Lattice Semiconductor Corporation
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Product Bulletin

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Reflow Profile for Lattice Lead-Free, RoHS Compliant Products

Introduction

Lattice offers a broad range of lead-free, RoHS compliant products in a variety of package configurations. These qualified packages include the Plastic Leaded Chip Carrier (PLCC), Plastic DIP (PDIP), Thin Quad Flat Pack (TQFP), Quad flat-pack (QFN), Fine Pitch BGA (fpBGA), Fine Pitch Super BGA (fpSBGA) and Chip-Scale BGA (csBGA).

Qualification

Lattice lead-free packages are qualified to the following moisture resistance depending on the package type with peak reflow temperatures of 245°C (large size packages), 250°C (medium size packages) or 260°C (small size packages), consistent with IPC/JEDEC J-STD-020B, "*Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices*." See Table 1 for specific reflow temperature by package. Reliability tests include high temperature operating life (HTOL), surface mount preconditioning testing, temperature cycling, moisture resistance testing, biased highly accelerated stress test (HAST) and unbiased HAST. Data for these tests are available upon request.

Table 1: ***Lead-Free Peak Reflow Temperature by Package***

Lead-Free Peak Reflow Temperature	Moisture Sensitivity Level (MSL)	Package
260 + 0/-5°C	3	TQFP, QFN, csBGA
250 + 0/-5°C	1	20-, 28-PLCC
	3	fpBGA
245 + 0/-5°C	4	fpSBGA

Lead-Free Solder Reflow Profiles

Lattice lead-free products are qualified to the reflow profiles documented below.

Figure 1: ***Typical Conditions for Lead-Free Reflow Soldering***

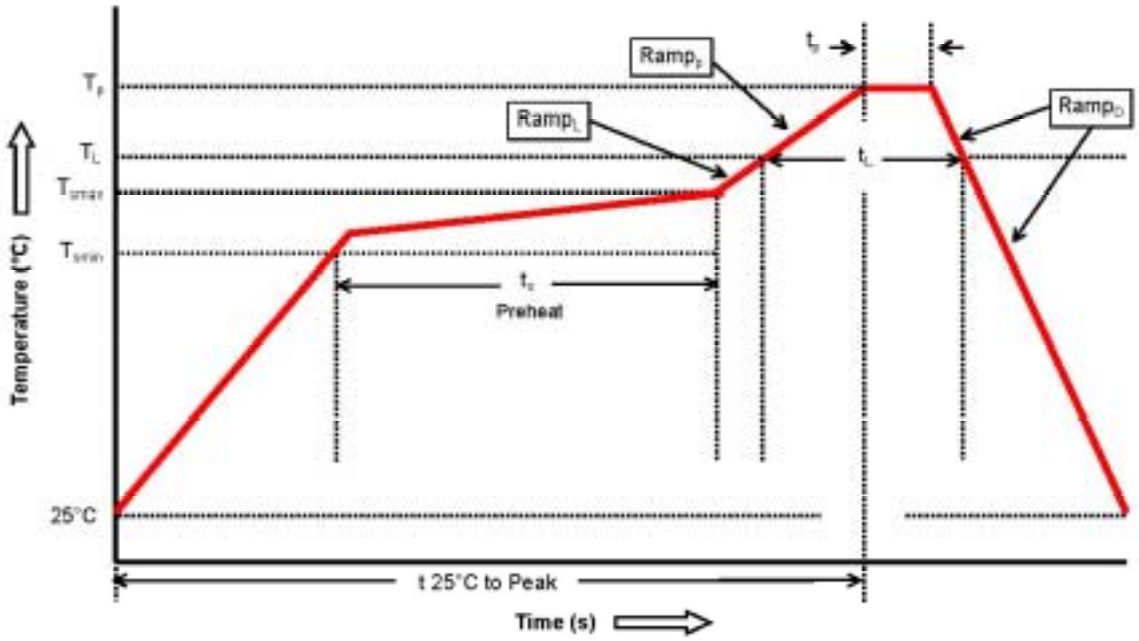

Table 2: ***Lead-Free Reflow Profile Conditions***

Profile Feature		260°C Peak Reflow Temperature	250°C Peak Reflow Temperature	245°C Peak Reflow Temperature
Preheat	Temperature Min (T_{SMIN})	150°C		
	Temperature Max (T_{SMAX})	200°C		
	Time (t_S)	120 ± 60 sec		
T_{SMAX} to T_L	Ramp-up Rate ($Ramp_L$)	3°C/sec max.		
Average Ramp-up Rate	T_L to T_P ($Ramp_p$)	3°C/sec max.		
Time Maintained Above:	Temperature (T_L)	217°C		
	Time (t_L)	105 ± 45 sec		
Peak Temperature (T_P)		260 + 0/-5°C	250 + 0/-5°C	245 + 0/-5°C
Time Within 5°C of Actual Peak Temperature (t_P)		25 ± 10 sec		
Ramp-down Rate ($Ramp_D$)		< 6°C/sec		
Time 25°C to Peak Temperature		6 ± 2 min		