#56011
First edition 2018.10.23

Contents

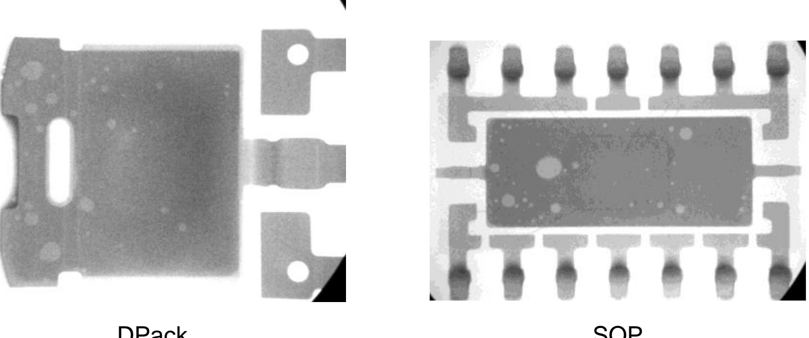
Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Koki no-clean LEAD FREE solder paste

High Performance Low Voiding Lead-Free Solder Paste

S3X58-G803

Product Information



DPack SOP

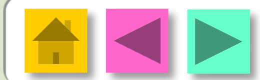
Disclaimer
This Product Information contains product performance assessed strictly according to our own test procedures and is not the guaranteed results at end-users. Please conduct thorough process optimization before mass production application.

Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Features

- Solder alloy composition: Sn 3.0Ag 0.5Cu (SAC305)
- Ensures consistent continual printability with fine pitch component board pad patterns.
- The combination of carefully selected low volatile ingredients and newly developed flux chemistry enables fast wetting to the substrate, ensures low void occurrence in the solder joints regardless of the type of component and surface finish.
- A heat-resistant flux activator system enables good solder coalescence with micro-components (0603 metric size chip) even under harsh reflow profiles



Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Development – Approach to reduce voiding

S3X58-G803 has deployed new flux technologies to cope with these fundamental elements of voiding.

Contents
- Feature
- Development
- Specification
- Continual printing
- Intermittent printing
- Meltability
- Voiding
- Head-in-Pillow
- General property
- Handling guide

Development – Approach to reduce voiding

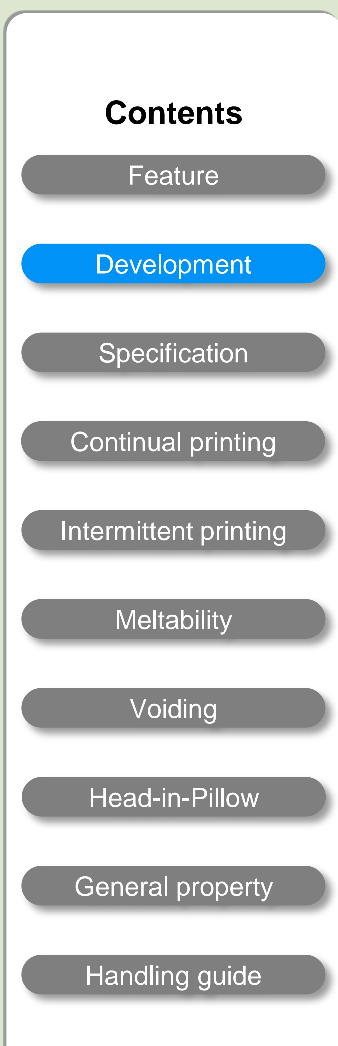
To realize **CONSISTENTLY LOW VOIDING**

regardless of;

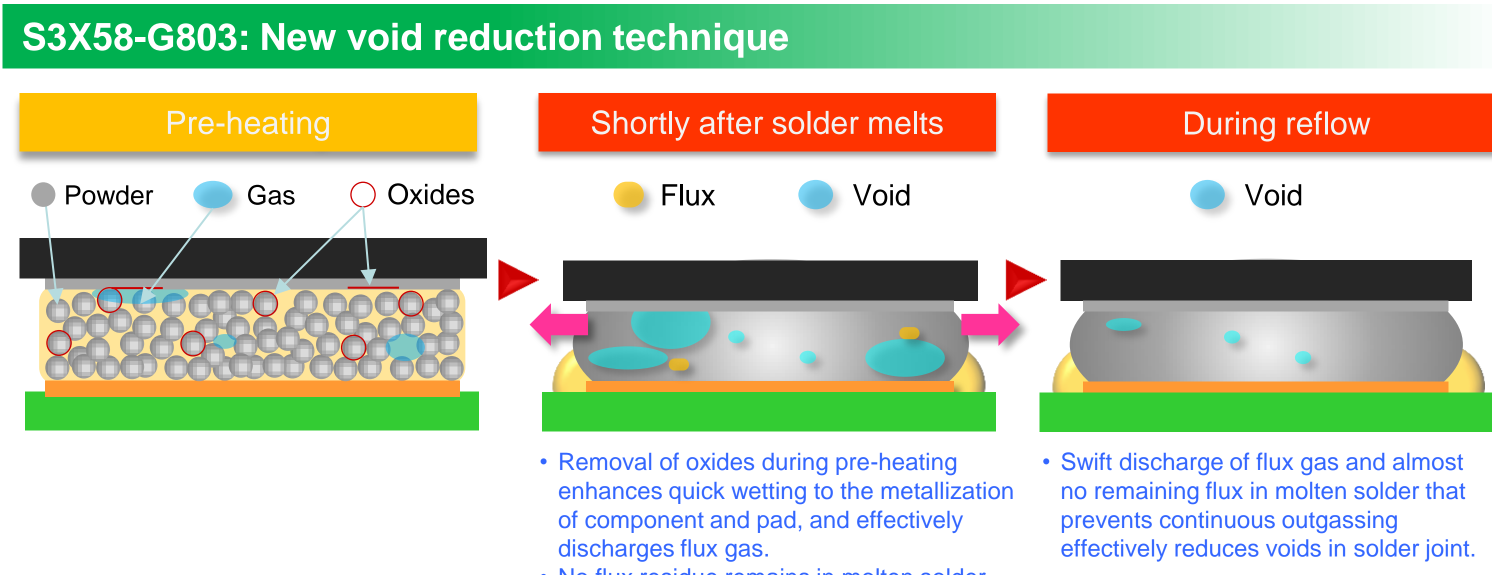
- metallization condition of component/PC board
- type (shape) of components

Key design concept of S3X58-G803

- **Removal of oxidation BEFORE solder melts**
- **Swift evacuation of flux**



Development – Approach to reduce voiding



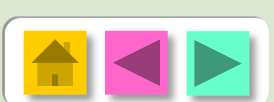
- Removal of oxides during pre-heating enhances quick wetting to the metallization of component and pad, and effectively discharges flux gas.
- No flux residue remains in molten solder.

- Swift discharge of flux gas and almost no remaining flux in molten solder that prevents continuous outgassing effectively reduces voids in solder joint.

S3X58-G803 design of flux formulation

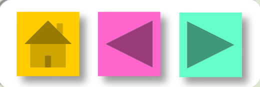
Maximum activation = oxide reduction reaction is designed to occur before solder melts / during pre-heating stage.

- Quick solder wetting action effectively and swiftly discharges flux gas once solder melts.
- Almost no non-wet locations are left = no flux remains in joint with no continuous outgassing.
- Oxidation reduction reaction takes place before solder melts → generation of flux gas while solder is molten is limited.



Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide



Specification

Application		Print
Product Name		S3X58-G803
Alloy Properties	Alloy Composition (%)	Sn 3.0Ag 0.5Cu
	Melting Point (ºC)	217 - 219
	Powder Shape	Spherical
	Grain Size (μm)	20 - 38
Flux Properties	Halide Content (%)	0
	Flux Designation *1	ROL0
Solder Paste Properties	Flux Content (%)	12.0±1.0
	Viscosity *2 (Pa.s)	200±30
	Cu Plate Corrosion *3	Passed
	Tack Time	> 48 hours
	Shelf Life (below 10ºC)	6 months

*1 Flux Designation: In accordance with IPC J-STD-004
*2 Viscosity: Measured by Malcom Viscometer at 25ºC, 10rpm
*3 Cu Plate Corrosion: In accordance with IPC-TM-650-2.6.15

Contents

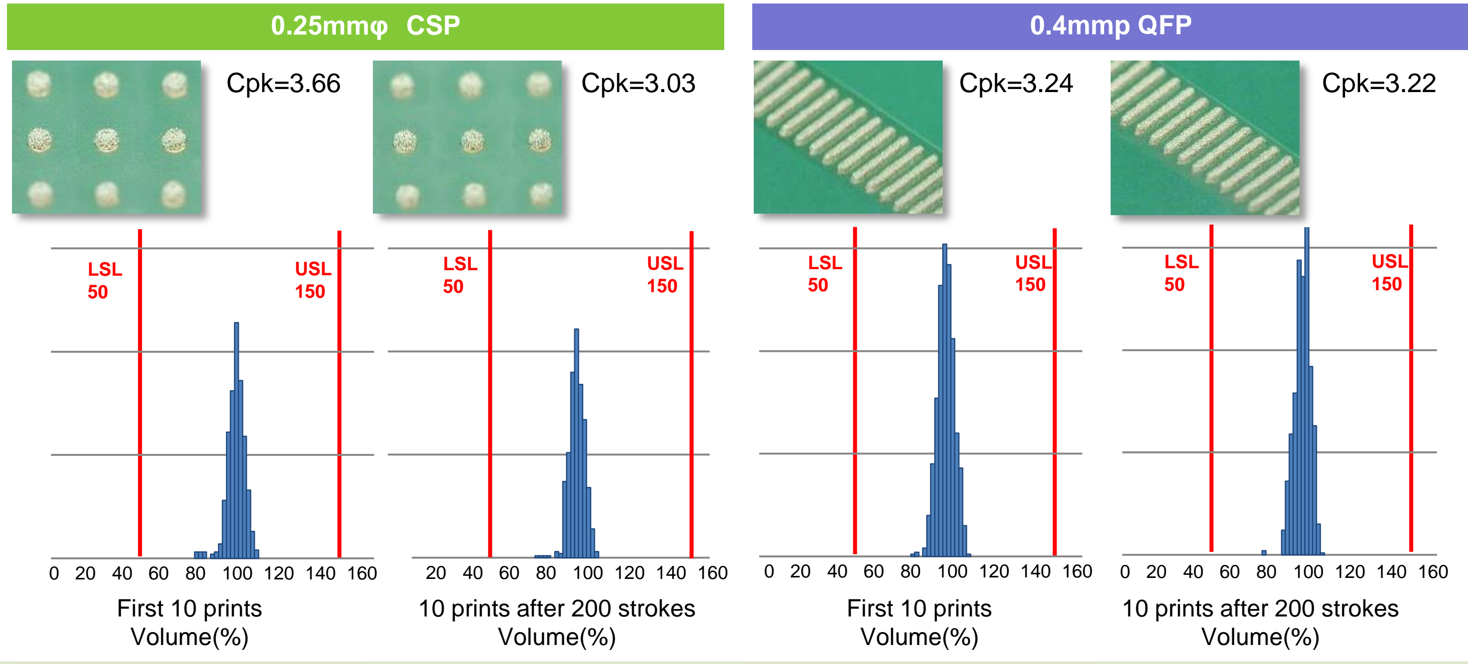
- Feature
- Development
- Specification
- Continual printing
- Intermittent printing
- Meltability
- Voiding
- Head-in-Pillow
- General property
- Handling guide

Continual printing

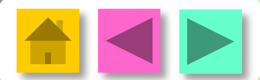
Evaluation method:

Print 10 test PCBs, measure and inspect the print transfer rate. Roll the solder paste for 200 print strokes, then clean the stencil. Print another 10 test PCBs and inspect the paste to calculate print transfer rate.

- Metal Stencil: 0.12mm thick (laser etched)
- Printer: YVP-Xg YAMAHA Motor
- Squeegee: Metal, angle is 60º
- Print Speed: 40 mm/sec
- Test Environment: 24~26ºC (50~60%RH)
- Evaluation Lands: 0.4mm P QFP pad (80 pins)
  0.25mmΦ CSP (50 pads)
- SPI: KOHYOUNG aSPIre



S3X58-G803 indicated consistent and stable transfer volume at 0.25mm dia. CSP and 0.4mmP QFP patterns.



S3X58-G803

Contents

- Feature
- Development
- Specification
- Continual printing
- Intermittent printing
- Meltability
- Voiding
- Head-in-Pillow
- General property
- Handling guide

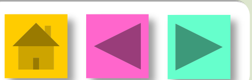
Intermittent printability (Print-to-Pause)

Evaluation method:

Pause printing for 45 minutes, then resume printing. Verify the print transfer rate after the pause.

- Metal Stencil: 0.12mm thick (laser etched)
- Printer: YVP-Xg YAMAHA Motor
- Squeegee: Metal, angle is 60º
- Print Speed: 40 mm/sec
- Test Environment: 24~26ºC (50~60%RH)
- Evaluation lands: 0.25mmφ CSP, 0.4mmp QFP (0.2x1.5mm)
- SPI: KOHYOUNG aSPIre

S3X58-G803 exhibited limited decrease in its paste volume after 45min. of pause and quickly recovers its paste volume from the 2nd print onwards.



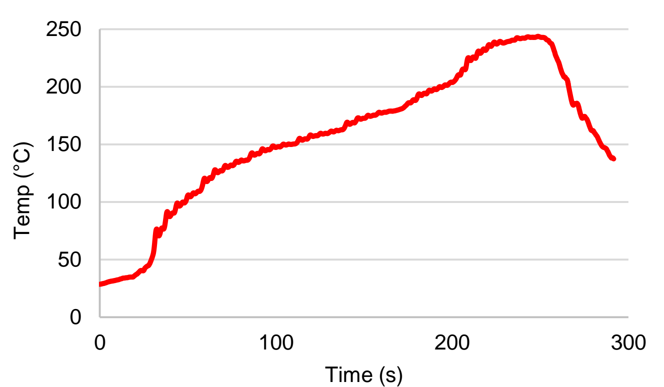
Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Meltability – Fine pattern wetting

Test conditions

- Material : Glass epoxy FR-4
- Surface finish : OSP, ImSn heating
- Stencil thickness : 0.12mm (laser cut)
- Pad size : 0.25mm diameter
- Component : 0603R (0201R) / Sn plated
- Stencil aperture : 100% aperture opening to pad
- Heat source : Hot air convection
- Reflow profile : Refer to reflow profile.



	No oxidation pretreatment		Intentionally oxidized (reflowed twice)	
	0.25mm dia.	0603R	0.25mm dia.	0603R
OSP				
ImSn				

Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

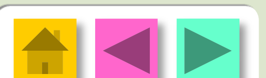
Meltability - De-wetting

Test condition

- Material pieces : Nickel, Copper, ImSn, C7701 (CuZn)
- Pretreatment: Reflowed twice in advance
- Stencil thickness : 0.20mm (laser cut)
- Stencil aperture : 6.5mm diameter
- Heat source: Same as *"Meltability"*

	Cu	ImSn	Ni	CuZn (C7701)
Without Reflow pretreatment				
With Reflow pretreatment				

No de-wetting is observed regardless of substrate material, even with pretreated (twice reflowed) substrates.



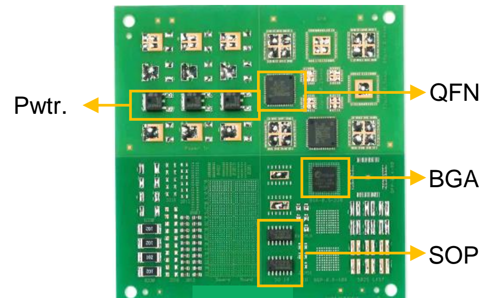
Contents

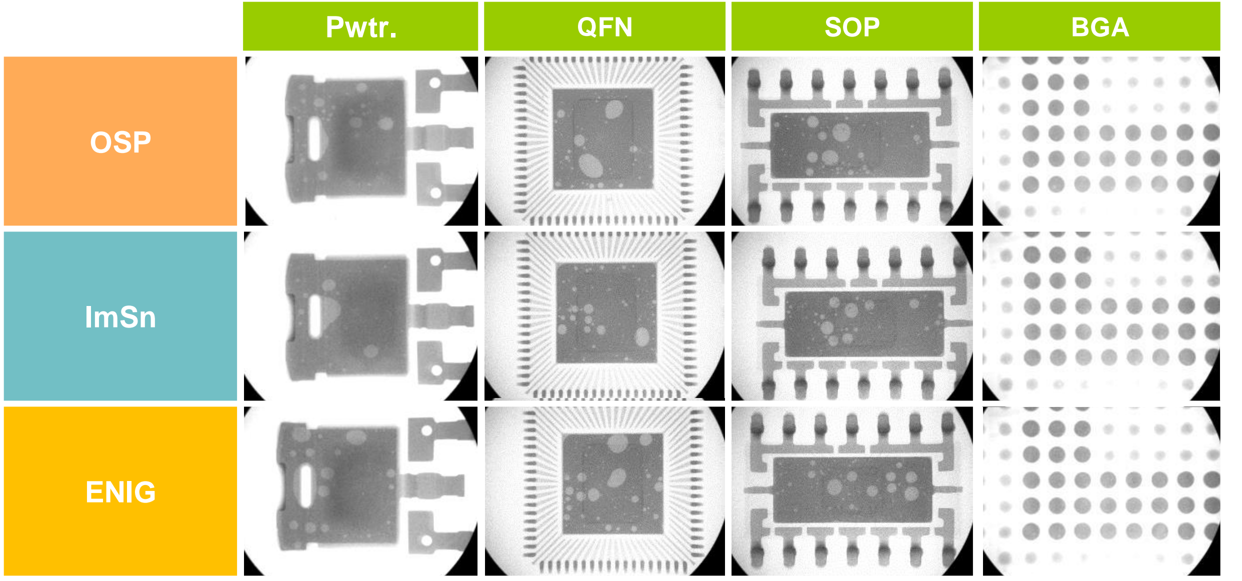
Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Voiding

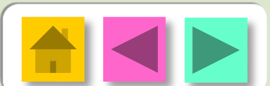
Test condition

• Material :	Glass epoxy FR-4
• Surface treatment :	OSP, ImSn, ENIG
• Stencil thickness :	0.12mm (laser cut)
• Components	Pwtr, QFN, SOP - 100% Sn plated BGA ball - SAC305,
• Heat source :	Hot air convection
• Atmosphere :	Air
• Reflow profile :	Refer to “Meltability”





S3X58-G803 exhibits consistently low voiding regardless of the type of the components



CHALLENGING NEW TECHNOLOGIES

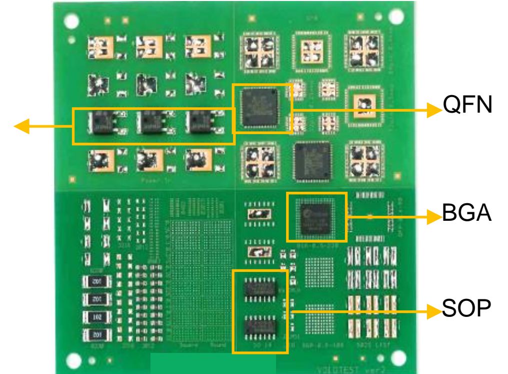
Voiding – Pretreated (oxidized PC board)

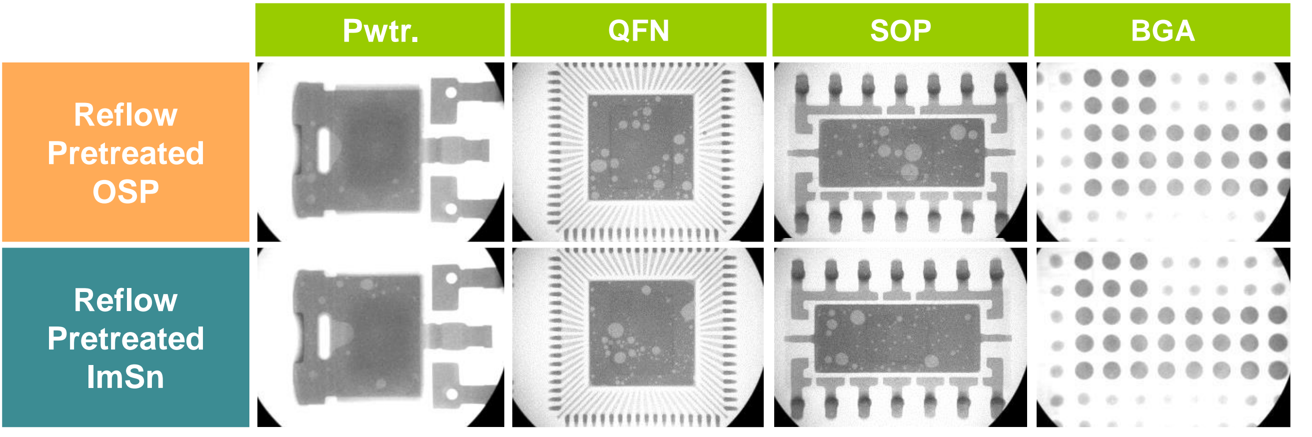
Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Test condition

- Material : Glass epoxy FR-4
- Surface treatment : OSP, ImSn, ENIG
- Pretreatment: Reflowed twice
- Stencil thickness : 0.12mm (laser cut)
- Components Pwtr, QFN, SOP - 100% Sn plated
  BGA ball - SAC305,
- Heat source : Hot air convection
- Atmosphere : Air
- Reflow profile : Refer to "Meltability"





S3X58-G803 exhibits consistently low voiding regardless of the type of the components even with the pretreated (oxidized) PC board.

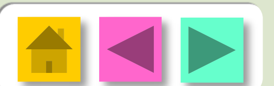
S3X58-G803

Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Voiding – Void rate

S3X58-G803 exhibits consistently low voiding regardless of the types of component with even pretreated PC board (reflowed twice prior to the test).



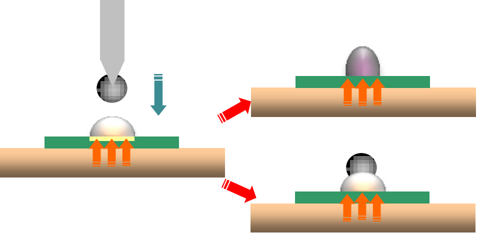
Contents

- Feature
- Development
- Specification
- Continual printing
- Intermittent printing
- Meltability
- Voiding
- Head-in-Pillow
- General property
- Handling guide

Anti-Head-in-Pillow property

Test condition

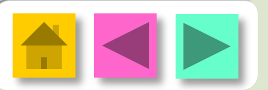
- Material : Glass epoxy FR-4
- Surface treatment : OSP
- Stencil thickness : 0.20mm (laser cut)
- Pad size : 0.8mm diameter
- Component: 0.76mm ball SAC305
- Stencil aperture : 100% aperture opening to pad
- Heat source : Solder pot 280ºC
- mount interval: 10sec.



Drop a solder ball every 10 sec. after the solder paste has melted to see the heat durability of flux.

	30 sec.	40 sec.	50 sec.	60 sec.
S3X58-G803	Complete merger	Complete merger	Complete merger	Complete merger
Conventional solder paste	Complete merger	Partial merger	Head-in-Pillow	Head-in-Pillow

S3X58-G803 indicates much longer heat durability (up to 60 sec) as compared to a conventional solder paste (less than 40 sec.) once the solder paste started to melt. The result demonstrates that S3X58-G803 effectively prevents the occurrence of head-on-pillow defects.



General property

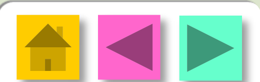
Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Item	Result	Method
Tack Time	> 48 hours (>100g.f)	JIS Z 3284-3
Slump Property	0.3mm pass	JIS Z 3284-3 Heating Condition: 150ºC for 10 min.
Solder Balling Test	Within category 3	JIS Z 3284-4
Cu Mirror Corrosion Test	Type L	IPC-TM-650-2.3.32
Cu Plate Corrosion Test	Pass	IPC-TM-650-2.6.15
Surface Insulation Resistance Test	> 1E+9	IPC-TM-650-2.6.3.3
Electromigration Test	No evidence of electrochemical migration	IPC-TM-650-2.6.14.1

Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide



Handling guide

1. Printing

(1) Squeegee

1. Shape:	Flat
2. Material:	Metal or Urethane
3. Angle:	60~70º
4. Squeegee pressure:	Low (Squeegee barely wipes clean solder paste on stencil)
5. Squeegee speed:	20~80mm/ sec.

(2) Metal stencil

1. Thickness:	0.10~0.15mm for 0.4~0.65mm pitch lands
2. Fabrication method:	Laser or chemical etched
3. Stencil separation speed:	7.0~10.0mm/ sec.
4. Snap-off distance:	0mm

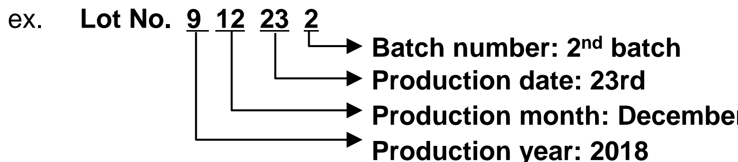
(3) Ambient

1. Temperature:	23~27°C
2. Humidity:	40~60%RH
3. Air Conditioning:	Minimum; draft in the printer may affect stencil life and tack performance of solder paste.

2. Shelf life

Stored at 0~10ºC: 6 months from the date of production

* Directions to interpret lot number



S3X58-G803

Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Handling Guide – Recommended Reflow Profile

Pre-heat conditions	
Target	: 140~185ºC 90sec
Upper limit	: 150~190ºC 110sec
Lower limit	: 130~175ºC 60sec

Pre-heat : 130~190ºC/ 60~110sec.

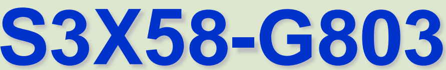
Peak temp.: 230~250ºC

Over 220ºC: >30 sec.

Ramp-up speed: 1.0~2.0ºC/sec.

(ºC): 0, 50, 100, 150, 200, 220, 250

(sec.): 60, 120, 180, 240



Contents

Feature
Development
Specification
Continual printing
Intermittent printing
Meltability
Voiding
Head-in-Pillow
General property
Handling guide

Handling Guide- Supplemental Information on Reflow Profile

(ºC)
250
220
200
150
100
50
0

60
120
180
240
(sec)

Shorter time above liquidus temperature (TAL) or lower peak temperature may cause voiding. In case of a relatively high void occurrence, it is recommended either to increase the peak temperature or to extend TAL (longer than 45 seconds)

High preheat temperature may lead to a grainy solder fillet or de-wetting because of the accelerated oxidization of the solder alloy and exhaustion of the flux activation. Lower the preheat temperature if poor solder wetting is observed.

Slow temperature elevation between preheating to the melting point is likely to become a grainy solder fillet and/ or de-wetting to the pad because of excessive oxidization of the metal surface (solder powder and pads) and exhaustion of the flux activation. It is recommended to use faster temperature elevation speed if poor solder wetting is observed (1.5~3 ºC/sec).

Fast ramp-up speed may cause bridging or solder balling due to heat slump. Alleviate ramp-up speed to improve bridging and side balls.