

**Pb-FREE SOLDER PASTE GP-SERIES**  
***LFSOLDER GP-211-167***

*LFSOLDER GP-211-167* is a Pb-free and cleaning-free solder paste used Pb-free spherical solder powder and special flux. Since this solder paste contains no Pb, the usage of hazardous materials is reduced, furthermore, the environment and the safe workplace are protected. As its flux residue contains no halides, it can be remained on the PCB without cleaning.

### 1. Outstanding Features

- 1) Pb-free (Sn/Ag/Cu series) alloy solder is used.
- 2) Stable printability and shape of the printed solder paste are obtained with little change in viscosity during continuous printing.
- 3) Excellent wettability for electronic component and land pattern.
- 4) Excellent solderability is brought with the reflow profile with high peak temperature.
- 5) Superior reliability is ensured without cleaning the flux residue.

### 2. Characteristics

The characteristics of LFSOLDER GP-211-167 is shown in Table 1 and Table 2.

Table 1 - The characteristics of LFSOLDER GP-211-167

Items	Characteristics	Test methods
Alloy composition	Sn 99.0 / Ag 0.3/ Cu 0.7	JIS Z 3282 (1999)
Melting point	217 ~ 227	DSC measurement
Particle size of solder powder	20 ~ 36 $\mu$ m	Laser diffraction method
Shape of solder powder	Spherical	Annex 1 to JIS Z 3284 (1994)
Flux content	11.9%	JIS Z 3284 (1994)
Chlorine content*	0.0%	JIS Z 3197 (1999)
Viscosity	200 Pa·s	Annex 6 to JIS Z 3284 (1994) Viscometer type PCU-205 manufactured by Malcom, at 25

\* Inspected the flux itself only

Table 2 - The characteristics of LFSOLDER GP-211-167

Items	Characteristics	Test methods
Water solution resistance test	More than $1 \times 10^4 \Omega \cdot \text{cm}$	JIS Z 3197 (1999)
Insulation resistance test	More than $1 \times 10^9 \Omega$	Board type 2, Annex 3 to JIS Z 3284 (1994) Reflow: By reflow soldering system.
Preheat slump test	Less than 0.20mm	Print the paste on ceramics board and heat for 60 seconds at 150 . Measure slumping 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 75%	JIS Z 3197 (1986) 6.10
Copper plate corrosion test	No corrosion	JIS Z 3197 (1986) 6.6.1

The standard test method in Tamura

(The written characteristics are not guaranteed values.)

### 3. Quality Guarantee Period

The quality guarantee period is 90 days after manufacture under the storage condition below 10 with sealed.

### 4. Product Packaging Units

The standard packing unit is 500g for LFSOLDER GP-211-167

## 5. Cautions for Use

### (1) Stirring of Solder Paste

#### (1.1) Manual Stirring

The solder paste has to be stirred thoroughly by a spatula and the like before use after its temperature is returned to the room temperature (it takes one to two hours under the atmosphere at 25 °C). If the seal is broken while it is cold, solder balls may happen when it is used because of absorption of moisture.

#### (1.2) Using Automatic Stirring Apparatus

An automatic stirring apparatus can be utilized in order to return the temperature of this solder paste kept in a refrigerator to the room temperature in a short period without any transform.

The temperature of the solder paste rises as shown in Fig. 1 with the lapse of stirring time: The appropriate mixing time is required to be settled as excessively long stirring time raises its temperature too high and it may cause a bleeding according to it which is higher than the working environment when the solder paste is thrown onto the stencil. It is in need of a test in advance to confirm the adequate time in each condition since the stirring time will vary according to the specifications of apparatus, ambient temperature, and other conditions. (for example, the appropriate stirring time for Malcom solder softener SS-1 will be about 20 minutes).

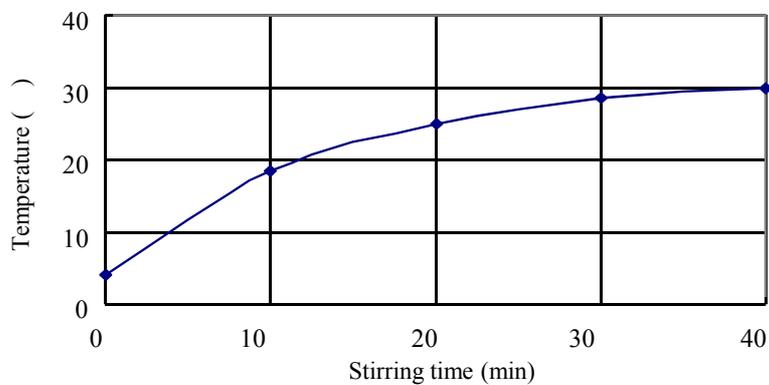


Fig.1 The dependency of stirring time and temperature of solder paste with automatic stirring apparatus

Apparatus: Solder softener SS-1 manufactured by Malcom

(2) Printing condition

Printing conditions recommended for LFSOLDER GP-211-167 is shown in Table 3:

Table 3 - Printing conditions recommended

Items	Setting range
Stencil	Laser machined, manufactured by additive (or those with flat opening side)
Squeegee	Metal
Squeegee angle	50 ~ 70 °
Squeegee speed	20 ~ 40mm/s
Printing pressure	15 ~ 45N

(3) Components Mounting Time

The components are required to be mounted within 12 hours after printing the solder paste. If it is left for a long time after printing, the surface of solder paste will dry up and cause components mounting deffects.

(4) Reflow Conditions

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

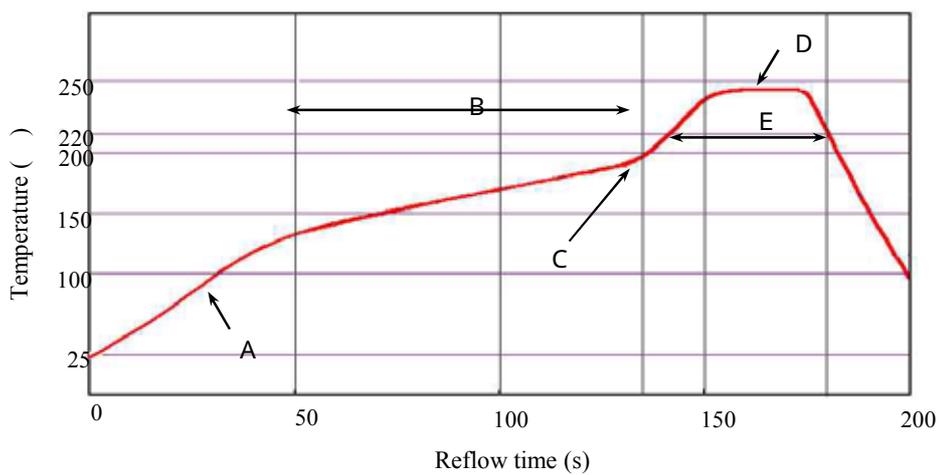


Fig.2 - Temperature profile of air reflow

[Precautions]

1) Preheat

- The appropriate temperature rising speed A is at a rate of 1~3 °/s. The rapid temperature rising in preheat zone causes excessive slumping of the solder paste.
- The appropriate preheat time B is 60 to 100 seconds. If the preheat is insufficient, large solder balls tend to be generated. On the other hand, excessively long preheat time causes small solder balls and large balls are generate in clusters, or poor soldering.
- The appropriate preheat-end temperature C is 150 to 190 °C. If the temperature is too low, non-melting tends to be caused in the area with large heat capacity after reflow.

2) Heating

- Sudden temperature rising worsens the slump of solder paste.
- The appropriate peak temperature D is in the range from 240 to 250 °C.
- The appropriate melting time E which is the time with the temperature over 230 °C is from 30 to 60 seconds.

3) Cooling

- Too slow cooling speed causes the shift of components and decline in joining strength.

It is in need of a test in advance to settle the adequate reflow machine settings as the reflow temperature profile depends on the conditions of components, PCBs and the specifications of the reflow oven.

## 6. Cautions of Safety and Sanitation

- 1) Physiological interaction varies by individuals. As a prudent policy, therefore, care, should be exercised not to inhale gas or 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 contains an organic solvent, but it is not 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, chemical and other characteristics mentioned in this document are not guarantee value. It is not included that the whole information, although the risks are evaluated based on the information which is available at present. The cautions deal with normal handlings but not irregular case. The related regulations must be observed and the safety measure appropriate for the circumstances should be carried out.

It is necessary to verify that LFSOLDER GP-211-167 is suitable for the process conditions and the required reliability under your situation in advance.

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**TAMURA TAMURA CORPORATION**

<http://www.tamura-ss.co.jp/>

Head Office: 1-19-43, Higashi-Oizumi, Nerima-ku, Tokyo, 178-8511, Japan

**Electronic Chemicals Business Sector**

**Production Base**

Iruma Factory: 16-2, Sayamagahara, Iruma-shi, Saitama, 358-8501, Japan

Phone: +81-4-2934-6134 Fax: +81-4-2935-1427

Kodama Factory: 200-2, Motohara, Kamikawa-cho, Kodama-gun, Saitama, 367-0241, Japan

Phone: +81-495-77-3611 Fax: +81-495-77-4468

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**SHANGHAI XIANGLE TAMURA ELECTRO CHEMICAL INDUSTRY CO., LTD.**

555, Xiangjiang Road, Nanxiang, Jiading, Shanghai 201802, China

Phone: +86-21-3919-9246 Fax: +86-21-3919-9249

**TAMURA KAKEN(DONGGUAN) LTD.**

The Scientific & Technologic Industry Zone, Shijie Town, Dongguan City, Guangdong Province, China

Phone: +86-769-8630-5888 Fax: +86-769-8630-6888

**TAMURA CHEMICAL KOREA CO., LTD.**

58-3, Shingunji-dong, Ansung-city, Kyungki-do, Korea

Phone: +82-31-672-1154 Fax: +82-31-674-4427

**TAMURA KAKEN TECH CO., LTD.**

5F-3, No.181, Fusing N. Rd., Songshan District, Taipei City 105, Taiwan

Phone: +886-2-8712-6023 Fax: +886-2-8712-7672

**TAMURA CORPORATION SINGAPORE PTE. LTD.**

NO 2, Toh Guan Road East #02-02 Singapore 608837

Phone: +65-6779-3100 Fax: +65-6778-2186

**TAMURA CORPORATION (THAILAND) CO., LTD.**

1858/120 Nation Tower 27th Floor, Bangna-Trad Road, Bangna Sub district, Bangna District, Bangkok 10260, Thailand

Phone: +66-2316-2270 Fax: +66-2316-2274

**TAMURA KAKEN (U.K.) LTD.**

Caswell Road, Brackmills, Northampton NN4 7PW, U.K.

Phone: +44-1604-768888 Fax: +44-1604-768808

**TAMURA KAKEN CORP., USA**

100 North Winchester Boulevard Suite 330. Santa Clara, CA 95050 U.S.A.

Phone: +1-408-246-1708 Fax: +1-408-246-0717

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Dealer: