

Sn/Pb and Pb-free Reflow Soldering Temperature Profiles

TABLE 1. REFLOW PROFILES

PROFILE FEATURE	SN-PB EUTECTIC ASSEMBLY	PB-FREE ASSEMBLY
Preheat/Soak		
Temperature Min (T_{SMIN})	100 °C	150 °C
Temperature Max (T_{SMAX})	150 °C	200 °C
Time (t_S) from (T_{SMIN} to T_{SMAX})	60-120 seconds	60-120 seconds
Ramp-up rate (T_L to T_P)	3 °C/second max.	3 °C/second max.
Liquidous Temperature (T_L)	183 °C	217 °C
Time (t_L) maintained above T_L	60-150 seconds	60-150 seconds
Peak package body temperature (T_P)	For users, T_P must not exceed the Classification temp in Table 2. For suppliers, T_P must equal or exceed the Classification temp in Table 2.	For users, T_P must not exceed the Classification temp in Table 3. For suppliers, T_P must equal or exceed the Classification temp in Table 3.
Time (t_P) within 5 °C of the specified classification temperature (T_C); see Figure 1 and Note 1	20 seconds (Note 1)	30 seconds (Note 1)
Ramp-down rate (T_P to T_L)	6 °C/second max.	6 °C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

NOTES:

1. Tolerance for peak profile temperature (TP) is defined as a supplier minimum and a user maximum.
2. All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow (e.g., live-bug). If parts are reflowed in other than the normal live-bug assembly reflow orientation (i.e., dead-bug), T_P shall be within ± 2 °C of the live-bug T_P and still meet the T_C requirements, otherwise, the profile shall be adjusted to achieve the latter. To accurately measure actual peak package body temperatures, refer to JEP140 for recommended thermocouple use.
3. Reflow profiles in this document are for classification/preconditioning and are not meant to specify board assembly profiles. Actual board assembly profiles should be developed based on specific process needs and board designs and should not exceed the parameters given above.
For example, if T_C is 260 °C and time t_P is 30 seconds, this means the following for the supplier and the user.
For a supplier: The peak temperature must be at least 260 °C. The time above 255 °C must be at least 30 seconds.
For a user: The peak temperature must not exceed 260 °C. The time above 255 °C must not exceed 30 seconds.

TABLE 2. SnPb EUTECTIC PROCESS - REFLOW PEAK TEMPERATURES (T_C)

PACKAGE THICKNESS	VOLUME mm ³ < 350	VOLUME mm ³ ≥ 350
< 2.5 mm	235 °C	220 °C
≥ 2.5 mm	220 °C	220 °C

TABLE 3. PB-FREE PROCESS - REFLOW PEAK TEMPERATURES (T_C)

PACKAGE THICKNESS	VOLUME mm ³ < 350	VOLUME mm ³ 350 -2000	VOLUME mm ³ > 2000
< 1.6mm	260 °C	260 °C	260 °C
1.6mm-2.5 mm	260 °C	250 °C	245 °C
> 2.5mm	250 °C	245 °C	245 °C

NOTES:

4. At the discretion of the device manufacturer, but not the board assembler/user, the maximum peak package body temperature (T_P) can exceed the values specified in Tables 2 or 3. The use of a higher T_P does not change the classification temperature (T_C).
5. Package volume excludes external terminals (e.g., balls, bumps, lands, leads) and/or non-integral heat sinks.
6. The maximum component temperature reached during reflow depends on package thickness and volume. The use of convection reflow processes reduces the thermal gradients between packages. However, thermal gradients due to differences in thermal mass of SMD packages may still exist.

Technical Brief 493

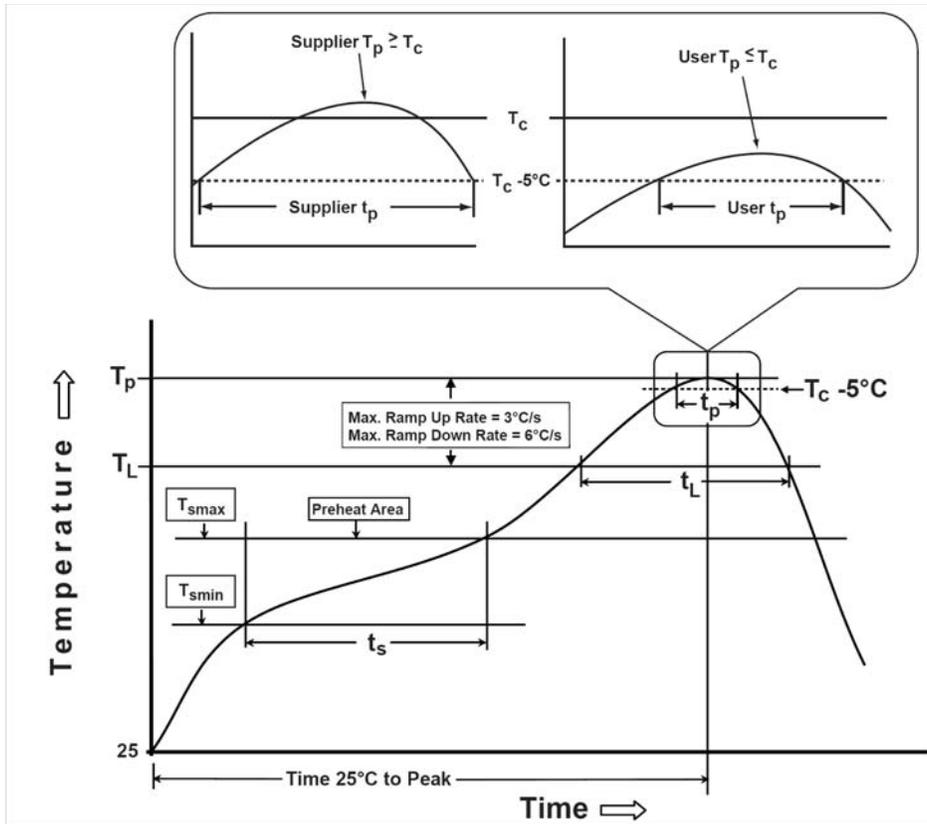


FIGURE 1. PEAK REFLOW PROFILE

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