Reflow soldering profile

Rev. 1.1 — 10 November 2025 Soldering information

1. General reflow soldering guidelines

The following soldering guidelines are derived from the IPC/JEDEC joint industry standard J-STD-020F, which defines classification temperatures for surface mount devices (SMDs). This standard introduces the concept of a classification temperature (T_c) to guide both component suppliers and end users during reflow soldering processes.

As illustrated in Fig. 1, the supplier qualification peak temperature (T_{Peak}) must be greater than or equal to the classification temperature. In contrast, it is recommended that users maintain reflow profiles with peak temperatures below the classification temperature to ensure device reliability.

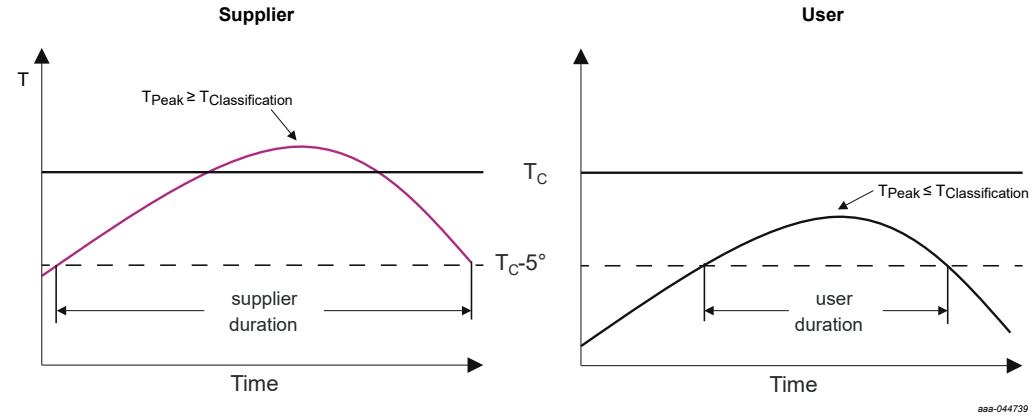

Fig. 1. Reflow classification temperature

Due to the thermal behavior of SMDs where smaller, thinner packages tend to reach higher body temperatures during reflow, J-STD-020F specifies classification temperatures based on package thickness and package volume, as shown in Table 1 and Table 2. Moisture Sensitivity Level (MSL) testing is conducted at the corresponding classification peak temperatures.

Table 1. SnPb Eutectic Process - Classification Temperature (T_c)

Package thickness	Volume < 350 mm^3	Volume ≥ 350 mm^3
< 2.5 mm	235 °C	220 °C
≥ 2.5 mm	220 °C	220 °C

Table 2. Pb-Free (SAC Alloys) Process - Classification Temperature (T_c)

Package Thickness	Volume < 350 mm^3	350 mm^3 ≤ Volume ≤ 2000 mm^3	Volume > 2000 mm^3
< 1.6 mm	260 °C	260 °C	260 °C
1.6 mm - 2.5 mm	260 °C	250 °C	245 °C
> 2.5 mm	250 °C	245 °C	245 °C

2. Recommended reflow soldering profile for user

This temperature profile recommendation for users adheres to the IPC/JEDEC joint industry standard, J-STD-020F. The profile shown is recommended for devices with a package thickness of 2.5 mm or less (≤ 2.5 mm) and a package volume less than 350 mm^3 (< 350 mm^3).

Table 3. Limiting values

Profile Feature		SnPb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_{Smax} to T_p)		3 °C/s	3 °C/s
Preheat	Temperature minimum (T_{Smin})	100 °C	150 °C
	Temperature maximum (T_{Smax})	150 °C	200 °C
	Time (t_{Smin} to t_{Smax})	60 s to 120 s	60 s to 120 s
Time maintained above	Temperature (T_L)	183 °C	217 °C
	Time (t_L)	60 s to 150 s	60 s to 150 s
Typical peak temperature (T_p)		235 °C	245 °C
Number of allowed reflow cycles		3	3
Time within 5 °C of actual peak temperature (t_p)		10 s to 30 s	20 s to 30 s
Ramp-down rate		6 °C/s maximum	6 °C/s maximum
Time 25 °C to peak temperature		6 minutes maximum	8 minutes maximum

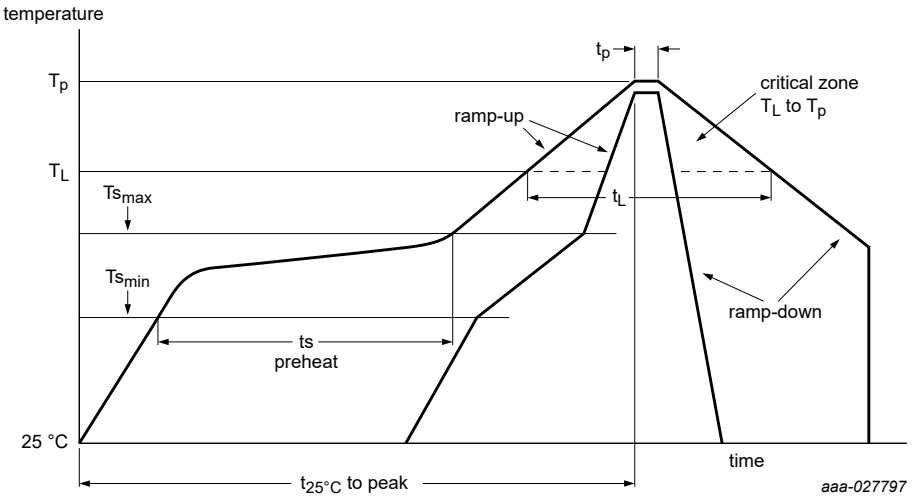

Fig. 2. Reflow soldering profile

3. Legal information

Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.