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### **Stencil Design Guidelines**

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# Stencil Design Guidelines

Developed by the Stencil Design Task Group (5-21e) of the Assembly and Joining Processes Committee (5-20) of IPC

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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

<b>1</b>	<b>PURPOSE</b>	1	3.2	Aperture Design	4
1.1	Terms and Definitions	1	3.2.1	Aperture Size	4
1.1.1	*Aperture	1	3.2.2	Aperture Size versus Board Land Size for Tin Lead Solder Paste	8
1.1.2	*Area Ratio	1	3.2.3	Aperture Size versus Board Land Size for Lead Free Solder Paste	9
1.1.3	*Aspect Ratio	1	3.2.4	Glue Aperture Chip Component	10
1.1.4	Border	1	3.2.5	Glue Apertures for Combination of Chip Components and Leaded Devices	10
1.1.5	Enclosed Print Head	1	3.2.6	Relief Etch with Glue Stencils	11
1.1.6	Etch Factor	1	3.3	Mixed Technology Surface-Mount/ Through-Hole (Intrusive Soldering)	11
1.1.7	Relief Etch	1	3.3.1	Solder Paste Volume	11
1.1.8	Fiducials	1	3.4	Mixed Technology Surface-Mount/ Flip Chip	13
1.1.9	Fine-Pitch BGA	1	3.4.1	Two-Print Stencil for Surface-Mount/ Flip Chip	13
1.1.10	Fine-Pitch Technology (FPT)	1	3.5	Step Stencil Design	13
1.1.11	Foil	1	3.5.1	Step-Down Stencil	14
1.1.12	Frame	1	3.5.2	Step-Up Stencil	14
1.1.13	Intrusive Soldering	1	3.5.3	Step Stencil for Enclosed Print Heads	14
1.1.14	*Land	1	3.5.4	Relief-Etch Stencil	14
1.1.15	Modification	1	3.6	Fiducials	14
1.1.16	*Overprinting	2	3.6.1	Global Fiducials	14
1.1.17	*Pad	2	3.6.2	Local Fiducials	14
1.1.18	Squeegee	2	3.7	Rework and Repair Stencils	14
1.1.19	Squeegee Direction	2	3.7.1	Mini Stencils	14
1.1.20	Standard BGA	2	3.7.2	Repair Tool for Printing Paste Directly on the Component	15
1.1.21	*Stencil	2	<b>4</b>	<b>STENCIL FABRICATION</b>	15
1.1.22	Step Stencil	2	4.1	Foils	15
1.1.23	*Surface-Mounting Technology (SMT)	2	4.2	Frames	15
1.1.24	*Through-Hole Technology (THT)	2	4.3	Stencil Border	15
1.1.25	Transfer Efficiency	2	4.4	Stencil Fabrication Technologies	15
1.1.26	Ultra-Fine Pitch Technology	2	4.4.1	Chemical Etch	15
<b>2</b>	<b>APPLICABLE DOCUMENTS</b>	2	4.4.2	Laser-Cut Stencils	16
2.1	IPC	2	4.4.3	Electroform	16
<b>3</b>	<b>STENCIL DESIGN</b>	3	4.4.4	Hybrid	16
3.1	Stencil Data	3	4.4.5	Trapezoidal Apertures	16
3.1.1	Data Format	3	4.4.6	Additional Options	16
3.1.2	Gerber® Format	3	<b>5</b>	<b>STENCIL MOUNTING</b>	16
3.1.3	Aperture List	3	5.1	Location of Image on Metal	16
3.1.4	Solder Paste Layer	3	5.2	Centering	16
3.1.5	Data Transfer	3	5.3	Additional Design Guidelines	16
3.1.6	Panelized Stencils	3			
3.1.7	Step-and-Repeat	3			
3.1.8	Image Orientation/Rotation	3			
3.1.9	Image Location	4			
3.1.10	Identification	4			

**6 STENCIL ORDERING** ..... 16

**7 STENCIL USER’S INSPECTION/VERIFICATION** .. 17

**8 STENCIL CLEANING** ..... 17

**9 END OF LIFE** ..... 17

**APPENDIX A: EXAMPLE ORDER FORM** ..... 19

**Figures**

Figure 3-1 4 mil Thick Stencil Tin Lead and Lead Free ..... 6

Figure 3-2 5 mil Thick Stencil Tin Lead and Lead Free ..... 6

Figure 3-3 6 mil Thick Stencil Tin Lead and Lead Free ..... 7

Figure 3-4 8 mil Thick Stencil Tin Lead and Lead Free ..... 7

Figure 3-5 Cross-Sectional View of A Stencil ..... 8

Figure 3-6 Home Plate Aperture Design ..... 8

Figure 3-7 Bow Tie Aperture Design ..... 9

Figure 3-8 Oblong Aperture Design ..... 9

Figure 3-9 Aperture Design for Cylindrical Components and Chip Components (All Corners Rounded) .. 9

Figure 3-10 Window Pane Design for Ground Plane ..... 9

Figure 3-11 Glue Stencil Aperture Design ..... 10

Figure 3-12 Chip Component and SOIC Present on Board ..... 10

Figure 3-13 Print Only Mode 15 mil Thick Stencil ..... 10

Figure 3-14 Glue Stencil With Glue Reservoir ..... 10

Figure 3-15 Through-Hole Solder Paste Volume ..... 11

Figure 3-16 Overprint Without Step ..... 12

Figure 3-17 Overprint With Step (Squeegee Side) ..... 12

Figure 3-18 Overprint With Step (Contact/Board Side) ..... 12

Figure 3-19 Two-Print Through-Hole Stencil ..... 13

Figure 3-20 Two-Print Stencil for Mixed Technology ..... 13

Figure 3-21 Print With Step ..... 13

Figure 3-22 Step Down ..... 14

Figure 3-23 Step Up ..... 14

Figure 3-24 BTC ..... 15

Figure 3-25 BGA ..... 15

Figure 4-1 Trapezoidal Apertures ..... 16

**Tables**

Table 3-1 Stencil Use Clauses ..... 4

Table 3-2 General Aperture Design Guideline Examples for Selective Surface-Mount Devices (Tin Lead Solder Paste) ..... 5

Table 3-3 Process Window for Intrusive Soldering - Maximum Limits Desirable ..... 11



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# Stencil Design Guidelines

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## 1 PURPOSE

This document provides a guide for the design and fabrication of stencils for solder paste and surface-mount adhesive. It is intended as a guideline only. 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 accordance with IPC-T-50. Definitions noted with an asterisk (\*) are quoted 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 \*Area Ratio** The ratio of the area of aperture opening to the area of aperture walls.

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

**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 Enclosed Print 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** Etched Depth/Lateral; Etch in a chemical etching process.

**1.1.7 Relief Etch** Also known as Etch Relief and Under Etch. Adding an under etch of the foil to create a pocket for raised features, labels, or a multi-print function.

**1.1.8 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.

**1.1.9 Fine-Pitch BGA** Ball grid array (BGA) with less than 1 mm [39 mil] pitch. Also known as chip scale package (CSP) when the package size is no more than 1.2X the area of the original die size.

**1.1.10 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].

**1.1.11 Foil** The sheet used to create the stencil.

**1.1.12 Frame** A frame may be made of tubular or cast aluminum to which a tensioned mesh (border) is permanently bonded using an adhesive.

**1.1.13 Intrusive Soldering** 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. Also known as Paste-In-Hole, Pin-In-Hole, or Pin-In-Paste Soldering.

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

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