

PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.	ADG/18/10672	
1.3 Title of PCN	LQFP64 (Muar): Standardization and High Density LeadFrame Introduction	
1.4 Product Category	see list	
1.5 Issue date	2018-01-19	

2. PCN Team

2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Elena Maria PERNIGOTTI,Giovanni FOLETTO,Luca CELANT
2.1.2 Marketing Manager	Maurizio GALLINARI,Alberto DA DALI,Valeria SCARCELLI
2.1.3 Quality Manager	Marcello Donato MENCHISE

3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Lead frame base material	ST Muar (Malaysia)

4. Description of change

	Old	New
4.1 Description	LQFP10x10x1.4 Matrix 30 units/strip Leadframe Supplier: Possehl Molding compound Sumitomo G700L	LQFP10x10x1.4 High Density 60 units/strip Leadframe Supplier: Shinko Molding compound Sumitomo G700LS (Low Stress)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No impact	

5. Reason / motivation for change

5.1 Motivation	Capacity and Quality Improvement
5.2 Customer Benefit	CAPACITY INCREASE

6. Marking of parts / traceability of change

6.1 Description	Dedicated Finished Good Codes
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7. Timing / schedule

7.1 Date of qualification results	2018-01-12
7.2 Intended start of delivery	2018-07-01
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation

8.1 Description	10672 Validation Report .pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2018-01-19

9. Attachments (additional documentations)		
10672 Public product.pdf 10672 Validation Report .pdf 10672 5W and Details.pdf		

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	L9781TR	

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PCN 10672

LQFP64 (Muar): Standardization and High Density LeadFrame Introduction

Change Description

In order to meet the demand increase on QFP10x10 we are going to activate a new High Density (HD) line in Muar replacing the current Matrix line.

- From: LQFP10x10x1.4 Matrix line
 - Matrix frame (215mm x 57mm), 30 units/strip
 - Leadframe Supplier: Possehl
- To: LQFP10x10x1.4 High Density line
 - HD frame (250mm x 70mm), 60 units/strip
 - Leadframe Supplier: Shinko

Together with activation of the new HD line, we are going to standardize the molding compound from Sumitomo G700L to Sumitomo G700LS (Low Stress), enhancing thermal mechanical characteristic (Quality Improvement)

No Changes in Die Attach Material and Bonding Wire Material

Lead Frame Comparison

ITEM	CURRENT	NEW
Frame size	215.7 x 57.6 mm	250 x 70 mm
Units/Strip	30	60
Inner Surface Treatment	L1	TNCu3
Inner Lead Plating	Spot Ag	Spot Ag
Frame base material	C194	C194
Frame process	Etched	Stamped
Plating	Sn	Sn
Leadframe Supplier	Possehl	Shinko

Validation was done according to ZVEI DeQuMa3.1 (AEC_Q100 Rev.H) recommendations, listed in the below table by selecting:

- SEM-PA-04 Change of lead frame finishing material / area (internal)
- SEM-PA-11 Change of mold compound / encapsulation material
- SEM-PA-16 Change of direct material supplier

	Test Group A					Test Group B		Test Group C					Test Group E		Test Group G	
	THB	AC	TC	PTC	HTSL	HTOL	ELFR	WBS	WBP	SD	PD	LI	SER	LF	MECH	DS
ZVEI/Q100 Rev. H	•	•	•	M	•	•	•		C	•	•	•	•	L	H	H
ST	G	X	X	NA	X	G	G	X	X	X	X	X	NA	G	NA	NA

LEGENDA

- Stress test should be considered for the appropriate process change
- M Power packages only
- C If bond to lead finger
- L Lead free
- H Hermetic packages only
- X Test performed by ST
- G Generic Data
- NA Not Applicable

Qualification Lots

Reliability trials have been performed by selecting two Test Vehicles:

TV1: ST Line UN18, MS84DCTR

TV2: ST Line A222, TDA7715

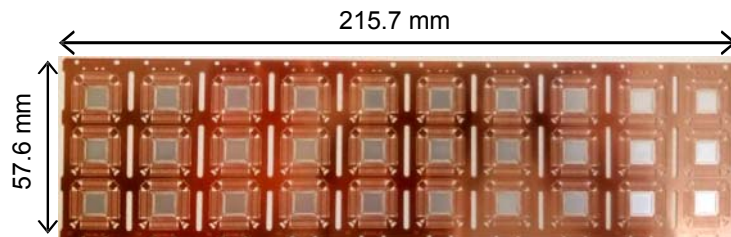
Qualification Lot ID		
ST Line	UN18	A222
Diffusion Lots	6649KFY	6702V8N
Assembly Lot A	9970908QRR	997162G501
Assembly Lot B	9970908QRQ	997162G5RQ
Assembly Lot C	9970908Q01	997162G5RR

Results

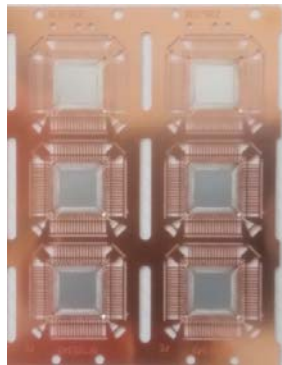
Based on the overall positive results we consider the change qualified

Matrix and HD Strip Comparison

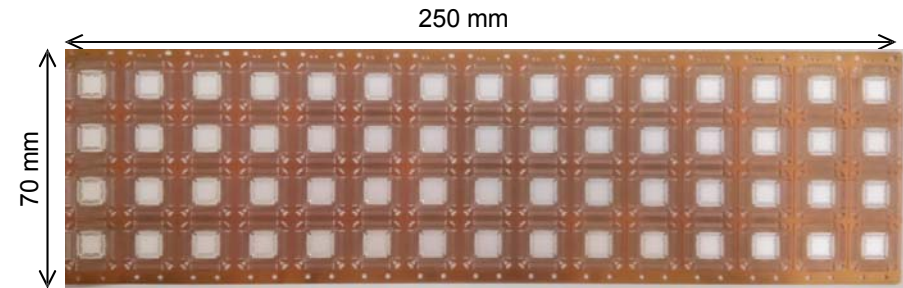
LQFP10x10 64L Matrix



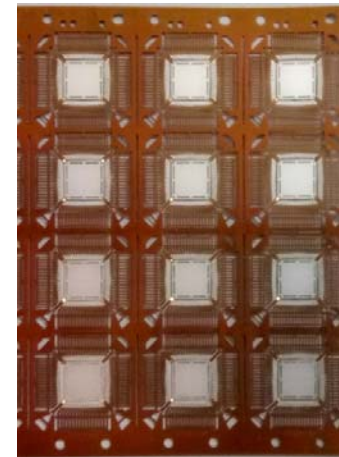
3rows x 10columns
30units



LQFP10x10 64L HD



4rows x 15columns
60units



ZVEI DeQuMa Rev3.1

Selected circuits or components select below:		AEC-Q100 Revision H						MATERIAL PERFORMANCE TEST RESULTS (on the basis of AEC-Q100 Revision H)																				
		Show Text		Values: Show Rows		Values: Show Columns		Evaluation level A / B / C																				
		Assessment of impact on Supply Chain regarding following aspects		Remainin g risks on Supply Chain?		A: Application level B: Component level C: Component level *: Not relevant for qualification matrix		AEC-Q100 Revision H																				
		- contractual agreements - technical interface of processability/manufacturability of customer - form, fit, function, quality performance, reliability																										
ID	Type of change	No	Year																		Remarks							
AMT																												
	DATA SHEET																											
	DESIGN																											
	PROCESS - WAFER PRODUCTION																											
	BARE DIE																											
	PROCESS - ASSEMBLY																											
SEM-PA-04	Change of lead frame finishing material / area (internal)	P	P	C	•	•	•	•	•	M	•	-	-	C	•	•	•	•	L	H	H	For wire bond strength test: Pre- & Post-process change comparison to evaluate process change robustness (AEC-Q101).						
SEM-PA-11	Change of mold compound / encapsulation material	P	P	B	•	•	•	•	•	M	•	•	•	-	•	•	•	•	L	-	-							
SEM-PA-16	Change of direct material supplier	-	P	C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	See change of material.						
	PACKING/SHIPPING																											
	EQUIPMENT																											
	TEST FLOW																											
	Q-GATE																											
Tests, which should be considered for the appropriate process change.				B	•	•	•	•	•	M	•	•	•	C	•	•	•	•	L	H	H	-						
Tests, which should be considered for the appropriate process change after selection of condition table.					•	•	•	•	•	-	•	•	•	C	•	•	•	•	-	-	-	-						
Suppliers performed tests (mark with an 'X' for done or 'G' for generic)								G	X	X		X	G	G	X	X	X	X										

Impacted Products List

ST Line	Package	Assy Plant	Commercial Product
A13103	LQFP 64 10x10x1.4	MUAR	TDA7415CB
A13103	LQFP 64 10x10x1.4	MUAR	TDA7415CBTR
A22203	LQFP 64 10x10x1.4	MUAR	TDA7715
A22903	LQFP 64 10x10x1.4	MUAR	TDA7715LV
A26803	LQFP 64 10x10x1.4	MUAR	PML020A
UI1503	LQFP 64 10x10x1.4	MUAR	L9781
UI1503	LQFP 64 10x10x1.4	MUAR	L9781TR
UJ2003	LQFP 64 10x10x1.4	MUAR	HVODDBA
UJ2003	LQFP 64 10x10x1.4	MUAR	HVODDBATR
UN1803	LQFP 64 10x10x1.4	MUAR	L9662
UN1803	LQFP 64 10x10x1.4	MUAR	L9662TR
UN1803	LQFP 64 10x10x1.4	MUAR	MS84DCTR
UN1803	LQFP 64 10x10x1.4	MUAR	MS84DC
UN3403	LQFP 64 10x10x1.4	MUAR	SD40ABTR
UN3403	LQFP 64 10x10x1.4	MUAR	L9660
UN3403	LQFP 64 10x10x1.4	MUAR	L9660TR
UN3403	LQFP 64 10x10x1.4	MUAR	SD40AB
UN3803	LQFP 64 10x10x1.4	MUAR	SD80ABTR
UN3803	LQFP 64 10x10x1.4	MUAR	L9659
UN3803	LQFP 64 10x10x1.4	MUAR	L9659TR
UN3803	LQFP 64 10x10x1.4	MUAR	SD80AB
UT4803	LQFP 64 10x10x1.4	MUAR	SS84CB1
UT4803	LQFP 64 10x10x1.4	MUAR	SS84CB1TR
UT4803	LQFP 64 10x10x1.4	MUAR	L9658
UT4803	LQFP 64 10x10x1.4	MUAR	L9658TR

Annex

Annex A: Reliability Report UN18 (MS84DCTR)

Annex B: Reliability Report A222 (TDA7715)

Reliability Qualification Report
LQFP 10X10 HD LF Qualification

	General Information
Product Line	XUN18DC6
Finished Good	MS84DCTR-LFH/
Product From	H55W*UN18DC6
Process Plan	A9F-T10442PLP20TC-RL-FIN-PG
Package Technology	LQFP 64 10x10x1.4 1

Locations	
Wafer Fab Location	AM6F - Singapore 6"
Assembly Plant Location	MU1A ST MUAR - MALAYSIA
Testing Plant	Z5GT SUBCO - KYEC - TAIWAN
Reliability Assessment	ST MUAR (QA RELIABILITY LAB)

Issued By: Mohd Ibrahim GHAZALI

Approved By: Olivier MEDARD

TABLE OF CONTENTS

1	APPLICABLE AND REFERENCE DOCUMENTS	Page: 3
2	TEST GLOSSARY	Page: 3
3	RELIABILITY EVALUATION OVERVIEW	
	3.1 OBJECTIVES	Page: 4
	3.2 CONCLUSIONS	Page: 4
4	DEVICE CHARACTERISTICS	
	4.1 TRACEABILITY	Page: 5
5	TEST RESULTS SUMMARY	
	5.1 LOT INFORMATION	Page: 6
	5.2 ELECTRICAL TEST RESULTS	Page: 6
	5.3 SAM ANALYSIS RESULT	Page: 7
	5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3 (3IR)	Page: 7
	5.4 DPA RESULTS (Wire Pull / Ball Shear)	Page: 9
	5.5 DPA RESULTS (Corrosion / Passivation & Bond Integrity)	Page: 10
6	TESTS DESCRIPTION	
	6.1 PACKAGE TESTS DESCRIPTION	Page: 11

1. APPLICABLE AND REFERENCE DOCUMENTS

Document Reference	Short Description
AEC-Q100	Stress test qualification for integrated circuits
SOP 2.6.11	Project management for product development
SOP 2.6.19	Front-end technology platform development & qualification
SOP 2.6.2	Internals change management
SOP 2.6.7	Product maturity level
SOP 2.6.9	Package and process maturity management in Back End
SOP 2.7.5	Automotive products definition and status
0061692	Reliability tests and criteria for product qualification
8160601	Internal reliability evaluation report template
8161393	General specification for product development
7512807	Delamination analysis for plastic packages in reliability tests

2. TEST GLOSSARY

TEST NAME	DESCRIPTION
PC (JL3)	Preconditioning (Solder Simulation)
TC	Temperature Cycling
AC or PPT	Autoclave or Pressure Pot Test
HTSL	High Temperature Storage Life

3. RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The aim of this report is to present the results of the reliability assessment evaluation performed on XUN18DC6 (H55W*UN18DC6) – ST Muar LQFP 64 10x10 High Density (HD) Lead Frame conversion project.

The main purpose is to qualify LQ10x10 High Density (HD) Lead Frame.

MS84DCTR-LFH/ is processed in A9F-T10442PLP20TC-RL-FIN-PG, diffused in AM6F - Singapore 6" and assembled in MU1A ST MUAR - MALAYSIA.

For the reliability assessment evaluation the following test were carried out:

- Preconditioning JL3 (3X Reflow)
- Thermal Cycle Test (TCT)
- Autoclave / Pressure Pot Test (PPT)
- High Temperature Storage Life (HTSL)

3.2 Conclusions

All reliability tests have been completed with positive results. Package oriented test and destructive physical analysis (SAM + Wire pull / ball shear + Bond Integrity Check) also have not put in evidence any criticality to package robustness.

4 DEVICE CHARACTERISTICS

4.1 Traceability

Wafer Fab Information	
Wafer fab manufacturing location	AM6F - Singapore 6"
Wafer diameter	6 inch
Wafer thickness	375+/-25 UM
Silicon process technology	BCD5
Die finishing back side	LAPPED SILICON
Die finishing front side	USG-PSG-SiON-PIX
Stepping Die Size(X,Y)	6720,6680 UM
Sawing Street Width(X,Y)	110,220 UM
Min Bond Pad Pitch	152 UM
No of Metal Layer	3

Assembly Information	
Assembly plant location	MU1A ST MUAR - MALAYSIA
Package description	LQFP 64 10x10x1.4
Molding compound	RESIN EME-G700LS
Wire bonding materials/diameters	Au 1.2 Mils
Die attach material	GLUE LOCTITE ABLESTIK QMI9507-2A1
Lead frame material	FRAME LQFP 64L SpAg+TNCU3

Final Testing Information	
Electrical testing location	Z5GT SUBCO - KYEC - TAIWAN
Tester	FUSION_MX

5. TEST RESULTS SUMMARY

5.1 Lot Information

Lot #	Diffusion Lot	Lot Details / Trace Code	Assy Lot Id	Testing Lot Id
1	V6649KFY	6649KFY / 9970908Q	9970908QRR	ZA10LYCAD1
2	V6649KFY	6649KFY / 9970908Q	9970908QRQ	KA10LYAAB1
3	V6649KFY	6649KFY / 9970908Q	9970908Q01	ZA10LY9AB1

5.2 Test Plan and Results Summary (Electrical Test)

Reliability Test Status								
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS			Notes
					Lot 1	Lot 2	Lot 3	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C / 60%RH Reflow Profile = 260°C	Final	0 / 164	0 / 164	0 / 164	Pass
2	TC	Yes	Test Conditions = -55°C/150°C	100cyc	0 / 87	0 / 87	0 / 87	Pass
				500cyc	0 / 82	0 / 82	0 / 82	Pass
				1000cyc	0 / 77	0 / 77	0 / 77	Pass
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 77	0 / 77	0 / 77	Pass
4	HTSL	No	Test Conditions = Ta = +150°C	500hrs	0 / 50	0 / 50	0 / 50	Pass
				1000hrs	0 / 45	0 / 45	0 / 45	Pass

NOTES

All units electrically tested good after each reliability test readout.

5.3 Test Plan and Results Summary (Scanning Acoustic Microscopy Analysis)

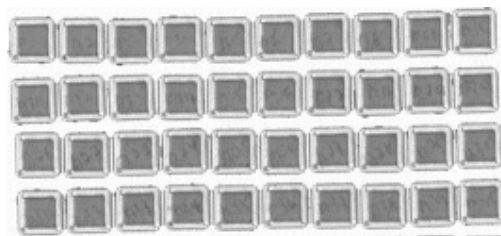
Reliability Test Status								
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS			Notes
					Lot 1	Lot 2	Lot 3	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C/60%RH Reflow Profile = J-STD-020D (Peak max = 260°C)	Final	0 / 40	0 / 40	0 / 40	No Delam
2	TC	Yes	Test Conditions = -55°C / +150°C	100cyc	0 / 20	0 / 20	0 / 20	No Delam
				500cyc	0 / 20	0 / 20	0 / 20	No Delam
				1000cyc	0 / 20	0 / 20	0 / 20	No Delam
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 20	0 / 20	0 / 20	No Delam
4	HTSL	No	Test Conditions = Ta = +150°C Without bias	500hrs	0 / 20	0 / 20	0 / 20	No Delam
				1000hrs	0 / 20	0 / 20	0 / 20	No Delam

NOTES

SAM analysis did not reveal any delamination issue on Die Attach Material (DAM), Die / Molding Compound (Die Top) and also Die-Pad (front side) / Molding Compound & Die-Pad (back side) / Molding Compound on sampling basis 20 pcs for each reliability trial.

5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3

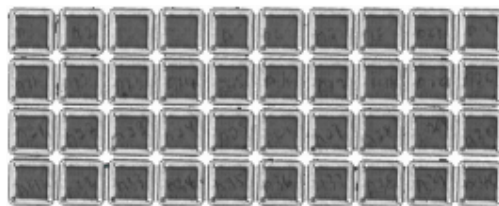
LOT A: 9970908QRR (ZA10LYCAD1)



T-SAM (Thru Scan) @ Time-0
Results: No Delamination



C-SAM (Reflected) @ Time-0
Results: No Delamination



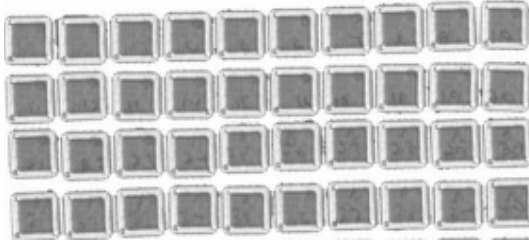
T-SAM (Thru Scan) After MSL3 (3IR)
Results: No Delamination



C-SAM (Reflected) After MSL3 (3IR)
Results: No Delamination

5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3

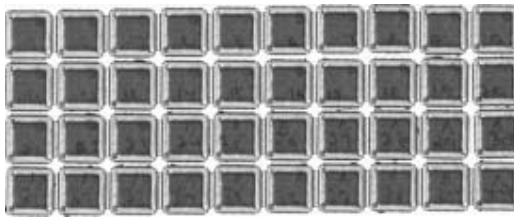
LOT B: 9970908QRO (KA10LYAAB1)



T-SAM (Thru Scan) @ Time-0
Results: **No Delamination**



C-SAM (Reflected) @ Time-0
Results: **No Delamination**

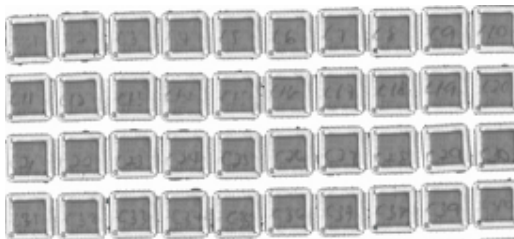


T-SAM (Thru Scan) After MSL3 (3IR)
Results: **No Delamination**



C-SAM (Reflected) After MSL3 (3IR)
Results: **No Delamination**

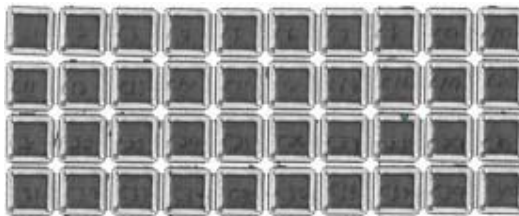
LOT C: 9970908Q01 (ZA10LY9AB1)



T-SAM (Thru Scan) @ Time-0
Results: **No Delamination**



C-SAM (Reflected) @ Time-0
Results: **No Delamination**



T-SAM (Thru Scan) After MSL3 (3IR)
Results: **No Delamination**



C-SAM (Reflected) After MSL3 (3IR)
Results: **No Delamination**

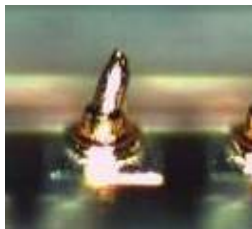
5.4 Test Plan and Results Summary (Wire / Stitch Pull & Ball Shear Analysis)

Reliability Test Status						
No	Test Name	Condition / Method	Fails/SS			Notes
			Lot 1	Lot 2	Lot 3	
1	Wire Pull	After TC 100 cycle	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
2	Wire Pull	After TC 500 cycle	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
3	Wire Pull	After TC 1000 cycle	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
4	Wire Pull	After PPT 96 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
5	Wire Pull	After HTSL 500 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
6	Wire Pull	After HTSL 1000 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	

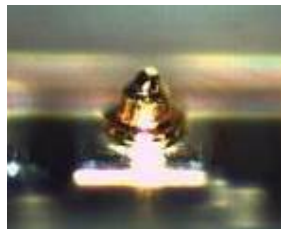
NOTES

Wire bonding strength has been verified through Wire / Stitch Pull & Ball Shear Test: neither abnormal break loads, nor forbidden failure modes have been found on sampling basis 5 pcs after each reliability readout.

Failure Mode Images:



Wire Break & Ball Neck Break



Weld Neck Break



Ball Shear

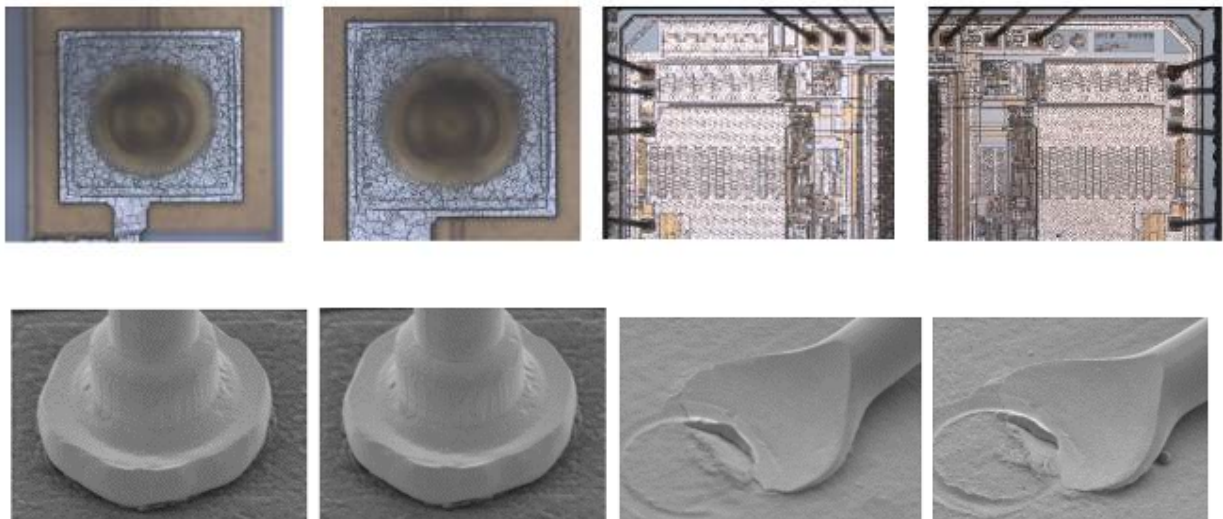
5.5 Test Plan and Results Summary (Corrosion/Passivation & Bond Integrity Check)

Reliability Test Status						
No	Test Name	Condition / Method	Fails/SS			Notes
			Lot 1	Lot 2	Lot 3	
1	Corrosion	After TC 500 cycle	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks
	Bond Integrity		Pass	Pass	Pass	No any abnormality found
2	Corrosion	After TC 1000 cycle	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks
	Bond Integrity		Pass	Pass	Pass	No any abnormality found
3	Corrosion	After PPT 96 hours	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks

NOTES

Decap + Internal VI did not observed any abnormality. There is no any passivation-cracks can be observed and no visible defect (No pad / metal corrosion). Bond Integrity check on 1st and 2nd bond also did not observed any failure / abnormality.

External VI & SEM Images:



6. TESTS DESCRIPTION

6.1 Package tests description

TEST NAME	DESCRIPTION	PURPOSE
PC Preconditioning MSL3 (solder simulation)	The device is submitted to a typical temperature profile used for surface mounting after storage in a control moisture absorption.	As stand-alone test: to investigate the level of moisture sensitivity. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop-corn" effect and delamination.
TC Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are link to metal displacement, dielectric cracking, molding compound delamination, wire bonds failure, die crack.
AC or PPT Autoclave / Pressure Pot Test	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity. To point out critical water entry paths with consequent electrochemical and galvanic corrosion.
HTSL High Temperature Storage Life	The device is stored in unbiased condition at the max temperature allowed by the package materials, sometimes higher than the max operative temperature.	To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding

Reliability Qualification Report
LQFP 10X10 HD LF Qualification

	General Information
Product Line	XA222ABZ
Finished Good	TDA7715-3KH/
Product From	H95W*A222AB6
Process Plan	A9W-LQ10HDA222
Package Technology	LQFP 64 10x10x1.4 1

Locations	
Wafer Fab Location	AM6F - Singapore 6"
Assembly Plant Location	MU1A ST MUAR - MALAYSIA
Testing Plant	Z5GT SUBCO - KYEC - TAIWAN
Reliability Assessment	ST MUAR (QA RELIABILITY LAB)

Issued By: Mohd Ibrahim GHAZALI

Approved By: Olivier MEDARD

TABLE OF CONTENTS

1	APPLICABLE AND REFERENCE DOCUMENTS	Page: 3
2	TEST GLOSSARY	Page: 3
3	RELIABILITY EVALUATION OVERVIEW	
	3.1 OBJECTIVES	Page: 4
	3.2 CONCLUSIONS	Page: 4
4	DEVICE CHARACTERISTICS	
	4.1 TRACEABILITY	Page: 5
5	TEST RESULTS SUMMARY	
	5.1 LOT INFORMATION	Page: 6
	5.2 ELECTRICAL TEST RESULTS	Page: 6
	5.3 SAM ANALYSIS RESULT	Page: 7
	5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3 (3IR)	Page: 8
	5.4 DPA RESULTS (Wire Pull / Ball Shear)	Page: 9
	5.5 DPA RESULTS (Corrosion / Passivation & Bond Integrity)	Page: 10
6	TESTS DESCRIPTION	
	6.1 PACKAGE TESTS DESCRIPTION	Page: 11

1. APPLICABLE AND REFERENCE DOCUMENTS

Document Reference	Short Description
AEC-Q100	Stress test qualification for integrated circuits
SOP 2.6.11	Project management for product development
SOP 2.6.19	Front-end technology platform development & qualification
SOP 2.6.2	Internals change management
SOP 2.6.7	Product maturity level
SOP 2.6.9	Package and process maturity management in Back End
SOP 2.7.5	Automotive products definition and status
0061692	Reliability tests and criteria for product qualification
8160601	Internal reliability evaluation report template
8161393	General specification for product development
7512807	Delamination analysis for plastic packages in reliability tests

2. TEST GLOSSARY

TEST NAME	DESCRIPTION
PC (JL3)	Preconditioning (Solder Simulation)
TC	Temperature Cycling
AC or PPT	Autoclave or Pressure Pot Test
HTSL	High Temperature Storage Life

3. RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The aim of this report is to present the results of the reliability assessment evaluation performed on XA222ABZ (H95W*A222AB6) – ST Muar LQFP 64 10x10 High Density (HD) Lead Frame conversion project.

The main purpose is to qualify LQ10x10 High Density (HD) Lead Frame.

TDA7715-3KH/ is processed in A9W-LQ10HDA222, diffused in AM6F - Singapore 6" and assembled in MU1A ST MUAR - MALAYSIA.

For the reliability assessment evaluation the following test were carried out:

- Preconditioning JL3 (3X Reflow)
- Thermal Cycle Test (TCT)
- Autoclave / Pressure Pot Test (PPT)
- High Temperature Storage Life (HTSL)

3.2 Conclusions

All reliability tests have been completed with positive results. Package oriented test and destructive physical analysis (SAM + Wire pull / ball shear + Bond Integrity Check) also have not put in evidence any criticality to package robustness.

4. DEVICE CHARACTERISTICS

4.1 Traceability

Wafer Fab Information	
Wafer fab manufacturing location	AM6F - Singapore 6"
Wafer diameter	6 inch
Wafer thickness	375+/-25 UM
Silicon process technology	HF4CMOS
Die finishing back side	LAPPED SILICON
Die finishing front side	PSG + NITRIDE
Stepping Die Size(X,Y)	3738,4608 UM
Sawing Street Width(X,Y)	100,100 UM
Min Bond Pad Pitch	180 UM
No of Metal Layer	3

Assembly Information	
Assembly plant location	MU1A ST MUAR - MALAYSIA
Package description	LQFP 64 10x10x1.4
Molding compound	RESIN SUMITOMO EME-G700LS
Wire bonding materials/diameters	Au 1.0 Mils
Die attach material	GLUE LOCTITE ABLESTIK QMI9507-2A1
Lead frame material	FRAME LQFP 64L SpAg+TNCU3

Final Testing Information	
Electrical testing location	Z5GT SUBCO - KYEC - TAIWAN
Tester	FUSION_MX

5. TEST RESULTS SUMMARY

5.1 Lot Information

Lot #	Diffusion Lot	Lot Details / Trace Code	Assy Lot Id	Testing Lot Id
1	V6702V8N	6702V8N / 997162G5	997162G501	ZA10C2EAB1
2	V6702V8N	6702V8N / 997162G5	997162G5RQ	ZA10C2GAB1
3	V6702V8N	6702V8N / 997162G5	997162G5RR	ZA10C2IAB1

5.2 Test Plan and Results Summary (Electrical Test)

Reliability Test Status								
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS			Notes
					Lot 1	Lot 2	Lot 3	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C / 60%RH Reflow Profile = 260°C	Final	0 / 159	0 / 159	0 / 159	Pass
2	TC	Yes	Test Conditions = -55°C/150°C	500cyc	0 / 82	0 / 82	0 / 82	Pass
				1000cyc	0 / 77	0 / 77	0 / 77	Pass
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 77	0 / 77	0 / 77	Pass
4	HTSL	No	Test Conditions = Ta = +150°C	500hrs	0 / 50	0 / 50	0 / 50	Pass
				1000hrs	0 / 45	0 / 45	0 / 45	Pass

NOTES

All units electrically tested good after each reliability test readout.

5.3 Test Plan and Results Summary (Scanning Acoustic Microscopy Analysis)

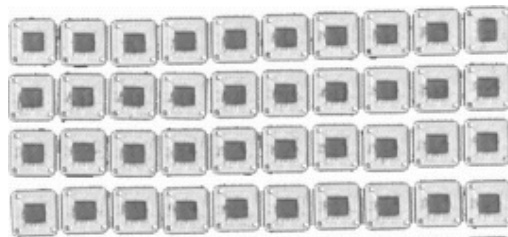
Reliability Test Status								
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS			Notes
					Lot 1	Lot 2	Lot 3	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C/60%RH Reflow Profile = J-STD-020D (Peak max = 260°C)	Final	0 / 40	0 / 40	0 / 40	No Delam
2	TC	Yes	Test Conditions = -55°C / +150°C	500cyc	0 / 20	0 / 20	0 / 20	No Delam
				1000cyc	0 / 20	0 / 20	0 / 20	No Delam
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 20	0 / 20	0 / 20	No Delam
4	HTSL	No	Test Conditions = Ta = +150°C Without bias	500hrs	0 / 20	0 / 20	0 / 20	No Delam
				1000hrs	0 / 20	0 / 20	0 / 20	No Delam

NOTES

SAM analysis did not reveal any delamination issue on Die Attach Material (DAM), Die / Molding Compound (Die Top) and also Die-Pad (front side) / Molding Compound & Die-Pad (back side) / Molding Compound on sampling basis 20 pcs for each reliability trial.

5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3

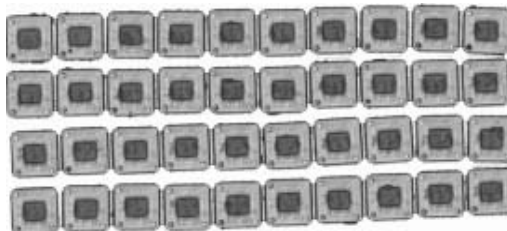
LOT A: 997162G501 (ZA10C2EAB1)



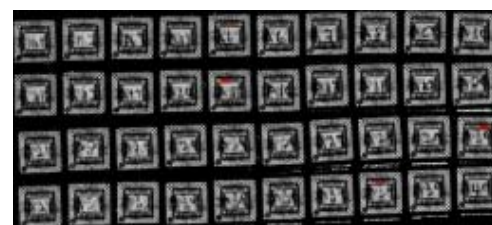
T-SAM (Thru Scan) @ Time-0
Results: No Delamination



C-SAM (Reflected) @ Time-0
Results: No Delamination



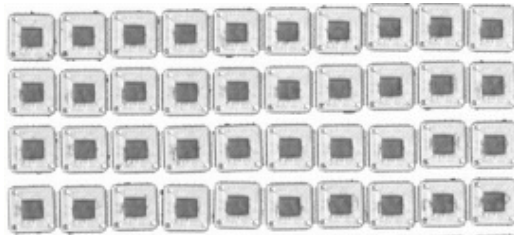
T-SAM (Thru Scan) After MSL3 (3IR)
Results: No Delamination



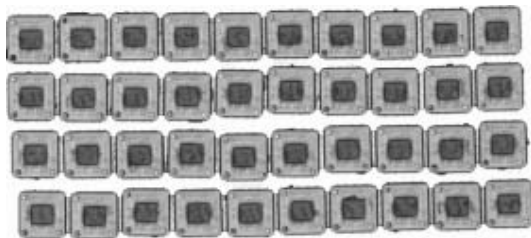
C-SAM (Reflected) After MSL3 (3IR)
Results: No Delamination

5.3.1 SAM IMAGES @ TIME-0 & AFTER MSL3

LOT B: 997162G5RQ (ZA10C2GAB1)



T-SAM (Thru Scan) @ Time-0
Results: No Delamination



T-SAM (Thru Scan) After MSL3 (3IR)
Results: No Delamination

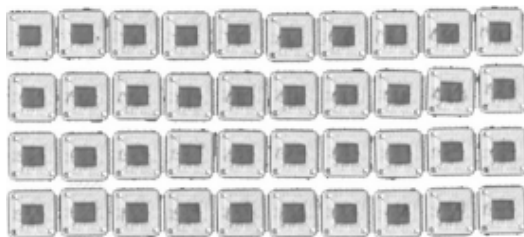


C-SAM (Reflected) @ Time-0
Results: No Delamination

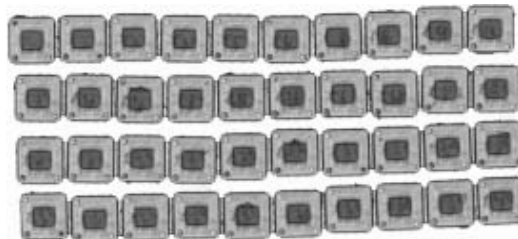


C-SAM (Reflected) After MSL3 (3IR)
Results: No Delamination

LOT C: 997162G5RR (ZA10C2IAB1)



T-SAM (Thru Scan) @ Time-0
Results: No Delamination



T-SAM (Thru Scan) After MSL3 (3IR)
Results: No Delamination



C-SAM (Reflected) @ Time-0
Results: No Delamination



C-SAM (Reflected) After MSL3 (3IR)
Results: No Delamination

5.4 Test Plan and Results Summary (Wire / Stitch Pull & Ball Shear Analysis)

Reliability Test Status						
No	Test Name	Condition / Method	Fails/SS			Notes
			Lot 1	Lot 2	Lot 3	
1	Wire Pull	After TC 500 cycle	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
2	Wire Pull	After TC 1000 cycle	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
3	Wire Pull	After PPT 96 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
4	Wire Pull	After HTSL 500 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	
5	Wire Pull	After HTSL 1000 hours	Pass	Pass	Pass	All WP & BS readings within spec limit
	Stitch Pull		Pass	Pass	Pass	
	Ball Shear		Pass	Pass	Pass	

NOTES

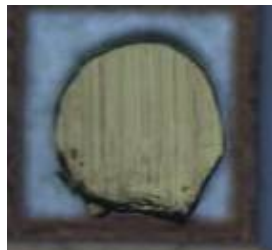
Wire bonding strength has been verified through Wire / Stitch Pull & Ball Shear Test: neither abnormal break loads, nor forbidden failure modes have been found on sampling basis 5 pcs after each reliability readout.

Failure Mode Images:



Wire Break & Ball Neck Break

Weld Neck Break



Ball Shear

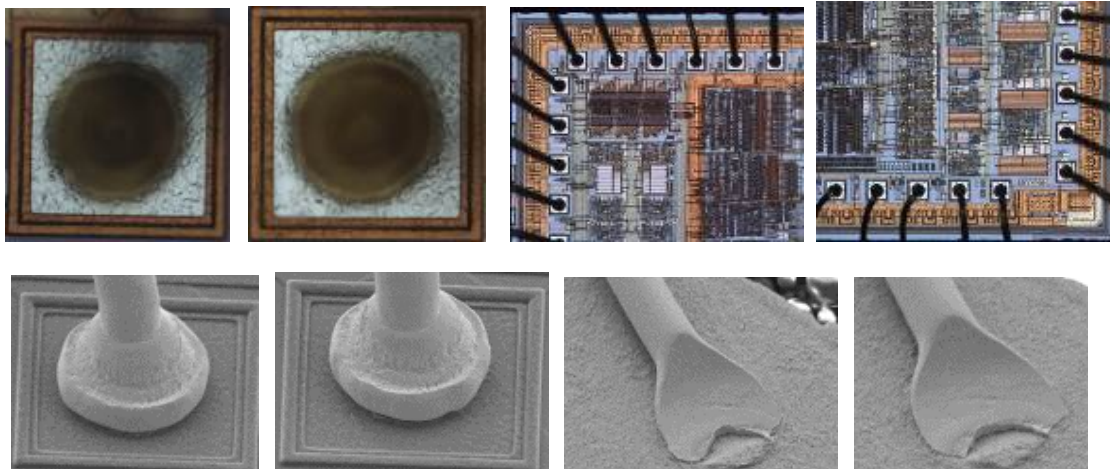
5.5 Test Plan and Results Summary (Corrosion/Passivation & Bond Integrity Check)

Reliability Test Status						
No	Test Name	Condition / Method	Fails/SS			Notes
			Lot 1	Lot 2	Lot 3	
1	Corrosion	After TC 500 cycle	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks
	Bond Integrity		Pass	Pass	Pass	No any abnormality found
2	Corrosion	After TC 1000 cycle	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks
	Bond Integrity		Pass	Pass	Pass	No any abnormality found
3	Corrosion	After PPT 96 hours	Pass	Pass	Pass	No pad / metal corrosion
	Passivation		Pass	Pass	Pass	No passivation-cracks

NOTES

Decap + Internal VI did not observed any abnormality. There is no any passivation-cracks can be observed and no visible defect (No pad / metal corrosion). Bond Integrity check on 1st and 2nd bond also did not observed any failure / abnormality.

External VI & SEM Images:



TESTS DESCRIPTION

6.1 Package tests description

TEST NAME	DESCRIPTION	PURPOSE
PC Preconditioning MSL3 (solder simulation)	The device is submitted to a typical temperature profile used for surface mounting after storage in a control moisture absorption.	As stand-alone test: to investigate the level of moisture sensitivity. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop-corn" effect and delamination.
TC Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are link to metal displacement, dielectric cracking, molding compound delamination, wire bonds failure, die crack.
AC or PPT Autoclave / Pressure Pot Test	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity. To point out critical water entry paths with consequent electrochemical and galvanic corrosion.
HTSL High Temperature Storage Life	The device is stored in unbiased condition at the max temperature allowed by the package materials, sometimes higher than the max operative temperature.	To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding