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Stencil Design Guidelines

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Users of this publication are encouraged to participate in the development of future revisions.

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Table of Contents

1 PURPOSE ... 1
1.1 Terms and Definitions ... 1
1.1.1 *Aperture ... 1
1.1.2 *Aspect Ratio ... 1
1.1.3 *Area Ratio ... 1
1.1.4 Border ... 1
1.1.5 Contained Paste Transfer Head ... 1
1.1.6 Etch Factor ... 1
1.1.7 Fiducials ... 1
1.1.8 Fine-Pitch BGA/Chip Scale Package (CSP) ... 1
1.1.9 *Fine-Pitch Technology (FPT) ... 1
1.1.10 Foil ... 1
1.1.11 Frame ... 1
1.1.12 *Intrusive Soldering ... 1
1.1.13 *Land ... 1
1.1.14 Modification ... 1
1.1.15 *Overprinting ... 1
1.1.16 *Pad ... 1
1.1.17 *Squeegee ... 1
1.1.18 Standard BGA ... 1
1.1.19 *Stencil ... 1
1.1.20 Step Stencil ... 1
1.1.21 *Surface-Mount Technology (SMT) ... 1
1.1.22 *Through-Hole Technology (THT) ... 1
1.1.23 Ultra-Fine Pitch Technology ... 2

2 APPLICABLE DOCUMENTS ... 2
2.1 IPC ... 2

3 STENCIL DESIGN ... 2
3.1 Stencil Data ... 2
3.1.1 Data Format ... 2
3.1.2 Gerber® Format ... 2
3.1.3 Aperture List ... 2
3.1.4 Solder Paste Layer ... 2
3.1.5 Data Transfer ... 2
3.1.6 Panelized Stencils ... 2
3.1.7 Step-and-Repeat ... 2
3.1.8 Image Orientation/Rotation ... 2
3.1.9 Image Location ... 2
3.1.10 Identification ... 3
3.2 Aperture Design ... 3
3.2.1 Aperture Size ... 3
3.2.2 Aperture Size Versus Board Land Size for Tin Lead Solder Paste ... 6
3.2.3 Aperture Size versus Board Land Size for Lead Free Solder Paste ... 7
3.2.4 Glue Aperture Chip Component ... 8
3.2.5 Glue Apertures for Combination of Chip Components and Leaded Devices ... 8
3.3 Mixed Technology Surface-Mount/Through-Hole (Intrusive Reflow) ... 8
3.3.1 Solder Paste Volume ... 9
3.4 Mixed Technology Surface-Mount/Flip Chip ... 10
3.4.1 Two-Print Stencil for Surface-Mount/ Flip Chip ... 11
3.5 Step Stencil Design ... 11
3.5.1 Step-Down Stencil ... 11
3.5.2 Step-Up Stencil ... 11
3.5.3 Step Stencil for Contained Paste Transfer Heads ... 11
3.5.4 Relief-Etch Stencil ... 11
3.6 Fiducials ... 12
3.6.1 Global Fiducials ... 12
3.6.2 Local Fiducials ... 12

4 STENCIL FABRICATION ... 12
4.1 Foils ... 12
4.2 Frames ... 12
4.3 Stencil Border ... 12
4.4 Stencil Fabrication Technologies ... 12
4.4.1 Chemical Etch ... 12
4.4.2 Laser-Cut Stencils ... 12
4.4.3 Electroform ... 12
4.4.4 Hybrid ... 12
4.4.5 Trapezoidal Apertures ... 12
4.4.6 Additional Options ... 12

5 STENCIL MOUNTING ... 13
5.1 Location of Image on Metal ... 13
5.2 Centering ... 13
5.3 Additional Design Guidelines ... 13

6 STENCIL ORDERING ... 13

7 STENCIL USER'S INSPECTION/VERIFICATION ... 13

8 STENCIL CLEANING ... 13

9 END OF LIFE ... 13

APPENDIX A EXAMPLE ORDER FORM ... 14

Figures

Figure 3-1 Area Ratio Chart Showing Recommendations for a 4 mil Thick Stencil 4
Figure 3-2 Area Ratio Chart Showing Recommendations for a 5 mil Thick Stencil 5
Figure 3-3 Area Ratio Chart Showing Recommendations for a 6 mil Thick Stencil 5
Figure 3-4 Area Ratio Chart Showing Recommendations for a 8 mil Thick Stencil 6
Figure 3-5 Cross-Sectional View of A Stencil 6
Figure 3-6 Home Plate Aperture Design 7
Figure 3-7 Bow Tie Aperture Design 7
Figure 3-8 Oblong Aperture Design 7
Figure 3-9 Aperture Design for MELF Components and Chip Components 7
Figure 3-10 Window Pane Design for Ground Plane 7
Figure 3-11 Glue Stencil Aperture Design 8
Figure 3-12 Chip Component and SOIC Present on Board 8
Figure 3-13 Print Only Mode 15 mil Thick Stencil 8
Figure 3-14 Glue Stencil with Glue Reservoir 9
Figure 3-15 Through-Hole Solder Paste Volume 9
Figure 3-16 Overprint without Step 10
Figure 3-17 Overprint with Step (Squeegee Side) 10
Figure 3-18 Overprint with Step (Contact/Board Side) 10
Figure 3-19 Two-Print Through-Hole Stencil 10
Figure 3-20 Two-Print Stencil for Mixed Technology 11
Figure 4-1 Trapezoidal Apertures 12

Tables

Table 3-1 General Aperture Design Guideline Examples for Selective Surface-Mount Devices (Tin Lead Solder Paste) 3
Table 3-2 Process Window for Intrusive Soldering - Maximum Limits Desirable 3

Stencil Design Guidelines

1 PURPOSE

This document provides guides for the design and fabrication of stencils for solder paste and surface-mount adhesive. It is intended as a guideline only as much of the content is based on the experience of stencil designers, fabricators and users. Printing performance depends on many different variables and therefore no single set of design rules can be established.

1.1 Terms and Definitions All terms and definitions used throughout this handbook are in compliance with IPC-T-50. Definitions denoted with an asterisk (*) below are reprints from IPC-T-50. Other specific terms and definitions, essential for the discussion of the subject, are provided below.

1.1.1 *Aperture An opening in the stencil foil.

1.1.2 *Aspect Ratio The ratio of the width of the aperture to the thickness of the stencil foil.

1.1.3 *Area Ratio The ratio of the area of aperture opening to the area of aperture walls.

1.1.4 Border Peripheral tensioned mesh, either polyester or stainless steel, which keeps the stencil foil flat and taut. The border connects the foil to the frame.

1.1.5 Contained Paste Transfer Head A stencil printer head that holds, in a single replaceable component, the squeegee blades and a pressurized chamber filled with solder paste.

1.1.6 Etch Factor Etch Factor = Etched Depth/Lateral; Etch in a chemical etching process

1.1.7 Fiducials Reference marks on the stencil foil (and other board layers) for aligning the board and the stencil when using a vision system in a printer.

1.1.8 Fine-Pitch BGA/Chip Scale Package (CSP) Ball grid array with less than 1 mm [39 mil] pitch. This is also known as Chip Scale Package (CSP) when the package size is no more than 1.2X the area of the original die size.

1.1.9 *Fine-Pitch Technology (FPT) A surface-mount assembly technology with component terminations on centers less than or equal to 0.625 mm [24.61 mil].

1.1.10 Foil The sheet used to create the stencil.

1.1.11 Frame This may be made of tubular or cast aluminum to which a tensioned mesh (border) is permanently bonded using an adhesive. The foil is bonded to the mesh. Some foils can be mounted into a re-usable tensioning master frame and do not require a mesh border and negate a permanent bonding of the foil to the frame.

1.1.12 *Intrusive Soldering Intrusive soldering may also be known as paste-in-hole, pin-in-hole, or pin-in-paste soldering. This is a process in which the solder paste for the through-hole components is applied using the stencil. The through-hole components are inserted and reflow-soldered together with the surface-mount components.

1.1.13 *Land A portion of a conductive pattern usually used for the connection and/or attachment of components.

1.1.14 Modification The process of changing an aperture in size or shape.

1.1.15 *Overprinting The use of stencils with apertures larger than the lands or annular rings on the board.

1.1.16 *Pad See land.

1.1.17 *Squeegee A metal or polymer blade used to wipe a material (ink or solder paste) across a stencil or silk screen to force the material through the openings in the screen or stencil, onto the surface of a printed board or mounting structure. Normally the squeegee is mounted at an angle such that the contacting edge of the squeegee trails behind the print head and the face of the squeegee slopes forward.

1.1.18 Standard BGA Ball grid array with 1 mm [39 mil] pitch or larger.

1.1.19 *Stencil A thin sheet of material containing openings to reflect a specific pattern, designed to transfer a paste-like material to a substrate for the purpose of component attachment.

1.1.20 Step Stencil A stencil with more than one foil thickness level.

1.1.21 *Surface-Mount Technology (SMT) The electrical connection of components to the surface of a conductive pattern that does not utilize component holes.

1.1.22 *Through-Hole Technology (THT) The electrical connection of components to a conductive pattern by the use of component holes.