



Green/Lead Free Packaging

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- Introduction
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- On Jan 27th, 2003, EU passed two Directives – the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment and Waste Electrical and Electronic Equipment (WEEE)
- From August 13th, 2005 onwards, under these Directives, producers are required to finance the collection, treatment, recycling, and recovery of all WEEE
- Beginning July 1, 2006, Electrical and Electronic Equipment will no longer be sold in EU if it contains lead(Pb), cadmium(Cd), mercury(Hg), hexavalent chromium(Cr⁺⁶), polybrominated biphenyls(PBB), and polybrominated diphenyl ethers(PBDE) exceeding the prescribed concentrations

Green vs. Lead Free

- Lead Free Definition
 - » Terminals:
 - ✓ Leaded package: pure matt tin
 - ✓ BGA package: Sn4.0Ag0.5Cu
 - » Lead (Pb) < 1000 ppm
- Green Definition
 - » Terminals:
 - ✓ Leaded package: pure matt tin
 - ✓ BGA package: Sn4.0Ag0.5Cu
 - » Lead (Pb) < 1000 PPM
 - » Mercury (Hg) < 1000 PPM
 - » Hexavalent Chromium (Cr⁺⁶) < 1000 PPM
 - » Cadmium (Cd) < 100 PPM
 - » PBB < 1000 PPM
 - » PBDE < 1000 PPM



GSI Green/Pb Free Strategy

- Offer green packages only, fully RoHS compliant (except SOJ and flip chip BGA)
- Work with assembly subcontractors on qualifying Pb free plating process and Pb free solder balls
- All green packages are JEDEC MSL level 3 at 260 C reflow
- Offer both standard (non-green) and green products until customers are fully converted
- Green samples are currently available, "G" character is added to package designator and is marked on the package
 - » Ex: GS816018T (standard)  GS816018GT (Green)

GSI Green Package Qual

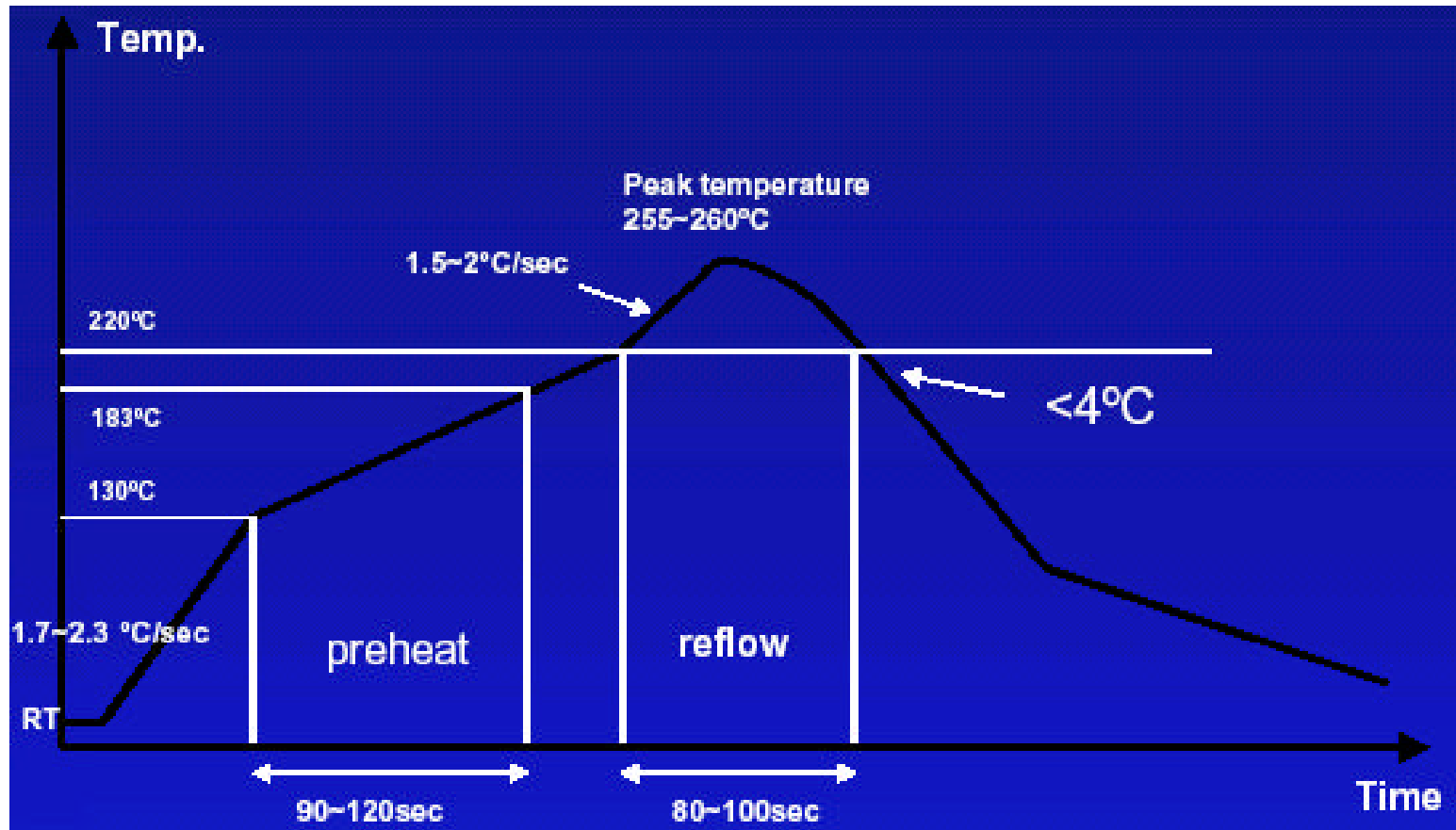
<u>Test Method</u>	<u>S.S.</u>	<u>Duration</u>	<u>Test Condition</u>
Preconditioning (MSL 3)	336/lot, 3 lots	N/A	30C/60RH/192hrs + IR x 3 (260 C)
HTOL	105/lot, 3 lots	1000 hours	125 C
Temp Cycle	77/lot, 3 lots	1000 cycles	-55 C/ 125 C
HAST	77/lot, 3 lots	264 hrs	110 C / 85% RH
Autoclave	77/lot, 3 lots	96 hrs	121C/100%RH/15psig
Thermal Shock	15/lot, 3 lots	300 cycles	-55 C to 125 C



Green Package Qual.....continued

- GSI does not perform solderability test in house. The green package solderability is evaluated based on the data conducted by assembly subcontractor per J-STD-002B.
- GSI does not perform tin whisker test in house. The green package tin whisker is evaluated based on the data conducted by assembly subcontractor.
 - » GSI's tin whisker criteria: < 50um w/ any L/F type

Recommended* Reflow Profile at MSL3 Preconditioning



* per JEDEC recommendations



Green Package Roadmap

Activities	2004				2005				2006	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Leadframe based packages: TSOP II	Development & Qual				Cust Qual/Sample		Production			
Leadframe based packages: TQFP	Development & Qual				Cust Qual/Sample		Production			
Array packages: TFBGA (119, 209, 165 "D", 165 "E")	Development & Qual				Cust Qual/Sample		Production			

Note:

1. No green/Pb free packages will be offered for PBGA119 and flip chip BGA
2. No green/Pb free packages will be offered for SOJ and SJ due to low production volume