

## Application Note

## SAC3-X(H)F3+

**Description product**

**SAC3-X(H)F3+** is a Resin based no clean lead-free solder paste. The SAC 305 alloy is a silver copper alloy which is near eutectic (melting range 217-219 °C).

SAC3 stands for the alloy composition Sn96.5Ag3.0Cu0.5.

The F3+ flux system is halogen and halide free.

See the Product Data Sheet (PDS) for the specification of the product concerned. Read the Safety Data Sheet (SDS) before handling and/or using this product.

**Receiving and storage**

Store unopened jars in a refrigerator, when the solder paste will not be used or inspected within the next 10 days. Recommended storage temperature is 4-10 °C.

**DO NOT:** store the solder paste at temperatures below 4 °C

**DO NOT:** exceed storage temperatures above 25 °C.

Cartridges should be stored in a horizontal position. To eliminate flux segregation it is advised to rotate the cartridges once a month.

**DO NOT:** store the cartridges in a vertical position

**Handling**

Solder paste is a shelf-life item and should be managed as a FIFO-supply. After taking the solder paste out of the fridge allow the solder paste (jars or cartridges) to reach the ambient temperature at the printer before use. This will take at least 4 hours for a full jar.

**DO NOT:** open cold containers as moisture may condense on the product and affect performance.

**DO NOT:** place the solder paste on a hot plate, furnace, reflow oven or any other artificial means to accelerate heating up.

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Stir the material for approx. 30 seconds with a (preferably) plastic spatula (or equivalent) with rounded edges. This practice homogenizes the product and prepares it for immediate test. The rounded edges of the spatula prevents plastic scratching from the jar.

Also an automatic paste conditioner device can be used to mix the solder paste instead of a spatula. In case a conditioner unit is used, the acclimated time can be reduced dramatically (30-60 seconds instead of 4-8 hours).

**DO NOT:** use sharp edged metal spatulas as these can scratch some plastics from the jars and gets plastics included in the solder paste.

**DO NOT:** set the mixing unit to too high intensity or mixing time as it will influence the dynamic viscosity of the solder paste and the paste might not be usable anymore.

Solder paste is a shelf-life item and should be managed as a FIFO-supply.  
Keep the jars tightly sealed when not used.

### Handling after first use

End of the day or at the end of the job, put the used paste back into an empty jar.

**DO NOT:** store new and used paste in the same jar as this will immediately degrade the new paste.

Store the paste in the fridge in case it will not be re-used within the next 10 days.

If re-used within the next 10 days, just store the paste at room temperature.

**DO NOT:** store the paste near to a window

**DO NOT:** store the paste in the sun as this will warm up the paste to too high temperatures.

**DO NOT:** Store the paste near to or on top of a heating source (e.g. reflow oven)

Too short period between cooling down and heating up might introduce humidity by condensation in the solder paste which can cause corrosion of the metal powder particles. This can result in an increase of solder ball formation and decreasing soldering performance.

At the moment of re-use it can be helpful to mix the old paste with 30-40% of fresh paste to restore properties of composition.

**DO NOT:** Add old solder paste into a jar with fresh un-used solder paste as this will degrade the new solder paste!

After each addition of paste on the stencil, the jar with paste should be closed.

**DO NOT:** Leave jars with remaining solder paste open, solvents will evaporate and the solder paste will change composition.

## Application Note

Solder paste cannot be used unlimited number of times. After one full day of use it can be re-used a second day but better not use it for a longer period, because the performance will degrade and reliability issues can be introduced.

Optimal time to use solder paste: 1-2 days.

→ In case of mass production, the refresh rate will be high enough to keep the paste in good condition without any of the above issues. However, it is imaginable that during the ramp up phase you have to use the same jar several times. Make sure you always use as fresh as possible paste to ensure a smooth and issue free process.

### Print recommendations – Squeegee

Use a squeegee with minimum necessary length. Recommended is to have an extra 25 mm (1 ") on both sides of the print pattern. Apply approx. 10 gram/cm of squeegee length on the stencil.

Standard squeegee angle should be 60°. Only in case of Intrusive reflow applications the choice can be to use 45° angled squeegee because of the higher down force offering better hole filling in this application. Check the sharpness of the squeegee before use by scratching on your finger nails.

**DO NOT:** Use 45° angled squeegees for standard printing applications.

**DO NOT:** Use damaged squeegees.

**DO NOT:** Use worn squeegees.

### Print recommendations – Squeegee set up

The stroke of the squeegee should start and end approx. 50 mm (2") before/after print pattern to allow the paste to roll properly.

Printer settings depend on printing equipment, stencil materials and temperature. General recommended settings:

Print speed [mm/s]	Squeegee pressure [kg/cm] @ 23 °C
25 – 80	0.20 (0.50 kg/inch)
80 – 150	0.25 (0.65 kg/inch)

Decrease pressure by 5% per 1 °C higher temperature.

Increase pressure by 5% per 1 °C lower temperature

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Squeegee pressure and speed should always be defined in such a way that the stencil is wiped completely clean after the print stroke.

**DO NOT:** Apply too high pressure as this will lead to under stencil smearing and will influence the final results.

**DO NOT:** Accept un-cleaned stencils after print stroke. Adjust by pressure and speed.

For typical PCB's: separation speed 5-10 mm/s.

Recommended operating temperature is between 22-28 °C and 30-70 %RH.

In case no printing has been done for more than four hours, it is highly recommended to perform a total stencil cleaning prior to re-start.

### Tack time

It is recommended to place components within 8 hours after printing and reflow the assembly no longer than 24 hours after printing.

### Reflow profile

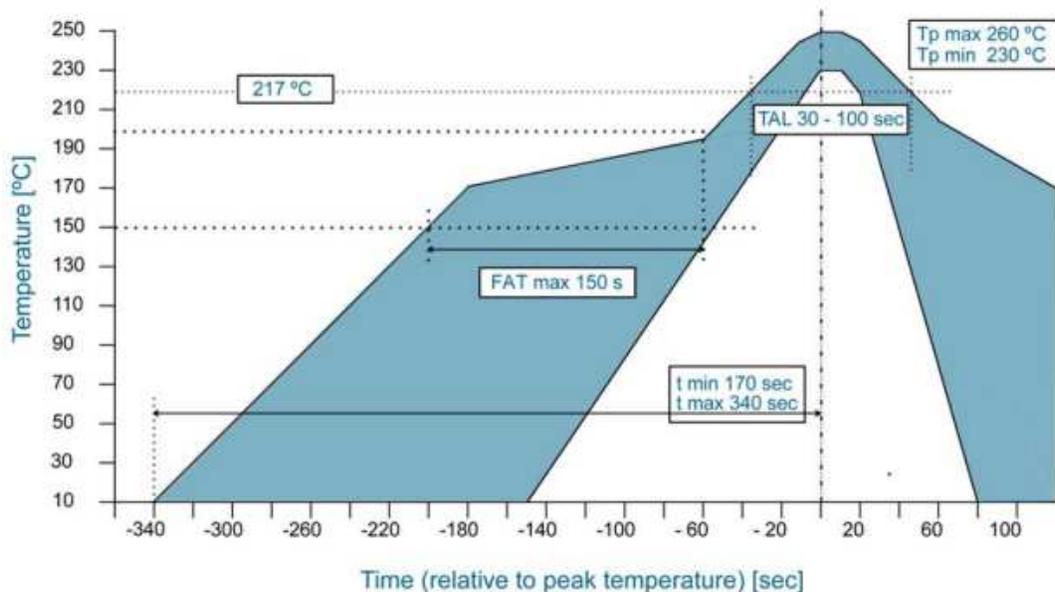
The printed boards can be reflowed up to 24 hours after printing without adverse effects. The recommended profile can only be considered as a guideline for the initial setting of the equipment. Set up the profile on actual production boards with a profiling system. Thermocouple should be attached to the most interesting thermal spots.

- Define coldest spot on the PCB (dependent on components and lay-out design). Attach thermocouple
- Define hottest spot on the PCB (dependent on components and lay-out design). Attach thermocouple
- Define critical components (heat sensitive devices / BGAs / CSP etc.). Use PSL levels acc. IPC-J-STD-075. Attach thermocouple

**DO NOT:** Set up the process with a general “golden board” or with a general device like a “reflow rider”.

**DO NOT:** Attach thermocouple on an inadequate manner this will influence the measured results.

## Application Note



FAT = Flux Activation Time (time between 150 and 200 °C)

TAL = Time Above Liquidus (time above 219 °C)

Tp = Peak Temperature (maximum temperature)

## NOTE:

Although the solder paste has a very wide process window, a linear reflow profile is preferred in case of poor wettable components/board finishes.

For vapor phase or inert reflow soldering a longer soak and/or time above liquidus are less critical.

**Residues/cleaning**

**SAC3-X(H)F3+** is a no-clean formulation. Residues that remain on the assembly after soldering are chemically inert and not meant to be cleaned. The residues on the PBA can however be cleaned with Cobar MCA-1424 Aqueous cleaner.

The residues on stencil, spatulas and other tools as well as misprints may be cleaned with cleaner MCI-2330.

*Disclaimer:*

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