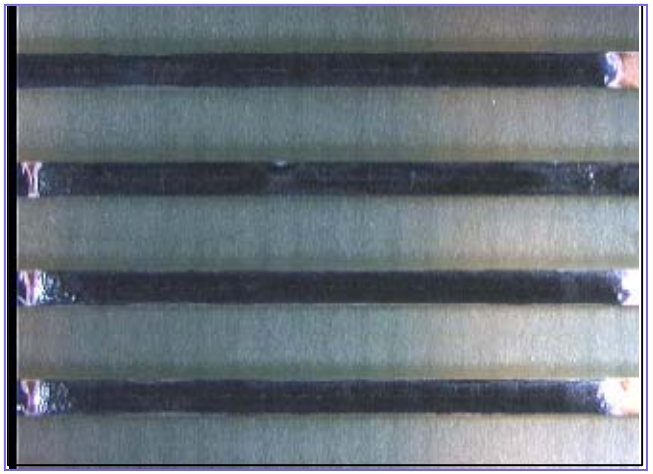
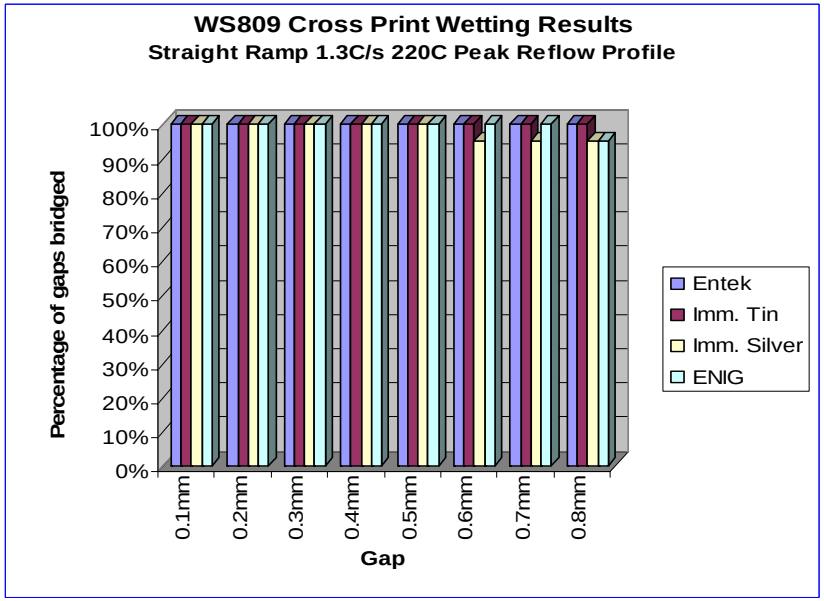
WS-809 Water-Soluble Solder Paste

Cross-Print Wetting: ALPHA WS-809 Performance

ALPHA WS-809

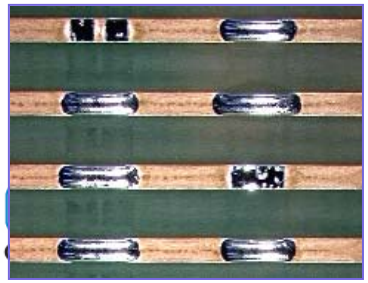




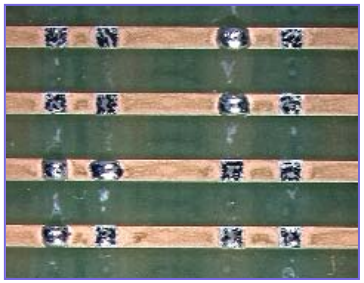
Test Parameters:

- All results shown on Entek HT OSP finish

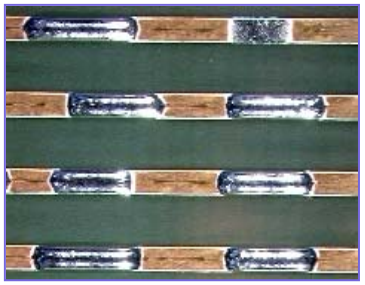
Competitor A



Competitor C



Competitor D



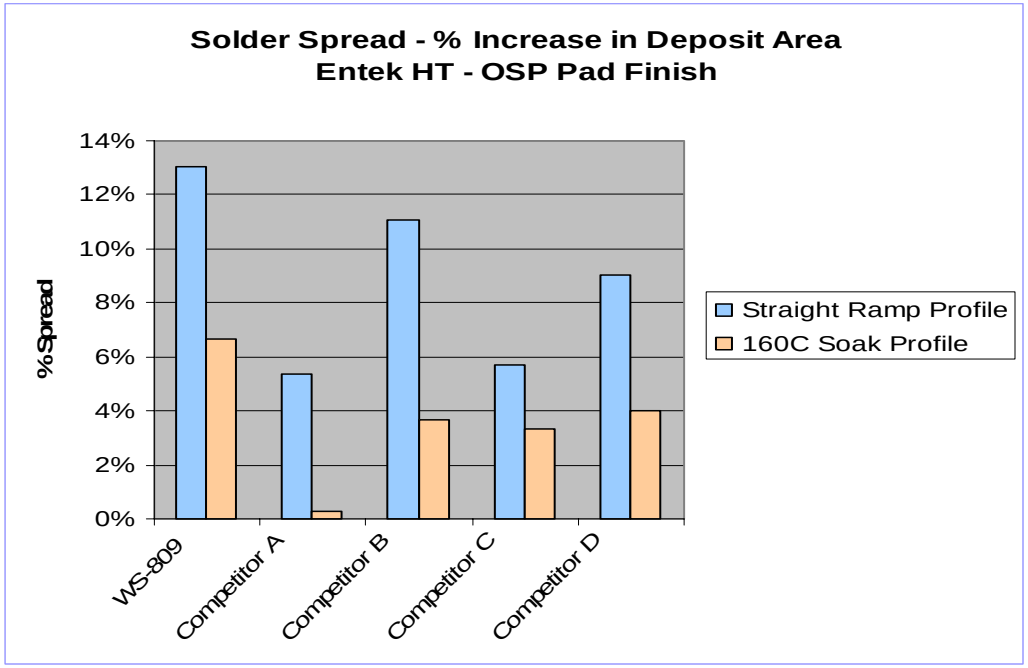
Excellent wetting performance

- Excellent Copper Wetting across various pad finishes including ENIG, Immersion Silver, Immersion Tin, and OSP-Coated Copper
- Outperforms the Leading Competitive Products

WS-809 Water-Soluble Solder Paste

Reflow Performance

Solder Spread



Excellent solder spread performance

- Spread was analyzed by measuring the % increase in solder deposit area after reflow
- ALPHA WS-809 exhibits best-in class performance for solder spread

Paste	Original Deposit Area	Straight Ramp Profile		160C Soak Profile	
		Area After Reflow	% Spread	Area After Reflow	% Spread
WS-809	0.0299	0.0338	13%	0.0319	7%
Competitor A	0.0299	0.0315	5%	0.0299	0%
Competitor B	0.0299	0.0332	11%	0.031	4%
Competitor C	0.0299	0.0316	6%	0.0309	3%
Competitor D	0.0299	0.0326	9%	0.0311	4%

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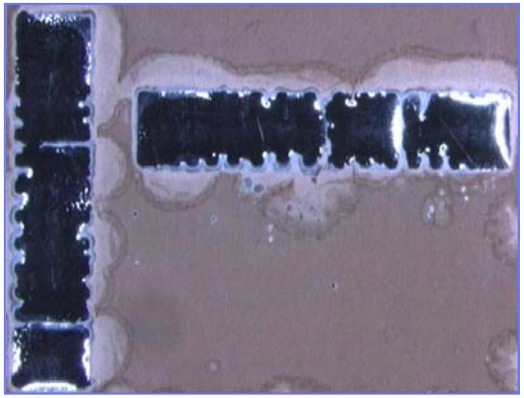
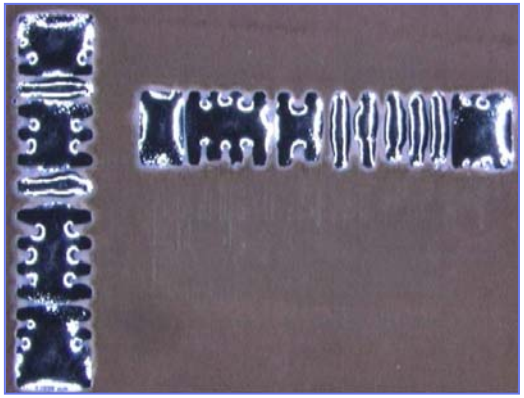
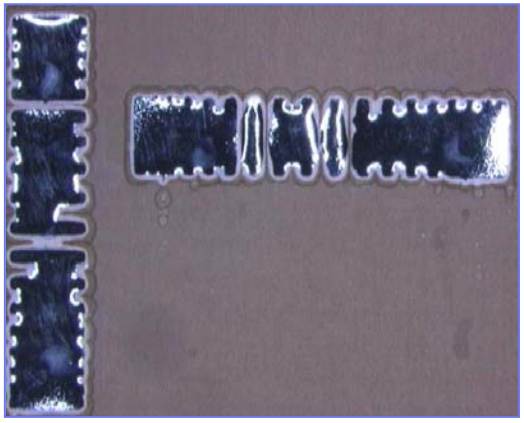
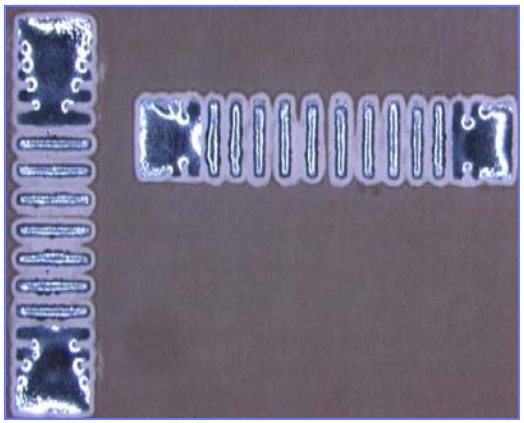
Solder Spread

	WS-809	Competitor A
Straight Ramp Profile		
Soak Profile		

	WS-809	Competitor B

Excellent solder spread performance

- ALPHA WS-809 outperforms all leading competitors for solder spread using various reflow profiles

Process Parameter:

- Entek HT OSP Pad Finish

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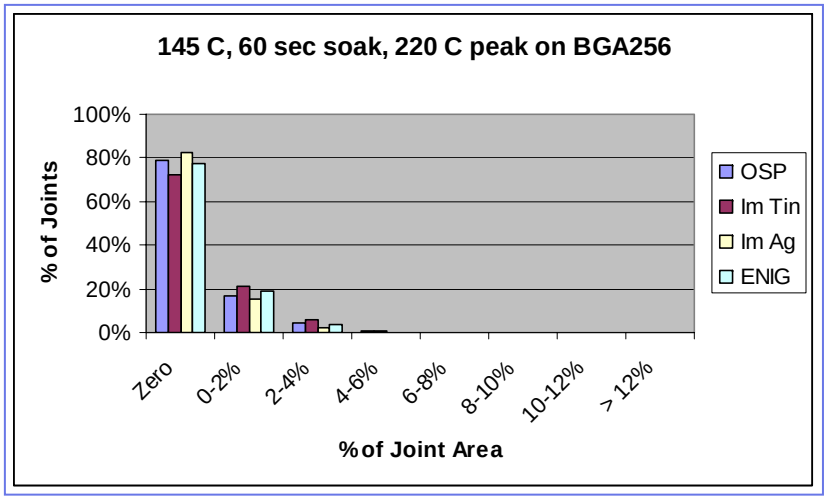
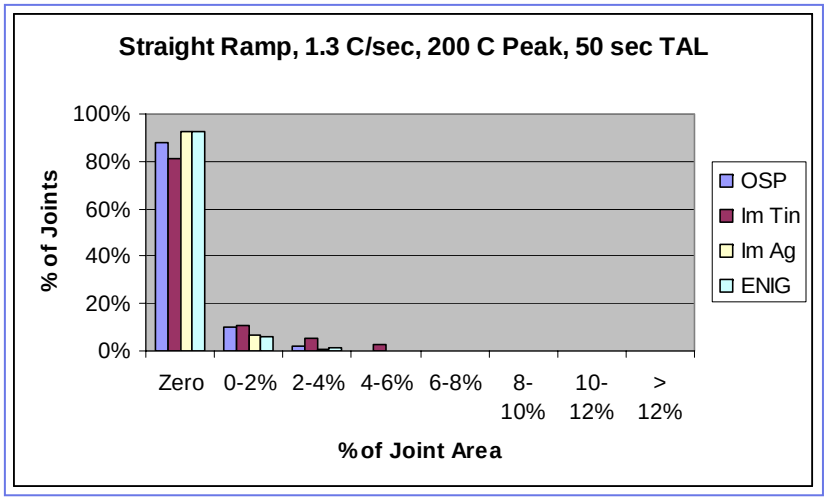
WS-809 Water-Soluble Solder Paste

Voiding Performance



Voiding - Soak Profile



Voiding – Straight Ramp Profile

Voiding Performance

- Excellent Low Voiding Performance on multiple pad finishes
- Exceeds IPC 7095 Class III requirements

Process Parameter:

- Stencil: 5 mil LC

Performance Indicator

- Ideal result is 100% at "zero voids"
- IPC calls for less than 9% void in joint area for Class III requirements

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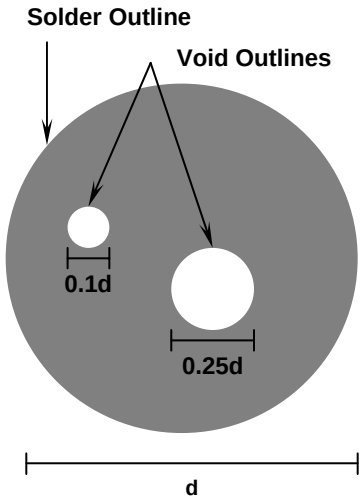
Reflow Yield: Application Note

Definition of Voiding Performance

Location of Void	Class I	Class II	Class III
Void in Solder (Solder Sphere)	60% of diameter = 36% of Area	42% of diameter = 20.25% of Area	30% of diameter = 9% of Area
Void at interface of Solder (Sphere) and Substrate	50% of diameter = 25% of Area	25% of diameter = 12.25% of Area	20% of diameter = 4% of Area



Example:
Total Void Diameter
0.10d +0.25d = 0.35d

IPC Criteria for Voids in BGAs, IPC 7095 7.4.1.6

The IPC criteria provide three classes of acceptance for both the solder sphere and the sphere-pad interface.

Where multiple voids exist, the dimensions will be added to calculate total voiding in the joint.

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WS-809 Water-Soluble Solder Paste

Hot and Cold Slump Performance

	Cold Slump After 10 min @ Room Temp	Hot Slump After 10 min @ 150 C
	Largest Gap Bridged	
Pad Size (mm)	0.33 x 2.03	0.33 x 2.03
25% RH	0.1	0.15
50% RH	0.1	0.15
75% RH	0.1	0.25
IPC max bridge allowed	0.2	0.25
	PASS	**PASS**

Meets Hot & Cold Slump Requirements per IPC J-STD-005

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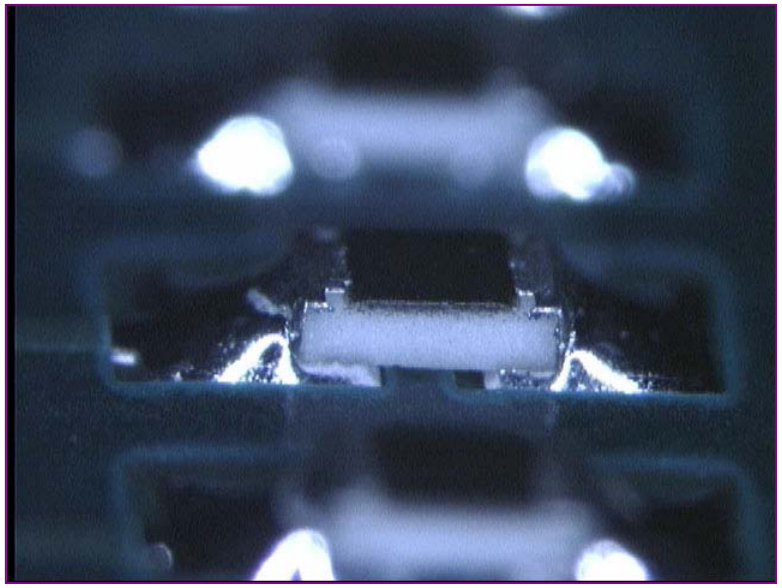
WS-809 Water-Soluble Solder Paste

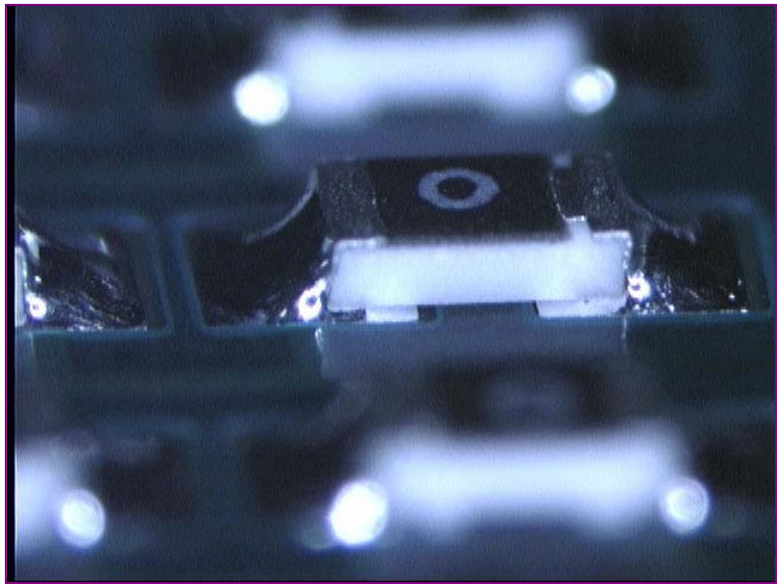
Solder Joint Cosmetics

0402 Resistor – OSP Pad Finish



Profile:	Straight Ramp 1.3°C/sec 200°C Peak, 50 sec TAL

0805 Resistor – Imm. Ag Pad Finish



Profile:	165°C, 60 sec Soak 235°C Peak, 120 sec TAL

Excellent Solder Joint Cosmetics

- Uniform Shiny Appearance
- Exceeds IPC Workmanship Standards
- Consistent Joint Cosmetics using Soak or Straight Ramp Profiles

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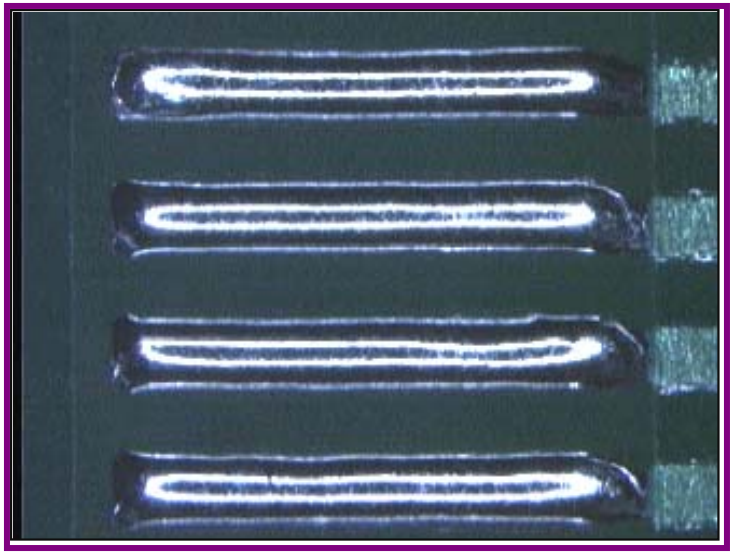
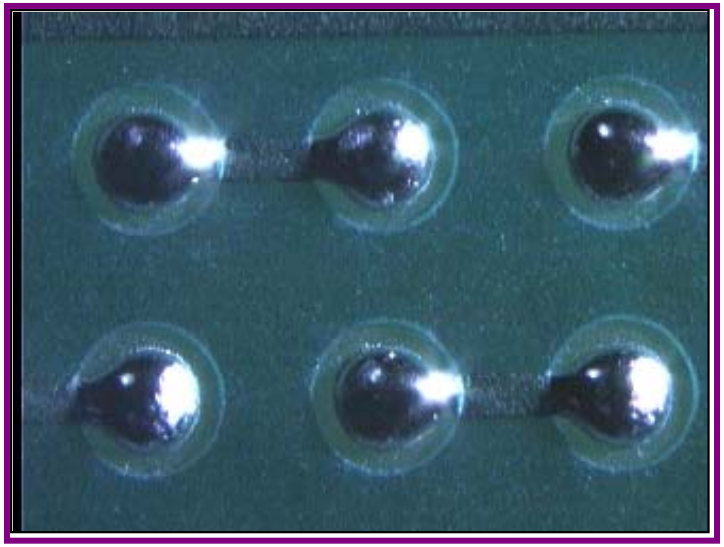
WS-809 Water-Soluble Solder Paste

Flux Residue Cosmetics



QFP: Immersion Tin, Straight Ramp



BGA36: Immersion Silver, Low Soak

Excellent Residue Cosmetics

- No Visible Post Cleaning Flux Residues (10x magnification)
- Highly Soluble Flux Residue Readily Cleanable in Water

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WS-809 Water-Soluble Solder Paste

Post-Reflow Cosmetics

Flux Residue Cleanability

Cleanability Matrix - 135° Water at Various Conveyor Speeds

	2.0 ft/min	2.5 ft/min	3.0 ft/min	3.5 ft/min	4.0 ft/min	4.5 ft/min	5.0 ft/min
Alpha WS-809	Y	Y	Y	Y	Y	Y	Y
Competitor A	Y	N	N	N	N	N	N
Competitor B	Y	N	N	N	N	N	N
Competitor C	Y	N	N	N	N	N	N

Y	Indicates the board passed both visual and ionic contamination acceptance requirements for cleanliness
N	Indicates the board failed either visual and/or ionic contamination acceptance requirements for cleanliness

Flux Residue Board Cleanliness

- ALPHA WS-809 outperforms all leading competitors for flux residue cleanliness
- Excellent reliability and cosmetics at higher conveyor speeds, increasing throughput rate

Test Method	Cleanliness Criteria
Visual Standard **IPC-A-610D**	*States that "no discernable residues from cleanable fluxes are allowed". This includes: white residues on PWB surface, white residues on or around solder terminations and crystalline white deposits on metallic areas.*
Ionic Cleanliness Standard **IPC J-STD-001D**	*States the contamination limit for assemblies tested using the dynamic method of detecting ionic surface contamination (method used with the Ionograph) is 10 µg/in2 (1.56 µg/cm2) sodium chloride equivalent ionic or ionizable flux residue.*

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WS-809 Water-Soluble Solder Paste

Electrical Reliability

IPC Surface Insulation Resistance (SIR):

ALPHA WS-809 DI Water Washed Immediately After Reflow				
Sample		1 Day	4 Day	7 Day
1	a	5.9E+09	6.0E+09	7.9E+09
	b	6.1E+09	5.6E+09	2.6E+09
	c	3.9E+09	3.5E+09	2.5E+09
	d	6.4E+09	6.3E+09	8.7E+09
2	a	1.8E+09	1.7E+09	1.6E+09
	b	2.6E+09	2.4E+09	1.3E+09
	c	5.7E+09	5.8E+09	4.7E+09
	d	4.5E+09	5.4E+09	4.0E+09
3	a	4.1E+09	4.0E+09	5.2E+09
	b	3.2E+09	2.3E+09	1.9E+09
	c	5.9E+09	5.7E+09	3.7E+09
	d	5.2E+09	5.7E+09	6.0E+09
Arithmetic Mean		**4.6E+09**	**4.5E+09**	**4.2E+09**
> 1.0E+08		**PASS**	**PASS**	**PASS**

ALPHA WS-809 DI Water Washed 48 hours After Reflow				
Sample		1 Day	4 Day	7 Day
1	a	2.6E+08	7.6E+08	1.2E+09
	b	2.3E+08	8.4E+08	1.3E+09
	c	1.5E+08	7.6E+08	1.2E+09
	d	1.5E+08	9.8E+08	1.0E+09
2	a	2.0E+08	7.5E+08	1.1E+09
	b	2.0E+08	8.9E+08	1.3E+09
	c	3.5E+08	1.0E+09	1.5E+09
	d	2.1E+08	7.9E+08	1.2E+09
3	a	2.1E+08	5.8E+08	8.0E+08
	b	2.9E+08	8.1E+08	7.8E+08
	c	3.1E+08	8.4E+08	1.2E+09
	d	2.3E+08	6.6E+08	9.3E+08
Arithmetic Mean		**2.3E+08**	**8.1E+08**	**1.1E+09**
> 1.0E+08		**PASS**	**PASS**	**PASS**

Cleanliness and Electrical Reliability

- ALPHA WS-809 can be effectively cleaned up to 48 hours after reflow.
- This allows maximum process flexibility and can eliminate a redundant cleaning step if double-sided reflow is used

Bellcore Electromigration

Test Condition	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
ALPHA WS-809	2.5E+09	5.0E+10	SIR (Initial)/SIR (Final) < 10	PASS	PASS
Control	2.8E+09	8.9E+10	SIR (Initial)/SIR (Final) < 10	PASS	PASS
Bellcore Test Condition (per GR 78-CORE, Issue 1): 65°C/85%RH/500 Hours/10V, measurement @ 100V/IPC B-25 B Pattern (12.5 mil lines, 12.5 mil spacing). All values in ohms.					

Cookson Electronics

WS-809 Water-Soluble Solder Paste

Summary

Delivers excellent print yield and process window

- Consistent print deposit volume
- Fine feature printing after 4 hours stencil life
- Consistent response to 1 hour pause
- Print speeds of 1 to 6 inches per second

Delivers excellent reflow yield and process window

- Best-in-class for Solder Spread and Wetting
  - Consistent results under multiple reflow profiles
  - Compatible with OSP, ENIG, Immersion Tin and Immersion Silver Finishes
- Best-in-class resistance to random solder balls
- IPC Class III resistance to voiding

Delivers excellent cleanability and cleaning process window

- Exceeds IPC and Bellcore Cleanliness Standards
- No visible residue post water cleaning (10x magnification)
- Cleanable after exposure to 2 reflow cycles
- Wide cleaning process window
  - Water temperatures from 120° F to 160° F (49° C to 70° C)
  - Conveyor Speeds from 2 to 5 feet/minute (0.6 – 1.5 meter/minute)
  - Can be effectively cleaned up to 48 hours after reflow

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WS-809 Water-Soluble Solder Paste

Leading Products

No-Clean, SnPb

- ALPHA OM-6106
- ALPHA OM-5200
- ALPHA OM-5100

No-Clean, Lead-Free

- ALPHA OM-338
- ALPHA OM-325

Water-Soluble, SnPb

- ALPHA WS-809
- ALPHA WS-709
- ALPHA WS-609

Water-Soluble, Lead-Free

- ALPHA WS-619

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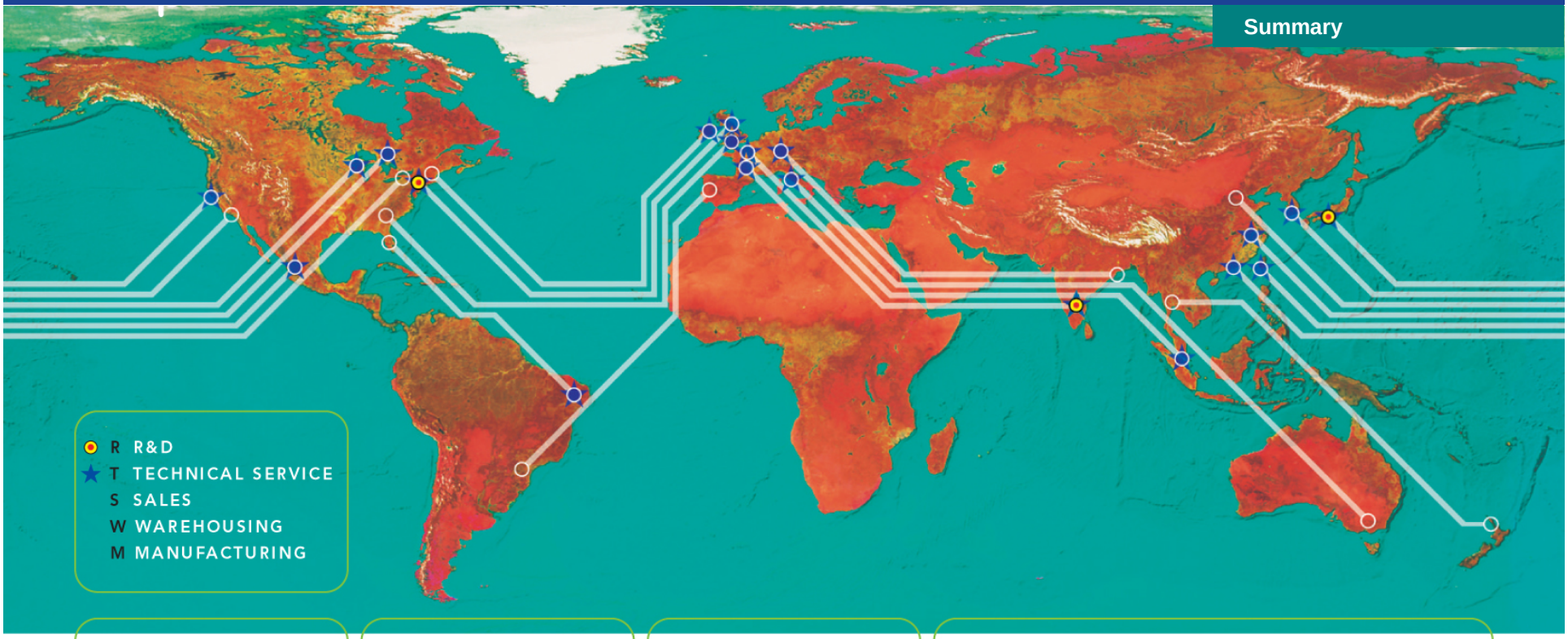
WS-809 Water-Soluble Solder Paste



NORTH AMERICA

California, USA	SM
Florida, USA	M
Georgia, USA	TSWM
Illinois, USA	TSWM
New Jersey, USA	RTSWM
New York, USA	M
Pennsylvania, USA	SWM
Ontario, Canada	TS
Guadalajara, Mexico	TSWM

SOUTH AMERICA

Buenos Aires, Argentina	SW
Manaus, Brazil	WM
São Paulo, Brazil	TSWM

EUROPE

Woking, England	TS
Ashford, England	WM
Turnhout, Belgium	TSWM
Cholet, France	TSW
Langenfeld, Germany	TS
Budapest, Hungary	TSWM
Dublin, Ireland	SWM
Milano, Italy	SW
Naarden, Netherlands	SWM
East Kilbride, Scotland	SWM

ASIA PACIFIC

Hong Kong, China	TSWM	Chennai, India	SWM
Shenzhen, China	TSWM	Hiratsuka, Japan	RTSWM
Beijing, China	TSWM	Sihung City, Korea	TSWM
Chengdu, China	SW	Penang, Malaysia	TSW
Nanjing, China	SW	Muntinlupa, Philippines	S
Shanghai, China	TSW	Singapore, Singapore	TSWM
Suzhou, China	S	Taoyuan, Taiwan	TSWM
Tianjin, China	SW	Bangkok, Thailand	SW
Xiamen, China	SW	Thomastown, Australia	S
Bangalore, India	RTS	Auckland, New Zealand	SW

SM-887-1

ALPHA WS-809 WATER SOLUBLE SOLDER PASTE

DESCRIPTION

ALPHA WS-809 is a SnPb, water-soluble solder paste which is designed for a broad range of SMT processes where aqueous post reflow cleaning is required.

FEATURES & BENEFITS

- Excellent volume transfer efficiency over broad range of environmental conditions
- Fine-pitch printing with consistent shape and volume to 16 mil pitch QFP (63x10x5 mil deposits) and 15 mil circles (BGA225)
- High throughput and yield with consistent print volumes at print speeds ranging from 1 – 6 inches/second
- Exhibits resistance to slumping and drying at temperature up to 66 – 84°F (19- 29°C) and relative humidity extremes (35%-65% RH)
- Water cleanable after two paste reflow cycles
- Excellent low voiding performance that exceeds IPC Class III requirement
- Superior solder spread performance on Cu OSP

PRODUCT INFORMATION

Alloys:	63Sn/37Pb, 62Sn/36Pb/2Ag, NT4S
Powder Size:	89.8% Metal, Type 3 (25-45 µm per IPC J-STD-005)
Packaging Sizes:	500 gram jars, 6" and 12" cartridges
Flux Gel:	Available in 10cc and 30cc syringes for rework applications.

PRINT CAPABILITY

ALPHA WS-809 is formulated for both standard and fine feature pitch stencil printing, at print speeds between 1"/sec (25 mm/sec) and 6"/sec (150 mm/sec) with stencil thicknesses of 5 mil (0.125 mm) to 6 mil (0.15 mm), particularly when used in conjunction with ALPHA® Stencils. Blade pressures should be between 1 – 2 lbs/in (0.16 – 0.34 kg/cm), depending on the print speed. The higher the print speed employed, the higher the blade pressure that is required.

SAFETY

While the **ALPHA WS-809** flux system is not considered toxic, its use in typical reflow will generate a small amount of reaction and decomposition vapors. These vapors should be adequately exhausted from the work area. Consult the MSDS for additional safety information, and for toxicity data on alloys containing lead and silver.

SHIPPING AND STORAGE

ALPHA WS-809 should be stored refrigerated upon receipt at 32°-46°F (0°-8°C). This will be sufficient to maintain a nominal shelf life. **ALPHA WS-809** should be permitted to reach room temperature before unsealing its package prior to use. Room temperature storage for sealed containers should not exceed 14 days. The shelf-life of refrigerated **ALPHA WS-809** is 6 months.

(TECHNICAL DATA ON PAGE 2)

Rev. 2-9-06

Cookson Electronics ASSEMBLY MATERIALS

ALPHA WS-809 TECHNICAL DATA

CATEGORY	RESULTS	PROCEDURES/REMARKS
CHEMICAL PROPERTIES		
Activity Level	ORH0 = J-STD Classification	IPC J-STD-004A
10 Day Copper Corrosion	**Pass,** (post-cleaning)	IPC J-STD-004A
ELECTRICAL PROPERTIES		
SIR (IPC) 1X Reflow	4.2 x 10^9 ohms	Pass, 7 days (>10^8 = Pass)
SIR (IPC) 2X Reflow with 48 hr delayed clean	1.1 x 10^9 ohms	Pass (>10^8 = Pass)
Electromigration (Bellcore)	Initial: 2.5 X 10^9 ohms; Final: 5.0 X 10^{10} ohms	Pass (Final > Initial/10)
PHYSICAL PROPERTIES		
Paste Density	4.4 g/cc typical	63Sn/37Pb alloy
Tack Force vs. Time and Humidity	**Pass**, Change of <1 g/mm^2 over 24 hours at 25% and 75% RH	IPC J-STD-005
Viscosity	1300 – 2300 poise	Malcom Spiral Viscometer; ICP-029 10 rpm
Solderball	Preferred	IPC J-STD-005
Stencil Life	8 hours	@ 30-50% RH, 75-80°F (24-27°C)
Slump	**Pass**	IPC J-STD-005 Pass, cold slump after 10 min RH and hot slump after 10 min at 150°C at 25%, 50%, and 75% RH

ALPHA WS-809 PROCESSING GUIDELINES

STORAGE-HANDLING

•Refrigerate to guarantee stability @ 0-8°C (32-46°F)

•Paste can be stored for 2 weeks at room temperature up to 77°F (25°C) prior to use.

•When refrigerated, warm-up paste to room temperature for up to 4 hours. Paste must be ≥66°F (19°C) before processing. Verify paste temperature with a thermometer to ensure paste is at 66°F (19°C) or greater before setup.

•Maximum Working Range is 35% - 65% RH and 66-84°F (19-29°C).

•Do not remove worked paste from stencil and mix with unused paste in jar. This will alter the rheology of the unused paste.

•These are starting recommendations and all process settings should be reviewed independently.

•6 month refrigerated shelf-life

PRINTING

STENCIL: Recommend Cookson Electronics Assembly Materials ALPHA CUT or ALPHA FORM stencils at 0.125mm – 0.150mm (5-6 mil) thick for 0.4 – 0.5mm (0.016" or 0.020") pitch. Stencil design is subject to many process variables. Contact your local Cookson Electronics site for advice.

SQUEEGEE: Metal (recommended)

PRESSURE: 1.0 – 2.0 pounds per inch of squeegee length (0.16 - 0.34 kg/cm).

SPEED: 1- 6 inches (25-150 mm) per second.

PASTE ROLL: 0.4 - 0.6 inches (1-1.5 cm) diameter and make additions when roll reaches 0.2 inch (0.5cm) diameter.

APPERTURE DESIGN: ALPHA WS-809 may be printed using various aperture designs. A 10% reduction is recommended to optimize wipe frequency when using a stencil > 5mils.

OPTIMAL PRINT SETTINGS: 4.9 in/s print speed; 1.5 lb/in print pressure; 0.02 in/s stencil release. These are the recommended starting points for process setup.

REFLOW (See Figure #1)

• Clean-dry air or nitrogen atmosphere.

PROFILE (63/37 alloy):

• Straight ramp of 0.5 – 1.3°C/sec to 200 – 235°C peak, TAL of 40 - 120 sec, time to peak < 4 minutes is recommended.

• Soak profile of 1.5 – 2.0°C/sec to 145-160° soak for a max of 90 seconds, peak temperature of 200-235°C , TAL of 40 - 120 sec, time to peak < 4 minutes is recommended.

Start with straight ramp design if new oven settings are required.

Internal testing has shown straight ramp profile to be most effective for superior joint cosmetics (shininess).

CLEANING

• ALPHA WS-809 can generate foam while being cleaned in recirculating systems. Alpha 2007 is the recommended de-foamer

• The flux residues from Alpha WS-809 are water cleanable after two paste reflow cycles

• Recommended rinse temperature 120-160°F (49-70°C)

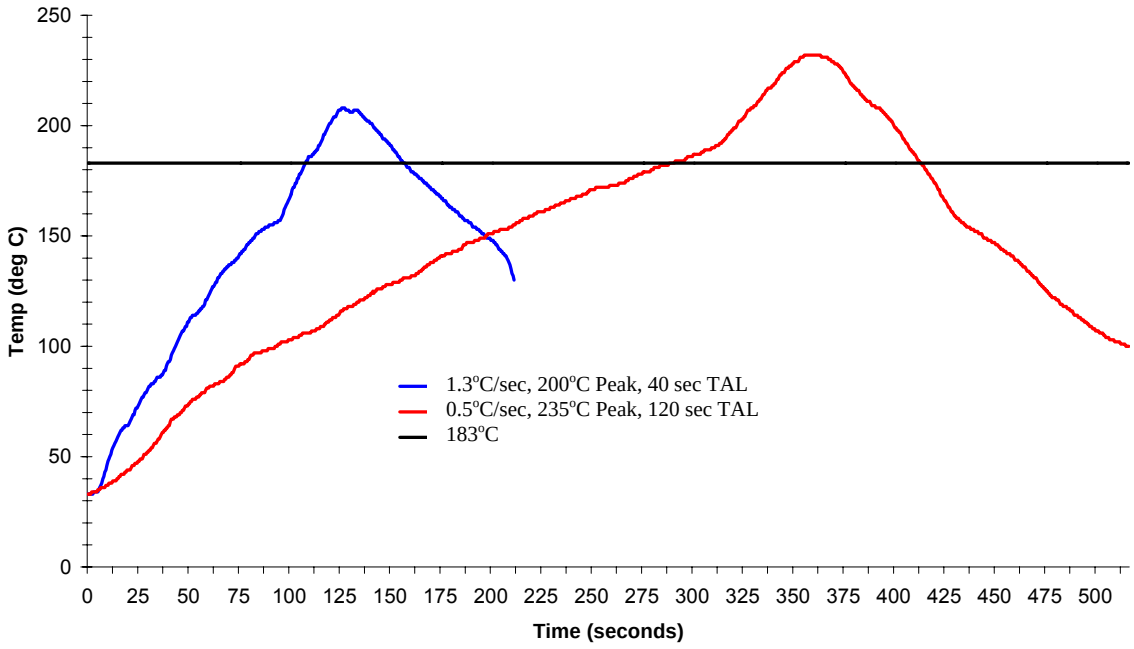
• No special nozzle configurations

• Effective residue cleanability up to 48 hours after reflow. This allows maximum process flexability and can eliminate an extra cleaning step in double-sided reflow processes

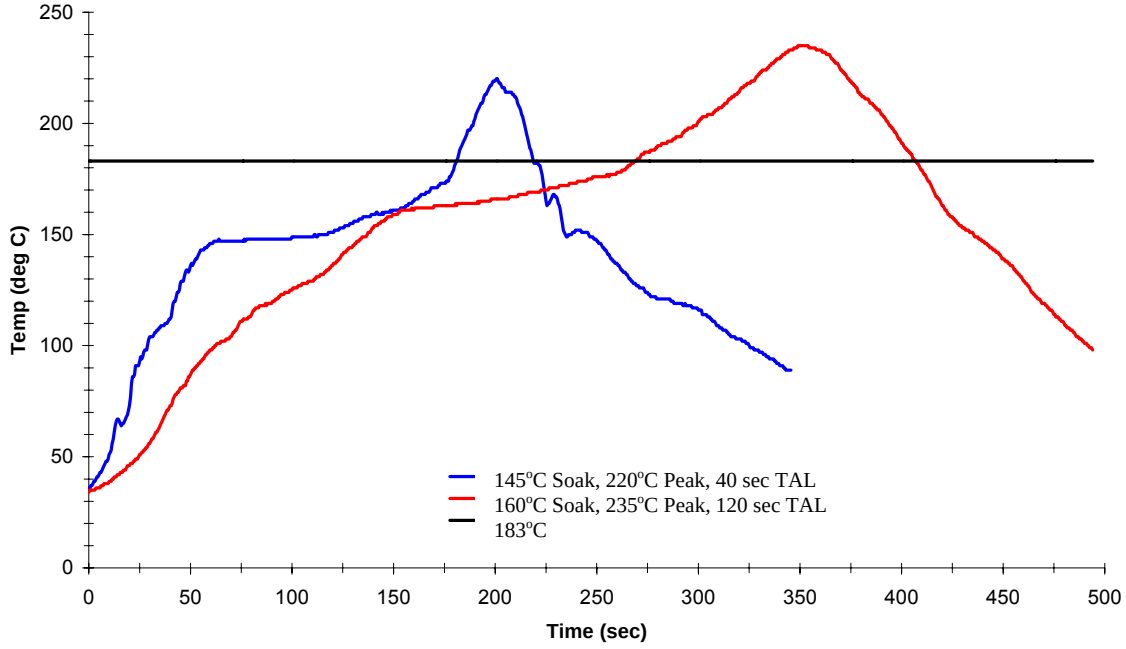
• Ionic contamination levels passes **IPC J-STD 001D** requirement (< 10μg/in^2) Typical result is <3 μg/in^2 attained with heated solution tested with an Ionograph™.

Rev. 2-9-06

Straight Ramp Profiles Tested



Reflow Profiles Tested



Cookson Electronics
A Division of Cookson Group plc

Revised 9/12/05
Replaces 8/24/05
Printed 9/12/05
MSDS ID: MM0029

MATERIAL SAFETY DATA SHEET

Alpha Metals
600 Route 440
Jersey City, New Jersey 07304
(201) 434-6778
(201) 434-7508 *fax*
www.alphametals.com

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: ALPHA WS-809

MANUFACTURER'S NAME: ALPHA METALS, INC
ADDRESS: 600 ROUTE 440
JERSEY CITY, NJ 07304
TRANSPORT EMERGENCY #: CHEMTREC: 1-800-424-9300

BUSINESS PHONE: 1-201-434-6778

2. INGREDIENT AND EXPOSURE LIMIT INFORMATION

CHEMICAL NAME	CAS #	% W/W	OSHA PEL - TWA
LEAD	7439-92-1	25 - 35	0.05mg/m3 TWA
TIN	7440-31-5	50 - 60	2 mg/m3 TWA
MODIFIED ROSIN	65997-06-0	0 - 2	**
ETHOXYLATED AMINES	61790-85-0	0 - 5	NOT ESTABLISHED

** Sensitizer

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: MODERATE EYE IRRITANT.
COMBUSTIBLE AT ELEVATED TEMPERATURES

MODERATE GASTROINTESTINAL TRACT IRRITANT.
MODERATE RESPIRATORY TRACT IRRITANT.
CAUSES SKIN IRRITATION

HMIS RATING SYSTEM:
Health: 2 ; Flammability: 1 ; Reactivity: 0 ; Protection: B

NFPA RATING SYSTEM:

ROUTES OF ENTRY: INHALATION; INGESTION; SKIN CONTACT; EYE CONTACT;
TARGET ORGANS: BLOOD; DIGESTIVE TRACT; KIDNEYS; NERVOUS SYSTEM
MEDICAL CONDITIONS AGGRAVATED: NO MEDICAL CONDITIONS AFFECTED BY EXPOSURE.
DIGESTIVE TRACT DISEASE; KIDNEY DISEASE

IMMEDIATE (ACUTE) SYMPTOMS OVER-EXPOSURE BY ROUTE OF EXPOSURE:
INHALATION: CAN CAUSE MODERATE RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA AND HEADACHE. MAY CAUSE AN ALLERGIC REACTION. MAY CAUSE RESPIRATORY TRACT SENSITIZATION, CHARACTERIZED BY ASTHMA-LIKE SYMPTOMS.
EYES: CAN CAUSE MODERATE IRRITATION, TEARING AND REDDENING, BUT NOT LIKELY TO PERMANENTLY INJURE EYE TISSUE.
SKIN CONTACT: CAN CAUSE MODERATE SKIN IRRITATION, DEFATTING, AND DERMATITIS. NOT LIKELY TO CAUSE PERMANENT DAMAGE.

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3. HAZARDS IDENTIFICATION (Cont.)

SKIN ABSORPTION: NO ABSORPTION HAZARD IN NORMAL INDUSTRIAL USE.
INGESTION: IRRITATING TO MOUTH, THROAT, AND STOMACH. CAN CAUSE ABDOMINAL DISCOMFORT, NAUSEA, VOMITING AND DIARRHEA.

LONG TERM (CHRONIC) HEALTH EFFECTS:
CARCINOGENICITY: NONE OF THE SUBSTANCES IN THIS PRODUCT ARE CONFIRMED AS HUMAN CARCINOGENS AT THIS TIME BY NTP, IARC, OR OSHA. IARC CLASSIFIES LEAD AND SOME LEAD COMPOUNDS AS 2B CARCINOGENS TO HUMANS). AGCIH LISTS AS LEAD AS A "A3, (ANIMAL CARCINOGEN WITH UNKNOWN RELEVANCE TO HUMANS).
REPRODUCTION: NO DATA AVAILABLE TO INDICATE PRODUCT OR ANY COMPONENTS PRESENT AT GREATER THAN 0.1% MAY CAUSE BIRTH DEFECTS. WOMEN OF CHILD BEARING AGE SHOULD AVOID EXPOSURE TO LEAD AND ITS INORGANIC COMPOUNDS DUE TO POST-NATAL EFFECTS.
MUTACENICITY: NO DATA AVAILABLE TO INDICATE PRODUCT OR ANY COMPONENTS PRESENT AT GREATER THAN 0.1% IS MUTAGENIC OR GENOTOXIC.

4. FIRST AID MEASURES

SKIN EXPOSURE: WASH WITH SOAP AND WATER. REMOVE CONTAMINATED CLOTHING AND LAUNDER. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS OR PERSISTS.
EYE EXPOSURE: FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 20 MINUTES RETRACTING EYELIDS OFTEN. TILT THE HEAD TO PREVENT CHEMICAL FROM TRANSFERRING TO THE UNCONTAMINATED EYE. GET IMMEDIATE MEDICAL ATTENTION.
INHALATION: REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT, HAVE A TRAINED INDIVIDUAL ADMINISTER OXYGEN. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION AND HAVE A TRAINED INDIVIDUAL ADMINISTER OXYGEN. GET MEDICAL ATTENTION IMMEDIATELY
INGESTION: DO NOT INDUCE VOMITING AND SEEK MEDICAL ATTENTION IMMEDIATELY. DRINK TWO GLASSES OF WATER OR MILK TO DILUTE. PROVIDE MEDICAL CARE PROVIDER WITH THIS MSDS.
NOTES TO DOCTOR: NO ADDITIONAL FIRST AID INFORMATION AVAILABLE

5. FIRE FIGHTING MEASURES

FLAMMABILITY SUMMARY: COMBUSTIBLE AT ELEVATED TEMPERATURES
FLASH POINT: 185 deg. C
AUTOIGNITION TEMPERATURE: N/E deg. C
EXPLOSIVE LIMITS % IN AIR: N/E /

EXTINGUISHING MEDIA: USE ALCOHOL RESISTANT FOAM, CARBON DIOXIDE, OR DRY CHEMICAL WHEN FIGHTING FIRES. WATER OR FOAM MAY CAUSE FROTHING IF LIQUID IS BURNING BUT IT STILL MAY BE A USEFUL EXTINGUISHING AGENT IF

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5. FIRE FIGHTING MEASURES (Cont.)

CAREFULLY APPLIED TO THE SURFACE OF THE FIRE. DO NOT DIRECT A STREAM OF WATER INTO THE HOT BURNING LIQUID.

FIRE AND EXPLOSION HAZARDS: MATERIAL MAY BE IGNITED ONLY IF PREHEATED TO TEMPERATURES ABOVE THE HIGH FLASH POINT, FOR EXAMPLE IN A FIRE.
EMPTY CONTAINERS THAT RETAIN PRODUCT RESIDUE (LIQUID, SOLID/SLUDGE, OR VAPOR) CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE CONTAINER TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. ANY OF THESE ACTIONS CAN POTENTIALLY CAUSE AN EXPLOSION THAT MAY LEAD TO INJURY OR DEATH. DUSTS AT SUFFICIENT CONCENTRATIONS CAN FORM EXPLOSIVE MIXTURES WITH AIR.

FIRE FIGHTING METHODS: WILL NOT BURN, NO SPECIAL INSTRUCTIONS AVAILABLE. USE METHODS APPROPRIATE FOR SURROUNDING MATERIALS.
USE METHODS FOR THE SURROUNDING FIRE.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE; METAL FUMES; TOXIC FUMES.

6. ACCIDENTAL RELEASE MEASURES

PRECAUTIONS AND EQUIPMENT: EXPOSURE TO THE SPILLED MATERIAL MAY BE IRRITATING OR HARMFUL. FOLLOW PERSONAL PROTECTIVE EQUIPMENT RECOMMENDATIONS FOUND IN SECTION VIII OF THIS MSDS.

METHODS FOR CLEAN-UP: WEAR COMPLETE AND PROPER PERSONAL PROTECTIVE EQUIPMENT FOLLOWING THE RECOMMENDATION OF SECTION VIII GATHER AND STORE IN A SEALED CONTAINER PENDING A WASTE DISPOSAL EVALUATION. DO NOT USE BROOM OR AIR CLEANING ETC.

7. HANDLING AND STORAGE

HANDLING MEASURES: HARMFUL OR IRRITATING MATERIAL. AVOID CONTACTING AND AVOID BREATHING THE MATERIAL. USE ONLY IN A WELL VENTILATED AREA.
AS WITH ALL CHEMICALS, GOOD INDUSTRIAL HYGIENE PRACTICES SHOULD BE FOLLOWED WHEN HANDLING THIS MATERIAL. AVOID CONTACT WITH MATERIAL, AVOID BREATHING DUSTS OR FUMES, USE ONLY IN A WELL VENTILATED AREA. WASH THOROUGHLY AFTER HANDLING; WASH HANDS BEFORE EATING; DO NOT GET IN EYES, ON SKIN AND CLOTHING; MINIMIZE DUST GENERATION AND

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7. HANDLING AND STORAGE (Cont.)

ACCUMULATION; REMOVE CONTAMINATED CLOTHING AND WASH BEFORE REUSE; GROUND AND BOND CONTAINERS WHEN TRANSFERRING MATERIAL; USE SPARK-PROOF TOOLS AND EXPLOSION-PROOF EQUIPMENT; AVOID CREATING DUSTS AS AN EXPLOSIVE DUST AIR MIXTURE CAN BE CREATED AT HIGH CONCENTRATIONS. IF DUSTS ARE CREATED, ENSURE NO SOURCES OF IGNITION ARE PRESENT. TAKE PRECAUTIONARY MEASURES TO PREVENT ELECTROSTATIC DISCHARGES.

STORAGE MEASURES: STORE IN A COOL DRY PLACE. ISOLATE FROM INCOMPATIBLE MATERIALS.
STORE IN A TIGHTLY CLOSED CONTAINER; KEEP AWAY FROM FOOD AND DRINKING WATER. STORE IN A COOL DRY PLACE; KEEP AWAY FROM HEAT, SPARKS, AND FLAME; KEEP UNDER A NITROGEN BLANKET

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

ENGINEERING MEASURES: USE LOCAL EXHAUST VENTILATION OR OTHER ENGINEERING CONTROLS TO MINIMIZE EXPOSURES AND MAINTAIN OPERATOR COMFORT.
ENGINEERING CONTROLS MUST BE DESIGNED TO MEET THE OSHA CHEMICAL SPECIFIC STANDARD IN 29 CFR 1910.
VENTILATION IS REQUIRED TO MAINTAIN OPERATOR EXPOSURE BELOW PUBLISHED EXPOSURE LIMITS. USE PROCESS ENCLOSURES, LOCAL EXHAUST VENTILATION, OR OTHER ENGINEERING CONTROLS TO CONTROL AIRBORNE LEVELS BELOW RECOMMENDED EXPOSURE LIMITS; EXPLOSION PROOF EXHAUST VENTILATION SHOULD BE USED. FACILITIES STORING OR USING THIS MATERIAL SHOULD BE EQUIPPED WITH AN EYEWASH AND SAFETY SHOWER.

RESPIRATORY PROTECTION: NO RESPIRATORY PROTECTION REQUIRED UNDER NORMAL CONDITIONS OF USE.
FOLLOW A RESPIRATORY PROTECTION PROGRAM THAT MEETS 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS WHENEVER WORK PLACE CONDITIONS WARRANT THE USE OF A RESPIRATOR. WEAR A NIOSH APPROVED RESPIRATOR IF ANY EXPOSURE IS POSSIBLE.

EYE PROTECTION: WEAR CHEMICALLY RESISTANT SAFETY GLASSES WITH SIDE SHIELDS WHEN HANDLING THIS PRODUCT. DO NOT WEAR CONTACT LENSES.
WEAR GOGGLES AND A FACE SHIELD

SKIN PROTECTION: NOT NORMALLY CONSIDERED A SKIN HAZARD. WHERE USE CAN RESULT IN SKIN CONTACT, PRACTICE GOOD PERSONAL HYGIENE. WASH HANDS AND OTHER EXPOSED AREAS WITH MILD SOAP AND WATER BEFORE EATING, DRINKING, AND WHEN LEAVING WORK.
WHERE CONTACT IS LIKELY, WEAR CHEMICAL RESISTANT

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8. EXPOSURE CONTROLS AND PERSONAL PROTECTION (Cont.)

GLOVES, A CHEMICAL SUIT, RUBBER BOOTS, AND CHEMICAL SAFETY GOGGLES PLUS A FACE SHIELD

GLOVES: NO INFORMATION AVAILABLE

CONTROL PARAMETERS:

	----------ACGIH EXPOSURE LIMITS----------		
CHEMICAL NAME	TLV-TWA	STEL	CEILING
MODIFIED ROSIN	Sensitizer; reduce exposure to as low as possible		
LEAD	0.05 mg/m3 TWA		
TIN	metal: 2 mg/m3 TWA		

9. PHYSICAL AND CHEMICAL PROPERTIES

COLOR:	WHITE
COLOR:	GREY
ODOR:	NONE
pH:	N/A
SPECIFIC GRAVITY:	7.0083
SOLUBILITY IN WATER:	NOT DETERMINED
VAPOR PRESSURE, mm Hg at 20C:	
MELTING POINT or RANGE (C):	327
BOILING POINT (C):	1744

10. STABILITY AND REACTIVITY

DECOMPOSITION PRODUCTS:	METAL FUMES; TOXIC FUMES.
INCOMPATIBLE MATERIALS:	STRONG OXIDIZING AGENTS; PEROXIDES; METALS; STRONG ACIDS; STRONG REDUCING AGENTS; ACIDS; CHLORINE; MOISTURE; STRONG ALKALIES
CONDITIONS TO AVOID:	NONE KNOWN CONTAMINATION; CONTACT WITH AIR. CONTACT WITH WATER

11. TOXICOLOGICAL INFORMATION

COMPONENT TOXICOLOGY DATA (NIOSH)

CHEMICAL NAME	LD50/LC50

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12. ECOLOGICAL INFORMATION

OVERVIEW: THIS MATERIAL IS NOT EXPECTED TO BE HARMFUL TO THE ECOLOGY.
MOBILITY: NO DATA
PERSISTENCE: NO DATA
DEGRADABILITY: NO DATA

13. DISPOSAL CONSIDERATIONS

WASTE DESCRIPTION: SPENT OR DISCARDED MATERIAL IS PROBABLY A HAZARDOUS WASTE.
DISPOSAL METHODS: DISPOSE OF IN A LANDFILL. DISPOSAL IS NOT LIKELY TO BE REGULATED.

14. TRANSPORT INFORMATION

SHIPPING BASIC DESCRIPTION: DOT & IATA: NOT RESTRICTED

15. REGULATORY INFORMATION

TSCA STATUS: ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY OF EXISTING CHEMICAL SUBSTANCES.
REGULATED CHEMICALS:

CHEMICAL NAME		REGULATION
LEAD	7439-92-1	SARA 313
LEAD	7439-92-1	CA PROP 65

CERCLA REGULATED CHEMICALS AND REPORTABLE QUANTITY (RQ):

LEAD METAL	7439-92-1	final RQ = 10 pounds (4.54 kg) of releases of this hazardous s required if the diameter of the the solid metal released is equ exceeds 0.004 inches)

CALIFORNIA SCAQMD RULE 443.1 VOCS:

WHMIS RATINGS: D2A(OTHER TOXIC EFFECTS), D2B(TOXIC MATERIAL, SKIN & EYE IRRITANT)

MATERIAL SAFETY DATA SHEET

Alpha Metals
600 Route 440
Jersey City, New Jersey 07304
(201) 434-6778
(201) 434-7508 *fax*
www.alphametals.com

16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed of implied regarding the accuracy of these data or the results to be obtained from the use thereof. Additionally, Alpha Metals, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.