



SMT Package Solder Re-Flow Profile

Table 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 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.

Note 1: The profiling tolerance is + 0 °C, -X °C (based on machine variation capability) whatever is required to control the profile process but at no time will it exceed - 5 °C. The producer assures process compatibility at the peak reflow profile temperatures defined in Table 4.2.

Note 2: Package volume excludes external terminals (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: GWS bump devices can satisfactorily withstand 2 passes through reflow temperatures. See Table 4 for supporting data.

Table 3 Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (Ts _{max} to Tp)	3 °C/second max.	3° C/second max.
Preheat		
– Temperature Min (Ts _{min})	100 °C	150 °C
– Temperature Max (Ts _{max})	150 °C	200 °C
– Time (ts _{min} to ts _{max})	60-120 seconds	60-180 seconds
Time maintained above:		
– Temperature (T _L)	183 °C	217 °C
– Time (t _L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (Tp)	See Table 1	See Table 2
Time within 5 °C of actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Table 4 Two Pass Pb Free Process Reflow Results

	ONE PASS					TWO PASS					DELTA %		
	IGSS	IDSS	BVDSS	VTH	RDSON	IGSS	IDSS	BVDSS	VTH	RDSON	BVDSS	VTH	RDSON
Condition 1	12V	30V	1mA	250uA	4.5V	12V	30V	1mA	250uA	4.5V			
Condition 1					12A					12A			
Max Limit	150nA	10uA		1.9	6.0E-3	150nA	10uA		1.9	6.0E-3			
Min Limit			30V	1.3				30V	1.3				
Unit	A	A	V	V	Ω	A	A	V	V	Ω			
1	2.7E-9	100.0E-9	31.54	1.76	4.4E-3	3.0E-9	90.0E-9	31.52	1.77	4.5E-3	-0.1%	0.2%	0.5%
2	2.6E-9	140.8E-9	30.84	1.78	4.5E-3	2.8E-9	130.4E-9	30.91	1.77	4.5E-3	0.2%	-0.5%	1.4%
3	3.0E-9	215.6E-9	31.40	1.76	4.4E-3	3.0E-9	214.8E-9	31.49	1.75	4.5E-3	0.3%	-0.7%	1.2%
4	2.0E-9	137.6E-9	31.26	1.76	4.4E-3	2.4E-9	125.6E-9	31.33	1.75	4.5E-3	0.2%	-0.6%	1.6%
5	2.0E-9	152.0E-9	31.28	1.76	4.5E-3	2.7E-9	132.8E-9	31.30	1.75	4.5E-3	0.1%	-0.2%	0.8%
6	2.9E-9	275.2E-9	30.49	1.78	4.5E-3	2.3E-9	217.6E-9	30.57	1.77	4.6E-3	0.3%	-0.7%	1.7%
7	2.3E-9	152.0E-9	30.86	1.75	4.5E-3	3.3E-9	142.4E-9	30.92	1.75	4.5E-3	0.2%	-0.5%	1.5%
8	2.8E-9	120.0E-9	31.37	1.75	4.5E-3	2.1E-9	109.2E-9	31.39	1.75	4.5E-3	0.1%	-0.2%	1.5%
9	2.6E-9	95.6E-9	31.62	1.75	4.5E-3	2.1E-9	88.0E-9	31.64	1.75	4.5E-3	0.1%	0.0%	0.9%
10	2.8E-9	116.4E-9	31.61	1.74	4.5E-3	2.0E-9	104.8E-9	31.64	1.74	4.6E-3	0.1%	-0.3%	0.9%
11	2.0E-9	123.2E-9	31.07	1.76	4.4E-3	2.8E-9	114.4E-9	31.12	1.76	4.5E-3	0.2%	-0.3%	0.8%
13	2.1E-9	93.6E-9	31.59	1.76	4.4E-3	2.0E-9	89.2E-9	31.71	1.74	4.5E-3	0.4%	-0.9%	1.7%
14	2.6E-9	96.8E-9	31.42	1.75	4.5E-3	2.4E-9	92.0E-9	31.51	1.74	4.5E-3	0.3%	-0.5%	1.6%
15	2.7E-9	120.4E-9	31.60	1.74	4.5E-3	2.3E-9	99.6E-9	31.49	1.75	4.5E-3	-0.3%	0.8%	0.0%
16	2.6E-9	112.4E-9	31.60	1.75	4.6E-3	1.8E-9	100.4E-9	31.60	1.75	4.6E-3	0.0%	0.1%	0.6%

Figure 1 Classification Reflow Profile (per Table 3)

