

**ECO SOLDER<sup>®</sup> PASTE**

# **M705-ULT369 Technical Report**

Senju Metal Industry Co.,Ltd.  
Solder Technical Center

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Product Characteristics

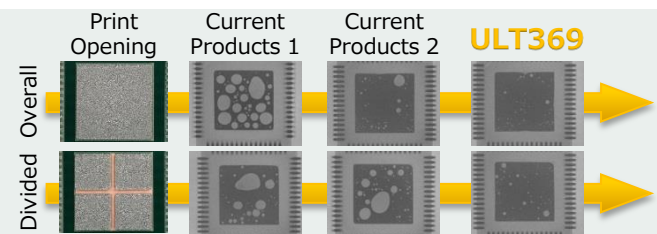
Next Generation Solder Paste

# M705-ULT369

Newly designed to be state-of-the-art. More user-friendly, achieving a high workability.

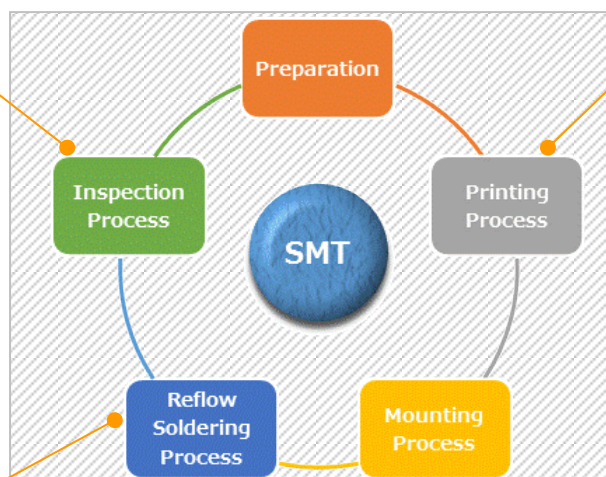
### Low Void

The trend to high-capacity and high-speed communication puts heat radiation into focus. In this connection, voiding became an important character in terms of soldering. ULT369 has a high flowability. Voids are easily discharged from solder. Even in case of subdivided pattern, ULT369 is able to decrease the voiding.



### High Printability

ULT369 has a high printability. Especially the filling/releasing ability is increased. This contributes to the printability at small openings and narrow pitches. ULT369 has an excellent temporal stability to achieve high productivity.

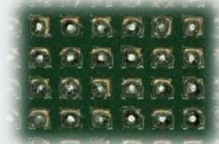


### High reflowability

- Electric parts become smaller and smaller, and require thus a smaller solder powder size. Smaller solder powder oxidizes easily, affecting the solderability. ULT369 can keep its solderability with high heat resistance.
- BGA Packages become thinner and thinner, bending more easily. This can cause HiP (Head in Pillow) and NOW (Non-wet Open) issues. ULT369 overcomes those problems with its outstanding wettability.
- Its high wettability can help soldering difficult places like QFN edges.



HiP



Meltability



NOW

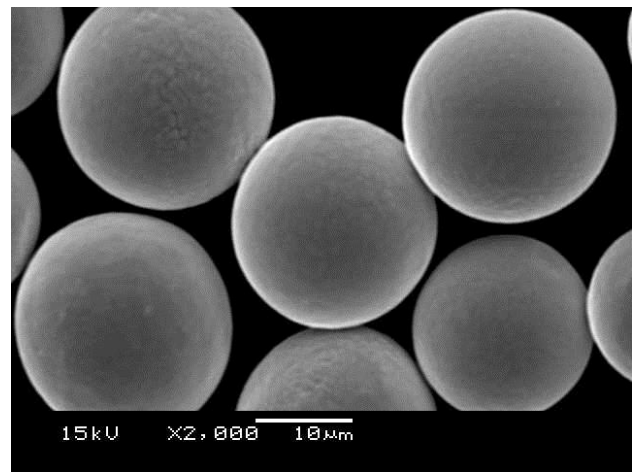
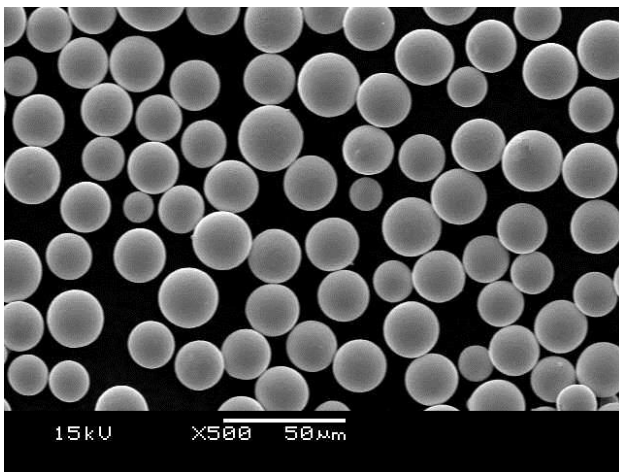


Wettability

## 2-1. Alloy Characteristic

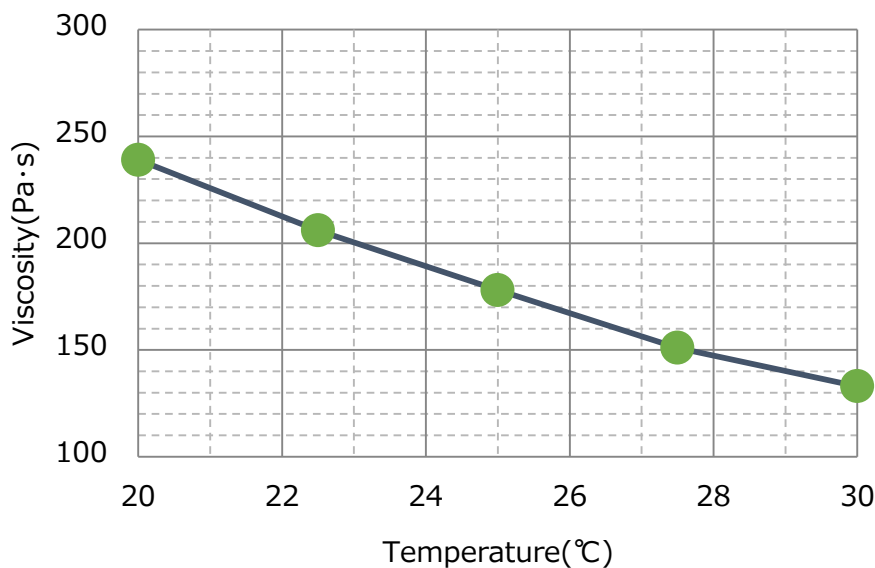
Alloy Name		M705
Alloy Composition (%)		Sn-Ag3.0-Cu0.5
Specific Gravity		7.4
Melting Temp. (°C)	Solidus	217
	Liquidus	220
Tensile Strength (MPa)		53.3
Elongation (%)		56
Young's Module (GPa)		46.9
0.2 Yield Point (MPa)		39.4
CTE (ppm/ C)		21.7
Vickers Hardness (Hv)		17.9

## 2-2. SEM Image



Almost no surface oxidation, spherical lead-free powder is used in all ECO-solder paste products from SMIC.

### 3-1. Fluid Characteristic at Temperature

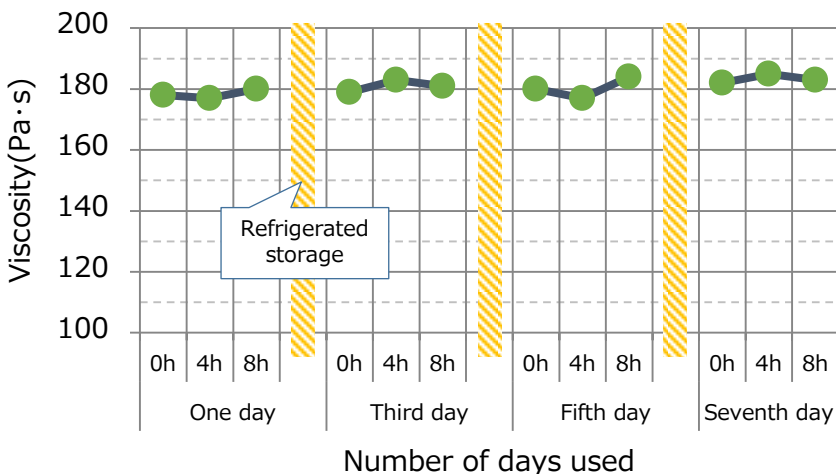


Solder paste characteristics change corresponding to temperature. There is a tendency for viscosity to become lower (softer) at low temperature. Slumping and/or spreading in the printing stage and solder ball or bridging in reflow stage may potentially occur if the paste has lower viscosity. Conversely, sticking to squeegee and/or clogging to stencil aperture may occur if viscosity is higher. Therefore, suitable environmental conditions are preferred for this paste's use. 25+/-3°C temperature is usually recommended for this product.

### 3-2. Viscosity Change by Continuous Printing

Printing Tact:	30sec/sheet	Environment:	25°C50%RH
Viscosity measurement:	PCU-205(Malcom)		

Test cycle

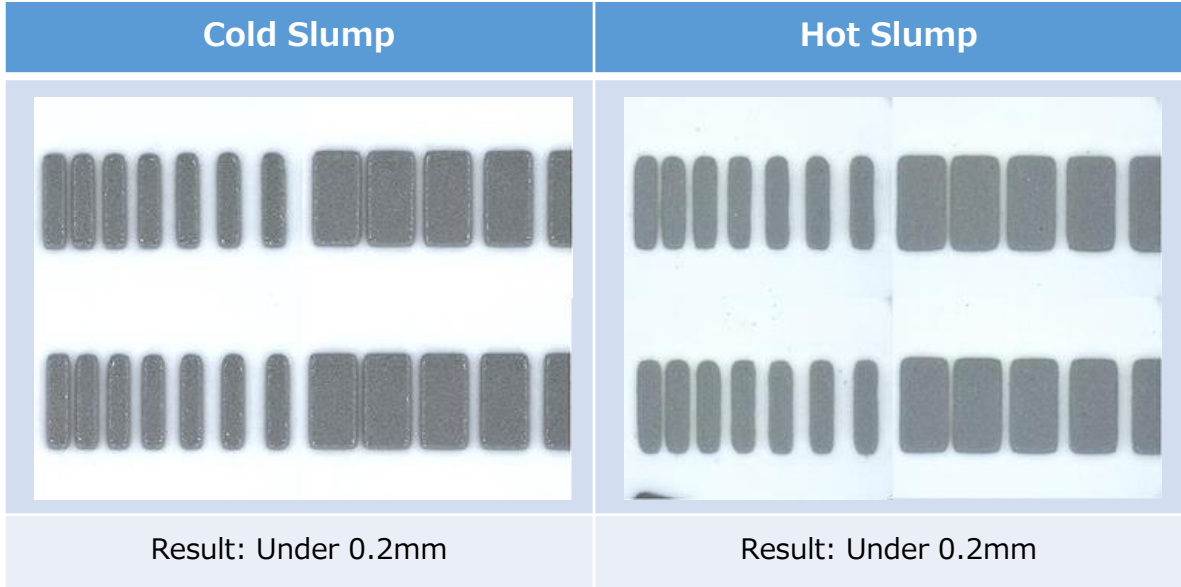


This product is excellent in continuous printing, contributing thus to waste reduction.

### 3-3. Slump Test

Reference: JIS Z 3284  
 Heating Condition: 150°C3min (Chamber)

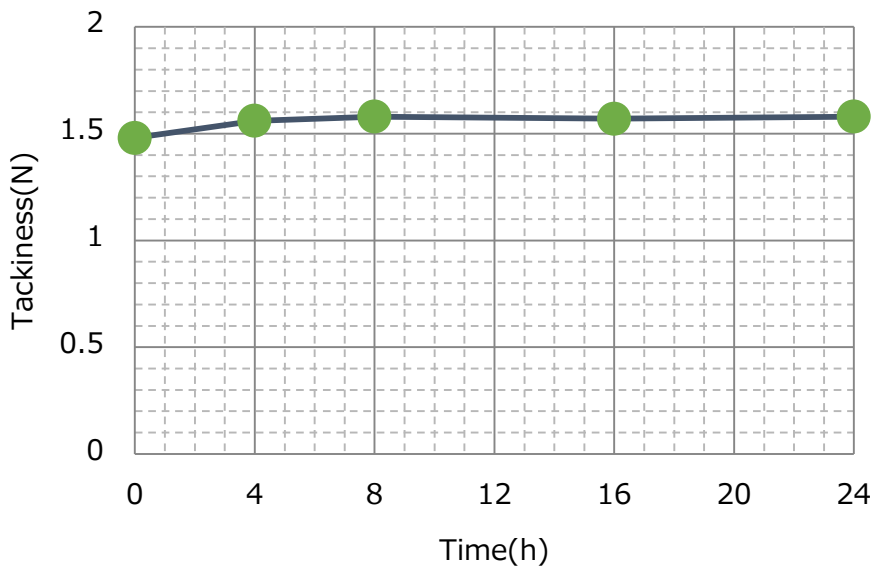
Stencil Thickness: 0.2mm



### 3-4. Tackiness Test

Reference: JIS Z 3284  
 Environment: 25°C50%RH

Stencil Thickness: 0.2mm



Also after 24hrs the paste keeps a tackiness of more than 1.0N.

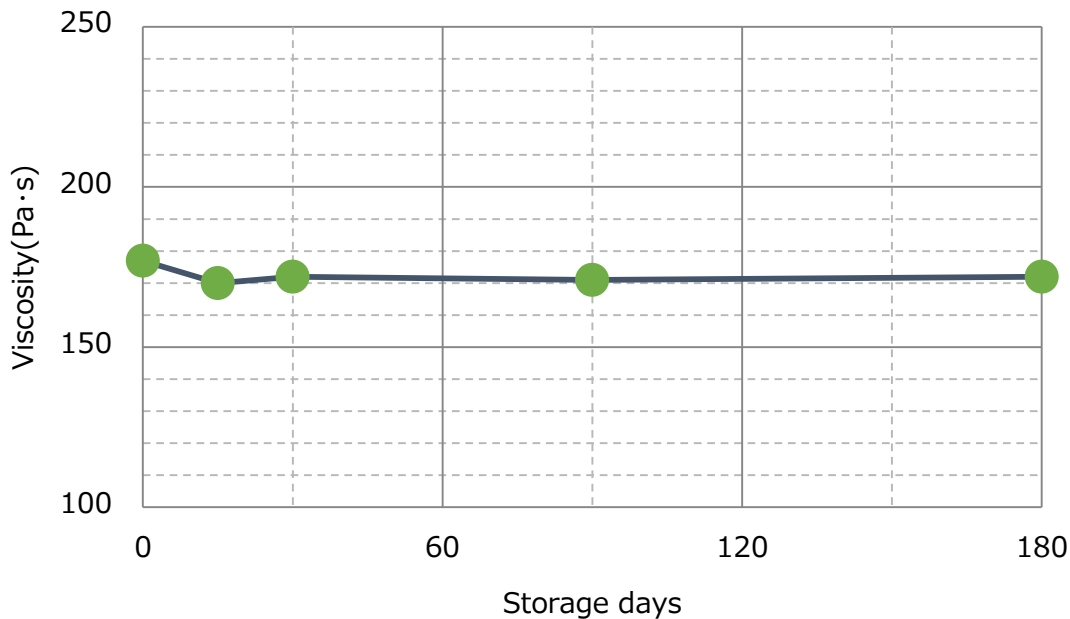
### 3-5. Solder Ball Test

Reference:	JIS Z 3284	Stencil Thickness:	0.2mm
Environment:	25°C50%RH, 30°C90%RH	Heating Condition:	270°C (Solder Bath)

	Initial	2h	6h	24h
25°C50%RH				
	Result: rank1	Result: rank1	Result: rank1	Result: rank1
30°C90%RH				
	Result: rank1	Result: rank1	Result: rank1	Result: rank2

### 3-6. Pot Life

Environment:	Keep at 0-10°C	Viscosity Measurement:	PCU-205(Malcom)
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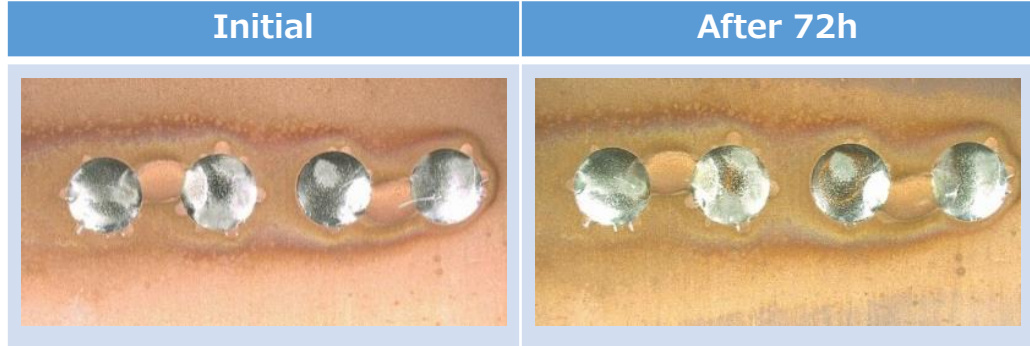
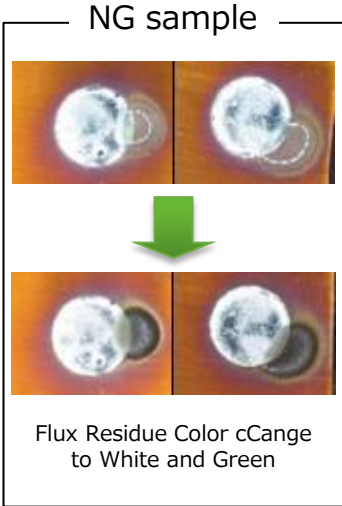
The product is stable and can keep its characteristics over a long period of time.

### 4-1. Cu Plate Corrosion Test

Reference: JIS Z 3197

Environment: 40°C90%RH

Test Time: 72h



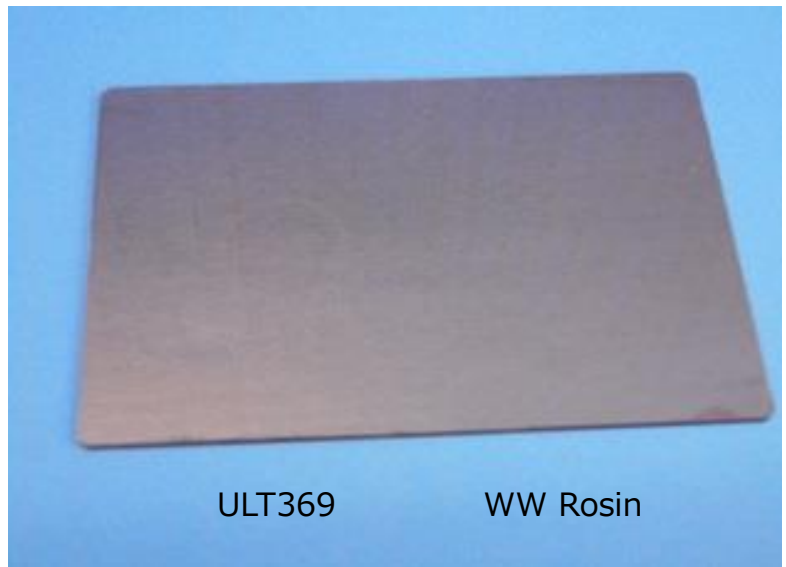
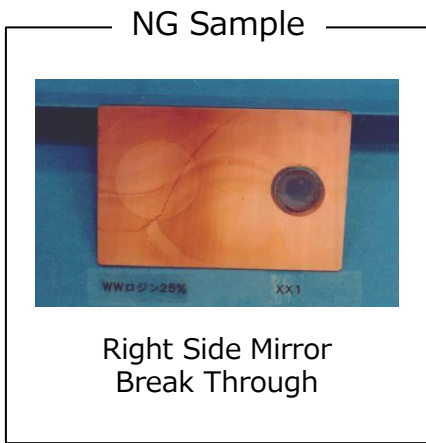
Result: PASS(No change of residue color)

### 4-2. Cu Mirror Corrosion Test

Reference: JIS Z 3197

Environment: 25°C50%RH

Test Time: 24h



Result: PASS(No evidence of mirror breakthrough)



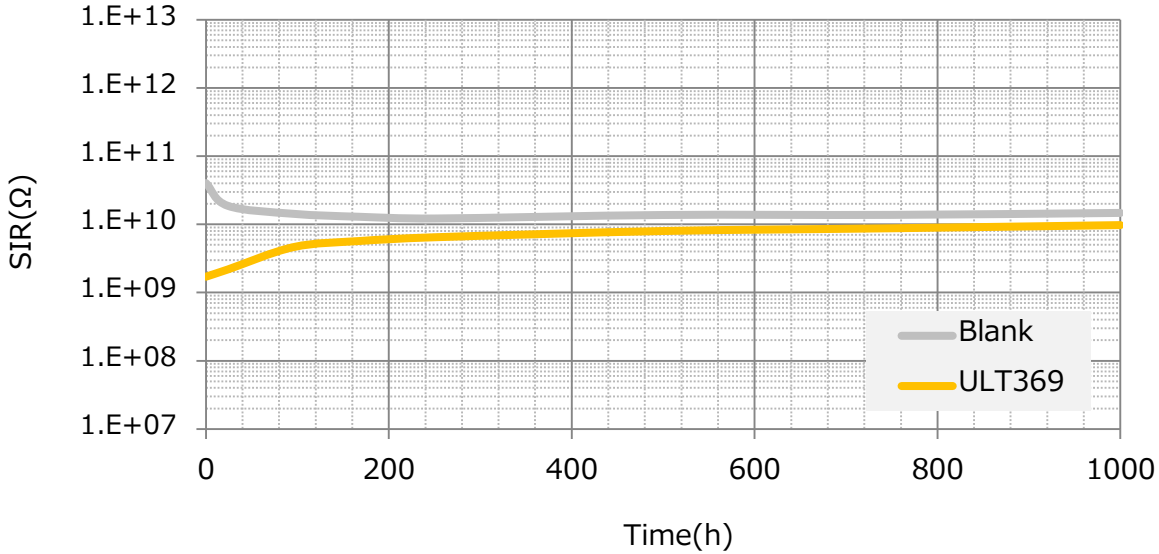
4-3. SIR Test and ECM Test

Reference: JIS Z 3197

Environment: 85°C85%RH

Measure Voltage: DV100V

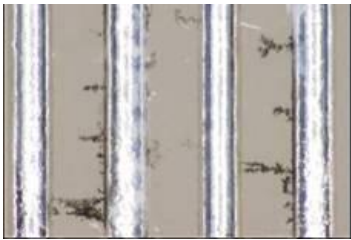
Applied Voltage: DC45V



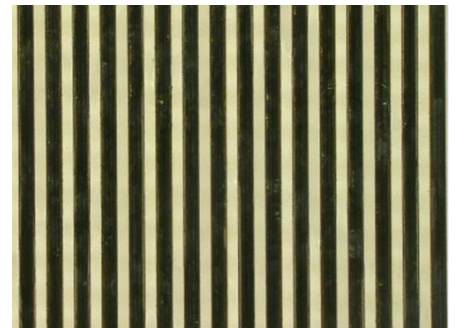
Blank								
Time(h)								
No.	0	24	96	168	250	500	750	1000
1	3.98E+09	1.34E+10	1.16E+10	1.09E+10	9.87E+09	1.12E+10	1.17E+10	1.25E+10
2	7.66E+10	2.40E+10	1.70E+10	1.49E+10	1.45E+10	1.62E+10	1.58E+10	1.69E+10
3	4.03E+10	1.87E+10	1.43E+10	1.29E+10	1.22E+10	1.37E+10	1.38E+10	1.47E+10
Average	4.03E+10	1.87E+10	1.43E+10	1.29E+10	1.22E+10	1.37E+10	1.38E+10	1.47E+10

ULT369								
Time(h)								
No.	0	24	96	168	250	500	750	1000
1	2.01E+09	2.60E+09	5.13E+09	6.12E+09	6.97E+09	7.75E+09	8.84E+09	1.01E+10
2	1.38E+09	1.97E+09	4.01E+09	4.95E+09	5.65E+09	7.69E+09	8.48E+09	9.31E+09
3	1.73E+09	1.98E+09	4.80E+09	6.03E+09	6.76E+09	8.51E+09	8.96E+09	9.86E+09
Average	1.71E+09	2.18E+09	4.65E+09	5.70E+09	6.46E+09	7.98E+09	8.76E+09	9.75E+09

NG Sample



Growth of Migration



Result: PASS(No migration)

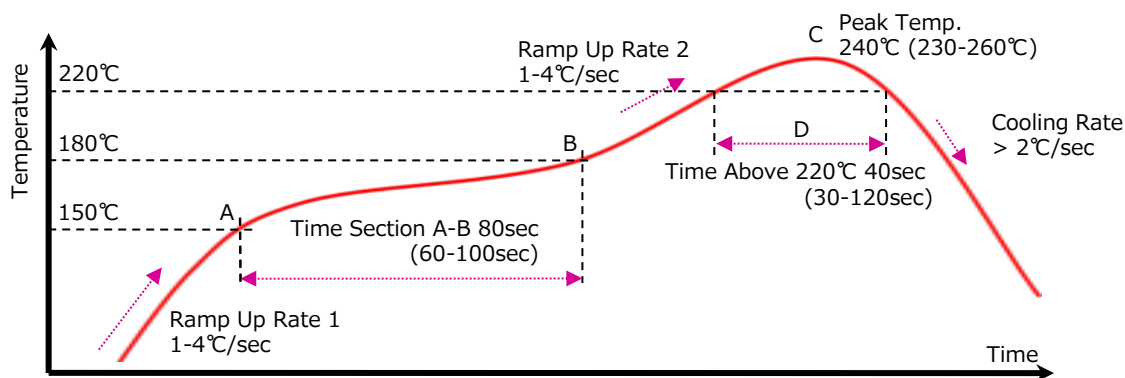
**Handling**

Item	Recommended	Remarks
Storage Condition	Keep at 0-10°C	Unopened
Warm-up Prior to Use	Min. 1h at Room Temp.	Do Not Open When Still Cold
Storage at Room Temperature Prior to Use	Max. 3 days	At 30°C or Lower
Stirring Condition Before Processing	30-60sec by Hand Mixing and Automatic Mixing	In Case of Jars
Operating Environment	22-28°C、30-70%RH	- - -
Stencil Life for Continuous Printing	Up to 24h	- - -
Abandon Time by Printing Process	Up to 1h	- - -
Idle Time After Printing	Up to 8h	- - -
Idle Time After Mounting Components	Up to 8h	- - -
Re-storage of Remaining Solder Paste in Container	at 0-10°C	Only Once

**Recommended Printing Process**

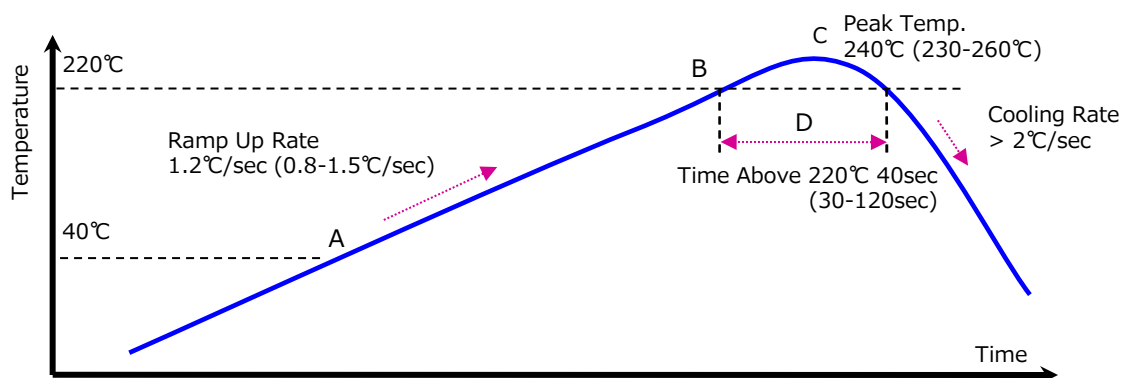
Category	Recommended	Capable
Printer Type	Open Squeegee Model	Enclosed Squeegee System
Squeegee Blade	Metal	Urethane, Plastic
Squeegee Angle	60°	45-60°
Print Speed	30-50mm/sec	20-100mm/sec
Print Pressure	0.20-0.30N/mm	Adjust not to Leave Paste on Stencil
Separation Speed	1.0-5.0 mm/sec	< 10mm/sec
Paste Rolling Height	10-20mm	- - -
Operating Environment	22-28°C、30-70%RH	- - -

Soak Reflow Profile \* It can be used with Air condition.



Category		Lower Limit	Recommend	Upper Limit
-A	Ramp Up Rate 1	1°C/sec	<b>2°C/sec</b>	4°C/sec
A	Soak Zone Start Temp.	140°C	<b>150°C</b>	160°C
B	Soak Zone End Temp.	160°C	<b>180°C</b>	200°C
A-B	A-B Section Time	60sec	<b>80sec</b>	100sec
B-C	Ramp Up Rate 2	1°C/sec	<b>2°C/sec</b>	4°C/sec
C	Peak Temp.	230°C	<b>240°C</b>	260°C
D	Time above 220°C	30sec	<b>40sec</b>	120sec
	Cooling Rate	2°C/sec	---	---

Ramp Reflow Profile \* It can be used with Air condition.



Category		Lower Limit	Recommend	Upper Limit
A	Ramp Start Temp.	---	<b>40°C</b>	---
B	Ramp End Temp.	---	<b>220°C</b>	---
A-B	A-B Section Time (Ramp Up Rate)	120sec (1.5°C/sec)	<b>150sec (1.2°C/sec)</b>	220sec (0.8°C/sec)
C	Peak Temp.	230°C	<b>240°C</b>	260°C
D	Time Above 220°C	30sec	<b>40sec</b>	120sec
	Cooling Rate	2°C/sec	---	---

Items	M705-ULT369	Test Method
<b>Solder Powder</b>		
Alloy Composition	Sn-3.0Ag-0.5Cu	- - -
Melting Temperature	217-220℃	DSC
Powder Shape	Spherical	SEM
Particle Size	Type5 (15-25μm)	SEM, Screen Method
<b>Solder Paste</b>		
Flux Classification	ROLO	J-STD-004B
Halogen Content	Less than 500ppm	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+12Ω	JIS Z 3197 (40℃/90%RH, 168h)
Electro Chemical Migration Test	Over 1.0E+9Ω No Migration	JIS Z 3197 (85℃/85%RH, 1000h)
Flux Content	11.5%	JIS Z 3197
Viscosity	180 Pa·s	JIS Z 3284
Thixotropic Index	0.60	JIS Z 3284
Slump Test	Cold 0.2mm/Hot 0.2mm	JIS Z 3284
Tackiness Test	Over 1.0N within 24h	JIS Z 3284
Solder Ball Test	Rank 1-2	JIS Z 3284
Validity	6 months	Unopened, Keep at 0-10℃

※The values in this table are for reference.