PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/13/7761
Dated 23 Apr 2013

DIACs in DO-35 and MiniMELF packages

Qualification of TiAl metallization

Table 1. Change Implementation Schedule

Forecasted implementation date for change	16-Apr-2013
Forecasted availability date of samples for customer	16-Apr-2013
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	16-Apr-2013
Estimated date of changed product first shipment	23-Jul-2013

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	DIACs in DO-35 and MiniMELF packages
Type of change	Waferfab material change
Reason for change	To improve the adherence of the layers and the internal contact interface
Description of the change	The metallization of the dice used in ST DIAC devices will be modified from Ti/Ag 3 um thickness to Ti/Al 6 um thickness.
Change Product Identification	internal part number, QA number
Manufacturing Location(s)	

DOCUMENT APPROVAL

Name	Function
Paris, Eric	Marketing Manager
Duclos, Franck	Product Manager
Cazaubon, Guy	Q.A. Manager

STMicroelectronics
IPD - ASD & IPAD™ Division[1]
BU Thyristors/Triacs and Rectifiers

(1) IPD: Industrial & Power Discretes - ASD: Application Specific Device – IPAD™: Integrated Passive and Active Devices

PCN
Product/Process Change Notification

DIACs in DO-35 and MiniMELF packages: Qualification of TiAl metallization

Notification number:	IPD-DIS/12/7761	**Issue Date**	March 2013
Issued by	Aline AUGIS		
Product series affected by the change		DB3xxx DB4xxx TMMDB3xxx	
Type of change		Wafer fab material change	

Description of the change

The **metallization** of the dice used in ST **DIAC devices** will be modified from Ti/Ag 3 µm thickness to **Ti/Al** 6 µm thickness.

Reason for change

ST has decided to upgrade the metalization of its Triacs devices housed in Diac package to improve the connection between the die and the metal lead of the products resulting in an optimization of the production process.

Former versus changed product:	The new Ti/Al metallization is compliant with ST's standards. The changed products do not present modified electrical, dimensional or thermal parameters, leaving unchanged the current information published in the product datasheet The footprint recommended by ST remain the same. There is no change in the packing modes and the standard delivery quantities either. The products remain in full compliance with the ST ECOPACK®2 grade ("halogen-free").

Disposition of former products

Deliveries of current product version will continue while the conversion is brought to completion and as long as former product stocks last.

Marking and traceability

The product marking remains unchanged.
The traceability of all products using the new metallization is ensured by the **internal part number** printed on the box labelling and by the **Q.A. number**.

Qualification complete date	March 2013

Forecasted sample availability

Product family	Sub-family	Commercial part Number	Availability date
Diac	DO-35	DB3	now
Diac	DO-35	DB3TG	Week 22-2013
Diac	DO-35	DB4	Week 22-2013
Diac	Mini Melf	TMMDB3	now

All other devices will be available 4 weeks after the request.

Change implementation schedule

Sales types	Estimated production start (Front-End)	Estimated first shipments
All	**Week 18-2013**	**Week 29-2013**

Comments:	

Customer's feedback

Please contact your local ST sales representative or quality contact for requests concerning this change notification.
Absence of acknowledgement of this PCN within 30 days of receipt will constitute acceptance of the change
Absence of additional response within 90 days of receipt of this PCN will constitute acceptance of the change

Qualification program and results	QRP13072 Attached

External Reliability Evaluation Report

Ti-Al metallization qualification dedicated to DIAC assembled in DO-35 and MINIMELF packages

DB3xx / DB4xx / TMMDB3

General Information		Locations	
Product Line	*AC Switch*	**Wafer fab**	*ST Tours (FRANCE)*
Product Description	*DIAC*	**Assembly plant**	*Chinese subcontractor (9980)*
Product Group	*IPD*	**Reliability Lab**	*ST Tours (FRANCE)*
Product division	*ASD & IPAD*		
Package	*DO-35 and Minimelf*		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev. 1	March 08, 2013	9	Gilles DUTRANNOY	Jean-Paul REBRASSE	
Rev. 2	March 26, 2013	9	Gilles DUTRANNOY		

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD 22	Reliability test methods for packaged devices
JESD 47	Stress-Test-Driven Qualification of Integrated Circuits
JESD 94	Application specific qualification using knowledge based test methodology
MIL-STD-750C	Test method for semiconductor devices
SOP 2614	Reliability requirements for product qualification (ST internal document)
SOP 267	Product maturity levels (ST internal document)
RER1214011	Confidential ST Internal Reliability Report

2 GLOSSARY

BOM	Bill Of Materials
D-FMEA	Device-oriented Failure Mode and Effects Analysis
DUT	Device Under Test
F/G	Finished Good
HTS	High Temperature Storage
PCN	Process Change Notification
RH	Relative Humidity
RSH	Resistance to Solder Heat
SAM	Scanning Acoustic Microscopy
SMPS	Switch Mode Power Supply
SS	Sample Size
TCT	Temperature Cycling Test
THB	Temperature Humidity Bias

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

This project consists in the qualification **of the Ti-Al metallization dedicated to DIAC dice assembled in the DO-35 and MINIMELF packages in China**.

3.2 Conclusion

Qualification Plan requirements have been fulfilled without exception. Reliability tests have shown that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the robustness of the product which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Device descriptions

DB3

FEATURES

- V_{BO} : 32V and 40V
- LOW BREAKOVER CURRENT

DO-35
(DB3 and DB4)

DESCRIPTION

Functioning as a trigger diode with a fixed voltage reference, the DB3/DB4 series can be used in conjunction with triacs for simplified gate control circuits or as a starting element in fluorenscent lamp ballasts.

A new surface mount version is now available in SOT-23 package, providing reduced space and compatibility with automatic pick and place equipment.

ABSOLUTE MAXIMUM RATINGS (limiting values)

Symbol	Parameter		Value	Unit
I_{TRM}	Repetitive peak on-state current tp = 20 µs F= 120 Hz	SMDB3	1.00	A
		DB3 / DB4	2.00	
Tstg Tj	Storage temperature range Operating junction temperature range		- 40 to + 125	°C

Note: * SMDB3 indicated as Preliminary spec as product is still in development stage.

TMMDB3

FEATURES

- V_{BO} : 32V
- Breakover voltage range: 28 to 36V

MINIMELF

DESCRIPTION

Functioning as a trigger diode with a fixed voltage reference, the TMMDB3 can be used in conjunction with triacs for simplified gate control circuits or as a starting element in fluorescent lamp ballasts.

ABSOLUTE MAXIMUM RATINGS (limiting values)

Symbol	Parameter	Value	Unit
I_{TRM}	Repetitive peak on-state current tp = 20 µs F= 120 Hz	2	A
Tstg Tj	Storage temperature range Operating junction temperature range	- 40 to + 125	°C

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Two test vehicles were chosen:

- **DB3**
- **TMMDB3**

lot	P/N	Package	Comment
1	DB3	DO35	Qualification lot
2	DB3	DO35	Qualification lot
3	TMMDB3	MINIMELF	Qualification lot

5.2 Test plan and results summary

Test	P/N	Std ref.	Conditions	SS	Step	LOT 1	LOT 2
HTS	**DB3**	MIL-STD-750C Method 1032	T_j = 125 °C 1000 h	154	168 h	**0/77**	**0/77**
					500 h	**0/77**	**0/77**
					1000 h	**0/77**	**0/77**
TC		JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	154	100 cycles	**0/77**	**0/77**
					500 cycles	**0/77**	**0/77**

Test	P/N	Std ref.	Conditions	SS	Step	Failure/SS
HTS	**TMMDB3**	MIL-STD-750C Method 1032	T_j = 125 °C 1000 h	77	168 h	**0/77**
					500 h	**0/77**
					1000 h	**0/77**
TC		JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	77	100 cycles	**0/77**
					500 cycles	**0/77**
RSH		J-STD-002	260 °C, 15 s ON, 10 s OFF	30	2 cycles	**0/30**

6 ANNEXES

6.1 Device details

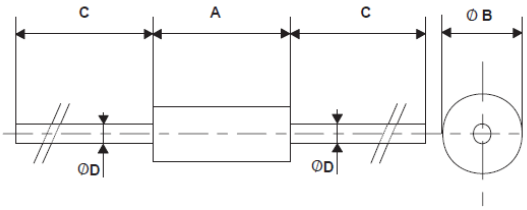
6.1.1 Pin connection

DO-35

MINIMELF

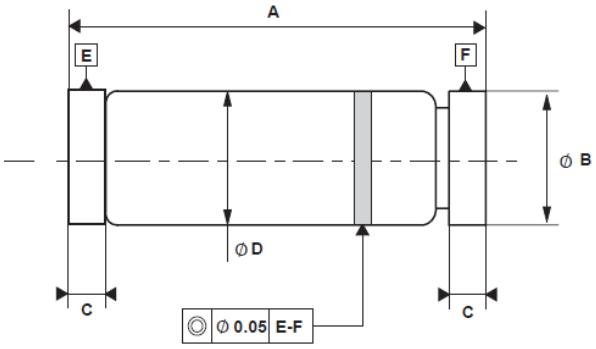
6.1.2 Package outline/Mechanical data

DO-35



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.05	4.50	0.120	0.177
B	1.53	2.00	0.060	0.079
C	28.00		1.102	
D	0.458	0.558	0.018	0.022

MINIMELF



REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	3.30	3.40	3.6	0.130	0.134	0.142
B	1.59	1.60	1.62	0.063	0.063	0.064
C	0.40	0.45	0.50	0.016	0.018	0.020
D		1.50			0.059	

6.2 Tests Description

Test name	Description	Purpose
Die and Package-oriented test		
HTS High Temperature Storage	The device is stored in unbiased condition at the maximum temperature allowed by the package materials, sometimes higher than the maximum operating temperature.	To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint aging, data retention faults, metal stress-voiding.
RSH Resistance to Solder Heat	The device is submitted to a dipping in a solder bath at 260 °C with a dwell time of 10 s.	This test is used to determine whether solid state devices can withstand the effects of the temperature to which they will be subjected during soldering of their leads. The heat is conducted through the leads into the device package from solder heat at the reverse side of the board. This procedure does not simulate wave soldering or reflow heat exposure on the same side of the board as the package body.
Solderability	This evaluation is made on the basis of the ability of these terminations to be wetted and to produce a suitable fillet when coated by tin lead eutectic solder. These procedures will test whether the packaging materials and processes used during the manufacturing operations process produce a component that can be successfully soldered to the next level assembly using tin lead eutectic solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish.	To provide a referee condition for the evaluation of the solderability of terminations (including leads up to 0.125 inch in diameter) that will be assembled using tin lead eutectic solder.
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.
TC Temperature Cycling	The device is submitted to cyclic 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 mechanisms are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.

6.3 APPENDIX

Products involved in this qualification:

- DB3xxx
- DB4xxx
- TMMDB3xxx

Public Products List

PCN Title : DIACs in DO-35 and MiniMELF packages//Qualification of TiAl metallization
PCN Reference : IPD-DIS/13/7761
PCN Created on : 29-APR-2013

Subject : Public Products List

Dear Customer,

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

ST COMMERCIAL PRODUCT

DB3	DB3TG	DB4
TMMDB3	TMMDB3TG	

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