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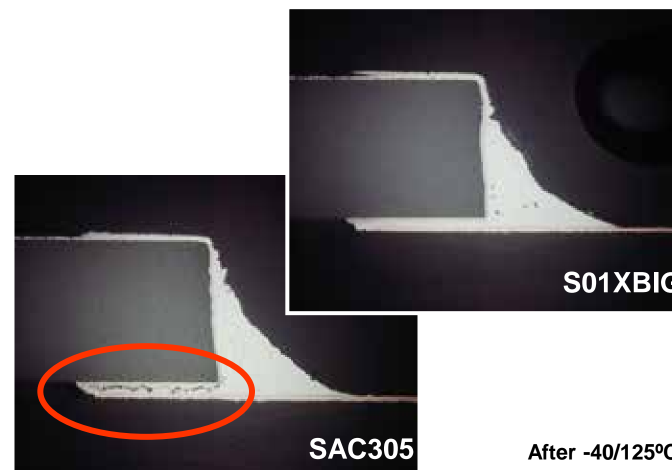
Koki no-clean LEAD FREE solder paste

High-reliability Low Ag Lead Free Solder Paste

S01XBIG58-M500-4

Product information



After -40/125ºC, 1000 cycles

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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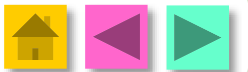

Product features

- Solder alloy composition is Sn 0.1Ag 0.7Cu 1.6Bi +Ni.
- HIGH RELIABILITY Low-Ag Alloy compared with conventional low-Ag alloys
- PERFECT MELTING and wetting at super fine pitch micro components (>0.25mm dia. CSP, 0603 chip).
- Stable viscosity performance due to prevention with chemical reaction between solder powder and flux.
- Low solidus point (211ºC) may allow to apply the CONVENTIONAL reflow profile for SAC305.
- Conforms to HALOGEN FREE standard (Cl+Br = Less than 1500ppm) BS EN14582.

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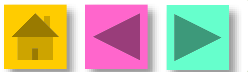

Specifications

Application		Printing - Stencil
Product		**S01XBIG58-M500-4**
Alloy	Alloy Composition (%)	**Sn 0.1Ag 0.7Cu 1.6Bi +Ni**
	Melting point (ºC)	211 - 227
	Shape	Spherical
	Particle size (µm)	20 - 38
Flux	Halide Content (%)	0
	Flux Type	ROL0*3
Product	Flux Content (%)	11.2 ±1.0
	Viscosity*1 (Pa.s)	220 ± 30
	Copper plate corrosion*2	Passed
	Tack Time	> 24 hours
	Shelf Life (0-10ºC)	6 months
	Optional powder size (µm)	20 ~ 45: S01XBIG48-M500-4

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

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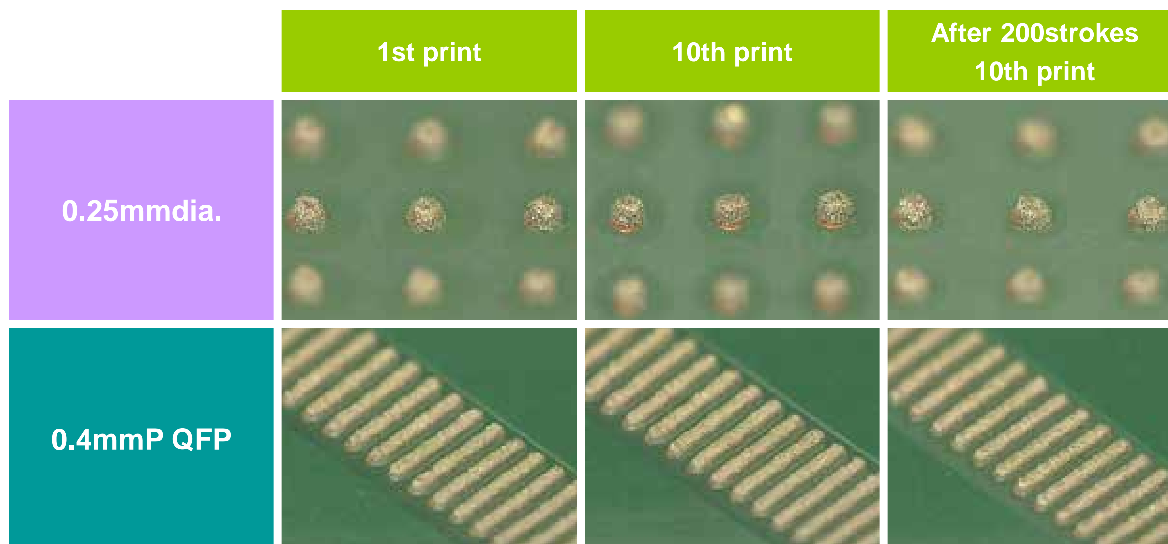
Continual printability

Test condition

- Stencil : 0.12mm thickness, laser cut stencil
- Printer : Model YVP-Xg YAMAHA Motor
- Squeegee : Metal blade, Angle - 60º
- Print speed : 40 mm/sec
- Atmosphere : 24-26ºC (50-60%RH)
- Test pattern : 0.25 mm dia., 0.4mmP QFP pattern



Consistent and quality printability over the continual prints.

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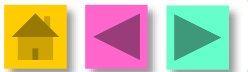
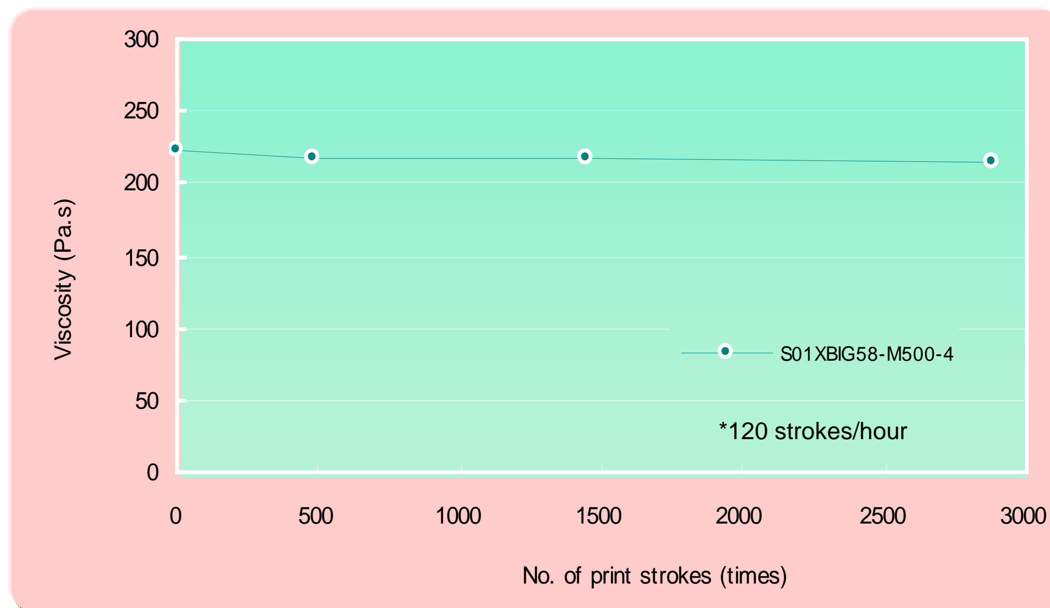


Viscosity variation

Test condition

Print (knead) solder paste on the sealed-up stencil continually up for 24 hours to observe viscosity variation.

- Squeegee : Metal blade, Angle - 60º
- Squeegee speed : 30mm/sec.
- Print stroke : 300mm
- Printing environment : 24-26ºC, 40-60%RH



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

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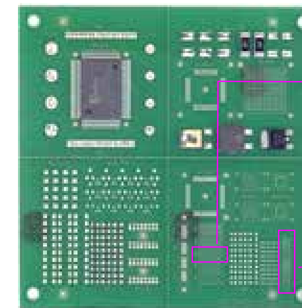
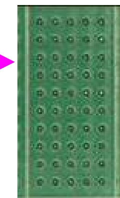
Super fine pattern wetting

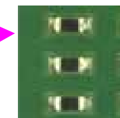
Test condition

- Material : Glass epoxy FR-4
- Surface treatment : OSP, NiAu
- Stencil thickness : 0.12mm (laser cut)
- Pad size : 0.25mm dia.
- Component: 0603R (0201) chip, 100%Sn
- Stencil aperture : 100% aperture opening to pad
- Heat source : Hot air convection
- Atmosphere : Air
- Reflow profile : See below

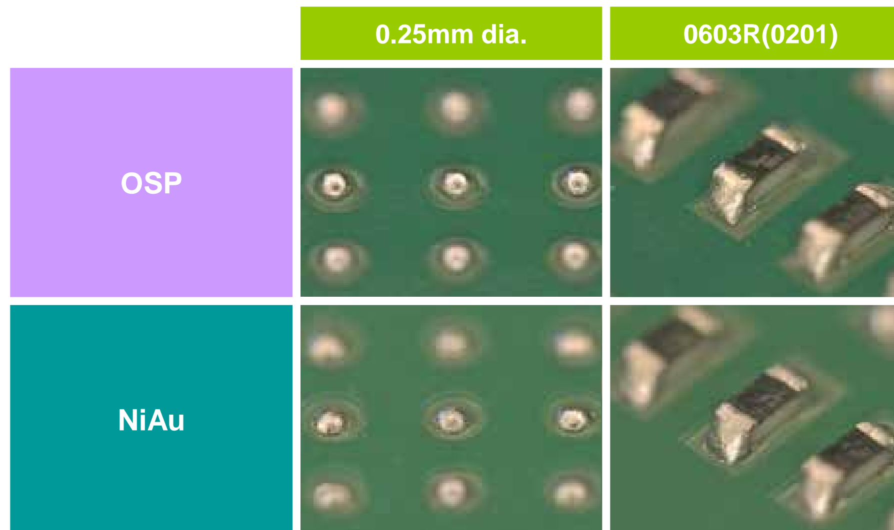


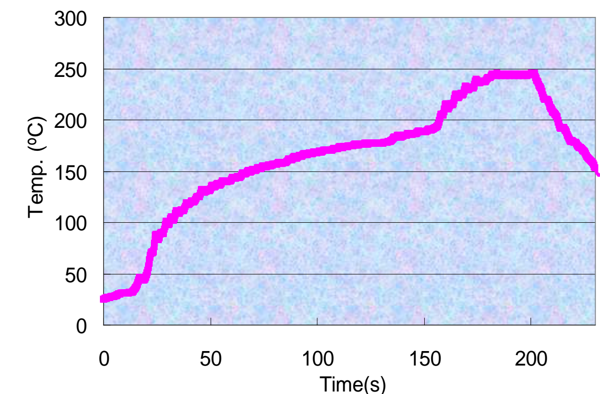
0.25mm dia.



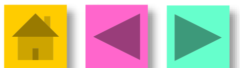


0603R(0201) chip





Larger relative surface areas of solder paste exposed due to miniaturization of components (CSP, 0603 chips), often causes incomplete coalescence of the solder due to excessive oxidation during the reflow. An improved flux formula ensures complete coalescence by minimum deterioration of barrier performances .



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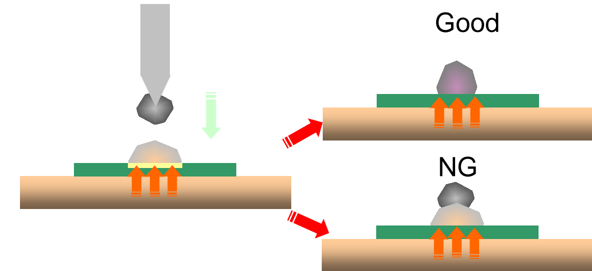
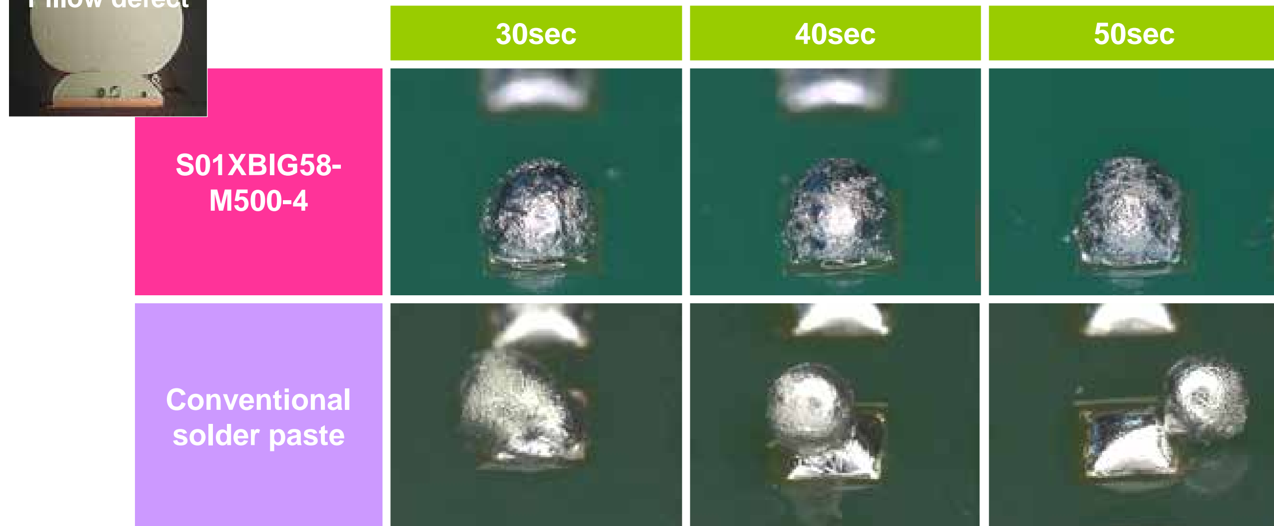
Anti-pillow test

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 area
- 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.



M500-4 retained the activation even up to 50sec. and allowed the complete merger of the solder bump with the molten solder, while the conventional solder paste resulted in the partial merger only 30sec. after the solder paste has melted. The results demonstrates that M500-4 shall effectively prevent the occurrence of head-in-pillow defect.

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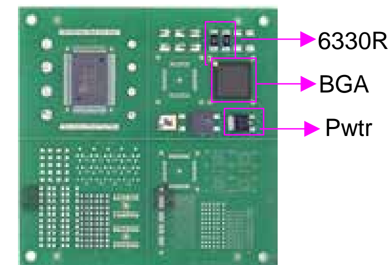
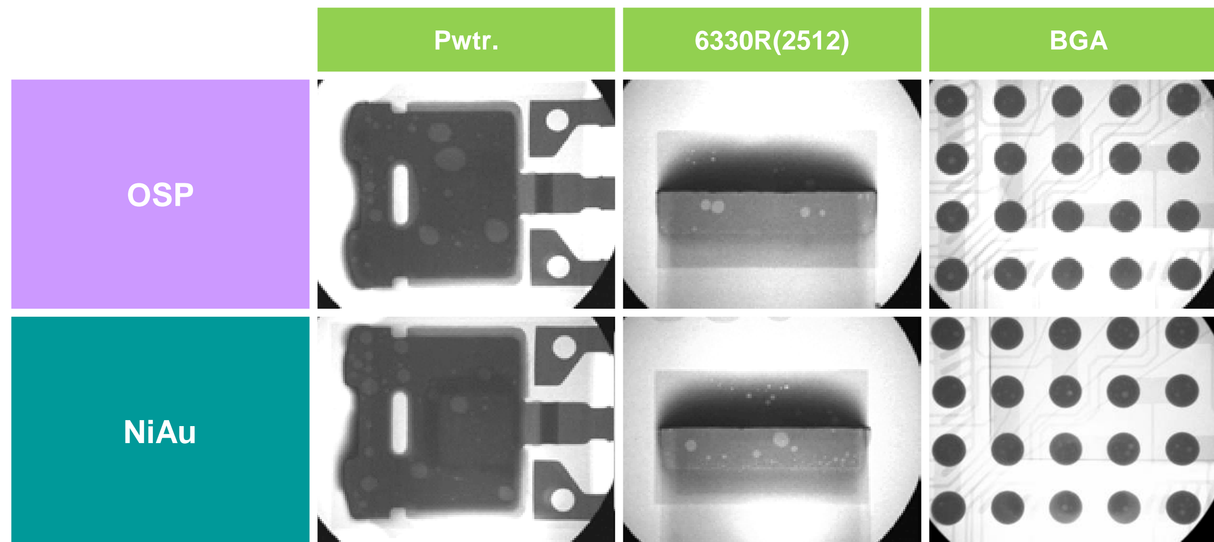
Voiding

Test condition

- Material : Glass epoxy FR-4
- Surface treatment : OSP, NiAu
- Stencil thickness : 0.12mm (laser cut)
- Stencil aperture : 100% aperture opening to pad area
- Components: Pwtr, 6330R(2512) -100% Sn
  BGA ball - SAC305
- Heat source : Hot air convection
- Atmosphere : Air
- Reflow profile : Same as *"Super fine pattern wetting"*





M500-4 ensures low voiding regardless of the type and size of the components.

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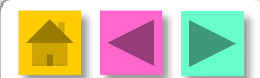

Halogen contents

Test condition

* BS EN14582

Elements	Results
F	Not detected
Cl	Not detected
Br	Not detected

Halogen contents (ppm)

Conforms to Halogen-free standard (Cl+Br: less than 1500ppm) BS EN14582.

eco+PLUS
Lead Free SOLUTIONS you can TRUST

S01XBIG58-M500-4

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Other properties

Item	Result	Method
Tack time	> 24 hours	JIS Z 3284
Heat slump	0.3mm pass	JIS Z 3284
Solder balling	< Category 3	JIS Z 3284
Copper mirror corrosion	Type L	IPC J-STD-004A
Copper plate corrosion	Pass	IPC J-STD-004A JIS Z 3284
Voltage applied SIR	> 1E+9	IPC J-STD-004A JIS Z 3284

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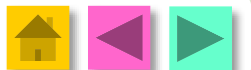
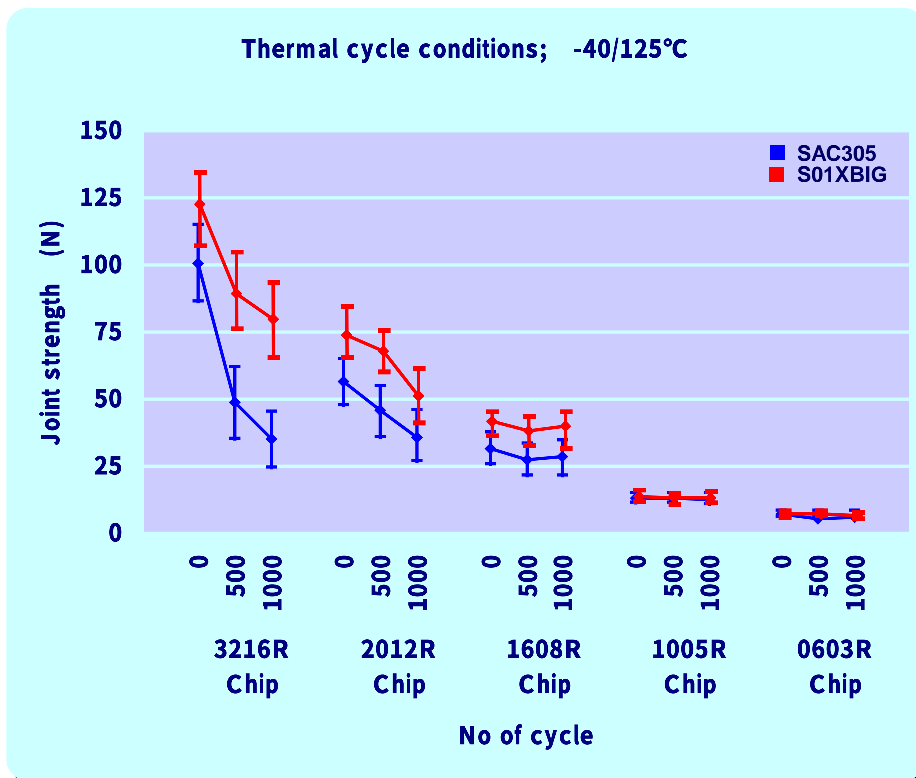
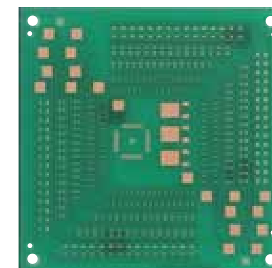


Thermal cycling test; Share strength

- Thermal cycling conditions : -40/+125ºC, 60min./cycle x 1000cycles
- Testing machine : SEISIN SS30WD



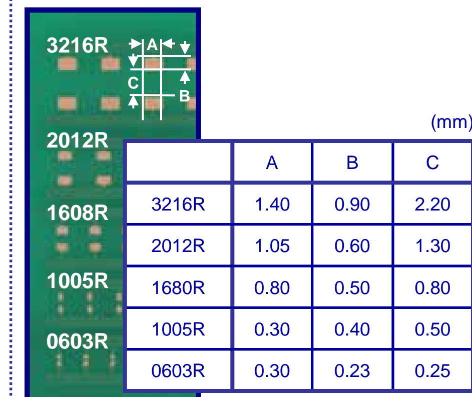
Test board & components



- 3216R (30pcs)
- 2012R (30pcs)
- 1608R (30pcs)
- 1005R (30pcs)
- 0603R (30pcs)

PCB: FR4
Surface finish: OSP
Cu thickness : 18μm
PCB thickness : 1.6mm

Pad size



(mm)

	A	B	C
3216R	1.40	0.90	2.20
2012R	1.05	0.60	1.30
1680R	0.80	0.50	0.80
1005R	0.30	0.40	0.50
0603R	0.30	0.23	0.25

S01XBIG solder alloy exhibits higher shear strength than SAC305, especially with relative large components due to solid solution effect of Bi containing alloy.

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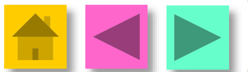
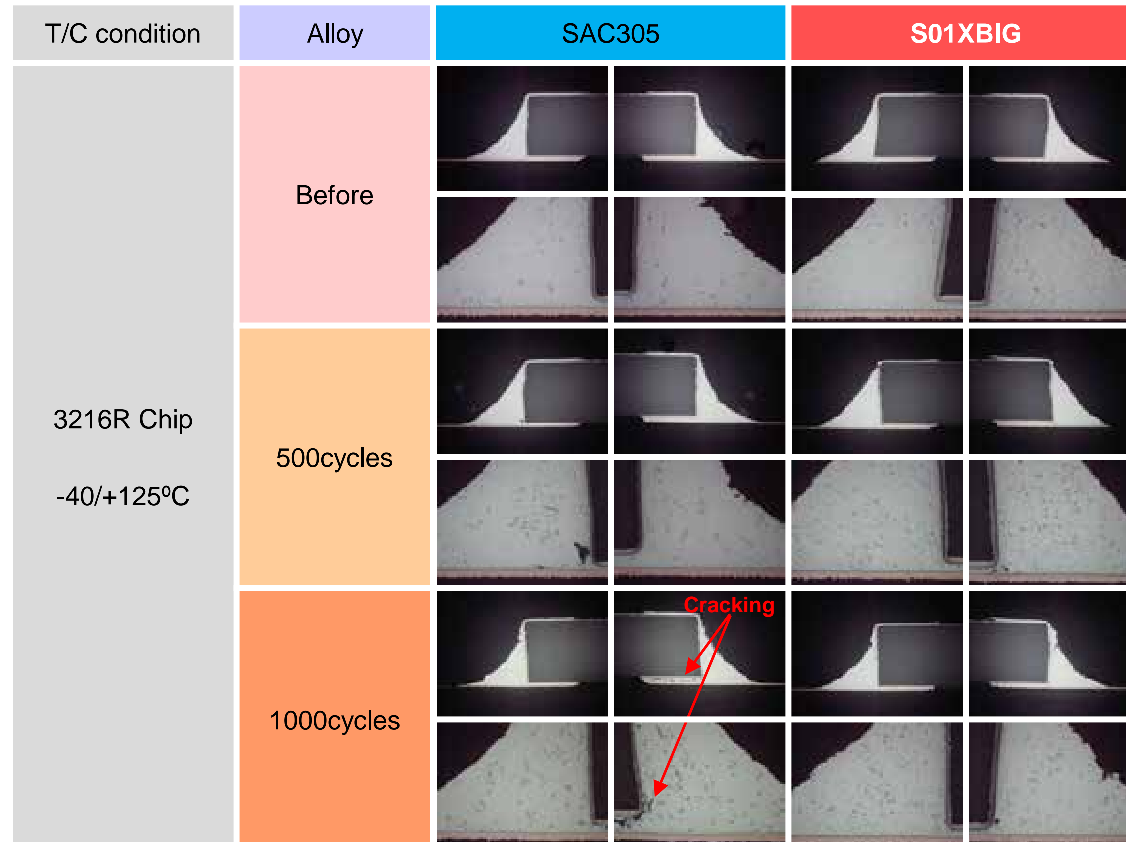


Thermal cycling test; Cross-sectional observation



T/C condition	Alloy	SAC305	S01XBIG
3216R Chip -40/+125ºC	Before		
	500cycles		
	1000cycles	Cracking	

No cracking or rupture occurred in the solder fillets formed by S01XBIG, while SAC305 solder fillets show some cracking after 1000 cycles.

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1. Printing

1) Recommended printing parameters

(1) Squeegee

1. Kind	:	Flat
2. Material	:	Rubber or metal blade
3. Angle	:	60º (rubber) or metal blade
4. Pressure	:	Lowest
5. Squeegee speed	:	20~100mm/sec.

(2) Stencil

1. Thickness	:	150~100㎛ 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 draft	:	Air draft 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. 4 02 04 2**

- **2 → No. of lot : 2nd**
- **04 → Date : 4th**
- **02 → Month : Feb**
- **4 → Year : 2014**

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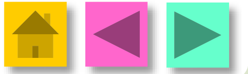

Handling guide – Recommended reflow profile

(ºC)

Y axis (ºC)
250
227
200
150
100
50
0

Peak temp.
235~250ºC

Pre-heat temp.
150~190ºC 60~100sec.

Over 227ºC >30 sec.

Ramp-up temp.
1.0~3.0ºC/sec.

Pre-heat conditions
Target : 150~180ºC 100sec
Upper limit: 180~190ºC 100sec
Lower limit: 150~175ºC 60sec

60 120 180 240
(sec.)

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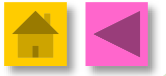

Handling guide – Recommended reflow profile

(ºC)

250

200

150

100

50

0

60 120 180 240

(sec.)

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.