PEX 8648
(Test Vehicle: PEX8648-BB50RBC F)

(Fab: TSMC 90 nm low K, 1Poly/9 Metal CMOS. Assy: ASEK- K7B UBM sputter/etch Site ,27x27 mm package body, 676 ball HFC-BGA package)

Package Reliability Qualification Report
Family Qualification:

PEX8648-BB50RBC F	**HFCBGA**	**27X27mm**	**676**
PEX8648-BB50BI F	**HFCBGA**	**27X27mm**	**676**
PEX8648-BB50BC F	**HFCBGA**	**27x27mm**	**676**
PEX8647-BB50RBC F	**HFCBGA**	**27X27mm**	**676**
PEX8632-BB50RBC F	**HFCBGA**	**27X27mm**	**676**
PEX8632-BB50BI F	**HFCBGA**	**27X27mm**	**676**
PEX8624-BB50RBC F	**HFCBGA**	**19X19mm**	**324**
PEX8624-BB50BI F	**HFCBGA**	**19X19mm**	**324**
PEX8616-BB50RBC F	**HFCBGA**	**19X19mm**	**324**
PEX8612-BB50RBC F	**HFCBGA**	**19X19mm**	**324**

May 17, 2014

Prepared and Reviewed By: Hung Vuong
Quality & Reliability Engineer

Approved By: Dave Towne
Director, Q&R and Package Engineering

1.Purpose:

The purpose of this qualification is to qualify ASE Kaohsiung - K7B site. ASE Kaohsiung (site K7B) is being added as an alternate Eutectic UBM site for Sputter and Etching processes used for PEX 8648 product family which includes the following devices:

- PEX8648-BB50RBC F HFCBGA 27X27 676
- PEX8648-BB50BI F HFCBGA 27X27 676
- PEX8648-BB50BC F HFCBGA 27x27 676
- PEX8647-BB50RBC F HFCBGA 27X27 676
- PEX8632-BB50RBC F HFCBGA 27X27 676
- PEX8632-BB50BI F HFCBGA 27X27 676
- PEX8624-BB50RBC F HFCBGA 19X19 324
- PEX8624-BB50BI F HFCBGA 19X19 324
- PEX8616-BB50RBC F HFCBGA 19X19 324
- PEX8612-BB50RBC F HFCBGA 19X19 324

PEX 8648 product device family fabricated in TSMC's 90 nm low K, 1Poly/9 Metal CMOS Technology, assembled at ASE Kaohsiung, Taiwan (ASEK) and UBM Sputter and Etching processes at ASE Kaohsiung (site K7B) in a 27 x 27 676 HFCBGA package.

This change allows PLX to improve manufacturing flexibility and capability of high volume production of eutectic bumping process in support of Flip Chip BGA packages and aid in Business Continuity Planning (BCP).

2.Scope:

The PEX8648-BB50RBC F is fabricated in TSMC's 90 nm Low-K process technology and is assembled at ASEK in a 27 x 27mm 676 HFCBGA package. The PEX8648-BB50RBC F is used as the reliability qualification vehicle for the affected products. Both process and package technologies that are used to manufacture this product were qualified previously by PLX with PEX8648-BB50BC. Additional package tests in this report serve to qualify ASE Kaohsiung's - K7B UBM sputter/etch site. The product family includes the following devices:

- PEX8648-BB50RBC F HFCBGA 27X27 676
- PEX8648-BB50BI F HFCBGA 27X27 676
- PEX8648-BB50BC F HFCBGA 27x27 676
- PEX8647-BB50RBC F HFCBGA 27X27 676

- PEX8632-BB50RBC F HFCBGA 27X27 676
- PEX8632-BB50BI F HFCBGA 27X27 676
- PEX8624-BB50RBC F HFCBGA 19X19 324
- PEX8624-BB50BI F HFCBGA 19X19 324
- PEX8616-BB50RBC F HFCBGA 19X19 324
- PEX8612-BB50RBC F HFCBGA 19X19 324

3. Background Information:

3.1 Wafer Fab Information

Process Type	**CMOS Logic**
Process Name	**90 nm low K**
Number of Metal layers	**9**

3.2 Assembly Process Information

	BOM	
1	**Package name:**	HFCBGA
2	**Package Size:**	27 X 27 mm
3	**Solder Ball Diameter:**	0.6 mm
4	**Solder Ball Pitch:**	1mm
5	**# of solder balls:**	676
6	**Solder Ball Composition:**	SAC305 (96.5Sn/3Ag/0.5Cu)
7	**Solder Bump for Die (exemption 15):**	63Sn/37Pb

4. Qualification Plan and Results:

4.1. Die Qualification

TSMC 90nm Low K CMOS technology generates consistent and reproducible performance from lot to lot, through a mature fabrication process, in-process monitors, and excellent reliability.

4.1.1 TSMC 90 nm low K, 1Poly/9 Metal CMOS Technology Process Qualification Report; Test Vehicle: PEX8648-BB50BC F.

PEX8648-BB_Reliabili ty_Qualification_Rev

4.2 Package Qualification Plan and Result.

ASEK 's HFCBGA package technologies were qualified previously by PLX with PEX8648-BB50RBC F in the 27 x 27mm 676 HFCBGA package. The full qualification report is embedded in section 4.1.1 above

4.2.1 Pre-condition Level 4 (JESD-A113-E), 96 hrs. 30 C/60 %RH

Device	Lot Code	Date Code	Sample Size	No. of Rejects	Result	Note
PEX8648-BB50RBCF	NKC876.00C	1407	105	0/105	Pass	
PEX8648-BB50RBCF	NKC876.00A	1407	105	0/105	Pass	
PEX8648-BB50RBCF	NKC876.00B	1407	105	0/105	Pass	

4.2.2 HAST (JESD22-A110, 130 C/85 %RH, 96 Hrs (After preconditioning from 4.2.1)

Device	Lot Code	Date Code	Sample Size	Hrs	No. of Rejects	Result	Note
PEX8648-BB50RBCF	NKC876.00C	1407	15	96**	0/15	Pass	
PEX8648-BB50RBCF	NKC876.00A	1407	15	96**	0/15	Pass	
PEX8648-BB50RBCF	NKC876.00B	1407	15	96**	0/15	Pass	

**** Conditional and Full Qualification Point**

4.2.3 Temperature Cycle Test (JESD22-A104B, Condition C), -65 C to 150 C for 1000 Cycles (After preconditioning from 4.2.1)

Device	Lot Code	Date Code	Sample Size	Cycles	No. of Rejects	Result	Note
PEX8648-BB50RBCF	NKC876.00C	1407	45	250*	0/45	Pass	
				500	0/45	Pass	
				1000	0/45	Pass	
PEX8648-BB50RBCF	NKC876.00A	1407	45	250*	0/45	Pass	
				500	0/45	Pass	
				1000	0/45	Pass	
PEX8648-BB50RBCF	NKC876.00B	1407	45	250*	0/45	Pass	
				500	0/45	Pass	
				1000	0/45	Pass	

***Conditional Qualification Point**

4.2.4 High Temperature Storage Life Test (JESD22-A103B), 150 C for 1000 hours (After preconditioning from 4.2.1)

Device	Lot Code	Date Code	Sample Size	Hrs	No. of Rejects	Result	Note
PEX8648-BB50RBCF	NKC876.00C	1407	45	1000***	0/45	Pass	
PEX8648-BB50RBCF	NKC876.00A	1407	45	1000***	0/45	Pass	

PEX8648-BB50RBCF	NKC876.00B	1407	45	1000***	0/45	Pass	

***** Full Qualification Point**

5.0 Conclusion

This qualification plan and results are used to qualify ASE Kaohsiung's - K7B UBM Sputter and Etching processes site. ASE Kaohsiung (site K7B) is being added as an alternate Eutectic UBM site for Sputter and Etching processes used for PEX 8648 product family which includes the following devices:

- PEX8648-BB50RBC F HFCBGA 27X27 676
- PEX8648-BB50BI F HFCBGA 27X27 676
- PEX8648-BB50BC F HFCBGA 27x27 676
- PEX8647-BB50RBC F HFCBGA 27X27 676
- PEX8632-BB50RBC F HFCBGA 27X27 676
- PEX8632-BB50BI F HFCBGA 27X27 676
- PEX8624-BB50RBC F HFCBGA 19X19 324
- PEX8624-BB50BI F HFCBGA 19X19 324
- PEX8616-BB50RBC F HFCBGA 19X19 324
- PEX8612-BB50RBC F HFCBGA 19X19 324

The PEX8648-BB50RBC F and its product family are fabricated in TSMC's 40 nm GP Low-K process technology and assembled at ASE Kaohsiung, Taiwan (ASEK) in a 27x27 mm, 676 HFCBGA package. The Qualification Test Vehicle has demonstrated that it passes Temperature Cycle 250,500, 1000, High Temperature Storage 1000 hrs, and Biased HAST 96 hrs testing which are required in our qualification test plan to meet PLX's requirements for full reliability qualification approval. The K7B UBM Sputter/Etch alternate site passes the full Qualification for the above-referenced product families.

6.0 REVISION HISTORY

Revision	Date	Originator	Comments
Rev. 1	March 1, 2014	Hung Vuong	Initial Product Reliability Qualification Plan
Rev. 2	March 25, 2014	Hung Vuong	Issued Conditional Product Reliability Qualification Report.
Rev. 2.1	May 17, 2014	Hung Vuong	Issued Full Product Reliability Qualification Report.