# 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 | HARTMANN DORIS |
| 2.1.2 Phone | +49 89460062186 |
| 2.1.3 Email | doris.hartmann@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 :<br>- Amkor<br>- ASE<br>- ST Shenzhen | Assembly plant :<br>- ST Shenzhen<br>- 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<br>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 | |
| | ULN2002D1013TR | |
| | ULN2003D1013TR | |
| | ULN2004D1013TR | |

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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*<br>*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.<br>As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance.<br>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. |

## 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 |

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