



PRODUCT/PROCESS CHANGE NOTIFICATION

PCN MPA-PMT/06/1871
Notification Date 07/14/2006

New Subcontractor location (GEM) for Low Voltage DPAK

Power Mosfets PMT - POWER MOSFET

PMT - POWER MOSFET

Table 1. Change Identification

| | |
|---|--|
| Product Identification (Product Family/Commercial Product) | see attached list |
| Type of change | Package assembly location change |
| Reason for change | Capacity Extension |
| Description of the change | Power Mosfet Division has decided to set up a new Subcontractor (GEM). Devices in DPAK, assembled in ST House plant, will be manufactured also in Subcontractor GEM. |
| Product Line(s) and/or Part Number(s) | See attached |
| Description of the Qualification Plan | See attached |
| Change Product Identification | See "GL" on trace code, "G" is China, "L" is GEM |
| Manufacturing Location(s) | |

Table 2. Change Implementation Schedule

| | |
|--|-------------|
| Forecasted implementation date for change | 25-Sep-2006 |
| Forecasted availability date of samples for customer | 26-Jun-2006 |
| Forecasted date for STMicroelectronics change Qualification Plan results availability | 26-Jun-2006 |
| Estimated date of changed product first shipment | 26-Jun-2006 |

Table 3. Change Responsibility


| | Name | Signature | Date |
|----------------------------|------------------|-----------|------------|
| Division Product Manager | Ian Wilson | | Jul.11 ,06 |
| Division Q.A. Manager | Giuseppe Falcone | | Jul.11 ,06 |
| Division Marketing Manager | Maurizio Giudice | | Jul.11 ,06 |

Table 4. List of Attachments

| | |
|----------------------------|--|
| Customer Part numbers list | |
| Qualification Plan results | |



| | | | |
|--|------------|------------------------------|--|
| Customer Acknowledgement of Receipt | | PCN MPA-PMT/06/1871 | |
| Please sign and return to STMicroelectronics Sales Office | | Notification Date 07/14/2006 | |
| <input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved | Name: | | |
| | Title: | | |
| | Company: | | |
| | Date: | | |
| | Signature: | | |
| Remark | | | |

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

RELIABILITY EVALUATION **ON** **DPAK ASSEMBLED IN GEM**

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 1 of 13 |
|------------------|-----------------------------------|---------------------|



| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Table of Contents

| | | |
|----|---------------------------------|--------|
| 1. | Introduction | pg. 3 |
| 2. | Test vehicles | pg. 4 |
| 3. | Failure Criteria | pg. 5 |
| 4. | Evaluation plan and results | pg. 6 |
| 5. | Appendixes | |
| | - Technological Characteristics | pg. 9 |
| | - Reliability Test Description | pg. 12 |

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 2 of 13 |
|------------------|-----------------------------------|---------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |


Introduction

This report aims at the internal qualification of the package DPAK assembled in sub-contractor GEM

The Qualification Reliability test trials have been performed in ST Catania Site.

The evaluation results meet ST products qualification targets, therefore the DPAK is qualified in GEM.

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 3 of 13 |
|------------------|-----------------------------------|---------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Test Vehicles:


Product Lines

432C
E33N
3L2B

Main Sales Types

STD55NH2LLT4
STD17NF03LT4
STD38NH02LT4

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 4 of 13 |
|------------------|-----------------------------------|---------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Failure Criteria :

A failed component is a device which becomes inoperative during the test or it fails on meeting the end limits foreseen in the device specification, for one or more than the parameters here below reported

Parameter Power MOSFET

Drain Leakage Current (I_{dss})
 Gate Leakage Current (I_{gss})
 Threshold Voltage ($V_{gs(th)}$)
 Forward On Voltage (V_{sd})
 Drain Source On Voltage ($V_{ds(on)}$)
 Drain Source Breakdown Voltage (B_{vds})

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 5 of 13 |
|------------------|-----------------------------------|---------------------|


| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Reliability Evaluation Plan and results

D.U.T. : STD55NH2LLT4 LINE: 432C PACKAGE: DPAK

| Test | Conditions | S.S. | Requirement | Results |
|---|---|----------------|--|---|
| PRECONDITIONING OF SMD DEVICES Before TC/THB/ENV. SEQ. | DRYNG 1H @ 125°C STORE 168H @ TA=85°C RH=85% Reflow @ 260°C 3 times | 204 x 1 Lot | Parameter deviation within spec. limits at end of preconditioning. | <i>No parameter deviation out of spec. limits at end of pre-conditioning.</i> |
| H.T.S. | TA=175°C | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| T.H.B. | <i>D.U.T. SMD PRECONDITIONED</i> TA=85°C - RH=85% Vbias= 20V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| H.T.R.B. | T.A.=175°C Vdd=20V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| H.T.F.B. | TA=150°C Vgss=16V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| PRESSURE POT | TA=121°C - PA=2Atm | 77 x 1 Lot | Parameter deviation within spec. limits at 96 hours. | No parameter deviation out of spec. limits at 96 hours. |
| THERMAL CYCLES AIR TO AIR | <i>D.U.T. SMD PRECONDITIONED</i> TA=-65°C TO 150°C 1 HOUR / CYCLE | 77 x 1 Lot | Parameter deviation within spec. limits at 500 cycles. | No parameter deviation out of spec. limits at 500 cy |
| THERMAL FATIGUE | ΔTC=105°C - Pd=2W | 77 x 1 Lot | Parameter deviation within spec. limits at 10k cycles. | No parameter deviation out of spec. limits at 10Kcy. |
| ENVIRONMENTAL SEQUENCE | D.U.T. SMD PRECONDITIONED 100 THERMAL CYCLES + 96H PP | 50 x 1 Lot | Parameter deviation within spec. limits at end of test. | <i>No parameter deviation out of spec. limits at end of test.</i> |

| | | |
|------------------|-------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 6 of 13 |
|------------------|-------------------------------|---------------------|


| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Reliability Evaluation Plan and results

D.U.T. : STD17NF03LT4 LINE: E33N PACKAGE: DPAK

| Test | Conditions | S.S. | Requirement | Results |
|---|---|----------------|--|--|
| PRECONDITIONING OF SMD DEVICES Before TC/THB/ENV. SEQ. | DRYNG 1H @ 125°C STORE 168H @ TA=85°C RH=85% Reflow @ 260°C 3 times | 204 x 1 Lot | Parameter deviation within spec. limits at end of preconditioning. | <i>No parameter deviation out of spec. limits at end of preconditioning.</i> |
| H.T.S. | TA=175°C | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| T.H.B. | <i>D.U.T. SMD PRECONDITIONED</i> TA=85°C - RH=85% Vbias= 24V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| H.T.R.B. | T.A.=175°C Vdd=24V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| H.T.F.B. | TA=150°C Vgss=16V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | No parameter deviation out of spec. limits at 1000 hours. |
| PRESSURE POT | TA=121°C - PA=2Atm | 77 x 1 Lot | Parameter deviation within spec. limits at 96 hours. | No parameter deviation out of spec. limits at 96 hours. |
| THERMAL CYCLES AIR TO AIR | <i>D.U.T. SMD PRECONDITIONED</i> TA=-65°C TO 150°C 1 HOUR / CYCLE | 77 x 1 Lot | Parameter deviation within spec. limits at 500 cycles. | No parameter deviation out of spec. limits at 500 cy |
| THERMAL FATIGUE | ΔTC=105°C - Pd=2W | 77 x 1 Lot | Parameter deviation within spec. limits at 10k cycles. | No parameter deviation out of spec. limits at 10Kcy. |
| ENVIRONMENTAL SEQUENCE | D.U.T. SMD PRECONDITIONED 100 THERMAL CYCLES + 96H PP | 50 x 1 Lot | Parameter deviation within spec. limits at end of test. | <i>No parameter deviation out of spec. limits at end of test.</i> |

| | | |
|------------------|-------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 7 of 13 |
|------------------|-------------------------------|---------------------|


| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Reliability Evaluation Plan and results

D.U.T. : STD38NH02LT4 LINE: 3L2B PACKAGE: DPAK

| Test | Conditions | S.S. | Requirement | Results |
|---|---|----------------|--|---|
| PRECONDITIONING OF SMD DEVICES Before TC/THB/ENV. SEQ. | DRYNG 1H @ 125°C STORE 168H @ TA=85°C RH=85% Reflow @ 260°C 3 times | 204 x 1 Lot | Parameter deviation within spec. limits at end of preconditioning. | <i>No parameter deviation out of spec. limits at end of pre-conditioning.</i> |
| H.T.S. | TA=175°C | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | <i>No parameter deviation out of spec. limits at 1000 hours.</i> |
| T.H.B. | <i>D.U.T. SMD PRECONDITIONED</i> TA=85°C - RH=85% Vbias= 20V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | <i>No parameter deviation out of spec. limits at 1000 hours.</i> |
| H.T.R.B. | T.A.=175°C; Vdd=16V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | <i>No parameter deviation out of spec. limits at 1000 hours.</i> |
| H.T.F.B. | TA = 150°C ; Vgss= 20V | 77 x 1 Lot | Parameter deviation within spec. limits at 1000 hours. | <i>No parameter deviation out of spec. limits at 1000 hours.</i> |
| PRESSURE POT | TA=121°C - PA=2Atm | 77 x 1 Lot | Parameter deviation within spec. limits at 96 hours. | <i>No parameter deviation out of spec. limits at 96 hours.</i> |
| THERMAL CYCLES AIR TO AIR | <i>D.U.T. SMD PRECONDITIONED</i> TA=-65°C TO 150°C 1 HOUR / CYCLE | 77 x 1 Lot | Parameter deviation within spec. limits at 500 cycles. | <i>No parameter deviation out of spec. limits at 500 cy</i> |
| THERMAL FATIGUE | TC=105°C - Pd=2W | 77 x 1 Lot | Parameter deviation within spec. limits at 10k cycles. | <i>No parameter deviation out of spec. limits at 10Kcy.</i> |
| ENVIRONMENTAL SEQUENCE | <i>D.U.T. SMD PRECONDITIONED</i> 100 THERMAL CYCLES + 96H PP | 50 x 1 Lot | Parameter deviation within spec. limits at end of test. | <i>No parameter deviation out of spec. limits at end of test.</i> |

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 8 of 13 |
|------------------|-----------------------------------|---------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |


Technological Characteristics

D.U.T. : STD55NH2LLT4 LINE: 432C PACKAGE: DPAK

| | | | | |
|-----------------------|--|------------------|--|--|
| DIE | <i>Technology:</i> PMOS 20V/14 mOhm SP3, 7 Masks <i>Material:</i> Silicon <i>Passivation :</i> NO Passivation <i>Metallization – Front :</i> AlSiCu <i>Dimensions :</i> 2500 x 1760 µm <i>- Back :</i> Ti-Ni-Au | | | |
| DIE ATTACH | Soft solder | FRAME | <i>Frame and lead material:</i> <i>Frame coating :</i> <i>Lead coating :</i> | Raw copper Sel Nickel on T-post Sn 100% |
| WIRE BOND | Ultrasonic | WIRE | <i>Material :</i> <i>Diameter :</i> | Al Gate; Al Source; 5 mils Gate; 15 mils Source |
| SEALING | Molding | PACKAGING | <i>Material :</i> | Epoxy resin |

PRODUCTION PLACES : WAFER PROCESSING : Catania
 ASSEMBLY LOCATION : Shanghai - China
 Q.A. LOCATION : Shanghai - China

| | | |
|------------------|-----------------------------------|---------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 9 of 13 |
|------------------|-----------------------------------|---------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |


Technological Characteristics

D.U.T. : STD38NH02LT4 LINE: 3L2B PACKAGE: DPAK

| | | | | |
|-----------------------|---|------------------|--|--|
| DIE | <i>Technology:</i> PMOS 20V/18 mOhm EHD3, 6 Masks <i>Material:</i> Silicon <i>Passivation :</i> NO Passivation <i>Metallization – Front :</i> AlSi <i>Dimensions :</i> 2160 x 1610 µm <i>- Back :</i> Ti-Ni-Au | | | |
| DIE ATTACH | Soft solder | FRAME | <i>Frame and lead material:</i> <i>Frame coating :</i> <i>Lead coating :</i> | Raw copper Sel Nickel on T-post Sn 100% |
| WIRE BOND | Ultrasonic | WIRE | <i>Material :</i> <i>Diameter :</i> | Al Gate; Al Source; 5 mils Gate; 10 mils Source |
| SEALING | Molding | PACKAGING | <i>Material :</i> | Epoxy resin |

PRODUCTION PLACES : WAFER PROCESSING : Catania
ASSEMBLY LOCATION : Shanghai - China
Q.A. LOCATION : Shanghai - China

| | | |
|------------------|-----------------------------------|----------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 11 of 13 |
|------------------|-----------------------------------|----------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Reliability Test Description

High Temperature Reverse Bias (HTRB)

This test is performed in order to demonstrate the quality and reliability of devices subjected to an elevated temperature and simultaneously reverse biased. The purpose of this test is to detect surface defects such as poor passivation, presence of contaminants, etc...

High Temperature Forward Bias (HTFB)

This test is performed in order to demonstrate the quality and reliability of devices subjected to an elevated temperature and simultaneously forward gate biased. The purpose of this test is to detect surface and gate oxide defects.


High Temperature Storage (HTS)

This stress test is performed to check the device life in a high temperature ambient. Specimens are put for a period of time inside a stove in free air. Detectable failure mechanisms are presence of contaminants and metal corrosion.

Thermal Cycles/Shocks

The purpose of this test is to determine the resistance of devices to exposure to extreme changes in temperature. Specimens are first placed in a suitable environment at a low temperature and then transferred to one at high temperature. Effects of thermal cycles/shocks include cracking of die, breaking of wire bonding, mechanical damage to the device case.

| | | |
|------------------|-----------------------------------|----------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 12 of 13 |
|------------------|-----------------------------------|----------------------|

| | | | |
|---|---|--------------|------------------|
|  | MLD CATANIA RELIABILITY REPORT | Date: | APRIL '06 |
| | | No | 006/'06 |

Reliability Test Description (continued)

Temperature Humidity Bias (THB)

This test is performed to check the device life in a high humidity ambient. Specimens are subjected to a permanent bias in a climatic chamber in the presence of steam. Detectable failure mechanisms are metal corrosion and moulding defects.

Pressure Pot

This test is performed in order to check device life in a high humidity ambient in an accelerated way. Specimens are subjected for a period of time inside an autoclave in the presence of steam and pressure. Detectable failure mechanism is metal corrosion.

Thermal Fatigue

This test is performed to demonstrate the quality and reliability of devices exposed to cyclic variation in electrical stress between "on" and "off" conditions and resultant cyclic variation in device and case temperatures (thermo-mechanical stress). The purpose of this test is to detect assembly defects : improper die-attach, bonding weakness and thermal mismatch among various components of the package.

Environmental Sequence

The purpose of this test is to study the influence of corrosion mechanism when the die/package system has already been stressed by temperature cycling.

| | | |
|------------------|-----------------------------------|----------------------|
| ISSUED BY | RELIABILITY DEPARTMENT | Page 13 of 13 |
|------------------|-----------------------------------|----------------------|

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZE REPRESENTATIVE OF ST,ST PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS, WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners

© 2006 STMicroelectronics - All rights reserved.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

