



Memorandum

To: Our Valued Customers
From: Steve Brower
Date: 08/10/20
Re: Lead-free/RoHS policy

Background

On January 27, 2003, the European Union passed the "Restriction on Use of Hazardous Substances in Electrical and Electronic Equipment," or "RoHS" directive 2002/95/EC, which has an implementation date of July 1, 2006. On 4 June 2015, the EU commission published a new Directive (EU) 2015/863 to amend Annex II to EU RoHS 2 (Directive 2011/65/EU) to add 4 phthalates onto the list of restricted substances. Member states were required ensure that new electrical and electronic equipment placed on the market, contain less than the maximum allowed levels of the following restricted hazardous substances:

Hazardous Substance	Maximum limit % by weight
Hg – Mercury	0.1%
Cd – Cadmium	0.01%
Cr6 – Hexavalent Chromium	0.1%
PBB – Polybrominated Biphenyls	0.1%
PBDE – Polybrominated Diphenylethers	0.1%
Pb - Lead	0.1%
Bis(2-Ethylhexyl) phthalate (DEHP)	0.1%
Benzyl butyl phthalate (BBP)	0.1%
Dibutyl phthalate (DBP)	0.1%
Diisobutyl phthalate (DIBP)	0.1%

It shall be noted that above maximum concentration values apply to each homogeneous material rather than a product or a part itself. A homogeneous material means material of uniform composition throughout that cannot be mechanically separated into different materials.

Materials Selection

In compliance with the RoHS European directives to eliminate lead (Pb) in the electronics industry, Holt Integrated Circuits has adopted the use of Pb-free terminations for its RoHS compliant plastic packages. Package molding compounds have been upgraded so that the product is fully RoHS compliant and able to withstand the higher soldering temperatures of lead-free solder alloys. Product qualification has validated that the products can withstand peak solder temperature rating per JEDEC J-STD-020E Table 5-2 and Figure 5-1.

Holt selected matte tin and NiPdAu lead finishes to provide forward and backward compatibility with both the current industry-standard SnPb-based soldering processes and higher-temperature Pb-free processes. Industry testing has shown that matte tin is backward compatible to standard 215°C to 225°C tin/lead (SnPb) reflow processes and compatible with up to 260°C Pb-free reflow processes.

JEDEC J-STD-020E Table 5-2 Classification 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 4-1. For suppliers T_p must equal or exceed the Classification temp in Table 4-1.	For users T_p must not exceed the Classification temp in Table 4-2. For suppliers T_p must equal or exceed the Classification temp in Table 4-2.
Time (t_p)* within 5 °C of the specified classification temperature (T_c), see Figure 5-1.	20* seconds	30* seconds
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.

* Tolerance for peak profile temperature (T_p) 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), 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.
- Note 2:** 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 in this table.
- 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.
- Note 3:** All components in the test load shall meet the classification profile requirements.
- Note 4:** 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.

JEDEC J-STD-020E Figure 5-1 Classification Reflow Profile

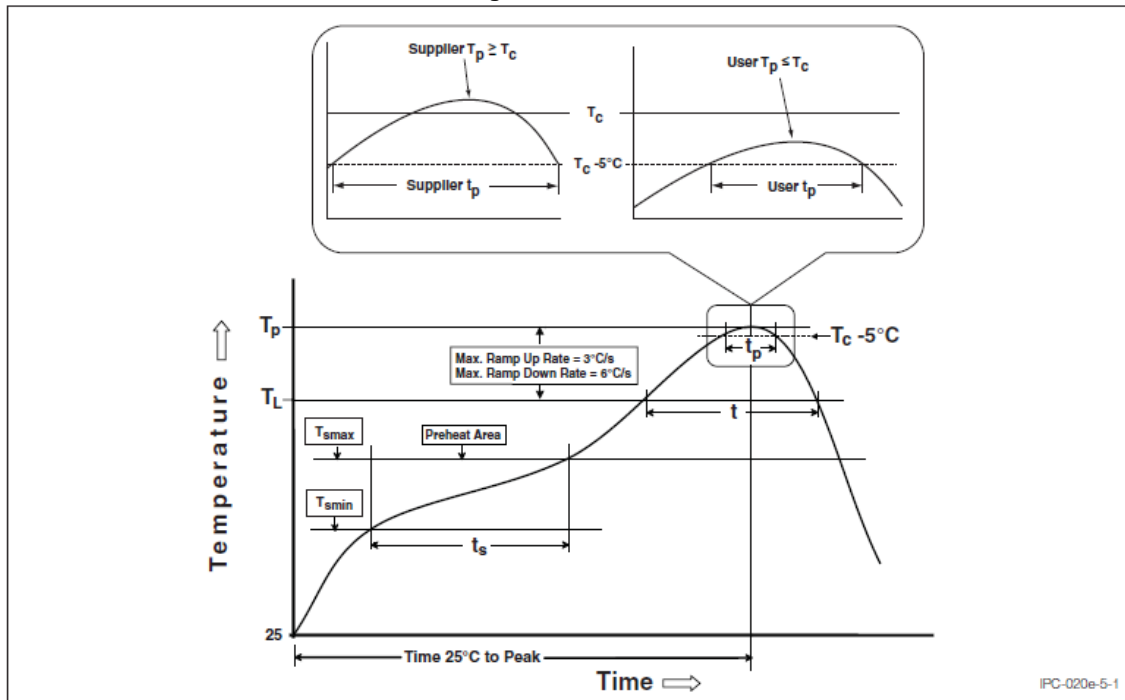


Figure 5-1 Classification Profile (Not to scale)



Tin Whisker Mitigation

Because of the lead-free movement and the European RoHS directive, many component manufacturers are moving from tin-lead (SnPb) to pure tin (Sn) lead finishes. Pure tin and high-tin content alloys are subject to tin whisker formation and growth. Tin whiskers are spontaneous filamentous or needlelike growths from the tin surface and are believed to be a result of stress relief in the tin layer. Holt's assembly subcontractors employ the following industry approved mitigation practices to mitigate the formation and growth of tin whiskers:

- Use of 100% matte tin.
 - Matte tin has a larger grain size (1µm-5µm) than bright tin (0.5µm-0.8µm)
- Use of a thicker matte tin plating
 - Plating thickness of 8µm minimum is recommended
- Use of an annealing process immediately after matte tin plating

Holt is aware of and will continue to monitor ongoing studies in tin whisker development and mitigation strategies. Additional information on tin whiskers can be found at the International Electronics Manufacturing Initiative website (www.nemi.org).

Product Offerings

To meet our customer's desire to meet these Directives, Holt is proud to offer RoHS compliant Lead-Free products. Holt's RoHS compliant ICs are in full compliance with the EU Directives for Restriction of Hazardous Substances (RoHS). Our lead-free products are easily identifiable. Plastic products compliant to the RoHS Directives are identified by an "F" contained in the part number marked on the device.

For example:

HI-8586PSI is non-RoHS SnPb plated

HI-8586PSIF is RoHS compliant lead-free plated with 100% matte tin

Ceramic parts with the following suffixes are also RoHS compliant:

C, CT, CM (without dash numbers)

S, ST, SM (without dash numbers)

CDI, CDT, CLI, CLT

Holt will continue to support the original line of tin/lead plated products, where possible. We recognize that many customers still require Tin/Lead products that are not RoHS compliant and many of these products are still available from Holt. In situations where this is not possible or practical (ex. QFN packages), we strive to employ lead finishes that do not contain tin. The part numbers will remain as they are. They will continue to be the same high quality products we have always delivered.

Steve Brower
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Holt Integrated Circuits, Inc.

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