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Koki no-clean LEAD FREE solder paste

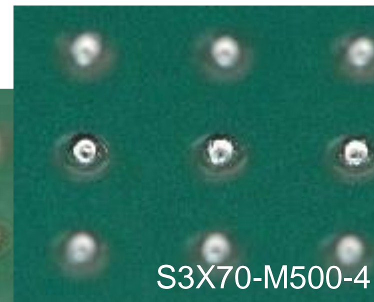
Fine-Pitch Soldering Compatible

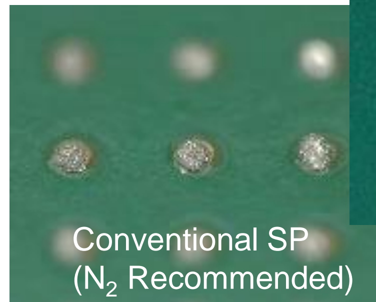
Lead Free Solder Paste

S3X70-M500-4

Technical Information

0.18mm φCSP after Air Atmosphere Reflow





Disclaimer

This Product Information contains product performance assessed strictly according to our own test procedures and is not the guaranteed results at end-users. Please conduct thorough process optimization before mass production application.

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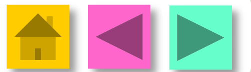

Features

- Alloy Composition: Sn 3.0Ag 0.5Cu (SAC305).
- Contains lubricants to improve the printability on fine-pitch.
- Adjusted flux fluidity inhibits solder powder from oxidizing and improves meltability at fine-pitch pads.
- Ensures good meltability at smaller components (e.g. 0201 size chip component).
- Void occurrence is reduced by the use of enhanced activators and flux fluidity.
- In compliance with Halogen Free standard (BS EN14582, Br+Cl < 1,500 ppm).

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Features

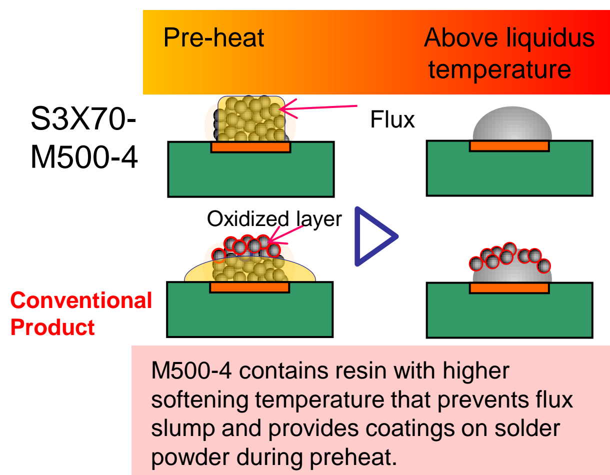
Development Background

Latest mobile devices are becoming highly functional and low-profile that the their components are also miniaturizing. The smallest chip component found on a smartphone motherboard is 0402; however, applications of 03015 or 0201 chip components are anticipated soon. S3X70-M500-4 is particularly developed to meet the demands for a solder paste which is compatible with ever-miniaturizing fine-pitch soldering.

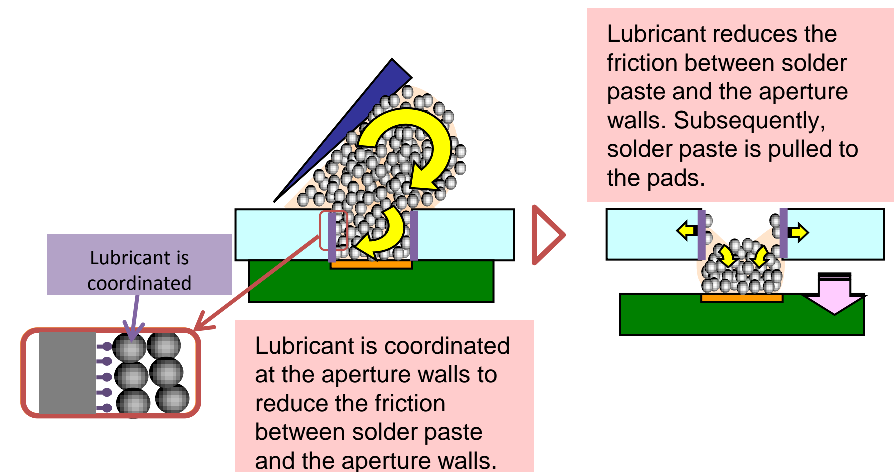
Development Concept

Since most mobile devices are required to be halogen-free, M500-4 is also designed to meet halogen-free standards. In general, a halogen-free solder paste suffers inferior meltability at fine-pitch pads. However, M500-4 maintains good meltability at fine-pitch pads by tuning flux fluidity adjustment to inhibit solder powder from being oxidized during pre-heat. In addition, M500-4 contains a lubricant with low friction coefficient to improve printability at fine-pitch pads for consistent printing results.

Preventing Solder Powder Degradation



Improving Fine-Pitch Printability



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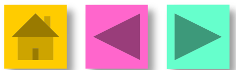

Features

S3X70-M500-4 has been printed on test PCBs using metal stencil with different thickness to investigate the minimum aperture size it can print. Then the test PCBs were reflowed to confirm the meltability on the smallest aperture with a perfect print transfer (the lands with 100% print pass rate).
Printing condition is the same as “Continuous Printability” in P6 and meltability test condition is the same as meltability test in P9.

Pass Rate: Ratio of good print transfer (+/- 30% of standard transfer rate) from 10 continuous prints (2880 prints total)

Stencil Thickness	0.14mmφCSP	0.16mmφCSP	0.18mmφCSP	0.20mmφCSP	Wettability at minimum land
0.05mm					
Pass Rate	99.9%	100%	100%	100%	Good
0.08mm					
Pass Rate	77.4%	99.9%	100%	100%	Good
0.10mm					
Pass Rate	5.0%	58.8%	99.3%	100.0%	Good

S3X70-M500-4 is capable of printing fine-pitch patterns properly with a wide range of stencil thickness and performing good meltability for enhanced PCB design flexibility.

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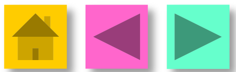

Specifications

Application		Printing
Product Name		**S3X70-M500-4**
Alloy	Alloy Composition (%)	**Sn 3.0Ag 0.5Cu**
	Melting Point (ºC)	217~219
	Grain Shape	Spherical
	Grain Size (µm)	10 – 25
Flux	Halide Content (%)	0
	Flux Classification*1	ROL0
Solder Paste	Flux Content (%)	11.5±1.0
	Viscosity*2 (Pa.s)	220±30
	Copper Plate Corrosion*3	Passed
	Tack Time	> 48 hours
	Shelf Life (<10ºC)	6 months
	Other Grain Sizes Available	20-38µm: Product Name: S3X58-M500-4

*1. Flux Classification: In compliance with IPC J-STD-004A
*2 . Viscosity: Measured by Malcom Viscometer at 25ºC ,10rpm
*3. Copper Plate Corrosion: In compliance with IPC-TM-650-2.6.15

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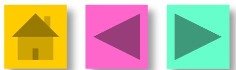
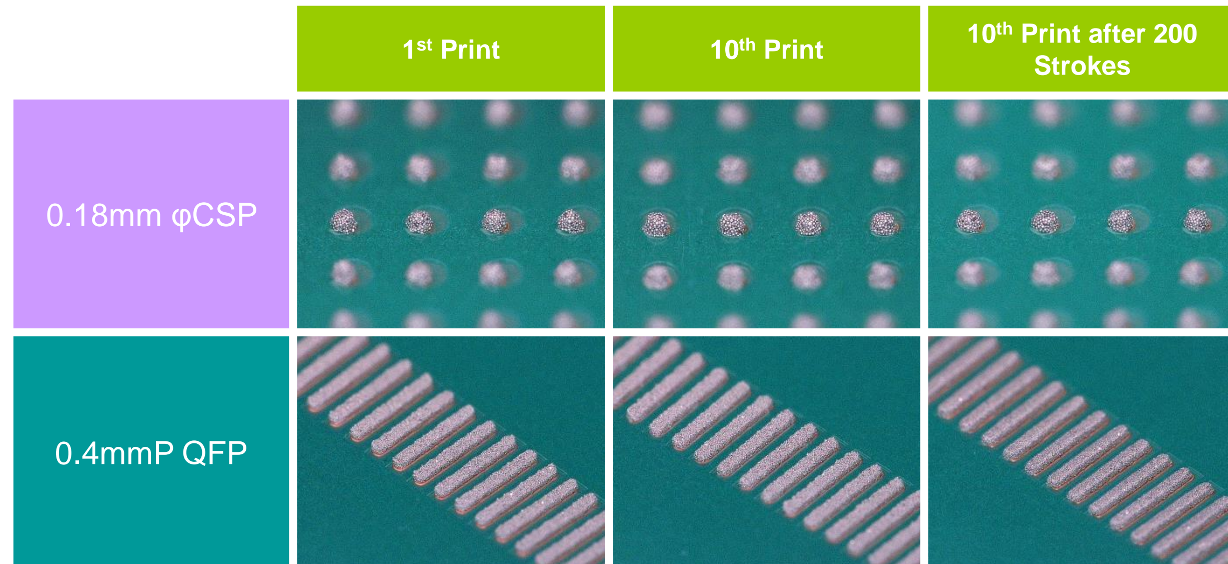


Continuous Printability

Evaluation Method:

- Metal Stencil Thickness: 0.08mm (Laser etched)
- Printer: YVP-Xg, YAMAHA Motor Co., Ltd.
- Squeegee: Metal squeegee, 60º angle
- Printing Speed: 40 mm/sec.
- Test Ambient: 24~26 ºC (50~60%RH)
- Test Pads: 0.18 mm φCSP,0.4mmP QFP



Consistent print shape transfer throughout the test

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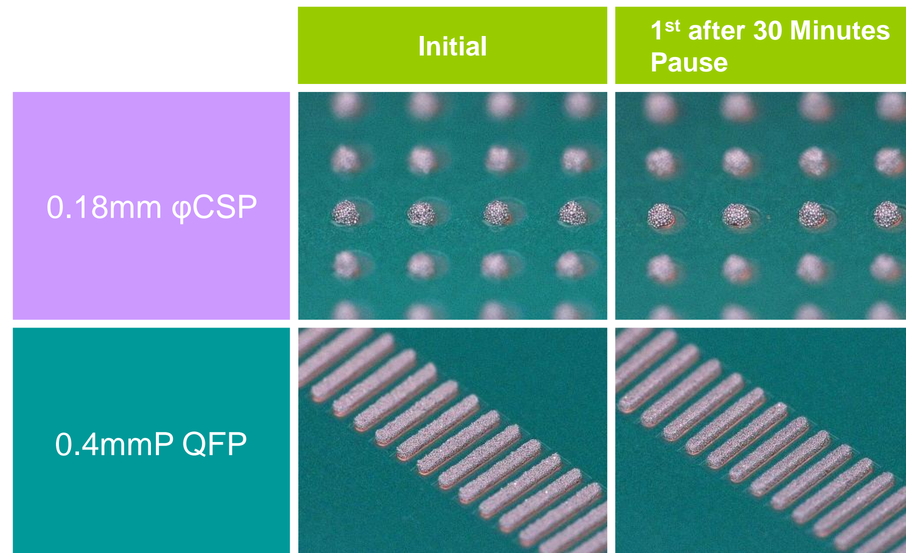
Intermittent Printability

Evaluation Method

Pause printing for 30 minutes, and then resume printing. Verify the print profile on the 1st print result.

- Squeegee: Metal Squeegee (Squeegee angle: 60º)
- Print Speed: 40mm/sec.
- Print Stroke: 300mm
- Printing Environment: 24~26ºC, 40~60%RH
- Test Pads: 0.18 mm φCSP, 0.4mmP QFP



Good intermittent printability thanks to the adjustment on additive.

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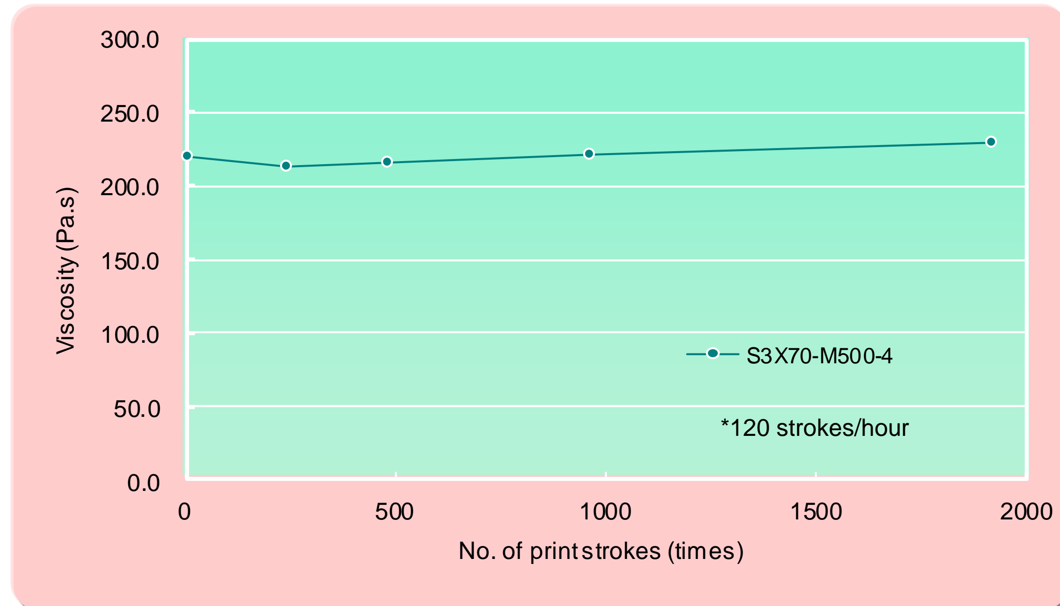
Viscosity Property

Evaluation Method:

Mask the metal stencil and roll the solder paste to apply rolling shear. Measure the viscosity after predetermined number of strokes.

- Squeegee: Metal Squeegee (Squeegee Angle: 60º)
- Squeegee Speed: 30mm/sec.
- Squeegee Stroke: 300mm
- Printing Environment: 24~26 ºC, 40~60%RH



Owing to the modified formulation that prevents the reaction between solder powder and activator, S3X70-M500-4 shows good consistent viscosity.

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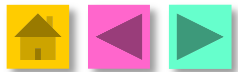
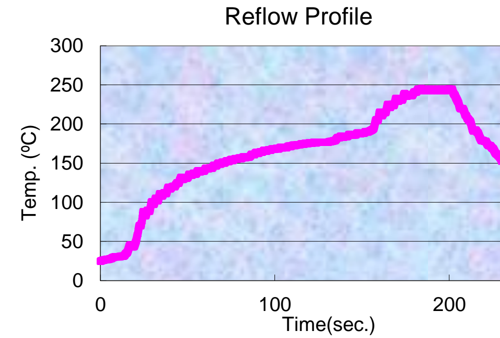
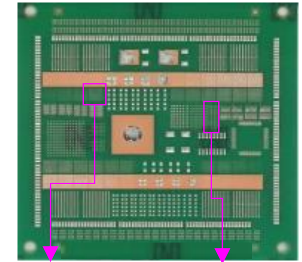


Meltability

Evaluation Method

- Test PCB: FR-4 grade glass epoxy
- Surface Finish: OSP (Air, N_2)/ ENIG (Air)
- Stencil Thickness: 0.08mm (Laser etched)
- Evaluation Land: 0.18mm φCSP
  0402R, 100%Sn
- Aperture: 100%
- Heating Method: Hot Air Oven
- Reflow Atmosphere: Air /N_2 (O_2: <1000ppm)





0.18mmφCSP 0402R chip

	OSP (Air)	OSP (N_2)	ENIG (Air)
0.18mm φCSP			
0402R			

S3X70-M500-4 showed good meltability at 0.18mmCSP and 0402 chip, even on the combination of ENIG surface finish and Air atmosphere reflow.

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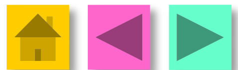
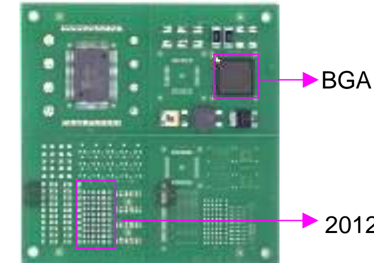
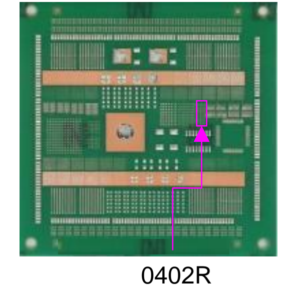


Voiding Property

Evaluation Method

- Test PCB: FR-4 grade glass epoxy
- Surface Finish: OSP (Air, N_2)/ ENIG (Air)
- Stencil Thickness: 0.08mm (Laser etched)
- Evaluation Land: 0402R, 2012R 100% Sn plating
  BGA ball - SAC305
- Aperture : 100%
- Reflow Atmosphere: Air/ N_2 (O_2:<1000ppm)
- Reflow Profile: Same as Meltability test





	OSP (Air)	OSP (N_2)	ENIG (Air)
0402R			
2125R			
BGA			

S3X70-M500-4 showed good voiding property at fine-pitch area, even on the ENIG surface finish under air atmosphere reflow.

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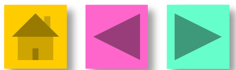
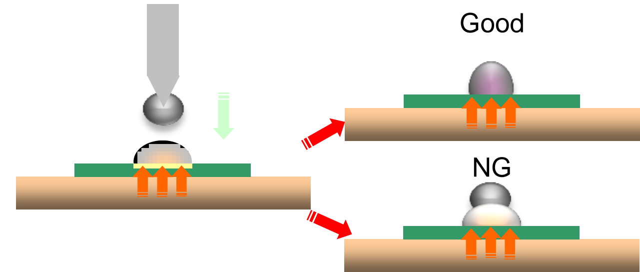


Head-in-Pillow (H-I-P) Resistance

Evaluation Method

- Test Board: FR-4 grade, glass epoxy
- Surface Finish: OSP
- Stencil Thickness: 0.12mm (Laser etched)
- Evaluation land: 0.8 x 0.8mm
- Test Component: 0.76mm BGA Ball (SAC305)
- Stencil Aperture: 100%
- Heating Method: Solder bath at 275ºC
- Ball drop interval: 10sec.



Drop BGA ball every 10 seconds on a molten solder. When the flux is exhausted due to exposure to high temperature, ball will no longer fuse with molten solder.

	30sec	40sec	50sec
S3X70-M500-4			
Conventional Solder Paste			

M500-4 is equipped with higher heat resistant flux and so its activation is maintained for 50 seconds after the solder is molten.

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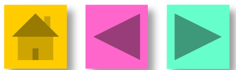

Halogen Content

Evaluation Method

- BS EN 14582 (Combustion-IC Method)

Halogen	Result
F	Not Detected
Cl	Not Detected
Br	Not Detected

Halogen Content(ppm)

S3X70-M500-4 meets halogen free standard, BS EN14582 (Br+Cl <1500ppm)

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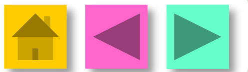

General Properties

Item	Result	Method
Tack Time	> 48 hours	JIS Z 3284-3
Slump Property	0.3mm pass	JIS Z 3284-3
Solder Ball Test	< Category 3	JIS Z 3284-4
Copper Mirror Corrosion	Type L	IPC-TM-650-2.3.32
Copper Plate Corrosion	Pass	IPC-TM-650-2.6.15
Surface Insulation Resistance	>1E+9	IPC-TM-650-2.6.14.1

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1. Printing

1) Recommended printing condition

(1) Squeegee

1. Shape:	Flat
2. Material:	Metal or Urethane
3. Angle:	60º
4. Print Pressure:	Relatively low
5. Squeegee Speed:	20~80mm/sec.

(2) Stencil

1. Thickness:	For 0.4~0.65mm pitch, 50~100µm
2. Fabrication:	Laser or chemical etching
3. Stencil Release Speed:	7.0~10.0mm/sec.
4. Clearance:	0mm

(3) Ambient

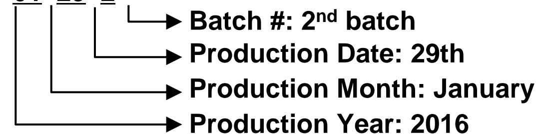
1. Temperature:	23~27ºC
2. Humidity:	40~60%RH
3. Air Conditioning:	Direct air blow on metal stencil would cause the solder paste to dry up quicker. Please use a shield to adjust the air flow direction.

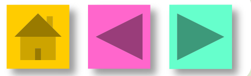
2. Product Life

0~10ºC: 6 month from the date of production

* How to interpret lot number

e.g. **Lot No. 6 01 29 2**





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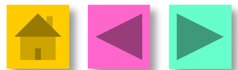
Handling Guide - Recommended Reflow Profile



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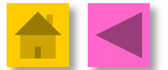

Handling Guide - Supplemental Information on Reflow Profile