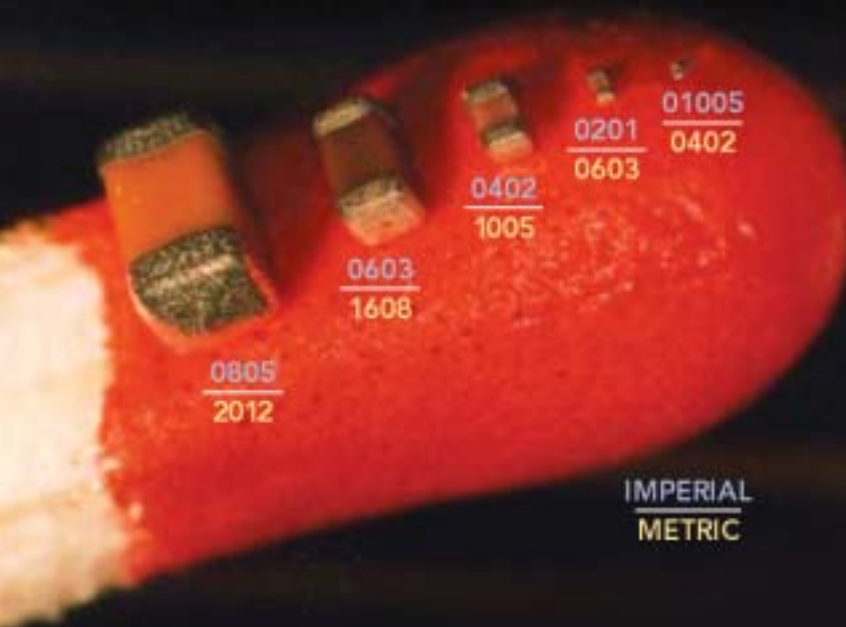


the product:

a superior lead-free solder paste that simplifies the transition to μ -fine feature printing.



ALPHA[®] OM-325 Solder Paste

product guide



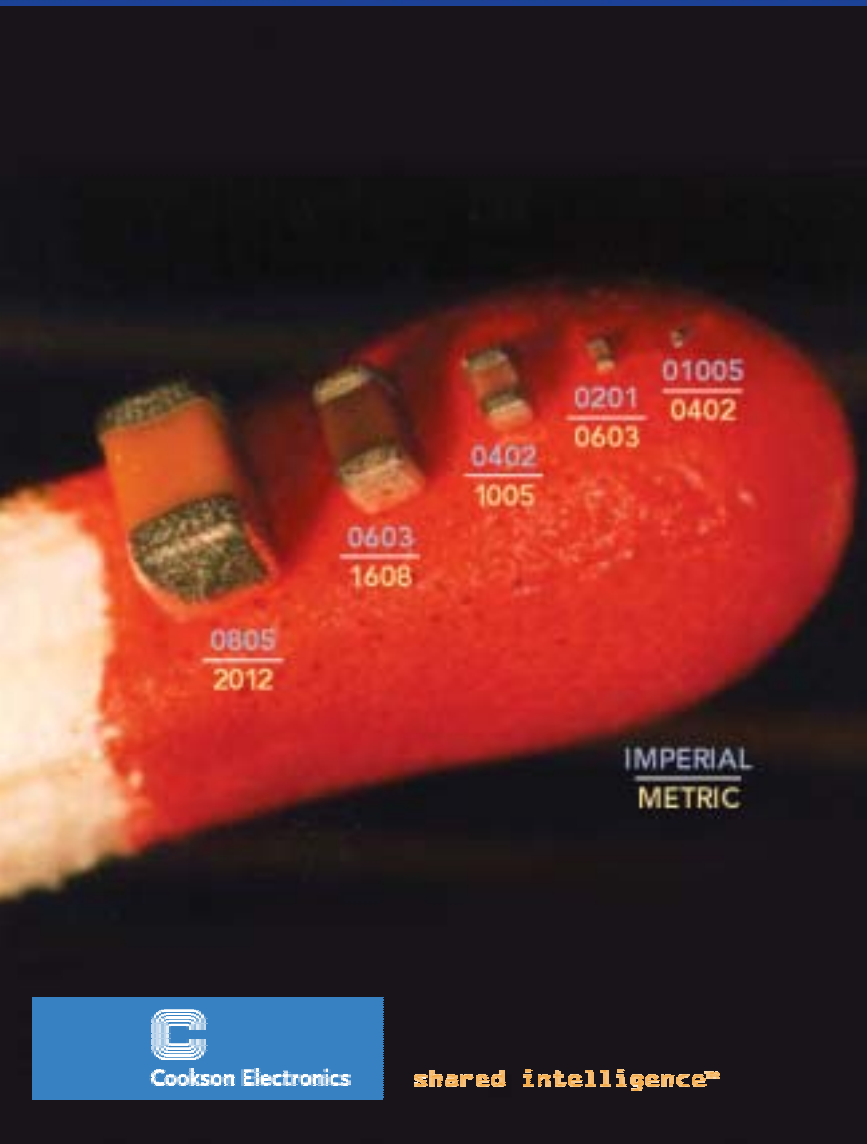
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OM-325 solder paste



Welcome to the ALPHA OM-325 Solder Paste Product Guide

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 - 3.2 μ -Fine Feature Transfer Efficiency
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Introduction

Introduction

As consumers demand ever-increasing functionality from electronic products, designers and manufacturers are delivering solutions by decreasing the size and weight of the manufactured goods.

Development of new design rules, manufacturing methods and materials is critical to achieve optimized process yields.

Transition to Lead-Free provides an additional challenge to miniaturization. This itself, is a major hurdle for manufacturers of electronic products.

To meet the challenge for these two technology advances, Cookson Electronics Assembly Materials has delivered a high performance, type 5, μ -fine, lead-free solder paste.

Using customer partnerships in technology, CEAM has delivered ALPHA OM-325.

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Background

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- Devices are getting smaller and thinner
- Chip components reach 0.4 x 0.2 mm (0.01 x 0.005 inch) sizes

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μ -chips vs. Embedded passives or Silicon Integration

To reduce passive real estate needs:

- Average proportion of different chips used on PWB Assembly
 - Resistors: Capacitors: Inductors about 2:1:0.7
- A cell phone can have >300 passives/unit
 - Performance (speed/inductance etc.)
 - Silicon integration > embedded passives ~0201
 - Real Estate
 - Silicon integration < embedded passives < 0201
 - High volume cost hierarchy
 - Silicon integration < embedded passives ~ 0201
 - Low volume cost/high flexibility
 - 0201 << silicon integration ~ embedded passives

For fast changing market and short life cycle modern edge consumer products, u-chips will be a desired solution!!

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2.0

Introducing ALPHA OM-325 Performance Summary

ALPHA OM-325

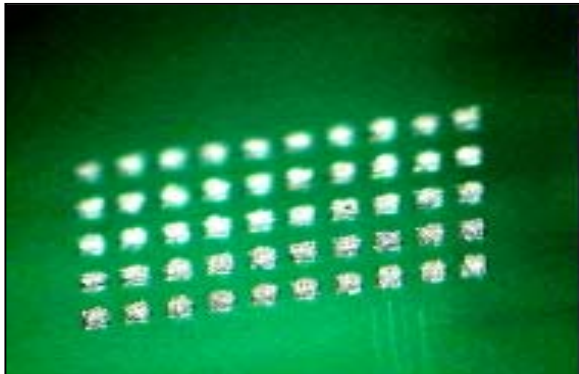
PROCESS BENEFIT	ALPHA OM-325 Attributes	Performance Capability
PRINT PROCESS WINDOW	Print Consistency	Pb-free Sn-3.0Ag-0.5Cu (SAC305) type 5 paste for most demanding micro-fine feature applications including 0402mm (01005inch) components (smaller than 0201 "inch").
	Print Speed	Excellent print repeatability to 50mm/sec (2inch/sec)
	Micro Fine Feature Transfer Efficiency	Excellent micro fine-feature release. Tested to 0.16mm (6.5mil) aperture using a 0.1mm (4mil) stencil.
	Stencil Life	Long Stencil Life. Tested over 6 hours in demanding dynamic stencil "knead" test, 32 hours Malcom viscosity test and 8 hours print test.
PLACEMENT	Excellent Self-Alignment Properties	Demonstrated placement of 0402mm (01005inch) chip components
REFLOW YIELD	Mid-Chip Solderballing	Competitive Mid-Chip solder ball performance
	Voiding Performance	Excellent Voiding Performance - Class III per IPC 7095 on optimized process conditions.
	Random Solderballs	Outstanding solder ball performance
	Post-Reflow Solder Cosmetics	Excellent micro-fine feature reflow properties using a range of high soak and straight ramp profiles. Excellent flux cosmetics, even at very high soak temperature profiles.
	Reliability	Excellent reliability performance. Passes IPC and JIS electrical and chemical corrosion tests.
	Hot /Cold Slump Performance	Good hot and cold slump performance as per JIS testing. Passes IPC hot and cold slump.

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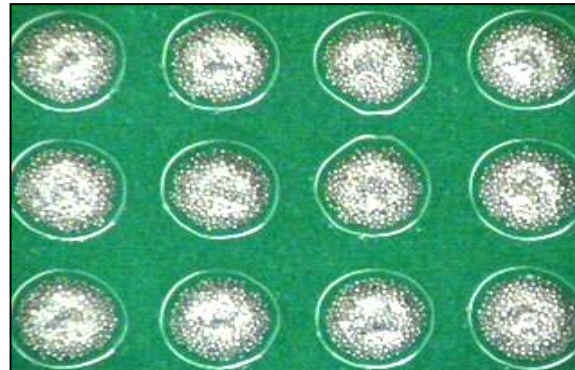
Print Capabilities

μ -Fine Feature Print Definition

ALPHA OM-325



0.16mm Square Pads (6.5mil) paste deposits



0.3mm (12mil) pitch deposits after 5 prints

Test Parameters:

Stencil thickness:	0.08 to 0.1mm (3.2 to 4mil).
Stencil aperture:	0.16 to 0.3mm (6.5 to 12mil) circles, 0.5mm (20mil) pitch.
Squeegee speed:	25mm/sec (1"/sec)
Snap off speed:	0.3mm/sec (12mil/sec)
Pressure:	165 g/cm (0.924lb/inch)

Delivering Excellent μ -Fine Feature Print Yields

- Excellent print definition & consistent volumetric performance to 0.16mm (6.5mil) circles and larger features.
- Delivers repeatable 0402 mm component print and reflow capability using type 5 Lead-Free paste.
- 8 prints per wipe at 0.3mm (12mil pitch).
 - A higher number of prints per wipe will be achieved at larger pitches than 0.3mm (12mil).

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Print Capabilities
 μ-Fine Feature Transfer Efficiency

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Sample Number	Feature Size (in mm)								
	0.3	0.275	0.25	0.225	0.2	0.19	0.18	0.17	0.16
1	1	1	1	1	1	1	1	1	2
2	1	1	1	1	1	1	1	2	3
3	1	1	1	1	1	1	1	2	2
4	1	1	1	1	1	1	2	3	3

Aperture Observation Grading Scale	
Grade	Description
1	All apertures fully open
2	(<10%) apertures clogged (including partially)
3	50% (+/- 10%) apertures clogged
4	(<10%) apertures fully open
5	All apertures clogged

Test Parameters	
• Stencil Thickness:	0.1mm (4mil)
• Squeegee speed:	25mm/sec (1"/sec)
• Snap off speed:	0.3mm/sec (12mil/sec)
• Pressure :	165 g/cm (0.924lb/inch)
• 84 printed deposits per Feature Size	

Capability to 0.16mm (6.5mil) using Demanding 0.1mm (4mil) Stencil Thickness

- μ-Fine feature print and reflow capability has been delivered by development of a visual inspection standard of stencil aperture observations*.

Note: * Since feature dimensions are smaller than most AOI instrumentation, an inspection method to judge print quality was developed.

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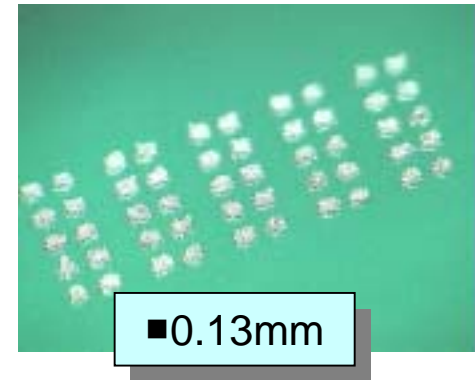
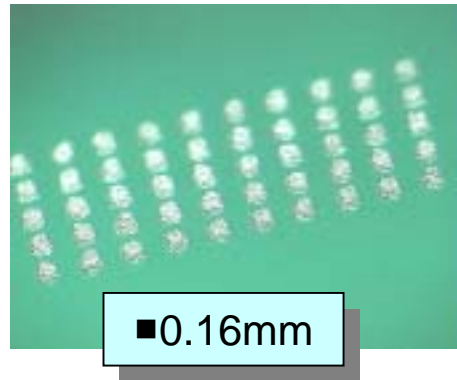
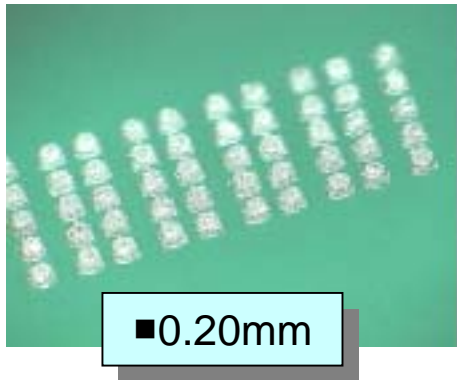
Print Capabilities

μ-Fine Feature Transfer Efficiency

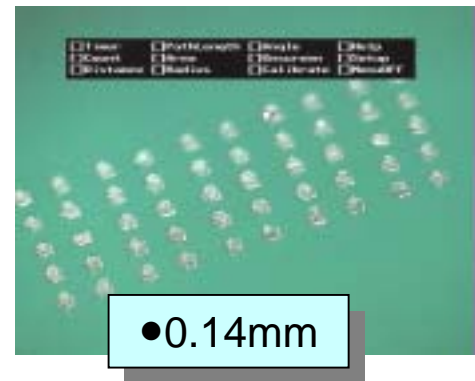
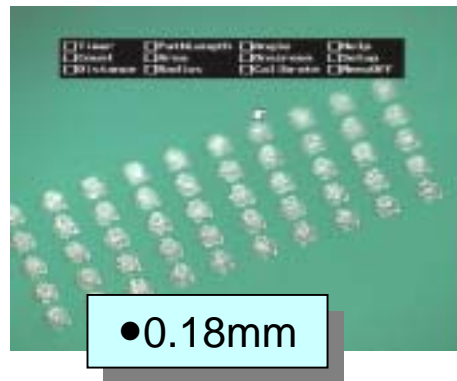
No missing deposits for all

ALPHA OM-325

Squares



Circles



Able to Achieve Excellent Deposit

Printable

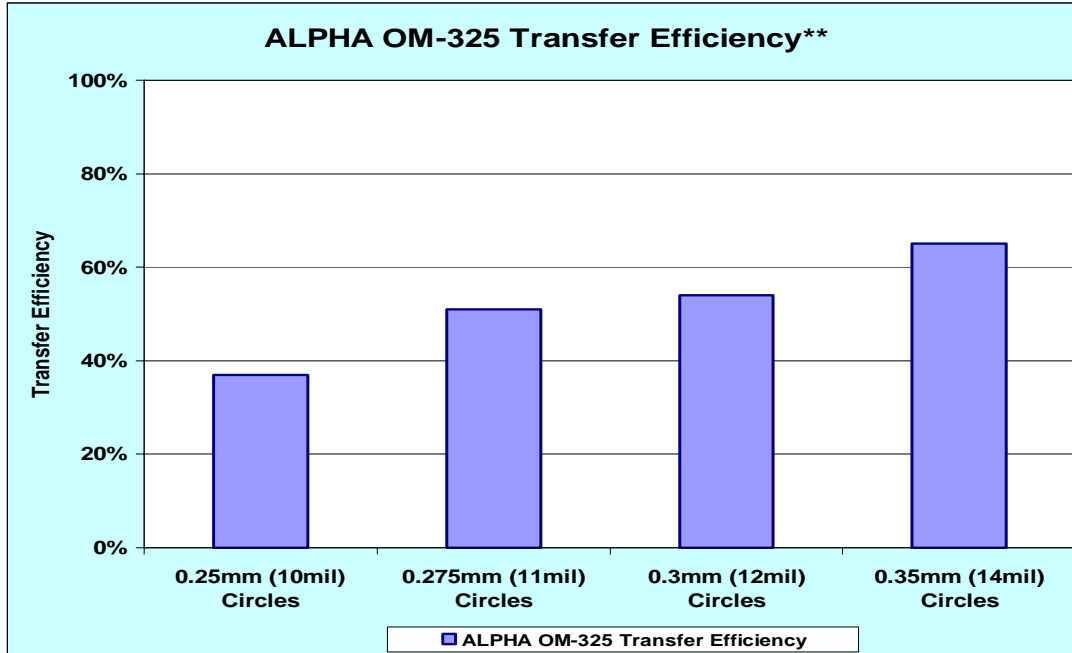


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Print Capabilities

Ultra-Fine Feature Transfer Efficiency

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Test Parameters

- Stencil Thickness: 0.125mm (5mil)
- Print Speed: 50 mm/sec (2 in/sec),
- Pressure: 0.22Kg/cm (1.25 lb/in)
- Separation Speed: 0.75mm/sec (0.030"/sec)

ALPHA OM-325 Delivers a High Performance, μ -Fine Feature Solder Paste

High transfer efficiency across all features tested.

Suitable for high volume BGA and μ -CSP applications, especially where 100% inspection is not possible.

This product allows violation of the aperture footprint versus the aperture wall ratio (area ratio).

0.16mm (6.5mil) circles printed with a 0.1mm (4mil) stencil*.

Note* Transfer efficiency is the percent of the measured volume to actual volume

Using a thinner stencil will greatly increase the transfer efficiency of this test

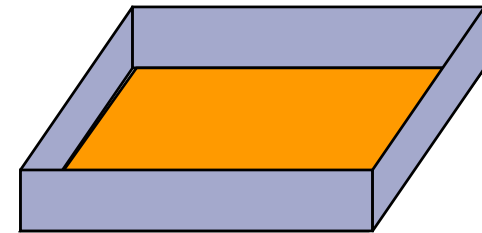
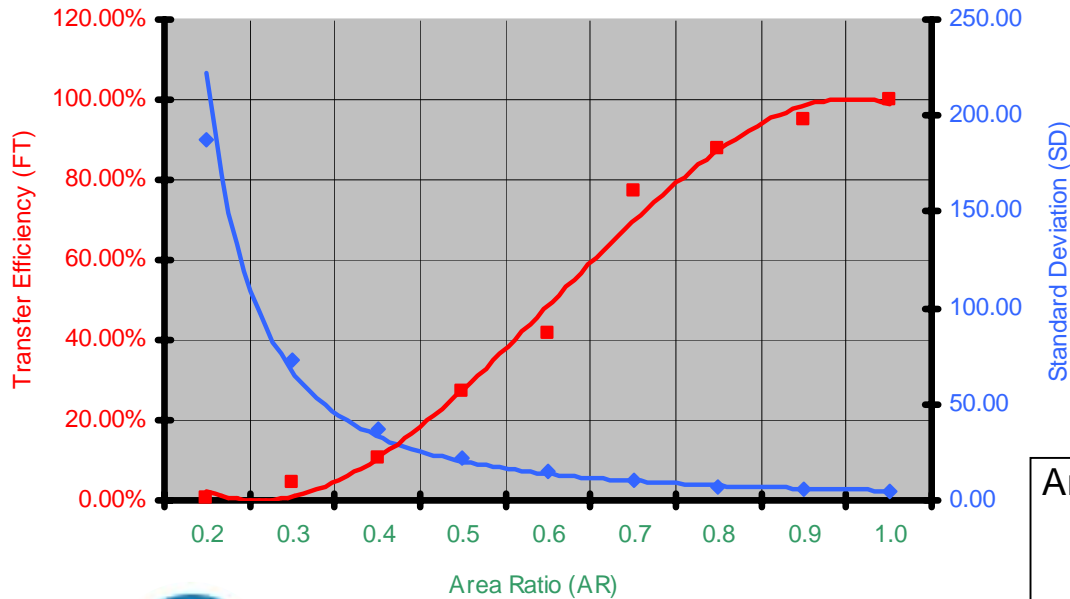
Allows violation of the stencil design guidelines.

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paste

Print Capabilities

Relationship of Transfer Efficiency, Area Ratio and Standard Deviation

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$$\text{Area Ratio} = \frac{\text{Pad Area}}{\text{Wall Area}} \geq 0.66$$

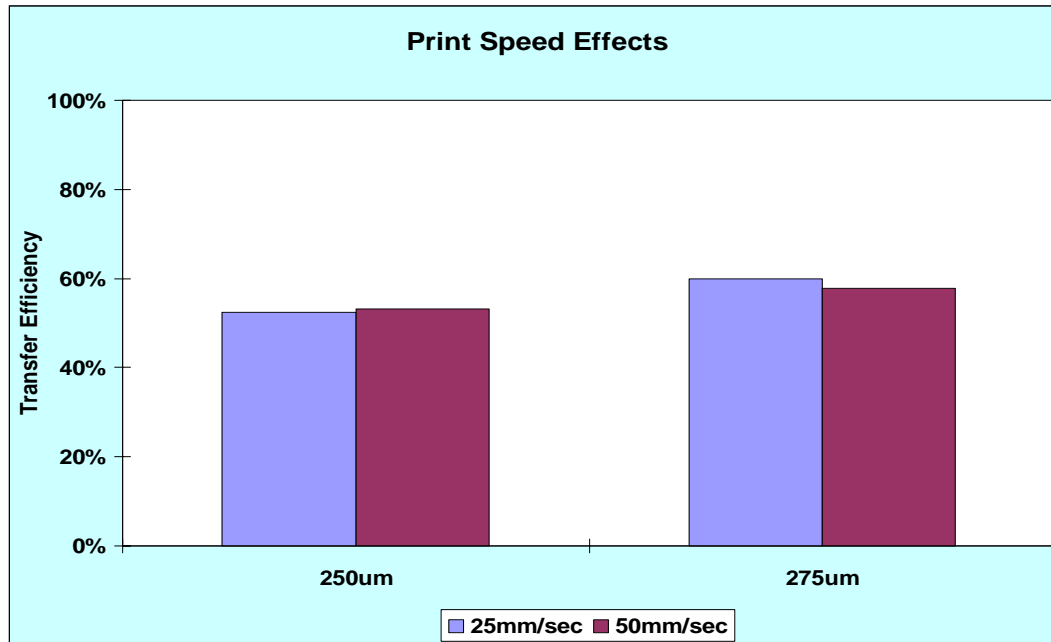
$$\text{Transfer Efficiency} = \frac{\text{Volume Deposit}}{\text{Volume Aperture}}$$



The higher the **Area Ratio**, the higher the **Transfer Efficiency**, the lower the **Standard Deviation**

Print Capabilities
Print Speed Effects

ALPHA OM-325



Test Parameters

- Stencil Thickness: 0.1mm (4mil)
- Print Speed: 50 mm/sec (2 in/sec)
- Pressure: 0.22Kg/cm (1.25 lb/in)
- Separation speed: 0.75mm/sec (0.030"/sec)
- 84 printed deposits per Feature Size

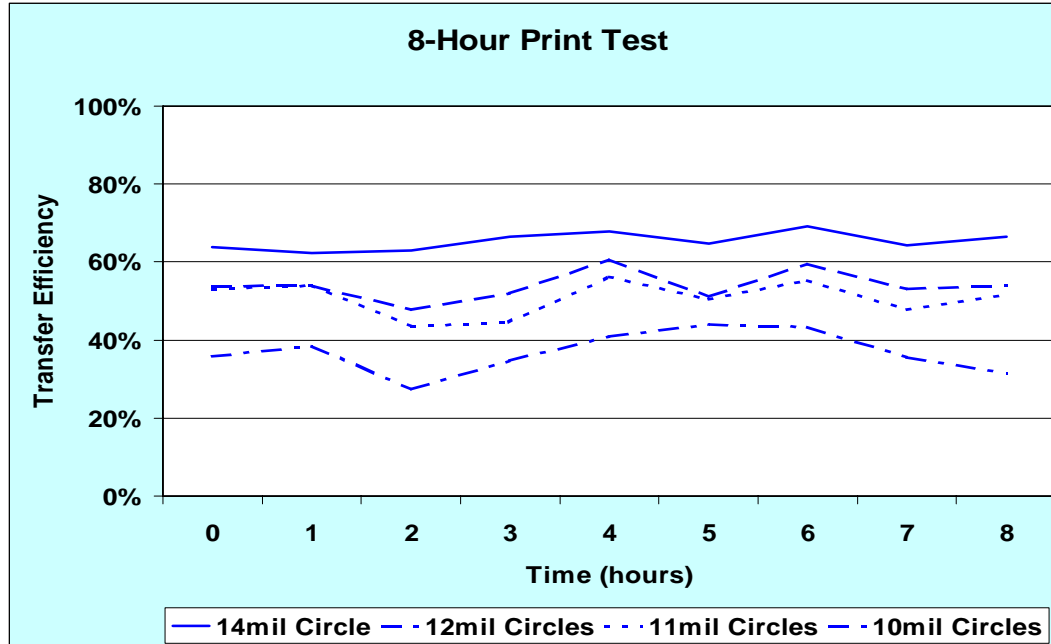
Excellent Transfer Efficiency across Processing Window

- Repeatable print volumes on Ultra-Fine features for print speeds up to 50mm/sec.
- Consistent Transfer Efficiency (i.e. flat line) over print speed range indicates decreased process sensitivity.

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ALPHA OM-325

Print Capabilities
Print Volume Consistency



Test Parameters

- Stencil Thickness: 0.125mm (5mil)
- Print Speed: 50 mm/sec (2 in/sec),
- Test boards are continually printed and samples are removed after every hour to measure volume deposition
- Test board contains a range of QFP and BGA devices
 - QFP: 0.3 to 0.65mm (12 to 25mil) pitch
 - BGA: 0.25 to 0.36mm (10 to 14mil) circles*
- Test conducted with an SVS 8200 laser profiling measurement system.

Repeatable Volumes over Time Delivers High Print Yields

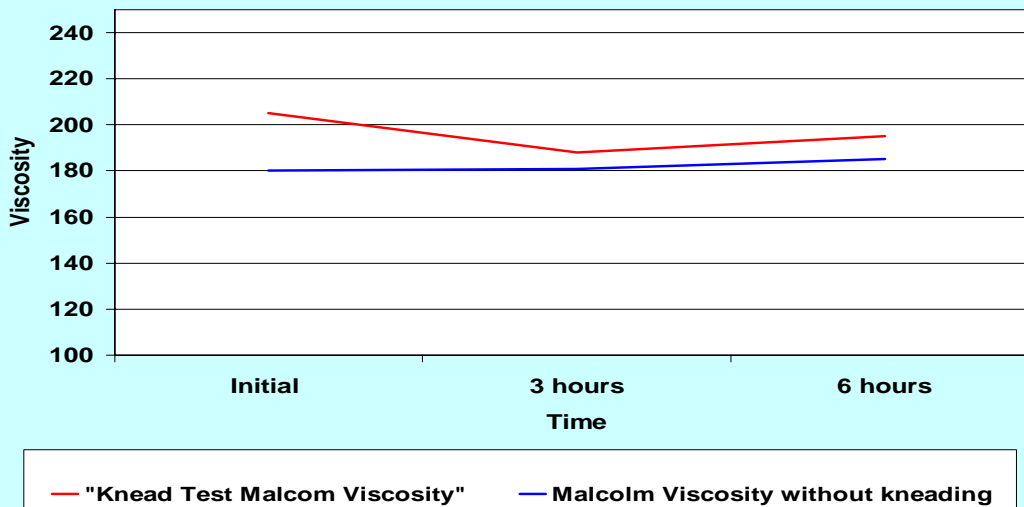
- Repeatable volumes with:
 - Maximum volume range less than +/-10% across all feature sizes tested.
 - Excellent volumetric performance on demanding 0.125mm (5mil) stencil thickness.

Note *Results shown are for BGA components only.

Print Capabilities Stencil Life "Knead" Test

ALPHA OM-325

**Stencil Life
Knead Test**



Custom Equipment simulating paste rolling on stencil with no replenishment

Test Parameters

- Test Temperature: 25°C.
- Number of cycles: 1300 print strokes
- Squeegee Force: 400gm (0.88lb) used
- Acceptance: Viscosity should measure +/- 10% from initial value
- Viscosity measured every 3 hours.

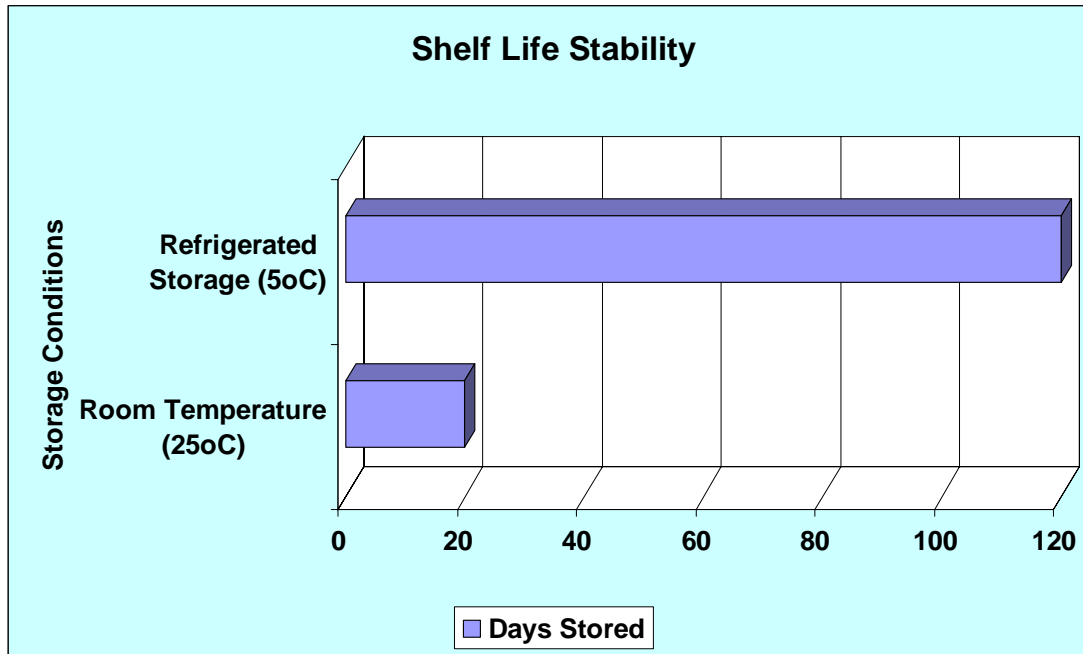
Excellent Product Stability on Stencil

- Repeatable viscosity throughout 6 hours on rolling test.
- Maintains viscosity within +/-10% of initial measured value.

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Print Capabilities Stability

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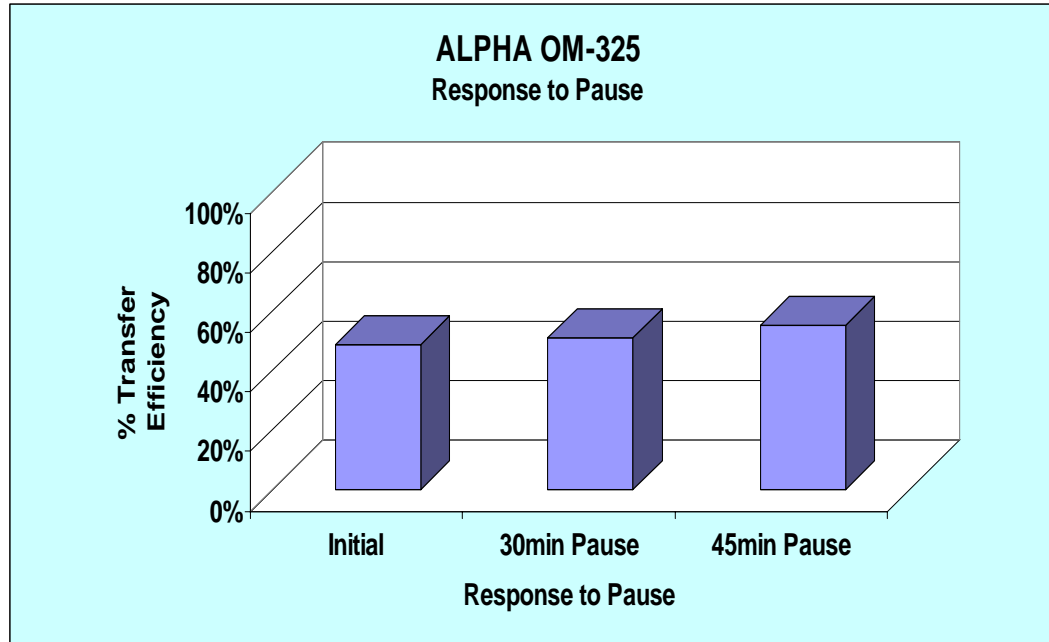
Excellent Shelf Life Stability Performance

- Less than 5% change in measured viscosity after refrigeration at 5°C for 4 months.
- The paste is stable at room temperature (25°C, 77°F) for 20 Days.
- Repeatable viscosity performance over 6 hours “Knead” test on all aged samples.
 - Less than +/-5% change in measured viscosity performance

Note: Viscosity measurements are made at 10rpm.

Print Capabilities Response to Pause

ALPHA OM-325



Test Parameters

- Print Speed: 25mm/sec (1inch/sec)
- Stencil: 0.125mm (5 mil) thick
- Aperture design: 0.25mm (10mil) Squares

Repeatable Response to Pause Performance Reduces Line Restart Defects

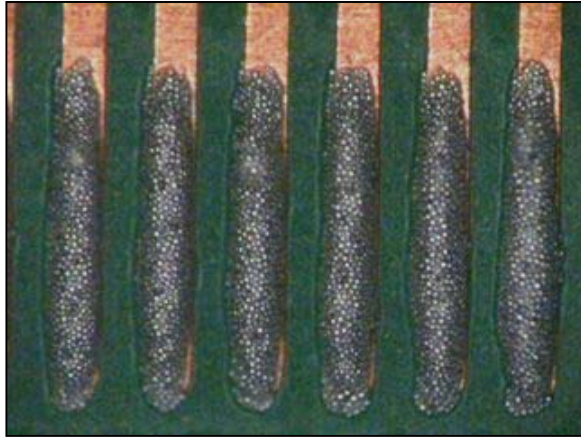
- Repeatable print deposition performance across 45 minute response to pause
- Lowest variability in fine feature performance with less than 5% deviation from the initial paste volume deposition.

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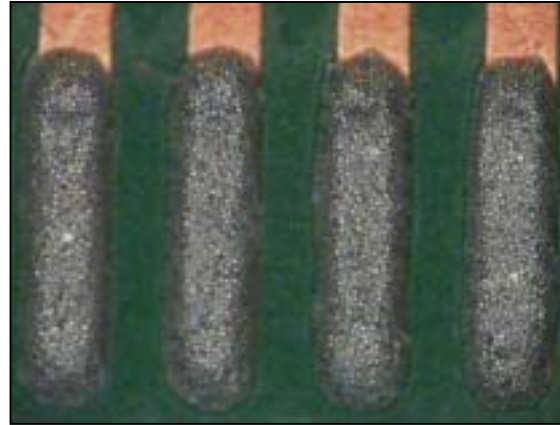
Note * : A wipe is conducted prior to running the response to pause test.

Print Capabilities

Wipe Frequency



0.3mm (12mil) pitch QFP



0.5 mm (20mil) pitch QFP

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Test Parameters

- Stencil Thickness: 0.125mm (5mil)
- Print Speed: 50 mm/sec (2 in/sec),
- Pressure: 0.165Kg/cm (0.91lb/in)
- Separation speed: 0.3mm/sec (12mil/sec)
- Test Devices: 0.3 to 0.5mm (12 to 20mil) pitch QFP

Excellent In-Line Process Capability

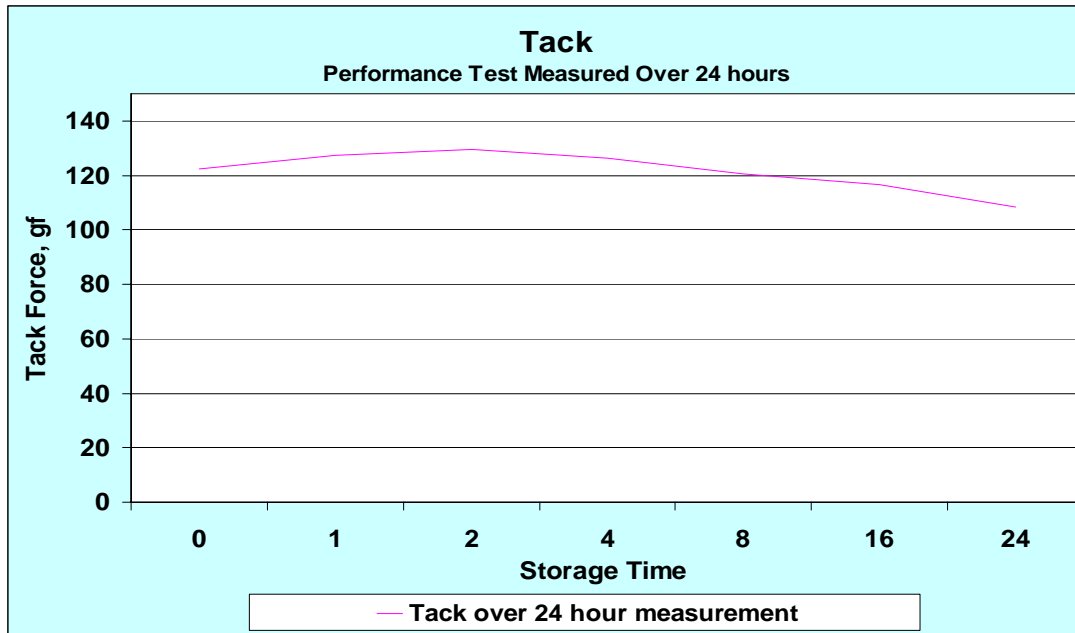
- No Bridging noticed with 0.3 mm pitch QFP's and larger after 8-10 subsequent prints (board design and printer set-up dependent).
- Number of prints between wiping increases potential reduction of consumables used.
 - Under stencil paper.
 - Solvents



Cookson Electronics Note 1: Tested under dry wiping conditions.

Print Capabilities
Tack-JIS Z 3284

ALPHA OM-325



YAMAHA YV88Xg Placement Head and Test Board

Excellent Placement Stability

- Sufficient and stable tack over 24 hours.
 - Less than +/- 10% change in tack over 24 hours.
- Compensates for placement alignment tolerances
 - Good self-alignment capability during reflow .
- Performed with various placement machines using a variety of components.

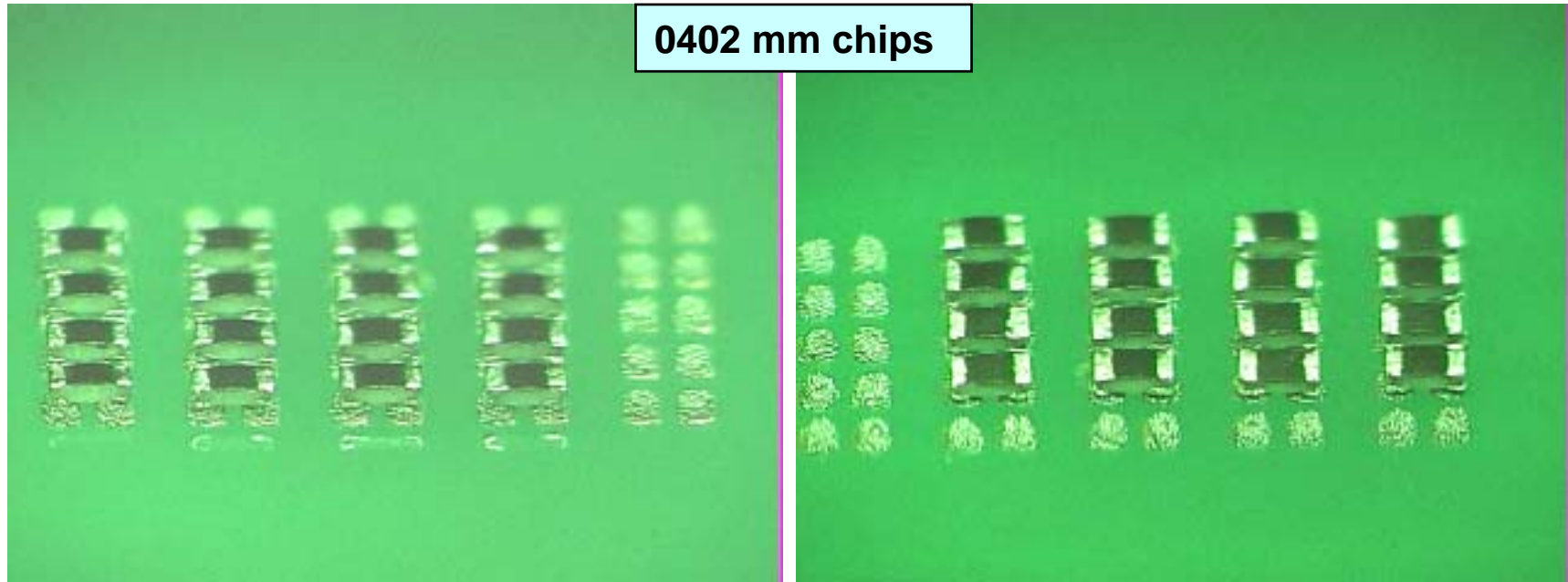
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Print Capabilities
Component Placement

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Enable Optimization with Good Tack Life

0402 mm chips



- **Weaker Force**
 - Good Placement Needs Good Stable Tack Force
- **Bigger Force**
 - Some Paste Squeezing

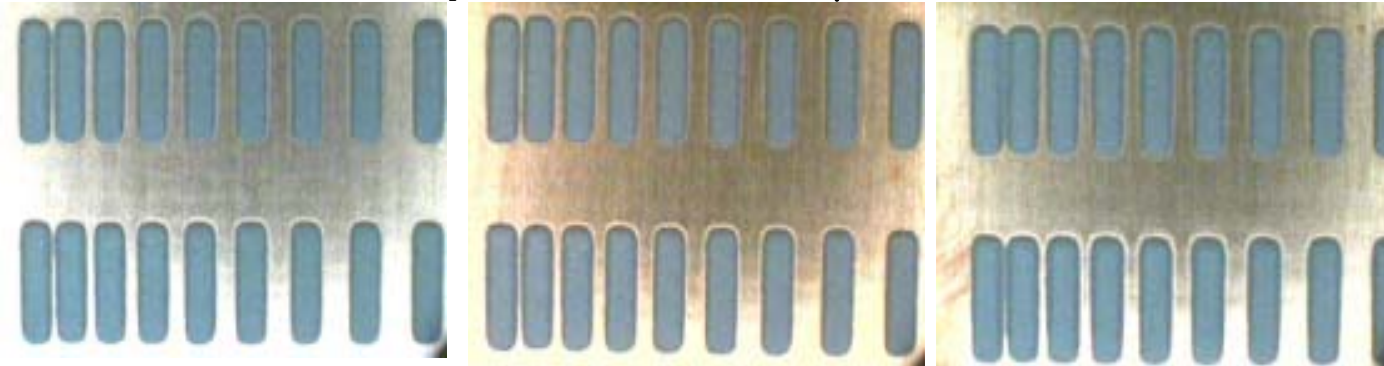
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Reflow Capabilities
Hot Slump Test

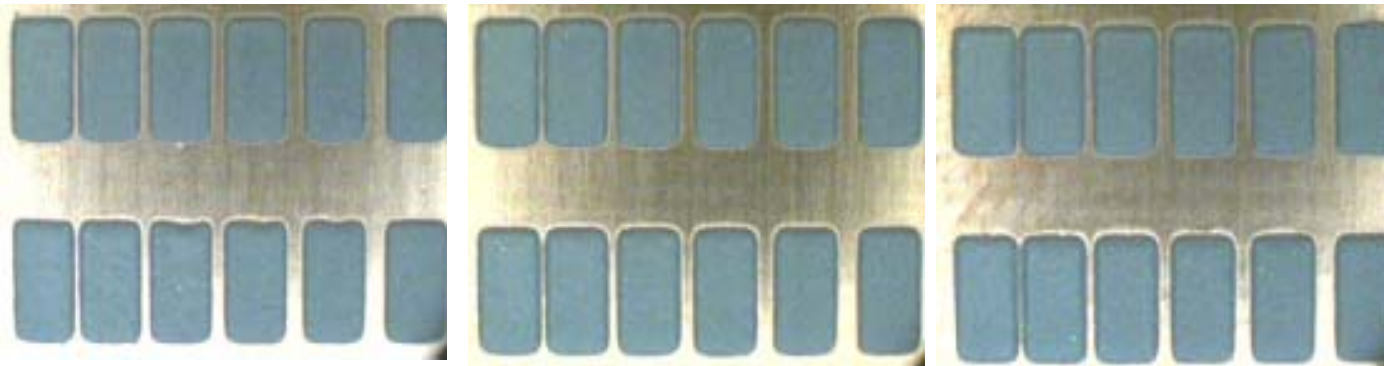
ALPHA OM-325

Hot Slump Test Using JIS Z 3284 Pattern Expanded to Various Temperatures @ 150 μ m Stencil Thickness

Aperture size:
3.0 x 0.7 mm



Aperture size:
3.0 x 1.5 mm



150°C, 1 min.

175°C, 1 min.

200°C, 1 min.





0.2 mm gaps open in all cases

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Reflow Capabilities

Fine Feature Reflow Performance

Product	Ultra-Fine Feature	u-Fine Feature
	0.25mm (10mil) Circles	0.16mm (6.5mil) Circles
Type 5 LF Paste Fine Feature		
Enlarged Picture		

Test Parameters

- Print Speed: 25mm/sec (1inch/sec)
- Stencil: 80µm (3mil) thick
- Print Apertures: 0.16 to 0.25mm (6.5 to 10mil)
- Reflow: **Very high soak profile (180°C for 2 min., 4 minutes to peak 230°C)**

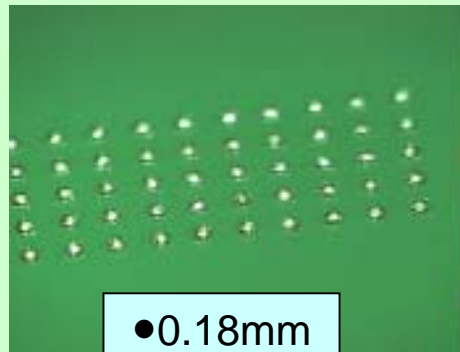
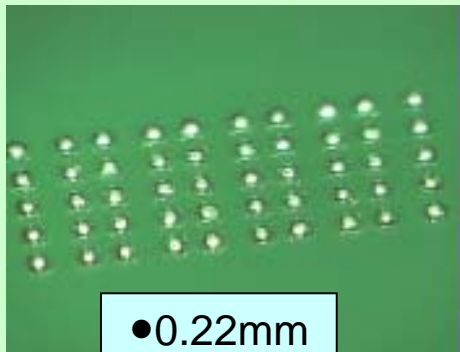
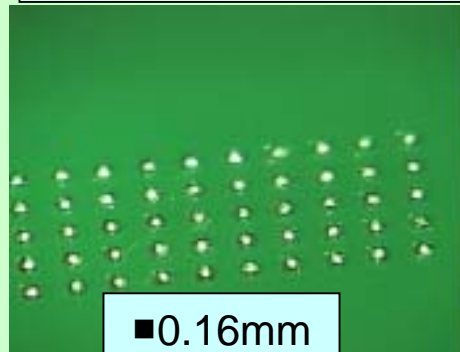
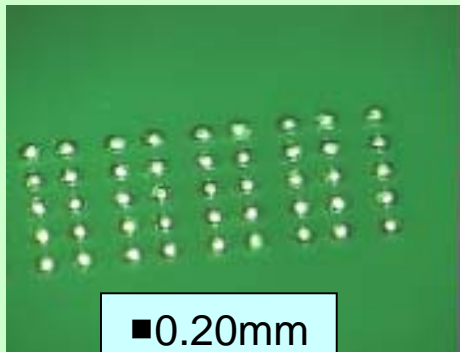
Excellent Fine-Feature Reflow Performance Using High Soak Reflow Profile in Air

- Repeatable and full coalescence down to features as small as 0.16mm (6.5mil).
- Verified against competitive leading product
- Delivering excellent reflow performance increases first time yield passes.

Reflow Capabilities

Soak : 180°C - 2 min in Air

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Needs
N2 to
Help

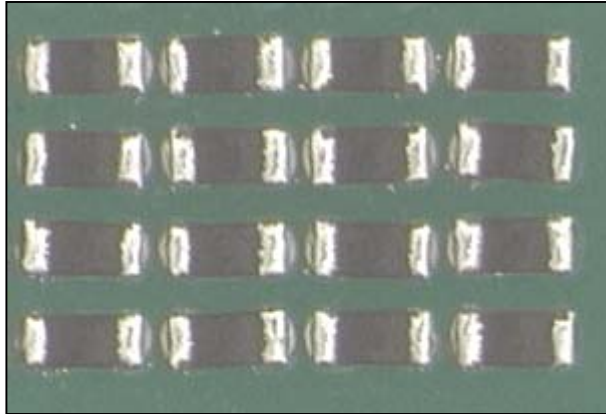
100% Fusion

ALPHA OM-325 delivers full fusion of small paste deposits (printed using 0.125mm stencil thickness)

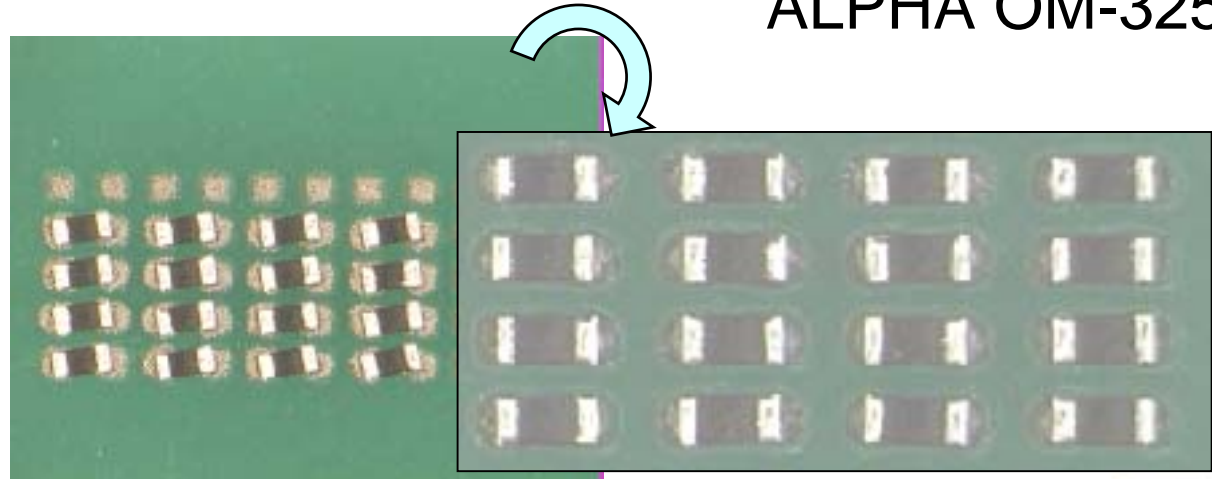
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Reflow Capabilities

Component Self Alignment During Reflow



Reflowed components with 0.07mm (2.8mil) gap between components



Reflowed components after 25° rotation

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Robust Reflow Process Delivers Wide Placement Capability

- 0.07mm (2.8mil) minimum gap is allowed for placement tolerances to deliver lowest defects.
- Excellent self-alignment ability which can correct 25° rotated components.
- Higher placement forces are required to ensure no tombstoning or “floating” component parts after reflow.
- Acceptable misplacement of solder deposit and component is 0.05mm.
- Excellent reliability for placement on 0402mm (01005inch) components.
- Floating components are where a tombstone has not completely occurred and the component lead is raised slightly at one end.

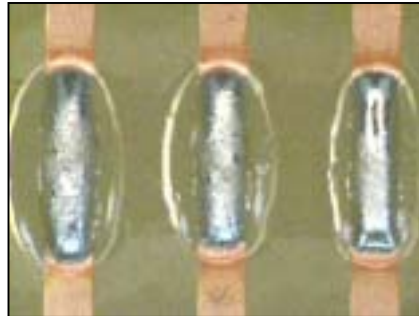
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Reflow Capabilities Solder Spread

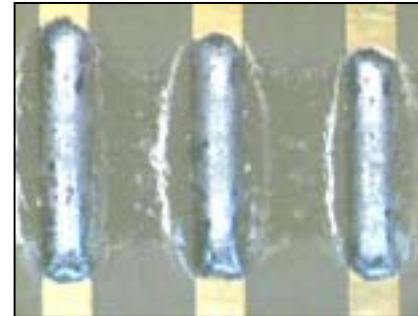
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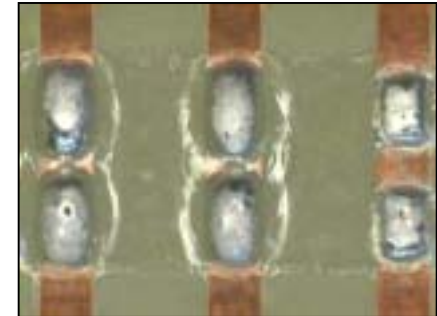
Rosin Coated Board Finish



Cu OSP



Nickel / Gold



Competitive Product

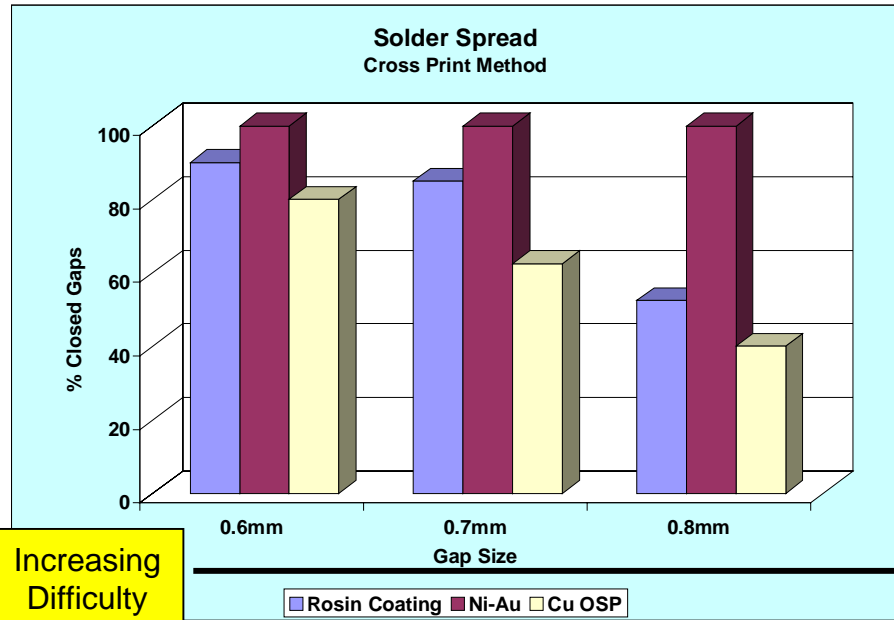
Delivers Excellent Lead-Free Solder Spread

- Excellent soldering across a wide range of board finishes.
- Smooth, uniform reflowed solder joint with 10% spread on board finishes tested.
- No de-wetting on any substrate finish tested.

Note: Horizontal lines (0.6mm (24mil) gap) across vertical pads are printed for this test. The paste ability to join deposits after reflow is a measure of reflow capacity and spread. The presence of solder balls is also characterized.

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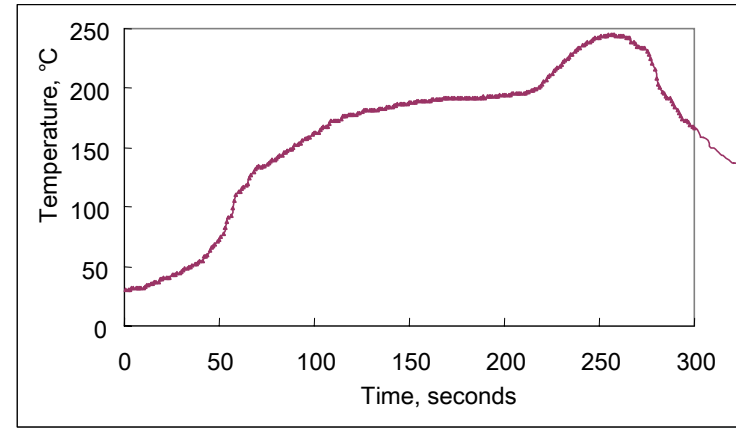
Reflow Capabilities Solder Spread



Increasing Difficulty

Increasing Performance

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Test Method

- Paste is printed, delivering various gap widths, that when reflowed, is intended to close the gap.
- The number of closed gaps are counted and reported with respect to the gap size.

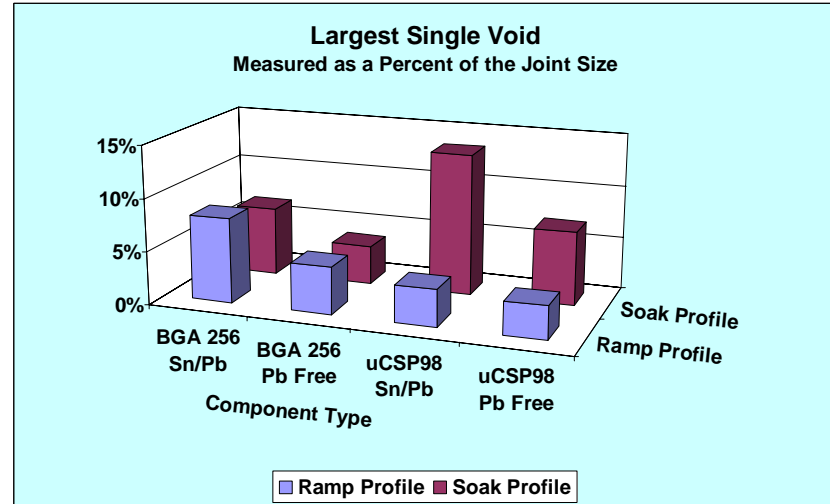
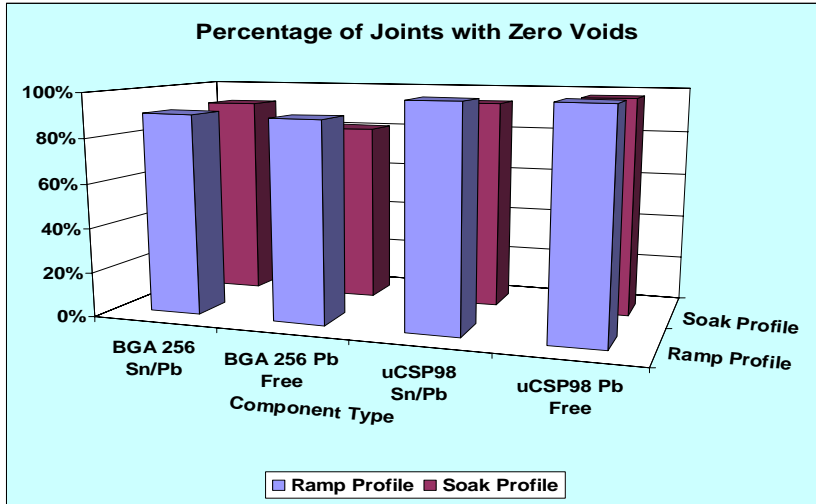
Wide Pad Finish Capability

- Delivers significant spread improvement over competitive paste, while maintaining excellent hot slump properties.
- Excellent gap closure with Ni/Au pad finishes.
- Very good performance with the demanding Cu OSP board finish, closing 40% of the demanding 0.8mm (32mil) gaps.

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Reflow Capabilities Voiding

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Minimal Impact on Voiding Performance due to Reflow Profile

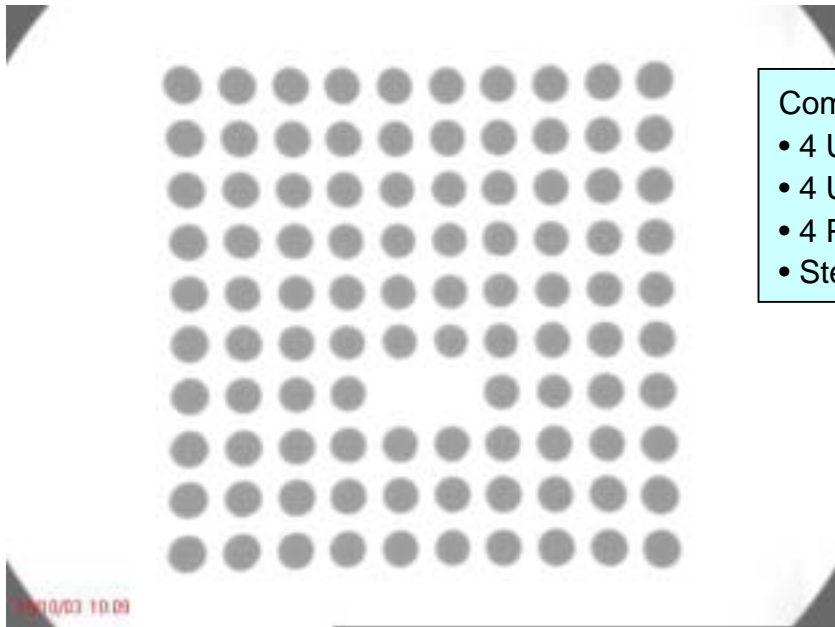
- Tested on a wide range of reflow profiles.
- Optimized performance on thinner stencils.
- Excellent Voiding Performance - Class III per IPC 7095 using optimized process conditions.

Components used:

- 4 Ultra CSP 98 (7.2 x 6.7 mm) – 0.5 mm pitch on 250 μm pads
- 4 Ultra CSP 98 – 0.5 mm pitch on 300 μm pads
- 4 PBGA256 (17 x 17 mm) – 1 mm pitch on 500 μm pads
- Stencils: Laser cut, 0.1mm and 0.125mm

Reflow Capabilities 0.5 mm Pitch CSP Package

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Components used:

- 4 Ultra CSP 98 (7.2 x 6.7 mm) – 0.4 mm pitch on 250 μ m pads
- 4 Ultra CSP 98 – 0.5 mm pitch on 300 μ m pads
- 4 PBGA256 (17 x 17 mm) – 1 mm pitch on 500 μ m pads
- Stencils: Laser cut, 0.1mm and 0.125 mm

There was no evidence of bridging observed for any of the CSP/BGA components used for voiding tests as observed using x-ray for over 100 components.

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Reflow Capabilities Random Solderballs per IPC.

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Short Straight Ramp Profile

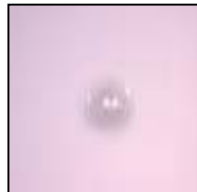


Initial



4 hrs @ 85% RH

Medium Straight Ramp Profile



Initial

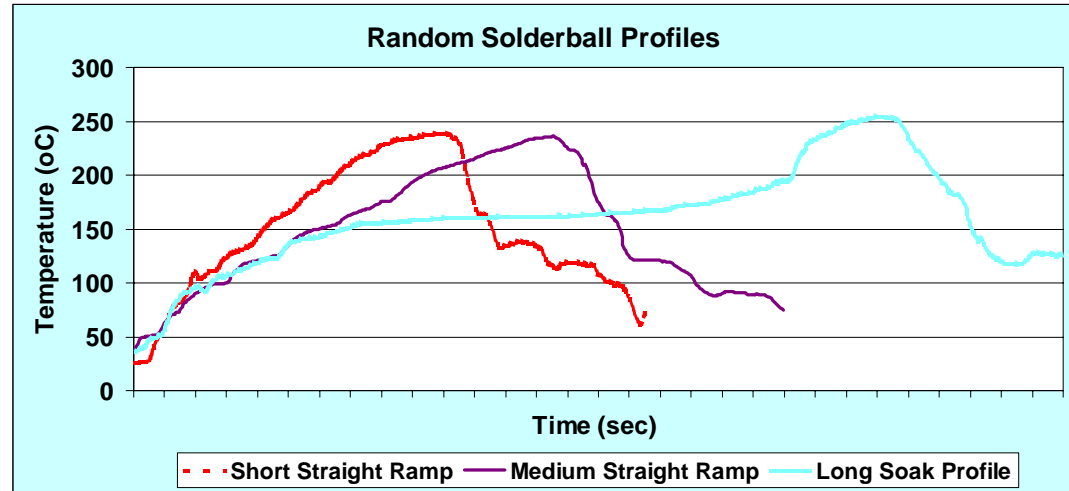


4 hrs @ 85% RH

Long soak profile



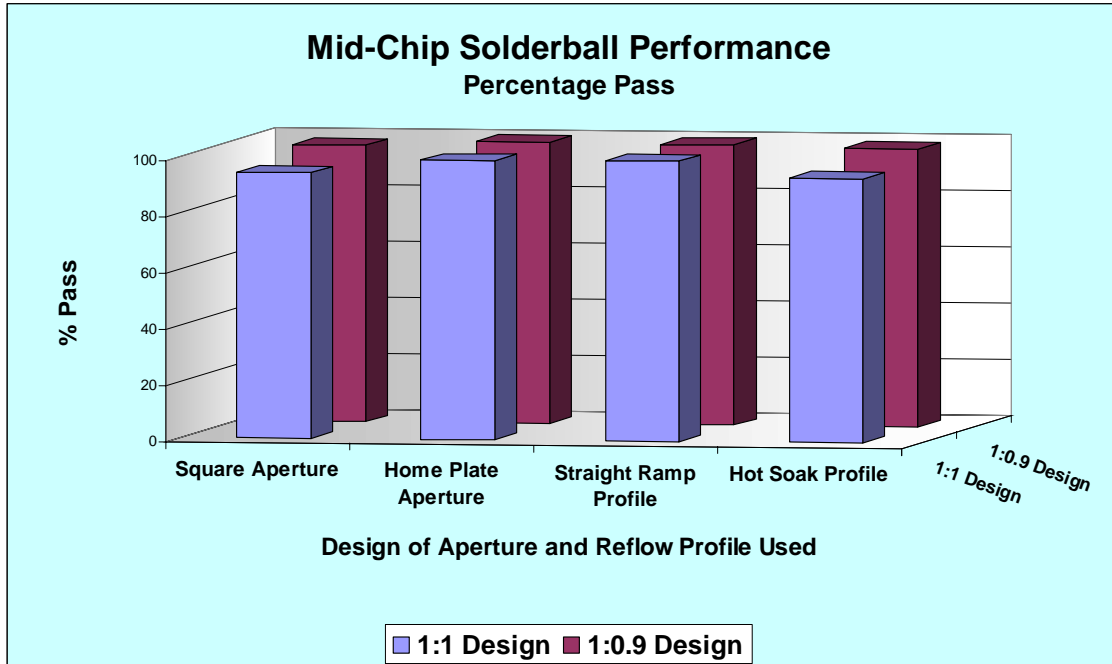
Results shown are for most demanding requirement of 4 hours @ 85% RH



Profile	Pre-Conditioning. (Samples tested at all profiles shown below)	Reflow Environment	Test as per IPC-TM-650
Fast Straight Ramp	Sample Reflowed Immediately after Printing 4hrs @ 25%RH 4hrs @ 50%RH 4hrs @ 85%RH	Air	Preferred (for all samples)
Slow Straight Ramp			Preferred (for all samples)
Slow, Long, Hot Soak Profile			Acceptable (for all samples)

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Reflow Capabilities Mid Chip Solder Ball Performance



ALPHA OM-325

Tested using

- 0402, 0603, 0805 & 1210 capacitor and resistor pads
- Results are collated results across all component Sizes
- 0.150 mm (6 mil) stencil
- Board with resist defined pads.

All mid-chip solder balls are counted in this test, regardless dimension of ball.

Excellent Mid-Chip Solderball Performance Increases Yield

- 100% pass on optimized processing conditions.
- Robust product across a range of demanding processing conditions.
- Verified on CuOSP and Ni-Au pads.

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Reflow Capabilities Joint Cosmetics

ALPHA OM-325



Straight Ramp Profile



Long Hot Soak Profile

Excellent Solder Cosmetics across All Profiles

- Smooth, uniform reflowed solder joint, tested on a combination of lead materials and finishes.
- Solder cosmetics are consistent across all profiles including demanding hot soak applications (200°C for 120sec.).
- Delivers excellent fillet wetting providing robust mechanical strength to the component.
- Good full fillet wetting performance on all component/lead finishes tested.
- Delivers good visual joint inspection properties.

Note: Board finishes shown are Cu OSP

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Reflow Capabilities Flux Cosmetics

ALPHA OM-325



**Leading Type 5 LF
Paste Technology**

Reflow Conditions:

Test conducted using a long, hot
soak profile.
This is the most demanding
condition.

Products that do not deliver clear residues can
lead to inconsistent flux cosmetics increasing the
difficulty of visual inspection



**Competitive
Product**

Flux burned =>
carbonized & reaction
with copper

Excellent Flux Cosmetics across all Profiles

- Clear, colorless residues across most challenging profile
 - Demanding hot soak profiles - 6 minutes to peak /100 secs above 217°C (soak profile 200°C for 120sec.)
- No copper discoloration
- Ensures that production visual inspection standards are not compromised
 - No difference in flux cosmetics from the cold to hot areas on the board.

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Reflow Capabilities Misprint and Stencil Cleaning

ALPHA OM-325

- Room temperature solvent cleaning of misprints and stencils:
 - BIOACT EC-7M and SC-10 E.
 - SC-22 in under-stencil wiping and with agitation.
- Aqueous misprint and stencil cleaning,
 - HYDREX WS.
 - PFX 366-151 at 20% concentration in water.
- Both products can be used in spray or ultrasonic cleaners.

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Reliability
Summary Table

ALPHA OM-325

Chemical

• Cu corrosion	IPC J-STD 004 & JIS Z 3197-1986	PASS
• Cu mirror	IPC J-STD 004	PASS
• Ag Chromate paper test	IPC J-STD 004	No halides detected
• Talc Test	JIS Z 3197	PASS
• Bono Corrosion Test	1 week @ 85oC/85%RH	PASS

Electrical

• IPC SIR	7 day 85°C / 85%RH	PASS
• Bellcore SIR	96 hours @ 35°C/85% RH	PASS
• Bellcore Electromigration	500 hours @ 65°C/85° RH	PASS
• JIS SIR	168 hours @ 60°C/90% RH	PASS
• JIS Electromigration	JIS Z 3197	PASS
•JIS Water Extract Resistance	JIS Z 3197	PASS

J-Standard Classification: ROL-0

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Electrical Reliability Data Passes IPC J-STD-004 SIR Test

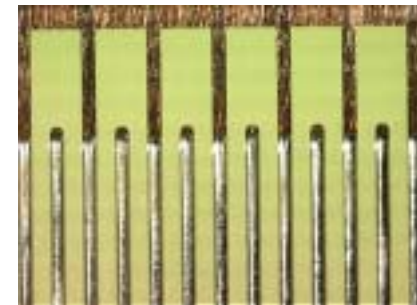
ALPHA OM-325

Surface Insulation Resistance Test Results – IPC-J-Standard 004

P/F limit: 1.0E+08 ohms

MATERIAL TESTED/ CONDITION	SIR(ohms) (1 day)	SIR (4 days)	SIR (7 days)
MATERIAL TESTED/ ALPHA OM-325 CONDITION Comb up Uncleaned SAC305	2.7 E+10 2.3 E+10 1.5 E+10 2.7 E+10 2.0 E+10 1.4 E+10 1.4 E+10 1.5 E+10 1.5 E+10 1.5 E+10 1.2 E+10 1.5 E+10	2.8 E+10 2.3 E+10 2.2 E+10 2.8 E+10 1.5 E+10 1.9 E+10 1.8 E+10 2.3 E+10 2.6 E+10 2.0 E+10 2.0 E+10 2.4 E+10	2.6 E+10 2.2 E+10 2.1 E+10 2.5 E+10 2.7 E+10 2.1 E+10 1.9 E+10 2.2 E+10 2.4 E+10 1.9 E+10 1.9 E+10 2.2 E+10
Arithmetic mean:	1.8 E+09	2.2 E+10	2.2 E+10
T/H/B 85C/85%RH/-48V Control boards	2.6 E+10 2.2 E+10 1.9 E+10 2.5 E+10 2.2 E+10 2.0 E+10 1.9 E+10 2.1 E+10 2.2 E+10 1.9 E+10 1.9 E+10 2.2 E+10	2.6 E+10 2.2 E+10 2.0 E+10 2.5 E+10 2.3 E+10 2.0 E+10 2.0 E+10 2.3 E+10 2.2 E+10 1.9 E+10 1.9 E+10 2.3 E+10	2.5 E+10 2.2 E+10 2.0 E+10 2.4 E+10 2.3 E+10 1.9 E+10 1.9 E+10 2.2 E+10 2.2 E+10 1.8 E+10 2.0 E+10 2.1 E+10
Arithmetic mean:	2.1E+10	2.2 E+10	2.1 E+10

COMMENTS
Meets Electrical and Visual Requirements



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Electrical Reliability Data Passes Bellcore SIR Test

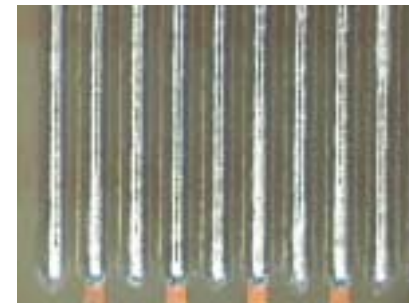
ALPHA OM-325

Surface Insulation Resistance Test Results – Bellcore GR-78-CORE

(Issue 1, September 1997)

P/F limit: 1E11 Ohms

MATERIAL TESTED/ CONDITION	SIR (1 day)	SIR (4 days)	COMMENTS
ALPHA OM-325 SAC305	1.0 E+12	1.0 E+12	Visually OK
Reflowed paste	1.0 E+12	1.0 E+12	
uncleaned	1.0 E+12	1.0 E+12	
T/H/B:35/85/-48	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	9.1 E+11	
	1.0 E+12	8.5 E+11	
	3.4 E+10	6.7 E+11	
	-----	-----	
Arithmetic mean:	9.2 E+11	9.5 E+11	
Control boards	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	7.0 E+10	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	1.0 E+12	
	1.0 E+12	9.1 E+11	
	1.0 E+12	8.5 E+11	
	1.0 E+12	6.7 E+11	
	-----	-----	
Arithmetic mean:	1.0 E+12	9.2 E+11	



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Electrical Reliability Data

ALPHA OM-325

Passes Bellcore Electromigration Test

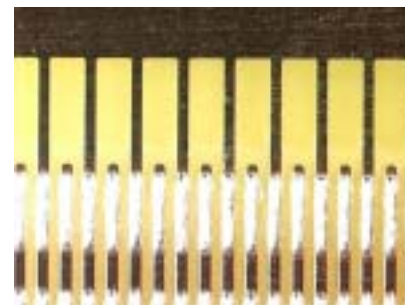
Electromigration Test Results – Bellcore GR-78-CORE

(Issue 1, September 1997)

Tested by: K.Tellefsen

Reported by: K. Tellefsen

MATERIAL TESTED/ CONDITION	SIR (96 hour)	SIR (500 hour)	COMMENTS
ALPHA OM-325 SAC305			
IPC-B-25 pattern B	3.3 E+11	4.1 E+11	Passed electrical and visual requirements
Reflowed paste	9.8 E+10	6.3 E+10	
uncleaned	9.6 E+11	1.2 E+11	
Test #:0349-e	1.8 E+11	3.1 E+11	
bias = 10 V T/H: 65/85	2.6 E+11	2.5 E+11	
	1.4 E+10	6.1 E+10	
	1.8 E+11	1.5 E+11	
	1.8 E+11	2.5 E+11	
	2.2 E+08	2.4 E+08	
	2.1 E+08	1.8 E+08	
	2.4 E+08	2.3 E+08	
	7.0 E+08	2.3 E+08	
Arithmetic mean:	2.0 E+10	1.8 E+10	
Control Boards	2.2 E+11	2.4 E+11	Passed electrical and visual requirements
IPC-B-25 pattern B	2.4 E+11	2.0 E+11	
	1.7 E+11	1.7 E+11	
	1.1 E+11	2.0 E+11	
	3.3 E+11	3.0 E+11	
	4.0 E+11	3.6 E+11	
	2.5 E+11	2.4 E+11	
	3.5 E+11	2.9 E+11	
	1.3 E+11	1.5 E+11	
	2.8 E+11	2.2 E+11	
	1.9 E+09	1.4 E+11	
	2.7 E+11	2.5 E+11	
Arithmetic mean:	1.6 E+11	2.2 E+11	



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Electrical Reliability Data Passes JIS SIR Test JIS Z 3197

ALPHA OM-325

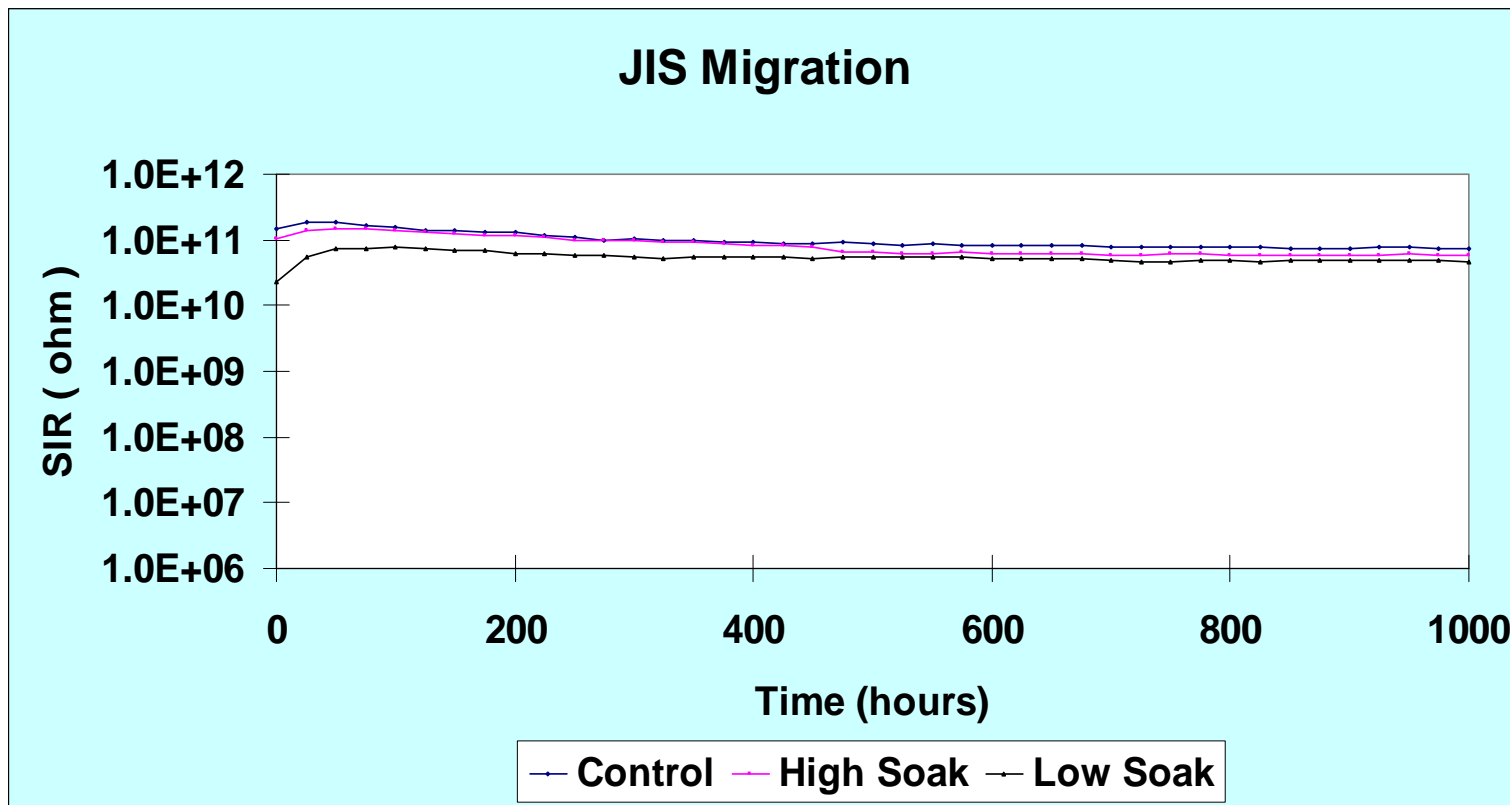
SIR per JIS Test Results

MATERIAL TESTED/ SIR Ohms		Initial	24 hr	96 hr	168 hr	Final
ALPHA OM-325	4a	>1.0 E+12	4.0 E+10	6.7 E+10	6.8 E+10	>1.0E+12
Reflowed paste	b	>1.0 E+12	9.4 E+09	5.2 E+09	3.4 E+09	>1.0E+12
uncleaned	c	>1.0 E+12	1.5 E+11	8.3 E+10	9.1 E+10	>1.0E+12
40°C/93%RH	d	>1.0 E+12	1.6 E+11	3.6 E+10	2.1 E+10	>1.0E+12
SAC 305	5a	>1.0 E+12	3.2 E+11	1.5 E+11	1.1 E+11	>1.0E+12
	b	>1.0 E+12	1.7 E+11	1.9 E+11	3.0 E+11	>1.0E+12
	c	>1.0 E+12	1.6 E+11	4.2 E+11	1.6 E+11	>1.0E+12
	d	>1.0 E+12	>1.0 E+12	4.9 E+11	4.3 E+11	>1.0E+12
	6a	>1.0 E+12	>1.0 E+12	>1.0 E+12	>1.0 E+12	>1.0E+12
	b	>1.0 E+12	4.6 E+11	4.0 E+11	4.8 E+11	>1.0E+12
	c	>1.0 E+12	>1.0 E+12	7.6 E+11	7.6 E+11	>1.0E+12
	d	>1.0 E+12	1.5 E+11	7.1 E+10	1.1 E+11	>1.0E+12
Geometric Mean		>1.0 E+12	2.0 E+11	1.5 E+11	1.4 E+11	>1.0E+12
Control Boards	1a	>1.0 E+12	8.8 E+11	6.7 E+11	4.9E+11	>1.0E+12
	b	>1.0 E+12	9.2 E+11	5.9 E+11	4.0E+11	>1.0E+12
	c	>1.0 E+12	6.0 E+11	4.9 E+11	4.0E+11	>1.0E+12
	d	>1.0 E+12	1.7 E+10	3.9 E+10	4.9E+10	>1.0E+12
	2a	>1.0 E+12	7.4 E+09	4.6 E+09	4.7E+09	>1.0E+12
	b	>1.0 E+12	>1.0 E+12	8.7 E+11	8.6E+11	>1.0E+12
	c	>1.0 E+12	1.8 E+11	6.6 E+11	6.1E+11	>1.0E+12
	d	>1.0 E+12	>1.0 E+12	9.1 E+11	7.7E+11	>1.0E+12
	3a	>1.0 E+12	>1.0 E+12	>1.0 E+12	9.5E+11	>1.0E+12
	b	>1.0 E+12	4.6 E+11	3.5 E+11	3.5E+11	>1.0E+12
	c	>1.0 E+12	>1.0 E+12	6.5 E+11	5.9E+11	>1.0E+12
	d	>1.0 E+12	5.6 E+11	7.1 E+11	5.9E+11	>1.0E+12
Geometric Mean		>1.0 E+12	3.4 E+11	3.5 E+11	3.1E+11	>1.0E+12

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Electrical Reliability Data Passes JIS Z 3197 Migration Test

ALPHA OM-325



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Reliability Data

ALPHA OM-325

Passes JIS Z 3197 Talc Test

- Test method: Place 0.3 g of the solder paste on copper plate (50 X 50 X 0.5mm).
- Reflow for approximately 5 seconds using 245 °C solder bath.
- After 30 min at RT, sprinkle talc powder, brush using soft brush and note remaining tack.



Pass : No talc left on top of residue

The information contained herein is based on data considered accurate and is offered at no charge. No warranty is expressed or implied regarding the accuracy of this data. Liability is expressly disclaimed for any loss or injury arising out of this information or use of any materials designated.

TOSCA/EINECS*

- All materials used for paste fabrication are listed in TOSCA and EINECS databases.
- The paste is suitable to use in all world regions.

*Toxic Substance Control Act (TSCA, TOSCA)

European Inventory of Existing Chemical Substances (EINECS)

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Reliability Data

ALPHA OM-325

Passes WER (Water Extract Resistance)

Test Method	JIS Z 3197
Sample	0.10g
1	211
2	216
3	211
Average	213

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OM-325 solder paste

High Yield Capability

ALPHA OM-325



- **Wide Print Process Window:**
 - OM325 can achieve 0402 mm/fine pitch requirements without special settings to print μ -fine aperture patterns using current printer.
 - Repeatable print definition up to 50mm/sec (2"/sec).
 - Excellent room temperature stability (20 days 25°C storage) and 8 hour stencil life
- **Excellent Reflow Capability**
 - Capable of high soak reflow profiles (200°C/120 sec. soak)
 - Excellent self-alignment capability during reflow on skewed components ($\theta=25$) under High Soak Air profile.
 - Delivers class III voiding performance (IPC 7095) on optimized conditions.
 - Excellent Hot and Cold Slump Performance. Passes JIS standards.
 - Clear, colorless flux residues.
- **Delivering High Yield**
 - Delivering excellent μ -Fine Feature Print Characteristics
 - Delivering good mid-chip solderball performance
 - Outstanding random solderballing performance

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The Complete Line of Solder Pastes

ALPHA OM-325

Application

- Universal, no-clean
- Universal, water-soluble
- Fine-feature, high-throughput
- Universal, no clean, lead-free

Series

- ALPHA OM-5000
- ALPHA WS-700
- ALPHA OM-6000
- ALPHA OM-300



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