



# PRODUCT/PROCESS CHANGE NOTIFICATION

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PCN IPG-DIS/14/8497  
Dated 29 May 2014

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**Assembly and testing transfer from ST China plant to  
subcontractor in China and ECOPACK2 conversion and  
leadframe rationalization**

**Table 1. Change Implementation Schedule**

Forecasted implementation date for change	22-May-2014
Forecasted availability date of samples for customer	10-Jun-2014
Forecasted date for <b>STMicroelectronics</b> change Qualification Plan results availability	22-May-2014
Estimated date of changed product first shipment	28-Aug-2014

**Table 2. Change Identification**

Product Identification (Product Family/Commercial Product)	AC Switches
Type of change	Package assembly location change
Reason for change	To optimize our industrial capacity
Description of the change	see attached
Change Product Identification	marking, internal codification and QA number
Manufacturing Location(s)	



## DOCUMENT APPROVAL

Name	Function
Paris, Eric	Marketing Manager
Duclos, Franck	Product Manager
Cazaubon, Guy	Q.A. Manager

# PCN

## Product/Process Change Notification

### AC Switches

**Change 1:** Assembly and testing transfer from ST China plant to subcontractor in China

**Change 2:** ECOPACK2 conversion and leadframe rationalization

<b>Notification number:</b>	IPG-DIS/14/8497	<b>Issue Date</b>	22/05/2014
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<b>Issued by</b>	Aline AUGIS
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<b>Product series affected by the change</b>	<b><u>DPAK</u></b> ACST410-8B ACST410-8BTR ACST435-8B ACST435-8BTR FLC01-200B-TR FLC10-200B LIC01-215B-TR T405-600B T405-600B-TR T405-700B-TR T405-800B-TR T405Q-600B-TR T410-600B T410-600B-TR T410-800B-TR T435-600B T435-600B-TR T435-700B-TR T435-800B-TR T810-600B T810-600B-TR T810-800B-TR T835-600B T835-600B-TR T835-800B T835-800B-TR TN1205T-600B TN1205T-600B-TR TN1215-600B TN1215-600B-TR TN1215-800B-TR TN1515-600B-TR TN805-600B-TR TN815-600B-TR TN815-800B-TR TN815-9BAS TN815-9BAS-TR TS1220-600B TS1220-600B-TR TS410-600BCTR TS420-600B TS420-600BCTR TS420-600B-TR TS450-600BCTR TS820-600B TS820-600B-TR TS820-700B-TR TS820-800BM-TR	<b><u>IPAK</u></b> FLC01-200H FLC01-200HEL LIC01-215H T405-600H T405-800H T405Q-600H T410-600H T410-800H T435-600H T435-800H T835-600H TC05A6I TN1215-600H TN1215-800H TN815-800H TS1220-600H TS420-600H TS820-600H
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(1) IPG: Industrial & Power Group - ASD: Application Specific Device – IPAD™: Integrated Passive and Active Devices

<b>Type of change</b>						Additional assembly package location				
<b>Description of the change</b>										
	Before					After				
	Back-End				Ecopack 2	Back-End				Ecopack 2
	Name	Type	Country	Marking		Name	Type	Country	Marking	
DPAK Thyristors & Triacs	LGG	subco	China	G4	N	NFME- Matrix	subco	China	GF	Y
	STS	ST	China	GK	N					
	NFME- STD	subco	China	GF	N					
IPAK Thyristors & Triacs	LGG	ST	China	G4	N	NFME- STD	subco	China	GF	Y
<b>Reason for change</b>										
<p><a href="#">Change 1</a>: The change is performed in order to optimize our industrial capacity.</p> <p><a href="#">Change 2</a>: ST upgrades its AC Switches housed in DPAK and IPAK packages with frame matrix and ECOPACK2 conversion in order to optimize its industrial process and give a better service to customers.</p>										
<b>Former versus changed product:</b>						<p>The changed products do not present modified electrical, parameters, leaving unchanged the current information published in the product datasheet, except for the POA.</p> <p>The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged.</p> <p>The footprint recommended by ST remains the same.</p> <p>There is no change in the packing modes and the standard delivery quantities either.</p> <p>The products are now in full compliance with the ST ECOPACK@2 grade ("halogen-free").</p>				
<b>Disposition of former products</b>										
Deliveries of former product will continue while the transfer is brought to completion and as long as former product stocks last.										
<b>Marking and traceability</b>										
<p><b>Traceability</b> for the implemented change will be ensured by the <b>marking</b>, an <b>internal codification</b> and by the <b>Q.A. number</b>.</p> <p>For <b>ECOPACK2</b> conversion a letter "G" printed to the right of the "e3" symbol on the marking.</p>										
<b>Qualification complete date</b>						19-05-2014				

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

**Forecasted sample availability**

Product family	Sub-family	Commercial part Number	Availability date
<b>AC Switches</b>	Triacs	T405Q-600B-TR	Week 24-2014
		T405-600B-TR	
		T410-600B-TR	
		T435-700B-TR	
		TN815-800B-TR	
		TS420-600B-TR	
		T835-600B-TR	
		TS820-800B-TR	

**Change implementation schedule**

Sales types	Estimated production start	Estimated first shipments
<b>All</b>	<b>Week 21 - 2014</b>	<b>Week 34 - 2014</b>

**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**

QRP14097

## External Reliability Report

*Qualification of DPAK/IPAK package at china subcontractor*

General Information		Locations	
<b>Product Lines</b>	<i>AC Switches</i>	<b>Wafer fab</b>	<i>STMicroelectronics Tours</i>
<b>Products Description</b>	<i>ACS/TRIAC/Thyristor</i>	<b>Assembly plant</b>	<i>China Subcontractor (998G)</i>
<b>Product Group</b>	<i>IPG</i>	<b>Reliability Lab</b>	<i>STMicroelectronics Tours</i>
<b>Product division</b>	<i>ASD&amp;IPAD</i>	<b>Reliability assessment</b>	<b>Passed</b>
<b>Package</b>	<i>DPAK/IPAK</i>		

### DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev. 1	May	14	Gilles DUTRANNOY	Jean-Paul REBRASSE	First issue

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
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)

## 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**


Qualification of DPAK/IPAK package at china subcontractor.

#### **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

## Devices Characteristics

### 3.3 Devices description

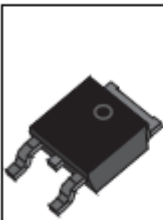

**ACST4**

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Overvoltage protected AC switch

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Datasheet - production data



**DPAK**  
ACST410-8B  
ACST435-8B



**TO-220FPAB**  
ACST410-8FP  
ACST435-8FP

#### Description

The ACST4 series belongs to the ACS™/ACST power switch family. This high performance device is suited to home appliances or industrial systems and drives loads up to 4A.

This ACST4 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 ACST410 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).

#### Features

- Triac with overvoltage protection
- Low  $I_{GT}$  (<10 mA) or high immunity ( $I_{GT}$ <35 mA) version
- High noise immunity: static  $dV/dt > 1000$  V/ $\mu$ s
- TO-220FPAB insulated package: 1500 V rms

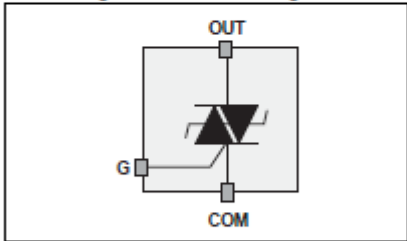
#### Benefits

- Enables equipment to meet IEC 61000-4-5
- High off-state reliability with planar technology
- Needs no external overvoltage protection
- Reduces 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

**Figure 1. Functional diagram**



**Table 1. Device summary**

Symbol	Value	Unit
$I_{T(RMS)}$	4	A
$V_{DRM}/V_{RRM}$	800	V
$I_{GT}(ACST410)$	10	mA
$I_{GT}(ACST435)$	35	mA

**TM:** ACS is a trademark of STMicroelectronics

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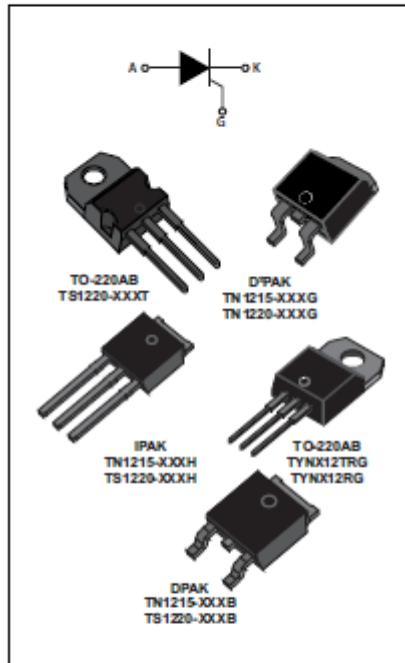
This is information on a product in full production. www.st.com



## TN12\_TS12\_TYNX12

### Sensitive and standard 12 A SCRs

Datasheet - production data



### Description

Available either in sensitive (TS1220) or standard (TN1215 / TYNX12) gate triggering levels, the 12A 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 (x100) $V_{DRM}/V_{RRM}$				$I_{GT}$	Package
	600	700	800	1000		
TN1215-xxxB	X		X		15 mA	DPAK
TN1215-xxxG	X		X		15 mA	D <sup>2</sup> PAK
TN1215-xxxH	X		X		15 mA	IPAK
TS1220-xxxB	X	X			0.2 mA	DPAK
TS1220-xxxH	X				0.2 mA	IPAK
TS1220-xxxT	X				0.2 mA	TO-220AB
TYNX12RG	X		X	X	15 mA	TO-220AB
TYNX12TRG	X		X	X	5 mA	TO-220AB

### Features

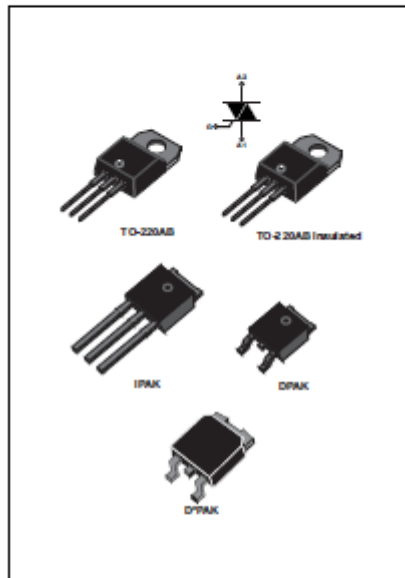
- On-state rms current,  $I_{T(RMS)}$  12A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 and 1000 V
- Triggering gate current,  $I_{GT}$  0.2 to 15 mA



## BTA08, BTB08 and T8 Series

Snubberless™, logic level and standard 8 A Triacs

Datasheet – production data



### 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 microcontroller.

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

### Features

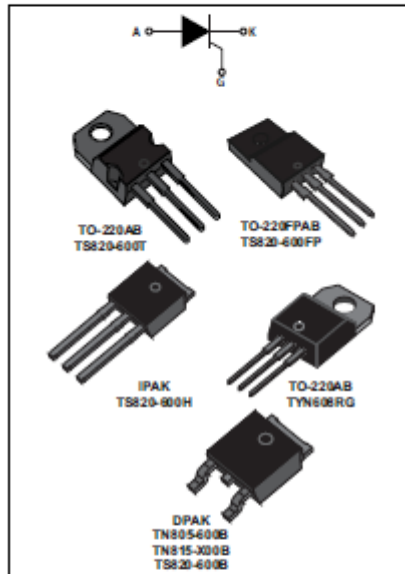
- On-state rms current,  $I_{T(RMS)}$  8 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 to 800 V
- Triggering gate current,  $I_{GT(Q1)}$  5 to 50 mA



## TN805, TN815, TS820, TYN608

Sensitive and standard 8 A SCRs

Datasheet - production data



### 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 (x100) $V_{DRM}/V_{RRM}$		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

### 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

## **4 TESTS RESULTS SUMMARY**

### **4.1 Test vehicles**

5 test vehicles were chosen:

- T835-600B-TR assembled in DPAK package
- ACST410-8BTR assembled in DPAK package
- TN1215-800B-TR assembled in DPAK package
  
- T835-600H assembled in IPACK package
- TS820-600H assembled in IPACK package

<b>Lot #</b>	<b>Part number</b>	<b>Process/ Package</b>	<b>Comments</b>
<b>L1</b>	T835-600B-TR	DPAK	Qualification lot
<b>L2</b>	ACST410-8BTR	DPAK	
<b>L3</b>	TN1215-800B-TR	DPAK	
<b>L4</b>	T835-600H	IPAK	Qualification lot
<b>L5</b>	TS820-600H	IPAK	

The results are detailed in the next sections.



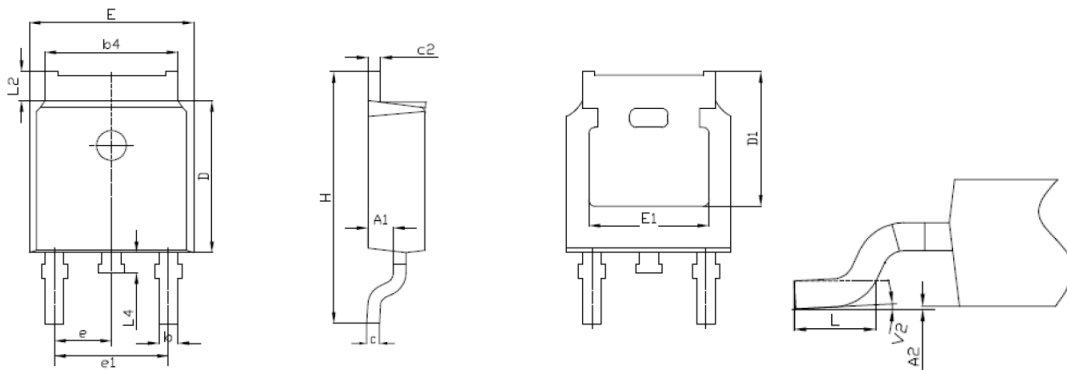
## 4.2 Test plan and results summary

Test	PC	Std ref.	Conditions	SS	Steps	Failure/SS					Note
						Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	
HTRB	N	JESD22 A-108	T <sub>j</sub> = 125 °C VAC	385	168 h	0/77	0/77	0/77	0/77	0/77	
		MIL-STD-750C method 1040			500 h	0/77	0/77	0/77	0/77	0/77	
					1000 h						
THB	Y	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 100 V	125	168 h	0/25	0/25	0/25	0/25	0/25	
					500 h	0/25	0/25	0/25	0/25	0/25	
					1000 h						
PCT	Y	JESD22 A-102	121°C 2bar 100% RH	125	96 h	0/25	0/25	0/25	0/25	0/25	
TC	Y	JESD22 A-104	-65 °C/+150 °C 2 cycles/h	125	500 cycles	0/25	0/25	0/25	0/25	0/25	
RSH	N	JESD22 B-106-A	260°C 10S 2 immersions	60	2 dipping	0/12	0/12	0/12	0/12	0/12	

## 5 ANNEXES

### 5.1 Device details

#### 5.1.1 Package outline/Mechanical data for DPAK

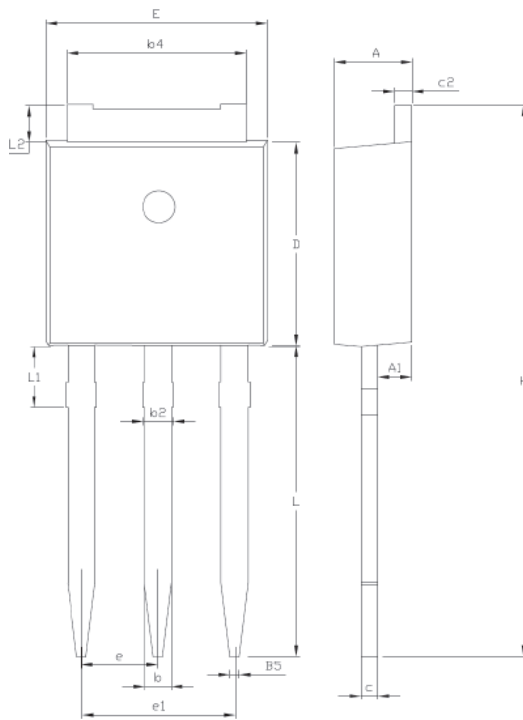


#### DIMENSIONS FOR TYPE "H"

#### ASE - NFME – SUBCON.

REF.DIM	DATA BOOK (mm)			NOTES
	NOM	MIN	MAX	
<b>A</b>		2.18	2.40	
<b>A1</b>		0.9	1.10	
<b>A2</b>		0.03	0.23	
<b>b</b>		0.64	0.90	
<b>b4</b>		4.95	5.46	
<b>c</b>		0.46	0.61	
<b>c2</b>		0.46	0.60	
<b>D</b>		5.97	6.22	
<b>D1</b>		5.1		
<b>E</b>		6.35	6.73	
<b>E1</b>		4.32		
<b>e1</b>		4.4	4.7	
<b>H</b>		9.35	10.40	
<b>L</b>		1.0	1.78	
<b>L2</b>			1.27	
<b>L4</b>		0.6	1.02	
<b>V2</b>		0°	8°	

**5.1.2 Package outline/Mechanical data for IPAK**



**DIMENSIONS FOR TYPE "D"**

REF.DIM	COMMON NFME - ST			NOTES
	DATA BOOK mm			
	NOM	MIN	MAX	
A		2.20	2.40	
A1		0.90	1.10	
b		0.64	0.90	
b2			0.95	
b4		5.20	5.43	
B5	0.30			
c		0.45	0.60	
c2		0.46	0.60	
D		6.00	6.20	
E		6.40	6.70	
e	2.28			
e1		4.40	4.60	
H	16.10			
L		9.00	9.60	
L1		0.80	1.20	
L2	0.80		1.25	
V1	10°			

## 5.2 Tests Description

Test name	Description	Purpose
<b>Die-oriented test</b>		
<b>HTRB (AC mode)</b> 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.
<b>Die and Package-oriented test</b>		
<b>THB</b> 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.
<b>TC</b> 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.
<b>RSH</b>	Device is submitted to a dipping in a solder bath at 260°C with a dwell time of 10s. Only for through hole mounted devices.	This test is used to determine whether solid state devices can withstand the effects of the temperature to which they will be subjected during soldering of their leads. The heat is conducted through the leads into the device package from solder heat at the reverse side of the board. This procedure does not simulate wave soldering or reflow heat exposure on the same side of the board as the package body.
<b>PCT</b> Pressure Cooker Test	The device is unbiased under 121 °C, 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).

**Appendix**

List of product involved in this qualification

cp	pkdescr	cp	pkdescr	cp	pkdescr
ACST410-8B	TO 252 DPAK	T410-800B-TR	TO 252 DPAK	TN1215-600H	IPAK TO-251
ACST410-8BTR	TO 252 DPAK	T410-800H	IPAK TO-251	TN1215-800B-TR	TO 252 DPAK
ACST435-8B	TO 252 DPAK	T435-600B	TO 252 DPAK	TN1215-800H	IPAK TO-251
ACST435-8BTR	TO 252 DPAK	T435-600B-TR	TO 252 DPAK	TN1515-600B-TR	TO 252 DPAK
FLC01-200B-TR	TO 252 DPAK	T435-600H	IPAK TO-251	TN805-600B-TR	TO 252 DPAK
FLC01-200H	IPAK TO-251	T435-700B-TR	TO 252 DPAK	TN815-600B-TR	TO 252 DPAK
FLC01-200HEL	IPAK TO-251	T435-800B-TR	TO 252 DPAK	TN815-800B-TR	TO 252 DPAK
FLC10-200B	TO 252 DPAK	T435-800H	IPAK TO-251	TN815-800H	IPAK TO-251
LIC01-215B-TR	TO 252 DPAK	T810-600B	TO 252 DPAK	TN815-9BAS	TO 252 DPAK
LIC01-215H	IPAK TO-251	T810-600B-TR	TO 252 DPAK	TN815-9BAS-TR	TO 252 DPAK
T405-600B	TO 252 DPAK	T810-800B-TR	TO 252 DPAK	TS1220-600B	TO 252 DPAK
T405-600B-TR	TO 252 DPAK	T835-600B	TO 252 DPAK	TS1220-600B-TR	TO 252 DPAK
T405-600H	IPAK TO-251	T835-600B-TR	TO 252 DPAK	TS1220-600H	IPAK TO-251
T405-700B-TR	TO 252 DPAK	T835-600H	IPAK TO-251	TS410-600BCTR	TO 252 DPAK
T405-800B-TR	TO 252 DPAK	T835-800B	TO 252 DPAK	TS420-600B	TO 252 DPAK
T405-800H	IPAK TO-251	T835-800B-TR	TO 252 DPAK	TS420-600BCTR	TO 252 DPAK
T405Q-600B-TR	TO 252 DPAK	TC05A6I	IPAK TO-251	TS420-600B-TR	TO 252 DPAK
T405Q-600H	IPAK TO-251	TN1205T-600B	TO 252 DPAK	TS420-600H	IPAK TO-251
T410-600B	TO 252 DPAK	TN1205T-600B-TR	TO 252 DPAK	TS450-600BCTR	TO 252 DPAK
T410-600B-TR	TO 252 DPAK	TN1215-600B	TO 252 DPAK	TS820-600B	TO 252 DPAK
T410-600H	IPAK TO-251	TN1215-600B-TR	TO 252 DPAK	TS820-600B-TR	TO 252 DPAK
TS820-600H	IPAK TO-251	TS820-700B-TR	TO 252 DPAK	TS820-800BM-TR	TO 252 DPAK

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