IR Reflow Profile

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1. Purpose

This user guide specifies the purpose of the Reflow Profile provided by WIZnet. WIZnet's Packages can withstand the MSL pre-condition test based on the Reflow Profile.

2. Scope

The Reflow Profile applies to specific Package types of WIZnet products.

- The Reflow Profile that WIZnet provides is for the MSL of Surface Mounted Devices (SMDs) that are sensitive to Moisture-Induced stress. Customers can refer to the classification level of the Package to ensure that the Product is well-packaged, stored, and handled to avoid damage during the assembly Solder Reflow Process and/or Repair Operations.
- The Reflow Profile WIZnet provides is only for Package reliability qualification; it is not directly applicable to the SMT Process. The Reflow Profile of SMT concerns many factors, such as Flux, PCB Layers, PCB Dimension, Components Type/Location, Package Thickness/Volume, and so on, so we cannot directly determine the Reflow Profile of SMT by an IC Package.
- For the definition of Reflow Profile, please refer to IPC/JEDEC J-STD-020E (Please refer to the appendix).

Caution: 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 of the classification Reflow Profiles.

3. Overview

This section provides a brief introduction of the Reflow Profile based on IPC/JEDEC J-STD-020E, including the definitions and specifications of different reflow profiles.

1.1 Reflow Profile

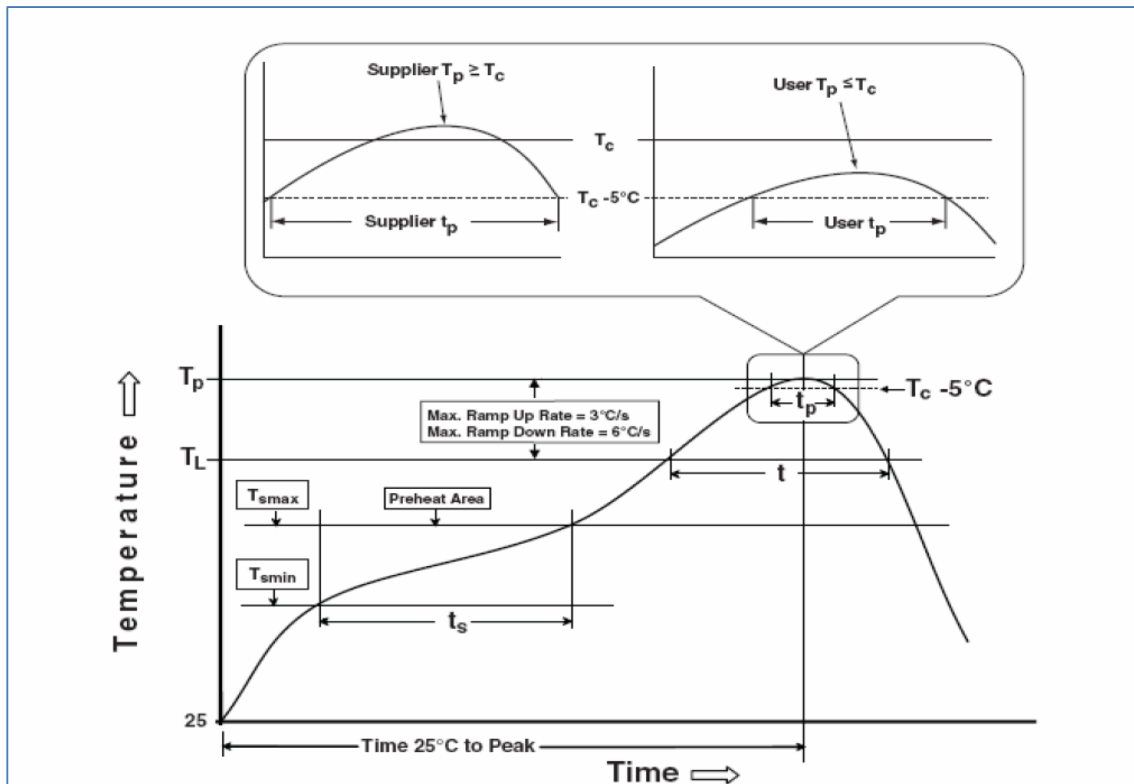

Figure 1 Reflow Profile

1.2 Classification Reflow Profiles

Profile	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat and soak		
Min. Temperature (Tsmin)	100 °C	150 °C
Max. temperature (Tsmax)	150 °C	200 °C
Time (tsmin to tsmax) (ts)	60 ~ 120 seconds	60 ~ 120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second (Max.)	3 °C/second (Max.)

Liquid temperature (TL)	183 °C	217 °C
Time at liquid (tL)	60 ~ 150 seconds	60 ~ 150 seconds
Peak package body temperature (Tp)*	Please refer to the classification temperature in Table 4.1 of IPC/JEDEC J-STD-020E provided on the next page.	Please refer to the classification temperature in Table 4.2 of IPC/JEDEC J-STD-020E provided on the next page.
Time (tp) within 5 °C of the specified classification temperature (Tc)**	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6 °C/second (Max.)	6 °C/second (Max.)
Time to peak temperature from 25 °C	6 minutes (Max.)	8 minutes (Max.)

*** Tolerance for peak profile temperature (Tp) is defined as a supplier minimum and a user maximum.**

**** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.**

Note 1: *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), Tp shall be within ± 2 °C of the live-bug Tp and still meet the Tc requirements, otherwise, the profile shall be adjusted to achieve the latter. To accurately measure actual peak package body temperatures, please refer to JEP140 for recommended thermocouple use.*

Note 2: *All components in the test load shall meet the classification profile requirements.*

Note 3: *SMD packages classified to a given moisture sensitivity level by using Procedures or Criteria defined within any previous version of J-STD-020, JESD22-A112 (Rescinded), IPC-SM-786 (Rescinded) do not need to be reclassified to the current revision unless a change in classification level or a higher peak classification temperature is desired.*

Table 1 IPC/JEDEC J-STD-020E:

Package Thickness	Volume (mm3) < 350	Volume (mm3) ≥ 350
< 2.5 mm	235 °C	220 °C

≥ 2.5 mm	220 °C	220 °C

Note 1: Previously classified SMDs should only be reclassified by the manufacturer. Users should refer to the "Moisture Sensitivity" label on the bag to determine at which reflow temperature the SMD packages were classified.

Note 2: Unless labeled otherwise, level 1 SMD packages are considered to be classified at 220 °C.

Note 3: If supplier and user agree, components can be classified at temperatures other than those in Table 1 and Table 2.

Table 2 IPC/JEDEC J-STD-020E:

Package Thickness	Volume (mm3) < 350	Volume (mm3) 350 ~ 2000	Volume (mm3) > 2000
< 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

Note 1: At the discretion of the device manufacturer, but not the board assembler/user, the maximum peak body temperature (Tp) can exceed the values specified in the Table 1 or Table 2. The use of a higher Tp does not change the classification temperature Tc.

Note 2: Package volume excludes external terminals (e.g. balls, bumps, lands, leads) and/or nonintegral heat sinks.

Note 3: 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.

Note 4: Moisture sensitivity levels of components intended for use in a Pb-free assembly process shall be evaluated using the Pb-free classification temperatures and profiles defined in Table 2, whether or not Pb-free.

Note 5: SMD packages classified to a given moisture sensitivity level by using Procedures or Criteria defined within any previous version of J-STD-020, JESD22-A112 (rescinded), IPC-SM-786 (rescinded) do not need to be reclassified to the current revision unless a change in classification level or a higher peak classification temperature is desired.

4. Caution

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 of classification reflow profiles.

For example, if Tc is 260 °C and time tp is 30 seconds:

- For supplier: The peak temperature must be at least 260 °C. The time above 255 °C must be at least 30 seconds.
- For user: The peak temperature must not exceed 260 °C. The time above 255 °C must not exceed 30 seconds.

5. References

IPC/JEDEC J-STD-020E

- Moisture/Reflow sensitivity classification for non-hermetic, solid-state surface mounted devices

6. Document Revision History

Version	Date	Descriptions
Ver. 1.0.0	1APR2018	Initial Release

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