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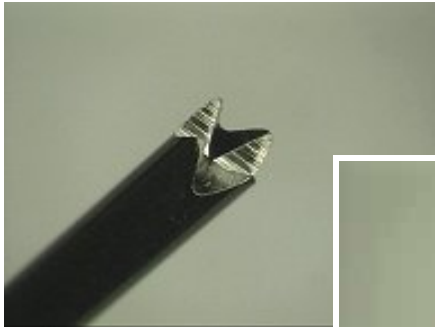
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Handling guide

Koki no-clean **LEAD FREE** solder paste

ICT Testable – *Halogen Free* **S3X58-M650 series**

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.



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Product features

- Solder alloy composition is **Sn3Ag0.5Cu**.
- Specially developed flux system ensures **EXCELLENT and CONSISTENT ICT TESTABILITY**.
- Carefully selected flux chemistry ensures extremely **LOW VOID** formation.
- **PERFECT MELTING** and **WETTING** at super fine pitch (<0.4mm pitch) and micro components (<0.25mm dia. CSP, 0603 chip).
- Genuine halogen free :BS EN14582 (F, Cl, Br, I=0ppm)

No clean ROLO	Powder Type 4	Fine pattern 0.4mm pitch CSP<0.3mm	Idle time > 30 min. CSP 0.3mm	Tack time > 48hrs.	High speed print >100mm/sec.	Low beading	Low voiding	Halogen Free	Pin testable	High reliability
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Application		Printing - Stencil	
Product		S3X58-M650-3	S3X58-M650H-3
Alloy	Composition (%)	Sn96.5, Ag3.0, Cu0.5	
	Melting point (°C)	217 - 218	
	Shape	Spherical	
	Particle size (μm)	20 - 38	
Flux	Halide content (%)	0.0	
Product	Flux content (%)	12.0 ± 0.5%	11.7± 0.5%
	Viscosity* ¹ (Pa.S)	170 ± 30%	200 ± 30%
	Copper plate corrosion* ²	Passed	
	Solder spread factor (%)	> 85	
	Tack time	> 48 hours	
	Shelf life (below 10°C)	6 months	
	Other alloy options	SX58- / S38X / TS58- / SXA58-	

1. Viscosity : Malcom spiral type viscometer, PCU-205 at 25°C 10rpm

2. Copper plate corrosion : In accordance with JIS



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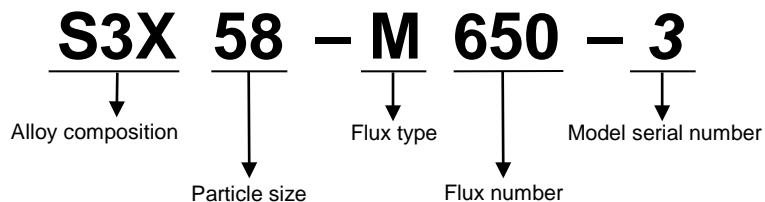
Surface insulation resistance

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Handling guide

Specifications

• Product number indication



• Alloy selections

Alloy composition (%)	S3X : SnAg3.0Cu0.5 SX : SnAg3.5Cu0.7 S38X : SnAg3.8Cu0.7 TS : SnAg3.5 SXA : SnAg3.5Cu0.5Sb0.2
Particle size (μm)	58 : 20 ~ 38
Flux type	M : Low halide, halide free N : Nitrogen use
Flux number	Solids and solvent used



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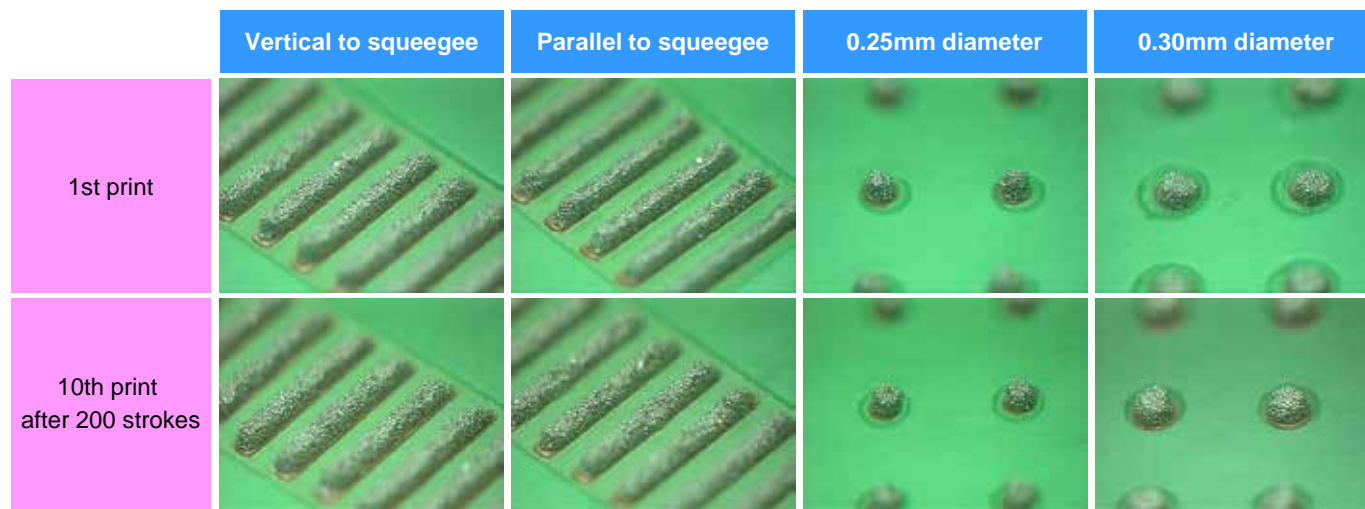
Print parameters

- Stencil : 0.12mm thickness, laser cut stencil
- Printer : Model MK-880SV Minami Kogaku
- Squeegee : Metal blade, Angle - 60°
- Print speed : **100 mm/sec**
- Stencil separation speed : 10.0 mm/sec
- Atmosphere : 24.5~27.0°C (50~60%RH)

Test patterns

- QFP pad pattern : Width 0.20 mm
Length 1.5 mm
Distance 0.2 mm
- MBGA pad pattern : 1) Diameter 0.25 mm
2) Diameter 0.30 mm

*Solder paste tested : S3X58-M650-3



Newly developed additives provide a lubricating effect that greatly improves the paste release properties and assures excellent print quality even with microBGA, 0603 and super fine pitch components.



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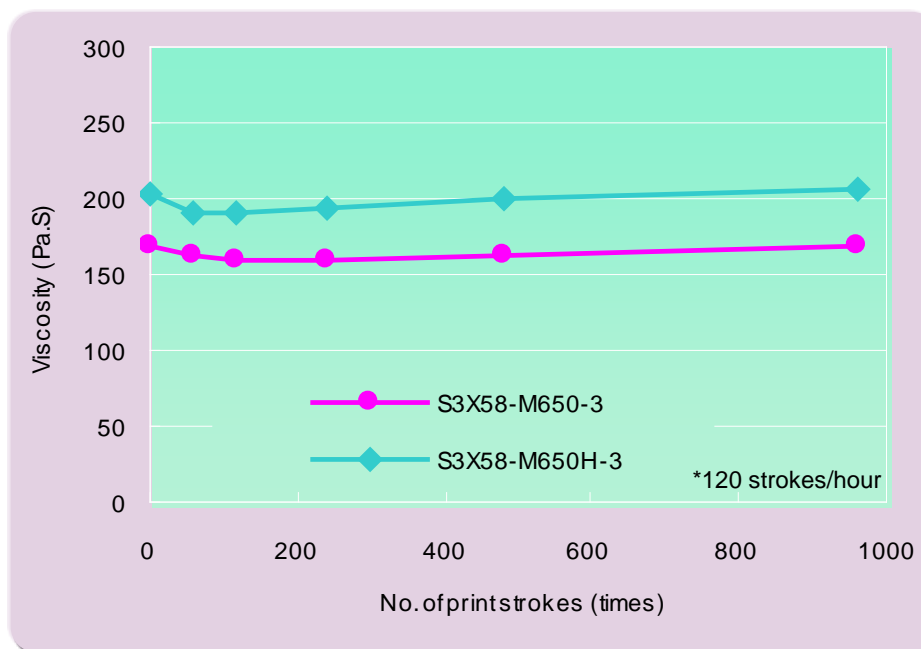
Surface insulation resistance

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Handling guide

Viscosity variation in continual printing

- Print (knead) solder paste on the sealed-up stencil continually up for 8 hours to observe viscosity variation.
- Squeegee : Metal blades
- Squeegee angle : 60°
- Squeegee speed : 30mm/sec.
- Print stroke : 300mm
- Printing environment : 25+/-1°C, 60+/-10%RH



A newly developed flux formula has succeeded to realize consistent long term printability by preventing excess viscosity drop due to shear thinning and excess increase due to chemical reaction between solder powder and flux during print rolling



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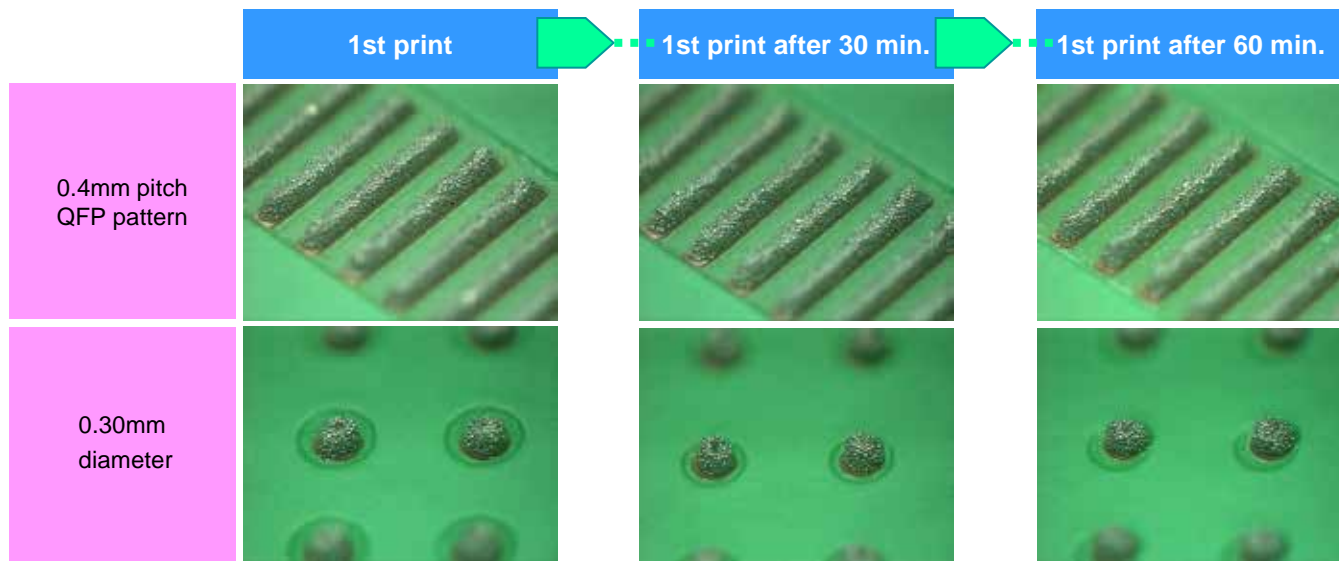
Voltage applied SIR

Handling guide

Intermittent printability (Stencil idle time)

- Print solder paste continuously and stop to idle the paste for 30, 60 min. intervals, and resume the printing and observe the 1st print result to verify intermittent printability.
- Squeegee : Metal blades
- Squeegee angle : 60°
- Squeegee speed : **100mm/sec.**
- Print stroke : 300mm
- Printing environment : 25+/-1°C, 60+/-10%RH
- Test pattern : QFP pad pattern - Width 0.20 mm Length 1.5 mm Distance 0.2 mm
MBGA pad pattern - Diameter 0.25 mm

*Solder paste tested : S3X58-M650-3



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



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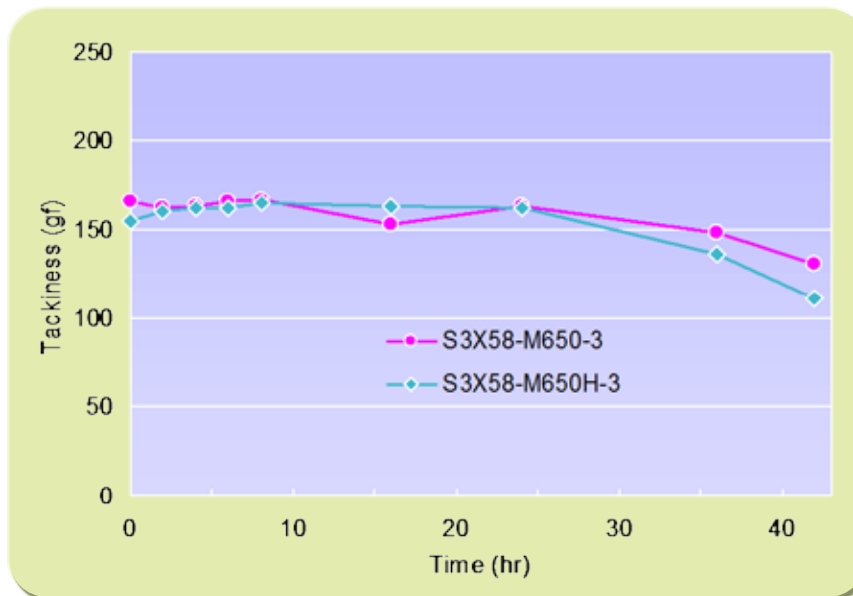
Surface insulation resistance

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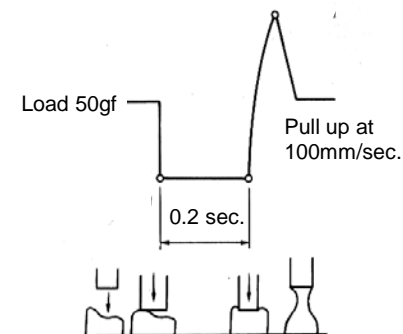
Handling guide

Tack time

- Stencil : 0.2mm thick, 0.6mm dia. aperture
- Measurement instrument : Malcom tackimeter FG-1
- Probe pressure : 50gs
- Pressurizing time : 0.2mm
- Pull speed : 10mm/sec.
- Test method : In accordance with JIS Z 3284



Tensile strength = Tack force



Unique solvent system has succeeded to extend tack time dramatically (>48 hours) helps widen process window significantly.



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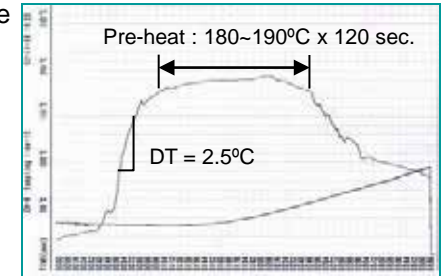
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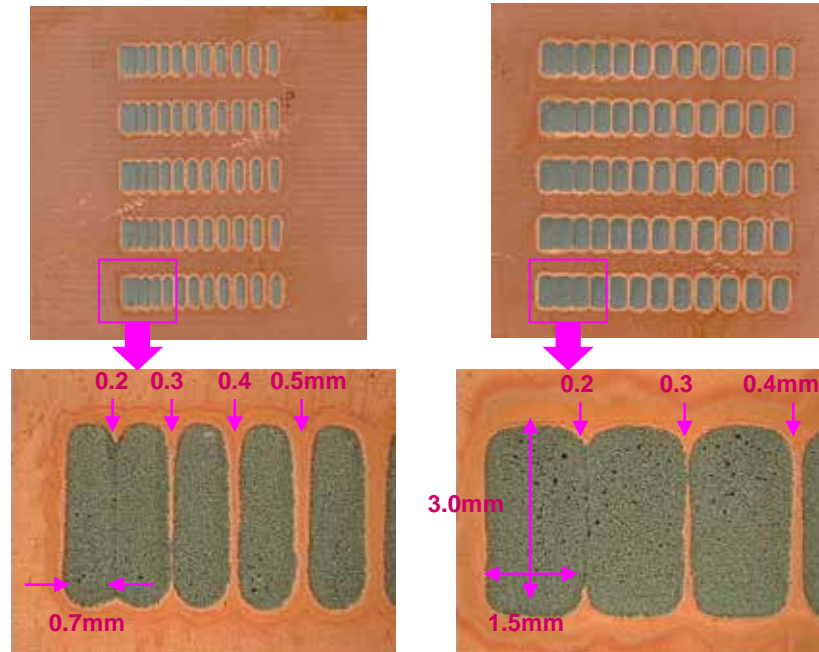
Heat slump

- Stencil : 0.2mm thick
- Stencil aperture : Pattern (1) 3.0mm x 0.7mm
Pattern (2) 3.0mm x 1.5mm,
- Spacing between apertures: 0.2mm to 1.2mm
- Heat profile : 190°C x 120 sec.
- Test method : In accordance with JIS Z 3284

Temperature profile



*Solder paste tested : S3X58-M650-3



Improved heat slump property assures reduced soldering defects, such as solder beading and bridging.



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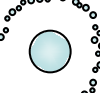
Surface insulation resistance

Voltage applied SIR

Handling guide

Solder balling (Residue cosmetics)

- Stencil : 0.2mm thick
- Stencil aperture : 6.5mm diameter
- Solder pot temperature : 250°C
- Test method : In accordance with JIS Z 3284
Knead the paste for 8 hours on sealed-up stencil and print it on alumina plate.
Melt it on hot plate after leaving it for a certain period of time at room temperature.

Category 1	2	3	4
			

*Solder paste tested : S3X58-M650-3

8-hour kneading + 1 hour after printing



8-hour kneading + 24-hour after printing



Almost no solder balling and resistant to ambient temperature and humidity.



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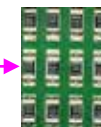
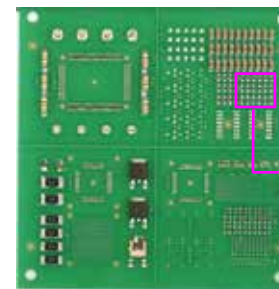
Handling guide

Solder beading

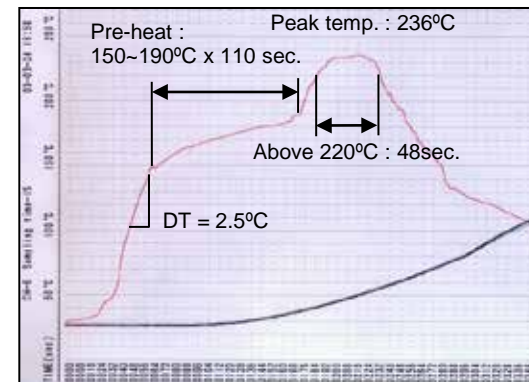
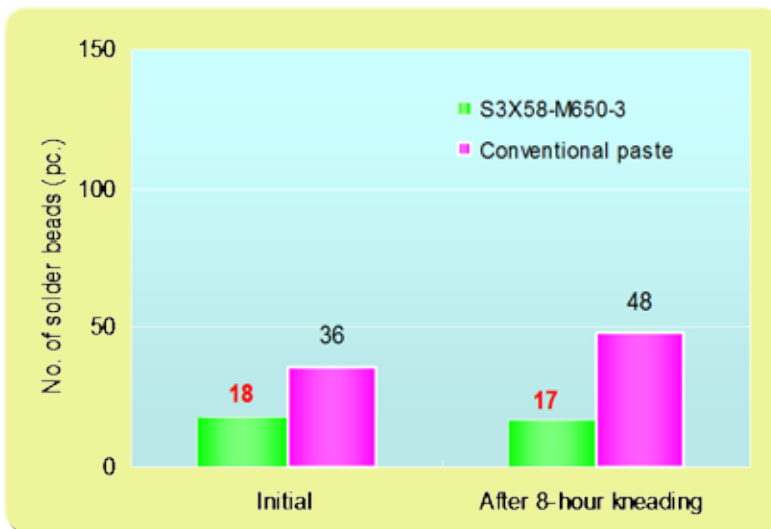
- Material : Glass epoxy FR-4
- Surface treatment : OSP
- Stencil thickness : 0.12mm (laser cut)
- Stencil aperture : 100% aperture opening to pad
**Fault finding design*
- Components
 - 2125 resistor : 30 pcs./board
 - Total : 30 chips/board × 5 boards = 150 components
- Heat source : Hot air convection
- Zone structure : 5 pre-heat zones +2 peak zones
- Atmosphere : Air



Test pattern (*Fault finding design)



2125 resistor



Reflow profile

*Solder paste tested : S3X58-M650-3

Largely reduces the generation of solder beads by the addition of resin fluidity suppressing effect at high temperature.



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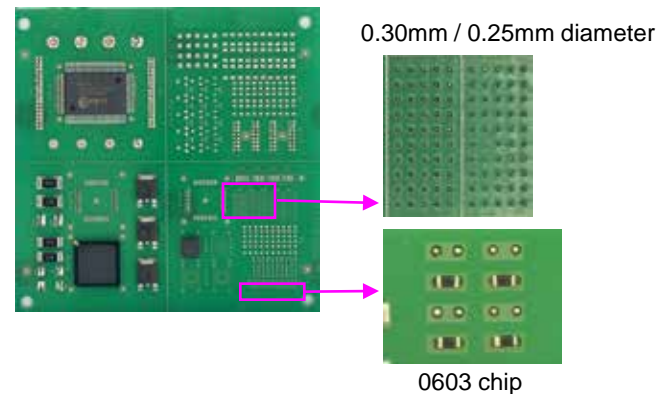
Voltage applied SIR

Handling guide

Super fine pattern wetting

- Material : Glass epoxy FR-4
- Surface treatment : OSP
- Stencil thickness : 0.12mm (laser cut)
- Pad size : 0.25, 0.30mm diameter, 0603 chip pattern
- 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 : Same as "Solder beading"

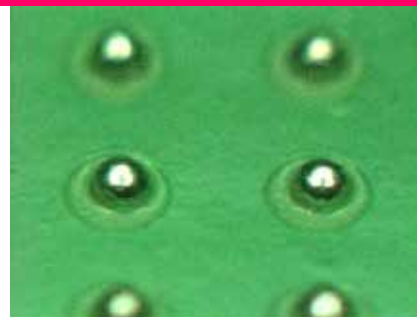
*Solder paste tested : S3X58-M650-3



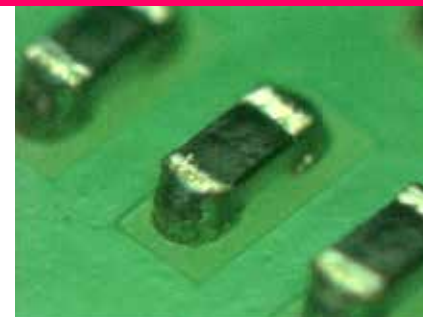
After 8-hour kneading on sealed-up stencil



0.30mm diameter



0.25mm diameter



0603 chip

Larger relative surface areas of solder paste exposed due to miniaturization of components (CSP, 0603 chips), often cause incomplete melting due to excess oxidation during the reflow.

An improved flux formula ensures complete coalescence by minimum deterioration of barrier performances .



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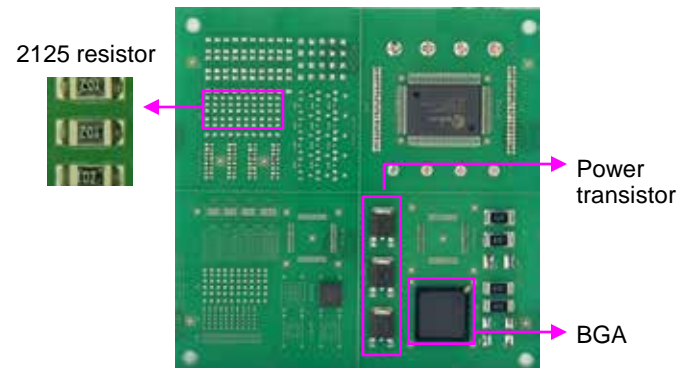
Surface insulation resistance

Voltage applied SIR

Handling guide

Voiding

- Material : Glass epoxy FR-4
- Surface treatment : OSP
- Stencil thickness : 0.12mm (laser cut)
- Stencil aperture : 100% aperture opening to pad
- Components
 - Power transistor : SnPb plated
 - 2125 resistor : 100% Sn plated
 - BGA : Sn3Ag0.5Cu solder balls, 1.0mm pitch
- Heat source : Hot air convection
- Zone structure : 5 pre-heat zones +2 peak zones
- Atmosphere : Air
- Reflow profile : Same as "Solder beading"



*Solder paste tested : S3X58-M650-3

	Power transistor (SnPb)	2125 chip (100Sn)	BGA (Sn3Ag0.5Cu)
Initial			
After 8-hour kneading on Sealed-up stencil			

Voiding with various components has been drastically reduced and offers consistently low voiding even after continual print for more than 8 hours.



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Solder spreading

- Material pieces : Copper plate (polished by #1500 abrasive paper)
- Stencil thickness : 0.2mm (laser cut)
- Stencil aperture : 6.5mm diameter
- Heat source & temp.: Hot plate-150°C for 60sec. + Solder bath 240+/-2°C for 5sec.
- Reflow profile : Same as "Solder beading"

Copper plate (polished)



Category 2

* Definition

Category 1 : Solder has spread more than the area where solder paste was printed.

Category 2 : Solder has spread whole area where solder paste was printed.

Category 3 : Solder has partially spread.

Category 4 : Solder spread is less than the area where solder paste was printed.

Good spreading



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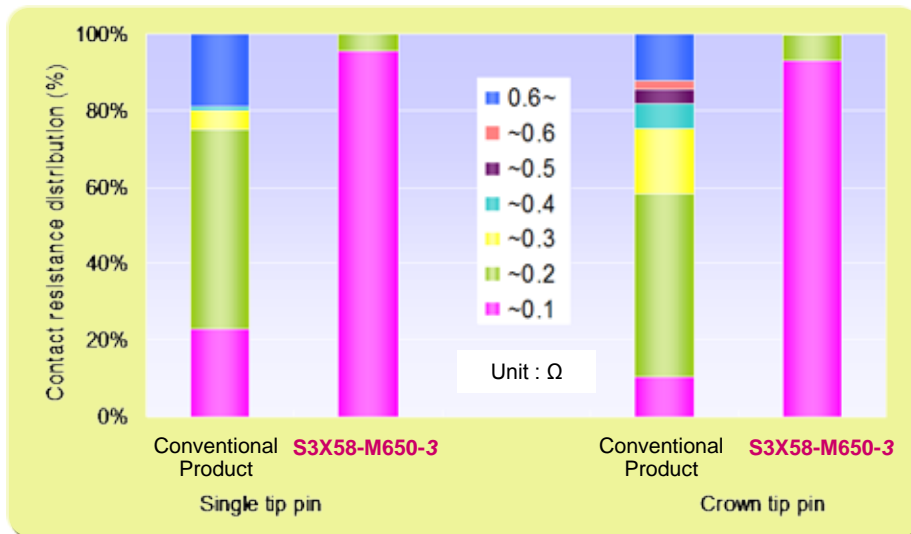
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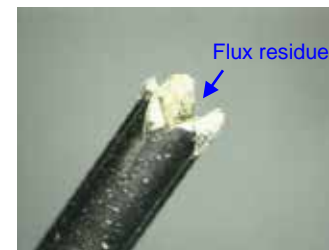
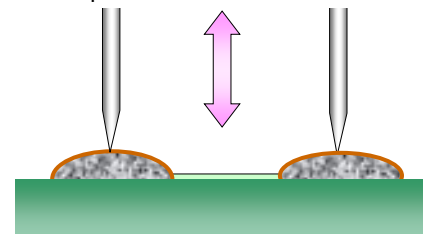
Reflow the test board, which is provided with a number of conductive twin pads as shown below, by printing the sample solder paste and measure contact resistance by a couple of ICT probe.

- Number of testing point : 1428 points (Single tip pin; 1.5~2.5mm dia. pads)
816 points (Multi-tip pin; 2.0~2.5mm dia. pads)
- Pad diameter : 1.5mm dia. × 612 points
2.0mm dia. × 612 point
2.5mm dia. × 204 points
- Contact resistant measurement : by Digital multi-meter
- Contact pressure : 150g



*Solder paste tested : S3X58-M650-3

Test pins



Conventional product



S3X58-M650-3

A special formula resin leaves waxy soft flux residue, which has no cracking and minimum sticking to the probes, ensure high testing yield and lower cleaning frequency.



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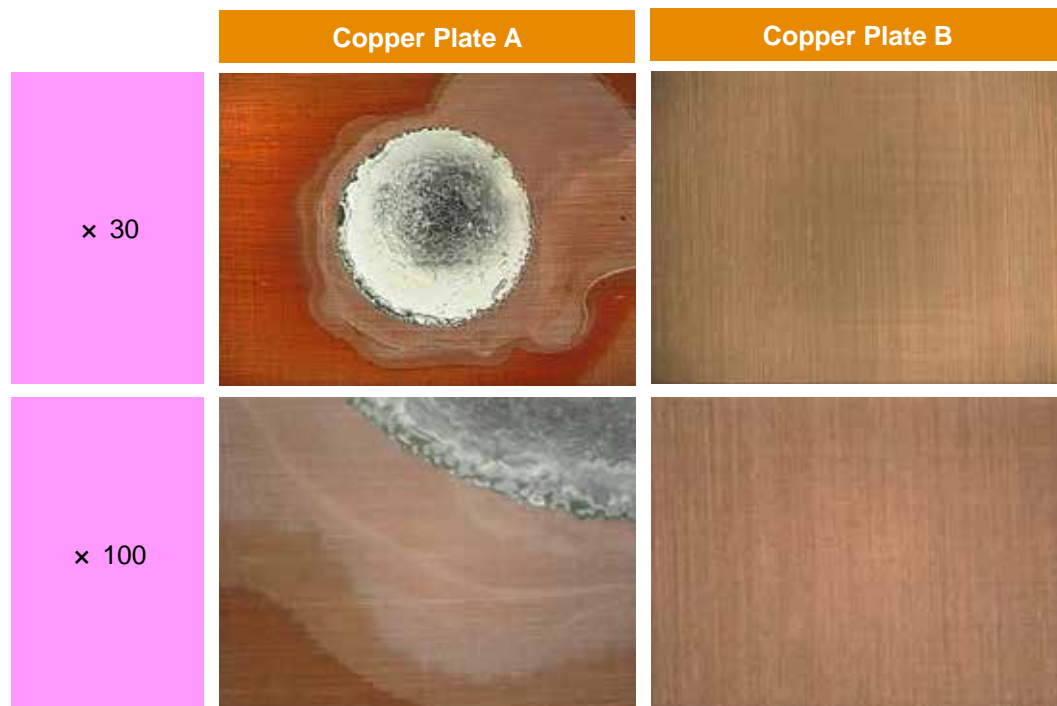
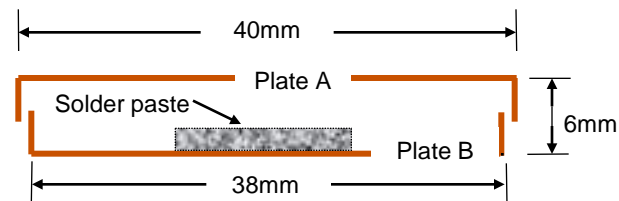
Voltage applied SIR

Handling guide

Copper corrosion

- Test conditions : $40 \pm 2^{\circ}\text{C}$ 90~95%RH for 72 hours
- Test method : JIS Z 3197

*Solder paste tested : S3X58-M650-3



No evidence of corrosion can be observed.



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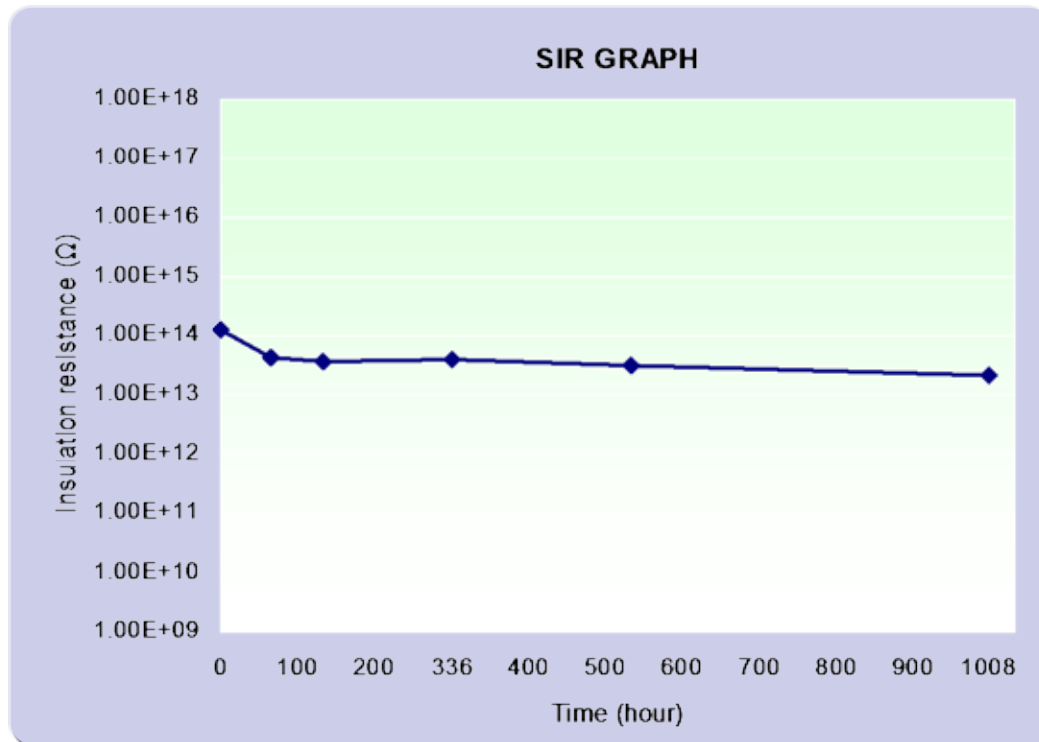
Voltage applied SIR

Handling guide

Surface insulation resistance

- Test conditions : 85 ± 2°C 85%RH for 1008 hours
- Stencil thickness : 100 µm
- Comb type electrode : JIS type-II
- Measurement voltage : DC100V
- Test method : JIS Z 3197

*Solder paste tested : S3X58-M650-3



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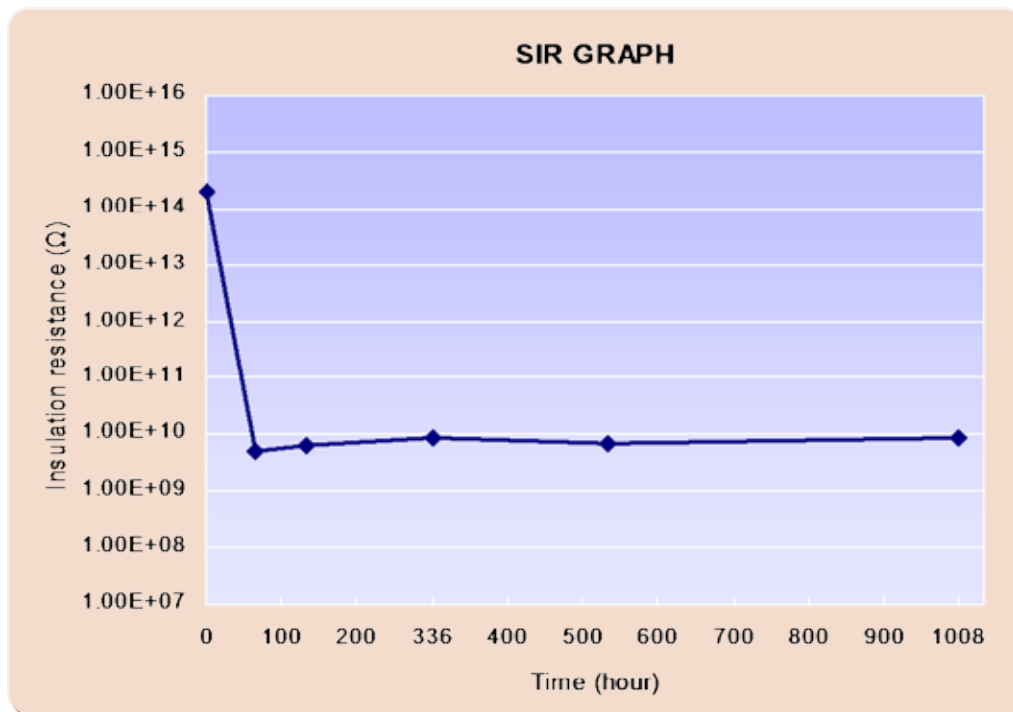
Voltage applied SIR

Handling guide

Voltage applied surface insulation resistance

- Test conditions : 85 ± 2°C 85%RH for 1008 hours
- Stencil thickness : 100 µm
- Comb type electrode : JIS type-II
- Measurement voltage : DC100V
- Voltage applied : DC50V
- Test method : JIS Z 3197

*Solder paste tested : S3X58-M650-3



No evidence of electromigration can be observed.



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1. Printing

1) Recommended printing parameters

(1) Squeegee

1. Kind : Flat
2. Material : Rubber or metal blade
3. Angle : 60~70°(rubber) or metal blade
4. Pressure : Lowest
5. Squeegee speed

S3X58-M650-3 : 30~100mm/sec.

S3X58-M650H-3 : 10~70mm/sec.

(2) Stencil

1. Thickness : 200~120mm for 0.65~0.4mm pitch pattern
2. Type : Laser or electroform
3. Separation speed : 0.5~10 mm/sec.
4. Snap-off distance : 0~0.5mm

(3) Ambiance

1. Temperature : 24 ± 3°C
2. Humidity : 40~60%RH
3. Air draft : Air draft in the printer badly affects stencil life and tack performance of solder pastes.

2. Shelf life

- 1) 0 ~ 10°C : 6 months from manufacturing date
- 2) At 20~30°C : 1 month from manufacturing date

* Manufacturing date can be obtained from the lot number

ex. Lot No. 4 07 21 2

No. of lot : 2nd
 Date : 21st
 Month : July
 Year : 2004



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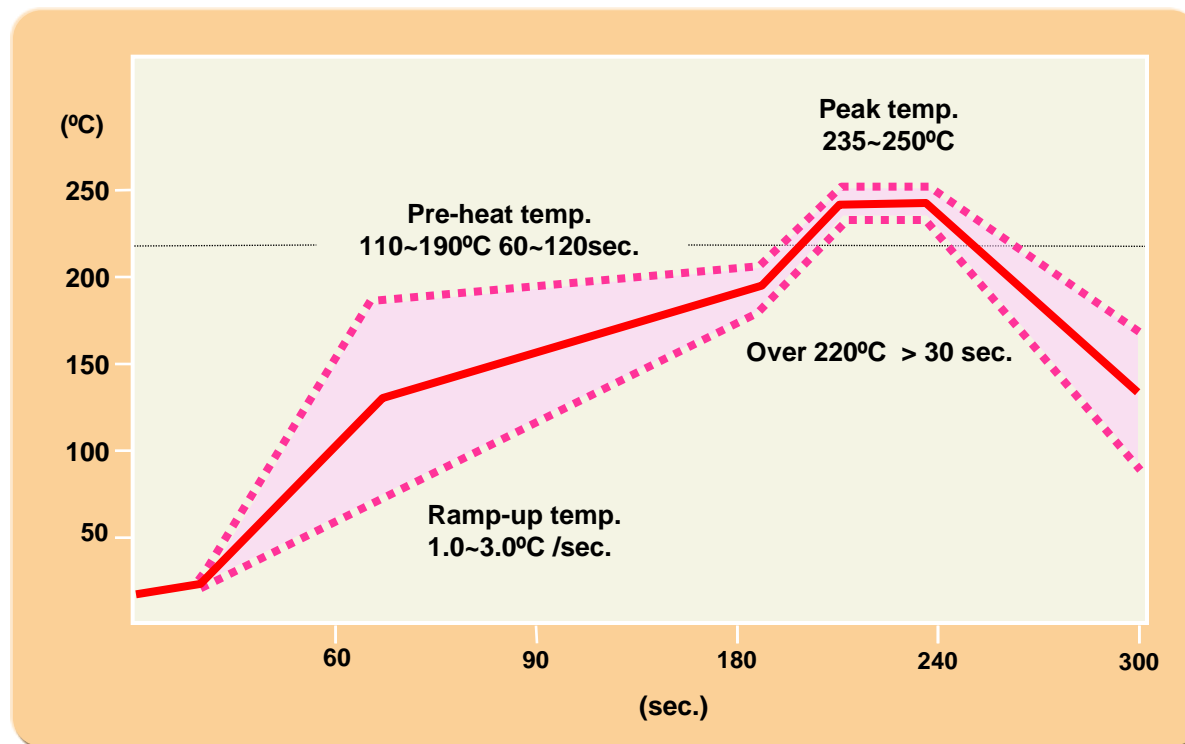
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Handling guide - Recommended reflow profile



Excess pre-heating (time & temperature) may cause too much oxidation.

Relatively short and low pre-heat may be recommendable, especially for fine pitch/micro pattern components.

