



PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/12/7235
Notification Date 04/24/2012

IPD - ASD & IPAD Division
Triacs, SCRs & FLC21-135A in TO-92 Package
High temperature soldering alloy in assembly process

Table 1. Change Implementation Schedule

Forecasted implementation date for change	30-Apr-2012
Forecasted availability date of samples for customer	17-Apr-2012
Forecasted date for STMicroelectronics change Qualification Plan results availability	17-Apr-2012
Estimated date of changed product first shipment	24-Jul-2012

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	Triacs, SCRs & FLC21-135A in TO-92 Package
Type of change	Package assembly material change
Reason for change	extension of the standard high temperature soldering alloy
Description of the change	The purpose of this document is to announce the extension of the standard high temperature soldering alloy (soft solder) to all of our Triacs, SCRs and FLC21-135A device in TO-92 package not already using this die attach process, in replacement of the current epoxy glue.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	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/12/7235					
Please sign and return to STMicroelectronics Sales Office		Notification Date 04/24/2012					
<input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">Name:</td></tr> <tr><td style="padding: 2px;">Title:</td></tr> <tr><td style="padding: 2px;">Company:</td></tr> <tr><td style="padding: 2px;">Date:</td></tr> <tr><td style="padding: 2px;">Signature:</td></tr> </table>		Name:	Title:	Company:	Date:	Signature:
Name:							
Title:							
Company:							
Date:							
Signature:							
Remark							

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**PRODUCT/PROCESS
CHANGE NOTIFICATION**

PCN IPD-DIS/12/7235

IPD - ASD & IPAD Division¹

Triacs, SCRs & FLC21-135A in TO-92 Package:

High temperature soldering alloy in assembly process



TO-92

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

WHY THIS CHANGE?

The purpose of this document is to announce the extension of the standard **high temperature soldering alloy** (soft solder) to all our **Triacs, SCRs** and **FLC21-135A device** in **TO-92** package not already using this die attach process, in replacement of the current epoxy glue.

This change will **homogenize our production** by the implementation of the same die attach process, widely used for **power products**, at our subcontractor in China.

WHAT IS THE CHANGE?

The high temperature soldering alloy is **already used** as standard process for our **ACS™** devices and a great part of our **SCRs** and **Triacs** in TO-92 package. It will be implemented according to the time schedule provided in the present document.

The devices **involved** in this change are listed below.

Product Sub-Family	Package type	Commercial products
Ignitors	TO-92	FLC21-135A
SCRs		P0xxxDA xxxx P0xxxMA xxxx P0xxxCA xxxx X00619MA xxxx X00602MA xxxx
Triacs		Z00607MA xxxx

Specific devices not expressly listed in the above table are included in this change.

The use of the soldering alloy has **no impact** on the **electrical, thermal** and **dimensional parameters of the products**, with reference to the product datasheet. This was verified by the qualification program.

There is **no change** in the **lead finish** and the products remain in compliance **with the ECOPACK®2** grade that includes the compliance to the **RoHS¹** directive and meets the **halogen-free** market requirements.

There is **no change** in the **packing modes** and the standard **delivery quantities**.

(*) *Restriction of the use of certain Hazardous Substances according to European Directive 2002/95/CE.*

HOW AND WHEN?Qualification and Test results:

The qualification has been done by similarities with the standard **SCRs** and **Triacs** in **TO-92 package** already qualified with the **soft solder** die attach at our subcontractor.

The **qualification program** has mainly consisted of **comparative electrical characterizations** and **reliability tests**.

It is based on the following **similarity** statements:

- **die technology**, implementing same backside finishing,
- **assembly technology**, involving same assembly line, lead frame and molding compound.

The **Reliability Test Report** is annexed to the present document.



Sampling:

Qualification samples of the devices used as **test vehicles** and produced with the soldering alloy are **available** on request **now**.

Product Sub-family	Salestypes (including test vehicles)	Availability
Ignitors	FLC21-135A	Now
SCRs	P0102DA X00602MA P0118MA X00619MA	From week 18-2012
		Now
Triacs	Z00607MA	Now

Change implementation schedule:

The **production start** and **first shipments** will be implemented according to our work in progress and materials availability as indicated in the schedule below:

Production Start	1st Shipments
From week 18 - 2012	From week 28 - 2012

Absence of acknowledgement of this PCN within **30 days** of receipt will constitute acceptance of the change. After an acknowledgement, unless otherwise previously agreed to in writing for a specific process change requirement or for device specific requirements, absence of additional response within **90 days** of receipt of this PCN will constitute acceptance of the change. **Shipments** may in any case start earlier with the customer's **written agreement**.

Product Marking and Traceability:

The marking will remain unchanged and the **traceability** will be ensured by an **internal codification** and by the **Q.A. number** printed on the box labels.

Annex:

Reliability Test Report 12039QRP.





Qualification Report
*Die-attach material change (glue to soft solder)
dedicated to PLANAR and TOP-GLASS dice
assembled in a TO-92 package*

General Information		Locations	
Product Line	<i>AC Switches</i>	Wafer fab	<i>ST TOURS</i>
Product Description	<i>SCR and TRIAC</i>		
P/N	<i>P0118MA5AL3 X00619MA5AL2 Z00607MA1BA2</i>	Assembly plant	<i>China subcontractor</i>
Product Group	<i>IMS</i>	Reliability Lab	<i>ST TOURS</i>
Product division	<i>IPD</i>		
Package	<i>TO-92</i>		
Silicon Process technologies	<i>ACS™</i>		
Production mask set rev.	<i>APM</i>		
Maturity level step	<i>Qualified</i>		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
1.0	13/03/2012	15	Gilles Dutranno	JP.Rebrasse	

Note: This report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the potential reliability risks during the product life using a set of defined test methods.
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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
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
SOP 2610	General product qualification procedure
SOP 2614	Reliability requirements for product qualification
SOP 267	Product maturity levels
0061692	Reliability tests and criteria for qualifications
8167736	ACS108 in soft solder TO-92
8176234	Thyristors, Triacs, ACS & Ignitors products assembled in TO-92 with Copper Wire at Chinese subcontractor
8350078	Soft Solder die attach conversion for TG5 & Planar dice assembled in TO92 at Chinese subcontractor

2 GLOSSARY

BOM	Bill Of Materials
DUT	Device Under Test
F/G	Finished Good
FMEA	Failure Modes and Effects Analysis
GMC	Green Molding Compound
HTRB	High Temperature Reverse Bias
PCT	Pressure Cooker Test
P/N	Part Number
SS	Sample Size
TC	Temperature Cycling
THB	Temperature Humidity Bias
U-HAST	Unbiased Highly Accelerated Temperature and Humidity Stress



3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The aim of this project is to qualify a **die-attach back-end process change dedicated to AC Switch products assembled in a TO-92 package at Chinese subcontractor.**

This die-attach process consists in converting the conductive glue into soft solder.

All products (refer to annex) dedicated to AC Switching are concerned by this back-end process change.

The following vehicle tests have been chosen for the qualification:

- P0118MA5AL3, SCR
- X00619MA5AL2, SCR
- Z00607MA1BA2, TRIAC

The reliability test results are detailed in the "Test results summary" (see § 6).

3.2 Conclusion

All the reliability test results are compliant with the qualification plan requirements.

It is stressed that 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 products and safe operation, which is consequently expected during their lifetime.

4 DEVICES CHARACTERISTICS

4.1 Description of the devices



P011xx

Sensitive high immunity SCRs up to 0.8 A

Features

- $I_{T(RMS)}$ up to 0.8 A
- V_{DRM}/V_{RRM} 400 and 600 V
- I_{GT} from 0.5 to 25 μ A

Description

Thanks to highly sensitive triggering levels, the P011xx SCR series is suitable for all applications where available gate current is limited, such as ground fault circuit interruptors, pilot circuits in solid state relays, standby mode power supplies, smoke and alarm detectors.

Available in through-hole or surface-mount packages, the voltage capability of this series has been upgraded since its introduction and is now available up to 600 V.

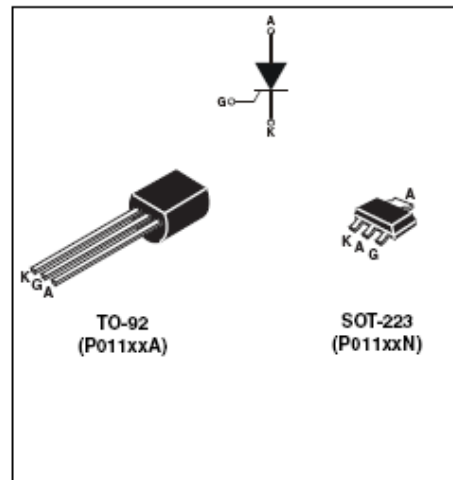


Table 1. Device summary

Order code	Voltage		Sensitivity		Package
	400 V	600 V	Min.	Max.	
P0111DA 1AA3	X		4 μ A	25 μ A	TO-92
P0111DA 5AL3	X		4 μ A	25 μ A	TO-92
P0111DN 5AA4	X		4 μ A	25 μ A	SOT-223
P0111MA 1AA3		X	4 μ A	25 μ A	TO-92
P0111MA2AL3 ⁽¹⁾		X	4 μ A	25 μ A	TO-92
P0111MN 5AA4		X	4 μ A	25 μ A	SOT-223
P0115DA 1AA3	X		15 μ A	50 μ A	TO-92
P0115DA 5AL3	X		15 μ A	50 μ A	TO-92
P0118DA 1AA3	X		0.5 μ A	5 μ A	TO-92
P0118DA 5AL3	X		0.5 μ A	5 μ A	TO-92
P0118DN 5AA4	X		0.5 μ A	5 μ A	SOT-223
P0118MA 2AL3		X	0.5 μ A	5 μ A	TO-92
P0118MA 5AL3		X	0.5 μ A	5 μ A	TO-92

1. This order code has no space.



X00619

0.8 A sensitive gate SCR

Features

- $I_{T(RMS)} = 0.8 \text{ A}$
- $V_{DRM} / V_{RRM} = 600 \text{ V}$
- $I_{GT} = 30 \text{ to } 200 \mu\text{A}$

Applications

- Limited gate current topologies
- Ground fault circuit interrupters
- Overvoltage crowbar protection in power supplies
- Protection in electronic ballasts
- Capacitive discharge ignitions
- Igniters (lighting, oven...)

Description

The X006 SCR can be used as on/off function in applications where topology does not offer high current for gate triggering.

This device is optimized in forward voltage drop and inrush current capabilities for reduced power losses and high reliability in harsh environments.

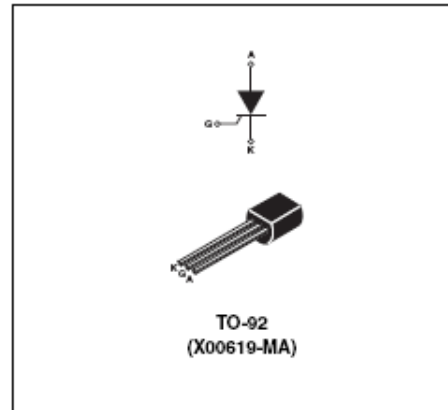


Table 1. Device summary

$I_{T(RMS)}$	0.8 A
V_{DRM} / V_{RRM}	600 V
I_{GT}	30 to 200 μA



Standard

Z00607

0.8 A Triacs

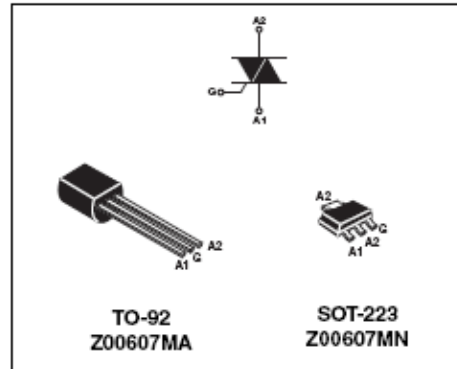
Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	0.8	A
V_{DRM}/V_{RRM}	600	V
$I_{GT}(Q_4)$	5	mA

Description

The Z00607 is suitable for low power AC switching applications. Typical applications include home appliances (electrovalve, pump, door lock, small lamp control), fan speed controllers,...

Thanks to the low gate triggering current these triacs can be driven directly by microcontrollers.



Order Codes

Part Number	Marking
Z00607MA 1BA2	Z0607MA
Z00607MA 2BL2	Z0607MA
Z00607MA 5BL2	Z0607MA
Z00607MN 5AA4	Z6M

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit	
$I_{T(RMS)}$	RMS on-state current (full sine wave)	SOT-223 $T_{lab} = 85^{\circ}C$	0.8	A
		TO-92 $T_L = 50^{\circ}C$		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_J initial = $25^{\circ}C$)	F = 50 Hz t = 20 ms	9	A
		F = 60 Hz t = 16.7 ms	9.5	
I^2t	I^2t Value for fusing	$t_p = 10$ ms	0.45	A^2s
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100$ ns	F = 120 Hz $T_J = 110^{\circ}C$	20	A/ μs
I_{GM}	Peak gate current	$t_p = 20$ μs $T_J = 110^{\circ}C$	1	A
$P_{G(AV)}$	Average gate power dissipation	$T_J = 110^{\circ}C$	0.1	W
T_{stg} T_J	Storage junction temperature range Operating junction temperature range		- 40 to + 150 - 40 to + 110	$^{\circ}C$



4.2 Construction notes

See referenced Product Baseline for detailed information.

P0118MA5AL3/E	
Wafer/Die fab. Information	
Wafer fab manufacturing location	TOURS
Wafer Testing (EWS) information	
Electrical testing manufacturing location	TOURS
Assembly information	
Assembly site	CHINESE SUBCONTRACTOR
Package description	TO-92
Lead finishing process	LEAD-FREE
Final testing information	
Testing location	CHINESE SUBCONTRACTOR



X00619MA5AL2/E	
Wafer/Die fab. Information	
Wafer fab manufacturing location	TOURS
Process family	SCR
Wafer Testing (EWS) information	
Electrical testing manufacturing location	TOURS
Assembly information	
Assembly site	CHINESE SUBCONTRACTOR
Package description	TO-92
Lead finishing process	LEAD-FREE
Final testing information	
Testing location	CHINESE SUBCONTRACTOR



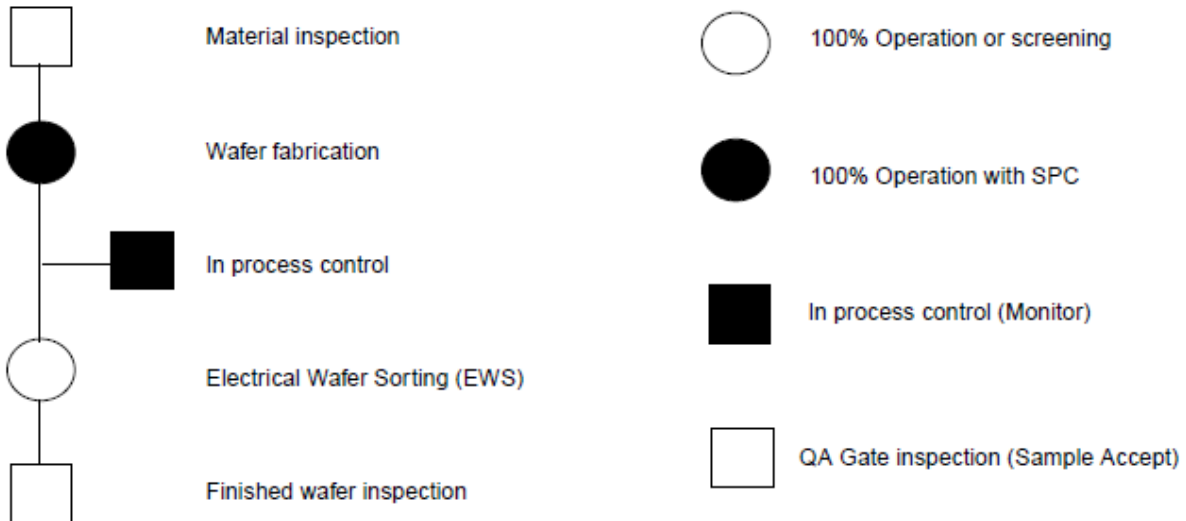
Z00607MA1BA2/E	
Wafer/Die fab. Information	
Wafer fab manufacturing location	TOURS
Process family	TRIAC
Wafer Testing (EWS) information	
Electrical testing manufacturing location	TOURS
Assembly information	
Assembly site	CHINESE SUBCONTRACTOR
Package description	TO-92
Final testing information	
Testing location	CHINESE SUBCONTRACTOR



5 QC PROCESS FRONTEND AND BACKEND FLOW CHART

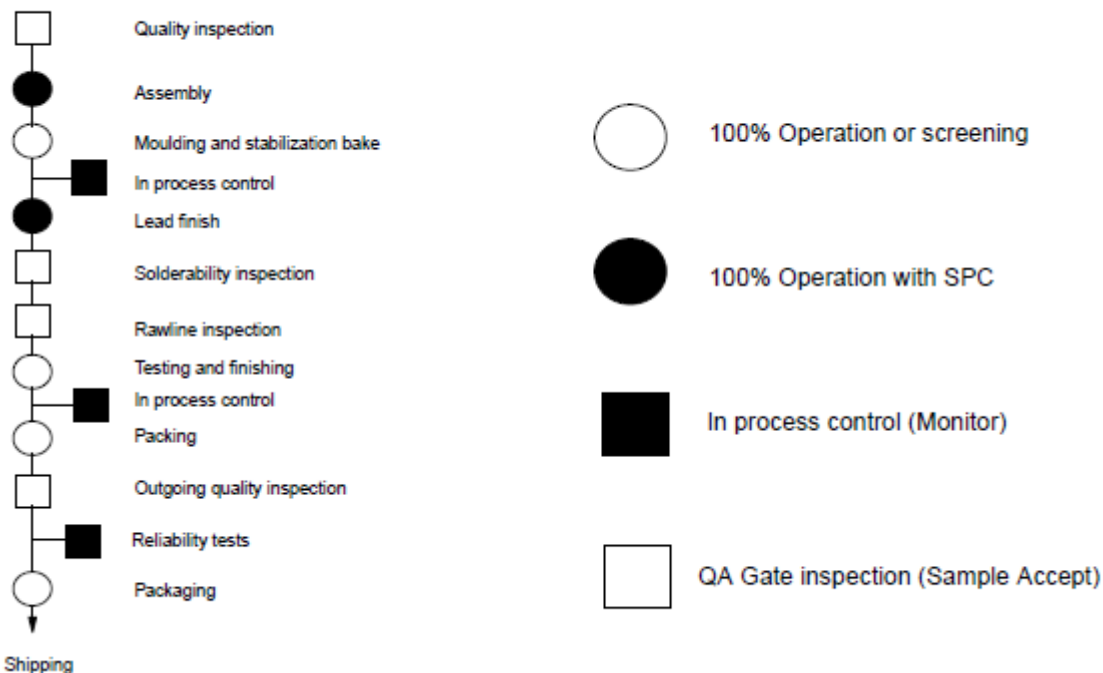
5.1 QC Process Frontend flow chart

Wafer Fab standard production process flow chart



5.2 QC Process backend flow chart

QC PROCESS BACK END FLOW CHART





6 TESTS RESULTS SUMMARY

6.1 Test vehicles

In this report, **3 finished goods** were chosen to perform the reliability tests:

- Z00607MA1BA2 TO-92 package.
- X00619MA5AL2 TO-92 package.
- P0118MA5AL3 TO-92 package.

Lot #	AREMIS Ref	Sample #	Diffusion Lot	Trace Code	Process/ Package	Comments
Z00607	L1142003L1	1	U102M59	GE137036	TO-92	THB: 85 °C, 85% RH, Bias = 100 V
		2				TC: -55 °C / +150 °C, 1 cycle/h
X00619	L1142003L2	1	U917M29	GE137115		TC: -55 °C / +150 °C, 1 cycle/h
P0118	L1142003L3	1	U101042	GE136136		TC: -55 °C / +150 °C, 1 cycle/h

Detailed results in below chapter will refer to P/N and Lot #.

6.2 Test plan and results summary

The reliability test results are summarized in the following tables.

- Die and/or Package-oriented test results

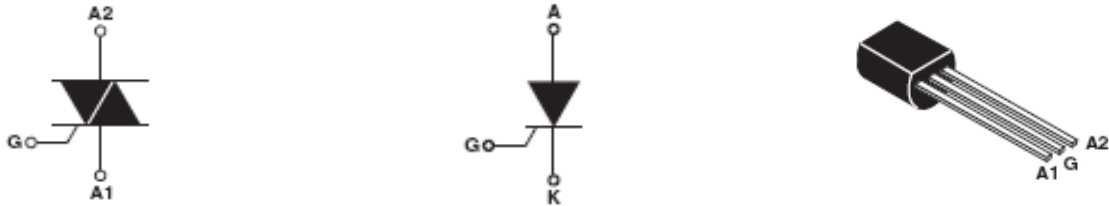
Test	F/G	Std ref.	Conditions	SS	Steps	Failure/SS
THB	Z00607MA1BA2/E	JESD22 A-101	85 °C, 85% RH Bias = 100 V DC 1000 h	77	168 h	0/77
					500 h	0/77
					1000 h	0/77

Test	F/G	Std ref.	Conditions	SS	Steps	Failure/SS		
						P0118	X00619	Z00607
TC	P0118MA5AL3/E X00619MA5AL2/E Z00607MA1BA2/E	JESD22 A-104	-55 °C / +150 °C 1 cycle/h 500 cycles	75	100 cycles	0/25	0/25	0/25
					500 cycles	0/25	0/25	0/25
					1000 cycles	0/25	0/25	0/25

7 ANNEXES

7.1 Device details

7.1.1 Pin connection



7.1.2 Package outline/Mechanical data

Table 6. TO-92 Dimensions

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.053	
B			4.70			0.185
C		2.54			0.100	
D	4.40			0.173		
E	12.70			0.500		
F			3.70			0.146
a			0.50			0.019



7.2 Tests Description

Test name	Description	Purpose
Die and Package-oriented test		
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.



Annex

List of part-numbers concerned by this back-end process change.

FLC21-135A
P0102DA 1AA3
P0102DA 2AL3
P0102DA 5AL3
P0109DA 1AA3
P0109DA 5AL3
P0111DA 1AA3
P0111DA 5AL3
P0111MA 1AA3
P0115DA 1AA3
P0115DA 5AL3
P0118DA 1AA3
P0118DA 5AL3
P0118MA 2AL3
P0118MA 5AL3
P0124CA 5AL3
P0130AA 1EA3
P0130AA 2AL3
X00602MA 1AA2
X00602MA 2AL2
X00602MA 5AL2
X00619MA1AA2
X00619MA2AL2
X00619MA5AL2
Z00607MA 1BA2
Z00607MA 2BL2
Z00607MA 5BL2

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