PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/13/8193
Dated 31 Oct 2013

TO202 conversion to ECOPACK2 grade

Table 1. Change Implementation Schedule

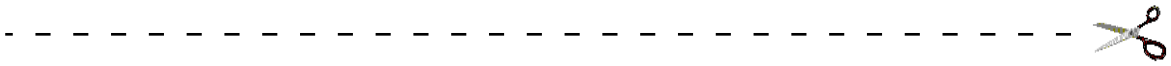
Forecasted implementation date for change	24-Oct-2013
Forecasted availability date of samples for customer	24-Oct-2013
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	24-Oct-2013
Estimated date of changed product first shipment	30-Jan-2014

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	TO202 devices
Type of change	Package assembly material change
Reason for change	To meet the so called "Halogen-Free" requirements of the market
Description of the change	TO202 conversion to green /halogen free molding compound.
Change Product Identification	marking, internal codification and QA number
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN IPD-DIS/13/8193**
Please sign and return to STMicroelectronics Sales Office	**Dated 31 Oct 2013**

☐ Qualification Plan Denied	Name:
☐ Qualification Plan Approved	Title:
	Company:
☐ Change Denied	Date:
☐ Change Approved	Signature:

Remark

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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 and Triacs

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

PCN
Product/Process Change Notification

TO202 conversion to ECOPACK2 grade

Notification number:	IPG-DIS/13/8193	**Issue Date**	21/10/2013
Issued by	Aline AUGIS		
Product series affected by the change		X04xF and Z04xF	
Type of change		Assembly package material change	

Description of the change

ST is converting its **AC Switches in TO202** package from the standard molding compound to **ECOPACK®2** grade “Halogen free” compound.

Reason for change

To meet the so called “Halogen-Free” requirements of the market, ST is converting its AC Switches housed in TO202 package to the ECOPACK®2 grade.

Former versus changed product:	The changed products do not present modified electrical, dimensional or thermal parameters, leaving unchanged the current information published in the product datasheet The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged. The footprint recommended by ST remain the same. There is no change in the packing modes and the standard delivery quantities either.

Disposition of former products

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

Marking and traceability

The marking of the ECOPACK2 component will be differentiated with an additional letter G that will be printed to the right of the e3 symbol of the IPC-JEDEC J—STD 609.

Qualification complete date	November 2013

Forecasted sample availability

Product family	Package	Commercial part Number	Availability date
AC switches	TO202	X0405MF 1AA2	From now
AC switches	TO202	Z0405ME 1AA2	From now
AC switches	TO202	Z0409MF 1AA2	From now
Other samples will be available on request			

Change implementation schedule

Sales types	Estimated production start	Estimated first shipments
X0402DE 1AA2 X0402DF 1AA2 X0402MF**x**AA2 X0402NF 1AA2 X0403**x**F 1AA2 X0405MF**x**AA2 X0405NF 1AA2 Z0402**x**F 1AA2 Z0405**xx** 1AA2 Z0409**x**F **x**AA2 Z0410**x**F **x**AA2	**W02/2014**	**W06/2014**

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	QRP12268 Attached

Qualification Report

Green Molding Compound qualification for AC Switch products assembled in a TO-202 package at Philippines subcontractor

General Information		Locations	
Product Lines	*AC Switches*	**Wafer fab**	*ST (France)*
Products Description	series X04xx & Z04xx	**Assembly plant**	*Subcontractor (Philippines)*
Product Group	*IPD (Integrated Passive Device group)*	**Reliability Lab**	*ST (France)*
Product division	ASD & IPAD division		
Package	*TO-202*		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev. 1	November 7 th	12	Gilles DUTRANNOY	Jean-Paul REBRASSE	First issue

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
ADCS 8377126	FMEA GREEN MOLD CPD TO202 PRODUCT Philippines Subcontractor
AEC-Q101	Stress test qualification for automotive grade discrete semiconductors
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
Product Change Notification	PCNxxx
SOP 2614	Reliability requirements for product qualification
SOP 267	Product maturity levels
0061692	Reliability tests and criteria for qualifications

2 GLOSSARY

BOM	Bill Of Materials
DUT	Device Under Test
F/G	Finished Good
HTRB	High Temperature Reverse Bias
PCT	Pressure Cooker Test
P/N	Part Number
RH	Relative Humidity
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 a Green Molding Compound** dedicated to AC Switch products assembled in a **TO-202** package at Philippines.

The products involved by this qualification are the series X04xx & Z04xx.

The reliability test results are detailed in the “Test results summary” (see **§ 5**).

3.2 Conclusion

Qualification plan requirements have been fulfilled without exception; it shows that the devices behave correctly against environmental tests (no failure). Moreover the stability of electrical parameters during the accelerated tests demonstrates the ruggedness of the product and safe operation, which consequently expected during their lifetime.

3.3 Devices Characteristics

3.4 Devices description

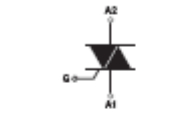
Z04

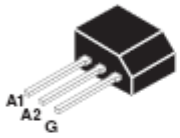
Standard

4 A Triacs

Main features

Symbol	Value	Unit
$I_{T(RMS)}$	4	A
V_{DRM}/V_{RRM}	600 to 800	V
$I_{GT\ (Q_I)}$	3 to 25	mA





TO202-3

Description

The Z04 series is suitable for general purpose AC switching applications. They can be found in applications such as home appliances (electrovalve, pump, door lock, small lamp control), fan speed controllers,...

Different gate current sensitivities are available, allowing optimized performances when controlled directly from microcontrollers.

Order codes

Part Number	Marking
Z04xxyF(1)	Z04xxyF(1)

1. xx = sensitivity, y = voltage

Table 1. Absolute maximum ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)		T_{amb} = 25° C	4	A
			T_l = 30° C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25° C)	F = 50 Hz	t = 20 ms	20	A
		F = 60 Hz	t = 16.7 ms	21	
I^2t	I^2t Value for fusing	t_p = 10 ms		2.2	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , $t_r \leq 100$ ns	F = 120 Hz	T_j = 125° C	20	A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125° C	1.2	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125° C	0.2	W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	° C

May 2006 Rev 7 1/8

www.st.com

X04 Series

SENSITIVE

4A SCRs

MAIN FEATURES:

Symbol	Value	Unit
$I_{T(RMS)}$	4	A
V_{DRM}/V_{RRM}	600 and 800	V
I_{GT}	50 to 200	µA

TO202-3
(X04xxF)

DESCRIPTION

Thanks to highly sensitive triggering levels, the X04 SCR series is suitable for all applications where the available gate current is limited, such as capacitive discharge ignitions, motor control in kitchen aids, overvoltage crowbar protection in low power supplies...

ABSOLUTE RATINGS (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)		Tl = 60°C	4	A
			Tamb = 25°C	1.35	
$IT_{(AV)}$	Average on-state current (180° conduction angle)		Tl = 60°C	2.5	A
			Tamb = 25°C	0.9	
I_{TSM}	Non repetitive surge peak on-state current	tp = 8.3 ms	Tj = 25°C	33	A
		tp = 10 ms		30	
I^2t	I^2t Value for fusing	tp = 10 ms	Tj = 25°C	4.5	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , tr ≤ 100ns	F = 60 Hz	Tj = 125°C	50	A/µs
I_{GM}	Peak gate current	tp = 20 µs	Tj = 125°C	1.2	A
$P_{G(AV)}$	Average gate power dissipation		Tj = 125°C	0.2	W
T_{stg} Tj	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	°C

3.5 Construction notes

See referenced Product Baseline for detailed information.

	Z0402MF1AA2
Wafer/Die fab. Information	
Wafer fab manufacturing location	France
Wafer Testing (EWS) information	
Electrical testing manufacturing location	France
Assembly information	
Assembly site	Philippines Subcontractor
Package description	TO-202
Molding compound	Halogen-free resin
Final testing information	
Testing location	Philippines Subcontractor

4 TESTS RESULTS SUMMARY

4.1 Test vehicles

Z0402MF1AA2/SK

Lot #	Diffusion Lot	Trace Code	Process/ Package	AREMIS Ref	Comments
LOT 1	U129M34	PHL222	TO202	L1227009L3	Qualification lot

Z0402MF1AA2/SK

Lot #	Diffusion Lot	Trace Code	Process/ Package	AREMIS Ref	Comments
LOT 2	U129M32I	PHL222	TO202	L1227009L4	Qualification lot

Z0402MF1AA2/SK

Lot #	Diffusion Lot	Trace Code	Process/ Package	AREMIS Ref	Comments
LOT 3	U129M31F	PHL222	TO202	L1227009L5	Qualification lot

The results are detailed in the next sections.

4.2 Test plan and results summary

- **Z0402MF1AA2/SK (lot 1 qualification) reliability test results synthesis**

Test	F/G	Std ref.	Conditions	SS	Step	Failure/SS
HTRB	**Z0402MF1AA2**	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C 600 V AC peak 1000 h	77	168 h	**0/77**
					500 h	**0/77**
					1000 h	**0/77**
THB		JESD22 A-101	85 °C 85% RH V_r = 100 V 1000 h	25	168 h	**0/25**
					500 h	**0/25**
					1000 h	**0/25**
PCT		JESD22 A-101	121 °C 2 bars 96 h	25	96 h	**0/25**
TC		JESD22 A-104	-65 °C/+150 °C 2 cycle/h 500 cycles	25	500 cycles	**0/25**

- **Z0402MF1AA2/SK (lot 2 qualification) reliability test results synthesis**

Test	F/G	Std ref.	Conditions	SS	Step	Failure/SS
HTRB	**Z0402MF1AA2**	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C 600 V AC peak 1000 h	77	168 h	**0/77**
					500 h	**0/77**
					1000 h	**0/77**
THB		JESD22 A-101	85 °C 85% RH V_r = 100 V 1000 h	25	168 h	**0/25**
					500 h	**0/25**
					1000 h	**0/25**
TC		JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	25	500 cycles	**0/25**

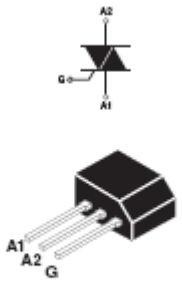
- **Z0402MF1AA2/SK (lot 3 qualification) reliability test results synthesis**

Test	F/G	Std ref.	Conditions	SS	Step	Failure/SS
HTRB	**Z0402MF1AA2**	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 ℃ 600 V AC peak 1000 h	77	168 h	**0/77**
					500 h	**0/77**
					1000 h	**0/77**
THB		JESD22 A-101	85 ℃ 85% RH V_r = 100 V 1000 h	25	168 h	**0/25**
					500 h	**0/25**
					1000 h	**0/25**
TC		JESD22 A-104	-65 ℃/+150 ℃ 2 cycles/h 500 cycles	25	500 cycles	**0/25**

5 ANNEXES

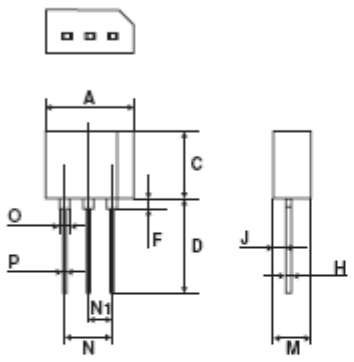
5.1 Device details

5.1.1 Pin connection



TO202-3

5.1.2 Package outline/Mechanical data



REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			10.1			0.398
C		7.3			0.287	
D		10.5			0.413	
F			1.5			0.059
H		0.51			0.020	
J		1.5			0.059	
M		4.5			0.177	
N			5.3			0.209
N1		2.54			0.100	
O			1.4			0.055
P			0.7			0.028

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

5.2 Tests Description

Test name	Description	Purpose
Die-oriented test		
HTRB (AC mode) High Temperature Reverse Bias	The device is stressed here in AC mode, trying to satisfy as much as possible the following conditions: - Low power dissipation. - Peak supply voltage compatible with diffusion process and internal circuitry limitations.	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. To maximize the electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide aging, layout sensitivity to surface effects.
Die and Package-oriented test		
PCT Pressure Cooker Test	The device is unbiased under 121 ℃, and a 2 bars air atmosphere during 96 hours.	The PCT is performed to evaluate the reliability of non-hermetic packaged solid-state devices in humid environments. It employs severe conditions of temperature, humidity, and pressure which accelerate the penetration of moisture through the external protective material (encapsulant or seal) or along the interface between the external protective material and the metallic conductors which pass through it. The stress usually activates the same failure mechanisms as the "85/85" Steady-State Humidity Life Test (THB).
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 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.

Public Products List

PCN Title : TO202 conversion to ECOPACK2 grade
PCN Reference : IPD-DIS/13/8193
PCN Created on : 28-OCT-2013

Subject : Public Products List

Dear Customer,

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

ST COMMERCIAL PRODUCT

X0402MF 0AA2	X0402MF 1AA2	X0402NF 1AA2
X0403MF 1AA2	X0405MF 1AA2	X0405NF 1AA2
Z0402MF 1AA2	Z0405MF 1AA2	Z0405NF 1AA2
Z0409MF 1AA2	Z0409NF 1AA2	Z0410MF 1AA2
Z0410NF 1AA2		

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