

PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.		ADG/20/12435
1.3 Title of PCN		Qualification of Rectifiers in TO-3PF package at additional Assembly/Test location in China
1.4 Product Category		STTH30AC06CPF STTH31AC06SPF STTH60AC06CPF
1.5 Issue date		2020-12-22

2. PCN Team

2.1 Contact supplier		
2.1.1 Name		ROBERTSON HEATHER
2.1.2 Phone		+1 8475853058
2.1.3 Email		heather.robertson@st.com
2.2 Change responsibility		
2.2.1 Product Manager		Stephane CHAMARD
2.2.2 Marketing Manager		Philippe LEGER
2.2.3 Quality Manager		Jean-Paul REBRASSE

3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Machines	(Not Defined)	Subcontractor in Korea (location A) and Subcontractor in China (location B)

4. Description of change

	Old	New
4.1 Description	Subcontractor in Korea (location A)	Subcontractor in China (location B)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No	

5. Reason / motivation for change

5.1 Motivation	Rectifiers production capacity increase
5.2 Customer Benefit	CAPACITY INCREASE

6. Marking of parts / traceability of change

6.1 Description	Finished Good and Marking
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7. Timing / schedule

7.1 Date of qualification results	2020-11-06
7.2 Intended start of delivery	2020-12-07
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation

8.1 Description	
8.2 Qualification report and qualification results	In progress

9. Attachments (additional documentations)

12435 Public product.pdf
12435 Qualification of Rectifiers in TO-3PF package at additional Assembly Test location in China.pdf

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	STTH31AC06SPF	
	STTH60AC06CPF	

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(1) ADG: Automotive and Discrete Group

PCN

Product/Process Change Notification

Qualification of Rectifiers in TO-3PF package at additional Assembly/Test location in China

Notification number:	ADG/20/12435	Issue Date	21-Dec-2020
Issued by	Isabelle Ballon		
Product series affected by the change	STTH30AC06CPF STTH31AC06SPF STTH60AC06CPF		
Type of change	Back-end realization		

Description of the change

Qualification of an additional back-end subcontractor located in China (location B) for the assembly and test and finishing of Rectifiers products in TO-3PF package as a double sourcing of subcontractor in Korea (location A). This subcontractor in China (Location B) is already a major production site for ST products.

Reason for change

STMicroelectronics investment on Rectifiers production capacity increase.

Former versus changed product:	<p>The changed products will remain fully compliant with product datasheet in term of electrical, dimensional or thermal parameters.</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 Rectifiers products from additional back-end subcontractor located in China (location B) are in full compliance with the ST ECOPACK®2 grade (so called “halogen-free”).</p>
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Disposition of former products

As the purpose is a manufacturing multi-sourcing approach, the current production will still run, and shipments will be supported using the both former and new assembly locations.

(1) ADG: Automotive and Discrete Group

Marking and traceability

Parts produced in China are differentiated by their **finish good** and **marking** as indicated below

CP	Finish Good	Finish Good
	Location A	Location B
STTH30AC06CPF	STTH30AC06CPF/E or TH30AC06CPF\$E	STTH30AC06CPF/W or TH30AC06CPF\$W
STTH31AC06SPF	STTH31AC06SPF/E	STTH31AC06SPF/W
STTH60AC06CPF	STTH60AC06CPF/E or TH60AC06CPF\$E	STTH60AC06CPF/W or TH60AC06CPF\$W

Assembly location	Plant and date code		
	Assy plant code	Assy year	Assy week
Korea (subcontractor)	HB (on label) HB (on unit)	Y (1 digit indicating the year)	WW (2 digits indicating the week number)
China (subcontractor)	GE (on label) GE (on unit)		

Traceability for the implemented change will be ensured by an **internal codification (finish good)** and by the Q.A. number.

Qualification complete date	2020, week 49
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Forecasted sample availability

All qualification samples are available on request.

Change implementation schedule

Sales types	Estimated production start	Estimated first shipments
STTH30AC06CPF	W52-2020	W10-2021
STTH31AC06SPF	W52-2020	W10-2021
STTH60AC06CPF	W52-2020	W10-2021

Comments:	With early PCN acceptance, shipment possible starting week 02-2021 on selected part numbers.
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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	20071QRP
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Qualification Report

Qualification of Rectifier in TO-3PF package at additional Assembly/Test location in China

General Information		Locations	
Product Line	<i>Rectifiers</i>	Wafer Fab	<i>ST TOURS - FRANCE</i>
Product Description	<i>Turbo 2 ultrafast high voltage rectifier</i> <i>Turbo 2 ultrasoft high voltage rectifier</i>	Assembly Plant	<i>SUBCONTRACTOR - CHINA - 994X</i>
Product Perimeter	<i>STTH30AC06CPF</i> <i>STTH31AC06SPF</i> <i>STTH60AC06CPF</i>	Reliability Lab	<i>ST TOURS - FRANCE</i>
Product Group	<i>ADG</i>	Reliability Assessment	<i>PASS</i>
Product Division	<i>Discrete & Filter</i>		
Packages	<i>TO-3PF</i>		
Maturity level step	<i>QUALIFIED</i>		

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	19-Nov-2020	12	Erika LAURET	Julien MICHELON	Initial release: Qualification of Rectifier in TO-3PF package at additional Assembly/Test location in China

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

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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
AEC-Q005	Pb-Free Test Requirements
AEC-Q006	Qualification Requirements for Components Using Copper (Cu) Wire Interconnections
JESD 47	Stress-Test-Driven Qualification of Integrated Circuits
JESD 94	Application specific qualification using knowledge-based test methodology
JESD 22	Reliability test methods for packaged devices
MIL-STD-750C	Test method for semiconductor devices

2 GLOSSARY

ACBV	Alternative Current Blocking Voltage
DBT	Dead Bug Test
GD	Generic Data
H3TRB	High Humidity High Temperature Reverse Bias
HTRB	High Temperature Reverse Bias
IOLT	Intermittent Operating Life Test
PD	Physical Dimensions
RSH	Resistance to Soldering Heat
SD	Solderability test
SS	Sample Size
TC	Temperature Cycling
TS	Terminal Strength
TW/WG	Tin Whiskers / Whiskers Growth
UHAST	Unbiased Highly Accelerated Stress Test

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The objective of this report is to qualify an additional back-end subcontractor located in China (location B) for the assembly and test and finishing of Rectifier products in TO-3PF package as a double sourcing of subcontractor in Korea (location A).

This subcontractor in China (Location B) is already a major production site for ST products.

Table of involved products

Commercial Product	Package	Comment
STTH60AC06CPF	TO-3PF	Standard product
STTH31AC06SPF	TO-3PF	Standard product
STTH60AC06CPF	TO-3PF	Standard product

Before	After
subcontractor in Korea	subcontractor in Korea subcontractor in China

The reliability test methodology used follows the JESD47: « Stress Test driven Qualification Methodology »

The reliability tests ensuing are:

- TC and IOLT to ensure the mechanical robustness of the products.
- HTRB, ACBV to evaluate the risk of contamination from the resin and the assembly process versus the die layout sensitivity.
- H3TRB, UHAST to check the robustness to corrosion and the good package hermeticity.
- Solderability, RSH, DBT, TS and screwing to check compatibility of package with customer assembly.
- TW/WG to check lead-finishing quality.

For some tests, similarity methodology is used. See 5.1 “comments” for more details about similarities.

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 DEVICE CHARACTERISTICS

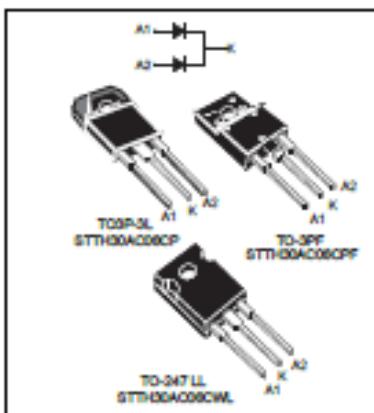
4.1 Device description

Refer to product datasheet(s).
Example here below

**STTH30AC06C**

Datasheet

Turbo 2 ultrafast high voltage rectifier



Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- Insulated package TO-3PF:
 - Insulated voltage: 2500 V_{DC}

Description

The STTH30AC06C uses ST Turbo 2 600 V technology. It is suited as boost diode specially for use in air conditioning equipment as continuous mode interleaved power factor correction.

Product status link	
STTH30AC06C	
Product summary	
I _F (AV)	2 x 15 A
V _{RRM}	600 V
t _{tr} (typ)	40 ns
V _F (typ)	1.15 V
T _J	175 °C

4.2 Construction Note

STTH30AC06CPF	
Wafer/Die fab. information	
Wafer fab manufacturing location	<i>ST TOURS - FRANCE</i>
Technology / Process family	<i>Turbo 2 ultrafast high voltage rectifier</i>
Wafer Testing (EWS) information	
Electrical testing manufacturing location	<i>ST TOURS - FRANCE</i>
Assembly information	
Assembly site	<i>SUBCONTRACTOR – CHINA- 994X</i>
Package description	TO-3PF
Molding compound	ECOPACK®2 (“Halogen-free”) molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	<i>SUBCONTRACTOR – CHINA- 994X</i>

STTH31AC06SPF	
Wafer/Die fab. information	
Wafer fab manufacturing location	<i>ST TOURS - FRANCE</i>
Technology / Process family	<i>Turbo 2 ultrasoft high voltage rectifier</i>
Wafer Testing (EWS) information	
Electrical testing manufacturing location	<i>ST TOURS - FRANCE</i>
Assembly information	
Assembly site	<i>SUBCONTRACTOR – CHINA- 994X</i>
Package description	TO-3PF
Molding compound	ECOPACK®2 (“Halogen-free”) molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	<i>SUBCONTRACTOR – CHINA- 994X</i>

STTH60AC06CPF	
Wafer/Die fab. information	
Wafer fab manufacturing location	<i>ST TOURS - FRANCE</i>
Technology / Process family	<i>Turbo 2 ultrafast high voltage rectifier</i>
Wafer Testing (EWS) information	
Electrical testing manufacturing location	<i>ST TOURS - FRANCE</i>
Assembly information	
Assembly site	<i>SUBCONTRACTOR – CHINA- 994X</i>
Package description	TO-3PF
Molding compound	ECOPACK®2 (“Halogen-free”) molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	<i>SUBCONTRACTOR – CHINA- 994X</i>

5 TESTS PLAN AND RESULTS SUMMARY

5.1 Test vehicles

Lot #	Part Number	Package	Comments
L1	T4050-6PF	TO-3PF	Triacs product
L2	STTH31AC06SPF	TO-3PF	Rectifier product
L3	STTH60AC06CPF	TO-3PF	Rectifier product
GD2	DUMMIES	TO-3PF	Generic data for SD, TS, WG and screwing Same BOM, same assy plant.

Detailed results in below chapter will refer to these references.

5.2 Test plan

Stress	Abrv	Reference	Lot	SS	Comments	To do?
Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	All qualification parts tested per the requirements of the appropriate device specification.			Y
External Visual	EV	JESD22B-101	All qualification parts tested per the requirements of the appropriate device specification.		Done during Assembly → Test & Finish inspection	Y
Parametric Verification	PV	User specification	L1 L2 L3	30 30 30		Y
AC blocking voltage	ACBV	MIL-STD-750-1 M1040 Test condition A	L1	77	Required for Thyristor only.	Y
Temperature Cycling	TC	JESD22A-104	L1 L2 L3	77 77 77		Y
Unbiased Highly Accelerated Stress Test	UHAST	JESD22A-118	L1 L2 L3	23 25 25	Can be covered by H3TRB	Y
High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	L1 L2 L3	76 77 76		Y
Intermittent Operational Life / Thermal Fatigue	IOL / TF	MIL-STD-750 Method 1037	L1 L2 L3	77 77 77	For power devices. Not required for Transient Voltage Suppressor (TVS)	Y
Whisker Growth Evaluation	WG	AEC-Q005	L1	See test method		Y
Physical Dimension	PD	JESD22B-100	L1	30		Y
Solderability	SD	J-STD-002 JESD22B102	L1	30		Y

Stress	Abrv	Reference	Lot	SS	Comments	To do?
Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification		All qualification parts tested per the requirements of the appropriate device specification.		Y
External Visual	EV	JESD22B-101		All qualification parts tested per the requirements of the appropriate device specification.	Done during Assembly → Test & Finish inspection	Y
Parametric Verification	PV	User specification	L1 L2 L3	30 30 30		Y
AC blocking voltage	ACBV	MIL-STD-750-1 M1040 Test condition A	L1	77	Required for Thyristor only.	Y
Temperature Cycling	TC	JESD22A-104	L1 L2 L3	77 77 77		Y
Unbiased Highly Accelerated Stress Test	UHAST	JESD22A-118	L1 L2 L3	23 25 25	Can be covered by H3TRB	Y
High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	L1 L2 L3	76 77 76		Y
Intermittent Operational Life / Thermal Fatigue	IOL / TF	MIL-STD-750 Method 1037	L1 L2 L3	77 77 77	For power devices. Not required for Transient Voltage Suppressor (TVS)	Y
Dead Bug Test	DBT	DM00112629	L1	30	Mandatory for SMD package Has to be done for PTH package	Y

5.3 Results summary

Test	Std ref.	Conditions	Steps / Duration	SS	Failure/SS			
					L1	L2	L3	GD1
Pre- and Post-Electrical Test	ST datasheet	Static parameters following product datasheet	-		PASS			
External Visual	JESD22 B-101	All qualification parts submitted for testing passed External & Visual inspection during manufacturing process						
Parametric Verification	ST datasheet	Over part temperature range		30	Refer to paragraph 6.1 in Annexes			
ACBV	MIL-STD-750-1 M1040 Method A	T _j =125°C V _{bias} = 600V AC blocking voltage	1Khrs	77	0/77			
HTRB	JESD22A-108	T _j =175°C V _{bias} = 480V	1Khrs	154		0/77	0/77	
TC	JESD22 A-104	-65/+150°C 2cy/h	500cy	231	0/77	0/77	0/77	
UHAST	JESD22 A-118	130°C; 85% RH 2.3bar	96hrs	73	0/23	0/25	0/25	
H3TRB	JESD22 A-101	85°C; 85% RH VR=100V	1Khrs	229	0/76	0/77	0/76	
IOLT	MIL-STD 750 Method 1037	ΔT _j =100°C Ton=Toff=210s	1Khrs	76	0/76			
IOLT	MIL-STD 750 Method 1037	ΔT _j =100°C Ton=Toff=300s	1Khrs	154		0/77	0/77	
RSH	JESD22 B-106 (PTH)	Temperature=270°C Time (on)=7s		30		0/30		
TS	MIL-STD-750 Method 2036	Condition E – Lead fatigue	-	15	0/15			
screwing	ST 0063378	Torque=1N.m	-	15	0/15			
SD	J-STD-002 JESD22 B-102	Wet ageing SnPb bath 245°C	-	15		0/15		
		Wet ageing SnAgCu bath 245°C		15		0/15		
WG	AEC-Q005 JESD201	No reflow THS 30°C/60%RH	4Khrs	3				0/3
		No reflow THS 55°C/85%RH	4Khrs	3				0/3
		No reflow TC -40°C/125°C	1.5Kcy	3				0/3
		Reflow SnPb 215°C THS 30°C/60%RH	4Khrs	3				0/3
		Reflow SnPb 215°C THS 55°C/85%RH	4Khrs	3				0/3
		Reflow SnPb 215°C TC -40°C/125°C	1.5Kcy	3				0/3
		Reflow Pb Free 245°C THS 30°C/60%RH	4Khrs	3				0/3
		Reflow Pb Free 245°C THS 55°C/85%RH	4Khrs	3				0/3
		Reflow Pb Free 245°C	1.5Kcy	3				0/3

Test	Std ref.	Conditions	Steps / Duration	SS	Failure/SS			
					L1	L2	L3	GD1
		TC -40°C/125°C						

6 ANNEXES

6.1 Parametric Verification

- Lot 2 : STTH31AC06SPF : No major change and all parameters are compliant to ST datasheet limits

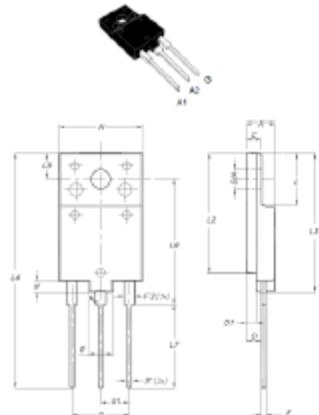
Parameters	Datasheet		Lot 2	
	Min	Max		
Ir		10µA	Med	9.95nA
			Min	9.12
			Max	11.47
Vf		2V	Med	1.48V
			Min	1.45
			Max	1.51
Vrrm	600V		Med	694
			Min	690
			Max	701
Ifsm	150A		Med	239
			Min	236
			Max	243
RTH			Value	2.1° C/W

- Lot 3 : STTH60AC06SPF : No major change and all parameters are compliant to ST datasheet limits

Parameters	Datasheet			Lot 3
	Min	Max		30 units
Ir		10µA	Med	59nA
			Min	43
			Max	71
Vf		2V	Med	1.46
			Min	1.35
			Max	1.50
Vrrm	600V		Med	659
			Min	647
			Max	667
Ifsm	280A		Med	409
			Min	398
			Max	416
RTH			Value	1.88° C/W

6.2 Physical Dimensions

Dimensional report for TO-3PF package at Subcontractor plant (China)



Ref.	Dimensions					
	Millimeters			Inches ^(D)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	5.30		5.70	0.2087		0.2244
C	2.80		3.20	0.1102		0.1260
D	3.10		3.50	0.1220		0.1378
D1	1.80		2.20	0.0709		0.0866
E	0.80		1.10	0.0315		0.0433
F	0.65		0.95	0.0256		0.0374
F2	1.80		2.20	0.0709		0.0866
G	10.30		11.50	0.4055		0.4528
G1		5.45			0.2146	
H	15.30		15.70	0.6024		0.6181
L	9.80	10.00	10.20	0.3858	0.3937	0.4016
L2	22.80		23.20	0.8976		0.9134
L3	26.30		26.70	1.0354		1.0512
L4	43.20		44.40	1.7008		1.7480
L5	4.30		4.70	0.1693		0.1850
L6	24.30		24.70	0.9567		0.9724
L7	14.60		15.00	0.5748		0.5906
N	1.80		2.20	0.0709		0.0866
R	3.00		4.20	0.1195		0.1654
Dia	3.40		3.80	0.1339		0.1496

	A	C	D	D1	E	F	F2	G	G1	H	L	L2	L3	L4	L5	L6	L7	N	R	Diag
1	5,50	3,01	3,29	1,98	0,89	0,85	2,08	10,95	5,49	15,48	9,97	22,96	26,49	43,89	4,35	24,55	14,73	1,97	3,98	3,58
2	5,50	3,00	3,24	1,99	0,89	0,85	2,06	10,93	5,44	15,48	10,00	22,97	26,42	43,80	4,34	24,53	14,73	1,98	3,99	3,59
3	5,50	3,00	3,28	2,00	0,88	0,83	2,08	10,93	5,44	15,49	9,98	23,00	26,50	43,84	4,33	24,54	14,72	1,97	3,97	3,59
4	5,51	3,02	3,25	1,99	0,89	0,86	2,08	10,94	5,47	15,50	10,00	22,96	26,46	43,72	4,34	24,52	14,75	1,99	3,98	3,57
5	5,51	3,02	3,25	2,00	0,89	0,87	2,09	10,96	5,46	15,49	10,00	22,97	26,50	43,86	4,34	24,54	14,75	1,99	3,99	3,57
6	5,52	3,03	3,21	1,98	0,89	0,87	2,08	10,93	5,46	15,51	9,95	23,00	26,49	43,84	4,35	24,47	14,78	1,98	3,98	3,59
7	5,51	3,02	3,27	2,00	0,89	0,86	2,00	10,95	5,46	15,48	9,98	22,99	26,53	43,88	4,34	24,52	14,75	1,99	3,98	3,58
8	5,52	3,03	3,25	1,99	0,89	0,87	2,04	10,95	5,47	15,50	10,00	23,02	26,50	43,89	4,35	24,47	14,80	1,99	4,00	3,60
9	5,49	3,00	3,25	2,00	0,88	0,84	2,05	10,95	5,44	15,49	9,97	23,09	26,55	43,93	4,33	24,51	14,77	1,98	3,98	3,59
10	5,49	3,00	3,26	1,99	0,87	0,81	2,04	10,94	5,48	15,49	9,98	22,98	26,54	43,73	4,35	24,50	14,75	2,00	3,99	3,59
11	5,52	3,02	3,25	1,99	0,88	0,86	2,09	10,96	5,45	15,52	9,98	23,02	26,53	43,89	4,35	24,54	14,79	2,00	3,99	3,59
12	5,52	3,02	3,27	2,00	0,89	0,87	1,99	10,95	5,47	15,49	9,98	22,98	26,52	43,89	4,33	24,51	14,80	1,99	3,97	3,59
13	5,51	3,01	3,21	1,97	0,88	0,85	2,08	10,94	5,45	15,50	10,00	22,96	26,55	43,90	4,35	24,53	14,75	2,00	4,01	3,59
14	5,51	3,01	3,24	1,99	0,87	0,87	2,08	10,98	5,47	15,49	9,98	22,97	26,53	43,93	4,33	24,51	14,80	2,00	4,01	3,59
15	5,52	3,02	3,24	2,00	0,88	0,85	2,08	10,94	5,44	15,52	9,99	23,02	26,45	43,94	4,34	24,54	14,75	1,99	4,00	3,60
16	5,52	3,01	3,26	1,99	0,89	0,88	2,05	10,96	5,47	15,51	9,98	23,03	26,46	43,93	4,34	24,48	14,80	2,00	4,00	3,61
17	5,53	3,02	3,30	2,00	0,89	0,84	2,00	10,95	5,44	15,50	9,95	22,97	26,45	43,83	4,36	24,50	14,78	2,00	3,99	3,59
18	5,53	3,03	3,29	2,00	0,89	0,87	2,07	10,96	5,46	15,50	9,97	23,02	26,53	43,89	4,34	24,51	14,77	2,00	4,01	3,59
19	5,55	3,02	3,28	2,00	0,89	0,86	2,03	10,97	5,48	15,53	9,99	22,98	26,45	43,82	4,35	24,46	14,81	2,00	3,99	3,57
20	5,55	3,04	3,28	1,99	0,89	0,87	2,03	10,96	5,49	15,52	9,95	23,05	26,55	43,92	4,35	24,58	14,72	2,00	4,02	3,58
21	5,52	3,02	3,28	2,00	0,89	0,86	2,05	10,95	5,43	15,50	9,94	23,03	26,48	43,87	4,34	24,51	14,77	2,00	4,01	3,59
22	5,53	3,03	3,29	2,00	0,89	0,86	2,07	10,96	5,44	15,50	9,96	23,06	26,52	43,87	4,33	24,54	14,74	2,00	3,97	3,58
23	5,52	3,03	3,23	1,98	0,89	0,87	2,05	10,95	5,47	15,50	9,96	23,04	26,54	43,93	4,33	24,49	14,83	2,00	3,94	3,59
24	5,52	3,03	3,26	1,99	0,89	0,86	2,06	10,91	5,43	15,50	9,95	22,96	26,53	43,88	4,33	24,50	14,78	1,98	3,99	3,61
25	5,52	3,03	3,23	1,98	0,88	0,87	2,04	10,95	5,46	15,50	9,94	23,01	26,53	43,90	4,33	24,48	14,81	1,98	3,96	3,58
26	5,51	3,03	3,24	1,98	0,90	0,84	2,03	10,92	5,44	15,50	9,95	23,01	26,51	43,86	4,33	24,51	14,76	1,99	3,99	3,58
27	5,51	3,02	3,24	1,99	0,88	0,87	2,03	10,94	5,44	15,50	9,97	22,95	26,52	43,90	4,34	24,52	14,74	1,98	3,98	3,58
28	5,52	3,02	3,28	2,00	0,90	0,86	2,07	10,97	5,44	15,51	9,96	22,97	26,53	43,88	4,34	24,52	14,72	1,98	3,92	3,61
29	5,52	3,02	3,25	1,98	0,89	0,87	2,04	10,96	5,48	15,53	9,94	22,98	26,52	43,91	4,34	24,50	14,75	1,98	4,01	3,59
30	5,51	3,02	3,27	1,99	0,89	0,87	2,04	10,99	5,50	15,49	9,94	22,92	26,54	43,86	4,34	24,52	14,75	1,97	3,98	3,60
Ave	5,52	3,02	3,26	1,99	0,89	0,86	2,05	10,95	5,46	15,50	9,97	23,00	26,51	43,87	4,34	24,51	14,77	1,99	3,99	3,59
Min	5,49	3,00	3,21	1,97	0,86	0,81	1,99	10,91	5,43	15,48	9,94	22,92	26,42	43,72	4,33	24,46	14,72	1,97	3,92	3,57
Max	5,55	3,04	3,30	2,00	0,90	0,88	2,09	10,99	5,50	15,53	10,00	23,09	26,55	43,94	4,36	24,56	14,83	2,00	4,02	3,61
LSL	5,3	2,8	3,1	1,8	0,8	0,65	1,8	10,3		15,3	9,8	22,8	26,3	43,2	4,3	24,3	14,6	1,8	3,8	3,4
USL	5,7	3,2	3,5	2,2	1,1	0,95	2,2	11,5		15,7	10,2	23,2	26,7	44,4	4,7	24,7	15	2,2	4,2	3,8
Cpk	4,52	5,84	2,29	7,54	3,44	2,06	1,84	11,09		5,05	2,83	1,75	1,84	3,38	1,63	2,55	1,86	6,12	2,91	5,95

6.3 Tests description

Test name	Description	Purpose
HTRB High Temperature Reverse Bias / HTFB High Temperature Forward Bias	<p>The device is stressed in static configuration, trying to satisfy as much as possible the following conditions:</p> <ul style="list-style-type: none"> - Low power dissipation - Max. supply voltage compatible with diffusion process and internal circuitry limitations. <p>Forward: device is forward biased with a current fixed and adjusted to reach the targeted junction temperature</p>	<p>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.</p> <p>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 ageing, layout sensitivity to surface effects.</p> <p>To assess active area and contacts integrity</p>
ACBV Alternative Current Blocking Voltage	<p>The device is stressed here in AC mode, trying to satisfy as much as possible the following conditions:</p> <ul style="list-style-type: none"> - Low power dissipation. - Peak supply voltage compatible with diffusion process and internal circuitry limitations. 	<p>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.</p> <p>To apply electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide ageing, layout sensitivity to surface effects.</p>
H3TRB High Humidity High Temperature Reverse Bias	<p>The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.</p>	<p>To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.</p>
TC Temperature Cycling	<p>The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.</p>	<p>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.</p>
UHAST Unbiased Highly Accelerated Stress Test	<p>The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.</p>	<p>To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.</p>
IOLT Intermittent Operating Life Test	<p>All test samples shall be subjected to the specified number of cycles. When stabilized after initial warm-up cycles, a cycle shall consist of an "on" period, when power is applied suddenly, not gradually, to the device for the time necessary to achieve a delta case temperature followed by an "off" period, when the power is suddenly removed, for cooling the case through a similar delta temperature.</p>	<p>The purpose of this test is to determine compliance with the specified numbers of cycles for devices subjected to the specified conditions. It accelerates the stresses on all bonds and interfaces between the chip and mounting face of devices subjected to repeated turn on and off of equipment and is therefore most appropriate for case mount style (e.g., stud, flange, and disc) devices.</p>
TS Terminal Strength	<p>Terminals submitted to lead fatigue</p>	<p>To check the resistance of the device leads to metal fatigue</p>
RSH Resistance to Solder Heat	<p>Package is dipped by the leads in a solder bath after initial wet ageing (for SMDs only). Assessment by electrical test + no external crack</p>	<p>To simulate wave soldering process and verify that package will not be thermally damaged during this step.</p>
SD Solderability	<p>The purpose of this test method is to provide a referee condition for the evaluation of the solderability of terminations (including leads up to 0.125 inch in diameter) that will be assembled using tin lead eutectic solder.</p>	<p>This evaluation is made on the basis of the ability of these terminations to be wetted and to produce a suitable fillet when coated by tin lead eutectic solder. These procedures will test whether the packaging materials and processes used during the manufacturing operations process produce a component that can be successfully soldered to the next level assembly using tin lead eutectic solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish.</p>

Test name	Description	Purpose
DBT Dead Bug Test	To evaluate the wettability of the package leads. Good indicator to determine the bad solderability behavior	Components are glued up-side down on a substrate. Pins are wetted with a moderately activated flux. Then run once through the reflow oven with leadfree temperature profile. Visual inspection is performed with suitable tool.
TW/WG Whiskers Growth	Forced growing of Tin Whiskers by various kind of environmental stress: temperature, moisture and temperature cycling.	To ensure no risk of electrical short due to Tin Whisker growth.



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PCN Reference : ADG/20/12435

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