Eco+PLUS® series

Lead free SOLUTIONS you can TRUST

TECHNICAL INFORMATION

Dispensing LEAD FREE No-clean SOLDER PASTE

S3X58 - M406D

[Contents]

1. FEATURES

1) A combination of Tin, Silver and Copper ternary eutectic alloy, with Koki's unique halide free no-clean fluxing medium, produces equivalent performance to conventional no-clean solder pastes in terms of printing, wetting and reliability.
2) Carefully selected flux chemistry ensures unique low voids formation and powerful wetting.
3) Specially developed flux system ensures both extremely high reliability and superior solder wettability.
4) Extremely long tack time offers wide process window.
5) Low color flux residue offers superior cosmetic appearance.

2. SPECIFICATION

1) Alloy

Item	Unit	**S3X58 - M406D**	Remarks
Composition	%	Sna96.5Ag3.0Cu0.5	JIS E grade
Melting point	°C	217 - 219	
Shape	--	Spherical	Microscope ×50
Particle size	μm	20 - 38	Laser microsizer

2) Flux

Halogen content		%	0.0	Potentiometer
SIR*1	Initial value	Ω	$> 1 \times 10^{13}$	JIS comb type electrode type-Ⅱ
	After humidification		$> 1 \times 10^{11}$	
Aqueous solution resistivity*2		Ω · cm	$> 5 \times 10^{4}$	Conductivity
Flux type		–	ROL0	ANSI/J-STD-004

3) Solder paste

Flux content	%	13.0	By weight
Viscosity*3	Pa.S	140 ± 10%	Malcom PCU-205
Copper plate corrosion*4	--	Passed	--
Solder spread factor	%	85	Copper plate
Tack time	hour	> 72	Malcom FG-1
Shelf life	month	3	Below 10°C

1. SIR ..... 40°C×95%RH×96Hr
2. Aqueous solution resistivity..... In accordance with MIL specifications.
3. Viscosity ..... Malcom spiral type viscometer, PCU-205 at 25°C 10rpm
4. Copper plate corrosion ..... In accordance with JIS

3. ALLOY PROPERTY

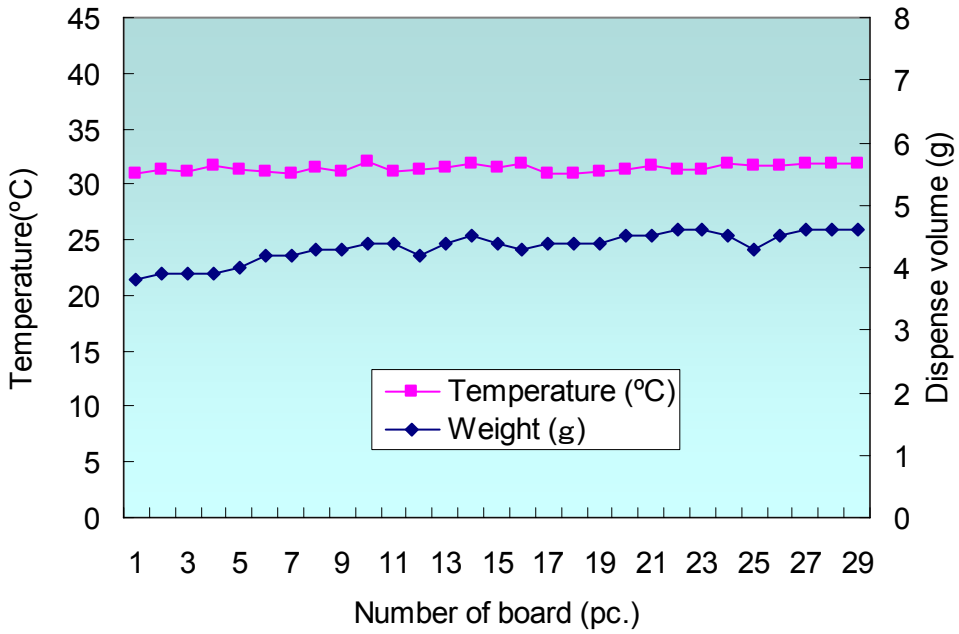
Item	Unit	Specification	Remarks
Composition	%	Sn96.5, Ag3.0, Cu0.5	JIS S grade
Melting point	°C	217 - 218	DSC method
Specific gravity	--	7.4	
Linear expansion coefficient	1/°C	2.2×10^{-4}	0 – 100 10°C/min.
Electric conductivity	$m/\Omega mm^2$	1.2	
Heat conductivity	Cal/cm·sec·°C	0.15	
Elongation	%	55	Pulling speed 10mm/min.
Yang's modulus	MPa	40000	
Hardness	HV	14	Vickers hardness test
Creep strength	Hrs	> 2000	125°C

4. DISPENSABILITY

- Dispense parameters

Dispense pressure	:	300Pa
Dispense time	:	0.2 sec./dot
Needle diameter	:	0.6mm
Number of dot	:	2000 dots/board
Dispense temperature	:	29~32°C
Substrate	:	Glass epoxy board

- Results



1st board	5th board
	

15th board	25th board
	

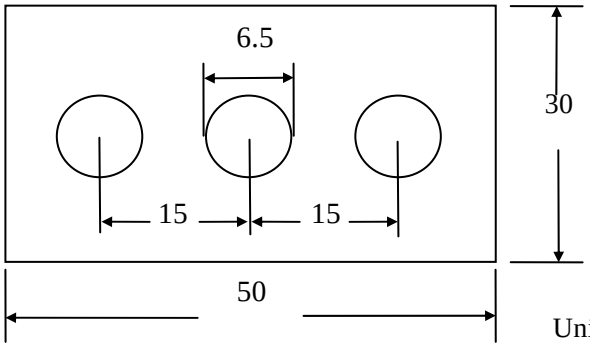
5. SOLDER BALLING

• Test method

Prepare two test pieces by printing the paste on each alumina plate (50×50×0.8tmm) with a 0.2mm thick stencil provided with three 6.5mm diameter apertures with a distance between centers of 15mm.

Reflow one of them, 1 hour after printing and the other after storing it at 25±2°C 60±20%RH for 24 hours, on a hot plate at 250°C. Remove the test pieces from the hot plate after 5 seconds since the solder paste melted completely and then cool them down to room temperature.

Inspect the degree of reflowing referring to 'Solder balling evaluation standard' using the ×10 magnifying glass.



Stencil used.

• Solder balling evaluation standard

Category	Status of coalescence of solder	Illustration (ex.)
1	The molten solder from the paste has melted in to one solder ball.	
2	The molten solder from the paste has melted into one large solder ball with no more than three isolated small solder balls with diameter less than 75μm.	
3	The molten solder from the paste has melted into one large solder ball surrounded by more than three solder balls with diameters less than 75μm which do not form a semi-continuous halo.	
4	The molten solder from the paste has melted into one ball accompanied by a large number of smaller solder balls which may form a semi-continuous halo, or has melted to form a number of similarly sized balls.	

• Test result

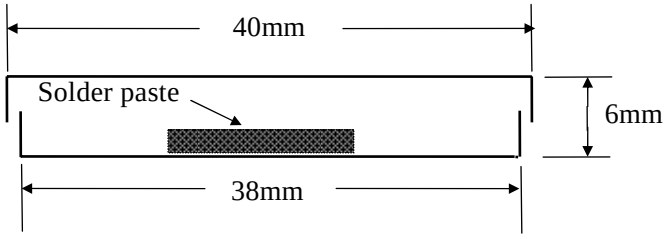
Sample	1 hour after print	24 hours after print
a	Category 3	Category 3
b	Category 3	Category 3
c	Category 3	Category 3

1 hour after printing	24 hours after printing
	

6. COPPER PLATE CORROSION

• Test method

Prepare 6 pcs. of phosphorus deoxidized copper plate of 50×50×0.5tmm in size (JIS-H-3100). Bend 3 of them at right angle at 5mm (copper plate A), and the rest at 6mm (copper plate B) from the both edges to form three open ended boxes.



After removing grease from the both copper plate A and B with acetone, soak them in 5% sulfuric acid for 1 minute and in ammonium persulfate solution (solution which contains 25% of ammonium persulfate in 0.5% of sulfuric acid) in 1 minute to etch the surface uniformly. After washing them with running water , soak in 5% sulfuric acid for 1 minute and then rinse thoroughly with running tap water and demineralized water. Then finally, finally, rinse them with acetone and dry.

Obtain test pieces by printing solder paste on the copper plate B with a 0.2mm thick stencil provided with a 6.5mm diameter aperture.

Place all three copper plate A over the copper plate B and lower each box in a horizontal position on to the surface of the solder bath at the temperature of 235±2°C and maintain the test pieces in this position for 5 seconds.

Remove each test piece from the solder bath and allow it to cool in a horizontal position down to room temperature. Place all three boxes in the thermohygrostat under the condition of 40±2°C, 90~95%RH for 72 hours.

Remove the boxes from the thermohygrostat and inspect the inside surfaces of the boxes (including the lid) for possible corrosion.

• Test result

n	Copper plate A	Copper plate B
1	No corrosion	No corrosion
2	No corrosion	No corrosion
3	No corrosion	No corrosion

x 100		

7. SURFACE INSULATION RESISTANCE

• Test method

Print the solder paste on to comb type electrode JIS type-II (stencil thickness: 0.1mm) and reflow it with the temperature profile, 160°C for 50sec. for pre-heat + temp. above 220°C for 30sec. (peak temp. 235°C) for reflow to obtain test piece.

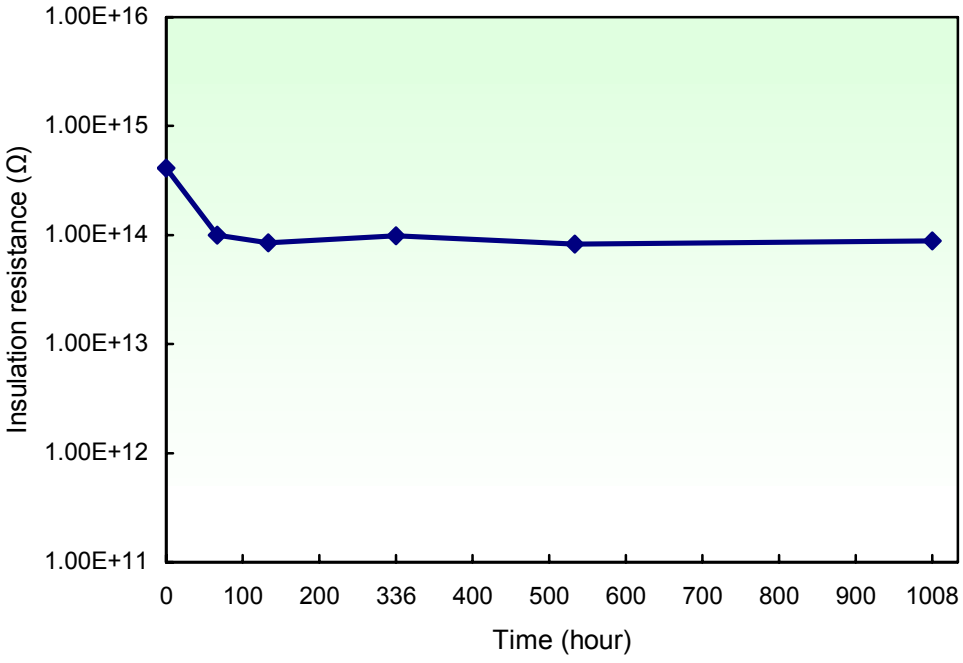
Put the test piece in a thermohygrostat under the conditions of 85±2°C and 85±2%RH.

Measure the insulation resistance at every specific time taking the test pieces out of the thermohygrostat. DC100V for the measurement.

• Test result

Time (hour)	S.I.R. Value (Ω)
Initial value	4.1×10^{14}
96	1.0×10^{14}
168	8.5×10^{13}
336	19.8×10^{13}
504	8.3×10^{13}
1008	8.8×10^{13}

SIR GRAPH



8. VOLTAGE APPLIED SIR

(Electromigration Test)

• Test method

Print the solder paste on to comb type electrode JIS type-II (stencil thickness: 0.1mm) and reflow it with the temperature profile, pre-heat: 160°C for 50sec. for pre-heat + temp. above 220°C for 30sec. (peak temp. 235°C) for reflow to obtain test piece

Put the test piece in a thermohygrostat under the conditions of 85±2°C and 85±2%RH.

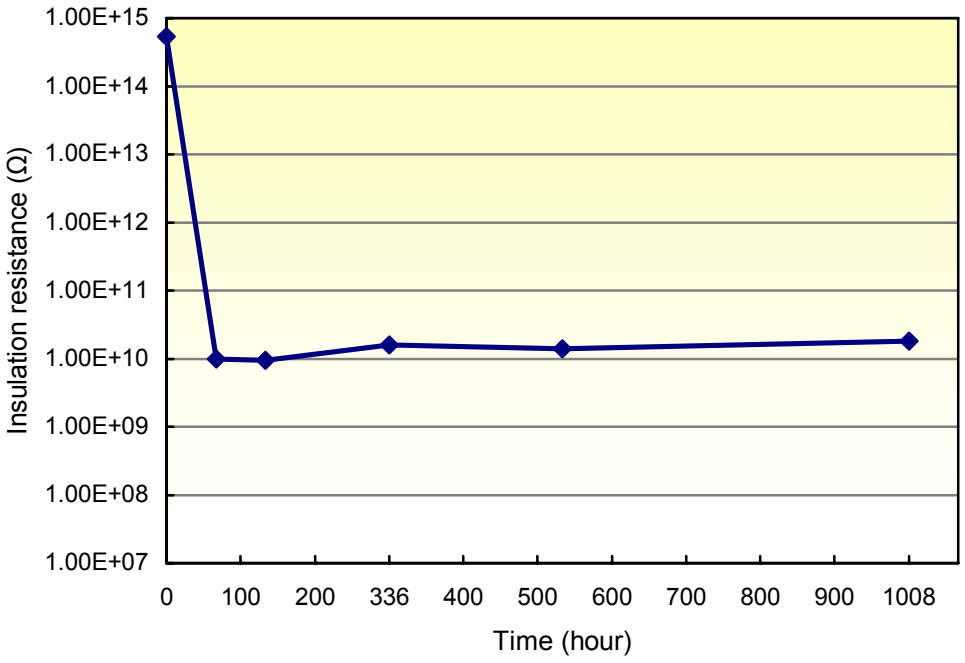
Measure the insulation resistance at every specific time keeping the test pieces in the thermohygrostat, and apply DC50V. Apply DC100V for measurement

• Test result

Condition	Time (hour)	S.I.R. Value (Ω)
Out of thermohygrostat	Initial value	5.3×10^{14}
In thermohygrostat	96	1.0×10^{10}
	168	9.5×10^{09}
	336	1.6×10^{10}
	504	1.4×10^{10}
	1008	1.8×10^{10}

* No evidence of electromigration.

SIR GRAPH



9. USE OF KOKI SOLDER PASTE

In order to make the paste use of KOKI SOLDER PASTE, please refer to the following guideline carefully before use.

1. Preparation for printing

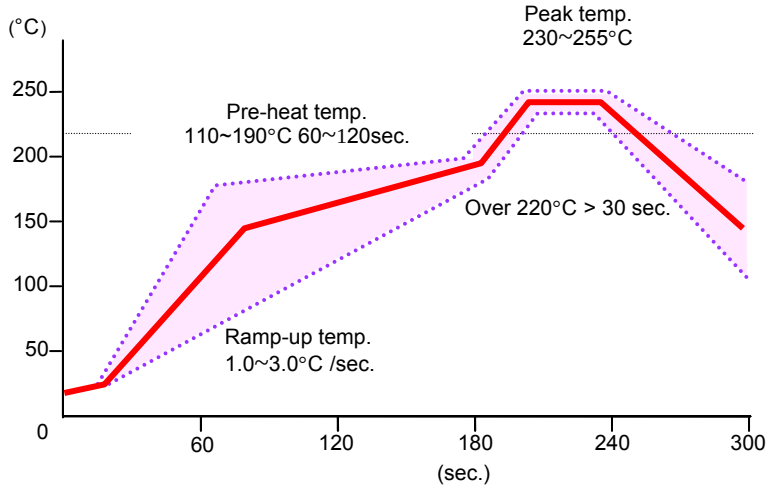
1) Temperature

After taking a solder paste out of the refrigerator, in which the temperature is controlled to be below 10°C, wait the paste temperature come back to a room temperature

*Caution : Do not open the jar while it is cold, or it causes condensation of moisture on the paste, and could be a cause of poor performance, such as increase of viscosity, solder balling and etc.

Do not heat the paste.

2. Reflowing



3. Storage

Store in a refrigerator at 10°C.

DO NOT FREEZE!

4. Shelf life

1) 0 ~ 10°C : 6 months from manufacturing date

2) At 20°C : 1 month from manufacturing date

3) At 30°C : 1 month from manufacturing date

* Manufacturing date can be obtained from the lot number

ex. **Lot No. 5 07 21 2**

No. of lot : 2nd

Date : 21st

Month : July

Year : 2005