



# Processor Pb-Reduction Plan

September 2004

## ● **PGA processor packages**

- Pb/Sn solders are used for attaching chip passives
- C4 bumps on die currently exempt from RoHS directive
  - Additional 63Pb37Sn solder in flipchip organic packages
- Processor packages are intended for socket mounting
  - 2<sup>nd</sup> level reflow temperature resistance is not an issue

- **Evaluate Pb content of Processor packages**
  - [http://www.amd.com/us-en/Processors/ProductInformation/0,,30\\_118\\_11170,00.html](http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_11170,00.html)
- **Pb-containing solder for flipchip on organic PGA**
  - Exemption request submitted to EU in April 2003
  - Expect completion of EU review in October 2004
- **Implement Pb-free solder for passive attach**
  - Define alternative material (Q4, 2003)
  - Engineering evaluation (Q2, 2004)
  - Process Development and reliability testing (Q3, 2004)
  - Product qualification (Q4, 2004)
  - Production implementation (Q1, 2005 – Q2, 2005)

This plan is forward looking and subject to change

## Implement Pb-free solder for passives assembly

- **Alloy Investigation and Selection**
  - Select Pb-free alloy with compatible melting point
- **Process Development and Manufacturability Study**
  - Printing of lead-free paste
  - Assembly of passives
  - Reflow profile
  - Wetting capability
  - Flux residue levels
  - Cost
  - Yield
- **Metallurgical Investigation**
  - Understand intermetallic growth
- **Reliability Study**
  - Engineering qualification with mechanical and functional die
- **Product Qualification**

## ● Chipsets

- BGA packages with eutectic Pb/Sn solder balls
- Pb/Sn solders for attaching chip passives
- Potential temperature sensitivity with 240° C reflow
  - Organic substrate warpage
  - Degradation of underfill
  - Degradation of lid adhesive and thermal interface
- Chipset production at subcontractor

- **Implement Pb-free solder for passive attach**
  - Follow processor plan
- **Evaluate temperature effect on lid attach process**
  - Evaluate temperature sensitivity with 240 °C reflow (Completed)
- **Sn/Ag/Cu and Sn/Ag solder ball reliability (completed)**
  - Report to be posted on [Pb-free Web Pages](#)
- **Qualification of subcontractor**
  - **Solder ball replacement for wire-bond PBGA**
    - Process qualification (Completed)
    - Customer samples October 2004
  - **Solder ball replacement for flipchip PBGA**
    - Process qualification (Completed)
    - Customer samples (October 2004)

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- Terminology used within AMD:

<b><u>Pb-free compliant</u></b>	<b>Component complies with regulations, meets higher processing temperatures required for Pb-free, and meets JEDEC standards (all products). Lead-free compliant components include lead-free and lead-reduced.</b>
<b><u>Pb-free</u></b>	<b>Component has maximum of 0.1% of lead in all materials (e.g. wirebond chipsets).</b>
<b><u>Pb-reduced</u></b>	<b>Component has Pb in a material that is exempted (or exemption has been requested) from lead-free regulations (e.g. organic PGA pins, C4 bumps).</b>

# AMD Pb-free Website

[http://www.amd.com/us-en/Processors/ProductInformation/0,,30\\_118\\_4040,00.html](http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_4040,00.html)

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