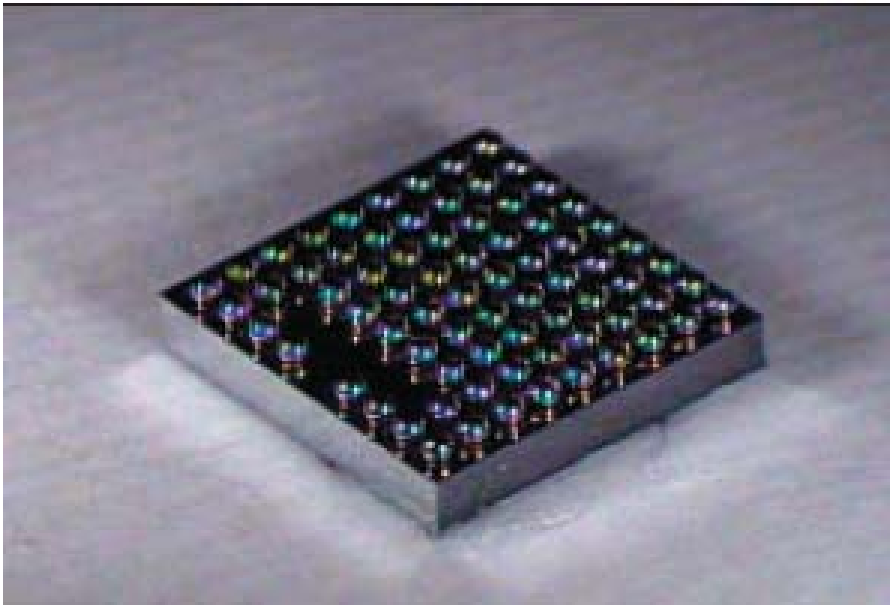




Lead-Free Assembly Recommendations

June 2005

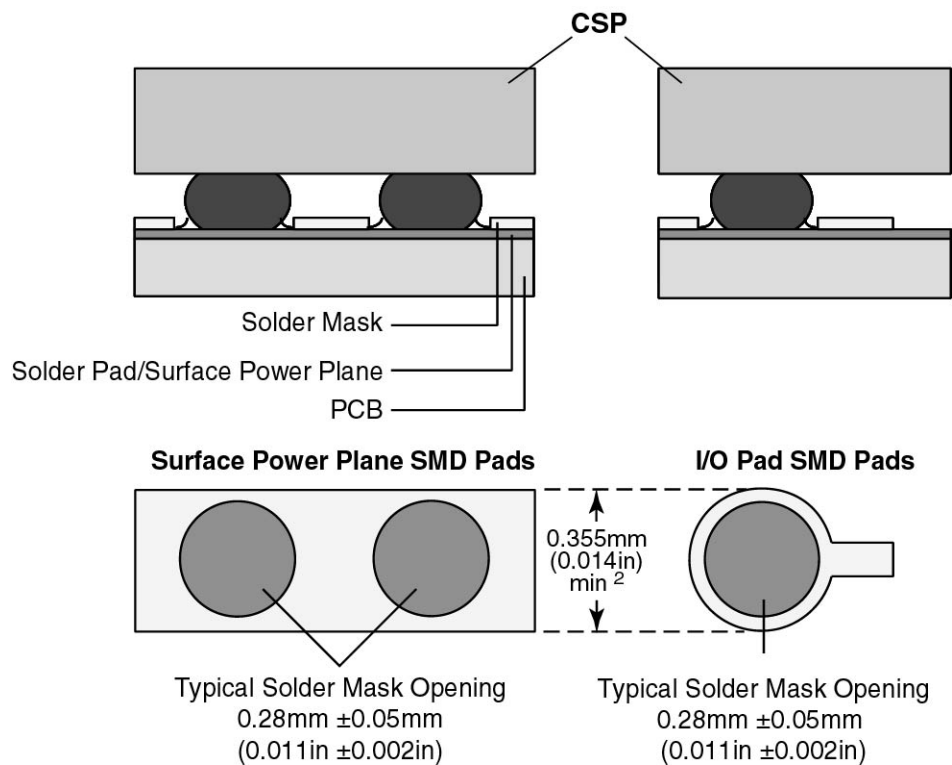
Package Construction



- Wafer-level CSP (WLCSP)
 - 0.35mm spheres
 - 0.5mm pitch
 - Back-side laser mark

- SAC405 lead-free alloy
 - 95.5% Sn
 - 4% Ag
 - 0.5% Cu

PCB Landing Pad Design


Notes:

- 1) Solder mask openings shall be positioned over copper features without exposing any FR-4 material or copper edge.
- 2) Some small reduction in the copper width may be required if the final copper thickness is to be greater than or equal to 2oz.

- SMD pads recommended for optimum performance
 - 14mil copper trace
 - 11mil ±2mil solder mask opening
 - Proper solder mask alignment is critical for yield and reliability

- Do NOT mix SMD and NSMD pads in the same component footprint

PCB Finish

Finish Name	Description	Recommendation	Comments
HASL	Hot Air Solder Leveled	Not recommended	Hard to get consistency across all pads.
Tin Immersion	Thin layer tin electroless plated	Not recommended	Oxidizes in a short period of time.
Gold Immersion	Thin layer gold electroless plated	Good	Very flat. Very good for quick-turn prototypes only.
Silver Immersion	Thin layer silver electroless plated	Very Good	Recommended for high volume manufacturing. Hard to get for quick-turn prototypes.
Copper OSP	Organic Solderability Preservative (OSP)	Very Good	Recommended for high volume manufacturing. Assembler must use a compatible no clean flux.

- Silver Immersion and Copper OSP recommended for best yield
- Silver Immersion thickness must be controlled to 0.150~0.625µm to minimize micro voids at the solder joint

Stencil Design

- Square aperture with smooth walls, rounded corners and a trapezoidal cross-section (5° tapering)
- 4mil thickness (5mil to 4mil step-down in the CSP area is allowed)
 - Required to meet the industry-standard area ratio of > 0.66
- Laser-cut process followed by electro-polish is recommended for best paste release

Lead-Free Solder Pastes

- Indium NC-SMQ230
- Kester EM907
- Senju GRN360
- Alpha OM338

Type 3 (-325/+500 mesh) with particle size of 25~45µm is preferred

Solder Paste Printing

- General recommendations:
 - Print head speed: 1-6 inches/sec.
 - Squeegee pressure: 0.75-1.5 pound per inch of squeegee
 - Under-stencil wiping: Every 3 boards
 - Temperature: 23-28°C
 - Humidity: 30-60 percent RH
 - A stainless steel squeegee should be used

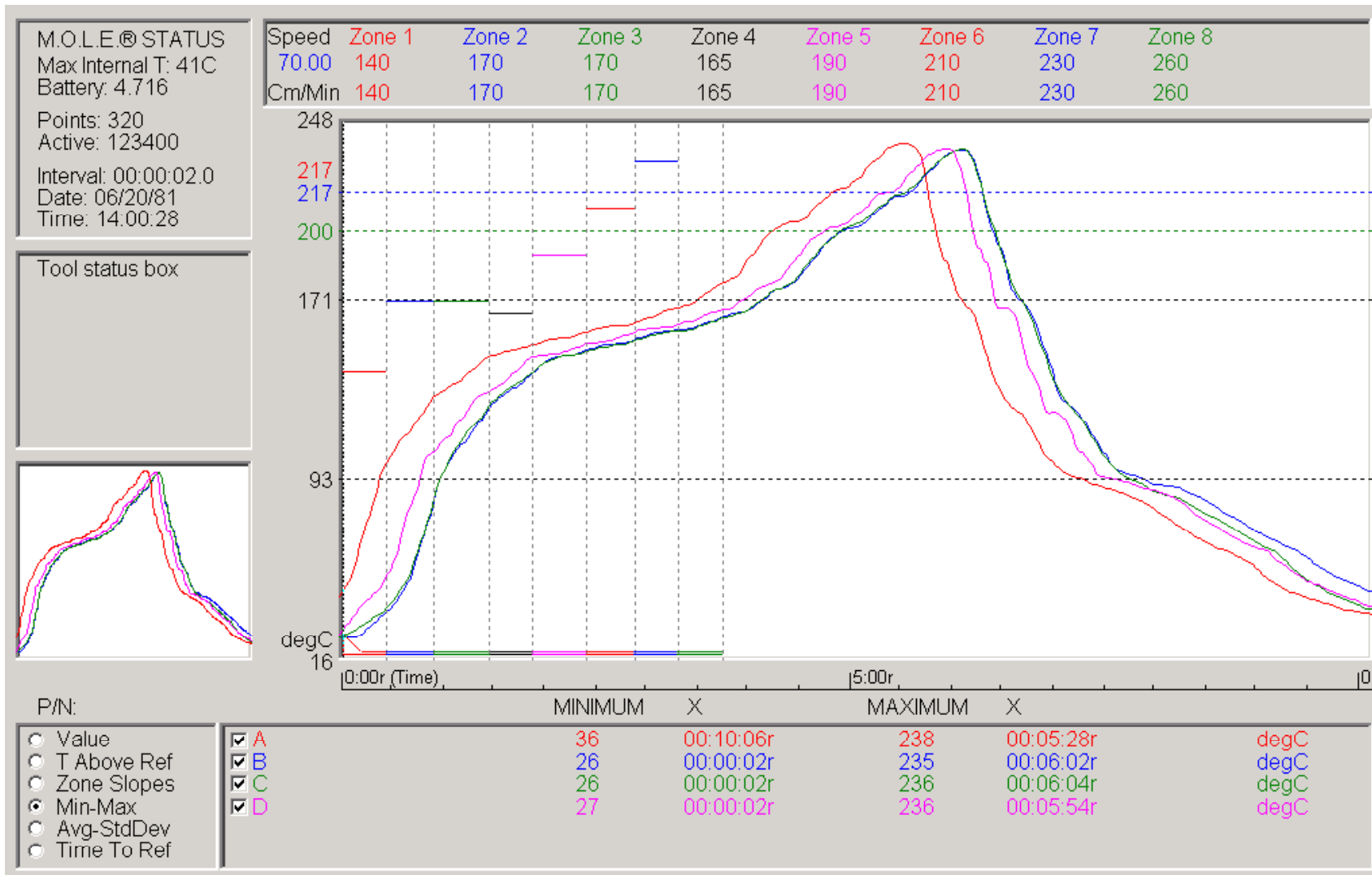
A DOE should always be used to establish optimum printing parameters

Solder Reflow

Reflow Profile	Description of Characteristics	Process Windows
Preheat	Initial heating of component solder balls	2.0°C to 2.5°C/sec
Thermal Soak	Solder paste dries out and flux activates	150°C to 170°C +/- 5°C 95 to 105 sec
Reflow	Time above 217°C Peak Reflow temperature	50 to 55 sec ~235°C
Cooling	Cooling rate	Max -4°C/sec

- The solder paste manufacturers reflow profile should be followed precisely for each individual paste
 - These profile guidelines are based on the temperature of the joint, which may vary significantly from the oven temperature
 - It is recommended that thermo-couples be used to characterize the realized reflow profiles at the joints
- Inert nitrogen environment is recommended for improved wetting and reduced voiding
- Oxygen level should be 20-50 ppm

Sample Reflow Profile



Post Reflow Inspection

- 2-D X-ray transmission system with Oblique View at Highest Magnification (OVHM) is highly recommended as a tool for post-reflow solder joint inspection
 - Detects opens
 - Detects shorts
 - Detects voids: This is especially critical to ensure good long-term solder joint reliability

- Minor chip outs & slight discoloration on the backside of the package are sometimes evident but should be ignored