

Sony Semiconductor Products Lead-Free Package

Sony Lead-Free Packages Contribute to the Elimination of Lead

Sony has begun mass production of Lead-free packages for semiconductor products.

Sony engages in a wide range of environmental activities. In particular, as part of its environmental action plan, Sony is introducing Lead-free solder in all models in production in Japan by March 2001, and is aiming at using Lead-free solder in all products manufactured outside Japan by March 2002. Sony has led other companies in environmental efforts related to semiconductor products since 1995, when it adopted in commercial products the S-Pd PPF (palladium pre-plating lead frame), which is a Lead-free lead frame. As part of this process, Sony has begun mass production of products that use Lead-free plating (Sn-Bi plating) on the external leads.

Lead-Free Packages

Lead-free packages are packages that either use the S-Pd PPF, which does not use lead on the IC's external leads, or use Lead-free plating (Sn-Bi plating) and at the same time achieve high heat resistance (the ability to withstand a temperature of 260°C) to withstand the increased temperatures required to mount components when Lead-free mounting is used.

Plating Specifications for Lead-Free Mounting

Sony now uses two types of plating in Lead-free packages: the S-Pd PPF (palladium pre-plating lead frame) which is already in production and the newly adopted Sn-Bi plating. (See figure 1.)

Both Traditional Lead Solder and Lead-Free Solder can be used for Printed Circuit Board Mounting

To investigate the ability to withstand heat during printed circuit board mounting, Sony adopted the process changes discussed here and the lead frame structural changes in certain products, and increased the maximum temperature that can be withstood from the earlier 235°C to 260°C to handle Lead-free mounting. No problems occurred at the earlier mounting temperature. Since these packages are guaranteed to withstand a surface temperature of 260°C, they can be used without problem with

Lead-free solder. (Note that there are some products that are excluded from this program. Contact your Sony representative for details.)

With regard to mounting reliability, the S-Pd PPF (palladium pre-plating lead frame) products have already achieved fully adequate performance in Lead-solder mounting. Sony has also verified that these products can assure high reliability even in Lead-free solder mounting.

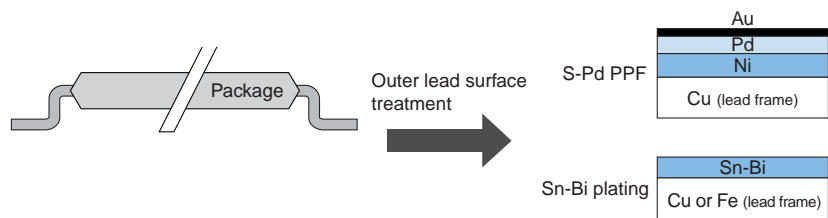
Sony is also verifying that the newly introduced Sn-Bi plating can assure the same high reliability as the earlier Lead-solder and Sn-Pb plating mounting in both Lead-solder mounting and Lead-free solder mounting. (See figure 2 and photograph 1.)

Other Efforts for the Environment

In addition to eliminating lead, Sony is also engaged in a wide range of other efforts for environmental protection. As part of those efforts, in particular to eliminate halogens from Sony products, Sony is first adopting package resins that contain no halogen-based flame retardants. Sony plans to gradually increase the number and range of products that use these halogen-free resins.

■ Table 1 Lead-free Specifications

Type	Present	Lead-free
SMD	Sn-Pb plating	Sn-Pb PPF or Sn-Bi plating
	S-Pd PPF	Same as present
	Ni/Au plating	Same as present
	Sn-Pb ball	Under development
THD	Sn-Pb plating	Sn-Pb PPF or Sn-Bi plating
	S-Pd PPF	Same as present
	Ni/Au plating	Same as present
	Sn plating	Same as present

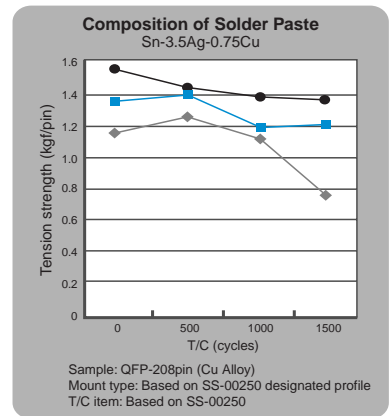
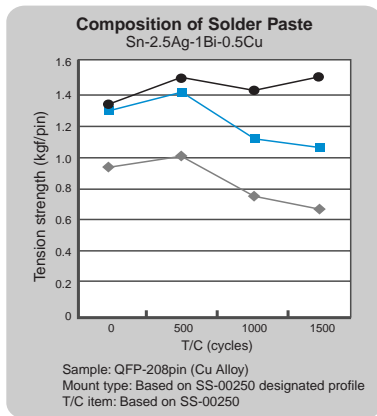
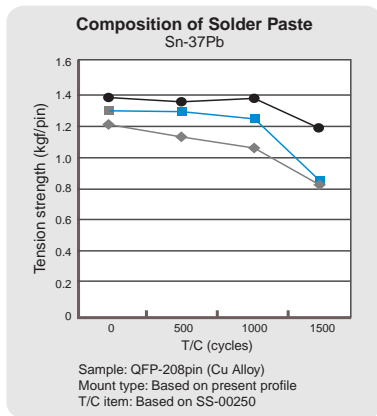


■ Figure 1 Plating Specifications for Lead-free Packages

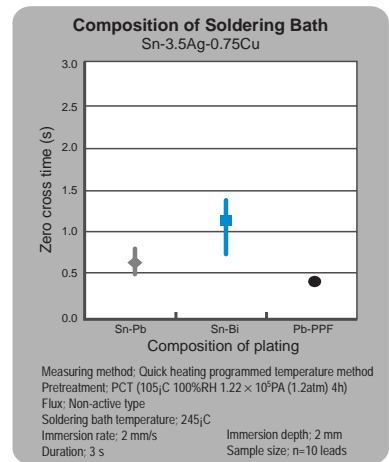
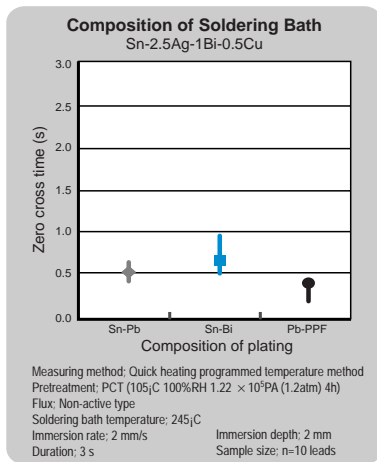
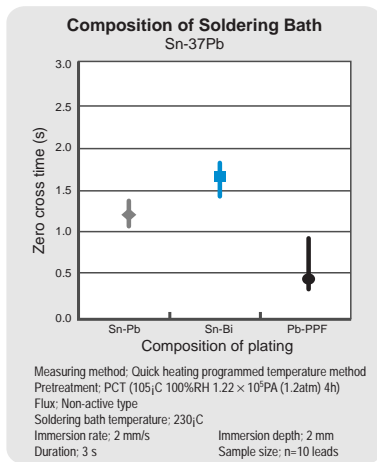


■ Photograph 1 Cross-Section Observations of Sn-Bi Plating Mounting

Mount Reliability (Tension Strength of Terminals)



Solder Wettability



* ●: Pd-PPF (Ni/Pd/Au) ■: Sn-Bi (Bi 3%) ◆: Sn-Pb (Pb 10)

■ Figure 2 Results of Soldering Tests

Type	SMD					THD					
Category	Integrated circuit				Discrete type	CCD	Integrated circuit			Laser diode	
Package	Name (Nominal)	QFP TQFP/LQFP QFN	SOP series	BGA	LGA	Mini mold package SSVc/SMVC	DIP/SOP series	DIP series	PGA	SIP/ZIP SZIP	CAN/ Laser coupler
Package	Shape (Representative)										
Lead-free specification	Pd plating	●	●					●			
	Sn-Bi plating	●	●			●		●		●	
	Au plating				●		●		●		●
	Sn plating						●				
	Lead-free ball				●						

■ Figure 3 Specifications for Lead-free Package Electrodes