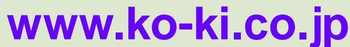

#52007
Revised on Nov.27, 2014

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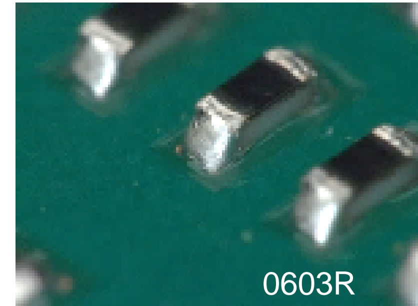
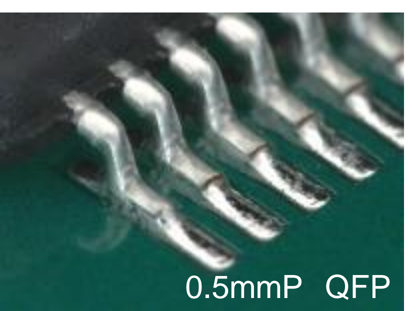
Koki no-clean LEAD FREE solder paste

High Reliability Lead Free Solder Paste

S3X58-M500-4

Technical Information





This product information contains product performance assessed based on our own test procedures. Product performance may be different according to the handling at the end-users. Please conduct through investigation to determine optimal process condition before mass production application

KOKI
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Features

- Alloy Composition: Sn 3.0Ag 0.5Cu
- Superior meltability allows lower solder volume to melt perfectly with thin stencil thickness (80µm)
- Low voids and anti-Head-in-Pillow formulation
- Complies with Halogen Free requirements (Br+Cl: <1500ppm; test method BS EN14582)

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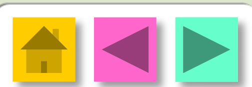
Specifications

Product for		Printing
Product Name		S3X58-M500-4
Alloy	Alloy Composition (%)	**Sn 3.0Ag 0.5Cu**
	Melt Point (ºC)	217~219
	Powder Shape	Sphere
	Grain Size (um)	20 – 38
Flux	Halide Content (%)	0
	Flux Type*1	ROL0
Solder Paste	Flux Content (%)	11.5±1.0
	Viscosity*2 (Pa.s)	220±30
	Copper Plate Corrosion*3	Passed
	Tack Time	> 48 hours
	Shelf Life (10ºC)	6 months

*1. Flux Type: per IPC J-STD-004A
*2. Viscosity: measured with PCU-205 (Malcom), at 25ºC-10rpm
*3. Copper Plate Corrosion: per IPC-TM-650 2.6.15



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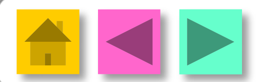
Continuous Printability

Test condition:

- Stencil Thickness: 0.12mm (Laser)
- Printer: Model YVP-Xg YAMAHA Motor
- Squeegee: Metal Squeegee (Squeegee angle - 60º)
- Print Speed: 40 mm/sec
- Print Condition: 24~26ºC (50~60%RH)
- Print Test Pattern: 0.25 mm dia. CSP, 0.4mmP QFP

	Original	10th Print	10th print after 200 strokes
0.25mm dia. CSP			
0.4mmP QFP			

Even after 200 strokes, it can be seen that the solder paste is holding the shape for both circular and rectangular pads.



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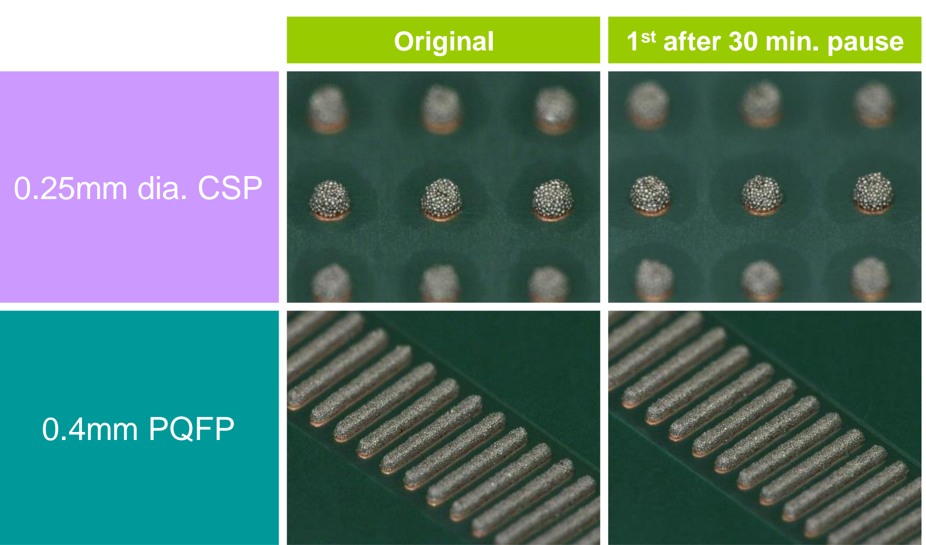
Intermittent Printability

Stop printing for 30 minutes, then resume printing. Verify the printed solder shape of 1st resumed result.

Test condition:

- Stencil Thickness: 0.12mm (Laser)
- Squeegee: Metal Squeegee (Squeegee angle - 60º)
- Print Speed: 40mm/sec.
- Print Condition: 24~26ºC, 40~60%RH
- Print Test Pattern: 0.25 mm dia. CSP, 0.4mmP QFP



Even after pausing for 30 minutes, the solder paste is printing as good as the first print without any stencil clogging.

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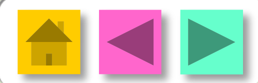
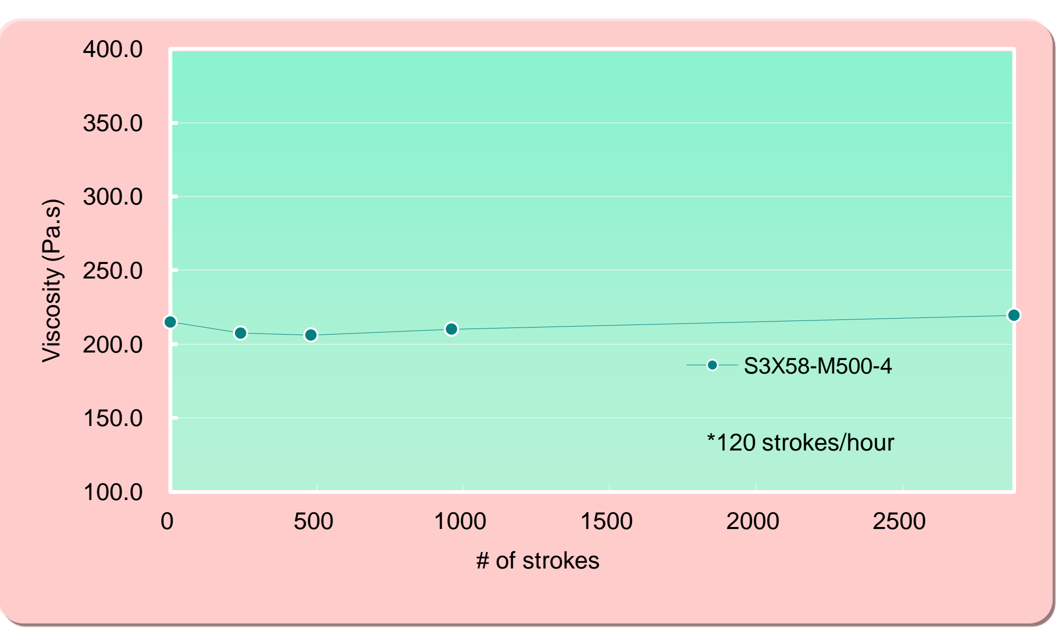


Viscosity Change

Measure the viscosity of the solder paste after continuously rolled on the masked metal stencil.

Test condition:

- Squeegee: Metal squeegee (Squeegee angle - 60º)
- Squeegee Speed: 30mm/sec.
- Squeegee travel distance: 300mm
- Test Condition: 24~26 ºC, 40~60%RH



By suppressing reaction between solder powder and flux, viscosity change due to continual printing is prevented.

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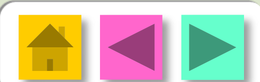
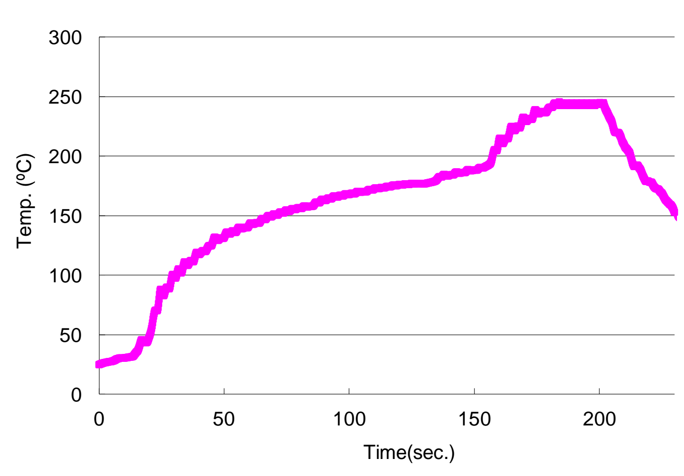


Solder Meltability

Evaluation-1: Surface Finish

Test condition:

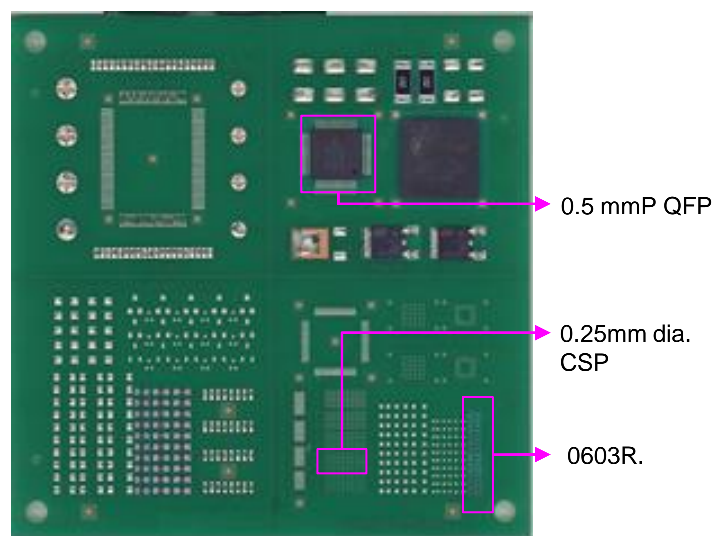
- PCB: Glass epoxy FR-4
- Surface Finish: OSP, Ni-Au, Sn
- Stencil Thickness: 0.12mm (Laser)
- Evaluation Pads: 0.25mm dia. CSP, 0.5mmP QFP (Sn plated) 0603R (Sn plating)
- Aperture: 100%
- Reflow Oven: Hot Air Reflow
- Reflow Atmosphere: Air Atmosphere
- Reflow Profile: See the chart below・



Evaluation-2: Stencil Thickness

Test condition:

- PCB: Glass epoxy FR-4
- Surface Finish: OSP
- Stencil Thickness: 0.12mm ,0.10mm, 0.08mm (Laser)
- Evaluation Pads: 0.25mm dia. CSP, 0603R (Sn plated)
- Aperture: 100%
- Reflow oven: Hot Air Reflow
- Reflow Atmosphere: Air Atmosphere
- Reflow Profile: See the chart to the left



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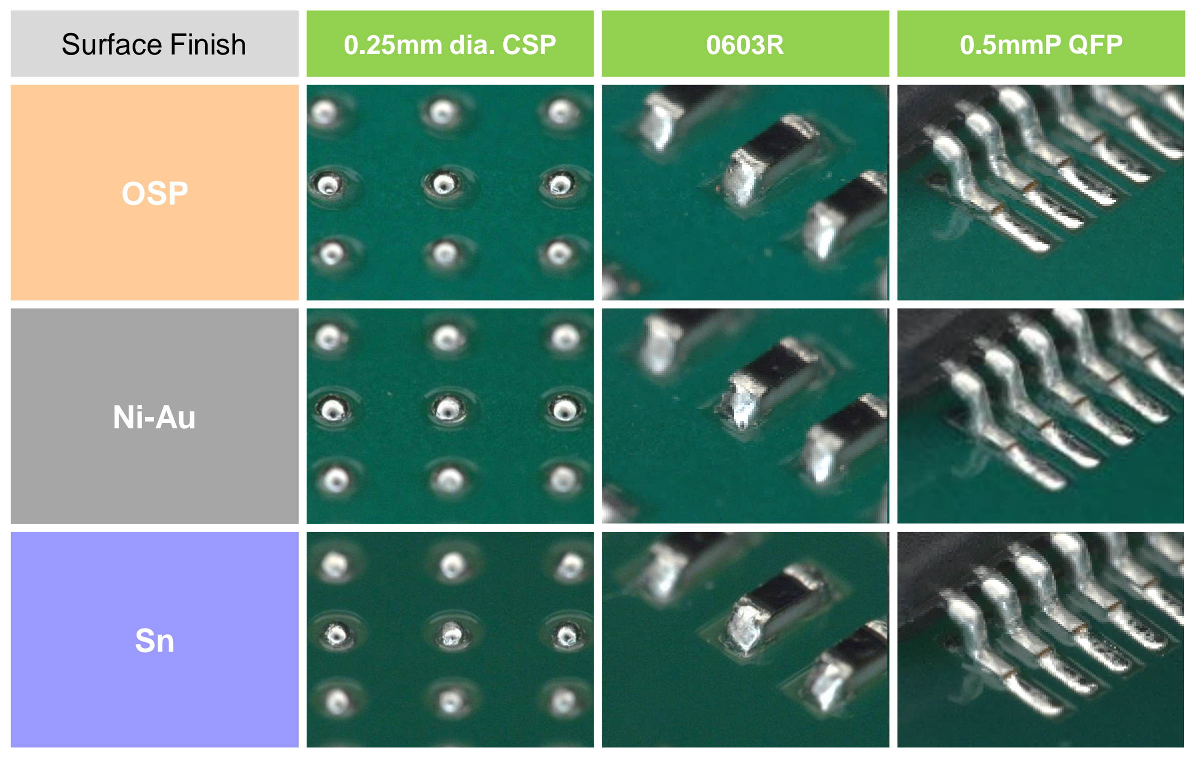
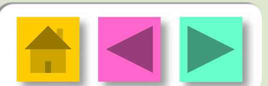
Meltability Evaluation-1: Surface Finish



The paste shows good wetting on different under bump metallurgies (UBM) with different components



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Meltability Evaluation-2: Stencil Thickness

Stencil Thickness	S3X58-M500-4		Conventional Product	
	0.25mm dia. CSP	0603R	0.25mm dia. CSP	0603R
0.12mm				
0.10mm				
0.08mm				

Even with low solder volumes, perfect solder joints are formed owing to newer flux formula used as compared with the conventional Type-4 SAC305 paste.

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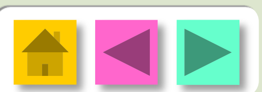
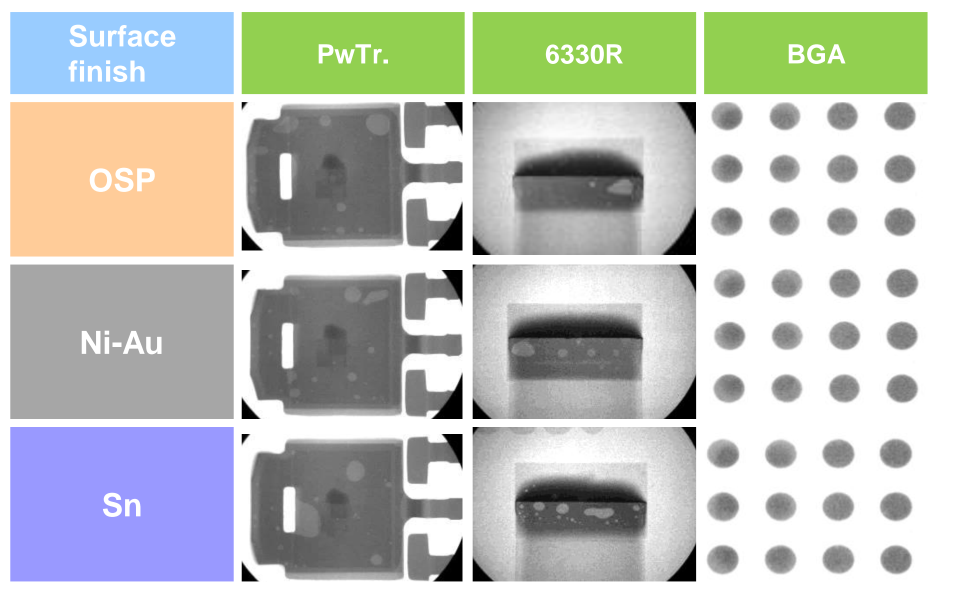


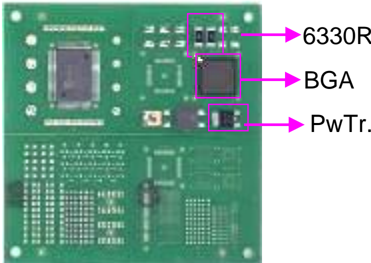
Void Property

Test condition:

- PCB: Glass epoxy FR-4
- Surface Finish: OSP・Ni-Au・Sn
- Stencil Thickness: 0.12mm (Laser)
- Evaluation Pads: Pwtr, 6330R (Sn plating)
  BGA ball - SAC305

- Aperture: 100%
- Reflow Oven: Hot air oven
- Reflow Atmosphere: Air Atmosphere
- Reflow Profile: Same as Solder meltability test condition・





Regardless of the surface finish, S3X58-M500-4 shows consistently low voids on various component types.

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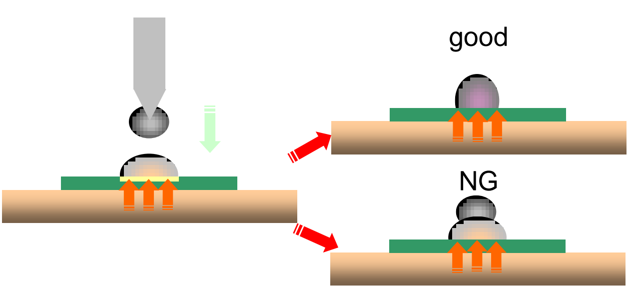
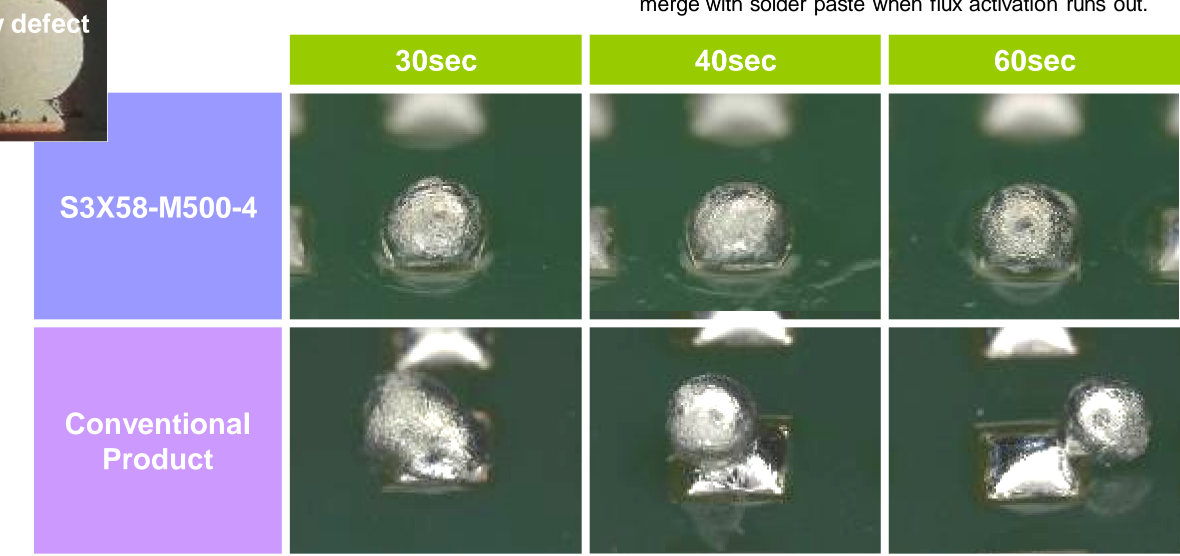
Head-in-Pillow Resistance

Test method

- Test PCB: FR-4
- Surface Finish: OSP
- Metal Stencil Thickness: 0.12mm (Laser)
- Test Pad Size: 0.8 x 0.8mm
- Loaded Balls: 0.76mm ball of SAC305
- Heating Method: Solder bath at 275ºC
- Loading : 10sec.



Drop solder ball on molten solder every 10 seconds. Ball will not merge with solder paste when flux activation runs out.



M500-4 behaves longer flux activation at higher temperatures maintaining high head-in-pillow resistance compared to conventional product.

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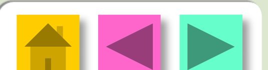

Halogen Content

Test method: BS EN14582

Measured Element	Result
F	Not Detected
Cl	Not Detected
Br	Not Detected

Halogen Content (ppm)

M500-4 meets Halogen Free requirements (Br+Cl= below 1500ppm). Tested in accordance with BS EN14582.

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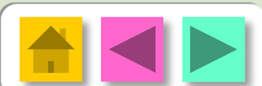
Item	Result	Specification
Tack Time	> 48 hours	JIS Z 3284-3
Slump Property	0.3mm, pass	JIS Z 3284-3
Solder Ball	< Category 3	JIS Z 3284-4
Copper Mirror Corrosion	Type L	IPC-TM-650-2.3.32
Copper Plate Corrosion	Pass	IPC-TM-650-2.6.15
SIR Test	>1E+9	IPC-TM-650-2.6.14.1



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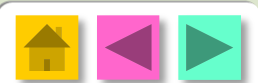


Handling Guide

1. Printing

1) Recommended Printing Condition

(1) Squeegee

1. Shape : Flat
2. Material : Polyurethane or metal blade
3. Angle : 60º
4. Print Pressure : Relatively low
5. Print Speed : 20~100mm/sec.

(2) Stencil

1. Thickness : 150~80µm when pitch is 0.65~0.4mm
2. Manufacturing Method : Laser or Additive
3. Stencil release speed : 7.0~10.0mm/sec.
4. Clearance : 0mm

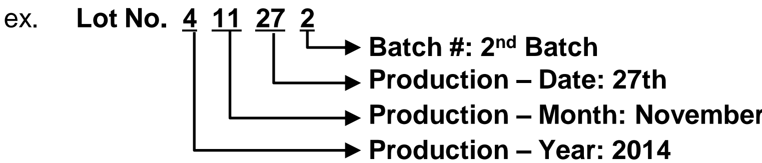
(3) Process Environment

1. Temperature : 23~27ºC
2. Humidity : 40~60%RH
3. Air Conditioning : Air draft in the printer dries up solder paste faster and deteriorates performance of the solder paste. Control the air flow by using a shield or other method.

2. Shelf Life

0~10ºC : 6 months after production date

* How to interpret Lot Number



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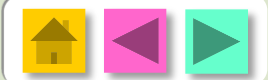
Handling Guide – Recommended Reflow Profile



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Handling Guide – Supplement on Recommended Reflow Profile

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

Low peak temperature or short time above liquidus temperature inhibits void release. In case of high void ratio, raise peak temperature or extend time above liquidus temperature (>45 seconds).

Higher preheat temperature may accelerate oxidation of the solder powder and electrode, and degrade flux which results in grainy solder fillet and dewetting. In case of poor solder meltability, lower the preheat temperature

Slow temperature elevation between preheating to melt point may accelerate oxidation of the solder powder and electrode, and degrade flux which results in grainy solder fillet and dewetting. In case of poor solder meltability, increase the temperature elevation speed.

Fast ramp-up speed may cause birding or solder balling due to the heat slump. To improve bridging or solder balling, alleviate the ramp-up speed.