Pb-Free and Green Products

12/9/2005

Pb-Free Definition

- Micron Pb-free p/n means RoHS compliance
- No intentional addition of lead to components or modules
  - No legislated threshold limit yet, proposed 1,000 ppm
  - Except where legislated, exemptions may apply
- All nonmemory components on modules must also meet above definition
  - Resistors, capacitors, EEPROM, register, PLL, AMB, etc.

Pb-Free Materials

- Matte Sn plating for leaded TSOP packages
  - Replaces 90Sn10Pb
  - Backward and forward compatible
- Au plating for leadless CMOS imager packages
- SnAgCu for BGA solder balls
  - Sn3.0Ag0.5Cu (SAC305) solder ball replaces Sn36Pb2Ag
  - Some questions with regard to backward compatibility and board-level reliability of mixed system
    - Micron can provide board-level reliability data for DDR2 comparison of mixed SAC-SnPb system, previous SnPb-SnPb baseline, and current SAC-SAC baseline
- SnAgCu for solder paste on modules
  - Sn3.8Ag0.7Cu solder paste replaces Sn37Pb
  - Baseline for all TSOP modules since April, 2004

Pb-Free Part Numbers

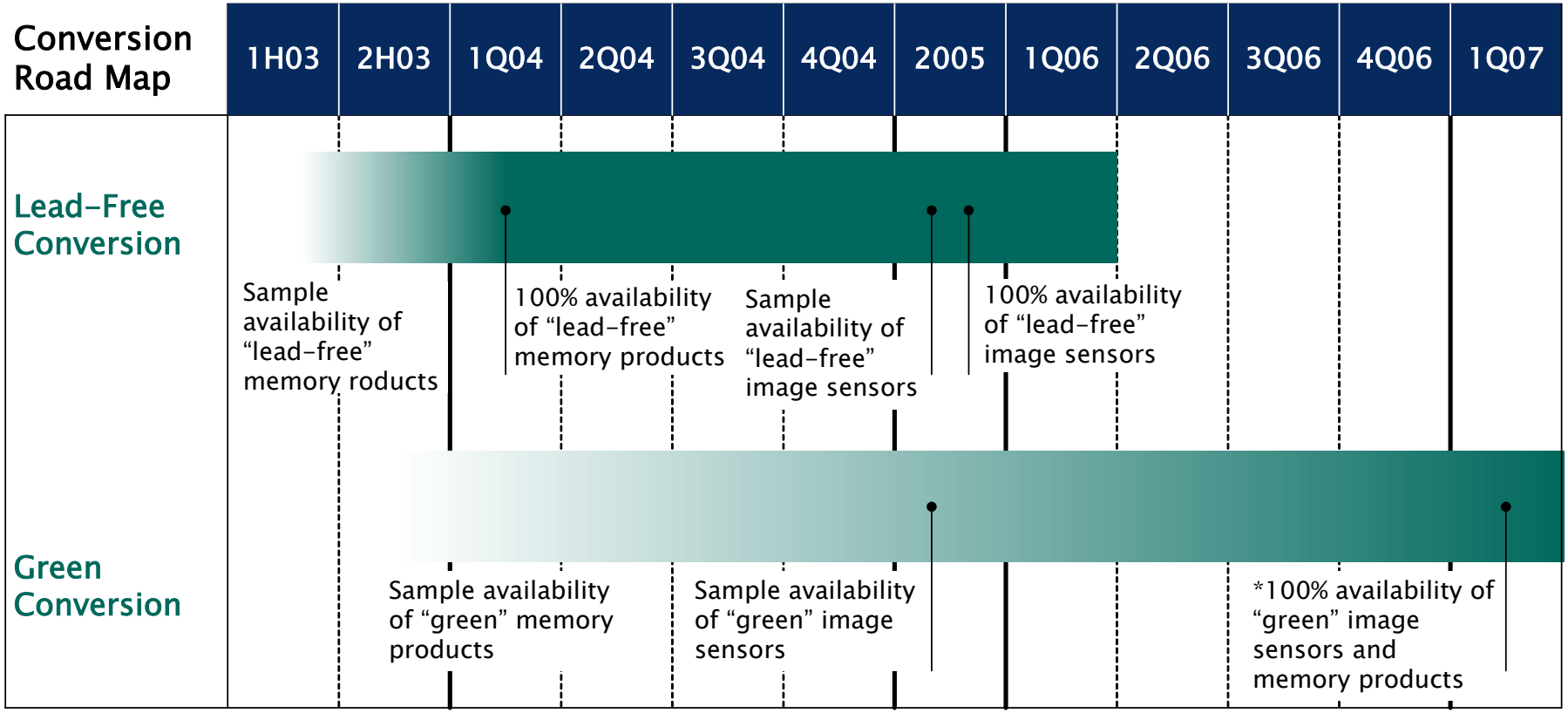
- Separate marketing part numbers for Pb-free
- Component example
  - MT48LC8M16A2P-xx, P denotes Pb-free
  - MT48LC8M16A2TG-xx, TG denotes SnPb
- Module example
  - MT16LSDT6464AY-xx, Y denotes Pb-free
  - MT16LSDT6464AG-xx, G denotes SnPb
- Refer to Micron Part Numbering Guides

Green Definition

- No intentional addition of elements known to be banned or expected to be banned by legislation in various regions of the world
  - Pb soldering alloys
    - Replacements are matte Sn or SAC
  - Sb, Br, Cl are used in flame-retardant systems of polymer compounds
    - Inorganic “red” P is not used as replacement
    - All nonmemory components on modules must also meet the definition above
  - “RoHS+”

Pb-Free/Green Conversion Status

- Conversion to Pb-free began in 1Q03
  - Volumes available now, 100 percent conversion is dependent on customer demand
  - DDR2 and NAND production is lead-free
- "Green" circuit board material availability issues



*Based on green material availability.

Micron's RoHS Status

- EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment applies to Micron product

Materials Regulated by RoHS	Micron's Compliance	Max Threshold Limits
Pb	Components available lead-free now	1,000 ppm
	Modules available lead-free now	1,000 ppm
Cd and its compounds	Not used	100 ppm
Hg and its compounds	Not used	1,000 ppm
Hexavalent Cr and its compounds	Not used	1,000 ppm
PBB	Not used	1,000 ppm
PBDE	Not used	1,000 ppm

Micron's WEEE Status

- EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) does not apply to Micron product
- WEEE applies to our customers' finished products
  - Annex IA excerpt of affected equipment types

Categories of electrical and electronic equipment covered by this directive:

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale, stationary, industrial tools)
7. Toys, leisure, and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

  - Annex IB contains a more detailed list of affected equipment

Quality and Reliability

- 260°C minimum reflow preconditioning is Micron's baseline for device qualification
  - Micron started implementing qualification tests with a 260°C reflow precondition in 2Q01
- Legacy DRAM packages meet reliability requirements at a 260°C minimum reflow
  - DRAM products still active in 2Q01 were requalified with a 260°C reflow precondition


Micron