PRODUCT/PROCESS CHANGE NOTIFICATION

PCN MMS-MIC/14/8747
Dated 14 Nov 2014

STR9 products in LQFP 12x12 & 14x14 packages - Back-end site transfer from Amkor ATK (Korea) to Amkor ATP (Philippines)

Table 1. Change Implementation Schedule

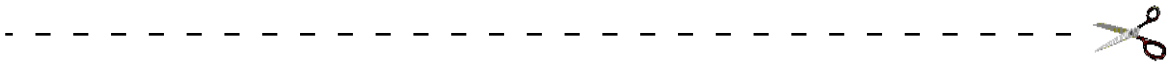
Forecasted implementation date for change	06-Mar-2015
Forecasted availability date of samples for customer	06-Feb-2015
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	06-Feb-2015
Estimated date of changed product first shipment	06-Mar-2015

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	STR9 products in LQFP 12x12 & 14x14 packages
Type of change	Package assembly location change
Reason for change	Amkor ATK (Korea) line closure
Description of the change	Due to Amkor ATK (Korea) line closure, ST Microcontrollers Division has decided to transfer manufacturing sites of LQFP 12x12 & 14x14 packages for STR9 family products, from Amkor ATK (Korea) to Amkor ATP (Philippines).
Change Product Identification	see indicated below
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN MMS-MIC/14/8747**
Please sign and return to STMicroelectronics Sales Office	**Dated 14 Nov 2014**

☐ Qualification Plan Denied	Name:
☐ Qualification Plan Approved	Title:
	Company:
☐ Change Denied	Date:
☐ Change Approved	Signature:

Remark

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DOCUMENT APPROVAL

Name	Function
Colonna, Daniel	Marketing Manager
Buffa, Michel	Product Manager
Narche, Pascal	Q.A. Manager

PRODUCT/PROCESS CHANGE NOTIFICATION

STR9 products in LQFP 12x12 & 14x14 packages - Back-end site transfer from Amkor ATK (Korea) to Amkor ATP (Philippines)

MMS - Microcontrollers Division (MCD)

Dear Customer,

Due to Amkor ATK (Korea) line closure, ST Microcontrollers Division has decided to transfer manufacturing sites of LQFP 12x12 & 14x14 packages for STR9 family products, from Amkor ATK (Korea) to Amkor ATP (Philippines).

What are the changes?

New Bill Of Material is described below:

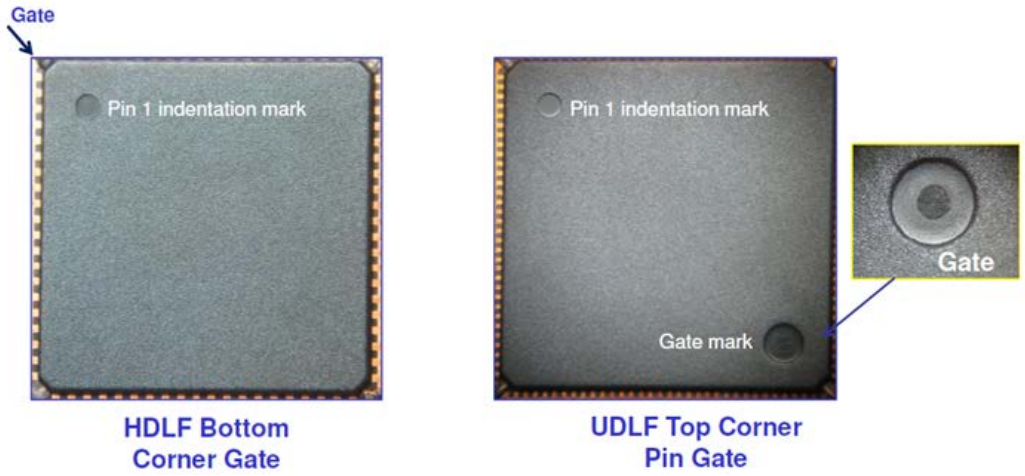
Package		Current	New
LQFP 12x12 & LQFP 14x14	Back end site	Amkor ATK (Korea)	Amkor ATP (Philippines)
LQFP 14x14 only	Mold compound	Sumitomo G700L	Sumitomo G631HQ
	Leadframe	High Density Lead Frame (HDLF)	Ultra high Density Lead Frame (UDLF) (*1)

Chosen Bill Of Material is standard Bill Of Material, already running in high volumes for LQFP at Amkor ATP (Philippines).

*(*1) Gate mark on Ultra high Density Lead Frame on LQFP 14x14 package only:*

An additional gate mark is visible on top of the package, in addition to pin 1 identification mark.

Amkor ATK1 *Amkor ATP1*



Why ?

Due to Amkor ATK (Korea) site closure, ST Microcontrollers division moves LQFP 12x12 & 14x14 packages production from Amkor ATK (Korea) to Amkor ATP (Philippines).

When ?

The production on the new back-end site will start from :

Package	Samples availability / Qual results date	Implementation / First shipment date
LQFP 12x12	Week 06 2015	Week 10 2015
LQFP 14x14	Week 10 2015	Week 14 2015

How will the change be qualified?

This change will be qualified using the standard STMicroelectronics Corporate Procedures for Quality and Reliability, in full compliancy with the JESD-47 international standard. You can find below Qualification Plan.

What is the impact of the change?

- Form: LQFP 12x12 package : no change

LQFP 14x14 package : Gate mark added

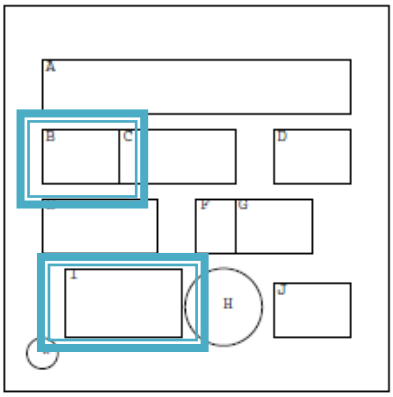
- Fit: no change

- Function: no change

How can the change be seen?

Traceability of the change is ensured by ST internal tools.

The marking instruction indicated on the products is changing from:



B : **Assembly plant** change from HP to 7B

I : **Country Of Origin** change from KOR to PHL

We remain available to discuss any concern that you may have regarding this Product Change Notification.

With our sincere regards.

Michel Buffa

Microcontroller Division General Manager

List of commercial products impacted

Commercial Product	Package
STR910FAM32X6	LQFP 12X12
STR911FAM42X6	LQFP 12X12
STR911FAM44X6	LQFP 12X12
STR911FAM44X6T	LQFP 12X12
STR911FAM46X6	LQFP 12X12
STR911FAM47X6	LQFP 12X12
STR911FAM47X6T	LQFP 12X12
STR910FAW32X6	LQFP 14x14
STR911FAW42X6	LQFP 14x14
STR911FAW44X6	LQFP 14x14
STR911FAW44X6T	LQFP 14x14
STR911FAW46X6	LQFP 14x14
STR911FAW47X6	LQFP 14x14
STR912FAW32X6	LQFP 14x14
STR912FAW42X6	LQFP 14x14
STR912FAW44X6	LQFP 14x14
STR912FAW44X6T	LQFP 14x14
STR912FAW46X6	LQFP 14x14
STR912FAW46X6T	LQFP 14x14
STR912FAW47X6	LQFP 14x14
STR912FAW47X6T	LQFP 14x14

RERMCD 1418- QUALIFICATION PLAN

Qualification of :

LQFP12x12 at Amkor Philippines for STR9 Stacked dice

Qualification Reference:	**RERMCD1418**
Issued on:	**Nov 3, 2014**
Assembly Plant:	**AMKOR Philippines (ATP)**
Assembly Line:	**LQFP**
Package / Process:	**12x12 x1.4 (80Leads)**
Device:	**STR9**
Lead termination:	**Pure Sn**
MSL:	**MSL3**

Purpose

Qualification of new assembly line for STR9- stacked dice in LQFP 12x12 package assembled at ATP (Philippines) with no change of the Bill Of Material.

Test Vehicles :

Package/ Assembly Line	Package	Device	Diffusion Process	Number of Lots
LQFP12*12	80L	STR9 Microcontroller - die 4P1 Memory Flash - die P4Q2	HCMOS8D- ST Rousset CMOST9X- ST Catania	**1**

Package Reliability Trials :

Reliability Trial		Test Conditions	Pass Criteria	Unit per Lot	Qual Lot nb
PC + SAM	Pre Conditioning: Moisture Sensitivity Jedec Level 3 J-STD-020/ JESD22-A113	Bake (125°C / 24 hrs) Soak (30°C / 60% RH / 192 hrs) for level 3 Convection reflow: 3 passes with Jedec level 3	3 passes MSL3 No delamination	**308**	**1 lot**
AC (1)	Autoclave JESD22 A102	121°C, 100% RH, 2 Atm	96h	**77**	**1 lot for monit.**
TC (1)	Thermal Cycling JESD22 A104	-50°C, +150°C	1000Cy	**77**	**1 lot for monit.**
THS(1)	Temperature Humidity Storage JESD22 A110	85°C, 85% RH, no bias	1000h	**77**	**1 lot for monit**
HTSL(1)	High Temperature Storage Life JESD22 A103	150°C- no bias	1000h	**77**	**1 lot for monit**
Physical dimension (2)	Dimension measurement JESD 22B100/B108		CPK >1.33 PPK >1.67	**10**	**1 lot**
Solderability (2)	Lead solderability JESD 22B102		>95% lead coverage	**45 leads**	**1 lot**

(1) Tests performed after preconditioning
(2) Full construction analysis with focus on stacked dice to be done on 20 parts at ST Muar.

RERMCD 1419- QUALIFICATION PLAN

Qualification of :

LQFP14x14 at Amkor Philippines for STR9 Stacked dice

Qualification Reference:	**RERMCD1419**
Issued on:	**Nov 3, 2014**
Assembly Plant:	**AMKOR Philippines (ATP)**
Assembly Line:	**LQFP**
Package / Process:	**14x14 x1.4 (128Leads)**
Device:	**STR9**
Lead termination:	**pure Sn**
MSL:	**MSL3**

Purpose

Qualification of new assembly line for STR9- stacked dice in LQFP 14x14 package assembled at ATP (Philippines).

Test Vehicles :

Package/ Assembly Line	Package	Device	Diffusion Process	Num-ber of Lots
LQFP14*14	128L	STR912FAW46X6 Microcontroller- die 4P1 Memory Flash – die P4D2 STR911FAW44X6 Microcontroller- die 4P1 Memory Flash – die P2D1	 HCMOS8D- ST Rousset CMOST9X- ST Catania HCMOS8D- ST Rousset CMOST9- ST Catania	 **2** **1**

Package Reliability Trials :

Reliability Trial		Test Conditions	Pass Criteria	Unit per Lot	Qual Lot nb
PC + SAM	Pre Conditioning: Moisture Sensi-tivity Jedec Level 3 J-STD-020/ JESD22-A113	Bake (125°C / 24 hrs) Soak (30°C / 60% RH / 192 hrs) for level 3 Convection reflow: 3 passes with Jedec level 3	3 passes MSL3 No delamination	**333**	**3 lots**
AC (1)	Autoclave JESD22 A102	121°C, 100% RH, 2 Atm	96h	**77**	**3 lots**
TC (1)	Thermal Cycling JESD22 A104	-50°C, +150°C	1000Cy	**77**	**3 lots**
THB(1)	Temperature Humidity Bias JESD22 A101	85°C, 85% RH, bias	1000h	**25**	**3 lots**
THS(1)	Temperature Humidity Storage JESD22 A110	85°C, 85% RH, no bias	1000h	**77**	**3 lots**
HTSL(1)	High Temperature Storage Life JESD22 A103	150°C- no bias	1000h	**77**	**3 lots**
ESD CDM	ESD Charge Device Model ANSI/ESDSTM5.3.1	min 250V	250V	**3**	**1 lot**
Physical dimension	Dimension measurement JESD 22B100/B108		CPK >1.33 PPK >1.67	**10**	**1 lot**
Solderability	Lead solderability JESD 22B102		>95% lead coverage	**45 leads**	**1 lot**

(1) Tests performed after preconditioning

Attachment : Reliability tests description

Package oriented tests/ Trials description

1. Preconditioning

According to ST spec 0098044.
Preconditioning test sequence simulates storage and soldering of SMD (surface mount devices) before submitting them to the reliability tests. It aims to validate the moisture sensitivity level of the package, and prepare it to the stress of additional reliability tests, thus enabling a good modelization of the life of the packaged product.
Out-of-bag floor life storage and soldering are modeled by the following test sequence:

- Bake to completely remove moisture from the package;
- Moisture soak according to the package moisture level;
- IR reflow.

The aim is to check that the chip and plastic package withstand the stress due to report on card. Depending on their technology, packages may absorb moisture during their transportation and/or storage, moisture that is released during the soldering operation. At this step, the moisture absorbed is vaporized due to high temperature of solder report process. This phenomenon can create plastic swelling, "pop corn" effect, and cracks which eventually results in wire breakage, passivation cracks, and delamination.

2. Autoclave (AC)

The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.
Purpose: to investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.
To point out critical water entry paths with consequent electrochemical and galvanic corrosion.

3. Temperature Cycling (TC)

The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere (thermal gradient typical 10 C/min).
Purpose: 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, moulding compound delamination, wire-bonds failure, die-attach layer degradation.

4. Temperature Humidity Bias (THB)

The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.

The Temperature Humidity Bias follows the same method than HAST at lower temperature.

Purpose: to investigate failure mechanisms activated in the die-package environment by electrical field and wet conditions.
Typical failure mechanisms are electro-chemical corrosion and surface effects related to the molding compound.

The package moisture resistance with electrical field applied is verified, both electrolytic and galvanic corrosion are put in evidence.

Conditions:

- Ta=85°C; R.H.=85%;
- Power supply voltage less or equal to max operative voltage to not exceed Tj = 95 °C.

5. Temperature Humidity Storage (THS)

The Temperature Humidity Storage is stored at controlled conditions of high temperature and relative humidity.

The Temperature Humidity Storage follows the same method than Unbiased HAST at lower temperature.

Purpose: to evaluate the reliability of non-hermetic packaged solid-state devices in humid environments. It is a highly accelerated test which employs temperature and humidity under non-condensing conditions to accelerate the penetration of moisture through the external protective material (encapsulant or seal) or along the interface between the external protective material and the metallic conductors which pass through it.
Bias is not applied in this test to ensure the failure mechanisms potentially overshadowed by bias can be uncovered (e.g. galvanic corrosion). This test is used to identify failure mechanisms internal to the package.

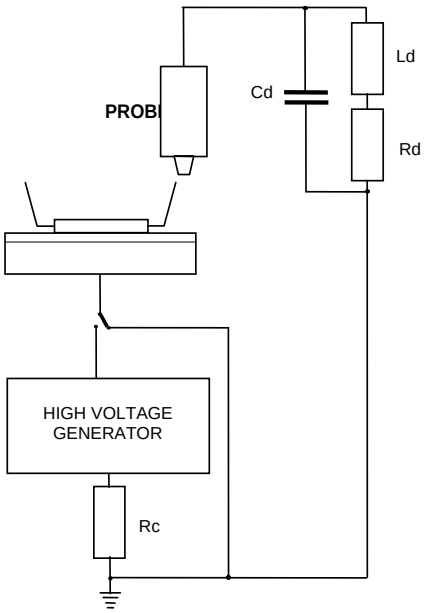
- Test conditions: 85°C / 85% RH.
- No power supply

6. High Temperature Storage Life (HTSL)

The device is stored in unbiased condition at the max. temperature allowed by the package materials, sometimes higher than the max. operative temperature.
Purpose: to investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding.

7. ESD Charge Device Model (CDM)

This ESD failure model is associated with the device and package itself. The CDM is intended to simulate charging/discharging events that occur in production equipment and processes. The Field induced CDM equivalent circuit used to describe this phenomenon is illustrated in Figure 1.



Possible (but not exhaustive) values of impedance:

Rc ≥ 100 MΩ
Rd = 1 - 10 Ω
Ld = 5 nH
Cd = 10 pF

Fig.1 : Field induced CDM equivalent circuit

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