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Design and Assembly Process Implementation for BGAs

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Users of this publication are encouraged to participate in the
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Table of Contents

1 SCOPE	1	4.2.1 Wire Bond	18
1.1 Purpose	1	4.2.2 Flip Chip	19
1.2 Intent	1	4.3 Standardization	19
2 APPLICABLE DOCUMENTS	1	4.3.1 Industry Standards for BGA	19
2.1 IPC	1	4.3.2 Ball Pitch	20
2.2 JEDEC	2	4.3.3 BGA Package Outline	21
3 SELECTION CRITERIA AND MANAGING BGA IMPLEMENTATION	2	4.3.4 Ball Size Relationships	21
3.1 Description of Infrastructure	3	4.3.5 Package-on-Package BGA	22
3.1.1 Land Patterns and Circuit Board Considerations	3	4.3.6 Coplanarity	22
3.1.2 Technology Comparison	5	4.4 Component Packaging Style Considerations	23
3.1.3 Assembly Equipment Impact	8	4.4.1 Solder Ball Alloy	23
3.1.4 Stencil Requirements	8	4.4.2 Ball Attach Process	24
3.1.5 Inspection Requirements	9	4.4.3 Ceramic Ball Grid Array	24
3.1.6 Test	9	4.4.4 Ceramic Column Grid Arrays	25
3.2 Time-to-Market Readiness	9	4.4.5 Tape Ball Grid Arrays	25
3.3 Methodology	9	4.4.6 Multiple Die Packaging	25
3.4 Process Step Analysis	9	4.4.7 System-in-Package (SiP)	26
3.5 BGA Limitations and Issues	9	4.4.8 3D Folded Package Technology	27
3.5.1 Visual Inspection	10	4.4.9 Ball Stack, Package-on-Package	27
3.5.2 Moisture Sensitivity	10	4.4.10 Folded and Stacked Packaging Combination	28
3.5.3 Thermally Unbalanced BGA Design	10	4.4.11 Package-on-Package	28
3.5.4 Rework	11	4.4.12 Benefits of Multiple Die Packaging	28
3.5.5 Cost	11	4.4.13 Solutions for Very Fine Pitch Array Packaging	28
3.5.6 Availability	12	4.5 BGA Connectors and Sockets	29
3.5.7 Voids in BGA	12	4.5.1 Material Considerations for BGA Connectors	29
3.5.8 Pad Cratering	12	4.5.2 Attachment Considerations for BGA Connectors	29
3.5.9 Standardization Issues	12	4.5.3 BGA Materials and Socket Types	30
3.5.10 Reliability Concerns	13	4.5.4 Attachment Considerations for BGA Sockets	30
3.5.11 Drivers for Lead-Free Technology	14	4.6 BGA Construction Materials	31
4 COMPONENT CONSIDERATIONS	14	4.6.1 Types of Substrate Materials	31
4.1 Semiconductor Packaging Comparisons and Drivers	14	4.6.2 Properties of Substrate Materials	33
4.1.1 Package Feature Comparisons	14	4.7 BGA Package Design Considerations	33
4.1.2 BGA Package Drivers	15	4.7.1 Power and Ground Planes	33
4.1.3 Cost Issues	15	4.7.2 Signal Integrity	34
4.1.4 Component Handling	15	4.7.3 Heat Spreader Incorporation Inside the Package	34
4.1.5 Thermal Performance	17	4.8 BGA Package Acceptance Criteria and Shipping Format	34
4.1.6 Real Estate	17	4.8.1 Missing Balls	34
4.1.7 Electrical Performance	17	4.8.2 Voids in Solder Balls	34
4.1.8 Mechanical Performance	17		
4.2 Die Mounting in the BGA Package	17		

4.8.3	Solder Ball Attach Integrity	35	6.3	Escape and Conductor Routing Strategies	54
4.8.4	Package and Ball Coplanarity	35	6.3.1	Escape Strategies	57
4.8.5	Moisture Sensitivity (Baking, Storage, Handling, Rebaking)	36	6.3.2	Surface Conductor Details	58
4.8.6	Shipping Medium (Tape and Reel, Trays, Tubes)	37	6.3.3	Dog Bone Through Via Details	58
4.8.7	Solder Ball Alloy	37	6.3.4	Design for Mechanical Strain	58
5	PRINTED BOARDS AND OTHER MOUNTING STRUCTURES	37	6.3.5	Uncapped Via-in-Pad and Impact on Reliability Issues	59
5.1	Types of Mounting Structures	37	6.3.6	Fine Pitch BGA Microvia in Pad Strategies	60
5.1.1	Organic Resin Systems	37	6.3.7	Power and Ground Connectivity	61
5.1.2	Inorganic Structures	37	6.4	Impact of Wave Solder on Top Side BGAs	61
5.1.3	Layering (Multilayer, Sequential or Build-Up)	37	6.4.1	Top Side Reflow	61
5.2	Properties of Mounting Structures	37	6.4.2	Impact of Top Side Reflow	61
5.2.1	Resin Systems	37	6.4.3	Methods of Avoiding Top Side Reflow	62
5.2.2	Reinforcements	38	6.4.4	Top Side Reflow for Lead-Free Boards	64
5.2.3	Laminate Material Properties	39	6.5	Testability and Test Point Access	64
5.3	Surface Finishes	40	6.5.1	Component Testing	64
5.3.1	Hot Air Solder Leveling (HASL)	41	6.5.2	Damage to the Solder Balls During Test and Burn-In	64
5.3.2	Organic Surface Protection (Organic Solderability Preservative) OSP Coatings	42	6.5.3	Bare Board Testing	65
5.3.3	Noble Platings/Coatings	42	6.5.4	Assembly Testing	66
5.4	Solder Mask	46	6.6	Other Design for Manufacturability Issues	68
5.4.1	Wet and Dry Film Solder Masks	46	6.6.1	Panel/Pallet Design	68
5.4.2	Photoimageable Solder Masks	47	6.6.2	In-Process/End Product Test Coupons	68
5.4.3	Jettable Solder Mask	47	6.7	Thermal Management	69
5.4.4	Registration of Board to Panel Image for Solder Mask	47	6.7.1	Conduction	70
5.4.5	Via Protection	47	6.7.2	Radiation	70
5.5	Thermal Spreader Structure Incorporation (e.g., Metal Core Boards)	48	6.7.3	Convection	70
5.5.1	Lamination Sequences	48	6.7.4	Thermal Interface Materials	71
5.5.2	Heat Transfer Pathway	48	6.7.5	Heat Sink Attachment Methods for BGAs	72
6	PRINTED CIRCUIT ASSEMBLY DESIGN CONSIDERATION	50	6.8	Documentation and Electronic Data Transfer ...	73
6.1	Component Placement and Clearances	50	6.8.1	Drawing Requirements	74
6.1.1	Pick and Place Requirements	50	6.8.2	Equipment Messaging Protocols	74
6.1.2	Repair/Rework Requirements	50	6.8.3	Specifications	75
6.1.3	Global Placement	51	7	ASSEMBLY OF BGAS ON PRINTED CIRCUIT BOARDS	76
6.1.4	Alignment Legends (Silkscreen, Copper Features, Pin 1 Identifier)	51	7.1	SMT Assembly Processes	76
6.2	Attachment Sites (Land Patterns and Vias)	52	7.1.1	Solder Paste and Its Application	76
6.2.1	Big vs. Small Land and Impact on Routing	52	7.1.2	Component Placement Impact	78
6.2.2	Solder Mask vs. Metal Defined Land Design	52	7.1.3	Vision Systems for Placement	78
6.2.3	Conductor Width	53	7.1.4	Reflow Soldering and Profiling	79
6.2.4	Via Size and Location	54	7.1.5	Material Issues	84
			7.1.6	Vapor Phase	84
			7.1.7	Cleaning vs. No-Clean	84
			7.1.8	Package Standoff	85
			7.2	Post-SMT Processes	86
			7.2.1	Conformal Coatings	86

7.2.2	Use of Underfills and Adhesives	86	8 RELIABILITY	117
7.2.3	Depaneling of Boards and Modules	90	8.1 Reliability Drivers for BGAs	117
7.3	Inspection Techniques	91	8.1.1 Cyclic strain	117
7.3.1	X-Ray Usage	91	8.1.2 Fatigue	117
7.3.2	X-Ray Image Acquisition	91	8.1.3 Creep	118
7.3.3	Definition and Discussion of X-Ray System Terminology	92	8.1.4 Creep and Fatigue Interaction	118
7.3.4	Analysis of the X-Ray Image	95	8.1.5 Mechanical reliability	119
7.3.5	Scanning Acoustic Microscopy	97	8.2 Damage Mechanisms and Failure of Solder Attachments	119
7.3.6	BGA Standoff Measurement	97	8.2.1 Comparison of Thermal Fatigue Crack Growth Mechanism in SAC vs. Tin/Lead BGA Solder Joints	119
7.3.7	Optical Inspection	97	8.2.2 Mixed Alloy Soldering	121
7.3.8	Destructive Analysis Methods	99	8.3 Solder Joints and Attachment Types	122
7.4	Testing and Product Verification	100	8.3.1 Global Expansion Mismatch	123
7.4.1	Electrical Testing	100	8.3.2 Local Expansion Mismatch	123
7.4.2	Test Coverage	101	8.3.3 Internal Expansion Mismatch	123
7.4.3	Burn-In Testing	101	8.4 Solder Attachment Failure	123
7.4.4	Product Screening Tests	101	8.4.1 Solder Attachment Failure Classification	123
7.5	Void Identification	101	8.4.2 Failure Signature-1: Cold Solder	123
7.5.1	Sources of Voids	101	8.4.3 Failure Signature-2: Land, Nonsolderable	124
7.5.2	Void Classification	102	8.4.4 Failure Signature-3: Ball Drop	124
7.5.3	Voids in BGA Solder Joints	102	8.4.5 Failure Signature-4: Missing Ball	124
7.6	Void Measurement	104	8.4.6 Failure Signature-5: PCB and BGA Stack Warpage	124
7.6.1	X-Ray Detection and Measurement Cautions	104	8.4.7 Failure Signature-6: Mechanical Failure	126
7.6.2	Impact of Voids	104	8.4.8 Failure Signature-7: Insufficient Reflow	127
7.6.3	Void Protocol Development	104	8.5 Critical Factors to Impact Reliability	127
7.6.4	Sampling Plans for Void Evaluation	105	8.5.1 Package Technology	127
7.7	Process Control for Void Reduction	106	8.5.2 Stand-Off Height	128
7.7.1	Process Parameter Impact on Void Formation	106	8.5.3 PCB Design Considerations	129
7.7.2	Process Control Criteria for Voids in Solder Balls	108	8.5.4 Reliability of Solder Attachments of Ceramic Grid Array	129
7.7.3	Process Control Criteria	109	8.5.5 Lead-Free Soldering of BGAs	129
7.8	Solder Defects	109	8.6 Design for Reliability (DfR) Process	135
7.8.1	Solder Bridging	109	8.7 Validation and Qualification Tests	135
7.8.2	Cold Solder	109	8.8 Screening Procedures	136
7.8.3	Opens	109	8.8.1 Solder Joint Defects	136
7.8.4	Insufficient/Uneven Heating	109	8.8.2 Screening Recommendations	136
7.8.5	Head-on-Pillow	110	8.9 Accelerated Reliability Testing	136
7.8.6	Hanging Ball/Non-Wet Open (NWO)	112	9 DEFECT AND FAILURE ANALYSIS CASE STUDIES	138
7.8.7	Component Defects	112	9.1 Solder Mask Defined BGA Conditions	138
7.8.8	Defect Correlation/Process Improvement	113	9.1.1 Solder Mask Defined and Nondefined Lands	138
7.9	Repair Processes	113	9.1.2 Solder Mask Defined Land on Product Board	139
7.9.1	Rework/Repair Philosophy	113	9.1.3 Solder Mask Defined BGA Failures	139
7.9.2	Removal of BGA	113		
7.9.3	Replacement	114		

9.2	Over-Collapse BGA Solder Ball Conditions ..	140	Figure 3-6	Plastic Ball Grid Array, Chip Wire Bonded	8
9.2.1	BGA Ball Shape without Heat Slug 500 μm Standoff Height	140	Figure 3-7	Ball Grid Array, Flip Chip Bonded	8
9.2.2	BGA Ball Shape with Heat Slug 375 μm Standoff Height	140	Figure 3-8	BGA Warpage	11
9.2.3	BGA Ball Shape with Heat Slug 300 μm Standoff Height	140	Figure 3-9	Examples of Pad Cratering	13
9.2.4	Critical Solder Paste Conditions	141	Figure 3-10	Various Possible Failure Modes for a BGA Solder Joint	13
9.2.5	Overly Thick Paste Deposit	141	Figure 4-1	Termination Types for Area Array Packages ..	16
9.2.6	Void Determination Through X-Ray and Cross-Section	141	Figure 4-2	BOC BGA Construction	18
9.2.7	Voids and Uneven Solder Balls	141	Figure 4-3	Top of Molded BOC Type BGA	18
9.2.8	Eggshell Void	142	Figure 4-4	Flip-Chip (Bumped Die) on BGA Substrate ...	19
9.3	BGA Interposer Bow and Twist	142	Figure 4-5	JEDEC Standard Format for Package-on- Package Components	22
9.3.1	BGA Interposer Warp	142	Figure 4-6	Polymer Coated Sphere Interconnection	23
9.3.2	Solder Joint Opens Due to Interposer Warp ...	143	Figure 4-7	Plastic Ball Grid Array (BGA) Package	24
9.4	Solder Joint Conditions	143	Figure 4-8	Cross-Section of a Thermally Enhanced Ceramic Ball Grid Array (CBGA) Package	25
9.4.1	Target Solder Condition	143	Figure 4-9	Ceramic Ball Grid Array (CBGA) Package with Molded Polymer Encapsulation	25
9.4.2	Solder Balls with Excessive Oxide	143	Figure 4-10	Ceramic-Based Column Grid Array (CCGA) Package	26
9.4.3	Evidence of Dewetting	144	Figure 4-11	Polyimide Film-Based Lead-Bond μBGA Package Substrate Furnishes Close Coupling Between Die Pad and Ball Contact	26
9.4.4	Mottled Condition	144	Figure 4-12	Comparing In-Package Circuit Routing Capability of the Single Metal Layer Tape Substrate to Two Metal Layer Tape Substrate	26
9.4.5	Tin/Lead Solder Ball Evaluation	144	Figure 4-13	Single Package Die-Stack BGA	27
9.4.6	SAC Alloy	144	Figure 4-14	Custom Eight Die (Flip-Chip and Wire-Bond) SiP Assembly	27
9.4.7	Cold Solder Joint	145	Figure 4-15	Folded Multiple-Die BGA Package	27
9.4.8	Incomplete Joining Due to Land Contamination	145	Figure 4-16	Eight Layer Ball Stack Package	27
9.4.9	Deformed Solder Ball Contamination	145	Figure 4-17	SO-DIMM Memory Card Assembly	28
9.4.10	Deformed Solder Ball	145	Figure 4-18	Folded and Stacked Multiple Die BGA Package	28
9.4.11	Insufficient Solder and Flux for Proper Joint Formation	146	Figure 4-19	Package-on-Package Assembly	28
9.4.12	Reduced Termination Contact Area	146	Figure 4-20	Semiconductors Packaged with μPILR Substrate	29
9.4.13	Solder Bridging	146	Figure 4-21	Solder Interface Between μPILR -Configured Substrate Interposer and Circuit Board	29
9.4.14	Incomplete Solder Reflow	146	Figure 4-22	BGA Connector	29
9.4.15	Missing Solder	147	Figure 4-23	PGA Socket Pins	30
9.4.16	Nonwet Open (NWO) Solder Joint	147	Figure 4-24	PGA Socket With and Without Pick and Place Cover	30
9.4.17	Head-on-Pillow (HoP) Solder Joint	147	Figure 4-25	LGA Contact Pin	31
10	GLOSSARY AND ACRONYMS	148	Figure 4-26	LGA Socket With and Without Pick and Place Cover	31
11	BIBLIOGRAPHY AND REFERENCES	150	Figure 4-27	Example of Missing Balls on a BGA Component	35
Appendix A	Process Control Characterization to Reduce the Occurrence of Voids	151	Figure 4-28	Example of Voids in Eutectic Solder Balls at Incoming Inspection	35
Figures					
Figure 3-1	BGA Package Manufacturing Process	3	Figure 4-29	Examples of Solder Ball/Land Surface Conditions	35
Figure 3-2	Area Array I/O Position Comparisons	5	Figure 4-30	Establishing BGA Coplanarity Requirement ...	36
Figure 3-3	Area Array I/O Position Patterns	5			
Figure 3-4	MCM Type 2S-L-WB	6			
Figure 3-5	Conductor Width to Pitch Relationship	7			

Figure 4-31	Ball Contact Positional Tolerance	36	Figure 6-25	Example of Wave Solder Temperature Profile of Topside of Mixed Component Assembly	62
Figure 5-1	Examples of Different Build-Up Constructions	38	Figure 6-26	Heat Pathways to BGA Solder Joint During Wave Soldering	63
Figure 5-2	Expansion Rate Above T_g	40	Figure 6-27	Methods of Avoiding BGA Topside Solder Joint Reflow	63
Figure 5-3	Hot Air Solder Level (HASL) Surface Topology Comparison	42	Figure 6-28	An Example of a Side Contact Made with a Tweezers Type Contact	64
Figure 5-4	Black Pad Related Fracture Showing Crack Between Nickel & Ni-Sn Intermetallic Layer ..	43	Figure 6-29	Pogo-Pin Type Electrical Contact Impressions on the Bottom of a Solder Ball	65
Figure 5-5	Crack Location for a) Black Pad Related Failure and (b) Interfacial Fracture When Using ENIG Surface Finish	43	Figure 6-30	Area Array Land Pattern Testing	66
Figure 5-6	Typical Mud Crack Appearance of Black Pad Surface	44	Figure 6-31	Board Panelization	69
Figure 5-7	A Large Region of Severe Black Pad with Corrosion Spikes Protruding into Nickel Rich Layer through Phosphorus Rich Layer Underneath Immersion Gold Surface	44	Figure 6-32	Comb Pattern Examples	70
Figure 5-8	Gold Embrittlement	45	Figure 6-33	Heat Sink Attached to a BGA with an Adhesive	72
Figure 5-9	Graphic Depiction of Electroless Nickel/ Electroless Palladium/Immersion Gold	45	Figure 6-34	Heat Sink Attached to a BGA with a Clip that Hooks onto the Component Substrate	72
Figure 5-10	Graphic Depiction of Directed Immersion Gold	45	Figure 6-35	Heat Sink Attached to a BGA with a Clip that Hooks into a Through-Hole on the Printed Circuit Board	72
Figure 5-11	Example of Micro Voids	46	Figure 6-36	Heat Sink Attached to a BGA with a Clip that Hooks onto a Stake Soldered in the Printed Circuit Board	73
Figure 5-12	Via Plug Methods	49	Figure 6-37	Heat Sink Attached to a BGA by Wave Soldering Its Pins in a Through-Hole in the Printed Circuit Board	73
Figure 5-13	Metal Core Board Construction Examples	50	Figure 7-1	Aspect and Area Ratios for Complete Paste Release	77
Figure 6-1	BGA Alignment Marks	51	Figure 7-2	High Lead and Eutectic Solder Ball and Joint Comparison	78
Figure 6-2	Solder Lands for BGA Components	53	Figure 7-3	Example of Peak Reflow Temperatures at Various Locations at or Near a BGA	79
Figure 6-3	Metal Defined Land Attachment Profile	53	Figure 7-4	Schematic of Reflow Profile for Tin/Lead Assemblies	81
Figure 6-4	Solder Mask Stress Concentration	53	Figure 7-5	An Example of Tin/Lead Profile with Multiple Thermocouples	81
Figure 6-5	Solder Joint Geometry Contrast	54	Figure 7-6	Schematic of Reflow Profile for Lead-Free Assemblies	81
Figure 6-6	Good/Bad Solder Mask Design	55	Figure 7-7	Examples of Lead-Free Profiles with Soak (Top) and Ramp to Peak (Bottom) with Multiple Thermocouples. The Profiles with Soak Tend to Reduce Voids in BGAs.	82
Figure 6-7	Examples of Metal-Defined Land	55	Figure 7-8	Locations of Thermocouples on a Board with Large and Small Components	82
Figure 6-8	Quadrant Dog Bone BGA Pattern	55	Figure 7-9	Recommended Locations of Thermocouples on a BGA	82
Figure 6-9	Square Array	56	Figure 7-10	Effect of Having Solder Mask Relief Around the BGA Lands of the Board	86
Figure 6-10	Rectangular Array	56	Figure 7-11	Map of Underfill Adhesive Usage for BGA and Other Packages	88
Figure 6-11	Depopulated Array	56	Figure 7-12	Flow of Underfill Between Two Parallel Surfaces	88
Figure 6-12	Square Array with Missing Balls	56	Figure 7-13	Examples of Underfill Voids - small, medium and large; upper left, lower left and left of solder balls, respectively	89
Figure 6-13	Interspersed Array	57			
Figure 6-14	Conductor Routing Strategy	58			
Figure 6-15	BGA Dogbone Land Pattern Preferred Direction for Conductor Routing	59			
Figure 6-16	Preferred Screw and Support Placement	59			
Figure 6-17	Connector Screw Support Placement	59			
Figure 6-18	Cross Section of 0.75 mm Ball with Via-in-Pad Structure (Indent to the Upper Left of the Ball is an Artifact.)	59			
Figure 6-19	Cross Section of Via-in-Pad Design Showing Via Cap and Solder Ball	60			
Figure 6-20	Via-in-Pad Process Descriptions	60			
Figure 6-21	Microvia Example	61			
Figure 6-22	Microvia-in-Pad Voiding	61			
Figure 6-23	Ground or Power BGA Connection	61			
Figure 6-24	Example of Top Side Reflow Joints	62			

Figure 7-14	Example of Partial Underfill - package was pulled from the PCB and dark underfill can be seen in the corners	89	Figure 7-49	Example of Head-on-Pillow Showing Ball and Solder Paste have not Coalesced	110
Figure 7-15	Corner Applied Adhesive	90	Figure 7-50	Head-on-Pillow Process Sequence Occurrences	111
Figure 7-16	Critical Dimension for Application of Prerflow Corner Glue	90	Figure 7-51	HoP Due to High Package Warpage	111
Figure 7-17	Typical Corner Glue Failure Mode in Shock if Glue Area is Too Low - Solder Mask Rips Off Board and Does Not Protect the Solder Joints	90	Figure 7-52	Example of Liquidus Time Delay	111
Figure 7-18	Fundamentals of X-Ray Technology	92	Figure 7-53	Solder Particles on Board Noncoalesced After Reflow	111
Figure 7-19	X-Ray Example of Missing Solder Balls	92	Figure 7-54	Hanging Ball Examples	112
Figure 7-20	X-ray Example of Voiding in Solder Ball Contacts	92	Figure 7-55	X-Ray Image of Popcorning	112
Figure 7-21	Manual X-Ray System Image Quality	92	Figure 7-56	X-Ray Image Showing Warpage in a BGA ..	113
Figure 7-22	Example of X-Ray Pin Cushion Distortion and Voltage Blooming	93	Figure 7-57	BGA/Assembly Shielding Examples	114
Figure 7-23	Transmission image (2D)	93	Figure 8-1	BGA Solder Joint of Eutectic Tin/Lead Solder Composition Exhibiting Lead Rich (Dark) Phase and Tin Rich (Light) Phase Grains ...	120
Figure 7-24	Tomosynthesis image (3D)	93	Figure 8-2	Socket BGA Solder Joints of SnAgCu Composition, Showing the Solder Joint Comprised of 6 Grains (Top Photo) and a Single Grain (Bottom Photo).	120
Figure 7-25	Laminographic Cross-Section Image (3D)	94	Figure 8-3	Thermal-Fatigue Crack Propagation in Eutectic Tin/Lead Solder Joints in a CBGA Module	120
Figure 7-26	Transmission Example	94	Figure 8-4	Thermal-Fatigue Crack Propagation in Sn-3.8Ag-0.7Cu Joints in a CBGA Module	120
Figure 7-27	Oblique Viewing Board Tilt	94	Figure 8-5	Incomplete Solder Joint Formation for 1% Ag Ball Alloy Assembled at Low End of Typical Process Window	122
Figure 7-28	Oblique Viewing Detector Tilt	94	Figure 8-6	Solder Joint Failure Due to Silicon and Board CTE Mismatch	123
Figure 7-29	Top Down View of FBGA Solder Joints	95	Figure 8-7	Grainy Appearing Solder Joint	124
Figure 7-30	Oblique View of FBGA Solder Joints	95	Figure 8-8	Nonsolderable Land (Black Pad)	124
Figure 7-31	Tomosynthesis	96	Figure 8-9	Land Contamination (Solder Mask Residue)	124
Figure 7-32	Scanned Beam X-Ray Laminography	96	Figure 8-10	Solder Ball Drop	124
Figure 7-33	Scanning Acoustic Microscopy	97	Figure 8-11	Missing Solder Ball	125
Figure 7-34	Endoscope Example	98	Figure 8-12	Example of Dynamic Warpage of Flip Chip BGA Packages and PCBs	125
Figure 7-35	Lead-Free 1.27 mm Pitch BGA Reflowed in Nitrogen and Washed Between SMT Passes	98	Figure 8-13	Example of a Severely Warped BGA Package and PCB After Reflow Soldering in an Un-Optimized SMT Process	125
Figure 7-36	Lead-Free BGA Reflowed in Air and Washed Between SMT Passes	98	Figure 8-14	Examples of Acceptable Convex Solder Joints with Solder Joint Surface Tangents Shown in the Top Left Photo	126
Figure 7-37	Engineering Crack Evaluation Technique	99	Figure 8-15	Example of an Acceptable Columnar Solder Joint	126
Figure 7-38	A Solder Ball Cross Sectioned Through a Void in the Solder Ball	100	Figure 8-16	Two Examples of Pad Cratering (Located at Corner of BGA)	127
Figure 7-39	Cross-Section of a Crack Initiation at the Ball/Pad Interface	100	Figure 8-17	Pad Crater Under 1.0 mm Pitch Lead-Free Solder Ball. Crack in Metal Trace Connected to the Land is Clear; However, the Pad Crater is Difficult to See in Bright Field Microscopy.	127
Figure 7-40	No Dye Penetration Under the Ball	100	Figure 8-18	Cross-Section Photographs Illustrating Insufficient Melting of Solder Joints During Reflow Soldering. These Solder Joints are Located Below the Cam of a Socket.	128
Figure 7-41	Corner Balls have 80-100% Dye Penetration Which Indicate a Crack	100	Figure 8-19	Solder Mask Influence	129
Figure 7-42	Small Voids Clustered in Mass at the Ball-to-Land Interface	102			
Figure 7-43	Typical Size and Location of Various Types of Voids in a BGA Solder Joint	103			
Figure 7-44	X-Ray Image of Solder Balls with Voids at 50 kV (a) and 60 kV (b)	104			
Figure 7-45	Examples of Suggested Void Protocols	105			
Figure 7-46	Example of Voided Area at Land and Board Interface	108			
Figure 7-47	X-Ray Image Showing Uneven Heating	110			
Figure 7-48	X-Ray Image at 45° Showing Insufficient Heating in One Corner of the BGA	110			

Figure 8-20	Reliability Test Failure Due to Very Large Void	129
Figure 8-21	Comparison of a Lead-Free (SnAgCu) and Tin/Lead (SnPb) BGA Reflow Soldering Profiles	132
Figure 8-22	Endoscope Photo of a SnAgCu BGA Solder Ball	133
Figure 8-23	Comparison of Reflow Soldering Profiles for Tin/Lead, Backward Compatibility and Total Lead-Free Board Assemblies	134
Figure 8-24	Micrograph of a cross-section of a BGA SnAgCu solder ball, assembled onto a board with tin/lead solder paste using the standard tin/lead reflow soldering profile. The SnAgCu solder ball does not melt; black/grey interconnecting fingers are lead-rich grain boundaries; rod shape particles are Ag ₃ Sn IMCs; grey particles are Cu ₆ Sn ₅ IMCs.	134
Figure 8-25	Micrograph of a cross-section of a BGA SnAgCu solder ball, assembled onto a board with tin/lead solder paste using a backward compatibility reflows soldering profile. The SnAgCu solder ball has melted.	134
Figure A-1	Typical Flow Diagram for Void Assessment	151
Figure A-2	Voids in BGAs with Crack Started at Corner Lead	155
Figure A-3	Void Diameter Related to Land Size	155

Tables

Table 3-1	Multichip Module Definitions	6
Table 3-2	Number of Escapes vs. Array Size on Two Layers of Circuitry	6
Table 3-3	Potential Plating or Component Termination Material Properties	10
Table 3-4	Example of Semiconductor Cost Predictions ...	12
Table 4-1	JEDEC Standard JEP95-1/5 Allowable Ball Diameter Variations for FBGA ...	20
Table 4-2	Ball Diameter Sizes for PBGAs	20
Table 4-3	Future Ball Size Diameters for DSPBGAs	21
Table 4-4	Land Size Approximation	21
Table 4-5	Land-to-Ball Calculations for Current and Future BGA Packages (mm)	22
Table 4-6	Examples of JEDEC Registered BGA Outlines	22
Table 4-7	Pb-Free Alloy Variations	24
Table 4-8	IPC-4101C FR-4 Property Summaries - Specification Sheets Projected to Better Withstand Lead-Free Assembly	32
Table 4-9	Typical Properties of Common Dielectric Materials for BGA Package Substrates	34
Table 4-10	Moisture Classification Level and Floor Life	36
Table 5-1	Environmental Properties of Common Dielectric Materials	39

Table 5-2	Key Attributes for Various Board Surface Finishes	41
Table 5-3	Via Filling/Encroachment to Surface Finish Process Evaluation	48
Table 5-4	Via Fill Options	50
Table 6-1	Number of Conductors Between Solder Lands for 1.27 mm Pitch BGAs	52
Table 6-2	Number of Conductors Between Solder Lands for 1.0 mm Pitch BGAs	52
Table 6-3	Maximum Solder Land to Pitch Relationship	53
Table 6-4	Escape Strategies for Full Arrays	57
Table 6-5	Conductor Routing - 1.27 mm Pitch	58
Table 6-6	Conductor Routing - 1.0 mm Pitch	58
Table 6-7	Conductor Routing - 0.8 mm Pitch	58
Table 6-8	Conductor Routing - 1.27 mm Pitch	58
Table 6-9	Conductor Routing - 1.0 mm Pitch	58
Table 6-10	Conductor Routing - 0.8 mm Pitch	58
Table 6-11	Effects of Material Type on Conduction	71
Table 6-12	Emissivity Ratings for Certain Materials	71
Table 7-1	Particle Size Comparisons	76
Table 7-2	Example of Solder Paste Volume Requirements for Ceramic Array Packages	78
Table 7-3	Profile Comparison Between SnPb and SAC Alloys	80
Table 7-4	Inspection Usage Application Recommendations	91
Table 7-5	Field of View for Inspection	96
Table 7-6	Void Classification	103
Table 7-7	Ball-to-Void Size Image - Comparison for Various Ball Diameters	105
Table 7-8	C=0 Sampling Plan (Sample Size for Specific Index Value*)	106
Table 7-9	Repair Process Temperature Profiles for Tin Lead Assembly	116
Table 7-10	Repair Process Temperature Profiles for Lead-Free Assemblies	116
Table 8-1	Tin/Lead Component Compatibility with Lead-Free Reflow Soldering	121
Table 8-2	Typical Stand-Off Heights for Tin/Lead Balls (in mm)	128
Table 8-3	Common Solders, Their Melting Points, Advantages and Drawbacks	130
Table 8-4	Comparison of Lead-Free Solder Alloy Compositions in The Sn-Ag-Cu Family Selection by Various Consortia	131
Table 8-5	Types of Lead-Free Assemblies Possible	133
Table 8-6	Accelerated Testing for End Use Environments	137
Table A-1	Corrective Action Indicator for Lands used with 1.5, 1.27 or 1.0 mm Pitch	152
Table A-2	Corrective Action Indicator for Lands used with 0.8, 0.65 or 0.5 mm Pitch	153
Table A-3	Corrective Action Indicator for Microvia in Pad Lands used with 0.5, 0.4 or 0.3 mm Pitch	154

Design and Assembly Process Implementation for BGAs

1 SCOPE

This document describes the design and assembly challenges for implementing Ball Grid Array (BGA) and Fine Pitch BGA (FBGA) technology. The effect of BGA and FBGA on current technology and component types is addressed, as is the move to lead-free assembly processes. The focus on the information contained herein is on critical inspection, repair, and reliability issues associated with BGAs. Throughout this document the word “BGA” can mean all types and forms of ball/column/bump/pillar grid array packages.

1.1 Purpose The target audiences for this document are managers, design and process engineers, and operators and technicians who deal with the electronic assembly, inspection, and repair processes. The purpose is to provide useful and practical information to those who are using BGAs, those who are considering BGA implementation and companies who are in the process of transition from standard tin/lead reflow processes to those that use lead-free materials.

1.2 Intent This document, although not a complete recipe, identifies many of the characteristics that influence the successful implementation of a robust assembly process. In many applications, the variation between assembly methods and materials is reviewed with the intent to highlight significant differences that relate to the quality and reliability of the final product. The accept/reject criteria for BGA assemblies, used in contractual agreements, is established by J-STD-001 and IPC-A-610.

An additional challenge in implementing BGA assembly processes, along with other types of components, is the need to meet the legislative directives that declare certain materials as hazardous to the environment. The requirements to eliminate these materials from electronic assemblies have caused component manufacturers to rethink the materials used for encapsulation, the plating finishes on the components and the metal alloys used in the assembly attachment process.

2 APPLICABLE DOCUMENTS

2.1 IPC¹

J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies

J-STD-020 Handling Requirements for Moisture Sensitive Components

J-STD-033 Standard for Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices

J-STD-609 Marking and Labeling of Components, PCBs and PCBAs to Identify Lead (Pb), Pb-Free and Other Attributes

IPC-T-50 Terms and Definitions for Printed Boards and Printed Board Assemblies

IPC-D-279 Design Guidelines for Reliable Surface Mount Technology Printed Board Assemblies

IPC-D-356 Bare Substrate Electrical Test Information in Digital Form

IPC-A-600 Acceptability of Printed Boards

IPC-A-610 Acceptability of Electronic Assemblies

IPC-SM-785 Guidelines for Accelerated Reliability Testing of Surface Mount Attachments

IPC-1601 Printed Board Handling and Storage Guidelines

IPC-2221 Generic Standard on Printed Board Design

IPC-2581 Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology

IPC-2611 Generic Requirements for Electronic Product Documentation

IPC-2614 Sectional Requirements for Board Fabrication Documentation

IPC-2616 Sectional Requirements for Assembly Documentation

IPC-4554 Specification for Immersion Tin Plating for Printed Circuit Boards

IPC-4761 Design Guide for Protection of Printed Board Via Structures

IPC-7093 Design and Assembly Process Implementation for Bottom Termination Components

IPC-7094 Design and Assembly Process Implementation for Flip Chip and Die Size Components

IPC-7351 Generic Requirements for Surface Mount Design and Land Pattern Standard

IPC-7525 Stencil Design Guidelines

1. www.ipc.org