PEX8619
(Vehicle: PEX 8619 BA50BC Green & non-Green)
Reliability Product Qualification Report

Family Qualification:

PEX8619 BA50BC (Green & non-Green)
PEX8618 BA50BC (Green & non-Green)
PEX8617 BA50BC (Green & non-Green)
PEX8615 BA50BC (Green & non-Green)
PEX8614 BA50BC (Green & non-Green)
PEX8613 BA50BC (Green & non-Green)
PEX8609 BA50BC (Green & non-Green)
PEX8608 BA50BC (Green & non-Green)
PEX8606 BA50BC (Green & non-Green)
PEX8604 BA50BC (Green & non-Green)

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Approved By: Brete Bigley
Director, Quality Assurance & Reliability

1. Purpose:

The purpose of this product qualification plan is to qualify the PEX8619-BA50BC G (Green) and Non-Green device. The PEX8619-BA50BC G is fabricated in TSMC's 90 nm low K, 1Poly/9 Metal CMOS Technology and assembled at ASE Kaohsiung, Taiwan (ASEK) in a 19x19 X 1.7 mm 324 HS-BGA package

This document summarizes the plan and results to qualify this product as the qualification test vehicle for the product family as per below.

2. Scope:

The PEX8619-BA50BC G (Green) and non Green is fabricated in TSMC 90 nm Low-K process technology and is assembled at ASEK in a 19x19 mm 324 HS-BGA package and is the product to be qualified as the test vehicle for the product family. Both process and package technologies that are used to manufacture this product were qualified previously by PLX.

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.

As noted, ASEK 's HS-BGA package technology was also qualified previously by PLX. The PEX8548S-AA25BI G 27 X 27 X 2.23 mm HS-BGA package andPEX8532-BC25BI G 35 X 35 X 2.23.mm HS-BGA package are the test vehicles for ASEK's HS-BGA package technology. As a result, the PEX8619-BA50BC G (Green) and non- Green device and its product family, that are assembled in the ASEK HS-BGA package type with comparable design rules are therefore package qualified by extension.

As such, only product die qualification is required because both process and package technologies were qualified and approved previously.

This document summarizes the plan and results to qualify the product as per below.

3. Backgound Information :

3,1 Wafer Fab Information :

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

3.2 Substarte Information

Solder Mask	AUS308
Dielectric Material	HL-832NX

3.3. Assembly Process Information

		BOM Green Package	BOM non-Green Package
1	**Package name:**	BGA	BGA
2	**Package Size:**	19 X 19 X 1.7 mm	19 X19 X 1.7 mm
3	**Solder Ball Diameter**	0.6 mm	0.6 mm
4	**Solder Ball Pitch**	1mm	1mm
5	**Number of solder balls**	324	324
6	**Die attach material:**	Ablestik 2100A	Ablestik 2100A
7	**Mold compound:**	9750ZHF10AKL	9750ZHF10AKL
8	**Bond wire:**	4N	4N
9	**Solder Ball composition:**	96.5Sn/3.0Ag/.5Cu	Sn63/Pb37
10	**Surface Finish:**	Ni/Au (electrolytic plating)	Ni/Au (electrolytic plating)

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: PEX 8648

PEX8648-BB_Reliability_Qualification_Rev2

4.1.1. 1 High Temperature Operating Life (Temperature : 125 C, Voltage= Vddmax)

Note : * Conditional Qual; ** Full Qual.

Device	Lot Code	Date Code	Sample Size	Time point	No. Of Rejects		Result	Note
PEX8619-BA50BC G	N6A532.00 CA-ES	0907	120	168 hrs cum.*	0	4/3/09	Passed	Conditional Qual
			120	500 Hrs cum.	0	4/19/09	Passed	
			120	1000 Hrs cum **	0	5/17/09	Passed	Full Qual

- Total Device hours of this family = 570000 Hrs
- FIT = 46 (based on 60% CL, Ea = 0.7 eV, Tstress = 125 °C, Tuse = 55 °C); with 1 reject (Note : Unit damaged during failure analysis; root cause could not be determined, random failure)

$$MTBF = 2.17 \times 10^{7} \; Hrs.$$

4.1. 2. Electrostatic Discharge (ESD)

4.1.2.1 Human Body Model, JESD22-A114E, +/- 2 KV.

Device	Lot Code	Date Code	Sample Size	Result	Note
PEX8619- BA50BC G	N6A532.00CA-ES	0907	5	4/5	All pins pass +/- 2000 V HBM * *Except ball A14 and A15 which are reserved pins in the datasheet and not connected for use at board level.

4.1.2.2 Charged Device Mode, JESD-C101C, 500 V

Device	Lot Code	Date Code	Sample Size	Result	Note
PEX8619- BA50BC G	N6A532.00CA-ES	0907	5	4/5	All pins pass 500V CDM* * Except ball A14 and A15 which are reserved pins in the datasheet and not connected for use at board level.

4.1.2.3 Latch-Up, JESD 78A, +/- 100 mA

Device	Lot Code	Date Code	Sample Size	Result	Note
PEX8619- BA50BC G	N6A532.00CA-ES	0907	6	0/6	All Pass

4.2. Package Qualification

ASEK ‘s HS-BGA package technology was qualified previously by PLX. The PEX8548S-AA25BI G and Non Green, 27 X 27 X 2.23 mm HS-BGA package and PEX8532-BC25BI G and Non Green, 35 X 35 X 2.23.mm HS-BGA package are the test vehicles for ASEK’s HS-BGA package technology and the full qualification reports are embedded below.

4.2.1. PEX8548S-AA25BI G and Non Green, 27 X 27 X 2.23 mm HS-BGA package Reliability Report.

PLX ASEK 27x27 Full Package qual report_

4.2.2. PEX8532-BC25BI G and Non Green, 35 X 35 X 2.23.mm HS-BGA package Reliability Report.

PLX_ASEK 35x35 Full Package qual report_

5. Conclusion:

The PEX8619-BA50BC G and non-Green device is fabricated in TSMC 90 nm low K, 1Poly/9 Metal CMOS Process Technology and assembled at ASEK in a 19x19 X 1.7 mm 324 HS-BGA package and has successfully demonstrated that it passes 1000 hours of High Temperature Operating Life Test and Latch-Up test.

The PEX8619-BA50BC G and non-Green device also demonstrates that all pins pass +/- 2000 V Human Body Model and +/- 500 V Charged Devcie Model except for balls A14 and A15 which are specified as reserved pins not connected for use at board level, and not guaranteed in the datasheet.

The TSMC 90 nm low K, 1Poly/9 Metal CMOS Technology technology generates consistent and reproducible performance from lot- to-lot, through a mature fabrication process, in-process monitors, and an excellent reliability demonstration with failure in time (FIT) of less than 46 FIT has been achieved.

As such, the PEX8619-BA50BC G and non-Green and its product family passed all required die related qualification test in our qualification test plan and is suitable for full production release with the non-gating exception (ESD, balls A14, A15) noted above.

6. Revision History:

Revision	Date	Originator	Comment
Rev. 1.0	April 24, 2009	Hung Vuong	Initial Conditonal Reliability Qualification Report.
Rev 1.1	May 7, 2009	Brete Bigley	Minor edit- A14, A15 are not guaranteed pins per datasheet
Rev 2.0	May 27, 2009	Hung Vuong	Issued Full Qualification Report.
Rev 2.1	June 17, 2009	Hung Vuong	Added FIT (Failure In Time), MTBF and Process data