

**PRODUCT / PROCESS CHANGE NOTIFICATION**

**1. PCN basic data**

<b>1.1 Company</b>		STMicroelectronics International N.V
<b>1.2 PCN No.</b>	AMS/20/12425	
<b>1.3 Title of PCN</b>	New assembly site for Standard products (General Purpose Analog) assembled in MiniSO8 packages	
<b>1.4 Product Category</b>	See product list	
<b>1.5 Issue date</b>	2020-11-09	

**2. PCN Team**

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<b>2.2.1 Product Manager</b>	Marcello SAN BIAGIO
<b>2.1.2 Marketing Manager</b>	Salvatore DI VINCENZO
<b>2.1.3 Quality Manager</b>	Jean-Marc BUGNARD

**3. Change**

<b>3.1 Category</b>	<b>3.2 Type of change</b>	<b>3.3 Manufacturing Location</b>
Transfer	Line transfer for a full process or process brick (process step, control plan, recipes) from one site to another site: Assembly site (SOP 2617)	Assembly location : - TSHT China

**4. Description of change**

	<b>Old</b>	<b>New</b>
<b>4.1 Description</b>	Assembly location : - Amkor Philippines	Assembly location : - Amkor Philippines - TSHT China
<b>4.2 Anticipated Impact on form, fit, function, quality, reliability or processability?</b>	No impact	

**5. Reason / motivation for change**

<b>5.1 Motivation</b>	Progressing on activities related to process modernization and quality improvement, ST is pleased to announce the introduction of TSHT/China (subcontractor) for Assy and Test & Finishing activities for some products assembled in our MiniSO8 package for analog products. The Assembly production will gradually be transferred from Amkor (current subcontractor) to TSHT China.
<b>5.2 Customer Benefit</b>	CAPACITY INCREASE

**6. Marking of parts / traceability of change**

<b>6.1 Description</b>	New Finished good codes
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**7. Timing / schedule**

<b>7.1 Date of qualification results</b>	2020-10-30
<b>7.2 Intended start of delivery</b>	2021-02-20
<b>7.3 Qualification sample available?</b>	Upon Request

**8. Qualification / Validation**

<b>8.1 Description</b>	12425 PCN MiniSO TSHT-H7 standard.pdf		
<b>8.2 Qualification report and qualification results</b>	Available (see attachment)	<b>Issue Date</b>	2020-11-09

**9. Attachments (additional documentations)**

12425 Public product.pdf  
12425 PCN MiniSO TSHT-H7 standard.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
	OA2MPA34S	
	OA2NP34S	
	OA2ZHA34S	
	TS882IST	
	TS883IST	
	TSU102IST	
	TSU112IST	
	TSV522AIST	
	TSV522IST	
	TSV712IST	
	TSV732IST	
	TSZ122IST	
	TSZ182IST	

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**PRODUCT/PROCESS  
CHANGE NOTIFICATION**

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**PCN AMS/20/12425**

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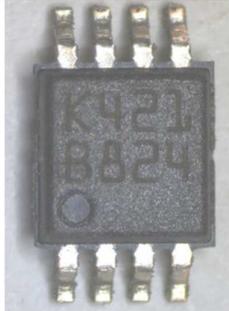
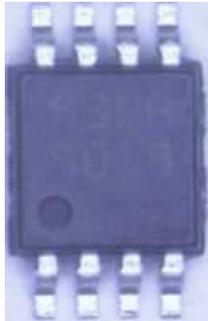
**Analog, MEMS & Sensors (AMS)**

**New assembly site for Standard products  
(General Purpose Analog) assembled in MiniSO8 packages**

**WHAT:**

Progressing on activities related to process modernization and quality improvement, ST is pleased to announce the introduction of TSHT/China (subcontractor) for Assy and Test & Finishing activities for some products assembled in our MiniSO8 package for analog products. The Assembly production will gradually be transferred from Amkor (current subcontractor) to TSHT China.

Please find more information related to material change in the table here below

Material	Current process	Modified process	Comment
Diffusion location	ST Ang Mo Kio (Singapore)/ UMC / ST Agrate	ST Ang Mo Kio (Singapore)/ UMC / ST Agrate	
Assembly location	Amkor Philippines	TSHT China	
Molding compound	Sumitomo G700	Hitachi CEL 9220	
Die attach	Henkel 8290	Henkel 8200T/Henkel8600	
Leadframe	Copper	Copper	
Plating	NiPdAu	Matte Sn	
Wire	Gold 0.8Mil	Copper Pd coated 1 mil	
Appearance			

**WHY:**

The purpose of the introduction of TSHT for both Assy and Test & Finishing activities for the here above listed commercial products is to further improve the rationalization of our manufacturing assets and provide a better delivery support to our customers.

**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:**

The new material set will be implemented in Q1/2021 in TSHT China.



### **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.



<h2 style="margin: 0;">Reliability Qualification plan</h2> <p style="margin: 0;"><i>AMS Back-end qualification</i></p> <p style="margin: 0;"><b>MSOP 8</b></p> <p style="margin: 0;"><i>Production transfer to TSHT</i></p>
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General Information	
<b>Product Line</b>	<i>0193, 0358, V992, UY32, VB2F</i>
<b>Product Description</b>	Dual comparator bipolar, Dual op amp bipolar, , Dual op amp, biCMOS, Dual precision op amp, 4 A dual low-side, High bandwidth (50MHz) Low offset (250µV) Op amp
<b>P/N</b>	<i>LM2903WST, LM2904WST, TSV9921ST, TSX9221ST, TSV7921YST</i>
<b>Product Group</b>	<i>AMS</i>
<b>Product division</b>	<i>General Purpose Analog &amp; RF</i>
<b>Package</b>	<i>MiniSO8</i>
<b>Silicon Process technology</b>	<i>Bipolar, HF5CMOS, HVG8A, HCMOS7</i>

Locations	
<b>Wafer fab</b>	<i>ST Singapore UMC, ST Agrate, ST Crolles</i>
<b>Assembly plant</b>	<i>TSHT China</i>
<b>Reliability Lab</b>	<i>ST Grenoble, TSHT</i>

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..... 10**  
**2 GLOSSARY ..... 10**  
**3 RELIABILITY EVALUATION OVERVIEW ..... 10**  
    3.1 OBJECTIVES..... 10  
    3.2 CONCLUSION ..... 10  
**4 DEVICE CHARACTERISTICS ..... 11**  
    4.1 DEVICE DESCRIPTION ..... 11  
    4.2 CONSTRUCTION NOTE..... 16  
**5 TESTS PLAN SUMMARY ..... 17**  
    5.1 TEST VEHICLE ..... 17  
    5.2 TEST PLAN SUMMARY ..... 17  
**6 ANNEXES ..... 18**  
    6.1 TESTS DESCRIPTION ..... 18

## **1 APPLICABLE AND REFERENCE DOCUMENTS**

Document reference	Short description
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 assembly site, TSHT China, for products in MiniSO8 package for Analog standard products

### **3.2 Conclusion**

Qualification Plan requirements have to be 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

LM2903WST



LM2903W

Low-power, dual-voltage comparator

Datasheet – production data

#### Features

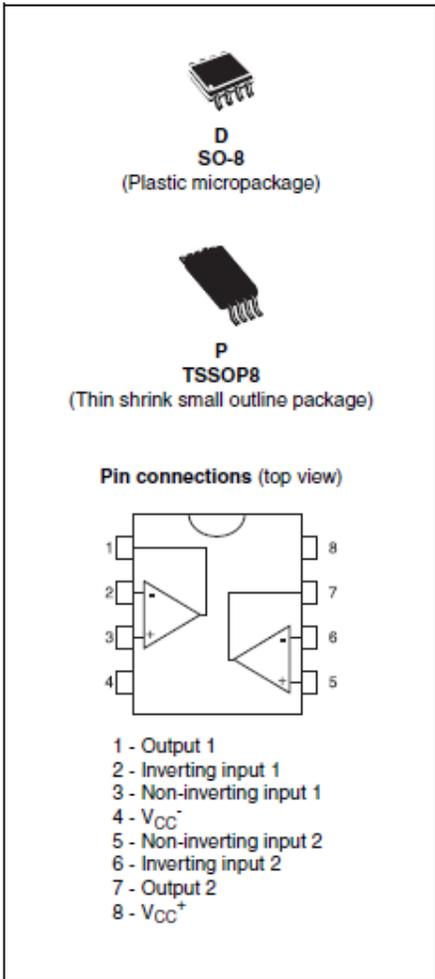
- Wide, single supply voltage range or dual supplies +2 V to +36 V or  $\pm 1$  V to  $\pm 18$  V
- Very low supply current (0.4 mA) independent of supply voltage (1 mW/comparator at +5 V)
- Low input bias current: 25 nA typ.
- Low input offset current:  $\pm 5$  nA typ.
- Input common-mode voltage range 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
- ESD internal protection: 2 kV

#### 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.

The input common-mode voltage range includes negative rail even though operated from a single power supply voltage.

All pins are protected against electrostatic discharge up to 2 kV. Consequently, the input voltages must not exceed the  $V_{CC}^+$  or  $V_{CC}^-$  magnitudes.

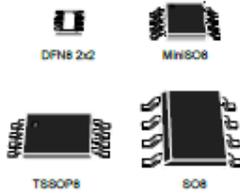


LM2904WST,



**LM2904, LM2904A**  
**LM2904W, LM2904AW**  
Datasheet

Low-power dual operational amplifier



**Features**

- Frequency compensation implemented internally
- Large DC voltage gain: 100 dB
- Wide bandwidth (unity gain): 1.1 MHz (temperature compensated)
- Very low supply current/amplifier, essentially independent of supply voltage
- Low input bias current: 20 nA (temperature compensated)
- Low input offset current: 2 nA
- Input common-mode voltage range includes negative rail
- Differential input voltage range equal to the power supply voltage
- Large output voltage swing 0 V to  $[(V_{CC}^+) - 1.5 V]$

**Description**

This circuit consists of two independent, high gain operational amplifiers (op amps) that have frequency compensation implemented internally. They are designed specifically for automotive and industrial control systems. The circuit operates from a single power supply over a wide range of voltages. The low power supply drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits which can now be more easily implemented in single power supply systems. For example, these circuits can be directly supplied from the standard 5 V which is used in logic systems and easily provides the required electronic interfaces without requiring any additional power supply.

In linear mode, the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from a single power supply.

Maturity status link		
	Enhanced V <sub>IO</sub>	Enhanced ESD
LM2904		
LM2904A	✓	
LM2904W		✓
LM2904AW	✓	✓

Related products	
TSB572	Dual op-amps for low-power consumption (380 µA with 2.5 MHz GBP)
LM2902 LM2902W	Quad op-amps version
LM2904WH LM2904AH	High temperature version (150 °C)

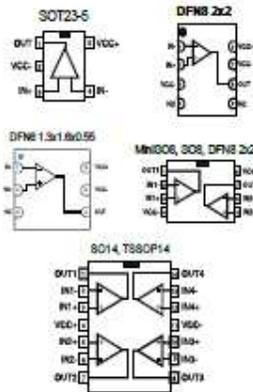
TSV992IST



**TSV991, TSV992, TSV994 TSV991A  
TSV992A, TSV994A**  
Datasheet

Rail-to-rail input/output 20 MHz GBP operational amplifiers

Pin connections  
(top view)



**Features**

- Low input offset voltage: 1.5 mV max. (A grade)
- Rail-to-rail input and output
- Wide bandwidth 20 MHz
- Stable for gain  $\geq 4$  or  $\leq -3$
- Low power consumption: 820  $\mu$ A typ.
- High output current: 35 mA
- Operating from 2.5 V to 5.5 V
- Low input bias current, 1 pA typ.
- ESD internal protection  $\geq 5$  kV

**Applications**

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

**Description**

The TSV99x and TSV99xA family of single, dual, and quad operational amplifiers offers low voltage operation and rail-to-rail input and output. These devices feature an excellent speed/power consumption ratio, offering a 20 MHz gain-bandwidth, stable for gains above 4 (100 pF capacitive load), while consuming only 1.1 mA maximum at 5 V. They also feature an ultra-low input bias current. These characteristics make the TSV99x family ideal for sensor interfaces, battery-supplied and portable applications, as well as active filtering. These characteristics make the TSV99x, TSV99xA family ideal for sensor interfaces, battery-supplied and portable applications, as well as active filtering.

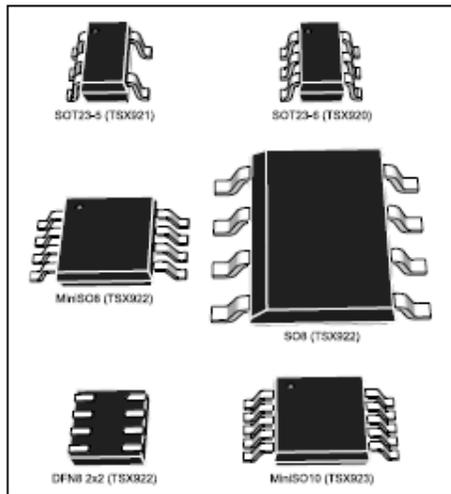
<b>Product status link</b>	
TSV991, TSV992, TSV994, TSV991A, TSV992A, TSV994A	
<b>Related products</b>	
See TSV911, TSV912, TSV914, TSV911A, TSV912A, TSV914A	For unity-gain stable amplifiers

TSX922IST

# TSX920, TSX921, TSX922, TSX923

## 10 MHz rail-to-rail CMOS 16 V operational amplifiers

Datasheet - production data



### Applications

- Communications
- Process control
- Test equipment

### Description

The TSX92x single and dual operational amplifiers (op amps) offer excellent AC characteristics such as 10 MHz gain bandwidth, 17 V/ms slew rate, and 0.0003 % THD+N. These features make the TSX92x family particularly well-adapted for communications, I/V amplifiers for ADCs, and active filtering applications.

Their rail-to-rail input and output capability, while operating on a wide supply voltage range of 4 V to 16 V, allows these devices to be used in a wide range of applications. Automotive qualification is available as these devices can be used in this market segment.

Shutdown mode is available on the single (TSX920) and dual (TSX923) versions enabling an important current consumption reduction while this function is active.

The TSX92x family is available in SMD packages featuring a high level of integration. The DFN8 package, used in the TSX922, with a typical size of 2x2 mm and a maximum height of 0.8 mm offers even greater package size reduction.

### Features

- Rail-to-rail input and output
- Wide supply voltage: 4 V - 16 V
- Gain bandwidth product: 10 MHz typ at 16 V
- Low power consumption: 2.8 mA typ per amplifier at 16 V
- Unity gain stable
- Low input bias current: 10 pA typ
- High tolerance to ESD: 4 kV HBM
- Extended temperature range: -40 °C to 125 °C
- Automotive qualification

Table 1: Device summary

Op-amp version	With shutdown mode	Without shutdown mode
Single	TSX920	TSX921
Dual	TSX923	TSX922

### Related products

- See the TSX5 series for low-power features
- See the TSX6 series for micro-power features
- See the TSX929 series for higher speeds
- See the TSV9 series for lower voltages

TSV792IST

TSV791, TSV792

Datasheet

High bandwidth (50 MHz) low offset (200  $\mu$ V) rail-to-rail 5 V op-amp



Features

- Gain bandwidth product 50 MHz, unity gain stable
- Slew rate 30 V/ $\mu$ s
- Low input offset voltage 50  $\mu$ V typ., 200  $\mu$ V max.
- Low input bias current: 2 pA typ.
- Low input voltage noise density 5 nV/ $\sqrt$ Hz @ 10 kHz
- Wide supply voltage range: 2.2 V to 5.5 V
- Rail-to-rail input and output
- Extended temperature range: - 40  $^{\circ}$ C to +125  $^{\circ}$ C
- Automotive grade version available
- Benefits:
  - Accuracy of measurement virtually unaffected by noise or input bias current
  - Signal conditioning for high frequencies

Applications

- High bandwidth low-side and high-side current sensing
- Photodiode transimpedance amplification
- A/D converters input buffers
- Power management in solar-powered systems
- Power management in automotive applications

Maturity status link	
TSV791, TSV792	

Related products	
TSZ181 TSZ182	Zero drift amplifiers with more power savings (3 MHz)
TSB712	36 V high-bandwidth amplifiers (6 MHz)
TSB7192	36 V high-bandwidth amplifiers (20 MHz)

Description

The TSV791 and TSV792 are single and dual 50 MHz-bandwidth unity-gain-stable amplifiers. The rail-to-rail input stage and the slew rate of 30 V/ $\mu$ s make the TSV791 and TSV792 ideal for low-side current measurement. The excellent accuracy provided by maximum input voltage of 200  $\mu$ V allows amplifying accurately small-amplitude input signal. The TSV792 can operate from a 2.2 V to 5.5 V single supply it can typically handle an output capacitor up to 1 nF and is fully specified on a load of 22 pF, therefore allowing easy usage as A/D converters input buffer.

## 4.2 Construction note

	P/N LM2903WST	P/N LM2904WST	P/N TSV9921ST	P/N TSX9221ST	P/N TSV7921ST
<b>Wafer/Die fab. information</b>					
Wafer fab manufacturing location	ST Singapore	ST Singapore	ST Singapore	UMC Taiwan	ST Crolles
Technology	Bipolar	Bipolar	HF5CMOS	HVG8A	HCMOS7A
Die finishing back side	RAW SILICON	RAW SILICON	LAPPED SILICON	LAPPED SILICON	RAW SILICON
Die size (microns)	1120x1050	1280x1210	1070x1100	1700x1400	938x1638
Bond pad metallization layers	AlSiCu	AlSiCu	AlCu	AlCu	AlCu
Passivation type	Nitride	Nitride	PSG + NITRIDE	PSG + NITRIDE	PSG + NITRIDE + PIX
<b>Wafer Testing (EWS) information</b>					
Electrical testing manufacturing location	ST Singapore				
<b>Assembly information</b>					
Assembly site	TSHT	TSHT	TSHT	TSHT	TSHT
Package description	MiniSO8	MiniSO8	MiniSO8	MiniSO8	MiniSO8
Molding compound	Hitachi CEL-9220				
Frame material	Cu	Cu	Cu	Cu	Cu
Die attach process	Epoxy Glue				
Die attach material	Henkel 8200T				
Wire bonding process	Thermosonic ball bonding				
Wires bonding materials/diameters	Cu 1 mil Pd Coated	Cu 0.8 mil Pd Coated			
Lead finishing process	electroplating	electroplating	electroplating	electroplating	electroplating
Lead finishing/bump solder material	Matte Sn				
<b>Final testing information</b>					
Testing location	TSHT	TSHT	TSHT	TSHT	TSHT



## 5 TESTS PLAN SUMMARY

### 5.1 Test vehicle

Lot #	Process/ Package	Product Line	Comments
1	Bipolar/MiniSO8	0193	GRAL2024018, T3L2017LG0295 and T3L2017LG0296
2	Bipolar/MiniSO8	0358	GRAL2024017 and T3L2017LG0304 and T3L2017LG0303
3	HF5CMOS/MiniSO8	V992	T3L2017LG0317 and T3L2017LG0316
4	HVG8A/MiniSO8	UY32	T3L2019HC0361and T3L2019HC0362
5	HCMOS7A	VB2F	

### 5.2 Test plan summary

Test	PC	Std ref.	Conditions	SS	Steps	Failure/SS					Note
						Lot 1 0193	Lot 2 0358	Lot3 V992	Lot 4 UY32	Lot 5 VB2F	
HTB/HTOL	N	JESD22 A-108	Ta = 125°C or 150°C, BIAS		168 H	0/77	0/77	77	77	0/77	Lot 1, 2 at 150°C
					500 H	0/77	0/77	77	77	0/77	
					1000 H	0/77	0/77	77	77	0/77	
ELFR	N	JESD22 A-008	Ta = 150°C or 150°C, BIAS		48H	0/800	0/240				
HTSL	N	JESD22 A-103	Ta = 150°C		168 H	2x0/50	3x0/50	2x0/50	2x0/50	0/77	
					500 H	2x0/50	3x0/50	2x0/50	2x0/50	0/77	
					1000 H	2x0/50	3x0/50	2x0/50	2x50	0/77	
					1500H		0/50			0/77	
					2000H					0/77	
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	PASS	PASS	
UHAST	Y	JESD22 A-102	85%RH / Ta=130°C		96 H	2x0/77	3X0/77	2X0/77	0/77	0/77	
TC	Y	JESD22 A-104	Ta = -55°C to 150°C		100 cy	2x0/77	3x0/77	2x0/77	2x0/77	0/77	
					200cy	2x0/77	3x0/77	2x0/77	2x0/77	0/77	
					500 cy	2x0/77	3x0/77	2x0/77	2x0/77	0/77	
					1000cy	2x0/77	3x0/77	2x0/77	2x77	0/77	
					2500cy		0/77				
THB	Y	JESD22 A-101	Ta = 85°C, RH = 85%, BIAS		168 H	0/77	0/77	77	77	0/77	
					500 H	0/77	0/77	77	77	0/77	
					1000 H	0/77	0/77	77	77	0/77	
					1500H		0/77			0/77	

## 6 ANNEXES

### 6.1 Tests Description

Test name	Description	Purpose
<b>Die Oriented</b>		
<b>HTOL</b> High Temperature Operating Life  <b>HTB</b> 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.
<b>HTRB</b> High Temperature Reverse Bias  <b>HTFB / HTGB</b> 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.
<b>HTSL</b> 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.
<b>ELFR</b> 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.
<b>Package Oriented</b>		
<b>PC</b> 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.
<b>AC</b> 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.
<b>TC</b> Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.



Test name	Description	Purpose
<b>TF / IOL</b> 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.
<b>THB</b> Temperature Humidity Bias	The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.	To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.
<b>Other</b>		
<b>ESD</b> 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.
<b>LU</b> 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.



## Public Products List

Public 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 assembly site for Standard products (General Purpose Analog) assembled in MiniSO8 packages

**PCN Reference** : AMS/20/12425

**Subject** : Public Products List

Dear Customer,

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

TSV712IST	TSV522AIST	TSV522IST
TSU112IST	OA2ZHA34S	TSZ122IST
OA2NP34S	TSV732IST	TS883IST
TSZ182IST	TSU102IST	TS882IST



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