PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/13/7730
Dated 12 Mar 2013

ASD Triacs and Thyristors in TO-220AB package - New ECOPACK2 molding compound & electroplating generalization

Table 1. Change Implementation Schedule

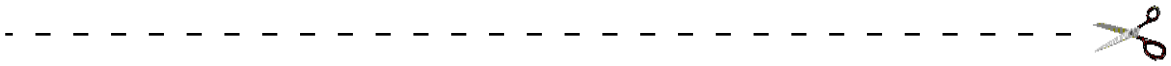
Forecasted implementation date for change	05-Apr-2013
Forecasted availability date of samples for customer	05-Mar-2013
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	05-Mar-2013
Estimated date of changed product first shipment	11-Jun-2013

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	ASD Triacs and Thyristors in TO-220AB package
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	ST is converting its ASD Triacs and Thyristors housed in TO-220AB package from the standard moulding compound to the ECOPACK2 grade compound
Change Product Identification	date code, QA number and marking
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN IPD-DIS/13/7730**
Please sign and return to STMicroelectronics Sales Office	**Dated 12 Mar 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/Triacs and Rectifiers

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

PCN
Product/Process Change Notification

ASD Triacs and Thyristors in TO-220AB package:

New ECOPACK®2 molding compound & electroplating generalization

Notification number:	IPD-DIS/13/7730	**Issue Date**	12/03/2013
Issued by	Aline AUGIS		
Product series affected by the change		ACS120-7ST ACST10xx-7T ACST12xx-7T ACST610-8T ACST830-8T BTB04-600SL TS1220-600T TS420-600T TS820-600T TYN612MRG TN22-1500T	
Type of change		Package assembly material change	

Description of the change

ST is converting its **ASD Triacs and Thyristors** housed in **TO-220AB package** from the standard moulding compound to the ECOPACK®2 grade compound.

Reason for change

To meet the so called “Halogen-Free” requirements of the market.

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. The products remain in full compliance with the ST ECOPACK®2 grade (“halogen-free”).

Disposition of former products

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

Marking and traceability

Date code, QA number and a letter “G” printed to the right of the “e3” symbol on the marking.

Qualification complete date	February 2013

Forecasted sample availability

Product family	Sub-family	Commercial part Number	Availability date
Triac	TO-220AB	ACST1235-7T	Now

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

Change implementation schedule

Sales types	Estimated production start	Estimated first shipments
All	**Week 14-2013**	**Week 23-2013**

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	13046QRP attached

External Reliability Report

Green Molding Compound qualification for AC Switch products assembled in a TO-220 AB package at Longgang (China)

General Information		Locations	
Product Lines	*AC Switches*	**Wafer fab**	*ST Tours (France)*
Products Description	*SCR & TRIACS*	**Assembly plant**	*ST Longgang (China)*
Product Group	*IPD*	**Reliability Lab**	*ST Tours (France)*
Product division	*ASD & IPAD*		
Package	*TO-220 AB*		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev. 1	February 14, 2013	11	Gilles Dutrannoy	Jean-Paul Rebrasse	First issue

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
ADCS 8273280	Product D-FMEA: FMEA Scr's/triacs & ACS assembled in DPAK transfer from Shenzhen to *Longgang*
ADCS 8294111	Product D-FMEA: Product:Transfer from Shenzhen to *Longgang* of TO-220FP AB & AC Power Schottky, Bipolar & Turboswitch rectifiers
ADCS 8326536_A	Product D-FMEA: Qualification of TO-220FPAB & TO220AB at LGG for PNL 58 products: - Transfer from Shenzhen to *Longgang* of TO220FP GMC - Qualif of TO220AB in *Longgang* resin STD & GMC
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 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 (ASDs and SCRs) assembled in a **TO-220 AB** package at ST Longgang (China).

The reliability test plan is defined following the “stress test driven” method.
Three test vehicles were chosen:

- TYN612MRG: SCR
- ACST1235-7T: ASD-TRIAC
- TN22-1500T: ASD-SCR

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

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

4 DEVICES CHARACTERISTICS

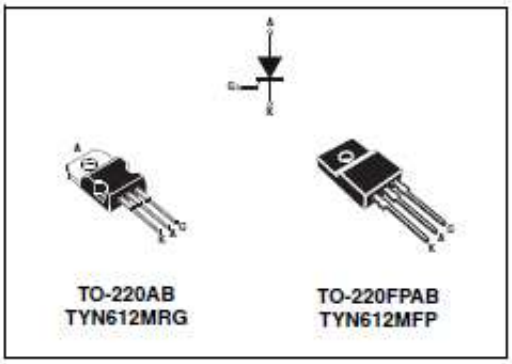
4.1 Devices description

TYN612M

12 A SCR

Main features

Symbol	Value	Unit
$I_{T(RMS)}$	12	A
V_{DRM}/V_{RRM}	600	V
I_{GT} (min / max)	1.5 / 5	mA



TO-220AB
TYN612MRG

TO-220FPAB
TYN612MFP

Description

The TYN612M SCR is suitable to fit modes of control found in applications such as voltage regulation circuits for motorbikes, overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition.

The insulated fullpack package allows a back to back configuration.

Order codes

Part Numbers	Marking
TYN612MRG	TYN612M
TYN612MFP	TYN612MFP

Table 1. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)	TO-220AB	T_c = 105° C	12	A
		TO-220FPAB	T_c = 70° C	12	
$I_{T(AV)}$	Average on-state current (180° conduction angle)	TO-220AB	T_c = 105° C	8	A
		TO-220FPAB	T_c = 70° C	8	
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	T_j = 25° C	125	A
		t_p = 10 ms		120	
I^2t	I^2t Value for fusing	t_p = 10 ms	T_j = 25° C	72	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , $t_r \leq$ 100 ns	F = 60 Hz	T_j = 125° C	50	A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125° C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125° C	1	W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	° C
V_{RGM}	Maximum peak reverse gate voltage			5	V

April 2007 Rev 4 1/8

www.st.com

ACST12

Overvoltage protected AC switch

Features

- Triac with overvoltage crowbar technology
- Low I_{GT} (<10 mA) or high immunity (I_{GT}<35 mA) version
- High noise immunity: static dV/dt > 2000 V/µs

Benefits

- Enables equipment to meet IEC 61000-4-5
- High off-state reliability with planar technology
- Need no external over voltage protection
- Reduces the power passive component count
- High immunity against fast transients described in IEC 61000-4-4 standards

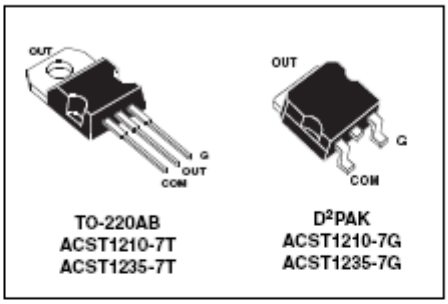
Applications

- AC mains static switching in appliance and industrial control systems
- Drive of medium power AC loads such as:
  - Universal motor of washing machine drum
  - Compressor for fridge or air conditioner

Description

The ACST12 series belongs to the ACS™/ACST power switch family built with A.S.D.® (application specific discrete) technology. This high performance device is suited to home appliances or industrial systems and drives loads up to 12 A.

This ACST12 switch embeds a Triac structure and a high voltage clamping device able to absorb the inductive turn-off energy and withstand line transients such as those described in the IEC 61000-4-5 standard. The ACST1210-7 needs a low gate current to be activated (I_{GT} < 10 mA) and still provides a high electrical noise immunity complying with the IEC 61000-4-4 standard. The ACST1235-7 offers an extremely high static dV/dt immunity of 2 kV/µs minimum.



TO-220AB
ACST1210-7T
ACST1235-7T

D²PAK
ACST1210-7G
ACST1235-7G

Figure 1. Functional diagram

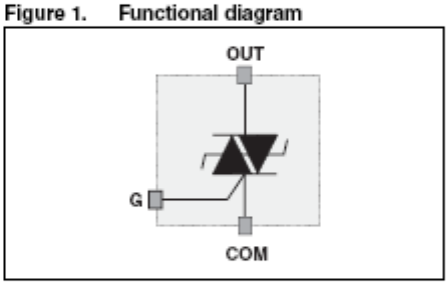


Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	12	A
V_{DRM}/V_{RRM}	700	V
I_{GT}	10 or 35	mA

TM: ACS is a trademark of STMicroelectronics

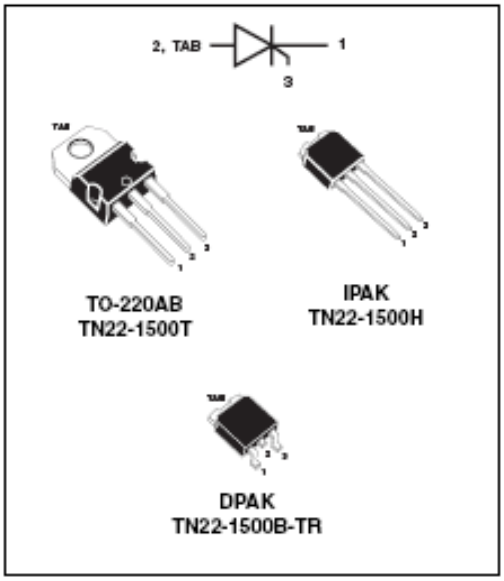
®: A.S.D. is a registered trademark of STMicroelectronics

TN22

Fluorescent tube lamp starter SCR

Features

- High clamping voltage structure (1200 to 1500 V)
- Low gate triggering current for direct drive from line (< 1.5 mA)
- High holding current (> 175 mA), ensuring high striking energy



Description

The TN22 has been specifically developed for use in tube lamp electronic starter circuits.

Used in conjunction with a sensitive SCR, it provides high energy striking characteristics with low triggering power.

Thanks to the optimized characteristics of the TN22, starters based on this device can offer high reliability levels and extended life time of the fluorescent tube lamps.

4.2 Construction notes

See referenced Product Baseline for detailed information.

	TYN612MRG
Wafer/Die fab. Information	
Wafer fab manufacturing location	Tours
Wafer Testing (EWS) information	
Electrical testing manufacturing location	Tours
Assembly information	
Assembly site	Longgang (China)
Final testing information	
Testing location	Longgang (China)

	ACST1235-7T
Wafer/Die fab. Information	
Wafer fab manufacturing location	Tours
Wafer Testing (EWS) information	
Electrical testing manufacturing location	Tours
Assembly information	
Assembly site	Longgang (China)
Final testing information	
Testing location	Longgang (China)

	TN22-1500T
Wafer/Die fab. Information	
Wafer fab manufacturing location	Tours
Wafer Testing (EWS) information	
Electrical testing manufacturing location	Tours
Assembly information	
Assembly site	Longgang (China)
Final testing information	
Testing location	Longgang (China)

5 TESTS RESULTS SUMMARY

5.1 Test vehicles

Three test vehicles were chosen:

- TYN612MRG: SCR
- ACST1235-7T: ASD-TRIAC
- TN22-1500T: ASD-SCR

5.2 Test plan and results summary

HTRB / JESD22 A-108 / MIL-STD-750C method 1040				
		TYN612MRG	ACST1235-7T/8	TN22-1500T/8
		L1121005L2	L1121005L1	L1121005L3
	Conditions	Tj = 125 °C 600V AC Peak	Tj = 125 °C 700V AC Peak	Tj = 125 °C 800V AC Peak
STEPS	168 h	0/77	0/77	0/77
	500 h	0/77	0/77	0/77
	1000 h	0/77	0/77	0/77

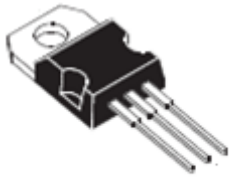
THB / JESD22 A-101					
		TYN612MRG		ACST1235-7T/8	TN22-1500T/8
		L1121005L2	L1121005L8	L1121005L1	L1121005L3
	Conditions	85 °C 85%HR VR = 100V		85 °C 85%HR V = 100VAC	85 °C 85%HR VR = 100V
STEPS	168 h	0/77	0/77	0/76	0/77
	500 h	0/77	0/77	0/76	0/77
	1000 h	0/77	0/77	0/76	0/77

TCT / JESD22 A-104				
		TYN612MRG	ACST1235-7T/8	TN22-1500T/8
		L1121005L2	L1121005L1	L1121005L3
	Conditions	-65°C / +150°C2 cycles/h		
	500C	0/25	0/25	0/25

AUTOCLAVE / JESD22A-101						
	TYN612MRG		ACST1235-7T/8		TN22-1500T/8	
	L1121005L2	L1121005L8	L1121005L1	L1121005L7	L1121005L3	L1121005L9
Conditions	121°C 2 Bars					
196 h	0/25	0/25	0/25	0/25	0/25	0/25

6 ANNEXES

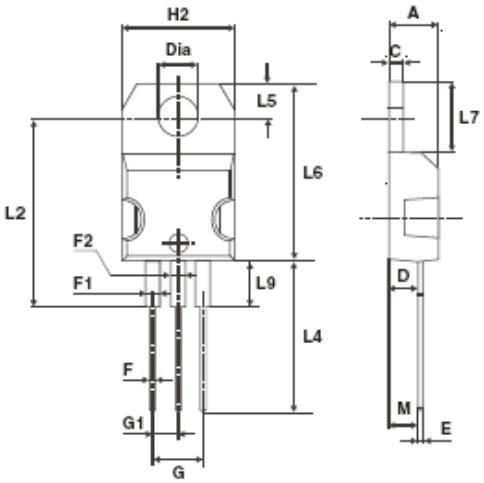
6.1 Device details



TO-220AB

6.1.1 Package outline/Mechanical data

Table 6. TO-220AB dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
F2	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
G1	2.40	2.70	0.094	0.106
H2	10	10.40	0.393	0.409
L2	16.4 typ.		0.645 typ.	
L4	13	14	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam.	3.75	3.85	0.147	0.151

6.2 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.
Package-oriented test		
AUTOCLAVE Pressure Cooker Test	The device is unbiased under 121 ℃, and a 2 bars air atmosphere during 96 hours.	The Autoclave 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.

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