

To:

Notification about change of WCSP products' UBM process (Urgent)

TOSHIBA

Issue No. H440-3A-001P

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Quality Assurance Department

Himeji Operations - Semiconductor

Toshiba Electronic Devices & Storage Corporation

1. Outline of change

1) Background of change



Our outsourced company has informed us that an indirect material (chemical solution A) used for the UBM process in which a metallic film is formed under solder bumps will be discontinued regarding WCSP products currently being manufactured.

Due to this, we will change to a UBM process using chemical solution B with which the outsourced company has a track record of manufacturing other devices.

In order to maintain a stable supply, the names of the products after the change will not change, and a “running change” will be applied after the existing products are out of stock.

We apologize for this short notice, but we would sincerely appreciate your understanding.

2) Description of change

Product Group	MOSFET	Load Switch IC	Package Image
Package Name	WCSP6C	WCSP4C WCSP6C	  WCSP4C WCSP6C
Product Before Change	UBM: Ti/NiV/Cu		
Product After Change	UBM: Ti/Cu/Cu		

※ Although the chemical will be changed, the outsourced company has a track record of manufacturing other devices with the process using chemical solution B.

3) Time of change

Products after the change will be able to be mass-produced from November 2023.

The products after the change will be supplied after the existing products are out of stock.

4) Products subject to change

This process change will not entail any change of the products' names. Please see the attachment.

2. Schedule for supplying products after change

The schedule for supplying products before and after the change is as follows.

Since the process after the change has a solid track record, products manufactured in the new process will be supplied after the existing products are out of stock.

We will report results of evaluating products of the new process around the end of May.

Item	2023												2024				
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	
Status of production (Old/new processes)																	
Announcement of change, notification of first lot		● Announcement															

Last production with old process

Start of production with new process

Running change: Products with the process changed will be supplied after the existing products are out of stock. The new process can be identified by the lot number.

● **Completion of evaluations**

● **Start of notifying of the first lot after the change**

3. Description of change (5M1E)

Changes in **5M1E** are shown below.

5M1E	Change Point
Man	No change
Machine	To be changed
Measurement	No change
Method	No change
Material	To be changed: UBM (Chemical solution A ⇒ B, Ti/NiV/Cu ⇒ Ti/Cu/Cu)
Environment	No change

These changes will not affect the products' electrical characteristics, reliability, etc.

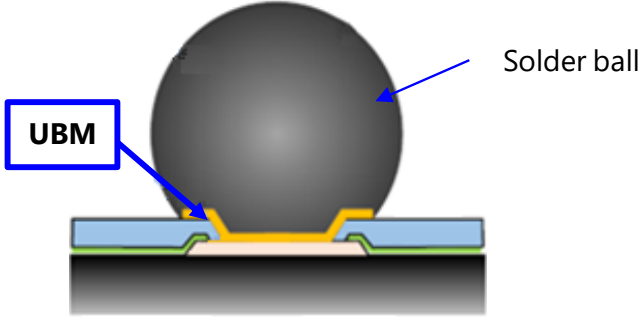
4. Change points and evaluations (DRBFM)

The DRBFM is as follows.

No	Part & product/Change and its purpose		Function	Concern from change (Failure mode)	Case where a concern arises	Effects on customer	Item reflected (Removal of concerns)	Action (based on result of DRBFM): What action was taken?				
	Ban against change without purpose		Required performance	Loss of function, lack of merchantability, and side effect caused by change	Cause, factor		(Current process control/design)	Item to be reflected on design drawing	Item to be reflected on evaluation (New evaluation method)			Item to be reflected on manufacturing (Measure)
	Part, product	Change							Item	Test result (Defectives / quantity tested)	Judgment	
1	Machine	JBM machine	UBM forming	Decrease in characteristics yields due to deterioration of UBM's finished condition	Insufficiency in optimization of process conditions	None	- Use of proven machine - Preparation and maintenance of standard documents	None	Check on assembly yields and appearance yields	Target completion date of evaluations: May 2023	- CP control - Check in testing process	
2	UBM Cu plating	JBM Cu plating forming	UBM forming	Decrease in characteristics yields (Ron) due to failure in Cu plating	Insufficiency in optimization of Cu plating process conditions	None	Application of proven machine and process conditions	None	- Check on characteristics yields - Check on initial characteristics		- CP control - Check in testing process	
3	Metallization material	Ti/Ni/Cu -Ti/Cu/Cu	UBM forming	Decrease in characteristics yields and reliability (moisture resistance) due to degradation of UBM's finished condition	Insufficiency in optimization of mask size and etching conditions	None	Application of proven process conditions	None	- Check on characteristics yields - Reliability (THB) check		Check in testing process	
4				Decrease in characteristics yields due to deterioration of contact resistance	Thicker UBM film	None	Application of proven process conditions	None	- Check on characteristics yields - Check on initial characteristics		Check in testing process	
5				Decrease in ball shear strength	Insufficiency in optimization of UBM structure	- Failure in device mounting - Deterioration of reliability	Application of proven process conditions	None	- Check on ball shear strength	Unit evaluations revealed no problem (0/250pcs).	OK	CP control (Ball shear test)
6				Decrease in appearance yields due to failure in product height	- Insufficiency in optimization of UBM structure - Insufficiency in optimization of mask size	None	Application of proven process conditions	None	- Check on appearance yields - Measurement of product height	Unit evaluations revealed no problem (0/500pcs).	OK	CP control (Ball height measurement)
7	Decrease in appearance yields due to failure in ball height	- Insufficiency in optimization of UBM structure - Insufficiency in optimization of mask size	None	Application of proven process conditions	None	- Check on appearance yields - Measurement of ball height	Unit evaluations revealed no problem (0/500pcs).	OK	CP control (Ball height measurement)			
8	Decrease in appearance yields due to failure in ball diameter	- Insufficiency in optimization of UBM structure - Insufficiency in optimization of mask size	None	Application of proven process conditions	None	- Check on appearance yields - Measurement of ball diameter	Unit evaluations revealed no problem (0/500pcs).	OK	CP control (Appearance inspection)			

5. Change points

The only point that will be changed in this process change will be the UBM structure.

Item	Product Before Change	Product After Change
Chip	No change	
Chemical Solution	Chemical solution A	Chemical solution B
UBM	Ti/NiV/Cu	Ti/Cu/Cu
Ball Diameter/Material	No change	
Cross-sectional Structure	 <p>The diagram shows a cross-section of a solder ball assembly. A dark grey spherical solder ball is mounted on a substrate. The substrate consists of a bottom layer (black), a thin green layer, and a yellow UBM (Under Bump Metallization) layer. The solder ball is connected to the UBM layer. Labels 'UBM' and 'Solder ball' with blue arrows point to the yellow layer and the dark grey ball, respectively.</p>	

6. Evaluation results

The following are the results of unit evaluations of products from the UBM process using chemical solution B which has a track record of manufacturing.

No problems were found in process capability of each item.

Unit evaluations (One representative lot)

Item	Purpose of evaluation	Product before change	Product after change
Ball shear	UBM structure evaluation	1.86	2.33
Bal height	Product evaluation	3.01	5.90
Ball diameter	Product evaluation	2.71	4.53

7. Control plan

QC process flow (Applicable to all WCSP products subject to the change)

The basic QCS will not be affected by the process change.

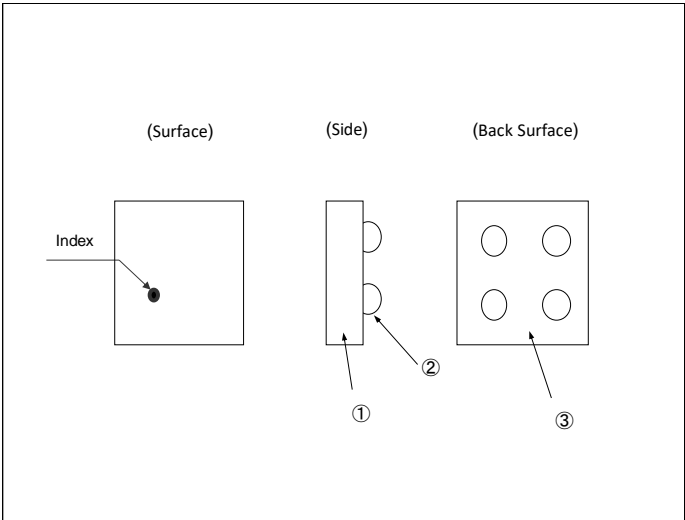
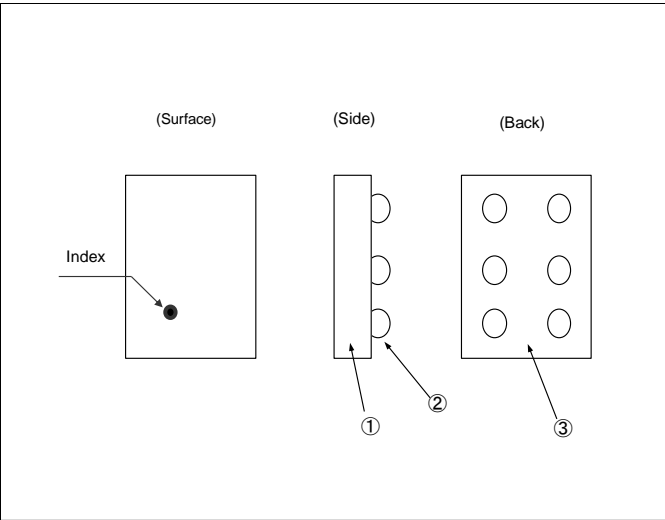
Manufacture Production		Items Controlled/Inspected	Check Frequency
Flow Chart	Process		
▽	(Wafer)		
○—□	Passivation Deposition	Film Thickness	Once / Day
○—□	Solde Ball UBM Deposition	Film Thickness	Once / Lot
○—□	Lapping	Wafer Thickness	Once / Lot
○—□	Marking	Appearance	Once / Lot
○—□	Solde Ball Deposition	Ball Heigth	Once / Lot
□	Testing	Electrical Characteristics	
○—□	Dicing	Kerf Width	Once / Lot
▽	(Taping Material)		
○	Taping		
□	Appearance Inspection		
▽	(Packing Material)		
○	Packing		
□△	Quality Monitoring	Electrical Characteristics Reliability Test	
▽	Shipping		
Symbol	▽:Storage □△:Special check	○:Operation ○—□:Check	□:100%Test □△: Sampling inspection

The above process may be changed or rationalized based on the result in our process.

8. Construction drawing

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There are no differences in construction drawing before and after the process change.

WCSP4				WCSP6			
							
NO.	Name	Material	Comment	NO.	Name	Material	Comment
1	Chip	Si		1	Chip	Si	
2	Solder Ball	Sn-Ag-Cu		2	Solder Ball	Sn-Ag-Cu	
3	Passivation	Polyimide		3	Passivation	Polyimide	
-	-	-		-	-	-	

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Our Semiconductor and Storage products
will always be a driving force to change the world

Toshiba Electronic Devices and Storage, together with our customers, will accelerate our future journey.
We aim to be a company that will be chosen for our pioneering technology and spirit embedded in our products.

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