



**PRODUCT/PROCESS
CHANGE NOTIFICATION**

PCN AMS/20/12142

Analog, MEMS & Sensors Group (AMS)

**Introduction of new Resin, new Bonding wire and new DAP
Plating on DPAK package in Subcontractor
Nantong Fujitsu (TFME)**

WHAT:

Progressing on the activities related to continuous quality improvement, ST is pleased to announce the release of a new set of materials for package DPAK assembled in Subcontractor Nantong Fujitsu (TFME), which will help us to improve the quality by enhancing the adhesion between lead frame-surface and Epoxy molding compound.

Please note that this **new set of materials will NOT affect the internal structure of the lead-frame** (keeping same form, same fit, same internal design and function). So, this change will allow us to improve the quality and robustness of the product.

Impacted Product(s): KS05, KS33, KSAD, L765, L964, LM05, LM09

The table here below shows the list of current and new material affected by this change.

| Material | Current process | Modified process | Comment |
|--------------------|---|--|--|
| Diffusion location | No change | | No change |
| Assembly location | NANTONG FUJITSU - CHINA | NANTONG FUJITSU - CHINA | No change |
| Molding compound | EME-500HA, Sumitomo | EME-G700HF, Sumitomo | greater adhesion performance with lead-frame surface |
| Lead-frame | TIN Plating Pure Sn with plating Ag die pad | TIN Plating Pure Sn with Bare Copper die pad and lock hole | The lock hole enhanced adhesion between lead frame surface & molding compound. |
| Wire | Gold 1.5 mil | CU 1.5 mil | Optimizing Cu bonding wires will allow future cost competitiveness |
| MSL | 1 | 1 | No change |

WHY:

This change will contribute to ST's continuous service improvement and to improve the quality of the product, enhancing adhesion between lead frame surface & molding compound

HOW:

The qualification program consists mainly of comparative electrical characterization and reliability tests on the selected Test Vehicles LM05, L765 and KSAD. You will find here after the Reliability Evaluation Report which summarizes the various test methods and conditions that ST used for this qualification program.

WHEN:

This new set of materials for package DPAK assembled in Subcontractor Nantong Fujitsu (TFME) from PCN approval by customer.

Marking and traceability:



Unless otherwise stated by customer's specific requirement, the traceability of the parts assembled with the set of materials will be ensured by new internal sales type, date code and lot number.

The changes here reported will not affect the electrical, dimensional and thermal parameters keeping unchanged all the information reported on the relevant datasheets.

There is -as well- no change in the packing process or in the standard delivery quantities.

APPENDICES:

Reliability Evaluation Report

Reliability Evaluation Report

**QUALIFICATION of NEW RESIN and NEW BONDING
 on TO 252 DPAK NANTONG FUJITSU**

| General Information | | Locations | |
|--|--|------------------------|---|
| Product Lines | TV1: LM0501 TV2: L76501 TV3: KSAD01 | Wafer fab | Singapore 6 |
| Product Description | Linear Voltage Regulator | Assembly plant | NANTONG FUJITSU - CHINA |
| P/N Positive voltage regulators | TV1: L78M05CDT TV2: L78M05ABDT TV3: LD1117DTTR | Reliability Lab | NANTONG FUJITSU Reliability LAB CATANIA Reliability LAB |
| Product Group | AMG | | |
| Product division | General Purpose Analog & RF Division | | |
| Package | DF TO 252 DPAK | | |
| Silicon Process technology | TV1: HBIP40 TV2: LAAT 100/180 TV3: BT 100 | | |

DOCUMENT INFORMATION

| Version | Date | Pages | Prepared by | Approved by | Comment |
|---------|------------|-------|-----------------------------|-------------------|--------------|
| 1.0 | April 2020 | 6 | Yang Feng/ Antonio Russo | Sergio Spampinato | Final Report |



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1 APPLICABLE AND REFERENCE DOCUMENTS

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

2 GLOSSARY

| | |
|-----|-------------------|
| DUT | Device Under Test |
| SS | Sample Size |

3 RELIABILITY EVALUATION OVERVIEW OBJECTIVES

To qualify new bonding wire Heraeus Cu 1.5mil Maxsoft and molding compound Sumitomo EME G700HF for TO 252 DPAK assembled in NANTONG FUJITSU – CHINA.

Qualification activity have been performed on six different assy lots as requested by JEDEC JESD47 for this type of change.

4 CONCLUSION

Qualification plan has been fulfilled without exception. Reliability tests have shown that those devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the robustness of those products and safe operation, which is consequently expected during their lifetime.

5 DEVICE CHARACTERISTIC

5.1 Change description

Qualification of new bonding wire Heraeus Cu 1.5mil Maxsoft and molding compound EME G700HF for TO 252 DPAK in NANTONG FUJITSU - CHINA.

5.2 Construction note

| | LM0501 | L76501 | KSAD01 |
|-----------------------------------|----------------------------|---------------|---------------|
| Wafer/Die fab. information | | | |
| Wafer fab manufacturing location | Ang Mo Kio 6" | | |
| Technology | HBIP40 | LAAT 100/180 | BT 100 |
| Die finishing back side | CHROMIUM/NICKEL/GOLD | Cr/Ni/Ag | Cr/Ni/Ag |
| Die size | 1.280 X 1.500 | 1.550 X 1.880 | 1.990 X 1.860 |
| Passivation type | P-VAPOX/NITRIDE | SiN (nitride) | |
| Assembly information | | | |
| Assembly Site | NANTONG FUJITSU - CHINA | | |
| Package description | TO 252 DPAK | | |
| Molding compound | Sumitomo EME-G600TF/G700HF | | |
| Die attach material | Soft solder | | |
| Wires bonding materials/diameters | Cu 1.5mil | | |

7 ANNEXES

7.1 Devices details

7.1.1 Pin connections

Refer to products datasheet

7.1.2 Package Mechanical data

Refer to products datasheet

8 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. |
| HTOL High Temperature Operating Life | The device is stressed in static or dynamic configuration, approaching the operative max. absolute ratings in terms of junction temperature and bias condition. | To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices' operating condition in an accelerated way. The typical failure modes are related to, silicon degradation, wire-bonds degradation, oxide faults. |
| Package Oriented | | |
| 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. |
| THB Temperature Humidity Bias | The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity. | To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence. |
| Other | | |



AMG (Analog & MEMS Group)
 General Purpose Analog & RF Division
 Signal Conditioning & Interface

REL.6088-1050-W-20

Quality and Reliability

| Test name | Description | Purpose |
|---------------------------------------|--|--|
| <p>WBS Wire Bond Shear</p> | <p>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.</p> | <p>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.</p> |
| <p>WBP Wire Bond Pull</p> | <p>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.</p> | <p>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.</p> |