



PRODUCT/PROCESS CHANGE NOTIFICATION

PCN CRP/06/1972
Notification Date 09/14/2006

Change on lead-free solder balls composition

CRP - Corporate Quality Assurance

Table 1. Change Identification

Product Identification (Product Family/Commercial Product)	BGA products as described in attachment
Type of change	Package assembly material change
Reason for change	To offer leadfree balls compliant with RoHs requirements
Description of the change	Replacement of SAC+ balls by SACN solder balls using same process and in process control methods. No change in board assembly conditions. No change in BGA pad metallurgy: CuOSP.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	No change in marking. Traceability by trace code
Manufacturing Location(s)	

Table 2. Change Implementation Schedule

Forecasted implementation date for change	10-Dec-2006
Forecasted availability date of samples for customer	01-Oct-2006
Forecasted date for STMicroelectronics change Qualification Plan results availability	01-Oct-2006
Estimated date of changed product first shipment	10-Dec-2006

Table 3. Change Responsibility

	Name	Signature	Date
Division Product Manager	please see attachment		Sep.12 ,06
Division Q.A. Manager	please see attachment		Sep.12 ,06
Division Marketing Manager	please see attachment		Sep.12 ,06

Table 4. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt		PCN CRP/06/1972	
Please sign and return to STMicroelectronics Sales Office		Notification Date 09/14/2006	
<input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved	Name:		
	Title:		
	Company:		
	Date:		
	Signature:		
Remark			

PCN CRP/06/1972

Change on lead-free solder balls composition

DETAILS

Change identification

Product identification (product family / Commercial product)

All BGA products having following characteristics:

- Sawn matrix BGA, with CuOSP pad finishing
- With up to 15x15mm² package body dimension
- With up to 0.45mm balls diameter

Reason of change

To offer lead-free balls compliant with RoHs requirements:

- Without lead (Pb): already achieved with SAC+
- Without antimony (Sb): not achieved with SAC+
- With Inter-metallic properties showing better failure mode (more ductile) than SAC+
- With good Board Level Reliability
- Standardization to a common industry SACN metallurgy used in matrix BGA

Description of the qualification program

Base on typical test vehicle, the qualification had been extended by similarity to above matrix BGA family.

Manufacturing locations

All manufacturing sites: ST and subcontractors

Change responsibility

Function	Name
Back End Project Manager	Carlo COGNETTI
Corporate Quality Manager	Marie-Helene SIBILLE

ROHS Compliance

The Lead-free BGA using the new solder balls: SACN will remain fully ROHS compliant.

Technical information on the change

The new balls metallurgy will increase the bonding strength of solder balls on BGA reinforcing the intermetallic strength at BGA side with more ductile balls.

SACN is standing for **Sn** (Tin) – **Ag** (Silver) – **Cu** (Copper) – **Ni** (Nickel)
Ni is used as a dopant that concentrates in (Cu, Ni)₆Sn₅ intermetallics.

Solder balls composition do not impact the package structure reliability.

Mounting of PBGA packages on printed boards

No change is needed in board mounting soldering profile and no change is required in lead-free solder pastes used to solder Lead-free Matrix BGA packages using SACN balls compare to packages using SAC+ balls.

Qualification information

This solder balls change does not affect the package structure and reliability.
All the relevant qualification tests have been done following qualification standard requirements JEDEC JESD47D and QC100 together with a risk analysis versus the process change.

The new alloy was tested and qualified, under following conditions:

- Ball shear: shear force and failure mode
- Board level solder joint reliability under drop testing
- Board level solder joint reliability under thermal cycling
- Construction analysis, including ball integrity, exposed pad, inter-metallic structure, and solder-ability tests.

Tests are showing good performances and compliance to ST qualification criteria.

Tests results summary

	SACN
Ball shear	OK
Drop testing on board	OK
Thermal cycling on board	OK
Construction analysis	OK

Balls shear test

Shear test is again improved reducing to close to zero the inter-metallic breaking mode.

Drop testing on board

Drop test resistance on chosen tests vehicles are all very good.

As reference, on 10x10-244 TFBGA package with SACN solder balls mounted on board the characteristic life has been improved by 30%.

Thermal cycling on board

Thermal cycles resistance on chosen tests vehicles have passed 1000 thermal cycles (-40°C / +125°C) without failures.

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