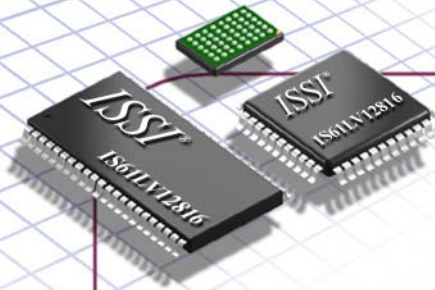


# Lead Free Project

**Prepared by Henry H. Pu, VP of  
Quality, Reliability and Assembly**



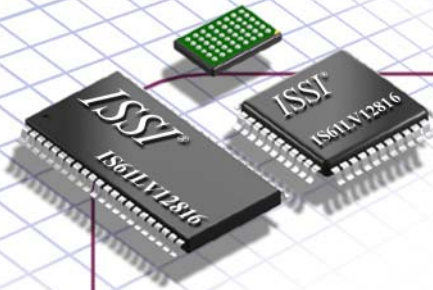
- **Lead Free Driving Forces**
- **Lead Free Plating Solution**
- **Reliability Evaluation**
- **ISSI Lead Free Roadmap**

# *Lead Free Driving Forces*

- **Europe:** WEEE prohibit all lead product import by Jan. 1, 2006
- **Japan:** JEIDA aims to implement full lead free production by 2004  
The consumer electronics recycle law requires manufacturers to recover harmful materials by the end of 2002
- **USA:** Environmental legislation in some States ask to stop selling lead product in 2004

# *Lead Free Plating Solution*

- **The conventional plating solution**
  - **85% Sn / 15% Pb**
- **Evaluate lead free finish materials**
  - **Lead free solder sphere (BGA):**
    - **95.5% Sn / 4.0% Ag / 0.5 Cu**
    - **96.5% Sn / 3.5% Ag**
  - **Lead free solder plating:**
    - **98% Sn / 2.0% Bi**
    - **99.3% Sn / 0.7% Cu**
    - **100% Sn**
- **Lead free plating solution of ISSI product**
  - **95.5% Sn / 4.0% Ag / 0.5 Cu (BGA)**
  - **100% Sn (other package types)**



# Reliability Evaluation

## Condition Level 3 @ 240C-260C

<u>Package</u>	<u>TCT1000hrs</u>	<u>TST168hrs</u>	<u>PCT168hrs</u>	<u>Solderability</u>
QFP	0/45 * 3	0/45 * 3	0/45* 3	0/5 * 3
LQFP	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
TQFP	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
SOP/SOJ	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
TSOP	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
PLCC	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
PBGA	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3
TFBGA	0/45 * 3	0/45 * 3	0/45 * 3	0/5 * 3

# *Reliability Test Condition*

- **Temperature Cycling Test (TCT)**  
JEDEC 22-B A104    -65C – 150C, 1000hrs
- **Temperature Storage Test (TST)**  
JEDEC 22-B A103    150C, 168hrs
- **Autoclave or Pressure Cooker Test (PCT)**  
JEDEC 22-B A102-A 121C, 100%RH, 30psia, 168hrs
- **Solderability Test**  
JEDEC 22-B B102    240C – 260C



# *Tin Whisker Evaluation*

## □ Condition

- Pretreated, reflow at 260°C peak temperature
- 60°C/85%RH, 2000 hours, 50 samples.
- Leave it in room temperature for 1 year.

## □ Method

- Observe image by Scan Electron Microscope

## □ Criteria

- 40μm or less

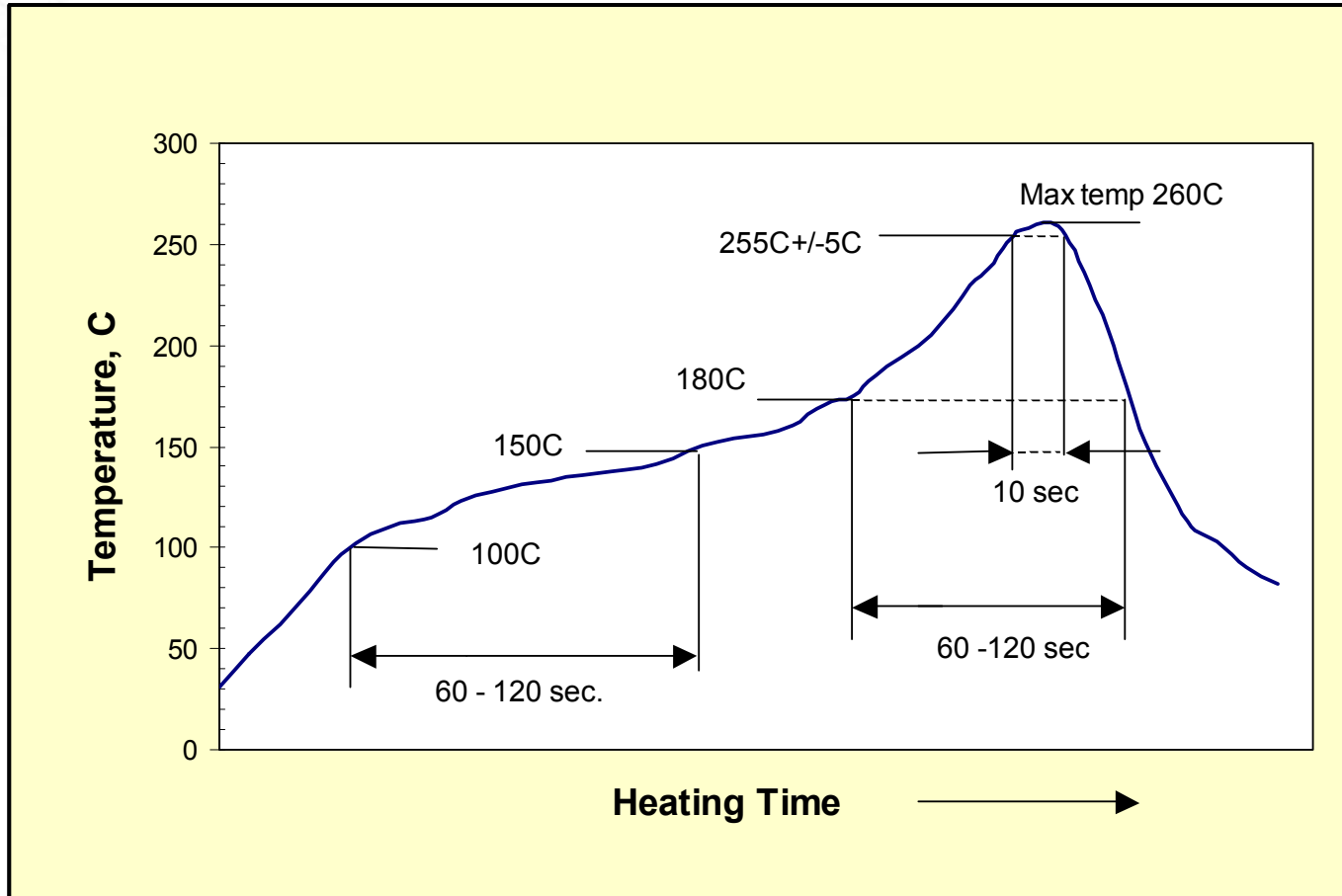
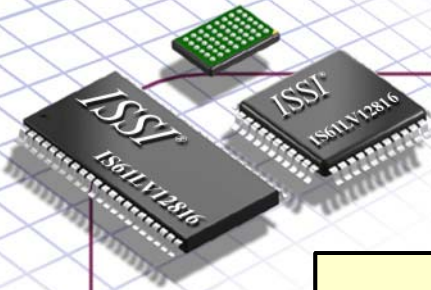
## □ Result

- No whiskers were found for all samples

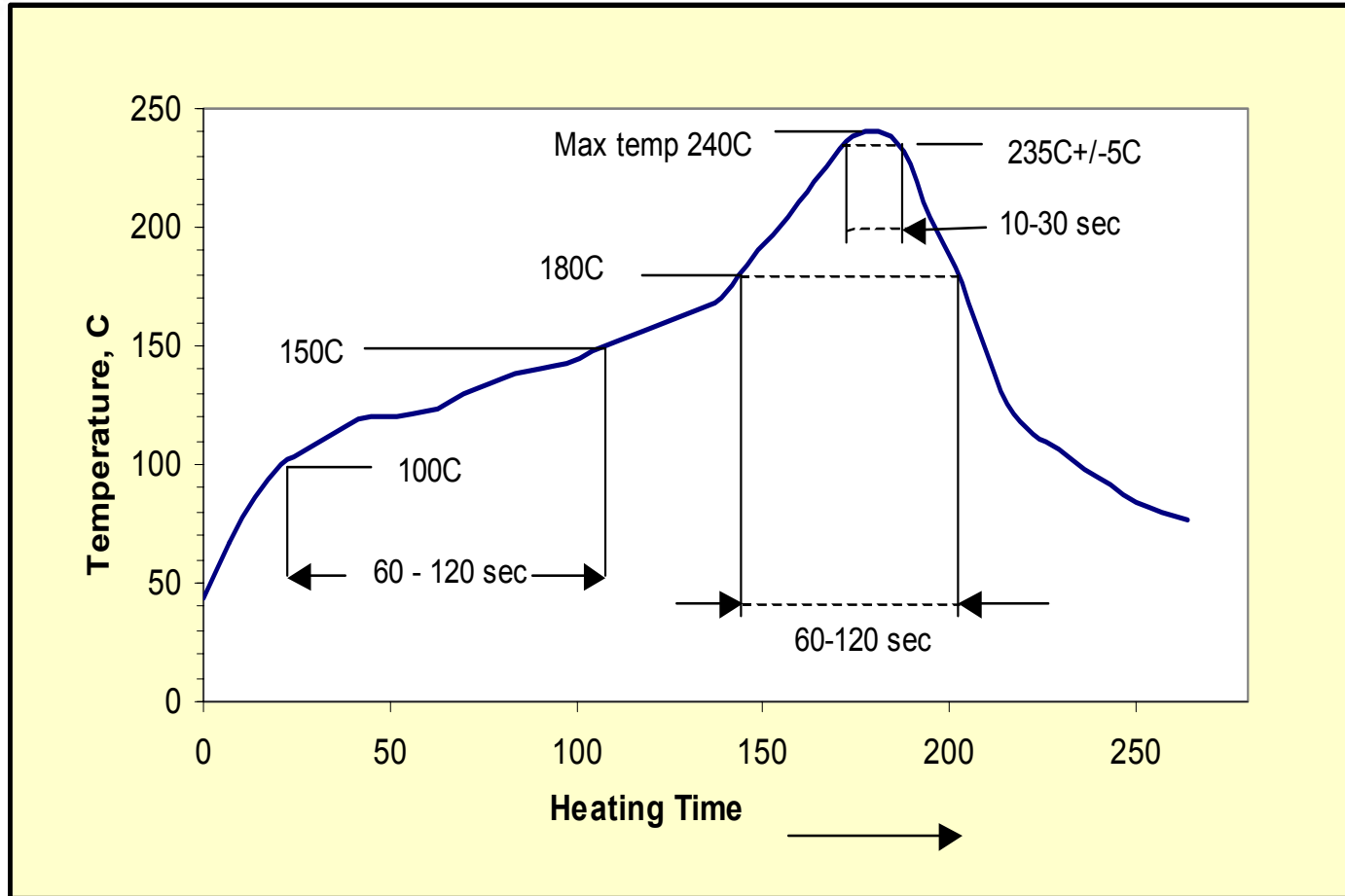
# *ISSI Lead Free Roadmap*

- **Provide samples for certain package types in 2002**
- **Implement mass production for certain package types in 2003**
- **Implement mass production for all package types which are used for ISSI products**

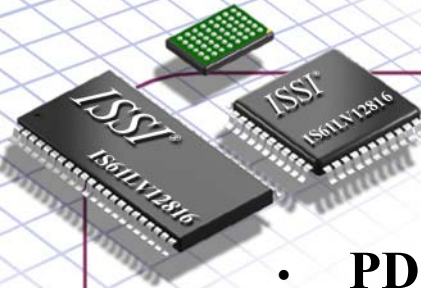
# IR-Reflow Profiles



# IR-Reflow Profiles



# Quality Levels of Package Types

- 
- **PDIP**
  - **SOJ (24/26 leads, 300mils)**
  - **SOJ (28/32 leads, 300mils)**
  - **SOJ (28/32/40/42/44 leads, 400mils)**
  - **SOP 8/28 leads**
  - **SOP 32 leads**
  - **TSOP I**
  - **TSOP II**
  - **STSOP**
  - **PLCC**
  - **PQFP**
  - **TQFP**
  - **BGA**
- |  |                           |
|--|---------------------------|
|  | <b>JEDEC A113 Level 1</b> |
|  | <b>JEDEC A113 Level 1</b> |
|  | <b>JEDEC A113 Level 3</b> |
|  | <b>JEDEC A113 Level 1</b> |
|  | <b>JEDEC A113 Level 3</b> |
|  | <b>JEDEC A113 Level 3</b> |
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|  | <b>JEDEC A113 Level 3</b> |

# Lead Free Development Milestone

Activities	2002				2003				2004			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Leadframe based packages: TSOP II, TSOP I	Development		CustQual/Samplin		Production							
Leadframe based packages: SOP, SOJ, PLCC	Development		CustQual/Samplin		Production							
Leadframe based packages: QFP, TQFP			Development		CustQual/Samplin		Production					
Array packages: BGAs, FBGAs, CSPs				Development		CustQual/Samplin		Production				