TECHNICAL INFORMATION

Powerful Wetting
NO-CLEAN SOLDER PASTE

SE48-M1000-*3*

SS48-M1000-*3*

SSA48-M1000-*3*

[Content]

1. FEATURES

1) Employment of rigidly classified 20~45 micron solder powder ensures outstanding continual printability with fine pitch (0.5mm/20mil) and even super fine pitch (0.4mm/16mil) application and long stencil idle time.

2) Carefully selected rosins and activators ensure powerful solder wettability.

3) Extremely long stencil idle time and tack time offer wide process window.

4) Low color flux residue offers superior cosmetic appearance.

5) Conforms to Bellcore tests (Copper mirror, Halides, Surface insulation resistance, Electromigration) GR-78-CORE, Issue 1.

2. SPECIFICATIONS

1) Alloy

Item	Unit	**SE48-M1000-*3***	**SS48-M1000-*3***	**SSA48-M1000-3**	Remarks
Composition	%	Sn63, Pb37	Sn62, Pb36, Ag2	Sn62.6, Pb36.8, Ag0.4, Sb0.2	JIS E grade
Shape	--	Spherical			Microscope×50
Particle size	μm	20 ~ 45			

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]		Ωcm	$> 2 \times 10^{4}$	Conductivity
Flux type		–	ROL0	ANSI/J-STD-004

3) Solder paste

Flux content	%	10	By weight
Viscosity*[3]	Ps	1900 ± 10%	Malcom PCU-2
Copper plate corrosion*[4]	--	Passed	--
Solder spreadability	%	90	Copper plate
Tack time	hour	> 24	Malcom FG-1
Shelf life	month	6	Below 10°C
Optional powder	μm	20 ~ 38; Product code: SE58- SS58-, SSA58-M1000-3	

1. SIR ..... 40°C×90%RH×96Hr
2. Aqueous solution resistivity..... In accordance with MIL specifications.
3. Viscosity ..... Malcom spiral type viscometer, PCU-2 at 25°C 10rpm
4. Copper plate corrosion ..... In accordance with JIS

**All the tests results hereafter are of SE48-M1000-3 unless specified.*

3. TEMPERATURE - VISCOSITY CURVE

• Test method

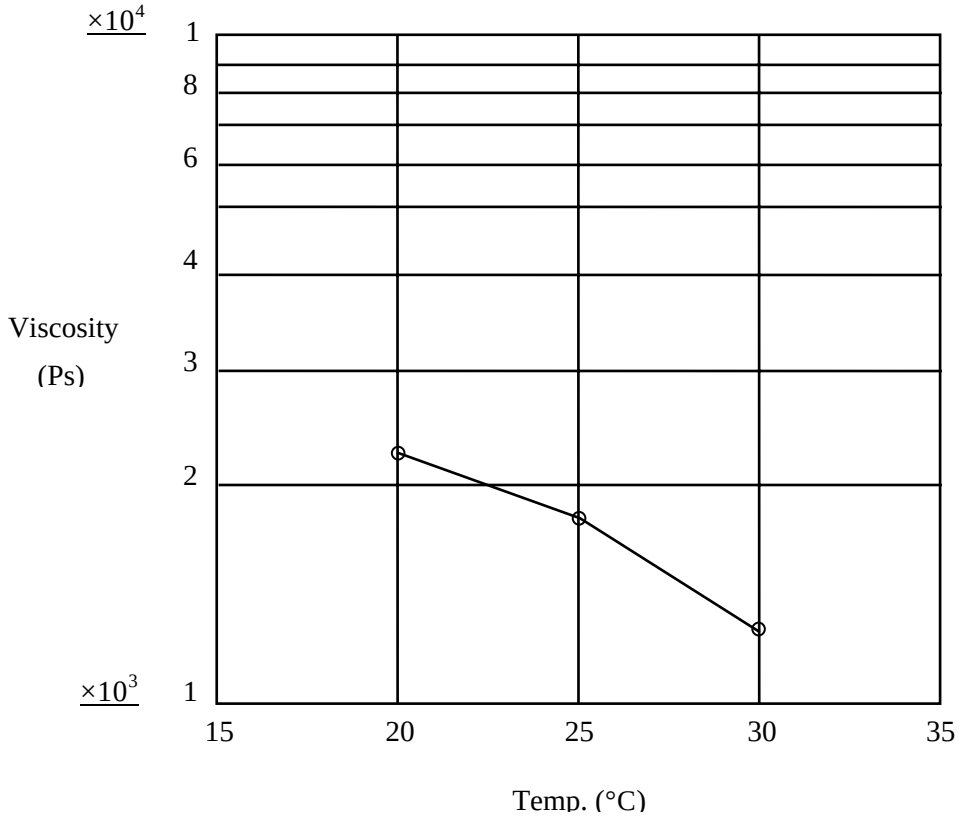
Equipment : Malcom viscometer PCU-205

Rotation of spindle : 10 r.p.m.

Measuring time : 5 min,

• Test result

Measuring temp. (°C)	Viscosity (Ps)
20	2280
25	1927
30	1385



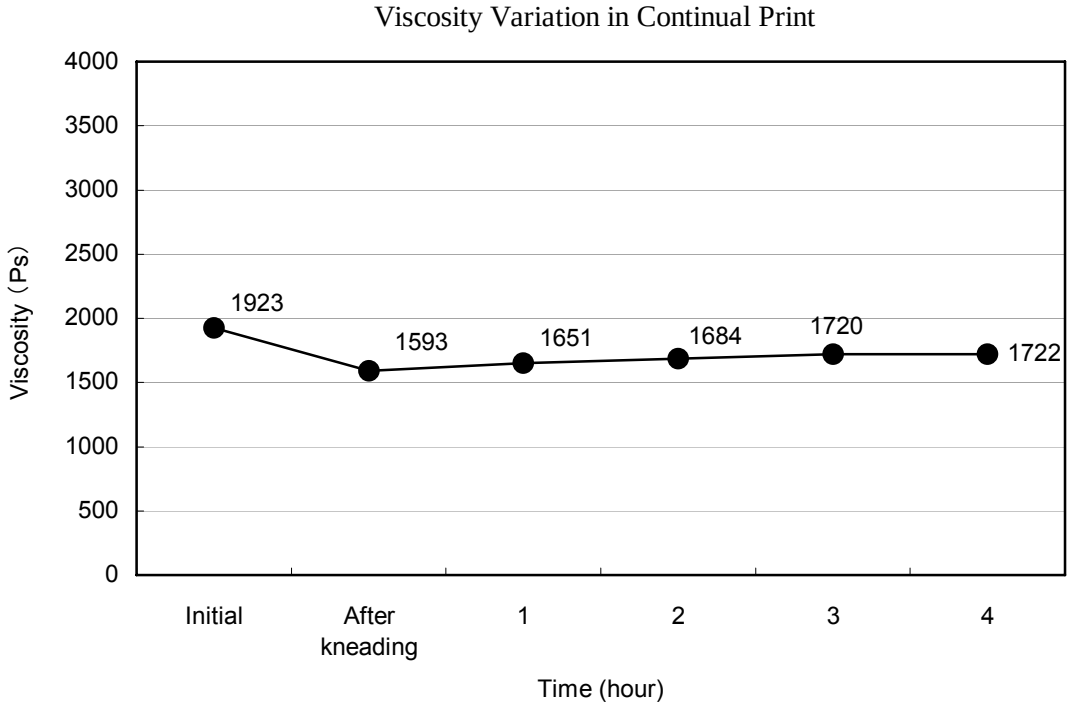
4. Viscosity Variation in Continual Print

- Test method
  Print (knead) solder paste on the sealed-up stencil continuously up to 4 hours to observe viscosity variation.

Stencil	:	0.15mm thickness, laser cut stencil
Printer	:	Model MK-880SV Minami Kogaku
Squeegee	:	Metal blade Angle - 60˚ Speed - 30 mm/sec
Print stroke	:	300mm
Atmosphere	:	23.5~25.0°C（50~60%RH）
Measurement of viscosity	:	Before printing, at 1, 2, 3 and 4 hours by Malcom viscometer PCU-205

- Result

Time (hour)	Initial	After kneading for 3 min.	1	2	3	4
Viscosity (Ps)	1923	1593	1651	1684	1720	1722



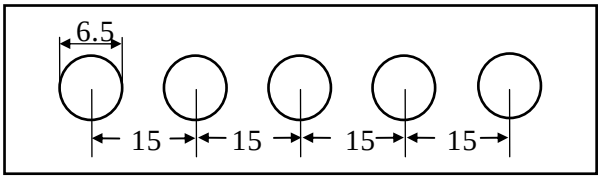
5. TACKINESS

- Test method
  Print the solder paste on the alumina plate with a 0.2mm thick stencil that has five 6.5mm dia. holes, to obtain test piece.

  Press a flat tip of a cylindrical probe of Malcom Solder Checker FG-1 on to the printed solder paste with the pressure of 50gs for 0.2mm sec. and pull it back up at the speed of 10mm/sec. to measure maximum tensile strength needed to separate the probe from the paste.

  Evaluate tackiness of the solder paste from obtained tack force and time after printing.

  *Ambient condition : 25°C 50±10%RH



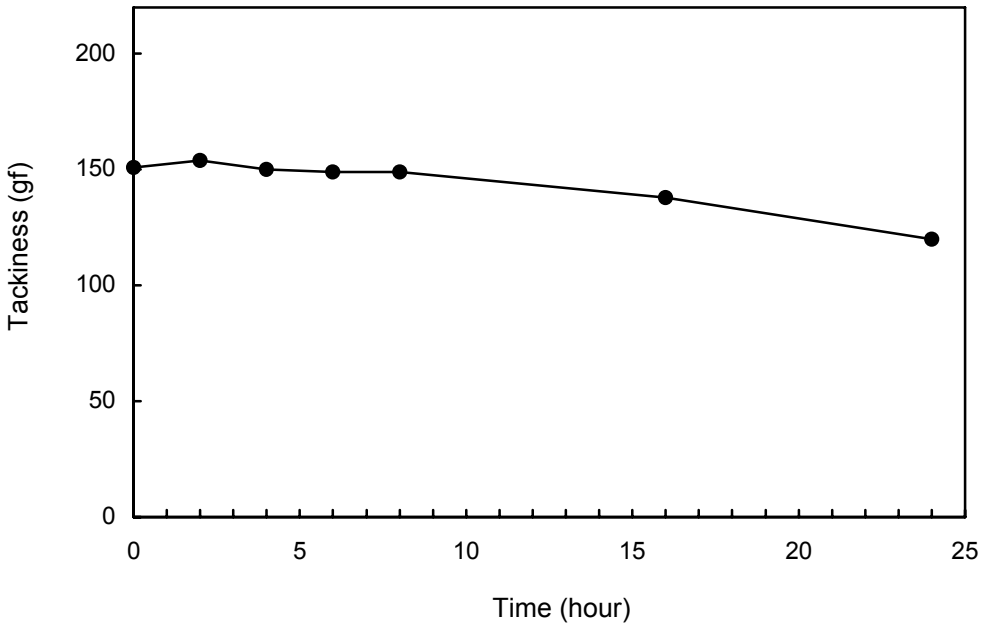
*Unit : mm

Stencil used

	Time (hour)						
Product	0	2	4	6	8	16	24
Tackiness (gf)	151	154	150	149	149	138	120

*Unit : (gf) Average of n = 5

Tackiness Data



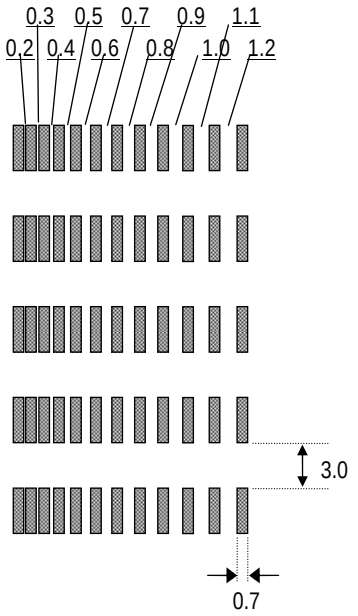
6. SLUMP

• Test method

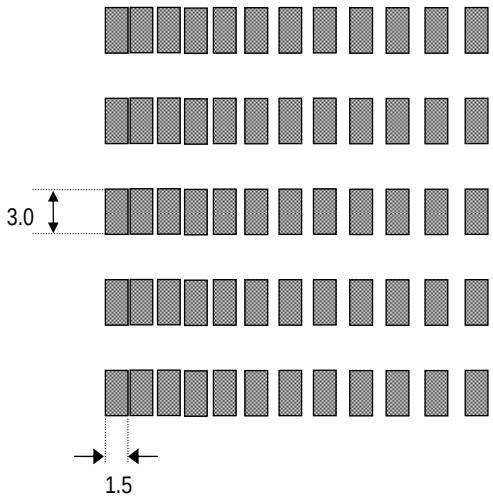
Using 0.2mm thick stainless steel stencil with two patterns of apertures, (1)3.0mm×0.7mm, (2)3.0mm×1.5mm arranged as grids with the spacing between the apertures varying from 0.2mm to 1.2mm in steps of 0.1mm, print the solder paste on 1.6mm thick copper clad laminate plate to obtain test pieces.

(1) Observe the slump behavior after leaving the test pieces at room temperature for 1 hour.

(2) Observe the minimum spacing across which the paste has not merged after storing the test pieces at room temperature for 1 hour, and heating it for 5 minutes at 150°C in the thermostatic oven.



Test pattern (1)



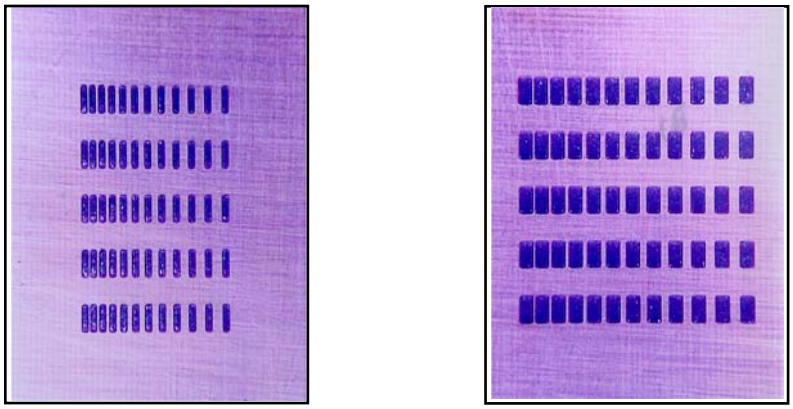
Test pattern (2)

• Test result

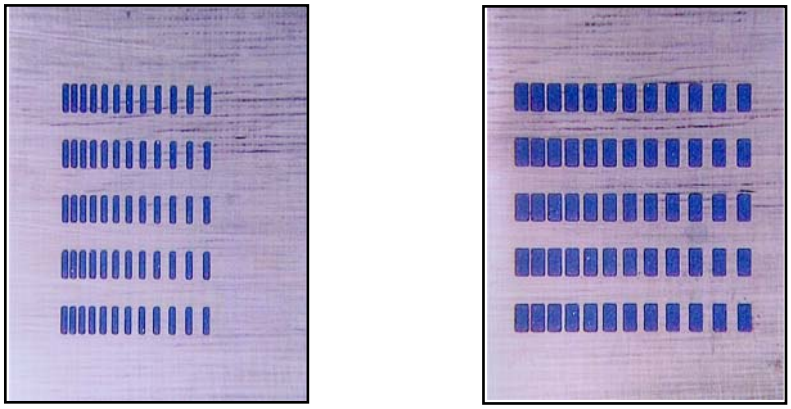
n	Stored at room temperature for 1 hour		
	Room temp.	100°C×20min.	150°C×5min.
(1)	0.2	0.2	0.3
(2)	0.2	0.2	0.3

*Store at room temperature for 1 hour.

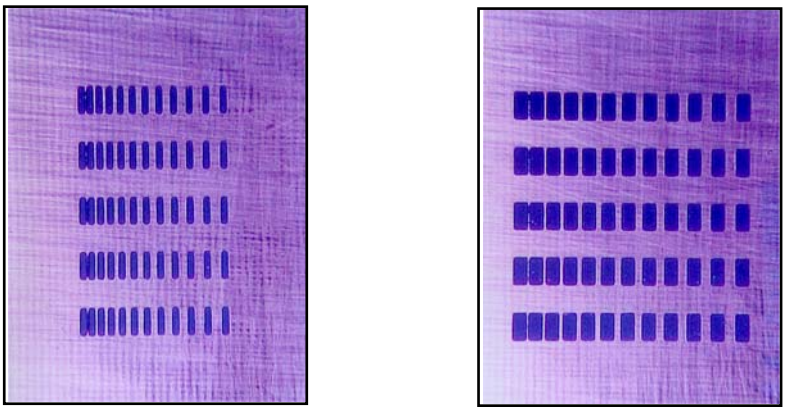
[Room temperature (no heating)]



[100°C × 20min.]



[150°C ×5min.]



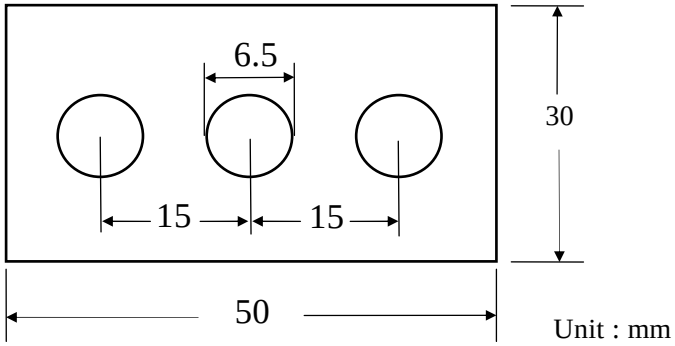
7. SOLDER BALL

• 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.

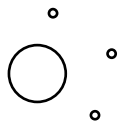
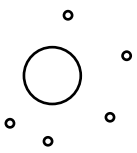
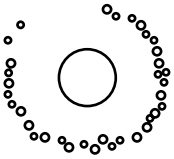
Reflow one of them in 1 hour after printing and the other after storing it at 25±2°C 60±20%RH for 24 hours, on a hot plate at 250°C. Remove the test pieces from the hot plate after 5 seconds since the solder paste melted completely and cool them down to room temperature.

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



Stencil used.

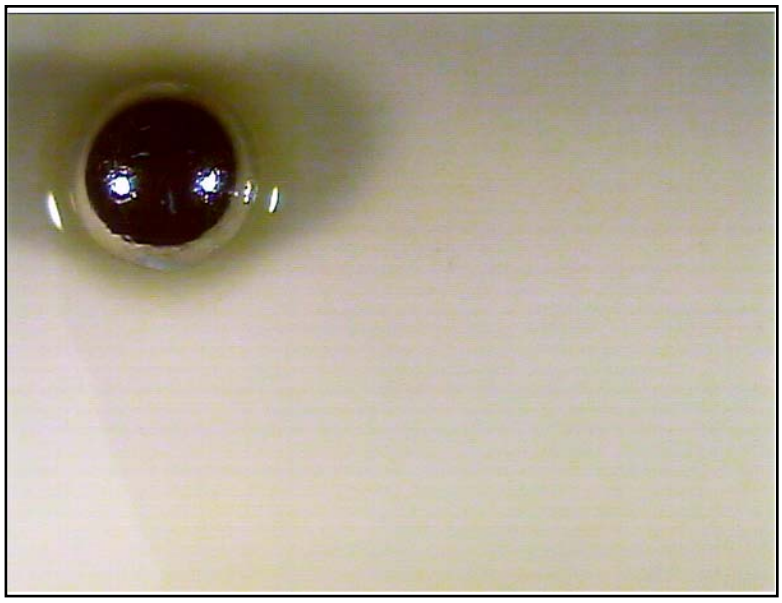
• Solder balling evaluation standard

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 :

Test piece	1 hour after print	24 hours after print
a	Category 2	Category 3
b	2	2
c	2	3

[1 hour after printing]



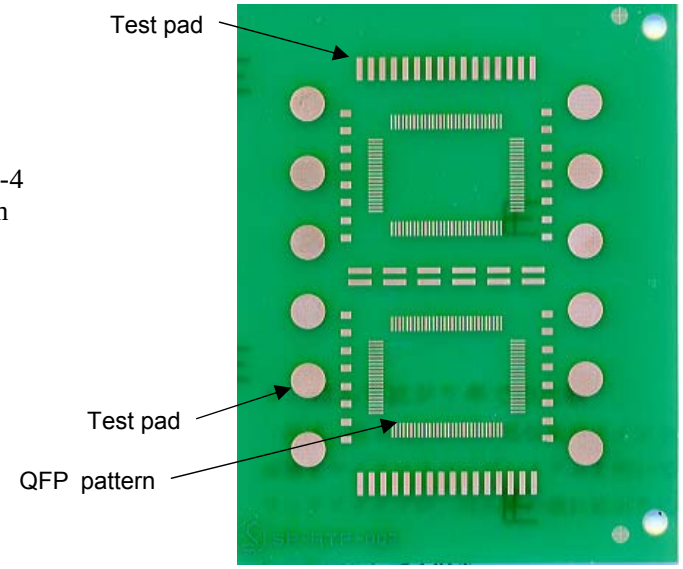
[24 hour after printing]

8. SOLDER SPREADABILITY & WETTABILITY

• Test method

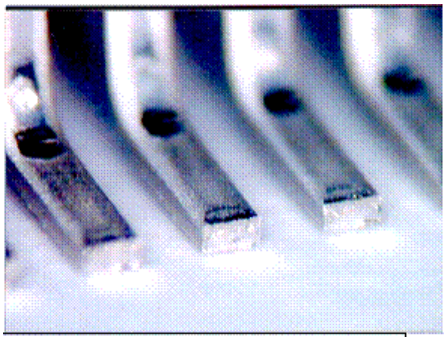
1. Test board

Model :	SP-RTP-002
Material :	Glass epoxy FR-4
Dimension :	80×100×1.6tmm
Surface treatment :	Bare copper
Pad size (round pad) :	6.0mm



2. QFP tested

PC board :	Glass epoxy FR-4
Component :	QFP 0.65mm pitch 100 pins
Lead wire :	Ni/Fe with Sn/Pb plating



3. Print condition

Stencil thickness :	0.150mm (laser cut)
Printer :	Model MK-880SV (Minami Kogaku)

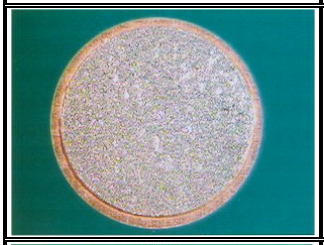
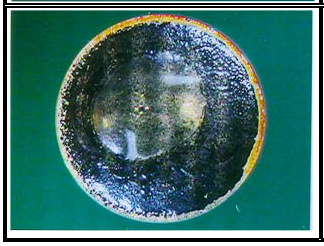
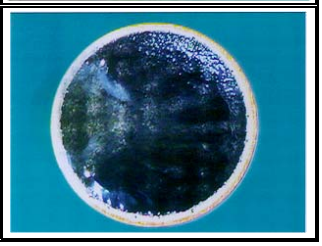
4. Reflow condition

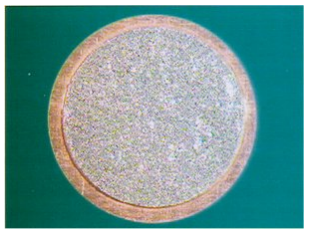
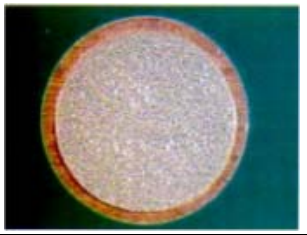
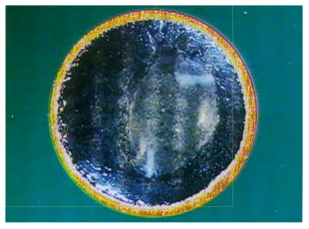
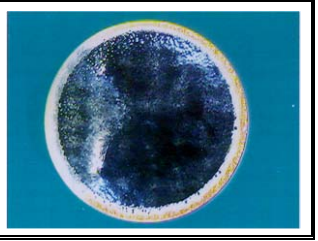
Heat source :	Far infrared + Hot air convection
Zone structure :	3 pre-heat zones + 1 reflow zone
Atmosphere :	Air
Temperature profile :	

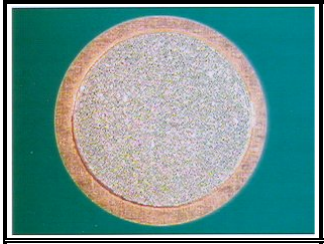
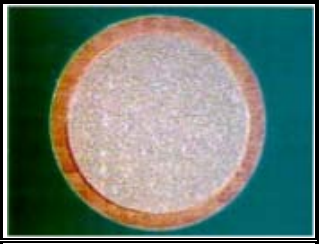
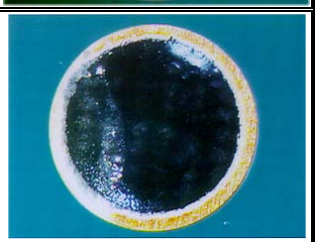
Profile	Pre-heat zones	Peak temp.	Time over 220°C
Profile	150 - 160°C × 90 sec.	220°C	40sec.

- Result

Solder spreadability results

Pad diameter 6.0mm stencil aperture 5.4mm	
SE48-M1000-*3*	Conventional Paste
	
	

Pad diameter 6.0mm stencil aperture 5.2mm	
SE48-M1000-*3*	Conventional Paste
	
	

Pad diameter 6.0mm stencil aperture 5.0mm	
SE48-M1000-*3*	Conventional Paste
	
	

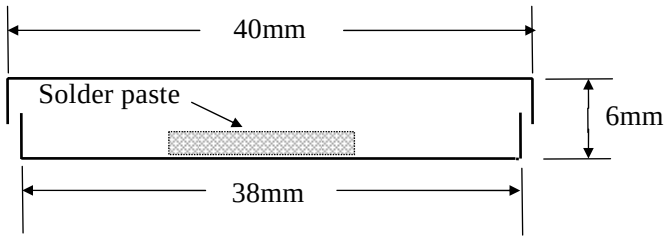
Solder wettability results

SE48-M1000-*3*	Conventional paste
	
	

9. 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 rinse thoroughly with running tap water and demineralized water. Then, 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 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

10. SURFACE INSULATION RESISTANCE

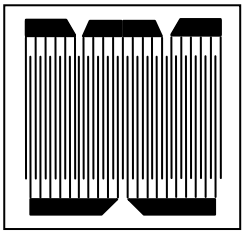
• Print the solder paste with a 0.2mm thick stencil on comb type electrode type-II specified in JIS-Z-3197: 1999 8.5.3 and reflow them to obtain test piece.

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

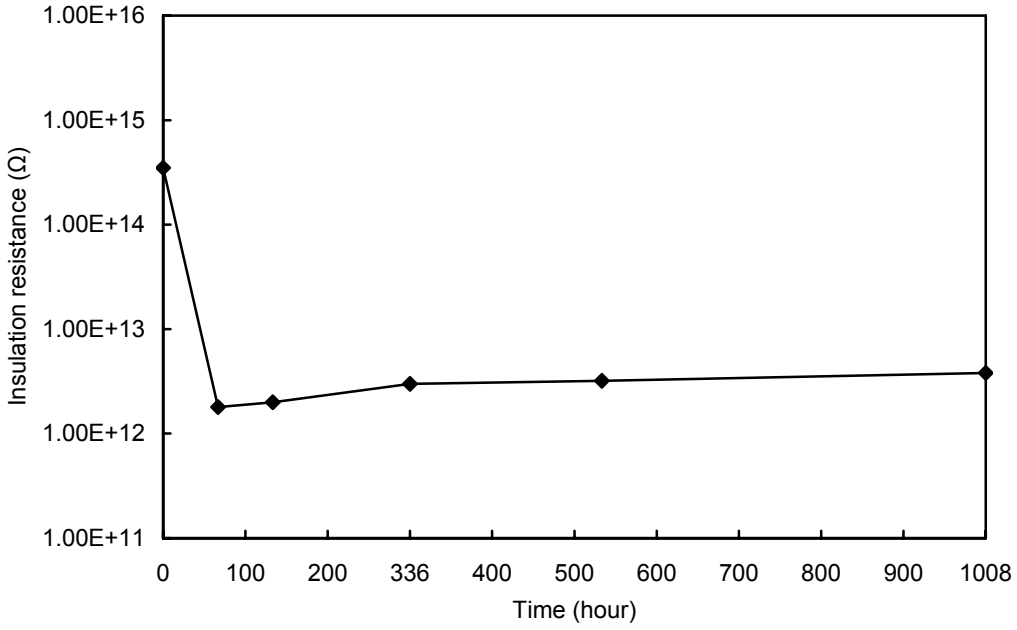
Measure the insulation resistance at every specific time taking the test pieces out of the thermohygrostat. DC100V for the measurement.

• Test result

Time (hour)	S.I.R. Value (Ω)
Initial value	3.5×10^{14}
96	1.8×10^{12}
168	2.0×10^{12}
336	3.0×10^{12}
504	3.2×10^{12}
1008	3.8×10^{12}

Comb type electrode Type-II	
	
Width of conductor	0.318 mm
Conductor spacing	0.318 mm
Overlap length	15.75 mm

SIR GRAPH



11. VOLTAGE APPLIED SIR

(Electromigration Test)

• Test method

Print the solder paste with a 0.2mm thick stencil on comb type electrode Type-II specified in JIS-Z-3197: 1999 8.5.4 and reflow them to obtain test pieces.

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

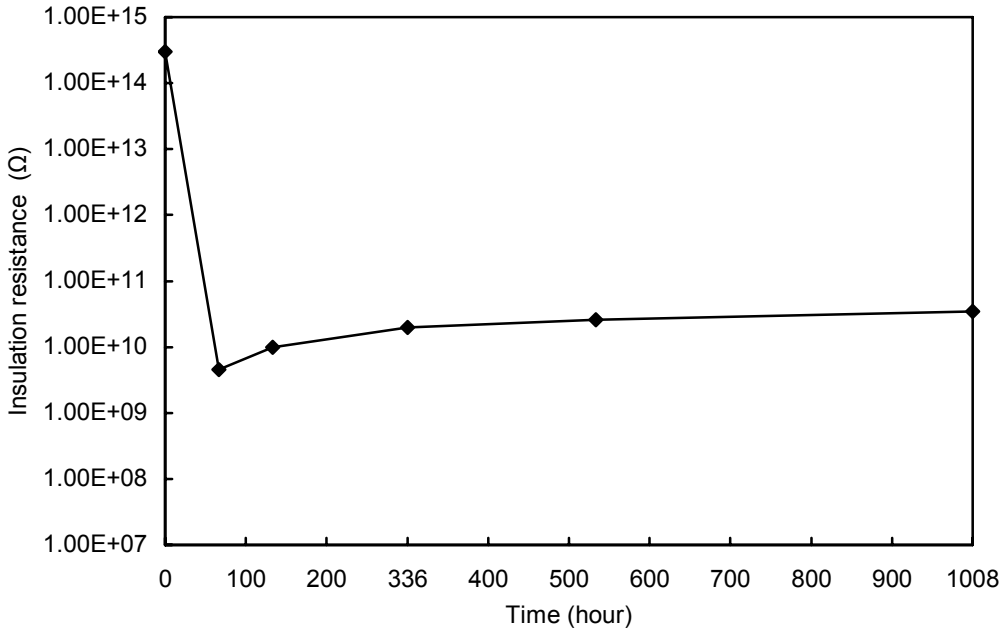
Measure the insulation resistance at every specific time keeping the test pieces in the thermohygrostat and apply DC50V. Apply 100V for the measurement.

• Test result

Time (hour)	Place measured	Average (Ω)
Initial value	Out thermohygrostat	3.0×10^{14}
96	In thermohygrostat	4.5×10^{9}
168	In thermohygrostat	1.0×10^{10}
336	In thermohygrostat	2.0×10^{10}
504	In thermohygrostat	2.6×10^{10}
1008	In thermohygrostat	3.5×10^{10}

✧ There was no evidence of electromigration.

SIR GRAPH



12. 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) Stirring

By using a stainless steel or chemically resistive plastic spatula, stir up the paste before use.

It is recommended to stir it for at least 1~2 min. to obtain uniform and stable viscosity.

*Caution : When an automatic stirring equipment is used, do not stir the paste longer than 4 min.

2. Printing

1) Recommended printing parameters

(1) Squeegee

1. Kind : Flat
2. Material : Rubber or metal blade
3. Angle : 60~70°
4. Pressure : Lowest.
5. Squeegee speed : 10~60 mm/sec.

(2) Stencil

1. Thickness : 200~120μm for 0.65~0.4mm pitch pattern
2. Snap-off distance : 0~0.5mm

*Although on-contact (0mm snap-off) is normally recommendable for fine pitch printing, if a printing equipment is not provided with a stencil separation speed control system, proper snap-off distance shall be provided to ensure smooth and gradual separation of the stencil from the substrate for good solder paste deposits.

3. Fixing method o substrate : It is recommended to have a fixture or vacuum system to hold the substrate in position during printing to prevent movement of PC board and to have a good separation from the stencil.
4. It is strongly recommended to set stencil separation speed as slow as possible.

(3) Ambiance

1. Temperature : 25 ± 5°C
2. Humidity : 40~60%RH
3. Wind : Wind badly affects stencil life and tack performance of solder pastes.

*Caution : When local air conditioner is equipped, make sure it is not enhancing drying out of solder paste.

(4) Printing

1. Initial quantity of solder paste to put on the stencil shall be decided according to the size of the stencil (PC board).

Ex. Size of PC board A5 - approx. 200gs
B5 - 300gs
A4 400gs

*In order to ensure good rolling of the paste across the stencil and easy separation from squeegees, a certain amount of solder paste must be required through out the printing process.

2. Add the paste to replenish only the consumed amount.

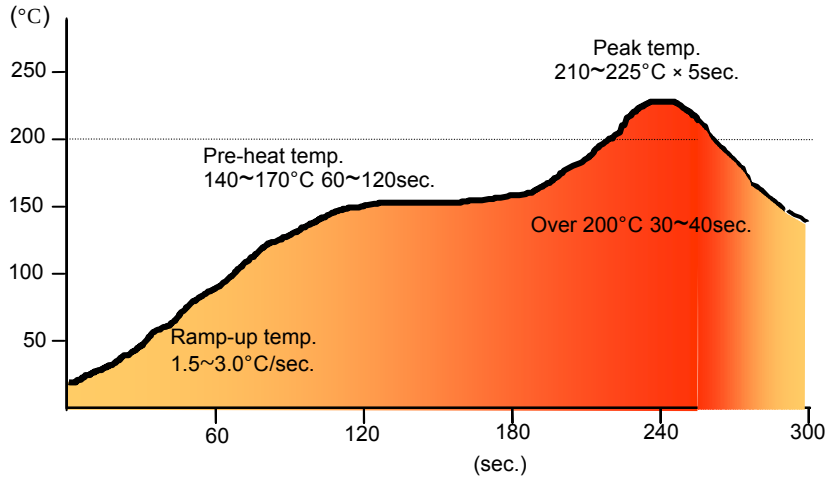
*Minimize the amount of paste left on the stencil as the degradation gets accelerated once it is processed on the stencil.

3. Every after certain times of continuous printing, thoroughly clean the bottom side or both the top and bottom side of the stencil.

4. Clean both the top and bottom side of the stencil before every break.

5. Do not return the used paste into the original jar to prevent mixture and contamination of the fresh paste, but put it in a separate container for reuse, if necessary.

3. Reflowing



4. Storage

Store in a refrigerator at 10°C.

DO NOT FREEZE!

5. 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. 2 04 10 8**

No. of lot : 2nd
Date : 10th
Month : April
Year : 2008