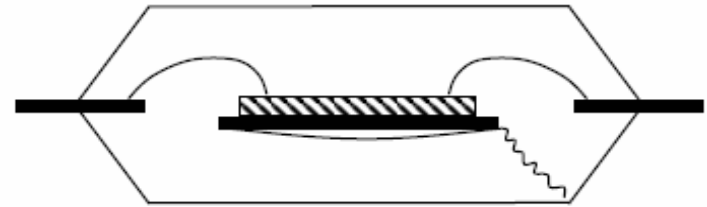


Reflow Profile

- Places additional stresses on printed boards and surface mount components
- Boards
 - Popcorning
 - Cracking in through-vias (PTHs)
- Components
 - Popcorning
- IPC-7530, “Guidelines for Temperature Profiling for Mass Soldering (Reflow and Wave)”
- J-STD-020D, “Moisture/Reflow Sensitivity Classification for Non-Hermetic Solid State Surface Mount Devices”

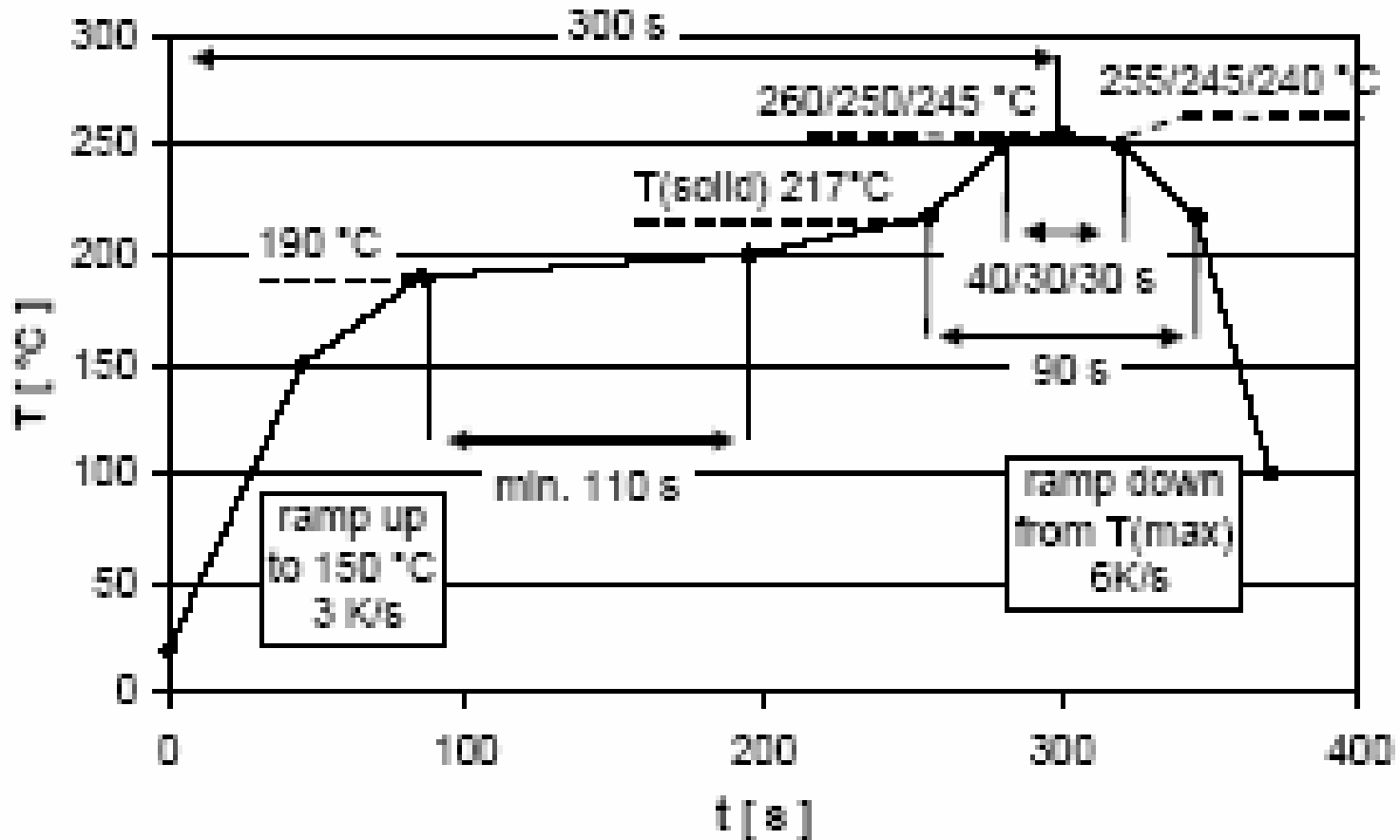


MSL -- Definition

Table 5-1 Moisture Sensitivity Levels

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS			
			Standard		Accelerated Equivalent ¹	
	TIME	CONDITIONS	TIME (hours)	CONDITIONS	TIME (hours)	CONDITIONS
1	Unlimited	≤30 °C/85% RH	168 +5/-0	85 °C/85% RH		
2	1 year	≤30 °C/60% RH	168 +5/-0	85 °C/60% RH		
2a	4 weeks	≤30 °C/60% RH	696 ² +5/-0	30 °C/60% RH	120 +1/-0	60 °C/60% RH
3	168 hours	≤30 °C/60% RH	192 ² +5/-0	30 °C/60% RH	40 +1/-0	60 °C/60% RH
4	72 hours	≤30 °C/60% RH	96 ² +2/-0	30 °C/60% RH	20 +0.5/-0	60 °C/60% RH
5	48 hours	≤30 °C/60% RH	72 ² +2/-0	30 °C/60% RH	15 +0.5/-0	60 °C/60% RH
5a	24 hours	≤30 °C/60% RH	48 ² +2/-0	30 °C/60% RH	10 +0.5/-0	60 °C/60% RH
6	Time on Label (TOL)	≤30 °C/60% RH	TOL	30 °C/60% RH		

Pb-Free Reflow Profile



Peak Temperatures

Table 4-1 SnPb Eutectic Process - Package Peak Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥ 350
< 2.5 mm	240 +0/-5 °C	225 +0/-5°C
≥ 2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 4-2 Pb-free Process - Package Classification Reflow Temperatures

Package Thickness	Volume mm ³ < 350	Volume mm ³ 350 - 2000	Volume mm ³ > 2000
< 1.6 mm	260 +0 °C *	260 +0 °C *	260 +0 °C *
1.6 mm - 2.5 mm	260 +0 °C *	250 +0 °C *	245 +0 °C *
> 2.5 mm	250 +0 °C *	245 +0 °C *	245 +0 °C *

* Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0 °C. For example 260 °C+0°C) at the rated MSL level.

Is Popcorning a Concern?

- Plastic encapsulated microcircuits (PQFP, SOP, TSOP, etc.)
 - Unlikely
 - Component manufacturers dedicated to maintaining MSL (< 3)
- Components with substrates (PBGAs, DC-to-DC converters)
 - Possibly
 - Maintaining MSL may require material transition
 - Low to High Tg FR4
 - High Tg FR4 to BT
- Plastic encapsulated components (tantalum and polymeric capacitors, other passives)
 - Likely
 - Low margin component; technology limitations

Moisture Sensitivity Levels and Capacitors

- Pb-free reflow is hotter
 - Increased susceptibility to popcorning
 - Tantalum/polymer capacitors are the primary risk
- Approach to labeling is inconsistent
 - Aluminum Polymer are rated MSL 3
 - Tantalum Polymer are stored in moisture proof bags (no MSL rating)
 - Approach to Tantalum is inconsistent (some packaged with dessicant; some not)
- Material issues
 - Aluminum Polymer are rated MSL 3 for eutectic (could be higher for Pb-free)
 - Sensitive conductive-polymer technology may prevent extensive changes
- Solutions
 - Confirm Pb-free MSL on incoming plastic encapsulated capacitors (PECs)
 - More rigorous inspection of PECs during initial build

