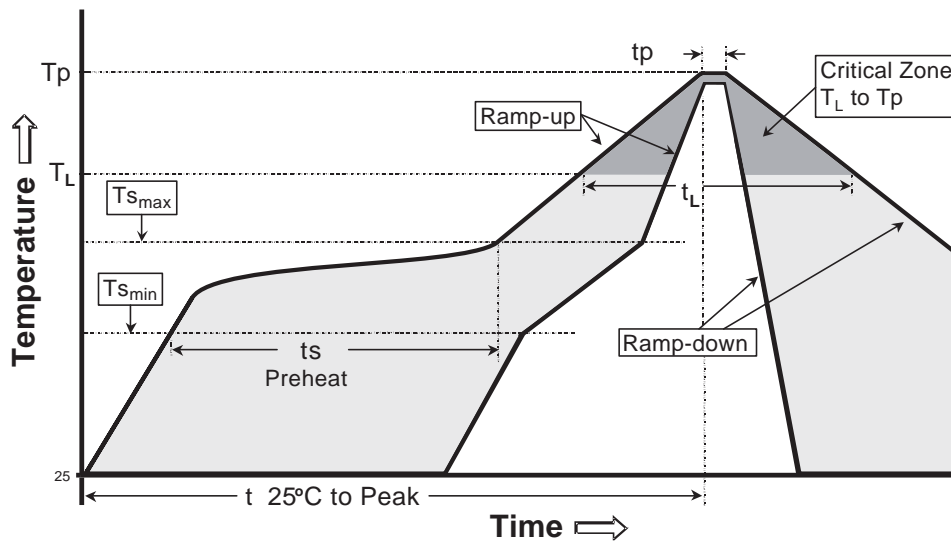


## Application Bulletin AB-9: Pb-free and Sn/Pb Solder Profiles

In July 2006 legislation went into effect in a number of jurisdictions, including Europe and Japan, for the reduction of hazardous substances (“RoHS”), such as lead, in electronic products.

NVE now offers its full range of products in Pb-free package options. The former Sn/Pb plated copper leadframe is now plated only with pure tin and the packaging compound complies with RoHS limits. Pure tin plated devices can be used in standard reflow solder processes where the temperatures are below the melting point of tin (232°C). Pb-free NVE devices are designated by an “E” in the part number and an “e” marked on the package. Customers should refer to the relevant data sheet for the ordering information.

The following JEDEC profile is recommended for Pb-free reflow soldering. Our recommended Sn/Pb profile information is included in Table 1 for comparison.



**Figure 1. JEDEC Reflow Soldering Profile**

| Profile Feature  | SnPb Eutectic Assembly |               | Pb-Free Assembly |               |
|--|------------------------|---------------|------------------|---------------|
|  | Large Body             | Small Body    | Large Body       | Small Body    |
| Average ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )     | 3°C/second max.        |               | 3°C/second max.  |               |
| Preheat  |                        |               |                  |               |
| - Temperature Min (T <sub>smin</sub> )                       | 100°C                  |               | 150°C            |               |
| - Temperature Max (T <sub>smax</sub> )                       | 150°C                  |               | 200°C            |               |
| - Time (min to max)(t <sub>s</sub> )                         | 60-120 seconds         |               | 60-180 seconds   |               |
| T <sub>smax</sub> to T <sub>L</sub>                          |                        |               |                  |               |
| - Ramp-up Rate   |                        |               | 3°C/second max.  |               |
| Time maintained above:                                       |                        |               |                  |               |
| - Temperature (T <sub>L</sub> )                              | 183°C                  |               | 217°C            |               |
| - Time (t <sub>L</sub> )                                     | 60-150 seconds         |               | 60-150 seconds   |               |
| Peak Temperature (T <sub>p</sub> )                           | 225 +0/-5°C            | 240 +0/-5°C   | 260 +0/-5°C      | 260 +0/-5°C   |
| Time within 5°C of actual Peak Temperature (t <sub>p</sub> ) | 10-30 seconds          | 10-30 seconds | 10-30 seconds    | 20-40 seconds |
| Ramp-down Rate   | 6°C/second max.        |               | 6°C/second max.  |               |
| Time 25°C to Peak Temperature                                | 6 minutes max.         |               | 8 minutes max.   |               |

Note: All temperatures refer to top side of the package, measured on the package body surface.

**Table 1. Classification Reflow Profiles Data**

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