SONY

Sony Semiconductor
Products Lead-free Package

Semiconductor Products Lead-free Package

Contents

1. The Need for Lead-free Products
1-1. Background
1-2. Trends in the Regulation of Lead Use

2. Sony's Strategy
2-1. Corporate Policy
2-2. Semiconductor Group's Approach

3. Developing Lead-free Semiconductors
3-1. Electrode Section of Lead-free
3-2. Lead-free Specifications

4. Heat-resistance of Solder

5. Results of Soldering Tests

6. Specifications for Lead-free Package Electrodes

1. The Need for Lead-free Products

1-1. Background

Scientists have reported various adverse environmental effects attributable to the use of lead. When accumulated in the human body through drinking water or food, it can retard growth in children and cause mental disorders in adults. The solder used in electronic assemblies contains substantial amounts of lead about 37 percent. If printed circuit boards disposed of in landfills, etc. are exposed to acid rain, the lead will leach out of the solder. The lead may then contaminate groundwater and rivers, and hence it is absorbed into the human body through drinking water.

The development of Lead-free solders and mount technology and the recovery and recycling of electronic products have become of paramount importance for protecting the global environment.

1-2. Trends in the Regulation of Lead Use

Europe: In 2000, the OECD tightened the standard for lead content in groundwater from 0.05mg/l to 0.025mg/l. The final draft of the EU directive on waste electrical and electronic equipment (WEEE) calls for the substitntion of lead, cadmium, hexavalent chromium and halogenated flame retardants by January 1, 2008, except in special applications.

United States: A bill providing for the regulation of lead used in electric appliances was submitted to Congress in 1990 (with electronic products being excluded). The use of lead in gasoline, food cans, pipes, home paints and other products has either been prohibited or restricted, and there is growing pressure for the total elimination of lead.

Japan: The Law Concerning Waste Disposal and Sanitation (1991) requires that industrial waste in which 0.3mg/l or more of lead has been detected in elution tests be treated in controlled disposal plants. The Water Contamination Prevention Law (1994) strengthened the standard for lead content in rivers, etc. from 0.1mg/l to 0.01mg/l. In addition, the Electrical Appliance Recycling Law, which will be fully enforced, is considered to obligate producers to take the responsibility for recovering or making harmless toxic substances containing lead.

2. Sony's Strategy

2-1. Corporate Policy

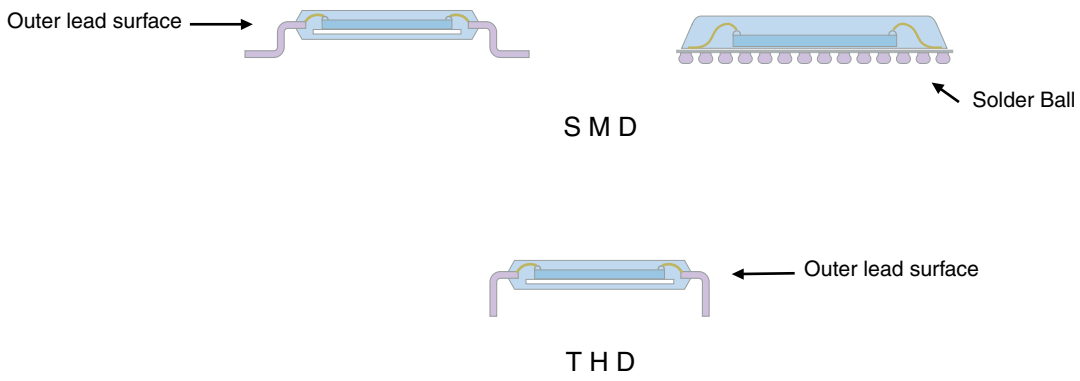
Sony aims to introduce Lead-free solder for all models produced in Japan and overseas by March 2001 and March 2002, respectively.

2-2. Semiconductor Group's Approach

Sony has already launched a number of semiconductor products with Lead-free external terminals. It plans to introduce Lead-free products progressively in all semiconductor categories, starting in the fall of 2000.

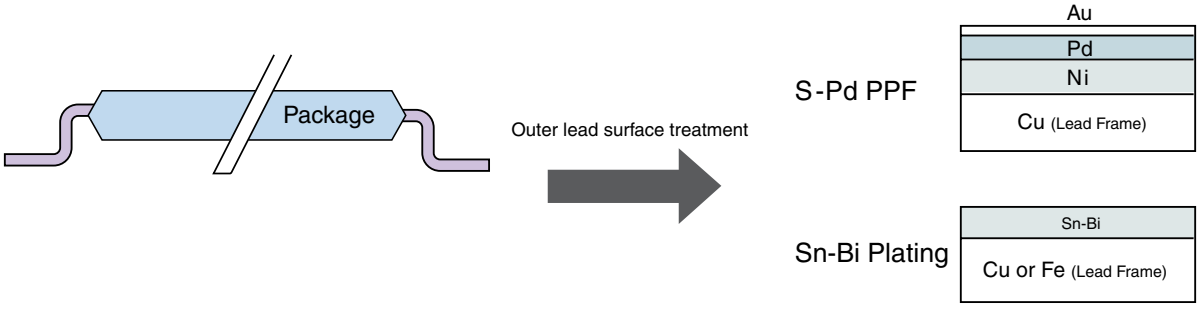
3. Developing Lead-free Semiconductors

3-1. Electrode Section of Lead-free



3-2. Lead-free Specifications

Type	Present	Lead-free
S M D	Sn-Pb Plating	S-Pd PPF or Sn-Bi Plating
	S-Pd PPF	Same as Present
	Ni / Au Plating	Same as Present
	Sn-Pb Ball	Under Development
T H D	Sn-Pb Plating	S-Pd PPF or Sn-Bi Plating
	S-Pd PPF	Same as Present
	Ni / Au Plating	Same as Present
	Sn Plating	Same as Present

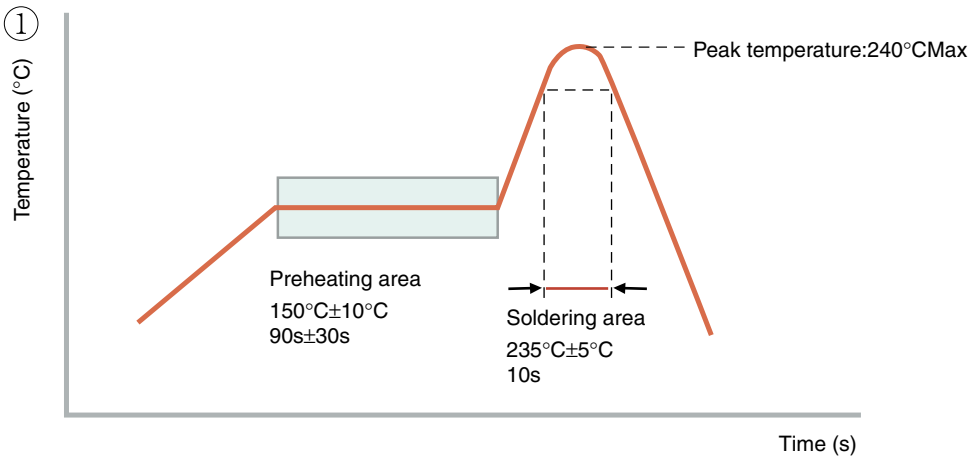


4. Heat-resistance of Solder

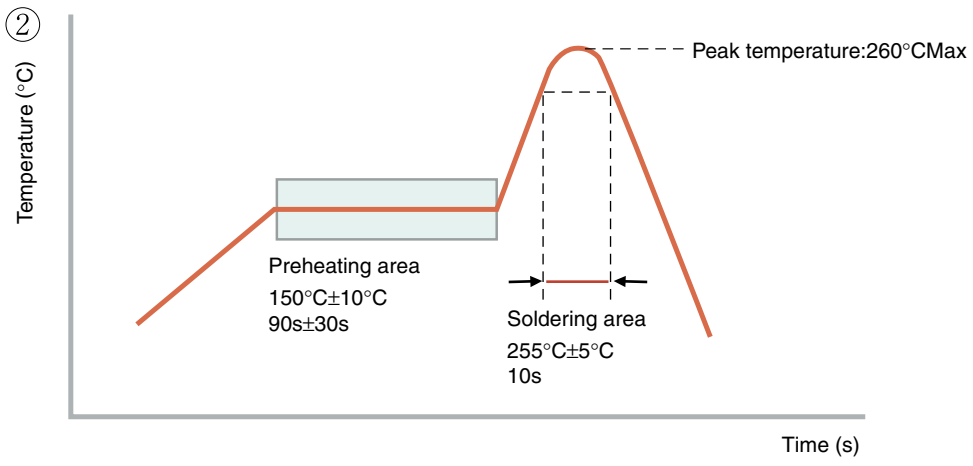
- For Lead-free solder, the maximum temperature during mounting processes will be
  260°C for both re-flow and flow soldering processes.

- Solder heat-resistance varies with different products. Contact your local sales representative for details.

Standard Temperature Profile for Lead Solder (Sn-Pb eutectic)



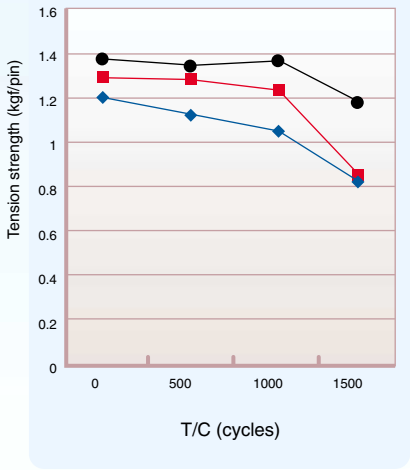
Standard Temperature Profile for Lead-free Solder



5. Results of Soldering Tests

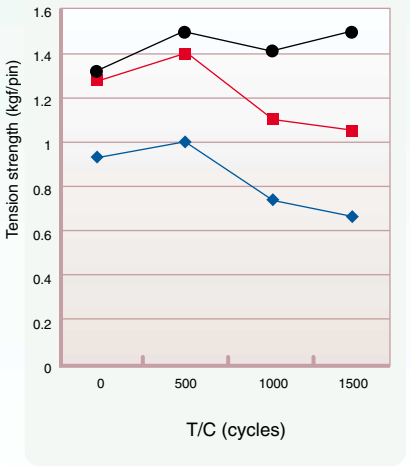
Mount Reliability (Tension Strength of Terminals)

Composition of Solder Paste
Sn-37Pb



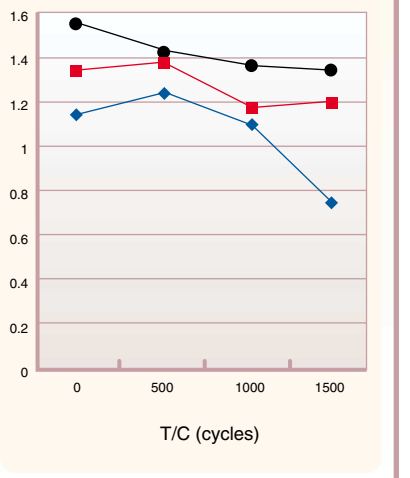
Sample: QFP-208pin (Cu Alloy)
Mount type: Based on present profile
T/C item: Based on SS-00250

Composition of Solder Paste
Sn-2.5Ag-1Bi-0.5Cu



Sample: QFP-208pin (Cu Alloy)
Mount type: Based on SS-00250 designated profile
T/C item: Based on SS-00250

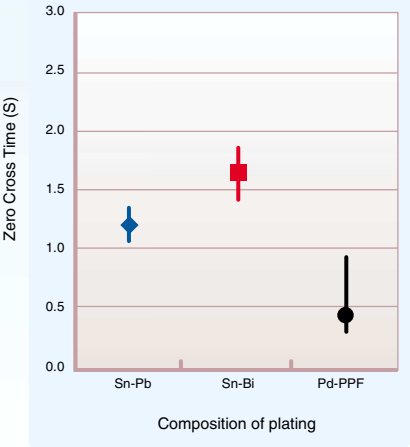
Composition of Solder Paste
Sn-3.5Ag-0.75Cu



Sample: QFP-208pin (Cu Alloy)
Mount type: Based on SS-00250 designated profile
T/C item: Based on SS-00250

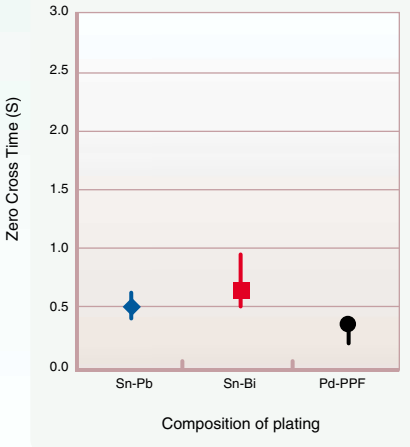
Solder Wettability

Composition of Soldering Bath
Sn-37Pb



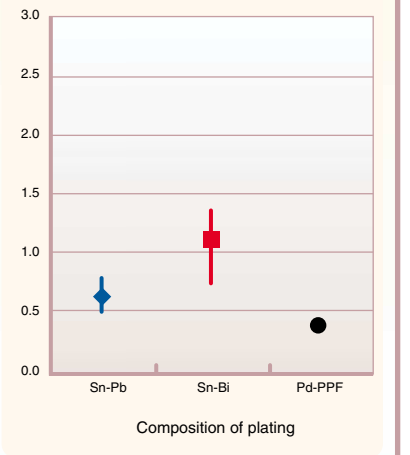
Measuring method …
Quick heating programmed temperature method
Pretreatment …
PCT(105°C 100%RH 1.22×10^{5}PA(1.2atm)4h)
Flux … Non-active type
Soldering bath temperature … 230°C
Immersion rate … 2mm/ s
Immersion depth … 2mm
Duration … 3 s
Sample size … n=10leads

Composition of Soldering Bath
Sn-2.5Ag-1Bi-0.5Cu



Measuring method …
Quick heating programmed temperature method
Pretreatment …
PCT(105°C 100%RH 1.22×10^{5}PA(1.2atm)4h)
Flux … Non-active type
Soldering bath temperature … 245°C
Immersion rate … 2mm/ s
Immersion depth … 2mm
Duration … 3 s
Sample size … n=10leads

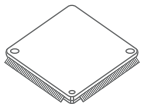
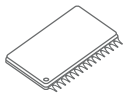
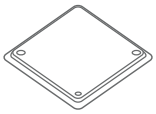
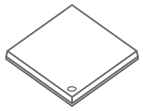
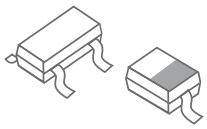
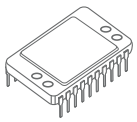
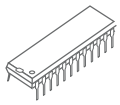
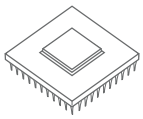
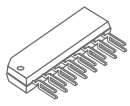
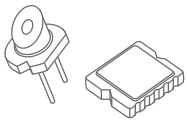
Composition of Soldering Bath
Sn-3.5Ag-0.75Cu



Measuring method …
Quick heating programmed temperature method
Pretreatment …
PCT(105°C 100%RH 1.22×10^{5}PA(1.2atm)4h)
Flux … Non-active type
Soldering bath temperature … 245°C
Immersion rate … 2mm/ s
Immersion depth … 2mm
Duration … 3 s
Sample size … n=10leads

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

6. Specifications for Lead-free Package Electrodes

Type	Category	Package		Lead-free specification				
		Name (Nominal)	Shape (Representative)	Pd plating	Sn-Bi plating	Au plating	Sn plating	Lead-free ball
S M D	Integrated circuit	QFP TQFP / LQFP QFN		●	●			
		SOP series		●	●			
		BGA						●
		LGA				●		
	Discrete type	Mini mold package SSVC / SMVC			●			
T H D	CCD	DIP / SOPseries				●	●	
	Integrated circuit	DIP series		●	●			
		PGA				●		
		SIP / ZIP SZIP			●			
	Laser Diode	CAN / Laser Coupler				●		

Sony Semiconductor
Products Lead-free Package

Sony Semiconductor Sales Offices:

Asia

http://www.world.sony.com/semicon/

Sony Electronics (Singapore) Pte. Ltd.
Semiconductor Sales & Marketing
Electronics Devices Marketing (S)
<Singapore, India, Indonesia, Malaysia, Australia, New Zealand, Thailand, Viet Nam, Philippines, South Africa>
10 Hoe Chiang Road #23-00 Keppel Towers, Singapore 089315
Tel: +65-329-1542 Fax: +65-329-1591

Sony Corporation of Hong Kong Limited
Electronic Device Marketing Hong Kong
<Hong Kong, China>
46/F, The Lee Gardens, 33 Hysan Avenue, Causeway Bay, Hong Kong
Tel: +852-2909-1111 Fax: +852-2909-2222

Sony Taiwan Limited
<Taiwan>
Rm 1506, Chia Hsin Bldg., No.96, Sec.2, Chung Shan N.Rd., Taipei, Taiwan, R.O.C.
Tel: +886-2-2542-6142 Fax: +886-2-2537-7459

Sony Korea Corporation
Electronic Devices Marketing Korea
<Korea>
5F, Chungjin B/D., 53-5 3GA Whonhyo-ro Yongsan-ku, Seoul, 140-719 Korea
Tel: +82-2-3271-7525 Fax: +82-2-3271-7778

America

http://www.sel.sony.com/semi/

Sony Electronics Inc.
Component Company, Semiconductor Business Division
<North America>
3300 Zanker Road, MS: SJ-3C4, San Jose, CA95134-1901, USA
Tel: +1-408-955-6572 Fax: +1-408-955-6022

Europe

http://www.semiconductor.sony-europe.com/

Sony Semiconductor & Devices Europe
<United Kingdom,Ireland,Italy,Israel>
The Heights,Brooklands,Weybridge,Surrey,KT13 0XW,UK
Tel: +44-1932-817455 Fax: +44-1932-817473

Sony Semiconductor & Devices Central & Eastern Europe
<Germany, Switzerland, Benelux, Austria, Turkey, Russia, Eastern Europe>
Max-Planck-Strasse 8, D-85609 Aschheim, Dornach,
Munich, Germany
Tel: +49-89-94582-448 Fax: +49-89-94582-444

Sony Semiconductor & Devices Southern Europe
<France, Spain, Portugal>
75831 Paris Cedex 17, France
Tel: +33-01-55-90-36-60 Fax: +33-01-55-90-36-65

Sony Semiconductor & Devices Nordic
<Finland, Denmark, Norway>
A/S Hoersvinget 1, PO Box 154, DK-2630 Taastrup, Denmark
Tel: +45-4355-7035 Fax: +45-4355-7142
<Sweden>
Salagatan 42, S-163 80 Spanga, Sweden
Tel: +46-8-598-90-019 Fax: +46-8-598-90-250

Sony Semiconductor Homepage <http://www.world.sony.com/semi/>