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PCN ADG/19/11660

Catania, July 1 2019

Automotive Discrete Group (ADG)
Power Transistor Macro-Division
High Voltage Business Unit
Process Change Notification

TO-92 new molding compound - ASE-WEIHAI (China)
INDUSTRIAL

Dear Customer,

Following Samsung SDI production discontinuation announcement, followed by ST Corporate Advance Notification **PCI CRP/19/11478**, sent in week 15-2019, this document is announcing the new molding compound for TO-92 package, manufactured in our subcontractor ASE-WEIHAI (China).

The new molding compound EK1850G guarantees the same quality and electrical characteristics as per current production, products remain in full compliance with the ST ECOPACK®2 grade (Halogen Free).

The involved product series are listed in the table below:

Product Family	Package	Part Number	Test Vehicle
Power MOSFET Transistors Power BIPOLAR Transistors	TO-92	See involved product list	STQ1NK60ZR-AP STQ2HNK60ZR-AP STX616-AP

Any other Product related to the above series, even if not expressly included or partially mentioned in the attached table, is affected by this change.

Qualification program and results availability:

The reliability test plan report is provided in attachment to this document.

Samples availability:

Samples of the test vehicle devices will be available on request starting from week 27-2019.
Any other sample request will be processed and scheduled by Power Transistor Division upon request.

Change implementation schedule:

The production start and first shipments will be implemented after week 40 of 2019, after stock depletion.

Marking and traceability:

Unless otherwise stated by customer specific requirement, traceability product assembled in TO-92 with new molding compound, will be ensured by Q.A. number.

Yours faithfully.

Reliability evaluation for

TO-92 New Molding compound - ASE-WEIHAI (China)
Industrial
Process change

General Information	
Commercial Product	: STQ1NK60ZR-AP STQ2HNK60ZR-AP STX616-AP
Product Line	: EZ6P01 – EZ6001 – BV0101
Product Description	: Power MOSFET, Power BIPOLAR
Package	: TO-92
Silicon Technology	: SuperMESH™ – Power Bipolar NPN High Voltage
Division	_:Power Transistor Division_

Traceability	
Diffusion Plant	: SG6" (Singapore)
Assembly Plant	: Ase Weihai (China)
Reliability Lab	: Catania (Italy)

Reliability Assessment	
Passed	☒

Disclaimer: *this report is a summary of the qualification plan results performed in good faith by STMicroelectronics to evaluate the electronic devices conformance to its specific mission profile. This report and its contents shall not be disclosed to a third party, except in full, without previous written agreement by STMicroelectronics or under the approval of the author (see below)*

REVISION HISTORY

Version	Date	Author	Changes description
1.0	26 June 2019	A.SETTINIERI	FINAL REPORT

APPROVED BY:

Corrado CAPPELLO
ADG Q&R department - Catania
STMicroelectronics

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TABLE OF CONTENTS

1. RELIABILITY EVALUATION OVERVIEW....3
1.1 OBJECTIVE....3
1.2 RELIABILITY TEST PLAN....3
1.3 CONCLUSION....4
2. DEVICE/TEST VEHICLE CHARACTERISTICS....4
2.1 GENERALITIES....4
2.2 PIN CONNECTION....4
2.3 TRACEABILITY....4
3. TESTS RESULTS SUMMARY....6
3.1 LOT INFORMATION....6
3.2 TEST RESULTS SUMMARY....6

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1. RELIABILITY EVALUATION OVERVIEW

1.1 Objective

Reliability evaluation for New Molding Compound on TO-92 manufactured in ASE-WEIHAI (China)

1.2 Reliability Test Plan

Reliability tests performed on this device are in agreement with JESD47 and 0061692 internal spec Guidelines and are listed in the Test Plan.
For details on test conditions, generic data used and spec reference see test results summary at Par.3 .

#	Stress	Abrv	Reference	Test Flag	Comments
1	Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	Y	
2	External Visual	EV	JESD22B-101	Y	
3	High Temperature Storage Life	HTSL	JESD22B-101	Y	
4	High Temperature Gate Bias	HTGB	JESD22A-108	Y	
5	High Temperature Reverse Bias	HTRB	JESD22A-108	Y	
6	Temperature Cycling	TC	JESD22A-104	Y	
7	Autoclave	AC	JESD22A-102	Y	
8	High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	Y	
9	Intermittent Operational Life / Thermal Fatigue	IOL / TF	MIL-STD-750 Method 1037	Y	
10	ESD Characterization	ESD (HBM, CDM)	ESDA-JEDEC JES-001 and AINSI-ESD S5.3.1	Y	

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1.3 Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.
Parameter drift analysis performed on samples submitted to die and package oriented test showed a good stability of the main electrical monitored parameters.
Package oriented tests have not put in evidence any criticality.
ESD is accordance with ST spec.

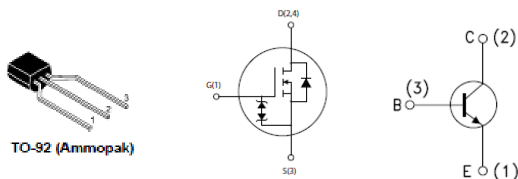
On the basis of the overall results obtained, we can give a positive judgment on the reliability evaluation for New Molding Compound on TO-92 manufactured in ASE-WEIHAI (China) in agreement with JESD47 and 0061692 internal spec.

2. DEVICE/TEST VEHICLE CHARACTERISTICS

2.1 Generalities

SuperMESH™
Power Bipolar NPN High Voltage

2.2 Pin Connection



2.3 Traceability

Reference “Product Baseline” document if existing, else provide following chapters/information:

D.U.T.: STQ1NK60ZR-AP **PACKAGE: TO-92**

Wafer fab information	
Wafer fab manufacturing location	SG6” (Singapore)
Wafer diameter (inches)	6”
Silicon process technology	SuperMESH™
Die finishing front side (passivation)	SiN (Nitride)
Die finishing back side	Ti/Ni/Ag
Die area (Stepping die size)	1800 x 1150 μm^2
Metal levels/Materials	1 / AlSi

Assembly Information	
Assembly plant location	Ase Weihai (China)
Package code description	TO-92
Lead frame/Substrate	FRAME TO92CC L1
Die attach material	Ag Epoxy
Wires bonding materials/diameters	Gate - Source: Cu 2mils
Molding compound	Halogen free

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D.U.T.: STQ2HNK60ZR-AP PACKAGE: TO-92

Wafer fab information	
Wafer fab manufacturing location	SG6" (Singapore)
Wafer diameter (inches)	6"
Silicon process technology	SuperMESH™
Die finishing front side (passivation)	SiN (Nitride)
Die finishing back side	Ti/Ni/Ag
Die area (Stepping die size)	2410 x 2000 µm^2
Metal levels/Materials	1 / AlSi

Assembly Information	
Assembly plant location	Ase Weihai (China)
Package code description	TO-92
Lead frame/Substrate	FRAME TO92CC L2
Die attach material	Ag Epoxy
Wires bonding materials/diameters	Gate - Source: Cu 2mils
Molding compound	Halogen free

D.U.T.: STX616-AP PACKAGE: TO-92

Wafer fab information	
Wafer fab manufacturing location	SG6" (Singapore)
Wafer diameter (inches)	6"
Silicon process technology	Planar HV NPN
Die finishing front side (passivation)	PSG
Die finishing back side	Ti/Ni/Ag
Die area (Stepping die size)	2520 x 1750 µm^2
Metal levels/Materials	1 / AlSi

Assembly Information	
Assembly plant location	Ase Weihai (China)
Package code description	TO-92
Lead frame/Substrate	FRAME TO92CC L1
Die attach material	Ag Epoxy
Wires bonding materials/diameters	Gate - Source: Cu 1.5mils
Molding compound	Halogen free

Reliability Testing Information	
Reliability laboratory location	Catania (Italy)
Electrical testing location	Catania (Italy)

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3. TESTS RESULTS SUMMARY

3.1 Lot Information

Lot #	Commercial Product	Silicon line	Package	Wafer Fab	Assembly plant	Note
1	STQ1NK60ZR-AP	EZ6P	TO-92	SG6" (Singapore)	Ase Weihai (China)	
2	STQ2HNK60ZR-AP	EZ60				
3	STX616-AP	BV01				

3.2 Test results summary

Test	Std ref.	Conditions	SS	Steps	Failure/SS		
					Lot 1	Lot 2	Lot 3
TEST	User specification	All qualification parts tested per the requirements of the appropriate device specification.			235	235	235
External visual	JESD22 B-101	All devices submitted for testing			235	235	235
Silicon oriented tests							
HTSL	JESD22B 101	TA = 150°C	135	1000 h	0/45	0/45	0/45
HTRB	JESD22 A-108	Tj = 150°C, BIAS = 480V	90	1000 h	0/45	0/45	
		Tj = 150°C, BIAS = 800V	45				0/45
HTGB	JESD22 A-108	Tj = 150°C, BIAS = 20V	135	1000 h	0/45	0/45	0/45
Package oriented Tests							
TC	JESD22 A-104	TA=-65°C TO 150°C	75	500cy	0/25	0/25	0/25
AC	JESD22 A-102	TA=121°C ; PA=2ATM	75	96h	0/25	0/25	0/25
H3TRB	JESD22 A-101	TA=85°C ; RH=85% BIAS= 100V	75	1000 h	0/25	0/25	0/25
IOL	MIL-STD-750 Method 1037	ΔTj ≥100°C	75	10Kcy	0/25	0/25	0/25
ESD	ESDA–JEDEC JES–001 ANSI – ESD S5.3.1	CDM / HBM	9		0/3 0/3		0/3 0/3

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