

Technology
FocusSMIC Resolves Conflicting
Properties in Solder Ball

Booth No. 1116

Various mobile devices, including smartphones, tablet computers, and e-book readers have appeared on the market recently in quick succession, and these devices have been developing at a remarkable pace. These mobile products contain many packaging components mounted on them, and the requirements for solder balls as joining parts have been becoming increasingly demanding. In particular, they are required to have thermal fatigue resistance, an important characteristic for personal computer devices, and drop impact resistance, an indispensable property for mobile devices, at the same time. Aiming to meet these requirements, Senju Metal Industry Co., Ltd. has developed M770, a solder ball optimal for cutting-edge mobile devices.

Technology Challenges

In manipulating alloy characteristics of Sn-Ag-Cu lead-free solder, the content of silver (Ag) mixed in the solder plays a significant role. Thermal fatigue resistance can be improved by increasing the amount of Ag and by strengthening precipitation of Ag₃Sn compound. In contrast, in order to improve drop impact resistance, it is important to decrease the amount of Ag so that the solder will have the flexibility to absorb shocks.



Photo 1

When considering thermal fatigue and drop impact separately as described above, requirements can be met to some extent by carefully determining the amount of Ag.

However, attaining both characteristics is difficult due to conflicting features of the two properties with respect to the amount of Ag.

Toward Achieving Two Properties

Senju Metal Industry has achieved the conflicting properties by developing a solder alloy, whose drop impact resistance does not deteriorate even when the amount of Ag is increased. Senju Metal Industry's engineers have found that the improvement of the joint interface significantly contributes to the improvement of the drop impact resistance, in addition to the reduction of Ag amount. This discovery has led to the development of M770.

Specifically, Senju Metal Industry has created a solder ball, which does not cause the debinding of joint interface, by making the compound layer formed



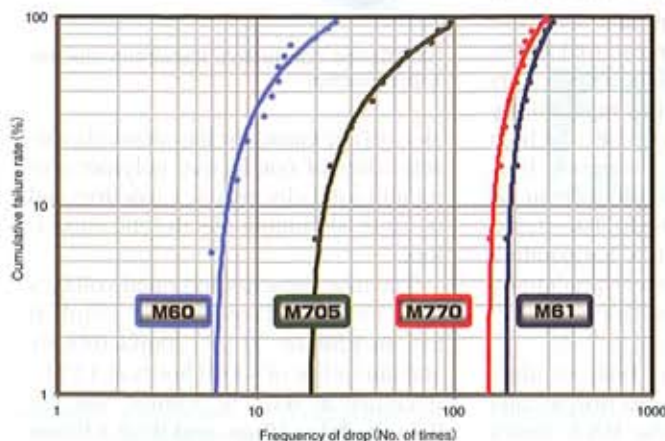
Photo 2

at the joint section extremely thin. This can be done by suppressing the metallic diffusion of copper (Cu) and nickel (Ni) used for surface treatment of printed circuit boards (PCBs).

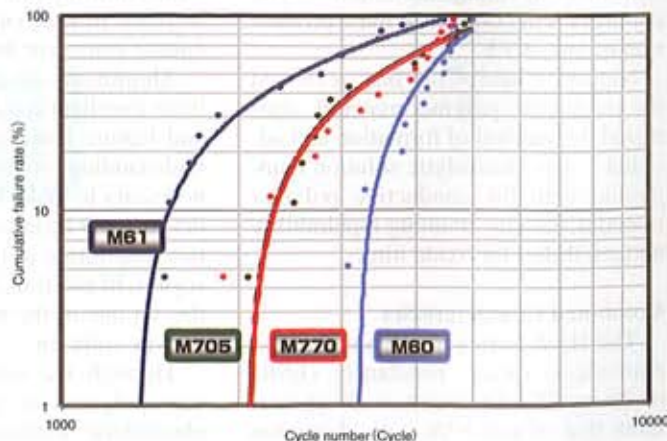
Wide Application Areas

Attaining both thermal fatigue and drop impact resistance characteristics, high expectations are placed on M770 for use not only in personal computer devices and portable devices, but also in cutting-edge mobile devices and ball grid arrays (BGAs) for automotive application.

Thanks to its effect to suppress the diffusion of board surface treatment materials, such as Cu and Ni (electrolysis, electroless), M770 can be used without restrictions on the kinds of surface treatment of PCBs and components. Thus, M770 can be used for all parts from BGAs to wafer level chip size packages (WL-CSPs) without changing materials, not to mention design changes of components. This is the strength of M770. □



Drop impact resistance (Cu-OSP Board)



Thermal fatigue resistance (Cu-OSP Board)