PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/12/7393
Dated 27 Jul 2012

IPD - ASD & IPAD Division

ACS108-6Sxxx devices in TO-92 and SOT-223

Design and features upgrade

Table 1. Change Implementation Schedule

Forecasted implementation date for change	20-Jul-2012
Forecasted availability date of samples for customer	20-Jul-2012
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	20-Jul-2012
Estimated date of changed product first shipment	03-Dec-2012

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	ACS108-6Sxxx devices in TO-92 and SOT-223
Type of change	Product design change
Reason for change	to give a higher performance to the currently delivered version
Description of the change	The design of the ACS108-6Sxxx has been upgraded with the goal of improving the electrical parameters of the products, specifically the dV/dt, (dI/dt)c, IH, ITSM, I2T, and with no degradation of any other parameters.
Change Product Identification	internal part number, labelling, product marking, QA number
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	

- -

Customer Acknowledgement of Receipt Please sign and return to STMicroelectronics Sales Office	**PCN IPD-DIS/12/7393** **Dated 27 Jul 2012**
☐ 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

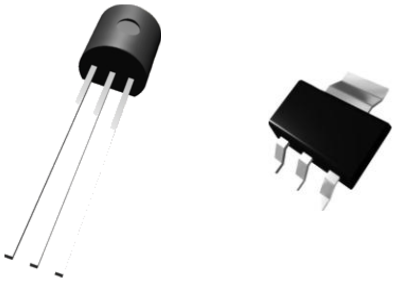
PRODUCT/PROCESS
CHANGE NOTIFICATION

PCN IPD-DIS/12/7393

IPD - ASD & IPAD Division[1]

<u>ACS108-6Sxxx devices in TO-92 and SOT-223</u>:

Design and features upgrade



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

WHY THIS CHANGE?

STMicroelectronics has developed a new version of its **ACS108-6Sxxx** devices in **TO-92** and **SOT-223** packages with **higher performance** than the currently delivered version, as a result of the optimization now made possible by its state-of-the-art technology.

WHAT IS THE CHANGE?

The **design** of the **ACS108-6Sxxx** has been upgraded with the goal of improving the electrical parameters of the products, specifically the dV/dt, (dI/dt)c, I_H, I_{TSM}, I^2T, and with **no degradation** of any other parameters.

A **new product datasheet** has been issued which includes the announced **parametric upgrade** for the 600 V device and a new **800V device**. It is annexed to the present document.

There is no reduction in the **die size** and no change in the **thermal** and **dimensional parameters** of the products with respect to the current product datasheet. This was verified in the qualification program.

There is **no change** in the **ECOPACK®2 grade**, in the **packing mode** and in the standard **delivery quantities**.

HOW AND WHEN?

Qualification and test results:

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

The **Reliability Report** for the new version of the product is annexed to the present document.

Sampling:

Samples of the new product versions are available now **upon request**.

Change implementation schedule:

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

Production Start	1st Shipments
From **wk 28-2012**	From **wk 49-2012**

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 **120 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 600 V Parts made with the upgraded design will have their **product marking** differentiated by the **indicated code** as indicated in the table below.

Package	Current marking	New marking
SOT-223	ACS 108 6S	ACS 1086 SN
TO-92	ACS1 086S	ACS108 6SA

The **traceability** of the new version is ensured by the **internal part number** printed on the **box labelling** and, by the **product marking** indicated above and by the **QA number**.

Annex: Related Reliability Report

- Updated **product datasheet** including the 800V feature,
- **Reliability report** for qualification.

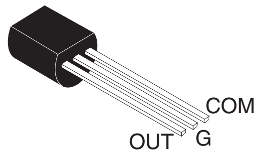
ACS108

Overvoltage protected AC switch (ACS™)

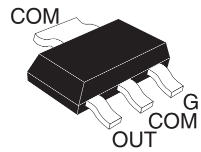
Datasheet — production data

Features

- Enables equipment to meet IEC 61000-4-5 surge with overvoltage crowbar technology
- High noise immunity against static dV/dt and IEC 61000-4-4 burst
- Needs no external protection snubber or varistor
- Reduces component count by up to 80% and Interfaces directly with the micro-controller
- Common package tab connection supports connection of several alternating current switches on the same cooling pad
- V_{CL} gives headroom before clamping then crowbar action



TO-92
ACS108-6SA
ACS108-8SA



SOT-223
ACS108-6SN
ACS108-8SN

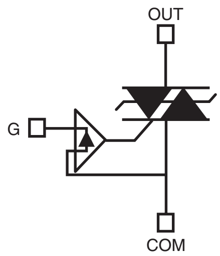
Applications

- Alternating current on/off static switching in appliances and industrial control systems
- Driving low power high inductive or resistive loads like:
  - relay, valve, solenoid, dispenser,
  - pump, fan, low power motor, door lock
  - lamp

Description

The ACS108 belongs to the AC switch range (built with A. S. D.® technology). This high performance switch can control a load of up to 0.8 A. The ACS108 switch includes an overvoltage crowbar 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.

Figure 1. Functional diagram



COM	Common drive reference to connect to the mains
OUT	Output to connect to the load.
G	Gate input to connect to the controller through gate resistor

Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	0.8	A
V_{DRM}, V_{RRM}	600 and 800	V
I_{GT}	10	mA

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

TM: ACS is a trademark of STMicroelectronics

1 Characteristics

Table 2. Absolute maximum ratings (T_{amb} = 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state rms current (full sine wave)	TO-92	T_{amb} = 64 °C	0.45	A
			T_{lead} = 76 °C	0.8	A
		SOT-223 S = 5 cm^2	T_{amb} = 76 °C		
			T_{tab} = 104 °C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle sine wave, T_j initial = 25 °C)	F = 60 Hz	t = 16.7 ms	13.7	A
		F = 50 Hz	t = 20 ms	13	
I^2t	I^2t Value for fusing		t_p = 10 ms	1.1	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2xI_{GT}, $t_r \leq$ 100 ns	F = 120 Hz	T_j = 125 °C	100	A/µs
V_{PP}	Non repetitive mains peak mains voltage(1)			2	kV
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	1	A
V_{GM}	Peak positive gate voltage		T_j = 125 °C	10	V
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	0.1	W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range			-40 to +150 -30 to +125	°C

1. According to test described by IEC 61000-4-5 standard and *Figure 18*

Table 3. Electrical characteristics (T_j = 25 °C, unless otherwise specified)

Symbol	Test conditions	Quadrant		Value	Unit
I_{GT}(1)	V_{OUT} = 12 V, R_L = 33 Ω	II - III	Max.	10	mA
V_{GT}		II - III	Max.	1	V
V_{GD}	V_{OUT} = V_{DRM}, R_L = 3.3 kΩ, T_j = 125 °C	II - III	Min.	0.15	V
I_H	I_{OUT} = 100 mA		Max.	10	mA
I_L	I_G = 1.2 x I_{GT}		Max.	25	mA
dV/dt	V_{OUT} = 402 V, gate open, T_j = 125 °C		Min.	2000	V/µs
	V_{OUT} = 536 V, gate open, T_j = 125 °C		Min.	400	V/µs
(dI/dt)c	Without snubber (15 V/µs), T_j = 125 °C, turn-off time ≤ 20 ms		Min.	2	A/ms
V_{CL}	I_{CL} = 0.1 mA, t_p = 1 ms, ACS108-6		Min.	650	V
	I_{CL} = 0.1 mA, t_p = 1 ms, ACS108-8		Min.	850	V

1. Minimum I_{GT} is guaranteed at 10% of I_{GT} max

Table 4. Static electrical characteristics

Symbol	Parameter and test conditions			Value	Unit
V_{TM} (1)	I_{TM} = 1.1 A, t_p = 500 µs	T_j = 25 °C	Max.	1.3	V
V_{t0} (1)	Threshold voltage	T_j = 125 °C	Max.	0.85	V
R_D (1)	Dynamic resistance	T_j = 125 °C	Max.	300	mΩ
I_{DRM} I_{RRM}	V_{OUT} = V_{DRM} = V_{RRM}	T_j = 25 °C	Max.	2	µA
		T_j = 125 °C		0.2	mA

1. For both polarities of OUT referenced to COM

Table 5. Thermal resistance

Symbol	Parameter				Value	Unit
$R_{th\ (j\text{-}l)}$	Junction to lead (AC)		TO-92	Max.	60	°C/W
$R_{th\ (j\text{-}t)}$	Junction to tab (AC)		SOT-223	Max.	25	
$R_{th\ (j\text{-}a)}$	Junction to ambient		TO-92	Max.	150	
		S = 5 cm²	SOT-223	Max.	60	

Figure 2. Maximum power dissipation versus on-state rms current

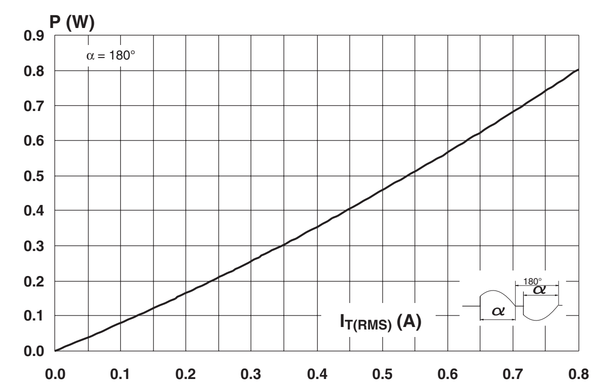


Figure 3. On-state rms current versus case temperature (SOT223)

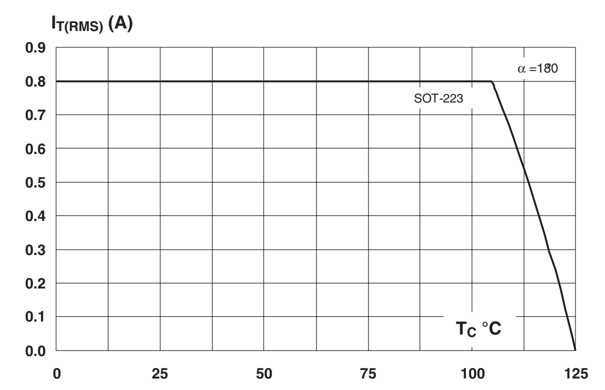


Figure 4. On-state rms current versus ambient temperature (free air convection)

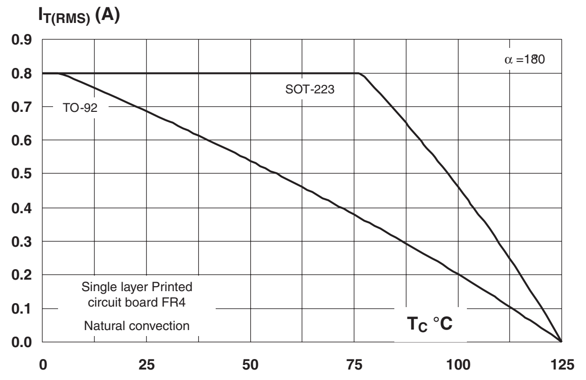


Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration

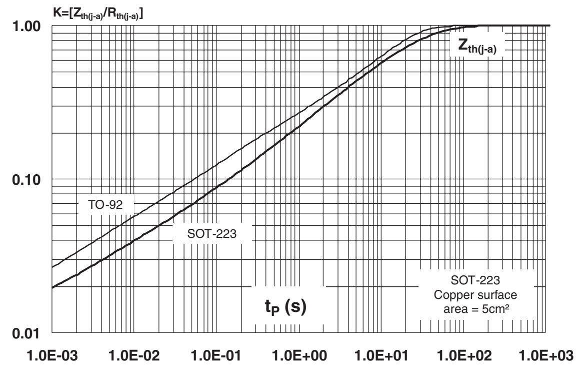


Figure 6. Relative variation of holding and latching current versus junction temperature

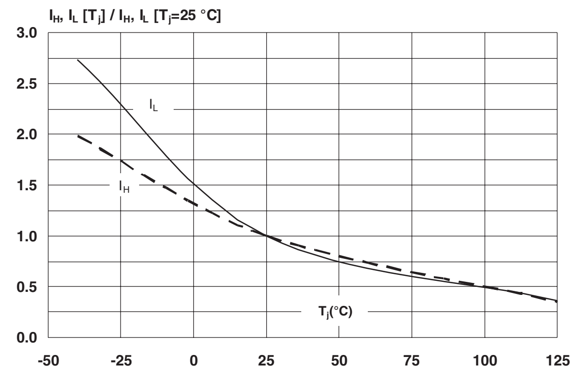


Figure 7. Relative variation of I_{GT} and V_{GT} versus junction temperature

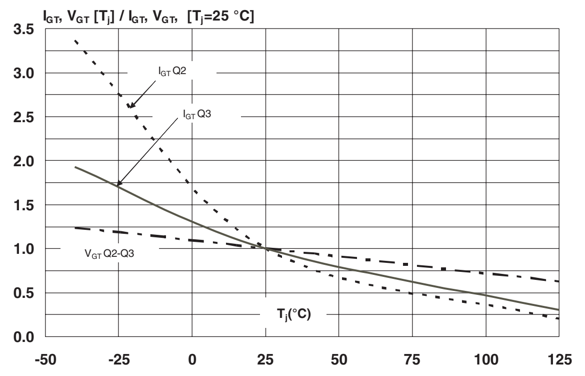


Figure 8. Surge peak on-state current versus number of cycles

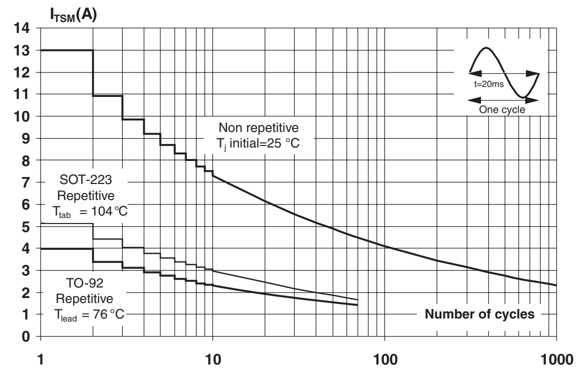


Figure 9. Non repetitive surge peak on-state current for a sinusoidal pulse, and corresponding value of I²t

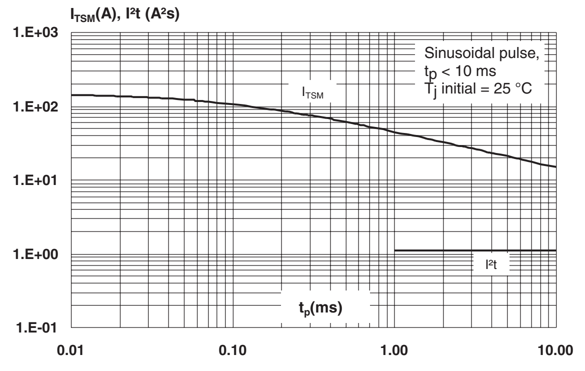


Figure 10. On-state characteristics (maximal values)

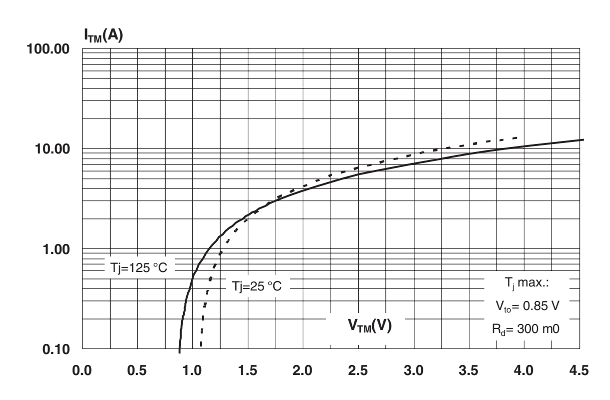


Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature

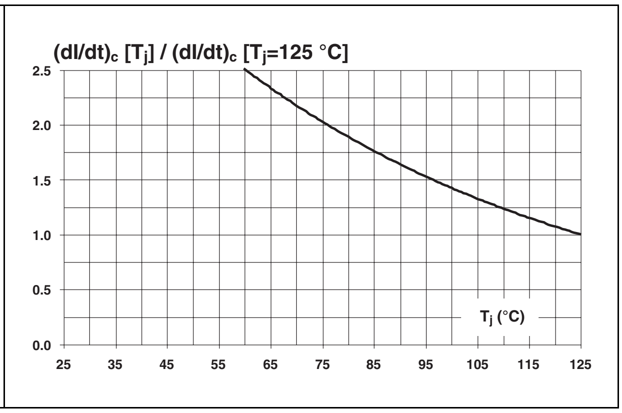


Figure 12. Relative variation of static dV/dt immunity versus junction temperature[(1)]

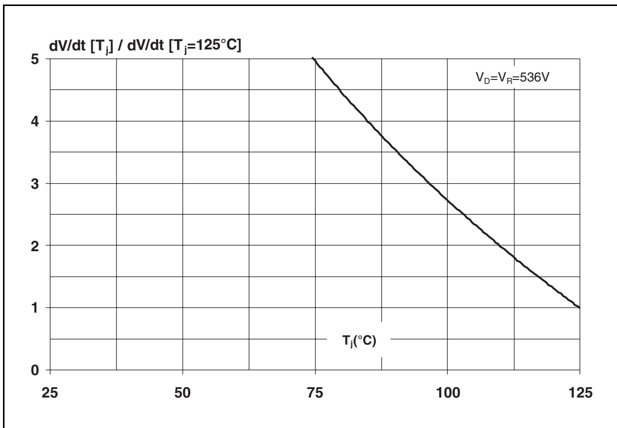
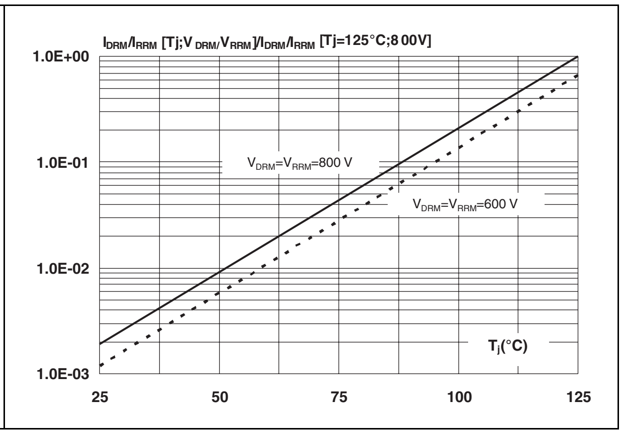


Figure 13. Relative variation of leakage current versus junction temperature



1. $V_D = V_R$ = 402 V: Typical values above 5 kV/µs. Beyond equipment capability

Figure 14. Relative variation of critical rate of decrease of main current (di/dt)c versus (dV/dt)c

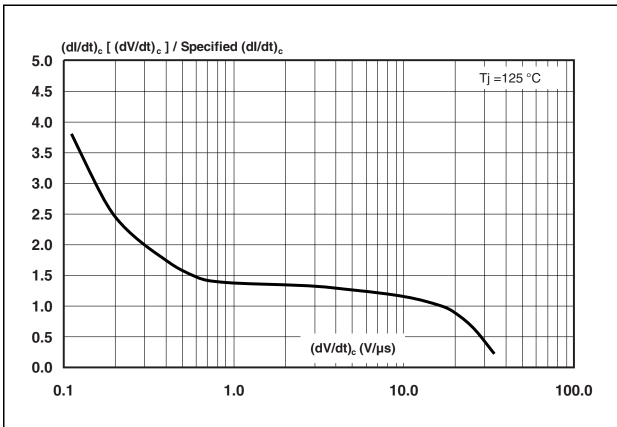
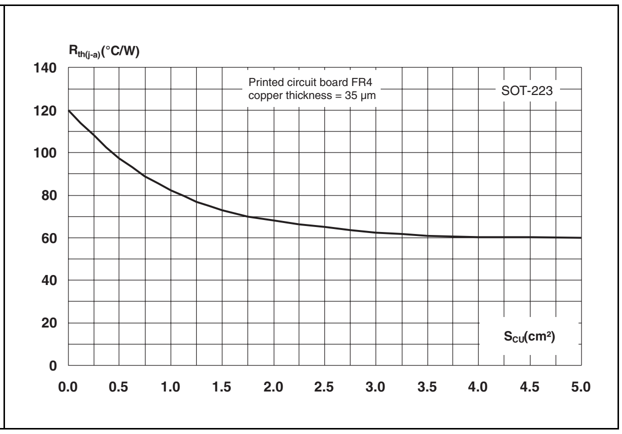


Figure 15. Thermal resistance junction to ambient versus copper surface under tab (SOT-223)

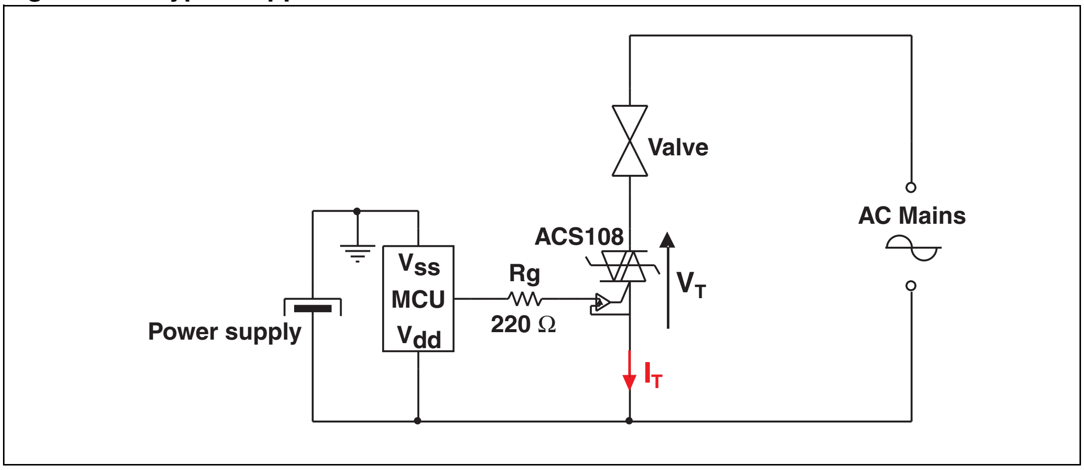


2 Alternating current mains switch - basic application

The ACS108 switch is triggered by a negative gate current flowing from the gate pin G. The switch can be driven directly by the digital controller through a resistor as shown in *Figure 16*.

Thanks to its overvoltage protection and turn-off commutation performance, the ACS108 switch can drive a small power high inductive load with neither varistor nor additional turn-off snubber.

Figure 16. Typical application schematic



2.1 Protection against overvoltage: the best choice is ACS

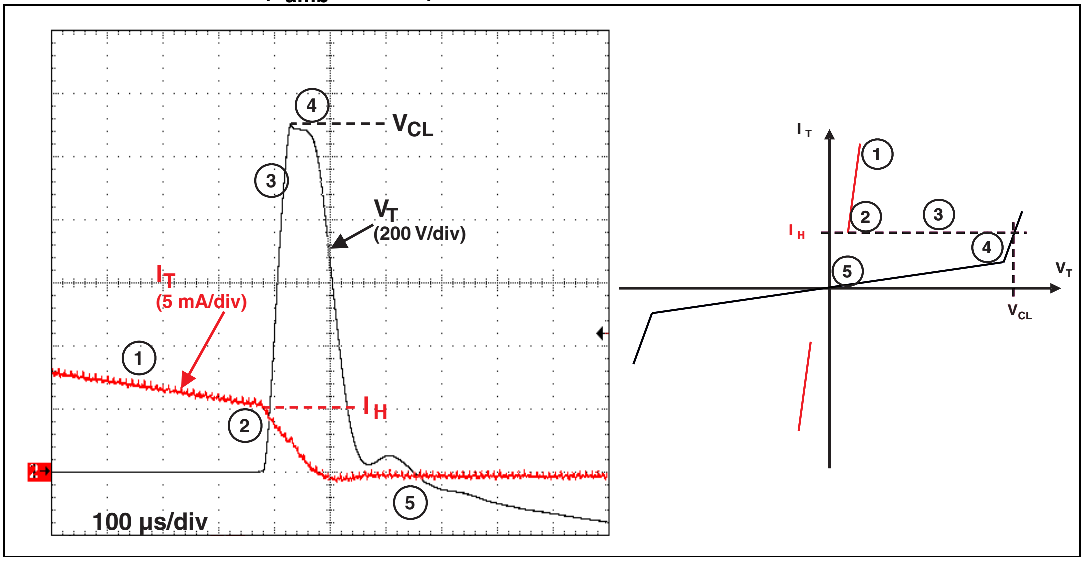
In comparison with standard Triacs the ACS108 is over-voltage self-protected, as specified by the new parameter V_{CL}. This feature is useful in two operating conditions: in case of turn-off of very inductive load, and in case of surge voltage that can occur on the electrical network.

2.1.1 High inductive load switch-off: turn-off overvoltage clamping

With high inductive and low RMS current loads the rate of decrease of the current is very low. An overvoltage can occur when the gate current is removed and the OUT current is lower than I_H.

As shown in *Figure 17*, at the end of the last conduction half-cycle, the load current decreases ①. The load current reaches the holding current level I_H ②, and the ACS turns off ③. The water valve, as an inductive load (up to 15 H), reacts as a current generator and an overvoltage is created, which is clamped by the ACS ④. The current flows through the ACS avalanche and decreases linearly to zero. During this time, the voltage across the switch is limited to the clamping voltage V_{CL}. The energy stored in the inductance of the load is dissipated in the clamping section that is designed for this purpose. When the energy has been dissipated, the ACS voltage falls back to the mains voltage value (230 V rms, 50 Hz)⑤.

Figure 17. Switching off of a high inductive load - typical clamping capability of ACS108 (T_{amb} = 25 °C)



2.1.2 Alternating current mains transient voltage ruggedness

The ACS108 switch is able to withstand safely the AC mains transients either by clamping the low energy spikes or by breaking-over when subjected to high energy shocks, even with high turn-on current rises.

The test circuit shown in *Figure 18* is representative of the final ACS108 application, and is also used to test the AC switch according to the IEC 61000-4-5 standard conditions. Thanks to the load limiting the current, the ACS108 switch withstands the voltage spikes up to 2 kV above the peak mains voltage. The protection is based on an overvoltage crowbar technology. Actually, the ACS108 breaks over safely as shown in *Figure 19*. The ACS108 recovers its blocking voltage capability after the surge (switch off back at the next zero crossing of the current).

Such non-repetitive tests can be done 10 times on each AC mains voltage polarity.

Figure 18. Overvoltage ruggedness test circuit for resistive and inductive loads, T_{amb} = 25 °C (conditions equivalent to IEC 61000-4-5 standard)

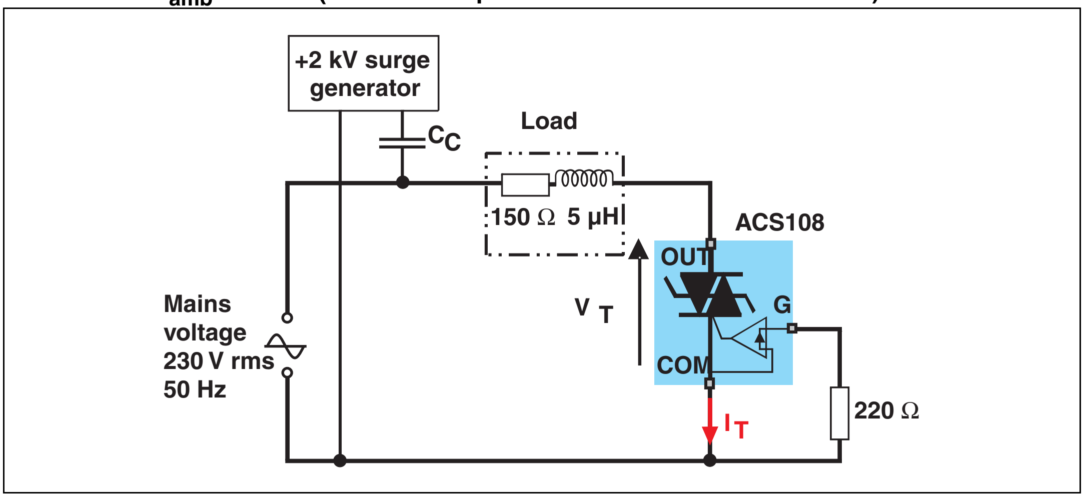
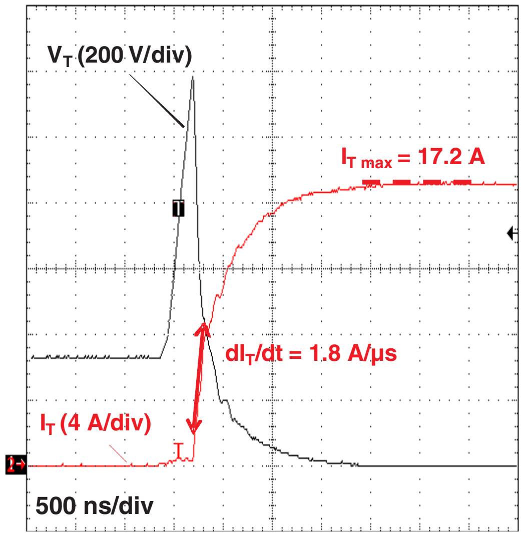
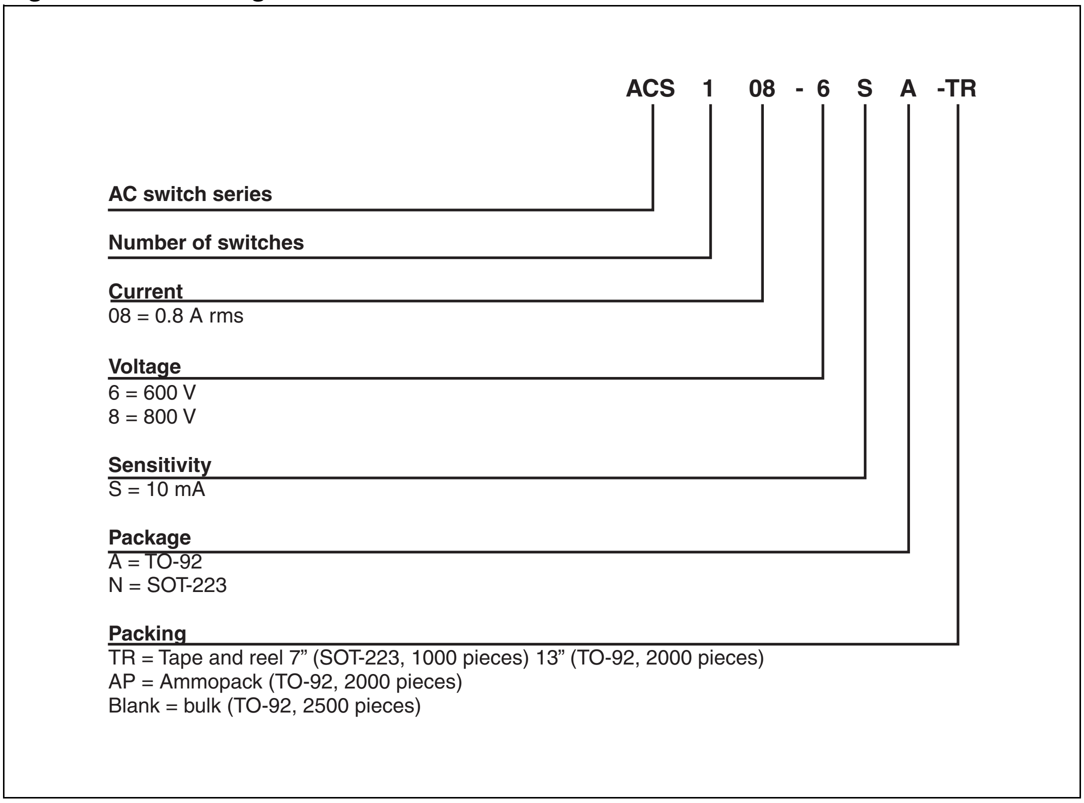


Figure 19. Typical current and voltage waveforms across the ACS108 (+2 kV surge, IEC 61000-4-5 standard)



3 Ordering information scheme

Figure 20. Ordering information scheme

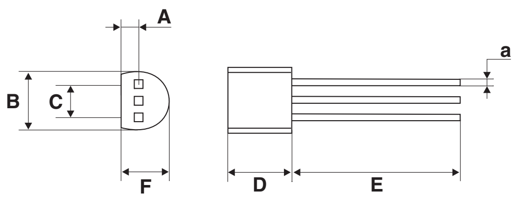


4 Package information

- Epoxy meets UL94, V0
- Lead-free packages

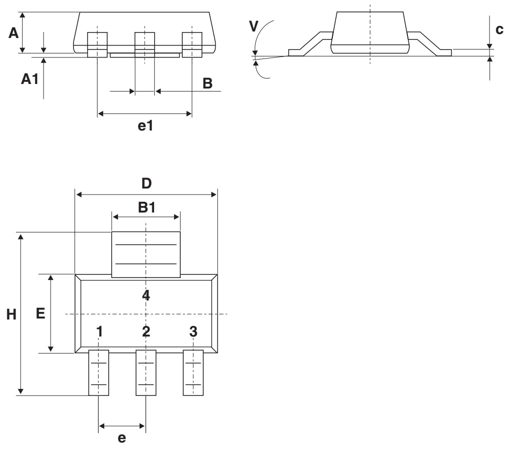
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

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

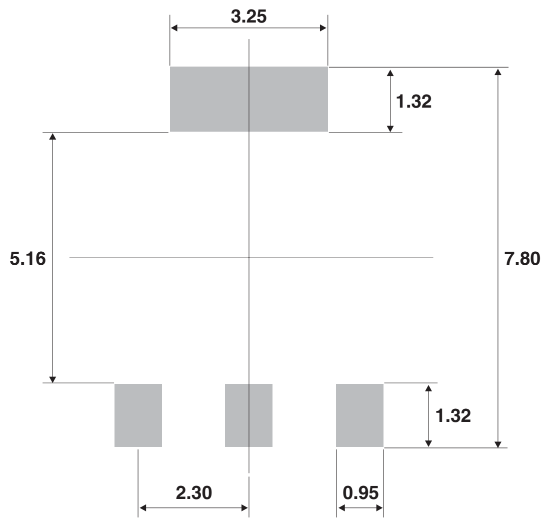
Table 7. SOT-223 dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.071
A1		0.02	0.10		0.001	0.004
B	0.60	0.70	0.85	0.024	0.027	0.033
B1	2.90	3.00	3.15	0.114	0.118	0.124
c	0.24	0.26	0.35	0.009	0.010	0.014
D(1)	6.30	6.50	6.70	0.248	0.256	0.264
e		2.3			0.090	
e1		4.6			0.181	
E(1)	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V	10° max					

1. Do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm (0.006inches)

Figure 21. SOT-223 footprint (dimensions in mm)



5 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base Qty	Delivery mode
ACS108-6SA	ACS1 086SA	TO-92	0.2 g	2500	Bulk
ACS108-6SA-TR		TO-92	0.2 g	2000	Tape and reel
ACS108-6SA-AP		TO-92	0.2 g	2000	Ammopack
ACS108-6SN-TR	ACS 108 6SN	SOT-223	0.11 g	1000	Tape and reel
ACS108-8SA	ACS1 088SA	TO-92	0.2 g	2500	Bulk
ACS108-8SA-TR		TO-92	0.2 g	2000	Tape and reel
ACS108-8SA-AP		TO-92	0.2 g	2000	Ammopack
ACS108-8SN-TR	ACS 108 8SN	SOT-223	0.11 g	1000	Tape and reel

6 Revision history

Table 9. Document revision history

Date	Revision	Changes
26-Jun-2012	1	Initial release. This datasheet covers order codes previously described in the datasheet for ACS108-6S, Doc ID 11962, Rev 3 December 2010.

Qualification Report

Qualification of the ACS108 ASD-TRIAC assembled in the SOT-223 and TO-92 packages

Design upgrade

General Information		Locations	
Product Lines	*AC Switches*	**Wafer fab**	*ST Tours*
Products Description	*ACS108 ASD-TRIAC*	**Assembly plant**	*Chinese subcontractor*
Product Group	*IMS (Industrial & Multisegment Sector)*	**Reliability Lab**	*ST Tours*
Product division	*ASD&IPAD*		
Packages	*SOT-223 and TO-92*		
Silicon Process technology	*PLANAR*		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
1.0	Mar. 07, 2012	12	Gilles Dutrannoy	JP.Rebrasse	

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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
ADCS 8176234	D-FMEA for BU58 products assembled in the TO-92 package (Cu wires) at Chinese subcontractor
ADCS 8305982	D-FMEA for BU58 products assembled in the SOT-223 package (Cu wires) at Chinese subcontractor
ADCS 8376902	D-FMEA for the design upgrade of ACS108 (600V & 800V) assembled in the SOT-223 and TO-92 packages at Chinese 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
RER1052002	Internal Reliability Report: Qualification of the SOT-223 package (copper wires, green molding compound) assembled at the Chinese subcontractor back-end plant, 20/06/2011
PCN Reference	PCN IPD-DIS/12/6913
SOP 2614	Reliability requirements for product qualification
SOP 267	Product maturity levels
0061692	Reliability tests and criteria for qualifications
11186QRP	External Reliability Report: Qualification of a new Chinese subcontractor dedicated to SOT-223 package with copper wire and ECOPACK®2 grade, 31/08/2011
11230QRP	External Reliability Report: SOT-223 package Cu wires and ECOPACK®2 grade: Qualification of a second Chinese subcontractor, 05/10/2011

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 document deals with the qualification of the **new design of the ACS108 ASD-TRIAC**. The front-end plant is ST Tours and the back-end is Chinese subcontractor.
The main characteristics of the new ACS108 ASD-TRIAC are:

- PLANAR die technology.
- $I_{T(RMS)}$ = 0.8 A.
- $T_{j(max)}$ = 125 °C.
- V_{DRM} / V_{RRM} = 600 V and 800 V.
- I_{GT} = 10 mA (maximum value).
- **SOT-223 and TO-92 packages with halogen-free ("green resin") molding compound and copper wire bonding**.

The ACS108 ASD-TRIAC is particularly dedicated to AC ON / OFF static switching in appliances and industrial control systems. This product has to be able to drive low power high inductive or resistive loads such as valves, pumps, fans or door locks.

The reliability test plan is defined following the "stress test driven" method.
This test plan is composed of HTRB (T_j = 125 °C, 600 V AC peak and 800 V AC peak, 1000 h) , THB (85 °C, 85% RH, Reverse bias = 100 V, 1000 h), PCT (121 °C, 2 bars, 96 h) and TC (-55 °C/+150 °C, 1 cycle/h, 500 cycles) tests. It is important to notice that the pre-conditioning test (MSL level 1) has to be done before the reliability tests since the ACS108 assembled in a SOT-223 package is a surface mounted device.

Regarding the functional tests, the ACS108 ASD-TRIAC could be embedded in an equipment that meets the IEC 61000-4-5 standard. So, the reliability test plan takes into consideration this document.
Finally, the ACS108 ASD-TRIAC could be subjected to repetitive $(dI/dt)_{ON}$ stress that could occur during the turn on of the device. As a consequence, these specific requirements are taken into account too.

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

3.2 Conclusion

The reliability plan requirements are fulfilled without exception.

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 DEVICE CHARACTERISTICS

4.1 Device description

ACS108

Overvoltage protected AC switch (ACS™)

Datasheet – production data

Features

- Enables equipment to meet IEC 61000-4-5 surge with overvoltage crowbar technology
- High noise immunity against static dV/dt and IEC 61000-4-4 burst
- Needs no external protection snubber or varistor
- Reduces component count by up to 80% and Interfaces directly with the micro-controller
- Common package tab connection supports connection of several alternating current switches on the same cooling pad
- V_{CL} gives headroom before clamping then crowbar action

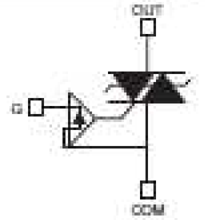
TO-92
ACS108-6SA
ACS108-8SA

SOT-223
ACS108-6SN
ACS108-8SN

Applications

- Alternating current on/off static switching in appliances and industrial control systems
- Driving low power high inductive or resistive loads like:
  – relay, valve, solenoid, dispenser,
  – pump, fan, low power motor, door lock
  – lamp

Figure 1. Functional diagram



COM Common drive reference to connect to the mains
OUT Output to connect to the load.
G Gate input to connect to the controller through gate resistor

Description

The ACS108 belongs to the AC switch range (built with A. S. D.® technology). This high performance switch can control a load of up to 0.8 A. The ACS108 switch includes an overvoltage crowbar 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.

Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	0.8	A
V_{DRM}, V_{RRM}	600 and 800	V
I_{GT}	10	mA

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

June 2012 Doc ID 022948 Rev 1 1/13

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

4.2 Construction notes

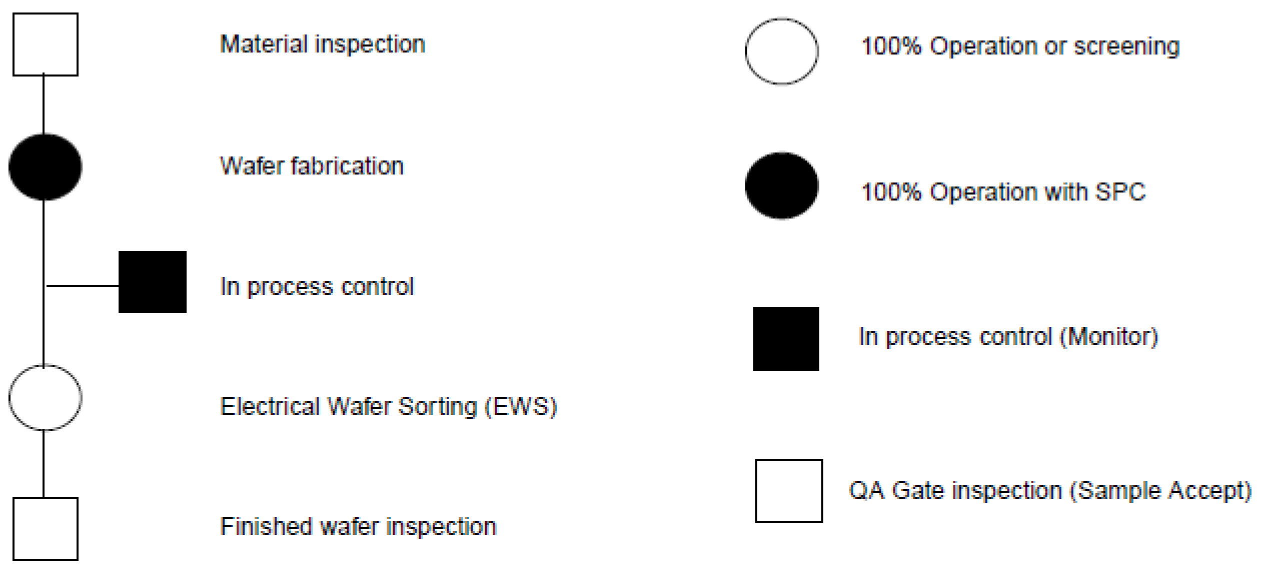
See referenced Product Baseline for detailed information.

	ACS108 ASD TRIAC
Wafer/Die fab. Information	
Wafer fab manufacturing location	Tours
Technology	PLANAR
Wafer Testing (EWS) information	
Electrical testing manufacturing location	Tours
Assembly information	
Assembly site	Chinese subcontractor
Package description	SOT-223 / TO92
Molding compound	Halogen-free resin
Die attach material	Soft solder
Wire bonding process	Copper wires
Lead finishing process	Mate tin
Final testing information	
Testing location	Chinese subcontractor

5 QC PROCESS FRONTEND AND BACKEND FLOW CHART

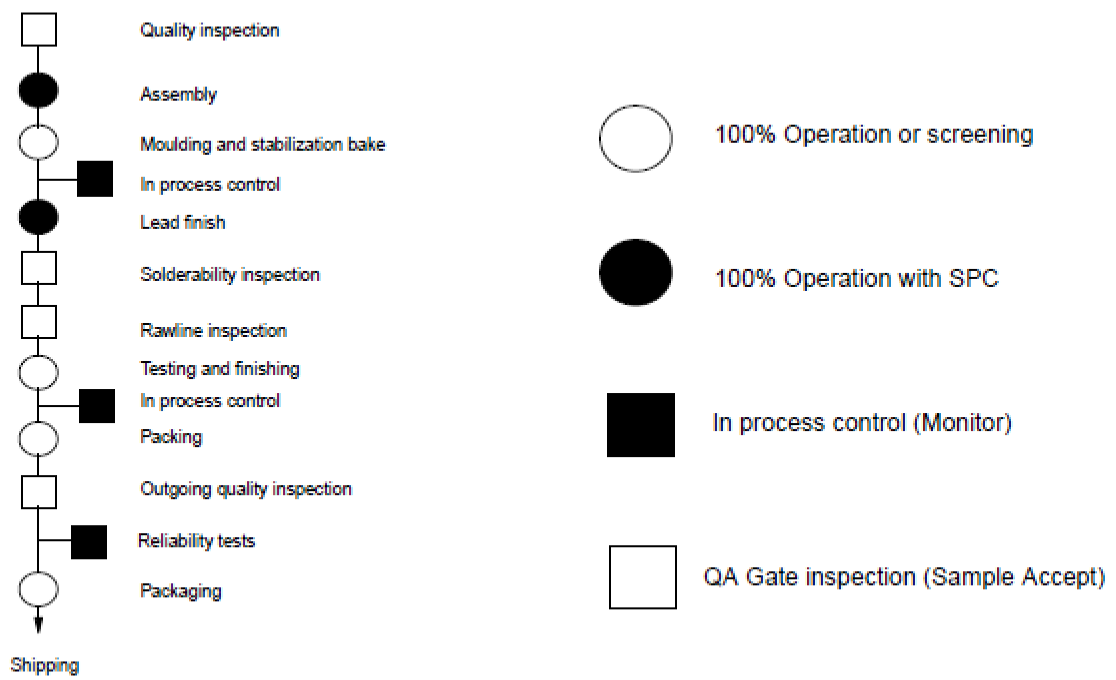
5.1 QC Process Frontend flow chart

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

Two test vehicles were chosen to perform the reliability tests according to the plan defined in the previous sections:

- ACS108-6SN-TR/EB finished good (SOT-223 package).
- ACS108-8SN-TR/EB finished good (SOT-223 package).

- ACS108-6TK-TR/EB finished good (TO-92 package).
- ACS108-8TK-TR/EB finished good (TO-92 package).

The results are detailed in the next sections.

6.2 Test plan and results summary

- **ACS108-6SN-TR/EB (SOT-223 package) reliability test results synthesis**

Test		Std ref.	Conditions	SS	Step	Failure/SS		
						LOT #1	LOT #2	LOT #3
MSL 1	**ACS108-6SN-TR/EB**	J-STD-020D.01	85 °C 85% RH 168 h	75	168 h	**0/25**	**0/25**	**0/25**
PCT		JESD22 A-101	121 °C 2 bars 96 h		96 h	**0/25**	**0/25**	**0/25**
HTRB		JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C 600 V AC peak 1000 h	152	168 h	**0/76**	**0/76**	
					500 h	**0/76**	**0/76**	
					1000 h	**0/76**	**0/76**	
Pre-conditioning		JESD22 A-113	85 °C 85% RH 168 h	77	168 h	**0/77**		
TC		JESD22 A-104	-55 °C/+150 °C 1 cycle/h 500 cycles		100 cycles	**0/77**		
					500 cycles	**0/77**		
Pre-conditioning		JESD22 A-113	85 °C 85% RH 168 h	50	168 h	**0/25**	**0/25**	
THB		JESD22 A-101	85 °C 85% RH Bias = 100 V 1000 h		168 h	**0/25**	**0/25**	
					500 h	**0/25**	**0/25**	
					1000 h	**0/25**	**0/25**	

- **ACS108-8SN-TR/EB (SOT-223 package) reliability test results synthesis**

Test		Std ref.	Conditions	SS	Step	Failure/SS		
						Lot #4	Lot #5	
HTRB	**ACS108-8SN-TR/EB**	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C 800 V AC peak 1000 h	154	168 h	**0/77**	**0/77**	
					500 h	**0/77**	**0/77**	
					1000 h	**0/77**	**0/77**	

- **ACS108-6TK-TR/EB (TO-92 package) reliability test results synthesis**

Test		Std ref.	Conditions	SS	Step	Failure/SS LOT #1	Failure/SS LOT #2
PCT	**ACS108-6TK-TR/EB**	JESD22 A-101	121 °C 2 bars 96 h	25	96 h	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	
HTRB		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
Repetitive $(dI/dt)_{ON}$		N.A.	Peak voltage triggering on 230 V – 50 Hz AC mains R_g = 250 Ω Load = 22 kΩ Snubber: Rs = 18 Ω - Cs = 47 nF $(dI/dt)_{ON}$ ≥ 150 A/µs	40	10 Millions of hits (Q2-quadrant)	0/20	0/20
					10 Millions of hits (Q3-quadrant)	0/20	0/20
Repetitive surges		N.A.	R_g = 220 Ω Load: R = 150 Ω - L = 5 µH Snubber: R_s = 10 Ω - C_s = 100 nF Surge = ± 3 kV 20 surges for each polarity 1 min wait between each surge	20	20 positive surges	0/20	
					20 negative surges	0/20	

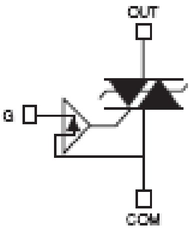
- **ACS108-8TK-TR/EB (TO-92 package) reliability test results synthesis**

Test		Std ref.	Conditions	SS	Step	Failure/SS LOT #3	Failure/SS LOT #4
HTRB	**ACS108-8TK-TR/EB**	JESD22 A-108 MIL-STD-750C method 1040	T_j = 125 °C 800 V AC peak 1000 h	80	168 h	0/40	0/40
					500 h	0/40	0/40
					1000 h	0/40	0/40

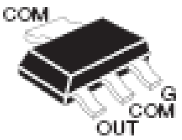
7 ANNEXES

7.1 Device details

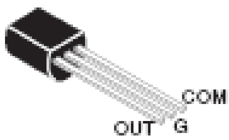
7.1.1 Pin connection



COM Common drive reference to connect to the mains
OUT Output to connect to the load.
G Gate input to connect to the controller through gate resistor



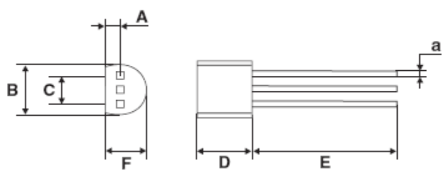
SOT-223
ACS108-6SN
ACS108-8SN



TO-92
ACS108-6SA
ACS108-8SA

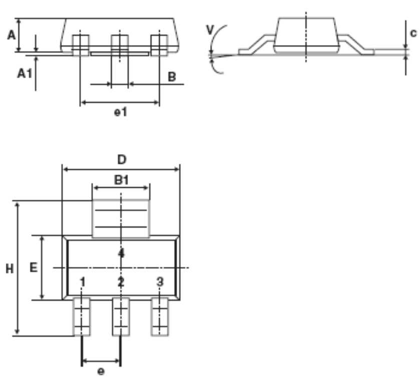
7.1.2 Package outline/Mechanical data

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

Table 7. SOT-223 dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.071
A1		0.02	0.10		0.001	0.004
B	0.60	0.70	0.85	0.024	0.027	0.033
B1	2.90	3.00	3.15	0.114	0.118	0.124
c	0.24	0.26	0.35	0.009	0.010	0.014
D(1)	6.30	6.50	6.70	0.248	0.256	0.264
e		2.3			0.090	
e1		4.6			0.181	
E(1)	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V	10° max					

1. Do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm (0.006inches)

7.2 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 °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).
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.