Package Reliability Qualification Report

BOM Standardization:

QFP Base Device	Package Type	Body Size	Lead Count
PCI9080-3/G	QFP	28X28	208L
PCI9052/G	QFP	28X28	160L
PCI6152-xx33PC/G	QFP	28X28	160L
PCI6150-xx66PC/G	QFP	28X28	208L
BGA Base Device	**Package Type**	**Body Size**	**Ball Count**
PEX8532-xx25BI/G	HSBGA	35x35	680L
PEX8524-xx25VBI/G	HSBGA	35x35	680L
PEX8516-xx25BI/G	HSBGA	27x27	312L
PEX8114-xx13BI G	PBGA	17x17	256L
PCI9656-xx66BI/G	PBGA	27x27	272L
PCI9056-xx66BI G	PBGA	17x17	256L
PCI6150-xx66BC G	PBGA	17x17	256L
PCI6540-xx13BI/G	HSBGA	27x27	380L
PCI6520-xx13BI/G	HSBGA	27x27	380L
PCI6466-xx66BI/G	HSBGA	27x27	380L
PCI6254-xx66BC/G	PBGA	31X31	365L
PCI6154-xx66BC/G	PBGA	31X31	304L

For ASE Malaysia (ASEM)

8/5/2011

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1. Purpose:

Support the qualification of the QFP and P/HSBGA BOM conversion activity, which also incorporates the LBGA package type change to further standardize the processes and improve productivity at our package assembly supplier, ASE Malaysia (ASEM). There are no other changes and hence only package qualification is required.

This document summarizes the qualification plan and the results of the product as per below.

2. Scope:

This QFP and P/HSBGA BOM conversion activity will further standardize the processes and improve productivity at our package assembly supplier at ASE Malaysia (ASEM). These are established and mature materials which will provide enhancement in design robustness, improving manufacturability, and performance.

3. Background information:

Assembly Process Information (ASEM)

QFP Base Device	QFP	As Is	To be
All QFP Devices	Die Attach Epoxy	ABLEBOND 8361J	YIZBOND 8143
All QFP Devices	Mold Compound	SUMITOMO G700LY, G600T	HITACHI CEL9240HFA10AKQ
All QFP Devices	Lead Frame Matrix	Low Density	High Density
PCI9052/G	Wire	Gold (Au)	Copper (Cu)

BGA Base Device	P/HSBGA	As Is	To be
All BGA Devices	Die Attach Epoxy	ABLEBOND 8510AA, 2000B	ABLEBOND 2100A
All BGA Devices	Mold Compound	COOKSON SMTB-1LV KYOCERA KEG1250 LKDS SUMITOMO EME7730C	KYOCERA KEG1250 LKDS
All BGA Devices	Heat Slug Epoxy	DOW CORNING DC7920	ABLEBOND 2025D
All BGA Devices	Substrate Matrix	Low Density	High Density
All BGA Devices without G (Green Devices)	Substrate material	HL832/(AUS 5 or AUS 303)	HL832NX/ AUS 308
PCI9656-xx66BI/G	Wire	Gold (Au)	Copper (Cu)
PEX8532-xx25BI/G, PEX8524-xx25VBI/G	Marking	Ink	Laser

BGA Base Device	Package Type	As Is	To be
PCI9656-xx66BI/G	27x27 PBGA 272L	PBGA	LBGA
PEX8114-xx13BI/ G	17x17 PBGA 256L	PBGA	LBGA
PCI9056-xx66BI/ G	17x17 PBGA 256L	PBGA	LBGA
PCI6150-xx66BC/ G	17x17 PBGA 256L	PBGA	LBGA

4 Package Qualification Plan and Results

4.1 Pre-Condition Level 3 (JESD22-A113-F), 192hrs 30C/60%RH, Sample Size: 45 per Lot/DC

QFP Lot #/ID	SS	Results	Notes
PCI6150-xx66PC/G: VM3352.1F/1044	45	0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45	0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	0/45	Conditional/Full Qualification
PCI9052/G: B0V201.1B/1047	45	0/45	Report Date: 4/21/11
PCI9052/G: B0V201.1C/1048	45	0/45	
PCI9052/G: B0V201.1D/1049	45	0/45	

PBGA/HSBGA Lot #/ID	SS	Results	Notes
PEX8516-xx25BI/G: G3X207.2A/1049	45	0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45	0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0U060.1I/1051	45	0/45	Report Date: 4/21/11
PCI9656-xx66BI/G K0U060.1J/1052	45	0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45	0/45	

LBGA Lot #/ID	SS	Results	Notes
PEX8114-xx13BI/G G4X051.1C/1120	45	0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45	0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0X882.1A/1113	45	0/45	Report Date: 8/5/11
PCI9656-xx66BI/G K0X882.1B/1114	45	0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45	0/45	

4.2 uHAST per JESD22-A118C, 130C/85% RH, 96 hrs (after precon from 1 above)
Sample Size: 45

QFP Lot #/ID	SS	Results	Notes
PCI6150-xx66PC/G: VM3352.1F/1044	45	0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45	0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	0/45	Conditional/Full Qualification
PCI9052/G: B0V201.1B/1047	45	0/45	Report Date: 4/21/11
PCI9052/G: B0V201.1C/1048	45	0/45	
PCI9052/G: B0V201.1D/1049	45	0/45	

PBGA/HSBGA Lot #/ID	SS	Results	Notes
PEX8516-xx25BI/G: G3X207.2A/1049	45	0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45	0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0U060.1I/1051	45	0/45	Report Date: 4/21/11
PCI9656-xx66BI/G K0U060.1J/1052	45	0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45	0/45	

LBGA Lot #/ID	SS	Results	sfdNotes
PEX8114-xx13BI/G G4X051.1C/1120	45	0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45	0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0X882.1A/1113	45	0/45	Report Date: 8/5/11
PCI9656-xx66BI/G K0X882.1B/1114	45	0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45	0/45	

4.3 Temperature Cycle Test (JESD22-A104B, Condition C), - 65˚C to 150˚C 1000 cycles (after precon from 1 above)

Sample Size: 45

QFP Lot #/ID	SS	Cycles	Results	Notes
PCI6150-xx66PC/G: VM3352.1F/1044	45		0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45		0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	250 cy	0/45	
PCI9052/G: B0V201.1B/1047	45	cum	0/45	
PCI9052/G: B0V201.1C/1048	45		0/45	
PCI9052/G: B0V201.1D/1049	45		0/45	
PCI6150-xx66PC/G: VM3352.1F/1044	45		0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45		0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	500 cy	0/45	
PCI9052/G: B0V201.1B/1047	45	cum	0/45	
PCI9052/G: B0V201.1C/1048	45		0/45	
PCI9052/G: B0V201.1D/1049	45		0/45	
PCI6150-xx66PC/G: VM3352.1F/1044	45		0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45		0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	1000 cy	0/45	Conditional/Full Qualification
PCI9052/G: B0V201.1B/1047	45	cum	0/45	Report Date: 4/21/11
PCI9052/G: B0V201.1C/1048	45		0/45	
PCI9052/G: B0V201.1D/1049	45		0/45	

PBGA/HSBGA Lot #/ID	SS	Cycles	Results	Notes
PEX8516-xx25BI/G: G3X207.2A/1049	45		0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45		0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	250 cy	0/45	
PCI9656-xx66BI/G K0U060.1I/1051	45	cum	0/45	
PCI9656-xx66BI/G K0U060.1J/1052	45		0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45		0/45	
PEX8516-xx25BI/G: G3X207.2A/1049	45		0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45		0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	500 cy	0/45	
PCI9656-xx66BI/G K0U060.1I/1051	45	cum	0/45	
PCI9656-xx66BI/G K0U060.1J/1052	45		0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45		0/45	
PEX8516-xx25BI/G: G3X207.2A/1049	45		0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45		0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	1000 cy	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0U060.1I/1051	45	cum	0/45	Report Date: 4/21/11
PCI9656-xx66BI/G K0U060.1J/1052	45		0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45		0/45	

LBGA Lot #/ID	SS	Cycles	Results	Notes
PEX8114-xx13BI/G G4X051.1C/1120	45		0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45		0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	250 cy	0/45	
PCI9656-xx66BI/G K0X882.1A/1113	45	cum	0/45	
PCI9656-xx66BI/G K0X882.1B/1114	45		0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45		0/45	
PEX8114-xx13BI/G G4X051.1C/1120	45		0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45		0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	500 cy	0/45	
PCI9656-xx66BI/G K0X882.1A/1113	45	cum	0/45	
PCI9656-xx66BI/G K0X882.1B/1114	45		0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45		0/45	
PEX8114-xx13BI/G G4X051.1C/1120	45		0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45		0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	1000 cy	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0X882.1A/1113	45	cum	0/45	Report Date: 8/5/11
PCI9656-xx66BI/G K0X882.1B/1114	45		0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45		0/45	

4.4 High Temperature Storage Life (JESD22-A103-C), 150˚C for 1000 hours (after precon from 1 above)
Sample Size: 45

QFP Lot #/ID	SS	Results	Notes
PCI6150-xx66PC/G: VM3352.1F/1044	45	0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45	0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	0/45	Conditional/Full Qualification
PCI9052/G: B0V201.1B/1047	45	0/45	Report Date: 4/21/11
PCI9052/G: B0V201.1C/1048	45	0/45	
PCI9052/G: B0V201.1D/1049	45	0/45	

PBGA/HSBGA Lot #/ID	SS	Results	Notes
PEX8516-xx25BI/G: G3X207.2A/1049	45	0/45	
PEX8532-xx25BI/G: G3U061.1A/1048	45	0/45	
PEX8532-xx25BI/G: G3U061.1B/1049	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0U060.1I/1051	45	0/45	Report Date: 4/21/11
PCI9656-xx66BI/G K0U060.1J/1052	45	0/45	
PCI9656-xx66BI/G K0U060.1K/1101	45	0/45	

LBGA Lot #/ID	SS	Results	Notes
PEX8114-xx13BI/G G4X051.1C/1120	45	0/45	
PEX8114-xx13BI/G G4X051.1D/1121	45	0/45	
PEX8114-xx13BI/G G4X051.1E/1122	45	0/45	Conditional/Full Qualification
PCI9656-xx66BI/G K0X882.1A/1113	45	0/45	Report Date: 8/5/11
PCI9656-xx66BI/G K0X882.1B/1114	45	0/45	
PCI9656-xx66BI/G K0X882.1C/1115	45	0/45	

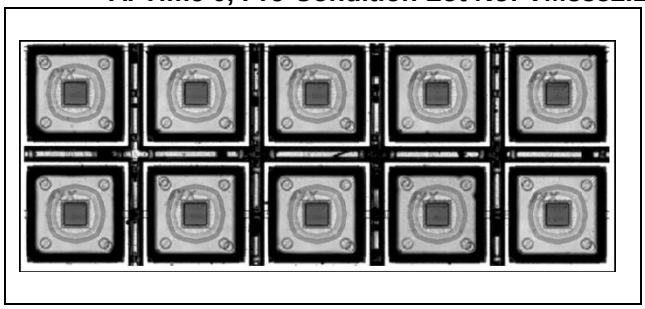
4.5 Pressure Cooker Test (JESD-A102-C), 100%RH/ 121˚C, 168 Hrs.
Sample Size: 45

QFP Lot #/ID	SS	Results	Notes
PCI6150-xx66PC/G: VM3352.1F/1044	45	0/45	
PCI6150-xx66PC/G: VN8714.1A/1045	45	0/45	
PCI6150-xx66PC/G: VN8714.1B/1046	45	0/45	Conditional/Full Qualification
PCI9052/G: B0V201.1B/1047	45	0/45	Report Date: 4/21/11
PCI9052/G: B0V201.1C/1048	45	0/45	
PCI9052/G: B0V201.1D/1049	45	0/45	

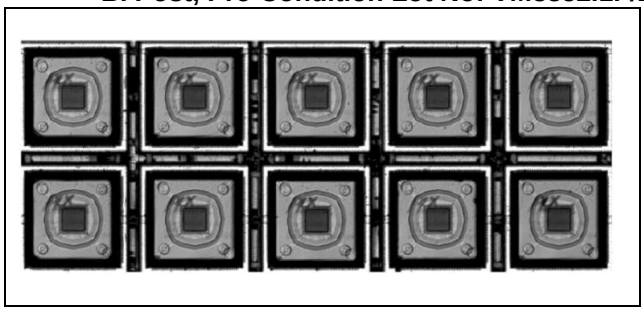
4.6 CSAM Data

4.6.1 PCI6150-xx66PC

A. Time 0, Pre-Condition Lot No: VM3352.1F/DC:1044

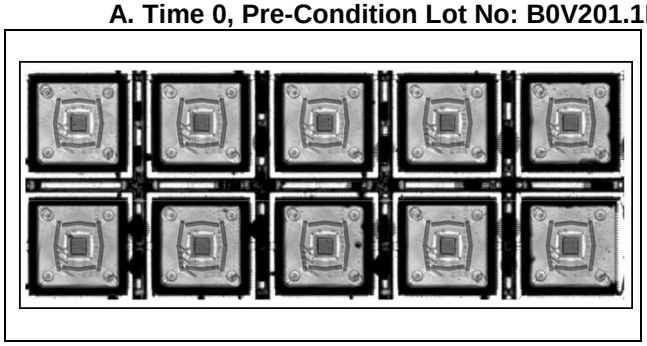


B. Post, Pre-Condition Lot No: VM3352.1F/DC:1044

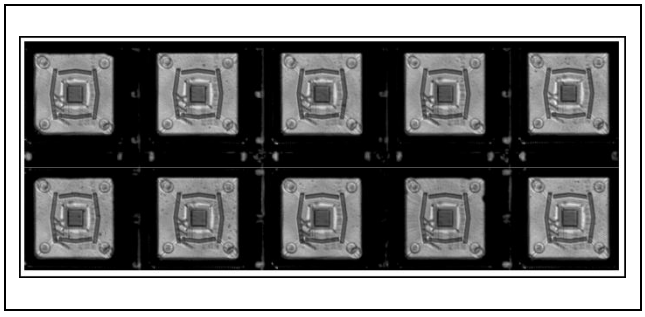


4.6.2 PCI9052/G

A. Time 0, Pre-Condition Lot No: B0V201.1B/DC:1047



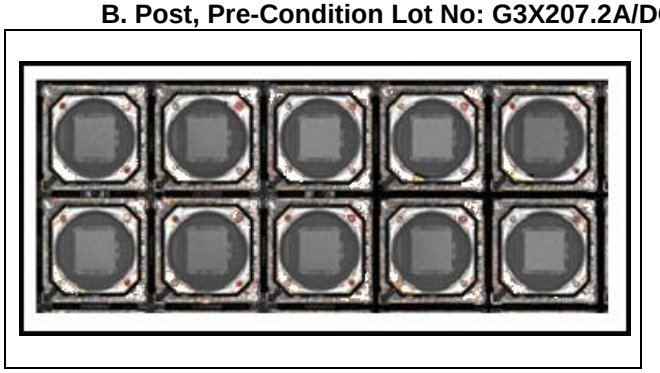
B. Post, Pre-Condition Lot No: B0V201.1B/DC:1047



4.6.3 PEX8516-xx25BI/G

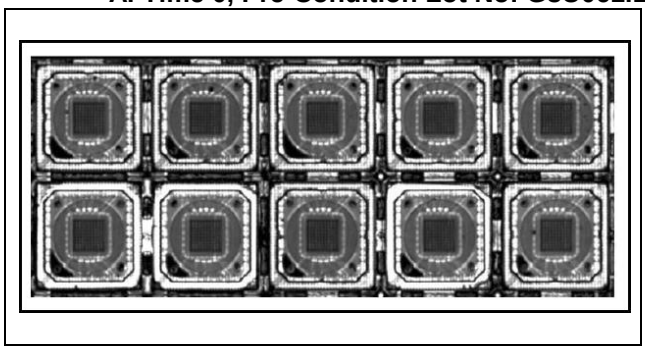
A. Time 0, Pre-Condition Lot No: G3X207.2A/DC:1049

B. Post, Pre-Condition Lot No: G3X207.2A/DC:1049

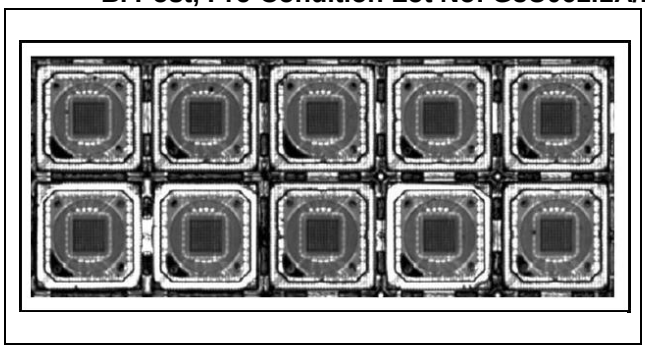


4.6.4 PEX8532-xx25BI/G

A. Time 0, Pre-Condition Lot No: G3U061.1A/DC:1048

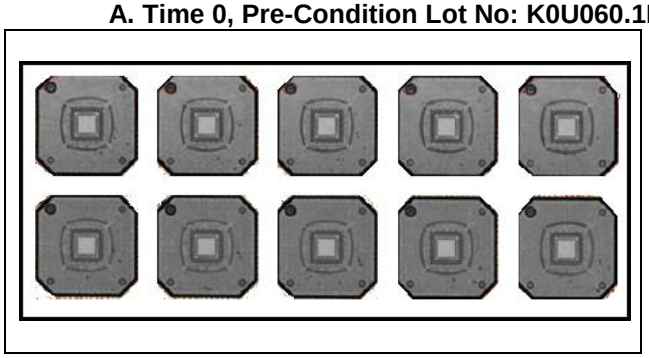


B. Post, Pre-Condition Lot No: G3U061.1A/DC:1048

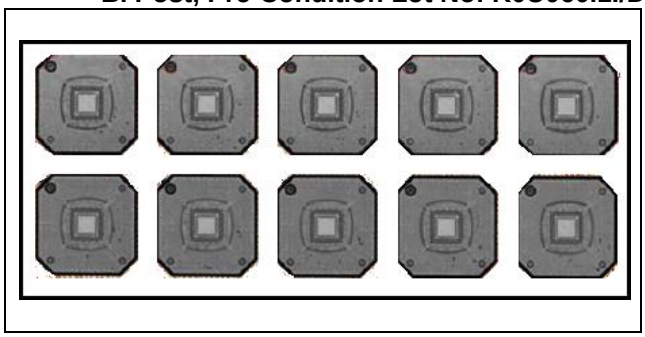


4.6.5 PCI9656-xx66BI/G K0U060.1I/1051

A. Time 0, Pre-Condition Lot No: K0U060.1I/DC:1051

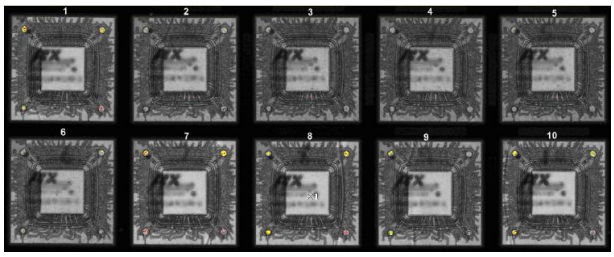


B. Post, Pre-Condition Lot No: K0U060.1I/DC:1051

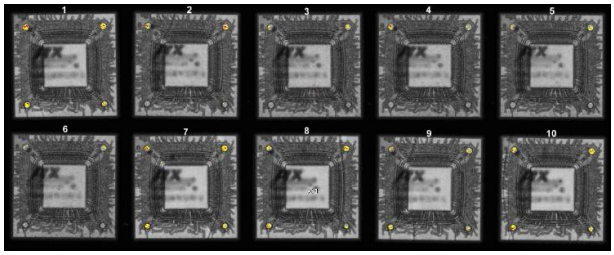


4.6.6 PEX8114-xx13BI/G G4X051.1C/1120

A. Time 0, Pre-Condition Lot No: G4X051.1C/DC:1120



B. Post, Pre-Condition Lot No: G4X051.1C/DC:1120



4.7 In-line Process Data

4.7.1 PCI6150-xx66PC/G: VM3352.1F/1044

Process	Criteria	Spec	Min	Max	Ave	Ppk	Result
Die Attach	Die Shear	Min 5.0 kg-F	24.67	32.16	28.00	3.90	Cpk > 1.33 : Pass
	Die Placement -X	0 +/-4 mils	-1.70	1.11	-0.26	1.47	Cpk > 1.33 : Pass
	Die Placement -Y	0 +/-4 mils	-1.04	0.56	-0.38	2.87	Cpk > 1.33 : Pass
	Die BLT	0.5-2.0 mils	1.27	1.53	1.35	2.64	Cpk > 1.33 : Pass
	Fillet Height	Max 75% of die thickness	50.00	60.00	52.50	NA	Pass
	Epoxy Void	Max 10% of die area	0.00	0.00	0.00	NA	Pass
	Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
	Appearance	No abnormality	NA				No Abnormality
Wire Bond	Wire Pull	Min 3 grams	5.08	8.13	6.47	1.36	Cpk > 1.33 : Pass
	Ball Shear	Min 8 grams	21.03	26.89	25.26	2.59	Cpk > 1.33 : Pass
	Stitch Pull	Min 3 grams	4.66	5.71	5.17	2.24	Cpk > 1.33 : Pass
	Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
	Cratering	No crater on bond pad	NA				Pass
	X-Section	No Metal Layer collapse	NA				Pass

Process	Criteria	Spec	Min	Max	Ave	Ppk	Result
Mold	Wire Sweep	< 15%	0.80	2.80	1.37	n/a	Pass
	Moldability Buyoff/Visual Inspection: Appearance	No abnormality	NA				0/24 : Pass
Dejunk	Protrusion/Intrusion	Max 4 mils	1.20	1.65	1.35	n/a	Pass
	Side Flash	Max 10 mils	2.25	2.80	2.52	n/a	Pass
Plating	Plating Thickness	400µl" ~ 800µl"	463.59	570.81	531.31	1.42	Cpk > 1.33 : Pass
	Plating Composition	Matte Tin: Min 99.9%	99.90	100.00	99.99	NA	Cpk > 1.33 : Pass
Trim & Forming	Lead to Lead (X)	1220-1236 mils	1225.50	1227.00	1225.90	3.02	Cpk > 1.33 : Pass
	Lead to Lead (Y)	1220-1236 mils	1225.50	1227.00	1226.20	3.63	Cpk > 1.33 : Pass
	Stand Off	Min 10 mils	12.70	15.30	13.81	1.82	Cpk > 1.33 : Pass
	Coplanarity	Max 2.4 mils	0.40	1.50	0.88	1.74	Cpk > 1.33 : Pass

4.7.2 PCI9052/G: B0V201.1B/1047

Criteria	Spec	Min	Max	Ave	Cpk	Result
Die Shear	Min 5.0 kg-F	16.32	26.06	20.84	1.65	Cpk > 1.33 : Pass
Die Placement -X	0 +/-4 mils	0.16	1.20	0.69	2.72	Cpk > 1.33 : Pass
Die Placement -Y	0 +/-4 mils	0.88	2.01	1.53	1.89	Cpk > 1.33 : Pass
Die BLT	0.5-2.0 mils	0.90	1.03	0.95	3.17	Cpk > 1.33 : Pass
Fillet Height	Max 75% of die thickness	30.00	40.00	36.00	NA	Pass
Epoxy Void	Max 10% of die area	0.00	0.00	0.00	NA	Pass
Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
Appearance	No abnormality	NA				No Abnormality
Wire Pull	Min 3 grams	6.92	9.01	8.28	3.26	Cpk > 1.33 : Pass
Ball Shear	Min 12 grams	16.38	21.26	18.11	1.78	Cpk > 1.33 : Pass
Stitch Pull	Min 3 grams	4.66	5.71	5.17	2.24	Cpk > 1.33 : Pass
Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
Cratering	No crater on bond pad	NA				Pass
X-Section	No Metal Layer collapse	NA				Pass

Mold	Wire Sweep	< 15%	0.40	7.40	2.91	n/a	Pass
	Moldability Buyoff/Visual Inspection: Appearance	No abnormality	NA				0/24 : Pass
Dejunk	Protrusion/Intrusion	Max 4 mils	1.10	1.70	1.33	n/a	Pass
	Side Flash	Max 10 mils	2.95	3.60	3.24	n/a	Pass
Plating	Plating Thickness	400µl" ~ 800µl"	463.59	570.81	531.31	1.42	Cpk > 1.33 : Pass
	Plating Composition	Matte Tin: Min 99.9%	99.90	100.00	99.99	n/a	Cpk > 1.33 : Pass
Trim & Forming	Lead to Lead (X)	1220-1236 mils	1222.70	1223.60	1223.10	2.40	Cpk > 1.33 : Pass
	Lead to Lead (Y)	1220-1236 mils	1223.80	1224.70	1224.20	3.68	Cpk > 1.33 : Pass
	Stand Off	Min 10 mils	13.40	14.10	13.65	7.28	Cpk > 1.33 : Pass
	Coplanarity	Max 2.4 mils	1.20	1.90	1.45	1.55	Cpk > 1.33 : Pass

4.7.3 PEX8516-xx25BI/G: G3X207.2A/1049

Process	Criteria	Spec	Min	Max	Ave	Ppk	Result
Die Attach	Die Shear	Min 5.0 kg-F	36.26	45.79	40.79	3.76	Cpk > 1.33 : Pass
	Die Placement -X	0 +/-4 mils	0.15	2.29	1.18	1.43	Cpk > 1.33 : Pass
	Die Placement -Y	0 +/-4 mils	0.01	1.96	0.84	1.79	Cpk > 1.33 : Pass
	Die BLT	0.5-2.0 mils	1.18	1.32	1.24	4.99	Cpk > 1.33 : Pass
	Fillet Height	Max 75% of die thickness	50.00	60.00	56.00	NA	Pass
	Epoxy Void	Max 10% of die area	0.00	0.00	0.00	NA	Pass
	Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
	Appearance	No abnormality	NA				No Abnormality
Wire Bond	Wire Pull	Min 3 grams	7.30	8.97	7.89	2.61	Cpk > 1.33 : Pass
	Ball Shear	Min 12 grams	13.14	15.20	13.61	1.24	Cpk > 1.33 : Pass
	Stitch Pull	Min 3 grams	5.03	6.59	5.93	2.43	Cpk > 1.33 : Pass
	Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
	Cratering	No crater on bond pad	NA				Pass
	X-Section	No Metal Layer collapse	NA				Pass

Process	Criteria	Spec	Min	Max	Ave	Ppk	Result
Mold	Wire Sweep	< 15%	0.73	4.81	2.64	N/A	Pass
	Moldability Buyoff/Visual Inspection: Appearance	No abnormality	N/A				0/24 : Pass
Ball Mount	Solder Ball Shear	Minimum 700 grams	929.17	1379.06	1221.03	2.02	Pass
Singulation	Package Dimension X	26.9 ~ 27.1 mm	27.02	27.10	27.04	2.32	Cpk > 1.33 : Pass
	Package Dimension Y	26.9 ~ 27.1 mm	27.00	27.05	27.02	2.82	Cpk > 1.33 : Pass

4.7.4 PEX8532-xx25BI/G: G3U061.1A/1048, G: G3U061.1B/1049

Process		Criteria	Spec	Min	Max	Ave	Ppk	Result
Die Attach		Die Shear	Min 5.0 kg-F	38.52	44.40	41.66	5.74	Cpk > 1.33 : Pass
		Die Placement -X	0 +/-4 mils	0.16	1.12	0.61	1.38	Cpk > 1.33 : Pass
		Die Placement -Y	0 +/-4 mils	0.41	1.26	0.74	1.36	Cpk > 1.33 : Pass
		Die BLT	0.5-2.0 mils	1.42	1.55	1.48	4.50	Cpk > 1.33 : Pass
		Fillet Height	Max 75% of die thickness	50.00	60.00	56.00	NA	Pass
		Epoxy Void	Max 10% of die area	0.00	0.00	0.00	50.00	60.00
		Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
		Appearance	No abnormality	NA				No Abnormality
Wire Bond	1st DC	Wire Pull	Min 3 grams	6.23	6.98	6.62	5.69	Cpk > 1.33 : Pass
		Ball Shear	Min 8 grams	10.27	12.65	11.45	1.40	Cpk > 1.33 : Pass
		Stitch Pull	Min 3 grams	4.22	5.67	4.88	1.46	Cpk > 1.33 : Pass
		Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
		Cratering	No crater on bond pad	NA				Pass
		X-Section	No Metal Layer collapse	NA				Pass
	2nd DC	Wire Pull	Min 3 grams	6.22	6.99	6.65	5.73	Cpk > 1.33 : Pass
		Ball Shear	Min 8 grams	10.22	12.97	11.48	1.42	Cpk > 1.33 : Pass
		Stitch Pull	Min 3 grams	4.01	5.39	4.83	1.62	Cpk > 1.33 : Pass
		Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
		Cratering	No crater on bond pad	NA				Pass
		X-Section	No Metal Layer collapse	NA				Pass

Process		Criteria	Spec	Min	Max	Ave	Ppk	Result
Mold	1st DC	Wire Sweep	< 15%	1.56	5.95	4.03	N/A	Pass
		Moldability Buyoff/Visual Inspection: Appearance	No abnormality	NA				0/24 : Pass
	2nd DC	Wire Sweep	< 15%	0.90	6.60	3.79	N/A	Pass
		Moldability Buyoff/Visual Inspection: Appearance	No abnormality	NA				0/24 : Pass
Ball Mount	1st DC	Ball Shear	Min 700 gram	1061.30	1325.66	1184.12	2.24	Pass
	2nd DC	Ball Shear	Min 700 gram	1040.97	1287.53	1204.25	2.26	Pass
Singulation	1st DC	Package Dimension X	34.9 ~ 35.1	34.98	35.05	35.02	2.05	Cpk > 1.33 : Pass
		Package Dimension Y	34.9 ~ 35.1	34.97	35.01	34.99	2.60	Cpk > 1.33 : Pass
	2nd DC	Package Dimension X	34.9 ~ 35.1	35.00	35.05	35.02	2.15	Cpk > 1.33 : Pass
		Package Dimension Y	34.9 ~ 35.1	34.97	35.02	34.99	2.54	Cpk > 1.33 : Pass

4.7.5 PCI9656-xx66BI/G K0U060.1I/1051

Process	Criteria	Spec	Min	Max	Ave	Cpk	Result
Die Attach	Die Shear	Min 5.0 kg-F	10.26	15.26	12.41	1.36	Cpk > 1.33 : Pass
	Die Placement -X	0 +/-4 mils	0.01	0.89	0.37	1.87	Cpk > 1.33 : Pass
	Die Placement -Y	0 +/-4 mils	0.01	0.98	0.39	1.95	Cpk > 1.33 : Pass
	Die BLT	0.5-2.0 mils	0.95	1.08	0.99	4.35	Cpk > 1.33 : Pass
	Fillet Height	< 66 %	50.00	60.00	54.00	NA	Pass
	Epoxy Void	Max 10% of die area	0.00	0.00	0.00	NA	Pass
	Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
	Appearance	No abnormality	NA				No Abnormality
Wire Bond	Wire Pull	Min 3 grams	6.93	9.37	8.29	3.13	Cpk > 1.33 : Pass
	Ball Shear	Min 8 grams	16.89	19.99	18.43	3.38	Cpk > 1.33 : Pass
	Stitch Pull	Min 3 grams	4.64	6.56	5.40	1.46	Cpk > 1.33 : Pass
	Intermetallic Coverage (IMC)	> 60% coverage	NA				> 60% : Pass
	Cratering	No crater on bond pad	NA				Pass
	X-Section	No Metal Layer collapse	NA				Pass
Mold	Wire Sweep	< 15%	1.17	5.88	4.22	N/A	Pass
	Moldability Buyoff/Visual Inspection: Appearance	No abnormality	N/A				0/24 : Pass
C-SAM	Delamination	Any	N/A	N/A	N/A	N/A	No Delamination
Ball Mount	Solder Ball Shear	Minimum 700 grams	1681.72	2248.49	1923.45	2.91	Pass
Package Saw	Package Dimension X	26.9 ~ 27.1 mm	26.95	26.99	26.98	2.13	Cpk > 1.33 : Pass
	Package Dimension Y	26.9 ~ 27.1 mm	26.94	27.00	26.96	1.71	Cpk > 1.33 : Pass

4.7.6 PEX8114-xx13BI/G G4X051.1C/D/E / 1120/21/22

Process	Lot	Criteria	Spec	Min	Max	Ave	Cpk	Result
Die Attach	All	Die Shear	Min 5.0 kg-F	58.20	79.50	71.83	3.69	Cpk > 1.33 : Pass
		Die Placement -X	0 +/-4 mils	-0.37	1.58	0.66	1.93	Cpk > 1.33 : Pass
		Die Placement -Y	0 +/-4 mils	-0.05	1.91	0.61	2.05	Cpk > 1.33 : Pass
		Die BLT	0.5-2.0 mils	0.88	1.05	0.97	3.18	Cpk > 1.33 : Pass
		Fillet Height	< 66 %	50.00	66.00	61.20	NA	Pass
		Epoxy Void	Max 10% of die area	0.00	0.00	0.00	NA	Pass
		Epoxy Coverage	Min 75% of die peripheral	100.00	100.00	100.00	NA	Pass
		Appearance	No abnormality	N/A				No Abnormality
Wire Bond	120PL16B01	Wire Pull	Min 3 grams	5.11	6.62	5.89	2.14	Cpk > 1.33 : Pass
		Ball Shear	Min 8 grams	10.33	12.37	11.29	1.78	Cpk > 1.33 : Pass
		Stitch Pull	Min 3 grams	3.92	4.81	4.34	1.84	Cpk > 1.33 : Pass
		Intermetallic Coverage (IMC)	> 60% coverage	N/A				> 60% : Pass
		Cratering	No crater on bond pad	N/A				Pass
		X-Section	No Metal Layer collapse	N/A				Pass
	120PL17B01	Wire Pull	Min 3 grams	4.42	6.29	5.59	1.95	Cpk > 1.33 : Pass
		Ball Shear	Min 8 grams	10.36	12.18	11.01	1.81	Cpk > 1.33 : Pass
		Stitch Pull	Min 3 grams	4.15	5.42	4.79	2.09	Cpk > 1.33 : Pass
		Intermetallic Coverage (IMC)	> 60% coverage	N/A				> 60% : Pass
		Cratering	No crater on bond pad	N/A				Pass
		X-Section	No Metal Layer collapse	N/A				Pass
	121PL01B01	Wire Pull	Min 3 grams	4.77	6.62	6.00	1.87	Cpk > 1.33 : Pass
		Ball Shear	Min 8 grams	10.30	12.10	11.19	1.81	Cpk > 1.33 : Pass
		Stitch Pull	Min 3 grams	4.08	5.07	4.54	1.78	Cpk > 1.33 : Pass
		Intermetallic Coverage (IMC)	> 60% coverage	N/A				> 60% : Pass
		Cratering	No crater on bond pad	N/A				Pass
		X-Section	No Metal Layer collapse	N/A				Pass

Process	Lot	Criteria	Spec	Min	Max	Ave	Cpk	Result
Mold	120PL16B01	Wire Sweep	< 10%	0.71	2.24	1.40	6.33	Pass
		Moldability Buyoff/Visual Inspection: Appearance	No abnormality	N/A				0/24 : Pass
	120PL17B01	Wire Sweep	< 10%	0.87	2.41	1.48	6.53	Pass
		Moldability Buyoff/Visual Inspection: Appearance	No abnormality	N/A				0/24 : Pass
	121PL01B01	Wire Sweep	< 10%	0.73	2.23	1.69	5.84	Pass
		Moldability Buyoff/Visual Inspection: Appearance	No abnormality	N/A				0/24 : Pass
C-SAM	121PL16B01	Delamination	Any	N/A	N/A	N/A	N/A	No Delamination
	121PL17B01	Delamination	Any	N/A	N/A	N/A	N/A	No Delamination
	121PL01B01	Delamination	Any	N/A	N/A	N/A	N/A	No Delamination
Ball Mount	120PL16B01	Solder Ball Shear	Minimum 500 grams	860.57	1079.09	962.13	2.69	Pass
	120PL17B01	Solder Ball Shear	Minimum 500 grams	895.98	1089.26	979.19	1.77	Pass
	121PL01B01	Solder Ball Shear	Minimum 500 grams	891.06	1119.76	976.19	1.81	Pass
Package Saw	120PL16B01	Package Dimension X	16.9 ~ 17.1 mm	16.97	17.01	17.00	3.17	Cpk > 1.33 : Pass
		Package Dimension Y	16.9 ~ 17.1 mm	16.96	17.01	16.99	2.53	Cpk > 1.33 : Pass
		Package Dimension Z	1.36 ~ 1.76 mm	1.50	1.56	1.53	3.72	Cpk > 1.33 : Pass
	120PL17B01	Package Dimension X	16.9 ~ 17.1 mm	16.96	17.01	17.00	2.59	Cpk > 1.33 : Pass
		Package Dimension Y	16.9 ~ 17.1 mm	16.96	17.01	16.99	2.59	Cpk > 1.33 : Pass
		Package Dimension Z	1.36 ~ 1.76 mm	1.52	1.56	1.54	5.67	Cpk > 1.33 : Pass
	121PL01B01	Package Dimension X	16.9 ~ 17.1 mm	16.97	17.00	16.99	3.46	Cpk > 1.33 : Pass
		Package Dimension Y	16.9 ~ 17.1 mm	16.97	17.01	16.99	2.97	Cpk > 1.33 : Pass
		Package Dimension Z	1.36 ~ 1.76 mm	1.54	1.59	1.57	4.98	Cpk > 1.33 : Pass

5.0 CONCLUSION

This reliability qualification report applies to the family of products described on the front page, all of which are manufactured at ASEM. The PCI9052/G, PCI6150-xx66PC/G, PCI9656-xx66BI/G, PEX8516-xx25BI/G, PEX8532-xx25BI/G, and PEX8114-xx13BI/G devices have been utilized as the qualification vehicles for this BOM standardization activity.

Based on the reliability data completed to date, PLX grants full qualification approval for the QFP, P/HSBGA, and LBGA base products.

6.0 REVISION HISTORY

Revision	Date	Orginator	Comments
Rev. 1.0	10/14/10	Norbe Mendoza	Package Reliability Qualification Plan
Rev. 2.0	4/21/11	Norbe Mendoza	Package Reliability Qualification Report for P/HSBGA and QFP product line.
Rev. 3.0	8/5/11	Norbe Mendoza	Package Reliability Qualification Report for LBGA product line.