

PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.	MDG/19/11337	
1.3 Title of PCN	AMKOR ATT (Taiwan) thick copper RDL for STM32L4x products in WLCSP package	
1.4 Product Category	STM32L4x products in WLCSP package	
1.5 Issue date	2019-09-24	

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	Ricardo Antonio DE SA EARP
2.1.2 Marketing Manager	Veronique BARLATIER
2.1.3 Quality Manager	Pascal NARCHE

3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Methods	Process adjustment within specification limits when no reliability or quality risk has been highlighted by the risk assessment.	Amkor ATT (Taiwan)

4. Description of change

	Old	New
4.1 Description	Amkor ATT(Taiwan), standard Copper ADL	Amkor ATT(Taiwan), thick Copper RDL See in PCN11337_Additional information document attached
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No Change	

5. Reason / motivation for change

5.1 Motivation	Alignment to state of the art WLCSP process with Thick RDL
5.2 Customer Benefit	QUALITY IMPROVEMENT

6. Marking of parts / traceability of change

6.1 Description	Traceability of the change is ensured by ST internal tools. No change on the marking or the labeling.
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7. Timing / schedule

7.1 Date of qualification results	2019-08-28
7.2 Intended start of delivery	2019-09-27
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation

8.1 Description	11337 MDG-MCD-RER1803 V1.0 - PCN11337 - Thick RDL for WLCSP - STM32L - reliability report.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2019-09-24

9. Attachments (additional documentations)
11337 Public product.pdf 11337 MDG-MCD-RER1803 V1.0 - PCN11337 - Thick RDL for WLCSP - STM32L - reliability report.pdf 11337 PCN11337_Additional information.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
	STM32L451REY6TR	
	STM32L452REY6TR	
	STM32L462REY6TR	
	STM32L4R5ZIY6TR	
	STM32L4R9ZIY6PTR	
	STM32L4R9ZIY6TR	
	STM32L4S9ZIY6TR	

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Public Products List

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PCN Title : AMKOR ATT (Taiwan) thick copper RDL for STM32L4x products in WLCSP package

PCN Reference : MDG/19/11337

Subject : Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

STM32L451REY6TR	STM32L4R5ZIY6TR	STM32L452REY6PTR
STM32L4R9ZIY6TR	STM32L4R9ZIY6PTR	STM32L462REY6TR
STM32L452REY6TR		



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AMKOR ATT (Taiwan) Back-End Site
New bill of material for STM32L4x in WLCSP

MDG - Microcontrollers Division (MCD)

	Current back-end source	Added back-end site
Assembly site	Amkor Taiwan T1 WLCSP12"	Amkor Taiwan T1 WLCSP12"
Redistribution layer thickness	Standard Copper RDL	Thick Copper RDL

How can the change be seen?

Traceability of the change is ensured by ST internal tools.
No change on the marking or the labeling.

How to order samples?

For all samples request linked to this PCN, please:

- place a **Non-standard** sample order (choose Sample Non Std Type from pull down menu)
- insert the PCN number "**PCN11337**" into the NPO Electronic Sheet/**Regional Sheet**
- request sample(s) through Notice tool, indicating a single Commercial Product for each request

Partial Ship: 01 Price Pol: 05 Status: 01 Canc: ☐

%: 0 Sample Type: Sample Non Std Type

Closing Type: Sample Std Type
Sample Non Std Type
Sample Non Std w Spl Tests

Lab Sheet:

SO | NPO Sample

Header

SO Nr: 8018S02433 Customer: 99770200 01 ST-TOKYO SO Type: 30 Sample Order Cost Center: JT3129 SAMPLES /SALES J

PO Nr: JT3129/Tokumitsu/AXIS_NidecSank Carrier Code: 0001 Price Policy: 05 Currency: 02 U.S. DOLLAR Req Name: Tokumitsu

Notes: Status: 01 All items pending, n Issuing Date: 25-JUN-2018 Ord Val: 0.0000 Sample Req Date: 25-Jun-2018

Sch I Nr	PO I. Nr.	Finished Good	Comm Qty	Open Qty	Plant Open Qty	Reqd Qty	Unit Price	RD	CD	EDD	St
1.1.10	000001	STM32F429NIH6	30	30	30	30	0.0000	25-Jun-18	01-Mar-59	01-Mar-59	01

Final Cust:

PO Item: 000001 Comm Prod: STM32F429NIH6 Qty: 30 RD: 25-Jun-18 Unit Price: 0.0000 Final Cust: 8800367006 SANSHIN/NPC

Cust Part Nr: Finishd Good: Partial Ship: 01 Price Pol: 05 Status: 01 Canc: ☐

Notes: TAM K Pieces: 0 Our Share%: 0 Sample Type: Sample Non Std Type

Project Name: Closing Date: Closing Type:

Regional Sheet: Lab Sheet:

PCN 10595

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MDG-MCD-RER1803

Reliability Report

Qualification Type: WLCSP RDL process improvement

12" WLCSP Thick Copper RDL in Amkor Taiwan

(PCN11337)

Product / Process / Package Information		
Commercial Product:	STM32L452REY6TR	STM32L4R9ZIY6PTR
Mask Set Revision:	E462XXXY	E470XXXY
Silicon Process Technology:	90nm eFlash Generic TSMC	
Wafer Fabrication Location:	TSMC Fab14 DIFF	
Package:	WLCSP64L	WLCSP144L
Assembly Plant location:	Amkor ATT1/3 (Taiwan)	

Approval List rev 1			
Function	Location	Name	Date
MDG-MCD Division Quality Manager	ST Rousset	Pascal Narche	July 24th, 2019
MDG-MCD BE Quality Manager	ST Rousset	Gisèle Seube	July 24th, 2019

MDG-MCD-RER1803

Reliability Report

Contents

1	RELIABILITY RESULTS OVERVIEW	3
1.1	Objectives.....	3
1.2	Reliability Evaluation: Context & strategy summary	3
1.3	Conclusion.....	3
2	TEST VEHICLE CHARACTERISTICS.....	4
2.1	Reliability Test vehicles description.....	4
2.2	Reliability Information.....	4
2.3	Reliability Evaluation: Results summary	5
3	RELIABILITY TEST VEHICLES CHARACTERISTICS.....	6
3.1	Front-End information	6
3.2	Back-End information.....	7
4	APPLICABLE AND REFERENCE DOCUMENTS	8
5	GLOSSARY AND TESTS DESCRIPTION.....	8
6	REVISION HISTORY	9

MDG-MCD-RER1803

Reliability Report

1 RELIABILITY RESULTS OVERVIEW

1.1 Objectives

The aim of this report is to present results of the reliability evaluation for WLCSP package with Thick RDL manufactured at Amkor ATT1/3 (Taiwan) assembly and test plant.

Test vehicle is described here below:

Product	Process or Package	Diffusion or Assembly plant
STM32L452REY6TR	WLCSP64L	ATT1/3 (Taiwan)
STM32L4R9ZIY6PTR	WLCSP144L	ATT1/3 (Taiwan)

Qualification is based on standard STMicroelectronics Corporate Procedures for Quality and Reliability, in full compliancy with the JESD-47 international standard

1.2 Reliability Evaluation: Context & strategy summary

This reliability evaluation concerns qualification of thick RDL for WLCSP at ATT.

Changes are described here below:

	Current back-end source	Added back-end site
Assembly site	Amkor Taiwan T1 WLCSP12"	Amkor Taiwan T1 WLCSP12"
Redistribution layer thickness	Standard Copper RDL	Thick Copper RDL

Reliability strategy has been defined as follows:

- 1 test vehicle for un-biased & biased reliability trials
- 1 test vehicle for un-biased reliability trials

1.3 Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.

According to good reliability tests results in line with validated product mission profile and reliability strategy, the qualification is granted for WLCSP thick RDL for TSMC90nm devices at Amkor ATT1/3 (Taiwan).

Refer to Section 2.0 for reliability test results.

MDG-MCD-RER1803

Reliability Report

2 TEST VEHICLE CHARACTERISTICS

2.1 Reliability Test vehicles description

Package line	Assembly Line Package	Device (Partial RawLine Code)	Diffusion Process	Number of Lots
WLCSP	WLCSP64	STM32 (CN*462)	TSMC90	1
	WLCSP144	STM32 (DF*470)	TSMC90	1

2.2 Reliability Information

Lot ID	Lot 1	Lot2
Finish Good:	ES32L452REY6\$64	ES32L4R9ZIY6P\$63
Die Name /cut:	E462XXXY	E470XXXY
Diffusion Lot Number:	9R716066	9R834018
Trace Code :	A581200F	A5846001
Reliability Lab location :	ST Grenoble	ST Grenoble
Fab name location:	TSMC Fab14	TSMC Fab14
Assembly plant location:	Amkor ATT1/3 (Taiwan)	Amkor ATT1/3 (Taiwan)
Package description:	WLCSP64L	WLCSP144L

MDG-MCD-RER1803

Reliability Report

2.3 Reliability Evaluation: Results summary

Package oriented test results in WLCSP64 L– 144L

Package Related Tests						Results	
Description	Test/Method	Conditions	Sample Size	Criteria	Readout / Duration	Lot 1	Lot 2
						Die 462	Die 470
Electrostatic discharge – Charge Device Model							
ESD	ANSI-ESDS5.3.1	DSI	2x3	250V Class 3	250V	0/3	0/3
Preconditioning: Moisture Sensitivity Level: MSL1							
PC	J-STD-020 JESD22-A113	24h bake @125°C 168h @ 85°C/ 85% RH Reflow simulation (3times) @ 260°C peak temperature	2x308	A0/R1	N.A	0/308	0/241
High Temperature Storage Life after Preconditioning							
HTSL	JESD 22-A103	150°C	1x77	A0/R1 1000h	1000h	0/77	0/77
Thermal Cycling after Preconditioning							
TC	JESD 22-A104	-65C/+150°C	1x77	A0/R1 500cy	500cy	0/77	0/77
Unbiased HAST after Preconditioning							
UHASt	JESD 22-A118	130°C ,85% 2Atm RH	1x77	A0/R1 96h	96h	0/77	0/77
HAST after Preconditioning							
HAST	JESD 22-A110	130°C ,85% 2Atm RH Bias	1x77	A0/R1 96h	96h	0/77	
Construction Analysis							
CA	Construction Analysis	JESD 22B102 JESDB100/ B108	50	No major concern	N.A	No concern	No concern

MDG-MCD-RER1803

Reliability Report

3 RELIABILITY TEST VEHICLES CHARACTERISTICS

3.1 Front-End information

Front-End	Diffusion FAB		
Wafer Fab Name	TSMC FAB14		
Wafer Fab Location/ Address	1-1, Nan-Ke North Rd., Tainan Science Park, Tainan 741-44, Taiwan		
Process Technology Name	TSMC090 ULL		
Wafer Diameter	12 inch		
Wafer Thickness	775µm +/- 25µm		
Die Size	X :3392.6 um Y: 3692.8 um / 12.5 mm ²		
Technology Mask Number	45		
Scribe Line size x/y:	80 x 80µm		
Pad Die Size /Pad type:	123 x 59µm		
Layer Under Metallization Material Thickness	Silicon oxide 180nm		
Metal Layers Number Materials Thickness	Metal 1	TaN/Ta/CuSeed/Cu	0.240 um
	Metal 2	TaN/Ta/CuSeed/Cu	0.310 um
	Metal 3	TaN/Ta/CuSeed/Cu	0.310 um
	Metal 4	TaN/Ta/CuSeed/Cu	0.310 um
	Metal 5	TaN/Ta/CuSeed/Cu	0.310 um
	Metal 6	TaN/Ta/CuSeed/Cu	0.850 um
	Metal 7	AlCu	1.450 um
Passivation Layers Number Materials Thickness	750Å nit+ 4000Å oxide + 750 Å nit + 2500 Å oxide		
Back Metal Finishing Thickness	NA		

MDG-MCD-RER1803

Reliability Report

3.2 Back-End information

Back-End	Lot 1- Lot 2
Assembly Plant Location/ Address:	Amkor ATT1/3 Taiwan
Die Thickness after Back grinding:	355 μ m
Die sawing method:	Laser Groove + step cut
Balls Material & Diameter (BGA & CSP)	SAC405 Diam 230um
Routing Layer Material (CSP)	Cu RDL
Passivation type (CSP)	PBO HD8820
Back side coating (CSP) Material Thickness	LC2850 25 μ m
Package Moisture Sensitivity Level (JEDEC J-STD020D):	MSL1

MDG-MCD-RER1803

Reliability Report

4 APPLICABLE AND REFERENCE DOCUMENTS

DMS 0061692 :	Reliability Tests And Criteria For Qualifications
SOP 2.6.2:	Process qualification and transfer management
SOP 2.6.7:	Product Maturity Level
SOP 2.6.9:	Package and process maturity management in Back End
SOP 2.6.11:	Program management from product qualification
SOP 2.6.19:	Process maturity level
JESD47	Stress-Test-Driven Qualification of Integrated Circuits
ANSI/ESDA/ JEDEC JS-001	Electrostatic discharge (ESD) sensitivity testing human body model (HBM)
ANSI/ESDA/ JEDEC JS-002	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
JESD78	IC Latch-up test
JESD 22-A108	Temperature, Bias and Operating Life
JESD 22-A117	Endurance and Data retention
JESD 22-A103	High Temperature Storage Life
J-STD-020:	Moisture/reflow sensitivity classification for non-hermetic solid state surface mount devices
JESD22-A113:	Preconditioning of non-hermetic surface mount devices prior to reliability testing
JESD22-A118:	Unbiased Highly Accelerated temperature & humidity Stress Test
JESD22-A104:	Temperature cycling
JESD22-A101:	Temperature Humidity Bias
JESD22-A110:	Biased Highly Accelerated temperature & humidity stress Test
JESD 22B102:	Solderability test
JESD22B100/B108:	Physical dimension

5 GLOSSARY AND TESTS DESCRIPTION

HTOL	High Temperature Operating Life
EDR	Endurance and Data Retention
ELFR	Early Failure Rate
PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
uHAST	Unbiased Highly Accelerated Stress Test
HAST	Highly Accelerated temperature & humidity stress Test
HTSL	High temperature storage life
DMS	ST Advanced Documentation Controlled system/ Documentation Management system
ESD HBM	Electrostatic discharge (human body model)
ESD CDM	Electrostatic discharge (charge device model)
LU	Latch-up
CA	Construction Analysis

MDG-MCD-RER1803

Reliability Report

6 REVISION HISTORY

Version	Date	Author	Comment
1	24 th July 2019	Céline Navarro	Initial version

MDG-MCD-RER1803

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