



Pb-FREE SOLDER PASTE PF-SERIES

LFSOLDER LF-4C-100

LFSOLDER LF-4C-100 is Pb-free solder paste using Pb-free manufactured with the atomized gas and centrifugal spraring methods, powder is fine, processes a truly spherical shape, less oxidation and mixed with high technical 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.

1. Features

1. Pb-free (Sn/Ag/Cu series) solder alloy is used.
2. Stable printability is obtained with little change in viscosity during continuous printing.
3. Excellent printability with fine patterns can be obtained.
4. Having a good solderability, adequate wettability is shown on various parts.
5. Can be used in air-reflow and N₂ reflow processes.
6. Excellent solderability can be attained for a high peak temperature.

2. Specifications

Characteristics of LFSOLDER LF-4C-100 is shown in Table 1 and Table 2.

Table 1 - Characteristics of LF-4C-100

Items	Characteristics	Test methods
Alloy composition	Sn 96.5 / Ag 3.0 / Cu 0.5	JIS 3282 (1999)
Melting point	217~220°C	Mitsui DSC measurement
Particle size of solder powder	20 - 45 μ m	IPC - TYPE 3
Shape of solder powder	Spherical	Annex 1 to JIS Z 3284 (1994)
Flux content	11.4%	JIS Z 3284 (1994)
Chlorine content	Less than 0.10%	JIS Z 3197 (1999)
Viscosity	190 ± 20Pa.s	Annex 6 to JIS Z 3284 (1994) Viscometer, type PCU, manufactured by Malcom, at 25°C

Table 2 - Characteristics of PFSOLDER LF-4C-100

Items	Characteristics	Test methods
Water solution resistance test	More than $1 \times 10^4 \Omega \text{ cm}$	JIS Z 3197 (1997)
Insulation resistance test	More than $1 \times 10^8 \Omega$	Board type 2, Annex 3 to JIS Z 3284 (1994)
Slump test	Less than 0.15mm	Print the paste on ceramics board and heat for 60 seconds at 150°C Measure sagging width from before and after heating. 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. STD-009e*
Solder spread test	More than 82%	JIS Z 3197 (1986) 6.10
Copper plate corrosion test	No corrosion	JIS Z 3197 (1986) 6.6.1
Tackiness test of residue	Pass	Annex12 to JIS Z 3284 (1994)
Test method of our company		

3. Quality Guarantee Period

The quality guarantee period shall be 90 days after manufacture if the products are stored in sealed containers at temperature below 10°C

4. Product Packaging Units

Table 3 - Packaging units of products

Containers	Packaging units
Wide-mouthed polyethylene	500g

5. Cautions for Use

1. Stirring of Solder Paste

1.1 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 °C.)

If the seal is broken the paste will absorb moisture to cause solder balls.

1.2 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 PASTE softener SS-1, appropriate stirring time will be about 20 minutes).

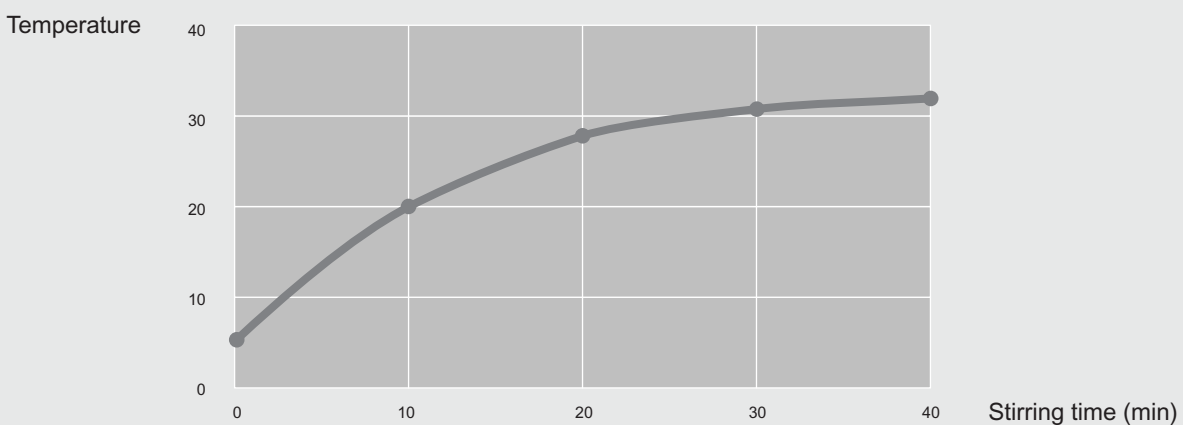


Fig. 1 - Stirring time and temperature rise of solder paste when using automatic stirring apparatus

Apparatus: Solder softener SS-1 manufactured by Malcom

2. Conditions for Printing

Printing conditions recommended for PFSOLDER LF-4C-100 is shown in Table 4:

Table 4 - Printing conditions recommended

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	20~80mm/s
Printing pressure	100 ~200kPa

3. Parts Mounting Time

Mount the parts within 24 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.

4. Reflow Conditions

Recommended temperature profile of air reflow is shown in Fig.2.

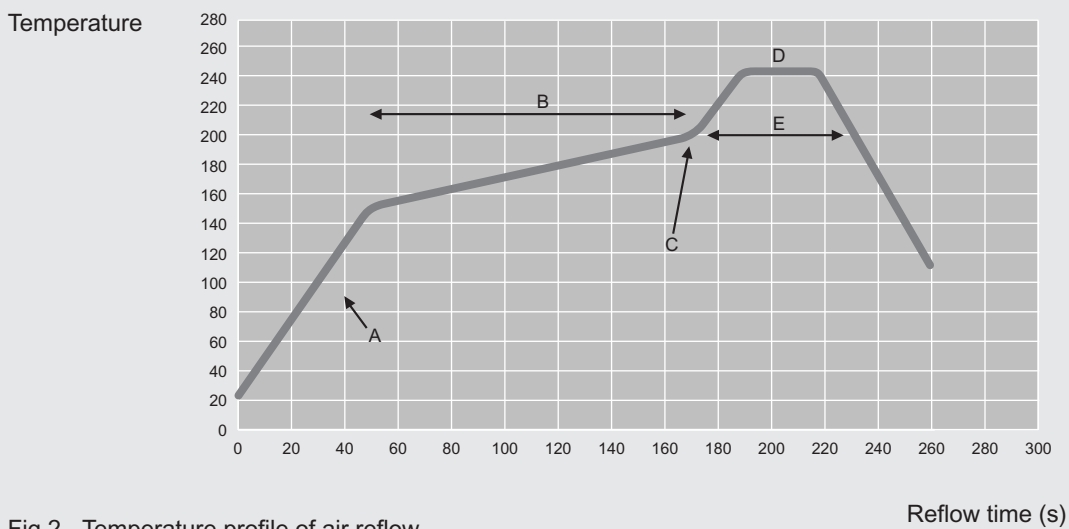


Fig.2 - Temperature profile of air reflow

Precautions

1. Preheat

- * Set the temperature rising speed A at a rate of **1~3°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.
- * Appropriate 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.

2. 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 250°C**
- * Adjust the melting time that the time over **220°C**, could not less than **30** seconds.

3. 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.

6. Cautions from Standpoints of Safety and Sanitation

1. 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.
2. This paste is contains the organic solvent, but it is no flammable.
3. If the paste sticks to the skin, wipe it off with ethanol and the like, and wash thoroughly with soapy water.

- * 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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Pb-FREE SOLDER PASTE PF-SERIES

Introduction

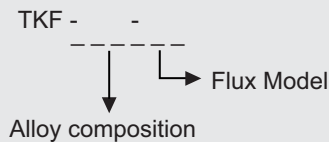
The UPF-Series solder pastes are composed of Lead-free spherical solder powder with very low oxide content and a highly reliable flux. As the paste contains no lead it will contribute to the protection of the global environment. The solder paste also employs a specially developed high thixotropic flux which enables excellent resolution during continuous printing of fine patterns such as 0.3 mm QFP's.

Outstanding features

- a. Pb-free solder alloy is used.
- b. Stable printability is obtained with little change in viscosity during continuous printing.
- c. Excellent printability with fine patterns can be obtained.
- d. Having a good solderability, adequate wettability is shown on various parts.
- e. Solder balls will seldom occur.
- f. Usable in air-reflow and in N₂ reflow.
- g. Excellent solderability can be attained for a high peak temperature.

Outline of products

Product markings



Alloy composition

A	Sn 93.0 / Ag 3.5 / Bi 0.5 / In 3.0	214°C
B	Sn 91.4 / Ag 3.2 / Bi 2.7 / In 2.7	217°C
I	Sn 88 / Ag 3.5 / Bi 0.5 / In 8	210°C
C	Sn 96.5 / Ag 3.0 / Cu 0.5	217°C
S	Sn 96.3 / Ag 3.0 / Cu 0.5 / Sb 0.2	217°C

Particle size of solder powder

The particle size of the solder powder is classified and indicated by the product number.

Particle sizes of solder powder

Unit: μm

Powder less than the following size: Less than 10%	Powder in the following size range: More than 90%	Powder exceeding the following size: Less than 1%
4 20	20-45	45
5 20	20-30	30

Solder powder content

88.5~89%

Viscosity

180-200 Pa's

Quality guarantee period

90 days after manufacture if stored, tightly sealed, at temperature below 10°C

Physical properties

The data shown below was measure from solder paste of composition Sn96.5 / Ag3.0 / Cu0.5, Solder powder content 88.5% and particle size 20-45 μ m

Appearance of solder powder

Fig.1 shows the appearance of the solder powder taken by SEM photography.

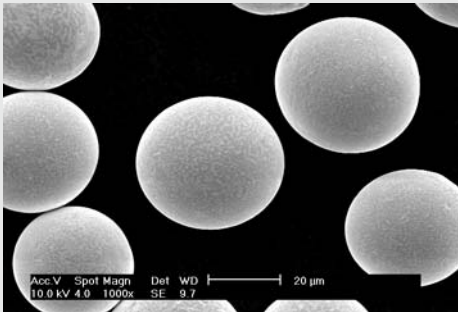


Fig.1 SEM photograph of solder powder

Particle size distribution of solder powder

Shown in Fig.2 is the particle size distribution of solder powder measured in accordance with JIS Z 3284:

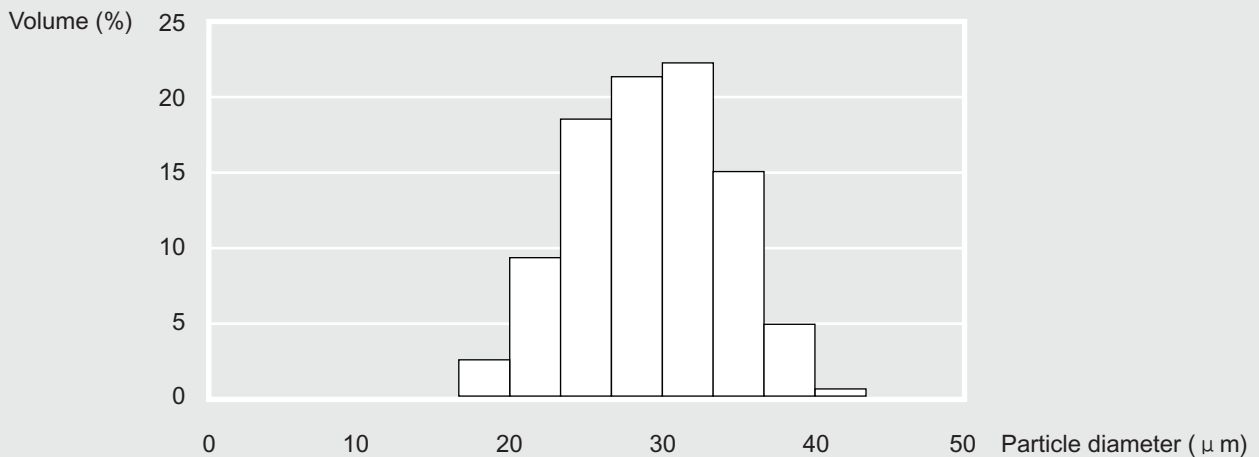


Fig.2 Particle size distribution of solder powder by Laser diffraction method

Viscosity characteristics of SOLDER PASTE UPF-SERIES

Table 1 shows the thixotropic index and the non-recovery rate of viscosity as measured in accordance with JIS Z 3284:

Table 1 Thixotropic index and non-recovery rate of

viscosity

Item	Measurement
Thixotropic index	0.58
Non-recovery rate of viscosity (%)	1.6

Temperature dependency of SOLDER PASTE UPF-SERIES

The relationship between temperature and viscosity is shown in Fig.3. The Viscosity changes with the temperature and as a result the printability.

Therefore it is important to control the temperature of the working environment.

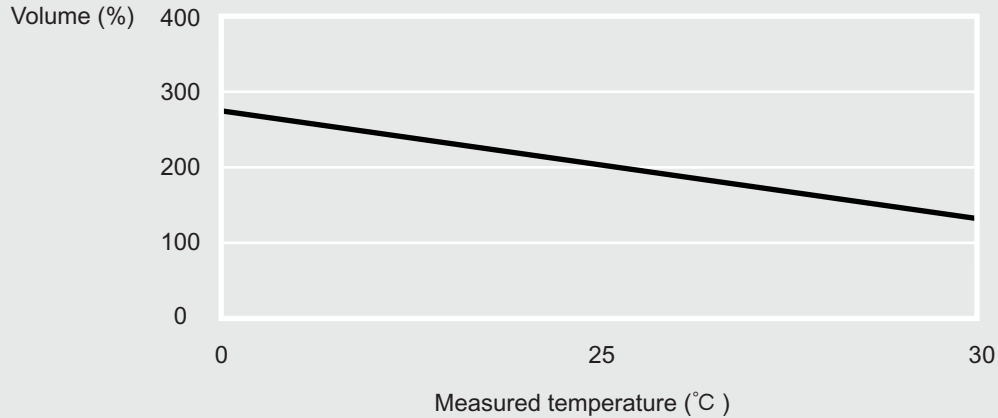


Fig.3 Relationship between temperature and viscosity

Viscometer: Type PCU manufactured by Malcom

Slump of SOLDER PASTE UPF SERIES

If the slump of the solder paste is too great during printing and/or the pre-heating this will tend to cause solder balls and bridging. Fig.4 shows the appearance of the solder paste after printing and after pre-heating, tested in accordance with JIS Z 3284.

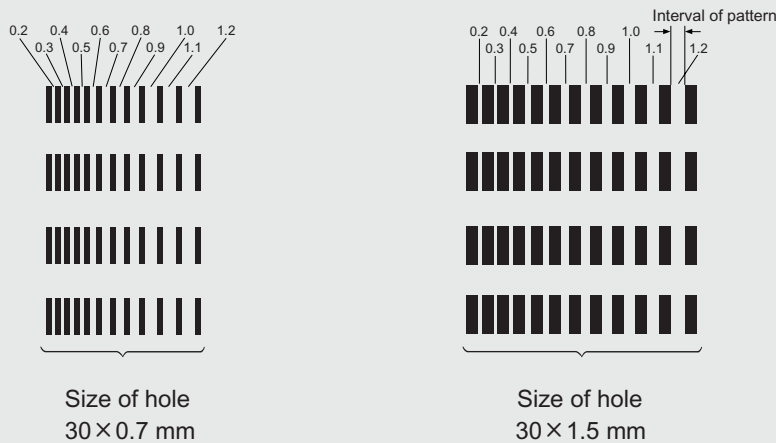


Fig.4 Slump after printing and after heating

Metal mask: 0.2 mm t

Slit spacing: 0.1, 0.2, 0.3, 0.4 mm

Heating conditions: 150°C , 1min