
LEAD-FREE ACTIVITIES



Product Engineering & Quality / Oct 2002

LEAD-FREE ACTIVITIES

LEGAL RESTRICTIONS

EUROPE

Member States shall ensure that the use of lead is substituted by 1.January 2008.

The following applications of lead are exempted from this provision:

- Lead as radiation protection
- Lead in glass of cathode ray tubes
- Lead as an alloying element in steel
- Lead in electronic ceramic parts

*Commission of the European Communities
WEEE, Article 4, 10.05.2000*

U.S.A.

No legal base.

JAPAN

No legal base.

LEAD-FREE ACTIVITIES ADDITIONAL MOTIVATIONS

Japanese Home Electronics Recycling Law

"We need suitable treatment not to release Pb into the environment."

Danish Decree

concerning the prohibition of the import and sale of products containing lead.

Review of criteria of EC legislation in 2004

"By 1. January 2004 the Commission shall review the requirements of Article 4 to take into account, as necessary, new scientific evidence."

Public Awareness



Competition

Corporate Customer OEM-Customer Consumer

LEAD-FREE ACTIVITIES MARKETING CONSIDERATIONS

- 20%** of consumers actively consider the environment when making a purchase.
- 45%** of consumers have bought a product because it is environmentally safe.
- 50%** of consumers have switched brands upon finding that a product hurts the environment.
- 76%** of consumers will switch to an environmentally safe product if price and quality are comparable.

Marketing Research, 1999
Motorola Advanced Technology Center

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MARKET ACTIVITIES

Japanese Electronics Industry Development Association (JEIDA)

Year 2000	Adoption of lead-free components.
Year 2000	Adoption of lead-free solders in wave soldering.
Year 2001	Expansion of use of lead-free components.
Year 2001	Expansion of use of lead-free solders in new products.
Year 2002	General use of lead-free solders in new products.
Year 2003	Full use of lead-free solders in all new products.
Year 2005	Lead-containing solder used only exceptionally.

Sony Green Management Plan 2002

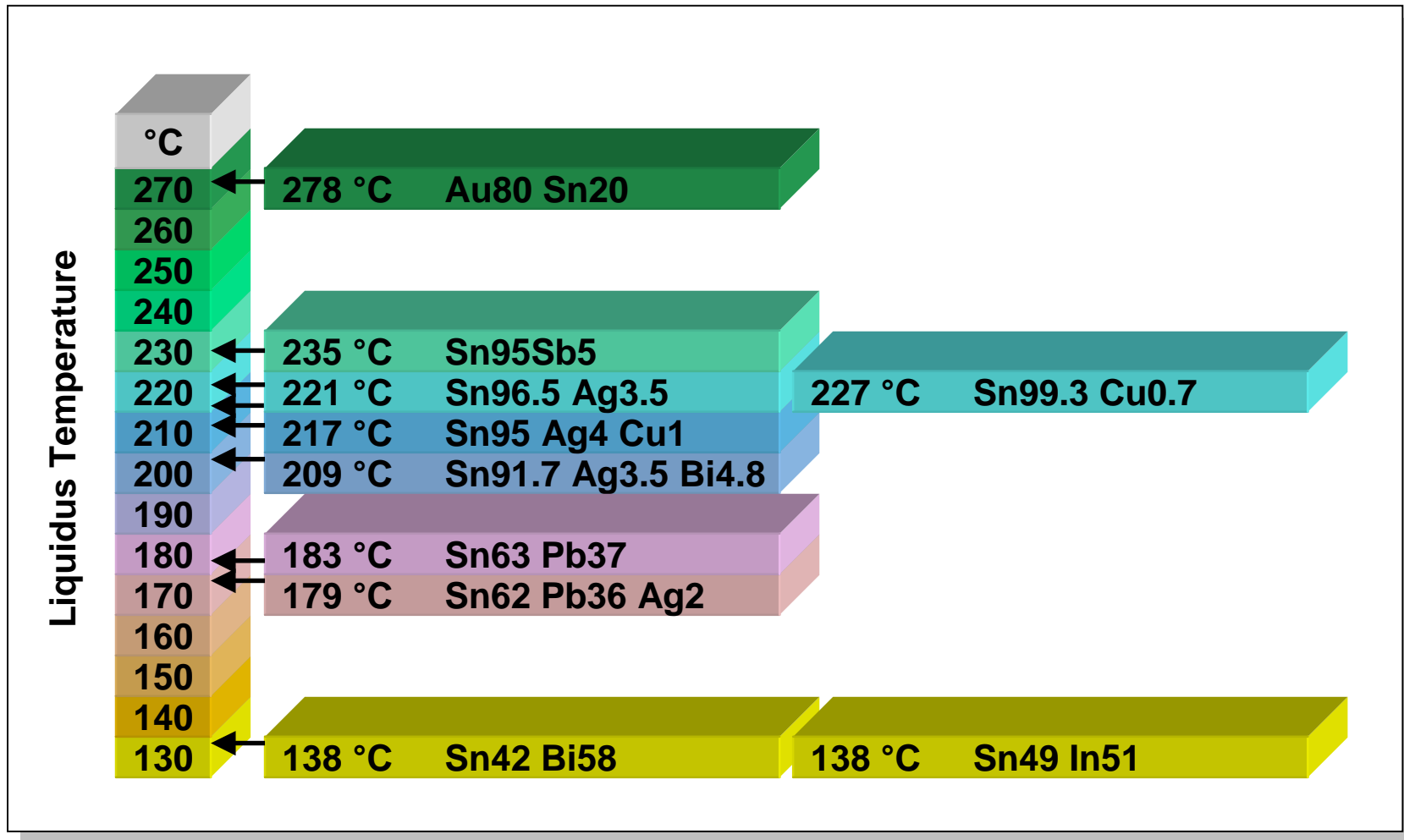
March 2000	Use in at least one model.
March 2002	Use in all models.

Ford Motor Company (EU)

End of 2002	All electronic assemblies are lead-free.
End of 2004	All vehicles, aside from batteries, are lead-free.

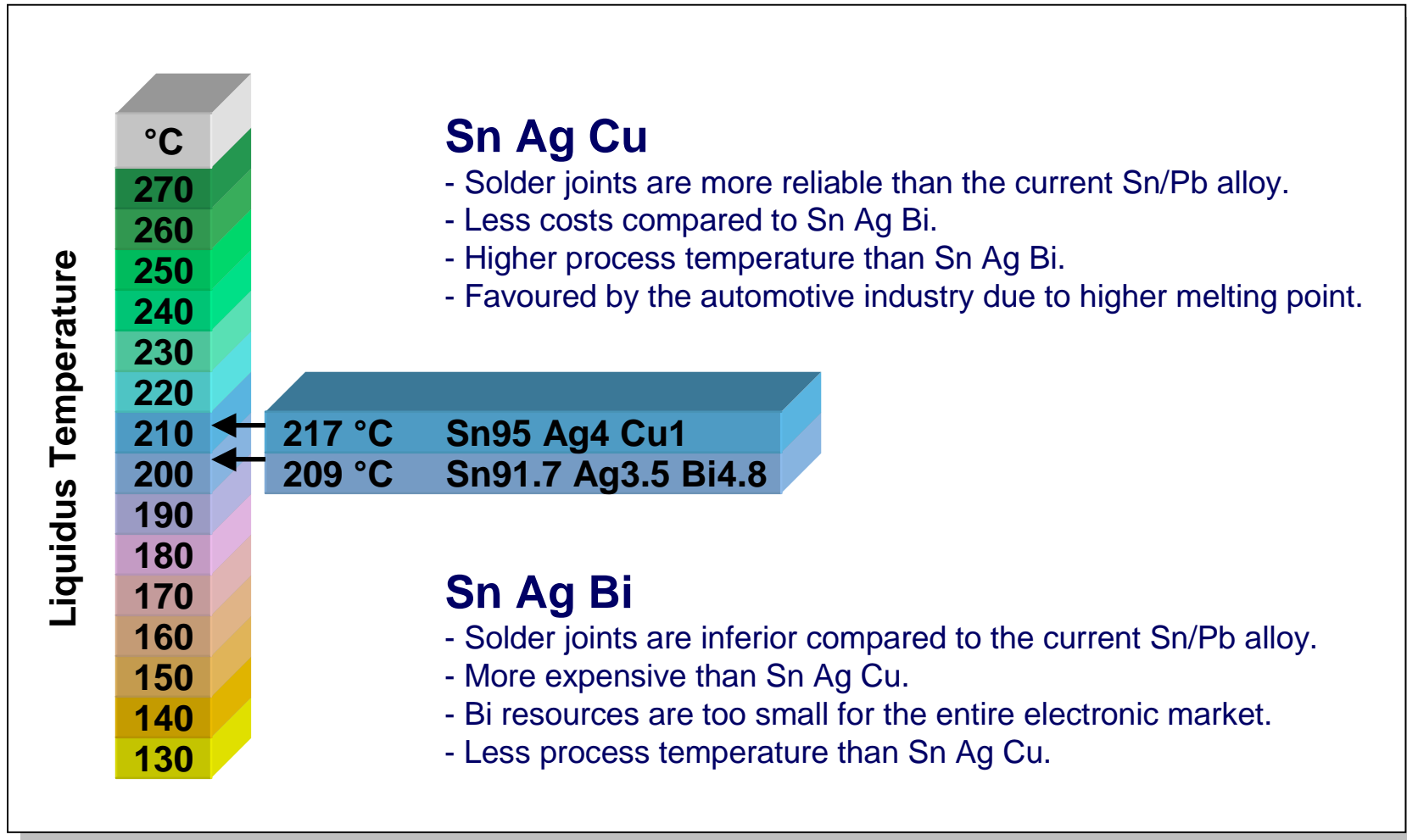
LEAD-FREE ACTIVITIES

SOLDER ALLOY COMPOSITIONS



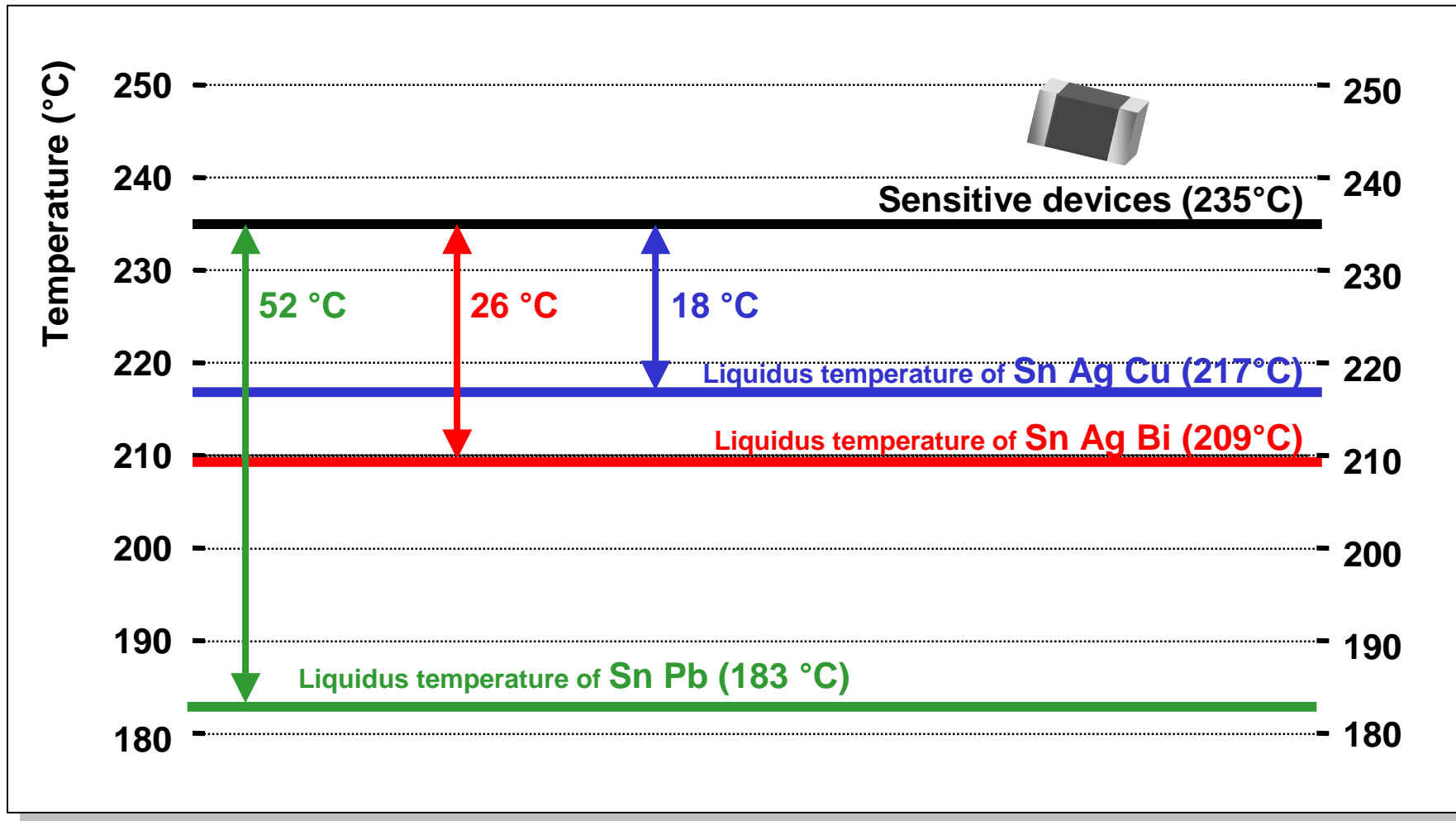
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THE FAVOURED SOLDER ALLOY COMPOSITIONS



LEAD-FREE ACTIVITIES

TECHNICAL CONSIDERATIONS



LEAD-FREE ACTIVITIES

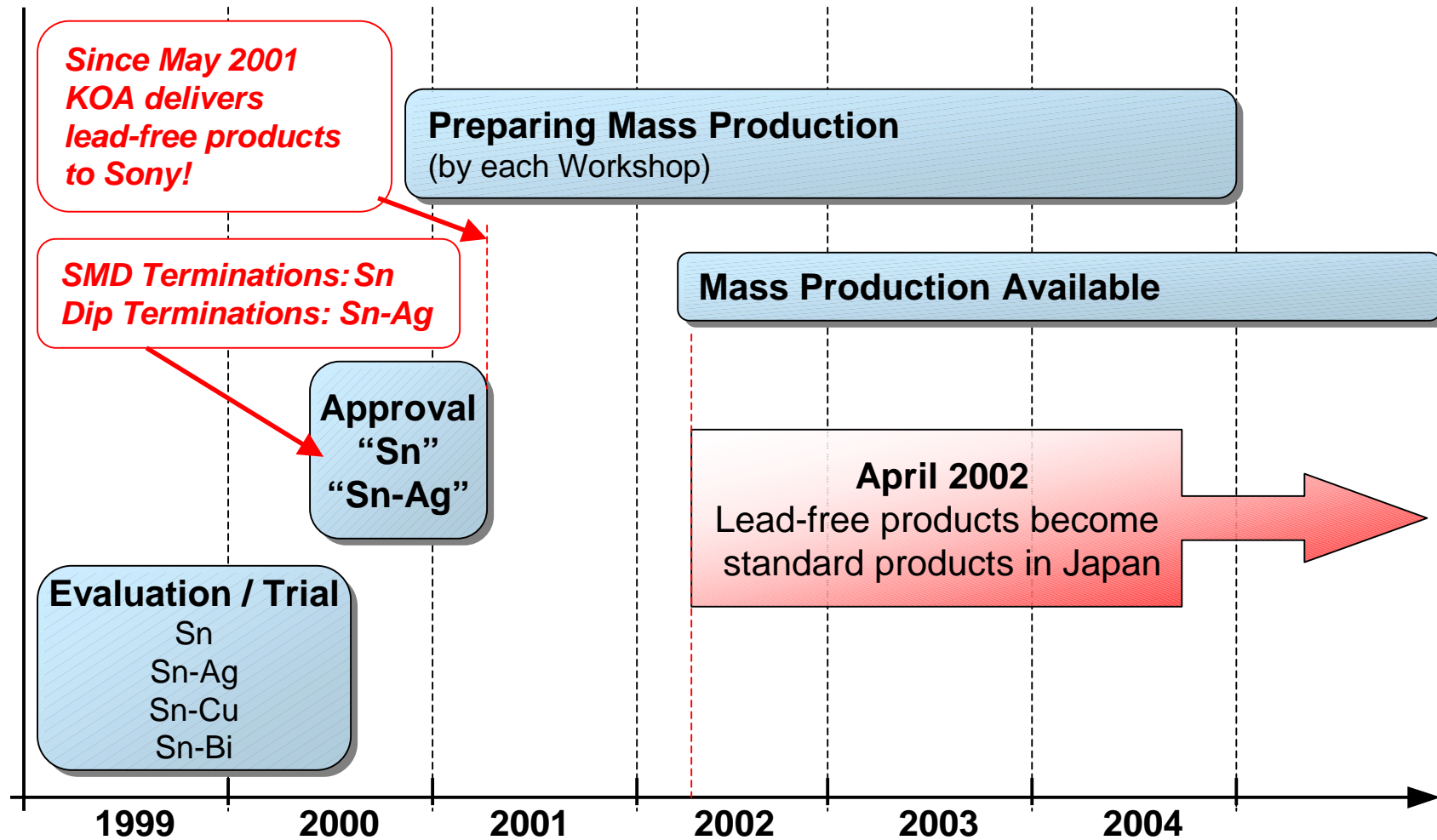
TASKS FOR THE PRODUCT MANUFACTURERS

Component Manufacturer are faced with a three-part challenge.

- 1. Remove lead from the products.**
- 2. Develop terminations that are compatible with lead-free solders. (e.g. Sn-Ag, Sn-Cu, Sn-Bi, Sn, etc.)**
- 3. Develop components with higher temperature tolerances.**

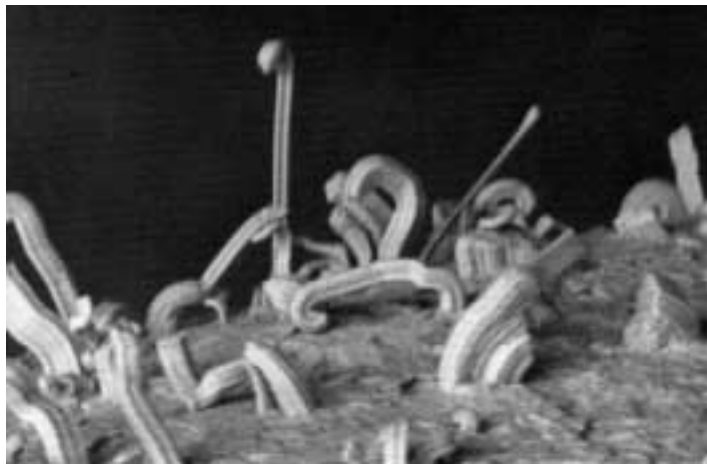
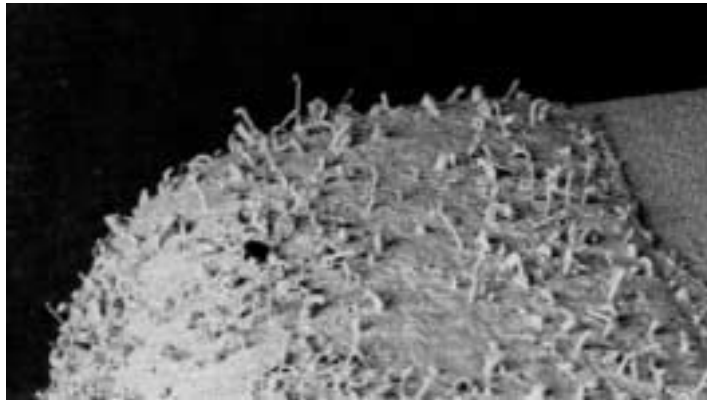
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KOA'S ACTIVITIES – SMD PRODUCTS



LEAD-FREE ACTIVITIES

WHISKER GROWTH IN SN – BACKGROUND

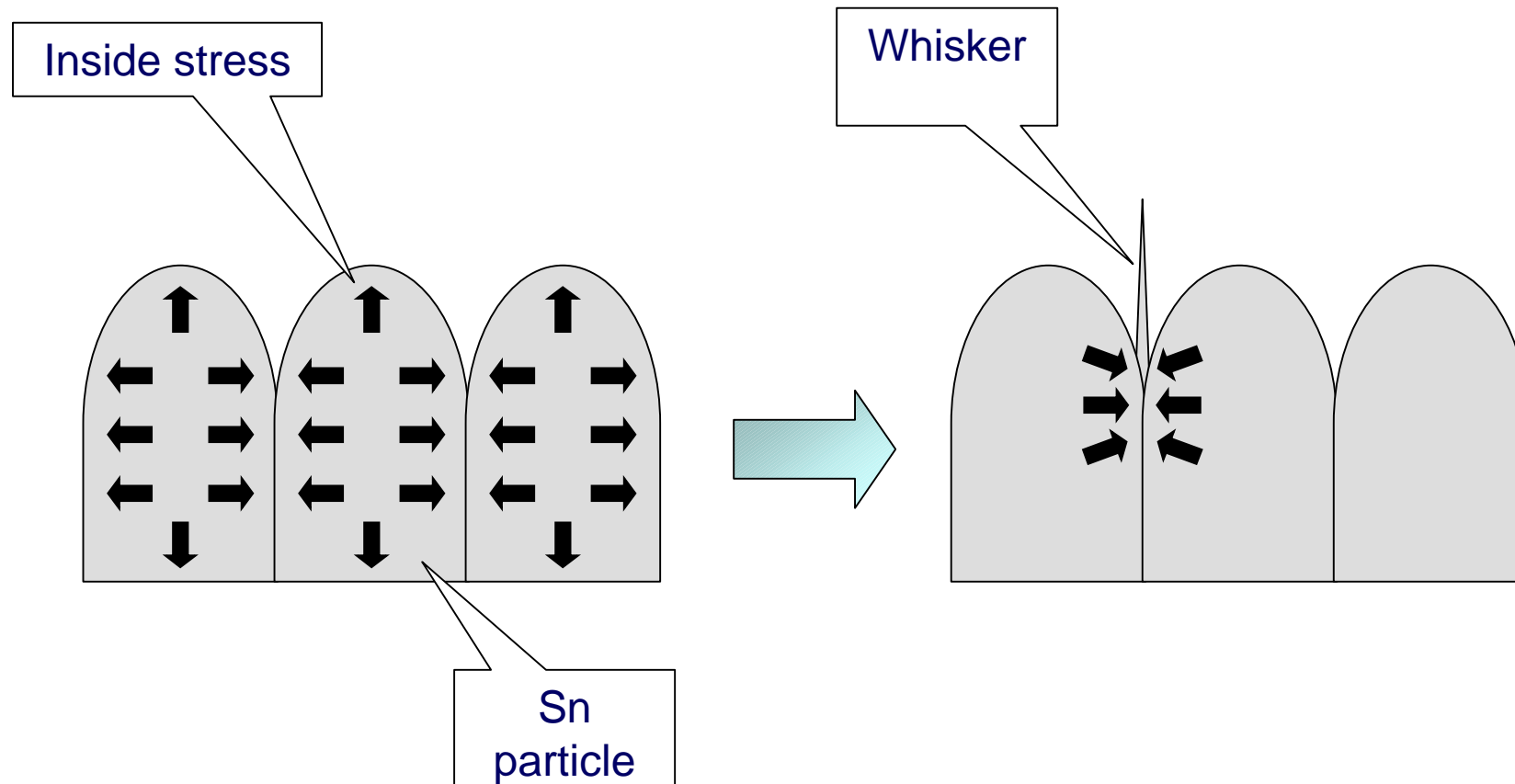


Tin whiskers are electrically conductive, single crystal structures that can grow from surfaces that use tin (especially electroplated tin) as a final finish. Tin whisker growth is believed to be purely mechanical phenomenon.

Source: NASA Goddard Space Flight Center

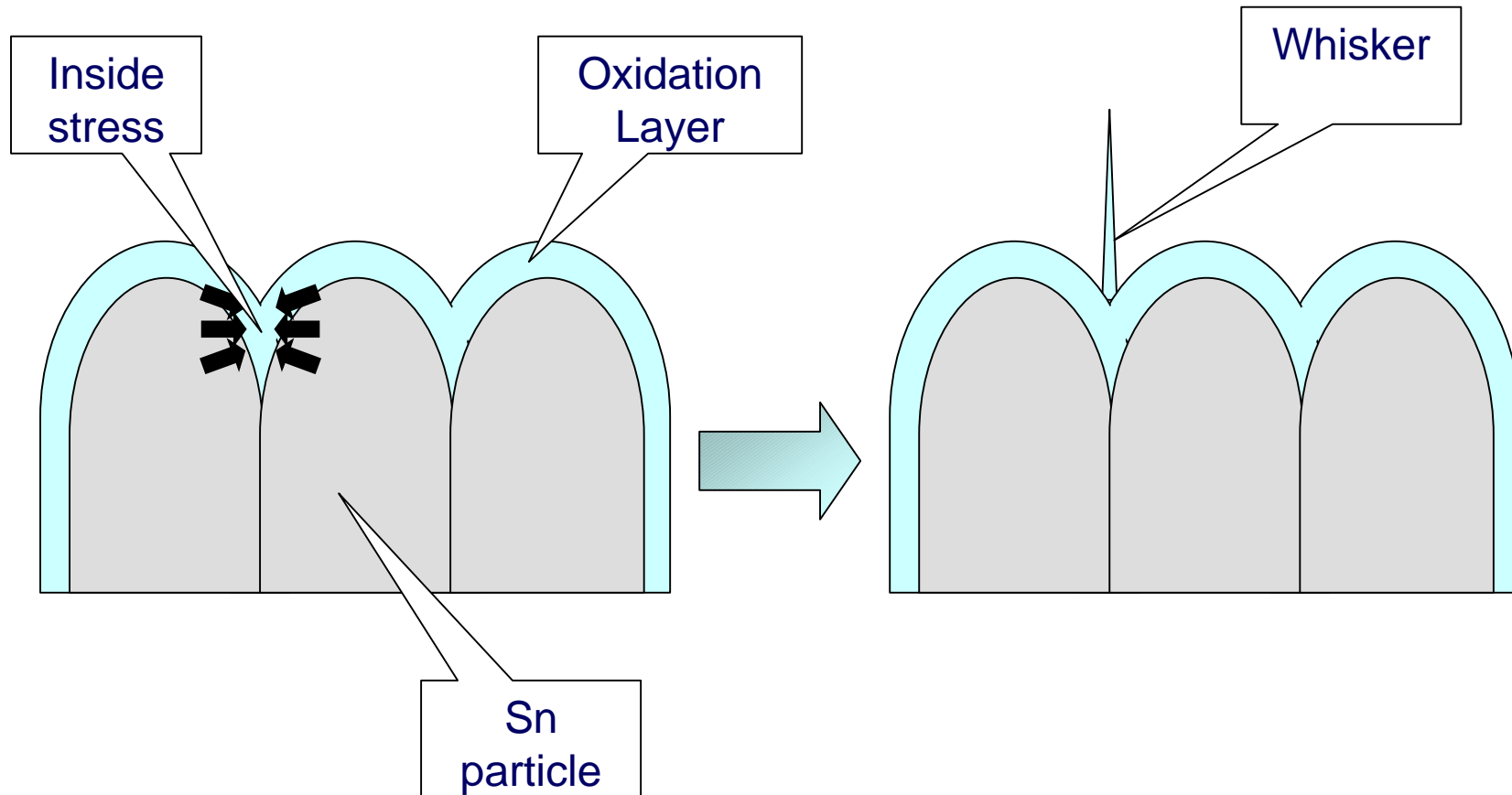
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WHISKER GROWTH IN SN – INSIDE STRESS OF SN PARTICLES



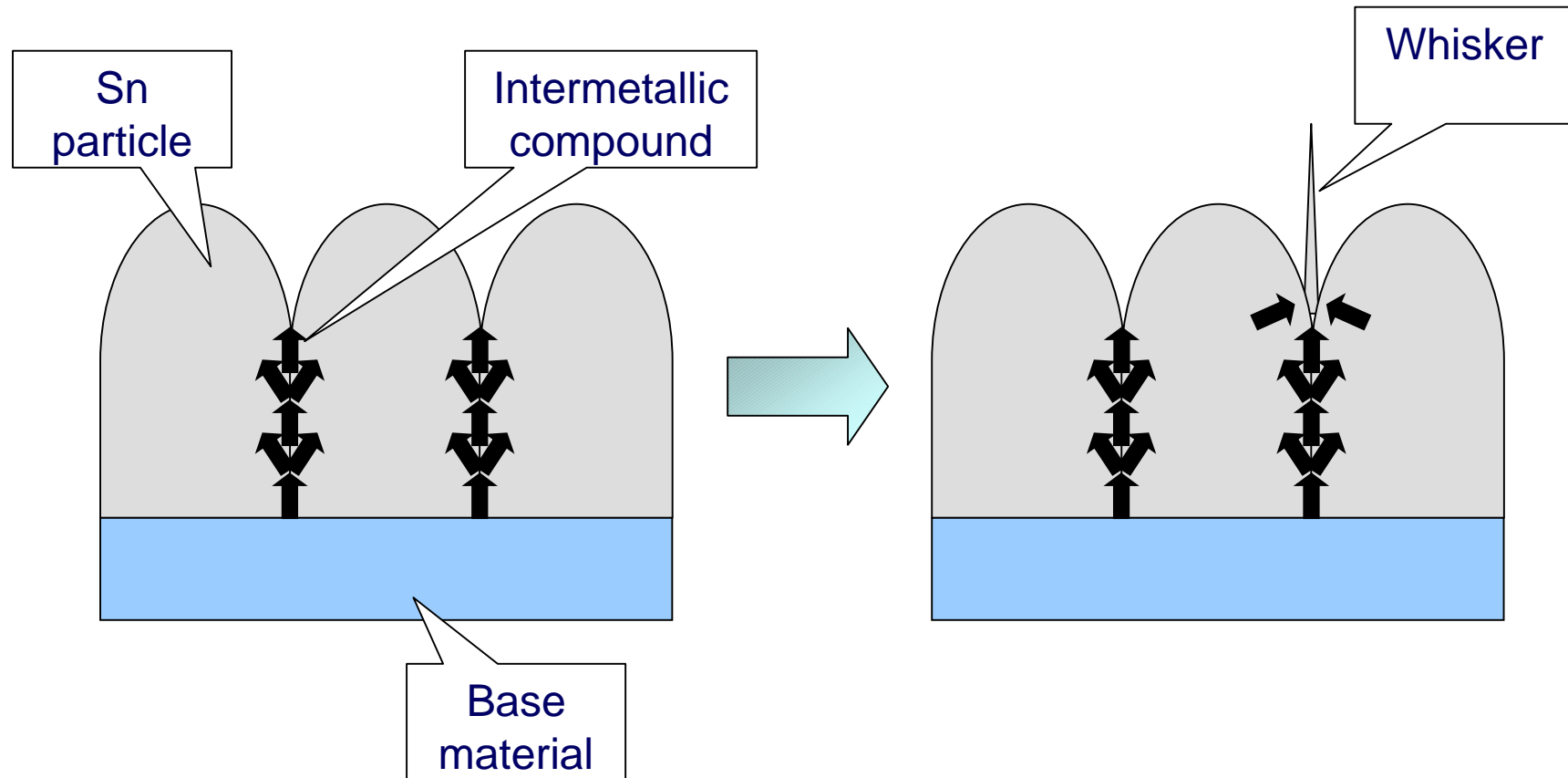
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WHISKER GROWTH IN SN – STRESS BY SN OXIDATION LAYER



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WHISKER GROWTH IN SN – STRESS BY INTERMETALLIC COMPOUND



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WHISKER GROWTH – PREVENTIVE ACTION

1. Inside stress of Sn particles

Plating materials and conditions are determined to minimize stress.

2. Stress by Sn oxidation layer

The storage conditions should be $<40^{\circ}\text{C}$ and $<70\%$ r.h. to avoid oxidation layer.

3. Stress by intermetallic compound

A Ni barrier is used to avoid diffusion of substances from the base material to the Sn.

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WHISKER GROWTH – RELIABILITY TESTS

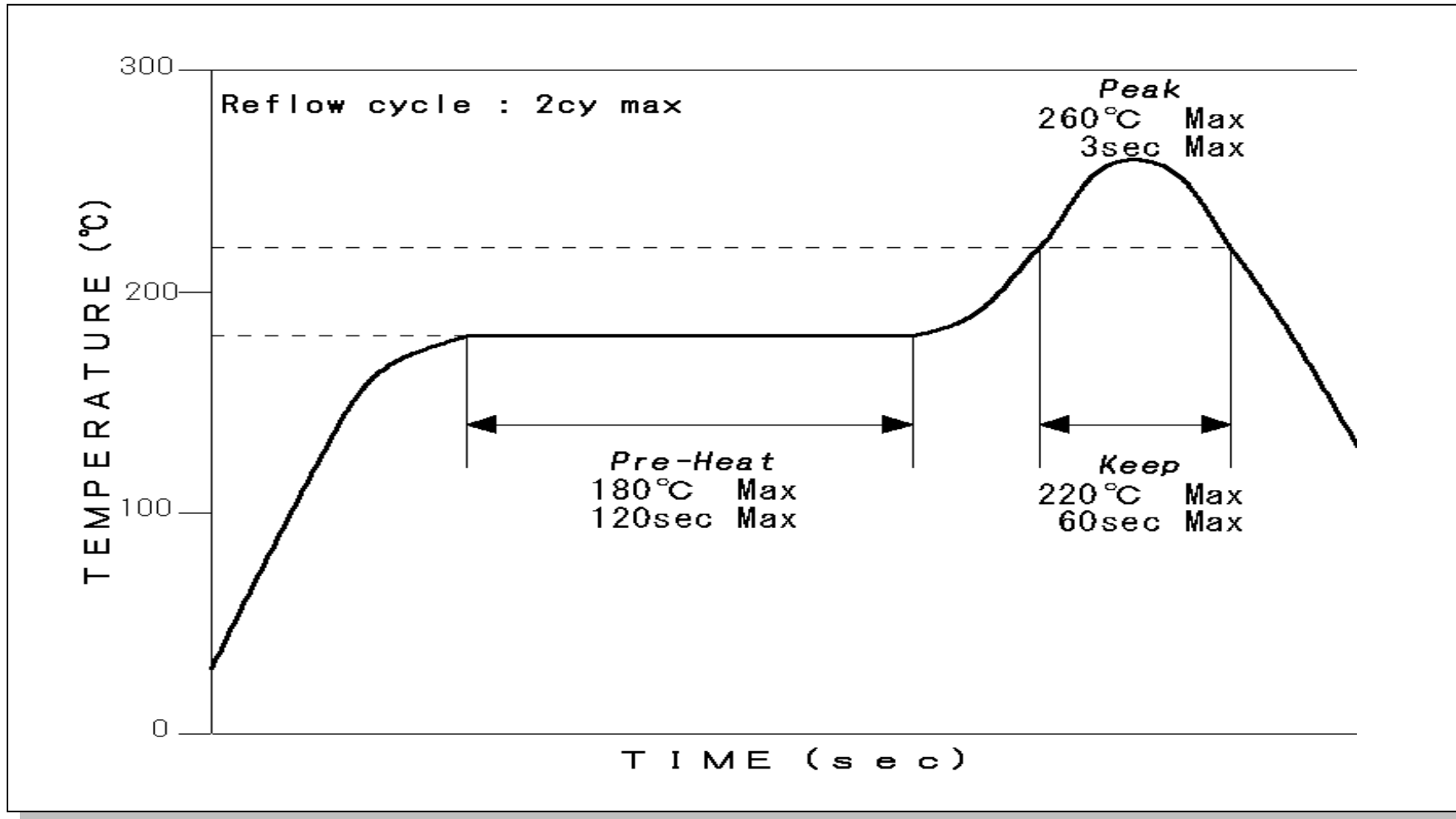
- 1. Temperature Cycling**
-55°C / 125°C – 1000 cycles
- 2. Moisture Test**
85°C / 85%r.h. – 1000 hours

Requirements:
Length of whisker < 50 µm

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SOLDER PROFILE FOR KOA RESISTORS (THIN & THICK F/C)

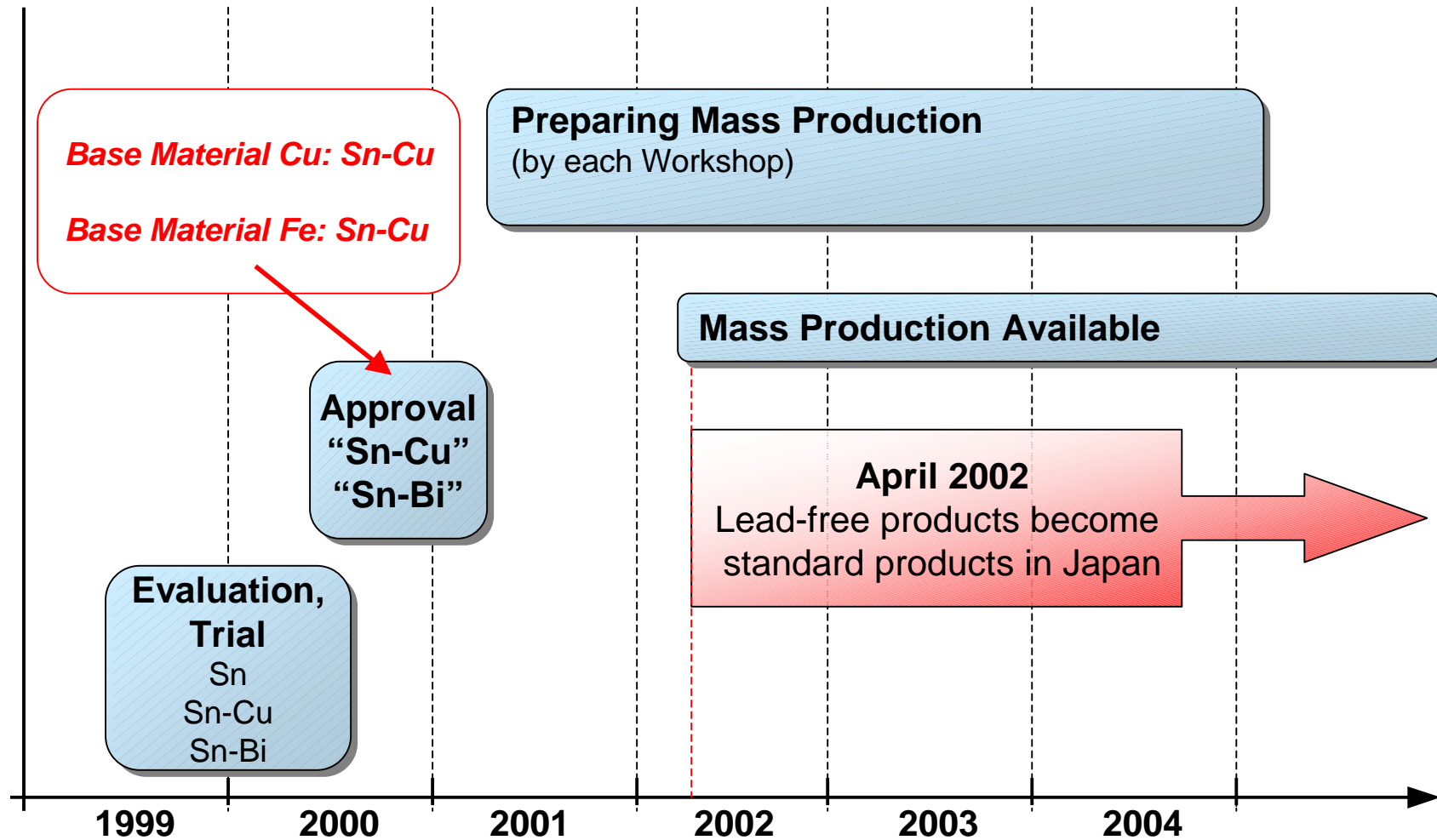
(RN73 & RK73 series)



Wave soldering: 260°C / 10s (1cycle)

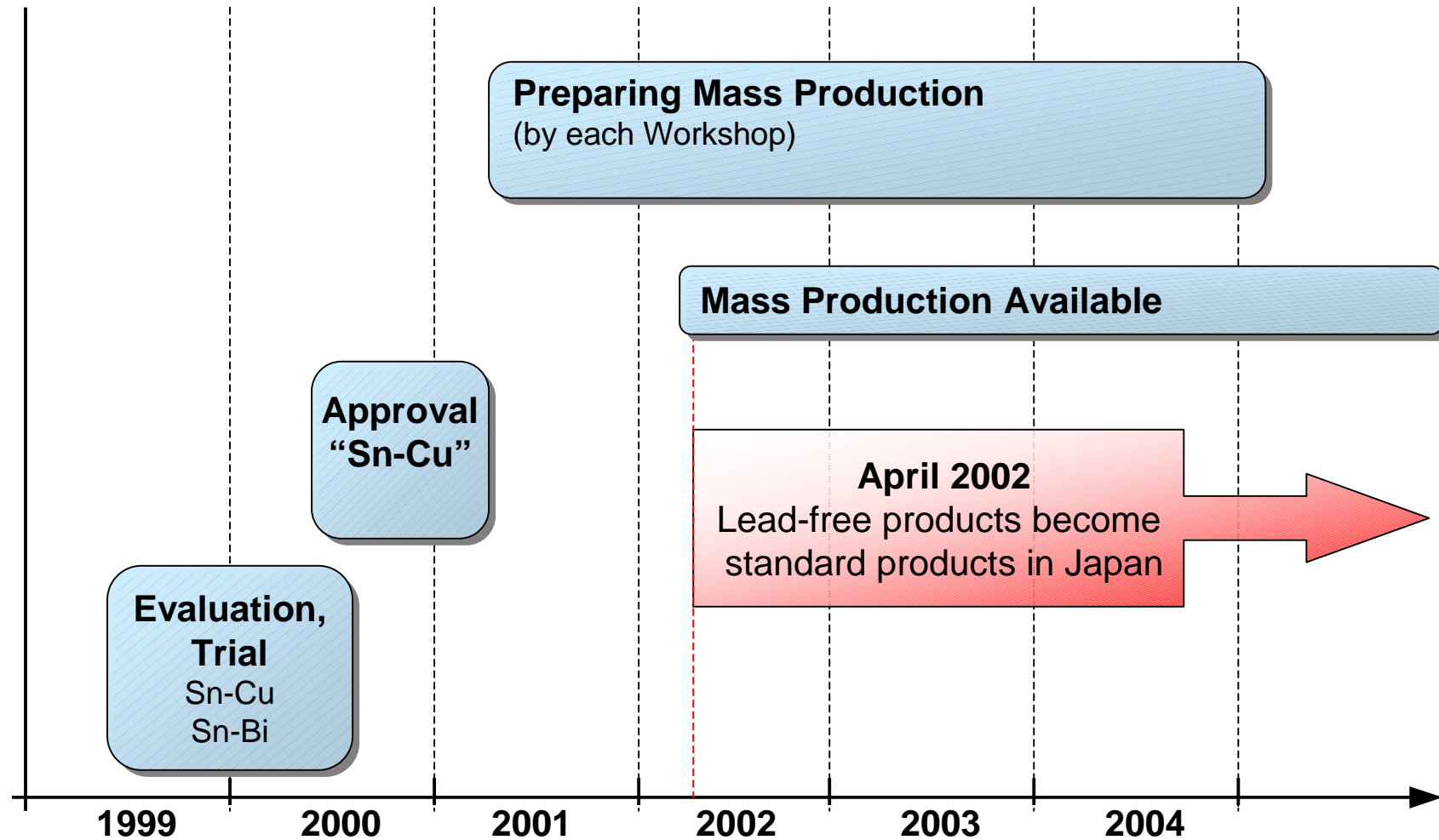
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KOA'S ACTIVITIES – LEADED PRODUCTS



LEAD-FREE ACTIVITIES

KOA'S ACTIVITIES – LEAD FRAME TERMINATIONS



LEAD-FREE ACTIVITIES

LEAD FREE & GLOBAL PARTNUMBR

1. Surface Plating Lead Free of Terminals

- SMD: Sn
- Leaded: Sn-Cu

2. Lead Free Samples

Available now

3. Mass Production Start

From orders received July, 2002 onwards

4. Characteristics

No differences between current products and lead free one

5. Global partnumber

New partnumber identifies Lead free products

E.g.: RK73H1J**TTD**1002**F**

Termination Value tolerance

Lead free

LEAD-FREE ACTIVITIES

KOA'S IDEALS

To take good care of humanity.

To pay attention to natural environment.

To make our life well-off.

