PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/13/8192
Dated 30 Oct 2013

ACST210-8B upgrade to ECOPACK2 grade with copper wire conversion in Longgang assembly plant

Table 1. Change Implementation Schedule

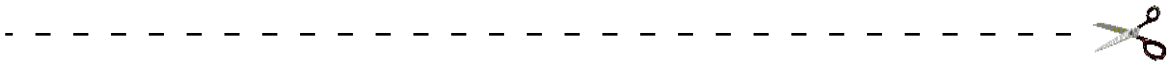
Forecasted implementation date for change	23-Oct-2013
Forecasted availability date of samples for customer	23-Oct-2013
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	23-Oct-2013
Estimated date of changed product first shipment	29-Jan-2014

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	ACST210-8B(TR)
Type of change	Package assembly material change
Reason for change	to upgrade the quality of the product
Description of the change	ST is converting its AC Switches in DPAK package from the standard molding compound to ECOPACK2 grade "Halogen free" compound. Package assembly will be done using copper wires instead of gold wires in ST LongGang factory instead of ST Shenzhen factory. Looking for the continuous improvement approach in terms of quality, will be implemented on DPAK a frame with new version so called "STANDARD BRIDGE FRAME". STANDARD BRIDGE FRAME has no impact in Data-sheet and Outline of the package.
Change Product Identification	internal codification and 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/13/8192**
Please sign and return to STMicroelectronics Sales Office	**Dated 30 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

ACST210-8B upgrade to ECOPACK®2 grade with copper wire conversion in Longgang assembly plant

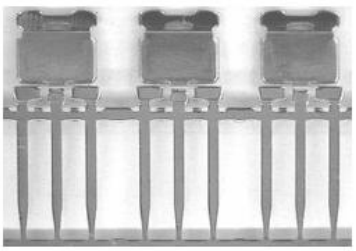
Notification number:	IPG-DIS/13/8192	**Issue Date**	23/10/2013
Issued by	Aline AUGIS		
Product series affected by the change		ACST210-8B and ACST210-8BTR	
Type of change		Assembly package material change	

Description of the change

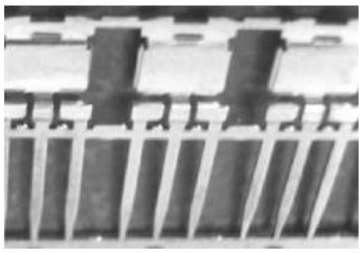
ST is converting its **AC Switches in DPAK** package from the standard molding compound to **ECOPACK®2** grade "Halogen free" compound. Package assembly will be done using copper wires instead of gold wires in ST LongGang factory instead of ST Shenzhen factory.

Looking for the continuous improvement approach in terms of quality, a new frame version called "**STANDARD BRIDGE FRAME**" will be implemented.

The STANDARD BRIDGE FRAME has no impact, neither on the datasheet nor on the package outline.



Picture 1: Actual Frame



Picture 2: New "Standard Bridge Frame"

Reason for change

To meet the so called "Halogen-Free" requirements of the market, ST is converting its AC Switches housed in DPAK 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 remains 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 product stocks last.

Marking and traceability

The **marking** of the ECOPACK®2 components 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 standard, as shown below.

The **traceability** for the modified products will be ensured by an **internal codification** called finish good and by the **Q.A. number**.

Qualification complete date	October 2013

Forecasted sample availability

Product family	Package	Commercial part Number	Availability date
ACSwitches	DPAK	ACST210-8B	now

Change implementation schedule

Sales types	Estimated production start	Estimated first shipments
ACST210-8B(-TR)	W42-2013	W05-2014

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	QRP12281 Attached

External Reliability Report

New ECOPACK®2 molding compound for selected products housed in IPAK DPAK package

General Information		Locations	
Product Lines	*AC Switches*	**Wafer fab**	*ST Tours (FRANCE)*
Products Description	*ACS / TRIAC / SCR*	**Assembly plant**	*ST Longgang (CHINA)*
Product Group	*IPD*	**Reliability Lab**	*ST Tours (FRANCE)*
Product division	*ASD&IPAD*		
Packages	*DPAK/IPAK*		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev. 1	November 21th, 2012	16	Gilles DUTRANNOY	Jean-Paul Rebrasse	First issue
Rev. 2	June 19th, 2013	14	Gilles DUTRANNOY	Jean-Paul Rebrasse	Add 800V series

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD 47	Stress-Test-Driven Qualification of Integrated Circuits
MIL-STD-750C	Test method for semiconductor devices
SOP 2614	Reliability requirements for product qualification (ST internal document)
SOP 267	Product maturity levels (ST internal document)
0061692	Reliability tests and criteria for qualifications (ST internal document)
PCN reference	IPD-DIF/12/xxxx

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

ST products housed in **IPAK DPAK package** are upgraded to ECOPACK®2 level by changing its current compound to halogen free.

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 product which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Device descriptions

TN805, TN815
TS820, TYN608

Sensitive and standard 8 A SCRs

Features

- On-state rms current, $I_{T(RMS)}$ 8 A
- Repetitive peak off-state voltage, V_{DRM}/V_{RRM} 600 and 800 V
- Triggering gate current, I_{GT} 0.2 to 15 mA

Description

Available either in sensitive (TS8) or standard (TN8 / TYN) gate triggering levels, the 8 A SCR series is suitable to fit all modes of control found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

Available in through-hole or surface-mount packages, they provide an optimized performance in a limited space.

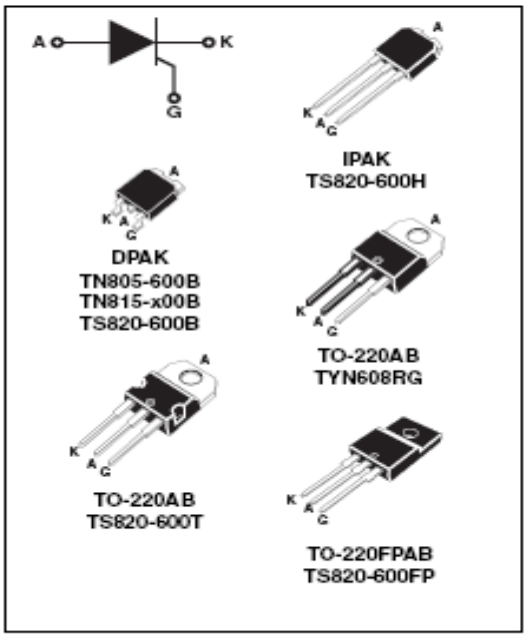


Table 1. Device summary

Order code	Voltage (x00) V_{DRM}/V_{RRM}		Sensitivity I_{GT}	Package
	600 V	800 V		
TS820-600B	X		0.2 mA	DPAK
TS820-600H	X		0.2 mA	IPAK
TS820-600T	X		0.2 mA	TO-220AB
TS820-600FP	X		0.2 mA	TO-220FPAB
TN805-600B	X		5 mA	DPAK
TN815-x00B	X	X	15 mA	DPAK
TYN608RG	X		15 mA	TO-220AB

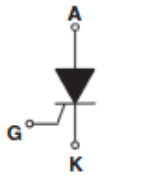
October 2011 Doc ID 7476 Rev 7 1/13
www.st.com

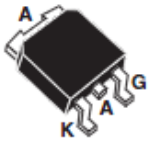
TN1515-600B

15 A standard SCR

Table 1. Main features

Symbol	Value	Unit
$I_{T(RMS)}$	15	A
V_{DRM}/V_{RRM}	600	V
$I_{GT\ (Q_1)}$	15	mA





DPAK
TN1515

Description

Specifically designed to control motor in hand tools application, the TN15 SCR is available in DPAK package, providing a high robustness against stalled rotor operating conditions in a small SMD package

Table 2. Order code

Part number	Marking
TN1515-600B-TR	TN15 15600
TN1515-600B	TN15 15600

Table 3. Absolute maximum ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)		T_c = 109° C	15	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)		T_c = 109° C	9.5	A
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	T_j = 25° C	165	A
		t_p = 10 ms		150	
I^2t	I^2t Value for fusing	t_p = 10 ms	T_j = 25° C	113	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	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

BTA08, BTB08
T810, T835

Snubberless™, logic level and standard 8 A Triacs

Features

- On-state rms current, $I_{T(RMS)}$ 8 A
- Repetitive peak off-state voltage, V_{DRM}/V_{RRM} 600 to 800 V
- Triggering gate current, $I_{GT\ (Q1)}$ 5 to 50 mA

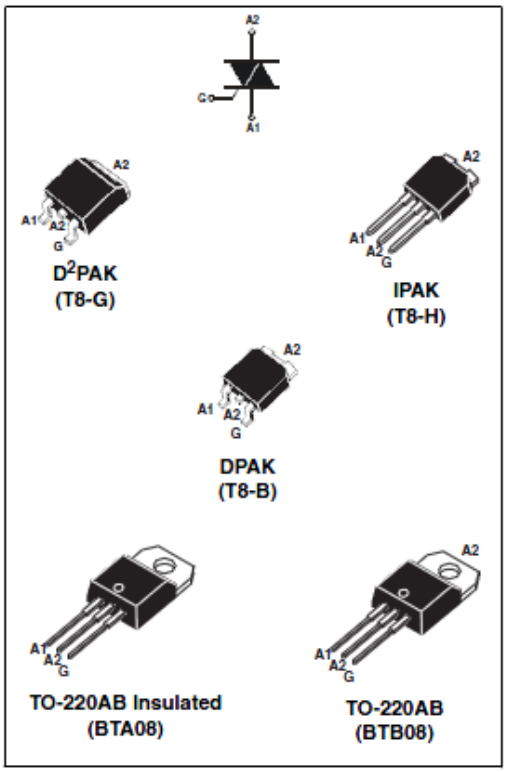
Description

Available either in through-hole or surface-mount packages, the **BTA08, BTB08** and **T8** triac series is suitable for general purpose AC switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits... or for phase control operation in light dimmers, motor speed controllers,...

The snubberless versions (BTA/BTB...W and T8 series) are specially recommended for use on inductive loads, thanks to their high commutation performances.

Logic level versions are designed to interface directly with low power drivers such as microcontrollers.

By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at 2500 V_{RMS}) complying with UL standards (file ref.: E81734).



ACS120-7SB/SFP/ST

ASD™ AC Switch Family

AC LINE SWITCH

MAIN APPLICATIONS

- AC static switching in appliance control systems
- Drive of low power high inductive or resistive loads like
  - relay, valve, solenoid, dispenser
  - pump, fan, micro-motor
  - defrost heater

FEATURES

- Blocking voltage : V_{DRM} / V_{RRM} = +/-700V
- Avalanche controlled : V_{CL} typ = 1100 V
- Nominal conducting current : $I_{T(RMS)}$ = 2A
- Gate triggering current : I_{GT} < 10 mA
- Switch integrated driver
- High noise immunity : static dV/dt >500V/µs

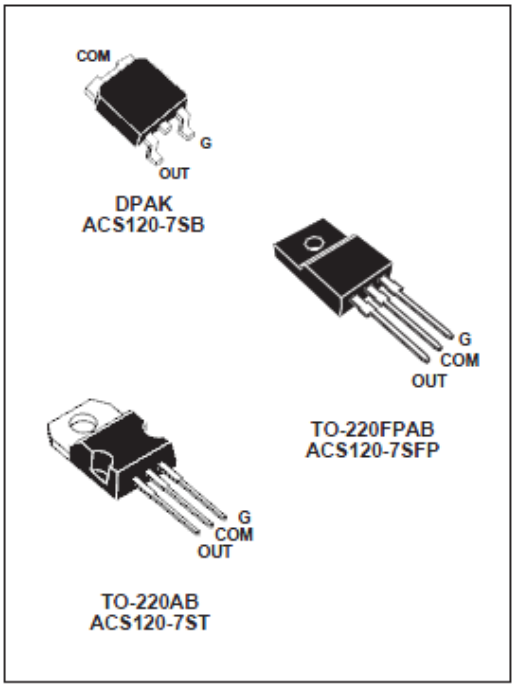
BENEFITS

- Needs no more external protection snubber or varistor
- Enables equipment to meet IEC 61000-4-5
- Reduces component count up to 80 %
- Interfaces directly with the microcontroller
- Eliminates any gate kick back on the microcontroller
- Allows straightforward connection of several ACS™ on same cooling pad.

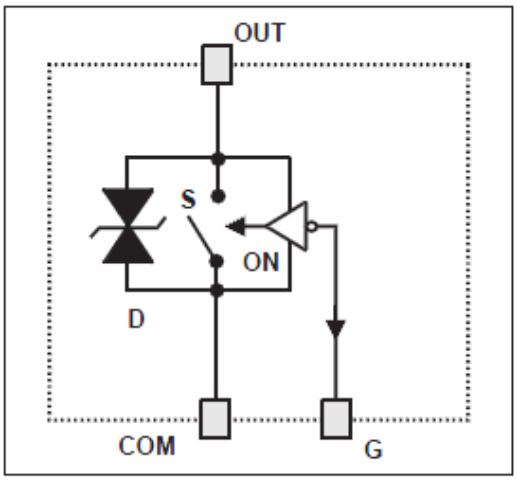
DESCRIPTION

The ACS120 belongs to the AC line switch family built around the ASD™ concept. This high performance switch circuit is able to control a load up to 2 A.

The ACS™ switch embeds a high voltage clamping structure to absorb the inductive turn off energy and a gate level shifter driver to separate the digital controller from the main switch. It is triggered with a negative gate current flowing out of the gate pin.



FUNCTIONAL DIAGRAM



ACST2

Overvoltage protected AC switch

Features

- Triac with overvoltage crowbar technology
- High noise immunity: static dV/dt > 500 V/µs
- ACST210-8FP, in the TO-220FPAB package, provides insulation voltage rated at 1500 V rms

Benefits

- Enables equipment to meet IEC 61000-4-5
- High off-state reliability with planar technology
- Needs no external overvoltage protection
- Reduces component count
- Interfaces directly with the micro-controller
- High immunity against fast transients described in IEC 61000-4-4 standards

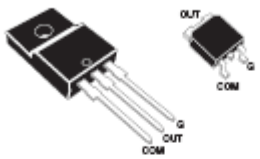
Applications

- AC on/off static switching in appliances and industrial control systems
- Driving low power highly inductive loads like solenoid, pump, fan, and micro-motor

Description

The ACST2 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 2 A.

This ACST2 switch embeds a Triac structure with a high voltage clamping device to absorb the inductive turn-off energy and withstand line transients such as those described in the IEC 61000-4-5 standards. The component needs a low gate current to be activated (I_{GT} < 10 mA) and still shows a high electrical noise immunity complying with IEC standards such as IEC 61000-4-4 (fast transient burst test).



TO-220FPAB ACST210-8FP | DPAK ACST210-8B

Figure 1. Functional diagram

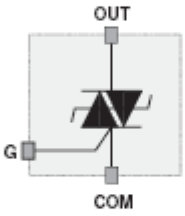


Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	2	A
V_{DRM}/V_{RRM}	800	V
I_{GT}	10	mA

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

5 TEST RESULTS SUMMARY

5.1 Test vehicles

8 test vehicles were chosen:

- TS820-600H
- TN1515-600B
- T835-600B
- ACS120-7SB
- T835-800B/8
- TN22-500H$
- ACST210-8B
- ACST410-8BTR

Lot #	Part Number	Process/ Package	Comments
LOT 1	TS820-600H/8	IPAK	Qualification lot
LOT 2	TN1515-600B/8	DPAK	Qualification lot
LOT 3	ACS120-7SB/8	DPAK	Qualification lot
LOT 4	T835-600B/8	DPAK	Qualification lot
LOT 5	T835-800B/8	DPAK	Qualification lot
LOT 6	TN22-500H$/8	IPAK	Qualification lot
LOT 7	ACST210-8B/8	DPAK	Qualification lot
LOT 8	ACST410-8BTR/8	DPAK	Qualification lot

5.2 Test plan and result summary

Test	Std ref.	Conditions	SS	Step	LOT 1
HTRB	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C V = VDRM rated (AC peak)	77	168 h	**0/77**
				500 h	**0/77**
				1000 h	**0/77**
TC	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	25	100 cycles	**0/25**
				500 cycles	**0/25**
THB	JESD22 A-101	85 °C 85% RH Bias = 100 V 1000 h	25	168 h	**0/25**
				500 h	**0/25**
				1000 h	**0/25**
AC	JESD22 A-101	121 °C 2 bars 96 h	25	96 h	**0/25**

Test	Std ref.	Conditions	SS	Step	LOT 2	LOT3	LOT4
HTRB	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C V = VDRM rated (AC peak)	203	168 h	**0/68**	**0/66**	**0/69**
				500 h	**0/68**	**0/66**	**0/69**
				1000 h	**0/68**	**0/66**	**0/69**
PC	JESD22 A-113	85 °C 85% RH 168 h	75	168 h	**0/25**	**0/25**	**0/25**
TC	JESD22 A-104	-65 °C/+150 °C cycle/h 1000 cycles		500 cycles	**0/25**	**0/25**	**0/25**
				1000 cycles	**0/25**	**0/25**	**0/25**
PC	JESD22 A-113	85 °C 85% RH 168 h	75	168 h	**0/25**	**0/25**	**0/25**
THB	JESD22 A-101	85 °C 85% RH Bias = 100 V 1000 h		168 h	**0/25**	**0/25**	**0/24**
				500 h	**0/25**	**0/25**	**0/24**
				1000 h	**0/25**	**0/25**	**0/24**
PC	JESD22 A-113	85 °C 85% RH 168 h	75	168 h	**0/25**	**0/25**	**0/25**
AC	JESD22 A-101	121 °C 2 bars 96 h		96 h	**0/25**	**0/25**	**0/25**

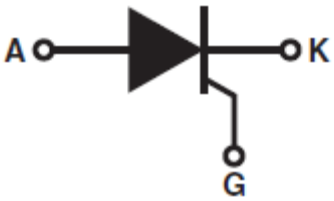
Test	Std ref.	Conditions	SS	Step	LOT5	LOT6	LOT7	LOT8
HTRB	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C V = VDRM rated (AC peak)	77	168 h	**0/77**	**0/77**	**0/77**	**0/77**
				500 h	**0/77**	**0/77**	**0/77**	**0/77**
				1000 h	**0/77**	**0/77**	**0/77**	**0/77**

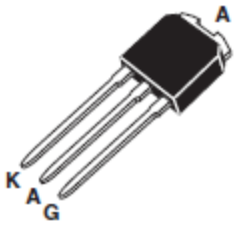
6 APPENDIX

6.1 Device details

6.1.1 Pin connection

DPAK

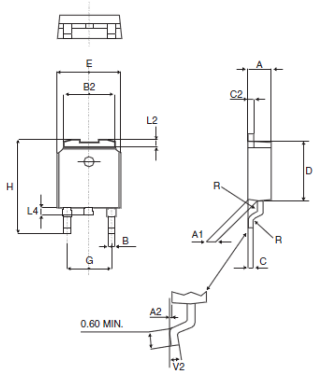




IPAK

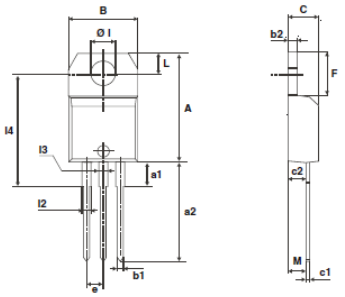
6.1.2 Package outline/Mechanical data

DPAK



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	2.20	2.40	0.086	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
B	0.64	0.90	0.025	0.035
B2	5.20	5.40	0.204	0.212
C	0.45	0.60	0.017	0.023
C2	0.48	0.60	0.018	0.023
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.251	0.259
G	4.40	4.60	0.173	0.181
H	9.35	10.10	0.368	0.397
L2	0.80 typ.		0.031 typ.	
L4	0.60	1.00	0.023	0.039
V2	0°	8°	0°	8°

IPAK



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
Ø I	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	

6.2 Test Descriptions

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		
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.
PC Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop corn" effect and delamination.
AC Autoclave	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.

6.3 Involved product series:

Package	ECOPACK®2 conversion	Involved Product Series
DPAK	All	ACS120-7SB(-TR) ACSTxxx-8B(-TR) FLC01-200B-TR FLC10-200B LIC01-215B-TR T405-xxxB(-TR) T405Q-600B-TR T410-xxxB(-TR) T435-xxxB(-TR) T810-xxxB(-TR) T835-xxxB(-TR) TN1205T-600B(-TR) TN1215-x00B(-TR) TN1515-600B-TR TN805-600B-TR TN815-x00B-TR TN815-9BAS(-TR) TS1220-600B(-TR) TSx20-x00B(-TR)
IPAK		FLC01-200H LIC01-xxxH T405-600H T405Q-600H T410-x00H T435-x00H T835-600H TN1215-x00H TN22-1500H TN815-800H TS1220-600H TSx20-600H

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