info@matronic.se 08-556 291 00 matronic.se

Koki no-clean LEAD FREE solder paste

Contents

Multi-feature Lead-free Solder Paste For Fine Pattern Application

S3X70-HF1200

Halogen Free HF

Product Information

Disclaimer

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

Contents

Feature

- Solder alloy composition： Sn3.0Ag0.5Cu
- Exhibits excellent print quality response with >1hour stencil idle time
- Powerful wetting as good as Halogen containing solder paste
- Succeeded to drastically mitigate flux splattering
- Ensures good meltability at smaller components in Air / N_2 reflow (e.g. 0402 metric size chip component)
- Realizes low voiding with BTCs (e.g., Pw.Tr., QFN, LGA) and BGA
- Comply with Halogen Free standard (Cl+Br = 0ppm): BS EN14582
  No artificial addition of any halogen element
- Flux type: ROL0 (Cl+Br+I+F = <0.05% / IPC J-STD-004B and 004C, D)
- RoHS, REACH compliant product

Contents

Feature – Flux Gas Discharge Effect

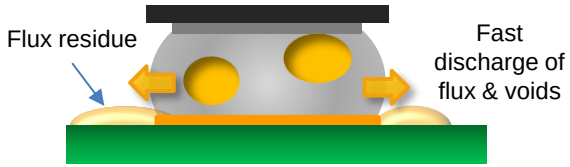
The 2-step Flux Gas Discharge Effect

The technology designed to reduce voids by rapidly discharging flux through the **Active Coagulation Effect** in the first step.

For the second step, the Extended Active Outflow Effect continues to discharge any remaining voids, realizing the lowest void performance ever achieved.

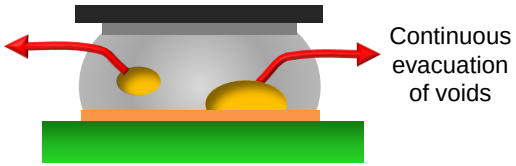
■ Step-1 Active Coagulation Effect

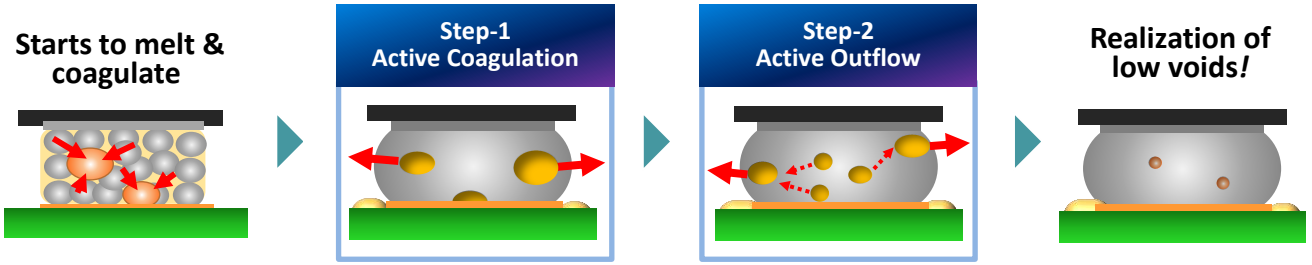
As solder powder melts, liquefied flux is designed to simultaneously enhance its coagulation and rapidly evacuate from the molten solder.



■ Step-2 Active Outflow Effect

After the Step-1 process, an 'Outflow' effect actively continues to discharge the liquefied flux and flux gas while the solder is in a molten state.





Contents

Feature – Activation Boost Effect

The 2-step Activation Boost Effect

This begins with **Activation Stabilizer technology**, which prevents premature chemical reactions during storage and transportation by stabilizing the activator system's reactivity.

Upon exposure to reflow heating, the stabilizer is released, unlocking maximum activation power.

For the second step, the newly formulated high-temperature-resistant activator, with superior activation in high-temperature zones, ensures robust and powerful solder meltability and wetting, despite being halogen-free.

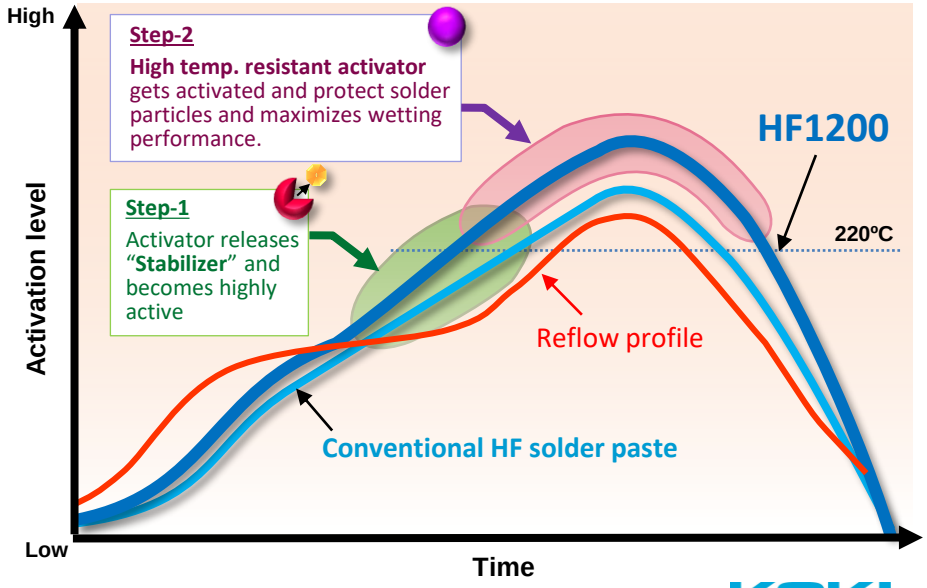
This breakthrough significantly enhances the flexibility of reflow profile design, providing a broad process window for a wide range of applications.

■ Step-1 Activation Stabilizer

The newly designed activator system inhibits the chemical reaction with solder during storage and even during the pre-heating stage and exerts maximum activation strength during the time above liquidus temperature.

■ Step-2 High Temperature Activator

High temp. resistant activator gets activated and protect solder particles and maximizes wetting performance.



Contents

Specification

Purpose		Printing
Product Name		**S3X70-HF1200**
Alloy Property	Alloy Composition (%)	Sn 3.0Ag 0.5Cu
	Melting Point (ºC)	217 – 219
	Powder Shape	Spherical
	Grain Size (µm)	10 – 25
Flux Property	Halide Content (%)	0
	Flux type*1	ROL0
Solder Paste Property	Flux Content (%)	12.5 ±1.0
	Viscosity *2 (Pa.s)	190 ± 30
	Copper Plate Corrosion*3	Passed
	Tack Time	≥ 72 hours
	Shelf Life (below 10ºC)	6 months

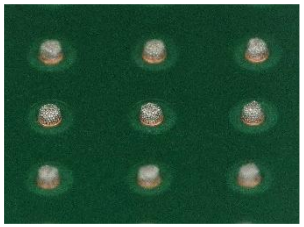
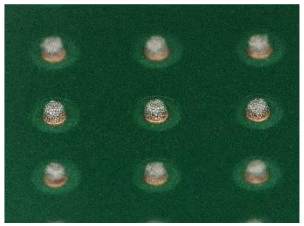
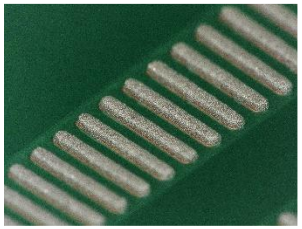
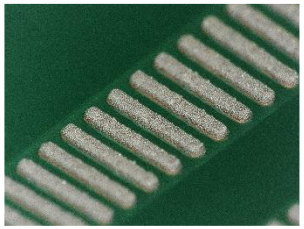
*1. Flux Designation: In accordance with IPC J-STD-004B, 004C, 004D
*2. Viscosity: Measured by Malcom viscometer at 10 rpm at 25ºC.
*3. Copper Plate Corrosion: In accordance with IPC-TM650-2.6.15

Contents

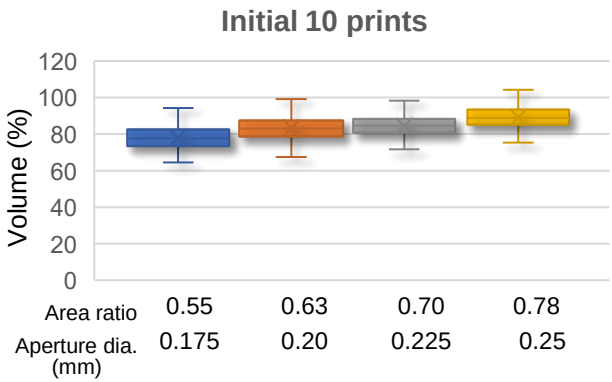
Printability - Continual printing

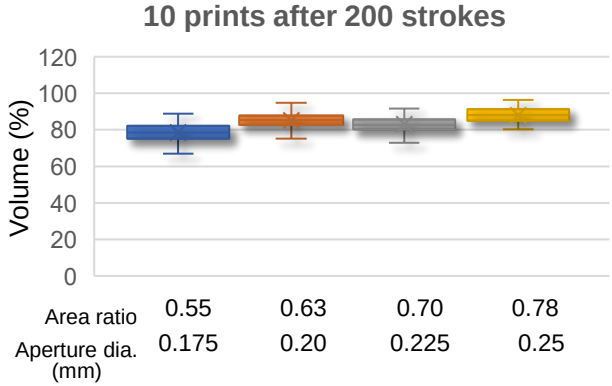
Test Condition

- Printer: Model YVP-Xg YAMAHA Motor
- Squeegee: Metal, 55º angle
- Stencil: 0.08 mm thick, laser
- Print speed: 40 mm/sec
- Atmosphere: 24~26ºC (40~60%RH)
- Pattern: 0.175 mm dia. CSP, 0.4 mm pitch QFP

	1st print	After 200strokes 10th print
CSP 0.175 mm dia. Area ratio: 0.55		
QFP 0.4 mm pitch (L/S=0.2/0.2) Area ratio: 1.10		

$$\text{Area ratio} = \frac{\text{Aperture area}}{\text{Aperture wall area}}$$



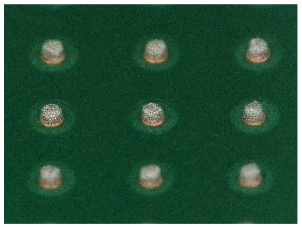
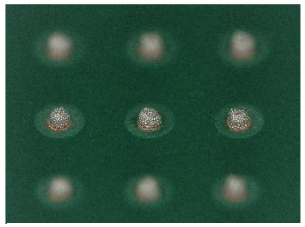
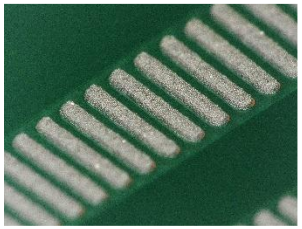
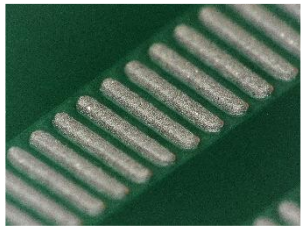


➢ Consistent print quality with good printed paste shape even with area ratio ≥0.55.

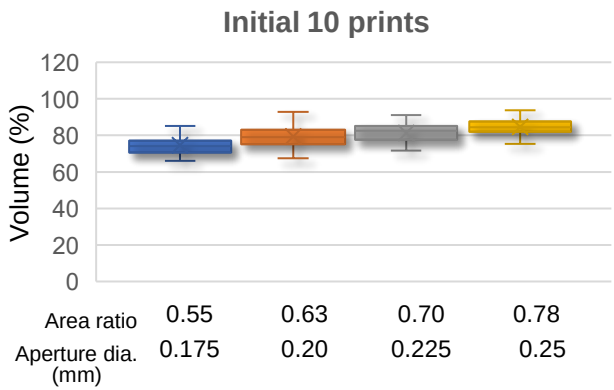
Printability - Intermittent printing

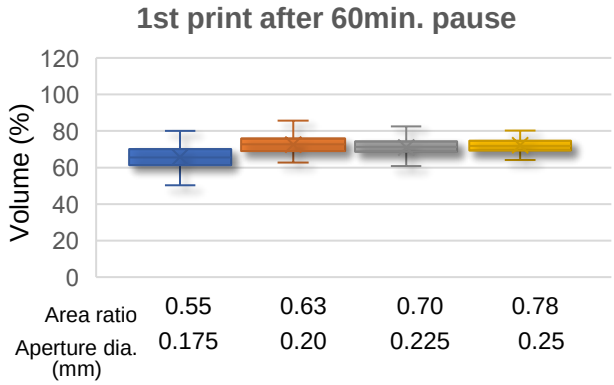
Test Condition

- Printer: Model YVP-Xg YAMAHA Motor
- Squeegee: Metal, 55º angle
- Stencil: 0.08 mm thick, laser
- Print speed: 40 mm/sec
- Atmosphere: 24~26ºC (40~60%RH)
- Pattern: 0.175 mm dia. CSP, 0.4 mm pitch QFP

	1st print	1st print after 60 min. pause
CSP 0.175 mm dia. Area ratio: 0.55		
QFP 0.4 mm pitch (L/S=0.2/0.2) Area ratio: 1.10		

Area ratio = Aperture area / Aperture wall area





➢ Consistent paste transfer volume from the initial paste print even after 60min. pause even with area ratio ≥0.55.

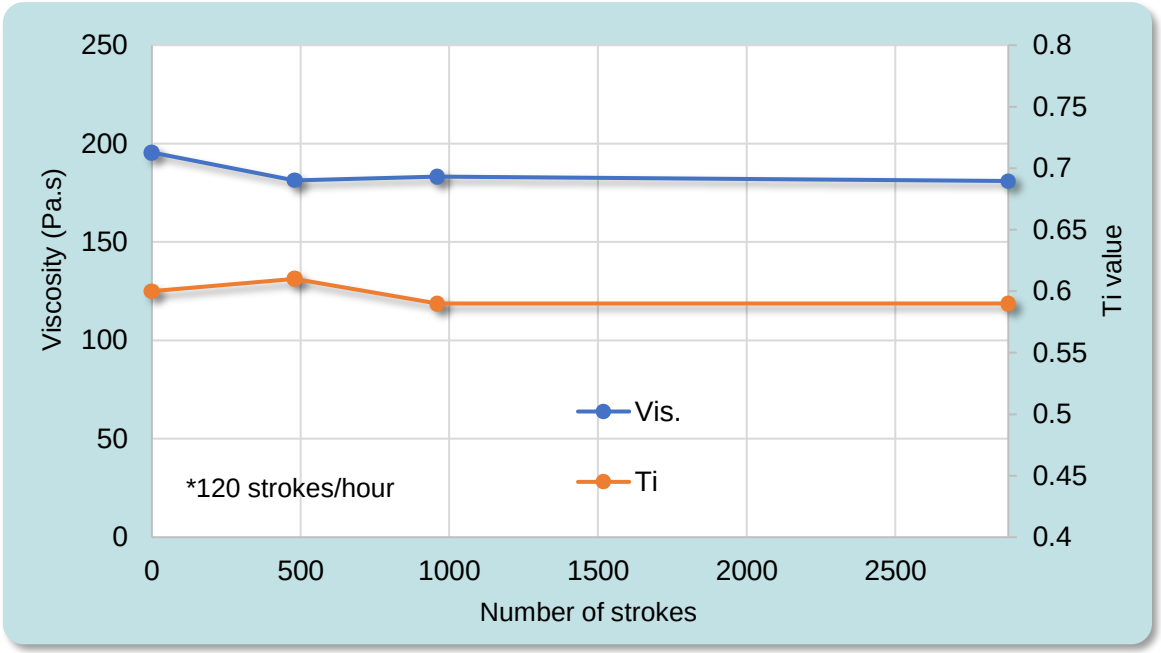
Contents

Viscosity stability - During continual paste printing

Test condition

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

- Squeegee: Metal blades
- Squeegee angle: 55°
- Squeegee speed: 20 mm/sec.
- Print stroke: 300 mm
- Printing environment: 24~26°C, 40~60%RH

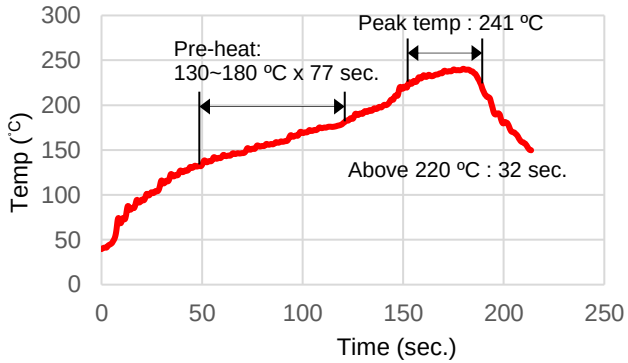


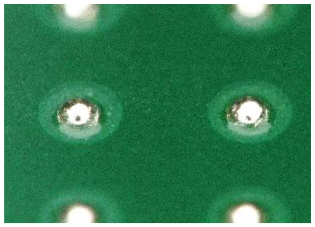
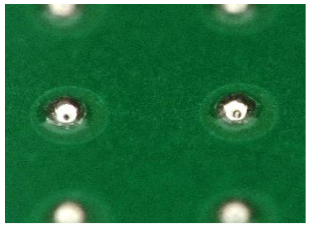
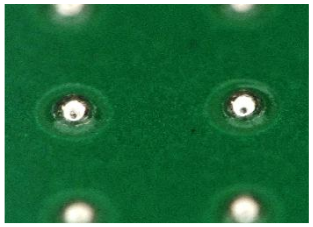
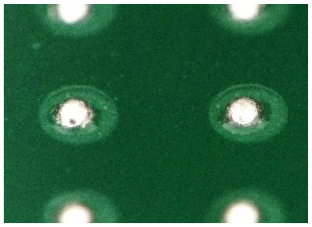
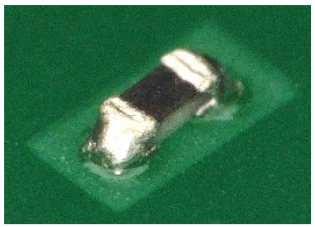
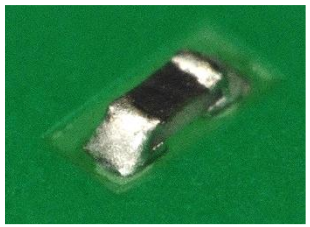
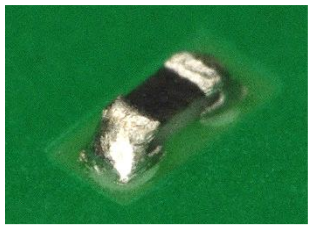
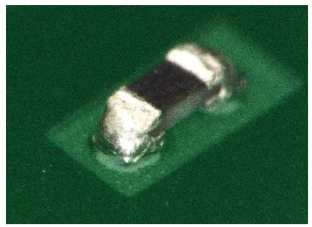
➢ Activator stability technology ensures minimal variation of rheology (viscosity & thixotropy) in continual printing.

Meltability – Fine pattern (Air atmosphere)

Test condition

- Material: Glass epoxy FR-4
- Surface finish: OSP, ImSn, ImAg, ENIG
- 0603chip: 100% Sn plated
- Stencil thickness: 0.08 mm (laser cut)
- Pad size: 0.175 mm dia.,
- 0402 metric chip pattern
- Stencil aperture: 100% aperture opening to pad
- Heat source: Hot air convection
- Atmosphere: Air



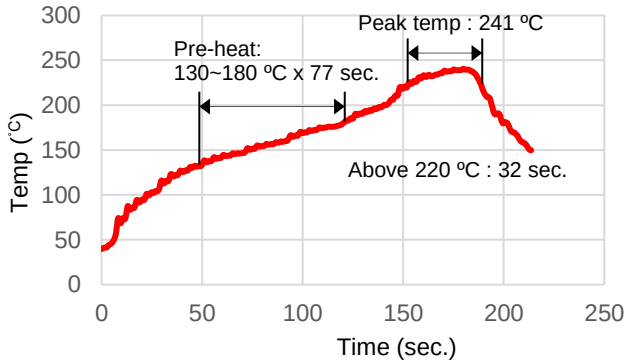
	OSP	ImSn	ImAg	ENIG
CSP 0.175 mm dia.				
0402R				

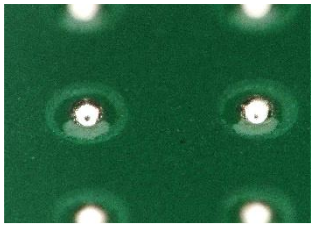
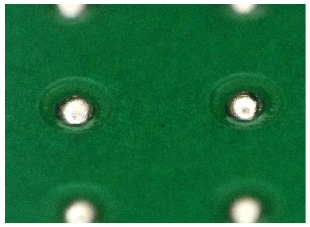
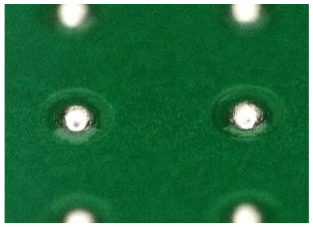
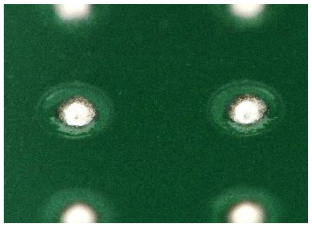
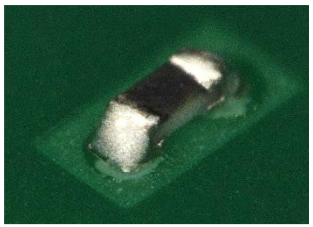
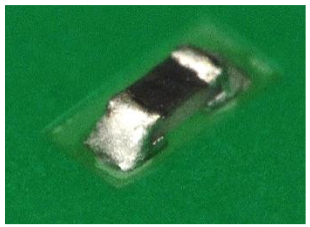
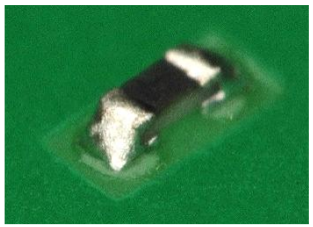
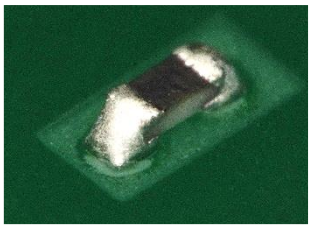
➢ Regardless of the type of surface finish, the solder coalesced completely and caused no unmolten solder particles.

Meltability – Fine pattern (N_2 atmosphere)

Test condition

- Material: Glass epoxy FR-4
- Surface finish: OSP, ImSn, ImAg, ENIG
- 0603chip: 100% Sn plated
- Stencil thickness: 0.08 mm (laser cut)
- Pad size: 0.175 mm dia.,
- 0402 metric chip pattern
- Stencil aperture: 100% aperture opening to pad
- Heat source: Hot air convection
- Atmosphere: N2 (O2: ≤ 5,000 ppm)



	OSP	ImSn	ImAg	ENIG
CSP 0.175 mm dia.				
0402R				

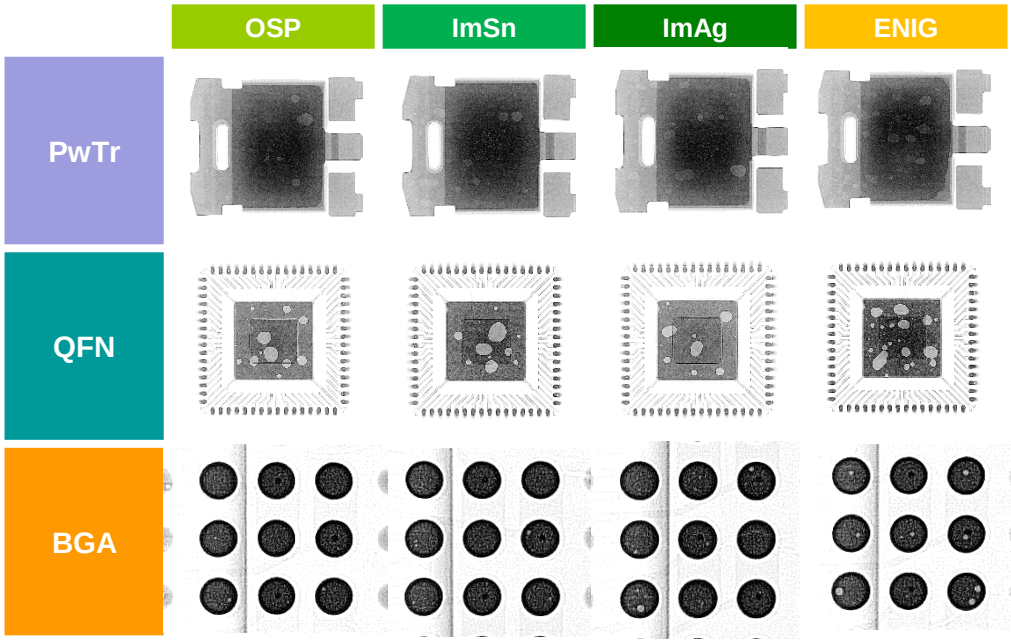
➢ Regardless of the type of surface finish, the solder coalesced completely and caused no unmolten solder particles.

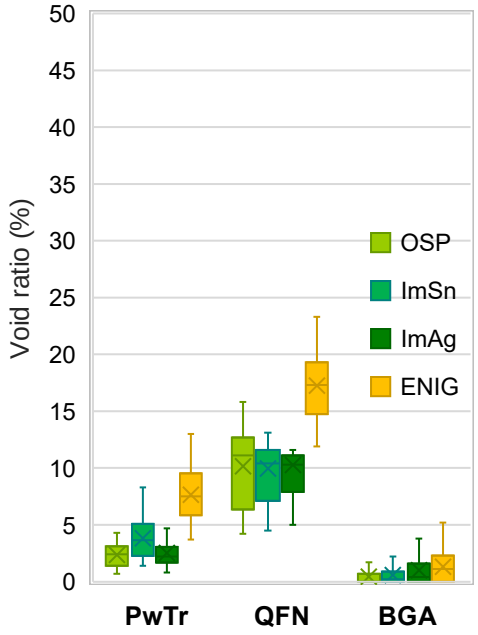
Contents

Voiding (Air atmosphere)

Test condition

- Material: Glass epoxy FR-4
- Surface finish: OSP, ImSn, ImAg, ENIG
- Stencil thickness: 0.08 mm (laser cut)
- Stencil aperture: 100% aperture opening to pad
- Component: 100% Sn plated - PwTr, QFN
  SAC305 - BGA
- Heat source: Hot air convection
- Atmosphere: Air
- Reflow profile: See “Meltability - Fine pattern”





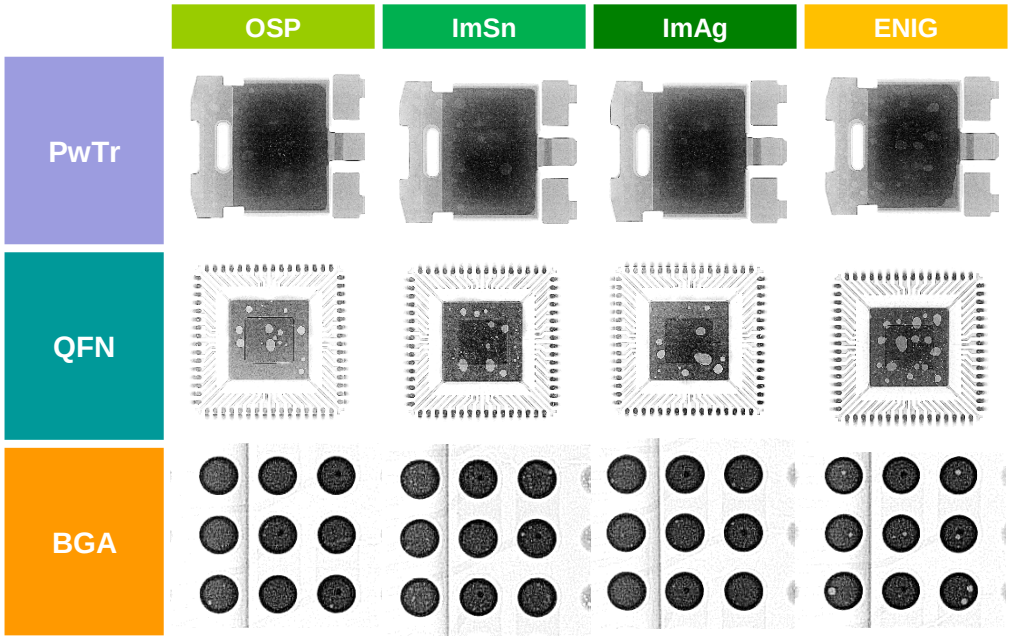
➢ Consistently low voiding is achieved with each type of component and surface finish.

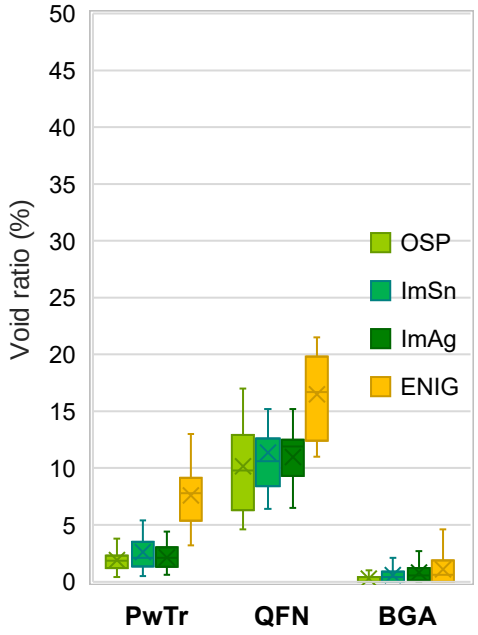
Contents

Voiding (N_2 atmosphere)

Test condition

- Material: Glass epoxy FR-4
- Surface finish: OSP, ImSn, ImAg, ENIG
- Stencil thickness: 0.08 mm (laser cut)
- Stencil aperture: 100% aperture opening to pad
- Component: 100% Sn plated - PwTr, QFN
  SAC305 - BGA
- Heat source: Hot air convection
- Atmosphere: N2 (O2: <5,000 ppm)
- Reflow profile: See “Meltability - Fine pattern”





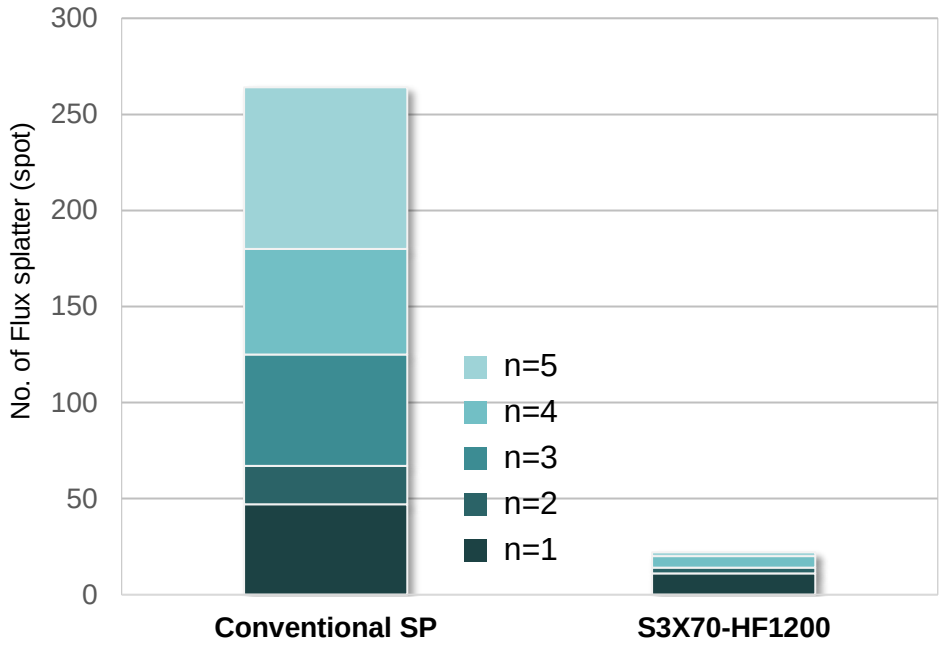
➢ Consistently low voiding is achieved with each type of component and surface finish.

Contents

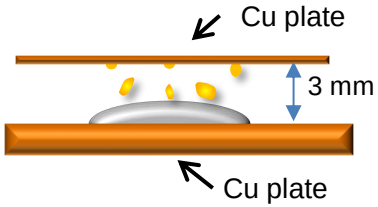
Flux splattering

Test condition

- Material: Phosphorous deoxidized copper (C1220)
- Stencil: 0.2 mm thickness, 6.5 mm diameter
- No. of specimens: n=5
- Reflow profile: See “Meltability - Fine pattern”

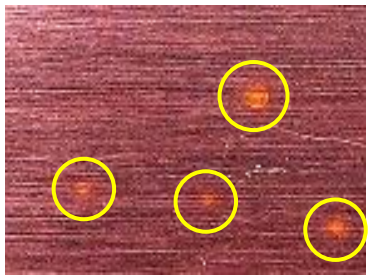


Splatter test



Place Cu plate above deposited solder paste and reflow to allow for attachment of flux splatter.

Count number of flux splatter.



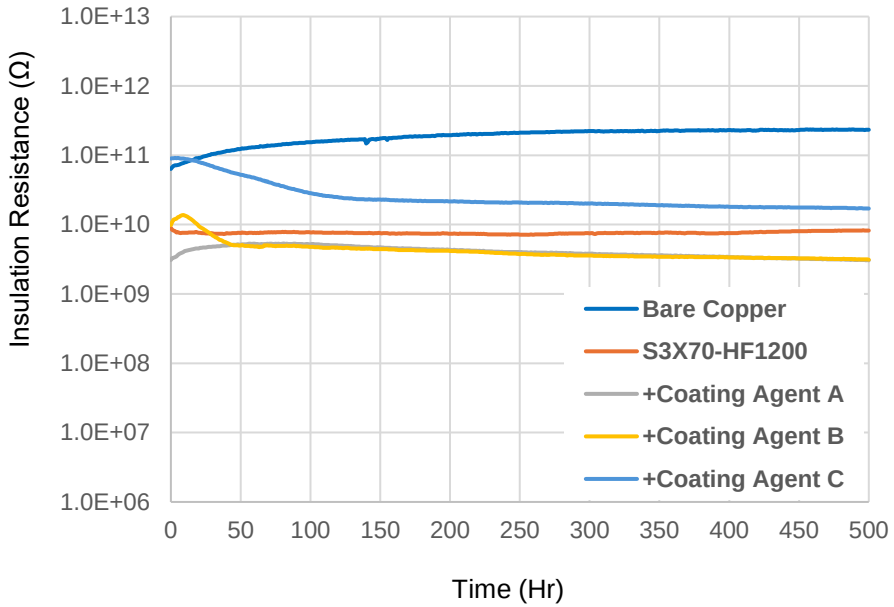
Flux splatter / example

➢ **S3X70-HF1200** resulted in **very few flux splatter** while conventional solder paste splattered in high amounts.

Electrical reliability - Electro-chemical Migration (ECM)

Test condition

- Test standard: IPC TM-650 2.6.14.1
- Test coupon: IPC-B-25
- Surface finish: OSP
- Chamber condition: 65ºC / 88.5%RH
- Voltage: Applied 10V / measurement 100V
- Reflow: Hot air convection in air atmosphere
- Reflow profile: See “Meltability - Fine pattern”
- Conformal coating: A) Acrylic type
  B) Polyolefin type
  C) Silicone type



$$IR_{avg} = 10^{\left[\frac{1}{N}\sum_{1}^{N}\log IR_i\right]}$$

N = number of test points (10 minimum),

IR_i = individual insulation resistance measurements

Coupon	IR_{avg}
Control	1.85E+11
S3X70-HF1200 only	7.59E+09
+Coating Agent A	4.03E+09
+Coating Agent B	4.13E+09
+Coating Agent C	2.44E+10

➢ With or without conformal coating applied, **S3X70-HF1200** had high insulation resistance.

Halogen content

Measurement Method

Ion Chromatography, Quartz combustion tube

Elements	Results
F	Not detected*
Cl	Not detected
Br	Not detected
I	Not detected

*Not detected: Detection limit <50ppm

➢ **S3X70-HF1200** has no addition of any of the halogens and is classified as ROL0 (Cl+Br+I+F = <500ppm according to IPC J-STD-004B and 004C,D).

Contents

General properties

Item	Result	Test Method
Slump properties	**0.3 mm pass**	JIS Z 3284-3 150ºC for 10 min.
Solder ball test	**Category 3**	JIS Z 3284-4
Tack time	**≥ 72 hours**	JIS Z 3284-3
Cu mirror test	**Type L**	IPC-TM-650 2.3.32
Cu plate corrosion test	**No corrosion**	IPC-TM-650 2.6.15
Insulation resistance test	**≥ 1E+11 Ω**	IPC-TM-650 2.6.3.7
Electrochemical migration test	**No evidence of migration**	IPC-TM-650 2.6.14.1

Contents

Handling guide – Recommended print condition

1) Squeegee condition

1. Shape	Flat
2. Material	Metal or Urethane blade
3. Angle	50-60º
4. Print pressure	Relatively low (40-60N)
5. Squeegee speed	20-80 mm/sec.

2) Stencil

1. Thickness	0.15-0.08 mm for 0.65-0.4 mm pitch pads
2. Fabrication method	Laser or chemical etch
3. Stencil release speed	7.0-10.0 mm/sec.
4. Snap-off speed	0 mm

3) Usage condition

1.Temperature	23-26ºC
2. Humidity	40-60%RH
3. Air conditioning	Direct air blowing on the stencil will dry the solder paste faster. Adjust the direction of air blowing on the stencil using a shield, etc.

4) Usage Notes

1. Pin-in-Paste	Flux residue may accumulate on the tip of connector pins. It is not recommended to strike the ICT probe at the tip of the connector pins.

Caution: When handling solder paste, personal protective measures as advised by your Health and Safety department should always be adhered to.

Handling guide – Pot life & Shelf life

1. Pot life

1) Once paste has returned to ambient temperature it is fit for use.

2) Once the solder paste is opened, but not kneaded by a spatula nor a mixing machine

→ **Within the remaining shelf life of the product by storing it back in the refrigerator at 0-10ºC.**

3) Once the solder paste is opened and kneaded by a spatula or a mixing machine

→ **Within 1 week to 1 month by storing it back in the refrigerator at 0-10ºC**

4) Once the solder paste is opened, kneaded by a spatula and worked on the stencil with the squeegee blades.

→ **Within 24 hours**

*NOTE: What are described in this guide do not necessarily mean to guarantee the performance/quality of the solder paste.

2. Shelf life (at 0 ~ 10ºC)

Storage temperature	Package	Shelf life
0 ~ 10ºC	Jar	6 months from manufacturing date
	Cartridges	6 months from manufacturing date

Attention: "Storage temperature" is applicable upon receipt by customer – label information on product also relates to storage conditions of product upon receipt by customer.

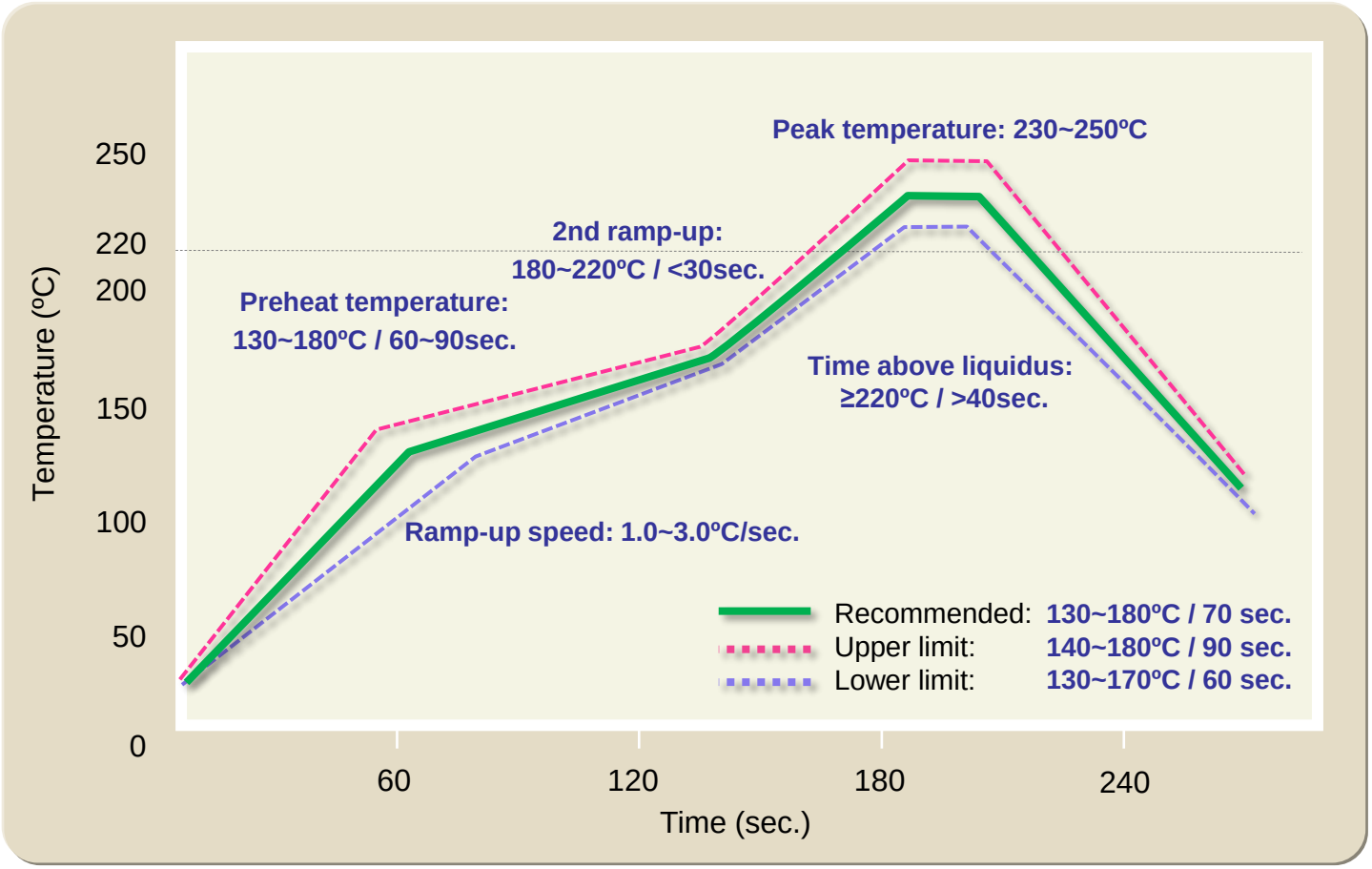
* How to interpret the lot number:

e.g. Lot No. **5 01 07 1**

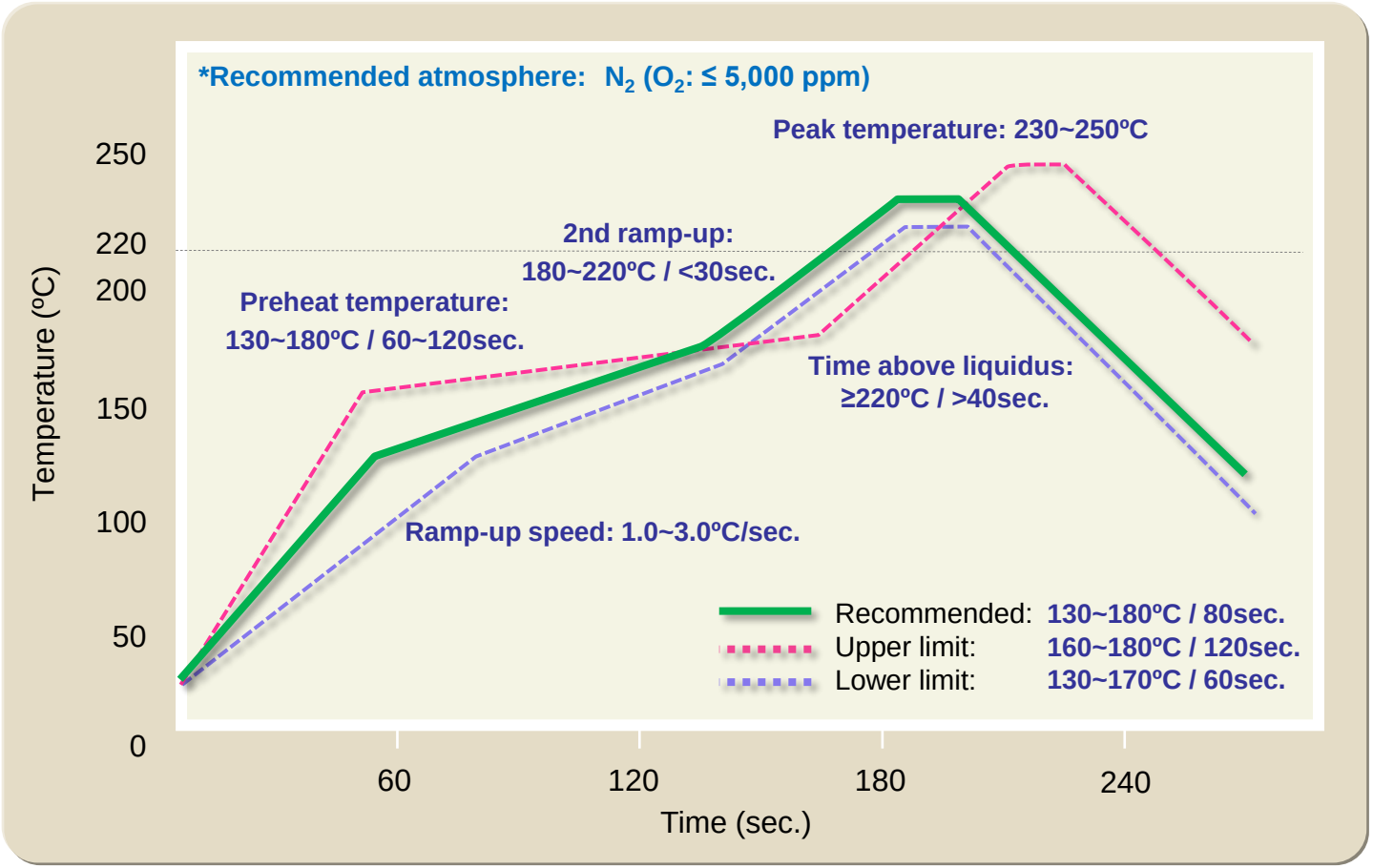
# of production batch:	1st batch
Date of production:	7th
Month of production:	Jan
Year of production:	2025

Contents

Handling guide – Recommended reflow profile (Air atmosphere)



Handling guide – Recommended reflow profile (N2 atmosphere)



Contents

Handling guide – Supplemental information