PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	AMS/21/12543
1.3 Title of PCN	Qualification of subcontractor TSHT for selected products in S016 package
1.4 Product Category	See product list
1.5 Issue date	2021-01-29

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	Marcello SAN BIAGIO
2.1.2 Marketing Manager	Salvatore DI VINCENZO
2.1.3 Quality Manager	Giuseppe LISI

3. Change		
3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Transfer	Line transfer for a full process or process brick (process step, control plan, recipes) from one site to another site: Assembly site (SOP 2617)	TSHT

4. Description of change		
	Old	New
4.1 Description	Assembly plant : - Amkor - ASE - ST Shenzhen	Assembly plant : - ST Shenzhen - TSHT
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No impact	

5. Reason / motivation for change	
5.1 Motivation	The qualification of TSHT for SO16 package will allow us to rationalize our production tool and provide better delivery service
5.2 Customer Benefit	SERVICE IMPROVEMENT

6. Marking of parts / traceability of change	
6.1 Description	New finished good codes

7. Timing / schedule	
7.1 Date of qualification results	2021-01-08
7.2 Intended start of delivery	2021-04-30
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	12543 W1410-2021-6088-New Assembly Plant TSHT for SO 16 Narrow_ ULN2003D1R (L203).pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2021-01-29

9. Attachments (additional documentations)
12543 Public product.pdf 12543 W1410-2021-6088-New Assembly Plant TSHT for SO 16 Narrow_ ULN2003D1R (L203).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
ULN2001D1013TR	ULN2001D1013TR	
ULN2002D1013TR	ULN2002D1013TR	
ULQ2003D1013TR	ULQ2003D1013TR	
ULQ2004D1013TR	ULQ2004D1013TR	

IMPORTANT NOTICE – PLEASE READ CAREFULLY

Subject to any contractual arrangement in force with you or to any industry standard implemented by us, STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

Public Products List

Publict Products are off the shelf products. They are not dedicated to specific customers, they are available through ST Sales team, or Distributors, and visible on ST.com

PCN Title : Qualification of subcontractor TSHT for selected products in S016 package

PCN Reference : AMS/21/12543

Subject : Public Products List

Dear Customer,

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

ULQ2003D1013TR	ULN2003D1013TR	ULN2004D1013TR
ULQ2004D1013TR	ULN2002D1013TR	ULN2001D1013TR

IMPORTANT NOTICE – PLEASE READ CAREFULLY

Subject to any contractual arrangement in force with you or to any industry standard implemented by us, STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

REL.6088- 1410 -2021

Reliability Evaluation Report

New Assembly Plant

SC-Tianshui Huatian-China (TSHT)
SO 16 Narrow

TV: ULN2003D1R (L203)

General Information	
Product Lines	L20303
Product Description	DARLINGTON ARRAY
P/N	*ULN2003D1R*
Product Group	*AMS (Analog MEMS & Sensor Group)*
Product division	*General Purpose Analog & RF Division* *POWER MANAGEMENT*
Package	*SO 16 Narrow*
Silicon Process technology	*Bipolar*

Locations	
Wafer fab	*Singapore 6*
Assembly plant	*SC-Tianshui Huatian-China (TSHT)*
Reliability Trials	*PASS*

Version	Date	Pages	Created by	Approved by	Comment
1.0	January 2021	6	Antonio Russo	Giuseppe Lisi	Final Report

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD47	Stress-Test-Driven Qualification of Integrated Circuits

2 RELIABILITY EVALUATION OVERVIEW

2.1 OBJECTIVES

This report contains the reliability evaluation of ULN2003D1R (L203) SO 16 narrow in the new assembly plant SC-Tianshui Huatian-China (TSHT). The reliability evaluation has been performed on three different assy lots as requested by JEDEC JESD47 for this type of change (new assembly plant).

2.1 CONCLUSION

Qualification Plan requirements have been defined accordingly to JESD47. We have completed the reliability trials on all 3 assy lots and have shown that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the ruggedness of the products and safe operation, which is consequently expected during their lifetime. More details are available below in test and results summary.

3 CHANGE DESCRIPTION

Qualification of new Assembly Plant SC-Tianshui Huatian-China (TSHT) for SO 16 Narrow

4 CONSTRUCTION NOTE

	L203
Wafer/Die fab. Information	
Wafer fab manufacturing location	Singapore 6
Technology	Bipolar
Die finishing back side	Cr/Ni/Ag
Die size	2280 x 1200 um
Passivation type	SiN (nitride)
Assembly information	
Assembly site	**SC-Tianshui Huatian-China (TSHT)**
Package description	SO 16 Narrow
Mold Compound	Epoxy
Frame	Pure Tin Plating Sn 100%
Bond Wire	1.0 mil PdCu

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Lot #	Commercial product	Rawline	Package	Product Line
1	ULN2003D1R	PRQ7*L2034A6	SO 16	L20303
2				
3				

5.2 Test plan and results summary

Test	PC	Std ref.	Conditions	ss	Steps	SS			Note
						Lot 1	Lot 2	Lot 3	
Die Oriented Reliability trials									
HTSL	N	JESD22 A-103	Ta = 150°C	240	168 H	0/80	0/80	0/80	2
					500 H	0/80	0/80	0/80	
					1000 H	0/80	0/80	0/80	
Package Oriented Reliability trials									
PC	-	JESD22 A-113	Drying 24 H @ 125°C Store 168 H @ Ta=85°C Rh=85% Oven Reflow @ Tpeak=260°C 3 times	480	Final	Pass	Pass	Pass	
AC	Y	JESD22 A-102	Pa=2Atm / Ta=121°C	240	96 H	0/80	0/80	0/80	1
TC	Y	JESD22 A-104	Ta = -65°C to 150°C	240	100cy	0/80	0/80	0/80	1
					500 cy	0/80	0/80	0/80	
Package Assembly Integrity trials									
WBP	-	M2011	30 wires, characterization	15	Final	Pass CPK>1.66	Pass CPK>1.66	Pass CPK>1.66	
WBS	-	JESD22-B116	30 balls, characterization	15	Final	Pass CPK>1.66	Pass CPK>1.66	Pass CPK>1.66	
Solderability	-	JESD22-B102	>95% lead coverage	15	Final	Pass	Pass	Pass	

Notes:
1. Preconditioning with soak per J-STD-020 at rated moisture sensitivity level prior to acceleration stress testing
2. Preconditioning without soak

6 ANNEXES

6.1 Pin connections

Please refer to product datasheet

6.2 Package Mechanical data

Please refer to product datasheet

7 TEST DESCRIPTION

Test name	Description	Purpose
Die Oriented		
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.
Package Oriented		
PC Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. 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.
AC Auto Clave (Pressure Pot)	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.
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 linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.
WBS Wire Bond Shear	A process in which an instrument uses a chisel shaped tool to shear or push a ball or wedge/stitch bond off the bonding surface. The force required to cause this separation is recorded and is referred to as the bond shear strength. The bond shear strength of a ball bond, when correlated to the diameter of the ball bond, is an indicator of the quality of the metallurgical bond between the ball bond and the die bonding surface metallization.	This test establishes a procedure for determining the strength of the interface between a ball bond and a package bonding surface. This strength measurement is extremely important in determining the integrity of the metallurgical bond which has been formed.
WBP Wire Bond Pull	The apparatus for this test shall consist of suitable equipment for applying the specified stress to lead wire or terminal as required in the specified test condition. A calibrated measurement and indication of the applied stress in grams force (gf) shall be provided by equipment capable of measuring stresses.	The purpose of this test is to measure bond strengths, evaluate bond strength distributions, or determine compliance with specified bond strength requirements of the applicable acquisition document.