PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	AMS/19/11679
1.3 Title of PCN	New set of material for selected products assembled in SO8 package in ST Bouskoura
1.4 Product Category	See product list
1.5 Issue date	2019-07-30

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	Matteo LO PRESTI
2.1.2 Marketing Manager	Lorenzo NASO,Domenico ARRIGO
2.1.3 Quality Manager	Paolo MORETTI

3. Change		
3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New Indirect material part number (same supplier or different supplier): Plating	ST Bouskoura

4. Description of change		
	Old	New
4.1 Description	Molding compound : Sumitomo G700K Plating : NiPdAu Lead-frame : Standard matrix frame	Molding compound : Sumitomo G700KC Plating : Sn Lead-frame : Super High density frame
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No impact	

5. Reason / motivation for change	
5.1 Motivation	Progressing on the activities related to quality continuous improvement, ST is glad to announce a new material set (molding compound and plating) for some selected products assembled in SO8 in ST Bouskoura. Besides, we will introduce a new lead-frame with higher density in order to increase our production capacity and rationalize our production tool. This change has no impact on the internal lead-frame structure.
5.2 Customer Benefit	QUALITY IMPROVEMENT

6. Marking of parts / traceability of change	
6.1 Description	New Finished Good codes

7. Timing / schedule	
7.1 Date of qualification results	2019-07-15
7.2 Intended start of delivery	2019-10-25
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	11679 RER_11679_Qual report SOSSHD Bouskoura UM0X_July2019-general case.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2019-07-30

9. Attachments (additional documentations)
11679 Public product.pdf 11679 RER_11679_Qual report SOSSHD Bouskoura UM0X_July2019-general case.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
	L6726A	
	L6726ATR	
	PM8834	
	PM8834TR	

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Publict Products are off the shelf products. They are not dedicated to specific customers, they are available through ST Sales team, or Distributors, and visible on ST.com

PCN Title : New set of material for selected products assembled in SO8 package in ST Bouskoura

PCN Reference : AMS/19/11679

Subject : Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

PM8834TR	PM8834	

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PRODUCT/PROCESS
CHANGE NOTIFICATION

PCN AMS/19/11679

Analog, MEMS & Sensors Group (AMS)

New set of material for selected products assembled in SO8 package in ST Bouskoura

WHAT:

Progressing on the activities related to quality continuous improvement, ST is glad to announce a new material set (molding compound and plating) for some selected products assembled in SO8 in ST Bouskoura.

Besides, we will introduce a new lead-frame with higher density in order to increase our production capacity and rationalize our production tool. This change has no impact on the internal lead-frame structure.

Material	Current process	Modified process	Comment
Diffusion location	No change		No change
Assembly location	ST Bouskoura	ST Bouskoura	No change
Molding compound	Sumitomo G700K	Sumitomo G700KC	Minor difference to adapt to high density frame
Die attach	Ablestick 8601-S25	Ablestick 8601-S25	No change
Lead-frame	Standard matrix frame	Super High density	Higher density but no change on the internal design
Wire	Gold 1 mil	Gold 1 mil	No change
Plating	NiPdAu	Sn	To solve discoloration issue sporadi-cally encountered
MSL	3	3	No change

WHY:

This change will contribute to ST's continuous service improvement and ensure a consistent assembly process through all the SO production lines.

HOW:

The qualification program consists mainly of comparative electrical characterization and reliability tests.

You will find here after the qualification test plan which summarizes the various test methods and conditions that ST uses for this qualification program.

WHEN:

This new set of material will be implemented in October 2019 in ST Bouskoura.

Marking and traceability:

Unless otherwise stated by customer's specific requirement, the traceability of the parts assembled with the new material set will be ensured by new internal sales type, date code and lot number.

The changes here reported will not affect the electrical, dimensional and thermal parameters keeping unchanged all the information reported on the relevant datasheets.
There is -as well- no change in the packing process or in the standard delivery quantities.

Shipments may start earlier with the customer's written agreement.

Reliability Report

New set of material for selected products assembled in SO8 package in ST Bouskoura

General Information	
Product Line	*UM07, 0912, 0393, V912, 0922, 16VA, 0431*
Product Description	Dual CMOS op amp, Dual comparator bipolar, Rail to Rail dual op amp 5V Supervisor, Vref
P/N	*A6727TR, TS912IYDT, LM2903YDT, TSV912HYDT,TS922IYDT, STM706YM7F, TL431IYDT*
Product Group	*AMS*
Product division	*GPA*
Package	*SO8*
Silicon Process technology	*BCD6S, HC1PA, Bipolar , HF5CMOS, HF2CMOS, HCMOS4, Bipolar*

Locations	
Wafer fab	*ST Catania, ST Singapore UMC Taiwan*
Assembly plant	*ST Bouskoura (Morocco)*
Reliability Lab	*ST Grenoble France ST Bouskoura Morocco ST Catania Italy*

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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TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
AEC-Q100	Stress test qualification for automotive grade integrated circuits
AEC-Q101	Stress test qualification for automotive grade discrete semiconductors
JESD47	Stress-Test-Driven Qualification of Integrated Circuits

2 GLOSSARY

DUT	Device Under Test
PCB	Printed Circuit Board
SS	Sample Size

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

To qualify a new material set for products in SO8 package produced in ST Bouskoura (Analog Mems & Sensors group.)

3.2 Conclusion

Qualification Plan requirements have been fulfilled without issue. It is stressed that reliability tests have to show that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests have to demonstrate the ruggedness of the products and safe operation, which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Device description

A6727

life.augmented

A6727

Single-phase PWM controller for automotive applications

Datasheet - production data

SO-8

Features

- AEC-Q100 compliant
- Flexible power supply from 5 V to 12 V
- Power conversion input as low as 1.5 V
- 1% output voltage accuracy
- High-current integrated drivers
- Adjustable output voltage
- 0.8 V internal reference
- Simple voltage mode control loop
- Sensorless and programmable OCP across
- Low-side $R_{DS(on)}$
- Oscillator internally fixed at 300 kHz
- Internal soft-start
- LS-less to manage pre-bias startup
- Disable function
- OV/UV protection
- FB disconnection protection
- SO-8 package

Applications

- Dedicated to automotive applications

Description

The A6727 is a single-phase step-down controller with integrated high-current drivers that provides complete control logic, protection and reference voltage to realize a general DC-DC converter by using a compact SO-8 package. The device flexibility allows the management of conversions with power input V_{IN} as low as 1.5 V and device supply voltage in the range of 5 V to 12 V.

The A6727 provides simple control loop with voltage mode error-amplifier. The integrated 0.8 V reference allows the regulation of output voltages with ±1% accuracy over line and temperature variations. The oscillator is internally fixed to 300 kHz.

The A6727 provides programmable overcurrent protection as well as over and undervoltage protection. The current information is monitored across the low-side MOSFET $R_{DS(on)}$ saving the use of expensive and space-consuming sense resistors while output voltage is monitored through FB pin.

FB disconnection protection prevents excessive and dangerous output voltages from floating FB pin.

Table 1. Device summary

Order code	Package	Packaging
A6727	SO-8	Tube
A6727TR		Tape and reel

TS912IYDT

TS912, TS912A, TS912B

Rail-to-rail CMOS dual operational amplifier

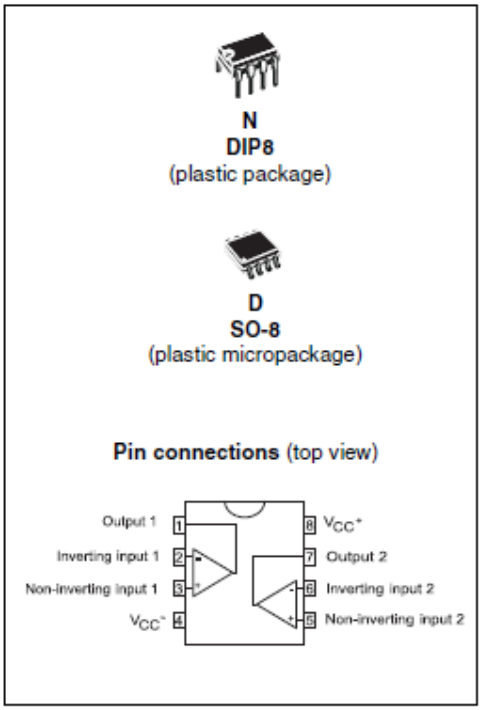
Datasheet – production data

Features

- Rail-to-rail input and output voltage ranges
- Single (or dual) supply operation from 2.7 to 16 V
- Extremely low input bias current: 1 pA typ.
- Low input offset voltage: 2 mV max.
- Specified for 600 Ω and 100 Ω loads
- Low supply current: 200 µA/amplifier (V_{CC} = 3 V)
- Latch-up immunity
- ESD tolerance: 3 kV
- Spice macromodel included in this specification

Related products

- See TS56x series for better accuracy and smaller packages



N
DIP8
(plastic package)

D
SO-8
(plastic micropackage)

Pin connections (top view)

Description

The TS912 device is a rail-to-rail CMOS dual operational amplifier designed to operate with a single or dual supply voltage.

The input voltage range V_{icm} includes the two supply rails V_{CC}^+ and V_{CC}^-.

The output reaches V_{CC}^- +30 mV, V_{CC}^+ -40 mV, with R_L = 10 kΩ and V_{CC}^- +300 mV, V_{CC}^+ -400 mV, with R_L = 600 Ω.

This product offers a broad supply voltage operating range from 2.7 to 16 V and a supply current of only 200 µA/amp. (V_{CC} = 3 V).

Source and sink output current capability is typically 40 mA (at V_{CC} = 3 V), fixed by an internal limitation circuit.

LM2903YDT

LM2903

Low-power dual voltage comparator

Datasheet - production data

N
DIP8
(plastic package)

D
SO8
(plastic micropackage)

P
TSSOP8
(thin shrink small outline package)

S
MiniSO8
(plastic micropackage)

DFN8 2x2 mm
(plastic micropackage)

Features

- Wide single supply voltage range or dual supplies +2 V to +36 V or ±1 V to ±18 V
- Very low supply current (0.4 mA) independent of supply voltage (1 mW/comparator at +5 V)
- Low input bias current: 25 nA typ.
- Low input offset current: ±5 nA typ.
- Input common-mode voltage range includes negative rail
- Low output saturation voltage: 250 mV typ. (I_O = 4 mA)
- Differential input voltage range equal to the supply voltage
- TTL, DTL, ECL, MOS, CMOS compatible outputs
- Automotive qualification

Related products

- See LM2903W for similar device with higher ESD performances
- See LM2903H for similar device with operating temperature up to 150 °C

Description

This device consists of two independent low-power voltage comparators designed specifically to operate from a single supply over a wide range of voltages. Operation from split power supplies is also possible.

In addition, the device has a unique characteristic in that the input common-mode voltage range includes the negative rail even though operated from a single power supply voltage.

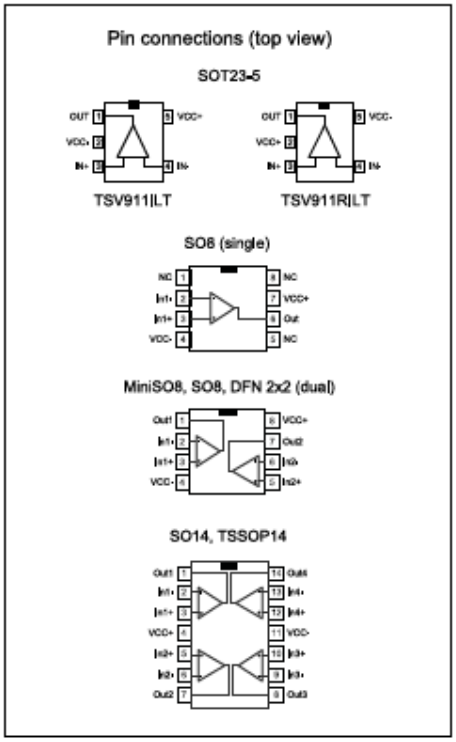
TSV912IYDT

life.augmented

TSV91x, TSV91xA

Single, dual, and quad rail-to-rail input/output 8 MHz operational amplifiers

Datasheet - production data



Features

- Rail-to-rail input and output
- Wide bandwidth
- Low power consumption: 820 µA typ
- Unity gain stability
- High output current: 35 mA
- Operating from 2.5 V to 5.5 V
- Low input bias current, 1 pA typ
- Low input offset voltage: 1.5 mV max (A grade)
- ESD internal protection ≥ 5 kV
- Latch-up immunity

Applications

- Battery-powered applications
- Portable devices
- Signal conditioning
- Active filtering
- Medical instrumentation
- Automotive applications

Description

The TSV91x operational amplifiers (op amps) offer low voltage operation and rail-to-rail input and output, as well as an excellent speed/power consumption ratio, providing an 8 MHz gain-bandwidth product while consuming only 1.1 mA maximum at 5 V. The op amps are unity gain stable and feature an ultra-low input bias current.

The devices are ideal for sensor interfaces, battery-supplied and portable applications, as well as active filtering.

Table 1: Device summary

Reference	Single	Dual	Quad
TSV91x	TSV911	TSV912	TSV914
TSV91xA	TSV911A	TSV912A	TSV914A

TS922IYDT

life.augmented

TS922, TS922A

Datasheet

Rail-to-rail, high output current, dual operational amplifier

Flip-chip with backcoating

SO8

TSSOP8

Product status link
TS922 and TS922A

Features

- Rail-to-rail input and output
- Low noise: 9 nV/√Hz
- Low distortion
- High output current: 80 mA (able to drive 32 Ω loads)
- High-speed: 4 MHz, 1 V/µs
- Operating from 2.7 to 12 V
- Low input offset voltage: 900 µV max. (TS922A)
- ESD internal protection: 2 kV
- Latch-up immunity

Applications

- Line drivers and actuator drivers
- Portable speakers
- Instrumentation with low noise as key factor
- Multimedia systems and portable equipments

Description

The TS922 and the TS922A devices are rail-to-rail dual BiCMOS operational amplifiers optimized and fully specified for 3 V and 5 V operations. These devices have high output currents which allow low-load impedances to be driven.

Very low noise, low distortion, low offset, and a high output current capability make these devices an excellent choice for high quality, low voltage, or battery operated audio systems.

The devices are stable for capacitive loads up to 500 pF.

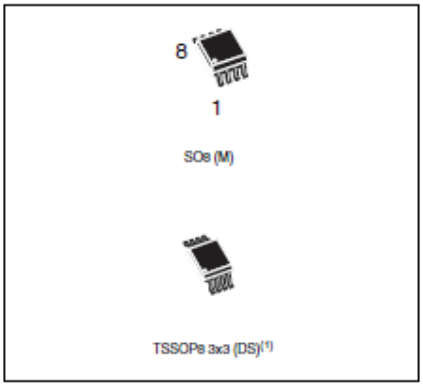
STM706YM7F

life.augmented

STM705, STM706 STM707, STM708, STM813L

5 V supervisor

Datasheet – production data



- 200 ms (typ) t_{rec}
- Watchdog timer - 1.6 s (typ)
- Manual reset input ($\overline{MR}$)
- Power-fail comparator (PFI/$\overline{PFO}$)
- Low supply current - 40 µA (typ)
- Guaranteed $\overline{RST}$ (RST) assertion down to V_{CC} = 1.0 V
- Operating temperature:
  –40 °C to 85 °C (industrial grade) or
  –40 °C to 125 °C (automotive grade for the STM706 only)
- RoHS compliance
  – Lead-free components are compliant with the RoHS directive

1. Contact local ST sales office for availability.

Features

- 5 V operating voltage
- Precision V_{CC} monitor
  – STM705/707/813L
  – 4.50 V ≤ V_{RST} ≤ 4.75 V
  – STM706/708
  – 4.25 ≤ V_{RST} ≤ 4.50 V
- RST and $\overline{RST}$ outputs

Table 1. Device summary

	Watchdog input	Watchdog output(1)	Active-low $\overline{RST}$(1)	Active-high RST(1)	Manual reset input	Power-fail comparator
STM705	✓	✓	✓		✓	✓
STM706(2)	✓	✓	✓		✓	✓
STM707			✓	✓	✓	✓
STM708			✓	✓	✓	✓
STM813L	✓	✓		✓	✓	✓

1. Push-pull output
2. Automotive grade (-40 °C to 125 °C) option for the STM706 only.

4.2 Construction note

	P/N A6727	P/N TS912IYDT	P/N LM2903YDT	P/N TSV912HYDT	P/N TS922IYDT	P/N STM706YM7F	P/N TL431IYDT
Wafer/Die fab. information							
Wafer fab manufacturing location	ST Catania	ST Singapore	ST Singapore	UMC Taiwan	ST Singapore	ST Singapore	ST Singapore
Technology	BCD6S	HC1PA	Bipolar	HF5CMOS	HF2CMOS	HCMOS4	Bipolar
Die finishing back side	CHROMIUM/ NICKEL/GOLD	RAW SILICON	RAW SILICON	Lapped Silicon	Raw silicon	RAW SILICON	RAW SILICON
Die size (microns)	1311x1242µm²	2600x1950µm²	950 x 870 µm²	1070x1100µm²	1720x1190µm²	1350x1510µm²	1380x1120µm²
Bond pad metallization layers	AlCu	AlSi	AlSiCu	AlCu	AlSiCu	AlSiCu	AlSiCu
Passivation type	TEOS/SiN/ Polyimide	P-VAPOX/ NITRIDE	Nitride	PSG + NITRIDE	PSG + NITRIDE	PSG+Silicon Nitride+Polyimide	Nitride
Wafer Testing (EWS) information							
Electrical testing manufacturing location		ST Singapore					
Assembly information							
Assembly site	ST Bouskoura						
Package description	SO8						
Molding compound	EME G700KC						
Frame material	Copper						
Die attach process	Epoxy Glue						
Die attach material	8601S-25						
Wire bonding process	Thermosonic ball bonding						
Wires bonding materials/diameters	Gold 1 mil	Cu 1 mil					
Lead finishing process	electroplating						
Lead finishing/bump solder material	Matte tin						
Final testing information							
Testing location	ST Bouskoura						

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Lot #	Process/ Package	Product Line	Comments
1	BCD6S/SO8	UM07	CZ9130B3RP
2	HC1PA/SO8	0912	CZ8150HK01 corner lot wire bonding HH CZ8150HKRQ corner lot wire bonding LL CZ8150HKRR corner lot wire bonding NN
3	Bipolar/SO8	0393	CZ7410EH0G CZ8040FLRE corner lot wire bonding HH CZ8040FLRC corner lot wire bonding LL CZ8040FLRD corner lot wire bonding NN
4	HF5CMOS/SO8	V912	CZ7410F3RP
5	HF2CMOS/SO8	0922	CZ7420D203
6	HCMOS4/SO8	16VA	CZ81701NR0 corner lot wire bonding HH CZ81701NQW corner lot wire bonding NN CZ81701NQY corner lot wire bonding LL
7	Bipolar/SO8	0431	CZ8520BWRR

5.2 Test plan and results summary

Test	PC	Std ref.	Conditions	SS	Steps	Failure/SS							Note
						UM07	0912	0393	V912	0922	16VA	0431	
HTOL	N	JESD22 A-108	Tj = 150°C, BIAS		168 H			0/77		0/77		0/77	
					500 H			0/77		0/77		0/77	
					1000 H			0/77		0/77		0/77	
					2000h			0/77		0/77			
HTSL	N	JESD22 A-103	Ta = 150°C		168 H	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77		
					500 H	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77	2x0/45	
					1000 H	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77	2x0/45	
Package Oriented Tests													
PC		JESD22 A-113	Drying 24 H @ 125°C Store 168 H @ Ta=85°C Rh=85% Over Reflow @ Tpeak=260°C 3 times		Final		PASS	PASS	PASS	PAS	PASS	PASS	
AC	Y	JESD22 A-102	Pa=2Atm / Ta=121°C		96 H	0/76	3x0/77	4x0/77	0/77	0/77	3x0/77	0/77	
TC	Y	JESD22 A-104	Ta = -65°C to 150°C		100 cy	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77	0/77	*DPA after 500 and 1000cy
					200 cy	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77	0/77	
					500 cy	0/77	3x0/77	4x0/77	0/77	0/77	3x0/77	0/77	
					1000cy		3x0/69*	3x0/69 1x0/77	0/69*	0/77	3x0/69*	0/77	
					2000cy			0/77		0/77			
THS	Y		Ta = 85°C, RH = 85%,		168h			0/77					
					1000h			0/77					
					2000h			0/77					
THB	Y	JESD22 A-101	Ta = 85°C, RH = 85%, BIAS		168 H			0/77			0/77*	0/77	*lot CZ53607S (HD)
					500 H			0/77			0/77*	0/77	
					1000 H			0/77			0/77*	0/77	
Other Tests													
ESD	N	AEC Q101-001, 002 and 005	CDM		1500V			Pass	Pass	Pass		Pass	

DPA: destructive physical analysis performed after test with positive results (both value and failure mode)

ELFR results

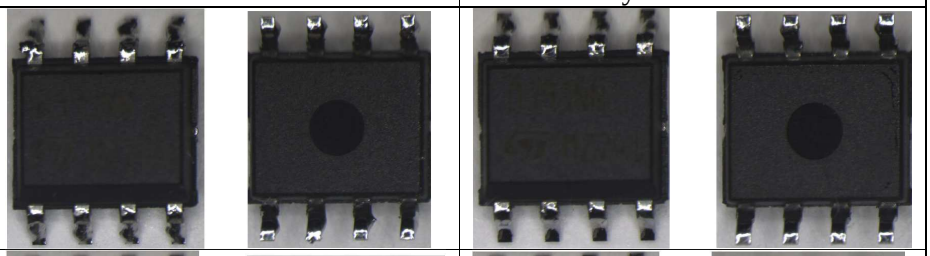
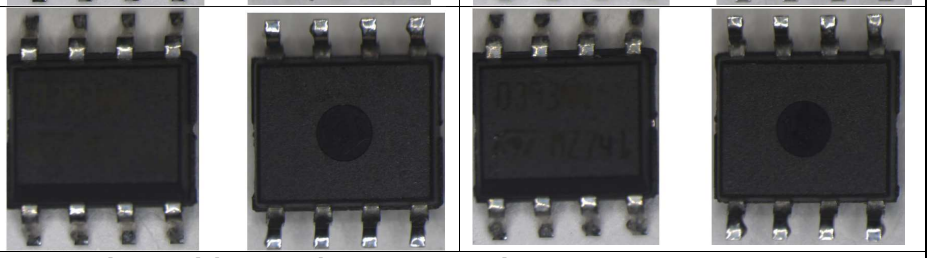
Lot #	Process/ Package	Product Line	Comments
1	Bipolar/SO8	0393	CZ53005LRP
	HVG8A/SO8	UY18	CZ537088RM
3	HF5CMOS/SO8	V912	CZ544OC1RR
4	HC1PA/SO8	0912	CZ5XX
5	HF2CMOS/SO14	0924	CZ5XX

Test	PC	Std ref.	Conditions	SS	Steps	Failure/SS								
						Lot 1	Lot 2	Lot 3	Lot 4	Lot 5				
Die Oriented Tests														
HTB	N	JESD22 A-108	Tj = 125°C, BIAS	468	168 H	0/78		0/78						
ELFR	N	JESD22 A-008	Tj = 125°C, BIAS	2028	48 H	0/450	0/450	0/450	0/450	0/450				

Solderability:

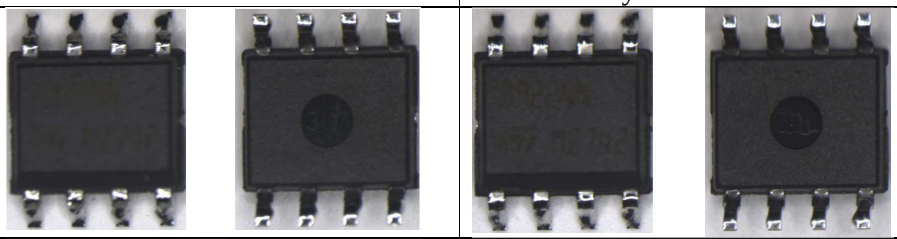
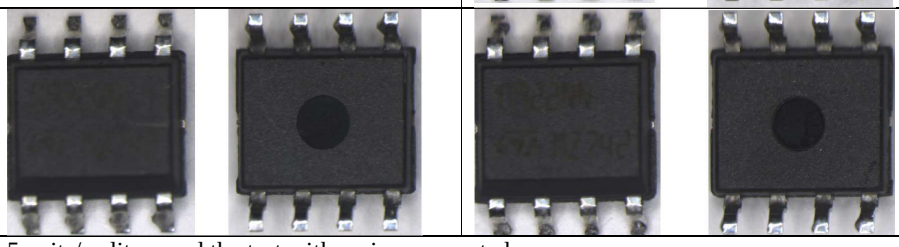
Test vehicle 0393

Lot ref: CZ7410EHQZ

	After 8h at 85°C/85%RH	After 16h dry air 150°C
SnPb bath		
SnAgCu bath		
Conclusion	5 units/ split passed the test with no issue reported	

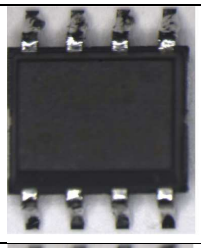
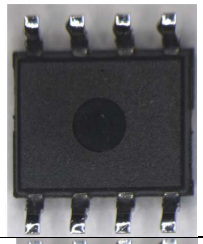
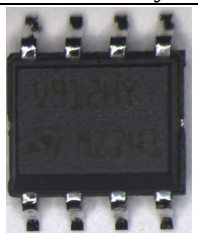
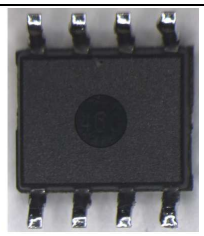
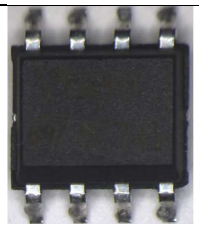
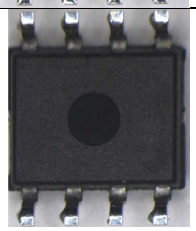
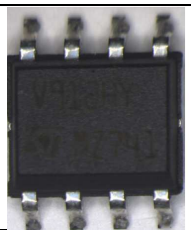
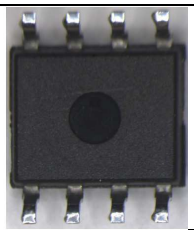
Test vehicle 0922

Lot ref: CZ7420D2RM

	After 8h at 85°C/85%RH	After 16h dry air 150°C
SnPb bath		
SnAgCu bath		
Conclusion	5 units/ split passed the test with no issue reported	

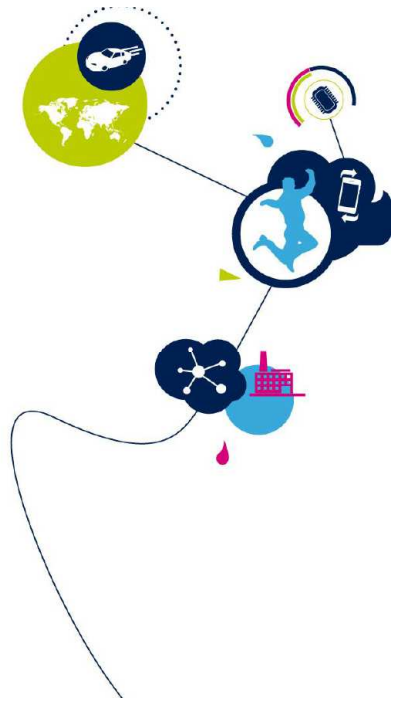
Test vehicle V912

Lot ref: CZ7410F3RN

	After 8h at 85°C/85%RH	After 16h dry air 150°C
SnPb bath	 	 
SnAgCu bath	 	 
Conclusion	5 units/ split passed the test with no issue reported	

Lead-free Matte tin verification versus whiskers risk

Whiskers Monitoring Report
ST BSK LAB: Q1-18



S. CHELLAOUI
K. OULAD BENAISSA

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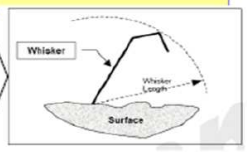
Whiskers related tests

(According to ST BSK Whiskers acceptance criteria referred to DM00485464)

1.	High temp. / high humidity 55 ° C / 85% rel. Hum.	2000h *	max. 20 µm whisker**
2.	Temperature cycle -40° C / +85° C	1000TC	max. 45 µm whisker
3.	Ambient Temp./Humidity 30 ° C / 60 % rel. Hum.	2000h *	max. 20 µm whisker

*In case of whiskers found (even below the Maximum spec. limit) the test must to continue up to 4000 hrs with the interim read out at 3000 hrs .
**In case of corrosion of solder and whiskers associated , this is not considered failure, therefore the lead in object must be discounted .

Whisker length : The straight line distance from the point of emergence of whiskers of the most distant point on the whiskers (i.e. the radius of a sphere containing the whiskers with its center located at the point of emergence).



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Monitoring period	Assy Plant	Requestors	Line	Date of aviability	Recieved by	Date of Report
Q1 / 2018	STM BOUSKOURA	A. CHEFFAJ	PLT	10 MARCH 2018	S CHELLAOUI	12/10/2018
		Y. ABOUTOURAB	SMD	15 MARCH 2018		

Line	Products	Lot ID	Devices	Plating Machine	Date process plating	Quantity units recieved	Comment
PLATING CENTRAL	PSO10	CZ8060CKRP	V526	MECO1	W08		
	PSO10	CZ8020AKRH	4D4K	MECO2	W07		
	PSSO12	CZ8060P4RM	VNU1	MECO3	W07		
	PSSO12	CZ80803SRQ	UH45	BELT1	W08		
	TO220 BOSCH	CZ8080CWRQ	Z06S	MECO2	W08		NO ABNORMALITY ISSUE
	TO220	CZ8070N301	E35H	MEC03	W08		
	TO220	CZ8060RMRN	MQ6	BELT3	W07		
	VIP BOSCH	CZ8060SX01	CR665	BELT3	W07		
	SWATT	CZ8050DF01	L200	BELT3	W08		
	MWATT 11L	CZ80506HRR	[illegible]9	MECO1	W07		
	SO-HD	CZ8030NERP	0922	BELT2	W04	50 Units	
	SO8-HD	CZ804008RG	0911	BELT1	W05		
	SO8-SSHD	CZ8090ADRR	0158	MECO4	W09		NO ABNORMALITY ISSUE
	SO14-HD	CZ8040M0RJ	V324	BELT2	W05		
	SO14-HD	CZ80802FRK	0324	BELT1	W03		
	SMA-SHD	CZ8080D6RJ	TFUV6	MECO4	W09		
	SMB-F	CZ8010FKRN	X020	BELT2	W03		
	SMB-F	CZ8010FKRQ	X020	BELT1	W03		
PLATING SMD	SMA	CZ81101E0J	TRANSIL	TPSL002	W11		
	SMA	CZ811011RQ	RECTIFIER	TPSL001	W11		
	SMB	CZ801010RH	TRANSIL	TPSL001	W11		
	SMB	CZ81100WRL	TRANSIL	TPSL002	W11	40 Units	
	SMC	CZ8100KK01	TRANSIL	TPSL002	W11		
	SMC	CZ8100KK0F	TRANSIL	TPSL001	W11		

Pull test (value in gram)

All failure mode acceptable

Unit / TV	UM07	393	V912	922	U494	16VA	0912	UY32
1	12.423	13.6	14.672	14.636	14.452	11.664	17.587	12.76
2	10.02	14.6	15.453	15.453	14.304	16.251	17.609	12.759
3	10.694	14.2	14.465	14.079	12.545	12.737	16.638	12.789
4	11.176	14.7	14.426	15.042	15.496	15.761	16.381	12.928
5	10.424	15.4	14.01	14.903	14.476	11.715	15.957	13.598
6	10.188	13.8	16.027	15.701	15.011	13.81	17.179	14.569
7	10.499	14.9	16.432	15.509	17.319	13.608	17.377	12.257
8	10.784	12.9	14.368	15.425	15.382	12.138	17.856	13.748
9	9.729	14.8	15.751	14.898	14.678	13.941	15.283	14.518
10	11.329	13.3	16.432	14.49	14.307	15.261	16.984	11.554
11	10.461	14.2	14.265	14.823	13.176	14.698	17.817	13.381
12	10.277	13.1	15.338	14.563	15.617	14.527	15.021	13.284
13	9.659	14.6	15.551	14.378	16.618	12.306	16.867	14.754
14	10.394	13.8	15.813	15.265	14.114	11.938	16.542	13.53
15	10.855	13.8	14.037	14.656	15.627	13.08	17.162	14.083
16	10.65	14.3	14.008	14.934	15.535	12.499	17.26	14.588
17	9.968	13.7	16.952	14.941	14.309	15.726	15.135	14.918
18	11.104	14	14.233	15.115	10.447	14.834	17.34	12.408
19	9.137	14.7	16.103	14.219	13.889	15.188	16.894	12.736
20	9.83	15.9	15.377	15.173	14.102	11.412	17.818	13.279
21	10.136	15.4	15.781	16.422	16.117	13.671	16.746	13.429
22	10.669	13.6	16.52	14.589	16.464	12.423	16.009	13.663
23	10.687	15.1	16.565	13.446	11.319	13.25	16.114	14.425
24	11.94	15.2	16.153	16.097	14.759	14.596	16.025	13.647
25	10.1	12.9	15.985	14.468	16.151	14.806	17.144	13.959
26	10.853	14.5	13.981	13.235	14.809	16.194	15.334	14.238
27	10.543	12.4	14.33	15.869	12.718	14.522	17.195	13.039
28	10.1	12.9	15.985	14.468	16.151	14.806	17.144	13.959
29	10.853	14.5	13.981	13.235	14.809	16.194	15.334	14.238
30	10.543	12.4	14.33	15.869	12.718	14.522	17.195	13.039
31	10.682	13.6	15.079	14.661	16.078	11.821	17.048	13.241
32	10.757	13.23	15.526	15.999	15.921	13.03	15.915	15.756
33	10.579	12.09	14.864	14.389	14.046	13.7	16.995	11.06
mean	**10.55**	**14.0**	**15.2**	**14.9**	**14.7**	**13.8**	**16.7**	**13.5**
stddev	**0.65**	**0.94**	**0.91**	**0.76**	**1.49**	**1.44**	**0.81**	**0.96**
Cpk	**4.32**	**3.56**	**4.11**	**4.78**	**2.38**	**2.28**	**5.19**	**3.30**

Shear test (value in gram)

All failure mode acceptable

Unit / TV	UM07	393	V912	922	U494	16VA	0912	UY32
1	33.71	37.4	33.31	32.73	36.896	32.616	32.35	33.9
2	39.92	30.4	36.67	36.46	34.027	36.157	29.17	32.02
3	34.64	37.7	35.22	35.01	37.666	35.672	31.8	33.71
4	33.12	36.3	36.2	35.55	38.577	33.409	32.34	33.43
5	38.83	30.3	33.38	34.55	39.49	35.665	33.03	36.58
6	37.52	33.8	36.16	34.96	43.477	34.332	31.53	35.95
7	39.86	33.4	35.76	32.62	40.777	37.463	31.4	36.2
8	33.96	29.1	33.57	32.61	36.792	34.529	32.94	36.81
9	38.78	31.2	33.69	35.94	39.999	36.368	31.02	35.36
10	39.46	33.8	32.33	33.07	37.303	35.716	32.88	36.53
11	36.21	33.2	34.12	32.95	36.429	37.593	31.79	40.53
12	34.26	30.2	33.26	36.35	41.61	35.997	32.66	35.96
13	35.6	30.6	33.03	35.42	39.354	35.229	32.62	35.89
14	35.71	34.7	35.67	36.34	34.663	37.549	32.86	34.59
15	38.5	34.2	32.38	34.6	39.124	34.581	32.7	33.42
16	33.54	32.8	35.91	34.74	34.463	38.432	31.46	36.52
17	30.78	33.9	33.51	34.56	36.495	35.111	30.12	35.1
18	34.33	33.9	35.96	34.21	37.507	34.353	31.47	37.01
19	36.45	33.9	36.31	33.56	38.906	34.877	31.86	33.93
20	38.59	30.6	35.14	35.94	36.378	35.99	33.01	34.94
21	38.19	38.9	36.35	33.87	38.274	33.866	31.61	35.04
22	37.82	33	36.58	36.57	35.377	32.912	32.37	36.55
23	36.41	34.3	35.22	35.73	39.367	35.678	31.09	35.38
24	38.9	37.1	34.89	35.02	41.16	33.921	32.69	35.35
25	34.95	30.4	33.35	33.65	38.662	34.133	32.26	35.9
26	31.38	36.2	34.58	33.54	38.292	35.004	29.13	35.76
27	35.5	34.3	33.31	34.87	41.859	36.838	29.8	35.37
28	34.95	30.4	33.35	33.65	38.662	34.133	32.26	35.9
29	31.38	36.2	34.58	33.54	38.292	35.004	29.13	35.76
30	35.5	34.3	33.31	34.87	41.859	36.838	29.8	35.37
31	37.21	35.2	33.87	34.98	42.42	37.448	31.44	37.26
32	37.15	33.3	32.47	34.74	35.713	36.472	31.09	36.55
33	34.75	33.9	31.48	35.43	39.333	34.733	33.19	34.29
mean	**36.2**	**33.6**	**34.4**	**34.6**	**38.5**	**35.4**	**31.7**	**35.5**
stddev	**2.46**	**2.44**	**1.43**	**1.15**	**2.34**	**1.41**	**1.19**	**1.47**
Cpk	**2.12**	**1.82**	**3.30**	**4.15**	**2.59**	**3.58**	**3.19**	**3.46**

Physical dimension

Test vehicle 0393

CZ7410EHR0

Dimensions (mm)	Specifi-cation	Data					
items:	min.	max.	Min.	Max.	Mean	StDev	Cpk
Dambar Protrusion		0.120	0.027	0.071	0.051	0.010	1.68
Lead Width	0.375	0.425	0.395	0.416	0.403	0.004	1.76
Coplanarity		0.040	0.002	0.016	0.006	0.004	3.21
Stand Off	0.120	0.180	0.141	0.160	0.152	0.005	1.99
Foot length	0.567	0.667	0.641	0.654	0.646	0.004	1.88
Lead tip to tip	5.900	6.100	6.020	6.060	6.034	0.008	2.62
K (angle)	3.000	7.000	4.200	5.500	4.723	0.351	1.64

Test vehicle V912

CZ7410F3RN (NN)

Dimensions (mm)	Specification		Data				
items:	min.	max.	Min.	Max.	Mean	StDev	Cpk
Side Flash	0.020	0.250	0.132	0.153	0.144	0.006	NA
Dambar Protrusion		0.120	0.027	0.071	0.051	0.010	1.675
Lead Width	0.375	0.425	0.395	0.416	0.403	0.004	1.763
Coplanarity		0.040	0.002	0.016	0.006	0.004	3.210
Stand Off	0.120	0.180	0.141	0.160	0.152	0.005	1.988
Foot length	0.567	0.667	0.641	0.654	0.646	0.004	1.881
Lead tip to tip	5.900	6.100	6.020	6.060	6.034	0.008	2.615
K (angle)	3.000	7.000	4.200	5.500	4.723	0.351	1.636

Test vehicle 0922

Dimensions (mm)	Specification		Data				
items:	min.	max.	Min.	Max.	Mean	StDev	Cpk
Dambar Protrusion		0.120	0.027	0.071	0.051	0.010	1.675
Lead Width	0.375	0.425	0.395	0.416	0.403	0.004	1.763
Coplanarity		0.040	0.002	0.016	0.006	0.004	3.210
Stand Off	0.120	0.180	0.141	0.160	0.152	0.005	1.988
Foot length	0.567	0.667	0.641	0.654	0.646	0.004	1.881
Lead tip to tip	5.900	6.100	6.020	6.060	6.034	0.008	2.615
K (angle)	3.000	7.000	4.200	5.500	4.723	0.351	1.636

Scanning acoustic microscopy:

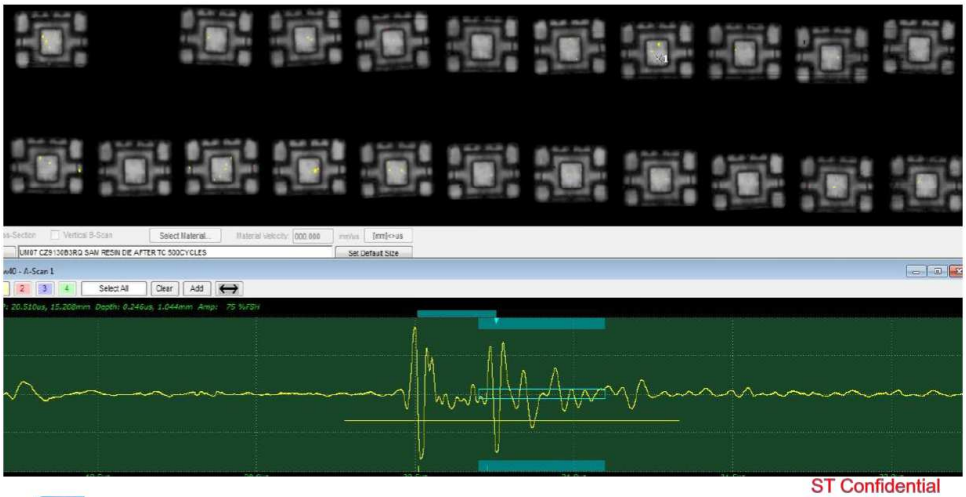
Test vehicle UM07

Delamination on die after 500thermal cycling : no delamination reported neither on die nor on lead

Scanning acoustic analysis Resin Die

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin lead				
Delamination resin Pad				

2



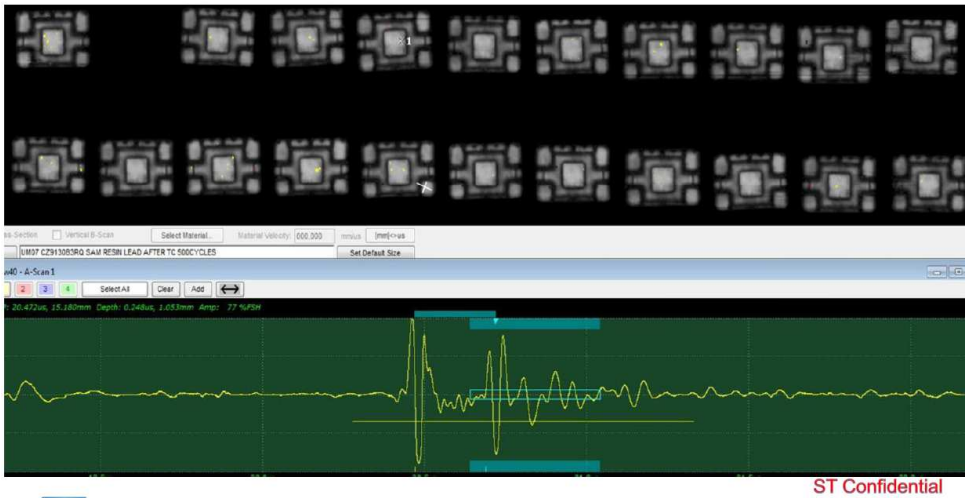
ST Confidential

No delamination issue on all units.

Scanning acoustic analysis Resin Lead

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin lead				
Delamination resin Pad				

4



ST Confidential

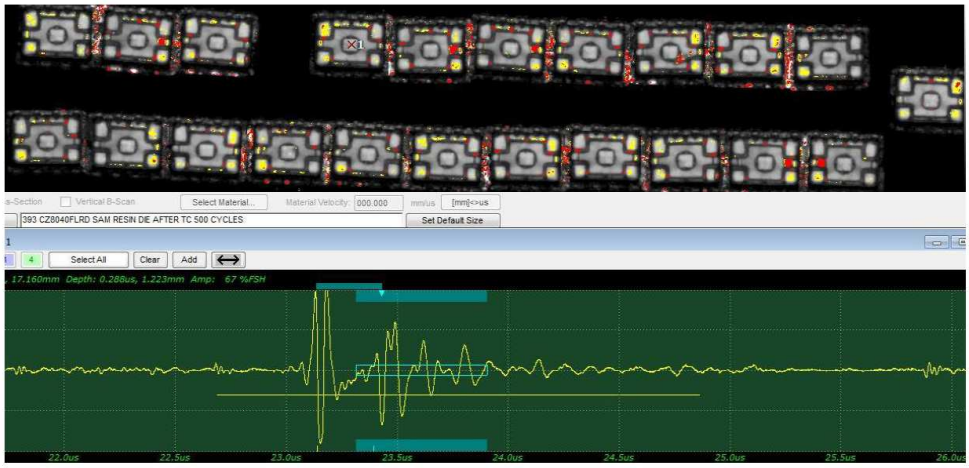
No delamination issue on all units.

Test vehicle 0393

Delamination on die after 500thermal cycling : no delamination reported neither on die nor on lead

Scanning acoustic analysis resin die

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin lead				
Delamination resin Pad				

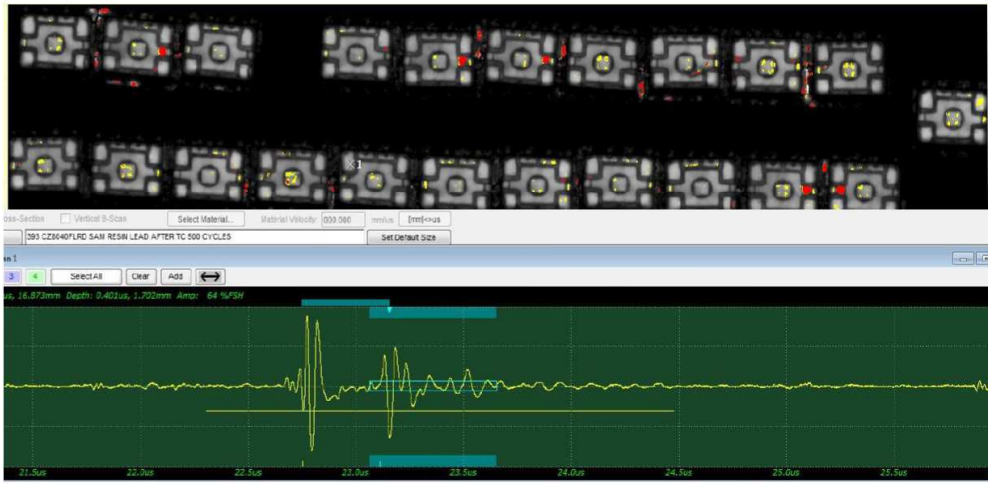


ST Confidential

No delamination issue on all units

Scanning acoustic analysis resin lead

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin lead				
Delamination resin Pad				



ST Confidential

No delamination issue at all units

Test vehicle 0922

Delamination on die after 500thermal cycling : no delamination reported neither on die nor on lead

Scanning acoustic analysis resin die a T0

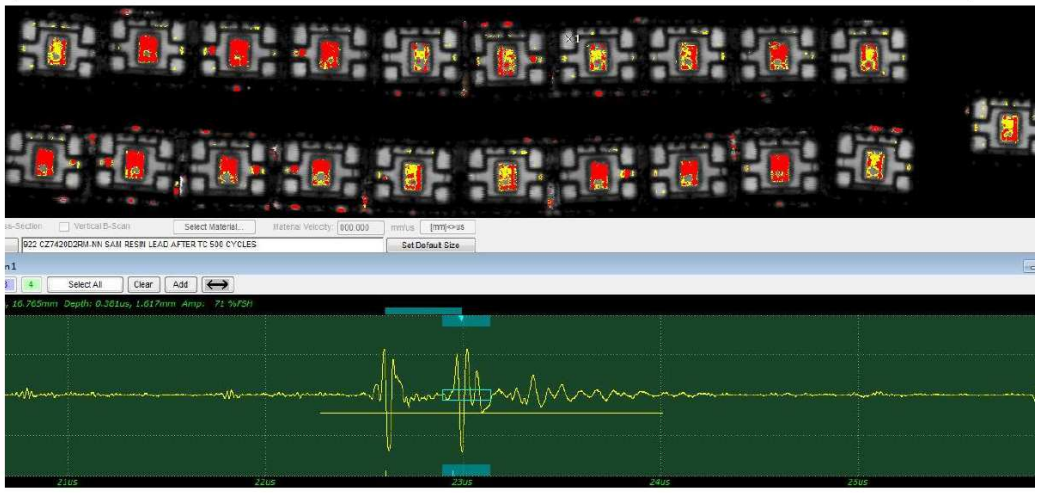
Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin lead				
Delamination resin Pad				

ST Confidential

No delamination issue on all units

Scanning acoustic analysis resin leads a T0

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die	7512807	Sonix	NA	7396821
Delamination resin Pad				



No delamination issue on all units

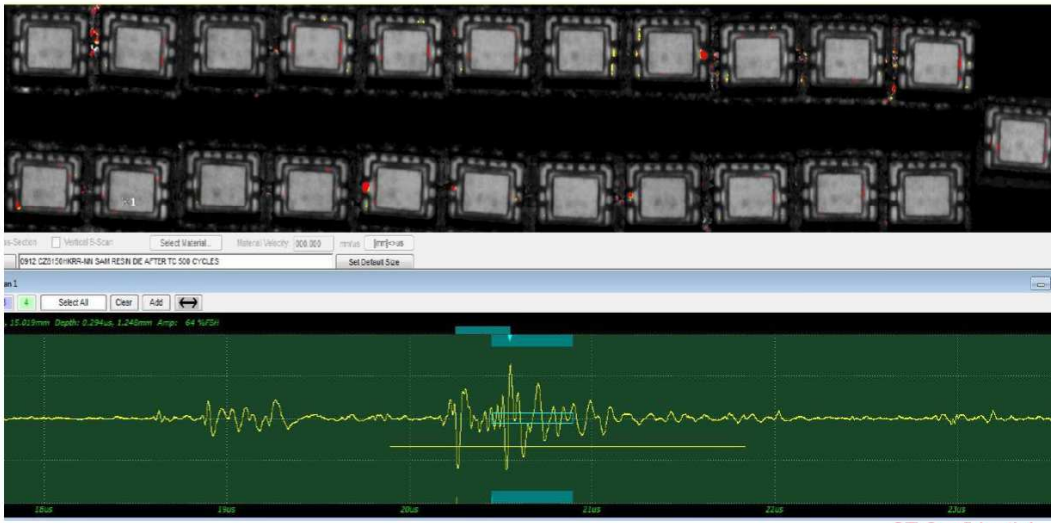
ST Confidential

Test vehicle 0912

Delamination on die after 500thermal cycling : no delamination reported neither on die nor on lead

Scanning acoustic analysis resin Die

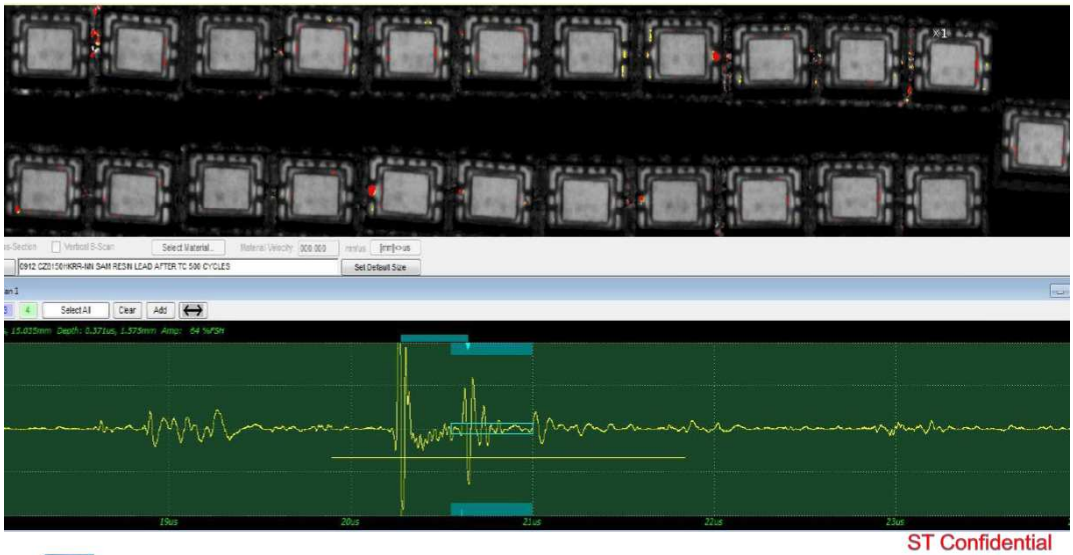
Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die				
Delamination resin lead	7512807	Sonix		7396821
Delamination resin Pad			NA	



No delamination issue at all units

Scanning acoustic analysis resin Lead

Defect inspected	Spec Number	Equipment	Mainte/Calib	Spec Number
Delamination resin Die				
Delamination resin lead	7512807	Sonix		7396821
Delamination resin Pad			NA	



No delamination issue at all units

6 ANNEXES

6.1 Tests Description

Test name	Description	Purpose
Die Oriented		
HTOL High Temperature Operating Life **HTB** High Temperature Bias	The device is stressed in static or dynamic configuration, approaching the operative max. absolute ratings in terms of junction temperature and bias condition.	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. The typical failure modes are related to, silicon degradation, wire-bonds degradation, oxide faults.
HTRB High Temperature Reverse Bias **HTFB / HTGB** High Temperature Forward (Gate) Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: low power dissipation; max. 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 ageing, layout sensitivity to surface effects.
HTSL High Temperature Storage Life	The device is stored in unbiased condition at the max. temperature allowed by the package materials, sometimes higher than the max. operative temperature.	To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding.
ELFR Early Life Failure Rate	The device is stressed in biased conditions at the max junction temperature.	To evaluate the defects inducing failure in early life.
Package Oriented		
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 Auto Clave (Pressure Pot)	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.
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.

Test name	Description	Purpose
TF / IOL Thermal Fatigue / Intermittent Operating Life	The device is submitted to cycled temperature excursions generated by power cycles (ON/OFF) at T ambient.	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.
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.
Other		
ESD Electro Static Discharge	The device is submitted to a high voltage peak on all his pins simulating ESD stress according to different simulation models. CBM: Charged Device Model HBM: Human Body Model MM: Machine Model	To classify the device according to his susceptibility to damage or degradation by exposure to electrostatic discharge.
LU Latch-Up	The device is submitted to a direct current forced/sunk into the input/output pins. Removing the direct current no change in the supply current must be observed.	To verify the presence of bulk parasitic effect inducing latch-up.