

## FAQ (Frequently Asked Questions) about Lead-Free\* (Pb-Free) Memory Products

### 1. Why is lead (Pb) being phased out? (Motivation)

- **Is there legislation that bans Pb use in electronics?**
- **What are the advantages of using Pb-Free packages?**

Lead (Pb) in semiconductor products has come under increased environmental scrutiny because of the growing number of electronic products requiring end of life treatment and disposal. A variety of jurisdictions around the globe have proposed regulations that would restrict the use of Pb, or impose additional requirements when Pb is used in products. For example, the European Community has established a phase-out date of July 1, 2006 for Pb in electronic products, with some exceptions. More information on the Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment, is available at the following link:

[http://europa.eu.int/prelex/detail\\_dossier\\_real.cfm?CL=en&DosId=158021](http://europa.eu.int/prelex/detail_dossier_real.cfm?CL=en&DosId=158021)

In addition, AMD customers are requesting information about Pb-Free products.

\* The concentration of lead, as an impurity, does not exceed the levels noted in section 3.3 of IPC/EIA J-STD-006A (May 2001).  
The maximum concentration of Pb allowed as an impurity in solder under this standard is 0.2 wt% (percent by weight).

### 2. What are AMD's definitions for 260°C maximum reflow temperature compliant and Pb-Free memory packages?






























- **260°C Maximum Reflow Temperature Compliant:**  
260°C maximum reflow temperature compliant memory packages are defined as packages able to withstand reflow temperatures of up to 260°C.

They use standard Tin-Lead (SnPb) solder and are suitable for use with both existing SnPb solder assembly processes and Pb-Free assembly processes.

- **Pb-Free:**  
AMD's Pb-Free memory packages can be defined as packages whose components or raw materials do not contain more than 0.2% (by weight) of Pb as an impurity.

### 3. What is AMD Memory Group's Pb-Free Roadmap?

Please see the matrix below:

Package Type	3D	Available Finish		
		SnPb	260°C Compliant with SnPb finish	Pb-Free
SOIC				
TSOP				
SSOP				
PLCC		TBD	TBD	TBD
PDIP		TBD	N/A	TBD
PQFP		N/A		
FBGA				
MCP [FLAxx, FLBxx]				
MCP [All other MCPs]				

**Legend:**

	Yellow	Red	Purple	Green	Blue	Gray
Samples Available	Product	2003	Now	Now	Now	2003
Qualified for Production	to be	2003	2002	Now	2003	2003
Implementation in Production	phased out	TBD	2003	Now	2003	2003

\*References to Pb-Free or "lead free," indicate compliance with IPC/EIA J-STD-006A (May 2001) section 3.3 limitations on alloy impurities.

The maximum concentration of Pb allowed as an impurity in solder under this standard is 0.2 wt% (percent by weight).

**4. What are AMD Memory Group's choices for Pb-Free finishes?**

Leadframe packages – 100% Sn (Tin) plating.

Laminate packages - Solder balls composed of 95.5% weight Tin, 4.0% Silver, and 0.5% Copper.

**5. Why has AMD Memory Group chosen 100% Sn in spite of concerns regarding whisker growth?**

Pure Sn plating has been chosen as AMD's Pb-Free lead finish alternative for the following reasons:

- It is compatible with existing SnPb and Pb-Free board assembly processes.
- It has a higher melting point than other Pb-Free alternatives, which makes it acceptable for automotive and high temperature applications.

Pure Sn plating has been known to be susceptible to tin whisker growth.

However, the pure Sn plating chemistry qualified at AMD [low stress or matte tin] has demonstrated satisfactory quality and reliability. AMD's reliability test results are available at:

**Pure Tin Whisker Growth Study**

[http://www.amd.com/us-en/assets/content\\_type/DownloadableAssets/whisker\\_study.pdf](http://www.amd.com/us-en/assets/content_type/DownloadableAssets/whisker_study.pdf)

**6. What is the reason AMD Memory Group chose to use 4.0% silver rather than 3.5 % silver alloy for the Pb-Free solder balls of laminate packages?**

The 4.0% silver alloy is the most widely used and accepted Pb-Free solder within the semiconductor industry. We are confident suppliers will be able to meet demand for this product with consistent quality.

**7. Does AMD Memory Group's choice of molding compounds contain inorganic Phosphorus?**

We understand customers have concern regarding a molding compound that contained red phosphorus, which caused failures in (other companies') products. The molding compound in question was later recalled by the manufacturer.

AMD never used the molding compound in question.

Customer interest in "Green Products" has prompted semiconductor manufacturers, including AMD, to reformulate molding compounds with alternative flame-retardants in order to eliminate bromine and antimony.

Some reformulated molding compounds contain metal hydroxides and small amounts of organically coated phosphorus as flame-retardants. Several of these reformulated molding compounds have been rigorously tested by AMD prior to qualification. These same materials are used for production at other large semiconductor manufacturers without quality or reliability issues.

**8. Does AMD Memory Group use any Bi (bismuth) in Pb-Free products?**

AMD does not intentionally use Bi or alloys of bismuth in Pb-Free products.

**9. Are Quality & Reliability Standards for Pb-Free packages different from the standards for existing packages?**

No. Quality and Reliability Standards remain the same.

**10. How will AMD Memory Group's Pb-Free and 260°C maximum reflow temperature compliant packages be identified?**

- Package Markings,

Leadframe Packages:

- 260°C maximum reflow temperature compliant packages maintain their original markings and Ordering Part Numbers (OPNs), and are identifiable by their date code.
- Pb-Free packages, when available, will maintain their original OPNs, and will be identifiable by their date code and die code revision.  
Please contact your local sales representative for details on how to order Pb-free products.

Laminate Packages:

- 260°C maximum reflow temperature compliant packages maintain their original markings and OPNs, and are identifiable by their date code.
- Pb-Free packages, when available, will have new OPNs.  
Customers can use the new OPN while ordering Pb-free products.

- External Packaging,

260°C Maximum Reflow Temperature Compliant Packages:

- No changes to the external package marking.

Pb-Free Packages:

- No changes to the external package marking for leadframe packages. Please contact your local sales representative for details.
- External marking will correspond to the new OPNs for laminate packages.

### **11. Will Pb-Free packages cost more than existing packages?**

We currently offer 260°C maximum reflow temperature compliant packages to our customers. These packages **cost the same** as our standard packages with the advantage of 260°C tolerance (as compared to 240°C for standard packages).

We currently do not offer totally Pb-free packages. Please contact your local AMD sales representative for availability and cost information.

### **12. Which changes will be necessary in customer processes when using Pb-Free components?**

- Solder Paste,  
For Pb-Free packages using Pb-Free surface mount process, the flux chemistry needs to be modified in order to meet high temperature reflow requirement. If voiding occurs, the user needs to work with solvent or resin systems to alleviate the problem. Check with your solder paste vendor for support.

A standard SnPb solder paste can be used for 260°C maximum reflow temperature compliant packages because the solder balls are eutectic SnPb. These packages are also compatible with Pb-Free surface mount process.

- Pb-Free Reflow Temperature Profile:  
Currently, there is no industry standard for Pb-Free temperature profiles for surface mount. The profile is recommended by paste/flux supplier and needs to be modified, based on specific application, to achieve optimum reflow process.

Both Pb-Free packages and 260°C maximum reflow temperature compliant packages are compliant with reflow temperatures of up to 260°C. Customers are encouraged to work with their solder paste and reflow process equipment suppliers to develop the optimum temperature profile for their application.

### **13. What is the lead-time for samples once they are ordered?**

After the date of initial order, please allow 10 to 12 weeks for delivery.

### **14. Have any customers requested Pb-Free packages?**

Yes. Some customers have already inquired regarding the availability of Pb-Free packages.

**15. Where should customer send requests for Pb-Free packages?**

Customers may contact their sales representatives for qualification data, to request product samples, and for production requests.

**16. How do I contact AMD Memory Group if I have additional questions?**

A single email address has been established as a communication point for customer questions regarding Pb-Free packaging.

[pb.free@amd.com](mailto:pb.free@amd.com)