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#50011E-0
Revised on JAN.22, 2013

Koki no-clean LEAD FREE solder paste

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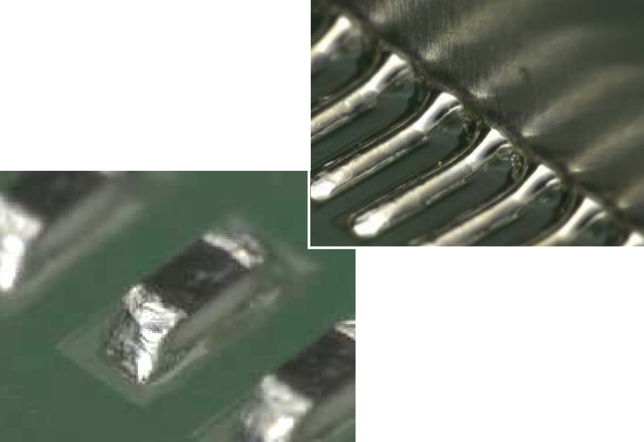
Powerful Wetting Lead Free Solder Paste

S3X48-M500C-5

Product information



This Product Information contains product performance assessed strictly according to our own test procedures and may not be compatible with results at end-users.

Product features

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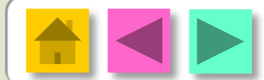
- Solder alloy composition is **Sn Ag3.0 Cu0.5** (SAC305)
- **EXCELLENT WETTING** to severely oxidized patterns or components, such as oxidized Cu substrate, oxidized Sn and NiPd plating.
- **PERFECT MELTING** and wetting at super fine pitch (>0.4mm pitch) and micro components (>0.30mm dia CSP, 0603 chip).
- Specially formulated flux chemistry ensures **EXTREMELY LOW VOIDING** with CSPs and broad contact area components, e.g. QFN.
- Designed to prevent occurrence of **HIDDEN PILLOW DEFECTS**.
- Enables **REUSE** of leftover from previous day. Economical.



Specifications

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Application		Printing - Stencil
Product		S3X48-M500C-5
Alloy	Alloy Composition (%)	Sn Ag3.0 Cu0.5
	Melting Point (ºC)	217 - 219
	Shape	Spherical
	Particle size (μm)	20 - 45
Flux	Halide Content (%)	0
	Flux Type	ROL0*3
Product	Flux Content (%)	11.5±1.0
	Viscosity*1 (Pa.s)	220±30
	Cupper plate corrosion*2	Passed
	Tack Time	> 48 hours
	Shelf Life (below 10ºC)	6 months
	Optional powder (μm)	20 – 38; Product code S3X58-M500C-5

*1. Viscosity : Malcom spiral type viscometer,PCU-205 at 25ºC 10rpm
*2. Copper plate corrosion : In accordance with IPC J-STD-004
*3. Flux type : According to IPC J-STD-004

Continual printing

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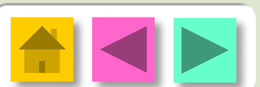

Test condition;

- Stencil : 0.12mm thickness, laser cut stencil
- Printer : Model YVP-Xg YAMAHA Motor
- Squeegee : Metal blade, Angle - 60°
- Print speed : 40 mm/sec
- Atmosphere : 24.5~25.5 ºC (50~60%RH)
- Test pattern : 0.4mmp QFP pad pattern - Width 0.20 mm Length 1.5 mm Distance 0.2 mm
  BGA pad pattern - Diameter 0.30mm

	1st print	10th print	After 200strokes 10th print
MBGA (0.30mm dia.)			
0.4mmP QFP			

Newly developed additives provide a lubricating effect that greatly improves the paste release properties and assures excellent print quality with microBGA, even at high printing speeds.

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Continual printing (SPI DATA)

• SPI: KOHYOUNG aSPIre

MAX
Quartile
MIN

MBGA 0.3mmdia.

Volume(%): 0, 20, 40, 60, 80, 100, 120, 140, 160

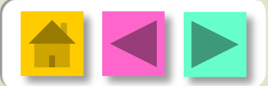
Initial | After 200 strokes

0.4mmP QFP

Volume(%): 0, 20, 40, 60, 80, 100, 120, 140, 160

Initial | After 200 strokes

Newly developed additives provide a lubricating effect that greatly improves the paste release properties and assures excellent print quality with microBGA, even at high printing speeds.



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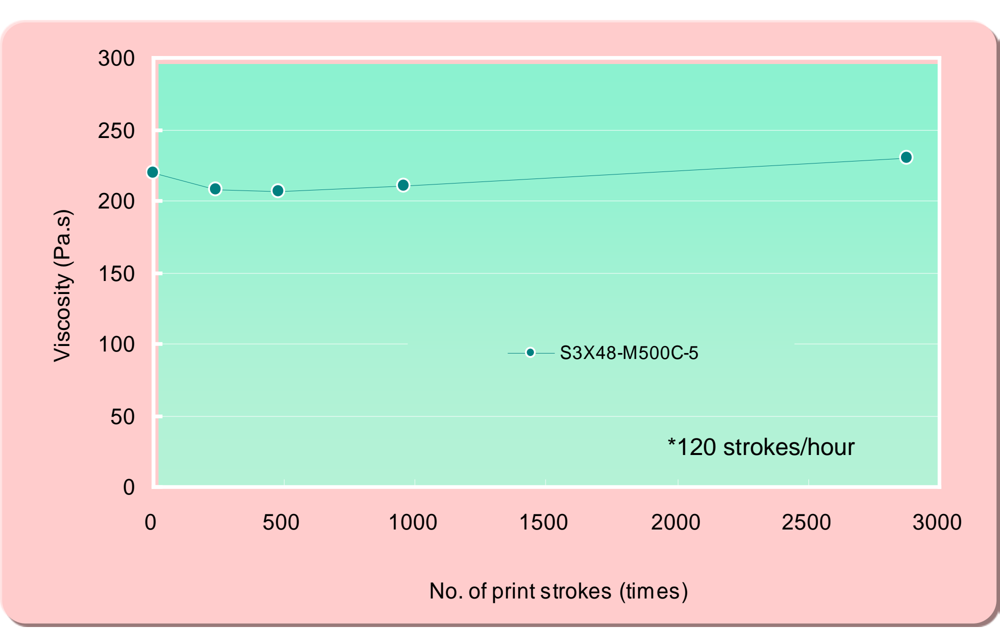
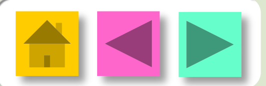
Viscosity variation

Test condition

- Print (knead) solder paste on the sealed-up stencil continually up for 24 hours to observe viscosity variation.
- Squeegee : Metal blades
- Squeegee angle : 60°
- Squeegee speed : 30mm/sec.
- Print stroke : 300mm
- Printing environment : 24~26°C, 40~60%RH



A newly developed flux formula has succeeded in delivering consistent long term printability by preventing excess viscosity drop due to shear thinning. Furthermore excessive increase of viscosity due to the chemical reaction between solder powder and flux during print rolling, is also eliminated.



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Intermittent printability (Stencil idle time)

Print solder paste continuously and stop to idle the paste for 45min. intervals, and resume the printing and observe the 1st print result to verify intermittent printability.

Test condition

- Squeegee : Metal blades
- Squeegee angle : 60°
- Squeegee speed : 40mm/sec.
- Print stroke : 300mm
- Printing environment : 24.0~26.0°C, 40~60%RH
- Test pattern : 0.4mmP QFP pad pattern - Width 0.20 mm Length 1.5 mm Distance 0.2 mm
  MBGA pad pattern - Diameter 0.30mm

	Initial	After 45min
MBGA (0.30 dia.)		
0.4mmP QFP		

Unique solvent formulation system assures extremely long stencil idle time, eliminating printing faults and improving the process window and production yields.

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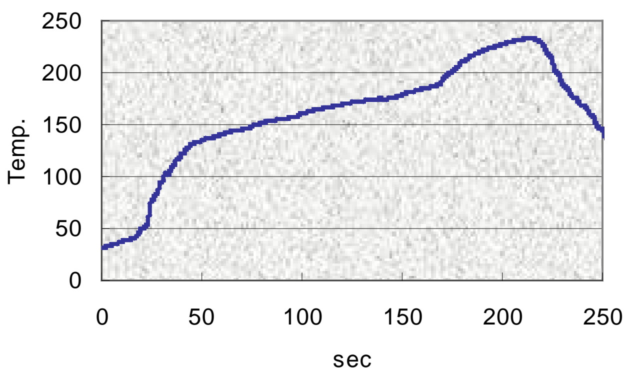
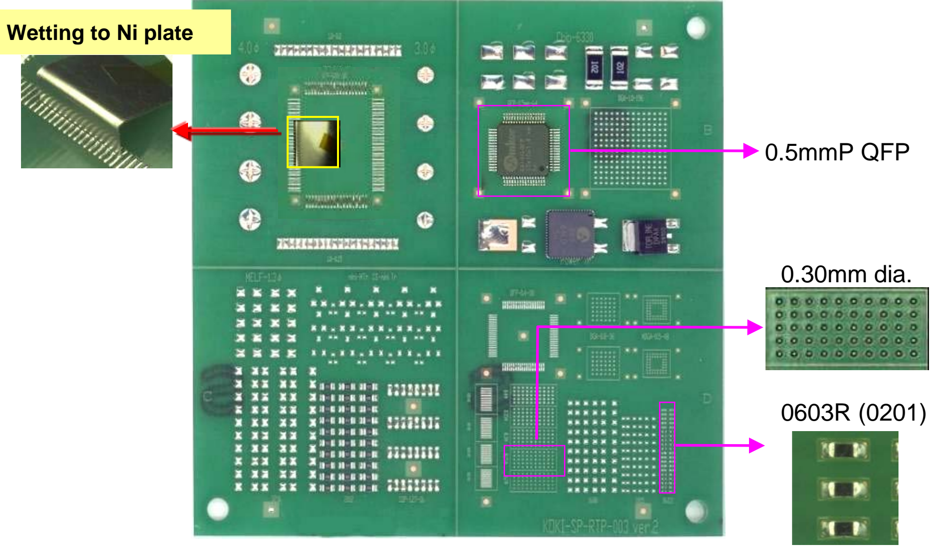
Wetting test

Test conditions

- Material : Glass epoxy FR-4
- Surface treatment : OSP, ImSn (Pre-reflowed x 2 times)
- Stencil thickness : 0.12mm (laser cut)
- Pad size : 0.30mm diameter
  Component: 0603R (0201) chip (100%Sn)
  0.5mmP QFP(Ni-Pd)
  Ni plate
- Stencil aperture : 100% aperture opening to pad
- Heat source : Hot air convection
- Zone structure : 5 pre-heat zones +2 peak zones
- Atmosphere : Air
- Reflow profile : See the reflow profile on the right



Wetting to Ni plate



0.5mmP QFP

0.30mm dia.

0603R (0201)

Convection reflow oven

S3X48-M500C-5

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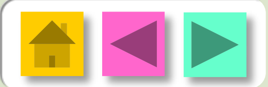

Wetting test

	0.3mm dia.CSP	0603R (0201)	0.5mmP QFP (Ni/Pd)	Ni plate
OSP				
ImSn (Pre-reflowed x 2 times)				
Au				

Generally, S3X48-M500C-5 indicated good coalescence with super fine patterns as well as large pads. It showed good meniscus/wetting to a Ni plate (simulation test to QFP component) while a competitive product had lesser results.

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Wetting test – Solder dewetting

Test condition

- Material pieces : Nickel, Copper, ImSn
- Stencil thickness : 0.20mm (laser cut)
- Stencil aperture : 6.5mm diameter
- Heat source: Same as *"Super fine pattern wetting"*

Preparation (ImSn)

Store inside the oven at 180°C (10 hrs).

Preparation (Ni)

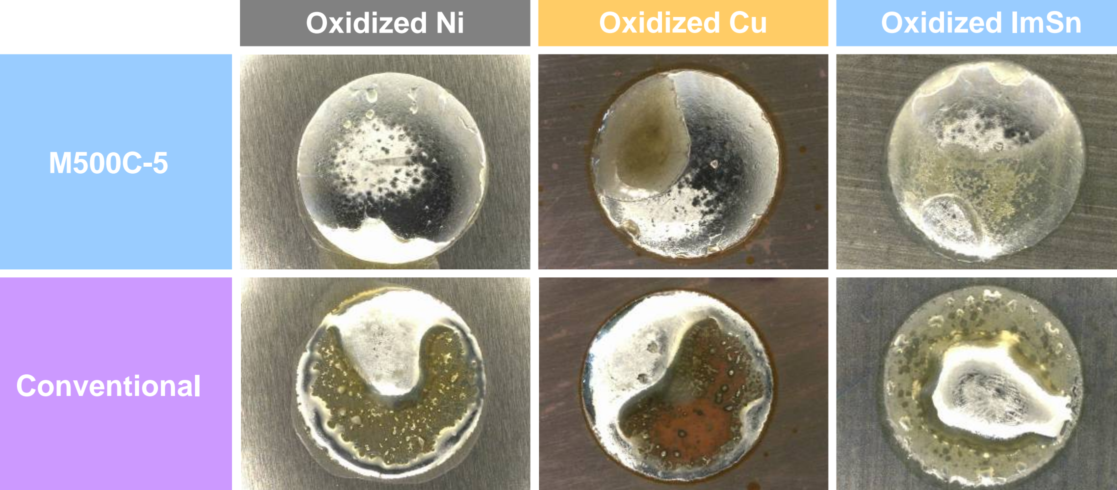
The nickel plates must be cleaned with acetone, dry with a mop, put them in a hydrochloride acid bath (1.75% in weight) for 2 min, then clean the acid with de-ionized water and air dry.

Store inside the oven in boiling de-ionized water for 5 minutes.

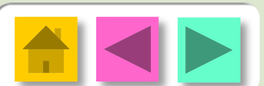
Preparation (Cu)

The copper plates must be cleaned with acetone, dry with a mop, put them in a hydrochloride acid bath (1.75% in weight) for 5 min, and then clean the acid with de-ionized water and air dry.

Store inside the oven at 70°C in a pot of de-ionized water (70 %RH for 24 hrs).



S3X48-M500C-5 secures good solder spreading even on the oxidized Ni ,Cu plates and ImSn peates.



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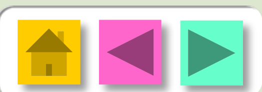
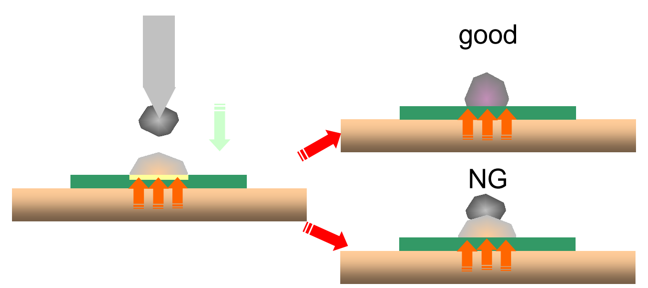


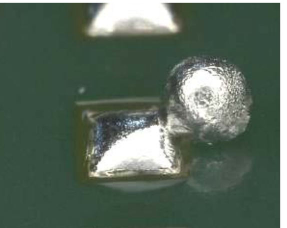
Anti-pillow test

Test condition

- Material : Glass epoxy FR-4
- Surface treatment : OSP
- Stencil thickness : 0.12mm (laser cut)
- Pad size : 0.8 x 0.8mm diameter
- Component: 0.76mm ball SAC305
- Stencil aperture : 100% aperture opening to pad
- Heat source : Solder pod 275ºC
- mount interval: 10sec.



Drop a solder ball every 10 sec. after the solder paste has melted to see the heat durability of flux.

	30sec	40sec	50sec
M500C-5			
Conventional solder paste			

S3X48-M500C-5 indicates much longer heat durability up to 50sec., while the conventional solder paste lost activation in less than 30 sec. once the solder paste had started to melt. The results demonstrates that S3X48-M500C-5 effectively prevents the occurrence of head-in-pillow defects.

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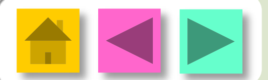
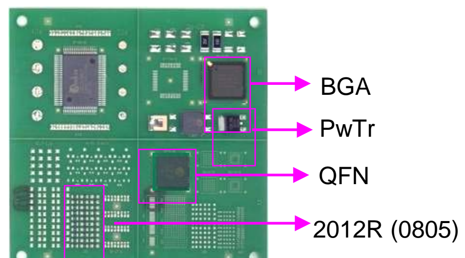


Voiding

- Material : Glass epoxy FR-4
- Surface treatment : OSP, ImSn, Ni/Au, HAL(SAC305)
- Stencil thickness : 0.12mm (laser cut)
- Components PwTr,2012R (0805)100% - Sn plated
  BGA ball - SAC305, QFN Sn plated
- Heat source : Hot air convection
- Atmosphere : Air
- Reflow profile : Same as *"Wetting test"*



	Pwtr.	QFN	2012R	BGA
OSP				
ImSn				
Au				

Other properties

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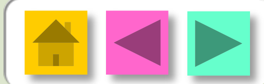
Item	Result	Method
Tack time	> 48 hours	JIS Z 3284
Heat slump	0.4mm pass	JIS Z 3284
Solder balling	Category 3	JIS Z 3284
Copper mirror corrosion	Type L	IPC-JSTD-004
Copper plate corrosion	Pass	IPC-JSTD-004 JIS Z 3194
Voltage applied SIR	> 1E+9	IPC-JSTD-004 JIS Z 3194



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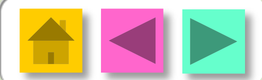

Handling guide

1. Printing

1) Recommended printing parameters

(1) Squeegee

1. Kind	:	Flat
2. Material	:	Rubber or metal blade
3. Angle	:	60~70º (rubber) or metal blade
4. Pressure	:	40~80N
5. Squeegee speed	:	20~80mm/sec.

(2) Stencil

1. Thickness	:	150~100µm for 0.65~0.4mm pitch pattern
2. Type :	:	Laser or electroform
3. Separation speed	:	7.0~10.0mm/sec.
4. Snap-off distance	:	0mm

(3) Ambiance

1. Temperature	:	23~27ºC
2. Humidity	:	40~60%RH
3. Air Flow	:	Excessive air flow in the printer badly affects stencil life and tack performance of solder pastes.

2. Shelf life

0~10ºC : 6 months from manufacturing date

* Manufacturing date can be obtained from the lot number

ex. **Lot No. 3 01 22 2**

No. of lot : 2nd
Date : 22th
Month : Jan.
Year : 2012

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Handling guide - reflow profile supplement

(ºC)
250
200
150
100
50
0
60
120
180
240

Shorter TAL and lower peak temperature may become a cause of voiding.
In case relatively larger volume of voiding is observed, it is recommended either to increase the peak temperature or extend TAL (for >45sec.).

Higher pre-heating temperature may lead to grainy solder fillet or de-wetting by accelerating oxidization of the solder alloy and exhaustion of the flux activation. It is recommended to decrease pre-heating temperature in case poor solder wetting is observed.

Similarly to the pre-heating, slow temperature elevation between pre-heating to the peak is prone to cause grainy solder fillet and/or de-wetting to the pad due to excessive oxidization of the solder alloy, pad surface and exhaustion of the flux activation.
It is recommended to quicken temperature elevation speed in case the poor solder wetting is observed.

Fast ramp-up speed is prone to cause bridging , mid-chip balling or solder beading by promoting heat slumping. It is recommended to slow down ramp-up temperature to alleviate the degree of heat slump of the solder paste.