

Why use solder paste with powder type 5?

Solder paste can be made with different powder size types. The solder powder sizes are mainly classified in the IPC standard J-STD005 (Requirements for Soldering Pastes).

Each type has its own particle size range. Below table shows the various powder size and corresponding particle size range.

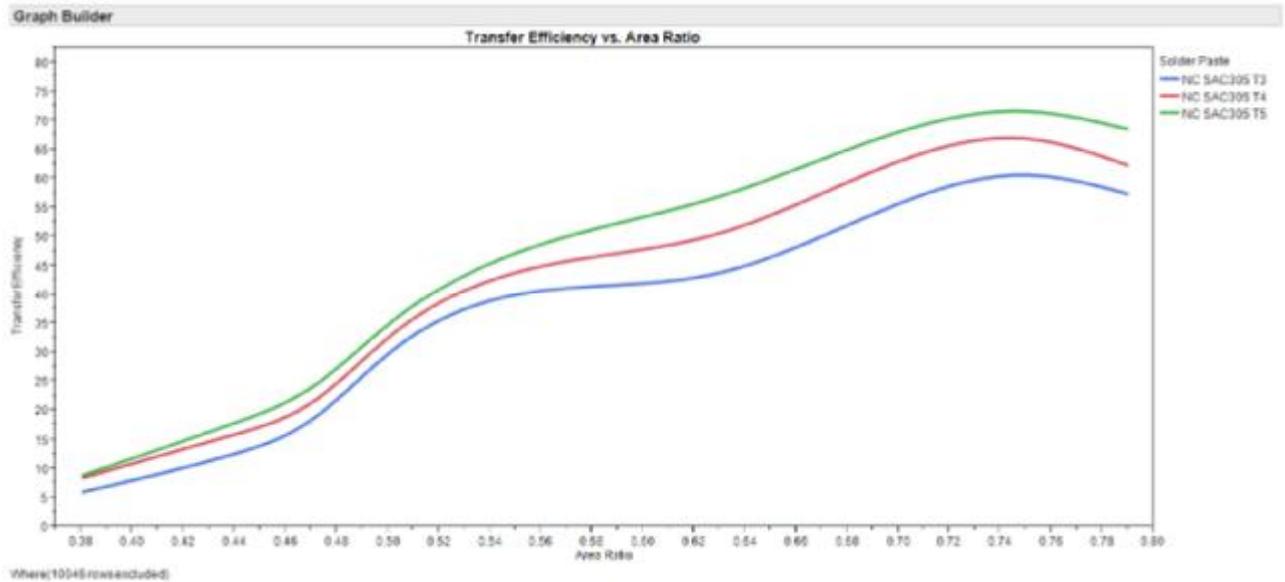
Type 3	Type 4	Type 5
25 – 45 micron	20 – 38 micron	15 – 25 micron

Below are some images showing the three main powder types.



When is the usage of type 5 solder powder recommended?

The main reason to use Type 4 or Type 5 solder paste is to improve printability for miniature components. Type 4 and Type 5 solder pastes can be printed through smaller stencil apertures than Type 3 solder paste. Generally speaking, Type 3 solder paste can be used for components ranging in size down to the 0402 imperial package size. Most solder paste users prefer Type 4 solder paste for 0201 imperial, 01005 imperial, micro-BGAs and similar components. Type 5 solder paste is typically used for even smaller soldering applications, or when Type 4 solder paste does not print adequately. A comparison of print data for Type 3, 4, and 5 no-clean, lead-free solder pastes is shown in chart below. Transfer efficiency was measured across a variety of stencil aperture area ratios ranging from 0.38 to 0.80.



In general, Type 5 gives higher transfer efficiency than Type 4 solder paste, and Type 4 gives higher transfer efficiency than Type 3 solder paste. At smaller area ratios this difference in transfer efficiency becomes less distinct.

Type 4 or 5 solder pastes enhance printing for miniaturized components. This is especially true when these solder pastes are coupled with stencil technologies designed to enhance printing. Fine grain laser cut steel stencils along with Nano coatings give a substantial increase in transfer efficiency as compared to standard steel stencils. The increase in transfer efficiency is dramatic when Type 4 or 5 solder pastes are used along with fine grain steel stencils coated with Nano coatings. This combination allows for printing of even the finest of components.

Smaller solder powder sizes like Type 4 and Type 5 give improved printability but also can create some issues due to chemical reactions with the solder powder. The surface area of the smaller solder powder types is significantly higher than the larger solder powder types. For the same mass of solder powder, the surface area of Type 4 solder powder is roughly 20% higher than Type 3, and the surface area for Type 5 solder powder is roughly 75% higher than Type 3.

The rate of chemical reaction with the solder powder is directly proportional to the surface area of the solder powder. Therefore, smaller solder powders react more quickly than larger solder powders. This higher rate of reaction leads to potential issues when using Type 4 and 5 solder pastes.

The shelf life of Type 4 and 5 solder paste is typically shorter than Type 3 due to a higher rate of reaction between the flux and solder powder. Type 4 and 5 solder pastes can generate more random solder balling and graping than Type 3 with certain solder paste formulations. This is due to a higher potential for oxidation of Type 4 and 5 solder powders. Most solder paste manufacturers correct these issues by adjusting the formulas for Type 4 and 5 solder pastes.