

KOA Speer Electronics, Inc.



Pb-Free and RoHS Solutions
March 2005

Pb-Free/RoHS Compliance

- All Pb-Free products are RoHS compliant.
- No products contain the following:
 - Polybrominated Biphenyls (PBB)
 - Polybrominated Diphenyl Ethers (PBDE)
 - Hexavalent Chromium
 - Cadmium
 - Mercury

Surface Mount Components

- All current SnPb products are currently available in Pb-free.
 - Customers choice
 - New products are Pb-free only
- Pb-Free parts are 100% matte Sn
 - Ni barrier
 - Meets 260° C solder profiles
 - MSL of 1

Through Hole Components

- Effective August 1, 2005 all standard through hole products offered by KOA will be Pb-Free (SnCu).
- Effective January 31, 2006 KOA will fully discontinue the SnPb products with some exceptions:
 - Only available from Japan Factories
 - Will be NCNR and offered at a premium.

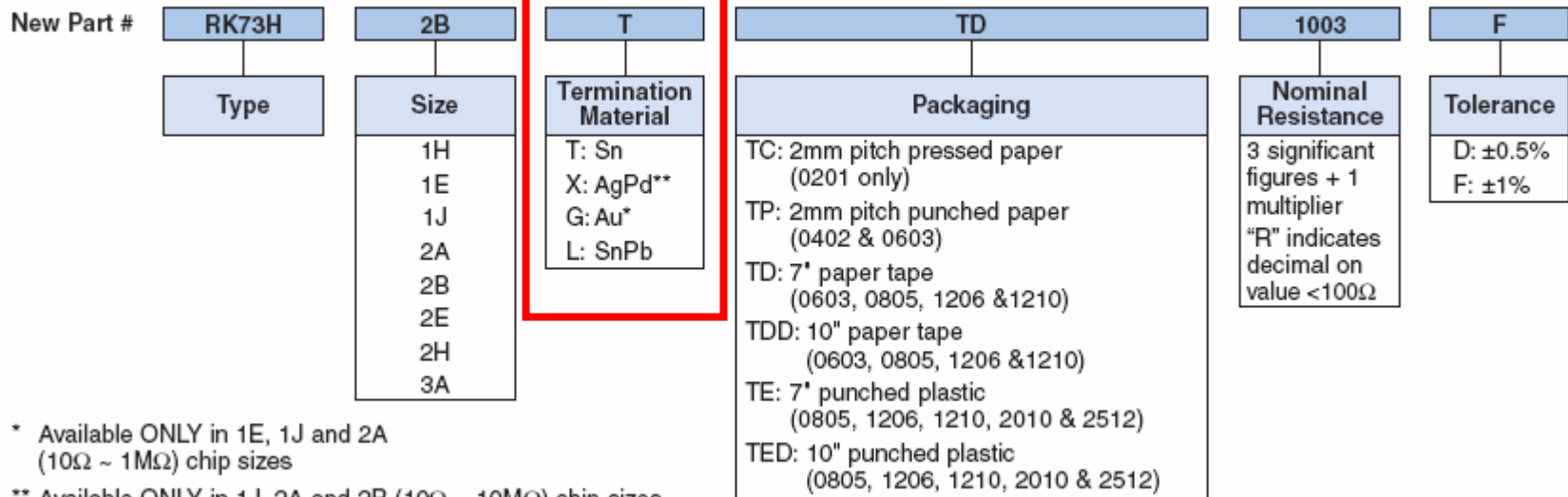
Capacitors

- Currently all MLCC's are already Pb-free and RoHS compliant.
- Effective April 1, 2005 all new items or items with no inventory position will be supplied as Pb-Free.

Part Numbering Changes

- Surface Mount Components

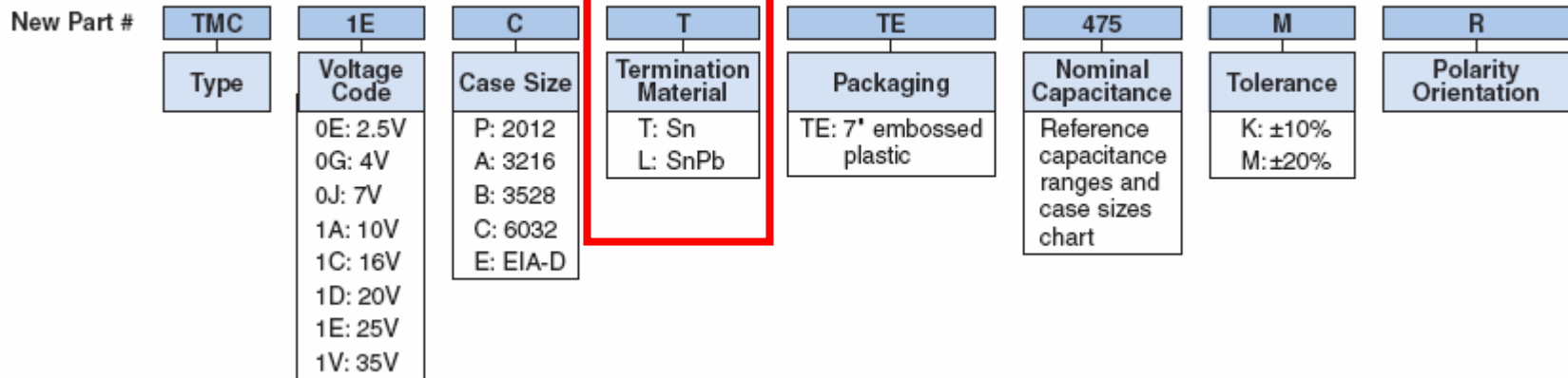
ordering information



Part Numbering Changes

- Tantalum Chip Capacitors

ordering information



Part Numbering Changes

- Through Hole Components

ordering information

New Part #

CF
Type
CF
CFP

1/4
Power Rating
S1/4: 0.25W
1/4: 0.25W
1/2: 0.5W
S1/2: 0.5W

C
Termination Material
C: SnCu
L: SnPb

T52
Taping and Forming
Axial: T26, T52
Radial: VT, MT, MHT, VTP, VTE
U Forming: U, UCL, US
M Forming: M5, M10, M12.5

R
Packaging
A: Ammo
R: Reel

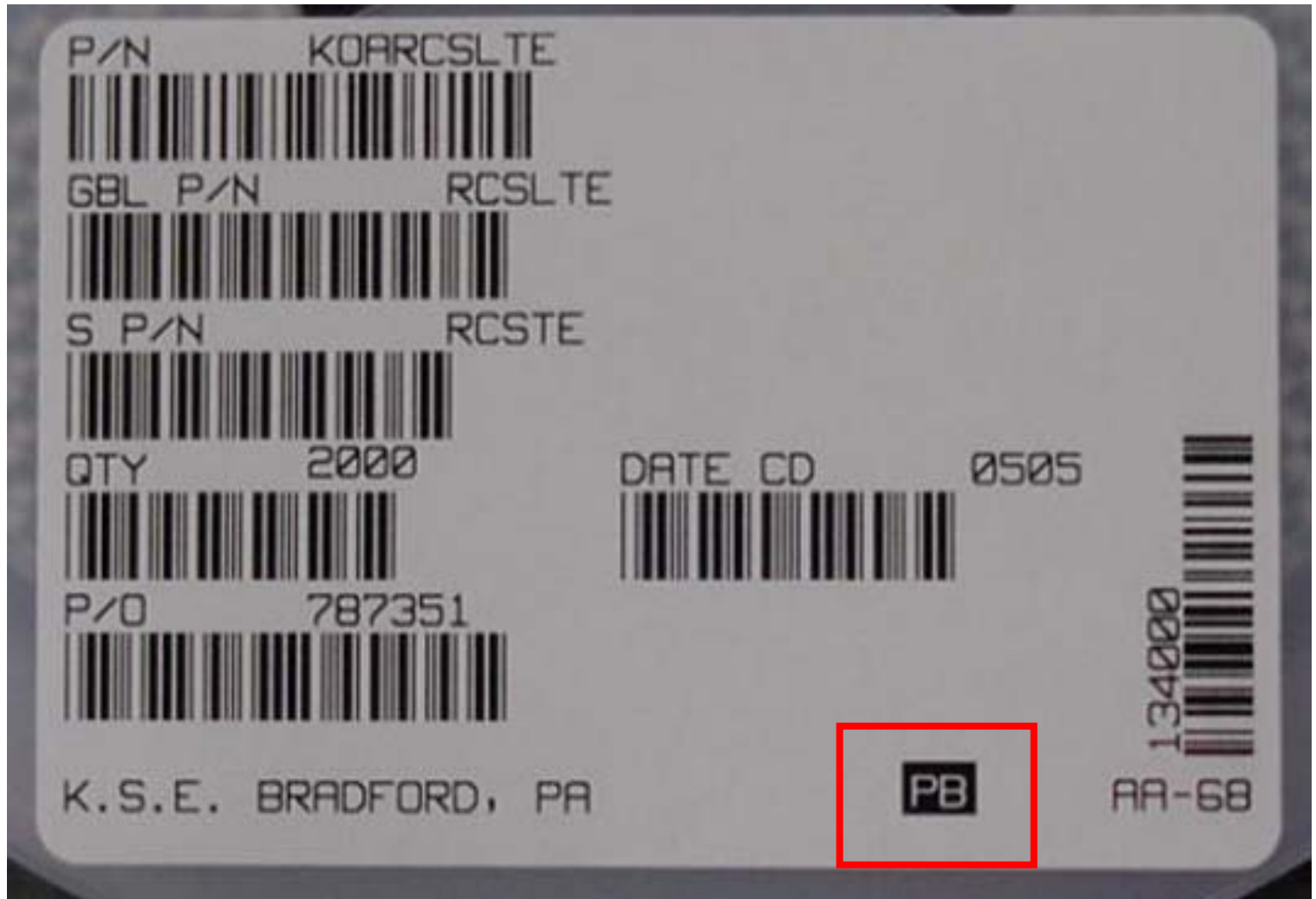
103
Nominal Resistance
2 significant figures + 1 multiplier
"R" indicates decimal on value <10Ω

J
Tolerance
G: ±2%
J: ±5%

Product Labeling

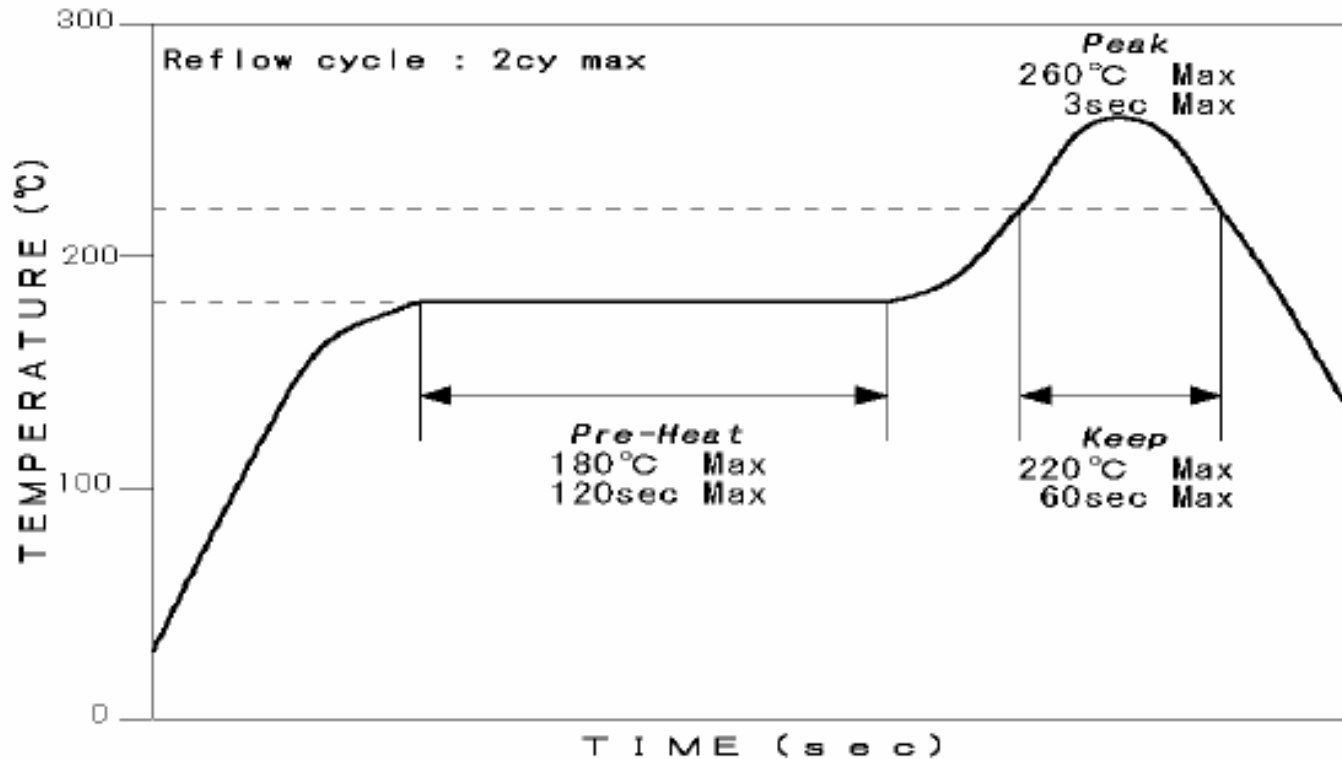
- KOA Speer Electronics will be labeling all products per **JEITA-ETR-7021**.
- Pb-Free/RoHS compliant products are marked as **ECO**
- SnPb terminated products will be marked as **Pb**

Product Labeling



Pb-Free Solder Profile

Recommended Reflow Curve:



N.B: Preheat is considered especially important for Pb-free soldering in order to minimise thermal shock risks.

Recommended Wave Soldering condition:
260 degC, 10 seconds, 1 cycle

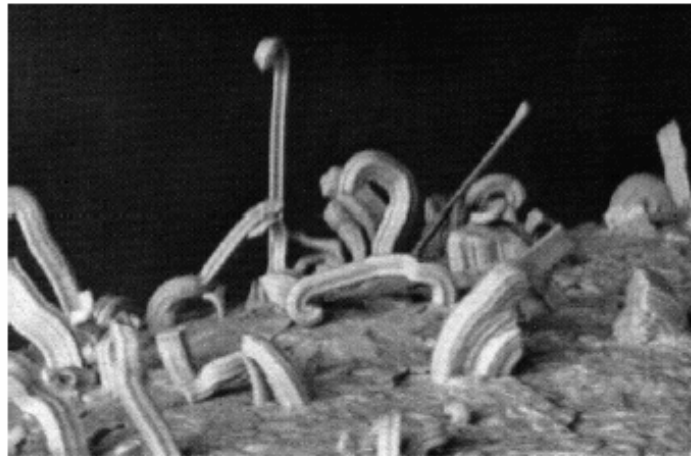
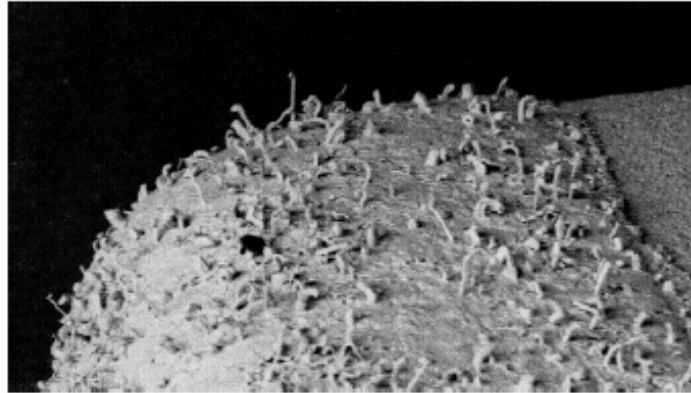
Sn Whisker Formation

KOA's Evaluation of Sn whisker formation:

There has been some discussion in industry forums about the possibility of Sn whisker formation when terminals are constructed from pure Sn. Concerns about this are based on the assumption that, if formed, long whiskers could potentially form a "bridge" between the terminals of the component and result in either malfunction or total failure. Clearly this is of concern to those using the smallest devices, however, KOA has taken steps to minimise the risk of Sn whisker formation across our entire range (much of which uses 100% Sn).

The risk of this is considered greatest if whiskers are able to form during the shipping and storage of the component, since after soldering has taken place it is highly unlikely that further whisker formation would be possible. Examples of Sn whisker formation can be seen in the images below:

Sn Whisker Formation



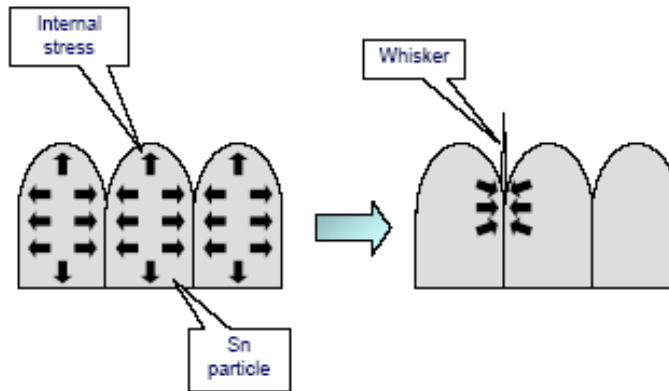
Source: NASA Goddard Space Flight Center

These Sn 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.

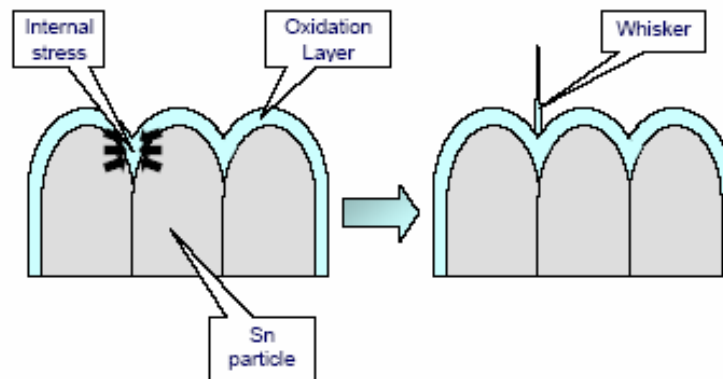
Sn Whisker Formation

Research provided an insight into the mechanisms of Sn whisker formation and concluded that it results, in part, from internal stresses within the metals used for termination plating.

Whisker growth resulting from internal particle stresses:

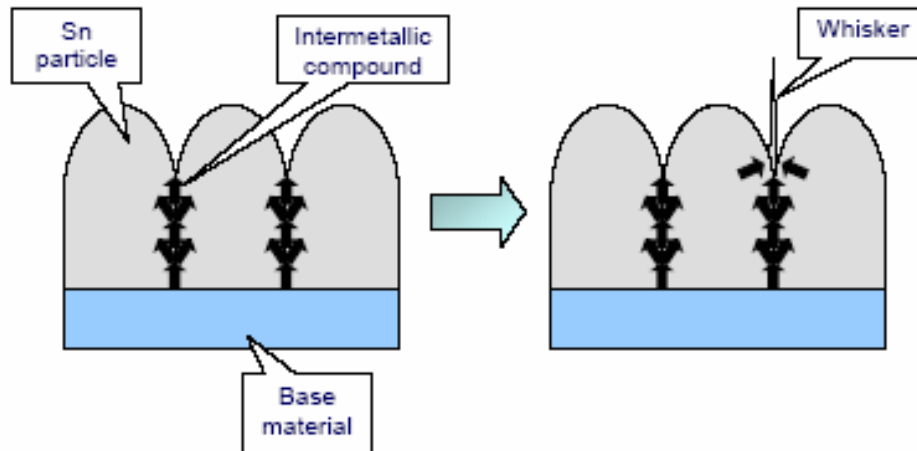


Whisker growth resulting from stresses in Sn oxide layer:



Sn Whisker Formation

Whisker growth resulting from stresses in intermetallic compounds:



KOA's engineers have been able to develop a proprietary low stress plating process which succeeds in minimising internal and intermetallic stresses and hence reduces the formation of Sn whiskers.

Sn Whisker Formation

KOA's preventative actions also result in storage guidelines for our Pb-free products:

- 1. Internal stresses in Sn particles**
Plating materials and conditions have been developed to minimize stress.
- 2. Stresses by Sn oxidation layer**
We recommend that storage conditions should be <40°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.

Material Reporting/Information

- Data is available in various formats ...
 - IMDS
 - Customer Specific Forms
 - KOA Speer Form
 - Excel file listing all currently sold parts (40,000 +)
 - NEDA Format

Technical Data Available

- KOA Speer Pb-Free Qualification Specification.
 - Temperature Cycling per AEC-Q-200
 - Operational Life per AEC-Q-200
 - Thermal Shock per AEC-Q-200
 - Terminal Strength per AEC-Q-200
 - Board Flex per AEC-Q-200

Technical Data Available

- KOA Speer Pb-Free Qualification Specification. (Con't)
 - Solderability per J-STD-002 and JESD22-B102 (Tested with both SnPb and Pb-Free Solders)
 - Whisker Growth – 50 to 55° C at 85% RH for 1000 hours & 50 to 55° C at no humidity (<5% RH) for 24 hours.