

## PRODUCT / PROCESS CHANGE NOTIFICATION

### 1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.		ADG/19/11660
1.3 Title of PCN		TO-92 new molding compound - ASE-WEIHAI (China)
1.4 Product Category		Power MOSFET / Power BIPOLAR
1.5 Issue date		2019-07-11

### 2. PCN Team

2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Maurizio GIUDICE,Angelo RAO
2.2.2 Marketing Manager	Paolo PETRALI,Natale Sandro D'ANGELO
2.2.3 Quality Manager	Vincenzo MILITANO

### 3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Lead frame base material	ASE WEIHAI (China)

### 4. Description of change

	Old	New
4.1 Description	TO-92 of Subcontractor ASE-WEIHAI (China) are manufactured with SG-8100GS molding compound.	TO-92 of Subcontractor ASE-WEIHAI (China) will be manufactured with EK1850G molding compound.
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	no impact	

### 5. Reason / motivation for change

5.1 Motivation	Samsung SDI production discontinuation
5.2 Customer Benefit	CAPACITY INCREASE

### 6. Marking of parts / traceability of change

6.1 Description	by FG code and Q.A. number
-----------------	----------------------------

### 7. Timing / schedule

7.1 Date of qualification results	2019-07-03
7.2 Intended start of delivery	2019-10-03
7.3 Qualification sample available?	Upon Request

### 8. Qualification / Validation

8.1 Description	11660 Rel14-2019.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2019-07-11

**9. Attachments (additional documentations)**

11660 Public product.pdf  
11660 TO-92 New Molding compound - ASE-WEIHAI (China) (002).pdf  
11660 Rel14-2019.pdf

**10. Affected parts**

<b>10. 1 Current</b>		<b>10.2 New (if applicable)</b>
<b>10.1.1 Customer Part No</b>	<b>10.1.2 Supplier Part No</b>	<b>10.1.2 Supplier Part No</b>
	STQ1HNK60R-AP	
	STQ1NC45R-AP	
	STQ1NK60ZR-AP	
	STQ1NK80ZR-AP	
	STQ2HNK60ZR-AP	
	STQ2LN60K3-AP	
	STQ2NK60ZR-AP	
STSA1805-AP	STSA1805-AP	
	STX13003-AP	
	STX13005-APH	
	STX616-AP	
	STX93003	

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

Subject to any contractual arrangement in force with you or to any industry standard implemented by us, STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved



## Public Products List

Public 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 :** TO-92 new molding compound - ASE-WEIHAI (China)

**PCN Reference :** ADG/19/11660

**Subject :** Public Products List

Dear Customer,

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

STX93003	STX616-AP	STQ2HNK60ZR-AP
STX13005	STQ1HNK60R-AP	STBV32-AP
STQ2NK60ZR-AP	STSA1805-AP	STX13003-AP
STQ1NK60ZR-AP	STQ2LN60K3-AP	



### **IMPORTANT NOTICE – PLEASE READ CAREFULLY**

Subject to any contractual arrangement in force with you or to any industry standard implemented by us, STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved

# Reliability evaluation for

## TO-92 New Molding compound - ASE-WEIHAI

### (China)

### Industrial

### Process change

General Information		Traceability	
<b>Commercial Product</b>	: STQ1NK60ZR-AP STQ2HNK60ZR-AP STX616-AP	<b>Diffusion Plant</b>	: SG6" (Singapore)
<b>Product Line</b>	: EZ6P01 – EZ6001 – BV0101	<b>Assembly Plant</b>	: Ase Weihai (China)
<b>Product Description</b>	: Power MOSFET, Power BIPOURAL	<b>Reliability Lab</b>	: Catania (Italy)
<b>Package</b>	: TO-92	<b>Reliability Assessment</b>	
<b>Silicon Technology</b>	: SuperMESH™ – Power Bipolar NPN High Voltage	<b>Passed</b>	<input checked="" type="checkbox"/>
<b>Division</b>	:Power Transistor Division		

**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

## TABLE OF CONTENTS

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

## 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	

### 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.

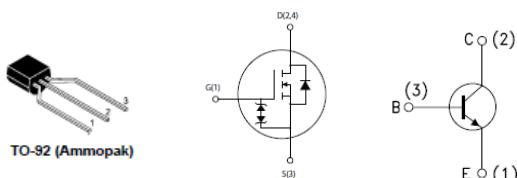
## 2. DEVICE/TEST VEHICLE CHARACTERISTICS

### 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 $\mu\text{m}^2$
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

**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 $\mu\text{m}^2$
Metal levels/Materials	1 / AISi

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 $\mu\text{m}^2$
Metal levels/Materials	1 / AISi

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)

### 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
<b>Silicon oriented tests</b>							
HTSL	JESD22B 101	TA = 150°C	135	1000 h	0/45	0/45	0/45
HTRB	JESD22 A-108	T <sub>j</sub> = 150°C, BIAS = 480V	90	1000 h	0/45	0/45	
		T <sub>j</sub> = 150°C, BIAS = 800V	45				0/45
HTGB	JESD22 A-108	T <sub>j</sub> = 150°C, BIAS = 20V	135	1000 h	0/45	0/45	0/45
<b>Package oriented Tests</b>							
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	ΔT <sub>j</sub> ≥ 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

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
<b>Power MOSFET Transistors</b>	TO-92	<b>See involved product list</b>	<b>STQ1NK60ZR-AP</b>
<b>Power BIPOLAR Transistors</b>			<b>STQ2HNK60ZR-AP</b> <b>STX616-AP</b>

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,