

Low Temperature Solder Paste L29-145HF Technical Report

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Solder Technical Center

① Benefits

- Reduce consumption energy
- Eliminate Flow soldering process
- Non Wet Open decrease

② Product Outline

- Product LINEUP
- Alloy Physicality
- TCT Reliability
- Drop Reliability

③ Physical properties of 145HF paste

- Storage stability (refrigeration)
- Continuous printing
 - Viscosity change
 - Reflow ability
- Reflow ability
 - Wettability for various material
 - Improvement of solder ball
- Electrochemical migration test
- Reliability test

④ Recommended reflow profile

⑤ Data Sheet

■ Reduce consumption energy.

Low Temperature Solder(Sn-Bi) Paste greatly contributes also to energy cost and exhaust CO₂ decreases.

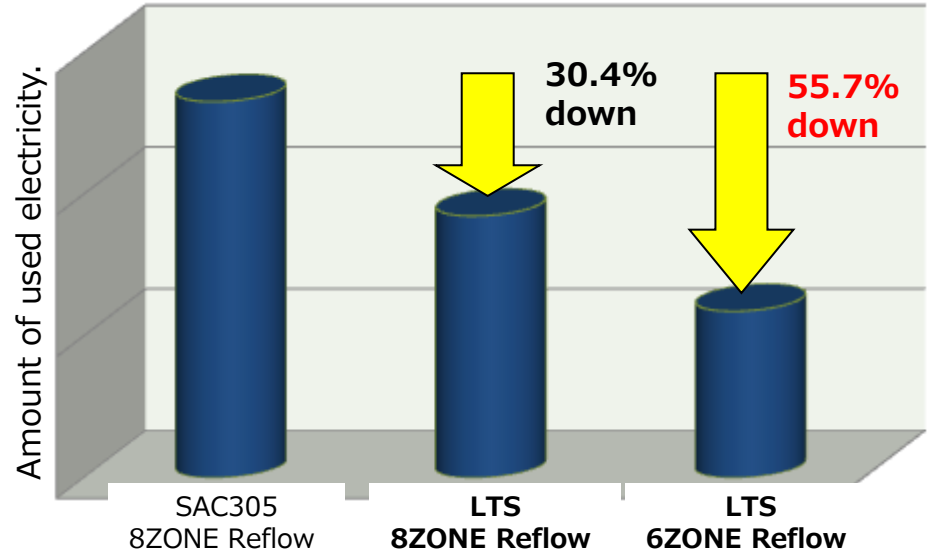
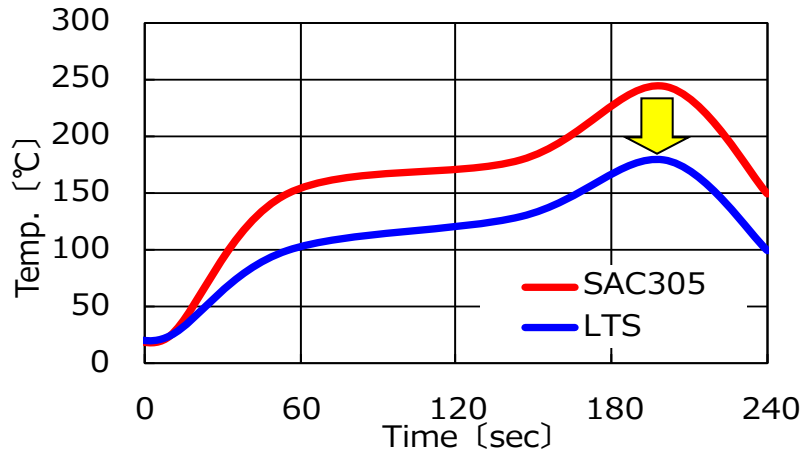


Table CO₂ Cutback Ratio by changing to SnBi from SAC305 solder paste.

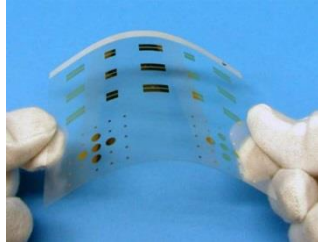
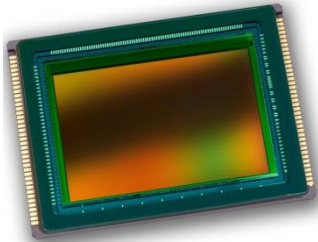
Solder	Reflow Type	Energy Consumption	Running time in one year	Annual Energy Consumption	Annual CO ₂ Emission	CO ₂ Cutback Ratio
M705 (SAC305)	8zone	15.8 kW	8400 hours	132.7 MW/year	49.5 ton/year	-----
LTS	6zone	7.0 kW	8400 hours	58.8 MW/year	21.93 ton/year	55.7 %
	8zone	11.0 kW	8400 hours	92.4 MW/year	34.47 ton/year	30.4 %

It is possible to reduce amount of used electricity by 50%.

■ Eliminate Flow soldering process.

<Current>

LTS paste can reflow for component (weak against heat) and PCB.



LTS paste can reflow C-MOS sensor(component of weak against heat)
And, LTS paste reduce parts cost
by lowing parts of operating temperature limit.

<Additional benefit>

- Eliminate Flow soldering process.

Large-size insertion parts (being used by flow soldering process and weak against heat) can reflow.

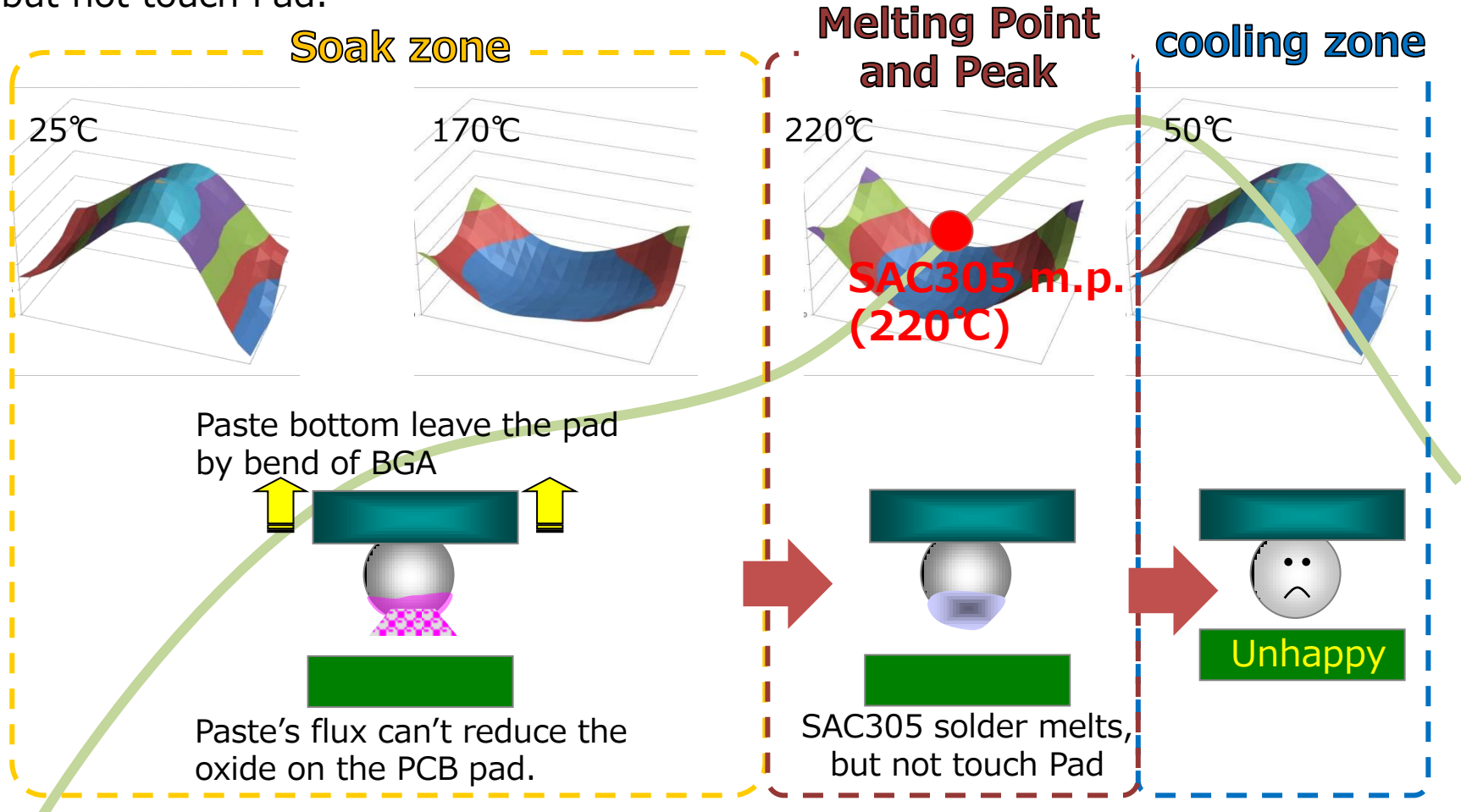
So, we can reduce number of process.



■ **NWO (Non Wet Open) SAC305 case**

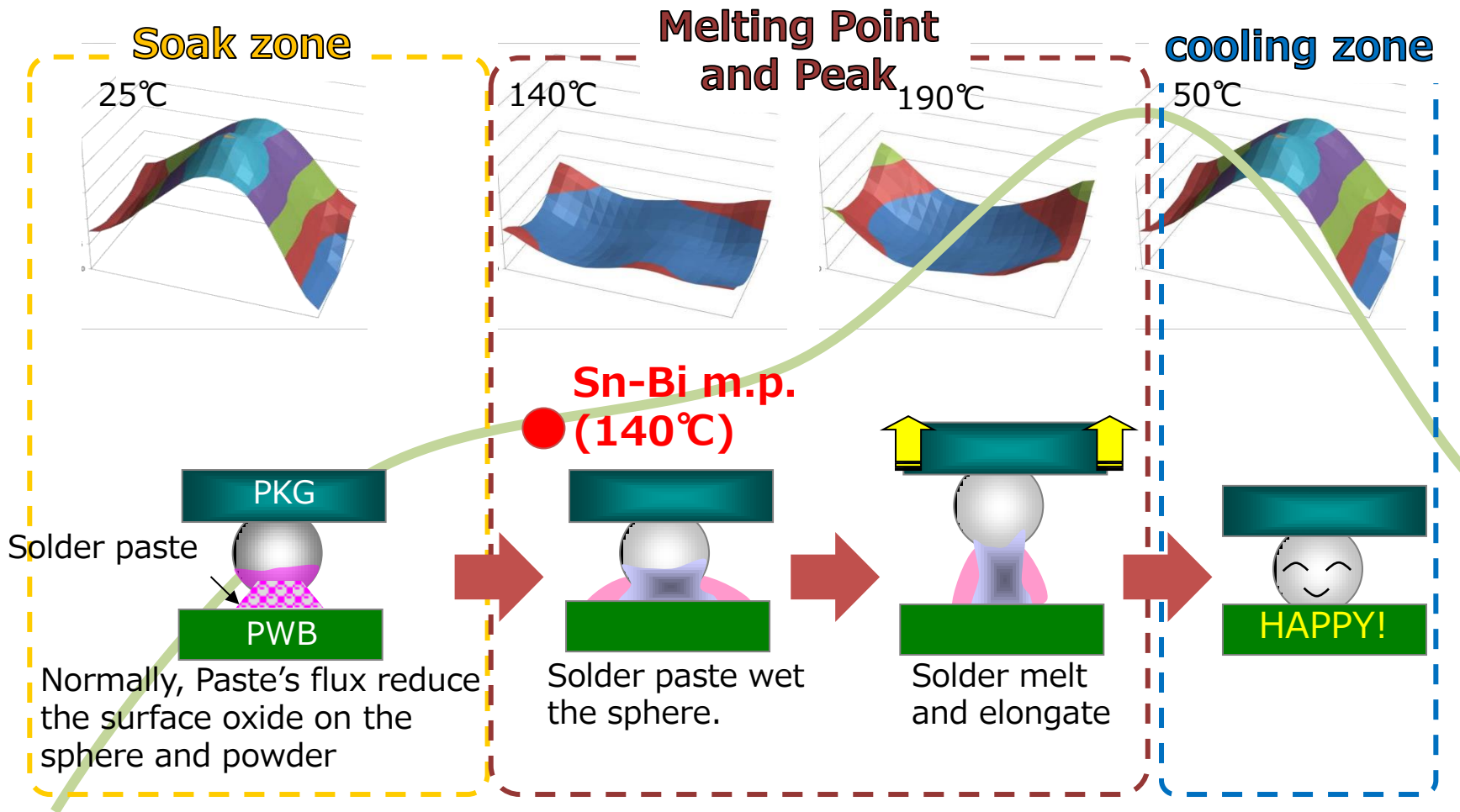
NWO is BGA open issue.

Paste bottom leave the pad by bend of BGA at Soak zone. And, SAC305 solder melts, but not touch Pad.



NWO issue is influenced by BGA warpage until melting point.

■ NWO (Non Wet Open) LTS case

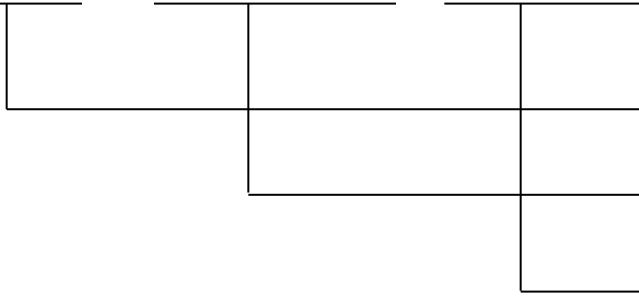


LTS paste is able to improve the NWO issue.

■ Product LINEUP

ECOSOLDER® PASTE

HF L29 – 145HF Type4



- Alloys: Senju Ecosolder L29(Sn-58Bi-Sb-Ni)
- Flux model: 145HF
- Powder size: Type 4 (20-38μm per IPC J-STD-005) available upon request

- Packaging Sizes: 500 gram jars, 6" & 12" cartridges, DEK ProFlow TM cassettes

■ Alloy Physicality

Alloy Type	Senju's Alloy Code	Composition	Melting Temperature [°C]
Sn-Bi	L29	Sn-58Bi-Sb-Ni	140 - 145
Sn-Ag-Cu	M705	Sn-3.0Ag-0.5Cu	217 - 220

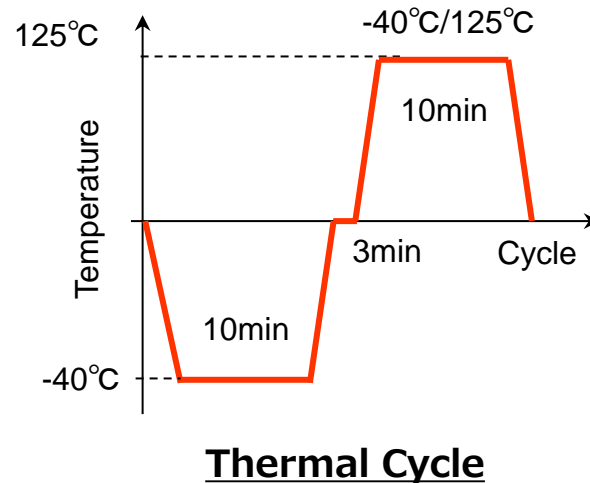
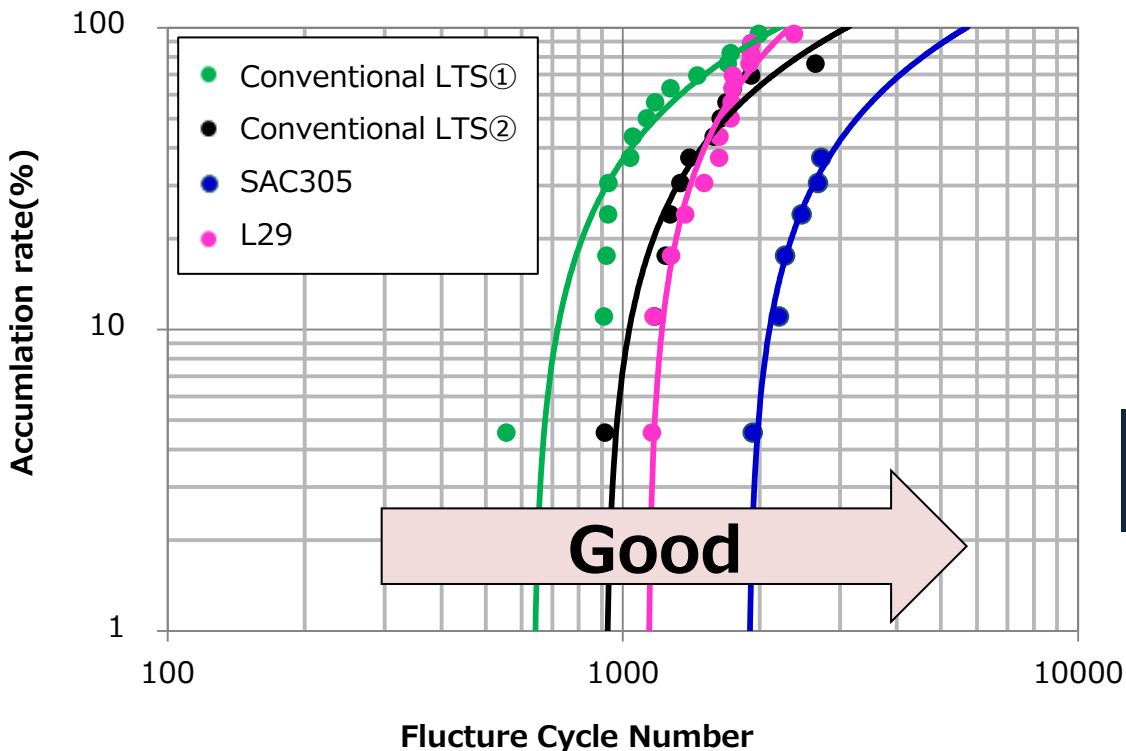
■ TCT Reliability

Test condition:
 Test device: 13x13mm BGA
 Electrode finish: Cu-OSP

PCB thickness: 0.8mmt
 Surface finish: Cu-OSP (SMD)

Impact acceleration: -40°C/125°C each 10min
 Test number: N=15

Solder alloy of SMT solder paste:
 ① Sn-58Bi-Sb-Ni (L29)
 ② Sn-3.0Ag-0.5Cu (M705)
 ③ Conventional LTS①
 ④ Conventional LTS②



L29 has higher TCT reliability than conventional LTS.

■ Drop Reliability

Test condition:
 Test device: 13x13mm BGA
 Electrode finish: Cu-OSP

PCB: 30x120x0.8t mm
 Surface finish: Cu-OSP (NSMD)

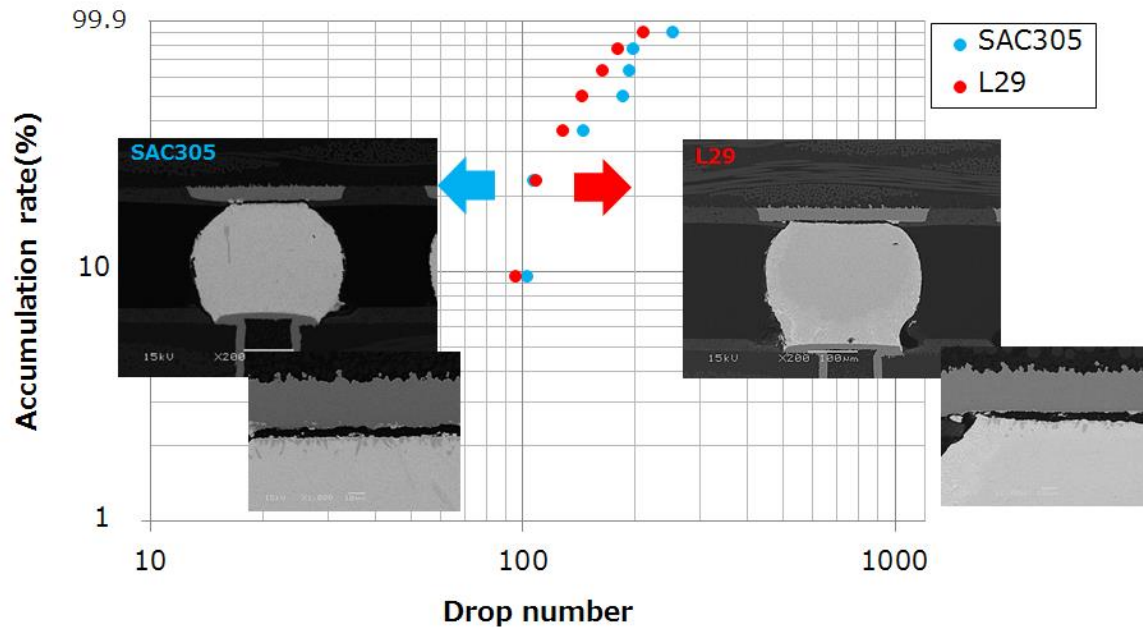
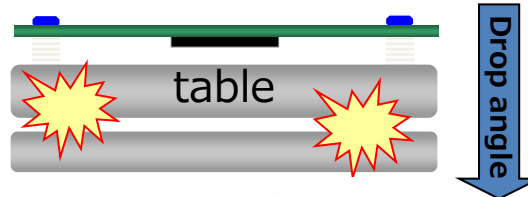
Solder alloy of SMT solder paste:

- ① Sn-58Bi-Sb-Ni (L29)
- ② Sn-3.0Ag-0.5Cu (M705)

Test Flow:

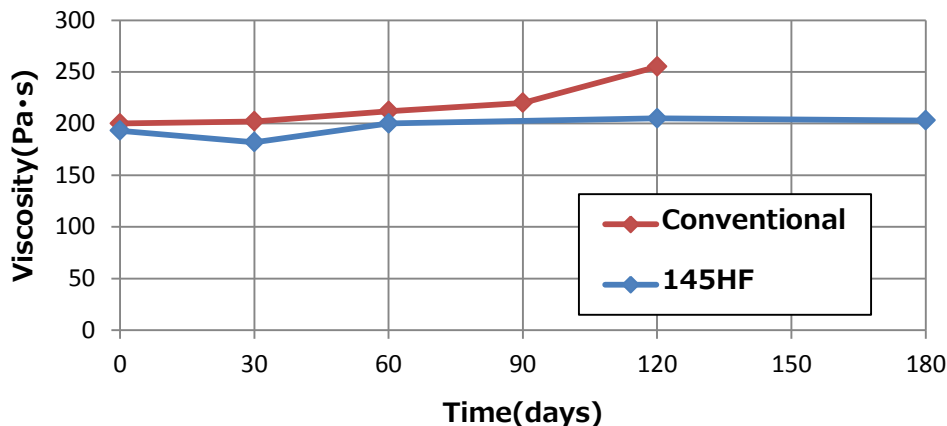
1. Set test coupon to test equipment
2. Conduct drop test with 1500G at impact acceleration
3. NG criteria is over 20%, compared with initial resistance

Drop test image



L29 is same drop reliability compare with SAC305.

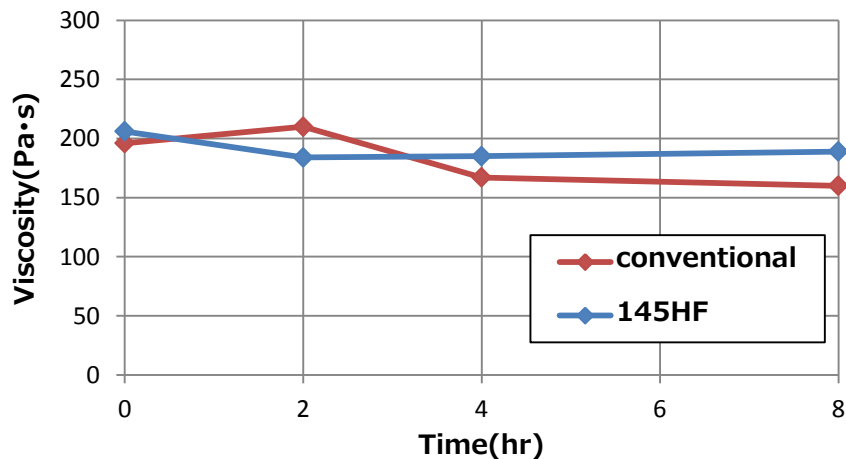
■ Storage stability (Refrigeration)



6 month pot life in refrigerator.

■ Continuous printing

[Viscosity change]

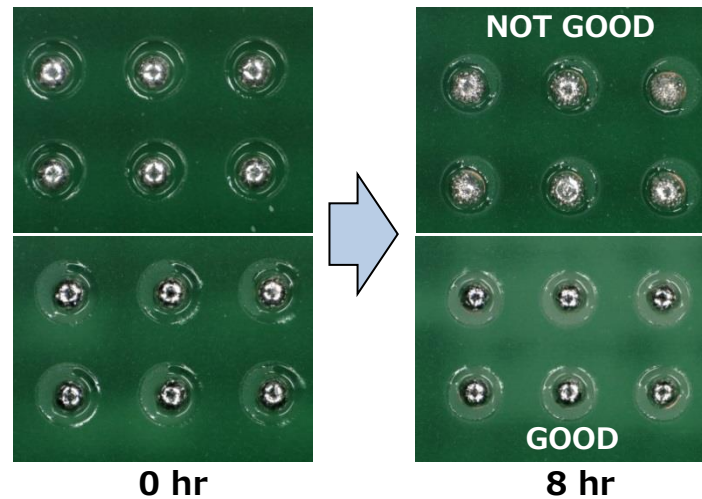


[Reflow ability]

0.3mm dot pattern
Stencil thick: 0.15mm

Conventional

145HF



145HF can be used for continuous printing till 8 hours.

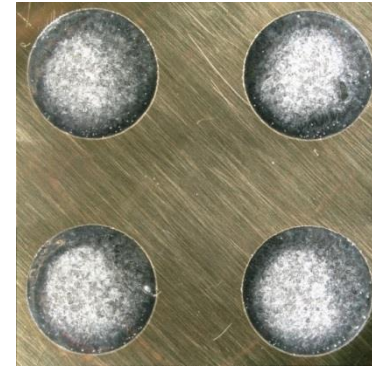
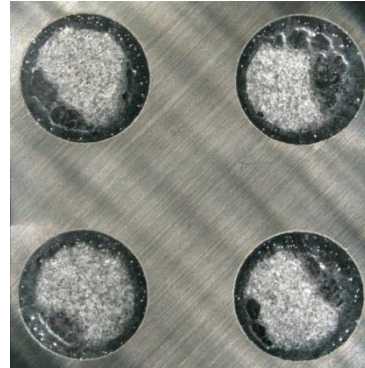
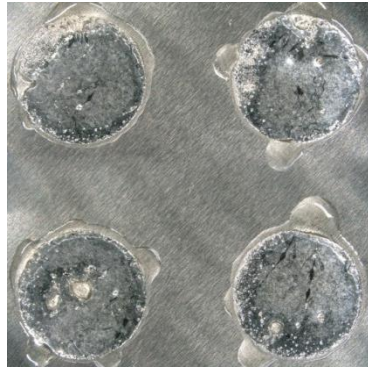
■ Reflow ability

Wettability for various material

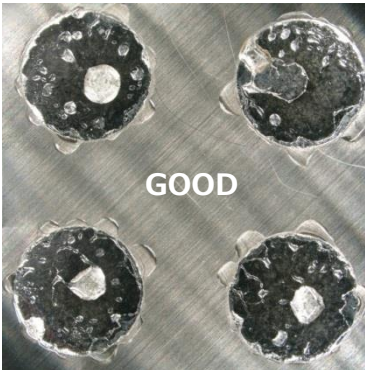
Stencil thick: 0.12mm

Stencil design: circle 7.5mm

Conventional



145HF



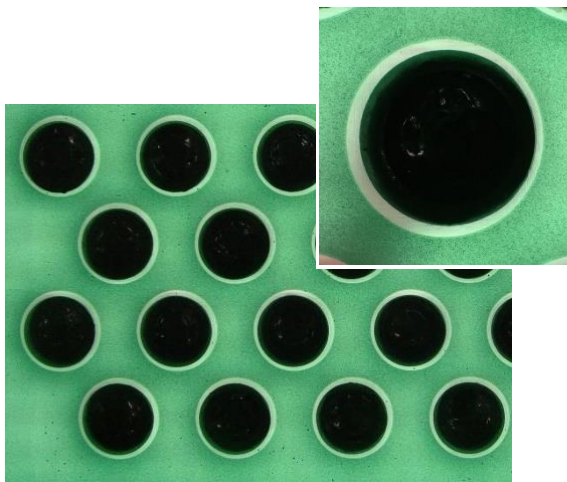
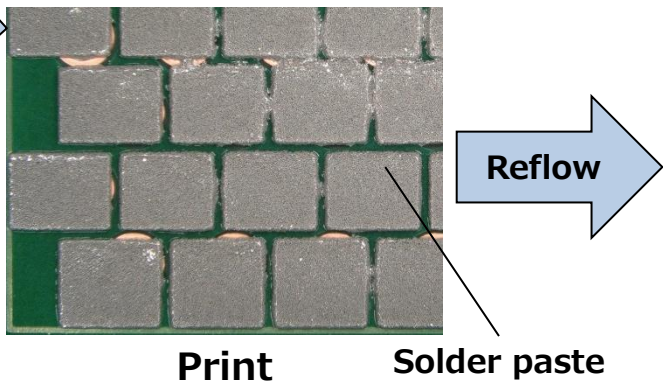
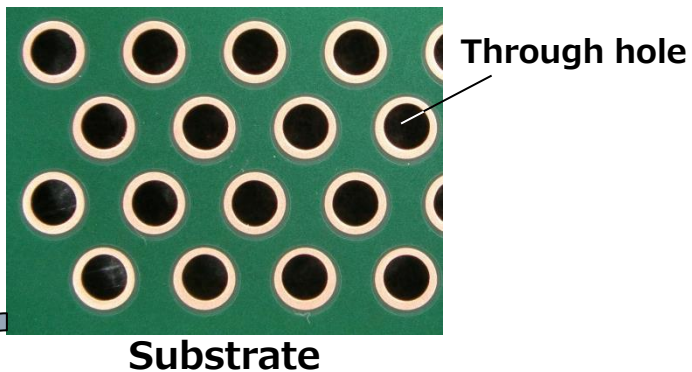
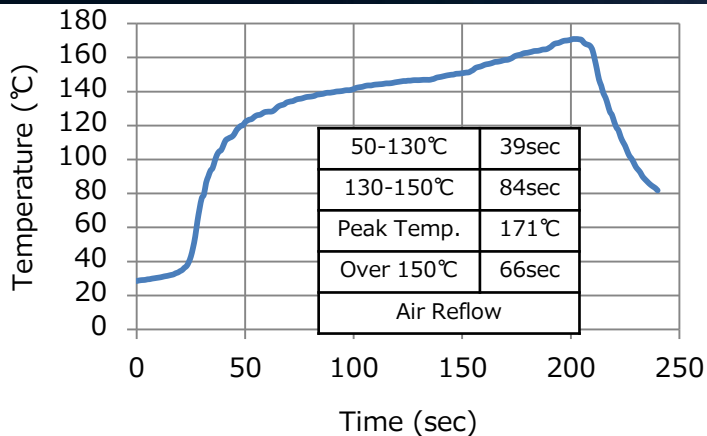
nickel silver

nickel

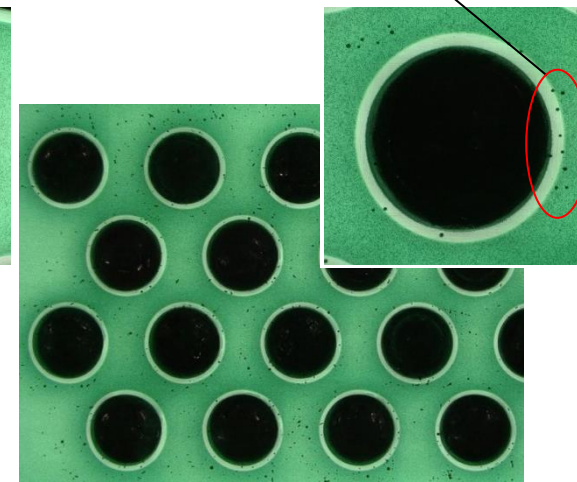
brass

145HF has good wettability on various surface finish.

■ Reflow ability
Improvement of solder ball



145HF
GOOD



Conventional

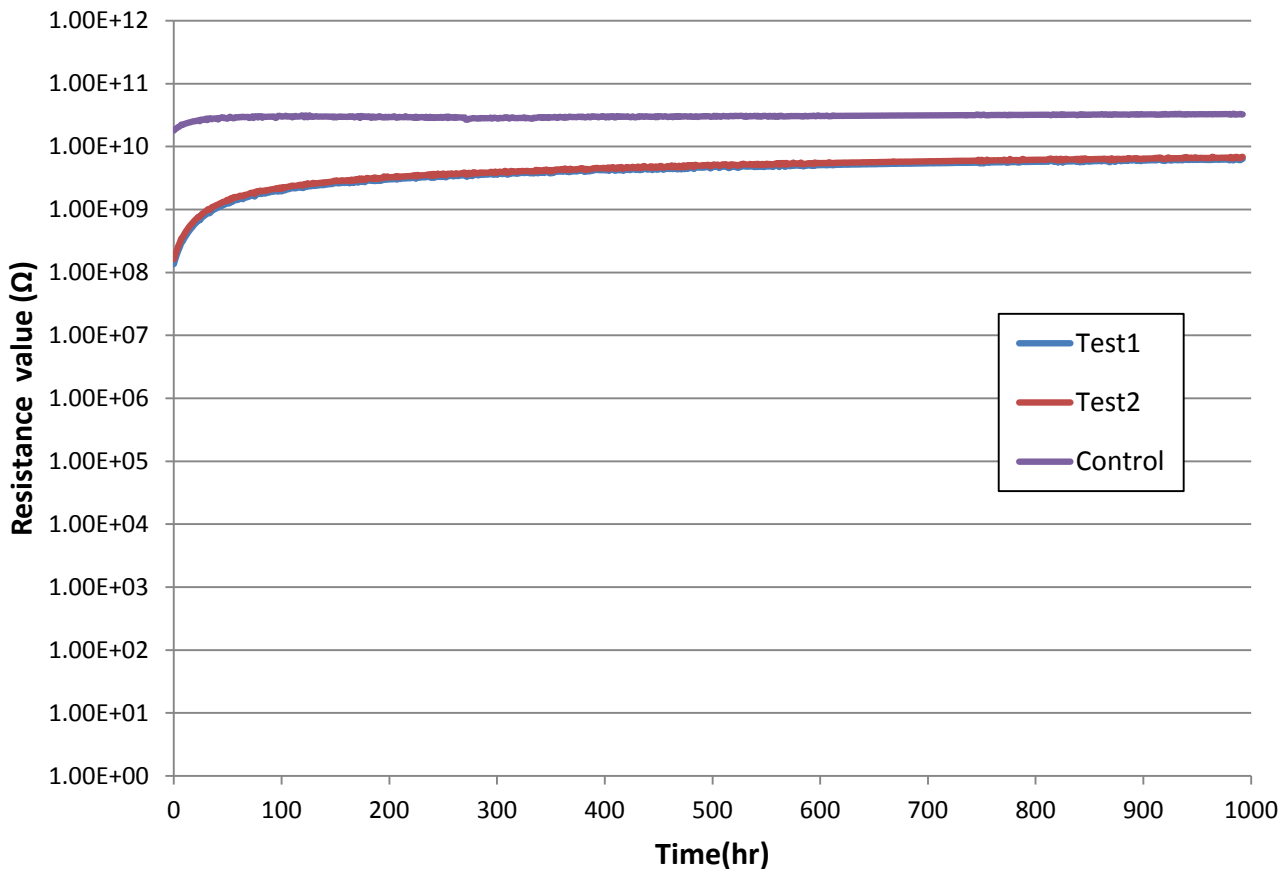
Stencil thick: 0.13mm
Inside diameter: 1.1mm
Stencil design: 1.9mm×2.3mm

145HF is few solder ball in Air reflow

■ Electrochemical migration test

Test PCB: Line/Space = 0.318mm / 0.318mm
 Stencil thickness: 0.1mm

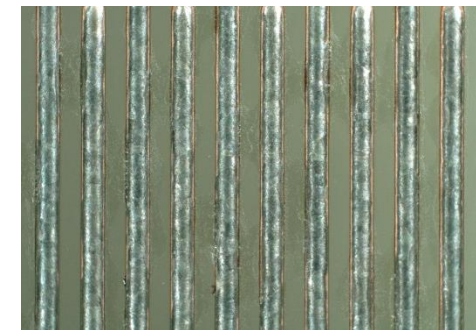
Measuring voltage: DC100V
 Applied voltage: DC50V
 Environment: 85°C85%RH



Control



145HF



**Results: Pass
 No migration**

■ Reliability Test

Cu Plate Corrosion Test

Procedure: JIS Z 3197
 Environment: 40°C90%RH
 Time: 72H



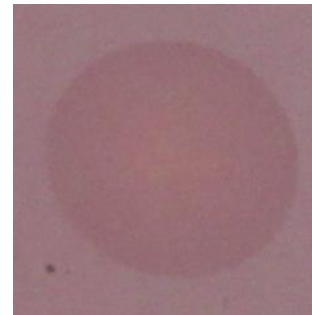
L29-145HF Type4

blank

Results: Pass

Cu Mirror Corrosion Test

Procedure: JIS Z 3197
 Control material: WW rosin 25% IPA solution
 Test material: 145HF flux 25% IPA solution
 Environment: 25°C50%RH
 Time: 24H



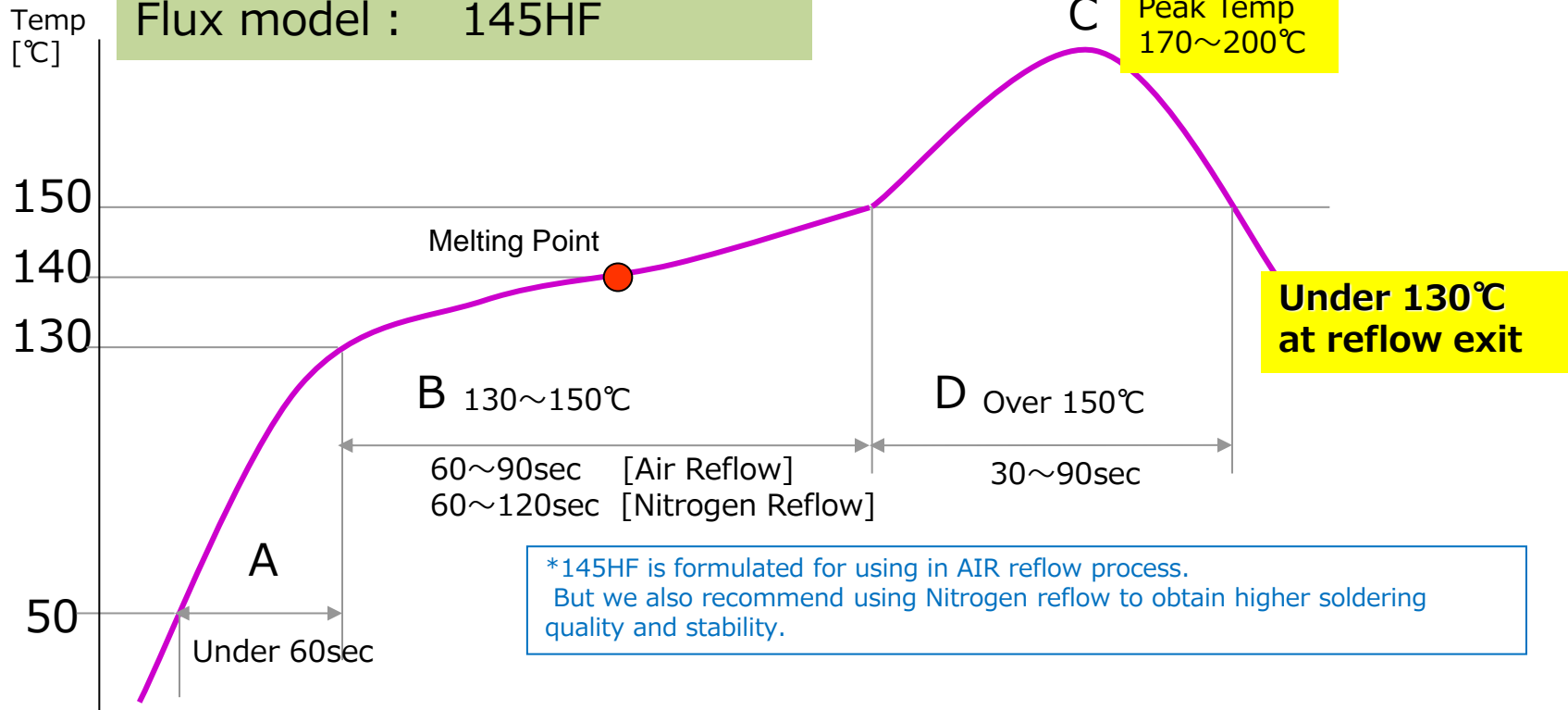
145HF solution



WW rosin solution

**Results: Pass
 No evidence of
 mirror breakthrough**

L29(Sn-Bi-Sb-Ni) solder paste
Flux model : 145HF



		Recommended Value		Time [sec]
		Air Reflow	Nitrogen Reflow	
A	50~130°C	under 60sec	under 60sec	
B	130~150°C	60~90sec	60~120sec	
C	Peak Temp	170~200°C	170~200°C	
D	Over 150°C	30~90sec	30~90sec	
E	O2 Concentration	----	under 1000ppm	

Items	L29-145HF	Test method
SOLDER POWDER		
Alloy Composition	L29 (Sn-58Bi-Sb-Ni)	- - -
Melting Temperature	140-145°C	DSC
Powder Shape	Spherical	SEM
Particle Size	Type4 (20-38μm)	SEM, Screen Method
SOLDER PASTE		
Flux Classification	ROL0	J-STD-004B
Halogen Content	Less than 900ppm	EN 14582
Halide Content	0.02% or less	JIS Z 3197
Cu Plate Corrosion Test	Pass	JIS Z 3197
Cu Mirror Corrosion Test	Pass	JIS Z 3197
Surface Insulation Resistance Test	Over 1.0E+9 Ω	JIS Z 3197 (40°C/90%RH, 168h)
Electro Chemical Migration Test	Over 1.0E+8 Ω No Migration	JIS Z 3197 (85°C/85%RH, 1000h)
Flux Content	10.5%	JIS Z 3197
Viscosity	190Pa·s	JIS Z 3284
Thixotropic Index	0.60	JIS Z 3284
Slump Test	Cold 0.3mm/Hot 0.3mm	JIS Z 3284
Tackiness Test	Over 1.0N within 24h	JIS Z 3284
Solder Ball Test	Rank 2-3	JIS Z 3284
Validity	6 months	Unopened, Keep at 0-10°C

※The values in this table are for reference.