Technical Product Information

Lead-free Solder Paste TLF-204-111M

LFSOLDER TLF-204-111M is Pb-free solder paste using Pb-free, spherical solder powder and special flux. As the paste contains no Pb, it will largely contribute to the protection of global environment. Furthermore, excellent reliability can be obtained with the flux without washing.

- Reduced area of voiding
- Reduction of chip side ball
- Reduced slump in preheating stage
- Stable printability
- Improvement of solderability of microscopic sized lands
- Excellent heat resistance for higher temperature preheating

Item	TLF-204-111M	Test method
Alloy composition(%)	Sn 96.5/Ag 3.0/Cu 0.5	JIS Z 3282 (1999)
Melting point(℃)	216/220	DSC
Solder grain diameter(μm)	25～38 / T4	Laser diffraction
Flux contents(%)	10.9	JIS Z 3284 (1994)
Viscosity(Pa・s)	220	
Thixotropy index	0.55	
Chlorine contents(%)	0.0	STD-018b / JIS Z 3197
Reliability	Class:L0	J-STD
Water solution resistance test	More than 5 x 10^4 Ω cm	JIS Z 3197 (1999)
Insulation resistance test	More than 1 x 10^9 Ω	Board type 2,Annex 3 to JIS Z 3284 (1994)
Slump test	Less than 0.2 mm	Print the paste on ceramics board and heat for 60 seconds at 150°C. Measure sagging width from before and after heating. Internal test based on STD-092b
Solder ball test	Solder balls seldom occur	Print the paste on ceramics board. After melting and heating, observe with a microscope of 50 times. Internal test based on STD-009e
Solder spread test	More than 76%	JIS Z 3197 (1986) 6.10
Copper plate corrosion test	No corrosion	JIS Z 3197 (1986) 6.6.1
Tackiness test of residue	Pass	Annex 12 to JIS Z 3284 (1994)

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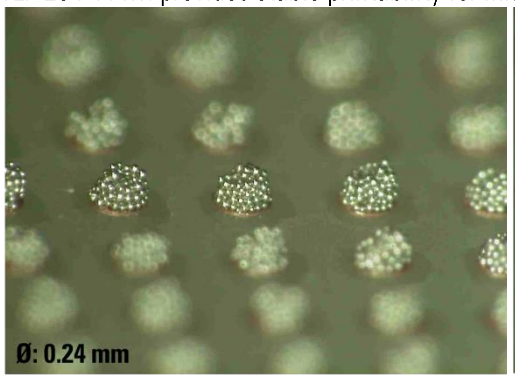
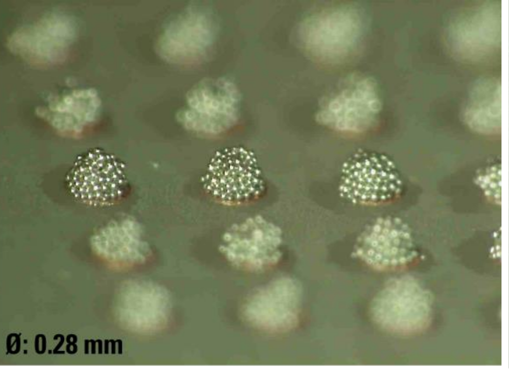
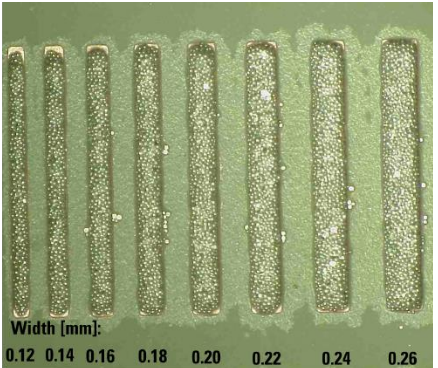
Printability & Solderability

TLF-204-111M provides stable printability for microscopic sized land

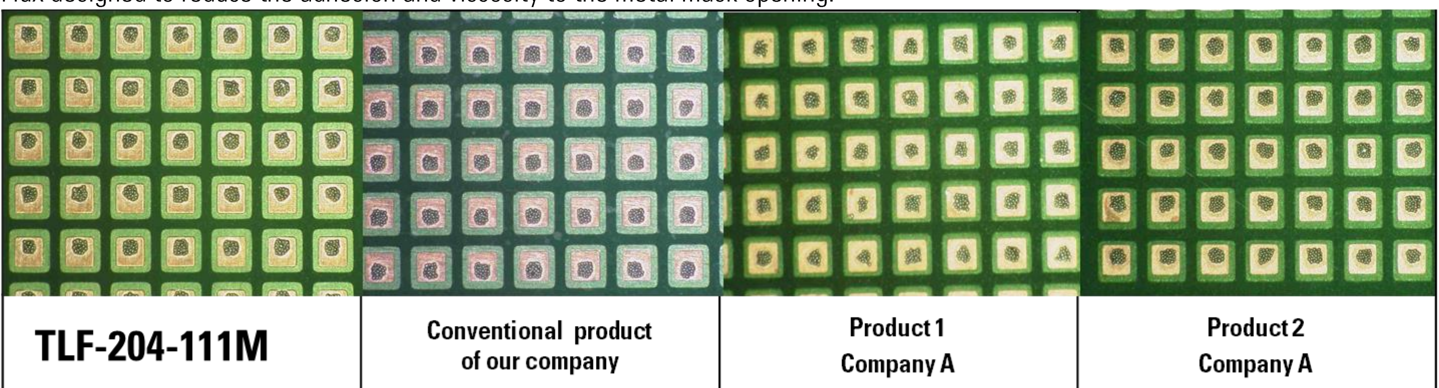






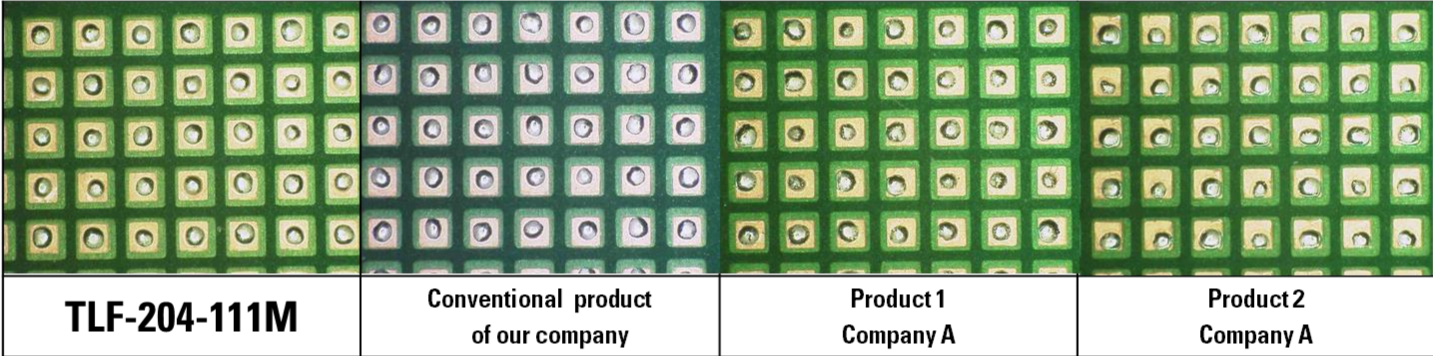
Circuit board for evaluation:	SP-059	Printing speed:	30 mm/s
Metal mask thickness:	120 µm	Snap off speed:	2 mm/s
Metal mask opening:	0.24 mmϕ, 0.28mmϕ, Slit	Evaluation by the 10th sheets	

Flux designed to reduce the adhesion and viscosity to the metal mask opening.



Circuit board for evaluation:	INSATSU-TEST	Printing speed:	30 mm/s
Metal mask thickness:	100 µm	Snap off speed:	2 mm/s
Metal mask opening:	0.30 mm (50%)		

Improvement of the solderability of microscopic sized lands by ensuring the stable printability. TLF-204-111M provides superior solderability even at the peak temperature of 225 °C.



Reflow conditions

preheating temperature:	150°C
peak temperature:	225°C

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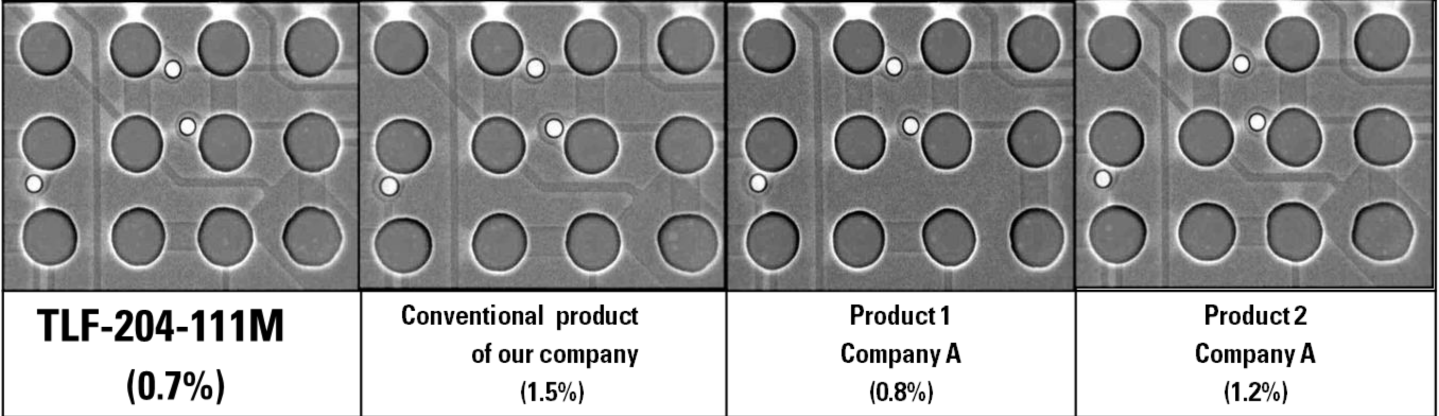
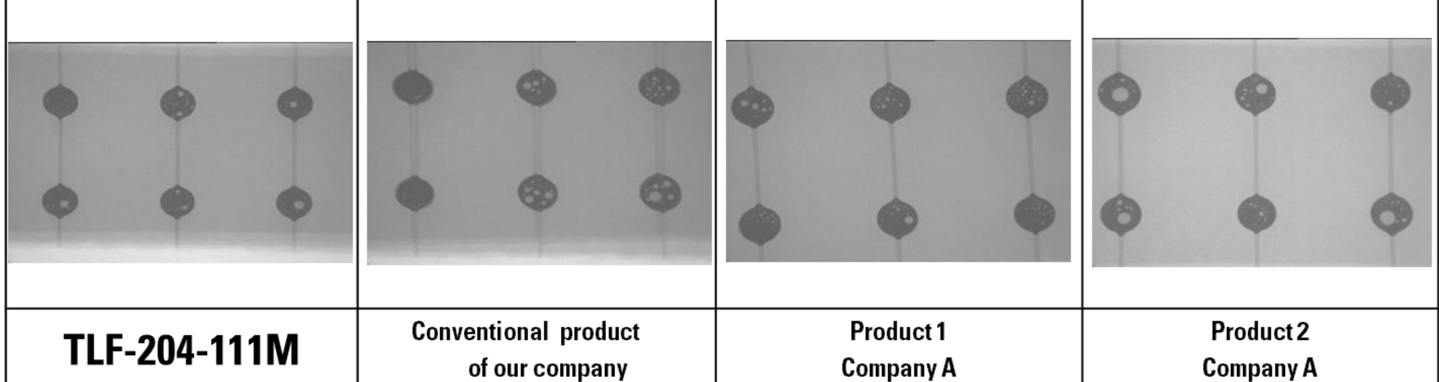
Void Reduction

Reducing the void by controlling the gas generation when soldering



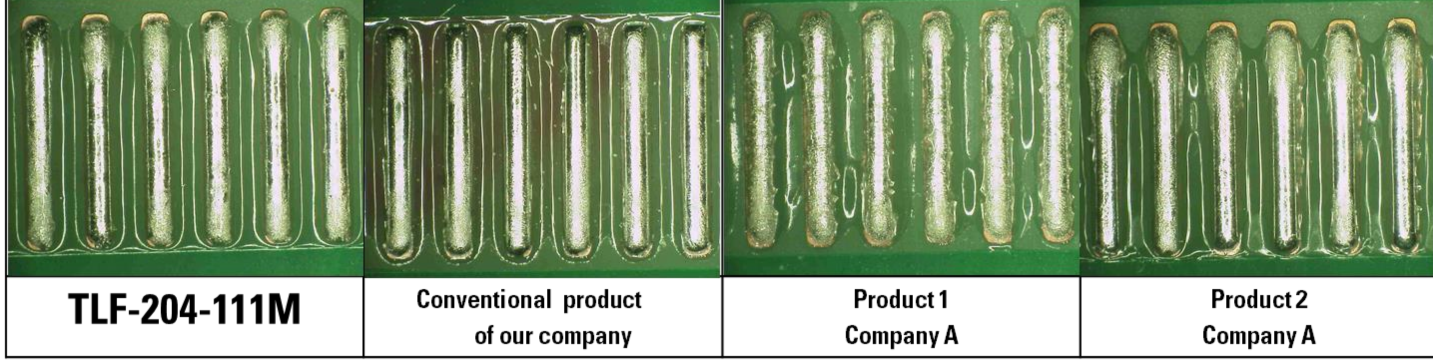
Circuit Board: Testing circuit board Tamura SP-045
Metal thickness : 150 µm
On-board parts : 1.5mmP, BGA SnAgCu Balls
Tamura standard profile

Reducing the void for circuit board on-board LGA



Circuit board: Testing circuit board Tamura SP-040
Metal thickness: 150 µm
On-board parts: imaginative LGA(SP-040) plated Au
Tamura standard profile

Improved Heat Resistance for Higher Temperature Preheating



Reflow conditions:preheating temperature 200 °C, 120 s

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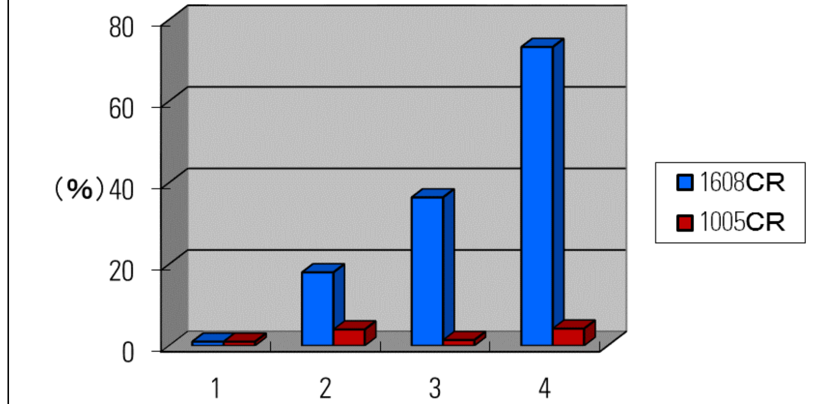
Chip Side Balls

Reducing chip side balls by stopping the flow of flux residue and stopping capillary flow. Also, the slump during pre-heating has been reduced.

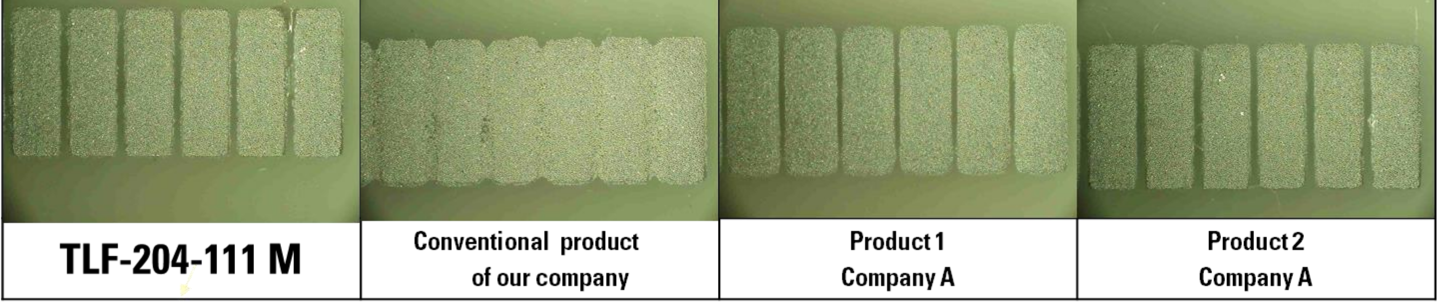


1: TLF-204-111M
2: Conventional product of our company
3: Product 1 Company A
4: Product 2 Company A

Chip Side Ball
110% metal mask opening

Slump in Preheating

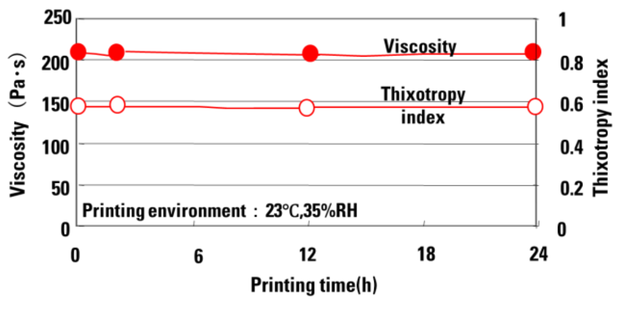
In preheating temperature of 200 °C the possibility of slump is very rare. Improvement of bridge caused by the slump under preheating conditions.



TLF-204-111 M	Conventional product of our company	Product 1 Company A	Product 2 Company A

Circuit board: slump tendency test board 0.2 mm gap
Metal mask thickness: 120 μm
Heating: Reflow condition 200 °C, 90 s

Viscosity reliability at the time of continuous printing



Characteristics of Solder Paste
Inferior 1 < 5 Superior

Item	TLF-204-111M	Conventional product of our company	Product 1 Company A	Product 2 Company A
Stable configuration	**4**	4	4	4
Solderability of microscope sized lands	**4**	4	4	4
Void	**5**	4	5	4
Heat resistance	**4**	4	2	4
Chip side ball	**5**	3	3	2
Slump in preheating	**4**	3	4	4

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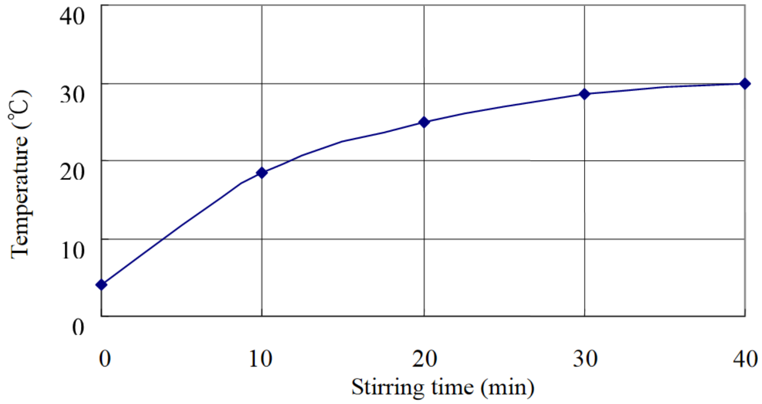
Cautions for Use

- Stirring of Solder Paste
  In the Case of Manual Stirring
  Thoroughly stir solder paste stored in refrigerators with spatula or the like after returning to room temperature without fail (It takes about three, four hours if left standing at 25). If the seal is broken the paste will absorb moisture to cause solder balls.

  In the Case of Using Automatic Stirring Apparatus
  An automatic stirring apparatus is utilized at times to use solder paste stored in refrigerators by returning it to room temperature in a short period of time. Even if such automatic stirring apparatus is used, no change will occur to the characteristics of the solder paste. With the lapse of stirring time, the temperature of solder paste will rise as shown in Fig.1: If the stirring time is lengthened, it will lead to the possibility of throwing solder paste with temperature higher than the working environment onto boards and thus causing bleeding during printing. So, be careful. Conduct adequate test beforehand since the stirring time will vary according to the specifications of apparatus, ambient temperature, and other conditions. (In case of using solder softener SS-1, appropriate stirring time will be about 20 minutes).



Stirring time and temperature rise of solder paste when using automatic stirring apparatus
(Solder softener SS-1 manufactured by Malcom)

- Conditions for Printing

Items	Setting range
Metal mask	Laser machined, manufactured by additive (or those having flat opening side)
Squeegee	Metal, Urethane (hardness 80 to 90 degrees)
Squeegee angle	50 to 70 degrees
Squeegee speed	20 to 60 mm/s
Printing pressure	100 to 200kPa

- Parts Mounting Time
  Mount the parts within 12 hours after printing the solder paste. If left standing for a long time after printing, the surface of solder paste will dry up to cause mount error of parts.

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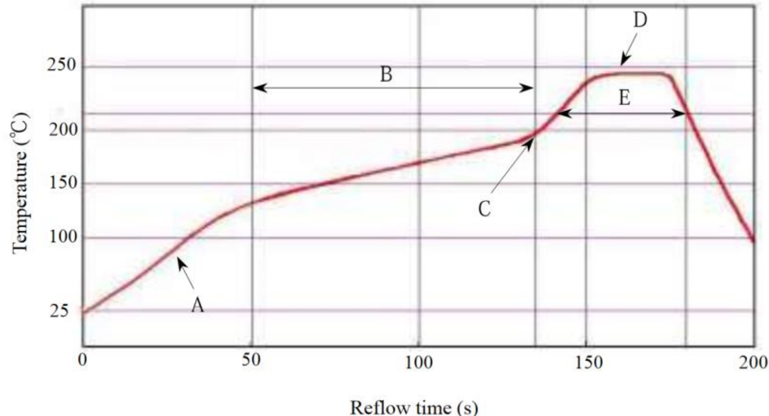
Reflow Conditions



Temperature profile of air reflow

- Preheat
  Set the temperature rising speed A at a rate of 2 to 4 °C/s. Careful about rapid temperature rise in preheat zone as it may cause excessive slumping of the solder paste.
  Appropriate preheat time B will be from 60 to 120 seconds. If the preheat is insufficient, rather large solder balls tend to be generated. Conversely, if performed excessively, fine balls and large balls will generate in clusters at a time.
  ppropriate preheat ending temperature C will be from 180 to 200 °C. If the temperature is too low, non-melting tends to be caused in the area with large heat capacity after reflow.
- Heating
  Careful about sudden rise in temperature as it may worsen the slump of solder paste.
  Set the peak temperature D in the range from 230 to 240 °C
  Adjust the melting time that the time over 220 °C, E, will be from 20 to 40 seconds.
- Cooling
  Careful about slow cooling as it may cause the positional shift of parts and decline in joining strength at times.
- Perform adequate test in advance as the reflow temperature profile will vary according to the conditions of parts and boards, and the specifications of the reflow furnace.

Quality Guarantee Period

The quality guarantee period shall be 6 months after manufacture if the products are stored in sealed containers at temperature below 10°C

Product Packaging Unit

Containers, Wide-mouthed polyethylene: 500 g | 1 kg

Cautions from Standpoints of Safety and Sanitation

Physiological interaction varies by individuals. As a prudent policy, therefore, care, should be exercised not to inhale gas of fume of solvent emitted during operations and not to have your skin exposed (especially mucous membrane and other parts vulnerable to stimuli) for a long time. This paste is contains the organic solvent , but it is no flammable .If the paste sticks to the skin, wipe it off with ethanol and the like, and wash thoroughly with soapy water. The flux ingredients in the paste contain nonionic halogen based activator.
The physical chemistry-character among written contents etc. is not a guarantee value. The evaluation of danger and noxiousness is based and makes material, information, and the data, etc. which can be acquired now. However, it is not because all material was covered and note handling enough, please. As for notes, it is the one intended for usual handling. Special handling is not assumed. Please observe the restriction of related various regulations, and use after executing suitable safety measures for the usage. Before using it in your company, it is related with process conditions or reliability. Please conduct sufficient examination surely performed.

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