Technical Information Book

MICROBOND SOP 91123 P *SAC305 Series*

Product - Disclaimer

The content of this document does not release the purchaser from verifying the suitability of the solder paste for its intended purpose prior to application. For further details, please refer to the Product Information Note below.

Product Information Note

- This product is in the scale-up phase and the information shown here has been determined for reference only and its formulation and/or manufacturing method may change after the finalization of the scale-up phase.
- The description and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to date on the date this document was printed (latest versions can always be supplied upon request).
- Although the data are considered accurate, we cannot, without prior written express agreement, provide a guarantee as to the accuracy of such data, the achievement of any intended results from the use of the solder paste or the non-infringement of any patent by the use of the solder paste.
- The data is supplied on the condition that the user shall conduct tests to determine materials suitability for a particular application.

Content:

Product - Key properties

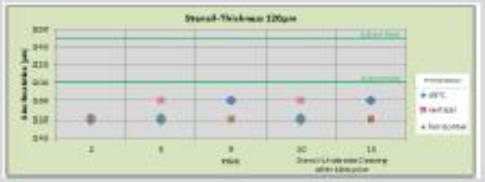
The SOP 91123 Solder Pastes Series is a state of the art no clean lead free solder paste that promotes outstanding wetting and minimizes soldering defects. The flux system is specifically optimized for led free alloys such as the SAC series. This Formula provides superior performance on a variety of surfaces and leaves a clear residue after reflow. The paste is developed a a halogen zero paste and therefore contains no halogens or halides.

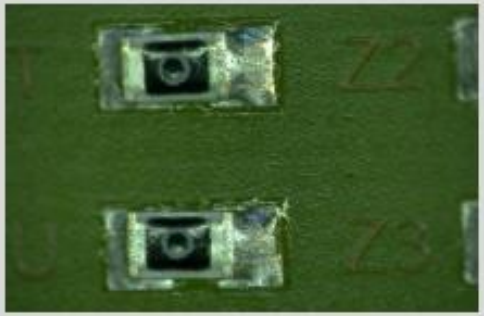
Other key features of the paste are:

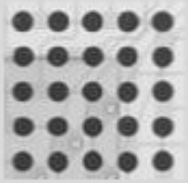
- Anti – Capillary effect beneath the QFP components
- Good high-volume print capability
- Halogen Zero

Product - Key properties

- Excellent Viscosity Stability
- Very Good Print Behavior
- Transparent Flux Residue
- Excellent Wetting In Air & Nitrogen
- Low Voiding







Metal powder

- Alloy Composition:
  - SOP91123
  - SAC305

1) Chemical composition : (Spectromax - Spark Analysis)

Element	Specification (%)
Ag	3 ± 0.2
Al	< 0,0050
As	< 0,0300
Au	< 0,0500
Bi	< 0,0300
Cd	< 0,0020
Cu	0.5 ± 0.1
Fe	< 0,0200
In	< 0,1000
Ni	< 0,0100
Pb	< 0,0500
Sb	< 0,0500
Sn	96.5 ± 0.5
Zn	< 0,0030

CUSTOMER : HMT				
Elements	Required Percentages		Percentages in Sample	Pass / Fail
	As an Alloy Element	As an Impurity Element		
Ag	2.80-3.20		2.95	PASS
Al		0.001 Max	< 0.001	PASS
As		0.01 Max	< 0.01	PASS
Au		0.005 Max	< 0.001	PASS
Bi		0.03 Max	< 0.007	PASS
Cd		0.002 Max	< 0.001	PASS
Cu	0.3-0.7		0.49	PASS
Fe		0.02 Max	< 0.007	PASS
In		0.05 Max	< 0.007	PASS
Ni		0.005 Max	< 0.005	PASS
P		0.0015 Max	< 0.0015	PASS
Pb		0.05 Max	< 0.04	PASS
S		0.0015 Max	< 0.0015	PASS
Sb		0.05 Max	< 0.015	PASS
Sn	96.0-97.0		96.46	PASS
Zn		0.001 Max	< 0.001	PASS

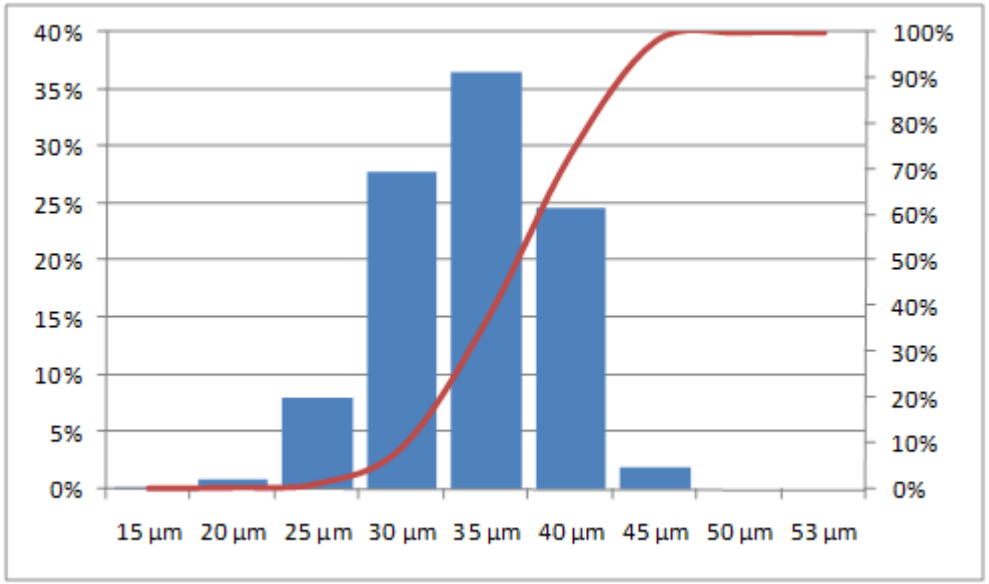
Metal powder

- Powder Content:
  - 89.25 weight-% +/- 0.5 weight-%

- Powder Size Distribution:
  - Type 4 (20 – 38 µm)

IN PRODUCT	
Ave. Diameter	32 ± 1.5 µm
Std. Deviation	5 µm
D10	25 ± 1 µm
D50	32 ± 1 µm
D90	37 ± 1 µm

Specification		IN PRODUCT
> 45 µm	0%	0 %
> 38 µm	/	13% ± 5%
20 - 38 µm	> 80 %	86% ± 5%
< 20 µm	< 5%	≤ 1 %



Flux classification

- Classification of SOP91123 solder paste according to J-STD-004B

Flux Composition – Classification: REL0

- RE:
  - *Resin based flux formulation used in SOP91123*
- L0:
  - *L = Low Activation*
  - *0 = Halide < 0.05%*

Corrosion – Classification: No Corrosion

- No Corrosion according to J-STD-004B Section 3.4.1.2 which refers to IPC-TM-650-#2.6.15
  - *Result: <u>No Corrosion</u>*

Flux classification

Flux activity type – Classification: L0 – all made tests are passed

- Classification according to J-STD-004B table 3-2, which includes the following tests:
- Corrosion Test according to IPC-TM-650, 2.6.15
  - *Result: No Corrosion*
  - *Copper Mirror Test according to IPC-TM-650, 2.3.32*
  - *Result: No Breakthrough*
- Halide Test according to IPC-TM-650, 2.3.28.1
  - *Result: All measurements of total bromine, chlorine & fluorine <1 ppm; iodine <20 ppm.*
- SIR Test according to CN 200010-000:2012-10-31
  - *262 h intermediate results: 5 soldered boards with resistance >100 MOhm*
- Summary:
  - *Classification L0*

Flux classification

Halogen content according IPC TM-650, Method 2.3.41:

- Remark: Halogen content according IPC TM-650, Method 2.3.41 does not exist
- Therefore, total halogen content tests according to J-STD-004B section 3.5.4 "optional halogen content test" were performed using the EN 14582 oxygen bomb method followed by ion chromatography per IPC-TM-650, Method 2.3.28.1 by lab "Dr. Pascher" in Sept. 2013
- Flux lots EVS 6015/1 - EVS 6015/3 results:

Probe	1) EVS 6015/1	2) EVS 6015/2	3) EVS 6015/3
Gesamt-Brom	<1 <1	<1 <1	<1 <1
Gesamt-Chlor	<1 <1	<1 <1	<1 <1
Gesamt-Fluor	<1 <1	<1 <1	<1 <1
Gesamt-Iod	<20 <20	<20 <20	<20 <20

Solder paste lot ES 10993 results:

Probe	11) ES 10993
Gesamt-Brom	<1 <1
Gesamt-Chlor	<1 <1
Gesamt-Fluor	<1 <1
Gesamt-Iod	<20 <20

- Summary based on:
  - *Formulation: halogen zero, i.e. no halogen containing compound added in flux.*
  - *Measurements of flux & paste: total bromine, chlorine & fluorine <1 ppm; iodine <20 ppm.*

Cleanability

- Classification of SOP91123 solder paste according to J-STD-004B

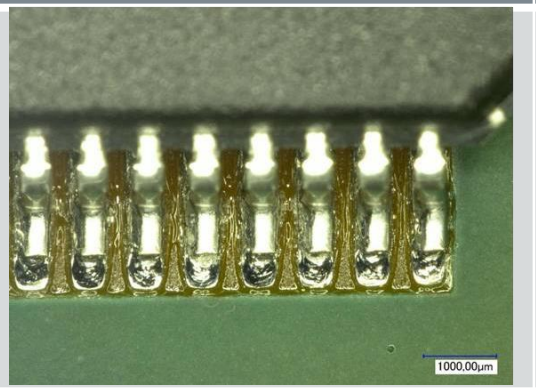
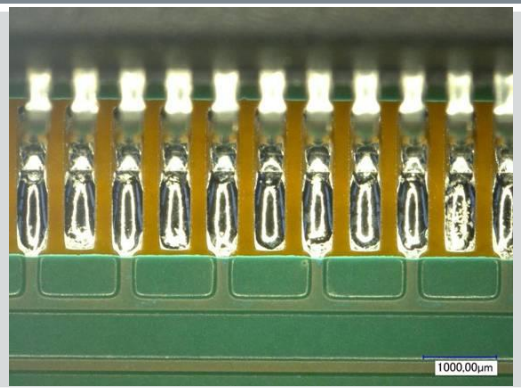
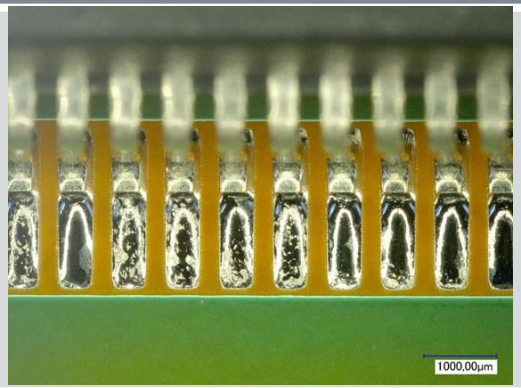
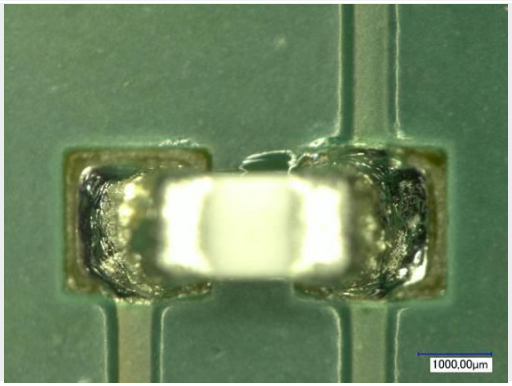
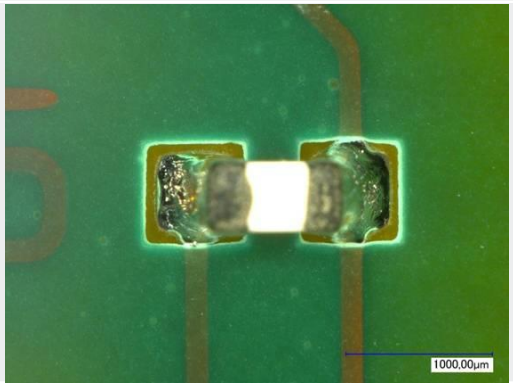
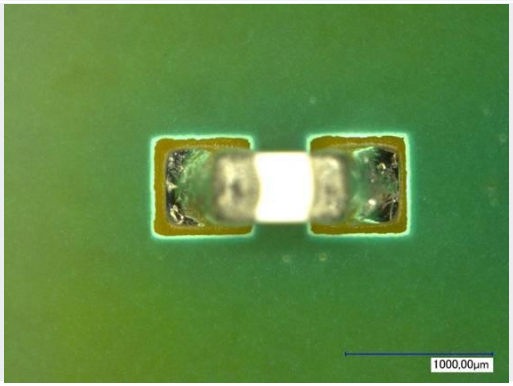
Resistance to solvents and cleaning agents

- Cleaning with Vigon A 201 and Vigon N 600 using standard cleaning conditions in an inhouse test at Zestron Ingolstadt in September 2013.
- Cleaning results - „+“:
  - *all flux residues easy removable with both agents (Vigon A 201 and Vigon N 600)*
  - *no corrosion visible - see next slide*
- Cleaning ranking:
  - „+“, *i.e. easy removable under standard conditions*
  - „0“, *i.e. removable with process optimizations*
  - „–“ , *i.e. difficult removable; process optimizations necessary*

Cleanability

- Classification of SOP91123 solder according to J-STD-004B

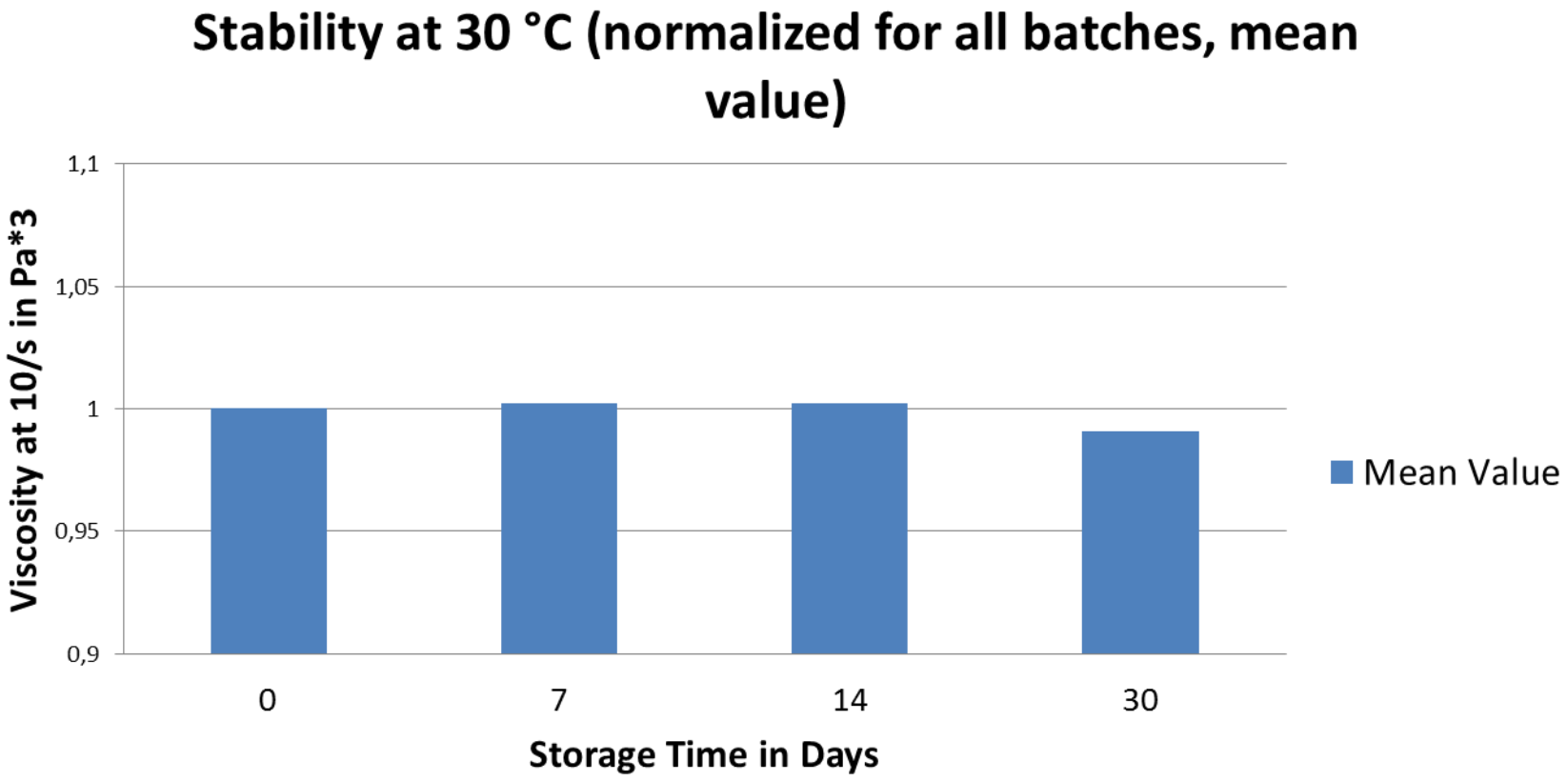
Section 4.2.3 – Resistance to solvents and cleaning agents

no cleaning	Vigon A201 cleaning: +	Vigon N600 cleaning: +
		
		

Viscosity

Solder Paste SOP91123				
	Initial	7 Days @ 30 °C	14 Days @ 30 °C	30 Days @ 30 °C
Batch	After Speedmixing	After Speedmixing	After Speedmixing	After Speedmixing
	Visc. @ 10/s (Pas)	Visc. @ 10/s (Pas)	Visc. @ 10/s (Pas)	Visc. @ 10/s (Pas)
ES 11231	**144**	**143**	**141**	**141**
ES 11266	**145**	**146**	**146**	**146**
ES 11267	**148**	**149**	**151**	**146**
Mean Value	**145,67**	**146,00**	**146,00**	**144,33**
Normalized	**1,00**	**1,00**	**1,00**	**0,99**

Viscosity


Stability at 30 °C (normalized for all batches, mean value)
Viscosity at 10/s in Pa*3
1,1
1,05
1
0,95
0,9
0
7
14
30
Storage Time in Days
Mean Value

Hot slump (according to IPC-TM-650 2.4.35)

No paste sample shall slump together for spacings of 0.40 mm or greater.

Requested

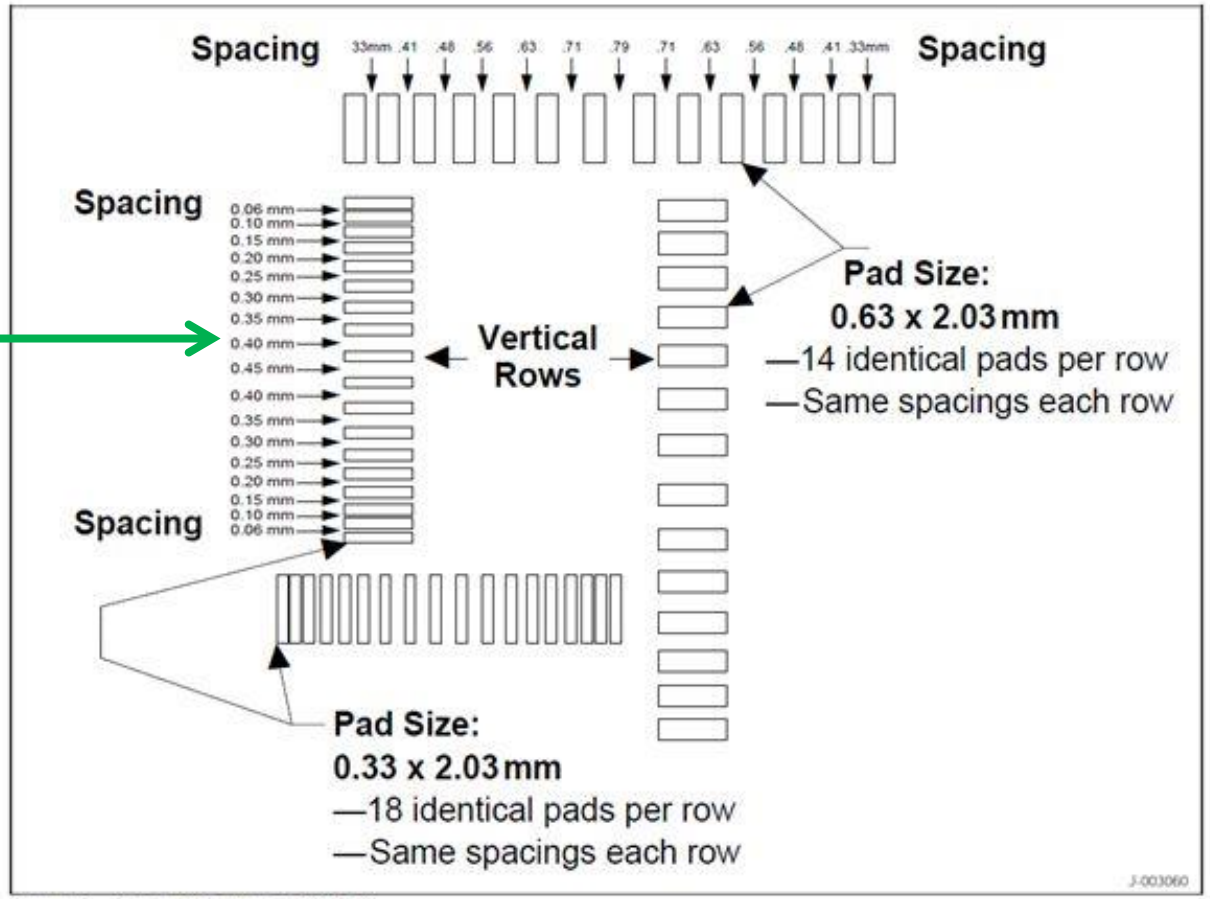
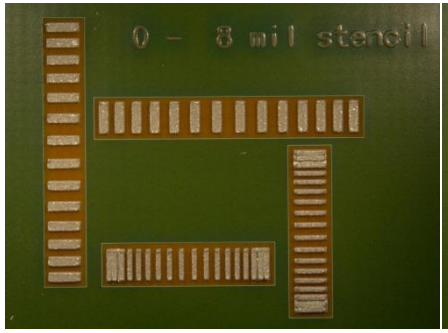


Figure 1 Slump test stencil, IPC-A-21

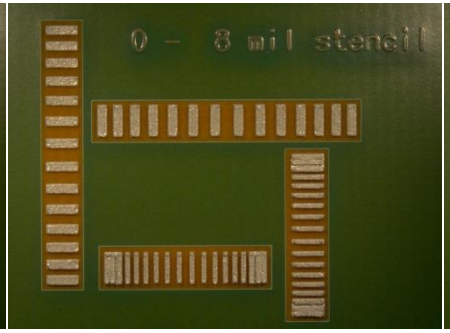
Hot slump

No slumping for solder paste SOP91123

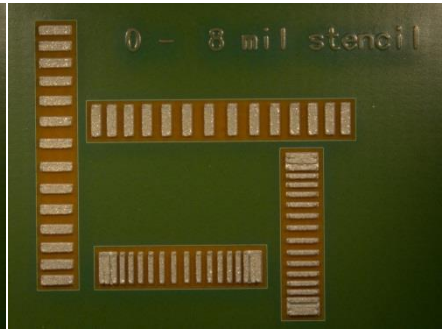
initial



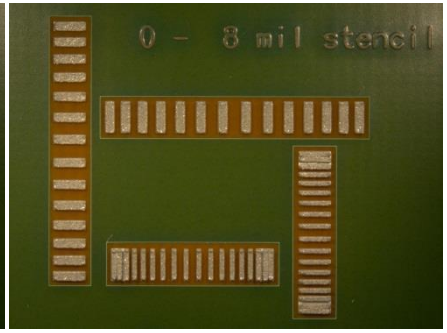
initial



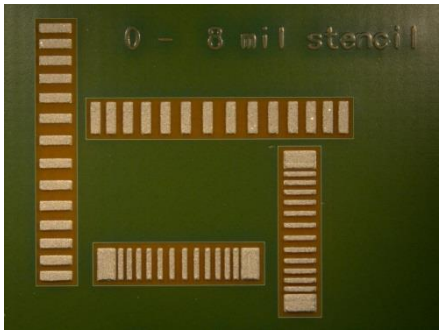
initial



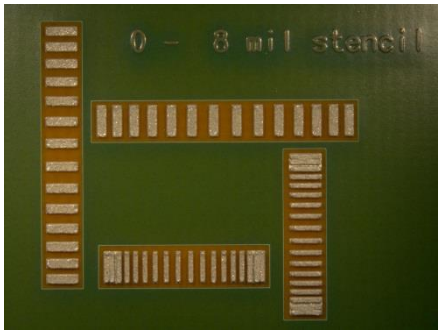
initial



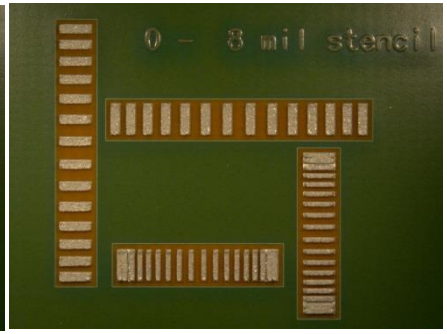
15min150°C



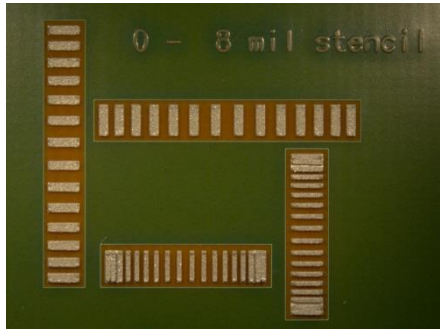
20min25°C



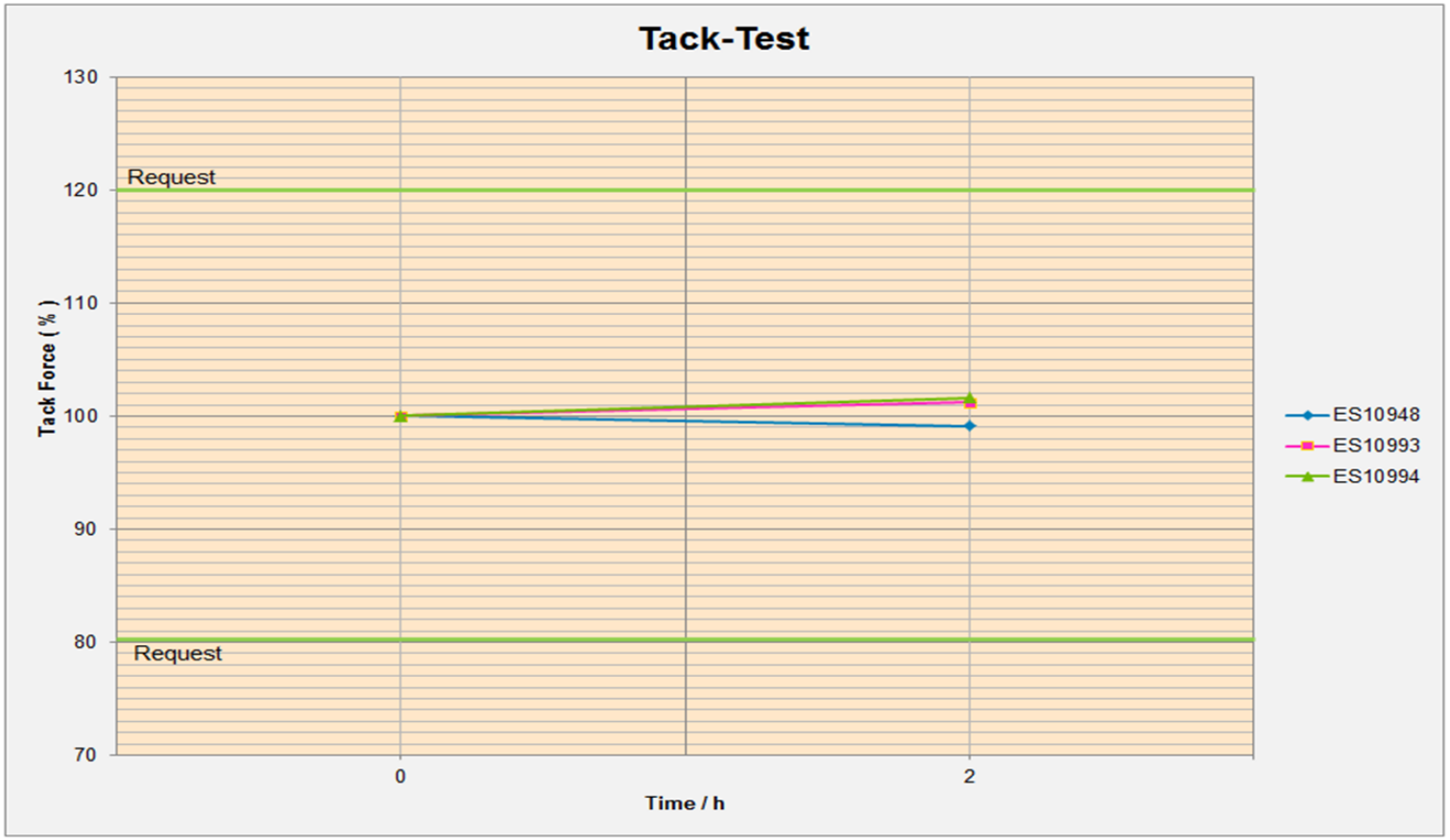
120min25°C-1



120min25°C-2

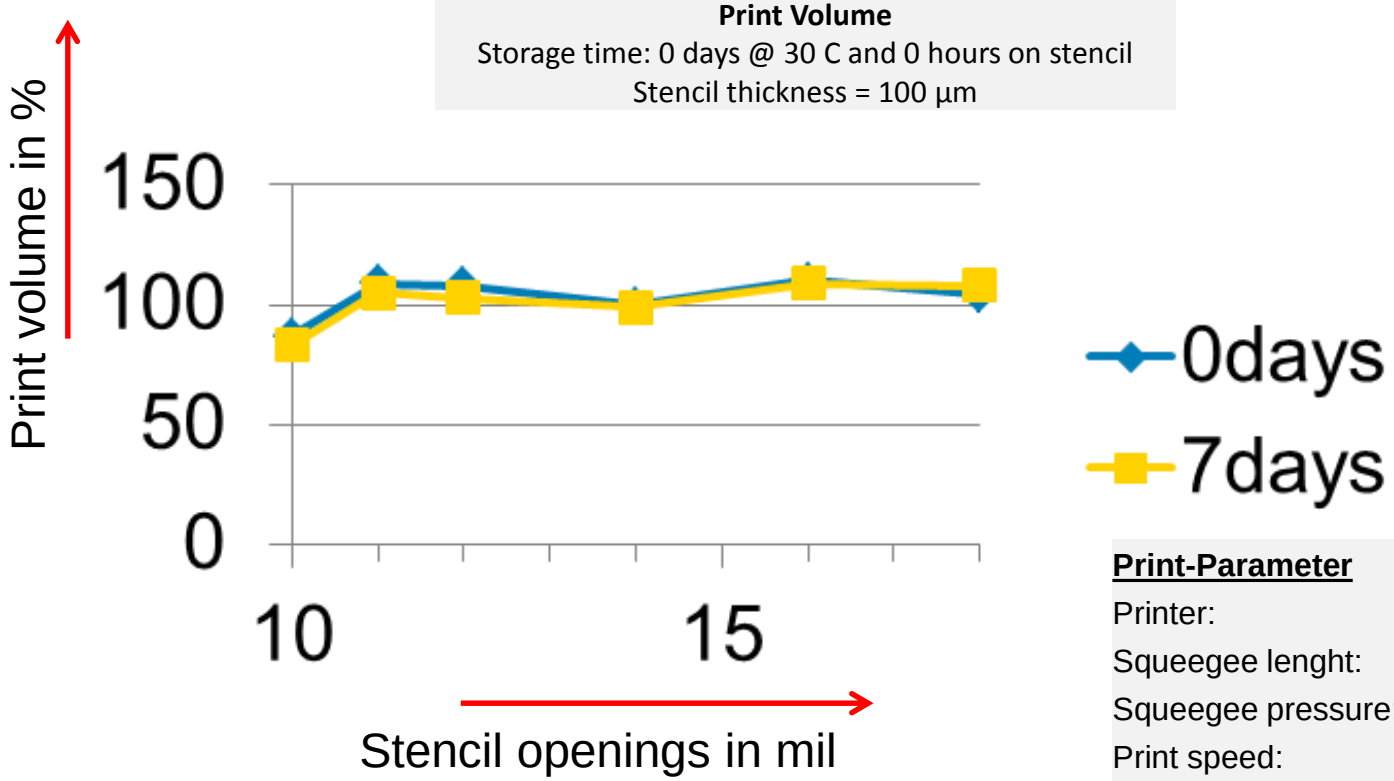


Tackiness (according to IPC-TM-650_2.4.44)



Printability

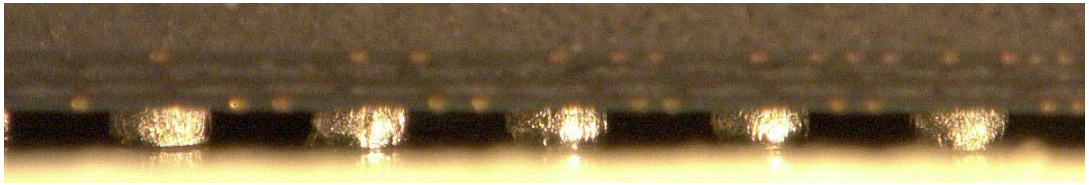
Print Volume
Storage time: 0 days @ 30 C and 0 hours on stencil
Stencil thickness = 100 µm



Print-Parameter

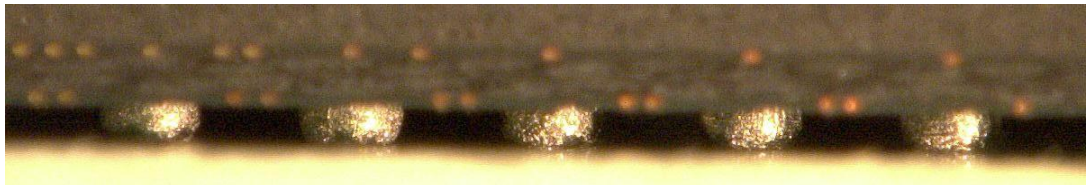
Printer:	Ekra X5
Squeegee lenght:	200mm
Squeegee pressure:	50-75N
Print speed:	50-100mm/s
Seperation speed:	78mm/s
Temp.:	26°C - 29°C
Humidity:	35% - 45%

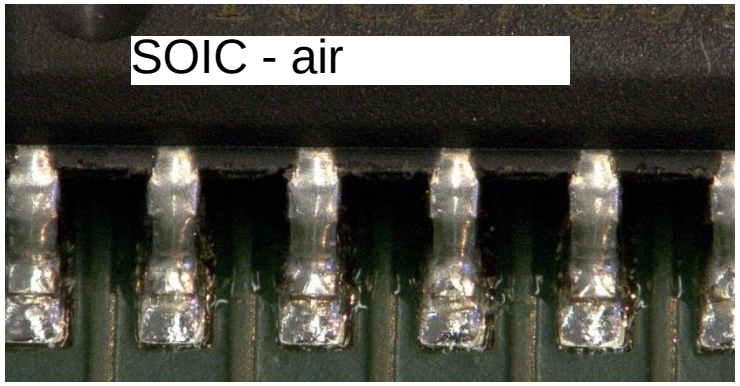
Solderability

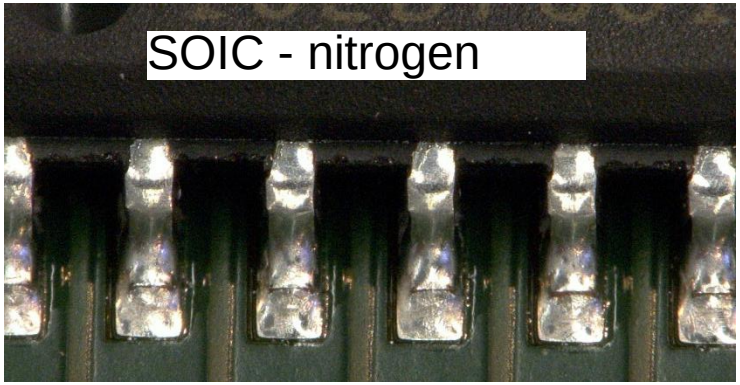


BGA soldered in air

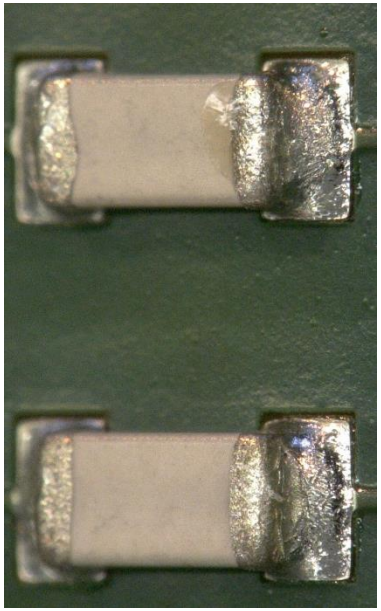
BGA soldered in nitrogen



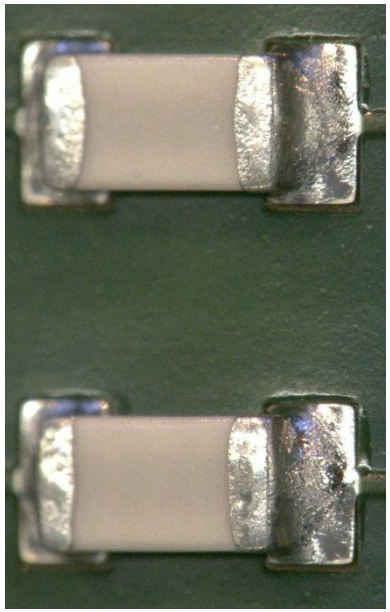




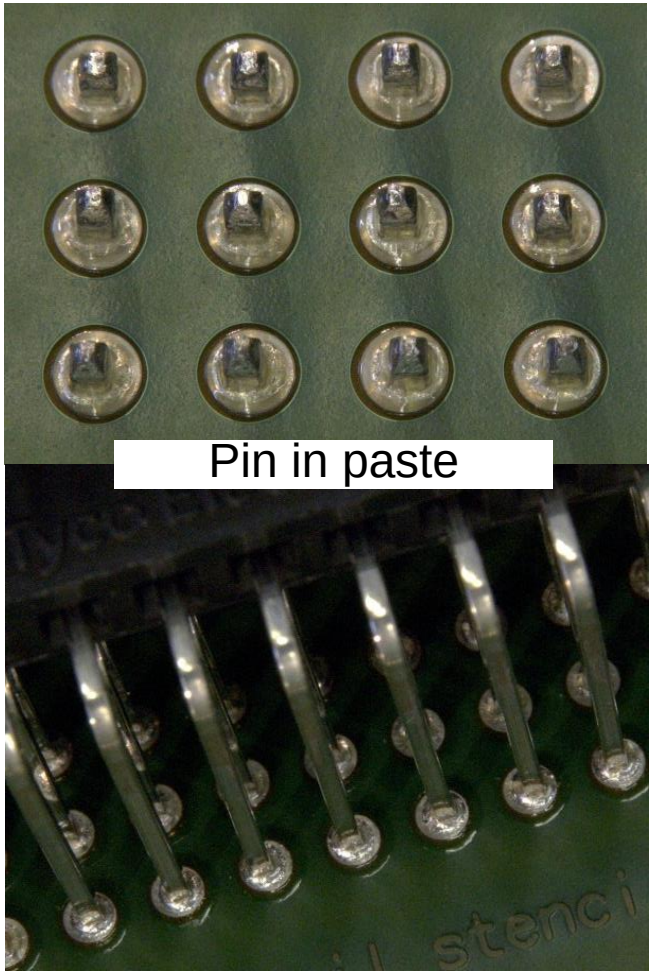
Solderability



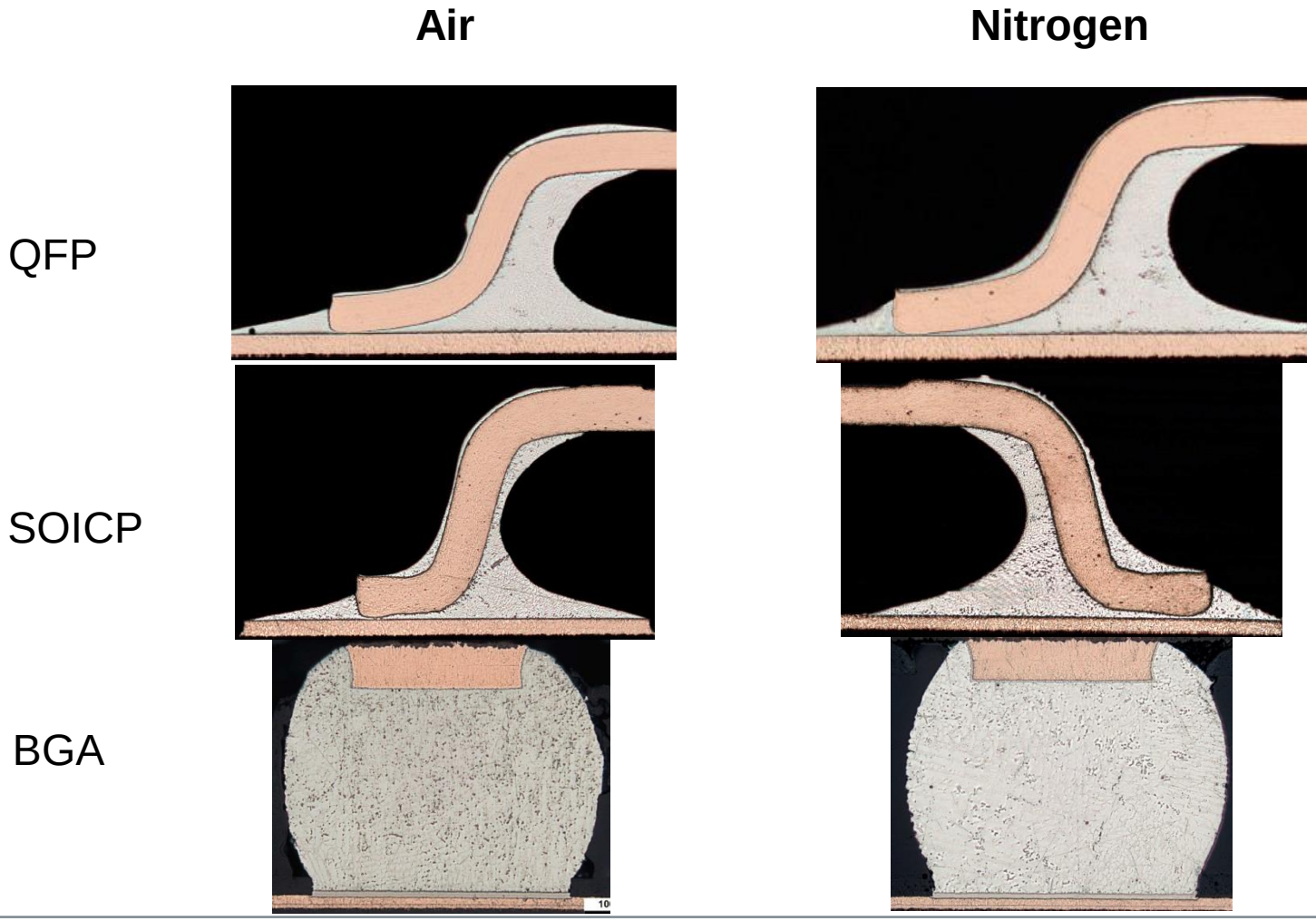
C1206 - air



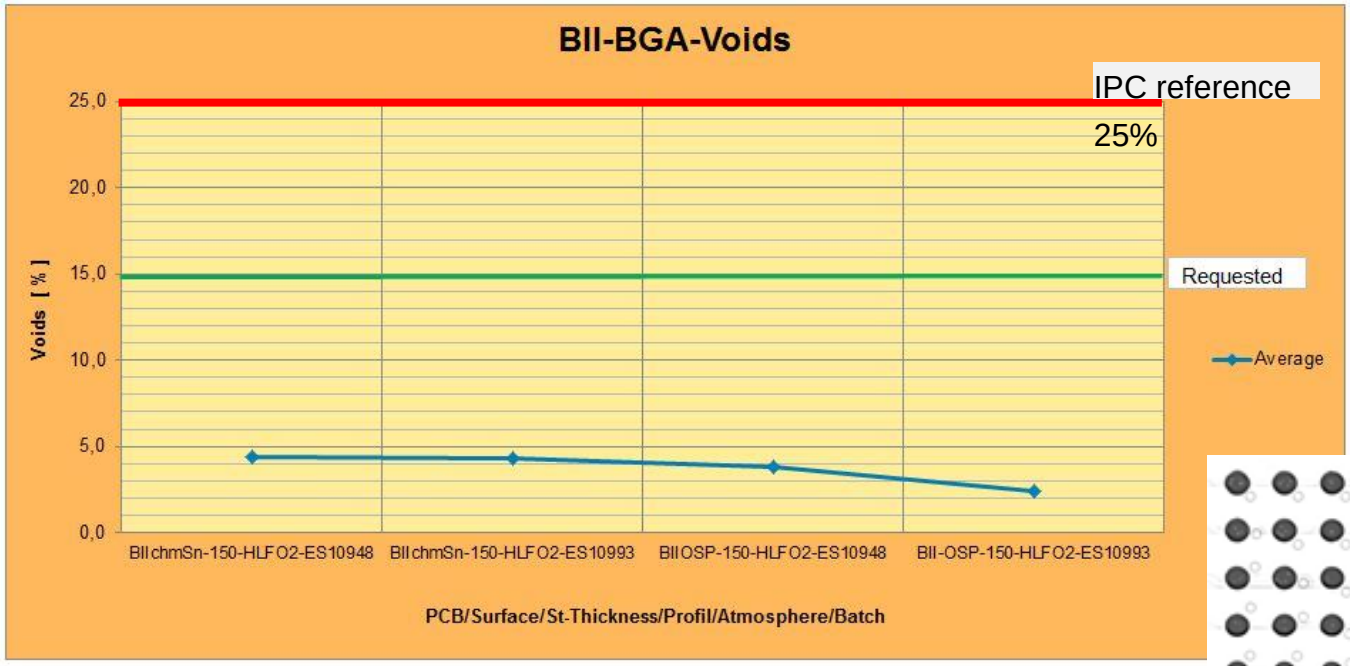
C1206 - nitrogen

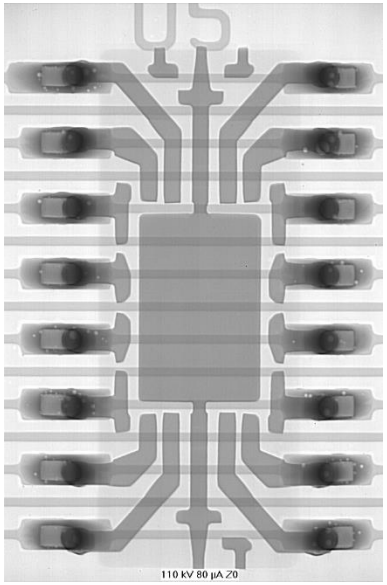


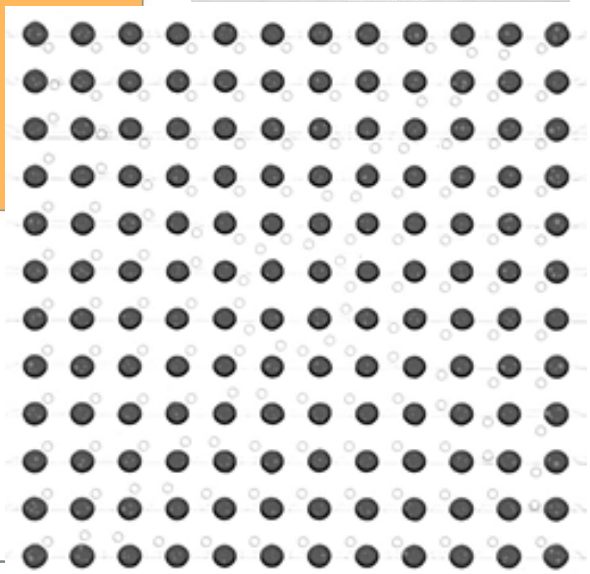
Solderability



Voiding


BII-BGA-Voids
IPC reference
25%
Requested
Average
Voids [%]
25,0
20,0
15,0
10,0
5,0
0,0
BII chmSn-150-HLF O2-ES10948
BII chmSn-150-HLF O2-ES10993
BII OSP-150-HLF O2-ES10948
BII-OSP-150-HLF O2-ES10993
PCB/Surface/St-Thickness/Profil/Atmosphere/Batch





Recommended profile – corresponding to IPC-020

Profile Feature	Pb-free Assembly	Sn-Pb Eutectic Assembly
Average Ramp Up Rate (Ts_{max} to Tp)	3° / second max.	3° / second max.
Preheat • Temperature Min (Ts_{min}) • Temperature Max (Ts_{max}) • Time (ts_{min} to ts_{max})	 150°C 200°C 60 – 180 seconds	 100°C 150°C 60 – 150 seconds
Time maintained above: • Temperature (T_L) • Time (t_L)	 217°C 60 – 150 seconds	 183°C 60 – 150 seconds
Peak/Classification Temperature (Tp)	See table below	See table below
Time within 5°C of actual Peak temperature (tp)	20 – 40 seconds	10 – 30 seconds
Ramp-Down rate	6°C / second max.	6°C / second max.
Time 25°C to Peak Temperature	8 minutes max.	6 minutes max

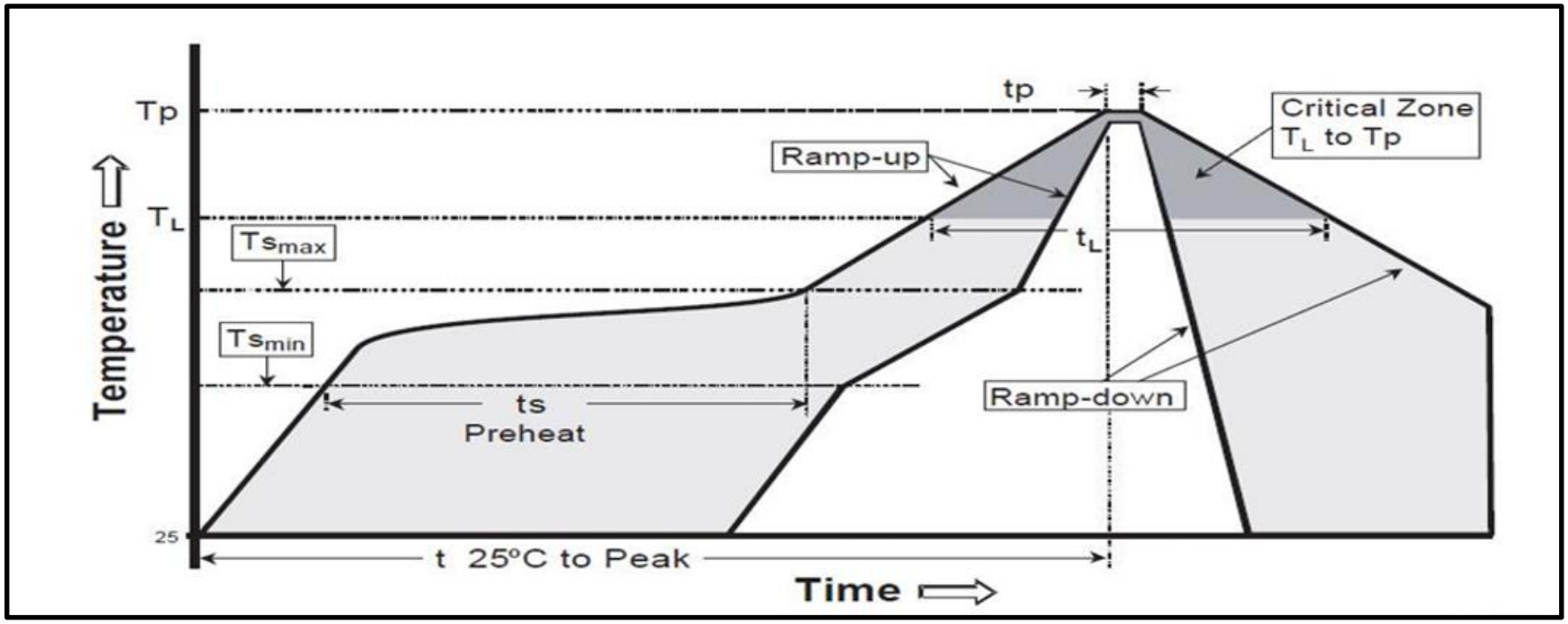
Pb-Free Process - Classification Temperatures (Tc):

Package Thickness	Volume mm^3 <350	Volume mm^3 350 - 2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm - 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Sn-Pb Process - Classification Temperatures (Tc):

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Recommended profile – corresponding to IPC-020



Storage and Conditioning

Refrigerated storage of the paste @ 2 – 10°C is recommended

- Shelf life: Please refer to the expiry date on the label of the packing unit
- Store the product in the tightly sealed packing unit and avoid exposure to high humidity and sunlight
- The paste should be removed from refrigeration at least two hours before use to reach ambient working temperature.
- Do not open the packing unit while the paste is still cold to prevent condensation of moisture.
- Do not heat up the paste
- Solder paste in cartridges or syringes should be stored tip down

Solder paste check of the solder paste prior to the usage

- Do not use the paste if packing unit is broken
- Do not use the paste if packing unit is not closed properly
- After opening the packing unit homogenize the paste for approx. 30 to 60 sec in order to mix possible separated flux in the paste. After mixing the paste should have a creamy appearance.
- For a uniform and stable viscosity stir the paste about 1 – 2 minutes, using a stainless steel or chemically resistive plastic spatula.

Description	**The SOP 91123 Solder Paste series, is a lead free, no-clean solder paste that promotes outstanding wetting and minimizes soldering defects. The flux system is specifically optimized for lead free solder alloys. This formula provides superior performance on a variety of surface finishes and leaves a clear residue after reflow. It is developed for J-STD-004 L0 classification and contains no halogens or halides.**
Key Benefits	- Anti-Capillary effect beneath QFP components - Good high-volume print capability - Halogen Zero

Product Code and Alloy

Code				Powder Properties			Application		
Paste	Alloy	Metal Content	Powder Type	Particle Size	Alloy	Melting Point	Stencil Printing	Dipping	Dispensing
SOP 91123	SAC305	89,25	4	25 - 45 µm	SnAg3,0Cu0,5	217°C	☑	☐	☐
							☐	☐	☐
							☐	☐	☐
							☐	☐	☐

Flux Activity

No Clean	Water Washable	ISO 9454-1:1990 [DIN EN 29454-1:1993]	J-STD-004A:2004	Bellcore GR-78-Core [Issue 1:1997]	Siemens Norm [SN 59650:1998]
☑	☐	1.2.2.C	REL0	not tested	not tested

Halogen Content

Halogen Free ☐
Halogen Free - Tolerances from IEC 61249-2-21: Cl or Br < 900 ppm, total < 1500 ppm; measured according BS EN 1458

Halogen Zero - No Halogen added in the Flux: ☑
Halogen Zero - Tolerance: Halogen < 50 ppm; measured according BS EN 14582

Paste Conditioning	Take paste from fridge: Before opening the package leave paste 2 hours at room temperature so that paste warms up. Do not open jar/cartridge while paste is cold to prevent condensation of moisture on the paste. Do not heat the paste. Before use of paste jar: To obtain uniform, stable viscosity stir paste for 1 to 2 min, using a stainless steel or chemically resistive plastic spatula.
Reflow	Peak temperature: 20 - 30°C above the melting temperature of the alloy. Time above melting temperature: 30 to 60 seconds.
Cleaning	After reflow flux residues may remain on the circuit and do not need to be washed. For cleaning of wet paste or if desired for cleaning of flux residues Zestron and Vigon cleaners can be used – see separate cleaning recommendations.
Storage	Store the solder paste in tightly-sealed containers and avoid exposure to sunlight and high humidity. Max. expiration date: Please refer to the expiry date on the lable of the packaged product. Store refrigerated @ 2 - 10°C

Contact	www.heraeus-contactmaterials.com / Product Management SMT	**Version**	Scale Up: MICROBOND SOP 91123 P SAC305 Series